



Acoustics Study

XA122.P1

Change of use of Mezzanine

**16 Cheetham Hill Shopping
Centre**

**40 Bury Old Road
Manchester**

M8 5EL

Manchester, UK

Version 2.0

March 29, 2018

Identification

Title: Acoustics Study: Change of use of Mezzanine
XA122.P1

Client: Manchester Plaza

Date: March 29, 2018

Local: Manchester, UK

Version: 2.0

Prepared by: Luis Pereira

Prepared for: Manchester Plaza & Manchester City Council

Revisions

Date	Changes / Comments	Reviser
Oct 21	Update to suit new application	TM

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Introduction

This technical report has been prepared in support of a planning application to allow a change of use from A1/A3 to include D1/D2 (now Use Class E), to the mezzanine areas at 16 Cheetham Hill Shopping Centre, 40 Bury Old Road, Manchester, M8 5EL.

Thus, environmental noise emissions at the closest noise sensitive receivers (NSR's) which relate to the operation of the proposed development, have been determined and compared with the required criteria - established by the Manchester City Council (MCC).

1 Proposed development

A site reference together with existing and proposed architectural plans of the mezzanine are presented as Annex A.

The type of events that will be held at the proposed space includes the following:

- Private hires for functions, parties, weddings etc.
- Conferences;
- Training;
- Fashion Shows;
- Business / Trade fairs;
- Networking events; and

As for its working hours, it is proposed that the mezzanine space operates on a daily basis from 11:00h to 23:00h.

Relevant noise sources

Following current proposals and consultation with the MCC regarding the operation details of the proposed change of use, the main relevant noise sources that have been considered are:

1. Entertainment noise break-out: noise break-out through the existing building facade elements during noisy events; and
2. Car parking activities: additional car passages and parking activities.

It is important to note that the proposed change of use does not require any additional mechanical units which may generate noise.

Closest noise sensitive receivers

The Manchester City Council considers that a noise sensitive receptor can be: residential units, educational establishments, hospitals, hostels, concert halls, theaters, law courts and broadcasting/recording studios.

Therefore, the closest identified noise sensitive receptors are the residential units on Bury Old Road (see Annex B).

2 Relevant criteria

The main criteria which is relevant for this assessment has been set after a brief consultation with the Council's Planning Team member Janet Lawless, based on the policies within Section 3.6.1.2 of the Manchester City Council Planning & Noise Technical Guidance (2015), and is presented as Table 1.

As for car parking activities, no specific criteria has been provided by the Council and as such, it is considered that if noise emissions are not higher than the overall residual noise during quiet times, then no adverse impacts at the closest NSR are expected.

Table 1 – Relevant criteria

Source	Required criteria
Entertainment noise	Entertainment noise (L_{Aeq}) should be controlled to 10dB below the background noise level (L_{A90}) without the entertainment noise present, in each octave band at the nearest noise sensitive location.
Increased traffic flow	$L_{Ar,Tr} \leq L_{Aeq}$

3 Methodology

Site survey

A site survey was carried out on the 23th, 25th and 27th of March 2018 to determine $L_{A90,15min}$ ¹ indexes, in line with the requirements set in Section 2. The measurements were taken at the identified NSR's over a total period of 1.5 hours during the quietest times of the proposed activities schedule for the mezzanine (from 22:30 to 23:00) (see Annex B).

The methodology adopted to determine the environmental noise parameters, is in line with BS 7445-2:1991 Description and measurement of environmental noise - Part 2: Guide to the acquisition of data pertinent to land use and can be briefly described as follows:

1. Calibration check of the sound level meter² at the beginning and end of the measuring period, confirming that no significant drift was registered (i.e. ≤ 0.5 dB) (calibration certifications for all the used equipment are presented in Annex D);
2. The sound level meter was set to measure average noise levels with the A-weighting frequency network;
3. As a precaution against interference, measurements were carried out with a windshield and in the absence of rain or wind speeds higher than 5 m/s .

Noise emissions

The calculations of noise emissions have been carried out for the identified NSR³ by means of a digital geometric acoustics software⁴ which uses the methodology laid out in ISO 9613-2:1996 Attenuation of sound during propagation outdoors - Part 2: General method of calculation.

¹ Since the criteria stated in Section 2 does not specify intervals for the L_{A90} index, a 15 minutes interval has been used with reference to BS 4142:2014 Methods for rating and assessing industrial and commercial sound.

² Conforming to BS EN 61672-1.

³ It is considered that noise emissions at any NSR which sits furthest away from the development are in line with the requirements by default.

⁴ The software Olive Tree Lab - Suite developed by Mediterranean Acoustics Research & Development (PEMARD) has been used.

The method can be briefly described as follows:

1. Production of a digital geometric acoustics model, representative of the proposed development and its surroundings;
2. Configuration of the sources specified in Section 1.1;
3. Configuration of a receivers grid (with a 3x3 meters resolution) as to determine which part of the closest sensitive properties are the most exposed to the emitted environmental noise; and
4. Propagation calculations.

For the characterization of each source within the digital geometric acoustics model, the following data/considerations has been taken into account:

- Entertainment noise (break-out): the typical reverberation noise spectrum for an entertaining venue has been used and is presented as Table 2. It is understood that the glazing/external walls constructions of the space are the following:
 - glazing: 6 mm of std glass + 100 mm (air-gap) + 12.5mm plasterboard (not connected); and
 - external walls: 75mm brickwork + 50 mm air-gap partially filled with mineral wool + 100mm brickwork (simply connected).
- Car parking activities: the typical semi-reverberant noise spectrum emitted by cars during parking for an overall distance of 1 meter have been previously recorded by Xacoustics and have been used for this assessment (Table ??). A maximum of 100 cars are expected to park during a busy event which equates to a total of 200 car movements (in/out).

Table 2 – Typical reverberant noise - busy venue

Space	Parameter	Frequency (Hz)									Global dB(Z)
		31	63	125	250	500	1k	2k	4k	8k	
Busy venue with amplified music	L_{eq}	92	92	90	89	92	89	81	78	74	99

Annex E includes further details of the digital geometric acoustics model which has been used to carry out propagation calculations.

Table 3 – Typical semi-reverberant noise spectrum - car parking

Activity	Parameter	Frequency (Hz)									Global dB(Z)
		31	63	125	250	500	1k	2k	4k	8k	
Car parking	L _{Aeq} (1 meter)	38	39	44	50	61	62	58	47	32	66

4 Results & initial conclusions

Site survey

The results of the site survey are presented as Tables 4 and 5. Time history graphs of the site survey are presented in Annex C.

In addition to the data presented below, it is important to refer that whilst on site it has been noticed that during day-time noise levels are significantly higher than during evening times (as expected) and as such these haven't been considered for assessment.

Table 4 – Results - noise survey

Parameter	Period	Results
Min $L_{A90,15min}$ dB	Friday 23rd of March (22:30h to 23:00h)	45
L_{Aeq} dB		61
Min $L_{A90,15min}$ dB	Sunday 25th of March (22:30h to 23:00h)	46
L_{Aeq} dB		64
Min $L_{A90,15min}$ dB	Monday 27th of March (22:30h to 23:00h)	46
L_{Aeq} dB		67

Table 5 – Results - noise survey ($L_{A90,15min}$ octave band values)

Parameter	Period	Frequency (Hz)								
		31.5	63	125	250	500	1k	2k	4k	8k
Min $L_{A90,15min}$ dB(A)	Friday 23rd of March (22:30h to 23:00h)	12	26	36	37	39	39	35	25	15

Noise emissions

The results for the calculated noise emissions related to the operation of the development and the previous stated relevant criteria to consider are presented as Table 6.

This results indicate that even during the noisiest events, the use of the proposed space is in line with the criteria deemed required by the Manchester City Council.

Table 6 – Results - calculated noise emissions

Parameter	Frequency (Hz)									Global dB(A)
	31.5	63	125	250	500	1k	2k	4k	8k	
L _{Aeq} (during the expected nois- iest events)	-	13	28	14	5	-	-	-	-	28
L _{Ar,Tr} car parking activities	19	20	25	30	42	43	39	28	13	47

Final considerations

It has been demonstrated that the proposed change of use to the mezzanine space at 16 Cheetham Hill Shopping Centre, from A1/A3 to include D1/D2 (now Use Class E), does comply with all the Manchester City Council policies for environmental noise emissions limits at the closest identified noise sensitive receivers.

Manchester, UK, March 29, 2018.



Luis Pereira

Director for Xacoustics

MSc (Hons) / EAA / MIOA (Membership No. 50580)

Annexes

ANNEX A – Proposed development

Notes

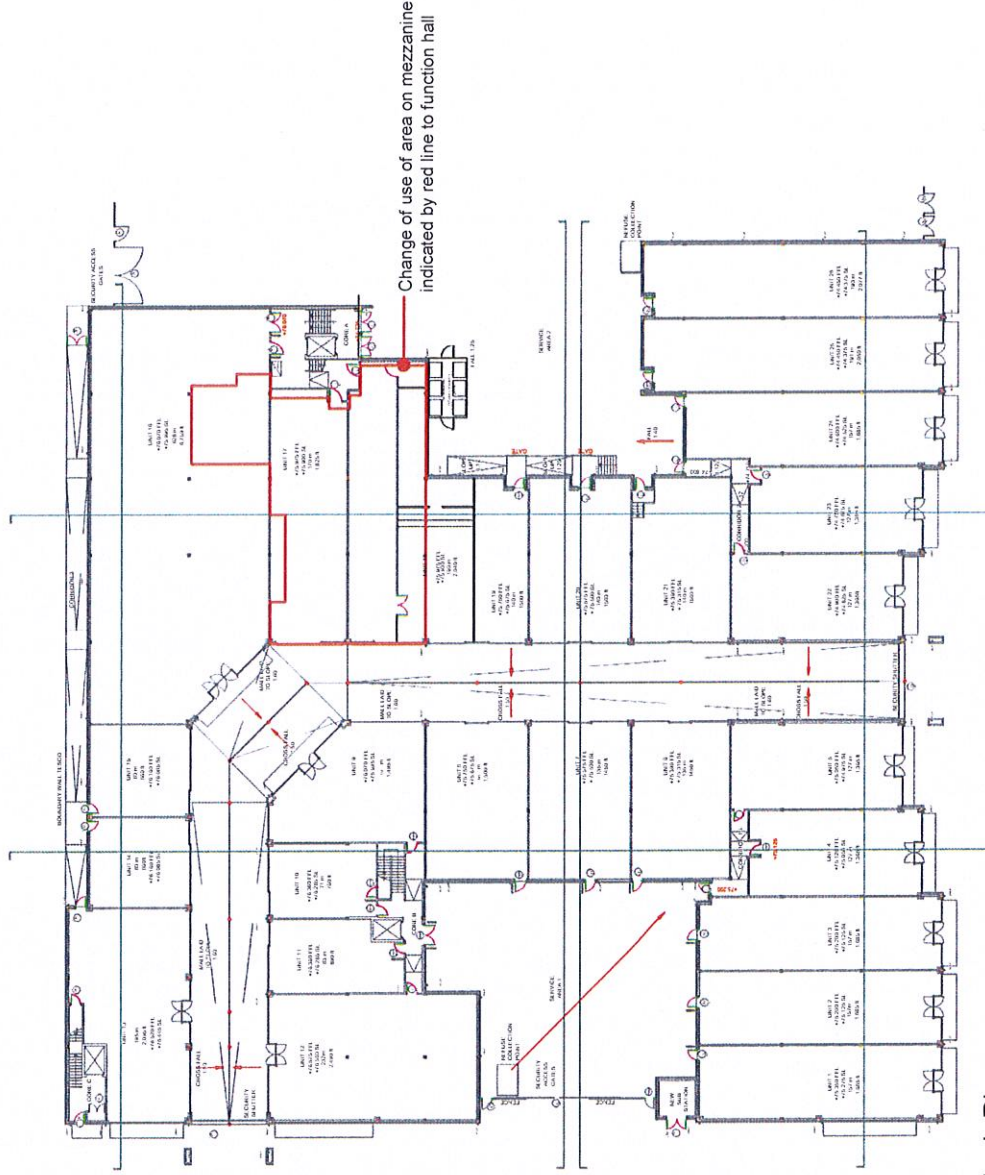
This drawing is the property of The Intelligent Design Centre Ltd and copyright is reserved by them. This drawing is not to be copied or disclosed by or to any unauthorised persons without the prior written consent of The Intelligent Design Centre Ltd.

Do not scale from this drawing.

All dimensions are to be checked on site prior to construction, manufacture of any components and ordering of materials and equipment.

Any discrepancies are to be reported to the architect for clarification. All materials and workmanship to be in accordance with the current British Standards and codes of practice.

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Block Plan

Rev Date Drawn by Comments

Client

Manchester Plaza

Project
Cheetham Hill Shopping Centre
Change of Use of Mezzanine

Drawn by
Block Plan

Date
November 2017

Drawn by
N/A

Scales
1:500 @ A3

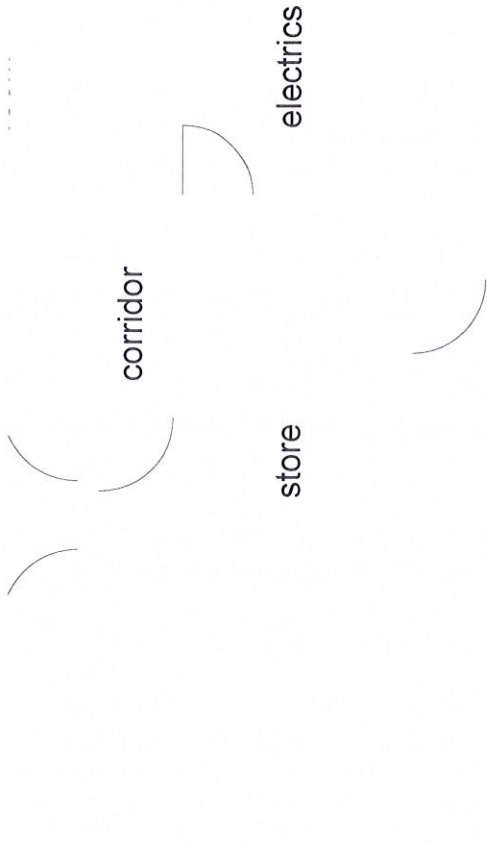
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corridor

store

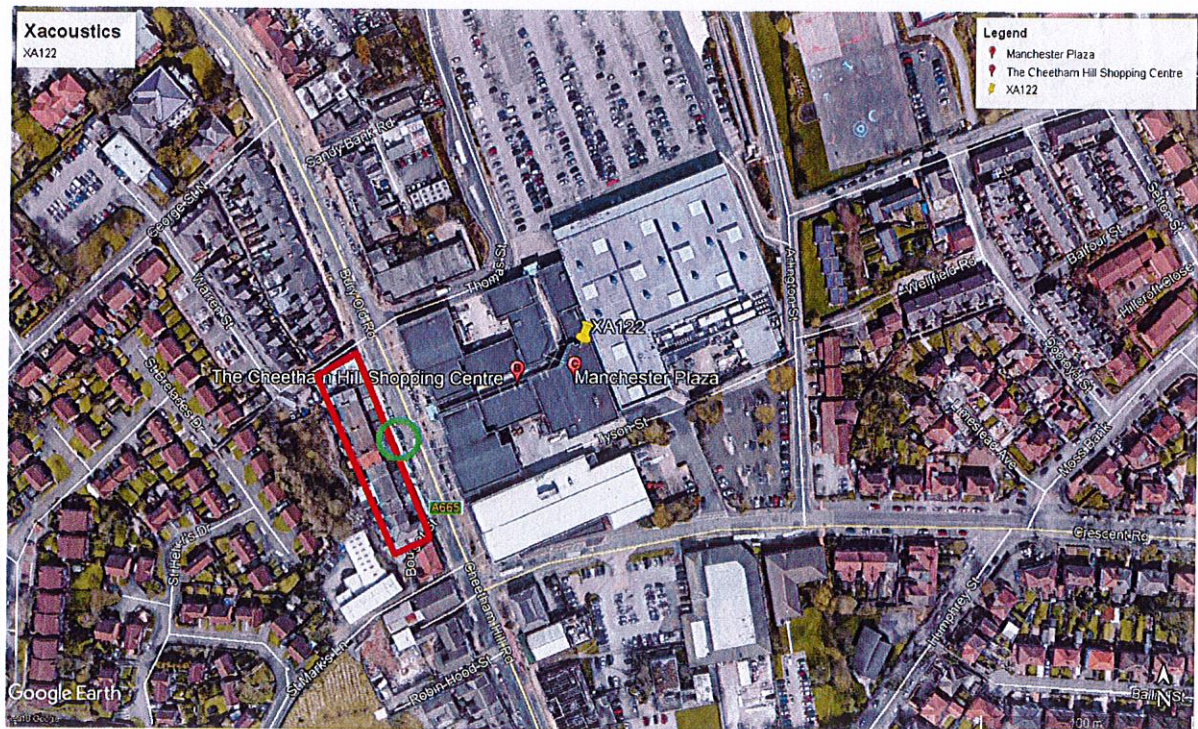
electrics

stair / lift
enclosure

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WC

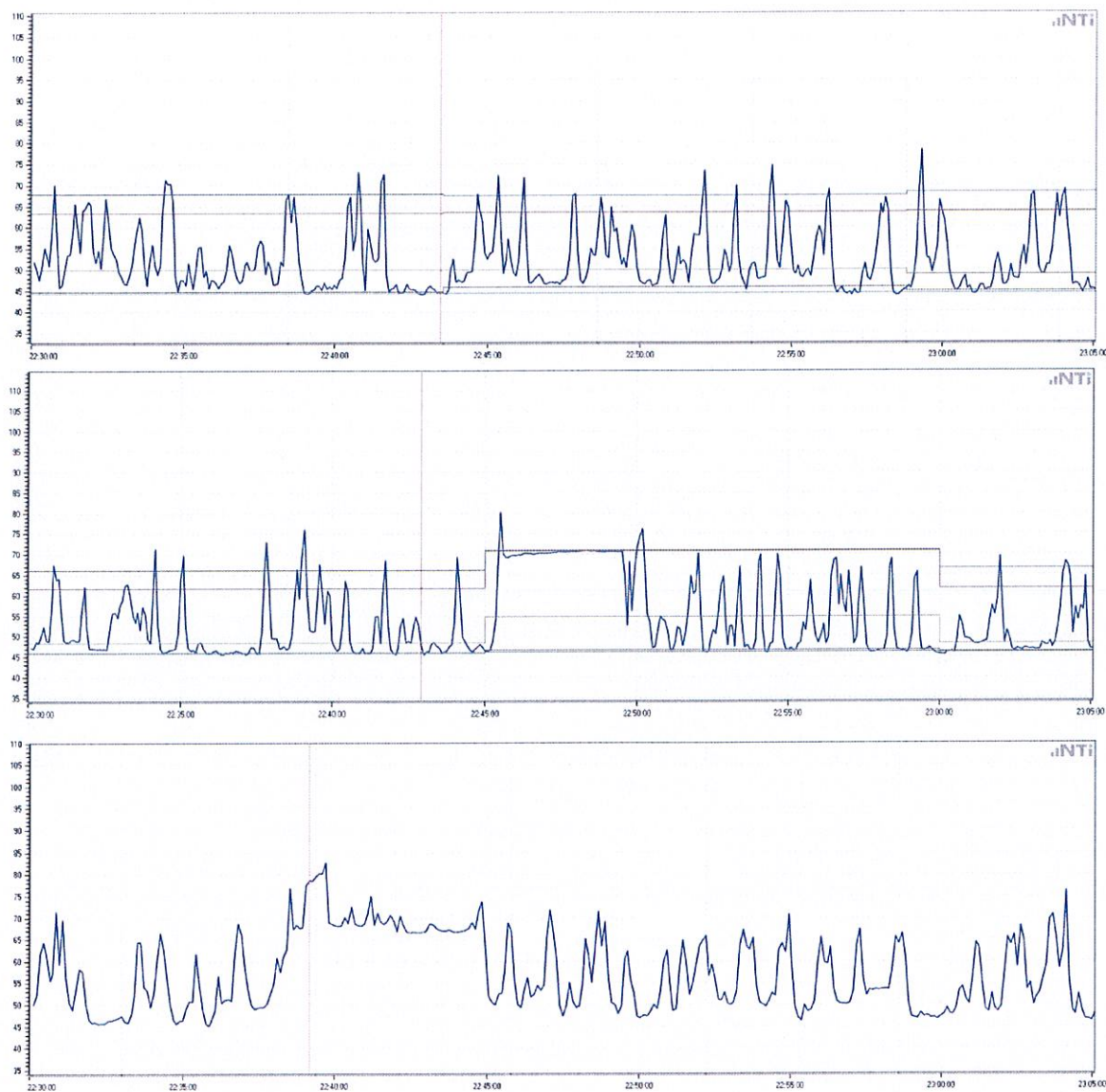
ANNEX B – Monitoring location & noise sensitive receivers



Closest identified NSR's

Monitoring location

ANNEX C – Site survey time history graphs



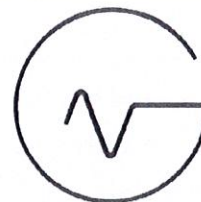
ANNEX D – Equipment details and calibration certificates

CERTIFICATE OF CALIBRATION

ISSUED BY Gracey & Associates
DATE OF ISSUE 20 February 2018
DATE OF CALIBRATION 08 February 2018
CALIBRATION INTERVAL 12 months

BSI CERTIFICATE FS 25913
CERTIFICATE NUMBER 2018-0197

PAGE 1 OF 2



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www.gracey.com

TEST ENGINEER

Jamie Bishop

APPROVING SIGNATORY

Greg Rice

Equipment **Nor 1251, s/n: 24322**
Description Calibrator - Acoustic - Class 1 for 1" & 1/2" microphones, Norsonic AS
Customer Gracey & Associates

Standards

BS EN 60942 Class 1

Conditions

Atmospheric Pressure 101.1 kPa

Temperature 20.2 °C

Relative Humidity 34.0 %

Calibration Data

Output Level 114.15 dB

Frequency 1000.09 Hz

Calibration Reference Sources

Equipment	S/N	Last Cal	Equipment	S/N	Last Cal
B&K 4134 L	1935995	12-Mar-15	Druck DPI 141	479	29-Oct-15
HP 34401	3146A16728	25-Jan-17	Nor 1253	22456	12-Mar-15
Stanford DS36	33213	02-Nov-15	Vaisala HMP23	S2430007	04-Nov-15

Notes

We certify that the above product was duly tested and found to be within the specification at the points measured (except where indicated). Measurements are traceable to UKAS reference sources from the UK National Physical Laboratory. Where no national or international standards exist, traceability is to standards maintained by the manufacturer. Our Quality Management System has been assessed to comply with BS EN ISO 9001:2008 - BSI Certificate number FS 25913. Tests were carried out in environmental conditions controlled to the extent appropriate to the instrument's specification. All relevant test certificates are available for inspection.

The uncertainties are for a confidence probability of not less than 95%.

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Sound Calibrator Certificate



Calibrator: Norsonic 1251

Serial no: 24322

Level: 114.15 dB

Frequency: 1000.09 Hz

The stated level is valid at measurement conditions.
Frequency stability: 0.00 %

Measured according to IEC 60942.

The stated level is relative to 20 μ Pa.

All results quoted are directly traceable to the National Physical Laboratory, London
with a calculated uncertainty less than 0.10 dB (2 $\times$ sd).

Reference conditions:

Pressure: 101.325 kPa
Temperature: 23.0 °C
Relative humidity: 50 %RH

Measurement conditions:

Pressure: 101.06 kPa
Temperature: 20.2 °C
Relative humidity: 34 % RH

Date: 08/02/2018

Signature:

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Sound Calibrator Certificate



Calibrator: Norsonic 1251

Serial no: 24322

Level: 114.15 dB

Frequency: 1000.09 Hz

The stated level is valid at measurement conditions.
Frequency stability: 0.00 %

Measured according to IEC 60942.

The stated level is relative to 20 μ Pa.

All results quoted are directly traceable to the National Physical Laboratory, London
with a calculated uncertainty less than 0.10 dB (2 $\times$ sd).

Reference conditions:

Pressure: 101.325 kPa
Temperature: 23.0 °C
Relative humidity: 50 %RH

Measurement conditions:

Pressure: 101.06 kPa
Temperature: 20.2 °C
Relative humidity: 34 % RH

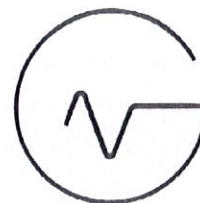
Date: 08/02/2018

Signature:

Comment:

CERTIFICATE OF CONFORMANCE

ISSUED BY Gracey & Associates BSI CERTIFICATE FS 25913
DATE OF ISSUE 14 March 2018 CERTIFICATE NUMBER 2018-0201
DATE OF CALIBRATION 14 March 2018
CALIBRATION INTERVAL 12 months PAGE 1 OF 1



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TEST ENGINEER APPROVING SIGNATORY

Jamie Bishop

Greg Rice

Equipment **NTi MA220, s/n: 6207**
Description Preamplifier - XL2, NTi Audio
Customer Gracey & Associates

Standards

Manufacturer's Original Specifications

Conditions

Atmospheric Pressure 99.7 kPa
Temperature 20.2 °C
Relative Humidity 38.7 %

Calibration Reference Sources

Equipment	S/N	Last Cal	Equipment	S/N	Last Cal
Druck DPI 141	479	29-Oct-15	HP 34401	3146A16728	25-Jan-17
Vaisala HMP23	S2430007	04-Nov-15			

Notes

We certify that the above product was duly tested and found to be within the specification at the points measured (except where indicated). Measurements are traceable to UKAS reference sources from the UK National Physical Laboratory. Where no national or international standards exist, traceability is to standards maintained by the manufacturer. Our Quality Management System has been assessed to comply with BS EN ISO 9001:2008 - BSI Certificate number FS 25913. Tests were carried out in environmental conditions controlled to the extent appropriate to the instrument's specification. All relevant test certificates are available for inspection.

The uncertainties are for a confidence probability of not less than 95%.

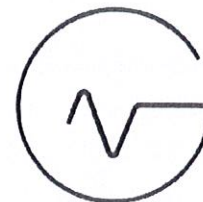
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CERTIFICATE OF CALIBRATION

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DATE OF CALIBRATION 14 March 2018
CALIBRATION INTERVAL 12 months

BSI CERTIFICATE FS 25913
CERTIFICATE NUMBER 2018-0202

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Greg Rice

Equipment **NTi MC230, s/n: 9385**
Description Microphone - 1/2" FF 48V, NTi Audio
Customer Gracey & Associates

Standards
BS EN 61672 Class 1

Conditions
Atmospheric Pressure 99.7 kPa
Temperature 20.2 °C
Relative Humidity 38.7 %

Calibration Data

Sensitivity -25.30 dB

Calibration Reference Sources

Equipment	S/N	Last Cal	Equipment	S/N	Last Cal
B&K 4134 L	1935995	12-Mar-15	Druck DPI 141	479	29-Oct-15
HP 34401	3146A16728	25-Jan-17	Nor 1253	22456	12-Mar-15
Stanford DS36	33213	02-Nov-15	Vaisala HMP23	S2430007	04-Nov-15

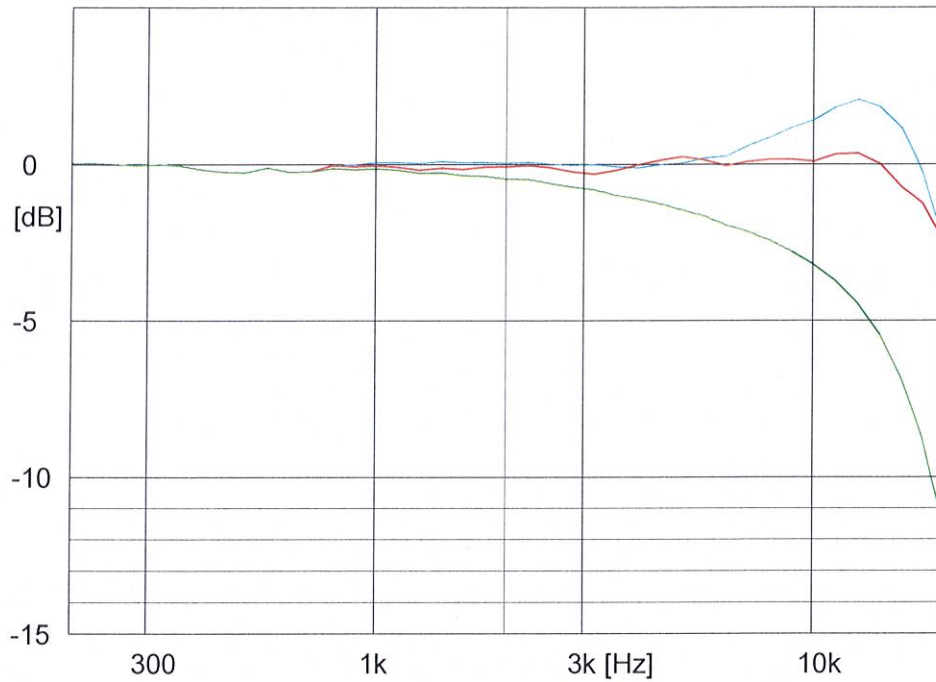
Notes

We certify that the above product was duly tested and found to be within the specification at the points measured (except where indicated). Measurements are traceable to UKAS reference sources from the UK National Physical Laboratory. Where no national or international standards exist, traceability is to standards maintained by the manufacturer. Our Quality Management System has been assessed to comply with BS EN ISO 9001:2008 - BSI Certificate number FS 25913. Tests were carried out in environmental conditions controlled to the extent appropriate to the instrument's specification. All relevant test certificates are available for inspection.

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Microphone Calibration Certificate



NTi
Type: MC230

Serial no: 9385

Sensitivity: 54.2 mV/Pa
-25.3 dB re. 1 V/Pa

Date: 14/03/2018

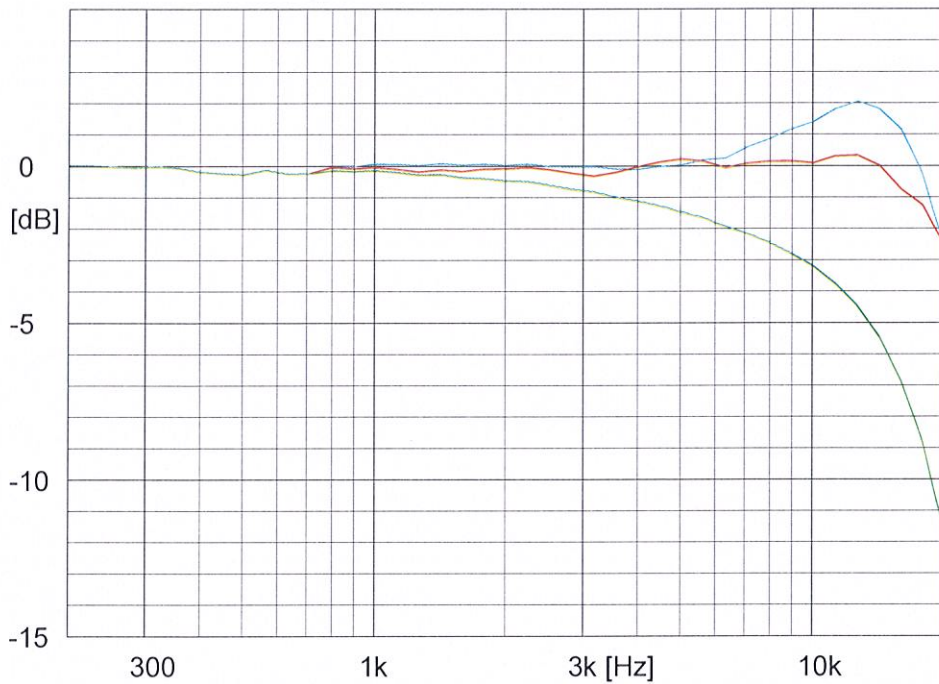
Signature:

Measurement conditions:
Polarisation voltage: 0.0 V
Pressure: 99.41 kPa
Temperature: 20.2 °C
Relative humidity: 38.7 %RH
Results are normalised to
the reference conditions.

Free field response
Diffuse field response
Pressure (Actuator) response

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Microphone Calibration Certificate



NTi
Type: MC230

Serial no: 9385

Sensitivity: 54.2 mV/Pa
-25.3 dB re. 1 V/Pa

Date: 14/03/2018

Signature:

Measurement conditions:
Polarisation voltage: 0.0 V
Pressure: 99.41 kPa
Temperature: 20.2 °C
Relative humidity: 38.7 %RH
Results are normalised to
the reference conditions.

Free field response
Diffuse field response
Pressure (Actuator) response

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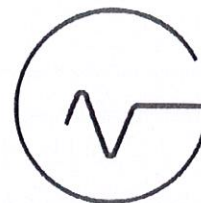
Comment:

CERTIFICATE OF CALIBRATION

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DATE OF CALIBRATION 14 March 2018
CALIBRATION INTERVAL 12 months

BSI CERTIFICATE FS 25913
CERTIFICATE NUMBER 2018-0204

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TEST ENGINEER

Jamie Bishop

APPROVING SIGNATORY

Greg Rice

Equipment **NTi XL2, s/n: a2a-12103-e0**
Description Hand Held Acoustic Analyser - Class 1, NTi Audio
Customer Gracey & Associates

Standards

IEC 61672 Class1

Conditions

Atmospheric Pressure 99.7 kPa
Temperature 20.2 °C
Relative Humidity 38.7 %

Calibration Reference Sources

Equipment	S/N	Last Cal	Equipment	S/N	Last Cal
Druck DPI 141	479	29-Oct-15	HP 34401	3146A16728	25-Jan-17
Vaisala HMP23	S2430007	04-Nov-15			

Notes

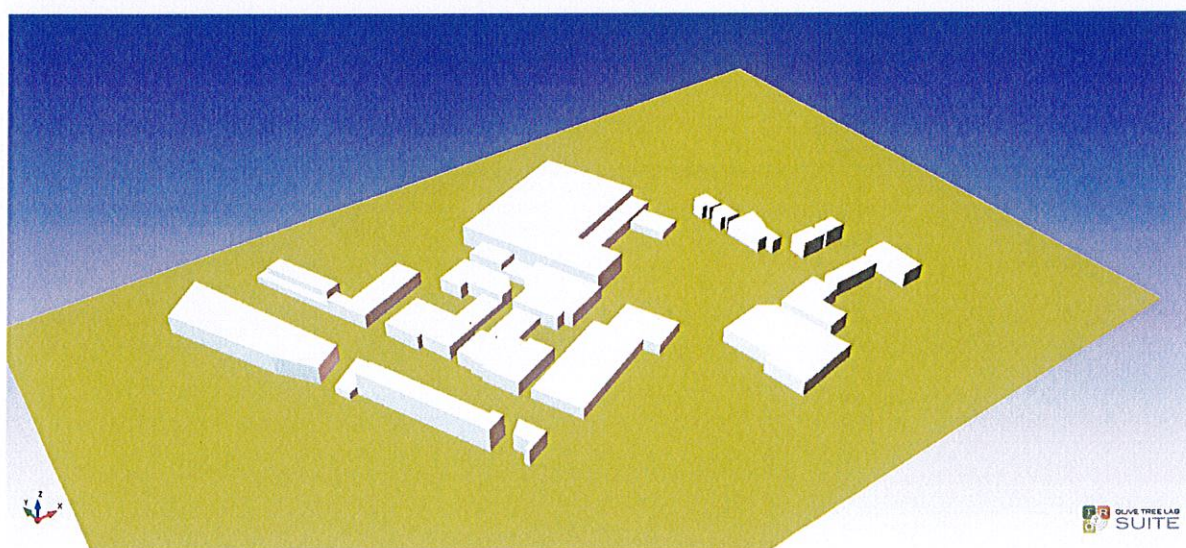
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ANNEX E – Digital geometric acoustics model

E.1 Geometric model configuration



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