ISVR Consulting
Consultants in Noise and Vibration

# Consultancy Report
# Ref: 10717-R01

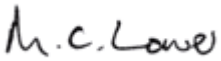
Submitted to:

Sarah Jones
TÜV SÜD
Octagon House
Concorde Way
Segensworth North
Fareham
Hampshire
PO15 5RL

Prepared by:

John Fithyan
*Laboratory Manager*

Approved for issue by:



M C Lower
*Principal Consultant*

## Acoustic noise and signals test of an Ocean Signal ATA100

August 2019

10717-R01

ISVR Consulting, University of Southampton
Highfield Campus, Southampton SO17 1BJ, United Kingdom
Tel: +44 (0)23 8059 2162 Fax: +44 (0)23 8059 2728
Email: consultancy@isvr.co.uk Web: www.isvr.co.uk

UNIVERSITY OF Southampton

## Contents

# 1. Introduction

ISVR Consulting were engaged by TÜV SÜD to carry out airborne noise measurements on an ocean Signal ATA100. The testing was conducted on the 30th August 2019 in EMC chamber number 2 at TÜV SÜD, Fareham.

During the acoustic measurements the Ocean Signal ATA100 was powered up and running. The purpose of the test was to determine the noise level of the Ocean Signal ATA100 when it was running under worst case conditions. The test standard also covers the noise levels of warning alarms. The Ocean Signal ATA100 was able to produce alert sounds but it wasn't clear if these were intended as alarms or not. However, for completeness the sound pressure level of the alert sounds was measured in accordance with the standard.

The acoustic measurements were made in accordance with BS EN 60945:2002.

This report describes the measurement method and presents the measured airborne noise levels.

## 2. Aim of the Test

The aim of the test was to determine whether the Ocean Signal ATA100 would meet the specification as described in BS EN 60945:2002 Maritime navigation and radio communication equipment and systems. General requirements. Methods of testing and required test results, Clause 11.1 'Acoustic noise and signals'.

The specification calls for measurements to be made of the 'acoustic noise' and 'acoustic pressure'. Our understanding of current standards on noise measurements is that the measured levels should be in terms of the Equivalent Continuous Sound Pressure Level, or $L_{Aeq,}$ at the monitoring position. The $L_{Aeq}$ is an average of the A-weighted sound pressure levels over the whole of the test period.

BS EN 60945:2002 Clause 11.1 'Acoustic noise and signals' requires two tests to be carried out. The first test measures the acoustic noise generated by the unit when any audible alarms are not operating. The acoustic noise detected should not exceed a level of 60 dB(A) at a distance of 1 m from any part of the unit.

The second test calls for a measurement of the acoustic noise generated by any alarms associated with the unit. As the Ocean Signal ATA100 only had alerts, the sound pressure level of those alerts was measured. The standard specifies that the acoustic noise pressure of an alarm should be at least 75 dB(A) but not greater than 85 dB(A) at a distance of 1 m from any part of the unit.

## 3. Methodology

### Noise level of the Ocean Signal ATA100

The Ocean Signal ATA100 was tested on the premises of TÜV SÜD on the 30th August 2019 in their EMC chamber number 2. The test room has a sufficiently low background noise level to allow the acoustic tests to be carried out.

The room is approximately 6 m × 3.4 m × 3 m high.

The Ocean Signal ATA100 was approximately 210 mm × 195 mm × 30 mm.

For the purposes of the noise measurements the Ocean Signal ATA100 was sat on a trolley which was approximately 810 mm × 600 mm × 800 mm high.

The Ocean Signal ATA100 was approximately 1550 mm from the chamber's anechoic wedges on the right hand side and approximately 1550 mm from the chambers anechoic wedges on the left hand side. It was approximately 3300 mm from the anechoic wedges on the front chamber wall (the wall containing the chamber door) and approximately 2900 mm from the back chamber wall.

Figures 1 and 2 show photos of the Ocean Signal ATA100 inside of the test chamber.

The test standard specifies that the noise level should not exceed 60 dB(A) at a distance of 1 m from any part of the Ocean Signal ATA100, therefore measurements were made at 1 m distance from the Ocean Signal ATA100. The microphone was placed at a height equivalent to the centre of the Ocean Signal ATA100 and at a distance of 1 m.

The Ocean Signal ATA100 was turned on and set up to run in a normal operating state. Measurements were carried out in the test room at five positions around it.

The monitoring positions were:

Position 1 – 1 m directly in front of the unit
Position 2 – 1 m from the right-hand side of the unit, as viewed from the front
Position 3 – 1 m from the bottom of the unit, as viewed from the front
Position 4 – 1 m from the left hand side of the unit, as viewed from the front
Position 5 – 1 m directly above the unit.

In addition to the measurement of the sound pressure level of the Ocean Signal ATA100, further measurements were made of the sound pressure level of the alert sounds produced by the Ocean Signal ATA100. The standard specifies that the acoustic noise pressure of an alarm should be at least 75 dB(A) but not greater than 85 dB(A) at a distance of 1 m from any part of the unit. A man overboard alert was manually triggered on the Ocean Signal ATA100 and the sound pressure level of the alert sound was measured at 1 m away. This process was repeated six times for comparison.

Background noise measurements, with the unit turned off, were also carried out. The microphone positions used were the same as for the measurements whilst the unit was turned on.

The measurements were made using a Brüel and Kjær (B&K) Sound Level Meter, type 2250, serial number 2611548. The sound level meter was calibrated before the tests began with a B&K Sound Level Calibrator, type 4231 serial number 2651921, and this calibration was checked at the end of the tests. There was no change in the calibration levels. This calibration is traceable to DANAK National Standards which is the Danish equivalent of UKAS. DANAK National Standards are used by Brüel & Kjær, the Danish company that manufacture the sound level meters and calibrator that was used here. (Calibrations from UKAS, DANAK and other accredited bodies are equally valid throughout the EU and accepted in all member states.)

## 4. Results

The results of the measurements on the Ocean Signal ATA100 are given in Table 1.

The equivalent continuous sound pressure level ($L_{Aeq}$) is given for each measurement. The measurement period was 30 seconds.

The results of the measurements on the Ocean Signal ATA100 alerts are given in Table 2. The equivalent continuous sound pressure level ($L_{Aeq}$) is given for each measurement. The measurement period was the time that the alert was sounding, roughly 10 seconds.

| **Ocean Signal ATA100 operating normally** | |
|---|---|
| | Equivalent continuous sound pressure level ($L_{Aeq}$), dB(A) re 20 μPa |
| Front | 23.4 |
| Right hand side | 23.1 |
| Back | 22.5 |
| Left hand side | 23.8 |
| Above / Top | 24.0 |

**Table 1: Measured Sound Pressure Levels at 1 m from the Ocean Signal ATA100**

*NB: The background noise levels were measured in the test chamber. They ranged from 21.1 dB(A) to 23.9 dB(A)*

| Ocean Signal ATA100 with man overboard alert sounding | |
|---|---|
| | Equivalent continuous sound pressure level ($L_{Aeq}$), dB(A) re 20 μPa |
| Measurement 1 | 77.6 |
| Measurement 2 | 78.4 |
| Measurement 3 | 78.8 |
| Measurement 4 | 78.2 |
| Measurement 5 | 77.9 |
| Measurement 6 | 78.5 |

**Table 2: Measured Sound Pressure Levels of the alert sound of the Ocean Signal ATA100**

## 5. Conclusions

### Ocean Signal ATA100 noise levels

With the Ocean Signal ATA100 turned on and operating, the highest measured value in any direction was 24.0 dB(A).

The Ocean Signal ATA100 met the requirement that the acoustic noise detected should not exceed a level of 60 dB(A) at a distance of 1 m from any part of the unit.

With the Ocean Signal ATA100 alert sounding the measured sound pressure levels ranged from 77.6 dB(A) to 78.8 dB(A).

The Ocean Signal ATA100 alert sounds met the requirement that the acoustic noise detected should be at least 75 dB(A) but not greater than 85 dB(A) at a distance of 1 m from any part of the unit.

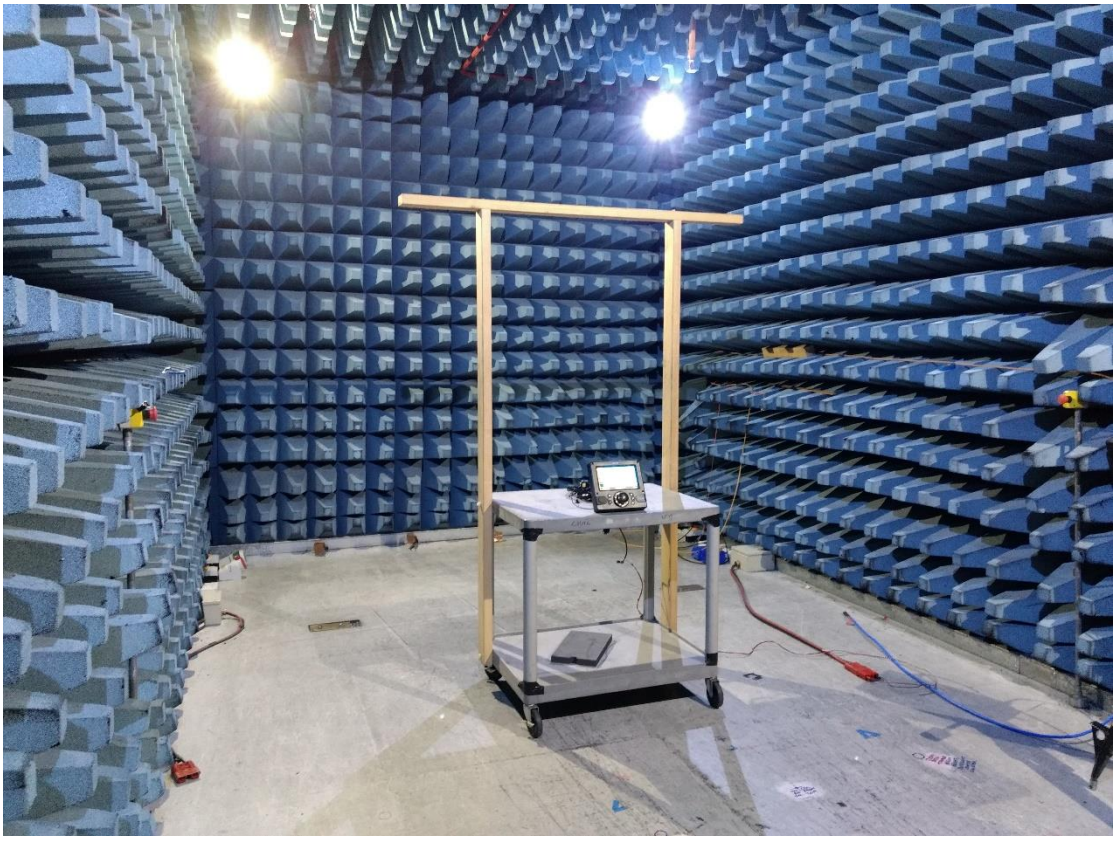


**Figure 1 – The Ocean Signal ATA100 inside of the test chamber**

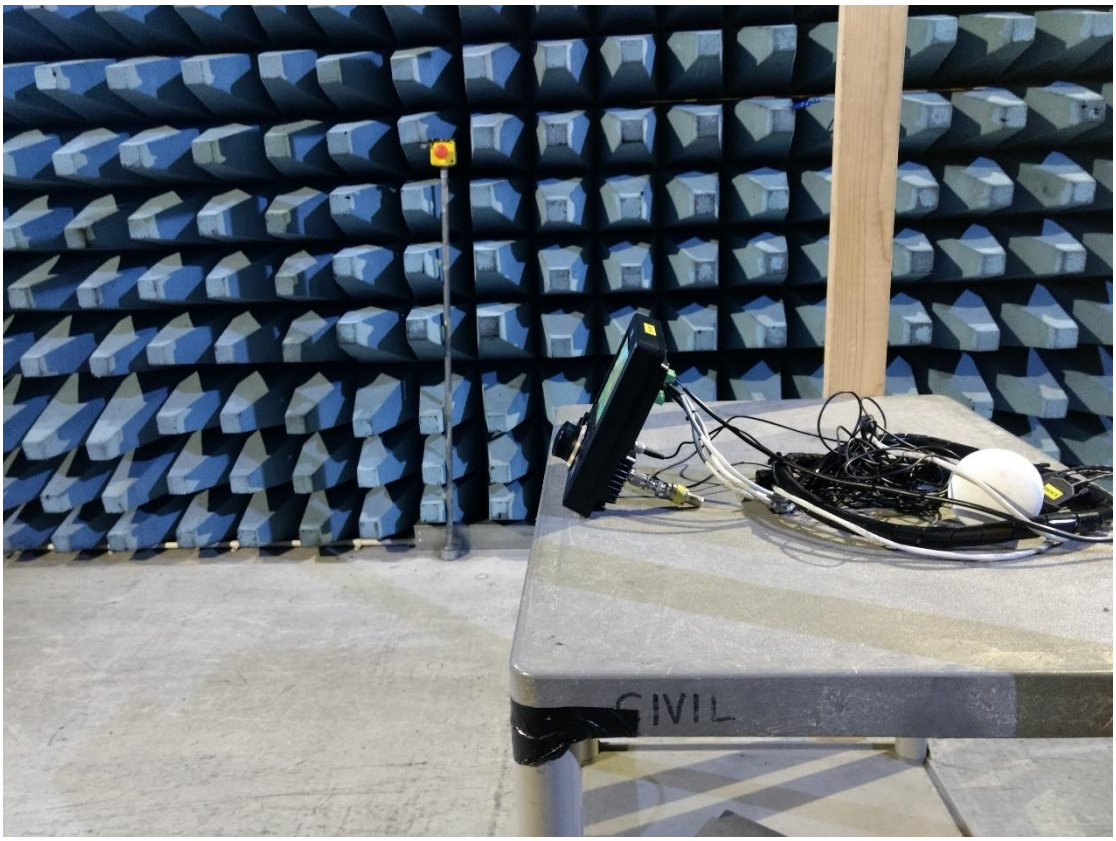



**Figure 2 – Side view of the Ocean Signal ATA100 inside of the test chamber**

## Appendix 1: Instrumentation and Calibration

The following pages show the calibration certificates for the sound level meter that was used as well as the acoustic calibrator.

ISVR Consulting also hold the following transfer standard equipment:

***Microphones and Calibrators***

ISVR Consulting hold two transfer standard Microphones, type 4145, serial numbers 375091 and 375617. The most recent calibration was carried out by CMR Ltd. This is fully documented in Certificates 186356 and 186357, dated 14th March 2019. A transfer standard Pistonphone, type 4220, serial number 1297434 and a transfer standard calibrator, type 4231, serial number 2162524 are also held. These were calibrated by CMR Ltd and are documented in certificate numbers 186353 and 186355, dated 8th March 2019.

***Additional Instrumentation***

A Digital Voltmeter (Fluke type 8050A) and a Frequency Counter (Marconi type 2430A) are used with these Transfer Standards to calibrate the above equipment. Both instruments were calibrated by Southern Calibration Laboratories and carry certificates numbered 19030504 and 19030503 respectively and are dated 13th and 14th March 2019.

The instrumentation complies with the requirements for a type 1 instrument, as specified in BS EN 61672:2003, BS EN 60942:2003 and BS EN IEC 61260:1996. The Standards are traceable to the National Physical Laboratory, Teddington, England.

Brüel & Kjær

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

DANAK
CAL Reg.No. 307
Member of EA MLA

# CERTIFICATE OF CALIBRATION

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## CALIBRATION OF

| | | |
|---|---|---|
| Sound Level Meter: | Brüel & Kjær Type 2250 | No: 2611548 Id: - |
| Microphone: | Brüel & Kjær Type 4189 | No: 2607791 |
| Preamplifier: | Brüel & Kjær Type ZC-0032 | No: 7402 |
| Supplied Calibrator: | Brüel & Kjær Type 4231 | No: 2651921 |
| Software version: | BZ7223 Version 4.6.2 | Pattern Approval: - |
| Instruction manual: | BE1712-22 | |

## CUSTOMER

University of Southampton
ISVR, Building 15
University Road, Highfield
SO17 1BJ Southampton
Hampshire, United Kingdom

## CALIBRATION CONDITIONS

Preconditioning: 4 hours at 23°C ± 3°C

Environment conditions: *See actual values in **Environmental conditions** sections.*

## SPECIFICATIONS

The Sound Level Meter Brüel & Kjær Type 2250 has been calibrated in accordance with the requirements as specified in IEC 61672-1:2013 class 1. Procedures from IEC 61672-3:2013 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 8.0 - DB: 8.00) by using procedure B&K proc 2250, 4189 (IEC 61672:2013).

## 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: 2019-05-20

Date of issue: 2019-05-20

Jonas Johannessen
Calibration Technician

Erik Bruus
Approved Signatory

Brüel & Kjær

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

DANAK
CAL Reg.No. 307
Member of EA MLA

# CERTIFICATE OF CALIBRATION

No: CDK1903753



## CALIBRATION OF

| | | |
|---|---|---|
| Calibrator: | Brüel & Kjær Type 4231 | No: 2651921 Id: - |
| ½ Inch adaptor: | Brüel & Kjær Type UC-0210 | |
| Pattern Approval: | PTB-1.61-4057176 | |

## CUSTOMER

University of Southampton
ISVR, Building 15
University Road, Highfield
SO17 1BJ Southampton
Hampshire, United Kingdom

## CALIBRATION CONDITIONS

| | |
|---|---|
| Preconditioning: | 4 hours at 23°C ± 3°C |
| Environment conditions: | Pressure: 102.13 kPa. Humidity: 43 % RH. Temperature: 23.1 °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 2.5) by using procedure P_4231_D07.

## 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: 2019-05-16

Date of issue: 2019-05-16

Lene Petersen
Calibration Technician

Nicki Eriksen
Approved Signatory