TECHNICAL PROTOCOL FOR BILATERAL COMPARISON OF PRESSURE CALIBRATION OF LABORATORY STANDARD MICROPHONES

<KRISS & KIM-LIPI>

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Sang Joon Suh
Korea Research Institute of Standards and Science

Daejeon, Korea

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PARTICIPANTS

NMI-Country	Contact
KRISS-Korea	Dr. Sang Joon Suh Korea Research Institute of Standards & Science PO Box 102 Yuseong Daejeon 305-600 Korea (Republic of) Email: sjs@kriss.re.kr Tel: +82 42 868 5300 Fax: +82 868 5643
KIM-LIPI-Indonesia	Mr. Achmad Suwandi Head of Acoustical Metrology Lab. Indonesian Institute of Sciences Research and Development Center for Calibration, Instrumentation and Metrology **KIM-LIPI** Komplex Puspiptek Serpong – Tangerang 15314 Indonesia Email: achmadsuwandi@kim.lipi.go.id Tel: +62 21 7560562
NMI-Australia Third party for data collection and release	Dr. Prem Narang National Measurement Institute Department of Innovation, Industry, Science and Research Bradfield Rd West Lindfield NSW 2070 Australia

AIM AND TASK OF THE COMPARISON

The task of the bilateral comparison is the measurement of the pressure sensitivity level of LS1P and LS2P microphones at the nominal preferred octave frequencies from 63 Hz to 1 kHz and the nominal preferred 1/3rd octave frequencies from 1.25 kHz to 8 kHz for LS1P microphone and the nominal preferred octave frequencies from 31.5 Hz to 4 kHz and the nominal preferred 1/3rd octave frequencies from 6.3 kHz to 25 kHz for LS2P by the reciprocity technique. The pressure sensitivity must be calculated according to the IEC 61094-2 "*Measurement microphones Part 2: Primary method for pressure calibration of laboratory standard microphones by the reciprocity technique"*. The pressure sensitivity level shall be given in dB re 1 V/Pa for reference conditions as specified in IEC 61094-2.

This document defines the protocol for the bilateral comparison of pressure calibration of laboratory standard microphones, to be calibrated by the reciprocity method - IEC 61094-2, between KRISS and KIM-LIPI, with KRISS as the pilot laboratory. It should be read in conjunction with the 'Guidelines for CIPM key comparisons' which includes more details on the purpose and conduct of key comparisons in general. The purpose of this document is to "specify the procedures necessary for the comparison, but not the procedures used for the realization of the standards being compared."

MEASUREMENT CONDITIONS

- Each laboratory is to measure the open-circuit pressure sensitivity level of both microphones at the nominal preferred octave frequencies from 63 Hz to 1 kHz (63.0, 125.0, 250.0, 500.0, 1000.0 Hz) and the nominal preferred 1/3rd octave frequencies from 1.25 kHz to 8 kHz (1.25, 1.6, 2.0, 2.5, 3.15, 4.0, 5.0, 6.3, 8.0 kHz) for LS1P microphone and the nominal preferred octave frequencies from 31.5 Hz to 4 kHz (31.5, 63.0, 125.0, 250.0, 500.0, 1000.0, 2000.0, 4000.0 Hz) and the nominal preferred 1/3rd octave frequencies from 6.3 kHz to 25 kHz (6.3, 8.0, 10.0, 12.5, 16.0, 20.0, 25.0 kHz) for LS2P using their normal method of calibration.
- Results should be corrected to the reference environmental conditions as specified on IEC 61094-2

  Temperature: 23 °C
  Static pressure: 101, 325 kPa
  Relative Humidity: 50 %

TRAVELLING STANDARDS

The microphones that will be used on the comparison are:

- Brüel & Kjær 4160, serial number 1792662
- Brüel & Kjær 4180, serial number 2341431

Both microphones will be provided by KRISS.

KIM-LIPI is responsible for the collection or return of the microphones to KRISS. Once agreed, the timetable must be followed as is indicated in this document.

The microphones must be always transported by a reliable international delivery service and by using the same packaging as KRISS has supplied.

The microphones must be used only for the purposes of this comparison; that means, they must not be used on pistonphones or on any sound calibrators, in order to avoid any change on their sensitivity.

The microphones circulated shall be used as receivers only.

No grease shall be used when assembling microphones and coupler.

REPORTING RESULTS

The calibration report shall be submitted to the pilot laboratory within 6 weeks after the calibration, and laboratories should report their results using a standard certificate as they would issue to a customer. In the report must be indicated:

- Calibration equipment
- Calibration method used
- Ambient conditions of measurement
- Calibration results. Open circuit sensitivity for each microphone and for each frequency in the frequency range specified above. The calibration results must be reported at reference conditions as indicated on IEC 61094-2
- The values of the front cavity volume, front cavity depth, equivalent volume, the resonance frequency, and the loss factor.
- Values of the pressure and temperature coefficients of the microphones used on the calculation of the pressure sensitivity.
- A summary of the uncertainty calculation, and the overall uncertainties calculated for a coverage factor of $k = 2$.

The calibration results for each microphone must be averaged from five different calibrations, and each measurement result must be included in the report of calibration.

All the measurement results should be sent to neutral third party, Dr. Prem Narang at National Measurement Institute of Australia (NMIA), and after the completion of measurements, he will release the results simultaneously to both NMIs.

The uncertainties shall be evaluated for a coverage factor $k = 2$ and information must be given on the number of effective degrees of freedom. The values of the components of the uncertainty budget and standard uncertainty shall be calculated for each microphone and for each frequency in the frequency range specified previously. It must be noticed that CIPM guidelines require uncertainty budgets to be submitted in advance of participation. Each participant shall submit uncertainty budgets to NMIA no latter than 30 June 2008.

TIMETABLE

Microphones shall be returned to KRISS on time according to this timetable.

Id	Task name	Duration	Start	Finish
1	Initial calibration at KRISS	2 weeks	Mon 30/06/2008	Fri 12/07/2008
2	Calibration at KIM-LIPI	4 weeks	Mon 14/07/2008	Fri 09/08/2008
3	Check calibration at KRISS	2 weeks	Mon 18/08/2008	Fri 30/08/2008
4	Preliminary Report		30 October, 2008	
5	Final Report		31 December, 2008	

FINANCE

The KIM-LIPI is responsible for their own costs. The KRISS will transport the microphones to KIM-LIPI, after calibration by KRISS. The KIM-LIPI is responsible for the return of microphones to KRISS after measurement.