A Rooftop Helipad at New Acute Hospital at Kai Tak Development Area

Technical Note – Helicopter Noise Survey Report

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Submitted to

Wong Tung & Partners Limited

Hospital Authority

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1.0 INTRODUCTION

1.1 Purpose of This Technical Note

1.1.1 A helicopter noise survey has been carried out on 22 May 2019, from 15:30 to 16:30, at Lo Wu Shooting Range to obtain reliable and latest helicopter noise data. Data obtained will be adopted for the purpose of design and assessment of the future New Acute Hospital at Kai Tak Development Area (NAH) and the proposed helipad on rooftop of NAH, including helicopter noise assessment of Environmental Impact Assessment (EIA) (Study Brief No.ESB-311/2019 "A Rooftop Helipad at New Acute Hospital at Kai Tak Development Area" issued by Environmental Protection Department (EPD) under EIA Ordinance (EIAO)).

1.1.2 As advised by Hospital Authority (HA), the Applicant of the Study Brief, it is agreed that the results of this noise survey can be used or referenced for EIA or environmental review for other helicopter landing sites (HLS) in the HA's facilities and proposal of HLS to be used by Government Flying Service (GFS), before the survey results are made available to the public under the EIAO mechanism.

1.1.3 This Technical Note presents the survey site location, measurement points, instrumentation, survey methodology for the helicopter noise survey and the noise measurement result. The identification of helicopter noise source is also included.

1.2 Structure of This Technical Note

1.2.1 This Technical Note comprises the following sections:

- Section 1 presents the background information
- Section 2 presents the survey site and measurement points
- Section 3 presents the instrumentation
- Section 4 presents the identification of helicopter noise source
- Section 5 presents the survey methodology
- Section 6 presents the helicopter noise measurement results

2.0 SURVEY SITE AND MEASUREMENT POINTS

2.1 Proposed Survey Site

2.1.1 In order to ensure the noise data obtained are reliable, with the least potential to be affected by the survey site itself or site environment, the following principles for site for site selection are identified:

- The site should be a large, flat and leveled ground with at least 150m* clear distance between the proposed location of the helicopter and each measurement point, and no reflective surface and obstacle such as building façade should behind or in between them as far as possible.

- The background noise level anticipated should be at least 10dB(A) lower than expected measured noise level.

- The more measurement points that could be accommodated on the site to represent different directions simultaneously, the more preferable.

*Note: refer to **Section 2.2.1**.

2.1.2 Based on the above principles, various sites including Government or public helipads or other potentially suitable areas including shooting ranges in Hong Kong have been explored to review their suitability for the helicopter noise survey. Details of the review for these helicopter landing sites are provided in **Appendix A**. All relevant factors including existing noise sources, practicality for measurement, etc. have been taken into account when reviewing the list of helicopter landing sites. This exercise has been undertaken in close consultation with the Government Flying Service (GFS) in March 2019.

2.1.3 The helipads located in urban areas are deemed not preferred since, due to the presence of buildings, the 150m clear distance could not be provided and there is no room to accommodate accessible measurement points. For example, the GFS Hong Kong Convention & Exhibition Centre Heliport at Wan Chai would not be suitable as there is only around 60m clear distance to the south available, and nothing in other directions. Besides, the background noise will be anticipated to be high due to its urban setting and the reflective structures in close proximity are not favorable for noise measurement.

2.1.4 Sites located in remote areas, such as those in the Country Parks, have also been reviewed. However, these sites located on hillsides, such as the Robin's Nest Heliport, are small in size, typically the helipad size with some small buffer, and could not maintain the same horizontal level for measurement points with clear distances and safe access due to topography. As such, these are not deemed suitable. Sites located in coastal areas, such as Yung Shue Wan Helipad or at Peng Chau, are also considered unsuitable as these facilities are surrounded by water on at least 2-3 sides and it is not practical for noise measurements to take place on the sea surface at 150m from the site due to constraint on fixing the measurement equipment and distance, unstable platform easily affected by marine vessel movements, waves and wind.

2.1.5 Another possibility is the Shek Kong airfield operated by the People's Liberation Army (PLA) which is open to civilian traffic at weekends and could have sufficient space for the noise measurements, unobstructed by buildings. However, it is understood from the GFS that at the weekend, the airfield is frequently utilized by aviation clubs, with

large volumes of landings and take-offs. As such, besides the need to get permission from the PLA, any noise reading would be affected by the background noise and the data could actually be even worse than those obtained at GFS Headquarters at Lantau (refer to **Section 2.1.7**). Therefore, this location is not recommended.

2.1.6 The Government Flying Service Headquarters, No.18 South Perimeter Road, Chek Lap Kok (GFS Headquarter at Lantau) has been used in the past for helicopter noise measurements (EIA for Peng Chau Helipad, Register No. AEIAR-087/2005 approved on 25 Aug 2005). The benefits of this location are that there are existing helipads with the designated FATO area, the ground surface is flat and hard and the results could be directly comparable with the previous EIA measurement.

2.1.7 However, although up to 3 measurement points could be accommodated, all of them could only be on the same side (to the east) of helicopter. While this could be addressed by the reorientation of the helicopter, the main issue of this location would be background aircraft noise from the adjacent runway due to the operation of HKIA. Given the concern of potential background noise, this location may not be the most preferred option.

2.1.8 With the above considerations, one site has been identified as feasible, the Hong Kong Police Lo Wu Shooting Range, Ho Sheung Heung Village, Ku Tung (Lo Wu Shooting Range).

2.1.9 This large site is located in a remote area, with limited background noise, as the measurement will be undertaken when no shooting practices are on-going. While the shape of the site is rectangular, it will allow for 2 measurement points on opposite sides of helicopter (1 point on each sides) to be accommodated and allow measurements to represent 2 directions simultaneously. The helicopter can then be re-orientated to allow the opposite sides to be measured, again at 150m. The proposed re-orientation of the helicopter and measurement procedure are detailed in **Section 5.2**.

2.1.10 This site is paved with grass which may not be directly comparable with hard structure of a helipad. However, it is anticipated that ground types would not contribute a significant difference in terms of noise level when compared to other factors such as intrusive noise.

2.1.11 It is noted that the GFS do use this area for helicopter manoeuvers in joint operations with the Hong Kong Police Force (HKPF) and have confirmed it is a suitable location.

2.1.12 The indicative measurement points for this site are shown in **Figure 1**.

2.1.13 Based on the above, it is considered that Lo Wu Shooting Range is the preferred option (the Proposed Site) since the noise survey could be done practically, with minimal background noise from the site environment where the constraints are limited. It is considered that the proposal of measurement survey at this Proposed Site is the best compromise among the factors as mentioned in **Sections 2.1.1 to 2.1.2** and **Appendix A**. Approval from HKPF for carry out helicopter noise survey on this site was sought.

2.1.14 Apart from noise issues, other factors such as flight safety, site availability should also be considered. No objection on the site proposal was received from EPD and GFS.

2.2 Measurement Points

2.2.1 Distance between the proposed location of the helicopter and each measurement point should be 150m to demonstrate far-field measurements, such that helicopter noise can be considered as a point source. Also, distance of 150m is adopted to consistent with International Civil Aviation Organization (ICAO) standard.

2.2.2 As mentioned in **Section 2.1.9**, two measurement points (i.e. M1 and M2) were proposed on opposite sides of helicopter (1 point on each side). Indicative measurement points adopted at the Lu Wu Shooting Range are shown in **Figure 1**.

2.2.3 GPS information of the two measurement points, the center point of helicopter and the GPS readout of helicopter provided by GFS were recorded on site and checked in order to ensure there were approximate 150m distance separations during the noise survey. The GPS information recorded are presented in **Table 2.1**.

Table 2.1 GPS Information Recorded

Record Point	GPS Information (WGS84)	
	Latitude	Longitude
Readout from Helicopter by GFS	22° 31.08’	114° 6.05’
Center Point of Helicopter	22° 31’ 4.9’’	114° 6’ 3.3’’
Measurement Point M1	22° 31’ 7’’	114° 6’ 8’’
Measurement Point M2	22° 31’ 2’’	114° 5’ 59.1’’

2.2.4 As advised by GFS, the GPS sensor which provided the readout is installed at the tail part of the helicopter. It is noted that the separation between the readout and the centre point is about 9m, which is about half of the total length of the helicopter (i.e. approx. 18m), and the readout was recorded while the helicopter head was facing toward northeast. Hence, it is reasonably concluded that the GPS recorded is representative for the center point of helicopter and thus, the two measurement points were approximate 150m from the helicopter according to GPS records.

3.0 INSTRUMENTATION

3.1 Adopted Instrument

3.1.1 The instruments adopted for the helicopter noise survey is presented in **Table 3.1**:

Table 3.1 Instrument Adopted for Helicopter Noise Survey

Item	Manufacturer and Model	Class / Standard
Sound Level Meter	NOR 139 (1 nos.)	IEC 61672 Class 1
	NTi-XL2 (1 nos.)	IEC 61672 Class 1
Acoustical Calibrator	Casella CEL CEL-120/1 (1 nos.)	IEC 60942 Class 1
	Castle GA607 (1 nos.)	IEC 60942 Class 1
GPS Device	Garmin eTrex 12 channel (1 nos.)	-
	Garmin GPSmap 62s (1 nos.)	-

3.1.2 Immediately prior to the noise measurement, the accuracy of the sound level meter was checked using an acoustic calibrator, which generated a known SPL at a known frequency. Measurements were accepted as valid only if the calibration level before and after the noise measurement agrees to be within 1.0 dB. Calibration certificates of the sound level meter are presented in **Appendix B**.

3.2 Measurement Parameter

3.2.1 Maximum A-weighted Sound Pressure Level (SPL) L_{Max} dB(A) is adopted to present the noise measurement results. "Fast" time-weighting was used for measurement of maximum SPL. SPL in 1/3 octave band are also obtained.

3.3 Competent Professionals

3.3.1 The noise measurements, data checking and calculation are carried out by the competent professionals, who are members of Hong Kong Institute of Acoustics (HKIOA) or equivalent institute, as listed in **Table 3.2**.

Table 3.2 Competent Professionals for Helicopter Noise Survey

Responsibility	Competent Professional
Data Checking and Calculation	Mr. W K Chiu
Noise Measurement at M1	Mr. Alvin Chan
Noise Measurement at M2	Mr. Henry Leung

4.0 IDENTIFICATION OF HELICOPTER NOISE SOURCE

4.1 Helicopter Model

4.1.1 The helicopter model Airbus H175 was operated by GFS.

4.1.2 Since the load carrying condition (e.g. % of fuel storage, no. of persons and equipment on board etc.) may affect the noise emission of the helicopter, equivalent weights were included to demonstrate a conservative measured helicopter noise for "casevac" (casualty evacuation), SAR (Search and Rescue) operations and urgent transportation of organs for transplantation by GFS. As advised by GFS, this weights is approximately 6,500 kg. However, it should be noted that the exact landing weight will differ from aircraft to aircraft depending on the mission equipment onboard.

4.1.3 The GPS data of the helicopter during the noise survey was obtained as presented in **Table 2.1**.

4.2 Operation Modes

4.2.1 Helicopter operations include lateral movements and non-lateral movements. For lateral movement (i.e. Take-Off, Overflight and Approach), noise data are available from the noise certificate for Airbus H175, which are determined under conditions prescribed in Chapter 8 and Appendix 4 of Annex 16 of ICAO. Therefore, the noise level due to the non-lateral movements of helicopter Airbus H175 as presented in **Table 4.1** are needed and hence were measured:

Table 4.1 Operation Modes of Helicopter

Operation Modes		Description
a	Idling	Helicopter remains on the ground surface with its rotary blades kept running
b	Lift-off	Helicopter ascends vertically from the ground surface to achieve a hover
c	Hovering	Helicopter turns on the spot over the ground to achieve the desirable orientation for touchdown / lift-off
d	Touchdown	Helicopter descends on the ground surface

5.0 SURVEY METHODOLOGY

5.1 Measurement Period

5.1.1 The helicopter noise measurement was carried out on 22 May 2019 at Lo Wo Classification Firing Range. The measurements were conducted between 3:30pm and 4:30pm.

5.1.2 The weather during the noise measurement period was fine and sunny. The wind speed measured before and after at both measurement locations was 1-3m/s.

5.2 Measurement Procedure

5.2.1 The following measurement procedure was followed:

1) 4 orientations of helicopter nose were specified on site (i.e. due northeast, due southeast, due southwest and due northwest).

2) 5-minute background noise was measured before the helicopter noise measurement.

3) Measurement started with the 1st orientation (i.e. due northeast).

4) The helicopter performed the 4 operation modes (i.e. Idling, Lift-off, Hovering and Touchdown) one by one. For each operation mode, the noise levels at all measurement points were recorded simultaneously.

5) Procedure no.3 and no.4 were repeated for the other 3 orientations (i.e. due southeast, southwest and northwest).

6) 5-minute background noise was measured after the helicopter noise measurement.

5.2.2 The operation sequence of helicopter based on above procedure is shown in **Table 5.1** as below:

Table 5.1 Operation Sequence of Helicopter

Sequence	Orientation	Event ID [1]	Operation Mode [2], [3]
1a	1st (due Northeast)	A01a	Idling (a)
1b		A01b	Idling (b)
2		A02	Lift-off
3		A03	Hovering (e)
4		A04	Hovering (a)
5		A05	Hovering (b)
6		A06	Hovering (c)
7		A07	Hovering (d)
8		A08	Touchdown
9		A09	Hovering (c)
10		A10	Hovering (d)
11		A11	Touchdown
12		A12	Hovering (c)
13		A13	Hovering (d)
14		A14	Touchdown
15a	2nd (due Southeast)	B01a	Idling (a)
15b		B01b	Idling (b)
16		B02	Lift-off

Sequence	Orientation	Event ID [1]	Operation Mode [2], [3]
17		B03	Hovering (a)
18		B04	Hovering (b)
19		B05	Hovering (e)
20		B06	Touchdown
21a	3rd (due Southwest)	C01a	Idling (a)
21b		C01b	Idling (b)
22		C02	Lift-off
23		C03	Hovering (e)
24		C04	Hovering (a)
25		C05	Hovering (b)
26		C06	Touchdown
27a	4th (due Northwest)	D01a	Idling (a)
27b		D01b	Idling (b)
28		D02	Lift-off
29		D03	Hovering (e)
30		D04	Hovering (a)
31		D05	Hovering (b)
32		D06	Touchdown

Note:
[1] Orientation of Event: A – Due Northeast; B – Southeast; C – Southwest; D – Northwest.
[2] The transition operation from idling steadily to lift off was included for conservative measurement. Idling mode specified with "a" and "b" represent the idling steadily and transition to lift off respectively.
[3] Hovering mode for both directions of turning were carried out. Hovering mode specified with "a" and "b" represent the turning direction as clockwise and anti-clockwise respectively. Also, the transition operation in the near vicinity of the helicopter landing site were included for conservative measurement. Hovering mode specified with "c" and "d" represent "transition from hovering mode to take-off mode" and "transition from approach mode to hovering mode" respectively, while "e" represent the hovering at the same elevation level.

5.2.3 As advised by GFS, the helicopter take-off and approach could only be conducted toward northeast (i.e. 1st orientation) due to flight safety reason at Lo Wu Classification Firing Range. Therefore, Hovering (c) and (d) were omitted in the 2nd, 3rd and 4th orientations (i.e. due southeast (B), southwest (C) and northwest (D)) and hence, they were repeated two times in the 1st orientation (i.e. due northeast (A)) for repeat measurement.

5.2.4 In addition, the helicopter controlled by GFS had been returned to the same landing location as close as possible after each approach to ensure the separation distance between center point of helicopter and measurement points remain approx. 150m as described in **Section 2.2**. However, it was noted that the helicopter did not appear to stay in exact one single position throughout the measurement, and the distance separation between helicopter and one of the measurement points was less than 150m at some instant. As advised by GFS, this distance deviation from the recorded center point was controlled to within 2-3m, which is considered small when compared to 150m. Nonetheless, the highest measurement results of the two measurement points are adopted for conservative approach.

6.0 MEASUREMENT RESULTS

6.1 Background Noise Measurement

6.1.1 The results of background noise measurement are presented in **Table 6.1**.

Table 6.1 Background Noise Measurement Results

Period	Measured Noise Level $L_{eq\ 5min}$ in dB(A)	
	M1	M2
Before Helicopter Noise Measurement	46.4	48.8
After Helicopter Noise Measurement	50.1	52.9

6.2 Helicopter Noise Measurement

6.2.1 The results of helicopter noise measurement are presented in **Table 6.2**. Detailed graphical time history of the measured noise levels are shown in **Appendix C**.

Table 6.2 Helicopter Noise Measurement Results

Operation Mode		Event ID[1]	Highest Measured Noise Level L_{Max} in dB(A)		
			M1	M2	Adopted
Idling	(a) – Idling Steadily	A01a	65.0	N/A	75.4
		B01a	64.7	64.6	
		C01a	61.1	78.8[1]	
		D01a	63.4	73.6[2]	
	(b) – Transition to Lift Off	A01b	75.4	N/A	
		B01b	64.5	71.0	
		C01b	75.2	82.0[1]	
		D01b	76.8[2]	80.3[2]	
Lift Off		A02	73.6	82.0	82.4
		B02	77.0	77.8	
		C02	75.2	82.4	
		D02	86.0[2]	82.7[2]	
Hovering	(a) - Rotate-Clockwise	A04	79.8	78.0	83.5
		B03	76.1	76.4	
		C04	82.3	80.9	
		D04	76.4	78.5	
	(b) - Rotate-Anti Clockwise	A05	81.4	79.1	
		B04	75.3	79.8	
		C05	78.4	78.2	
		D05	83.0	80.5	
	(c) - Transition to Take-Off	A06	81.8	80.8	
		A09	81.2	79.9	
		A12	80.6	78.5	
	(d) - Transition from Approach	A07	80.7	78.1	
		A10	83.2	83.5	
		A13	81.7	82.8	
	(e) - Hovering at the same elevation level	A03	79.6	75.1	
		B05	75.6	80.0	
		C03	74.5	79.3	
		D03	80.1	79.0	
Touchdown		A08	75.3	78.9	78.9
		A11	78.7	73.7	
		A14	76.8	75.2	
		B06	72.7	66.1	
		C06	72.5	73.3	
		D06	75.9	71.5	

Note:
[1] Noise measurement result was discarded due to intermittent traffic noise at Ma Tso Lung Road. According to the GPS data and site layout, M2 is only approx. 40m from the nearby Ma Tso Lung Road. Based on the site observation, high intrusive road traffic noise was induced by heavy vehicle (e.g. container truck) crossing the Ma Tso Lung Road to nearby open storage area during the C01 event. The sound record was checked. The duration of the high extraneous noise matches with the noise character from heavy vehicle.
[2] Noise measurement result was discarded due to other helicopter flyover.

6.2.2 The SPL in one third octave bands of the adopted noise levels for each operation mode are presented in **Table 6.3**. Graphical presentations of the SPL in one third octave bands are shown in **Appendix D**.

Table 6.3 SPL in One Third Octave Bands of the Adopted Noise Levels

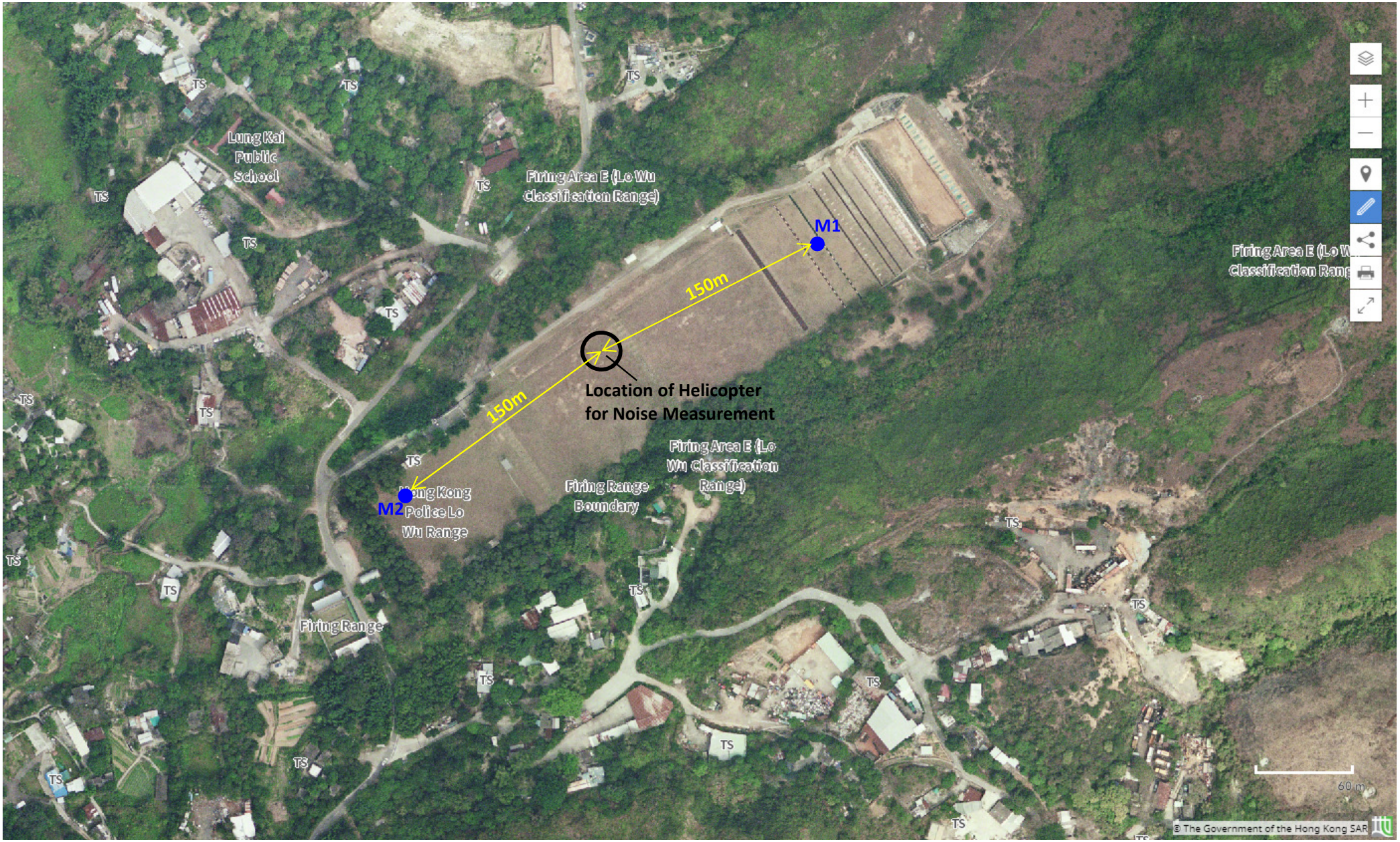
SPL at Approx. 150m		**Operation Mode of Helicopter**							
		Idling		**Lift-off**		**Hovering**		**Touchdown**	
Adopted L_{max} dB(A)		75.4		82.4		83.5		78.9	
SPL (dB/dB(A)) in One Third Octave Band	50 Hz	57.8	27.6	78.2	48.0	84.0	53.8	80.1	49.9
	63 Hz	56.0	29.8	85.7	59.5	84.9	58.7	87.0	60.8
	80 Hz	56.9	34.4	74.7	52.2	77.5	55.0	71.4	48.9
	100 Hz	57.0	37.9	77.9	58.8	75.9	56.8	72.1	53.0
	125 Hz	61.1	45.0	77.6	61.5	77.2	61.1	81.8	65.7
	160 Hz	58.9	45.5	74.6	61.2	76.6	63.2	74.9	61.5
	200 Hz	57.2	46.3	73.7	62.8	75.9	65.0	69.8	58.9
	250 Hz	53.2	44.6	65.2	56.6	63.5	54.9	67.8	59.2
	315 Hz	49.1	42.5	64.0	57.4	71.6	65.0	59.3	52.7
	400 Hz	42.5	37.7	69.3	64.5	74.0	69.2	65.9	61.1
	500 Hz	40.8	37.6	74.3	71.1	78.9	75.7	66.1	62.9
	630 Hz	42.8	40.9	72.4	70.5	77.4	75.5	69.1	67.2
	800 Hz	46.5	45.7	72.3	71.5	75.0	74.2	73.5	72.7
	1000 Hz	48.9	48.9	72.2	72.2	71.5	71.5	74.4	74.4
	1250 Hz	49.6	50.2	71.4	72.0	74.9	75.5	65.0	65.6
	1600 Hz	54.3	55.3	72.8	73.8	72.7	73.7	65.6	66.6
	2000 Hz	59.2	60.4	69.6	70.8	68.9	70.1	63.5	64.7
	2500 Hz	63.0	64.3	66.0	67.3	67.8	69.1	61.1	62.4
	3150 Hz	65.7	66.9	64.5	65.7	66.6	67.8	59.0	60.2
	4000 Hz	69.1	70.1	61.8	62.8	64.4	65.4	55.8	56.8
	5000 Hz	68.2	68.7	58.2	58.7	61.0	61.5	53.6	54.1
	6300 Hz	66.9	66.8	56.1	56.0	58.5	58.4	51.1	51.0
	8000 Hz	64.9	63.8	75.1	74.0	59.1	58.0	47.7	46.6
	10000 Hz	60.1	57.6	75.0	72.5	58.7	56.2	41.7	39.2

Figure 1

Figure 1 – Location of the Survey Site and Measurement Points

Survey Site: Lo Wu Shooting Range

● **Locations of Noise Measurement Point**



Appendix A

A Rooftop Helipad at New Acute Hospital at Kai Tak Development Area
Technical Note – Helicopter Noise Survey Report
Appendix A – List of Helicopter Landing Sites Under Review (Source: GEOINFO MAP - https://www.map.gov.hk/gm/)

Site		Location	Remarks [*]
1	Helicopter Landing Site - LT36 - GFS DISPERSAL - CLK	Government Flying Service, Hong Kong International Airport, 18 South Perimeter Road, Chek Lap Kok, NT	Refer to Sections 2.1.6 to 2.1.7
2	Helicopter Landing Site - HK07 - HONG KONG CONVENTION AND EXHIBITION CENTRE	Expo Drive East, Wan Chai, HK	Refer to Section 2.1.3
3	Helicopter Landing Site - LT34 - SHA CHAU HELIPAD	Sha Chau, Tuen Mun, NT	a, b
4	Helicopter Landing Site - CP17 - DEEP BAY LINK HELIPAD	Kong Sham Western Highway, Ha Tsuen, Yuen Long, NT	c
5	Helicopter Landing Site - HK01 - PENG CHAU NORTH HELIPAD	Peng Chau, NT (Near Sea Crest Villa)	Refer to Section 2.1.4
6	Helicopter Landing Pad	Sha Chau, Tuen Mun, NT	b
7	Helicopter Landing Pad	Cove Hill, Sha Tin, NT (Tai Po Kau Forest Track - Chueng Lek Mei Section)	c
8	Helicopter Landing Pad	Lung Kwu Tan, Tuen Mun, NT (Near Black Point Power Station)	c
9	Helicopter Landing Pad	Tsing Shan Firing Range, Siu Lang Shui, Tuen Mun, NT	c
10	Helicopter Landing Pad	Tai Lam Country Park Tai Tong Management Centre, Tai Tong Shan Road, Shap Pat Heung, Yuen Long, NT (Tai Tong Forest Nursery)	c
11	Helicopter Landing Pad	Kadoorie Farm and Botanic Garden, Lam Kam Road, Lam Tsuen Valley, Tai Po, NT	c
12	Helicopter Landing Pad	Dai Kwai Street, Tai Po Industrial Estate, NT	a
13	Helicopter Landing Pad	Tuen Mun, NT	c
14	Helicopter Landing Pad	Lantau Island, NT (Near Kap Shui Mun Bridge)	a
15	Helicopter Landing Pad	Chuen Lung, Route Twisk, Tsuen Wan, NT (Near Tai Mo Shan Country Park Chuen Lung Management Office)	c
16	Helicopter Landing Pad	The Jockey Club Kau Sai Chau Public Golf Course, Kau Sai Chau, Sai Kung, NT	c
17	Helicopter Landing Pad	North Lantau Highway, Lantau Island, NT (Near Toll Plaza)	a
18	Helicopter Landing Pad	Lamma Island, NT (Near Lamma Fire Station)	c
19	Helicopter Landing Pad	The Jockey Club Kau Sai Chau Public Golf Course, Kau Sai Chau, Sai Kung, NT	c

Site		Location	Remarks [*]
20	Helicopter Landing Pad	Hong Kong International Airport, Chek Lap Kok, NT	d
21	Helicopter Landing Site - CC04 - CHEUNG CHAU	Hak Pai Road, Cheung Chau, NT	a, b
22	Helicopter Landing Site - EB07 - LUK KENG	Luk Keng, Sha Tau Kok, NT (Near Shek Pan Tam)	c
23	Helicopter Landing Site - LT08 - SOKO ISLANDS	Ha Tsuen, Tai A Chau, NT	c
24	Helicopter Landing Site - PT02 - WAGLAN ISLAND	Waglan Radar Station, Waglan Island, NT	c
25	Helicopter Landing Site - CC03 - HEI LING CHAU	Hei Ling Chau, NT (Near Nei Kwu Correctional Institution)	c
26	Helicopter Landing Site - CP02 - BLACK POINT VTMS	Black Point, Tuen Mun, NT	c
27	Helicopter Landing Site - CP03 - CASTLE PEAK TRANSMITTERS	Castle Peak, Tuen Mun, NT	c
28	Helicopter Landing Site - CP09 - TSING SHAN RANGE	Castle Peak, Tuen Mun, NT	c
29	Helicopter Landing Site - EB06 - FAN SHUI AU	Fan Shui Au, Kuk Po, Sha Tau Kok, NT	c
30	Helicopter Landing Site - HK24 - PAMELA YOUDE HOSPITAL	Pamela Youde Nethersole Eastern Hospital, 3 Lok Man Road, Chai Wan, HK	a
31	Helicopter Landing Site - JB08 - LEAD MINE PASS	Lead Mine Pass, Tsuen Wan, NT	c
32	Helicopter Landing Site - LT08A - SOKO FOOTBALL PITCH	Tai A Chau, NT (Near Tung Wan)	a
33	Helicopter Landing Site - LT35 - LUNG KWU CHAU	Lung Kwu Chau, Tuen Mun, NT	c
34	Helicopter Landing Site - P01 - PAK HOK CHAU	Tam Kon Chau, Tam Kon Chau Road, Mai Po, Yuen Long, NT (Near Hong Kong Police Force Pak Hok Chau Operational Base)	d
35	Helicopter Landing Site - P03 - CREST HILL OP	Crest Hill, Sheung Shui, NT	c
36	Helicopter Landing Site - P05 - LO WU RANGE	Lo Wu Classification Range, Ma Tso Lung Road, Sheung Shui, NT	Proposed Site, refer to Sections 2.1.9 to 2.1.13
37	Helicopter Landing Site - P10 - MAN KAM TO	Man Kam To, Man Kam To Road, Sheung Shui, NT (Near Man Kam To Operation Base, Ta Kwu Ling Division, Hong Kong Police Force)	a
38	Helicopter Landing Site - P23 - KAT O SOUTH	Mun Tsai Wan, Crooked Island, NT	c

Site		Location	Remarks [*]
39	Helicopter Landing Site - P24 - SHA TAU KOK	Sha Tau Kok Sewage Treatment Works, Sha Tau Kok Road-Shek Chung Au, Sha Tau Kok, NT	a
40	Helicopter Landing Site - P25 - KAT O ISLAND	Tung O Wan, Crooked Island, NT	b
41	Helicopter Landing Site - P27 - ROBINS NEST ALTERNATE	Robin's Nest, Ta Kwu Ling, NT	Refer to Section 2.1.4
42	Helicopter Landing Site - WB12 - LUT CHAU NORTH	Lut Chau, Mai Po, Yuen Long, NT	d
43	Helicopter Landing Site - WB13 - TSIM BEI TSUI	Tsim Bei Tsui, Deep Bay Road, Lau Fau Shan, Yuen Long, NT	a
44	Helicopter Landing Site - WB15 - PTU HQ FANLING	Hong Kong Police Force Police Tactical Unit Headquarters, 1 Wu Tip Shan Road, Fanling, NT	a
45	Helicopter Landing Site - WB16 - FANLING LODGE (LAWN)	Kam Tsin Road, Fanling, NT	a
46	Helicopter Landing Site - WB17 - FANLING LODGE (GOLFCOURSE)	The Hong Kong Golf Club Fanling Golf Course, Kam Tsin Road, Fanling, NT	a
47	Helicopter Landing Site - HK21 - BRICK HILL	Brick Hill, Wong Chuk Hang, HK	c
48	Helicopter Landing Site - JB05 - ISLAND HOUSE	Yuen Chau Tsai, 1 Island House Lane, Tai Po, NT	b
49	Helicopter Landing Site - LT04 - SHEK PIK	Wang Pui Road, Shek Pik, Lantau Island, NT	b
50	Helicopter Landing Site - LT06 - SHUI HAU	Shui Hau, South Lantau Road, Lantau Island, NT	c
51	Helicopter Landing Site - LT12 - LUK TEI	Nam Shan, Lantau Trail, Lantau Island, NT	c
52	Helicopter Landing Site - LT23 - HILL 275	Lantau Island, NT (Near Pak Fu Tin)	c
53	Helicopter Landing Site - P26 - PING CHAU	Au Kung Shan, Ping Chau, NT	c
54	Helicopter Landing Site - HK02 - LAMMA YUNG SHUE WAN	Yung Shue Wan, Lamma Island, NT	Refer to Section 2.1.4
55	SHEK KONG BARRACKS	250 KAM TIN ROAD	Refer to Section 2.1.5
56	Helipad at Tuen Mun Hospital	23 Tsing Chung Koon Road, Tuen Mun, NT	a

*Note:

Remark a – Site with less than 150m clear distance or with reflective structure in vicinity

Remark b – Site located in coastal areas surrounded by water on at least 2-3 sides

Remark c – Site located on hillsides with topographically challenge

Remark d – Site where anticipated measurement location is inaccessible

Appendix B

Certificate of Calibration

Certificate No.: 474271593

Object:	Sound Analyser Nor139
Supplier:	Norsonic AS
Type:	Nor139
Serial number:	1392834
Client:	Ramboll, Hong Kong

This instrument is tested and calibrated in accordance to the Norsonic production standard set for Nor139, ensuring that the instrument conforms to the following standards;

IEC 61672-1:2002 class 1
IEC 61260-1 class 1 Ed 1.0 2014-02
ANSI S1.4-1983 (R2001) with amd. S1.4A-1985 class 1
ANSI S1.43-1997 (R2002) class 1
ANSI S1.11-2004 class 1
DIN 45 657, Applicable parts
IEC 61094 part 4

Instrumentation used for calibration traceable to:

Electrical Parameters: MT, Norway
Acoustical Parameters: PTB, Germany
Environmental Parameters: Justervesenet. Norway

Adjustments: None

Comments: None

Date of calibration:	**Calibration interval recommended**
2018-02-14	2 years

The environmental parameters applicable to this calibration are kept well within limits ensuring negligible deviation on obtained measurement results.

Calibrated by:

Sign.

Norsonic
P.O.BOX 24, N-3420 LIERSKOGEN, NORWAY
TEL: +47 32 85 89 00

Warranty

Norsonic products are thoroughly inspected before they leave the factory. Carefully check the shipment for any physical damage in transit. Notify the factory or the distributor and file the claim with the carrier if there is any such damage.

Product type: Sound Analyser Nor139

Serial no.: 1392834

Power: 11-15 Volt DC

Option included: 1,3,4,5,6,7,8,16,58,68

Option description:

00: Tmax 5 and Leql according to German standards
01: 1/1 octave real time frequency filters 0,5 - 16.000Hz
03: 1/3 octave real time filters 0,4 - 20.000Hz, require opt 2
04: Statistical Calculations for weighting network and 1/n octave filters
05: Parallel calculation of F, S, I time constants
06: Profile. L/t measuring mode w / multi spectrum if opt 2 or 3 are installed
07: Enhanced profile including 4 markers and time resolution from 50ms
08 Sound recording
16: Enhanced global trigger

Application version: 3.1.984 2015-03-27 09:58r

Id no.: 4271593

Accessories:

Preamplifier	1207	Serial No.: 20873
Microphone	1228	Serial No.: 02739

Related to order: SO1807003

Checked and approved by: **Date:** 2018-02-14

Norsonic
P.O.BOX 24, N-3420 LIERSKOGEN, NORWAY
TEL: +47 32 85 89 00

Warranty statement

Norsonic products are warranted against defects in material and workmanship. This warranty applies to 36 months from date of delivery.
Norsonic AS will repair or replace equipment, which proves to be defective during the warranty period. This warranty includes labour and parts. Equipment returned to the factory, for repair must be shipped freight prepaid. Repair due to misuse of the equipment and/or use of hardware, software or interfacing not provided by Norsonic AS are not covered by this warranty.
No other warranty is expressed or implied, included, but not limited to, the implied warranties of merchantability and fitness for a particular purpose.
Norsonic AS shall not be liable for consequential damages

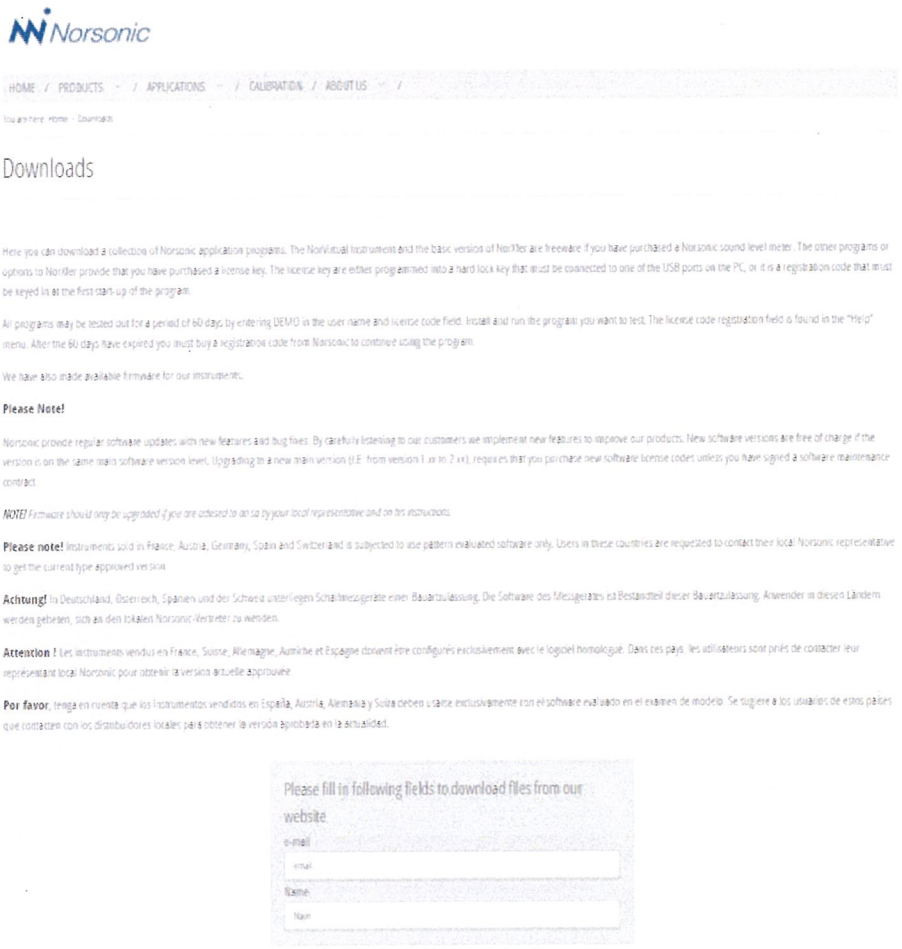
Thank you for purchasing measurement instrumentation from Norsonic.

Before starting to use this, there are a few simple steps you need to do:

- Download and install USB drivers
- Download and install NorXfer file download software

The drivers and program are available from www.norsonic.com/download

Fill in the required fields


Norsonic

HOME / PRODUCTS / APPLICATIONS / CALIBRATION / ABOUT US /

You are here: Home - Downloads

Downloads

Here you can download a collection of Norsonic application programs. The NorVirtual Instrument and the basic version of Nor3fler are freeware. If you have purchased a Norsonic sound level meter. The other programs or options to Nor3fler provide that you have purchased a license key. The license key are either programmed into a hard lock key that must be connected to one of the USB ports on the PC, or it is a registration code that must be keyed in at the first start-up of the program.

All programs may be tested out for a period of 60 days by entering DEMO in the user name and license code field. Install and run the program you want to test. The license code registration field is found in the "Help" menu. After the 60 days have expired you must buy a registration code from Norsonic to continue using the program.

We have also made available firmware for our instruments.

Please Note!

Norsonic provide regular software updates with new features and bug fixes. By carefully listening to our customers we implement new features to improve our products. New software versions are free of charge if the version is on the same main software version level. Upgrading to a new main version (i.E. from version 1.xx to 2.xx), requires that you purchase new software license codes unless you have signed a software maintenance contract.

NOTE! Firmware should only be upgraded if you are advised to do so by your local representative and on his instructions.

Please note! Instruments sold in France, Austria, Germany, Spain and Switzerland is subjected to use pattern evaluated software only. Users in these countries are requested to contact their local Norsonic representative to get the current type approved version.

Achtung! In Deutschland, Österreich, Spanien und der Schweiz unterliegen Schallmessgeräte einer Bauartzulassung. Die Software des Messgerätes ist Bestandteil dieser Bauartzulassung. Anwender in diesen Ländern werden gebeten, sich an den lokalen Norsonic-Vertreter zu wenden.

Attention ! Les instruments vendus en France, Suisse, Allemagne, Autriche et Espagne doivent être configurés exclusivement avec le logiciel homologué. Dans ces pays, les utilisateurs sont priés de contacter leur représentant local Norsonic pour obtenir la version actuelle approuvée.

Por favor, tenga en cuenta que los instrumentos vendidos en España, Austria, Alemania y Suiza deben utilizar exclusivamente con el software evaluado en el examen de modelo. Se sugiere a los usuarios de estos países que contacten con los distribuidores locales para obtener la versión aprobada en la actualidad.

Please fill in following fields to download files from our website

e-mail

email

Name

Name

Download USB drivers and follow the instruction included in the .zip file

Download and install the latest NorXfer software.

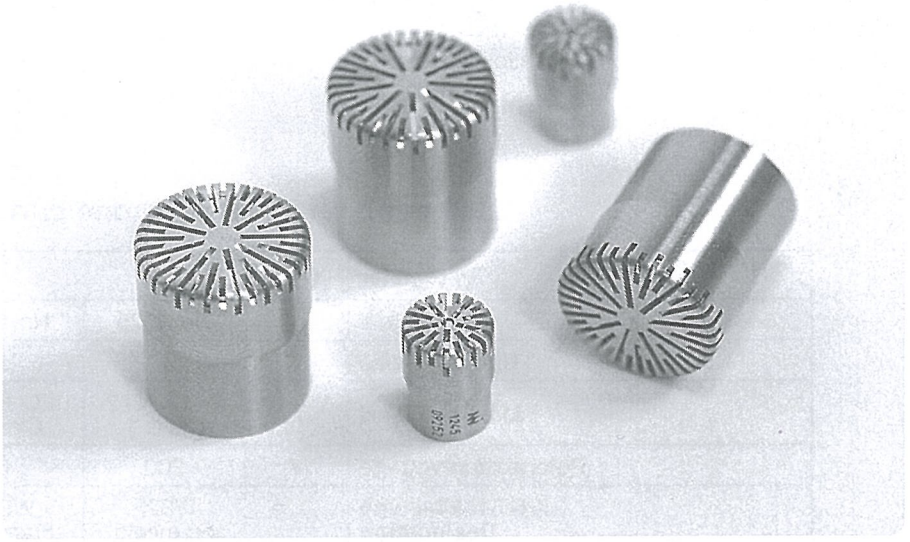
We also recommend you to take a trial measurement, transfer this to the PC and get the results in Excel.

A brief example is given in Instruction Manual for NorXfer, included in the program. Chapter “Quick Reference Guide – transfer and convert a measurement to Excel”.

Please contact your local representative if you have problems downloading/installing the drivers/sofware.

Norsonic

Microphone Cartridges



The key components that determines the accuracy of a sound level meter is the measurement microphone and its associated preamplifier. The effectiveness of these components in converting the acoustic signal into an electrical analogue set the maximum accuracy that can be achieved by the ensuing signal processing. Norsonic have a carefully balanced range of measurement microphones to suite a range of applications that complement modern instrumentation yet maintain traditional values.

Norsonic's range of microphones covers most application and can be used as direct replacement with other brands.

Full use has been made of modern materials which when coupled with traditional engineering skills produces microphones that meet all the requirements of the precision measurement standards yet are robust and resistant to corrosion. These microphones are used in conjunction with the Norsonic range of preamplifiers that closely couple to them and ensure perfect matching to the associated instrument with minimum disturbance to the acoustic field. The preamplifiers have the necessary signal handling capability and low self noise to allow full use to be made of the wide dynamic range of the microphones.

Calibration

Calibration of all Norsonic microphones is directly traceable to National and International Standards with particular attention being paid in the design to ensuring long term stability. Each microphone is delivered with an individual certificate of calibration giving all the key information relating to its performance. This includes the nominal sensitivity and frequency response along with the environmental data that relates to the calibration.

Norsonic Calibration Laboratory is an international accreditated laboratory. This ensures that the quality of the measured values are at the highest possible level.

Free-Field Microphones

All Norsonic microphones are free-field types. A free-field microphone is designed to measure the sound pressure in the sound field, compensating for the influence of the presence of the microphone in the sound field. In effect, the microphone measures the sound pressure as it existed before the microphone was introduced in the sound field, i.e. free-field conditions. Applicable standard is IEC 61672 and the former IEC 60651. The free-field microphone should be pointed towards the sound source at a 0° angle of incidence.

Cartridge Overview

Below is a summary of our range of microphone cartridges.

Nor1225 is a ½" free-field high sensitivity microphone. A general purpose microphone covering the frequency range from 3.15Hz to 20 kHz. Correspond to the Class 1 of the sound level meter standard IEC 61672.

Nor1227 is a ½" free-field, high sensitivity self-polarised microphone for use in applications where environmental or safety considerations do not permit the use of 200-volt polarisation supplies, or as a general IEC 61672 Class 1 microphone in sound level meters with no polarisation voltage.

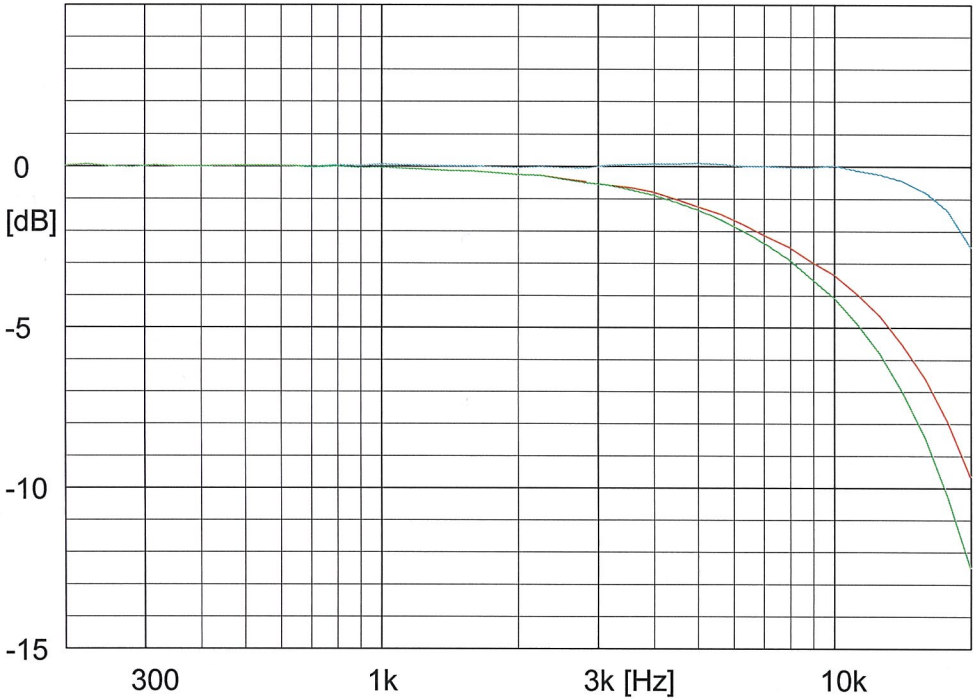
Nor1228 is a ½" free-field, high sensitivity, low cost self-polarised Class 1 microphone. Ideal for use in multi channels systems or other applications that requires a self polarised IEC 61672 Class 1 microphone at low cost.

Nor1229 is a ½" free-field, high sensitivity, low cost self-polarised Class 2 microphone. Ideal for use in multi channels systems or other applications that requires a self polarised microphone at low cost with Class 2 accuracy. Unlike most other low cost Class 2 microphones it features a nickel membrane and a stainless steel housing, ensuring low sensitivity to environmental parameters such as temperature, static pressure and humidity.

Selection chart microphone cartridges

Parameter	Unit				
		Nor1225	**Nor1227**	**Nor1228**	**Nor1229**
Cartridge size	"	½"	½"	½"	½"
Main standard		IEC 61672 Class 1	IEC 61672 Class 1	IEC 61672 Class 1	IEC 61672 Class 2
Polarisation voltage	V	200	0	0	0
IEC 61094-4 type Designation	—	WS2F Free-field	WS2F Free-field	WS2F Free-field	WS2F Free-field
Nomial sensitivity@ 250Hz	mV/Pa	50	50	50	40
Frequency Respons ±1dB ±3dB	Hz Hz	5-10k 3.15-20k	5-10k 3.15-20k	20-10k 12.5-16k	– 20-10k
Maximum SPL 3%	dB	146	146	146	146
Self noise Based on typical thermal noise	dB(A)	15	15	16	24
Response		Free field	Free field	Free field	Free field
Capacitance	pF	18	14	16	13
Effective front volume	mm^3	50	50	50	45
Temperature coeff. @250Hz -10 to +50°C -40 to +150°C	dB/°C	<-0.005 <-0.01	<-0.005 <-0.01	<-0.005 —	<-0.01 —
Max. temperature	°C	300	150	80	80
Static pressure coeff @250Hz	dB/kPa	-0.0008	-0.0008	-0.004	±0.03
Realtive humidity NM = not measureable 0-100% RH no condensation	dB/%	NM	NM	-0.003	±0.006
Vibration sensitivity SPL for 0.1g perpendicular do diaphragm	dB	62	62	62	65
Magnetic field effect SPL for field strength of 80A/m	dB	3.5	3.5	4	5
Diameter with protection grid	mm	13.2	13.2	13.2	13.2
Length with protection grid	mm	16.2	16.2	17.3	16.6
Weight with protection grid	g	6	6	9	7

Microphone Calibration Certificate



Norsonic
Type: 1228

Serial no: 02739

Sensitivity: 56,0 mV/Pa
-25,0 dB re. 1 V/Pa
Capacitance: 14,4 pF
Date: 2018-02-14

Signature:

Measurement conditions:

Polarisation voltage:	0,0 V
Pressure:	98,50 kPa
Temperature:	23,0 °C
Relative humidity:	31,2 %RH

Results are normalized to the reference conditions.

Free field response
Diffuse field response
Pressure (Actuator) response

Norsonic AS
www.norsonic.com

Microphone Specifications

Calibration of your microphone cartridge has been made with utmost care to meet all your needs for a high quality measurement device. The calibration is traceable to PTB in Germany.

Nominal Specifications

Ambient temperature coeffecient: 0.01 dB/°C
Ambient pressure coeffecient: -1×10^{-5} dB/Pa
Temperature range: -30 to +70°C
Diameter: 13.2 mm with protection grid on,
12.7 mm without protection grid
Thread for preamp mounting: 11.7 mm 60 UNS

Reference Values

Temperature: 23°C
Relative humidity: 50%
Ambient pressure: 101.325 kPa
Test frequency for sensitivity: 250 Hz

Norsonic Warranty Statement

The warranty period for microphones is 36 months after the time of delivery.
The warranty does not include damage due to improper handling, overload, force majeur, or normal wear and tear. The warranty is not granted if the buyer make modifications or repairs without our written consent. Norsonic can choose either to repair or replace microphones having defects due to material or workmanship. Defective goods should be returned to our factory or one of our distributors, and shipments are to be paid and insured by the buyer unless otherwise agreed.

CASELLA CEL

Certificate of Conformance and Calibration for

CEL-120 Acoustic Calibrator

Applicable Standards :-IEC 60942: 2003 & ANSI S1.40: 2006

CEL-120/1 Class 1 [✓]

CEL-120/2 Class 2 [ ]

Serial No: 2383737

Firmware: 04

Temperature: 19 °C Pressure: 1013 mb %RH 50

Frequency = 1.00kHz ± 2Hz T.H.D. = < 1%	Calibration Level
SPL @ 114.0dB Setting	114.00 dB
SPL @ 94.0dB Setting (CEL-120/1 only)	93.97 dB/N.A

Engineer :- [signature] Date :- 17 OCT 2018

Company test equipment and acoustic working standards, used for conformance testing, are subject to periodic calibration, traceable to UK national standards, in accordance with the company's ISO9001 Quality System.

DECLARATION OF CONFORMITY

This certificate confirms that the instrument specified above has been produced and tested to comply with the manufacturer's published specifications and the relevant European Community CE directives.

Casella CEL (U.K.),
Regent House, Wolseley Road, Kempston, Bedford. MK42 7JY
Phone: +44 (0) 1234 844100 Fax: +44 (0) 1234 841490
E-mail: info@casellacel.com
Web: www.casellameasurement.com

198032A-01

Manufacturer Calibration Certificate

The following instrument has been tested and calibrated to the manufacturer specifications.
The calibration is traceable in accordance with ISO/IEC 17025 covering all instrument functions.

- Device Type: **XL2 Audio and Acoustic Analyzer**
- Serial Number: **A2A-14829-E0**

- Certificate Issued: **28 August 2018**
- Certificate Number: **43340-A2A-14829-E0**

- Results: **PASSED**
  (for detailed report see next page)

Tested by: M. Frick

Signature:

Stamp:

NTi Audio AG
Im alten Riet 102
LI - 9494 Schaan
www.nti-audio.com

Calibration of: XL2 Audio and Acoustic Analyzer
Serial Number: A2A-14829-E0
Date: 28 August 2018

- Detailed Calibration Test Results:

		reference	actual	unit	actual error	XL2 tolerance	calibration uncertainty[2]
RMS Level @ 1kHz, XLR Input		0.1	**0.100**	V	≤0.1%	±0.5%	±0.10%
		1	**1.000**	V	≤0.1%	±0.5%	±0.09%
		10	**9.988**	V	-0.1%	±0.5%	±0.09%
Flatness, XLR Input[1]	20 Hz	1	**0.996**	V	-0.4%	±1.1%	±0.09%
	20 kHz	1	**1.005**	V	0.5%	±1.1%	±0.09%
Frequency		1000	**999.99**	Hz	≤0.003%	±0.003%	±0.01%
Residual Noise	XLR		**< 2 uV**			<2 uV	±0.50%
THD+N @ 0 dBu, 1 kHz, XLR Input			**-98.5**	dB		typ. -100 dB	±0.50%

- Test Conditions: Temperature: **25.7** °C
  Relative Humidity: **55.2** %

- Calibration Equipment Used:

  - Agilent Multimeter, Typ 34401A, Serial No. MY 5300 4607
    Last calibration: 15.08.2018, Next calibration: 15.08.2019
    Calibrated by ELCAL to the national standards maintained
    at Swiss Federal Office of Metrology. SCS 0002

  - FX100 Audio Analyzer, Serial No. 10408
    Last Calibration: 27.04.2018, Next Calibration: 27.04.2019
    Manufacturer calibration based on Agilent 34410, Serial No. MY47014254,
    Last Calibration: 11.05.2018, Next Calibration: 11.05.2019
    which is calibrated by ELCAL to national standards maintained
    at Swiss Federal Office of Metrology. SCS 002

[1] The specified tolerance +/-0.1 dB @ 1V = +/- 1.1%

[2] The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k=2, providing a level of confidence of approximately 95%. The uncertainty evaluation has been carried out in accordance with the regulations of the GUM.

Hong Kong Calibration Ltd.
香 港 校 正 有 限 公 司

Calibration Certificate

Certificate No. **807533** Page 1 of 2 Pages

Customer : Mott MacDonald Hong Kong Limited

Address : 20/F, Two Landmark East, 100 How Ming Street, Kwun Tong, Kowloon, Hong Kong.

Order No. : Q82248 **Date of receipt :** 25-Jul-18

Item Tested

Description : Acoustic Calibrator

Manufacturer : Castle **I.D.** : --

Model : GA607 **Serial No.** : 040162

Test Conditions

Date of Test : 7-Aug-18 **Supply Voltage** : --

Ambient Temperature : (23 ± 3)°C **Relative Humidity :** (50 ± 25) %

Test Specifications

Calibration check.

Ref. Document/Procedure : F06, F20, Z02.

Test Results

All results were within the IEC 60942 Class 1 specification.

The results are shown in the attached page(s).

Main Test equipment used:

Equipment No.	Description	Cert. No.	Traceable to
S014	Spectrum Analyzer	805025	NIM-PRC & SCL-HKSAR
S240	Sound Level Calibrator	803357	NIM-PRC & SCL-HKSAR
S041	Universal Counter	802061	SCL-HKSAR
S206	Sound Level Meter	805027	SCL-HKSAR

The values given in this Calibration Certificate only relate to the values measured at the time of the test and any uncertainties quoted will not include allowance for the equipment long term drift, variations with environmental changes, vibration and shock during transportation, overloading, mis-handling, or the capability of any other laboratory to repeat the measurement. Hong Kong Calibration Ltd. shall not be liable for any loss or damage resulting from the use of the equipment.

The test equipment used for calibration are traceable to International System of Units (SI), or by reference to a natural constant.
The test results apply to the above Unit-Under-Test only

Calibrated by : Elva Chong

Approved by : Kin Wong

Date: 7-Aug-18

This Certificate is issued by:
Hong Kong Calibration Ltd.
Unit 8B, 24/F., Well Fung Industrial Centre, No. 58-76, Ta Chuen Ping Street,Kwai Chung, NT,Hong Kong.
Tel: 2425 8801 Fax: 2425 8646

The copyright of this certificate is owned by Hong Kong Calibration Ltd.. It may not be reproduced except in full.

Calibration Certificate

Results :

1. Generated Sound Pressure Level

UUT Nominal Value (dB)	Measured Value (dB)	IEC 60942 Class 1 Spec.
94.0	94.0	± 0.4 dB

Uncertainty : ± 0.2 dB

2. Short-term Level Fluctuation : 0.0 dB

IEC 60942 Class 1 Spec. : ± 0.1 dB
Uncertainty : ± 0.01 dB

3. Frequency

UUT Nominal Value (kHz)	Measured Value (kHz)	IEC 60942 Class 1 Spec.
1	1.000	± 1 %

Uncertainty : $\pm 3.6 \times 10^{-6}$

4. Total Distortion : < 0.7%

IEC 60942 Class 1 Spec. : < 4 %
Uncertainty : ± 2.3 % of reading

Remark : 1. UUT : Unit-Under-Test
2. The uncertainty claimed is for a confidence probability of not less than 95%.
3. Atmospheric Pressure : 1 004 hPa.

---------- END ----------

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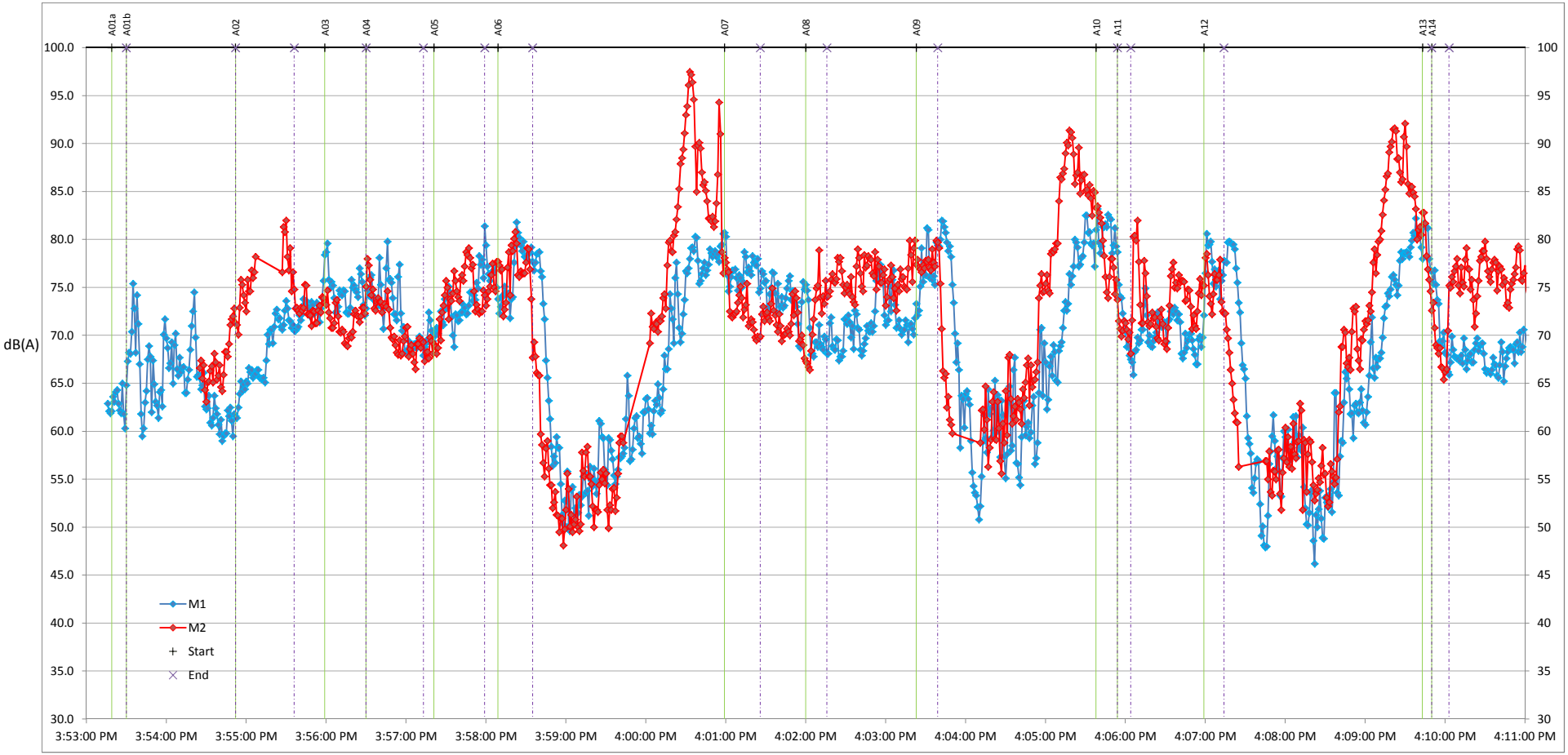
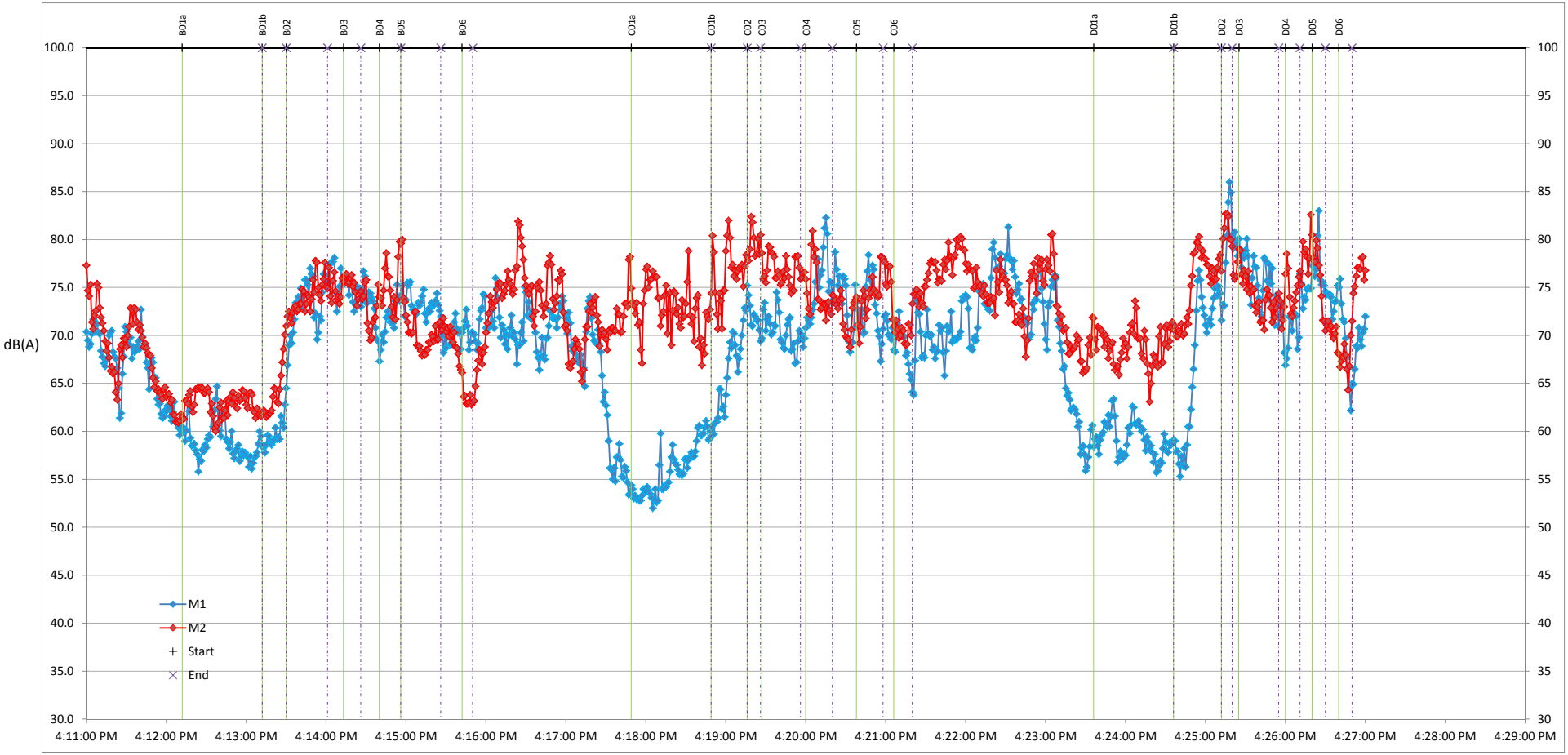
Appendix C

A Rooftop Helipad at New Acute Hospital at Kai Tak Development Area
Technical Note - Helicopter Noise Survey Report
Appendix C - Graphical Time History of Measured Noise Levels




B01a
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C04
C05
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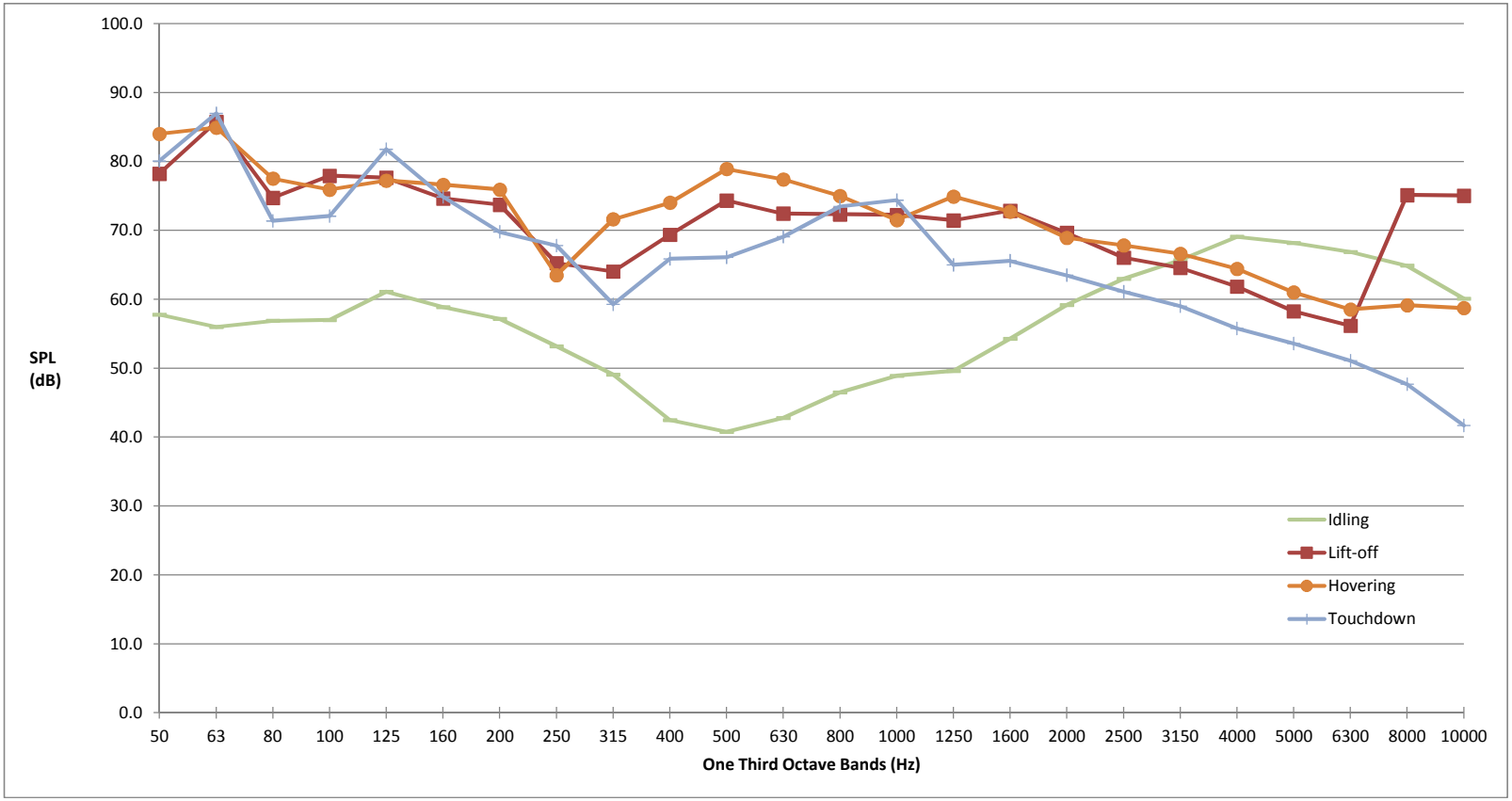
D01b
D02
D03
D04
D05
D06
100.0
95.0
90.0
85.0
80.0
75.0
70.0
65.0
60.0
55.0
50.0
45.0
40.0
35.0
30.0
dB(A)
M1
M2
Start
End
4:11:00 PM
4:12:00 PM
4:13:00 PM
4:14:00 PM
4:15:00 PM
4:16:00 PM
4:17:00 PM
4:18:00 PM
4:19:00 PM
4:20:00 PM
4:21:00 PM
4:22:00 PM
4:23:00 PM
4:24:00 PM
4:25:00 PM
4:26:00 PM
4:27:00 PM
4:28:00 PM
4:29:00 PM
Time

Appendix D

A Rooftop Helipad at New Acute Hospital at Kai Tak Development Area
Technical Note - Helicopter Noise Survey Report
Appendix D - Graphical Presentation of SPL in One Third Octave Bands



Operation Mode	L_{max} (dB(A))	SPL (dB) in One Third Octave Bands (Hz)																							
		50	63	80	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10000
Idling	75.4	57.8	56.0	56.9	57.0	61.1	58.9	57.2	53.2	49.1	42.5	40.8	42.8	46.5	48.9	49.6	54.3	59.2	63.0	65.7	69.1	68.2	66.9	64.9	60.1
Lift-off	82.4	78.2	85.7	74.7	77.9	77.6	74.6	73.7	65.2	64.0	69.3	74.3	72.4	72.3	72.2	71.4	72.8	69.6	66.0	64.5	61.8	58.2	56.1	75.1	75.0
Hovering	83.5	84.0	84.9	77.5	75.9	77.2	76.6	75.9	63.5	71.6	74.0	78.9	77.4	75.0	71.5	74.9	72.7	68.9	67.8	66.6	64.4	61.0	58.5	59.1	58.7
Touchdown	78.9	80.1	87.0	71.4	72.1	81.8	74.9	69.8	67.8	59.3	65.9	66.1	69.1	73.5	74.4	65.0	65.6	63.5	61.1	59.0	55.8	53.6	51.1	47.7	41.7

Operation Mode	L_{max} (dB(A))	SPL (dB(A)) in One Third Octave Bands (Hz)																								
		50	63	80	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10000
Idling	75.4	27.6	29.8	34.4	37.9	45.0	45.5	46.3	44.6	42.5	37.7	37.6	40.9	45.7	48.9	50.2	55.3	60.4	64.3	66.9	70.1	68.7	66.8	63.8	57.6
Lift-off	82.4	48.0	59.5	52.2	58.8	61.5	61.2	62.8	56.6	57.4	64.5	71.1	70.5	71.5	72.2	72.0	73.8	70.8	67.3	65.7	62.8	58.7	56.0	74.0	72.5
Hovering	83.5	53.8	58.7	55.0	56.8	61.1	63.2	65.0	54.9	65.0	69.2	75.7	75.5	74.2	71.5	75.5	73.7	70.1	69.1	67.8	65.4	61.5	58.4	58.0	56.2
Touchdown	78.9	49.9	60.8	48.9	53.0	65.7	61.5	58.9	59.2	52.7	61.1	62.9	67.2	72.7	74.4	65.6	66.6	64.7	62.4	60.2	56.8	54.1	51.0	46.6	39.2