Odin Metrology, Inc.
Calibration of Sound & Vibration Instruments

Certificate Number: **N/A**

Certificate of Calibration for G.R.A.S. IEC 60711 Ear Simulator

This calibration is performed by comparison with measurement reference standard:

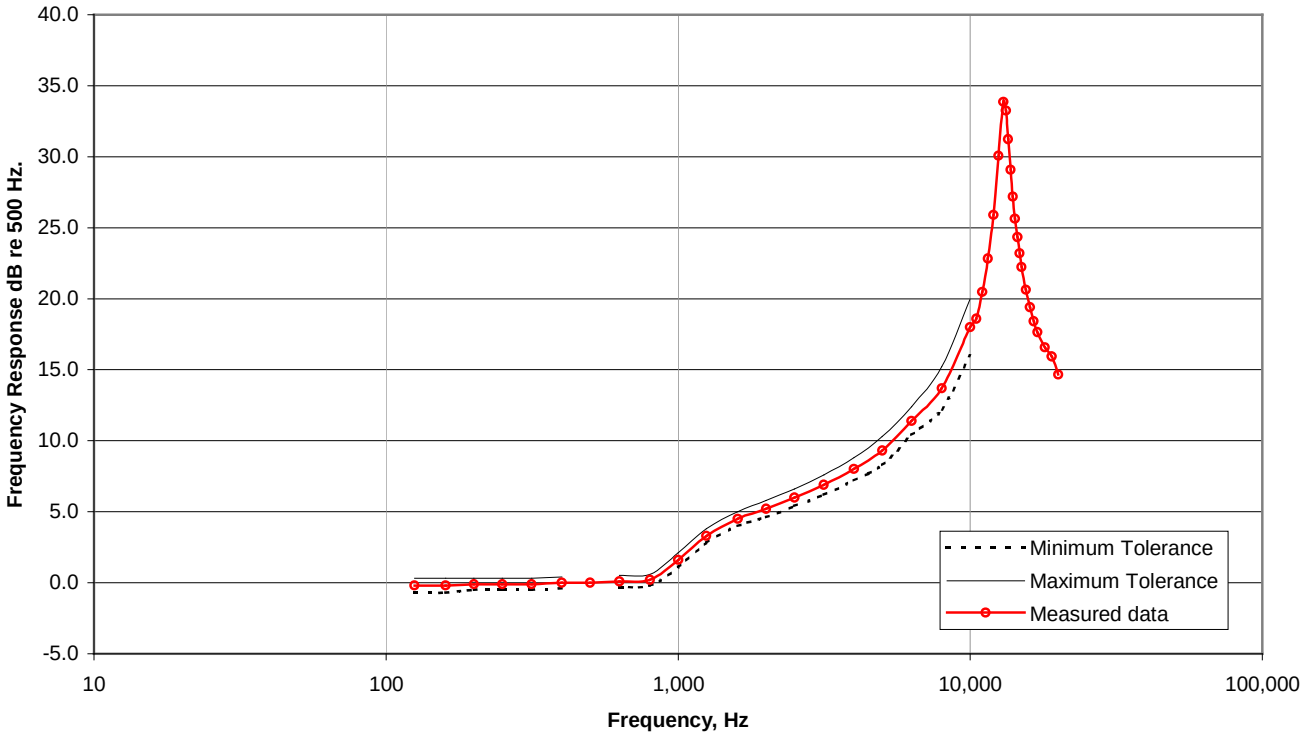
Reference Standards	
Type No.	4134/UA0825
Serial No.	1866524
Calibrated by	DANAK
Cal Date	06 SEP 2011
Due Date	06 SEP 2013

Type no.	**RA0045**
Serial no.	**XXX**
Asset no.	**N/A**
With built in microphone	**40AG**
Microphone serial no.	**XXX**
With preamplifier type no.	**N/A**
Preamplifier Serial no.	**N/A**
Submitted by	**Odin Metrology, Inc.**
Purchase order no.	**N/A**

a) Estimated uncertainty of comparison: ± **0.065** dB
b) Estimated uncertainty of 4134: ± **0.04** dB
c) Total uncertainty: $\sqrt{a^2+b^2}$ = ± **0.076** dB
d) Expanded uncertainty (coverage factor *k* = 2 for 95% confidence level): = ± **0.15** dB

Performance Data		
Open circuit sensitivity at 1,013 mbar, 23°C, 50% RH, 251.2 Hz	**-38.32**	dB re 1 V/Pa
	12.14	mV/Pa
System sensitivity (with preamplifier) at 251.2 Hz	**N/A**	dB re 1 V/Pa
	N/A	mV/Pa

Ear Simulator Frequency Response: Type RA0045
S/N XXX : Measured 9 Aug 2012



Calibration performed by

Signature Not Verified

Torben Ehlert, Quality Assurance Manager

Condition of Test		
Ambient Pressure	**985.08**	hPa
Temperature	**23**	°C
Relative Humidity	**35**	%
Polarization Voltage	**200**	V
Frequency	**251.2**	Hz
Date of Calibration	**09 AUG 2012**	
Re-calibration due on	**09 AUG 2013**	

Odin Metrology, Inc.
3533 Old Conejo Road, Suite 125
Thousand Oaks, CA 91320
Phone: (805) 375-0830; Fax: (805) 375-0405

The calibration data is both "as found" and "as final." At the time of calibration this ear simulator was found to be **within** the manufacturer's specifications.

This calibration is traceable to NIST Test Number: **822/279494-10, D1295**.

Instrumentation used for calibration of microphones

Instrument Type	Type no.	Serial no.	Cal. Date	Cal. Due	Cal. by
B&K Sine/Random Generator	1049	1464545	20 JUN 12	20 JUN 13	HL
Precision Barometer	141	299/95-10	23 NOV 11	23 NOV 12	CMI
Measuring Amplifier	2636	1324114	05 JUN 12	05 JUN 13	HL
Preamplifier	2639	1202131	27 JUN 12	27 JUN 13	HL
Preamplifier	2645	1097320	04 SEP 12	04 SEP 13	HL
Multimeter	34401A	US36071531	12 JUN 12	12 JUN 13	Agilent
Multimeter	34401A	MY41029778	05 SEP 12	05 SEP 13	Agilent
Microphone	4134/UA0825	1866524	06 SEP 11	06 SEP 13	DANAK
Pistonphone	4220/40cc	1048747	24 OCT 11	24 OCT 12	TE
Multitone Calibrator	4226	2141942	01 DEC 11	01 DEC 12	HL
Precision Attenuator	5936	1637820	04 SEP 12	04 SEP 13	HL
Polarization Voltmeter	WB0781	04	07 SEP11	07 SEP12	HL

Calibration of reference microphones 4160 serial numbers 991820, 991821, and 1054926, and standard pistonphones 4220 serial numbers 1048473, 1048795, 1510240, 4228 serial number 1048747 with 40 cm^3 volume are calibrated traceable to NIST with NIST test number **822/279494-10, D1295**

The verification/calibration listed on page 1 of this document was performed on a test system which conforms to and operates under the requirements of **ANSI/NCSL Z540-1** which also covers the requirements for **MIL STD 45662A**, **ISO 17025**, and ISO 9001:2008 NQA certification no.: **11252**.

Procedure: Odin Metrology, Inc. standing microphone calibration procedure.

This page revised: 13 September, 2012

Odin Metrology Inc.
Calibration of Brüel & Kjær Instruments
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IEC 60711 Ear Simulator Type RA0045

Serial# XXX
ID# N/A
Certificate# N/A

Measured with
Microphone 40AO# N/A Preamplifier N/A

See Below for Frequency Response Tabulation including tolerances

Frequency (Hz)	Nominal Value (dB)	Tolerance (dB) Minimum	Tolerance (dB) Maximum	Data Found (dB) Re. 500 Hz	Pass/Fail	Data Found (dB) Re. 1000 Hz
100	-0.3	-0.8	0.2	-0.30	Pass	-1.90
125	-0.2	-0.7	0.3	-0.20	Pass	-1.80
160	-0.2	-0.7	0.3	-0.20	Pass	-1.80
200	-0.1	-0.5	0.3	-0.10	Pass	-1.70
250	-0.1	-0.5	0.3	-0.10	Pass	-1.70
315	-0.1	-0.5	0.3	-0.10	Pass	-1.70
400	0.0	-0.4	0.4	0.00	Pass	-1.60
500	REF			0.00		-1.60
630	0.1	-0.3	0.5	0.10	Pass	-1.50
800	0.2	-0.2	0.6	0.20	Pass	-1.40
1,000	1.6	1.1	2.1	1.60	Pass	0.00
1,250	3.3	2.8	3.8	3.30	Pass	1.70
1,600	4.5	4.0	5.0	4.50	Pass	2.90
2,000	5.2	4.6	5.8	5.20	Pass	3.60
2,500	6.0	5.4	6.6	6.00	Pass	4.40
3,150	6.9	6.2	7.6	6.90	Pass	5.30
4,000	8.0	7.2	8.8	8.00	Pass	6.40
5,000	9.3	8.3	10.3	9.30	Pass	7.70
6,300	11.4	10.4	12.4	11.40	Pass	9.80
8,000	13.7	12.2	15.2	13.70	Pass	12.10
10,000	18.0	16.0	20.0	18.00	Pass	16.40
10,500				18.58		16.98
11,000				20.47		18.87
11,500				22.82		21.22
12,000				25.90		24.30
12,500				30.05		28.45
13,000				33.86		32.26
13,250				33.25		31.65
13,500				31.23		29.63
13,750				29.08		27.48
14,000				27.19		25.59
14,250				25.62		24.02
14,500				24.33		22.73
14,750				23.20		21.60
15,000				22.22		20.62
15,500				20.62		19.02
16,000				19.39		17.79
16,500				18.41		16.81
17,000				17.63		16.03
18,000				16.56		14.96
19,000				15.93		14.33
20,000				14.65		13.05

Measurements were also made at these additional frequencies as requested. Note however that no tolerances are defined for these frequencies and these data are provided for reference only.

750				-0.19		-1.79
1,500				4.70		3.10
2,250				5.96		4.36
3,000				6.39		4.79
4,500				8.26		6.66
6,000				9.88		8.28
9,000				14.54		12.94

Customer Odin Metrology, Inc.
Purchase Order# N/A
Date 9-Aug-12 Performed by: TE
Environmental Conditions:
Temperature 23 deg C
Pressure 985.08 hPa
Relative Humidity 35%

Ear Simulator Frequency Response: Type RA0045
S/N XXX : Measured 9 Aug 2012