



America

**Choose certainty.
Add value.**

Report On

EMC Evaluation of
Novatel Wireless Inc.
MT 3060 Asset locating and diagnostic data reporting device

FCC Part 15 Subpart B
ICES-003 Issue 5

Report No. SC1308862A

September 2013



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 Novatel Wireless Inc. MT 3060 Asset locating and diagnostic data reporting device
TEST REPORT NUMBER	SC1308862A
TEST REPORT DATE	September 2013
PREPARED FOR	Novatel Wireless Inc. 9645 Scranton Road, San Diego, CA 92121
CONTACT PERSON	Daryl Therens Technical Specialist, Regulatory. dtherens@nvtl.com (403) 516-5503
PREPARED BY	 _____ Juan Manuel Gonzalez Name Title: EMC Engineer
APPROVED BY	 _____ Chip Fleury Name Authorized Signatory Title: EMC Manager
DATED	_____ 06 September 2013



America

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

Revision History

SC1308862A Novatel Wireless Inc. MT 3060 Asset locating and diagnostic data reporting device					
DATE	OLD REVISION	NEW REVISION	REASON	PAGES AFFECTED	APPROVED BY
09/05/13	Initial Release				Fleury Chip



CONTENTS

Section	Page No
1	REPORT SUMMARY 4
1.1	Introduction 5
1.2	Brief Summary of Results..... 6
1.3	Product Information 7
1.4	EUT Test configuration..... 8
1.5	Deviations from the Standard 9
1.6	Modification Record 9
1.7	Test methodology..... 9
1.8	Test facility 9
2	TEST DETAILS..... 10
2.1	RAdiated emission limits 11
3	TEST EQUIPMENT USED..... 25
3.1	Test Equipment Used..... 26
3.2	Measurement Uncertainty 27
4	Diagram of test setup..... 28
4.1	Radiated Emission Test Setup (Below 1GHz) 29
4.2	Radiated Emission Test Setup (Above 1GHz)..... 30
5	ACCREDITATION, DISCLAIMERS AND COPYRIGHT 31
5.1	Accreditation, Disclaimers and Copyright 32



SECTION 1

REPORT SUMMARY

EMC Evaluation of the
Novatel Wireless Inc.
Asset locating and diagnostic data reporting device



1.1 INTRODUCTION

The information contained in this report is intended to show verification of the Novatel Wireless Inc. "Asset locating and diagnostic data reporting device "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	Novatel Wireless Inc.
Model Number(s)	GSM2398-00
Serial Number(s)	Engineering Sample
Number of Samples Tested	1
Highest Frequency Generated or Used	1900 MHz
Test Specification/Issue/Date	<ul style="list-style-type: none"> • FCC Part 15 Subpart B (October 1, 2011) • 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	September 05, 2013
Finish of Test	September 05, 2013
Name of Engineer(s)	Juan Manuel Gonzalez
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 Limits	Compliant	Class B requirement
§15.109	Radiated Emission Limits	Compliant	Class B requirement

1.3 PRODUCT INFORMATION

1.3.1 EUT General Description

The Equipment Under Test (EUT) was an Novatel Wireless Inc. MT 3060 Asset locating and diagnostic data reporting device for the Usage Based Insurance (UBI), telematics, and fleet management markets.

It has embedded GSM0308 modules that provide the cellular (GSM/GPRS) functionality. The GSM2398-00 provides GPS radio functionality.

The GSM2398-00 is intended to be connected to a vehicle's OBD-II connection port, and has the following:

- On-Board Diagnostics II interface
- Three LEDs (the fourth location marked for Bluetooth is not populated)
- Modem Antenna
- GPS Antenna
- SIM Interface



1.4 EUT TEST CONFIGURATION

1.4.1 Test Configuration Description

Test Configuration	Description
Default	EUT connected to an OBD Connector and supplied with +12 VDC from a AC/DC Adaptor. Waiting for a call (Idle Mode).

1.4.2 EUT Exercise Software

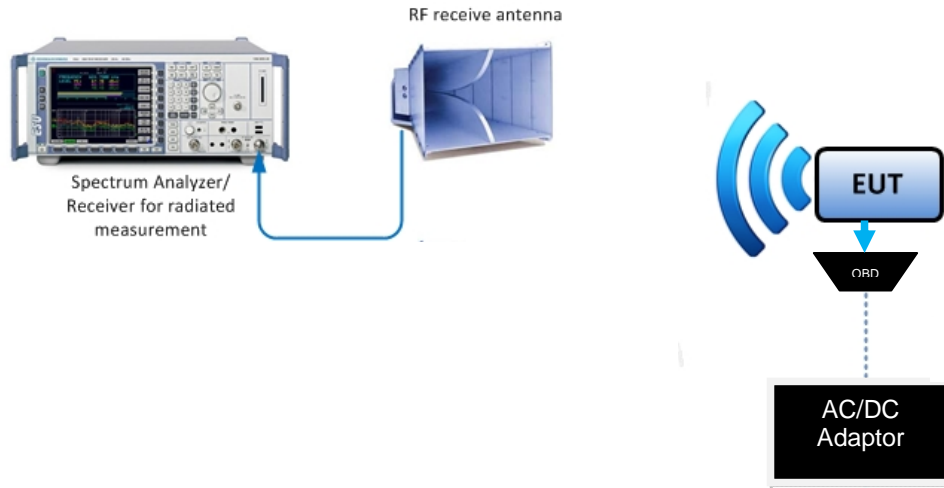
None. No special software was used to exercise the EUT during the investigation.

1.4.3 Support Equipment and I/O cables

Manufacturer	Equipment/Cable	Description

1.4.4 Simplified Test Configuration Diagram

Radiated Test Configuration/Conducted Emissions Test Configuration



For Illustration Purpose Only
 Image presented may not represent the actual EUT or support equipment



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: Engineering Sample		
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.: US5296

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 US5296.

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
Novatel Wireless Inc.
Asset locating and diagnostic data reporting device



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: Engineering Sample /Default Test Configuration

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

September 05, 2013/JMG

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 22.5°C
 Relative Humidity 45.0%
 ATM Pressure 100.3 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 2.2.8 for sample computation.



2.1.8 Sample Computation (Conducted Emission – Quasi Peak)

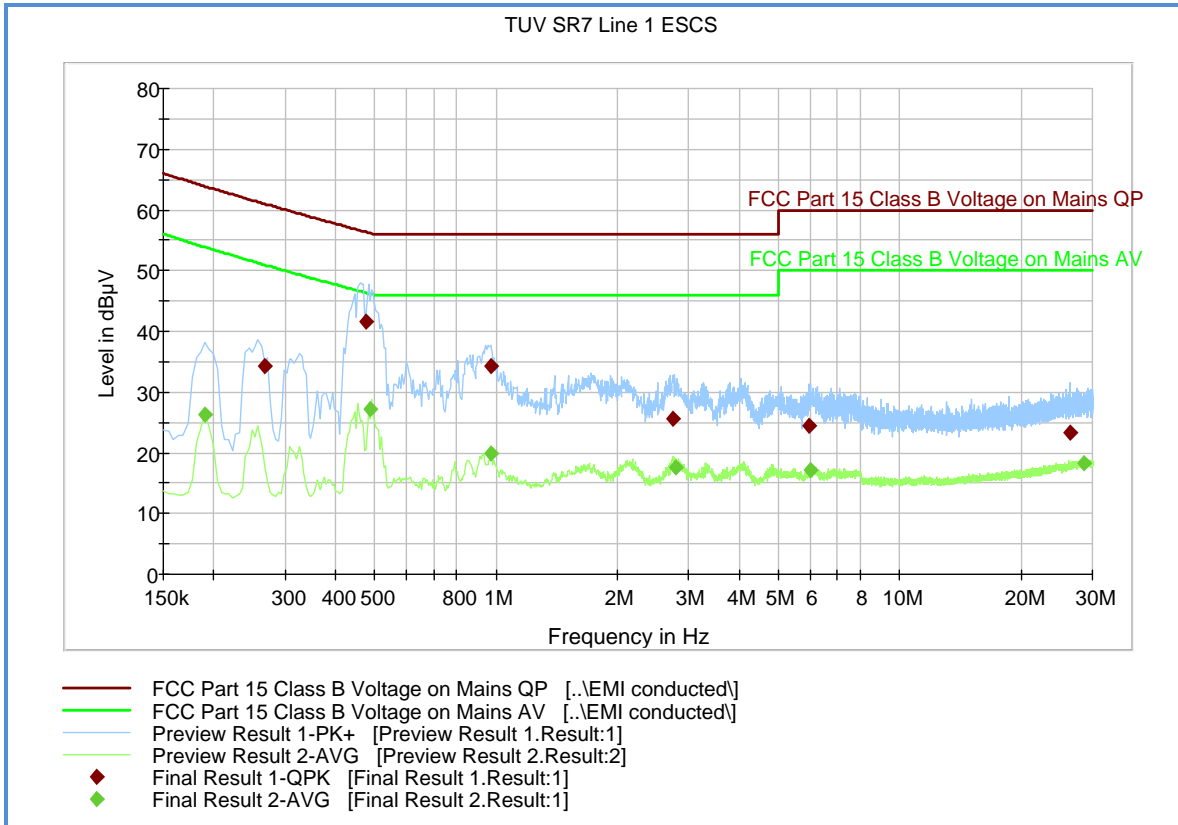
Measuring equipment raw measurement (db μ V) @ 150kHz		5.5
Correction Factor (dB)	Asset# 8607 (20 dB attenuator)	19.9
	Asset# 1177 (cable)	0.15
	Asset# 1176 (cable)	0.35
	Asset# 7568 (LISN)	0.30
Reported QuasiPeak Final Measurement (dbμV) @ 150kHz		26.2

2.1.9 Test Results

Compliant. See attached plots and tables.



2.1.10 Line 1



Quasi Peak

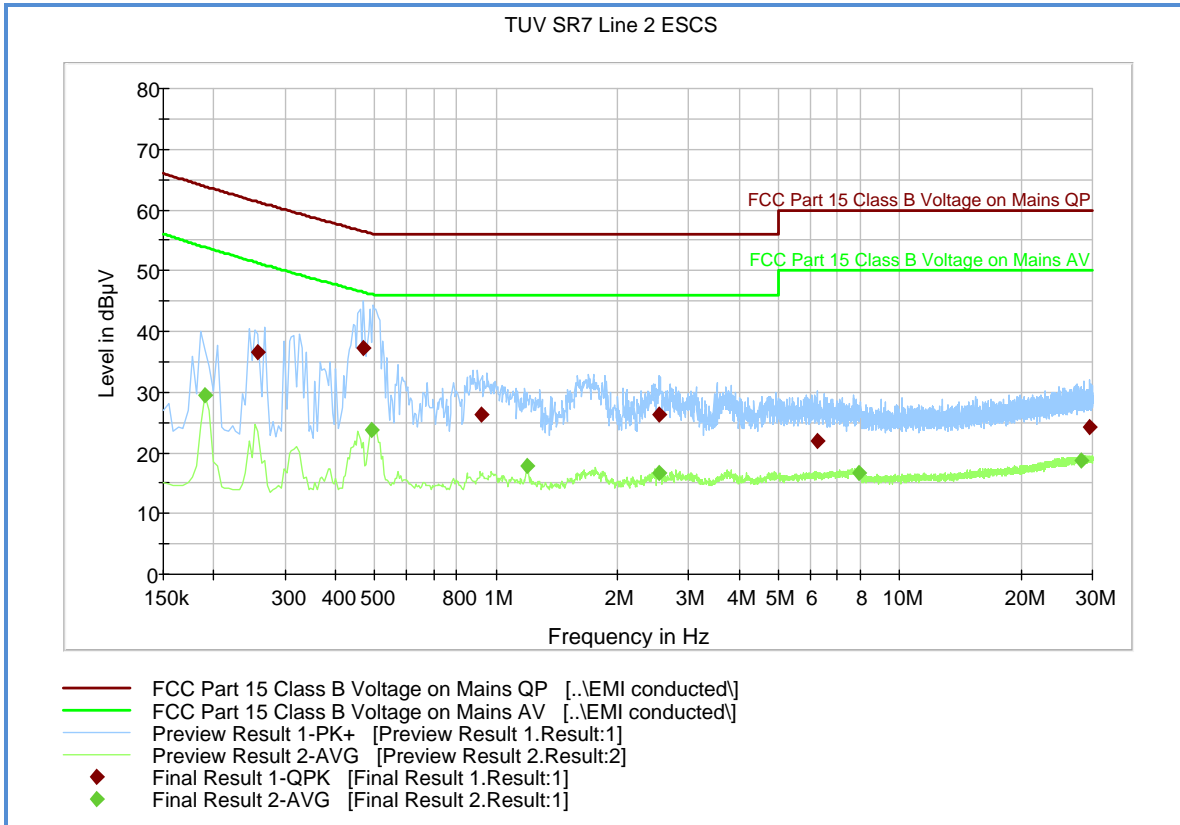
Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.267000	34.4	1000.0	9.000	Off	L1	20.3	26.6	61.0	
0.478500	41.6	1000.0	9.000	Off	L1	20.2	14.7	56.3	
0.973500	34.2	1000.0	9.000	Off	L1	20.2	21.8	56.0	
2.751000	25.5	1000.0	9.000	Off	L1	20.3	30.5	56.0	
2.796000	24.4	1000.0	9.000	Off	L1	20.4	35.6	60.0	
26.524500	23.2	1000.0	9.000	Off	L1	21.4	36.8	60.0	

Average

Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.190500	26.4	1000.0	9.000	Off	L1	20.3	27.5	53.9	
0.487500	27.2	1000.0	9.000	Off	L1	20.2	18.9	46.2	
0.973500	20.0	1000.0	9.000	Off	L1	20.2	26.0	46.0	
2.796000	17.7	1000.0	9.000	Off	L1	20.3	28.3	46.0	
6.013500	17.1	1000.0	9.000	Off	L1	20.4	32.9	50.0	
28.698000	18.3	1000.0	9.000	Off	L1	21.6	31.7	50.0	



2.1.11 Line 2



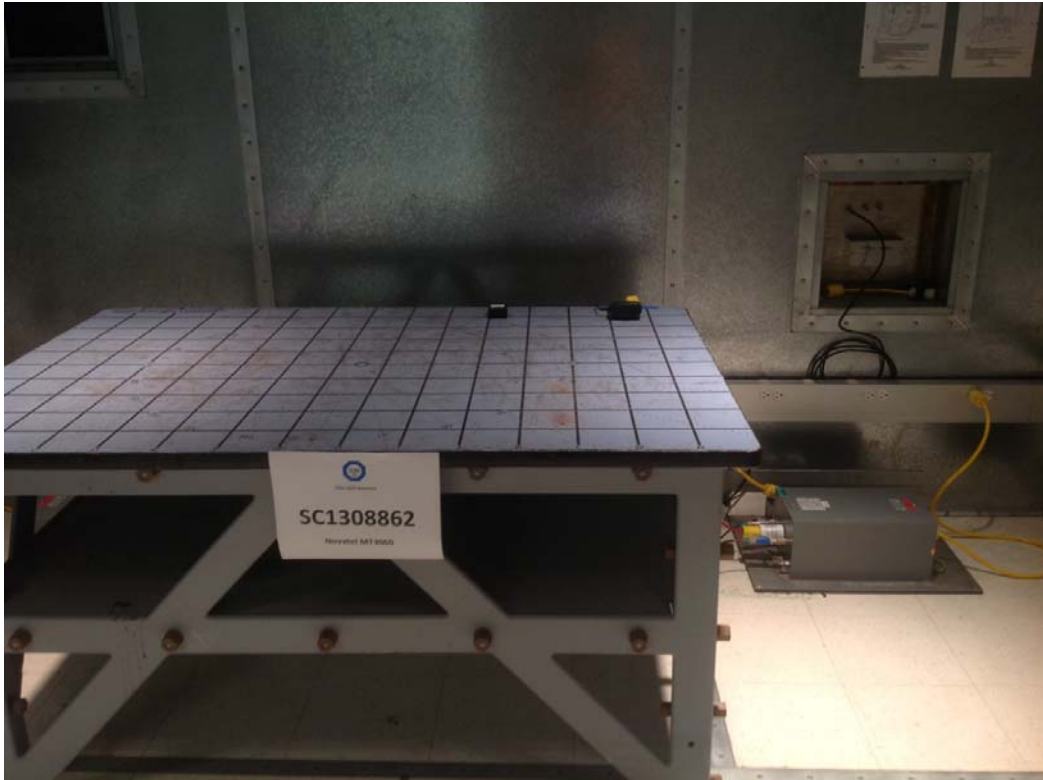
Quasi Peak

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.258000	36.6	1000.0	9.000	Off	N	21.1	24.7	61.3	
0.469500	37.3	1000.0	9.000	Off	N	21.1	19.2	56.5	
0.919500	26.3	1000.0	9.000	Off	N	21.1	29.7	56.0	
2.535000	26.2	1000.0	9.000	Off	N	21.1	29.8	56.0	
6.261000	21.9	1000.0	9.000	Off	N	21.2	38.1	60.0	
29.436000	24.2	1000.0	9.000	Off	N	22.3	35.8	60.0	

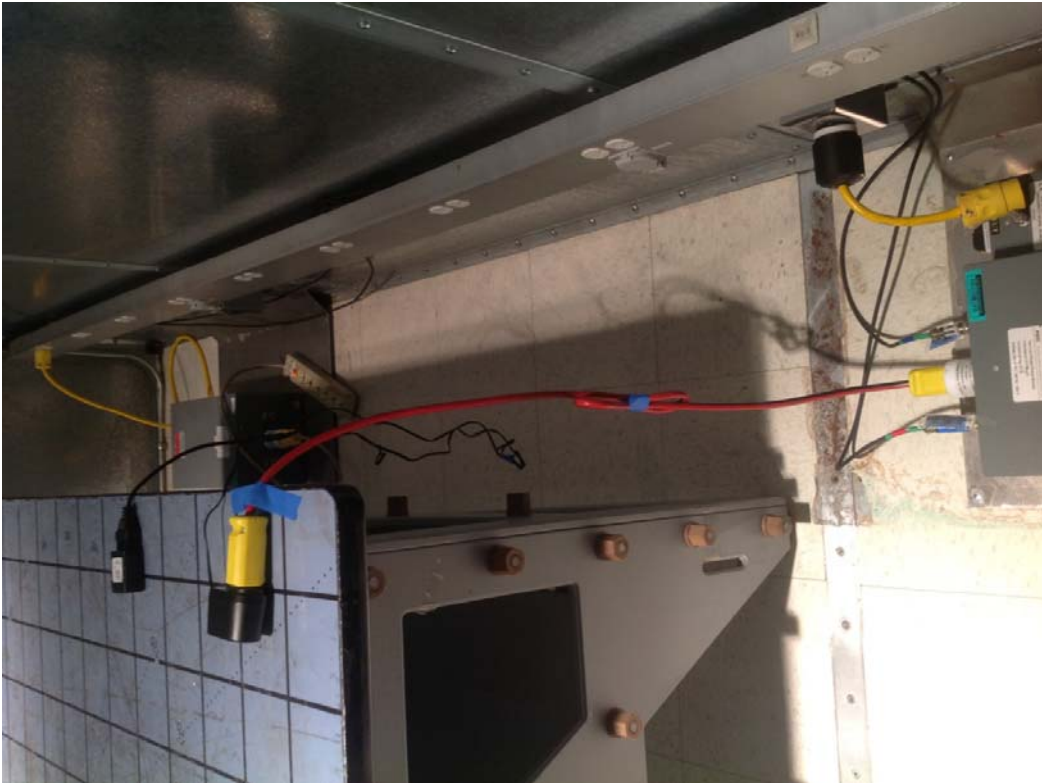
Average

Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.190500	29.6	1000.0	9.000	Off	N	21.2	24.3	53.9	
0.492000	23.8	1000.0	9.000	Off	N	21.1	22.3	46.1	
1.198500	17.9	1000.0	9.000	Off	N	21.1	28.1	46.0	
2.530500	16.6	1000.0	9.000	Off	N	21.1	29.4	46.0	
7.903500	16.7	1000.0	9.000	Off	N	21.2	33.3	50.0	
28.063500	18.8	1000.0	9.000	Off	N	22.2	31.2	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: Engineering Sample / Default Test Configuration

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

September 5, 2013/JMG

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 22.5°C
 Relative Humidity 45.0%
 ATM Pressure 100.3 kPa

2.2.7 Additional Observations

- The spectrum was searched from 30MHz to 18GHz and verified to Class B limits.
- 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)

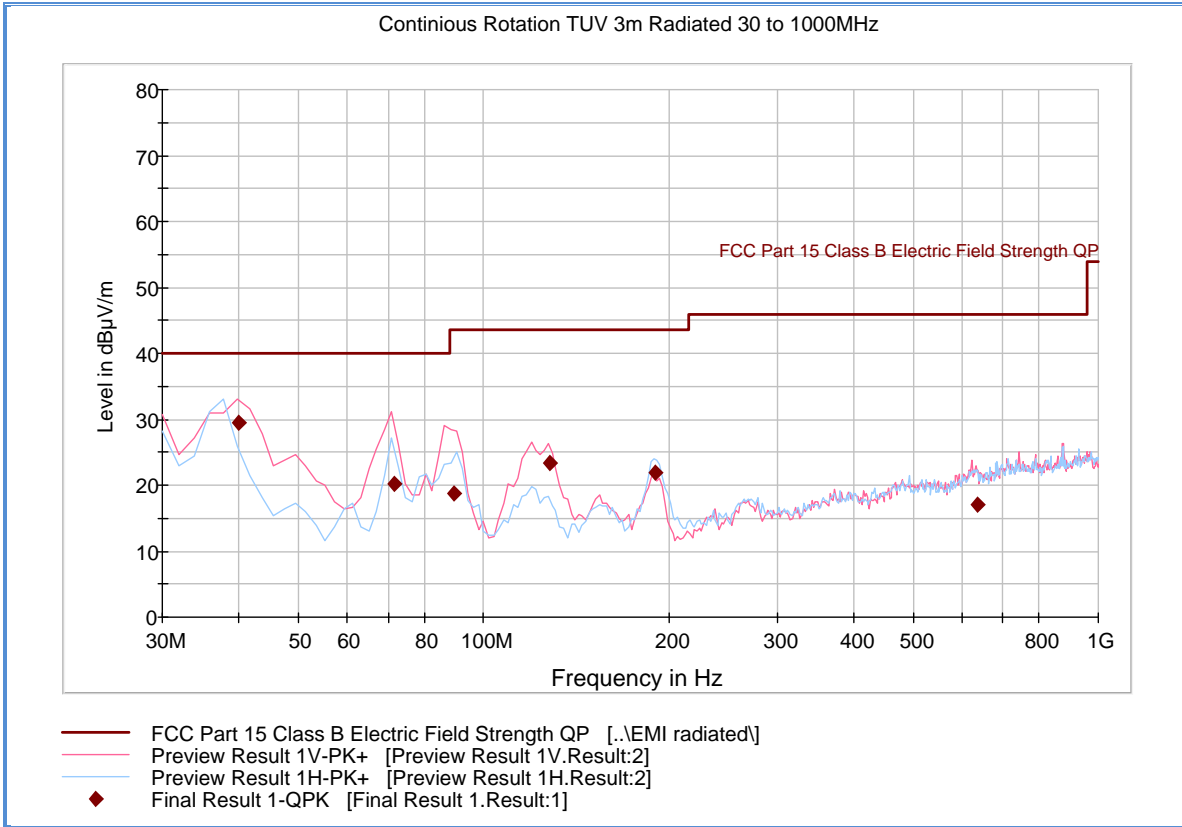
Measuring equipment raw measurement (db μ V) @ 30 MHz		24.4
Correction Factor (dB)	Asset# 1066 (cable)	0.3
	Asset# 1172 (cable)	0.3
	Asset# 1016 (preamplifier)	-30.7
	Asset# 1175(cable)	0.3
	Asset# 1002 (antenna)	17.2
Reported QuasiPeak Final Measurement (dbμV/m) @ 30MHz		11.8

2.2.9 Test Results

See attached plots.



2.2.9.1 Below 1GHz Radiated Emission Test

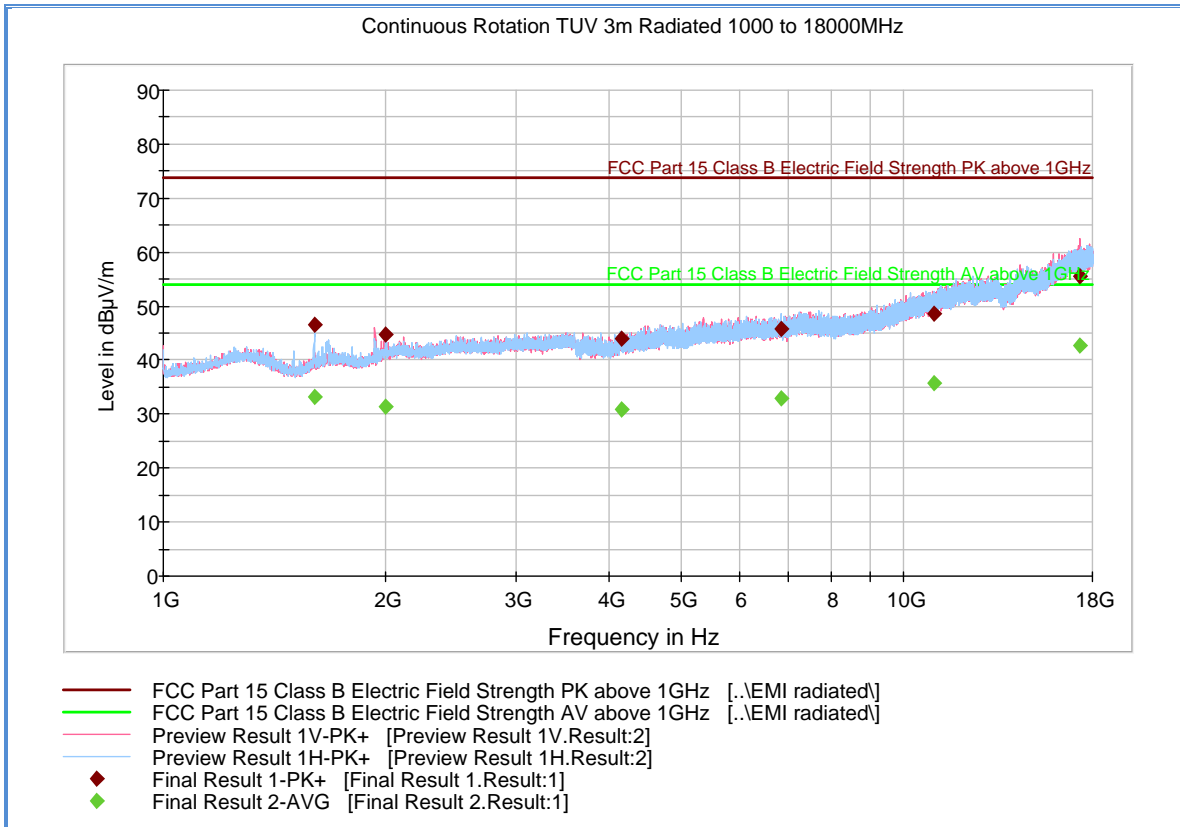


Quasi-Peak Data

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
39.999439	29.5	1000.0	120.000	100.0	V	197.0	-16.1	10.5	40.0
71.501643	20.3	1000.0	120.000	200.0	V	186.0	-21.7	19.7	40.0
89.532745	18.8	1000.0	120.000	313.0	V	15.0	-20.1	24.7	43.5
127.994389	23.5	1000.0	120.000	100.0	V	15.0	-19.9	20.0	43.5
190.558798	21.9	1000.0	120.000	166.0	H	269.0	-15.1	21.6	43.5
635.172986	17.1	1000.0	120.000	150.0	V	151.0	-3.2	28.9	46.0



2.2.9.2 Above 1GHz Radiated Emission Test



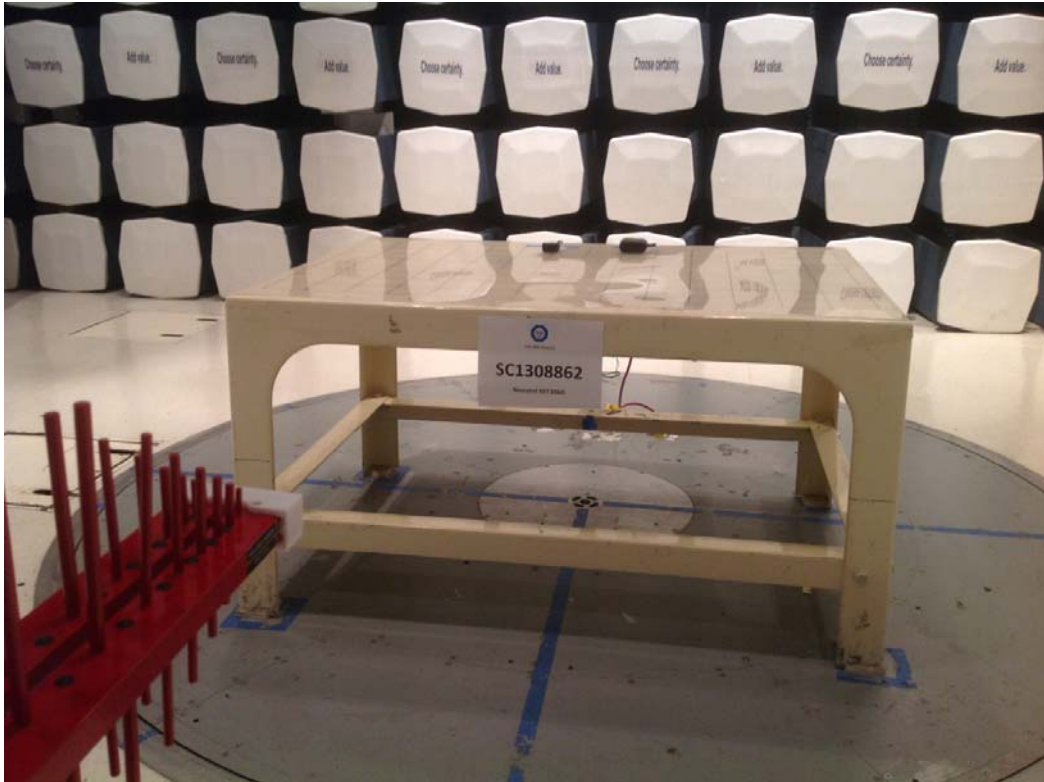
Peak Data

Frequency (MHz)	Max Peak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1599.586667	46.5	1000.0	1000.000	398.2	H	126.0	-4.3	27.4	73.9
2000.180000	44.6	1000.0	1000.000	384.1	H	177.0	-1.6	29.3	73.9
4159.266667	44.1	1000.0	1000.000	99.6	H	20.0	3.7	29.8	73.9
6841.626667	45.8	1000.0	1000.000	100.6	H	0.0	8.8	28.1	73.9
10978.49333	48.5	1000.0	1000.000	194.4	H	231.0	14.5	25.4	73.9
17334.88000	55.6	1000.0	1000.000	293.2	V	137.0	22.0	18.3	73.9

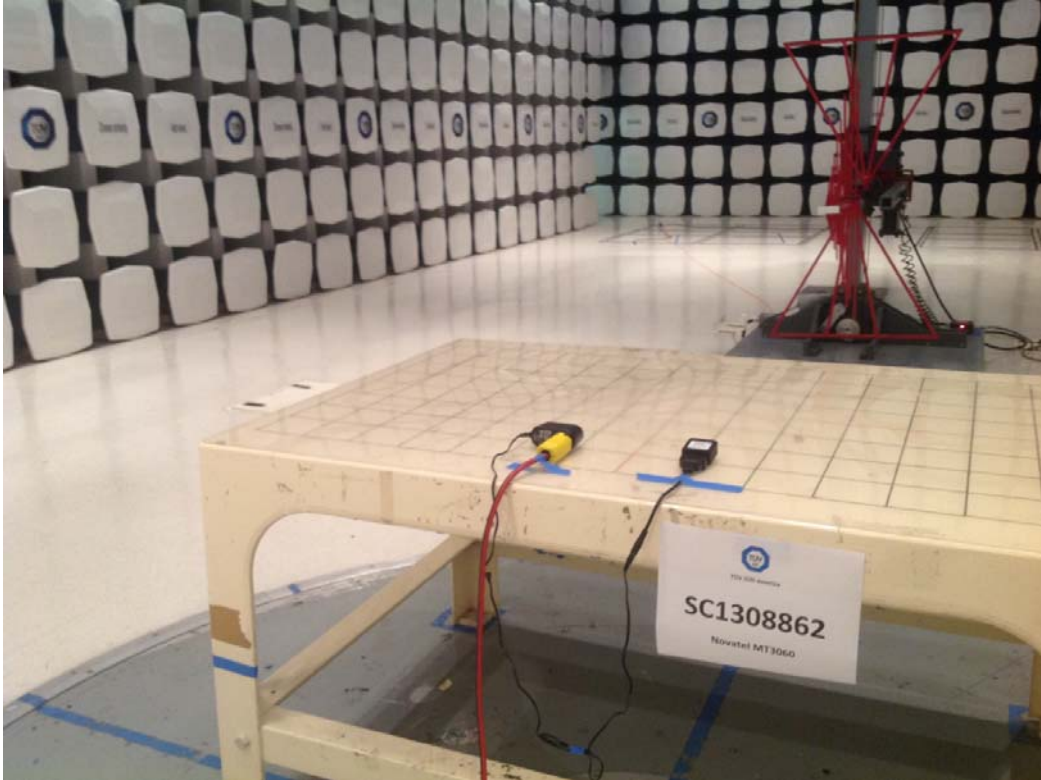
Average Data

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1599.586667	33.2	1000.0	1000.000	398.2	H	126.0	-4.3	20.7	53.9
2000.180000	31.3	1000.0	1000.000	384.1	H	177.0	-1.6	22.6	53.9
4159.266667	30.8	1000.0	1000.000	99.6	H	20.0	3.7	23.1	53.9
6841.626667	32.9	1000.0	1000.000	100.6	H	0.0	8.8	21.0	53.9
10978.49333	35.6	1000.0	1000.000	194.4	H	231.0	14.5	18.3	53.9
17334.88000	42.6	1000.0	1000.000	293.2	V	137.0	22.0	11.3	53.9

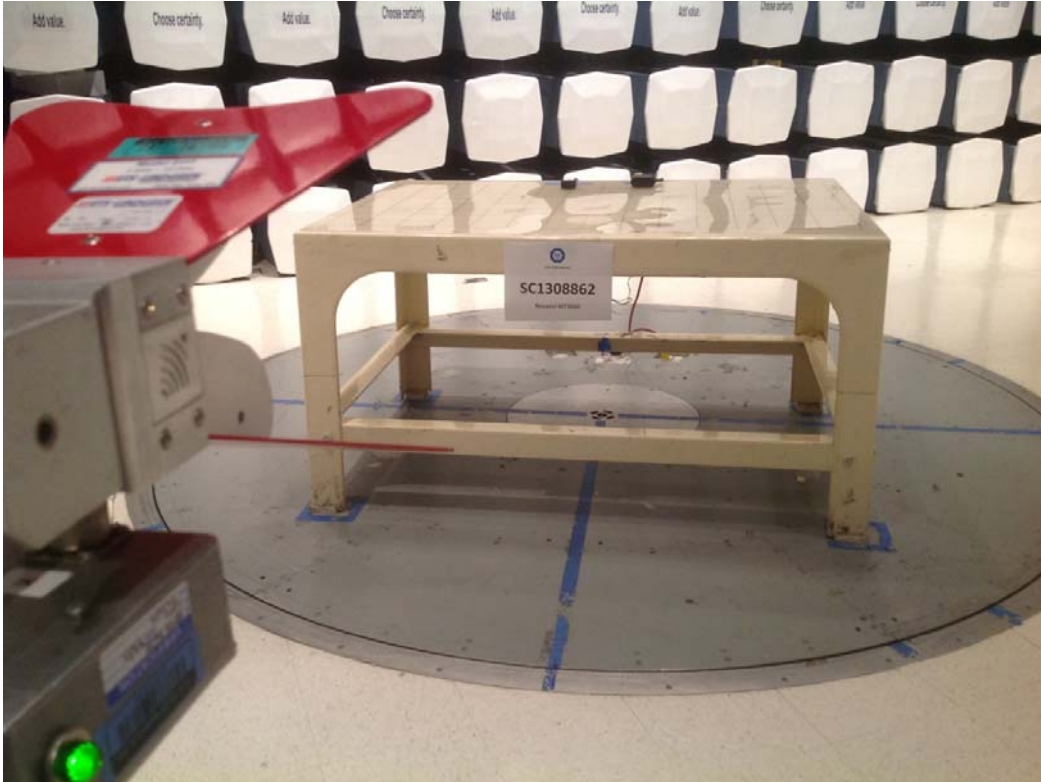
2.2.10 Test Setup Photo (Below 1GHz Front)



2.2.11 Test Setup Photo (Below 1GHz Back)



2.2.12 Test Setup Photo (Above 1GHz Front)



2.2.13 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
Radiated Test Setup						
1033	Bilog Antenna	3142C	00044556	EMCO	06/25/13	06/25/14
7575	Double-ridged waveguide horn antenna	3117	00155511	EMCO	03/25/13	03/25/14
8628	Pre-amplifier	QLJ 01182835-JO	8986002	QuinStar Technologies Inc.	09/21/12	09/21/13
1153	High-frequency cable	SucoFlex 100 SX	N/A	Suhner	09/21/12	09/21/13
8543	High-frequency cable	Micropore 19057793	N/A	United Microwave Products	09/21/12	09/21/13
1040	EMI Test Receiver	ESIB40	100292	Rhode & Schwarz	07/31/13	07/31/14
1049	EMI Test Receiver	ESU	100133	Rhode & Schwarz	07/24/13	07/24/14
1016	Pre-amplifier	PAM-0202	187	PAM	09/24/12	09/24/13
Conducted Emissions						
1024	EMI Test Receiver	ESCS 30	847793/001	Rhode & Schwarz	03/11/13	03/11/14
7567	LISN	FCC-LISN-50-25-2-10	120304	Fischer Custom Comm.	06/11/13	06/11/14
7568	LISN	FCC-LISN-50-25-2-10	120305	Fischer Custom Comm.	07/10/13	07/10/14
8789	20dB Attenuator	HAT-20	N/A	Minicircuits	03/1/13	03/1/14
8607	20dB Attenuator	CAT-20	N/A	Minicircuits	0/17/13	01/17/14
Miscellaneous						
	Test Software	EMC32	V8.53	Rhode & Schwarz	N/A	
6452	Multimeter	3478A	2911A52177	Hewlett Packard	08/02/13	08/02/14
7560	Barometer/Temperature /Humidity Transmitter	iBTHX-W	1240476	Omega	11/19/12	11/19/13

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	3.89	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

3.2.2 Radiated Emission Measurements (Above 1GHz)

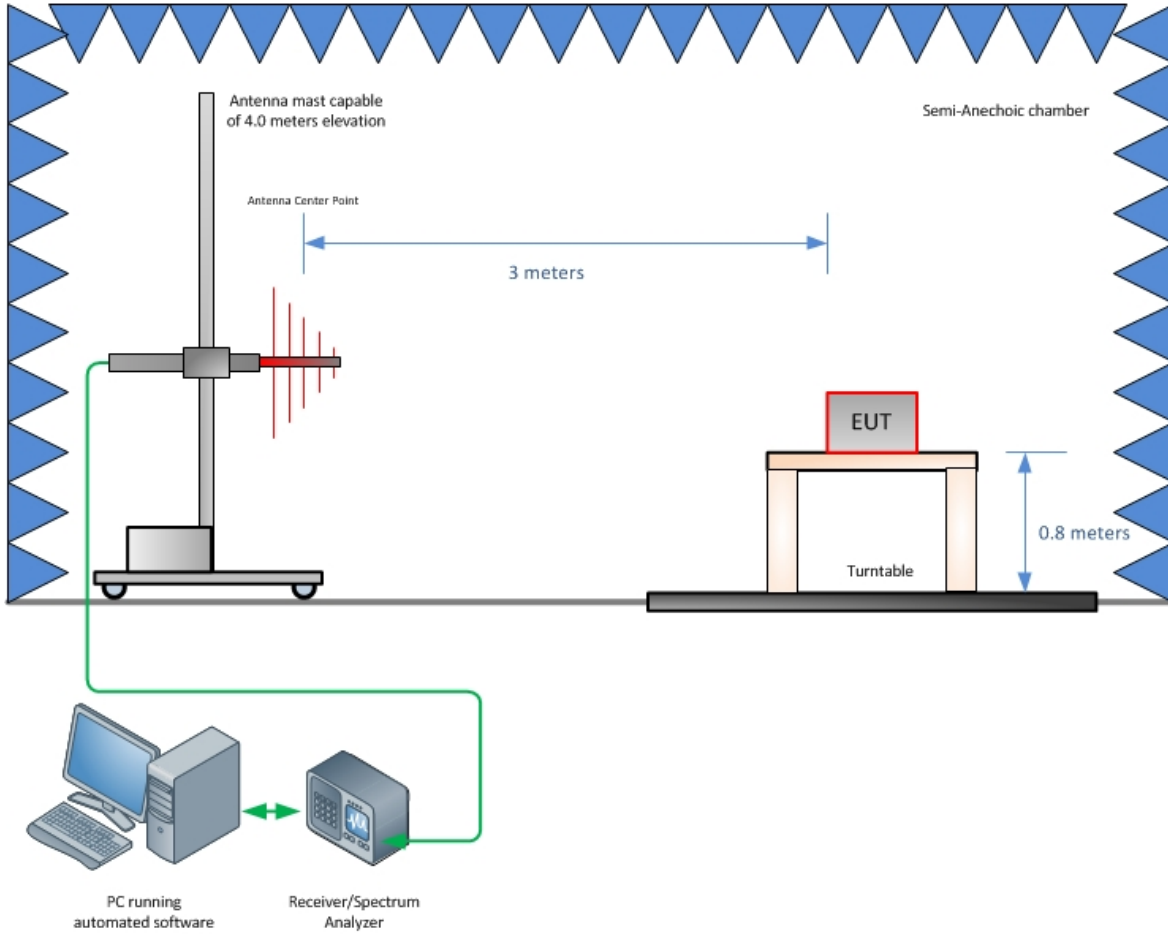
Contribution		Probability Distribution Type	Probability Distribution x_i	Standard Uncertainty $u(x_i)$	$[u(x_i)]^2$
1	Receiver/Spectrum Analyzer	Rectangular	0.57	0.33	0.11
2	Cables	Rectangular	0.70	0.40	0.16
3	Preamp	Rectangular	0.50	0.29	0.08
4	Antenna	Rectangular	0.37	0.21	0.05
5	Site	Rectangular	3.89	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



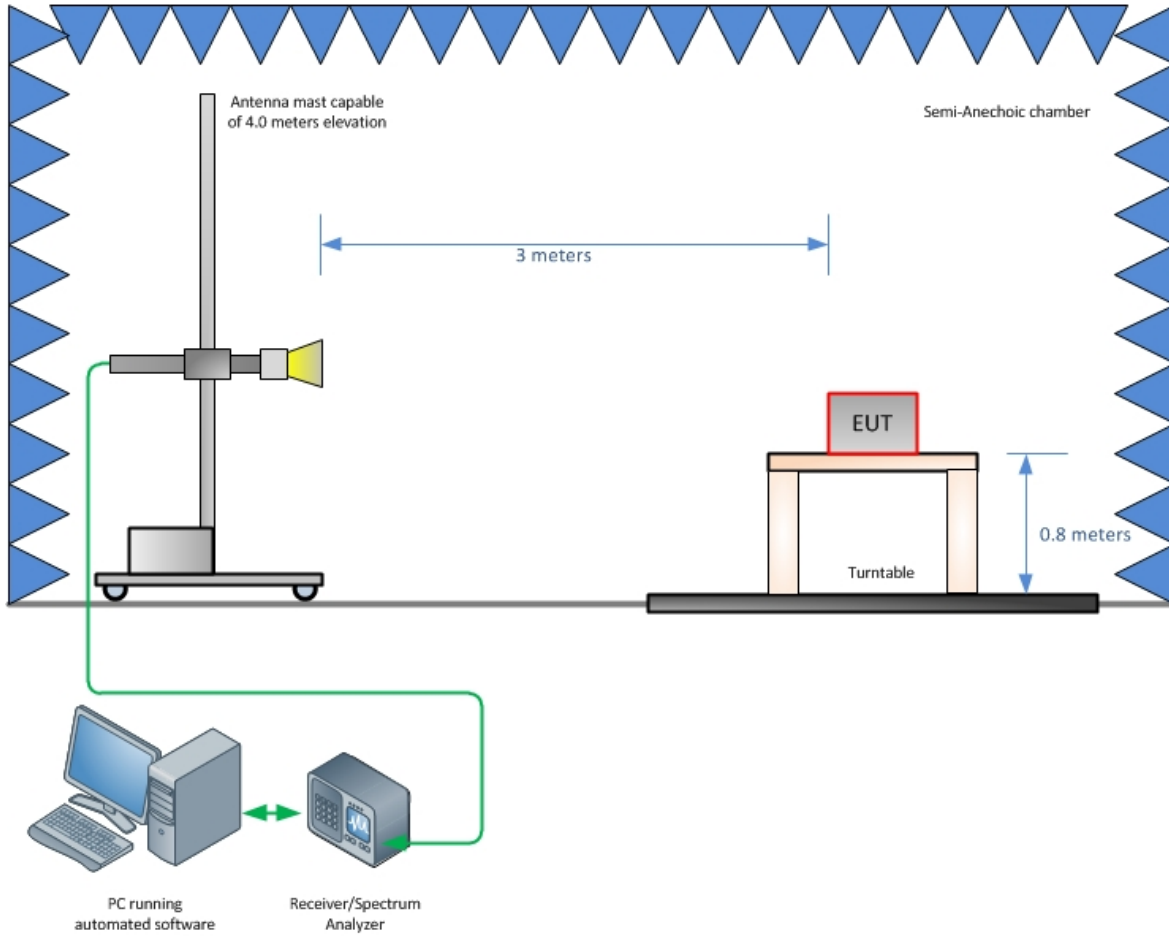
SECTION 4

DIAGRAM OF TEST SETUP

4.1 RADIATED EMISSION TEST SETUP (BELOW 1GHZ)



4.2 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.

This report is the confidential property of the client. As a mutual protection to our clients, the public and TÜV SÜD America, Inc., extracts from the test report shall not be reproduced, except in full without TÜV SÜD America, Inc.'s written approval.

This report must not be used to claim product certification, approval, or endorsement by A2LA, NIST, or any agency of the federal government.

TÜV SÜD America, Inc. and its professional staff hold government and professional organization certifications for AAMI, ACIL, AEA, ANSI, IEEE, A2LA, NIST and VCCI.



A2LA Cert. No. 2955.13