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Final Report on the

Key comparison CCAUV.A-K6

Summary

The Key comparison CCAUV.A-K6 has been carried out under the auspices of the Consultative Committee on Acoustics, Ultrasound and Vibration (CCAUV) of the International Committee of Weights and Measures (CIPM). This comparison is concerned with primary pressure calibration of laboratory standard microphones type LS2P. The participating NMI's are HBK-DPLA (Denmark), CENAM (Mexico), GUM (Poland), INMETRO (Brazil), KRISS (Korea), LNE (France), METAS (Switzerland), NMIA (Australia), NMIJ (Japan), NMISA (South Africa), NRC (Canada), UME (Turkey) and VNIIFTRI (Russia). The role of Pilot laboratory was undertaken by LNE (France). The measurements took place between March 2019 and December 2020. Two LS2P microphones were circulated. This report includes the measurement results from the participants, information about their calibration methods, and the analysis leading to the assignment of the Key Comparison Reference Values (KCRV) and Degrees of Equivalence (DoE).

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1 Contents

2 Introduction

The CCAUV.A-K6 is a Key comparison realised under the auspices of the CIPM CCAUV.

The standards circulated among the laboratories were two LS2P microphones of the type Brüel & Kjær 4180. The microphones had to be calibrated in the scope given in Table 1 using a primary method under pressure conditions.

Table 1. Scope of key comparison.

Frequency range	Sensitivity level	Sensitivity phase
2 Hz - 20 Hz (1/3-octave)	Optional	Optional
20 Hz – 25 kHz (1/3-octave)	Mandatory	Optional

Thirteen national measurement institutes took part and the LNE (France) piloted the project. The participants are listed in Table 2. The measurements took place between March 2019 and December 2020. Two LS2P microphones were circulated. This report includes the measurement results from the participants, information about their calibration methods, and the analysis leading to the assignment of the Key Comparison Reference Values (KCRV) and Degrees of Equivalence (DoE).

Table 2. List of participating institutes

Participant (in order of participation)	Acronym	Country	Country code
Hottinger Brüel & Kjær A/S	HBK-DPLA	Denmark	DK
Centro Nacional de Metrología	CENAM	Mexico	MX
Central Office of Measures	GUM	Poland	PL
Instituto Nacional de Metrologia, Qualidade e Tecnologia	INMETRO	Brazil	BR
Korea Research Institute of Standards and Science	KRISS	Korea	KR
Laboratoire National de Métrologie et d'Essais	LNE	France	FR
Federal Institute of Metrology METAS	METAS	Switzerland	CH
National Measurement Institute, Australia	NMIA	Australia	AU
National Metrology Institute of Japan, AIST	NMIJ/AIST	Japan	JP
National Metrology Institute of South Africa	NMISA	South Africa	ZA
National Research Council of Canada	NRC	Canada	CA
TÜBITAK Ulusal Metroloji Enstitüsü	UME	Turkey	TR
All-Russian Scientific Research Institute of Physical Technical Measurements, Rosstandart	VNIIFTRI	Russia	RU

3 Comparison protocol

The technical protocol for the Key comparison CCAUV.A-K6 [1] was approved by all participants. It specified the determination of the pressure sensitivities of two LS2P microphones by using a primary method in pressure conditions. It specified that where reciprocity calibration was used, it had to be according to IEC 61094-2:2009 [2]. It was emphasized that the results had to be corrected to the reference environmental conditions given in IEC 61094-2:2009.

Table 1 shows the measurand and frequency ranges within the scope of the comparison. Participants were asked to complete the mandatory elements. Each laboratory was asked to determine the open-circuit pressure sensitivity level and phase (optional) of each reference microphone.

The microphones were circulated as travelling standards to each participant in turn, who were asked to calibrate them by their normal method (as might be offered to a customer) and report the results in their usual calibration certificate format. The first participant received the microphones in March 2019 and the final participant completed their measurements in December 2020. It should be noted that the measurement phase of the comparison was interrupted several times in 2020 due to the closures of some institutes in the context of the COVID-19 crisis.

4 Stability of travelling standards

Two LS2P microphones, Brüel & Kjær 4180, serial numbers 2124385 and 2412872 were supplied respectively by NPL and LNE, they circulated among the participants. LNE has monitored the microphones since the beginning of the comparison. The monitoring consisted of pressure reciprocity calibrations. The measurements were made over the complete frequency range.

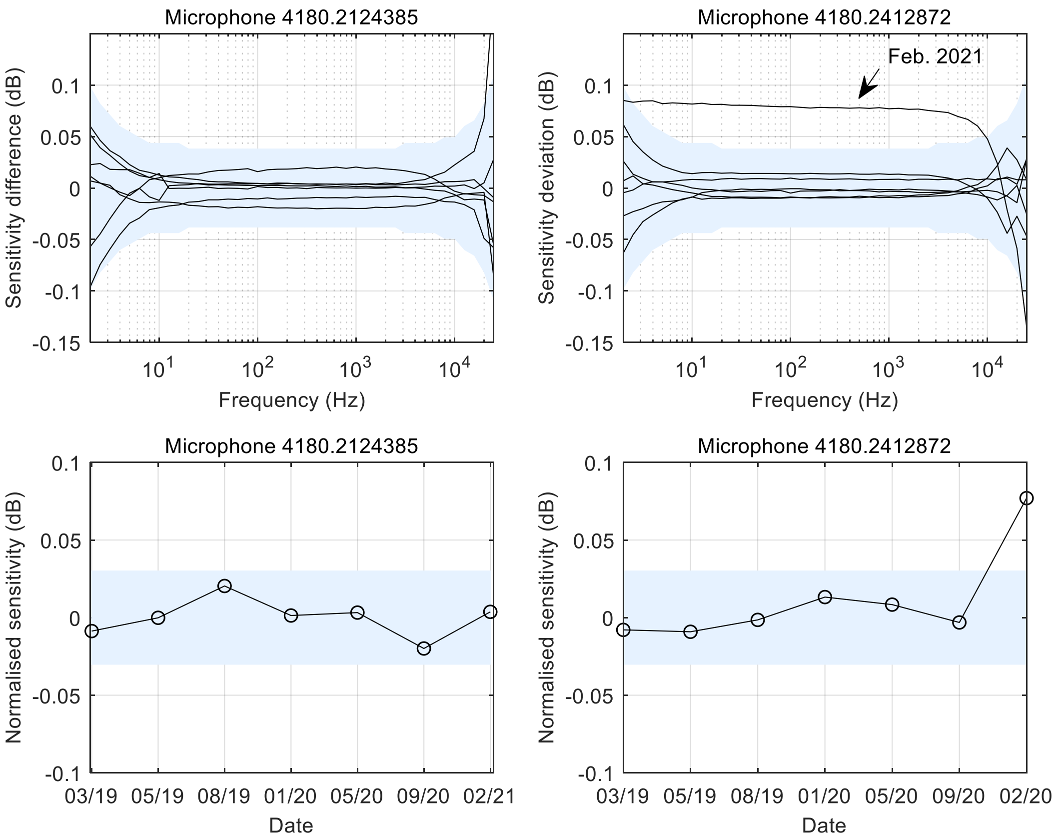

Figure 1. Upper charts: Difference of the sensitivity level obtained at each calibration at LNE with respect to their common average for each microphone as a function of frequency (blue area: Uncertainty bounds on sensitivity difference). Lower charts: Changes in the sensitivity level of the microphones at 1 kHz with respect to their common average for each microphone as a function of time (blue area: Uncertainty bounds on normalised sensitivity). Note: the measurement provided in 02/2021 is excluded here in the calculation of the average sensitivity level for microphone 4180.2412872.

Ideally, the behaviour of an individual microphone's sensitivity throughout the intercomparison would be describable by a constant value, allowing for some random variability within the type A allowances of the pilot laboratory's uncertainty budget (type B components are expected to act systematically). Figure 1 and Figure 2 show respectively in amplitude and phase the difference with respect to a common average for the two microphones over the whole frequency range. Figure 1 and Figure 2 show also respectively in amplitude and phase the temporal evolution of the sensitivities at 1 kHz for the two microphones.

It is worth noting that a drift of the microphone 2412872 was observed in its sensitivity amplitude at the last monitoring calibration in February 2021. Two laboratories are potentially affected by this drift: NMISA and INMETRO. The microphones travelled from LNE to NMISA in October 2020, then from NMISA to INMETRO in November 2020 and finally from INMETRO to LNE in January 2021. The drift in the sensitivity amplitude may have occurred during one of these travels. No trend was observed in phase.

Finally, it can be concluded that the microphone 4180 2412872 does not have an acceptable level of stability. The decision agreed with the participants of the Key comparison how to manage the observed drift is presented in section 7.

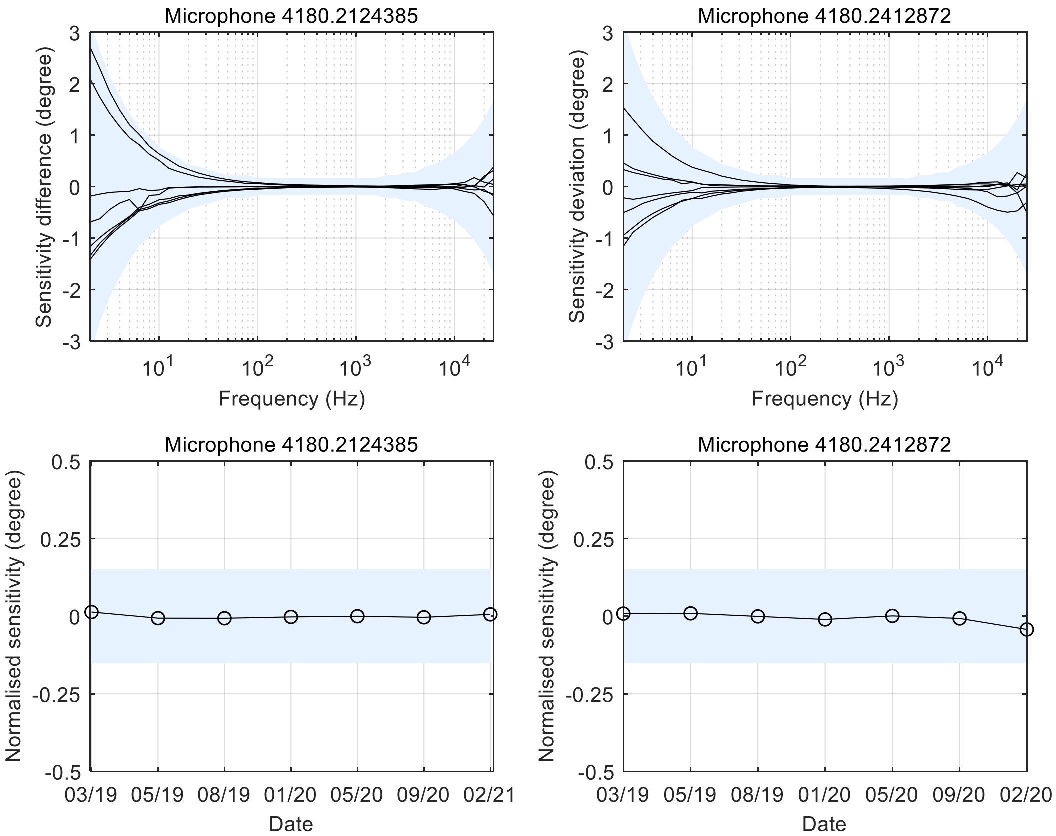

Figure 2. Upper charts: Difference of the sensitivity phase obtained at each calibration at LNE with respect to their common average for each microphone as a function of frequency (blue area: Uncertainty bounds on sensitivity difference). Lower charts: Changes in the sensitivity phase of the microphones at 1 kHz with respect to their common average for each microphone as a function of time (blue area: Uncertainty bounds on normalised sensitivity). Note: the measurement provided in 02/2021 is excluded here in the calculation of the average sensitivity phase for microphone 4180.2412872.

5 Calibration methods

5.1 Calibration methods

A description of the calibration methods and the reporting of results of each laboratory is given below as submitted by each laboratory. No editing of the contents but a small amount of reformatting has been performed.

5.1.1 HBK-DPLA

a) Method

The microphones were calibrated following HBK-DPLA method M3. The method will supersede method 2.10 that is currently used for accredited calibrations at HBK-DPLA. The method is an implementation of the methods described in IEC 61094-2. However, the standard does to some extent present different methods that can be chosen from, and there are also comments and recommendations that must be considered. The choices that have been made are believed to result in the most reliable results, but research is still in progress in order to clarify what is most correct. Particularly, this is the case for calculation of losses in the acoustic couplers used in the calibrations.

One deliberate departure from the required method of IEC 61094-2 is made, as the shield is driven in the ground shield configuration of both the transmitter and the receiver.

Overall measurement method

The calibrations are made with reciprocity calibration following HBK-DPLA method M3. Each sensitivity product is determined up to two times in four different plane wave couplers. In the second measurement the microphones are interchanged so that both microphones are used as transmitter and receiver in the measurement. For calibration of microphones with known calibration history, a reduced number of coupler and microphone combinations may be used. During the measurements the venting tubes of the couplers are closed with a needle, leaving only very small leakage around the needle and at the microphones' front surfaces.

The electrical transfer impedances are measured with Microphone Reciprocity Calibration System, Brüel & Kjær Type 9699 with a Brüel & Kjær PULSE analyser and the associated measurement program PRMP.EXE.

The acoustical transfer impedances, application of corrections and sensitivity calculations for each combination of three microphones in one coupler are done with a dedicated version of DFM microphone pressure sensitivity calibration calculation program, MP.EXE [H-D.6]. The dedicated version implements the differences in the methods described below from those implemented in the standard version 4.00 of the program.

The microphone parameters are determined when a microphone is measured for the first time. The parameters are only re-determined at following calibrations if there is indication that observed sensitivity changes are not due to random variations.

The results from the calculations for all coupler and microphone combinations are combined in Excel files. Calculation of mean values and the variation of the individual results are made in the Excel files. Macros have been developed for the Excel files for importing data and writing certificates.

Measurement of electrical transfer impedance

The electrical transfer impedance is measured with Microphone Reciprocity Calibration System, Brüel & Kjær Type 9699 with a Brüel & Kjær PULSE analyser. The current in the transmitter microphone is determined by measuring the voltage across a series capacitor. The series capacitor is built into the transmitter unit and directly coupled to the preamplifier.

The open circuit voltage of the receiver microphone is measured by the normal insert voltage technique. The gain of the transmitter preamplifier is measured by coupling the signal in series with the series capacitor and connecting the microphone housing to the output of the preamplifier. With this method the polarization resistor is changed from being in parallel to being in series with the series capacitance. This is compensated for in the measurement software.

The output from the two channels are measured simultaneously using two channels in a Brüel & Kjær PULSE analyzer so that the complex ratio between the output signals are determined first with current in the transmitter and subsequently with the same signal applied for reference measurement in both channels. The measurements are made using Brüel & Kjær's so-called SSR algorithm, which is an adaptive filtering method.

The shield is driven (having virtually the same potential as the center terminal of the microphones) on the transmitter as well as on the receiver. This is a deliberate deviation from the procedure in the standard. It does not influence the calibration results whether the guard is driven or grounded [H-D.7].

Calculation of acoustic transfer impedance

The acoustic transfer impedances of the couplers are calculated with the transmission line formulation in equation (4) of IEC 61094-2. The method is implemented for plane wave (PW) couplers in the calculation program. The details of the calculations that are ambiguously defined in the standard are given below.

<u>Heat conduction correction and viscous losses</u>

Annex A of IEC 61094-2 presents two methods for calculating the correction for losses in the coupler surfaces, the low frequency solution and the broad band solution. The low frequency method is the method proposed by Gerber in ref. A.1 in [H-D.2] and only takes into account heat conduction. The broad band solution is based on an approximative solution of Navier-Stokes equations for plane wave propagation in tubes, including both heat conduction and viscous losses.

The two methods are not consistent. The calculated corrections do intercept at a certain frequency, but with considerably different slope. At present, it is well established [H-D.3, H-D.4, H-D.5] that the broad band solution is wrong at frequencies below around 20 Hz, and, to the author's knowledge, a fully correct solution at the lowest frequencies it is still not found, and, in the opinion of the author, there is not full evidence available that support the choice of method at higher frequencies. However, at HBK-DPLA it is at present considered likely that the full low frequency solution is the most correct available for low and medium frequencies, whereas the broad-band solution is considered the best suggestion for the calculation of losses at higher frequencies. The calculations are made assuming this is correct. In order to minimise (unrealistic) fluctuations on the microphone responses, a gradual transition between the two methods is made in the frequency range from 1/7 to 2/7 of the lowest length resonance frequency in the coupler. The heat conduction correction of the low frequency solution is applied as a complex factor to the cross-sectional area of the coupler, considering the propagation coefficient, γ, purely imaginary.

Microphone parameters

The front cavity volume and the lumped microphone impedance parameters, resonance frequency, equivalent volume and loss factor are determined using the third method mentioned in E.4 of IEC 61094-2. The resonance frequency is determined as the 90° phase shift frequency. The total volume and the equivalent volume are determined by minimising the difference between the results from four different couplers. The loss factor is determined to give a reasonable match to the microphone's frequency response at and above the resonance frequency.

Note that the lumped parameter model of the microphone acoustic impedance is known to be too simple around and above the resonance frequency [H-D.8]. Therefore, it is not possible to make a perfect match with the lumped parameter model, but how the impedance varies around and above the resonance frequency requires further investigation before an improved model can be available.

At very low frequencies the compliances of the microphones increase, because the stiffness of the air in the back cavity is reduced due to heat conduction, cf. 7.3.3.2 of IEC 61094-2. At frequencies where the vent of the microphone becomes open to the surrounding air, the air stiffness contribution vanishes. For LS2 microphones the increase in compliance due to heat conduction corresponds to around 0.23 mm^3, and it corresponds to around 0.85 mm^3 at frequencies where the vent is open. This is taken into account in the calculations. The increase in sensitivity at low frequencies is directly proportional to the increase in compliance.

The low frequency value of the static pressure coefficient of the microphones is determined from the pressure sensitivity at 250 Hz [H-D.9].

The values of the microphone parameters used are stated in the certificates.

Radial wave motion

Radial wave motion in the couplers is calculated as described in ref. C.2 of [H-D.2], assuming a Bessel shaped diaphragm excursion.

Leakage

There are no capillary tubes in the couplers used. The couplers have short venting tubes that are closed with a needle during the calibrations, leaving only very small leakage around the needle and at the microphones' front surfaces. A small leakage is considered preferable to a complete sealing, as the measurements are known by experience to be unstable in completely sealed couplers, and as a microphone will change response if there is static pressure difference between the back and front of the diaphragm. The leakage is assumed to be small enough so as not to influence the measurement results.

Calculation of the sensitivity products

From each transfer impedance measurement and corresponding calculated acoustic transfer impedance the sensitivity product is calculated, cf. equation (2) of IEC 61094-2.

For each combination of the three microphones in one coupler (each individual calibration in one coupler), environmental parameter corrections are applied to the sensitivity products so as to achieve the sensitivity products valid at the mean environmental conditions during the measurement of that combination.

<u>Environmental parameter corrections</u>

The pressure sensitivity of condenser microphones depends on the static pressure and temperature, cf. Annex D of IEC 61094-2. Data for the frequency dependence normalized with resonance frequency and typical low frequency values of the coefficients are from the data resource file MP.TVR for MP.EXE [H-D.11] expressed as coefficients in dB/kPa, °/kPa, dB/K and °/K, respectively. These data are based on measurements on a large number of microphones at DTU and DFM [H-D.9, H-D.10]. The typical low frequency value is used for the temperature coefficient, whereas the low frequency value of the static pressure coefficient is calculated for the individual microphones from their pressure sensitivity at 250 Hz based on the data shown in [H-D.9].

The coefficients used for each of the three microphones measured are given in the Excel file “PsandTcoeffCCAUV-A-K6.xls”

Calculation of final results

From the sensitivity products valid at the mean environmental conditions during measurement the sensitivities valid at those environmental conditions are calculated.

The complex pressure sensitivities at mean environmental conditions are corrected to the sensitivities at reference environmental conditions by applying the individual environmental coefficients for each microphone.

Finally, the mean values of the sensitivities valid at mean environmental conditions during measurement and at reference environmental conditions are calculated for each of the microphones. As a rather large number of measurements are made, it is possible to evaluate whether any of the measurements are clearly outlaying from the others. A few outlaying measurement points are excluded from the mean value calculations.

The actual frequencies measured were third-octave frequencies from 1 Hz to 20 Hz and twelfth-octave frequencies from 21.1 Hz to 35.5 kHz.

Results

The results of calibration are given in the certificates issued, certificate numbers M3.00 1292 2.1 and M3.00-1292-3.1 and M3.00-1293-3.1. The results for the two circulated microphones are also reported in proforma Excel spreadsheet file, “CCAUV.A K6 results sheet BKSV-DPLA.xls”, as required by the protocol. The results for the third microphone measured are also reported in a proforma Excel spreadsheet file, “CCAUV.A K6 results sheet BKSV DPLA_Mic3.xlsx”

One certificate of calibration with results is issued for each of the two circulated microphones. The results given in the certificates are from one complete measurement as described above, and these results are also reported in the proforma results sheet circulated with the protocol. One certificate of calibration with results is made for the third microphone included for redundancy.

More measurements were made than those reported in the certificates. The average of the results from all complete measurements is given as supplementary information in a separate Excel file, “CCAUV.A K6 AverageForLNE.xlsx”. Further information on the individual measurements is available, if needed for the analysis of the results.

b) Deviations from standard

None declared.

c) Uncertainty calculations

Details on uncertainty calculations are given in Appendix A.

d) References

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[H-D.2] IEC 61094-2:2009, Measurement microphones – Part 2: Primary method for pressure calibration of laboratory standard microphones by the reciprocity technique

[H-D.3] Olsen, Erling Sandermann. Heat conduction correction in reciprocity calibration of laboratory standard microphones, presented at Inter-noise 2012, New York, USA, 2012.

[H-D.4] Jackett, Richard. The effect of heat conduction on the realization of the primary standard for sound pressure, Metrologia 51, 423, BIPM 2014

[H-D.5] Vincent, Paul et.al. Acoustic transfer admittance of cylindrical cavities in infrasonic frequency range, Metrologia 56, BIPM 2019

[H-D.6] Olsen, Erling Sandermann. MP.EXE DFM microphone pressure sensitivity calibration calculation program, Version 4.00, Publication s008.002, Danish Fundamental Metrology Ltd., Denmark 2010

[H-D.7] Sandermann Olsen, Erling; Carlsen, Henrik. Influence of ground-shield configuration in reciprocity calibration of laboratory standard microphones, presented at Inter-noise 2014, Melbourne, Australia, 2014.

[H-D.8] Sandermann Olsen, Erling; Frederiksen, Erling. Microphone acoustic impedance in reciprocity calibration of laboratory standard microphones, presented at Inter-noise 2013, Innsbruck, Austria, 2013.

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[H-D.10] Rasmussen, Knud. Static pressure and temperature coefficients of LS microphones. Draft paper, Technical University of Denmark, approximately 2000.

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[H-D.12] Expression of the Uncertainty of Measurement in Calibration, European co-operation for accreditation, Publication EA-4/02, December 1999.

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[H-D.14] Rasmussen, Knud. Free-field reciprocity calibration programs – A description of the measurement and calculation programs used at DPLA/DFM, Danish Fundamental Metrology Ltd., Denmark 2009

[H-D.15] Uncertainty of Voltage Ratio Measurements. B&K Reciprocity Calibration Systems Type 9699 applying PULSE Multi-analyzer. Brüel & Kjær document WW6065, Denmark 2009.

[H-D.16] Condenser Microphones and Microphone Preamplifiers, Data Handbook, Brüel & Kjær Publication BE 0089, Brüel & Kjær, 1982

5.1.2 CENAM

a) Method

The calibrations of LS2P microphones were carried out according to IEC 61094-2. Four plane wave couplers were used. They had nominal lengths of 9.4 mm, 4.7 mm, 3.8 mm and 3.0 mm.

Measurements are performed using a Brüel & Kjær 5998 Reciprocity Apparatus, without modifications.

The electrical transfer impedance was determined by the measurement of the transfer function between the transmitter and receiver channels, using a two channel signal analyzer B&K Pulse 3560D. Measurements were carried out using the FFT function in different frequency ranges in order to adjust the frequency resolution as close as possible to the set of frequencies required for the CCAUV.A-K6 Key Comparison. Final sensitivity levels and sensitivity phase, for the set of frequencies required, were obtained by linear interpolation from the modified frequency set used to perform measurements.

The coupled microphones are placed inside a pressure chamber that can be pressurized from the ambient static pressure at the Laboratory to the reference static pressure (101.32 kPa).

<u>Declared parameters</u>

The resonance frequency was estimated using the measured sensitivity phase. The microphone impedance parameters (equivalent volume, frontal cavity volume and loss factor) were obtained by the curve fitting method, using data obtained from the different sized couplers.

<u>Calculations</u>

Calculations of pressure sensitivity levels are carried out using the version 4.00 of the MP.EXE program, which takes into account additional heat conduction losses.

b) Deviations from standard

None declared.

c) Uncertainty calculations

Details on uncertainty calculations are given in Appendix A.

5.1.3 GUM

a) Method

GUM uses a customised version of NPL's reciprocity measurement system and software.

Open-circuit pressure sensitivity level and open-circuit pressure sensitivity phase of the microphones was determined by the reciprocity technique described in IEC 61094-2:2009.

A single acoustic coupler of diameter 9,2928 mm and length 3,8543 mm, filled with air, without capillary tubes, was used for the electrical transfer impedance measurements.

The total volume of each microphone was measured using an acoustical technique.

The acoustic impedance parameters were determined for each microphone individually. The method is based on the optimization of the results of four sensitivity magnitude and phase determinations obtained for four couplers of different length.

Heat conduction correction was calculated according to the broad-band solution given in IEC 61094-2, Annex A, clause A.3.

No radial corrections were applied.

b) Deviations from standard

None declared.

c) Uncertainty calculations

Details on uncertainty calculations are given in Appendix A.

5.1.4 INMETRO

a) Method

The following equipment have been used for the calibrations:

- Preamplifiers: B&K 2673 and ZE0796 with shunt capacitance of 4.7474 nF (250 Hz);
- Plane wave couplers: CPL2898, CPL2888, CPL203 and CPL204 with needle bung DA5563 to seal the couplers' capilar pressure equalization vents;
- Microphone fixture: B&K 1412 ;
- Measurement frontend: Aurélio Audio CMF22 (with integrated switching facility for insert voltage and mic-TX mode);
- Measurement and analysis software: Monkey Forest;
- Statistical post-processing: Excel worksheets.

The microphone fixture with the coupler and microphones inside was placed on a pneumatically suspended table (Kinetic Systems) normally used by the Electroacoustics Laboratory in order to reduce structure-borne infrasonic interference. The microphone's front cavity depths were measured with a microscope equipped with a meter scale and the coupler lengths determined by means of a Carl Zeiss UMM 500 precision coordinate measurement system.

Estimation of acoustic transfer impedances

The total acoustic impedance of each setup consisting of two microphones in a coupler, needed in the relations of equation (7), was estimated by using equation (4) on page 11 of the standard IEC 61094-2:2019 [IN.1]. This equation takes as input the individual acoustic admittances of the two microphones and the one of the coupler itself, connected by terms taken from transmission line theory to account for the idealized propagation of a supposed plane wave in the couplers.

Estimation of acoustic microphone admittances

To estimate the acoustic microphone admittances, values for the resonance frequency, the equivalent volume and the loss factor (see Table IN.1) were used to yield the lumped elements (acoustic mass, compliance and resistance, connected in series in the equivalent electric circuit) according to the three equations given in annex E of the standard [IN.1]. To account for thermal losses via the diaphragm, an additional admittance defined in equation A.5 on page 22 was added to each acoustic microphone admittance.

Estimation of the coupler's acoustic impedances

The acoustic impedance of each coupler, needed to feed equation (4) on page 11, was estimated by taking into account isothermal and viscous losses according to the "broadband solution" (A.3 on page 22). The ingredients for calculating the complex coupler impedance $Z_{a,0}$ along with the complex propagation coefficient γ (i.e. sound velocity, viscosity, ratio of specific heats, density and thermal diffusivity of the air enclosed in the coupler) were calculated according to the equation framework given in annex F. An offset of +1.5 °C was added to the laboratory temperature to estimate the temperature inside the coupler.

It was understood that the viscous and thermal losses contemplated by equations A.3 and A.4 are those occurring along the total length of the inner cylindrical surface comprising the coupler volume and the two microphone front cavities.

The thermal losses occurring at the end surfaces (diaphragms) were accounted for separately by equation A.5, defining an additional admittance to be added to the acoustic admittances of the microphones.

Excitation and signal processing

Instead of traditional pure tone testing, a broadband signal in conjunction with synchronous AD/DA conversion, FFT and deconvolution techniques was used to determine the complex electrical transfer functions between the transmitting and receiving microphones with high spectral resolution.

The special excitation signal generated for this purpose, using the method described in chapter 4.3 of reference [IN.2], has a duration of 2^{21} samples and was played back with a sample rate of 64 kHz, corresponding to roughly 32.8 seconds. The Figure IN.1 shows the spectrum of the excitation signal. It features a spectral distribution adapted to the prevailing background noise to render the SNR of the measurements almost frequency-independent. The envelope of the rms amplitude was constant (4 V). As there was a strong emphasis for the subsonic frequencies at the inferior limit of the frequency range to be reported, the excitation signal spent most of the time passing through these infrasonic frequencies.

Components that interfere in the determination of the sensitivity of the microphones, harmonic distortion artifacts and background noise were later suppressed by windowing the impulse responses correspondent to the measured transfer functions.

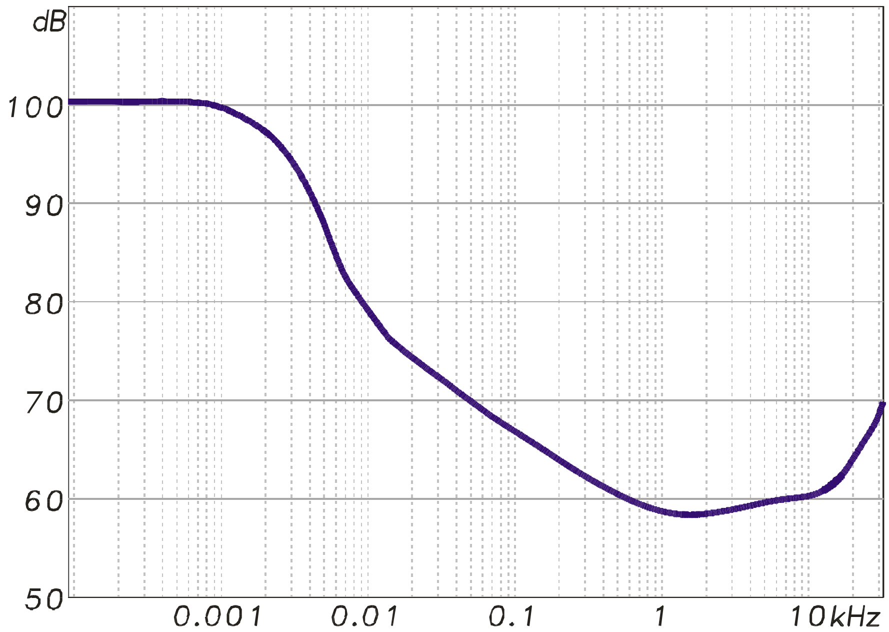

Figure IN.1. Frequency response of swept sine used as excitation signal.

As shown in the block diagram of the Figure IN.2, the swept sine drives the transmitting microphone preamplifier ZE0796 over a precision 10 kΩ resistor (built-in the measurement frontend to maintain compatibility with the B&K 5998 "reciprocity apparatus" concerning the frequency-dependant driving voltage of the TX microphone).

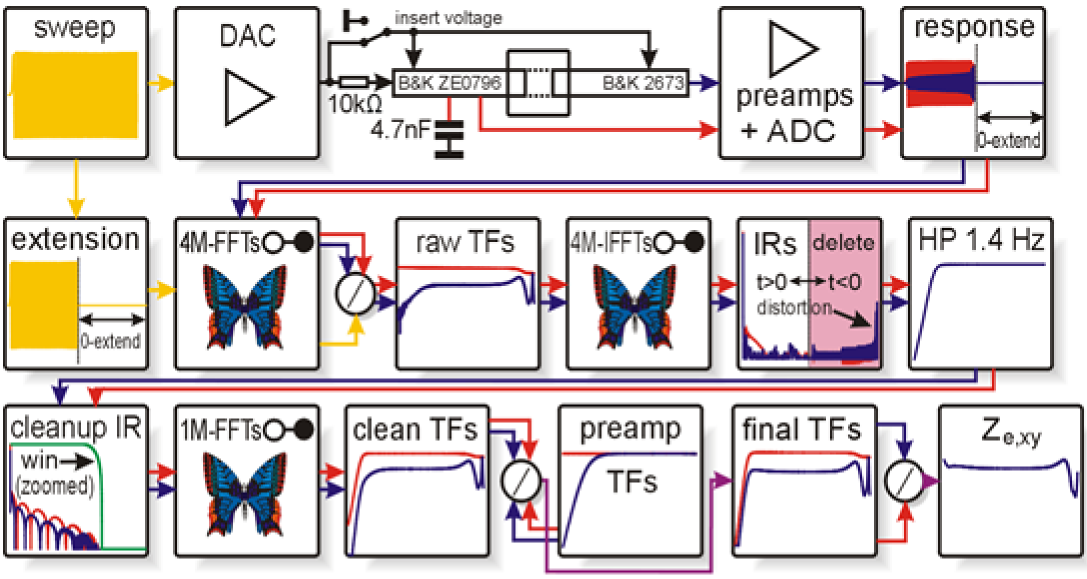

Figure IN.2. Block diagram of signal processing used to determine the electrical transfer impedance ($Z_{e,xy}$).

The acoustic signal is converted into an electric signal by the receiver microphone and an analog-to-digital converter (ADC) digitizes the electric signals. This way, the received signals can be processed using the fast Fourier transform (FFT). A linear deconvolution has been used by padding the excitation signal and the microphone preamplifier output signals with zeros to double the original length (Figure IN.2). The deconvolution is performed in the spectral domain via division of the response spectra by that of the excitation signal. To achieve highest accuracy, the deconvolution spectrum would normally be derived from a "reference measurement" in which the excitation signal is directly passed from the measurement system's output to the input. This allows to eliminate any deviation from the ideal frequency-independent gain of the measurement system's signal processing itself. However, this step has been omitted here because the correction of the gain and phase deviations of the measurement system channels occurs automatically by dividing the measured acoustical transfer functions by the electrical transfer functions obtained with the voltage insertion technique. The voltage insertion takes both the frequency response of the B&K preamplifiers (types ZE0796 and 2673) and the measurement system's signal processing into account.

The voltage drop over the shunt capacitor in the ZE0796 preamplifier that drives the transmitter microphone was measured simultaneously with the output voltage from the B&K 2673 preamplifier attached to the receiving microphone. The relays for switching between voltage insertion (Lemo 1B pin 1) and transmit mode (Lemo 1B pin 5) are integrated in the measurement frontend and remote-controllable from the measurement software.

The measurements of the electrical transfer impedances were accomplished with four different couplers (Brüel & Kjaer CPL2898, CPL2888, CPL203 and CPL204). The nominal volumes of these couplers are the following: CPL2898 is 0.7 cm^3, CPL2888 is 0.4 cm^3, CPL203 is 0.2 cm^3 and CPL204 is 0.25 cm^3.

The final transfer functions were obtained by executing FFTs over 106 samples only, resulting in a frequency resolution of 30.519 mHz between the FFT bins. To obtain the values at the exact 10 base fractional octave frequencies, a linear interpolation of the magnitude and phase values was performed between the frequency bins adjacent to the required report frequency.

The microphone sensitivity (magnitude and phase) was calculated according to equation (7), given on page 12 of the IEC 61094-2:2009 [IN.1]. The complex results were then adjusted to the reference environmental conditions by using the tenth-order polynomial corrections given by Knud Rasmussen in reference [IN.3]. As the measurements had been executed almost at sea level and very near to the reference temperature of 23 °C, the corrections were almost insignificant (in the range of the uncertainty budget).

Six replicas were obtained during six different days and the arithmetic mean calculated using these magnitude and phase values provide the final result reported by INMETRO. The deviation from the ideal 180° phase shift expected at low frequencies was mainly caused by the thermal loss corrections imposed by the IEC 61094-2:2009 standard [IN.1].

The Table IN.1 presents the microphone parameters used for the sensitivity calculation of the two microphones circulated for key comparison CCAUV.A-k6.

Table IN.1. INMETRO; Microphone parameters.

Microphone Parameters	Microphones	
	4180_2124385	4180_2412872
Front Cavity Volume (mm^3)	34.64	35.18
Front Cavity Depth (mm)	0.510	0.518
Equivalent Volume (mm^3)	9.4	9.0
Diaphragm Resonance Frequency (Hz)	21634.40	21717.10
Diaphragm Loss Factor	1.05	1.06

The measuring system (Aurelio CMF22) used to measure the electrical transfer impedance ($Z_{e,xy}$) was conceived at the Acoustic and Vibration Division (DIAVI) of INMETRO. The software Monkey Forest controls the Aurelio CMF22 and performs the complete calculation and final export of the sensitivity results of microphones.

During all electrical transfer impedance ($Z_{e,xy}$) measurements, the microphones 2124385 and 2412872 acted only as a receiver.

b) Deviations from standard

None declared.

c) Uncertainty calculations

Details on uncertainty calculations are given in Appendix A.

d) References

[IN.1]: IEC 61094-2:2009 – Primary method for pressure calibration of laboratory standard microphones by the reciprocity technique

[IN.2]: Swen Müller, Paulo Massarani, “Transfer-function Measurements with Sweeps”, Journal of the Audio Engineering Society 25, 1037-1067 (2001)

[IN.3]: Knud Rasmussen, “The Influence of Environmental Conditions on the Pressure Sensitivity of Measurement Microphones”. Brüel & Kjær Review 1, 2001, p. 1-13.

5.1.5 KRISS

a) Method

The calibration is performed by a reciprocity calibration according to IEC 61094-2 by using the Brüel & Kjær reciprocity calibration unit, type 5998. The microphones are coupled in pairs with two plane-wave couplers with nominal length of 4.7 mm and 9.4 mm, filled with air at all frequencies. A capillary tube was blocked by a needle and no capillary corrections were applied.

Declared parameters

The front cavity depths of the microphones are measured by the Video Measuring Scope, Nikon, VMH-300N. The equivalent volume is determined by fitting the final results for the two couplers at the frequency of about 250 Hz. The nominal value of resonance frequency and the loss factor are applied.

Calculations/Models

The microphone pressure sensitivities are calculated by using the Brüel & Kjær Sensitivity Calculation Program MP.EXE, Ver. 4.00. Corrections for radial wave motion in the couplers are not applied and the difference from the heat conduction correction with Geber’s full solution is included in the uncertainty budget.

b) Deviations from standard

None declared.

c) Uncertainty calculations

Details on uncertainty calculations are given in Appendix A.

5.1.6 LNE

a) Method

Microphone parameters determination

Determinations of the microphone parameters were carried out by running a calibration in two different couplers. The parameters are determined by minimizing the sensitivity level differences obtained in the two different couplers.

The dimensions of the used couplers are:

Type	UA 1430	UA 1414
Diameter (mm)	9.309	9.313
Length (mm)	4.701	9.402

Microphone sensitivity determination

Measurements were made in accordance of IEC 61094 2:2009. The effect of heat conduction in the coupler on sensitivity level and phase has been accounted for by using the “Broad-band” model of IEC 61094-2:2009 clause A.3. Radial wave motion in the couplers is calculated as described in ref. [C.2] of the standard, assuming a Bessel shaped diaphragm excursion.

Note: In order to be compliant with the standard IEC 61094 2:2009, the effect of heat conduction in the coupler on sensitivity level and phase has been accounted by using the “Broad-band” solution, despite the literature seems providing a better formulation at low frequencies (P. Vincent, D. Rodrigues, F. Larsonnier, C. Guianvarc'h, S. Durand. Acoustic transfer admittance of cylindrical cavities in infrasonic frequency range. Metrologia, Volume 56, Number 1). The “Heat conduction theory” component is added in the uncertainty budgets to take account the deviation of the “Broad-band” solution to ideal solution. This uncertainty component could be reduced if accounting the heat conduction effects with the formulation provided in the above paper.

The used coupler was the UA 1430 previously described. No capillarity tube was used and measurements were made at the local atmospheric pressure. Measurements were carried out from 1.995 Hz until 25119 Hz and repeated five times.

Microphone parameters determination

Serial number	2124385	2412872
Front cavity depth mm	0.513	0.519
Equivalent volume mm^3	8.9	9.0
Resonance frequency Hz	20800	21250
Loss factor	1.20	1.19
Front volume mm^3	34.8	35.3

Microphone sensitivity determination

Mean atmospheric conditions:

Microphone serial number	2124385	2412872
Mean pressure (hPa)	975.3	1006.7
Mean temperature (°C)	22.8	23.2
Mean relative humidity (%)	38	35

Results are corrected to the reference environmental conditions given in IEC 61094 2:2009 using the polynomial coefficients given in the reference “Technical Review Properties and Calibration of Laboratory Standard Microphones”, Brüel & Kjær n°1 2001”.

b) Deviations from standard

None declared.

c) Uncertainty calculations

Details on uncertainty calculations are given in Appendix A.

5.1.7 METAS

a) Method

METAS uses a measurement set-up, which was developed in-house around the B&K reciprocity apparatus B&K 5998. The data acquisition is performed by means of a National Instruments front-end involving an A/D- and D/A-conversion board PXI-4461. The measurement routine has been programmed in LabView. For the determination of the complex sensitivity (amplitude and phase) quasi stationary signals are analyzed by the sine-approximation method.

Pairings of laboratory standard microphones are made using different sets of couplers. For the calibration of LS2 microphones we are using a set of four sapphire couplers of nominal lengths of 3.06 mm, 3.75 mm, 4.70 mm and 6.10 mm. These couplers were designed by METAS – they don't have any capillary tubes. All measurements are performed in a quiet laboratory (semi-reflecting room) within the pressurized vessel (under stabilized environmental conditions being close to the standard pressure and temperature).

Geometrical data of the couplers are measured by the laboratory of dimensional metrology at METAS. The required microphone parameters are determined by fitting procedures to yield consistent results from the various couplers (front cavity depth, front cavity volume, equivalent volume, effective diameter) or by iterative means from the resulting microphone sensitivity (loss factor, resonance frequency).

Microphone parameters determination

Serial number	2124385	2412872
Front cavity depth mm	0.533	0.504
Equivalent volume mm^3	8.5	10.4
Resonance frequency Hz	19536	19587
Loss factor	1.08	1.13
Front volume mm^3	36.1	34.1

The calculation of the sensitivity was carried out using a MatLab Script ("MpETAS.exe" V3.1) developed at METAS. This SW allows us to carry out calculations according to the different versions of the IEC 61094 standard and the therein specified options. When the CCAUV.A-K6 comparison started, it had just become clear, that the "low-frequency solution" quoted in IEC Standard 61094-2:2009 was flawed. As a remedy a "model related uncertainty" was included in the measurement uncertainty budget. The estimate of this model-related uncertainty contribution was based on the sensitivity difference obtained by performing the calculations according to the different methods.

b) Deviations from standard

None declared.

c) Uncertainty calculations

The measurement uncertainty budget calculated in the acoustics laboratory at METAS is based on Unclib (https://www.metas.ch/metas/en/home/fabe/hochfrequenz/unclib.html). This software library performs the calculation of uncertainty propagation strictly according to the

GUM automatically while evaluating the MatLab-Scripts implementing the measurement model.

Details on uncertainty calculations are given in Appendix A.

5.1.8 NMIA

a) Method

The calibration performed at the NMIA followed the method in IEC 61094-2 Edition 2.0: 2009-02, Electroacoustics — Measurement microphones — Part 2: Primary method for pressure calibration of laboratory standard microphones by the reciprocity technique (henceforth referred to as 'the Standard').

The calibration system includes a Brüel & Kjær 5998 reciprocity calibration apparatus with version 4 of the MP.exe calculation package. The Brüel & Kjær - 5998 reciprocity apparatus has been modified to extend the low frequency cut-off of the generator input from 10 Hz to 1 Hz. This modification corresponds to the replacement of four electrolytic capacitors labelled as C5, C6, C33 and C34 on the transmitter PCB of the 5998 unit with four 220 µF electrolytic capacitors as recommended by Brüel & Kjær.

The program MP.exe uses values of several microphone parameters, supplied by the user, along with electrical measurements acquired through the reciprocity procedure to determine the sensitivity values for each microphone. These parameters: front cavity depth, resonance frequency, front cavity volume, diaphragm diameter, loss factor, and diaphragm equivalent volume, are varied with the aim of minimizing the differences in calculated sensitivity of each microphone when different couplers are used in the reciprocity apparatus. The assumption is that a microphone's pressure sensitivity should not be dependent on the volume to which it is exposed.

The front cavity depths of the microphones were measured using a Leica DM6000 M automated microscope. The measurements of the front cavity depths correspond to the average of five measurements on each microphone performed at random locations. The resonance frequency of each microphone was measured using an electrostatic actuator, with this value used as a starting value for data fitting. Similarly, the starting value of the front cavity volume was calculated from the measured cavity depth and the nominal diaphragm diameter of the microphones. Nominal Brüel & Kjær values for the loss factor and diaphragm equivalent volume were also used as starting values for data fitting procedures.

A data fitting procedure was employed which consisted of minimizing the differences in the calculated microphone sensitivities from reciprocity measurements using four plane-wave couplers of different volumes. The four plane-wave couplers were a Brüel & Kjær Type UA 1430, 4.7 mm coupler, a Brüel & Kjær Type UA 1414, 9.4 mm coupler and two couplers produced by the Commonwealth Scientific and Industrial Research Organisation (CSIRO) in Australia that are nominally 3 mm and 4 mm long. This process was iterative, incorporating both automated and manual fitting procedures. The combined diaphragm equivalent volume and front cavity volumes were adjusted to minimize the calculated sensitivity differences across all four couplers in the low-to mid-frequency range. The ratio of these volumes, while maintaining the combined total volume, was adjusted to minimize differences at higher frequencies. The resonance frequency was also varied to minimize calculated sensitivity differences across all four couplers, with the loss factor determined sequentially as the ratio of the calculated sensitivity at the resonance frequency (found via interpolation), to the calculated sensitivity at 250 Hz. An automated data fitting procedure was also used to verify the process described above, and to further improve the fit.

As the sensitivity calculations were performed with a standard copy of version 4 of the MP.exe software, the broadband solution as provided in annex A.3 of the Standard has been used to account for viscous and thermal losses. Likewise, the environmental parameters, as provided in annex F of the standard, have been used in the calculation software. The calculations of microphone sensitivity have also incorporated radial wave motion corrections corresponding to the Bessel shape profile of the diaphragm velocity distribution as provided by Rasmussen [NM.1].

Environmental corrections were applied based on the equations provided by Rasmussen [NM.2] to determine the sensitivity at standard environmental conditions.

Capillary tube corrections were not applied in the calculations, where the vents in the Brüel & Kjær couplers were blocked by a needle bung. The CSIRO-manufactured couplers do not incorporate vents.

b) Deviations from standard

None declared.

c) Uncertainty calculations

Details on uncertainty calculations are given in Appendix A.

d) References

[NM.1] Rasmussen, K. Radial wave-motion in cylindrical plane-wave couplers. Acta Acustica, 1, 1993, pp 145-151.

[NM.2] Rasmussen, K. The influence of environmental conditions on the pressure sensitivity of measurement microphones, B&K Technical Review, 1, 2001.

5.1.9 NMIJ/AIST

a) Method

The pressure sensitivity was determined in compliance with IEC 61094-2(2009), using a reciprocity calibration system developed by NMIJ. In this system, the signal generation was made by a PXI waveform generator, PXI-5406 and the signal processing were executed by a PXI sound and vibration module, PXI-4461. Both modules were assembled in PXI chassis, PXIe-1078. All PXI modules and chassis were manufactured by National Instruments Co. Signal to noise ratio was improved by the synchronous waveform averaging method. The insert voltage technique was used to cancel the effect of the gain and impedance of an electrical circuit. The calibration was performed by LabVIEW.

Brüel & Kjær type UA1430 plane-wave (short) coupler was used for the reciprocity calibration, and a long coupler type UA1414 was also used for determining the equivalent volume of the microphones under test. Both couplers were filled with air. No grease was used to the contacting surfaces between the microphones and the couplers. The capillary tube was blocked by a needle bung DA5563. The capillary tube correction was not applied.

All the measurements were conducted within a room whose temperature and humidity were controlled ((23.0 ± 0.5) °C and (50 ± 5) %rh, respectively). Modulus and phase of pressure sensitivity were corrected to the value under the reference environmental conditions by using K. Rasmussen's method: "The static pressure and temperature coefficients of laboratory standard microphones," Metrologia 36 (1999). For modulus of pressure sensitivity below 250 Hz, it was corrected with reference to the technical paper by R. Kosoborodov, S.Kuznetsov "Static pressure coefficients of laboratory standard microphones in the frequency range 2-250 Hz," 11th ICSV, pp. 1441-1448 (2004). Below 200 Hz, pressure and temperature dependency of the phase were not corrected because there were no reliable pressure and temperature coefficients.

Microphone parameters were determined as follows: The resonance frequency and loss factor were taken from Brüel & Kjær's nominal values. Front depth was measured using a microscope calibrated by an ISO 17025 accredited calibration laboratory. Equivalent volume was calculated as an averaged value from 200 Hz to 4 kHz.

Microphone parameters used in the calculation.

Serial number	2124385	2412872
Front cavity depth	0.51 mm	0.52 mm
Front cavity volume	35.0 mm^3	35.2 mm^3
Equivalent volume	8.8 mm^3	9.0 mm^3
Resonance frequency	22000 Hz	22000 Hz
Loss factor	1.05	1.05
Dimension of coupler	D = 9.3 mm, L = 4.7 mm for short coupler and D = 9.3 mm, L = 9.4 mm for long coupler	D = 9.3 mm, L = 4.7 mm for short coupler and D = 9.3 mm, L = 9.4 mm for long coupler

b) Deviations from standard

None declared.

c) Uncertainty calculations

Details on uncertainty calculations are given in Appendix A.

5.1.10 NMISA

a) Method

The open-circuit pressure and phase sensitivities of the microphone were determined by the pressure reciprocity technique as described in IEC 61094-2: 2009. A Brüel & Kjær 9699 calibration system, comprising of a 5998 reciprocity calibration apparatus with low frequency modification WH3432 and a Pulse 3160-A-042, were used in measuring the voltage ratios. The Pulse analysers were used in the SSR mode with an accuracy setting of 0,001 dB and with generator levels of 3 V and 4 V, the latter being for the low frequency range to improve signal-to-noise levels. Grounded guard configurations were used for the transmitter unit, Brüel & Kjær ZE-0796-W-001, and the two preamplifiers, Brüel & Kjær 2673-W-003 (15 GΩ) and 2673-W-004 (1 GΩ). The microphone measurement pairings were placed inside a chamber connected to a buffer tank. The chamber with the buffer tank were pressurised to the nominal reference static pressure. Additionally, the chamber was placed on an optical table with active isolation.

The environmental parameters were measured using a Rotronics Hygroclip probe located inside the chamber and a Vaisala PT330 barometer. The microphone's modulus and phase pressure- and temperature coefficients were determined based on the technique as described by: K. Rasmussen, "The static pressure and temperature coefficients of laboratory standard microphones", Metrologia, 1999, 36, pp. 265 — 273; K. Rasmussen, "The influence of environmental conditions on the pressure sensitivity of measurement microphones", Brüel & Kjær Technical Review No. 1, 2001.

The broad-band heat conduction solution, as described in IEC 61094-2: 2009, was applied. Corrections for radial wave motions were applied as described by: K. Rasmussen, "Radial wave-motion in cylindrical plane-wave couplers", Acta Acustica, 1, pp. 145 — 151.

Five air filled sapphire plane-wave couplers of nominal lengths 3,06 mm, 3,75 mm, 4,70 mm, 6,10 mm and 9,40 mm were used. The couplers with the longest nominal lengths were used at the lowest frequencies and couplers with the shortest nominal lengths were used at the highest frequencies, as described by: RNel et.aL, "Analysing the effects of phase sensitivity in low frequency primary microphone calibrations", Applied Acoustics, 2017, 127, pp. 95 —104. The results were calculated with the Mp.exe V4.0 software. The front volume, equivalent volume, resonant frequency and loss factor were determined analytically.

b) Deviations from standard

None declared.

c) Uncertainty calculations

Details on uncertainty calculations are given in Appendix A.

5.1.11 NRC

a) Method

The following calibrations were performed in a triad with NRC standard microphone Brüel & Kjær Type 4180, SIN 1698191, and client's microphone Brüel & Kjær Type 4180, SIN 2412872, using the reciprocity method according to revision 15.0 of procedure AS-01A and the protocol for key comparison CCAUV.A-K6. The measurements were performed from 2020-03-10 to 2020-03-16.

b) Deviations from standard

None declared.

c) Uncertainty calculations

Details on uncertainty calculations are given in Appendix A.

5.1.12 UME

a) Method

The magnitude and phase of complex open-circuit pressure sensitivity of the microphone were determined by the pressure reciprocity technique as described in IEC 61094-2:2009. Three microphones pair-wise were coupled using air filled plane wave couplers of four different lengths with nominal lengths of 3.8 mm, 4.7 mm, 6.1 mm and 9.4 mm. Actual dimensions of the couplers were determined by using Coordinate Measuring Machine.

The receiver microphone was connected to a preamplifier Brüel & Kjaer type 2673 with insert voltage facilities (driven shield) and the current through the transmitter microphone was determined by the voltage across a reference capacitor in series with the microphone. The capacitor (nominal 4.7 nF || 1 MΩ) is calibrated in the frequency range 20 Hz to 40 kHz and the results extrapolated down to 2 Hz.

A Brüel & Kjær 9699 calibration system, comprising of a type 5998 Reciprocity Calibration Apparatus, Brüel & Kjaer type 3160-A-022 LAN (2 channel Input, 2 channel output, Generator Module 50 kHz) Pulse front-end was used for voltage ratio measurements. The Pulse front-end was used in the Steady State Response (SSR) mode with an accuracy setting of 0.001 dB and with generator levels of 2 V.

All measurements were conducted in a temperature-controlled room at 23.0 °C ± 1.0 °C. Humidity was kept within the range 35 %rh – 60 %rh. Actual values of temperature, static pressure and relative humidity were measured by Vaisala type PTU30011AO1G0AAAA1A Relative Humidity, Temperature and Pressure Meter during calibrations.

The resulting sensitivity was calculated by using the software MP.EXE Version 4.00 (2010-08-10).

The microphone parameters (equivalent volume, front volume and resonance frequency) were determined by fitting the sensitivity obtained using the above-mentioned 4 couplers. Nominal value for loss factor as declared by microphone's manufacturer was used in calculations. The microphone front cavity depth was measured using 3D Optical Profiler (Sensofar, type S neox). Individual values for low frequency temperature and static pressure coefficient was determined based on microphone sensitivity value at low frequency and by using approximation formula stated in "User Manual of Pressure Reciprocity Calibration System Type 9699". Once determined, the microphone parameters remained unchanged during all calibrations. The broad-band solution, as described in IEC 61094-2: 2009, was applied in correcting for heat conduction effects together with corrections made for radial wave motion.

The final results reported within the comparison are average of ten calibrations performed in different days, while microphones were combined in different triads.

b) Deviations from standard

None declared.

c) Uncertainty calculations

Details on uncertainty calculations are given in Appendix A.

5.1.13 VNIIFTRI

a) Method

Microphone parameters determination

Calibration is performed by using The National Primary Standard GET 19-2018. Determinations of the microphone parameters were carried out by running a calibration in two different couplers.

The dimensions of the used couplers are:

Type	UA 1430	UA 1414
Diameter (mm)	9.3	9.3
Length (mm)	4.7	9.4

Microphone sensitivity determination

Measurements were made in accordance of IEC 61094 2:2009. No capillarity tube was used and measurements were made at the local atmospheric pressure. Measurements were carried out from 1.995 Hz until 25119 Hz and repeated five times.

Microphone parameters determination

Serial number	2124385	2412872
Front cavity depth, mm	0.512	0.517
Frontal volume, mm^3	34.816	35.156
Equivalent volume, mm^3	9.2	9.2
Resonance frequency, Hz	22000	22000
Loss factor	1.05	1.05
Pressure Coefficient at 250 Hz, dB/kPa	-0.0055	-0.0055
Temperature Coefficient at 250 Hz, dB/K	-0.0020	-0.0020
Polarization Voltage, V	200.0	200.0

Microphone sensitivity determination

Mean atmospheric conditions:

Microphone serial number	2124385	2412872
Mean pressure, kPa	98.61	98.57
Mean temperature, °C	23.1	23.2
Mean relative humidity, %	49	49

Results are corrected to the reference environmental conditions given in IEC 61094 2:2009 using the polynomial coefficients given in the reference “Technical Review Properties and Calibration of Laboratory Standard Microphones”, Bruël & Kjaer №1 2001”.

Heat conduction correction and wave-motion

Heat conduction correction was calculated according to the full low-frequency solution, see [VNIIFTRI.1]. The correctness of this approach is the research [VNIIFTRI.2] and recently published [VNIIFTRI.3]. At [VNIIFTRI.3] showed numerical calculation of sound pressure for closed volume with heat conducting walls at frequency range from 1 Hz to 10 kHz based on regularized Navier-Stokes equations for a compressible viscous heat-conducting gas

[VNIIFTRI.4] and plane-wave approximation. Change of numerically calculated sound pressure showed good agreement with theoretical change based on full low-frequency solution and longtidutal wave-motion expression. So we believe the full low-frequency solution is the only one solution which should be applied to calculate microphone sensitivity.

Radial non-uniformity estimation of sound pressure and sound pressure phase was calculated using numerical algorithm described in [VNIIFTRI.3], but using approximation of free oscillations first mode of circular fixed membrane instead of plane-wave approximation, and was reduced to standard uncertainty form.

b) Deviations from standard

None declared.

c) Uncertainty calculations

NOTE. The uncertainty budget of phase sensitivity does not take into account the uncertainty of voltage ratio phase. It will be fixed before submitting new CMC lines based on this comparison.

The expanded uncertainties of the measurements are stated as the combined standard uncertainties multiplied by the coverage factor, which is based on effective degrees of freedom and corresponds to coverage probability of 95 %. The standard uncertainties of the measurements is determined in accordance with the ISO/IEC GUIDE 98-3:2008 "Uncertainty of measurement - Part 3: Guide to the expression of uncertainty in measurement (GUM:1995)".

d) References

[VNIIFTRI.1] H. Gerber. Acoustic properties of fluid-filled chambers at infrasonic frequencies in the absence of convection // Journal of Acoustical Society of America, 1964, t.36, p.1427-1434. doi:10.1121/1.1919219.

[VNIIFTRI.2] P. Vincent, D. Rodrigues, F. Larsonnier, C. Guianvarc'h, S. Durand. Acoustic transfer admittance of cylindrical cavities in infrasonic frequency range // Metrologia, 2019, v.56, №1, p.015003. doi: 10.1088/1681-7575/aaee28.

[VNIIFTRI.3] D. Golovin. Numerical simulation of sound pressure for calibration system of LS type measurement microphones. Matematicheskoe Modelirovanie. 2021, t. 33, №10, p.96–108. doi: 10.20948/mm-2021-10-07.

[VNIIFTRI.4] T.G. Elizarova. Quasi-Gas Dynamic Equations. Springer-Verlag Berlin Heidelberg, 2009, 286 p. doi: 10.1007/978-3-642-00292-2.

6 Collation of results and uncertainties

Each laboratory reported their results after their own measurement round. Once all data was gathered, a preliminary analysis was made. As pilot laboratory, LNE was tasked with identifying anomalous results and providing the participants concerned with the opportunity to review their data for numerical errors according to the CIPM Guideline [3]. The analysis of outliers was conducted according to the method defined in section 7.2.

The concerned laboratories were contacted (without being informed as to the magnitude or sign of the apparent anomaly) and were invited to check their results for numerical errors. All laboratories declined to resubmit results excepted KRISS, NMIJ, CENAM and VNIIFTRI. The original data and reasons explaining the revised data are provided in Appendix B.

The reported parameters of the microphones 2124385 and 2412872 are given respectively in Table 3 and Table 4.

Table 3. Microphone parameters 4180.2124385.

	Front cavity depth (mm)	Equivalent volume (mm^3)	Front volume (mm^3)	Resonance frequency (Hz)	Loss factor
LNE	0.513	8.9	34.8	20800	1.20
HBK-DPLA	0.516	9.5	35.4	21300	1.09
METAS	0.533	8.5	36.1	19536	1.08
KRISS	0.510	11.2	35.3	22000	1.05
NMIJ	0.51	8.8	35.0	22000	1.05
GUM	0.521	8.3	35.5	21195	1.18
UME	0.5133	9.90	35.25	21277	1.05
NMIA	0.52	9.3	34.8	21330	1.04
CENAM	0.511	9.5	34.912	21140	1.05
NRC	0.515	9.3	36.5	-	-
VNIIFTRI	0.512	9.2	34.816	22000	1.05
NMISA	0.512	9.05	34.85	21264	1.04
INMETRO	0.510	9.4	34.64	21634	1.05

Table 4. Microphone parameters 4180.2412872.

	Front cavity depth (mm)	Equivalent volume (mm^3)	Front volume (mm^3)	Resonance frequency (Hz)	Loss factor
LNE	0.519	9.0	35.3	21250	1.19
HBK-DPLA	0.523	9.2	35.8	21300	1.15
METAS	0.504	10.4	34.1	19587	1.13
KRISS	0.520	10.3	36.0	22000	1.05
NMIJ	0.52	9.0	35.2	22000	1.05
GUM	0.522	8.3	36.2	21294	1.19
UME	0.5199	9.37	35.90	21316	1.05
NMIA	0.52	8.6	35.8	21440	1.05
CENAM	0.505	9.88	34.555	21266	1.05
NRC	0.510	9.3	36.3	-	-
VNIIFTRI	0.517	9.2	35.156	22000	1.05
NMISA	0.511	8.60	35.65	21333	1.05
INMETRO	0.518	9.0	35.18	21717	1.06

The open-circuit, pressure sensitivity level reported by each laboratory are given in Table 5 and Table 6 for the microphones 2124385 and 2412872 respectively, while the associated expanded uncertainties are presented in Table 7 and Table 8.

The open-circuit, pressure sensitivity phase reported by each laboratory are given in Table 9 and Table 10 for the microphones 2124385 and 2412872, while the associated expanded uncertainties are presented in Table 11 and Table 12.

Note: The values marked with * have been excluded from the calculation of the Key Comparison Reference Values (see section 7.2).

Table 5. Pressure sensitivity level in dB re 1 V/Pa of the microphone 4180 2124385, as declared by the participant laboratories.

Frequency (Hz)	LNE	HBK-DPLA	METAS	KRISS	NMIJ	GUM	UME	NMIA	CENAM	NRC	VNIIFTRI	NMISA	INMETRO
1.995	-38.023	-37.943	-37.994	-37.98	-38.10	-37.84	-37.88	-37.83	-37.929	-37.85	-37.91	-37.875	-37.932
2.512	-38.030	-37.969	-38.022	-38.00	-38.09	-37.90	-37.90	-37.88	-37.955	-37.96	-37.94	-37.911	-37.949
3.162	-38.030	-37.994	-38.057	-38.01	-38.07	-37.92	-37.92	-37.92	-37.968	-37.98	-37.97	-37.938	-37.977
3.981	-38.029	-38.016	-38.063	-38.03	-38.15	-37.95	-37.94	-37.95	-37.978	-37.97	-37.99	-37.960	-37.992
5.012	-38.030	-38.034	-38.067	-38.04	-38.02	-37.96	-37.96	-37.96	-37.986	-37.97	-38.00	-37.979	-38.012
6.310	-38.035	-38.049	-38.066	-38.02	-37.98	-37.97	-37.97	-37.97	-37.995	-37.98	-38.02	-37.995	-38.024
7.943	-38.041	-38.061	-38.070	-38.04	-38.02	-37.99	-37.99	-37.99	-38.005	-37.98	-38.03	-38.010	-38.035
10.000	-38.052	-38.071	-38.075	-38.05	-38.03	-38.01	-38.00	-38.01	-38.017	-38.00	-38.05	-38.025	-38.044
12.589	-38.063	-38.081	-38.082	-38.05	-38.05	-38.02	-38.02	-38.02	-38.030	-38.01	-38.06	-38.041	-38.065
15.849	-38.076	-38.092	-38.094	-38.06	-38.06	-38.04	-38.03	-38.04	-38.043	-38.02	-38.07	-38.056	-38.081
19.953	-38.085	-38.100	-38.100	-38.10	-38.08	-38.06	-38.05	-38.06	-38.053	-38.04	-38.09	-38.070	-38.087
25.119	-38.097	-38.106	-38.105	-38.11	-38.09	-38.07	-38.06	-38.07	-38.064	-38.05	-38.10	-38.083	-38.097
31.623	-38.105	-38.112	-38.111	-38.11	-38.10	-38.08	-38.07	-38.084	-38.074	-38.06	-38.11	-38.094	-38.107
39.811	-38.114	-38.117	-38.117	-38.12	-38.11	-38.09	-38.08	-38.093	-38.081	-38.08	-38.12	-38.103	-38.110
50.119	-38.121	-38.121	-38.119	-38.12	-38.12	-38.10	-38.08	-38.100	-38.089	-38.09	-38.13	-38.112	-38.117
63.096	-38.129	-38.125	-38.124	-38.13	-38.12	-38.11	-38.09	-38.107	-38.096	-38.10	-38.13	-38.120	-38.120
79.433	-38.135	-38.128	-38.126	-38.13	-38.12	-38.11	-38.10	-38.114	-38.103	-38.10	-38.14	-38.126	-38.126
100.00	-38.141	-38.132	-38.131	-38.13	-38.13	-38.12	-38.10	-38.119	-38.108	-38.11	-38.14	-38.132	-38.132
125.89	-38.145	-38.134	-38.133	-38.14	-38.14	-38.13	-38.11	-38.126	-38.114	-38.12	-38.15	-38.138	-38.137
158.49	-38.151	-38.137	-38.134	-38.14	-38.14	-38.13	-38.11	-38.131	-38.119	-38.13	-38.16	-38.143	-38.139
199.53	-38.156	-38.139	-38.140	-38.14	-38.15	-38.13	-38.12	-38.135	-38.126	-38.13	-38.16	-38.148	-38.144
251.19	-38.159	-38.141	-38.138	-38.14	-38.15	-38.14	-38.12	-38.139	-38.130	-38.14	-38.16	-38.151	-38.147
316.23	-38.162	-38.142	-38.141	-38.14	-38.16	-38.14	-38.12	-38.143	-38.133	-38.14	-38.17	-38.155	-38.150
398.11	-38.164	-38.143	-38.142	-38.14	-38.16	-38.14	-38.13	-38.145	-38.135	-38.14	-38.17	-38.158	-38.153
501.19	-38.167	-38.144	-38.143	-38.14	-38.16	-38.15	-38.13	-38.147	-38.138	-38.14	-38.17	-38.159	-38.155
630.96	-38.169	-38.144	-38.143	-38.14	-38.16	-38.15	-38.13	-38.148	-38.139	-38.15	-38.17	-38.161	-38.156
794.33	-38.169	-38.143	-38.142	-38.14	-38.16	-38.15	-38.13	-38.148	-38.139	-38.15	-38.17	-38.161	-38.156
1000.0	-38.167	-38.140	-38.141	-38.14	-38.16	-38.15	-38.13	-38.148	-38.138	-38.14	-38.17	-38.160	-38.155
1258.9	-38.164	-38.136	-38.135	-38.13	-38.16	-38.14	-38.13	-38.144	-38.134	-38.14	-38.17	-38.156	-38.152
1584.9	-38.157	-38.128	-38.128	-38.13	-38.15	-38.14	-38.12	-38.137	-38.127	-38.13	-38.16	-38.149	-38.146
1995.3	-38.144	-38.115	-38.115	-38.11	-38.14	-38.12	-38.11	-38.125	-38.115	-38.12	-38.15	-38.136	-38.135
2511.9	-38.124	-38.094	-38.094	-38.09	-38.12	-38.11	-38.09	-38.105	-38.096	-38.10	-38.13	-38.116	-38.117
3162.3	-38.092	-38.060	-38.061	-38.06	-38.08	-38.07	-38.05	-38.072	-38.063	-38.07	-38.10	-38.083	-38.086
3981.1	-38.042	-38.008	-38.010	-38.00	-38.03	-38.02	-38.00	-38.021	-38.012	-38.01	-38.05	-38.031	-38.040
5011.9	-37.964	-37.928	-37.929	-37.92	-37.96	-37.95	-37.93	-37.940	-37.933	-37.93	-37.97	-37.951	-37.966
6309.6	-37.849	-37.810	-37.811	-37.81	-37.84	-37.83	-37.81	-37.820	-37.815	-37.81	-37.85	-37.831	-37.859
7943.3	-37.688	-37.644	-37.645	-37.64	-37.67	-37.67	-37.65	-37.651	-37.650	-37.64	-37.68	-37.662	-37.710 *
10000	-37.490	-37.446	-37.445	-37.44	-37.47	-37.48	-37.45	-37.444	-37.449	-37.43	-37.48	-37.458	-37.535 *
12589	-37.365 *	-37.312	-37.308	-37.31	-37.34	-37.35	-37.32	-37.300	-37.316	-37.29	-37.35	-37.318	-37.432 *
15849	-37.666 *	-37.595	-37.586	-37.61	-37.63	-37.66	-37.62	-37.574	-37.601	-37.57	-37.64	-37.603	-37.735 *
19953	-39.141	-39.033	-39.025	-39.03	-39.07	-39.11	-39.06	-39.01	-39.022	-39.04	-39.08	-39.020	-39.121
25119	-42.013	-41.934	-41.916	-41.78	-41.96	-42.08	-41.90	-41.90	-41.938	-41.94	-41.9	-41.929	-41.953

Table 6. Pressure sensitivity level in dB re 1 V/Pa of the microphone 4180 2412872, as declared by the participant laboratories.

Frequency (Hz)	LNE	HBK-DPLA	METAS	KRISS	NMIJ	GUM	UME	NMIA	CENAM	NRC	VNIIFTRI	NMISA	INMETRO[1]
1.995	-37.567	-37.652	-37.743	-37.68	-37.91	-37.51	-37.57	-37.56	-37.558	-37.46	-37.59	-37.598	-37.506
2.512	-37.614	-37.688	-37.718	-37.73	-37.73	-37.57	-37.63	-37.62	-37.617	-37.54	-37.63	-37.637	-37.601
3.162	-37.653	-37.720	-37.741	-37.75	-37.83	-37.61	-37.66	-37.65	-37.646	-37.64	-37.67	-37.667	-37.596
3.981	-37.681	-37.747	-37.765	-37.76	-37.81	-37.64	-37.68	-37.68	-37.670	-37.66	-37.69	-37.691	-37.629
5.012	-37.704	-37.771	-37.787	-37.78	-37.69	-37.66	-37.70	-37.70	-37.689	-37.67	-37.71	-37.711	-37.657
6.310	-37.724	-37.789	-37.795	-37.77	-37.74	-37.68	-37.71	-37.71	-37.704	-37.68	-37.73	-37.729	-37.674
7.943	-37.744	-37.805	-37.806	-37.79	-37.75	-37.71	-37.73	-37.73	-37.720	-37.70	-37.74	-37.745	-37.690
10.000	-37.763	-37.817	-37.813	-37.80	-37.77	-37.72	-37.75	-37.75	-37.737	-37.72	-37.76	-37.761	-37.707
12.589	-37.780	-37.830	-37.826	-37.80	-37.78	-37.74	-37.76	-37.76	-37.754	-37.74	-37.78	-37.777	-37.722
15.849	-37.797	-37.840	-37.838	-37.81	-37.80	-37.76	-37.78	-37.78	-37.768	-37.75	-37.79	-37.791	-37.734
19.953	-37.811	-37.849	-37.846	-37.82	-37.81	-37.78	-37.79	-37.79	-37.781	-37.77	-37.81	-37.806	-37.745
25.119	-37.824	-37.856	-37.853	-37.83	-37.82	-37.79	-37.80	-37.81	-37.793	-37.79	-37.82	-37.819	-37.758
31.623	-37.835	-37.862	-37.860	-37.83	-37.83	-37.80	-37.81	-37.816	-37.803	-37.80	-37.83	-37.829	-37.763
39.811	-37.844	-37.867	-37.864	-37.84	-37.84	-37.82	-37.82	-37.825	-37.812	-37.81	-37.84	-37.839	-37.772
50.119	-37.852	-37.871	-37.872	-37.84	-37.85	-37.82	-37.83	-37.833	-37.820	-37.82	-37.84	-37.846	-37.777
63.096	-37.860	-37.875	-37.871	-37.85	-37.85	-37.83	-37.84	-37.840	-37.827	-37.83	-37.85	-37.855	-37.785
79.433	-37.866	-37.878	-37.875	-37.85	-37.86	-37.84	-37.84	-37.845	-37.834	-37.84	-37.86	-37.861	-37.788
100.00	-37.872	-37.880	-37.879	-37.85	-37.86	-37.84	-37.85	-37.855	-37.840	-37.85	-37.86	-37.866	-37.795
125.89	-37.877	-37.883	-37.880	-37.86	-37.88	-37.85	-37.85	-37.857	-37.845	-37.85	-37.87	-37.872	-37.798
158.49	-37.882	-37.886	-37.885	-37.86	-37.88	-37.85	-37.86	-37.861	-37.850	-37.86	-37.87	-37.876	-37.800
199.53	-37.885	-37.887	-37.885	-37.86	-37.88	-37.85	-37.86	-37.862	-37.857	-37.87	-37.88	-37.880	-37.805
251.19	-37.889	-37.888	-37.886	-37.86	-37.89	-37.86	-37.86	-37.869	-37.860	-37.87	-37.88	-37.884	-37.808
316.23	-37.893	-37.889	-37.888	-37.86	-37.89	-37.86	-37.87	-37.872	-37.863	-37.87	-37.89	-37.887	-37.812
398.11	-37.895	-37.890	-37.889	-37.86	-37.89	-37.86	-37.87	-37.876	-37.866	-37.88	-37.89	-37.890	-37.814
501.19	-37.896	-37.890	-37.888	-37.86	-37.89	-37.86	-37.87	-37.877	-37.868	-37.88	-37.89	-37.892	-37.815
630.96	-37.898	-37.890	-37.889	-37.86	-37.89	-37.87	-37.87	-37.879	-37.869	-37.88	-37.89	-37.893	-37.816
794.33	-37.898	-37.889	-37.888	-37.86	-37.89	-37.87	-37.87	-37.876	-37.869	-37.88	-37.89	-37.893	-37.817
1000.0	-37.897	-37.886	-37.887	-37.86	-37.89	-37.87	-37.87	-37.877	-37.869	-37.88	-37.89	-37.893	-37.817
1258.9	-37.894	-37.882	-37.882	-37.85	-37.89	-37.86	-37.87	-37.874	-37.865	-37.87	-37.89	-37.889	-37.814
1584.9	-37.889	-37.875	-37.875	-37.85	-37.88	-37.86	-37.86	-37.869	-37.860	-37.87	-37.88	-37.884	-37.810
1995.3	-37.878	-37.864	-37.865	-37.83	-37.87	-37.85	-37.85	-37.857	-37.849	-37.86	-37.87	-37.873	-37.801
2511.9	-37.861	-37.845	-37.846	-37.81	-37.85	-37.83	-37.84	-37.841	-37.833	-37.84	-37.86	-37.856	-37.785
3162.3	-37.832	-37.817	-37.818	-37.79	-37.82	-37.80	-37.81	-37.813	-37.805	-37.81	-37.83	-37.828	-37.760
3981.1	-37.789	-37.773	-37.773	-37.74	-37.78	-37.76	-37.76	-37.770	-37.762	-37.77	-37.79	-37.784	-37.723
5011.9	-37.723	-37.705	-37.705	-37.67	-37.72	-37.70	-37.70	-37.701	-37.698	-37.70	-37.72	-37.718	-37.665
6309.6	-37.625	-37.606	-37.609	-37.58	-37.63	-37.61	-37.60	-37.605	-37.602	-37.60	-37.63	-37.620	-37.582
7943.3	-37.497	-37.475	-37.477	-37.45	-37.50	-37.49	-37.47	-37.474	-37.476	-37.46	-37.50	-37.487	-37.475
10000	-37.354	-37.332	-37.332	-37.31	-37.36	-37.35	-37.33	-37.329	-37.338	-37.31	-37.36	-37.344	-37.373
12589	-37.308	-37.288	-37.285	-37.27	-37.33	-37.33	-37.29	-37.284	-37.308	-37.27	-37.33	-37.300	-37.379
15849	-37.696	-37.679	-37.668	-37.70	-37.74	-37.75	-37.70	-37.670	-37.712	-37.67	-37.75	-37.693	-37.827
19953	-39.197	-39.166	-39.117	-39.19	-39.21	-39.27	-39.20	-39.14	-39.179	-39.17	-39.24	-39.175	-39.305
25119	-42.066	-42.069	-41.950	-41.91	-42.02	-42.19	-42.05	-42.05	-42.017	-42.03	-42.0	-42.056	-42.168

[1] The results of INMETRO for the microphone 4180.2412872 are not considered in this comparison due to the identified drift of the microphone (see section 7.2).

Table 7. Expanded uncertainties in dB using a coverage factor of k=2 for the pressure sensitivity level of the microphone 4180 2124385, as declared by the participant laboratories.

Frequency (Hz)	LNE	HBK-DPLA	METAS	KRISS	NMIJ	GUM	UME	NMIA	CENAM	NRC	VNIIFTRI	NMISA	INMETRO
1.995	0.145	0.100	0.116	0.40	0.62	0.20	0.20	0.40	0.23	0.76	0.07	0.200	0.200
2.512	0.115	0.080	0.105	0.30	0.48	0.20	0.19	0.40	0.20	0.54	0.06	0.150	0.170
3.162	0.095	0.080	0.097	0.30	0.38	0.20	0.19	0.35	0.18	0.38	0.06	0.150	0.150
3.981	0.075	0.080	0.090	0.20	0.35	0.14	0.18	0.30	0.16	0.28	0.06	0.150	0.130
5.012	0.060	0.080	0.086	0.15	0.19	0.14	0.11	0.30	0.14	0.22	0.06	0.080	0.130
6.310	0.055	0.080	0.081	0.10	0.15	0.14	0.11	0.30	0.13	0.16	0.06	0.080	0.090
7.943	0.045	0.080	0.077	0.10	0.14	0.11	0.11	0.25	0.12	0.12	0.06	0.080	0.080
10.000	0.040	0.075	0.073	0.10	0.08	0.11	0.11	0.25	0.12	0.08	0.06	0.080	0.060
12.589	0.040	0.070	0.069	0.10	0.08	0.11	0.11	0.20	0.11	0.06	0.06	0.080	0.060
15.849	0.035	0.065	0.065	0.10	0.07	0.08	0.08	0.18	0.09	0.06	0.06	0.050	0.050
19.953	0.035	0.060	0.061	0.08	0.07	0.05	0.07	0.10	0.09	0.05	0.06	0.050	0.050
25.119	0.035	0.055	0.058	0.08	0.06	0.04	0.06	0.10	0.08	0.04	0.06	0.050	0.045
31.623	0.035	0.050	0.055	0.08	0.05	0.04	0.05	0.08	0.07	0.04	0.06	0.050	0.045
39.811	0.035	0.045	0.053	0.06	0.04	0.04	0.04	0.08	0.07	0.03	0.06	0.050	0.045
50.119	0.035	0.040	0.054	0.05	0.04	0.04	0.04	0.08	0.07	0.03	0.06	0.030	0.045
63.096	0.035	0.035	0.049	0.05	0.04	0.03	0.03	0.06	0.05	0.03	0.06	0.030	0.045
79.433	0.035	0.035	0.047	0.05	0.04	0.03	0.03	0.06	0.05	0.03	0.06	0.030	0.045
100.00	0.035	0.030	0.046	0.05	0.04	0.03	0.03	0.06	0.05	0.03	0.06	0.030	0.045
125.89	0.035	0.030	0.045	0.05	0.04	0.03	0.03	0.04	0.05	0.03	0.06	0.030	0.045
158.49	0.035	0.025	0.045	0.04	0.04	0.03	0.03	0.04	0.05	0.03	0.06	0.030	0.045
199.53	0.035	0.025	0.043	0.04	0.04	0.03	0.03	0.04	0.05	0.03	0.06	0.030	0.045
251.19	0.035	0.025	0.043	0.04	0.04	0.03	0.03	0.04	0.05	0.03	0.06	0.030	0.045
316.23	0.035	0.020	0.042	0.04	0.04	0.03	0.03	0.04	0.05	0.03	0.06	0.030	0.045
398.11	0.035	0.020	0.042	0.04	0.04	0.03	0.03	0.04	0.05	0.03	0.06	0.030	0.045
501.19	0.035	0.020	0.042	0.04	0.04	0.03	0.03	0.04	0.05	0.03	0.06	0.030	0.045
630.96	0.035	0.020	0.041	0.04	0.04	0.03	0.03	0.04	0.05	0.03	0.06	0.030	0.045
794.33	0.035	0.020	0.041	0.04	0.04	0.03	0.03	0.04	0.05	0.03	0.06	0.030	0.045
1000.0	0.035	0.015	0.041	0.04	0.04	0.03	0.03	0.04	0.05	0.03	0.06	0.030	0.045
1258.9	0.035	0.015	0.041	0.04	0.04	0.03	0.03	0.04	0.05	0.03	0.06	0.030	0.045
1584.9	0.035	0.015	0.041	0.04	0.04	0.03	0.03	0.04	0.05	0.03	0.06	0.030	0.045
1995.3	0.035	0.015	0.040	0.04	0.04	0.03	0.03	0.04	0.05	0.03	0.06	0.030	0.045
2511.9	0.035	0.015	0.040	0.04	0.04	0.03	0.03	0.04	0.05	0.03	0.06	0.030	0.045
3162.3	0.035	0.015	0.040	0.04	0.04	0.03	0.03	0.04	0.05	0.03	0.06	0.030	0.045
3981.1	0.035	0.015	0.039	0.04	0.04	0.03	0.04	0.04	0.06	0.03	0.06	0.030	0.045
5011.9	0.035	0.015	0.039	0.04	0.04	0.03	0.04	0.04	0.06	0.03	0.06	0.030	0.045
6309.6	0.035	0.015	0.039	0.04	0.04	0.04	0.04	0.04	0.06	0.03	0.06	0.030	0.045
7943.3	0.040	0.015	0.041	0.04	0.04	0.05	0.05	0.04	0.06	0.03	0.06	0.040	0.045*
10000	0.040	0.015	0.047	0.05	0.04	0.06	0.05	0.05	0.09	0.03	0.07	0.040	0.045*
12589	0.045*	0.015	0.060	0.06	0.04	0.08	0.06	0.06	0.10	0.04	0.09	0.040	0.045*
15849	0.055*	0.025	0.090	0.07	0.05	0.08	0.08	0.08	0.13	0.06	0.13	0.060	0.050*
19953	0.080	0.050	0.154	0.12	0.12	0.12	0.12	0.10	0.19	0.10	0.21	0.100	0.090
25119	0.145	0.070	0.414	0.25	0.21	0.24	0.20	0.15	0.40	0.37	0.5	0.150	0.160

Table 8. Expanded uncertainties in dB using a coverage factor of k=2 for the pressure sensitivity level of the microphone 4180 2412872, as declared by the participant laboratories.

Frequency (Hz)	LNE	HBK-DPLA	METAS	KRISS	NMIJ	GUM	UME	NMIA	CENAM	NRC	VNIIFTRI	NMISA	INMETRO[2]
1.995	0.145	0.100	0.131	0.40	0.62	0.20	0.20	0.40	0.23	0.76	0.07	0.200	0.200
2.512	0.115	0.080	0.106	0.30	0.48	0.20	0.19	0.40	0.20	0.54	0.06	0.150	0.170
3.162	0.090	0.080	0.095	0.30	0.38	0.20	0.19	0.35	0.18	0.38	0.06	0.150	0.150
3.981	0.075	0.080	0.091	0.20	0.35	0.14	0.18	0.30	0.16	0.28	0.06	0.150	0.130
5.012	0.060	0.080	0.088	0.15	0.19	0.14	0.11	0.30	0.14	0.22	0.06	0.080	0.130
6.310	0.050	0.080	0.085	0.10	0.15	0.14	0.11	0.30	0.13	0.16	0.06	0.080	0.090
7.943	0.045	0.080	0.080	0.10	0.14	0.11	0.11	0.25	0.12	0.12	0.06	0.080	0.080
10.000	0.040	0.075	0.077	0.10	0.08	0.11	0.11	0.25	0.12	0.08	0.06	0.080	0.060
12.589	0.035	0.070	0.073	0.10	0.08	0.11	0.11	0.20	0.11	0.06	0.06	0.080	0.060
15.849	0.035	0.065	0.070	0.10	0.07	0.08	0.08	0.18	0.09	0.06	0.06	0.050	0.050
19.953	0.035	0.060	0.066	0.08	0.07	0.05	0.07	0.10	0.09	0.05	0.06	0.050	0.050
25.119	0.030	0.055	0.064	0.08	0.06	0.04	0.06	0.10	0.08	0.04	0.06	0.050	0.045
31.623	0.030	0.050	0.061	0.08	0.05	0.04	0.05	0.08	0.07	0.04	0.06	0.050	0.045
39.811	0.030	0.045	0.059	0.06	0.04	0.04	0.04	0.08	0.07	0.03	0.06	0.050	0.045
50.119	0.030	0.040	0.060	0.05	0.04	0.04	0.04	0.08	0.07	0.03	0.06	0.030	0.045
63.096	0.030	0.035	0.055	0.05	0.04	0.03	0.03	0.06	0.05	0.03	0.06	0.030	0.045
79.433	0.030	0.035	0.054	0.05	0.04	0.03	0.03	0.06	0.05	0.03	0.06	0.030	0.045
100.00	0.030	0.030	0.053	0.05	0.04	0.03	0.03	0.06	0.05	0.03	0.06	0.030	0.045
125.89	0.030	0.030	0.052	0.05	0.04	0.03	0.03	0.04	0.05	0.03	0.06	0.030	0.045
158.49	0.030	0.025	0.053	0.04	0.04	0.03	0.03	0.04	0.05	0.03	0.06	0.030	0.045
199.53	0.030	0.025	0.051	0.04	0.04	0.03	0.03	0.04	0.05	0.03	0.06	0.030	0.045
251.19	0.030	0.025	0.051	0.04	0.04	0.03	0.03	0.04	0.05	0.03	0.06	0.030	0.045
316.23	0.030	0.020	0.050	0.04	0.04	0.03	0.03	0.04	0.05	0.03	0.06	0.030	0.045
398.11	0.030	0.020	0.050	0.04	0.04	0.03	0.03	0.04	0.05	0.03	0.06	0.030	0.045
501.19	0.030	0.020	0.050	0.04	0.04	0.03	0.03	0.04	0.05	0.03	0.06	0.030	0.045
630.96	0.030	0.020	0.050	0.04	0.04	0.03	0.03	0.04	0.05	0.03	0.06	0.030	0.045
794.33	0.030	0.020	0.050	0.04	0.04	0.03	0.03	0.04	0.05	0.03	0.06	0.030	0.045
1000.0	0.030	0.015	0.049	0.04	0.04	0.03	0.03	0.04	0.05	0.03	0.06	0.030	0.045
1258.9	0.030	0.015	0.049	0.04	0.04	0.03	0.03	0.04	0.05	0.03	0.06	0.030	0.045
1584.9	0.030	0.015	0.049	0.04	0.04	0.03	0.03	0.04	0.05	0.03	0.06	0.030	0.045
1995.3	0.030	0.015	0.049	0.04	0.04	0.03	0.03	0.04	0.05	0.03	0.06	0.030	0.045
2511.9	0.030	0.015	0.048	0.04	0.04	0.03	0.03	0.04	0.05	0.03	0.06	0.030	0.045
3162.3	0.030	0.015	0.048	0.04	0.04	0.03	0.03	0.04	0.05	0.03	0.06	0.030	0.045
3981.1	0.030	0.015	0.047	0.04	0.04	0.03	0.04	0.04	0.06	0.03	0.06	0.030	0.045
5011.9	0.030	0.015	0.047	0.04	0.04	0.03	0.04	0.04	0.06	0.03	0.06	0.030	0.045
6309.6	0.030	0.015	0.046	0.04	0.04	0.04	0.04	0.04	0.06	0.03	0.06	0.030	0.045
7943.3	0.030	0.015	0.048	0.04	0.04	0.05	0.05	0.04	0.06	0.03	0.06	0.040	0.045
10000	0.030	0.015	0.054	0.05	0.04	0.06	0.05	0.05	0.09	0.03	0.07	0.040	0.045
12589	0.030	0.015	0.067	0.06	0.04	0.08	0.06	0.06	0.10	0.04	0.09	0.040	0.045
15849	0.035	0.025	0.095	0.07	0.05	0.08	0.08	0.08	0.13	0.06	0.13	0.060	0.050
19953	0.060	0.050	0.157	0.12	0.12	0.12	0.12	0.10	0.19	0.10	0.21	0.100	0.090
25119	0.130	0.070	0.419	0.25	0.21	0.24	0.20	0.15	0.40	0.37	0.5	0.150	0.160

[2] The results of INMETRO for the microphone 4180.2412872 are not considered in this comparison due to the identified drift of the microphone (see section 7.2).

Table 9. Pressure sensitivity phase in degree of the microphone 4180 2124385, as declared by the participant laboratories.

Frequency (Hz)	LNE	HBK-DPLA	METAS	KRISS	NMIJ	GUM	UME	NMIA	CENAM	NRC	VNIIFTRI	NMISA	INMETRO
1.995	183.13	182.00	182.09 *	179.4	-	179.15	178.78	-	181.213	181.78	178.80	178.67	178.756
2.512	182.54 *	181.41	181.65 *	179.4	-	179.22	179.03	-	180.799	181.64	179.00	178.80	178.956
3.162	181.96 *	180.97	181.29 *	179.4	-	179.33	179.19	-	180.649	180.95 *	179.10	178.91	179.152
3.981	181.50 *	180.65	181.03 *	179.5	-	179.38	179.26	-	180.443	180.73	179.20	179.01	179.259
5.012	181.10 *	180.43	180.74 *	179.5	-	179.38	179.31	-	180.263	180.49 *	179.20	179.09	179.360
6.310	180.78 *	180.25	180.53 *	179.5	-	179.37	179.33	-	180.106	180.29 *	179.30	179.16	179.412
7.943	180.51 *	180.12	180.30 *	179.5	-	179.37	179.37	-	179.961	180.08 *	179.29	179.20	179.473
10.000	180.30 *	180.00	180.17 *	179.5	-	179.38	179.42	-	179.857	179.93 *	179.32	179.24	179.544
12.589	180.16 *	179.94	180.08 *	179.5	-	179.36	179.42	-	179.769	179.82 *	179.34	179.28	179.546
15.849	180.01 *	179.89	179.97 *	179.5	-	179.35	179.44	-	179.711	179.69	179.37	179.32	179.548
19.953	179.92 *	179.85	179.93 *	179.5	-	179.53	179.49	-	179.612	179.66	179.40	179.36	179.557
25.119	179.85 *	179.82	179.89 *	179.5	-	179.55	179.50	-	179.597	179.59	179.43	179.40	179.549
31.623	179.79 *	179.79	179.84 *	179.5	-	179.58	179.51	-	179.587	179.64	179.45	179.42	179.547
39.811	179.74	179.77	179.80	179.5	-	179.57	179.52	-	179.529	179.62	179.47	179.44	179.540
50.119	179.69	179.73	179.71	179.5	-	179.58	179.52	-	179.524	179.57	179.48	179.46	179.582
63.096	179.65	179.70	179.73 *	179.5	-	179.56	179.51	-	179.511	179.51	179.47	179.45	179.556
79.433	179.60	179.66	179.68	179.5	-	179.55	179.48	-	179.488	179.50	179.46	179.44	179.521
100.00	179.55	179.61	179.62	179.5	-	179.51	179.45	-	179.453	179.57	179.43	179.42	179.489
125.89	179.48	179.54	179.58	179.4	-	179.45	179.40	-	179.402	179.52	179.39	179.37	179.439
158.49	179.40	179.46	179.50	179.3	-	179.39	179.33	-	179.332	179.46	179.32	179.30	179.345
199.53	179.29	179.36	179.38	179.2	-	179.29	179.24	-	179.238	179.36	179.23	179.21	179.303
251.19	179.16	179.22	179.24	179.1	-	179.18	179.12	-	179.112	179.26	179.11	179.09	179.280
316.23	178.99	179.05	179.05	179.0	-	179.02	178.95	-	178.948	179.09	178.95	178.94	179.130
398.11	178.77	178.83	178.83	178.8	-	178.82	178.74	-	178.738	178.92 *	178.74	178.73	178.971
501.19	178.50	178.55	178.54	178.5	-	178.53	178.47	-	178.464	178.66 *	178.47	178.47	178.664
630.96	178.14	178.19	178.18	178.2	-	178.23	178.12	-	178.114	178.29 *	178.12	178.12	178.266
794.33	177.70	177.75	177.73	177.7	-	177.75	177.68	-	177.669	177.72	177.68	177.69	177.787
1000.0	177.13	177.19	177.16	177.2	-	177.17	177.12	-	177.101	177.19	177.13	177.13	177.190
1258.9	176.41	176.47	176.44	176.5	-	176.46	176.41	-	176.388	176.39	176.41	176.42	176.446
1584.9	175.50	175.56	175.52	175.6	-	175.57	175.51	-	175.480	175.53	175.51	175.52	175.516
1995.3	174.34	174.41	174.36	174.4	-	174.42	174.36	-	174.349	174.45	174.37	174.38	174.342
2511.9	172.87	172.95	172.88	173.0	-	172.99	172.89	-	172.877	172.94	172.91	172.92	172.870
3162.3	170.98	171.07	171.00	171.1	-	171.11	171.02	-	170.994	171.02	171.03	171.06	170.968
3981.1	168.55	168.66	168.57	168.7	-	168.72	168.61	-	168.564	168.65	168.62	168.65	168.523
5011.9	165.38	165.50	165.38	165.6	-	165.53	165.45	-	165.388	165.49	165.46	165.50	165.333
6309.6	161.15	161.28	161.14	161.3	-	161.41	161.24	-	161.154	161.26	161.25	161.30	161.088
7943.3	155.35	155.52	155.31	155.6	-	155.69	155.46	-	155.342	155.51	155.47	155.53	155.306
10000	147.12	147.32	147.06	147.4	-	147.51	147.25	-	147.095	147.29	147.26	147.32	147.148
12589	135.06	135.31	134.98 *	135.4	-	135.49	135.22	-	135.040	135.27	135.23	135.28	135.301
15849	117.68	117.91	117.49 *	118.1	-	118.12	117.88	-	117.583	117.81	117.82	117.84	118.289
19953	95.82	96.16	95.55	96.5	-	96.16	96.13	-	95.578	95.82	96.10	95.89	96.916 *
25119	75.69	75.97	75.31	77.1	-	75.80	76.48	-	75.520	75.81	76.30	75.90	76.871

Table 10. Pressure sensitivity phase in degree of the microphone 4180 2412872, as declared by the participant laboratories.

Frequency (Hz)	LNE	HBK-DPLA	METAS	KRISS	NMIJ	GUM	UME	NMIA	CENAM	NRC	VNIIFTRI	NMISA	INMETRO[3]
1.995	176.49	179.80	179.32	177.4	-	176.40	177.42	-	177.971	178.84	176.90	177.39	177.587
2.512	177.06	179.63	179.27	177.7	-	176.90	177.96	-	178.394	178.00	177.40	177.76	178.003
3.162	177.53	179.54	179.39	178.2	-	177.44	178.27	-	178.610	178.38	177.80	178.08	178.409
3.981	177.90	179.50	179.48	178.4	-	177.78	178.43	-	178.780	178.64	178.10	178.34	178.409
5.012	178.19	179.48	179.51	178.7	-	178.12	178.59	-	178.900	178.79	178.40	178.56	178.716
6.310	178.41	179.50	179.53	178.8	-	178.37	178.76	-	178.999	178.85	178.60	178.73	178.878
7.943	178.60	179.51	179.57 *	178.9	-	178.55	178.88	-	179.073	178.98	178.74	178.86	179.021
10.000	178.76	179.52	179.55 *	179.0	-	178.66	178.96	-	179.138	179.02	178.88	178.97	179.055
12.589	178.89	179.55	179.59 *	179.1	-	178.84	179.05	-	179.196	179.05	178.99	179.07	179.201
15.849	179.02	179.58	179.59 *	179.2	-	178.98	179.14	-	179.255	179.09	179.09	179.15	179.242
19.953	179.11	179.60	179.61 *	179.3	-	179.20	179.22	-	179.273	179.17	179.18	179.23	179.312
25.119	179.20	179.62	179.63 *	179.3	-	179.29	179.29	-	179.328	179.23	179.25	179.28	179.373
31.623	179.27	179.64	179.65 *	179.4	-	179.37	179.34	-	179.374	179.36	179.31	179.34	179.423
39.811	179.32	179.65	179.64 *	179.4	-	179.40	179.38	-	179.383	179.37	179.36	179.38	179.453
50.119	179.36	179.64	179.59	179.4	-	179.44	179.41	-	179.408	179.36	179.39	179.41	179.488
63.096	179.38	179.63	179.63 *	179.4	-	179.47	179.42	-	179.418	179.39	179.40	179.41	179.479
79.433	179.38	179.60	179.60 *	179.4	-	179.46	179.42	-	179.413	179.36	179.40	179.41	179.470
100.00	179.37	179.56	179.57	179.4	-	179.45	179.39	-	179.390	179.48	179.37	179.38	179.450
125.89	179.33	179.50	179.50	179.4	-	179.40	179.35	-	179.347	179.46	179.34	179.35	179.415
158.49	179.27	179.42	179.41	179.3	-	179.33	179.29	-	179.282	179.37	179.27	179.27	179.301
199.53	179.18	179.32	179.31	179.2	-	179.24	179.20	-	179.188	179.31	179.18	179.18	179.193
251.19	179.06	179.18	179.16	179.1	-	179.14	179.07	-	179.060	179.18	179.05	179.06	179.045
316.23	178.89	179.00	178.99	179.0	-	178.95	178.90	-	178.890	179.05 *	178.88	178.90	178.881
398.11	178.67	178.77	178.75	178.8	-	178.73	178.68	-	178.668	178.84 *	178.66	178.68	178.654
501.19	178.39	178.48	178.46	178.5	-	178.46	178.40	-	178.380	178.56 *	178.38	178.39	178.361
630.96	178.03	178.11	178.08	178.1	-	178.08	178.04	-	178.012	178.18	178.02	178.03	178.001
794.33	177.56	177.64	177.60	177.6	-	177.60	177.58	-	177.543	177.59	177.55	177.57	177.544
1000.0	176.97	177.05	177.00	177.0	-	177.05	176.99	-	176.948	177.02	176.96	176.98	176.947
1258.9	176.22	176.30	176.24	176.3	-	176.27	176.24	-	176.193	176.21	176.21	176.24	176.169
1584.9	175.26	175.35	175.27	175.3	-	175.31	175.29	-	175.229	175.27	175.26	175.29	175.196
1995.3	174.05	174.14	174.05	174.1	-	174.10	174.09	-	174.032	174.13	174.05	174.09	173.956
2511.9	172.51	172.60	172.49	172.6	-	172.61	172.55	-	172.479	172.54	172.51	172.56	172.395
3162.3	170.53	170.64	170.51	170.6	-	170.64	170.59	-	170.492	170.60	170.54	170.60	170.387
3981.1	167.99	168.11	167.94	168.1	-	168.08	168.06	-	167.935	168.05	167.99	168.07	167.810
5011.9	164.68	164.82	164.60	164.8	-	164.77	164.77	-	164.599	164.69	164.69	164.78	164.446
6309.6	160.27	160.43	160.16	160.5	-	160.41	160.39	-	160.177	160.35	160.29	160.40	159.999
7943.3	154.31	154.49	154.14 *	154.5	-	154.48	154.41	-	154.150	154.37	154.31	154.43	153.980
10000	145.92	146.12	145.69 *	146.2	-	146.09	146.03	-	145.722	146.01	145.91	146.06	145.591
12589	133.89	134.09	133.59 *	134.1	-	134.06	133.99	-	133.663	134.02	133.87	133.97	133.705
15849	116.79	117.09	116.52 *	117.2	-	117.09	116.99	-	116.697	117.15	116.93	116.96	117.095
19953	95.76	96.12	95.53	96.6	-	96.21	96.05	-	95.781	95.93	96.20	95.96	96.755
25119	76.41	76.86	76.15	78.1	-	76.60	77.19	-	76.702	77.00	77.40	76.78	77.792

[3] The results of INMETRO for the microphone 4180.2412872 are not considered in this comparison due to the identified drift of the microphone (see section 7.2).

Table 11. Expanded uncertainties in degree using a coverage factor of k=2 for the pressure sensitivity phase of the microphone 4180 2124385, as declared by the participant laboratories.

Frequency (Hz)	LNE	HBK-DPLA	METAS	KRISS	NMIJ	GUM	UME	NMIA	CENAM	NRC	VNIIFTRI	NMISA	INMETRO
1.995	4.15	3.75	2.39*	2.5	-	3.20	2.00	-	3.10	5.39	1.10	2.00	3.60
2.512	2.65*	2.95	2.02*	2.0	-	3.20	1.00	-	2.80	2.32	0.90	1.00	2.50
3.162	1.70*	2.30	1.65*	1.5	-	3.20	1.00	-	2.60	1.29*	0.70	1.00	2.00
3.981	1.10*	1.80	1.38*	1.5	-	1.90	1.00	-	2.30	1.29	0.60	1.00	1.25
5.012	0.70*	1.45	1.10*	1.0	-	1.90	0.90	-	2.10	0.66*	0.50	0.90	1.25
6.310	0.50*	1.15	0.91*	1.0	-	1.90	0.80	-	1.80	0.53*	0.40	0.90	0.95
7.943	0.35*	0.95	0.74*	1.0	-	1.30	0.65	-	1.40	0.44*	0.32	0.65	0.90
10.000	0.30*	0.80	0.64*	0.8	-	1.30	0.50	-	1.10	0.44*	0.26	0.50	0.80
12.589	0.25*	0.70	0.56*	0.8	-	1.30	0.45	-	1.00	0.35*	0.22	0.50	0.80
15.849	0.20*	0.60	0.46*	0.6	-	1.10	0.40	-	0.80	0.35	0.19	0.40	0.50
19.953	0.20*	0.50	0.40*	0.5	-	0.90	0.40	-	0.60	0.35	0.16	0.40	0.50
25.119	0.20*	0.45	0.35*	0.5	-	0.80	0.35	-	0.60	0.35	0.14	0.40	0.35
31.623	0.20*	0.40	0.29*	0.5	-	0.70	0.30	-	0.60	0.23	0.12	0.30	0.35
39.811	0.20	0.35	0.25	0.4	-	0.70	0.25	-	0.60	0.15	0.11	0.30	0.35
50.119	0.20	0.30	0.22	0.4	-	0.70	0.25	-	0.60	0.15	0.10	0.30	0.35
63.096	0.20	0.25	0.20*	0.4	-	0.70	0.15	-	0.60	0.15	0.08	0.15	0.35
79.433	0.20	0.25	0.18	0.4	-	0.70	0.15	-	0.60	0.15	0.08	0.15	0.35
100.00	0.20	0.20	0.15	0.4	-	0.70	0.15	-	0.60	0.12	0.08	0.15	0.35
125.89	0.20	0.20	0.15	0.4	-	0.60	0.15	-	0.13	0.12	0.06	0.15	0.35
158.49	0.20	0.15	0.14	0.3	-	0.60	0.10	-	0.13	0.12	0.06	0.10	0.35
199.53	0.20	0.15	0.11	0.3	-	0.60	0.10	-	0.12	0.12	0.05	0.10	0.35
251.19	0.20	0.15	0.11	0.3	-	0.50	0.10	-	0.12	0.12	0.05	0.10	0.35
316.23	0.20	0.15	0.09	0.3	-	0.50	0.10	-	0.12	0.13	0.04	0.10	0.35
398.11	0.20	0.10	0.08	0.3	-	0.50	0.10	-	0.12	0.13*	0.04	0.10	0.35
501.19	0.20	0.10	0.07	0.3	-	0.50	0.10	-	0.11	0.13*	0.04	0.10	0.35
630.96	0.20	0.10	0.06	0.3	-	0.50	0.10	-	0.11	0.13*	0.04	0.10	0.35
794.33	0.20	0.10	0.06	0.3	-	0.50	0.10	-	0.11	0.13	0.04	0.10	0.35
1000.0	0.25	0.10	0.05	0.3	-	0.40	0.10	-	0.13	0.13	0.04	0.10	0.35
1258.9	0.25	0.10	0.05	0.3	-	0.40	0.10	-	0.13	0.14	0.04	0.10	0.35
1584.9	0.25	0.10	0.05	0.3	-	0.40	0.10	-	0.13	0.17	0.04	0.10	0.35
1995.3	0.30	0.10	0.06	0.3	-	0.40	0.10	-	0.19	0.17	0.05	0.10	0.35
2511.9	0.35	0.10	0.07	0.3	-	0.40	0.10	-	0.19	0.18	0.06	0.10	0.35
3162.3	0.40	0.10	0.08	0.3	-	0.40	0.10	-	0.20	0.18	0.07	0.10	0.35
3981.1	0.50	0.10	0.10	0.3	-	0.40	0.10	-	0.20	0.19	0.09	0.10	0.35
5011.9	0.60	0.10	0.12	0.3	-	0.50	0.15	-	0.20	0.26	0.11	0.10	0.35
6309.6	0.75	0.10	0.15	0.3	-	0.50	0.15	-	0.20	0.28	0.13	0.15	0.35
7943.3	0.90	0.10	0.19	0.3	-	0.60	0.15	-	0.30	0.29	0.15	0.15	0.35
10000	1.10	0.10	0.22	0.4	-	0.60	0.20	-	0.45	0.38	0.15	0.25	0.35
12589	1.40	0.15	0.25*	0.6	-	0.70	0.25	-	0.98	0.48	0.11	0.25	0.35
15849	1.75	0.15	0.33*	1.0	-	0.90	0.35	-	1.80	0.58	0.10	0.45	0.50
19953	2.20	0.25	0.46	1.5	-	1.30	0.45	-	1.88	0.91	0.60	0.55	0.80*
25119	2.90	0.45	0.60	3.0	-	1.90	0.55	-	2.73	1.87	2.30	0.55	2.20

Table 12. Expanded uncertainties in degree using a coverage factor of k=2 for the pressure sensitivity phase of the microphone 4180 2412872, as declared by the participant laboratories.

Frequency (Hz)	LNE	HBK-DPLA	METAS	KRISS	NMIJ	GUM	UME	NMIA	CENAM	NRC	VNIIFTRI	NMISA	INMETRO[4]
1.995	4.15	2.80	2.13	4.0	-	3.20	2.00	-	3.10	5.39	1.10	2.00	3.60
2.512	2.65	2.15	1.70	3.0	-	3.20	1.00	-	2.80	2.32	0.90	1.00	2.50
3.162	1.70	1.65	1.37	2.5	-	3.20	1.00	-	2.60	1.29	0.70	1.00	2.00
3.981	1.10	1.30	1.12	2.0	-	1.90	1.00	-	2.30	1.29	0.60	1.00	1.25
5.012	0.70	1.05	0.93	1.5	-	1.90	0.90	-	2.10	0.66	0.50	0.90	1.25
6.310	0.45	0.85	0.78	1.5	-	1.90	0.80	-	1.80	0.53	0.40	0.90	0.95
7.943	0.35	0.75	0.66*	1.5	-	1.30	0.65	-	1.40	0.44	0.32	0.65	0.90
10.000	0.25	0.65	0.57*	1.0	-	1.30	0.50	-	1.10	0.44	0.26	0.50	0.80
12.589	0.20	0.55	0.49*	1.0	-	1.30	0.45	-	1.00	0.35	0.22	0.50	0.80
15.849	0.15	0.50	0.42*	0.8	-	1.10	0.40	-	0.80	0.35	0.19	0.40	0.50
19.953	0.15	0.45	0.37*	0.6	-	0.90	0.40	-	0.60	0.35	0.16	0.40	0.50
25.119	0.15	0.40	0.32*	0.5	-	0.80	0.35	-	0.60	0.35	0.14	0.40	0.35
31.623	0.15	0.35	0.28*	0.5	-	0.70	0.30	-	0.60	0.23	0.12	0.30	0.35
39.811	0.15	0.30	0.25*	0.4	-	0.70	0.25	-	0.60	0.15	0.11	0.30	0.35
50.119	0.15	0.30	0.23	0.4	-	0.70	0.25	-	0.60	0.15	0.10	0.30	0.35
63.096	0.15	0.25	0.20*	0.4	-	0.70	0.15	-	0.60	0.15	0.08	0.15	0.35
79.433	0.15	0.25	0.17*	0.4	-	0.70	0.15	-	0.60	0.15	0.08	0.15	0.35
100.00	0.15	0.20	0.16	0.4	-	0.70	0.15	-	0.60	0.12	0.08	0.15	0.35
125.89	0.15	0.20	0.14	0.4	-	0.60	0.15	-	0.13	0.12	0.06	0.15	0.35
158.49	0.15	0.15	0.12	0.3	-	0.60	0.10	-	0.13	0.12	0.06	0.10	0.35
199.53	0.15	0.15	0.11	0.3	-	0.60	0.10	-	0.12	0.12	0.05	0.10	0.35
251.19	0.15	0.15	0.10	0.3	-	0.50	0.10	-	0.12	0.12	0.05	0.10	0.35
316.23	0.15	0.15	0.09	0.3	-	0.50	0.10	-	0.12	0.13*	0.04	0.10	0.35
398.11	0.15	0.10	0.08	0.3	-	0.50	0.10	-	0.12	0.13*	0.04	0.10	0.35
501.19	0.15	0.10	0.07	0.3	-	0.50	0.10	-	0.11	0.13*	0.04	0.10	0.35
630.96	0.15	0.10	0.06	0.3	-	0.50	0.10	-	0.11	0.13	0.04	0.10	0.35
794.33	0.15	0.10	0.06	0.3	-	0.50	0.10	-	0.11	0.13	0.04	0.10	0.35
1000.0	0.15	0.10	0.06	0.3	-	0.40	0.10	-	0.13	0.13	0.04	0.10	0.35
1258.9	0.15	0.10	0.06	0.3	-	0.40	0.10	-	0.13	0.14	0.04	0.10	0.35
1584.9	0.15	0.10	0.06	0.3	-	0.40	0.10	-	0.13	0.17	0.04	0.10	0.35
1995.3	0.15	0.10	0.07	0.3	-	0.40	0.10	-	0.19	0.17	0.05	0.10	0.35
2511.9	0.15	0.10	0.08	0.3	-	0.40	0.10	-	0.19	0.18	0.06	0.10	0.35
3162.3	0.15	0.10	0.10	0.3	-	0.40	0.10	-	0.20	0.18	0.07	0.10	0.35
3981.1	0.20	0.10	0.12	0.3	-	0.40	0.10	-	0.20	0.19	0.09	0.10	0.35
5011.9	0.20	0.10	0.15	0.3	-	0.50	0.15	-	0.20	0.26	0.11	0.10	0.35
6309.6	0.25	0.10	0.18	0.3	-	0.50	0.15	-	0.20	0.28	0.13	0.15	0.35
7943.3	0.30	0.10	0.21*	0.3	-	0.60	0.15	-	0.30	0.29	0.15	0.15	0.35
10000	0.35	0.10	0.24*	0.4	-	0.60	0.20	-	0.45	0.38	0.15	0.25	0.35
12589	0.40	0.15	0.28*	0.6	-	0.70	0.25	-	0.98	0.48	0.11	0.25	0.35
15849	0.50	0.15	0.39*	1.0	-	0.90	0.35	-	1.80	0.58	0.10	0.45	0.50
19953	0.65	0.25	0.55	1.5	-	1.30	0.45	-	1.88	0.91	0.60	0.55	0.80
25119	1.20	0.45	0.78	3.0	-	1.90	0.55	-	2.73	1.87	2.30	0.55	2.20

[4] The results of INMETRO for the microphone 4180.2412872 are not considered in this comparison due to the identified drift of the microphone (see section 7.2).

7 Method for the analysis of the results

7.1 Key Comparison Reference Values and Degrees of Equivalence

The methodology used in this report for the analysis of the results is similar to the one used in the Key Comparisons CCAUV.A-K3 and CCAUV.A-K4 [4, 5].

The linear model of the comparison is $E(y) = X \cdot a$, where a is a vector of parameters of the model, $E(y)$ the expectations of the measurements and X is the design matrix. In our case, the model takes the form in equation (1).

$$\begin{bmatrix} E(y_{1,1}) \\ \vdots \\ E(y_{1,13}) \\ E(y_{2,1}) \\ \vdots \\ E(y_{2,13}) \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ \vdots & \vdots \\ 1 & 0 \\ 0 & 1 \\ \vdots & \vdots \\ 0 & 1 \end{bmatrix} \begin{bmatrix} a_1 \\ a_2 \end{bmatrix}, \tag{1}$$

where $E(y_{i,j})$ is the expected value of the i-th sensor being measured by the j-th laboratory in the loop. The parameters a_i is the value of the two sensor i to be estimated.

The input data for the model are the measurement results y_i and the covariance matrix Σ. The covariance matrix has in its main diagonal the squares of the standard uncertainties claimed by the participants. The off-diagonal elements of Σ are only non-zero when they represent the covariance of measurements by the same laboratory. In this analysis, a high degree of correlation is assumed for measurements made by the same laboratory. However, total correlations affect the least squares calculation in the sense that measurements are linked with no uncertainties, making minimization unsolvable [5]. With all these considerations, a correlation value of 0.7 is chosen, somewhat arbitrarily, for the results presented here.

The estimated values of the standards $\hat{y}$ and their covariance matrix $V(\hat{y})$ are obtained using:

$$\begin{gathered} \hat{y} = X \cdot \hat{a}, \\ V(\hat{y}) = X \cdot V(\hat{a}) \cdot X^T, \end{gathered} \tag{2}$$

where,

$$\begin{gathered} \hat{a} = (X^T \cdot \Sigma^{-1} \cdot X)^{-1} \cdot X^T \cdot \Sigma^{-1} \cdot y, \\ C = V(\hat{a}) = (X^T \cdot \Sigma^{-1} \cdot X)^{-1}. \end{gathered} \tag{3}$$

The degrees of equivalence D_{ii} per laboratory are obtained using:

$$D_{ii} = A^T \cdot (y - \hat{y}) \qquad \text{and} \qquad V(D_{ii}) = A^T \cdot V(y - \hat{y}) \cdot A, \tag{4}$$

where A is an averaging matrix [5]. The inter-laboratory degrees of equivalence can be estimated using:

$$D_{i,j} = D_{i,i} - D_{j,j} \qquad \text{and} \qquad V(D_{i,j}) = u_{i,i} + u_{j,j} - u_{i,j} - u_{j,i}, \tag{5}$$

where $D_{i,j}$ is the inter-laboratory deviation. The $u_{x,x}$ elements are obtained from equation (4).

7.2 Equivalence and consistence of results

The participating laboratories are supposed to be measuring the same item and their results are assumed to be drawn from a normal distribution. This hypothesis is tested by means of an observed χ^2 distributed estimator, the so-called 'chi-squared test' as described in [6]. The degrees of freedom of the χ^2 distribution are $v = n - k$, where n is the number of measurements (26 for most cases) and k the number of standards (2 microphones). To accept the hypothesis with a significance of 5%, the probability $P\left\{\chi^2(v) > {\chi^2}^2_{obs}\right\}$ has to be larger than 5%.

a) Identifying discrepant measurements

Once all data was collected, and the participants reported any problem with their measurement, the analysis method in [6] was implemented. This method uses the normalized deviations that were calculated for every frequency and measurement. The method assumes that the normalized deviations are distributed as $N(0,1)$. Therefore, if the modulus of a particular normalized deviation is greater than 2, the corresponding measurement can be considered discrepant with a significance of 5 %.

b) Handling of discrepant measurements

If a measurement has been judged to be discrepant, it should be excluded from the least squares calculation of the reference values. Otherwise the calculated reference values cannot be considered to be proper estimates of the SI values of the quantities represented by the circulated objects. If there is a discrepant measurement $y_{i,j}$ in a comparison and the uncertainty assigned to this measurement is very small, the comparison reference value will be attracted to this discrepant result. As a consequence the remaining results might appear to be discrepant as well even if they are mutually consistent. Since one discrepant measurement will always have a value $|d_{i,j}|$ larger than the values $|d_{k,j}|$, $i \neq k$ of two or more mutually consistent values, the value $y_{i,j}$ with the larger value $|d_{i,j}|$ should be excluded first. A repeated least squares adjustment of the reference values will then show if there are further discrepant results.

The procedure of excluding discrepant results one by one can be summarized as follows:

1. Identify the result $y_{i,j}$ with the largest value $|d_{i,j}| > 2$ in the (reduced) set of results.
2. Exclude the result $y_{i,j}$ from the reduced set of results.
3. Repeat the least squares adjustment of reference values for the reduced set of results.
4. If the results in the reduced set are not mutually consistent, continue at point 1.

It has to be emphasized, that the discrepant results are excluded only from the calculation of the reference values and not from the key comparison as such. It is therefore still necessary to calculate the deviations of the discrepant results from the reference values and the uncertainties of these deviations. Reference [6] gives a detailed explanation of the procedure.

c) Handling of instability of sensors

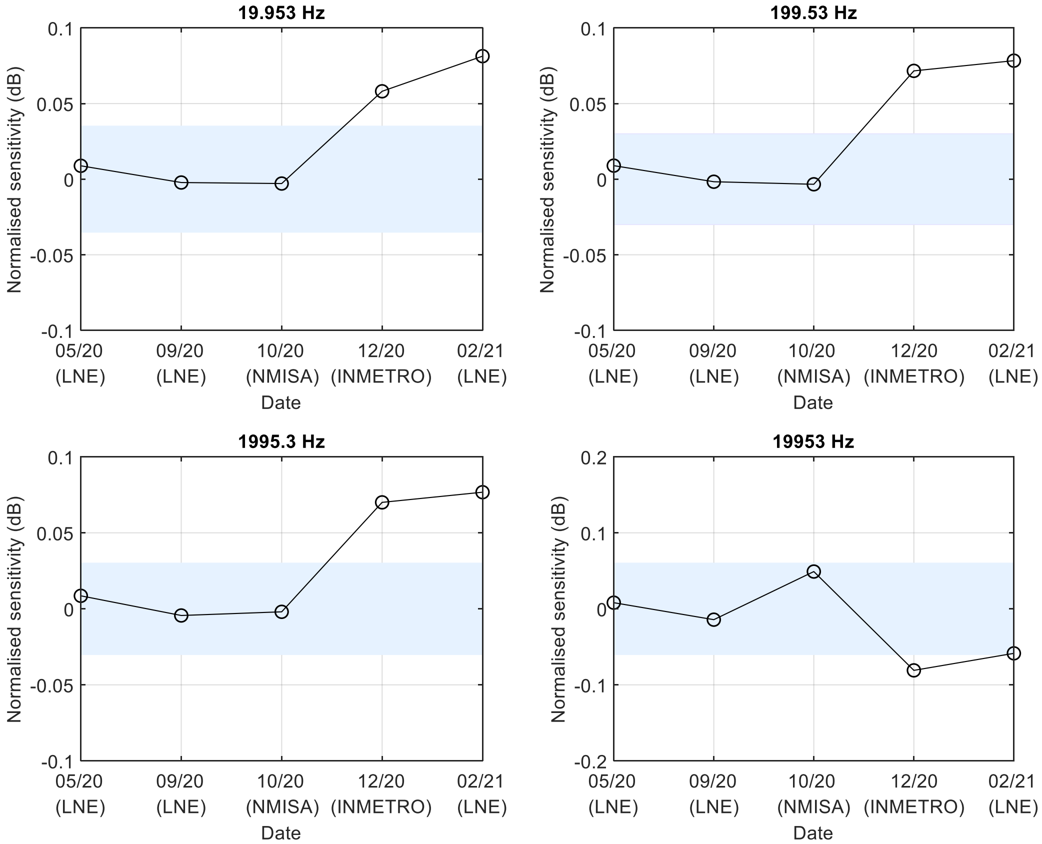

Figure 3. Changes in the sensitivity level of the microphone 4180.2412872 at 19.953 Hz, 199.53 Hz, 1995.3 Hz and 19953 Hz with respect to the average value as a function of time (blue area: Uncertainty bounds on normalised sensitivity). Note: the measurements from NMISA, INMETRO and LNE provided in 02/2021 are excluded here in the calculation of the average sensitivity level.

Ideally, the behaviour of an individual microphone's sensitivity throughout the comparison would be described by a constant value, allowing for some random variability within the type A allowances of the pilot laboratory's uncertainty budget. A microphone conforming to this ideal would be said to have been stable throughout the period of measurements. If the microphone's stability data could not be fitted successfully with a constant value, the next simplest description of its behaviour would be a straight line with a non-zero gradient. If the straight line could be successfully fitted to the data, it was relatively simple to correct the data to compensate for the drift of the microphone sensitivity, but there were uncertainties associated with the corrections. If the microphone's stability data could not be fitted successfully with a straight line, then it can be concluded that the behaviour of the microphone over the duration of the key comparison was more complex.

As discussed in section 4, a drift in the sensitivity level of the microphone 2412872 was observed at the last monitoring calibration in February 2021. The Figure 1 showing the changes in the sensitivity level of the microphones at 1 kHz as a function of time shows a sudden drift occurred in the period September 2020 – January 2021, impacting potentially two laboratories, NMISA and INMETRO. The Figure 3 which presents the same stability analysis of the microphone 2412872 at more frequencies and introducing the results of NMISA and INMETRO allows to date more precisely the event causing the drift in the period October 2020 - December 2020, impacting only the results of INMETRO. The Figure 4 which present the same stability analysis of the microphone 2124385 and showing the absence of drift support the hypothesis of a sudden event having causing the drift of the microphone 2412872 and impacting only the results of INMETRO.

On that basis, it was agreed with the participants in the key comparison that the results of INMETRO for the microphone 4180.2412872 would be removed and not considered in this comparison. Thus, the degrees of equivalence presented in this report for INMETRO are based only on the results of the microphone 4180.2124385

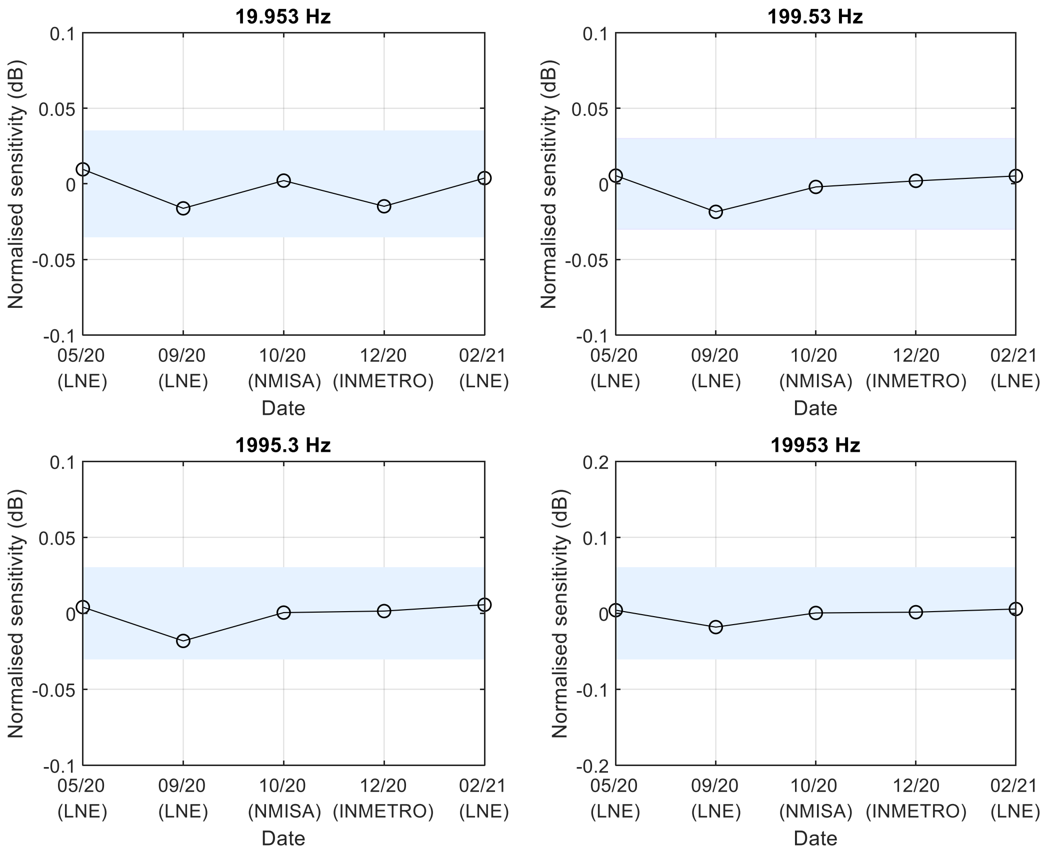

Figure 4. Changes in the sensitivity level of the microphone 4180.2124385 at 19.953 Hz, 199.53 Hz, 1995.3 Hz and 19953 Hz with respect to the average value as a function of time (blue area: Uncertainty bounds on normalised sensitivity). Note: the measurements from NMISA, INMETRO and LNE provided in 02/2021 are excluded here in the calculation of the average sensitivity level.

8 Results

8.1 Key Comparison Reference Values

The reference values are listed in Table 13 and Table 14 respectively for the sensitivity level and sensitivity phase respectively. These values were obtained using the procedure described in the previous section. Some discrepant results were found at some frequencies. In all cases where a discrepant measurement was found, this measurement result or results have been excluded from the determination of the reference values (see Tables in Section 6). Table 15 shows the results of the χ^2 test applied to the comparison results as described in Section 7.2. In general, this test has been considered to be satisfactory.

Table 13. Reference values for the comparison, pressure sensitivity levels in dB re 1V/Pa and expanded uncertainties U (*k=2*) in dB.

Frequency (Hz)	4180. 2124385		4180. 2412872	
	Sensitivity (dB ref 1V/Pa)	U(*k=2*) (dB)	Sensitivity (dB ref 1V/Pa)	U(*k=2*) (dB)
1.995	-37.931	0.042	-37.613	0.043
2.512	-37.962	0.036	-37.650	0.036
3.162	-37.989	0.034	-37.684	0.034
3.981	-38.006	0.031	-37.705	0.032
5.012	-38.011	0.027	-37.722	0.028
6.310	-38.020	0.025	-37.738	0.025
7.943	-38.031	0.023	-37.752	0.024
10.000	-38.042	0.021	-37.767	0.021
12.589	-38.053	0.020	-37.781	0.020
15.849	-38.065	0.017	-37.795	0.018
19.953	-38.076	0.016	-37.806	0.016
25.119	-38.084	0.014	-37.816	0.014
31.623	-38.092	0.014	-37.829	0.014
39.811	-38.100	0.012	-37.833	0.012
50.119	-38.108	0.012	-37.842	0.012
63.096	-38.113	0.011	-37.847	0.011
79.433	-38.117	0.011	-37.854	0.011
100.00	-38.124	0.010	-37.859	0.010
125.89	-38.130	0.010	-37.864	0.010
158.49	-38.134	0.010	-37.869	0.010
199.53	-38.138	0.010	-37.872	0.010
251.19	-38.142	0.010	-37.875	0.010
316.23	-38.144	0.009	-37.879	0.009
398.11	-38.146	0.009	-37.881	0.009
501.19	-38.148	0.009	-37.882	0.009
630.96	-38.149	0.009	-37.883	0.009
794.33	-38.149	0.009	-37.883	0.009
1000.0	-38.146	0.009	-37.882	0.009
1258.9	-38.142	0.009	-37.878	0.009
1584.9	-38.135	0.009	-37.872	0.009
1995.3	-38.122	0.009	-37.862	0.009
2511.9	-38.102	0.009	-37.844	0.009
3162.3	-38.068	0.009	-37.815	0.009
3981.1	-38.017	0.009	-37.772	0.009
5011.9	-37.939	0.009	-37.706	0.009
6309.6	-37.820	0.009	-37.610	0.009
7943.3	-37.651	0.010	-37.477	0.010
10000	-37.451	0.010	-37.334	0.010
12589	-37.315	0.011	-37.294	0.011
15849	-37.603	0.016	-37.693	0.015
19953	-39.057	0.027	-39.183	0.027
25119	-41.939	0.045	-42.057	0.046

Table 14. Reference values for the comparison, pressure sensitivity phase in degree and expanded uncertainties U (k=2) in degree.

Frequency (Hz)	4180. 2124385		4180. 2412872	
	Sensitivity (degree)	U(k=2) (degree)	Sensitivity (degree)	U(k=2) (degree)
1.995	179.450	0.697	177.513	0.691
2.512	179.306	0.475	177.890	0.467
3.162	179.314	0.412	178.215	0.392
3.981	179.488	0.354	178.420	0.340
5.012	179.386	0.298	178.637	0.265
6.310	179.403	0.250	178.751	0.212
7.943	179.355	0.205	178.814	0.177
10.000	179.358	0.166	178.908	0.142
12.589	179.364	0.145	179.002	0.120
15.849	179.430	0.115	179.091	0.099
19.953	179.450	0.104	179.182	0.092
25.119	179.470	0.094	179.261	0.086
31.623	179.495	0.081	179.329	0.075
39.811	179.564	0.067	179.372	0.065
50.119	179.548	0.063	179.402	0.062
63.096	179.500	0.053	179.407	0.052
79.433	179.499	0.051	179.413	0.051
100.00	179.489	0.048	179.418	0.048
125.89	179.429	0.041	179.373	0.040
158.49	179.356	0.036	179.302	0.036
199.53	179.261	0.033	179.211	0.033
251.19	179.142	0.033	179.082	0.032
316.23	178.974	0.029	178.908	0.029
398.11	178.761	0.029	178.687	0.029
501.19	178.490	0.028	178.405	0.028
630.96	178.143	0.027	178.048	0.027
794.33	177.700	0.026	177.574	0.026
1000.0	177.143	0.026	176.983	0.026
1258.9	176.421	0.026	176.228	0.026
1584.9	175.517	0.026	175.274	0.027
1995.3	174.375	0.030	174.069	0.031
2511.9	172.908	0.033	172.529	0.034
3162.3	171.032	0.036	170.567	0.037
3981.1	168.621	0.040	168.033	0.041
5011.9	165.462	0.046	164.734	0.046
6309.6	161.244	0.053	160.342	0.053
7943.3	155.476	0.057	154.399	0.057
10000	147.268	0.065	146.024	0.066
12589	135.261	0.074	133.957	0.074
15849	117.858	0.077	116.985	0.076
19953	96.016	0.167	96.006	0.165
25119	75.951	0.250	76.815	0.255

Table 15. Results of the χ^2 test as described in Section 7.2. The correlation used in the calculations is 0.7.

Frequency (Hz)	$P\{\chi^2(\nu) > \chi^2_{obs}\}$ (%)	
	Sensitivity level	Sensitivity phase
1.995	88,5	26.5
2.512	96,3	33.0
3.162	98,3	81.3
3.981	99,1	40.8
5.012	98,6	79.5
6.310	99,0	75.7
7.943	99,7	92.4
10.000	99,7	92.7
12.589	99,7	95.0
15.849	99,1	74.3
19.953	99,5	87.8
25.119	98,3	97.8
31.623	92,2	95.6
39.811	99,1	11.6
50.119	95,5	56.2
63.096	94,2	81.6
79.433	98,9	75.5
100.00	96,0	79.0
125.89	98,2	80.3
158.49	91,4	75.0
199.53	97,3	76.6
251.19	98,4	76.9
316.23	92,4	79.2
398.11	96,8	87.4
501.19	91,5	95.4
630.96	98,0	89.7
794.33	97,8	99.8
1000.0	95,5	99.8
1258.9	93,5	100.0
1584.9	93,9	100.0
1995.3	96,1	99.9
2511.9	87,9	99.7
3162.3	83,6	98.7
3981.1	89,2	94.6
5011.9	82,9	82.6
6309.6	88,4	63.9
7943.3	95,2	59.1
10000	96,1	58.6
12589	98,5	93.9
15849	97,0	94.4
19953	87,7	96.6
25119	99,9	91.9

8.2 Degrees of equivalence per laboratory

The degrees of equivalence per laboratory were determined as mentioned in the previous section.

Table 16 and Table 17 show the degrees of equivalence per laboratory as function of frequency for sensitivity levels. The values of degrees of equivalence and uncertainties are reported in Figure 5 to Figure 7 for each laboratory.

Table 18 and Table 19 show the degrees of equivalence per laboratory as function of frequency for sensitivity phases. The values of degrees of equivalence and uncertainties are reported in Figure 8 to Figure 10 for each laboratory.

Table 16. Degrees of equivalence per laboratory as function of frequency for sensitivity levels, deviations (dB) and uncertainties k=2 (dB), Part I.

Frequency (Hz)	LNE		HBK-DPLA		METAS		KRISS		NMIJ		GUM		UME	
	D_{ii} (dB)	U(k=2) (dB)	D_{ii} (dB)	U(k=2) (dB)	D_{ii} (dB)	U(k=2) (dB)	D_{ii} (dB)	U(k=2) (dB)	D_{ii} (dB)	U(k=2) (dB)	D_{ii} (dB)	U(k=2) (dB)	D_{ii} (dB)	U(k=2) (dB)
1.995	-0.023	0.128	-0.025	0.083	-0.096	0.107	-0.055	0.367	-0.233	0.570	0.097	0.180	0.047	0.180
2.512	-0.016	0.101	-0.023	0.066	-0.064	0.091	-0.059	0.275	-0.104	0.441	0.071	0.181	0.041	0.172
3.162	-0.005	0.079	-0.021	0.067	-0.063	0.083	-0.042	0.275	-0.114	0.349	0.071	0.182	0.046	0.172
3.981	0.000	0.063	-0.026	0.068	-0.059	0.078	-0.036	0.182	-0.125	0.321	0.060	0.126	0.045	0.163
5.012	-0.001	0.049	-0.036	0.069	-0.061	0.077	-0.040	0.136	0.011	0.173	0.056	0.127	0.036	0.098
6.310	-0.001	0.043	-0.040	0.070	-0.052	0.073	-0.020	0.089	0.019	0.136	0.054	0.127	0.039	0.099
7.943	-0.001	0.036	-0.041	0.071	-0.046	0.069	-0.022	0.090	0.007	0.127	0.042	0.099	0.032	0.099
10.000	-0.003	0.031	-0.039	0.066	-0.039	0.066	-0.016	0.090	0.005	0.071	0.040	0.100	0.030	0.100
12.589	-0.004	0.030	-0.038	0.062	-0.037	0.063	-0.011	0.090	0.002	0.072	0.037	0.100	0.027	0.100
15.849	-0.006	0.028	-0.036	0.058	-0.036	0.060	-0.007	0.091	0.000	0.063	0.030	0.072	0.025	0.072
19.953	-0.007	0.029	-0.034	0.053	-0.032	0.057	-0.018	0.072	-0.004	0.063	0.021	0.044	0.021	0.063
25.119	-0.011	0.027	-0.031	0.049	-0.029	0.055	-0.017	0.073	-0.005	0.054	0.020	0.034	0.020	0.054
31.623	-0.009	0.027	-0.026	0.044	-0.025	0.052	-0.011	0.073	-0.004	0.044	0.021	0.035	0.021	0.044
39.811	-0.012	0.028	-0.025	0.040	-0.023	0.050	-0.011	0.054	-0.008	0.035	0.012	0.035	0.017	0.035
50.119	-0.012	0.028	-0.021	0.035	-0.020	0.051	-0.007	0.045	-0.010	0.035	0.015	0.035	0.020	0.035
63.096	-0.014	0.028	-0.020	0.031	-0.017	0.047	-0.010	0.045	-0.005	0.036	0.010	0.026	0.015	0.026
79.433	-0.015	0.028	-0.017	0.031	-0.015	0.046	-0.006	0.045	-0.004	0.036	0.011	0.026	0.016	0.026
100.00	-0.015	0.028	-0.015	0.026	-0.014	0.045	-0.003	0.045	-0.004	0.036	0.011	0.026	0.016	0.026
125.89	-0.014	0.028	-0.011	0.026	-0.009	0.044	0.001	0.045	-0.013	0.036	0.007	0.026	0.017	0.026
158.49	-0.015	0.029	-0.010	0.021	-0.008	0.044	0.004	0.036	-0.008	0.036	0.012	0.026	0.017	0.026
199.53	-0.015	0.029	-0.008	0.021	-0.007	0.043	0.006	0.036	-0.010	0.036	0.015	0.026	0.015	0.026
251.19	-0.016	0.029	-0.006	0.021	-0.003	0.042	0.008	0.036	-0.012	0.036	0.008	0.026	0.018	0.026
316.23	-0.016	0.029	-0.004	0.016	-0.003	0.042	0.010	0.036	-0.014	0.036	0.011	0.026	0.016	0.026
398.11	-0.016	0.029	-0.003	0.016	-0.002	0.042	0.011	0.036	-0.012	0.036	0.013	0.026	0.013	0.026
501.19	-0.017	0.029	-0.002	0.016	-0.001	0.041	0.013	0.036	-0.010	0.036	0.010	0.026	0.015	0.026
630.96	-0.017	0.029	-0.001	0.016	0.000	0.041	0.014	0.036	-0.009	0.036	0.006	0.026	0.016	0.026
794.33	-0.018	0.029	0.000	0.016	0.001	0.041	0.015	0.036	-0.009	0.036	0.006	0.026	0.016	0.026
1000.0	-0.018	0.029	0.001	0.011	0.000	0.041	0.015	0.036	-0.011	0.036	0.004	0.026	0.014	0.026
1258.9	-0.019	0.029	0.001	0.011	0.001	0.041	0.017	0.036	-0.015	0.036	0.010	0.026	0.010	0.026
1584.9	-0.020	0.029	0.002	0.011	0.002	0.041	0.017	0.036	-0.012	0.036	0.003	0.026	0.013	0.026
1995.3	-0.019	0.029	0.002	0.011	0.002	0.040	0.019	0.036	-0.013	0.036	0.007	0.026	0.012	0.026
2511.9	-0.019	0.029	0.004	0.011	0.003	0.040	0.022	0.036	-0.012	0.036	0.003	0.026	0.008	0.026
3162.3	-0.020	0.029	0.003	0.011	0.002	0.040	0.022	0.036	-0.008	0.036	0.007	0.026	0.012	0.026
3981.1	-0.021	0.029	0.004	0.011	0.003	0.039	0.023	0.036	-0.010	0.036	0.005	0.026	0.015	0.036
5011.9	-0.021	0.029	0.006	0.011	0.005	0.038	0.025	0.036	-0.017	0.036	-0.002	0.026	0.008	0.036
6309.6	-0.022	0.029	0.007	0.011	0.005	0.038	0.023	0.036	-0.020	0.036	-0.005	0.036	0.010	0.036
7943.3	-0.029	0.031	0.004	0.011	0.003	0.040	0.023	0.036	-0.021	0.036	-0.016	0.045	0.004	0.045
10000	-0.030	0.031	0.003	0.010	0.004	0.046	0.017	0.045	-0.023	0.036	-0.023	0.055	0.002	0.045
12589	-0.032	0.036	0.005	0.010	0.008	0.058	0.015	0.054	-0.030	0.036	-0.035	0.073	0.000	0.054
15849	-0.033	0.044	0.011	0.018	0.021	0.084	-0.007	0.063	-0.037	0.044	-0.057	0.072	-0.012	0.072
19953	-0.049	0.060	0.020	0.039	0.049	0.141	0.012	0.108	-0.020	0.108	-0.070	0.108	-0.010	0.108
25119	-0.041	0.120	-0.003	0.049	0.065	0.382	0.150	0.227	0.008	0.189	-0.137	0.217	0.023	0.180

Table 17. Degrees of equivalence per laboratory as function of frequency for sensitivity levels, deviations (dB) and uncertainties k=2 (dB), Part II.

Frequency (Hz)	NMIA		CENAM		NRC		VNIIFTRI		NMISA		INMETRO	
	D_{ii} (dB)	U(k=2) (dB)	D_{ii} (dB)	U(k=2) (dB)	D_{ii} (dB)	U(k=2) (dB)	D_{ii} (dB)	U(k=2) (dB)	D_{ii} (dB)	U(k=2) (dB)	D_{ii} (dB)	U(k=2) (dB)
1.995	0.074	0.367	0.029	0.208	0.117	0.700	0.022	0.051	0.036	0.180	-0.001	0.196
2.512	0.057	0.367	0.020	0.181	0.056	0.497	0.021	0.044	0.032	0.134	0.013	0.166
3.162	0.051	0.321	0.029	0.163	0.026	0.349	0.016	0.046	0.034	0.135	0.012	0.146
3.981	0.044	0.275	0.031	0.145	0.040	0.257	0.015	0.047	0.030	0.135	0.014	0.126
5.012	0.038	0.275	0.029	0.127	0.046	0.201	0.011	0.049	0.021	0.069	-0.001	0.127
6.310	0.036	0.276	0.029	0.118	0.049	0.146	0.004	0.050	0.017	0.070	-0.004	0.086
7.943	0.032	0.229	0.029	0.109	0.052	0.109	0.007	0.051	0.014	0.071	-0.004	0.077
10.000	0.028	0.230	0.028	0.109	0.045	0.071	0.000	0.052	0.012	0.071	-0.002	0.056
12.589	0.023	0.184	0.025	0.100	0.042	0.052	-0.003	0.052	0.008	0.072	-0.012	0.057
15.849	0.021	0.165	0.025	0.081	0.045	0.053	0.000	0.053	0.007	0.043	-0.016	0.047
19.953	0.014	0.091	0.024	0.082	0.036	0.044	-0.009	0.053	0.003	0.044	-0.011	0.047
25.119	0.011	0.091	0.021	0.073	0.030	0.034	-0.010	0.054	-0.001	0.044	-0.013	0.043
31.623	0.011	0.073	0.022	0.063	0.031	0.035	-0.009	0.054	-0.001	0.044	-0.015	0.043
39.811	0.008	0.073	0.020	0.064	0.022	0.025	-0.013	0.054	-0.004	0.045	-0.010	0.043
50.119	0.009	0.073	0.020	0.064	0.020	0.026	-0.010	0.054	-0.004	0.026	-0.009	0.043
63.096	0.007	0.054	0.019	0.045	0.015	0.026	-0.010	0.054	-0.007	0.026	-0.007	0.044
79.433	0.006	0.054	0.017	0.045	0.016	0.026	-0.014	0.054	-0.008	0.026	-0.009	0.044
100.00	0.005	0.054	0.017	0.045	0.011	0.026	-0.009	0.054	-0.008	0.026	-0.008	0.044
125.89	0.006	0.036	0.018	0.045	0.012	0.026	-0.013	0.055	-0.008	0.026	-0.007	0.044
158.49	0.006	0.036	0.017	0.045	0.007	0.026	-0.013	0.055	-0.008	0.026	-0.005	0.044
199.53	0.006	0.036	0.014	0.045	0.005	0.026	-0.015	0.055	-0.009	0.026	-0.006	0.044
251.19	0.004	0.036	0.013	0.045	0.003	0.026	-0.012	0.055	-0.009	0.026	-0.005	0.044
316.23	0.004	0.036	0.013	0.045	0.006	0.026	-0.019	0.055	-0.010	0.026	-0.006	0.044
398.11	0.003	0.036	0.013	0.045	0.003	0.026	-0.017	0.055	-0.011	0.026	-0.007	0.044
501.19	0.002	0.036	0.012	0.045	0.005	0.026	-0.015	0.055	-0.011	0.026	-0.007	0.044
630.96	0.002	0.036	0.012	0.045	0.001	0.026	-0.014	0.055	-0.011	0.026	-0.007	0.044
794.33	0.003	0.036	0.012	0.045	0.001	0.026	-0.014	0.055	-0.011	0.026	-0.007	0.044
1000.0	0.002	0.036	0.010	0.045	0.004	0.026	-0.016	0.055	-0.013	0.026	-0.009	0.044
1258.9	0.001	0.036	0.011	0.045	0.005	0.026	-0.020	0.055	-0.012	0.026	-0.010	0.044
1584.9	0.001	0.036	0.010	0.045	0.003	0.026	-0.017	0.055	-0.013	0.026	-0.011	0.044
1995.3	0.001	0.036	0.010	0.045	0.002	0.026	-0.018	0.055	-0.013	0.026	-0.013	0.044
2511.9	0.000	0.036	0.009	0.045	0.003	0.026	-0.022	0.055	-0.013	0.026	-0.015	0.044
3162.3	-0.001	0.036	0.008	0.045	0.002	0.026	-0.023	0.055	-0.014	0.026	-0.018	0.044
3981.1	-0.001	0.036	0.008	0.055	0.005	0.026	-0.025	0.055	-0.013	0.026	-0.023	0.044
5011.9	0.002	0.036	0.007	0.055	0.008	0.026	-0.022	0.055	-0.012	0.026	-0.027	0.044
6309.6	0.002	0.036	0.006	0.055	0.010	0.026	-0.025	0.055	-0.011	0.026	-0.039	0.044
7943.3	0.002	0.036	0.001	0.055	0.014	0.026	-0.026	0.055	-0.011	0.036	-0.059	0.046
10000	0.006	0.045	-0.001	0.082	0.022	0.026	-0.028	0.064	-0.009	0.036	-0.084	0.046
12589	0.012	0.054	-0.007	0.092	0.025	0.036	-0.035	0.082	-0.004	0.036	-0.117	0.046
15849	0.026	0.072	-0.008	0.119	0.028	0.053	-0.047	0.119	0.000	0.053	-0.132	0.053
19953	0.043	0.089	0.019	0.173	0.015	0.089	-0.040	0.192	0.022	0.089	-0.064	0.086
25119	0.022	0.132	0.021	0.366	0.013	0.339	0.048	0.459	0.006	0.132	-0.014	0.153

Table 18. Degrees of equivalence per laboratory as function of frequency for sensitivity phases, deviations (degree) and uncertainties k=2 (degree), Part I.

Frequency (Hz)	LNE		HBK-DPLA		METAS		KRISS		NMIJ		GUM		UME	
	D_{ii} (degree)	U(k=2) (degree)	D_{ii} (degree)	U(k=2) (degree)	D_{ii} (degree)	U(k=2) (degree)	D_{ii} (degree)	U(k=2) (degree)	D_{ii} (degree)	U(k=2) (degree)	D_{ii} (degree)	U(k=2) (degree)	D_{ii} (degree)	U(k=2) (degree)
1.995	1.329	3.773	2.419	2.958	2.223	2.179	-0.066	2.943	-	-	-0.706	2.881	-0.381	1.732
2.512	1.202	2.481	1.922	2.316	1.861	1.767	-0.025	2.273	-	-	-0.538	2.919	-0.103	0.815
3.162	0.980	1.609	1.490	1.789	1.575	1.441	0.058	1.818	-	-	-0.380	2.928	-0.035	0.847
3.981	0.746	1.062	1.121	1.397	1.302	1.198	0.013	1.586	-	-	-0.374	1.723	-0.109	0.867
5.012	0.633	0.692	0.943	1.127	1.112	0.967	0.050	1.129	-	-	-0.262	1.734	-0.062	0.791
6.310	0.518	0.483	0.798	0.901	0.950	0.805	0.061	1.138	-	-	-0.207	1.740	-0.032	0.709
7.943	0.471	0.365	0.731	0.766	0.848	0.666	0.107	1.144	-	-	-0.124	1.186	0.041	0.575
10.000	0.397	0.288	0.627	0.655	0.724	0.573	0.109	0.819	-	-	-0.113	1.191	0.057	0.440
12.589	0.342	0.239	0.562	0.565	0.650	0.496	0.103	0.822	-	-	-0.083	1.193	0.052	0.398
15.849	0.254	0.187	0.474	0.499	0.522	0.416	0.066	0.640	-	-	-0.096	1.010	0.029	0.356
19.953	0.199	0.184	0.409	0.429	0.456	0.364	0.055	0.500	-	-	0.049	0.825	0.039	0.358
25.119	0.160	0.181	0.355	0.384	0.393	0.320	0.046	0.454	-	-	0.055	0.733	0.030	0.312
31.623	0.118	0.176	0.303	0.339	0.330	0.275	0.028	0.456	-	-	0.063	0.641	0.013	0.267
39.811	0.062	0.150	0.242	0.294	0.252	0.224	-0.009	0.364	-	-	0.017	0.643	-0.018	0.222
50.119	0.050	0.151	0.210	0.271	0.178	0.201	-0.001	0.364	-	-	0.035	0.643	-0.010	0.223
63.096	0.062	0.154	0.212	0.225	0.225	0.189	0.016	0.366	-	-	0.062	0.644	0.012	0.130
79.433	0.034	0.155	0.174	0.226	0.182	0.154	0.001	0.366	-	-	0.049	0.644	-0.006	0.130
100.00	0.006	0.155	0.131	0.179	0.140	0.136	-0.026	0.366	-	-	0.026	0.644	-0.034	0.131
125.89	0.004	0.157	0.119	0.181	0.142	0.129	-0.016	0.367	-	-	0.024	0.552	-0.026	0.133
158.49	0.006	0.158	0.111	0.134	0.125	0.117	-0.013	0.275	-	-	0.031	0.552	-0.019	0.086
199.53	-0.001	0.159	0.104	0.135	0.110	0.098	-0.014	0.275	-	-	0.029	0.552	-0.016	0.087
251.19	-0.002	0.159	0.088	0.135	0.089	0.090	-0.016	0.275	-	-	0.048	0.460	-0.017	0.087
316.23	-0.001	0.159	0.084	0.136	0.078	0.076	0.072	0.275	-	-	0.044	0.460	-0.016	0.088
398.11	-0.004	0.159	0.076	0.088	0.064	0.067	0.060	0.275	-	-	0.051	0.460	-0.014	0.088
501.19	-0.002	0.160	0.068	0.088	0.053	0.059	0.047	0.275	-	-	0.048	0.460	-0.012	0.088
630.96	-0.010	0.160	0.055	0.089	0.036	0.052	0.038	0.275	-	-	0.060	0.460	-0.015	0.089
794.33	-0.007	0.160	0.058	0.089	0.032	0.047	0.038	0.276	-	-	0.038	0.460	-0.007	0.089
1000.0	-0.013	0.184	0.057	0.089	0.018	0.044	0.038	0.276	-	-	0.047	0.368	-0.008	0.089
1258.9	-0.009	0.184	0.061	0.089	0.012	0.043	0.042	0.276	-	-	0.041	0.368	0.001	0.089
1584.9	-0.015	0.184	0.060	0.089	0.001	0.045	0.047	0.275	-	-	0.045	0.368	0.005	0.089
1995.3	-0.027	0.208	0.053	0.088	-0.016	0.051	0.046	0.275	-	-	0.038	0.368	0.003	0.088
2511.9	-0.029	0.232	0.056	0.087	-0.031	0.061	0.067	0.275	-	-	0.081	0.367	0.001	0.087
3162.3	-0.044	0.256	0.056	0.086	-0.044	0.076	0.072	0.275	-	-	0.076	0.367	0.006	0.086
3981.1	-0.057	0.326	0.058	0.084	-0.073	0.096	0.077	0.274	-	-	0.073	0.367	0.008	0.084
5011.9	-0.068	0.374	0.062	0.082	-0.108	0.119	0.096	0.273	-	-	0.052	0.459	0.012	0.132
6309.6	-0.083	0.469	0.062	0.078	-0.147	0.146	0.116	0.272	-	-	0.117	0.458	0.022	0.130
7943.3	-0.107	0.563	0.068	0.076	-0.214	0.177	0.122	0.272	-	-	0.148	0.551	-0.002	0.128
10000	-0.126	0.681	0.074	0.070	-0.267	0.200	0.141	0.364	-	-	0.154	0.550	-0.006	0.175
12589	-0.134	0.849	0.091	0.120	-0.327	0.252	0.170	0.549	-	-	0.166	0.642	-0.004	0.220
15849	-0.186	1.063	0.079	0.119	-0.414	0.341	0.227	0.919	-	-	0.184	0.827	0.014	0.315
19953	-0.221	1.339	0.129	0.173	-0.472	0.438	0.558	1.374	-	-	0.174	1.189	0.079	0.386
25119	-0.333	1.904	0.032	0.344	-0.652	0.595	1.217	2.756	-	-	-0.183	1.736	0.452	0.451

Table 19. Degrees of equivalence per laboratory as function of frequency for sensitivity phases, deviations (degree) and uncertainties k=2 (degree), Part II.

Frequency (Hz)	NMIA		CENAM		NRC		VNIIFTRI		NMISA		INMETRO	
	D_{ii} (degree)	U(k=2) (degree)	D_{ii} (degree)	U(k=2) (degree)	D_{ii} (degree)	U(k=2) (degree)	D_{ii} (degree)	U(k=2) (degree)	D_{ii} (degree)	U(k=2) (degree)	D_{ii} (degree)	U(k=2) (degree)
1.995	-	-	1.111	2.787	1.829	4.929	-0.631	0.792	-0.451	1.732	-0.694	3.532
2.512	-	-	0.999	2.545	1.222	2.095	-0.398	0.710	-0.318	0.815	-0.350	2.455
3.162	-	-	0.865	2.369	0.900	1.244	-0.315	0.533	-0.270	0.847	-0.162	1.957
3.981	-	-	0.658	2.097	0.731	1.147	-0.304	0.455	-0.279	0.867	-0.229	1.199
5.012	-	-	0.570	1.920	0.628	0.658	-0.212	0.387	-0.187	0.791	-0.026	1.214
6.310	-	-	0.476	1.647	0.493	0.530	-0.127	0.307	-0.132	0.804	0.009	0.917
7.943	-	-	0.433	1.279	0.446	0.440	-0.069	0.241	-0.054	0.575	0.118	0.876
10.000	-	-	0.364	1.005	0.342	0.428	-0.033	0.197	-0.028	0.440	0.186	0.783
12.589	-	-	0.300	0.914	0.252	0.343	-0.018	0.165	-0.008	0.446	0.182	0.787
15.849	-	-	0.222	0.731	0.129	0.308	-0.031	0.147	-0.026	0.356	0.118	0.487
19.953	-	-	0.127	0.546	0.099	0.311	-0.026	0.119	-0.021	0.358	0.107	0.489
25.119	-	-	0.097	0.547	0.045	0.312	-0.025	0.101	-0.025	0.360	0.079	0.337
31.623	-	-	0.068	0.549	0.088	0.200	-0.032	0.085	-0.032	0.267	0.052	0.340
39.811	-	-	-0.012	0.550	0.027	0.124	-0.053	0.081	-0.058	0.270	-0.024	0.344
50.119	-	-	-0.009	0.550	-0.010	0.126	-0.040	0.072	-0.040	0.271	0.034	0.344
63.096	-	-	0.011	0.551	-0.003	0.130	-0.018	0.056	-0.023	0.130	0.056	0.346
79.433	-	-	-0.006	0.551	-0.026	0.130	-0.026	0.057	-0.031	0.130	0.022	0.346
100.00	-	-	-0.032	0.551	0.071	0.101	-0.054	0.059	-0.054	0.131	0.000	0.347
125.89	-	-	-0.027	0.116	0.089	0.104	-0.036	0.041	-0.041	0.133	0.010	0.348
158.49	-	-	-0.022	0.115	0.086	0.106	-0.034	0.044	-0.044	0.086	-0.011	0.348
199.53	-	-	-0.023	0.107	0.099	0.106	-0.031	0.035	-0.041	0.087	0.042	0.348
251.19	-	-	-0.026	0.105	0.108	0.106	-0.032	0.035	-0.037	0.087	0.138	0.348
316.23	-	-	-0.022	0.107	0.129	0.117	-0.026	0.025	-0.021	0.088	0.156	0.349
398.11	-	-	-0.021	0.107	0.156	0.123	-0.024	0.026	-0.019	0.088	0.210	0.349
501.19	-	-	-0.025	0.100	0.163	0.123	-0.022	0.026	-0.017	0.088	0.174	0.349
630.96	-	-	-0.032	0.099	0.140	0.122	-0.025	0.027	-0.020	0.089	0.123	0.349
794.33	-	-	-0.031	0.099	0.018	0.117	-0.022	0.028	-0.007	0.089	0.087	0.349
1000.0	-	-	-0.038	0.117	0.042	0.117	-0.018	0.028	-0.008	0.089	0.047	0.349
1258.9	-	-	-0.034	0.115	-0.024	0.127	-0.014	0.028	0.006	0.089	0.025	0.349
1584.9	-	-	-0.041	0.119	0.005	0.155	-0.010	0.028	0.010	0.089	-0.001	0.349
1995.3	-	-	-0.032	0.174	0.068	0.154	-0.012	0.037	0.013	0.088	-0.033	0.349
2511.9	-	-	-0.041	0.171	0.021	0.163	-0.009	0.046	0.021	0.087	-0.038	0.348
3162.3	-	-	-0.056	0.183	0.011	0.163	-0.014	0.055	0.031	0.086	-0.064	0.348
3981.1	-	-	-0.078	0.179	0.023	0.171	-0.022	0.074	0.033	0.084	-0.098	0.348
5011.9	-	-	-0.105	0.179	-0.008	0.236	-0.023	0.092	0.042	0.082	-0.129	0.347
6309.6	-	-	-0.127	0.178	0.012	0.254	-0.023	0.110	0.057	0.130	-0.156	0.346
7943.3	-	-	-0.191	0.272	0.003	0.262	-0.047	0.128	0.043	0.128	-0.170	0.345
10000	-	-	-0.237	0.411	0.004	0.345	-0.061	0.125	0.044	0.223	-0.120	0.344
12589	-	-	-0.258	0.899	0.036	0.437	-0.059	0.075	0.016	0.220	0.040	0.342
15849	-	-	-0.281	1.658	0.059	0.530	-0.046	0.059	-0.021	0.409	0.431	0.494
19953	-	-	-0.332	1.726	-0.136	0.825	0.139	0.532	-0.086	0.483	0.900	0.817
25119	-	-	-0.272	2.507	0.022	1.708	0.467	2.108	-0.043	0.451	0.920	2.186

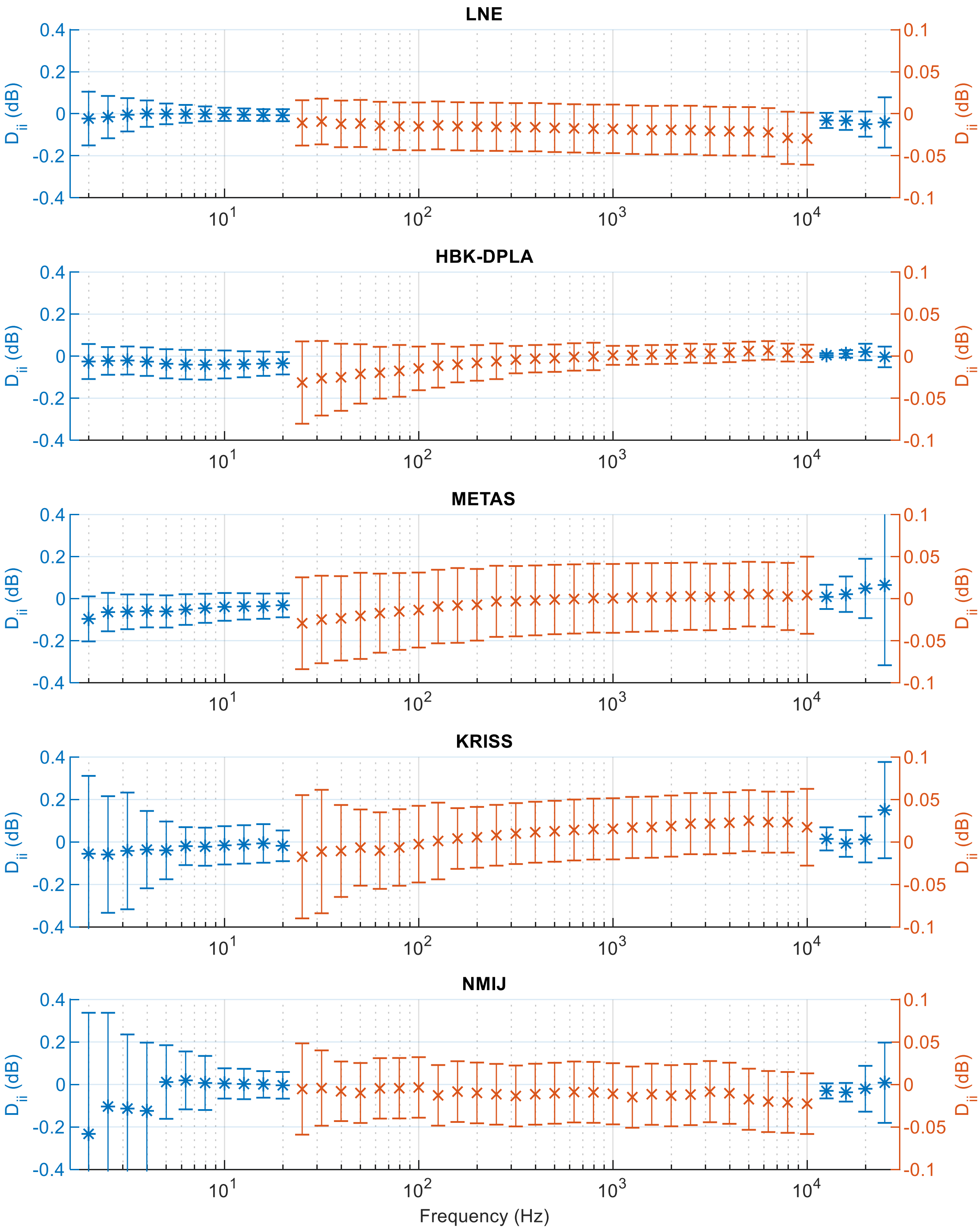

Figure 5. Degrees of equivalence per laboratory for sensitivity level (Part I) with uncertainty bars corresponding to coverage factor k=2. The blue asterisks data refer to the left axis scale and the orange crosses data refer to the right axis scale.

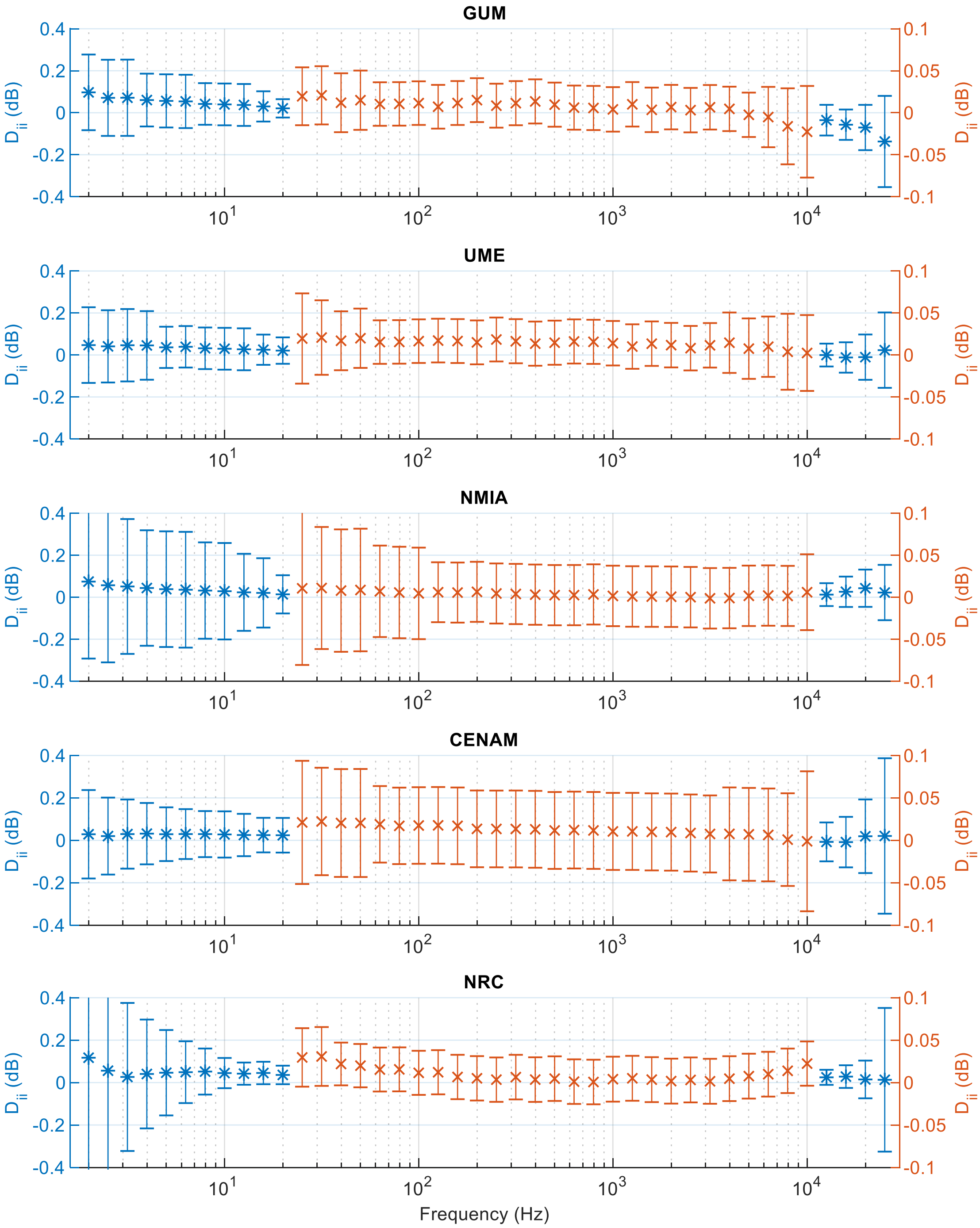

Figure 6. Degrees of equivalence per laboratory for sensitivity level (Part II) with uncertainty bars corresponding to coverage factor k=2. The blue asterisks data refer to the left axis scale and the orange crosses data refer to the right axis scale.

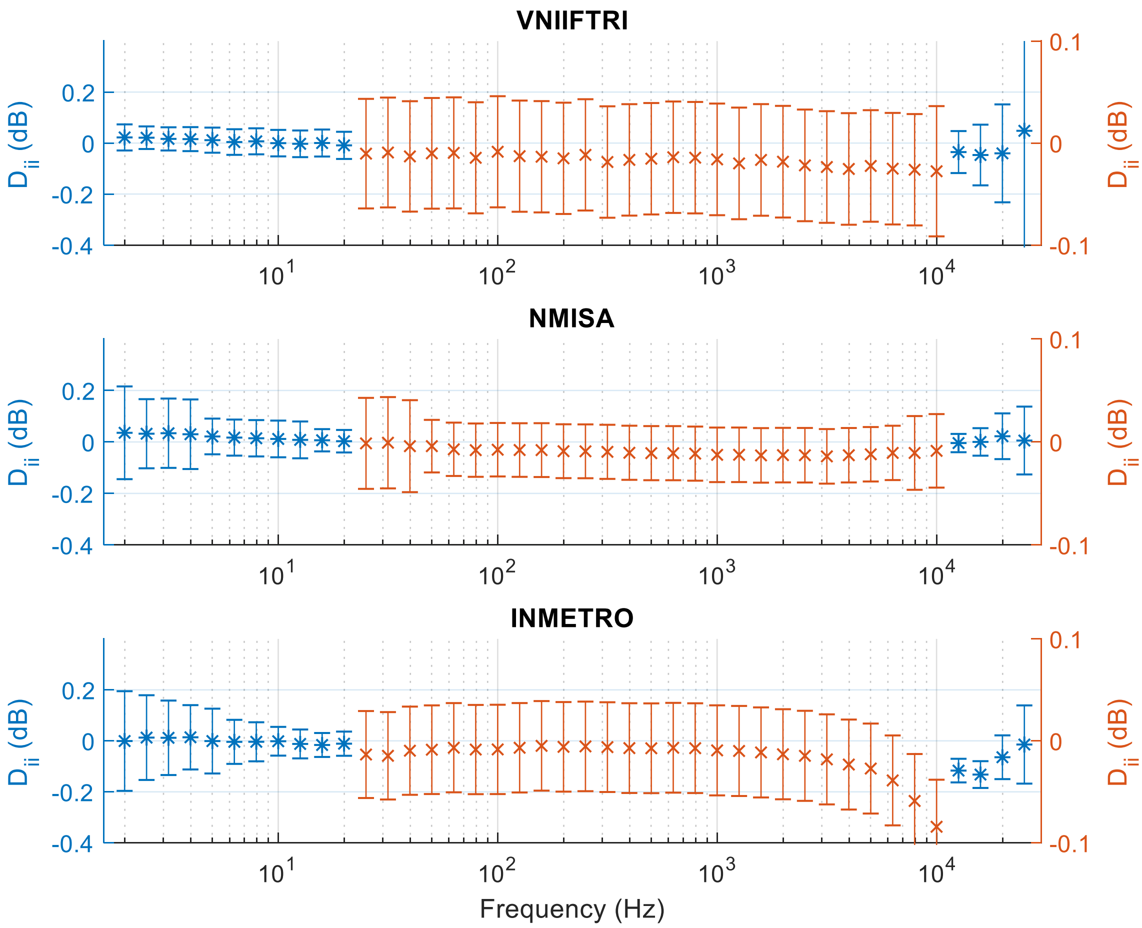

Figure 7. Degrees of equivalence per laboratory for sensitivity level (Part III) with uncertainty bars corresponding to coverage factor k=2. The blue asterisks data refer to the left axis scale and the orange crosses data refer to the right axis scale.

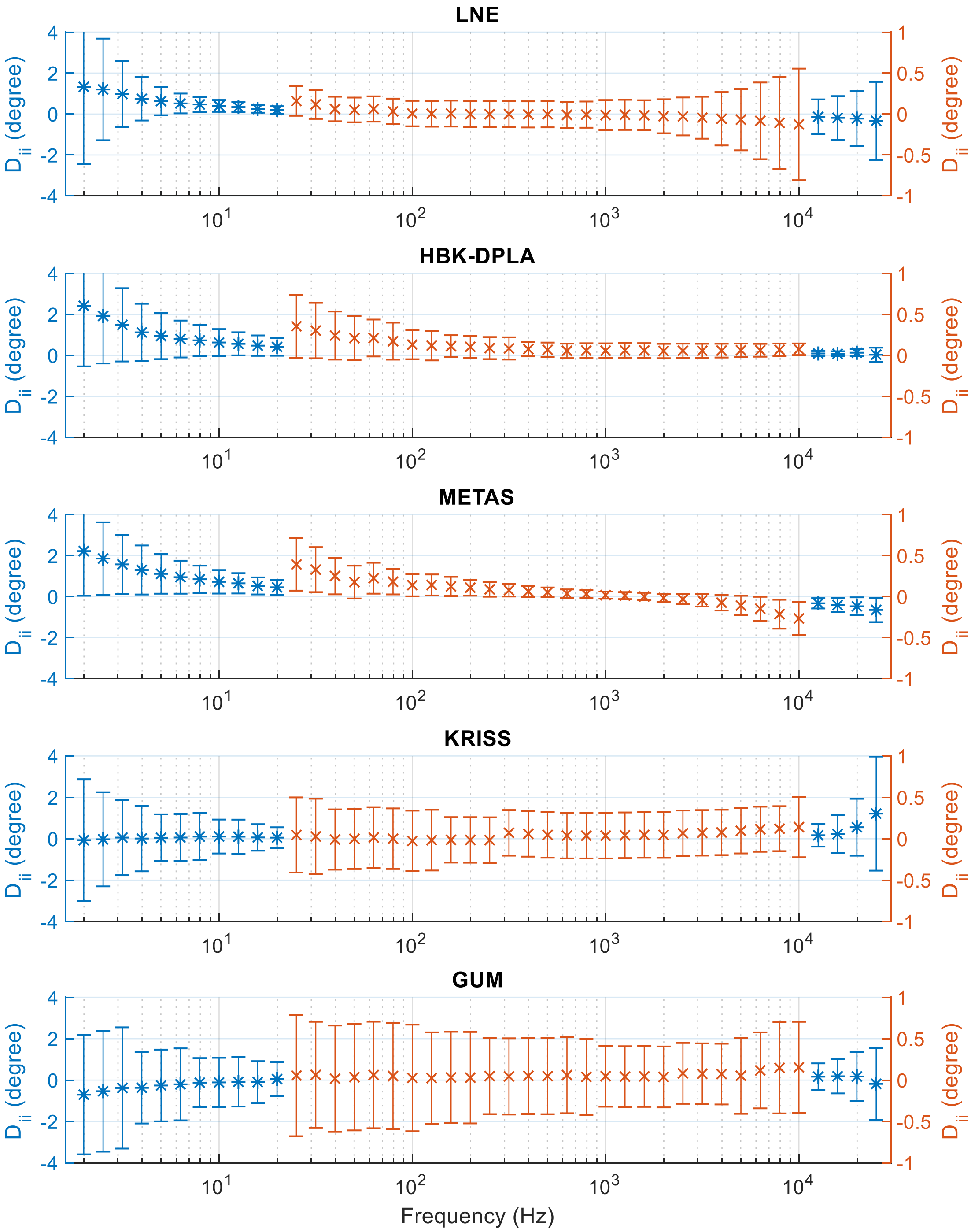

Figure 8. Degrees of equivalence per laboratory for sensitivity phase (Part I) with uncertainty bars corresponding to coverage factor k=2. The blue asterisks data refer to the left axis scale and the orange crosses data refer to the right axis scale.

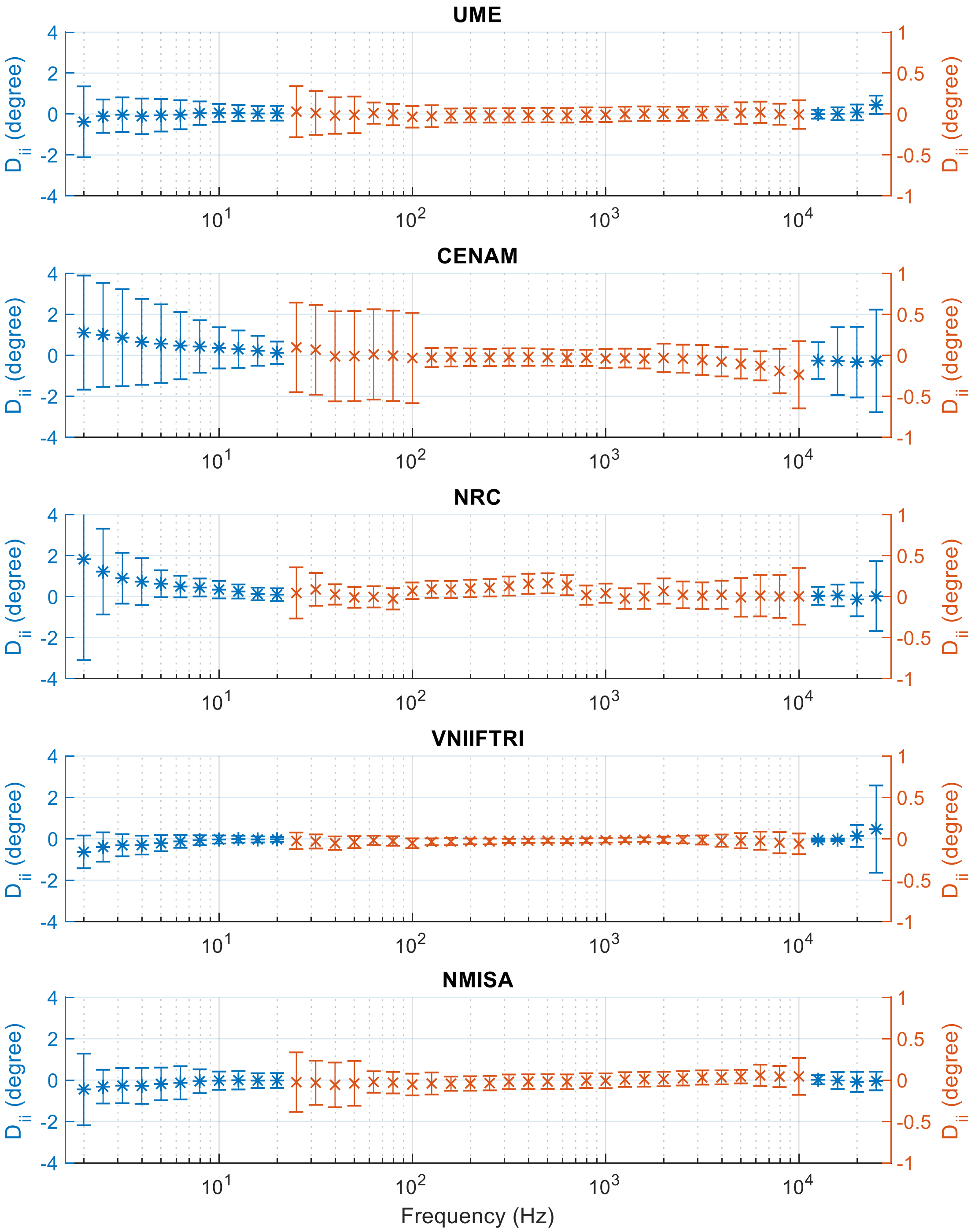

Figure 9. Degrees of equivalence per laboratory for sensitivity phase (Part II) with uncertainty bars corresponding to coverage factor k=2. The blue asterisks data refer to the left axis scale and the orange crosses data refer to the right axis scale.

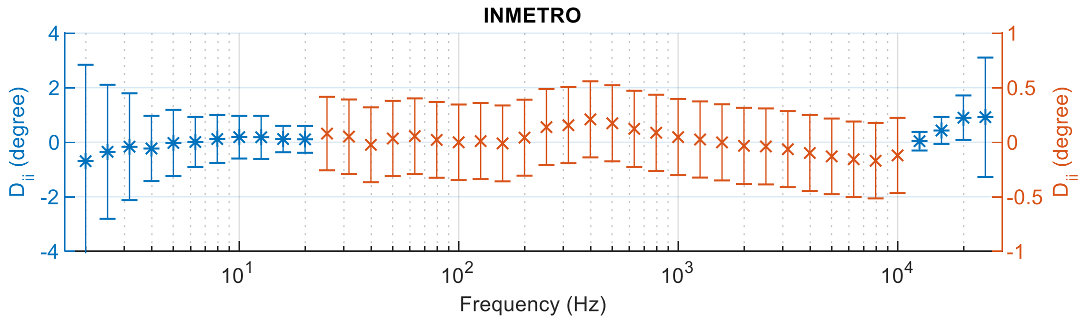

Figure 10. Degrees of equivalence per laboratory for sensitivity phase (Part III) with uncertainty bars corresponding to coverage factor k=2. The blue asterisks data refer to the left axis scale and the orange crosses data refer to the right axis scale.

8.3 Interlaboratory Degrees of Equivalence

Table 20 to Table 23 contain the interlaboratory degrees of equivalence for sensitivity levels at frequencies 1.995 Hz, 1 kHz, 10 kHz and 25.119 kHz.

Table 24 to Table 27 contain the inter-laboratory degrees of equivalence for sensitivity phases at frequencies 1.995 Hz, 1 kHz, 10 kHz and 25.119 kHz.

Table 20. Inter-laboratory degrees of equivalence for sensitivity levels at 1.995 Hz. The upper triangle contains the differences in dB; the lower triangle contains the uncertainties in dB k=2.

1.995 Hz	LNE	HBK/DPLA	METAS	KRISS	NMIJ	GUM	UME	NMIA	CENAM	NRC	VNIIFTRI	NMISA	INMETRO
LNE	-	0.002	0.073	0.032	0.210	-0.120	-0.070	-0.097	-0.052	-0.140	-0.045	-0.059	-0.022
HBK/DPLA	0.162	-	0.071	0.030	0.208	-0.122	-0.072	-0.100	-0.054	-0.142	-0.047	-0.061	-0.025
METAS	0.176	0.147	-	-0.041	0.137	-0.193	-0.143	-0.171	-0.125	-0.213	-0.118	-0.132	-0.096
KRISS	0.392	0.380	0.386	-	0.177	-0.153	-0.102	-0.130	-0.084	-0.172	-0.078	-0.091	-0.055
NMIJ	0.587	0.579	0.583	0.680	-	-0.330	-0.280	-0.307	-0.261	-0.350	-0.255	-0.269	-0.232
GUM	0.228	0.206	0.217	0.412	0.601	-	0.050	0.023	0.069	-0.020	0.075	0.061	0.098
UME	0.228	0.206	0.217	0.412	0.601	0.261	-	-0.027	0.018	-0.070	0.025	0.011	0.048
NMIA	0.392	0.380	0.386	0.522	0.680	0.412	0.412	-	0.046	-0.043	0.052	0.039	0.075
CENAM	0.251	0.231	0.241	0.425	0.610	0.281	0.281	0.425	-	-0.088	0.006	-0.007	0.029
NRC	0.713	0.707	0.710	0.792	0.904	0.725	0.725	0.792	0.732	-	0.095	0.081	0.118
VNIIFTRI	0.148	0.113	0.131	0.374	0.575	0.195	0.195	0.374	0.222	0.704	-	-0.014	0.023
NMISA	0.228	0.206	0.217	0.412	0.601	0.261	0.261	0.412	0.281	0.725	0.195	-	0.036
INMETRO	0.166	0.134	0.150	0.381	0.580	0.209	0.209	0.381	0.233	0.707	0.117	0.209	-

Table 21. Inter-laboratory degrees of equivalence for sensitivity levels at 1000 Hz. The upper triangle contains the differences in dB; the lower triangle contains the uncertainties in dB k=2.

1000 Hz	LNE	HBK/DPLA	METAS	KRISS	NMIJ	GUM	UME	NMIA	CENAM	NRC	VNIIFTRI	NMISA	INMETRO
LNE	-	-0.019	-0.018	-0.034	-0.007	-0.022	-0.032	-0.020	-0.029	-0.022	-0.002	-0.006	-0.009
HBK/DPLA	0.033	-	0.001	-0.015	0.012	-0.003	-0.013	-0.001	-0.010	-0.003	0.017	0.013	0.010
METAS	0.051	0.044	-	-0.015	0.011	-0.004	-0.014	-0.001	-0.010	-0.004	0.016	0.013	0.010
KRISS	0.048	0.039	0.056	-	0.026	0.011	0.002	0.014	0.005	0.012	0.032	0.028	0.025
NMIJ	0.048	0.039	0.056	0.052	-	-0.015	-0.025	-0.013	-0.021	-0.015	0.005	0.002	-0.002
GUM	0.041	0.031	0.050	0.046	0.046	-	-0.010	0.002	-0.006	0.000	0.020	0.017	0.013
UME	0.041	0.031	0.050	0.046	0.046	0.039	-	0.012	0.003	0.010	0.030	0.026	0.023
NMIA	0.048	0.039	0.056	0.052	0.052	0.046	0.046	-	-0.009	-0.002	0.018	0.014	0.011
CENAM	0.055	0.048	0.062	0.059	0.059	0.054	0.054	0.059	-	0.007	0.027	0.023	0.020
NRC	0.041	0.031	0.050	0.046	0.046	0.039	0.039	0.046	0.054	-	0.020	0.016	0.013
VNIIFTRI	0.063	0.057	0.069	0.066	0.066	0.062	0.062	0.066	0.072	0.062	-	-0.004	-0.007
NMISA	0.041	0.031	0.050	0.046	0.046	0.039	0.039	0.046	0.054	0.039	0.062	-	-0.003
INMETRO	0.037	0.026	0.047	0.043	0.043	0.035	0.035	0.043	0.051	0.035	0.060	0.035	-

Table 22. Inter-laboratory degrees of equivalence for sensitivity levels at 10 kHz. The upper triangle contains the differences in dB; the lower triangle contains the uncertainties in dB k=2.

10 kHz	LNE	HBK/DPLA	METAS	KRISS	NMIJ	GUM	UME	NMIA	CENAM	NRC	VNIIFTRI	NMISA	INMETRO
LNE	-	-0,033	-0,034	-0,047	-0,007	-0,007	-0,032	-0,036	-0,029	-0,052	-0,002	-0,021	0,055
HBK/DPLA	0,035	-	-0,001	-0,014	0,026	0,026	0,001	-0,003	0,005	-0,019	0,031	0,012	0,088
METAS	0,057	0,049	-	-0,013	0,027	0,027	0,002	-0,002	0,005	-0,018	0,032	0,013	0,088
KRISS	0,056	0,048	0,066	-	0,040	0,040	0,015	0,011	0,018	-0,005	0,045	0,026	0,102
NMIJ	0,049	0,039	0,060	0,059	-	0,000	-0,025	-0,029	-0,021	-0,045	0,005	-0,014	0,062
GUM	0,064	0,057	0,072	0,072	0,066	-	-0,025	-0,029	-0,021	-0,045	0,005	-0,014	0,062
UME	0,056	0,048	0,066	0,065	0,059	0,072	-	-0,004	0,003	-0,020	0,030	0,011	0,087
NMIA	0,056	0,048	0,066	0,065	0,059	0,072	0,065	-	0,007	-0,016	0,034	0,015	0,090
CENAM	0,089	0,084	0,095	0,095	0,091	0,100	0,095	0,095	-	-0,023	0,026	0,008	0,083
NRC	0,043	0,031	0,054	0,054	0,046	0,062	0,054	0,054	0,087	-	0,050	0,031	0,107
VNIIFTRI	0,072	0,066	0,080	0,079	0,074	0,085	0,079	0,079	0,105	0,070	-	-0,019	0,057
NMISA	0,049	0,039	0,060	0,059	0,052	0,066	0,059	0,059	0,091	0,046	0,074	-	0,076
INMETRO	0,039	0,026	0,052	0,051	0,043	0,060	0,051	0,051	0,086	0,035	0,068	0,043	-

Table 23. Inter-laboratory degrees of equivalence for sensitivity levels at 25.119 kHz. The upper triangle contains the differences in dB; the lower triangle contains the uncertainties in dB k=2.

25.119 kHz	LNE	HBK/DPLA	METAS	KRISS	NMIJ	GUM	UME	NMIA	CENAM	NRC	VNIIFTRI	NMISA	INMETRO
LNE	-	-0.038	-0.106	-0.192	-0.049	0.095	-0.065	-0.064	-0.062	-0.055	-0.090	-0.047	-0.027
HBK/DPLA	0.142	-	-0.068	-0.154	-0.011	0.133	-0.027	-0.026	-0.024	-0.017	-0.052	-0.009	0.011
METAS	0.405	0.390	-	-0.085	0.057	0.202	0.042	0.043	0.044	0.052	0.017	0.059	0.079
KRISS	0.263	0.239	0.448	-	0.142	0.287	0.127	0.128	0.130	0.137	0.102	0.145	0.164
NMIJ	0.231	0.204	0.430	0.301	-	0.145	-0.015	-0.014	-0.012	-0.005	-0.040	0.002	0.022
GUM	0.255	0.230	0.443	0.320	0.294	-	-0.160	-0.159	-0.157	-0.150	-0.185	-0.142	-0.123
UME	0.224	0.195	0.426	0.295	0.267	0.288	-	0.001	0.003	0.010	-0.025	0.018	0.037
NMIA	0.188	0.153	0.408	0.269	0.238	0.261	0.230	-	0.002	0.009	-0.026	0.017	0.037
CENAM	0.390	0.374	0.533	0.435	0.417	0.430	0.412	0.394	-	0.007	-0.028	0.015	0.035
NRC	0.364	0.347	0.514	0.412	0.392	0.407	0.388	0.368	0.502	-	-0.035	0.008	0.027
VNIIFTRI	0.478	0.465	0.600	0.515	0.500	0.511	0.496	0.481	0.590	0.573	-	0.043	0.062
NMISA	0.188	0.153	0.408	0.269	0.238	0.261	0.230	0.196	0.394	0.368	0.481	-	0.020
INMETRO	0.148	0.100	0.392	0.243	0.208	0.234	0.200	0.158	0.377	0.350	0.467	0.158	-

Table 24. Inter-laboratory degrees of equivalence for sensitivity phases at 1.995 Hz. The upper triangle contains the differences in degrees; the lower triangle contains the uncertainties in degrees k=2.

1.995 Hz	LNE	HBK/DPLA	METAS	KRISS	GUM	UME	CENAM	NRC	VNIIFTRI	NMISA	INMETRO
LNE	-	-1,090	-0,894	1,395	2,035	1,710	0,218	-0,500	1,960	1,780	2,023
HBK/DPLA	4,877	-	0,196	2,485	3,125	2,800	1,308	0,590	3,050	2,870	3,113
METAS	4,358	3,674	-	2,289	2,929	2,604	1,112	0,394	2,854	2,674	2,917
KRISS	4,868	4,268	3,662	-	0,640	0,316	-1,177	-1,895	0,565	0,386	0,628
GUM	4,831	4,225	3,613	4,215	-	-0,325	-1,817	-2,535	-0,075	-0,255	-0,012
UME	4,247	3,543	2,784	3,530	3,479	-	-1,492	-2,210	0,250	0,070	0,313
CENAM	4,776	4,162	3,538	4,151	4,108	3,401	-	-0,718	1,742	1,562	1,805
NRC	6,272	5,818	5,389	5,810	5,779	5,300	5,733	-	2,460	2,280	2,523
VNIIFTRI	3,958	3,190	2,319	3,177	3,120	2,104	3,033	5,072	-	-0,180	0,063
NMISA	4,247	3,543	2,784	3,530	3,479	2,608	3,401	5,300	2,104	-	0,243
INMETRO	4,214	3,503	2,733	3,490	3,439	2,554	3,360	5,274	2,037	2,554	-

Table 25. Inter-laboratory degrees of equivalence for sensitivity phases at 1000 Hz. The upper triangle contains the differences in degrees; the lower triangle contains the uncertainties in degrees k=2.

1000 Hz	LNE	HBK/DPLA	METAS	KRISS	GUM	UME	CENAM	NRC	VNIIFTRI	NMISA	INMETRO
LNE	-	-0,070	-0,031	-0,051	-0,060	-0,005	0,025	-0,055	0,005	-0,005	-0,060
HBK/DPLA	0,207	-	0,039	0,019	0,010	0,065	0,096	0,015	0,075	0,065	0,010
METAS	0,192	0,105	-	-0,020	-0,029	0,026	0,057	-0,024	0,036	0,026	-0,028
KRISS	0,333	0,292	0,281	-	-0,009	0,046	0,076	-0,004	0,056	0,046	-0,009
GUM	0,413	0,380	0,372	0,461	-	0,055	0,085	0,005	0,065	0,055	0,000
UME	0,207	0,130	0,105	0,292	0,380	-	0,031	-0,050	0,010	0,000	-0,055
CENAM	0,221	0,151	0,130	0,301	0,388	0,151	-	-0,081	-0,020	-0,030	-0,085
NRC	0,221	0,151	0,130	0,301	0,388	0,151	0,170	-	0,060	0,050	-0,005
VNIIFTRI	0,189	0,099	0,062	0,279	0,371	0,099	0,125	0,125	-	-0,010	-0,065
NMISA	0,207	0,130	0,105	0,292	0,380	0,130	0,151	0,151	0,099	-	-0,055
INMETRO	0,255	0,197	0,181	0,327	0,408	0,197	0,212	0,212	0,178	0,197	-

Table 26. Inter-laboratory degrees of equivalence for sensitivity phases at 10 kHz. The upper triangle contains the differences in degrees; the lower triangle contains the uncertainties in degrees k=2.

10 kHz	LNE	HBK/DPLA	METAS	KRISS	GUM	UME	CENAM	NRC	VNIIFTRI	NMISA	INMETRO
LNE	-	-0,200	0,141	-0,267	-0,280	-0,120	0,111	-0,130	-0,065	-0,170	-0,006
HBK/DPLA	0,690	-	0,341	-0,067	-0,080	0,080	0,311	0,070	0,135	0,030	0,194
METAS	0,715	0,228	-	-0,408	-0,421	-0,261	-0,030	-0,271	-0,206	-0,311	-0,147
KRISS	0,777	0,380	0,424	-	-0,013	0,147	0,378	0,137	0,202	0,097	0,261
GUM	0,880	0,561	0,591	0,665	-	0,160	0,391	0,150	0,215	0,110	0,274
UME	0,708	0,206	0,279	0,412	0,583	-	0,231	-0,010	0,055	-0,050	0,114
CENAM	0,800	0,425	0,465	0,555	0,691	0,454	-	-0,241	-0,176	-0,281	-0,117
NRC	0,769	0,362	0,408	0,509	0,655	0,396	0,543	-	0,065	-0,040	0,124
VNIIFTRI	0,698	0,166	0,251	0,394	0,570	0,230	0,437	0,377	-	-0,105	0,059
NMISA	0,722	0,248	0,311	0,435	0,599	0,295	0,475	0,419	0,269	-	0,164
INMETRO	0,705	0,195	0,271	0,407	0,579	0,252	0,449	0,390	0,221	0,288	-

Table 27. Inter-laboratory degrees of equivalence for sensitivity phases at 25.119 kHz. The upper triangle contains the differences in degrees; the lower triangle contains the uncertainties in degrees k=2.

25.119 kHz	LNE	HBK/DPLA	METAS	KRISS	GUM	UME	CENAM	NRC	VNIIFTRI	NMISA	INMETRO
LNE	-	-0,365	0,319	-1,550	-0,150	-0,785	-0,061	-0,355	-0,800	-0,290	-1,253
HBK/DPLA	1,963	-	0,684	-1,185	0,215	-0,420	0,304	0,010	-0,435	0,075	-0,888
METAS	2,022	0,762	-	-1,868	-0,469	-1,104	-0,380	-0,674	-1,119	-0,609	-1,572
KRISS	3,366	2,797	2,839	-	1,400	0,764	1,489	1,195	0,749	1,260	0,296
GUM	2,598	1,800	1,865	3,274	-	-0,635	0,089	-0,205	-0,650	-0,140	-1,103
UME	1,984	0,655	0,816	2,812	1,824	-	0,724	0,430	-0,015	0,495	-0,468
CENAM	3,165	2,552	2,598	3,740	3,067	2,568	-	-0,294	-0,739	-0,229	-1,192
NRC	2,579	1,773	1,839	3,259	2,458	1,797	3,051	-	-0,445	0,065	-0,898
VNIIFTRI	2,860	2,161	2,215	3,485	2,750	2,180	3,292	2,733	-	0,510	-0,453
NMISA	1,984	0,655	0,816	2,812	1,824	0,717	2,568	1,797	2,180	-	-0,963
INMETRO	2,208	1,169	1,266	2,974	2,065	1,204	2,745	2,041	2,385	1,204	-

9 Conclusions

The aim of the Key Comparison CCAUV.A-K6 is to establish reliable equivalence between National Metrology Institutes for pressure calibration of Laboratory Standard microphones of the type LS2P. The comparison involved thirteen participants from five regional metrology organisations (RMOs). The comparison CCAUV.A-K6 covers (up to 25 kHz only) and extends the scope of previous key comparisons CCAUV.A-K3. CCAUV.A-K6 includes the phase of the pressure sensitivity within its scope.

Two LS2P microphones were circulated among the participants in a single star configuration. All participants reported the open-circuit pressure sensitivities.

The reported sensitivities have been analysed using a least-squares technique [4-6]. The monitoring of the microphones highlighted a drift of the microphone 4180.2412872 impacting the results provided by INMETRO. It was agreed with the participants of the key comparison that the results of INMETRO for the microphone 4180.2412872 would be removed and not considered in this comparison. Except for the foregoing, all laboratories were included in the estimation of the KCRVs with however some outliers identified and not considered for some laboratories.

The consistency of each participant's results, with respect to the KCRVs, has been assessed using a chi-squared test. For measurements of the microphone's sensitivity level and phase, a small minority of the measurements were shown to be inconsistent with the KCRVs.

10 References

[1] Technical Protocol for the Key Comparison CCAUV.A-K6, Issue 2, December 2018.

[2] IEC 61094-2:2009. Electroacoustics - Measurement microphones - Part 2: Primary method for pressure calibration of laboratory standard microphones by the reciprocity technique.

[3] Measurement comparisons in the CIPM MRA. Guidelines for organizing, participating and reporting, CIPM MRA-G-11, version 1.1, 18/01/2021.

[4] S. Barrera-Figueroa. L. Nielsen. K. Rasmussen. A. E. Pérez Matzumoto and J. Noé Razo Razo. Final Report on the Key Comparison CCAUV.A-K4. Centro Nacional de Metrología. México. Danish Primary Laboratory for Acoustics. Denmark.

[5] V. Cutanda Henriquez. K. Rasmussen. Final report on the Key Comparison CCAUV.A-K3. Centro Nacional de Metrología. México. Danish Primary Laboratory for Acoustics. Denmark.

[6] L. Nielsen. Identification and handling of discrepant measurements in key comparisons. Danish Institute of Fundamental Metrology. DFM-01-R28. 2002.

Appendix A - Uncertainty budgets

Uncertainty budgets were requested from all participants. The budgets are reproduced here as they were received from the participants. No editing of the contents but a small amount of reformatting has been performed. Table, equation and figure numbers do not follow the numbering in the report.

HBK-DPLA

In this section the uncertainty calculations and the considerations behind are described. The quantification of the components considered and the combined calculation can be found in the Excel file ”UncertCCAUV A K6.xls”.

The calculations have been made following the rules and guidelines of EA-4/02 [H-D.12]. The rules laid down in the document are in compliance with the recommendations of GUM [H-D.13]. However, since all uncertainties available from other sources are expressed as expanded uncertainties with a coverage factor of 2, all uncertainty calculations are similarly made on expanded uncertainties, i.e. the uncertainties calculated or estimated here are expressed as 2 times the standard uncertainty. For the same reason, the values shall be considered valid for infinite degrees of freedom. The calculated values have been rounded up to the nearest 0.005 dB and 0.05°.

The contribution to the uncertainty from the uncertainty of each input quantity has been calculated directly by varying the quantity with an amount equal to the expanded uncertainty associated with the quantity. This is effectively the same as calculating the sensitivity coefficients and applying them to the uncertainties. The sensitivity coefficients have not been explicitly calculated, as that would be a ‘backwards’ calculation and the calculation of some of the contributions require complete recalculation of the sensitivities, including redetermination of microphone parameters. The calculations are made considering microphone sensitivity level and phase, i.e. dB and ° values.

The reported uncertainty of measurement does not include variations of the microphones, as microphones may change sensitivity over time, in particularly if they are exposed to mechanical stress. However, short-term variations of the microphones in the measurements used for reproducibility evaluation are unavoidably included in the type A uncertainty.

a) Type A uncertainty

The type A uncertainty is determined from the reproducibility of measurements. The measurements made in preparation of and for the present key comparison have been used.

b) Electrical Transfer Impedance

Series impedance

The capacitance and loss factor of the transmitter unit is calibrated at an accredited laboratory. The expanded uncertainty associated with the capacitance measurements are provided by the laboratory. The loss factor calibration is supplemented with direct measurement of the DC resistance of the polarization resistor at BKSV DPLA. The frequency dependence of the complex series impedance in the transmitter unit is calculated from a model developed at DFM [H-D.14]. The lowest frequencies in the present key comparison are outside the frequency range of the capacitance calibration. At these frequencies the impedance is extrapolated using the model, and the uncertainty is evaluated based on worst-case variations inside the calibration frequency range.

Voltage ratio

The uncertainty associated with the measurement of the voltage ratio level, as measured with the PULSE analyzer, has been estimated based on linearity measurements and comparison with a calibrated voltmeter. This is documented in [H-D.15]. The evaluation of the uncertainty of the voltage ratio phase is still not well founded at the time of writing. It has been estimated assuming that the uncertainty associated with the level corresponds to an internal error signal in the analyzer. Cross-talk in the remaining parts of the measurement set up is not included in this uncertainty component, see below.

Crosstalk

The amount of crosstalk in the measurement set-up is verified to be less than −66 dB. The influence of the crosstalk is calculated for the worst case, i.e. assuming 0° phase shift between signal and crosstalk signal in the calculation of the influence on the level and 90° in the calculation of the influence on the phase.

Noise

Inherent noise from the microphones and the electronic components is present in the measurement setup. Some background noise may also be present from the laboratory environment, although it is kept to a minimum. As noise is the primary reason for short-term variations in the measurements reported here, and as there seems not to be significant differences between the variations in the four voltages in the voltage ratio, noise will contribute to the results as random variations, and noise will therefore be included in the type A uncertainty.

Distortion

The uncertainty of measurement associated with distortion is assumed to be negligible in the present context.

Frequency

The frequency accuracy of the PULSE analyzer is specified to 25 ppm. The frequency of the generator is locked to the analyzer, and therefore the filters inherently match the generator. The frequency will have influence on the measured results, however, as most parameters depend on frequency, see below.

Stray capacitances

The uncertainty associated with stray capacitances is assumed to be included in the uncertainty associated with series impedance and is not treated as contributing separately to the uncertainty.

Transmitter ground shield configuration

HBK-DPLA is using driven shield (guarding), instead of grounded shield as required by IEC 61094-2. It does not influence the calibration results whether the guard is driven or grounded [H-D.7]. The shield is also driven during calibration of the series impedance so that the configuration is as similar as possible to the configuration during measurements.

The 5998 calibration apparatus couples the input impedance of the transmitter preamplifier, including the stray capacitances, and the series capacitor different in the electric and acoustic measurements. This is compensated for; the uncertainty of the compensation is minimized by using the driven shield.

Receiver ground shield configuration

HBK-DPLA is using driven shield (guarding), instead of grounded shield as required by IEC 61094-2. It does not influence the calibration results whether the guard is driven or grounded [H-D.7].

c) *Coupler Properties*

Coupler length

The coupler lengths are calibrated at an accredited laboratory. The uncertainty associated with the coupler lengths is provided by the laboratory.

The length of the couplers varies approximately with the same amount as the measurement uncertainty when measured in different positions. The microphone sensitivity is calculated from measurements in four different couplers. It is not simple to determine the influence of the uncertainty on the combined result. It is assumed, as a worst-case scenario, that the combined contribution to the uncertainty of measurement of the uncertainty associated with the coupler lengths corresponds to a systematic error on the lengths of all four couplers (the expanded uncertainty is added to each coupler length in the calculation).

Coupler diameter

The coupler diameters are calibrated at an accredited laboratory. The uncertainty associated with the coupler is provided by the laboratory.

The diameter of the couplers varies more than the measurement uncertainty when measured in different positions in the coupler. The influence on the average diameter is small, but it is assumed to lead to a slightly higher uncertainty on the coupler diameter than that reported by the calibration laboratory. The contribution to the uncertainty of measurement is treated similarly as for the coupler lengths, see above, but with two times the expanded uncertainty of the individual measurements.

Coupler leakage

As mentioned, a small leakage is present in the couplers, and it is assumed not to influence the measurement results. However, at the lowest frequencies the leak may have some influence. It is difficult to determine the leak. Although some experiments have been made at BKSV-DPLA, a consistent method to determine the leak has not yet been developed.

Based on experience and preliminary investigations, it is considered reasonable to assume an uncertainty contribution due to leakage corresponding to the influence of a leak with a time constant of 10 s (0.016 Hz cutoff frequency) or more.

Note, however, that this uncertainty component does not cover leakage at the microphones' front surfaces. Two of the microphones dealt with in the present key comparison exhibit significant leakage, cf. section 6, and hence increased uncertainty must be assumed at the lowest frequencies for these two microphones. The phase of the reciprocity calibration results for the two microphones at 1 Hz is around 5° higher than expected. The additional uncertainty component is estimated to the response of a 1st order high pass filter with a phase of 5° at 1 Hz. This component is included in the evaluation of the uncertainty of measurement for these two microphones.

d) Environmental Conditions

The contributions from the uncertainty of measurement of environmental parameters are calculated for the complete calculation of results, including the corrections for static pressure and temperature. The contribution of the uncertainty of the corrections coefficients is considered an independent contribution and is treated in the section on microphone properties below.

Static pressure

The barometer used for measuring the static pressure is calibrated at an accredited laboratory. The uncertainty associated with the static pressure measurements is provided by the laboratory.

Relative humidity

The temperature and humidity transmitter used for measuring the relative humidity and temperature in the laboratory room is calibrated at an accredited laboratory. The uncertainty associated with the relative humidity and temperature measurements is provided by the laboratory.

The uncertainty on the relative humidity measurement is 2 %-point, but as the relevant humidity is that in the coupler and in the microphones and the humidity is measured in the room, the uncertainty is probably larger, although the humidity is corrected for the temperature difference between the room and the surface of the microphone. 5% is used in the calculations.

Temperature

The temperature probe used for measuring the surface temperature on the microphones is calibrated at an accredited laboratory together with the multimeter. The uncertainty associated with the temperature measurements is provided by the laboratory and is stated to be 0.2°. The temperature in the coupler and in the microphone probably deviates from the temperature of the microphone housing. The uncertainty of the temperature in the coupler and of the microphones is estimated to be 0.5°.

e) Microphone properties

Front cavity depth

The uncertainty associated with the front cavity depth were estimated in separate calculations when the measurement method was established in 2004. The front cavity depth uncertainty influences the total length in the coupler with the microphones, but it does not influence the volume, as the microphone’s total acoustical volume is determined from measurements in four couplers, see below.

Front cavity volume

The front cavity volume is determined as the difference between the total acoustical volume and the equivalent volume. The uncertainty associated with the front cavity volume is the combined uncertainty of the front cavity volume and the equivalent volume. The front cavity volume is used only to determine the amount of excess volume that cannot be accounted for by the front cavity dimensions. The uncertainty associated with the front cavity volume is considered negligible.

Equivalent volume

The equivalent volume is determined by minimizing the difference between the sensitivity around the resonance frequency determined in four couplers. The uncertainty associated with the equivalent volume is estimated to be the amount necessary to give a significant variation between the four couplers.

Total volume (sum of front cavity volume and equivalent volume)

The total volume, i.e. the sum of the front cavity volume and the diaphragm equivalent volume, of the microphone is determined by minimizing the difference between the sensitivity at low frequencies determined in four couplers. The uncertainty associated with the total volume is estimated to be the amount necessary to give a significant dependence on the coupler volume.

Resonance frequency

The resonance frequency is determined as the 90° phase shift frequency of the microphone sensitivity. The frequency determined this way only varies a little, even with rather large changes in other parameters in the calculations. The uncertainty associated with the resonance frequency is estimated on the basis of the changes seen when the other microphone and coupler parameters are varied. See also section 6.7 on imperfection of theory.

Loss factor

The loss factor is adjusted to give a reasonable match to the microphone's frequency response at and above the resonance frequency. The loss factor determined this way can only be varied a little, and therefore seemingly have a low uncertainty. See also section 6.7 on imperfection of theory.

Front cavity surface area

The front cavity surface area is calculated from the front cavity volume and depth. The uncertainty of the area is estimated on basis of the front cavity dimensions and their relation to the determined front cavity volume. For LS2 microphones, the uncertainty of the front cavity surface area is estimated to be less than 1 mm^2. The contribution of this to the combined uncertainty is considered negligible.

Polarization voltage

The voltmeter is calibrated at an accredited laboratory. The calibration is in this context considered a verification that the voltmeter is within specifications. Consequently, the uncertainty of the polarization voltage is considered to be the specified accuracy of the voltmeter.
The sensitivity level of Type 4180 at low frequencies is known to change 1.05 times the change in polarization voltage level. The influence of polarization voltage on frequency response is negligible. Data for Brüel & Kjær Type 4134 [H-D.16], that is similar to Type 4180 in this

respect, show very small difference in relative frequency response between 150 V and 200 V polarization voltage.

Frequency

The uncertainty associated with the frequency contributes to the uncertainty of measurement corresponding to the microphone response. This must be considered in combination with the contribution to the acoustic transfer impedance.

Static pressure correction coefficients

The uncertainty associated with the static pressure coefficients is discussed in [9]. The phase of the coefficient is close to zero at low frequencies, and thus the uncertainty on the low frequency value of the phase coefficient is considered to be negligible.

The uncertainty of the frequency dependence is estimated assuming an uncertainty associated with the resonance frequency used for normalization of 250 Hz. An additional contribution to the uncertainty is included due to the increasing variation with frequency visible in Fig. 2 of [H-D.9] and Fig. 4 of [H-D.10]. This contribution is assumed to be numerically ten times larger for the phase.

At very low frequencies, however, it is not accounted for in the calculations that the air stiffness, and thereby the influence of static pressure, vanishes due to the venting of the microphone. This is accounted for by increasing the uncertainty of the static pressure correction to the value of the coefficient at these frequencies.

The combined uncertainty of the static pressure coefficients is calculated assuming that the contributions from the low frequency value and the frequency dependence are independent.

The contribution to the combined uncertainty from the uncertainty associated with the static pressure correction coefficients depends on the actual pressure at the time of measurement and must be calculated for each measurement. Note, however, that the contribution from the static pressure correction due to the uncertainty associated with the static pressure is always present and included in the calculation of the contribution from static pressure uncertainty.

The measurements for the present key comparison were made at static pressures within around ±1 kPa from reference pressure. A rectangular distribution in this range is assumed.

Temperature correction coefficients

The temperature coefficients are discussed in the same papers as the static pressure coefficients [H-D.9, H-D.10], and the same principles are used in the estimation, see above. The temperature dependence does not vanish towards very low frequencies, however. The increase in variation with frequency is assumed to be the same as for the pressure coefficients. It is the experience of the author that this assumption is reasonable.

The measurements for the present key comparison were made at temperatures less than 0.8 K from the reference temperature. A rectangular distribution in this range is assumed.

f) Acoustic Transfer Impedance

Frequency

See also electrical transfer impedance.

The contribution to the uncertainty from the uncertainty associated with frequency is two ways that are fully correlated. The calculations are made assuming the specified frequency, however made at the actual frequency. Hence, the influence of the calculations are the ratio of the calculated sensitivity at the specified frequency to the calculated sensitivity at the actual frequency, whereas the microphone sensitivity present in the measurement is that at the actual frequency and the influence is the ratio of the microphone sensitivity at the actual frequency to the microphone sensitivity at the specified frequency. The combined influence is calculated.

CO_2 content

The CO_2 content in atmospheric air is increasing nowadays, and the concentration may also be slightly higher indoor than outdoor. The uncertainty associated with the CO_2 content is estimated to be 0.02%-point, i.e. CO_2 content is estimated to be between 0.04% and 0.06%.

The influence of CO_2 content uncertainty on the results is calculated with a dedicated version of the calculation software.

Speed of sound

The uncertainty associated with the speed of sound is stated as an equation uncertainty in the standard.

The influence of speed of sound uncertainty on the results is calculated with a dedicated version of the calculation software.

Ratio of specific heats

The uncertainty associated with the ratio of specific heats is stated as an equation uncertainty in the standard.

The influence of ratio of specific heats uncertainty on the results is calculated with a dedicated version of the calculation software.

Density of air

The uncertainty associated with the density of air is stated as an equation uncertainty in the standard.

The influence of density of air uncertainty on the results is calculated with a dedicated version of the calculation software.

Viscosity

The uncertainty associated with the viscosity is not stated in the standard. It is more or less arbitrarily set to 1%. The contribution to the combined uncertainty is very low.

The influence of viscosity uncertainty on the results is calculated with a dedicated version of the calculation software.

Thermal diffusivity

The uncertainty associated with the thermal diffusivity is not stated in the standard. It is more or less arbitrarily set to 1%. The contribution to the combined uncertainty is very low.

The influence of thermal diffusivity uncertainty on the results is calculated with a dedicated version of the calculation software.

g) *Imperfection of theory*

Heat conduction theory

As mentioned, losses due to heat conduction and viscosity are corrected for with a combination of the low frequency and broad band solutions, but no clear evidence that this is correct exists.

At low frequencies, the uncertainty of the applied correction is estimated to be the difference (ratio) between the broad band solution and the full low frequency solution as used, taking into account microphone impedance change. At high frequencies (above around 17 kHz) the uncertainty is estimated to be half the contribution from the broad band solution, and the uncertainty is estimated to be at least 0.003 dB and 0.03 ° in the frequency range where the correction changes sign.

Note that the uncertainty as described here includes the uncertainty due to imperfection of theory with respect to viscous losses and the influence of variation in microphone compliance.

Viscous losses

The uncertainty due to imperfection of theory with respect to viscous losses is discussed together with the uncertainty of the heat conduction theory, see above.

Radial wave motion

The uncertainty due to radial wave motion is – more or less arbitrarily – estimated to be one fifth of the calculated influence of the radial wave motion.

Asymmetric wave motion

The influence of asymmetric wave motion is considered to be a part of the random variations in the measurements. This is supported by the fact that relatively large variations occur around 21.2 kHz where the first asymmetrical mode is present and that the variations seem to occur randomly from measurement to measurement although they relate in some way to the couplers within a measurement.

Imperfect reciprocity of microphones

Measurements at HBK-DPLA are practically always repeated with the microphones interchanged. This allows observation of imperfections in reciprocity, but it has not been done systematically until now. The measurements reported here do not indicate any systematic differences between the microphones as transmitter and as receiver.

Microphone impedance model

The microphone impedance model is too simple and that contributes to the uncertainty. At low frequencies the contribution is minimized by including the increase in compliance in the calculations. At high frequencies the sensitivity falls more off than expected from the impedance model, indicating that the impedance increases more than predicted by the model. A simple evaluation of the associated uncertainty has been made based on the influence, at frequencies above resonance, of changing the resonance frequency (rather much) so as to increase the impedance. The contribution to the uncertainty of measurement is very small.

h) Processing of results

Rounding

The results are rounded to nearest 0.001 dB and 0.01°. The uncertainty associated with rounding is calculated assuming a rectangular distribution.

Uncertainty, LS2 microphones in four PW couplers, LEVEL																					
Values as of 2019-05-15																					
Component	2 Hz	2.5 Hz	3.15 Hz	4 Hz	5 Hz	6.3 Hz	8 Hz	10 Hz	12.5 Hz	16 Hz	20 Hz	25 Hz	31.5 Hz	40 Hz	50 Hz	63 Hz	80 Hz	100 Hz	125 Hz	160 Hz	200 Hz
1.1 Type A uncertainty																					
Reproducibility	0,012	0,010	0,009	0,008	0,007	0,007	0,008	0,007	0,007	0,007	0,007	0,007	0,007	0,007	0,007	0,007	0,008	0,008	0,007	0,008	0,008
1.2 Electrical Transfer Impedance																					
Series impedance, capacitance	0,002	0,002	0,002	0,002	0,002	0,002	0,002	0,002	0,002	0,002	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001
Series impedance, resistance	0,003	0,002	0,001	0,001	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
Voltage ratio	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003
Cross-talk	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003
1.3 Coupler Properties																					
Coupler length	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001
Coupler diameter	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003
Undeterminable leakage	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
1.4 Environmental Conditions																					
Static pressure	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001
Temperature	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,000	0,000	0,000	0,000
Relative humidity	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
1.5 Microphone properties																					
Front cavity depth	0,005	0,005	0,004	0,004	0,004	0,003	0,003	0,002	0,002	0,002	0,002	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001
Equivalent volume	0,001	0,002	0,002	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
Total volume (sum of Vfront and Veq)	0,005	0,005	0,005	0,005	0,005	0,006	0,006	0,006	0,006	0,006	0,006	0,006	0,006	0,007	0,007	0,007	0,007	0,007	0,007	0,007	0,007
Resonance frequency	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
Loss factor	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
Polarization voltage	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001
Static pressure corrections	0,003	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001
Temperature corrections	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001
1.6 Acoustic Transfer Impedance																					
Frequency, including microphone response gradient	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
CO2 content in air in coupler	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
Speed of sound (equation uncertainty, zero frequency)	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,002	0,002	0,002	0,002	0,002	0,002	0,002	0,002	0,002	0,002	0,002	0,002	0,002
Ratio of specific heats	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
Density of air	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
Viscosity	0,001	0,001	0,001	0,001	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
Thermal diffusivity	0,028	0,025	0,023	0,021	0,018	0,017	0,015	0,013	0,012	0,011	0,010	0,009	0,008	0,007	0,006	0,005	0,005	0,004	0,004	0,003	0,003
1.7 Imperfection of theory																					
Heat conduction theory, overall	0,089	0,068	0,063	0,066	0,071	0,074	0,073	0,070	0,065	0,060	0,054	0,049	0,044	0,040	0,036	0,032	0,029	0,026	0,023	0,021	0,019
Radial wave motion	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
Microphone impedance model	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
1.7.1 Processing of results																					
Rounding error	0,0006	0,0006	0,0006	0,0006	0,0006	0,0006	0,0006	0,0006	0,0006	0,0006	0,0006	0,0006	0,0006	0,0006	0,0006	0,0006	0,0006	0,0006	0,0006	0,0006	0,0006
NB frihedsgrader, fordelinger etc. skal overvejes																					
RESULTING UNCERTAINTY	0,0942	0,0736	0,0681	0,0702	0,0742	0,0765	0,0758	0,0720	0,0676	0,0620	0,0564	0,0512	0,0465	0,0422	0,0383	0,0348	0,0318	0,0290	0,0264	0,0243	0,0224
Heat conduction uncertainty ignored	0,0320	0,0288	0,0263	0,0240	0,0219	0,0204	0,0192	0,0177	0,0167	0,0159	0,0149	0,0143	0,0139	0,0134	0,0128	0,0128	0,0129	0,0127	0,0124	0,0124	0,0124
Heat conduction and leakage uncertainty ignored	0,0320	0,0288	0,0263	0,0240	0,0219	0,0204	0,0192	0,0177	0,0167	0,0159	0,0149	0,0143	0,0139	0,0134	0,0128	0,0128	0,0129	0,0127	0,0124	0,0124	0,0124
Leakage, heat cond. and type A uncertainty ignored	0,0297	0,0270	0,0247	0,0226	0,0207	0,0190	0,0175	0,0161	0,0150	0,0141	0,0132	0,0125	0,0119	0,0114	0,0109	0,0106	0,0103	0,0101	0,0099	0,0098	0,0097
Frequency	1,995262	2,511886	3,162278	3,981072	5,011872	6,309573	7,943282	10	12,58925	15,84893	19,95262	25,11886	31,62278	39,81072	50,11872	63,09573	79,43282	100	125,8925	158,4893	199,5262
Rounded up to nearest 0.005 dB	0,095	0,075	0,070	0,075	0,075	0,080	0,080	0,075	0,070	0,065	0,060	0,055	0,050	0,045	0,040	0,035	0,035	0,030	0,030	0,025	0,025
Adjusted, unknown HC, less couplers at highes frequen	0,1	0,08	0,08	0,08	0,08	0,08	0,08	0,075	0,07	0,065	0,06	0,055	0,05	0,045	0,04	0,035	0,035	0,03	0,03	0,025	0,025
Microphone additional leak	0,0083	0,0053	0,0033	0,0021	0,0013	0,0008	0,0005	0,0003	0,0002	0,0001	0,0001	0,0001	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000
Resulting uncertainty wit leaking microphones	0,0946	0,0738	0,0682	0,0703	0,0742	0,0765	0,0758	0,0720	0,0676	0,0620	0,0564	0,0512	0,0465	0,0422	0,0383	0,0348	0,0318	0,0290	0,0264	0,0243	0,0224
Rounded and adjusted	0,1	0,08	0,08	0,08	0,08	0,08	0,08	0,075	0,07	0,065	0,06	0,055	0,05	0,045	0,04	0,035	0,035	0,03	0,03	0,025	0,025

Uncertainty, LS2 microphones in four PW couplers, LEVEL

Values as of 2019-05-15

Component	250 Hz	315 Hz	400 Hz	500 Hz	630 Hz	800 Hz	1000 Hz	1250 Hz	1600 Hz	2000 Hz	2500 Hz	3150 Hz	4000 Hz	5000 Hz	6300 Hz	8000 Hz	10000 Hz	12500 Hz	16000 Hz	20000 Hz	25000 Hz
1.1 Type A uncertainty																					
Reproducibility	0,008	0,007	0,007	0,008	0,008	0,007	0,007	0,008	0,008	0,008	0,008	0,008	0,008	0,008	0,008	0,008	0,008	0,007	0,017	0,031	0,034
1.2 Electrical Transfer Impedance																					
Series impedance, capacitance	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,001
Series impedance, resistance	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
Voltage ratio	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003
Cross-talk	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003
1.3 Coupler Properties																					
Coupler length	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,000	0,000	0,001	0,002
Coupler diameter	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,004	0,004	0,005	0,005
Undeterminable leakage	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
1.4 Environmental Conditions																					
Static pressure	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,002	0,002	0,002	0,002	0,002	0,001	0,000
Temperature	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,001	0,001	0,001	0,001	0,001	0,001	0,002	0,003	0,004	0,006	0,007	0,007	0,004
Relative humidity	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,001	0,001	0,001	0,001	0,001	0,002	0,003	0,003
1.5 Microphone properties																					
Front cavity depth	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,001	0,001	0,001	0,002
Equivalent volume	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,001	0,008	0,019
Total volume (sum of Vfront and Veq)	0,007	0,007	0,007	0,007	0,007	0,007	0,007	0,007	0,007	0,007	0,007	0,007	0,007	0,006	0,006	0,005	0,004	0,003	0,000	0,003	0,005
Resonance frequency	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,002	0,002
Loss factor	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,001	0,001	0,002	0,003	0,003	0,003	0,001	0,000	0,009
Polarization voltage	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001
Static pressure corrections	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,002	0,002	0,004	0,007	0,006
Temperature corrections	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,002	0,002	0,002	0,002	0,002	0,002	0,002	0,002	0,003	0,003	0,003
1.6 Acoustic Transfer Impedance																					
Frequency, including microphone response gradient	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
CO2 content in air in coupler	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,001
Speed of sound (equation uncertainty, zero frequency)	0,002	0,002	0,002	0,002	0,002	0,002	0,002	0,002	0,002	0,002	0,002	0,002	0,002	0,002	0,002	0,002	0,002	0,002	0,001	0,000	0,001
Ratio of specific heats	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
Density of air	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
Viscosity	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
Thermal diffusivity	0,003	0,002	0,002	0,002	0,002	0,002	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,000	0,000	0,000	0,000	0,000	0,000
1.7 Imperfection of theory																					
Heat conduction theory, overall	0,017	0,015	0,013	0,012	0,011	0,009	0,008	0,007	0,006	0,005	0,004	0,003	0,003	0,003	0,003	0,003	0,005	0,003	0,003	0,009	0,012
Radial wave motion	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,001	0,001	0,002	0,003	0,005	0,007	0,011	0,025
Microphone impedance model	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,001	0,002	0,002	0,004	0,028	0,024
1.7.1 Processing of results																					
Rounding error	0,0006	0,0006	0,0006	0,0006	0,0006	0,0006	0,0006	0,0006	0,0006	0,0006	0,0006	0,0006	0,0006	0,0006	0,0006	0,0006	0,0006	0,0006	0,0006	0,0006	0,0006
NB frihedsgrader, fordelinger etc. skal overvejes																					
RESULTING UNCERTAINTY	0,0207	0,0192	0,0179	0,0170	0,0161	0,0152	0,0145	0,0142	0,0136	0,0131	0,0130	0,0127	0,0124	0,0126	0,0125	0,0127	0,0141	0,0135	0,0216	0,0470	0,0558
Heat conduction uncertainty ignored	0,0122	0,0121	0,0119	0,0121	0,0121	0,0119	0,0119	0,0122	0,0121	0,0120	0,0122	0,0122	0,0121	0,0122	0,0121	0,0123	0,0132	0,0131	0,0214	0,0462	0,0544
Heat conduction and leakage uncertainty ignored	0,0122	0,0121	0,0119	0,0121	0,0121	0,0119	0,0119	0,0122	0,0121	0,0120	0,0122	0,0122	0,0121	0,0122	0,0121	0,0123	0,0132	0,0131	0,0214	0,0462	0,0544
Leakage, heat cond. and type A uncertainty ignored	0,0096	0,0095	0,0095	0,0094	0,0094	0,0094	0,0093	0,0093	0,0093	0,0093	0,0092	0,0092	0,0092	0,0091	0,0092	0,0095	0,0103	0,0114	0,0135	0,0340	0,0426
Frequency	251,1886	316,2278	398,1072	501,1872	630,9573	794,3282	1000	1258,925	1584,893	1995,262	2511,886	3162,278	3981,072	5011,872	6309,573	7943,282	10000	12589,25	15848,93	19952,62	25118,86
Rounded up to nearest 0.005 dB	0,025	0,020	0,020	0,020	0,020	0,020	0,015	0,015	0,015	0,015	0,015	0,015	0,015	0,015	0,015	0,015	0,015	0,015	0,025	0,050	0,060
Adjusted, unknown HC, less couplers at highes frequen	0,025	0,02	0,02	0,02	0,02	0,02	0,015	0,015	0,015	0,015	0,015	0,015	0,015	0,015	0,015	0,015	0,015	0,015	0,025	0,05	0,07
Microphone additional leak	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000
Resulting uncertainty wit leaking microphones	0,0207	0,0192	0,0179	0,0170	0,0161	0,0152	0,0145	0,0142	0,0136	0,0131	0,0130	0,0127	0,0124	0,0126	0,0125	0,0127	0,0141	0,0135	0,0216	0,0470	0,0558
Rounded and adjusted	0,025	0,02	0,02	0,02	0,02	0,02	0,015	0,015	0,015	0,015	0,015	0,015	0,015	0,015	0,015	0,015	0,015	0,015	0,025	0,05	0,07

Uncertainty, LS2 microphones in four PW couplers, PHASE

Values as of 2019-05-15

Component	2 Hz	2.5 Hz	3.15 Hz	4 Hz	5 Hz	6.3 Hz	8 Hz	10 Hz	12.5 Hz	16 Hz	20 Hz	25 Hz	31.5 Hz	40 Hz	50 Hz	63 Hz	80 Hz	100 Hz	125 Hz	160 Hz	200 Hz
1.1 Type A uncertainty																					
Reproducibility	0,249	0,205	0,164	0,135	0,112	0,087	0,077	0,062	0,049	0,042	0,032	0,028	0,024	0,019	0,017	0,013	0,009	0,010	0,008	0,008	0,006
1.2 Electrical Transfer Impedance																					
Series impedance, capacitance	0,001	0,001	0,001	0,001	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
Series impedance, resistance	0,226	0,180	0,143	0,114	0,091	0,072	0,057	0,045	0,036	0,029	0,023	0,018	0,014	0,011	0,009	0,007	0,006	0,004	0,004	0,003	0,002
Voltage ratio	0,040	0,040	0,040	0,040	0,040	0,040	0,040	0,040	0,040	0,040	0,040	0,040	0,040	0,040	0,040	0,040	0,040	0,040	0,040	0,040	0,040
Cross-talk	0,016	0,016	0,016	0,016	0,016	0,016	0,016	0,016	0,016	0,016	0,016	0,016	0,016	0,016	0,016	0,016	0,016	0,016	0,016	0,016	0,016
1.3 Coupler Properties																					
Coupler length	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
Coupler diameter	0,001	0,001	0,001	0,001	0,001	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
Undeterminable leakage	0,230	0,182	0,145	0,115	0,091	0,073	0,058	0,046	0,036	0,029	0,023	0,018	0,014	0,012	0,009	0,007	0,006	0,005	0,004	0,003	0,002
1.4 Environmental Conditions																					
Static pressure	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
Temperature	0,003	0,002	0,001	0,000	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,000	0,000	0,000	0,000	0,000	0,000
Relative humidity	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,000	0,000	0,000	0,000	0,000	0,000	0,000
1.5 Microphone properties																					
Front cavity depth	0,007	0,009	0,010	0,012	0,012	0,012	0,012	0,011	0,010	0,010	0,009	0,008	0,007	0,007	0,006	0,005	0,005	0,004	0,004	0,004	0,003
Equivalent volume	0,003	0,002	0,000	0,002	0,003	0,003	0,004	0,003	0,003	0,003	0,003	0,002	0,002	0,002	0,002	0,002	0,002	0,001	0,001	0,001	0,001
Total volume (sum of Vfront and Veq)	0,002	0,003	0,004	0,005	0,005	0,006	0,005	0,005	0,005	0,004	0,004	0,004	0,003	0,003	0,003	0,002	0,002	0,002	0,002	0,001	0,001
Resonance frequency	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
Loss factor	0,002	0,002	0,002	0,002	0,002	0,002	0,002	0,002	0,002	0,002	0,002	0,002	0,002	0,002	0,002	0,002	0,002	0,002	0,002	0,002	0,002
Polarization voltage	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
Static pressure corrections	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
Temperature corrections	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
1.6 Acoustic Transfer Impedance																					
Frequency, including microphone response gradient	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
CO2 content in air in coupler	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,003	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
Speed of sound (equation uncertainty, zero frequency)	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,002	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
Ratio of specific heats	0,005	0,005	0,005	0,004	0,004	0,004	0,004	0,001	0,003	0,003	0,002	0,002	0,002	0,002	0,002	0,001	0,001	0,001	0,001	0,001	0,001
Density of air	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,002	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
Viscosity	0,021	0,018	0,015	0,012	0,010	0,009	0,007	0,008	0,005	0,004	0,003	0,002	0,002	0,002	0,001	0,001	0,001	0,001	0,001	0,000	0,000
Thermal diffusivity	0,117	0,110	0,103	0,097	0,090	0,083	0,076	0,067	0,064	0,059	0,054	0,049	0,044	0,040	0,036	0,033	0,029	0,026	0,024	0,021	0,019
1.7 Imperfection of theory																					
Heat conduction theory, overall	2,742	2,106	1,603	1,235	0,980	0,808	0,687	0,591	0,524	0,461	0,405	0,356	0,314	0,277	0,246	0,218	0,194	0,172	0,153	0,136	0,122
Radial wave motion	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
Microphone impedance model	0,002	0,002	0,002	0,002	0,002	0,002	0,002	0,002	0,002	0,002	0,002	0,002	0,002	0,002	0,002	0,002	0,002	0,002	0,002	0,002	0,002
1.7.1 Processing of results																					
Rounding error	0,006	0,006	0,006	0,006	0,006	0,006	0,006	0,006	0,006	0,006	0,006	0,006	0,006	0,006	0,006	0,006	0,006	0,006	0,006	0,006	0,006
NB frihedsgrader, fordelinger etc. skal overvejes																					
RESULTING UNCERTAINTY	2,775	2,135	1,629	1,258	1,000	0,824	0,702	0,603	0,535	0,470	0,414	0,365	0,322	0,285	0,253	0,225	0,201	0,180	0,161	0,145	0,131
Heat conduction uncertainty ignored	0,427	0,350	0,285	0,237	0,198	0,165	0,143	0,121	0,106	0,094	0,083	0,076	0,070	0,065	0,061	0,057	0,054	0,053	0,051	0,049	0,048
Heat conduction and leakage uncertainty ignored	0,360	0,298	0,246	0,207	0,176	0,148	0,131	0,112	0,100	0,090	0,080	0,074	0,068	0,064	0,060	0,057	0,054	0,052	0,051	0,049	0,048
Leakage, heat cond. and type A uncertainty ignored	0,260	0,217	0,183	0,157	0,136	0,119	0,106	0,094	0,087	0,079	0,073	0,068	0,064	0,061	0,058	0,055	0,053	0,051	0,050	0,049	0,048
Frequency	1,995262	2,511886	3,162278	3,981072	5,011872	6,309573	7,943282	10	12,58925	15,84893	19,95262	25,11886	31,62278	39,81072	50,11872	63,09573	79,43282	100	125,8925	158,4893	199,5262
Rounded up to nearest 0.05 °	2,80	2,15	1,65	1,30	1,05	0,85	0,75	0,65	0,55	0,50	0,45	0,40	0,35	0,30	0,30	0,25	0,25	0,20	0,20	0,15	0,15
Adjusted, unknown HC, less couplers at highes frequen	2,8	2,15	1,65	1,3	1,05	0,85	0,75	0,65	0,55	0,5	0,45	0,4	0,35	0,3	0,3	0,25	0,25	0,2	0,2	0,15	0,15
Microphone additional leak	2,5110	1,9951	1,5850	1,2591	1,0002	0,7945	0,6311	0,5013	0,3982	0,3163	0,2513	0,1996	0,1585	0,1259	0,1000	0,0795	0,0631	0,0501	0,0398	0,0316	0,0251
Resulting uncertainty wit leaking microphones	3,7427	2,9220	2,2726	1,7796	1,4144	1,1448	0,9439	0,7846	0,6666	0,5669	0,4841	0,4156	0,3586	0,3115	0,2723	0,2390	0,2109	0,1869	0,1663	0,1486	0,1333
Rounded and adjusted	3,75	2,95	2,3	1,8	1,45	1,15	0,95	0,8	0,7	0,6	0,5	0,45	0,4	0,35	0,3	0,25	0,25	0,2	0,2	0,15	0,15

Uncertainty, LS2 microphones in four PW couplers, PHASE

Values as of 2019-05-15

Component	250 Hz	315 Hz	400 Hz	500 Hz	630 Hz	800 Hz	1000 Hz	1250 Hz	1600 Hz	2000 Hz	2500 Hz	3150 Hz	4000 Hz	5000 Hz	6300 Hz	8000 Hz	10000 Hz	12500 Hz	16000 Hz	20000 Hz	25000 Hz
1.1 Type A uncertainty																					
Reproducibility	0,006	0,005	0,005	0,005	0,005	0,006	0,008	0,008	0,007	0,007	0,011	0,013	0,018	0,026	0,031	0,040	0,059	0,082	0,092	0,079	0,230
1.2 Electrical Transfer Impedance																					
Series impedance, capacitance	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
Series impedance, resistance	0,002	0,001	0,001	0,001	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,001	0,001	0,001	0,002
Voltage ratio	0,040	0,040	0,040	0,040	0,040	0,040	0,040	0,040	0,040	0,040	0,040	0,040	0,040	0,040	0,040	0,040	0,040	0,040	0,040	0,040	0,040
Cross-talk	0,016	0,016	0,016	0,016	0,016	0,016	0,016	0,016	0,016	0,016	0,016	0,016	0,016	0,016	0,016	0,016	0,016	0,016	0,016	0,016	0,016
1.3 Coupler Properties																					
Coupler length	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,001	0,002	0,002
Coupler diameter	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,001	0,003	0,004
Undeterminable leakage	0,002	0,001	0,001	0,001	0,001	0,001	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
1.4 Environmental Conditions																					
Static pressure	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,001	0,002	0,005	0,009	0,012	0,009
Temperature	0,000	0,000	0,000	0,001	0,001	0,001	0,002	0,002	0,002	0,003	0,004	0,004	0,005	0,006	0,008	0,008	0,004	0,006	0,025	0,048	0,047
Relative humidity	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,001	0,002	0,003
1.5 Microphone properties																					
Front cavity depth	0,003	0,003	0,002	0,002	0,002	0,002	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,000	0,000	0,001	0,001	0,003	0,006	0,010	0,012
Equivalent volume	0,001	0,001	0,002	0,002	0,002	0,002	0,003	0,003	0,004	0,005	0,006	0,008	0,009	0,012	0,014	0,017	0,018	0,016	0,002	0,036	0,044
Total volume (sum of Vfront and Veq)	0,001	0,001	0,001	0,000	0,000	0,000	0,000	0,001	0,001	0,002	0,002	0,003	0,004	0,005	0,006	0,007	0,008	0,006	0,003	0,030	0,039
Resonance frequency	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,001	0,001	0,001	0,001	0,001	0,002	0,002	0,003	0,003	0,002	0,000	0,007	0,023
Loss factor	0,002	0,002	0,002	0,002	0,002	0,003	0,003	0,004	0,005	0,007	0,008	0,010	0,012	0,014	0,016	0,015	0,011	0,002	0,004	0,064	0,065
Polarization voltage	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
Static pressure corrections	0,000	0,000	0,000	0,001	0,001	0,001	0,001	0,001	0,002	0,002	0,003	0,004	0,005	0,006	0,007	0,009	0,014	0,029	0,047	0,065	0,061
Temperature corrections	0,000	0,000	0,000	0,000	0,000	0,001	0,001	0,001	0,001	0,002	0,002	0,002	0,003	0,004	0,005	0,006	0,010	0,016	0,024	0,025	0,022
1.6 Acoustic Transfer Impedance																					
Frequency, including microphone response gradient	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,001	0,001	0,001	0,002	0,002	0,003	0,002
CO2 content in air in coupler	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,001	0,001
Speed of sound (equation uncertainty, zero frequency)	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,001	0,001	0,001	0,003	0,003
Ratio of specific heats	0,001	0,001	0,001	0,001	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
Density of air	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
Viscosity	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,001	0,001	0,002	0,003	0,003
Thermal diffusivity	0,017	0,015	0,014	0,012	0,011	0,010	0,009	0,008	0,007	0,006	0,006	0,005	0,004	0,004	0,003	0,003	0,002	0,001	0,000	0,001	0,002
1.7 Imperfection of theory																					
Heat conduction theory, overall	0,109	0,097	0,087	0,077	0,069	0,061	0,054	0,047	0,041	0,035	0,030	0,030	0,030	0,030	0,030	0,030	0,030	0,030	0,030	0,092	0,117
Radial wave motion	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,001	0,001	0,002	0,005	0,010	0,018	0,023
Microphone impedance model	0,002	0,002	0,002	0,002	0,002	0,003	0,004	0,005	0,006	0,008	0,010	0,012	0,016	0,020	0,026	0,032	0,036	0,029	0,006	0,104	0,294
1.7.1 Processing of results																					
Rounding error	0,006	0,006	0,006	0,006	0,006	0,006	0,006	0,006	0,006	0,006	0,006	0,006	0,006	0,006	0,006	0,006	0,006	0,006	0,006	0,006	0,006
NB frihedsgrader, fordelinger etc. skal overvejes																					
RESULTING UNCERTAINTY	0,118	0,108	0,098	0,090	0,083	0,076	0,071	0,066	0,061	0,058	0,056	0,058	0,061	0,066	0,071	0,079	0,092	0,109	0,123	0,204	0,413
Heat conduction uncertainty ignored	0,048	0,047	0,046	0,046	0,045	0,045	0,046	0,046	0,046	0,046	0,048	0,049	0,053	0,059	0,064	0,073	0,087	0,104	0,119	0,182	0,396
Heat conduction and leakage uncertainty ignored	0,047	0,047	0,046	0,046	0,045	0,045	0,046	0,046	0,046	0,046	0,048	0,049	0,053	0,059	0,064	0,073	0,087	0,104	0,119	0,182	0,396
Leakage, heat cond. and type A uncertainty ignored	0,047	0,046	0,046	0,045	0,045	0,045	0,045	0,045	0,045	0,046	0,046	0,048	0,050	0,053	0,056	0,061	0,064	0,065	0,075	0,164	0,322
Frequency	251,1886	316,2278	398,1072	501,1872	630,9573	794,3282	1000	1258,925	1584,893	1995,262	2511,886	3162,278	3981,072	5011,872	6309,573	7943,282	10000	12589,25	15848,93	19952,62	25118,86
Rounded up to nearest 0.05 °	0,15	0,15	0,10	0,10	0,10	0,10	0,10	0,10	0,10	0,10	0,10	0,10	0,10	0,10	0,10	0,10	0,10	0,15	0,15	0,25	0,45
Adjusted, unknown HC, less couplers at highes frequen	0,15	0,15	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,15	0,15	0,25	0,45
Microphone additional leak	0,0200	0,0159	0,0126	0,0100	0,0079	0,0063	0,0050	0,0040	0,0032	0,0025	0,0020	0,0016	0,0013	0,0010	0,0008	0,0006	0,0005	0,0004	0,0003	0,0003	0,0002
Resulting uncertainty wit leaking microphones	0,1201	0,1087	0,0989	0,0905	0,0832	0,0765	0,0709	0,0658	0,0613	0,0577	0,0563	0,0577	0,0609	0,0660	0,0711	0,0789	0,0918	0,1085	0,1228	0,2036	0,4128
Rounded and adjusted	0,15	0,15	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,15	0,15	0,25	0,45

CENAM

The expanded measurement uncertainty is obtained multiplying the standard combined uncertainty by a coverage factor, k = 2, which corresponds to a confidence level of at least 95%, under the assumption that the probability distribution function associated to the measurand is approximately normal. The measurement uncertainty has been estimated according to the Mexican National Standard NMX-CH-140-IMNC-2002 : "Guia para Ia Expresion de la Incertidumbre en las Mediciones", which is equivalent to the document JCGM 100:2008 (GUM with minor corrections) —Evaluation of measurement data —"Guide to the expression of uncertainty in measurement. BIPM. First Edition — September 2008". The uncertainty value given in this certificate does not take into account the contributions due to long term stability, drift and transportation effects of the instrument under calibration.

Summary of uncertainty analysis for LS2P microphones - Pressure sensitivity level

	Measurement quantities							Microphone quantities							Coupler quantities					Capillary tubes		Others	OVERALL RESULTS			
Frec., f, [Hz]	Voltage ratios, Rij	Ref. capacitor, C	Ref. resistor, R	Static pressure, ps	Temperature, T	Relative Humidity, RH	Frequency, f	Front Volume, Vf	Cavity depth, lf	Equivalent volume, Ve	Resonance frequency, f0	Loss factor, d	Static pressure Coeff, Cps	Temperature Coeff, Ct	Coupler length, lcpl	Coupler diameter, Dcpl	Coupler volume, Vcpl	Coupler surface S_{cpl}	Radial wave motion	Capillary tube length, l_{ct}	Capillary tube diameter, D_{ct}	Polarization voltage, Vpol, V_{pol}	Combined std uncertainty Type B	Std uncertainty Type A	Expanded uncertainty, U95,45%, k=2	CMC/CC AUV.A-K6 - Claimed Expanaded Uncertainty
2	9.3	9.5	2.3	2.7	0.4	0.7	2.0	170.0	21.0	168.0	4.1	3.4	3.0	9.2	8.2	11.8	3.0	4.8	0.0	5.1	270.0	13.0	0.036	0.040	0.11	0.23
2.5	9.3	9.5	2.2	2.7	0.4	0.7	1.9	165.0	19.0	164.0	3.8	2.9	2.8	9.1	8.5	11.9	2.8	4.5	0.0	4.2	250.0	13.0	0.034	0.032	0.09	0.20
3.15	9.2	9.5	2.1	2.7	0.4	0.7	1.9	160.0	17.1	160.0	3.5	2.5	2.5	9.1	8.8	11.9	2.7	4.2	0.0	3.7	225.0	13.0	0.032	0.023	0.08	0.18
4	9.2	9.5	2.0	2.8	0.5	0.7	1.8	156.0	15.4	157.0	3.2	2.2	2.3	9.0	9.1	12.0	2.6	3.9	0.0	3.3	205.0	13.0	0.030	0.019	0.07	0.16
5	9.2	9.5	1.9	2.8	0.5	0.8	1.7	152.0	14.0	153.0	2.9	1.9	2.1	9.0	9.3	12.0	2.5	3.7	0.0	3.1	190.0	13.0	0.029	0.017	0.07	0.14
6.3	9.1	9.5	1.8	2.9	0.5	0.8	1.6	148.0	12.6	150.0	2.7	1.7	2.0	8.9	9.5	12.1	2.4	3.4	0.0	2.9	170.0	13.0	0.027	0.014	0.06	0.13
8	9.1	9.5	1.7	2.9	0.6	0.8	1.6	145.0	11.4	146.0	2.4	1.6	1.8	8.9	9.7	12.2	2.3	3.2	0.0	2.7	153.0	13.0	0.026	0.011	0.06	0.12
10	9.1	9.5	1.6	3.0	0.6	0.8	1.5	141.0	10.2	143.0	2.2	1.4	1.7	8.8	9.9	12.2	2.3	3.0	0.0	2.5	138.0	13.0	0.025	0.010	0.05	0.12
12.5	9.0	9.5	1.5	3.0	0.7	0.8	1.4	138.0	9.3	139.0	2.0	1.3	1.6	8.8	10.1	12.3	2.2	2.8	0.0	2.3	123.0	13.0	0.023	0.009	0.05	0.11
16	9.0	9.5	1.5	3.1	0.7	0.9	1.4	135.0	8.4	136.0	1.8	1.3	1.5	8.7	10.2	12.3	2.1	2.6	0.0	2.2	109.0	13.0	0.022	0.008	0.05	0.09
20	9.0	9.5	1.4	3.1	0.8	0.9	1.3	132.0	7.7	133.0	1.6	1.2	1.4	8.7	10.3	12.4	2.0	2.5	0.0	2.1	95.0	13.0	0.021	0.008	0.05	0.09
25	8.9	9.5	1.3	3.1	0.9	0.9	1.3	130.0	6.9	131.0	1.5	1.2	1.4	8.7	10.5	12.5	1.9	2.3	0.0	2.0	80.0	13.0	0.020	0.008	0.04	0.08
31.5	8.9	9.5	1.2	3.1	1.1	1.1	1.3	130.6	6.1	130.6	1.1	1.2	1.3	8.6	10.6	13.0	1.9	2.0	0.0	2.2	104.6	13.0	0.021	0.023	0.06	0.07
40	8.9	9.5	1.1	3.4	1.0	1.0	1.1	121.9	4.9	121.9	1.1	1.1	1.2	8.6	10.8	13.3	1.7	1.8	0.0	1.5	39.3	13.0	0.018	0.018	0.05	0.07
50	8.9	9.5	1.1	3.3	1.1	1.1	1.2	125.6	5.4	125.6	1.1	1.1	1.2	8.6	10.7	13.2	1.8	1.9	0.0	1.8	67.7	13.0	0.019	0.012	0.05	0.07
63	8.8	9.5	1.0	3.5	1.0	1.0	1.1	118.6	4.4	118.6	1.0	1.1	1.2	8.5	11.0	13.4	1.6	1.7	0.0	1.2	15.1	13.0	0.017	0.010	0.04	0.05
80	8.8	9.5	1.0	3.6	1.0	1.0	1.0	120.9	3.6	120.9	1.0	1.0	1.1	8.5	11.0	13.4	1.4	1.5	0.0	1.3	12.2	13.0	0.017	0.010	0.04	0.05
100	8.8	9.5	1.0	3.6	1.0	1.0	1.0	119.9	4.0	119.9	1.0	1.1	1.2	8.5	11.0	13.4	1.5	1.5	0.0	1.2	13.5	13.0	0.017	0.010	0.04	0.05
125	8.8	9.5	0.9	3.6	0.9	0.9	1.0	121.8	3.3	121.8	1.0	1.0	1.1	8.5	11.0	13.4	1.3	1.4	0.0	1.3	11.0	13.0	0.017	0.010	0.04	0.05
160	8.6	9.5	0.8	3.7	2.4	1.4	0.8	115.5	2.8	115.5	0.8	0.9	1.0	8.1	11.5	13.2	1.1	1.2	0.0	1.4	15.0	13.0	0.017	0.010	0.04	0.05
200	8.7	9.5	0.9	3.7	1.7	1.2	0.9	118.3	3.0	118.3	0.9	0.9	1.1	8.3	11.3	13.3	1.2	1.3	0.0	1.3	13.2	13.0	0.017	0.010	0.04	0.05
250	8.6	9.5	0.8	3.8	3.0	1.5	0.8	113.1	2.6	113.1	0.8	0.8	1.0	8.0	11.6	13.0	1.1	1.1	0.0	1.4	16.5	13.0	0.016	0.010	0.04	0.05
315	8.5	9.5	0.7	3.8	2.8	1.5	0.7	113.4	2.1	113.4	0.7	0.7	0.9	8.0	11.6	13.0	0.9	1.0	0.0	1.3	12.1	13.0	0.016	0.010	0.04	0.05
400	8.5	9.5	0.7	3.8	2.9	1.5	0.7	113.2	2.4	113.2	0.7	0.8	1.0	8.0	11.6	13.0	1.0	1.0	0.0	1.3	14.1	13.0	0.016	0.010	0.04	0.05
500	8.5	9.5	0.7	3.8	2.8	1.4	0.7	113.5	2.0	113.5	0.7	0.7	0.9	7.9	11.5	13.0	0.9	0.9	0.0	1.2	10.6	13.0	0.016	0.010	0.04	0.05
630	8.5	9.5	0.7	3.8	2.7	1.4	0.7	113.3	1.7	113.3	0.7	0.8	0.9	8.0	11.5	12.9	0.9	0.9	0.0	1.1	4.3	13.0	0.016	0.010	0.04	0.05
800	8.5	9.5	0.7	3.8	2.7	1.4	0.7	113.4	1.8	113.4	0.7	0.8	0.9	8.0	11.5	12.9	0.9	0.9	0.0	1.2	7.2	13.0	0.016	0.010	0.04	0.05
1 000	8.5	9.5	0.7	3.7	2.7	1.4	0.7	113.3	1.6	113.3	0.8	0.9	0.9	8.0	11.5	12.9	0.9	0.9	0.0	1.1	2.1	13.0	0.016	0.010	0.04	0.05
1 250	8.5	9.5	0.6	3.8	2.7	1.3	0.6	113.0	1.4	113.0	1.0	1.0	0.9	7.9	11.4	12.9	0.8	0.8	0.0	1.0	1.0	13.0	0.016	0.010	0.04	0.05
1 600	8.5	9.5	0.6	3.8	2.9	1.3	0.6	112.6	1.3	112.6	1.1	1.2	0.9	7.9	11.4	12.9	0.8	0.8	0.0	0.9	1.1	13.0	0.016	0.010	0.04	0.05
2 000	8.4	9.5	0.6	3.9	3.0	1.3	0.6	112.1	1.1	112.1	1.2	2.1	0.8	7.8	11.3	12.8	0.7	0.7	0.0	0.8	2.2	13.0	0.016	0.010	0.04	0.05
2 500	8.3	9.5	0.5	4.0	3.3	1.3	0.5	111.3	0.9	111.3	1.5	3.7	0.7	7.8	11.1	12.8	0.6	0.6	0.0	0.6	3.4	13.0	0.016	0.010	0.04	0.05
3 150	8.3	9.5	0.5	4.0	3.7	1.3	0.6	110.4	0.8	110.4	2.0	6.2	0.7	7.8	11.1	12.8	0.6	0.6	0.0	0.6	0.8	13.0	0.016	0.010	0.04	0.05
4 000	8.3	9.5	0.5	4.2	4.5	1.2	0.6	148.2	0.6	148.2	4.7	10.4	0.7	7.7	10.8	12.8	0.6	0.6	0.0	0.7	0.7	13.0	0.021	0.010	0.05	0.06
5 000	8.3	9.5	0.4	4.3	5.4	1.3	0.6	144.7	0.5	144.7	32.0	16.1	0.7	7.7	10.5	12.9	0.5	0.5	5.0	0.6	0.8	13.0	0.021	0.010	0.05	0.06
6 300	8.2	9.5	0.4	4.5	6.0	1.3	0.6	139.1	0.5	139.1	47.3	24.7	0.6	7.7	10.0	13.0	0.4	0.4	10.0	0.5	0.4	13.0	0.021	0.010	0.05	0.06
8 000	8.2	9.5	0.4	4.9	8.2	1.4	0.8	129.3	0.7	129.3	52.7	36.3	0.6	7.7	9.3	13.2	0.4	0.4	20.0	0.5	0.5	13.0	0.020	0.010	0.04	0.06
10 000	8.2	9.5	0.4	5.8	42.0	1.7	2.5	114.1	1.4	114.1	81.1	46.5	0.6	7.6	8.1	13.6	0.4	0.4	30.0	0.4	0.4	13.0	0.020	0.012	0.05	0.09
12 500	8.1	9.5	0.3	5.8	45.0	1.8	2.7	172.8	2.4	89.9	90.7	45.0	0.6	7.6	6.1	14.2	0.4	0.4	50.0	0.4	0.5	13.0	0.023	0.015	0.06	0.10
16 000	8.1	9.5	0.3	10.0	50.0	2.3	5.1	123.9	3.7	53.6	74.6	20.0	0.5	7.6	4.1	15.3	0.3	0.3	100.0	0.4	0.3	13.0	0.019	0.020	0.06	0.13
20 000	12.0	9.5	0.3	15.0	46.0	3.0	9.8	316.0	4.2	52.6	282.4	42.9	0.5	7.5	12.8	17.4	0.3	0.3	150.0	0.3	0.4	13.0	0.046	0.040	0.12	0.19
25 000	15.0	9.5	0.2	20.0	35.0	5.6	15.0	635.5	6.5	132.2	300.0	150.7	0.4	7.2	24.5	19.8	0.2	0.2	200.0	0.2	0.3	13.0	0.076	0.094	0.24	0.28
31 500	30.0	9.5	0.3	30.0	44.0	14.4	25.0	1343.0	28.8	274.4	350.0	385.2	0.6	7.2	52.5	26.8	0.4	0.4	300.0	0.3	0.4	13.0	0.150	0.120	0.38	0.40
	dBx10^{-4}	dBx10^{-4}	dBx10^{-4}	dBx10^{-4}	dBx10^{-4}	dBx10^{-4}	dBx10^{-4}	dBx10^{-4}	dBx10^{-4}	dBx10^{-4}	dBx10^{-4}	dBx10^{-4}	dBx10^{-4}	dBx10^{-4}	dBx10^{-4}	dBx10^{-4}	dBx10^{-4}	dBx10^{-4}	dBx10^{-4}	dBx10^{-4}	dBx10^{-4}	dBx10^{-4}	dB	dB	dB	dB

Summary of uncertainty analysis for LS2P microphones - Pressure sensitivity phase

	Measurement quantities								Microphone quantities								Coupler quantities				Others	Overall results			
Frequency, [Hz]	Voltage ratios, R_i	Ref. capacitor, C	Ref. resistor, R	Elec. Ref. impedace, $Z_{e,ref}(f)$	Static pressure, p_s	Temperature, T	Relative Humidity, RH	Frequency, f	Front Volume, V_f	Cavity depth, l_r	Excess Microphone Surface, S_{me}	Equivalent volume, V_e	Resonance frequency, f_0	Loss factor, d	Static pressure Coeff,	Temperature Coeff, C_t	Coupler length, l_{cpl}	Coupler diameter, D_{cpl}	Coupler volume, V_{cpl} & S_{cpl}	Radial wave motion	Polarization voltage, V_{pol}	**Combined std uncertainty Type B**	**Std uncertainty Type A**	**Expanded uncertainty, $U_{95.45\%}$, k=2**	**CMC/CCAUV.A-K6 - Claimed Expanaded Uncertainty**
1.995	4161.5	0.8	0.0	0.8	3.0	46.1	6.2	0.8	59.6	37.4	70.8	35.7	0.8	0.2	0.0	0.0	5.1	1.6	6.2	0.0	0.0	**0.240**	**0.934**	**1.93**	**3.10**
2.513	4284.6	0.7	0.0	0.7	2.8	43.6	5.7	0.8	55.0	34.7	64.9	32.9	0.8	0.2	0.0	0.0	4.6	1.5	5.8	0.0	0.0	**0.247**	**0.802**	**1.68**	**2.80**
3.162	4106.5	0.5	0.0	0.5	2.6	41.1	5.2	0.8	50.7	32.1	59.4	30.3	0.9	0.3	0.0	0.0	4.3	1.5	5.3	0.0	0.0	**0.237**	**0.630**	**1.35**	**2.60**
3.981	3807.7	0.3	0.0	0.3	2.4	38.5	4.7	0.8	46.1	29.3	53.7	27.5	0.9	0.3	0.0	0.0	3.8	1.4	4.9	0.0	0.0	**0.220**	**0.500**	**1.09**	**2.30**
5.013	3371.1	0.2	0.0	0.2	2.2	36.2	4.3	0.7	42.2	26.9	49.0	25.1	0.9	0.4	0.0	0.0	3.5	1.3	4.5	0.0	0.0	**0.195**	**0.407**	**0.90**	**2.10**
6.310	2883.4	0.2	0.0	0.2	2.1	34.0	3.9	0.7	38.5	24.6	44.5	22.8	1.0	0.5	0.0	0.0	3.2	1.2	4.1	0.0	0.0	**0.167**	**0.333**	**0.74**	**1.80**
7.943	2361.9	0.1	0.0	0.1	1.9	31.7	3.5	0.7	34.7	22.3	40.0	20.5	1.1	0.7	0.0	0.0	2.9	1.1	3.7	0.0	0.0	**0.136**	**0.274**	**0.61**	**1.40**
10.000	1952.5	0.0	0.0	0.0	1.8	30.8	3.2	0.6	37.3	22.7	40.5	21.9	1.1	1.0	0.0	0.0	4.1	1.1	4.4	0.0	0.0	**0.113**	**0.225**	**0.50**	**1.10**
12.589	1577.6	0.0	0.0	0.0	1.8	29.6	3.0	0.6	39.1	22.6	40.2	22.8	1.3	1.4	0.0	0.0	5.4	1.5	5.0	0.0	0.0	**0.091**	**0.181**	**0.40**	**1.00**
15.849	1267.4	0.0	0.0	0.0	1.6	27.8	2.7	0.6	35.4	20.5	36.3	20.4	1.5	1.8	0.0	0.0	4.9	1.3	4.5	0.0	0.0	**0.073**	**0.145**	**0.33**	**0.80**
19.953	1009.7	0.0	0.0	0.0	1.5	26.7	2.5	0.5	36.8	20.2	35.7	20.8	1.8	2.5	0.0	0.0	6.2	1.9	5.0	0.0	0.0	**0.058**	**0.057**	**0.16**	**0.60**
25.119	802.6	0.1	0.0	0.1	1.4	25.2	2.3	0.5	33.3	18.3	32.3	18.4	2.2	3.1	0.0	0.0	5.6	1.7	4.5	0.0	0.0	**0.046**	**0.046**	**0.13**	**0.60**
31.623	663.0	0.1	0.0	0.1	1.3	23.6	2.1	0.5	30.1	16.5	29.0	16.1	2.6	3.9	0.0	0.0	5.1	1.5	4.1	0.0	0.0	**0.038**	**0.037**	**0.11**	**0.60**
39.811	514.2	0.1	0.0	0.1	1.2	22.2	1.8	0.4	27.1	14.8	26.0	13.7	3.1	5.0	0.0	0.0	4.6	1.4	3.7	0.0	0.0	**0.030**	**0.035**	**0.09**	**0.60**
50.119	416.3	0.1	0.0	0.1	1.1	21.0	1.7	0.4	24.5	13.4	23.4	11.5	3.8	6.2	0.0	0.0	4.1	1.2	3.4	0.0	0.0	**0.024**	**0.028**	**0.07**	**0.60**
63.096	334.6	0.1	0.0	0.1	1.0	19.9	1.5	0.3	22.2	12.0	21.0	9.3	4.6	7.9	0.0	0.0	3.8	1.1	3.2	0.0	0.0	**0.019**	**0.022**	**0.06**	**0.60**
79.433	259.1	0.1	0.0	0.1	0.9	18.8	1.3	0.3	20.1	10.8	18.8	7.0	5.7	10.0	0.0	0.0	3.4	1.0	2.9	0.0	0.0	**0.015**	**0.018**	**0.05**	**0.60**
100.00	207.3	0.1	0.0	0.1	0.8	17.1	1.2	0.3	18.2	9.7	16.8	4.5	6.7	12.6	0.0	0.0	3.2	0.8	2.8	0.0	0.0	**0.012**	**0.014**	**0.04**	**0.60**
125.89	169.5	0.0	0.0	0.0	0.7	14.7	1.1	0.2	16.6	8.7	15.1	1.9	8.4	15.9	0.0	0.0	2.9	0.7	2.6	0.0	0.0	**0.010**	**0.012**	**0.03**	**0.13**
158.49	130.3	0.0	0.0	0.0	0.6	12.0	1.0	0.2	15.3	7.8	13.5	1.0	10.4	20.1	0.0	0.0	2.7	0.7	2.6	0.0	0.0	**0.008**	**0.010**	**0.02**	**0.13**
199.53	104.1	0.0	0.0	0.0	0.4	8.8	0.9	0.2	14.2	7.0	12.0	4.4	13.0	25.3	0.0	0.0	2.6	0.6	2.6	0.0	0.0	**0.006**	**0.007**	**0.02**	**0.12**
251.19	81.2	0.0	0.0	0.0	0.3	5.2	0.8	0.1	13.3	6.2	10.8	8.2	16.2	31.9	0.0	0.0	2.6	0.6	2.7	0.0	0.0	**0.005**	**0.006**	**0.02**	**0.12**
316.23	57.1	0.0	0.0	0.0	0.1	0.9	0.7	0.1	12.7	5.5	9.6	12.8	20.3	40.1	0.0	0.0	2.6	0.6	2.8	0.0	0.0	**0.004**	**0.005**	**0.01**	**0.12**
398.11	61.1	0.0	0.0	0.0	0.1	4.8	0.6	0.0	12.3	4.9	8.6	18.4	25.4	50.5	0.0	0.0	2.6	0.7	3.1	0.0	0.0	**0.005**	**0.006**	**0.02**	**0.12**
501.19	41.3	0.0	0.0	0.0	0.3	10.9	0.6	0.0	12.3	4.4	7.6	25.1	32.0	63.5	0.0	0.0	2.8	0.9	3.5	0.1	0.0	**0.005**	**0.005**	**0.01**	**0.11**
630.96	30.3	0.0	0.0	0.0	0.7	18.3	0.5	0.1	12.5	3.8	6.8	33.4	40.3	79.6	0.0	0.0	3.1	1.1	4.0	0.2	0.0	**0.006**	**0.004**	**0.01**	**0.11**
794.33	34.9	0.0	0.0	0.0	1.1	27.4	0.5	0.1	13.2	3.3	6.0	43.5	50.8	99.6	0.0	0.0	3.5	1.4	4.7	0.4	0.0	**0.007**	**0.004**	**0.02**	**0.11**
1 000.0	26.0	0.0	0.0	0.0	1.6	37.7	0.5	0.2	14.3	2.8	5.3	56.1	64.5	123.8	0.0	0.0	4.0	1.8	5.7	0.8	0.0	**0.009**	**0.010**	**0.03**	**0.13**
1 258.9	20.0	0.0	0.0	0.0	2.2	50.1	0.4	0.2	16.0	2.2	4.7	71.6	81.7	152.7	0.0	0.0	4.8	2.2	6.9	1.6	0.0	**0.011**	**0.008**	**0.03**	**0.13**
1 584.9	25.4	0.0	0.0	0.0	2.9	64.7	0.4	0.3	18.4	1.3	4.1	90.7	104.1	185.7	0.0	0.0	5.9	2.8	8.5	3.2	0.0	**0.014**	**0.011**	**0.04**	**0.13**
1 995.3	27.2	0.0	0.0	0.0	3.6	81.5	0.4	0.4	21.6	0.0	3.6	113.9	133.3	220.2	0.0	0.0	7.4	3.3	10.6	6.5	0.0	**0.017**	**0.031**	**0.07**	**0.19**
	Degreex10^{-4}	Degreex10^{-4}	Degreex10^{-4}	Degreex10^{-4}	Degreex10^{-4}	Degreex10^{-4}	Degreex10^{-4}	Degreex10^{-4}	Degreex10^{-4}	Degreex10^{-4}	Degreex10^{-4}	Degreex10^{-4}	Degreex10^{-4}	Degreex10^{-4}	Degreex10^{-4}	Degreex10^{-4}	Degreex10^{-4}	Degreex10^{-4}	Degreex10^{-4}	Degreex10^{-4}	Degreex10^{-4}	Degree	Degree	Degree	Degree

	Measurement quantities								Microphone quantities								Coupler quantities				Others	Overall results			
Frequency, [Hz]	Voltage ratios, R_j	Ref. capacitor, C	Ref. resistor, R	Elec. Ref. impedace, $Z_{elref}(f)$	Static pressure, p_s	Temperature, T	Relative Humidity, RH	Frequency, f	Front Volume, V_f	Cavity depth, l_f	Excess Microphone Surface, S_{mic}	Equivalent volume, V_e	Resonance frequency, f_0	Loss factor, d	Static pressure Coeff,	Temperature Coeff, C_t	Coupler length, l_{cpl}	Coupler diameter, D_{cpl}	Coupler volume, V_{cpl} & S_{cpl}	Radial wave motion	Polarization voltage, V_{pol}	**Combined std uncertainty Type B**	**Std uncertainty Type A**	**Expanded uncertainty, $U_{95.45\%}$, k=2**	**CMC/CCAUV.A-K6 - Claimed Expanaded Uncertainty**
2 511.9	36.2	0.0	0.0	0.0	4.2	100.5	0.3	0.5	26.1	2.3	3.0	140.9	170.2	248.8	0.0	0.0	9.5	3.8	13.3	13.3	0.0	**0.020**	**0.025**	**0.06**	**0.19**
3 162.3	20.2	0.0	0.0	0.0	4.5	117.8	0.1	0.5	32.2	6.7	2.5	170.1	216.4	254.5	0.0	0.0	12.8	4.0	16.8	27.9	0.0	**0.023**	**0.021**	**0.06**	**0.20**
3 981.1	11.6	0.0	0.0	0.0	3.7	120.3	0.5	0.2	41.0	15.6	1.9	193.0	262.2	204.3	0.0	0.0	18.2	3.8	21.3	59.0	0.0	**0.024**	**0.019**	**0.06**	**0.20**
5 011.9	10.3	0.0	0.0	0.0	0.7	79.8	1.1	0.0	60.6	33.1	1.6	251.2	343.6	75.9	0.0	0.0	26.1	2.7	26.8	126.2	0.0	**0.027**	**0.019**	**0.07**	**0.20**
6 309.6	42.3	0.0	0.0	0.0	12.5	133.6	3.3	2.2	82.7	66.6	0.8	202.5	262.9	153.3	0.0	0.0	40.5	11.4	32.5	258.8	0.0	**0.028**	**0.020**	**0.07**	**0.20**
7 943.3	247.0	0.0	0.0	0.0	32.1	479.9	5.3	4.6	114.8	110.2	0.3	144.5	118.1	266.7	0.0	0.0	51.7	20.1	33.3	439.1	0.0	**0.045**	**0.023**	**0.10**	**0.21**
10 000	598.2	0.0	0.0	0.0	46.2	752.0	9.6	6.6	154.9	132.9	1.1	117.8	367.6	165.6	0.0	0.0	68.4	41.2	28.8	581.4	0.0	**0.070**	**0.029**	**0.15**	**0.26**
12 589	875.2	0.0	0.0	0.0	35.3	528.8	18.3	10.0	335.0	121.5	4.2	387.2	1195.5	137.7	0.0	0.0	125.9	81.0	44.8	481.3	0.0	**0.100**	**0.036**	**0.21**	**0.98**
15 849	147.9	0.0	0.0	0.0	6.3	535.2	12.4	5.2	290.4	100.5	5.4	276.9	1137.3	190.2	0.0	0.0	56.6	39.9	16.5	883.9	0.0	**0.093**	**0.049**	**0.21**	**1.80**
19 953	37.0	0.0	0.0	0.0	3.0	407.0	6.2	2.1	231.0	65.0	9.0	151.0	1070.0	250.0	0.0	0.0	12.0	20.0	8.0	1250.0	0.0	**0.100**	**0.070**	**0.24**	**1.88**
25 119	12.0	0.0	0.0	0.0	1.0	317.0	0.7	0.1	175.0	34.0	12.3	53.0	997.0	295.0	0.0	0.0	1.1	12.0	3.0	1580.0	0.0	**0.111**	**0.101**	**0.30**	**2.73**
	Degreex10^{-4}	Degreex10^{-4}	Degreex10^{-4}	Degreex10^{-4}	Degreex10^{-4}	Degreex10^{-4}	Degreex10^{-4}	Degreex10^{-4}	Degreex10^{-4}	Degreex10^{-4}	Degreex10^{-4}	Degreex10^{-4}	Degreex10^{-4}	Degreex10^{-4}	Degreex10^{-4}	Degreex10^{-4}	Degreex10^{-4}	Degreex10^{-4}	Degreex10^{-4}	Degreex10^{-4}	Degreex10^{-4}	Degree	Degree	Degree	Degree

NOTE 1: For LS2P, CENAM does not declare level sensitivity values for frequencies below 31.5 Hz, nor has these CMCs declared in Appendix C of the BIPM - MRA.

NOTE 2: CENAM does not declare phase sensitivity values in its currently offered calibration services for LS microphones, nor has these CMCs declared in Appendix C of the BIPM - MRA.

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The measurement uncertainty has been determined in accordance with EA-4/02 M: 2013 document. The reported expanded uncertainty is stated as the standard uncertainty multiplied by the coverage factor k = 2, which corresponds to a coverage probability of approximately 95 %.

Uncertainty budget (sensitivity level) of LS2 microphone calibration by reciprocity method

Table 1 Sensitivity level uncertainty – Type B uncertainty components

Uncertainty source		**Value, in mB, of Type B uncertainty component expressed as rectangular probability distribution halfwidth, at frequency**																					
		2 Hz	4 Hz	8 Hz	16 Hz	20 Hz	25 Hz	31,5 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	5 kHz	6,3 kHz	8 kHz	10 kHz	12,5 kHz	16 kHz	20 kHz	25 kHz
1	Standard resistors accuracy	0	0	0	0	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05
2	Standard capacitor accuracy	2,38	2,42	2,43	2,44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	Stray capacitance	2	2	2	2	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,1	0,1	0,3	0,3	0,3	0,3
4	Nonlinearity	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5
5	Radius of coupler	0,15	0,15	0,15	0,15	0,15	0,14	0,15	0,15	0,15	0,15	0,15	0,15	0,15	0,16	0,16	0,16	0,16	0,17	0,18	0,21	0,29	0,64
6	Velocity of sound (dry air)	0,42	0,42	0,42	0,42	0,42	0,42	0,42	0,42	0,42	0,42	0,42	0,42	0,42	0,41	0,4	0,39	0,37	0,34	0,28	0,18	0,03	0,66
7	Ratio of specific heats	0,32	0,22	0,16	0,11	0,1	0,09	0,08	0,06	0,04	0,03	0,02	0,01	0,01	0,01	0,01	0,01	0	0	0	0	0,01	0,01
8	Ambient pressure	0,13	0,13	0,13	0,13	0,13	0,13	0,13	0,13	0,13	0,13	0,13	0,13	0,13	0,13	0,13	0,13	0,13	0,13	0,13	0,13	0,13	0,1
9	Density of air	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,11	0,11	0,11	0,11	0,11	0,11	0,11	0,11	0,11	0,11	0,11	0,11	0,11	0,11	0,1
10	Length of coupler	0,42	0,42	0,42	0,42	0,42	0,43	0,43	0,43	0,43	0,44	0,44	0,44	0,43	0,41	0,39	0,37	0,32	0,25	0,14	0,1	0,54	1,86
11	Front cavity depth	0,04	0,04	0,04	0,04	0,04	0,04	0,02	0,02	0,02	0,02	0	0	0	0	0	0,01	0,02	0,02	0,02	0,04	0,04	0,02
12	Front cavity volume	0,2	0,2	0,2	0,2	0,2	0,2	0,22	0,22	0,22	0,22	0,22	0,22	0,22	0,2	0,2	0,18	0,16	0,14	0,08	0,04	0,26	0,9
13	Theory of adding volume	0	0	0	0	0	0,01	0,01	0,01	0	0	0	0	0	0,01	0,01	0,02	0,03	0,04	0,07	0,13	0,24	0,57
14	Acoustical compliance	0	0	0	0	0	0	0	0	0	0	0	0	0,04	0,18	0,3	0,5	0,8	1,14	1,08	1,06	5,8	14,08
15	Acoustical mass	0	0	0	0	0	0	0	0	0	0	0	0	0,02	0,04	0,08	0,1	0,12	0,1	0,02	0,2	1,48	2,32
16	Acoustical resistance	0	0	0	0	0	0	0	0	0	0	0	0,02	0,06	0,24	0,38	0,56	0,8	0,94	0,72	0,2	0,28	5,06
17	Heat conduction theory	5	3	1	1	1	1	1	1	1	1	0,93	0,64	0,41	0,14	0,02	0,14	0,36	0,65	1,06	1,78	2,99	6,21
18	Thermal diffusivity	2,78	1,94	1,36	0,96	0,92	0,74	0,66	0,46	0,33	0,23	0,16	0,12	0,08	0,06	0,06	0,05	0,04	0,03	0,02	0,01	0,01	0,06
19	Capillary radius	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20	Air viscosity	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21	Humidity determination	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,02	0,02	0,02	0,03	0,04	0,04	0,06	0,09	0,2
22	Polarization voltage	0,22	0,22	0,22	0,22	0,22	0,22	0,22	0,22	0,22	0,22	0,22	0,22	0,22	0,22	0,22	0,22	0,22	0,22	0,22	0,22	0,22	0,22
23	Temperature	0,057	0,045	0,032	0,03	0,03	0,02	0,02	0,02	0,02	0,01	0,01	0,01	0,01	0,02	0,03	0,04	0,06	0,1	0,16	0,29	0,34	0,78
24	Non-uniformity of pressure radial distribution	0	0	0	0	0	0	0	0	0	0	0	0,01	0,02	0,09	0,14	0,22	0,34	0,52	0,76	1,08	1,23	0,43
25	Temperature dependence of microphone	0,35	0,35	0,35	0,35	0,35	0,35	0,35	0,35	0,35	0,35	0,35	0,35	0,35	0,35	0,35	0,35	0,37	0,40	0,39	0,36	0,68	0,73
26	Ambient pressure dependence of microphone	0,28	0,28	0,28	0,28	0,28	0,28	0,28	0,28	0,28	0,28	0,28	0,28	0,28	0,28	0,29	0,31	0,37	0,40	0,28	1,05	2,09	1,41
27	Transmitter ground shield	0,68	0,68	0,68	0,68	0,68	0,68	0,68	0,68	0,68	0,68	0,68	0,68	0,68	0,68	0,68	0,68	0,68	0,68	0,68	0,68	0,68	0,68
28	Receiver ground shield	0,68	0,68	0,68	0,68	0,68	0,68	0,68	0,68	0,68	0,68	0,68	0,68	0,68	0,68	0,68	0,68	0,68	0,68	0,68	0,68	0,68	0,68
29	Rounding error	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5
30	Frequency	0	0	0	0	0	0	0	0	0	0	0	0	0,02	0,03	0,04	0,05	0,05	0,04	0	0,1	2,49	3
Sum of squares		44,6	24,8	14,9	14,0	4,0	3,7	3,6	3,4	3,3	3,2	3,0	2,6	2,3	2,2	2,4	2,7	3,6	5,0	5,4	8,6	59,6	287,2
Type B comb. uncert. (rectang. distr. halfwidth)		6,68	4,98	3,86	3,74	2,00	1,92	1,89	1,83	1,80	1,79	1,74	1,60	1,52	1,49	1,54	1,65	1,90	2,23	2,32	2,93	7,72	16,95
Estimate of Type B comb. standard uncertainty		**3,86**	**2,87**	**2,23**	**2,16**	**1,15**	**1,11**	**1,09**	**1,06**	**1,04**	**1,03**	**1,01**	**0,93**	**0,88**	**0,86**	**0,89**	**0,95**	**1,10**	**1,29**	**1,34**	**1,69**	**4,46**	**9,78**

Table 2 Sensitivity level uncertainty – Type A uncertainty components

Uncertainty source	Value, in mB, of Type A uncertainty component expressed as standard uncertainty (normal probability distribution with n→∞), at frequency																					
	2 Hz	4 Hz	8 Hz	16 Hz	20 Hz	25 Hz	31,5 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	5 kHz	6,3 kHz	8 kHz	10 kHz	12,5 kHz	16 kHz	20 kHz	25 kHz
1 Allowed repeatability	9	6	4,5	3	2	1	1	1	1	1	1	1	1	1	1	1,5	2	2,5	3,5	3,5	3,5	3,5
2 Front cavity volume	0,32	0,32	0,32	0,32	0,32	0,32	0,32	0,32	0,32	0,32	0,32	0,32	0,32	0,3	0,3	0,28	0,24	0,2	0,12	0,06	0,38	4,94
Sum of squares	81,1	36,1	20,4	9,1	4,1	1,1	1,1	1,1	1,1	1,1	1,1	1,1	1,1	1,1	1,1	2,3	4,1	6,3	12,3	12,3	12,4	36,7
Type A combined standard uncertainty	**9,01**	**6,01**	**4,51**	**3,02**	**2,03**	**1,05**	**1,05**	**1,05**	**1,05**	**1,05**	**1,05**	**1,05**	**1,05**	**1,04**	**1,04**	**1,53**	**2,01**	**2,51**	**3,50**	**3,50**	**3,52**	**6,05**

Table 3 Sensitivity level uncertainty – overall uncertainty calculation

Component name	Value, in mB, of overall uncertainty component at frequency																					
	2 Hz	4 Hz	8 Hz	16 Hz	20 Hz	25 Hz	31,5 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	5 kHz	6,3 kHz	8 kHz	10 kHz	12,5 kHz	16 kHz	20 kHz	25 kHz
Type B overall expanded uncertainty at *k* = 2	7,71	5,75	4,46	4,32	2,30	2,22	2,19	2,12	2,08	2,07	2,01	1,85	1,76	1,73	1,77	1,91	2,20	2,57	2,68	3,38	8,92	19,57
Type A overall expanded uncertainty at *k* = 2	18,01	12,02	9,02	6,03	4,05	2,10	2,10	2,10	2,10	2,10	2,10	2,10	2,10	2,09	2,09	3,05	4,03	5,02	7,00	7,00	7,04	12,11
Sum of squares	383,9	177,5	101,3	55,1	21,7	9,3	9,2	8,9	8,7	8,7	8,5	7,8	7,5	7,3	7,5	12,9	21,1	31,8	56,2	60,4	129,1	529,5
Overall expanded uncertainty at *k* =2	**19,59**	**13,32**	**10,06**	**7,42**	**4,66**	**3,05**	**3,03**	**2,98**	**2,96**	**2,95**	**2,91**	**2,80**	**2,74**	**2,71**	**2,74**	**3,60**	**4,59**	**5,64**	**7,50**	**7,77**	**11,36**	**23,01**
Declared overall uncertainty, in dB	**0,20**	**0,14**	**0,11**	**0,08**	**0,05**	**0,04**	**0,04**	**0,03**	**0,03**	**0,03**	**0,03**	**0,03**	**0,03**	**0,03**	**0,03**	**0,04**	**0,05**	**0,06**	**0,08**	**0,08**	**0,12**	**0,24**

Uncertainty budget (sensitivity phase) of LS2 microphone calibration by reciprocity method

Table 1 Sensitivity phase uncertainty – Type B uncertainty components

Uncertainty source		**Value, in hundredths of degree, of Type B uncertainty component expressed as rectangular probability distribution halfwidth, at frequency**																					
		2 Hz	4 Hz	8 Hz	16 Hz	20 Hz	25 Hz	31,5 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	5 kHz	6,3 kHz	8 kHz	10 kHz	12,5 kHz	16 kHz	20 kHz	25 kHz
1	Standard resistors accuracy	0,28	0,15	0,08	0,04	0,04	0,04	0,04	0,04	0,04	0,04	0,04	0,04	0,04	0,04	0,04	0,04	0,04	0,04	0,04	0,04	0,04	0,04
2	Standard capacitor accuracy	4,91	2,5	1,25	0,63	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	Stray capacitance	70	66	57	42	35,8	27,96	22,63	22,65	22,48	17,99	17,99	18	14,4	14,4	18	22,68	28,8	35,99	44,98	57,54	71,88	44,99
4	Nonlinearity	25	25	25	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	25	25	25	25
5	Radius of coupler	0,06	0,05	0,05	0,05	0,05	0,03	0,03	0,02	0,02	0,01	0,01	0,01	0,01	0,02	0,02	0,02	0,03	0,03	0,01	0,05	0,17	0,48
6	Velocity of sound (dry air)	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0	0	0,01	0,02	0,04	0,06	0,08	0,1	0,14	0,2	0,31	0,53	1,58
7	Ratio of specific heats	3,58	2,58	1,86	1,34	1,18	1,07	0,96	0,71	0,52	0,37	0,27	0,19	0,13	0,09	0,08	0,07	0,06	0,05	0,04	0,04	0,03	0,12
8	Ambient pressure	0,14	0,11	0,08	0,06	0,06	0,06	0,05	0,04	0,03	0,02	0,01	0,01	0	0,01	0,01	0,01	0,02	0,02	0,02	0,01	0,07	0,16
9	Density of air	0	0	0	0	0	0	0	0	0	0	0	0	0	0,01	0,01	0,02	0,02	0,02	0,01	0,01	0,06	0,13
10	Length of coupler	0,32	0,26	0,21	0,18	0,18	0,17	0,15	0,11	0,08	0,06	0,05	0,04	0,05	0,07	0,08	0,11	0,15	0,23	0,37	0,7	1,35	3,86
11	Front cavity depth	0,97	0,73	0,55	0,42	0,38	0,36	0,3	0,24	0,18	0,12	0,1	0,06	0,04	0,04	0,04	0,04	0,08	0,14	0,26	0,54	0,82	0,88
12	Front cavity volume	0,47	0,36	0,28	0,21	0,2	0,18	0,16	0,12	0,1	0,06	0,06	0,04	0,04	0,04	0,04	0,06	0,06	0,08	0,1	0,18	0,42	1,62
13	Theory of adding volume	0	0	0	0	0,05	0,05	0,05	0,03	0,03	0,02	0,02	0,01	0,01	0,01	0,01	0,02	0,02	0,02	0,03	0,05	0,11	0,42
14	Acoustical compliance	0,006	0,014	0,031	0,064	0,09	0,1	0,12	0,26	0,52	1,04	2,08	4,18	8,34	16,24	19,76	23,58	26,58	25,68	16,38	15	13,68	72,96
15	Acoustical mass	0	0	0	0	0	0	0	0	0	0	0	0	0,04	0,3	0,56	1,08	2	3,12	3,2	1,14	3,64	48,14
16	Acoustical resistance	0,001	0,001	0,005	0,022	0,03	0,04	0,06	0,12	0,24	0,48	0,98	1,94	3,76	6,74	7,68	8,12	7,2	3,98	0,62	5,66	35,62	57,02
17	Heat conduction theory	**160**	80	50	25	25	25	25	25	24,85	17,4	12,14	8,26	5,03	1,34	0,3	2,49	5,58	9,72	15,91	27,22	46,7	102,96
18	Thermal diffusivity	30,91	22,33	16,14	11,66	10,37	9,3	8,43	6,21	4,54	3,27	2,35	1,67	1,18	0,81	0,7	0,6	0,54	0,49	0,44	0,4	0,37	1,08
19	Capillary radius	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20	Air viscosity	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21	Humidity determination	0,11	0,08	0,05	0,04	0,03	0,03	0,02	0,02	0,01	0,01	0,01	0	0	0	0	0	0	0,01	0,02	0,06	0,12	0,33
22	Polarization voltage	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23	Temperature	0,69	0,49	0,34	0,24	0,22	0,21	0,15	0,12	0,09	0,06	0,05	0,03	0,02	0,02	0,02	0,02	0,03	0,05	0,11	0,25	0,54	1,48
24	Non-uniformity of pressure radial distribution	0	0	0	0	0	0	0	0	0	0	0	0,01	0,02	0,09	0,14	0,22	0,34	0,52	0,76	1,08	1,23	0,43
25	Temperature dependence of microphone	0	0	0	0	0	0	0	0	0,01	0,01	0,03	0,05	0,09	0,15	0,18	0,20	0,16	0,08	0,80	2,37	3,57	1,03
26	Ambient pressure dependence of microphone	0	0	0	0	0	0	0	0	0,00	0,01	0,02	0,05	0,13	0,19	0,18	0,11	0,13	0,77	2,35	5,60	7,57	1,37
27	Transmitter ground shield	2,56	1,18	0,55	0,25	0,18	0,15	0,12	0,06	0,03	0,01	0,01	0	0	0	0	0	0	0	0	0	0	0
28	Receiver ground shield	2,56	1,18	0,55	0,25	0,18	0,15	0,12	0,06	0,03	0,01	0,01	0	0	0	0	0	0	0	0	0	0	0
29	Rounding error	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
30	Frequency	0	0	0	0	0,02	0,02	0,02	0,02	0,02	0,17	0,16	0,16	1,48	1,46	1,52	1,63	1,84	2,13	2,48	2,75	24,21	4,16
Sum of squares		32157	11921	6665,7	2952,6	2440,9	1919,7	1634,3	1602,4	1569,1	1063,6	906,9	841,3	745,0	946,3	1201,8	1571,8	2051,8	2505,5	3218,6	5007,0	10128	24212
Type B comb. uncert. (rectang. distr. halfwidth)		179,32	109,18	81,64	54,34	49,41	43,81	40,43	40,03	39,61	32,61	30,12	29,01	27,29	30,76	34,67	39,65	45,30	50,06	56,73	70,76	100,64	155,60
Estimate of Type B comb. standard uncertainty		**103,53**	**63,04**	**47,14**	**31,37**	**28,52**	**25,30**	**23,34**	**23,11**	**22,87**	**18,83**	**17,39**	**16,75**	**15,76**	**17,76**	**20,01**	**22,89**	**26,15**	**28,90**	**32,75**	**40,85**	**58,10**	**89,84**

Table 2 Sensitivity phase uncertainty – Type A uncertainty components

	Uncertainty source	Value, in hundredths of degree, of Type A uncertainty component expressed as standard uncertainty (normal probability distribution with n→∞), at frequency																					
		2 Hz	4 Hz	8 Hz	16 Hz	20 Hz	25 Hz	31,5 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	5 kHz	6,3 kHz	8 kHz	10 kHz	12,5 kHz	16 kHz	20 kHz	25 kHz
1	Allowed repeatability	120	70	40	40	30	25	20	20	15	10	10	10	8	8	8	8	8	8	10	15	20	30
2	Front cavity volume	0,83	0,61	0,46	0,34	0,3	0,28	0,26	0,18	0,14	0,1	0,08	0,06	0,06	0,06	0,06	0,08	0,1	0,12	0,16	0,28	0,64	2,44
Sum of squares		14401	4900,4	1600,2	1600,1	900,1	625,1	400,1	400,0	225,0	100,0	100,0	100,0	64,0	64,0	64,0	64,0	64,0	64,0	100,0	225,1	400,4	906,0
Type A combined standard uncertainty		**120,00**	**70,00**	**40,00**	**40,00**	**30,00**	**25,00**	**20,00**	**20,00**	**15,00**	**10,00**	**10,00**	**10,00**	**8,00**	**8,00**	**8,00**	**8,00**	**8,00**	**8,00**	**10,00**	**15,00**	**20,01**	**30,10**

Table 3 Sensitivity phase uncertainty – overall uncertainty calculation

Component name	Value, in hundredths of degree, of overall uncertainty component at frequency																					
	2 Hz	4 Hz	8 Hz	16 Hz	20 Hz	25 Hz	31,5 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	5 kHz	6,3 kHz	8 kHz	10 kHz	12,5 kHz	16 kHz	20 kHz	25 kHz
Type B overall expanded uncertainty at *k* = 2	207,07	126,08	94,27	62,74	57,05	50,59	46,68	46,22	45,74	37,66	34,77	33,49	31,52	35,52	40,03	45,78	52,30	57,80	65,51	81,71	116,21	179,67
Type A overall expanded uncertainty at *k* = 2	240,01	140,01	80,01	80,00	60,00	50,00	40,00	40,00	30,00	20,00	20,00	20,00	16,00	16,00	16,00	16,00	16,00	16,00	20,00	30,01	40,02	60,20
Sum of squares	100479	35497	15288	10337	6854,9	5059,9	3779,4	3736,7	2992,3	1818,2	1609,3	1521,8	1249,3	1517,7	1858,3	2351,8	2991,8	3596,8	4691,6	7576,3	15106	35906
Overall expanded uncertainty at *k* =2	**316,98**	**188,41**	**123,65**	**101,67**	**82,79**	**71,13**	**61,48**	**61,13**	**54,70**	**42,64**	**40,12**	**39,01**	**35,35**	**38,96**	**43,11**	**48,50**	**54,70**	**59,97**	**68,50**	**87,04**	**122,90**	**189,49**
Declared overall uncertainty, in degrees	**3,2**	**1,9**	**1,3**	**1,1**	**0,9**	**0,8**	**0,7**	**0,7**	**0,6**	**0,5**	**0,5**	**0,4**	**0,4**	**0,4**	**0,5**	**0,5**	**0,6**	**0,6**	**0,7**	**0,9**	**1,3**	**1,9**

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The expanded uncertainties of the measurements are stated as the combined standard uncertainties multiplied by the coverage factor k = 2, which corresponds to a coverage probability of approximately 95 %. The standard uncertainties of the measurements have been determined in accordance with the "Evaluation of Measurement Data — Guide to the Expression of Uncertainty in Measurement — GUM 2008".

INMETRO Uncertainty Budget – Sensitivity Magnitude (dB)

	Uncertainty contribuitions (dB) at each Frequency (Hz)																				
Source of Uncertainty	**2.00**	**2.50**	**3.15**	**4.00**	**5.00**	**6.30**	**8.00**	**10.00**	**12.50**	**16.00**	**20.00**	**25.00**	**31.50**	**40.00**	**50.00**	**63.00**	**80.00**	**100.00**	**125.00**	***v_i***	***distribuition***
Capacitor	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	Infinite	normal
Polarization Voltage	0.0038	0.0038	0.0038	0.0038	0.0038	0.0038	0.0038	0.0038	0.0038	0.0038	0.0038	0.0038	0.0038	0.0038	0.0038	0.0038	0.0038	0.0038	0.0038	Infinite	rectangular
Environmetal Parameters	0.0100	0.0100	0.0100	0.0100	0.0100	0.0099	0.0099	0.0099	0.0099	0.0099	0.0099	0.0099	0.0099	0.0099	0.0099	0.0099	0.0099	0.0099	0.0099	Infinite	rectangular
Microphone Parameters	0.0150	0.0145	0.0143	0.0141	0.0140	0.0139	0.0139	0.0139	0.0139	0.0139	0.0139	0.0139	0.0139	0.0139	0.0139	0.0139	0.0139	0.0139	0.0139	Infinite	rectangular
Heat Conduction& Wave M. Corrections	0.0462	0.0404	0.0375	0.0346	0.0318	0.0289	0.0260	0.0231	0.0202	0.0173	0.0144	0.0115	0.0104	0.0087	0.0058	0.0057	0.0056	0.0055	0.0054	Infinite	rectangular
Correction results to environmetal condition	0.0017	0.0016	0.0016	0.0015	0.0011	0.0009	0.0007	0.0004	0.0005	0.0005	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	Infinite	rectangular
Coupler (Leakage & Asymmetry)	0.0800	0.0700	0.0600	0.0550	0.0520	0.0300	0.0180	0.0130	0.0100	0.0090	0.0050	0.0050	0.0030	0.0010	0.0008	0.0005	0.0002	0.0001	0.0000	Infinite	rectangular
Voltage Ratio	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	Infinite	rectangular
Rounding	0.0029	0.0029	0.0029	0.0029	0.0029	0.0029	0.0029	0.0029	0.0029	0.0029	0.0029	0.0029	0.0029	0.0029	0.0029	0.0029	0.0029	0.0029	0.0029	Infinite	rectangular
Repeatability	0.0314	0.0186	0.0172	0.0112	0.0064	0.0060	0.0032	0.0054	0.0024	0.0028	0.0025	0.0031	0.0024	0.0024	0.0019	0.0020	0.0019	0.0015	0.0011	5	normal
Combined Uncertainty	0.0994	0.0850	0.0751	0.0684	0.0639	0.0457	0.0365	0.0325	0.0289	0.0267	0.0237	0.0221	0.0211	0.0201	0.0190	0.0189	0.0189	0.0188	0.0188		
Veff	500.7274	2174.12	1806.84	6884.54	51059	17012	85879	6439.3	112245	41791	38955	13561	29942	23182	44991	37884.8	50677.6	117316	357425		
Coverage factor, k	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96		
Expanded uncertainty	**0.195**	**0.167**	**0.147**	**0.134**	**0.125**	**0.090**	**0.072**	**0.064**	**0.057**	**0.052**	**0.046**	**0.043**	**0.041**	**0.039**	**0.037**	**0.037**	**0.037**	**0.037**	**0.037**		

	Uncertainty contribuitions (dB) at each Frequency (Hz)																								
Source of Uncertainty	**160**	**200**	**250**	**315**	**400**	**500**	**630**	**800**	**1000**	**1250**	**1600**	**2000**	**2500**	**3150**	**4000**	**5000**	**6300**	**8000**	**10000**	**12500**	**16000**	**20000**	**25000**	***v_i***	***distribuition***
Capacitor	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	Infinite	normal
Polarization Voltage	0.0038	0.0038	0.0038	0.0038	0.0038	0.0038	0.0038	0.0038	0.0038	0.0038	0.0038	0.0038	0.0038	0.0038	0.0038	0.0038	0.0038	0.0038	0.0038	0.0038	0.0038	0.0038	0.0038	Infinite	rectangular
Environmetal Parameters	0.0099	0.0099	0.0099	0.0099	0.0099	0.0099	0.0099	0.0099	0.0099	0.0099	0.0099	0.0099	0.0099	0.0099	0.0099	0.0099	0.0099	0.0099	0.0099	0.0099	0.0010	0.0015	0.0019	Infinite	rectangular
Microphone Parameters	0.0139	0.0139	0.0139	0.0139	0.0139	0.0139	0.0139	0.0139	0.0139	0.0139	0.0139	0.0139	0.0139	0.0139	0.0139	0.0139	0.0139	0.0146	0.0156	0.0166	0.0186	0.0286	0.0346	Infinite	rectangular
Heat Conduction& Wave M. Corrections	0.0054	0.0054	0.0054	0.0054	0.0054	0.0054	0.0054	0.0054	0.0054	0.0054	0.0054	0.0054	0.0054	0.0054	0.0054	0.0054	0.0054	0.0058	0.0087	0.0115	0.0173	0.0289	0.0462	Infinite	rectangular
Correction results to environmetal condition	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0005	0.0006	0.0008	0.0008	0.0009	0.0010	0.0013	0.0016	0.0020	0.0026	Infinite	rectangular
Coupler (Leakage & Asymmetry)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0003	0.0005	0.0010	0.0015	0.0015	0.0019	0.0030	0.0035	0.0040	Infinite	rectangular
Voltage Ratio	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	Infinite	rectangular
Rounding	0.0029	0.0029	0.0029	0.0029	0.0029	0.0029	0.0029	0.0029	0.0029	0.0029	0.0029	0.0029	0.0029	0.0029	0.0029	0.0029	0.0029	0.0029	0.0029	0.0029	0.0029	0.0029	0.0029	Infinite	rectangular
Repeatability	0.0014	0.0013	0.0011	0.0011	0.0011	0.0015	0.0013	0.0013	0.0013	0.0013	0.0010	0.0012	0.0013	0.0013	0.0015	0.0017	0.0020	0.0029	0.0042	0.0060	0.0062	0.0043	0.0086	5	normal
Combined Uncertainty	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.020	0.022	0.024	0.027	0.041	0.059		
Veff	137289	187825	352689	389566	420765	110792	177239	207665	204545	185557	503297	288861	176876	175417	115678	80026	35991	11033	3590	1283	1792	40743	10993		
Coverage factor, k	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96		
Expanded uncertainty	**0.037**	**0.037**	**0.037**	**0.037**	**0.037**	**0.037**	**0.037**	**0.037**	**0.037**	**0.037**	**0.037**	**0.037**	**0.037**	**0.037**	**0.037**	**0.037**	**0.037**	**0.039**	**0.042**	**0.047**	**0.053**	**0.081**	**0.115**		

INMETRO Uncertainty Budget – Sensitivity Phase (Degree)

	Uncertainty contribuitions (Degree) at each Frequency (Hz)																				
Source of Uncertainty	**2.00**	**2.50**	**3.15**	**4.00**	**5.00**	**6.30**	**8.00**	**10.00**	**12.50**	**16.00**	**20.00**	**25.00**	**31.50**	**40.00**	**50.00**	**63.00**	**80.00**	**100.00**	**125.00**	***v_i***	***distribuition***
Capacitor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	Infinite	normal
Polarization Voltage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	Infinite	rectangular
Environmetal Parameters	0.0075	0.0070	0.0065	0.0060	0.0055	0.0050	0.0045	0.0040	0.0035	0.0030	0.0025	0.0020	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	Infinite	rectangular
Microphone Parameters	0.0100	0.0090	0.0080	0.0070	0.0065	0.0060	0.0055	0.0050	0.0045	0.0040	0.0035	0.0030	0.0030	0.0030	0.0030	0.0030	0.0030	0.0030	0.0030	Infinite	rectangular
Heat Conduction& Wave M. Corrections	0.4640	0.4590	0.4520	0.4450	0.4360	0.4270	0.4180	0.3680	0.3080	0.2180	0.1180	0.0480	0.0480	0.0480	0.0480	0.0480	0.0480	0.0480	0.0480	Infinite	rectangular
Correction results to environmetal condition	0.056	0.0555	0.055	0.0545	0.054	0.0535	0.053	0.0525	0.0524	0.0523	0.0522	0.0521	0.0521	0.0521	0.0521	0.0521	0.0521	0.0521	0.0521	Infinite	rectangular
Coupler (Leakage & Asymmetry)	1.7321	1.1547	0.8660	0.4041	0.2887	0.1443	0.0722	0.0375	0.0289	0.0289	0.0289	0.0231	0.0231	0.0173	0.0058	0.0029	0.0006	0.0001	0.0000	Infinite	rectangular
Voltage Ratio	0.0500	0.0500	0.0500	0.0500	0.0500	0.0500	0.0500	0.0500	0.0500	0.0500	0.0500	0.0500	0.0500	0.0500	0.0500	0.0500	0.0500	0.0500	0.0500	Infinite	rectangular
Rounding	0.0029	0.0029	0.0029	0.0029	0.0029	0.0029	0.0029	0.0029	0.0029	0.0029	0.0029	0.0029	0.0029	0.0029	0.0029	0.0029	0.0029	0.0029	0.0029	Infinite	rectangular
Repeatability	0.3167	0.2881	0.2288	0.2166	0.1333	0.1106	0.0928	0.0838	0.0611	0.0572	0.0462	0.0360	0.0277	0.0210	0.0175	0.0172	0.0137	0.0237	0.0191	5	normal
Combined Uncertainty	1.8225	1.2778	1.0061	0.6433	0.5447	0.4699	0.4404	0.3862	0.3236	0.2385	0.1488	0.0968	0.0940	0.0910	0.0888	0.0886	0.0879	0.0900	0.0889		
Veff	5480.397	1935.72	1869.5	389.27	1395.1	1629.1	2533	2253.3	3922.9	1507.2	537.23	262.02	662.75	1773.4	3279.8	3522.14	8494.12	1036.17	2355.825		
Coverage factor, k	1.96	1.96	1.96	1.97	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.97	1.96	1.96	1.96	1.96	1.96	1.96	1.96		
Expanded uncertainty	**3.57**	**2.51**	**1.97**	**1.26**	**1.07**	**0.92**	**0.86**	**0.76**	**0.63**	**0.47**	**0.29**	**0.19**	**0.18**	**0.18**	**0.17**	**0.17**	**0.17**	**0.18**	**0.17**		

	Uncertainty contribuitions (Degree) at each Frequency (Hz)																								
Source of Uncertainty	**160**	**200**	**250**	**315**	**400**	**500**	**630**	**800**	**1000**	**1250**	**1600**	**2000**	**2500**	**3150**	**4000**	**5000**	**6300**	**8000**	**10000**	**12500**	**16000**	**20000**	**25000**	***v_i***	***distribuition***
Capacitor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	Infinite	normal
Polarization Voltage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	Infinite	rectangular
Environmetal Parameters	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0017	0.0018	0.0020	0.0021	0.0023	0.0024	0.0026	0.0027	0.0029	0.0030	0.0036	0.0045	0.0055	0.0070	0.0085	0.0100	0.0115	Infinite	rectangular
Microphone Parameters	0.0030	0.0030	0.0030	0.0030	0.0030	0.0030	0.0030	0.0030	0.0030	0.0030	0.0030	0.0030	0.0030	0.0034	0.0038	0.0042	0.0046	0.0050	0.0054	0.0059	0.0065	0.0072	0.0080	Infinite	rectangular
Heat Conduction& Wave M. Corrections	0.0480	0.0480	0.0480	0.0480	0.0480	0.0480	0.0480	0.0480	0.0480	0.0480	0.0480	0.0530	0.0580	0.0630	0.0680	0.0730	0.0780	0.0870	0.1020	0.1520	0.2220	0.3720	1.0720	Infinite	rectangular
Correction results to environmetal condition	0.0521	0.0521	0.0521	0.0521	0.0521	0.0521	0.0521	0.0521	0.0521	0.0521	0.0521	0.0521	0.0521	0.0521	0.0521	0.0521	0.0531	0.0551	0.0581	0.0621	0.0681	0.0761	0.0851	Infinite	rectangular
Coupler (Leakage & Asymmetry)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0002	0.0003	0.0004	0.0005	0.0006	0.0007	0.0008	0.0009	0.0010	0.0012	0.0017	0.0023	0.0030	0.0038	0.0047	Infinite	rectangular
Voltage Ratio	0.0500	0.0500	0.0500	0.0500	0.0500	0.0500	0.0500	0.0500	0.0500	0.0500	0.0500	0.0500	0.0500	0.0500	0.0500	0.0500	0.0500	0.0500	0.0500	0.0500	0.0500	0.0500	0.0500	Infinite	rectangular
Rounding	0.0029	0.0029	0.0029	0.0029	0.0029	0.0029	0.0029	0.0029	0.0029	0.0029	0.0029	0.0029	0.0029	0.0029	0.0029	0.0029	0.0029	0.0029	0.0029	0.0029	0.0029	0.0029	0.0029	Infinite	rectangular
Repeatability	0.0303	0.0230	0.0191	0.0207	0.0163	0.0130	0.0197	0.0194	0.0139	0.0112	0.0092	0.0080	0.0081	0.0070	0.0073	0.0071	0.0069	0.0076	0.0094	0.0173	0.0410	0.0624	0.0753	5	normal
Combined Uncertainty	0.092	0.090	0.089	0.089	0.088	0.088	0.089	0.089	0.088	0.088	0.087	0.090	0.093	0.096	0.100	0.103	0.107	0.115	0.128	0.173	0.241	0.388	1.079		
Veff	423	1160	2326	1712	4357	10217	2079	2212	8024	18861	39339	80139	84188	166824	160308	209101	261263	237578	161812	47908	5989	7462	174948		
Coverage factor, k	1.97	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96		
Expanded uncertainty	**0.18**	**0.18**	**0.17**	**0.18**	**0.17**	**0.17**	**0.17**	**0.17**	**0.17**	**0.17**	**0.17**	**0.18**	**0.18**	**0.19**	**0.20**	**0.20**	**0.21**	**0.23**	**0.25**	**0.34**	**0.47**	**0.76**	**2.12**		

KRISS

a) *Series Capacitance*

The uncertainty of the capacitance in the transmitter unit is determined by combining the instrument accuracy (which is about two times the calibration uncertainty) and the variation of the capacitance (±0.01 nF, rectangular distribution). The sensitivity uncertainty is obtained by multiplying the relative uncertainty of the capacitance to the pressure sensitivity given in V/Pa (or degree) and divided by two since the pressure sensitivity is determined by the square root of the inverse of the capacitance. The sensitivity uncertainty in dB is obtained by 20log(1+sensitivity uncertainty).

b) *Voltage Ratio*

The voltage measurement uncertainty is obtained by combining the calibration uncertainty and the accuracy of the voltmeter. The voltage ratio is based on four voltage measurements. Therefore, the resulting voltage ratio uncertainty is given by multiplying sqrt(4) to the above combined uncertainty. The sensitivity is determined by the square root of three voltage ratios. Therefore, the sensitivity of the voltage ratio is multiplied by sqrt(3) and divided by 2. For the phase measurement, the phase difference between two channels is measured.

c) *Cross-talk*

The cross-talk is measured by substituting the receiver microphone with a dummy microphone having the same capacitance and external geometry as the receiver microphone and then determining the resulting difference in the electric transfer impedance. The coupler and microphones should be positioned as during a calibration.

d) *Coupler Parameters*

The coupler length and diameter are measured in the Length Laboratory. The uncertainties of coupler length and diameter are 0.002 mm and 0.003 mm, respectively. The uncertainty of the pressure sensitivity is calculated using sensitivity calculation program, MP.EXE, V4.0.

e) *Static Pressure Measurement*

The calibration uncertainty of the barometer is very small (0.0034 kPa, 1σ). The variation of the static pressure during the measurement is measured and assumed as a rectangular distribution. These can be combined with other uncertainties, e.g., stability and rounding error. The uncertainty of the pressure sensitivity is calculated using sensitivity calculation program, MP.EXE, V4.0.

f) *Temperature*

The calibration uncertainty of the thermometer is very small (0.05 °C, 1σ). The variation of the static pressure during the measurement is measured and assumed as a rectangular distribution.

These can be combined with other uncertainties, e.g., rounding error and uncertainty in the temperature difference inside and outside the coupler.

The uncertainty of the pressure sensitivity is calculated using sensitivity calculation program, MP.EXE, V4.0.

g) Microphone Parameters

The equivalent volume is determined by fitting the two sensitivities obtained from short and long couplers at 250 Hz. The standard uncertainty is obtained from the standard deviation divided by square root of number of measurements.

The front cavity depth is measured using Video Measuring Instrument, 3D Metrology (Nikon, VHM-300)

The nominal value of resonance frequency and loss factor were applied and the uncertainty of each parameter is 1220 Hz and 0.09.

The uncertainties of these parameters can be determined from the standard deviations of measured data.

The uncertainty of the pressure sensitivity is calculated using sensitivity calculation program, MP.EXE, V4.0.

h) Polarizing Voltage

The calibration uncertainty of the DC voltmeter is 2 mV (1σ). This is combined with the drift and stability (10.2 mV), rounding error, and variation of polarizing voltage during calibration. The uncertainty of polarizing voltage is about 0.0063 V. The sensitivity variation as a function of polarizing voltage is about 6 dB/100 V (at 250 Hz, B&K Instruction Manual 4180). Therefore, the sensitivity uncertainty is (6 dB/100 V)*0.0063 V = 0.0004 dB.

i) Rounding error

Where results are being rounded from a high precision to the normally stated precision of 0.01 dB and 0.1°, an uncertainty will result from the semi-range of the rounding, that is ±0.005 dB and ±0.05° with a rectangular distribution.

u = 0.0029 dB for modulus 0.0289° for phase

j) Repeatability

The standard uncertainty for the repeatability is obtained from the standard deviation of repeated measurements.

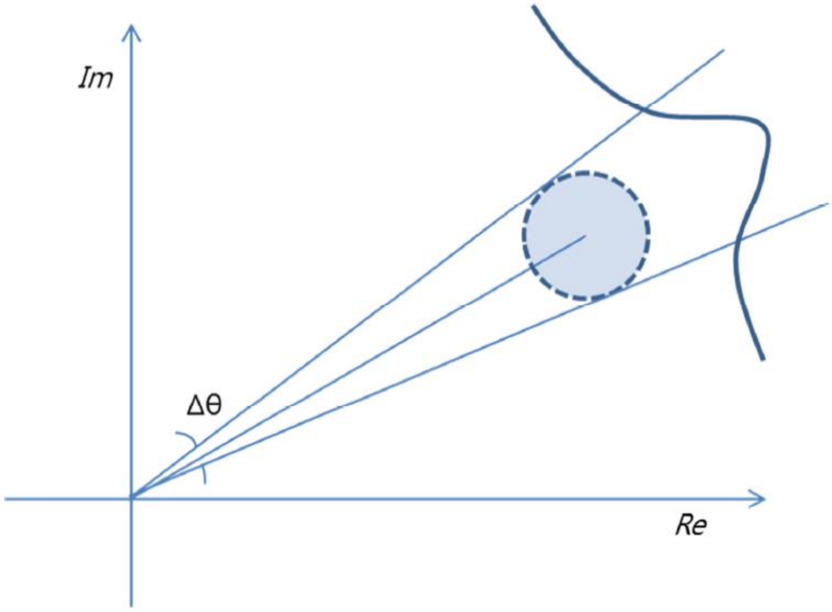
k) Combined and Expanded Uncertainties

The combined uncertainty uc(Mp) is calculated as the positive square root of the square sum of standard uncertainties at each frequency. The uncertainty components were assumed to be uncorrelated. The expanded uncertainty U is obtained by multiplying the combined uncertainty u_c(Mp) by a coverage factor k=2.

Note: The uncertainty of the pressure sensitivity is determined as the difference between two calculated sensitivities using MP.EXE, one is calculated with undisturbed parameter and the other calculated with the sum of undisturbed parameter and the uncertainty for that parameter.

Note: Phase Uncertainty Evaluation for the Random Error

To evaluate the uncertainty of phase, the relative distribution of error components would be considered. Without loss of generality, the considered components could be assumed to distribute randomly in a normal distribution around the true value because of the assumption of uniformly distributed random phase. Within a small range of angle, the relative distribution of phase would be less than the diameter of the distribution circle with a unit length of true value. Therefore the phase uncertainty might be less than the modulus uncertainty value in consideration.



Uncertainty Budget for LS2P (Mod	S/N 2124385																							
MEASURED QUANTITY	Type	Unc.	Unit																					
Frequency			Hz	1,995	2,512	3,162	3,981	5,012	6,310	7,943	10,000	12,589	15,849	19,953	25,119	31,623	39,811	50,119	63,096	79,433	100,00	125,89	158,49	199,53
Electrical Transfer Impedance				**0,0264**	**0,0264**	**0,0263**	**0,0262**	**0,0262**	**0,0261**	**0,0261**	**0,0260**	**0,0260**	**0,0259**	**0,0209**	**0,0207**	**0,0206**	**0,0220**	**0,0136**	**0,0069**	**0,0063**	**0,0063**	**0,0062**	**0,0059**	**0,0059**
Series Impedance	B	Table	nF	0,0182	0,0182	0,0182	0,0182	0,0182	0,0182	0,0182	0,0182	0,0182	0,0182	0,0182	0,0182	0,0182	0,0176	0,0041	0,0041	0,0033	0,0033	0,0033	0,0029	0,0029
Voltage Ratio	B	Table		0,0170	0,0170	0,0170	0,0170	0,0170	0,0170	0,0170	0,0170	0,0170	0,0170	0,0075	0,0075	0,0075	0,0118	0,0118	0,0022	0,0022	0,0022	0,0022	0,0021	0,0021
Cross-talk	B	Meas.		0,0045	0,0045	0,0045	0,0044	0,0044	0,0044	0,0044	0,0044	0,0044	0,0044	0,0044	0,0045	0,0045	0,0045	0,0046	0,0046	0,0046	0,0046	0,0046	0,0045	0,0045
Inherent Noise	B	Meas.		0,0074	0,0072	0,0070	0,0068	0,0066	0,0064	0,0062	0,0060	0,0058	0,0056	0,0054	0,0046	0,0039	0,0033	0,0027	0,0023	0,0019	0,0016	0,0013	0,0012	0,0011
Distortion	B	Meas.		0,0002	0,0002	0,0002	0,0002	0,0002	0,0002	0,0002	0,0002	0,0002	0,0002	0,0002	0,0002	0,0002	0,0002	0,0002	0,0002	0,0002	0,0002	0,0002	0,0002	0,0002
Frequency	B	Table	Hz	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000
Reveiver Ground Shield	B	B&K		0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003
Transmitter Ground Shield	B	B&K		0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003
Coupler Properties				**0,0038**	**0,0038**	**0,0038**	**0,0038**	**0,0038**	**0,0038**	**0,0038**	**0,0038**	**0,0038**	**0,0038**	**0,0038**	**0,0038**	**0,0038**	**0,0038**	**0,0038**	**0,0039**	**0,0039**	**0,0039**	**0,0039**	**0,0039**	**0,0039**
Coupler Length	B	0,0020	mm	0,0014	0,0014	0,0014	0,0014	0,0014	0,0014	0,0014	0,0014	0,0014	0,0014	0,0014	0,0014	0,0014	0,0014	0,0014	0,0014	0,0014	0,0014	0,0014	0,0014	0,0014
Coupler Diameter	B	0,0030	mm	0,0022	0,0022	0,0022	0,0022	0,0022	0,0022	0,0022	0,0022	0,0022	0,0022	0,0022	0,0022	0,0022	0,0022	0,0022	0,0022	0,0022	0,0022	0,0022	0,0022	0,0022
Coupler Volume	B	0,2470	mm3	0,0027	0,0027	0,0027	0,0027	0,0027	0,0027	0,0027	0,0027	0,0027	0,0027	0,0027	0,0027	0,0027	0,0027	0,0027	0,0027	0,0027	0,0027	0,0027	0,0027	0,0027
Coupler Surface Area	B	0,1440	mm2	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000
Static Pressure	B	0,6000	kPa	0,0002	0,0002	0,0002	0,0002	0,0002	0,0002	0,0002	0,0002	0,0002	0,0002	0,0002	0,0003	0,0004	0,0004	0,0005	0,0006	0,0007	0,0007	0,0007	0,0008	0,0008
Temperature	B	0,7000	K	0,0004	0,0004	0,0004	0,0004	0,0004	0,0004	0,0004	0,0004	0,0004	0,0004	0,0004	0,0003	0,0003	0,0003	0,0002	0,0002	0,0002	0,0001	0,0001	0,0001	0,0001
Relative Humidity	B	10,0000	%	0,0006	0,0006	0,0006	0,0006	0,0006	0,0006	0,0006	0,0006	0,0006	0,0006	0,0006	0,0006	0,0006	0,0006	0,0006	0,0006	0,0006	0,0006	0,0006	0,0006	0,0006
Microphone Parameters				**0,0057**	**0,0058**	**0,0058**	**0,0059**	**0,0059**	**0,0060**	**0,0060**	**0,0060**	**0,0061**	**0,0061**	**0,0071**	**0,0071**	**0,0072**	**0,0072**	**0,0072**	**0,0072**	**0,0072**	**0,0073**	**0,0073**	**0,0073**	**0,0073**
Front Cavity Depth	B	0,0030	mm	0,0002	0,0002	0,0002	0,0002	0,0002	0,0002	0,0002	0,0002	0,0002	0,0002	0,0002	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0000
Front Cavity Volume	B	0,2100	mm3	0,0045	0,0045	0,0045	0,0045	0,0045	0,0045	0,0045	0,0045	0,0045	0,0045	0,0045	0,0045	0,0045	0,0045	0,0045	0,0045	0,0045	0,0045	0,0045	0,0045	0,0045
Equivalent Volume	B	0,3600	mm3	0,0035	0,0036	0,0037	0,0038	0,0038	0,0039	0,0040	0,0040	0,0040	0,0041	0,0055	0,0055	0,0055	0,0056	0,0056	0,0056	0,0057	0,0057	0,0057	0,0057	0,0057
Resonance Frequency	B	2440	Hz	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000
Loss Factor	B	0,1800		0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000
Additional Heat Conduction																								
Caused by Front Cavity Thread	N.A.	Table																						
Polarizing Voltage	B		V	0,0004	0,0004	0,0004	0,0004	0,0004	0,0004	0,0004	0,0004	0,0004	0,0004	0,0004	0,0004	0,0004	0,0004	0,0004	0,0004	0,0004	0,0004	0,0004	0,0004	0,0004
Imperfection of Theory				**0,0121**	**0,0521**	**0,0538**	**0,0352**	**0,0156**	**0,0014**	**0,0053**	**0,0062**	**0,0047**	**0,0028**	**0,0017**	**0,0013**	**0,0012**	**0,0011**	**0,0010**	**0,0009**	**0,0008**	**0,0007**	**0,0006**	**0,0005**	**0,0005**
Heat Conduction Theory	N.A.			0,0121	0,0521	0,0538	0,0352	0,0156	0,0014	0,0053	0,0062	0,0047	0,0028	0,0017	0,0013	0,0012	0,0011	0,0010	0,0009	0,0008	0,0007	0,0006	0,0005	0,0005
Adding of Excess Volume	N.A.																							
Radial Wave Motion	N.A.																							
Processing of Results				**0,0414**	**0,0142**	**0,0060**	**0,0157**	**0,0225**	**0,0112**	**0,0289**	**0,0316**	**0,0331**	**0,0338**	**0,0314**	**0,0224**	**0,0167**	**0,0124**	**0,0096**	**0,0075**	**0,0061**	**0,0055**	**0,0049**	**0,0047**	**0,0046**
Rounding Error	B	0,005	dB	0,0029	0,0029	0,0029	0,0029	0,0029	0,0029	0,0029	0,0029	0,0029	0,0029	0,0029	0,0029	0,0029	0,0029	0,0029	0,0029	0,0029	0,0029	0,0029	0,0029	0,0029
Repeatability of Measurements	A	Table	dB	0,0412	0,0135	0,0042	0,0151	0,0221	0,0103	0,0286	0,0313	0,0328	0,0336	0,0311	0,0220	0,0161	0,0116	0,0085	0,0061	0,0043	0,0033	0,0023	0,0017	0,0012
Static Pressure Corrections	B	0,6000	kPa	0,0031	0,0031	0,0031	0,0031	0,0031	0,0031	0,0031	0,0031	0,0031	0,0031	0,0031	0,0031	0,0031	0,0031	0,0032	0,0032	0,0032	0,0032	0,0032	0,0032	0,0033
Temperature Corrections	B	0,7000	K	0,0008	0,0008	0,0008	0,0008	0,0008	0,0008	0,0008	0,0008	0,0008	0,0008	0,0008	0,0008	0,0008	0,0008	0,0008	0,0008	0,0008	0,0008	0,0008	0,0008	0,0008
Combined Uncertainty(Sum)				**0,0511**	**0,0605**	**0,0606**	**0,0472**	**0,0385**	**0,0293**	**0,0399**	**0,0420**	**0,0429**	**0,0433**	**0,0386**	**0,0316**	**0,0277**	**0,0265**	**0,0185**	**0,0131**	**0,0121**	**0,0117**	**0,0115**	**0,0112**	**0,0112**
Expanded Uncertainty (k=2)				**0,1021**	**0,1209**	**0,1211**	**0,0943**	**0,0771**	**0,0586**	**0,0799**	**0,0840**	**0,0859**	**0,0866**	**0,0772**	**0,0632**	**0,0555**	**0,0530**	**0,0371**	**0,0262**	**0,0242**	**0,0234**	**0,0229**	**0,0224**	**0,0223**
Stated Uncertainty				**0,4**	**0,3**	**0,3**	**0,2**	**0,15**	**0,1**	**0,1**	**0,1**	**0,1**	**0,1**	**0,08**	**0,08**	**0,08**	**0,06**	**0,05**	**0,05**	**0,05**	**0,05**	**0,05**	**0,04**	**0,04**

Uncertainty Budget for LS2P (Mod	S/N 2124385																							
MEASURED QUANTITY	Type	Unc.	Unit																					
Frequency			Hz	251,19	316,23	398,11	501,19	630,96	794,33	1000,0	1258,9	1584,9	1995,3	2511,9	3162,3	3981,1	5011,9	6309,6	7943,3	10000,0	12589,0	15849,0	19953,0	25119,0
Electrical Transfer Impedance				**0,0059**	**0,0059**	**0,0058**	**0,0058**	**0,0058**	**0,0058**	**0,0058**	**0,0057**	**0,0058**	**0,0058**	**0,0057**	**0,0057**	**0,0058**	**0,0059**	**0,0062**	**0,0069**	**0,0091**	**0,0091**	**0,0091**	**0,0090**	**0,0090**
Series Impedance	B	Table	nF	0,0029	0,0029	0,0026	0,0026	0,0026	0,0026	0,0026	0,0026	0,0026	0,0027	0,0027	0,0027	0,0026	0,0026	0,0026	0,0029	0,0029	0,0029	0,0029	0,0028	0,0028
Voltage Ratio	B	Table		0,0021	0,0021	0,0021	0,0021	0,0020	0,0020	0,0020	0,0020	0,0021	0,0021	0,0021	0,0021	0,0021	0,0020	0,0021	0,0021	0,0052	0,0052	0,0052	0,0052	0,0052
Cross-talk	B	Meas.		0,0045	0,0045	0,0046	0,0046	0,0046	0,0046	0,0046	0,0045	0,0045	0,0045	0,0045	0,0045	0,0046	0,0048	0,0051	0,0058	0,0067	0,0067	0,0067	0,0067	0,0067
Inherent Noise	B	Meas.		0,0011	0,0010	0,0011	0,0011	0,0011	0,0011	0,0012	0,0011	0,0011	0,0011	0,0010	0,0009	0,0009	0,0008	0,0008	0,0009	0,0012	0,0012	0,0012	0,0012	0,0012
Distortion	B	Meas.		0,0002	0,0002	0,0002	0,0002	0,0002	0,0002	0,0002	0,0002	0,0002	0,0002	0,0002	0,0002	0,0002	0,0002	0,0002	0,0002	0,0002	0,0002	0,0002	0,0002	0,0002
Frequency	B	Table	Hz	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000
Reveiver Ground Shield	B	B&K		0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003
Transmitter Ground Shield	B	B&K		0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003
Coupler Properties				**0,0039**	**0,0039**	**0,0039**	**0,0040**	**0,0040**	**0,0040**	**0,0039**	**0,0039**	**0,0039**	**0,0039**	**0,0039**	**0,0039**	**0,0040**	**0,0040**	**0,0040**	**0,0041**	**0,0045**	**0,0055**	**0,0077**	**0,0127**	**0,0281**
Coupler Length	B	0,0020	mm	0,0014	0,0014	0,0015	0,0015	0,0015	0,0015	0,0014	0,0014	0,0014	0,0014	0,0014	0,0014	0,0014	0,0013	0,0012	0,0011	0,0008	0,0004	0,0003	0,0017	0,0058
Coupler Diameter	B	0,0030	mm	0,0022	0,0022	0,0022	0,0022	0,0022	0,0022	0,0022	0,0022	0,0022	0,0022	0,0022	0,0022	0,0022	0,0022	0,0022	0,0022	0,0023	0,0023	0,0023	0,0023	0,0022
Coupler Volume	B	0,2470	mm3	0,0027	0,0027	0,0027	0,0027	0,0027	0,0027	0,0027	0,0027	0,0027	0,0027	0,0027	0,0027	0,0027	0,0027	0,0027	0,0027	0,0027	0,0027	0,0028	0,0028	0,0026
Coupler Surface Area	B	0,1440	mm2	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000
Static Pressure	B	0,6000	kPa	0,0008	0,0009	0,0009	0,0010	0,0010	0,0010	0,0010	0,0010	0,0010	0,0010	0,0010	0,0010	0,0010	0,0010	0,0009	0,0008	0,0006	0,0002	-0,0002	-0,0002	0,0013
Temperature	B	0,7000	K	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0002	0,0004	0,0006	0,0008	0,0013	0,0022	0,0036	0,0062	0,0111	0,0252
Relative Humidity	B	10,0000	%	0,0006	0,0006	0,0006	0,0006	0,0006	0,0006	0,0006	0,0006	0,0006	0,0006	0,0006	0,0006	0,0007	0,0008	0,0009	0,0011	0,0014	0,0020	0,0029	0,0048	0,0103
Microphone Parameters				**0,0073**	**0,0073**	**0,0073**	**0,0073**	**0,0073**	**0,0073**	**0,0073**	**0,0073**	**0,0073**	**0,0073**	**0,0086**	**0,0086**	**0,0087**	**0,0089**	**0,0095**	**0,0108**	**0,0120**	**0,0105**	**0,0085**	**0,0402**	**0,0980**
Front Cavity Depth	B	0,0030	mm	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0001	0,0001	0,0001	0,0002	0,0003	0,0005	0,0007	0,0012	0,0019	0,0032	0,0054	0,0097	0,0216
Front Cavity Volume	B	0,2100	mm3	0,0045	0,0045	0,0045	0,0045	0,0045	0,0045	0,0045	0,0045	0,0045	0,0045	0,0045	0,0045	0,0045	0,0045	0,0045	0,0046	0,0046	0,0047	0,0047	0,0047	0,0044
Equivalent Volume	B	0,3600	mm3	0,0058	0,0058	0,0058	0,0058	0,0058	0,0058	0,0058	0,0058	0,0057	0,0057	0,0073	0,0072	0,0070	0,0067	0,0063	0,0055	0,0043	0,0023	0,0002	0,0002	0,0114
Resonance Frequency	B	2440	Hz	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0001	0,0003	0,0007	0,0016	0,0023	0,0037	0,0380	0,0737
Loss Factor	B	0,1800		0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0001	0,0002	0,0004	0,0006	0,0010	0,0015	0,0024	0,0036	0,0055	0,0079	0,0099	0,0082	0,0027	0,0077	0,0597
Additional Heat Conduction																								
Caused by Front Cavity Thread	N.A.	Table																						
Polarizing Voltage	B		V	0,0004	0,0004	0,0004	0,0004	0,0004	0,0004	0,0004	0,0004	0,0004	0,0004	0,0004	0,0004	0,0004	0,0004	0,0004	0,0004	0,0004	0,0004	0,0004	0,0004	0,0004
Imperfection of Theory				**0,0004**	**0,0004**	**0,0003**	**0,0003**	**0,0003**	**0,0002**	**0,0002**	**0,0000**	**0,0000**	**0,0000**	**0,0000**	**0,0000**	**0,0000**	**0,0000**	**0,0000**	**0,0000**	**0,0000**	**0,0000**	**0,0000**	**0,0000**	**0,0000**
Heat Conduction Theory	N.A.			0,0004	0,0004	0,0003	0,0003	0,0003	0,0002	0,0002	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000
Adding of Excess Volume	N.A.																							
Radial Wave Motion	N.A.																							
Processing of Results				**0,0046**	**0,0047**	**0,0048**	**0,0049**	**0,0050**	**0,0052**	**0,0052**	**0,0053**	**0,0054**	**0,0052**	**0,0044**	**0,0043**	**0,0042**	**0,0043**	**0,0047**	**0,0064**	**0,0092**	**0,0128**	**0,0141**	**0,0174**	**0,0518**
Rounding Error	B	0,005	dB	0,0029	0,0029	0,0029	0,0029	0,0029	0,0029	0,0029	0,0029	0,0029	0,0029	0,0029	0,0029	0,0029	0,0029	0,0029	0,0029	0,0029	0,0029	0,0029	0,0029	0,0029
Repeatability of Measurements	A	Table	dB	0,0012	0,0014	0,0016	0,0019	0,0022	0,0025	0,0025	0,0028	0,0030	0,0028	0,0009	0,0010	0,0008	0,0011	0,0013	0,0024	0,0033	0,0055	0,0083	0,0104	0,0438
Static Pressure Corrections	B	0,6000	kPa	0,0033	0,0033	0,0033	0,0034	0,0034	0,0034	0,0034	0,0033	0,0032	0,0031	0,0029	0,0026	0,0021	0,0015	0,0006	0,0011	0,0033	0,0047	0,0006	0,0124	0,0273
Temperature Corrections	B	0,7000	K	0,0008	0,0008	0,0008	0,0008	0,0008	0,0009	0,0009	0,0010	0,0011	0,0012	0,0014	0,0017	0,0020	0,0025	0,0034	0,0050	0,0074	0,0102	0,0109	0,0058	0,0039
Combined Uncertainty(Sum)				**0,0112**	**0,0112**	**0,0112**	**0,0113**	**0,0113**	**0,0114**	**0,0114**	**0,0114**	**0,0114**	**0,0113**	**0,0119**	**0,0119**	**0,0119**	**0,0122**	**0,0129**	**0,0149**	**0,0182**	**0,0197**	**0,0203**	**0,0465**	**0,1148**
Expanded Uncertainty (k=2)				**0,0223**	**0,0224**	**0,0224**	**0,0225**	**0,0227**	**0,0228**	**0,0228**	**0,0228**	**0,0229**	**0,0227**	**0,0239**	**0,0238**	**0,0238**	**0,0243**	**0,0259**	**0,0297**	**0,0364**	**0,0393**	**0,0406**	**0,0931**	**0,2295**
Stated Uncertainty				**0,04**	**0,04**	**0,04**	**0,04**	**0,04**	**0,04**	**0,04**	**0,04**	**0,04**	**0,04**	**0,04**	**0,04**	**0,04**	**0,04**	**0,04**	**0,04**	**0,05**	**0,06**	**0,07**	**0,12**	**0,25**

2124385 Phase

Uncertainty Budget for LS2P (pl	S/N 2124385																							
MEASURED QUANTITY	Type	Unc.	Unit																					
Frequency			Hz	1,9953	2,5119	3,1623	3,9811	5,0119	6,3096	7,9433	10,000	12,589	15,849	19,953	25,119	31,623	39,811	50,119	63,096	79,433	100,00	125,89	158,49	199,53
Electrical Transfer Impedance				**0,3031**	**0,2838**	**0,2688**	**0,2570**	**0,2478**	**0,2406**	**0,2350**	**0,2306**	**0,1580**	**0,1557**	**0,1539**	**0,1516**	**0,1498**	**0,1484**	**0,1473**	**0,1465**	**0,1458**	**0,1453**	**0,1448**	**0,1216**	**0,1212**
Series Impedance	B	Table	nF	0,2976	0,2781	0,2631	0,2512	0,2421	0,2350	0,2295	0,2252	0,1504	0,1483	0,1467	0,1455	0,1445	0,1437	0,1430	0,1425	0,1421	0,1417	0,1414	0,1175	0,1172
Voltage Ratio	B	Table		0,0002	0,0004	0,0001	0,0003	0,0004	0,0001	0,0002	0,0003	0,0003	0,0003	0,0000	0,0002	0,0003	0,0001	0,0005	0,0004	0,0001	0,0001	0,0001	0,0000	0,0005
Cross-talk	B	Meas.		0,0298	0,0296	0,0295	0,0294	0,0293	0,0292	0,0292	0,0292	0,0292	0,0293	0,0293	0,0295	0,0298	0,0300	0,0301	0,0302	0,0302	0,0301	0,0301	0,0300	0,0300
Inherent Noise	B	Meas.		0,0492	0,0478	0,0465	0,0452	0,0438	0,0425	0,0411	0,0398	0,0384	0,0371	0,0358	0,0307	0,0260	0,0217	0,0180	0,0149	0,0123	0,0104	0,0089	0,0079	0,0073
Distortion	B	Meas.		0,0013	0,0013	0,0013	0,0013	0,0013	0,0013	0,0013	0,0013	0,0013	0,0013	0,0013	0,0013	0,0013	0,0013	0,0013	0,0013	0,0013	0,0013	0,0013	0,0013	0,0013
Frequency	B	Table	Hz	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000
Reveiver Ground Shield	B	B&K		0,0020	0,0020	0,0020	0,0020	0,0020	0,0020	0,0020	0,0020	0,0020	0,0020	0,0020	0,0020	0,0020	0,0020	0,0020	0,0020	0,0020	0,0020	0,0020	0,0020	0,0020
Transmitter Ground Shield	B	B&K		0,0020	0,0020	0,0020	0,0020	0,0020	0,0020	0,0020	0,0020	0,0020	0,0020	0,0020	0,0020	0,0020	0,0020	0,0020	0,0020	0,0020	0,0020	0,0020	0,0020	0,0020
Coupler Properties				**0,0010**	**0,0010**	**0,0009**	**0,0009**	**0,0008**	**0,0008**	**0,0008**	**0,0007**	**0,0007**	**0,0007**	**0,0006**	**0,0006**	**0,0006**	**0,0005**	**0,0005**	**0,0005**	**0,0005**	**0,0005**	**0,0005**	**0,0005**	**0,0004**
Coupler Length	B	0,0020	mm	0,0005	0,0004	0,0004	0,0004	0,0003	0,0003	0,0003	0,0003	0,0002	0,0002	0,0002	0,0002	0,0002	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001
Coupler Diameter	B	0,0030	mm	0,0001	0,0001	0,0001	0,0001	0,0001	0,0002	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001
Coupler Volume	B	0,2470	mm3	0,0006	0,0005	0,0005	0,0005	0,0005	0,0005	0,0004	0,0004	0,0004	0,0004	0,0003	0,0003	0,0003	0,0002	0,0002	0,0002	0,0002	0,0002	0,0002	0,0002	0,0001
Coupler Surface Area	B	0,1440	mm2	0,0006	0,0005	0,0005	0,0005	0,0005	0,0005	0,0004	0,0004	0,0004	0,0004	0,0003	0,0003	0,0003	0,0002	0,0002	0,0002	0,0002	0,0002	0,0002	0,0002	0,0001
Static Pressure	B	0,6000	kPa	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003
Temperature	B	0,7000	K	0,0002	0,0002	0,0002	0,0002	0,0002	0,0002	0,0003	0,0002	0,0002	0,0002	0,0002	0,0002	0,0003	0,0002	0,0003	0,0002	0,0002	0,0003	0,0003	0,0002	0,0002
Relative Humidity	B	10,0000	%	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001
Microphone Parameters				**0,0056**	**0,0053**	**0,0051**	**0,0048**	**0,0046**	**0,0044**	**0,0042**	**0,0040**	**0,0038**	**0,0036**	**0,0035**	**0,0033**	**0,0032**	**0,0031**	**0,0031**	**0,0030**	**0,0030**	**0,0031**	**0,0032**	**0,0033**	**0,0036**
Front Cavity Depth	B	0,0030	mm	0,0018	0,0017	0,0016	0,0015	0,0015	0,0014	0,0013	0,0012	0,0011	0,0010	0,0009	0,0008	0,0008	0,0007	0,0006	0,0006	0,0005	0,0005	0,0004	0,0004	0,0003
Front Cavity Volume	B	0,2100	mm3	0,0033	0,0031	0,0029	0,0027	0,0025	0,0023	0,0022	0,0020	0,0018	0,0017	0,0015	0,0014	0,0013	0,0011	0,0010	0,0009	0,0009	0,0008	0,0007	0,0006	0,0006
Equivalent Volume	B	0,3600	mm3	0,0033	0,0031	0,0029	0,0027	0,0025	0,0023	0,0022	0,0020	0,0018	0,0017	0,0015	0,0014	0,0013	0,0011	0,0010	0,0009	0,0009	0,0008	0,0007	0,0006	0,0006
Resonance Frequency	B	2440	Hz	0,0004	0,0004	0,0004	0,0005	0,0005	0,0005	0,0005	0,0005	0,0005	0,0005	0,0005	0,0006	0,0006	0,0006	0,0007	0,0008	0,0009	0,0010	0,0011	0,0013	0,0015
Loss Factor	B	0,1800		0,0000	0,0000	0,0000	0,0000	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0002	0,0002	0,0003	0,0004	0,0005	0,0006	0,0008	0,0010	0,0012	0,0015	0,0019
Additional Heat Conduction																								
Caused by Front Cavity Thread	N.A.	Table																						
Polarizing Voltage	B	0,0063	V	0,0025	0,0025	0,0025	0,0025	0,0025	0,0025	0,0025	0,0025	0,0025	0,0025	0,0025	0,0025	0,0025	0,0025	0,0025	0,0025	0,0025	0,0025	0,0025	0,0025	0,0025
Imperfection of Theory				**0,9931**	**0,5489**	**0,1855**	**0,0261**	**0,0922**	**0,0819**	**0,0423**	**0,0093**	**0,0090**	**0,0140**	**0,0118**	**0,0089**	**0,0071**	**0,0063**	**0,0058**	**0,0052**	**0,0047**	**0,0042**	**0,0038**	**0,0034**	**0,0031**
Heat Conduction Theory	N.A.			0,9931	0,5489	0,1855	0,0261	0,0922	0,0819	0,0423	0,0093	0,0090	0,0140	0,0118	0,0089	0,0071	0,0063	0,0058	0,0052	0,0047	0,0042	0,0038	0,0034	0,0031
Adding of Excess Volume	N.A.																							
Radial Wave Motion	N.A.																							
Processing of Results				**0,4536**	**0,2844**	**0,2095**	**0,1929**	**0,1394**	**0,1168**	**0,1051**	**0,0844**	**0,0692**	**0,0575**	**0,0484**	**0,0456**	**0,0403**	**0,0363**	**0,0344**	**0,0316**	**0,0301**	**0,0297**	**0,0294**	**0,0294**	**0,0292**
Rounding Error	B	0,050	degree	0,0289	0,0289	0,0289	0,0289	0,0289	0,0289	0,0289	0,0289	0,0289	0,0289	0,0289	0,0289	0,0289	0,0289	0,0289	0,0289	0,0289	0,0289	0,0289	0,0289	0,0289
Repeatability of Measurements	A	Table	degree	0,4526	0,2829	0,2075	0,1907	0,1364	0,1131	0,1010	0,0793	0,0629	0,0497	0,0388	0,0353	0,0282	0,0220	0,0187	0,0129	0,0085	0,0071	0,0057	0,0054	0,0046
Static Pressure Corrections	B	0,6000	kPa	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0001	0,0001	0,0001	0,0001	0,0001	0,0002	0,0002	0,0003	0,0004	0,0004	0,0005	0,0007	0,0008
Temperature Corrections	B	0,7000	K	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0001	0,0001	0,0001	0,0001	0,0001	0,0002	0,0002	0,0003	0,0003	0,0004	0,0005	0,0007	0,0008	0,0010
Combined Uncertainty(Sum)				**1,1331**	**0,6802**	**0,3880**	**0,3224**	**0,2989**	**0,2797**	**0,2609**	**0,2457**	**0,1728**	**0,1666**	**0,1618**	**0,1586**	**0,1553**	**0,1529**	**0,1514**	**0,1500**	**0,1490**	**0,1484**	**0,1479**	**0,1252**	**0,1248**
Expanded Uncertainty (k=2)				**2,2662**	**1,3604**	**0,7761**	**0,6448**	**0,5978**	**0,5595**	**0,5218**	**0,4915**	**0,3455**	**0,3332**	**0,3235**	**0,3172**	**0,3107**	**0,3059**	**0,3028**	**0,2999**	**0,2980**	**0,2967**	**0,2957**	**0,2503**	**0,2495**
Stated Uncertainty				**2,50**	**2**	**1,5**	**1,5**	**1**	**1**	**1**	**0,8**	**0,8**	**0,6**	**0,5**	**0,5**	**0,5**	**0,4**	**0,4**	**0,4**	**0,4**	**0,4**	**0,4**	**0,3**	**0,3**

Uncertainty Budget for LS2P (pl	S/N 2124385																							
MEASURED QUANTITY	Type	Unc.	Unit																					
Frequency			Hz	251,19	316,23	398,11	501,19	630,96	794,33	1000,0	1258,9	1584,9	1995,3	2511,9	3162,3	3981,1	5011,9	6309,6	7943,3	10000,0	12589,0	15849,0	19953,0	25119,0
Electrical Transfer Impedance				**0,1209**	**0,1206**	**0,1148**	**0,1144**	**0,1139**	**0,1132**	**0,1123**	**0,1112**	**0,1097**	**0,1078**	**0,1101**	**0,1067**	**0,1020**	**0,0953**	**0,0860**	**0,0746**	**0,0732**	**0,0739**	**0,0751**	**0,0777**	**0,0805**
Series Impedance	B	Table	nF	0,1169	0,1166	0,1106	0,1101	0,1096	0,1088	0,1079	0,1068	0,1053	0,1033	0,1058	0,1022	0,0970	0,0895	0,0783	0,0628	0,0559	0,0559	0,0559	0,0559	0,0559
Voltage Ratio	B	Table		0,0006	0,0001	0,0005	0,0007	0,0010	0,0016	0,0010	0,0016	0,0023	0,0027	0,0035	0,0047	0,0062	0,0069	0,0086	0,0113	0,0143	0,0174	0,0221	0,0297	0,0364
Cross-talk	B	Meas.		0,0300	0,0300	0,0300	0,0301	0,0301	0,0301	0,0300	0,0299	0,0297	0,0295	0,0295	0,0296	0,0302	0,0315	0,0339	0,0380	0,0444	0,0444	0,0444	0,0444	0,0444
Inherent Noise	B	Meas.		0,0070	0,0069	0,0070	0,0072	0,0074	0,0076	0,0076	0,0075	0,0073	0,0070	0,0066	0,0061	0,0057	0,0055	0,0056	0,0063	0,0077	0,0077	0,0077	0,0077	0,0077
Distortion	B	Meas.		0,0013	0,0013	0,0013	0,0013	0,0013	0,0013	0,0013	0,0013	0,0013	0,0013	0,0013	0,0013	0,0013	0,0013	0,0013	0,0013	0,0013	0,0013	0,0013	0,0013	0,0013
Frequency	B	Table	Hz	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000
Reveiver Ground Shield	B	B&K		0,0020	0,0020	0,0020	0,0020	0,0020	0,0020	0,0020	0,0020	0,0020	0,0020	0,0020	0,0020	0,0020	0,0020	0,0020	0,0020	0,0020	0,0020	0,0020	0,0020	0,0020
Transmitter Ground Shield	B	B&K		0,0020	0,0020	0,0020	0,0020	0,0020	0,0020	0,0020	0,0020	0,0020	0,0020	0,0020	0,0020	0,0020	0,0020	0,0020	0,0020	0,0020	0,0020	0,0020	0,0020	0,0020
Coupler Properties				**0,0002**	**0,0009**	**0,0019**	**0,0032**	**0,0048**	**0,0069**	**0,0095**	**0,0116**	**0,0133**	**0,0155**	**0,0172**	**0,0192**	**0,0217**	**0,0242**	**0,0241**	**0,0175**	**0,0550**	**0,1869**	**0,4118**	**0,6228**	**0,5573**
Coupler Length	B	0,0020	mm	0,0001	0,0000	0,0001	0,0000	0,0000	0,0000	0,0000	0,0001	0,0000	0,0001	0,0001	0,0001	0,0001	0,0002	0,0002	0,0003	0,0005	0,0008	0,0016	0,0035	0,0113
Coupler Diameter	B	0,0030	mm	0,0001	0,0000	0,0000	0,0000	0,0001	0,0000	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0002	0,0002	0,0002	0,0002	0,0000	0,0005	0,0021	0,0065
Coupler Volume	B	0,2470	mm3	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0002	0,0002	0,0003	0,0003	0,0004	0,0005	0,0007	0,0009	0,0011	0,0015	0,0048
Coupler Surface Area	B	0,1440	mm2	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0002	0,0002	0,0003	0,0003	0,0004	0,0005	0,0007	0,0009	0,0011	0,0015	0,0048
Static Pressure	B	0,6000	kPa	0,0000	0,0007	0,0014	0,0025	0,0037	0,0053	0,0073	0,0090	0,0106	0,0125	0,0145	0,0167	0,0193	0,0222	0,0233	0,0155	0,0182	0,1057	0,2576	0,4066	0,3748
Temperature	B	0,7000	K	0,0000	0,0006	0,0012	0,0020	0,0031	0,0044	0,0061	0,0073	0,0081	0,0090	0,0092	0,0095	0,0098	0,0095	0,0063	0,0081	0,0519	0,1541	0,3213	0,4717	0,4122
Relative Humidity	B	10,0000	%	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001
Microphone Parameters				**0,0038**	**0,0043**	**0,0050**	**0,0060**	**0,0072**	**0,0088**	**0,0109**	**0,0140**	**0,0173**	**0,0214**	**0,0349**	**0,0430**	**0,0523**	**0,0627**	**0,0738**	**0,0869**	**0,1090**	**0,1399**	**0,1371**	**0,3251**	**1,2267**
Front Cavity Depth	B	0,0030	mm	0,0003	0,0003	0,0002	0,0002	0,0002	0,0002	0,0002	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0000	0,0001	0,0002	0,0005	0,0011	0,0023	0,0039	0,0046
Front Cavity Volume	B	0,2100	mm3	0,0005	0,0004	0,0004	0,0004	0,0004	0,0003	0,0003	0,0003	0,0003	0,0003	0,0004	0,0004	0,0005	0,0005	0,0006	0,0007	0,0009	0,0012	0,0022	0,0061	0,0279
Equivalent Volume	B	0,3600	mm3	0,0005	0,0004	0,0004	0,0004	0,0004	0,0003	0,0003	0,0003	0,0003	0,0003	0,0004	0,0004	0,0005	0,0005	0,0006	0,0007	0,0009	0,0012	0,0022	0,0061	0,0279
Resonance Frequency	B	2440	Hz	0,0014	0,0017	0,0020	0,0024	0,0029	0,0035	0,0044	0,0066	0,0082	0,0101	0,0176	0,0222	0,0280	0,0361	0,0481	0,0683	0,1022	0,1396	0,1329	0,1676	1,0639
Loss Factor	B	0,1800		0,0024	0,0030	0,0039	0,0049	0,0061	0,0077	0,0096	0,0121	0,0151	0,0187	0,0300	0,0367	0,0441	0,0512	0,0559	0,0536	0,0377	0,0096	0,0332	0,2785	0,6093
Additional Heat Conduction																								
Caused by Front Cavity Thread	N.A.	Table																						
Polarizing Voltage	B	0,0063	V	0,0025	0,0025	0,0025	0,0025	0,0025	0,0025	0,0025	0,0025	0,0025	0,0025	0,0025	0,0025	0,0025	0,0025	0,0025	0,0025	0,0025	0,0025	0,0025	0,0025	0,0025
Imperfection of Theory				**0,0028**	**0,0025**	**0,0023**	**0,0021**	**0,0020**	**0,0018**	**0,0017**	**0,0000**	**0,0000**	**0,0000**	**0,0000**	**0,0000**	**0,0000**	**0,0000**	**0,0000**	**0,0000**	**0,0000**	**0,0000**	**0,0000**	**0,0000**	**0,0000**
Heat Conduction Theory	N.A.			0,0028	0,0025	0,0023	0,0021	0,0020	0,0018	0,0017	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000
Adding of Excess Volume	N.A.																							
Radial Wave Motion	N.A.																							
Processing of Results				**0,0291**	**0,0290**	**0,0781**	**0,0665**	**0,0540**	**0,0498**	**0,0438**	**0,0390**	**0,0352**	**0,0325**	**0,0306**	**0,0325**	**0,0349**	**0,0370**	**0,0377**	**0,0443**	**0,0532**	**0,0827**	**0,1409**	**0,2254**	**0,3579**
Rounding Error	B	0,050	degree	0,0289	0,0289	0,0289	0,0289	0,0289	0,0289	0,0289	0,0289	0,0289	0,0289	0,0289	0,0289	0,0289	0,0289	0,0289	0,0289	0,0289	0,0289	0,0289	0,0289	0,0289
Repeatability of Measurements	A	Table	degree	0,0034	0,0022	0,0725	0,0599	0,0456	0,0406	0,0328	0,0262	0,0201	0,0148	0,0099	0,0148	0,0196	0,0232	0,0240	0,0317	0,0337	0,0398	0,0421	0,1352	0,3242
Static Pressure Corrections	B	0,6000	kPa	0,0010	0,0012	0,0014	0,0017	0,0020	0,0022	0,0024	0,0025	0,0025	0,0023	0,0019	0,0012	0,0003	0,0010	0,0037	0,0112	0,0292	0,0665	0,1313	0,1780	0,1489
Temperature Corrections	B	0,7000	K	0,0013	0,0016	0,0020	0,0024	0,0030	0,0036	0,0043	0,0052	0,0062	0,0073	0,0086	0,0103	0,0125	0,0151	0,0178	0,0188	0,0135	0,0056	0,0493	0,0947	0,0994
Combined Uncertainty(Sum)				**0,1245**	**0,1241**	**0,1390**	**0,1326**	**0,1264**	**0,1242**	**0,1214**	**0,1192**	**0,1173**	**0,1156**	**0,1207**	**0,1210**	**0,1217**	**0,1224**	**0,1218**	**0,1240**	**0,1519**	**0,2585**	**0,4625**	**0,7419**	**1,3964**
Expanded Uncertainty (k=2)				**0,2489**	**0,2483**	**0,2780**	**0,2651**	**0,2527**	**0,2485**	**0,2429**	**0,2385**	**0,2345**	**0,2312**	**0,2415**	**0,2421**	**0,2435**	**0,2447**	**0,2436**	**0,2481**	**0,3039**	**0,5170**	**0,9249**	**1,4838**	**2,7928**
Stated Uncertainty				**0,3**	**0,3**	**0,3**	**0,3**	**0,3**	**0,3**	**0,3**	**0,3**	**0,3**	**0,3**	**0,3**	**0,3**	**0,3**	**0,3**	**0,3**	**0,3**	**0,4**	**0,6**	**1**	**1,5**	**3**

Uncertainty Budget for LS2P (Mod	S/N 2412872																							
MEASURED QUANTITY	Type	Unc.	Unit																					
Frequency			Hz	1,995	2,512	3,162	3,981	5,012	6,310	7,943	10,000	12,589	15,849	19,953	25,119	31,623	39,811	50,119	63,096	79,433	100,00	125,89	158,49	199,53
Electrical Transfer Impedance				**0,0264**	**0,0264**	**0,0263**	**0,0262**	**0,0262**	**0,0261**	**0,0261**	**0,0260**	**0,0260**	**0,0259**	**0,0209**	**0,0207**	**0,0206**	**0,0220**	**0,0136**	**0,0069**	**0,0063**	**0,0063**	**0,0062**	**0,0059**	**0,0059**
Series Impedance	B	Table	nF	0,0182	0,0182	0,0182	0,0182	0,0182	0,0182	0,0182	0,0182	0,0182	0,0182	0,0182	0,0182	0,0182	0,0176	0,0041	0,0041	0,0033	0,0033	0,0033	0,0029	0,0029
Voltage Ratio	B	Table		0,0170	0,0170	0,0170	0,0170	0,0170	0,0170	0,0170	0,0170	0,0170	0,0170	0,0075	0,0075	0,0075	0,0118	0,0118	0,0022	0,0022	0,0022	0,0022	0,0021	0,0021
Cross-talk	B	Meas.		0,0045	0,0045	0,0045	0,0044	0,0044	0,0044	0,0044	0,0044	0,0044	0,0044	0,0044	0,0045	0,0045	0,0045	0,0046	0,0046	0,0046	0,0046	0,0046	0,0045	0,0045
Inherent Noise	B	Meas.		0,0074	0,0072	0,0070	0,0068	0,0066	0,0064	0,0062	0,0060	0,0058	0,0056	0,0054	0,0046	0,0039	0,0033	0,0027	0,0023	0,0019	0,0016	0,0013	0,0012	0,0011
Distortion	B	Meas.		0,0002	0,0002	0,0002	0,0002	0,0002	0,0002	0,0002	0,0002	0,0002	0,0002	0,0002	0,0002	0,0002	0,0002	0,0002	0,0002	0,0002	0,0002	0,0002	0,0002	0,0002
Frequency	B	Table	Hz	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000
Reveiver Ground Shield	B	B&K		0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003
Transmitter Ground Shield	B	B&K		0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003
Coupler Properties				**0,0039**	**0,0039**	**0,0039**	**0,0039**	**0,0039**	**0,0039**	**0,0039**	**0,0039**	**0,0039**	**0,0039**	**0,0039**	**0,0039**	**0,0039**	**0,0039**	**0,0039**	**0,0039**	**0,0039**	**0,0039**	**0,0039**	**0,0039**	**0,0039**
Coupler Length	B	0,0020	mm	0,0014	0,0014	0,0014	0,0014	0,0014	0,0014	0,0014	0,0014	0,0014	0,0014	0,0014	0,0014	0,0014	0,0014	0,0014	0,0014	0,0014	0,0014	0,0014	0,0014	0,0014
Coupler Diameter	B	0,0030	mm	0,0022	0,0022	0,0022	0,0022	0,0022	0,0022	0,0022	0,0022	0,0022	0,0022	0,0022	0,0022	0,0022	0,0022	0,0022	0,0022	0,0022	0,0022	0,0022	0,0022	0,0022
Coupler Volume	B	0,2470	mm3	0,0027	0,0027	0,0027	0,0027	0,0027	0,0027	0,0027	0,0027	0,0027	0,0027	0,0027	0,0027	0,0027	0,0027	0,0027	0,0027	0,0027	0,0027	0,0027	0,0027	0,0027
Coupler Surface Area	B	0,1440	mm2	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000
Static Pressure	B	0,6000	kPa	0,0002	0,0002	0,0002	0,0002	0,0002	0,0002	0,0002	0,0002	0,0002	0,0002	0,0002	0,0003	0,0004	0,0004	0,0005	0,0006	0,0007	0,0007	0,0007	0,0008	0,0008
Temperature	B	1,4000	K	0,0007	0,0007	0,0007	0,0007	0,0007	0,0007	0,0007	0,0007	0,0007	0,0007	0,0007	0,0006	0,0006	0,0006	0,0004	0,0004	0,0004	0,0003	0,0003	0,0003	0,0003
Relative Humidity	B	10,0000	%	0,0006	0,0006	0,0006	0,0006	0,0006	0,0006	0,0006	0,0006	0,0006	0,0006	0,0006	0,0006	0,0006	0,0006	0,0006	0,0006	0,0006	0,0006	0,0006	0,0006	0,0006
Microphone Parameters				**0,0057**	**0,0058**	**0,0058**	**0,0059**	**0,0059**	**0,0060**	**0,0060**	**0,0060**	**0,0061**	**0,0061**	**0,0071**	**0,0071**	**0,0072**	**0,0072**	**0,0072**	**0,0072**	**0,0072**	**0,0073**	**0,0073**	**0,0073**	**0,0073**
Front Cavity Depth	B	0,0030	mm	0,0002	0,0002	0,0002	0,0002	0,0002	0,0002	0,0002	0,0002	0,0002	0,0002	0,0002	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0000
Front Cavity Volume	B	0,2100	mm3	0,0045	0,0045	0,0045	0,0045	0,0045	0,0045	0,0045	0,0045	0,0045	0,0045	0,0045	0,0045	0,0045	0,0045	0,0045	0,0045	0,0045	0,0045	0,0045	0,0045	0,0045
Equivalent Volume	B	0,3600	mm3	0,0035	0,0036	0,0037	0,0038	0,0038	0,0039	0,0040	0,0040	0,0040	0,0041	0,0055	0,0055	0,0055	0,0056	0,0056	0,0056	0,0057	0,0057	0,0057	0,0057	0,0057
Resonance Frequency	B	2440	Hz	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000
Loss Factor	B	0,1800		0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000
Additional Heat Conduction																								
Caused by Front Cavity Thread	N.A.	Table																						
Polarizing Voltage	B		V	0,0004	0,0004	0,0004	0,0004	0,0004	0,0004	0,0004	0,0004	0,0004	0,0004	0,0004	0,0004	0,0004	0,0004	0,0004	0,0004	0,0004	0,0004	0,0004	0,0004	0,0004
Imperfection of Theory				**0,0121**	**0,0521**	**0,0538**	**0,0352**	**0,0156**	**0,0014**	**0,0053**	**0,0062**	**0,0047**	**0,0028**	**0,0017**	**0,0013**	**0,0012**	**0,0011**	**0,0010**	**0,0009**	**0,0008**	**0,0007**	**0,0006**	**0,0005**	**0,0005**
Heat Conduction Theory	N.A.			0,0121	0,0521	0,0538	0,0352	0,0156	0,0014	0,0053	0,0062	0,0047	0,0028	0,0017	0,0013	0,0012	0,0011	0,0010	0,0009	0,0008	0,0007	0,0006	0,0005	0,0005
Adding of Excess Volume	N.A.																							
Radial Wave Motion	N.A.																							
Processing of Results				**0,0384**	**0,0106**	**0,0095**	**0,0155**	**0,0162**	**0,0276**	**0,0191**	**0,0233**	**0,0234**	**0,0252**	**0,0049**	**0,0048**	**0,0048**	**0,0048**	**0,0047**	**0,0076**	**0,0065**	**0,0057**	**0,0051**	**0,0048**	**0,0047**
Rounding Error	B	0,005	dB	0,0029	0,0029	0,0029	0,0029	0,0029	0,0029	0,0029	0,0029	0,0029	0,0029	0,0029	0,0029	0,0029	0,0029	0,0029	0,0029	0,0029	0,0029	0,0029	0,0029	0,0029
Repeatability of Measurements	A	Table	dB	0,0381	0,0096	0,0083	0,0148	0,0155	0,0272	0,0186	0,0229	0,0230	0,0247	0,0017	0,0013	0,0015	0,0014	0,0010	0,0060	0,0046	0,0033	0,0022	0,0014	0,0009
Static Pressure Corrections	B	0,6000	kPa	0,0031	0,0031	0,0031	0,0031	0,0031	0,0031	0,0031	0,0031	0,0031	0,0031	0,0031	0,0031	0,0031	0,0031	0,0032	0,0032	0,0032	0,0032	0,0032	0,0032	0,0033
Temperature Corrections	B	1,4000	K	0,0017	0,0017	0,0017	0,0017	0,0017	0,0017	0,0017	0,0017	0,0017	0,0017	0,0017	0,0017	0,0017	0,0017	0,0017	0,0017	0,0017	0,0016	0,0016	0,0016	0,0016
Combined Uncertainty(Sum)				**0,0487**	**0,0597**	**0,0610**	**0,0471**	**0,0352**	**0,0387**	**0,0335**	**0,0362**	**0,0360**	**0,0369**	**0,0230**	**0,0228**	**0,0227**	**0,0239**	**0,0166**	**0,0131**	**0,0123**	**0,0118**	**0,0115**	**0,0113**	**0,0112**
Expanded Uncertainty (k=2)				**0,0973**	**0,1195**	**0,1220**	**0,0942**	**0,0704**	**0,0774**	**0,0671**	**0,0724**	**0,0721**	**0,0739**	**0,0460**	**0,0456**	**0,0454**	**0,0479**	**0,0331**	**0,0263**	**0,0246**	**0,0236**	**0,0231**	**0,0225**	**0,0225**
Stated Uncertainty				**0,4**	**0,3**	**0,3**	**0,2**	**0,15**	**0,1**	**0,1**	**0,1**	**0,1**	**0,1**	**0,08**	**0,08**	**0,08**	**0,06**	**0,05**	**0,05**	**0,05**	**0,05**	**0,05**	**0,04**	**0,04**

Uncertainty Budget for LS2P (Mod	S/N 2412872																							
MEASURED QUANTITY	Type	Unc.	Unit																					
Frequency			Hz	251,19	316,23	398,11	501,19	630,96	794,33	1000,0	1258,9	1584,9	1995,3	2511,9	3162,3	3981,1	5011,9	6309,6	7943,3	10000,0	12589,0	15849,0	19953,0	25119,0
Electrical Transfer Impedance				**0,0059**	**0,0059**	**0,0058**	**0,0058**	**0,0058**	**0,0058**	**0,0058**	**0,0057**	**0,0058**	**0,0058**	**0,0057**	**0,0057**	**0,0058**	**0,0059**	**0,0062**	**0,0069**	**0,0091**	**0,0091**	**0,0091**	**0,0090**	**0,0090**
Series Impedance	B	Table	nF	0,0029	0,0029	0,0026	0,0026	0,0026	0,0026	0,0026	0,0026	0,0026	0,0027	0,0027	0,0027	0,0026	0,0026	0,0026	0,0029	0,0029	0,0029	0,0029	0,0028	0,0028
Voltage Ratio	B	Table		0,0021	0,0021	0,0021	0,0021	0,0020	0,0020	0,0020	0,0020	0,0021	0,0021	0,0021	0,0021	0,0021	0,0020	0,0021	0,0021	0,0052	0,0052	0,0052	0,0052	0,0052
Cross-talk	B	Meas.		0,0045	0,0045	0,0046	0,0046	0,0046	0,0046	0,0046	0,0045	0,0045	0,0045	0,0045	0,0045	0,0046	0,0048	0,0051	0,0058	0,0067	0,0067	0,0067	0,0067	0,0067
Inherent Noise	B	Meas.		0,0011	0,0010	0,0011	0,0011	0,0011	0,0011	0,0012	0,0011	0,0011	0,0011	0,0010	0,0009	0,0009	0,0008	0,0008	0,0009	0,0012	0,0012	0,0012	0,0012	0,0012
Distortion	B	Meas.		0,0002	0,0002	0,0002	0,0002	0,0002	0,0002	0,0002	0,0002	0,0002	0,0002	0,0002	0,0002	0,0002	0,0002	0,0002	0,0002	0,0002	0,0002	0,0002	0,0002	0,0002
Frequency	B	Table	Hz	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000
Reveiver Ground Shield	B	B&K		0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003
Transmitter Ground Shield	B	B&K		0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003
Coupler Properties				**0,0039**	**0,0039**	**0,0039**	**0,0040**	**0,0040**	**0,0040**	**0,0039**	**0,0039**	**0,0039**	**0,0039**	**0,0039**	**0,0040**	**0,0040**	**0,0041**	**0,0042**	**0,0047**	**0,0059**	**0,0084**	**0,0132**	**0,0230**	**0,0519**
Coupler Length	B	0,0020	mm	0,0014	0,0014	0,0015	0,0015	0,0015	0,0015	0,0014	0,0014	0,0014	0,0014	0,0014	0,0014	0,0014	0,0013	0,0012	0,0011	0,0008	0,0004	0,0003	0,0017	0,0058
Coupler Diameter	B	0,0030	mm	0,0022	0,0022	0,0022	0,0022	0,0022	0,0022	0,0022	0,0022	0,0022	0,0022	0,0022	0,0022	0,0022	0,0022	0,0022	0,0022	0,0023	0,0023	0,0023	0,0023	0,0022
Coupler Volume	B	0,2470	mm3	0,0027	0,0027	0,0027	0,0027	0,0027	0,0027	0,0027	0,0027	0,0027	0,0027	0,0027	0,0027	0,0027	0,0027	0,0027	0,0027	0,0027	0,0027	0,0028	0,0028	0,0026
Coupler Surface Area	B	0,1440	mm2	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000
Static Pressure	B	0,6000	kPa	0,0008	0,0009	0,0009	0,0010	0,0010	0,0010	0,0010	0,0010	0,0010	0,0010	0,0010	0,0010	0,0010	0,0010	0,0009	0,0008	0,0006	0,0002	-0,0002	-0,0002	0,0013
Temperature	B	1,4000	K	0,0003	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0003	0,0003	0,0004	0,0007	0,0011	0,0017	0,0027	0,0043	0,0073	0,0123	0,0221	0,0504
Relative Humidity	B	10,0000	%	0,0006	0,0006	0,0006	0,0006	0,0006	0,0006	0,0006	0,0006	0,0006	0,0006	0,0006	0,0006	0,0007	0,0008	0,0009	0,0011	0,0014	0,0020	0,0029	0,0048	0,0103
Microphone Parameters				**0,0073**	**0,0073**	**0,0073**	**0,0073**	**0,0073**	**0,0073**	**0,0073**	**0,0073**	**0,0073**	**0,0073**	**0,0086**	**0,0086**	**0,0087**	**0,0089**	**0,0095**	**0,0108**	**0,0120**	**0,0105**	**0,0085**	**0,0402**	**0,0980**
Front Cavity Depth	B	0,0030	mm	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0001	0,0001	0,0001	0,0002	0,0003	0,0005	0,0007	0,0012	0,0019	0,0032	0,0054	0,0097	0,0216
Front Cavity Volume	B	0,2100	mm3	0,0045	0,0045	0,0045	0,0045	0,0045	0,0045	0,0045	0,0045	0,0045	0,0045	0,0045	0,0045	0,0045	0,0045	0,0045	0,0046	0,0046	0,0047	0,0047	0,0047	0,0044
Equivalent Volume	B	0,3600	mm3	0,0058	0,0058	0,0058	0,0058	0,0058	0,0058	0,0058	0,0058	0,0057	0,0057	0,0073	0,0072	0,0070	0,0067	0,0063	0,0055	0,0043	0,0023	0,0002	0,0002	0,0114
Resonance Frequency	B	2440	Hz	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0001	0,0003	0,0007	0,0016	0,0023	0,0037	0,0380	0,0737
Loss Factor	B	0,1800		0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0001	0,0002	0,0004	0,0006	0,0010	0,0015	0,0024	0,0036	0,0055	0,0079	0,0099	0,0082	0,0027	0,0077	0,0597
Additional Heat Conduction																								
Caused by Front Cavity Thread	N.A.	Table																						
Polarizing Voltage	B		V	0,0004	0,0004	0,0004	0,0004	0,0004	0,0004	0,0004	0,0004	0,0004	0,0004	0,0004	0,0004	0,0004	0,0004	0,0004	0,0004	0,0004	0,0004	0,0004	0,0004	0,0004
Imperfection of Theory				**0,0004**	**0,0004**	**0,0003**	**0,0003**	**0,0003**	**0,0002**	**0,0002**	**0,0000**	**0,0000**	**0,0000**	**0,0000**	**0,0000**	**0,0000**	**0,0000**	**0,0000**	**0,0000**	**0,0000**	**0,0000**	**0,0000**	**0,0000**	**0,0000**
Heat Conduction Theory	N.A.			0,0004	0,0004	0,0003	0,0003	0,0003	0,0002	0,0002	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000
Adding of Excess Volume	N.A.																							
Radial Wave Motion	N.A.																							
Processing of Results				**0,0047**	**0,0048**	**0,0049**	**0,0050**	**0,0051**	**0,0054**	**0,0054**	**0,0054**	**0,0054**	**0,0055**	**0,0051**	**0,0052**	**0,0055**	**0,0063**	**0,0077**	**0,0110**	**0,0160**	**0,0216**	**0,0238**	**0,0254**	**0,0370**
Rounding Error	B	0,005	dB	0,0029	0,0029	0,0029	0,0029	0,0029	0,0029	0,0029	0,0029	0,0029	0,0029	0,0029	0,0029	0,0029	0,0029	0,0029	0,0029	0,0029	0,0029	0,0029	0,0029	0,0029
Repeatability of Measurements	A	Table	dB	0,0007	0,0009	0,0013	0,0017	0,0019	0,0024	0,0024	0,0025	0,0024	0,0026	0,0010	0,0011	0,0007	0,0017	0,0020	0,0033	0,0042	0,0048	0,0088	0,0187	0,0234
Static Pressure Corrections	B	0,6000	kPa	0,0033	0,0033	0,0033	0,0034	0,0034	0,0034	0,0034	0,0033	0,0032	0,0031	0,0029	0,0026	0,0021	0,0015	0,0006	0,0011	0,0033	0,0047	0,0006	0,0124	0,0273
Temperature Corrections	B	1,4000	K	0,0016	0,0016	0,0016	0,0016	0,0017	0,0017	0,0018	0,0019	0,0021	0,0024	0,0028	0,0033	0,0041	0,0051	0,0068	0,0100	0,0148	0,0203	0,0219	0,0115	0,0078
Combined Uncertainty(Sum)				**0,0112**	**0,0112**	**0,0112**	**0,0113**	**0,0114**	**0,0115**	**0,0115**	**0,0115**	**0,0114**	**0,0115**	**0,0122**	**0,0123**	**0,0124**	**0,0130**	**0,0144**	**0,0175**	**0,0227**	**0,0270**	**0,0299**	**0,0536**	**0,1173**
Expanded Uncertainty (k=2)				**0,0224**	**0,0225**	**0,0225**	**0,0226**	**0,0227**	**0,0229**	**0,0229**	**0,0229**	**0,0229**	**0,0230**	**0,0244**	**0,0245**	**0,0249**	**0,0261**	**0,0288**	**0,0350**	**0,0455**	**0,0540**	**0,0598**	**0,1072**	**0,2345**
Stated Uncertainty				**0,04**	**0,04**	**0,04**	**0,04**	**0,04**	**0,04**	**0,04**	**0,04**	**0,04**	**0,04**	**0,04**	**0,04**	**0,04**	**0,04**	**0,04**	**0,04**	**0,05**	**0,06**	**0,07**	**0,12**	**0,25**

Uncertainty Budget for LS2P (pl	S/N 2412872																							
MEASURED QUANTITY	Type	Unc.	Unit																					
Frequency			Hz	1,9953	2,5119	3,1623	3,9811	5,0119	6,3096	7,9433	10,000	12,589	15,849	19,953	25,119	31,623	39,811	50,119	63,096	79,433	100,00	125,89	158,49	199,53
Electrical Transfer Impedance				**0,3031**	**0,2838**	**0,2688**	**0,2570**	**0,2478**	**0,2406**	**0,2350**	**0,2306**	**0,1580**	**0,1557**	**0,1539**	**0,1516**	**0,1498**	**0,1484**	**0,1473**	**0,1465**	**0,1458**	**0,1453**	**0,1448**	**0,1216**	**0,1212**
Series Impedance	B	Table	nF	0,2976	0,2781	0,2631	0,2512	0,2421	0,2350	0,2295	0,2252	0,1504	0,1483	0,1467	0,1455	0,1445	0,1437	0,1430	0,1425	0,1421	0,1417	0,1414	0,1175	0,1172
Voltage Ratio	B	Table																						
Cross-talk	B	Meas.		0,0298	0,0296	0,0295	0,0294	0,0293	0,0292	0,0292	0,0292	0,0292	0,0293	0,0293	0,0295	0,0298	0,0300	0,0301	0,0302	0,0302	0,0301	0,0301	0,0300	0,0300
Inherent Noise	B	Meas.		0,0492	0,0478	0,0465	0,0452	0,0438	0,0425	0,0411	0,0398	0,0384	0,0371	0,0358	0,0307	0,0260	0,0217	0,0180	0,0149	0,0123	0,0104	0,0089	0,0079	0,0073
Distortion	B	Meas.		0,0013	0,0013	0,0013	0,0013	0,0013	0,0013	0,0013	0,0013	0,0013	0,0013	0,0013	0,0013	0,0013	0,0013	0,0013	0,0013	0,0013	0,0013	0,0013	0,0013	0,0013
Frequency	B	Table	Hz	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000
Reveiver Ground Shield	B	B&K		0,0020	0,0020	0,0020	0,0020	0,0020	0,0020	0,0020	0,0020	0,0020	0,0020	0,0020	0,0020	0,0020	0,0020	0,0020	0,0020	0,0020	0,0020	0,0020	0,0020	0,0020
Transmitter Ground Shield	B	B&K		0,0020	0,0020	0,0020	0,0020	0,0020	0,0020	0,0020	0,0020	0,0020	0,0020	0,0020	0,0020	0,0020	0,0020	0,0020	0,0020	0,0020	0,0020	0,0020	0,0020	0,0020
Coupler Properties				**0,0010**	**0,0010**	**0,0009**	**0,0009**	**0,0008**	**0,0008**	**0,0008**	**0,0007**	**0,0007**	**0,0007**	**0,0006**	**0,0006**	**0,0006**	**0,0005**	**0,0005**	**0,0005**	**0,0005**	**0,0005**	**0,0005**	**0,0005**	**0,0004**
Coupler Length	B	0,0020	mm	0,0005	0,0004	0,0004	0,0004	0,0003	0,0003	0,0003	0,0003	0,0002	0,0002	0,0002	0,0002	0,0002	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001
Coupler Diameter	B	0,0030	mm	0,0001	0,0001	0,0001	0,0001	0,0001	0,0002	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001
Coupler Volume	B	0,2470	mm3	0,0006	0,0005	0,0005	0,0005	0,0005	0,0005	0,0004	0,0004	0,0004	0,0004	0,0003	0,0003	0,0003	0,0002	0,0002	0,0002	0,0002	0,0002	0,0002	0,0002	0,0001
Coupler Surface Area	B	0,1440	mm2	0,0006	0,0005	0,0005	0,0005	0,0005	0,0005	0,0004	0,0004	0,0004	0,0004	0,0003	0,0003	0,0003	0,0002	0,0002	0,0002	0,0002	0,0002	0,0002	0,0002	0,0001
Static Pressure	B	0,6000	kPa	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003
Temperature	B	0,7000	K	0,0002	0,0002	0,0002	0,0002	0,0002	0,0002	0,0003	0,0002	0,0002	0,0002	0,0002	0,0002	0,0003	0,0002	0,0003	0,0002	0,0002	0,0003	0,0003	0,0002	0,0002
Relative Humidity	B	10,0000	%	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001
Microphone Parameters				**0,0056**	**0,0053**	**0,0051**	**0,0048**	**0,0046**	**0,0044**	**0,0042**	**0,0040**	**0,0038**	**0,0036**	**0,0035**	**0,0033**	**0,0032**	**0,0031**	**0,0031**	**0,0030**	**0,0030**	**0,0031**	**0,0032**	**0,0033**	**0,0036**
Front Cavity Depth	B	0,0030	mm	0,0018	0,0017	0,0016	0,0015	0,0015	0,0014	0,0013	0,0012	0,0011	0,0010	0,0009	0,0008	0,0008	0,0007	0,0006	0,0006	0,0005	0,0005	0,0004	0,0004	0,0003
Front Cavity Volume	B	0,2100	mm3	0,0033	0,0031	0,0029	0,0027	0,0025	0,0023	0,0022	0,0020	0,0018	0,0017	0,0015	0,0014	0,0013	0,0011	0,0010	0,0009	0,0009	0,0008	0,0007	0,0006	0,0006
Equivalent Volume	B	0,3600	mm3	0,0033	0,0031	0,0029	0,0027	0,0025	0,0023	0,0022	0,0020	0,0018	0,0017	0,0015	0,0014	0,0013	0,0011	0,0010	0,0009	0,0009	0,0008	0,0007	0,0006	0,0006
Resonance Frequency	B	2440	Hz	0,0004	0,0004	0,0004	0,0005	0,0005	0,0005	0,0005	0,0005	0,0005	0,0005	0,0005	0,0006	0,0006	0,0006	0,0007	0,0008	0,0009	0,0010	0,0011	0,0013	0,0015
Loss Factor	B	0,1800		0,0000	0,0000	0,0000	0,0000	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0002	0,0002	0,0003	0,0004	0,0005	0,0006	0,0008	0,0010	0,0012	0,0015	0,0019
Additional Heat Conduction																								
Caused by Front Cavity Thread	N.A.	Table																						
Polarizing Voltage	B	0,0063	V	0,0025	0,0025	0,0025	0,0025	0,0025	0,0025	0,0025	0,0025	0,0025	0,0025	0,0025	0,0025	0,0025	0,0025	0,0025	0,0025	0,0025	0,0025	0,0025	0,0025	0,0025
Imperfection of Theory				**0,9931**	**0,5489**	**0,1855**	**0,0261**	**0,0922**	**0,0819**	**0,0423**	**0,0093**	**0,0090**	**0,0140**	**0,0118**	**0,0089**	**0,0071**	**0,0063**	**0,0058**	**0,0052**	**0,0047**	**0,0042**	**0,0038**	**0,0034**	**0,0031**
Heat Conduction Theory	N.A.			0,9931	0,5489	0,1855	0,0261	0,0922	0,0819	0,0423	0,0093	0,0090	0,0140	0,0118	0,0089	0,0071	0,0063	0,0058	0,0052	0,0047	0,0042	0,0038	0,0034	0,0031
Adding of Excess Volume	N.A.																							
Radial Wave Motion	N.A.																							
Processing of Results				**1,7155**	**1,2861**	**1,0219**	**0,8466**	**0,6967**	**0,5563**	**0,4237**	**0,3398**	**0,2737**	**0,2175**	**0,1782**	**0,1411**	**0,1156**	**0,0931**	**0,0762**	**0,0652**	**0,0541**	**0,0446**	**0,0405**	**0,0381**	**0,0352**
Rounding Error	B	0,050	degree	0,0289	0,0289	0,0289	0,0289	0,0289	0,0289	0,0289	0,0289	0,0289	0,0289	0,0289	0,0289	0,0289	0,0289	0,0289	0,0289	0,0289	0,0289	0,0289	0,0289	0,0289
Repeatability of Measurements	A	Table	degree	1,7153	1,2857	1,0215	0,8461	0,6961	0,5556	0,4227	0,3386	0,2722	0,2156	0,1758	0,1381	0,1119	0,0885	0,0705	0,0585	0,0458	0,0340	0,0284	0,0249	0,0202
Static Pressure Corrections	B	0,6000		0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0001	0,0001	0,0001	0,0001	0,0001	0,0002	0,0002	0,0003	0,0004	0,0004	0,0005	0,0007	0,0008
Temperature Corrections	B	1,4000		0,0000	0,0000	0,0000	0,0000	0,0001	0,0001	0,0001	0,0001	0,0001	0,0002	0,0002	0,0003	0,0003	0,0004	0,0005	0,0007	0,0009	0,0011	0,0013	0,0017	0,0021
Combined Uncertainty(Sum)				**2,0053**	**1,4268**	**1,0728**	**0,8851**	**0,7452**	**0,6117**	**0,4863**	**0,4108**	**0,3162**	**0,2679**	**0,2357**	**0,2073**	**0,1894**	**0,1753**	**0,1660**	**0,1604**	**0,1556**	**0,1521**	**0,1505**	**0,1275**	**0,1263**
Expanded Uncertainty (k=2)				**4,0106**	**2,8536**	**2,1456**	**1,7703**	**1,4903**	**1,2233**	**0,9727**	**0,8216**	**0,6324**	**0,5358**	**0,4715**	**0,4146**	**0,3787**	**0,3507**	**0,3319**	**0,3209**	**0,3113**	**0,3041**	**0,3009**	**0,2550**	**0,2526**
Stated Uncertainty				**4,00**	**3**	**2,5**	**2**	**1,5**	**1,5**	**1,5**	**1**	**1**	**0,8**	**0,6**	**0,5**	**0,5**	**0,4**	**0,4**	**0,4**	**0,4**	**0,4**	**0,4**	**0,3**	**0,3**

2412872 Phase

Uncertainty Budget for LS2P (pl	S/N 2412872																							
MEASURED QUANTITY	Type	Unc.	Unit																					
Frequency			Hz	251,19	316,23	398,11	501,19	630,96	794,33	1000,0	1258,9	1584,9	1995,3	2511,9	3162,3	3981,1	5011,9	6309,6	7943,3	10000	12589	15849	19953	25119
Electrical Transfer Impedance				**0,1209**	**0,1206**	**0,1148**	**0,1144**	**0,1139**	**0,1132**	**0,1123**	**0,1112**	**0,1097**	**0,1077**	**0,1101**	**0,1066**	**0,1018**	**0,0951**	**0,0855**	**0,0738**	**0,0718**	**0,0718**	**0,0718**	**0,0718**	**0,0718**
Series Impedance	B	Table	nF	0,1169	0,1166	0,1106	0,1101	0,1096	0,1088	0,1079	0,1068	0,1053	0,1033	0,1058	0,1022	0,0970	0,0895	0,0783	0,0628	0,0559	0,0559	0,0559	0,0559	0,0559
Voltage Ratio	B	Table																						
Cross-talk	B	Meas.		0,0300	0,0300	0,0300	0,0301	0,0301	0,0301	0,0300	0,0299	0,0297	0,0295	0,0295	0,0296	0,0302	0,0315	0,0339	0,0380	0,0444	0,0444	0,0444	0,0444	0,0444
Inherent Noise	B	Meas.		0,0070	0,0069	0,0070	0,0072	0,0074	0,0076	0,0076	0,0075	0,0073	0,0070	0,0066	0,0061	0,0057	0,0055	0,0056	0,0063	0,0077	0,0077	0,0077	0,0077	0,0077
Distortion	B	Meas.		0,0013	0,0013	0,0013	0,0013	0,0013	0,0013	0,0013	0,0013	0,0013	0,0013	0,0013	0,0013	0,0013	0,0013	0,0013	0,0013	0,0013	0,0013	0,0013	0,0013	0,0013
Frequency	B	Table	Hz	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000
Reveiver Ground Shield	B	B&K		0,0020	0,0020	0,0020	0,0020	0,0020	0,0020	0,0020	0,0020	0,0020	0,0020	0,0020	0,0020	0,0020	0,0020	0,0020	0,0020	0,0020	0,0020	0,0020	0,0020	0,0020
Transmitter Ground Shield	B	B&K		0,0020	0,0020	0,0020	0,0020	0,0020	0,0020	0,0020	0,0020	0,0020	0,0020	0,0020	0,0020	0,0020	0,0020	0,0020	0,0020	0,0020	0,0020	0,0020	0,0020	0,0020
Coupler Properties				**0,0002**	**0,0009**	**0,0019**	**0,0032**	**0,0048**	**0,0069**	**0,0095**	**0,0116**	**0,0133**	**0,0155**	**0,0172**	**0,0192**	**0,0217**	**0,0242**	**0,0241**	**0,0175**	**0,0550**	**0,1869**	**0,4118**	**0,6228**	**0,5573**
Coupler Length	B	0,0020	mm	0,0001	0,0000	0,0001	0,0000	0,0000	0,0000	0,0000	0,0001	0,0000	0,0001	0,0001	0,0001	0,0001	0,0002	0,0002	0,0003	0,0005	0,0008	0,0016	0,0035	0,0113
Coupler Diameter	B	0,0030	mm	0,0001	0,0000	0,0000	0,0000	0,0001	0,0000	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0002	0,0002	0,0002	0,0002	0,0000	0,0005	0,0021	0,0065
Coupler Volume	B	0,2470	mm3	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0002	0,0002	0,0003	0,0003	0,0004	0,0005	0,0007	0,0009	0,0011	0,0015	0,0048
Coupler Surface Area	B	0,1440	mm2	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0002	0,0002	0,0003	0,0003	0,0004	0,0005	0,0007	0,0009	0,0011	0,0015	0,0048
Static Pressure	B	0,6000	kPa	0,0000	0,0007	0,0014	0,0025	0,0037	0,0053	0,0073	0,0090	0,0106	0,0125	0,0145	0,0167	0,0193	0,0222	0,0233	0,0155	0,0182	0,1057	0,2576	0,4066	0,3748
Temperature	B	0,7000	K	0,0000	0,0006	0,0012	0,0020	0,0031	0,0044	0,0061	0,0073	0,0081	0,0090	0,0092	0,0095	0,0098	0,0095	0,0063	0,0081	0,0519	0,1541	0,3213	0,4717	0,4122
Relative Humidity	B	10,0000	%	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001
Microphone Parameters				**0,0038**	**0,0043**	**0,0050**	**0,0060**	**0,0072**	**0,0088**	**0,0109**	**0,0140**	**0,0173**	**0,0214**	**0,0349**	**0,0430**	**0,0523**	**0,0627**	**0,0738**	**0,0869**	**0,1090**	**0,1399**	**0,1371**	**0,3251**	**1,2267**
Front Cavity Depth	B	0,0030	mm	0,0003	0,0003	0,0002	0,0002	0,0002	0,0002	0,0002	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0000	0,0001	0,0002	0,0005	0,0011	0,0023	0,0039	0,0046
Front Cavity Volume	B	0,2100	mm3	0,0005	0,0004	0,0004	0,0004	0,0004	0,0003	0,0003	0,0003	0,0003	0,0003	0,0004	0,0004	0,0005	0,0005	0,0006	0,0007	0,0009	0,0012	0,0022	0,0061	0,0279
Equivalent Volume	B	0,3600	mm3	0,0005	0,0004	0,0004	0,0004	0,0004	0,0003	0,0003	0,0003	0,0003	0,0003	0,0004	0,0004	0,0005	0,0005	0,0006	0,0007	0,0009	0,0012	0,0022	0,0061	0,0279
Resonance Frequency	B	2440	Hz	0,0014	0,0017	0,0020	0,0024	0,0029	0,0035	0,0044	0,0066	0,0082	0,0101	0,0176	0,0222	0,0280	0,0361	0,0481	0,0683	0,1022	0,1396	0,1329	0,1676	1,0639
Loss Factor	B	0,1800		0,0024	0,0030	0,0039	0,0049	0,0061	0,0077	0,0096	0,0121	0,0151	0,0187	0,0300	0,0367	0,0441	0,0512	0,0559	0,0536	0,0377	0,0096	0,0332	0,2785	0,6093
Additional Heat Conduction																								
Caused by Front Cavity Thread	N.A.	Table																						
Polarizing Voltage	B	0,0063	V	0,0025	0,0025	0,0025	0,0025	0,0025	0,0025	0,0025	0,0025	0,0025	0,0025	0,0025	0,0025	0,0025	0,0025	0,0025	0,0025	0,0025	0,0025	0,0025	0,0025	0,0025
Imperfection of Theory				**0,0028**	**0,0025**	**0,0023**	**0,0021**	**0,0020**	**0,0018**	**0,0017**	**0,0000**	**0,0000**	**0,0000**	**0,0000**	**0,0000**	**0,0000**	**0,0000**	**0,0000**	**0,0000**	**0,0000**	**0,0000**	**0,0000**	**0,0000**	**0,0000**
Heat Conduction Theory	N.A.			0,0028	0,0025	0,0023	0,0021	0,0020	0,0018	0,0017	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000
Adding of Excess Volume	N.A.																							
Radial Wave Motion	N.A.																							
Processing of Results				**0,0330**	**0,0876**	**0,0730**	**0,0616**	**0,0529**	**0,0454**	**0,0408**	**0,0375**	**0,0343**	**0,0327**	**0,0302**	**0,0316**	**0,0316**	**0,0340**	**0,0370**	**0,0413**	**0,0482**	**0,0776**	**0,1371**	**0,2121**	**0,3205**
Rounding Error	B	0,050	degree	0,0289	0,0289	0,0289	0,0289	0,0289	0,0289	0,0289	0,0289	0,0289	0,0289	0,0289	0,0289	0,0289	0,0289	0,0289	0,0289	0,0289	0,0289	0,0289	0,0289	0,0289
Repeatability of Measurements	A	Table	degree	0,0159	0,0826	0,0670	0,0543	0,0443	0,0350	0,0287	0,0239	0,0183	0,0152	0,0087	0,0127	0,0128	0,0179	0,0229	0,0273	0,0251	0,0275	0,0270	0,1117	0,2823
Static Pressure Corrections	B	0,6000		0,0010	0,0012	0,0014	0,0017	0,0020	0,0022	0,0024	0,0025	0,0025	0,0023	0,0019	0,0012	0,0003	0,0010	0,0037	0,0112	0,0292	0,0665	0,1313	0,1780	0,1489
Temperature Corrections	B	1,4000		0,0026	0,0032	0,0040	0,0048	0,0059	0,0072	0,0087	0,0103	0,0124	0,0146	0,0173	0,0206	0,0250	0,0301	0,0356	0,0376	0,0270	0,0111	0,0986	0,1894	0,1989
Combined Uncertainty(Sum)				**0,1254**	**0,1491**	**0,1362**	**0,1301**	**0,1259**	**0,1225**	**0,1204**	**0,1187**	**0,1170**	**0,1156**	**0,1206**	**0,1207**	**0,1207**	**0,1213**	**0,1213**	**0,1225**	**0,1496**	**0,2563**	**0,4608**	**0,7373**	**1,3868**
Expanded Uncertainty (k=2)				**0,2509**	**0,2983**	**0,2724**	**0,2603**	**0,2518**	**0,2450**	**0,2408**	**0,2375**	**0,2339**	**0,2313**	**0,2412**	**0,2414**	**0,2413**	**0,2425**	**0,2426**	**0,2450**	**0,2992**	**0,5126**	**0,9216**	**1,4747**	**2,7736**
Stated Uncertainty				**0,3**	**0,3**	**0,3**	**0,3**	**0,3**	**0,3**	**0,3**	**0,3**	**0,3**	**0,3**	**0,3**	**0,3**	**0,3**	**0,3**	**0,3**	**0,3**	**0,4**	**0,6**	**1**	**1,5**	**3**

LNE

The uncertainty on the pressure sensitivity level was determined in accordance with the Guide to the Expression of Uncertainties in Measurement. Uncertainty of measurement are reported using a coverage factor of k = 2.

A condensed uncertainty budget is given in Annex A for the level and phase. The uncertainty budget includes all components listed in the Table 1 of the standard IEC 61094-2:2009.

Note 1: Separate uncertainty budget is provided for microphone 2124385 given the low static pressure during the measurements.

Note 2: In order to be compliant with the standard IEC 61094 2:2009, the effect of heat conduction in the coupler on sensitivity level and phase has been accounted by using the “Broad-band” solution, despite the literature seems providing a better formulation at low frequencies (*P. Vincent, D. Rodrigues, F. Larsonnier, C. Guianvarc'h, S. Durand. Acoustic transfer admittance of cylindrical cavities in infrasonic frequency range. Metrologia, Volume 56, Number 1*). The “Heat conduction theory” component is added in the uncertainty budgets to take account the deviation of the “Broad-band” solution to ideal solution. This uncertainty component could be reduced if accounting the heat conduction effects with the formulation provided in the above paper.

Microphone 2412872: Level

Frequency (Hz)	1,995	2,512	3,162	3,981	5,012	6,310	7,943	10,000	12,589	15,849	19,953	25,119	31,623	39,811	50,119	63,096	79,433	100,00
Components of type B uncertainties in dB*1000																		
Series impedance	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9
Voltage ratio	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9
Cross talk	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5
Inherent and ambient noise	17,3	14,8	11,7	7,8	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9
Distortion	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6
Frequency	6,4	7,6	6,1	6,5	5,1	5,1	4,9	5,2	4,7	4,5	4,3	4,2	4,2	4,0	3,7	3,6	3,4	3,2
Receiver ground shield	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5
Transmitter ground shield	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5
Electrical Transfer Impedance (u_1)	18,9	17,2	13,9	11,0	7,2	7,2	7,1	7,3	6,9	6,8	6,7	6,6	6,6	6,5	6,3	6,2	6,1	6,1
Coupler length	6,5	6,6	6,6	6,7	6,8	6,8	6,8	6,9	6,9	7,0	7,0	7,0	7,0	7,1	7,1	7,1	7,1	7,1
Coupler diameter	8,5	8,5	8,5	8,6	8,6	8,6	8,7	8,7	8,7	8,7	8,8	8,8	8,8	8,8	8,8	8,8	8,8	8,9
Unintentional coupler/microphone leakage	12,7	9,8	7,5	5,8	4,5	3,5	2,7	2,1	1,7	1,4	1,1	0,9	0,8	0,7	0,6	0,5	0,5	0,4
Static pressure	2,3	2,3	2,2	2,2	2,2	2,2	2,2	2,2	2,1	2,1	2,1	2,1	2,1	2,1	2,1	2,1	2,1	2,1
Temperature	0,6	0,6	0,5	0,5	0,5	0,4	0,4	0,4	0,3	0,3	0,3	0,2	0,2	0,2	0,2	0,2	0,2	0,2
Relative humidity	0,0	0,0	0,0	0,0	0,0	0,0	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1
Coupler properties (u_1)	16,8	14,7	13,4	12,5	12,0	11,7	11,6	11,5	11,5	11,5	11,5	11,5	11,5	11,5	11,5	11,5	11,6	11,6
Front cavities depth	9,1	9,2	9,3	9,4	9,5	9,6	9,6	9,7	9,8	9,8	9,9	9,9	9,9	10,0	10,0	10,0	10,0	10,1
Front cavities diameter	5,3	5,1	4,9	4,8	4,6	4,4	4,3	4,1	4,0	3,9	3,8	3,7	3,6	3,5	3,4	3,4	3,3	3,3
Equivalent volumes	5,7	5,8	6,0	6,1	6,3	6,4	6,5	6,6	6,7	6,8	6,8	6,9	7,0	7,0	7,1	7,1	7,2	7,2
Resonance frequencies	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Loss factors	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Polarizing voltage	2,5	2,5	2,5	2,5	2,5	2,5	2,5	2,5	2,5	2,5	2,5	2,5	2,5	2,5	2,5	2,5	2,5	2,5
Microphone parameters (u_1)	12,3	12,3	12,4	12,5	12,5	12,6	12,6	12,7	12,7	12,8	12,8	12,9	12,9	12,9	13,0	13,0	13,0	13,0
Heat conduction theory	96,2	75,0	58,5	45,6	35,6	27,8	21,7	16,9	13,2	10,3	8,0	6,3	4,9	3,8	3,0	2,3	1,8	1,4
Adding of excess volume	0,8	0,8	0,8	0,9	0,9	0,9	0,9	0,9	0,9	0,9	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,0
Viscosity losses	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1
Radial wave-motion	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Imperfection of theory (u_1)	96,2	75,0	58,5	45,6	35,6	27,8	21,7	16,9	13,2	10,3	8,1	6,3	5,0	3,9	3,1	2,5	2,1	1,7
Static pressure corrections	2,7	2,7	2,7	2,7	2,7	2,7	2,7	2,7	2,7	2,7	2,7	2,7	2,7	2,7	2,7	2,7	2,7	2,7
Temperature corrections	2,1	2,1	2,1	2,1	2,1	2,1	2,1	2,1	2,1	2,1	2,1	2,1	2,1	2,1	2,1	2,1	2,1	2,1
Processing of results (u_2)	3,4	3,4	3,4	3,4	3,4	3,4	3,4	3,4	3,4	3,4	3,4	3,4	3,4	3,4	3,4	3,4	3,4	3,4
Rounding error (u_1)	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3
Components of type A uncertainties in dB*1000																		
Repeatability of measurements (u_1)	13,4	8,9	6,7	4,5	4,5	4,5	4,5	4,5	4,5	4,5	4,5	4,5	4,5	4,5	4,5	4,5	4,5	4,5
Expanded uncertainty in dB (k=2) $2\sqrt{\sum u_1^2/2+4\sum u_2^2/2}$	0,143	0,113	0,090	0,072	0,058	0,049	0,042	0,037	0,034	0,032	0,031	0,030	0,029	0,029	0,029	0,029	0,029	0,029
Declared values in dB (k=2)	**0,145**	**0,115**	**0,090**	**0,075**	**0,060**	**0,050**	**0,045**	**0,040**	**0,035**	**0,035**	**0,035**	**0,030**	**0,030**	**0,030**	**0,030**	**0,030**	**0,030**	**0,030**

Frequency (Hz)	125,89	158,49	199,53	251,19	316,23	398,11	501,19	630,96	794,33	1000,0	1258,9	1584,9	1995,3	2511,9	3162,3	3981,1	5011,9	6309,6	7943,3	10000	12589	15849	19953	25119
Components of type B uncertainties in dB*1000																								
Series impedance	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9
Voltage ratio	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9
Cross talk	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,6	0,6	0,7	0,8	0,9	1,1	1,5	2,1	3,0	4,5	6,8	10,5	16,4
Inherent and ambient noise	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9
Distortion	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6
Frequency	3,2	3,0	2,9	2,8	2,6	2,5	2,4	2,3	2,2	2,1	2,0	1,9	1,8	1,8	1,7	1,6	1,5	1,4	1,3	1,1	1,0	1,0	1,2	3,1
Receiver ground shield	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5
Transmitter ground shield	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5
Electrical Transfer Impedance (u_1)	6,0	5,9	5,9	5,8	5,7	5,7	5,7	5,6	5,6	5,5	5,5	5,5	5,4	5,4	5,4	5,4	5,4	5,5	5,6	6,0	6,9	8,6	11,8	17,4
Coupler length	7,2	7,2	7,2	7,2	7,2	7,2	7,2	7,2	7,2	7,2	7,2	7,2	7,1	7,1	6,9	6,8	6,5	6,1	5,4	4,2	2,1	1,5	9,0	31,4
Coupler diameter	8,9	8,9	8,9	8,9	8,9	8,9	8,9	8,9	8,9	8,9	8,9	8,9	8,9	8,9	8,9	9,0	9,0	9,0	9,1	9,1	9,2	9,4	9,4	8,9
Unintentional coupler/microphone leakage	0,4	0,4	0,4	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3
Static pressure	2,1	2,1	2,0	2,0	2,0	2,0	2,0	2,0	2,0	2,0	2,0	2,0	2,0	2,0	2,0	2,0	2,0	2,0	2,1	2,1	2,1	2,1	2,1	2,0
Temperature	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,2	0,2	0,3	0,5	0,7	1,2	2,0	3,5	8,1
Relative humidity	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,2	0,2	0,2	0,2	0,2	0,3	0,3	0,4	0,6	1,0	2,0
Coupler properties (u_1)	11,6	11,6	11,6	11,6	11,6	11,6	11,6	11,6	11,6	11,6	11,6	11,6	11,6	11,6	11,5	11,4	11,3	11,1	10,7	10,3	9,8	10,0	13,7	33,7
Front cavities depth	10,1	10,1	10,1	10,1	10,1	10,1	10,1	10,1	10,1	10,1	10,1	10,1	10,0	9,9	9,8	9,5	9,2	8,5	7,5	5,9	3,0	2,1	12,7	44,2
Front cavities diameter	3,2	3,2	3,1	3,1	3,1	3,0	3,0	3,0	3,0	3,0	3,0	2,9	2,9	2,9	2,9	2,9	2,9	2,8	2,8	2,9	3,0	3,7	5,9	15,7
Equivalent volumes	7,2	7,3	7,3	7,3	7,3	7,3	7,3	7,4	7,4	7,4	7,4	7,3	7,3	7,2	7,1	6,9	6,6	6,1	5,3	4,1	2,1	0,3	0,8	8,7
Resonance frequencies	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,1	0,1	0,2	0,3	0,5	0,8	1,4	2,2	2,3	3,0	23,6	47,7
Loss factors	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,1	0,1	0,2	0,2	0,4	0,6	0,9	1,4	2,0	2,4	1,9	0,9	3,1	13,0
Polarizing voltage	2,5	2,5	2,5	2,5	2,5	2,5	2,5	2,5	2,5	2,5	2,5	2,5	2,5	2,5	2,5	2,5	2,5	2,5	2,5	2,5	2,5	2,5	2,5	2,5
Microphone parameters (u_1)	13,0	13,1	13,1	13,1	13,1	13,1	13,1	13,1	13,1	13,1	13,1	13,0	13,0	12,9	12,7	12,4	12,0	11,3	10,3	8,7	6,2	5,9	27,7	68,7
Heat conduction theory	1,1	0,9	0,7	0,5	0,4	0,3	0,2	0,2	0,2	0,1	0,1	0,1	0,1	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Adding of excess volume	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,1	1,1	1,1	1,1	1,1	1,2	1,3	1,5	1,8	2,6	5,4
Viscosity losses	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,2	0,2	0,2	0,2	0,2	0,3	0,3	0,4	0,6	0,9	1,5
Radial wave-motion	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,3	0,4	0,4	0,4	0,5	0,5	0,6	0,7	1,0	1,3	1,9	3,2	5,9	12,8	34,1
Imperfection of theory (u_1)	1,5	1,3	1,2	1,2	1,1	1,1	1,1	1,1	1,1	1,1	1,1	1,1	1,1	1,2	1,2	1,3	1,3	1,5	1,8	2,3	3,5	6,2	13,1	34,6
Static pressure corrections	2,7	2,7	2,7	2,7	2,7	2,7	2,7	2,7	2,8	2,8	2,8	2,8	2,9	3,0	3,1	3,4	3,7	4,2	4,8	5,7	6,9	8,4	10,3	12,9
Temperature corrections	2,1	2,1	2,1	2,1	2,1	2,1	2,1	2,1	2,1	2,1	2,1	2,1	2,1	2,1	2,1	2,1	2,1	2,1	2,1	2,1	2,2	2,2	2,3	2,5
Processing of results (u_2)	3,4	3,4	3,4	3,4	3,4	3,4	3,4	3,4	3,4	3,5	3,5	3,5	3,6	3,7	3,8	4,0	4,3	4,7	5,3	6,1	7,2	8,7	10,6	13,1
Rounding error (u_1)	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3
Components of type A uncertainties in dB*1000																								
Repeatability of measurements (u_1)	4,5	4,5	4,5	4,5	4,5	4,5	4,5	4,5	4,5	4,5	4,5	4,5	4,5	4,5	4,5	4,5	4,5	4,5	4,5	4,5	4,5	4,5	6,7	11,2
Expanded uncertainty in dB (k=2) $2\sqrt{\sum u_1^2/2+4\sum u_2^2/2}$	0,029	0,029	0,029	0,029	0,029	0,029	0,029	0,029	0,029	0,029	0,029	0,028	0,028	0,028	0,028	0,028	0,028	0,028	0,028	0,028	0,029	0,034	0,059	0,128
Declared values in dB (k=2)	**0,030**	**0,030**	**0,030**	**0,030**	**0,030**	**0,030**	**0,030**	**0,030**	**0,030**	**0,030**	**0,030**	**0,030**	**0,030**	**0,030**	**0,030**	**0,030**	**0,030**	**0,030**	**0,030**	**0,030**	**0,030**	**0,035**	**0,060**	**0,130**

Microphone 2412872: Phase

Frequency (Hz)	1,995	2,512	3,162	3,981	5,012	6,310	7,943	10,000	12,589	15,849	19,953	25,119	31,623	39,811	50,119	63,096	79,433	100,00	125,89	158,49	199,53
Components of type B uncertainties in degree*100																					
Series impedance	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9
Voltage ratio	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9
Cross talk	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5
Inherent and ambient noise	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9
Distortion	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6
Frequency	0,2	0,2	0,2	0,2	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Receiver ground shield	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5
Transmitter ground shield	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5
Electrical Transfer Impedance (u_1)	5,1	5,1	5,1	5,1	5,1	5,1	5,1	5,1	5,1	5,1	5,1	5,1	5,1	5,1	5,1	5,1	5,1	5,1	5,1	5,1	5,1
Coupler length	0,3	0,3	0,3	0,3	0,3	0,2	0,2	0,2	0,2	0,2	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1
Coupler diameter	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,0	0,0	0,0	0,0
Unintentional coupler/microphone leakage	0,5	0,4	0,3	0,2	0,2	0,2	0,1	0,1	0,1	0,1	0,1	0,1	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Static pressure	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Temperature	0,2	0,2	0,2	0,2	0,2	0,2	0,2	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,0	0,0
Relative humidity	0,1	0,1	0,1	0,1	0,1	0,1	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Coupler properties (u_1)	0,7	0,6	0,5	0,4	0,4	0,4	0,3	0,3	0,3	0,2	0,2	0,2	0,2	0,2	0,2	0,1	0,1	0,1	0,1	0,1	0,1
Front cavities depth	0,5	0,4	0,4	0,4	0,4	0,3	0,3	0,3	0,3	0,2	0,2	0,2	0,2	0,2	0,1	0,1	0,1	0,1	0,1	0,1	0,1
Front cavities diameter	0,9	0,9	0,8	0,8	0,8	0,7	0,7	0,6	0,6	0,5	0,5	0,4	0,4	0,4	0,3	0,3	0,3	0,3	0,2	0,2	0,2
Equivalent volumes	0,7	0,7	0,7	0,6	0,6	0,5	0,5	0,5	0,4	0,4	0,4	0,3	0,3	0,3	0,2	0,2	0,2	0,2	0,1	0,1	0,1
Resonance frequencies	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,1	0,1	0,1
Loss factors	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,1
Polarizing voltage	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1
Microphone parameters (u_1)	1,3	1,2	1,2	1,1	1,0	1,0	0,9	0,8	0,8	0,7	0,6	0,6	0,5	0,5	0,4	0,4	0,4	0,3	0,3	0,3	0,3
Heat conduction theory	290,0	183,0	115,5	72,9	46,0	29,0	18,3	11,5	7,3	4,6	2,9	1,8	1,2	0,7	0,5	0,3	0,2	0,1	0,1	0,0	0,0
Adding of excess volume	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Viscosity losses	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Radial wave-motion	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Imperfection of theory (u_1)	290,0	183,0	115,5	72,9	46,0	29,0	18,3	11,5	7,3	4,6	2,9	1,8	1,2	0,7	0,5	0,3	0,2	0,1	0,1	0,1	0,0
Static pressure corrections	1,4	1,4	1,4	1,4	1,4	1,4	1,4	1,4	1,4	1,4	1,4	1,4	1,4	1,4	1,4	1,4	1,4	1,4	1,4	1,4	1,4
Temperature corrections	2,1	2,1	2,1	2,1	2,1	2,1	2,1	2,1	2,1	2,1	2,1	2,1	2,1	2,1	2,1	2,1	2,1	2,1	2,1	2,1	2,1
Processing of results (u_2)	2,5	2,5	2,5	2,5	2,5	2,5	2,5	2,5	2,5	2,5	2,5	2,5	2,5	2,5	2,5	2,5	2,5	2,5	2,5	2,5	2,5
Rounding error (u_1)	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3
Components of type A uncertainties in degree*100																					
Repeatability of measurements (u_1)	26,8	22,4	17,9	13,4	11,2	8,9	8,9	6,7	6,7	4,5	4,5	2,2	2,2	2,2	2,2	2,2	2,2	2,2	2,2	2,2	2,2
Expanded uncertainty in dB (k=2) $2\sqrt{\sum u_1^2/2+4\sum u_2^2/2}$	4,12	2,61	1,66	1,05	0,68	0,44	0,31	0,21	0,17	0,14	0,13	0,11	0,11	0,11	0,11	0,11	0,11	0,11	0,11	0,11	0,11
Declared values in degree (k=2)	**4,15**	**2,65**	**1,70**	**1,10**	**0,70**	**0,45**	**0,35**	**0,25**	**0,20**	**0,15**	**0,15**	**0,15**	**0,15**	**0,15**	**0,15**	**0,15**	**0,15**	**0,15**	**0,15**	**0,15**	**0,15**

Frequency (Hz)	251,19	316,23	398,11	501,19	630,96	794,33	1000,0	1258,9	1584,9	1995,3	2511,9	3162,3	3981,1	5011,9	6309,6	7943,3	10000	12589	15849	19953	25119
Components of type B uncertainties in degree*100																					
Series impedance	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9
Voltage ratio	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9
Cross talk	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,6	0,6	0,7	0,8	0,9	1,1	1,5	2,1	3,0	4,5	6,8	10,5	16,4
Inherent and ambient noise	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9
Distortion	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6
Frequency	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,1	0,2	0,4
Receiver ground shield	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5
Transmitter ground shield	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5
Electrical Transfer Impedance (u_1)	5,1	5,1	5,1	5,1	5,1	5,1	5,1	5,1	5,1	5,1	5,1	5,1	5,2	5,2	5,3	5,5	5,9	6,8	8,5	11,7	17,2
Coupler length	0,1	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,1	0,1	0,1	0,1	0,1	0,2	0,3	0,6	1,4	5,0
Coupler diameter	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,3	0,9
Unintentional coupler/microphone leakage	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Static pressure	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,1	0,2
Temperature	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,1	0,1	0,3	1,2
Relative humidity	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,1	0,3
Coupler properties (u_1)	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,2	0,2	0,4	0,7	1,5	5,2
Front cavities depth	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,2	0,3	0,5	0,9	2,0	7,0
Front cavities diameter	0,2	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,1	0,1	0,3
Equivalent volumes	0,1	0,0	0,0	0,0	0,1	0,1	0,2	0,2	0,3	0,4	0,6	0,7	0,9	1,1	1,3	1,5	1,5	1,0	0,9	5,9	16,2
Resonance frequencies	0,1	0,1	0,2	0,2	0,3	0,3	0,4	0,5	0,6	0,8	1,0	1,3	1,6	2,0	2,5	2,9	3,0	2,1	0,1	4,5	47,3
Loss factors	0,1	0,1	0,1	0,1	0,2	0,2	0,3	0,3	0,4	0,5	0,6	0,8	1,0	1,1	1,2	1,2	0,8	0,3	0,6	5,7	16,0
Polarizing voltage	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1
Microphone parameters (u_1)	0,2	0,2	0,3	0,3	0,4	0,4	0,5	0,7	0,9	1,1	1,3	1,7	2,1	2,6	3,1	3,5	3,5	2,4	1,4	9,6	52,9
Heat conduction theory	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Adding of excess volume	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,1	0,6
Viscosity losses	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,1	0,1	0,1	0,3	0,6	1,8
Radial wave-motion	0,0	0,0	0,0	0,0	0,0	0,0	0,3	0,4	0,4	0,4	0,5	0,5	0,6	0,7	1,0	1,3	1,9	3,2	5,9	12,8	34,1
Imperfection of theory (u_1)	0,0	0,0	0,0	0,0	0,0	0,0	0,3	0,4	0,4	0,4	0,5	0,5	0,6	0,7	1,0	1,3	1,9	3,2	5,9	12,8	34,2
Static pressure corrections	1,4	1,4	1,4	1,5	1,5	1,6	1,7	1,9	2,1	2,4	2,9	3,5	4,2	5,2	6,5	8,1	10,1	12,7	15,9	20,0	25,2
Temperature corrections	2,1	2,1	2,1	2,1	2,1	2,1	2,1	2,1	2,1	2,1	2,1	2,1	2,1	2,1	2,1	2,1	2,1	2,1	2,1	2,1	2,1
Processing of results (u_2)	2,5	2,5	2,5	2,6	2,6	2,6	2,7	2,8	3,0	3,2	3,5	4,0	4,7	5,6	6,8	8,3	10,3	12,8	16,0	20,1	25,2
Rounding error (u_1)	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3
Components of type A uncertainties in degree*100																					
Repeatability of measurements (u_1)	2,2	2,2	2,2	2,2	2,2	2,2	2,2	2,2	2,2	2,2	2,2	2,2	2,2	2,2	2,2	2,2	2,2	2,2	4,5	4,5	4,5
Expanded uncertainty in dB (k=2) $2\sqrt{\sum u_1^2/2+4\sum u_2^2/2}$	0,11	0,11	0,11	0,11	0,11	0,11	0,11	0,11	0,12	0,12	0,13	0,14	0,16	0,18	0,21	0,26	0,31	0,38	0,48	0,64	1,17
Declared values in degree (k=2)	**0,15**	**0,15**	**0,15**	**0,15**	**0,15**	**0,15**	**0,15**	**0,15**	**0,15**	**0,15**	**0,15**	**0,15**	**0,20**	**0,20**	**0,25**	**0,30**	**0,35**	**0,40**	**0,50**	**0,65**	**1,20**

Microphone 2124385: Level

Frequency (Hz)	1,995	2,512	3,162	3,981	5,012	6,310	7,943	10,000	12,589	15,849	19,953	25,119	31,623	39,811	50,119	63,096	79,433	100,00	125,89	158,49	199,53	251,19	316,23	398,11	501,19	630,96	794,33	1000,0	1258,9	1584,9	1995,3	2511,9	3162,3	3981,1	5011,9	6309,6	7943,3	10000	12589	15849	19953	25119
Components of type B uncertainties in dB*1000																																										
Series impedance	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9
Voltage ratio	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9
Cross talk	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,6	0,6	0,7	0,8	0,9	1,1	1,5	2,1	3,0	4,5	6,8	10,5	16,4
Inherent and ambient noise	17,3	14,8	11,7	7,8	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9
Distortion	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6
Frequency	6,4	7,6	6,1	6,5	5,1	5,1	4,9	5,2	4,7	4,5	4,3	4,2	4,2	4,0	3,7	3,6	3,4	3,2	3,2	3,0	2,9	2,8	2,6	2,5	2,4	2,3	2,2	2,1	2,0	1,9	1,8	1,8	1,7	1,6	1,5	1,4	1,3	1,1	1,0	1,0	1,2	3,1
Receiver ground shield	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5
Transmitter ground shield	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5
Electrical Transfer Impedance (u_1)	18,9	17,2	13,9	11,0	7,2	7,2	7,1	7,3	6,9	6,8	6,7	6,6	6,6	6,5	6,3	6,2	6,1	6,1	6,0	5,9	5,9	5,8	5,7	5,7	5,7	5,6	5,6	5,5	5,5	5,5	5,4	5,4	5,4	5,4	5,4	5,5	5,6	6,0	6,9	8,6	11,8	17,4
Coupler length	6,5	6,6	6,6	6,7	6,8	6,8	6,8	6,9	6,9	7,0	7,0	7,0	7,0	7,1	7,1	7,1	7,1	7,1	7,2	7,2	7,2	7,2	7,2	7,2	7,2	7,2	7,2	7,2	7,2	7,2	7,1	7,1	6,9	6,8	6,5	6,1	5,4	4,2	2,1	1,5	9,0	31,4
Coupler diameter	8,5	8,5	8,5	8,6	8,6	8,6	8,7	8,7	8,7	8,7	8,8	8,8	8,8	8,8	8,8	8,8	8,8	8,9	8,9	8,9	8,9	8,9	8,9	8,9	8,9	8,9	8,9	8,9	8,9	8,9	8,9	8,9	8,9	9,0	9,0	9,0	9,1	9,1	9,2	9,4	9,4	8,9
Unintentional coupler/microphone leakage	12,7	9,8	7,5	5,8	4,5	3,5	2,7	2,1	1,7	1,4	1,1	0,9	0,8	0,7	0,6	0,5	0,5	0,4	0,4	0,4	0,4	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3
Static pressure	2,3	2,3	2,2	2,2	2,2	2,2	2,2	2,2	2,1	2,1	2,1	2,1	2,1	2,1	2,1	2,1	2,1	2,1	2,1	2,1	2,0	2,0	2,0	2,0	2,0	2,0	2,0	2,0	2,0	2,0	2,0	2,0	2,0	2,0	2,0	2,0	2,1	2,1	2,1	2,1	2,1	2,0
Temperature	0,6	0,6	0,5	0,5	0,5	0,4	0,4	0,4	0,3	0,3	0,3	0,2	0,2	0,2	0,2	0,2	0,2	0,2	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,2	0,2	0,3	0,5	0,7	1,2	2,0	3,5	8,1
Relative humidity	0,0	0,0	0,0	0,0	0,0	0,0	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,2	0,2	0,2	0,2	0,2	0,3	0,3	0,4	0,6	1,0	2,0
Coupler properties (u_1)	16,8	14,7	13,4	12,5	12,0	11,7	11,6	11,5	11,5	11,5	11,5	11,5	11,5	11,5	11,5	11,5	11,6	11,6	11,6	11,6	11,6	11,6	11,6	11,6	11,6	11,6	11,6	11,6	11,6	11,6	11,6	11,6	11,5	11,4	11,3	11,1	10,7	10,3	9,8	10,0	13,7	33,7
Front cavities depth	9,1	9,2	9,3	9,4	9,5	9,6	9,6	9,7	9,8	9,8	9,9	9,9	9,9	10,0	10,0	10,0	10,0	10,1	10,1	10,1	10,1	10,1	10,1	10,1	10,1	10,1	10,1	10,1	10,1	10,1	10,0	9,9	9,8	9,5	9,2	8,5	7,5	5,9	3,0	2,1	12,7	44,2
Front cavities diameter	5,3	5,1	4,9	4,8	4,6	4,4	4,3	4,1	4,0	3,9	3,8	3,7	3,6	3,5	3,4	3,4	3,3	3,3	3,2	3,2	3,1	3,1	3,1	3,0	3,0	3,0	3,0	3,0	3,0	2,9	2,9	2,9	2,9	2,9	2,9	2,8	2,8	2,9	3,0	3,7	5,9	15,7
Equivalent volumes	5,7	5,8	6,0	6,1	6,3	6,4	6,5	6,6	6,7	6,8	6,8	6,9	7,0	7,0	7,1	7,1	7,2	7,2	7,2	7,3	7,3	7,3	7,3	7,3	7,3	7,4	7,4	7,4	7,4	7,3	7,3	7,2	7,1	6,9	6,6	6,1	5,3	4,1	2,1	0,3	0,8	8,7
Resonance frequencies	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,1	0,1	0,2	0,3	0,5	0,8	1,4	2,2	2,3	3,0	23,6	47,7
Loss factors	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,1	0,1	0,2	0,2	0,4	0,6	0,9	1,4	2,0	2,4	1,9	0,9	3,1	13,0
Polarizing voltage	2,5	2,5	2,5	2,5	2,5	2,5	2,5	2,5	2,5	2,5	2,5	2,5	2,5	2,5	2,5	2,5	2,5	2,5	2,5	2,5	2,5	2,5	2,5	2,5	2,5	2,5	2,5	2,5	2,5	2,5	2,5	2,5	2,5	2,5	2,5	2,5	2,5	2,5	2,5	2,5	2,5	2,5
Microphone parameters (u_1)	12,3	12,3	12,4	12,5	12,5	12,6	12,6	12,7	12,7	12,8	12,8	12,9	12,9	12,9	13,0	13,0	13,0	13,0	13,0	13,1	13,1	13,1	13,1	13,1	13,1	13,1	13,1	13,1	13,1	13,0	13,0	12,9	12,7	12,4	12,0	11,3	10,3	8,7	6,2	5,9	27,7	68,7
Heat conduction theory	96,2	75,0	58,5	45,6	35,6	27,8	21,7	16,9	13,2	10,3	8,0	6,3	4,9	3,8	3,0	2,3	1,8	1,4	1,1	0,9	0,7	0,5	0,4	0,3	0,2	0,2	0,2	0,1	0,1	0,1	0,1	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Adding of excess volume	0,8	0,8	0,8	0,9	0,9	0,9	0,9	0,9	0,9	0,9	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,1	1,1	1,1	1,1	1,1	1,2	1,3	1,5	1,8	2,6	5,4
Viscosity losses	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,2	0,2	0,2	0,2	0,2	0,3	0,3	0,4	0,6	0,9	1,5
Radial wave-motion	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,3	0,4	0,4	0,4	0,5	0,5	0,6	0,7	1,0	1,3	1,9	3,2	5,9	12,8	34,1
Imperfection of theory (u_1)	96,2	75,0	58,5	45,6	35,6	27,8	21,7	16,9	13,2	10,3	8,1	6,3	5,0	3,9	3,1	2,5	2,1	1,7	1,5	1,3	1,2	1,2	1,1	1,1	1,1	1,1	1,1	1,1	1,1	1,1	1,1	1,2	1,2	1,3	1,3	1,5	1,8	2,3	3,5	6,2	13,1	34,6
Static pressure corrections	5,4	5,4	5,4	5,4	5,4	5,4	5,4	5,4	5,4	5,4	5,4	5,4	5,4	5,4	5,4	5,4	5,4	5,4	5,4	5,4	5,4	5,4	5,4	5,4	5,4	5,4	5,4	5,5	5,5	5,6	5,7	5,9	6,3	6,7	7,4	8,3	9,6	11,4	13,7	16,7	20,7	25,7
Temperature corrections	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,1	1,1	1,1	1,1	1,1	1,2
Processing of results (u_2)	5,5	5,5	5,5	5,5	5,5	5,5	5,5	5,5	5,5	5,5	5,5	5,5	5,5	5,5	5,5	5,5	5,5	5,5	5,5	5,5	5,5	5,5	5,5	5,5	5,5	5,5	5,5	5,6	5,6	5,7	5,8	6,0	6,3	6,8	7,4	8,4	9,7	11,4	13,7	16,8	20,7	25,7
Rounding error (u_1)	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3
Components of type A uncertainties in dB*1000																																										
Repeatability of measurements (u_1)	13,4	8,9	6,7	4,5	4,5	4,5	4,5	4,5	4,5	4,5	4,5	4,5	4,5	4,5	4,5	4,5	4,5	4,5	4,5	4,5	4,5	4,5	4,5	4,5	4,5	4,5	4,5	4,5	4,5	4,5	4,5	4,5	4,5	4,5	4,5	4,5	4,5	4,5	4,5	4,5	6,7	11,2
Expanded uncertainty in dB (k=2) $2\sqrt{(\sum u_1^2/2+4\sum u_2^2/2)}$	0,144	0,114	0,091	0,073	0,059	0,050	0,044	0,039	0,036	0,034	0,033	0,032	0,032	0,032	0,031	0,031	0,031	0,031	0,031	0,031	0,031	0,031	0,031	0,031	0,031	0,031	0,031	0,031	0,031	0,031	0,031	0,031	0,032	0,032	0,033	0,034	0,036	0,039	0,044	0,053	0,078	0,142
Declared values in dB (k=2)	**0,145**	**0,115**	**0,095**	**0,075**	**0,060**	**0,055**	**0,045**	**0,040**	**0,040**	**0,035**	**0,035**	**0,035**	**0,035**	**0,035**	**0,035**	**0,035**	**0,035**	**0,035**	**0,035**	**0,035**	**0,035**	**0,035**	**0,035**	**0,035**	**0,035**	**0,035**	**0,035**	**0,035**	**0,035**	**0,035**	**0,035**	**0,035**	**0,035**	**0,035**	**0,035**	**0,035**	**0,040**	**0,040**	**0,045**	**0,055**	**0,080**	**0,145**

Microphone 2124385: Phase

Frequency (Hz)	1,995	2,512	3,162	3,981	5,012	6,310	7,943	10,000	12,589	15,849	19,953	25,119	31,623	39,811	50,119	63,096	79,433	100,00
Components of type B uncertainties in degree*100																		
Series impedance	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9
Voltage ratio	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9
Cross talk	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5
Inherent and ambient noise	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9
Distortion	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6
Frequency	0,2	0,2	0,2	0,2	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,0	0,0	0,0	0,0	0,0
Receiver ground shield	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5
Transmitter ground shield	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5
Electrical Transfer Impedance (u_1)	5,1	5,1	5,1	5,1	5,1	5,1	5,1	5,1	5,1	5,1	5,1	5,1	5,1	5,1	5,1	5,1	5,1	5,1
Coupler length	0,3	0,3	0,3	0,3	0,3	0,2	0,2	0,2	0,2	0,2	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1
Coupler diameter	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,0
Unintentional coupler/microphone leakage	0,5	0,4	0,3	0,2	0,2	0,2	0,1	0,1	0,1	0,1	0,1	0,1	0,0	0,0	0,0	0,0	0,0	0,0
Static pressure	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Temperature	0,2	0,2	0,2	0,2	0,2	0,2	0,2	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1
Relative humidity	0,1	0,1	0,1	0,1	0,1	0,1	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Coupler properties (u_1)	0,7	0,6	0,5	0,4	0,4	0,4	0,3	0,3	0,3	0,2	0,2	0,2	0,2	0,2	0,2	0,1	0,1	0,1
Front cavities depth	0,5	0,4	0,4	0,4	0,4	0,3	0,3	0,3	0,3	0,2	0,2	0,2	0,2	0,2	0,1	0,1	0,1	0,1
Front cavities diameter	0,9	0,9	0,8	0,8	0,8	0,7	0,7	0,6	0,6	0,5	0,5	0,4	0,4	0,4	0,3	0,3	0,3	0,3
Equivalent volumes	0,7	0,7	0,7	0,6	0,6	0,5	0,5	0,5	0,4	0,4	0,4	0,3	0,3	0,3	0,2	0,2	0,2	0,2
Resonance frequencies	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Loss factors	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Polarizing voltage	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1
Microphone parameters (u_1)	1,3	1,2	1,2	1,1	1,0	1,0	0,9	0,8	0,8	0,7	0,6	0,6	0,5	0,5	0,4	0,4	0,4	0,3
Heat conduction theory	290,0	183,0	115,5	72,9	46,0	29,0	18,3	11,5	7,3	4,6	2,9	1,8	1,2	0,7	0,5	0,3	0,2	0,1
Adding of excess volume	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Viscosity losses	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Radial wave-motion	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Imperfection of theory (u_1)	290,0	183,0	115,5	72,9	46,0	29,0	18,3	11,5	7,3	4,6	2,9	1,8	1,2	0,7	0,5	0,3	0,2	0,1
Static pressure corrections	5,1	5,1	5,1	5,1	5,1	5,1	5,1	5,1	5,1	5,1	5,1	5,1	5,1	5,1	5,1	5,1	5,1	5,1
Temperature corrections	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,0
Processing of results (u_2)	5,2	5,2	5,2	5,2	5,2	5,2	5,2	5,2	5,2	5,2	5,2	5,2	5,2	5,2	5,2	5,2	5,2	5,2
Rounding error (u_1)	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3
Components of type A uncertainties in degree*100																		
Repeatability of measurements (u_1)	26,8	22,4	17,9	13,4	11,2	8,9	8,9	6,7	6,7	4,5	4,5	2,2	2,2	2,2	2,2	2,2	2,2	2,2
Expanded uncertainty in dB (k=2) $2\sqrt{\sum u_1^2/2+4\sum u_2^2/2}$	4,12	2,61	1,66	1,06	0,69	0,46	0,33	0,25	0,22	0,19	0,18	0,17	0,17	0,17	0,17	0,17	0,17	0,17
Declared values in degree (k=2)	**4,15**	**2,65**	**1,70**	**1,10**	**0,70**	**0,50**	**0,35**	**0,30**	**0,25**	**0,20**	**0,20**	**0,20**	**0,20**	**0,20**	**0,20**	**0,20**	**0,20**	**0,20**

Frequency (Hz)	125,89	158,49	199,53	251,19	316,23	398,11	501,19	630,96	794,33	1000,0	1258,9	1584,9	1995,3	2511,9	3162,3	3981,1	5011,9	6309,6	7943,3	10000	12589	15849	19953	25119
Components of type B uncertainties in degree*100																								
Series impedance	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9
Voltage ratio	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9
Cross talk	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,6	0,6	0,7	0,8	0,9	1,1	1,5	2,1	3,0	4,5	6,8	10,5	16,4
Inherent and ambient noise	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9	2,9
Distortion	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6
Frequency	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,1	0,2	0,4
Receiver ground shield	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5
Transmitter ground shield	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5
Electrical Transfer Impedance (u_1)	5,1	5,1	5,1	5,1	5,1	5,1	5,1	5,1	5,1	5,1	5,1	5,1	5,1	5,1	5,1	5,2	5,2	5,3	5,5	5,9	6,8	8,5	11,7	17,2
Coupler length	0,1	0,1	0,1	0,1	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,1	0,1	0,1	0,1	0,1	0,2	0,3	0,6	1,4	5,0
Coupler diameter	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,3	0,9
Unintentional coupler/microphone leakage	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Static pressure	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,1	0,2
Temperature	0,1	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,1	0,1	0,3	1,2
Relative humidity	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,1	0,3
Coupler properties (u_1)	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,2	0,2	0,4	0,7	1,5	5,2
Front cavities depth	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,2	0,3	0,5	0,9	2,0	7,0
Front cavities diameter	0,2	0,2	0,2	0,2	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,1	0,1	0,3
Equivalent volumes	0,1	0,1	0,1	0,1	0,0	0,0	0,0	0,1	0,1	0,2	0,2	0,3	0,4	0,6	0,7	0,9	1,1	1,3	1,5	1,5	1,0	0,9	5,9	16,2
Resonance frequencies	0,1	0,1	0,1	0,1	0,1	0,2	0,2	0,3	0,3	0,4	0,5	0,6	0,8	1,0	1,3	1,6	2,0	2,5	2,9	3,0	2,1	0,1	4,5	47,3
Loss factors	0,0	0,0	0,1	0,1	0,1	0,1	0,1	0,2	0,2	0,3	0,3	0,4	0,5	0,6	0,8	1,0	1,1	1,2	1,2	0,8	0,3	0,6	5,7	16,0
Polarizing voltage	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1
Microphone parameters (u_1)	0,3	0,3	0,3	0,2	0,2	0,3	0,3	0,4	0,4	0,5	0,7	0,9	1,1	1,3	1,7	2,1	2,6	3,1	3,5	3,5	2,4	1,4	9,6	52,9
Heat conduction theory	0,1	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Adding of excess volume	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,1	0,6
Viscosity losses	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,1	0,1	0,1	0,3	0,6	1,8
Radial wave-motion	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,3	0,4	0,4	0,4	0,5	0,5	0,6	0,7	1,0	1,3	1,9	3,2	5,9	12,8	34,1
Imperfection of theory (u_1)	0,1	0,1	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,3	0,4	0,4	0,4	0,5	0,5	0,6	0,7	1,0	1,3	1,9	3,2	5,9	12,8	34,2
Static pressure corrections	5,1	5,2	5,2	5,2	5,3	5,3	5,5	5,7	5,9	6,4	7,0	7,9	9,2	10,8	13,1	16,0	19,7	24,5	30,6	38,3	48,1	60,4	76,0	95,6
Temperature corrections	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,0
Processing of results (u_2)	5,3	5,3	5,3	5,3	5,4	5,4	5,6	5,8	6,0	6,5	7,1	8,0	9,2	10,9	13,1	16,0	19,7	24,5	30,6	38,4	48,1	60,5	76,0	95,6
Rounding error (u_1)	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3
Components of type A uncertainties in degree*100																								
Repeatability of measurements (u_1)	2,2	2,2	2,2	2,2	2,2	2,2	2,2	2,2	2,2	2,2	2,2	2,2	2,2	2,2	2,2	2,2	2,2	2,2	2,2	2,2	2,2	4,5	4,5	4,5
Expanded uncertainty in dB (k=2) $2\sqrt{\sum u_1^2/2+4\sum u_2^2/2}$	0,17	0,17	0,17	0,17	0,17	0,17	0,18	0,18	0,19	0,20	0,22	0,24	0,27	0,32	0,38	0,46	0,57	0,70	0,87	1,09	1,37	1,72	2,17	2,86
Declared values in degree (k=2)	**0,20**	**0,20**	**0,20**	**0,20**	**0,20**	**0,20**	**0,20**	**0,20**	**0,20**	**0,20**	**0,25**	**0,25**	**0,30**	**0,35**	**0,40**	**0,50**	**0,60**	**0,75**	**0,90**	**1,10**	**1,40**	**1,75**	**2,20**	**2,90**

METAS

The measurement uncertainty calculated in the acoustics laboratory at METAS is based on Unclib. The following two tables summarize the uncertainties calculated for typical values obtained following this procedure.

Uncertainty components for average sensitivity [dB]

	Parameter	nom. Value	Unit	Uncertainity relative	absolute		Frequencies [Hz] [2…10[	[10…1k[	[1k…5k[	[5k…10k[	[10k…20k[	[20k…30k[
Ambi	Static pressure	96000	[Pa]	0.016%	15	U95	5.8E-04	5.3E-04	5.3E-04	6.4E-04	6.8E-04	3.7E-04
	Relative humidity	45	[%]	3.3%	1.5	U95	9.0E-05	8.6E-05	1.1E-04	1.9E-04	8.4E-04	3.0E-03
	Absolute temperature	296.15	[K]	0.10%	0.3	U95	8.1E-04	5.3E-04	1.1E-03	3.4E-03	7.6E-03	2.2E-02
	Pressure Coefficient			10%		U95	6.1E-05	1.8E-03	2.1E-03	2.0E-03	4.4E-03	1.4E-02
	Temperature Coeff.			10%		U95	1.3E-06	3.7E-05	9.0E-05	2.7E-04	4.1E-04	3.0E-04
Microphone	Front cavity depth	5.00E-04	[m]	2.0%	1.00E-05	U95	5.0E-03	2.4E-03	2.3E-04	4.3E-04	1.1E-03	4.3E-03
	Front cavity volume	3.20E-08	[m^3]	1.3%	4.00E-10	U95	7.5E-03	9.2E-03	9.2E-03	8.6E-03	1.0E-02	4.8E-02
	Diameter of diaphr.	8.95E-03	[m]	20%	1.79E-03	U95	3.5E-08	3.5E-04	8.9E-03	2.6E-02	1.2E-01	2.2E-01
	Equivalent volume	9.80E-09	[m^3]	20%	1.96E-09	U95	3.1E-02	3.8E-02	3.6E-02	3.1E-02	2.6E-02	1.3E-01
	Resonance freq.	21	[kHz]	20%	4.20E+00	U95	1.8E-06	5.4E-05	2.2E-03	1.0E-02	8.3E-02	2.8E-01
	Loss factor	1		20%	2.00E-01	U95	1.8E-06	2.1E-04	5.5E-03	1.5E-02	1.6E-02	1.4E-01
Cpl	Coupler diameter	9.30E-03	[m]	0.11%	1.00E-05	U95	3.7E-03	3.7E-03	3.7E-03	4.1E-03	5.9E-03	1.1E-02
	Coupler length	5.00E-03	[m]	0.20%	1.00E-05	U95	3.9E-03	4.1E-03	4.1E-03	3.8E-03	6.5E-03	4.7E-02
Electrical	Receiver voltage	0.5	[V]	0.10%	5.00E-04	U95	7.0E-02	4.0E-03	4.8E-04	5.8E-04	5.7E-04	1.3E-03
	Transmitter voltage	1.4	[V]	0.10%	1.40E-03	U95	3.6E-03	6.9E-04	1.3E-04	1.9E-04	2.8E-04	4.2E-04
	Receiver ref voltage	1	[V]	0.10%	1.00E-03	U95	2.2E-02	1.3E-03	1.9E-04	2.7E-04	3.7E-04	5.3E-04
	Transmitter ref volt.	1	[V]	0.10%	1.00E-03	U95	5.4E-03	1.0E-03	1.9E-04	2.7E-04	3.7E-04	5.3E-04
	Rec. voltage phase	180	[°]		1.00E-01	U95	1.3E-03	4.2E-05	2.3E-05	2.3E-05	1.9E-05	3.7E-05
	Rec. ref voltage ph.	0	[°]		1.00E-02	U95	5.4E-04	2.7E-05	9.7E-06	1.1E-05	1.6E-05	1.4E-05
	Polarisation voltage	200	[V]	0.010%	2.00E-02	U95	8.7E-04	8.7E-04	8.7E-04	8.7E-04	8.7E-04	8.7E-04
	Capacitance	4.7	[nF]	0.020%	9.40E-04	U95	7.5E-04	7.5E-04	7.5E-04	7.5E-04	7.5E-04	7.5E-04
	Unc_Reproducibility						4.9E-02	6.5E-03	6.0E-03	6.4E-03	1.9E-02	1.9E-02
	Unc_low-f_Model						6.7E-02	6.1E-02	6.9E-03	0.0E+00	0.0E+00	0.0E+00
	Sum of squares						0.12	0.07	0.04	0.05	0.15	0.41

Uncertainty components for average phase [°]

	Parameter	nom. Value	Unit	Uncertainity relative	Uncertainity absolute		Frequencies [Hz] [2…10[	[10…1k[	[1k…5k[	[5k…10k[	[10k…20k[	[20k…30k[
Ambi	Static pressure	96000	[Pa]	0.016%	15	U95	1.4E-04	1.4E-04	3.5E-05	6.7E-05	3.1E-04	1.5E-03
	Relative humidity	45	[%]	3.3%	1.5	U95	2.6E-04	2.5E-05	2.3E-06	3.2E-05	1.0E-03	1.9E-02
	Absolute temperature	296.15	[K]	0.10%	0.3	U95	8.0E-04	8.0E-04	1.3E-04	3.2E-04	6.7E-03	1.4E-01
	Pressure Coefficient			10%		U95	2.4E-08	8.9E-07	1.1E-06	1.0E-05	1.9E-04	4.7E-04
	Temperature Coeff.			10%		U95	7.5E-10	3.0E-08	2.7E-07	9.1E-07	5.3E-06	4.9E-06
Microphone	Front cavity depth	5.00E-04	[m]	2.0%	1.00E-05	U95	1.1E-02	1.0E-02	1.5E-03	1.1E-03	9.5E-03	1.5E-02
	Front cavity volume	3.20E-08	[m^3]	1.3%	4.00E-10	U95	8.6E-03	8.0E-03	1.4E-03	2.0E-03	1.4E-02	3.3E-01
	Diameter of diaphr.	8.95E-03	[m]	20%	1.79E-03	U95	4.4E-11	4.4E-05	5.7E-03	5.6E-02	2.7E-01	1.6E-01
	Equivalent volume	9.80E-09	[m^3]	20%	1.96E-09	U95	2.3E-02	1.8E-02	5.4E-02	9.3E-02	1.6E-01	1.6E-01
	Resonance freq.	21	[kHz]	20%	4.20E+00	U95	6.8E-05	7.6E-03	3.8E-02	1.1E-01	1.2E-01	4.0E-01
	Loss factor	1		20%	2.00E-01	U95	1.1E-04	1.2E-02	5.0E-02	6.2E-02	1.6E-01	1.5E-01
Cpl	Coupler diameter	9.30E-03	[m]	0.11%	1.00E-05	U95	5.9E-05	2.4E-05	1.3E-05	1.6E-05	2.3E-04	2.5E-03
	Coupler length	5.00E-03	[m]	0.20%	1.00E-05	U95	5.1E-05	4.9E-05	2.5E-05	5.9E-05	4.5E-04	1.5E-02
Electrical	Receiver voltage	0.5	[V]	0.10%	5.00E-04	U95	5.0E-02	1.5E-03	6.8E-04	9.8E-04	9.2E-04	2.1E-03
	Transmitter voltage	1.4	[V]	0.10%	1.40E-03	U95	3.0E-03	2.6E-04	1.6E-04	2.8E-04	3.9E-04	7.7E-04
	Receiver ref voltage	1	[V]	0.10%	1.00E-03	U95	1.9E-02	6.1E-04	2.6E-04	4.2E-04	7.3E-04	1.0E-03
	Transmitter ref volt.	1	[V]	0.10%	1.00E-03	U95	4.4E-03	3.0E-04	3.1E-04	4.5E-04	6.9E-04	8.7E-04
	Rec. voltage phase	180	[°]		1.00E-01	U95	8.4E-03	4.7E-04	5.5E-05	6.7E-05	6.6E-05	1.5E-04
	Rec. ref voltage ph.	0	[°]		1.00E-02	U95	2.5E-03	1.5E-04	2.1E-05	3.1E-05	4.3E-05	6.1E-05
	Polarisation voltage	200	[V]	0.010%	2.00E-02	U95	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Capacitance	4.7	[nF]	0.020%	9.40E-04	U95	8.3E-05	1.7E-05	1.7E-07	3.3E-08	1.7E-08	8.3E-09
	Unc_Reproducibility	0					1.4E+00	3.5E-01	4.2E-02	8.7E-02	9.2E-02	5.8E-02
	Unc_low-f_Model	0					2.0E+00	5.4E-01	4.5E-02	5.6E-02	1.5E-01	1.7E-01
	Sum of squares						2.39	0.64	0.10	0.20	0.41	0.63

NMIA

The uncertainty stated in this Report has been calculated in accordance with the principles in JCGM 100:2008 - Evaluation of measurement data - Guide to the expression of uncertainty in measurement, and gives an interval estimated to have a level of confidence of 95%. Unless otherwise stated, a coverage factor (k) of 2.0 has been used. The uncertainty applies at the time of measurement only and takes no account of any drift or other effects that may apply afterwards. When estimating the uncertainty at any later time, other relevant information should also be considered, including, where possible, the history of the performance of the instrument and the manufacturer's specification.

NOTES:

a) *Microphone parameters*

Each microphone parameter has been varied by its estimated error in the calculation of the microphone sensitivities, where the resulting sensitivity difference has been used as the corresponding uncertainty component.

The estimation of the error associated with each microphone parameter is based on the methods that have been used in their evaluation. For example, the error associated with the depth measuring microscope for the measurement of front cavity depth, and the loading caused by an electrostatic actuator in the determination of the resonance frequency.

An additional error has also been applied to each microphone parameter, based on the repeatability of the data fitting process in determining microphone parameters.

A conservative estimate of leakage has been determined which is based on the identification of one coupler where leakage at low frequencies is significant. This coupler is not used in reciprocity calibrations at low frequencies for this reason, however it has provided a conservative method of evaluating the effects of leakage.

b) *Coupler Parameters*

The uncertainty components corresponding to errors in the measurements of the physical dimensions of the couplers used in the reciprocity system have been determined in the same way as described for the microphone parameters. The coupler dimensions have been varied by their corresponding uncertainty in measurement, and the corresponding difference in the calculation of microphone sensitivities can then be determined.

c) *Ambient conditions.*

The ambient conditions are monitored by an environmental logger; the coupler temperature is monitored with a platinum resistance thermometer (PRT), both calibrated at the NMIA. The uncertainty in the calibration of the environmental logger, and PRT have been used to determine the corresponding contributions to uncertainties in the calculation of microphone sensitivities.

The estimation of the amount of drift in temperature, humidity and pressure that occurs during the reciprocity calibration procedure has been based on the typical level of drift that has been observed over the history of reciprocity calibrations performed at the NMIA. This level of drift has also been included in calculating the corresponding contribution to the calculation of microphone sensitivities.

d) *Electrical parameters and measurement uncertainties*

For the determination of the current injection to the transmitting microphone, the voltage developed across a series capacitor is measured. In the Brüel and Kjær 9669 system, a capacitor is an integral part of the ZE0796 transmitter unit and has a nominal value of 4.66 nF. The capacitance of the transmitter unit is calibrated at the NMIA every 5 years. The uncertainty in the calibration of the capacitor is determined by the impedance group of the NMIA, and this error's contribution to the uncertainty in the primary calibration of laboratory standard microphones is determined as below.

The pressure sensitivity of a microphone is calculated via reciprocity according to the following equation.

$$|M_{p,x}| = \left(\left|\frac{Z_{e,xy}Z_{e,xy}}{Z_{e,xy}}\right|\left|\frac{Z_{a,xy}}{Z_{axy}Z_{axy}}\right|\right)^{1/2}$$

Where

$$Z_{e,xy} = \frac{U_o}{U_{zm}}\frac{1}{j\omega C + \frac{1}{R}}$$

The pressure sensitivity dependence on the variation of the capacitance can therefore be approximated by:

$$\left|\frac{\Delta Z_{e,xy}}{Z_{e,xy}}\right|_{\Delta C} = \left|-\frac{U_o U_{zm}}{U_{zm}U_o}\frac{j\omega\left(j\omega C + \frac{1}{R}\right)}{\left(j\omega C + \frac{1}{R}\right)^2}\Delta C\right| = \frac{j\omega}{j\omega C + \frac{1}{R}}\Delta C$$

The parallel loss resistance R is assumed to be large, and hence the $\frac{1}{R}$ term can be neglected, resulting in:

$$\left|\frac{\Delta Z_{e,xy}}{Z_{e,xy}}\right| = \frac{\Delta C}{C}$$

Since the sensitivity calculation is dependent on three configurations of electrical transfer impedance, where the error in the capacitance value has a correlative contribution to the overall uncertainty, we have:

$$\left|\frac{\Delta M_{p,1}}{M_{p,1}}\right|_{\Delta C} = \left|\frac{\Delta Z_{e,12}}{Z_{e,12}}\right|_{\Delta C} + \left|\frac{\Delta Z_{e,13}}{Z_{e,13}}\right|_{\Delta C} + \left|\frac{\Delta Z_{e,23}}{Z_{e,23}}\right|_{\Delta C} = 3\frac{\Delta C}{C}$$

Or in dB:

$$20\log\left|\frac{\Delta M_{p,x}}{M_{p,x}}\right|_{\Delta C} = 20\log\left(1 + 3\frac{\Delta C}{C}\right)$$

A Hewlett Packard 3458A digital voltmeter is used to make the electrical measurements during a reciprocity calibration, which is routinely calibrated at the NMIA. The worst case uncertainty in reading, and the worst case corrections over the frequency and voltage range applicable to the reciprocity procedure from the NMIA calibration is used as a conservative estimate of the associated uncertainties introduced by the voltmeter. As voltage ratios are used in determining microphone pressure sensitivities, deviations in unit/unit linearity need to be considered. The worst case linearity deviation over the frequency and voltage range of interest has been used as a conservative estimate. For the determination of pressure sensitivity based on reciprocity, 6 voltage ratios are required. Following a similar argument to the error contributions for the transmitter capacitance above, if we consider that the errors associated with corrections are correlated, and reading errors as independent and random, the estimation of the uncertainty associated with voltage measurements can therefore be determined as follows:

$$\left|\frac{\Delta M_{p,1}}{M_{p,1}}\right|_{\Delta \mathrm{V}} = \sqrt{6\left|\frac{\Delta Z_{e,xy}}{Z_{e,xy}}\right|_{\Delta \mathrm{Vcor}} + \sqrt{6\left|\frac{\Delta Z_{e,xy}}{Z_{e,xy}}\right|^2_{\Delta Vran}}}$$

The maximum error in the accuracy of the frequency generator has been determined by reference to the NMIA's atomic clock. The sensitivity profile of a typical Brüel and Kjær 4180 microphone is relatively flat from 100 Hz to 1 kHz. However, the sensitivity profile has significantly greater gradients at very low frequencies, and at higher frequencies beyond a local maximum sensitivity of the microphone. A worst case estimation of the influence of frequency accuracy on the sensitivity measurements via reciprocity is determined by considering the gradients of the microphone sensitivity curves at low frequencies which also corresponds to largest errors in generated frequency, for the frequency generator used.

The acoustic and electrical noise levels that are present in the reciprocity system have been determined by performing THDN measurements of the reciprocity systems receiver and transmitter signals. As described above, there are 6 sets of voltage ratios of the receiver and transmitter channels, and the contribution of harmonic distortion and noise to the uncertainty are determined in a similar fashion to what is described above for uncorrelated electrical measurements.

The level of electrical cross talk has been determined by running the reciprocity system with the polarisation voltages of the receiver and transmitter microphones set to 0 V, and then measuring the output of the receiver channel with a frequency selective technique. This has been treated in a similar way as the uncertainties for noise and distortion described above.

The polarisation voltage supply of the Brüel and Kjær 5998 system is routinely measured via the buffered monitor output with the same HP3458A as described above. Type 4180 microphones are estimated to have a sensitivity to polarisation voltage of -0.05 dB/V, which provides the basis for determining the uncertainty contributions caused by errors in polarisation voltage.

e) Physical corrections

In general, it is difficult to determine the associated uncertainties caused by physical corrections, such as wave motion, heat conduction and viscosity, as exact analytical models incorporating these phenomena are unknown. Conservative approaches are considered, as discussed below.

The uncertainty contributions of radial wave motion have been determined by calculating the differences in the corrections corresponding to the Bessel and parabolic excursion model of Rasmussen. The Bessel and parabolic excursion models are more realistic than the piston excursion model, and hence the differences in these models provides a reasonable (but conservative) basis for determining the uncertainty contributions caused by errors in wave motion corrections.

Similarly, the uncertainty caused by errors in heat conduction corrections have been estimated by calculating the difference in the broadband and low frequency solutions provided in the standard. It should be noted however, that the differences between the low frequency and broadband solution are also caused by the inclusion of viscosity effects in the broadband model. It is expected that the influence of viscosity is primarily an effect that becomes apparent at higher frequencies. The uncertainty introduced by viscosity corrections has been determined by considering the difference between the low frequency and broadband models at higher frequencies. This is likely very conservative and corresponds to uncertainties that are possibly larger than the corrections for viscosity themselves.

f) Errors in theory and residual errors.

The parameters of humid air such as density, carbon monoxide mole ratio, speed of sound and the ratio of specific heats as provided in the standard are supplied with an estimate of their error. The contributions of these errors on the calculation of microphone sensitivities have been determined by adjusting the physical parameters of humid air correspondingly and recalculating the microphone sensitivities.

There are additional error sources that are difficult to quantify. An example of this is that the transmission line model of acoustic transfer impedance of the standard assumes that the coupler and microphone front cavities have the same radius. Differences in the radius of the microphone front volumes and coupler will result in additional sources of wave motion, as well as additional errors in the calculation for heat conduction and viscosity corrections, as the microphone-coupler-microphone system is considered a single transmission line with a fixed radius, as opposed to three cascading transmission lines with different dimensions. The front volumes of the microphones determined through a parameter fitting process are also, in general, different from the volume determined by the nominal diameter and front cavity depth of the microphone. An additional term, as described in the standard, is used to accommodate this difference, which also introduces an error.

Due to the relatively small values in the uncertainties associated with the parameters of humid air, and that a quantifiable method of determining the contributions of the errors as described above is difficult, an arbitrary value, that is believed to be conservative, has been assigned lumping these errors together.

	Frequency	2	2.51	3.16	3.98	5.01	6.31	7.94
Parameters								
Microphone								
Front Cavity Volume U1.1	Rect	0.0062	0.0065	0.0067	0.0069	0.0070	0.0072	0.0073
DoF		30	30	30	30	30	30	30
Front Cavity Depth U1.2	Rect	0.00319	0.00292	0.00267	0.00242	0.00220	0.00199	0.00179
DoF		30	30	30	30	30	30	30
Equivalent Volume U1.3	Rect	0.00624	0.00646	0.00666	0.00685	0.00703	0.00719	0.00734
DoF		30	30	30	30	30	30	30
Resonance Frequency U1.4	Rect	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
DoF		30	30	30	30	30	30	30
Loss Factor U1.5	Rect	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
DoF		30	30	30	30	30	30	30
Diaphragm Diameter U1.6	Rect	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
DoF		30	30	30	30	30	30	30
Microphone Parameters Combined		0.00939	0.00959	0.00979	0.00999	0.01018	0.01036	0.01054
EffDoF		74.17	71.40	69.12	67.22	65.69	64.48	63.53
Coupler	Rect							
Coupler Length U2.1		0.0015	0.0015	0.0015	0.0016	0.0016	0.0016	0.0016
DoF		30	30	30	30	30	30	30
Coupler Diameter U2.2	Rect	0.0009	0.0009	0.0009	0.0009	0.0009	0.0009	0.0009
DoF		30	30	30	30	30	30	30
Leakage U2.3	Rect	0.12	0.11	0.10	0.09	0.09	0.08	0.07
DoF		5	5	5	5	5	5	5
Coupler Parameters Combined		0.1205	0.1119	0.1031	0.0943	0.0856	0.0768	0.0680
EffDoF		5.00	5.00	5.00	5.00	5.00	5.01	5.01
Ambient Conditions								
Static Pressure U3.1	Rect	0.00135	0.00134	0.00132	0.00130	0.00130	0.00129	0.00128
DoF		10	10	10	10	10	10	10
Drift in Pressure U3.2	Rect	0.00054	0.00053	0.00053	0.00052	0.00052	0.00052	0.00051
DoF		10	10	10	10	10	10	10
Temperature U3.3	Rect	0.00105	0.00099	0.00091	0.00082	0.00077	0.00070	0.00063
DoF		10	10	10	10	10	10	10
Drift in Temperature U3.4	Rect	0.00042	0.00040	0.00037	0.00033	0.00031	0.00028	0.00025
DoF		10	10	10	10	10	10	10
Humidity U3.5	Rect	0.00058	0.00058	0.00058	0.00058	0.00058	0.00058	0.00058
DoF		5	5	5	5	5	5	5
Ambient Conditions Combined		0.0019	0.0019	0.0018	0.0018	0.0017	0.0017	0.0016
EffDoF		28.51	28.01	27.23	26.03	25.31	24.34	23.09
Electrical								
Cross Talk U4.1	Rect	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00119
DoF		5	5	5	5	5	5	30
THDN U4.2	Rect	0.0002309	0.0002309	0.0002309	0.0002309	0.0002309	0.0001155	0.0001155
DoF		30	30	30	30	30	30	30
Voltae Ratio U4.3	Rect	0.00598	0.00598	0.00598	0.00598	0.00598	0.00598	0.00598
DoF		30	30	30	30	30	30	30
Polarisation Voltage U4.4	Rect	0.00058	0.00058	0.00058	0.00058	0.00058	0.00058	0.00058
DoF		30	30	30	30	30	30	30
Capacitane of Transmitter U4.5	Rect	0.00047	0.00047	0.00047	0.00047	0.00047	0.00047	0.00047
DoF		30	30	30	30	30	30	30
Frequency U4.6	Rect	0.00012	0.00012	0.00012	0.00012	0.00012	0.00012	0.00012
DoF		10	10	10	10	10	10	10
Electrical Combined		0.006	0.006	0.006	0.006	0.006	0.006	0.006
EffDoF		31.04	31.04	31.04	31.04	31.04	30.97	33.37
Corrections								
Heat Conduction Corrections U5.1	Rect	0.089	0.088	0.087	0.086	0.084	0.082	0.078
DoF		5	5	5	5	5	5	5
Viscosity U5.2	Rect	0	0	0	0	0	0	0
DoF		5	5	5	5	5	5	5
Radial Wave Motion U5.3	Rect	0	0	0	0	0	0	0
DoF		5	5	5	5	5	5	5
Corrections Combined		0.0889	0.0883	0.0872	0.0860	0.0837	0.0820	0.0779
EffDoF		5.00	5.00	5.00	5.00	5.00	5.00	5.00
Error in Theory/Residual U6.1	Rect	0.0057735	0.0057735	0.0057735	0.0057735	0.0057735	0.0057735	0.0057735
DoF		30	30	30	30	30	30	30
Type A U6.1	Standard	0.058	0.030	0.016	0.015	0.013	0.012	0.012
DoF		7	7	7	7	7	7	7
Rounding U7.1	Rect	0.0057735	0.0057735	0.0057735	0.0057735	0.0057735	0.0005774	0.0005774
DoF		30	30	30	30	30	30	30
Frequency		2.00	2.51	3.16	3.98	5.01	6.31	7.94
Ucombined		0.161	0.146	0.137	0.129	0.121	0.114	0.105
EffDoF		11.97	10.50	10.22	10.45	10.52	10.46	10.42
k		2.186	2.221	2.229	2.222	2.221	2.222	2.223
Uexp		**0.35**	**0.32**	**0.30**	**0.29**	**0.27**	**0.253**	**0.233**
Rounding to 1 or 2 dp		0.40	0.40	0.30	0.30	0.30	0.30	0.24
Final U95		**0.4**	**0.4**	**0.35**	**0.3**	**0.3**	**0.3**	**0.25**

	Frequency	10	12.59	15.85	19.95	25.12	31.62	39.81
Parameters								
Microphone								
Front Cavity Volume U1.1	Rect	0.0075	0.0076	0.0077	0.0078	0.0079	0.0080	0.0081
DoF		30	30	30	30	30	30	30
Front Cavity Depth U1.2	Rect	0.00161	0.00145	0.00130	0.00117	0.00105	0.00094	0.00084
DoF		30	30	30	30	30	30	30
Equivalent Volume U1.3	Rect	0.00748	0.00760	0.00771	0.00781	0.00790	0.00799	0.00806
DoF		30	30	30	30	30	30	30
Resonance Frequency U1.4	Rect	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
DoF		30	30	30	30	30	30	30
Loss Factor U1.5	Rect	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
DoF		30	30	30	30	30	30	30
Diaphragm Diameter U1.6	Rect	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
DoF		30	30	30	30	30	30	30
Microphone Parameters Combined		0.01069	0.01084	0.01098	0.01111	0.01123	0.01133	0.01143
EffDoF		62.76	62.17	61.70	61.34	61.05	60.82	60.65
Coupler	Rect							
Coupler Length U2.1		0.0016	0.0016	0.0017	0.0017	0.0017	0.0017	0.0017
DoF		30	30	30	30	30	30	30
Coupler Diameter U2.2	Rect	0.0009	0.0009	0.0009	0.0009	0.0009	0.0009	0.0009
DoF		30	30	30	30	30	30	30
Leakage U2.3	Rect	0.05	0.05	0.03	0.03	0.02	0.02	0.01
DoF		5	5	5	5	5	5	5
Coupler Parameters Combined		0.0549	0.0462	0.0347	0.0289	0.0242	0.0154	0.0068
EffDoF		5.01	5.02	5.03	5.04	5.06	5.16	5.90
Ambient Conditions								
Static Pressure U3.1	Rect	0.00127	0.00127	0.00126	0.00125	0.00125	0.00124	0.00124
DoF		10	10	10	10	10	10	10
Drift in Pressure U3.2	Rect	0.00051	0.00051	0.00050	0.00050	0.00050	0.00050	0.00050
DoF		10	10	10	10	10	10	10
Temperature U3.3	Rect	0.00059	0.00054	0.00048	0.00044	0.00040	0.00037	0.00034
DoF		10	10	10	10	10	10	10
Drift in Temperature U3.4	Rect	0.00023	0.00022	0.00019	0.00017	0.00016	0.00015	0.00013
DoF		10	10	10	10	10	10	10
Humidity U3.5	Rect	0.00058	0.00058	0.00058	0.00058	0.00058	0.00058	0.00058
DoF		5	5	5	5	5	5	5
Ambient Conditions Combined		0.0016	0.0016	0.0016	0.0015	0.0015	0.0015	0.0015
EffDoF		22.49	21.74	20.83	20.24	19.77	19.36	19.01
Electrical								
Cross Talk U4.1	Rect	0.00119	0.00119	0.00119	0.00119	0.00119	0.00119	0.00124
DoF		30	30	30	30	30	30	30
THDN U4.2	Rect	0.0001155	0.0001155	0.0001155	0.0001155	0.0001155	0.0001155	0.0001155
DoF		30	30	30	30	30	30	30
Voltae Ratio U4.3	Rect	0.00598	0.00598	0.00147	0.00147	0.00147	0.00147	0.00147
DoF		30	30	30	30	30	30	30
Polarisation Voltage U4.4	Rect	0.00058	0.00058	0.00058	0.00058	0.00058	0.00058	0.00058
DoF		30	30	30	30	30	30	30
Capacitane of Transmitter U4.5	Rect	0.00047	0.00047	0.00047	0.00047	0.00047	0.00047	0.00047
DoF		30	30	30	30	30	30	30
Frequency U4.6	Rect	0.00012	0.00012	0.00012	0.00012	0.00012	0.00012	0.00012
DoF		10	10	10	10	10	10	10
Electrical Combined		0.006	0.006	0.002	0.002	0.002	0.002	0.002
EffDoF		33.37	33.37	75.71	75.71	75.71	75.71	76.25
Corrections								
Heat Conduction Corrections U5.1	Rect	0.074	0.070	0.063	0.028	0.006	0.003	0.002
DoF		5	5	5	5	5	5	5
Viscosity U5.2	Rect	0	0	0	0	0	0	0
DoF		5	5	5	5	5	5	5
Radial Wave Motion U5.3	Rect	0	0	0	0	0	0	0
DoF		5	5	5	5	5	5	5
Corrections Combined		0.0739	0.0699	0.0629	0.0282	0.0064	0.0026	0.0016
EffDoF		5.00	5.00	5.00	5.00	5.00	5.00	5.00
Error in Theory/Residual U6.1	Rect	0.0057735	0.0057735	0.0057735	0.0057735	0.0057735	0.0057735	0.0057735
DoF		30	30	30	30	30	30	30
Type A U6.1	Standard	0.012	0.012	0.012	0.012	0.012	0.012	0.012
DoF		7	7	7	11	11	11	11
Rounding U7.1	Rect	0.0005774	0.0005774	0.0005774	0.0005774	0.0005774	0.0005774	0.0005774
DoF		30	30	30	30	30	30	30
Frequency		10.00	12.59	15.85	19.95	25.12	31.62	39.81
Ucombined		0.094	0.086	0.074	0.044	0.030	0.023	0.019
EffDoF		9.95	9.50	8.70	13.95	12.32	23.17	53.64
k		2.237	2.252	2.282	2.152	2.179	2.072	2.007
Uexp		**0.210**	**0.193**	**0.169**	**0.095**	**0.066**	**0.049**	**0.038**
Rounding to 1 or 2 dp		0.21	0.20	0.17	0.10	0.07	0.05	0.04
Final U95		**0.25**	**0.2**	**0.18**	**0.1**	**0.1**	**0.08**	**0.08**

	Frequency	50.12	63.1	79.43	100	125.89	158.49	199.5262
Parameters								
Microphone								
Front Cavity Volume U1.1	Rect	0.0081	0.0082	0.0082	0.0083	0.0083	0.0084	0.0084
DoF		30	30	30	30	30	30	30
Front Cavity Depth U1.2	Rect	0.00075	0.00067	0.00060	0.00054	0.00048	0.00043	0.00019
DoF		30	30	30	30	30	30	30
Equivalent Volume U1.3	Rect	0.00813	0.00819	0.00824	0.00829	0.00833	0.00837	0.00840
DoF		30	30	30	30	30	30	30
Resonance Frequency U1.4	Rect	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
DoF		30	30	30	30	30	30	30
Loss Factor U1.5	Rect	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
DoF		30	30	30	30	30	30	30
Diaphragm Diameter U1.6	Rect	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
DoF		30	30	30	30	30	30	30
Microphone Parameters Combined		0.01152	0.01160	0.01167	0.01174	0.01179	0.01184	0.01189
EffDoF		60.51	60.41	60.32	60.25	60.20	60.16	60.03
Coupler	Rect							
Coupler Length U2.1		0.0017	0.0017	0.0017	0.0017	0.0017	0.0017	0.0017
DoF		30	30	30	30	30	30	30
Coupler Diameter U2.2	Rect	0.0009	0.0009	0.0009	0.0009	0.0009	0.0009	0.0009
DoF		30	30	30	30	30	30	30
Leakage U2.3	Rect	0.00	0.00	0.00	0.00	0.00	0.00	0.00
DoF		5	5	5	5	5	5	5
Coupler Parameters Combined		0.0019	0.0019	0.0019	0.0020	0.0020	0.0020	0.0020
EffDoF		46.79	46.68	46.67	46.57	46.51	46.53	46.46
Ambient Conditions								
Static Pressure U3.1	Rect	0.00124	0.00123	0.00123	0.00123	0.00123	0.00122	0.00122
DoF		10	10	10	10	10	10	10
Drift in Pressure U3.2	Rect	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049
DoF		10	10	10	10	10	10	10
Temperature U3.3	Rect	0.00031	0.00029	0.00026	0.00024	0.00023	0.00022	0.00020
DoF		10	10	10	10	10	10	10
Drift in Temperature U3.4	Rect	0.00012	0.00011	0.00011	0.00010	0.00009	0.00009	0.00008
DoF		10	10	10	10	10	10	10
Humidity U3.5	Rect	0.00058	0.00058	0.00058	0.00058	0.00058	0.00058	0.00058
DoF		5	5	5	5	5	5	5
Ambient Conditions Combined		0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015
EffDoF		18.73	18.48	18.27	18.11	17.97	17.87	17.77
Electrical								
Cross Talk U4.1	Rect	0.00124	0.00124	0.00124	0.00124	0.00124	0.00124	0.00113
DoF		30	30	30	30	30	30	30
THDN U4.2	Rect	0.0001155	0.0001155	0.0001155	0.0001155	0.0001155	0.0001155	0.0001155
DoF		30	30	30	30	30	30	30
Voltae Ratio U4.3	Rect	0.00147	0.00147	0.00147	0.00147	0.00147	0.00147	0.00147
DoF		30	30	30	30	30	30	30
Polarisation Voltage U4.4	Rect	0.00058	0.00058	0.00058	0.00058	0.00058	0.00058	0.00058
DoF		30	30	30	30	30	30	30
Capacitane of Transmitter U4.5	Rect	0.00047	0.00047	0.00047	0.00047	0.00047	0.00047	0.00047
DoF		30	30	30	30	30	30	30
Frequency U4.6	Rect	0.00012	0.00012	0.00012	0.00012	0.00012	0.00012	0.00012
DoF		10	10	10	10	10	10	10
Electrical Combined		0.002	0.002	0.002	0.002	0.002	0.002	0.002
EffDoF		76.25	76.25	76.25	76.25	76.25	76.25	74.90
Corrections								
Heat Conduction Corrections U5.1	Rect	0.001	0.001	0.001	0.001	0.001	0.001	0.001
DoF		5	5	5	5	5	5	5
Viscosity U5.2	Rect	0	0	0	0	0	0	0
DoF		5	5	5	5	5	5	5
Radial Wave Motion U5.3	Rect	0	0	0	0	0	0	0
DoF		5	5	5	5	5	5	5
Corrections Combined		0.0010	0.0008	0.0006	0.0006	0.0006	0.0006	0.0006
EffDoF		5.00	5.00	5.00	5.00	5.00	5.00	5.00
Error in Theory/Residual U6.1	Rect	0.0057735	0.0057735	0.0057735	0.0057735	0.0057735	0.0057735	0.0057735
DoF		30	30	30	30	30	30	30
Type A U6.1	Standard	0.012	0.012	0.012	0.012	0.012	0.012	0.012
DoF		11	11	11	11	11	11	11
Rounding U7.1	Rect	0.0005774	0.0005774	0.0005774	0.0005774	0.0005774	0.0005774	0.0005774
DoF		30	30	30	30	30	30	30
Frequency		50.12	63.10	79.43	100.00	125.89	158.49	199.53
Ucombined		0.018	0.018	0.018	0.018	0.018	0.018	0.018
EffDoF		49.15	49.36	49.62	49.93	50.19	50.42	50.52
k		2.012	2.012	2.011	2.011	2.011	2.011	2.010
Uexp		**0.036**	**0.036**	**0.036**	**0.036**	**0.036**	**0.036**	**0.036**
Rounding to 1 or 2 dp		0.04	0.04	0.04	0.04	0.04	0.04	0.04
Final U95		**0.08**	**0.06**	**0.06**	**0.06**	**0.04**	**0.04**	**0.04**

	Frequency	251.19	316.23	398.11	501.19	630.96	794.3285	1000
Parameters								
Microphone								
Front Cavity Volume U1.1	Rect	0.0084	0.0085	0.0085	0.0085	0.0085	0.0085	0.0085
DoF		30	30	30	30	30	30	30
Front Cavity Depth U1.2	Rect	0.00034	0.00031	0.00027	0.00024	0.00022	0.00010	0.00017
DoF		30	30	30	30	30	30	30
Equivalent Volume U1.3	Rect	0.00844	0.00846	0.00849	0.00851	0.00853	0.00854	0.00855
DoF		30	30	30	30	30	30	30
Resonance Frequency U1.4	Rect	0.00001	0.00001	0.00001	0.00001	0.00001	0.00000	0.00001
DoF		30	30	30	30	30	30	30
Loss Factor U1.5	Rect	0.00000	0.00000	0.00000	0.00000	0.00001	0.00001	0.00002
DoF		30	30	30	30	30	30	30
Diaphragm Diameter U1.6	Rect	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00001
DoF		30	30	30	30	30	30	30
Microphone Parameters Combined		0.01193	0.01197	0.01200	0.01203	0.01206	0.01207	0.01209
EffDoF		60.10	60.08	60.06	60.05	60.04	60.01	60.02
Coupler	Rect							
Coupler Length U2.1		0.0017	0.0017	0.0017	0.0017	0.0017	0.0017	0.0017
DoF		30	30	30	30	30	30	30
Coupler Diameter U2.2	Rect	0.0009	0.0009	0.0009	0.0009	0.0009	0.0009	0.0009
DoF		30	30	30	30	30	30	30
Leakage U2.3	Rect	0.00	0.00	0.00	0.00	0.00	0.00	0.00
DoF		5	5	5	5	5	5	5
Coupler Parameters Combined		0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020
EffDoF		46.43	46.41	46.39	46.38	46.36	46.38	46.41
Ambient Conditions								
Static Pressure U3.1	Rect	0.00122	0.00122	0.00122	0.00122	0.00122	0.00122	0.00121
DoF		10	10	10	10	10	10	10
Drift in Pressure U3.2	Rect	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049
DoF		10	10	10	10	10	10	10
Temperature U3.3	Rect	0.00019	0.00018	0.00017	0.00016	0.00015	0.00015	0.00015
DoF		10	10	10	10	10	10	10
Drift in Temperature U3.4	Rect	0.00008	0.00007	0.00007	0.00006	0.00006	0.00006	0.00006
DoF		10	10	10	10	10	10	10
Humidity U3.5	Rect	0.00058	0.00058	0.00058	0.00058	0.00058	0.00058	0.00058
DoF		5	5	5	5	5	5	5
Ambient Conditions Combined		0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014
EffDoF		17.70	17.62	17.57	17.52	17.47	17.44	17.48
Electrical								
Cross Talk U4.1	Rect	0.00113	0.00113	0.00113	0.00113	0.00113	0.00113	0.00113
DoF		30	30	30	30	30	30	30
THDN U4.2	Rect	5.774E-05	5.774E-05	5.774E-05	5.774E-05	5.774E-05	5.774E-05	5.774E-05
DoF		30	30	30	30	30	30	30
Voltae Ratio U4.3	Rect	0.00147	0.00147	0.00147	0.00147	0.00147	0.00147	0.00147
DoF		30	30	30	30	30	30	30
Polarisation Voltage U4.4	Rect	0.00058	0.00058	0.00058	0.00058	0.00058	0.00058	0.00058
DoF		30	30	30	30	30	30	30
Capacitane of Transmitter U4.5	Rect	0.00047	0.00047	0.00047	0.00047	0.00047	0.00047	0.00047
DoF		30	30	30	30	30	30	30
Frequency U4.6	Rect	0.00012	0.00012	0.00012	0.00012	0.00012	0.00012	0.00012
DoF		10	10	10	10	10	10	10
Electrical Combined		0.002	0.002	0.002	0.002	0.002	0.002	0.002
EffDoF		74.53	74.53	74.53	74.53	74.53	74.53	74.53
Corrections								
Heat Conduction Corrections U5.1	Rect	0.001	0.001	0.001	0.001	0.001	0.001	0.001
DoF		5	5	5	5	5	5	5
Viscosity U5.2	Rect	0	0	0	0	0	0	0
DoF		5	5	5	5	5	5	5
Radial Wave Motion U5.3	Rect	0	0	0	0	0	0	0
DoF		5	5	5	5	5	5	5
Corrections Combined		0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006
EffDoF		5.00	5.00	5.00	5.00	5.00	5.00	5.00
Error in Theory/Residual U6.1	Rect	0.0057735	0.0057735	0.0057735	0.0057735	0.0057735	0.0057735	0.0057735
DoF		30	30	30	30	30	30	30
Type A U6.1	Standard	0.012	0.012	0.012	0.012	0.012	0.012	0.012
DoF		11	11	11	11	11	11	11
Rounding U7.1	Rect	0.0005774	0.0005774	0.0005774	0.0005774	0.0005774	0.0005774	0.0005774
DoF		30	30	30	30	30	30	30
Frequency		251.19	316.23	398.11	501.19	630.96	794.33	1000.0
Ucombined		0.018	0.018	0.018	0.018	0.018	0.018	0.018
EffDoF		50.74	50.93	51.07	51.20	51.31	51.39	51.47
k		2.010	2.010	2.010	2.010	2.010	2.010	2.009
Uexp		**0.036**	**0.036**	**0.036**	**0.036**	**0.036**	**0.036**	**0.036**
Rounding to 1 or 2 dp		0.04	0.04	0.04	0.04	0.04	0.04	0.04
Final U95		**0.04**	**0.04**	**0.04**	**0.04**	**0.04**	**0.04**	**0.04**

	Frequency	1258.93	1584.89	1995.26	2511.89	3162.28	3981.07	5011.87
Parameters								
Microphone								
Front Cavity Volume U1.1	Rect	0.0085	0.0085	0.0085	0.0085	0.0085	0.0084	0.0082
DoF		30	30	30	30	30	30	30
Front Cavity Depth U1.2	Rect	0.00015	0.00012	0.00010	0.00007	0.00003	0.00004	0.00009
DoF		30	30	30	30	30	30	30
Equivalent Volume U1.3	Rect	0.00855	0.00855	0.00854	0.00852	0.00847	0.00839	0.00825
DoF		30	30	30	30	30	30	30
Resonance Frequency U1.4	Rect	0.00004	0.00005	0.00005	0.00007	0.00009	0.00011	0.00021
DoF		30	30	30	30	30	30	30
Loss Factor U1.5	Rect	0.00003	0.00005	0.00008	0.00013	0.00021	0.00034	0.00053
DoF		30	30	30	30	30	30	30
Diaphragm Diameter U1.6	Rect	0.00001	0.00002	0.00003	0.00005	0.00007	0.00012	0.00019
DoF		30	30	30	30	30	30	30
Microphone Parameters Combined		0.01209	0.01209	0.01208	0.01204	0.01197	0.01186	0.01167
EffDoF		60.02	60.02	60.02	60.02	60.05	60.12	60.33
Coupler	Rect							
Coupler Length U2.1		0.0017	0.0017	0.0017	0.0017	0.0017	0.0017	0.0017
DoF		30	30	30	30	30	30	30
Coupler Diameter U2.2	Rect	0.0009	0.0010	0.0010	0.0010	0.0010	0.0010	0.0010
DoF		30	30	30	30	30	30	30
Leakage U2.3	Rect	0.00	0.00	0.00	0.00	0.00	0.00	0.00
DoF		5	5	5	5	5	5	5
Coupler Parameters Combined		0.0020	0.0020	0.0020	0.0020	0.0020	0.0019	0.0019
EffDoF		46.48	46.55	46.70	46.98	47.43	48.17	49.27
Ambient Conditions								
Static Pressure U3.1	Rect	0.00122	0.00121	0.00121	0.00121	0.00122	0.00122	0.00122
DoF		10	10	10	10	10	10	10
Drift in Pressure U3.2	Rect	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049
DoF		10	10	10	10	10	10	10
Temperature U3.3	Rect	0.00017	0.00019	0.00022	0.00029	0.00040	0.00057	0.00087
DoF		10	10	10	10	10	10	10
Drift in Temperature U3.4	Rect	0.00007	0.00007	0.00009	0.00012	0.00016	0.00023	0.00035
DoF		10	10	10	10	10	10	10
Humidity U3.5	Rect	0.00058	0.00058	0.00058	0.00058	0.00058	0.00058	0.00058
DoF		5	5	5	5	5	5	5
Ambient Conditions Combined		0.0014	0.0014	0.0014	0.0015	0.0015	0.0016	0.0017
EffDoF		17.55	17.70	18.01	18.66	20.02	22.93	27.97
Electrical								
Cross Talk U4.1	Rect	0.00113	0.00113	0.00113	0.00113	0.00113	0.00113	0.00113
DoF		30	30	30	30	30	30	30
THDN U4.2	Rect	5.774E-05	5.774E-05	5.774E-05	5.774E-05	5.774E-05	5.774E-05	5.774E-05
DoF		30	30	30	30	30	30	30
Voltae Ratio U4.3	Rect	0.00158	0.00158	0.00158	0.00158	0.00158	0.00158	0.00158
DoF		30	30	30	30	30	30	30
Polarisation Voltage U4.4	Rect	0.00058	0.00058	0.00058	0.00058	0.00058	0.00058	0.00058
DoF		30	30	30	30	30	30	30
Capacitane of Transmitter U4.5	Rect	0.00047	0.00047	0.00047	0.00047	0.00047	0.00047	0.00047
DoF		30	30	30	30	30	30	30
Frequency U4.6	Rect	0.00012	0.00012	0.00012	0.00012	0.00012	0.00012	0.00012
DoF		10	10	10	10	10	10	10
Electrical Combined		0.002	0.002	0.002	0.002	0.002	0.002	0.002
EffDoF		70.44	70.44	70.44	70.44	70.44	70.44	70.44
Corrections								
Heat Conduction Corrections U5.1	Rect	0.001	0.001	0.001	0.001	0.001	0.001	0.001
DoF		5	5	5	5	5	5	5
Viscosity U5.2	Rect	0	0	0	0	0	0.0005774	0.0011547
DoF		5	5	5	5	5	5	5
Radial Wave Motion U5.3	Rect	0	0	0	0	0	0	0
DoF		5	5	5	5	5	5	5
Corrections Combined		0.0006	0.0006	0.0006	0.0006	0.0006	0.0008	0.0013
EffDoF		5.00	5.00	5.00	5.00	5.00	10.00	7.35
Error in Theory/Residual U6.1	Rect	0.0057735	0.0057735	0.0057735	0.0057735	0.0057735	0.0057735	0.0057735
DoF		30	30	30	30	30	30	30
Type A U6.1	Standard	0.012	0.012	0.012	0.012	0.012	0.012	0.012
DoF		11	11	11	11	11	11	11
Rounding U7.1	Rect	0.0005774	0.0005774	0.0005774	0.0005774	0.0005774	0.0005774	0.0005774
DoF		30	30	30	30	30	30	30
Frequency		1258.9	1584.9	1995.3	2511.9	3162.3	3981.1	5011.9
Ucombined		0.018	0.018	0.018	0.018	0.018	0.018	0.018
EffDoF		51.60	51.59	51.52	51.36	51.06	50.69	50.28
k		2.009	2.009	2.009	2.010	2.010	2.010	2.011
Uexp		**0.036**	**0.036**	**0.036**	**0.036**	**0.036**	**0.036**	**0.036**
Rounding to 1 or 2 dp		0.04	0.04	0.04	0.04	0.04	0.04	0.04
Final U95		**0.04**	**0.04**	**0.04**	**0.04**	**0.04**	**0.04**	**0.04**

	Frequency	6309.57	7943.28	10000	12589.25	15848.92	19952.63	25118.87
Parameters								
Microphone								
Front Cavity Volume U1.1	Rect	0.0080	0.0076	0.0071	0.0061	0.0045	0.0038	0.0147
DoF		30	30	30	30	30	30	30
Front Cavity Depth U1.2	Rect	0.00020	0.00037	0.00063	0.00100	0.00147	0.00197	0.00370
DoF		30	30	30	30	30	30	30
Equivalent Volume U1.3	Rect	0.00800	0.00757	0.00680	0.00544	0.00324	0.00095	0.00478
DoF		30	30	30	30	30	30	30
Resonance Frequency U1.4	Rect	0.00044	0.00096	0.00213	0.00448	0.00756	0.00921	0.01970
DoF		30	30	30	30	30	30	30
Loss Factor U1.5	Rect	0.00084	0.00131	0.00194	0.00253	0.00225	0.00063	0.00371
DoF		30	30	30	30	30	30	30
Diaphragm Diameter U1.6	Rect	0.00030	0.00048	0.00076	0.00120	0.00180	0.00254	0.00384
DoF		30	30	30	30	30	30	30
Microphone Parameters Combined		0.01137	0.01090	0.01027	0.00978	0.00992	0.01051	0.02584
EffDoF		60.97	63.11	71.48	101.49	76.00	49.29	67.65
Coupler	Rect							
Coupler Length U2.1		0.0016	0.0015	0.0014	0.0011	0.0008	0.0008	0.0030
DoF		30	30	30	30	30	30	30
Coupler Diameter U2.2	Rect	0.0010	0.0011	0.0011	0.0012	0.0013	0.0014	0.0016
DoF		30	30	30	30	30	30	30
Leakage U2.3	Rect	0.00	0.00	0.00	0.00	0.00	0.00	0.00
DoF		5	5	5	5	5	5	5
Coupler Parameters Combined		0.0019	0.0019	0.0017	0.0016	0.0015	0.0016	0.0034
EffDoF		51.12	54.31	57.41	59.95	49.23	48.42	45.55
Ambient Conditions								
Static Pressure U3.1	Rect	0.00123	0.00124	0.00121	0.00121	0.00123	0.00124	0.00123
DoF		10	10	10	10	10	10	10
Drift in Pressure U3.2	Rect	0.00049	0.00050	0.00048	0.00049	0.00049	0.00050	0.00049
DoF		10	10	10	10	10	10	10
Temperature U3.3	Rect	0.00137	0.00227	0.00312	0.00364	0.00416	0.00525	0.00649
DoF		10	10	10	10	10	10	10
Drift in Temperature U3.4	Rect	0.00055	0.00091	0.00113	0.00145	0.00183	0.00219	0.00260
DoF		10	10	10	10	10	10	10
Humidity U3.5	Rect	0.00058	0.00058	0.00058	0.00058	0.00058	0.00058	0.00058
DoF		5	5	5	5	5	5	5
Ambient Conditions Combined		0.0021	0.0028	0.0036	0.0042	0.0048	0.0059	0.0071
EffDoF		29.42	21.90	17.23	16.59	16.53	15.13	14.24
Electrical								
Cross Talk U4.1	Rect	0.00113	0.00113	0.00113	0.00113	0.00201	0.01096	0.01096
DoF		30	30	30	30	30	30	30
THDN U4.2	Rect	5.774E-05	5.774E-05	5.774E-05	5.774E-05	5.774E-05	5.774E-05	5.774E-05
DoF		30	30	30	30	30	30	30
Voltae Ratio U4.3	Rect	0.00158	0.00158	0.00158	0.00158	0.00158	0.00158	0.00158
DoF		30	30	30	30	30	30	30
Polarisation Voltage U4.4	Rect	0.00058	0.00058	0.00058	0.00058	0.00058	0.00058	0.00058
DoF		30	30	30	30	30	30	30
Capacitane of Transmitter U4.5	Rect	0.00047	0.00047	0.00047	0.00047	0.00047	0.00047	0.00047
DoF		30	30	30	30	30	30	30
Frequency U4.6	Rect	0.00012	0.00012	0.00012	0.00012	0.00012	0.00012	0.00012
DoF		10	10	10	10	10	10	10
Electrical Combined		0.002	0.002	0.002	0.002	0.003	0.011	0.011
EffDoF		70.44	70.44	70.44	70.44	66.77	31.54	31.54
Corrections								
Heat Conduction Corrections U5.1	Rect	0.001	0.001	0.001	0.001	0.001	0.002	0.002
DoF		5	5	5	5	5	5	5
Viscosity U5.2	Rect	0.0017321	0.0017321	0.0023094	0.0023094	0.0028868	0.0028868	0.0057735
DoF		5	5	5	5	5	5	5
Radial Wave Motion U5.3	Rect	0.0001097	0.0002829	0.0007448	0.0019688	0.0053463	0.0152132	0.048151
DoF		5	5	5	5	5	5	5
Corrections Combined		0.0018	0.0018	0.0027	0.0032	0.0062	0.0156	0.0486
EffDoF		6.14	6.39	8.54	12.28	8.54	5.49	5.17
Error in Theory/Residual U6.1	Rect	0.0057735	0.0057735	0.0057735	0.0057735	0.0057735	0.0057735	0.0057735
DoF		30	30	30	30	30	30	30
Type A U6.1	Standard	0.012	0.012	0.012	0.012	0.012	0.022	0.027
DoF		11	11	11	11	11	11	11
Rounding U7.1	Rect	0.0005774	0.0005774	0.0005774	0.0005774	0.0005774	0.0005774	0.0005774
DoF		30	30	30	30	30	30	30
Frequency		6309.6	7943.3	10000.0	12589.3	15848.9	19952.6	25118.9
Ucombined		0.018	0.018	0.017	0.017	0.018	0.032	0.063
EffDoF		49.76	48.85	48.70	49.34	56.16	32.21	13.83
k		2.011	2.012	2.012	2.012	2.005	2.040	2.154
Uexp		**0.036**	**0.035**	**0.035**	**0.035**	**0.037**	**0.066**	**0.135**
Rounding to 1 or 2 dp		0.04	0.04	0.04	0.04	0.04	0.07	0.14
Final U95		**0.04**	**0.04**	**0.05**	**0.06**	**0.08**	**0.1**	**0.15**

NMIJ/AIST

The expanded uncertainty is given as the standard uncertainty multiplied with a coverage factor of k=2. which corresponds to a coverage probability of approximately 95 % for a normal distribution.

CCAUV.A-K6 (NMIJ)

Uncertainty budget for type LS2aP microphones (Modulus)

Uncertainty components	Type	Dist.	Freq. [Hz] 1,9953	2,5119	3,1623	3,9811	5,0119	6,3096	7,9433	10,000	12,589	15,849	19,953	25,119	31,623	39,811	50,119	63,096	79,433	100,00	125,89	158,49	199,53
Electrical impedance of transmitter		Combined	0,004	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,004	0,003	0,003	0,003	0,003	0,003	0,003
Reference capacitance	*B*	*Rect.*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*
Stray capacitance	*B*	*Rect.*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*
Repeatability	*A*	*Normal*	*0,004*	*0,003*	*0,003*	*0,003*	*0,003*	*0,003*	*0,003*	*0,003*	*0,003*	*0,003*	*0,003*	*0,003*	*0,003*	*0,003*	*0,004*	*0,003*	*0,003*	*0,003*	*0,003*	*0,003*	*0,002*
Voltage transfer function between transmitter and receiver		Combined	0,283	0,205	0,143	0,123	0,069	0,040	0,030	0,019	0,015	0,012	0,010	0,009	0,010	0,009	0,008	0,009	0,009	0,011	0,008	0,009	0,009
Attenuator	*B*	*Rect.*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*
Crosstalk	*B*	*Rect.*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*
Linearity of FFT analyzer	*B*	*Rect.*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*
Static pressure	*B*	*Rect.*	*0,004*	*0,004*	*0,004*	*0,004*	*0,004*	*0,004*	*0,004*	*0,004*	*0,004*	*0,004*	*0,004*	*0,004*	*0,004*	*0,004*	*0,004*	*0,004*	*0,004*	*0,004*	*0,004*	*0,004*	*0,004*
Aoustic coupler difference	*B*	*Rect.*	*0,269*	*0,180*	*0,120*	*0,080*	*0,054*	*0,036*	*0,024*	*0,016*	*0,011*	*0,007*	*0,005*	*0,003*	*0,002*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*
Polarizing voltage	*B*	*Rect.*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*
Repeatability	*A*	*Normal*	*0,090*	*0,098*	*0,078*	*0,093*	*0,043*	*0,017*	*0,018*	*0,009*	*0,010*	*0,009*	*0,007*	*0,008*	*0,009*	*0,008*	*0,006*	*0,008*	*0,007*	*0,010*	*0,007*	*0,007*	*0,008*
Coupler volume	A	Normal	0,004	0,004	0,004	0,004	0,004	0,004	0,004	0,004	0,004	0,004	0,004	0,004	0,004	0,004	0,004	0,004	0,004	0,004	0,004	0,004	0,004
Specific heat ratio	B	Rect.	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001
Coupler correction (Heat conduction, Wave motion)		Combined	0,010	0,010	0,010	0,010	0,010	0,011	0,011	0,011	0,011	0,011	0,011	0,011	0,012	0,012	0,012	0,012	0,012	0,012	0,012	0,012	0,012
Static pressure, temperature and relative humidity	*B*	*Rect.*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*
Coupler length and diameter	*B*	*Rect.*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*
Resonance freq., quality factor and microphone equivalent volume	*B*	*Rect.*	*0,009*	*0,010*	*0,010*	*0,010*	*0,010*	*0,011*	*0,011*	*0,011*	*0,011*	*0,011*	*0,011*	*0,011*	*0,012*	*0,012*	*0,012*	*0,012*	*0,012*	*0,012*	*0,012*	*0,012*	*0,012*
Environmental corrections of microphone sensitivities		Combined	0,002	0,002	0,002	0,002	0,002	0,002	0,002	0,002	0,002	0,002	0,002	0,002	0,002	0,002	0,002	0,002	0,002	0,002	0,002	0,002	0,002
Temperature coeff.	*B*	*Rect.*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*
Pressure coeff.	*B*	*Rect.*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*
Discrepancy by frequency drift	B	Rect.	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
Imperfection of microphone mounting and Instability of microphones	B	Rect.	0,120	0,120	0,120	0,120	0,060	0,060	0,060	0,030	0,030	0,030	0,030	0,025	0,015	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
Rounding error	B	Rect.	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003
Combined standard uncertainty			0,308	0,238	0,187	0,172	0,092	0,073	0,068	0,038	0,036	0,035	0,034	0,030	0,022	0,016	0,016	0,016	0,016	0,017	0,016	0,016	0,016
Expanded uncertainty (k=2)			*0,616*	0,475	0,375	0,344	0,185	0,146	0,137	0,075	0,072	0,070	0,068	0,060	0,045	0,033	0,031	0,032	0,032	0,035	0,032	0,032	0,032
Expanded uncertainty (Stated)			**0,62**	**0,48**	**0,38**	**0,35**	**0,19**	**0,15**	**0,14**	**0,08**	**0,08**	**0,07**	**0,07**	**0,06**	**0,05**	**0,04**	**0,04**	**0,04**	**0,04**	**0,04**	**0,04**	**0,04**	**0,04**

CCAUV.A-K6 (NMIJ)

Uncertainty budget for type LS2aP mic

Uncertainty components	Type	Dist.	251,19	316,23	398,11	501,19	630,96	794,33	1000,0	1258,9	1584,9	1995,3	2511,9	3162,3	3981,1	5011,9	6309,6	7943,3	10000	12589	15849	19953	25119
Electrical impedance of transmitter		Combined	0,003	0,003	0,003	0,003	0,003	0,003	0,002	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,002	0,002	0,002	0,002	0,002
Reference capacitance	*B*	*Rect.*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*
Stray capacitance	*B*	*Rect.*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*
Repeatability	*A*	*Normal*	*0,003*	*0,002*	*0,003*	*0,003*	*0,003*	*0,003*	*0,002*	*0,003*	*0,003*	*0,003*	*0,003*	*0,003*	*0,003*	*0,002*	*0,002*	*0,003*	*0,002*	*0,002*	*0,002*	*0,002*	*0,002*
Voltage transfer function between transmitter and receiver		Combined	0,009	0,009	0,008	0,008	0,008	0,009	0,008	0,008	0,009	0,008	0,008	0,008	0,008	0,008	0,009	0,008	0,008	0,009	0,009	0,010	0,012
Attenuator	*B*	*Rect.*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*
Crosstalk	*B*	*Rect.*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*
Linearity of FFT analyzer	*B*	*Rect.*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*
Static pressure	*B*	*Rect.*	*0,004*	*0,004*	*0,004*	*0,004*	*0,004*	*0,004*	*0,004*	*0,004*	*0,004*	*0,004*	*0,004*	*0,004*	*0,004*	*0,004*	*0,004*	*0,004*	*0,004*	*0,004*	*0,004*	*0,004*	*0,004*
Aoustic coupler difference	*B*	*Rect.*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*
Polarizing voltage	*B*	*Rect.*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*
Repeatability	*A*	*Normal*	*0,008*	*0,008*	*0,007*	*0,007*	*0,007*	*0,007*	*0,007*	*0,007*	*0,007*	*0,007*	*0,007*	*0,007*	*0,007*	*0,007*	*0,008*	*0,007*	*0,007*	*0,008*	*0,008*	*0,009*	*0,011*
Coupler volume	A	Normal	0,004	0,004	0,004	0,004	0,004	0,004	0,004	0,004	0,004	0,004	0,004	0,004	0,004	0,004	0,004	0,004	0,004	0,004	0,004	0,004	0,004
Specific heat ratio	B	Rect.	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001
Coupler correction (Heat conduction, Wave motion)		Combined	0,012	0,012	0,012	0,012	0,012	0,012	0,012	0,012	0,012	0,012	0,012	0,013	0,013	0,013	0,013	0,013	0,013	0,009	0,009	0,038	0,081
Static pressure, temperature and relative humidity	*B*	*Rect.*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,001*	*0,001*	*0,002*	*0,003*	*0,006*	*0,013*
Coupler length and diameter	*B*	*Rect.*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*	*0,002*	*0,003*	*0,004*	*0,007*	*0,017*
Resonance freq., quality factor and microphone equivalent volume	*B*	*Rect.*	*0,012*	*0,012*	*0,012*	*0,012*	*0,012*	*0,012*	*0,012*	*0,012*	*0,012*	*0,012*	*0,012*	*0,013*	*0,013*	*0,013*	*0,013*	*0,013*	*0,013*	*0,009*	*0,007*	*0,037*	*0,078*
Environmental corrections of microphone sensitivities		Combined	0,002	0,002	0,002	0,002	0,002	0,002	0,002	0,002	0,002	0,002	0,002	0,002	0,002	0,002	0,002	0,002	0,002	0,002	0,002	0,002	0,002
Temperature coeff.	*B*	*Rect.*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*	*0,002*	*0,002*	*0,001*	*0,001*
Pressure coeff.	*B*	*Rect.*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*
Discrepancy by frequency drift	B	Rect.	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
Imperfection of microphone mounting and Instability of microphones	B	Rect.	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,010	0,020	0,040	0,060
Rounding error	B	Rect.	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003
Combined standard uncertainty			0,016	0,016	0,016	0,016	0,016	0,016	0,016	0,016	0,016	0,016	0,016	0,016	0,016	0,016	0,017	0,017	0,017	0,017	0,024	0,056	0,102
Expanded uncertainty (k=2)			0,033	0,032	0,032	0,032	0,032	0,032	0,032	0,032	0,032	0,032	0,032	0,032	0,033	0,033	0,034	0,034	0,033	0,035	0,049	0,113	0,204
Expanded uncertainty (Stated)			**0,04**	**0,04**	**0,04**	**0,04**	**0,04**	**0,04**	**0,04**	**0,04**	**0,04**	**0,04**	**0,04**	**0,04**	**0,04**	**0,04**	**0,04**	**0,04**	**0,04**	**0,04**	**0,05**	**0,12**	**0,21**

CCAUV.A-K6 (NMIJ)

Uncertainty budget for type LS2aP microphones (Phase)

			Freq. [Hz]																				
Uncertainty components	Type	Dist.	1,9953	2,5119	3,1623	3,9811	5,0119	6,3096	7,9433	10,000	12,589	15,849	19,953	25,119	31,623	39,811	50,119	63,096	79,433	100,00	125,89	158,49	199,53
Electrical impedance of transmitter		Combined	0,029	0,009	0,007	0,007	0,008	0,007	0,007	0,006	0,007	0,006	0,005	0,004	0,004	0,003	0,005	0,003	0,003	0,003	0,003	0,003	0,003
Reference capacitance	*B*	*Rect.*	*0,006*	*0,006*	*0,006*	*0,006*	*0,006*	*0,006*	*0,006*	*0,006*	*0,006*	*0,006*	*0,003*	*0,003*	*0,003*	*0,003*	*0,003*	*0,003*	*0,003*	*0,003*	*0,003*	*0,003*	*0,003*
Stray capacitance	*B*	*Rect.*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*
Repeatability	*A*	*Normal*	*0,029*	*0,007*	*0,005*	*0,005*	*0,005*	*0,004*	*0,004*	*0,003*	*0,003*	*0,003*	*0,004*	*0,003*	*0,003*	*0,002*	*0,004*	*0,001*	*0,000*	*0,001*	*0,000*	*0,000*	*0,000*
Voltage transfer function between transmitter and receiver		Combined	3,254	2,501	1,989	1,515	1,479	1,010	0,809	0,694	0,544	0,425	0,342	0,261	0,208	0,170	0,142	0,102	0,085	0,084	0,050	0,050	0,036
Attenuator	*B*	*Rect.*	*0,010*	*0,010*	*0,010*	*0,010*	*0,010*	*0,010*	*0,010*	*0,010*	*0,010*	*0,010*	*0,010*	*0,010*	*0,010*	*0,010*	*0,010*	*0,010*	*0,010*	*0,010*	*0,010*	*0,010*	*0,010*
Crosstalk	*B*	*Rect.*	*0,003*	*0,003*	*0,003*	*0,003*	*0,003*	*0,003*	*0,003*	*0,003*	*0,003*	*0,003*	*0,003*	*0,003*	*0,003*	*0,003*	*0,003*	*0,003*	*0,003*	*0,003*	*0,003*	*0,003*	*0,003*
Linearity of FFT analyzer	*B*	*Rect.*	*0,010*	*0,010*	*0,010*	*0,010*	*0,010*	*0,010*	*0,010*	*0,010*	*0,010*	*0,010*	*0,010*	*0,010*	*0,010*	*0,010*	*0,010*	*0,010*	*0,010*	*0,010*	*0,010*	*0,010*	*0,010*
Static pressure	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Aoustic coupler difference	*B*	*Rect.*	*1,827*	*1,420*	*1,100*	*0,857*	*0,667*	*0,520*	*0,407*	*0,312*	*0,242*	*0,191*	*0,147*	*0,113*	*0,095*	*0,069*	*0,061*	*0,043*	*0,035*	*0,026*	*0,026*	*0,017*	*0,017*
Polarizing voltage	*B*	*Rect.*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*
Repeatability	*A*	*Normal*	*2,693*	*2,059*	*1,657*	*1,249*	*1,321*	*0,866*	*0,699*	*0,620*	*0,487*	*0,380*	*0,308*	*0,235*	*0,184*	*0,154*	*0,128*	*0,091*	*0,076*	*0,079*	*0,041*	*0,045*	*0,028*
Coupler volume	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Specific heat ratio	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Coupler correction (Heat conduction, Wave motion)		Combined	0,014	0,013	0,012	0,012	0,011	0,010	0,010	0,009	0,008	0,008	0,007	0,006	0,006	0,005	0,005	0,004	0,004	0,004	0,004	0,003	0,003
Static pressure, temperature and relative humidity	*B*	*Rect.*	*0,005*	*0,005*	*0,004*	*0,004*	*0,004*	*0,004*	*0,003*	*0,003*	*0,003*	*0,003*	*0,003*	*0,002*	*0,002*	*0,002*	*0,002*	*0,002*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*
Coupler length and diameter	*B*	*Rect.*	*0,002*	*0,002*	*0,002*	*0,002*	*0,002*	*0,002*	*0,002*	*0,002*	*0,002*	*0,002*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*
Resonance freq., quality factor and microphone equivalent volume	*B*	*Rect.*	*0,013*	*0,012*	*0,011*	*0,011*	*0,010*	*0,009*	*0,009*	*0,008*	*0,007*	*0,007*	*0,006*	*0,006*	*0,005*	*0,005*	*0,004*	*0,004*	*0,004*	*0,003*	*0,003*	*0,003*	*0,003*
Environmental corrections of microphone sensitivities		Combined	0,008	0,008	0,008	0,008	0,008	0,008	0,008	0,008	0,008	0,008	0,008	0,008	0,008	0,008	0,008	0,008	0,008	0,008	0,008	0,008	0,008
Temperature coeff.	*B*	*Rect.*	*0,007*	*0,007*	*0,007*	*0,007*	*0,007*	*0,007*	*0,007*	*0,007*	*0,007*	*0,007*	*0,007*	*0,007*	*0,007*	*0,007*	*0,007*	*0,007*	*0,007*	*0,007*	*0,007*	*0,007*	*0,007*
Pressure coeff.	*B*	*Rect.*	*0,002*	*0,002*	*0,002*	*0,002*	*0,002*	*0,002*	*0,002*	*0,002*	*0,002*	*0,002*	*0,002*	*0,002*	*0,002*	*0,002*	*0,002*	*0,002*	*0,002*	*0,002*	*0,002*	*0,002*	*0,002*
Discrepancy by frequency drift	B	Rect.	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
Imperfection of microphone mounting and Instability of microphones	B	Rect	2,000	1,500	1,000	1,000	1,000	0,501	0,501	0,501	0,301	0,301	0,301	0,202	0,202	0,104	0,104	0,104	0,104	0,104	0,058	0,058	0,042
Rounding error	B	Rect.	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003
Combined standard uncertainty			3,820	2,917	2,226	1,816	1,786	1,128	0,952	0,856	0,623	0,521	0,456	0,330	0,290	0,200	0,177	0,146	0,135	0,135	0,078	0,077	0,056
Expanded uncertainty (k=2)			7,640	5,834	4,453	3,631	3,572	2,256	1,903	1,713	1,245	1,043	0,912	0,660	0,581	0,399	0,354	0,293	0,270	0,269	0,155	0,155	0,113
Expanded uncertainty (Stated)			**7,64**	**5,84**	**4,46**	**3,64**	**3,58**	**2,26**	**1,91**	**1,72**	**1,25**	**1,05**	**0,92**	**0,66**	**0,59**	**0,40**	**0,36**	**0,30**	**0,27**	**0,27**	**0,16**	**0,16**	**0,12**

CCAUV.A-K6 (NMIJ)

Uncertainty budget for type LS2aP micro

Uncertainty components	Type	Dist.	251,19	316,23	398,11	501,19	630,96	794,33	1000,0	1258,9	1584,9	1995,3	2511,9	3162,3	3981,1	5011,9	6309,6	7943,3	10000	12589	15849	19953	25119
Electrical impedance of transmitter		Combine	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,004	0,003	0,004	0,005	0,004	0,004	0,004
Reference capacitance	*B*	*Rect.*	*0,003*	*0,003*	*0,003*	*0,003*	*0,003*	*0,003*	*0,003*	*0,003*	*0,003*	*0,003*	*0,003*	*0,003*	*0,003*	*0,003*	*0,003*	*0,003*	*0,003*	*0,003*	*0,003*	*0,003*	*0,003*
Stray capacitance	*B*	*Rect.*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*
Repeatability	*A*	*Normal*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,001*	*0,001*	*0,000*	*0,001*	*0,000*	*0,001*	*0,001*	*0,003*	*0,001*	*0,002*	*0,004*	*0,003*	*0,002*	*0,003*
Voltage transfer function between transmitter and receiver		Combine	0,034	0,031	0,024	0,025	0,018	0,018	0,019	0,017	0,016	0,017	0,019	0,020	0,024	0,027	0,031	0,038	0,047	0,048	0,046	0,097	0,147
Attenuator	*B*	*Rect.*	*0,010*	*0,010*	*0,010*	*0,010*	*0,010*	*0,010*	*0,010*	*0,010*	*0,010*	*0,010*	*0,010*	*0,010*	*0,010*	*0,010*	*0,010*	*0,010*	*0,010*	*0,010*	*0,010*	*0,010*	*0,010*
Crosstalk	*B*	*Rect.*	*0,003*	*0,003*	*0,003*	*0,003*	*0,003*	*0,003*	*0,003*	*0,003*	*0,003*	*0,003*	*0,003*	*0,003*	*0,003*	*0,003*	*0,003*	*0,003*	*0,003*	*0,003*	*0,003*	*0,003*	*0,003*
Linearity of FFT analyzer	*B*	*Rect.*	*0,010*	*0,010*	*0,010*	*0,010*	*0,010*	*0,010*	*0,010*	*0,010*	*0,010*	*0,010*	*0,010*	*0,010*	*0,010*	*0,010*	*0,010*	*0,020*	*0,020*	*0,020*	*0,030*	*0,030*	*0,040*
Static pressure	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Aoustic coupler difference	*B*	*Rect.*	*0,017*	*0,009*	*0,009*	*0,009*	*0,004*	*0,002*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*
Polarizing voltage	*B*	*Rect.*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*
Repeatability	*A*	*Normal*	*0,025*	*0,026*	*0,017*	*0,018*	*0,010*	*0,010*	*0,012*	*0,009*	*0,008*	*0,009*	*0,012*	*0,014*	*0,019*	*0,023*	*0,027*	*0,030*	*0,041*	*0,042*	*0,034*	*0,091*	*0,141*
Coupler volume	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Specific heat ratio	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Coupler correction (Heat conduction, Wave motion)		Combine	0,003	0,003	0,004	0,005	0,007	0,009	0,012	0,015	0,019	0,024	0,031	0,038	0,048	0,058	0,068	0,075	0,070	0,040	0,038	0,263	1,119
Static pressure, temperature and relative humidity	*B*	*Rect.*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,000*	*0,001*	*0,001*	*0,003*	*0,007*	*0,021*
Coupler length and diameter	*B*	*Rect.*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*	*0,001*	*0,002*	*0,002*	*0,004*	*0,007*	*0,020*
Resonance freq., quality factor and microphone equivalent volume	*B*	*Rect.*	*0,003*	*0,003*	*0,004*	*0,005*	*0,007*	*0,009*	*0,012*	*0,015*	*0,019*	*0,024*	*0,031*	*0,038*	*0,048*	*0,058*	*0,068*	*0,075*	*0,070*	*0,039*	*0,038*	*0,263*	*1,118*
Environmental corrections of microphone sensitivities		Combine	0,008	0,008	0,008	0,008	0,008	0,008	0,008	0,008	0,008	0,008	0,008	0,008	0,008	0,008	0,008	0,008	0,008	0,008	0,008	0,009	0,009
Temperature coeff.	*B*	*Rect.*	*0,007*	*0,007*	*0,007*	*0,007*	*0,007*	*0,007*	*0,007*	*0,007*	*0,007*	*0,007*	*0,007*	*0,007*	*0,007*	*0,007*	*0,007*	*0,007*	*0,007*	*0,007*	*0,007*	*0,009*	*0,009*
Pressure coeff.	*B*	*Rect.*	*0,002*	*0,002*	*0,002*	*0,002*	*0,002*	*0,002*	*0,002*	*0,002*	*0,002*	*0,002*	*0,002*	*0,002*	*0,002*	*0,002*	*0,002*	*0,002*	*0,002*	*0,002*	*0,002*	*0,002*	*0,002*
Discrepancy by frequency drift	B	Rect.	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
Imperfection of microphone mounting and Instability of microphones	B	Rect	0,042	0,042	0,030	0,030	0,050	0,050	0,050	0,050	0,050	0,050	0,050	0,100	0,100	0,100	0,100	0,100	0,300	0,300	0,300	0,500	0,500
Rounding error	B	Rect.	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003
Combined standard uncertainty			0,055	0,054	0,040	0,040	0,054	0,055	0,055	0,056	0,057	0,059	0,062	0,109	0,114	0,119	0,125	0,131	0,312	0,306	0,306	0,573	1,234
Expanded uncertainty (k=2)			0,110	0,107	0,079	0,080	0,109	0,109	0,111	0,111	0,113	0,118	0,124	0,219	0,227	0,238	0,250	0,262	0,624	0,613	0,612	1,147	2,469
Expanded uncertainty (Stated)			**0,12**	**0,11**	**0,08**	**0,09**	**0,11**	**0,11**	**0,12**	**0,12**	**0,12**	**0,12**	**0,13**	**0,22**	**0,23**	**0,24**	**0,26**	**0,27**	**0,63**	**0,62**	**0,62**	**1,15**	**2,47**

NMISA

The reported uncertainties of measurement were calculated and expressed in accordance with the BIPM, IEC, ISO, IUPAP, OIML document entitled "A Guide to the Expression of Uncertainty in Measurement" (International Organisation for Standardisation, Geneva, Switzerland).

The reported expanded uncertainty of measurement, U, is stated as the standard uncertainty of measurement multiplied by a coverage factor of k = 2, which for a normal distribution approximates a level of confidence of 95,45 %.

Symbol	Frequency (Hz) **LS2P Modulus *U* calculated with *k*=2 which approximates 95%**	2,00 $u(x_i)$ (dB)	2,51 $u(x_i)$ (dB)	5,01 $u(x_i)$ (dB)	15,85 $u(x_i)$ (dB)	50,12 $u(x_i)$ (dB)	7 943,3 $u(x_i)$ (dB)	15 848,9 $u(x_i)$ (dB)	19 952,6 $u(x_i)$ (dB)	25 118,9 $u(x_i)$ (dB)
	Electrical Parameters									
C_{ref}	Reference capacitor	0,0255	0,0241	0,0203	0,0134	0,0027	0,0022	0,0027	0,0032	0,0032
Z_e	Voltage ratio	0,0015	0,0015	0,0015	0,0015	0,001	0,001	0,001	0,001	0,001
$Z_{e,XT}$	Channel cross-talk	0,0008	0,0008	0,0008	0,0008	0,0008	0,0008	0,0008	0,0008	0,0008
p_{sn}	Signal to noise ratio	0,0012	0,00103	0,00064	0,00027	0,00011	0,00075	0,0012	0,00139	0,00162
$T_xR_{x,gs}$ C_s	Transmitter & Receiver driven ground shield & stray capacitance	0,0015	0,0015	0,0015	0,0013	0,0010	0,0010	0,0030	0,0040	0,004
E_0	Polarization voltage	0,0008	0,0008	0,0008	0,0008	0,0008	0,0008	0,0008	0,0008	0,0008
	Coupler Properties									
l_c, d_c V_c, S_0	Coupler length, diameter, volume, cross-sectional surface area	0,0003	0,0003	0,0003	0,0003	0,0003	0,0002	0,0015	0,0012	0,0018
$L_{m,c}$	Unintentional microphone/coupler leakage	0,0177	0,0107	0,006	0,0018	0,000	0,000	0,000	0,000	0,000
	Radial wave-motion	0,000	0,000	0,000	0,000	0,000	0,0015	0,0057	0,0074	0,0091
HC	Heat conduction	0,0354	0,0341	0,0281	0,0093	0,0000	0,0000	0,0000	0,0000	0,0000
	Microphone Parameters									
V_f, V_e	Front cavity volume, Equivalent volume	0,0051	0,0053	0,0057	0,0062	0,0065	0,01	0,001	0,035	0,023
f_0	Resonant frequency	0,0000	0,0000	0,0000	0,0000	0,0000	0,0002	0,0019	0,0017	0,0031
d	loss factor	0,0000	0,0000	0,0000	0,0000	0,0000	0,0018	0,0019	0,0007	0,0031
	Ambient Conditions									
$p_{s,\Delta+m}$	Static pressure & pressure corrections	0,004	0,004	0,004	0,004	0,004	0,005	0,005	0,002	0,001
$t_{\Delta+m}$	Temperature & temperature corrections	0,0004	0,0004	0,0004	0,0004	0,0003	0,0013	0,0028	0,0017	0,0005
$H_{\Delta+m}$	Relative humidity	0,0004	0,0004	0,0004	0,0004	0,0003	0,0013	0,0028	0,0017	0,0005
	Processing of Results - Type A									
$E_{c,f}$	Curve fitting ESDM	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000
r_e	Rounding error	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003
rp	Reproduceability	0,017	0,016	0,015	0,015	0,010	0,012	0,015	0,030	0,017
u_c	**Combined Standard Uncertainty (*k*=1)**	0,051	0,047	0,039	0,024	0,013	0,017	0,018	0,047	0,031
U	**Expanded Standard Uncertainty (*k*=2)**	0,200	0,150	0,080	0,050	0,030	0,040	0,060	0,100	0,150

Symbol	Frequency (Hz) LS2P Phase *U* calculated with *k*=2 which approximates 95%	2,00 $u(x_i)$ (dB)	2,51 $u(x_i)$ (dB)	5,01 $u(x_i)$ (dB)	7,94 $u(x_i)$ (dB)	10,00 $u(x_i)$ (dB)	15,85 $u(x_i)$ (dB)	31,62 $u(x_i)$ (°)	63,10 $u(x_i)$ (°)	158,49 $u(x_i)$ (°)	6309,6 $u(x_i)$ (°)	10000,0 $u(x_i)$ (°)	15 848,9 $u(x_i)$ (dB)	19 952,6 $u(x_i)$ (dB)	25 118,9 $u(x_i)$ (dB)
	Electrical Parameters														
Θa	Phase accuracy	0,0029	0,0029	0,0029	0,0029	0,0029	0,0029	0,0029	0,0029	0,0029	0,0029	0,0029	0,0029	0,0029	0,0029
$\Theta Cref$	Reference capacitor	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000
Θf	Frequency accuracy	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000
Θ_{Res}	Phase resolution of Analyzer	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003
$\Theta T_x R_{x,gs}$ $_\Theta C_s$	Transmitter & Receiver driven ground shield & stray cap	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,0010	0,0020	0,0030	0,0040	0,0040
	Coupler Properties														
Θl_c, Θd_c ΘV_c, ΘS_0	Coupler length, diameter, volume, cross-sectional surfa	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0002	0,0002	0,0004	0,0006	0,0010	0,0013	0,0014
$\Theta L_{m,c}$	Unintentional microphone/coupler leakage	0,162	0,113	0,073	0,047	0,038	0,023	0,012	0,007	0,001	0,000	0,000	0,000	0,000	0,000
	Radial wave-motion	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,0050	0,0145	0,0520	0,0708	0,0895
HC	Heat conduction	0,433	0,407	0,299	0,213	0,171	0,105	0,044	0,008	0,000	0,000	0,000	0,000	0,000	0,000
	Microphone Parameters														
ΘV_f, Θv_e	Front cavity volume, Equivalent volume	0,0099	0,0094	0,0079	0,0068	0,0063	0,0053	0,0040	0,0030	0,0030	0,0020	0,0020	0,0020	0,0020	0,0020
Θf_0	Resonant frequency	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0001	0,0001	0,0002	0,0067	0,0134	0,0171	0,0095	0,0260
Θd	loss factor	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0001	0,0002	0,0003	0,0099	0,0073	0,0050	0,0011	0,0177
	Ambient Conditions														
$\Theta p_{s,\Delta+m}$	Static pressure & pressure corrections	0,0013	0,0013	0,0013	0,0013	0,0013	0,0013	0,0011	0,0008	0,0005	0,0004	0,0062	0,0266	0,0341	0,0250
$\Theta t_{\Delta+m}$	Temperature & temperature corrections	0,0007	0,0007	0,0007	0,0007	0,0007	0,0007	0,0006	0,0004	0,0002	0,0038	0,0020	0,0128	0,0219	0,0400
$\Theta H_{\Delta+m}$	Relative humidity	0,0007	0,0007	0,0007	0,0007	0,0007	0,0007	0,0006	0,0004	0,0002	0,0038	0,002	0,0128	0,0219	0,0400
	Processing of Results - Type A														
$\Theta E_{c,f}$	Curve fitting	0,00144	0,00144	0,00144	0,00144	0,00144	0,00144	0,00144	0,00144	0,00144	0,00144	0,00144	0,00144	0,00144	0,00144
Θr_e	Rounding error	0,0029	0,0029	0,0029	0,0029	0,0029	0,0029	0,0029	0,0029	0,0029	0,0029	0,0029	0,0029	0,0029	0,0029
Θrp	Reproduceability	0,4	0,32	0,17	0,12	0,09	0,08	0,06	0,03	0,02	0,03	0,03	0,06	0,11	0,16
	Uncertainty quoted in degrees (°)														
Θu_c	**Combined Standard Uncertainty (*k*=1)**	0,612	0,530	0,352	0,249	0,197	0,135	0,076	0,032	0,021	0,033	0,038	0,088	0,139	0,192
	Expanded Standard Uncertainty (*k*=2)	2,00	1,00	0,90	0,65	0,50	0,40	0,30	0,15	0,10	0,15	0,25	0,45	0,55	0,55

NRC

The uncertainties were evaluated by Monte Carlo simulation of the component uncertainty distributions using the measurement equation to propagate the distributions for the pressure sensitivity levels. The expanded uncertainty was calculated as the half-length of the shortest 95% coverage interval for the pressure sensitivity level.

Uncertainty contributions at one-third-octave band-centre frequencies (0.0020 kHz to 0.0063 kHz)

Input quantity (distribution)	0.002 0	0.002 5	0.003 2	0.004 0	0.005 0	0.006 3	Unit
Electrical transfer impedance							
Ref. imped: capac. at 1 kHz (*t*, 95 %, *k*=2)	500	500	500	500	500	500	µF/F
Ref. impedance: leakg res. (Gau, std unc.)	0.1	0.1	0.1	0.1	0.1	0.1	GΩ
Ref. imp.: freq. dependence (Gau, std unc.)	6	5	5	5	5	5	µΩ/Ω
Voltage ratio: voltmeter (*t*, std unc.)	500	500	500	500	120	120	µV/V
Voltage ratio: phasemeter (Gau, std dev.)	0.040	0.040	0.040	0.040	0.040	0.040	°
Voltage ratio: magn.repeat. (Gau, std dev.)	4 000	2 000	900	900	900	300	µV/V
Voltage ratio : phase rept. (Gau, std dev.)	3	1	1	0.7	0.25	0.1	°
Noise: cross-talk (Gau, std unc.)	0.002 5	0.002 5	0.002 5	0.002 5	0.002 5	0.002 5	dB
Noise: inherent noise (Gau, std unc.)	0.000 1	0.000 1	0.000 1	0.000 1	0.000 1	0.000 1	dB
Noise: distortn & harmonics (Gau, std unc.)	0.000 1	0.000 1	0.000 1	0.000 1	0.000 1	0.000 1	dB
Frequency of signal: tolerance (rect., s-rng)	4	4	4	4	4	4	mHz
Ground shield: transmitter (rect., s-rng)	0.001 5	0.001 5	0.001 5	0.001 5	0.001 5	0.001 5	dB
Ground shield: receiver (rect., s-rng)	0.000 9	0.000 9	0.000 9	0.000 9	0.000 9	0.000 9	dB
Acoustic transfer impedance							
Static pressure: barometer (*t*, 95 %, *k*=2)	5	5	5	5	5	5	Pa
Pressure: spatial variation (rect., s-rng)	8	8	8	8	8	8	Pa
Pressure: temporal varn (Gau, 95 %, *k*=2)	10	10	10	10	10	10	Pa
Temperature: calibration (*t*, 95 %, *k*=2)	0.006	0.006	0.006	0.006	0.006	0.006	°C
Temperature: indication error (rect; s-rng)	0.001	0.001	0.001	0.001	0.001	0.001	°C
Temperature: spatial varn (Gau, 95 %, *k*=2)	0.9	0.9	0.9	0.9	0.9	0.9	°C
Temperat.: temporal varn (Gau, 95 %, *k*=2)	0.03	0.03	0.03	0.03	0.03	0.03	°C
Rel. humid: calibration (*t*, 95 %, *k* =2)	1.5	1.5	1.5	1.5	1.5	1.5	%
Rel. humid: indication error (rect., s-rng)	1	1	1	1	1	1	%
Rel. humid: spatial variation (Gau., std dev)	0.1	0.1	0.1	0.1	0.1	0.1	%
Rel. humid: temporal variation (rect., s-rng)	0.5	0.5	0.5	0.5	0.5	0.5	%
Couplers: length (*t*, 95 %, *k* =2)	1.5	1.5	1.5	1.5	1.5	1.5	µm
Couplers: diameter (*t*, 95 %, *k* =2)	1	1	1	1	1	1	µm
Couplers: leakage (Gau, std unc.)	0.34	0.25	0.18	0.14	0.10	0.076	dB
Pressure radial non-uniformity (rect., s-rng)	0	0	0	0	0	0	dB
Pol. voltage: tolerance (rect., s-rng)	0.02	0.02	0.02	0.02	0.02	0.02	V
Pol. voltage: electrometer (rect, s-rng)	400	400	400	400	400	400	µV/V
Pol. voltage: effect at 250 Hz (rect., s-rng)	0.01	0.01	0.01	0.01	0.01	0.01	dB/V
Pol. Volt.: freq depend of effect (rect, s-rng)	0	0	0	0	0	0	dB/V
Front cavity: depth (*t*, 95 %, *k* =2)	10	10	10	10	10	10	µm
Front cavity: diameter (rect., s-rng)	30	30	30	30	30	30	µm
Front volume (Gauss., std. unc.)	0.5	0.5	0.5	0.5	0.5	0.5	mm^3
Diaphragm equiv. vol. (Gau., 95 %, *k*=2)	1	1	1	1	1	1	mm^3
Diaphragm reson. freq. (Gau., 95 %, *k*=2)	1.68	1.68	1.68	1.68	1.68	1.68	kHz
Loss factor of mic. (Gau., 95 %, *k* = 2)	0.05	0.05	0.05	0.05	0.05	0.05	1
Diaphragm: effect. diam. (Gau., std unc.)	0.1	0.1	0.1	0.1	0.1	0.1	mm
Pressure coeff.: unc. (Gau., 95 %, *k* = 2)	0.000 5	0.000 5	0.000 5	0.000 5	0.000 5	0.000 5	dB/kPa
Pressure coeff.: repeat. (Gau, rel. std unc.)	5	5	5	5	5	5	%
Temp. coeff.: unc. (Gau, 95 %, *k* = 2)	0.002 3	0.002 3	0.002 3	0.002 3	0.002 3	0.002 3	dB/°C
Temp. coeff.: repeat. (Gau, rel. std unc.)	5	5	5	5	5	5	%
Influence of rel. humidity (Gau, std unc.)	$8\cdot10^{-6}$	$8\cdot10^{-6}$	$8\cdot10^{-6}$	$8\cdot10^{-6}$	$8\cdot10^{-6}$	$8\cdot10^{-6}$	dB/%
Speed of sound: eq. (Gau, rel. std unc.)	$3\cdot10^{-4}$	$3\cdot10^{-4}$	$3\cdot10^{-4}$	$3\cdot10^{-4}$	$3\cdot10^{-4}$	$3\cdot10^{-4}$	1
Density: equation (Gau, rel. std unc.)	$2.2\cdot10^{-5}$	$2.2\cdot10^{-5}$	$2.2\cdot10^{-5}$	$2.2\cdot10^{-5}$	$2.2\cdot10^{-5}$	$2.2\cdot10^{-5}$	1
Ratio spec. heats: eqn (Gau, rel. std unc.)	$3.2\cdot10^{-4}$	$3.2\cdot10^{-4}$	$3.2\cdot10^{-4}$	$3.2\cdot10^{-4}$	$3.2\cdot10^{-4}$	$3.2\cdot10^{-4}$	1
Effect of excess volume (rect., s-rng)	0	0	0	0	0	0	dB
Effect of viscous losses (Gau, std unc.)	0	0	0	0	0	0	dB
Rad. wave motion correc. (Gau, std unc.)	0	0	0	0	0	0	dB
Experiment							
Calculation error (rect., s-rng)	0	0	0	0	0	0	dB
Repeatability: magnitude (Gau, std dev.)	0.10	0.07	0.04	0.02	0.01	0.01	dB
Repeatability: phase (Gau, std dev.)	0.9	0.8	0.25	0.25	0.25	0.25	°
Rounding of results: magn. (rect., s-rng)	$5\cdot10^{-3}$	$5\cdot10^{-3}$	$5\cdot10^{-3}$	$5\cdot10^{-3}$	$5\cdot10^{-3}$	$5\cdot10^{-3}$	dB
Rounding of results: phase (rect., s-rng)	$5\cdot10^{-3}$	$5\cdot10^{-3}$	$5\cdot10^{-3}$	$5\cdot10^{-3}$	$5\cdot10^{-3}$	$5\cdot10^{-3}$	°
OVERALL UNCERTAINTIES							
Standard uncertainty: magnitude	0.38	0.27	0.19	0.14	0.11	0.08	dB
Uncertainty (95 %): magnitude	**0.76**	**0.54**	**0.38**	**0.28**	**0.22**	**0.16**	**dB**
Standard uncertainty: phase	2.76	1.18	0.66	0.66	0.33	0.27	°
Uncertainty (95 %): phase	**5.39**	**2.32**	**1.29**	**1.29**	**0.66**	**0.53**	**°**

Uncertainty contributions at one-third-octave band-centre frequencies (1.995 kHz to 6.310 kHz)

Input quantity (distribution)	1.995	2.512	3.162	3.981	5.012	6.310	Unit
Electrical transfer impedance							
Ref. imped: capac. at 1 kHz (*t*, 95 %, *k*=2)	500	500	500	500	500	500	µF/F
Ref. impedance: leakg res. (Gau, std unc.)	0.1	0.1	0.1	0.1	0.1	0.1	GΩ
Ref. imp.: freq. dependence (Gau, std unc.)	1	1	1	1	1	2	µΩ/Ω
Voltage ratio: voltmeter (*t*, std unc.)	120	120	120	120	120	120	µV/V
Voltage ratio: phasemeter (Gau, std dev.)	0.056	0.059	0.063	0.068	0.074	0.082	°
Voltage ratio: magn.repeat. (Gau, std dev.)	50	50	50	50	50	50	µV/V
Voltage ratio : phase rept. (Gau, std dev.)	0.05	0.05	0.05	0.05	0.05	0.05	°
Noise: cross-talk (Gau, std unc.)	0.002 5	0.002 5	0.002 5	0.002 5	0.002 5	0.002 5	dB
Noise: inherent noise (Gau, std unc.)	0.000 1	0.000 1	0.000 1	0.000 1	0.000 1	0.000 1	dB
Noise: distortn & harmonics (Gau, std unc.)	0.000 1	0.000 1	0.000 1	0.000 1	0.000 1	0.000 1	dB
Frequency of signal: tolerance (rect., s-rng)	54	67	83	104	129	162	mHz
Ground shield: transmitter (rect., s-rng)	0.001 5	0.001 5	0.001 5	0.001 5	0.001 5	0.001 5	dB
Ground shield: receiver (rect., s-rng)	0.000 9	0.000 9	0.000 9	0.000 9	0.000 9	0.000 9	dB
Acoustic transfer impedance							
Static pressure: barometer (*t*, 95 %, *k*=2)	5	5	5	5	5	5	Pa
Pressure: spatial variation (rect., s-rng)	8	8	8	8	8	8	Pa
Pressure: temporal varn (Gau, 95 %, *k*=2)	10	10	10	10	10	10	Pa
Temperature: calibration (*t*, 95 %, *k*=2)	0.006	0.006	0.006	0.006	0.006	0.006	°C
Temperature: indication error (rect; s-rng)	0.001	0.001	0.001	0.001	0.001	0.001	°C
Temperature: spatial varn (Gau, 95 %, *k*=2)	0.9	0.9	0.9	0.9	0.9	0.9	°C
Temperat.: temporal varn (Gau, 95 %, *k*=2)	0.03	0.03	0.03	0.03	0.03	0.03	°C
Rel. humid: calibration (*t*, 95 %, *k* =2)	1.5	1.5	1.5	1.5	1.5	1.5	%
Rel. humid: indication error (rect., s-rng)	1	1	1	1	1	1	%
Rel. humid: spatial variation (Gau., std dev)	0.1	0.1	0.1	0.1	0.1	0.1	%
Rel. humid: temporal variation (rect., s-rng)	0.5	0.5	0.5	0.5	0.5	0.5	%
Couplers: length (*t*, 95 %, *k* =2)	1.5	1.5	1.5	1.5	1.5	1.5	µm
Couplers: diameter (*t*, 95 %, *k* =2)	1	1	1	1	1	1	µm
Couplers: leakage (Gau, std unc.)	$4\cdot10^{-5}$	$3\cdot10^{-5}$	$2\cdot10^{-5}$	$2\cdot10^{-5}$	$1\cdot10^{-5}$	$1\cdot10^{-5}$	dB
Pressure radial non-uniformity (rect., s-rng)	$2\cdot10^{-4}$	$9\cdot10^{-4}$	$9\cdot10^{-4}$	$9\cdot10^{-4}$	0.001 4	0.002 2	dB
Pol. voltage: tolerance (rect., s-rng)	0.02	0.02	0.02	0.02	0.02	0.02	V
Pol. voltage: electrometer (rect, s-rng)	400	400	400	400	400	400	µV/V
Pol. voltage: effect at 250 Hz (rect., s-rng)	0.01	0.01	0.01	0.01	0.01	0.01	dB/V
Pol. Volt.: freq depend of effect (rect, s-rng)	0	0	0	0	0.005	0.005	dB/V
Front cavity: depth (*t*, 95 %, *k* =2)	10	10	10	10	10	10	µm
Front cavity: diameter (rect., s-rng)	30	30	30	30	30	30	µm
Front volume (Gauss., std. unc.)	0.5	0.5	0.5	0.5	0.5	0.5	mm^3
Diaphragm equiv. vol. (Gau., 95 %, *k*=2)	1	1	1	1	1	1	mm^3
Diaphragm reson. freq. (Gau., 95 %, *k*=2)	1.68	1.68	1.68	1.68	1.68	1.68	kHz
Loss factor of mic. (Gau., 95 %, *k* = 2)	0.05	0.05	0.05	0.05	0.05	0.05	1
Diaphragm: effect. diam. (Gau., std unc.)	0.1	0.1	0.1	0.1	0.1	0.1	mm
Pressure coeff.: unc. (Gau., 95 %, *k* = 2)	0.000 5	0.000 5	0.000 5	0.000 5	0.000 5	0.000 5	dB/kPa
Pressure coeff.: repeat. (Gau, rel. std unc.)	5	5	5	5	5	5	%
Temp. coeff.: unc. (Gau, 95 %, *k* = 2)	0.002 3	0.002 3	0.002 3	0.002 3	0.002 3	0.002 3	dB/°C
Temp. coeff.: repeat. (Gau, rel. std unc.)	5	5	5	5	5	5	%
Influence of rel. humidity (Gau, std unc.)	$8\cdot10^{-6}$	$8\cdot10^{-6}$	$8\cdot10^{-6}$	$8\cdot10^{-6}$	$8\cdot10^{-6}$	$8\cdot10^{-6}$	dB/%
Speed of sound: eq. (Gau, rel. std unc.)	$3\cdot10^{-4}$	$3\cdot10^{-4}$	$3\cdot10^{-4}$	$3\cdot10^{-4}$	$3\cdot10^{-4}$	$3\cdot10^{-4}$	1
Density: equation (Gau, rel. std unc.)	$2.2\cdot10^{-5}$	$2.2\cdot10^{-5}$	$2.2\cdot10^{-5}$	$2.2\cdot10^{-5}$	$2.2\cdot10^{-5}$	$2.2\cdot10^{-5}$	1
Ratio spec. heats: eqn (Gau, rel. std unc.)	$3.2\cdot10^{-4}$	$3.2\cdot10^{-4}$	$3.2\cdot10^{-4}$	$3.2\cdot10^{-4}$	$3.2\cdot10^{-4}$	$3.2\cdot10^{-4}$	1
Effect of excess volume (rect., s-rng)	0	$1\cdot10^{-4}$	$1\cdot10^{-4}$	$1\cdot10^{-4}$	$1.5\cdot10^{-4}$	$2\cdot10^{-4}$	dB
Effect of viscous losses (Gau, std unc.)	0	0	0	0	$2\cdot10^{-4}$	$2\cdot10^{-4}$	dB
Rad. wave motion correc. (Gau, std unc.)	0	0	0	0	0.001	0.001	dB
Experiment							
Calculation error (rect., s-rng)	0	0	0	0	0	0	dB
Repeatability: magnitude (Gau, std dev.)	0.002	0.002	0.002	0.002	0.002	0.002	dB
Repeatability: phase (Gau, std dev.)	0.05	0.05	0.05	0.05	0.1	0.1	°
Rounding of results: magn. (rect., s-rng)	$5\cdot10^{-3}$	$5\cdot10^{-3}$	$5\cdot10^{-3}$	$5\cdot10^{-3}$	$5\cdot10^{-3}$	$5\cdot10^{-3}$	dB
Rounding of results: phase (rect., s-rng)	$5\cdot10^{-3}$	$5\cdot10^{-3}$	$5\cdot10^{-3}$	$5\cdot10^{-3}$	$5\cdot10^{-3}$	$5\cdot10^{-3}$	°
OVERALL UNCERTAINTIES							
Standard uncertainty: magnitude	0.01	0.01	0.01	0.01	0.01	0.01	dB
Uncertainty (95 %): magnitude	**0.03**	**0.03**	**0.03**	**0.03**	**0.03**	**0.03**	**dB**
Standard uncertainty: phase	0.09	0.09	0.09	0.10	0.13	0.14	°
Uncertainty (95 %): phase	**0.17**	**0.18**	**0.18**	**0.19**	**0.26**	**0.28**	°

Uncertainty contributions at one-third-octave band-centre frequencies (0.008 kHz to 0.025 kHz)

Input quantity (distribution)	0.008	0.010	0.013	0.016	0.020	0.025	Unit
Electrical transfer impedance							
Ref. imped: capac. at 1 kHz (*t*, 95 %, *k*=2)	500	500	500	500	500	500	µF/F
Ref. impedance: leakg res. (Gau, std unc.)	0.1	0.1	0.1	0.1	0.1	0.1	GΩ
Ref. imp.: freq. dependence (Gau, std unc.)	4	4	4	4	4	3	µΩ/Ω
Voltage ratio: voltmeter (*t*, std unc.)	120	120	120	120	120	120	µV/V
Voltage ratio: phasemeter (Gau, std dev.)	0.04	0.04	0.04	0.04	0.04	0.04	°
Voltage ratio: magn.repeat. (Gau, std dev.)	300	300	90	90	90	90	µV/V
Voltage ratio : phase rept. (Gau, std dev.)	0.1	0.1	0.1	0.1	0.1	0.1	°
Noise: cross-talk (Gau, std unc.)	0.002 5	0.002 5	0.002 5	0.002 5	0.002 5	0.002 5	dB
Noise: inherent noise (Gau, std unc.)	0.000 1	0.000 1	0.000 1	0.000 1	0.000 1	0.000 1	dB
Noise: distortn & harmonics (Gau, std unc.)	0.000 1	0.000 1	0.000 1	0.000 1	0.000 1	0.000 1	dB
Frequency of signal: tolerance (rect., s-rng)	4	4	4	4	5	5	mHz
Ground shield: transmitter (rect., s-rng)	0.001 5	0.001 5	0.001 5	0.001 5	0.001 5	0.001 5	dB
Ground shield: receiver (rect., s-rng)	0.000 9	0.000 9	0.000 9	0.000 9	0.000 9	0.000 9	dB
Acoustic transfer impedance							
Static pressure: barometer (*t*, 95 %, *k*=2)	5	5	5	5	5	5	Pa
Pressure: spatial variation (rect., s-rng)	8	8	8	8	8	8	Pa
Pressure: temporal varn (Gau, 95 %, *k*=2)	10	10	10	10	10	10	Pa
Temperature: calibration (*t*, 95 %, *k*=2)	0.006	0.006	0.006	0.006	0.006	0.006	°C
Temperature: indication error (rect; s-rng)	0.001	0.001	0.001	0.001	0.001	0.001	°C
Temperature: spatial varn (Gau, 95 %, *k*=2)	0.9	0.9	0.9	0.9	0.9	0.9	°C
Temperat.: temporal varn (Gau, 95 %, *k*=2)	0.03	0.03	0.03	0.03	0.03	0.03	°C
Rel. humid: calibration (*t*, 95 %, *k* =2)	1.5	1.5	1.5	1.5	1.5	1.5	%
Rel. humid: indication error (rect., s-rng)	1	1	1	1	1	1	%
Rel. humid: spatial variation (Gau., std dev)	0.1	0.1	0.1	0.1	0.1	0.1	%
Rel. humid: temporal variation (rect., s-rng)	0.5	0.5	0.5	0.5	0.5	0.5	%
Couplers: length (*t*, 95 %, *k* =2)	1.5	1.5	1.5	1.5	1.5	1.5	µm
Couplers: diameter (*t*, 95 %, *k* =2)	1	1	1	1	1	1	µm
Couplers: leakage (Gau, std unc.)	0.056	0.042	0.03	0.023	0.017	0.013	dB
Pressure radial non-uniformity (rect., s-rng)	0	0	0	0	0	0	dB
Pol. voltage: tolerance (rect., s-rng)	0.02	0.02	0.02	0.02	0.02	0.02	V
Pol. voltage: electrometer (rect, s-rng)	400	400	400	400	400	400	µV/V
Pol. voltage: effect at 250 Hz (rect., s-rng)	0.01	0.01	0.01	0.01	0.01	0.01	dB/V
Pol. Volt.: freq depend of effect (rect, s-rng)	0	0	0	0	0	0	dB/V
Front cavity: depth (*t*, 95 %, *k* =2)	10	10	10	10	10	10	µm
Front cavity: diameter (rect., s-rng)	30	30	30	30	30	30	µm
Front volume (Gauss., std. unc.)	0.5	0.5	0.5	0.5	0.5	0.5	mm^3
Diaphragm equiv. vol. (Gau., 95 %, *k*=2)	1	1	1	1	1	1	mm^3
Diaphragm reson. freq. (Gau., 95 %, *k*=2)	1.68	1.68	1.68	1.68	1.68	1.68	kHz
Loss factor of mic. (Gau., 95 %, *k* = 2)	0.05	0.05	0.05	0.05	0.05	0.05	1
Diaphragm: effect. diam. (Gau., std unc.)	0.1	0.1	0.1	0.1	0.1	0.1	mm
Pressure coeff.: unc. (Gau., 95 %, *k* = 2)	0.000 5	0.000 5	0.000 5	0.000 5	0.000 5	0.000 5	dB/kPa
Pressure coeff.: repeat. (Gau, rel. std unc.)	5	5	5	5	5	5	%
Temp. coeff.: unc. (Gau, 95 %, *k* = 2)	0.002 3	0.002 3	0.002 3	0.002 3	0.002 3	0.002 3	dB/°C
Temp. coeff.: repeat. (Gau, rel. std unc.)	5	5	5	5	5	5	%
Influence of rel. humidity (Gau, std unc.)	$8\cdot10^{-6}$	$8\cdot10^{-6}$	$8\cdot10^{-6}$	$8\cdot10^{-6}$	$8\cdot10^{-6}$	$8\cdot10^{-6}$	dB/%
Speed of sound: eq. (Gau, rel. std unc.)	$3\cdot10^{-4}$	$3\cdot10^{-4}$	$3\cdot10^{-4}$	$3\cdot10^{-4}$	$3\cdot10^{-4}$	$3\cdot10^{-4}$	1
Density: equation (Gau, rel. std unc.)	$2.2\cdot10^{-5}$	$2.2\cdot10^{-5}$	$2.2\cdot10^{-5}$	$2.2\cdot10^{-5}$	$2.2\cdot10^{-5}$	$2.2\cdot10^{-5}$	1
Ratio spec. heats: eqn (Gau, rel. std unc.)	$3.2\cdot10^{-4}$	$3.2\cdot10^{-4}$	$3.2\cdot10^{-4}$	$3.2\cdot10^{-4}$	$3.2\cdot10^{-4}$	$3.2\cdot10^{-4}$	1
Effect of excess volume (rect., s-rng)	0	0	0	0	0	0	dB
Effect of viscous losses (Gau, std unc.)	0	0	0	0	0	0	dB
Rad. wave motion correc. (Gau, std unc.)	0	0	0	0	0	0	dB
Experiment							
Calculation error (rect., s-rng)	0	0	0	0	0	0	dB
Repeatability: magnitude (Gau, std dev.)	0.005	0.005	0.004	0.002 5	0.002 5	0.002 5	dB
Repeatability: phase (Gau, std dev.)	0.2	0.2	0.15	0.15	0.15	0.15	°
Rounding of results: magn. (rect., s-rng)	$5\cdot10^{-3}$	$5\cdot10^{-3}$	$5\cdot10^{-3}$	$5\cdot10^{-3}$	$5\cdot10^{-3}$	$5\cdot10^{-3}$	dB
Rounding of results: phase (rect., s-rng)	$5\cdot10^{-3}$	$5\cdot10^{-3}$	$5\cdot10^{-3}$	$5\cdot10^{-3}$	$5\cdot10^{-3}$	$5\cdot10^{-3}$	°
OVERALL UNCERTAINTIES							
Standard uncertainty: magnitude	0.06	0.04	0.03	0.03	0.02	0.02	dB
Uncertainty (95 %): magnitude	**0.12**	**0.08**	**0.06**	**0.06**	**0.05**	**0.04**	**dB**
Standard uncertainty: phase	0.22	0.22	0.18	0.18	0.18	0.18	°
Uncertainty (95 %): phase	**0.44**	**0.44**	**0.35**	**0.35**	**0.35**	**0.35**	°

Uncertainty contributions at one-third-octave band-centre frequencies (7.943 kHz to 25.000 kHz)

Input quantity (distribution)	7.943	10.000	12.589	15.849	19.953	25.119	Unit
Electrical transfer impedance							
Ref. imped: capac. at 1 kHz (*t* , 95 %, *k* =2)	500	500	500	500	500	500	µF/F
Ref. impedance: leakg res. (Gau, std unc.)	0.1	0.1	0.1	0.1	0.1	0.1	GΩ
Ref. imp.: freq. dependence (Gau, std unc.)	2	2	2	2	2	2	µΩ/Ω
Voltage ratio: voltmeter (*t* , std unc.)	120	120	120	120	120	600	µV/V
Voltage ratio: phasemeter (Gau, std dev.)	0.092	0.104	0.120	0.139	0.164	0.195	°
Voltage ratio: magn.repeat. (Gau, std dev.)	50	50	50	50	50	50	µV/V
Voltage ratio : phase rept. (Gau, std dev.)	0.05	0.05	0.05	0.05	0.05	0.2	°
Noise: cross-talk (Gau, std unc.)	0.002 5	0.002 5	0.002 5	0.002 5	0.002 5	0.002 5	dB
Noise: inherent noise (Gau, std unc.)	0.000 1	0.000 1	0.000 1	0.000 1	0.000 1	0.000 1	dB
Noise: distortn & harmonics (Gau, std unc.)	0.000 1	0.000 1	0.000 1	0.000 1	0.000 1	0.000 1	dB
Frequency of signal: tolerance (rect., s-rng)	203	254	319	400	503	632	mHz
Ground shield: transmitter (rect., s-rng)	0.001 5	0.001 5	0.001 5	0.001 5	0.001 5	0.001 5	dB
Ground shield: receiver (rect., s-rng)	0.000 9	0.000 9	0.000 9	0.000 9	0.000 9	0.000 9	dB
Acoustic transfer impedance							
Static pressure: barometer (*t* , 95 %, *k* =2)	5	5	5	5	5	5	Pa
Pressure: spatial variation (rect., s-rng)	8	8	8	8	8	8	Pa
Pressure: temporal varn (Gau, 95 %, *k* =2)	10	10	10	10	10	10	Pa
Temperature: calibration (*t* , 95 %, *k* =2)	0.006	0.006	0.006	0.006	0.006	0.006	°C
Temperature: indication error (rect; s-rng)	0.001	0.001	0.001	0.001	0.001	0.001	°C
Temperature: spatial varn (Gau, 95 %, *k* =2)	0.9	0.9	0.9	0.9	0.9	0.9	°C
Temperat.: temporal varn (Gau, 95 %, *k* =2)	0.03	0.03	0.03	0.03	0.03	0.03	°C
Rel. humid: calibration (*t* , 95 %, *k* =2)	1.5	1.5	1.5	1.5	1.5	1.5	%
Rel. humid: indication error (rect., s-rng)	1	1	1	1	1	1	%
Rel. humid: spatial variation (Gau., std dev)	0.1	0.1	0.1	0.1	0.1	0.1	%
Rel. humid: temporal variation (rect., s-rng)	0.5	0.5	0.5	0.5	0.5	0.5	%
Couplers: length (*t* , 95 %, *k* =2)	1.5	1.5	1.5	1.5	1.5	1.5	µm
Couplers: diameter (*t* , 95 %, *k* =2)	1	1	1	1	1	1	µm
Couplers: leakage (Gau, std unc.)	$7\cdot10^{-6}$	$5\cdot10^{-6}$	$4\cdot10^{-6}$	$3\cdot10^{-6}$	$2\cdot10^{-6}$	$2\cdot10^{-6}$	dB
Pressure radial non-uniformity (rect., s-rng)	0.003 4	0.005 2	0.007 6	0.010 8	0.012 3	0.004 3	dB
Pol. voltage: tolerance (rect., s-rng)	0.02	0.02	0.02	0.02	0.02	0.02	V
Pol. voltage: electrometer (rect, s-rng)	400	400	400	400	400	400	µV/V
Pol. voltage: effect at 250 Hz (rect., s-rng)	0.01	0.01	0.01	0.01	0.01	0.01	dB/V
Pol. Volt.: freq depend of effect (rect, s-rng)	0.005	0.005	0.005	0.005	0.01	0.01	dB/V
Front cavity: depth (*t* , 95 %, *k* =2)	10	10	10	10	10	10	µm
Front cavity: diameter (rect., s-rng)	30	30	30	30	30	30	µm
Front volume (Gauss., std. unc.)	0.5	0.5	0.5	0.5	0.5	0.5	mm^3
Diaphragm equiv. vol. (Gau., 95 %, *k* =2)	1	1	1	1	1	1	mm^3
Diaphragm reson. freq. (Gau., 95 %, *k* =2)	1.68	1.68	1.68	1.68	1.68	1.68	kHz
Loss factor of mic. (Gau., 95 %, *k* = 2)	0.05	0.05	0.05	0.05	0.05	0.05	1
Diaphragm: effect. diam. (Gau., std unc.)	0.1	0.1	0.1	0.1	0.1	0.1	mm
Pressure coeff.: unc. (Gau., 95 %, *k* = 2)	0.000 5	0.000 5	0.000 5	0.000 5	0.000 5	0.000 5	dB/kPa
Pressure coeff.: repeat. (Gau, rel. std unc.)	5	5	5	5	5	5	%
Temp. coeff.: unc. (Gau, 95 %, *k* = 2)	0.002 3	0.002 3	0.002 3	0.002 3	0.002 3	0.002 3	dB/°C
Temp. coeff.: repeat. (Gau, rel. std unc.)	5	5	5	5	5	5	%
Influence of rel. humidity (Gau, std unc.)	$8\cdot10^{-6}$	$8\cdot10^{-6}$	$8\cdot10^{-6}$	$8\cdot10^{-6}$	$8\cdot10^{-6}$	$8\cdot10^{-6}$	dB/%
Speed of sound: eq. (Gau, rel. std unc.)	$3\cdot10^{-4}$	$3\cdot10^{-4}$	$3\cdot10^{-4}$	$3\cdot10^{-4}$	$3\cdot10^{-4}$	$3\cdot10^{-4}$	1
Density: equation (Gau, rel. std unc.)	$2.2\cdot10^{-5}$	$2.2\cdot10^{-5}$	$2.2\cdot10^{-5}$	$2.2\cdot10^{-5}$	$2.2\cdot10^{-5}$	$2.2\cdot10^{-5}$	1
Ratio spec. heats: eqn (Gau, rel. std unc.)	$3.2\cdot10^{-4}$	$3.2\cdot10^{-4}$	$3.2\cdot10^{-4}$	$3.2\cdot10^{-4}$	$3.2\cdot10^{-4}$	$3.2\cdot10^{-4}$	1
Effect of excess volume (rect., s-rng)	$3.5\cdot10^{-4}$	$6\cdot10^{-4}$	0.001	0.002	0.004 1	0.020 3	dB
Effect of viscous losses (Gau, std unc.)	$5\cdot10^{-4}$	0.001	0.003	0.005	0.010	0.015	dB
Rad. wave motion correc. (Gau, std unc.)	0.002	0.003	0.005	0.01	0.015	0.02	dB
Experiment							
Calculation error (rect., s-rng)	$5\cdot10^{-5}$	$5\cdot10^{-5}$	$1\cdot10^{-4}$	$2\cdot10^{-4}$	$4\cdot10^{-4}$	$7\cdot10^{-4}$	dB
Repeatability: magnitude (Gau, std dev.)	0.002	0.002	0.004	0.01	0.03	0.03	dB
Repeatability: phase (Gau, std dev.)	0.1	0.15	0.2	0.25	0.4	0.5	°
Rounding of results: magn. (rect., s-rng)	$5\cdot10^{-3}$	$5\cdot10^{-3}$	$5\cdot10^{-3}$	$5\cdot10^{-3}$	$5\cdot10^{-3}$	$5\cdot10^{-3}$	dB
Rounding of results: phase (rect., s-rng)	$5\cdot10^{-3}$	$5\cdot10^{-3}$	$5\cdot10^{-3}$	$5\cdot10^{-3}$	$5\cdot10^{-3}$	$5\cdot10^{-3}$	°
OVERALL UNCERTAINTIES							
Standard uncertainty: magnitude	0.01	0.02	0.02	0.03	0.05	0.19	dB
Uncertainty (95 %): magnitude	**0.03**	**0.03**	**0.04**	**0.06**	**0.10**	**0.37**	**dB**
Standard uncertainty: phase	0.15	0.19	0.24	0.29	0.46	0.96	°
Uncertainty (95 %): phase	**0.29**	**0.38**	**0.48**	**0.58**	**0.91**	**1.87**	**°**

Uncertainty contributions at one-third-octave band-centre frequencies (0.032 kHz to 0.100 kHz)

Input quantity (distribution)	0.032	0.040	0.050	0.063	0.079	0.100	Unit
Electrical transfer impedance							
Ref. imped: capac. at 1 kHz (t, 95 %, k=2)	500	500	500	500	500	500	µF/F
Ref. impedance: leakg res. (Gau, std unc.)	0.1	0.1	0.1	0.1	0.1	0.1	GΩ
Ref. imp.: freq. dependence (Gau, std unc.)	3	3	3	2	2	2	µΩ/Ω
Voltage ratio: voltmeter (t, std unc.)	120	120	120	120	120	120	µV/V
Voltage ratio: phasemeter (Gau, std dev.)	0.04	0.04	0.04	0.04	0.04	0.04	°
Voltage ratio: magn.repeat. (Gau, std dev.)	90	90	90	90	90	90	µV/V
Voltage ratio : phase rept. (Gau, std dev.)	0.05	0.05	0.05	0.05	0.05	0.05	°
Noise: cross-talk (Gau, std unc.)	0.002 5	0.002 5	0.002 5	0.002 5	0.002 5	0.002 5	dB
Noise: inherent noise (Gau, std unc.)	0.000 1	0.000 1	0.000 1	0.000 1	0.000 1	0.000 1	dB
Noise: distortn & harmonics (Gau, std unc.)	0.000 1	0.000 1	0.000 1	0.000 1	0.000 1	0.000 1	dB
Frequency of signal: tolerance (rect., s-rng)	5	5	5	6	6	7	mHz
Ground shield: transmitter (rect., s-rng)	0.001 5	0.001 5	0.001 5	0.001 5	0.001 5	0.001 5	dB
Ground shield: receiver (rect., s-rng)	0.000 9	0.000 9	0.000 9	0.000 9	0.000 9	0.000 9	dB
Acoustic transfer impedance							
Static pressure: barometer (t, 95 %, k=2)	5	5	5	5	5	5	Pa
Pressure: spatial variation (rect., s-rng)	8	8	8	8	8	8	Pa
Pressure: temporal varn (Gau, 95 %, k=2)	10	10	10	10	10	10	Pa
Temperature: calibration (t, 95 %, k=2)	0.006	0.006	0.006	0.006	0.006	0.006	°C
Temperature: indication error (rect; s-rng)	0.001	0.001	0.001	0.001	0.001	0.001	°C
Temperature: spatial varn (Gau, 95 %, k=2)	0.9	0.9	0.9	0.9	0.9	0.9	°C
Temperat.: temporal varn (Gau, 95 %, k=2)	0.03	0.03	0.03	0.03	0.03	0.03	°C
Rel. humid: calibration (t, 95 %, k =2)	1.5	1.5	1.5	1.5	1.5	1.5	%
Rel. humid: indication error (rect., s-rng)	1	1	1	1	1	1	%
Rel. humid: spatial variation (Gau., std dev)	0.1	0.1	0.1	0.1	0.1	0.1	%
Rel. humid: temporal variation (rect., s-rng)	0.5	0.5	0.5	0.5	0.5	0.5	%
Couplers: length (t, 95 %, k =2)	1.5	1.5	1.5	1.5	1.5	1.5	µm
Couplers: diameter (t, 95 %, k =2)	1	1	1	1	1	1	µm
Couplers: leakage (Gau, std unc.)	$9.2\cdot10^{-3}$	$6.9\cdot10^{-3}$	$5.1\cdot10^{-3}$	$3.8\cdot10^{-3}$	$2.8\cdot10^{-3}$	$2.1\cdot10^{-3}$	dB
Pressure radial non-uniformity (rect., s-rng)	0	0	0	0	0	0	dB
Pol. voltage: tolerance (rect., s-rng)	0.02	0.02	0.02	0.02	0.02	0.02	V
Pol. voltage: electrometer (rect, s-rng)	400	400	400	400	400	400	µV/V
Pol. voltage: effect at 250 Hz (rect., s-rng)	0.01	0.01	0.01	0.01	0.01	0.01	dB/V
Pol. Volt.: freq depend of effect (rect, s-rng)	0	0	0	0	0	0	dB/V
Front cavity: depth (t, 95 %, k =2)	10	10	10	10	10	10	µm
Front cavity: diameter (rect., s-rng)	30	30	30	30	30	30	µm
Front volume (Gauss., std. unc.)	0.5	0.5	0.5	0.5	0.5	0.5	mm^3
Diaphragm equiv. vol. (Gau., 95 %, k=2)	1	1	1	1	1	1	mm^3
Diaphragm reson. freq. (Gau., 95 %, k=2)	1.68	1.68	1.68	1.68	1.68	1.68	kHz
Loss factor of mic. (Gau., 95 %, k = 2)	0.05	0.05	0.05	0.05	0.05	0.05	1
Diaphragm: effect. diam. (Gau., std unc.)	0.1	0.1	0.1	0.1	0.1	0.1	mm
Pressure coeff.: unc. (Gau., 95 %, k = 2)	0.000 5	0.000 5	0.000 5	0.000 5	0.000 5	0.000 5	dB/kPa
Pressure coeff.: repeat. (Gau, rel. std unc.)	5	5	5	5	5	5	%
Temp. coeff.: unc. (Gau, 95 %, k = 2)	0.002 3	0.002 3	0.002 3	0.002 3	0.002 3	0.002 3	dB/°C
Temp. coeff.: repeat. (Gau, rel. std unc.)	5	5	5	5	5	5	%
Influence of rel. humidity (Gau, std unc.)	$8\cdot10^{-6}$	$8\cdot10^{-6}$	$8\cdot10^{-6}$	$8\cdot10^{-6}$	$8\cdot10^{-6}$	$8\cdot10^{-6}$	dB/%
Speed of sound: eq. (Gau, rel. std unc.)	$3\cdot10^{-4}$	$3\cdot10^{-4}$	$3\cdot10^{-4}$	$3\cdot10^{-4}$	$3\cdot10^{-4}$	$3\cdot10^{-4}$	1
Density: equation (Gau, rel. std unc.)	$2.2\cdot10^{-5}$	$2.2\cdot10^{-5}$	$2.2\cdot10^{-5}$	$2.2\cdot10^{-5}$	$2.2\cdot10^{-5}$	$2.2\cdot10^{-5}$	1
Ratio spec. heats: eqn (Gau, rel. std unc.)	$3.2\cdot10^{-4}$	$3.2\cdot10^{-4}$	$3.2\cdot10^{-4}$	$3.2\cdot10^{-4}$	$3.2\cdot10^{-4}$	$3.2\cdot10^{-4}$	1
Effect of excess volume (rect., s-rng)	0	0	0	0	0	0	dB
Effect of viscous losses (Gau, std unc.)	0	0	0	0	0	0	dB
Rad. wave motion correc. (Gau, std unc.)	0	0	0	0	0	0	dB
Experiment							
Calculation error (rect., s-rng)	0	0	0	0	0	0	dB
Repeatability: magnitude (Gau, std dev.)	0.002	0.002	0.002	0.002	0.002	0.002	dB
Repeatability: phase (Gau, std dev.)	0.1	0.05	0.05	0.05	0.05	0.02	°
Rounding of results: magn. (rect., s-rng)	$5\cdot10^{-3}$	$5\cdot10^{-3}$	$5\cdot10^{-3}$	$5\cdot10^{-3}$	$5\cdot10^{-3}$	$5\cdot10^{-3}$	dB
Rounding of results: phase (rect., s-rng)	$5\cdot10^{-3}$	$5\cdot10^{-3}$	$5\cdot10^{-3}$	$5\cdot10^{-3}$	$5\cdot10^{-3}$	$5\cdot10^{-3}$	°
OVERALL UNCERTAINTIES							
Standard uncertainty: magnitude	0.02	0.02	0.01	0.01	0.01	0.01	dB
Uncertainty (95 %): magnitude	**0.04**	**0.03**	**0.03**	**0.03**	**0.03**	**0.03**	**dB**
Standard uncertainty: phase	0.12	0.08	0.08	0.08	0.08	0.06	°
Uncertainty (95 %): phase	**0.23**	**0.15**	**0.15**	**0.15**	**0.15**	**0.12**	°

Uncertainty contributions at one-third-octave band-centre frequencies (0.126 kHz to 0.398 kHz)

Input quantity (distribution)	0.126	0.159	0.200	0.251	0.316	0.398	Unit
Electrical transfer impedance							
Ref. imped: capac. at 1 kHz (*t*, 95 %, *k*=2)	500	500	500	500	500	500	µF/F
Ref. impedance: leakg res. (Gau, std unc.)	0.1	0.1	0.1	0.1	0.1	0.1	GΩ
Ref. imp.: freq. dependence (Gau, std unc.)	2	2	1	1	1	1	µΩ/Ω
Voltage ratio: voltmeter (*t*, std unc.)	120	120	120	120	120	120	µV/V
Voltage ratio: phasemeter (Gau, std dev.)	0.041	0.041	0.041	0.042	0.042	0.042	°
Voltage ratio: magn.repeat. (Gau, std dev.)	50	50	50	50	50	50	µV/V
Voltage ratio : phase rept. (Gau, std dev.)	0.05	0.05	0.05	0.05	0.05	0.05	°
Noise: cross-talk (Gau, std unc.)	0.002 5	0.002 5	0.002 5	0.002 5	0.002 5	0.002 5	dB
Noise: inherent noise (Gau, std unc.)	0.000 1	0.000 1	0.000 1	0.000 1	0.000 1	0.000 1	dB
Noise: distortn & harmonics (Gau, std unc.)	0.000 1	0.000 1	0.000 1	0.000 1	0.000 1	0.000 1	dB
Frequency of signal: tolerance (rect., s-rng)	7	8	9	10	12	14	mHz
Ground shield: transmitter (rect., s-rng)	0.001 5	0.001 5	0.001 5	0.001 5	0.001 5	0.001 5	dB
Ground shield: receiver (rect., s-rng)	0.000 9	0.000 9	0.000 9	0.000 9	0.000 9	0.000 9	dB
Acoustic transfer impedance							
Static pressure: barometer (*t*, 95 %, *k*=2)	5	5	5	5	5	5	Pa
Pressure: spatial variation (rect., s-rng)	8	8	8	8	8	8	Pa
Pressure: temporal varn (Gau, 95 %, *k*=2)	10	10	10	10	10	10	Pa
Temperature: calibration (*t*, 95 %, *k*=2)	0.006	0.006	0.006	0.006	0.006	0.006	°C
Temperature: indication error (rect; s-rng)	0.001	0.001	0.001	0.001	0.001	0.001	°C
Temperature: spatial varn (Gau, 95 %, *k*=2)	0.9	0.9	0.9	0.9	0.9	0.9	°C
Temperat.: temporal varn (Gau, 95 %, *k*=2)	0.03	0.03	0.03	0.03	0.03	0.03	°C
Rel. humid: calibration (*t*, 95 %, *k* =2)	1.5	1.5	1.5	1.5	1.5	1.5	%
Rel. humid: indication error (rect., s-rng)	1	1	1	1	1	1	%
Rel. humid: spatial variation (Gau., std dev)	0.1	0.1	0.1	0.1	0.1	0.1	%
Rel. humid: temporal variation (rect., s-rng)	0.5	0.5	0.5	0.5	0.5	0.5	%
Couplers: length (*t*, 95 %, *k* =2)	1.5	1.5	1.5	1.5	1.5	1.5	µm
Couplers: diameter (*t*, 95 %, *k* =2)	1	1	1	1	1	1	µm
Couplers: leakage (Gau, std unc.)	$1.5\cdot10^{-3}$	$1.1\cdot10^{-3}$	$8\cdot10^{-4}$	$6\cdot10^{-4}$	$5\cdot10^{-4}$	$3\cdot10^{-4}$	dB
Pressure radial non-uniformity (rect., s-rng)	0	0	0	0	0	0	dB
Pol. voltage: tolerance (rect., s-rng)	0.02	0.02	0.02	0.02	0.02	0.02	V
Pol. voltage: electrometer (rect, s-rng)	400	400	400	400	400	400	µV/V
Pol. voltage: effect at 250 Hz (rect., s-rng)	0.01	0.01	0.01	0.01	0.01	0.01	dB/V
Pol. Volt.: freq depend of effect (rect, s-rng)	0	0	0	0	0	0	dB/V
Front cavity: depth (*t*, 95 %, *k* =2)	10	10	10	10	10	10	µm
Front cavity: diameter (rect., s-rng)	30	30	30	30	30	30	µm
Front volume (Gauss., std. unc.)	0.5	0.5	0.5	0.5	0.5	0.5	mm^3
Diaphragm equiv. vol. (Gau., 95 %, *k*=2)	1	1	1	1	1	1	mm^3
Diaphragm reson. freq. (Gau., 95 %, *k*=2)	1.68	1.68	1.68	1.68	1.68	1.68	kHz
Loss factor of mic. (Gau., 95 %, *k* = 2)	0.05	0.05	0.05	0.05	0.05	0.05	1
Diaphragm: effect. diam. (Gau., std unc.)	0.1	0.1	0.1	0.1	0.1	0.1	mm
Pressure coeff.: unc. (Gau., 95 %, *k* = 2)	0.000 5	0.000 5	0.000 5	0.000 5	0.000 5	0.000 5	dB/kPa
Pressure coeff.: repeat. (Gau, rel. std unc.)	5	5	5	5	5	5	%
Temp. coeff.: unc. (Gau, 95 %, *k* = 2)	0.002 3	0.002 3	0.002 3	0.002 3	0.002 3	0.002 3	dB/°C
Temp. coeff.: repeat. (Gau, rel. std unc.)	5	5	5	5	5	5	%
Influence of rel. humidity (Gau, std unc.)	$8\cdot10^{-6}$	$8\cdot10^{-6}$	$8\cdot10^{-6}$	$8\cdot10^{-6}$	$8\cdot10^{-6}$	$8\cdot10^{-6}$	dB/%
Speed of sound: eq. (Gau, rel. std unc.)	$3\cdot10^{-4}$	$3\cdot10^{-4}$	$3\cdot10^{-4}$	$3\cdot10^{-4}$	$3\cdot10^{-4}$	$3\cdot10^{-4}$	1
Density: equation (Gau, rel. std unc.)	$2.2\cdot10^{-5}$	$2.2\cdot10^{-5}$	$2.2\cdot10^{-5}$	$2.2\cdot10^{-5}$	$2.2\cdot10^{-5}$	$2.2\cdot10^{-5}$	1
Ratio spec. heats: eqn (Gau, rel. std unc.)	$3.2\cdot10^{-4}$	$3.2\cdot10^{-4}$	$3.2\cdot10^{-4}$	$3.2\cdot10^{-4}$	$3.2\cdot10^{-4}$	$3.2\cdot10^{-4}$	1
Effect of excess volume (rect., s-rng)	0	0	0	0	0	0	dB
Effect of viscous losses (Gau, std unc.)	0	0	0	0	0	0	dB
Rad. wave motion correc. (Gau, std unc.)	0	0	0	0	0	0	dB
Experiment							
Calculation error (rect., s-rng)	0	0	0	0	0	0	dB
Repeatability: magnitude (Gau, std dev.)	0.002	0.002	0.002	0.002	0.002	0.002	dB
Repeatability: phase (Gau, std dev.)	0.02	0.02	0.02	0.02	0.02	0.02	°
Rounding of results: magn. (rect., s-rng)	$5\cdot10^{-3}$	$5\cdot10^{-3}$	$5\cdot10^{-3}$	$5\cdot10^{-3}$	$5\cdot10^{-3}$	$5\cdot10^{-3}$	dB
Rounding of results: phase (rect., s-rng)	$5\cdot10^{-3}$	$5\cdot10^{-3}$	$5\cdot10^{-3}$	$5\cdot10^{-3}$	$5\cdot10^{-3}$	$5\cdot10^{-3}$	°
OVERALL UNCERTAINTIES							
Standard uncertainty: magnitude	0.01	0.01	0.01	0.01	0.01	0.01	dB
Uncertainty (95 %): magnitude	**0.03**	**0.03**	**0.03**	**0.03**	**0.03**	**0.03**	**dB**
Standard uncertainty: phase	0.06	0.06	0.06	0.06	0.06	0.06	°
Uncertainty (95 %): phase	**0.12**	**0.12**	**0.12**	**0.12**	**0.13**	**0.13**	°

Uncertainty contributions at one-third-octave band-centre frequencies (0.501 kHz to 1.585 kHz)

Input quantity (distribution)	0.501	0.631	0.794	1.000	1.259	1.585	Unit
Electrical transfer impedance							
Ref. imped: capac. at 1 kHz (*t*, 95 %, *k*=2)	500	500	500	500	500	500	µF/F
Ref. impedance: leakg res. (Gau, std unc.)	0.1	0.1	0.1	0.1	0.1	0.1	GΩ
Ref. imp.: freq. dependence (Gau, std unc.)	1	0	0	0	0	0	µΩ/Ω
Voltage ratio: voltmeter (*t*, std unc.)	120	120	120	120	120	120	µV/V
Voltage ratio: phasemeter (Gau, std dev.)	0.043	0.044	0.045	0.046	0.052	0.054	°
Voltage ratio: magn.repeat. (Gau, std dev.)	50	50	50	50	50	50	µV/V
Voltage ratio : phase rept. (Gau, std dev.)	0.05	0.05	0.05	0.05	0.05	0.05	°
Noise: cross-talk (Gau, std unc.)	0.002 5	0.002 5	0.002 5	0.002 5	0.002 5	0.002 5	dB
Noise: inherent noise (Gau, std unc.)	0.000 1	0.000 1	0.000 1	0.000 1	0.000 1	0.000 1	dB
Noise: distortn & harmonics (Gau, std unc.)	0.000 1	0.000 1	0.000 1	0.000 1	0.000 1	0.000 1	dB
Frequency of signal: tolerance (rect., s-rng)	17	20	24	29	35	44	µHz/Hz
Ground shield: transmitter (rect., s-rng)	0.001 5	0.001 5	0.001 5	0.001 5	0.001 5	0.001 5	dB
Ground shield: receiver (rect., s-rng)	0.000 9	0.000 9	0.000 9	0.000 9	0.000 9	0.000 9	dB
Acoustic transfer impedance							
Static pressure: barometer (*t*, 95 %, *k*=2)	5	5	5	5	5	5	Pa
Pressure: spatial variation (rect., s-rng)	8	8	8	8	8	8	Pa
Pressure: temporal varn (Gau, 95 %, *k*=2)	10	10	10	10	10	10	Pa
Temperature: calibration (*t*, 95 %, *k*=2)	0.006	0.006	0.006	0.006	0.006	0.006	°C
Temperature: indication error (rect; s-rng)	0.001	0.001	0.001	0.001	0.001	0.001	°C
Temperature: spatial varn (Gau, 95 %, *k*=2)	0.9	0.9	0.9	0.9	0.9	0.9	°C
Temperat.: temporal varn (Gau, 95 %, *k*=2)	0.03	0.03	0.03	0.03	0.03	0.03	°C
Rel. humid: calibration (*t*, 95 %, *k* =2)	1.5	1.5	1.5	1.5	1.5	1.5	%
Rel. humid: indication error (rect., s-rng)	1	1	1	1	1	1	%
Rel. humid: spatial variation (Gau., std dev)	0.1	0.1	0.1	0.1	0.1	0.1	%
Rel. humid: temporal variation (rect., s-rng)	0.5	0.5	0.5	0.5	0.5	0.5	%
Couplers: length (*t*, 95 %, *k* =2)	1.5	1.5	1.5	1.5	1.5	1.5	µm
Couplers: diameter (*t*, 95 %, *k* =2)	1	1	1	1	1	1	µm
Couplers: leakage (Gau, std unc.)	$3\cdot10^{-4}$	$2\cdot10^{-4}$	$1\cdot10^{-4}$	$1\cdot10^{-4}$	$8\cdot10^{-5}$	$6\cdot10^{-5}$	dB
Pressure radial non-uniformity (rect., s-rng)	0	$1\cdot10^{-4}$	$1\cdot10^{-4}$	$1\cdot10^{-4}$	$2\cdot10^{-4}$	$2\cdot10^{-4}$	dB
Pol. voltage: tolerance (rect., s-rng)	0.02	0.02	0.02	0.02	0.02	0.02	V
Pol. voltage: electrometer (rect, s-rng)	400	400	400	400	400	400	µV/V
Pol. voltage: effect at 250 Hz (rect., s-rng)	0.01	0.01	0.01	0.01	0.01	0.01	dB/V
Pol. Volt.: freq depend of effect (rect, s-rng)	0	0	0	0	0	0	dB/V
Front cavity: depth (*t*, 95 %, *k* =2)	10	10	10	10	10	10	µm
Front cavity: diameter (rect., s-rng)	30	30	30	30	30	30	µm
Front volume (Gauss., std. unc.)	0.5	0.5	0.5	0.5	0.5	0.5	mm^3
Diaphragm equiv. vol. (Gau., 95 %, *k*=2)	1	1	1	1	1	1	mm^3
Diaphragm reson. freq. (Gau., 95 %, *k*=2)	1.68	1.68	1.68	1.68	1.68	1.68	kHz
Loss factor of mic. (Gau., 95 %, *k* = 2)	0.05	0.05	0.05	0.05	0.05	0.05	1
Diaphragm: effect. diam. (Gau., std unc.)	0.1	0.1	0.1	0.1	0.1	0.1	mm
Pressure coeff.: unc. (Gau., 95 %, *k* = 2)	0.000 5	0.000 5	0.000 5	0.000 5	0.000 5	0.000 5	dB/kPa
Pressure coeff.: repeat. (Gau, rel. std unc.)	5	5	5	5	5	5	%
Temp. coeff.: unc. (Gau, 95 %, *k* = 2)	0.002 3	0.002 3	0.002 3	0.002 3	0.002 3	0.002 3	dB/°C
Temp. coeff.: repeat. (Gau, rel. std unc.)	5	5	5	5	5	5	%
Influence of rel. humidity (Gau, std unc.)	$8\cdot10^{-6}$	$8\cdot10^{-6}$	$8\cdot10^{-6}$	$8\cdot10^{-6}$	$8\cdot10^{-6}$	$8\cdot10^{-6}$	dB/%
Speed of sound: eq. (Gau, rel. std unc.)	$3\cdot10^{-4}$	$3\cdot10^{-4}$	$3\cdot10^{-4}$	$3\cdot10^{-4}$	$3\cdot10^{-4}$	$3\cdot10^{-4}$	1
Density: equation (Gau, rel. std unc.)	$2.2\cdot10^{-5}$	$2.2\cdot10^{-5}$	$2.2\cdot10^{-5}$	$2.2\cdot10^{-5}$	$2.2\cdot10^{-5}$	$2.2\cdot10^{-5}$	1
Ratio spec. heats: eqn (Gau, rel. std unc.)	$3.2\cdot10^{-4}$	$3.2\cdot10^{-4}$	$3.2\cdot10^{-4}$	$3.2\cdot10^{-4}$	$3.2\cdot10^{-4}$	$3.2\cdot10^{-4}$	1
Effect of excess volume (rect., s-rng)	0	0	0	0	0	0	dB
Effect of viscous losses (Gau, std unc.)	0	0	0	0	0	0	dB
Rad. wave motion correc. (Gau, std unc.)	0	0	0	0	0	0	dB
Experiment							
Calculation error (rect., s-rng)	0	0	0	0	0	0	dB
Repeatability: magnitude (Gau, std dev.)	0.002	0.002	0.002	0.002	0.002	0.002	dB
Repeatability: phase (Gau, std dev.)	0.02	0.02	0.02	0.02	0.02	0.05	°
Rounding of results: magn. (rect., s-rng)	$5\cdot10^{-3}$	$5\cdot10^{-3}$	$5\cdot10^{-3}$	$5\cdot10^{-3}$	$5\cdot10^{-3}$	$5\cdot10^{-3}$	dB
Rounding of results: phase (rect., s-rng)	$5\cdot10^{-3}$	$5\cdot10^{-3}$	$5\cdot10^{-3}$	$5\cdot10^{-3}$	$5\cdot10^{-3}$	$5\cdot10^{-3}$	°
OVERALL UNCERTAINTIES							
Standard uncertainty: magnitude	0.01	0.01	0.01	0.01	0.01	0.01	dB
Uncertainty (95 %): magnitude	**0.03**	**0.03**	**0.03**	**0.03**	**0.03**	**0.03**	**dB**
Standard uncertainty: phase	0.06	0.06	0.06	0.07	0.07	0.08	°
Uncertainty (95 %): phase	**0.13**	**0.13**	**0.13**	**0.13**	**0.14**	**0.17**	°

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The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2 which for a normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty of measurement has been determined in accordance with GUM and EA-4/02 documents.

TÜBİTAK UME / Uncertainty budget for complex microphone open-circuit sensitivity: magnitude

Uncertainty Components		Frequency [Hz]							
		1.995	2.512 - 3.162	3.981	5.012 - 12.589	15.849	19.953	25.119	31.623
		Uncertainty contribution [dB]							
Electrical parameters	Voltage ratio measurements	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015
	Reference capacitor	0.0008	0.0008	0.0008	0.0008	0.0008	0.0008	0.0008	0.0008
	Cross talk	0.0013	0.0013	0.0013	0.0013	0.0013	0.0013	0.0013	0.0013
	Distortion	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
	Polarization voltage	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006
	Inherent and ambient noise	0.0010	0.0010	0.0010	0.0010	0.0010	0.0010	0.0010	0.0010
	Transmitter and receiver ground shield	0.0110	0.0110	0.0090	0.0080	0.0080	0.0060	0.0060	0.0060
Microphone parameters	Cavity depth	0.0040	0.0040	0.0030	0.0030	0.0020	0.0020	0.0010	0.0010
	Resonance frequency	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
	Loss factor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	Total volume	0.0110	0.0110	0.0120	0.0120	0.0130	0.0140	0.0140	0.0140
	Equivalent volume	0.0009	0.0009	0.0009	0.0009	0.0009	0.0009	0.0009	0.0009
Coupler parameters	Coupler diameter	0.0010	0.0010	0.0010	0.0010	0.0010	0.0010	0.0010	0.0010
	Coupler length	0.0010	0.0010	0.0010	0.0010	0.0010	0.0010	0.0010	0.0010
	Coupler/microphone leakage	0.0245	0.0245	0.0245	0.0245	0.0180	0.0170	0.0170	0.0044
	Heat conduction correction	0.0650	0.0610	0.0560	0.0405	0.0290	0.0249	0.0192	0.0192
	Radial wave motion	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Ambient conditions	Static pressure and pressure correction	0.0040	0.0040	0.0040	0.0040	0.0040	0.0040	0.0040	0,0040
	Temperature and temperature correction	0.0050	0.0050	0.0040	0.0040	0.0030	0.0030	0.0030	0,0020
	Relative humidity	0.0005	0.0005	0.0005	0.0005	0.0005	0.0004	0.0004	0,0004
Others	Rounding of results	0.0029	0.0029	0.0029	0.0029	0.0029	0.0029	0.0029	0,0029
	Reproducibility	0.0670	0.0654	0.0610	0.0230	0.0129	0.0122	0.0103	0,0102
Combined uncertainty		0.0981	0.0943	0.0879	0.0550	0.0399	0.0363	0.0320	0.0273
Expanded uncertainty		0.1961	0.1887	0.1758	0.1099	0.0799	0.0727	0.0640	0.0546
Reported expanded uncertainty		**0.20**	**0.19**	**0.18**	**0.11**	**0.08**	**0.07**	**0.06**	**0.05**

Uncertainty Components		Frequency [Hz]							
		39.81 - 50.12	63.096 - 3162.3	3981.1 - 6309.6	7983.3 - 10000	12589	15849	19953	25119
		Uncertainty contribution [dB]							
Electrical parameters	Voltage ratio measurements	0.0010	0.0010	0.0010	0.0010	0.0010	0.0010	0.0010	0,0010
	Reference capacitor	0.0008	0.0008	0.0008	0.0008	0.0008	0.0008	0.0008	0,0008
	Cross talk	0.0013	0.0013	0.0013	0.0013	0.0013	0.0013	0.0013	0,0013
	Distortion	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0,0001
	Polarization voltage	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0,0006
	Inherent and ambient noise	0.0010	0.0010	0.0010	0.0010	0.0010	0.0010	0.0010	0,0010
	Transmitter and receiver ground shield	0.0060	0.0060	0.0060	0.0060	0.0060	0.0060	0.0060	0,0060
Microphone parameters	Cavity depth	0.0010	0.0010	0.0004	0.0030	0.0030	0.0030	0.0030	0,0040
	Resonance frequency	0.0001	0.0001	0.0020	0.0080	0.0110	0.0210	0.0370	0,0610
	Loss factor	0.0000	0.0000	0.0010	0.0080	0.0110	0.0140	0.0140	0,0160
	Total volume	0.0140	0.0140	0.0140	0.0110	0.0110	0.0090	0.0090	0,0120
	Equivalent volume	0.0009	0.0009	0.0009	0.0047	0.0073	0.0109	0.0111	0,0125
Coupler parameters	Coupler diameter	0.0010	0.0010	0.0010	0.0010	0.0020	0.0020	0.0020	0,0090
	Coupler length	0.0010	0.0010	0.0010	0.0010	0.0008	0.0008	0.0010	0,0020
	Coupler/microphone leakage	0.0032	0.0011	0.0001	0.0001	0.0001	0.0001	0.0001	0,0001
	Heat conduction correction	0.0140	0.0040	0.0025	0.0017	0.0065	0.0110	0.0140	0,0230
	Radial wave motion	0.0000	0.0000	0.0000	0.0015	0.0078	0.0078	0.0116	0,0330
Ambient conditions	Static pressure and pressure correction	0.0040	0.0040	0.0040	0.0050	0.0050	0.0020	0.0020	0,0010
	Temperature and temperature correction	0.0020	0.0020	0.0060	0.0100	0.0090	0.0090	0.0100	0,0210
	Relative humidity	0.0004	0.0004	0.0004	0.0012	0.0012	0.0015	0.0020	0,0028
Others	Rounding of results	0.0029	0.0029	0.0029	0.0029	0.0029	0.0029	0.0029	0,0029
	Reproducibility	0.0051	0.0050	0.0035	0.0085	0.0100	0.0200	0.0350	0,0550
Combined uncertainty		0,0220	0.0172	0.0175	0.0226	0.0276	0.0396	0.0591	0.0976
Expanded uncertainty		0,0440	0.0344	0.0351	0.0452	0.0553	0.0791	0.1182	0.1951
Reported expanded uncertainty		**0,04**	**0.03**	**0.04**	**0.05**	**0.06**	**0.08**	**0.12**	**0.20**

TÜBİTAK UME / Uncertainty budget for complex microphone open-circuit sensitivity: phase

Uncertainty Components		Frequency [Hz]									
		1.995	2.512 - 3.981	5.012	6.312	7.943	10.00	12.589	15.849 - 19.953	25.119	31.623
		Uncertainty contribution [degree]									
Electrical parameters	Phase accuracy	0.0029	0.0029	0.0029	0.0029	0.0029	0.0029	0.0029	0.0029	0.0029	0.0029
	Reference capacitor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	Frequency accuracy	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	Phase resolution of analyzer	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003
	Polarization voltage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	Transmitter and receiver ground shield	0.0030	0.0030	0.0030	0.0030	0.0030	0.0030	0.0030	0.0030	0.0030	0.0030
Microphone parameters	Cavity depth	0.0140	0.0140	0.0120	0.0120	0.0110	0.0100	0.0100	0.0100	0.0070	0.0070
	Resonance frequency	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	Loss factor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	Total volume	0.0092	0.0092	0.0081	0.0069	0.0064	0.0058	0.0058	0.0052	0.0040	0.0040
	Equivalent volume	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006
Coupler parameters	Coupler diameter	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
	Coupler length	0.0007	0.0007	0.0007	0.0007	0.0007	0.0007	0.0007	0.0007	0.0007	0.0007
	Coupler/microphone leakage	0.7055	0.3150	0.2800	0.2300	0.2000	0.1300	0.1250	0.1100	0.1050	0.0900
	Heat conduction correction	0.0310	0.0260	0.0200	0.0110	0.0100	0.0060	0.0050	0.0050	0.0050	0.0050
	Radial wave motion	0.0100	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Ambient conditions	Static pressure and pressure correction	0.0013	0.0013	0.0013	0.0013	0.0013	0.0013	0.0013	0.0013	0.0012	0.0011
	Temperature and temperature correction	0.0007	0.0007	0.0007	0.0007	0.0007	0.0007	0.0007	0.0007	0.0007	0.0007
	Relative humidity	0.0007	0.0007	0.0007	0.0007	0.0007	0.0007	0.0007	0.0007	0.0007	0.0006
Others	Rounding of results	0.0029	0.0029	0.0029	0.0029	0.0029	0.0029	0.0029	0.0029	0.0029	0.0029
	Reproducibility	0.7100	0.3900	0.3300	0.3100	0.2500	0.2100	0.1800	0.1600	0.1400	0.1200
Combined uncertainty		1,0016	0.5023	0.4335	0.3864	0.3206	0.2474	0.2196	0.1946	0.1753	0.1504
Expanded uncertainty		2,0032	1.0046	0.8670	0.7729	0.6412	0.4948	0.4391	0.3893	0.3507	0.3008
Reported expanded uncertainty		**2.00**	**1.00**	**0.90**	**0.80**	**0.65**	**0.50**	**0.45**	**0.40**	**0.35**	**0.30**

	Uncertainty Components	Frequency [Hz]								
		39.81 - 50.12	**63.096 - 125.89**	**158.49 - 3981.1**	**5011.9 - 7943.3**	**10000**	**12859**	**15849**	**19953**	**25119**
		Uncertainty contribution [degree]								
Electrical parameters	Phase accuracy	0.0029	0.0029	0.0029	0.0029	0.0029	0.0029	0.0029	0.0029	0.0029
	Reference capacitor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	Frequency accuracy	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	Phase resolution of analyzer	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003
	Polarization voltage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	Transmitter and receiver ground shield	0.0030	0.0030	0.0030	0.0040	0.0040	0.0070	0.0070	0.0070	0.0070
Microphone parameters	Cavity depth	0.0060	0.0050	0.0040	0.0010	0.0020	0.0040	0.0090	0.0170	0.0220
	Resonance frequency	0.0000	0.0000	0.0006	0.0190	0.0196	0.0104	0.0092	0.0144	0.0208
	Loss factor	0.0000	0.0000	0.0010	0.0340	0.0340	0.0210	0.0160	0.0250	0.0360
	Total volume	0.0035	0.0029	0.0023	0.0017	0.0023	0.0029	0.0035	0.0046	0.0058
	Equivalent volume	0.0006	0.0006	0.0012	0.0410	0.0782	0.0934	0.1100	0.1250	0.0341
Coupler parameters	Coupler diameter	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0010	0.0020
	Coupler length	0.0005	0.0005	0.0005	0.0005	0.0005	0.0007	0.0012	0.0016	0.0021
	Coupler/microphone leakage	0.0850	0.0450	0.0400	0.0050	0.0050	0.0050	0.0050	0.0050	0.0050
	Heat conduction correction	0.0050	0.0050	0.0050	0.0050	0.0050	0.0050	0.0050	0.0050	0.0050
	Radial wave motion	0.0000	0.0000	0.0000	0.0000	0.0032	0.0041	0.0057	0.0074	0.0091
Ambient conditions	Static pressure and pressure correction	0.0010	0.0008	0.0005	0.0005	0.0066	0.0145	0.0900	0.0941	0.0250
	Temperature and temperature correction	0.0007	0.0007	0.0007	0.0012	0.0210	0.0360	0.0340	0.0022	0.0020
	Relative humidity	0.0005	0.0004	0.0002	0.0032	0.0020	0.0033	0.0205	0.0219	0.0040
Others	Rounding of results	0.0029	0.0029	0.0029	0.0029	0.0029	0.0029	0.0029	0.0029	0.0029
	Reproducibility	0.0900	0.0600	0.0300	0.0450	0.0420	0.0650	0.0900	0.1550	0.2650
Combined uncertainty		0.1242	0.0756	0.0508	0.0730	0.1001	0.1232	0.1745	0.2243	0.2729
Expanded uncertainty		0.2484	0.1511	0.1015	0.1459	0.2001	0.2464	0.3491	0.4486	0.5458
Reported expanded uncertainty		**0.25**	**0.15**	**0.10**	**0.15**	**0.20**	**0.25**	**0.35**	**0.45**	**0.55**

VNIIFTRI

Uncertainty Budget for Pressure Reciprocity Calibration of LS2P Microphones

The expanded uncertainties of the measurements are stated as the combined standard uncertainties multiplied by the coverage factor, which is based on effective degrees of freedom and corresponds to a coverage probability of 95 %. The standard uncertainties of the measurements have been determined in accordance with the ISO/IEC GUIDE 98-3:2008 "Uncertainty of measurement — Part 3: Guide to the expression of uncertainty in measurement (GUM:1995)".

Table 1. Uncertainty Budget of Pressure Sensitivity Level for Reciprocity Calibration of LS2P Microphones

Source	Δx_i	Frequency, Hz													
		1.995	**2.512**	**3.162**	**3.981**	**5.012**	**6.310**	**7.943**	**10.000**	**12.589**	**15.849**	**19.953**	**25.119**	**31.623**	**39.811**
Components of Type B Uncertainty, 10^{-3} dB															
Electrical Transfer Impedance															
Series Capacitor	–	5.2	5.2	5.2	5.2	5.1	5.1	5.1	5.1	5.0	5.0	5.0	5.0	4.9	4.9
Voltage Ratios	–	7.1	7.1	7.1	7.1	7.1	7.1	7.1	7.1	7.1	7.1	7.1	7.1	7.1	7.1
Microphone															
Equivalent Volume	0.43 mm^3	21.7	22.2	22.7	23.1	23.5	23.9	24.2	24.6	24.8	25.1	25.4	25.6	25.8	26.0
Resonance Frequency	738 Hz	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Loss Factor	0.047	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Coupler															
Coupler Length	0.003 mm	15.2	15.3	14.8	13.9	12.8	11.7	10.9	10.2	9.7	9.3	9.0	8.7	8.6	8.6
Coupler Diameter	0.0017 mm	8.6	8.6	8.6	8.6	8.6	8.7	8.7	8.7	8.7	8.7	8.8	8.8	8.8	8.8
Environmental Conditions															
Static Pressure	20 Pa	7.4	7.5	7.5	7.6	7.7	7.7	7.8	7.8	7.9	7.9	7.9	8.0	8.0	8.0
Temperature	0.2 °C	3.5	3.5	3.4	3.2	3.0	2.8	2.6	2.4	2.2	2.0	1.9	1.7	1.5	1.4
Relative Humidity	5 %RH	1.4	1.3	1.3	1.2	1.2	1.1	1.1	1.1	1.0	1.0	1.0	0.9	0.9	0.9
Radial Movement	–	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Type B Uncertainty, dB		0.029	0.030	0.030	0.030	0.030	0.030	0.029	0.029	0.030	0.030	0.030	0.030	0.030	0.030
Type A Uncertainty, dB															
Standard Deviation of 5 Measurements		0.016	0.012	0.009	0.007	0.005	0.004	0.004	0.004	0.004	0.004	0.003	0.004	0.003	0.003
Effective Degrees of Freedom		73.5	210.3	586.7	1500.4	5476.0	13110.3	11475.8	11475.8	13110.3	13110.3	40804.0	13110.3	40804.0	40804.0
Coverage Factor for the Level of Confidence 0.95		1.99	1.97	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96
Combined Standard Uncertainty, dB		0.034	0.032	0.031	0.031	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030
Expanded Uncertainty, dB		0.066	0.064	0.062	0.060	0.060	0.059	0.057	0.057	0.059	0.059	0.059	0.059	0.059	0.059
Declared Expanded Uncertainty, dB		**0.07**	**0.06**	**0.06**	**0.06**	**0.06**	**0.06**	**0.06**	**0.06**	**0.06**	**0.06**	**0.06**	**0.06**	**0.06**	**0.06**

Table 2. Uncertainty Budget of Pressure Sensitivity Level for Reciprocity Calibration of LS2P Microphones

Source	Δx_i	Frequency, Hz													
		50.119	**63.096**	**79.433**	**100.00**	**125.89**	**158.49**	**199.53**	**251.19**	**316.23**	**398.11**	**501.19**	**630.96**	**794.33**	**1000.0**
Components of Type B Uncertainty, 10^{-3} dB															
Electrical Transfer Impedance															
Series Capacitor	–	4.8	4.8	4.7	4.7	4.6	4.6	4.5	4.4	4.4	4.4	4.5	4.5	4.6	4.6
Voltage Ratios	–	7.1	7.1	7.1	7.1	7.1	7.1	7.1	7.1	7.1	7.1	7.1	7.1	7.1	7.1
Microphone															
Equivalent Volume	0.43 mm^3	26.2	26.3	26.5	26.6	26.7	26.8	26.9	27.0	27.0	27.1	27.1	27.2	27.2	27.2
Resonance Frequency	738 Hz	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Loss Factor	0.047	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.3	0.4	0.5	0.6	0.8	1.0	1.2
Coupler															
Coupler Length	0.003 mm	8.6	8.7	8.9	9.1	9.4	9.6	9.9	10.1	10.4	10.6	10.8	11.0	11.2	11.4
Coupler Diameter	0.0017 mm	8.8	8.8	8.8	8.8	8.8	8.9	8.9	8.9	8.9	8.9	8.9	8.9	8.9	8.9
Environmental Conditions															
Static Pressure	20 Pa	8.0	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.2	8.2	8.2	8.2	8.2	8.2
Temperature	0.2 °C	1.3	1.1	1.0	0.9	0.8	0.7	0.7	0.6	0.6	0.6	0.6	0.5	0.5	0.5
Relative Humidity	5 %RH	0.9	0.9	0.9	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
Radial Movement	–	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.2	0.3
Total Type B Uncertainty, dB		0.030	0.031	0.031	0.031	0.031	0.031	0.031	0.032	0.032	0.032	0.032	0.032	0.032	0.032
Type A Uncertainty, dB															
Standard Deviation of 5 Measurements		0.003	0.003	0.004	0.004	0.004	0.004	0.004	0.003	0.003	0.003	0.003	0.003	0.003	0.003
Effective Degrees of Freedom		40804.0	46464.2	14914.5	14914.5	14914.5	14914.5	14914.5	52695.8	52695.8	52695.8	52695.8	52695.8	52695.8	52695.8
Coverage Factor for the Level of Confidence 0.95		1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96
Combined Standard Uncertainty, dB		0.031	0.031	0.031	0.031	0.031	0.031	0.032	0.032	0.032	0.032	0.032	0.032	0.032	0.032
Expanded Uncertainty, dB		0.059	0.061	0.061	0.061	0.061	0.061	0.061	0.063	0.063	0.063	0.063	0.063	0.063	0.063
Declared Expanded Uncertainty, dB		**0.06**	**0.06**	**0.06**	**0.06**	**0.06**	**0.06**	**0.06**	**0.06**	**0.06**	**0.06**	**0.06**	**0.06**	**0.06**	**0.06**

Table 3. Uncertainty Budget of Pressure Sensitivity Level for Reciprocity Calibration of LS2P Microphones

Source	Δx_i	Frequency, Hz													
		1258.9	**1584.9**	**1995.3**	**2511.9**	**3162.3**	**3981.1**	**5011.9**	**6309.6**	**7943.3**	**10000**	**12589**	**15849**	**19953**	**25119**
Components of Type B Uncertainty, 10^{-3} dB															
Electrical Transfer Impedance															
Series Capacitor	–	4.6	4.7	4.7	4.7	4.8	4.8	4.8	4.9	5.0	5.0	5.1	5.2	5.3	5.4
Voltage Ratios	–	7.1	7.1	7.1	7.1	7.1	7.1	7.1	7.1	7.1	7.1	7.1	7.1	7.1	7.1
Microphone															
Equivalent Volume	0.43 mm^3	27.1	27.0	26.9	26.6	26.2	25.5	24.4	22.6	19.8	15.4	8.1	4.7	34.2	146.5
Resonance Frequency	738 Hz	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.000	0.000	0.001	0.004
Loss Factor	0.047	1.6	2.0	2.5	3.1	3.8	4.7	5.7	6.8	7.6	7.6	5.4	3.2	30.1	129.8
Coupler															
Coupler Length	0.003 mm	11.5	11.6	11.7	11.7	11.6	11.4	11.0	10.3	9.1	7.1	3.8	3.4	16.5	53.6
Coupler Diameter	0.0017 mm	8.9	8.9	8.9	8.9	8.9	8.9	9.0	9.0	9.0	9.1	9.2	9.3	9.4	8.5
Environmental Conditions															
Static Pressure	20 Pa	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.1	8.1	8.0	8.0	7.8	7.8	8.9
Temperature	0.2 °C	0.5	0.4	0.4	0.3	0.2	0.4	0.9	1.7	3.1	5.4	9.4	16.5	30.9	69.1
Relative Humidity	5 %RH	0.7	0.7	0.7	0.7	0.7	0.6	0.6	0.5	0.3	0.0	0.4	1.3	2.9	7.2
Radial Movement	–	0.5	0.8	1.2	1.9	3.0	4.6	7.3	11.5	17.9	27.9	42.9	64.1	89.1	96.5
Total Type B Uncertainty, dB		0.032	0.032	0.032	0.032	0.032	0.031	0.031	0.031	0.032	0.036	0.047	0.068	0.107	0.236
Type A Uncertainty, dB															
Standard Deviation of 5 Measurements		0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.004	0.004	0.005	0.004	0.009	0.028
Effective Degrees of Freedom		52695.8	52695.8	52695.8	52695.8	52695.8	46464.2	46464.2	46464.2	16900.0	26896.0	31940.8	336400.0	81049.2	20759.5
Coverage Factor for the Level of Confidence 0.95		1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96
Combined Standard Uncertainty, dB		0.032	0.032	0.032	0.032	0.032	0.032	0.031	0.031	0.032	0.037	0.047	0.068	0.107	0.237
Expanded Uncertainty, dB		0.063	0.063	0.063	0.063	0.063	0.061	0.061	0.061	0.063	0.071	0.093	0.134	0.210	0.466
Declared Expanded Uncertainty, dB		**0.06**	**0.06**	**0.06**	**0.06**	**0.06**	**0.06**	**0.06**	**0.06**	**0.06**	**0.07**	**0.09**	**0.13**	**0.21**	**0.5**

Table 4. Uncertainty Budget of Pressure Sensitivity Phase for Reciprocity Calibration of LS2P Microphones

Source	Δx_i	Frequency, Hz													
		1.995	**2.512**	**3.162**	**3.981**	**5.012**	**6.310**	**7.943**	**10.000**	**12.589**	**15.849**	**19.953**	**25.119**	**31.623**	**39.811**
Components of Type B Uncertainty, 10^{-3} degrees															
Microphone															
Equivalent Volume	0.43 mm^3	14.7	15.5	15.8	15.7	15.3	14.8	14.1	13.5	12.7	12.0	11.2	10.4	9.7	9.0
Resonance Frequency	738 Hz	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.006	0.006	0.006	0.006	0.006	0.006	0.006
Loss Factor	0.047	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.3
Coupler															
Coupler Length	0.003 mm	5.5	27.9	52.1	65.3	69.9	69.9	68.2	66.1	63.8	61.1	57.9	54.2	50.5	46.7
Coupler Diameter	0.0017 mm	0.0	0.5	0.9	1.1	1.2	1.3	1.3	1.3	1.2	1.2	1.1	1.0	1.0	0.9
Environmental Conditions															
Static Pressure	20 Pa	0.1	0.1	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.2	0.2	0.2
Temperature	0.2 °C	0.0	1.1	1.9	2.3	2.4	2.4	2.4	2.3	2.2	2.1	2.0	1.9	1.7	1.6
Relative Humidity	5 %RH	1.3	1.3	1.2	1.2	1.1	1.1	1.0	1.0	0.9	0.8	0.8	0.7	0.7	0.6
Radial Movement	–	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Type B Uncertainty, degrees		0.016	0.032	0.055	0.067	0.072	0.072	0.070	0.068	0.065	0.062	0.059	0.055	0.051	0.048
Type A Uncertainty, degrees															
Standard Deviation of 5 Measurements		0.380	0.332	0.272	0.223	0.182	0.146	0.117	0.093	0.075	0.064	0.049	0.039	0.032	0.026
Effective Degrees of Freedom		4.0	4.1	4.3	4.8	5.3	6.1	7.3	9.3	12.3	15.2	24.0	36.3	51.3	75.7
Coverage Factor for the Level of Confidence 0.95		2.77	2.76	2.70	2.61	2.52	2.43	2.34	2.25	2.17	2.13	2.06	2.03	2.01	1.99
Combined Standard Uncertainty, degrees		0.381	0.334	0.278	0.233	0.195	0.162	0.136	0.115	0.099	0.089	0.077	0.068	0.061	0.054
Expanded Uncertainty, degrees		1.055	0.919	0.748	0.608	0.493	0.395	0.319	0.259	0.216	0.190	0.158	0.137	0.122	0.108
Declared Expanded Uncertainty, degrees		**1.1**	**0.9**	**0.7**	**0.6**	**0.5**	**0.4**	**0.32**	**0.26**	**0.22**	**0.19**	**0.16**	**0.14**	**0.12**	**0.11**

Table 5. Uncertainty Budget of Pressure Sensitivity Phase for Reciprocity Calibration of LS2P Microphones

Source	Δx_i	Frequency, Hz													
		50.119	**63.096**	**79.433**	**100.00**	**125.89**	**158.49**	**199.53**	**251.19**	**316.23**	**398.11**	**501.19**	**630.96**	**794.33**	**1000.0**
Components of Type B Uncertainty, 10^{-3} degrees															
Microphone															
Equivalent Volume	0.43 mm^3	8.4	7.8	7.3	6.8	6.5	6.2	6.1	6.1	6.2	6.5	7.0	7.8	8.9	10.3
Resonance Frequency	738 Hz	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006
Loss Factor	0.047	0.4	0.5	0.6	0.8	1.0	1.3	1.6	2.0	2.6	3.2	4.1	5.2	6.5	8.2
Coupler															
Coupler Length	0.003 mm	43.0	39.4	36.1	32.8	29.8	27.1	24.5	22.1	20.0	18.0	16.2	14.6	13.1	11.8
Coupler Diameter	0.0017 mm	0.8	0.8	0.7	0.7	0.6	0.5	0.5	0.5	0.4	0.4	0.4	0.4	0.4	0.4
Environmental Conditions															
Static Pressure	20 Pa	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0
Temperature	0.2 °C	1.5	1.4	1.2	1.1	1.0	0.9	0.8	0.8	0.7	0.6	0.6	0.5	0.4	0.4
Relative Humidity	5 %RH	0.6	0.5	0.5	0.4	0.4	0.3	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.1
Radial Movement	–	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.3	0.4	0.5	0.7
Total Type B Uncertainty, degrees		0.044	0.040	0.037	0.034	0.031	0.028	0.025	0.023	0.021	0.019	0.018	0.017	0.017	0.018
Type A Uncertainty, degrees															
Standard Deviation of 5 Measurements		0.021	0.015	0.013	0.022	0.010	0.007	0.006	0.007	0.006	0.005	0.005	0.005	0.005	0.004
Effective Degrees of Freedom		115.4	267.8	325.0	44.4	429.6	1125.2	1410.8	565.5	714.7	1031.0	812.2	673.0	644.8	1694.2
Coverage Factor for the Level of Confidence 0.95		1.98	1.97	1.97	2.01	1.97	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96
Combined Standard Uncertainty, degrees		0.049	0.043	0.039	0.040	0.032	0.029	0.026	0.024	0.022	0.020	0.019	0.018	0.018	0.018
Expanded Uncertainty, degrees		0.096	0.084	0.077	0.081	0.063	0.056	0.051	0.047	0.043	0.039	0.037	0.035	0.035	0.036
Declared Expanded Uncertainty, degrees		**0.10**	**0.08**	**0.08**	**0.08**	**0.06**	**0.06**	**0.05**	**0.05**	**0.04**	**0.04**	**0.04**	**0.04**	**0.04**	**0.04**

Table 6. Uncertainty Budget of Pressure Sensitivity Phase for Reciprocity Calibration of LS2P Microphones

Source	Δx_i	Frequency, Hz													
		1258.9	**1584.9**	**1995.3**	**2511.9**	**3162.3**	**3981.1**	**5011.9**	**6309.6**	**7943.3**	**10000**	**12589**	**15849**	**19953**	**25119**
Components of Type B Uncertainty, 10^{-3} degrees															
Microphone															
Equivalent Volume	0.43 mm^3	12.2	14.6	17.7	21.6	26.4	32.1	38.7	45.6	51.2	51.4	35.5	26.1	223.9	859.4
Resonance Frequency	738 Hz	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.005	0.005	0.004	0.002	0.001	0.007	0.025
Loss Factor	0.047	10.3	13.0	16.2	20.3	25.2	31.1	37.7	44.6	50.1	50.4	35.6	20.2	196.9	824.6
Coupler															
Coupler Length	0.003 mm	10.7	9.6	8.7	8.0	7.3	6.8	6.4	6.2	6.3	6.9	8.4	12.4	26.1	111.5
Coupler Diameter	0.0017 mm	0.4	0.4	0.4	0.5	0.5	0.6	0.7	0.8	0.8	0.8	0.6	0.3	3.2	12.2
Environmental Conditions															
Static Pressure	20 Pa	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.5	2.0
Temperature	0.2 °C	0.4	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.3	0.5	0.9	2.0	5.6	25.8
Relative Humidity	5 %RH	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.5	1.2	3.6	16.3
Radial Movement	–	0.9	1.3	1.9	2.7	3.9	5.5	7.5	10.2	13.7	18.2	24.2	32.1	41.5	46.6
Total Type B Uncertainty, degrees		0.019	0.022	0.026	0.031	0.037	0.046	0.055	0.065	0.073	0.075	0.056	0.048	0.302	1.198
Type A Uncertainty, degrees															
Standard Deviation of 5 Measurements		0.006	0.006	0.008	0.008	0.007	0.010	0.009	0.012	0.011	0.016	0.013	0.022	0.082	0.051
Effective Degrees of Freedom		505.4	806.7	505.4	1001.4	3491.9	1884.0	5840.0	3660.3	8202.2	2068.2	1582.3	130.0	851.6	1220675.4
Coverage Factor for the Level of Confidence 0.95		1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.98	1.96	1.96
Combined Standard Uncertainty, degrees		0.020	0.023	0.027	0.032	0.038	0.047	0.056	0.066	0.074	0.076	0.058	0.053	0.313	1.199
Expanded Uncertainty, degrees		0.040	0.044	0.053	0.062	0.075	0.091	0.109	0.129	0.145	0.150	0.114	0.104	0.615	2.349
Declared Expanded Uncertainty, degrees		**0.04**	**0.04**	**0.05**	**0.06**	**0.07**	**0.09**	**0.11**	**0.13**	**0.15**	**0.15**	**0.11**	**0.10**	**0.6**	**2.3**

Appendix B - Corrections to reported results

During the process of writing the first draft A, laboratories concerned with outliers were contacted (without being informed as to the magnitude or sign of the apparent anomaly) and were invited to check their results for numerical errors. All laboratories declined to resubmit results excepted the following laboratories who sent reviewed data with the following explanations:

KRISS: *We re-checked the whole measurement data and it was found that one of couplers has a problem in the infrasound range. The data having problem were removed and recalculated.*

NMIJ: *Firstly, NMIJ checked the sensitivity calculation procedure and found no mistake. Then, we experimentally inspected the electrical transfer impedance data by using the two completely different calibration systems: one was used for determining the pressure sensitivities in this key-comparison and the other was only used for the inspection. Results obtained by the two calibration systems showed that the magnitude of the electrical transfer impedance is consistent within the range of reproducibility. However, the phase of the electrical transfer impedance has unexpected difference. NMIJ decided that this phenomenon will influence the sensitivity phase data submitted by NMIJ. Therefore, NMIJ would like to withdraw the sensitivity phase data for all the frequencies and for the two microphones. No modification is necessary for the sensitivity level data.*

CENAM : *The anomalous results in phase sensitivity for both microphones were due to an error in the processing sheet, a shift of the cells was detected for the results of the frequencies 501.187 Hz and 630.957 Hz. For microphone 4180.2412872 at frequencies 7943.28 Hz and 10000 Hz, review of the data showed that the uncertainty determined for that frequency range was underestimated, as the variations detected in the data indicate an even larger shift than previously considered.*

VNIIFTRI: *We revised our calculations and, unfortunately, found several errors. They had an uncritical impact on the estimate of the measurement uncertainty of the sensitivity level and increased the estimate of the phase measurement uncertainty.*

The original data are provided in Table B1 to Table B.4.

In addition, after the circulation of the first Draft A, NRC communicated the following error in the reported results. This correction was accepted by the participants of the comparison.

NRC: *I regret to inform you that I have found one error in the results reported by NRC in our calibration report and results sheets: the sensitivity level for 4180 s/n 2412872 at 31.5 Hz should be -37.80 dB instead of the reported -37.83 dB; this was an error of transcription in writing the report that was not found at previous stages of checking.*

Table B.1. Original declared pressure sensitivities level in dB re 1 V/Pa and expanded uncertainties in dB of the microphone 4180 2124385.

Frequency (Hz)	KRISS		VNIIFTRI	
	M (dB)	U(k=2) (dB)	M (dB)	U(k=2) (dB)
1.995	-38.660	0.400	-37.906	0.044
2.512	-38.524	0.300	-37.941	0.034
3.162	-38.411	0.300	-37.967	0.028
3.981	-38.314	0.200	-37.985	0.025
5.012	-38.253	0.150	-38.002	0.022
6.310	-38.190	0.100	-38.016	0.022
7.943	-38.158	0.100	-38.031	0.022
10.000	-38.136	0.080	-38.045	0.022
12.589	-38.124	0.080	-38.06	0.022
15.849	-38.116	0.080	-38.074	0.022
19.953	-38.119	0.080	-38.087	0.021
25.119	-38.119	0.080	-38.098	0.022
31.623	-38.119	0.080	-38.109	0.021
39.811	-38.119	0.060	-38.117	0.021
50.119	-38.121	0.050	-38.126	0.021
63.096	-38.122	0.050	-38.133	0.021
79.433	-38.124	0.050	-38.14	0.022
100.00	-38.126	0.050	-38.144	0.022
125.89	-38.129	0.050	-38.15	0.022
158.49	-38.130	0.040	-38.155	0.022
199.53	-38.132	0.040	-38.16	0.022
251.19	-38.134	0.040	-38.164	0.021
316.23	-38.142	0.040	-38.167	0.021
398.11	-38.143	0.040	-38.17	0.021
501.19	-38.143	0.040	-38.172	0.021
630.96	-38.143	0.040	-38.174	0.021
794.33	-38.141	0.040	-38.174	0.021
1000.0	-38.139	0.040	-38.173	0.021
1258.9	-38.133	0.040	-38.169	0.021
1584.9	-38.126	0.040	-38.162	0.021
1995.3	-38.112	0.040	-38.15	0.021
2511.9	-38.089	0.040	-38.131	0.021
3162.3	-38.055	0.040	-38.098	0.021
3981.1	-38.003	0.040	-38.046	0.021
5011.9	-37.922	0.040	-37.968	0.021
6309.6	-37.805	0.040	-37.85	0.021
7943.3	-37.636	0.040	-37.684	0.021
10000	-37.439	0.050	-37.48	0.021
12589	-37.306	0.060	-37.347	0.022
15849	-37.611	0.070	-37.637	0.022
19953	-39.030	0.120	-39.08	0.047
25119	-41.783	0.250	-41.898	0.097

Table B.2. Original declared pressure sensitivities level in dB re 1 V/Pa and expanded uncertainties in dB of the microphone 4180 2412872.

Frequency (Hz)	KRISS		VNIIFTRI	
	M (dB)	U(k=2) (dB)	M (dB)	U(k=2) (dB)
1.995	-38.229	0.400	-37.594	0.044
2.512	-38.140	0.300	-37.634	0.034
3.162	-38.054	0.300	-37.666	0.028
3.981	-37.980	0.200	-37.689	0.025
5.012	-37.935	0.150	-37.710	0.022
6.310	-37.893	0.100	-37.728	0.022
7.943	-37.872	0.100	-37.744	0.022
10.000	-37.858	0.080	-37.761	0.022
12.589	-37.850	0.080	-37.777	0.022
15.849	-37.847	0.080	-37.792	0.022
19.953	-37.847	0.080	-37.805	0.021
25.119	-37.847	0.080	-37.817	0.022
31.623	-37.848	0.080	-37.827	0.021
39.811	-37.849	0.060	-37.836	0.021
50.119	-37.851	0.050	-37.844	0.021
63.096	-37.852	0.050	-37.851	0.021
79.433	-37.853	0.050	-37.858	0.022
100.00	-37.855	0.050	-37.863	0.022
125.89	-37.857	0.050	-37.869	0.022
158.49	-37.858	0.040	-37.873	0.022
199.53	-37.860	0.040	-37.878	0.022
251.19	-37.862	0.040	-37.882	0.021
316.23	-37.861	0.040	-37.885	0.021
398.11	-37.861	0.040	-37.888	0.021
501.19	-37.861	0.040	-37.890	0.021
630.96	-37.861	0.040	-37.892	0.021
794.33	-37.859	0.040	-37.893	0.021
1000.0	-37.858	0.040	-37.892	0.021
1258.9	-37.852	0.040	-37.889	0.021
1584.9	-37.846	0.040	-37.884	0.021
1995.3	-37.834	0.040	-37.874	0.021
2511.9	-37.814	0.040	-37.858	0.021
3162.3	-37.785	0.040	-37.830	0.021
3981.1	-37.741	0.040	-37.789	0.021
5011.9	-37.673	0.040	-37.723	0.021
6309.6	-37.578	0.040	-37.629	0.021
7943.3	-37.445	0.040	-37.501	0.021
10000	-37.311	0.050	-37.362	0.021
12589	-37.274	0.060	-37.331	0.022
15849	-37.699	0.070	-37.745	0.022
19953	-39.178	0.120	-39.239	0.047
25119	-41.924	0.250	-42.009	0.097

Table B.3. Original declared pressure sensitivities phase in degree and expanded uncertainties in degree of the microphone 4180 2124385.

Frequency (Hz)	KRISS		NMIJ		CENAM		VNIIFTRI	
	M (degree)	U(k=2) (degree)	M (degree)	U(k=2) (degree)	M (degree)	U(k=2) (degree)	M (degree)	U(k=2) (degree)
1.995	186.966	2.500	180.99	7.64	181.213	3.10	178.845	1.469
2.512	185.978	2.000	180.22	5.84	180.799	2.80	178.976	1.269
3.162	185.067	1.500	179.78	4.46	180.649	2.60	179.072	1.033
3.981	184.217	1.500	179.93	3.64	180.443	2.30	179.153	0.841
5.012	183.406	1.000	179.92	3.58	180.263	2.10	179.216	0.686
6.310	182.726	1.000	179.79	2.26	180.106	1.80	179.258	0.555
7.943	182.137	1.000	179.60	1.91	179.961	1.40	179.292	0.444
10.000	181.638	0.800	179.60	1.72	179.857	1.10	179.316	0.358
12.589	181.226	0.800	179.60	1.25	179.769	1.00	179.340	0.283
15.849	180.893	0.600	179.57	1.05	179.711	0.80	179.370	0.247
19.953	180.632	0.500	179.55	0.92	179.612	0.60	179.400	0.186
25.119	180.423	0.500	179.54	0.66	179.597	0.60	179.431	0.147
31.623	180.254	0.500	179.52	0.59	179.587	0.60	179.453	0.125
39.811	180.112	0.400	179.54	0.40	179.529	0.60	179.469	0.100
50.119	179.997	0.400	179.54	0.36	179.524	0.60	179.479	0.078
63.096	179.890	0.400	179.49	0.30	179.511	0.60	179.474	0.055
79.433	179.796	0.400	179.48	0.27	179.488	0.60	179.459	0.047
100.00	179.701	0.400	179.47	0.27	179.453	0.60	179.428	0.058
125.89	179.605	0.400	179.40	0.16	179.402	0.13	179.386	0.039
158.49	179.495	0.300	179.34	0.16	179.332	0.13	179.317	0.028
199.53	179.372	0.300	179.26	0.12	179.238	0.12	179.226	0.022
251.19	179.222	0.300	179.15	0.12	179.112	0.12	179.106	0.016
316.23	179.040	0.300	178.97	0.11	178.948	0.12	178.945	0.011
398.11	178.817	0.300	178.75	0.08	178.738	0.12	178.737	0.011
501.19	178.532	0.300	178.50	0.09	178.334	0.11	178.466	0.011
630.96	178.180	0.300	178.16	0.11	177.709	0.11	178.122	0.014
794.33	177.730	0.300	177.72	0.11	177.669	0.11	177.682	0.013
1000.0	177.171	0.300	177.17	0.12	177.101	0.13	177.125	0.015
1258.9	176.458	0.300	176.47	0.12	176.388	0.13	176.413	0.021
1584.9	175.556	0.300	175.58	0.12	175.480	0.13	175.512	0.025
1995.3	174.411	0.300	174.45	0.12	174.349	0.19	174.365	0.031
2511.9	172.967	0.300	173.02	0.13	172.877	0.19	172.905	0.039
3162.3	171.096	0.300	171.17	0.22	170.994	0.20	171.033	0.05
3981.1	168.690	0.300	168.79	0.23	168.564	0.20	168.618	0.059
5011.9	165.550	0.300	165.67	0.24	165.388	0.20	165.457	0.073
6309.6	161.347	0.300	161.52	0.26	161.154	0.20	161.252	0.088
7943.3	155.605	0.300	155.78	0.27	155.342	0.21	155.469	0.109
10000	147.416	0.400	147.65	0.63	147.095	0.26	147.260	0.108
12589	135.416	0.600	135.69	0.62	135.040	0.98	135.233	0.085
15849	118.093	1.000	118.35	0.62	117.583	1.80	117.823	0.085
19953	96.533	1.500	96.56	1.15	95.578	1.88	96.105	0.340
25119	77.117	3.000	76.97	2.47	75.520	2.73	76.334	1.543

Table B.4. Original declared pressure sensitivities phase in degree and expanded uncertainties in degree of the microphone 4180 2412872.

Frequency (Hz)	KRISS		NMIJ		CENAM		VNIIFTRI	
	M (degree)	U(k=2) (degree)	M (degree)	U(k=2) (degree)	M (degree)	U(k=2) (degree)	M (degree)	U(k=2) (degree)
1.995	184.874	3.000	179.08	7.64	177.971	3.10	176.870	1.469
2.512	184.167	2.500	178.98	5.84	178.394	2.80	177.358	1.269
3.162	183.561	2.500	178.94	4.46	178.610	2.60	177.771	1.033
3.981	182.904	2.000	179.97	3.64	178.780	2.30	178.103	0.841
5.012	182.332	1.500	179.52	3.58	178.900	2.10	178.367	0.686
6.310	181.811	1.500	179.61	2.26	178.999	1.80	178.575	0.555
7.943	181.383	1.500	179.33	1.91	179.073	1.40	178.740	0.444
10.000	181.024	1.000	179.35	1.72	179.138	1.10	178.877	0.358
12.589	180.730	1.000	179.42	1.25	179.196	1.00	178.989	0.283
15.849	180.493	0.800	179.39	1.05	179.255	0.80	179.089	0.247
19.953	180.313	0.600	179.44	0.92	179.273	0.60	179.177	0.186
25.119	180.171	0.500	179.44	0.66	179.328	0.60	179.253	0.147
31.623	180.052	0.500	179.48	0.59	179.374	0.60	179.312	0.125
39.811	179.953	0.400	179.52	0.40	179.383	0.60	179.357	0.100
50.119	179.870	0.400	179.50	0.36	179.408	0.60	179.387	0.078
63.096	179.788	0.400	179.47	0.30	179.418	0.60	179.398	0.055
79.433	179.713	0.400	179.51	0.27	179.413	0.60	179.395	0.047
100.00	179.632	0.400	179.45	0.27	179.390	0.60	179.373	0.058
125.89	179.549	0.400	179.38	0.16	179.347	0.13	179.335	0.039
158.49	179.445	0.300	179.33	0.16	179.282	0.13	179.272	0.028
199.53	179.321	0.300	179.22	0.12	179.188	0.12	179.178	0.022
251.19	179.172	0.300	179.08	0.12	179.060	0.12	179.052	0.016
316.23	178.985	0.300	178.92	0.11	178.890	0.12	178.884	0.011
398.11	178.751	0.300	178.71	0.08	178.668	0.12	178.664	0.011
501.19	178.457	0.300	178.44	0.09	178.244	0.11	178.380	0.011
630.96	178.087	0.300	178.06	0.11	177.584	0.11	178.016	0.014
794.33	177.619	0.300	177.61	0.11	177.543	0.11	177.550	0.013
1000.0	177.031	0.300	177.02	0.12	176.948	0.13	176.960	0.015
1258.9	176.275	0.300	176.28	0.12	176.193	0.13	176.210	0.021
1584.9	175.328	0.300	175.35	0.12	175.229	0.13	175.256	0.025
1995.3	174.125	0.300	174.15	0.12	174.032	0.19	174.049	0.031
2511.9	172.605	0.300	172.63	0.13	172.479	0.19	172.508	0.039
3162.3	170.646	0.300	170.69	0.22	170.492	0.20	170.537	0.050
3981.1	168.118	0.300	168.19	0.23	167.935	0.20	167.993	0.059
5011.9	164.839	0.300	164.92	0.24	164.599	0.20	164.685	0.073
6309.6	160.470	0.300	160.59	0.26	160.177	0.20	160.290	0.088
7943.3	154.513	0.300	154.65	0.27	154.150	0.21	154.310	0.109
10000	146.158	0.400	146.34	0.63	145.722	0.26	145.911	0.108
12589	134.143	0.600	134.39	0.62	133.663	0.98	133.865	0.085
15849	117.204	1.000	117.55	0.62	116.697	1.80	116.930	0.085
19953	96.605	1.500	96.87	1.15	95.781	1.88	96.230	0.340
25119	78.082	3.000	78.06	2.47	76.702	2.73	77.379	1.543

Appendix C - DoE for INMETRO considering the results of both microphones

As mentioned in Section 7.2, it was agreed with the participants in the key comparison that the results of INMETRO for the microphone 4180.2412872 would be removed and not considered in this comparison due to the drift detected for this microphone.

This Appendix present just for purpose of INMETRO investigation, the Degrees of Equivalence for INMETRO introducing the results of the microphone 4180.2412872 declared by INMETRO and the results of the pilot laboratory for this microphone measured at the final monitoring calibration in 02/2021. These data are introduced in the model presented in Section 7 as a “third” and independent microphone, measured only by LNE and INMETRO.

It should be noted that it is not possible to predict the behaviour of these microphones after the change. Some are stable at the new value, some slowly finds their way back and some seem not to stabilise.

The open-circuit, pressure sensitivity level and phase and uncertainties reported by INMETRO and measured by LNE in 02/2021 for the microphone 4180.2412872 are given in Table C.1.

The reference values are listed in Table C.2 for the sensitivity level and sensitivity phase for the microphone 4180.2412872 measured after drift.

Table C.3 shows the degrees of equivalence for INMETRO as function of frequency for sensitivity level and phase when considering the results of the microphone 4180.2124385 and the microphone 4180.2412872 measured after drift. The values of degrees of equivalence and uncertainties are presented in Figure C.1.

Table C.1. Pressure sensitivities level and phase and expanded uncertainties of the microphone 4180.2412872 reported by INMETRO and measured by LNE in 02/2021.

Frequency (Hz)	LNE				INMETRO			
	Level		Phase		Level		Phase	
	M (dB re 1 V/Pa)	U(k=2) (dB)	M (degree)	U(k=2) (degree)	M (dB re 1 V/Pa)	U(k=2) (dB)	M (degree)	U(k=2) (degree)
1.995	-37.489	0.145	176.93	4.15	-37.506	0.200	177.587	3.60
2.512	-37.543	0.115	177.43	2.65	-37.601	0.170	178.003	2.50
3.162	-37.573	0.090	177.85	1.70	-37.596	0.150	178.409	2.00
3.981	-37.599	0.075	178.16	1.10	-37.629	0.130	178.409	1.25
5.012	-37.622	0.060	178.40	0.70	-37.657	0.130	178.716	1.25
6.310	-37.640	0.050	178.59	0.45	-37.674	0.090	178.878	0.95
7.943	-37.658	0.045	178.75	0.35	-37.690	0.080	179.021	0.90
10.000	-37.676	0.040	178.87	0.25	-37.707	0.060	179.055	0.80
12.589	-37.691	0.035	178.94	0.20	-37.722	0.060	179.201	0.80
15.849	-37.708	0.035	179.05	0.15	-37.734	0.050	179.242	0.50
19.953	-37.722	0.035	179.14	0.15	-37.745	0.050	179.312	0.50
25.119	-37.735	0.030	179.22	0.15	-37.758	0.045	179.373	0.35
31.623	-37.746	0.030	179.29	0.15	-37.763	0.045	179.423	0.35
39.811	-37.755	0.030	179.34	0.15	-37.772	0.045	179.453	0.35
50.119	-37.763	0.030	179.37	0.15	-37.777	0.045	179.488	0.35
63.096	-37.771	0.030	179.38	0.15	-37.785	0.045	179.479	0.35
79.433	-37.778	0.030	179.38	0.15	-37.788	0.045	179.470	0.35
100.00	-37.784	0.030	179.36	0.15	-37.795	0.045	179.450	0.35
125.89	-37.790	0.030	179.33	0.15	-37.798	0.045	179.415	0.35
158.49	-37.795	0.030	179.27	0.15	-37.800	0.045	179.301	0.35
199.53	-37.798	0.030	179.17	0.15	-37.805	0.045	179.193	0.35
251.19	-37.803	0.030	179.05	0.15	-37.808	0.045	179.045	0.35
316.23	-37.806	0.030	178.88	0.15	-37.812	0.045	178.881	0.35
398.11	-37.809	0.030	178.65	0.15	-37.814	0.045	178.654	0.35
501.19	-37.811	0.030	178.37	0.15	-37.815	0.045	178.361	0.35
630.96	-37.813	0.030	177.99	0.15	-37.816	0.045	178.001	0.35
794.33	-37.812	0.030	177.52	0.15	-37.817	0.045	177.544	0.35
1000.0	-37.812	0.030	176.92	0.15	-37.817	0.045	176.947	0.35
1258.9	-37.809	0.030	176.16	0.15	-37.814	0.045	176.169	0.35
1584.9	-37.805	0.030	175.19	0.15	-37.810	0.045	175.196	0.35
1995.3	-37.794	0.030	173.95	0.15	-37.801	0.045	173.956	0.35
2511.9	-37.779	0.030	172.39	0.15	-37.785	0.045	172.395	0.35
3162.3	-37.752	0.030	170.38	0.15	-37.760	0.045	170.387	0.35
3981.1	-37.711	0.030	167.81	0.20	-37.723	0.045	167.810	0.35
5011.9	-37.650	0.030	164.45	0.20	-37.665	0.045	164.446	0.35
6309.6	-37.559	0.030	160.00	0.25	-37.582	0.045	159.999	0.35
7943.3	-37.440	0.030	153.93	0.30	-37.475 *	0.045	153.980	0.35
10000	-37.316	0.030	145.44	0.35	-37.373 *	0.045	145.591	0.35
12589	-37.306	0.030	133.33	0.40	-37.379 *	0.045	133.705	0.35
15849	-37.756	0.035	116.25	0.50	-37.827 *	0.050	117.095	0.50
19953	-39.283	0.060	95.41	0.65	-39.305	0.090	96.755 *	0.80
25119	-42.210	0.130	76.09	1.20	-42.168	0.160	77.792	2.20

Table C.2. Reference values for the comparison, pressure sensitivity level and phase and expanded uncertainties for the microphone 4180.2412872 after drift.

Frequency (Hz)	4180.2412872			
	Level		Phase	
	Sensitivity (dB ref 1V/Pa)	U(*k=2*) (dB)	Sensitivity (degree)	U(*k=2*) (degree)
1.995	-37.481	0.085	177.010	177.010
2.512	-37.552	0.069	178.135	178.135
3.162	-37.578	0.057	178.408	178.408
3.981	-37.608	0.049	178.542	178.542
5.012	-37.627	0.041	178.721	178.721
6.310	-37.646	0.034	178.839	178.839
7.943	-37.664	0.031	178.905	178.905
10.000	-37.683	0.027	178.973	178.973
12.589	-37.693	0.024	179.022	179.022
15.849	-37.709	0.023	179.110	179.110
19.953	-37.722	0.022	179.198	179.198
25.119	-37.733	0.019	179.274	179.274
31.623	-37.743	0.019	179.338	179.338
39.811	-37.751	0.019	179.325	179.325
50.119	-37.759	0.018	179.358	179.358
63.096	-37.766	0.018	179.361	179.361
79.433	-37.771	0.018	179.379	179.379
100.00	-37.777	0.018	179.377	179.377
125.89	-37.783	0.018	179.339	179.339
158.49	-37.787	0.018	179.271	179.271
199.53	-37.790	0.018	179.175	179.175
251.19	-37.794	0.018	179.036	179.036
316.23	-37.797	0.018	178.865	178.865
398.11	-37.800	0.018	178.639	178.639
501.19	-37.801	0.018	178.351	178.351
630.96	-37.803	0.018	177.991	177.991
794.33	-37.802	0.018	177.522	177.522
1000.0	-37.802	0.018	176.927	176.927
1258.9	-37.798	0.018	176.160	176.160
1584.9	-37.793	0.018	175.197	175.197
1995.3	-37.783	0.018	173.971	173.971
2511.9	-37.767	0.018	172.404	172.404
3162.3	-37.740	0.018	170.409	170.409
3981.1	-37.699	0.018	167.845	167.845
5011.9	-37.638	0.018	164.494	164.494
6309.6	-37.543	0.021	160.058	160.058
7943.3	-37.420	0.021	154.025	154.025
10000	-37.296	0.021	145.578	145.578
12589	-37.296	0.023	133.535	133.535
15849	-37.754	0.027	116.550	116.550
19953	-39.253	0.038	95.531	95.531
25119	-42.171	0.075	76.470	76.470

Table C.3. Degrees of equivalence for INMETRO as function of frequency for sensitivity levels and phases, deviations and uncertainties, when considering data of the microphone 4180.2124385 and the microphone 4180.2412872 after drift.

Frequency (Hz)	INMETRO Level D_{ii} (dB)	U(k=2) (dB)	Phase D_{ii} (degree)	U(k=2) (degree)
1.995	-0.013	0.176	-0.058	3.130
2.512	-0.018	0.150	-0.240	2.178
3.162	-0.003	0.133	-0.079	1.756
3.981	-0.004	0.115	-0.180	1.079
5.012	-0.015	0.116	-0.015	1.110
6.310	-0.016	0.079	0.025	0.844
7.943	-0.015	0.070	0.118	0.808
10.000	-0.013	0.051	0.133	0.723
12.589	-0.020	0.052	0.181	0.727
15.849	-0.021	0.043	0.126	0.451
19.953	-0.017	0.043	0.111	0.452
25.119	-0.019	0.039	0.090	0.311
31.623	-0.018	0.039	0.069	0.313
39.811	-0.015	0.039	0.053	0.315
50.119	-0.013	0.039	0.083	0.315
63.096	-0.013	0.040	0.087	0.317
79.433	-0.013	0.040	0.056	0.317
100.00	-0.013	0.040	0.036	0.317
125.89	-0.011	0.040	0.043	0.318
158.49	-0.009	0.040	0.010	0.318
199.53	-0.010	0.040	0.030	0.318
251.19	-0.010	0.040	0.074	0.318
316.23	-0.010	0.040	0.086	0.319
398.11	-0.011	0.040	0.113	0.319
501.19	-0.011	0.040	0.092	0.319
630.96	-0.010	0.040	0.066	0.319
794.33	-0.011	0.040	0.055	0.319
1000.0	-0.012	0.040	0.033	0.319
1258.9	-0.013	0.040	0.017	0.319
1584.9	-0.014	0.040	-0.001	0.319
1995.3	-0.016	0.040	-0.024	0.319
2511.9	-0.016	0.040	-0.024	0.318
3162.3	-0.019	0.040	-0.043	0.318
3981.1	-0.024	0.040	-0.066	0.316
5011.9	-0.027	0.040	-0.088	0.316
6309.6	-0.039	0.040	-0.107	0.313
7943.3	-0.057	0.043	-0.107	0.310
10000	-0.081	0.043	-0.053	0.307
12589	-0.100	0.044	0.107	0.304
15849	-0.103	0.049	0.490	0.441
19953	-0.058	0.078	1.062	0.777
25119	-0.005	0.138	1.123	1.989

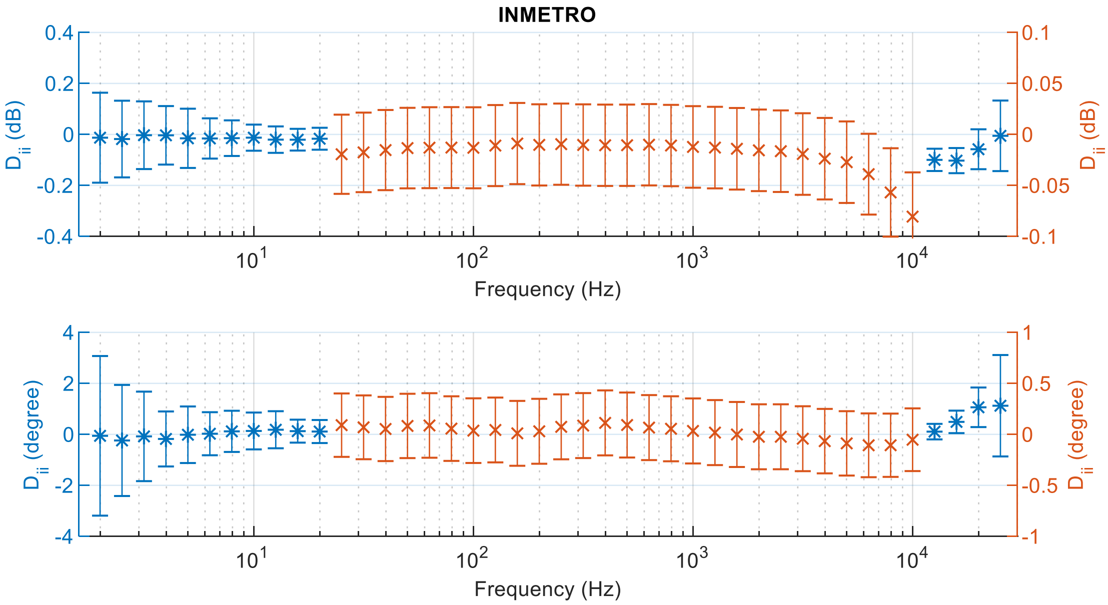

Figure C.1. Degrees of equivalence for INMETRO for sensitivity level and phase with uncertainty bars corresponding to coverage factor k=2. The blue asterisks data refer to the left axis scale and the orange crosses data refer to the right axis scale.