



APLAC

Asia Pacific Laboratory Accreditation Cooperation

SOUND LEVEL

INTERLABORATORY COMPARISON APLAC M010

Final Report – March 2007

ACKNOWLEDGMENTS

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1. INTRODUCTION

This report summarises the results of an interlaboratory comparison on sound level calibration by laboratories accredited by bodies that are members of the Asia Pacific Laboratory Accreditation Cooperation (APLAC). The program was coordinated by the National Association of Testing Authorities, Australia (NATA).

This program was the tenth APLAC calibration interlaboratory comparison. Circulation of the artefact commenced in March 2001 and finished in April 2003.

2. AIM OF THE PROGRAM

One of APLAC's main aims is to build up and maintain mutual confidence in the technical competence of APLAC members. Interlaboratory comparisons provide objective evidence that laboratories are competent and that they can achieve the level of accuracy for which they are accredited. They also provide a means for improving the quality and performance of laboratories throughout the region.

APLAC APM010 sound level program was designed to test the participants' ability to perform calibration of the acoustic and electrical performance of sound level meters and to determine compliance with the requirements of IEC Publication 651 Sound Level Meters within their accredited uncertainties of measurement. A secondary aim was to assess the participants' ability to estimate their uncertainty of measurement.

3. DESIGN OF THE PROGRAM

This interlaboratory comparison program involved the single loop circulation of the measurement artefact around the group of participating laboratories. The measurement artefact was comprised of a Bruel & kjaer precision Integration Sound Level Meter Type 2236A-009 and a Rion Precision Integration Sound Level Meter Type NL-14.

Also supplied with the meters were two direct electrical input adaptors, a 4 nF and a 11.5 pF to be used where appropriate, together with a BNC lead terminated with the appropriate connector for access to the meter output.

In measuring the performance of the meters, participants were asked to specify whether the standard had been rigorously applied and whether an acoustic input or direct electrical input had been used. Their reports were also to indicate whether the instrument complied with the appropriate part of the standard, or if not, in what respect it failed to comply.

National Measurement Laboratory (NML) of CSIRO and the Australian Government National Measurement Institute (NMI) acted as the Reference Laboratory, deriving the reference values

from the calibrations of the measurement artefact at the beginning (NML) and the end (NMI) of the program.

Note: On 1 July 2004, the CSIRO National Measurement Laboratory (NML) underwent an organisational change, leaving CSIRO, and becoming the National Measurement Institute (NMI), part of the Australian Government Department of Industry Tourism and Resources.

The selected instrument needed to have sufficient resolution, repeatability and stability to be suitable for laboratories.

4. PARTICIPANTS

Sixteen laboratories from ten accreditation bodies participated in the program. These laboratories are accredited for various levels of accuracy as defined in their scope of accreditation which lists their least uncertainties of measurement.

Along with the sound level meter, participating laboratories were sent the operating manuals for each and a set of instructions. A copy of the *Instructions to Laboratories* appears in Appendix A.

To keep to schedule all participants were asked to carry out the measurements within one week of receipt of the artefacts. A *Circulation Schedule* listing the accreditation bodies that participated appears in Appendix B.

To maintain confidentiality, participating laboratories were assigned a random Lab Code number and these numbers are used in the report.

5. REPORTING BY PARTICIPANTS

Laboratories were asked to provide formal calibration reports specifying whether or not the instrument complied with the standard for consideration of their accredited status. The participating laboratories were asked to report uncertainties at the 95% confidence levels, supply copies of worksheets with the relevant test data and copies of the uncertainty calculations.

6. STABILITY OF THE ARTEFACTS

After initial calibration of the artefacts set by NML, they were sent around all participating laboratories.

During and after the circulation, the artefacts were recalibrated by NMI. It was confirmed that the artefacts are stable and no significant drift was found.

7. REFERENCE VALUES

The reference values are derived from the mean of the three calibrations carried out by the NML & NMI (before, during and after the circulation). As the three calibration uncertainties are derived independently, the uncertainty of the reference is the root sum squared result of the three calibration uncertainties.

8. SUMMARY OF RESULTS

A summary of the results returned by the participating laboratories, compared to the reference values, appears in Section 9 in the tables and graphs along with general technical comments. The graphs plot the difference between each laboratory's result and the reference value (*Lab - Ref*).

In accordance with international practice, measurement performance has been assessed on the basis of an E_n ratio for each measurement. The E_n ratios are calculated using a standard statistical technique for comparing values and are derived from the following expression:

$$E_n = \frac{\text{Lab Result} - \text{Ref Value}}{\sqrt{(U_{Lab})^2 + (U_{Ref})^2}}$$

where U_{Lab} is the laboratory's reported uncertainty of measurement at a 95% confidence level, and U_{Ref} is the reference uncertainty of measurement at a 95% confidence level. For the results to be acceptable, values of E_n less than unity are required.

Values of $|E_n| > 1$ require investigation and corrective action by both the laboratory concerned and its accreditation body, and it is detailed in Section 11.

9 PERFORMANCE OF PARTICIPANTS

The table of E_n ratios shows an overall good performance by the majority of participating laboratories.

10. UNCERTAINTIES OF MEASUREMENT

Uncertainty calculations were generally adequate and covered the major sources of uncertainty. The introduction of the ISO Guide[2] ensures a consistent approach to the determination of uncertainties, particularly with respect to Type A uncertainties, which can be evaluated statistically.

In general, the random component of the uncertainty was small. If a laboratory chooses not to make repeated measurements, then a large allowance must be made for this component.

11. CORRECTIVE ACTION

Details of corrective action were not requested for this interlaboratory comparisons mentioned in Section 8, values of $|E_n| > 1$ require investigation and corrective action by the participating laboratory. The laboratory's accreditation body needs to ensure that the problem has been rectified and procedures have been put in place to prevent a recurrence

12. REFERENCES

- (1) APLAC PT001 *Calibration Interlaboratory Comparisons*, 2006.
- (2) ISO *Guide to the Expression of Uncertainty in Measurement*, 1993.
- (3) NATA Assessment of Uncertainties of Measurement for Electrical Testing, P R Cook 1992.
- (4) Guide to Proficiency Testing Australia, 2006, Version 1.

APPENDIX A

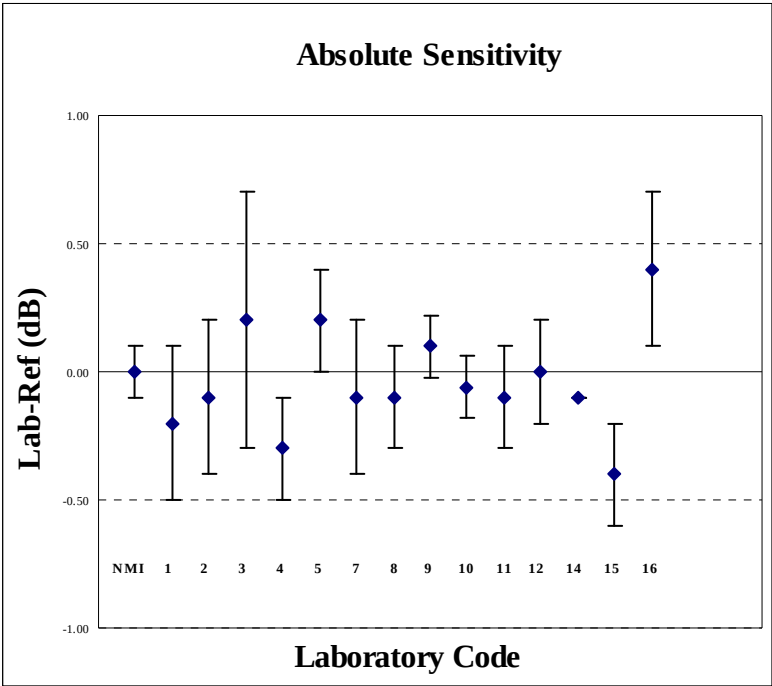
SUMMARY OF ABSOLUTE SENSITIVITY

APPENDIX A

Absolute Sensitivity (f=1000Hz)

Lab Code	Lab (dB)	Ref (dB)	U _{Lab} (dB)	U _{Ref} (dB)	Lab-Ref	En
NMI	0.0	0.0	0.1	0.1	0.00	0.00
1	-0.2	0.0	0.3	0.1	-0.20	-0.63
2	-0.1	0.0	0.3	0.1	-0.10	-0.32
3	0.2	0.0	0.5	0.1	0.20	0.39
4	-0.3	0.0	0.2	0.1	-0.30	-1.34
5	0.2	0.0	0.2	0.1	0.20	0.89
6	-	0.0	-	0.1	-	-
7	-0.1	0.0	0.3	0.1	-0.10	-0.32
8	-0.1	0.0	0.2	0.1	-0.10	-0.45
9	0.1	0.0	0.12	0.1	0.10	0.64
10	-0.06	0.0	0.12	0.1	-0.06	-0.38
11	-0.1	0.0	0.2	0.1	-0.10	-0.45
12	0.0	0.0	0.2	0.1	0.00	0.00
13	-	0.0	-	0.1	-	-
14	-0.1	0.0	-	0.1	-0.10	-
15	-0.4	0.0	0.2	0.1	-0.40	-1.79
16	0.4	0.0	0.3	0.1	0.40	1.26

APPENDIX A



APPENDIX B

SUMMARY OF FREQUENCY WEIGHTING

APPENDIX B

Frequency Weighting (A)

Frequency (Hz)	Lab 1			Lab 2			Lab 3			Lab 4		
	Result (dB)	U ₉₅ (dB)	En	Result (dB)	U ₉₅ (dB)	En	Result (dB)	U ₉₅ (dB)	En	Result (dB)	U ₉₅ (dB)	En
10	-	-	-	-	-	-	-64.1	0.5	-13.71	-	-	-
12.5	-	-	-	-	-	-	-61.8	0.5	-3.88	-	-	-
16	-	-	-	-	-	-	-56.5	0.5	-0.76	-	-	-
20	-	-	-	-	-	-	-50.5	0.5	-0.33	-50.0	0.2	-3.18
25	-	-	-	-	-	-	-44.7	0.5	-0.31	-44.0	0.2	-3.85
31.5	-	-	-	-39.1	0.3	-1.42	-39.5	0.5	-0.10	-38.1	0.2	-6.31
40	-	-	-	-	-	-	-34.7	0.5	-0.08	-33.1	0.2	-7.20
50	-	-	-	-	-	-	-30.2	0.5	-0.27	-29.2	0.2	-4.96
63	-25.0	0.3	-3.89	-26.1	0.3	-0.41	-26.2	0.5	-0.06	-25.4	0.2	-3.76
80	-	-	-	-	-	-	-22.5	0.5	-0.12	-21.9	0.2	-2.95
100	-	-	-	-	-	-	-19.1	0.5	-0.04	-18.7	0.2	-1.70
125	-16.0	0.3	-0.38	-16.1	0.3	-0.06	-16.1	0.5	-0.04	-15.8	0.2	-1.43
160	-	-	-	-	-	-	-13.4	0.5	-0.02	-12.9	0.2	-2.50
200	-	-	-	-	-	-	-10.7	0.5	-0.41	-10.5	0.2	-1.97
250	-8.7	0.3	0.32	-8.7	0.3	0.32	-8.6	0.5	0.00	-8.5	0.2	-0.31
315	-	-	-	-	-	-	-6.6	0.5	0.00	-6.5	0.2	-0.40
400	-	-	-	-	-	-	-4.8	0.5	0.00	-4.6	0.2	-0.85
500	-3.4	0.3	0.35	-3.4	0.3	0.35	-3.2	0.5	-0.18	-3.0	0.2	-1.16
630	-	-	-	-	-	-	-1.9	0.5	0.02	-1.7	0.2	-0.85
800	-	-	-	-	-	-	-0.8	0.5	-0.12	-0.6	0.2	-1.07
1000	0.0	0.3	0.00	0.0	0.3	0.00	0.0	0.5	0.00	0.0	0.2	0.00
1250	-	-	-	-	-	-	0.6	0.5	-0.04	0.7	0.2	-0.49
1600	-	-	-	-	-	-	1.0	0.5	-0.06	0.8	0.2	0.85
2000	0.8	0.3	1.11	1.0	0.3	0.47	1.2	0.5	-0.10	1.2	0.2	-0.22
2500	-	-	-	-	-	-	1.3	0.5	-0.16	1.3	0.2	-0.22
3150	-	-	-	-	-	-	1.2	0.5	-0.10	1.5	0.2	-1.57
4000	1.0	0.3	-0.13	0.8	0.3	0.51	1.0	0.5	-0.08	0.9	0.2	0.40
5000	-	-	-	-	-	-	0.5	0.5	0.16	0.6	0.2	0.13
6300	-	-	-	-	-	-	-0.2	0.5	0.20	-0.1	0.2	0.09
8000	-2.4	0.3	4.14	-1.0	0.3	-0.28	-1.2	0.5	0.22	-1.2	0.2	0.54
10000	-	-	-	-	-	-	-2.6	0.5	0.41	-2.8	0.2	1.79
12500	-	-	-	-4.5	0.3	0.07	-4.6	0.5	0.78	-4.7	0.2	2.33
16000	-	-	-	-	-	-	-7.1	0.5	1.24	-	-	-
20000	-	-	-	-	-	-	-10.2	0.5	2.06	-	-	-

APPENDIX B

Frequency Weighting (A)

Frequency (Hz)	Lab 5			Lab 6			Lab 7			Lab 8		
	Result (dB)	U ₉₅ (dB)	En	Result (dB)	U ₉₅ (dB)	En	Result (dB)	U ₉₅ (dB)	En	Result (dB)	U ₉₅ (dB)	En
10	-	-	-	-	-	-	23.1	0.2	-421.23	-	-	-
12.5	-	-	-	-	-	-	30.1	0.2	-419.84	-	-	-
16	-	-	-	-	-	-	37.4	0.2	-421.68	-	-	-
20	-49.84	0.2	-3.71	-	-	-	43.5	0.2	-421.14	44.4	-	-
25	-44.22	0.2	-2.86	-	-	-	49.1	0.2	-420.20	50.0	-	-
31.5	-39.02	0.2	-2.37	-	-	-	54.3	0.2	-419.71	55.1	-	-
40	-34.07	0.2	-3.00	-	-	-	59.4	0.2	-421.01	60.0	-	-
50	-29.96	0.2	-1.70	-	-	-	63.7	0.2	-420.56	64.2	-	-
63	-25.86	0.2	-1.65	-	-	-	67.8	0.2	-420.51	68.2	-	-
80	-22.18	0.2	-1.70	-	-	-	71.6	0.2	-421.10	71.9	-	-
100	-18.90	0.2	-0.98	-	-	-	74.5	0.2	-418.68	75.2	-	-
125	-15.99	0.2	-0.58	-	-	-	77.6	0.2	-419.13	78.1	-	-
160	-13.19	0.2	-0.98	-	-	-	80.5	0.2	-419.98	81.0	-	-
200	-10.75	0.2	-0.72	-	-	-	83.0	0.2	-419.98	83.3	-	-
250	-8.64	0.2	0.18	-	-	-	85.2	0.2	-419.49	85.4	-	-
315	-6.76	0.2	0.72	-	-	-	87.2	0.2	-419.49	87.5	-	-
400	-4.85	0.2	0.22	-	-	-	89.1	0.2	-419.93	89.4	-	-
500	-3.15	0.2	-0.63	-	-	-	90.7	0.2	-420.34	90.8	-	-
630	-1.94	0.2	0.22	-	-	-	92.0	0.2	-419.89	92.1	-	-
800	-0.94	0.2	0.36	-	-	-	93.2	0.2	-420.65	93.2	-	-
1000	-0.20	0.2	0.89	-	-	-	94.0	0.2	-420.38	94.0	-	-
1250	0.37	0.2	0.94	-	-	-	94.6	0.2	-420.47	94.5	-	-
1600	0.57	0.2	1.79	-	-	-	95.0	0.2	-420.51	94.8	-	-
2000	0.93	0.2	0.98	-	-	-	95.2	0.2	-420.60	94.9	-	-
2500	0.98	0.2	1.07	-	-	-	95.3	0.2	-420.74	94.8	-	-
3150	1.09	0.2	0.27	-	-	-	95.2	0.2	-420.60	94.4	-	-
4000	0.99	0.2	-0.13	-	-	-	95.0	0.2	-420.56	93.9	-	-
5000	0.21	0.2	1.65	-	-	-	94.6	0.2	-420.47	93.0	-	-
6300	-0.55	0.2	2.01	-	-	-	93.9	0.2	-420.38	91.4	-	-
8000	-1.89	0.2	3.58	-	-	-	92.9	0.2	-420.34	88.9	-	-
10000	-3.19	0.2	3.58	-	-	-	91.6	0.2	-420.34	85.3	-	-
12500	-5.75	0.2	6.93	-	-	-	89.7	0.2	-419.93	80.9	-	-
16000	-	-	-	-	-	-	87.1	0.2	-418.46	75.8	-	-
20000	-	-	-	-	-	-	84.2	0.2	-417.47	68.2	-	-

APPENDIX B

Frequency Weighting (A)

Frequency (Hz)	Lab 9			Lab 10			Lab 11			Lab 12		
	Result (dB)	U ₉₅ (dB)	En	Result (dB)	U ₉₅ (dB)	En	Result (dB)	U ₉₅ (dB)	En	Result (dB)	U ₉₅ (dB)	En
10	-	-	-	-	-	-	-	-	-	-70.9	0.1	-1.34
12.5	-	-	-	-	-	-	-	-	-	-63.7	0.1	-0.57
16	-	-	-	-	-	-	-	-	-	-56.9	0.1	0.07
20	-	-	-	-	-	-	-	-	-	-50.7	0.1	0.21
25	-	-	-	-	-	-	-	-	-	-44.9	0.1	0.28
31.5	55.6	0.12	-609.14	-38.91	0.12	-4.10	-0.1	0.1	-278.95	-39.6	0.1	0.35
40	-	-	-	-	-	-	0.0	0.1	-245.65	-34.8	0.1	0.42
50	-	-	-	-	-	-	0.0	0.1	-130.72	-30.4	0.1	0.42
63	68.0	0.12	-603.25	-26.1	0.12	-0.83	0.0	0.1	-185.47	-26.2	0.1	-0.21
80	-	-	-	-	-	-	0.0	0.1	-159.52	-22.6	0.1	0.28
100	-	-	-	-	-	-	0.0	0.1	-83.81	-19.2	0.1	0.57
125	77.9	0.12	-601.90	-16.21	0.12	0.58	0.0	0.1	-113.99	-16.1	0.1	-0.14
160	-	-	-	-	-	-	0.0	0.1	-94.82	-13.4	0.1	-0.07
200	-	-	-	-	-	-	0.0	0.1	-46.82	-10.8	0.1	-0.78
250	85.7	0.12	-603.69	-8.8	0.12	1.28	0.0	0.1	-60.81	-8.6	0.1	0.00
315	-	-	-	-	-	-	0.0	0.1	-46.67	-6.6	0.1	0.00
400	-	-	-	-	-	-	0.0	0.1	-20.62	-4.8	0.1	0.00
500	90.7	0.12	-601.71	-3.36	0.12	0.45	0.0	0.1	-23.26	-3.2	0.1	-0.64
630	-	-	-	-	-	-	0.0	0.1	-13.36	-1.9	0.1	0.07
800	-	-	-	-	-	-	0.0	0.1	-2.77	-0.8	0.1	-0.42
1000	94.1	0.12	-602.41	-0.06	0.12	0.38	0.0	0.1	0.00	0	0.1	0.00
1250	-	-	-	-	-	-	0.0	0.1	4.10	0.6	0.1	-0.14
1600	-	-	-	-	-	-	0.0	0.1	3.49	1	0.1	-0.21
2000	95.3	0.12	-602.73	1.08	0.12	0.45	0.0	0.1	8.13	1.1	0.1	0.35
2500	-	-	-	-	-	-	0.0	0.1	8.63	1.2	0.1	0.14
3150	-	-	-	-	-	-	0.0	0.1	6.71	1.1	0.1	0.35
4000	94.9	0.21	-403.88	0.65	0.21	1.33	0.0	0.1	6.79	1	0.1	-0.28
5000	-	-	-	-	-	-	0.0	0.1	4.10	0.6	0.1	-0.14
6300	-	-	-	-	-	-	0.0	0.1	-0.54	-0.1	0.1	0.00
8000	92.6	0.26	-336.33	-2.25	0.26	4.16	0.0	0.1	-7.71	-1	0.1	-0.64
10000	-	-	-	-7.16	0.26	17.12	-0.1	0.1	-16.19	-2.4	0.1	0.07
12500	88.8	0.26	-333.85	-10.39	0.31	19.00	-0.3	0.1	-19.77	-4.2	0.1	0.00
16000	84.6	0.31	-279.59	-	-	-	-0.5	0.1	-42.21	-6.5	0.1	0.21
20000	-	-	-	-	-	-	-0.8	0.1	-59.04	-9.3	0.1	1.06

APPENDIX B

Frequency Weighting (A)

Frequency (Hz)	Lab 13			Lab 14			Lab 15			Lab 16		
	Result (dB)	U ₉₅ (dB)	En	Result (dB)	U ₉₅ (dB)	En	Result (dB)	U ₉₅ (dB)	En	Result (dB)	U ₉₅ (dB)	En
10	-	-	-	-	-	-	-	-	-	-94.0	0.3	72.54
12.5	-	-	-	-	-	-	-	-	-	-63.7	0.3	-0.35
16	-	-	-	-	-	-	-	-	-	-57.0	0.3	0.32
20	-	-	-	-50.4	0.2	-1.21	43.4	0.2	-420.69	-50.7	0.3	-0.03
25	-	-	-	-44.9	0.2	0.18	-	-	-	-44.9	0.3	0.13
31.5	-	-	-	-39.7	0.2	0.67	54.4	0.2	-420.16	-39.5	0.3	-0.03
40	-	-	-	-34.7	0.2	-0.18	-	-	-	-34.8	0.3	0.28
50	-	-	-	-30.4	0.2	0.27	-	-	-	-30.2	0.3	-0.35
63	-	-	-	-26.4	0.2	0.76	67.7	0.2	-420.07	-26.1	0.3	-0.44
80	-	-	-	-22.5	0.2	-0.27	-	-	-	-22.4	0.3	-0.51
100	-	-	-	-19.3	0.2	0.80	-	-	-	-19.0	0.3	-0.25
125	-	-	-	-16.3	0.2	0.80	77.8	0.2	-420.02	-16.1	0.3	-0.06
160	-	-	-	-13.4	0.2	-0.04	-	-	-	-13.4	0.3	-0.19
200	-	-	-	-10.9	0.2	-0.04	-	-	-	-10.9	0.3	-0.13
250	-	-	-	-8.7	0.2	0.45	85.3	0.2	-419.93	-8.7	0.3	0.41
315	-	-	-	-6.7	0.2	0.45	-	-	-	-6.6	0.3	0.03
400	-	-	-	-4.8	0.2	0.00	-	-	-	-4.8	0.3	0.03
500	-	-	-	-3.3	0.2	0.04	90.7	0.2	-420.34	-3.2	0.3	-0.19
630	-	-	-	-1.9	0.2	0.04	-	-	-	-1.9	0.3	0.03
800	-	-	-	-0.8	0.2	-0.27	-	-	-	-0.8	0.3	-0.13
1000	-	-	-	0.0	0.2	0.00	94.0	0.2	-420.38	0.0	0.3	0.00
1250	-	-	-	0.6	0.2	-0.09	-	-	-	0.5	0.3	0.28
1600	-	-	-	1.0	0.2	-0.13	-	-	-	1.0	0.3	-0.03
2000	-	-	-	1.2	0.2	-0.22	95.2	0.2	-420.60	1.2	0.3	-0.16
2500	-	-	-	1.3	0.2	-0.36	-	-	-	1.2	0.3	0.16
3150	-	-	-	1.2	0.2	-0.22	-	-	-	1.2	0.3	-0.16
4000	-	-	-	1.0	0.2	-0.18	95.0	0.2	-420.56	0.9	0.3	0.28
5000	-	-	-	0.6	0.2	-0.09	-	-	-	0.6	0.3	0.09
6300	-	-	-	-0.1	0.2	0.00	-	-	-	-0.1	0.3	0.06
8000	-	-	-	-1.1	0.2	0.04	92.9	0.2	-420.34	-1.0	0.3	-0.25
10000	-	-	-	-2.4	0.2	0.04	-	-	-	-2.4	0.3	0.00
12500	-	-	-	-4.2	0.2	0.00	89.7	0.2	-419.93	-4.2	0.3	0.06
16000	-	-	-	-6.6	0.2	0.58	87.4	0.2	-419.80	-6.5	0.3	0.09
20000	-	-	-	-9.3	0.2	0.67	84.7	0.2	-419.71	-9.3	0.3	0.51

APPENDIX B

Frequency Weighting (C)

Frequency (Hz)	Lab 1			Lab 2			Lab 3			Lab 4		
	Result (dB)	U ₉₅ (dB)	En	Result (dB)	U ₉₅ (dB)	En	Result (dB)	U ₉₅ (dB)	En	Result (dB)	U ₉₅ (dB)	En
10	-	-	-	-	-	-	-14.9	0.5	0.10	-	-	-
12.5	-	-	-	-	-	-	-11.4	0.5	-0.08	-	-	-
16	-	-	-	-	-	-	-8.5	0.5	-0.08	-	-	-
20	-	-	-	-	-	-	-6.2	0.5	-0.06	-5.6	0.2	-2.64
25	-	-	-	-	-	-	-4.3	0.5	-0.06	-3.5	0.2	-3.67
31.5	-4.2	0.3	4.02	-2.6	0.3	-1.04	-3.0	0.5	0.14	-1.6	0.2	-5.90
40	-	-	-	-	-	-	-2.0	0.5	0.14	-0.4	0.2	-6.84
50	-	-	-	-	-	-	-1.3	0.5	-0.06	-0.1	0.2	-5.55
63	-0.8	0.3	-0.09	-0.6	0.3	-0.73	-0.8	0.5	-0.06	0.0	0.2	-3.62
80	-	-	-	-	-	-	-0.5	0.5	-0.06	0.1	0.2	-2.82
100	-	-	-	-	-	-	-0.3	0.5	0.06	0.3	0.2	-2.55
125	0.0	0.3	-0.73	-0.1	0.3	-0.41	-0.2	0.5	-0.06	0.4	0.2	-2.95
160	-	-	-	-	-	-	-0.1	0.5	-0.06	0.3	0.2	-1.97
200	-	-	-	-	-	-	0.0	0.5	-0.06	0.3	0.2	-1.34
250	-0.1	0.3	0.22	-0.1	0.3	0.22	0.0	0.5	-0.06	0.2	0.2	-1.03
315	-	-	-	-	-	-	0.0	0.5	-0.06	0.2	0.2	-1.12
400	-	-	-	-	-	-	0.0	0.5	-0.06	0.3	0.2	-1.61
500	-0.1	0.3	0.22	-0.1	0.3	0.22	0.0	0.5	-0.06	0.3	0.2	-1.61
630	-	-	-	-	-	-	0.0	0.5	-0.06	0.3	0.2	-1.61
800	-	-	-	-	-	-	0.0	0.5	-0.06	0.2	0.2	-1.12
1000	0.0	0.3	0.00	0.0	0.3	0.00	0.0	0.5	0.00	0.0	0.2	0.00
1250	-	-	-	-	-	-	0.0	0.5	-0.06	0.1	0.2	-0.45
1600	-	-	-	-	-	-	-0.1	0.5	-0.06	-0.3	0.2	0.72
2000	-0.2	0.3	0.22	-0.4	0.3	0.85	-0.2	0.5	0.14	-0.1	0.2	-0.27
2500	-	-	-	-	-	-	-0.3	0.5	0.14	-0.3	0.2	0.31
3150	-	-	-	-	-	-	-0.5	0.5	-0.06	-0.3	0.2	-1.03
4000	-1.1	0.3	0.85	-1.0	0.3	0.54	-0.8	0.5	-0.06	-0.9	0.2	0.40
5000	-	-	-	-	-	-	-1.3	0.5	-0.04	-1.3	0.2	-0.13
6300	-	-	-	-	-	-	-2.0	0.5	0.14	-2.0	0.2	0.31
8000	-4.5	0.3	4.96	-2.9	0.3	-0.10	-3.1	0.5	0.33	-3.2	0.2	1.24
10000	-	-	-	-	-	-	-4.5	0.5	0.33	-4.7	0.2	1.70
12500	-	-	-	-6.4	0.3	0.04	-6.5	0.5	0.73	-6.6	0.2	2.28
16000	-	-	-	-	-	-	-9.0	0.5	1.29	-	-	-
20000	-	-	-	-	-	-	-12.1	0.5	1.88	-	-	-

APPENDIX B

Frequency Weighting (C)

Frequency (Hz)	Lab 5			Lab 6			Lab 7			Lab 8		
	Result (dB)	U ₉₅ (dB)	En	Result (dB)	U ₉₅ (dB)	En	Result (dB)	U ₉₅ (dB)	En	Result (dB)	U ₉₅ (dB)	En
10	-	-	-	-	-	-	79.2	0.2	-420.60	-	-	-
12.5	-	-	-	-	-	-	82.5	0.2	-420.11	-	-	-
16	-	-	-	-	-	-	85.6	0.2	-421.01	-	-	-
20	-5.50	0.2	-3.26	-	-	-	87.8	0.2	-420.51	88.3	-	-
25	-3.61	0.2	-3.22	-	-	-	89.6	0.2	-420.07	90.2	-	-
31.5	-2.39	0.2	-2.41	-	-	-	91.0	0.2	-420.07	91.5	-	-
40	-1.42	0.2	-2.28	-	-	-	92.0	0.2	-420.07	92.6	-	-
50	-0.73	0.2	-2.68	-	-	-	92.7	0.2	-420.51	93.2	-	-
63	-0.42	0.2	-1.83	-	-	-	93.2	0.2	-420.51	93.6	-	-
80	-0.08	0.2	-2.01	-	-	-	93.5	0.2	-420.51	93.9	-	-
100	-0.01	0.2	-1.16	-	-	-	93.7	0.2	-420.25	94.1	-	-
125	0.13	0.2	-1.61	-	-	-	93.8	0.2	-420.51	94.1	-	-
160	0.02	0.2	-0.67	-	-	-	93.9	0.2	-420.51	94.2	-	-
200	0.13	0.2	-0.72	-	-	-	94.0	0.2	-420.51	94.2	-	-
250	0.17	0.2	-0.89	-	-	-	94.0	0.2	-420.51	94.1	-	-
315	-0.07	0.2	0.18	-	-	-	94.0	0.2	-420.51	94.2	-	-
400	-0.02	0.2	-0.04	-	-	-	94.0	0.2	-420.51	94.1	-	-
500	0.19	0.2	-0.98	-	-	-	94.0	0.2	-420.51	94.1	-	-
630	0.09	0.2	-0.54	-	-	-	94.0	0.2	-420.51	94.1	-	-
800	-0.16	0.2	0.58	-	-	-	94.0	0.2	-420.51	94.1	-	-
1000	-0.21	0.2	0.94	-	-	-	94.0	0.2	-420.38	94.0	-	-
1250	-0.24	0.2	0.94	-	-	-	94.0	0.2	-420.51	93.9	-	-
1600	-0.52	0.2	1.74	-	-	-	93.9	0.2	-420.51	93.8	-	-
2000	-0.44	0.2	1.39	-	-	-	93.8	0.2	-420.07	92.6	-	-
2500	-0.53	0.2	1.34	-	-	-	93.7	0.2	-420.07	93.3	-	-
3150	-0.66	0.2	0.58	-	-	-	93.5	0.2	-420.51	92.8	-	-
4000	-0.92	0.2	0.40	-	-	-	93.2	0.2	-420.51	92.0	-	-
5000	-1.64	0.2	1.43	-	-	-	92.7	0.2	-420.47	91.2	-	-
6300	-2.44	0.2	2.28	-	-	-	92.0	0.2	-420.07	89.5	-	-
8000	-3.82	0.2	3.97	-	-	-	90.9	0.2	-419.63	86.9	-	-
10000	-4.95	0.2	2.77	-	-	-	89.6	0.2	-420.07	83.3	-	-
12500	-7.61	0.2	6.62	-	-	-	87.8	0.2	-420.07	79.1	-	-
16000	-	-	-	-	-	-	85.1	0.2	-417.88	74.0	-	-
20000	-	-	-	-	-	-	82.2	0.2	-417.43	66.8	-	-

APPENDIX B

Frequency Weighting (C)

Frequency (Hz)	Lab 9			Lab 10			Lab 11			Lab 12		
	Result (dB)	U ₉₅ (dB)	En	Result (dB)	U ₉₅ (dB)	En	Result (dB)	U ₉₅ (dB)	En	Result (dB)	U ₉₅ (dB)	En
10	-	-	-	-	-	-	-	-	-	-14.8	0.1	-0.35
12.5	-	-	-	-	-	-	-	-	-	-11.4	0.1	-0.28
16	-	-	-	-	-	-	-	-	-	-8.5	0.1	-0.28
20	-	-	-	-	-	-	-	-	-	-6.2	0.1	-0.21
25	-	-	-	-	-	-	-	-	-	-4.4	0.1	0.49
31.5	91.7	0.12	-605.81	-2.57	0.12	-2.30	0.1	0.1	-21.43	-3	0.1	0.49
40	-	-	-	-	-	-	0.0	0.1	-13.65	-2	0.1	0.49
50	-	-	-	-	-	-	0.0	0.1	-0.40	-1.3	0.1	-0.21
63	93.6	0.12	-604.53	-0.55	0.12	-1.79	0.0	0.1	-5.87	-0.9	0.1	0.49
80	-	-	-	-	-	-	0.0	0.1	-3.75	-0.5	0.1	-0.21
100	-	-	-	-	-	-	0.0	0.1	1.34	-0.3	0.1	0.21
125	94.0	0.12	-603.25	-0.08	0.12	-0.96	0.0	0.1	-1.63	-0.2	0.1	-0.21
160	-	-	-	-	-	-	0.0	0.1	-0.92	-0.1	0.1	-0.21
200	-	-	-	-	-	-	0.0	0.1	1.21	-0.1	0.1	0.49
250	94.3	0.12	-603.89	-0.03	0.12	0.00	0.0	0.1	-0.21	0	0.1	-0.21
315	-	-	-	-	-	-	0.0	0.1	-0.21	0	0.1	-0.21
400	-	-	-	-	-	-	0.0	0.1	1.48	0	0.1	-0.21
500	94.0	0.12	-601.97	-0.03	0.12	0.00	0.0	0.1	-0.21	0	0.1	-0.21
630	-	-	-	-	-	-	0.0	0.1	-0.21	0	0.1	-0.21
800	-	-	-	-	-	-	0.0	0.1	0.98	0	0.1	-0.21
1000	94.1	0.12	-602.41	-0.07	0.12	0.45	0.0	0.1	0.00	0	0.1	0.00
1250	-	-	-	-	-	-	0.0	0.1	-0.21	-0.1	0.1	0.49
1600	-	-	-	-	-	-	0.0	0.1	-1.30	-0.1	0.1	-0.21
2000	94.0	0.12	-602.61	-0.28	0.12	0.96	0.0	0.1	-0.92	-0.2	0.1	0.49
2500	-	-	-	-	-	-	0.0	0.1	-1.63	-0.3	0.1	0.49
3150	-	-	-	-	-	-	0.0	0.1	-1.34	-0.5	0.1	-0.21
4000	93.2	0.21	-404.27	-0.17	0.21	-2.84	0.0	0.1	-5.87	-0.8	0.1	-0.21
5000	-	-	-	-	-	-	0.0	0.1	-9.33	-1.3	0.1	-0.14
6300	-	-	-	-	-	-	0.0	0.1	-8.94	-2	0.1	0.49
8000	91.0	0.26	-337.20	-4.25	0.26	4.73	-0.1	0.1	-20.03	-3	0.1	0.47
10000	-	-	-	-9.17	0.26	17.37	-0.1	0.1	-29.91	-4.4	0.1	0.49
12500	87.0	0.26	-334.32	-12.36	0.31	19.13	-0.3	0.1	-28.35	-6.2	0.1	0.49
16000	93.8	0.31	-313.57	-	-	-	-0.5	0.1	-55.44	-8.5	0.1	1.13
20000	-	-	-	-	-	-	-0.8	0.1	-73.11	-11.3	0.1	1.13

APPENDIX B

Frequency Weighting (C)

Frequency (Hz)	Lab 13			Lab 14			Lab 15			Lab 16		
	Result (dB)	U ₉₅ (dB)	En	Result (dB)	U ₉₅ (dB)	En	Result (dB)	U ₉₅ (dB)	En	Result (dB)	U ₉₅ (dB)	En
10	-	-	-	-	-	-	-	-	-	-15.2	0.3	1.20
12.5	-	-	-	-	-	-	-	-	-	-11.7	0.3	0.66
16	-	-	-	-	-	-	-	-	-	-8.7	0.3	0.47
20	-	-	-	-6.2	0.2	-0.13	87.7	0.2	-420.07	-6.3	0.3	0.35
25	-	-	-	-4.4	0.2	0.31	-	-	-	-4.4	0.3	0.25
31.5	-	-	-	-3.0	0.2	0.31	93.2	0.2	-429.91	-3.0	0.3	0.25
40	-	-	-	-2.0	0.2	0.31	-	-	-	-2.0	0.3	0.22
50	-	-	-	-1.3	0.2	-0.13	-	-	-	-1.1	0.3	-0.76
63	-	-	-	-0.8	0.2	-0.13	93.8	0.2	-423.20	-0.7	0.3	-0.35
80	-	-	-	-0.5	0.2	-0.13	-	-	-	-0.3	0.3	-0.73
100	-	-	-	-0.3	0.2	0.13	-	-	-	-0.2	0.3	-0.22
125	-	-	-	-0.2	0.2	-0.13	94.0	0.2	-421.41	-0.2	0.3	-0.19
160	-	-	-	-0.1	0.2	-0.13	-	-	-	-0.1	0.3	-0.13
200	-	-	-	-0.1	0.2	0.31	-	-	-	-0.1	0.3	0.32
250	-	-	-	0.0	0.2	-0.13	94.0	0.2	-420.51	-0.1	0.3	0.22
315	-	-	-	0.0	0.2	-0.13	-	-	-	0.0	0.3	-0.16
400	-	-	-	0.0	0.2	-0.13	-	-	-	0.0	0.3	-0.19
500	-	-	-	0.0	0.2	-0.13	94.0	0.2	-420.51	0.0	0.3	-0.19
630	-	-	-	0.0	0.2	-0.13	-	-	-	0.0	0.3	-0.19
800	-	-	-	0.0	0.2	-0.13	-	-	-	0.0	0.3	-0.16
1000	-	-	-	0.0	0.2	0.00	93.8	0.2	-419.49	0.0	0.3	0.00
1250	-	-	-	0.0	0.2	-0.13	-	-	-	-0.1	0.3	0.32
1600	-	-	-	-0.1	0.2	-0.13	-	-	-	-0.1	0.3	-0.13
2000	-	-	-	-0.2	0.2	0.31	93.2	0.2	-417.38	-0.2	0.3	0.13
2500	-	-	-	-0.3	0.2	0.31	-	-	-	-0.3	0.3	0.22
3150	-	-	-	-0.5	0.2	-0.13	-	-	-	-0.5	0.3	-0.09
4000	-	-	-	-0.8	0.2	-0.13	91.0	0.2	-410.68	-0.8	0.3	-0.03
5000	-	-	-	-1.3	0.2	-0.09	-	-	-	-1.2	0.3	-0.41
6300	-	-	-	-2.0	0.2	0.31	-	-	-	-1.9	0.3	-0.09
8000	-	-	-	-3.0	0.2	0.30	87.8	0.2	-405.77	-2.9	0.3	-0.07
10000	-	-	-	-4.3	0.2	-0.13	-	-	-	-4.3	0.3	-0.06
12500	-	-	-	-6.1	0.2	-0.13	87.8	0.2	-420.07	-6.2	0.3	0.35
16000	-	-	-	-8.6	0.2	1.16	85.5	0.2	-419.67	-8.5	0.3	0.60
20000	-	-	-	-11.2	0.2	0.27	82.8	0.2	-420.11	-11.3	0.3	0.35

APPENDIX B

Frequency Weighting (Linear)

Frequency (Hz)	Lab 1			Lab 2			Lab 3			Lab 4		
	Result (dB)	U ₉₅ (dB)	En	Result (dB)	U ₉₅ (dB)	En	Result (dB)	U ₉₅ (dB)	En	Result (dB)	U ₉₅ (dB)	En
10	-	-	-	-	-	-	0.8	0.5	-29.67	-	-	-
12.5	-	-	-	-	-	-	0.4	0.5	-22.85	-	-	-
16	-	-	-	-	-	-	0.2	0.5	-17.12	-	-	-
20	-	-	-	-	-	-	0.1	0.5	-12.43	0.8	0.2	-31.30
25	-	-	-	-	-	-	0.0	0.5	-8.65	1.1	0.2	-24.60
31.5	-0.2	0.3	-8.89	0.5	0.3	-11.10	0.0	0.5	-5.90	1.6	0.2	-20.57
40	-	-	-	-	-	-	0.0	0.5	-3.92	1.6	0.2	-16.05
50	-	-	-	-	-	-	0.1	0.5	-2.73	1.3	0.2	-11.54
63	-0.1	0.3	-2.28	0.2	0.3	-3.23	0.1	0.5	-1.80	1.0	0.2	-8.09
80	-	-	-	-	-	-	0.0	0.5	-0.98	0.8	0.2	-5.77
100	-	-	-	-	-	-	0.0	0.5	-0.59	0.7	0.2	-4.43
125	0.1	0.3	-0.85	0.1	0.3	-0.85	0.0	0.5	-0.33	0.6	0.2	-3.58
160	-	-	-	-	-	-	0.0	0.5	-0.18	0.4	0.2	-2.33
200	-	-	-	-	-	-	0.0	0.5	-0.06	0.4	0.2	-1.88
250	-0.1	0.3	0.32	-0.1	0.3	0.32	0.0	0.5	0.00	0.3	0.2	-1.30
315	-	-	-	-	-	-	0.0	0.5	0.04	0.3	0.2	-1.21
400	-	-	-	-	-	-	0.0	0.5	0.06	0.3	0.2	-1.16
500	0.0	0.3	0.09	-0.2	0.3	0.73	0.0	0.5	0.06	0.4	0.2	-1.48
630	-	-	-	-	-	-	0.0	0.5	0.06	0.3	0.2	-1.34
800	-	-	-	-	-	-	0.0	0.5	0.04	0.2	0.2	-0.76
1000	0.0	0.3	0.00	0.0	0.3	0.00	0.0	0.5	0.00	0.0	0.2	0.00
1250	-	-	-	-	-	-	0.0	0.5	-0.06	0.1	0.2	-0.72
1600	-	-	-	-	-	-	0.0	0.5	-0.18	-0.1	0.2	0.22
2000	-0.2	0.3	0.09	-0.2	0.3	0.09	0.0	0.5	-0.33	0.0	0.2	-0.89
2500	-	-	-	-	-	-	0.0	0.5	-0.59	0.1	0.2	-1.74
3150	-	-	-	-	-	-	0.0	0.5	-0.98	0.3	0.2	-3.53
4000	-0.1	0.3	-2.28	-0.1	0.3	-2.28	0.0	0.5	-1.61	0.1	0.2	-4.07
5000	-	-	-	-	-	-	0.0	0.5	-2.53	0.1	0.2	-6.17
6300	-	-	-	-	-	-	0.0	0.5	-3.92	0.3	0.2	-10.06
8000	-1.7	0.3	-4.14	0.3	0.3	-10.47	0.1	0.5	-6.10	0.3	0.2	-14.76
10000	-	-	-	-	-	-	0.1	0.5	-8.84	0.2	0.2	-20.53
12500	-	-	-	0.2	0.3	-17.21	0.1	0.5	-12.43	0.1	0.2	-28.26
16000	-	-	-	-	-	-	0.7	0.5	-18.10	-	-	-
20000	-	-	-	-	-	-	3.0	0.5	-27.95	-	-	-

APPENDIX B

Frequency Weighting (Linear)

Frequency (Hz)	Lab 5			Lab 6			Lab 7			Lab 8		
	Result (dB)	U ₉₅ (dB)	En	Result (dB)	U ₉₅ (dB)	En	Result (dB)	U ₉₅ (dB)	En	Result (dB)	U ₉₅ (dB)	En
10	-	-	-	-	-	-	93.4	0.2	-417.25	-	-	-
12.5	-	-	-	-	-	-	93.7	0.2	-469.35	-	-	-
16	-	-	-	-	-	-	93.9	0.2	-458.08	-	-	-
20	0.70	0.2	-31.04	-	-	-	93.9	0.2	-447.84	94.5	-	-
25	0.77	0.2	-23.17	-	-	-	94.0	0.2	-440.10	94.6	-	-
31.5	0.64	0.2	-16.32	-	-	-	94.0	0.2	-433.84	94.5	-	-
40	0.60	0.2	-11.63	-	-	-	94.0	0.2	-429.33	94.6	-	-
50	0.52	0.2	-8.09	-	-	-	94.0	0.2	-426.15	94.6	-	-
63	0.46	0.2	-5.72	-	-	-	94.0	0.2	-424.05	94.5	-	-
80	0.41	0.2	-4.07	-	-	-	94.0	0.2	-422.62	94.4	-	-
100	0.33	0.2	-2.82	-	-	-	94.0	0.2	-421.72	94.3	-	-
125	0.33	0.2	-2.24	-	-	-	94.0	0.2	-421.14	94.3	-	-
160	0.14	0.2	-1.03	-	-	-	94.0	0.2	-420.78	94.3	-	-
200	0.20	0.2	-1.03	-	-	-	94.0	0.2	-420.51	94.2	-	-
250	0.14	0.2	-0.63	-	-	-	94.0	0.2	-420.38	94.2	-	-
315	-0.06	0.2	0.36	-	-	-	94.0	0.2	-420.29	94.1	-	-
400	0.03	0.2	0.00	-	-	-	94.0	0.2	-420.25	94.1	-	-
500	0.17	0.2	-0.63	-	-	-	94.0	0.2	-420.25	94.1	-	-
630	0.06	0.2	-0.13	-	-	-	94.0	0.2	-420.25	94.0	-	-
800	-0.15	0.2	0.76	-	-	-	94.0	0.2	-420.29	94.0	-	-
1000	-0.20	0.2	0.89	-	-	-	94.0	0.2	-420.38	94.0	-	-
1250	-0.18	0.2	0.67	-	-	-	94.0	0.2	-420.51	94.0	-	-
1600	-0.43	0.2	1.52	-	-	-	94.0	0.2	-420.78	93.9	-	-
2000	-0.25	0.2	0.36	-	-	-	94.0	0.2	-421.14	93.8	-	-
2500	-0.25	0.2	-0.22	-	-	-	94.0	0.2	-421.72	93.6	-	-
3150	-0.12	0.2	-1.70	-	-	-	94.0	0.2	-422.62	93.3	-	-
4000	-0.02	0.2	-3.58	-	-	-	94.0	0.2	-424.05	93.0	-	-
5000	-0.30	0.2	-4.43	-	-	-	94.0	0.2	-426.15	92.4	-	-
6300	-0.34	0.2	-7.42	-	-	-	94.0	0.2	-429.33	91.5	-	-
8000	-0.61	0.2	-10.73	-	-	-	94.0	0.2	-433.84	90.2	-	-
10000	-0.42	0.2	-17.84	-	-	-	94.0	0.2	-440.10	88.1	-	-
12500	-1.23	0.2	-22.41	-	-	-	93.9	0.2	-447.84	85.6	-	-
16000	-	-	-	-	-	-	93.3	0.2	-455.40	82.4	-	-
20000	-	-	-	-	-	-	91.3	0.2	-458.62	76.0	-	-

APPENDIX B

Frequency Weighting (Linear)

Frequency (Hz)	Lab 9			Lab 10			Lab 11			Lab 12		
	Result (dB)	U ₉₅ (dB)	En	Result (dB)	U ₉₅ (dB)	En	Result (dB)	U ₉₅ (dB)	En	Result (dB)	U ₉₅ (dB)	En
10	-	-	-	-	-	-	-	-	-	-0.6	0.1	-97.09
12.5	-	-	-	-	-	-	-	-	-	-0.3	0.1	-77.43
16	-	-	-	-	-	-	-	-	-	-0.1	0.1	-59.61
20	-	-	-	-	-	-	-	-	-	-0.1	0.1	-43.42
25	-	-	-	-	-	-	-	-	-	0	0.1	-31.18
31.5	94.6	0.12	-624.88	0.43	0.12	-28.67	0.0	0.1	-21.28	0	0.1	-21.28
40	-	-	-	-	-	-	0.0	0.1	-14.14	0	0.1	-14.14
50	-	-	-	-	-	-	0.0	0.1	5.77	0	0.1	-9.12
63	94.4	0.12	-609.58	0.25	0.12	-8.92	0.0	0.1	-5.80	0	0.1	-5.80
80	-	-	-	-	-	-	0.0	0.1	-3.54	0	0.1	-3.54
100	-	-	-	-	-	-	0.0	0.1	3.09	0	0.1	-2.12
125	94.3	0.12	-604.78	0.12	0.12	-1.86	0.0	0.1	-1.20	0	0.1	-1.20
160	-	-	-	-	-	-	0.0	0.1	-0.64	0	0.1	-0.64
200	-	-	-	-	-	-	0.0	0.1	1.74	0	0.1	-0.21
250	94.1	0.12	-602.41	-0.03	0.12	0.19	0.0	0.1	0.00	0	0.1	0.00
315	-	-	-	-	-	-	0.0	0.1	0.14	0	0.1	0.14
400	-	-	-	-	-	-	0.0	0.1	1.30	0	0.1	0.21
500	94.0	0.12	-601.58	-0.03	0.12	0.38	0.0	0.1	0.21	0	0.1	0.21
630	-	-	-	-	-	-	0.0	0.1	0.21	0	0.1	0.21
800	-	-	-	-	-	-	0.0	0.1	0.85	0	0.1	0.14
1000	94.1	0.12	-602.41	-0.07	0.12	0.45	0.0	0.1	0.00	0	0.1	0.00
1250	-	-	-	-	-	-	0.0	0.1	-0.21	0	0.1	-0.21
1600	-	-	-	-	-	-	0.0	0.1	-0.63	0	0.1	-0.64
2000	94.2	0.12	-604.14	0.02	0.12	-1.22	0.0	0.1	-1.20	0	0.1	-1.20
2500	-	-	-	-	-	-	0.0	0.1	-2.12	0	0.1	-2.12
3150	-	-	-	-	-	-	0.0	0.1	1.30	0	0.1	-3.54
4000	93.9	0.21	-407.23	-0.27	0.21	-2.36	0.0	0.1	-5.80	0	0.1	-5.80
5000	-	-	-	-	-	-	0.0	0.1	-9.12	0	0.1	-9.12
6300	-	-	-	-	-	-	0.0	0.1	1.12	0.1	0.1	-14.85
8000	92.9	0.26	-344.30	-1.15	0.26	-6.68	0.0	0.1	-21.28	0.1	0.1	-21.99
10000				-2.67	0.26	-6.25	0.0	0.1	-31.18	0.2	0.1	-32.60
12500	92.0	0.26	-352.66	-3.96	0.31	-7.00	-0.1	0.1	0.80	0.2	0.1	-45.54
16000	91.1	0.31	-305.87	-	-	-	-0.7	0.1	-55.37	-0.2	0.1	-58.90
20000	-	-	-	-	-	-	-3.0	0.1	-58.34	-2.2	0.1	-63.99

APPENDIX B

Frequency Weighting (Linear)

Frequency (Hz)	Lab 13			Lab 14			Lab 15			Lab 16		
	Result (dB)	U ₉₅ (dB)	En	Result (dB)	U ₉₅ (dB)	En	Result (dB)	U ₉₅ (dB)	En	Result (dB)	U ₉₅ (dB)	En
10	-	-	-	-	-	-	-	-	-	-0.99	0.3	-42.18
12.5	-	-	-	-	-	-	-	-	-	-0.40	0.3	-34.31
16	-	-	-	-	-	-	-	-	-	-0.20	0.3	-26.34
20	-0.09	0.28	-20.68	-0.1	0.2	-27.46	94.0	0.2	-448.29	-0.10	0.3	-19.42
25	-0.15	0.28	-14.33	0.0	0.2	-19.72	-	-	-	-0.03	0.3	-13.85
31.5	-0.14	0.28	-9.65	0.0	0.2	-13.46	94.0	0.2	-433.84	0.00	0.3	-9.52
40	-0.02	0.28	-6.66	0.0	0.2	-8.94	-	-	-	0.00	0.3	-6.32
50	-0.06	0.28	-4.14	0.0	0.2	-5.77	-	-	-	0.20	0.3	-4.71
63	-0.10	0.28	-2.42	0.0	0.2	-3.67	94.0	0.2	-424.05	0.20	0.3	-3.23
80	-0.10	0.28	-1.35	0.0	0.2	-2.24	-	-	-	0.20	0.3	-2.21
100	0.10	0.28	-1.35	0.0	0.2	-1.34	-	-	-	0.20	0.3	-1.58
125	0.18	0.28	-1.18	0.0	0.2	-0.76	94.0	0.2	-421.14	0.00	0.3	-0.54
160	0.06	0.28	-0.50	0.0	0.2	-0.40	-	-	-	0.00	0.3	-0.28
200	-0.02	0.28	-0.03	0.0	0.2	-0.13	-	-	-	0.00	0.3	-0.09
250	-0.01	0.28	0.03	0.0	0.2	0.00	94.0	0.2	-420.38	-0.10	0.3	0.32
315	0.00	0.28	0.07	0.0	0.2	0.09	-	-	-	0.00	0.3	0.06
400	0.12	0.28	-0.30	0.0	0.2	0.13	-	-	-	0.00	0.3	0.09
500	0.12	0.28	-0.30	0.0	0.2	0.13	94.0	0.2	-420.25	0.00	0.3	0.09
630	0.08	0.28	-0.17	0.0	0.2	0.13	-	-	-	0.00	0.3	0.09
800	0.08	0.28	-0.20	0.0	0.2	0.09	-	-	-	0.00	0.3	0.06
1000	0.00	0.28	0.00	0.0	0.2	0.00	94.0	0.2	-420.38	0.00	0.3	0.00
1250	0.05	0.28	-0.27	0.0	0.2	-0.13	-	-	-	0.00	0.3	-0.09
1600	-0.05	0.28	-0.13	0.0	0.2	-0.40	-	-	-	0.00	0.3	-0.28
2000	-0.08	0.28	-0.30	0.0	0.2	-0.76	94.0	0.2	-421.14	0.00	0.3	-0.54
2500	-0.11	0.28	-0.64	0.0	0.2	-1.34	-	-	-	0.00	0.3	-0.95
3150	-0.06	0.28	-1.48	0.0	0.2	-2.24	-	-	-	0.00	0.3	-1.58
4000	0.09	0.28	-3.06	0.1	0.2	-4.11	94.0	0.2	-424.05	0.00	0.3	-2.59
5000	0.08	0.28	-4.61	0.1	0.2	-6.22	-	-	-	0.10	0.3	-4.40
6300	0.05	0.28	-6.89	0.1	0.2	-9.39	-	-	-	0.10	0.3	-6.64
8000	0.09	0.28	-10.43	0.2	0.2	-14.36	94.2	0.2	-434.74	0.20	0.3	-10.15
10000	-0.19	0.28	-14.19	0.3	0.2	-21.06	-	-	-	0.20	0.3	-14.58
12500	-0.31	0.28	-19.94	0.3	0.2	-29.25	94.2	0.2	-449.18	0.20	0.3	-20.37
16000	-	-	-	-0.2	0.2	-37.25	93.8	0.2	-457.63	-0.20	0.3	-26.34
20000	-	-	-	-2.1	0.2	-40.92	91.9	0.2	-461.30	-2.10	0.3	-28.93

APPENDIX C

SUMMARY OF DIFFERENTIAL & LEVEL LINEARITY

APPENDIX C

Differential & Level Linearity (31.5 Hz)

Input (dB)	Lab 1			Lab 2			Lab 3			Lab 4		
	Result (dB)	U ₉₅ (dB)	En	Result (dB)	U ₉₅ (dB)	En	Result (dB)	U ₉₅ (dB)	En	Result (dB)	U ₉₅ (dB)	En
114	-	-	-	-	-	-	-	-	-	-	-	-
113	-	-	-	-	-	-	-	-	-	-	-	-
112	-	-	-	-	-	-	-	-	-	-	-	-
111	-	-	-	-	-	-	-	-	-	-	-	-
110	-	-	-	-	-	-	110.0	0.5	-0.20	-	-	-
109	-	-	-	-	-	-	-	-	-	-	-	-
108	-	-	-	-	-	-	-	-	-	-	-	-
107	-	-	-	-	-	-	-	-	-	-	-	-
106	-	-	-	-	-	-	-	-	-	-	-	-
105	-	-	-	-	-	-	-	-	-	-	-	-
104	-	-	-	-	-	-	105.0	0.5	-10.00	-	-	-
103	-	-	-	-	-	-	-	-	-	-	-	-
102	-	-	-	-	-	-	-	-	-	-	-	-
101	-	-	-	-	-	-	-	-	-	-	-	-
100	-	-	-	-	-	-	100.0	0.5	0.00	-	-	-
99	-	-	-	-	-	-	99.0	0.5	0.00	-	-	-
98	-	-	-	-	-	-	98.0	0.5	0.00	-	-	-
97	-	-	-	-	-	-	97.0	0.5	0.00	-	-	-
96	-	-	-	-	-	-	96.0	0.5	0.00	-	-	-
95	-	-	-	-	-	-	95.0	0.5	0.00	-	-	-
94	-	-	-	-	-	-	94.0	0.5	0.00	-	-	-
93	-	-	-	-	-	-	93.0	0.5	0.00	-	-	-
92	-	-	-	-	-	-	92.0	0.5	0.00	-	-	-
91	-	-	-	-	-	-	91.0	0.5	0.00	-	-	-
90	-	-	-	-	-	-	90.0	0.5	0.00	-	-	-
89	-	-	-	-	-	-	89.0	0.5	0.00	-	-	-
85	-	-	-	-	-	-	85.0	0.5	0.00	-	-	-
80	-	-	-	-	-	-	80.0	0.5	0.00	-	-	-
75	-	-	-	-	-	-	75.0	0.5	0.00	-	-	-
70	-	-	-	-	-	-	70.0	0.5	0.00	-	-	-
65	-	-	-	-	-	-	65.0	0.5	0.00	-	-	-
60	-	-	-	-	-	-	60.0	0.5	-0.20	-	-	-
55	-	-	-	-	-	-	55.0	0.5	-0.20	-	-	-
50	-	-	-	-	-	-	50.0	0.5	-0.20	-	-	-
45	-	-	-	-	-	-	45.1	1.5	-0.07	-	-	-
40	-	-	-	-	-	-	40.3	2.5	-0.16	-	-	-
35	-	-	-	-	-	-	36.0	3.5	-0.31	-	-	-
34	-	-	-	-	-	-	-	-	-	-	-	-
33	-	-	-	-	-	-	-	-	-	-	-	-
32	-	-	-	-	-	-	-	-	-	-	-	-
31	-	-	-	-	-	-	-	-	-	-	-	-
30	-	-	-	-	-	-	32.1	3.5	-0.49	-	-	-
29	-	-	-	-	-	-	-	-	-	-	-	-

APPENDIX C

Differential & Level Linearity (31.5 Hz)

Input (dB)	Lab 5			Lab 6			Lab 7			Lab 8		
	Result (dB)	U ₉₅ (dB)	En	Result (dB)	U ₉₅ (dB)	En	Result (dB)	U ₉₅ (dB)	En	Result (dB)	U ₉₅ (dB)	En
114	-	-	-	-	-	-	-	-	-	-	-	-
113	-	-	-	-	-	-	-	-	-	-	-	-
112	-	-	-	-	-	-	-	-	-	-	-	-
111	-	-	-	-	-	-	-	-	-	-	-	-
110	-	-	-	-	-	-	-	-	-	109.9	-	-
109	-	-	-	-	-	-	-	-	-	-	-	-
108	-	-	-	-	-	-	-	-	-	-	-	-
107	-	-	-	-	-	-	-	-	-	-	-	-
106	-	-	-	-	-	-	-	-	-	-	-	-
105	-	-	-	-	-	-	-	-	-	105.0	-	-
104	-	-	-	-	-	-	-	-	-	-	-	-
103	-	-	-	-	-	-	-	-	-	-	-	-
102	-	-	-	-	-	-	-	-	-	-	-	-
101	-	-	-	-	-	-	-	-	-	-	-	-
100	-	-	-	-	-	-	-	-	-	100.0	-	-
99	-	-	-	-	-	-	-	-	-	-	-	-
98	-	-	-	-	-	-	-	-	-	-	-	-
97	-	-	-	-	-	-	-	-	-	-	-	-
96	-	-	-	-	-	-	-	-	-	-	-	-
95	-	-	-	-	-	-	-	-	-	95.0	-	-
94	-	-	-	-	-	-	-	-	-	94.0	-	-
93	-	-	-	-	-	-	-	-	-	-	-	-
92	-	-	-	-	-	-	-	-	-	-	-	-
91	-	-	-	-	-	-	-	-	-	-	-	-
90	-	-	-	-	-	-	-	-	-	90.0	-	-
89	-	-	-	-	-	-	-	-	-	-	-	-
85	-	-	-	-	-	-	-	-	-	85.0	-	-
80	-	-	-	-	-	-	-	-	-	80.0	-	-
75	-	-	-	-	-	-	-	-	-	75.0	-	-
70	-	-	-	-	-	-	-	-	-	70.0	-	-
65	-	-	-	-	-	-	-	-	-	65.0	-	-
60	-	-	-	-	-	-	-	-	-	59.9	-	-
55	-	-	-	-	-	-	-	-	-	54.9	-	-
50	-	-	-	-	-	-	-	-	-	49.9	-	-
45	-	-	-	-	-	-	-	-	-	44.9	-	-
40	-	-	-	-	-	-	-	-	-	40.0	-	-
35	-	-	-	-	-	-	-	-	-	35.0	-	-
34	-	-	-	-	-	-	-	-	-	-	-	-
33	-	-	-	-	-	-	-	-	-	-	-	-
32	-	-	-	-	-	-	-	-	-	-	-	-
31	-	-	-	-	-	-	-	-	-	-	-	-
30	-	-	-	-	-	-	-	-	-	-	-	-
29	-	-	-	-	-	-	-	-	-	-	-	-

APPENDIX C

Differential & Level Linearity (31.5 Hz)

Input (dB)	Lab 9			Lab 10			Lab 11			Lab 12		
	Result (dB)	U ₉₅ (dB)	En	Result (dB)	U ₉₅ (dB)	En	Result (dB)	U ₉₅ (dB)	En	Result (dB)	U ₉₅ (dB)	En
114	-	-	-	-	-	-	-	-	-	-	-	-
113	-	-	-	-	-	-	-	-	-	-	-	-
112	-	-	-	-	-	-	-	-	-	-	-	-
111	-	-	-	-	-	-	-	-	-	-	-	-
110	110.0	0.1	-0.71	110.1	0.12	-1.28	110.0	0.1	-0.71	110	0.1	-0.71
109	-	-	-	109.0	0.12	0.00	-	-	-	-	-	-
108	-	-	-	108.1	0.12	-0.64	-	-	-	-	-	-
107	-	-	-	107.0	0.12	0.00	-	-	-	-	-	-
106	-	-	-	106.0	0.12	0.00	-	-	-	-	-	-
105	-	-	-	105.0	0.12	0.00	-	-	-	-	-	-
104	-	-	-	104.0	0.12	0.00	-	-	-	-	-	-
103	-	-	-	103.0	0.12	0.00	-	-	-	-	-	-
102	-	-	-	102.0	0.12	0.00	-	-	-	-	-	-
101	-	-	-	101.0	0.12	0.00	-	-	-	-	-	-
100	100.0	0.1	0.00	100.0	0.12	0.00	100.0	0.1	0.00	100.1	0.1	-0.71
99	-	-	-	99.0	0.12	0.00	99.0	0.1	0.00	99	0.1	0.00
98	-	-	-	98.0	0.12	0.00	98.0	0.1	0.00	98	0.1	0.00
97	-	-	-	97.0	0.12	0.00	97.0	0.1	0.00	97	0.1	0.00
96	-	-	-	96.0	0.12	0.00	96.0	0.1	0.00	96	0.1	0.00
95	-	-	-	95.0	0.12	0.00	95.0	0.1	0.00	95	0.1	0.00
94	-	-	-	94.0	0.12	0.00	94.0	0.1	0.00	94	0.1	0.00
93	-	-	-	93.0	0.12	0.00	93.0	0.1	0.00	93	0.1	0.00
92	-	-	-	92.1	0.12	-0.64	92.0	0.1	0.00	92	0.1	0.00
91	-	-	-	91.0	0.12	0.00	91.0	0.1	0.00	91	0.1	0.00
90	90.0	0.1	0.00	90.1	0.12	-0.64	90.0	0.1	0.00	90.1	0.1	-0.71
89	-	-	-	89.0	0.12	0.00	-	-	-	89	0.1	0.00
85	-	-	-	85.0	0.12	0.00	-	-	-	-	-	-
80	79.9	0.1	0.71	80.0	0.12	0.00	80.0	0.1	0.00	80	0.1	0.00
75	-	-	-	75.0	0.12	0.00	-	-	-	-	-	-
70	69.9	0.1	0.71	70.0	0.12	0.00	70.0	0.1	0.00	70	0.1	0.00
65	-	-	-	65.0	0.12	0.00	-	-	-	-	-	-
60	60.0	0.1	-0.71	60.0	0.12	-0.64	60.0	0.1	-0.71	60	0.1	-0.71
55	-	-	-	55.0	0.12	-0.64	-	-	-	-	-	-
50	50.0	0.1	-0.71	50.0	0.12	-0.64	50.0	0.1	-0.71	50	0.1	-0.71
45	-	-	-	45.0	0.12	0.00	-	-	-	-	-	-
40	40.0	0.1	-0.71	40.1	0.12	-1.28	40.2	0.1	-2.12	39.9	0.1	0.00
35	-	-	-	35.4	0.12	-3.20	-	-	-	-	-	-
34	-	-	-	34.5	0.12	-3.20	-	-	-	-	-	-
33	-	-	-	33.5	0.12	-3.20	-	-	-	-	-	-
32	-	-	-	32.7	0.12	-3.84	-	-	-	-	-	-
31	-	-	-	31.7	0.12	-2.56	-	-	-	-	-	-
30	30.0	0.1	2.83	30.7	0.12	-1.92	31.5	0.1	-7.78	30	0.1	2.83
29	-	-	-	-	-	-	-	-	-	-	-	-

APPENDIX C

Differential & Level Linearity (31.5 Hz)

Input (dB)	Lab 13			Lab 14			Lab 15			Lab 16		
	Result (dB)	U ₉₅ (dB)	En	Result (dB)	U ₉₅ (dB)	En	Result (dB)	U ₉₅ (dB)	En	Result (dB)	U ₉₅ (dB)	En
114	-	-	-	-	-	-	-	-	-	-	-	-
113	-	-	-	-	-	-	-	-	-	-	-	-
112	-	-	-	-	-	-	-	-	-	-	-	-
111	-	-	-	-	-	-	-	-	-	-	-	-
110	109.9	0.26	0.00	109.9	0.06	0.00	110.0	0.2	-0.45	110.0	0.3	-0.32
109	108.9	0.26	0.36	-	-	-	-	-	-	109.0	0.3	0.00
108	107.9	0.26	0.36	-	-	-	-	-	-	108.0	0.3	-0.09
107	107.0	0.26	0.00	-	-	-	-	-	-	107.0	0.3	-0.03
106	105.9	0.26	0.36	-	-	-	-	-	-	106.1	0.3	-0.32
105	105.0	0.26	0.00	105.0	0.06	0.00	105.0	0.2	0.00	105.1	1.3	-0.08
104	104.0	0.26	0.00	-	-	-	-	-	-	104.1	0.3	-0.32
103	103.0	0.26	0.00	-	-	-	-	-	-	103.1	0.3	-0.32
102	102.0	0.26	0.00	-	-	-	-	-	-	102.1	0.3	-0.32
101	101.0	0.26	0.00	-	-	-	-	-	-	101.1	0.3	-0.32
100	100.0	0.26	0.00	100.0	0.06	0.00	100.1	0.2	-0.45	100.1	0.3	-0.32
99	99.0	0.26	0.00	99.0	0.06	0.00	-	-	-	99.1	0.3	-0.32
98	98.0	0.26	0.00	98.0	0.06	0.00	-	-	-	98.1	0.3	-0.32
97	97.0	0.26	0.00	97.0	0.06	0.00	-	-	-	97.1	0.3	-0.32
96	96.0	0.26	0.00	96.0	0.06	0.00	-	-	-	96.0	0.3	0.00
95	95.0	0.26	0.00	95.0	0.06	0.00	95.1	0.2	-0.45	95.0	0.3	0.00
94	94.0	0.26	0.00	94.0	0.06	0.00	-	-	-	94.0	0.3	0.00
93	93.0	0.26	0.00	93.0	0.06	0.00	-	-	-	93.1	0.3	-0.32
92	92.1	0.26	-0.36	92.0	0.06	0.00	-	-	-	92.1	0.3	-0.32
91	91.0	0.26	0.00	91.0	0.06	0.00	-	-	-	91.0	0.3	-0.03
90	89.9	0.26	0.36	90.0	0.06	0.00	90.1	0.2	-0.45	90.1	0.3	-0.32
89	-	-	-	89.0	0.06	0.00	-	-	-	89.1	0.3	-0.32
85	84.9	0.26	0.36	85.0	0.06	0.00	85.0	0.2	0.00	85.1	0.3	-0.32
80	79.9	0.26	0.36	79.9	0.06	0.86	80.0	0.2	0.00	80.1	0.3	-0.32
75	74.9	0.26	0.36	74.9	0.06	0.86	75.0	0.2	0.00	75.1	0.3	-0.32
70	69.9	0.26	0.36	69.9	0.06	0.86	70.0	0.2	0.00	70.0	0.3	0.00
65	64.9	0.26	0.36	64.9	0.06	0.86	65.0	0.2	0.00	65.0	0.3	0.00
60	59.9	0.26	0.00	59.9	0.1	0.00	60.0	0.2	-0.45	60.0	0.3	-0.32
55	54.9	0.26	0.00	54.9	0.1	0.00	55.0	0.2	-0.45	55.1	0.3	-0.54
50	49.9	0.26	0.00	49.9	0.1	0.00	50.0	0.2	-0.45	50.0	0.3	-0.35
45	45.0	0.26	0.00	44.9	0.2	0.45	45.0	0.2	0.00	45.0	0.3	0.03
40	40.2	0.26	-1.08	39.8	0.3	0.32	40.2	0.2	-1.34	40.0	0.3	-0.28
35	35.6	0.26	-2.51	34.8	0.4	0.24	35.6	0.2	-3.13	35.2	0.3	-0.92
34	34.7	0.26	-2.51	-	-	-	-	-	-	34.2	0.3	-0.63
33	33.8	0.26	-2.87	-	-	-	-	-	-	33.3	0.3	-0.92
32	33.0	0.26	-3.23	-	-	-	-	-	-	32.3	0.3	-0.66
31	32.2	0.26	-3.23	-	-	-	31.4	0.2	-0.45	31.6	0.3	-0.82
30	31.4	0.26	-3.59	-	-	-	-	-	-	26.1	0.3	13.50
29	-	-	-	-	-	-	-	-	-	-	-	-

APPENDIX C

Differential & Level Linearity (1000 Hz)

Input (dB)	Lab 1			Lab 2			Lab 3			Lab 4		
	Result (dB)	U ₉₅ (dB)	En	Result (dB)	U ₉₅ (dB)	En	Result (dB)	U ₉₅ (dB)	En	Result (dB)	U ₉₅ (dB)	En
114	-	-	-	-	-	-	-	-	-	-	-	-
113	-	-	-	-	-	-	-	-	-	-	-	-
112	-	-	-	-	-	-	-	-	-	-	-	-
111	-	-	-	-	-	-	-	-	-	-	-	-
110	-	-	-	-	-	-	110.0	0.5	0.00	-	-	-
109	-	-	-	-	-	-	-	-	-	-	-	-
108	-	-	-	-	-	-	-	-	-	-	-	-
107	-	-	-	-	-	-	-	-	-	-	-	-
106	-	-	-	-	-	-	-	-	-	-	-	-
105	-	-	-	-	-	-	105.0	0.5	0.00	-	-	-
104	-	-	-	104.0	0.3	0.00	-	-	-	-	-	-
103	-	-	-	-	-	-	-	-	-	-	-	-
102	-	-	-	-	-	-	-	-	-	-	-	-
101	-	-	-	-	-	-	-	-	-	-	-	-
100	-	-	-	-	-	-	100.0	0.5	0.00	-	-	-
99	-	-	-	-	-	-	99.0	0.5	0.00	-	-	-
98	-	-	-	-	-	-	98.0	0.5	0.00	-	-	-
97	-	-	-	-	-	-	97.0	0.5	0.00	-	-	-
96	-	-	-	-	-	-	96.0	0.5	0.00	-	-	-
95	-	-	-	-	-	-	95.0	0.5	0.00	-	-	-
94	-	-	-	94.0	0.3	0.00	94.0	0.5	0.00	-	-	-
93	-	-	-	-	-	-	93.0	0.5	0.00	-	-	-
92	-	-	-	-	-	-	92.0	0.5	0.00	-	-	-
91	-	-	-	-	-	-	91.0	0.5	0.00	-	-	-
90	-	-	-	-	-	-	90.0	0.5	0.00	-	-	-
89	-	-	-	-	-	-	89.0	0.5	0.00	-	-	-
85	-	-	-	-	-	-	85.0	0.5	0.00	-	-	-
80	-	-	-	-	-	-	80.0	0.5	0.00	-	-	-
75	-	-	-	-	-	-	75.0	0.5	0.00	-	-	-
70	-	-	-	-	-	-	70.0	0.5	0.00	-	-	-
65	-	-	-	-	-	-	65.0	0.5	-0.20	-	-	-
60	-	-	-	-	-	-	60.0	0.5	-0.20	-	-	-
55	-	-	-	-	-	-	55.0	0.5	-0.20	-	-	-
50	-	-	-	-	-	-	50.0	0.5	-0.20	-	-	-
45	-	-	-	-	-	-	45.1	1.5	-0.13	-	-	-
40	-	-	-	-	-	-	40.2	2.5	-0.12	-	-	-
35	-	-	-	-	-	-	35.7	3.5	-0.20	-	-	-
34	-	-	-	34.4	0.3	-0.01	-	-	-	-	-	-
33	-	-	-	-	-	-	-	-	-	-	-	-
32	-	-	-	-	-	-	-	-	-	-	-	-
31	-	-	-	-	-	-	-	-	-	-	-	-
30	-	-	-	-	-	-	32.0	3.5	-0.46	-	-	-
29	-	-	-	-	-	-	-	-	-	-	-	-

APPENDIX C

Differential & Level Linearity (1000 Hz)

Input (dB)	Lab 5			Lab 6			Lab 7			Lab 8		
	Result (dB)	U ₉₅ (dB)	En	Result (dB)	U ₉₅ (dB)	En	Result (dB)	U ₉₅ (dB)	En	Result (dB)	U ₉₅ (dB)	En
114	-	-	-	-	-	-	-	-	-	-	-	-
113	-	-	-	-	-	-	-	-	-	-	-	-
112	-	-	-	-	-	-	-	-	-	-	-	-
111	-	-	-	-	-	-	-	-	-	-	-	-
110	-	-	-	-	-	-	-	-	-	109.9	-	-
109	-	-	-	-	-	-	-	-	-	-	-	-
108	-	-	-	-	-	-	-	-	-	-	-	-
107	-	-	-	-	-	-	-	-	-	-	-	-
106	-	-	-	-	-	-	-	-	-	-	-	-
105	-	-	-	-	-	-	-	-	-	105.0	-	-
104	-	-	-	-	-	-	-	-	-	-	-	-
103	-	-	-	-	-	-	-	-	-	-	-	-
102	-	-	-	-	-	-	-	-	-	-	-	-
101	-	-	-	-	-	-	-	-	-	-	-	-
100	-	-	-	-	-	-	-	-	-	100.0	-	-
99	-	-	-	-	-	-	-	-	-	-	-	-
98	-	-	-	-	-	-	-	-	-	-	-	-
97	-	-	-	-	-	-	-	-	-	-	-	-
96	-	-	-	-	-	-	-	-	-	-	-	-
95	-	-	-	-	-	-	-	-	-	95.0	-	-
94	-	-	-	-	-	-	-	-	-	94.0	-	-
93	-	-	-	-	-	-	-	-	-	-	-	-
92	-	-	-	-	-	-	-	-	-	-	-	-
91	-	-	-	-	-	-	-	-	-	-	-	-
90	-	-	-	-	-	-	-	-	-	90.0	-	-
89	-	-	-	-	-	-	-	-	-	-	-	-
85	-	-	-	-	-	-	-	-	-	85.0	-	-
80	-	-	-	-	-	-	-	-	-	80.0	-	-
75	-	-	-	-	-	-	-	-	-	75.0	-	-
70	-	-	-	-	-	-	-	-	-	70.0	-	-
65	-	-	-	-	-	-	-	-	-	65.0	-	-
60	-	-	-	-	-	-	-	-	-	60.0	-	-
55	-	-	-	-	-	-	-	-	-	55.0	-	-
50	-	-	-	-	-	-	-	-	-	50.0	-	-
45	-	-	-	-	-	-	-	-	-	45.0	-	-
40	-	-	-	-	-	-	-	-	-	40.0	-	-
35	-	-	-	-	-	-	-	-	-	35.2	-	-
34	-	-	-	-	-	-	-	-	-	-	-	-
33	-	-	-	-	-	-	-	-	-	-	-	-
32	-	-	-	-	-	-	-	-	-	-	-	-
31	-	-	-	-	-	-	-	-	-	-	-	-
30	-	-	-	-	-	-	-	-	-	-	-	-
29	-	-	-	-	-	-	-	-	-	-	-	-

APPENDIX C

Differential & Level Linearity (1000 Hz)

Input (dB)	Lab 9			Lab 10			Lab 11			Lab 12		
	Result (dB)	U ₉₅ (dB)	En	Result (dB)	U ₉₅ (dB)	En	Result (dB)	U ₉₅ (dB)	En	Result (dB)	U ₉₅ (dB)	En
114	-	-	-	-	-	-	-	-	-	-	-	-
113	-	-	-	-	-	-	-	-	-	-	-	-
112	-	-	-	-	-	-	-	-	-	-	-	-
111	-	-	-	-	-	-	-	-	-	-	-	-
110	109.9	0.1	0.71	110.0	0.12	0.00	110.0	0.1	0.00	110	0.1	0.00
109	-	-	-	109.0	0.12	0.00	-	-	-	-	-	-
108	-	-	-	108.0	0.12	0.00	-	-	-	-	-	-
107	-	-	-	107.0	0.12	0.00	-	-	-	-	-	-
106	-	-	-	106.0	0.12	0.00	-	-	-	-	-	-
105	-	-	-	105.0	0.12	0.00	-	-	-	-	-	-
104	-	-	-	104.0	0.12	0.00	-	-	-	-	-	-
103	-	-	-	103.0	0.12	0.00	-	-	-	-	-	-
102	-	-	-	102.0	0.12	0.00	-	-	-	-	-	-
101	-	-	-	101.0	0.12	0.00	-	-	-	-	-	-
100	99.9	0.1	0.71	100.0	0.12	0.00	100.0	0.1	0.00	100.1	0.1	-0.71
99	-	-	-	99.0	0.12	0.00	99.0	0.1	0.00	99	0.1	0.00
98	-	-	-	98.0	0.12	0.00	98.0	0.1	0.00	98	0.1	0.00
97	-	-	-	97.0	0.12	0.00	97.0	0.1	0.00	97	0.1	0.00
96	-	-	-	96.0	0.12	0.00	96.0	0.1	0.00	96	0.1	0.00
95	-	-	-	95.0	0.12	0.00	95.0	0.1	0.00	95	0.1	0.00
94	-	-	-	94.0	0.12	0.00	94.0	0.1	0.00	94	0.1	0.00
93	-	-	-	93.0	0.12	0.00	93.0	0.1	0.00	93	0.1	0.00
92	-	-	-	92.1	0.12	-0.64	92.0	0.1	0.00	92	0.1	0.00
91	-	-	-	91.0	0.12	0.00	91.0	0.1	0.00	91	0.1	0.00
90	89.9	0.1	0.71	90.0	0.12	0.00	90.0	0.1	0.00	90.1	0.1	-0.71
89	-	-	-	89.0	0.12	0.00	-	-	-	89	0.1	0.00
85	-	-	-	85.0	0.12	0.00	-	-	-	-	-	-
80	79.9	0.1	0.71	80.0	0.12	0.00	80.0	0.1	0.00	80	0.1	0.00
75	-	-	-	74.9	0.12	0.64	-	-	-	-	-	-
70	69.9	0.1	0.71	70.0	0.12	0.00	70.0	0.1	0.00	70	0.1	0.00
65	-	-	-	65.0	0.12	-0.64	-	-	-	-	-	-
60	59.8	0.1	0.71	60.0	0.12	-0.64	60.0	0.1	-0.71	60	0.1	-0.71
55	-	-	-	55.0	0.12	-0.64	-	-	-	-	-	-
50	49.9	0.1	0.00	50.0	0.12	-0.64	50.0	0.1	-0.71	50	0.1	-0.71
45	-	-	-	45.0	0.12	-0.64	-	-	-	-	-	-
40	39.8	0.1	0.71	39.9	0.12	0.00	40.0	0.1	-0.71	39.9	0.1	0.00
35	-	-	-	35.1	0.12	-0.64	-	-	-	-	-	-
34	-	-	-	34.2	0.12	-1.28	-	-	-	-	-	-
33	-	-	-	33.3	0.12	-1.28	-	-	-	-	-	-
32	-	-	-	32.4	0.12	-1.28	-	-	-	-	-	-
31	-	-	-	31.4	0.12	-0.64	-	-	-	-	-	-
30	30.0	0.1	2.83	30.4	0.12	0.00	31.0	0.1	-4.24	30.1	0.1	2.12
29	-	-	-	-	-	-	-	-	-	-	-	-

APPENDIX C

Differential & Level Linearity (1000 Hz)

Input (dB)	Lab 13			Lab 14			Lab 15			Lab 16		
	Result (dB)	U ₉₅ (dB)	En	Result (dB)	U ₉₅ (dB)	En	Result (dB)	U ₉₅ (dB)	En	Result (dB)	U ₉₅ (dB)	En
114	-	-	-	-	-	-	-	-	-	-	-	-
113	-	-	-	-	-	-	-	-	-	-	-	-
112	-	-	-	-	-	-	-	-	-	-	-	-
111	-	-	-	-	-	-	-	-	-	-	-	-
110	109.9	0.26	0.36	110.0	0.06	0.00	109.0	0.2	4.47	110.0	0.3	0.00
109	108.9	0.26	0.36	-	-	-	-	-	-	109.0	0.3	0.00
108	107.9	0.26	0.36	-	-	-	-	-	-	108.0	0.3	0.00
107	106.9	0.26	0.36	-	-	-	-	-	-	107.0	0.3	0.00
106	105.9	0.26	0.36	-	-	-	-	-	-	106.1	0.3	-0.32
105	104.9	0.26	0.36	105.0	0.06	0.00	105.0	0.2	0.00	105.1	1.3	-0.08
104	103.9	0.26	0.36	-	-	-	-	-	-	104.1	0.3	-0.32
103	102.9	0.26	0.36	-	-	-	-	-	-	103.1	0.3	-0.32
102	101.9	0.26	0.36	-	-	-	-	-	-	102.1	0.3	-0.32
101	100.9	0.26	0.36	-	-	-	-	-	-	101.1	0.3	-0.32
100	99.9	0.26	0.36	100.0	0.06	0.00	100.0	0.2	0.00	100.1	0.3	-0.32
99	98.9	0.26	0.36	99.0	0.06	0.00	-	-	-	99.1	0.3	-0.32
98	97.9	0.26	0.36	98.0	0.06	0.00	-	-	-	98.1	0.3	-0.32
97	96.9	0.26	0.36	97.0	0.06	0.00	-	-	-	97.1	0.3	-0.32
96	95.9	0.26	0.36	96.0	0.06	0.00	-	-	-	96.0	0.3	0.00
95	95.0	0.26	0.00	95.0	0.06	0.00	95.0	0.2	0.00	95.0	0.3	0.00
94	94.0	0.26	0.00	94.0	0.06	0.00	-	-	-	94.0	0.3	0.00
93	92.9	0.26	0.36	93.0	0.06	0.00	-	-	-	93.1	0.3	-0.32
92	91.9	0.26	0.36	92.0	0.06	0.00	-	-	-	92.1	0.3	-0.32
91	90.9	0.26	0.36	91.0	0.06	0.00	-	-	-	91.1	0.3	-0.28
90	89.9	0.26	0.36	90.0	0.06	0.00	90.0	0.2	0.00	90.1	0.3	-0.32
89	-	-	-	89.0	0.06	0.00	-	-	-	89.1	0.3	-0.32
85	84.9	0.26	0.36	85.0	0.06	0.00	85.0	0.2	0.00	85.1	0.3	-0.32
80	79.9	0.26	0.36	80.0	0.06	0.00	80.0	0.2	0.00	80.1	0.3	-0.32
75	74.9	0.26	0.36	75.0	0.06	0.00	75.0	0.2	0.00	75.1	0.3	-0.22
70	69.9	0.26	0.36	70.0	0.06	0.00	70.0	0.2	0.00	70.0	0.3	0.09
65	64.9	0.26	0.00	65.0	0.06	-0.86	65.0	0.2	-0.45	65.0	0.3	-0.32
60	59.8	0.26	0.36	60.0	0.1	-0.71	59.9	0.2	0.00	60.0	0.3	-0.32
55	54.8	0.26	0.36	55.0	0.1	-0.71	54.9	0.2	0.00	55.0	0.3	-0.32
50	49.8	0.26	0.36	49.9	0.1	0.00	49.9	0.2	0.00	50.0	0.3	-0.32
45	44.8	0.26	0.36	45.0	0.2	-0.45	44.9	0.2	0.00	45.0	0.3	-0.32
40	39.9	0.26	0.00	39.8	0.3	0.32	40.0	0.2	-0.45	40.0	0.3	-0.28
35	35.2	0.26	-0.72	34.8	0.4	0.49	35.2	0.2	-0.89	35.1	0.3	-0.41
34	34.3	0.26	-1.08	-	-	-	-	-	-	34.2	0.3	-0.54
33	33.5	0.26	-1.44	-	-	-	-	-	-	33.2	0.3	-0.44
32	32.6	0.26	-1.44	-	-	-	-	-	-	32.4	0.3	-0.63
31	31.8	0.26	-1.79	-	-	-	30.7	0.2	2.68	31.5	0.3	-0.73
30	31.1	0.26	-2.51	-	-	-	-	-	-	30.7	0.3	-0.85
29	-	-	-	-	-	-	-	-	-	-	-	-

APPENDIX C

Differential & Level Linearity (8000 Hz)

Input (dB)	Lab 1			Lab 2			Lab 3			Lab 4		
	Result (dB)	U ₉₅ (dB)	En	Result (dB)	U ₉₅ (dB)	En	Result (dB)	U ₉₅ (dB)	En	Result (dB)	U ₉₅ (dB)	En
114	-	-	-	-	-	-	-	-	-	-	-	-
113	-	-	-	-	-	-	-	-	-	-	-	-
112	-	-	-	-	-	-	-	-	-	-	-	-
111	-	-	-	-	-	-	-	-	-	-	-	-
110	-	-	-	-	-	-	110.0	0.5	-0.20	-	-	-
109	-	-	-	-	-	-	-	-	-	-	-	-
108	-	-	-	-	-	-	-	-	-	-	-	-
107	-	-	-	-	-	-	-	-	-	-	-	-
106	-	-	-	-	-	-	-	-	-	-	-	-
105	-	-	-	-	-	-	105.0	0.5	0.00	-	-	-
104	-	-	-	104.0	0.3	0.00	-	-	-	-	-	-
103	-	-	-	-	-	-	-	-	-	-	-	-
102	-	-	-	-	-	-	-	-	-	-	-	-
101	-	-	-	-	-	-	-	-	-	-	-	-
100	-	-	-	-	-	-	100.0	0.5	0.00	-	-	-
99	-	-	-	-	-	-	99.0	0.5	0.00	-	-	-
98	-	-	-	-	-	-	98.0	0.5	0.00	-	-	-
97	-	-	-	-	-	-	97.0	0.5	0.00	-	-	-
96	-	-	-	-	-	-	96.0	0.5	0.00	-	-	-
95	-	-	-	-	-	-	95.0	0.5	0.00	-	-	-
94	-	-	-	94.0	0.3	0.00	94.0	0.5	0.00	-	-	-
93	-	-	-	-	-	-	93.0	0.5	0.00	-	-	-
92	-	-	-	-	-	-	92.0	0.5	0.00	-	-	-
91	-	-	-	-	-	-	91.0	0.5	0.00	-	-	-
90	-	-	-	-	-	-	90.0	0.5	0.00	-	-	-
89	-	-	-	-	-	-	89.0	0.5	0.00	-	-	-
85	-	-	-	-	-	-	85.0	0.5	0.00	-	-	-
80	-	-	-	-	-	-	80.0	0.5	0.00	-	-	-
75	-	-	-	-	-	-	75.0	0.5	0.00	-	-	-
70	-	-	-	-	-	-	70.0	0.5	0.00	-	-	-
65	-	-	-	-	-	-	65.0	0.5	-0.20	-	-	-
60	-	-	-	-	-	-	60.0	0.5	-0.20	-	-	-
55	-	-	-	-	-	-	55.0	0.5	-0.20	-	-	-
50	-	-	-	-	-	-	50.0	0.5	-0.20	-	-	-
45	-	-	-	-	-	-	45.0	1.5	-0.07	-	-	-
40	-	-	-	-	-	-	40.2	2.5	-0.12	-	-	-
35	-	-	-	-	-	-	35.6	3.5	-0.20	-	-	-
34	-	-	-	34.4	0.3	-0.01	-	-	-	-	-	-
33	-	-	-	-	-	-	-	-	-	-	-	-
32	-	-	-	-	-	-	-	-	-	-	-	-
31	-	-	-	-	-	-	-	-	-	-	-	-
30	-	-	-	-	-	-	31.9	3.5	-0.49	-	-	-
29	-	-	-	-	-	-	-	-	-	-	-	-

APPENDIX C

Differential & Level Linearity (8000 Hz)

Input (dB)	Lab 5			Lab 6			Lab 7			Lab 8		
	Result (dB)	U ₉₅ (dB)	En	Result (dB)	U ₉₅ (dB)	En	Result (dB)	U ₉₅ (dB)	En	Result (dB)	U ₉₅ (dB)	En
114	-	-	-	-	-	-	-	-	-	-	-	-
113	-	-	-	-	-	-	-	-	-	-	-	-
112	-	-	-	-	-	-	-	-	-	-	-	-
111	-	-	-	-	-	-	-	-	-	-	-	-
110	-	-	-	-	-	-	-	-	-	110.1	-	-
109	-	-	-	-	-	-	-	-	-	-	-	-
108	-	-	-	-	-	-	-	-	-	-	-	-
107	-	-	-	-	-	-	-	-	-	-	-	-
106	-	-	-	-	-	-	-	-	-	-	-	-
105	-	-	-	-	-	-	-	-	-	105.1	-	-
104	-	-	-	-	-	-	-	-	-	-	-	-
103	-	-	-	-	-	-	-	-	-	-	-	-
102	-	-	-	-	-	-	-	-	-	-	-	-
101	-	-	-	-	-	-	-	-	-	-	-	-
100	-	-	-	-	-	-	-	-	-	100.2	-	-
99	-	-	-	-	-	-	-	-	-	-	-	-
98	-	-	-	-	-	-	-	-	-	-	-	-
97	-	-	-	-	-	-	-	-	-	-	-	-
96	-	-	-	-	-	-	-	-	-	-	-	-
95	-	-	-	-	-	-	-	-	-	95.2	-	-
94	-	-	-	-	-	-	-	-	-	94.2	-	-
93	-	-	-	-	-	-	-	-	-	-	-	-
92	-	-	-	-	-	-	-	-	-	-	-	-
91	-	-	-	-	-	-	-	-	-	-	-	-
90	-	-	-	-	-	-	-	-	-	90.2	-	-
89	-	-	-	-	-	-	-	-	-	-	-	-
85	-	-	-	-	-	-	-	-	-	85.2	-	-
80	-	-	-	-	-	-	-	-	-	80.2	-	-
75	-	-	-	-	-	-	-	-	-	75.2	-	-
70	-	-	-	-	-	-	-	-	-	70.2	-	-
65	-	-	-	-	-	-	-	-	-	65.2	-	-
60	-	-	-	-	-	-	-	-	-	60.2	-	-
55	-	-	-	-	-	-	-	-	-	55.2	-	-
50	-	-	-	-	-	-	-	-	-	50.2	-	-
45	-	-	-	-	-	-	-	-	-	45.2	-	-
40	-	-	-	-	-	-	-	-	-	40.2	-	-
35	-	-	-	-	-	-	-	-	-	35.3	-	-
34	-	-	-	-	-	-	-	-	-	-	-	-
33	-	-	-	-	-	-	-	-	-	-	-	-
32	-	-	-	-	-	-	-	-	-	-	-	-
31	-	-	-	-	-	-	-	-	-	-	-	-
30	-	-	-	-	-	-	-	-	-	-	-	-
29	-	-	-	-	-	-	-	-	-	-	-	-

APPENDIX C

Differential & Level Linearity (8000 Hz)

Input (dB)	Lab 9			Lab 10			Lab 11			Lab 12		
	Result (dB)	U ₉₅ (dB)	En	Result (dB)	U ₉₅ (dB)	En	Result (dB)	U ₉₅ (dB)	En	Result (dB)	U ₉₅ (dB)	En
114	-	-	-	-	-	-	-	-	-	-	-	-
113	-	-	-	-	-	-	-	-	-	-	-	-
112	-	-	-	-	-	-	-	-	-	-	-	-
111	-	-	-	-	-	-	-	-	-	-	-	-
110	110.1	0.1	-1.41	110.2	0.12	-1.92	110.0	0.1	-0.71	110	0.1	-0.71
109	-	-	-	109.2	0.12	-1.92	-	-	-	-	-	-
108	-	-	-	108.2	0.12	-1.28	-	-	-	-	-	-
107	-	-	-	107.2	0.12	-1.28	-	-	-	-	-	-
106	-	-	-	106.2	0.12	-1.28	-	-	-	-	-	-
105	-	-	-	105.2	0.12	-1.28	-	-	-	-	-	-
104	-	-	-	104.2	0.12	-1.28	-	-	-	-	-	-
103	-	-	-	103.2	0.12	-1.28	-	-	-	-	-	-
102	-	-	-	102.2	0.12	-1.28	-	-	-	-	-	-
101	-	-	-	101.2	0.12	-1.28	-	-	-	-	-	-
100	99.9	0.1	0.71	100.2	0.12	-1.28	100.0	0.1	0.00	100.1	0.1	-0.71
99	-	-	-	99.2	0.12	-1.28	99.0	0.1	0.00	99	0.1	0.00
98	-	-	-	98.2	0.12	-1.28	98.0	0.1	0.00	98	0.1	0.00
97	-	-	-	97.2	0.12	-1.28	97.0	0.1	0.00	97	0.1	0.00
96	-	-	-	96.2	0.12	-1.28	96.0	0.1	0.00	96	0.1	0.00
95	-	-	-	95.2	0.12	-1.28	95.0	0.1	0.00	95	0.1	0.00
94	-	-	-	94.2	0.12	-1.28	94.0	0.1	0.00	94	0.1	0.00
93	-	-	-	93.2	0.12	-1.28	93.0	0.1	0.00	93	0.1	0.00
92	-	-	-	92.2	0.12	-1.28	92.0	0.1	0.00	92	0.1	0.00
91	-	-	-	91.2	0.12	-1.28	91.0	0.1	0.00	91	0.1	0.00
90	89.8	0.1	1.41	90.2	0.12	-1.28	90.0	0.1	0.00	90	0.1	0.00
89	-	-	-	89.2	0.12	-1.28	-	-	-	89	0.1	0.00
85	-	-	-	85.2	0.12	-1.28	-	-	-	-	-	-
80	79.7	0.1	2.12	80.2	0.12	-1.28	80.0	0.1	0.00	80	0.1	0.00
75	-	-	-	75.2	0.12	-1.28	-	-	-	-	-	-
70	69.8	0.1	1.41	70.2	0.12	-1.28	70.0	0.1	0.00	70	0.1	0.00
65	-	-	-	65.2	0.12	-1.92	-	-	-	-	-	-
60	59.8	0.1	0.71	60.2	0.12	-1.92	60.0	0.1	-0.71	60	0.1	-0.71
55	-	-	-	55.2	0.12	-1.92	-	-	-	-	-	-
50	49.9	0.1	0.00	50.1	0.12	-1.28	50.0	0.1	-0.71	50	0.1	-0.71
45	-	-	-	49.1	0.12	-26.89	-	-	-	-	-	-
40	39.9	0.1	0.00	39.2	0.12	4.48	40.1	0.1	-1.41	40	0.1	-0.71
35	-	-	-	35.3	0.12	-2.56	-	-	-	-	-	-
34	-	-	-	34.3	0.12	-2.56	-	-	-	-	-	-
33	-	-	-	33.4	0.12	-2.56	-	-	-	-	-	-
32	-	-	-	32.4	0.12	-1.92	-	-	-	-	-	-
31	-	-	-	31.5	0.12	-2.56	-	-	-	-	-	-
30	30.1	0.1	0.71	30.7	0.12	-3.20	31.1	0.1	-6.36	30.1	0.1	0.71
29	-	-	-	-	-	-	-	-	-	-	-	-

APPENDIX C

Differential & Level Linearity (8000 Hz)

Input (dB)	Lab 13			Lab 14			Lab 15			Lab 16		
	Result (dB)	U ₉₅ (dB)	En	Result (dB)	U ₉₅ (dB)	En	Result (dB)	U ₉₅ (dB)	En	Result (dB)	U ₉₅ (dB)	En
114	-	-	-	-	-	-	-	-	-	-	-	-
113	-	-	-	-	-	-	-	-	-	-	-	-
112	-	-	-	-	-	-	-	-	-	-	-	-
111	-	-	-	-	-	-	-	-	-	-	-	-
110	109.9	0.26	0.00	110.2	0.06	-2.57	110.1	0.2	-0.89	110.1	0.3	-0.63
109	108.9	0.26	0.00	-	-	-	-	-	-	109.2	0.3	-0.95
108	107.9	0.26	0.36	-	-	-	-	-	-	108.2	0.3	-0.63
107	106.9	0.26	0.36	-	-	-	-	-	-	107.2	0.3	-0.63
106	105.9	0.26	0.36	-	-	-	-	-	-	106.2	0.3	-0.63
105	104.9	0.26	0.36	105.0	0.06	0.00	105.2	0.2	-0.89	105.2	1.3	-0.15
104	103.9	0.26	0.36	-	-	-	-	-	-	104.2	0.3	-0.63
103	103.0	0.26	0.00	-	-	-	-	-	-	103.3	0.3	-0.95
102	102.0	0.26	0.00	-	-	-	-	-	-	102.3	0.3	-0.92
101	100.9	0.26	0.36	-	-	-	-	-	-	101.3	0.3	-0.95
100	100.0	0.26	0.00	100.0	0.06	0.00	100.2	0.2	-0.89	100.3	0.3	-0.85
99	99.0	0.26	0.00	99.0	0.06	0.00	-	-	-	99.3	0.3	-0.95
98	97.9	0.26	0.36	98.0	0.06	0.00	-	-	-	98.3	0.3	-0.95
97	97.0	0.26	0.00	97.0	0.06	0.00	-	-	-	97.3	0.3	-0.95
96	96.0	0.26	0.00	96.0	0.06	0.00	-	-	-	96.2	0.3	-0.63
95	95.0	0.26	0.00	95.0	0.06	0.00	95.2	0.2	-0.89	95.2	0.3	-0.63
94	94.0	0.26	0.00	94.0	0.06	0.00	-	-	-	94.2	0.3	-0.63
93	93.0	0.26	0.00	93.0	0.06	0.00	-	-	-	93.2	0.3	-0.73
92	92.0	0.26	0.00	92.0	0.06	0.00	-	-	-	92.2	0.3	-0.63
91	90.9	0.26	0.36	91.0	0.06	0.00	-	-	-	91.2	0.3	-0.63
90	89.9	0.26	0.36	90.0	0.06	0.00	90.2	0.2	-0.89	90.2	0.3	-0.63
89	-	-	-	89.0	0.06	0.00	-	-	-	89.3	0.3	-0.95
85	84.9	0.26	0.36	85.0	0.06	0.00	85.2	0.2	-0.89	85.2	0.3	-0.63
80	79.9	0.26	0.36	80.0	0.06	0.00	80.2	0.2	-0.89	80.3	0.3	-0.95
75	74.9	0.26	0.36	75.0	0.06	0.00	75.1	0.2	-0.45	75.2	0.3	-0.63
70	69.9	0.26	0.36	70.0	0.06	0.00	70.1	0.2	-0.45	70.1	0.3	-0.32
65	64.9	0.26	0.00	65.0	0.06	-0.86	65.2	0.2	-1.34	65.2	0.3	-0.95
60	59.9	0.26	0.00	60.0	0.1	-0.71	60.1	0.2	-0.89	60.2	0.3	-0.95
55	54.9	0.26	0.00	55.0	0.1	-0.71	55.2	0.2	-1.34	55.2	0.3	-0.95
50	49.9	0.26	0.00	50.0	0.1	-0.71	50.1	0.2	-0.89	50.2	0.3	-0.95
45	44.9	0.26	0.00	45.0	0.2	-0.45	45.1	0.2	-0.89	45.1	0.3	-0.63
40	39.9	0.26	0.00	39.8	0.3	0.32	40.2	0.2	-1.34	40.2	0.3	-0.95
35	35.3	0.26	-1.44	34.8	0.4	0.24	35.4	0.2	-2.24	35.3	0.3	-1.36
34	34.4	0.26	-1.79	-	-	-	-	-	-	34.4	0.3	-1.58
33	33.5	0.26	-1.79	-	-	-	-	-	-	33.4	0.3	-1.39
32	32.7	0.26	-2.15	-	-	-	-	-	-	32.6	0.3	-1.58
31	32.0	0.26	-3.23	-	-	-	31.1	0.2	0.00	31.7	0.3	-1.99
30	31.1	0.26	-3.23	-	-	-	-	-	-	30.8	0.3	-1.90
29	-	-	-	-	-	-	-	-	-	-	-	-

APPENDIX D

CIRCULATION SCHEDULE

APPENDIX D

APLAC INTERLABORATORY COMPARISON APM010 - SOUND LEVEL

Order	Economic Body	Laboratory Accreditation Body	Date of Receipt	Date of Dispatch	No. of Labs	Available Results	Comments
1	Australia	NATA/NML					Calibration at NML
2	Australia	NATA		29-Aug-01	4	4	
3	South Africa	SANAS	10-Sep-01	9-Oct-01	1	1	
4	Thailand	TISI	23-Oct-01	20-Nov-01	2	2	
5	Hong Kong	HKAS	4-Dec-01	31-Dec-01	1	1	
6	PR China	CNAS	22-Jan-02	19-Feb-02	3	2	
7	Chinese Taipei	TAF	5-Mar-02	26-Mar-02	2	1	
8	Australia	NATA/NML	9-Apr-02	1-Oct-02			Calibration at NML
9	New Zealand	IANZ	15-Oct-02	29-Oct-02	3	1	
10	Indonesia	KAN-BSN	12-Nov-02	26-Nov-02	1	1	
11	Korea	KOLAS	10-Dec-02	14-Jan-03	1	0	
12	Japan	IAJapan	28-Jan-03	25-Feb-03	4	2	
13	Canada	SCC	11-Mar-03	1-Apr-03	1	1	
14	Australia	NATA/NML	15-Apr-03				Calibration at NML
Total Labs =					23	16	

Notes:

1. One week allowed per laboratory.
2. Two weeks allowed for transportation time between countries.
3. A maximum of four weeks allowed for each Laboratory Accreditation Body.

APPENDIX E

INSTRUCTIONS TO LABORATORIES

APLAC INTERLABORATORY COMPARISON APM010 - SOUND LEVEL

INSTRUCTIONS TO LABORATORIES

1. EQUIPMENT

- Bruel and Kjaer model 2236A precision integration sound level meter S/No.1764350;
- 4 nF direct electrical adaptor;
- 11.5 pF direct electrical adaptor;
- BNC to LEMO cable.

On receipt, unpack and inspect the equipment. Contact your accreditation body if there is any damage.

2. MEASUREMENTS TO BE CARRIED OUT

Switch on the meter for at least 15 minutes before taking measurements.

DO **NOT** ADJUST THE METER'S CALIBRATION FACTOR AT ANY TIME.

2.1 Absolute sensitivity

Determine the absolute sensitivity of the meter by imparting a nominal 94 dB acoustic signal to the microphone according to IEC 651 Clause 9.2.1.

2.2 Frequency weighting

Measure the characteristics of the weighting networks (A, C and Linear) according to IEC 651 Clause 9.2.2.

2.3 Level linearity

Take measurements at appropriate steps relative to the Reference level (94 dB). Refer IEC 651 Clause 7.9.

2.4 Differential linearity

Take measurements at appropriate steps relative to the Reference level (94 dB). Refer IEC 651 Clause 7.10.

3. NOTES TO MEASUREMENTS

3.1 The requirements of Clause 9.2.1 (2.1 absolute Sensitivity) and 9.2.2 (2.2 frequency weighting) are that the tests be carried out with plane progressive waves arriving at the microphone in the reference direction of incidence. Many laboratories use simplified methods that differ from "Free Field Conditions" but are designed to achieve the same result. Where the calibration or test has been carried by methods that deviate from the requirements of the standard, the participant should describe the method used and how the test is modified to comply with the standard.

APPENDIX E

3.2 The requirements of Clause 7.9 (2.3 Level Linearity) and Clause 7.10 (2.4 Differential Linearity) differentiate between primary and secondary indicator range. For the purpose of these tests, the whole of the Linearity range on one input range shall be regarded as 'primary'. To avoid effects on accuracy from the instrument noise floor the 30 to 110 dB range should be used for the linearity tests. These tests shall be centred on 94 dB as the reference level.

4. DOCUMENTS TO BE SUBMITTED

Within 2 weeks of the completion of the measurements, participating laboratories are required to send to their accreditation body:-

- an explanation of how the measurements were carried out, reference equipment, microphones etc. and what corrections were made (include worksheets);
- calibration certificate.

A final report will be issued at the end of the program with each laboratory only identified by a **confidential** code number.

5. GENERAL INFORMATION

For general queries, please contact your accreditation body. Additional information may be obtained from David Hayles, NATA, Fax: +(61) 2 9743 5311 or 9743 6664, Ph: +(61) 2 9736 8222.

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