

# Limited Radio Testing of the

Iridium Satellite LLC  
Satellite Device  
Model: Iridium Edge Pro

In accordance with

FCC Part 25 Subpart C  
RSS-170 Issue 3 (July 2015)



Product Service

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Iridium Satellite LLC  
1750 Tysons Blvd. #1400  
McLean, VA 22102  
USA

Date: June 2020  
Document Number: 72156172A Issue 01 | Version Number: 01

RESPONSIBLE FOR	NAME	DATE	SIGNATURE
Authorized Signatory	Ferdinand S. Custodio	June 18, 2020	

Signatures in this approval box have checked this document in line with the requirements of TÜV SÜD Product Service document control rules.

### EXECUTIVE SUMMARY

The EUT in general was confirmed to be in compliance with FCC Part 25 Subpart C and RSS-170 Issue 3 (July 2015) Radiated Spurious Emissions requirement.



A2LA Cert. No. 2955.13

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**REPORT ON** Limited Radio Testing of the  
Iridium Satellite LLC  
Iridium Edge Pro

**TEST REPORT NUMBER** 72156172A

**REPORT DATE** June 2020

**PREPARED FOR** Iridium Satellite LLC  
1750 Tysons Blvd. #1400  
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Xiaoying Zhang

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### Revision History

72156172A Iridium Satellite LLC Iridium Edge Pro Satellite Device				
DATE	OLD REVISION	NEW REVISION	REASON	APPROVED BY
06/18/2020	—	Initial Release		Ferdinand S. Custodio



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## **SECTION 1**

### **REPORT SUMMARY**

Radio Testing of the  
Iridium Satellite LLC  
Iridium Edge Pro Satellite Device



## 1.1 INTRODUCTION

The information contained in this report is intended to show verification of the Iridium Satellite LLC Iridium Edge Pro 9690 to the requirements of FCC Part 25 Subpart C and RSS-170 Issue 3 (July 2015).

Objective	To perform Radio Testing to determine the Equipment Under Test's (EUT's) compliance with the Test Specification, for the series of tests carried out.
Applicant	Iridium Satellite LLC
Manufacturer	MetOcean Telematics
Model Name	Iridium Edge Pro
Model Number(s)	9690
EUT	Satellite Device
FCC ID	Q639690
IC ID	4629A-9690
Serial Number(s)	N/A (engineering sample)
Number of Samples Tested	1
Date sample(s) received	January 10, 2020
Test Specification/Issue/Date	<ul style="list-style-type: none"> <li>• FCC Part 25 Subpart C (October 1, 2019)</li> <li>• RSS-170 Issue 3 (July 2015) Mobile Earth Stations (MESs) and Ancillary Terrestrial Component (ATC) Equipment Operating in the Mobile-Satellite Services (MSS)</li> </ul>
Start of Test	January 23, 2020
Finish of Test	January 26, 2020
Name of Engineer(s)	Xiaoying Zhang
Related Document(s)	None



**1.2 BRIEF SUMMARY OF RESULTS**

A brief summary of the tests carried out in accordance with FCC Part 25 Subpart C is shown below:

Section	Part 2	Part 25	RSS-170	Test Description	Result	Comments
-	§2.1046	§25.204(a)	Sec. 5.3.2	RF Power Output	N/T	
-	§2.1049			Occupied Bandwidth	N/T	
-	§2.1051	§25.202(f)	Sec. 5.4.3.1	Spurious Emissions at Antenna Terminals	N/T	
2.1	§2.1053	§25.202(f)	Sec. 5.4.3.1	Field Strength of Radiated Spurious Emissions	Compliant	
-	§2.1055	§25.202(d)	Sec. 5.2	Frequency Stability	N/T	
-	-	§25.216 (c)(f)(g)(l) and (j)	Sec. 5.4.3.2.1, Sec. 5.4.4	Protection of Aeronautical Radio Navigation Satellite Service	N/T	

**N/T** Not tested as per client's test plan.

### 1.3 PRODUCT INFORMATION

#### 1.3.1 Technical Description

The Equipment Under Test (EUT) was a Iridium Satellite LLC Iridium Edge Pro Satellite Device as shown in the photograph below. The EUT is a standalone satellite device containing an Iridium transceiver, BLE and GNSS with a Java application programming environment. The device consists of a power supply, dedicated Iridium antenna, dedicated GNSS antenna, BLE, four configurable inputs/outputs, RS232, RS485, and CAN bus in an environmentally sealed enclosure. It contains an Iridium Short Burst Data Transceiver modem which allows remote devices to send and receive satellite messages from anywhere in the world.



**Equipment Under Test**





**1.3.2 EUT General Description**

EUT Description	Satellite Device
Model Name	Iridium Edge Pro
Model Number(s)	9690
Rated Voltage	7 - 32 VDC
Output RF Power	-
Mode Verified	1610 – 1626.5 MHz Satellite Service (TX)
Capability	1610 – 1626.5 MHz Satellite Service (TX), 2400 – 2483.5 MHz BLE, and GPS
Primary Unit (EUT)	<input checked="" type="checkbox"/> Production <input type="checkbox"/> Pre-Production <input type="checkbox"/> Engineering
Antenna Type	Ceramic Antenna
Antenna Model	2JCP3642603a
Antenna gain	Max. 4.5 dBi



**1.4 EUT TEST CONFIGURATION**

**1.4.1 Test Configuration Description**

Test Configuration	Description
Default	Case/Cabinet Radiated Emission Single Channel Mode. The EUT was connected to a test box via 10 meter Edge Pro cable which provides power to the DUT. The test box could get access to all the DUT peripherals via this cable. The CAN SNOOP port, DUT port, USB port and RS-485 port on the test box were connected to a USB-Hub which connects to the control laptop via a USB cable. The Iridium module was set to transmit in fixed channel by exercising Realterm commands.
Intermodulation	Case/Cabinet Radiated Emission Satellite and BLE Intermodulation Mode. The EUT was connected to a test box via 10 meter Edge Pro cable which provides power to the DUT. The test box could get access to all the DUT peripherals via this cable. The CAN SNOOP port, DUT port, USB port and RS-485 port on the test box were connected to a USB-Hub which connects to the control laptop via a USB cable. EUT was set to transmit satellite and BLE signals simultaneously by exercising Realterm commands.

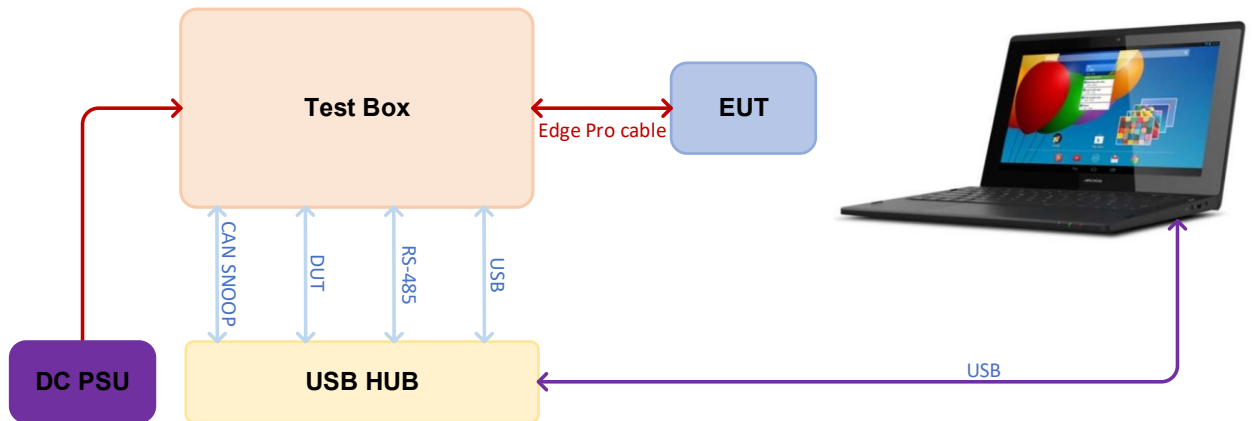
**1.4.2 EUT Exercise Software**

Firmware build is PID7962. Realterm 2.0.070 and Putty software were used to setup the EUT and monitor the EUT.

**1.4.3 Support Equipment and I/O cables**

Manufacturer	Equipment/Cable	Description
Lenovo	Support Laptop (T440s)	P/N: SL10G10663 JS
MetOcean	Test Box with CAN SNOOP, DUT, RS-485 and USB Ports	IP: 12 VDC, OP: 12 VDC
Plugable	Super Speed 7-Port USB 3.0 Hub	M/N: USB3-HUB7-81X S/N: 109000231963
Duralast	Battery	P/N: 24MD-DL
Hewlett Packard	DC Power Supply	M/N: E3611A 0-20V 1.5A

**1.4.4 Simplified Test Configuration Diagram**



**1.5 DEVIATIONS FROM THE STANDARD**

All deviations made during testing from the applicable test standards or test plan if any are detailed under Section 1.2 of this test report.

**1.6 MODIFICATION RECORD**

Description of Modification	Modification Fitted By	Date Modification Fitted
Serial Number: N/A (engineering sample)		
None	-	-

The table above details modifications made to the EUT during the test program. The modifications incorporated during each test (if relevant) are recorded on the appropriate test pages.

**1.7 TEST METHODOLOGY**

All measurements contained in this report were conducted with ANSI C63.10-2013. American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.

For conducted and radiated emissions, the equipment under test (EUT) was configured to measure its highest possible emission level. This level was based on the maximized cable configuration from exploratory testing per ANSI C63.10-2013. The test modes were adapted according to the Operating Instructions provided by the manufacturer/client.

**1.8 TEST FACILITY LOCATION**

**1.8.1 TÜV SÜD America Inc. (Mira Mesa)**

10040 Mesa Rim Road, San Diego, CA 92121-2912 (32.901268,-117.177681). Phone: (858) 678 1400 Fax: (858) 546 0364.

**1.8.2 TÜV SÜD America Inc. (Rancho Bernardo)**

16936 Via Del Campo, San Diego, CA 92127-1708 (33.018644,-117.092409). Phone: (858) 678 1400 Fax: (858) 546 0364.



## **1.9 TEST FACILITY REGISTRATION**

### **1.9.1 FCC – Designation No.: US1146**

TÜV SÜD America Inc. (San Diego), is an accredited test facility with the site description report on file and has met all the requirements specified in §2.948 of the FCC rules. The acceptance letter from the FCC is maintained in our files and the Designation is US1146.

### **1.9.2 Innovation, Science and Economic Development Canada (IC) Registration No.: 3067A-1 & 22806-1**

The 10m Semi-anechoic chamber of TUV SUD America Inc. (San Diego Rancho Bernardo) has been registered by Certification and Engineering Bureau of Innovation, Science and Economic Development Canada for radio equipment testing with Registration No. 3067A-1.

The 3m Semi-anechoic chamber of TUV SUD America Inc. (San Diego Mira Mesa) has been registered by Certification and Engineering Bureau of Innovation, Science and Economic Development Canada for radio equipment testing with Registration No. 22806-1.

### **1.9.3 BSMI – Laboratory Code: SL2-IN-E-028R (US0102)**

TUV Product Service Inc. (San Diego) is a recognized EMC testing laboratory by the BSMI under the MRA (Mutual Recognition Arrangement) with the United States. Accreditation includes CNS 13438 up to 6GHz.

### **1.9.4 NCC (National Communications Commission - US0102)**

TUV SUD America Inc. (San Diego) is listed as a Foreign Recognized Telecommunication Equipment Testing Laboratory and is accredited to ISO/IEC 17025 (A2LA Certificate No.2955.13) which under APEC TEL MRA Phase 1 was designated as a Conformity Assessment Body competent to perform testing of equipment subject to the Technical Regulations covered under its scope of accreditation including RTTE01, PLMN01 and PLMN08 for TTE type of testing and LP002 for Low-Power RF Device type of testing.

### **1.9.5 VCCI – Registration No. A-0280 and A-0281**

TUV SUD America Inc. (San Diego) is a VCCI registered measurement facility which includes radiated field strength measurement, radiated field strength measurement above 1GHz, mains port interference measurement and telecommunication port interference measurement.

### **1.9.6 RRA – Identification No. US0102**

TUV SUD America Inc. (San Diego) is National Radio Research Agency (RRA) recognized laboratory under Phase I of the APEC Tel MRA.

### **1.9.7 OFCA – U.S. Identification No. US0102**

TUV SUD America Inc. (San Diego) is recognized by Office of the Communications Authority (OFCA) under Appendix B, Phase I of the APEC Tel MRA.



## **SECTION 2**

### **TEST DETAILS**

Radio Test of the  
Iridium Satellite LLC  
Iridium Edge Pro Satellite Device



## **2.1 FIELD STRENGTH OF RADIATED SPURIOUS EMISSIONS**

### **2.1.1 Specification Reference**

Part 25 Subpart C §25.202(f) as required by Part 2 Subpart J §2.1053, RSS-170 Issue 3 Sec. 5.4.3.1

### **2.1.2 Standard Applicable**

(f) Emission limitations. Except for SDARS terrestrial repeaters, the mean power of emissions shall be attenuated below the mean output power of the transmitter in accordance with the schedule set forth in paragraphs (f)(1) through (f)(4) of this section. The out-of-band emissions of SDARS terrestrial repeaters shall be attenuated in accordance with the schedule set forth in paragraph (h) of this section.

(1) In any 4 kHz band, the center frequency of which is removed from the assigned frequency by more than 50 percent up to and including 100 percent of the authorized bandwidth: 25 dB;

(2) In any 4 kHz band, the center frequency of which is removed from the assigned frequency by more than 100 percent up to and including 250 percent of the authorized bandwidth: 35 dB;

(3) In any 4 kHz band, the center frequency of which is removed from the assigned frequency by more than 250 percent of the authorized bandwidth: An amount equal to 43 dB plus 10 times the logarithm (to the base 10) of the transmitter power in watts;

(4) In any event, when an emission outside of the authorized bandwidth causes harmful interference, the Commission may, at its discretion, require greater attenuation than specified in paragraphs (f) (1), (2) and (3) of this section.

### **2.1.3 Equipment Under Test and Modification State**

Serial No: N/A / Default and Intermodulation Test Configurations

### **2.1.4 Date of Test/Initial of test personnel who performed the test**

January 23 and 26, 2020 / XYZ

### **2.1.5 Test Equipment Used**

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

### **2.1.6 Environmental Conditions**

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

Ambient Temperature	22.6 - 23.1 °C
Relative Humidity	43.7 - 49.7 %
ATM Pressure	99.6 - 100.5 kPa



**2.1.7 Additional Observations**

- This is a radiated test.
- The spectrum was searched from 30MHz to 10x the transmit frequency.
- Investigation was performed on Low, Middle and High channels of the satellite for above 1GHz and worst case channel for below 1GHz.
- Satellite and BLE simultaneous transmission was verified.
- Test procedure is per ANSI C63.26-2015 (120kHz RBW below 1GHz and 1MHz RBW above 1GHz).
- Limit for this test is 82.23dBµV/m @ 3 meters (-13dBm) E.I.R.P.
- All emissions observed comply using higher RBW settings. Re-evaluation using 4kHz RBW is not required.
- Measurement was done using EMC32 automated software. Reported level is the actual level with all the correction factors factored in. Correction Factor column is for informational purposes only. See Section 2.1.8 for sample computation.

**2.1.8 Sample Computation (Radiated Emission)**

Measuring equipment raw measurement (dbµV) @ 30 MHz		24.4
Correction Factor (dB)	Asset# 1066 (cable)	0.3
	Asset# 1172 (cable)	0.3
	Asset# 1016 (preamplifier)	-30.7
	Asset# 1175(cable)	0.3
	Asset# 1002 (antenna)	17.2
<b>Reported QuasiPeak Final Measurement (dbµV/m) @ 30MHz</b>		<b>11.8</b>

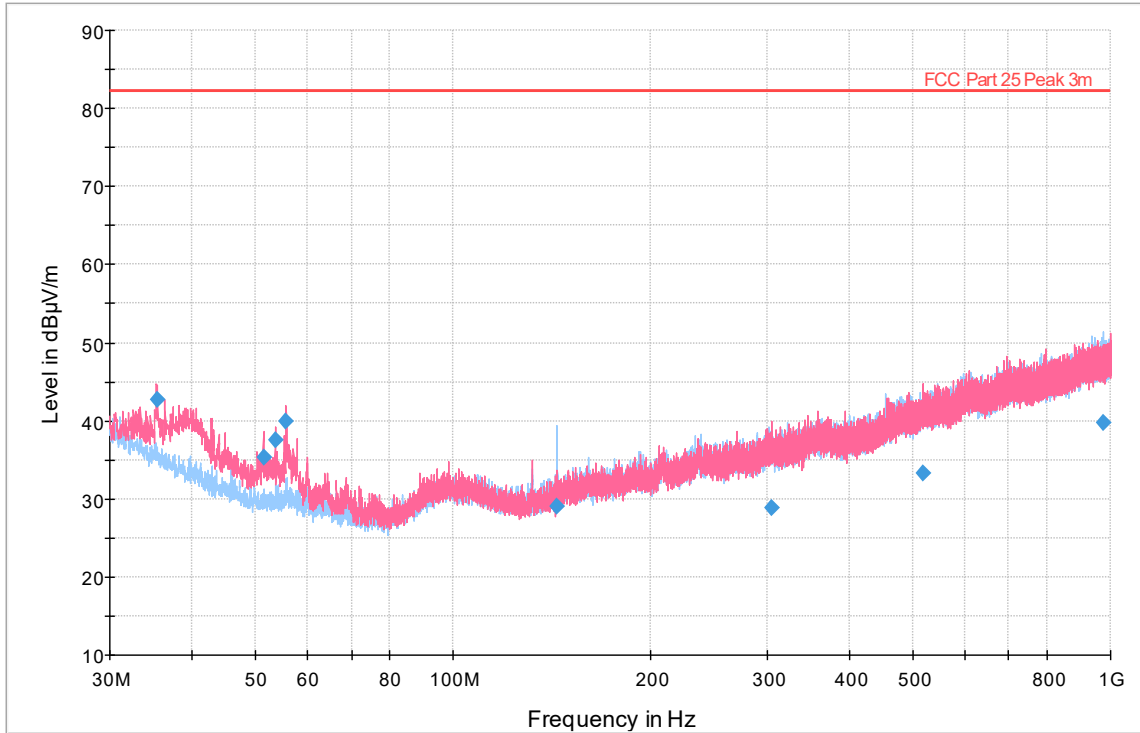
**2.1.9 Test Results**

See attached plots.



2.1.9.1 Below 1GHz Radiated Emission Test – Worst case channel

Full Spectrum



— Preview Result 1H-PK+ [Preview Result 1H.Result:2]     — Preview Result 1V-PK+ [Preview Result 1V.Result:2]  
— FCC Part 25 Peak 3m [..\EMI Radiated\]     ◆ Final\_Result QPK [Final\_Result.Result:4]

Quasi-Peak Data

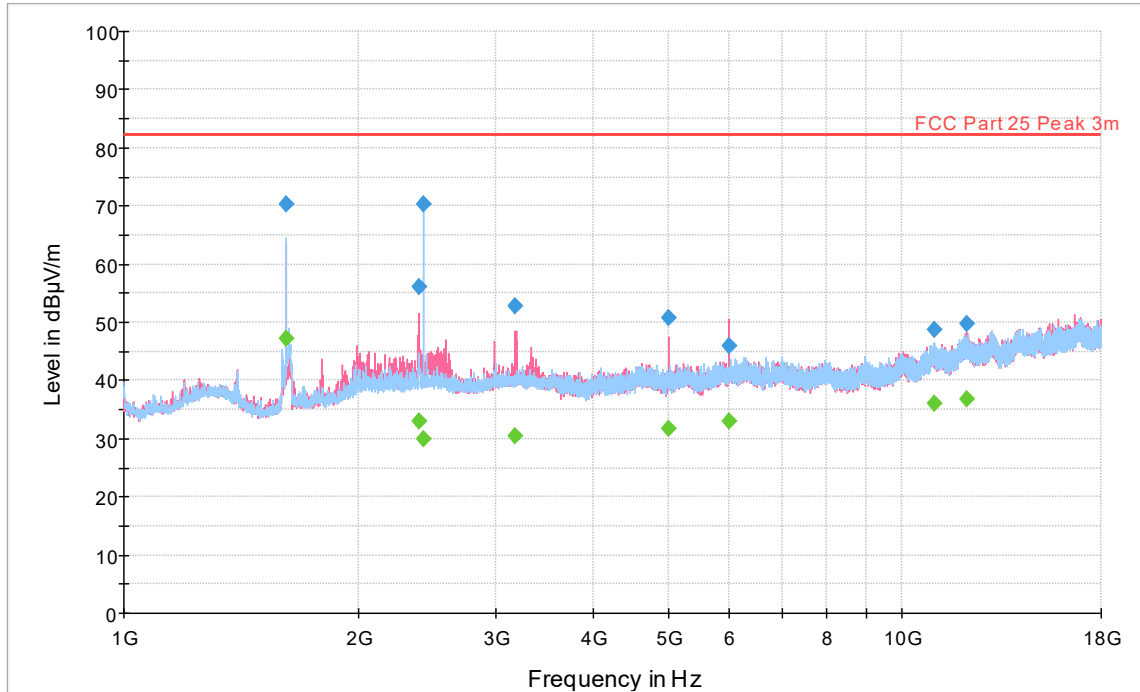
Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
30.560000	24.5	1000.0	120.000	115.0	V	294.0	-8.0	57.7	82.2
70.981643	17.5	1000.0	120.000	400.0	V	343.0	-16.9	64.7	82.2
151.457154	32.5	1000.0	120.000	100.0	V	106.0	-12.7	49.8	82.2
246.011543	39.0	1000.0	120.000	100.0	H	124.0	-8.7	43.2	82.2
450.295872	17.5	1000.0	120.000	105.0	H	16.0	-3.1	64.7	82.2
650.020200	34.9	1000.0	120.000	110.0	H	187.0	0.8	47.3	82.2
750.022365	34.8	1000.0	120.000	100.0	H	200.0	2.9	47.4	82.2





2.1.9.2 Above 1GHz Radiated Emission Test – Low Channel

Continuous Rotation TUV 3m Radiated 1000 to 18000MHz



— FCC Part 25 Peak 3m [..\EMI Radiated\  
— Preview Result 1H-PK+ [Preview Result 1H.Result:2]  
◆ Final Result 2-AVG [Final Result 2.Result:1]

Peak Data

Frequency (MHz)	Max Peak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1615.766667	70.3	1000.0	1000.000	315.2	H	340.0	-5.6	Fundamental Carrier	
2396.666667	56.0	1000.0	1000.000	404.3	V	-13.0	-1.1	26.2	82.2
2426.733333	70.4	1000.0	1000.000	151.2	H	333.0	-0.8	BLE signal from test box	
3185.833333	52.9	1000.0	1000.000	377.1	V	263.0	1.0	29.4	82.2
4999.733333	50.7	1000.0	1000.000	195.5	V	95.0	3.8	31.5	82.2
5989.866667	45.9	1000.0	1000.000	404.3	V	332.0	5.7	36.3	82.2
11008.700000	48.8	1000.0	1000.000	102.7	H	12.0	11.8	33.4	82.2
12110.633333	49.8	1000.0	1000.000	252.3	V	191.0	13.4	32.4	82.2

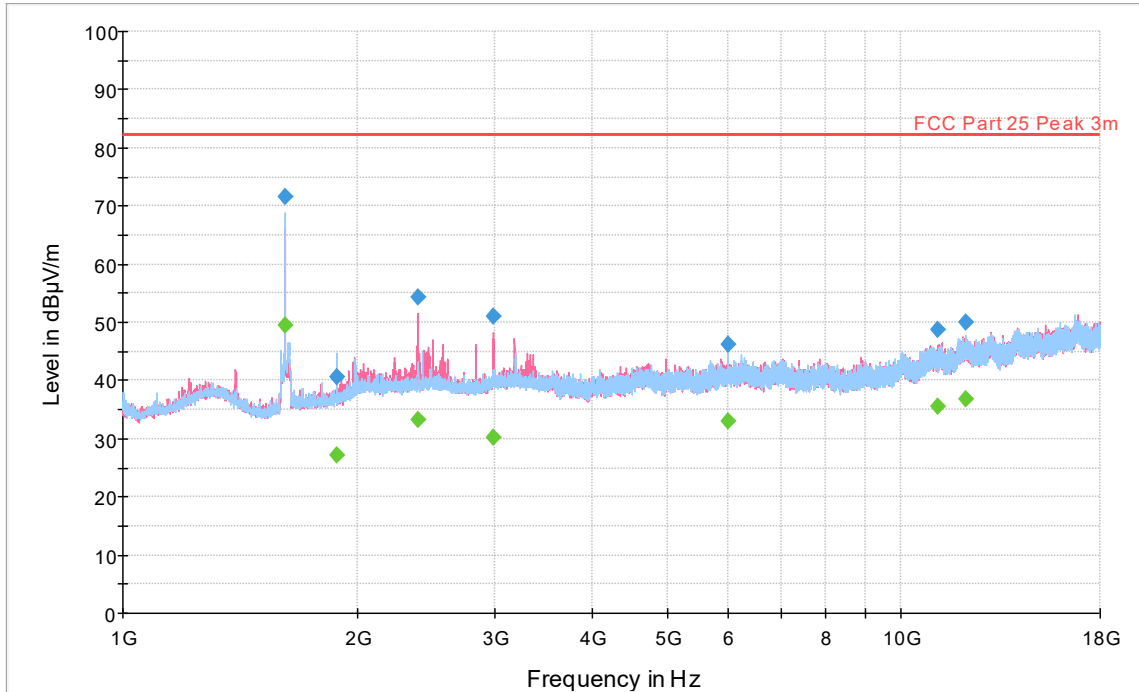
Average Data

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1615.766667	47.2	1000.0	1000.000	315.2	H	340.0	-5.6	Fundamental Carrier	
2396.666667	33.1	1000.0	1000.000	404.3	V	-13.0	-1.1	49.2	82.2
2426.733333	30.0	1000.0	1000.000	151.2	H	333.0	-0.8	BLE signal from test box	
3185.833333	30.4	1000.0	1000.000	377.1	V	263.0	1.0	51.8	82.2
4999.733333	31.8	1000.0	1000.000	195.5	V	95.0	3.8	50.4	82.2
5989.866667	33.1	1000.0	1000.000	404.3	V	332.0	5.7	49.1	82.2
11008.700000	36.0	1000.0	1000.000	102.7	H	12.0	11.8	46.2	82.2
12110.633333	36.8	1000.0	1000.000	252.3	V	191.0	13.4	45.4	82.2



2.1.9.3 Above 1GHz Radiated Emission Test – Middle Channel

Continuous Rotation TUV 3m Radiated 1000 to 18000MHz



— FCC Part 25 Peak 3m [..\EMI Radiated\  
— Preview Result 1H-PK+ [Preview Result 1H.Result:2] ◆ Final Result 1-PK+ [Final Result 1.Result:1]  
◆ Final Result 2-AVG [Final Result 2.Result:1]

Peak Data

Frequency (MHz)	Max Peak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1621.966667	71.4	1000.0	1000.000	306.2	H	107.0	-5.6	Fundamental Carrier	
2396.666667	56.0	1000.0	1000.000	404.3	V	-13.0	-1.1	26.2	82.2
1879.833333	40.7	1000.0	1000.000	115.7	H	20.0	-2.7	41.6	82.2
2398.000000	54.3	1000.0	1000.000	162.6	V	195.0	-1.1	27.9	82.2
2995.066667	50.9	1000.0	1000.000	251.5	V	200.0	0.8	31.3	82.2
5988.966667	46.2	1000.0	1000.000	327.2	H	221.0	5.7	36.1	82.2
11115.200000	48.7	1000.0	1000.000	252.3	V	336.0	12.3	33.5	82.2
12088.566667	50.1	1000.0	1000.000	151.2	H	80.0	13.4	32.1	82.2

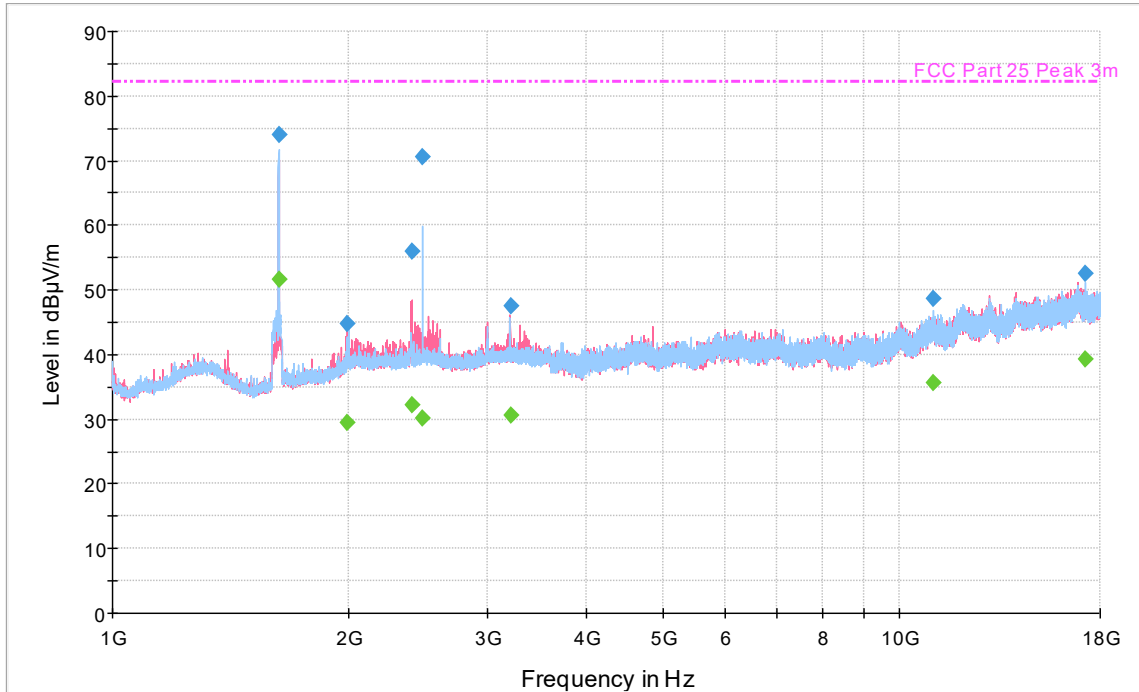
Average Data

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1621.966667	49.4	1000.0	1000.000	306.2	H	107.0	-5.6	Fundamental Carrier	
1879.833333	27.1	1000.0	1000.000	115.7	H	20.0	-2.7	55.1	82.2
2398.000000	33.3	1000.0	1000.000	162.6	V	195.0	-1.1	48.9	82.2
2995.066667	30.3	1000.0	1000.000	251.5	V	200.0	0.8	51.9	82.2
5988.966667	33.0	1000.0	1000.000	327.2	H	221.0	5.7	49.2	82.2
11115.200000	35.6	1000.0	1000.000	252.3	V	336.0	12.3	46.6	82.2
12088.566667	36.9	1000.0	1000.000	151.2	H	80.0	13.4	45.3	82.2



2.1.9.4 Above 1GHz Radiated Emission Test – High Channel

Continuous Rotation TUV 3m Radiated 1000 to 18000MHz



- - - FCC Part 25 Peak 3m [..\EMI Radiated\  
— Preview Result 1H-PK+ [Preview Result 1H.Result:2] ◆ Final Result 1-PK+ [Final Result 1.Result:1]  
◆ Final Result 2-AVG [Final Result 2.Result:1]

Peak Data

Frequency (MHz)	Max Peak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1626.366667	73.9	1000.0	1000.000	280.2	H	71.0	-5.5	Fundamental Carrier	
1987.333333	44.7	1000.0	1000.000	103.7	V	-7.0	-2.3	37.5	82.2
2399.866667	55.9	1000.0	1000.000	200.5	V	182.0	-1.1	26.4	82.2
2481.100000	70.7	1000.0	1000.000	250.5	H	154.0	-0.5	BLE signal from test box	
3204.366667	47.6	1000.0	1000.000	250.5	V	30.0	1.1	29.4	82.2
11047.433333	48.6	1000.0	1000.000	208.5	H	20.0	11.9	34.6	82.2
17225.733333	52.5	1000.0	1000.000	352.7	H	213.0	17.5	33.6	82.2
1626.366667	73.9	1000.0	1000.000	280.2	H	71.0	-5.5	29.7	82.2

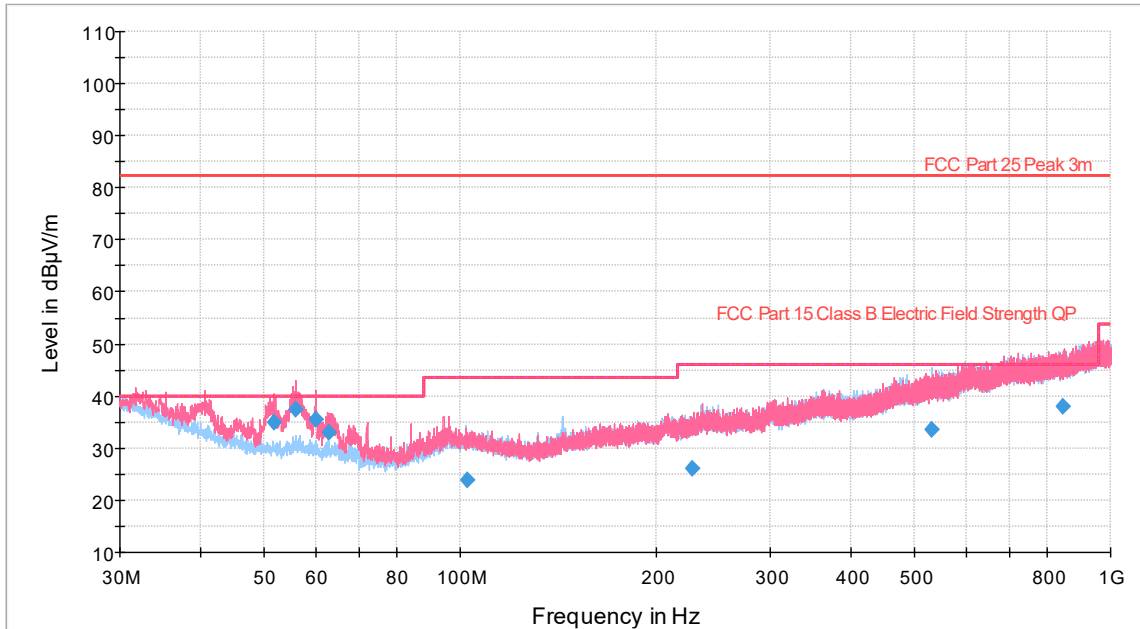
Average Data

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1626.366667	51.5	1000.0	1000.000	280.2	H	71.0	-5.5	Fundamental Carrier	
1987.333333	29.5	1000.0	1000.000	103.7	V	-7.0	-2.3	52.7	82.2
2399.866667	32.3	1000.0	1000.000	200.5	V	182.0	-1.1	50.0	82.2
2481.100000	30.2	1000.0	1000.000	250.5	H	154.0	-0.5	BLE signal from test	
3204.366667	30.5	1000.0	1000.000	250.5	V	30.0	1.1	51.7	82.2
11047.433333	35.7	1000.0	1000.000	208.5	H	20.0	11.9	46.6	82.2
17225.733333	39.2	1000.0	1000.000	352.7	H	213.0	17.5	43.1	82.2



**2.1.9.5 Below 1GHz Radiated Emission Test (Satellite and BLE Intermodulation Mode)**

Full Spectrum



- Preview Result 1H-PK+ [Preview Result 1H.Result:2]
- Preview Result 1V-PK+ [Preview Result 1V.Result:2]
- FCC Part 25 Peak 3m [..\EMI Radiated\]
- FCC Part 15 Class B Electric Field Strength QP [..\EMI Radiated\]
- FCC Part 15 Class B Electric Field Strength QP [..\EMI Radiated\]
- ◆ Final\_Result QPK [Final\_Result.Result:4]
- FCC Part 15 Class B Electric Field Strength QP [..\EMI Radiated\]

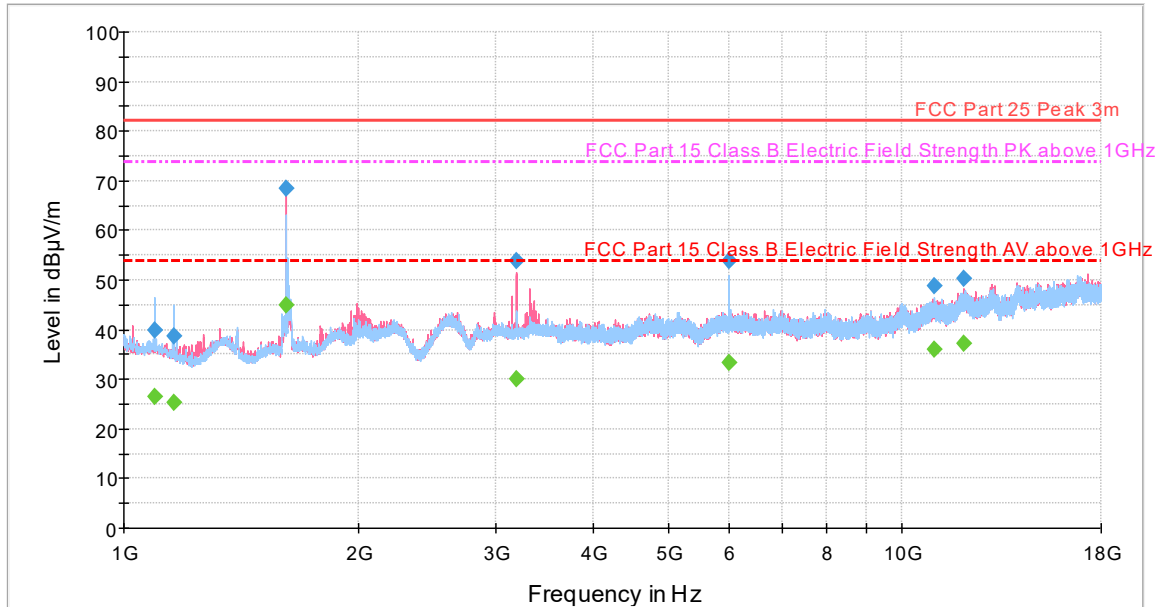
**Quasi-Peak Data**

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
51.855667	34.95	1000.0	120.000	115.0	107.0	V	280.0	47.25	82.2
56.011333	37.46	1000.0	120.000	400.0	125.0	V	218.0	44.74	82.2
59.925333	35.60	1000.0	120.000	100.0	125.0	V	274.0	46.60	82.2
62.862667	33.01	1000.0	120.000	100.0	189.0	V	228.0	49.19	82.2
102.781667	23.95	1000.0	120.000	105.0	187.0	H	283.0	58.25	82.2
228.080667	26.13	1000.0	120.000	110.0	293.0	V	237.0	56.07	82.2
529.862000	33.50	1000.0	120.000	100.0	293.0	H	251.0	48.70	82.2
847.073333	37.84	1000.0	120.000	100.0	303.0	V	-6.0	44.36	82.2

Note: Less stringent limit applies

**2.1.9.6 Above 1GHz Radiated Emission Test (Satellite and BLE Intermodulation Mode)**

Continuous Rotation TUV 3m Radiated 1000 to 18000MHz



- FCC Part 25 Peak 3m [.\EMI Radiated\]
- - - FCC Part 15 Class B Electric Field Strength PK above 1GHz [.\EMI Radiated\]
- Preview Result 1V-PK+ [Preview Result 1V.Result:2]
- Preview Result 1H-PK+ [Preview Result 1H.Result:2]
- ◆ Final Result 1-PK+ [Final Result 1.Result:1]
- ◆ Final Result 2-AVG [Final Result 2.Result:1]
- - - FCC Part 15 Class B Electric Field Strength AV above 1GHz [.\EMI Radiated\]

**Peak Data**

Frequency (MHz)	Max Peak (dBµV/m)	Meas. Time (ms)	Bandwidth h (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1095.56666	39.9	1000.0	1000.000	274.3	H	140.0	-7.0	42.3	82.2
1158.50000	38.6	1000.0	1000.000	116.7	H	153.0	-6.7	43.6	82.2
1616.16666	68.5	1000.0	1000.000	230.4	V	232.0	-5.6	13.7	82.2
3195.80000	53.8	1000.0	1000.000	252.3	V	74.0	1.1	28.4	82.2
5997.10000	53.8	1000.0	1000.000	404.3	H	332.0	5.7	28.4	82.2
11003.9333	48.9	1000.0	1000.000	130.7	H	33.0	11.8	33.3	82.2
12012.0666	50.2	1000.0	1000.000	153.2	V	18.0	13.5	32.0	82.2

**Average Data**

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth h (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1095.56666	26.5	1000.0	1000.000	274.3	H	140.0	-7.0	55.7	82.2
1158.50000	25.2	1000.0	1000.000	116.7	H	153.0	-6.7	57.0	82.2
1616.16666	45.0	1000.0	1000.000	230.4	V	232.0	-5.6	37.2	82.2
3195.80000	30.0	1000.0	1000.000	252.3	V	74.0	1.1	52.2	82.2
5997.10000	33.2	1000.0	1000.000	404.3	H	332.0	5.7	49.0	82.2
11003.9333	35.9	1000.0	1000.000	130.7	H	33.0	11.8	46.3	82.2
12012.0666	37.3	1000.0	1000.000	153.2	V	18.0	13.5	44.9	82.2

Note: A 2.4 GHz Notch was used when testing. Less stringent limit applies. No significant emissions observed above 18GHz. Measurements above 18GHz are noise floor figures.



## **SECTION 4**

### **TEST EQUIPMENT USED**



### 3.1 TEST EQUIPMENT USED

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

ID Number (SDGE/SDRB)	Test Equipment	Type	Serial Number	Manufacturer	Cal Date	Cal Due Date
<b>Radiated Test Setup</b>						
1033	Bilog Antenna	3142C	00044556	EMCO	09/05/19	09/05/21
1002	Bilog Antenna	3142C	00058717	ETS-Lindgren	10/09/19	10/09/21
7575	Double-ridged waveguide horn antenna	3117	00155511	EMCO	06/16/18	06/16/20
8628	Pre-amplifier	QLJ 01182835-JO	8986002	QuinStar Technologies Inc.	03/07/19	03/07/20
1016	Pre-amplifier	PAM-0202	187	A.H. Systems, Inc.	03/08/19	03/08/20
1040	EMI Test Receiver	ESIB40	100292	Rhode & Schwarz	10/11/19	10/11/20
7620	EMI Test Receiver	ESU40	100399	Rhode & Schwarz	10/18/19	10/18/20
<b>Miscellaneous</b>						
11312	Mini Environmental Quality Meter	850027	CF099-56010-340	Sper Scientific	04/16/19	04/16/20
-	Test Software	EMC32	V8.52	Rhode & Schwarz	N/A	



**3.2 MEASUREMENT UNCERTAINTY**

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

**3.2.1 RADIATED MEASUREMENTS (BELOW 1GHZ)**

	Input Quantity (Contribution) $X_i$	Value	Prob. Dist.	Divisor	$u_i(x)$	$u_i(x)^2$
1	Receiver reading	0.10 dB	Normal, k=1	1.000	0.10	0.01
2	Attenuation: antenna-receiver	0.20 dB	Normal, k=2	2.000	0.10	0.01
3	Antenna factor AF	0.75 dB	Normal, k=2	2.000	0.38	0.14
4	Receiver sinewave accuracy	0.45 dB	Normal, k=2	2.000	0.23	0.05
5	Receiver pulse amplitude	1.50 dB	Rectangular	1.732	0.87	0.75
6	Receiver pulse repetition rate	1.50 dB	Rectangular	1.732	0.87	0.75
7	Noise floor proximity	0.50 dB	Rectangular	1.732	0.29	0.08
8	Mismatch: antenna-receiver	0.95 dB	U-shaped	1.414	0.67	0.45
9	AF frequency interpolation	0.30 dB	Rectangular	1.732	0.17	0.03
10	AF height deviations	0.10 dB	Rectangular	1.732	0.06	0.00
11	Directivity difference at 3 m	3.12 dB	Rectangular	1.732	1.80	3.24
12	Phase center location at 3 m	1.00 dB	Rectangular	1.732	0.58	0.33
13	Cross-polarisation	0.90 dB	Rectangular	1.732	0.52	0.27
14	Balance	0.00 dB	Rectangular	1.732	0.00	0.00
15	Site imperfections	3.76 dB	Triangular	2.449	1.54	2.36
16	Separation distance at 3 m	0.30 dB	Rectangular	1.732	0.17	0.03
17	Effect of setup table material	0.77 dB	Rectangular	1.732	0.44	0.20
18	Table height at 3 m	0.10 dB	Normal, k=2	2.000	0.05	0.00
19	Near-field effects	0.00 dB	Triangular	2.449	0.00	0.00
20	Effect of ambient noise on OATS	0.00 dB				0.00
<b>Combined standard uncertainty</b>				Normal	<b>2.95 dB</b>	
<b>Expanded uncertainty</b>				Normal, k=2	<b>5.90 dB</b>	





**3.2.2 RADIATED EMISSION MEASUREMENTS (ABOVE 1GHZ)**

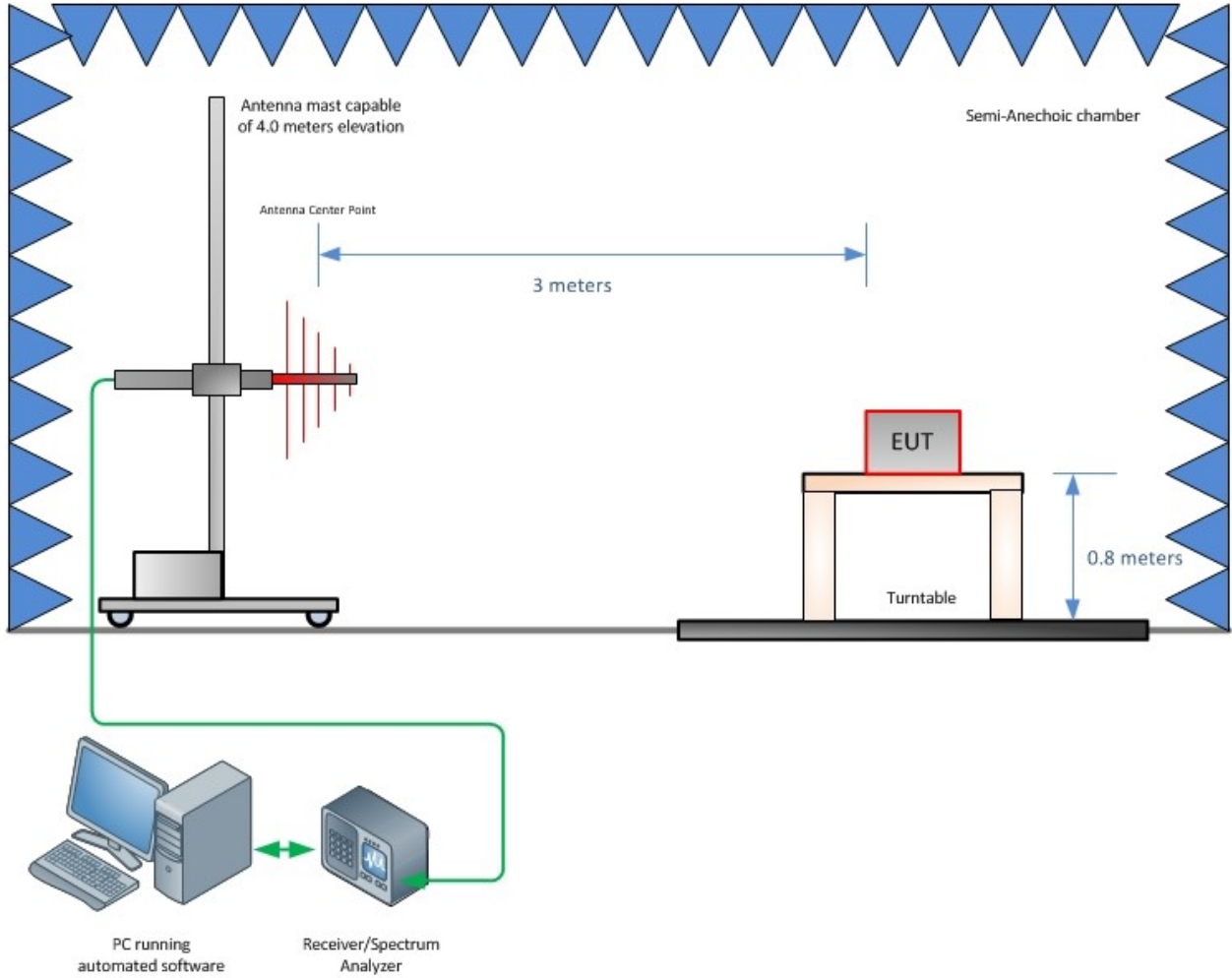
	Input Quantity (Contribution) $X_i$	Value	Prob. Dist.	Divisor	$u_i(x)$	$u_i(x)^2$						
1	Receiver reading	0.10 dB	Normal, k=1	1.000	0.10	0.01						
2	Attenuation: antenna-receiver	0.20 dB	Normal, k=2	2.000	0.10	0.01						
3	Antenna factor AF	0.75 dB	Normal, k=2	2.000	0.38	0.14						
4	Receiver sinewave accuracy	0.45 dB	Normal, k=2	2.000	0.23	0.05						
5	Receiver pulse amplitude	1.50 dB	Rectangular	1.732	0.87	0.75						
6	Receiver pulse repetition rate	1.50 dB	Rectangular	1.732	0.87	0.75						
7	Noise floor proximity	0.50 dB	Rectangular	1.732	0.29	0.08						
8	Mismatch: antenna-receiver	0.95 dB	U-shaped	1.414	0.67	0.45						
9	AF frequency interpolation	0.30 dB	Rectangular	1.732	0.17	0.03						
10	AF height deviations	0.10 dB	Rectangular	1.732	0.06	0.00						
11	Directivity difference at 3 m	3.12 dB	Rectangular	1.732	1.80	3.24						
12	Phase center location at 3 m	1.00 dB	Rectangular	1.732	0.58	0.33						
13	Cross-polarisation	0.90 dB	Rectangular	1.732	0.52	0.27						
14	Balance	0.00 dB	Rectangular	1.732	0.00	0.00						
15	Site imperfections	3.25 dB	Triangular	2.449	1.33	1.76						
16	Separation distance at 3 m	0.30 dB	Rectangular	1.732	0.17	0.03						
17	Effect of setup table material	0.77 dB	Rectangular	1.732	0.44	0.20						
18	Table height at 3 m	0.10 dB	Normal, k=2	2.000	0.05	0.00						
19	Near-field effects	0.00 dB	Triangular	2.449	0.00	0.00						
20	Effect of ambient noise on OATS	0.00 dB				0.00						
<table border="1" style="margin-left: auto;"> <tr> <td>Combined standard uncertainty</td> <td>Normal</td> <td>2.85 dB</td> </tr> <tr> <td><b>Expanded uncertainty</b></td> <td><b>Normal, k=2</b></td> <td><b>5.70 dB</b></td> </tr> </table>							Combined standard uncertainty	Normal	2.85 dB	<b>Expanded uncertainty</b>	<b>Normal, k=2</b>	<b>5.70 dB</b>
Combined standard uncertainty	Normal	2.85 dB										
<b>Expanded uncertainty</b>	<b>Normal, k=2</b>	<b>5.70 dB</b>										



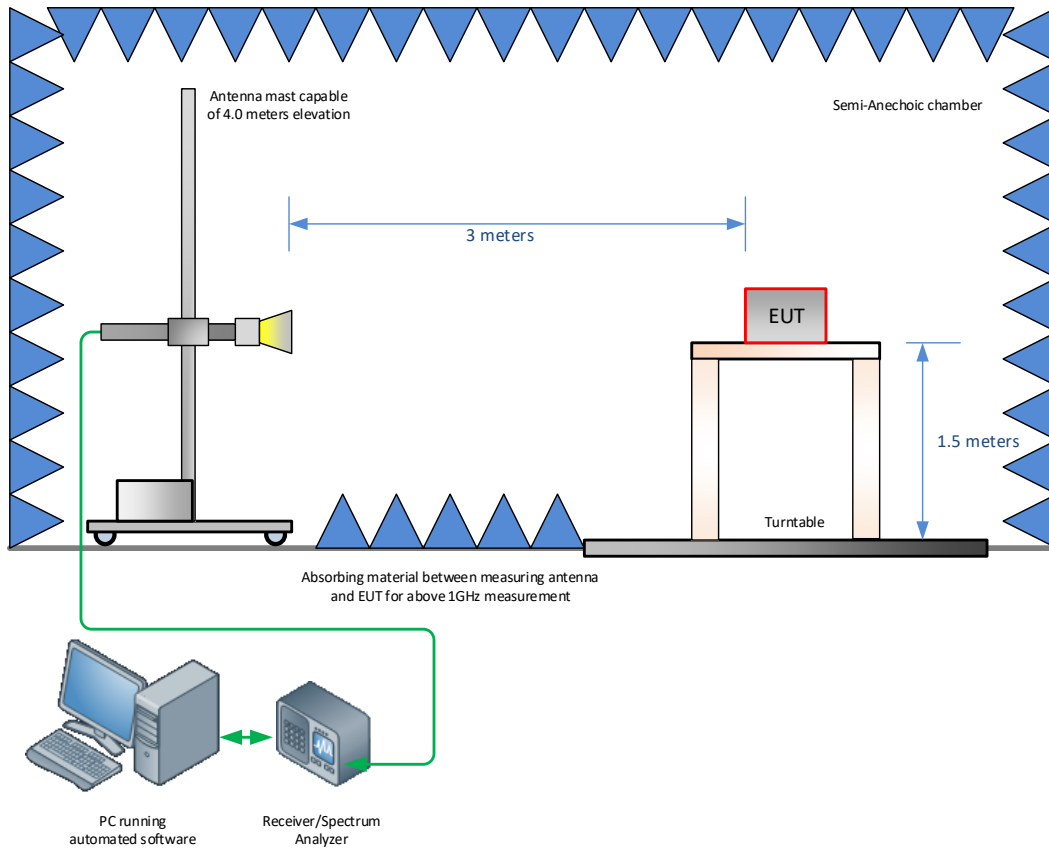
## SECTION 5

### DIAGRAM OF TEST SETUP

#### 4.1 TEST SETUP DIAGRAM



**Radiated Emission Test Setup (Below 1GHz)**



**Radiated Emission Test Setup (Above 1GHz)**



## **SECTION 6**

### **ACCREDITATION, DISCLAIMERS AND COPYRIGHT**



## 5.1 ACCREDITATION, DISCLAIMERS AND COPYRIGHT

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