FORCE Technology Test Report

TEST Reg. no. 19

EMC emission test of
Echo audible military altimeter for skydivers

Performed for Larsen & Brusgaard ApS

Project no.: 119-28984-3

7 August 2019

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Title	EMC emission test of Echo audible military altimeter for skydivers
Test object	Echo audible military altimeter
Project no.	119-28984-3
Test period	15 July 2019
Client	Larsen & Brusgaard ApS Ledreborg Alle 28 4000 Roskilde Denmark Tel.: +45 3064 0077
Contact person	Jacob Nielsen E-mail: jacob@lbaltimeters.com
Manufacturer	Larsen & Brusgaard ApS
Specifications	FCC Part 15, Subpart B, Class A
Results	The test object was found to be in compliance with the specifications
Test personnel	Johan Weisbjerg
Test site	FORCE Technology, Agro Food Park 13, 8200 Aarhus N, Denmark

Date 7 August 2019

Project Manager

Johan Weisbjerg
Specialist EMC
FORCE Technology

Responsible

Karsten Kruse Jensen
Head of Department
FORCE Technology

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1. Summary of tests

Tests	Test methods	Results
Measurement of radio frequency voltage on mains	ANSI C63.4:2014	Not relevant, see note 1
Measurement of radio frequency electromagnetic field	ANSI C63.4:2014	Passed

Note 1: The test object contains no AC mains port.

The given result is based on a shared risk principle with respect to the measurement uncertainty.

Conclusion

The test object mentioned in this report meets the requirements of the standard stated below, with respect to the tests listed above.

- FCC Part 15, Subpart B, Class A

The test results relate only to the object tested.

2. Test object and auxiliary equipment

2.1 Test object

Photo 2.1.1 Test object.

Test object 2.1.1

Name of test object	Echo
Model / type	Audible military altimeter
Part no.	275727
Serial no.	EMC01
FCC ID	-
Manufacturer	Larsen & Brusgaard ApS
Supply voltage	2 x CR 2325 lithium 3 V renata
Software version	1.01
Hardware version	Ares 1-1-3
Cycle time	< 1 sec.
Highest frequency generated or used	7.3728 MHz
Received	Date: 12 July 2019. Status: Test object sampled and provided by customer.

3. General test conditions

3.1 Test set-up during test

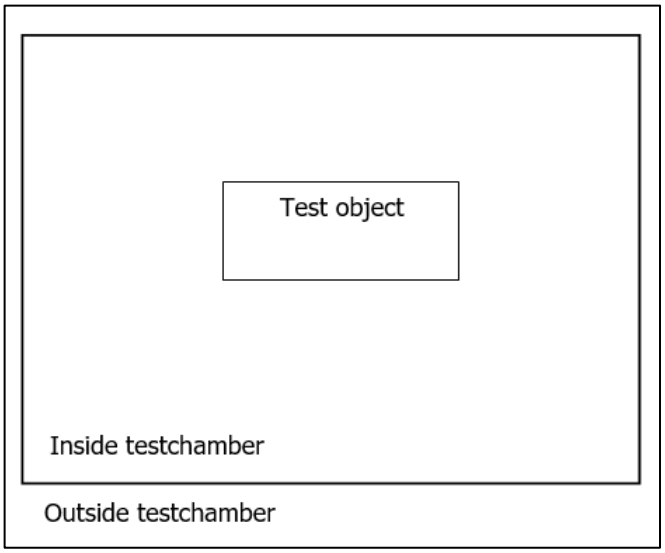


Figure 3.1.1 Block diagram of test object with cables and auxiliary equipment.

3.1.1 Description of test set-up

The test object is placed inside the EMC chamber and is turned on.

3.1.2 Description and intended use of test object

The test object is a waterproof altimeter for skydivers built in an aluminium case and it specifies an operating altitude up to 12.2 km. The altimeter is configurable and includes IrDA communication.
Display reading can be selected to feet, meters, KPH and MPH.

3.1.3 Test modes during emission tests

Unit powered on.

3.1.4 Nominal power consumption

Max. 2 mA (6 mW @ 3 VDC).

3.2 Test sequence

The tests described in this test report were performed in the following sequence:

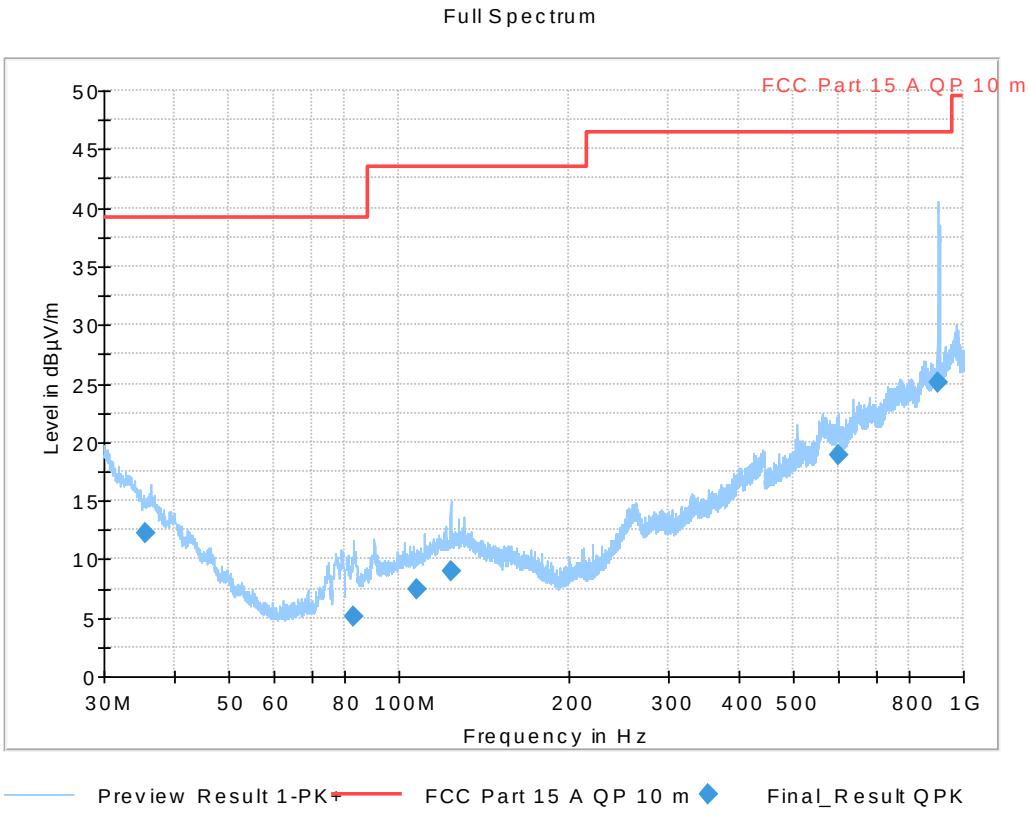
1. Measurement of radio frequency electromagnetic field

4. Test results

4.1 Measurement of radio frequency electromagnetic field

Test object	Echo	Sheet	RE-1
Type	Audible military altimeter	Project no.	119-28984-3
Serial no.	EMC01	Date	15 July 2019
Client	Larsen & Brusgaard ApS	Initials	JOW
Specification	FCC Part 15, Subpart B, Class A	Frequency	30-1000 MHz

Test method Characteristics	ANSI C63.4:2014 Complete search, antenna distance 10 m	Temperature Humidity	24 °C 43 % RH
Detector	Peak and quasi peak	Bandwidth	120 kHz
Test equipm.	Room 1 Aarhus Set-up AEC1	Uncertainty	5.5 dB



Comments None

Test object	Echo	Sheet	RE-2
Type	Audible military altimeter	Project no.	119-28984-3
Serial no.	EMC01	Date	15 July 2019
Client	Larsen & Brusgaard ApS	Initials	JOW
Specification	FCC Part 15, Subpart B, Class A	Frequency	30-1000 MHz

Test method Characteristics	ANSI C63.4:2014 Complete search, antenna distance 10 m	Temperature Humidity	24 °C 43 % RH
Detector	Quasi peak	Bandwidth	120 kHz
Test equipm.	Room 1 Aarhus Set-up AEC1	Uncertainty	5.5 dB

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
35.64	12.15	39.10	26.95	15000	120	100.0	H	-132	-2.8
83.22	5.08	39.10	34.02	15000	120	100.0	V	-66	-10.0
107.61	7.50	43.50	36.00	15000	120	100.0	V	110	-6.9
123.36	8.93	43.50	34.57	15000	120	100.0	V	22	-5.6
599.22	18.82	46.40	27.58	15000	120	100.0	H	0	6.5
900.27	25.01	46.40	21.39	15000	120	100.0	H	-22	11.8

Test result The measured field strengths were below the limit

Compliant Yes

Comments Final maximal measurements by variation of turntable azimuth, antenna height, and antenna polarisation.

Photo 4.1.1 Test set-up regarding measurement of radio frequency electromagnetic field.

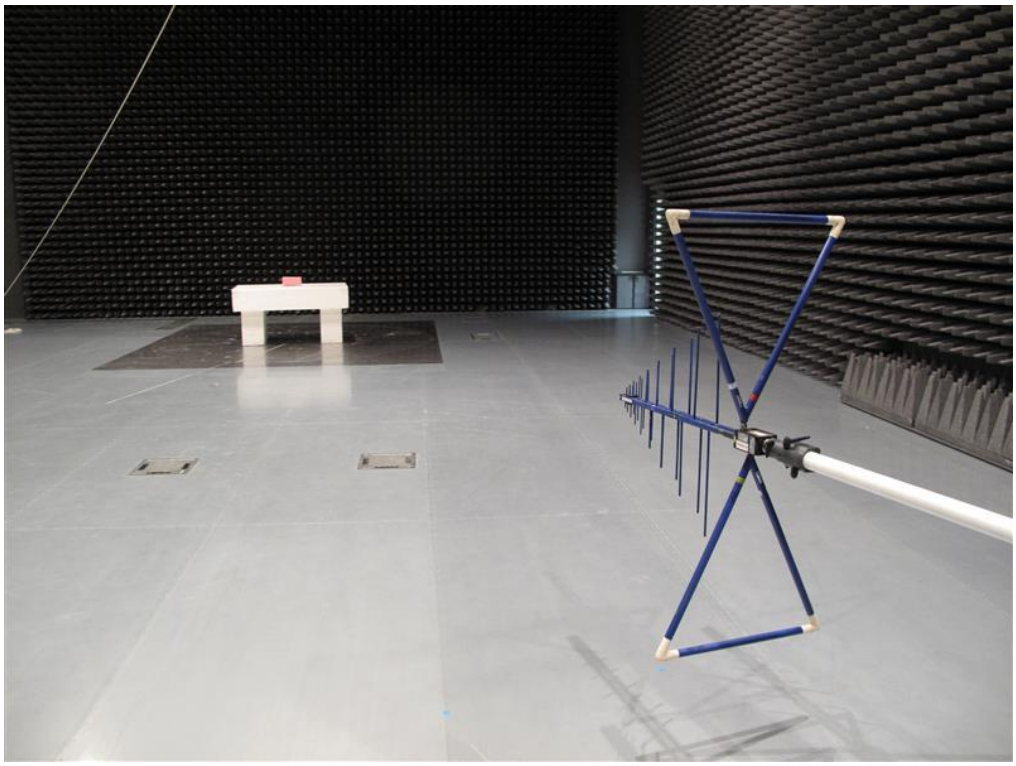


Photo 4.1.2 Test set-up regarding measurement of radio frequency electromagnetic field.

5. National registrations and accreditations

5.1 DANAK Accreditation

Organization: Danish Accreditation and Metrology Fund - DANAK, see www.danak.dk and www.ilac.org

Registration Number: 19

Area Number: K

DANAK is part of ILAC (International Laboratory Accreditation Cooperation) including its MRA (Mutual Recognition Arrangement). The MRA includes the Australian NATA and Canadian SCC.

5.2 FCC Registrations

Organization: Federal Communications Commission, USA

Registration Number: 913950

Facilities: EMI Room 1 Aarhus
EMC Room 4 Aarhus

5.3 Kraftfahrt-Bundesamt (KBA)

Registration no.: KBA-P 00078-18

Date of designation: 2018-02-06

The KBA has designated FORCE Technology to Technical Service for Germany according to the regulatory acts for ESA and vehicles according to:

- 72/245/EEC * 2006/28/EC
- 97/24EC Chapter 8
- 2009/64/EC
- Regulation (EU) 44/2014 * Regulation (EU) 2016/1824 (Annex VII)
- Regulation (EU) 2015/208 * Regulation (EU) 2016/1788 (Annex XV, Part 3-5)
- Regulation (EU) 2015/208 * Regulation (EU) 2016/1788 (Annex XV, Part 6-8)
- Regulation (EC) 661/2009 with regard to UN-R 10 * UN-R 10.05
- UN-Regulation No. 10 series 05

5.4 Swedish Transport Agency (STA)

Registration no.: TT 0010

Date of designation: 2014-09-23 expiry data 2020-08-28

The STA has designated FORCE Technology to Technical Service for Sweden according to the regulatory acts for ESA and vehicles according to:

- 72/245/EEC
- 2009/64/EC
- 97/24EC Chapter 8
- UN-Regulation No. 10 series 05

6. List of instruments

Set-up AEC1					
Measurement of radio frequency electromagnetic field 30-1000 MHz					
No	**Category/Action**	**Manufacturer**	**Type no**	**Cal. date**	**Cal. exp.**
237	Antenna	Chase	CBL6111A	05-04-2018	05-04-2020
826	Pre-amplifier	Mini-Circuits	ZX60-4016E-S+	24-07-2019	24-07-2020
667	RF Relay switch unit	DELTA (MRV)	RF Relay board LISN vs. 25-1000MHz	22-07-2019	22-07-2020
668	Juction box	DELTA (MRV)	Junction box for ESU (user port)	N/A	N/A
669	Relay switch for antennas	DELTA (MRV)	Relay switch for antennas	N/A	N/A
742	Measurement receiver	ROHDE & SCHWARZ	ESW26	05-01-2019	05-01-2020
K169	Cable	Huber+ Suhner	Sucoflex 104 15,5m	02-08-2019	02-08-2020
K179	Cable	Huber+ Suhner	Sucoflex 104 5m	22-07-2019	22-07-2020
K200	Cable	Huber+ Suhner	Sucoflex 104B 8m	25-07-2019	25-07-2020
K214	Cable	Huber+ Suhner	Sucoflex 404A 0,3m	22-07-2019	22-07-2020