

Report on the EMC Testing

For

QinetiQ Limited

On

Bracer PTT Handset and Associated Ancillaries

Report No. TRA-037400-36-03D

4th January 2019

RF088 16.0

Report Number: TRA-037400-36-03D
Copy Number: PDF

**REPORT ON THE EMC TESTING OF A
QINETIQ LIMITED
BRACER PTT HANDSET AND ASSOCIATED ANCILLARIES
WITH RESPECT TO SPECIFICATION
FCC RULES CFR 47: 1st October 2017 PART 15.107 AND 15.109 CLASS B**

TEST DATES: 14th – 29th May 2018

Written by: Shami Mashari
EMC Test Engineer

Approved by: Neil Roche
Department Manager – EMC

Date: 4th January 2019

Distribution:

Copy 1: Element Materials Technology

Copy 2: QinetiQ Limited

Copy 3: Not Applicable

Disclaimers:

[1] THIS DOCUMENT MAY BE REPRODUCED ONLY IN ITS ENTIRETY AND WITHOUT CHANGE
[2] THE RESULTS CONTAINED IN THIS DOCUMENT RELATE ONLY TO THE ITEM(S) TESTED

1 Revision Record

<i>Issue Number</i>	<i>Issue Date</i>	<i>Revision History</i>
A	27 th June 2018	Original
B	20 th September 2018	Build Level / Revision Number change from prototype to pre-production in section 6.1.
C	30 th November 2018	EUT FCC ID added to Sections 2 & 6. Integral FCC listed radio module FCC ID added to Sections 4 & 14.
D	4 th January 2019	Client contact details changes and ICES statement added to Section 4, introduction.

2 Summary

TEST REPORT NUMBER:	TRA-037400-36-03D
PURPOSE OF TEST:	Electromagnetic Compatibility – Emissions
TEST SPECIFICATION:	FCC Rules CFR 47: 1st October 2017 Part 15.107 and 15.109 Class B
DEVIATIONS FROM SPECIFICATION:	Not Applicable (refer to individual sections)
EQUIPMENT UNDER TEST (EUT):	Bracer PTT Handset and Associated Ancillaries
EUT SERIAL NUMBER:	PPTEST018
EUT FCC ID :	2ARQW10073537
EUT CATEGORY:	Radio Equipment and Services, Mobile Earth Stations (MES) used in the Mobile Satellite Services (MSS)
TEST RESULT:	Measured As Compliant Given any modifications stated in the relevant section of this report.
MANUFACTURER/AGENT:	QinetiQ Limited
ADDRESS:	Malvern Technology Centre St Andrews Road Malvern, Worcestershire, WR14 3PS
CLIENT CONTACT:	Richard Smith ☎ 01684 894883 ✉ rsmith6@QinetiQ.com
ORDER NUMBER:	3000291470
TEST DATES:	14 th – 29 th May 2018
TESTED BY:	S. Mashari & A. Santoriello Element Materials Technology

3 Contents

1	Revision Record.....	3
2	Summary.....	4
3	Contents.....	5
4	Introduction	6
5	Normative References	7
6	Equipment Under Test	8
6.1	EUT Identification.....	8
6.2	EUT Selection, Configuration & Loading.....	8
6.3	System Equipment	8
6.3.1	Components of the EUT.....	8
6.3.2	Support Equipment	8
6.4	EUT Mode of Operation	9
6.4.1	Final Testing.....	9
6.5	EUT Description.....	9
7	Block Diagram.....	10
8	Test Standard Selection.....	11
8.1	Product Standard	11
8.2	Basic Test Standard Selection	11
9	Radiated Emissions as per ANSI C63.4:2014.....	12
9.1	General	12
9.2	Radiated Emission Test Parameters.....	12
9.3	EUT Test Results	13
9.3.1	Radiated Emissions Test Data – 30 MHz to 1 GHz.....	13
9.3.2	Radiated Emissions Test Data – 1 GHz to 8 GHz.....	15
10	Sample Calculation	17
11	Conducted Emissions as per ANSI C63.4:2014.....	18
11.1	General	18
11.2	Conducted Emission Test Parameters.....	18
11.3	EUT Test Results	19
11.3.1	Conducted Emissions Test Data – Live and Neutral Line	19
12	Test Equipment List – Element Malvern.....	21
13	EMC Modifications	23
14	Conclusion	24
14.1	Conformity in Production.....	24
15	Measurement Uncertainty.....	25
16	Appendix A – Photographs	26

4 Introduction

This report TRA-037400-36-03D presents the results of the EMC testing on a QinetiQ Limited, Bracer PTT Handset and Associated Ancillaries to specification FCC Rules CFR 47: 1st October 2017 Part 15.107 and 15.109 Class B.

The testing was carried out for QinetiQ Limited by Element Materials Technology, an independent accredited testing laboratory, at their EMC test facility located at:

- | | |
|--|--|
| <input checked="" type="checkbox"/> 100 Frobisher Business Park
Leigh Sinton Road
Malvern
Worcestershire
WR14 1BX
UK
FCC Site Registration Number: 452983 | <input type="checkbox"/> Unit 1
Pendle Place
Skelmersdale
West Lancashire
WN8 9PN
UK
FCC Site Registration Number: 444512 |
| <input type="checkbox"/> 74-78 Condor Close
Woolsbridge Industrial Park
Three Legged Cross
Wimborne
Dorset
BH21 6SU
UK
FCC Site Registration Number: 430273 | <input type="checkbox"/> Unit E
South Orbital Trading Park
Hedon Road
Hull
East Yorkshire
HU9 1NJ
UK
FCC Site Registration Number: 378340 |

This report details the configuration of the equipment, the test methods used and any relevant modifications where appropriate.

All test and measurement equipment under the control of the laboratory and requiring calibration is subject to an established programme and procedures to control and maintain measurement standards. The QMS meets the principles of ISO 9001, and has quality control procedures for monitoring the validity of tests undertaken, being additionally UKAS accredited to EN ISO 17025. Records and sufficient detail are retained to establish an audit trail of calibration records relating to its test results for a defined period. Under control of the established calibration programme, key quantities or values of the test and measurement instrumentation are within specification and comply with the relevant traceable internationally recognised and appropriate standard specifications, which are UKAS calibrated as such where these properties have a significant effect on results. Participation in inter-laboratory comparisons and proficiency testing ensures satisfactory correlation of results conform to Element Materials Technology's own procedures, as well as statistical techniques for analysis of test data providing the appropriate confidence in measurements.

It is Element Materials Technology policy to always use the latest version of any applicable base test standard. Where a product specification calls up a superseded dated revision or an undated basic standard, the latest state-of-the-art version will typically be used. However this would be a departure from what is urged by the Commission using dated references for measurement standards and hence a deviation. Therefore, unless specifically requested by the client, only the measurement procedures cited by the FCC rules will be relied upon & used in testing the equipment for compliance.

The results obtained within this FCC CFR 47 Part 15 report are deemed satisfactory evidence to comply with the requirements of Industry Canada Interference-Causing Equipment Standard ICES-003 Issue 6.'

Throughout this report EUT denotes equipment under test.

The EUT contains a previously approved and FCC listed radio module, FCC ID Q639523 (Iridium Satellite LLC 9523 voice and data transceiver module 9523). The intentional radiator tests for this module fall outside the scope of this test report and reference should be made to the approval filing listed under the named FCC ID.

5 Normative References

- ANSI C63.4-2014 'American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz'

6 Equipment Under Test

6.1 EUT Identification

- Name: Bracer PTT Handset and Associated Ancillaries
- Serial Number: PPTTEST018
- Model Number: 10073537
- Software Revision: 0.1.1-EMC-Test
- Hardware Version: BM1800449 v0.6
- Build Level / Revision Number: Pre-Production
- FCC ID: 2ARQW10073537

Incorporating the following external interconnecting cables, ports or terminals:

Description		Cable Type	Part No.	Manufacturer	Test Length	Max. Length
1	AC/DC Mains Adaptor	Shielded, 2-core	418-TR15RA120 11E03G6	Cincon	2m	2m
2	Audio input/output & PPT	Unshielded, Multi-wire	CA17928	Sonic	2.5m	>3m
3	External RF port	Shielded, Coaxial	Not Specified	QinetiQ	5m	25m

Note: Excess length of cables interconnecting units of the EUT were bundled $0.3\text{ m} \leq 0.4\text{ m}$ non-inductively in the approximate centre, forming the arranged cable lengths identified in Section 7.

6.2 EUT Selection, Configuration & Loading

The HOPLON PTT Handset is a portable satellite communications device, designed to interface with users' audio headsets.

An internal, rechargeable Li-ion battery is used for powering the device in general use, and an off-the-shelf external mains AC-DC power adaptor is supplied for the purposes of charging this internal battery, which may be performed while in operation.

6.3 System Equipment

6.3.1 Components of the EUT

Not Applicable – The EUT is a one-box solution as identified in Section 6.1, requiring no additional intra-unit equipment

6.3.2 Support Equipment

Equipment listed below forms part of the overall test setup and is required for equipment functionality and/or monitoring during testing. The compliance levels achieved in this report relate only to the EUT and not items given in the following list.

Type	Description	Make	Model No.	Serial No.	
1	Support Equipment	Universal Mains Charger	Cincon	418-TR15RA120 011E03G6	Not Specified
2	Support Equipment	D Earhanger Headset	Sonic	CA17928	Not Specified
3	Support/Monitoring Equipment	HOPLON Handheld Radio	QinetiQ	PPT Handset	PPTTEST019
4	Monitoring Equipment	Sound level meter	Tenma	72-6635	P834020

6.4 EUT Mode of Operation

6.4.1 Final Testing

The EUT was exercised primarily by transmitting or receiving a 1kHz audio tone (test tone), which is the device's primary function - via the iridium satellite network (using external cable connection to antennas fitted to the roof of the test facility) while in the 'On' state, either while Mains powered (i.e. charging) or running on the internal, rechargeable battery. The system also requires a GPS fix in order to function.

Testing was carried out with the carrier on –the EUT is attempting to 'hold the floor', i.e. 'TALKING' (repeated 20s floor-holding periods with a brief pause between attempts);

A custom build of firmware had been implemented to maximise transmissions ('holding the floor') in order to test the system over a longer period of time.

During emissions testing the measurements were made with the EUT powered from AC/DC PSU.

6.5 EUT Description

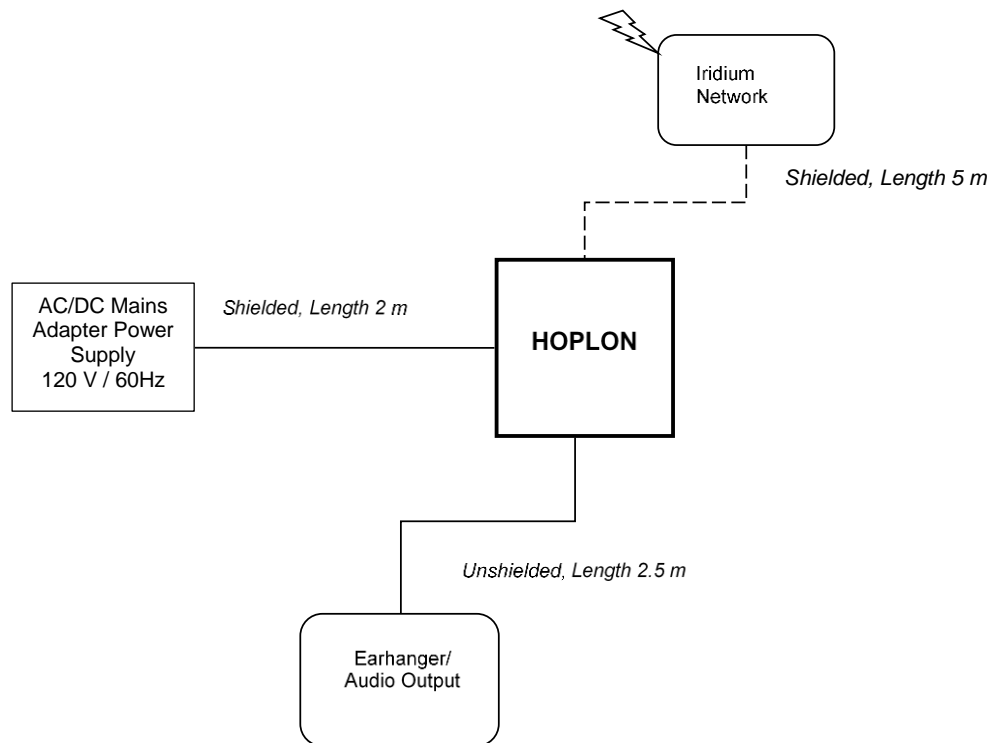
The HOPLON PTT Handset is a portable satellite communications device, designed to interface with users' audio headsets.

Its primary function is provision of secured push-to-talk, all-aware voice communications to dismounted operators within a 'Talk group', as such transmits and receives radio signals.

It should be noted that it has an internal, rechargeable Li-ion battery for powering the device in general use, and an off-the-shelf external mains AC-DC power adaptor is supplied for the purposes of charging this internal battery, which may be performed while in operation.

7 Block Diagram

The following diagram shows basic EUT interconnections with major functional component units, cable type and cable lengths identified in Section 6.1.



8 Test Standard Selection

8.1 Product Standard

The following product standard was used as the basis of the test levels required and has been deemed the most appropriate product standard to apply to the HOPLON Handheld Radio Communications Product, or has been requested by the manufacturer:

FCC RULES CFR 47: 1st October 2017

Federal Communications Commission Title 47
CFR Part 15: Radio Frequency Devices.

8.2 Basic Test Standard Selection

<i>Basic Test Standard</i>	<i>Applicable</i>	
	<i>Class A</i>	<i>Class B</i>
ANSI C63.4:2014 – Radiated Emissions	<input type="checkbox"/>	<input checked="" type="checkbox"/>
ANSI C63.4:2014 – Conducted Emissions	<input type="checkbox"/>	<input checked="" type="checkbox"/>

9 Radiated Emissions as per ANSI C63.4:2014

9.1 General

This test measures radiated electromagnetic emissions that may emanate from EUT enclosures and cables. This test ensures the protection of broadcast and telecommunication services used in the vicinity of the EUT.

The test set-up used complies with all the dimension requirements set out in ANSI C63.4:2014. The semi-anechoic chamber used meets the site attenuation measurements required by ANSI C63.4:2014 Clause 5.4.2 & 5.5. Reference is made to company procedure RTP1029 and RTP1005.

Measurement instrumentation used meets the requirements of CISPR 16-1-1:2010, and uncertainties of CISPR 16-4-2:2011. Expanded laboratory uncertainties U_{lab} are less than or equal to CISPR 16-4-2:2011 U_{CISPR} Table 1. Therefore no compensation is required to the actual measured level in determining compliance with the applied limit.

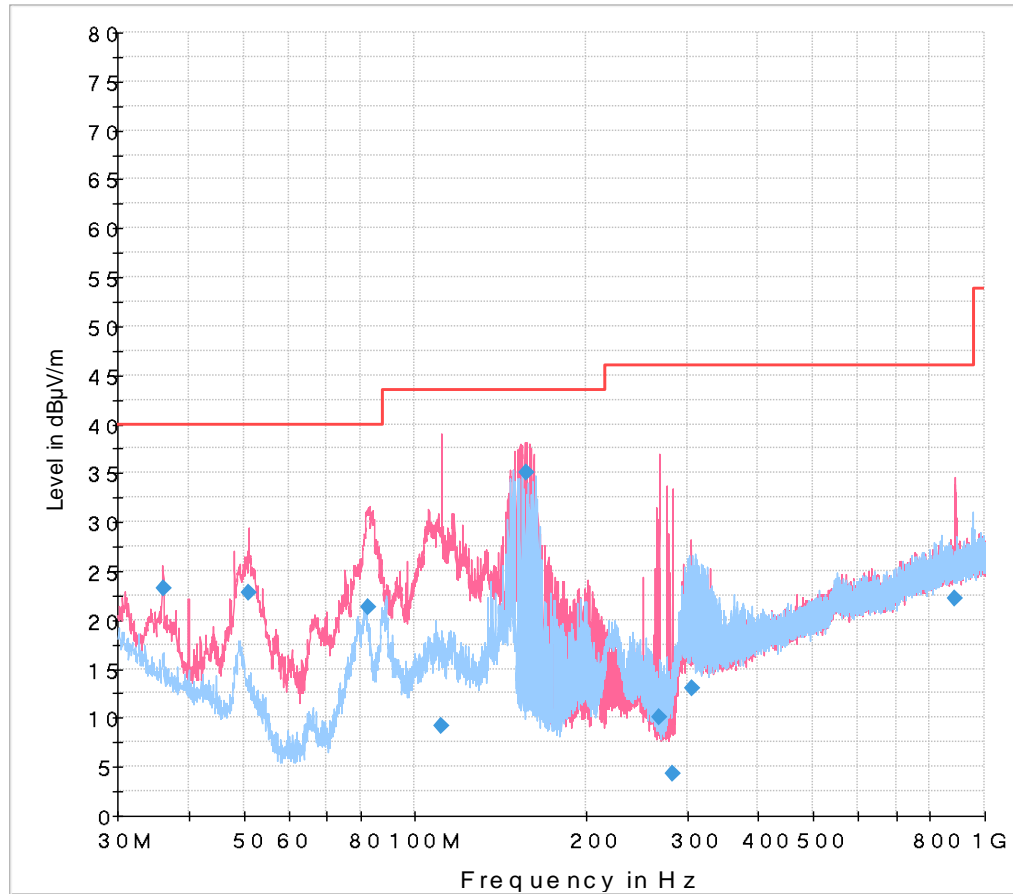
An initial scan is carried out in order to establish a frequency list that is attributable to the EUT, using automated R&S EMC32 measurement software. Receiver/analyser scan speed and bandwidth adjustments where applicable are in accordance with the reference standard, appropriate to the intercepted signal being resolved. Any emissions measurements that fall within 20 dB μ V/m of the limit line are then maximised by rotating the equipment through 360 ° and raising/lowering the antenna through 1 to 4 m height for each frequency of interest.

9.2 Radiated Emission Test Parameters

EUT Classification:	<input type="checkbox"/> A	<input checked="" type="checkbox"/> B
Highest EUT Frequency:	1.6265 GHz (if >1 GHz upper frequency of measurement will be 5 th harmonic of highest EUT frequency or 40 GHz whichever is lower)	
Frequency Range:	30 MHz to 1 GHz	
	<input checked="" type="checkbox"/> 1 GHz to 2 GHz	<input type="checkbox"/> N/A – Max EUT Freq Used <108 MHz
	<input checked="" type="checkbox"/> 2 GHz to 5GHz	<input type="checkbox"/> N/A – Max EUT Freq Used <500 MHz
	<input checked="" type="checkbox"/> 5 GHz to 8 GHz	<input type="checkbox"/> N/A – Max EUT Freq Used <1 GHz
Measurement Bandwidth:	120 kHz (Measurements \leq 1 GHz) 1 MHz (Measurements \geq 1 GHz)	
Video Bandwidth:	>500 kHz (Measurements \leq 1 GHz) 3 MHz (Measurements \geq 1 GHz)	
Detectors:	Peak (\leq 1 GHz scan / \geq 1 GHz Final Measurements) Average (\geq 1 GHz Final Measurements) Quasi-peak (\leq 1 GHz Final Measurements)	
Receiver Frequency Step Size:	50 kHz (Measurements <1 GHz) 450 kHz (Measurements >1 GHz)	
Analyser Frequency Sweep Point Size:	\leq 50 kHz (Measurements <1 GHz) \leq 450 kHz (Measurements >1 GHz)	
Quasi-peak Detector Dwell:	Minimum 2 s per Frequency Point	
Ambient Climatic Conditions:	Temperature 18.6 °C	Humidity 45.6 % Pressure 1023 mb
Antenna Height:	1 to 4 Metres	
EUT to Antenna Distance:	<input type="checkbox"/> 1 m	<input checked="" type="checkbox"/> 3 m
EUT Measurement Height:	<input checked="" type="checkbox"/> 0.8 m Insulated Table <input type="checkbox"/> 0.1 m Insulated Support/Pallet	
EUT Operation Voltage:	120 V AC	
EUT Operating Frequency:	<input checked="" type="checkbox"/> 60 Hz	<input type="checkbox"/> DC

9.3 EUT Test Results

9.3.1 Radiated Emissions Test Data – 30 MHz to 1 GHz



Key

- Quasi Peak Measurement ◆
- Max Peak Vertical Polarisation ~
- Max Peak Horizontal Polarisation ~
- Quasi Peak Class B Limit —

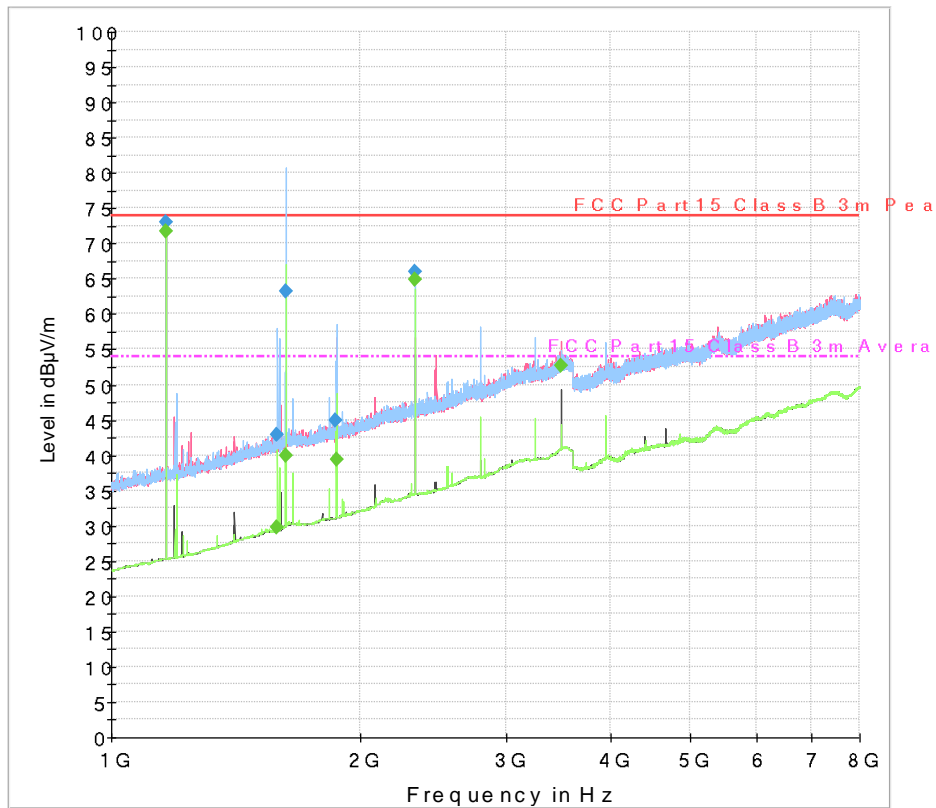
NOTES:

1. Emissions that have significantly dropped from the measured scan level were investigated manually to establish actual level to determine compliance against the limits and were found to comply

Quasi-Peak Final Result

Frequency (MHz)	QuasiPeak (dB μ V/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dB μ V/m)
36.074000	23.2	15000.0	120.000	100.0	V	99.0	15.1	16.8	40.0
51.010500	22.7	15000.0	120.000	100.0	V	99.0	8.2	17.3	40.0
82.922000	21.4	15000.0	120.000	100.0	V	106.0	8.4	18.6	40.0
111.250500	9.1	15000.0	120.000	350.0	V	296.0	12.8	34.4	43.5
156.686000	35.1	15000.0	120.000	100.0	V	62.0	11.2	8.4	43.5
267.811500	10.0	15000.0	120.000	250.0	V	350.0	14.1	36.0	46.0
283.034500	4.3	15000.0	120.000	150.0	V	321.0	14.5	41.7	46.0
305.491500	12.9	15000.0	120.000	150.0	V	144.0	15.5	33.1	46.0
886.759500	22.2	15000.0	120.000	150.0	V	75.0	24.8	23.8	46.0

9.3.2 Radiated Emissions Test Data – 1 GHz to 8 GHz



Key

Max Peak



Average



Average Final



Peak Final



Average Limit



Peak Limit



NOTES:

1. The narrowband emissions displayed on the graph at 1.164, 2.328 & 3.492 GHz are intentional transmit frequencies from an in chamber GPS repeater. Therefore consider ambient as are not emanating from the EUT and can be ignored.
2. The 1.624 GHz measurement in the above graph relates to the EUT, MES and MSS capability fundamental frequency of the previously approved module contained within the EUT. Therefore does not form part of this assessment and can be ignored.

Peak Final Result

Frequency (MHz)	MaxPeak (dB μ V/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dB μ V/m)
1164.000000	73.1	15000.0	1000.000	154.0	H	180.0	26.8	0.8	73.9
1585.500000	42.9	15000.0	1000.000	152.0	H	202.0	30.4	31.0	73.9
1622.000000	63.2	15000.0	1000.000	100.0	H	-22.0	30.8	10.7	73.9
1867.500000	44.9	15000.0	1000.000	175.0	H	191.0	32.1	29.0	73.9
2328.000000	66.0	15000.0	1000.000	100.0	H	11.0	34.8	7.9	73.9

Average Final Result

Frequency (MHz)	CAverage (dB μ V/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dB μ V/m)
1164.000000	71.8	15000.0	1000.000	127.0	H	180.0	26.8	-17.9	53.9
1586.000000	29.7	15000.0	1000.000	100.0	H	202.0	30.4	24.2	53.9
1625.000000	39.8	15000.0	1000.000	100.0	H	-11.0	30.8	14.1	53.9
1870.000000	39.3	15000.0	1000.000	100.0	H	169.0	32.1	14.6	53.9
2328.000000	64.9	15000.0	1000.000	100.0	H	-11.0	34.8	-11.0	53.9
3492.500000	52.7	15000.0	1000.000	128.0	V	13.0	40.3	1.2	53.9

10 Sample Calculation

The radiated emission levels used in the report are calculated thus:

<i>Frequency (MHz)</i>	<i>Measured Value (dBμV)</i>	<i>Combined Antenna & Cable Factor (dB/m)</i>	<i>Emission Level (dBμV/m)</i>
36.074000	8.1	15.1	23.2
111.250500	-3.7	12.8	9.1
283.034500	-10.2	14.5	4.3

11 Conducted Emissions as per ANSI C63.4:2014

11.1 General

This test measures conducted noise that may be present on an EUT's power supply cable. This test ensures the protection of broadcast and telecommunication services used in the vicinity of the EUT.

The test setup used complies with all the dimension requirements set out in ANSI C63.4:2014. Reference is made to company procedure RTP1029 and RTP1002. Measurement instrumentation used meets the requirements of CISPR16-1-1:2010 or CISPR 16-1-2:2006 as appropriate, and uncertainties of CISPR 16-4-2:2011. Expanded laboratory uncertainties U_{lab} are less than or equal to CISPR 16-4-2:2011 U_{cisp} Table 1. Therefore no compensation is required to the actual measured level in determining compliance with the applied limit.

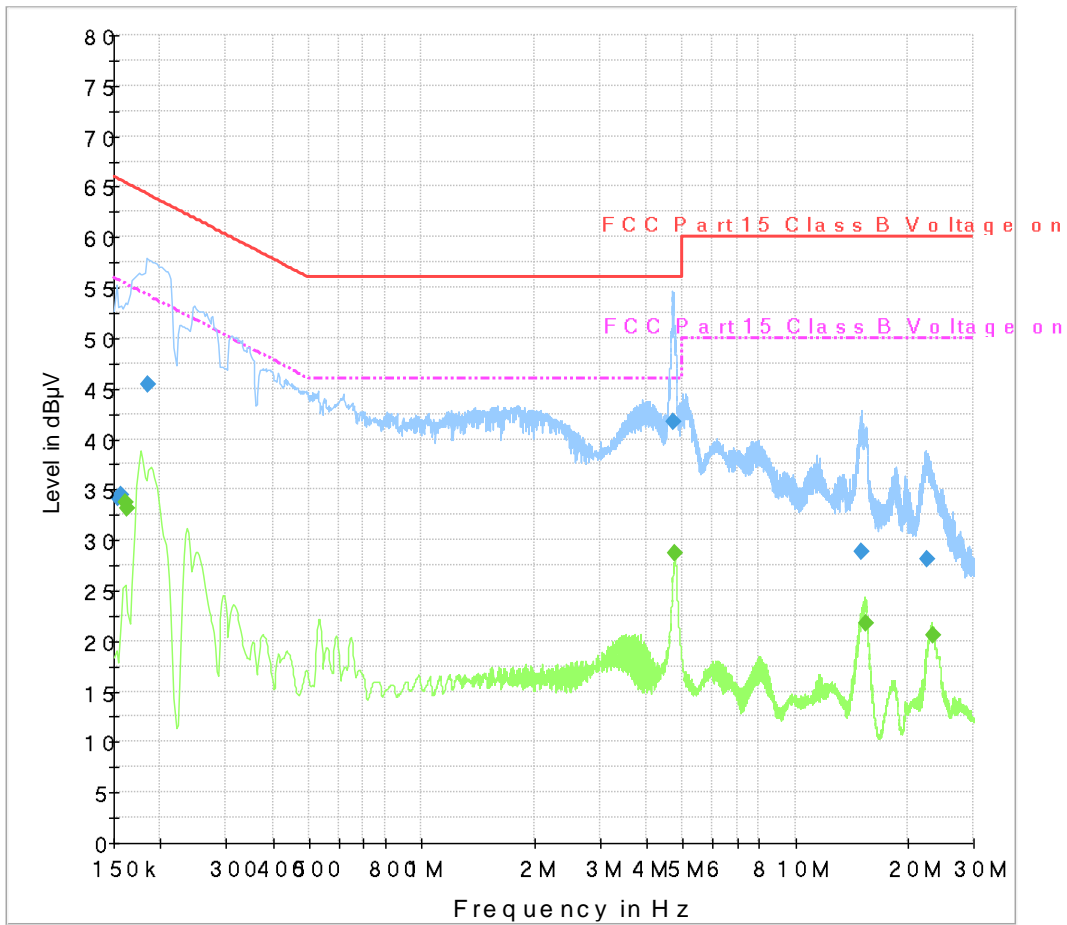
An initial scan is carried out in order to establish a frequency list that is attributable to the EUT, using automated R&S EMC32 measurement software. Receiver/analyser scan speed and bandwidth adjustments where applicable are in accordance with the reference standard, appropriate to the intercepted signal being resolved. Any emissions measurements that fall within 20 dB μ V of the Average or Quasi-Peak limit line are then re-measured using the associated CISPR detector for each frequency of interest.

11.2 Conducted Emission Test Parameters

EUT Classification:	<input type="checkbox"/> A	<input checked="" type="checkbox"/> B
Frequency Range:	150 kHz to 30 MHz	
Receiver Frequency Step Size:	4.5 kHz	
Analyser Frequency Sweep Point Size:	≤ 4.5 kHz	
Measurement Bandwidth:	9 kHz / 10 kHz	
Video Bandwidth:	>30 kHz	
Detectors:	Peak (Pre-scan) Quasi-peak (Final Measurements) Average (Final Measurements)	
Quasi-peak Detector Dwell:	Minimum 2 s per frequency point	
Ambient Climatic Conditions:	Temperature 21 °C	Humidity 46 % Pressure 1025 mb
EUT Measurement Height:	<input checked="" type="checkbox"/> 0.8 m Insulated Table <input type="checkbox"/> 0.1 m Insulated Support/Pallet Mounted	
EUT Operation Voltage:	120 V AC	
EUT Operating Frequency:	<input checked="" type="checkbox"/> 60 Hz	<input type="checkbox"/> DC

11.3 EUT Test Results

11.3.1 Conducted Emissions Test Data – Live and Neutral Line



Key:

- Max Peak
- Average
- Average Final
- Quasi Peak Final
- Average Limit
- Quasi Peak Limit

Quasi-Peak Final Results

Frequency (MHz)	QuasiPeak (dB μ V)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dB μ V)
0.156750	46.6	15000.0	9.000	GND	N	10.0	19.1	65.6
4.634250	46.6	15000.0	9.000	GND	L1	10.2	9.4	56.0
4.926750	41.2	15000.0	9.000	GND	N	10.2	14.8	56.0
14.786250	44.5	15000.0	9.000	GND	L1	10.9	15.5	60.0
15.483750	32.7	15000.0	9.000	GND	L1	10.9	27.3	60.0
22.625250	35.0	15000.0	9.000	GND	L1	11.1	25.0	60.0

Average Final Results

Frequency (MHz)	CAverage (dB μ V)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dB μ V)
0.204000	35.0	15000.0	9.000	GND	L1	10.0	18.4	53.4
0.208500	35.0	15000.0	9.000	GND	L1	10.0	18.2	53.3
4.636500	30.2	15000.0	9.000	GND	L1	10.2	15.8	46.0
4.926750	38.2	15000.0	9.000	GND	L1	10.2	7.8	46.0
14.781750	41.0	15000.0	9.000	GND	L1	10.9	9.0	50.0
16.192500	35.6	15000.0	9.000	GND	N	10.9	14.4	50.0
22.816500	22.9	15000.0	9.000	GND	L1	11.1	27.1	50.0

12 Test Equipment List – Element Malvern

The following test equipment was used:

Type of Equipment	Maker/Supplier	Model Number	Serial Number	Element Number	Actual Equipment Used	Calibration Date	Interval
Current Probe	Eaton	91550-1	2822	L159	<input type="checkbox"/>		
3 Phase LISN	Schwarzbeck	NSLK8128	8128151	L207	<input type="checkbox"/>		
Test Receiver	Rohde & Schwarz	ESHS20	837960/003	L237	<input type="checkbox"/>		
LISN	Rohde & Schwarz	ESHS3-Z5	839135/013	L238	<input checked="" type="checkbox"/>	04/10/2017	12
Bi-Log Antenna	Chase	CBL6112	2098	L274	<input checked="" type="checkbox"/>	30/11/2017	24
LISN	Rohde & Schwarz	ESHS3-Z5	837469/010	L289	<input type="checkbox"/>		
Bi-Log Antenna	Chase	CBL6111	1945	L290	<input type="checkbox"/>		
Voltage Probe	Element	None	None	L316	<input type="checkbox"/>		
Receiver	Rohde & Schwarz	ESVS10	844594/003	L352	<input type="checkbox"/>		
Receiver	Rohde & Schwarz	ESHS10	844077/019	L353	<input type="checkbox"/>		
Receiver	Rohde & Schwarz	ESVS20	838804/005	L415	<input type="checkbox"/>		
Bi-Log Antenna	Schaffner	CBL6112B	2761	L431	<input type="checkbox"/>		
Microwave Pre-Amplifier	Agilent	8449B	3008A016	L572	<input type="checkbox"/>		
Receiver/Analyser	Rohde & Schwarz	ESIB7	100182	L630	<input type="checkbox"/>		
Receiver/Analyser	Rohde & Schwarz	ESIB40	100241	L691	<input type="checkbox"/>		
ALSE RF Chamber \leq 1 GHz (Radiated & Line Conducted Site)	Panashield	G72131 Comm1	A	L717	<input type="checkbox"/>		
ALSE RF Chamber \geq 1 GHz (Radiated & Line Conducted Site)	Panashield	G72131 Comm1	A	L717	<input type="checkbox"/>		
ALSE RF Chamber \leq 1 GHz (Radiated & Line Conducted Site)	Panashield	G72231 Comm2	B	L718	<input checked="" type="checkbox"/>	29/04/2017	36
ALSE RF Chamber \geq 1 GHz (Radiated & Line Conducted Site)	Panashield	G72231 Comm2	B	L718	<input checked="" type="checkbox"/>	29/04/2017	36
Vertical Ground Reference Plane	Element	2.5m x 2m	None	-	<input checked="" type="checkbox"/>		
AC Power Source	Schaffner	NSG1007	54544	L767	<input type="checkbox"/>		
Log Periodic Antenna	Rohde & Schwarz	HL050	100530	L869	<input checked="" type="checkbox"/>	23/01/2018	24
RF Cable	Rosenberger	FB293C1040005050	70558-01	L871	<input checked="" type="checkbox"/>	29/11/2017	12
RF Cable	Rosenberger	FB293C1040005050	70558-02	L888	<input checked="" type="checkbox"/>	29/11/2017	12
RF Cable	Rosenberger	FB293C1060005050	70559-02	L889	<input type="checkbox"/>		
RF Cable	Rosenberger	FB293C1040005050	70558-03	L890	<input type="checkbox"/>		
RF Cable	Rosenberger	FB293C1040005050	70558-04	L891	<input type="checkbox"/>		
RF Cable	Rosenberger	FB293C1060005050	70559-01	L892	<input checked="" type="checkbox"/>	29/11/2017	12
Bi-Log Antenna	Chase	CBL6111	None	L912	<input type="checkbox"/>		
Receiver/Analyser	Rohde & Schwarz	ESR7	101056	L927	<input checked="" type="checkbox"/>	21/06/2017	12
ISN ST08	Teseq	ISN ST08	32634	L933	<input type="checkbox"/>		
Pulse Limiter	Rohde & Schwarz	ESH3-Z2	101738	L938	<input checked="" type="checkbox"/>	15/08/2017	12
Pulse Limiter	Rohde & Schwarz	ESH3-Z2	101740	L939	<input type="checkbox"/>		
Receiver	Rohde & Schwarz	ESU26	100447	L940	<input checked="" type="checkbox"/>	18/07/2017	12
LISN	Chase	MN2050B	1203	L944	<input type="checkbox"/>		
Unshielded ISN/CDN	Teseq	T800	34436	L945	<input type="checkbox"/>		
T2 Balanced ISN	Fischer FCC	T2-02-09	20467	H483	<input type="checkbox"/>		
T2 Balanced ISN	Fischer FCC	T2-02-09	20468	H484	<input type="checkbox"/>		
T8 Balanced ISN	Fischer FCC	T8-02-09	None	H485	<input type="checkbox"/>		
T4 Balanced ISN	Fischer FCC	T4-02-09	20450	H486	<input type="checkbox"/>		
T4 Balanced ISN	Fischer FCC	T4-02-09	20451	H487	<input type="checkbox"/>		

Type of Equipment	Maker/ Supplier	Model Number	Serial Number	Element Number	Actual Equipment Used	Calibration Date	Interval
Shielded ISN	Fischer FCC	ST08	26589	H655	<input type="checkbox"/>		
Receiver/Analyser	Rohde & Schwarz	ESU26	100081	UH377	<input type="checkbox"/>		
EMC32 EMI Measurement Software	Rohde & Schwarz	V8.54.0	None	N/A	<input checked="" type="checkbox"/>	N/A	N/A

13 EMC Modifications

No modifications were performed during this assessment.

14 Conclusion

The EUT meets the performance requirements of the specification, when tested in a system configuration described in section 6 of this report.

Note should be taken of any modifications listed in the relevant section of this report.

The EUT achieved the following performance criteria during the test programme.

<i>Test Standard</i>	<i>Test Order</i>	<i>Class</i>		<i>Pass</i>	<i>Fail</i>
ANSI C63.4:2014 – Radiated Emissions	1	A <input type="checkbox"/>	B <input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
ANSI C63.4:2014 – Conducted Emissions	2	A <input type="checkbox"/>	B <input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

The EUT contains a previously approved and FCC listed radio module, FCC ID Q639523 (Iridium Satellite LLC 9523 voice and data transceiver module 9523). The intentional radiator tests for this module fall outside the scope of this test report and reference should be made to the approval filing listed under the named FCC ID.

14.1 Conformity in Production

Element Materials Technology has based this test report on results from the equipment sample(s) provided.

The manufacturer is advised that they may have an obligation to demonstrate that production samples are in conformity with the Standards noted.

The EMC performance reported above was achieved after incorporation of any modifications as detailed in Section 13 of this report.

15 Measurement Uncertainty

SCHEDULE A – EMC MEASUREMENT UNCERTAINTY (LAB BASED)

All uncertainties listed are standard uncertainties multiplied by a coverage factor $K=2.00$ to give a 95 % confidence level.

Conducted Emissions including Discontinuous Emissions

[1] Conducted Emissions 150 kHz to 30 MHz = **3.4 dB**

Radiated Emissions

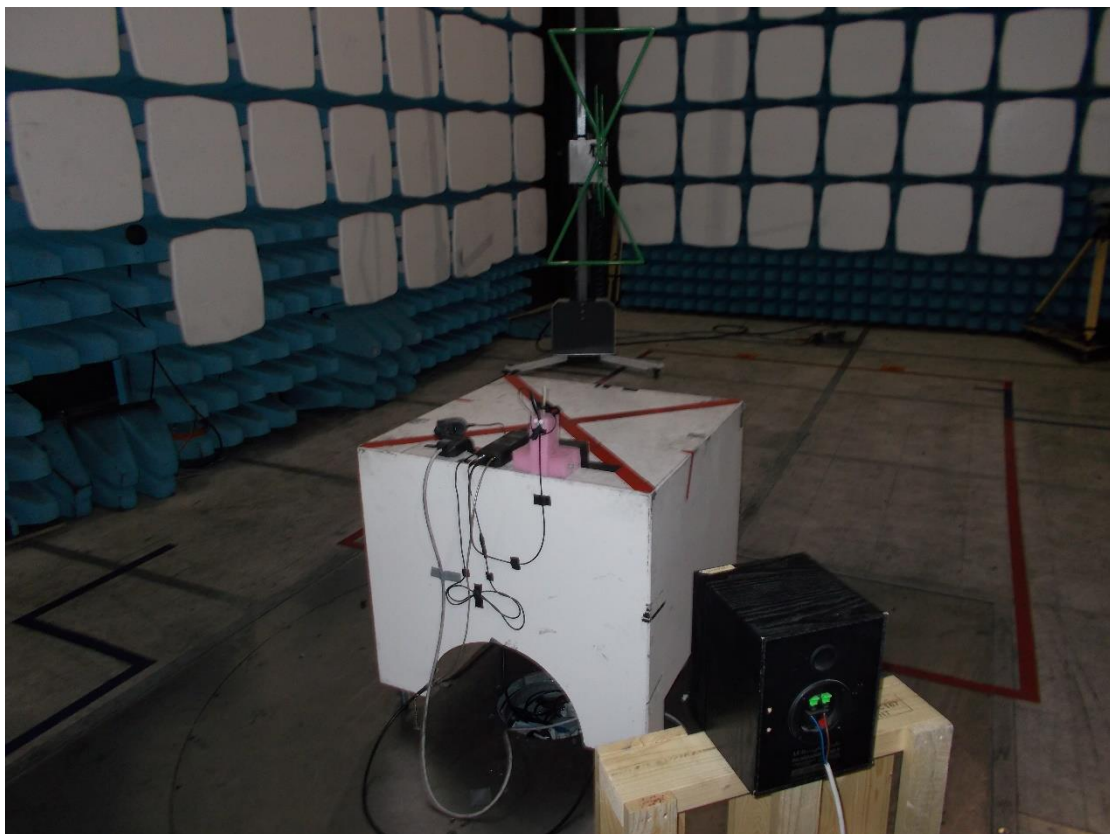
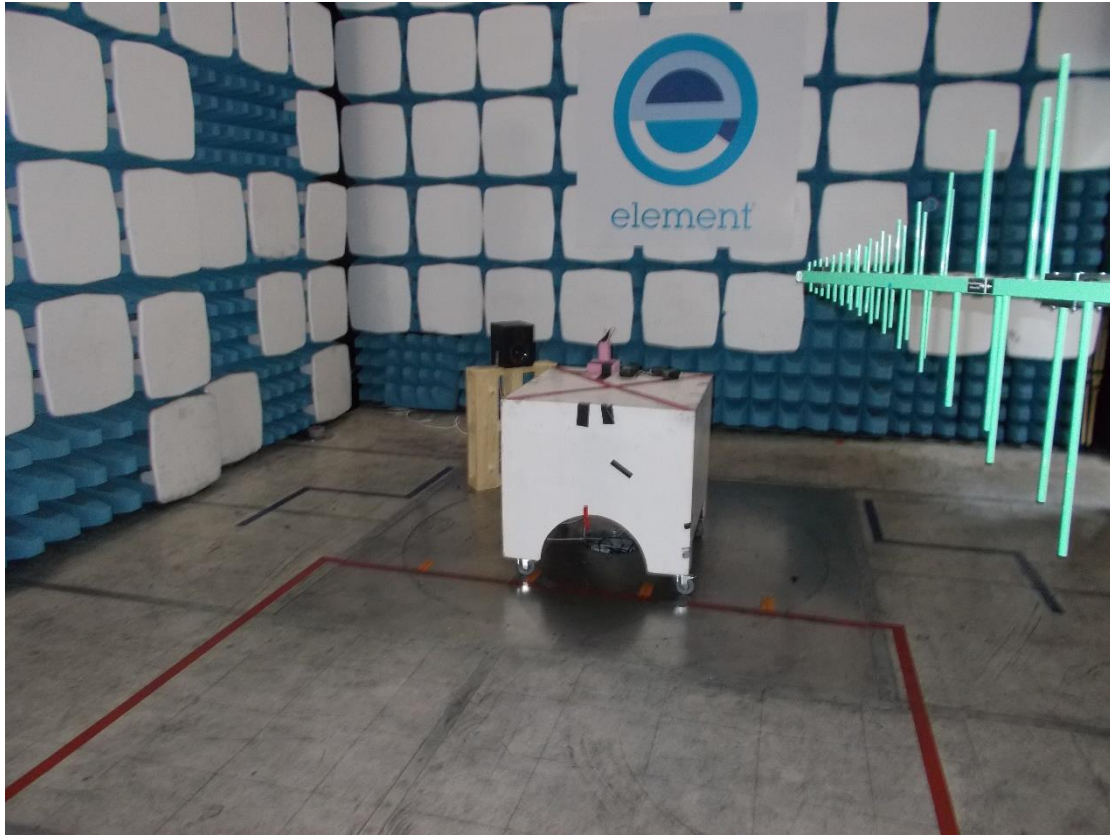
- [1] Radiated Emissions 30 MHz to 1 GHz using CBL6111/2 Bilog Antenna = **4.6 dB**
- [2] Radiated Emissions 1 GHz to 6 GHz using HL050 Log Periodic Antenna = **5.1 dB**
- [3] Radiated Emissions 6 GHz to 18 GHz using Standard Gain Horn = **3.8 dB**
- [4] Radiated Emissions 18 GHz to 26.5 GHz using Standard Gain Horn = **3.2 dB**
- [5] Radiated Emissions 26.5 GHz to 40 GHz using Standard Gain Horn = **3.2 dB**

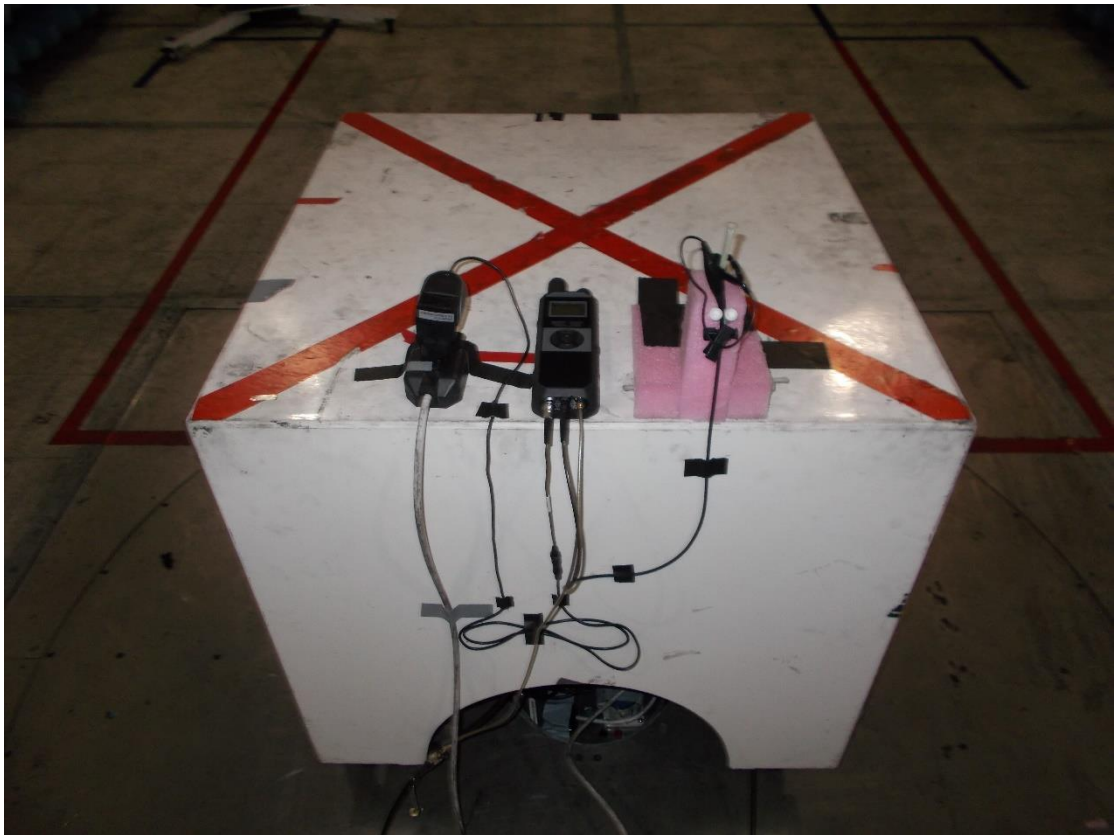
Cable Calibrations

[1] Cable calibration up to 40 GHz = **0.4 dB**

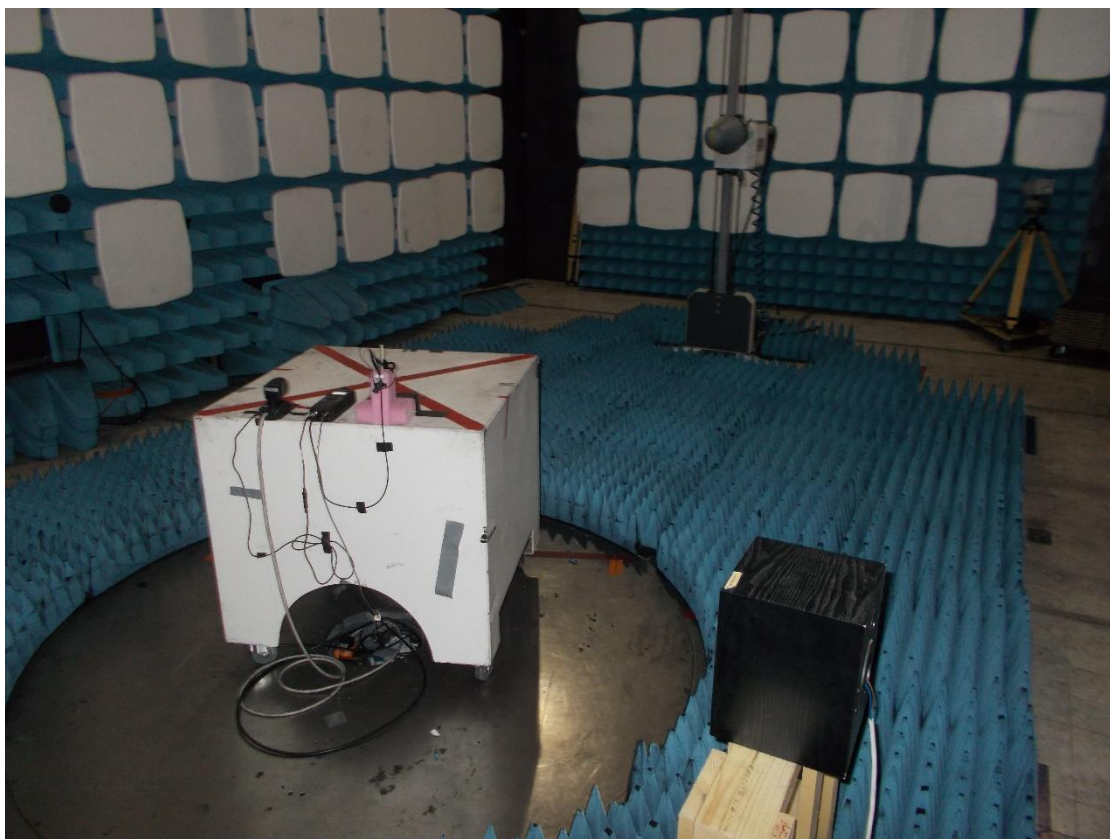
16 Appendix A – Photographs

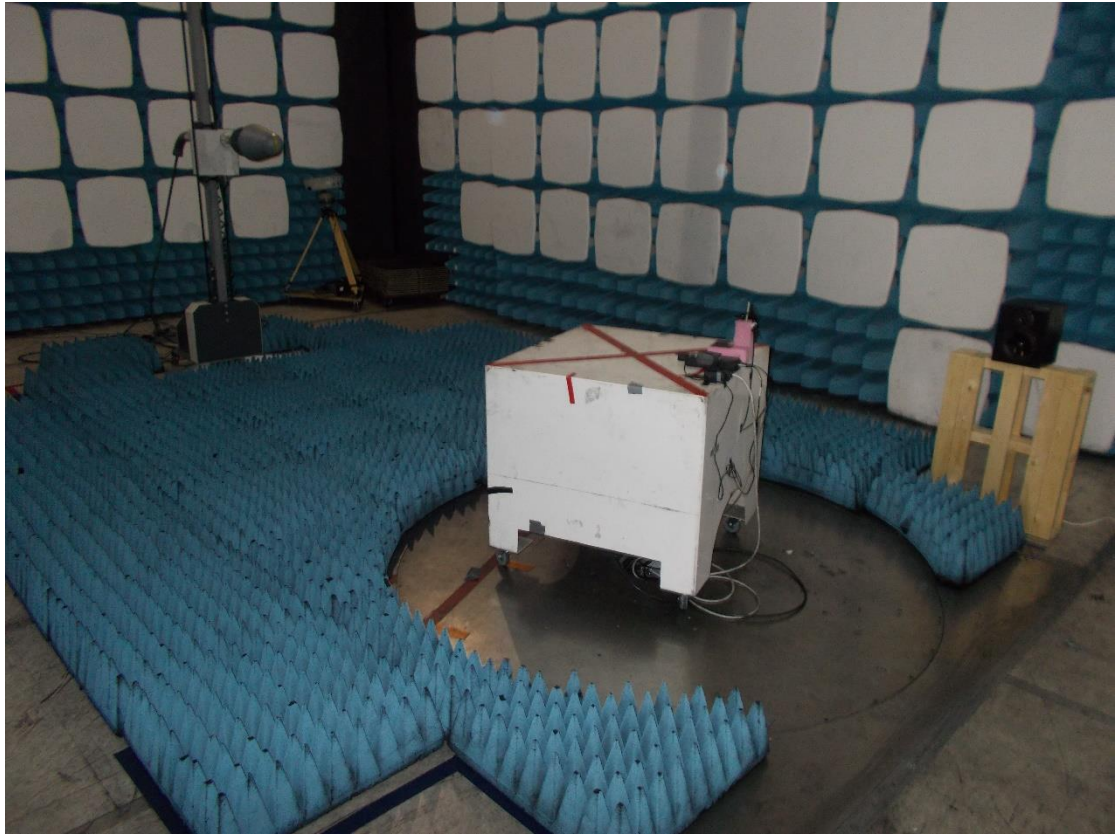
Radiated Emissions <1 GHz





Radiated Emissions >1 GHz





Conducted Emissions

