

Appendix C Calibration Certificates of Monitoring Equipment



RECALIBRATION DUE DATE: February 13, 2019

Environmental Certificate of Calibration

| | | | Calibration | Certificatio | on Informat | ion | | | |
|------------------------|--|-----------------------------|--|---|--|---------------------|---------------------------|-------|--|
| Cal. Date: | February 1 | 3,2018 | Roots | meter S/N: | 438320 | Ta: | 293 | °К | |
| Operator: | Jim Tisch | | | | | Pa: | 763.3 | mm Hg | |
| Calibration | Model #: | TE-5025A | Calil | prator S/N: | 1612 | | | | |
| | [] | | | | | | | 1 | |
| | | Vol. Init | Vol. Final | ΔVol. | ΔTime | ΔΡ | | | |
| | Run | (m3) | (m3) | (m3) | (min) 1.3970 | (mm Hg) 3.2 | (in H2O) 2.00 | | |
| | 1 | 1 | 2 | 1 | 1.0000 | 6.3 | 4.00 | | |
| | 3 | 5 | 6 | 1 | 0.8900 | 7.9 | 5.00 | | |
| | 4 | 7 | 8 | 1 | 0.8440 | 8.7 | 5.50 | 1 | |
| | 5 | 9 | 10 | 1 | 0.7010 | 12.6 | 8.00 | 4 | |
| | | | | Data Tabula | tion | | | 1 | |
| | | | | | | | | - | |
| | Vstd Qstd $\sqrt{\Delta H \left(\frac{Pa}{Pstd}\right)}$ | | | $\frac{1}{1}\left(\frac{\text{Tstd}}{\text{Ta}}\right)$ | | Qa | $\sqrt{\Delta H}$ (Ta/Pa) | | |
| (m3) (x-axis) (y-axis) | | | ALCONOMIC AND A DESCRIPTION OF A DESCRIP | Va | (x-axis) | (y-axis) | | | |
| | 1.0172 0.7281 1.4293 | | | | 0.9958 | 0.7128 | 0.8762 | - | |
| | 1.0130 | | | | 0.9917 | 0.9917 | 1.2392 | 4 | |
| | 1.0109 | 1.1358 2.2599 | | | 0.9896 | 1.1120 | 1.3854 | -1 | |
| | 1.0098 | | | and the second se | 0.9886 | 1.1713 | 1.4530 | - | |
| | 1.0046 | 1.0046 1.4331 2.8586 | | | 0.9835 | 1.4030 m= | 1.7524 1.26500 | - | |
| | QSTD | 0STD b= -0.03691 | | | QA | b= | -0.02263 | | |
| | QSID | b= -0.03691 r= 0.99988 | | QA | r= | 0.99988 | | | |
| | | | | Calculatio | ns | | | 1 | |
| | Vstd= | ∆Vol((Pa-∆P |)/Pstd)(Tstd/T | | Va= | 1 | | | |
| | and the second s | Vstd/∆Time | | | Qa= |] | | | |
| | | | For subsequ | uent flow ra | te calculatio | | | | |
| | Qstd= $1/m\left(\left(\sqrt{\Delta H\left(\frac{Pa}{Pstd}\right)\left(\frac{Tstd}{Ta}\right)}\right)-b\right)$ | | | | Qa= | | | | |
| | Standard | Conditions | | | | | | | |
| Tstd | | | | | RECALIBRATION | | | | |
| Pstd | | mm Hg | | | LICEDA recommende annual recelibration per 1000 | | | | |
| AH: calibra | | Key ter reading (| in H2O) | | US EPA recommends annual recalibration per 1998 40 Code of Federal Regulations Part 50 to 51, | | | | |
| | | eter reading | | | 1 | | , Reference Met | | |
| Ta: actual a | bsolute tem | perature (°K |) | 1 | 1 | | ended Particulat | | |
| | the second se | ressure (mm | Hg) | | 1 | | ere, 9.2.17, page | | |
| b: intercep | t | | | | | | | | |
| m: slope | | | |] | | | | | |

Tisch Environmental, Inc.

145 South Miami Avenue

Village of Cleves, OH 45002

www.tisch-env.cor TOLL FREE: (877)263-761(FAX: (513)467-900

TSP Sampler Calibration

| | | SI | ſE | | |
|----------------|-----------------|---------------|-----------|------------|------|
| Location: Lian | 2 | | | January 5, | 2019 |
| Sampler: TE-5 | 170 MFC (Serial | ₩ : 23 | Jy) Tech: | Sam Wong | |

| | | (| CONDITIONS | | |
|---------------------|----------|-------|--------------------|----------|------|
| | | | | | |
| Barometric Pressure | (in Hg): | 40.15 | Corrected Pressure | (mm Hg): | 1020 |
| Temperature | (deg F): | 66 | Temperature | (deg K): | 292 |
| Average Press. | (in Hg): | 40.15 | Corrected Average | (mm Hg): | 1020 |
| Average Temp. | (deg F): | 66 | Average Temp. | (deg K): | 292 |

| CALIBRATION ORIFICE | | | | | | | | |
|---------------------|----------|-----------------|-------------------|--|--|--|--|--|
| Make: | Tisch | Qstd Slope: | 2.02017 | | | | | |
| Model: | TE-5025A | Qstd Intercept: | -0.03691 | | | | | |
| Serial#: | 1612 | Date Certified: | February 13, 2018 | | | | | |

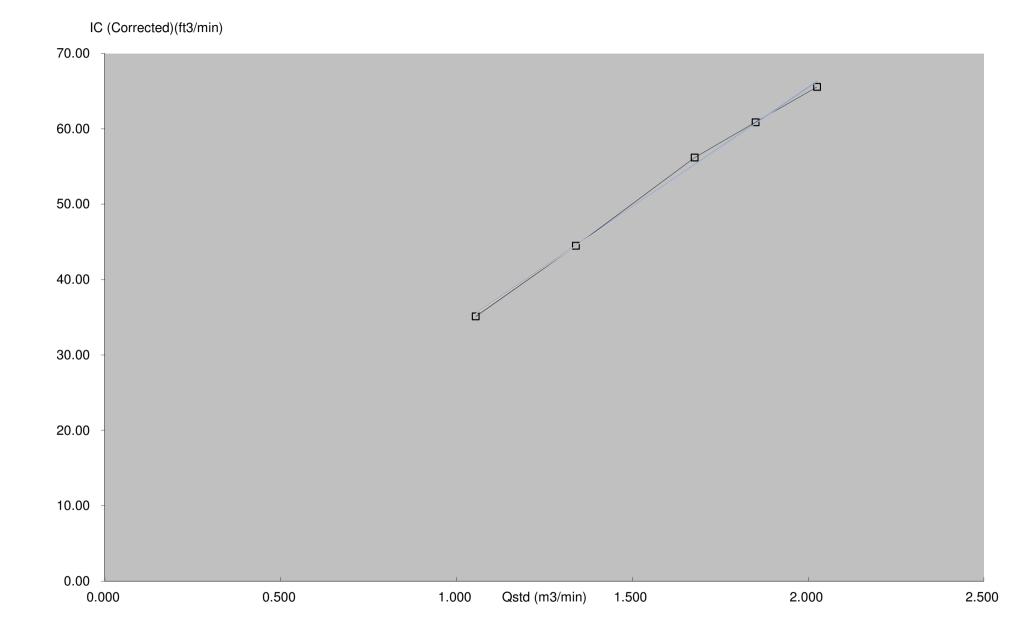
| CALIBRATIONS | | | | | | | | |
|--------------------|-------------|------------------|--------------|-------------------|-------------------------------|---------|--|--|
| Plate or Test # | H2O (in) | Qstd (m3/min) | I (chart) | IC (corrected) | LINEAR REGRESSION | | | |
| 1 | 12.00 | 2.025 | 56.0 | 65.55 | Slope = | 31.7376 | | |
| 2 | 10.00 | 1.850 | 52.0 | 60.86 | Intercept = | 1.9907 | | |
| 3 | 8.20 | 1.677 | 48.0 | 56.18 | Corr. coeff.= | 0.9987 | | |
| 4 | 5.20 | 1.339 | 38.0 | 44.48 | | | | |
| 5 | 3.20 | 1.055 | 30.0 | 35.11 | <pre># of Observations:</pre> | 5 | | |

Calculations

IC = I[Sqrt(Pa/Pstd)(Tstd/Ta)]
Qstd = standard flow rate
IC = corrected chart response
I = actual chart response
m = calibrator Qstd slope
b = calibrator Qstd intercept
Ta = actual temperature during calibration (deg K)
Pa = actual pressure during calibration (mm Hg)
Tstd = 298 deg K
Pstd = 760 mm Hg
For subsequent calculation of sampler flow:
1/m((I)[Sqrt(298/Tav)(Pav/760)]-b)

Qstd = 1/m[Sqrt(H2O(Pa/Pstd)(Tstd/Ta))-b]

m = sampler slope b = sampler intercept I = chart response Tav = daily average temperature Pav = daily average pressure





| Item Tested Description : Sound Level Calibrator Manufacturer Rion I.D. : 217656 Model : NC-74 Serial No. : 34678506 Test Conditions Date of Test : 20-Apr-18 Supply Voltage : Relative Humidity : (50 ± 25) % Test Specifications Calibration check. Relative Humidity : (50 ± 25) % Test Specifications Calibration check. Ref. Document/Procedure : F21, Z02. Test Results All results were within the IEC 60942 Class 1 specifications. The results are shown in the attached page(s). Main Test equipment used: Traceable to S014 Spectrum Analyzer 707126 NIM-PRC & SCL-S240 S041 Universal Counter 802061 SCL-HKSAR | ges | | | |
|---|---------------|--|--|--|
| Order No.: Q81437 Date of receipt : 13- Item Tested Description : Sound Level Calibrator I.D. : 217656 Model : NC-74 Serial No. : 34678506 Test Conditions Date of Test: 20-Apr-18 Supply Voltage : Ambient Temperature: (23 ± 3)°C Relative Humidity: (50 ± 25) % Test Specifications Calibration check. Ref. Document/Procedure: F21, Z02. Test Results All results were within the IEC 60942 Class 1 specifications. Traceable to Main Test equipment used: Equipment No. Description Cert. No. Traceable to S014 Spectrum Analyzer 707126 NIM-PRC & SCL- S0240 Sound Level Calibrator 703741 NIM-PRC & SCL- S041 Universal Counter 802061 SCL-HKSAR SCL-HKSAR | | | | |
| Order No.: Q81437 Date of receipt : 13- Item Tested Jescription : Sound Level Calibrator Manufacturer : Rion I.D. : 217656 Model : NC-74 Serial No. : 34678506 Test Conditions Jate of Test : 20-Apr-18 Date of Test : 20-Apr-18 Supply Voltage : Ambient Temperature : (23 ± 3)°C Relative Humidity : (50 ± 25) % Test Specifications Calibration check. Ref. Document/Procedure : F21, Z02. Test Results All results were within the IEC 60942 Class 1 specifications. The results are shown in the attached page(s). Main Test equipment used: Equipment No. Description Equipment No. Description Cert. No. Traceable to S014 Spectrum Analyzer 707126 NIM-PRC & SCL- S240 Sound Level Calibrator 703741 NIM-PRC & SCL- S041 Universal Counter 802061 SCL-HKSAR | 1g. | | | |
| Item Tested Description : Sound Level Calibrator Manufacturer Rion I.D. : 217656 Model : NC-74 Serial No. : 34678506 Test Conditions Date of Test : 20-Apr-18 Supply Voltage : Relative Humidity : (50 ± 25) % Test Specifications Calibration check. Relative Humidity : (50 ± 25) % Test Specifications Calibration check. Ref. Document/Procedure : F21, Z02. Test Results All results were within the IEC 60942 Class 1 specifications. The results are shown in the attached page(s). Main Test equipment used: Traceable to S014 Spectrum Analyzer 707126 NIM-PRC & SCL-S240 S041 Universal Counter 802061 SCL-HKSAR | | | | |
| Manufacturer : RionI.D.: 217656Model: NC-74Serial No.: 34678506Test ConditionsDate of Test :20-Apr-18Supply Voltage:Ambient Temperature :(23 ± 3)°CRelative Humidity : (50 ± 25) %Test SpecificationsCalibration check. Ref. Document/Procedure : F21, Z02.Test ResultsAll results were within the IEC 60942 Class 1 specifications. The results are shown in the attached page(s).Main Test equipment used: Equipment No. DescriptionCert. No. Traceable to NIM-PRC & SCL- S014Traceable to NIM-PRC & SCL- S0261Supply Coltage:Traceable to NIM-PRC & SCL- S0261 | | | | |
| Manufacturer : RionI.D.: 217656Model: NC-74Serial No.: 34678506Test ConditionsDate of Test :20-Apr-18Supply Voltage:Ambient Temperature :(23 ± 3)°CRelative Humidity : (50 ± 25) %Test SpecificationsCalibration check. Ref. Document/Procedure : F21, Z02.Test ResultsAll results were within the IEC 60942 Class 1 specifications. The results are shown in the attached page(s).Main Test equipment used: Equipment No. DescriptionCert. No. Traceable to NIM-PRC & SCL- S014Traceable to NIM-PRC & SCL- S0261Supply Coltage:Traceable to NIM-PRC & SCL- S0261 | | | | |
| Model : NC-74 Serial No. : 34678506 Test Conditions Supply Voltage : Ambient Temperature : (23 ± 3)°C Relative Humidity : (50 ± 25) % Test Specifications Calibration check. Calibration check. Ref. Document/Procedure : F21, Z02. Test Results All results were within the IEC 60942 Class 1 specifications. Main Test equipment used: Traceable to Equipment No. Description Cert. No. Traceable to S014 Spectrum Analyzer 703741 NIM-PRC & SCL-S240 S041 Universal Counter 802061 SCL-HKSAR | | | | |
| Test Conditions Date of Test : 20-Apr-18 Supply Voltage : Ambient Temperature : (23 ± 3)°C Relative Humidity : (50 ± 25) % Test Specifications Calibration check. Calibration check. Ref. Document/Procedure : F21, Z02. Test Results All results were within the IEC 60942 Class 1 specifications. The results are shown in the attached page(s). Main Test equipment used: Equipment No. Description Cert. No. S014 Spectrum Analyzer 707126 S014 Spectrum Analyzer 703741 S014 Universal Counter 802061 | | | | |
| Ambient Temperature : (23 ± 3)°C Relative Humidity : (50 ± 25) % Test Specifications Calibration check. Calibration check. Ref. Document/Procedure : F21, Z02. Test Results All results were within the IEC 60942 Class 1 specifications. The results are shown in the attached page(s). Main Test equipment used: Equipment No. Description Cert. No. Solut Spectrum Analyzer 707126 Solut Sound Level Calibrator 703741 Solut Universal Counter 802061 | | | | |
| Ambient Temperature : (23 ± 3)°C Relative Humidity : (50 ± 25) % Test Specifications Calibration check. Calibration check. Ref. Document/Procedure : F21, Z02. Test Results All results were within the IEC 60942 Class 1 specifications. The results are shown in the attached page(s). Main Test equipment used: Equipment No. Description Cert. No. Solut Spectrum Analyzer 707126 Solut Sound Level Calibrator 703741 Solut Universal Counter 802061 | | | | |
| Test Specifications Calibration check. Ref. Document/Procedure : F21, Z02. Test Results All results were within the IEC 60942 Class 1 specifications. The results are shown in the attached page(s). Main Test equipment used: Equipment No. Description Cert. No. S014 Spectrum Analyzer S014 Spectrum Analyzer S240 Sound Level Calibrator S041 Universal Counter | | | | |
| Calibration check. Ref. Document/Procedure : F21, Z02. Test Results All results were within the IEC 60942 Class 1 specifications. The results are shown in the attached page(s). Main Test equipment used: Equipment No. Description Cert. No. Traceable to S014 Spectrum Analyzer 707126 NIM-PRC & SCL- S240 Sound Level Calibrator 703741 NIM-PRC & SCL- S041 Universal Counter 802061 SCL-HKSAR | | | | |
| Ref. Document/Procedure : F21, Z02. Test Results All results were within the IEC 60942 Class 1 specifications. The results are shown in the attached page(s). Main Test equipment used: Equipment No. Description S014 Spectrum Analyzer S014 Spectrum Analyzer S041 Universal Counter | | | | |
| Test Results All results were within the IEC 60942 Class 1 specifications. The results are shown in the attached page(s). Main Test equipment used: Equipment No. Equipment No. Description Cert. No. S014 Spectrum Analyzer 707126 S240 Sound Level Calibrator 703741 S041 Universal Counter 802061 | | | | |
| All results were within the IEC 60942 Class 1 specifications. The results are shown in the attached page(s). Main Test equipment used: Equipment No. Description Solut Spectrum Analyzer 707126 NIM-PRC & SCL-S240 Sound Level Calibrator 703741 Solut Universal Counter | | | | |
| The results are shown in the attached page(s). Main Test equipment used: Equipment No. Description Cert. No. Traceable to S014 Spectrum Analyzer 707126 NIM-PRC & SCL- S240 Sound Level Calibrator 703741 NIM-PRC & SCL- S041 Universal Counter 802061 SCL-HKSAR | | | | |
| The results are shown in the attached page(s). Main Test equipment used: Equipment No. Description Cert. No. Traceable to S014 Spectrum Analyzer 707126 NIM-PRC & SCL- S240 Sound Level Calibrator 703741 NIM-PRC & SCL- S041 Universal Counter 802061 SCL-HKSAR | | | | |
| Main Test equipment used:Equipment No.DescriptionCert. No.Traceable toS014Spectrum Analyzer707126NIM-PRC & SCL-S240Sound Level Calibrator703741NIM-PRC & SCL-S041Universal Counter802061SCL-HKSAR | | | | |
| Equipment No.DescriptionCert. No.Traceable toS014Spectrum Analyzer707126NIM-PRC & SCL-S240Sound Level Calibrator703741NIM-PRC & SCL-S041Universal Counter802061SCL-HKSAR | | | | |
| Equipment No.DescriptionCert. No.Traceable toS014Spectrum Analyzer707126NIM-PRC & SCL-S240Sound Level Calibrator703741NIM-PRC & SCL-S041Universal Counter802061SCL-HKSAR | | | | |
| S014Spectrum Analyzer707126NIM-PRC & SCL-S240Sound Level Calibrator703741NIM-PRC & SCL-S041Universal Counter802061SCL-HKSAR | | | | |
| S240Sound Level Calibrator703741NIM-PRC & SCL-S041Universal Counter802061SCL-HKSAR | HKSAR | | | |
| S041 Universal Counter 802061 SCL-HKSAR | | | | |
| | -HROAR | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| The values given in this Calibration Certificate only relate to the values measured at the time of the test and any uncertainties qu will not include allowance for the equipment long term drift, variations with environmental changes, vibration and shock during tra overloading, mis-handling, or the capability of any other laboratory to repeat the measurement. Hong Kong Calibration Ltd. shal for any loss or damage resulting from the use of the equipment. | ansportation. | | | |
| The test equipment used for calibration are traceable to International System of Units (SI), or by reference to a natural constant. The test results apply to the above Unit-Under-Test only | | | | |
| AA . | | | | |
| Calibrated by : Approved by : | | | | |
| Elva Chong Kin Wong | | | | |
| This Certificate is issued by: Date: 20-Apr-18 | | | | |
| Hong Kong Calibration Ltd. Unit 88, 24/F., Well Fung Industrial Centre, No. 58-76, Ta Chuen Ping Street,Kwai Chung, NT,Hong Kong. | | | | |

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



Certificate No. 803615

Page 2 of 2 Pages

Results :

1. Generated Sound Pressure Level

| UUT Nominal Value (dB) | Measured Value (dB) | IEC 60942 Class 1 Spec. |
|------------------------|---------------------|-------------------------|
| 94.0 | 94.2 | ± 0.4 dB |

Uncertainty : $\pm 0.2 \text{ dB}$

2. Short-term Level Fluctuation : 0.0 dB IEC 60942 Class 1 Spec. : ± 0.1 dB Uncertainty : ± 0.01 dB

3. Frequency

| UUT Nominal Value (kHz) | Measured Value (kHz) | IEC 60942 Class 1 Spec. |
|-------------------------|----------------------|-------------------------|
| 1 | 0.999 | ± 1 % |

Uncertainty : \pm 3.6 x 10 ⁻⁶

4. Total Distortion : < 1.1 % IEC 60942 Class 1 Spec. : < 4 % Uncertainty : ± 2.3 % of reading

Remark : 1. UUT : Unit-Under-Test

2. The uncertainty claimed is for a confidence probability of not less than 95%.

3. Atmospheric Pressure : 1 016 hPa.

----- END -----

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



| Certificate No. | 804605 | | Page | 1 of | 3 | Pages |
|--|--|--|-------------------------|-----------------|---------|---------------------|
| Customer : | Enovative Environmental Servic | e Limited | | | | |
| Address : | Flat 6, 3/F, Block E, Wah Lok Indus | strial Centre, 31-35 Sha | an Mei Street, Shati | n, N.T., | Hong | Kong. |
| Order No. : | Q81807 | | Date of receipt | : | | 9-May-18 |
| Item Tested | | | | | | |
| Description : | Sound Level Meter | | | | | |
| Manufacturer : | | | I.D. | : | | |
| | NL-52 | | Serial No. | : 01 | 14348 | 34 |
| Test Conditi | ons | | | | | |
| Date of Test : | 15-May-18 | | Supply Voltage | : | | |
| Ambient Temp | erature : (23 ± 3)°C | | Relative Humidi | ty : (50 | ± 25 |) % |
| Test Specifi | cations | | | | | |
| Calibration chec Ref. Document/ | k. Procedure: Z01, IEC 61672. | | | | | |
| Test Results | • | | | | | |
| | within the IEC 61672 Type1 or n shown in the attached page(s). | nanufacturer's specif | ication. | | | |
| Main Test equip | ment used: | | | | | |
| Equipment No. | | <u>Cert. No.</u> | - | Traceat | ole to | |
| S017 | Multi-Function Generator | C170120 | | SCL-HK | SAR | |
| S240 | Sound Level Calibrator | 803357 | 1 | NIM-PR | C & S | SCL-HKSAR |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| will not include allow overloading, mis-ha | this Calibration Certificate only relate to vance for the equipment long term drift, v ndling, or the capability of any other labc age resulting from the use of the equipm | variations with environmen pratory to repeat the meas | ntal changes, vibration | n and sho | ck duri | ing transportation, |
| | used for calibration are traceable to Inte ly to the above Unit-Under-Test only | rnational System of Units | (SI), or by reference t | to a natur | al cons | stant. |

| Calibrated by : | Appro | ved by : | (A) |
|--|-------|-----------|----------|
| Elva Chong | | | Kin Wong |
| This Certificate is issued by: | Date: | 15-May-18 | |
| Hong Kong Calibration Ltd. | | | |
| Hait OD 24/E Wall Euro Industrial Castra No. 59 76 To Obuse Disc Obuset Musi Obuse NT Hans M | | | |



Certificate No. 804605

Page 2 of 3 Pages

Results :

1. Self-generated noise: 16.0 dBA (Mfr's Spec \leq 17 dBA)

2. Acoustical signal test

| | UUT S | Setting | | | |
|------------|-----------|-----------|--------|------------|--------------|
| | Frequency | Time | Octave | Applied | UUT |
| Range (dB) | Weighting | Weighting | Filter | Value (dB) | Reading (dB) |
| 20-130 | A | F | OFF | 94.0 | 94.0 |
| | | S | OFF | | 94.0 |
| | С | F | OFF | | 94.0 |
| | Z | F | OFF | | 94.0 |
| | А | F | OFF | 114.0 | 114.1 |
| | | S | OFF | : | 114.1 |
| | С | F | OFF | | 114.1 |
| | Z | F | OFF | | 114.1 |

IEC 61672 Type 1 Spec. : \pm 1.1 dB Uncertainty : \pm 0.1 dB

Attenuation (dB) IEC 61672 Type 1 Spec. Frequency 31.5 Hz -39.6 - 39.4 dB, ± 2 dB -26.2 - 26.2 dB, ± 1.5 dB 63 Hz -16.2 125 Hz - 16.1 dB, ± 1.5 dB -8.7 - 8.6 dB, ± 1 dB 250 Hz -3.2 500 Hz - $3.2 \text{ dB}, \pm 1.4 \text{ dB}$ 1 kHz 0.0 (Ref) $0 \, dB, \pm 1.1$ dB 2 kHz +1.0+ 1.2 dB, ± 1.6 dB +0.7+ $1.0 \text{ dB}, \pm 1.6 \text{ dB}$ 4 kHz - 1.1 dB, + $2.1 \text{ dB} \sim -3.1 \text{ dB}$ 8 kHz -1.26.6 dB, + 3.5 dB ~ - 17.0 dB 16 kHz -8.6 -

3 Electrical signal tests of frequency weightings (A weighting)

Uncertainty : $\pm 0.1 \text{ dB}$



Certificate No. 804605

Page 3 of 3 Pages

4. Frequency & Time weightings at 1 kHz

4.1 Frequency Weighting (Fast)

| UUT | Applied | UUT | Difference | IEC 61672 |
|---------|------------|--------------|------------|----------------------|
| Setting | Value (dB) | Reading (dB) | (dB) | Type 1 Spec. |
| Setting | | | (uD) | |
| A | 94.0 | 94.0 (Ref.) | | $\pm 0.4 \text{ dB}$ |
| C | 94.0 | 94.0 | 0.0 | |
| Z | 94.0 | 94.0 | 0.0 | |

4.2 Time Weighting (A-weighted)

| UUT | Applied | UUT | Difference | IEC 61672 |
|----------------|------------|--------------|------------|----------------------|
| Setting | Value (dB) | Reading (dB) | (dB) | Type 1 Spec. |
| Fast | 94.0 | 94.0 (Ref.) | · | $\pm 0.3 \text{ dB}$ |
| Slow | 94.0 | 94.0 | 0.0 | |
| Time-averaging | 94.0 | 94.0 | 0.0 | |

Uncertainty : $\pm 0.1 \text{ dB}$

Remarks : 1. UUT : Unit-Under-Test

- 2. The uncertainty claimed is for a confidence probability of not less than 95%.
- 3. Atmospheric Pressure : 1 009 hPa.
- 4. Preamplifier model : NH-25, S/N : 21113
- 5. Firmware Version: 1.8
- 6. Power Supply Check: OK
- 7. The UUT was adjusted with the laboratory's sound calibrator at the reference sound pressure level before the calibration.

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