

Certificate of Calibration

| Calibration Certification Information | | | |
|---------------------------------------|------------------------|-----------|-------|
| Cal. Date: May 22, 2018 | Rootsmeter S/N: 438320 | Ta: 296 | °K |
| Operator: Jim Tisch | | Pa: 749.3 | mm Hg |
| Calibration Model #: TE-5025A | Calibrator S/N: 0988 | | |

| Run | Vol. Init (m3) | Vol. Final (m3) | ΔVol. (m3) | ΔTime (min) | ΔP (mm Hg) | ΔH (in H2O) |
|-----|----------------|-----------------|------------|-------------|------------|-------------|
| 1 | 1 | 2 | 1 | 1.3840 | 3.2 | 2.00 |
| 2 | 3 | 4 | 1 | 0.9840 | 6.4 | 4.00 |
| 3 | 5 | 6 | 1 | 0.8790 | 7.9 | 5.00 |
| 4 | 7 | 8 | 1 | 0.8420 | 8.7 | 5.50 |
| 5 | 9 | 10 | 1 | 0.6900 | 12.7 | 8.00 |

| Data Tabulation | | | | | |
|-----------------|---------------|--|-----------|-------------|------------------------------------|
| Vstd (m3) | Qstd (x-axis) | $\sqrt{\Delta H \left(\frac{Pa}{Pstd} \right) \left(\frac{Tstd}{Ta} \right)}$ (y-axis) | Va | Qa (x-axis) | $\sqrt{\Delta H (Ta/Pa)}$ (y-axis) |
| 0.9883 | 0.7141 | 1.4090 | 0.9957 | 0.7195 | 0.8889 |
| 0.9841 | 1.0001 | 1.9926 | 0.9915 | 1.0076 | 1.2570 |
| 0.9821 | 1.1173 | 2.2278 | 0.9895 | 1.1257 | 1.4054 |
| 0.9811 | 1.1652 | 2.3365 | 0.9884 | 1.1739 | 1.4740 |
| 0.9758 | 1.4141 | 2.8179 | 0.9831 | 1.4247 | 1.7777 |
| QSTD | m= | 2.01748 | QA | m= | 1.26331 |
| | b= | -0.02651 | | b= | -0.01673 |
| | r= | 0.99988 | | r= | 0.99988 |

| Calculations | |
|---|---|
| Vstd= $\Delta Vol / ((Pa - \Delta P) / Pstd) (Tstd / Ta)$ | Va= $\Delta Vol (Pa - \Delta P) / Pa$ |
| Qstd= $Vstd / \Delta Time$ | Qa= $Va / \Delta Time$ |
| For subsequent flow rate calculations: | |
| Qstd= $1/m \left(\left(\sqrt{\Delta H \left(\frac{Pa}{Pstd} \right) \left(\frac{Tstd}{Ta} \right)} \right) - b \right)$ | Qa= $1/m \left(\left(\sqrt{\Delta H (Ta/Pa)} \right) - b \right)$ |

| Standard Conditions | |
|---------------------|---------------------------------------|
| Tstd: | 298.15 °K |
| Pstd: | 760 mm Hg |
| Key | |
| ΔH: | calibrator manometer reading (in H2O) |
| ΔP: | rootsmeter manometer reading (mm Hg) |
| Ta: | actual absolute temperature (°K) |
| Pa: | actual barometric pressure (mm Hg) |
| b: | intercept |
| m: | slope |

| RECALIBRATION |
|--|
| US EPA recommends annual recalibration per 1998 40 Code of Federal Regulations Part 50 to 51, Appendix B to Part 50, Reference Method for the Determination of Suspended Particulate Matter in the Atmosphere, 9.2.17, page 30 |

AECOM Asia Company Limited
Tisch TSP Mass Flow Controlled High Volume Air Sampler
Field Calibration Report

Station Block B, Merit Industrial Centre (E-A14a) Operator: Choi Wing Ho
 Cal. Date: 17-May-19 Next Due Date: 17-Jul-19
 Model No.: TE-5170 Serial No. 10380
 Equipment No.: A-001-15T

| Ambient Condition | | | |
|---------------------|-----|---------------------|-------|
| Temperature, Ta (K) | 303 | Pressure, Pa (mmHg) | 752.5 |

| Orifice Transfer Standard Information | | | | | |
|---------------------------------------|-----------|---|---------|---------------|----------|
| Serial No: | 988 | Slope, mc | 2.01748 | Intercept, bc | -0.02651 |
| Last Calibration Date: | 22-May-18 | $mc \times Qstd + bc = [H \times (Pa/760) \times (298/Ta)]^{1/2}$ | | | |
| Next Calibration Date: | 22-May-19 | | | | |

| Calibration of TSP Sampler | | | | | |
|----------------------------|----------------------------|--|-----------------------------------|-----------------------------|--|
| Resistance Plate No. | Orifice | | | HVS Flow Recorder | |
| | DH (orifice), in. of water | $[DH \times (Pa/760) \times (298/Ta)]^{1/2}$ | Qstd (m ³ /min) X-axis | Flow Recorder Reading (CFM) | Continuous Flow Recorder Reading IC (CFM) Y-axis |
| 18 | 7.1 | 2.63 | 1.32 | 46.0 | 45.39 |
| 13 | 6.2 | 2.46 | 1.23 | 42.0 | 41.45 |
| 10 | 5.0 | 2.21 | 1.11 | 37.0 | 36.51 |
| 7 | 3.5 | 1.85 | 0.93 | 30.0 | 29.60 |
| 5 | 2.5 | 1.56 | 0.79 | 25.0 | 24.67 |

By Linear Regression of Y on X
 Slope, mw = 38.9459 Intercept, bw = -6.2960
 Correlation Coefficient* = 0.9983
 *If Correlation Coefficient < 0.990, check and recalibrate.

Set Point Calculation

From the TSP Field Calibration Curve, take Qstd = 1.30m³/min
 From the Regression Equation, the "Y" value according to

$mw \times Qstd + bw = IC \times [(Pa/760) \times (298/Ta)]^{1/2}$

Therefore, Set Point; IC = $(mw \times Qstd + bw) \times [(760 / Pa) \times (Ta / 298)]^{1/2} =$ 44.93

Remarks: _____

QC Reviewer: WS CHAN Signature: PC Date: 17/05/19

EQUIPMENT CALIBRATION RECORD

Type: Laser Dust Monitor
 Manufacturer/Brand: SIBATA
 Model No.: LD-3B
 Equipment No.: A.005.16a
 Sensitivity Adjustment Scale Setting: 521 CPM

Operator: Mike Shek (MSKM)

Standard Equipment

Equipment: Rupprecht & Patashnick TEOM®
 Venue: Cyberport (Pui Ying Secondary School)
 Model No.: Series 1400AB
 Serial No: Control: 140AB219899803
 Sensor: 1200C143659803 K_o: 12500
 Last Calibration Date*: 3 May 2018

*Remarks: Recommended interval for hardware calibration is 1 year

Calibration Result

Sensitivity Adjustment Scale Setting (Before Calibration): 521 CPM
 Sensitivity Adjustment Scale Setting (After Calibration): 521 CPM

| Hour | Date (dd-mm-yy) | Time | Ambient Condition | | Concentration ¹ (mg/m ³) Y-axis | Total Count ² | Count/ Minute ³ X-axis |
|------|--------------------|---------------|-------------------|-------------|--|--------------------------|---|
| | | | Temp (°C) | R.H. (%) | | | |
| 1 | 14-07-18 | 10:15 - 11:15 | 29.1 | 79 | 0.04328 | 1742 | 29.03 |
| 2 | 14-07-18 | 11:15 - 12:15 | 29.1 | 78 | 0.04673 | 1874 | 31.23 |
| 3 | 14-07-18 | 12:15 - 13:15 | 29.2 | 79 | 0.04904 | 1961 | 32.68 |
| 4 | 14-07-18 | 13:15 - 14:15 | 29.2 | 79 | 0.04734 | 1897 | 31.62 |

Note: 1. Monitoring data was measured by Rupprecht & Patashnick TEOM®
 2. Total Count was logged by Laser Dust Monitor
 3. Count/minute was calculated by (Total Count/60)

By Linear Regression of Y or X

Slope (K-factor): 0.0015
 Correlation coefficient: 0.9974

Validity of Calibration Record: 14 July 2019

Remarks:

QC Reviewer: YW Fung Signature:  Date: 16 July 2018

EQUIPMENT CALIBRATION RECORD

Type: Laser Dust Monitor
 Manufacturer/Brand: SIBATA
 Model No.: LD-3
 Equipment No.: A.005.07a
 Sensitivity Adjustment Scale Setting: 557 CPM
 Operator: Mike Shek (MSKM)

Standard Equipment

Equipment: Rupprecht & Patashnick TEOM®
 Venue: Cyberport (Pui Ying Secondary School)
 Model No.: Series 1400AB
 Serial No: Control: 140AB219899803
 Sensor: 1200C143659803 K_o: 12500
 Last Calibration Date*: 3 May 2018

*Remarks: Recommended interval for hardware calibration is 1 year

Calibration Result

Sensitivity Adjustment Scale Setting (Before Calibration): 557 CPM
 Sensitivity Adjustment Scale Setting (After Calibration): 557 CPM

| Hour | Date (dd-mm-yy) | Time | Ambient Condition | | Concentration ¹ (mg/m ³) Y-axis | Total Count ² | Count/ Minute ³ X-axis |
|------|--------------------|---------------|-------------------|-------------|--|--------------------------|---|
| | | | Temp (°C) | R.H. (%) | | | |
| 1 | 05-05-18 | 09:15 - 10:15 | 27.6 | 79 | 0.05367 | 2151 | 35.85 |
| 2 | 05-05-18 | 10:15 - 11:15 | 27.6 | 80 | 0.05864 | 2347 | 39.12 |
| 3 | 05-05-18 | 11:15 - 12:15 | 27.7 | 80 | 0.06661 | 2679 | 44.65 |
| 4 | 05-05-18 | 12:15 - 13:15 | 27.7 | 79 | 0.06335 | 2546 | 42.43 |

Note: 1. Monitoring data was measured by Rupprecht & Patashnick TEOM®
 2. Total Count was logged by Laser Dust Monitor
 3. Count/minute was calculated by (Total Count/60)

By Linear Regression of Y or X

Slope (K-factor): 0.0015
 Correlation coefficient: 0.9994

Validity of Calibration Record: 5 May 2019

Remarks:

QC Reviewer: YW Fung Signature:  Date: 07 May 2018

EQUIPMENT CALIBRATION RECORD

Type: Laser Dust Monitor
 Manufacturer/Brand: SIBATA
 Model No.: LD-3
 Equipment No.: A.005.07a
 Sensitivity Adjustment Scale Setting: 557 CPM
 Operator: Mike Shek (MSKM)

Standard Equipment

Equipment: Rupprecht & Patashnick TEOM®
 Venue: Cyberport (Pui Ying Secondary School)
 Model No.: Series 1400AB
 Serial No: Control: 140AB219899803
 Sensor: 1200C143659803 Ko: 12500
 Last Calibration Date*: 2 May 2019

*Remarks: Recommended interval for hardware calibration is 1 year

Calibration Result

Sensitivity Adjustment Scale Setting (Before Calibration): 557 CPM
 Sensitivity Adjustment Scale Setting (After Calibration): 557 CPM

| Hour | Date (dd-mm-yy) | Time | Ambient Condition | | Concentration ¹ (mg/m ³) Y-axis | Total Count ² | Count/ Minute ³ X-axis |
|------|--------------------|---------------|-------------------|-------------|--|-----------------------------|---|
| | | | Temp (°C) | R.H. (%) | | | |
| 1 | 04-05-19 | 09:15 - 10:15 | 23.7 | 81 | 0.04765 | 1914 | 31.90 |
| 2 | 04-05-19 | 10:15 - 11:15 | 23.7 | 82 | 0.05036 | 2025 | 33.75 |
| 3 | 04-05-19 | 11:15 - 12:15 | 23.8 | 82 | 0.05251 | 2103 | 35.05 |
| 4 | 04-05-19 | 12:15 - 13:15 | 23.8 | 82 | 0.05587 | 2231 | 37.18 |

- Note:
1. Monitoring data was measured by Rupprecht & Patashnick TEOM®
 2. Total Count was logged by Laser Dust Monitor
 3. Count/minute was calculated by (Total Count/60)

By Linear Regression of Y or X

Slope (K-factor): 0.0015
 Correlation coefficient: 0.9977

Validity of Calibration Record: 4 May 2020

Remarks:

QC Reviewer: YW Fung

Signature: 

Date: 06 May 2019



CERTIFICATE OF CALIBRATION

Certificate No.: 18CA0914 03 Page 1 of 2

Item tested

| | | |
|-----------------------|----------------------------|------------|
| Description: | Sound Level Meter (Type 1) | Microphone |
| Manufacturer: | B & K | B & K |
| Type/Model No.: | 2238 | 4188 |
| Serial/Equipment No.: | 2800927 | 2791211 |
| Adaptors used: | - | - |

Item submitted by

Customer Name: AECOM ASIA CO., LTD.
Address of Customer: -
Request No.: -
Date of receipt: 14-Sep-2018

Date of test: 17-Sep-2018

Reference equipment used in the calibration

| Description: | Model: | Serial No. | Expiry Date: | Traceable to: |
|---------------------------------|----------|------------|--------------|---------------|
| Multi function sound calibrator | B&K 4226 | 2288444 | 23-Aug-2019 | CIGISMEC |
| Signal generator | DS 360 | 33873 | 24-Apr-2019 | CEPREI |
| Signal generator | DS 360 | 61227 | 23-Apr-2019 | CEPREI |

Ambient conditions

Temperature: 21 ± 1 °C
Relative humidity: 55 ± 10 %
Air pressure: 1005 ± 5 hPa

Test specifications

1. The Sound Level Meter has been calibrated in accordance with the requirements as specified in BS 7580: Part 1: 1997 and the lab calibration procedure SMTP004-CA-152.
2. The electrical tests were performed using an electrical signal substituted for the microphone which was removed and replaced by an equivalent capacitance within a tolerance of $\pm 20\%$.
3. The acoustic calibration was performed using an B&K 4226 sound calibrator and corrections was applied for the difference between the free-field and pressure responses of the Sound Level Meter.

Test results

This is to certify that the Sound Level Meter conforms to BS 7580: Part 1: 1997 for the conditions under which the test was performed.

Details of the performed measurements are presented on page 2 of this certificate.

Actual Measurement data are documented on worksheets.

Approved Signatory:



Feng Junqi

Date: 18-Sep-2018

Company Chop:



Comments: The results reported in this certificate refer to the condition of the instrument on the date of calibration and carry no implication regarding the long-term stability of the instrument.



CERTIFICATE OF CALIBRATION

(Continuation Page)

Certificate No.: 18CA0914 03 Page 2 of 2

1, Electrical Tests

The electrical tests were performed using an equivalent capacitance substituted for the microphone. The results are given in below with test status and the estimated uncertainties. The "Pass" means the result of the test is inside the tolerances stated in the test specifications. The "-" means the result of test is outside these tolerances.

| Test: | Subtest: | Status: | Expanded Uncertainty (dB) | Coverage Factor |
|-------------------------|--|---------|---------------------------|-----------------|
| Self-generated noise | A | Pass | 0.3 | |
| | C | Pass | 1.0 | 2.1 |
| | Lin | Pass | 2.0 | 2.2 |
| Linearity range for Leq | At reference range, Step 5 dB at 4 kHz | Pass | 0.3 | |
| | Reference SPL on all other ranges | Pass | 0.3 | |
| | 2 dB below upper limit of each range | Pass | 0.3 | |
| | 2 dB above lower limit of each range | Pass | 0.3 | |
| Linearity range for SPL | At reference range, Step 5 dB at 4 kHz | Pass | 0.3 | |
| | Frequency weightings | | | |
| Time weightings | A | Pass | 0.3 | |
| | C | Pass | 0.3 | |
| | Lin | Pass | 0.3 | |
| Peak response | Single Burst Fast | Pass | 0.3 | |
| | Single Burst Slow | Pass | 0.3 | |
| R.M.S. accuracy | Single 100µs rectangular pulse | Pass | 0.3 | |
| | Crest factor of 3 | Pass | 0.3 | |
| Time weighting I | Single burst 5 ms at 2000 Hz | Pass | 0.3 | |
| | Repeated at frequency of 100 Hz | Pass | 0.3 | |
| Time averaging | 1 ms burst duty factor 1/10 ³ at 4kHz | Pass | 0.3 | |
| | 1 ms burst duty factor 1/10 ⁴ at 4kHz | Pass | 0.3 | |
| Pulse range | Single burst 10 ms at 4 kHz | Pass | 0.4 | |
| Sound exposure level | Single burst 10 ms at 4 kHz | Pass | 0.4 | |
| Overload indication | SPL | Pass | 0.3 | |
| | Leq | Pass | 0.4 | |

2, Acoustic tests

The complete sound level meter was calibrated on the reference range using a B&K 4226 acoustic calibrator with 1000Hz and SPL 94 dB. The sensitivity of the sound level meter was adjusted. The test result at 125 Hz and 8000 Hz are given in below with test status and the estimated uncertainties.

| Test: | Subtest | Status | Expanded Uncertainty (dB) | Coverage Factor |
|-------------------|------------------------|--------|---------------------------|-----------------|
| Acoustic response | Weighting A at 125 Hz | Pass | 0.3 | |
| | Weighting A at 8000 Hz | Pass | 0.5 | |

3, Response to associated sound calibrator

N/A

The expanded uncertainties have been calculated in accordance with the ISO Publication "Guide to the expression of uncertainty in measurement", and gives an interval estimated to have a level of confidence of 95%. A coverage factor of 2 is assumed unless explicitly stated.

Calibrated by:

Date: 17-Sep-2018

Fung Chi Yip

- End -

Checked by:

Date: 18-Sep-2018

Shek Kwong Tat

The standard(s) and equipment used in the calibration are traceable to national or international recognised standards and are calibrated on a schedule to maintain the required accuracy level.



CERTIFICATE OF CALIBRATION

Certificate No.: 19CA0327 01-02

Page: 1 of 2

Item tested

Description: Acoustical Calibrator (Class 1)
Manufacturer: B & K
Type/Model No.: 4231
Serial/Equipment No.: 3006428 / N004.03
Adaptors used: -

Item submitted by

Customer: AECOM ASIA CO LIMITED
Address of Customer: -
Request No.: -
Date of receipt: 27-Mar-2019

(N.004.03)

Date of test: 27-Mar-2019

Reference equipment used in the calibration

| Description: | Model: | Serial No. | Expiry Date: | Traceable to: |
|-------------------------|----------|------------|--------------|---------------|
| Lab standard microphone | B&K 4180 | 2341427 | 20-Apr-2019 | SCL |
| Preamplifier | B&K 2673 | 2743150 | 27-Apr-2019 | CEPREI |
| Measuring amplifier | B&K 2610 | 2346941 | 08-May-2019 | CEPREI |
| Signal generator | DS 360 | 33873 | 24-Apr-2019 | CEPREI |
| Digital multi-meter | 34401A | US36087050 | 23-Apr-2019 | CEPREI |
| Audio analyzer | 8903B | GB41300350 | 23-Apr-2019 | CEPREI |
| Universal counter | 53132A | MY40003662 | 24-Apr-2019 | CEPREI |

Ambient conditions

Temperature: 22 ± 1 °C
Relative humidity: 55 ± 10 %
Air pressure: 1005 ± 5 hPa

Test specifications

- The Sound Calibrator has been calibrated in accordance with the requirements as specified in IEC 60942 1997 Annex B and the lab calibration procedure SMTP004-CA-156.
- The calibrator was tested with its axis vertical facing downwards at the specific frequency using insert voltage technique.
- The results are rounded to the nearest 0.01 dB and 0.1 Hz and have not been corrected for variations from a reference pressure of 1013.25 hectoPascals as the maker's information indicates that the instrument is insensitive to pressure changes.

Test results

This is to certify that the sound calibrator conforms to the requirements of annex B of IEC 60942: 1997 for the conditions under which the test was performed. This does not imply that the sound calibrator meets IEC 60942 under any other conditions.

Details of the performed measurements are presented on **page 2** of this certificate.

Approved Signatory:


Feng Junqi

Date: 29-Mar-2019

Company Chop:



Comments: The results reported in this certificate refer to the condition of the instrument on the date of calibration and carry no implication regarding the long-term stability of the instrument.



CERTIFICATE OF CALIBRATION

(Continuation Page)

Certificate No.: 19CA0327 01-02

Page: 2 of 2

1, Measured Sound Pressure Level

The output Sound Pressure Level in the calibrator head was measured at the setting and frequency shown using a calibrated laboratory standard microphone and insert voltage technique. The results are given in below with the estimated uncertainties.

| Frequency Shown Hz | Output Sound Pressure Level Setting dB | Measured Output Sound Pressure Level dB | (Output level in dB re 20 μ Pa) |
|-----------------------|---|--|--------------------------------------|
| | | | Estimated Expanded Uncertainty dB |
| 1000 | 94.00 | 94.23 | 0.10 |

2, Sound Pressure Level Stability - Short Term Fluctuations

The Short Term Fluctuations was determined by measuring the maximum and minimum of the fast weighted DC output of the B&K 2610 measuring amplifier over a 20 second time interval as required in the standard. The Short Term Fluctuation was found to be:

At 1000 Hz **STF = 0.014 dB**

Estimated expanded uncertainty 0.005 dB

3, Actual Output Frequency

The determination of actual output frequency was made using a B&K 4180 microphone together with a B&K 2673 preamplifier connected to a B&K 2610 measuring amplifier. The AC output of the B&K 2610 was taken to an universal counter which was used to determine the frequency averaged over 20 second of operation as required by the standard. The actual output frequency at 1 KHz was:

At 1000 Hz **Actual Frequency = 1000.0 Hz**

Estimated expanded uncertainty 0.1 Hz Coverage factor k = 2.2

4, Total Noise and Distortion

For the Total Noise and Distortion measurement, the unfiltered AC output of the B&K 2610 measuring amplifier was connected to an Agilent Type 8903 B distortion analyser. The TND result at 1 KHz was:

At 1000 Hz **TND = 0.3 %**

Estimated expanded uncertainty 0.7 %

The expanded uncertainties have been calculated in accordance with the ISO Publication "Guide to the expression of uncertainty in measurement", and gives an interval estimated to have a level of confidence of 95%. A coverage factor of 2 is assumed unless explicitly stated.

- End -

Calibrated by:

Date:

Fung Chi Yip
27-Mar-2019

Checked by:

Date:

Fong Chun Wai
29-Mar-2019

The standard(s) and equipment used in the calibration are traceable to national or international recognised standards and are calibrated on a schedule to maintain the required accuracy level.



CERTIFICATE OF CALIBRATION

Certificate No.: 18CA1008 02

Page: 1 of 2

Item tested

Description: Acoustical Calibrator (Class 1)
Manufacturer: Rion Co., Ltd.
Type/Model No.: NC-74
Serial/Equipment No.: 34246490 / N.004.10
Adaptors used: -

Item submitted by

Customer: AECOM ASIA CO LIMITED
Address of Customer: -
Request No.: -
Date of receipt: 08-Oct-2018

Date of test: 10-Oct-2018

Reference equipment used in the calibration

| Description: | Model: | Serial No. | Expiry Date: | Traceable to: |
|-------------------------|----------|------------|--------------|---------------|
| Lab standard microphone | B&K 4180 | 2341427 | 20-Apr-2019 | SCL |
| Preamplifier | B&K 2673 | 2743150 | 27-Apr-2019 | CEPREI |
| Measuring amplifier | B&K 2610 | 2346941 | 08-May-2019 | CEPREI |
| Signal generator | DS 360 | 61227 | 24-Apr-2019 | CEPREI |
| Digital multi-meter | 34401A | US36087050 | 23-Apr-2019 | CEPREI |
| Audio analyzer | 8903B | GB41300350 | 23-Apr-2019 | CEPREI |
| Universal counter | 53132A | MY40003662 | 24-Apr-2019 | CEPREI |

Ambient conditions

Temperature: 21 ± 1 °C
Relative humidity: 50 ± 10 %
Air pressure: 1005 ± 5 hPa

Test specifications

- The Sound Calibrator has been calibrated in accordance with the requirements as specified in IEC 60942 1997 Annex B and the lab calibration procedure SMTP004-CA-156.
- The calibrator was tested with its axis vertical facing downwards at the specific frequency using insert voltage technique.
- The results are rounded to the nearest 0.01 dB and 0.1 Hz and have not been corrected for variations from a reference pressure of 1013.25 hectoPascals as the maker's information indicates that the instrument is insensitive to pressure changes.

Test results

This is to certify that the sound calibrator conforms to the requirements of annex B of IEC 60942: 1997 for the conditions under which the test was performed. This does not imply that the sound calibrator meets IEC 60942 under any other conditions.

Details of the performed measurements are presented on **page 2** of this certificate.

Approved Signatory:


Feng Junqi

Date: 10-Oct-2018

Company Chop:



Comments: The results reported in this certificate refer to the condition of the instrument on the date of calibration and carry no implication regarding the long-term stability of the instrument.



CERTIFICATE OF CALIBRATION

(Continuation Page)

Certificate No.: 18CA1008 02 Page: 2 of 2

1, Measured Sound Pressure Level

The output Sound Pressure Level in the calibrator head was measured at the setting and frequency shown using a calibrated laboratory standard microphone and insert voltage technique. The results are given in below with the estimated uncertainties.

| Frequency Shown Hz | Output Sound Pressure Level Setting dB | Measured Output Sound Pressure Level dB | (Output level in dB re 20 µPa) | |
|-----------------------|---|--|--------------------------------|----------------------------|
| | | | Estimated | Expanded Uncertainty dB |
| 1000 | 94.00 | 93.89 | 0.10 | |

2, Sound Pressure Level Stability - Short Term Fluctuations

The Short Term Fluctuations was determined by measuring the maximum and minimum of the fast weighted DC output of the B&K 2610 measuring amplifier over a 20 second time interval as required in the standard. The Short Term Fluctuation was found to be:

At 1000 Hz **STF = 0.030 dB**
Estimated expanded uncertainty 0.005 dB

3, Actual Output Frequency

The determination of actual output frequency was made using a B&K 4180 microphone together with a B&K 2673 preamplifier connected to a B&K 2610 measuring amplifier. The AC output of the B&K 2610 was taken to an universal counter which was used to determine the frequency averaged over 20 second of operation as required by the standard. The actual output frequency at 1 KHz was:

At 1000 Hz **Actual Frequency = 1002.0 Hz**
Estimated expanded uncertainty 0.1 Hz Coverage factor k = 2.2

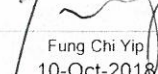
4, Total Noise and Distortion


For the Total Noise and Distortion measurement, the unfiltered AC output of the B&K 2610 measuring amplifier was connected to an Agilent Type 8903 B distortion analyser. The TND result at 1 KHz was:

At 1000 Hz **TND = 2.3 %**
Estimated expanded uncertainty 0.7 %

The expanded uncertainties have been calculated in accordance with the ISO Publication "Guide to the expression of uncertainty in measurement", and gives an interval estimated to have a level of confidence of 95%. A coverage factor of 2 is assumed unless explicitly stated.

- End -

Calibrated by: 
Date: 10-Oct-2018

Checked by: 
Date: 10-Oct-2018

The standard(s) and equipment used in the calibration are traceable to national or international recognised standards and are calibrated on a schedule to maintain the required accuracy level.