

## **CCAUV.A-K5, COOMET.AUV.A-K5, AFRIMETS.AUV.A-K5 and EURAMET.AUV.V-K5**

### **Key comparison CCAUV.A-K5**

**MEASURANDS :** Pressure sensitivity levels and pressure sensitivity phases of two standard microphones IEC type LS1P

**FREQUENCIES :** 2 Hz to 10 kHz

**TRANSFER STANDARDS :** Microphone 4160 811012 IEC type LS1P, and microphone 4160 2652754 IEC type LS1P

The individual measurement results and associated standard uncertainties declared by the participating laboratories for both microphones can be found in the EXCEL file "[CCAUV-A-K5 Final Report Tables of Data.xls](#)" attached to the Final Report of key comparison CCAUV.A-K5 under the tabs, "811012 Level", "811012 Phase", "2652754 Level Adjusted", and "2652754 Phase".

### **Key comparison COOMET.AUV.A-K5**

**MEASURANDS :** Pressure sensitivity levels and pressure sensitivity phases of one standard microphone IEC type LS1P

**FREQUENCIES :** 2 Hz to 10 kHz

**TRANSFER STANDARD :** Microphone 4160 2545015 IEC type LS1P

The individual measurement results and associated standard uncertainties declared by the participating laboratories for the travelling microphone can be found in the EXCEL file "[COOMET.AUV.A-K5 Final Report Tables of Data.xls](#)".

### **Key comparison AFRIMETS.AUV.A-K5**

**MEASURANDS :** Pressure sensitivity levels and pressure sensitivity phases of two standard microphones IEC type LS1P

**FREQUENCIES :** 2 Hz to 10 kHz

**TRANSFER STANDARDS :** Microphone 4160 811014 IEC type LS1P, and microphone 4160 2036126 IEC type LS1P

The individual measurement results and associated uncertainties declared by the participating laboratories for both microphones can be found in Annex C of the AFRIMETS.AUV.A-K5 Final Report and in "[AFRIMETS.AUV.A-K5\\_Final\\_Report\\_Results.xls](#)".

The results obtained using the microphone 4160 811014 IEC type LS1P were not linked to CCAUV.A-K5 results because of the observed shift in the sensitivity.

**Key comparison EURAMET.AUV.A-K5**

**MEASURANDS :** Pressure sensitivity levels and pressure sensitivity phases of two standard microphones IEC type LS1P

**FREQUENCIES :** 2 Hz to 10 kHz

**TRANSFER STANDARDS :** Microphone 4160 811014 IEC type LS1P, and microphone 4160 2036126 IEC type LS1P

The individual measurement results and associated uncertainties declared by the participating laboratories for both microphones can be found in Section 4 of the EURAMET.AUV.A-K5 Final Report and in "[EURAMET.AUV-A-K5\\_Tables\\_of\\_Data.xls](#)".

The results obtained using the microphone 4160 811014 IEC type LS1P were not linked to CCAUV.A-K5 results because of the observed shift in the sensitivity.

**CCAUV.A-K5, COOMET.AUV.A-K5, AFRIMETS.AUV.A-K5 and EURAMET.AUV.V-K5**

Key comparison CCAUV.A-K5

MEASURANDS : Pressure sensitivity levels and pressure sensitivity phases of two standard microphones IEC type LS1P

FREQUENCIES : 2 Hz to 10 kHz

TRANSFER STANDARDS : Microphone 4160 811012 IEC type LS1P, and microphone 4160 2652754 IEC type LS1P

For each frequency and each standard, the key comparison reference value,  $x_R$ , expressed in dB re 1 V/Pa, and associated standard uncertainty,  $u_R$ , expressed in dB, is computed as described in Section 7 of the Final Report.

Measurand: Sensitivity level					Measurand: Sensitivity phase						
		Microphone 4160 811012		Microphone 4160 2652754				Microphone 4160 811012		Microphone 4160 2652754	
Frequency / Hz	$x_R$ / dB	$u_R$ / dB	$x_R$ / dB	$u_R$ / dB	Frequency / Hz	$x_R$ / degrees	$u_R$ / degrees	$x_R$ / degrees	$u_R$ / degrees		
251.189	-26.808	0.004	-27.352	0.004	251.189	177.725	0.014	177.886	0.014		
1000	-26.780	0.004	-27.341	0.004	1000	172.586	0.012	172.961	0.012		

For each frequency and each standard, the degree of equivalence of laboratory  $i$ ,  $D_i$  and expanded uncertainty ( $k = 2$ )  $U_i$ , is determined as explained in Section 8 of the CCAUV.A-K5 Final Report.

Results for the degrees of equivalence presented here are those for the frequency values of 251.189 Hz and 1 kHz only, and the results obtained for other frequency values from 2 Hz to 10 kHz for microphone 811012, and from 2 Hz to 1 kHz for microphone 2652754 can be found in the EXCEL file "[CCAUV-A-K5 Final Report Tables of Data.xls](#)" attached to the Final Report of key comparison CCAUV.A-K5.

#### Linking COOMET.AUV.A-K5 to CCAUV.A-K5

**MEASURANDS :** Pressure sensitivity levels and pressure sensitivity phases of one standard microphone type LS1P

**FREQUENCIES :** 2 Hz to 10 kHz

**TRANSFER STANDARD :** Microphone 4160 2545015 IEC type LS1P

**The CCAUV.A-K5 key comparison reference values for sensitivity level and sensitivity phase were applied using the GUM as linking laboratory. The linking procedure is described in Section 7 of the COOMET.AUV.A-K5 Final Report.**

Results for the degrees of equivalence presented here are those for the frequency values of 251.189 Hz and 1 kHz only. The results obtained for other frequency values from 2 Hz to 10 kHz are given in the EXCEL file "[COOMET.AUV.A-K5 Final Report Tables of Data.xls](#)".

#### Linking key comparison AFRIMETS.AUV.A-K5 to CCAUV.A-K5

**MEASURANDS :** Pressure sensitivity levels and pressure sensitivity phases of one standard microphone type LS1P

**FREQUENCIES :** 2 Hz to 10 kHz

**TRANSFER STANDARD:** Microphone 4160 2036126 IEC type LS1P

**NPL provides the link between both comparisons, and the linkage procedure is described in Section 7 of the AFRIMETS.AUV.A-K5 Final Report.**

Results for the degrees of equivalence presented here are those for the frequency values of 251.189 Hz and 1 kHz only. The results obtained for other frequency values from 2 Hz to 10 kHz are given in the EXCEL file "[AFRIMETS.AUV.A-K5\\_Final\\_Report\\_Results.xls](#)".

#### Linking key comparison EURAMET.AUV.A-K5 to CCAUV.A-K5

**MEASURANDS :** Pressure sensitivity levels and pressure sensitivity phases of one standard microphone type LS1P

**FREQUENCIES :** 2 Hz to 10 kHz

**TRANSFER STANDARD:** Microphone 4160 2036126 IEC type LS1P

**NPL and INRiM provide the link between both comparisons, and the linkage procedure is described in Section 5 of the EURAMET.AUV.A-K5 Final Report.**

Results for the degrees of equivalence presented here are those for the frequency values of 251.189 Hz and 1 kHz only. The results obtained for other frequency values from 2 Hz to 10 kHz are given in the EXCEL file "[EURAMET.AUV-A-K5\\_Tables\\_of\\_Data.xls](#)".

CCAUV.A-K5, COOMET.AUV.A-K5, AFRIMETS.AUV.A-K5 and EURAMET.AUV.V-K5

MEASURAND : Pressure sensitivity levels of standard microphones IEC type LS1P

FREQUENCIES : 251.189 Hz and 1 kHz

TRANSFER STANDARDS:

CCAUV.A-K5: Microphone 4160 811012 IEC type LS1P, and microphone 4160 2652754 IEC type LS1P

COOMET.AUV.A-K5: Microphone 4160 2545015 IEC type LS1P

AFRIMETS.AUV.A-K5: Microphone 4160 2036126 IEC type LS1P

EURAMET.AUV.A-K5: Microphone 4160 2036126 IEC type LS1P

Degrees of equivalence relative to CCAUV.A-K5 key comparison reference values expressed in dB

Lab <i>i</i> ↓	251.189 Hz				1 kHz			
	Microphone 4160 SN 811012		Microphone 4160 SN 2652754		Microphone 4160 SN 811012		Microphone 4160 SN 2652754	
	$D_i$ / dB	$U_i$ / dB	$D_i$ / dB	$U_i$ / dB	$D_i$ / dB	$U_i$ / dB	$D_i$ / dB	$U_i$ / dB
NPL	-0.0118	0.0288	0.0018	0.0287	-0.0097	0.0289	0.0012	0.0288
BKSV-DPLA	-0.0028	0.0181	0.0073	0.0123	0.0003	0.0127	0.0127	0.0124
GUM	-0.0018	0.0288	-0.0260	0.0287	-0.0097	0.0289	-0.0266	0.0288
NIM	0.0082	0.0288	-0.0107	0.0288	0.0103	0.0289	-0.0113	0.0288
INMETRO	0.0072	0.0391	0.0050	0.0392	0.0023	0.0392	0.0013	0.0392
CENAM	-0.0078	0.0288	-0.0094	0.0290	-0.0097	0.0289	-0.0100	0.0290
INRIM	0.0082	0.0288	-0.0023	0.0292	0.0003	0.0289	-0.0029	0.0291
NMISA	0.0182	0.0391	0.0198	0.0395	0.0203	0.0392	0.0092	0.0394
KRISS	0.0082	0.0181	0.0023	0.0192	0.0103	0.0184	0.0017	0.0190
NRC	-0.0318	0.0391	-0.0252	0.0398	-0.0297	0.0392	-0.0259	0.0396
VNIIFTRI	0.0032	0.0329	0.0144	0.0343	-0.0027	0.0331	-0.0063	0.0340
NMIJ	-0.0118	0.0391	0.0083	0.0408	0.0003	0.0392	0.0075	0.0404
<b>DP NDI Systema</b>	<b>0.023</b>	<b>0.043</b>	-	-	<b>0.017</b>	<b>0.043</b>	-	-
<b>CMI</b>	<b>-0.014</b>	<b>0.041</b>	-	-	<b>-0.004</b>	<b>0.041</b>	-	-
<b>NMISA</b>	<b>-0.017</b>	<b>0.031</b>	-	-	<b>-0.015</b>	<b>0.031</b>	-	-
<b>NPL</b>	<b>-0.012</b>	<b>0.029</b>	-	-	<b>-0.010</b>	<b>0.029</b>	-	-
<b>MIKES</b>	<b>-0.012</b>	<b>0.039</b>	-	-	<b>-0.012</b>	<b>0.042</b>	-	-

Lab <i>i</i> ↓	251.189 Hz		1 kHz	
	Microphone 4160 SN 811012		Microphone 4160 SN 811012	
	$D_i$ / dB	$U_i$ / dB	$D_i$ / dB	$U_i$ / dB
<b>LNE</b>	<b>0.004</b>	<b>0.033</b>	<b>0.004</b>	<b>0.033</b>
<b>METAS</b>	<b>0.014</b>	<b>0.045</b>	<b>0.013</b>	<b>0.047</b>
<b>UME</b>	<b>-0.002</b>	<b>0.042</b>	<b>-0.001</b>	<b>0.042</b>
<b>BIM</b>	<b>-0.001</b>	<b>0.052</b>	<b>0.001</b>	<b>0.052</b>
<b>DMDM</b>	<b>0.893</b>	<b>0.081</b>	<b>0.958</b>	<b>0.081</b>
<b>BEV</b>	<b>0.007</b>	<b>0.040</b>	<b>-0.003</b>	<b>0.040</b>
<b>RISE</b>	<b>-0.003</b>	<b>0.042</b>	<b>-0.009</b>	<b>0.042</b>
<b>PTB</b>	<b>-0.007</b>	<b>0.033</b>	<b>-0.010</b>	<b>0.033</b>
<b>CEM</b>	<b>-0.009</b>	<b>0.033</b>	<b>-0.011</b>	<b>0.033</b>
<b>NIS</b>	<b>0.001</b>	<b>0.050</b>	<b>-0.001</b>	<b>0.049</b>

Black: CCAUV.A-K5

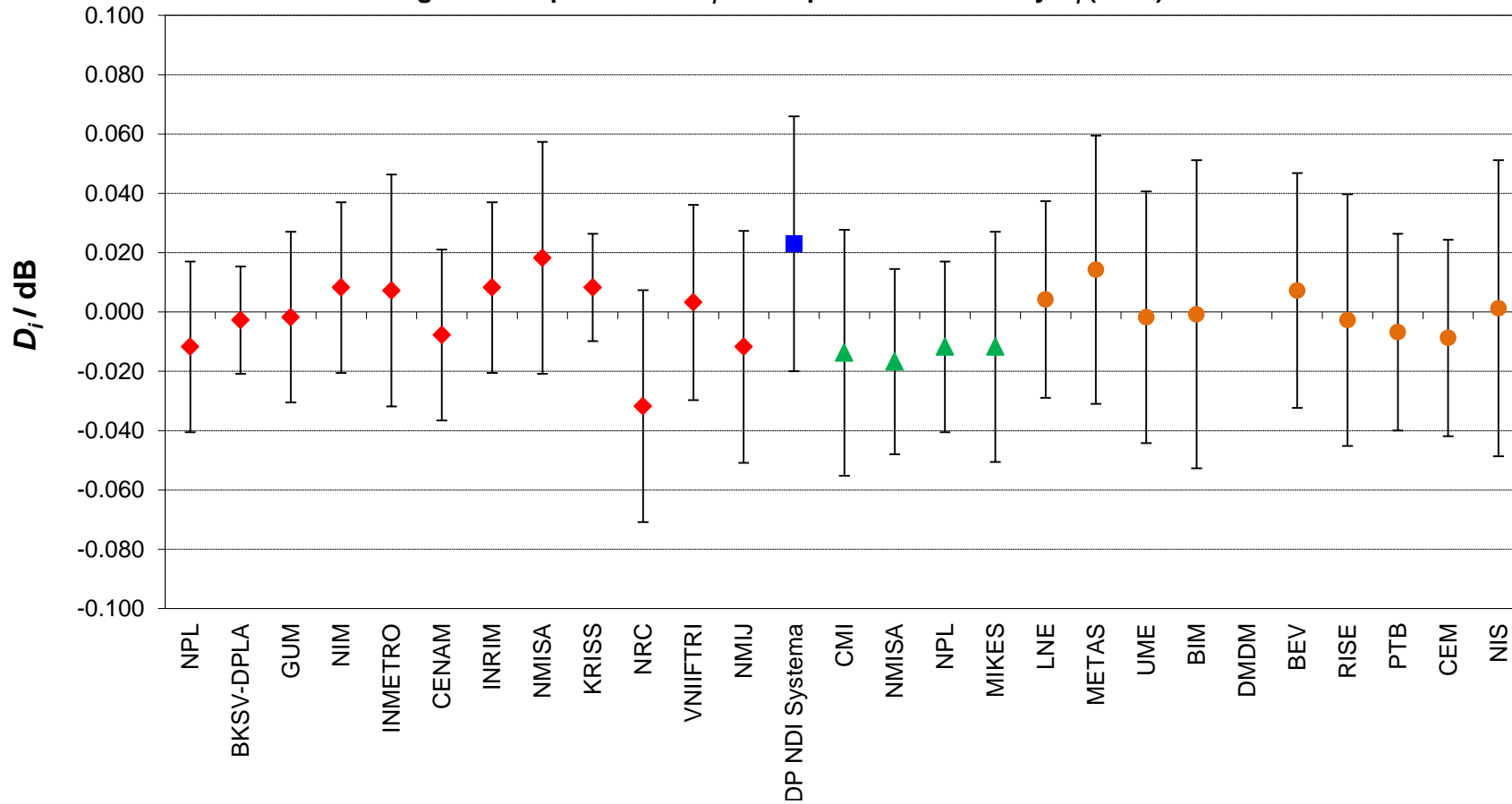
Blue : COOMET.AUV.A-K5

Green : AFRIMETS.AUV.A-K5

Orange: participants in EURAMET.AUV.A-K5

**CCAUV.A-K5, COOMET.AUV.A-K5, AFRIMETS.AUV.A-K5 and EURAMET.AUV.A-K5  
Sensitivity level of LS1P microphones at 251.189 Hz**

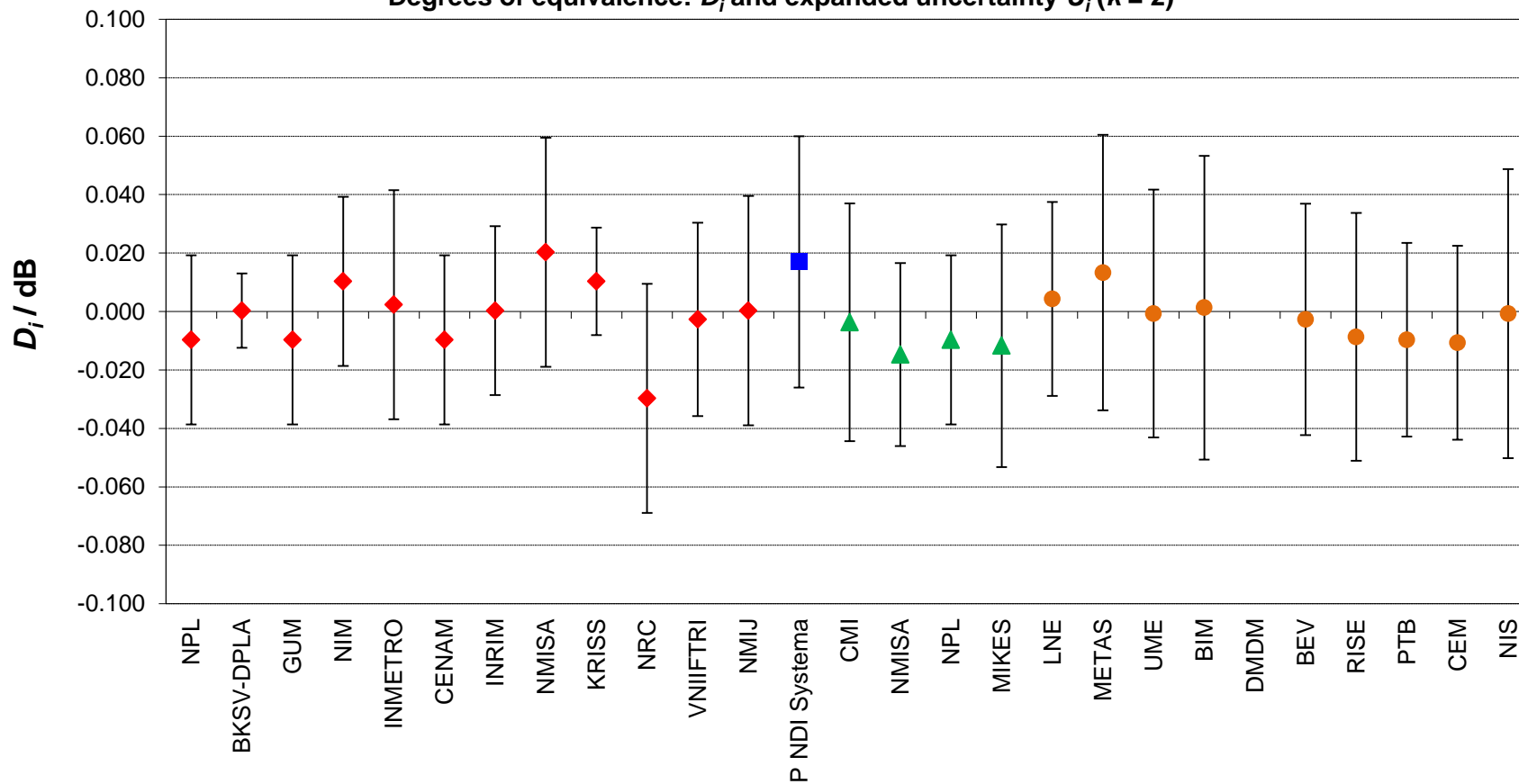
Degrees of equivalence:  $D_i$  and expanded uncertainty  $U_i$  ( $k = 2$ )



**Red diamonds:** CCAUV.A-K5 (Microphone 4160 SN 811012);  
**Blue square:** COOMET.AUV.A-K5 (Microphone 4160 254501),  
**Green triangles:** AFRIMETS.AUV.A-K5 (Microphone 4160 2036126)  
**Orange circles:** EURAMET.AUV.A-K5 (Microphone 4160 2036126)

**CCAUV.A-K5, COOMET.AUV.A-K5, AFRIMETS.AUV.A-K5 and EURAMET.AUV.A-K5**  
**Sensitivity level of LS1P microphones at 1000 Hz**

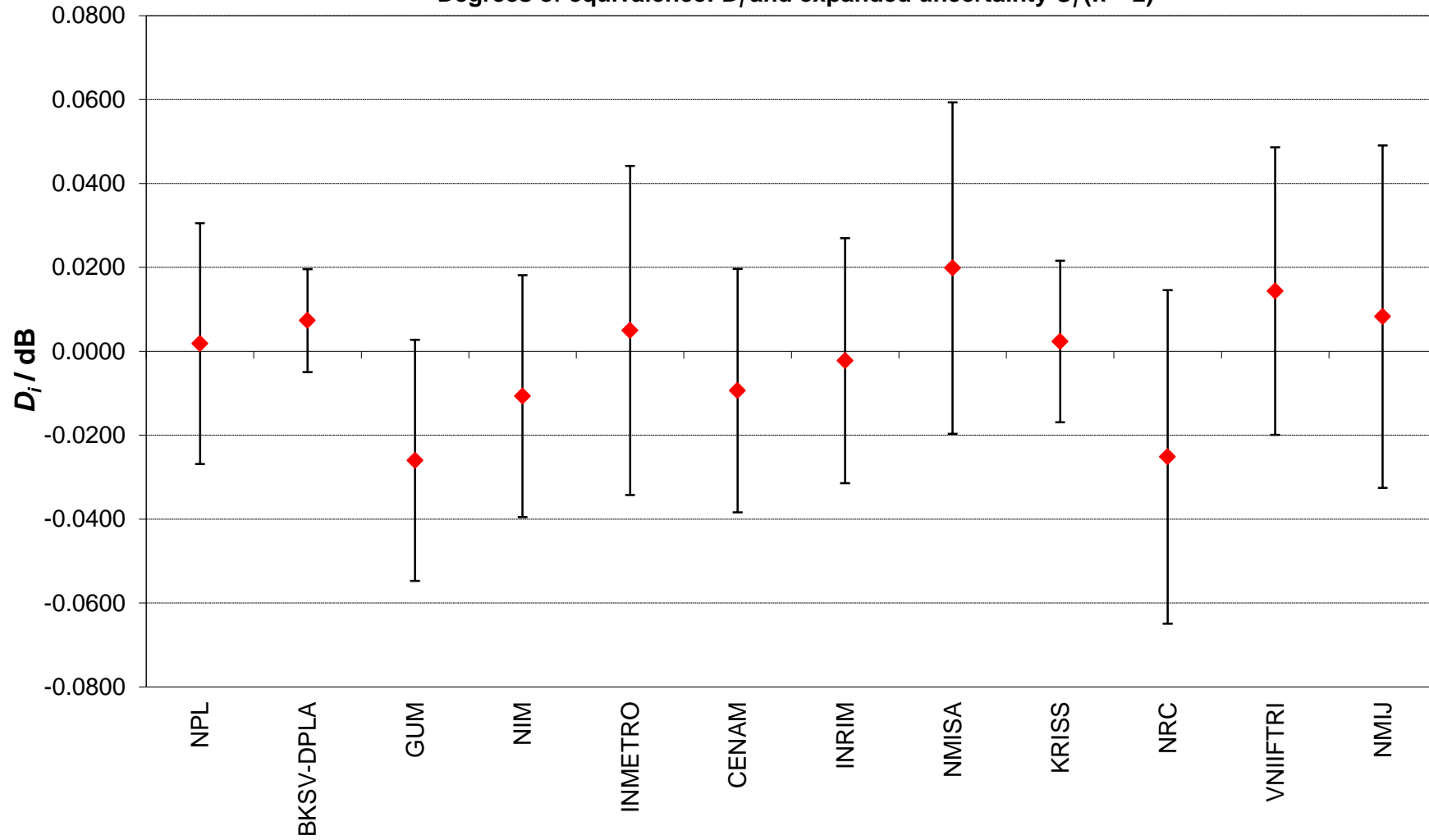
Degrees of equivalence:  $D_i$  and expanded uncertainty  $U_i$  ( $k = 2$ )



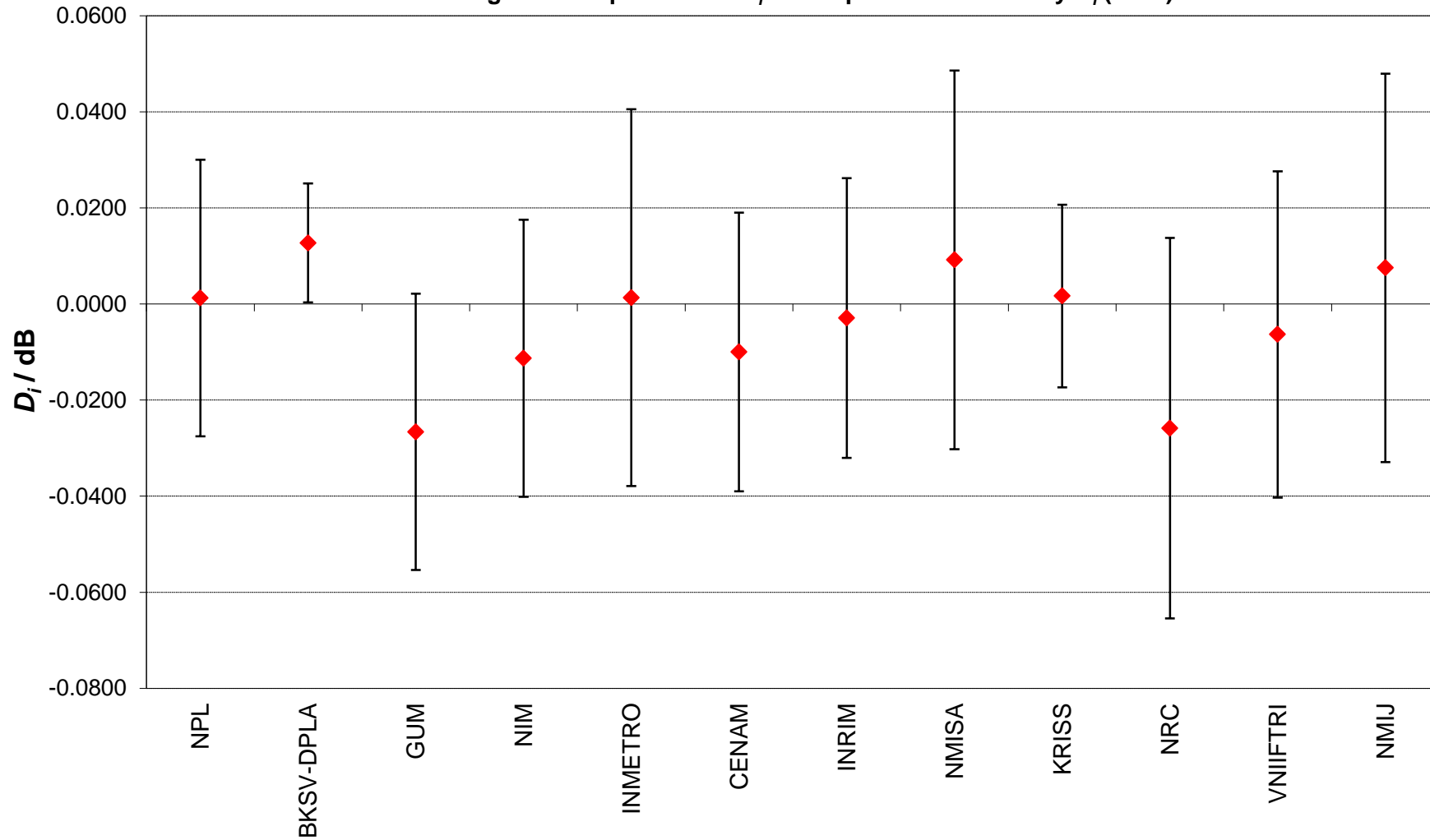
**Red diamonds:** CCAUV.A-K5 (Microphone 4160 SN 811012);  
**Blue square:** COOMET.AUV.A-K5 (Microphone 4160 254501),  
**Green triangles:** AFRIMETS.AUV.A-K5 (Microphone 4160 2036126)  
**Orange circles:** EURAMET.AUV.A-K5 (Microphone 4160 2036126)



CCAUV.A-K5  
Sensitivity level of 4160 2652754 LS1P microphone at 251.189 Hz  
Degrees of equivalence:  $D_i$  and expanded uncertainty  $U_i$  ( $k = 2$ )



**CCAUV.A-K5**  
**Sensitivity level of LS1P microphone 4160 2652754 LS1P at 1000 Hz**  
**Degrees of equivalence:  $D_i$  and expanded uncertainty  $U_i$  ( $k = 2$ )**



CCAUV.A-K5, COOMET.AUV.A-K5, AFRIMETS.AUV.A-K5 and EURAMET.AUV.V-K5

MEASURANDS : Pressure sensitivity phases of standard microphones IEC type LS1P

FREQUENCIES : 251.189 Hz and 1 kHz

TRANSFER STANDARDS

CCAUV.A-K5: Microphone 4160 811012 IEC type LS1P, and microphone 4160 2652754 IEC type LS1P

COOMET.AUV.A-K5: Microphone 4160 2545015 IEC type LS1P

AFRIMETS.AUV.A-K5: Microphone 4160 2036126 IEC type LS1P

EURAMET.AUV.A-K5: Microphone 4160 2036126 IEC type LS1P

Degrees of equivalence with respect to CCAUV.A-K5 key comparison reference values expressed in dB

Lab <i>i</i> ↓	251.189 Hz				1 kHz			
	Microphone 4160 SN 811012		Microphone 4160 SN 2652754		Microphone 4160 SN 811012		Microphone 4160 SN 2652754	
	$D_i$ / degrees	$U_i$ / degrees	$D_i$ / degrees	$U_i$ / degrees	$D_i$ / degrees	$U_i$ / degrees	$D_i$ / degrees	$U_i$ / degrees
NPL	-0.0548	0.3990	0.0135	0.3990	-0.0960	0.4994	-0.0012	0.4994
BKSV-DPLA	0.0352	0.0961	0.0535	0.0961	0.0240	0.0971	0.0688	0.0971
GUM	-0.0148	0.8996	0.0635	0.8996	-0.1160	0.6996	0.1488	0.6996
NIM	-0.0148	0.0416	-0.0165	0.0416	0.0040	0.0439	-0.0012	0.0439
INMETRO	-0.0278	0.1981	-0.0415	0.1981	-0.0150	0.1986	-0.0462	0.1986
CENAM	0.0092	0.0288	0.0045	0.0288	-0.0040	0.0181	-0.0052	0.0181
INRIM	-0.0248	0.5994	0.0135	0.5994	0.0140	0.5995	-0.0612	0.5995
NMISA	-	-	-	-	-	-	-	-
KRISS	-0.0248	0.1981	-0.0865	0.1981	0.0140	0.1986	-0.0612	0.1986
NRC	-0.0248	0.0961	0.0235	0.0961	0.0140	0.1176	0.0388	0.1176
VNIIFTRI	-	-	-	-	-	-	-	-
NMIJ	0.0752	0.2987	-0.0865	0.2987	0.0140	0.2990	-0.0612	0.2990
DP NDI Systema	-0.036	0.938	-	-	-0.252	0.693	-	-
CMI	-	-	-	-	-	-	-	-
NMISA	-0.03	0.33	-	-	-0.01	0.52	-	-
NPL	-0.05	0.40	-	-	-0.10	0.50	-	-
MIKES	-	-	-	-	-	-	-	-

Lab <i>i</i> ↓	251.189 Hz		1 kHz	
	Microphone 4160 SN 811012		Microphone 4160 SN 811012	
	$D_i$ / degrees	$U_i$ / degrees	$D_i$ / degrees	$U_i$ / degrees
LNE	0.004	0.483	-0.040	0.563
METAS	0.010	0.274	-0.034	0.409
RISE	-0.086	0.483	-0.090	0.563
PTB	-0.046	0.569	-0.010	0.638

Black: CCAUV.A-K5

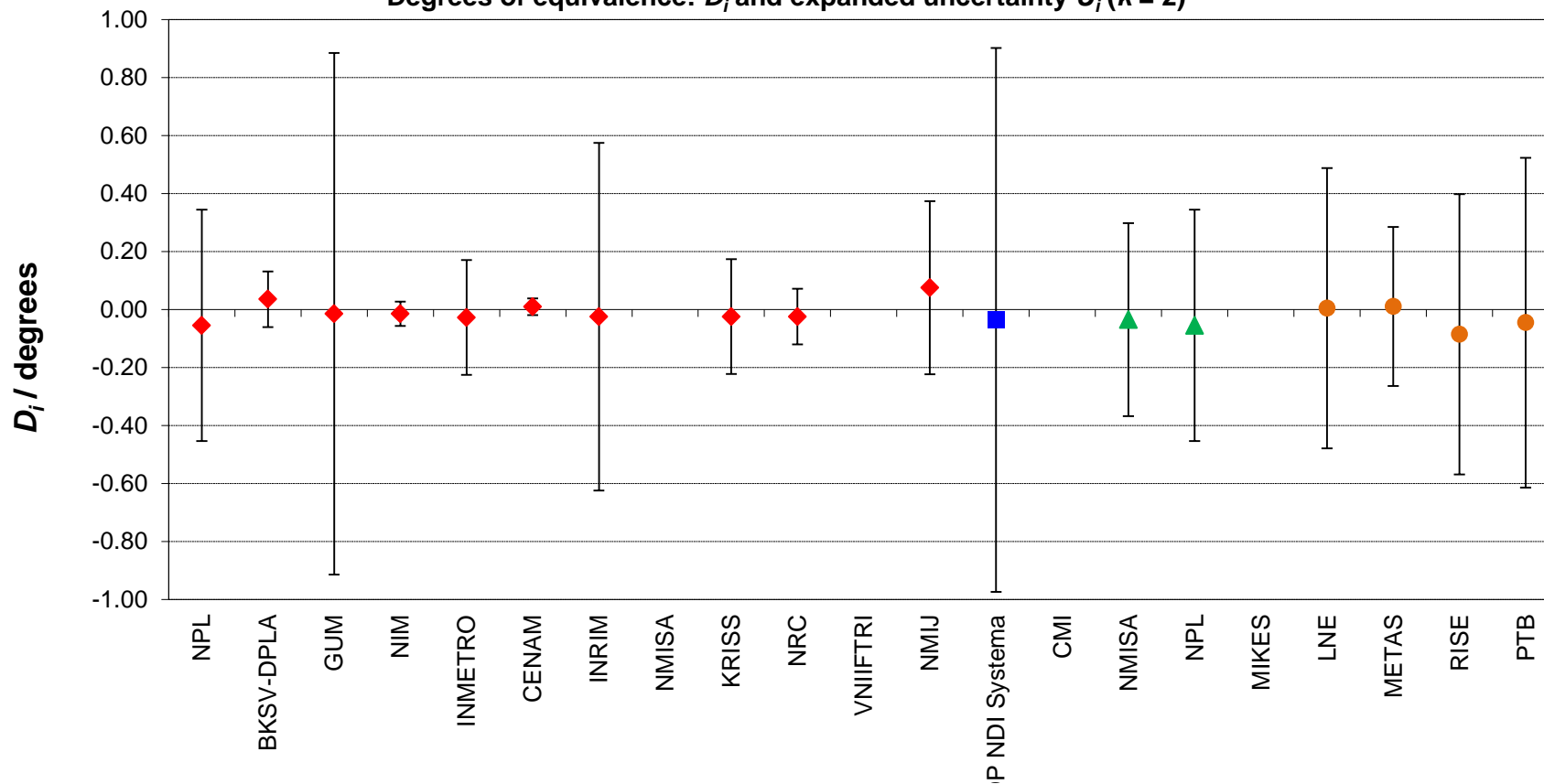
Blue : COOMET.AUV.A-K5

Green : AFRIMETS.AUV.A-K5

Orange: participants in EURAMET.AUV.A-K5

**CCAUV.A-K5, COOMET.AUV.A-K5, AFRIMETS.AUV.A-K5 and EURAMET.AUV.A-K5  
Sensitivity phase of LS1P microphones at 251.189 Hz**

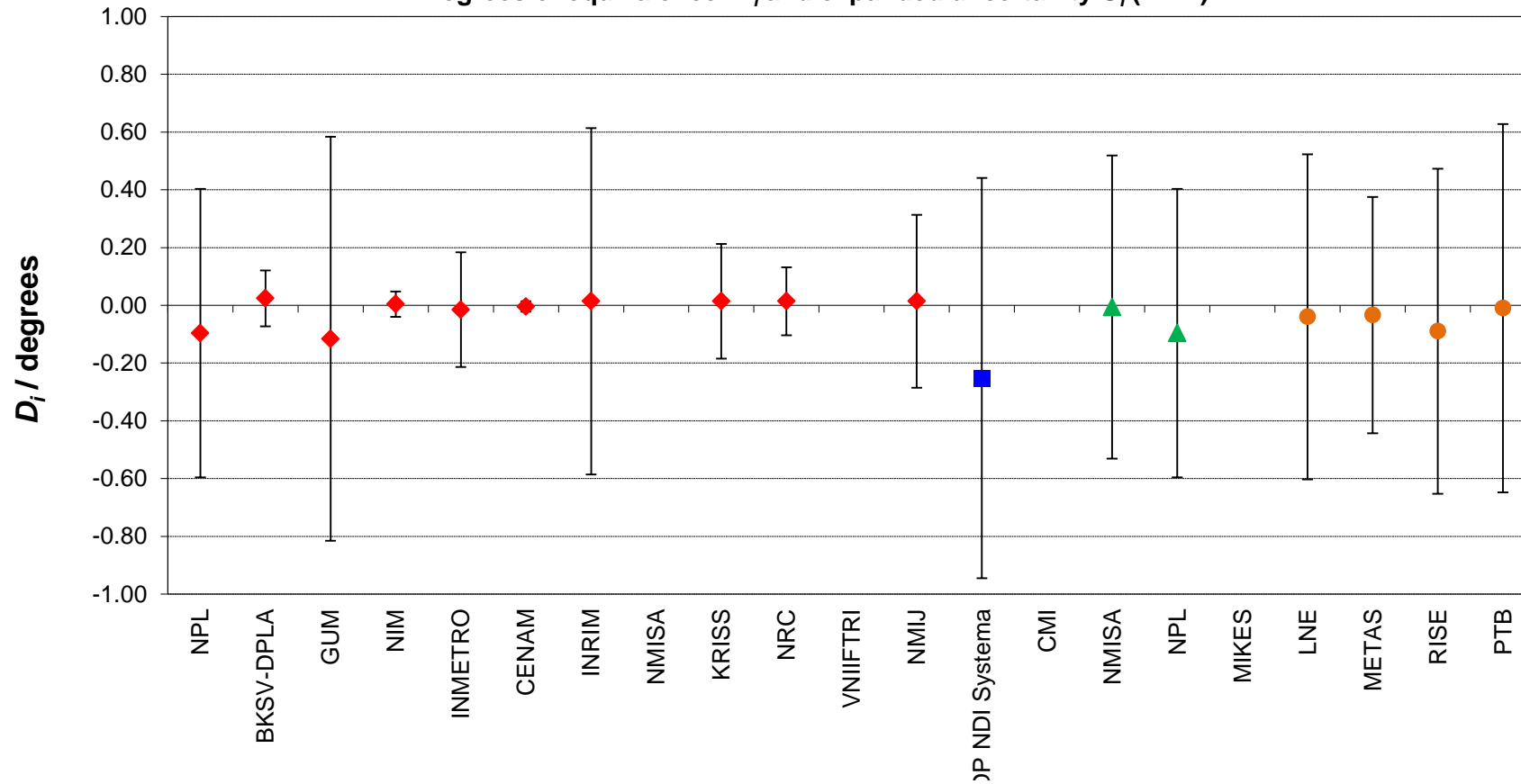
**Degrees of equivalence:  $D_i$  and expanded uncertainty  $U_i$  ( $k = 2$ )**



**Red diamonds:** CCAUV.A-K5 (Microphone 4160 SN 811012);  
**Blue square:** COOMET.AUV.A-K5 (Microphone 4160 254501),  
**Green triangles:** AFRIMETS.AUV.A-K5 (Microphone 4160 2036126)  
**Orange circles:** EURAMET.AUV.A-K5 (Microphone 4160 2036126)

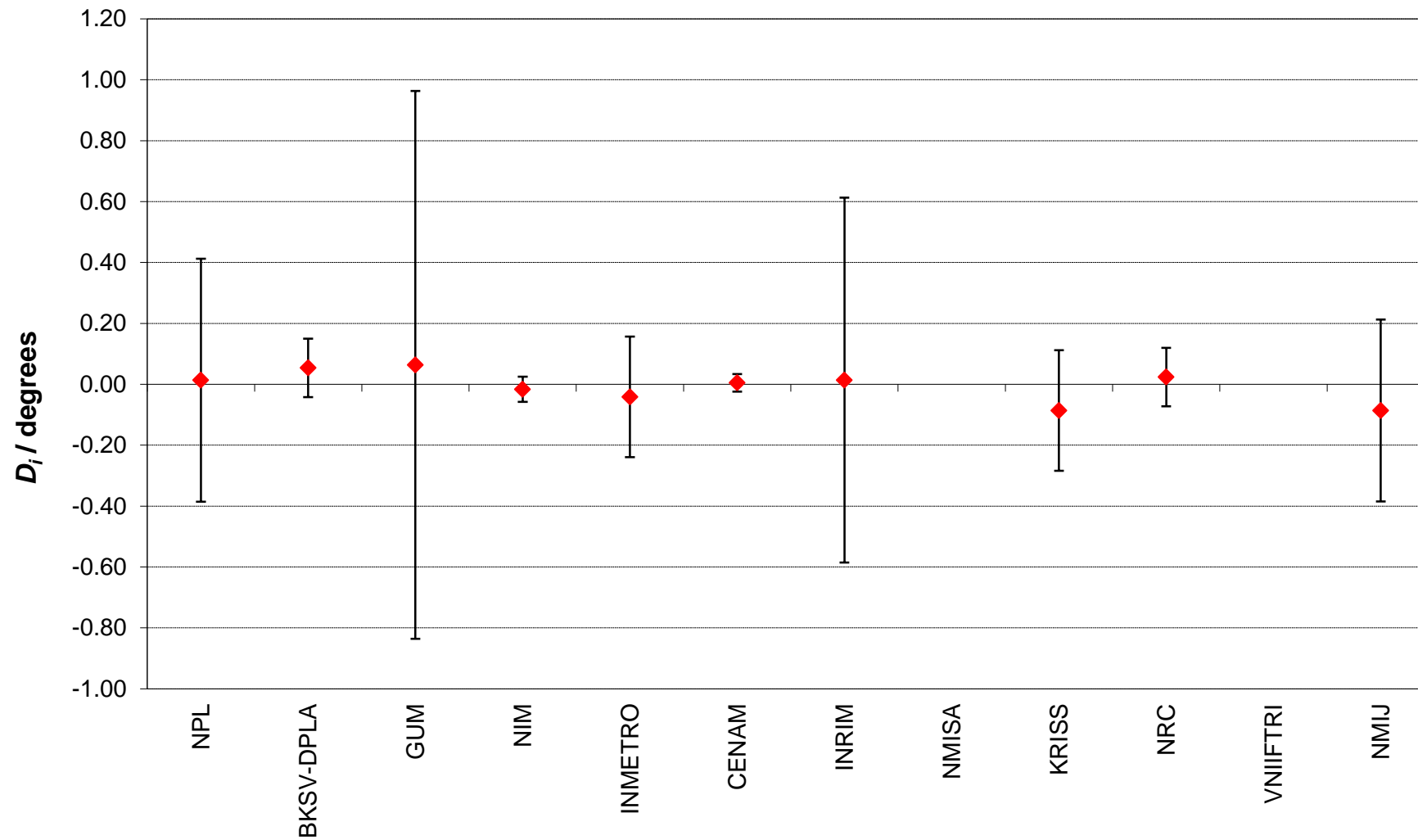
**CCAUV.A-K5, COOMET.AUV.A-K5, AFRIMETS.AUV.A-K5 and EURAMET.AUV.A-K5  
Sensitivity phase of LS1P microphones at 1000 Hz**

Degrees of equivalence:  $D_i$  and expanded uncertainty  $U_i$  ( $k = 2$ )



**Red diamonds:** CCAUV.A-K5 (Microphone 4160 SN 811012);  
**Blue square:** COOMET.AUV.A-K5 (Microphone 4160 254501),  
**Green triangles:** AFRIMETS.AUV.A-K5 (Microphone 4160 2036126)  
**Orange circles:** EURAMET.AUV.A-K5 (Microphone 4160 2036126)

CCAUV.A-K5 Sensitivity phase of microphone 4160 2652754 LS1P at 251.189 Hz  
Degrees of equivalence:  $D_i$  and expanded uncertainty  $U_i$  ( $k = 2$ )



CCAUV.A-K5 Sensitivity phase of microphone 4160 2652754 LS1P at 1000 Hz  
Degrees of equivalence:  $D_i$  and expanded uncertainty  $U_i$  ( $k = 2$ )

