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Report On

Application for Grant of Equipment Authorization of the
ImThera Medical, Inc.
aura6000 IPG Implantable Pulse Generator

FCC Part 95 Subpart I § 95.627
IC RSS-243 Issue 3 February 2010

Report No. SD72112017-1215A Rev.1 December 2015

REPORT ON	Radio Testing of the ImThera Medical, Inc. Implantable Pulse Generator
TEST REPORT NUMBER	SD72112017-1215A Rev.1
PREPARED FOR	ImThera Medical, Inc. 12555 High Bluff Drive, Suite 310 San Diego, CA 92130-2056
CONTACT PERSON	Paul Meadows VP-R&D, CTO (858) 259-2980 x11 pmeadows@imtheramedical.com
PREPARED BY	Ferdinand S. Custodio **Name** Authorized Signatory Title: EMC/Senior Wireless Test Engineer
APPROVED BY	Chip R. Fleury **Name** Authorized Signatory
DATED	March 03, 2016

Revision History

SD72112017-1215A Rev.1 ImThera Medical, Inc. aura6000 IPG Implantable Pulse Generator					
DATE	OLD REVISION	NEW REVISION	REASON	PAGES AFFECTED	APPROVED BY
03/03/2016	Initial Release				Chip R. Fleury
03/17/2016	Initial Release	Rev. 1	Corrected High Channel frequency on Section 2.1.8 from 500MHz to 405MHz	17	Ferdie Custodio

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SECTION 1

REPORT SUMMARY

Radio Testing of the
ImThera Medical, Inc.
Implantable Pulse Generator

1.1 INTRODUCTION

The information contained in this report is intended to show verification of the ImThera Medical, Inc. aura6000 IPG Implantable Pulse Generator to the requirements of FCC Part 95 Subpart I § 95.627 and IC RSS-243 Issue 3 February 2010.

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	ImThera Medical, Inc.
Model Number(s)	100.0100
FCC ID Number	2AGS5-IPG
IC Number	20934-IPG
Serial Number(s)	F114120904649; F1141209049
Number of Samples Tested	2
Test Specification/Issue/Date	• FCC Part 95 Subpart I § 95.627 (October 1, 2014). • IC RSS-243 Issue 3 February 2010. Medical Devices Operating in the 401-406 MHz Frequency Band • RSS-Gen - General Requirements for Compliance of Radio Apparatus (Issue 4, November 2014). • KDB 412172 D01 Determining ERP And EIRP V01r01 (August 07, 2015) Guidelines For Determining The Effective Radiated Power (ERP) and Equivalent Isotropically Radiated Power (EIRP) of an RF Transmitting System
Start of Test	December 07, 2015
Finish of Test	December 14, 2015
Name of Engineer(s)	Ferdinand Custodio
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 FCC Part 95 Subpart I § 95.627 with cross-reference to the corresponding IC RSS standard is shown below.

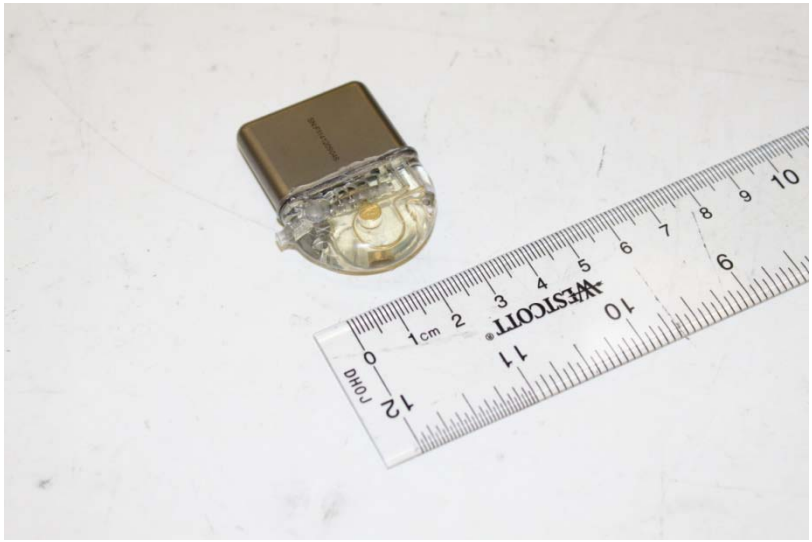
Section	FCC Part 95 Spec Clause	RSS	Test Description	Result	Comments/ Base Standard
2.1	§95.639(f)(1)	RSS-243 Section 5.4	Transmitter Output Power	Compliant	
2.2		RSS-Gen 8.8	Conducted Emissions	N/A	
2.3		RSS-Gen 6.6	99% Emission Bandwidth	Compliant	
2.4	§95.635(d)(4)	RSS-243 Section 5.5(b)	Emission Mask	Compliant	
2.5	§95.633(e)	RSS-243 Section 5.1	Emission Bandwidth	Compliant	
2.6	§95.628(d)	RSS-243 Section 5.3	Frequency Stability	Compliant	
2.7	§95.635(d)(1)(i)	RSS-243 Section 5.5	Transmitter Unwanted Emissions	Compliant	
2.8		RSS-243 Section 5.6	Receiver Spurious Emissions	Compliant	

N/A EUT is an implantable medical device.

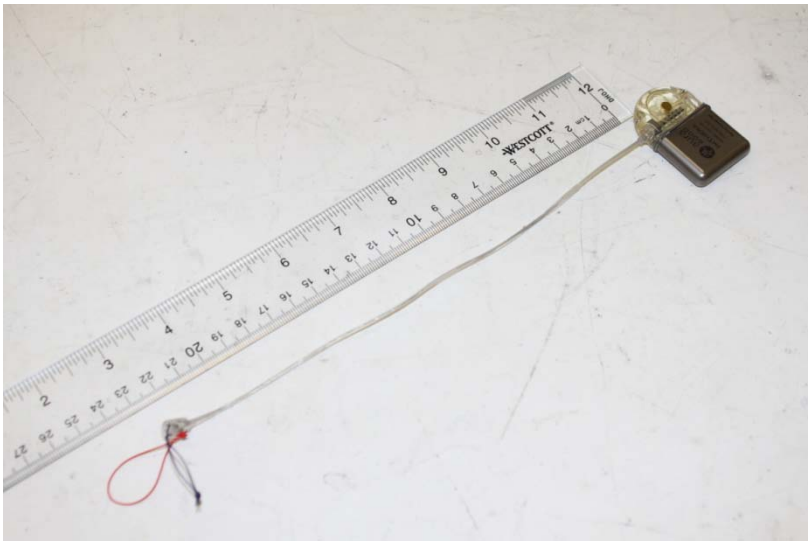
1.3 PRODUCT INFORMATION

1.3.1 Technical Description

The Equipment Under Test (EUT) was an ImThera Medical, Inc. aura6000 IPG Implantable Pulse Generator as shown in the photograph below. The EUT is an implantable neurostimulator for the treatment of Obstructive Sleep Apnea.



Equipment Under Test



EUT with Lead

1.3.2 EUT General Description

EUT Description	Implantable Pulse Generator
Model Name	aura6000 IPG
Model Number(s)	100.0100
Battery Type	3.6V Lithium-ion secondary cell 50 mAh, inductive coupling charging with an estimated lifespan of 15 years
Dimensions	45 x 32 x 8 mm
Weight	16 g
Mode Verified	MedRadio 401.01 MHz to 405.81 MHz
Capability	MedRadio 401.01 MHz to 405.81 MHz
Transmitter Output Power	0.993 µW (EIRP)
Primary Unit (EUT)	☐ Production ☐ Pre-Production ☒ Engineering
Antenna Type	Telemetry Coil (gold wire (material SPC-00557-01) with resistance 1Ω max)
Antenna Part Number	C30-C00015

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1.4 EUT TEST CONFIGURATION

1.4.1 Test Configuration Description

Test Configuration	Description
Default	Telemetry Mode. The EUT Firmware (FW) was replaced with a special version of the FW that, when commanded, would continuously broadcast packets of data on the assigned channel of the MedRadio band for 20 minutes. This command is mediated by using a notebook PC running the aura6000 Clinical Manager (aCM) software program, connected via USB to an RCC, and using a manual command window function in the aCM the broadcast command is sent to the IPG.

1.4.2 EUT Exercise Software

Aura6000 Clinical Manager (aCM) software program on the support laptop.

1.4.3 Support Equipment and I/O cables

Manufacturer	Equipment/Cable	Description
-	-	-

Note: *EUT verified on a standalone configuration. The manufacturer was present during testing and programs the EUT prior each test. Support equipment used to program the EUT were not part of the actual test setup therefore not listed.*

1.4.4 General Test Configuration

For a transmitter intended to be implanted in a human body, radiated emissions and EIRP measurements for transmissions by stations authorized under the present Section (§95.627) may be made in accordance with a Commission-approved human body simulator and test technique. A formula for a suitable tissue substitute material as defined in OET Bulletin 65 Supplement C (01-01) was used.

Listed below is the composition of the solution used during radiated emissions tests:

Solution	Percentage by weight	Specific Gravity
Water	52.40 %	1.00
Salt	1.400 %	2.17
Sugar	45.00 %	0.85
HEC	1.000 %	0.98
Bactericide	0.100 %	
Total	**99.90 %**	

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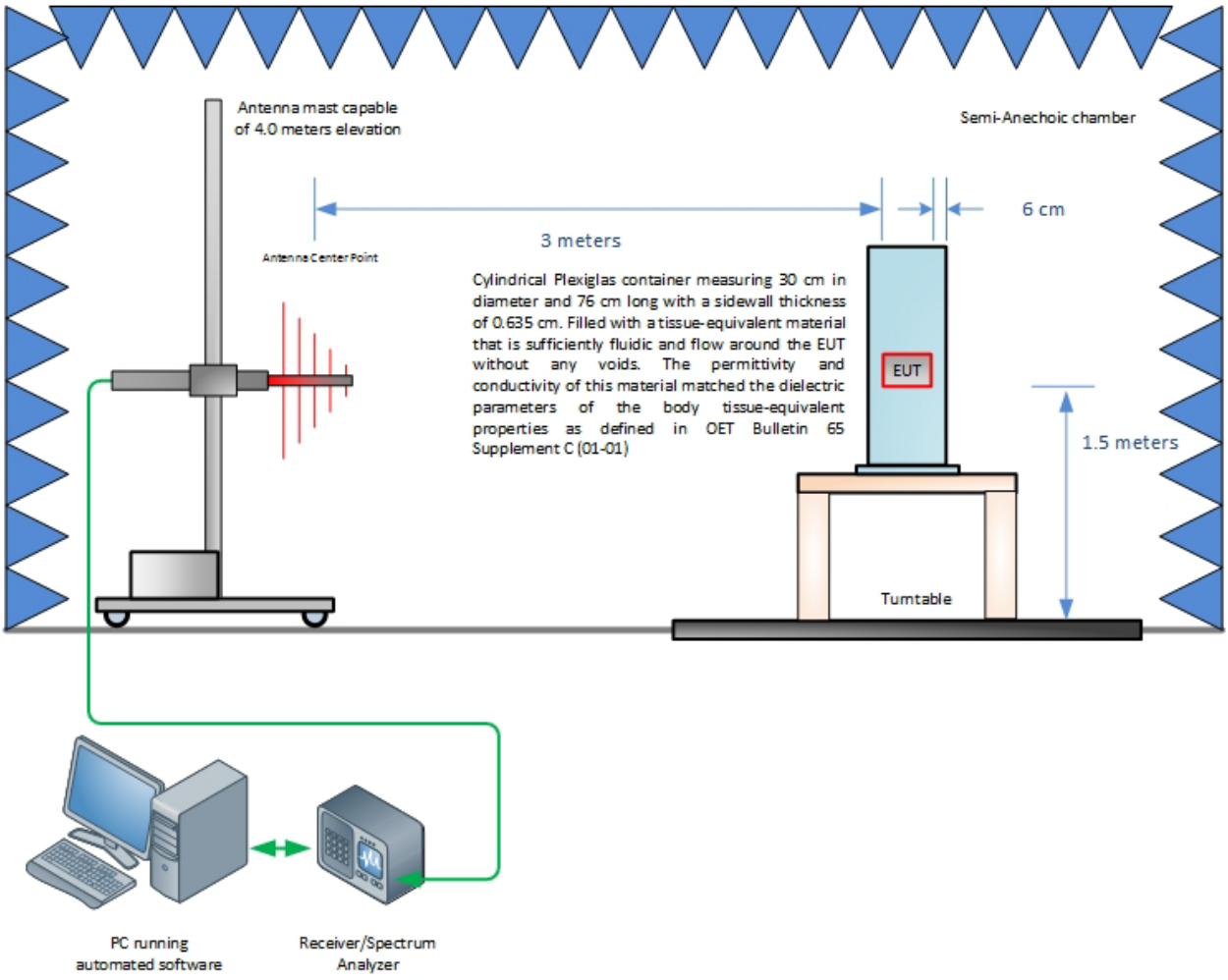
1.4.5 Simplified Test Configuration Diagram



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 F114120904649 and F1141209049		
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 conducted and 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)

Sony Electronics Inc., Building #8 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 §2.948 of the FCC rules. The acceptance letter from the FCC is maintained in our files and the Registration is US1146.

1.9.2 **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

Radio Testing of the
ImThera Medical, Inc.
Implantable Pulse Generator

2.1 TRANSMITTER OUTPUT POWER

2.1.1 Specification Reference

Part 95 Subpart E §95.639(f)(1) and RSS-243 Section 5.4

2.1.2 Standard Applicable

(1) For transmitters operating in the 401-406 MHz band that are not excepted under §95.627(b) from the frequency monitoring requirements of §95.627(a), the maximum radiated power in any 300 kHz bandwidth by MedRadio transmitters operating at 402-405 MHz, or in any 100 kHz bandwidth by MedRadio transmitters operating at 401-402 MHz or 405-406 MHz shall not exceed 25 microwatts EIRP. For transmitters that are excepted under §95.627(b) from the frequency monitoring requirements of §95.627(a), the power radiated by any station operating in 402-405 MHz shall not exceed 100 nanowatts EIRP confined to a maximum total emission bandwidth of 300 kHz centered at 403.65 MHz, the power radiated by any station operating in 401-401.85 MHz or 405-406 MHz shall not exceed 250 nanowatts EIRP in any 100 kHz bandwidth and the power radiated by any station operating in 401.85-402 MHz shall not exceed 25 microwatts in the 150 kHz bandwidth. See §§95.633(e).

2.1.3 Equipment Under Test and Modification State

Serial No: F1141209049 / Default Test Configuration

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

December 07, 2015/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/ Test Location

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

Ambient Temperature	22.4 °C
Relative Humidity	29.2 %
ATM Pressure	98.9 kPa

2.1.7 Additional Observations

- EIRP was calculated using Field Strength Approach (linear terms) of KDB 412172.

$$EIRP = \frac{(\mathrm{E\ x\ d})^2}{30}$$

Where: E = electric field strength in V/m
d = measurement distance in meters

- Only the worst case orientation (between Horizontal and Vertical EUT mounting) presented.
- Field Strength measurements were from Section 2.7 of this test report.
- Electric Field Strength was calculated from the formula:

$$V/m = 10^{\left(\frac{\left(db\mu\frac{V}{m}\right)-120}{20}\right)}$$

2.1.8 **Test Results (Calculation)**

Channel	Frequency (MHz)	Field Strength @ 3 meters (dbµV/m)	Electric Field Strength (V/m)	EIRP (mW)	EIRP Limit (mW)	Compliance
Low	401.85	65.2	0.00182	0.000993	0.025	Complies
High	405.00	61.9	0.00124	0.000461	0.025	Complies

2.2 CONDUCTED EMISSIONS

2.2.1 Specification Reference

RSS Gen. 8.8

2.2.2 Standard Applicable

A radio apparatus that is designed to be connected to the public utility (AC) power line shall ensure that the radio frequency voltage, which is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz-30 MHz, shall not exceed the limits in the Table below.

Unless the requirements applicable to a given device state otherwise, for any radio apparatus equipped to operate from the public utility AC power supply either directly or indirectly (such as with a battery charger), the radio frequency voltage of emissions conducted back onto the AC power lines in the frequency range of 0.15 MHz to 30 MHz shall not exceed the limits shown in the below. The more stringent limit applies at the frequency range boundaries.

The conducted emissions shall be measured in accordance with the reference publication mentioned in Section 3 of RSS-Gen.

Frequency of emission (MHz)	Conducted limit (dBµV)	
	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.*

2.2.3 Equipment Under Test and Modification State

N/A (Not Applicable). EUT is an implantable medical device.

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2.3 99% EMISSION BANDWIDTH

2.3.1 Specification Reference

RSS-Gen Clause 6.6

2.3.2 Standard Applicable

The emission bandwidth (x dB) is defined as the frequency range between two points, one above and one below the carrier frequency, at which the spectral density of the emission is attenuated x dB below the maximum in-band spectral density of the modulated signal. Spectral density (power per unit bandwidth) is to be measured with a detector of resolution bandwidth in the range of 1% to 5% of the anticipated emission bandwidth, and a video bandwidth at least 3x the resolution bandwidth.
When the occupied bandwidth limit is not stated in the applicable RSS or reference measurement method, the transmitted signal bandwidth shall be reported as the 99% emission bandwidth, as calculated or measured.

- The transmitter shall be operated at its maximum carrier power measured under normal test conditions.
- The span of the analyzer shall be set to capture all products of the modulation process, including the emission skirts.
- The resolution bandwidth (RBW) shall be in the range of 1% to 5% of the occupied bandwidth (OBW) and video bandwidth (VBW) shall be approximately 3x RBW.

Note: Video averaging is not permitted.
A peak, or peak hold, may be used in place of the sampling detector as this may produce a wider bandwidth than the actual bandwidth (worst-case measurement). Use of a peak hold may be necessary to determine the occupied bandwidth if the device is not transmitting continuously.
The trace data points are recovered and are directly summed in linear power level terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached and that frequency recorded. The process is repeated for the highest frequency data points (starting at the highest frequency, at the right side of the span, and going down in frequency). This frequency is then recorded.
The difference between the two recorded frequencies is the 99% occupied bandwidth.

2.3.3 Equipment Under Test and Modification State

Serial No: F114120904649 and F1141209049 / Default Test Configuration

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

December 10, 2015/FSC

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

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Ambient Temperature	23.6 °C
Relative Humidity	37.3.%
ATM Pressure	99.1 kPa

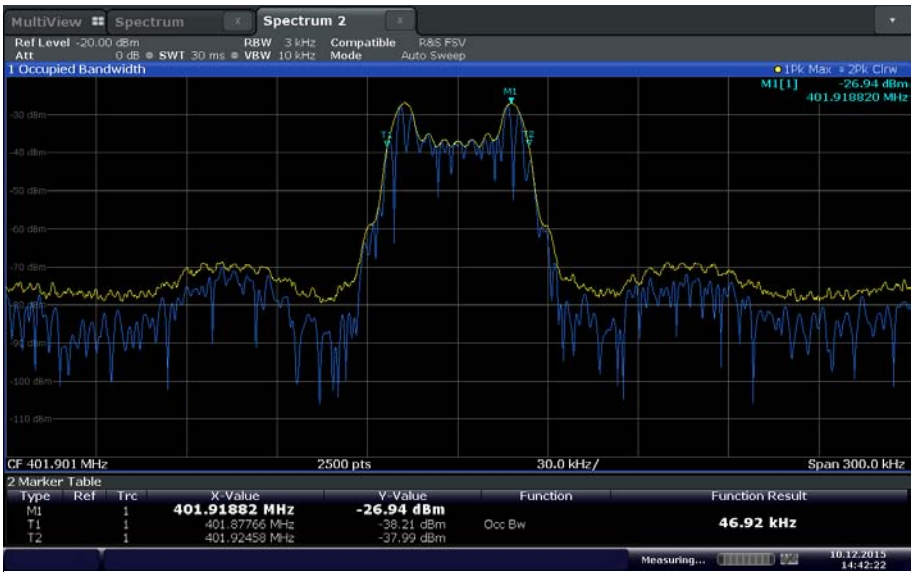
2.3.7 Additional Observations

- This is a radiated test.
- Span is wide enough to capture the channel transmission.
- RBW is 1% of the span.
- VBW is 3X RBW.
- Sweep is auto.
- Detector is peak.
- The % Power Bandwidth setting in the spectrum analyzer was set to 99% (default).
- The Channel Bandwidth measurement function of the spectrum analyzer was used for this test.

2.3.8 Test Results (For reporting purposes only)

Channel	Measured 99% EBW (kHz)
Low (401.85 MHz)	46.92
High (405 MHz)	46.92

2.3.9 Test Results Plots



Date: 10.DEC.2015 14:42:22

Low Channel

Date: 10.DEC.2015 14:39:54

High Channel

2.4 EMISSION MASK

2.4.1 Specification Reference

Part 95 Subpart E §95.635(d)(4) and RSS-243 Section 5.5(b)

2.4.2 Standard Applicable

(4) For devices designed to operate in the 402-405 MHz band: Emissions within the band more than 150 kHz away from the center frequency of the spectrum the transmission is intended to occupy and emissions 250 kHz or less below 402 MHz or above 405 MHz band will be attenuated below the maximum permitted output power by at least 20 dB.

2.4.3 Equipment Under Test and Modification State

Serial No: F114120904649 and F1141209049/ Default Test Configuration

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

December 11, 2015/FSC

2.4.5 Test Equipment Used

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

2.4.6 Environmental Conditions/ Test Location

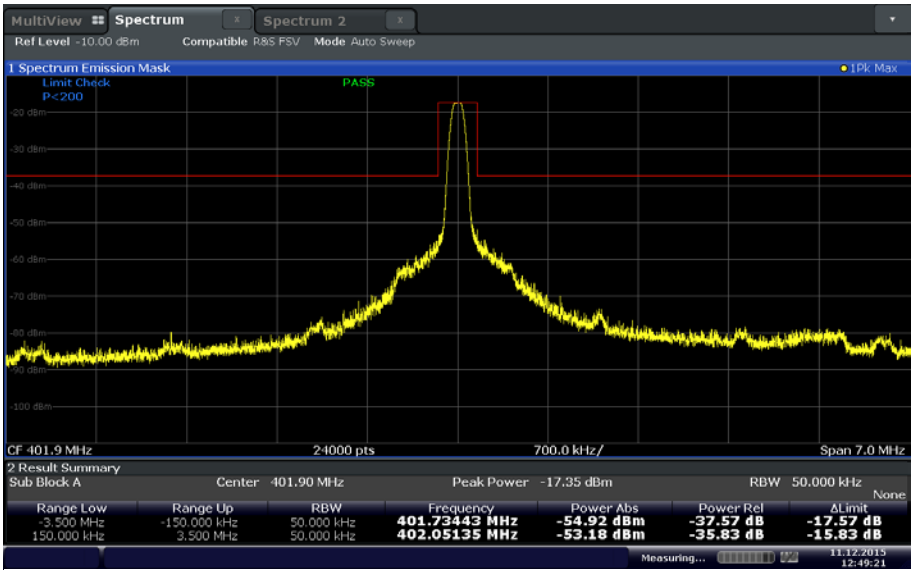
Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

Ambient Temperature	24.4 °C
Relative Humidity	44.1.%
ATM Pressure	98.7 kPa

2.4.7 Additional Observations

- This is a radiated test.
- Span was adjusted to always show frequency range between 401.75 MHz and 405.25 MHz.
- RBW is set to approximately 1% to 5% of the span (worst case).
- VBW is ≥3X RBW.
- Detector is peak.
- The Spectrum Emission Mask function of the spectrum analyzer was used for this test.
- Mask was set to 20dBc more than 150kHz away from the center frequency.

2.4.8 **Test Results Plots**



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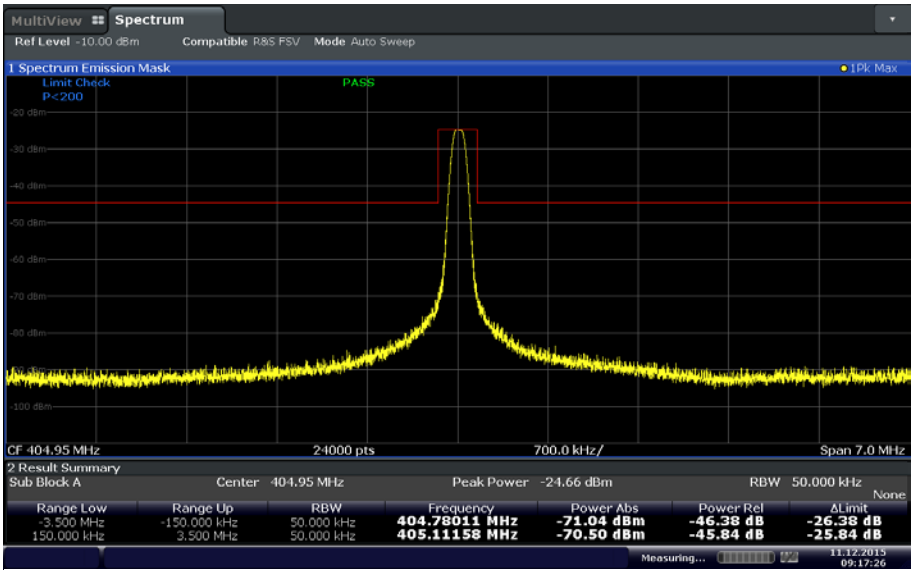
Low Channel



Date: 11.DEC.2015 09:17:26

High Channel

2.5 EMISSION BANDWIDTH

2.5.1 Specification Reference

Part 95 Subpart E §95.633(e) and RSS-243 Section 5.1

2.5.2 Standard Applicable

(1) For stations operating in 402-405 MHz, the maximum authorized emission bandwidth is 300 kHz. For stations operating in 401-401.85 MHz or 405-406 MHz, the maximum authorized emission bandwidth is 100 kHz. For stations operating in 401.85-402 MHz, the maximum authorized emission bandwidth is 150 kHz. For stations operating in 413-419 MHz, 426-432 MHz, 438-444 MHz, or 451-457 MHz, the maximum authorized emission bandwidth is 6 megahertz. For stations operating in 2360-2400 MHz, the maximum authorized emission bandwidth is 5 megahertz.

(3) Emission bandwidth will be determined by measuring the width of the signal between points, one below the carrier center frequency and one above the carrier center frequency, that are 20 dB down relative to the maximum level of the modulated carrier. Compliance with the emission bandwidth limit is based on the use of measurement instrumentation employing a peak detector function with an instrument resolution bandwidth approximately equal to 1.0 percent of the emission bandwidth of the device under measurement

2.5.3 Equipment Under Test and Modification State

Serial No: F114120904649 and F1141209049 / Default Test Configuration

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

December 10, 2015/FSC

2.5.5 Test Equipment Used

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

2.5.6 Environmental Conditions/ Test Location

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

Ambient Temperature	23.6 °C
Relative Humidity	37.3.%
ATM Pressure	99.1 kPa

2.5.7 Additional Observations

- This is a radiated test.
- Span is between 2X and 5X of the OBW.
- RBW is set to approximately 1% to 5% of the OBW.
- VBW is ≥3X RBW.
- Sweep is auto.

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- Detector is peak.
- The "n" dB down marker function of the spectrum analyzer was used for this test.

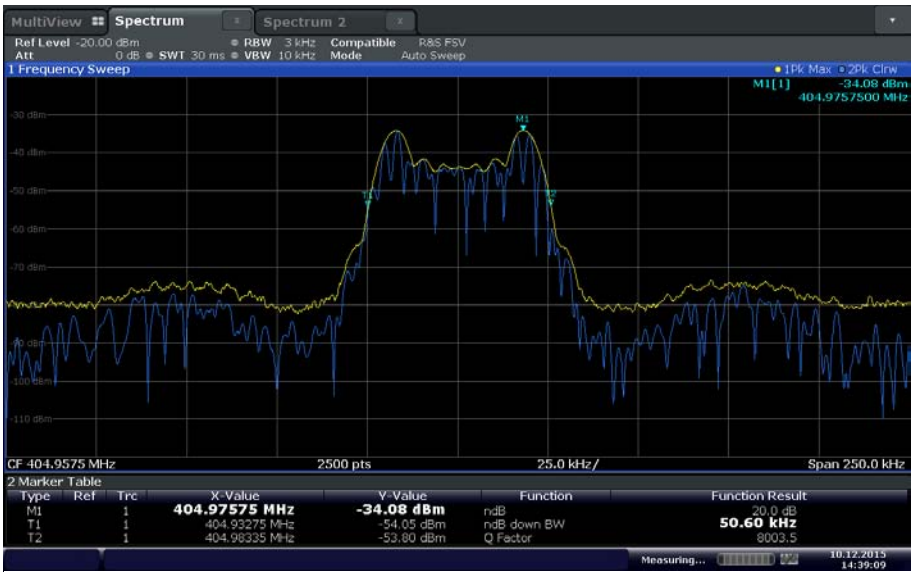
2.5.8 Test Results

Channel	Measured Emission Bandwidth (kHz)	Maximum Authorized Emission Bandwidth (kHz)	Compliance
Low (401.85 MHz)	50.70	100	Complies
High (405.00 MHz)	50.60	300	Complies

2.5.9 Test Results Plots

Date: 10.DEC.2015 14:43:36

Low Channel



Date: 10.DEC.2015 14:39:09

High Channel

2.6 FREQUENCY STABILITY

2.6.1 Specification Reference

Part 95 Subpart E §95.628(d) and RSS-243 Section 5.3

2.6.2 Standard Applicable

Each transmitter in the MedRadio service must maintain a frequency stability of ±100 ppm of the operating frequency over the range:

(1) 25 °C to 45 °C in the case of medical implant transmitters; and
(2) 0 °C to 55 °C in the case of MedRadio programmer/control transmitters and Medical body-worn transmitters

2.6.3 Equipment Under Test and Modification State

Serial No: F1141209049/ Default Test Configuration

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

December 10, 2015/FSC

2.6.5 Test Equipment Used

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

2.6.6 Environmental Conditions/ Test Location

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

Ambient Temperature	23.6 °C
Relative Humidity	37.3.%
ATM Pressure	99.1 kPa

2.6.7 Additional Observations

- The EUT is a medical implant transmitter. Temperature range verified was from 25 °C to 45 °C.
- The EUT is hermetically sealed. It is impractical to perform variation of primary supply voltage. Verification performed near the battery operating end point as specified by the manufacturer (near discharged state).
- Both Low and High channels verified, only Low channel presented.
- Since the fundamental frequency is modulated, the center frequency was calculated by using OBW measurement function of the spectrum analyzer and the following formula:

$$Center\ Frequency = \frac{T1 + T2}{2}$$

Where: T1 = Lower OBW edge
T2 = Upper OBW edge

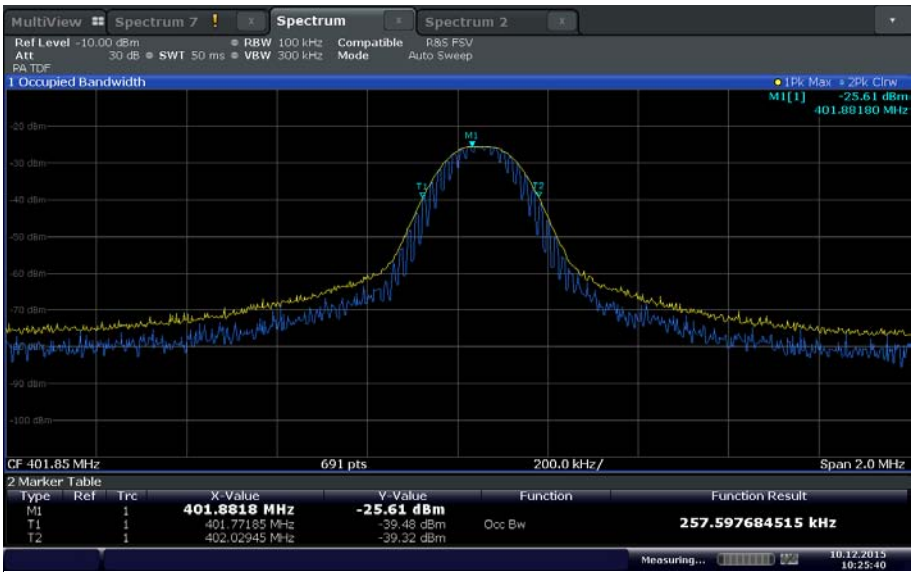
- The limit is ±100 ppm. Reference fundamental frequency at 25°C is 401.90065 MHz, therefore calculated deviation limit is ±40.190 kHz.

2.6.8 Test Results

Complies. See attached table and plots.

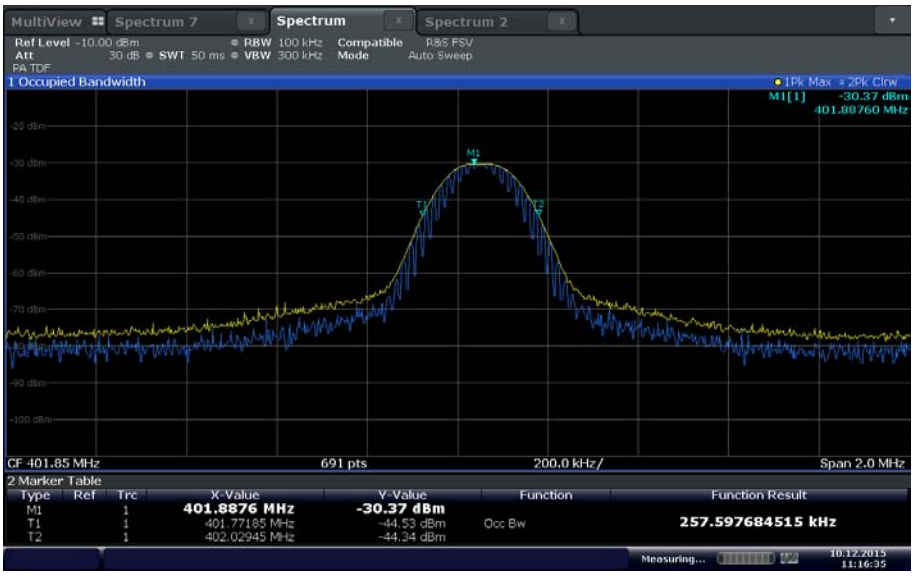
Voltage (%)	Power (VDC)	Temp (°C)	Frequency (MHz)	Max. Frequency Deviation (Hz)	Deviation Limit (Hz)
100	Voltage variation not performed. Instead, EUT operated close to battery operating end point.	+25	401.90065	-	±40.190
		+35	401.90065	0	
		+45	401.90210	1.45	
115		+25	-	-	
85		+25	-	-	

2.6.9 Test Plots



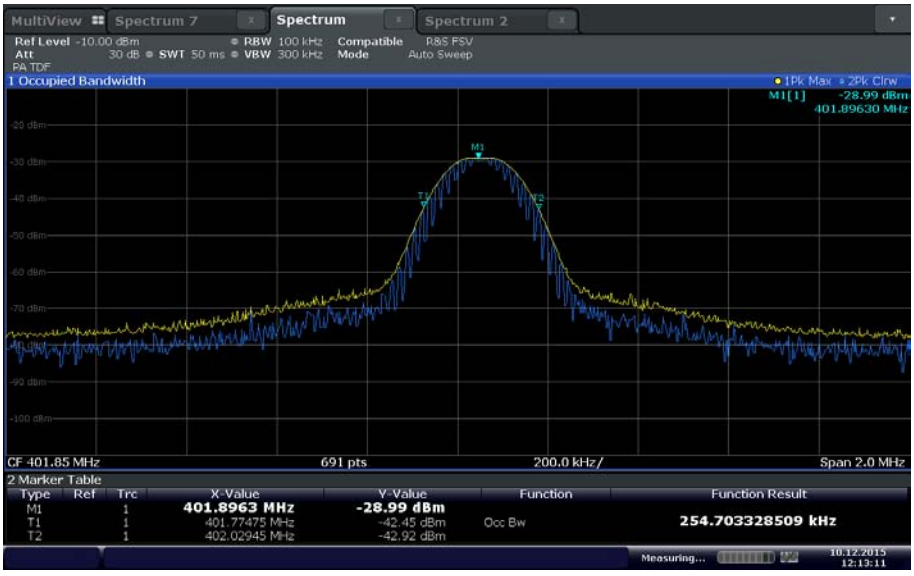
Date: 10.DEC.2015 10:25:40

Low Channel @ 25°C



Date: 10.DEC.2015 11:16:35

Low Channel @ 35°C



Date: 10.DEC.2015 12:13:11

Low Channel @ 45°C

2.7 TRANSMITTER UNWANTED EMISSIONS

2.7.1 Specification Reference

Part 95 Subpart E §95.635(d)(1)(i) and RSS-243 Section 5.5

2.7.2 Standard Applicable

(d) For transmitters designed to operate in the MedRadio service, emissions shall be attenuated in accordance with the following:

(1) Emissions from a MedRadio transmitter shall be attenuated to a level no greater than the field strength limits shown in the following table when they:

(i) Are more than 250 kHz outside of the 402-405 MHz band (for devices designed to operate in the 402-405 MHz band);

Frequency (MHz)	Field Strength (µV/m)	Measurement Distance (meters)
30-88	100	3
88-216	150	3
216-960	200	3
960 and above	500	3

2.7.3 Equipment Under Test and Modification State

Serial No: F1141209049 / Default Test Configuration

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

December 07, 2015/FSC

2.7.5 Test Equipment Used

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

2.7.6 Environmental Conditions/ Test Location

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

Ambient Temperature	22.4 °C
Relative Humidity	29.2 %
ATM Pressure	98.9 kPa

2.7.7 Additional Observations

- This is a radiated test. The spectrum was searched from 30MHz to the 10th harmonic.
- Limits used were from §15.209 which are identical with §95.635(d)(1)(i) limits.

- Only noise floor measurements observed above 18GHz.
- Measurement was done using EMC32 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 2.7.8 for sample computation.

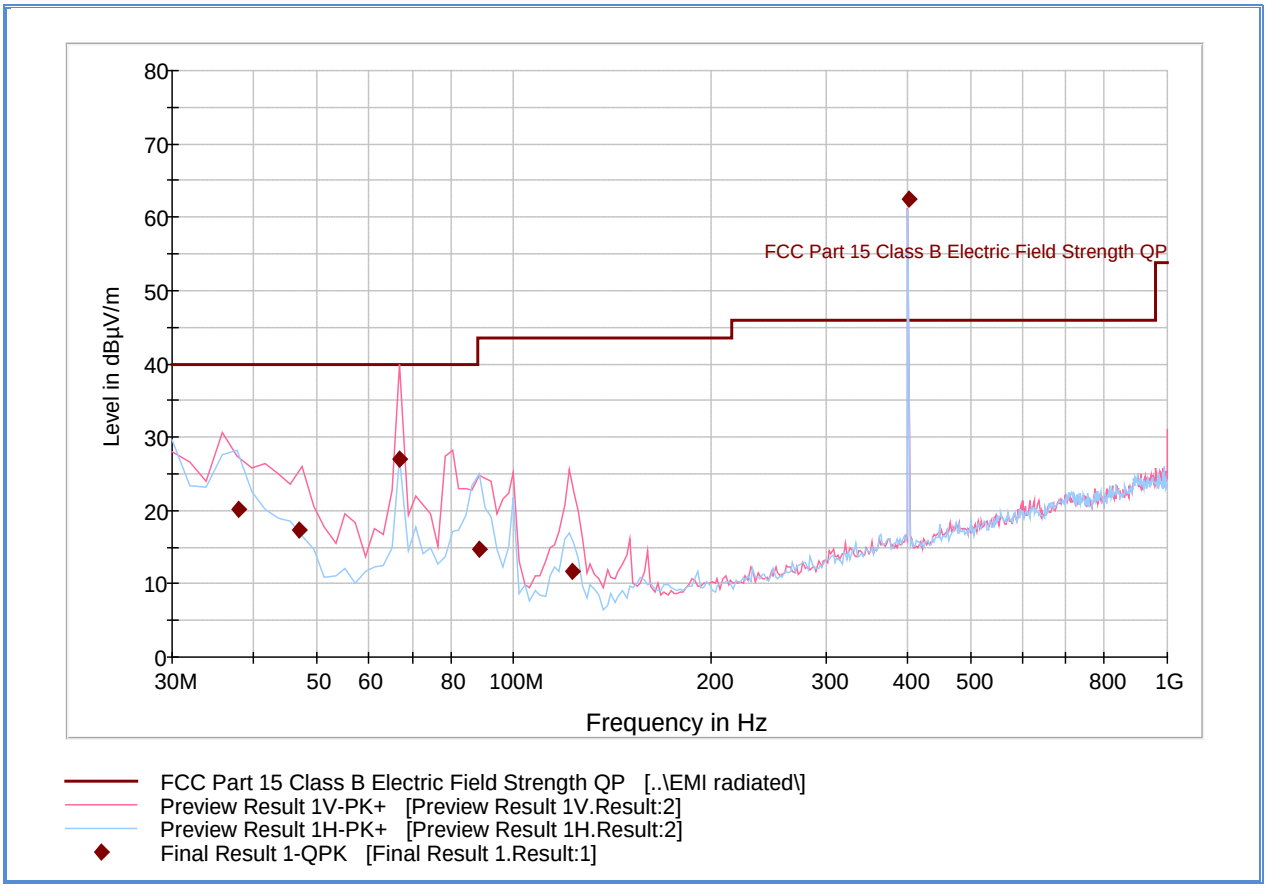
2.7.8 Sample Computation (Radiated Emission)

Measuring equipment raw measurement (dbµV) @ 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 (dbµV/m) @ 30MHz			**11.8**

2.7.9 Test Results

See attached plots.

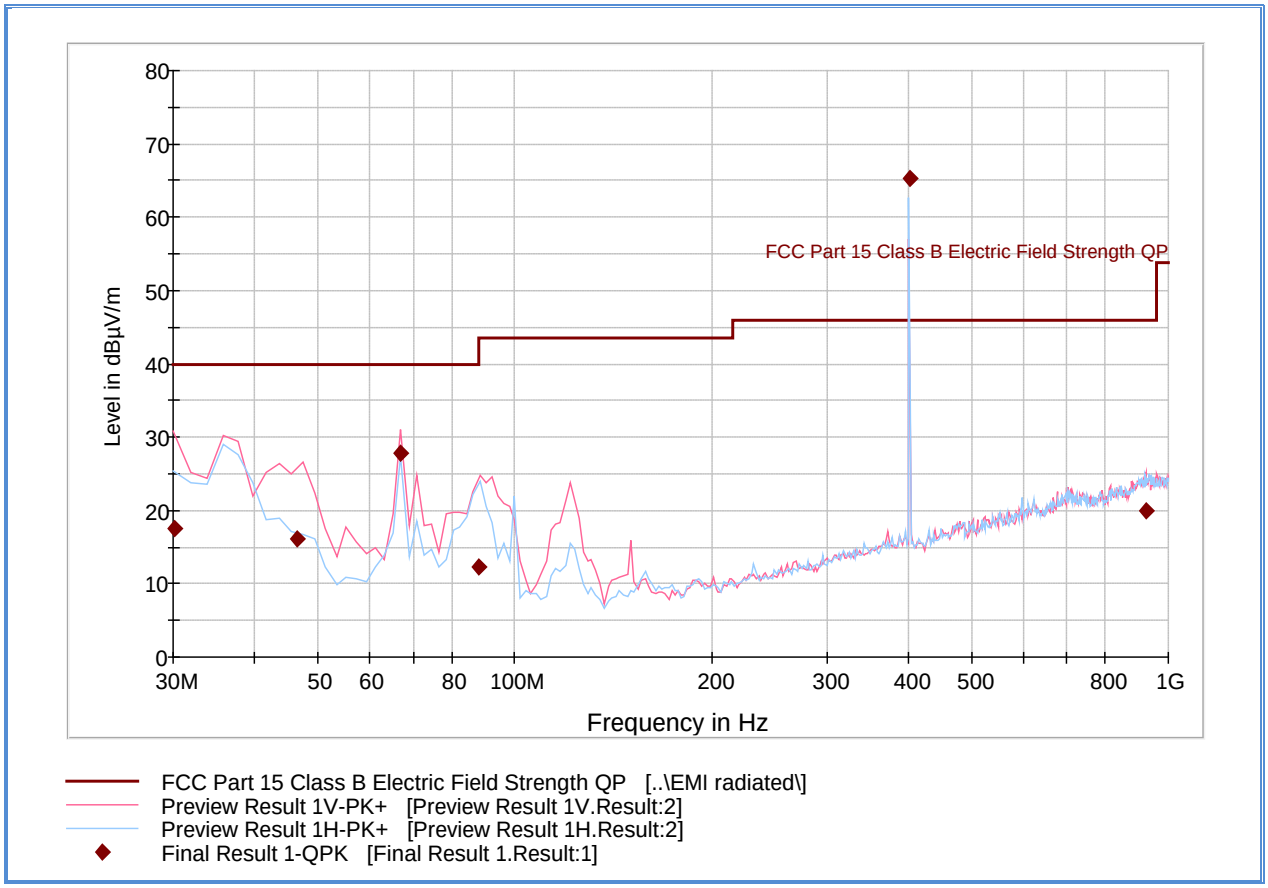
2.7.10 Test Results Below 1GHz (EUT Mounted Vertically – Low Channel)



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)
37.831663	20.2	1000.0	120.000	104.0	V	46.0	-15.6	19.8	40.0
47.014990	17.2	1000.0	120.000	150.0	V	257.0	-19.3	22.8	40.0
66.813868	27.0	1000.0	120.000	102.0	V	281.0	-22.3	13.0	40.0
88.452745	14.7	1000.0	120.000	200.0	H	266.0	-21.1	28.8	43.5
122.866613	11.6	1000.0	120.000	102.0	V	-12.0	-20.6	31.9	43.5
401.922565	62.5	1000.0	120.000	174.0	V	82.0	-9.1	Fundamental	

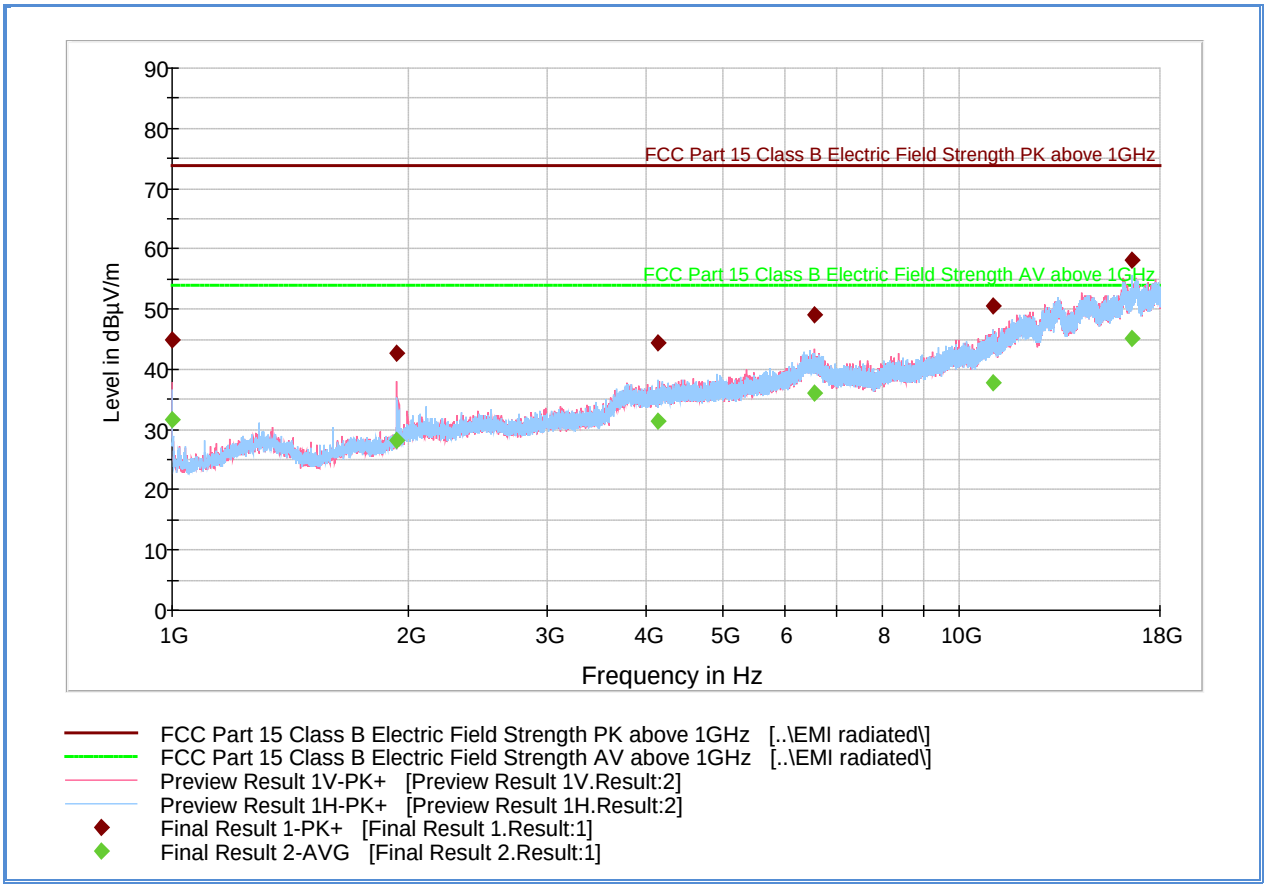
2.7.11 Test Results Below 1GHz (EUT Mounted Horizontally – Low Channel)



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	17.6	1000.0	120.000	128.0	V	15.0	-11.6	22.4	40.0
46.534990	16.2	1000.0	120.000	100.0	V	276.0	-19.1	23.8	40.0
66.853868	27.7	1000.0	120.000	105.0	V	122.0	-22.3	12.3	40.0
88.252745	12.2	1000.0	120.000	300.0	V	15.0	-21.2	31.3	43.5
401.922565	65.2	1000.0	120.000	134.0	H	0.0	-9.1	Fundamental	
923.308377	20.0	1000.0	120.000	350.0	V	34.0	1.4	26.0	46.0

2.7.12 Test Results Above 1GHz (EUT Mounted Vertically – Low Channel)



Peak Data

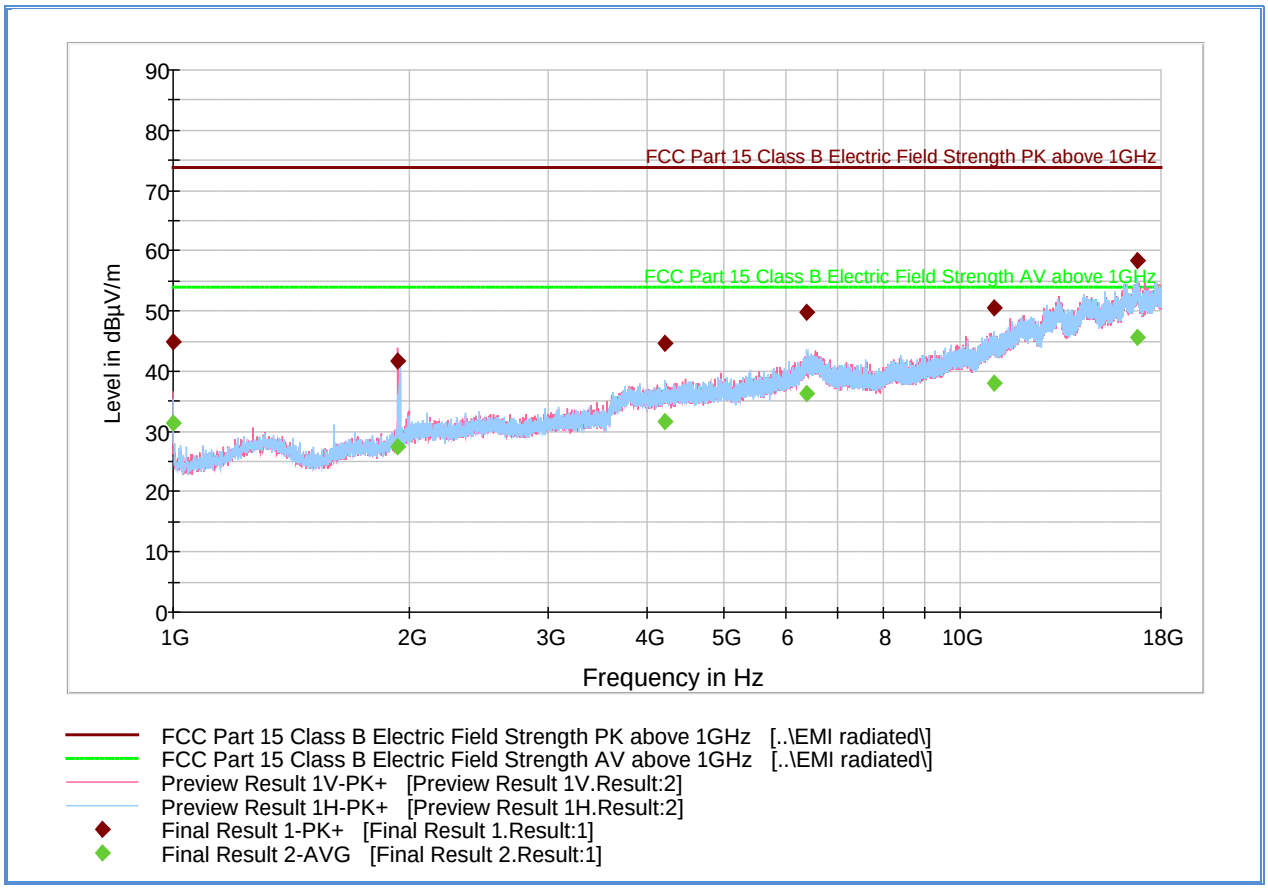
Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1000.000000	44.8	1000.0	1000.000	264.3	V	285.0	-7.2	29.1	73.9
1932.600000	42.6	1000.0	1000.000	202.3	V	-20.0	-2.3	31.3	73.9
4150.866667	44.3	1000.0	1000.000	345.6	H	16.0	5.2	29.6	73.9
6538.966667	49.0	1000.0	1000.000	132.7	V	171.0	11.5	24.9	73.9
11044.30000	50.6	1000.0	1000.000	402.3	V	351.0	15.4	23.3	73.9
16607.93333	58.2	1000.0	1000.000	400.7	H	99.0	23.6	15.7	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)
1000.000000	31.7	1000.0	1000.000	264.3	V	285.0	-7.2	22.2	53.9
1932.600000	28.1	1000.0	1000.000	202.3	V	-20.0	-2.3	25.8	53.9
4150.866667	31.5	1000.0	1000.000	345.6	H	16.0	5.2	22.4	53.9
6538.966667	36.0	1000.0	1000.000	132.7	V	171.0	11.5	17.9	53.9
11044.30000	37.9	1000.0	1000.000	402.3	V	351.0	15.4	16.0	53.9
16607.93333	45.1	1000.0	1000.000	400.7	H	99.0	23.6	8.8	53.9

Test Notes: No significant emissions observed above 3GHz.

2.7.13 Test Results Above 1GHz (EUT Mounted Horizontally – Low Channel)



Peak Data

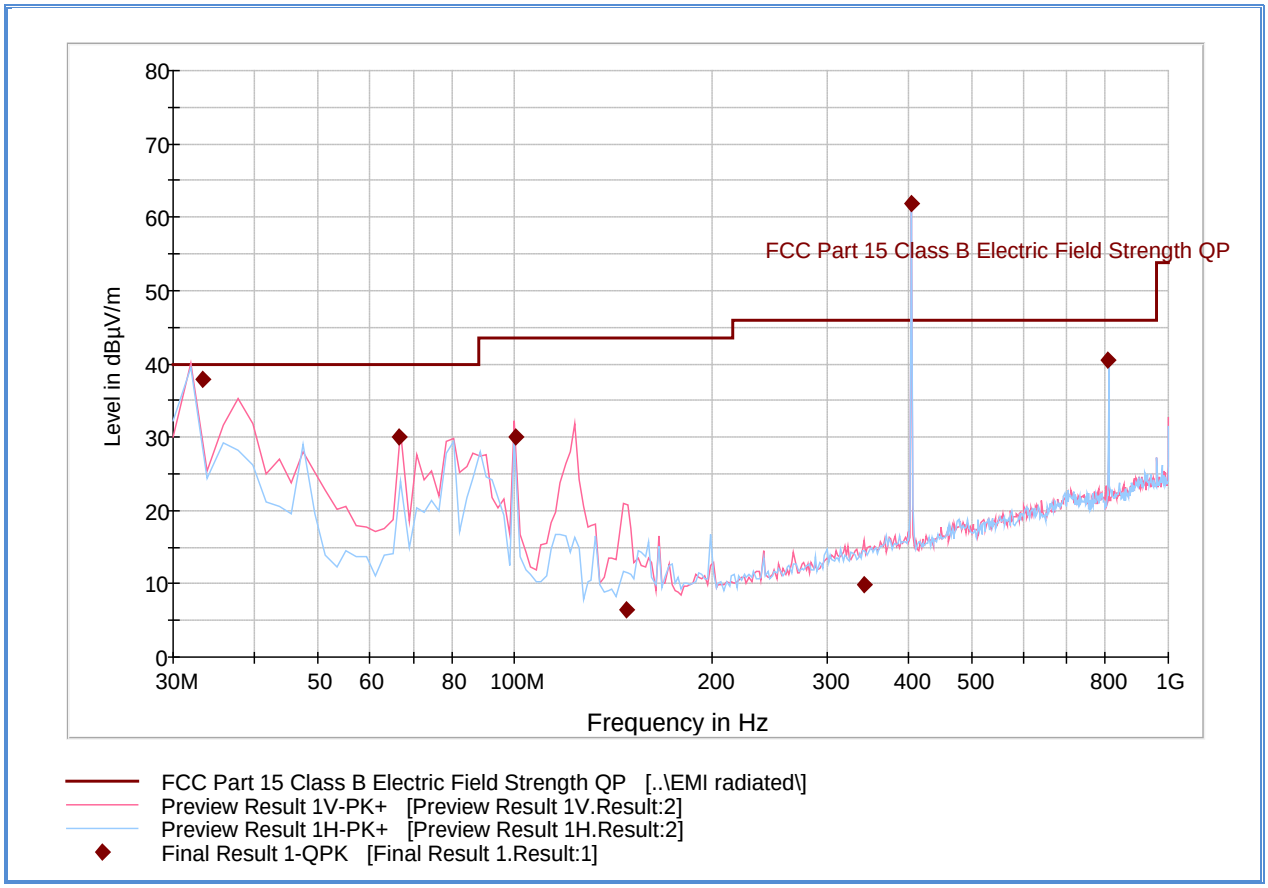
Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1000.000000	44.9	1000.0	1000.000	258.3	V	301.0	-7.2	29.0	73.9
1932.600000	41.8	1000.0	1000.000	163.6	V	-4.0	-2.3	32.1	73.9
4212.833333	44.6	1000.0	1000.000	322.2	H	264.0	5.4	29.3	73.9
6380.333333	49.7	1000.0	1000.000	202.5	H	20.0	11.4	24.2	73.9
11031.83333	50.6	1000.0	1000.000	402.3	H	173.0	15.5	23.3	73.9
16775.96666	58.5	1000.0	1000.000	349.2	H	3.0	24.6	15.4	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)
1000.000000	31.4	1000.0	1000.000	258.3	V	301.0	-7.2	22.5	53.9
1932.600000	27.4	1000.0	1000.000	163.6	V	-4.0	-2.3	26.5	53.9
4212.833333	31.7	1000.0	1000.000	322.2	H	264.0	5.4	22.2	53.9
6380.333333	36.3	1000.0	1000.000	202.5	H	20.0	11.4	17.6	53.9
11031.83333	38.0	1000.0	1000.000	402.3	H	173.0	15.5	15.9	53.9
16775.96666	45.7	1000.0	1000.000	349.2	H	3.0	24.6	8.2	53.9

Test Notes: No significant emissions observed above 3GHz.

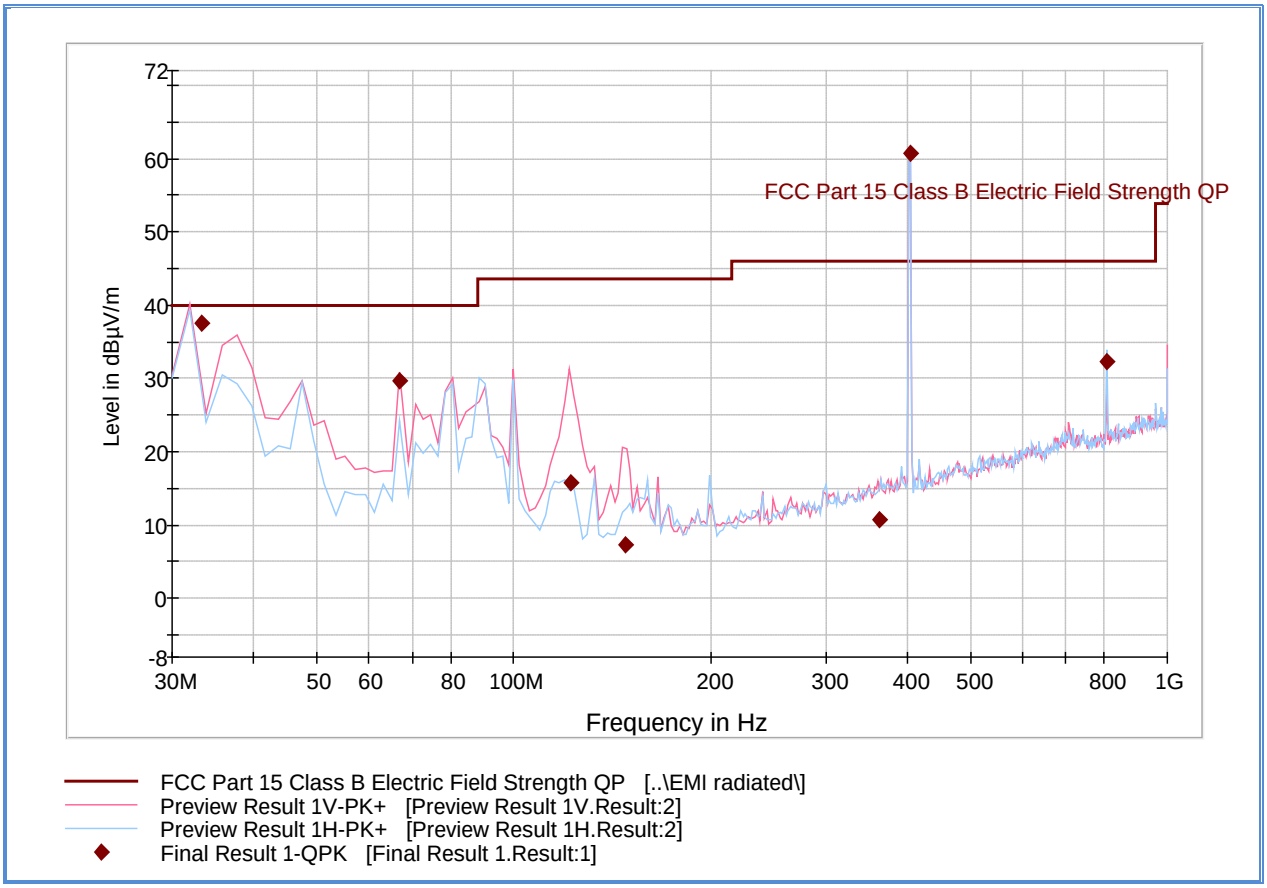
2.7.14 Test Results Below 1GHz (EUT Mounted Vertically – High Channel)



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)
33.320000	37.9	1000.0	120.000	100.0	V	38.0	-13.2	2.1	40.0
66.533868	30.0	1000.0	120.000	100.0	V	223.0	-22.3	10.0	40.0
100.219960	30.1	1000.0	120.000	100.0	V	38.0	-19.8	13.4	43.5
147.833267	6.5	1000.0	120.000	100.0	V	-1.0	-19.1	37.0	43.5
341.885932	9.8	1000.0	120.000	250.0	V	211.0	-11.1	36.2	46.0
404.970341	61.9	1000.0	120.000	100.0	H	101.0	-9.2	Fundamental	
809.962886	40.5	1000.0	120.000	100.0	H	276.0	-1.1	5.5	46.0

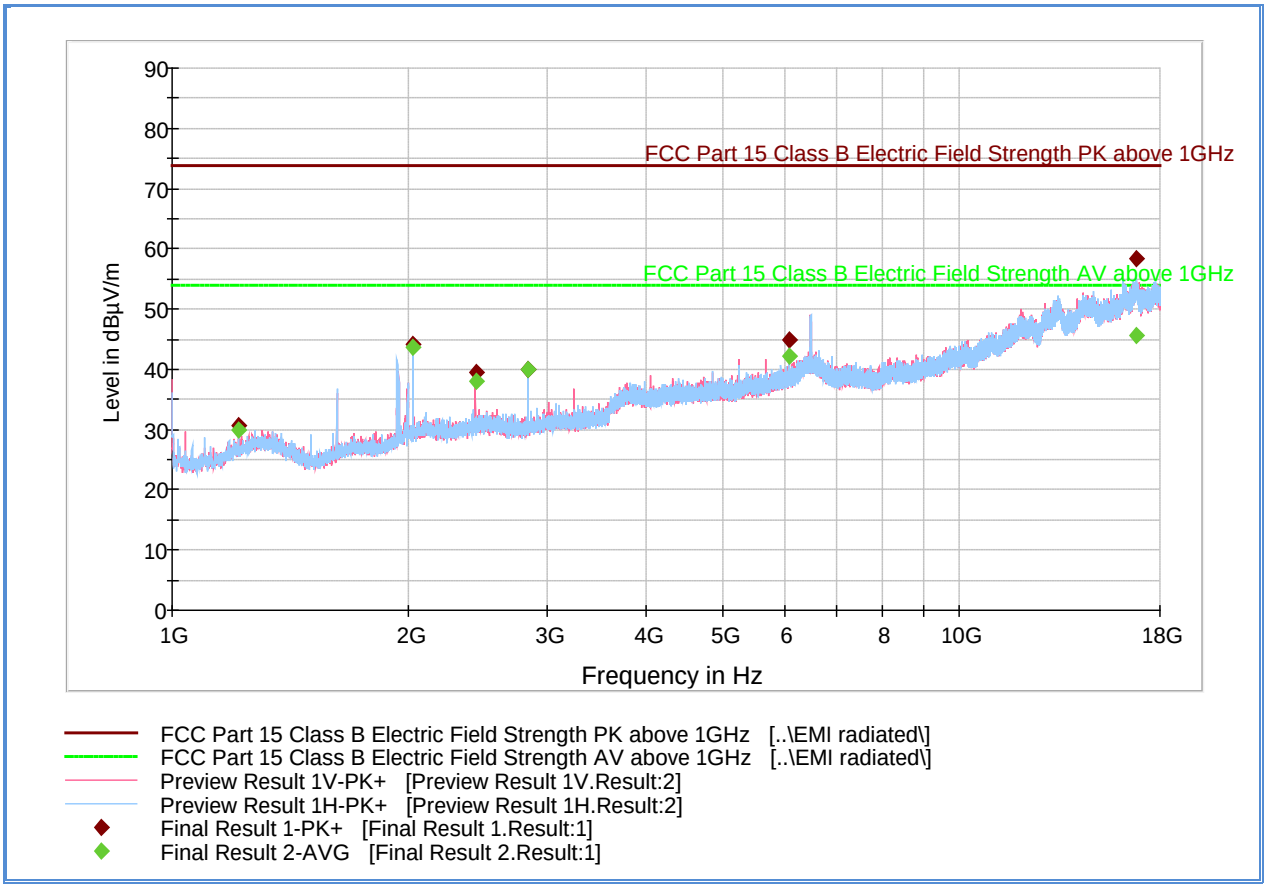
2.7.15 Test Results Below 1GHz (EUT Mounted Horizontally – High Channel)



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)
33.280000	37.5	1000.0	120.000	100.0	V	57.0	-13.2	2.5	40.0
66.813868	29.7	1000.0	120.000	100.0	V	302.0	-22.3	10.3	40.0
122.002725	15.9	1000.0	120.000	100.0	V	12.0	-20.6	27.6	43.5
147.953267	7.2	1000.0	120.000	100.0	V	-1.0	-19.1	36.3	43.5
362.548697	10.8	1000.0	120.000	145.0	H	15.0	-10.2	35.2	46.0
404.986453	60.7	1000.0	120.000	100.0	H	267.0	-9.1	Fundamental	
807.635110	32.3	1000.0	120.000	100.0	H	62.0	-1.2	13.7	46.0

2.7.16 Test Results Above 1GHz (EUT Mounted Vertically – High Channel)



Peak Data

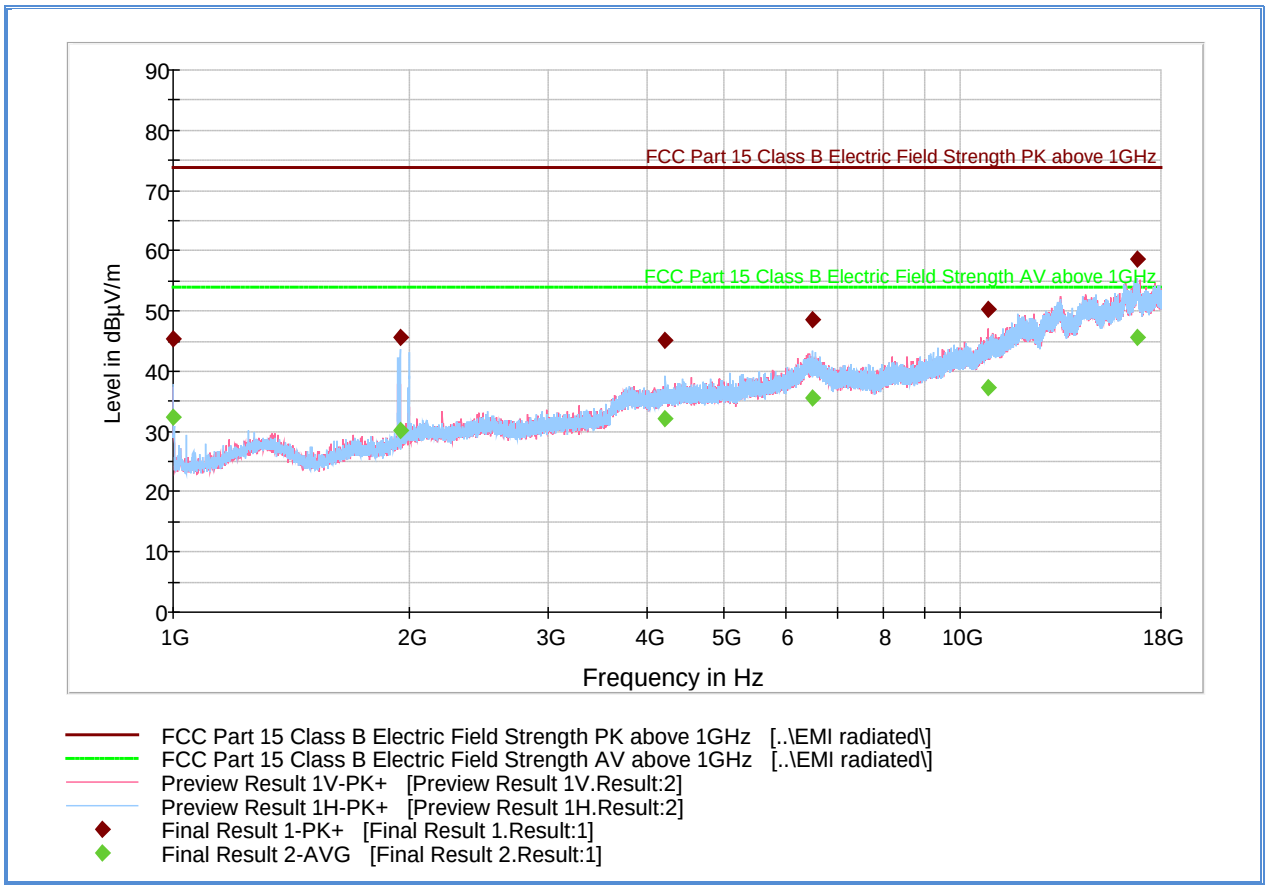
Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1214.966667	30.7	1000.0	1000.000	124.7	H	315.0	-6.0	43.2	73.9
2024.733333	44.2	1000.0	1000.000	103.7	H	337.0	-1.7	29.7	73.9
2429.900000	39.5	1000.0	1000.000	115.8	H	132.0	-0.3	34.4	73.9
2834.666667	40.0	1000.0	1000.000	168.6	V	23.0	0.5	33.9	73.9
6074.300000	44.9	1000.0	1000.000	247.4	H	173.0	9.2	29.0	73.9
16788.86666	58.4	1000.0	1000.000	131.7	H	37.0	24.7	15.5	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)
1214.966667	29.9	1000.0	1000.000	124.7	H	315.0	-6.0	24.0	53.9
2024.733333	43.7	1000.0	1000.000	103.7	H	337.0	-1.7	10.2	53.9
2429.900000	38.0	1000.0	1000.000	115.8	H	132.0	-0.3	15.9	53.9
2834.666667	40.0	1000.0	1000.000	168.6	V	23.0	0.5	13.9	53.9
6074.300000	42.2	1000.0	1000.000	247.4	H	173.0	9.2	11.7	53.9
16788.86666	45.6	1000.0	1000.000	131.7	H	37.0	24.7	8.3	53.9

Test Notes: No significant emissions observed above 8GHz.

2.7.17 Test Results Above 1GHz (EUT Mounted Horizontally – High Channel)



Peak Data

Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1000.000000	45.4	1000.0	1000.000	218.4	H	3.0	-7.2	28.5	73.9
1941.433333	45.6	1000.0	1000.000	322.2	H	116.0	-2.2	28.3	73.9
4223.733333	45.1	1000.0	1000.000	288.2	H	-9.0	5.4	28.8	73.9
6503.833333	48.6	1000.0	1000.000	115.8	H	-20.0	11.5	25.3	73.9
10865.90000	50.4	1000.0	1000.000	182.6	V	308.0	14.9	23.5	73.9
16796.40000	58.6	1000.0	1000.000	402.4	H	218.0	24.7	15.3	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)
1000.000000	32.4	1000.0	1000.000	218.4	H	3.0	-7.2	21.5	53.9
1941.433333	30.0	1000.0	1000.000	322.2	H	116.0	-2.2	23.9	53.9
4223.733333	32.2	1000.0	1000.000	288.2	H	-9.0	5.4	21.7	53.9
6503.833333	35.6	1000.0	1000.000	115.8	H	-20.0	11.5	18.3	53.9
10865.90000	37.3	1000.0	1000.000	182.6	V	308.0	14.9	16.6	53.9
16796.40000	45.6	1000.0	1000.000	402.4	H	218.0	24.7	8.3	53.9

Test Notes: No significant emissions observed above 3GHz.

2.8 RECEIVER SPURIOUS EMISSIONS

2.8.1 Specification Reference

RSS-243 Section 5.6

2.8.2 Standard Applicable

Receiver spurious emissions shall comply with the limits specified in RSS-Gen.

2.8.3 Equipment Under Test and Modification State

Serial No: F1141209049 / Default Test Configuration

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

December 07, 2015/FSC

2.8.5 Test Equipment Used

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

2.8.6 Environmental Conditions/ Test Location

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

Ambient Temperature	22.4 °C
Relative Humidity	29.2 %
ATM Pressure	98.9 kPa

2.8.7 Additional Observations

- This is a radiated test. The spectrum was searched from 30MHz to the 3rd harmonic (up to 10th performed).
- In RX mode, data from the whole system when verified is presented.
- Measurement was done using EMC32 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 2.8.8 for sample computation.

2.8.8 Sample Computation (Radiated Emission)

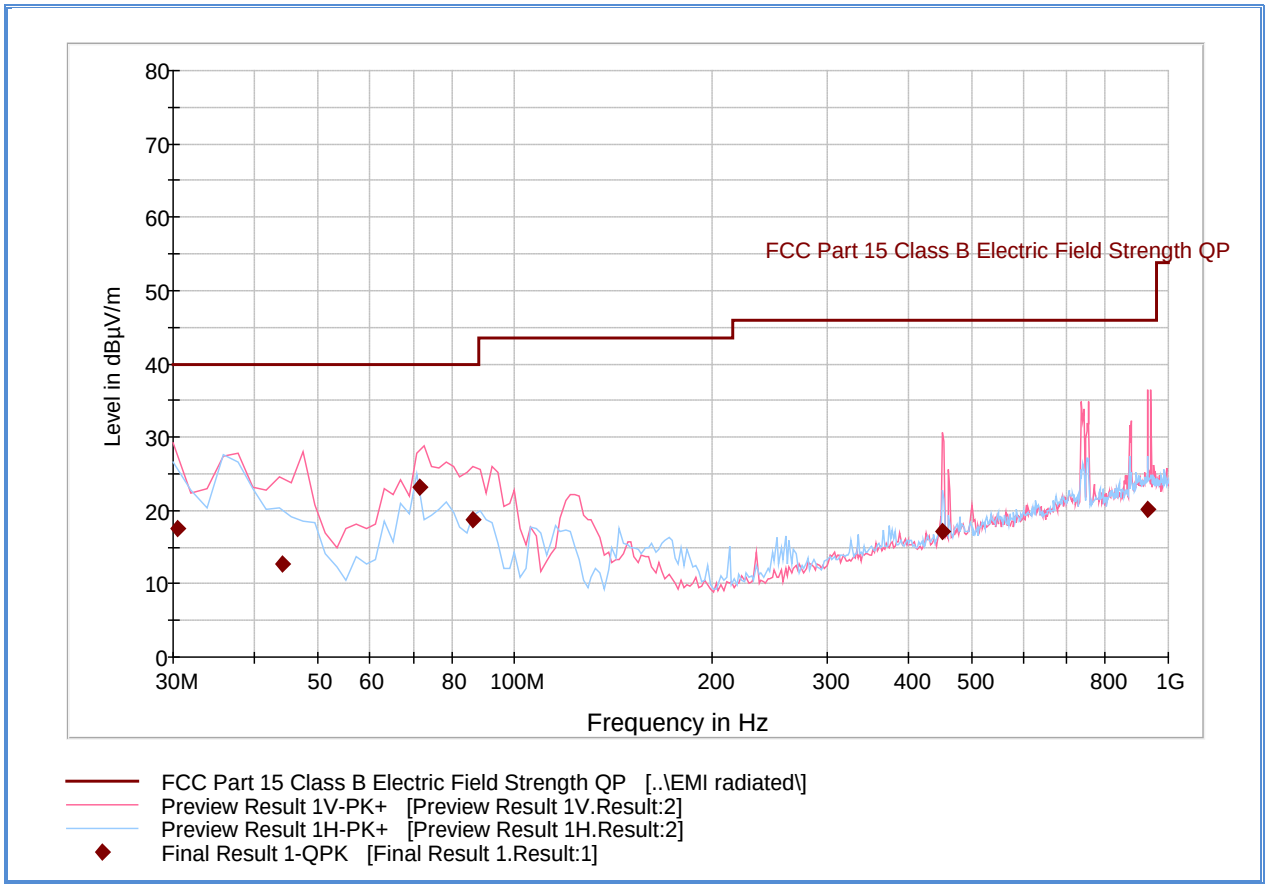
Measuring equipment raw measurement (dbµV) @ 2400 MHz			53.9
Correction Factor (dB)	Asset# 1153 (cable)	3.4	-0.4
	Asset# 8628(preamplifier)	-36.5	
	Asset#7575 (antenna)	32.7	
Reported Max Peak Final Measurement (dbµV/m) @ 2400 MHz			**53.5**

2.8.9 Test Results

See attached plots.

TÜV SÜD AMERICA INC 10040 Mesa Rim Road San Diego, CA 92121-2912 Phone: 858 678 1400 FAX: 858 546 0364

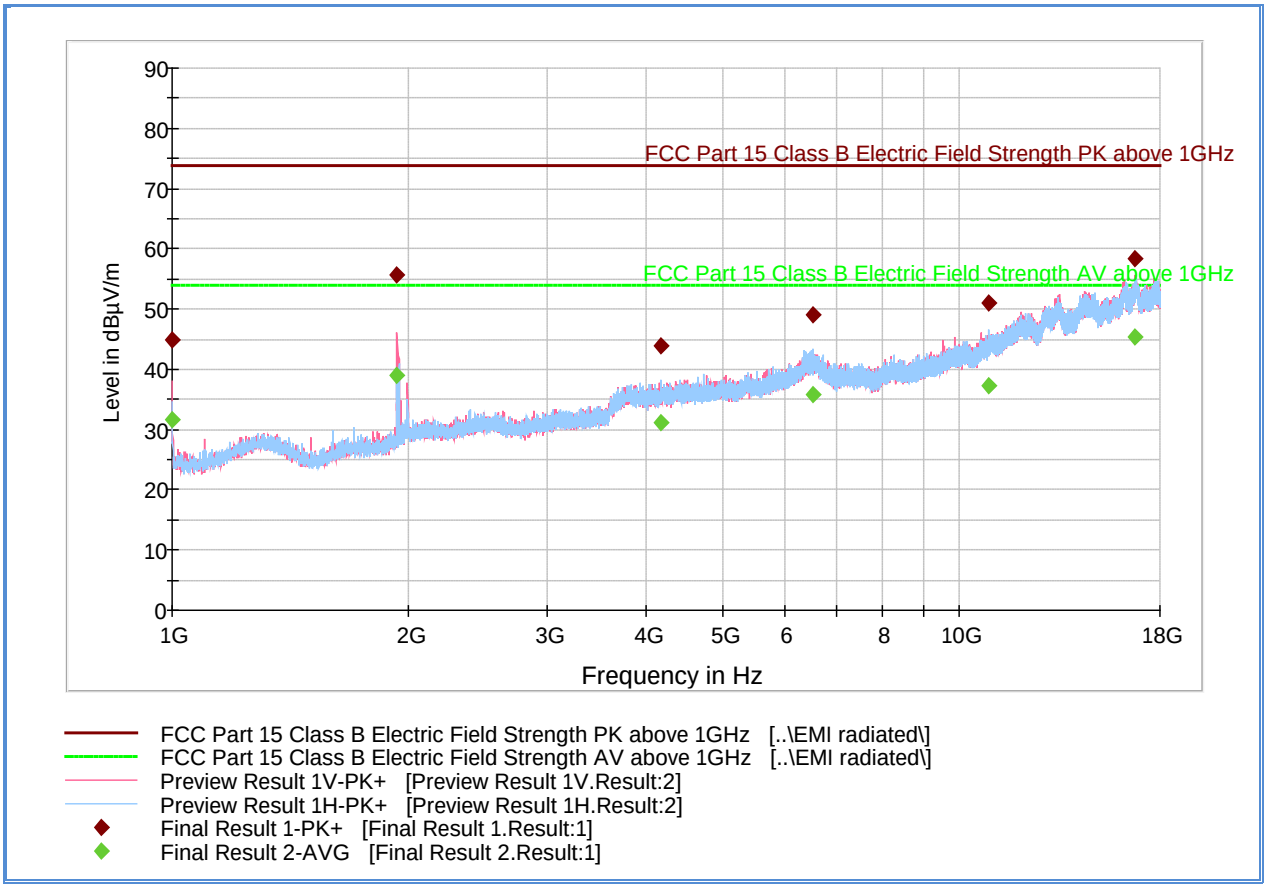
2.8.10 Test Results Below 1GHz



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)
30.400000	17.4	1000.0	120.000	108.0	V	15.0	-11.7	22.6	40.0
44.134990	12.7	1000.0	120.000	102.0	V	314.0	-18.3	27.3	40.0
71.605531	23.1	1000.0	120.000	100.0	V	62.0	-22.4	16.9	40.0
86.372745	18.7	1000.0	120.000	123.0	V	223.0	-21.4	21.3	40.0
451.943647	17.1	1000.0	120.000	108.0	V	61.0	-8.1	28.9	46.0
932.100040	20.2	1000.0	120.000	108.0	V	15.0	1.4	25.8	46.0

2.8.11 Test Results Above 1GHz



Peak Data

Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1000.000000	44.8	1000.0	1000.000	155.6	V	314.0	-7.2	29.1	73.9
1932.366667	55.8	1000.0	1000.000	202.3	V	247.0	-2.3	18.1	73.9
4176.133333	43.9	1000.0	1000.000	343.1	H	182.0	5.3	30.0	73.9
6528.600000	49.1	1000.0	1000.000	181.6	H	160.0	11.5	24.8	73.9
10906.03333	51.0	1000.0	1000.000	402.5	H	280.0	15.1	22.9	73.9
16718.63333	58.4	1000.0	1000.000	227.4	V	247.0	24.3	15.5	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)
1000.000000	31.7	1000.0	1000.000	155.6	V	314.0	-7.2	22.2	53.9
1932.366667	38.9	1000.0	1000.000	202.3	V	247.0	-2.3	15.0	53.9
4176.133333	31.1	1000.0	1000.000	343.1	H	182.0	5.3	22.8	53.9
6528.600000	35.7	1000.0	1000.000	181.6	H	160.0	11.5	18.2	53.9
10906.03333	37.4	1000.0	1000.000	402.5	H	280.0	15.1	16.5	53.9
16718.63333	45.3	1000.0	1000.000	227.4	V	247.0	24.3	8.6	53.9

Test Notes: No significant emissions observed above 3GHz.

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						
1002	Bilog Antenna	3142C	00058717	ETS-Lindgren	01/30/14	01/30/16
7575	Double-ridged waveguide horn antenna	3117	00155511	EMCO	04/27/15	04/27/16
8628	Pre-amplifier	QLJ 01182835-JO	8986002	QuinStar Technologies Inc.	03/20/15	03/20/16
1153	High-frequency cable	SucoFlex 100 SX	N/A	Suhner	04/03/15	04/03/16
1040	EMI Test Receiver	ESIB40	100292	Rhode & Schwarz	09/29/15	09/29/16
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
Miscellaneous						
	Test Software	EMC32	V8.53	Rhode & Schwarz	N/A	
6792	Multimeter	3478A	2911A70964	Hewlett Packard	08/14/15	08/14/16
7560	Barometer/Temperature/Humidity Transmitter	iBTHX-W	1240476	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 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	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

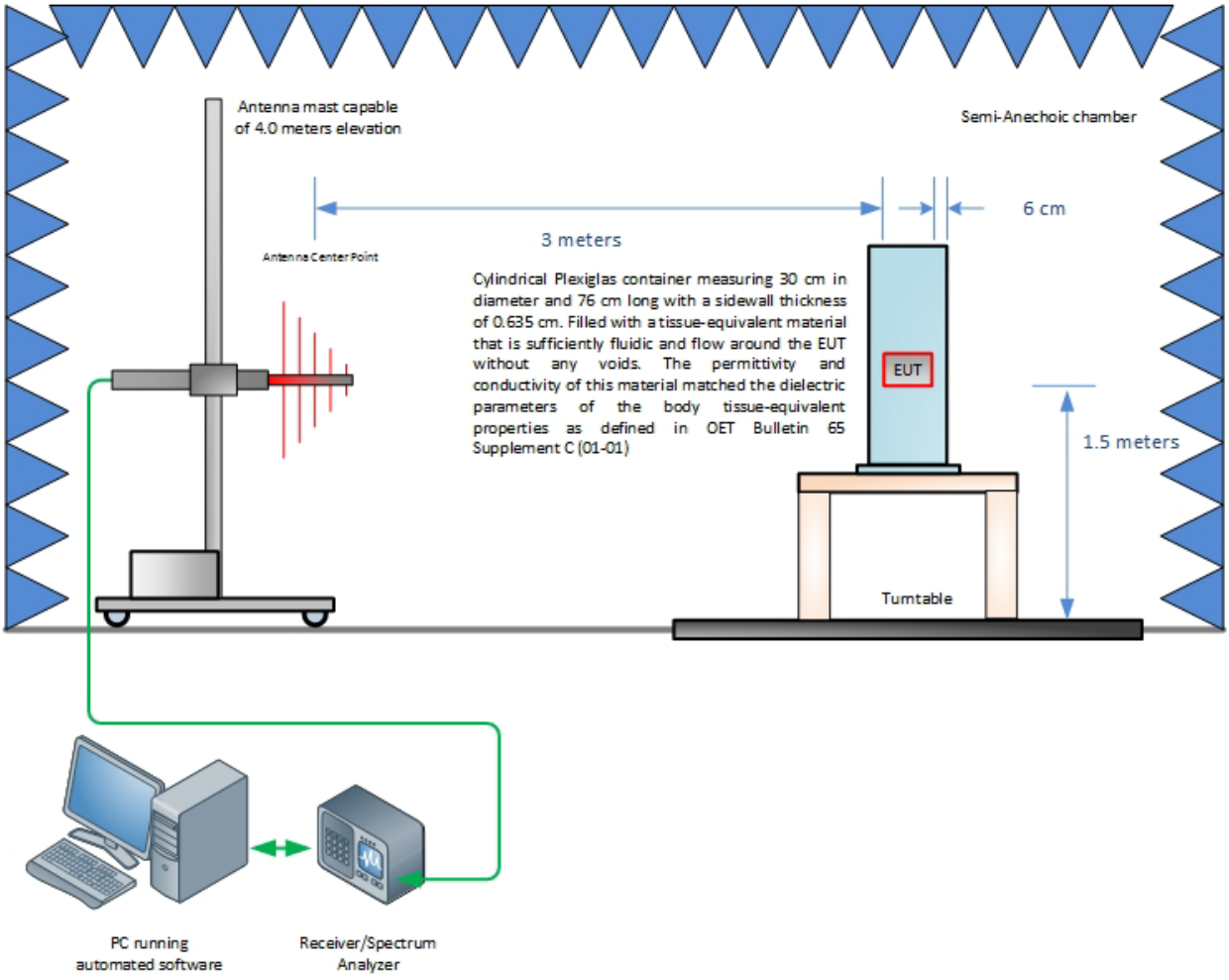
3.2.2 Radiated Measurements (Above 1GHz)

	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:	3.57

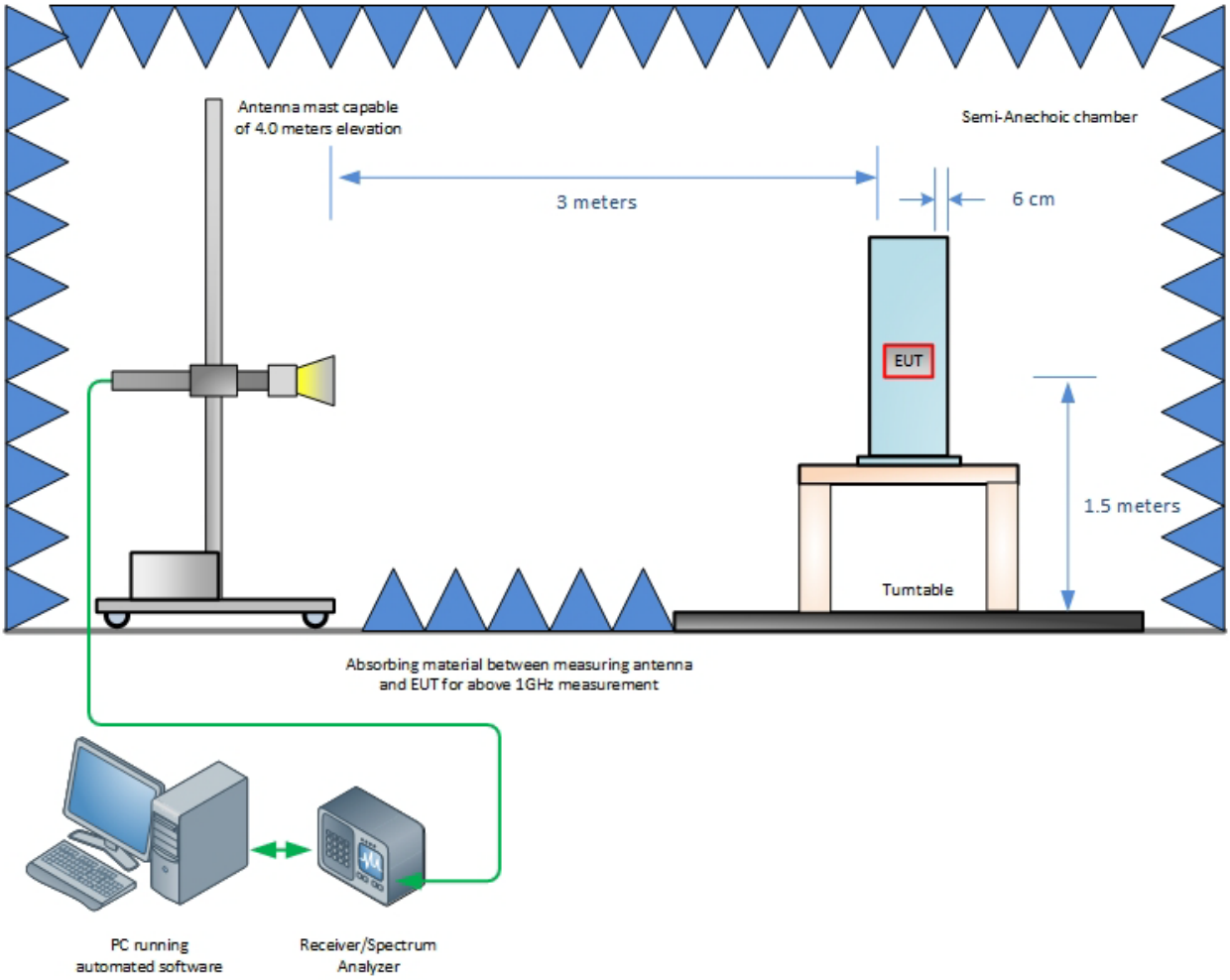
SECTION 4

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

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