Wilga Park Power Station - Compliance Noise Modelling

March 2024

Santos

→ The Power of Commitment

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Appendices

1. Introduction

1.1 Purpose of this report

Santos NSW (Eastern) Limited (Santos) is the operator of the Wilga Park Power Station (WPPS) which was approved in 2008.

The Department of Planning, Housing and Infrastructure (the Department) Minister's condition of approval (Project Approval) places standards on the proponent with regards to noise monitoring once the WPPS is operating above 12 MW capacity. GHD Pty Ltd (GHD) was commissioned by Santos to undertake noise monitoring as the WPPS. Monitoring was undertaken from 5 and 7 March 2024.

2. Requirements

The Planning Approval (07_0023) requirements are provided in the following sections.

2.1 Condition 3.5

Condition 3.5: *Within 90 days of the commencement of operation of the power station at a capacity of more than 12 megawatts and at every stage that new generation capacity is added to the power station or as otherwise agreed by the Secretary, and during a period in which the power station is operating under normal operating conditions (considering all operational generators at the time), the Proponent shall undertake a program to confirm the noise emission performance of the project. The program shall include, but not necessarily be limited to:*

a) noise monitoring, consistent with the guidelines provided in the New South Wales Industrial Noise Policy (EPA, 2000), to assess compliance with the maximum allowable noise contributions specified in Table 2 of condition 2.8 of this approval in relation to the locations specified in condition 2.8; and

b) details of any entries in the Complaints Register (condition 5.3 of this approval) relating to noise impacts.

A report providing the results of the program shall be submitted to the Secretary and the EPA within 28 days of completion of the assessment required under condition 3.5.

2.2 Condition 2.8 and 2.9

Condition 2.8: *The Proponent shall implement all reasonable and feasible at-source noise control measures at the Wilga Park power station to ensure that the noise contributions from the operation of the power station does not exceed the maximum allowable noise contributions specified in Table 2, at the following locations:*

> *a) all existing sensitive receivers identified in Attachment A;*
>
> *b) any residential dwelling within the land area shown in Attachment A for which an approval has been obtained under the Environmental Planning and Assessment Act 1979 at the date of this project approval; and*
>
> *c) over 25% or more of a vacant allotment within the land area shown in Attachment A in existence at the date of this project approval and for which a dwelling is permissible under the Environmental Planning and Assessment Act 1979 at the date of this project approval.*

The maximum allowable noise contributions apply under wind speeds up to 3 ms-1 (measured at 10 metres above ground level), or under temperature inversion conditions of up to 3 ºC/ 100 metres and wind speeds of up to 2m/s at 10 metres above the ground.

Table 2 Maximum Allowable Noise Contribution

7:00am to 6:00pm Mondays to Saturdays 8:00am to 6:00pm Sundays and public holidays	***Evening 6:00pm to 10:00pm on any day***	***Night 10:00pm to 7:00am Mondays to Saturdays 10:00pm to 8:00am Sundays and public holidays***	
35 LAeq(15 minute)	*35 LAeq(15 minute)*	*35 LAeq(15 minute)*	*45 LA1 (1 minute)*

Condition 2.9: *For the purpose of assessment of noise contributions specified under condition 2.8 of this approval, noise from the project shall be:*

a) measured at the most affected point within the residential boundary or at the most affected point within 30 metres of the dwelling where the dwelling is more than 30 metres from the boundary to determine compliance with the LAeq(15 minute) noise limits;

b) measured at 1 metre from the dwelling façade to determine compliance with the LA1 (1 minute) noise limits; and

c) subject to the modification factors provided in Section 4 of the New South Wales Industrial Noise Policy (EPA, 2000), where applicable.

Notwithstanding the above, should direct measurement of noise from the project be impractical, the Proponent may employ an alternative noise assessment method deemed acceptable by the EPA (refer to Section 11 of the New South Wales Industrial Noise Policy (EPA, 2000)). Details of such an alternative noise assessment method accepted by the EPA shall be submitted to the Secretary prior to the implementation of the assessment method.

Condition 2.16*: Should the monitoring required under condition 3.5 indicate that the operational noise contributions of the Wilga Park Power Station, following the implementation of all reasonable and feasible at-source mitigation measures in accordance with condition 2.8, exceed the maximum allowable noise contributions specified in Table 2 at the location identified in condition 2.8c) by more than 5 dB(A), then the Proponent shall, upon receiving a written request for acquisition from the landowner within two years of the date of that landowner being notified of his/her acquisition rights, acquire the land in accordance with the procedures in conditions 2.17 to 2.21 of this approval.*

3. Assessment

3.1 Assessment methodology

A noise monitoring program was undertaken between 5 and 7 March 2024 at the WPPS to confirm compliance with Condition 2.8 and 2.9 of the Planning Approval. The WPPS was operating at its full available output at the time of monitoring.

The following Type 1 Sound Level Meters (SLMs) were used for the monitoring program

Svantek SV977 serial number 36872 within NATA calibration (Certificate provided in Appendix B)

Svantek SV977 serial number 36873 within NATA calibration (Certificate provided in Appendix B)

The LAeq(15min) measurements were set to linear averaging and the LAmax and LA90(15min) measurements were set to Fast time-response. Field calibration checks were performed at the start and end of the measurement sessions and were with acceptable tolerances.

Meteorological data was obtained from the Leewood weather station which is located 16 km to the south-south-west of the WPPS. This data was used to determine the presence of noise enhancing meteorological conditions including the temperature lapse rate and wind speed at 10 m. Wind speed observations were also undertaken simultaneously with the noise measurements at the WPPS site at ground level (2 m) to confirm the influence of wind over the microphone did not affect the noise measurements. At ground level, during all measurements, the wind speed was observed to be light and less than 2 m/s.

Direct noise measurements were undertaken at all of the locations identified in Condition 2.8 of the Planning Approval where practical, or conservatively on the intervening site boundary. Where the receiver was a vacant allotment, the measurement was either taken on the lot boundary nearest the WPPS or at a location within the allotment set back so that it is representative of 25% of the vacant land area (estimated based on spherical spreading). Access was not available to Location K.

3.2 Noise level contribution from WPPS

The total measured ambient noise level and the noise level contribution from the WPPS is provided in Table 2. The WPPS noise level contribution has been determined based on the direct operator attended measurements. It is noted that the noise level contribution may still contain influence from ambient noise, particularly for receivers where the WPPS was inaudible or only just audible.

The ambient noise environment has an influence on the measured WPPS noise levels. The WPPS was observed to be a steady state noise source, whereas attended observations noted that the ambient environment contained significant contributions from insects, livestock and other fauna. The total measured noise level (LAeq) in Table 2 includes extraneous contribution and would be a conservative estimate of noise levels from the WPPS. The LA90 noise level provides a better representation of a steady-state noise source where there are irregular contributions from extraneous noise and using the LA90 noise level to estimate noise levels from the WPPS is consistent with EPA guidance (Noise Policy for Industry (EPA, 2017) Section 7.1.1 and Industrial Noise Policy (EPA, 2000) Section 2.3) for steady state noise sources. Based on the conditions at the time of monitoring high frequency noise (around 4 kHz) from insects has been excluded from the reported data in Table 2, noting that based on historic data noise emissions from the WPPS are not prevalent in the higher frequencies. Note at location E the results were influenced by a flock of bird and at location G and H results were influenced by dogs barking.

During all operator attended measurements, when the WPPS was audible, no impulsive noise characteristics or maximum noise events were attributed to the WPPS. It is not possible to isolate LA1(1min) contributions from the WPPS at the receivers due to the influence of the ambient noise environment over a 1 minute period. A risk approach to assessing compliance was adopted which assessed source measurements on site at the WPPS which shows that the difference between the LAeq noise level and the LA1 noise level was less than 1 dBA. As such, since the WPPS is a continues noise source, the received LA1(1minute) noise level should not exceed the WPPS contribution shown in Table 2 by more than 1 dBA. The estimated LA1(1min) noise levels have been

included in Table 2. The WPPS is assessed to be compliant with the 45 dBA LA1 (1 minute) maximum allowable noise contribution.

Condition 2.9 requires the adoption of the modification factors provided in Section 4 of the New South Wales Industrial Noise Policy (EPA, 2000). Note that under the *Implementation and transitional arrangements for the Noise Policy for Industry (2017) (EPA 2017P0293; October 2017),* where conditions reference the *New South Wales Industrial Noise Policy (EPA, 200*0) the modification factors these are to be transitioned to the *Noise Policy for Industry (2017) Fact Sheet C* through the practice notes issued on the EPA website. The potential for low frequency noise impacts were assessed using the difference between the modelled C- and A-weighted noise levels. At some locations a difference of 15 dB was measured. Therefore, there is the potential for low frequency noise if the threshold levels are exceeded. The measured one-third octave noise levels were reviewed and assessed against the Noise Policy for Industry (2017) one-third octave noise threshold levels provided in Table1. The measured noise levels were generally below the noise threshold levels in all one-third octave bands with the exception of the following:

- Location E, where the noise level was 56 dBZ at 40 Hz, 53 dBZ at 63 Hz, 52 dBZ at 80 Hz and 49 dBZ at 100 Hz. Since the threshold levels are exceeded by between 1 dB and 5 dB during the night time period, a 2 dB modifying factor correction for low frequency noise has been applied.
- Location B, where the noise level was 52 dBZ at 50 Hz. Since the threshold levels are exceeded by between 1 dB and 5 dB during the night time period, a 2 dB modifying factor correction for low frequency noise has been applied.

Table 1 One-third octave low-frequency noise threshold level

Frequency	10	12.5	16	20	25	31.5	40	50	63	80	100	125	160
dBZ criteria	92	89	86	77	69	61	54	50	50	48	48	46	44

Based on the direct attended noise measurements and the assessment methodology in Section 3.2, all receivers comply with the criteria (considering any low frequency noise modification factor).

3.3 Complaints register

Santos has advised that no complaints have been received.

Table 2 WPPS noise contribution, dBA

Receiver	Criteria, LAeq(15min)	LAeq(15min)	WPPS Contribution, LAeq(15min) L90 method	WPPS Contribution LAmax(1min) estimate (Criteria 45 and 50 vacant lot)	Wind speed	Stability Catagory[1]	Observations
B	40 (vacant lot)	35	30 (32)[2]	31	0.4 m/s	E	WPPS audible insects
C	35	34	30	31	1.1 m/s	E	WPPS audible Insects
D (Boundary)	35	35	34	35	1.1 m/s	E	WPPS just audible Cows Insects
E	40 (vacant lot)	43	35 (37)[2]	36	1.5 m/s	E	WPPS audible insects Flock of birds arriving during the measurement
F	35	31	27	28	0.7 m/s	F	WPPS not audible Insects
G	35	35	25	26	1.2 m/s	D	WPPS not audible Dogs barking throughout the measurement at the residence Insects
H	35	36	24	25	1.1 m/s	E	WPPS not audible Dogs barking throughout the measurement at the residence Insects
I	35	34	32	33	1.1 m/s	D	WPPS not audible Insects
J	35	27	21	22	1.1 m/s	D	WPPS not audible Insects

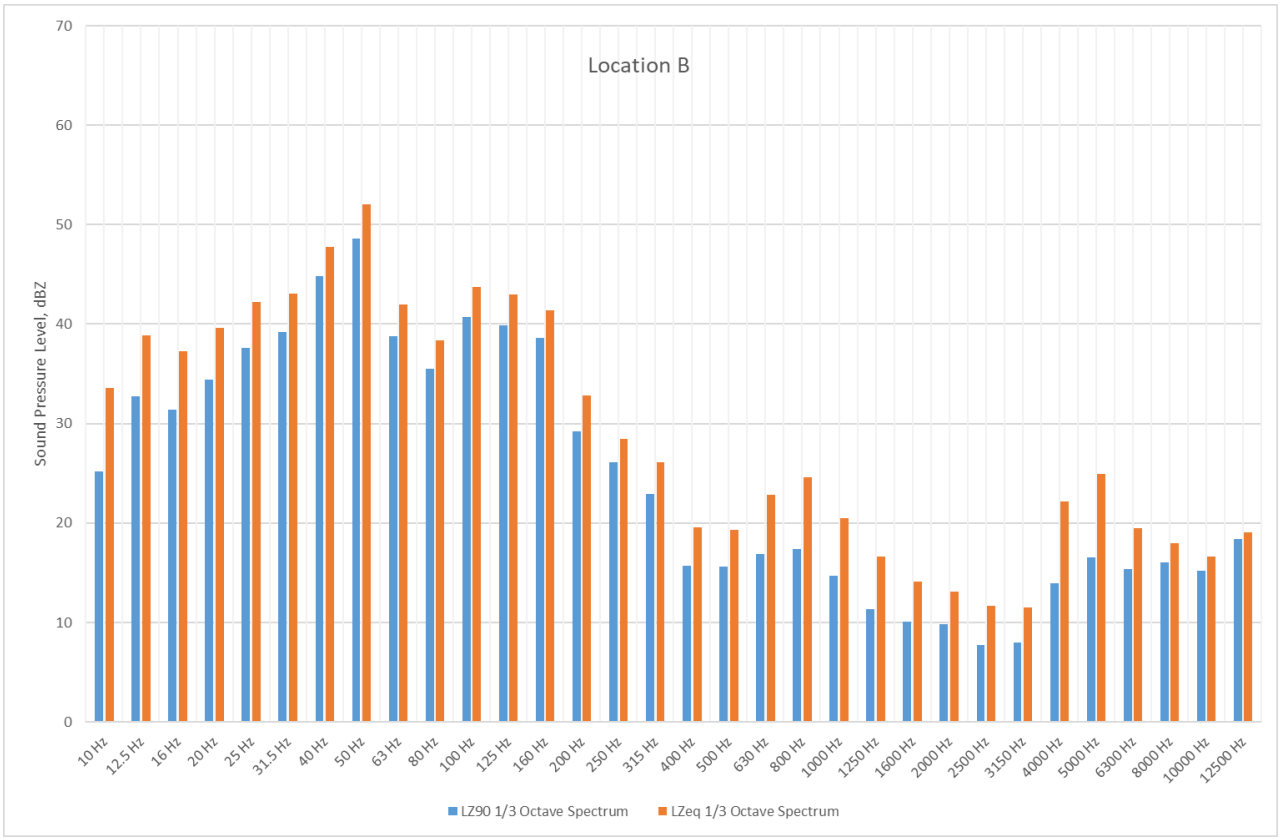
Receiver	Criteria, LAeq(15min)	LAeq(15min)	WPPS Contribution, LAeq(15min) L90 method	WPPS Contribution LAmax(1min) estimate (Criteria 45 and 50 vacant lot)	Wind speed	Stability Catagory[1]	Observations
L	40 (vacant lot)	29	25	26	0.3 m/s	F	WPPS not audible Insects Newell Highway
M	Negotiated agreement in place	31	28	29	0.6 m/s	E	WPPS just audible Insects
N	Negotiated agreement in place (vacant lot)	37	34	35	0.6 m/s	E	WPPS audible Insects
O	40 (vacant lot)	32	28	29	0.4 m/s	F	WPPS audible insects audible
P, Q, R (Boundary)	40 (vacant lot)	28	25	26	0.2 m/s	F	WPPS not audible Insects
S, T, U (Boundary)	35	31	30	31	0.2 m/s	F	WPPS just audible Insects

Note 1: Stability category calculated based on the sigma theta method Section D1.4 of the Noise Policy for Industry (EPA, 2017) for the Leewood weather station.

Note 2: Includes modifying factor correction for low frequency noise

Appendix A

Measured noise level frequency spectrums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30
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12.5 Hz
16 Hz
20 Hz
25 Hz
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40 Hz
50 Hz
63 Hz
80 Hz
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125 Hz
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500 Hz
630 Hz
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1000 Hz
1250 Hz
1600 Hz
2000 Hz
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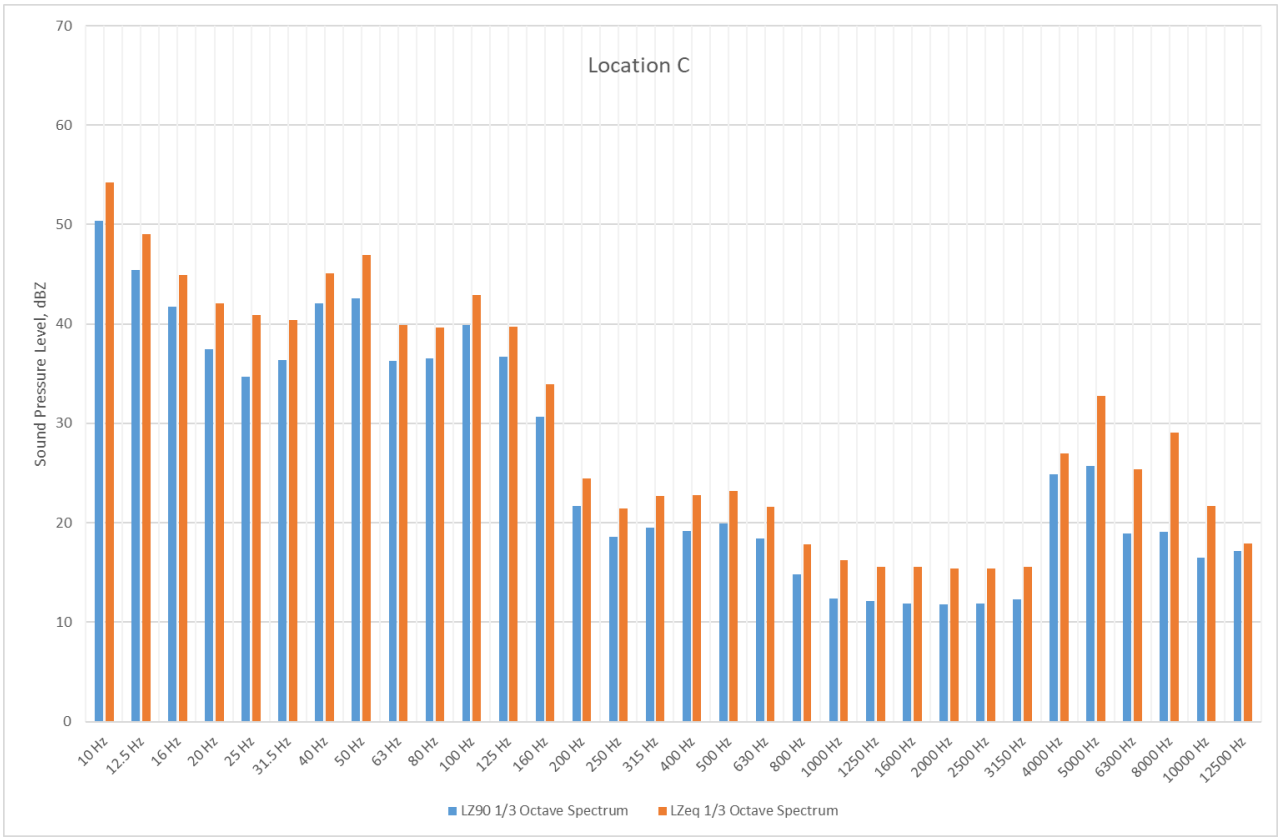
LZ90 1/3 Octave Spectrum
LZeq 1/3 Octave Spectrum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1250 Hz
1600 Hz
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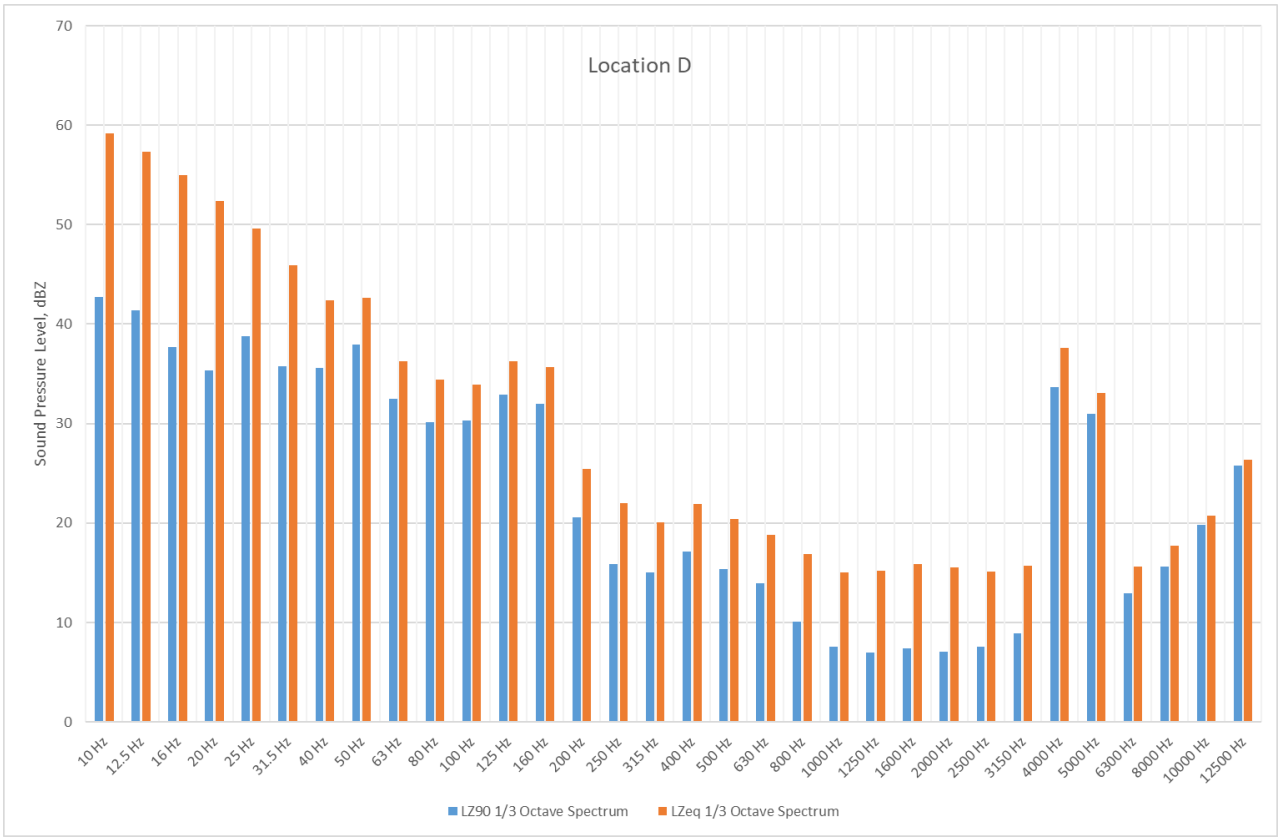
LZ90 1/3 Octave Spectrum
LZeq 1/3 Octave Spectrum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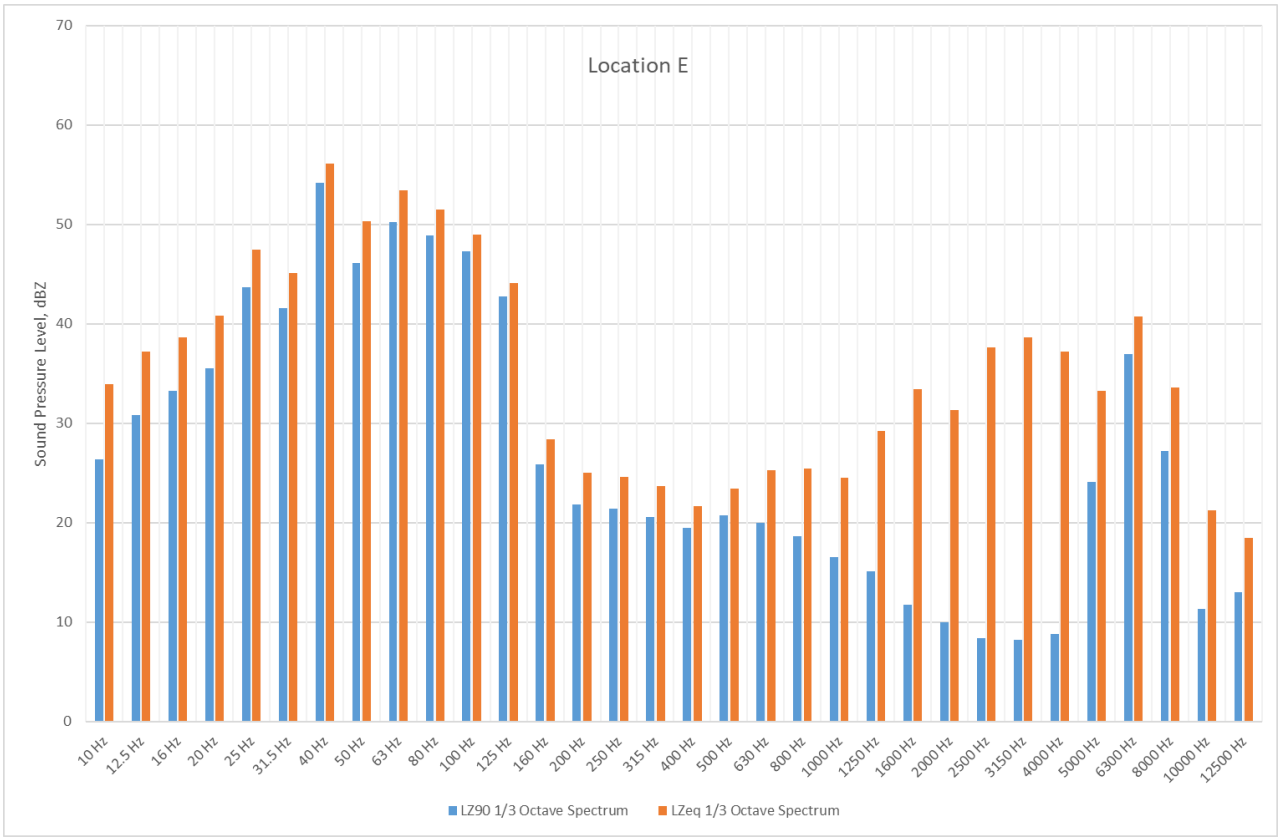
LZ90 1/3 Octave Spectrum
LZeq 1/3 Octave Spectrum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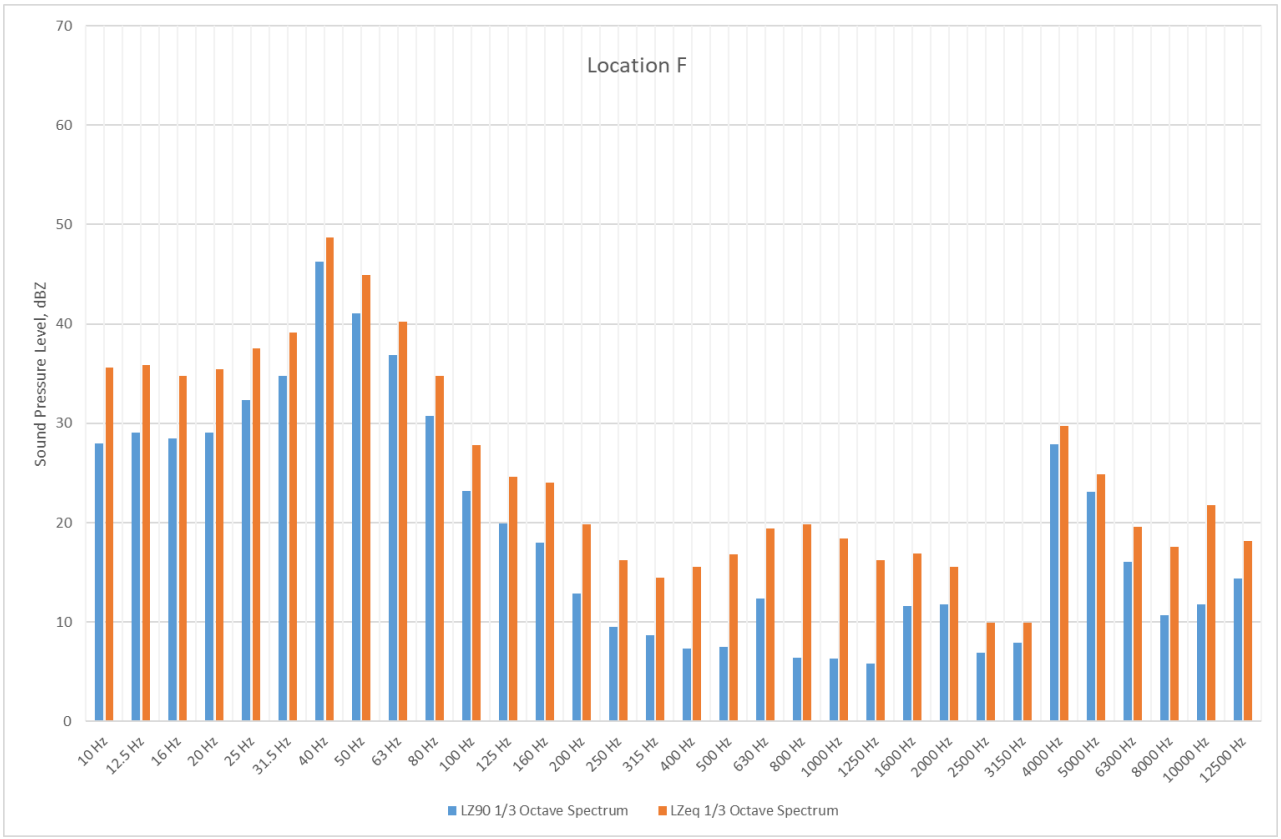
LZeq 1/3 Octave Spectrum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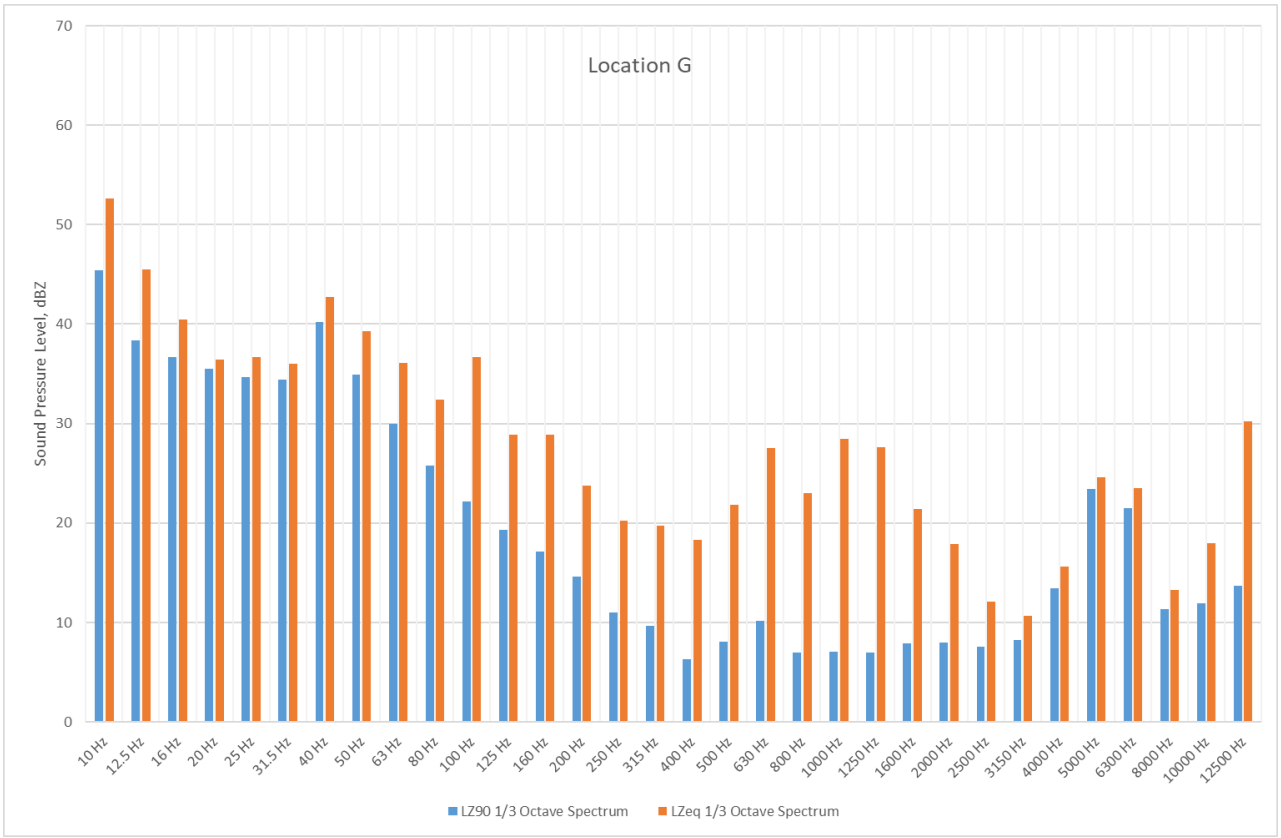
LZ90 1/3 Octave Spectrum
LZeq 1/3 Octave Spectrum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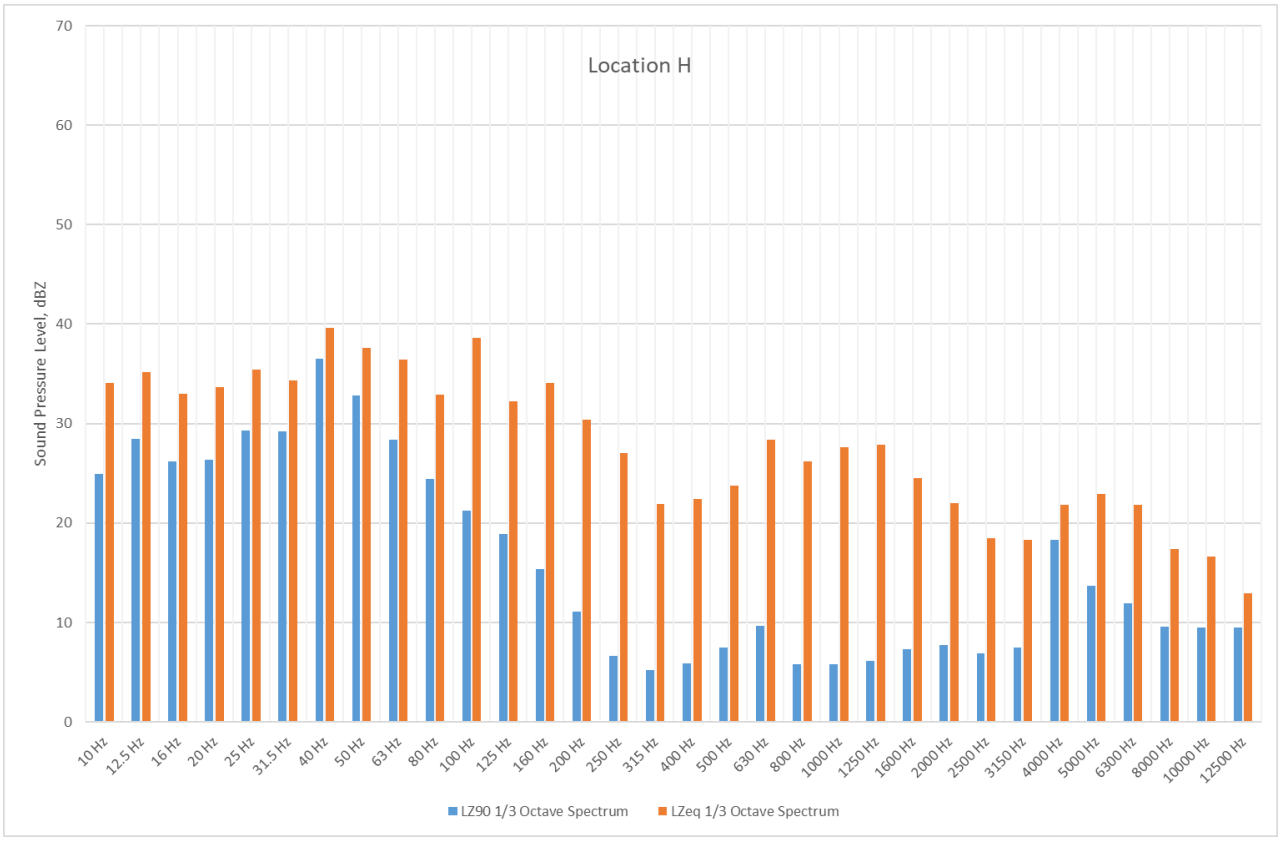
LZ90 1/3 Octave Spectrum
LZeq 1/3 Octave Spectrum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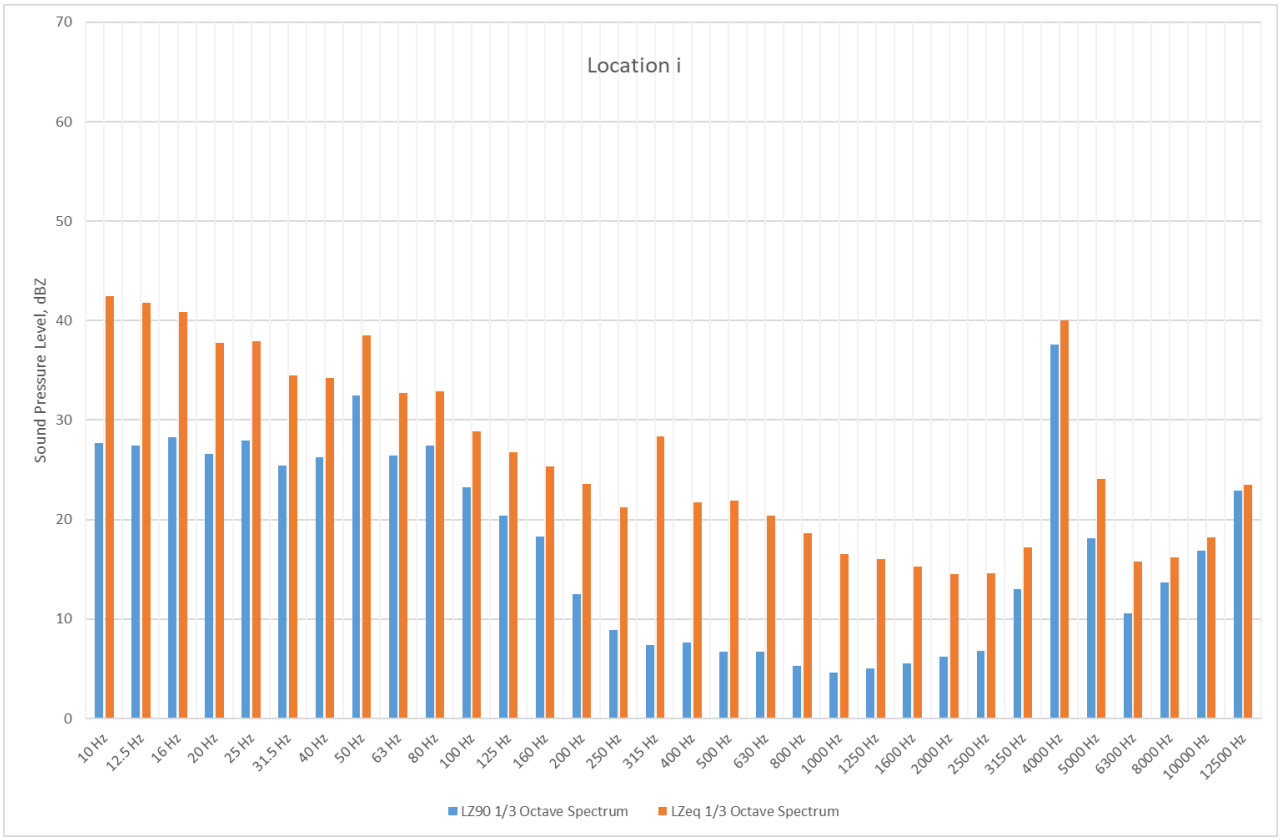
LZeq 1/3 Octave Spectrum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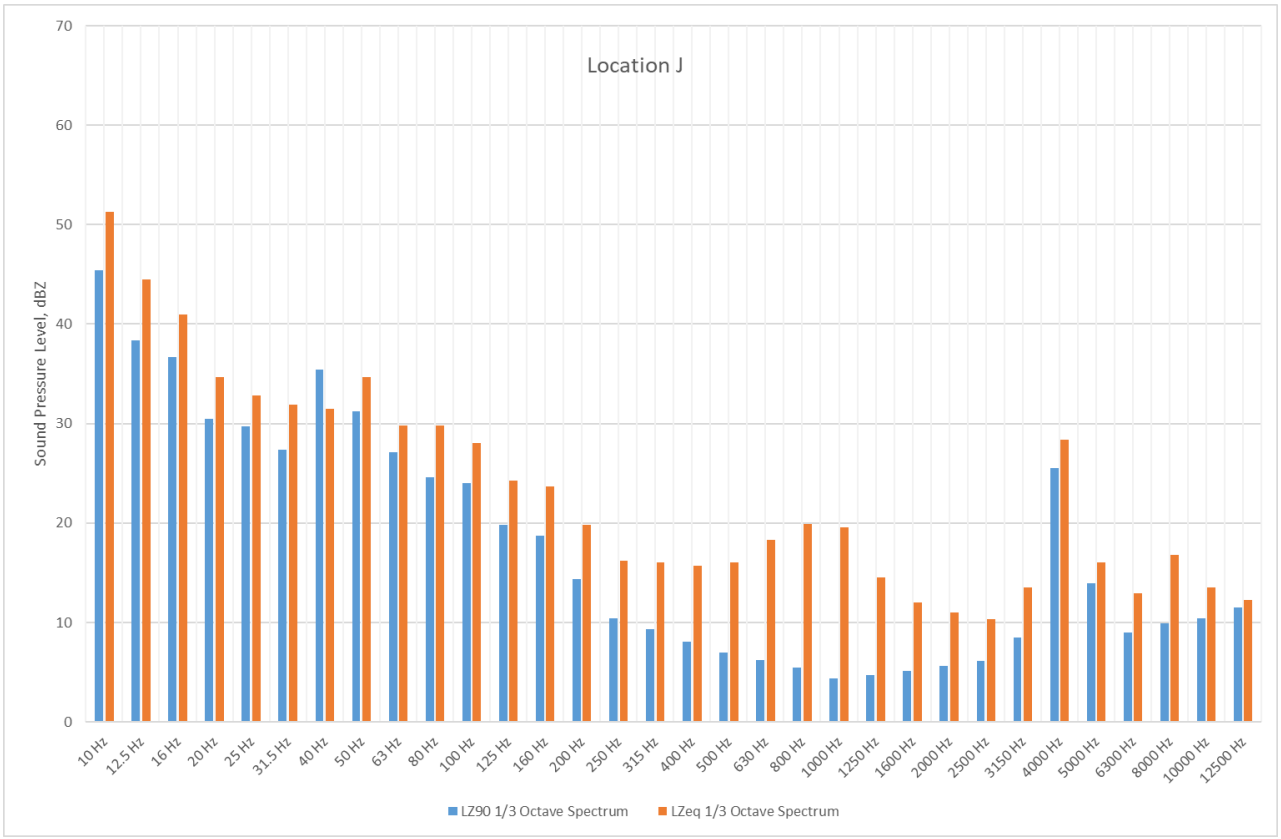
LZeq 1/3 Octave Spectrum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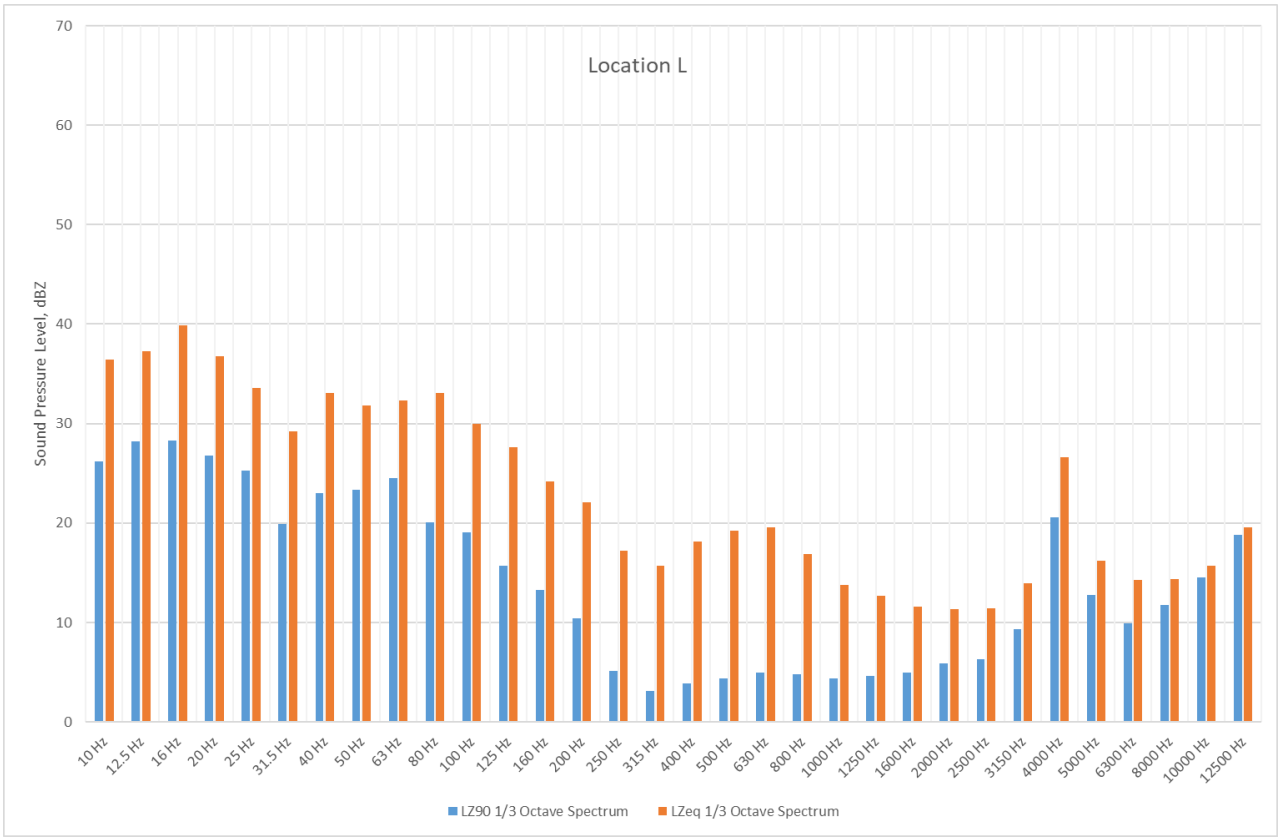
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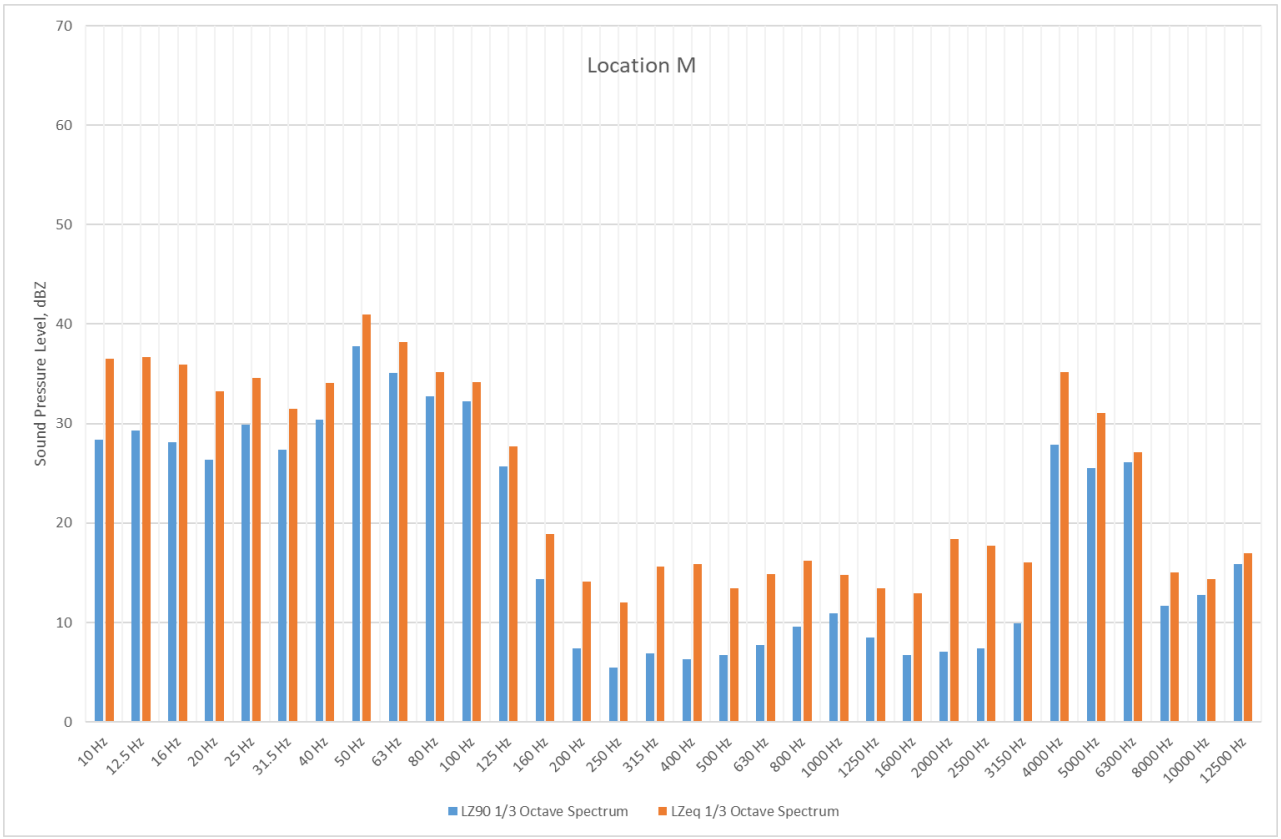
LZeq 1/3 Octave Spectrum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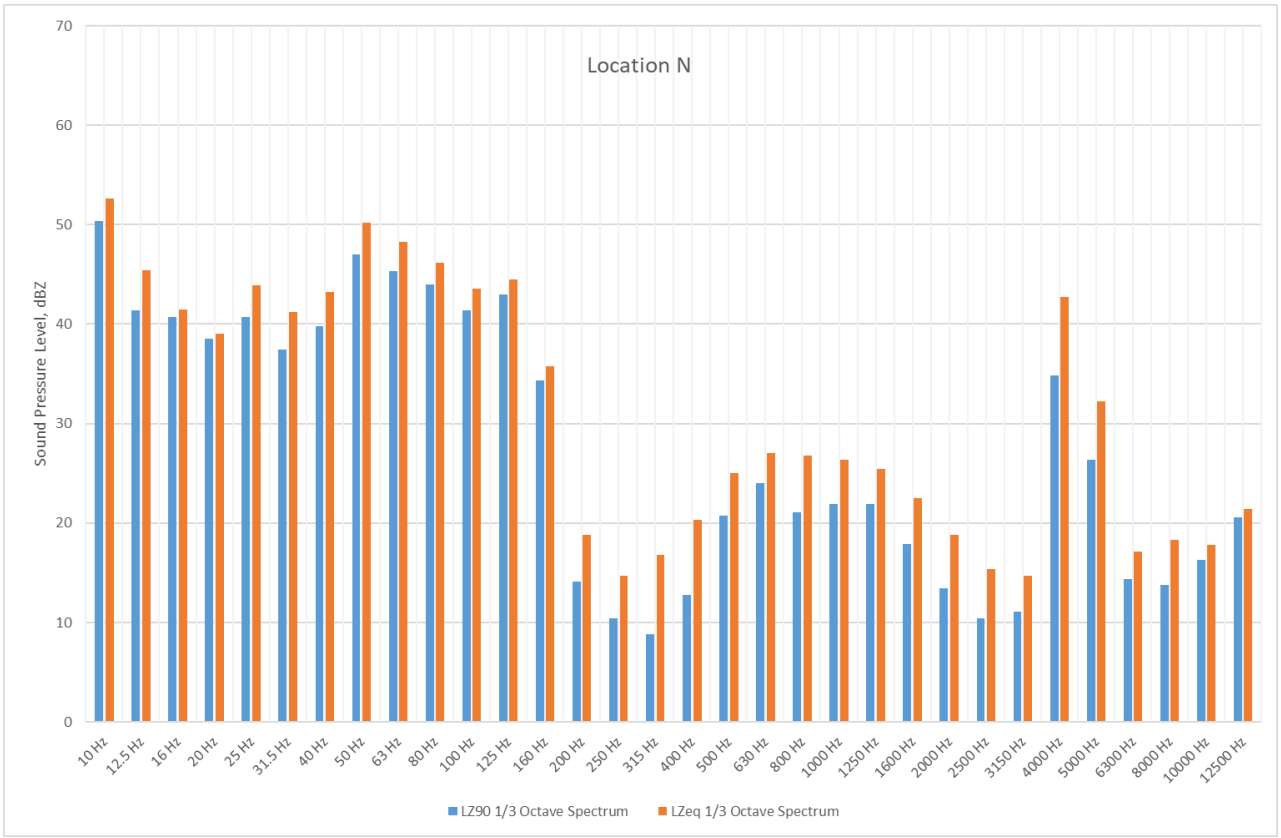
LZeq 1/3 Octave Spectrum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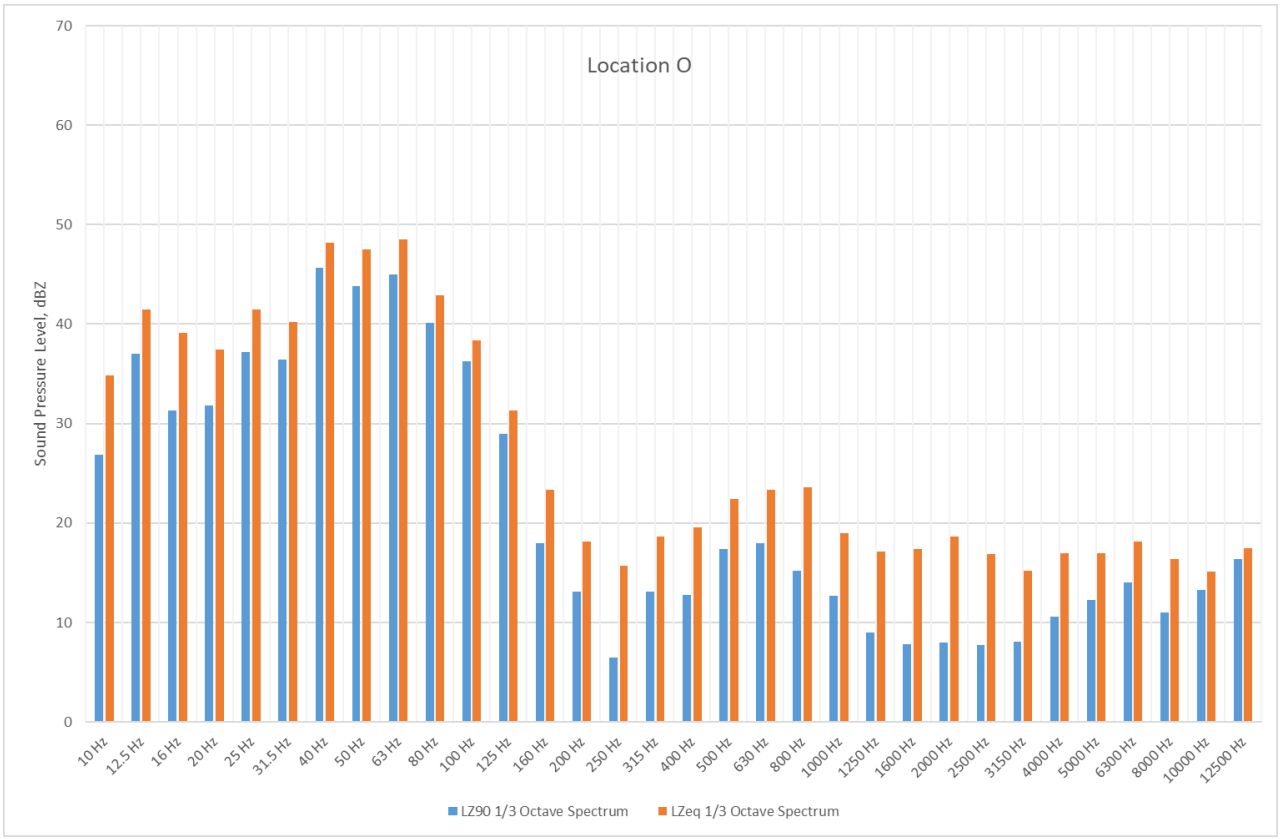
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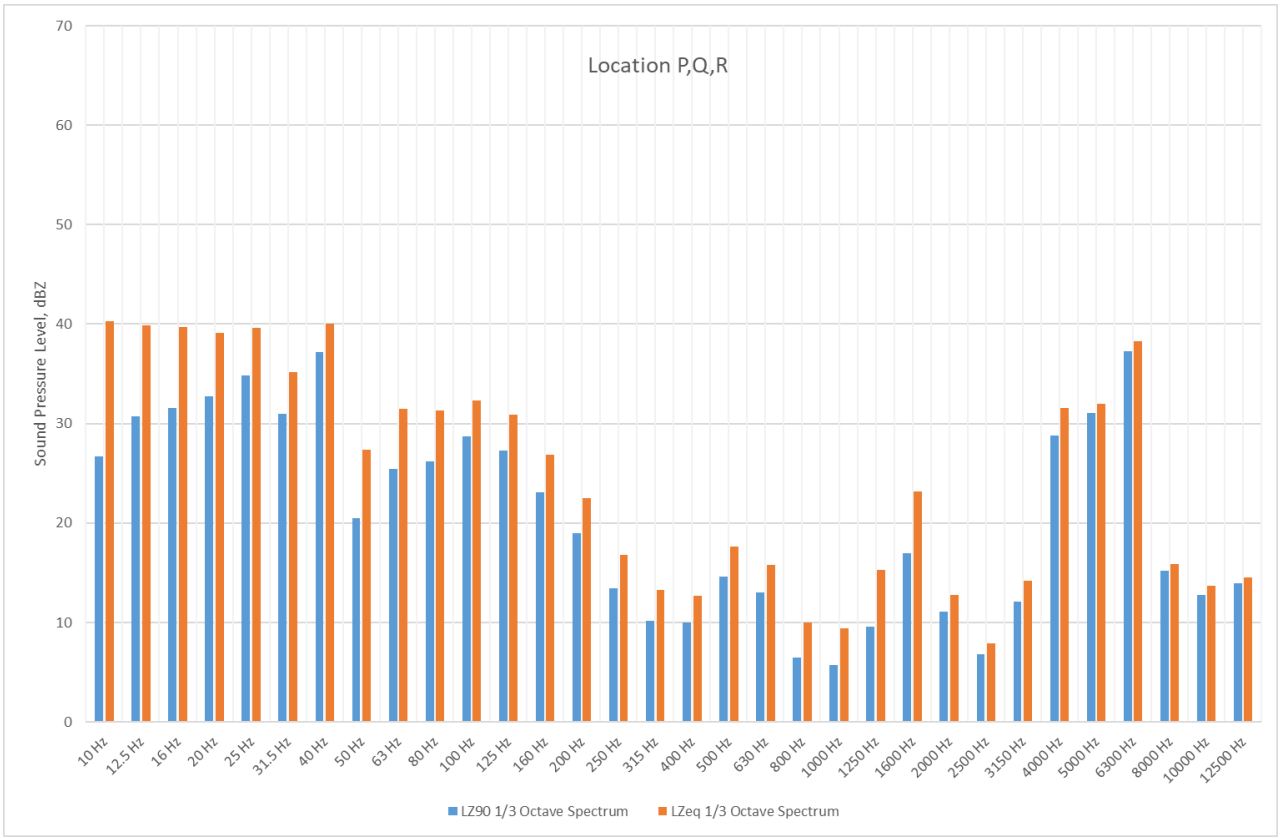
LZeq 1/3 Octave Spectrum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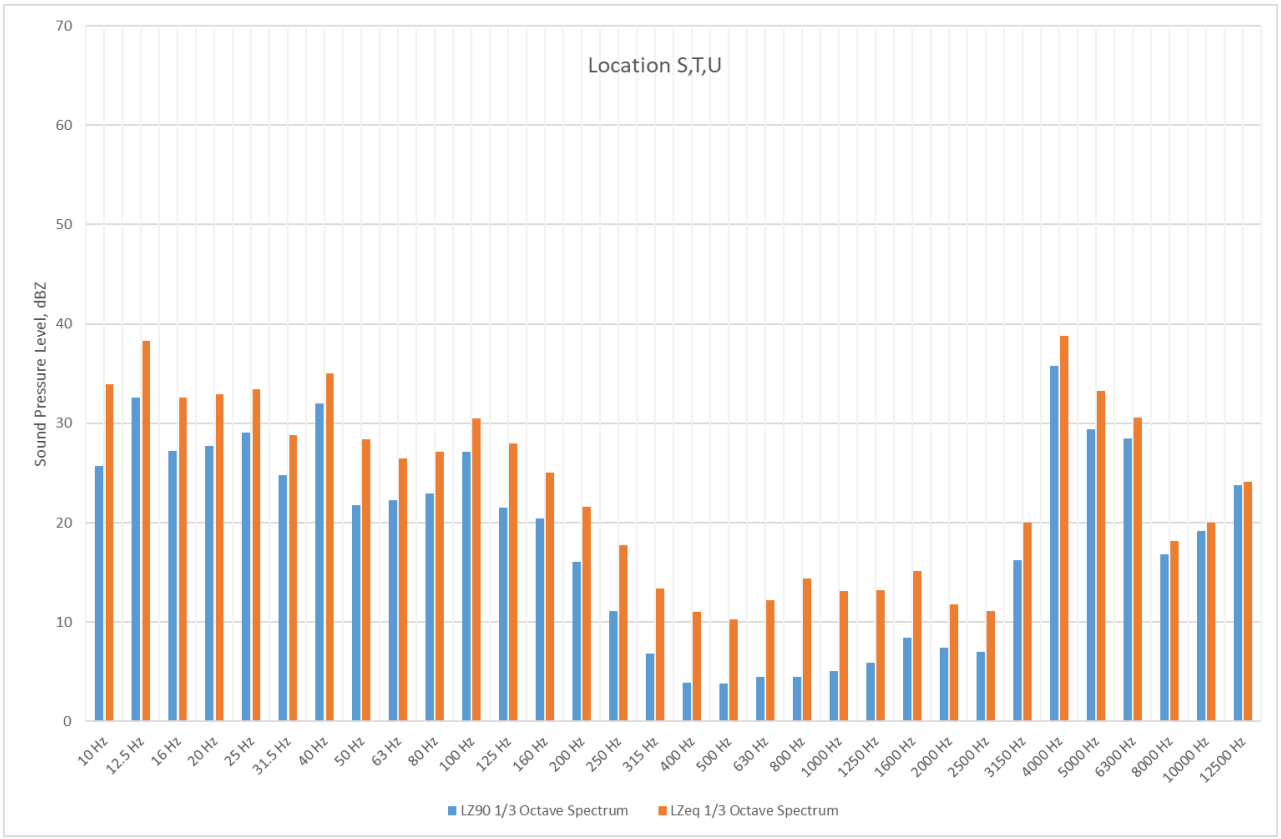
30
20
10
0
10 Hz
12.5 Hz
16 Hz
20 Hz
25 Hz
31.5 Hz
40 Hz
50 Hz
63 Hz
80 Hz
100 Hz
125 Hz
160 Hz
200 Hz
250 Hz
315 Hz
400 Hz
500 Hz
630 Hz
800 Hz
1000 Hz
1250 Hz
1600 Hz
2000 Hz
2500 Hz
3150 Hz
4000 Hz
5000 Hz
6300 Hz
8000 Hz
10000 Hz
12500 Hz
LZ90 1/3 Octave Spectrum
LZeq 1/3 Octave Spectrum


Location S,T,U
Sound Pressure Level, dBZ
70
60
50
40
30
20
10
0
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
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
LZ90 1/3 Octave Spectrum
LZeq 1/3 Octave Spectrum

Appendix B

Calibration certificates

CERTIFICATE OF CALIBRATION

CERTIFICATE NO: SLM34462

EQUIPMENT TESTED: Sound Level Meter

Manufacturer:	Svantek		
Type No:	SVAN-977	**Serial No:**	36872
Mic. Type:	7052E	**Serial No:**	63647
Pre-Amp. Type:	SV12L	**Serial No:**	52947
Filter Type:	1/3 Octave	**Test No:**	F034470

Owner: GHD Pty Ltd
Level 15, 133 Castlereagh Street
Sydney, NSW 2000

Tests Performed: IEC 61672-3:2013 & IEC 61260-3:2016

Comments: All Test passed for Class 1. (See overleaf for details)

CONDITIONS OF TEST:

Ambient Pressure	991	hPa ±1 hPa	**Date of Receipt :**	21/11/2022
Temperature	23	°C ±1° C	**Date of Calibration :**	28/11/2022
Relative Humidity	51	% ±5%	**Date of Issue :**	28/11/2022

Acu-Vib Test Procedure: AVP10 (SLM) & AVP06 (Filters)

CHECKED BY: ..... **AUTHORISED SIGNATURE:** .....

Hein Soe

Accredited for compliance with ISO/IEC 17025 - Calibration
Results of the tests, calibration and/or measurements included in this document are traceable to SI units through reference equipment that has been calibrated by the Australian National Measurement Institute or other NATA accredited laboratories demonstrating traceability.

The uncertainties quoted are calculated in accordance with the methods of the ISO Guide to the Uncertainty of Measurement and quoted at a coverage factor of 2 with a confidence interval of approximately 95%.

NATA
WORLD RECOGNISED ACCREDITATION
Accredited Lab No. 9262
Acoustic and Vibration Measurements

Acu-Vib Electronics
CALIBRATIONS SALES RENTALS REPAIRS
Head Office & Calibration Laboratory
Unit 14, 22 Hudson Ave. Castle Hill NSW 2154
(02) 9680 8133
www.acu-vib.com.au

The performance characteristics listed below were tested. The tests are based on the relevant clauses of IEC 61672-3:2013

Tests Performed:	*Clause*	*Result*
Absolute Calibration	10	Pass
Acoustical Frequency Weighting	12	Pass
Self-Generated Noise	11.1	Observed
Electrical Noise	11.2	Observed
Long Term Stability	15	Pass
Electrical Frequency Weightings	13	Pass
Frequency and Time Weightings	14	Pass
Reference Level Linearity	16	Pass
Range Level Linearity	17	Pass
Toneburst	18	Pass
Peak C Sound Level	19	Pass
Overload Indicator	20	Pass
High Level Stability	21	Pass

Statement of Compliance: The sound level meter submitted for testing has successfully completed the class 1 periodic tests of IEC 61672-3:2013, for the environmental conditions under which the tests were performed. As public evidence was available, from an independent organization responsible for approving the results of pattern evaluation tests performed in accordance with IEC 61672-2:2013, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1:2013, the sound level meter submitted for testing conforms to the class 1 requirements of IEC61672-1:2013.

This Sound Level Meter included an Octave Filter Set. Tests were based on IEC 61260-3:2016 and were conducted to test the following performance characteristics:

Tests performed	*Clause*	*Result*
Test of relative attenuation at filter midband frequency	10	Pass
Linear operating range including range control if fitted	11	Pass
Test of lower limit of linear operating range	12	Pass
Measurement of relative attenuation (filter shape)	13	Pass

The filter submitted for testing successfully completed the tests listed above for the environmental conditions under which the tests were performed. If the filter type has successfully completed the pattern-evaluation tests of IEC 61260-2 then it can be stated that the filter set continues to conform to the specifications of IEC 61260-1.

A full technical report is available on request.

CERTIFICATE OF CALIBRATION

CERTIFICATE NO: SLM34948

EQUIPMENT TESTED: Sound Level Meter

Manufacturer:	Svantek		
Type No:	Svan-977	**Serial No:**	36873
Mic. Type:	7052E	**Serial No:**	83116
Pre-Amp. Type:	SV12L	**Serial No:**	47551
Filter Type:	1/3 Octave	**Test No:**	F034953

Owner: GHD Pty Ltd
Level 15, 133 Castlereagh Street
Sydney, NSW 2000

Tests Performed: IEC 61672-3:2013 & IEC 61260-3:2016

Comments: All Test passed for Class 1. (See overleaf for details)

CONDITIONS OF TEST:

Ambient Pressure	988	hPa ±1 hPa	**Date of Receipt :**	24/01/2023
Temperature	22	°C ±1° C	**Date of Calibration :**	01/02/2023
Relative Humidity	47	% ±5%	**Date of Issue :**	01/02/2023

Acu-Vib Test Procedure: AVP10 (SLM) & AVP06 (Filters)

CHECKED BY: ..... **AUTHORISED SIGNATURE:** .....

Hein Soe

Accredited for compliance with ISO/IEC 17025 - Calibration
Results of the tests, calibration and/or measurements included in this document are traceable to SI units through reference equipment that has been calibrated by the Australian National Measurement Institute or other NATA accredited laboratories demonstrating traceability.

This report applies only to the item identified in the report and may not be reproduced in part.

The uncertainties quoted are calculated in accordance with the methods of the ISO Guide to the Uncertainty of Measurement and quoted at a coverage factor of 2 with a confidence interval of approximately 95%.

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The performance characteristics listed below were tested. The tests are based on the relevant clauses of IEC 61672-3:2013

Tests Performed:	*Clause*	*Result*
Absolute Calibration	10	Pass
Acoustical Frequency Weighting	12	Pass
Self-Generated Noise	11.1	Observed
Electrical Noise	11.2	Observed
Long Term Stability	15	Pass
Electrical Frequency Weightings	13	Pass
Frequency and Time Weightings	14	Pass
Reference Level Linearity	16	Pass
Range Level Linearity	17	Pass
Toneburst	18	Pass
Peak C Sound Level	19	Pass
Overload Indicator	20	Pass
High Level Stability	21	Pass

Statement of Compliance: The sound level meter submitted for testing has successfully completed the class 1 periodic tests of IEC 61672-3:2013, for the environmental conditions under which the tests were performed. As public evidence was available, from an independent organization responsible for approving the results of pattern evaluation tests performed in accordance with IEC 61672-2:2013, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1:2013, the sound level meter submitted for testing conforms to the class 1 requirements of IEC61672-1:2013.

This Sound Level Meter included an Octave Filter Set. Tests were based on IEC 61260-3:2016 and were conducted to test the following performance characteristics:

Tests performed	*Clause*	*Result*
Test of relative attenuation at filter midband frequency	10	Pass
Linear operating range including range control if fitted	11	Pass
Test of lower limit of linear operating range	12	Pass
Measurement of relative attenuation (filter shape)	13	Pass

The filter submitted for testing successfully completed the tests listed above for the environmental conditions under which the tests were performed. If the filter type has successfully completed the pattern-evaluation tests of IEC 61260-2 then it can be stated that the filter set continues to conform to the specifications of IEC 61260-1.

A full technical report is available on request.

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