Solutions Together

Hunter Galvanizing – Environmental Noise Report - November 2024

Report No.:	1241-0
Job No.:	1241
Date:	29 November 2024
Report To:	Hunter Galvanizing Operations Pty Ltd
Attention Of:	Seth Allwood
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1.0 Introduction

pHE was appointed by Hunter Galvanizing Pty Ltd (hereon referred to as HG) to carry out environmental noise monitoring. The purpose of the monitoring was to evaluate compliance with the conditions of Environment Protection Licence (EPL) No. 12014.

Testing was conducted on 26 November 2024 to investigate environmental noise at two (2) locations during Day (7am to 6pm), Evening (6pm to 10pm) and Night (10pm to 7am) time periods as described in section L3.1 of EPL 12014.

Environmental noise terminology used in this report is defined in **Appendix 1**.

1.1 Site

The HG site is located in an industrial zoned area at 13 Old Punt Road Tomago NSW 2322, and is bounded by a precast concrete facility to the South, electrical engineering workshops to the West and North West, as well as a steel house framing fabrication facility to the North.

Site noise is generally characterised as intermittent truck and forklift noise (loading and unloading deliveries etc.), and process alarms, such as forklift reversing alarms, as well as use of power tools and general material handling. The site currently operates from 6:30am-11pm Monday to Friday.

1.2 Criteria

Hunter Galvanizing in accordance with conditions listed in EPL 12014, issued under the Protection of the Environment Operations Act 1997. The licence conditions relating to noise emissions include:

L3.1 Noise emissions from the operation of the premises must:

a) Not exceed an LAeq noise emission criterion of 52 dB(A) during the day (7 am to 6 pm) at the nearest residential receiver.
b) Not exceed an LAeq noise emission criterion of 43 dB(A) during the evening (6 pm to 10 pm) at the nearest residential receiver, and
c) Not exceed an LAeq noise emission criterion of 43 dB(A) during the night (10 pm to 7 am) at the nearest residential receiver.

The noise limits apply under winds of up to 3 metres per second (measured at 10 metres above ground level) and Pasquill stability class from A to F.

L3.2 For the purpose of noise measurement for condition L3.1, the LAeq noise level must be measured or computed at the most affected area within 30 metres of the residence or at the boundary, if the boundary is closer than 30 metres to the residence, over a period/s of 15 minutes using a "FAST" response on the sound level meter.

L3.3 For the purpose of the noise measurements referred to in Condition L3.1, 5dB must be added to the measured level if the noise is substantially tonal or impulsive in character.

In order to evaluate compliance with these conditions, assessment of both measured noise levels and meteorological conditions are required.

2.0 Methodology

2.1 Hunter Galvanizing Site Noise Monitoring

Nearest receiver: Noise receivers are commonly defined as domestic premises, hotels, educations institutions, hospitals, clinics and other similar uses where people may be present for extended durations. For reporting purposes, 10 old punt road, Tomago 2322 was used to be consistent with previous environmental noise reports and attenuation calculated results.

In order to determine the noise contribution of the facility, direct site boundary measurements were used from one point in addition to the nearest identified receiver. The site and locations monitored are identified in **Figure 1** and sample locations are shown in **Table 1**.

Figure 1 Site Monitoring Locations

Table 1 Direct Environmental Noise Measured Locations

Location	Sample Description	Coordinates
1	10 Old Punt Road, Tomago	-32.818712 151.707717
2	13 Old Punt Road, Tomago	-32.821385 151.707813

2.2 Calculation of noise

EPL noise limits are difficult to determine through direct measurement due to the influence of extraneous noise sources during the day, evening and night periods. As HG is situated in a highly industrialised area, it is impacted by heavy movement of cars, trucks and mobile equipment, as well as frequent use of many types of machinery. Therefore, an alternative method of determining compliance, in accordance with the Approved Methods for the Measurement and Analysis of Environmental Noise in NSW was considered appropriate.

In order to evaluate any potential noise contributions from HG, monitoring was carried out at a single location on the North-Western boundary of the site in order to predict the noise levels received at location 1.

The distance attenuation calculation below is used to determine the reduction of sound pressure level (SPL) as a function of distance. This method of noise calculation is suitable to satisfy EPL compliance under Condition L3.2 stating “noise levels must be measured or computed”.

$$SPL_x = SPL_y - 20\log\left(\frac{d_x}{d_y}\right)$$

Where:

SPLx = Sound pressure level at distance x from the source in metres
SPLy = Sound pressure level at distance y from the source in metres
Dx = Distance in metres to location x from the source
Dy = Distance in metres to location y from the source

2.3 Instrumentation

Direct measurements were conducted using a NATA calibrated Cirrus SLM Optimus 171B. This instrument has Class 1 characteristics as defined in AS IEC 61672.1-2004 “Electroacoustics - Sound Level Meters”. Measurements were conducted over 15-minute intervals. Calibration of the instrument was confirmed with a Cirrus 515 Class 1 Sound Level Calibrator prior to, and at the completion of monitoring with all calibration checks at 94.2dB. All equipment used for the monitoring has current NATA accredited calibration certificates.

The sound level meter was set to ‘fast’ time, A weighting and programmed to store L_{Aeq}(15 min) and L_{A90} (15 min) noise levels during each measurement period.

3.0 Monitoring

3.1 Meteorological Conditions

For the purposes of this condition:

a) Data recorded by the Bureau of Meteorology's meteorological station located at Williamtown Automatic Weather Station (AWS) (ID: 061078) was used to determine meteorological conditions; and
b) Temperature inversion conditions (stability category) are to be determined by the Pasquill-Gifford method referred to in Part D1.3.1 of Appendix D in the NSW Industrial Noise Policy.

Meteorological parameters were also taken onsite via portable wind anemometer and temperature gauge. Conditions at the time of monitoring were suitable to meet the criteria listed in L3.1 of EPL 12014.

Meteorological conditions for each sampling period are shown in **Table 2.**

Table 2 Meteorological Conditions

Period	Time	Temperature (C^O)	Wind speed[1] (m/s)- Williamtown AWS	Local Wind speed (m/s)	Insolation[2] (W/m^2)	Cloud Coverage (Oktas)	Pasquill–Gifford stability category
Day	14:48	33	5.5	1.3	357	0	C-D
Evening	21:31	26	4.7	<1.0	N/A	0	E
Night	22:24	25	4.7	<1.0	N/A	0	E

Note [1] wind speed data supplemented using handheld anemometer as Williamtown AWS conditions proved unrepresentative.

Note[2] Insolation defined as Strong, Moderate and Slight based solar radiation data provided by BOM. Strong >500 W/m^2, Moderate 300-500 W/Mm^2, Slight <300 W/m^2.

3.2 Noise Descriptors

Table 3 Noise Descriptors

Descriptor	
L_{Aeq}	The L_{Aeq} descriptor is used for both the intrusiveness noise level and the amenity noise level. This descriptor represents the level of average noise energy over the relevant period of measurement and takes account of peak noise levels as well as the degree of noise fluctuation. This descriptor is most widely correlated with the subjective effect of noise.
L_{A90}	The A-weighted sound pressure level that is exceeded for 90 percent of the time over which a given sound is measured. Any underlying level of noise present in the ambient noise level after extraneous noise is removed is defined as the L_{a90} descriptor.

3.3 Environment Protection Licence Noise Limits

Table 4 EPL Noise limits (EPL ID: 12014)

Time period	Measurement parameter	Noise level dB(A)
Day (7am-6pm)	L_{Aeq} (15 minute)	52
Evening (6pm-10pm)	L_{Aeq} (15 minute)	43
Night (10pm-7am)	L_{Aeq} (15 minute)	43

4.0 Results

Direct environmental noise monitoring was conducted at two locations during the day, evening and night time period.

The results are presented as:

- L_{Aeq} (15min) (the equivalent continuous sound level);
- L_{A90} (15min) (the sound pressure level exceeded for 90% of the measurement period);
- Direct environmental noise monitoring results from two locations (10 Old Punt Road, Tomago and 13 Old Punt Road, Tomago) presented in **Table 5**; and
- Attenuation calculated environmental noise results are presented in **Table 6**.

Table 5 Hunter Galvanising Environmental Noise Results, 26 November 2024

Period	Location	Time	L_{Aeq} dB(A)	L_{A90} dB(A)	Observations
Day	1	14:48	72.7	56.7	Consistent movement of trucks, cars and motorcycles along Old Punt Road. Background noise dominated by cicadas and crickets. Consistent noise generated from trucks idling at the truck stop near the sample location. Industrial processes nearby could not be heard over traffic movement.
	2	14:23	55.6	47.2	Regular forklift movement, reverse alarms and horns. Material handling noise from forklifts and personnel. Background noise of cicadas and crickets as well as distance and persistent 'hum' dominating much of the background noise from a nearby industrial site. General metal impact noises from inside the facility as well as infrequent process alarms inside workshop. Occasional power tool usage onsite and grinding at a nearby offsite location.
Evening	1	21:31	61.7	44.6	Intermittent trucks and cars passing on Old Punt Road as well as trucks infrequently pulling into stopping bay adjacent to sample location. Cricket and persistent 'hum' dominate background noise. Occasional reverse alarms in distance.
	2	21:07	55.8	52.8	Infrequent movement of forklifts, reverse alarms and horn. General metal impact noises from inside facility as well as process alarms. Persistent 'hum' dominating much of the background noise from a nearby industrial site. Background crickets.
Night	1	22:24	61.2	40.2	Intermittent trucks and cars passing on Old Punt Road as well as trucks infrequently pulling into and out of stopping bay adjacent to sample location. Crickets made up majority of the background noise. Note – 'Hum' noise previously heard was not apparent during this noise recording.
	2	22:01	54.6	52.1	Infrequent movement of forklifts, reverse alarms and horn. General metal impact noises from inside facility as well as process alarms. Persistent 'hum' dominating much of the background noise from a nearby industrial site. Background crickets.

Table 6 Attenuation Calculated Hunter Galvanizing Environmental Noise Results, 26 November 2024

Period	Location	Time	Calculated L_{Aeq} dB(A)	L_{Aeq} EPL limit dB(A)	Compliant
Day	1	14:48	39.2	52	Yes
Evening	1	21:31	39.4	43	Yes
Night	1	22:24	38.2	43	Yes

5.0 Discussion

Environmental noise monitoring was conducted on 26 November 2024, during day, evening and night time periods. A Weighted, 15-minute samples were taken using a NATA calibrated class 1 sound level meter at the nearest receiver as directed in Environment Protection Licence 12014. Noise level contributions from HG were unable to be heard from the receiver location, as such, a second monitoring event at the HG site boundary for day, evening and night was deemed necessary to assess noise contributions. Noise level data taken from location 2 (HG boundary) was then used to compute noise levels at the receiver location.

Meteorological observations on the day of noise monitoring were mostly clear skies with light winds. The evening and night periods were clear skies with little to no wind. The Pasquill's stability categories were chosen based off the nearest local weather station (Williamtown AWS) for wind speed and cloud coverage, as well as daily solar radiation from the Bureau of Meteorology. Day, evening and night monitoring periods are in line with section L3.1 of the EPL (12014), and have been categorised as C-D, E and E respectively.

On 26 November 2024 the HG facility was operating under normal conditions as advised by staff. At the time of monitoring, site noise from HG was very minor compared to the surrounding industries and main road between locations 1 and 2, which has heavy truck and car traffic throughout the day and moderate levels of movement through the evening and night. Any noise contributions from HG were not audible at the nearest receiver (Location 1) at either day, evening or night periods, therefore an attenuation calculation was used to determine L_{Aeq} site noise contribution and remove the influence of extraneous noise sources. Much of the noise emissions observed from the onsite boundary consisted of forklift movements around the premises, material handling, reverse alarms and horns, occasional use of power tools and impact noise generated from metal handling inside the premises. Background noise heard at the boundary was primarily from nearby industrial activities and an underlying electrical 'hum' produced by another site. At the offsite receiver location, noise emission was dominated by passing trucks, cars and motorcycles on Old Punt Road, as well as trucks entering the nearby truck stop. Background noise was heavily made up of cicada drone, crickets and distant industrial activities.

The described 'hum' noise which was audible during the evening (but absent during the day and night periods) at the receiver location was emitting from a neighbouring site and contributed to the tonality noise of the monitoring for those noise sampling periods.

The nearest receiver location (10 old punt road, Tomago 2322) was used for consistency with previous environmental noise reports. The location at 10 old punt road, Tomago is classified as an E4 - general industrial land zone and may not be an ideal monitoring location. Investigating into other potential receiver locations shows the nearest site (819 Tomago Road, Tomago) at 810m away may have closer attributes to be classed as a domestic premises. 819 Tomago Road, Tomago as the nearest receiver would have calculated noise emissions levels generated from the HG site to be:

- Day 31.4dB;
- Evening 31.6dB; and
- Night 30.4dB.

6.0 Conclusion

Port Hunter Environmental have undertaken noise monitoring for Hunter Galvanizing at their 13 Old Punt Road, Tomago site. The purpose of this study was to monitor noise emission produced by the Hunter Galvanizing site at the nearest receiver to assess compliance with the stipulated criteria listed in the Environmental Protection Licence 12014. Direct noise contributions were unable to be determined at the nearest receiver due to excessive ambient noise and as such, noise emission levels were taken from the boundary of HG to calculate any potential contributions coming from site activities.

To satisfy the criteria listed in section L3.1 of the EPL (12014) ('winds up to 3 metres per second'), it was determined that meteorological data recorded from the Williamtown Automatic weather station at the time of the assessment were not representative of the local wind speed, therefore manual measurements on site were also taken which were in line with this criterion.

LAeq noise emissions for day, evening and night period were within the EPL criteria for each monitoring period. The attenuated noise contributions computed from the HG premises as well as meteorological conditions at the time of monitoring were considered to be compliant with conditions established in L3.1 EPL 12014.

This concludes the Hunter Galvanizing Pty Ltd Environmental Noise Report. If there are any questions relating to this sampling event, please do not hesitate to contact either Dylan Flannery or Sharn Crosdale of pHE.

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Appendix 1 - Environmental Noise Terminology

The following is a brief description of acoustic terminology used in this report:

Sound power level	The total sound emitted by a source
Sound pressure level	The amount of sound at a specified point
Decibel [dB]	The measurement unit of sound
A Weighted decibels [dB(A)]	The A weighting is a frequency filter applied to measured noise levels to represent how humans hear sounds. The A-weighting filter emphasises frequencies in the speech range (between 1kHz and 4 kHz) which the human ear is most sensitive to, and places less emphasis on low frequencies at which the human ear is not so sensitive. When an overall sound level is A-weighted it is expressed in units of dB (A).
Decibel scale	The decibel scale is logarithmic in order to produce a better representation of the response of the human ear. A 3 dB increase in the sound pressure level corresponds to a doubling in the sound energy. A 10 dB increase in the sound pressure level corresponds to a perceived doubling in volume. Examples of decibel levels of common sounds are as follows: 0dB(A) Threshold of human hearing 30dB(A) A quiet country park 40dB(A) Whisper in a library 50dB(A) Open office space 70dB(A) Inside a car on a freeway 80dB(A) Outboard motor 90dB(A) Heavy truck pass-by 100dB(A) Jackhammer/Subway train 110 dB(A) Rock Concert 115dB(A) Limit of sound permitted in industry 120dB(A) 747 take off at 250 metres
Frequency [f]	The repetition rate of the cycle measured in Hertz (Hz). The frequency corresponds to the pitch of the sound. A high frequency corresponds to a high-pitched sound and a low frequency to a low-pitched sound.
L_{Aeq}	The constant sound level which, when occurring over the same period of time, would result in the receiver experiencing the same amount of sound energy.
L_{max}	The maximum sound pressure level measured over the measurement period
L_{min}	The minimum sound pressure level measured over the measurement period
L_{10}	The sound pressure level exceeded for 10% of the measurement period.
L_{A90}	The sound pressure level exceeded for 90% of the measurement period.
Ambient noise	The all-encompassing noise at a point composed of sound from all sources near and far.
Background noise	The underlying level of noise present in the ambient noise when extraneous noise (such as transient traffic and dogs barking) is removed. The L_{A90} sound pressure level is used to quantify background noise.
Traffic noise	The total noise resulting from road traffic. The L_{eq} sound pressure level is used to quantify traffic noise.
Day	The period from 0700 to 1800 h Monday to Saturday and 0800 to 1800 h Sundays and Public Holidays.
Evening	The period from 1800 to 2200 h Monday to Sunday and Public Holidays.
Night	The period from 2200 to 0700 h Monday to Saturday and 2200 to 0800 h Sundays and Public Holidays.
Assessment background level [ABL]	The overall background level for each day, evening and night period for each day of the noise monitoring.
Rating background level [RBL]	The overall background level for each day, evening and night period for the entire length of noise monitoring.

Appendix 2 – Noise Reports

Cirrus Research plc

Measurement Summary Report

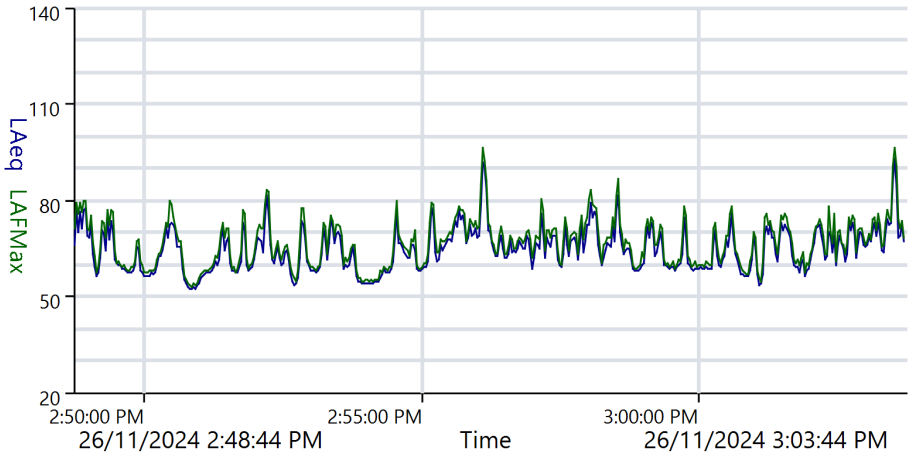
Name	Location 1 - Receiver (Day): 10 Old Punt Road				
Time	26/11/2024 2:48:44 PM	**Person**		**Place**	**Project**
Duration	00:15:00				
Instrument	G301210, CR:171B				

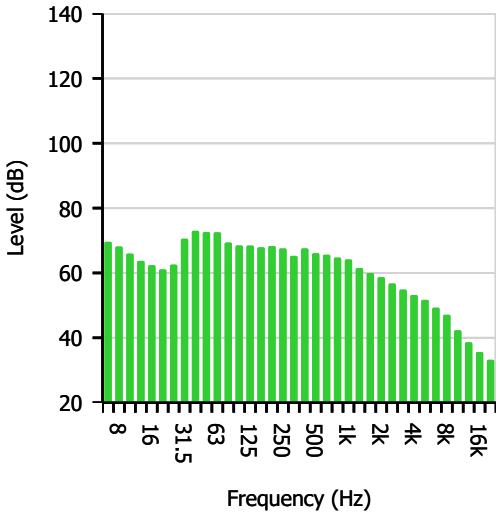
Calibration

Before	25/11/2024 1:33 PM	Offset	0.86 dB	**After**	Offset

Basic Values	
LAeq	72.7 dB
LAE	102.2 dB
LAFMax	96.4 dB

Statistical Levels (Ln)	
LAF1	84.2 dB
LAF5	75.0 dB
LAF10	72.4 dB
LAF50	63.4 dB
LAF90	56.7 dB
LAF95	54.5 dB
LAF99	52.8 dB





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Measurement Summary Report

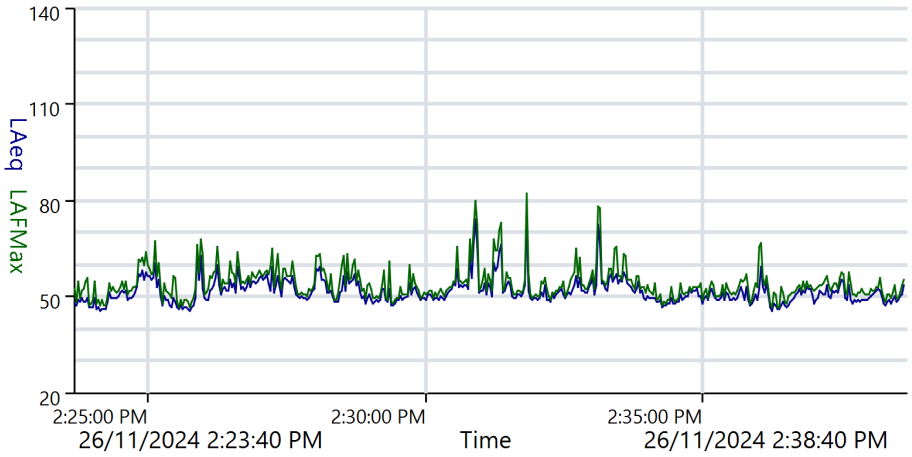
Name	Location 2 - Site Boundary (Day): 13 Old Punt Road			
Time	26/11/2024 2:23:40 PM	**Person**	**Place**	**Project**
Duration	00:15:00			
Instrument	G301210, CR:171B			

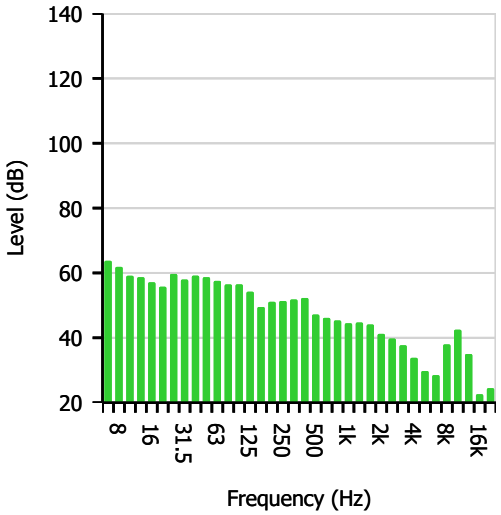
Calibration

Before	25/11/2024 1:33 PM	Offset	0.86 dB	**After**	Offset

Basic Values	
LAeq	55.6 dB
LAE	85.1 dB
LAFMax	81.8 dB

Statistical Levels (Ln)	
LAF1	65.1 dB
LAF5	57.0 dB
LAF10	55.2 dB
LAF50	50.4 dB
LAF90	47.2 dB
LAF95	46.4 dB
LAF99	45.4 dB





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Cirrus Research plc

Measurement Summary Report

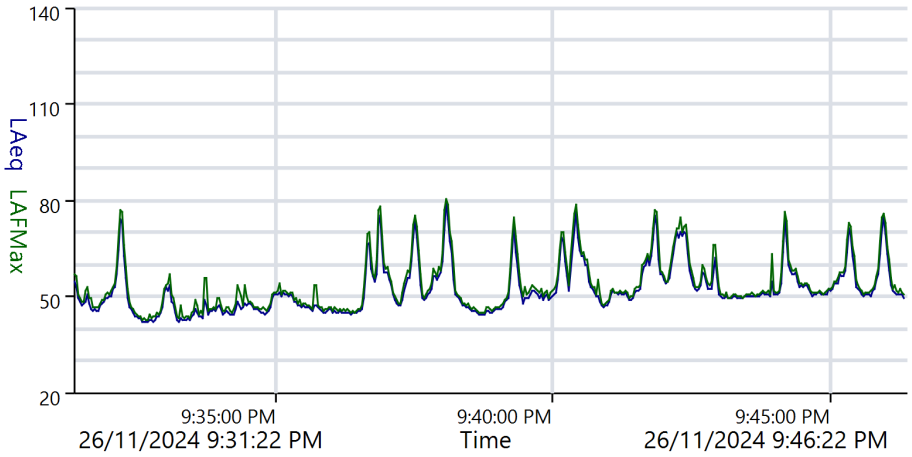
Name	Location 1 - Receiver (Evening): 10 Old Punt Road				
Time	26/11/2024 9:31:22 PM	**Person**		**Place**	**Project**
Duration	00:15:00				
Instrument	G301210, CR:171B				

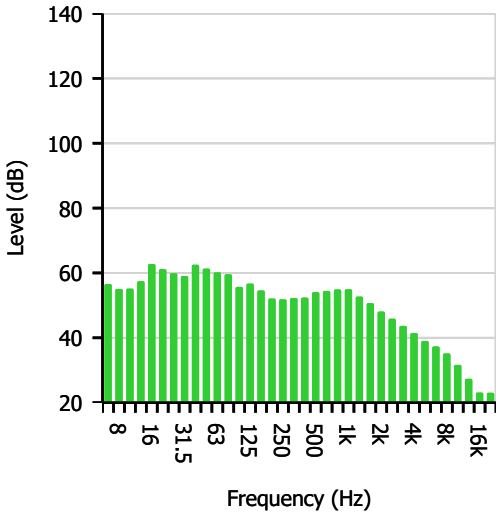
Calibration

Before	25/11/2024 1:33 PM	Offset	0.86 dB	**After**	Offset

Basic Values	
LAeq	61.7 dB
LAE	91.2 dB
LAFMax	80.1 dB

Statistical Levels (Ln)	
LAF1	75.1 dB
LAF5	68.6 dB
LAF10	62.7 dB
LAF50	50.2 dB
LAF90	44.6 dB
LAF95	43.5 dB
LAF99	41.9 dB





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Measurement Summary Report

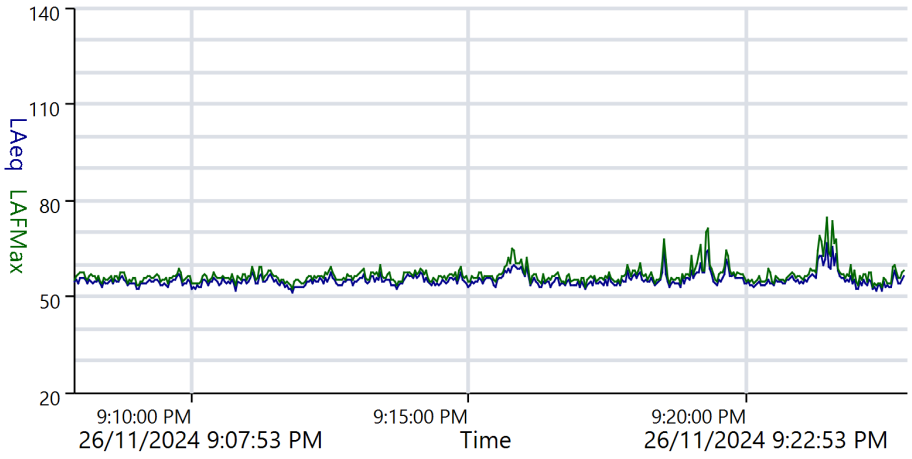
Name	Location 2 - Site Boundary (Evening): 13 Old Punt Road				
Time	26/11/2024 9:07:53 PM	**Person**		**Place**	**Project**
Duration	00:15:00				
Instrument	G301210, CR:171B				

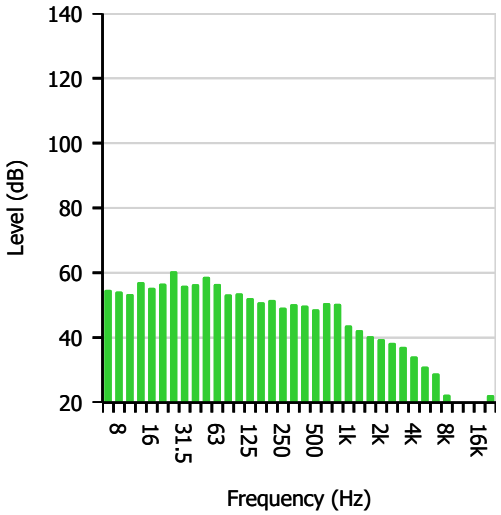
Calibration

Before	25/11/2024 1:33 PM	Offset	0.86 dB	**After**	Offset

Basic Values	
LAeq	55.8 dB
LAE	85.3 dB
LAFMax	74.5 dB

Statistical Levels (Ln)	
LAF1	62.5 dB
LAF5	58.3 dB
LAF10	57.1 dB
LAF50	54.5 dB
LAF90	52.8 dB
LAF95	52.4 dB
LAF99	51.6 dB





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Measurement Summary Report

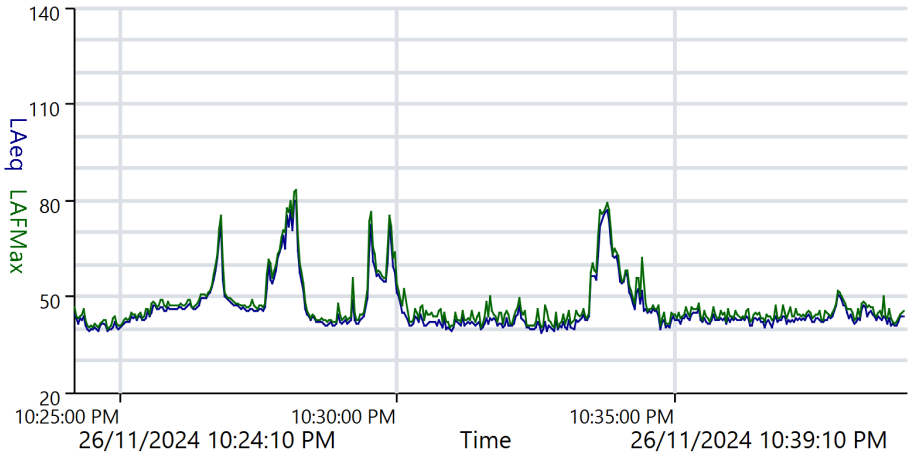
Name	Location 1 - Receiver (Night): 10 Old Punt Road				
Time	26/11/2024 10:24:10 PM	**Person**		**Place**	**Project**
Duration	00:15:00				
Instrument	G301210, CR:171B				

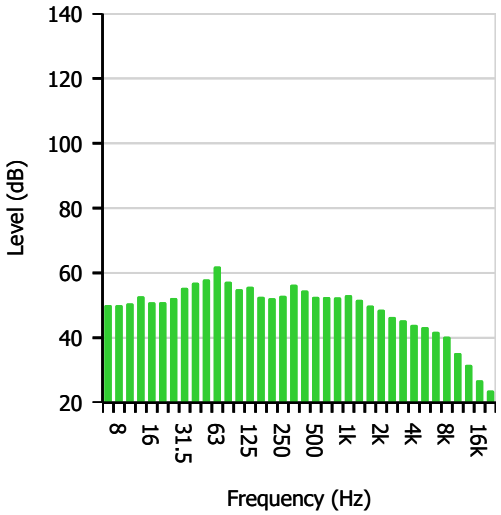
Calibration

Before	25/11/2024 1:33 PM	Offset	0.86 dB	**After**	Offset

Basic Values	
LAeq	61.2 dB
LAE	90.7 dB
LAFMax	83.0 dB

Statistical Levels (Ln)	
LAF1	75.7 dB
LAF5	63.2 dB
LAF10	56.1 dB
LAF50	43.0 dB
LAF90	40.2 dB
LAF95	39.7 dB
LAF99	38.9 dB





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Cirrus Research plc

Measurement Summary Report

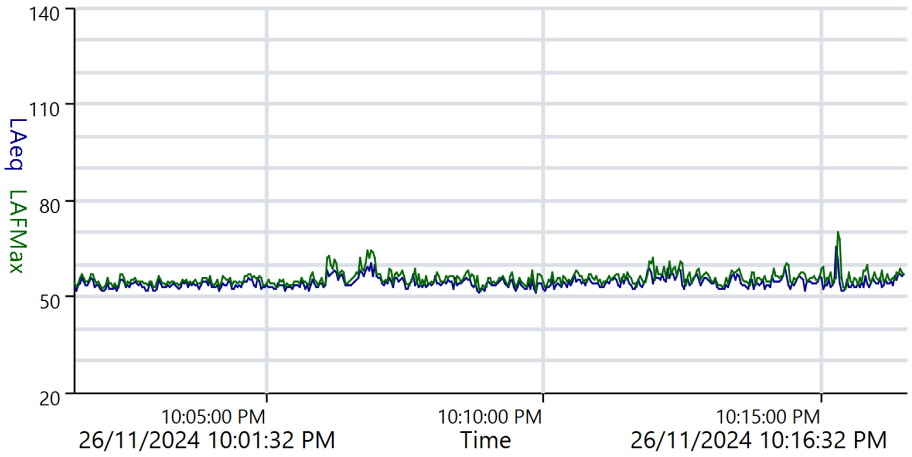
Name	Location 2 - Site Boundary (Night): 13 Old Punt Road				
Time	26/11/2024 10:01:32 PM	**Person**		**Place**	**Project**
Duration	00:15:00				
Instrument	G301210, CR:171B				

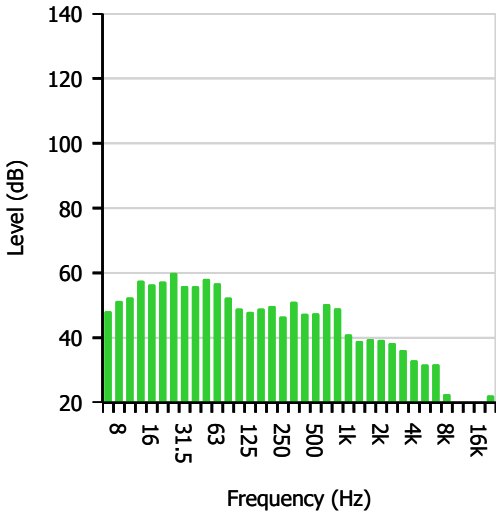
Calibration

Before	25/11/2024 1:33 PM	Offset	0.86 dB	**After**	Offset

Basic Values	
LAeq	54.6 dB
LAE	84.1 dB
LAFMax	69.8 dB

Statistical Levels (Ln)	
LAF1	59.6 dB
LAF5	57.2 dB
LAF10	56.2 dB
LAF50	53.8 dB
LAF90	52.1 dB
LAF95	51.7 dB
LAF99	51.0 dB





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Appendix 3 – Calibration Certificates

THE CALIBRE TECHNOLOGY
ACOUSTIC & VIBRATION CALIBRATION CENTRE

CERTIFICATE OF CALIBRATION

Certificate Number: 7603

NATA Accreditation No: 20688

Customer: **Active Environmental Solutions**

Test Object:	Manufacturer:	Model:	Serial No:	ID:
Sound Level Meter	Cirrus	Optimus 171B	G301210	7603
Microphone	Cirrus	MK224	212412D	7603
Preamplifier	Cirrus	MK224	9847F	7603
Calibrator	None	-	-	-
Connecting Cable	None	-	-	-

Information:

Test Configuration:	Microphone on Preamp
Instrument Manual:	Optimus Sound Level Meters User Manual Part B Technical Information
Firmware Version:	V5.3.2807
Class of Instrument:	Class 1
Source of Correction Data:	Cirrus
Reference Level:	94 dB
Reference Level Range:	55 - 135 dB

Environmental Conditions:	Pressure	Temperature	Relative Humidity
Reference Conditions:	101.325 kPa	23.0 °C	50.0 % RH
Conditions Before Measurement:	101.10 kPa	24.7 °C	55.3 % RH
Conditions After Measurement:	101.05 kPa	25.4 °C	58.8 % RH

The laboratory environmental conditions remained within the acceptable limits as defined in IEC 61672.3 and IEC 61260 throughout the calibration test.

The measurements are performed according to the *IEC 61672 Sound level meters – Part 3: Periodic tests (2013)*, and *DIN 45657 Sound Level Meters – Requirements for Special Applications (2015).* Where applicable testing has also been completed in accordance with *IEC 61260 Electroacoustics – Octave-band and fractional-octave-band filters (2016)*.

This certificate only relates to the test object calibrated. This certificate shall only be reproduced in full with the permission of Calibre Technology.

Accredited for compliance with ISO/IEC 17025 - Calibration.
The results of the tests, calibrations and/or measurements included in this document are traceable to the International System of Units (SI) via international or Australian/national standards. NATA is a signatory to the ILAC Mutual Recognition Arrangement for the mutual recognition of the equivalence of testing, medical testing, calibration and inspection reports.

Date of Calibration: 07/02/2024
Date of Issue: 07/02/2024
Authorised Signatory:

Claire Richardson

ilac-MRA NATA WORLD RECOGNISED ACCREDITATION

Certificate Number: 7603

NATA Accreditation No: 20688

Statement of Conformity

The sound level meter submitted for testing has successfully completed the Class 1 periodic tests of IEC 61672-3, for the environmental conditions under which the tests were performed. However, no general statement or conclusion can be made about conformance of the sound level meter to the full requirements of IEC 61672-1 because evidence was not publicly available, from an independent testing organization responsible for pattern approvals, to demonstrate that the model of sound level meter fully conforms to the requirements of IEC 61672-1:2002, and because the periodic tests of IEC 61672-3 cover only a limited subset of the specifications in IEC 61672-1.

Uncertainty

For all tests, the expanded uncertainty of measurement is reported at approximately 95% confidence level with a coverage factor k, of 2 calculated in accordance with the principles stated in *JCGM 100:2008 – Evaluation of Measurement Data – Guide to the Expression of Uncertainty in Measurement.*

Except where noted otherwise, the results provided in this report are associated with the following expanded uncertainties:
Electrical Tests: 0.09 dB
Toneburst: 0.09 dB
Acoustic Tests:
0.13 dB for 31.5 Hz to below 2 kHz
0.14 dB for 2 kHz to below 8 kHz
0.16 dB for 8 kHz to below 12.5 kHz
0.10 dB at a reference frequency of 1 kHz

Bandpass Filters:
0.10 dB for attenuation less than 4 dB
0.15 dB for attenuation less above 4 dB to 18 dB
0.25 for attenuation 18 dB to 80 dB

Traceability

The measured values are traceable to the following laboratories:

Sound Pressure Level:	National Measurement Institute, Australia
Voltage:	TR Calibration, Australia
Frequency:	TR Calibration, Australia
Ambient Pressure:	IPAC Solutions, Australia
Temperature:	IPAC Solutions, Australia
Relative Humidity:	IPAC Solutions, Australia

Test Overview

Periodic tests were performed in accordance with procedures from IEC 61672-3 Ed. 2.0 (2013) and, where acoustic filters are provided on the instrument, in accordance with IEC 61260-3(2019). In accordance with Clause 8.1 of IEC 61672-3, all design features that are required by IEC 61672-1 that are available on the instrument have been tested.

The verification measurements were performed using the calibration system Nor1504A with software Nor1019. The output signal was manually confirmed to match instrument display as per IEC61672-3 (2013, Clause 8.4) Most of the verification tests are electrical tests. Test signals are fed to the sound measuring device through an adapter that resembles the microphone signal. A special adapter with a suitable electrical characteristic is used.

Some measurements are acoustical tests. This is the acoustical part of the self noise test and the acoustical verification of the frequency response. This test was completed automatically.

Detailed measurement results are printed on the following pages. Each of the verification test points has a Result indication (P, U, or N) that tells the obtained result of the actual test.
P = the result is Passed
U = due to the Uncertainty of the measurement it is not possible to state if the result is passed or not
N = the result is Not passed
All verification tests must have a Passed indication in order to fulfill the requirements in the standard.

Acoustical levels are stated relative to 20 µPa. Other dB levels are relative values.
Version of Calibration Software Used: 6.1S-(CT 2.1.2)

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Version of Template Certificate Used: v8.6

Measurement Results:

Indication at the Calibration Check Frequency - IEC61672-3 Ed.2 #10	**Passed**
Self-generated Noise - IEC 61672-3 Ed.2.0 #11	**Passed**
Acoustical Signal Tests Of A Frequency Weighting - IEC 61672-3 Ed.2.0 #12	**Passed**
Frequency Weightings: A Network - IEC 61672-3 Ed.2.0 #13.3	**Passed**
Frequency Weightings: C Network - IEC 61672-3 Ed.2.0 #13.3	**Passed**
Frequency Weightings: Z Network - IEC 61672-3 Ed.2.0 #13.3	**Passed**
Frequency and Time Weightings at 1 kHz IEC 61672-3 Ed.2.0 #14	**Passed**
Level Linearity on the Reference Level Range - IEC 61672-3 Ed.2.0 #16	**Passed**
Toneburst Response - IEC 61672-3 Ed.2.0 #18	**Passed**
Peak C Sound Level - IEC 61672-3 Ed.2.0 #19	**Passed**
Overload Indication - IEC 61672-3 Ed.2.0 #20	**Passed**
High Level Stability Test - IEC 61672-3 Ed.2.0 #21	**Passed**
Long Term Stability Test - IEC 61672-3 Ed.2.0 #15	**Passed**
DIN 45657 (2013): Statistical Distribution Test #5.2	**Passed**
Filter Test - IEC 61260.3 2019 1/1 Octave: Relative attenuation at Midband Frequency #10.2	**Passed**
Filter Test - IEC 61260.3 2019 1/1 Octave: Linear Operating Range #11.5	**Passed**
Filter Test - IEC 61260.3 2019 1/1 Octave: Overload Indicator #11.8	**Passed**
Filter Test - IEC 61260.3 2019 1/1 Octave: Lower Limit Of Operating Range #12	**Passed**
Filter Test - IEC 61260.3 2019 1/1 Octave: Relative attenuation #13	**Passed**
Filter Test - IEC 61260.3 2019 1/3 Octave: Relative attenuation at Midband Frequency #10.2	**Passed**
Filter Test - IEC 61260.3 2019 1/3 Octave: Linear Operating Range #11.5	**Passed**
Filter Test - IEC 61260.3 2019 1/3 Octave: Overload Indicator #11.8	**Passed**
Filter Test - IEC 61260.3 2019 1/3 Octave: Lower Limit Of Operating Range #12	**Passed**
Filter Test - IEC 61260.3 2019 1/3 Octave: Relative attenuation #13	**Passed**

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Results

Indication at the Calibration Check Frequency - IEC61672-3 Ed.2 #10

Reference Calibrator: WSC3 - B&K4226_1k_94dB
Reference calibrator level: 94.22
Before calibration:
Environmental corrections:
Other corrections:
Notional level:
Calibrator level before adjustment: 94.1
After calibration:
Environmental corrections:
Other corrections:
Notional level:
Reference calibrator level after calibration: 94.1
Associated Calibrator: - -
Associated calibrator level: Not calibrated
Test Passed

Self-generated Noise - IEC 61672-3 Ed.2.0 #11

Network	Level (dB)	Max (dB)	Uncert. (dB)	Result	Comment
A	14.5	15.0	0.09	P	Equivalent capacity
C	15.9	24.0	0.09	P	Equivalent capacity
Z	18.5	35.0	0.09	P	Equivalent capacity

Test Passed 07/02/2024
Note: Compliance with this test is not a requirement of IEC61672.3-2013, these results are provided for reference only.

Acoustical Signal Tests of A Frequency Weighting - IEC 61672-3 Ed.2.0 #12

C-Weighted Results: Free Field Response

Frequency	Response (dB)	Tol. (dB)		Uncert. (dB)	Result
125 Hz	0.1	1.0	-1.0	0.2	P
1 kHz	-0.1	0.7	-0.7	0.2	P
8 kHz	-1.0	1.5	-2.5	0.2	P

Test Passed 07/02/2024
The overall frequency response of the sound level meter, nominal case reflections and microphone response has shown to conform with the requirements in IEC 61672-3 for a Class 1 sound level meter.
Frequency response test using multi frequency calibrator.
Sources for Correction Data:
Calibrator Levels and Uncertainty: National Measurement Institute
Case Reflections Uncertainty Source: Cirrus
No information on the uncertainty of measurement, required by IEC61672-3:2019, for the correction data given in the Instruction Manual or obtained from the manufacturer or supplier of the sound level meter, or the manufacturer of the microphone, or the manufacturer of the multi-frequency sound calibrator was provided in the Instruction Manual or made available by the manufacturer or supplier of the sound level meter. The uncertainty of measurement of the correction data was therefore assumed to be the maximum-permitted uncertainty given in IEC 62585 for the corresponding free-field correction data and for a coverage probability of 95%.

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Frequency Weightings: A Network - IEC 61672-3 Ed.2.0 #13.3

Freq (Hz)	Ref. (dB)	Meas. (dB)	Tol. (dB)	Tol. (dB)	Uncert. (dB)	Dev. (dB)	Result
63.1	95.0	95.4	1.0	-1.0	0.09	0.4	P
125.9	95.0	95.3	1.0	-1.0	0.09	0.3	P
251.2	95.0	95.1	1.0	-1.0	0.09	0.1	P
501.2	95.0	95.1	1.0	-1.0	0.09	0.1	P
1000.0	95.0	94.9	0.7	-0.7	0.09	-0.1	P
1995.3	95.0	94.7	1.0	-1.0	0.09	-0.3	P
3981.1	95.0	94.5	1.0	-1.0	0.09	-0.5	P
7943.3	95.0	94.4	1.5	-2.5	0.09	-0.6	P
15848.9	95.0	95.1	2.5	-16.0	0.09	0.1	P

Test Passed 07/02/2024

Frequency Weightings: C Network - IEC 61672-3 Ed.2.0 #13.3

Freq (Hz)	Ref. Level (dB)	Meas. Value (dB)	Tol. (dB)	Tol. (dB)	Uncert. (dB)	Dev. (dB)	Result
63.1	95.0	95.0	1.0	-1.0	0.09	0.0	P
125.9	95.0	95.0	1.0	-1.0	0.09	0.0	P
251.2	95.0	94.9	1.0	-1.0	0.09	-0.1	P
501.2	95.0	95.0	1.0	-1.0	0.09	0.0	P
1000.0	95.0	94.9	0.7	-0.7	0.09	-0.1	P
1995.3	95.0	94.9	1.0	-1.0	0.09	-0.1	P
3981.1	95.0	94.7	1.0	-1.0	0.09	-0.3	P
7943.3	95.0	94.6	1.5	-2.5	0.09	-0.4	P
15848.9	95.0	95.2	2.5	-16.0	0.09	0.2	P

Test Passed 07/02/2024

Frequency Weightings: Z Network - IEC 61672-3 Ed.2.0 #13.3

Freq (Hz)	Ref. Level (dB)	Meas. Value (dB)	Tol. (dB)	Tol. (dB)	Uncert. (dB)	Dev. (dB)	Result
63.1	95.0	95.1	1.0	-1.0	0.09	0.1	P
125.9	95.0	95.0	1.0	-1.0	0.09	0.0	P
251.2	95.0	94.9	1.0	-1.0	0.09	-0.1	P
501.2	95.0	94.9	1.0	-1.0	0.09	-0.1	P
1000.0	95.0	94.9	0.7	-0.7	0.09	-0.1	P
1995.3	95.0	94.9	1.0	-1.0	0.09	-0.1	P
3981.1	95.0	94.8	1.0	-1.0	0.09	-0.2	P
7943.3	95.0	94.8	1.5	-2.5	0.09	-0.2	P
15848.9	95.0	94.5	2.5	-16.0	0.09	-0.5	P

Test Passed 07/02/2024

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Frequency and Time Weightings at 1 kHz IEC 61672-3 Ed.2.0 #14

Weightings		Ref.	Measured	Lim.		Uncert.	Dev.	Result
Time	Netw	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	
Fast	A	94.0	94.0	0.1	-0.1	0.09	0.0	P
Fast	C	94.0	94.0	0.1	-0.1	0.09	0.0	P
Fast	Z	94.0	94.0	0.1	-0.1	0.09	0.0	P
Slow	A	94.0	94.0	0.1	-0.1	0.09	0.0	P
Leq	A	94.0	94.0	0.1	-0.1	0.09	0.0	P
SEL	A	114.0	114.0	0.1	-0.1	0.09	0.0	P

Test Passed 07/02/2024

Level Linearity on the Reference Level Range - IEC 61672-3 Ed.2.0 #16

Ref.	Measured	Lim.		Uncert.	Dev.	Result
(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	
Measurements are SPL measurements						
94.0	94.0	0.8	-0.8	0.09	0.0	P
99.0	99.0	0.8	-0.8	0.09	0.0	P
104.0	104.0	0.8	-0.8	0.09	0.0	P
109.0	109.0	0.8	-0.8	0.09	0.0	P
114.0	114.0	0.8	-0.8	0.09	0.0	P
119.0	119.0	0.8	-0.8	0.09	0.0	P
124.0	124.0	0.8	-0.8	0.09	0.0	P
129.0	129.0	0.8	-0.8	0.09	0.0	P
135.0	135.0	0.8	-0.8	0.09	0.0	P
136.0	136.0	0.8	-0.8	0.09	0.0	P
137.0	137.0	0.8	-0.8	0.09	0.0	P
138.0	138.0	0.8	-0.8	0.09	0.0	P
139.0	139.0	0.8	-0.8	0.09	0.0	P
94.0	94.0	0.8	-0.8	0.09	0.0	P
89.0	89.0	0.8	-0.8	0.09	0.0	P
84.0	84.0	0.8	-0.8	0.09	0.0	P
79.0	79.0	0.8	-0.8	0.09	0.0	P
74.0	74.0	0.8	-0.8	0.09	0.0	P
69.0	69.0	0.8	-0.8	0.09	0.0	P
64.0	64.0	0.8	-0.8	0.09	0.0	P
59.0	59.0	0.8	-0.8	0.09	0.0	P
54.0	54.0	0.8	-0.8	0.09	0.0	P
49.0	49.0	0.8	-0.8	0.09	0.0	P
44.0	44.0	0.8	-0.8	0.09	0.0	P
39.0	39.0	0.8	-0.8	0.09	0.0	P
34.0	34.0	0.8	-0.8	0.09	0.0	P
29.0	29.0	0.8	-0.8	0.09	0.0	P
24.0	24.0	0.8	-0.8	0.09	0.0	P
23.0	23.0	0.8	-0.8	0.09	0.0	P
22.0	22.0	0.8	-0.8	0.09	0.0	P
21.0	21.0	0.8	-0.8	0.09	0.0	P
20.0	20.0	0.8	-0.8	0.09	0.0	P

Test Passed 07/02/2024
Full scale setting: 140dB
Measured at 8 kHz

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Toneburst Response - IEC 61672-3 Ed.2.0 #18

Burst type	Ref. (dB)	Measured (dB)	Lim. (dB)	Lim. (dB)	Uncert. (dB)	Dev. (dB)	Result
Fast 200 mSec	136.0	136.0	0.5	-0.5	0.09	0.0	P
Fast 2.0 mSec	119.0	119.0	1.0	-1.5	0.09	0.0	P
Fast 0.25 mSec	110.0	109.9	1.0	-3.0	0.09	-0.1	P
Slow 200 mSec	129.6	129.6	0.5	-0.5	0.09	0.0	P
Slow 2.0 mSec	110.0	110.0	1.0	-3.0	0.09	0.0	P
SEL 200 mSec	130.0	129.6	0.5	-0.5	0.09	-0.4	P
SEL 2.0 mSec	110.0	110.0	1.0	-1.5	0.09	0.0	P
SEL 0.25 mSec	101.0	100.0	1.0	-3.0	0.09	-1.0	P

Test Passed 07/02/2024

Peak C Sound Level - IEC 61672-3 Ed.2.0 #19

Pulse Type	Pulse Freq. (Hz)	Ref. RMS (dB)	Ref. Peak (dB)	Measured Value (dB)	Lim. (+/-dB)	Uncert. (dB)	Dev. (dB)	Result
1 cycle	8k	127.0	130.4	128.6	2.0	0.09	-1.8	P
Pos 1/2 cycle	500	130.0	132.4	132.5	1.0	0.09	0.1	P
Neg 1/2 cycle	500	130.0	132.4	132.2	1.0	0.09	-0.2	P

Test Passed 07/02/2024

Overload Indication - IEC 61672-3 Ed.2.0 #20

	Deviation (dB)	Lim. (+/-dB)	Uncert. (dB)	Result
Level difference of positive and negative pulses:	0.1	1.5	0.09	P

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Positive 1/2 cycle 4 kHz. Overload occurred at: 141.8
Negative 1/2 cycle 4 kHz. Overload occurred at: 141.7
Test Passed 07/02/2024

High Level Stability Test - IEC 61672-3 Ed.2.0 #21

Test signal: Sine wave at 1 kHz

Initial level (dB)	Final level (dB)	Diff. (dB)	Lim. value (dB)	Uncert. (dB)	Result
139.0	139.0	0.0	0.1	0.09	P

Test Passed 07/02/2024

Long Term Stability Test - IEC 61672-3 Ed.2.0 #15

Test signal: Sine wave at 1 kHz

Time interval (mm:SS)	StartLevel (dB)	StopLevel (dB)	Difference (dB)	Tolerance (dB)	Result
41:11	93.9	93.9	0.0	0.1	P

Test Passed 07/02/2024

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DIN 45657 (2013): Statistical Distribution Test #5.2

Ln %	Ref. Value (dB)	Measured Value (dB)	Tolerance Norm (dB)	Result Value (dB)	
1%	139.4	139.3	0.5	-0.1	P
5%	137.0	136.8	0.5	-0.2	P
10%	134.0	133.9	0.5	-0.1	P
50%	110.0	109.9	0.5	-0.1	P
90%	86.0	85.9	0.5	-0.1	P
95%	83.0	82.8	0.5	-0.2	P
99%	80.6	80.5	0.5	-0.1	P
LeqA	128.8	128.7	0.5	-0.1	P

Test Passed 07/02/2024

Filter Test - IEC 61260.3 2019 1/1 Octave: Relative Attenuation at Midband Frequency #10.2

Instrument Class: 1
Reference SPL: 94 dB
Frequency Base: 10
Octave Band: 1/1
Tolerance (dB): +/-0.4

Octave Band (Hz)	Frequency (Hz)	Filter Out (dB)	Filter In (dB)	Difference (dB)	Uncert. (dB)	Result
31.5	31.623	94.20	94.00	0.2	0.09	P
63	63.096	94.10	93.90	0.2	0.09	P
125	125.893	94.00	93.90	0.1	0.09	P
250	251.189	93.90	93.90	0.0	0.09	P
500	501.187	93.90	93.90	0.0	0.09	P
1000	1000.000	94.00	93.90	0.1	0.09	P
2000	1995.262	93.90	93.90	0.0	0.09	P
4000	3981.072	93.90	93.90	0.0	0.09	P
8000	7943.282	93.80	93.80	0.0	0.09	P
16000	15848.932	93.70	93.80	0.1	0.09	P

Test Passed 07/02/2024

Filter Test - IEC 61260.3 2019 1/1 Octave: Linear Operating Range #11.5

Test 1/1 Octave Filter X=-5 fexact=31.623Hz Class 1
Uncertainty = 0.09 dB

Nominal L[dB]	Measured L[dB]	LoLim L[dB]	HiLim L[dB]	Result [P/F]
135.0	135.0	-0.5	0.5	P
134.0	133.9	-0.5	0.5	P
133.0	132.9	-0.5	0.5	P
132.0	131.9	-0.5	0.5	P
131.0	131.0	-0.5	0.5	P
130.0	129.9	-0.5	0.5	P
125.0	124.9	-0.5	0.5	P
120.0	120.0	-0.5	0.5	P
115.0	115.0	-0.5	0.5	P
110.0	109.9	-0.5	0.5	P
105.0	105.0	-0.5	0.5	P
100.0	100.0	-0.5	0.5	P
95.0	95.0	-0.5	0.5	P
90.0	90.0	-0.7	0.7	P
85.0	84.9	-0.7	0.7	P

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80.0	79.9	-0.7	0.7	P
75.0	74.9	-0.7	0.7	P
70.0	69.9	-0.7	0.7	P
65.0	64.9	-0.7	0.7	P
60.0	59.9	-0.7	0.7	P
59.0	58.9	-0.7	0.7	P
58.0	57.9	-0.7	0.7	P
57.0	56.9	-0.7	0.7	P
56.0	55.9	-0.7	0.7	P
55.0	54.9	-0.7	0.7	P

Test 1/1 Octave Filter X= 0 fexact=1000.000Hz Class 1
Uncertainty = 0.09 dB

Nominal L[dB]	Measured L[dB]	LoLim L[dB]	HiLim L[dB]	Result [P/F]
135.0	134.9	-0.5	0.5	P
134.0	133.9	-0.5	0.5	P
133.0	132.9	-0.5	0.5	P
132.0	131.9	-0.5	0.5	P
131.0	130.9	-0.5	0.5	P
130.0	129.9	-0.5	0.5	P
125.0	124.9	-0.5	0.5	P
120.0	119.9	-0.5	0.5	P
115.0	114.9	-0.5	0.5	P
110.0	109.9	-0.5	0.5	P
105.0	104.9	-0.5	0.5	P
100.0	99.9	-0.5	0.5	P
95.0	94.9	-0.5	0.5	P
90.0	89.9	-0.7	0.7	P
85.0	84.9	-0.7	0.7	P
80.0	79.9	-0.7	0.7	P
75.0	74.9	-0.7	0.7	P
70.0	69.9	-0.7	0.7	P
65.0	64.9	-0.7	0.7	P
60.0	59.9	-0.7	0.7	P
59.0	58.9	-0.7	0.7	P
58.0	57.9	-0.7	0.7	P
57.0	56.9	-0.7	0.7	P
56.0	55.9	-0.7	0.7	P
55.0	54.9	-0.7	0.7	P

Test 1/1 Octave Filter X= 4 fexact=15848.932Hz Class 1
Uncertainty = 0.09 dB

Nominal L[dB]	Measured L[dB]	LoLim L[dB]	HiLim L[dB]	Result [P/F]
135.0	134.8	-0.5	0.5	P
134.0	133.8	-0.5	0.5	P
133.0	132.8	-0.5	0.5	P
132.0	131.8	-0.5	0.5	P
131.0	130.8	-0.5	0.5	P
130.0	129.8	-0.5	0.5	P
125.0	124.8	-0.5	0.5	P
120.0	119.8	-0.5	0.5	P
115.0	114.8	-0.5	0.5	P
110.0	109.8	-0.5	0.5	P
105.0	104.8	-0.5	0.5	P
100.0	99.8	-0.5	0.5	P
95.0	94.7	-0.5	0.5	P
90.0	89.8	-0.7	0.7	P
85.0	84.7	-0.7	0.7	P
80.0	79.7	-0.7	0.7	P

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75.0	74.7	-0.7	0.7	P
70.0	69.7	-0.7	0.7	P
65.0	64.7	-0.7	0.7	P
60.0	59.7	-0.7	0.7	P
59.0	58.7	-0.7	0.7	P
58.0	57.7	-0.7	0.7	P
57.0	56.7	-0.7	0.7	P
56.0	55.7	-0.7	0.7	P
55.0	54.7	-0.7	0.7	P

Test Passed 07/02/2024

Filter Test - IEC 61260.3 2019 1/1 Octave: Overload Indicator #11.8

Class 1, 1/1 Octave Filter at Frequency of: 31.623 Hz with Uncertainty: 0.09 dB

	Deviation Value (dB)	Lim. (+/-dB)	Uncert. (dB)	Result
Level difference of positive and negative pulses:	0.1	0.5	0.09	P

Positive 1/2 cycles of 31.623 Hz. Overload occurred at: 140.9
Negative 1/2 cycles of 31.623 Hz. Overload occurred at: 140.8

Class 1, 1/1 Octave Filter at Frequency of: 1000 Hz with Uncertainty: 0.09 dB

	Deviation Value (dB)	Lim. (+/-dB)	Uncert. (dB)	Result
Level difference of positive and negative pulses:	0.2	0.5	0.09	P

Positive 1/2 cycles of 1000 Hz. Overload occurred at: 140.4
Negative 1/2 cycles of 1000 Hz. Overload occurred at: 140.6

Class 1, 1/1 Octave Filter at Frequency of: 15848.932 Hz with Uncertainty: 0.09 dB

	Deviation Value (dB)	Lim. (+/-dB)	Uncert. (dB)	Result
Level difference of positive and negative pulses:	0.4	0.5	0.09	P

Positive 1/2 cycles of 15848.932 Hz. Overload occurred at: 148.1
Negative 1/2 cycles of 15848.932 Hz. Overload occurred at: 148.5
Test Passed 07/02/2024

Filter Test - IEC 61260.3 2019 1/1 Octave: Lower Limit of Operating Range #12

Reference Range:55 - 135 dB

1/1 Octave Band	Frequency	Level(dB)	Max(dB)	Uncert.(dB)	Result
31.5	31.623	15.10	35.00	0.09	P
63	63.096	11.80	35.00	0.09	P
125	125.893	10.00	35.00	0.09	P
250	251.189	10.40	35.00	0.09	P
500	501.187	12.60	35.00	0.09	P
1000	1000.000	13.90	35.00	0.09	P
2000	1995.262	14.90	35.00	0.09	P
4000	3981.072	17.50	35.00	0.09	P
8000	7943.282	19.10	35.00	0.09	P
16000	15848.932	26.10	35.00	0.09	P

Test Passed 07/02/2024

Certificate Number: 7603

NATA Accreditation No: 20688

Filter Test - IEC 61260.3 2019 1/1 Octave: Relative Attenuation #13

Test 1/1 Octave Filter X=-5 fexact=31.623Hz Class 1
Uncertainty: < 4dB = 0.09dB, 4-80dB = 0.33dB

Nominal f[Hz]	Measured L[dB]	LoLim [dB]	HiLim [dB]	Result [P/F]
1.995	33.8	0.0	64.0	P
3.981	41.9	0.0	73.0	P
7.943	61.4	0.0	92.0	P
15.849	88.2	0.0	116.5	P
22.387	131.9	129.0	132.0	P
24.406	133.9	132.7	134.3	P
26.607	134.1	133.4	134.3	P
29.007	134.0	133.6	134.3	P
31.623	133.9	133.7	134.3	P
34.475	134.0	133.6	134.3	P
37.584	134.1	133.4	134.3	P
40.973	133.9	132.7	134.3	P
44.668	129.2	129.0	132.0	P
63.096	54.7	0.0	116.5	P
125.893	25.4	0.0	92.0	P
251.189	26.5	0.0	73.0	P
501.187	30.8	0.0	64.0	P

Test 1/1 Octave Filter X= 0 fexact=1000.000Hz Class 1
Uncertainty: < 4dB = 0.09dB, 4-80dB = 0.33dB

Nominal f[Hz]	Measured L[dB]	LoLim [dB]	HiLim [dB]	Result [P/F]
63.096	35.9	0.0	64.0	P
125.893	40.2	0.0	73.0	P
251.189	57.4	0.0	92.0	P
501.187	86.7	0.0	116.5	P
707.946	131.2	129.0	132.0	P
771.792	133.9	132.7	134.3	P
841.395	134.1	133.4	134.3	P
917.276	134.0	133.6	134.3	P
1000.000	133.9	133.7	134.3	P
1090.184	134.0	133.6	134.3	P
1188.502	134.0	133.4	134.3	P
1295.687	133.9	132.7	134.3	P
1412.538	130.7	129.0	132.0	P
1995.262	60.0	0.0	116.5	P
3981.072	44.4	0.0	92.0	P
7943.282	34.8	0.0	73.0	P
15848.932	35.3	0.0	64.0	P

Test 1/1 Octave Filter X= 4 fexact=15848.932Hz Class 1
Uncertainty: < 4dB = 0.09dB, 4-80dB = 0.33dB

Nominal f[Hz]	Measured L[dB]	LoLim [dB]	HiLim [dB]	Result [P/F]
1000.000	55.9	0.0	64.0	P
1995.262	57.6	0.0	73.0	P
3981.072	62.1	0.0	92.0	P
7943.282	85.2	0.0	116.5	P
11220.185	129.0	129.0	132.0	P
12232.071	133.8	132.7	134.3	P
13335.214	133.9	133.4	134.3	P
14537.844	133.8	133.6	134.3	P
15848.932	133.8	133.7	134.3	P
17278.260	134.0	133.6	134.3	P
18836.491	133.9	133.4	134.3	P

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20535.250	133.7	132.7	134.3	P
22387.211	131.3	129.0	132.0	P
31622.777	69.5	0.0	116.5	P
63095.734	48.8	0.0	92.0	P
125892.541	52.7	0.0	73.0	P
200000.000	50.8	0.0	64.0	P

Test Passed 07/02/2024

Filter Test - IEC 61260.3 2019 1/3 Octave: Relative Attenuation at Midband Frequency #10.2

Instrument Class: 1
Reference SPL: 94 dB
Frequency Base: 10
Octave Band: 1/3
Tolerance (dB): +/-0.4

Octave Band (Hz)	Frequency (Hz)	Filter Out (dB)	Filter In (dB)	Difference (dB)	Uncert. (dB)	Result
12.5	12.589	94.10	94.10	0.0	0.09	P
16	15.849	94.10	94.10	0.0	0.09	P
20	19.953	94.30	94.00	0.3	0.09	P
25	25.119	94.30	94.00	0.3	0.09	P
31.5	31.623	94.20	94.00	0.2	0.09	P
40	39.811	94.10	94.00	0.1	0.09	P
50	50.119	94.10	94.10	0.0	0.09	P
63	63.096	94.10	94.00	0.1	0.09	P
80	79.433	94.10	94.00	0.1	0.09	P
100	100.000	94.00	94.00	0.0	0.09	P
125	125.893	94.00	94.00	0.0	0.09	P
160	158.489	94.00	94.00	0.0	0.09	P
200	199.526	94.00	94.00	0.0	0.09	P
250	251.189	93.90	93.90	0.0	0.09	P
315	316.228	94.00	94.00	0.0	0.09	P
400	398.107	94.00	94.00	0.0	0.09	P
500	501.187	94.00	94.00	0.0	0.09	P
630	630.957	94.00	94.00	0.0	0.09	P
800	794.328	94.00	94.00	0.0	0.09	P
1000	1000.000	94.00	94.00	0.0	0.09	P
1250	1258.925	93.90	94.00	0.1	0.09	P
1600	1584.893	94.00	94.00	0.0	0.09	P
2000	1995.262	94.00	94.00	0.0	0.09	P
2500	2511.886	94.00	94.00	0.0	0.09	P
3150	3162.278	94.00	94.00	0.0	0.09	P
4000	3981.072	93.90	94.00	0.1	0.09	P
5000	5011.872	93.90	94.00	0.1	0.09	P
6300	6309.573	93.90	93.90	0.0	0.09	P
8000	7943.282	93.90	93.90	0.0	0.09	P
10000	10000.000	93.80	93.90	0.1	0.09	P
12500	12589.254	93.70	93.80	0.1	0.09	P
16000	15848.932	93.70	93.70	0.0	0.09	P
20000	19952.623	93.70	94.00	0.3	0.09	P

Test Passed 07/02/2024

Certificate Number: 7603

NATA Accreditation No: 20688

Filter Test - IEC 61260.3 2019 1/3 Octave: Linear Operating Range #11.5

Test 1/3 Octave Filter X=-15 fexact=31.623Hz Class 1
Uncertainty = 0.09 dB

Nominal L[dB]	Measured L[dB]	LoLim L[dB]	HiLim L[dB]	Result [P/F]
135.0	135.0	-0.5	0.5	P
134.0	134.0	-0.5	0.5	P
133.0	133.0	-0.5	0.5	P
132.0	132.0	-0.5	0.5	P
131.0	131.0	-0.5	0.5	P
130.0	130.0	-0.5	0.5	P
125.0	125.0	-0.5	0.5	P
120.0	120.0	-0.5	0.5	P
115.0	115.0	-0.5	0.5	P
110.0	110.0	-0.5	0.5	P
105.0	105.0	-0.5	0.5	P
100.0	100.1	-0.5	0.5	P
95.0	95.1	-0.5	0.5	P
90.0	90.1	-0.7	0.7	P
85.0	85.0	-0.7	0.7	P
80.0	80.0	-0.7	0.7	P
75.0	75.0	-0.7	0.7	P
70.0	70.0	-0.7	0.7	P
65.0	65.0	-0.7	0.7	P
60.0	60.0	-0.7	0.7	P
59.0	59.0	-0.7	0.7	P
58.0	58.0	-0.7	0.7	P
57.0	57.0	-0.7	0.7	P
56.0	56.0	-0.7	0.7	P
55.0	55.0	-0.7	0.7	P

Test 1/3 Octave Filter X= 0 fexact=1000.000Hz Class 1
Uncertainty = 0.09 dB

Nominal L[dB]	Measured L[dB]	LoLim L[dB]	HiLim L[dB]	Result [P/F]
135.0	135.0	-0.5	0.5	P
134.0	134.0	-0.5	0.5	P
133.0	133.0	-0.5	0.5	P
132.0	132.0	-0.5	0.5	P
131.0	131.0	-0.5	0.5	P
130.0	130.0	-0.5	0.5	P
125.0	125.0	-0.5	0.5	P
120.0	120.0	-0.5	0.5	P
115.0	115.0	-0.5	0.5	P
110.0	110.0	-0.5	0.5	P
105.0	105.0	-0.5	0.5	P
100.0	100.0	-0.5	0.5	P
95.0	95.0	-0.5	0.5	P
90.0	90.0	-0.7	0.7	P
85.0	85.0	-0.7	0.7	P
80.0	80.0	-0.7	0.7	P
75.0	75.0	-0.7	0.7	P
70.0	70.0	-0.7	0.7	P
65.0	65.0	-0.7	0.7	P
60.0	60.0	-0.7	0.7	P
59.0	59.0	-0.7	0.7	P
58.0	58.0	-0.7	0.7	P
57.0	57.0	-0.7	0.7	P
56.0	56.0	-0.7	0.7	P
55.0	55.0	-0.7	0.7	P

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Test 1/3 Octave Filter X= 12 fexact=15848.932Hz Class 1
Uncertainty = 0.09 dB

Nominal L[dB]	Measured L[dB]	LoLim L[dB]	HiLim L[dB]	Result [P/F]
135.0	134.7	-0.5	0.5	P
134.0	133.7	-0.5	0.5	P
133.0	132.7	-0.5	0.5	P
132.0	131.7	-0.5	0.5	P
131.0	130.7	-0.5	0.5	P
130.0	129.7	-0.5	0.5	P
125.0	124.7	-0.5	0.5	P
120.0	119.7	-0.5	0.5	P
115.0	114.7	-0.5	0.5	P
110.0	109.7	-0.5	0.5	P
105.0	104.7	-0.5	0.5	P
100.0	99.7	-0.5	0.5	P
95.0	94.7	-0.5	0.5	P
90.0	89.7	-0.7	0.7	P
85.0	84.6	-0.7	0.7	P
80.0	79.6	-0.7	0.7	P
75.0	74.6	-0.7	0.7	P
70.0	69.6	-0.7	0.7	P
65.0	64.6	-0.7	0.7	P
60.0	59.6	-0.7	0.7	P
59.0	58.6	-0.7	0.7	P
58.0	57.6	-0.7	0.7	P
57.0	56.6	-0.7	0.7	P
56.0	55.6	-0.7	0.7	P
55.0	54.6	-0.7	0.7	P

Test Passed 07/02/2024

Filter Test - IEC 61260.3 2019 1/3 Octave: Overload Indicator #11.8

Class 1, 1/3 Octave Filter at Frequency of: 31.623 Hz with Uncertainty: 0.09 dB

	Deviation Value (dB)	Lim. (+/-dB)	Uncert. (dB)	Result
Level difference of positive and negative pulses:	0.1	0.5	0.09	P

Positive 1/2 cycles of 31.623 Hz. Overload occurred at: 140.9
Negative 1/2 cycles of 31.623 Hz. Overload occurred at: 140.8

Class 1, 1/3 Octave Filter at Frequency of: 1000 Hz with Uncertainty: 0.09 dB

	Deviation Value (dB)	Lim. (+/-dB)	Uncert. (dB)	Result
Level difference of positive and negative pulses:	0.0	0.5	0.09	P

Positive 1/2 cycles of 1000 Hz. Overload occurred at: 140.4
Negative 1/2 cycles of 1000 Hz. Overload occurred at: 140.4

Class 1, 1/3 Octave Filter at Frequency of: 15848.932 Hz with Uncertainty: 0.09 dB

	Deviation Value (dB)	Lim. (+/-dB)	Uncert. (dB)	Result
Level difference of positive and negative pulses:	0.2	0.5	0.09	P

Positive 1/2 cycles of 15848.932 Hz. Overload occurred at: 151.5
Negative 1/2 cycles of 15848.932 Hz. Overload occurred at: 151.7
Test Passed 07/02/2024

Certificate Number: 7603

NATA Accreditation No: 20688

Filter Test - IEC 61260.3 2019 1/3 Octave: Lower Limit of Operating Range #12

Reference Range:55 - 135 dB

1/3 Octave Band	Frequency	Level(dB)	Max(dB)	Uncert.(dB)	Result
31.5	31.623	10.50	35.00	0.09	P
40	39.811	9.40	35.00	0.09	P
50	50.119	8.80	35.00	0.09	P
63	63.096	7.10	35.00	0.09	P
80	79.433	5.10	35.00	0.09	P
100	100.000	4.50	35.00	0.09	P
125	125.893	3.90	35.00	0.09	P
160	158.489	7.00	35.00	0.09	P
200	199.526	2.90	35.00	0.09	P
250	251.189	6.70	35.00	0.09	P
315	316.228	6.80	35.00	0.09	P
400	398.107	7.90	35.00	0.09	P
500	501.187	8.80	35.00	0.09	P
630	630.957	6.70	35.00	0.09	P
800	794.328	9.70	35.00	0.09	P
1000	1000.000	8.80	35.00	0.09	P
1250	1258.925	7.60	35.00	0.09	P
1600	1584.893	8.90	35.00	0.09	P
2000	1995.262	10.40	35.00	0.09	P
2500	2511.886	10.00	35.00	0.09	P
3150	3162.278	11.80	35.00	0.09	P
4000	3981.072	12.80	35.00	0.09	P
5000	5011.872	12.90	35.00	0.09	P
6300	6309.573	13.60	35.00	0.09	P
8000	7943.282	14.40	35.00	0.09	P
10000	10000.000	15.10	35.00	0.09	P
12500	12589.254	16.90	35.00	0.09	P

Test Passed 07/02/2024

Filter Test - IEC 61260.3 2019 1/3 Octave: Relative Attenuation #13

Test 1/3 Octave Filter X=-15 fexact=31.623Hz Class 1

Uncertainty: < 4dB = 0.09dB, 4-80dB = 0.33dB

Nominal f[Hz]	Measured L[dB]	LoLim [dB]	HiLim [dB]	Result [P/F]
5.865	49.4	0.0	64.0	P
10.356	60.8	0.0	73.0	P
16.805	69.5	0.0	92.0	P
24.431	112.5	0.0	116.5	P
28.184	132.0	129.0	132.0	P
29.080	133.7	132.7	134.3	P
29.953	134.0	133.4	134.3	P
30.801	134.0	133.6	134.3	P
31.623	134.0	133.7	134.3	P
32.466	134.0	133.6	134.3	P
33.386	133.9	133.4	134.3	P
34.388	133.0	132.7	134.3	P
35.481	131.9	129.0	132.0	P
40.932	105.9	0.0	116.5	P
59.505	34.5	0.0	92.0	P
96.565	21.3	0.0	73.0	P
170.508	20.3	0.0	64.0	P

Certificate Number: 7603

NATA Accreditation No: 20688

Test 1/3 Octave Filter X= 0 fexact=1000.000Hz Class 1
Uncertainty: < 4dB = 0.09dB, 4-80dB = 0.33dB

Nominal f[Hz]	Measured L[dB]	LoLim [dB]	HiLim [dB]	Result [P/F]
185.462	35.5	0.0	64.0	P
327.477	57.7	0.0	73.0	P
531.427	66.3	0.0	92.0	P
772.574	110.9	0.0	116.5	P
891.251	131.2	129.0	132.0	P
919.577	133.3	132.7	134.3	P
947.190	133.9	133.4	134.3	P
974.019	134.0	133.6	134.3	P
1000.000	134.0	133.7	134.3	P
1026.674	134.0	133.6	134.3	P
1055.754	134.0	133.4	134.3	P
1087.457	133.4	132.7	134.3	P
1122.018	131.4	129.0	132.0	P
1294.374	107.8	0.0	116.5	P
1881.728	32.5	0.0	92.0	P
3053.652	39.4	0.0	73.0	P
5391.949	26.9	0.0	64.0	P

Test 1/3 Octave Filter X= 12 fexact=15848.932Hz Class 1
Uncertainty: < 4dB = 0.09dB, 4-80dB = 0.33dB

Nominal f[Hz]	Measured L[dB]	LoLim [dB]	HiLim [dB]	Result [P/F]
2939.370	52.1	0.0	64.0	P
5190.156	60.5	0.0	73.0	P
8422.543	75.5	0.0	92.0	P
12244.475	104.6	0.0	116.5	P
14125.375	129.0	129.0	132.0	P
14574.309	132.7	132.7	134.3	P
15011.951	133.6	133.4	134.3	P
15437.156	133.7	133.6	134.3	P
15848.932	133.7	133.7	134.3	P
16271.692	133.6	133.6	134.3	P
16732.578	133.7	133.4	134.3	P
17235.030	133.6	132.7	134.3	P
17782.794	132.0	129.0	132.0	P
20514.447	105.7	0.0	116.5	P
29823.373	61.2	0.0	92.0	P
48397.124	37.7	0.0	73.0	P
85456.627	45.8	0.0	64.0	P

Test Passed 07/02/2024

CERTIFICATE OF CALIBRATION

Certificate Number: **7715** **NATA Accreditation No: 20688**

Customer: **Active Environmental Solutions**
2 Merchant Avenue, Thomastown, VIC 3074

Test Object:	**Calibrator**
Manufacturer:	**Cirrus**
Model:	**515**
Serial No:	**81733**
Class:	**Class 1**
Adapter Make:	**None**
Adapter Model:	**N/A**

Environmental Conditions:	**Pressure**	**Temperature**	**Relative Humidity**
Reference Conditions:	101.325 kPa	23.0 ℃	50.0 % RH
Measurement Conditions:	101.474 kPa	24.7 ℃	49.1 % RH

Measurement Results:	**Level**	**Frequency**	**THD + Noise**
1:	94.22 dB	1000.31 Hz	2.42 %
2:	94.22 dB	1000.32 Hz	2.41 %
3:	94.19 dB	1000.36 Hz	2.42 %
Result (Average):	94.21 dB	1000.33 Hz	2.42 %
Expanded Uncertainty:	0.11 dB	1.00033 Hz	0.3 %
Degree of Freedom:	>100	>100	>100
Coverage Factor:	2.00	2.00	2.00
Level when received:	94.57		

The stated level is relative to 20µPa and is valid at measurement conditions.
Tested when received – level adjustment of –0.36 dB required to comply with tolerances in IEC 60942.

Accredited for Compliance with ISO/IEC 17025 - Calibration
The results of the tests, calibrations and/or measurements included in this document are traceable to the International System of Units (SI) via International and Australian/national standards. NATA is a signatory to the ILAC Mutual Recognition Arrangement for the mutual recognition of the equivalence of testing, medical testing, calibration and inspection reports.

Date of Calibration: 28/02/2024
Date of Issue: 28/02/2024
Authorised Signatory:

Claire Richardson

Certificate Number : 7715

NATA Accreditation No: 20688

Calibration and Verification Performed

The performed tests refer to sections 5.3, 5.4 and 5.6 in IEC 60942 (2017): Electro-acoustics - Sound Calibrators. The calibrator has been tested as described in Annex B of the same standard.

Conformity

For all tests, the expanded uncertainty of measurement is reported at approximately 95% confidence level with a coverage factor k, of 2 calculated in accordance with the principles stated in *JCGM 100:2008 – Evaluation of Measurement Data – Guide to the Expression of Uncertainty in Measurement.*

Except where noted otherwise, the results provided in this report are associated with the following expanded uncertainties:
0.11 dB for Sound Level at nominal frequencies of 250 Hz and 1 kHz
0.1 % for Frequency
0.3 % for Distortion

Instruments and Program

A complete list of instruments, hardware and software, that has been used for this calibration is separately available from the calibration laboratory.

Version of Calibration Software Used:	CalCal-CT-6.1.2.9 13-Sep-2022
Certificate Version:	4.6.8

Traceability

The measured values are traceable to the following laboratories:
Sound Pressure Level: National Measurement Institute, Australia
Voltage: TR Calibration, Australia
Frequency: TR Calibration, Australia
THD and Noise: TR Calibration, Australia
Ambient Pressure: IPAC Solutions, Australia
Temperature: IPAC Solutions, Australia
Relative Humidity: IPAC Solutions, Australia

Scope of Calibration Certificate

This certificate only relates to the test object calibrated. This certificate shall only be reproduced in full with the permission of Calibre Technology.