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Report On

EMC Evaluation of
Novatel Wireless Inc. an Inseego Company
NX35-L7504 Mobile Tracking Device

FCC Part 15 Subpart B
ICES-003 Issue 6

Report No. 72141149D

August 2018



America

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REPORT ON EMC Evaluation of the
Novatel Wireless Inc. an Inseego Company
NX35-L7504 Mobile Tracking Device

TEST REPORT NUMBER 72141149D

TEST REPORT DATE August 2018

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DATE	OLD REVISION	NEW REVISION	REASON	PAGES AFFECTED	APPROVED BY
08/29/2018	Initial Release				Ferdinand Custodio



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SECTION 1

REPORT SUMMARY

EMC Evaluation of the
Novatel Wireless Inc. an Inseego Company
NX35-L7504 Mobile Tracking Device



1.1 INTRODUCTION

The information contained in this report is intended to show verification of the Novatel Wireless Inc. an Inseego Company NX35-L7504 Mobile Tracking Device to the requirements of FCC Part 15 Subpart B and Innovation, Science and Economic Development 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. an Inseego Company
Product Marketing Name	NX35-L7504
Model Number(s)	NX35-L7504
Serial Number(s)	N/A (FCC Test Sample)
Number of Samples Tested	1
Highest Frequency Generated or Used	2.4 GHz (Bluetooth)
Test Specification/Issue/Date	<ul style="list-style-type: none"> • FCC Part 15 Subpart B (October 1, 2017) • Spectrum Management and Telecommunications Interference-Causing Equipment Standard ICES-003 Information Technology Equipment (ITE) — Limits and methods of measurement (Issue 6 April 2017).
Start of Test	July 31, 2018
Finish of Test	July 31, 2018
Name of Engineer(s)	Xiaoying Zhang
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 with cross-reference to Innovation, Science and Economic Development Canada Interference-Causing Equipment Standard ICES-003 is shown below.

Part 15	ICES-003	Test Description	Result	Comments/Base Standard
§15.107	Clause 6.1	Conducted Emissions	N/A*	Class B requirement
§15.109	Clause 6.2	Radiated Emissions	Compliant	Class B requirement

N/A* Not Applicable. The EUT is DC powered.



1.3 PRODUCT INFORMATION

1.3.1 Technical Description

The Equipment Under Test (EUT) is a Novatel Wireless Inc. an Inseego Company NX35-L7504 Mobile Tracking Device. The EUT is designed to accurately track position and other data of vehicles or assets and report this data to a data centre. The NX35 is used to gather information relevant to fleet management services, to plot a vehicle position on a map and to follow the route taken by a vehicle during a journey. The position and speed of the vehicle is sampled using GNSS (Global Navigation Satellite System) and reported through a multi-band modem data link with industry standard communication protocols (UMTS/CDMA/LTE networks).

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
Default	The EUT is powered by internal battery or AC/DC Power Supply and work in unintentional mode.

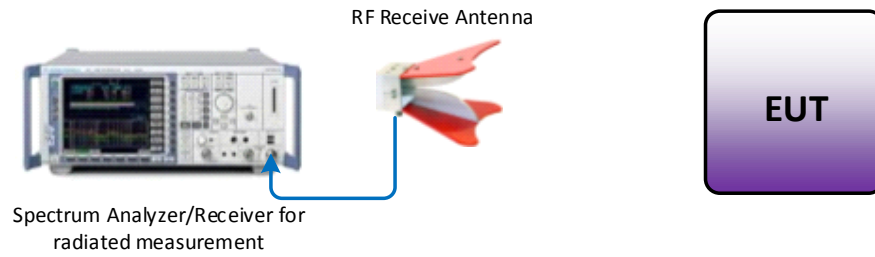
1.4.2 EUT Exercise Software

None.

1.4.3 Support Equipment and I/O cables

Manufacturer	Equipment/Cable	Description
Novatel Wireless	Main Harness	Custom cable/connector which include the main power, RS232, Driver ID, Business/Private/Panic Inputs, Digital Inputs/Outputs, Power and Ignition Inputs
-	USB cable	1.0 meter shielded USB Type A to Micro B cable
Novatel Wireless	GPS/GLONASS Antenna	GPS/GLONASS Antenna including cable
Hewlett Packard	Support DC Power Supply	Model E3610A 0-8V, 0-3A/0-15V, 0-2A

1.4.4 Simplified Test Configuration Diagram



Not To Scale – Illustration Purpose Only
Objects may not represent actual image of original equipment/s 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 (FCC Test 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 C63.4-2014, 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)

16936 Via Del Campo, 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 – Designation 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 Designation is US1146.



1.9.2 Innovation, Science and Economic Development Canada (IC) Registration No.: 3067A-1 & 22806-1

The 10m Semi-anechoic chamber of TUV SUD America Inc. (San Diego Rancho Bernardo) has been registered by Certification and Engineering Bureau of Innovation, Science and Economic Development Canada for radio equipment testing with Registration No. 3067A-1.

The 3m Semi-anechoic chamber of TUV SUD America Inc. (San Diego Mira Mesa) has been registered by Certification and Engineering Bureau of Innovation, Science and Economic Development Canada for radio equipment testing with Registration No. 22806-1.

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 NCC (National Communications Commission - US0102)

TUV SUD America Inc. (San Diego) is listed as a Foreign Recognized Telecommunication Equipment Testing Laboratory and is accredited to ISO/IEC 17025 (A2LA Certificate No.2955.13) which under APEC TEL MRA Phase 1 was designated as a Conformity Assessment Body competent to perform testing of equipment subject to the Technical Regulations covered under its scope of accreditation including RTTE01, PLMN01 and PLMN08 for TTE type of testing and LP002 for Low-Power RF Device type of testing.

1.9.5 VCCI – Registration No. A-0280 and A-0281

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.

1.9.6 RRA – Identification No. US0102

TUV SUD America Inc. (San Diego) is National Radio Research Agency (RRA) recognized laboratory under Phase I of the APEC Tel MRA.

1.9.7 OFCA – U.S. Identification No. US0102

TUV SUD America Inc. (San Diego) is recognized by Office of the Communications Authority (OFCA) under Appendix B, Phase I of the APEC Tel MRA.



SECTION 2

TEST DETAILS

EMC Evaluation of the
Novatel Wireless Inc. an Inseego Company
NX35-L7504 Mobile Tracking Device



2.1 RADIATED EMISSIONS

2.1.1 Specification Reference

Part 15 Subpart B §15.109(a)

2.1.2 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

2.1.3 Equipment Under Test and Modification State

Serial No: N/A (FCC Test Sample) / Default Test Configuration

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

July 31, 2018/XYZ

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	25.0 °C
Relative Humidity	47.8 %
ATM Pressure	98.8 kPa

2.1.7 Additional Observations

- The spectrum was searched from 30MHz 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.



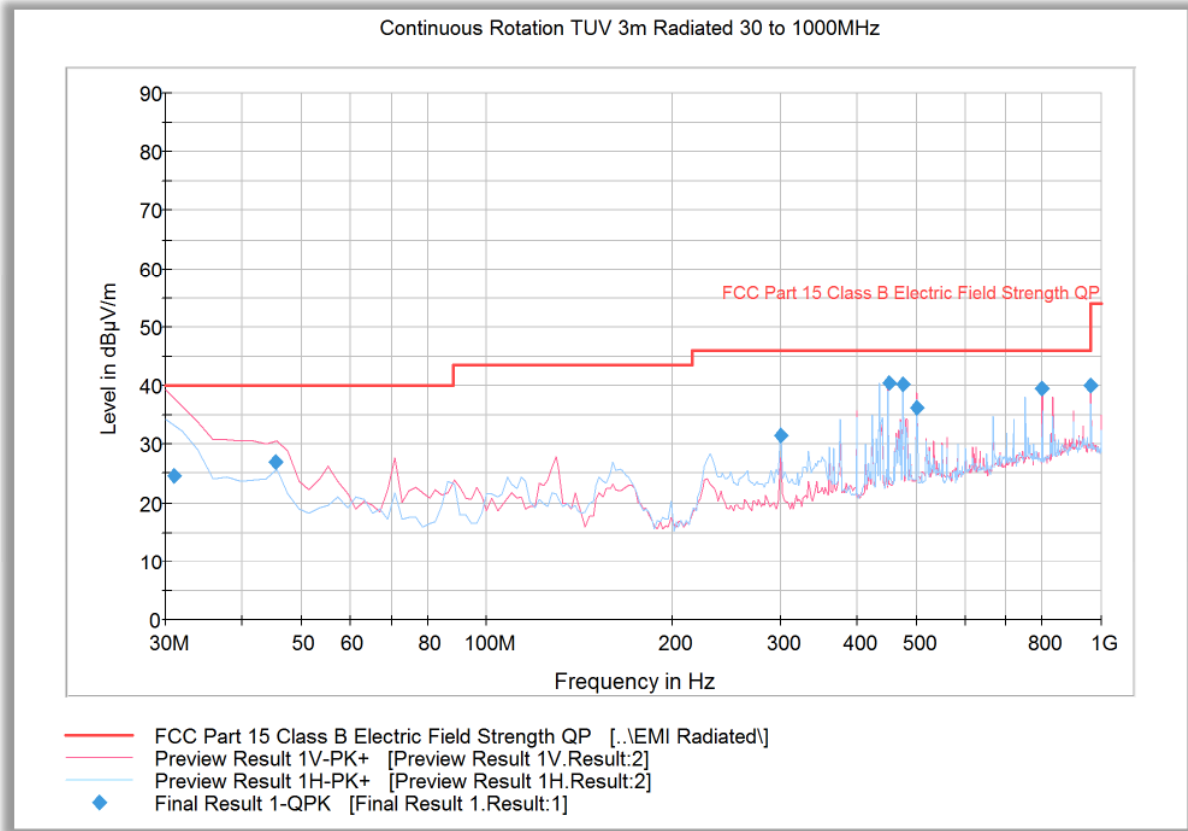
2.1.8 Sample Computation (Radiated Emission)

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

2.1.9 Test Results

See attached plots.

2.1.9.1 Below 1GHz Radiated Emissions



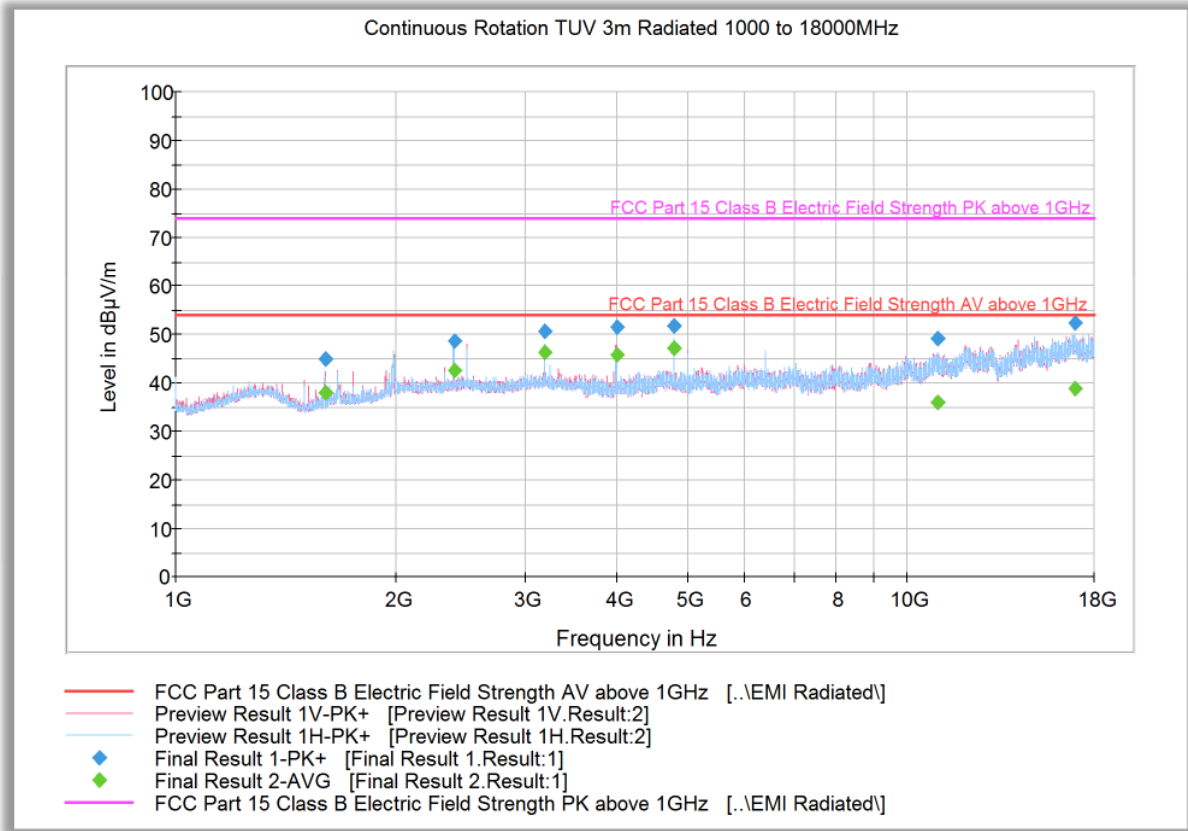
Quasi-Peak Data

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
30.920000	24.7	1000.0	120.000	100.0	V	277.0	-7.1	15.3	40.0
45.231102	26.9	1000.0	120.000	100.0	V	126.0	-14.1	13.1	40.0
300.000401	31.5	1000.0	120.000	100.0	H	31.0	-8.1	14.5	46.0
449.999760	40.6	1000.0	120.000	100.0	V	34.0	-3.2	5.4	46.0
474.990301	40.3	1000.0	120.000	100.0	V	33.0	-1.5	5.7	46.0
499.980842	36.1	1000.0	120.000	100.0	V	30.0	-1.7	9.9	46.0
800.003447	39.6	1000.0	120.000	100.0	H	64.0	4.0	6.4	46.0
960.042244	40.0	1000.0	120.000	100.0	V	168.0	6.9	13.9	53.9

Test Notes:



2.1.9.2 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)
1600.133333	44.9	1000.0	1000.000	400.0	V	3.0	-5.8	29.0	73.9
2400.266667	48.6	1000.0	1000.000	384.0	V	339.0	-1.2	25.3	73.9
3200.000000	50.7	1000.0	1000.000	300.1	H	321.0	1.0	23.2	73.9
4000.166667	51.5	1000.0	1000.000	200.5	V	5.0	2.4	22.4	73.9
4799.900000	51.7	1000.0	1000.000	289.2	H	338.0	3.5	22.2	73.9
10978.666667	49.0	1000.0	1000.000	401.1	H	126.0	11.5	24.9	73.9
16908.433333	52.2	1000.0	1000.000	372.1	H	213.0	17.9	21.7	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)
1600.133333	38.0	1000.0	1000.000	400.0	V	3.0	-5.8	15.9	53.9
2400.266667	42.7	1000.0	1000.000	384.0	V	339.0	-1.2	11.2	53.9
3200.000000	46.4	1000.0	1000.000	300.1	H	321.0	1.0	7.5	53.9
4000.166667	45.7	1000.0	1000.000	200.5	V	5.0	2.4	8.2	53.9
4799.900000	47.2	1000.0	1000.000	289.2	H	338.0	3.5	6.7	53.9
10978.666667	35.9	1000.0	1000.000	401.1	H	126.0	11.5	18.0	53.9
16908.433333	38.9	1000.0	1000.000	372.1	H	213.0	17.9	15.0	53.9

Test Notes:



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						
1033	Bilog Antenna	3142C	00044556	EMCO	10/11/16	10/11/18
1040	EMI Test Receiver	ESIB40	100292	Rhode & Schwarz	10/25/17	10/25/18
1049	EMI Test Receiver	ESU	100133	Rhode & Schwarz	07/13/18	07/13/19
1193	Pre-amplifier	PAM-0202	185	A.H. Systems, Inc.	04/11/18	04/11/19
7575	Double-ridged waveguide horn antenna	3117	00155511	EMCO	06/16/18	06/16/20
8628	Pre-amplifier	QLI-01182835-JO	8986002	Quinstar	03/06/18	03/06/19
7582	Signal/Spectrum Analyzer	FSW26	101614	Rhode & Schwarz	12/14/17	12/14/18
7608	Vector Signal Generator	SMBV100A	259021	Rhode & Schwarz	09/19/17	09/19/19
8921	High-frequency cable	SucoFlex 100 SX	N/A	Suhner	Verified by 7608 and 7582	
8923	High-frequency cable	Micropore 19057793	N/A	United Microwave Products	Verified by 7608 and 7582	
Miscellaneous						
6708	Multimeter	34401A	US36086974	Hewlett Packard	07/18/18	07/18/19
11312	Mini Environmental Quality Meter	850027	CF099-56010-340	Sper Scientific	02/26/18	02/26/19
	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	3.52	1.44	2.07
6	EUT Setup	Rectangular	1.00	0.58	0.33
Combined Uncertainty (u_c):					1.68
Coverage Factor (k):					2
Expanded Uncertainty:					3.36

3.2.3 Radiated Emission Measurements (Above 1GHz)

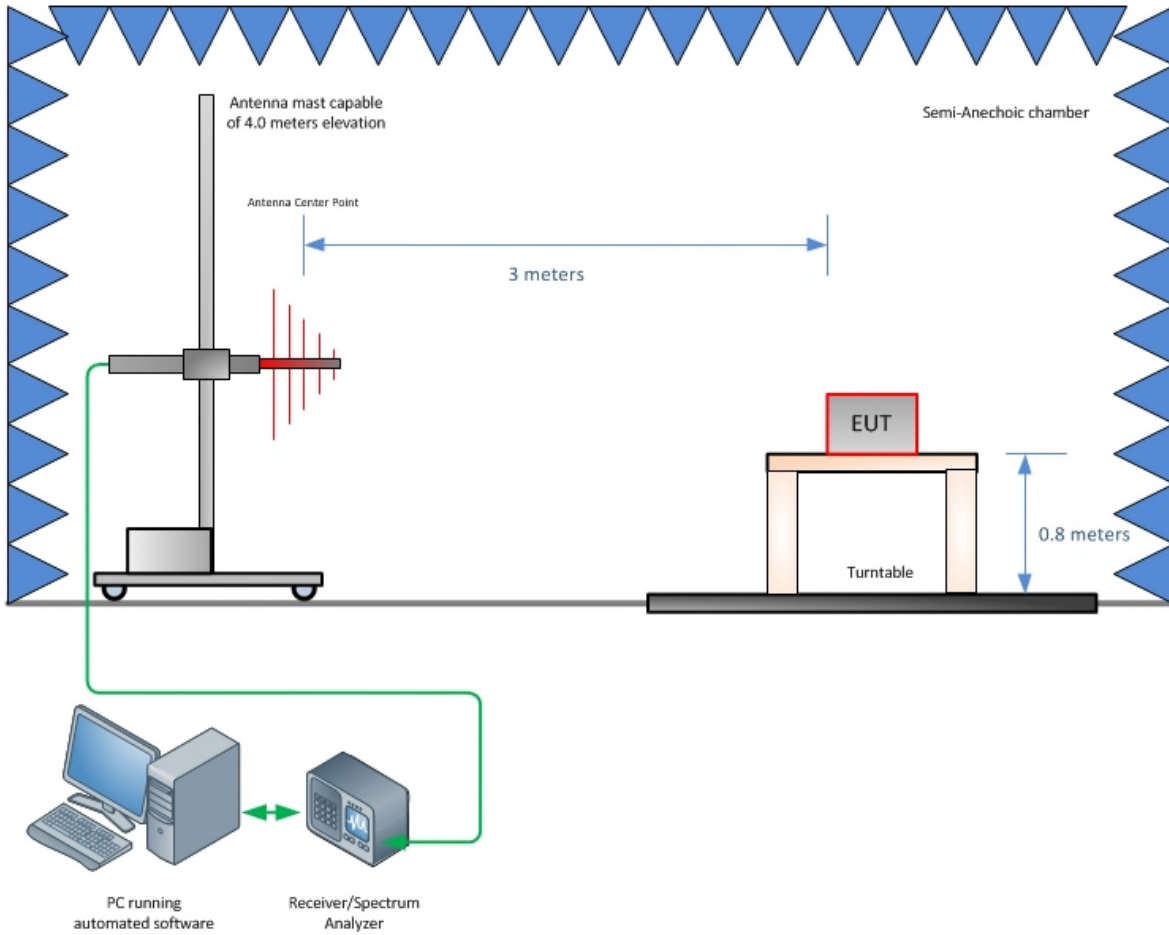
Contribution		Probability Distribution Type	Probability Distribution x_i	Standard Uncertainty $u(x_i)$	$[u(x_i)]^2$
1	Receiver/Spectrum Analyzer	Rectangular	0.57	0.33	0.11
2	Cables	Rectangular	0.70	0.40	0.16
3	Preamp	Rectangular	0.50	0.29	0.08
4	Antenna	Rectangular	0.37	0.21	0.05
5	Site	Rectangular	3.00	1.22	1.50
6	EUT Setup	Rectangular	1.00	0.58	0.33
Combined Uncertainty (u_c):					1.49
Coverage Factor (k):					2
Expanded Uncertainty:					2.99



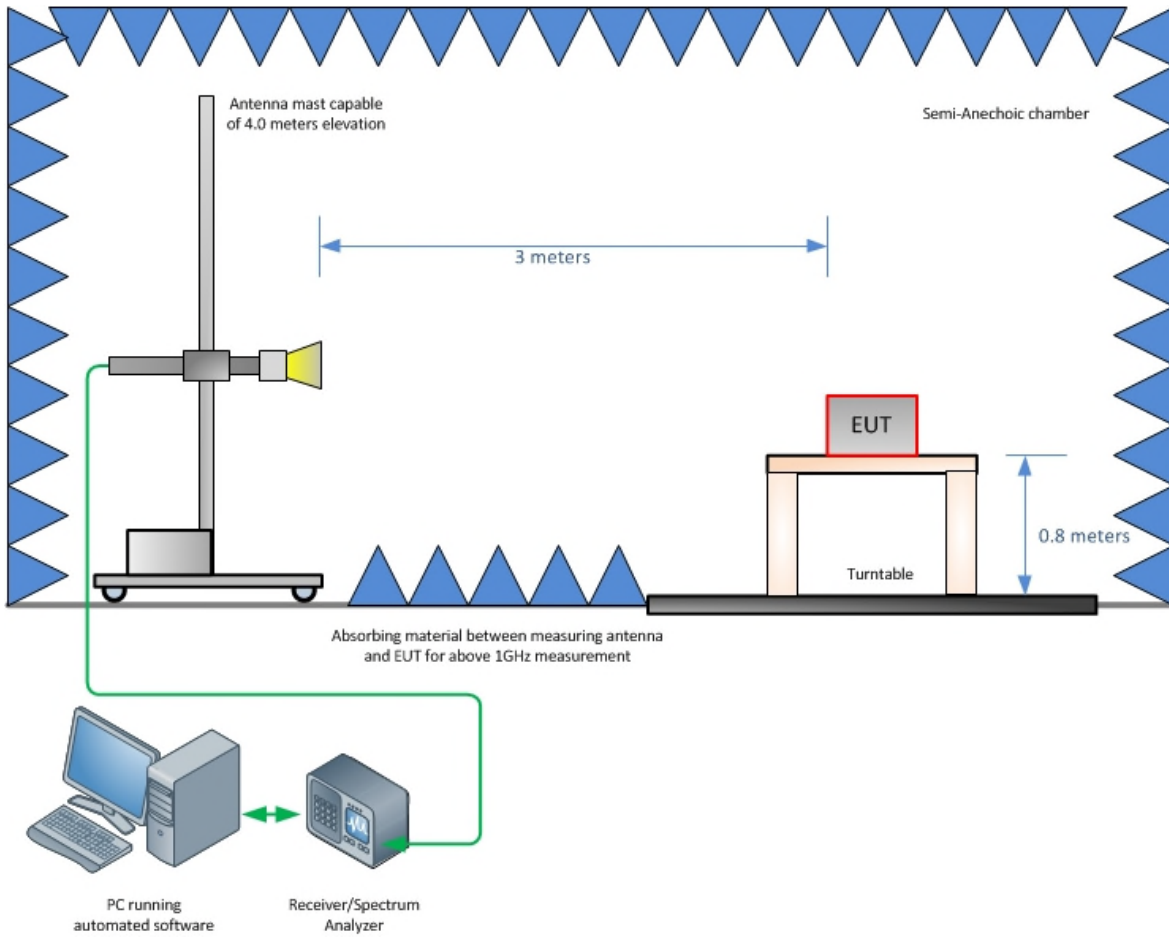
SECTION 4

DIAGRAM OF TEST SETUP

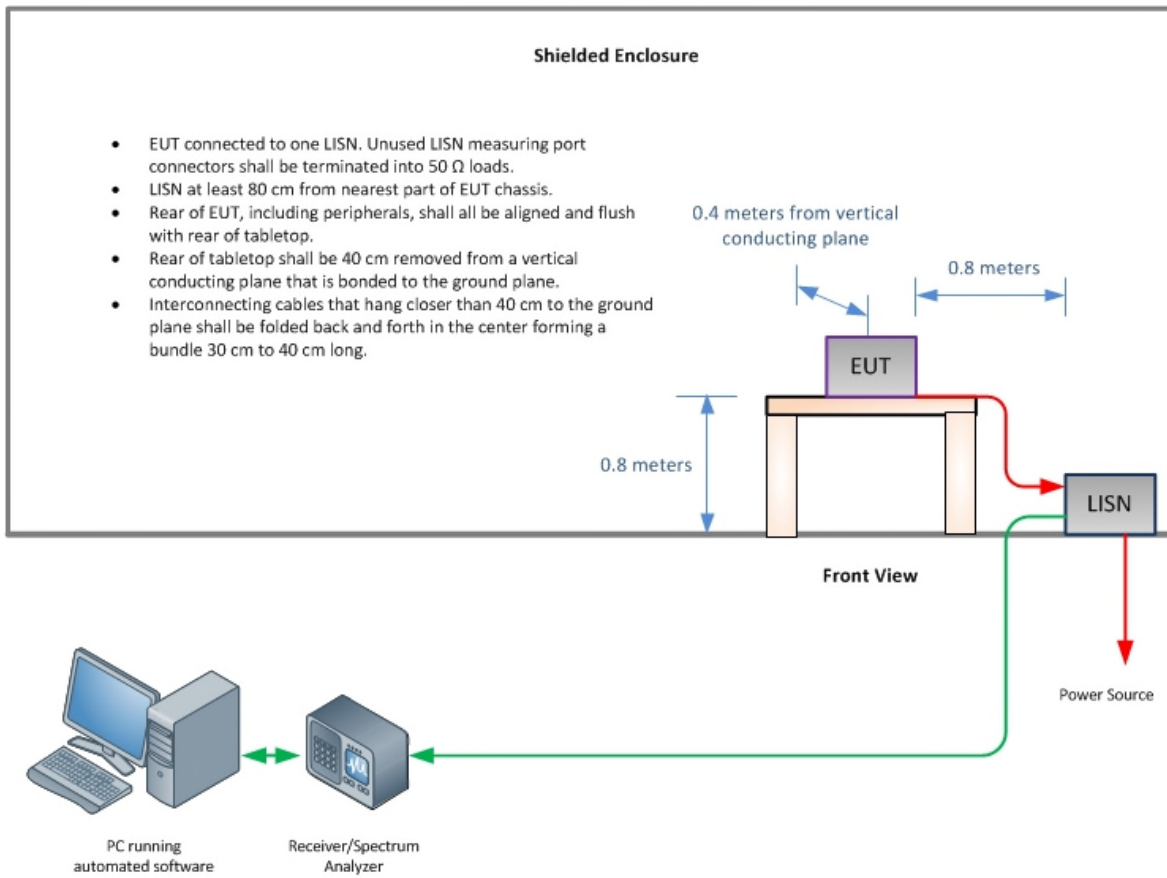
4.1 TEST SETUP DIAGRAM



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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