

AIGBURTH PEOPLES HALL LIVERPOOL

EVENT NOISE ASSESSMENT AND NOISE MITIGATION STRATEGY

ACOUSTIC REPORT

March 18, 2015

Direct Acoustic Solutions Document Control

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| Document Title | Acoustic Report |
| Project Number | 180315 |
| Document Reference | AIG180315- 001 |
| Status | Final |
| Issued To | Aigburth Peoples Hall |

| | |
|----------|---------------------------------|
| Revision | 1.0 |
| Date | 18 th March 18, 2015 |
| Author | Adam Alfrey |
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1.0 INTRODUCTION

1.1 Direct Acoustic Solutions has been commissioned by Aigburth Peoples Hall to assist in the planning application of a semi permanent marquee situated within the grounds of Aigburth Peoples Hall Social Club, Aigburth Vale, Liverpool, L17 0DJ.

1.2 As part of this application the council have requested :

“Any application would be required to be accompanied by a noise assessment which would be key to the success or otherwise of any application.”

1.3 The purpose of this report is to provide an assessment of the potential noise impact of events held within the proposed marquee on existing nearby residential properties and if necessary provide mitigation measures for the venue to control amplified noise.

1.4 The scope of the report is as follows:

- a) To provide details of a background noise survey at the nearest noise sensitive dwellings.
- b) To provide a noise assessment of the potential noise impact on noise sensitive dwellings
- c) To provide recommendations of appropriate noise mitigation methods to assist the noise mitigation strategy.

1.5 A glossary of terms can be found at the rear of this document in Appendix A.

1.6 Direct Acoustic Solutions Limited (DAS) specialise in assisting entertainment venues obtain licences and planning consent, specifically venues in noise sensitive locations. DAS have worked within over 200 marquee venues since 2007.

Using intelligent speaker design and process limiting software DAS can minimise and control problematic frequencies that traditional speaker systems cannot. DAS manufacture, install, service and manage this equipment. Alongside robust mitigation strategies DAS are able to control volume levels whilst abiding by specific Environmental Health guidelines and law.

2.0 THE SITE AND ENVIRONMENT

- 2.1 Aigburth Peoples Hall is located to the South East of Liverpool City Centre. A long established social club that has provided licensed entertainment for decades. Marquee events have taken place since 2009, predominantly wedding receptions and other functions.
- 2.1.1 A planning application is being prepared for submission to Liverpool City Council. The council have requested additional information around noise control to supplement the application. Direct Acoustic Solutions were appointed to assist in this matter.
- 2.1.2 The marquee purchased by Aigburth Peoples Hall is 12m x 24m on a 2.3m leg. The proposed marquee will be erected in the far northwesterly corner of the grounds (see fig 1. for new location).
- 2.1.3 The dance floor will not move from a fixed position in the northwesterly corner of the marquee. The dance floor is in the furthest position possible from any nearby noise sensitive dwelling.
- 2.1.4 The nearest noise sensitive residents are located on Aigburth Vale, Elmswood Road and Victoria Close.

Fig 1 : Nearest Noise Sensitive dwellings and monitoring locations 1,2 and 3



3.0 THE VENUE AND EVENTS

- 3.1.1 The proposed marquee is a semi permanent structure to be used for weddings, corporate events and other functions within the planned hours of operation of 12:00 to 00:00.
- 3.1.2 The internal layout of the marquee will not change with the dance floor being permanently located furthest away from the nearest noise sensitive dwellings.
- 3.1.3 It is understood that the events will predominantly be weddings.
- 3.1.4 This document is to support a planning application for a semi permanent marquee. It is understood the application is seeking for the marquee to be erected in April and dismantled in October.
- 3.1.5 All events will finish by 00:00 hours.

4.0 ENTERTAINMENT NOISE DESIGN CRITERIA

4.1 Guidance for this type of venue and proposed events may be gathered from various acoustic documents that suggest acceptable internal and external noise levels.

4.2 Noise Council Code of Practice

The established guidance for noise from outdoor music events is contained in the Noise Councils Code of Practice on environment Noise Control at Concerts. The recommended noise limits contained within the Code of Practice for events held between the hours of 09.00 and 23.00 hours are summarised in the Table below

Table 1. Recommended Noise Limits – Noise Council Code of Practice

| Concert days per Calendar year | Venue Category | Guide Line |
|---------------------------------------|------------------------------|---|
| 1 to 3 | Urban Stadia and Arenas | The Music Noise Level should not exceed 75dBA over a 15 minuet period |
| 1 to 3 | Other Urban and Rural Venues | The Music Noise Level should not exceed 65 dBA over a 15 minuet period |
| 4 to 12 | All Venues | The Music Noise Level should not exceed the background noise level by more than 15dBA over a 15 minuet period |

4.3 IOA Good Practice Guide on the Control of Noise from Pubs and Clubs

Table 2 – Good Practice Guide on the Control of Noise in Pubs and Clubs

| Operational scenario | Noise limits |
|---|--|
| 1. Where events take place fewer than 30 times per year and end by 23:00 hours | The LAeq,(15 min) of the Entertainment Noise should not exceed the LA90(15 min) Background Noise Level (in the absence of the Entertainment Noise) by more than 5 dB, when measured 1m from the façade of the closest residential premises to the development. |
| 2. Where events take place more than 30 times per year and end by 23:00 hours | The LAeq,(15 min) of the Entertainment Noise should not exceed the LA90(15 min) Background Noise Level (in the absence of the Entertainment Noise) by more than 5 dB, when measured 1m from the façade of the closest residential premises to the development. In addition, the L10(15 min) from the Entertainment Noise, should not exceed the L90(15 min) Background Noise Level (in the absence of the Entertainment Noise) in the 40, 50, 63, 80 100, 125 and 160 Hz one-third octave bands by more than 5 dB when measured 1m from the façade of the closest residential premises to the development. |
| 3. Where events take place more than 30 times per year and finish after 23:00 hours | LAeq(15 min) from the Entertainment Noise not exceeding the LA90(15 min) Background Noise Level (in the absence of the Entertainment Noise). In addition, the L10(15 min) from the Entertainment Noise, not exceeding the L90(15 min) Background Noise Level in the absence of the Entertainment Noise) in the 40, 50, 63, ,80, 100, 125 and 160 Hz one-third octave bands when measured 1m from the façade of the closest residential premises of the development. |

4.4 BS8233:2014 Sound Insulation and noise reduction for buildings

- 4.4.1 The British Standard BS8233:2014 recommends design criteria for internal noise levels within residential properties. This standard suggests criteria, such as reasonable resting and sleeping conditions and proposes noise limits that will normally satisfy these criteria for most people.

Table 3: Recommended Indoor Ambient Levels for Dwellings – Taken from BS8233:2014

| Activity | Location | 07:00 to 23:00 | 23:00 to 07:00 |
|----------------------------|------------------|--------------------|-------------------|
| Resting | Living Room | 35 dB LAeq, 16hour | - |
| Dining | Dining room/area | 40 dB LAeq, 16hour | - |
| Sleeping (daytime resting) | Bedroom | 35 dB LAeq, 16hour | 30 dB LAeq, 8hour |

- 4.4.2 In respect to bedrooms the standard recommends a level of 35 dB LAeq between the hours of 07:00 to 23:00 and 30 dB LAeq between the hours of 23:00 to 07:00

4.5 Aigburth Peoples Hall entertainment noise design criteria

- 4.5.1 Using the outlined documentation above, within this report we shall be setting a pass criteria of:

4.5.1.1 Between the hours of 23:00 to 07:00 the LAeq(15 min) from the Entertainment Noise shall not exceed the LA90(15 min) Background Noise Level (in the absence of the Entertainment Noise).

4.5.1.2 Indoor ambient noise levels within the bedrooms of: 35dB LAeq between 07:00 to 23:00 and 30dB LAeq between 23:00 to 07:00

5.0 BACKGROUND NOISE SURVEY

- 5.1 An attended background noise survey was undertaken on the 18th March 2015 at the nearest identified noise sensitive properties. The background noise survey commenced at 18:04 and concluded at 00:21. These are the planned hours of operation and this was in accordance to the Noise Council's Code of Practice on Environmental Noise Control at Concerts.
- 5.2 The noise monitoring equipment during the survey comprised of a Bruel & Kjaer 2250 Type 1 integrated sound pressure level meter. The Meter calibrated before and after the survey and no drift in calibration was found.

Table 4: Measurements taken at Aigburth Vale (Position 1)

| Location | Start Time | Elapsed Time | L _{Aeq} | L _A F90.0 | L _{Aeq} Average |
|----------|----------------|--------------|------------------|----------------------|--------------------------|
| Aigburth | 18/03/15 18:09 | 00:05:00 | 60.85 | 49.82 | 59.01 |
| Aigburth | 18/03/15 19:11 | 00:05:00 | 59.42 | 48.17 | |
| Aigburth | 18/03/15 20:03 | 00:05:00 | 57.58 | 47.79 | |
| Aigburth | 18/03/15 21:07 | 00:05:00 | 60.02 | 45.71 | |
| Aigburth | 18/03/15 22:09 | 00:05:00 | 57.21 | 43.54 | |
| Aigburth | 18/03/15 23:09 | 00:05:00 | 59.7 | 40.65 | 57.82 |
| Aigburth | 19/03/15 00:10 | 00:05:00 | 55.95 | 40.57 | |

Table 5: Measurements taken at Elmswood Road (Position 2)

| Location | Start Time | Elapsed Time | L _{Aeq} | L _A F90.0 | L _{Aeq} Average |
|----------|----------------|--------------|------------------|----------------------|--------------------------|
| Elmswood | 18/03/15 18:04 | 00:05:00 | 55.75 | 48.69 | 61.13 |
| Elmswood | 18/03/15 19:06 | 00:05:00 | 62.61 | 52.02 | |
| Elmswood | 18/03/15 19:58 | 00:05:00 | 63.57 | 49.6 | |
| Elmswood | 18/03/15 21:02 | 00:05:00 | 62.85 | 45.91 | |
| Elmswood | 18/03/15 22:03 | 00:05:00 | 60.69 | 43.97 | |
| Elmswood | 18/03/15 23:04 | 00:05:00 | 61.51 | 43.37 | 60.78 |
| Elmswood | 19/03/15 00:05 | 00:05:00 | 60.05 | 40.76 | |

Table 6: Measurements taken at Victoria Close (Position 3)

| Location | Start Time | Elapsed Time | L _{Aeq} | L _A F90.0 | L _{Aeq} Average |
|----------|----------------|--------------|------------------|----------------------|--------------------------|
| Victoria | 18/03/15 18:15 | 00:05:00 | 55.65 | 49.06 | 50.69 |
| Victoria | 18/03/15 19:17 | 00:05:00 | 51.4 | 44.21 | |
| Victoria | 18/03/15 20:08 | 00:05:00 | 50.14 | 41.71 | |
| Victoria | 18/03/15 21:12 | 00:05:00 | 48.8 | 42.45 | |
| Victoria | 18/03/15 22:14 | 00:05:00 | 47.46 | 41.3 | |
| Victoria | 18/03/15 23:14 | 00:05:00 | 48.3 | 39.3 | 53.02 |
| Victoria | 19/03/15 00:15 | 00:05:00 | 57.75 | 37.96 | |

6.0 REQUIRED LEVELS TO MEET NOISE DESIGN CRITERIA

6.1 Below sets out the operational noise limits after comparative analysis of background noise levels recorded and previously detailed noise design criteria.

Table 7: Criteria 1 - Post 23:00 noise limits at the monitoring positions (1m from façade)

| Location | Lowest Recorded LA90 |
|----------------|----------------------|
| Aigburth Vale | 40.57 |
| Elmswood Road | 40.76 |
| Victoria Close | 37.96 |

Table 8: Criteria 2 - Pre 23:00 noise limit in order to meet recommended internal bedroom level of 35dB LAeq

| Location | Window open in typical manner attenuation (-13dB) | Pass level required 1m from façade LAeq |
|----------------|---|---|
| Aigburth Vale | -13 | 48 |
| Elmswood Road | -13 | 48 |
| Victoria Close | -13 | 48 |

Table 9: Criteria 3 - Post 23:00 noise limit in order to meet recommended internal bedroom level of 30dB LAeq

| Location | Window open in typical manner attenuation (-13dB) | Pass level required 1m from façade LAeq |
|----------------|---|---|
| Aigburth Vale | -13 | 33 |
| Elmswood Road | -13 | 33 |
| Victoria Close | -13 | 33 |

7.0 PROPOSED NOISE MITIGATION MEASURES

7.1 Zone Array Speaker System

- 7.1.1 The Zone Array is a modular speaker system enabling multiples of loudspeakers to be installed on a single plane.
- 7.1.2 Due to the alignment and orientation of the speakers the system becomes highly directional.
- 7.1.3 The Zone Array has been designed and developed to specifically control the lower end of the frequency spectrum. Using an array in this format enables control of the 63Hz to 800Hz bandwidth.
- 7.1.4 Using a Zone Array speaker system it is possible to create “hot zones” of sound within a single space, outside of these zones volume levels decay at a much faster rate than a comparative conventional speaker system.
- 7.1.5 Areas requiring high volume levels i.e. dance-floors can be catered for, surrounding areas such as tables and bars can be individually treated according to the specific requirements and noise sensitivity of each venue or event.

7.2 Process Limiting and Control

- 7.2.1 The Symetrix Solus digital signal processor enables all zones to be processed and limited to the requirements of the client and Environmental Health Office recommendations.
- 7.2.2 This process limiter controls the output power and therefore the volume level of the visiting DJ.
- 7.2.3 Through an open architecture software program Direct Acoustic Solutions have created a frequency specific limiter that has the capacity to control troublesome frequencies dependent on venue specific criteria.
- 7.2.4 The Symetrix Solus can be setup and password protected in conjunction with the relevant authorities to prevent tampering.
- 7.2.5 The Symetrix Solus also contains a digital clock for automatic volume level reduction should that be required to meet conditions on a venue's license.

8.0 NOISE PREDICTIONS

8.1 Noise predictions of music from the marquee have been made at the nearest noise sensitive locations on Aigburth Vale (80m to 110m from the dancefloor - with Aigburth People Hall in line between the properties), Victoria Close (70m from dance floor) and Elmswood Road (120m from dance floor).

8.2 All predictions are based on the intended coverage underneath the Zone Array sound achieving a music noise level of 95 LAeq (t1min) on the dance floor.

8.3 The following assumptions have been made in predicting noise levels at the nearest noise sensitive locations.

8.3.1 A horizontal 48 panel Zone Array speaker system has been installed into the marquee.

8.3.1.1 Distance attenuation of the Zone Array is based on the following displayed in Table 10.

8.3.1.2 Table 10 shows previous measurements taken in a marquee with a Zone Array speaker system in a rural setting. There was an ambient of 34.1dB (LA90) whilst music was not in operation

Table 10: Comparative data previously recorded with Zone Array Speaker System in operation.

| Location | Dancefloor DF | 2m from DF | 5m from DF | 10m from DF | 20m from DF | 50m from DF | 80m from DF |
|--------------------|---------------|------------|------------|-------------|-------------|-------------|-------------|
| LAeqt1min | 95.1 | 77.6 | 73.2 | 68.5 | 56.2 | 37.7 | 35.8 |
| Reduction Achieved | - | -17.5 | -21.9 | -26.6 | -38.9 | -57.4 | -59.3 |

8.3.2 The marquee structure will provide a nominal 3dB attenuation.

8.3.3 The attenuation provided by a window open in a typical manner for ventilation is 13dB as suggested in PPG24 Planning Policy Guidance.

8.3.4 All amplified music within the marquee is run through the Zone Array speaker system and accompanying Symetrix Solus Digital Processor.

Table 11: Predictions incorporating attenuating factors with dancefloor level of 95dB(A)

| Site | Distance (m) | Dancefloor level dB(A) | Zone Array attenuation over distance (m)(dB) | Predicted level 1m from façade (dB) | Façade attenuation (dB) | Predicted bedroom level dB(A) |
|----------------|--------------|------------------------|--|-------------------------------------|-------------------------|-------------------------------|
| Aigburth Vale | 80m | 95 | (80m) / -59.3dB | 35.7 | -13 | 22.7 |
| Elmswood Rd | 120m | 95 | (80m) / -59.3dB | 35.7 | -13 | 22.7 |
| Victoria Close | 70m | 95 | (50m) / -57.4dB | 37.7 | -13 | 24.7 |

NOTE: Where specified distance was not recorded in Table 10 – data from next lower distance is used.

9.0 NOISE ASSESSMENT

Table 12: Criteria 1 – Post 23:00 noise limits at the monitoring positions

| Location | Lowest Recorded LA90 | Predicted level 1m from façade (dB) | Pass/Fail |
|----------------|----------------------|-------------------------------------|-----------|
| Aigburth Vale | 40.57 | 35.7 | Pass |
| Elmswood Road | 40.76 | 35.7 | Pass |
| Victoria Close | 37.96 | 37.7 | Pass |

Table 13: Criteria 2 - Pre 23:00 noise limit in order to meet recommended bedroom level of 35dB LAeq

| Location | Recommended Level in bedroom pre 23:00 | Predicted level in bedroom | Pass/Fail |
|----------------|--|----------------------------|-----------|
| Aigburth Vale | 35 | 22.7 | Pass |
| Elmswood Road | 35 | 22.7 | Pass |
| Victoria Close | 35 | 24.7 | Pass |

Table 14: Criteria 3 - Post 23:00 noise limit in order to meet recommended bedroom level of 30dB LAeq

| Location | Recommended Level in bedroom pre 23:00 | Predicted level in bedroom | Pass/Fail |
|----------------|--|----------------------------|-----------|
| Aigburth Vale | 30 | 22.7 | Pass |
| Elmswood Road | 30 | 22.7 | Pass |
| Victoria Close | 30 | 24.7 | Pass |




10.0 CONCLUSIONS

- 10.1 Direct Acoustic Solutions have been commissioned by Aigburth Peoples Hall to assist in the planning application of a semi permanent marquee situated in the grounds of Aigburth Peoples Hall, Liverpool. This report provides a noise assessment of the proposed marquee events at the venue in terms of potential noise impact of amplified music on nearby residential properties.
- 10.2 Following the assessment set out above Direct Acoustic Solutions would make a series of suggested mitigation strategies in order to make sure the noise design criteria is achieved.
 - 10.2.1 A Zone Array speaker system is utilized in order to provide targeted audio for the dancefloor area.
 - 10.2.2 All amplified sound is run through the Symetrix Solus Process limiting software and no additional amplification equipment is permitted within the marquee.
 - 10.2.3 The sound system will need to be commissioned prior to the first event. A representative from the Environmental Health Department should be invited to witness the process. Following commissioning of the sound system, the noise limiter should be 'locked' to ensure that the noise limit values cannot be exceeded.
 - 10.2.4 It is recommended no live acts and instruments are played in the marquee after 21:00
- 10.3 Following the recommended mitigation measures is our opinion that the noise design criteria would be achievable.

APPENDIX A – GLOSSARY OF ACOUSTIC TERMINOLOGY

| | |
|---------------------------------------|--|
| Sound Pressure | Sound, or sound pressure, is a fluctuation in air pressure over the static ambient pressure. |
| Sound Pressure Level (Sound Level) | The sound level is the sound pressure relative to a standard reference pressure of 20mPa (20x10 ⁻⁶ Pascals) on a decibel scale. |
| Decibel (dB) | A scale for comparing the ratios of two quantities, including sound pressure and sound power. The difference in level between two sounds s1 and s2 is given by $20 \log_{10} (s1 / s2)$. The decibel can also be used to measure absolute quantities by specifying a reference value that fixes one point on the scale. For sound pressure, the reference value is 20mPa. |
| A-weighting, dB(A) | The unit of sound level, weighted according to the A-scale, which takes into account the increased sensitivity of the human ear at some frequencies. |
| Noise Level Indices | Noise levels usually fluctuate over time, so it is often necessary to consider an average or statistical noise level. This can be done in several ways, so a number of different noise indices have been defined, according to how the averaging or statistics are carried out. |
| Leq,T | A noise level index called the equivalent continuous noise level over the time period T. This is the level of a notional steady sound that would contain the same amount of sound energy as the actual, possibly fluctuating, sound that was recorded. |
| Fast Time Weighting | Weighting An averaging time used in sound level meters. Defined in BS 5969. |
| Music Noise Level (MNL) | The LAeq of the music noise measured at a particular location. |

APPENDIX B - CERTIFICATION

| | | | |
|--|---|---|---|
| Brüel & Kjær  | |  |  |
| The Calibration Laboratory Skodsborgvej 307, DK-2850 Nærum, Denmark | | | |
| CERTIFICATE OF CALIBRATION | | No: CDK1308136 | Page 1 of 4 |
| CALIBRATION OF | | | |
| Calibrator: | Brüel & Kjær Type 4231 | No: 3008150 | Id: - |
| 1/2 Inch adaptor: | Brüel & Kjær Type UC-0210 | | |
| Pattern Approval: | PTB-1.61-4057176 | | |
| CUSTOMER | | | |
| Direct Acoustic Solutions Ltd Unit 4 Crawfold Business Park GU28 9JT Balls Cross West Sussex, United Kingdom | | | |
| CALIBRATION CONDITIONS | | | |
| Preconditioning: | 4 hours at 23°C ± 3°C | | |
| Environment conditions: | Pressure: 101.7 kPa. Humidity: 40 % RH. Temperature: 23 °C. | | |
| SPECIFICATIONS | | | |
| The Calibrator Brüel & Kjær Type 4231 has been calibrated in accordance with the requirements as specified in IEC60942:2003 Annex B Class 1. The accreditation assures the traceability to the international units system SI. | | | |
| PROCEDURE | | | |
| The measurements have been performed with the assistance of Brüel & Kjær acoustic calibrator calibration application software Type 7794 (version 2.4) by using procedure P_4231_D04. | | | |
| RESULTS | | | |
| Calibration Mode: Calibration as received. | | | |
| The reported expanded uncertainty is based on the standard uncertainty multiplied by a coverage factor $k = 2$ providing a level of confidence of approximately 95 %. The uncertainty evaluation has been carried out in accordance with EA-4/02 from elements originating from the standards, calibration method, effect of environmental conditions and any short time contribution from the device under calibration. | | | |
| Date of calibration: 2013-10-14 | | Date of issue: 2013-10-14 | |
|  Ole Hougard Bager Calibration Technician | |  Erik Bruus Approved Signatory | |
| Reproduction of the complete certificate is allowed. Parts of the certificate may only be reproduced after written permission. | | | |

Brüel & Kjær

The Calibration Laboratory
Skodsborgvej 307, DK-2850 Nærum, Denmark



DANAK
CAL. Reg. nr. 307

CERTIFICATE OF CALIBRATION

No: CDK1308137

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CALIBRATION OF

| | | | |
|----------------------|------------------------------|-------------------|---------|
| Sound Level Meter: | Brüel & Kjær Type 2250 Light | No: 3002639 | Id: - |
| Microphone: | Brüel & Kjær Type 4950 | No: 2880083 | |
| Preamplifier: | Brüel & Kjær Type ZC-0032 | No: 19747 | |
| Supplied Calibrator: | Brüel & Kjær Type 4231 | No: 3008150 | |
| Software version: | BZ7130 Version 4.1.6 | Pattern Approval: | PENDING |
| Instruction manual: | BE1853-11 | | |

CUSTOMER

Direct Acoustic Solutions Ltd
Unit 4
Crawford Business Park
GU28 9JT Balls Cross
West Sussex, United Kingdom

CALIBRATION CONDITIONS

Preconditioning: 4 hours at $23^{\circ}\text{C} \pm 3^{\circ}\text{C}$
Environment conditions: See actual values in *Environmental conditions* sections.

SPECIFICATIONS

The Sound Level Meter Brüel & Kjær Type 2250 Light has been calibrated in accordance with the requirements as specified in IEC61672-1:2002 class 1. Procedures from IEC 61672-3:2006 were used to perform the periodic tests. The accreditation assures the traceability to the international units system SI.

PROCEDURE

The measurements have been performed with the assistance of Brüel & Kjær Sound Level Meter Calibration System 3630 with application software type 7763 (version 4.9 - DB: 4.90) by using procedure 2250-L-4950.

RESULTS

Calibration Mode: **Calibration as received.**

The reported expanded uncertainty is based on the standard uncertainty multiplied by a coverage factor $k = 2$ providing a level of confidence of approximately 95 %. The uncertainty evaluation has been carried out in accordance with EA-4/02 from elements originating from the standards, calibration method, effect of environmental conditions and any short time contribution from the device under calibration.

Date of calibration: 2013-10-14

Date of issue: 2013-10-14

Steen Vodstrup Andersen
Calibration Technician

Erik Bruus
Approved Signatory

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