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Report On

EMC Evaluation of
Mobilogix, Inc.
ATD300S Asset Tracking Device

FCC Part 15 Subpart B
ICES-003 Issue 6
FCC Part 15 Subpart C §15.247
FCC Part 27

Report No. JT72138801-0418A **June 2018**

TÜV SÜD America Inc., 10040 Mesa Rim Road, San Diego, CA 92121
Tel: (858) 678-1400. Website: www.TUVamerica.com

REPORT ON	EMC Evaluation of the Mobilogix, Inc. ATD300S Asset Tracking Device
TEST REPORT NUMBER	JT72138801-0418A
TEST REPORT DATE	June 2018
PREPARED FOR	Mobilogix, Inc. 5500 Trabuco Road, Suite 150 Irvine, CA 92620 USA
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PREPARED BY	Xiaoying Zhang **Name** Authorized Signatory Title: EMC/Wireless Test Engineer
APPROVED BY	Ferdinand S. Custodio **Name** Authorized Signatory Title: Senior EMC Test Engineer/Wireless Team Lead
DATED	June 23, 2018

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Revision History

JT72138801-0418A Mobilogix, Inc. ATD300S Asset Tracking Device					
DATE	OLD REVISION	NEW REVISION	REASON	PAGES AFFECTED	APPROVED BY
06/23/2018	—	Initial Release			Ferdinand Custodio

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SECTION 1

REPORT SUMMARY

EMC Evaluation of the
Mobilogix, Inc.
ATD300S Asset Tracking Device

1.1 INTRODUCTION

The information contained in this report is intended to show verification of the Mobilogix, Inc. ATD300S Model ATD300S to the requirements of FCC Part 15 Subpart B and Innovation, Science and Economic Development Canada ICES-003.

Objective	To perform EMC Evaluation to determine the Equipment Under Test's (EUT's) compliance with the Test Specification, for the series of tests carried out.
Manufacturer	Mobilogix, Inc.
EUT	Asset Tracking Device
Model Name	ATD300S
Model Number(s)	ATD300S
Serial Number(s)	861108037056255 (IMEI) 861108037055513 (IMEI) 861108037056305 (IMEI) (Conducted Sample)
Number of Samples Tested	3
Highest Frequency Generated or Used	2483.5 MHz (Bluetooth Low Energy)
Test Specification/Issue/Date	• FCC Part 15 Subpart B (October 1, 2017) • FCC Part 15 Subpart C §15.247 (October 1, 2017) • FCC Part 27 (October 1, 2017) • Spectrum Management and Telecommunications Interference-Causing Equipment Standard ICES-003 Information Technology Equipment (Including Digital Apparatus) — Limits and Methods of Measurement (Issue 6 January 2016 / Updated April 2017). • RSS-247–Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices (Issue 2, February 2017). • RSS-139 - Advanced Wireless Services (AWS) Equipment Operating in the bands 1710-1780 MHz and 2110-2180 MHz (Issue 3, July 2015).
Start of Test	May 02, 2018
Finish of Test	May 03, 2018
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 15 Subpart B, FCC Part 15 Subpart C 15.247 and FCC Part 27 is shown below. Test results from these tests are deemed satisfactory evidence of compliance with Innovation, Science and Economic Development Canada Interference-Causing Equipment Standard ICES-003.

Part 15/27	Test Description	Result	Comments/Base Standard
§15.107	Conducted Emissions	N/A	Class B requirement
§15.109 §15.247(d) §27.53 (h)(1)	Radiated Emissions (Radiated Spurious Emission for Cell and BTLE Simutaneous Transmission only)	Compliant	Class B requirement

N/A: Not Applicable. The EUT is DC Powered

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1.3 PRODUCT INFORMATION

1.3.1 Technical Description

The Equipment Under Test (EUT) was a Mobilogix, Inc. ATD300S Asset Tracking Device. The ATD300S is a multi-purpose LTE CAT1 tracking and monitoring device with GPS, accelerometer, battery monitoring, buzzer/tone generation, throttle control, brake control, and headlamp control.

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1.3.2 Labelling Requirement for Innovation, Science and Economic Development Canada (ISED)

The manufacturer, importer or supplier shall meet the labelling requirements set out in this section for every ITE unit:

(i) Prior to marketing in Canada, for ITE manufactured in Canada, and;
(ii) Prior to importation into Canada, for imported ITE.

The presence of the label on the ITE represents the manufacturer's or importer's Self-Declaration of Compliance (SDoC) to Innovation, Science and Economic Development Canada (ISED) ICES-003. Each unit of an ITE model shall bear a label indicating the model's compliance with ICES-003.

The label shall be permanently affixed to the ITE or displayed electronically and its text must be clearly legible. When the dimension of the device is too small or it is otherwise not practical to place the label on the ITE, the label shall be placed in a prominent location in the user manual supplied with the ITE. The user manual may be in an electronic format and must be readily available.

Innovation, Science and Economic Development Canada (ISED) ICES-003 Compliance Label

CAN ICES-3 (B)/NMB-3(B)

* Insert either "A" or "B" but not both to identify the applicable Class of ITE.

1.3.3 Labelling Requirement for Part 15 (Verification) Device

See FCC Publication Number: 784748 for details:

https://apps.fcc.gov/oetcf/kdb/forms/FTSSearchResultPage.cfm?id=27980&switch=P

1.4 EUT TEST CONFIGURATION

1.4.1 Test Configuration Description

Test Configuration	Description
Standby	EUT is battery powered and work in standby mode with all transmitters disabled.
Transmit	EUT is battery powered. LTE Band 4 which is controled by CMW500 Call Box by connecting directly or through the air and Bluetooth LE is set to transmit simutaneously.

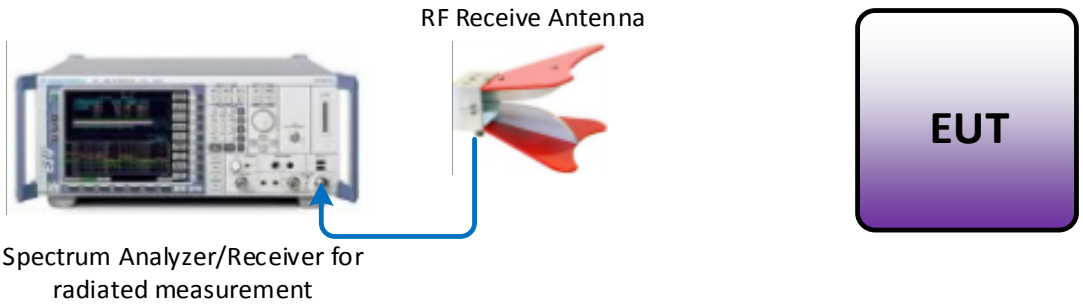
1.4.2 EUT Exercise Software

nRFgo Studio (firmware 7000) is used to setup Bluetooth Low Engery.

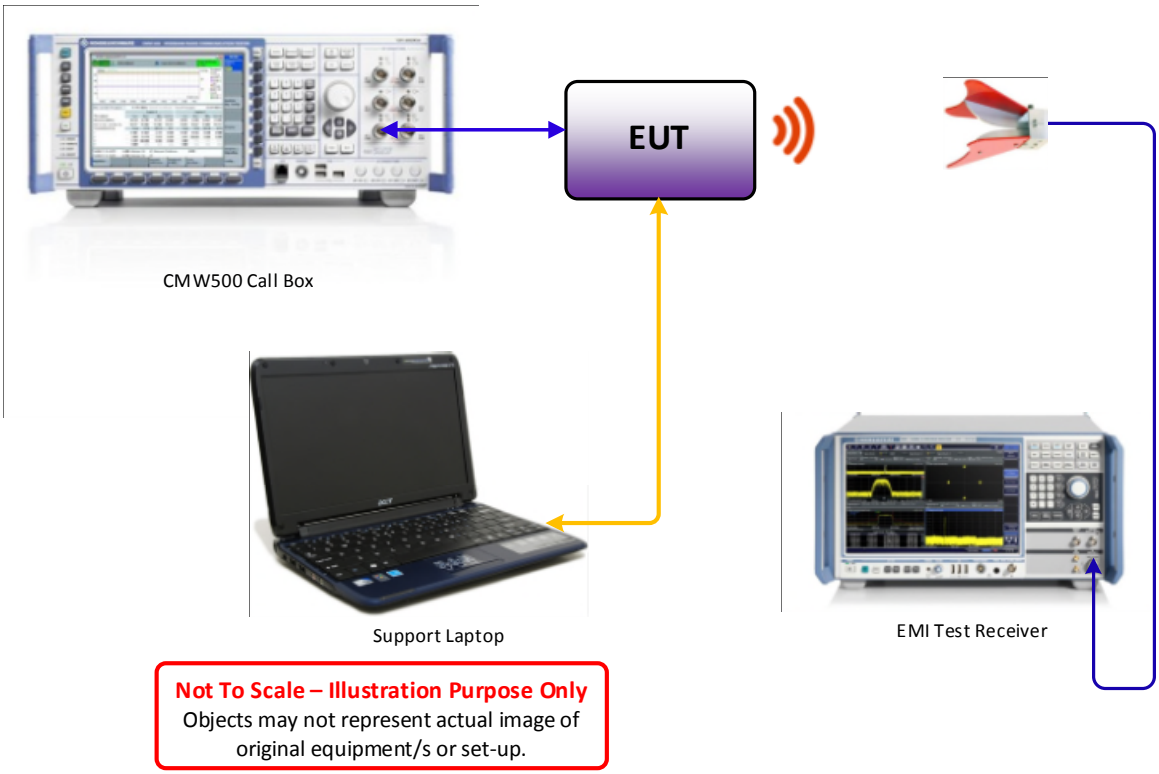
1.4.3 Support Equipment and I/O cables

Manufacturer	Equipment/Cable	Description
Microsoft	Support Laptop	Model: DESKTOP-7HCNAON
Rhode & Schwarz	CMW 500 Wideband Radio Communication Tester	S/N: 116815
USB to Serial Cable	USB Type A to Serial 3.3V cable	USB 2.0 cable , 1 meter length

1.4.4 Simplified Test Configuration Diagram



Standby Test Configuration



Simutaneous Transmission Test Configuration

1.5 DEVIATIONS FROM THE STANDARD

No deviations from the applicable test standards or test plan were made during testing.

1.6 MODIFICATION RECORD

Description of Modification	Modification Fitted By	Date Modification Fitted
Serial Number: 861108037056255 (IMEI), 861108037055513 (IMEI) and 861108037056305 (IMEI)		
None	—	—

The table above details modifications made to the EUT during the test programme. 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 C63.4-2014, 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.

For 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 C63.4-2014. 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

TUV SUD 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.

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SECTION 2

TEST DETAILS

EMC Evaluation of the
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ATD300S Asset Tracking Device

2.1 RADIATED EMISSION

2.1.1 Specification Reference

FCC Part 15 Subpart B Clause 15.109(a)
FCC 47 CFR Part 15, Clause 15.247(d)
FCC Part 27 Clause 27.53 (h)(1)

2.1.2 Standard Applicable

FCC Part 15 Subpart B Clause 15.109(a):
(a) Except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values:

Frequency of emission (MHz)	Field Strength (microvolts/meter)
30-88	100
88-216	150
216-960	200
Above 960	500

FCC Part 27 Clause 27.53 (h)(1):
Out of band emissions. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.

2.1.3 Equipment Under Test and Modification State

Serial No: 861108037056255 (IMEI) / Standby Test Configuration
Serial No: 861108037055513 (IMEI) and 861108037056305 (IMEI)/ Transmit Test Configuration

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

May 03 - 04, 2018 / 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	21.8 - 23.9 °C
Relative Humidity	47.7 - 50.3 %
ATM Pressure	99.2 - 99.5 kPa

2.1.7 Additional Observations

- The spectrum was searched from 30MHz to 18GHz.
- EUT was evaluated in two configurations; Standby mode and BT LE and LTE Band 4 simutaneous transmission mode.
- Verification was performed at 3 meters.
- 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 2.2.8 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	-12.6
	Asset# 1172 (cable)	0.3	
	Asset# 1016 (preamplifier)	-30.7	
	Asset# 1175(cable)	0.3	
	Asset# 1033 (antenna)	17.2	
Reported Quasi Peak Final Measurement (dBµV/m) @ 30MHz			**11.8**

2.1.9 Test Results

Compliant. See attached plots and tables.

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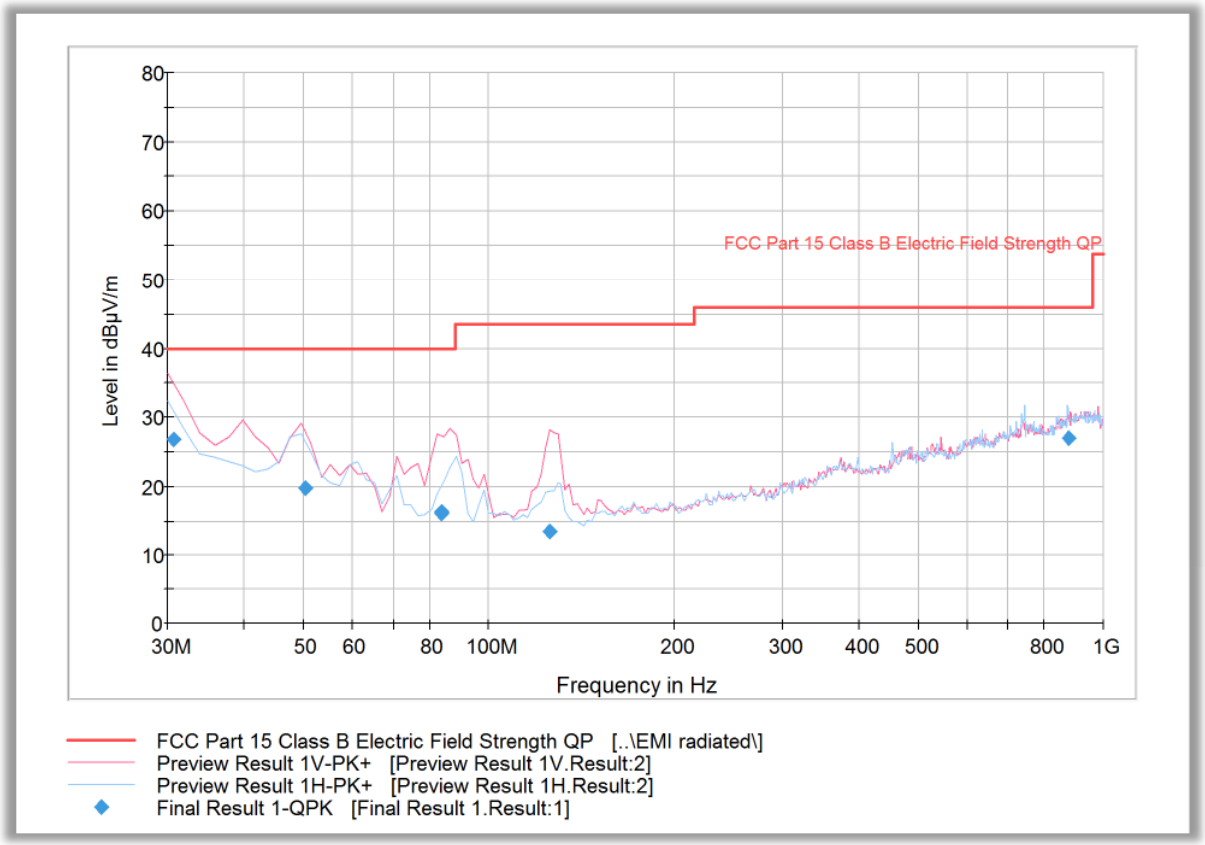
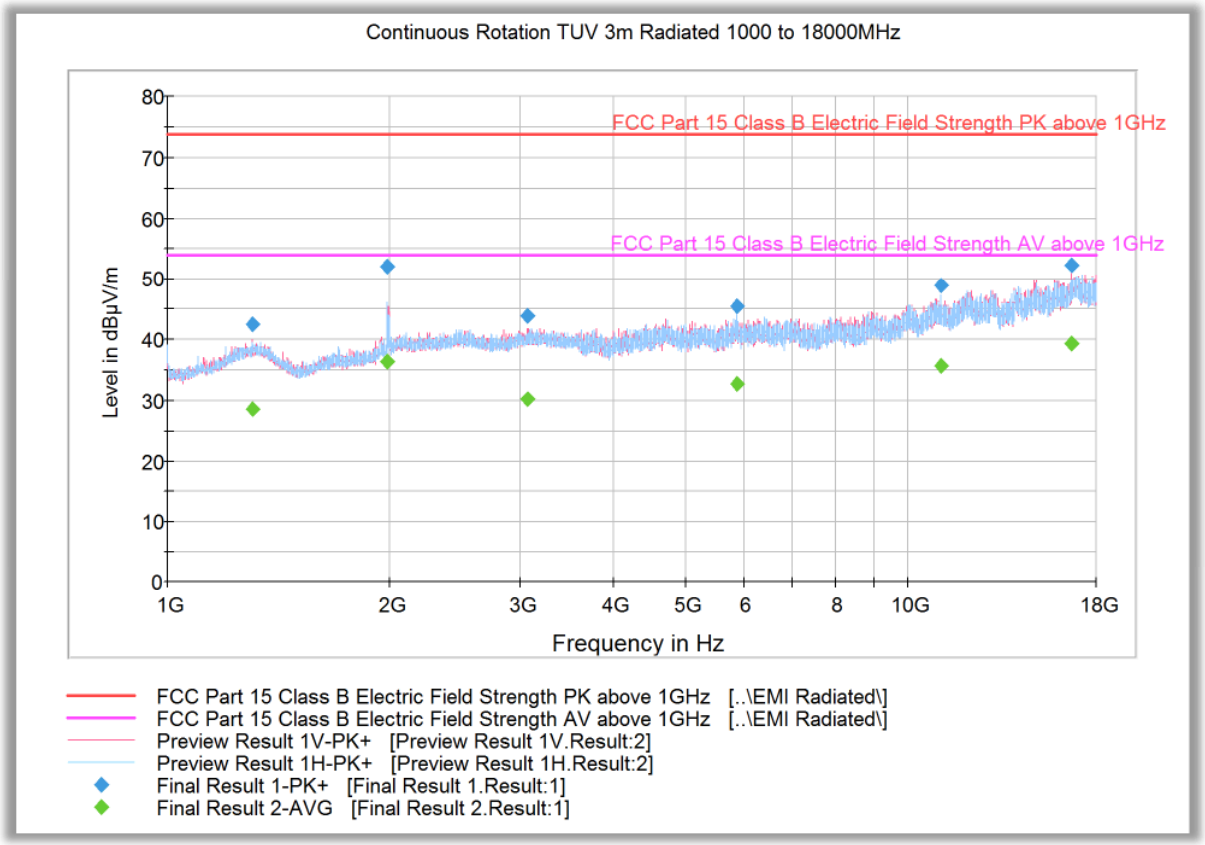
2.1.10 Below 1GHz Radiated Emission Test (EUT in Standby mode)



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	26.9	1000.0	120.000	100.0	V	111.0	-6.0	13.1	40.0
50.158878	19.7	1000.0	120.000	100.0	V	97.0	-14.1	20.3	40.0
83.444970	16.3	1000.0	120.000	100.0	V	-4.0	-16.6	23.7	40.0
83.492745	16.1	1000.0	120.000	100.0	V	-4.0	-16.6	23.9	40.0
125.570501	13.4	1000.0	120.000	200.0	V	355.0	-15.6	30.1	43.5
876.231182	27.0	1000.0	120.000	250.0	H	163.0	5.8	19.0	46.0

2.1.11 Above 1GHz Radiated Emission Test (EUT in Standby mode)



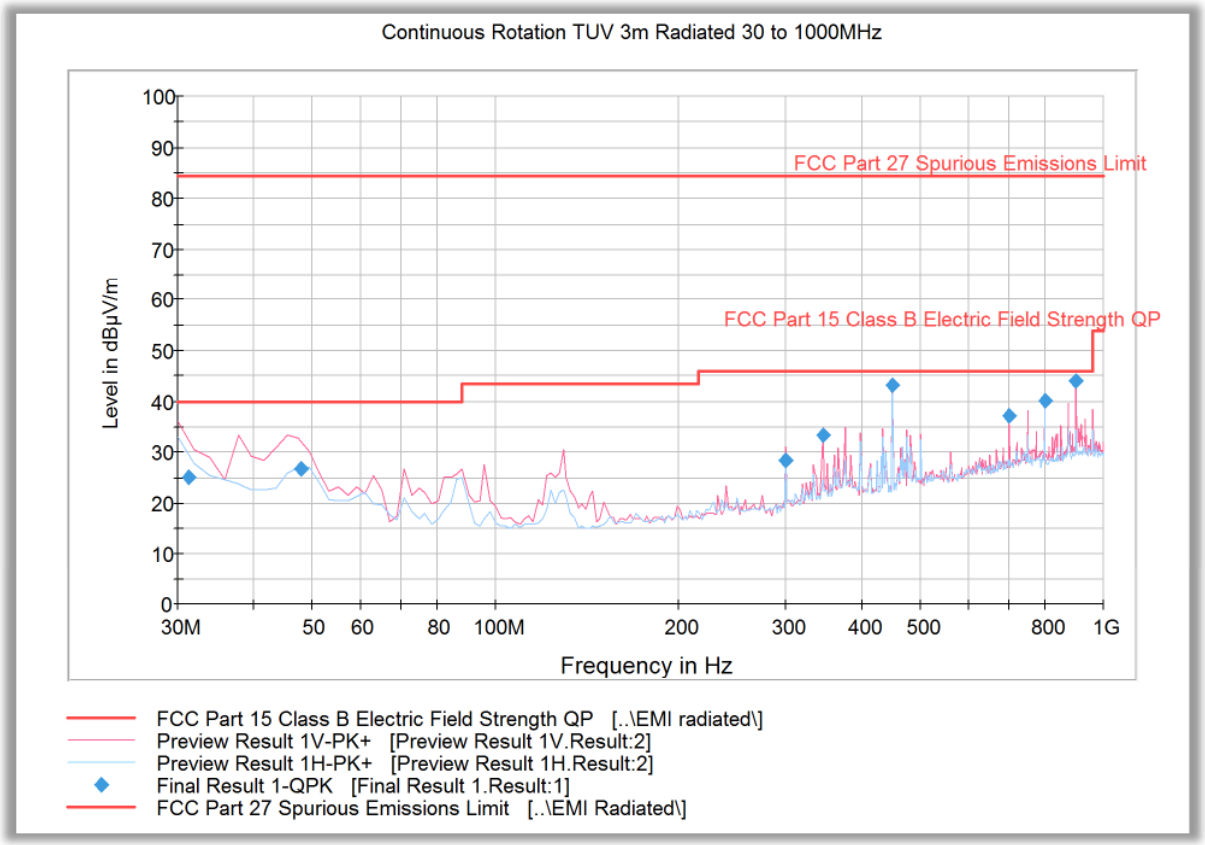
Peak Data

Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1300.133333	42.5	1000.0	1000.000	146.7	V	183.0	-5.2	31.4	73.9
1981.466667	52.2	1000.0	1000.000	406.9	H	129.0	-2.3	21.7	73.9
3059.866667	43.9	1000.0	1000.000	327.2	V	195.0	0.8	30.0	73.9
5887.500000	45.6	1000.0	1000.000	406.9	H	301.0	5.4	28.3	73.9
11080.833333	48.9	1000.0	1000.000	406.9	H	228.0	11.6	25.0	73.9
16670.000000	52.2	1000.0	1000.000	274.3	V	165.0	17.7	21.7	73.9

Average Data

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1300.133333	28.7	1000.0	1000.000	146.7	V	183.0	-5.2	25.2	53.9
1981.466667	36.3	1000.0	1000.000	406.9	H	129.0	-2.3	17.6	53.9
3059.866667	30.3	1000.0	1000.000	327.2	V	195.0	0.8	23.6	53.9
5887.500000	32.6	1000.0	1000.000	406.9	H	301.0	5.4	21.3	53.9
11080.833333	35.7	1000.0	1000.000	406.9	H	228.0	11.6	18.2	53.9
16670.000000	39.4	1000.0	1000.000	274.3	V	165.0	17.7	14.5	53.9

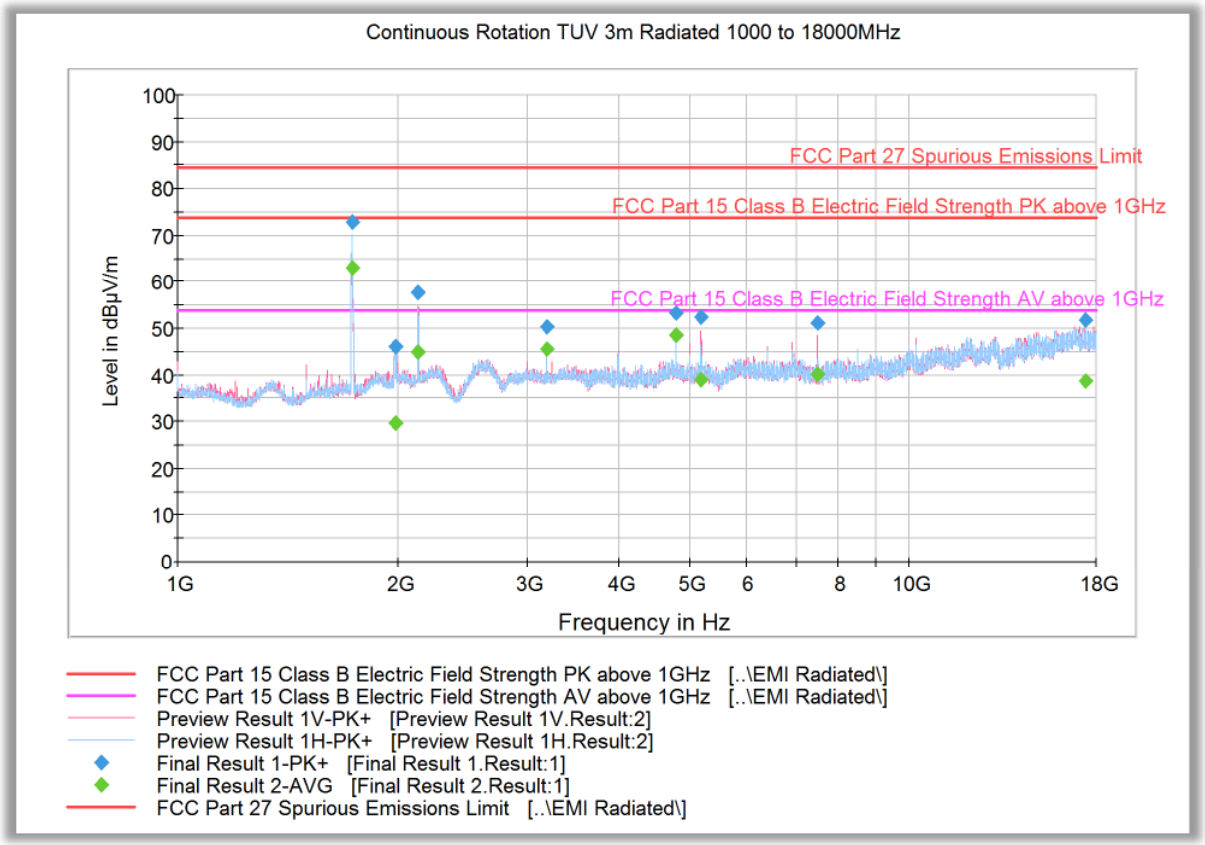
2.1.12 Below 1GHz Radiated Emission Test (EUT in Simutaneous transmission mode)



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)
31.240000	25.1	1000.0	120.000	121.0	V	275.0	-6.5	14.9	40.0
47.951102	26.8	1000.0	120.000	100.0	V	329.0	-13.8	13.2	40.0
300.000401	28.3	1000.0	120.000	350.0	H	40.0	-7.5	17.7	46.0
345.029820	33.4	1000.0	120.000	100.0	V	234.0	-5.4	12.6	46.0
449.999760	43.2	1000.0	120.000	106.0	V	100.0	-2.8	2.8	46.0
700.001283	37.1	1000.0	120.000	121.0	V	263.0	3.3	8.9	46.0
800.003447	40.2	1000.0	120.000	100.0	V	355.0	4.4	5.8	46.0

2.1.13 Above 1GHz Radiated Emission Test (EUT in Simutaneous transmission mode)



Peak Data

Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1732.500000	72.8	1000.0	1000.000	210.5	H	295.0	-4.6	LTE Band 4 Carrier	
1986.200000	46.2	1000.0	1000.000	378.1	H	192.0	-2.3	27.7	73.9
2128.666667	57.8	1000.0	1000.000	102.8	H	35.0	-2.2	16.1	73.9
3200.000000	50.2	1000.0	1000.000	204.5	V	210.0	1.0	23.8	73.9
4799.866667	53.2	1000.0	1000.000	103.7	V	144.0	3.5	20.7	73.9
5189.200000	52.3	1000.0	1000.000	290.3	V	287.0	4.1	21.6	73.9
7499.500000	51.3	1000.0	1000.000	219.5	V	144.0	6.5	22.6	73.9

Average Data

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1732.500000	63.2	1000.0	1000.000	210.5	H	295.0	-4.6	LTE Band 4 Carrier	
1986.200000	29.9	1000.0	1000.000	378.1	H	192.0	-2.3	24.0	53.9
2128.666667	44.9	1000.0	1000.000	102.8	H	35.0	-2.2	9.0	53.9
3200.000000	45.5	1000.0	1000.000	204.5	V	210.0	1.0	8.4	53.9
4799.866667	48.4	1000.0	1000.000	103.7	V	144.0	3.5	5.5	53.9
5189.200000	39.0	1000.0	1000.000	290.3	V	287.0	4.1	14.9	53.9
7499.500000	40.0	1000.0	1000.000	219.5	V	144.0	6.5	13.9	53.9

Note: The emission at 2128.666667 MHz which is above the FCC Part 15 Class B Average limit is the peak result and applies to the peak limit above.

SECTION 3

TEST EQUIPMENT USED

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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
Conducted Emissions						
7567	LISN	FCC-LISN-50-25-2-10	120304	Fischer Custom Comm.	12/14/17	12/14/18
8822	20dB Attenuator	34-20-34	N/A	MCE / Weinschel	03/06/18	03/06/19
8824	20dB Attenuator	34-20-34	N/A	MCE / Weinschel	03/06/18	03/06/19
1024	EMI Test Receiver	ESCS30	847793/0001	Rhode & Schwarz	09/15/17	09/15/18
Radiated Emissions						
1040	EMI Test Receiver	ESIB40	100292	Rhode & Schwarz	10/25/17	10/25/18
1016	Pre-amplifier	PAM-0202	187	PAM	02/06/18	02/06/19
1033	Bilog Antenna	3142C	00044556	EMCO	10/11/16	10/11/18
7575	Double-ridged waveguide horn antenna	3117	00155511	EMCO	06/01/17	06/01/18
8628	Pre-amplifier	QLJ 01182835-JO	8986002	QuinStar Technologies Inc.	03/06/18	03/06/19
1049	EMI Test Receiver	ESU	100133	Rhode & Schwarz	07/13/17	07/13/18
Miscellaneous						
11312	Mini Environmental Quality Meter	850027	CF099-56010-340	Sper Scientific	02/26/18	02/26/19
-	Test Software	EMC32	V8.53	Rhode & Schwarz	N/A	

3.2 MEASUREMENT UNCERTAINTY

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

3.2.1 Conducted Measurements

	Contribution	Probability Distribution Type	Probability Distribution x_i	Standard Uncertainty $u(x_i)$	$[u(x_i)]^2$
1	Receiver/Spectrum Analyzer	Rectangular	0.36	0.21	0.04
2	Cables	Rectangular	0.50	0.29	0.08
3	LISN	Rectangular	0.66	0.38	0.15
4	Attenuator	Rectangular	0.30	0.17	0.03
5	EUT Setup	Rectangular	1.00	0.58	0.33
				Combined Uncertainty (u_c):	0.80
				Coverage Factor (k):	2
				Expanded Uncertainty:	1.59

3.2.2 Radiated Measurements (Below 1GHz)

	Contribution	Probability Distribution Type	Probability Distribution x_i	Standard Uncertainty $u(x_i)$	$[u(x_i)]^2$
1	Receiver/Spectrum Analyzer	Rectangular	0.45	0.26	0.07
2	Cables	Rectangular	0.50	0.29	0.08
3	Preamp	Rectangular	0.50	0.29	0.08
4	Antenna	Rectangular	0.75	0.43	0.19
5	Site	Triangular	3.52	1.44	2.07
6	EUT Setup	Rectangular	1.00	0.58	0.33
				Combined Uncertainty (u_c):	1.68
				Coverage Factor (k):	2
				Expanded Uncertainty:	3.36

3.2.3 Radiated Emission Measurements (Above 1GHz)

	Contribution	Probability Distribution Type	Probability Distribution x_i	Standard Uncertainty $u(x_i)$	$[u(x_i)]^2$
1	Receiver/Spectrum Analyzer	Rectangular	0.57	0.33	0.11
2	Cables	Rectangular	0.70	0.40	0.16
3	Preamp	Rectangular	0.50	0.29	0.08
4	Antenna	Rectangular	0.37	0.21	0.05
5	Site	Triangular	3.00	1.22	1.50
6	EUT Setup	Rectangular	1.00	0.58	0.33
				Combined Uncertainty (u_c):	1.49
				Coverage Factor (k):	2
				Expanded Uncertainty:	2.99

SECTION 4

DIAGRAM OF TEST SETUP

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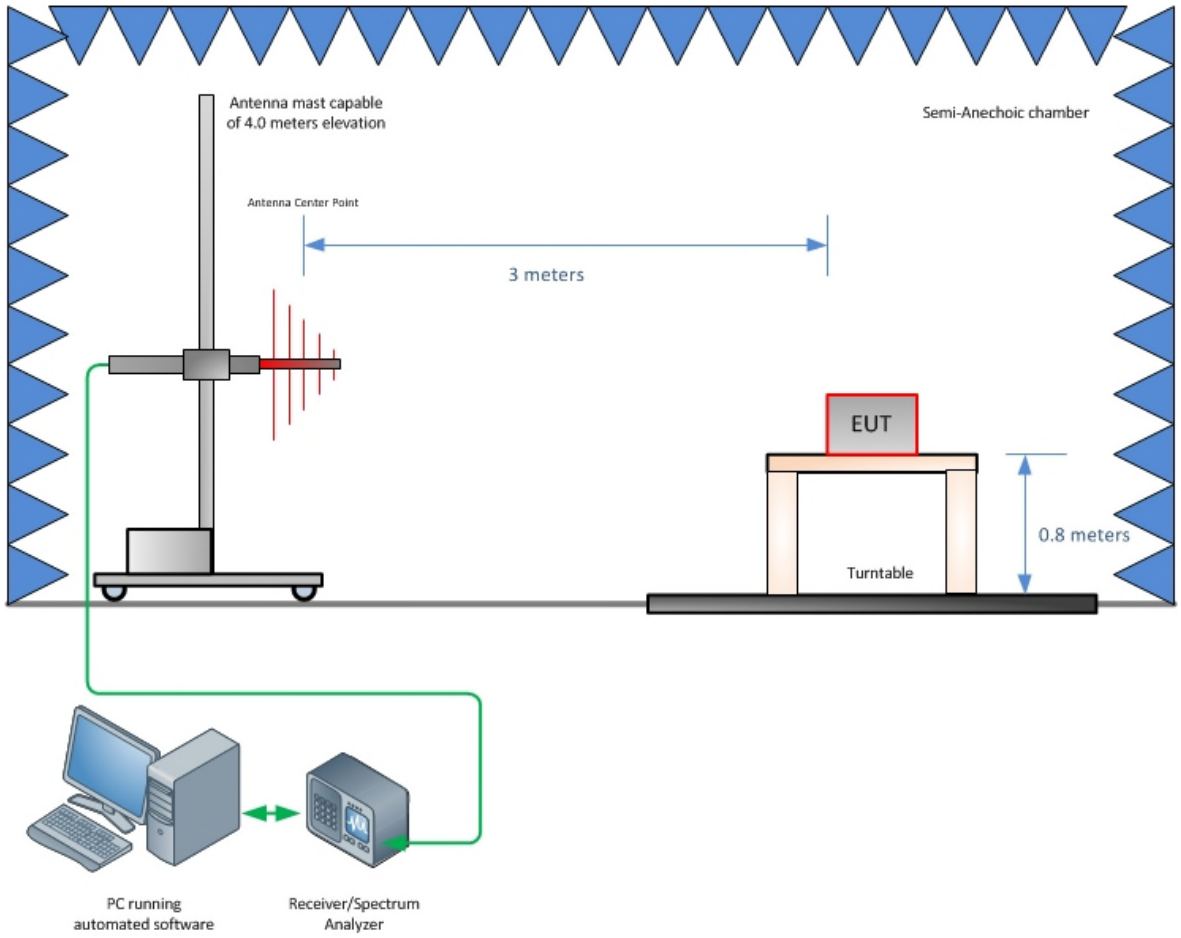
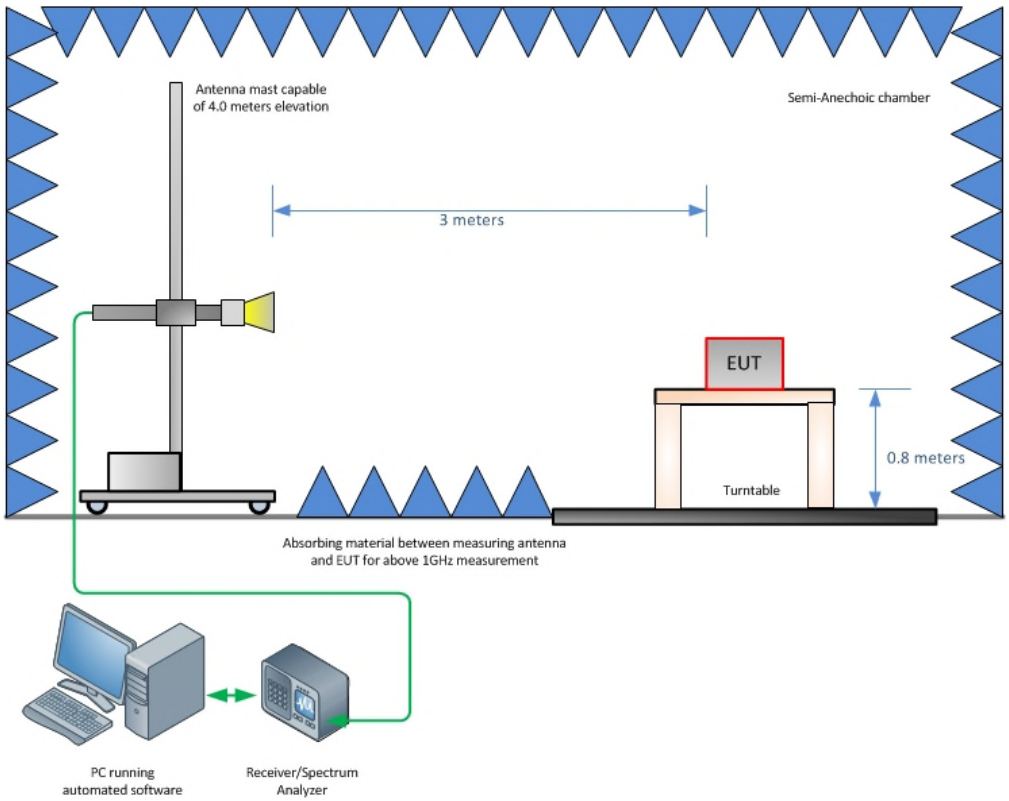
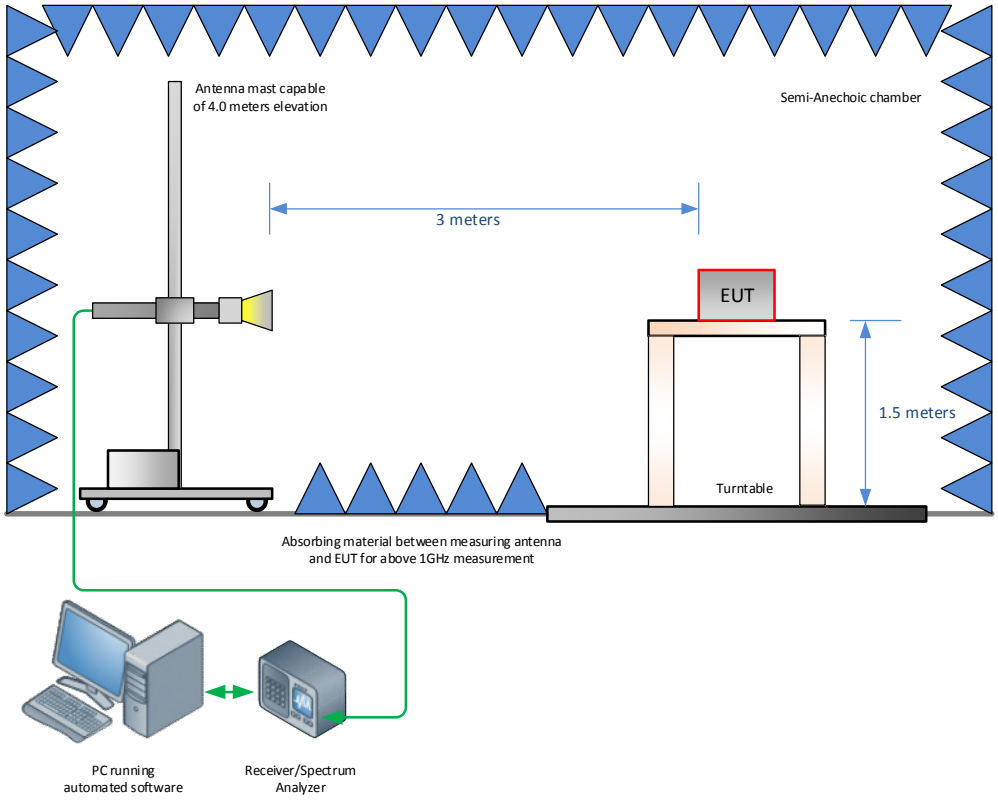
4.1 TEST SETUP DIAGRAM

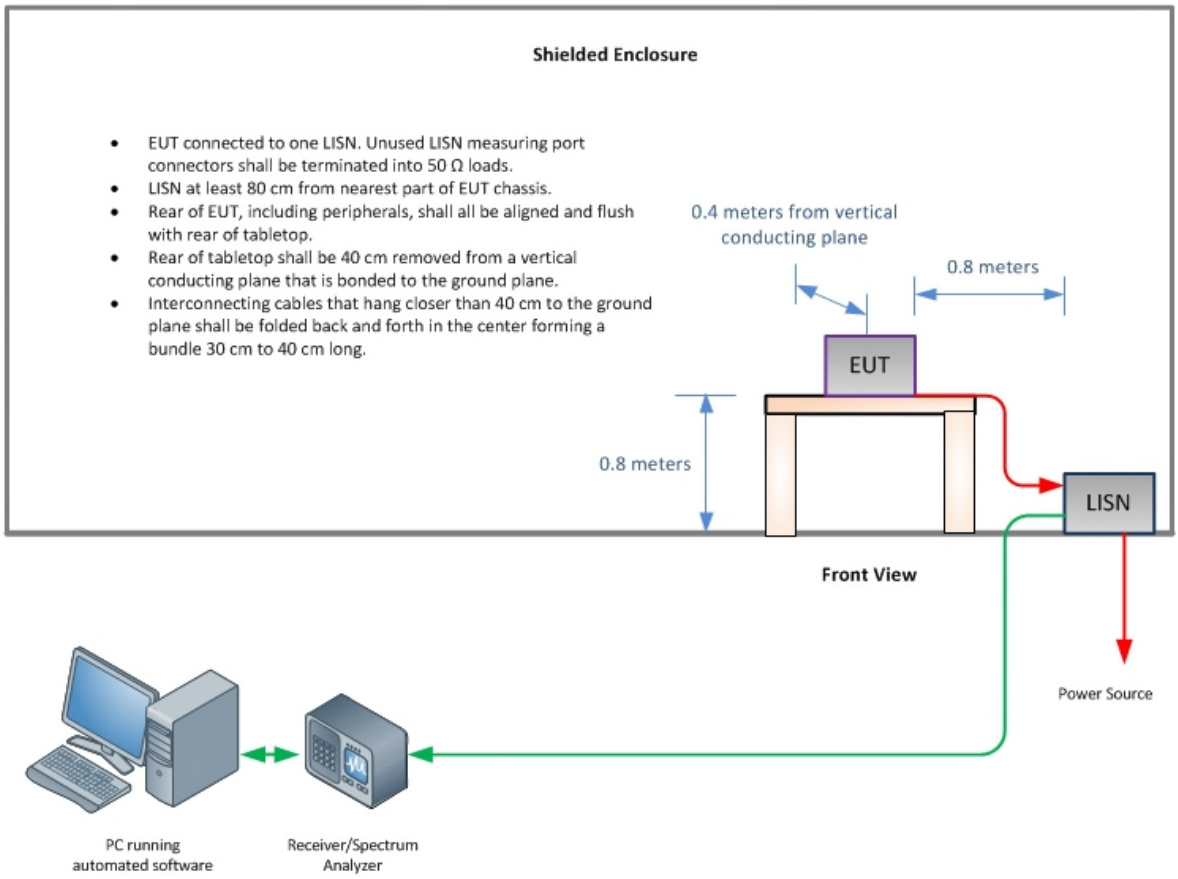


Radiated Emission Test Setup (Below 1GHz)





Radiated Emission Test Setup (Above 1GHz



Conducted Emission Test Setup

SECTION 5

ACCREDITATION, DISCLAIMERS AND COPYRIGHT

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