
**Appendix A14.2
Baseline Noise
Monitoring for DART+
West EIAR**

APPENDIX A14.2 – BASELINE NOISE MONITORING REPORT FOR DART+ WEST EIAR

Executive Summary

Noise monitoring has been conducted at 53 locations along the alignment of the DART+ West Project consisting of 42 long-term unattended surveys and 11 short-term attended surveys.

Within Zones A, B and C, the surrounding environment is urban. The noise monitoring locations are adjacent to the railway line. The primary noise contributor at the vast majority of locations is the railway line. Road traffic was also a significant noise source at many of the locations within these zones.

Within Zones D, E and F, the surrounding environment is suburban. The noise monitoring locations in these zones are also adjacent to the railway line and, similar to Zones A, B and C, the primary noise contributor at the vast majority of locations is the railway line. Road traffic was less dominant at many of the locations within these zones, however, it remained significant in some cases.

Specific details of the survey locations, procedures and results are included for each assessment zone within this report.

Introduction

This report includes the relevant survey details and results associated with baseline noise monitoring undertaken as part of the DART+ West project. The surveys have been undertaken to inform the airborne noise and vibration chapter of the DART+ West EIAR.

Long-term surveys (typically 24hours in duration) were made at a total of 42 locations.

Short-term surveys (attended measurements), made at a total of 11 locations along the length of the Proposed Project, were used to supplement the long-term surveys.

Survey details and results for each of the noise monitoring locations are included within this report.

Survey Methodology

Study Area

The Proposed Project covers an extensive linear study area between the Dublin Docklands and Clonsilla. At Clonsilla, the route splits in two and the study area proceeds linearly to Maynooth and M3 Parkway. The study area for the EIAR is split into six distinct zones, as described in Table 1.

Table 1 Geographical Split of Assessment Zones

Reference	Description
Zone A	Connolly to Glasnevin Junction (GSRW) approximately 2,530 m in length.
Zone B	Spencer Dock to Glasnevin Junction (MGWR) approximately 3,020 m in length.
Zone C	Glasnevin Junction to Clonsilla Station approximately 10,320 m in length.
Zone D	Clonsilla to M3 Parkway approximately 7,500 m in length.
Zone E	Clonsilla Station to Maynooth Station approximately 12,620 m in length.
Zone F	Maynooth Station to Depot approximately 5,000 m in length.

Survey Locations

Baseline noise surveys have been conducted at locations representative of the nearest noise sensitive areas which have the potential to be impacted by construction works and/or those likely to be impacted during the operational phase of the Proposed Project. Baseline noise measurements were made over both long-term and short-term periods to inform the assessment.

- Long-term surveys (typically one day in duration) were made at a total of 42 locations.
- Short-term surveys (attended day-time measurements), made at a total of 11 locations along the length of the proposed Project were used to supplement the long-term surveys.

Each location is discussed in the relevant geographic area, Zone A to Zone F, in the following sections.

Zone A

A total of 4 long-term unattended monitoring locations and 2 attended monitoring locations were surveyed within Zone A. The location reference and a description of the survey positions are included in Table 2.

Table 2 Noise Monitoring Locations Zone A

Location	Description of Survey Location
Unattended (Long-term) Noise Survey Locations	
N02	Shamrock Terrace, North Strand, Dublin 3
N04	Newcomen Ave, North Strand, Dublin 3
N08	Ardilaun Square, Ballybough, Dublin 13
N10	Drumcondra Park, Drumcondra, Dublin 3
Attended Noise Survey Locations	
N03	Ossory Road, Dublin 3
N12	Whitworth Road, Dublin 3

Zone B

Six (6 no.) long-term unattended monitoring locations and 2 attended monitoring locations were surveyed within Zone B, as described in Table 3.

Table 3 Noise Monitoring Locations Zone B

Location	Description of Survey Location
Unattended (Long-term) Noise Survey Locations	
N51	Access road to Docklands Coach Park
N01	Canon Lillis Avenue, Seville, Place Dublin 1
N07	Clonliffe Avenue, Ballybough, Dublin 3
N09	Fitzroy Avenue, Drumcondra, Dublin 3
N11	St Patrick's Road, Drumcondra, Dublin 9
N13	Lindsay Road, Glasnevin, Dublin 7
Attended Noise Survey Locations	
N05	Bessborough Avenue, Dublin 3
N06	Spring Gardens Street, Dublin 3

Zone C

A total of 13 long-term unattended monitoring locations and 2 attended survey locations were surveyed within Zone C. The location reference and a description of the survey positions are included in Table 4.

Table 4 Noise Monitoring Locations Zone C

Location	Description of Survey Location
Unattended (Long-term) Noise Survey Locations	
N15	Dalcassian downs, Glasnevin, Dublin 9
N16	Garden to rear of residential building in Coke Oven Cottages
N17	Garden to rear of residential building in Claremont Crescent
N18	Claremont Court, Glasnevin, Dublin 11
N19	Ratoath Estate, Cabra, Dublin 7.
N20	Ashington Gardens, Navan Road, Dublin 7.

Location	Description of Survey Location
N21	Glendhu Road, Navan Road, Dublin 7.
N22	Martin Savage Park, Navan Road, Ashtown, Dublin 15
N24	Castleknock Meadows, Laurel Lodge, Dublin 15
N25	Cherry Drive, Carpenterstown, Dublin 15
N26	Riverwood Square, Carpenterstown, Dublin 15
N28	Larch Grove, Clonsilla, Co. Dublin
N53	Trackside at Irish Rail compound, Carnlough Road, Cabra, Dublin 7
Attended Noise Survey Locations	
N54	Clareville Court, Glasnevin, Dublin 9
N23	Castleknock Park, Castleknock, Dublin 15

Zone D

A total of 6 long-term unattended monitoring locations and 1 attended survey location were surveyed within Zone D. The location reference and a description of the survey positions are included in Table 5.

Table 5 Noise Monitoring Locations Zone D

Location	Description of Survey Location
Unattended (Long-term) Noise Survey Locations	
N46	Barnhill, Clonsilla, Co Dublin
N48	Edenmore House, Loughsallagh, Dunboyne, Co. Meath
N49	Elton Grove, Millfarm, Dunboyne, County Meath
N50	Silver Birches Crescent, Millfarm, Dunboyne, Co. Meath
N51	Bennetstown, Dunboyne, County Meath
N55	Dunboyne, Co. Meath
Attended Noise Survey Locations	
N47	Stirling Road, Hilltown, Co. Meath

Zone E

A total of 9 long-term unattended monitoring locations and 4 attended survey locations were surveyed within Zone E. The location reference and a description of the survey positions are included in Table 6.

Table 6 Noise Monitoring Locations Zone E

Location	Description of Survey Location
Unattended (Long-term) Noise Survey Locations	
N29	Barberstown House, Clonsilla, Dublin 15
N30	Station House, Clonee Road, Allenswood, Lucan
N31	Glendale Meadows, Leixlip, County Kildare
N33	River Forest, Leixlip, County Kildare
N34	Riverforest, Captains Hill, Leixlip, County Kildare
N35	River Forest View, Leixlip, Cco. Kildare

Location	Description of Survey Location
N37	Glen Easton Way, Leixlip, County Kildare
N39	Donoughmore House, Pyke Bridge, Maynooth, County Kildare
N41	Silken Vale, Maynooth, County Kildare
Attended Noise Survey Locations	
N32	Glendale Meadows, Leixlip, County Kildare
N36	Louisa Bridge, Leixlip, County Kildare
N38	Blakestown, Leixlip, County Kildare
N40	Parklands Grove, Maynooth, Co. Kildare

Zone F

A total of 6 long-term unattended monitoring locations were surveyed within Zone F. The location reference and a description of the survey positions are included in Table 7. No attended monitoring locations were surveyed within this zone.

Table 7 Noise Monitoring Locations Zone F

Location	Description of Survey Location
Unattended (Long-term) Noise Survey Locations	
N42	Woodlands, Maynooth, County Kildare
N56	Treadstown House, Millfarm, Co. Kildare
N57	Gragadder, Kilcock, Co. Kildare
N43	Braganstown, Kilcock, Co. Kildare
N44	Connaught Street, Kilcock, Co. Kildare
N45	Brayton Park, Kilcock, Co. Kildare

Survey Periods

Unattended noise surveys were undertaken between September 2020 and July 2021. The specific survey dates for each location are included in the survey results tables in Section 3.0.

Attended noise surveys were undertaken between April 2021 and September 2021. The specific survey dates and times for each location are included in the survey results tables in Section 3.0.

Survey Equipment and Personnel

The unattended surveys were undertaken by AWN Consulting using Rion NL-52 sound level meters, while the attended surveys were undertaken using a Bruel & Kjaer 2250L sound level meter. The specific equipment details are summarised in Table 8. Calibration certificates of the monitoring equipment are included within Appendix A.

Table 8 Noise Monitoring Equipment

Equipment	Serial Number	Calibration Date
Rion NL-52	586940	28/10/2020
	998413	22/01/2020

Equipment	Serial Number	Calibration Date
	1076328	21/08/2020
	164427	05/05/2020
	564808	15/09/2020
Bruel & Kjaer 2250L	3008402	04/11/2019

For unattended surveys, a Rion WS-15 Outdoor Microphone Protection System was used with microphone extension cable and outdoor peli-case. An image of the equipment install at each monitoring location is included in Appendix B.

Survey Parameters

The following noise parameters were measured and are discussed within this report.

L_{Aeq,T} is the A-weighted equivalent continuous steady sound level during the sample period and effectively represents an average value over the defined measurement period, T.

L_{Aeq,16hr} refers to the ambient daytime noise level between 07:00 and 23:00hrs.

L_{Aeq,8hr} refers to the ambient night-time noise level between 23:00 and 07:00hrs

L_{A10,T} is the A-weighted sound level that is exceeded for 10% of the sample period; this parameter gives an indication of the upper limit of fluctuating noise such as that from road traffic. The T is the sample period the parameter is measured over.

L_{A10,18hr} is the L_{A10} parameter between 06:00 and 00:00hrs as defined within the CRTN¹.

L_{A90,T} is the A-weighted sound level that is exceeded for 90% of the sample period; generally used to quantify background noise. The T is the sample period the parameter is measured over.

L_{A90,16hr} refers to the background daytime noise level between 07:00 and 23:00hrs

L_{A90,8hr} refers to the background night-time noise level between 23:00 and 07:00hrs

The L_{den} parameter is also discussed within the report. For long-term survey locations, this parameter is derived from the L_{Aeq} data over each 24 hour period and is defined as follows:

L_{den} is the 24hour noise rating level determined by the averaging of the L_{day} with the L_{evening} (plus a 5 dB penalty) and the L_{night} (plus a 10 dB penalty). L_{den} is calculated using the following formula, as defined within the Environmental Noise Regulations²:

$$L_{den} = 10 \log \left(\frac{1}{24} \left(12 * \left(10^{\frac{L_{day}}{10}} \right) + 4 * \left(10^{\frac{L_{evening+5}}{10}} \right) + 8 * \left(10^{\frac{L_{night+10}}{10}} \right) \right) \right)$$

Where:

¹ UK's Department of Transport. 1988. *Calculation of Road Traffic Noise (CRTN)*

² S.I. No. 140/2006 - Environmental Noise Regulations 2006

L_{day} is the A-weighted long-term average sound level as defined in ISO 1996-2, determined over all the day periods of a year. The 12 hour daytime period is between 07:00 to 19:00hrs.

L_{evening} is the A-weighted long-term average sound level as defined in ISO 1996-2, determined over all the evening periods of a year. The 4 hour evening period is between 19:00 to 23:00hrs.

L_{night} is the A-weighted long-term average sound level as defined in ISO 1996-2, determined over all the night periods of a year. The 8 hour night-time period is between 23:00 to 07:00hrs.

Survey Procedure

Noise measurements were conducted in general accordance with the guidance contained in ISO 1996: *Acoustics – Description measurement and assessment and environmental noise. Part 1: Basic quantities and assessment procedures* (2016) and Part 2: *Determination of sound pressure levels* (2017).

Unattended Measurements

For unattended noise surveys, the monitoring equipment was installed within the private grounds of residential properties or private property lands (schools, churches, hospitals, parks etc.). The microphone was installed at a height of approximately 3.8 m above ground. The equipment was set to measure continuously over a 1 day period, logging data at 1 hour intervals.

Attended Measurements

Attended noise surveys were undertaken at public locations at positions representative of the adjacent noise sensitive locations (e.g. on green areas in residential areas, footpaths, parks etc.). For all attended surveys, the microphone was positioned at a height of approximately 1.2 m above ground.

The attended surveys were undertaken in accordance with the shortened measurement procedure described in the UK Department of Transport document *Calculation of Road Traffic Noise* (CRTN) (1988) and the Transport Infrastructure Ireland (TII) document *Guidelines for the Treatment of Noise and Vibration on National Roads* (2004).

This methodology involves a method whereby $L_{A10(18\text{hour})}$ and L_{den} values are obtained through a combination of measurement and calculation as follows:

- Noise level measurements are undertaken at the chosen location over three consecutive hours between 10:00 and 17:00hrs;
- Each sample period should be 15 minutes in duration;
- The $L_{A10(18\text{hour})}$ for the location is derived by subtracting 1 dB from the arithmetic average of the three hourly sample values, i.e.
$$L_{A10(18\text{hour})} = ((\sum L_{A10(15\text{minutes})}) \div 3) - 1 \text{ dB};$$
- The derived L_{den} value is calculated from the $L_{A10(18\text{hour})}$ value, i.e.
$$L_{\text{den}} = 0.86 \times L_{A10(18\text{hour})} + 9.86 \text{ dB}.$$

Survey Results

Zone A

Unattended Surveys

The unattended noise survey results relating to Zone A are summarised in Table 9.

Within Zone A, trains are the dominant noise source at the monitoring positions in the vicinity of the Proposed Project with contribution also from road traffic on R105, R803 and R132. During daytime periods, average ambient noise levels were recorded in range of 49 to 60 dB $L_{Aeq,16hr}$. Average daytime background noise levels were measured in the range of 43 to 50 dB $L_{A90,16hr}$.

Night-time noise levels at the monitoring locations are dominated by road traffic noise. Average ambient night-time noise levels were measured in the range of 44 to 52 dB $L_{Aeq,8hr}$. Average background noise levels during this time period were measured in the range of 39 to 48 dB $L_{A90,8hr}$.

The measured L_{den} values in this study area ranged between 52 and 61 dB L_{den} .

Table 9 Summary of unattended noise measurements in Zone A

Location	Date	Daytime				Evening	Night-time					L_{den}
		$L_{Aeq,16hr}$	L_{day}	$L_{A10,16hr}$	$L_{A90,16hr}$	$L_{evening}$	L_{night}	$L_{A10,8hr}$	$L_{A90,8hr}$	$L_{AFMax, 8hr, max}$	$L_{AFMax, 8hr, min}$	
N02	13/01/2021	60	63	52	47	50	47	49	42	77	57	61
N04	13/10/2020	49	50	49	43	47	44	46	39	72	51	52
N08	15/12/2020	53	54	52	46	50	52	53	47	72	67	58
N10	25/11/2020	55	55	54	50	55	51	51	48	86	54	59

Attended Surveys

The survey results for the attended monitoring locations within Zone A are presented in Table 10.

Table 10 Attended survey results for Zone A

Survey Location Reference	Date	Start Time	Measured Noise Levels (dB re.2x10 ⁻⁵ Pa)			Derived L _{den}	Survey Notes
			L _{Aeq}	L _{A10}	L _{A90}		
N03	22/04/2021	09:22	62	63	46	63	Minor road traffic from Ossory Road, birdsong, train noise occasionally dominant.
		11:17	59	62	45		
		12:44	70	64	45		More significant road traffic from Ossory Road during this measurement including loud motorcycle, birdsong.
N12	22/04/2021	10:39	51	52	47	55	Road traffic Whitworth Road, pedestrian chatter. Train tracks are sunk at this point to the extent that they are out of sight and not a major noise source.
		12:19	50	52	47		
		13:49	52	54	48		

Zone B

Unattended Survey

The unattended noise survey results relating to Zone B are summarised in Table 11.

Within Zone B, trains are the dominant noise source at the monitoring positions in the vicinity of the Proposed Project with contribution also from varying levels of road traffic with the exception of the Spencer Dock location where construction noise was by far the largest contributor during the day.

Ambient daytime noise levels were measured in the range of 52 to 60 dB L_{Aeq,16hr}. Background noise levels during daytime periods were measured in the range of 42 to 49 dB L_{A90,16hr}.

Ambient night-time noise levels were measured in the range of 44 to 56 dB L_{Aeq,8hr}. Background noise levels during night-time periods were measured in the range of 37 to 45 dB L_{A90,8hr}.

L_{den} values at this location were measured in the range of 54 to 63 dB L_{den}.

Table 11 Summary of unattended noise measurements in Zone B

Location	Date	Daytime				Evening	Night-time					L _{den}
		L _{Aeq,16hr}	L _{day}	L _{A10,16hr}	L _{A90,16hr}	L _{evening}	L _{night}	L _{A10,8hr}	L _{A90,8hr}	L _{AFMax, 8hr, max}	L _{AFMax, 8hr, min}	
N51	22/06/2021	59	62	57	49	50	56	52	45	75	45	63
N01	16/12/2020	52	53	51	47	50	44	45	40	74	52	54
N07	15/12/2020	60	61	54	44	58	55	53	45	84	67	63
N09	13/01/2021	53	53	48	42	52	45	42	37	76	48	55
N11	12/10/2020	58	59	56	42	56	53	46	39	84	53	61
N13	02/12/2020	53	54	52	45	52	48	48	41	76	57	56

Attended Surveys

The survey results for the attended monitoring locations within Zone B are presented in Table 12.

Table 12 Attended survey results for Zone B

Survey Location Reference	Date	Start Time	Measured Noise Levels (dB re.2x10 ⁻⁵ Pa)			Derived L _{den}	Survey Notes
			L _{Aeq}	L _{A10}	L _{A90}		
N05	22/04/2021	09:43	60	55	42	58	Very faint road traffic from North Strand Road, birdsong. Train noise occasionally dominant.
		11:36	61	56	39		
		13:05	63	59	42		
N06	22/04/2021	10:06	58	59	47	57	Road traffic from North Strand Road (partially shielded from it). Train noise occasionally significant.
		11:56	53	56	44		
		13:24	52	54	46		

Zone C

Unattended Surveys

The unattended noise survey results relating to Zone C are summarised in Table 13.

Within Zone C, trains are the dominant noise source at the monitoring positions in the vicinity of the Proposed Project with contribution also from varying levels of road traffic with the exception of the Cabra Compound location where construction noise was by far the largest contributor during the day.

Ambient daytime noise levels were measured in the range of 53 to 66 dB $L_{Aeq,16hr}$. Background noise levels during daytime periods were measured in the range of 42 to 51 dB $L_{A90,16hr}$.

Ambient night-time noise levels were measured in the range of 46 to 59 dB $L_{Aeq,8hr}$. Background noise levels during night-time periods were measured in the range of 32 to 45 dB $L_{A90,8hr}$.

L_{den} values at this location were measured in the range of 55 to 68 dB L_{den} .

Table 13 Summary of unattended noise measurements in Zone C

Location	Date	Daytime				Evening	Night-time					L_{den}
		$L_{Aeq,16hr}$	L_{day}	$L_{A10,16hr}$	$L_{A90,16hr}$	$L_{evening}$	L_{night}	$L_{A10,8hr}$	$L_{A90,8hr}$	$L_{AFMax, 8hr, max}$	$L_{AFMax, 8hr, min}$	
N15	24/11/2020	59	60	52	42	58	54	45	39	81	59	62
N16 (UT39)	16-22/05/2019	57	57		42	56	52		38			60
N17 (UT36)	23-29/10/2019	58	57		41	57	51		37			60
N18	24/11/2020	55	56	52	47	54	49	46	44	77	50	58
N19	17/12/2020	57	58	56	49	55	52	52	39	78	64	60
N20	29/09/2020	60	60	52	46	58	56	52	45	88	70	64
N21	26/11/2020	62	62	56	44	60	56	44	36	87	52	64
N22	18/01/2021	56	57	58	48	55	52	54	45	77	66	60
N24	25/01/2021	66	66	49	45	65	59	47	41	93	53	68

Location	Date	Daytime				Evening	Night-time					L _{den}
		L _{Aeq,16hr}	L _{day}	L _{A10,16hr}	L _{A90,16hr}	L _{evening}	L _{night}	L _{A10,8hr}	L _{A90,8hr}	L _{AFMax, 8hr, max}	L _{AFMax, 8hr, min}	
N25	01/12/2020	57	58	53	45	56	46	42	35	75	49	58
N26	30/03/2021	63	66	61	51	58	54	47	32	83	54	65
N28	19/10/2020	53	54	51	44	51	46	45	36	78	53	55
N53	20/07/2021	61	64	55	48	48	46	46	44	75	46	61

Attended Surveys

The survey results for the attended monitoring locations within Zone C are presented in Table 14.

Table 14 Attended survey results for Zone C

Survey Location Reference	Date	Start Time	Measured Noise Levels (dB re.2x10 ⁻⁵ Pa)			Derived L _{den}	Survey Notes
			L _{Aeq}	L _{A10}	L _{A90}		
N54	20/07/2021 (Daytime)	11:05	45	47	38	49	Some vehicle movements in Claremont Lawns, occasional train passes, faint road traffic from R135 and R108, wind, birdsong.
		11:21	43	46	38		
		11:55	45	48	41		
	09/09/2021 (Evening / Night)	22:40	37	39	32	-	Road traffic R135 and R108 (dominant, i.e. the combination of R135 and R108), trains (equal to road traffic when trains passing).
		23:00	37	38	33		
23:16		35	37	31			
N23	28/04/2021	11:30	63	65	61	64	Significant screening from train tracks due to trees, significant traffic noise from M50, birdsong.
		12:32	62	63	60		
		13:30	64	64	61		

Zone D

Unattended Surveys

The unattended noise survey results relating to Zone D are summarised in Table 15.

Within Zone D, trains are the dominant noise source at the monitoring positions in the vicinity of the Proposed Project with contribution also from varying levels of road traffic.

Ambient daytime noise levels were measured in the range of 51 to 57 dB $L_{Aeq,16hr}$. Background noise levels during daytime periods were measured in the range of 44 to 52 dB $L_{A90,16hr}$.

Ambient night-time noise levels were measured in the range of 47 to 56 dB $L_{Aeq,8hr}$. Background noise levels during night-time periods were measured in the range of 33 to 46 dB $L_{A90,8hr}$.

L_{den} values at this location were measured in the range of 55 to 63 dB L_{den} .

Table 15 Summary of unattended noise measurements in Zone D

Location	Date	Daytime				Evening	Night-time					L_{den}
		$L_{Aeq,16hr}$	L_{day}	$L_{A10,16hr}$	$L_{A90,16hr}$	$L_{evening}$	L_{night}	$L_{A10,8hr}$	$L_{A90,8hr}$	$L_{AFMax, 8hr, max}$	$L_{AFMax, 8hr, min}$	
N46	26/11/2020	51	53	51	44	47	47	47	33	68	54	55
N48	01/12/2020	57	58	55	50	55	51	52	45	85	58	60
N49	30/11/2020	57	57	53	47	57	51	47	35	86	52	60
N50	07/01/2021	56	57	52	47	54	51	49	37	84	54	59
N51	30/11/2020	55	56	56	52	55	49	50	40	71	55	58
N55	21/06/2021	57	57	54	50	57	56	54	46	75	45	63

Attended Surveys

The survey results for the attended monitoring locations within Zone D are presented in Table 16.

Table 16 Attended survey results for Zone D

Survey Location Reference	Date	Start Time	Measured Noise Levels (dB re.2x10 ⁻⁵ Pa)			Derived L _{den}	Survey Notes
			L _{Aeq}	L _{A10}	L _{A90}		
N47	28/04/2021	12:02	57	60	45	61	Traffic noise from L2222, birdsong, train noise occasionally significant.
		13:01	57	61	45		
		14:01	58	62	45		

Zone E

Unattended Surveys

The unattended noise survey results relating to Zone E are summarised in Table 17.

Within Zone E, trains are the dominant noise source at the monitoring positions in the vicinity of the Proposed Project with contribution also from varying levels of road traffic.

Ambient daytime noise levels were measured in the range of 54 to 62 dB L_{Aeq,16hr}. Background noise levels during daytime periods were measured in the range of 37 to 48 dB L_{A90,16hr}.

Ambient night-time noise levels were measured in the range of 46 to 57 dB L_{Aeq,8hr}. Background noise levels during night-time periods were measured in the range of 31 to 41 dB L_{A90,8hr}.

L_{den} values at this location were measured in the range of 56 to 67 dB L_{den}.

Table 17 Summary of unattended noise measurements in Zone E

Location	Date	Daytime				Evening	Night-time					L _{den}
		L _{Aeq,16hr}	L _{day}	L _{A10,16hr}	L _{A90,16hr}	L _{evening}	L _{night}	L _{A10,8hr}	L _{A90,8hr}	L _{AFMax, 8hr, max}	L _{AFMax, 8hr, min}	
N29	19/01/2021	54	54	56	47	54	46	47	38	80	55	56
N30	07/12/2020	64	63	53	45	65	57	46	37	87	55	67
N31	15/09/2020	61	61	50	39	60	55	40	31	85	49	63
N33	17/09/2020	60	59	46	37	60	54	38	31	94	42	62
N34	06/10/2020	55	56	48	41	55	48	42	37	79	58	58
N35	07/12/2020	59	60	48	42	59	54	44	41	88	47	63
N37	16/09/2020	62	63	50	44	60	53	42	38	82	48	63
N39	05/10/2020	56	57	56	48	54	49	48	39	78	61	58
N41	10/12/2020	57	59	53	48	53	48	46	39	91	54	58

Attended Surveys

The survey results for the attended monitoring locations within Zone E are presented in Table 18.

Table 18 Attended survey results for Zone E

Survey Location Reference	Date	Start Time	Measured Noise Levels (dB re.2x10 ⁻⁵ Pa)			Derived L _{den}	Survey Notes
			L _{Aeq}	L _{A10}	L _{A90}		
N32	21/04/2021	10:33	49	53	42	54	Road traffic noise from the housing estate, birdsong. No trains passed during this measurement.
		12:13	59	53	42		Trains passed during this measurement.
		13:50	55	51	40		Trains passed during this measurement.
N36	21/04/2021	10:59	46	48	38	56	Occasional vehicle movements in the car park, birdsong, faint voices. No trains passed during this measurement.
		12:38	59	60	41		Trains passed during this measurement.
		14:22	56	56	39		Trains passed during this measurement.

Survey Location Reference	Date	Start Time	Measured Noise Levels (dB re.2x10 ⁻⁵ Pa)			Derived L _{den}	Survey Notes
			L _{Aeq}	L _{A10}	L _{A90}		
N38	21/04/2021	11:20	60	60	54	61	Siren at level crossing, train horn, on gravel patch, faint construction noise from construction site, minor road traffic from L81206.
		13:00	58	59	54		
		14:43	62	60	53		
N40	21/04/2021	11:43	55	52	47	55	Minor vehicle movement within the carpark, birdsong, train noise occasionally significant.
		13:21	56	57	48		
		15:06	56	54	46		

Zone F

Unattended Surveys

The unattended noise survey results relating to Zone F are summarised in Table 19.

Within Zone F, trains are the dominant noise source at the monitoring positions in the vicinity of the Proposed Project with contribution also from varying levels of road traffic with the exceptions of the two Depot locations where the main noise sources were road traffic and low farming activity.

Ambient daytime noise levels were measured in the range of 48 to 57 dB L_{Aeq,16hr}. Background noise levels during daytime periods were measured in the range of 40 to 47 dB L_{A90,16hr}.

Ambient night-time noise levels were measured in the range of 43 to 49 dB L_{Aeq,8hr}. Background noise levels during night-time periods were measured in the range of 34 to 41 dB L_{A90,8hr}.

L_{den} values at this location were measured in the range of 52 to 59 dB L_{den}.

Table 19 Summary of unattended noise measurements in Zone F

Location	Date	Daytime				Evening	Night-time					L _{den}
		L _{Aeq,16hr}	L _{day}	L _{A10,16hr}	L _{A90,16hr}	L _{evening}	L _{night}	L _{A10,8hr}	L _{A90,8hr}	L _{AFMax, 8hr, max}	L _{AFMax, 8hr, min}	
N42	12/01/2021	52	54	51	46	50	46	47	41	67	53	55
N56	14/07/2021	48	49	50	45	47	44	46	37	70	49	52
N57	15/07/2021	50	46	49	40	52	48	44	34	81	53	55
N43	09/12/2020	53	55	55	46	51	45	45	35	70	62	55
N44	09/12/2020	57	57	60	47	56	49	47	36	80	63	59
N45	10/12/2020	50	52	51	46	48	43	44	38	67	52	52

Summary and Conclusions

Baseline noise monitoring has been undertaken at 53 locations across the DART+ West study area to inform the baseline study for the noise and vibration chapter of the DART+ West EIAR.

The survey locations have been selected to gain a representative range of noise levels associated with the nearest noise sensitive areas which have the potential to be impacted by construction works and/or those likely to be impacted during the operational phase of the DART+ West Project.

Long-term surveys (typically 24hours in duration) were made at a total of 42 locations. Short-term surveys (attended measurements) were made at a total of 11 locations along the length of the Proposed Project to supplement the long-term surveys.

The majority of noise sensitive buildings and areas along the length of the Proposed Project are in urban and suburban areas, however, more rural locations were surveyed towards the western end of the scheme. Trains are the dominant source of noise at the vast majority of survey locations.

APPENDIX A. Calibration Certificate for Monitoring Equipment

Rion NL-52 S/N 1076328



**CERTIFICATE
OF
CALIBRATION**



Date of Issue: 21 August 2020

Certificate Number: UCRT20/1795

Issued by:

ANV Measurement Systems
Beaufort Court
17 Roebuck Way
Milton Keynes MK5 8HL
Telephone 01908 642846 Fax 01908 642814
E-Mail: info@noise-and-vibration.co.uk
Web: www.noise-and-vibration.co.uk

Acoustics Noise and Vibration Ltd trading as ANV Measurement Systems

Page 1 of 2 Pages

Approved Signatory



K. Mistry

Customer	AWN Consulting Limited The Tecpro Building IDA Business and Technology Park Clonshaugh Dublin 17 Ireland			
Order No.	PO 2062			
Description	Sound Level Meter / Pre-amp / Microphone / Associated Calibrator			
Identification	<i>Manufacturer</i>	<i>Instrument</i>	<i>Type</i>	<i>Serial No. / Version</i>
	Rion	Sound Level Meter	NL-52	01076328
	Rion	Firmware		2.0
	Rion	Pre Amplifier	NH-25	76545
	Rion	Microphone	UC-59	17212
	Rion	Calibrator	NC-74	34536109
		Calibrator adaptor type if applicable		NC-74-002
Performance Class	1			
Test Procedure	TP 2.SLM 61672-3 TPS-49 <i>Procedures from IEC 61672-3:2006 were used to perform the periodic tests.</i>			
Type Approved to IEC 61672-1:2002	YES	Approval Number	21.21 / 13.02	
	<i>If YES above there is public evidence that the SLM has successfully completed the applicable pattern evaluation tests of IEC 61672-2:2003</i>			
Date Received	19 August 2020	ANV Job No.	UKAS20/08452	
Date Calibrated	21 August 2020			

The sound level meter submitted for testing has successfully completed the class 1 periodic tests of IEC 61672-3:2006, for the environmental conditions under which the tests were performed. As public evidence was available, from an independent testing organisation responsible for approving the results of pattern evaluation tests performed in accordance with IEC 61672-2:2003, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1:2002, the sound level meter submitted for testing conforms to the class 1 requirements of IEC 61672-1:2002.

Previous Certificate	<i>Dated</i>	<i>Certificate No.</i>	<i>Laboratory</i>
	15 August 2018	UCRT18/1836	0653

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CERTIFICATE OF CALIBRATION	Certificate Number UCRT20/1795
	Page 2 of 2 Pages

UKAS Accredited Calibration Laboratory No. 0653

Sound Level Meter Instruction manual and data used to adjust the sound levels indicated.

SLM instruction manual title	Sound Level Meter	NL-42 / NL-52
SLM instruction manual ref / issue		11-03
SLM instruction manual source	Manufacturer	
Internet download date if applicable		N/A
Case corrections available	Yes	
Uncertainties of case corrections	Yes	
Source of case data	Manufacturer	
Wind screen corrections available	Yes	
Uncertainties of wind screen corrections	Yes	
Source of wind screen data	Manufacturer	
Mic pressure to free field corrections	Yes	
Uncertainties of Mic to F.F. corrections	Yes	
Source of Mic to F.F. corrections	Manufacturer	
Total expanded uncertainties within the requirements of IEC 61672-1:2002	Yes	
Specified or equivalent Calibrator	Specified	
Customer or Lab Calibrator	Lab Calibrator	
Calibrator adaptor type if applicable	NC-74-002	
Calibrator cal. date	19 August 2020	
Calibrator cert. number	UCRT20/1789	
Calibrator cal cert issued by	0653	
Calibrator SPL @ STP	94.02	dB Calibration reference sound pressure level
Calibrator frequency	1001.89	Hz Calibration check frequency
Reference level range	25 - 130	dB

Accessories used or corrected for during calibration - Extension Cable & Wind Shield WS-15

Note - if a pre-amp extension cable is listed then it was used between the SLM and the pre-amp.

Environmental conditions during tests	Start	End	
Temperature	22.72	23.10	± 0.30 °C
Humidity	64.7	62.8	± 3.00 %RH
Ambient Pressure	98.89	98.98	± 0.03 kPa

Response to associated Calibrator at the environmental conditions above.

Initial indicated level	94.0	dB	Adjusted indicated level	94.0	dB
The uncertainty of the associated calibrator supplied with the sound level meter ±				0.10	dB

Self Generated Noise This test is currently not performed by this Lab.

Microphone installed (if requested by customer) = Less Than	N/A	dB	A Weighting
Uncertainty of the microphone installed self generated noise ±	N/A	dB	

Microphone replaced with electrical input device -	UR = Under Range indicated		
Weighting	A	C	Z
	11.0	14.5	20.8
	dB	dB	dB
	UR	UR	UR

Uncertainty of the electrical self generated noise ± 0.12 dB

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor $k=2$, providing a coverage probability of approximately 95%. The uncertainty evaluation has been carried out in accordance with UKAS requirements.

For the test of the frequency weightings as per paragraph 12. of IEC 61672-3:2006 the actual microphone free field response was used.

The acoustical frequency tests of a frequency weighting as per paragraph 11 of IEC 61672-3:2006 were carried out using an electrostatic actuator.

..... END

Calibrated by: B. Giles

R 1

Additional Comments The results on this certificate only relate to the items calibrated as identified above. Prior to calibration the instrument's microphone was replaced and the meter was re-aligned.

Rion NL-52 S/N 586940



**CERTIFICATE
OF
CALIBRATION**



Date of Issue: 28 October 2020

Certificate Number: UCRT20/2049

Calibrated at & Certificate issued by:

ANV Measurement Systems

Beaufort Court

17 Roebuck Way

Milton Keynes MK5 8HL

Telephone 01908 642846 Fax 01908 642814

E-Mail: info@noise-and-vibration.co.uk

Web: www.noise-and-vibration.co.uk

Acoustics Noise and Vibration Ltd trading as ANV Measurement Systems

Page 1 of 2 Pages

Approved Signatory



K. Mistry

Customer AWN Consulting Limited
The Tecpro Building
IDA Business and Technology Park
Clonshaugh
Dublin 17
Ireland

Order No. PO-2083

Description Sound Level Meter / Pre-amp / Microphone / Associated Calibrator

Identification	Manufacturer	Instrument	Type	Serial No. / Version
	Rion	Sound Level Meter	NL-52	00586940
	Rion	Firmware		2.0
	Rion	Pre Amplifier	NH-25	87059
	Rion	Microphone	UC-59	17049
	Brüel & Kjær	Calibrator	4231	3010369
		Calibrator adaptor type if applicable		UC 0210

Performance Class 1

Test Procedure TP 2.SLM 61672-3 TPS-49

Procedures from IEC 61672-3:2006 were used to perform the periodic tests.

Type Approved to IEC 61672-1:2002 YES Approval Number 21.21 / 13.02

If YES above there is public evidence that the SLM has successfully completed the applicable pattern evaluation tests of IEC 61672-2:2003

Date Received 19 October 2020

ANV Job No. UKAS20/10584

Date Calibrated 28 October 2020

The sound level meter submitted for testing has successfully completed the class 1 periodic tests of IEC 61672-3:2006, for the environmental conditions under which the tests were performed. As public evidence was available, from an independent testing organisation responsible for approving the results of pattern evaluation tests performed in accordance with IEC 61672-2:2003, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1:2002, the sound level meter submitted for testing conforms to the class 1 requirements of IEC 61672-1:2002.

Previous Certificate	Dated	Certificate No.	Laboratory
	15 August 2018	UCRT18/1831	0653

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CERTIFICATE OF CALIBRATION	Certificate Number UCRT20/2049
	Page 2 of 2 Pages

UKAS Accredited Calibration Laboratory No. 0653

Sound Level Meter Instruction manual and data used to adjust the sound levels indicated.

SLM instruction manual title	Sound Level Meter	NL-42 / NL-52
SLM instruction manual ref / issue		11-03
SLM instruction manual source	Manufacturer	
Internet download date if applicable		N/A
Case corrections available		Yes
Uncertainties of case corrections		Yes
Source of case data	Manufacturer	
Wind screen corrections available		Yes
Uncertainties of wind screen corrections		Yes
Source of wind screen data	Manufacturer	
Mic pressure to free field corrections		Yes
Uncertainties of Mic to F.F. corrections		Yes
Source of Mic to F.F. corrections	Manufacturer	
Total expanded uncertainties within the requirements of IEC 61672-1:2002	Yes	
Specified or equivalent Calibrator	Specified	
Customer or Lab Calibrator	Customers Calibrator	
Calibrator adaptor type if applicable	UC 0210	
Calibrator cal. date	03 March 2020	
Calibrator cert. number	UCRT20/1259	
Calibrator cal cert issued by	0653	
Calibrator SPL @ STP	94.17	dB Calibration reference sound pressure level
Calibrator frequency	999.96	Hz Calibration check frequency
Reference level range	25 - 130	dB

Accessories used or corrected for during calibration - Extension Cable & Wind Shield WS-15
 Note - if a pre-amp extension cable is listed then it was used between the SLM and the pre-amp.

Environmental conditions during tests	Start	End	
Temperature	23.30	23.31	± 0.30 °C
Humidity	48.0	47.6	± 3.00 %RH
Ambient Pressure	99.06	99.03	± 0.03 kPa

Response to associated Calibrator at the environmental conditions above.			
Initial indicated level	94.2	dB	Adjusted indicated level 94.2 dB
The uncertainty of the associated calibrator supplied with the sound level meter ±			0.10 dB

Self Generated Noise	This test is currently not performed by this Lab.		
Microphone installed (if requested by customer) = Less Than	N/A	dB	A Weighting
Uncertainty of the microphone installed self generated noise ±	N/A	dB	

Microphone replaced with electrical input device -	UR = Under Range indicated		
Weighting	A	C	Z
	11.6 dB UR	16.0 dB UR	22.5 dB UR
Uncertainty of the electrical self generated noise ±	0.12 dB		

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor $k=2$, providing a coverage probability of approximately 95%. The uncertainty evaluation has been carried out in accordance with UKAS requirements.

For the test of the frequency weightings as per paragraph 12. of IEC 61672-3:2006 the actual microphone free field response was used.

The acoustical frequency tests of a frequency weighting as per paragraph 11 of IEC 61672-3:2006 were carried out using an electrostatic actuator.

..... END

Calibrated by: **B. Bogdan** R 2

Additional Comments The results on this certificate only relate to the items calibrated as identified above.
 Prior to calibration the instrument's microphone was replaced and the meter was re-aligned.

Rion NL-52 S/N 998413




**CERTIFICATE
OF
CALIBRATION**



Date of Issue: 22 January 2020

Certificate Number: UCRT20/1095

Issued by:
ANV Measurement Systems
Beaufort Court
17 Roebuck Way
Milton Keynes MK5 8HL
Telephone 01908 642846 Fax 01908 642814
E-Mail: info@noise-and-vibration.co.uk
Web: www.noise-and-vibration.co.uk
Acoustics Noise and Vibration Ltd trading as ANV Measurement Systems

Page 1 of 2 Pages
Approved Signatory

K. Mistry

Customer AWN Consulting
The Tecpro Building
IDA Business and Technology Park
Clonshaugh
Dublin 17

Order No. AWNC150120QTE
Description Sound Level Meter / Pre-amp / Microphone / Associated Calibrator
Identification

Manufacturer	Instrument	Type	Serial No. / Version
Rion	Sound Level Meter	NL-52	00998413
Rion	Firmware		2.0
Rion	Pre Amplifier	NH-25	98627
Rion	Microphone	UC-59	15920
Rion	Calibrator	NC-74	34536109
	Calibrator adaptor type if applicable		NC-74-002

Performance Class 1
Test Procedure TP 2.SLM 61672-3 TPS-49
Procedures from IEC 61672-3:2006 were used to perform the periodic tests.
Type Approved to IEC 61672-1:2002 YES Approval Number 21.21 / 13.02
If YES above there is public evidence that the SLM has successfully completed the applicable pattern evaluation tests of IEC 61672-2:2003
Date Received 17 January 2020 ANV Job No. UKAS20/01036
Date Calibrated 22 January 2020

The sound level meter submitted for testing has successfully completed the class 1 periodic tests of IEC 61672-3:2006, for the environmental conditions under which the tests were performed. As public evidence was available, from an independent testing organisation responsible for approving the results of pattern evaluation tests performed in accordance with IEC 61672-2:2003, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1:2002, the sound level meter submitted for testing conforms to the class 1 requirements of IEC 61672-1:2002.

Previous Certificate	Dated	Certificate No.	Laboratory
	Initial Calibration		

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CERTIFICATE OF CALIBRATION

Certificate Number

UCRT20/1095

UKAS Accredited Calibration Laboratory No. 0653

Page 2 of 2 Pages

Sound Level Meter Instruction manual and data used to adjust the sound levels indicated.

SLM instruction manual title	Sound Level Meter	NL-42 / NL-52
SLM instruction manual ref / issue		11-03
SLM instruction manual source	Manufacturer	
Internet download date if applicable		N/A
Case corrections available		Yes
Uncertainties of case corrections		Yes
Source of case data	Manufacturer	
Wind screen corrections available		Yes
Uncertainties of wind screen corrections		Yes
Source of wind screen data	Manufacturer	
Mic pressure to free field corrections		Yes
Uncertainties of Mic to F.F. corrections		Yes
Source of Mic to F.F. corrections	Manufacturer	
Total expanded uncertainties within the requirements of IEC 61672-1:2002		Yes
Specified or equivalent Calibrator	Specified	
Customer or Lab Calibrator	Lab Calibrator	
Calibrator adaptor type if applicable	NC-74-002	
Calibrator cal. date	21 January 2020	
Calibrator cert. number	UCRT20/1082	
Calibrator cal cert issued by	0653	
Calibrator SPL @ STP	93.98	dB Calibration reference sound pressure level
Calibrator frequency	1001.97	Hz Calibration check frequency
Reference level range	25 - 130	dB

Accessories used or corrected for during calibration - Extension Cable & Wind Shield WS-15
 Note - if a pre-amp extension cable is listed then it was used between the SLM and the pre-amp.

Environmental conditions during tests	Start	End	
Temperature	22.18	22.19	± 0.30 °C
Humidity	38.7	37.6	± 3.00 %RH
Ambient Pressure	102.72	102.74	± 0.03 kPa

Response to associated Calibrator at the environmental conditions above.

Initial indicated level	93.9	dB	Adjusted indicated level	94.0	dB
The uncertainty of the associated calibrator supplied with the sound level meter ±			0.10		dB

Self Generated Noise This test is currently not performed by this Lab.
 Microphone installed (if requested by customer) = Less Than N/A dB A Weighting
 Uncertainty of the microphone installed self generated noise ± N/A dB

Microphone replaced with electrical input device - UR = Under Range indicated

Weighting	A	C	Z
	11.7	16.3	23.2
	dB UR	dB UR	dB UR
Uncertainty of the electrical self generated noise ±		0.12	
		dB	

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor $k=2$, providing a coverage probability of approximately 95%. The uncertainty evaluation has been carried out in accordance with UKAS requirements.

For the test of the frequency weightings as per paragraph 12. of IEC 61672-3:2006 the actual microphone free field response was used.

The acoustical frequency tests of a frequency weighting as per paragraph 11 of IEC 61672-3:2006 were carried out using an electrostatic actuator.

END

Calibrated by: B. Bogdan

R 2

Additional Comments The results on this certificate only relate to the items calibrated as identified above.

None

Rion NL-52 S/N 164427



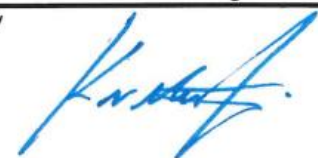
CERTIFICATE OF CALIBRATION



Date of Issue: 05 May 2020

Certificate Number: UCRT20/1393

Issued by:
ANV Measurement Systems
Beaufort Court
17 Roebuck Way
Milton Keynes MK5 8HL
Telephone 01908 642846 Fax 01908 642814
E-Mail: info@noise-and-vibration.co.uk
Web: www.noise-and-vibration.co.uk
Acoustics Noise and Vibration Ltd trading as ANV Measurement Systems

Page 1 of 2 Pages
Approved Signatory 
K. Mistry

Customer AWN Consulting
 The Tecpro Building
 IDA Business and Technology Park
 Clonshaugh
 Dublin 17

Order No.	RM/20/Cal019			
Description	Sound Level Meter / Pre-amp / Microphone / Associated Calibrator			
Identification	<i>Manufacturer</i>	<i>Instrument</i>	<i>Type</i>	<i>Serial No. / Version</i>
	Rion	Sound Level Meter	NL-52	00164427
	Rion	Firmware		2.0
	Rion	Pre Amplifier	NH-25	54560
	Rion	Microphone	UC-59	09208
	Brüel & Kjær	Calibrator	4231	2205805
		Calibrator adaptor type if applicable		UC 0210

Performance Class 1
Test Procedure TP 2.SLM 61672-3 TPS-49
Procedures from IEC 61672-3:2006 were used to perform the periodic tests.

Type Approved to IEC 61672-1:2002 YES Approval Number 21.21 / 13.02
If YES above there is public evidence that the SLM has successfully completed the applicable pattern evaluation tests of IEC 61672-2:2003

Date Received 30 April 2020 ANV Job No. UKAS20/04240
Date Calibrated 05 May 2020

The sound level meter submitted for testing has successfully completed the class 1 periodic tests of IEC 61672-3:2006, for the environmental conditions under which the tests were performed. As public evidence was available, from an independent testing organisation responsible for approving the results of pattern evaluation tests performed in accordance with IEC 61672-2:2003, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1:2002, the sound level meter submitted for testing conforms to the class 1 requirements of IEC 61672-1:2002.

Previous Certificate	<i>Dated</i>	<i>Certificate No.</i>	<i>Laboratory</i>
	09 April 2018	TCRT18/1306	ANV Measurement Systems

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CERTIFICATE OF CALIBRATION	Certificate Number UCRT20/1393
	Page 2 of 2 Pages

Sound Level Meter Instruction manual and data used to adjust the sound levels indicated.

SLM instruction manual title	Sound Level Meter	NL-42 / NL-52
SLM instruction manual ref / issue		11-03
SLM instruction manual source		Manufacturer
Internet download date if applicable		N/A
Case corrections available		Yes
Uncertainties of case corrections		Yes
Source of case data		Manufacturer
Wind screen corrections available		Yes
Uncertainties of wind screen corrections		Yes
Source of wind screen data		Manufacturer
Mic pressure to free field corrections		Yes
Uncertainties of Mic to F.F. corrections		Yes
Source of Mic to F.F. corrections		Manufacturer
Total expanded uncertainties within the requirements of IEC 61672-1:2002	Yes	
Specified or equivalent Calibrator	Specified	
Customer or Lab Calibrator	Customers Calibrator	
Calibrator adaptor type if applicable	UC 0210	
Calibrator cal. date	06 December 2019	
Calibrator cert. number	UCRT19/2333	
Calibrator cal cert issued by	0653	
Calibrator SPL @ STP	93.95	dB Calibration reference sound pressure level
Calibrator frequency	999.97	Hz Calibration check frequency
Reference level range	25 - 130	dB

Accessories used or corrected for during calibration - Extension Cable & Wind Shield WS-15
 Note - if a pre-amp extension cable is listed then it was used between the SLM and the pre-amp.

Environmental conditions during tests	Start	End	
Temperature	22.91	23.51	± 0.30 °C
Humidity	35.5	36.1	± 3.00 %RH
Ambient Pressure	101.11	101.12	± 0.03 kPa

Response to associated Calibrator at the environmental conditions above.			
Initial indicated level	94.2	dB	Adjusted indicated level
			93.9 dB
The uncertainty of the associated calibrator supplied with the sound level meter ±	0.10 dB		

Self Generated Noise	This test is currently not performed by this Lab.		
Microphone installed (if requested by customer) = Less Than	N/A	dB	A Weighting
Uncertainty of the microphone installed self generated noise ±	N/A	dB	

Microphone replaced with electrical input device -	UR = Under Range indicated							
Weighting	A		C		Z			
	13.2	dB UR	16.8	dB UR	21.3	dB UR		
Uncertainty of the electrical self generated noise ±	0.12 dB							

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor $k=2$, providing a coverage probability of approximately 95%. The uncertainty evaluation has been carried out in accordance with UKAS requirements.

For the test of the frequency weightings as per paragraph 12. of IEC 61672-3:2006 the actual microphone free field response was used.

The acoustical frequency tests of a frequency weighting as per paragraph 11 of IEC 61672-3:2006 were carried out using an electrostatic actuator.

..... END

Calibrated by: B. Bogdan R 2
Additional Comments The results on this certificate only relate to the items calibrated as identified above.
 None

Rion NL-52 S/N 564808



**CERTIFICATE
OF
CALIBRATION**



Date of Issue: 15 September 2020

Certificate Number: UCRT20/1867

Calibrated at & Certificate issued by:

ANV Measurement Systems

Beaufort Court

17 Roebuck Way


Milton Keynes MK5 8HL

Telephone 01908 642846 Fax 01908 642814

E-Mail: info@noise-and-vibration.co.uk

Web: www.noise-and-vibration.co.uk

Acoustics Noise and Vibration Ltd trading as ANV Measurement Systems

Page 1 of 2 Pages
Approved Signatory

K. Mistry

Customer AWN Consulting Limited
The Tecpro Building
IDA Business and Technology Park
Clonshaugh
Dublin 17
Ireland

Order No. 2074
Description Sound Level Meter / Pre-amp / Microphone / Associated Calibrator
Identification

Manufacturer	Instrument	Type	Serial No. / Version
Rion	Sound Level Meter	NL-52	00564808
Rion	Firmware		2.0
Rion	Pre Amplifier	NH-25	64933
Rion	Microphone	UC-59	09446
Rion	Calibrator	NC-74	34536109
	Calibrator adaptor type if applicable		NC-74-002

Performance Class 1
Test Procedure TP 2.SLM 61672-3 TPS-49
Procedures from IEC 61672-3:2006 were used to perform the periodic tests.

Type Approved to IEC 61672-1:2002 **YES** **Approval Number** 21.21 / 13.02
If YES above there is public evidence that the SLM has successfully completed the applicable pattern evaluation tests of IEC 61672-2:2003

Date Received 14 September 2020 **ANV Job No.** UKAS20/09501
Date Calibrated 15 September 2020

The sound level meter submitted for testing has successfully completed the class 1 periodic tests of IEC 61672-3:2006, for the environmental conditions under which the tests were performed. As public evidence was available, from an independent testing organisation responsible for approving the results of pattern evaluation tests performed in accordance with IEC 61672-2:2003, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1:2002, the sound level meter submitted for testing conforms to the class 1 requirements of IEC 61672-1:2002.

Previous Certificate	Dated	Certificate No.	Laboratory
	22 August 2018	UCRT18/1862	0653

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CERTIFICATE OF CALIBRATION	Certificate Number UCRT20/1867
	Page 2 of 2 Pages

UKAS Accredited Calibration Laboratory No. 0653

Sound Level Meter Instruction manual and data used to adjust the sound levels indicated.

SLM instruction manual title	Sound Level Meter	NL-42 / NL-52
SLM instruction manual ref / issue		11-03
SLM instruction manual source	Manufacturer	
Internet download date if applicable		N/A
Case corrections available	Yes	
Uncertainties of case corrections	Yes	
Source of case data	Manufacturer	
Wind screen corrections available	Yes	
Uncertainties of wind screen corrections	Yes	
Source of wind screen data	Manufacturer	
Mic pressure to free field corrections	Yes	
Uncertainties of Mic to F.F. corrections	Yes	
Source of Mic to F.F. corrections	Manufacturer	
Total expanded uncertainties within the requirements of IEC 61672-1:2002	Yes	
Specified or equivalent Calibrator	Specified	
Customer or Lab Calibrator	Lab Calibrator	
Calibrator adaptor type if applicable		NC-74-002
Calibrator cal. date		19 August 2020
Calibrator cert. number		UCRT20/1789
Calibrator cal cert issued by		0653
Calibrator SPL @ STP	94.02	dB Calibration reference sound pressure level
Calibrator frequency	1001.89	Hz Calibration check frequency
Reference level range	25 - 130	dB

Accessories used or corrected for during calibration - Extension Cable & Wind Shield WS-15
 Note - if a pre-amp extension cable is listed then it was used between the SLM and the pre-amp.

Environmental conditions during tests	Start	End	
Temperature	23.62	23.52	± 0.30 °C
Humidity	57.7	53.9	± 3.00 %RH
Ambient Pressure	100.73	100.74	± 0.03 kPa

Response to associated Calibrator at the environmental conditions above.			
Initial indicated level	93.7	dB	Adjusted indicated level
			94.0
			dB
The uncertainty of the associated calibrator supplied with the sound level meter ±			0.10
			dB

Self Generated Noise This test is currently not performed by this Lab.
 Microphone installed (if requested by customer) = Less Than N/A dB A Weighting
 Uncertainty of the microphone installed self generated noise ± N/A dB

Microphone replaced with electrical input device -	UR = Under Range indicated					
Weighting	A		C		Z	
	11.9	dB UR	15.8	dB UR	22.1	dB UR
Uncertainty of the electrical self generated noise ±	0.12					dB

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor $k=2$, providing a coverage probability of approximately 95%. The uncertainty evaluation has been carried out in accordance with UKAS requirements.

For the test of the frequency weightings as per paragraph 12. of IEC 61672-3:2006 the actual microphone free field response was used.

The acoustical frequency tests of a frequency weighting as per paragraph 11 of IEC 61672-3:2006 were carried out using an electrostatic actuator.

..... END

Calibrated by: B. Giles R 1

Additional Comments The results on this certificate only relate to the items calibrated as identified above.
 None

Bruel and Kjaer 2250L S/N 3008402**CERTIFICATE
OF
CALIBRATION**

0653

Date of Issue: 04 November 2019**Certificate Number: UCRT19/2218**

Issued by:
ANV Measurement Systems
Beaufort Court
17 Roebuck Way
Milton Keynes MK5 8HL
Telephone 01908 642846 Fax 01908 642814
E-Mail: info@noise-and-vibration.co.uk
Web: www.noise-and-vibration.co.uk

Acoustics Noise and Vibration Ltd trading as ANV Measurement Systems

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Approved Signatory

K. Mistry

CUSTOMER AWN Consulting Limited
The Tecpro Building
IDA Business and Technology Park
Clonshaugh
Dublin 17
Ireland

ORDER No DOD/19/Cal013 Job No UKAS19/11718

DATE OF RECEIPT 01 November 2019

PROCEDURE Calibration Engineer's Handbook, section 25: periodic testing of sound level meters to IEC 61672-3:2006 (BS EN 61672-3:2006) as modified by UKAS TPS 49 Edition 2:June 2009

IDENTIFICATION Sound level meter Brüel & Kjær type 2250-L serial No 3008402 connected via a preamplifier type ZC 0032 serial No 22882 to a half-inch microphone type 4950 serial No 3016830. Associated calibrator Brüel & Kjær type 4231 serial No 2263026 with a one-inch housing and adapter type UC 0210 for half-inch microphone.

CALIBRATED ON 04 November 2019

PREVIOUS CALIBRATION Calibrated on 16 October 2017, Certificate No. UCRT17/1897 issued by this laboratory.

This certificate is issued in accordance with the laboratory accreditation requirements of the United Kingdom Accreditation Service. It provides traceability of measurement to the SI system of units and/or to units of measurement realised at the National Physical Laboratory or other recognised national metrology institutes. This certificate may not be reproduced other than in full, except with the prior written approval of the issuing laboratory.

CERTIFICATE OF CALIBRATION

UKAS ACCREDITED CALIBRATION LABORATORY No 0653

Certificate No UCRT19/2218

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The sound level meter was set up using the type 4231 sound calibrator supplied; it was set to frequency weighting A, and initially read 94.1 dB. It was then adjusted to read 93.9 dB (corresponding to 93.9 dB at standard atmospheric pressure). This reading was derived from Calibration Certificate no. UCRT19/2217 supplied by this laboratory and manufacturers' information on the free-field response of the sound level meter. The calibration check frequency was 1kHz. The final microphone sensitivity calculated and stored by the instrument was 45.25 mV/Pa.

Procedures from IEC 61672-3:2006 (BS EN 61672-3:2006) as modified by UKAS TPS 49 Edition 2: June 2009 were used to perform the periodic tests.

RESULTS

The sound level meter submitted for testing has successfully completed the class 1 periodic tests of IEC 61672-3:2006 (BS EN 61672-3:2006), for the environmental conditions under which the tests were performed. As public evidence was available, from an independent testing organization responsible for approving the results of pattern evaluation tests performed in accordance with IEC 61672-2 : 2003 (BS EN 61672-2 : 2003), to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1 : 2002 (BS EN 61672-1 : 2003), the sound level meter submitted for testing conforms to the class 1 requirements of IEC 61672-1 : 2002 (BS EN 61672-1 2003).

The self-generated noise recorded with the microphone replaced by the electrical input device was:

13.4 dB (A) 13.8 dB (C) 19.5 dB (Z)

The environmental conditions recorded at the start and end of testing were:

Start: 23 to 24 °C, 31 to 41 %RH and 97.2 to 97.3 kPa

End: 24 to 25 °C, 34 to 44 %RH and 97.2 to 97.3 kPa

Technical information including adjustment data specified in the manufacturers' Instruction Manual BE 1774-11 (2007) and User Manual BE 1766 has been used to carry out this verification. These data include manufacturer-specified uncertainties.

Publicly-available evidence has been found that the B&K 2250-L sound level meter design has successfully undergone pattern evaluation in accordance with IEC 61672-2:2002 (BS EN 61672-2:2003) by Physikalisch-Technische Bundesanstalt (PTB), an independent testing organisation responsible for pattern approvals.

All measurement data are held at ANV Measurement Systems for a period of at least six years.

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor $k=2$, providing a coverage probability of approximately 95%. The uncertainty evaluation has been carried out in accordance with UKAS requirements.

CERTIFICATE OF CALIBRATION

UKAS ACCREDITED CALIBRATION LABORATORY No 0653

Certificate No UCRT19/2218

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NOTES

Any opinions or interpretations which may be expressed in the following notes are not UKAS Accredited.

- 1 All tests were carried out in "Broad Band".
- 2 Windscreen correction was set to "None", soundfield to "Free-field" and microphone to "4950".
- 3 No suitable microphone frequency response information was supplied with the instrument. It was therefore measured by this laboratory using the electrostatic actuator method. This response in isolation is not UKAS Accredited.
- 4 It was noted that in order to obtain the correct A-weighted response to the sound calibrator, the relevant software setting in the meter had to be changed from '4231' to 'custom' with the appropriate calibration level entered.
- 5 The electrical tests have been carried out with the instrument set for the nominal microphone sensitivity, as specified in the Instruction Manual. This may mean that the instrument has a slightly different linearity range when in normal use.
- 6 Typical case reflection factors specified by the manufacturer have been used for this verification.

The instrument was running on hardware version 4.0

The instrument firmware settings were:






Module i.d.	Function	Version	Active?	Licenced?	Template used?
BZ 7130	SLM	4.7.5	Y	Y	Y
BZ 7131	Octave analysis	4.7.5	Y	N	N/A
BZ 7132	1/3-oct analysis	4.7.5	Y	Y	N/A
BZ 7133	Logging	4.7.5	Y	Y	N/A
BZ 7226	Signal Recording Option	4.7.5	Y	N	N/A
BZ 7231	Tone Assessment	4.7.5	Y	N	N/A
BZ 7232	Noise Monitoring Software	4.7.5	Y	N	N/A
BZ	N/A	N/A	N/A	N/A	N/A
BZ	N/A	N/A	N/A	N/A	N/A
BZ	N/A	N/A	N/A	N/A	N/A




The results on this certificate only relate to the items calibrated as identified above.

END

R 3

APPENDIX B. Unattended Monitoring Equipment Setup




Location	Equipment Set up	
Location N01		
Location N02		
Location N04	Not available	
Location N07		




Location	Equipment Set up	
Location N08		
Location N09		
Location N10		


Location	Equipment Set up
Location N11	
Location N13	
Location N15	





Location	Equipment Set up
Location N18	
Location N19	
Location N20	
Location N21	

Location	Equipment Set up
Location N22	
Location N24	
Location N25	
Location N26	
Location N28	Not available

Location	Equipment Set up
Location N29	
Location N30	
Location N31	

Location	Equipment Set up
Location N33	
Location N34	Not available
Location N35	
Location N37	
Location N39	Not available

Location	Equipment Set up
Location N41	
Location N42	
Location N43	
Location N44	
Location N45	
Location N46	

Location	Equipment Set up
Location N48	
Location N49	
Location N50	
Location N51	

Location	Equipment Set up
Location N52	
Location N53	
Location N54	

Location	Equipment Set up
Location N55	
Location N56	
Location N57	