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Report On

EMC Evaluation of
Si14
i'm Watch Smart Watch

FCC Part 15 Subpart B

Report No. SC1210158B

October 2012



America

TÜV SÜD America Inc., 10040 Mesa Rim Road, San Diego, CA 92121
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REPORT ON	EMC Evaluation of the Si14 i'm Watch Smart Watch
TEST REPORT NUMBER	SC1210158B October 2012
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DATED	<u>October 05, 2012</u>



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Revision History

SC1210158B Si14 i'm Watch Smart Watch					
DATE	OLD REVISION	NEW REVISION	REASON	PAGES AFFECTED	APPROVED BY
10/05/12	Initial Release				Ferdinand Custodio

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SECTION 1

REPORT SUMMARY

EMC Evaluation of the
Si14
Smart Watch



1.1 INTRODUCTION

The information contained in this report is intended to show verification of the Si14 Smart Watch to the requirements of FCC Part 15 Subpart B.

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	Si14
Model Number(s)	i'm Watch
Serial Number(s)	00133596. Sample verified uses an aluminium housing (i'm Color). I'm Jewel uses silver or gold housing while i'm tech uses titanium housing. All three models are identical electrically. Verification performed only on one housing type since all are metallic type.
FCC ID Number	QJN280276
IC Number	10673A-280276
Number of Samples Tested	1
Highest Frequency Generated or Used	2480.0 MHz
Test Specification/Issue/Date	FCC Part 15 Subpart B (October 1, 2011)
Start of Test	September 30, 2012
Finish of Test	October 01, 2012
Name of Engineer(s)	Ferdie Custodio
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 is shown below.

Part 15	Test Description	Result	Comments/Base Standard
§15.107	Conducted Limits	Compliant	Class B requirement
§15.109	Radiated Emission Limits	Compliant	Class B requirement

1.3 PRODUCT INFORMATION

1.3.1 Technical Description

The Equipment Under Test (EUT) is a Si14 Smart Watch as shown in the photograph below. The EUT connects to a smart phone through Bluetooth™. The operating system is i'm Droid specifically developed for the EUT. The EUT uses various app supported by the operating system, this includes but not limited to calls, text message, emails, notifications, music, pictures, etc. Three models are covered by this report (i'm Color; i'm Jewel; i'm Tech), the difference is cosmetic primarily the strap and housing of the EUT.



Equipment Under Test

1.4 EUT TEST CONFIGURATION

1.4.1 Test Configuration Description

Test Configuration	Description
Default	EUT running on standard production firmware. The EUT connected to a support PC through USB.

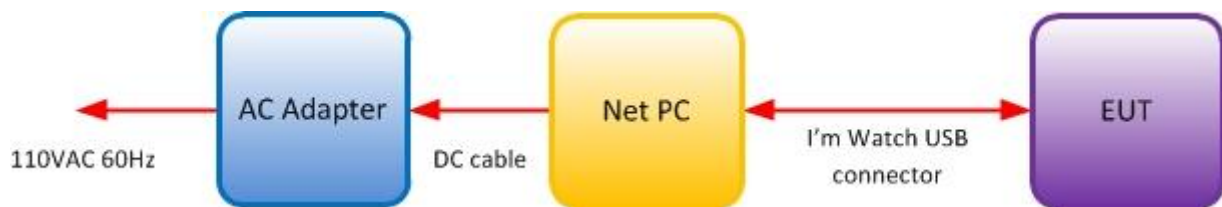
1.4.2 EUT Exercise Software

None. No special software was used to exercise the EUT during the investigation.

1.4.3 Support Equipment and I/O cables

Manufacturer	Equipment/Cable	Description
I'm S.p.A.	I'm Watch connector	30cm, shielded, USB A type to 3.5mm mini plug with three metal bands (rings)
Asus	Support Net PC	Eee PC R101 SNACOAAS237383

1.4.4 Simplified Test Configuration Diagram



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: 00133596		
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 C63.4-2009, 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 C63.4-2009. The test modes were adapted according to the Operating Instructions provided by the manufacturer/client.

1.8 TEST FACILITY

1.8.1 FCC – Registration No.: US5281

TUV SUD America Inc. (San Diego), a \$2.498 listed test firm operates the EMC Laboratory registered under Sony Electronics Inc. Product Quality Division EMC. This laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files and the Registration is US5281.

1.8.2 Industry 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 Industry Canada for radio equipment testing with Registration No. 3067A.



SECTION 2

TEST DETAILS

EMC Evaluation of the
Si14
Smart Watch

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: 00133596 /Default Test Configuration

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

October 01, 2012/FSC

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	21.3°C
Relative Humidity	41.2%
ATM Pressure	99.6 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.

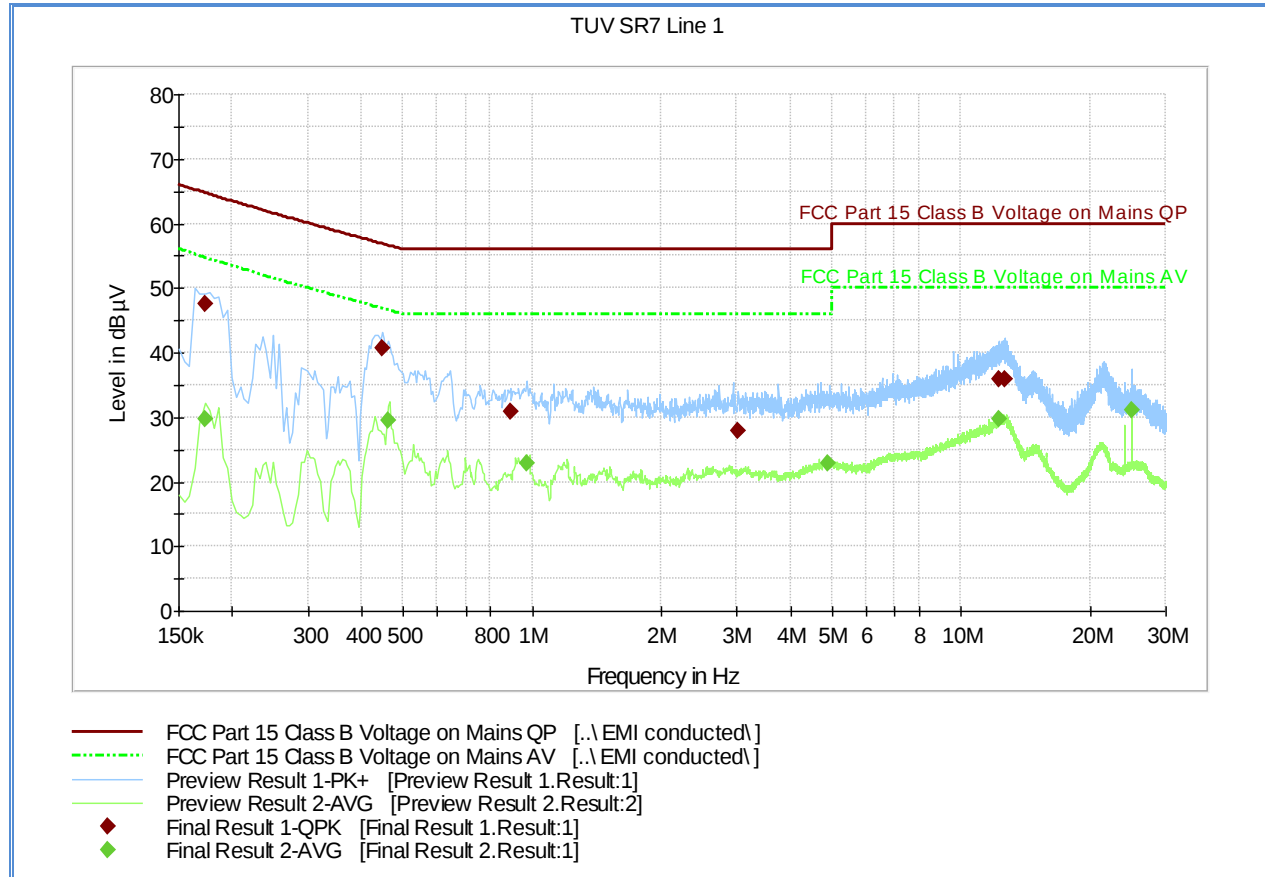
2.1.8 Sample Computation (Conducted Emission – Quasi Peak)

Measuring equipment raw measurement (db μ V) @ 150kHz			5.5
Correction Factor (dB)	Asset# 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

2.1.9 Test Results

Compliant. See attached plots and tables.

2.1.10 Line 1 (Hot)



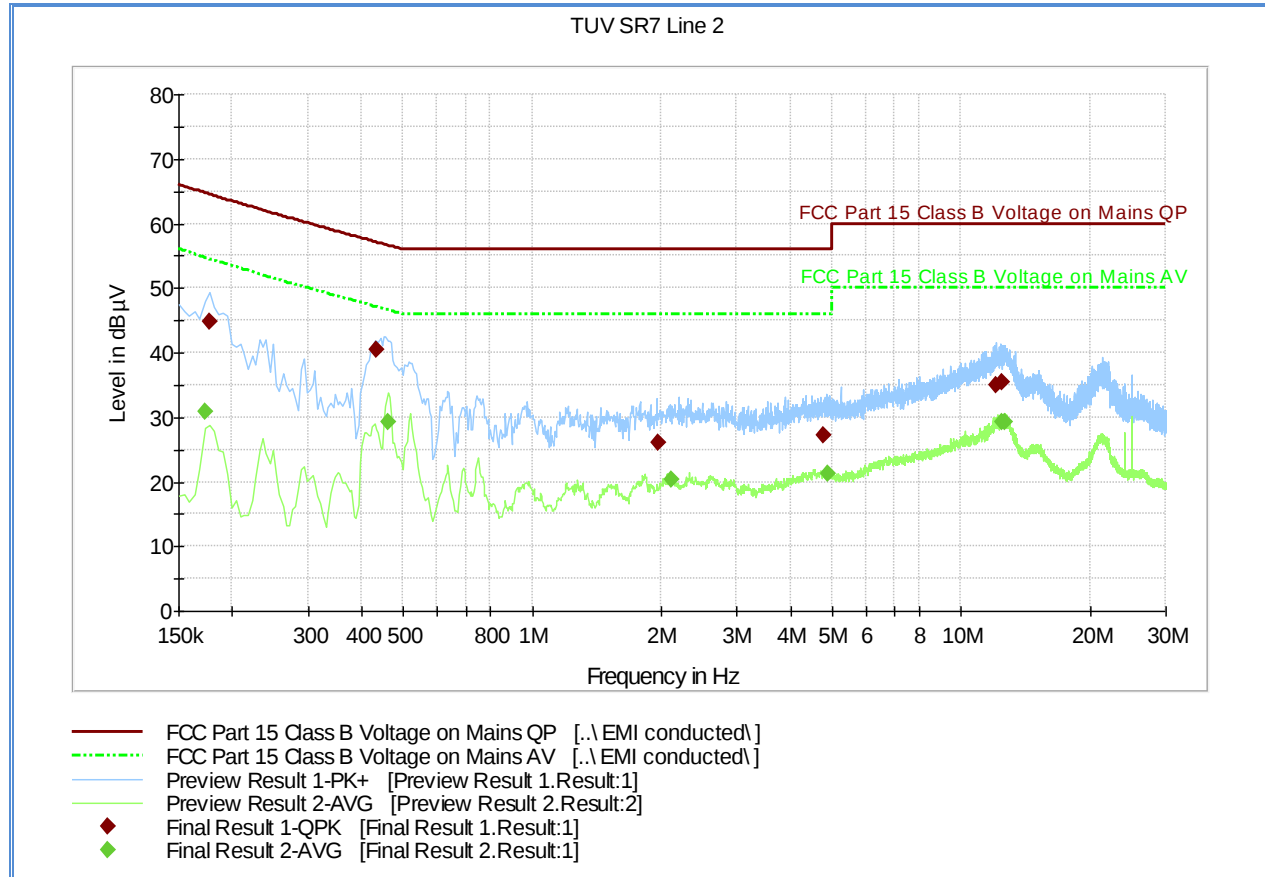
Quasi Peak

Frequency (MHz)	QuasiPeak (dB μ V)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dB μ V)
0.172500	47.5	1000.0	9.000	Off	L1	19.5	17.3	64.8
0.447000	40.7	1000.0	9.000	Off	L1	19.4	16.1	56.9
0.892500	30.9	1000.0	9.000	Off	L1	19.6	25.1	56.0
3.025500	27.8	1000.0	9.000	Off	L1	20.2	28.2	56.0
12.241500	35.9	1000.0	9.000	Off	L1	20.5	24.1	60.0
12.642000	36.0	1000.0	9.000	Off	L1	20.5	24.0	60.0

Average

Frequency (MHz)	Average (dB μ V)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin - Ave (dB)	Limit - Ave (dB μ V)
0.172500	29.8	1000.0	9.000	Off	L1	19.5	24.9	54.7
0.460500	29.4	1000.0	9.000	Off	L1	19.4	17.2	46.6
0.973500	22.9	1000.0	9.000	Off	L1	19.6	23.1	46.0
4.884000	22.8	1000.0	9.000	Off	L1	20.4	23.2	46.0
12.304500	29.8	1000.0	9.000	Off	L1	20.5	20.2	50.0
24.999000	31.0	1000.0	9.000	Off	L1	21.0	19.0	50.0

2.1.11 Line 2 (Neutral)



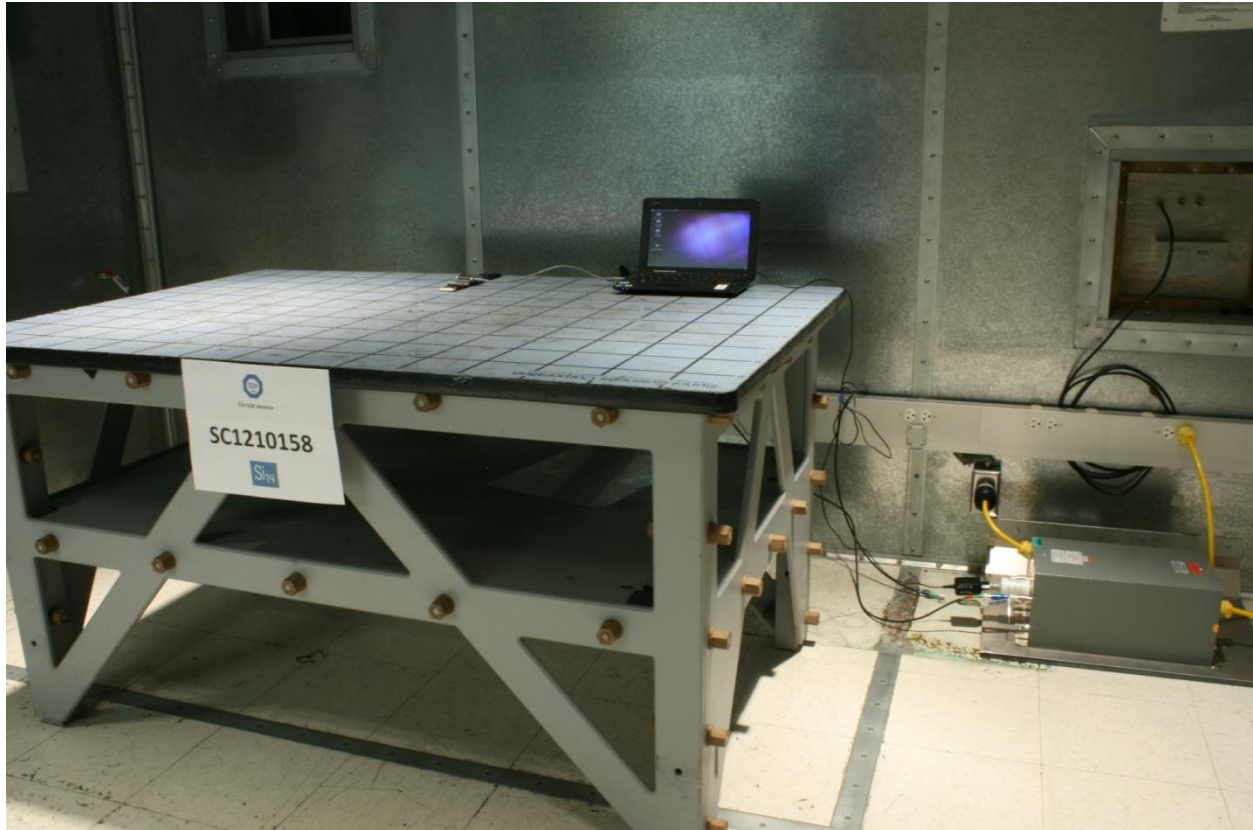
Quasi Peak

Frequency (MHz)	QuasiPeak (dB μ V)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dB μ V)
0.177000	44.9	1000.0	9.000	Off	N	19.6	19.6	64.5
0.433500	40.5	1000.0	9.000	Off	N	19.6	16.6	57.1
1.963500	26.1	1000.0	9.000	Off	N	20.6	29.9	56.0
4.785000	27.2	1000.0	9.000	Off	N	21.1	28.8	56.0
12.057000	35.0	1000.0	9.000	Off	N	21.3	25.0	60.0
12.453000	35.5	1000.0	9.000	Off	N	21.3	24.5	60.0

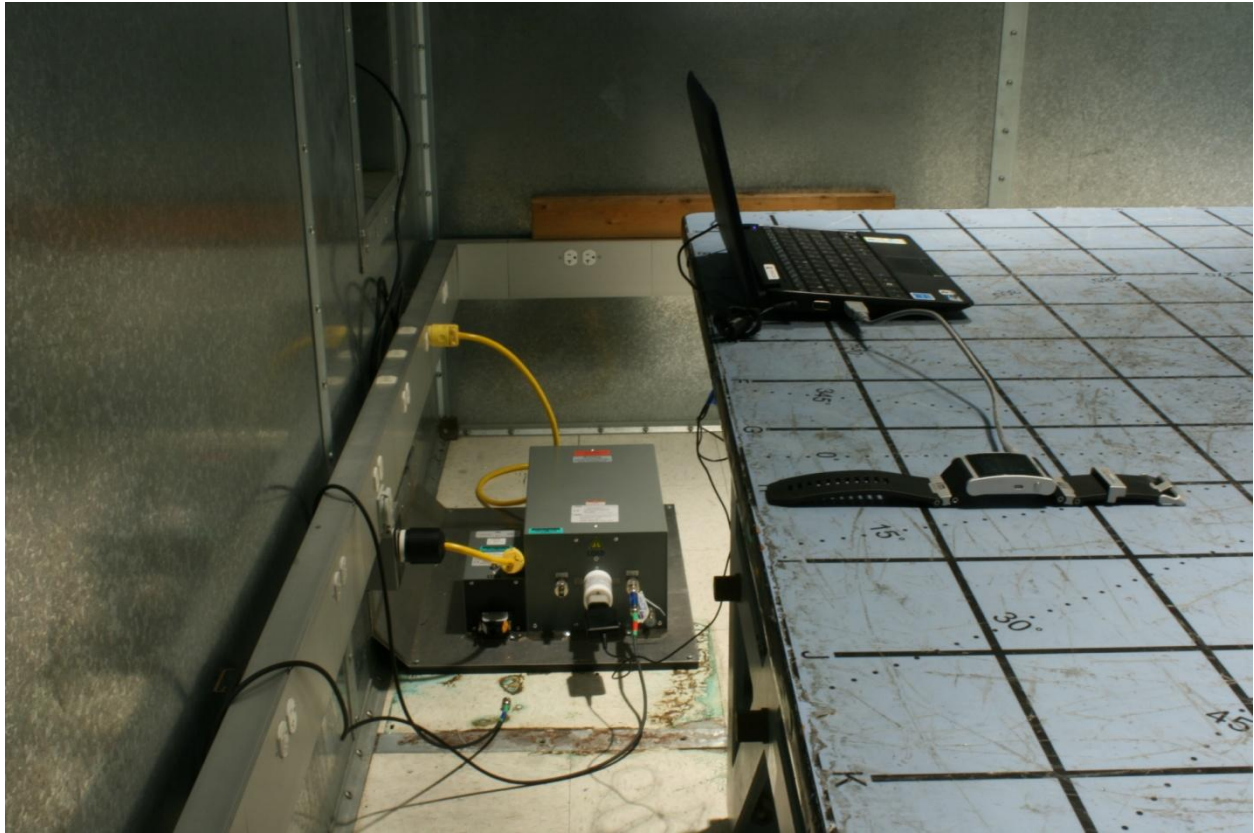
Average

Frequency (MHz)	Average (dB μ V)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin - Ave (dB)	Limit - Ave (dB μ V)
0.172500	30.9	1000.0	9.000	Off	N	19.6	23.8	54.7
0.460500	29.4	1000.0	9.000	Off	N	19.6	17.3	46.6
2.112000	20.3	1000.0	9.000	Off	N	20.7	25.7	46.0
4.879500	21.2	1000.0	9.000	Off	N	21.2	24.8	46.0
12.430500	29.4	1000.0	9.000	Off	N	21.3	20.6	50.0
12.606000	29.2	1000.0	9.000	Off	N	21.3	20.8	50.0

2.1.12 Test Setup Photo (Front)



2.1.1 Test Setup Photo (Back)



2.2 RADIATED EMISSION LIMITS

2.2.1 Specification Reference

Part 15 Subpart B §15.109(a)

2.2.2 Standard Applicable

(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 Equipment Under Test and Modification State

Serial No: 00133596 / Default Test Configuration

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

September 30, 2012/FSC

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	24.6°C
Relative Humidity	49.4%
ATM Pressure	99.8kPa

2.2.7 Additional Observations

- The spectrum was searched from 30MHz to 18GHz and verified to Class B limits. There are no emissions observed after 5.1GHz.
- 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.

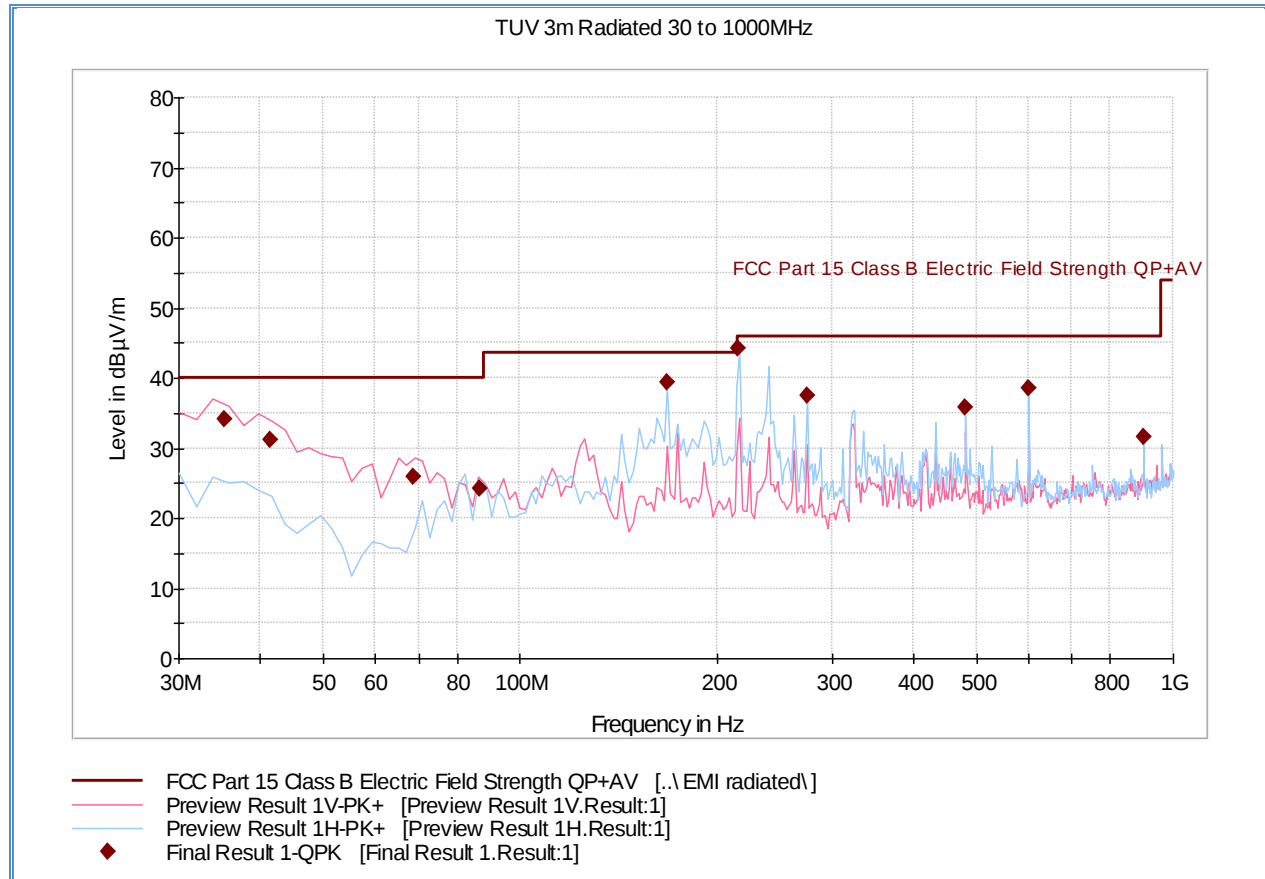
2.2.8 Sample Computation (Radiated Emission)

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

2.2.9 Test Results

See attached plots.

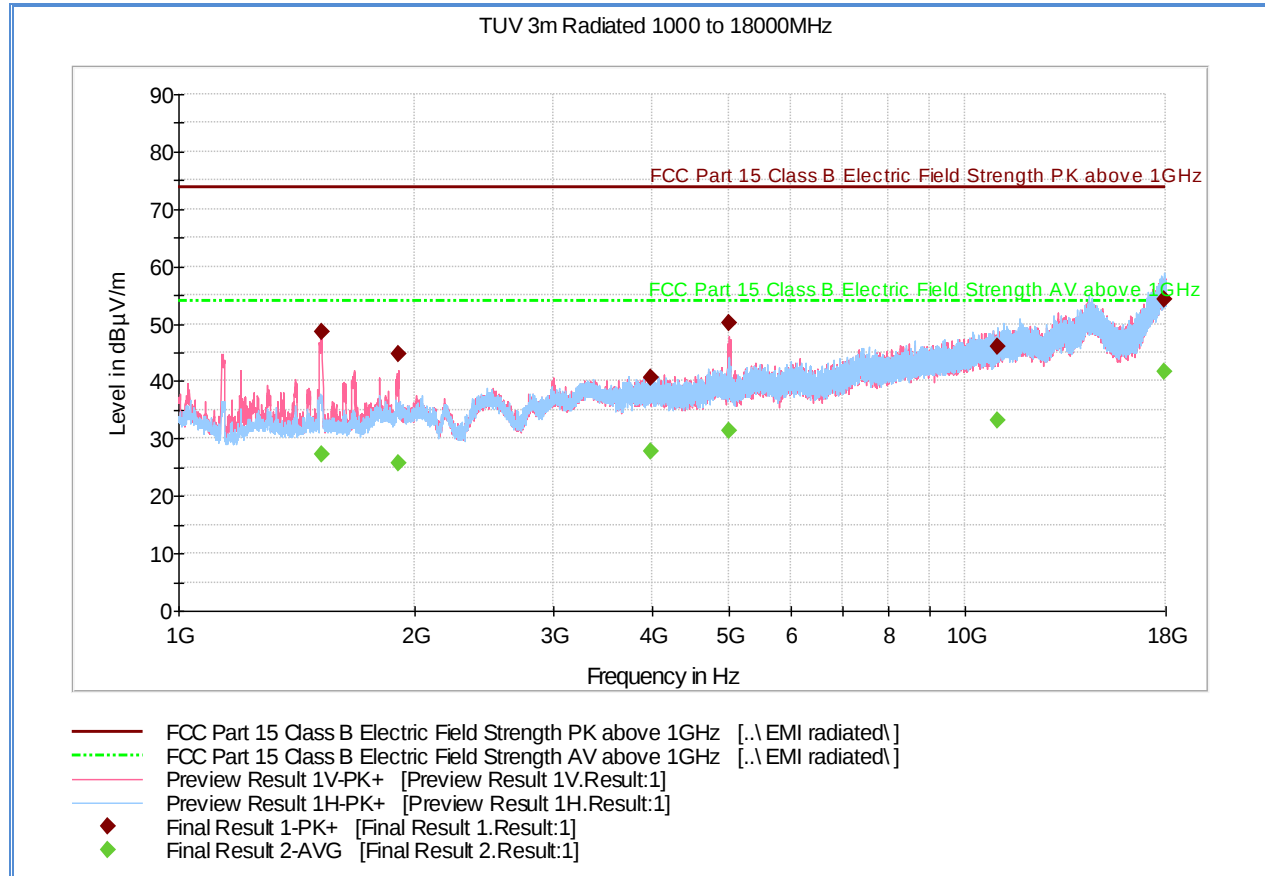
2.2.10 Below 1GHz Radiated Emission Test



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)
35.247776	34.1	1000.0	120.000	104.0	V	159.0	-14.8	5.9	40.0
41.367214	31.2	1000.0	120.000	106.0	V	206.0	-17.7	8.8	40.0
68.509980	25.8	1000.0	120.000	117.0	V	110.0	-21.8	14.2	40.0
86.772745	24.2	1000.0	120.000	100.0	V	294.0	-21.1	15.8	40.0
168.016032	39.3	1000.0	120.000	185.0	H	193.0	-17.3	4.2	43.5
216.013226	44.3	1000.0	120.000	125.0	H	5.0	-15.3	1.7	46.0
275.009860	37.5	1000.0	120.000	100.0	H	244.0	-12.5	8.5	46.0
480.021964	35.8	1000.0	120.000	157.0	H	158.0	-6.3	10.2	46.0
600.023006	38.5	1000.0	120.000	129.0	H	154.0	-5.5	7.5	46.0

2.2.11 Above 1GHz Radiated Emission Test



Peak Data

Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1519.773333	48.6	1000.0	1000.000	100.0	V	0.0	-9.0	25.3	73.9
1904.013333	44.7	1000.0	1000.000	100.0	V	286.0	-6.5	29.2	73.9
3986.553333	40.8	1000.0	1000.000	280.0	V	330.0	1.4	33.1	73.9
5004.166667	50.2	1000.0	1000.000	100.0	V	162.0	2.4	23.7	73.9
10982.30000	46.0	1000.0	1000.000	267.0	H	194.0	11.5	27.9	73.9
17920.07333	54.2	1000.0	1000.000	139.0	H	18.0	21.4	19.7	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)
1519.773333	27.2	1000.0	1000.000	100.0	V	0.0	-9.0	26.7	53.9
1904.013333	25.7	1000.0	1000.000	100.0	V	286.0	-6.5	28.2	53.9
3986.553333	27.8	1000.0	1000.000	280.0	V	330.0	1.4	26.1	53.9
5004.166667	31.5	1000.0	1000.000	100.0	V	162.0	2.4	22.4	53.9
10982.30000	33.2	1000.0	1000.000	267.0	H	194.0	11.5	20.7	53.9
17920.07333	41.5	1000.0	1000.000	139.0	H	18.0	21.4	12.4	53.9

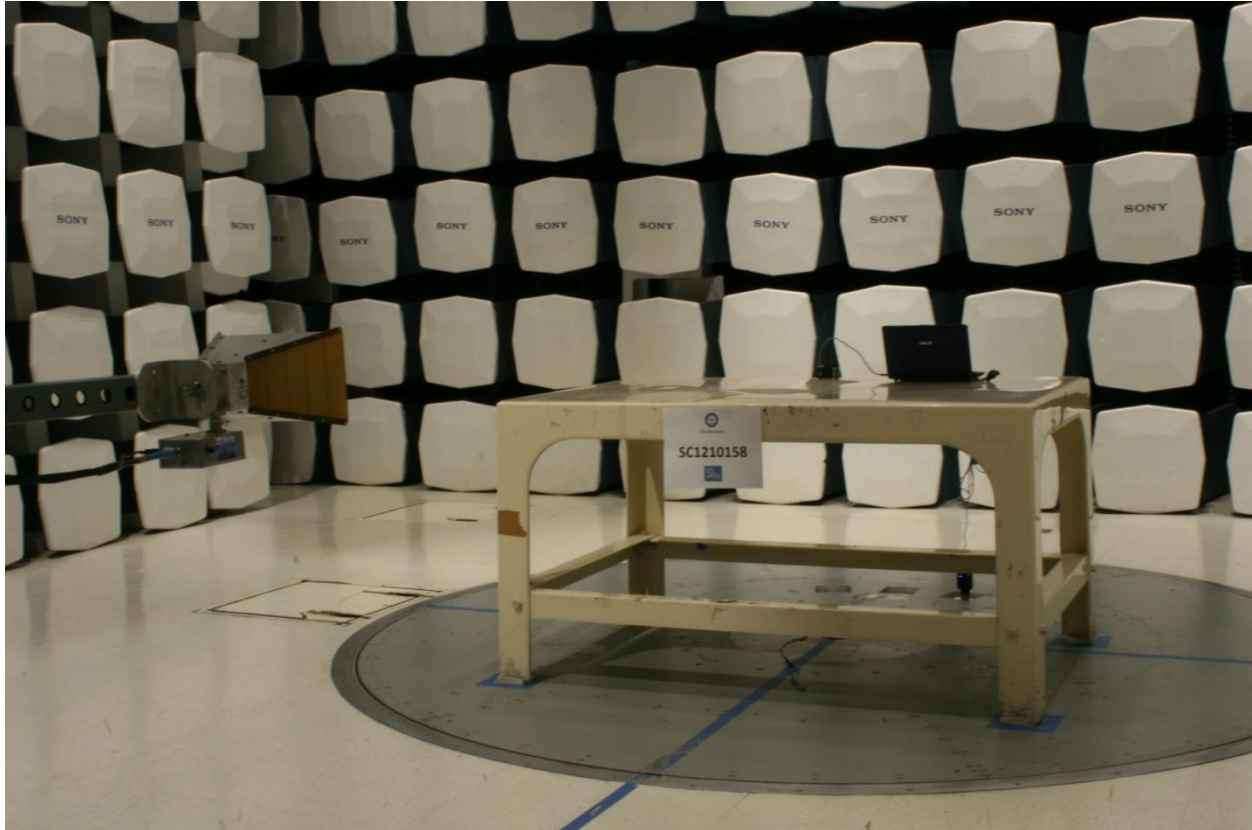
2.2.12 Test Setup Photo (Below 1GHz Front)



2.2.13 Test Setup Photo (Below 1GHz Back)



2.2.14 Test Setup Photo (Above 1GHz Front)



2.2.15 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						
1024	EMI Test Receiver	ESCS 30	847793/001	Rhode & Schwarz	02/29/12	02/28/13
7568	LISN	FCC-LISN-50-25-2-10	120305	Fischer Custom Comm.	05/24/12	05/24/13
8607	20dB Attenuator	CAT-20	N/A	MCL HAT-20	08/21/12	08/21/13
8609	20dB Attenuator	CAT-20	N/A	MCL HAT-20	08/21/12	08/21/13
Radiated Emissions						
1002	Bilog Antenna	3142C	00058717	ETS-Lindgren	12/06/11	12/06/12
6669	Double-ridged waveguide horn antenna	3115	94124364	EMCO	11/07/11	11/07/12
8628	Pre-amplifier	QLJ 01182835-JO	8986002	QuinStar Technologies Inc.	08/17/12	08/17/13
1153	High-frequency cable	SucoFlex 100 SX	N/A	Suhner	08/17/12	08/17/13
1040	EMI Test Receiver	ESIB40	100292	Rhode & Schwarz	08/10/12	08/10/13
1049	EMI Test Receiver	ESU	100133	Rhode & Schwarz	06/13/12	06/13/13
1016	Pre-amplifier	PAM-0202	187	PAM	08/17/12	08/17/13

3.2 MEASUREMENT UNCERTAINTY

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

3.2.1 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	3.55	2.05	4.20
6	EUT Setup	Rectangular	1.00	0.58	0.33
Combined Uncertainty (u_c):					2.23
Coverage Factor (k):					2
Expanded Uncertainty:					4.45

3.2.2 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	3.55	2.05	4.20
6	EUT Setup	Rectangular	1.00	0.58	0.33
Combined Uncertainty (u_c):					2.22
Coverage Factor (k):					2
Expanded Uncertainty:					4.44

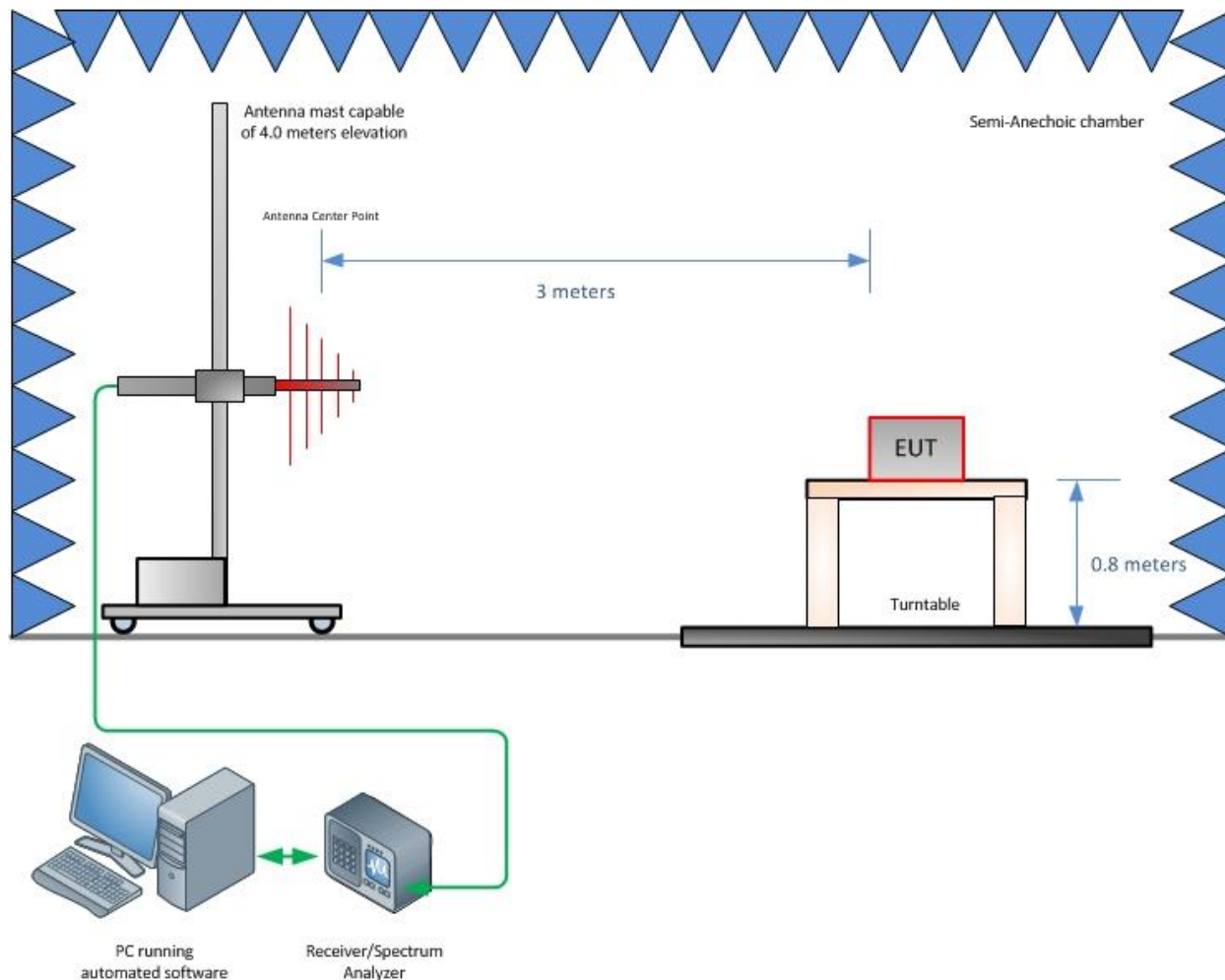
3.2.3 Conducted Emissions Measurement

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
	Attenuator	Rectangular	0.30	0.17	0.03
Combined Uncertainty (u_c):					0.80
Coverage Factor (k):					2
Expanded Uncertainty:					1.59

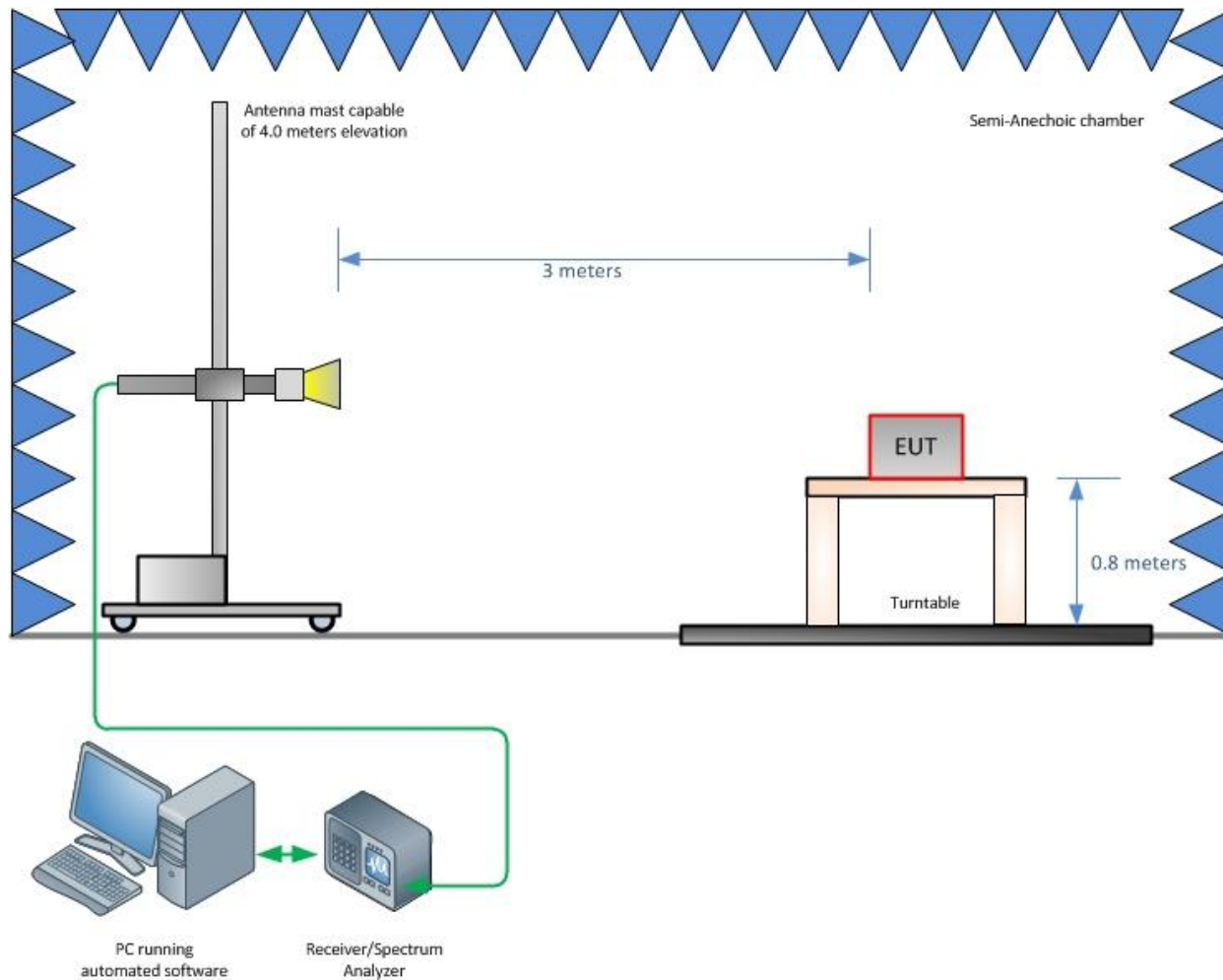
SECTION 4

DIAGRAM OF TEST SETUP

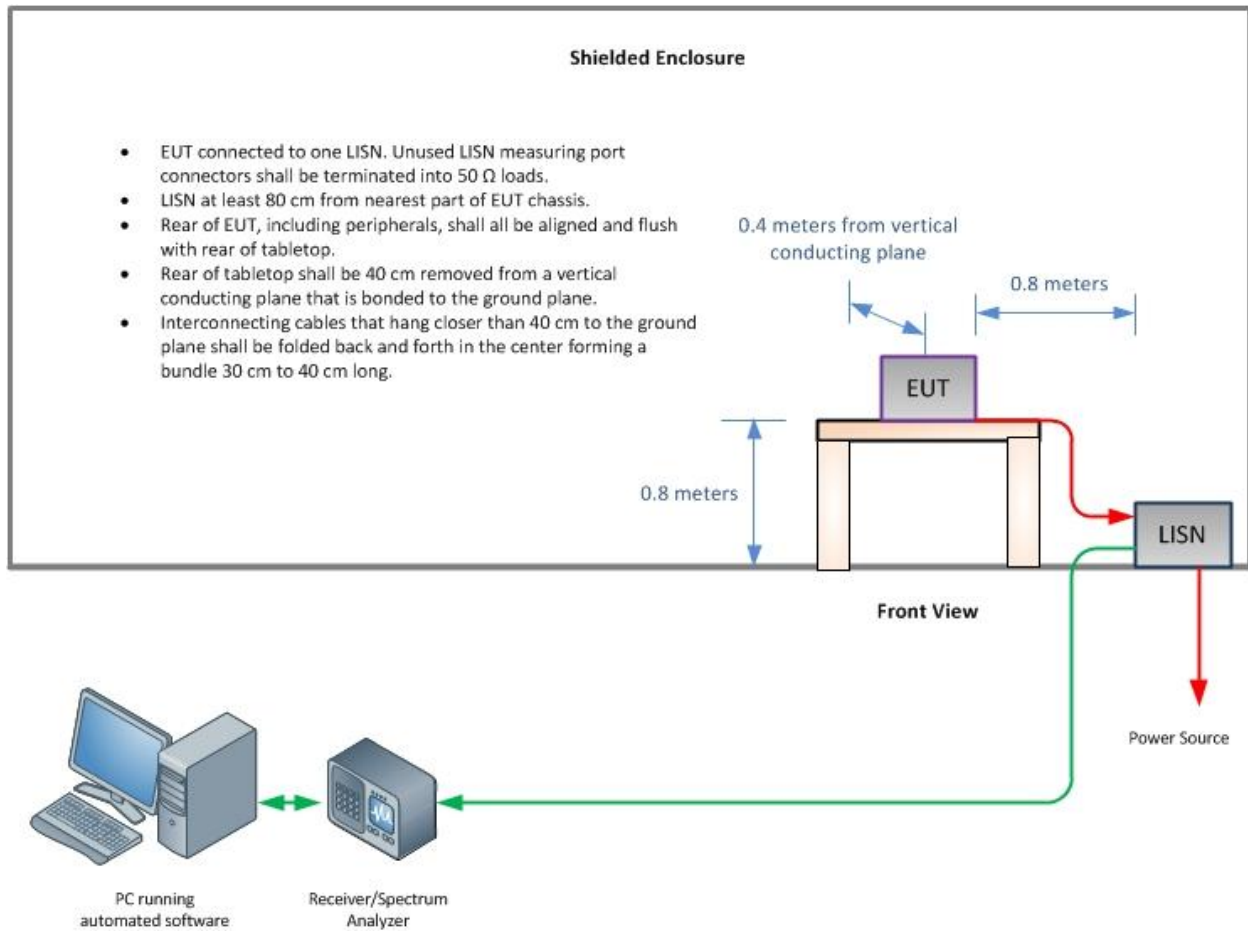
4.1 RADIATED EMISSION TEST SETUP (BELOW 1GHZ)



4.2 RADIATED EMISSION TEST SETUP (ABOVE 1GHZ)



4.3 CONDUCTED EMISSION TEST SETUP





SECTION 5

ACCREDITATION, DISCLAIMERS AND COPYRIGHT



5.1 ACCREDITATION, DISCLAIMERS AND COPYRIGHT

TÜV SÜD America Inc.'s reports apply only to the specific sample tested under stated test conditions. It is the manufacturer's responsibility to assure the continued compliance of production units of this model. TÜV SÜD America, Inc. shall have no liability for any deductions, inferences or generalizations drawn by the client or others from TÜV SÜD America, Inc.'s issued reports.

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