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Report On

EMC Evaluation of
Electronic Identification Device
LID-710 Portable RFID Reader

FCC Part 15 Subpart B
ICES 003
FCC Part 15 Subpart C §15.209
FCC Part 15 Subpart C §15.247(RSE Only)

Report No. SD72116594-0516

June 2016



America

TÜV SÜD America Inc., 10040 Mesa Rim Road, San Diego, CA 92121
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REPORT ON	EMC Evaluation of the Electronic Identification Device LID-710 Portable RFID Reader
TEST REPORT NUMBER	SD72116594-0516
TEST REPORT DATE	June 2016
PREPARED FOR	Electronic Identification Device 1595 Ramona Lane Santa Barbara, CA 91308
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APPROVED BY	 Juan Manuel Gonzalez Name Authorized Signatory Title: EMC Service Line manager West Region
DATED	June 16, 2016



America

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Revision History

SD72116594-0516 Electronic Identification Device LID-710 Portable RFID Reader					
DATE	OLD REVISION	NEW REVISION	REASON	PAGES AFFECTED	APPROVED BY
06/16/2016	Initial Release				Juan M Gonzalez

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SECTION 1

REPORT SUMMARY

EMC Evaluation of the
Electronic Identification Device
Portable RFID Reader



1.1 INTRODUCTION

The information contained in this report is intended to show verification of the Electronic Identification Device LID-710 Portable RFID Reader to the requirements of FCC Part 15 Subpart B, Innovation, Science and Economic Development Canada ICES-003, FCC Part 15 Subpart C §15.209 and FCC Part 15 Subpart C §15.247 (RSE only)

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	Electronic Identification Device
Model Name	LID-710
Model Number(s)	LID-710
Serial Number(s)	000881
Number of Samples Tested	1
Highest Frequency Generated or Used	2483.5 MHz
FCC/IC ID's	BLE (FCC ID: T9JRN4020) RFID (FCC ID: PNOLID710)
Test Specification/Issue/Date	• FCC Part 15 Subpart B (October 1, 2015) • FCC Part 15 Subpart C §15.209 (October 1, 2015) • FCC Part 15 Subpart C §15.247 (October 1, 2015) • Spectrum Management and Telecommunications Interference-Causing Equipment Standard ICES-003 Information Technology Equipment (ITE) — Limits and methods of measurement (Issue 6 January 2016).
Start of Test	May 18, 2016
Finish of Test	May 26, 2016
Name of Engineer(s)	Kathy MacKenzie Ivan Retana
Related Document(s)	



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 §15.209 and FCC Part 15 Subpart C §15.247 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 B	Test Description	Result	Comments/Base Standard
§15.107	Conducted Limits	Compliant	Class B requirement
§15.109	Radiated Emission Limits	Compliant	Class B requirement

Part 15 C	Test Description	Result	Comments/Base Standard
§15.209	Radiated emission limits	Compliant	
§15.247	Spurious Radiated Emissions	Compliant	

1.3 PRODUCT INFORMATION

1.3.1 Technical Description

The Equipment Under Test (EUT) was a Electronic Identification Device LID-710 Portable RFID Reader as shown in the photograph below. The LID710 is a RFID low frequency reader. It comprises a microprocessor system, memory, radio receiver (131KHz), ferrite rod transmitter / aerial (131KHz), LCD backlit display, single push button operation, Bluetooth Low Energy receiver/transmitter module, battery recharging circuit and an external detachable mains powered switch mode power supply generating 12 volts DC 1 Amp for supplying power during the battery recharging.



Equipment Under Test



1.3.2 Labelling Requirement for Innovation, Science and Economic Development Canada

The manufacturer, importer or supplier shall meet the labelling requirements set out in this section and in Notice 2014-DRS1003 for electronic labelling for every unit:

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

Each unit of an ITE model shall bear a label (see below) that represents the manufacturer's or the importer's SDoC with Innovation, Science and Economic Development Canada's ICES-003. This label shall be permanently affixed to the ITE or displayed electronically and its text must be clearly legible. If the dimensions of the device are too small or if it is not practical to place the label on the ITE and electronic labelling has not been implemented, the label shall be, upon agreement with Innovation, Science and Economic Development Canada, 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 ICES-003 Compliance Label:

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

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
A	RFID mode
B	BTLE on
C	Idle mode
D	Charging mode- The battery is recharged from an external 12 Volt power supply

1.4.2 EUT Exercise Software

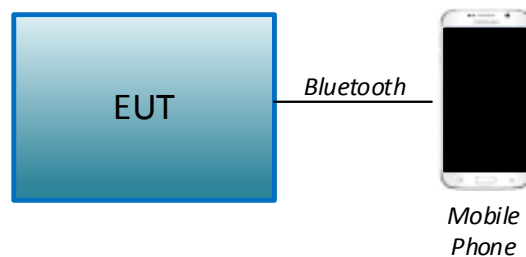
Mobile Android Application: Trovan LID-700 Reader V1.0.2

1.4.3 Support Equipment and I/O cables

Manufacturer	Equipment/Cable	Description
Samsung	Galaxy S6	Android OS:6.0.1

1.4.4 Simplified Test Configuration Diagram

Test Configuration B





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: 000881		
N/A		

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)

16530 Via Esprillo, 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 – Registration 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 Registration is US1146.



1.9.2 Innovation, Science and Economic Development Canada (IC) Registration No.: 3067A

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

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 VCCI – Registration No. A-0230

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.



SECTION 2

TEST DETAILS

EMC Evaluation of the
Electronic Identification Device
Portable RFID Reader

2.1 CONDUCTED LIMITS

2.1.1 Specification Reference

Part 15 Subpart B §15.107(a)

2.1.2 Standard Applicable

Except for Class A digital devices, for equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 μ H/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the band edges

Frequency of emission (MHz)	Conducted limit (dB μ V)	
	Quasi-peak	Average
0.15–0.5	66 to 56*	56 to 46*
0.5–5	56	46
5–30	60	50

*Decreases with the logarithm of the frequency.

2.1.3 Equipment Under Test and Modification State

Serial No: 000881 / Test Configuration D

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

May 19, 2016/KAM

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	24.8 °C
Relative Humidity	57.1 %
ATM Pressure	99.1 kPa

2.1.7 Additional Observations

- Measurement was done using EMC32 V8.53 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.



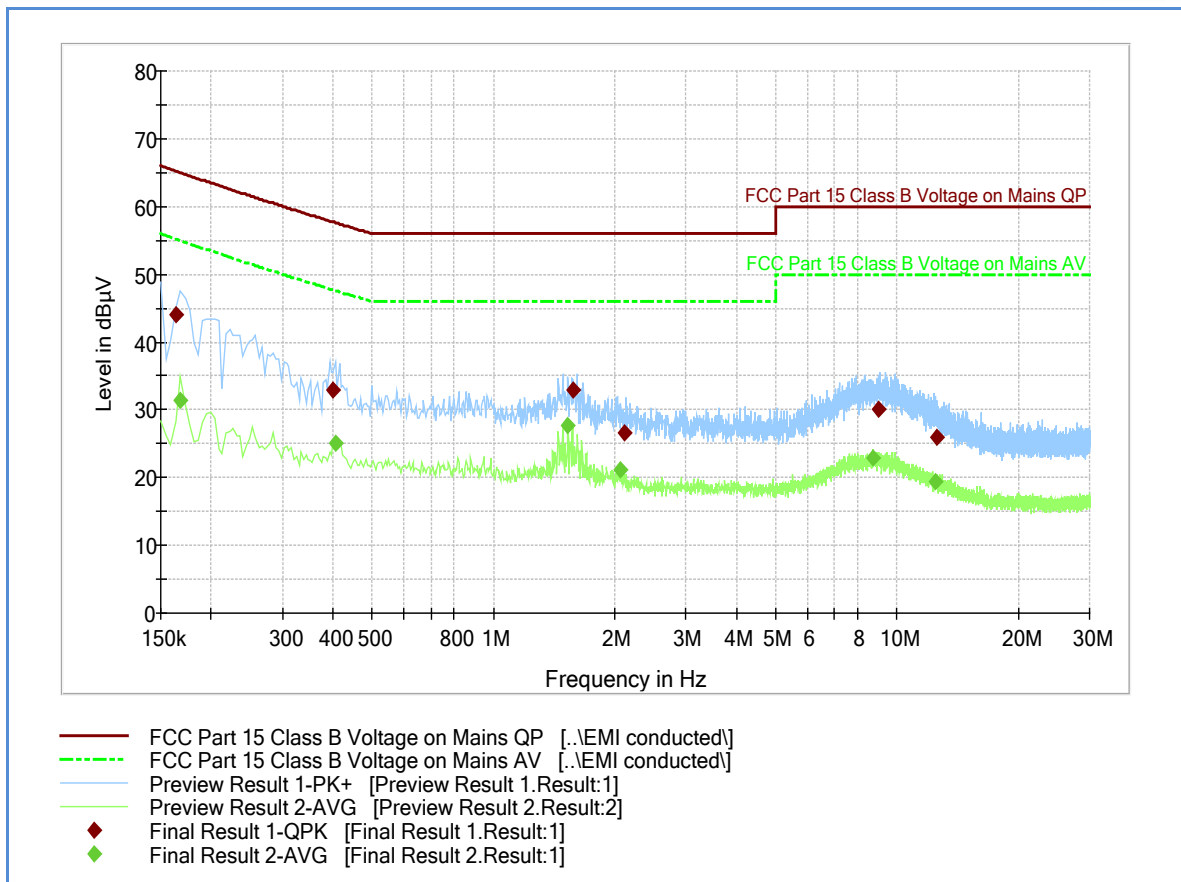
2.1.8 Sample Computation (Conducted Emission – Quasi Peak)

Measuring equipment raw measurement (db μ V) @ 150kHz			5.5
Correction Factor (dB)	Asset# 8822(20 dB attenuator)	19.9	20.7
	Asset# 1177 (cable)	0.15	
	Asset# 1176 (cable)	0.35	
	Asset# 7567(LISN)	0.30	
Reported QuasiPeak Final Measurement (db μ V) @ 150kHz			26.2

2.1.9 Test Results

Compliant. See attached plots and tables.

2.1.10 FCC Class B 120V 60Hz (Line 1)



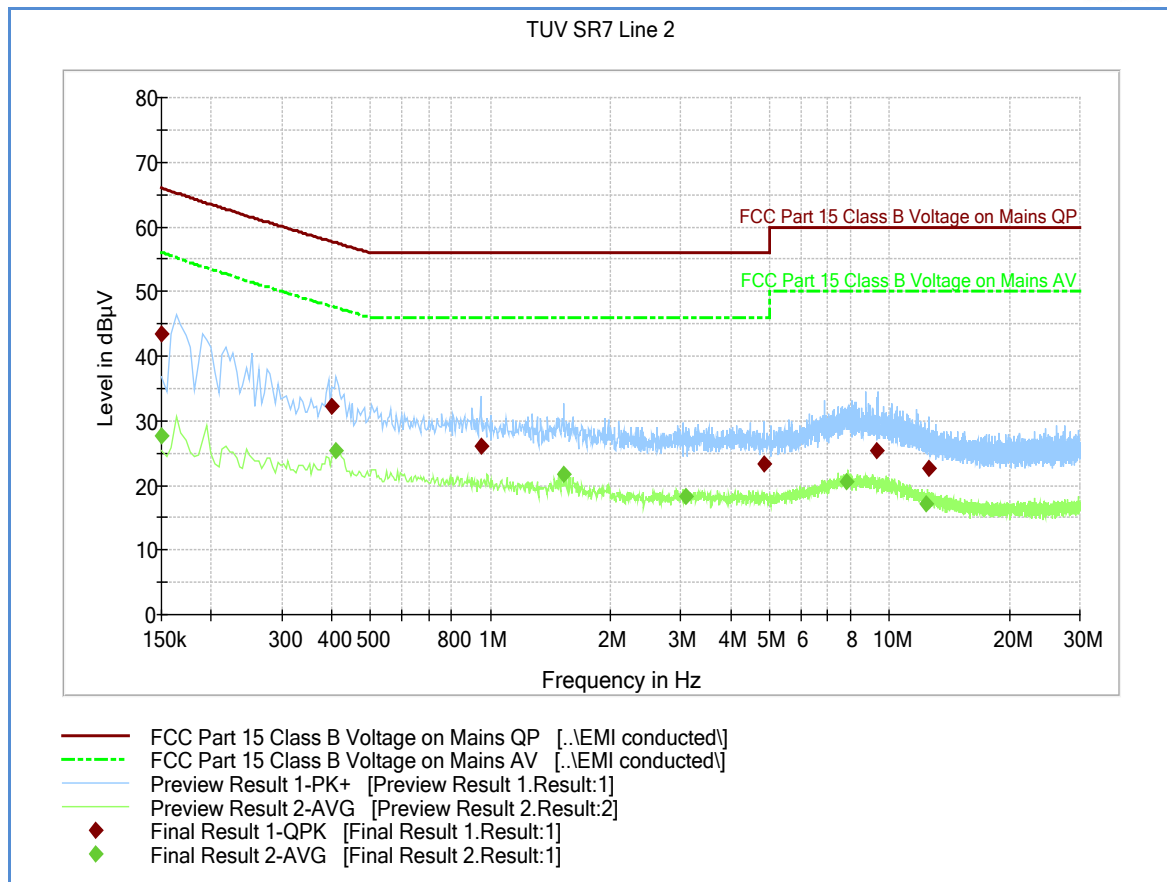
Quasi Peak

Frequency (MHz)	QuasiPeak (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBμV)
0.163500	44.0	1000.0	9.000	Off	L1	20.1	21.2	65.2
0.402000	33.0	1000.0	9.000	Off	L1	20.0	24.7	57.7
1.572000	33.0	1000.0	9.000	Off	L1	20.0	23.0	56.0
2.116500	26.6	1000.0	9.000	Off	L1	20.0	29.4	56.0
8.997000	30.1	1000.0	9.000	Off	L1	20.1	29.9	60.0
12.565500	25.9	1000.0	9.000	Off	L1	20.2	34.1	60.0

Average

Frequency (MHz)	Average (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin - Ave (dB)	Limit - Ave (dBμV)
0.168000	31.3	1000.0	9.000	Off	L1	20.1	23.7	55.0
0.406500	25.0	1000.0	9.000	Off	L1	20.0	22.6	47.6
1.531500	27.7	1000.0	9.000	Off	L1	20.0	18.3	46.0
2.071500	21.2	1000.0	9.000	Off	L1	20.0	24.8	46.0
8.740500	22.8	1000.0	9.000	Off	L1	20.1	27.2	50.0
12.435000	19.4	1000.0	9.000	Off	L1	20.2	30.6	50.0

2.1.11 FCC Class B 120V 60Hz (Line 2 – Neutral)



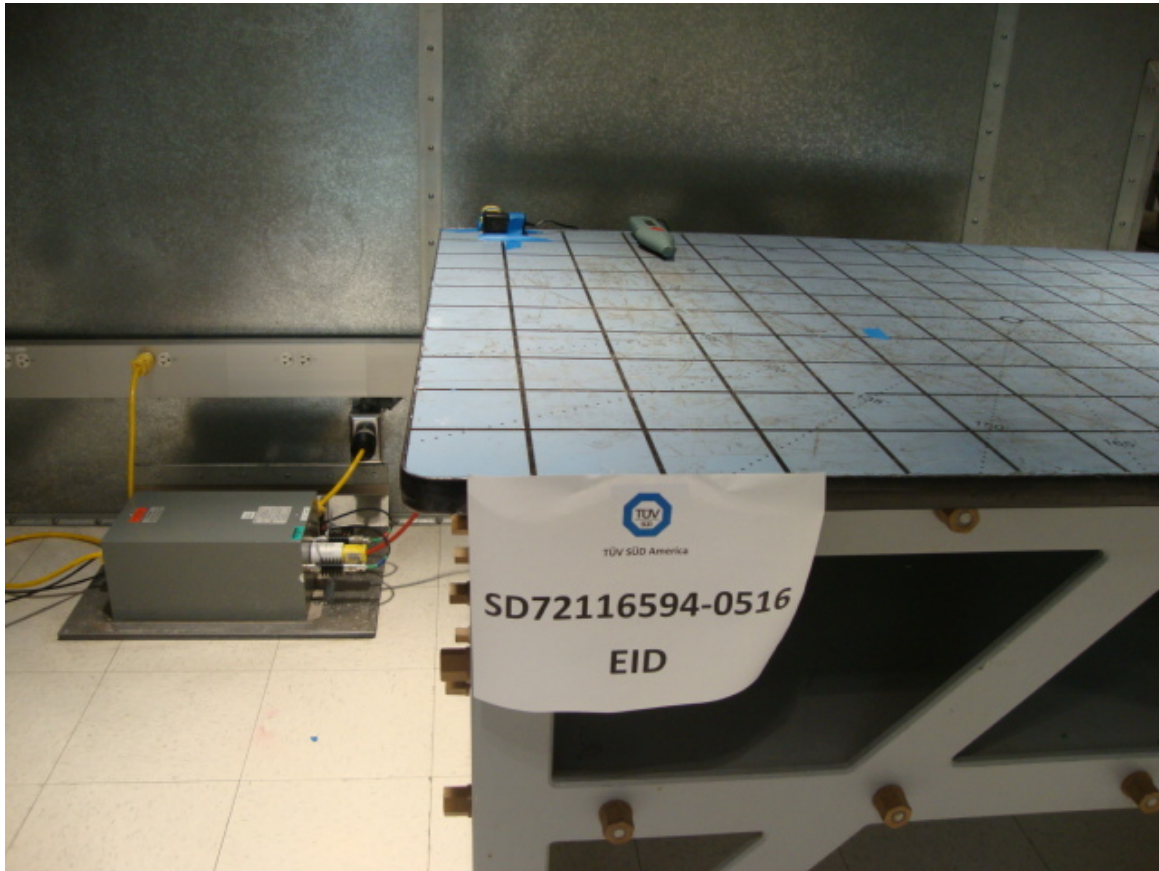
Quasi Peak

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBµV)
0.150000	43.5	1000.0	9.000	Off	N	20.2	22.5	66.0
0.402000	32.1	1000.0	9.000	Off	N	20.0	25.5	57.7
0.946500	26.0	1000.0	9.000	Off	N	20.0	30.0	56.0
4.848000	23.4	1000.0	9.000	Off	N	20.1	32.6	56.0
9.321000	25.3	1000.0	9.000	Off	N	20.1	34.7	60.0
12.538500	22.7	1000.0	9.000	Off	N	20.2	37.3	60.0

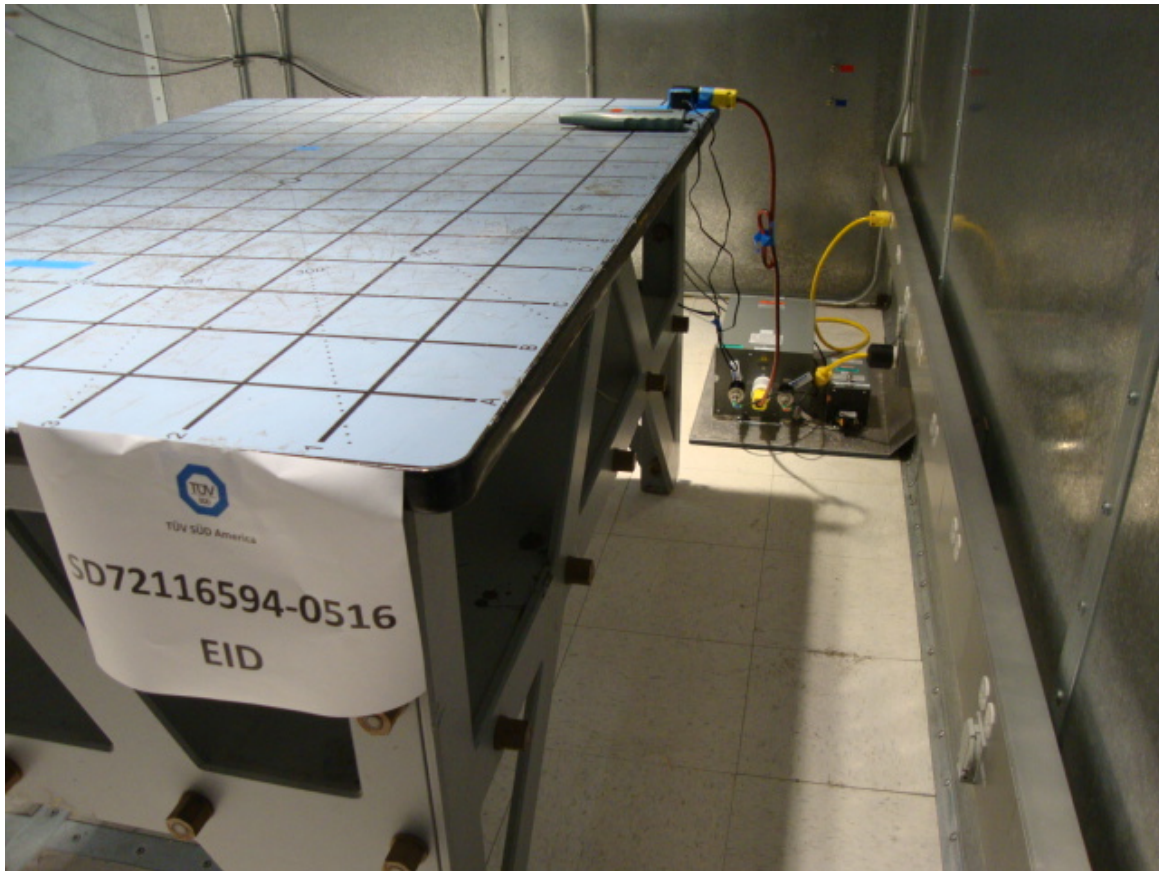
Average

Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin - Ave (dB)	Limit - Ave (dBµV)
0.150000	27.7	1000.0	9.000	Off	N	20.2	28.3	56.0
0.411000	25.5	1000.0	9.000	Off	N	20.0	22.0	47.5
1.527000	21.6	1000.0	9.000	Off	N	20.0	24.4	46.0
3.102000	18.3	1000.0	9.000	Off	N	20.1	27.7	46.0
7.800000	20.5	1000.0	9.000	Off	N	20.1	29.5	50.0
12.390000	17.1	1000.0	9.000	Off	N	20.2	32.9	50.0

2.1.12 Test Setup Photo (Front)



2.1.13 Test Setup Photo (Back)



2.2 RADIATED EMISSION

2.2.1 Specification Reference

Part 15 Subpart B §15.109(a) and Part 15 Subpart C §15.209

2.2.2 Standard Applicable FCC part 15 B

(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

2.2.3 Standard Applicable FCC part 15 C (15.209)

a) Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency of emission (MHz)	Field Strength (microvolts/meter)
0.009-0.490	2400/F(KHz)
0.490-1.705	24000/F(KHz)
1.705-30.0	30

2.2.4 Equipment Under Test and Modification State

Serial No: 000881 /Test Configurations A, C and D

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

May 18-19, 2016/KAM

2.2.6 Test Equipment Used

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

2.2.7 Environmental Conditions

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility.

Ambient Temperature	27.2 °C
Relative Humidity	44.3 %
ATM Pressure	98.9 kPa



2.2.8 Additional Observations

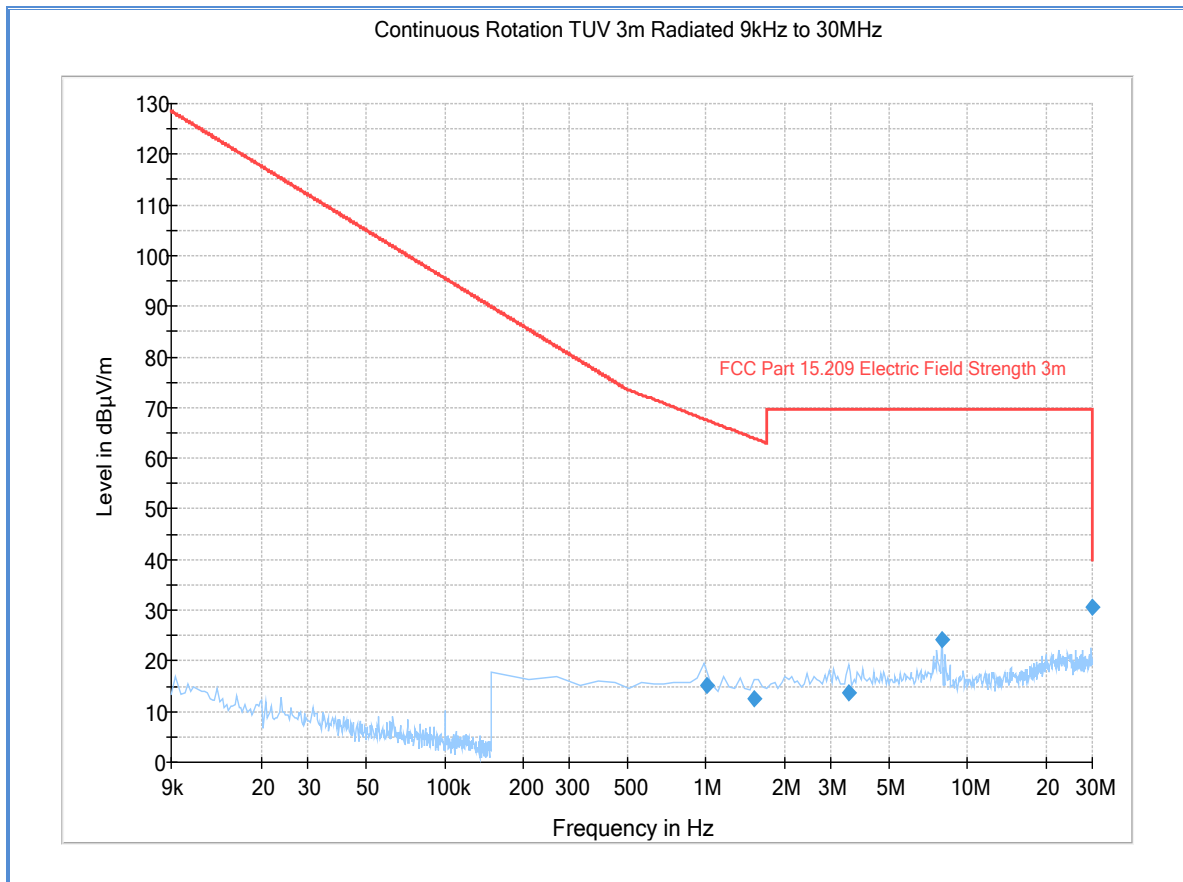
- The spectrum was searched from 9kHz to 18GHz.
- Verification was performed at 3 meters.
- Measurement was done using EMC32 V8.53 automated software. Reported level is the actual level with all the correction factors factored in. Correction Factor column is for informational purposes only. See Section 2.2.8 for sample computation.

2.2.9 Sample Computation (Radiated Emission)

Measuring equipment raw measurement (db μ V) @ 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 QuasiPeak Final Measurement (db μ V/m) @ 30MHz			11.8

2.2.10 Test Results

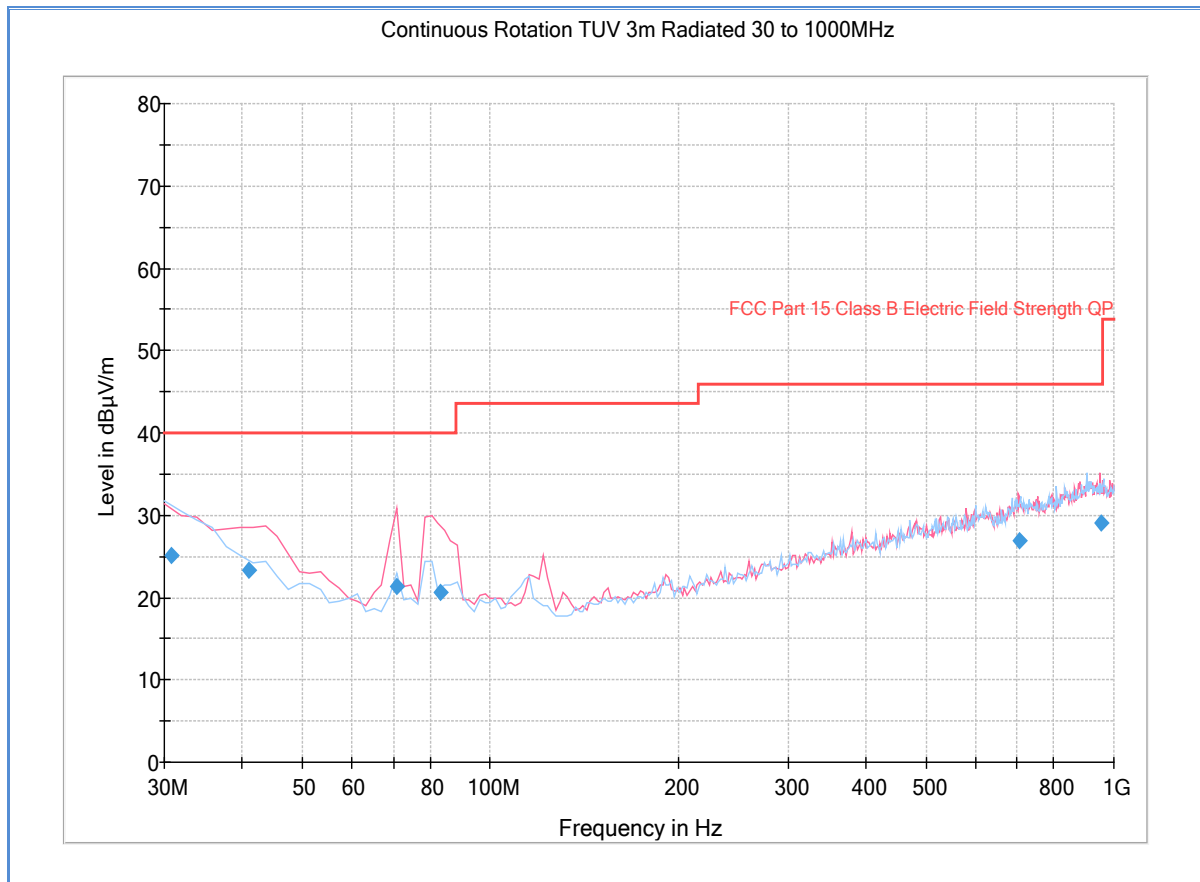
See attached plots.

2.2.10.1 9kHz to 30MHz Radiated Emission Test(FCC §15.209)**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)
0.098269	-4.4	1000.0	0.200	100.0	H	260.0	19.6	100.2	95.8
1.005475	15.2	1500.0	9.000	100.0	H	-15.0	20.2	52.4	67.6
1.523671	12.6	1500.0	9.000	100.0	H	15.0	20.2	51.3	63.9
3.513900	13.7	1500.0	9.000	100.0	H	-15.0	20.4	55.9	69.5
8.012373	24.3	1500.0	9.000	100.0	H	-15.0	20.4	45.3	69.5
30.000000	30.5	1500.0	9.000	100.0	H	15.0	24.2	9.5	40.0

Test Notes:

2.2.10.2 Below 1GHz Radiated Emission Test (Charging Mode) - (FCC Subpart B)

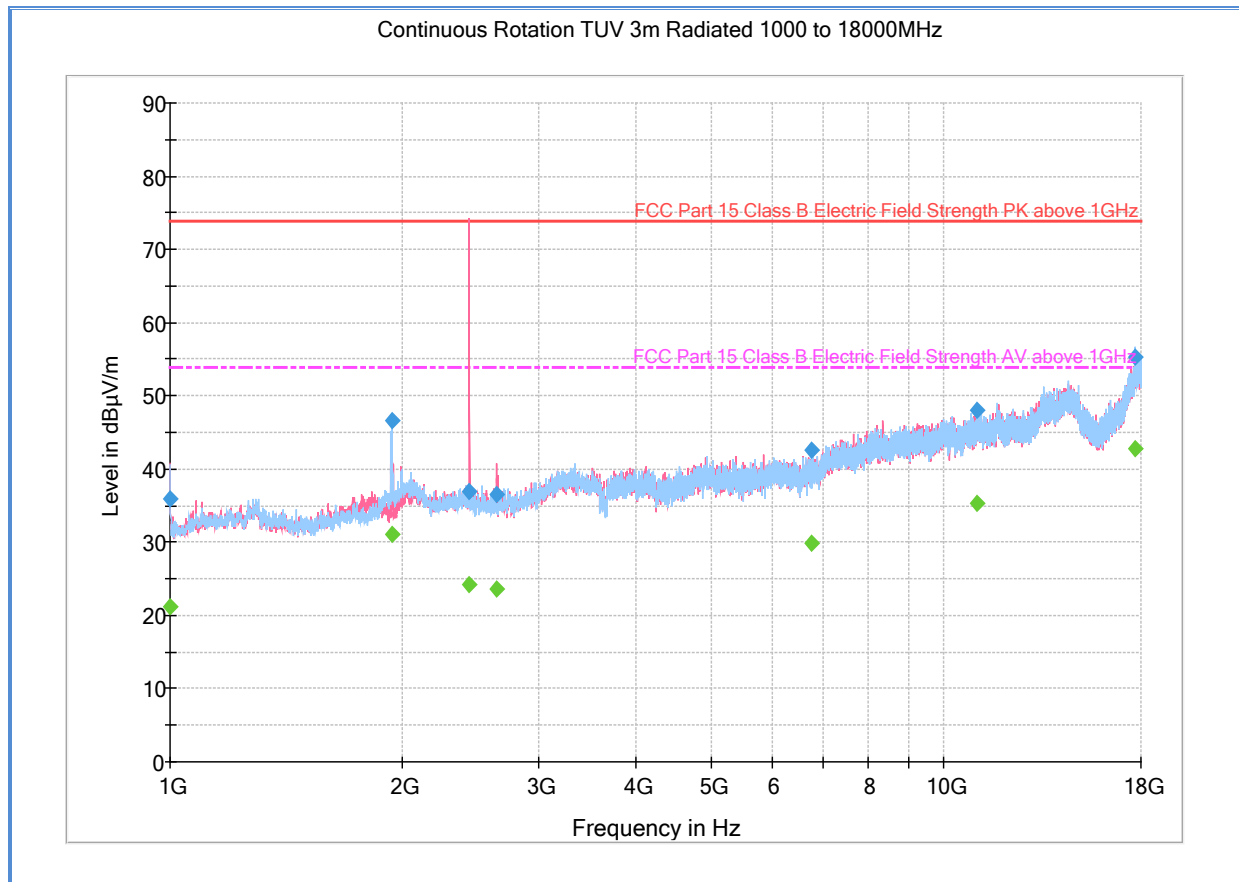


Quasi-Peak Data

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
30.760000	25.0	1000.0	120.000	400.0	H	70.0	-6.2	15.0	40.0
41.007214	23.2	1000.0	120.000	106.0	V	332.0	-11.5	16.8	40.0
70.741643	21.4	1000.0	120.000	100.0	V	323.0	-16.8	18.6	40.0
83.252745	20.6	1000.0	120.000	109.0	V	14.0	-16.2	19.4	40.0
704.665170	26.9	1000.0	120.000	255.0	V	30.0	3.0	19.1	46.0
953.922806	29.0	1000.0	120.000	150.0	V	103.0	6.2	17.0	46.0

Test Notes:

2.2.10.3 Above 1GHz Radiated Emission Test (FCCSubpart B)



Peak Data

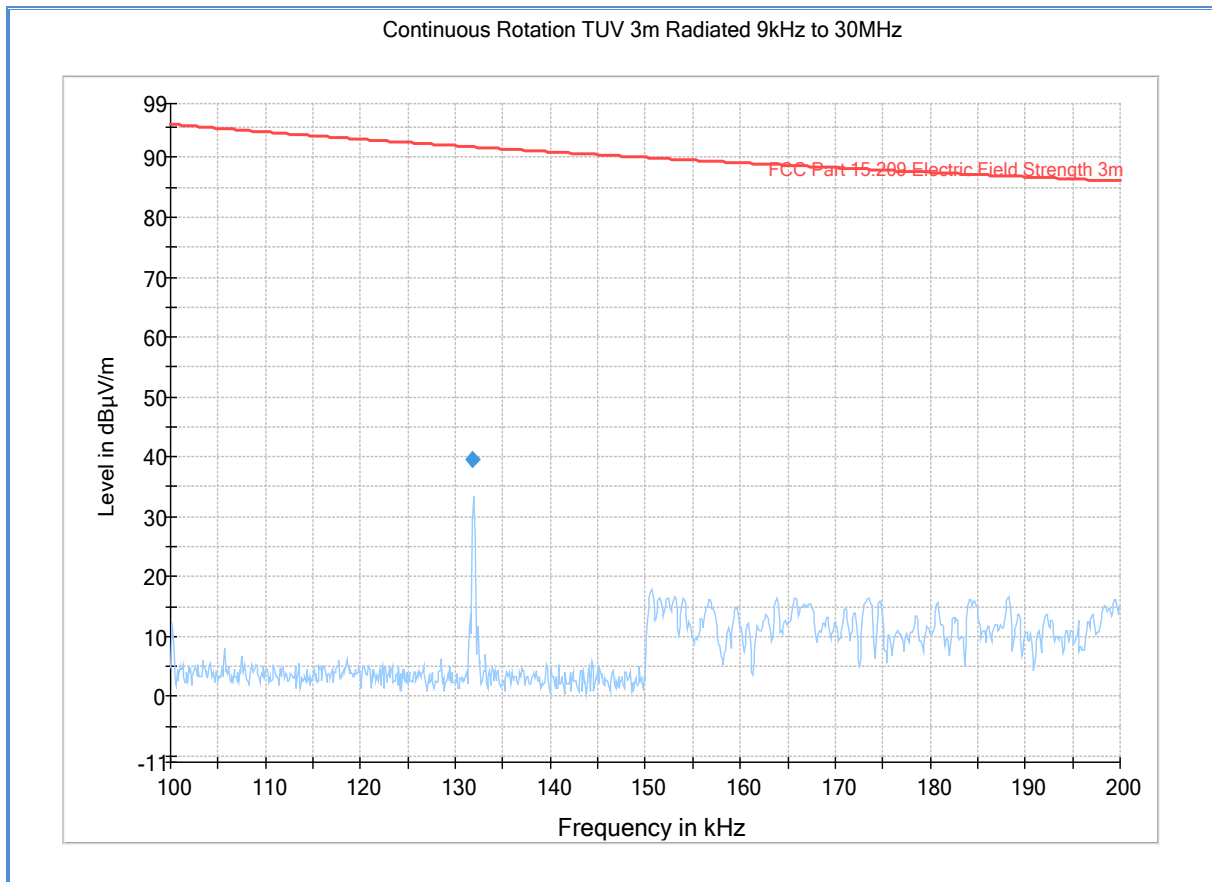
Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1000.800000	35.9	1000.0	1000.000	300.6	V	232.0	-11.2	38.0	73.9
1934.400000	46.6	1000.0	1000.000	404.0	H	146.0	-4.6	27.3	73.9
2438.166667	36.9	1000.0	1000.000	380.0	V	162.0	-5.1	37.0	73.9
2646.533333	36.6	1000.0	1000.000	235.4	V	30.0	-4.7	37.3	73.9
6750.966667	42.7	1000.0	1000.000	118.7	H	-13.0	5.3	31.2	73.9
11041.900000	48.0	1000.0	1000.000	357.1	H	36.0	13.1	25.9	73.9
17716.866667	55.2	1000.0	1000.000	142.7	H	20.0	22.9	18.7	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)
1000.800000	21.2	1000.0	1000.000	300.6	V	232.0	-11.2	32.7	53.9
1935.400000	31.1	1000.0	1000.000	404.3	H	146.0	-4.6	22.8	53.9
2438.166667	24.3	1000.0	1000.000	380.0	V	162.0	-5.1	29.6	53.9
2646.533333	23.5	1000.0	1000.000	235.4	V	30.0	-4.7	30.4	53.9
6750.966667	29.8	1000.0	1000.000	118.7	H	-13.0	5.3	24.1	53.9
11041.900000	35.4	1000.0	1000.000	357.1	H	36.0	13.1	18.5	53.9
17716.866667	42.8	1000.0	1000.000	142.7	H	20.0	22.9	11.1	53.9

Test Notes. - Worst case presented with 2.4 GHz (BLE) active.

2.2.10.4 RFID 131kHz Peak Output @5cm (RFID Active Mode)

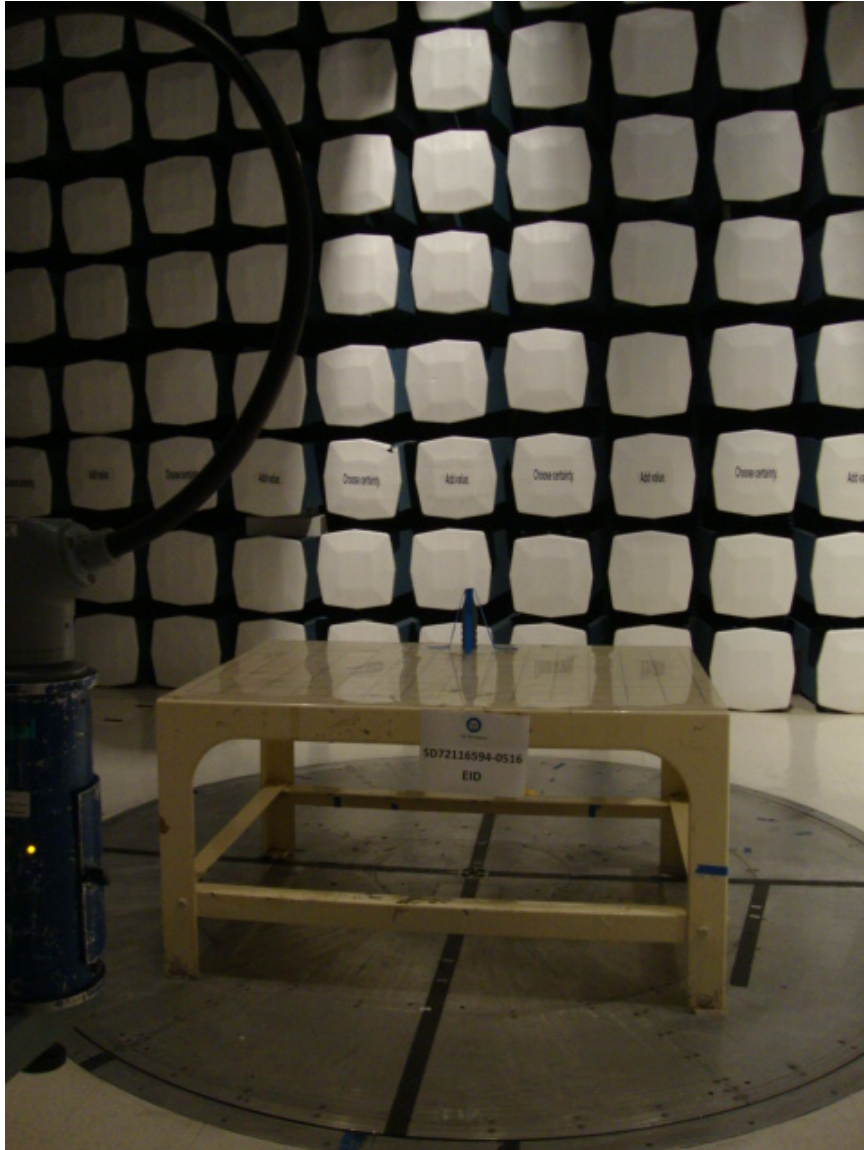


Quasi-Peak Data

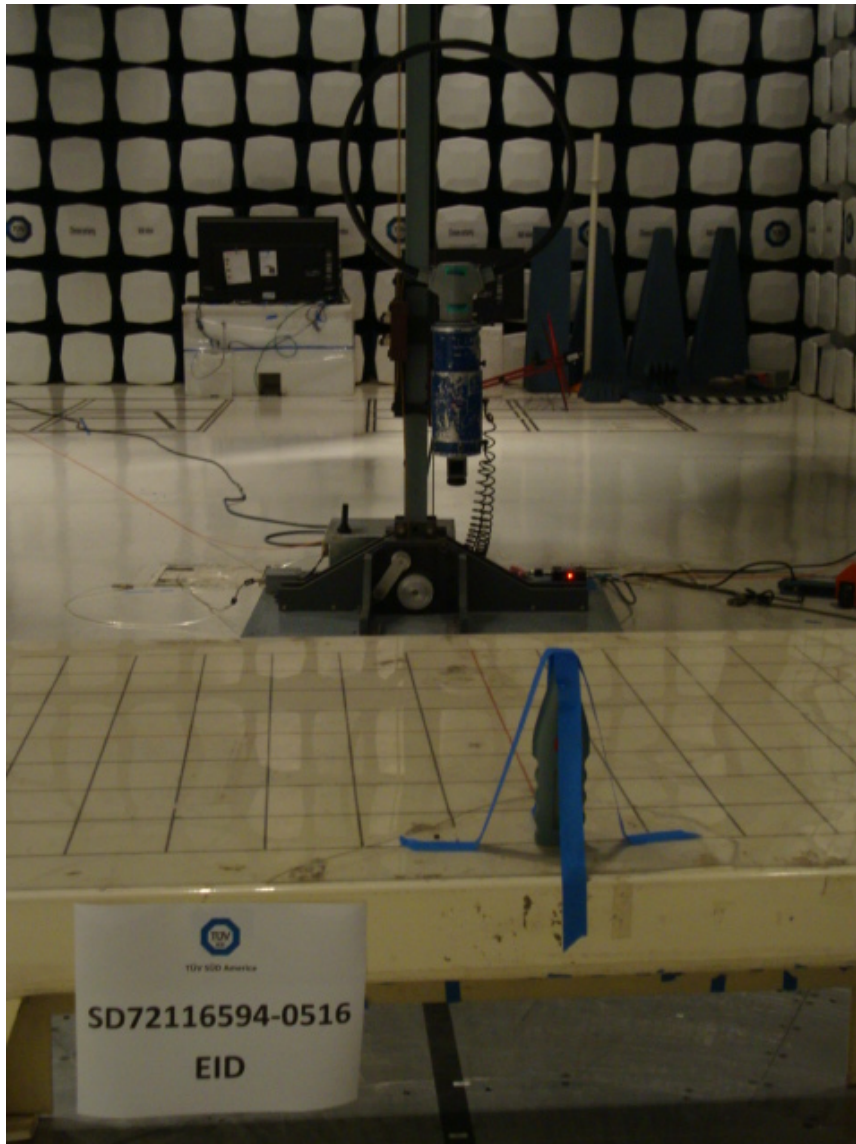
Frequency (MHz)	QuasiPeak (dB μ V/m)	QuasiPeak (mW)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)
0.131800	39.5	0.00000045	1000.0	0.200	100.0	H	16.0	19.5

Test Notes:

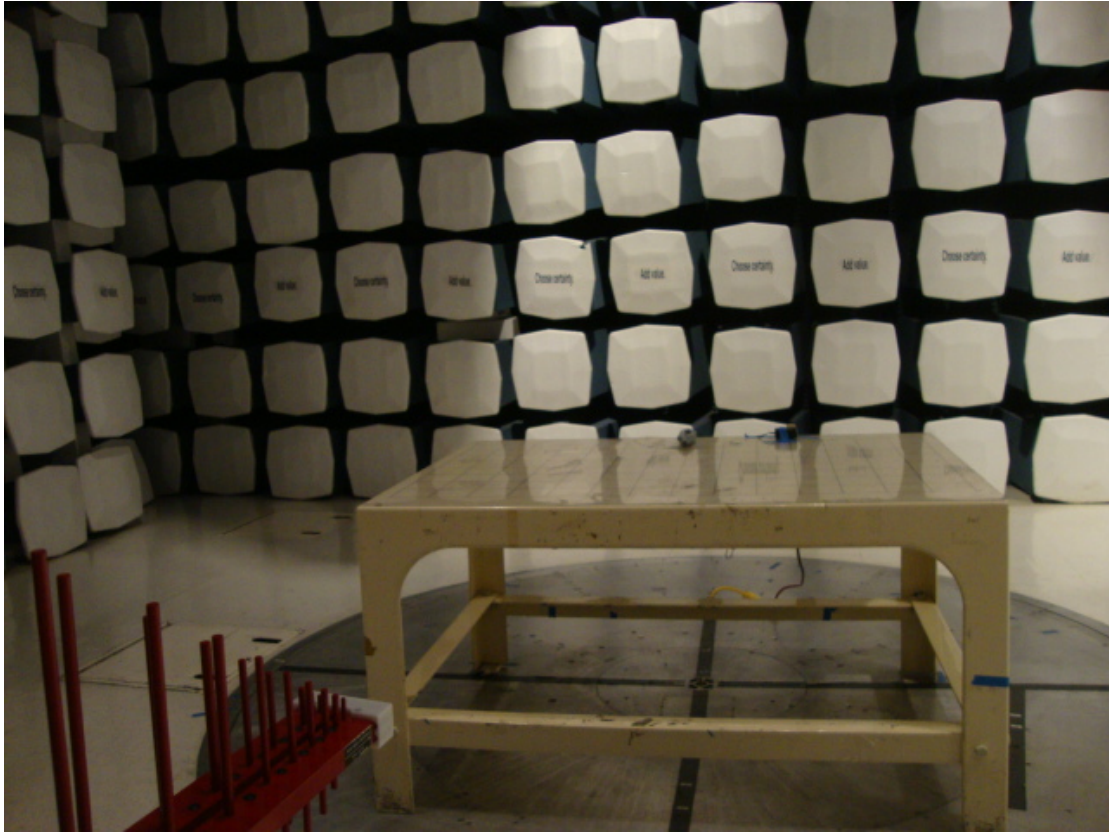
2.2.11 Test Setup Photo (9kHz to 30MHz Front)



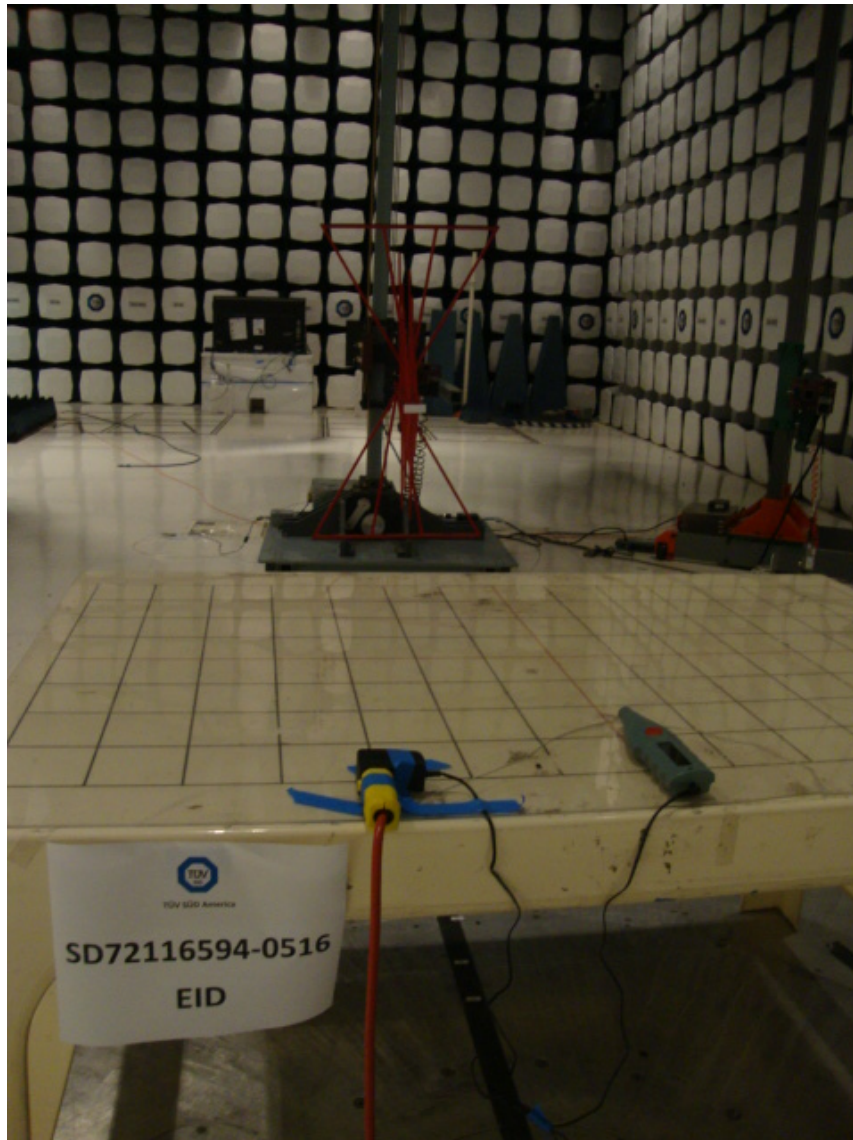
2.2.12 Test Setup Photo (9kHz to 30MHz Back)



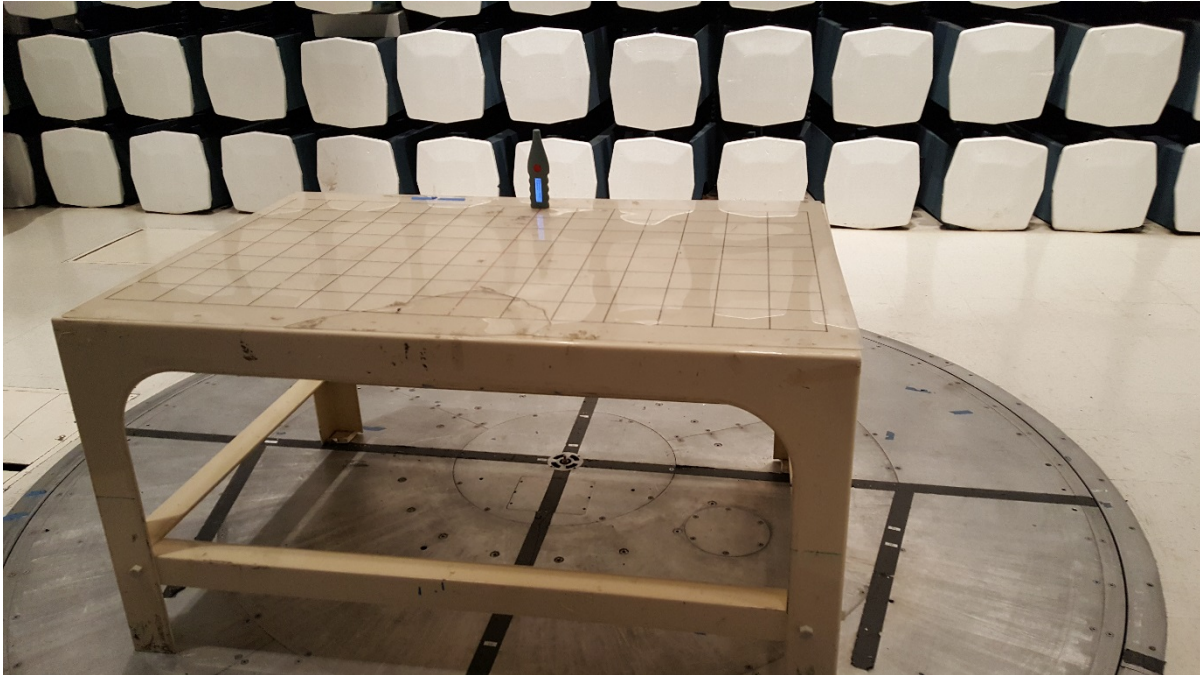
2.2.13 Test Setup Photo (30MHz to 1GHz Front)



2.2.14 Test Setup Photo (30MHz to 1GHz Back)



2.2.1 Test Setup Photo (Above 1GHz Front)



2.2.2 Test Setup Photo (Above 1GHz Back)





2.3 SPURIOUS RADIATED EMISSIONS

2.3.1 Specification Reference

Part 15 Subpart C §15.247(d)

2.3.2 Standard Applicable

(d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

2.3.3 Equipment Under Test and Modification State

Serial No: 000881 / Test Configuration B

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

May 26, 2016 / IR

2.3.5 Test Equipment Used

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

2.3.6 Environmental Conditions

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

Ambient Temperature	27.2°C
Relative Humidity	37.8%
ATM Pressure	99.2 kPa

2.3.7 Additional Observations

- This is a radiated test. The spectrum was searched from 30MHz to the 10th harmonic.
- There are no emissions found that do not comply to the restricted bands defined in FCC Part 15 Subpart C, 15.205 or Part 15.247(d).
- Measured with Bluetooth On and synced with mobile device (Bluetooth is hopping)



- Only noise floor measurements observed above 18GHz.
- 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 2.7.8 for sample computation.

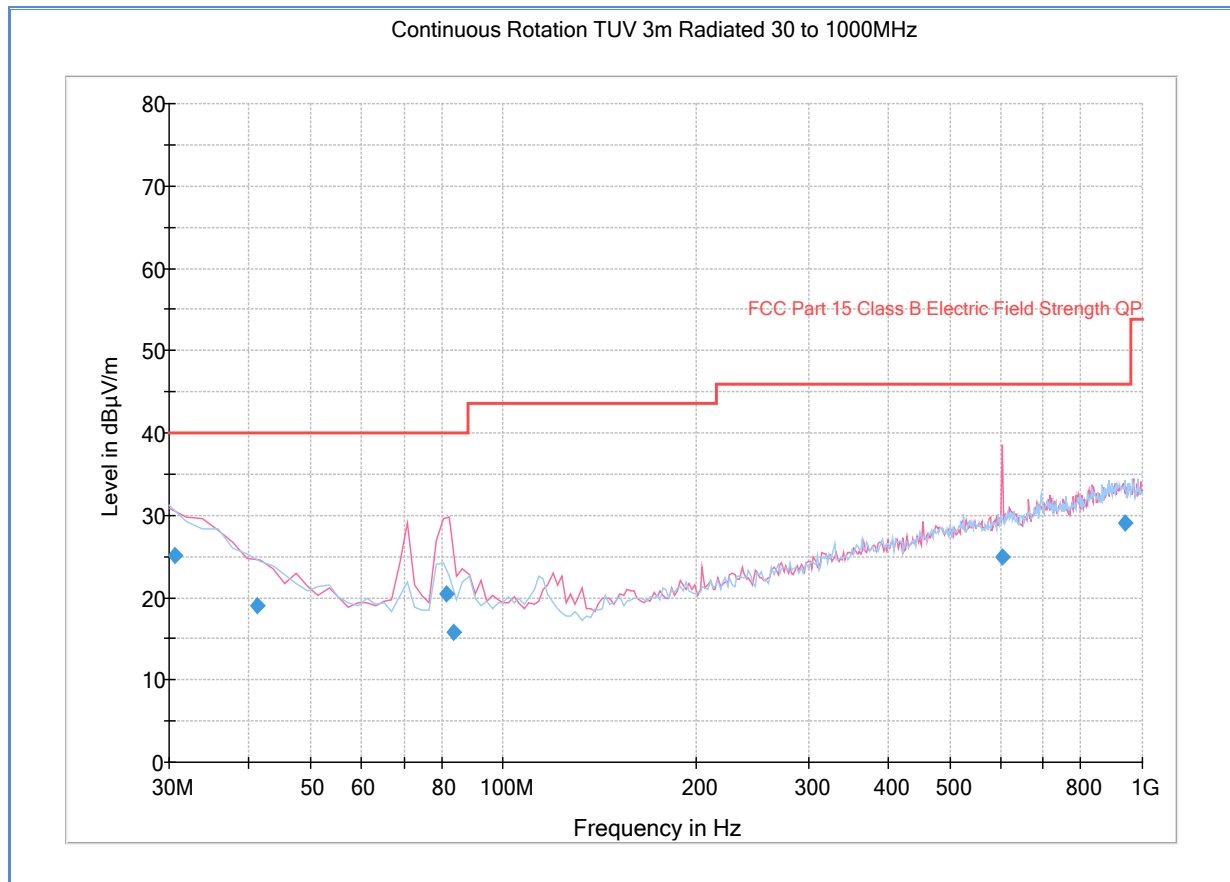
2.3.8 Sample Computation (Radiated Emission)

Measuring equipment raw measurement (db μ V) @ 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# 1002 (antenna)	17.2	
Reported QuasiPeak Final Measurement (db μ V/m) @ 30MHz			11.8

2.3.9 Test Results

See attached plots.

2.3.9.1 Below 1GHz Radiated Emission Test (BT Active Mode)



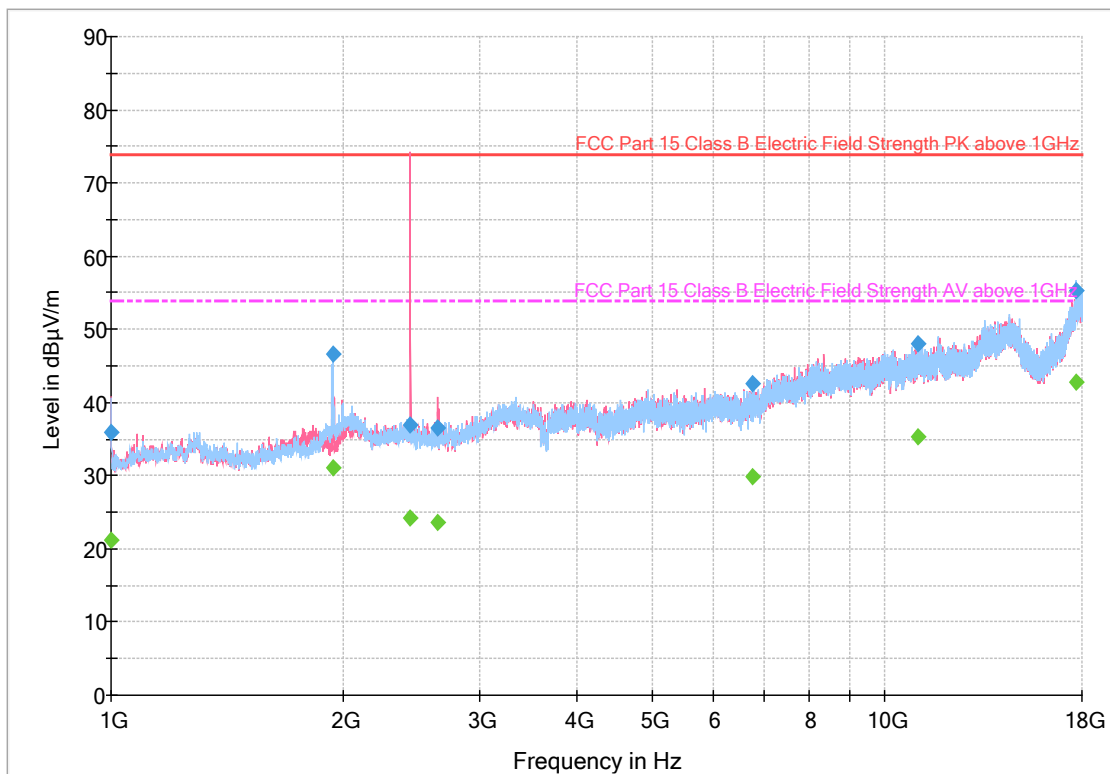
Quasi-Peak Data

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)
30.560000	25.0	1000.0	120.000	377.0	H	94.0	-6.1	15.0	40.0
41.167214	19.0	1000.0	120.000	150.0	H	282.0	-11.6	21.0	40.0
81.644970	20.4	1000.0	120.000	109.0	V	-12.0	-16.4	19.6	40.0
83.452745	15.9	1000.0	120.000	400.0	V	7.0	-16.2	24.1	40.0
602.606894	24.9	1000.0	120.000	127.0	V	63.0	0.7	21.1	46.0
937.499479	29.1	1000.0	120.000	138.0	H	4.0	6.3	16.9	46.0

Test Notes:

2.3.9.2 Above 1GHz Radiated Emission Test (BT Active Mode)

Continuous Rotation TUV 3m Radiated 1000 to 18000MHz



Peak Data

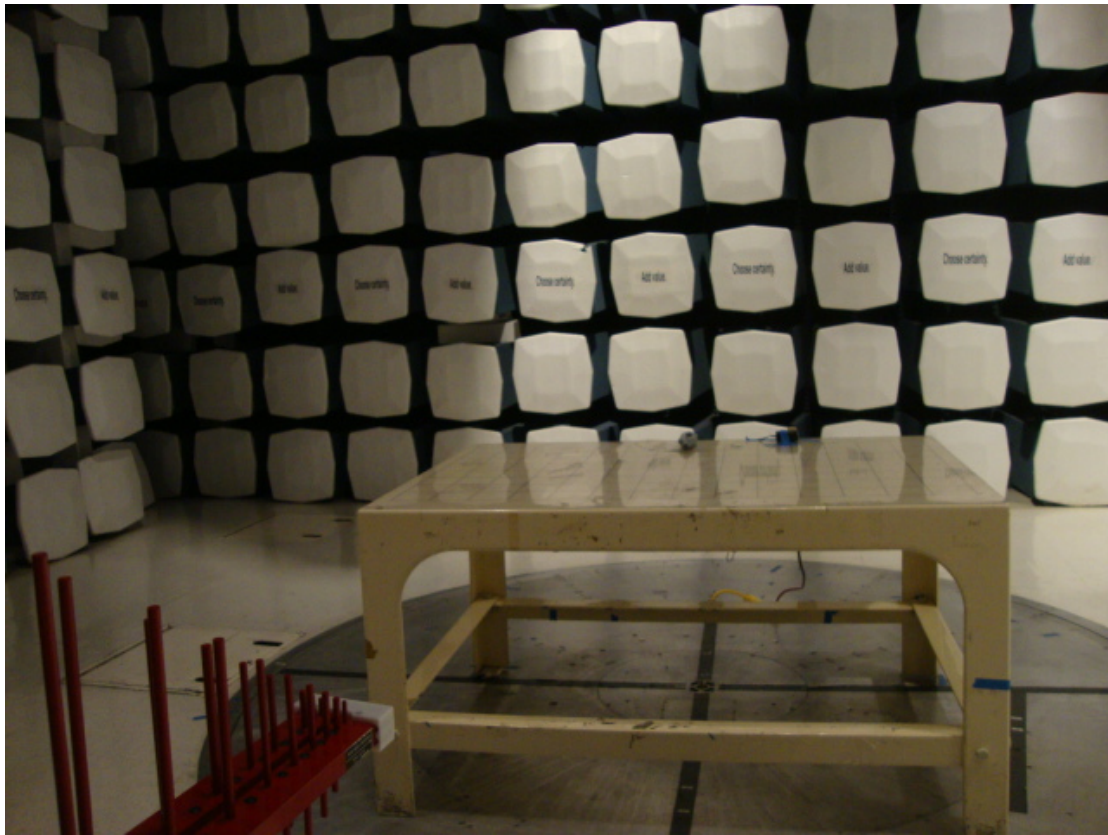
Frequency (MHz)	MaxPeak (dBμV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
1000.800000	35.9	1000.0	1000.000	300.6	V	232.0	-11.2	38.0	73.9
1934.400000	46.6	1000.0	1000.000	404.0	H	146.0	-4.6	27.3	73.9
2438.166667	36.9	1000.0	1000.000	380.0	V	162.0	-5.1	37.0	73.9
2646.533333	36.6	1000.0	1000.000	235.4	V	30.0	-4.7	37.3	73.9
6750.966667	42.7	1000.0	1000.000	118.7	H	-13.0	5.3	31.2	73.9
11041.900000	48.0	1000.0	1000.000	357.1	H	36.0	13.1	25.9	73.9
17716.866667	55.2	1000.0	1000.000	142.7	H	20.0	22.9	18.7	73.9

Average Data

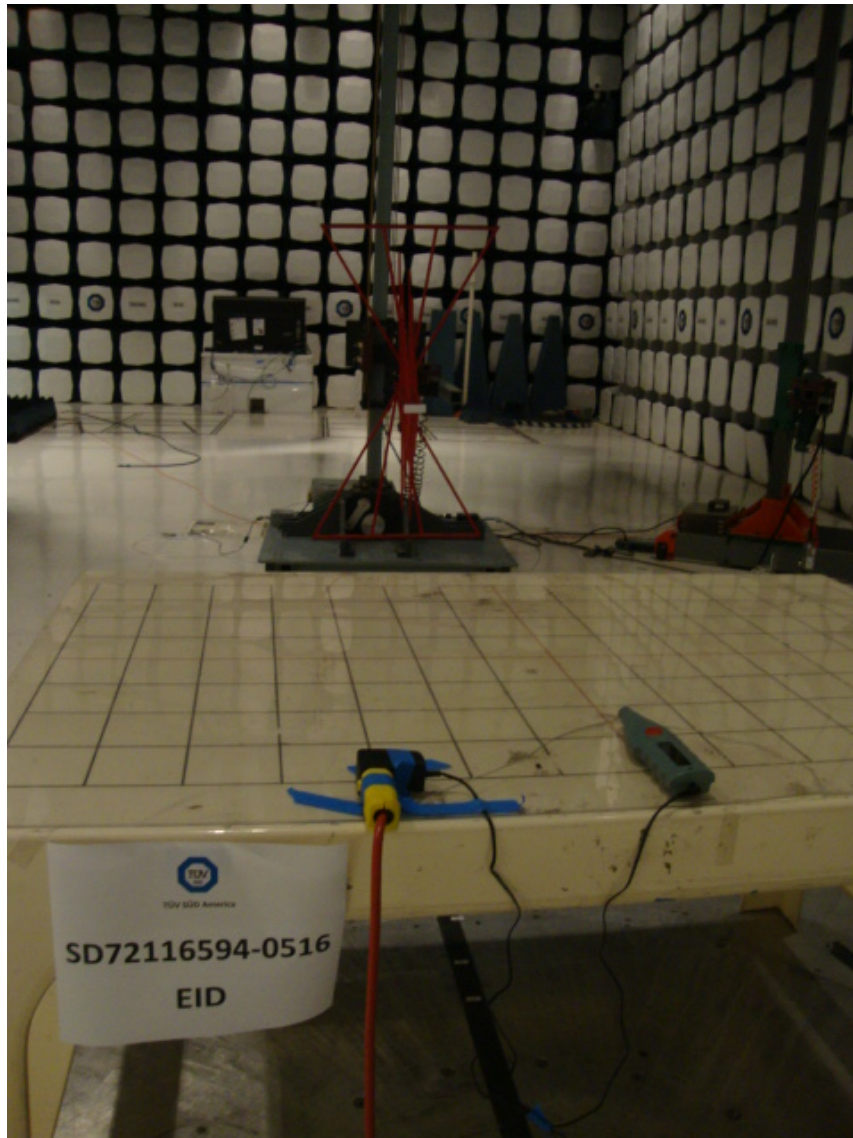
Frequency (MHz)	Average (dBμV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
1000.800000	21.2	1000.0	1000.000	300.6	V	232.0	-11.2	32.7	53.9
1935.400000	31.1	1000.0	1000.000	404.3	H	146.0	-4.6	22.8	53.9
2438.166667	24.3	1000.0	1000.000	380.0	V	162.0	-5.1	29.6	53.9
2646.533333	23.5	1000.0	1000.000	235.4	V	30.0	-4.7	30.4	53.9
6750.966667	29.8	1000.0	1000.000	118.7	H	-13.0	5.3	24.1	53.9
11041.900000	35.4	1000.0	1000.000	357.1	H	36.0	13.1	18.5	53.9
17716.866667	42.8	1000.0	1000.000	142.7	H	20.0	22.9	11.1	53.9

Test Notes.- 2.4 GHZ signal from BLE in Sync Mode.

2.3.10 Test Setup Photo (30MHz to 1GHz Front)



2.3.11 Test Setup Photo (30MHz to 1GHz Back)



2.3.12 Test Setup Photo (Above 1GHz Front)



2.3.13 Test Setup Photo (Above 1GHz Back)





SECTION 3

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
Conducted Emissions						
7620	EMI Test Receiver	ESU40	100399	Rhode & Schwarz	09/03/15	09/03/16
7567	LISN	FCC-LISN-50-25-2-10	120305	Fischer Custom Comm.	10/28/15	10/28/16
8822	20dB Attenuator	34-20-34	N/A	MCE / Weinschel	02/29/16	02/28/17
8824	20dB Attenuator	34-20-34	N/A	MCE / Weinschel	02/29/16	02/28/17
Radiated Emissions						
1002	Bilog Antenna	3142C	00058717	ETS-Lindgren	11/06/15	11/06/17
6628	Loop Antenna	HFH 2 –Z2	880 458/25	Rhode & Schwarz	10/28/15	10/28/16
1040	EMI Test Receiver	ESIB40	100292	Rhode & Schwarz	09/29/15	09/29/16
1016	Pre-amplifier	PAM-0202	187	PAM	12/15/15	12/15/16
1051	Double-ridged waveguide horn antenna	3115	9408-4329	EMCO	03/21/16	03/21/17
1049	EMI Test Receiver	ESU	100133	Rhode & Schwarz	03/17/16	03/17/17
8628	Pre-amplifier	QLJ 01182835-JO	8986002	QuinStar Technologies Inc.	01/11/16	01/11/17
Miscellaneous						
6792	Multimeter	3478A	2911A70964	Hewlett Packard	08/14/15	08/14/16
7560	Barometer/Temperature /Humidity Transmitter	iBTHX-W	1240476	Omega	10/19/15	10/19/16
	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	Rectangular	2.70	1.56	2.43
6	EUT Setup	Rectangular	1.00	0.58	0.33
Combined Uncertainty (u_c):					1.78
Coverage Factor (k):					2
Expanded Uncertainty:					3.57

3.2.3 Radiated Emission Measurements (Above 1GHz)

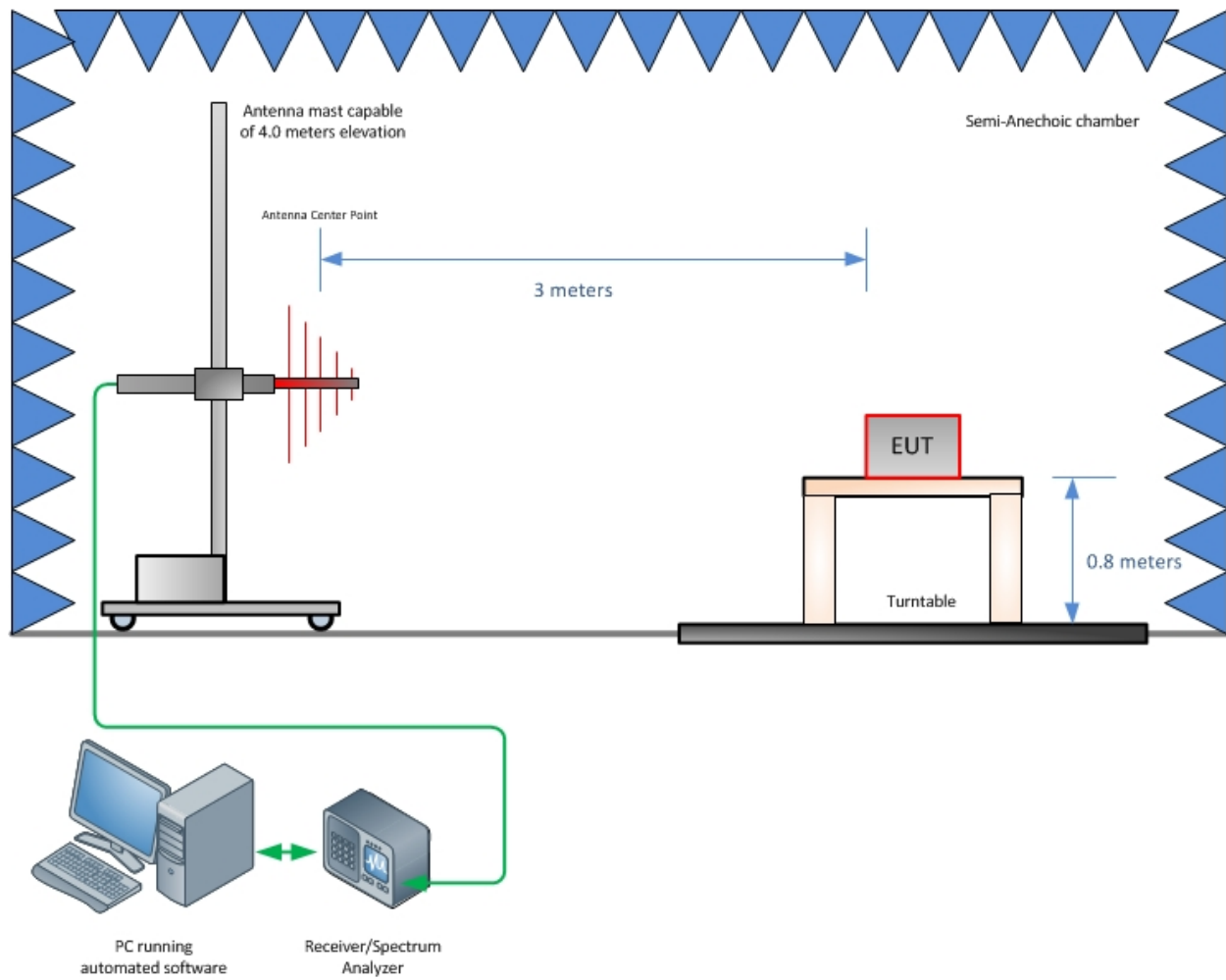
Contribution		Probability Distribution Type	Probability Distribution x_i	Standard Uncertainty $u(x_i)$	$[u(x_i)]^2$
1	Receiver/Spectrum Analyzer	Rectangular	0.57	0.33	0.11
2	Cables	Rectangular	0.70	0.40	0.16
3	Preamp	Rectangular	0.50	0.29	0.08
4	Antenna	Rectangular	0.37	0.21	0.05
5	Site	Rectangular	2.70	1.56	2.43
6	EUT Setup	Rectangular	1.00	0.58	0.33
Combined Uncertainty (u_c):					1.78
Coverage Factor (k):					2
Expanded Uncertainty:					3.56



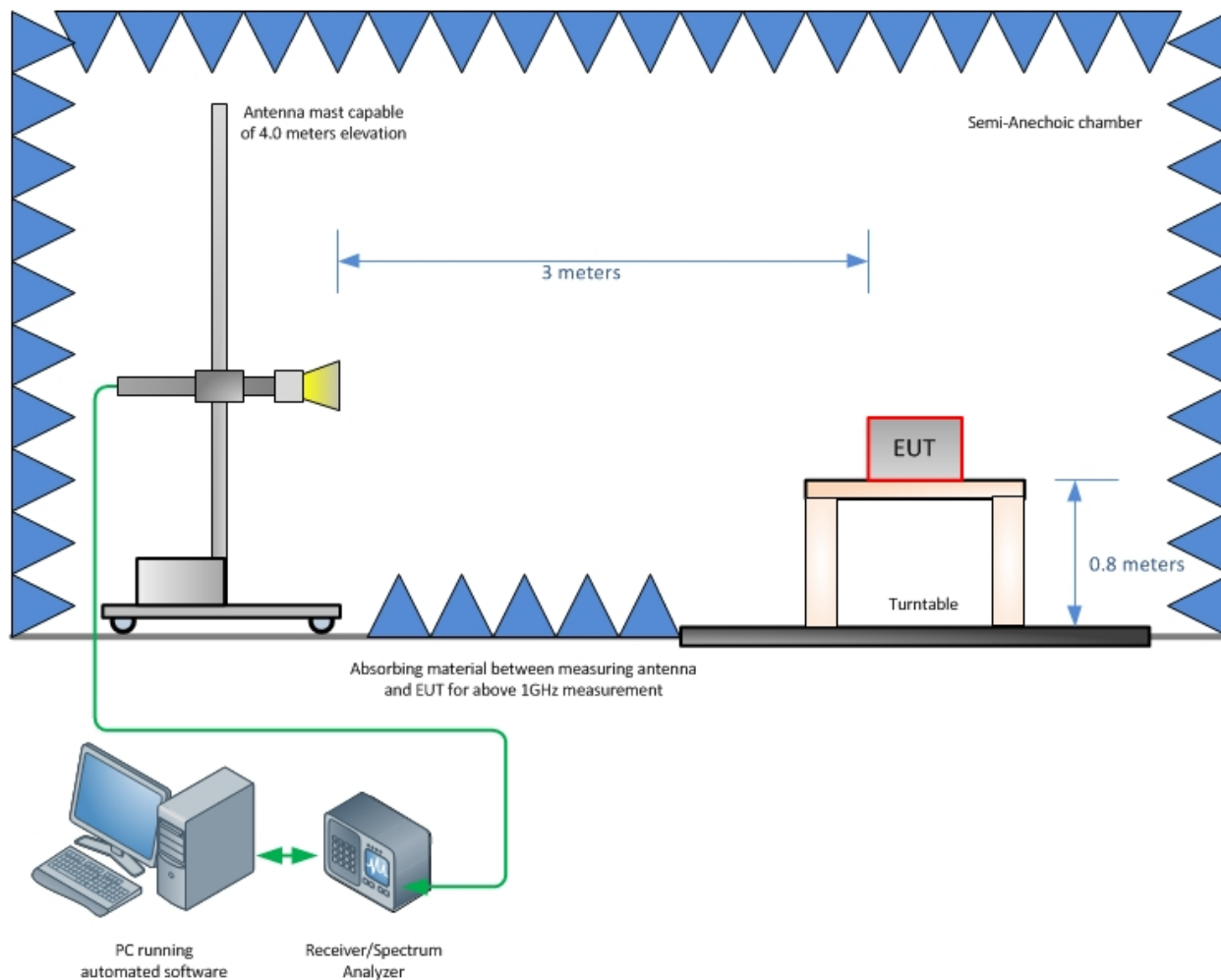
SECTION 4

DIAGRAM OF TEST SETUP

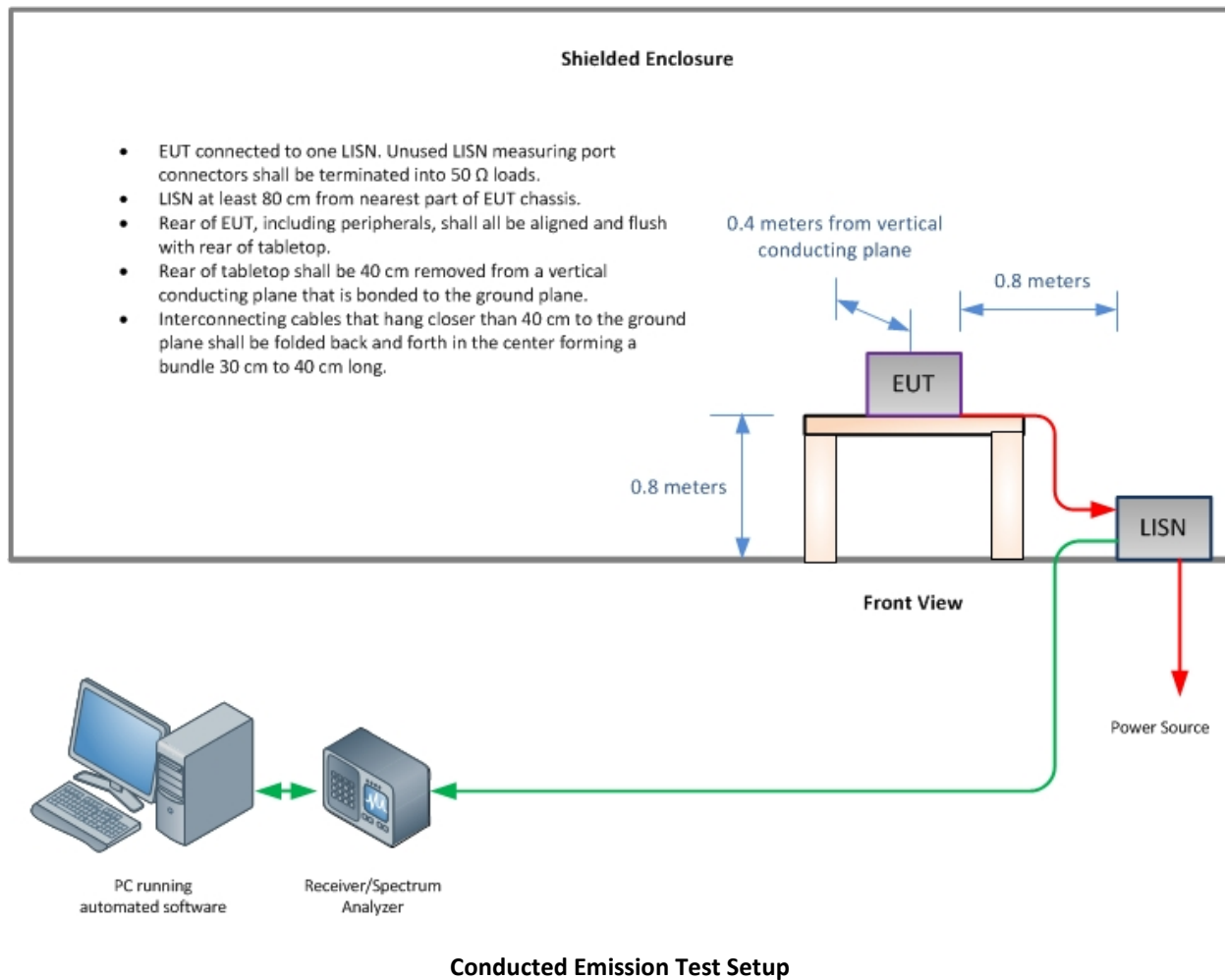
4.1 TEST SETUP DIAGRAM



Radiated Emission Test Setup (Below 1GHz)



Radiated Emission Test Setup (Above 1GHz)





SECTION 5

ACCREDITATION, DISCLAIMERS AND COPYRIGHT



5.1 ACCREDITATION, DISCLAIMERS AND COPYRIGHT

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