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Report On

EMC Evaluation of
NantWorks
HBox Access Point for Medical Devices

FCC Part 15 Subpart B
ICES-003 Issue 5

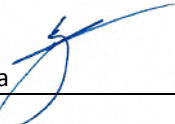
Report No. SD72106517-0515E Rev.1

July 2015



America

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 NantWorks HBox Access Point for Medical Devices
TEST REPORT NUMBER	SD72106517-0515E Rev.1
TEST REPORT DATE	July 2015
PREPARED FOR	NantWorks 9920 Jefferson Blvd. Culver City, CA 90232
CONTACT PERSON	David Lu Principal Engineer dlu@nantworks.com (858) 735-6852
PREPARED BY	 _____ Ivan Retana Name Title: EMC Test Engineer
APPROVED BY	 _____ Juan Manuel Gonzalez Name Authorized Signatory Title: Commercial/Wireless EMC Lab Manager
DATED	_____ July 15, 2105



America

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

Revision History

SD72106517-0515E Rev.1 NantWorks 200-HBX-PDL rev 1 HBox Access Point for Medical Devices					
DATE	OLD REVISION	NEW REVISION	REASON	PAGES AFFECTED	APPROVED BY
06/24/2015	Initial Release				Juan M. Gonzalez
07/15/2015		Rev.1	Model name correction	5	Alex Chang



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SECTION 1

REPORT SUMMARY

EMC Evaluation of the
NantWorks
Access Point for Medical Devices



1.1 INTRODUCTION

The information contained in this report is intended to show verification of the NantWorks HBox Access Point for Medical Devices to the requirements of FCC Part 15 Subpart B and Industry 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	NantWorks
Model Name	HBox
Model Number(s)	200-HBX-PDL rev 1
FCC ID Number:	IFU1001012
Serial Number(s)	5
Number of Samples Tested	1
Highest Frequency Generated or Used	5825 MHz
Test Specification/Issue/Date	• FCC Part 15 Subpart B (October 1, 2014) • Spectrum Management and Telecommunications Interference-Causing Equipment Standard ICES-003 Information Technology Equipment (ITE) — Limits and methods of measurement (Issue 5 August 2012).
Start of Test	April 28, 2015
Finish of Test	April 28, 2015
Name of Engineer(s)	Ivan Retana
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. Test results from these tests are deemed satisfactory evidence of compliance with Industry Canada Interference-Causing Equipment Standard ICES-003.

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

Note: All verifications performed on model 200-HBV-PDL. The two models 200-HBV-PDL and HBox are identical except that 200-HBV-PDL has CDMA2000 and ISM900 RF modules and HBox unit does not have.



1.3 PRODUCT INFORMATION

1.3.1 Technical Description

The Equipment Under Test (EUT) was a NantWorks HBox Access Point for Medical Devices. The EUT can connect to a network through Ethernet port or Wi-Fi. In normal operation, the EUT collects user data via USB, Bluetooth or Wi-Fi and upload the information back to a data server. The NFC function is for quick Bluetooth pairing by obtaining the device info when within NFC range of the EUT.

1.3.2 Labelling Requirement for Industry Canada

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 Industry Canada 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.

Industry Canada ICES-003 Compliance Label

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

1.3.3 Labelling Requirement for Part 15 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
Default	Normal test operation. EUT powered and all I/O ports populated.

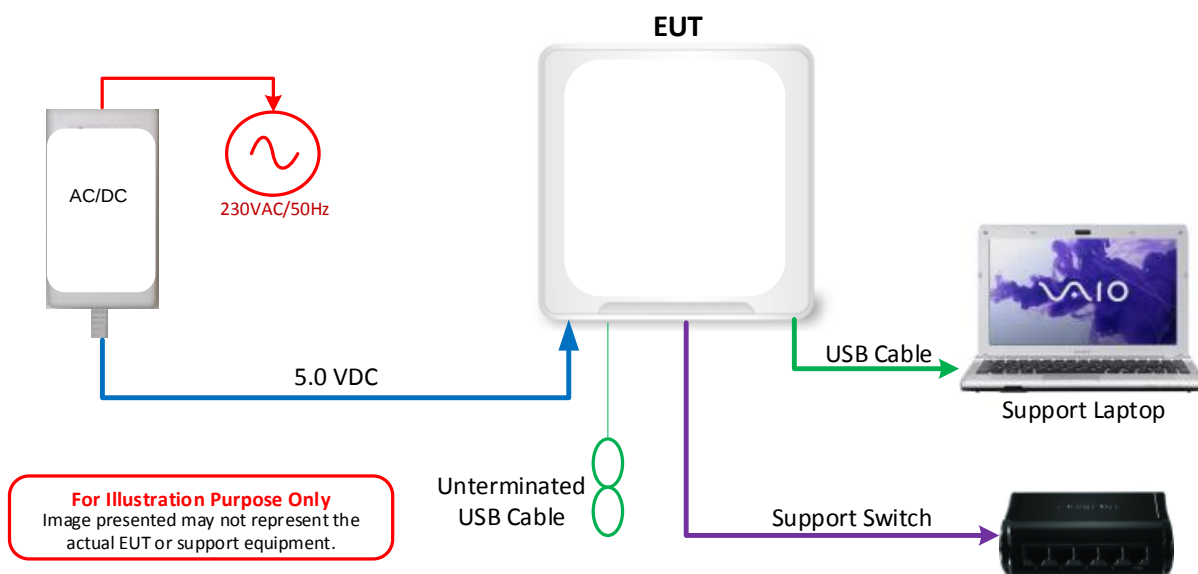
1.4.2 EUT Exercise Software

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

1.4.3 Support Equipment and I/O cables

Manufacturer	Equipment/Cable	Description
Sony	Personal Computer (Y Series Laptop)	PCG-31311L
Sony	AC Adapter	PCGA-AC19V9
HON-KWANG	Switching Power Supply (x2)	HK-AD-050A500-US
Trendnet	Broadband Router	TW100-S4W1CA,
Generic	CAT5E Cable	Unshielded, 1.5 meters Ethernet cable
Generic	USB cable	Shielded, 1.7m generic USB cable

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: 5		
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.: 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.

1.8.2 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
NantWorks
Access Point for Medical Devices



2.1 CONDUCTED EMISSIONS

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: 5 /Default Test Configuration

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

April 28, 2015/IR

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 Location

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

Ambient Temperature	23.7°C
Relative Humidity	45.2%
ATM Pressure	99.9 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)**

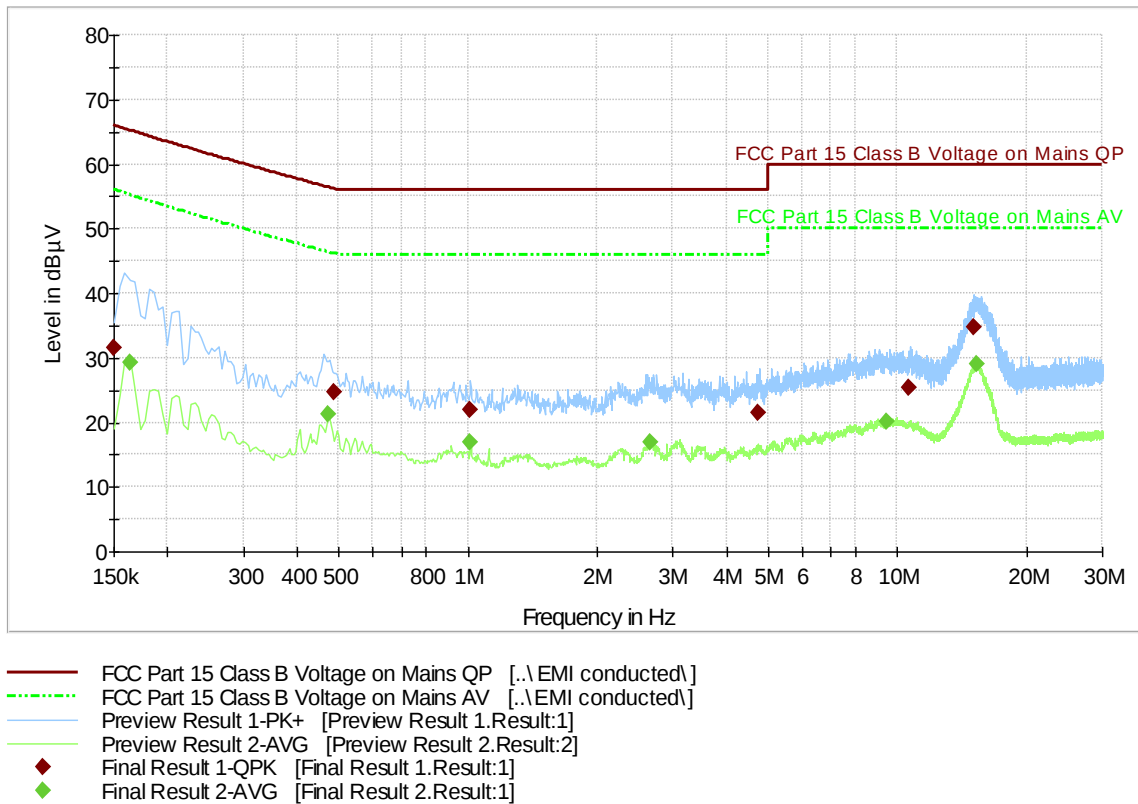
Measuring equipment raw measurement (db μ V) @ 150kHz			5.5
Correction Factor (dB)	Asset# 8607 (20 dB attenuator)	19.9	20.7
	Asset# 1177 (cable)	0.15	
	Asset# 1176 (cable)	0.35	
	Asset# 7568 (LISN)	0.30	
Reported QuasiPeak Final Measurement (db μ V) @ 150kHz			26.2

2.1.9 Test Results

Compliant. See attached plots and tables.

2.1.10 Line 1 (120V/60Hz – Hot)

TUV SR7 Line 1 ESCS



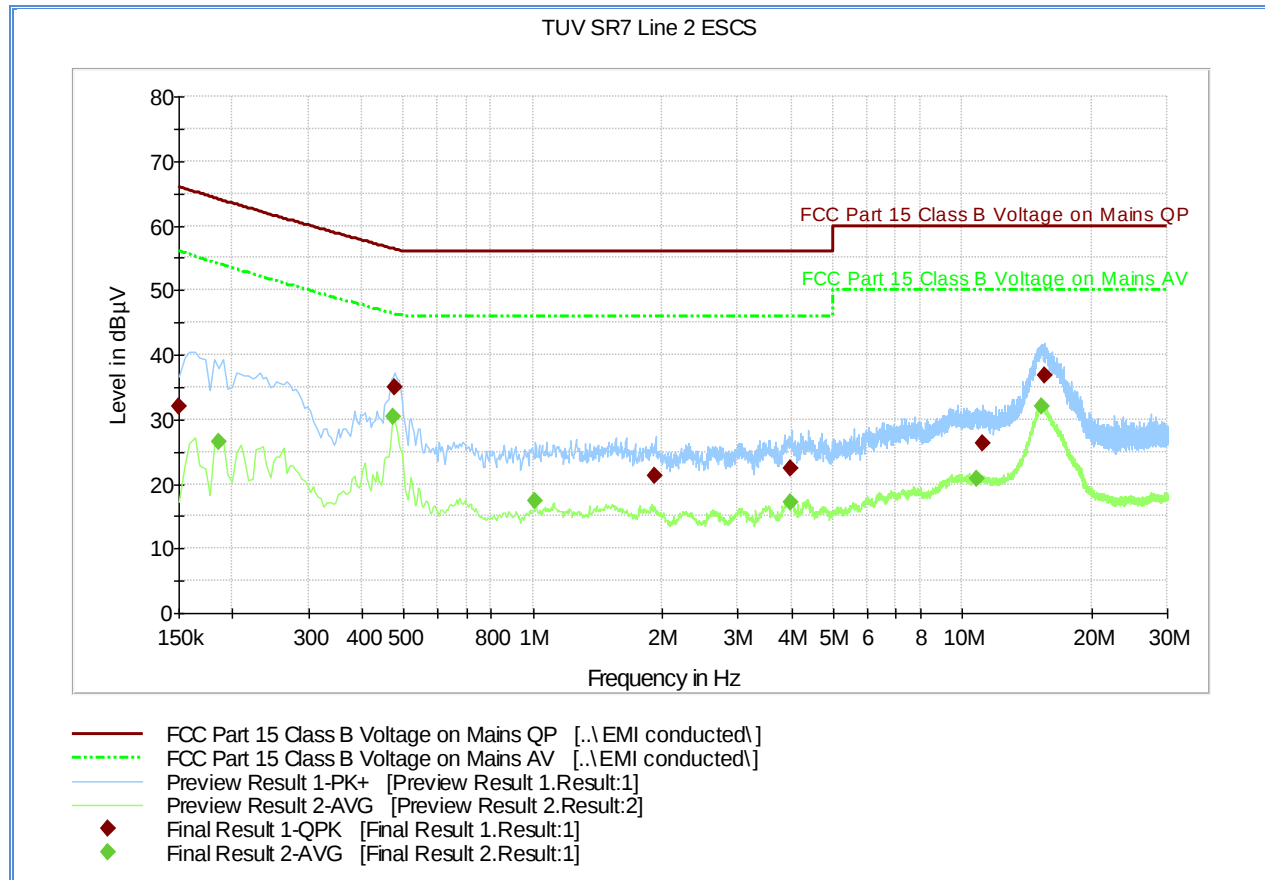
Quasi Peak Data

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBµV)
0.150000	31.6	1000.0	9.000	Off	L1	20.1	34.4	66.0
0.487500	24.7	1000.0	9.000	Off	L1	20.1	31.5	56.2
1.014000	21.9	1000.0	9.000	Off	L1	20.2	34.1	56.0
4.722000	21.6	1000.0	9.000	Off	L1	20.6	34.4	56.0
10.671000	25.4	1000.0	9.000	Off	L1	20.7	34.6	60.0
15.076500	34.8	1000.0	9.000	Off	L1	20.9	25.2	60.0

Average Data

Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin - Ave (dB)	Limit - Ave (dBµV)
0.163500	29.3	1000.0	9.000	Off	L1	20.1	25.9	55.2
0.474000	21.2	1000.0	9.000	Off	L1	20.1	25.2	46.4
1.014000	17.0	1000.0	9.000	Off	L1	20.2	29.0	46.0
2.661000	16.9	1000.0	9.000	Off	L1	20.5	29.1	46.0
9.433500	20.1	1000.0	9.000	Off	L1	20.7	29.9	50.0
15.310500	28.9	1000.0	9.000	Off	L1	20.9	21.1	50.0

2.1.11 Line 2 (120V/60Hz – Neutral)



Quasi Peak Data

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBµV)
0.150000	32.1	1000.0	9.000	Off	N	20.1	33.9	66.0
0.478500	35.0	1000.0	9.000	Off	N	20.1	21.4	56.3
1.927500	21.1	1000.0	9.000	Off	N	20.1	34.9	56.0
3.975000	22.3	1000.0	9.000	Off	N	20.5	33.7	56.0
11.134500	26.3	1000.0	9.000	Off	N	20.7	33.7	60.0
15.513000	36.9	1000.0	9.000	Off	N	20.7	23.1	60.0

Average Data

Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin - Ave (dB)	Limit - Ave (dBµV)
0.186000	26.4	1000.0	9.000	Off	N	20.1	27.6	54.1
0.474000	30.4	1000.0	9.000	Off	N	20.1	16.0	46.4
1.014000	17.3	1000.0	9.000	Off	N	20.2	28.7	46.0
3.966000	17.1	1000.0	9.000	Off	N	20.5	28.9	46.0
10.770000	20.8	1000.0	9.000	Off	N	20.6	29.2	50.0
15.310500	32.0	1000.0	9.000	Off	N	20.7	18.0	50.0



2.2 RADIATED EMISSIONS

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: 5 / Default Test Configuration

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

April 28, 2015/IR

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/Test Location

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

Ambient Temperature	23.7°C
Relative Humidity	45.2%
ATM Pressure	99.9 kPa

2.2.7 Additional Observations

- The spectrum was searched from 30MHz to 18GHz and verified to Class B limits. There are no spurious emissions observed above 3GHz when in "Receive" mode.
- Verifications are 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.

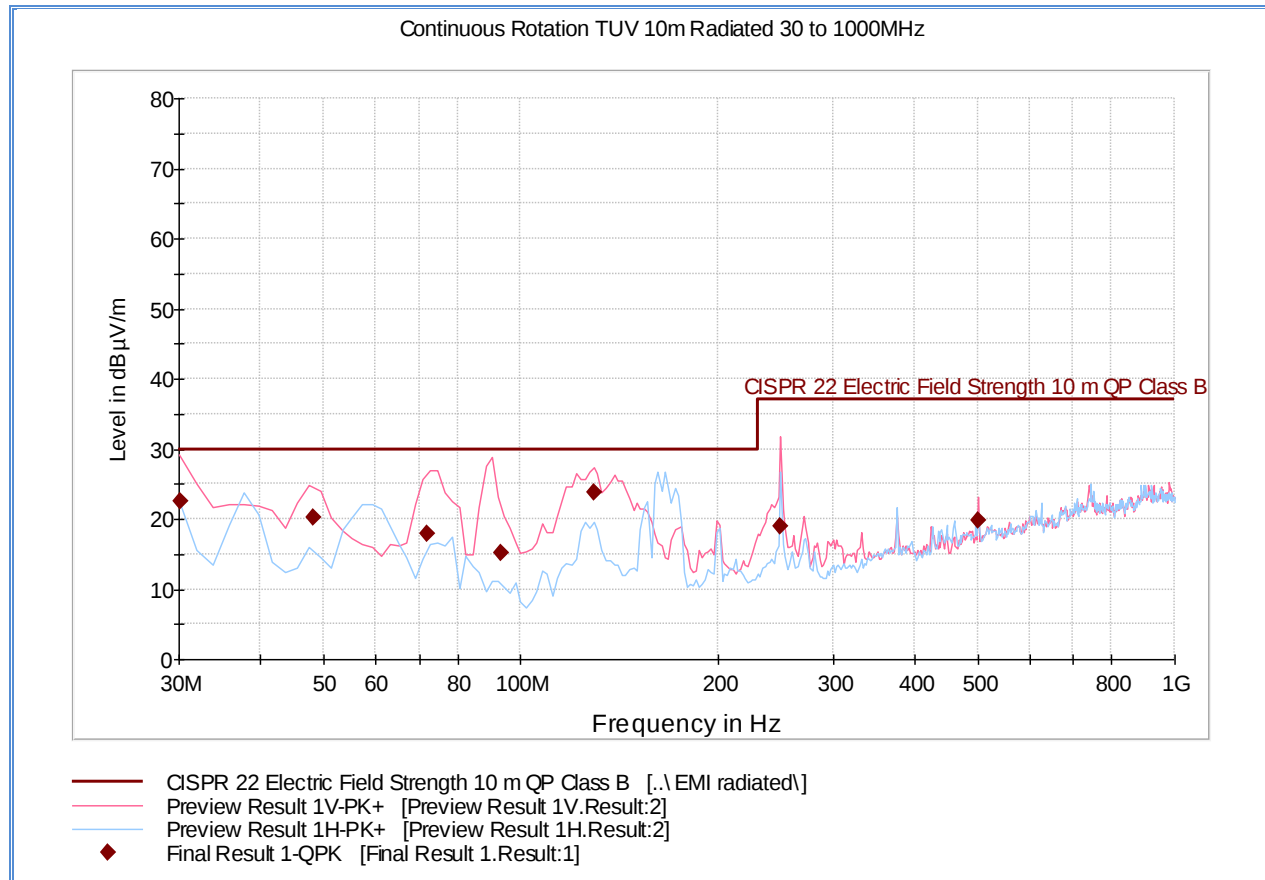
**2.2.8** Sample Computation (Radiated Emission)

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

Compliant. See attached plots.

2.2.9.1 Below 1GHz Radiated Emission Test

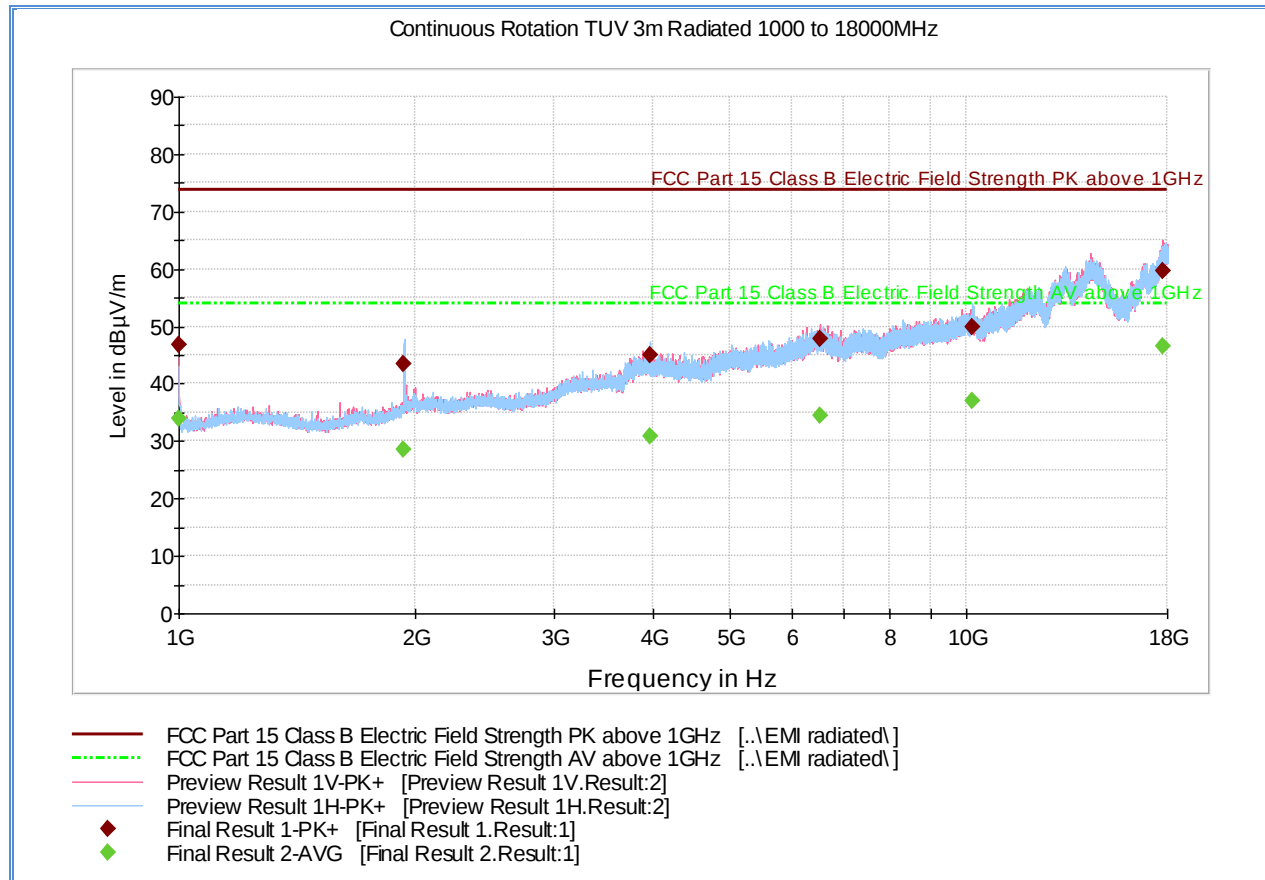


Note: FCC Accepts CISPR 22 by §15.38 Incorporation by reference.

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)
30.080000	22.5	1000.0	120.000	100.0	V	263.0	-13.1	7.5	30.0
48.134990	20.2	1000.0	120.000	105.0	V	104.0	-21.1	9.8	30.0
71.925531	18.0	1000.0	120.000	400.0	V	284.0	-23.1	12.0	30.0
93.460521	15.2	1000.0	120.000	109.0	V	-14.0	-21.5	14.8	30.0
129.298277	23.9	1000.0	120.000	128.0	V	87.0	-22.5	6.1	30.0
249.899319	18.9	1000.0	120.000	150.0	V	189.0	-15.5	18.1	37.0
500.020842	19.7	1000.0	120.000	100.0	V	296.0	-8.6	17.3	37.0

2.2.9.2 Above 1GHz Radiated Emission Test



Peak Data

Frequency (MHz)	Max Peak (dB μ V/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dB μ V/m)
1000.000000	46.9	1000.0	1000.000	256.4	V	211.0	-10.5	27.0	73.9
1932.533333	43.4	1000.0	1000.000	354.2	H	272.0	-5.9	30.5	73.9
3967.866667	44.9	1000.0	1000.000	403.6	H	211.0	3.8	29.0	73.9
6512.366667	47.8	1000.0	1000.000	279.3	V	200.0	9.7	26.1	73.9
10191.333333	49.9	1000.0	1000.000	201.3	H	3.0	13.5	24.0	73.9
17797.533333	59.7	1000.0	1000.000	303.5	V	192.0	26.1	14.2	73.9

Average Data

Frequency (MHz)	Average (dB μ V/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dB μ V/m)
1000.000000	33.9	1000.0	1000.000	256.4	V	211.0	-10.5	20.0	53.9
1932.533333	28.6	1000.0	1000.000	354.2	H	272.0	-5.9	25.3	53.9
3967.866667	31.0	1000.0	1000.000	403.6	H	211.0	3.8	22.9	53.9
6512.366667	34.5	1000.0	1000.000	279.3	V	200.0	9.7	19.4	53.9
10191.333333	37.0	1000.0	1000.000	201.3	H	3.0	13.5	16.9	53.9
17797.533333	46.6	1000.0	1000.000	303.5	V	192.0	26.1	7.3	53.9



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 Test Setup						
1002	Bilog Antenna	3142C	00058717	ETS-Lindgren	01/30/14	01/30/16
1051	Double-ridged waveguide horn antenna	3115	9408-4329	EMCO	02/28/14	02/28/16
8628	Pre-amplifier	QLJ 01182835-JO	8986002	QuinStar Technologies Inc.	03/20/15	03/20/16
1040	EMI Test Receiver	ESIB40	100292	Rhode & Schwarz	09/29/14	09/29/15
1049	EMI Test Receiver	ESU	100133	Rhode & Schwarz	03/11/15	03/11/16
1016	Pre-amplifier	PAM-0202	187	PAM	12/10/14	12/10/15
Conducted Emissions						
1024	EMI Test Receiver	ESCS 30	847793/001	Rhode & Schwarz	04/10/15	04/10/16
7567	LISN	FCC-LISN-50- 25-2-10	120304	Fischer Custom Comm.	07/01/14	07/01/15
8822	20dB Attenuator	34-20-34	N/A	MCE / Weinschel	02/20/15	02/20/16
8824	20dB Attenuator	34-20-34	N/A	MCE / Weinschel	02/20/15	02/20/16
1024	EMI Test Receiver	ESCS 30	847793/001	Rhode & Schwarz	04/10/15	04/10/16
Miscellaneous						
	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 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	Preamplifier	Rectangular	0.50	0.29	0.08
4	Antenna	Rectangular	0.75	0.43	0.19
5	Site	Rectangular	3.89	2.25	5.04
6	EUT Setup	Rectangular	1.00	0.58	0.33
Combined Uncertainty (u_c):					2.41
Coverage Factor (k):					2
Expanded Uncertainty:					4.82

3.2.1 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	Preamplifier	Rectangular	0.50	0.29	0.08
4	Antenna	Rectangular	0.37	0.21	0.05
5	Site	Rectangular	3.89	2.25	5.04
6	EUT Setup	Rectangular	1.00	0.58	0.33
Combined Uncertainty (u_c):					2.40
Coverage Factor (k):					2
Expanded Uncertainty:					4.81

3.2.2 AC Conducted Emissions Measurements

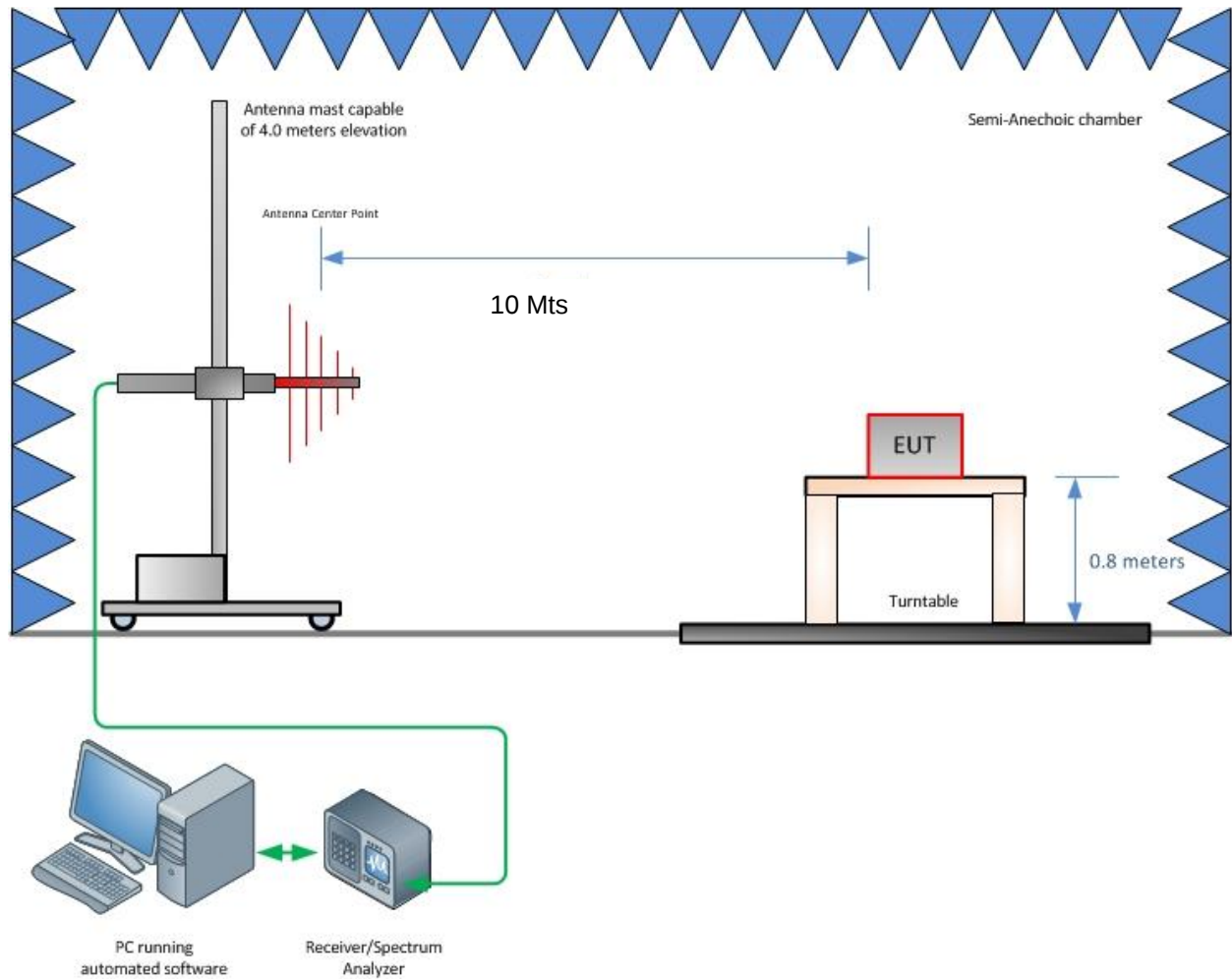
Contribution		Probability Distribution Type	Probability Distribution x_i	Standard Uncertainty $u(x_i)$	$[u(x_i)]^2$
1	Receiver/Spectrum Analyzer	Rectangular	0.36	0.21	0.04
2	Cables	Rectangular	0.50	0.29	0.08
3	LISN	Rectangular	0.66	0.38	0.15
4	Attenuator	Rectangular	0.30	0.17	0.03
5	EUT Setup	Rectangular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



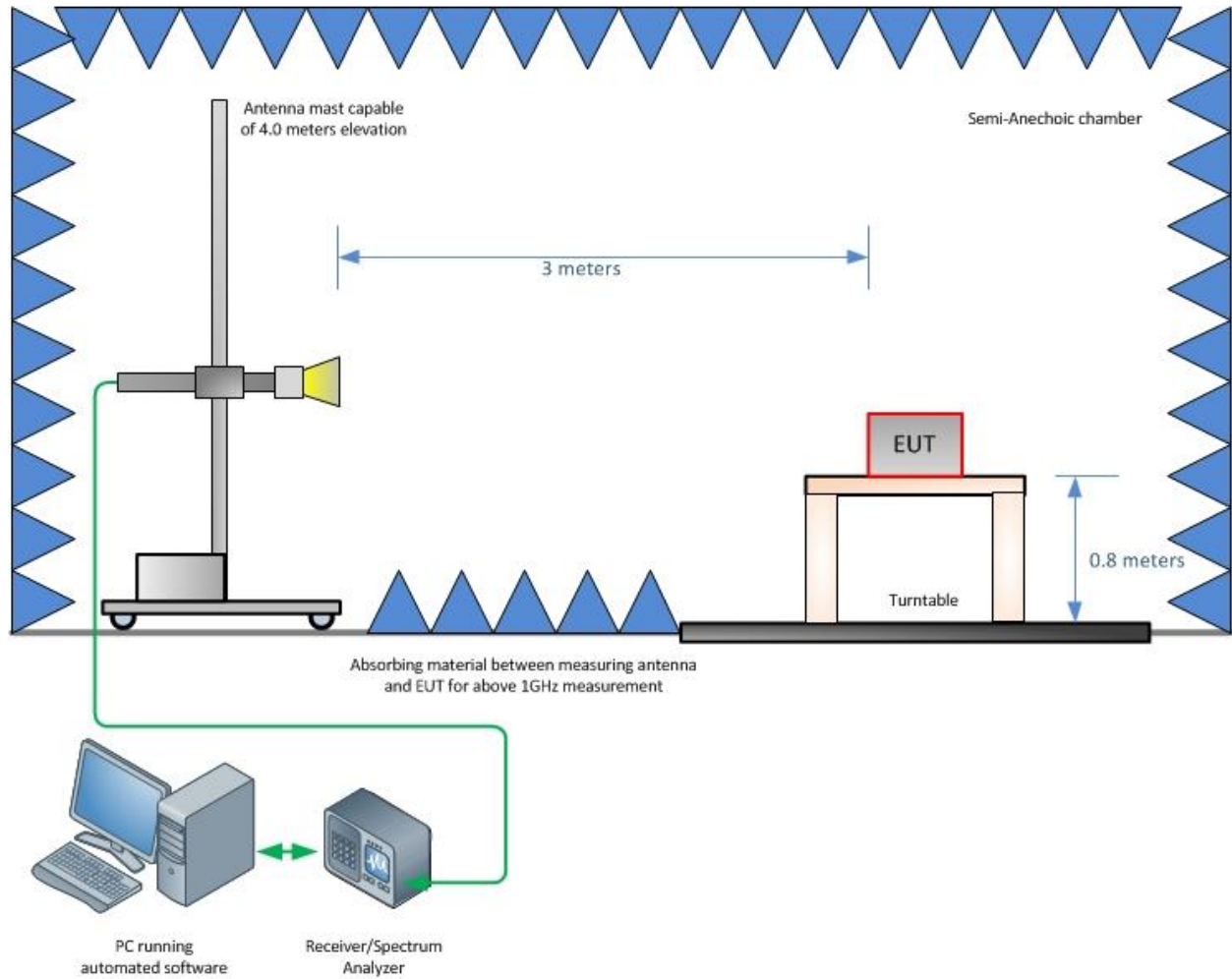
SECTION 4

DIAGRAM OF TEST SETUP

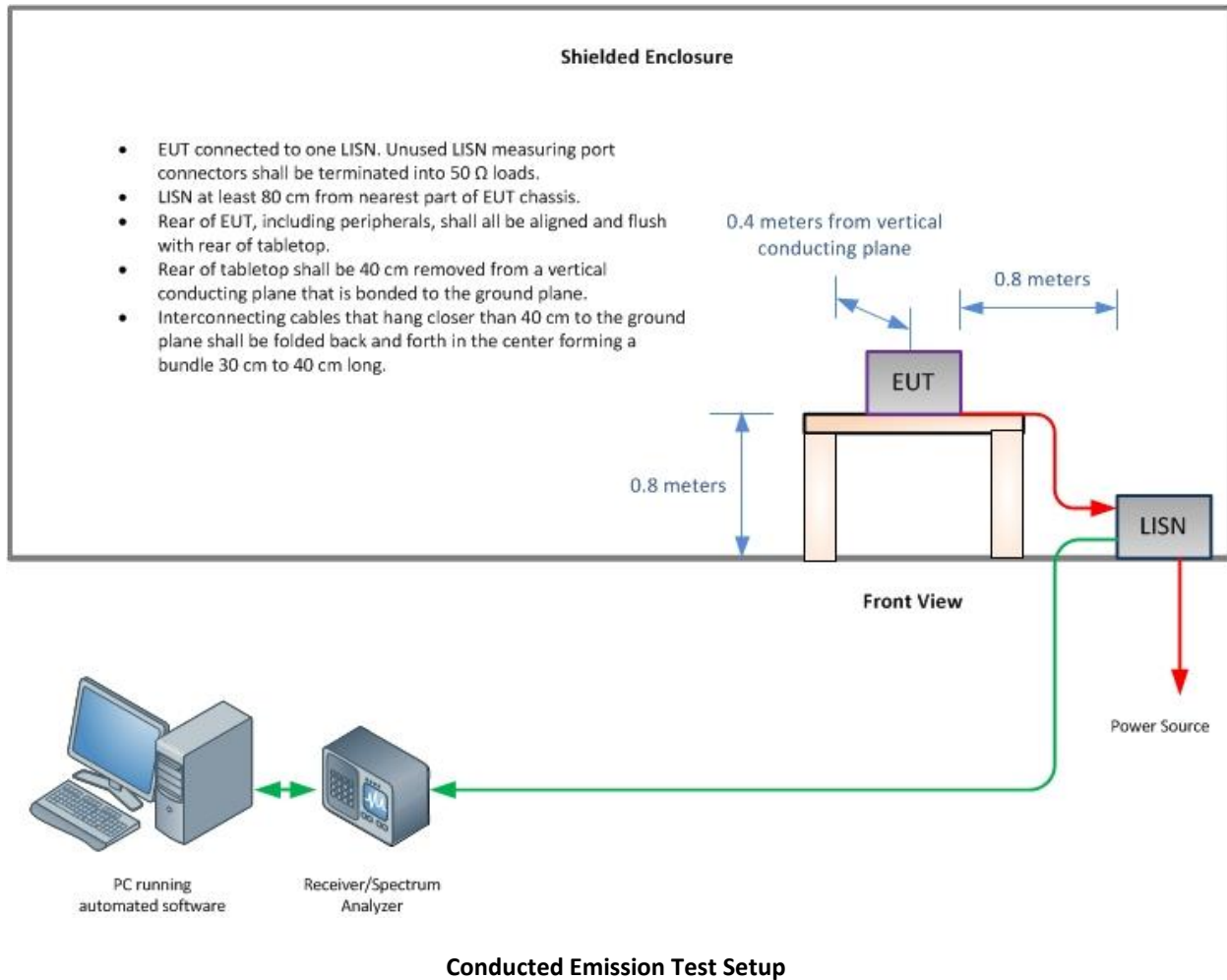
4.1 TEST SETUP DIAGRAM



Radiated Emission Test Setup (Below 1GHz)



Radiated Emission Test Setup (Above 1GHz)





SECTION 5

ACCREDITATION, DISCLAIMERS AND COPYRIGHT

**5.1 ACCREDITATION, DISCLAIMERS AND COPYRIGHT**

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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