

ภาคผนวก จ

เอกสารสอบเทียบเครื่องมือวิเคราะห์

## Certificate of Calibration

### Customer

Name : UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.  
Address : 81 Soi Udomsuk 41, Sukhumvit Road, Bangchak, Prakanong, Bangkok 10260

Certificate No : 22-ACT-311

Request No : Req-2022-0790

### Unit Under Calibration Details

|                    |                 |                      |        |
|--------------------|-----------------|----------------------|--------|
| Measurement item : | Noise dosimeter | Microphone Class :   | 2      |
| Manufacturer :     | SVANTEK         | Microphone Model :   | SV27   |
| Model :            | SV104           | Microphone S/N :     | 112805 |
| Serial Number :    | 117694          | Preamplifier Model : | -      |
| ID :               | -               | Preamplifier S/N :   | -      |
| Resolution :       | 0.1 dB          | Intrument Status :   | New    |

### Calibration Environment and Details


Temperature : 23 °C ± 2 °C  
Humidity : 50 %RH ± 20 %RH  
Barometric Pressure : 1013 hPa ± 10 hPa  
Received Date : 6 May 2022  
Calibrated Date : 11 May 2022  
Calibration Procedure : In-house method CP-NDM-01 based on IEC 61252 : 2017  
Location of Calibration : Lab Acoustic


### Reference Standard

| Instrument                | Brand   | Model     | SN.    | Due calibration   | Traceability |
|---------------------------|---------|-----------|--------|-------------------|--------------|
| Multifrequency Calibrator | Quest   | Quest-cal | 188272 | 14 June 2022      | TSI          |
| Standard Microphone       | GRAS    | 40AN      | 188273 | 15 September 2022 | GRAS         |
| Sine Generator            | Svantek | Svan401   | 131    | 18 October 2022   | WK Electric  |
| Timer                     | EXTECH  | -         | 05-ACT | 24 March 2023     | TPA          |

### Note

The reported uncertainty is based on standard uncertainty multiplied by the Coverage Factor  $k = 2$ , providing a level of confidence approximately 95 %.

Calibrated By :   
Mr. Noppadon Luangart  
Calibration Officer

Approved By :   
Mr. Pacit Mathavorn  
Calibration Engineer Supervisor  
Issue Date : 11 May 2022

Certificate No : 22-ACT-311

Request No : Req-2022-0790

### 1. Absolute acoustical sensitivity

| UUC Setting        | Time   |     | Exposure Measurement |                     |       | UNCERTAINTY | Tolerances<br>Limit |
|--------------------|--------|-----|----------------------|---------------------|-------|-------------|---------------------|
| FAST / A / 55-140  | Ref    | UUC | Ref                  | UUC                 | Error |             |                     |
| Calibrator Setting | (s)    | (s) | (Pa <sup>2</sup> h)  | (Pa <sup>2</sup> h) | (%)   | (%)         | (%)                 |
| 1000 Hz 114 dB     | 120.00 | 120 | 3.23                 | 3.20                | -0.93 | 3.0         | -21, +26            |

Note : Absolute sensitivity was established by the use of Sound Calibrator Brand SVANTEK, Model SV 35A, SN. 58079

### 2. Frequency weightings

| UUC Setting   | Deviation from various<br>Frequency Weighting |      | UNCERTAINTY | Tolerances<br>Limit |
|---------------|---|------|-------------|---------------------|
| FAST / 55-140 | A   | C    | ( ± dB)     | ( ± dB)             |
| STD Setting   | (dB)  | (dB) |             |                     |
| *63 Hz        | 0.0   | 0.0  | 0.40        | 2.0                 |
| 125 Hz        | -0.4  | -0.4 | 0.40        | 1.5                 |
| 250 Hz        | -0.1  | -0.2 | 0.40        | 1.5                 |
| 500 Hz        | -0.1  | 0.0  | 0.40        | 1.5                 |
| 1000 Hz       | 0.0   | 0.0  | 0.40        | -                   |
| 2000 Hz       | 0.0   | -0.1 | 0.40        | 2.0                 |
| 4000 Hz       | 0.8   | 0.8  | 0.40        | 3.0                 |
| 8000 Hz       | -1.9  | -1.9 | 0.40        | 5.0                 |

Certificate No : 22-ACT-311

Request No : Req-2022-0790

### 3. Linearity of response to steady signals

#### a. Sound exposure meter, linearity of response for changes of input sinusoidal signal level

| UUC Setting      |         | FAST / A / High |      |      |      |       |       |       |       |       |       |
|------------------|---------|-----------------|------|------|------|-------|-------|-------|-------|-------|-------|
| 1000 Hz          | Ref     | (dB)            | 55.0 | 80.0 | 90.0 | 100.0 | 110.0 | 114.0 | 120.0 | 130.0 | 140.0 |
|                  | Level A | (dB)            | 54.6 | 80.0 | 90.0 | 100.0 | 110.0 | 114.0 | 119.9 | 129.9 | 139.9 |
|                  | Error   | (dB)            | -0.4 | 0.0  | 0.0  | 0.0   | 0.0   | 0.0   | -0.1  | -0.1  | -0.1  |
| 8000 Hz          | Ref     | (dB)            |      |      |      | 88.9  | 98.9  | 108.9 | 112.9 | 118.9 | 128.9 |
|                  | Level A | (dB)            |      |      |      | 88.9  | 98.9  | 108.9 | 112.9 | 118.9 | 128.8 |
|                  | Error   | (dB)            |      |      |      | 0.0   | 0.0   | 0.0   | 0.0   | -0.1  | -0.2  |
| 63 Hz            | Ref     | (dB)            |      |      |      |       |       | 87.8  | 93.8  | 103.8 | 113.8 |
|                  | Level A | (dB)            |      |      |      |       |       | 87.8  | 93.8  | 103.8 | 113.8 |
|                  | Error   | (dB)            |      |      |      |       |       | 0.0   | 0.0   | 0.0   | 0.0   |
| Tolerances Limit |         | (±dB)           | 1.0  |      |      |       |       |       |       |       |       |
| UNCERTAINTY      |         | (±dB)           | 0.27 |      |      |       |       |       |       |       |       |

#### b. Sound exposure meter linearity of error

| UUC Setting        | Time |     | Exposure Measurement |                     |       | UNCERTAINTY | Tolerances |
|--------------------|------|-----|----------------------|---------------------|-------|-------------|------------|
| FAST / A / 55-140  | Ref  | UUC | Ref                  | UUC                 | Error |             | Limit      |
| Calibrator Setting | (s)  | (s) | (Pa <sup>2</sup> h)  | (Pa <sup>2</sup> h) | (%)   | (%)         | (%)        |
| 1000 Hz 110 dB     | 27   | 27  | 0.30                 | 0.30                | 0.00  | 4.3         | -21, +26   |
| 1000 Hz 110 dB     | 45   | 45  | 0.50                 | 0.51                | +2.00 |             |            |
| 1000 Hz 110 dB     | 90   | 90  | 1.00                 | 1.01                | +1.00 |             |            |
| 1000 Hz 110 dB     | 180  | 180 | 2.00                 | 2.02                | +1.00 |             |            |
| 1000 Hz 120 dB     | 36   | 36  | 4.00                 | 4.03                | +0.75 |             |            |
| 1000 Hz 120 dB     | 72   | 72  | 8.00                 | 8.05                | +0.63 | 3.8         |            |
| 1000 Hz 120 dB     | 90   | 90  | 10.00                | 10.13               | +1.30 |             |            |
| 1000 Hz 120 dB     | 180  | 180 | 20.00                | 20.22               | +1.10 |             |            |
| 1000 Hz 120 dB     | 360  | 360 | 40.00                | 40.34               | +0.85 |             |            |
| 1000 Hz 120 dB     | 720  | 720 | 80.00                | 80.49               | +0.61 |             |            |



Certificate No : 22-ACT-311

Request No : Req-2022-0790

#### 4. Response to short duration

##### a. Response for sinusoidal signals - reference level

| UUC Setting        | Time |      | Exposure Measurement |                     |                     | UNCERTAINTY         | Tolerances                   |
|--------------------|------|------|----------------------|---------------------|---------------------|---------------------|------------------------------|
| FAST / A / 55-140  | Ref  | UUC  | Ref                  | UUC                 | Error               |                     |                              |
| Calibrator Setting | (s)  | (s)  | (Pa <sup>2</sup> h)  | (Pa <sup>2</sup> h) | (Pa <sup>2</sup> h) | (Pa <sup>2</sup> h) | Limit<br>(Pa <sup>2</sup> h) |
| 4000 Hz 95 dB      | 2846 | 2846 | 1.00                 | 1.00                | 0.00                | 0.01                | -0.29 - 0.41                 |

##### b. Sound exposure meter response for series of toneburst impulses

| UUC Setting        | Time |      | Exposure Measurement |                     |       | UNCERTAINTY | Tolerances   |
|--------------------|------|------|----------------------|---------------------|-------|-------------|--------------|
| FAST / A / 55-140  | Ref  | UUC  | Ref                  | UUC                 | Error |             |              |
| Calibrator Setting | (s)  | (s)  | (Pa <sup>2</sup> h)  | (Pa <sup>2</sup> h) | (%)   | (%)         | Limit<br>(%) |
| Burst 1 ms, 95 dB  | 2846 | 2846 | 1.00                 | 1.00                | 0.00  | 3.0         | -21 - +26    |
| Burst 1 ms, 100 dB | 900  | 900  | 1.00                 | 1.00                | 0.00  |             | -21 - +41    |
| Burst 1 ms, 108 dB | 143  | 143  | 1.00                 | 1.01                | +1.00 |             | -21 - +41    |

#### 5. Response to unipolar pulse

| UUC Setting            | Time | Exposure Measurement |           | UNCERTAINTY | Tolerances   |
|------------------------|------|----------------------|-----------|-------------|--------------|
| FAST / A / 55-140      | UUC  | UUC                  | Different |             |              |
| Calibrator Setting     | (s)  | (Pa <sup>2</sup> h)  | (%)       | (%)         | Limit<br>(%) |
| Continuous Rectangle + | 7    | 10.86                | 0.00      | 2.4         | -21 - +26    |
| Continuous Rectangle - |      | 10.86                |           |             |              |

\* Indicates non accredited

End of Certificate

## Certificate of Calibration

### Customer

Name : UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD. Certificate No : 22-ACT-534  
Address : 81 Soi Udomsuk 41, Sukhumvit Road, Bangchak, Prakanong, Bangkok 10260 Request No : Req-2022-1571

### Unit Under Calibration Details

Measurement item : Noise dosimeter Microphone Class : 2  
Manufacturer : SVANTEK Microphone Model : SV 27IS  
Model : SV 104IS Microphone S/N : 68643  
Serial Number : 67629 Preamplifier Model : -  
ID : - Preamplifier S/N : -  
Resolution : 0.1 dB Instrument Status : Used

### Calibration Environment and Details


Temperature : 23 °C ± 2 °C  
Humidity : 50 %RH ± 20 %RH  
Barometric Pressure : 1013 hPa ± 10 hPa  
Received Date : 11 August 2022  
Calibrated Date : 22 August 2022  
Calibration Procedure : In-house method CP-NDM-01 based on IEC 61252 : 2017  
Location of Calibration : Lab Acoustic


### Reference Standard

| Instrument                | Brand   | Model     | SN.    | Due calibration   | Traceability |
|---------------------------|---------|-----------|--------|-------------------|--------------|
| Multifrequency Calibrator | Quest   | Quest-cal | 188272 | 29 June 2023      | TSI          |
| Standard Microphone       | GRAS    | 40AN      | 188273 | 15 September 2022 | GRAS         |
| Sine Generator            | Svantek | Svan401   | 131    | 18 October 2022   | WK Electric  |
| Timer                     | EXTECH  | -         | 05-ACT | 24 March 2023     | TPA          |

### Note

The reported uncertainty is based on standard uncertainty multiplied by the Coverage Factor  $k = 2$ , providing a level of confidence approximately 95 %.

Calibrated By :   
Mr. Noppadon Luangart  
Calibration Officer

Approved By :   
Mr. Pacit Mathavorn  
Calibration Engineer Supervisor  
Issue Date : 22 August 2022

Certificate No : 22-ACT-534

Request No : Req-2022-1571

### 1. Absolute acoustical sensitivity

| UUC Setting        | Time   |     | Exposure Measurement |                     |       | UNCERTAINTY | Tolerances<br>Limit |
|--------------------|--------|-----|----------------------|---------------------|-------|-------------|---------------------|
| FAST / A / 60-140  | Ref    | UUC | Ref                  | UUC                 | Error |             |                     |
| Calibrator Setting | (s)    | (s) | (Pa <sup>2</sup> h)  | (Pa <sup>2</sup> h) | (%)   | (%)         | (%)                 |
| 1000 Hz 114 dB     | 120.00 | 120 | 3.40                 | 3.43                | +0.88 | 3.0         | -21, +26            |

Note : Absolute sensitivity was established by the use of Sound Calibrator Brand SVANTEK, Model SV 36, SN. 107224

### 2. Frequency weightings

| UUC Setting   | Deviation from various<br>Frequency Weighting |      | UNCERTAINTY | Tolerances<br>Limit |
|---------------|---|------|-------------|---------------------|
| FAST / 60-140 | A   | C    |             |                     |
| STD Setting   | (dB)  | (dB) | ( ± dB)     | ( ± dB)             |
| *63 Hz        | 0.3   | 0.3  | 0.40        | 2.0                 |
| 125 Hz        | -0.6  | -0.7 | 0.40        | 1.5                 |
| 250 Hz        | -0.1  | -0.1 | 0.40        | 1.5                 |
| 500 Hz        | 0.0   | 0.0  | 0.40        | 1.5                 |
| 1000 Hz       | 0.0   | 0.0  | 0.40        | -                   |
| 2000 Hz       | -0.4  | -0.4 | 0.40        | 2.0                 |
| 4000 Hz       | -0.3  | -0.3 | 0.40        | 3.0                 |
| 8000 Hz       | -0.8  | -0.9 | 0.40        | 5.0                 |



Certificate No : 22-ACT-534

Request No : Req-2022-1571

### 3. Linearity of response to steady signals

#### a. Sound exposure meter, linearity of response for changes of input sinusoidal signal level

| UUC Setting      |         | FAST / A / High |      |      |      |       |       |       |       |       |       |
|------------------|---------|-----------------|------|------|------|-------|-------|-------|-------|-------|-------|
| 1000 Hz          | Ref     | (dB)            | 60.0 | 80.0 | 90.0 | 100.0 | 110.0 | 114.0 | 120.0 | 130.0 | 140.0 |
|                  | Level A | (dB)            | 59.9 | 80.0 | 90.1 | 100.0 | 110.0 | 114.0 | 120.0 | 130.0 | 140.0 |
|                  | Error   | (dB)            | -0.1 | 0.0  | 0.1  | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |
| 8000 Hz          | Ref     | (dB)            |      |      |      |       | 88.9  | 98.9  | 108.9 | 112.9 | 118.9 |
|                  | Level A | (dB)            |      |      |      |       | 89.0  | 98.9  | 108.9 | 112.9 | 118.9 |
|                  | Error   | (dB)            |      |      |      |       | 0.1   | 0.0   | 0.0   | 0.0   | -0.1  |
| 63 Hz            | Ref     | (dB)            |      |      |      |       |       | 87.8  | 93.8  | 103.8 | 113.8 |
|                  | Level A | (dB)            |      |      |      |       |       | 87.8  | 93.8  | 103.8 | 113.8 |
|                  | Error   | (dB)            |      |      |      |       |       | 0.0   | 0.0   | 0.0   | 0.0   |
| Tolerances Limit |         | (±dB)           | 1.0  |      |      |       |       |       |       |       |       |
| UNCERTAINTY      |         | (±dB)           | 0.27 |      |      |       |       |       |       |       |       |

#### b. Sound exposure meter linearity of error

| UUC Setting        | Time |     | Exposure Measurement |                     |       | UNCERTAINTY | Tolerances |
|--------------------|------|-----|----------------------|---------------------|-------|-------------|------------|
| FAST / A / 60-140  | Ref  | UUC | Ref                  | UUC                 | Error |             | Limit      |
| Calibrator Setting | (s)  | (s) | (Pa <sup>2</sup> h)  | (Pa <sup>2</sup> h) | (%)   | (%)         | (%)        |
| 1000 Hz 110 dB     | 27   | 27  | 0.30                 | 0.30                | 0.00  | 4.3         | -21, +26   |
| 1000 Hz 110 dB     | 45   | 45  | 0.50                 | 0.50                | 0.00  |             |            |
| 1000 Hz 110 dB     | 90   | 90  | 1.00                 | 1.00                | 0.00  |             |            |
| 1000 Hz 110 dB     | 180  | 180 | 2.00                 | 2.02                | +1.00 |             |            |
| 1000 Hz 120 dB     | 36   | 36  | 4.00                 | 3.94                | -1.50 |             |            |
| 1000 Hz 120 dB     | 72   | 72  | 8.00                 | 8.05                | +0.63 | 3.8         |            |
| 1000 Hz 120 dB     | 90   | 90  | 10.00                | 9.90                | -1.00 |             |            |
| 1000 Hz 120 dB     | 180  | 180 | 20.00                | 19.76               | -1.20 |             |            |
| 1000 Hz 120 dB     | 360  | 360 | 40.00                | 39.42               | -1.45 |             |            |
| 1000 Hz 120 dB     | 720  | 720 | 80.00                | 80.49               | +0.61 |             |            |



Certificate No : 22-ACT-534

Request No : Req-2022-1571

#### 4. Response to short duration

##### a. Response for sinusoidal signals - reference level

| UUC Setting        | Time |      | Exposure Measurement |                     |                     | UNCERTAINTY         | Tolerances<br>Limit |
|--------------------|------|------|----------------------|---------------------|---------------------|---------------------|---------------------|
| FAST / A / 60-140  | Ref  | UUC  | Ref                  | UUC                 | Error               |                     |                     |
| Calibrator Setting | (s)  | (s)  | (Pa <sup>2</sup> h)  | (Pa <sup>2</sup> h) | (Pa <sup>2</sup> h) | (Pa <sup>2</sup> h) | (Pa <sup>2</sup> h) |
| 4000 Hz 95 dB      | 2846 | 2846 | 1.00                 | 0.98                | -0.02               | 0.01                | -0.29 - 0.41        |

##### b. Sound exposure meter response for series of toneburst impulses

| UUC Setting        | Time |      | Exposure Measurement |                     |       | UNCERTAINTY | Tolerances<br>Limit |
|--------------------|------|------|----------------------|---------------------|-------|-------------|---------------------|
| FAST / A / 60-140  | Ref  | UUC  | Ref                  | UUC                 | Error |             |                     |
| Calibrator Setting | (s)  | (s)  | (Pa <sup>2</sup> h)  | (Pa <sup>2</sup> h) | (%)   | (%)         | (%)                 |
| Burst 1 ms, 95 dB  | 2846 | 2846 | 1.00                 | 0.98                | -2.00 | 3.0         | -21 - +26           |
| Burst 1 ms, 100 dB | 900  | 900  | 1.00                 | 0.98                | -2.00 |             | -21 - +41           |
| Burst 1 ms, 108 dB | 143  | 143  | 1.00                 | 0.99                | -1.00 |             | -21 - +41           |

#### 5. Response to unipolar pulse

| UUC Setting            | Time | Exposure Measurement |           | UNCERTAINTY | Tolerances<br>Limit |
|------------------------|------|----------------------|-----------|-------------|---------------------|
| FAST / A / 60-140      | UUC  | UUC                  | Different |             |                     |
| Calibrator Setting     | (s)  | (Pa <sup>2</sup> h)  | (%)       | (%)         | (%)                 |
| Continuous Rectangle + | 7    | 10.61                | 0.00      | 2.4         | -21 - +26           |
| Continuous Rectangle - |      | 10.61                |           |             |                     |

\* Indicates non accredited

End of Certificate

## Certificate of Calibration

### Customer

Name : UNITED ANALYST AND ENGINEERING CONSULTANT  
CO.,LTD.  
Address : 81 Soi Udomsuk 41, Sukhumvit Road, Bangchak, Prakanong,  
Bangkok 10260

Certificate No : 22-LXM-139

Request No : Req-2022-0916

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### Unit Under Calibration Details

Instrument Name : Digital Lux Meter  
Manufacturer : EXTECH  
Model : 407026  
Serial Number : A052262  
Resolution : 1 lx  
ID Number : UAE.EFM.174/2564

Range Calibration : 2000 , 20000 lx

Intrument Status : Used

### Calibration Environment and Details

Temperature : 25 °C ± 2 °C  
Humidity : 60 %RH ± 20 %RH  
Received Date : 19 May 2022  
Calibrated Date : 23 May 2022

Calibration Procedure : The measurement was done in accordance with CP-LXM-01

**Reference Standard** : Photometer and Illuminance Sensor, Serial No.: 30662/2, 30592/2, which was calibrated on 26 October 2021,  
Certificate No.: TP-1026-21

**Traceability** : This Certificate is traceable to International System of Unit (SI) Unit through National Institute of  
Metrology (Thailand)

### Note

The reported uncertainty is based on a standard uncertainty multiplied by the Coverage Factor  $k = 2$ , providing a level of confidence approximately 95 %.

Approved By :

ภาพิต

Mr. Pacit Mathavorn

Calibration Engineer Supervisor

Issue Date :

23 May 2022

**Calibration Note**

UUC Adjustment : Zero adjustment before use

Certificate No : 22-LXM-139

Request No : Req-2022-0916

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**Result of Calibration :**

| UUC Range (lx) | Standard<br>(lx) | UUC Reading<br>(lx) | Correction<br>(lx) | Uncertainty<br>(± lx) |
|----------------|------------------|---------------------|--------------------|-----------------------|
| 2000           | 0                | 0                   | 0                  | 0.58                  |
|                | 50               | 50                  | 0                  | 2.3 % of Reading      |
|                | 100              | 100                 | 0                  |                       |
|                | 200              | 200                 | 0                  |                       |
|                | 300              | 301                 | -1                 |                       |
|                | 400              | 401                 | -1                 |                       |
|                | 600              | 603                 | -3                 |                       |
|                | 800              | 803                 | -3                 |                       |
|                | 1000             | 1005                | -5                 |                       |
|                | 1200             | 1207                | -7                 |                       |
|                | 1400             | 1408                | -8                 |                       |
|                | 1600             | 1608                | -8                 |                       |
|                | 1800             | 1803                | -3                 |                       |
|                | 2000             | 1991                | 9                  |                       |
| 20000          | 3000             | 2970                | 30                 |                       |
|                | 4000             | 3970                | 30                 |                       |
|                | 5000             | 4960                | 40                 |                       |

End of Certificate

Calibrated By :



Mr. Noppadon Luangart



## Certificate of Calibration

### Customer

Name : UNITED ANALYST AND ENGINEERING CONSULTANT  
CO.,LTD.

Certificate No : 23-ACT-021

Request No : Req-2022-2269

Address : 81 Soi Udomsuk 41, Sukhumvit Road, Bangchak,  
Prakanong, Bangkok 10260

### Unit Under Calibration Details

Measurement item : Acoustic Calibrator Class : 1  
Manufacturer : SVANTEK Range : 94 , 114 dB / 1000 Hz  
Model : SV35 Intrument Status : Used  
Serial Number : 44792  
ID : UAE.EFM.020/2559

### Calibration Environment and Details


Temperature : ( 23  $\pm$ 2  $^{\circ}$ C )  
Humidity : ( 50  $\pm$  20 %RH )  
Barometric Pressure : ( 1013  $\pm$ 10.0 hPa )  
Received Date : 26 December 2022  
Calibration Date : 14 February 2023  
Location of Calibration : LAB 1 Acoustic  
Calibration Procedure : In-house method CP-ACT-02 based on IEC 60942:2017 Electroacoustics - Sound calibrators


| Reference Standard | Model  | Serial Number | Traceable | Due Calibration |
|--------------------|--------|---------------|-----------|-----------------|
| Sound Calibrator   | SV 35A | 58079         | EEI       | 31 May 2023     |
| THD Multimeter     | 2015   | 1047765       | NIMT      | 31 January 2024 |

**Traceability** : This certificate provides traceability of measurement to recognized national standard, and to the realization of the international System of Units (SI).

### Note

The reported uncertainty is based on standard uncertainty multiplied by the Coverage Factor k=2, providing a level of confidence approximately 95 %.

Calibrated By :   
Mr. Noppadon Luangart  
Service Calibration Engineer

Approved By :   
Mr. Pacit Mathavorn  
Calibration Engineer Supervisor

Issue Date : 14 February 2023



Certificate No : 23-ACT-021

Request No : Req-2022-2269

Sound pressure level

Calibration Results : Without Adjustment

| Calibration Range<br>(dB) | Without Adjustment (dB) |       | Adjustment (dB) |       | Uncertainty<br>( ± dB) | Acceptance limit<br>Class 1 ( ± dB) |
|---------------------------|-------------------------|-------|-----------------|-------|------------------------|-------------------------------------|
|                           | Measured                | Error | Measured        | Error |                        |                                     |
| 94 dB / 1000 Hz           | 94.06                   | 0.06  | -               | -     | 0.11                   | 0.25                                |
| 114 dB / 1000 Hz          | 114.07                  | 0.07  | -               | -     | 0.11                   | 0.25                                |

Frequency of Sound pressure level

| Calibration Range<br>(Hz) | Without Adjustment |           | Adjustment    |           | Uncertainty<br>( ± %) | Acceptance limit<br>Class 1 ( ± %) |
|---------------------------|--------------------|-----------|---------------|-----------|-----------------------|------------------------------------|
|                           | Measured (Hz)      | Error (%) | Measured (Hz) | Error (%) |                       |                                    |
| 94 dB / 1000 Hz           | 1000.00            | 0.00      | -             | -         | 0.10                  | 0.70                               |
| 114 dB / 1000 Hz          | 1000.00            | 0.00      | -             | -         | 0.10                  | 0.70                               |

Total Harmonic Distortion plus Noise of Sound pressure level (THD+N %)

| Calibration Range<br>(Hz) | Without Adjustment | Adjustment   | Uncertainty<br>( ± %) | Acceptance limit<br>Class 1 ( ± %) |
|---------------------------|--------------------|--------------|-----------------------|------------------------------------|
|                           | Measured (%)       | Measured (%) |                       |                                    |
| 94 dB / 1000 Hz           | 0.04               | -            | 0.40                  | 2.5                                |
| 114 dB / 1000 Hz          | 0.03               | -            | 0.40                  | 2.5                                |

Note :

- Acceptance limit was IEC60942:2017 Class 1
- The calibration results exclude the calibrator pressure correction
- The calibration results exclude the microphone volume correction

End of Calibration

## Certificate of Calibration

### Customer

Name : UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.  
Address : 81 Soi Udomsuk 41, Sukhumvit Road, Bangchak, Prakanong, Bangkok 10260

Certificate No : 23-NDM-061

Request No : Req-2023-0604

### Unit Under Calibration Details

|                    |                 |                      |         |
|--------------------|-----------------|----------------------|---------|
| Measurement item : | Noise dosimeter | Microphone Class :   | 2       |
| Manufacturer :     | SVANTEK         | Microphone Model :   | SV 27IS |
| Model :            | SV 104IS        | Microphone S/N :     | 106322  |
| Serial Number :    | 106134          | Preamplifier Model : | -       |
| ID :               | -               | Preamplifier S/N :   | -       |
| Resolution :       | 0.1 dB          | Intrument Status :   | Used    |

### Calibration Environment and Details


Temperature : 23 °C ± 2 °C  
Humidity : 50 %RH ± 20 %RH  
Barometric Pressure : 1013 hPa ± 10 hPa  
Received Date : 16 March 2023  
Calibrated Date : 22 March 2023  
Calibration Procedure : In-house method CP-NDM-01 based on IEC 61252 : 2017  
Location of Calibration : Lab Acoustic


### Reference Standard

| Instrument                | Brand   | Model     | SN.    | Due calibration | Tracebility |
|---------------------------|---------|-----------|--------|-----------------|-------------|
| Multifrequency Calibrator | Quest   | Quest-cal | 188272 | 29 June 2023    | TSI         |
| Standard Microphone       | GRAS    | 40AN      | 188273 | 6 October 2023  | GRAS        |
| Sine Generator            | Svantek | Svan401   | 131    | 12 October 2023 | WK Electric |
| Timer                     | EXTECH  | -         | 05-ACT | 24 March 2023   | TPA         |

### Note

The reported uncertainty is based on standard uncertainty multiplied by the Coverage Factor  $k = 2$ , providing a level of confidence approximately 95 %.

Calibrated By :   
Mr. Noppadon Luangart  
Calibration Officer

Approved By :   
Mr. Pacit Mathavorn  
Calibration Engineer Supervisor  
Issue Date : 22 March 2023

**LAE** ☒ PASS  
COMPLIANT COLOR ☐ NOT PASS

Remarks  
 Tolerances Limit =  $\pm 1.2 \text{ dB}$   
 Uncertainty =  $\pm 0.27 \text{ dB}$

*[Signature]* (10/2/16) 28 ม.ค. 66  
 Verify Approve

Certificate No : 23-NDM-061

Request No : Req-2023-0604

### 1. Absolute acoustical sensitivity

| UUC Setting        | Time   |     | Exposure Measurement |                     |       | UNCERTAINTY | Tolerances<br>Limit |
|--------------------|--------|-----|----------------------|---------------------|-------|-------------|---------------------|
| FAST / A / 60-140  | Ref    | UUC | Ref                  | UUC                 | Error |             |                     |
| Calibrator Setting | (s)    | (s) | (Pa <sup>2</sup> h)  | (Pa <sup>2</sup> h) | (%)   | (%)         | (%)                 |
| 1000 Hz 114 dB     | 120.00 | 120 | 3.19                 | 3.20                | +0.31 | 3.0         | -21, +26            |

Note : Absolute sensitivity was established by the use of Sound Calibrator Brand SVANTEK, Model SV 35A, SN. 58079

### 2. Frequency weightings

| UUC Setting   | Deviation from various<br>Frequency Weighting |      | UNCERTAINTY | Tolerances<br>Limit |
|---------------|---|------|-------------|---------------------|
| FAST / 60-140 | A   | C    | ( ± dB)     | ( ± dB)             |
| STD Setting   | (dB)  | (dB) |             |                     |
| *63 Hz        | 0.0   | 0.0  | 0.40        | 2.0                 |
| 125 Hz        | 0.2   | 0.1  | 0.40        | 1.5                 |
| 250 Hz        | 0.1   | 0.1  | 0.40        | 1.5                 |
| 500 Hz        | 0.0   | 0.0  | 0.40        | 1.5                 |
| 1000 Hz       | 0.0   | 0.0  | 0.40        | -                   |
| 2000 Hz       | -0.6  | -0.6 | 0.40        | 2.0                 |
| 4000 Hz       | 0.6   | 0.6  | 0.40        | 3.0                 |
| 8000 Hz       | -1.1  | -1.1 | 0.40        | 5.0                 |



Certificate No : 23-NDM-061

Request No : Req-2023-0604

### 3. Linearity of response to steady signals

#### a. Sound exposure meter, linearity of response for changes of input sinusoidal signal level

| UUC Setting      |         | FAST / A / High |      |      |      |       |       |       |       |       |       |
|------------------|---------|-----------------|------|------|------|-------|-------|-------|-------|-------|-------|
| 1000 Hz          | Ref     | (dB)            | 60.0 | 80.0 | 90.0 | 100.0 | 110.0 | 114.0 | 120.0 | 130.0 | 140.0 |
|                  | Level A | (dB)            | 59.9 | 80.2 | 90.2 | 100.1 | 110.1 | 114.0 | 120.0 | 130.0 | 140.0 |
|                  | Error   | (dB)            | -0.1 | 0.2  | 0.2  | 0.1   | 0.1   | 0.0   | 0.0   | 0.0   | 0.0   |
| 8000 Hz          | Ref     | (dB)            |      |      | 88.9 | 98.9  | 108.9 | 112.9 | 118.9 | 128.9 | 138.9 |
|                  | Level A | (dB)            |      |      | 88.9 | 98.9  | 108.9 | 112.9 | 118.9 | 128.9 | 138.8 |
|                  | Error   | (dB)            |      |      | 0.0  | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | -0.1  |
| 63 Hz            | Ref     | (dB)            |      |      |      |       |       | 87.8  | 93.8  | 103.8 | 113.8 |
|                  | Level A | (dB)            |      |      |      |       |       | 87.8  | 93.8  | 103.8 | 113.8 |
|                  | Error   | (dB)            |      |      |      |       |       | 0.0   | 0.0   | 0.0   | 0.0   |
| Tolerances Limit |         | (±dB)           | 1.0  |      |      |       |       |       |       |       |       |
| UNCERTAINTY      |         | (±dB)           | 0.27 |      |      |       |       |       |       |       |       |

#### b. Sound exposure meter linearity of error

| UUC Setting        | Time |     | Exposure Measurement |                     |       | UNCERTAINTY | Tolerances |
|--------------------|------|-----|----------------------|---------------------|-------|-------------|------------|
| FAST / A / 60-140  | Ref  | UUC | Ref                  | UUC                 | Error |             | Limit      |
| Calibrator Setting | (s)  | (s) | (Pa <sup>2</sup> h)  | (Pa <sup>2</sup> h) | (%)   |             | (%)        |
| 1000 Hz 110 dB     | 27   | 27  | 0.30                 | 0.30                | 0.00  | 4.3         | -21, +26   |
| 1000 Hz 110 dB     | 45   | 45  | 0.50                 | 0.51                | +2.00 |             |            |
| 1000 Hz 110 dB     | 90   | 90  | 1.00                 | 1.01                | +1.00 |             |            |
| 1000 Hz 110 dB     | 180  | 180 | 2.00                 | 2.02                | +1.00 |             |            |
| 1000 Hz 120 dB     | 36   | 36  | 4.00                 | 4.03                | +0.75 |             |            |
| 1000 Hz 120 dB     | 72   | 72  | 8.00                 | 8.05                | +0.63 | 3.8         |            |
| 1000 Hz 120 dB     | 90   | 90  | 10.00                | 9.90                | -1.00 |             |            |
| 1000 Hz 120 dB     | 180  | 180 | 20.00                | 20.22               | +1.10 |             |            |
| 1000 Hz 120 dB     | 360  | 360 | 40.00                | 40.34               | +0.85 |             |            |
| 1000 Hz 120 dB     | 720  | 720 | 80.00                | 80.49               | +0.61 |             |            |

Certificate No : 23-NDM-061

Request No : Req-2023-0604

#### 4. Response to short duration

##### a. Response for sinusoidal signals - reference level

| UUC Setting        | Time |      | Exposure Measurement |                     |                     | UNCERTAINTY         | Tolerances<br>Limit |
|--------------------|------|------|----------------------|---------------------|---------------------|---------------------|---------------------|
| FAST / A / 60-140  | Ref  | UUC  | Ref                  | UUC                 | Error               |                     |                     |
| Calibrator Setting | (s)  | (s)  | (Pa <sup>2</sup> h)  | (Pa <sup>2</sup> h) | (Pa <sup>2</sup> h) | (Pa <sup>2</sup> h) | (Pa <sup>2</sup> h) |
| 4000 Hz 95 dB      | 2846 | 2846 | 1.00                 | 1.00                | 0.00                | 0.01                | -0.29 - 0.41        |

##### b. Sound exposure meter response for series of toneburst impulses

| UUC Setting        | Time |      | Exposure Measurement |                     |       | UNCERTAINTY | Tolerances<br>Limit |
|--------------------|------|------|----------------------|---------------------|-------|-------------|---------------------|
| FAST / A / 60-140  | Ref  | UUC  | Ref                  | UUC                 | Error |             |                     |
| Calibrator Setting | (s)  | (s)  | (Pa <sup>2</sup> h)  | (Pa <sup>2</sup> h) | (%)   | (%)         | (%)                 |
| Burst 1 ms, 95 dB  | 2846 | 2846 | 1.00                 | 1.00                | 0.00  | 3.0         | -21 - +26           |
| Burst 1 ms, 100 dB | 900  | 900  | 1.00                 | 1.00                | 0.00  |             | -21 - +41           |
| Burst 1 ms, 108 dB | 143  | 143  | 1.00                 | 1.01                | +1.00 |             | -21 - +41           |

#### 5. Response to unipolar pulse

| UUC Setting            | Time | Exposure Measurement |           | UNCERTAINTY | Tolerances<br>Limit |
|------------------------|------|----------------------|-----------|-------------|---------------------|
| FAST / A / 60-140      | UUC  | UUC                  | Different |             |                     |
| Calibrator Setting     | (s)  | (Pa <sup>2</sup> h)  | (%)       | (%)         | (%)                 |
| Continuous Rectangle + | 29   | 10.37                | 0.00      | 2.4         | -21 - +26           |
| Continuous Rectangle - |      | 10.37                |           |             |                     |

\* Indicates non accredited

End of Certificate

## Certificate of Calibration

### Customer

Name : UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.  
Address : 81 Soi Udomsuk 41, Sukhumvit Road, Bangchak, Prakanong, Bangkok 10260

Certificate No : 23-NDM-062

Request No : Req-2023-0663

### Unit Under Calibration Details

|                    |                  |                      |         |
|--------------------|------------------|----------------------|---------|
| Measurement item : | Noise dosimeter  | Microphone Class :   | 2       |
| Manufacturer :     | SVANTEK          | Microphone Model :   | SV 27IS |
| Model :            | SV 104IS         | Microphone S/N :     | 106782  |
| Serial Number :    | 106063           | Preamplifier Model : | -       |
| ID :               | UAE.EFM.168/2564 | Preamplifier S/N :   | -       |
| Resolution :       | 0.1 dB           | Instrument Status :  | Used    |

### Calibration Environment and Details


Temperature : 23 °C ± 2 °C  
Humidity : 50 %RH ± 20 %RH  
Barometric Pressure : 1013 hPa ± 10 hPa  
Received Date : 22 March 2023  
Calibrated Date : 23 March 2023  
Calibration Procedure : In-house method CP-NDM-01 based on IEC 61252 : 2017  
Location of Calibration : Lab Acoustic


### Reference Standard

| Instrument                | Brand   | Model     | SN.    | Due calibration | Traceability |
|---------------------------|---------|-----------|--------|-----------------|--------------|
| Multifrequency Calibrator | Quest   | Quest-cal | 188272 | 29 June 2023    | TSI          |
| Standard Microphone       | GRAS    | 40AN      | 188273 | 6 October 2023  | GRAS         |
| Sine Generator            | Svantek | Svan401   | 131    | 12 October 2023 | WK Electric  |
| Timer                     | EXTECH  | -         | 05-ACT | 24 March 2023   | TPA          |

### Note

The reported uncertainty is based on standard uncertainty multiplied by the Coverage Factor  $k = 2$ , providing a level of confidence approximately 95 %.

Calibrated By :   
Mr. Noppadon Luangart  
Calibration Officer

Approved By :   
Mr. Pacit Mathavorn  
Calibration Engineer Supervisor  
Issue Date : 23 March 2023



Certificate No : 23-NDM-062

Request No : Req-2023-0663

### 1. Absolute acoustical sensitivity

| UUC Setting        | Time   |     | Exposure Measurement |                     |       | UNCERTAINTY | Tolerances<br>Limit |
|--------------------|--------|-----|----------------------|---------------------|-------|-------------|---------------------|
| FAST / A / 60-140  | Ref    | UUC | Ref                  | UUC                 | Error |             |                     |
| Calibrator Setting | (s)    | (s) | (Pa <sup>2</sup> h)  | (Pa <sup>2</sup> h) | (%)   | (%)         | (%)                 |
| 1000 Hz 114 dB     | 120.00 | 120 | 3.19                 | 3.13                | -1.88 | 3.0         | -21, +26            |

Note : Absolute sensitivity was established by the use of Sound Calibrator Brand SVANTEK, Model SV 35A, SN. 58079

### 2. Frequency weightings

| UUC Setting   | Deviation from various<br>Frequency Weighting |      | UNCERTAINTY | Tolerances<br>Limit |
|---------------|---|------|-------------|---------------------|
| FAST / 60-140 | A   | C    | ( ± dB)     | ( ± dB)             |
| STD Setting   | (dB)  | (dB) |             |                     |
| *63 Hz        | 0.2   | 0.2  | 0.40        | 2.0                 |
| 125 Hz        | 0.2   | 0.1  | 0.40        | 1.5                 |
| 250 Hz        | 0.2   | 0.2  | 0.40        | 1.5                 |
| 500 Hz        | 0.1   | 0.1  | 0.40        | 1.5                 |
| 1000 Hz       | 0.0   | 0.0  | 0.40        | -                   |
| 2000 Hz       | -0.9  | -0.9 | 0.40        | 2.0                 |
| 4000 Hz       | -0.7  | -0.7 | 0.40        | 3.0                 |
| 8000 Hz       | -1.6  | -1.7 | 0.40        | 5.0                 |



Request No : Req-2023-0663

Certificate No : 23-NDM-062

Request No : Req-2023-0663

#### 4. Response to short duration

##### a. Response for sinusoidal signals - reference level

| UUC Setting        | Time |      | Exposure Measurement |                     |                     | UNCERTAINTY         | Tolerances<br>Limit<br>(Pa <sup>2</sup> h) |
|--------------------|------|------|----------------------|---------------------|---------------------|---------------------|--|
|                    | Ref  | UUC  | Ref                  | UUC                 | Error               |                     |  |
| FAST / A / 60-140  |      |      |                      |                     |                     |                     |  |
| Calibrator Setting | (s)  | (s)  | (Pa <sup>2</sup> h)  | (Pa <sup>2</sup> h) | (Pa <sup>2</sup> h) | (Pa <sup>2</sup> h) |  |
| 4000 Hz 95 dB      | 2846 | 2846 | 1.00                 | 1.00                | 0.00                | 0.01                | -0.29 - 0.41                               |

##### b. Sound exposure meter response for series of toneburst impulses

| UUC Setting        | Time |      | Exposure Measurement |                     |       | UNCERTAINTY | Tolerances<br>Limit<br>(%) |
|--------------------|------|------|----------------------|---------------------|-------|-------------|----------------------------|
|                    | Ref  | UUC  | Ref                  | UUC                 | Error |             |                            |
| FAST / A / 60-140  |      |      |                      |                     |       |             |                            |
| Calibrator Setting | (s)  | (s)  | (Pa <sup>2</sup> h)  | (Pa <sup>2</sup> h) | (%)   | (%)         |                            |
| Burst 1 ms, 95 dB  | 2846 | 2846 | 1.00                 | 1.00                | 0.00  | 3.0         | -21 - +26                  |
| Burst 1 ms, 100 dB | 900  | 900  | 1.00                 | 1.00                | 0.00  |             | -21 - +41                  |
| Burst 1 ms, 108 dB | 143  | 143  | 1.00                 | 1.01                | +1.00 |             | -21 - +41                  |

#### 5. Response to unipolar pulse

| UUC Setting            | Time | Exposure Measurement |           | UNCERTAINTY | Tolerances<br>Limit<br>(%) |
|------------------------|------|----------------------|-----------|-------------|----------------------------|
|                        |      | UUC                  | Different |             |                            |
| FAST / A / 60-140      |      |                      |           |             |                            |
| Calibrator Setting     | (s)  | (Pa <sup>2</sup> h)  | (%)       | (%)         |                            |
| Continuous Rectangle + | 29   | 10.13                | +2.37     | 2.4         | -21 - +26                  |
| Continuous Rectangle - |      | 10.37                |           |             |                            |

\* Indicates non accredited

End of Certificate

## Certificate of Calibration

### Customer

Name : UNITED ANALYST AND ENGINEERING  
CONSULTANT CO.,LTD.

Address : 81 Soi Udomsuk 41, Sukhumvit Road, Bangchak, Prakanong,  
Bangkok 10260

Certificate No : 23-TPM-049

Request No : Req-2023-0048

Page : 1/2

### Unit Under Calibration Details

Calibration Parameter : Temperature

Instrument Name : Thermal Environment Monitor

Range Calibration : 20 °C to 60 °C

Manufacturer : TSI QUEST

Type of Sensor : RTD

Model : QT-32

Sensor Diameter (mm) : 4.5

Serial Number : TPT060015

Calibration Position (mm) : 67.5

Resolution : 0.1 °C

Intrument Status : Used

ID Number : UAE.EFM222/2562

### Calibration Environment and Details

Temperature : 23 °C ± 3 °C

Humidity : 55 %RH ± 15 %RH

Received Date : 10 January 2023

Calibrated Date : 25 January 2023

Calibration Procedure : In-house method CP-TPM-01 by Comparison with Standard Thermometer.

### Reference Standard

Digital Thermometer with Sensor, Manufacturer: GINGO/GINGO, Model: GT11/ RTD100, SN:  
08000057, ID: 02-TPM Which was calibrated on 10 March 2022, Calibration Certificate No. : QR22-0578

### Traceability

: This Certificate is traceable to SI Unit through Quality Reborn Co., Ltd., NSC-ONSC Accreditation No.:  
Calibration 0292

### Note

The reported uncertainty is based on standard uncertainty multiplied by the Coverage Factor  $k=2$ , providing a level of confidence approximately 95 %.

Approved By :

  
Mr. Pacit Mathavorn

Calibration Engineer Supervisor

Issue Date :

25 January 2023



**Calibration Note**

UUC Adjustment : Not Adjust

**Certificate No :** 23-TPM-049

**Request No :** Req-2023-0048

**Page :** 2/2

**Result of Calibration :**

| UUC Sensor | Standard Temperature (°C) | UUC Reading (°C) | Correction (°C) | Uncertainty (± °C) |
|------------|---------------------------|------------------|-----------------|--------------------|
| WET        | 20.003                    | 20.0             | 0.0             | 0.14               |
|            | 25.004                    | 25.0             | 0.0             | 0.14               |
|            | 30.005                    | 30.0             | 0.0             | 0.14               |
|            | 35.006                    | 35.0             | 0.0             | 0.14               |
|            | 40.005                    | 40.0             | 0.0             | 0.14               |
|            | 45.005                    | 45.0             | 0.0             | 0.14               |
|            | 50.004                    | 50.0             | 0.0             | 0.14               |
|            | 60.007                    | 60.0             | 0.0             | 0.14               |
| DRY        | 20.006                    | 20.0             | 0.0             | 0.14               |
|            | 25.004                    | 25.0             | 0.0             | 0.14               |
|            | 30.006                    | 30.0             | 0.0             | 0.14               |
|            | 35.006                    | 35.0             | 0.0             | 0.14               |
|            | 40.006                    | 40.1             | - 0.1           | 0.14               |
|            | 45.006                    | 45.1             | - 0.1           | 0.14               |
|            | 50.006                    | 50.1             | - 0.1           | 0.14               |
|            | 60.006                    | 60.1             | - 0.1           | 0.14               |
| GLOBE      | 20.004                    | 19.9             | + 0.1           | 0.14               |
|            | 25.006                    | 24.9             | + 0.1           | 0.14               |
|            | 30.004                    | 29.9             | + 0.1           | 0.14               |
|            | 35.003                    | 34.9             | + 0.1           | 0.14               |
|            | 40.007                    | 40.0             | 0.0             | 0.14               |
|            | 45.006                    | 45.0             | 0.0             | 0.14               |
|            | 50.006                    | 50.0             | 0.0             | 0.14               |
|            | 60.005                    | 60.0             | 0.0             | 0.14               |

End of Certificate

Calibrated By :



Mr. Sittichok Jirapukdeesakun



# SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY



451-451/1 Sirinthorn Rd., Bangbumru, Bangplud Bangkok 10700 THAILAND.  
Tel.0-2435-8800 Fax.0-2433-1679 e-mail:cal-center@sithiporn.com http://www.sithiporn.com

Cert. No. : ACL23022

Pages : 1 of 8

## Calibration Certificate

**Equipment :** SOUND LEVEL METER  
**Manufacturer :** RION  
**Model :** NL-42/ Microphone UC-52 / Preamplifier NH-24  
**Serial No.:** 00321434 / 156124 / 11454  
**ID No.:** -

**Condition As Found :** GOOD

**Customer :** UNITED ANALYST AND ENGINEERING CONSULTANT (UAE)  
81 SOI UDOMSUK 41, SUKHUMVIT ROAD,  
BANGCHAK SUB-DISTRICT,  
PHRAKHANONG DISTRICT, BANGKOK 10260  
THAILAND.

**Location :** -

**Ambient Temperature :** ( 23.0  $\pm$  3 ) °C  
**Pressure :** ( 101.3  $\pm$  3 ) kPa  
**Relative Humidity :** ( 50.0  $\pm$  20 ) %

**Received Date :** 06 JANUARY 2023  
**Calibration Date :** 10 -12 JANUARY 2023  
**Date of Issue :** 16 JANUARY 2023

**Calibrated by :**

Nathakorn Pisutpaisan

**Approved by :**

( Thanakul Petchurai )

This certificate is issued in accordance with the requirements of ISO/IEC 17025 standard, may not be reproduced other than in full, except with the prior written approval of the head of Calibration Laboratory.

## Continuation of Calibration Certificate

Cert. No. : ACL23022  
Job No. : VC66AC0023  
Pages : 2 of 8

Calibration Procedure : CP-AC-01

**Calibration Method :**

This equipment was calibrated by based on IEC-61672-3 (2013) Standard for sound level meter (SLM).

The SLM had tests to Acoustical and Electrical signal tests of frequency weighting with Anechoic chamber and Reference Standard Instruments.

For tests results of each items were made by observation of each Instruments display and also with SLM's display.

**Condition of this result of calibration :****1. Reference Standard Instruments :**

| <u>Instrument</u>       | <u>Model</u> | <u>Serial No.</u> | <u>Cert. No.</u> | <u>Due Date</u> |
|-------------------------|--------------|-------------------|------------------|-----------------|
| Waveform Generator      | 33210A       | MY48017076        | EF-0007-22       | 04-Feb-23       |
| Waveform Generator      | 33511B       | MY52302742        | EF-0008-22       | 04-Feb-23       |
| Digital Multimeter      | 33461A       | MY53220104        | EEL.BP. 04/0265  | 09-Feb-23       |
| Digital Multimeter      | 33461A       | MY53220076        | EEL.BP. 03/0265  | 09-Feb-23       |
| Digital Multimeter      | 34461A       | MY60024273        | EEL.BP. 05/0265  | 09-Feb-23       |
| Programmable Attenuator | MAT-1070     | 62100114          | EF-0009-22       | 07-Feb-23       |
| Condenser Microphone    | 4180         | 2977900           | AA-1013-22       | 24-Feb-23       |
| Measuring Amplifier     | NA-42KAI     | 34560495          | AA-3005-22       | 22-Feb-23       |

2. This result of calibration was found accurate as shown on date and place of calibration for this calibrated item only.

3. This certificate is traceable to the international system of unit maintained at :

3.1 National Institute of Metrology (Thailand).

3.2 Thailand Institute of Scientific and Technological Research (TISTR).

Continuation of Calibration Certificate

**Cert. No. : ACL23022**  
**Job No. : VC66AC0023**  
**Pages : 3 of 8**

**Summary of Measurement Result :**

| Parameter  | Pass | Fail | Uncertainty<br>(dB) | Maximum-permitted<br>uncertainty of<br>measurement (dB) |
|--|------|------|---------------------|---|
| 1. Absolute sensitivity                              | ✓    | -    | 0.2                 | N/A   |
| 2. Self-generated noise                              | ✓    | -    | 0.2                 | N/A   |
| 3. Acoustical signal tests of frequency weightings   |      |      |                     |   |
| 125 Hz   | ✓    | -    | 0.3                 | 0.6   |
| 1000 Hz  | ✓    | -    | 0.3                 | 0.6   |
| 8000 Hz  | ✓    | -    | 0.3                 | 0.7   |
| 4. Electrical signal tests of frequency weightings   |      |      |                     |   |
| For 10 Hz to 4 kHz                                   | ✓    | -    | 0.3                 | 0.6   |
| For > 4 kHz to 10 kHz                                | ✓    | -    | 0.3                 | 0.7   |
| For > 10 kHz to 20 kHz                               | -    | -    | -                   | 1.0   |
| 5. Frequency and time weightings at 1 kHz            | ✓    | -    | 0.2                 | 0.2   |
| 6. Long - term stability                             | ✓    | -    | 0.1                 | 0.1   |
| 7. Level linearity on the reference level range      | ✓    | -    | 0.2                 | 0.3   |
| 8. Level linearity including the level range control | ✓    | -    | 0.2                 | 0.3   |
| 9. Tone burst response                               | ✓    | -    | 0.2                 | 0.3   |
| 10. Peak C sound level                               | ✓    | -    | 0.2                 | 0.35  |
| 11. Overload indication                              | ✓    | -    | 0.2                 | 0.25  |
| 12. High level stability                             | ✓    | -    | 0.1                 | 0.1   |

## Continuation of Calibration Certificate

Cert. No. : ACL23022

Job No. : VC66AC0023

Pages : 4 of 8

**Result of calibration :****1. Absolute sensitivity**

| Reference<br>Acoustic Signal<br>( dB ) | Measured<br>Value<br>( dB ) | Deviation<br>( dB ) | Acceptance<br>Limit<br>( dB ) |
|--|-----------------------------|---------------------|-------------------------------|
| 93.9 (93.95)                           | 93.9                        | 0.0                 | ±0.3                          |

**2. Self-generated noise**

## 2.1 Normal test

| Measured Value<br>( dB ) |
|--------------------------|
| 15.4                     |

2.2 The microphone of the sound level meter was replaced by electrical signal input device.

| Frequency<br>Weighting | Measured value<br>( dB ) |
|------------------------|--------------------------|
| A - weight             | 10.8                     |
| C - weight             | 17.3                     |
| Flat                   | 22.9                     |

**3. Acoustical signal tests of frequency weightings**

Meter free-field acoustic response at a level of 84 dB

| Frequency<br>( Hz ) | Deviation from various frequency weighting response curve (dB) |          |          | Acceptance<br>Limits |
|---------------------|--|----------|----------|----------------------|
|                     | Flat   | C-weight | A-weight |                      |
| 125                 | 0.1  | 0.2      | 0.2      | ± 1.5                |
| 1000                | 0.0  | 0.0      | 0.0      | ± 1.0                |
| 8000                | 0.1  | 0.2      | 0.2      | ±5.0                 |



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## 4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

| Frequency<br>( Hz ) | Deviation from various frequency weighting response curve (dB) |          |          |                      |
|---------------------|--|----------|----------|----------------------|
|                     | Flat   | C-weight | A-weight | Acceptance<br>Limits |
| 63                  | 0.0  | 0.0      | -0.1     | ±2.0                 |
| 125                 | 0.0  | 0.0      | 0.0      | ±1.5                 |
| 250                 | 0.0  | 0.0      | 0.0      | ±1.5                 |
| 500                 | 0.0  | 0.1      | 0.0      | ±1.5                 |
| 1000                | 0.0  | 0.0      | 0.0      | ±1.0                 |
| 2000                | 0.0  | 0.1      | 0.0      | ±2.0                 |
| 4000                | 0.0  | 0.1      | 0.0      | ±3.0                 |
| 8000                | 0.0  | 0.1      | 0.1      | ±5.0                 |

## 5. Frequency and time weightings at 1 kHz

## 5.1 Frequency weightings at 1 kHz

| Frequency<br>Weighting | Measured<br>Value<br>( dB ) | Deviated<br>Value<br>( dB ) | Acceptance<br>Limits<br>( dB ) |
|------------------------|-----------------------------|-----------------------------|--------------------------------|
| A - weight             | 94.0                        | 0.0                         | -                              |
| C - weight             | 94.0                        | 0.0                         | ± 0.2                          |
| Flat                   | 94.0                        | 0.0                         | ± 0.2                          |

## 5.2 Time weighting at 1 kHz

| Frequency<br>Weighting | Measured<br>Value<br>( dB ) | Deviated<br>Value<br>( dB ) | Acceptance<br>Limits<br>( dB ) |
|------------------------|-----------------------------|-----------------------------|--------------------------------|
| Fast                   | 94.0                        | 0.0                         | -                              |
| Slow                   | 94.0                        | 0.0                         | ± 0.1                          |
| Leq                    | 94.0                        | 0.0                         | ± 0.1                          |

## 6. Long - term stability

| Frequency<br>Weighting | SLM Display<br>at initial<br>( dB ) | SLM Display<br>at final<br>( dB ) | Deviated<br>Value<br>( dB ) | Acceptance<br>Limits<br>( dB ) |
|------------------------|-------------------------------------|-----------------------------------|-----------------------------|--------------------------------|
| A - weight             | 94.0                                | 94.1                              | 0.1                         | ± 0.3                          |

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## 7. Level linearity on the reference level range

| Anticipated<br>Value<br>( dB ) | Measured<br>Value<br>( dB ) | Deviated<br>Value<br>( dB ) | Acceptance<br>Limits<br>( dB ) |
|--------------------------------|-----------------------------|-----------------------------|--------------------------------|
| 137.0                          | 137.0                       | 0.0                         | $\pm 1.1$                      |
| 136.0                          | 136.0                       | 0.0                         | $\pm 1.1$                      |
| 135.0                          | 135.0                       | 0.0                         | $\pm 1.1$                      |
| 134.0                          | 134.0                       | 0.0                         | $\pm 1.1$                      |
| 133.0                          | 133.0                       | 0.0                         | $\pm 1.1$                      |
| 132.0                          | 132.0                       | 0.0                         | $\pm 1.1$                      |
| 131.0                          | 131.0                       | 0.0                         | $\pm 1.1$                      |
| 129.0                          | 129.0                       | 0.0                         | $\pm 1.1$                      |
| 124.0                          | 124.0                       | 0.0                         | $\pm 1.1$                      |
| 119.0                          | 119.0                       | 0.0                         | $\pm 1.1$                      |
| 114.0                          | 114.0                       | 0.0                         | $\pm 1.1$                      |
| 109.0                          | 109.0                       | 0.0                         | $\pm 1.1$                      |
| 104.0                          | 104.1                       | 0.1                         | $\pm 1.1$                      |
| 99.0                           | 99.0                        | 0.0                         | $\pm 1.1$                      |
| 94.0                           | 94.0                        | 0.0                         | $\pm 1.1$                      |
| 89.0                           | 89.0                        | 0.0                         | $\pm 1.1$                      |
| 84.0                           | 84.0                        | 0.0                         | $\pm 1.1$                      |
| 79.0                           | 79.0                        | 0.0                         | $\pm 1.1$                      |
| 74.0                           | 74.0                        | 0.0                         | $\pm 1.1$                      |
| 69.0                           | 69.0                        | 0.0                         | $\pm 1.1$                      |
| 64.0                           | 64.0                        | 0.0                         | $\pm 1.1$                      |
| 59.0                           | 59.0                        | 0.0                         | $\pm 1.1$                      |
| 54.0                           | 54.0                        | 0.0                         | $\pm 1.1$                      |
| 49.0                           | 49.0                        | 0.0                         | $\pm 1.1$                      |
| 44.0                           | 44.0                        | 0.0                         | $\pm 1.1$                      |
| 39.0                           | 39.0                        | 0.0                         | $\pm 1.1$                      |
| 34.0                           | 33.9                        | -0.1                        | $\pm 1.1$                      |
| 30.0                           | 29.9                        | -0.1                        | $\pm 1.1$                      |
| 29.0                           | 28.9                        | -0.1                        | $\pm 1.1$                      |
| 28.0                           | 27.9                        | -0.1                        | $\pm 1.1$                      |
| 27.0                           | 26.9                        | -0.1                        | $\pm 1.1$                      |
| 26.0                           | 25.8                        | -0.2                        | $\pm 1.1$                      |
| 25.0                           | 24.8                        | -0.2                        | $\pm 1.1$                      |

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**8. Level linearity including the level range control**

| Range | Anticipated<br>Value<br>( dB ) | Measured<br>Value<br>( dB ) | Deviated<br>Value<br>( dB ) | Acceptance<br>Limits<br>( dB ) |
|-------|--------------------------------|-----------------------------|-----------------------------|--------------------------------|
| Auto  | 94.0                           | 94.0                        | 0.0                         | ±1.1                           |

**9. Tone burst response**

| Time<br>Weighting | Tone burst<br>duration, Tb<br>( ms ) | Cycle | Anticipated<br>Value<br>( dB ) | Measured<br>Value<br>( dB ) | Deviated<br>Value<br>( dB ) | Acceptance<br>Limits<br>( dB ) |
|-------------------|--------------------------------------|-------|--------------------------------|-----------------------------|-----------------------------|--------------------------------|
| Fast              | 0.25                                 | 1     | 108.0                          | 108.0                       | 0.0                         | 1.5 ; -5.0                     |
|                   | 2                                    | 8     | 117.0                          | 117.0                       | 0.0                         | 1.0 ; -2.5                     |
|                   | 200                                  | 800   | 134.0                          | 134.1                       | 0.1                         | ±1.0                           |
| Slow              | 2                                    | 8     | 108.0                          | 108.0                       | 0.0                         | 1.5 ; -5.0                     |
|                   | 200                                  | 800   | 127.6                          | 127.6                       | 0.0                         | ±1.0                           |
| SEL               | 0.25                                 | 1     | 99.0                           | 98.9                        | -0.1                        | 1.5 ; -5.0                     |
|                   | 2                                    | 8     | 108.0                          | 108.0                       | 0.0                         | 1.0 ; -2.5                     |
|                   | 200                                  | 800   | 128.0                          | 128.1                       | 0.1                         | ±1.0                           |

**10. Peak C sound level**

| Number of cycle<br>in<br>test signal | Anticipated<br>Value<br>( dB ) | Measured<br>Value, L <sub>cpeak</sub><br>( dB ) | Deviated<br>Value<br>( dB ) | Acceptance<br>Limits<br>( dB ) |
|--------------------------------------|--------------------------------|---|-----------------------------|--------------------------------|
| Continuous                           | 133.0                          | 133.0   | 0.0                         | -                              |
| One                                  | 136.4                          | 136.3   | -0.1                        | ±3.0                           |

| Number of cycle<br>in<br>test signal | Anticipated<br>Value<br>( dB ) | Measured<br>Value<br>( dB ) | Deviated<br>Value<br>( dB ) | Acceptance<br>Limits<br>( dB ) |
|--------------------------------------|--------------------------------|-----------------------------|-----------------------------|--------------------------------|
| Continuous                           | 133.0                          | 133.1                       | 0.1                         | -                              |
| Positive half cycle                  | 135.4                          | 135.2                       | -0.2                        | ±2.0                           |
| Negative half cycle                  | 135.4                          | 135.2                       | -0.2                        | ±2.0                           |

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## 11. Overload indication

| Measured value ( dB )      |                            | Deviated<br>Value<br>( dB ) | Acceptance<br>Limits<br>( dB ) |
|----------------------------|----------------------------|-----------------------------|--------------------------------|
| Positive<br>one-half cycle | Negative<br>one-half cycle |                             |                                |
| 89.6                       | 89.5                       | -0.1                        | ±1.5                           |

## 12. High level stability

| Frequency<br>Weighting | SLM Display<br>at initial<br>( dB ) | SLM Display<br>at final<br>( dB ) | Deviated<br>Value<br>( dB ) | Acceptance<br>Limits<br>( dB ) |
|------------------------|-------------------------------------|-----------------------------------|-----------------------------|--------------------------------|
| A - weight             | 137.0                               | 136.9                             | 0.1                         | ±0.3                           |

The reported uncertainty is based on a standard uncertainty multiplied by coverage factor  $k = 2$   
or any value following calculation, providing a level of confidence of approximately 95 %

End of Calibration Certificate



# SITHIPHORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

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NSC-TISI-TIS 17025  
CALIBRATION 0394

Cert. No. : ACL23032

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## Calibration Certificate

**Equipment :** SOUND LEVEL METER  
**Manufacturer :** RION  
**Model :** NL-42/ Microphone UC-52 / Preamplifier NH-24  
**Serial No.:** 01000182 / 187202 / 01844  
**ID No.:** -

**Condition As Found :** GOOD

**Customer :** UNITED ANALYST AND ENGINEERING CONSULTANT (UAE)  
81 SOI UDOMSUK 41, SUKHUMVIT ROAD,  
BANGCHAK SUB-DISTRICT,  
PHRAKHANONG DISTRICT, BANGKOK 10260  
THAILAND.

**Location :** -

**Ambient Temperature :** ( 23.0  $\pm$  3 ) °C  
**Pressure :** ( 101.3  $\pm$  3 ) kPa  
**Relative Humidity :** ( 50.0  $\pm$  20 ) %

**Received Date :** 06 JANUARY 2023  
**Calibration Date :** 10 -12 JANUARY 2023  
**Date of Issue :** 16 JANUARY 2023

**Calibrated by :**

Nathakorn Pisutpaisan

**Approved by :**

  
( Thanakul Petchurai )

This certificate is issued in accordance with the requirements of ISO/IEC 17025 standard, may not be reproduced other than in full, except with the prior written approval of the head of Calibration Laboratory.

เอกสารไม่ควบคุม

## Continuation of Calibration Certificate

Cert. No. : ACL23032

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Calibration Procedure : CP-AC-01

**Calibration Method :**

This equipment was calibrated by based on IEC-61672-3 (2013) Standard for sound level meter (SLM).

The SLM had tests to Acoustical and Electrical signal tests of frequency weighting with Anechoic chamber and Reference Standard Instruments.

For tests results of each items were made by observation of each Instruments display and also with SLM's display.

**Condition of this result of calibration :**

## 1. Reference Standard Instruments :

| <u>Instrument</u>       | <u>Model</u> | <u>Serial No.</u> | <u>Cert. No.</u> | <u>Due Date</u> |
|-------------------------|--------------|-------------------|------------------|-----------------|
| Waveform Generator      | 33210A       | MY48017076        | EF-0007-22       | 04-Feb-23       |
| Waveform Generator      | 33511B       | MY52302742        | EF-0008-22       | 04-Feb-23       |
| Digital Multimeter      | 33461A       | MY53220104        | EEL.BP. 04/0265  | 09-Feb-23       |
| Digital Multimeter      | 33461A       | MY53220076        | EEL.BP. 03/0265  | 09-Feb-23       |
| Digital Multimeter      | 34461A       | MY60024273        | EEL.BP. 05/0265  | 09-Feb-23       |
| Programmable Attenuator | MAT-1070     | 62100114          | EF-0009-22       | 07-Feb-23       |
| Condenser Microphone    | 4180         | 2977900           | AA-1013-22       | 24-Feb-23       |
| Measuring Amplifier     | NA-42KAI     | 34560495          | AA-3005-22       | 22-Feb-23       |

2. This result of calibration was found accurate as shown on date and place of calibration for this calibrated item only.

3. This certificate is traceable to the international system of unit maintained at :

3.1 National Institute of Metrology (Thailand).

3.2 Thailand Institute of Scientific and Technological Research (TISTR).



## Continuation of Calibration Certificate

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Summary of Measurement Result :

| Parameter  | Pass | Fail | Uncertainty<br>(dB) | Maximum-permitted<br>uncertainty of<br>measurement (dB) |
|--|------|------|---------------------|---|
| 1. Absolute sensitivity                              | ✓    | -    | 0.2                 | N/A   |
| 2. Self-generated noise                              | ✓    | -    | 0.2                 | N/A   |
| 3. Acoustical signal tests of frequency weightings   |      |      |                     |   |
| 125 Hz   | ✓    | -    | 0.3                 | 0.6   |
| 1000 Hz  | ✓    | -    | 0.3                 | 0.6   |
| 8000 Hz  | ✓    | -    | 0.3                 | 0.7   |
| 4. Electrical signal tests of frequency weightings   |      |      |                     |   |
| For 10 Hz to 4 kHz                                   | ✓    | -    | 0.3                 | 0.6   |
| For > 4 kHz to 10 kHz                                | ✓    | -    | 0.3                 | 0.7   |
| For > 10 kHz to 20 kHz                               | -    | -    | -                   | 1.0   |
| 5. Frequency and time weightings at 1 kHz            | ✓    | -    | 0.2                 | 0.2   |
| 6. Long - term stability                             | ✓    | -    | 0.1                 | 0.1   |
| 7. Level linearity on the reference level range      | ✓    | -    | 0.2                 | 0.3   |
| 8. Level linearity including the level range control | ✓    | -    | 0.2                 | 0.3   |
| 9. Tone burst response                               | ✓    | -    | 0.2                 | 0.3   |
| 10. Peak C sound level                               | ✓    | -    | 0.2                 | 0.35  |
| 11. Overload indication                              | ✓    | -    | 0.2                 | 0.25  |
| 12. High level stability                             | ✓    | -    | 0.1                 | 0.1   |



## Continuation of Calibration Certificate

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**Result of calibration :****1. Absolute sensitivity**

| Reference<br>Acoustic Signal<br>( dB ) | Measured<br>Value<br>( dB ) | Deviation<br>( dB ) | Acceptance<br>Limit<br>( dB ) |
|--|-----------------------------|---------------------|-------------------------------|
| 93.9 (93.95)                           | 93.9                        | 0.0                 | ±0.3                          |

**2. Self-generated noise**

## 2.1 Normal test

| Measured Value<br>( dB ) |
|--------------------------|
| 15.1                     |

2.2 The microphone of the sound level meter was replaced by electrical signal input device.

| Frequency<br>Weighting | Measured value<br>( dB ) |
|------------------------|--------------------------|
| A - weight             | 11.6                     |
| C - weight             | 18.0                     |
| Flat                   | 23.6                     |

**3. Acoustical signal tests of frequency weightings**

Meter free-field acoustic response at a level of 84 dB

| Frequency<br>( Hz ) | Deviation from various frequency weighting response curve (dB) |          |          | Acceptance<br>Limits |
|---------------------|--|----------|----------|----------------------|
|                     | Flat   | C-weight | A-weight |                      |
| 125                 | 0.2  | 0.2      | 0.2      | ± 1.5                |
| 1000                | 0.0  | 0.0      | 0.0      | ± 1.0                |
| 8000                | 0.9  | 0.9      | 0.9      | ±5.0                 |

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## 4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

| Frequency<br>( Hz ) | Deviation from various frequency weighting response curve (dB) |          |          |                      |
|---------------------|--|----------|----------|----------------------|
|                     | Flat   | C-weight | A-weight | Acceptance<br>Limits |
| 63                  | -0.1   | -0.1     | -0.1     | ±2.0                 |
| 125                 | -0.1   | 0.0      | -0.1     | ±1.5                 |
| 250                 | -0.1   | 0.0      | -0.1     | ±1.5                 |
| 500                 | 0.0  | 0.0      | -0.1     | ±1.5                 |
| 1000                | 0.0  | 0.0      | 0.0      | ±1.0                 |
| 2000                | 0.0  | 0.0      | 0.0      | ±2.0                 |
| 4000                | 0.0  | 0.0      | 0.0      | ±3.0                 |
| 8000                | 0.0  | 0.0      | 0.0      | ±5.0                 |

## 5. Frequency and time weightings at 1 kHz

## 5.1 Frequency weightings at 1 kHz

| Frequency<br>Weighting | Measured<br>Value<br>( dB ) | Deviated<br>Value<br>( dB ) | Acceptance<br>Limits<br>( dB ) |
|------------------------|-----------------------------|-----------------------------|--------------------------------|
| A - weight             | 94.0                        | 0.0                         | -                              |
| C - weight             | 93.9                        | 0.0                         | ± 0.2                          |
| Flat                   | 93.9                        | 0.0                         | ± 0.2                          |

## 5.2 Time weighting at 1 kHz

| Frequency<br>Weighting | Measured<br>Value<br>( dB ) | Deviated<br>Value<br>( dB ) | Acceptance<br>Limits<br>( dB ) |
|------------------------|-----------------------------|-----------------------------|--------------------------------|
| Fast                   | 94.0                        | 0.0                         | -                              |
| Slow                   | 93.9                        | 0.0                         | ± 0.1                          |
| Leq                    | 94.0                        | 0.0                         | ± 0.1                          |

## 6. Long - term stability

| Frequency<br>Weighting | SLM Display<br>at initial<br>( dB ) | SLM Display<br>at final<br>( dB ) | Deviated<br>Value<br>( dB ) | Acceptance<br>Limits<br>( dB ) |
|------------------------|-------------------------------------|-----------------------------------|-----------------------------|--------------------------------|
| A - weight             | 94.0                                | 94.1                              | 0.1                         | ± 0.3                          |



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## 7. Level linearity on the reference level range

| Anticipated<br>Value<br>( dB ) | Measured<br>Value<br>( dB ) | Deviated<br>Value<br>( dB ) | Acceptance<br>Limits<br>( dB ) |
|--------------------------------|-----------------------------|-----------------------------|--------------------------------|
| 137.0                          | 137.0                       | 0.0                         | $\pm 1.1$                      |
| 136.0                          | 136.1                       | 0.1                         | $\pm 1.1$                      |
| 135.0                          | 135.1                       | 0.1                         | $\pm 1.1$                      |
| 134.0                          | 134.1                       | 0.1                         | $\pm 1.1$                      |
| 133.0                          | 133.0                       | 0.0                         | $\pm 1.1$                      |
| 132.0                          | 132.0                       | 0.0                         | $\pm 1.1$                      |
| 131.0                          | 131.0                       | 0.0                         | $\pm 1.1$                      |
| 129.0                          | 129.0                       | 0.0                         | $\pm 1.1$                      |
| 124.0                          | 124.0                       | 0.0                         | $\pm 1.1$                      |
| 119.0                          | 119.1                       | 0.1                         | $\pm 1.1$                      |
| 114.0                          | 114.1                       | 0.1                         | $\pm 1.1$                      |
| 109.0                          | 109.1                       | 0.1                         | $\pm 1.1$                      |
| 104.0                          | 104.1                       | 0.1                         | $\pm 1.1$                      |
| 99.0                           | 99.1                        | 0.1                         | $\pm 1.1$                      |
| 94.0                           | 94.0                        | 0.0                         | $\pm 1.1$                      |
| 89.0                           | 89.0                        | 0.0                         | $\pm 1.1$                      |
| 84.0                           | 84.0                        | 0.0                         | $\pm 1.1$                      |
| 79.0                           | 79.0                        | 0.0                         | $\pm 1.1$                      |
| 74.0                           | 74.0                        | 0.0                         | $\pm 1.1$                      |
| 69.0                           | 69.0                        | 0.0                         | $\pm 1.1$                      |
| 64.0                           | 64.0                        | 0.0                         | $\pm 1.1$                      |
| 59.0                           | 59.0                        | 0.0                         | $\pm 1.1$                      |
| 54.0                           | 54.0                        | 0.0                         | $\pm 1.1$                      |
| 49.0                           | 49.0                        | 0.0                         | $\pm 1.1$                      |
| 44.0                           | 44.0                        | 0.0                         | $\pm 1.1$                      |
| 39.0                           | 39.0                        | 0.0                         | $\pm 1.1$                      |
| 34.0                           | 34.0                        | 0.0                         | $\pm 1.1$                      |
| 30.0                           | 30.0                        | 0.0                         | $\pm 1.1$                      |
| 29.0                           | 29.0                        | 0.0                         | $\pm 1.1$                      |
| 28.0                           | 28.0                        | 0.0                         | $\pm 1.1$                      |
| 27.0                           | 27.0                        | 0.0                         | $\pm 1.1$                      |
| 26.0                           | 25.9                        | -0.1                        | $\pm 1.1$                      |
| 25.0                           | 24.9                        | -0.1                        | $\pm 1.1$                      |

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## 8. Level linearity including the level range control

| Range | Anticipated<br>Value<br>( dB ) | Measured<br>Value<br>( dB ) | Deviated<br>Value<br>( dB ) | Acceptance<br>Limits<br>( dB ) |
|-------|--------------------------------|-----------------------------|-----------------------------|--------------------------------|
| Auto  | 94.0                           | 94.0                        | 0.0                         | ±1.1                           |

## 9. Tone burst response

| Time<br>Weighting | Tone burst<br>duration, Tb<br>( ms ) | Cycle | Anticipated<br>Value<br>( dB ) | Measured<br>Value<br>( dB ) | Deviated<br>Value<br>( dB ) | Acceptance<br>Limits<br>( dB ) |
|-------------------|--------------------------------------|-------|--------------------------------|-----------------------------|-----------------------------|--------------------------------|
| Fast              | 0.25                                 | 1     | 108.0                          | 107.9                       | -0.1                        | 1.5 ; -5.0                     |
|                   | 2                                    | 8     | 117.0                          | 116.9                       | -0.1                        | 1.0 ; -2.5                     |
|                   | 200                                  | 800   | 134.0                          | 134.0                       | 0.0                         | ±1.0                           |
| Slow              | 2                                    | 8     | 108.0                          | 108.0                       | 0.0                         | 1.5 ; -5.0                     |
|                   | 200                                  | 800   | 127.6                          | 127.6                       | 0.0                         | ±1.0                           |
| SEL               | 0.25                                 | 1     | 99.0                           | 98.8                        | -0.2                        | 1.5 ; -5.0                     |
|                   | 2                                    | 8     | 108.0                          | 108.0                       | 0.0                         | 1.0 ; -2.5                     |
|                   | 200                                  | 800   | 128.0                          | 128.0                       | 0.0                         | ±1.0                           |

## 10. Peak C sound level

| Number of cycle<br>in<br>test signal | Anticipated<br>Value<br>( dB ) | Measured<br>Value, Lcpeak<br>( dB ) | Deviated<br>Value<br>( dB ) | Acceptance<br>Limits<br>( dB ) |
|--------------------------------------|--------------------------------|-------------------------------------|-----------------------------|--------------------------------|
| Continuous                           | 133.0                          | 133.0                               | 0.0                         | -                              |
| One                                  | 136.4                          | 136.3                               | -0.1                        | ±3.0                           |

| Number of cycle<br>in<br>test signal | Anticipated<br>Value<br>( dB ) | Measured<br>Value<br>( dB ) | Deviated<br>Value<br>( dB ) | Acceptance<br>Limits<br>( dB ) |
|--------------------------------------|--------------------------------|-----------------------------|-----------------------------|--------------------------------|
| Continuous                           | 133.0                          | 133.0                       | 0.0                         | -                              |
| Positive half cycle                  | 135.4                          | 135.1                       | -0.3                        | ±2.0                           |
| Negative half cycle                  | 135.4                          | 135.1                       | -0.3                        | ±2.0                           |



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## 11. Overload indication

| Measured value ( dB )      |                            | Deviated<br>Value<br>( dB ) | Acceptance<br>Limits<br>( dB ) |
|----------------------------|----------------------------|-----------------------------|--------------------------------|
| Positive<br>one-half cycle | Negative<br>one-half cycle |                             |                                |
| 89.5                       | 89.6                       | 0.1                         | ±1.5                           |

## 12. High level stability

| Frequency<br>Weighting | SLM Display<br>at initial<br>( dB ) | SLM Display<br>at final<br>( dB ) | Deviated<br>Value<br>( dB ) | Acceptance<br>Limits<br>( dB ) |
|------------------------|-------------------------------------|-----------------------------------|-----------------------------|--------------------------------|
| A - weight             | 137.0                               | 137.0                             | 0.0                         | ±0.3                           |

The reported uncertainty is based on a standard uncertainty multiplied by coverage factor  $k = 2$   
or any value following calculation, providing a level of confidence of approximately 95 %

End of Calibration Certificate

เอกสารไม่ควบคุม

T. Petchu