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Report On

Radio Testing of the
BARTEC GmbH

MC92NOex-G Mobile Computer with RuBee add-on module
Model: MC92NOex IS RuBee

CFR 47 Part 15, Subpart C
RSS-210 Issue 9 and RSS-GEN Issue 4

Report No. SD72121135-1016

October 2016

REPORT ON Radio Testing of the
BARTEC GmbH
MC92NOex-G Mobile Computer with RuBee add-on module

TEST REPORT NUMBER SD72121135-1016

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DATED October 27, 2016

Revision History

SD72121135-1016 BARTEC GmbH MC92NOex-G Mobile Computer with RuBee add-on module					
DATE	OLD REVISION	NEW REVISION	REASON	PAGES AFFECTED	APPROVED BY
10/27/2016	Initial Release				Juan Manuel Gonzalez

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SECTION 1

REPORT SUMMARY

Radio Testing of the
BARTEC GmbH
MC92NOex-G Mobile Computer with RuBee add-on module

1.1 INTRODUCTION

The information contained in this report is intended to show verification of the BARTEC GmbH MC92NOex-G Mobile Computer with RuBee add-on module to the requirements of the CFR 47 Part 15, Subpart C and RSS-210 Issue 9.

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.
Manufacturer	BARTEC GmbH
Model Number(s)	MC92NOex IS RuBee
FCC ID Number	TBURuBee
IC Number	5736C-RuBee
Serial Number(s)	1530600504547
Number of Samples Tested	1
Test Specification/Issue/Date	• CFR 47 Part 15, Subpart C (October 1, 2016) • RSS-210 Issue 9 (August 2016) • RSS-Gen Issue 4 (November 13, 2014)
Start of Test	October 17, 2016
Finish of Test	October 19, 2016
Test Facility location	All tests performed on this test report were performed at: TÜV SÜD America Inc. (Mira Mesa Location) 10040 Mesa Rim Road, San Diego, CA 92121-2912 (32.901268,- 117.177681). Phone: 858 678 1400, FAX: 858-546 0364
Name of Engineer(s)	Nikolay Shtin
Related Document(s)	None. Supporting documents for EUT certification are separate exhibits.

1.2 BRIEF SUMMARY OF RESULTS

A brief summary of the tests carried out in accordance with CFR 47 Part 15, Subpart C with cross-reference to the corresponding ISED standards is shown below.

Section	FCC	RSS	Test Description	Result	Comments/Base Standard
-	§2.1046(a)		Conducted output power	N/A*	
2.1	§2.1049, §2.202(a)	RSS-Gen 6.6	Occupied Bandwidth	As Reported	
2.2	§15.205, §15.209	RSS-210 4.4, RSS-Gen 8.9 and 8.10	Radiated Emissions	Compliant	
2.3	§15.207(a)	RSS-Gen 8.8	AC Conducted Emissions	Compliant	

N/A* Not applicable. No requirements on the EUT output power.

1.3 PRODUCT INFORMATION

1.3.1 Technical Description

The Equipment Under Test (EUT) was a BARTEC GmbH MC92N0ex-G Mobile Computer with RuBee add-on module as shown in the photographs below. The conjunction between BARTEC's MC 92N0ex and a RuBee module is used as a mobile platform capable of reading the tags and wirelessly passing on their information onto a higher processing level (usually hosted as a cloud-based database). RuBee add-on module uses two electromagnetic frequencies of 65.5 kHz (Inductive power carrier) and 131.0 kHz (TX/RX data). RuBee passive tags require inductive power to be transmitted from the reader. As such, the add-on module's loop antenna provides the required power using the 65.5 kHz carrier.



Equipment Under Test

1.3.2 EUT General Description

EUT Description	MC92N0ex-G Mobile Computer with RuBee add-on module
Model Number(s)	MC92N0ex IS RuBee
Rated Voltage	11-16 VDC
Mode Verified	131 kHz RFID Reader with Inductive Power
Device Capabilities	131 kHz RF Reader, 65.5 kHz Inductive Power
Frequency Range	RFID: 65.5 kHz/131.000 kHz Wi-Fi
Primary Unit (EUT)	☐ Production ☐ Pre-Production ☒ Engineering
Output Power	68.84 dBµV/m @ 3 meters
Number of Operating Frequencies	2
Channels Verified	65.5 kHz 131.000 KHz
Antenna Type (used during evaluation)	65.5 kHz Loop Antenna 131 kHz Ferrite Coil Antenna
Modulation Used	ASK

1.4 EUT TEST CONFIGURATION

1.4.1 Test Configuration Description

Test Configuration	Description
A	Radiated Emissions Test configuration. EUT powered from Li-ion Battery in continuous modulated transmission mode reading RFID Tag.
B	Conducted Emissions Test configuration. EUT in charging mode connected to the AC Adapter.

1.4.2 EUT Exercise Software

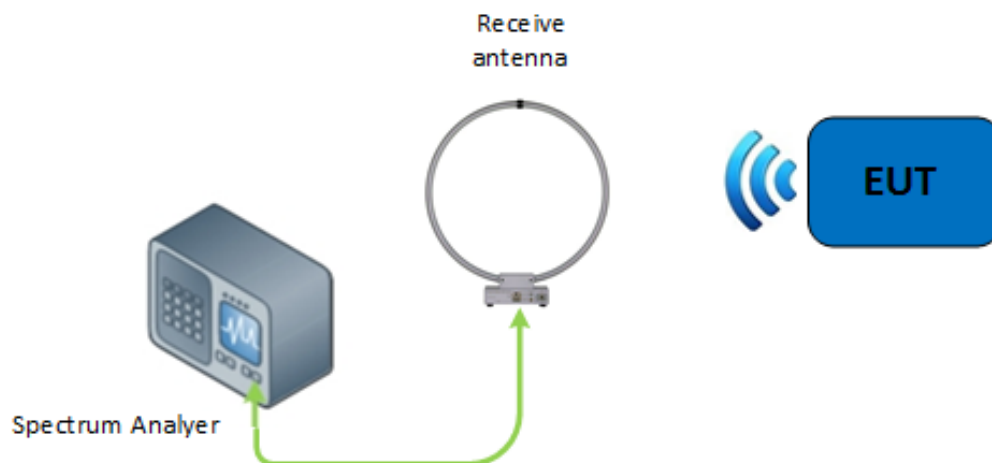
EUT is loaded with Windows Embedded Handheld 6.5 Classic (CE OS 5.2.29326 Build 29326.5.3.12.38). SensiOnDrillPipe (2146680832 v1.0.1.0) App was used to set the EUT in continuous RFID tag reading mode.

1.4.3 Support Equipment and I/O cables

Manufacturer	Equipment/Cable	Description
Symbol Technologies Inc.	Single slot charging and communications cradle	Model: CRD9000-1000, S/N: 13323000501315
HIPRO	AC Adapter, Input: 100-240 V 50-60 Hz 2.4A, Output: 12 VDC 4.16 A	Model: HP-A0502R3D, S/N: F33351144023627
-	SensiOn RFID Tag	-

1.4.4 Simplified Test Configuration Diagram

Radiated Test Setup



Not To Scale – Illustration Purpose Only
Objects may not represent actual image of
original equipment or set-up.

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: N/A		
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 C63.10-2013: American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.

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: 858 942 5542 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 §2.498 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 Registration No.: 3067A

The 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

Radio Testing of the
BARTEC GmbH
MC92NOex-G Mobile Computer with RuBee add-on module

2.1 OCCUPIED BANDWIDTH

2.1.1 Specification Reference

FCC 47 CFR Part 2, Clause 2.1049 and 2.202(a)
RSS-GEN Issue 4 Sections 6.6

2.1.2 Standard Applicable

The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission shall be measured.

2.1.3 Equipment Under Test and Modification State

Serial No: 1530600504547 / Test Configuration A

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

October 17, 2016/NS

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

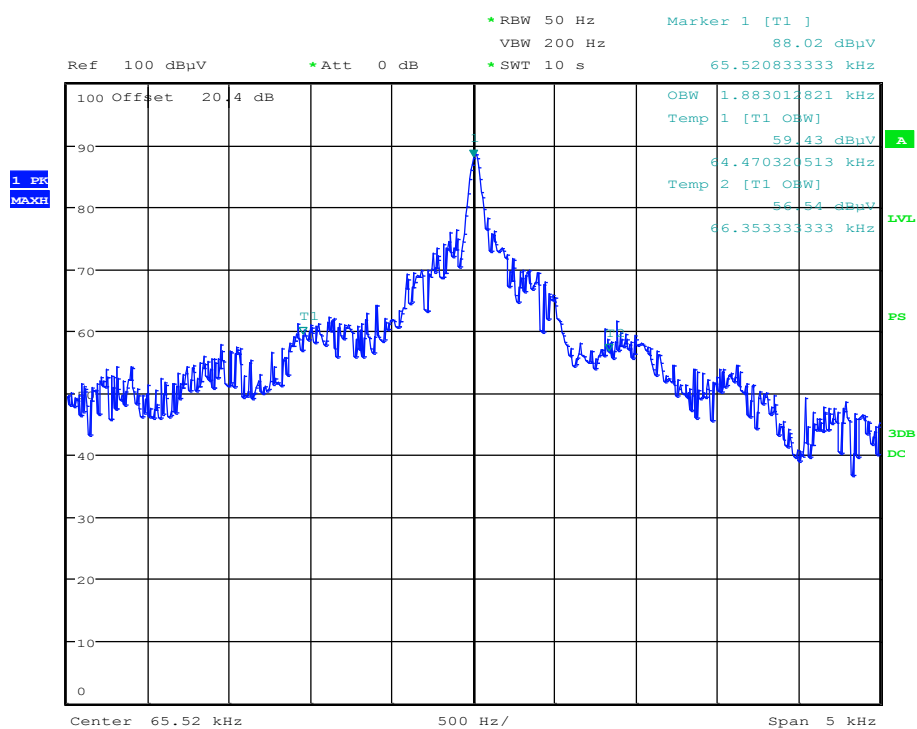
Ambient Temperature	23.8°C
Relative Humidity	43.6%
ATM Pressure	100.2kPa

2.1.7 Additional Observations

- This is a radiated test using a loop antenna connected to the spectrum analyzer.
- A peak output reading was taken.
- For 99% bandwidth, the OBW measurement function of the spectrum analyzer was used.
- 20dB bandwidth verified using the “n” dB down marker function of the spectrum analyzer.
- Span is wide enough to capture the channel transmission.
- RBW is approx. 2% of the expected OBW
- VBW is approx. 3×RBW.
- Sweep is auto.
- Detector is peak.
- Trace is Max Hold.

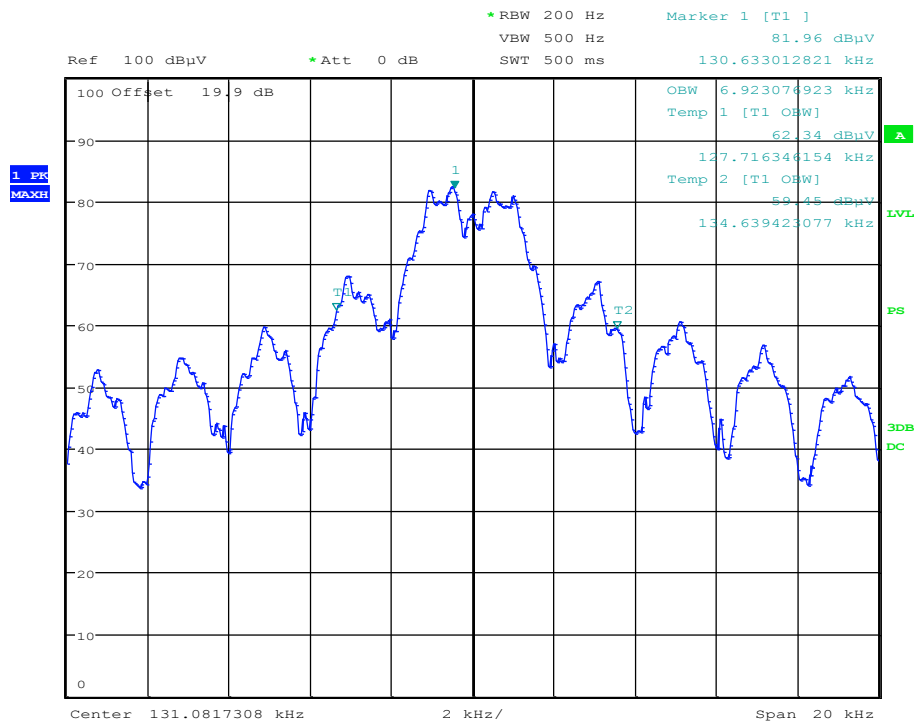
2.1.8 Test Results

Frequency	20 dB Bandwidth	99% Bandwidth
65.5 kHz	0.112 kHz	1.883 kHz
131.0 kHz	3.654 kHz	6.923 kHz

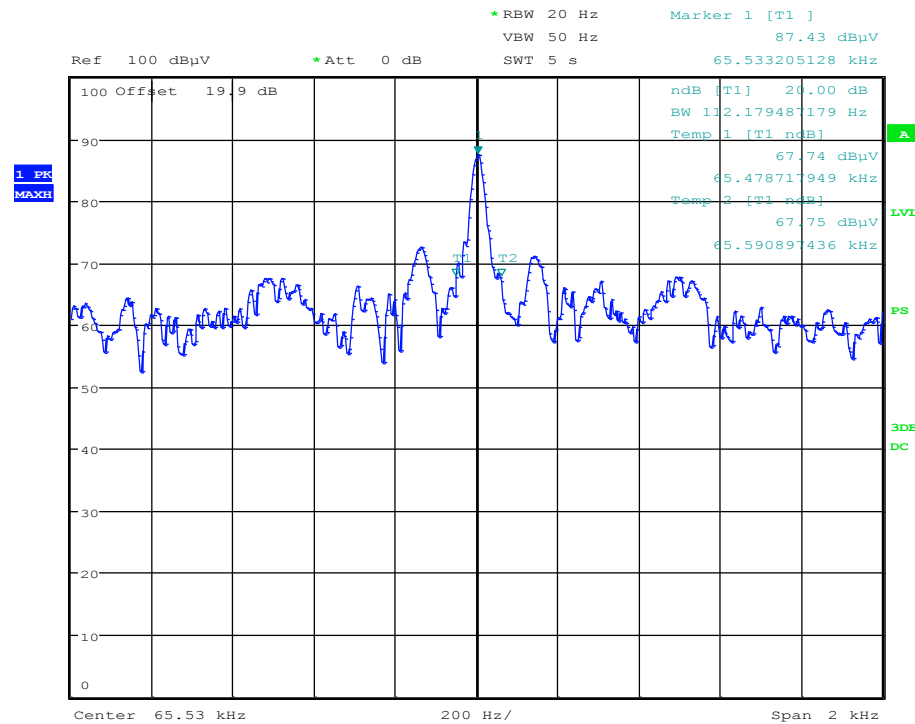


Date: 17.OCT.2016 12:12:49

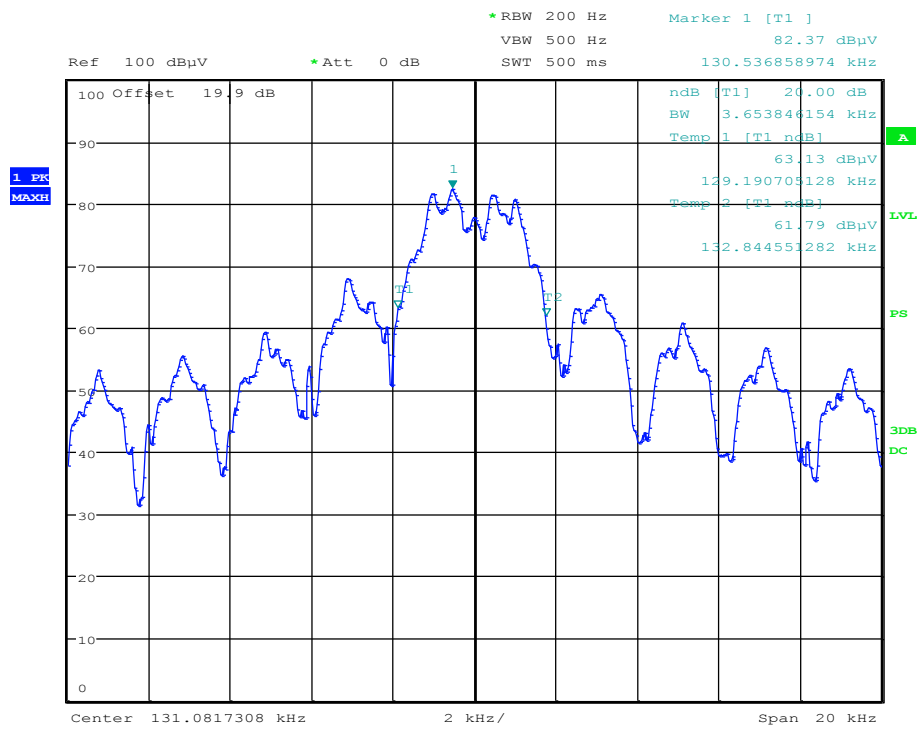
99% OBW (65.5 kHz channel)



99% OBW (131 kHz channel)



20 dB BW (65.5 kHz channel)



20 dB BW (131 kHz channel)

2.1.9 Test Setup Pictures

Test setup pictures are similar to those from section 2.2.13.

2.2 RADIATED EMISSIONS

2.2.1 Specification Reference

FCC 47 CFR Part 15, Clause 15.205 and 15.209
RSS-GEN Issue 4 Sections 8.9 and 8.10

2.2.2 Standard Applicable

§ 15.209 Radiated emission limits; general requirements.

(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)	Measurement distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this part, e.g., §§ 15.231 and 15.241.

(b) In the emission table above, the tighter limit applies at the band edges.

(c) The level of any unwanted emissions from an intentional radiator operating under these general provisions shall not exceed the level of the fundamental emission. For intentional radiators which operate under the provisions of other sections within this part and which are required to reduce their unwanted emissions to the limits specified in this table, the limits in this table are based on the frequency of the unwanted emission and not the fundamental frequency. However, the level of any unwanted emissions shall not exceed the level of the fundamental frequency.

(d) The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.

§ 15.205 Restricted bands of operation.

(a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	MHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
¹ 0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	(²)
13.36-13.41			

¹ Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz
² Above 38.6

(b) Except as provided in paragraphs (d) and (e) of this section, the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in § 15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in § 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in § 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in § 15.35 apply to these measurements.

(c) Except as provided in paragraphs (d) and (e) of this section, regardless of the field strength limits specified elsewhere in this subpart, the provisions of this section apply to emissions from any intentional radiator.

2.2.3 Equipment Under Test and Modification State

Serial No: 1530600504547 / Test Configuration A

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

October 18, October 19, 2016/NS

2.2.5 Test Equipment Used

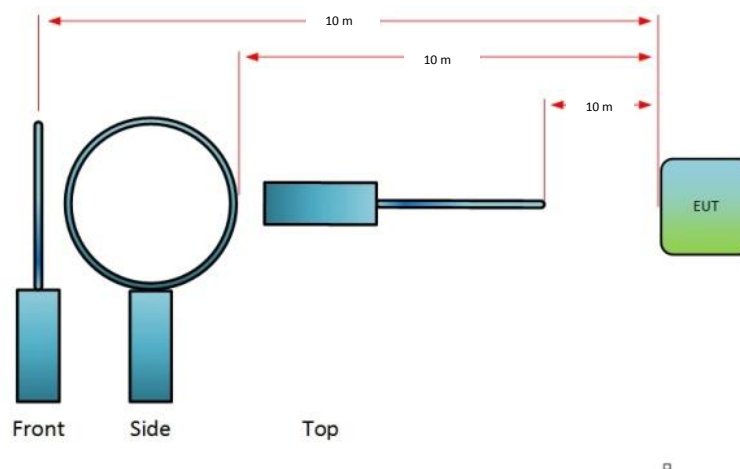
The major items of test equipment used for the above tests are identified in Section 3.1.

2.2.6 Environmental Conditions

Ambient Temperature	22.7-23.9°C
Relative Humidity	44.1-48.3%
ATM Pressure	99.9-100.1kPa

2.2.7 Additional Observations

- This is a radiated test. The spectrum was searched from 9 kHz to 18 GHz.
- Below 30MHz, prescans were performed to determine best test antenna orientation with the highest recorded emissions. Verification was performed using “Side” configuration (see the figure below) corresponding to the best antenna orientation as found during the prescans.



- The EUT was verified with antenna in three (3) orthogonal axes. Only the worst case configuration presented (“X” Axis).



- Measurement was done at 3 meters. Limits below 30 MHz were corrected using extrapolation factor of 40 dB/decade. See sample computation below:

$$\begin{aligned} \text{Limit @ 9kHz} &= 2400/F(\text{kHz}) \mu\text{V/m} \\ &= 20 \log (2400/9) \text{ dB}\mu\text{V/m} \\ &= 48.52 \text{ dB}\mu\text{V/m @ 300 meters} \\ &= 48.52 \text{ dB}\mu\text{V/m} + (40 \log 300/3) @ 3 \text{ meters} \\ &= 128.52 \text{ dB}\mu\text{V/m @ 3 meters} \end{aligned}$$
- Measurement was done using EMC32 V9.26.0 automated software. Reported level is the actual level with all the correction factors factored in. Correction Factor column is for informational purposes only. See Sections 2.2.8 and 2.2.9 for sample computations.

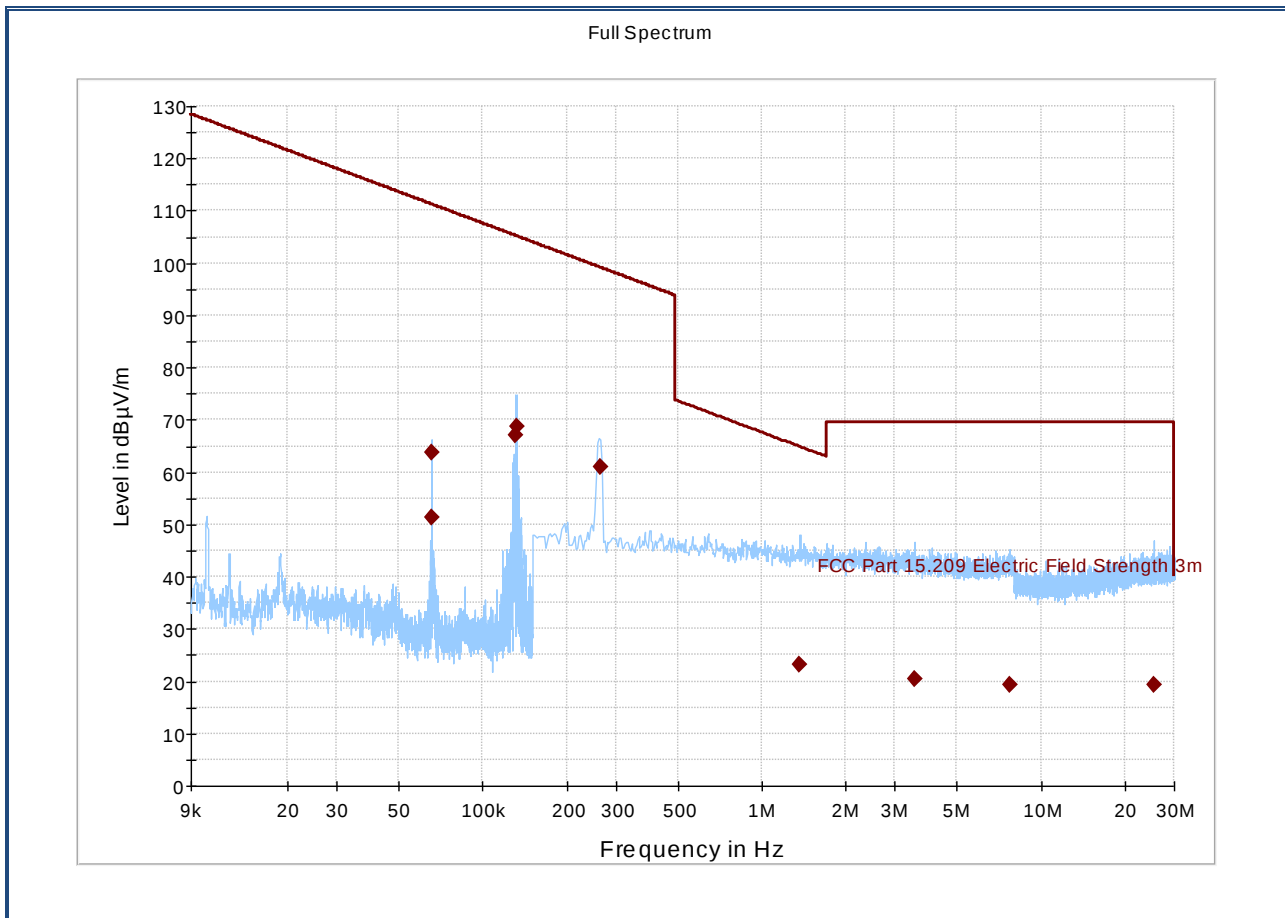
2.2.8 Sample Computation (Radiated Emission 9kHz to 30MHz)

Measuring equipment raw measurement (db μ V) @ 9 kHz			25.0
Correction Factor (dB)	Asset# 1057 (cable)	0.1	24.8
	Asset# 8850 (cable)	0.3	
	Asset# 6628 (antenna)	24.4	
Reported QuasiPeak Final Measurement (dbμV/m) @ 9kHz			49.8

2.2.9 Sample Computation (Radiated Emission 30MHz to 1GHz)

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# 8850 (cable)	0.3	
	Asset# 1033 (antenna)	17.2	
Reported QuasiPeak Final Measurement (dbμV/m) @ 30MHz			11.8

2.2.10 Test Results (Worst Case Orientation 9kHz to 30MHz)

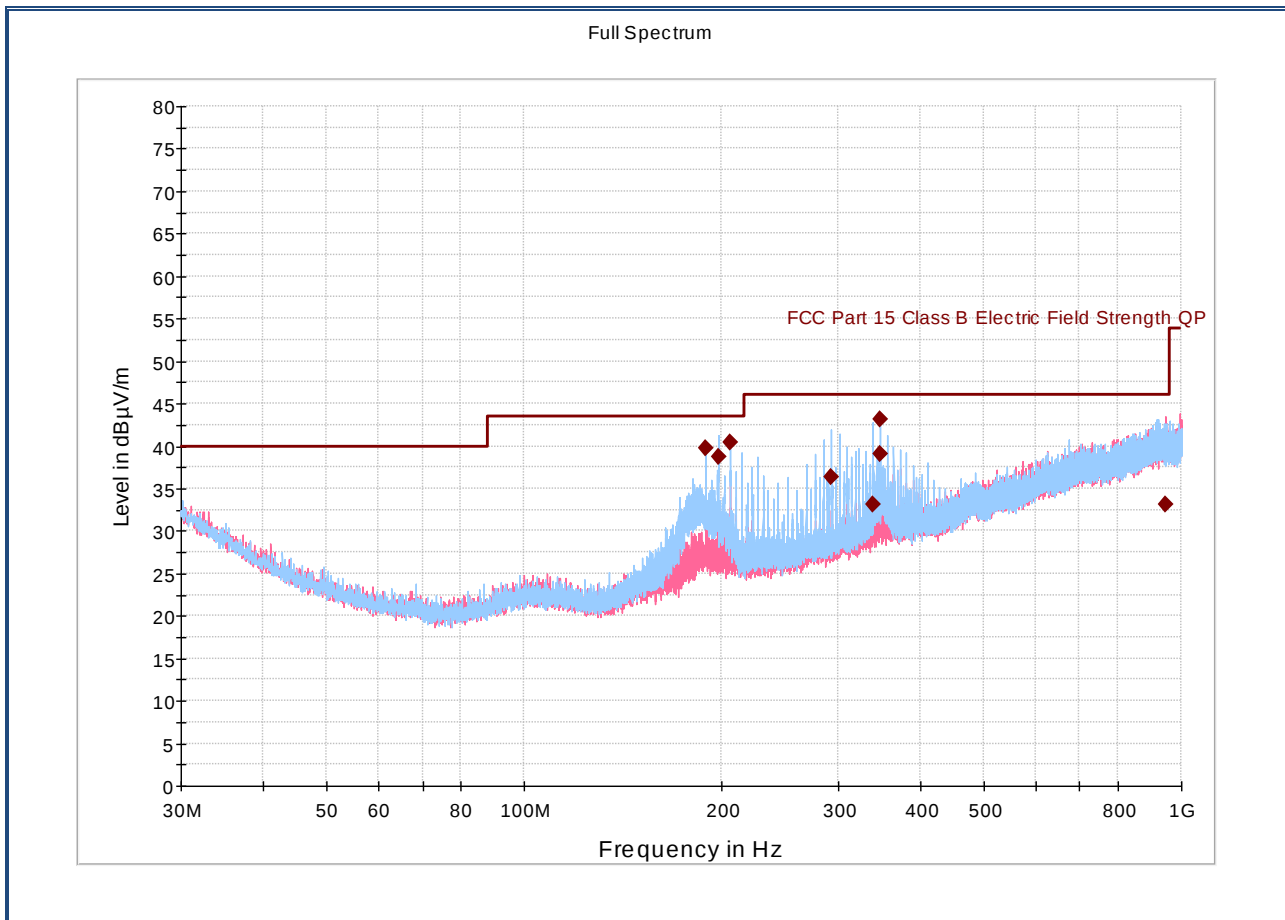


Quasi Peak Data

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
0.065387	51.36	111.29	59.93	1000.0	0.200	100.0	H	133.0	20.4
0.065561	63.75	111.27	47.52	1000.0	0.200	100.0	H	141.0	20.4
0.130590	67.11	105.28	38.17	1000.0	0.200	100.0	H	264.0	19.9
0.131652	68.84	105.21	36.38	1000.0	0.200	100.0	H	88.0	19.9
0.262945	61.03	99.21	38.17	1000.0	9.000	100.0	H	284.0	19.8
1.369365	23.19	64.87	41.68	1000.0	9.000	100.0	H	265.0	20.2
3.545490	20.30	69.50	49.20	1000.0	9.000	100.0	H	306.0	20.3
7.705505	19.38	69.50	50.12	1000.0	9.000	100.0	H	64.0	20.4
25.273185	19.20	69.50	50.30	1000.0	9.000	100.0	H	127.0	23.8

Test Notes:

2.2.11 Test Results (Worst Case Orientation 30MHz to 1GHz)

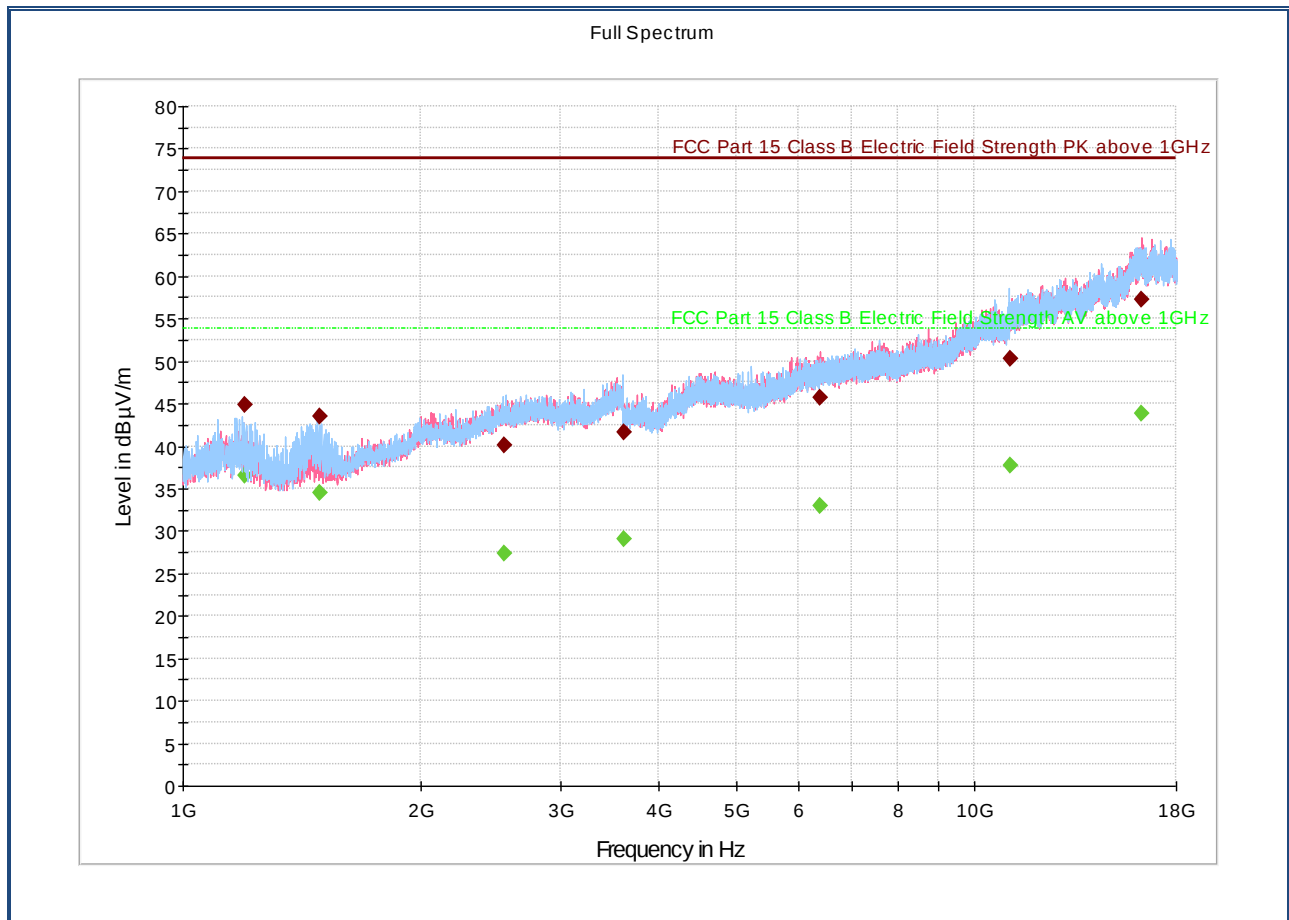


Quasi Peak Data

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
188.744333	39.75	43.50	3.75	1000.0	120.000	142.0	H	286.0	18.3
197.158667	38.72	43.50	4.78	1000.0	120.000	140.8	H	276.0	18.2
205.525333	40.46	43.50	3.04	1000.0	120.000	127.9	H	121.0	18.5
293.561333	36.35	46.00	9.65	1000.0	120.000	112.3	H	85.0	21.3
339.621000	33.17	46.00	12.83	1000.0	120.000	103.7	H	284.0	22.9
348.155333	39.15	46.00	6.85	1000.0	120.000	103.8	H	117.0	23.4
945.407333	33.04	46.00	12.96	1000.0	120.000	150.3	V	353.0	33.0

Test Notes:

2.2.12 Test Results (1GHz to 18GHz)



Peak Data

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
1195.20000	44.92	73.90	28.98	1000.0	1000.000	191.4	H	-20.0	-1.2
1488.86363	43.42	73.90	30.48	1000.0	1000.000	150.1	H	-14.0	-1.7
2551.96363	40.16	73.90	33.74	1000.0	1000.000	410.2	H	299.0	4.4
3604.10909	41.68	73.90	32.22	1000.0	1000.000	250.1	H	314.0	6.4
6374.49090	45.66	73.90	28.24	1000.0	1000.000	150.3	V	109.0	13.1
11091.4636	50.36	73.90	23.54	1000.0	1000.000	219.3	H	126.0	19.2
16263.1454	57.24	73.90	16.66	1000.0	1000.000	203.7	V	142.0	25.2

Average Data

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
1195.20000	36.52	53.90	17.38	1000.0	1000.000	191.4	H	-20.0	-1.2
1488.86363	34.51	53.90	19.39	1000.0	1000.000	150.1	H	-14.0	-1.7
2551.96363	27.29	53.90	26.61	1000.0	1000.000	410.2	H	299.0	4.4
3604.10909	29.10	53.90	24.80	1000.0	1000.000	250.1	H	314.0	6.4
6374.49090	32.92	53.90	20.98	1000.0	1000.000	150.3	V	109.0	13.1
11091.4636	37.78	53.90	16.12	1000.0	1000.000	219.3	H	126.0	19.2
16263.1454	43.84	53.90	10.06	1000.0	1000.000	203.7	V	142.0	25.2

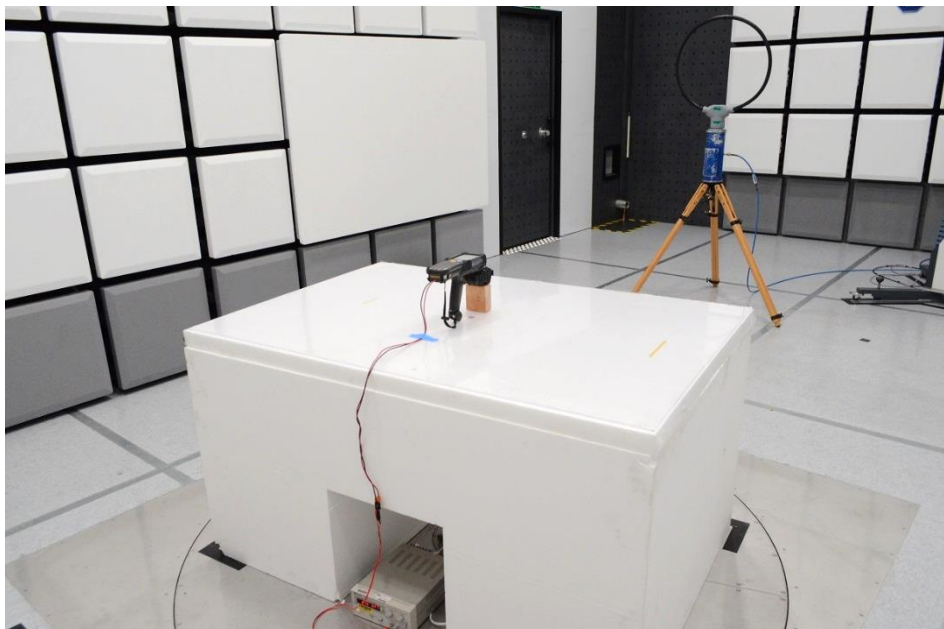
Test Notes:

2.2.13 Test Setup Pictures

9 kHz to 30 MHz (Front)



9 kHz to 30 MHz (Back)



2.2.14 Test Setup Pictures

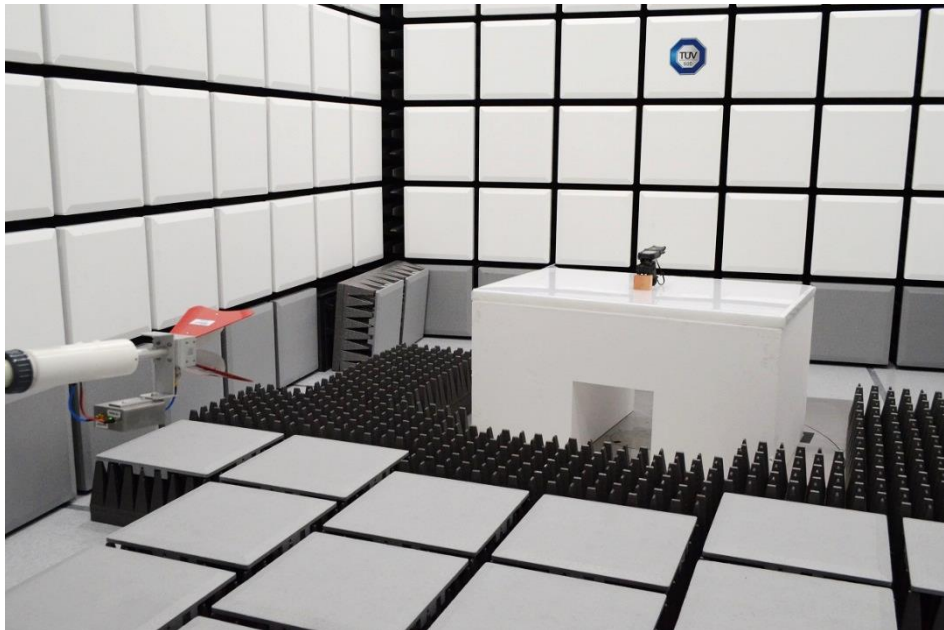
30 to 1000 MHz (Front)



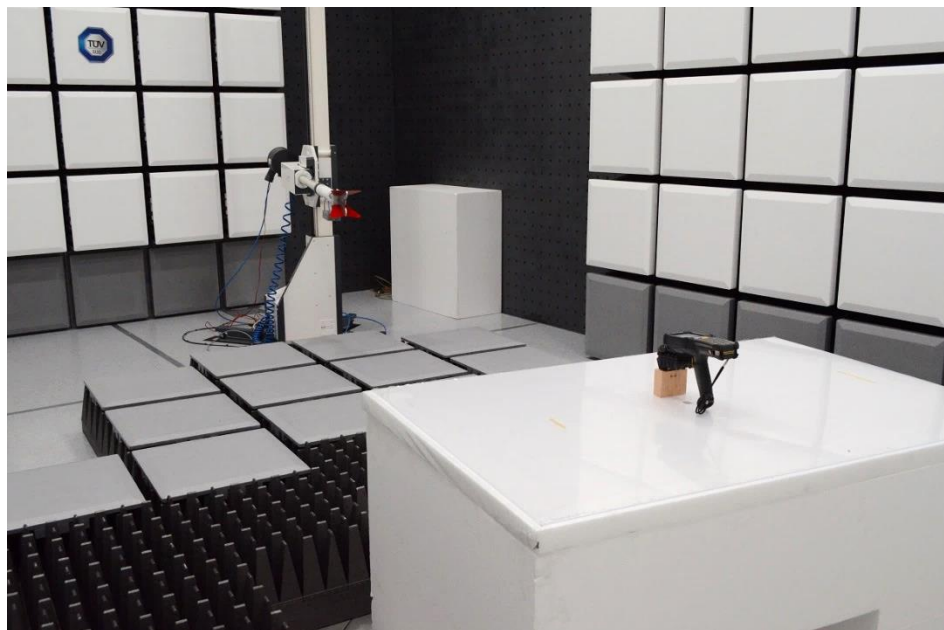
30 to 1000 MHz (Back)



Above 1 GHz (Front)



Above 1 GHz (Back)



2.3 CONDUCTED EMISSIONS

2.3.1 Specification Reference

Part 15 Subpart C §15.207(a)
RSS-GEN Issue 4 Sections 8.8

2.3.2 Standard Applicable

An intentional radiator 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).

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.*

2.3.3 Equipment Under Test and Modification State

Serial No: 1530600504547 / Test Configuration B

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

October 19, 2016 /NS

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 Location

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

Ambient Temperature	22.7°C
Relative Humidity	48.3%
ATM Pressure	99.9 kPa

2.3.7 Additional Observations

- The EUT was powered from the AC adapter. The test was performed on the Adapter AC lines.

- 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 2.3.8 for sample computation.

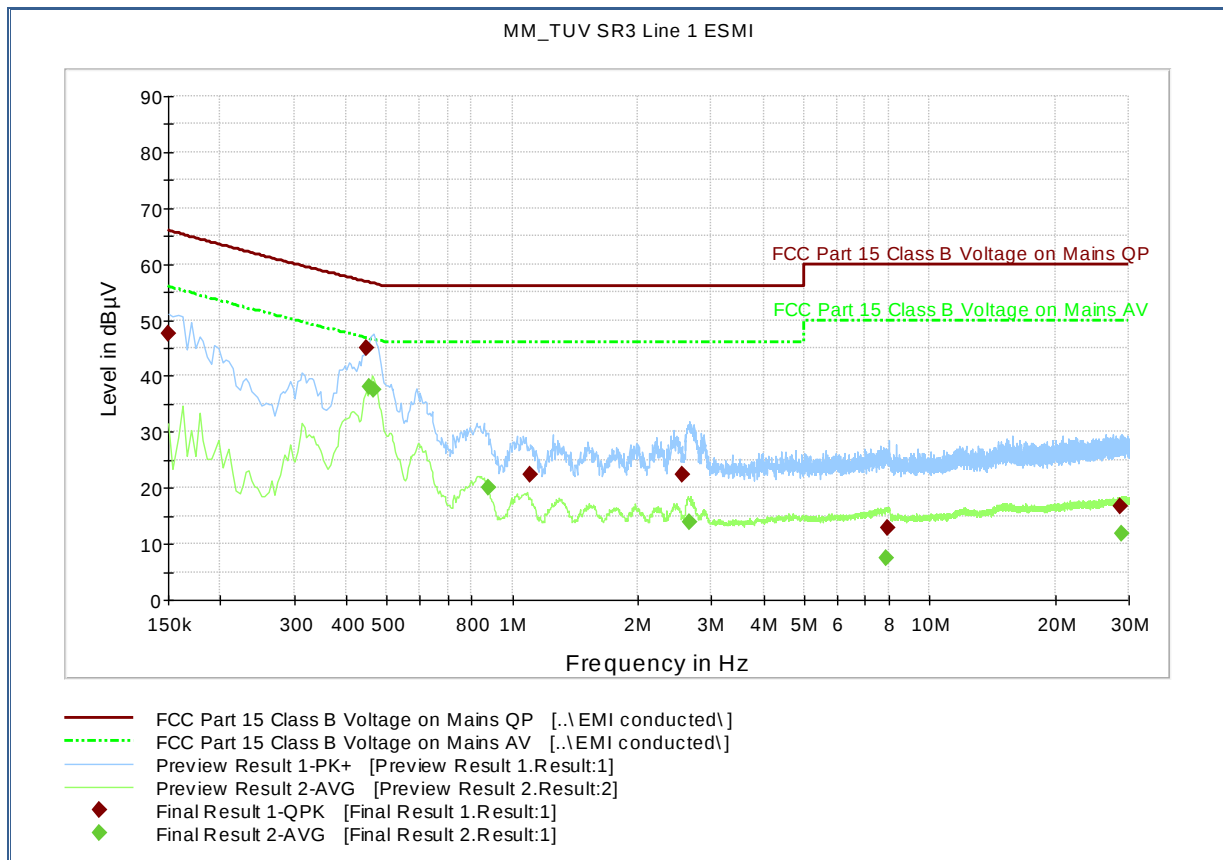
2.3.8 Sample Computation (Conducted Emission – Quasi Peak)

Measuring equipment raw measurement (db μ V) @ 150kHz			5.5
Correction Factor (dB)	Asset# 8607 (20 dB attenuator)	19.9	20.7
	Asset# 1177 (cable)	0.15	
	Asset# 1176 (cable)	0.35	
	Asset# 7568 (LISN)	0.30	
Reported QuasiPeak Final Measurement (db μ V) @ 150kHz			26.2

2.3.9 Test Results

Compliant. See attached plots and tables.

2.3.10 Line 1 (Hot)



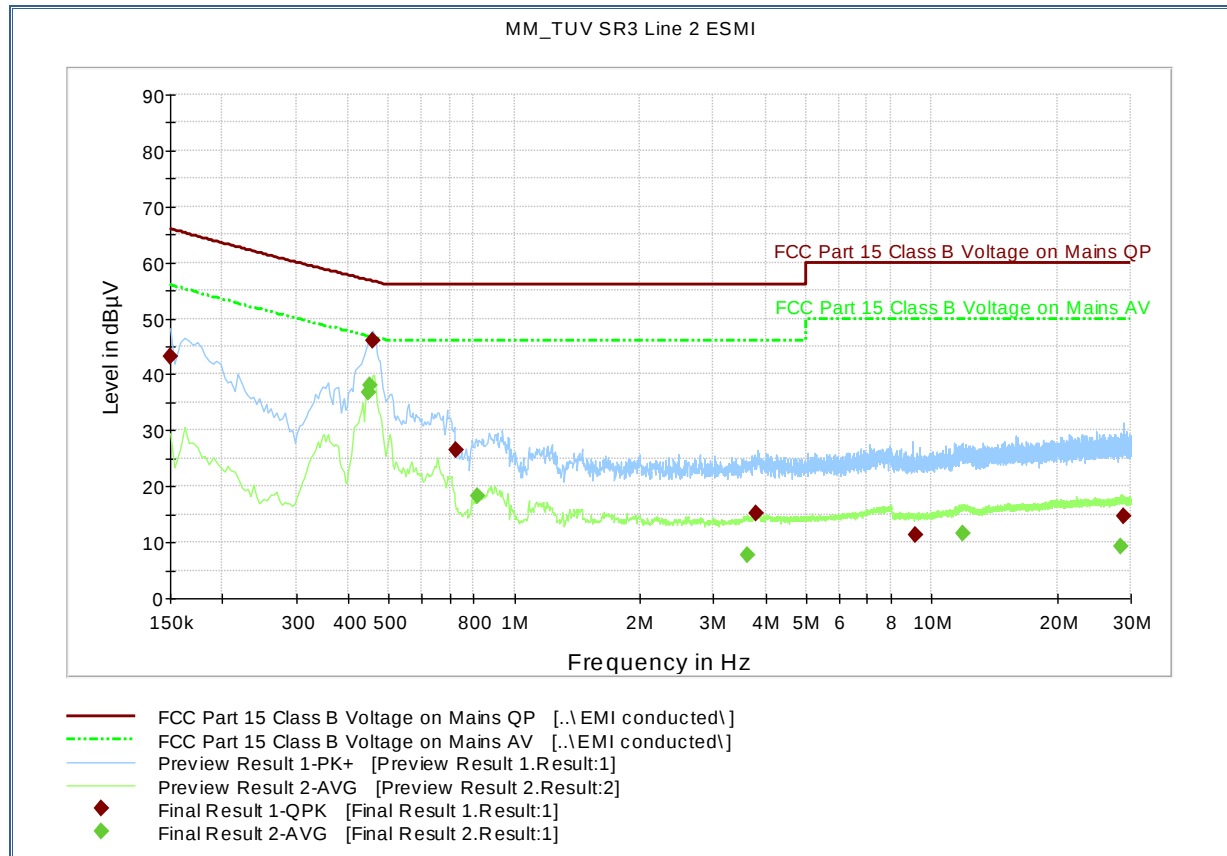
Final Result 1

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBµV)	Comment
0.150000	47.4	1000.0	9.000	Off	L1	20.3	18.6	66.0	
0.448000	45.1	1000.0	9.000	Off	L1	20.1	11.8	56.8	
1.106000	22.3	1000.0	9.000	Off	L1	20.1	33.7	56.0	
2.549500	22.5	1000.0	9.000	Off	L1	20.1	33.5	56.0	
7.899500	12.9	1000.0	9.000	Off	L1	20.1	47.1	60.0	
28.661500	16.8	1000.0	9.000	Off	L1	20.3	43.2	60.0	

Final Result 2

Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin - AVG (dB)	Limit - AVG (dBµV)	Comment
0.453000	38.1	1000.0	9.000	Off	L1	20.1	8.7	46.7	
0.465000	37.6	1000.0	9.000	Off	L1	20.1	8.9	46.5	
0.878500	20.0	1000.0	9.000	Off	L1	20.1	26.0	46.0	
2.652000	13.9	1000.0	9.000	Off	L1	20.1	32.1	46.0	
7.868000	7.4	1000.0	9.000	Off	L1	20.1	42.6	50.0	
28.841500	11.9	1000.0	9.000	Off	L1	20.3	38.1	50.0	

2.3.11 Line 2 (Neutral)



Final Result 1

Frequency (MHz)	QuasiPeak (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.150000	43.1	1000.0	9.000	Off	N	20.3	22.9	66.0	
0.458000	46.1	1000.0	9.000	Off	N	20.1	10.5	56.7	
0.726500	26.4	1000.0	9.000	Off	N	20.1	29.6	56.0	
3.799500	15.3	1000.0	9.000	Off	N	20.1	40.7	56.0	
9.163500	11.3	1000.0	9.000	Off	N	20.1	48.7	60.0	
28.751500	14.6	1000.0	9.000	Off	N	20.4	45.4	60.0	

Final Result 2

Frequency (MHz)	Average (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.449000	36.9	1000.0	9.000	Off	N	20.1	10.0	46.8	
0.452500	38.1	1000.0	9.000	Off	N	20.1	8.7	46.8	
0.815000	18.3	1000.0	9.000	Off	N	20.1	27.7	46.0	
3.620500	7.7	1000.0	9.000	Off	N	20.1	38.3	46.0	
11.836000	11.6	1000.0	9.000	Off	N	20.1	38.4	50.0	
28.279500	9.2	1000.0	9.000	Off	N	20.3	40.8	50.0	

2.3.12 Test Setup Pictures



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
Radiated Emission						
1003	Signal Generator	SMR-40	1104.0002.40	Rhode & Schwarz	05/16/16	05/16/17
1049	EMI Test Receiver	ESU	100133	Rhode & Schwarz	03/17/16	03/17/17
7631	Double-ridged waveguide horn antenna	3117	00205418	ETS-Lindgren	07/05/16	07/05/17
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
8891	Pre-amplifier (1-18 GHz)	PE15A3262	1012	Pasternack	Verified with 1003 and 7611	
8878	High-frequency cable	R90-088-240	N/A	Teledyne/Storm Microwave	03/16/16	03/16/17
8879	High-frequency cable	084-0505-100	N/A	Teledyne/Storm Microwave	03/16/16	03/16/17
Conducted Test Setup						
1024	EMI Test Receiver	ESCS-30	847793/001	Rhode & Schwarz	09/07/16	09/07/17
6836	LISN	FCC-LISN-50-25-2	5024	FCC	04/29/16	04/29/17
Miscellaneous						
	Test Software	EMC32	V9.26.0	Rhode & Schwarz	N/A	
	Test Software	EMC32	V8.53	Rhode & Schwarz	N/A	
7619	Barometer/Temperature/Hu midity Transmitter	iBTHX-W	15250268	Omega	10/19/15	10/19/16

3.2 MEASUREMENT UNCERTAINTY

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

3.2.1 Conducted Emissions (AC) 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 Emission 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

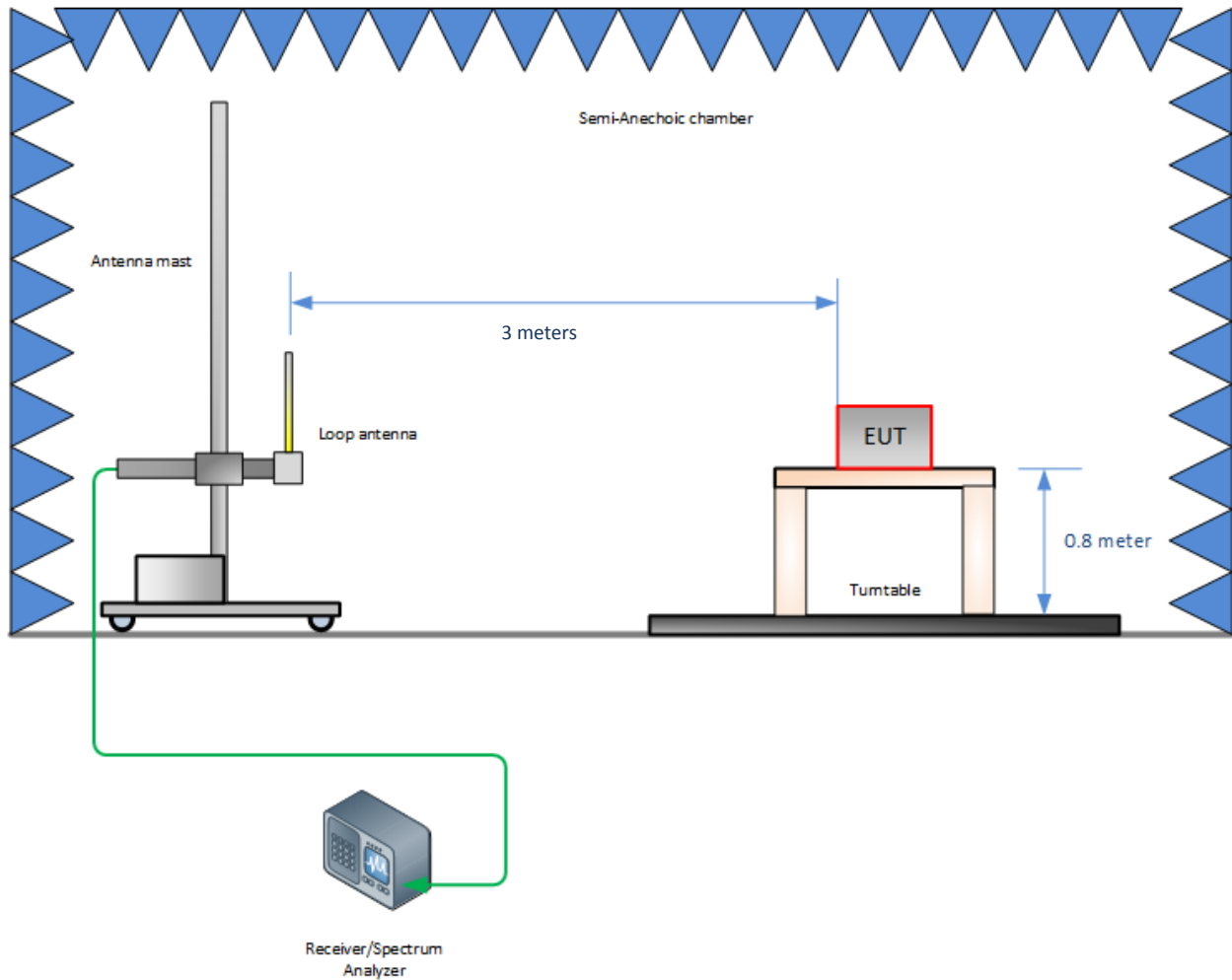
3.2.3 Radiated Emission Measurements (Above 1GHz)

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

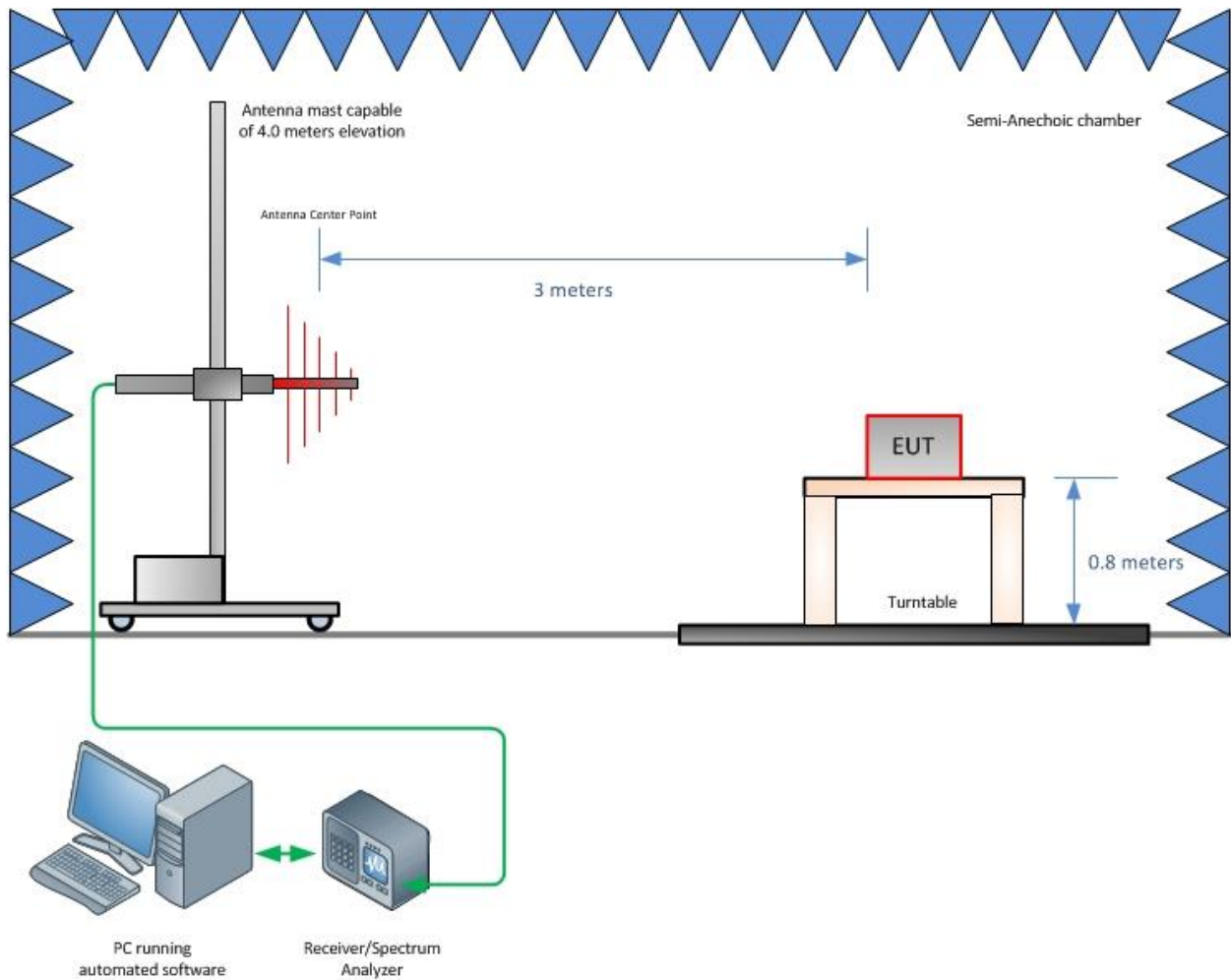
SECTION 4

DIAGRAM OF TEST SETUP

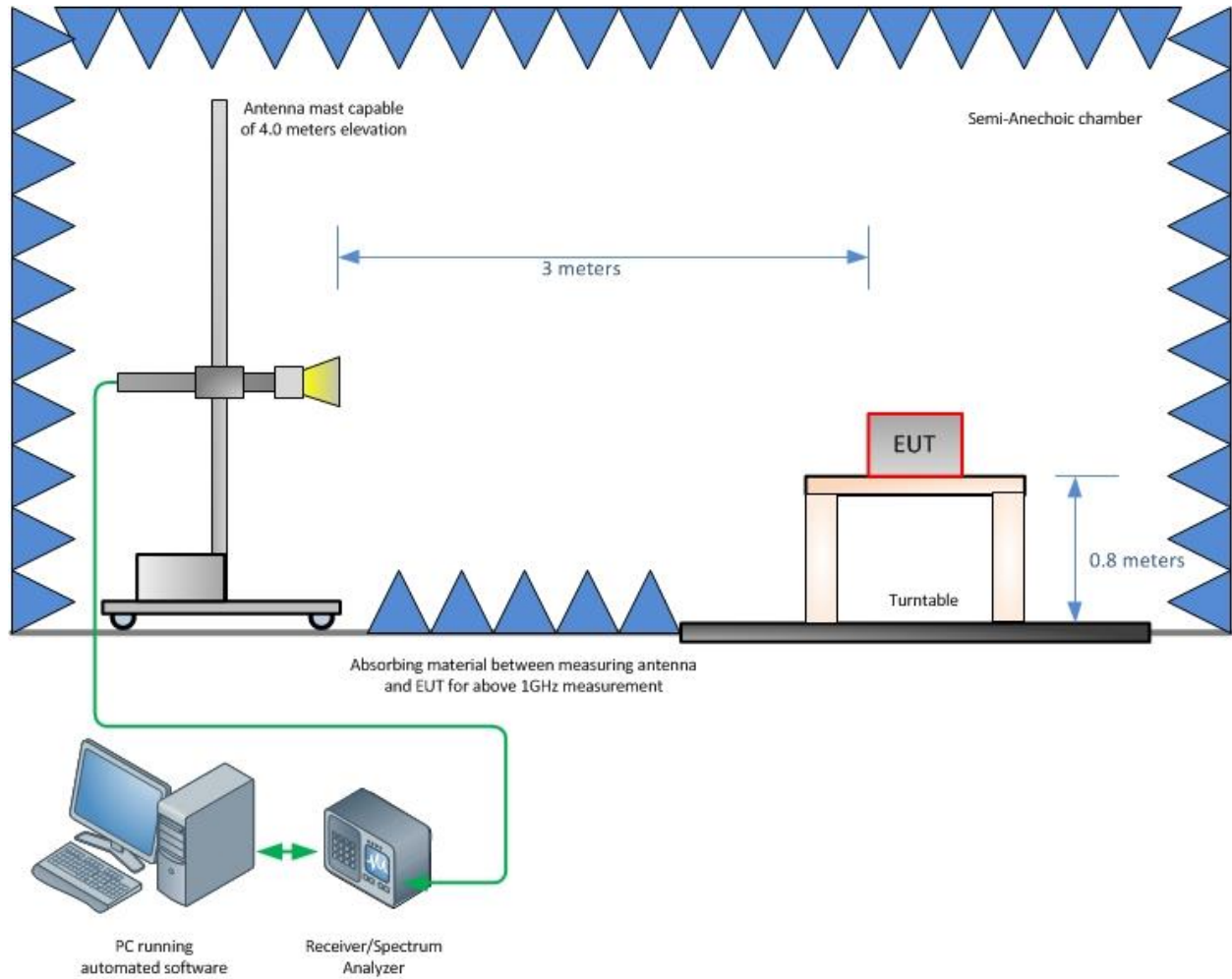
4.1 TEST SETUP DIAGRAM (RADIATED EMISSIONS)



Radiated Emission Test Setup (Below 30 MHz)

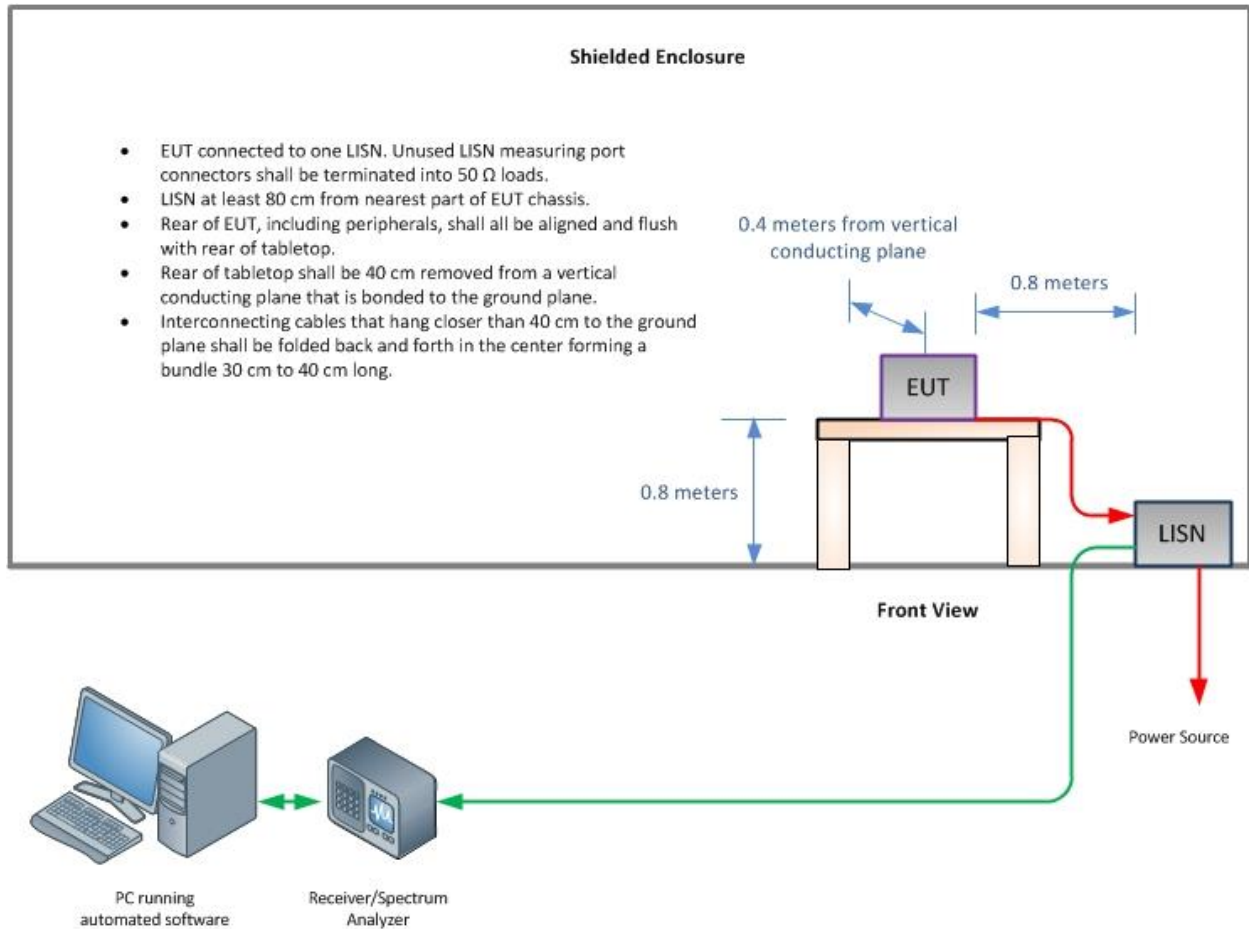


Radiated Emission Test Setup (30MHz to 1GHz)



Radiated Emission Test Setup (Above 1 GHz)

4.2 TEST SETUP DIAGRAM (CONDUCTED EMISSIONS)



SECTION 5

ACCREDITATION, DISCLAIMERS AND COPYRIGHT

5.1 ACCREDITATION, DISCLAIMERS AND COPYRIGHT

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