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Report On

Limited FCC and Industry Canada Testing of the
VECTRONIC Aerospace GmbH Survey VERTEX PLUS
In accordance with FCC 47 CFR Part 25, FCC 47 CFR Part 2,
Industry Canada RSS-170 and Industry Canada RSS-GEN

COMMERCIAL-IN-CONFIDENCE

FCC ID: XZ5VERTEXPLUS
IC: 8020A-13604SURVEY

Document 75934743 Report 01 Issue 2

August 2016



Product Service

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COMMERCIAL-IN-CONFIDENCE

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DATED

31 August 2016

This report has been up-issued to Issue 2 to include the FCC and Industry Canada ID's.

ENGINEERING STATEMENT

The measurements shown in this report were made in accordance with the procedures described on test pages. All reported testing was carried out on a sample equipment to demonstrate limited compliance with FCC 47 CFR Part 25, FCC 47 CFR Part 2, Industry Canada RSS-170 and Industry Canada RSS-GEN. The sample tested was found to comply with the requirements defined in the applied rules.

Test Engineer(s);

J Tuckwell





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SECTION 1

REPORT SUMMARY

Limited FCC and Industry Canada Testing of the
VECTRONIC Aerospace GmbH Survey VERTEX PLUS
In accordance with FCC 47 CFR Part 25, FCC 47 CFR Part 2, Industry Canada RSS-170 and
Industry Canada RSS-GEN



1.1 INTRODUCTION

The information contained in this report is intended to show the verification of Limited FCC and Industry Canada Testing of the VECTRONIC Aerospace GmbH Survey VERTEX PLUS to the requirements of FCC 47 CFR Part 25, FCC 47 CFR Part 2, Industry Canada RSS-170 and Industry Canada RSS-GEN.

Objective	To perform Limited FCC and Industry Canada Testing to determine the Equipment Under Test's (EUT's) compliance with the Test Specification, for the series of tests carried out.
Manufacturer	VECTRONIC Aerospace GmbH
Model Number(s)	Survey VERTEX PLUS
Serial Number(s)	60105 0-2317134
Number of Samples Tested	1
Test Specification/Issue/Date	FCC 47 CFR Part 25 (2015) FCC 47 CFR Part 2 (2015) Industry Canada RSS-170 (Issue 3, 2015) Industry Canada RSS-GEN (Issue 4, 2014)
Incoming Release Date	Application Form 9 May 2016
Disposal Reference Number Date	Held Pending Disposal Not Applicable Not Applicable
Order Number Date	201604274 27 April 2016
Start of Test	14 June 2016
Finish of Test	14 June 2016
Name of Engineer(s)	J Tuckwell



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1.2 BRIEF SUMMARY OF RESULTS

A brief summary of the tests carried out in accordance with FCC 47 CFR Part 25, FCC 47 CFR Part 2, Industry Canada RSS-170 and Industry Canada RSS-GEN is shown below.

Section	Specification Clause				Test Description	Result	Comments/Base Standard
	Part 25	Part 2	RSS-170	RSS-GEN			
Transmit							
2.1	25.202(f)	2.1053	5.4.3.1	6.13	Radiated Spurious Emissions	Pass	
2.2	25.204	-	5.3	-	Radiated Output Power	Pass	



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1.3 APPLICATION FORM

EQUIPMENT DESCRIPTION	
Model Name/Number	Survey VERTEX PLUS
Part Number	60105
Hardware Version	5.1
Software Version	2.5.4
FCC ID (if applicable)	To be supplied
Industry Canada ID (if applicable)	To be supplied
Technical Description (Please provide a brief description of the intended use of the equipment)	The Survey VERTEX PLUS collar has been designed for long-term survey and survival studies on wild animals with regular GPS data updates using GLOBALSTAR satellite communication.

POWER SOURCE	
☐ AC mains	State voltage
AC supply frequency (Hz)	
VAC	
Max Current	
Hz	
☐ Single phase	☐ Three phase
And / Or	
☐ External DC supply	
Nominal voltage	V Max Current A
Extreme upper voltage	V
Extreme lower voltage	V
Battery	
☐ Nickel Cadmium	☐ Lead acid (Vehicle regulated)
☐ Alkaline	☐ Leclanche
☒ Lithium	☐ Other Details :
3.6	Volts nominal.
End point voltage as quoted by equipment manufacturer	2.7 V



Product Service

FREQUENCY INFORMATION			
Frequency Range	1611.25 to 1618.75	MHz	
Channel Spacing (where applicable)	2.5 MHz		
Receiver Frequency Range (if different)	to	MHz	
Channel Spacing (if different)			
Test Frequencies*	Bottom	MHz	Channel Number (if applicable)
	Middle	MHz	Channel Number (if applicable)
	Top	MHz	Channel Number (if applicable)
Intermediate Frequencies		MHz	
Highest Internally Generated Frequency :		MHz	

POWER CHARACTERISTICS			
Maximum TX power	0.1	W	
Minimum TX power	0.040	W (if variable)	
Is transmitter intended for :			
Continuous duty		☐ Yes	☐ No
Intermittent duty		☒ Yes	☐ No
If intermittent state DUTY CYCLE			
Transmitter ON	1.44 seconds		
Transmitter OFF	300 seconds		

ANTENNA CHARACTERISTICS			
☐	Antenna connector	State impedance	Ohm
☐	Temporary antenna connector	State impedance	Ohm
☒	Integral antenna	Type PA251633025SBLF	State impedance 3.51 dBi
☐	External antenna	Type	State impedance dBi

MODULATION CHARACTERISTICS			
☐	Amplitude	☐	Frequency
☐	Phase	☒	Other (please provide details): DSSS, BPSK
Can the transmitter operate un-modulated?			☐ Yes ☒ No

CLASS OF EMISSION USED	
ITU designation or Class of Emission:	
1 2M50G1D	
(if applicable) 2	
(if applicable) 3	
If more than three classes of emission, list separately:	



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BATTERY POWER SUPPLY			
Model name/number	LSH20	Identification/Part number	LSH20
Manufacturer	SAFT	Country of Origin	France

ANCILLARIES (If applicable)	
Model name/number	Identification/Part number
Manufacturer	Country of Origin

EXTREME CONDITIONS					
Extreme test voltages (Max)	3.6	V	Extreme test voltages (Mix)	2.7	V
Nominal DC Voltage	3.3	V	DC Maximum Current	0.6	A
Maximum temperature	50	°C	Minimum temperature	-40	°C

I hereby declare that that the information supplied is correct and complete.

Name: Robert Schulte

Position held:

CEO

Date: 2016-05-09



Product Service

1.4 PRODUCT INFORMATION

1.4.1 Technical Description

The Equipment Under Test (EUT) was a VECTRONIC Aerospace GmbH Survey VERTEX PLUS. A full technical description can be found in the manufacturer's documentation.

1.5 TEST CONDITIONS

For all tests the EUT was set up in accordance with the relevant test standard and to represent typical operating conditions. Tests were applied with the EUT situated in a shielded enclosure.

The EUT was powered from a 3.6 V DC supply.

FCC Measurement Facility Registration Number
90987 Octagon House, Fareham Test Laboratory

Industry Canada Company Address Code
IC2932B-1 Octagon House, Fareham Test Laboratory

1.6 DEVIATIONS FROM THE STANDARD

No deviations from the applicable test standard were made during testing.

1.7 MODIFICATION RECORD

Modification 0 - No modifications were made to the test sample during testing.



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SECTION 2

TEST DETAILS

Limited FCC and Industry Canada Testing of the
VECTRONIC Aerospace GmbH Survey VERTEX PLUS
In accordance with FCC 47 CFR Part 25, FCC 47 CFR Part 2, Industry Canada RSS-170 and
Industry Canada RSS-GEN



Product Service

2.1 RADIATED SPURIOUS EMISSIONS

2.1.1 Specification Reference

FCC 47 CFR Part 25, Clause 25.202(f)
FCC 47 CFR Part 2, Clause 2.1053
Industry Canada RSS-170, Clause 5.4.3.1
Industry Canada RSS-GEN, Clause 6.13

2.1.2 Equipment Under Test and Modification State

Survey VERTEX PLUS S/N: 60105 0-2317134 - Modification State 0

2.1.3 Date of Test

14 June 2016

2.1.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.1.5 Test Procedure

For radiated testing, a preliminary profile of the Spurious Radiated Emissions was obtained up to the 10th harmonic by operating the EUT on a remotely controlled turntable within a semi-anechoic chamber. Measurements of emissions from the EUT were obtained with the Measurement Antenna in both Horizontal and Vertical Polarisations. The profiling produced a list of the worst-case emissions together with the EUT azimuth and antenna polarisation.

Using the information from the preliminary profiling of the EUT, the list of emissions was then confirmed or updated under Alternative Open Site conditions. Emission levels were maximised by adjusting the antenna height, antenna polarisation and turntable azimuth.

(The EUT was set to transmit on maximum power with both channels operating simultaneously.)

For any emissions found the EUT was then removed from the chamber and replaced with a substitution antenna. Using a signal generator the level was adjusted to achieve the same value on the measuring instrument as previously recorded with the EUT. The final result was determined by a calculation using the signal generator level, antenna gain and cable loss.

The measurements were performed at a 3m distance unless otherwise stated.

2.1.6 Environmental Conditions

Ambient Temperature	18.9 - 19.1°C
Relative Humidity	63.0 - 64.0%



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2.1.7 Test Results

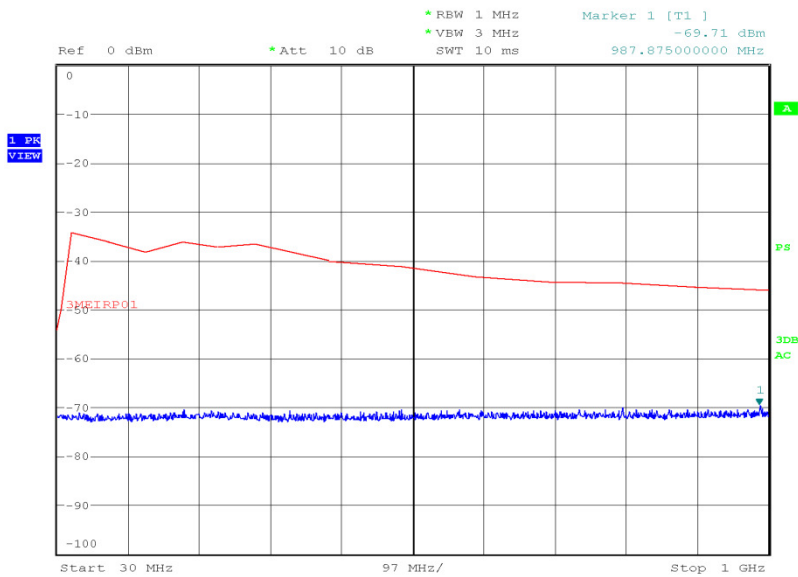
3.6 V DC Supply

Transmit, 1611.250 MHz, 30 MHz to 18 GHz, Radiated Spurious Emissions Results

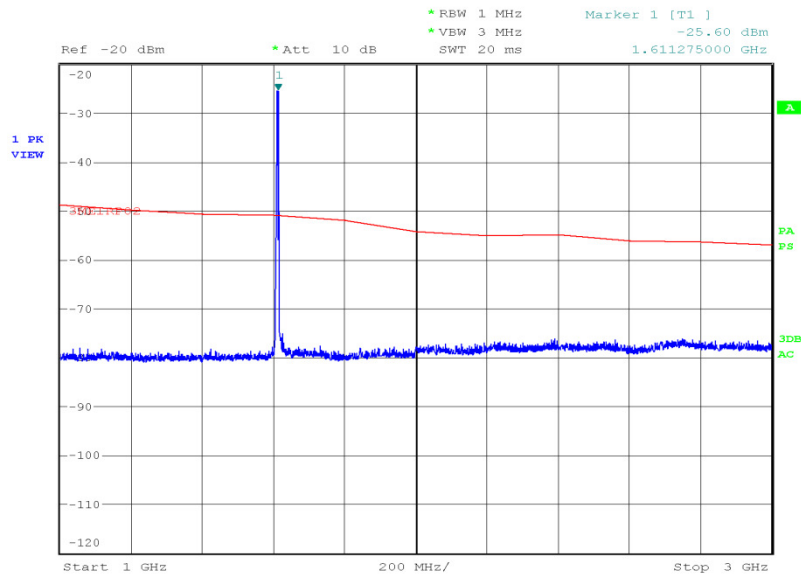
Frequency (MHz)	Emission Results (dBm)
*	

*No emissions were detected within 20 dB of the limit.

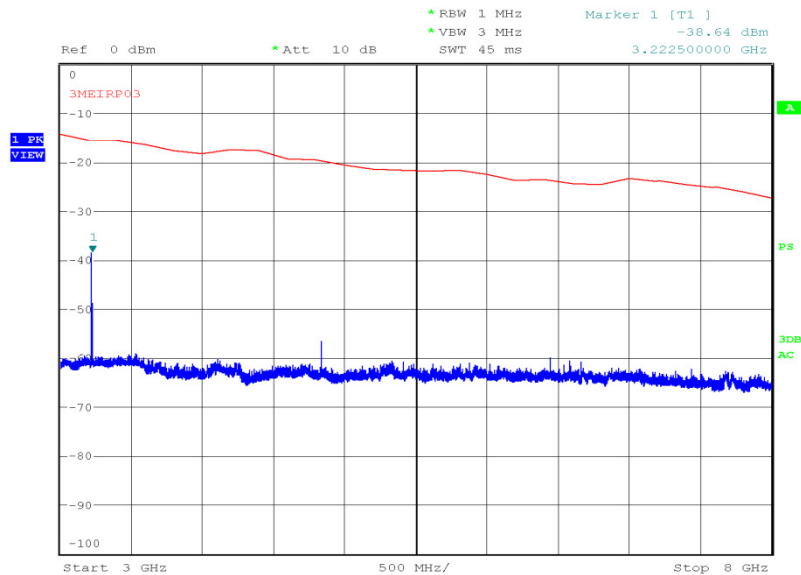
Transmit, 1611.250 MHz, 30 MHz to 1 GHz, Radiated Spurious Emissions Plot



Date: 14.JUN.2016 10:06:35

Transmit, 1611.250 MHz, 1 GHz to 3 GHz, Radiated Spurious Emissions Plot

Date: 13.JUN.2016 15:01:06

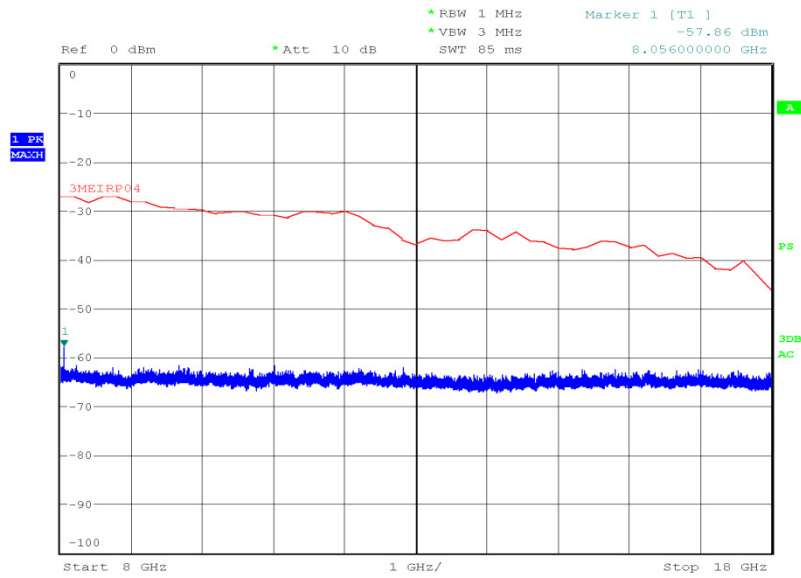
Transmit, 1611.250 MHz, 3 GHz to 8 GHz, Radiated Spurious Emissions Plot

Date: 14.JUN.2016 09:19:39



Product Service

Transmit, 1611.250 MHz, 8 GHz to 18 GHz, Radiated Spurious Emissions Plot



Date: 13.JUN.2016 16:30:47



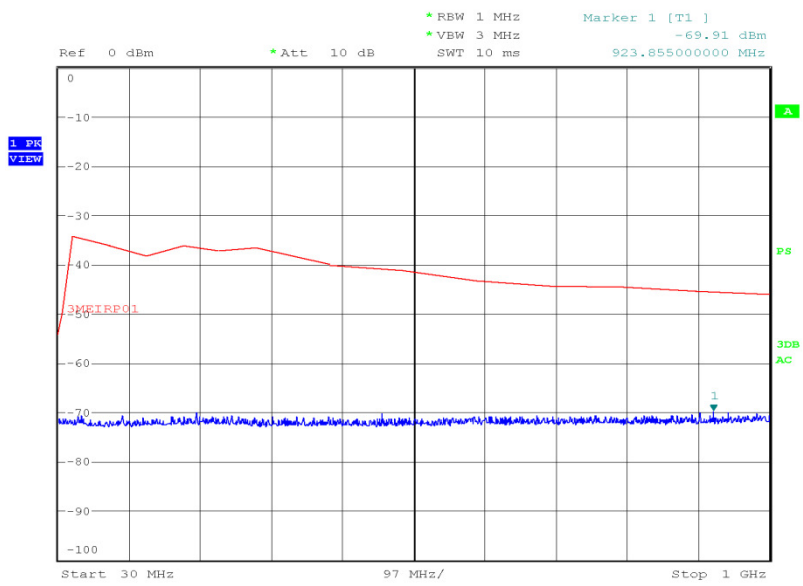
Product Service

Transmit, 1616.250 MHz, 30 MHz to 18 GHz, Radiated Spurious Emissions Results

Frequency (MHz)	Emission Results (dBm)
*	

*No emissions were detected within 20 dB of the limit.

Transmit, 1618.750 MHz, 30 MHz to 1 GHz, Radiated Spurious Emissions Plot

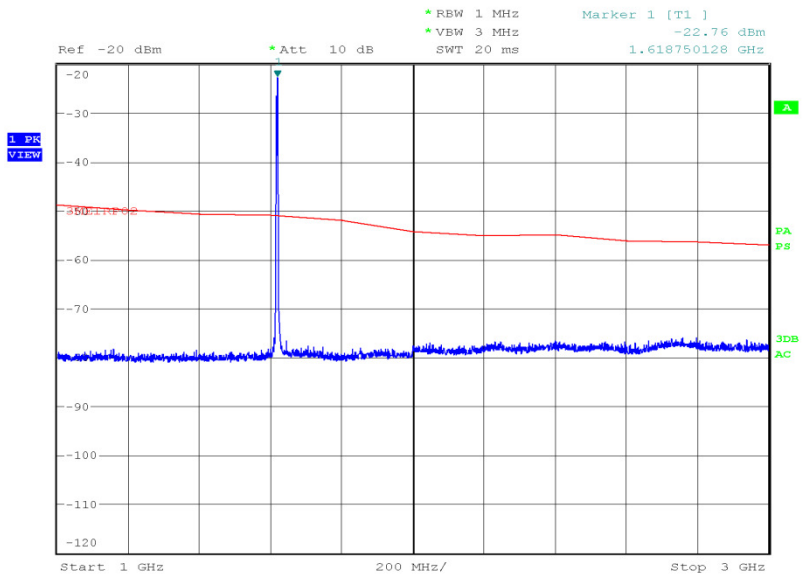


Date: 14.JUN.2016 10:14:42



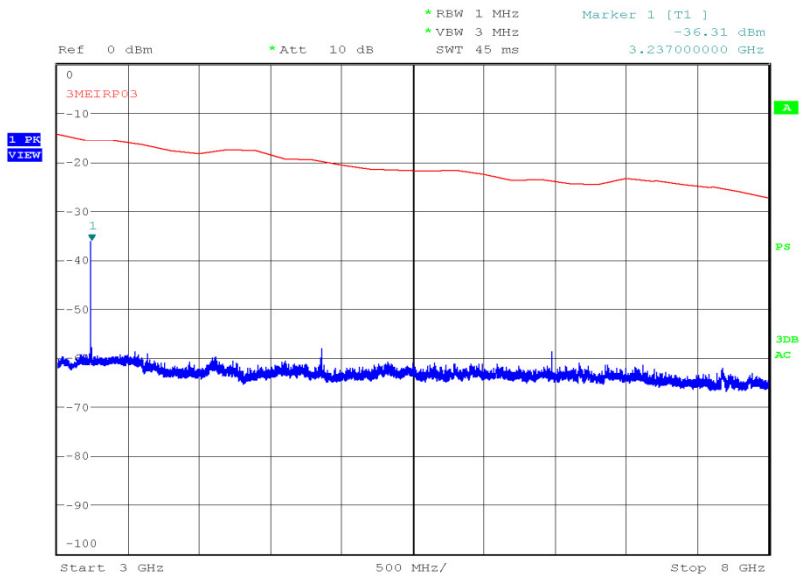
Product Service

Transmit, 1616.250 MHz, 1 GHz to 3 GHz, Radiated Spurious Emissions Plot



Date: 13.JUN.2016 14:49:06

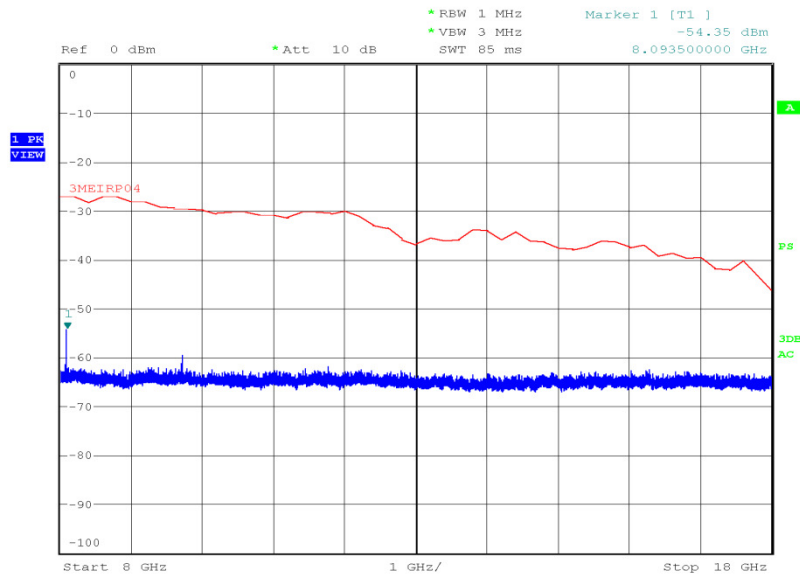
Transmit, 1616.250 MHz, 3 GHz to 8 GHz, Radiated Spurious Emissions Plot



Date: 14.JUN.2016 09:08:22



Transmit, 1616.250 MHz, 8 GHz to 18 GHz, Radiated Spurious Emissions Plot



Date: 14.JUN.2016 09:39:22

FCC 47 CFR Part 2, Limit Clause 25.202(f)

The average power of unwanted emissions shall be attenuated below the average output power, P(dBW), of the transmitter, as specified below:

- 1) $43 + 10 \log p$ (watts) in any 4 kHz band, the centre frequency of which is offset from the channel frequency by more than 250% of the authorised bandwidth.

Industry Canada RSS-170, Limit Clause 5.4.3.1

The average power of unwanted emissions shall be attenuated below the average output power, P(dBW), of the transmitter, as specified below:

- 1) $43 + 10 \log p$ (watts) in any 4 kHz band, the centre frequency of which is offset from the channel frequency by more than 250% of the occupied bandwidth or necessary bandwidth, whichever is greater.



Product Service

2.2 RADIATED OUTPUT POWER

2.2.1 Specification Reference

FCC 47 CFR Part 25, Clause 25.204
Industry Canada RSS-170, Clause 5.3

2.2.2 Equipment Under Test and Modification State

Survey VERTEX PLUS S/N: 60105 0-2317134 - Modification State 0

2.2.3 Date of Test

14 June 2016

2.2.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.2.5 Test Procedure

For radiated power, the EUT was transmitted at maximum power via a cable to the Spectrum Analyser. The Analyser settings were adjusted to display the resultant trace on screen and a resolution bandwidth and video bandwidth of 1 MHz were used to perform the measurement. The level on the spectrum analyser was maximised by rotating the EUT through 360° and a height search of the measuring antenna. A substitution was then performed using a suitable calibrated antenna and signal generator.

This level was maximised by adjusting the height of the measuring antenna once more. The level from the signal generator was then adjusted to achieve the same raw result as with the EUT. This level was then corrected to account for cable loss and antenna factor.

A calculation was then performed to obtain the final figure.

2.2.6 Environmental Conditions

Ambient Temperature	21.3°C
Relative Humidity	63.0%



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2.2.7 Test Results

3.6 V DC Supply

Transmit, EIRP, Radiated, Power Limits Results

1611.250 MHz	1618.750 MHz
dBW	dBW
15.23	15.00

FCC 47 CFR Part 25, Limit Clause 25.204

+40 dBW in any 4 kHz band for $\theta \leq 0^\circ$

+40 + 3 θ dBW in any 4 kHz band for $0^\circ < \theta \leq 5^\circ$

For angles of elevation of the horizon greater than 5° there shall be no restriction as to the equivalent isotropically radiated power transmitted by an earth station towards the horizon.

Industry Canada RSS-170, Limit Clause 5.3

The application for MES certification shall state the MES e.i.r.p. that is necessary for satisfactory communication. The maximum permissible e.i.r.p. will be the stated necessary e.i.r.p. plus a 2 dB margin. If a detachable antenna is used, the certification application shall state the recommended antenna type and manufacturer, the antenna gain and the maximum transmitter output power at the antenna terminal.



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SECTION 3

TEST EQUIPMENT USED



3.1 TEST EQUIPMENT USED

List of absolute measuring and other principal items of test equipment.

Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Due
Section 2.1 - Radiated Spurious Emissions					
Antenna (Double Ridge Guide, 1GHz-18GHz)	EMCO	3115	234	12	29-Apr-2017
Antenna (Double Ridge Guide, 1GHz-18GHz)	EMCO	3115	235	12	27-Nov-2016
Pre-Amplifier	Phase One	PS04-0086	1533	12	30-Jul-2016
Screened Room (5)	Rainford	Rainford	1545	36	20-Dec-2017
Turntable Controller	Inn-Co GmbH	CO 1000	1606	-	TU
EMI Test Receiver	Rohde & Schwarz	ESU40	3506	12	2-Nov-2016
Tilt Antenna Mast	mature GmbH	TAM 4.0-P	3916	-	TU
Mast Controller	mature GmbH	NCD	3917	-	TU
1GHz to 8GHz Low Noise Amplifier	Wright Technologies	APS04-0085	4365	12	6-Oct-2016
Suspended Substrate Highpass Filter	Advance Power Components	11SH10-3000/X18000-O/O	4412	12	23-Mar-2017
Section 2.2 - Radiated Output Power					
Antenna (Double Ridge Guide, 1GHz-18GHz)	EMCO	3115	234	12	29-Apr-2017
Antenna (Double Ridge Guide, 1GHz-18GHz)	EMCO	3115	235	12	27-Nov-2016
Screened Room (5)	Rainford	Rainford	1545	36	20-Dec-2017
Turntable Controller	Inn-Co GmbH	CO 1000	1606	-	TU
EMI Test Receiver	Rohde & Schwarz	ESU40	3506	12	2-Nov-2016
Tilt Antenna Mast	mature GmbH	TAM 4.0-P	3916	-	TU
Mast Controller	mature GmbH	NCD	3917	-	TU

TU – Traceability Unscheduled



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3.2 MEASUREMENT UNCERTAINTY

For a 95% confidence level, the measurement uncertainties for defined systems are:-

Test Discipline	MU
Radiated Output Power	± 6.3 dB
Radiated Spurious Emissions	30 MHz to 1 GHz: ± 5.1 dB 1 GHz to 17 GHz: ± 6.3 dB



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SECTION 4

ACCREDITATION, DISCLAIMERS AND COPYRIGHT



Product Service

4.1 ACCREDITATION, DISCLAIMERS AND COPYRIGHT



This report relates only to the actual item/items tested.

Our UKAS Accreditation does not cover opinions and interpretations and any expressed are outside the scope of our UKAS Accreditation.

Results of tests not covered by our UKAS Accreditation Schedule are marked NUA
(Not UKAS Accredited).

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