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Report On

Radio Testing of the
Hughes Network Systems
Land Portable Terminal Model 9202

FCC Part 15 Subpart C §15.247

Report No. SC1102725B June 2011

REPORT ON	Radio Testing of the Hughes Network Systems Land Portable Terminal
TEST REPORT NUMBER	SC1102725B
	June 2011
PREPARED FOR	Hughes Network Systems 9605 Scranton Road, Suite 500, San Diego, CA 92121
PREPARED BY	Ferdinand S. Custodio **Name** Title: EMC/Wireless Test Engineer
APPROVED BY	Chip R. Fleury **Name** Authorized Signatory
DATED	June 21, 2011

CONTENTS

SECTION 1

REPORT SUMMARY

Radio Testing of the
Hughes Network Systems
Land Portable Terminal

1.1 INTRODUCTION

The information contained in this report is intended to show verification of the Radio Testing of the Hughes Network Systems Land Portable Terminal to the requirements of FCC Part 15 Subpart C §15.247

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	Hughes Network Systems
Model Number(s)	Model 9202
FCC ID Number	K3YHNS9202
Serial Number(s)	004401-64-001017-5
Number of Samples Tested	1
Test Specification/Issue/Date	FCC Part 15 Subpart C §15.247 (October 1, 2010)
Start of Test	May 20, 2011
Finish of Test	June 17, 2011
Name of Engineer(s)	Ferdinand S. Custodio Kathy MacKenzie
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 C §15.247 is shown below.

Section	Spec Clause	Test Description	Result	Comments/Base Standard
2.1	§15.247(b)(3)	Peak Output Power	Compliant	
2.2	§15.207(a)	Conducted Emissions	Compliant	
2.3	§15.215(c)	20 dB Bandwidth	Compliant	
2.4	§15.247(a)(2)	Minimum 6 dB RF Bandwidth	Compliant	
2.5	§15.247(d)	Out-of-Band Emissions - Conducted	Compliant	
2.6	§15.247(d)	Band-edge Compliance of RF Conducted Emissions	Compliant	
2.7	§15.247(d)	Spurious Radiated Emissions	Compliant	
2.8	§15.247(e)	Power Spectral Density for Digitally Modulated Device	Compliant	

1.3 PRODUCT INFORMATION

1.3.1 Technical Description

The Equipment Under Test (EUT) was a Hughes Network Systems Land Portable Terminal as shown in the photograph below. The GPS antenna port and the external satellite antenna port will not be available on the final production units. A full technical description can be found in the manufacturer's documentation.

Equipment Under Test (with antenna test port)

Equipment Under Test (with production antenna and battery installed)

1.3.2 EUT General Description

EUT Description	Land Portable Terminal
Model Number(s)	Model 9202
Rated Voltage	7.2VDC Li-Ion battery
Output Power	15.24mW
Frequency Range	2412 MHz to 2462 MHz
Channels Verified	Channel 1 (Low Channel 2412 MHz) Channel 7 (Mid Channel 2442 MHz) Channel 11 (High Channel 2462 MHz)
Antenna Type	Integral Antenna
Antenna Gain	2.5 dBi typical
Modulation Used	DSSS. Test modulation (worst case). EUT configured to transmit continuously (100% duty cycle)

1.3.3 Antenna Details

Please refer to the manufacturer documentation titled “Specification Control Document – Antenna, L-Band 12 dB Transportable” Cage Code 3L0W2 No. 350048 Rev. 4 (04/28/2011).

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

1.4 EUT TEST CONFIGURATION

1.4.1 Test Configuration Description

Test Configuration	Description
A	Conducted measurement configuration. I/O ports not populated.
B	Radiated emissions configuration. I/O ports populated.

1.4.2 EUT Exercise Software

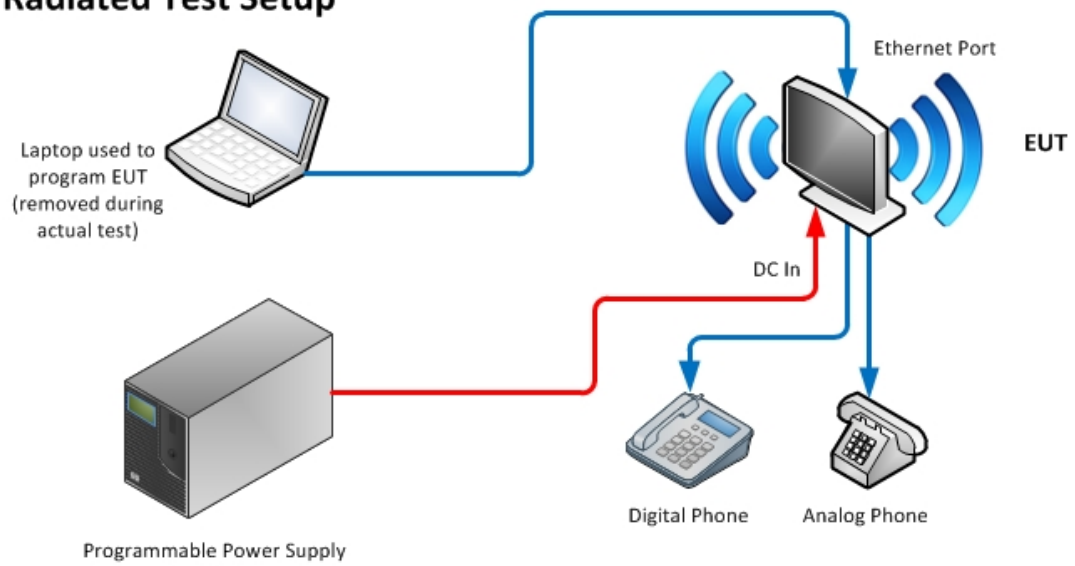
"Perl Command" software provided by the client was used to exercise the EUT. A file containing commands to change channels preset for testing was also provided. Low, Mid and High channels file are copied from this file and transferred to the test software, once executed the EUT will transmit at max power (default setting if TX) at that channel.

1.4.3 Support Equipment and I/O cables

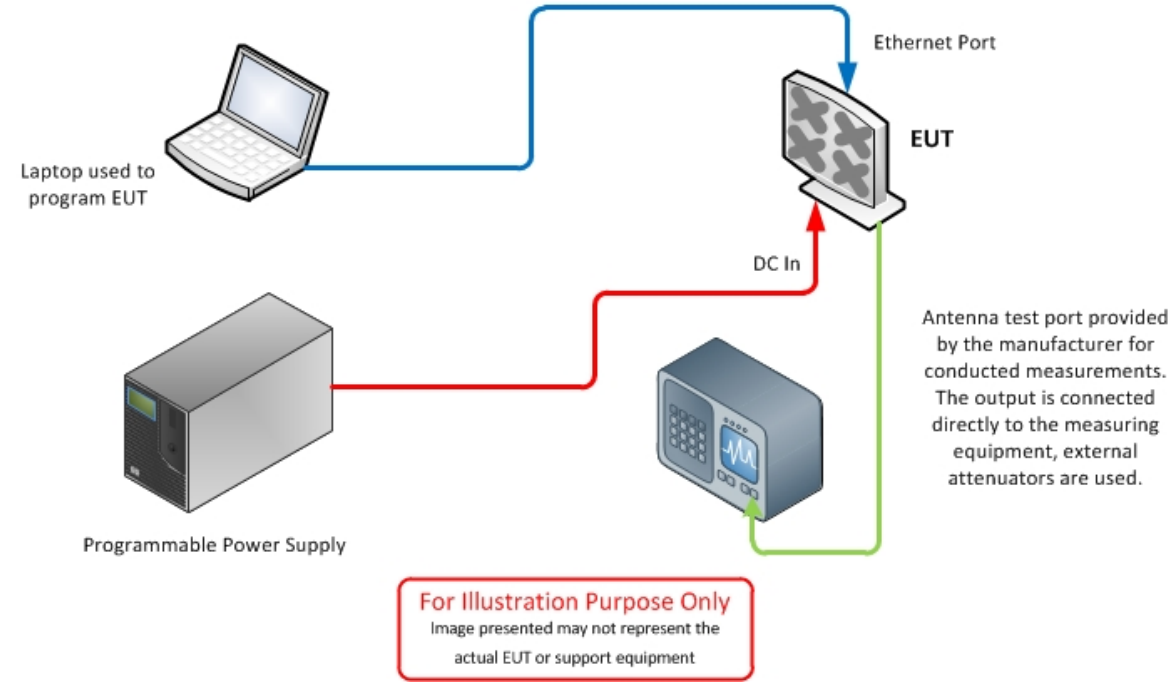
Manufacturer	Equipment/Cable	Description
Toshiba	Laptop	Model Satellite Pro 4600 SN91685670PU
Toshiba	Laptop External PSU	Model PA3049U-1ACA SN0184957G
Logitech	Mouse for Laptop	Model M-CAA42 SNLZA21203529
Swisscon	ISDN Telephone	Model A47 SN013930456500203210660007
AT&T	Analog Telephone	Model 210 SNY050407003698304
-	Telco cable (analog phone to EUT)	2.1m unshielded RJ11 conector
-	CAT5E (ISDN phone to EUT)	2.1m unshielded RJ45 conector
-	CAT6 (Laptop to EUT)	2.1m unshielded RJ45 conector

1.4.4 Simplified Test Configuration Diagram

Radiated Test Setup



Conducted Port Measurement Test Setup



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: 004401-64-001017-5		
The actual antenna was installed into the EUT. Before the modification, all tests were performed conductively through the antenna test port.	Dave Couchman	June 8, 2011

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.
The equipment under test (EUT) was configured to measure its highest possible emission level. The test modes were adapted according to the Operating Instructions provided by the manufacturer/client.

1.8 TEST FACILITY

1.8.1 FCC – Registration No.: US5281

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

1.8.2 Industry Canada (IC) Registration No.: 3067A

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

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SECTION 2

TEST DETAILS

Radio Testing of the
Hughes Network Systems
Land Portable Terminal

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2.1 PEAK OUTPUT POWER

2.1.1 Specification Reference

Part 15 Subpart C §15.247(b)(3)

2.1.2 Standard Applicable

(3) For systems using digital modulation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.

2.1.3 Equipment Under Test and Modification State

Serial No: 004401-64-001017-5 / Test Configuration A

2.1.4 Date of Test/Verification

May 20, 2011

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	23°C
Relative Humidity	46%
ATM Pressure	1000 mbar

2.1.7 Additional Observations

- This is a conducted test utilizing a peak power meter.
- An offset of 20.2dB was added to compensate for the external attenuator and cable used.
- Measurements were performed at 85% of nominal, nominal and 115% of nominal voltage. Nominal voltage is defined as 7.2VDC base from the battery supplied with the EUT.

2.1.8 Test Results

Measured maximum power from the antenna port is 11.83dBm (15.24mW). See attached table.

Voltage Input	Peak Output Power (Low Channel) dBm	Peak Output Power (Mid Channel) dBm	Peak Output Power (High Channel) dBm
6.12VDC	11.65	11.75	11.02
7.2VDC	11.73	11.20	10.90
8.28VDC	**11.83**	11.06	11.26

Test Notes: The EUT was provided with an AC Adapter primarily used to charge the battery pack. Nominal output voltage is 19VDC. Peak output power of the EUT was also verified at 16.15VDC, 19VDC and 21.85VDC however no significant change was observed compared to what is reported.

2.2 CONDUCTED EMISSIONS

2.2.1 Specification Reference

Part 15 Subpart C §15.207(a)

2.2.2 Standard Applicable

An intentional radiator 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 µH/50 ohms line impedance stabilization network (LISN).

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

Serial No: 004401-64-001017-5 / Test Configuration B

2.2.4 Date of Test

June 15, 2011

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	25°C
Relative Humidity	43%
ATM Pressure	1001 mbar

2.2.7 Additional Observations

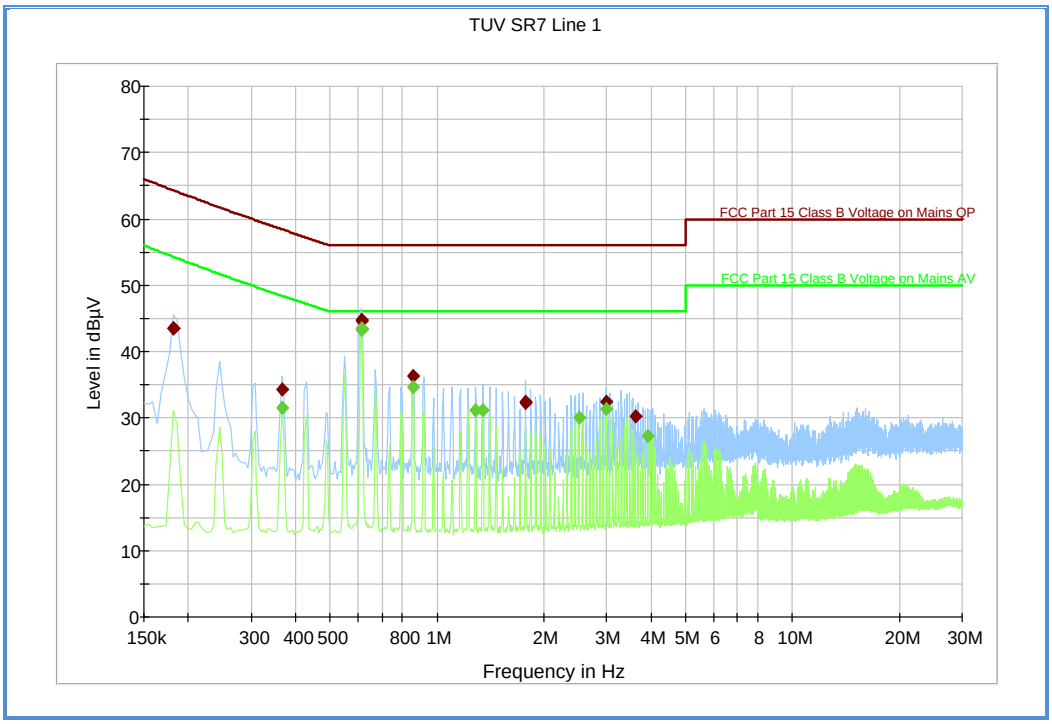
- The EUT is a portable battery powered device. A provision however is provided to charge the battery using an external AC adapter.
- The EUT was verified using worst case configuration. The EUT was set to transmit max. power while plugged into the AC adapter. Only the worst channel presented.

- This is considered worst case condition for Conducted Emissions as the EUT is a portable device with an intended primary use out in the open field under battery power. The EUT requires direct line of sight with a Satellite as a primary function.
- Measurement was done using EMC32 V8.51 automated software. Reported level is the actual level with all the correction factors factored in. Correction Factor column is for informational purposes only.

2.2.8 Test Results

Compliant. See attached plots and tables.

2.2.9 Line 1 (Hot)



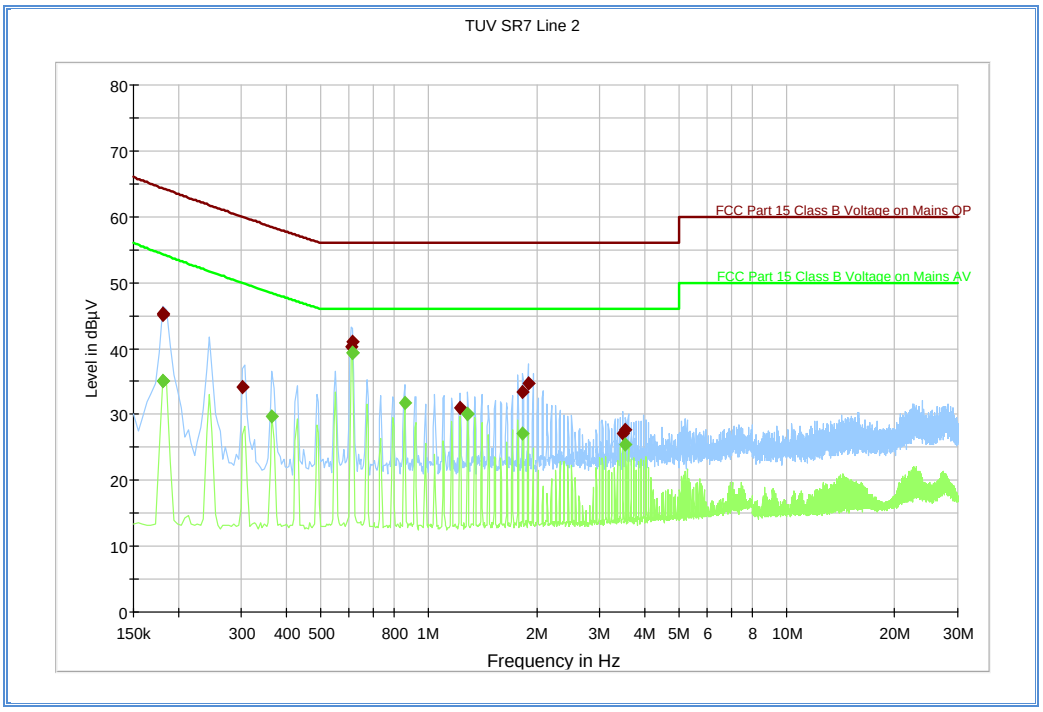
Quasi Peak

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBµV)
0.181500	43.5	1000.0	9.000	Off	L1	19.9	20.9	64.3
0.181500	43.4	1000.0	9.000	Off	L1	19.9	20.9	64.3
0.366000	34.2	1000.0	9.000	Off	L1	20.2	24.2	58.4
0.613500	44.7	1000.0	9.000	Off	L1	20.3	11.3	56.0
0.613500	44.7	1000.0	9.000	Off	L1	20.3	11.3	56.0
0.856500	36.3	1000.0	9.000	Off	L1	20.3	19.7	56.0
1.774500	32.4	1000.0	9.000	Off	L1	20.3	23.6	56.0
1.774500	32.3	1000.0	9.000	Off	L1	20.3	23.7	56.0
2.998500	32.5	1000.0	9.000	Off	L1	20.5	23.5	56.0
3.610500	30.3	1000.0	9.000	Off	L1	20.5	25.7	56.0

Average

Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBµV)
0.366000	31.5	1000.0	9.000	Off	L1	20.2	16.9	48.4
0.613500	43.4	1000.0	9.000	Off	L1	20.3	2.6	46.0
0.613500	43.3	1000.0	9.000	Off	L1	20.3	2.7	46.0
0.613500	43.3	1000.0	9.000	Off	L1	20.3	2.7	46.0
0.856500	34.6	1000.0	9.000	Off	L1	20.3	11.4	46.0
1.284000	31.2	1000.0	9.000	Off	L1	20.3	14.8	46.0
1.347000	31.1	1000.0	9.000	Off	L1	20.3	14.9	46.0
2.508000	30.1	1000.0	9.000	Off	L1	20.5	15.9	46.0
2.998500	31.3	1000.0	9.000	Off	L1	20.5	14.7	46.0
3.916500	27.3	1000.0	9.000	Off	L1	20.5	18.7	46.0

2.2.10 Line 2 (Neutral)



Quasi Peak

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBµV)
0.181500	45.2	1000.0	9.000	Off	L2/N	19.9	19.1	64.3
0.181500	45.1	1000.0	9.000	Off	L2/N	19.9	19.2	64.3
0.303000	34.1	1000.0	9.000	Off	L2/N	20.2	25.8	60.0
0.609000	40.2	1000.0	9.000	Off	L2/N	20.3	15.8	56.0
0.613500	41.1	1000.0	9.000	Off	L2/N	20.3	14.9	56.0
1.225500	31.0	1000.0	9.000	Off	L2/N	20.3	25.0	56.0
1.833000	33.4	1000.0	9.000	Off	L2/N	20.3	22.6	56.0
1.896000	34.6	1000.0	9.000	Off	L2/N	20.3	21.4	56.0
3.484500	27.1	1000.0	9.000	Off	L2/N	20.5	28.9	56.0
3.547500	27.6	1000.0	9.000	Off	L2/N	20.5	28.4	56.0

Average

Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBµV)
0.181500	35.2	1000.0	9.000	Off	L2/N	19.9	19.1	54.3
0.181500	35.1	1000.0	9.000	Off	L2/N	19.9	19.2	54.3
0.366000	29.7	1000.0	9.000	Off	L2/N	20.2	18.7	48.4
0.613500	39.4	1000.0	9.000	Off	L2/N	20.3	6.6	46.0
0.613500	39.4	1000.0	9.000	Off	L2/N	20.3	6.6	46.0
0.856500	31.7	1000.0	9.000	Off	L2/N	20.3	14.3	46.0
1.284000	30.1	1000.0	9.000	Off	L2/N	20.3	15.9	46.0
1.284000	30.1	1000.0	9.000	Off	L2/N	20.3	15.9	46.0
1.833000	27.0	1000.0	9.000	Off	L2/N	20.3	19.0	46.0
3.547500	25.4	1000.0	9.000	Off	L2/N	20.5	20.6	46.0

2.3 20 dB BANDWIDTH

2.3.1 Specification Reference

Part 15 Subpart C §15.215(c)

2.3.2 Standard Applicable

(c) Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§15.217 through 15.257 and in Subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated. The requirement to contain the designated bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage. If a frequency stability is not specified in the regulations, it is recommended that the fundamental emission be kept within at least the central 80% of the permitted band in order to minimize the possibility of out-of-band operation.

2.3.3 Equipment Under Test and Modification State

Serial No: 004401-64-001017-5 / Test Configuration A

2.3.4 Date of Test/Verification

May 20, 2011

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

Ambient Temperature	26°C
Relative Humidity	35%
ATM Pressure	1012 mbar

2.3.7 Additional Observations

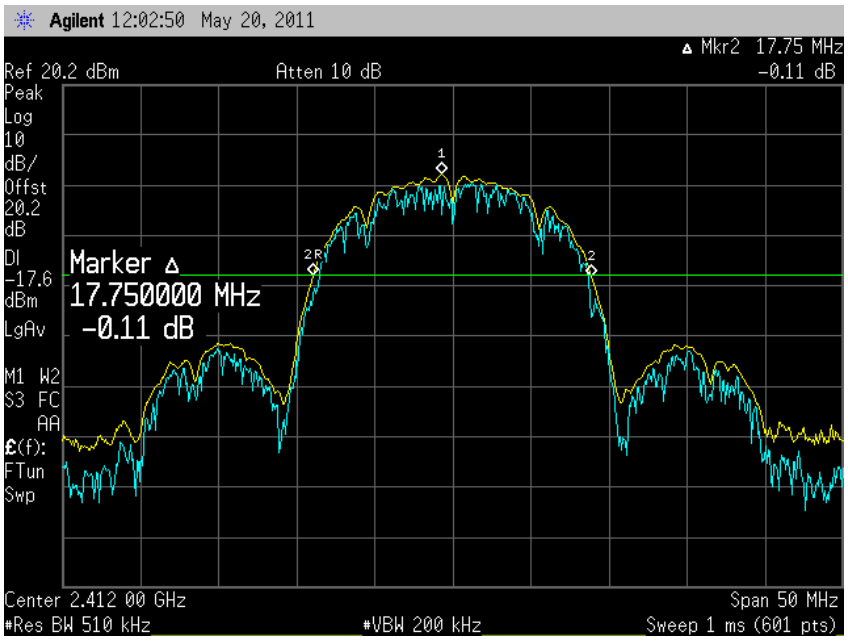
- This is a conducted test.
- An offset of 20.2dB was added to compensate for the external attenuator and cable used.
- A peak output reading was taken. A display line was drawn 20dB below the peak level.
- 20dB bandwidth verified using delta-marker measurements from the line drawn.
- Span is wide enough to capture the channel transmission.
- RBW is 1% of the span.
- VBW is 3X RBW.
- Sweep is auto.

- Detector is peak.
- Trace is max hold.

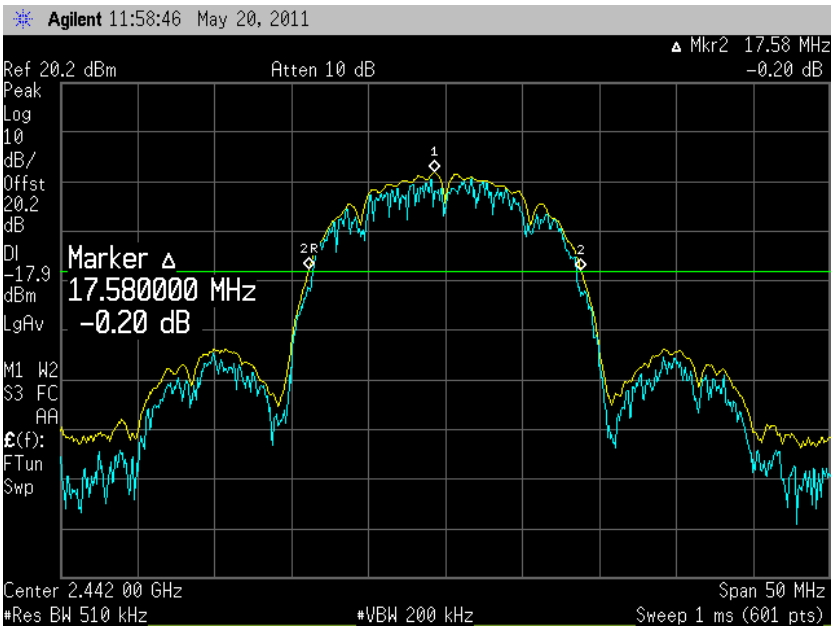
2.3.8 Test Results

Low Channel (2412 MHz)	Mid Channel (2442 MHz)	High Channel (2462 MHz)
17.75 MHz	17.58 MHz	17.58 MHz

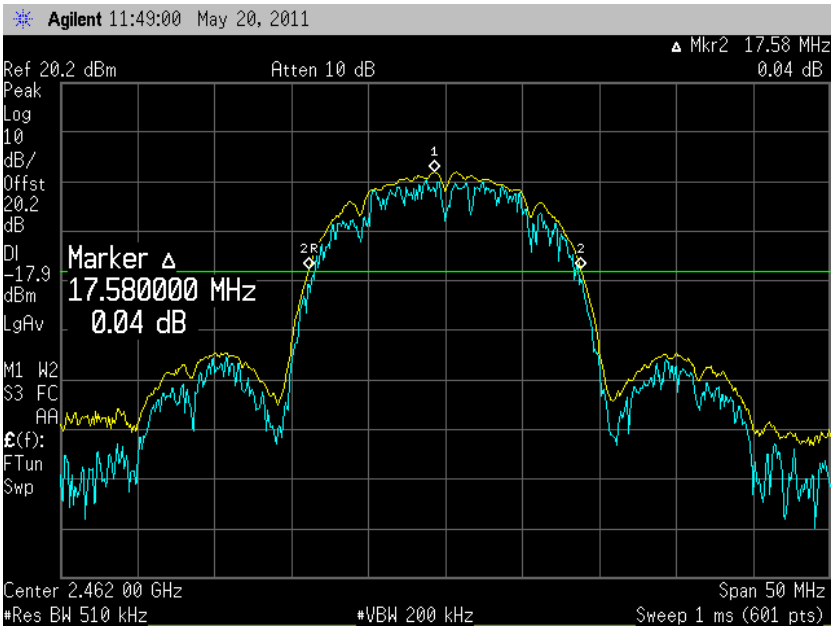
2412 MHz – (20dB BW/2) = 2403.125 MHz (within the frequency band - **Compliant**)
2462 MHz + (20dB BW/2) = 2470.790 MHz (within the frequency band - **Compliant**)



Low Channel



Mid Channel



High Channel

2.4 MINIMUM 6 dB RF BANDWIDTH

2.4.1 Specification Reference

Part 15 Subpart C §15.247(a)(2)

2.4.2 Standard Applicable

(2) Systems using digital modulation techniques may operate in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz..

2.4.3 Equipment Under Test and Modification State

Serial No: 004401-64-001017-5 / Test Configuration A

2.4.4 Date of Test/Verification

May 20, 2011

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

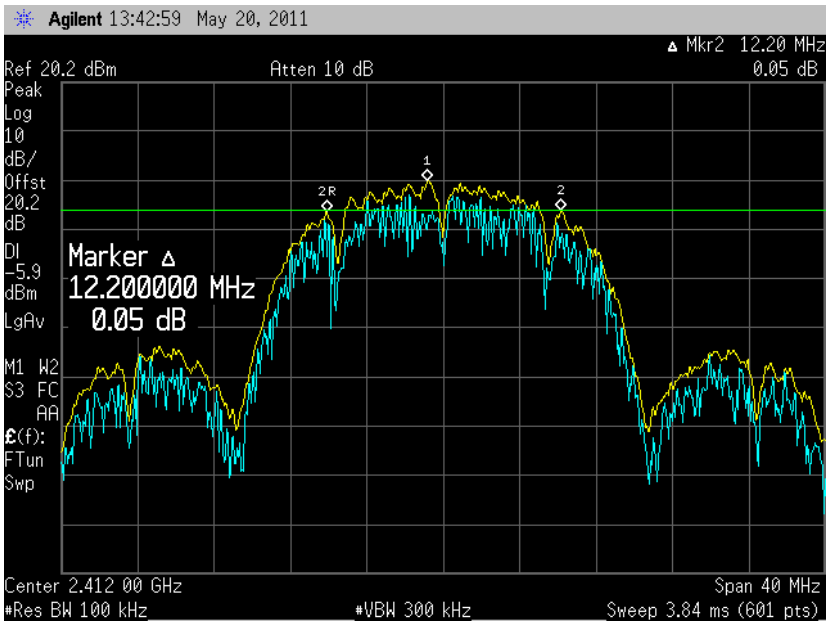
Ambient Temperature	26°C
Relative Humidity	35%
ATM Pressure	1012 mbar

2.4.7 Additional Observations

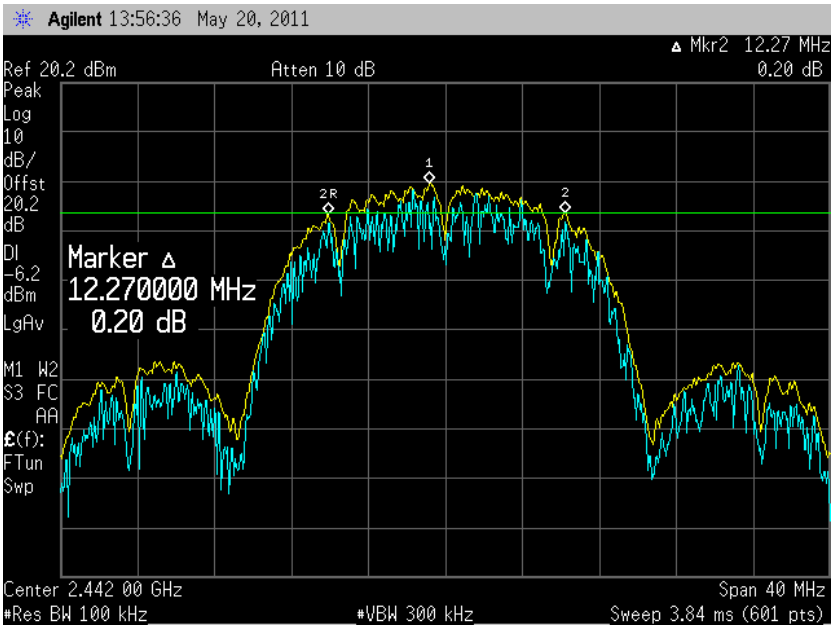
- This is a conducted test.
- An offset of 20.2dB was added to compensate for the external attenuator and cable used.
- A peak output reading was taken. A display line was drawn 6dB below the peak level.
- 6dB bandwidth verified using delta-marker measurements from the line drawn.
- Span is wide enough to capture the channel transmission.
- RBW is 100kHz.
- VBW is 3X RBW.
- Sweep is auto.
- Detector is peak.
- Trace is max hold.

2.4.8 Test Results

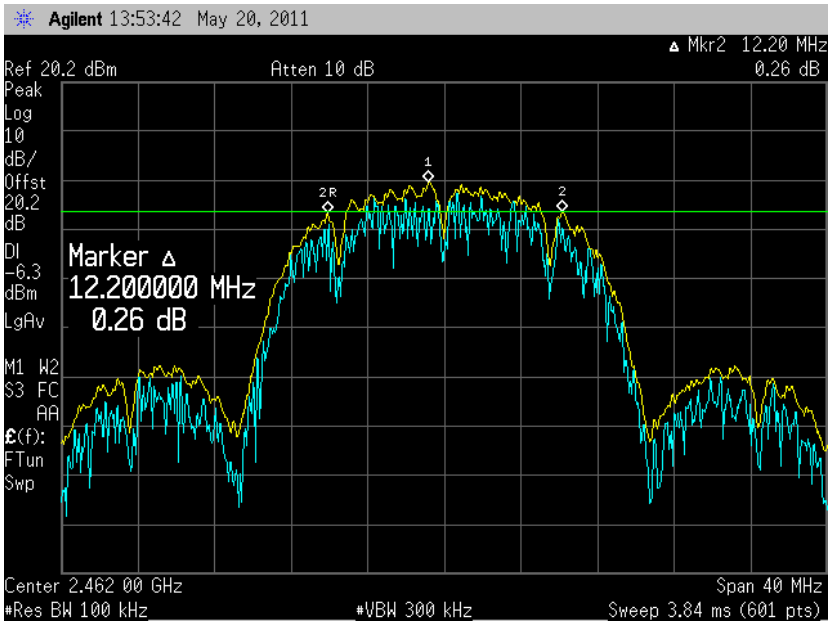
Low Channel (2412 MHz)	Mid Channel (2442 MHz)	High Channel (2462 MHz)
12.20 MHz	12.27 MHz	12.20 MHz



Low Channel



Mid Channel



High Channel

2.5 OUT-OF-BAND EMISSIONS - CONDUCTED

2.5.1 Specification Reference

Part 15 Subpart C §15.247(d)

2.5.2 Standard Applicable

(d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

2.5.3 Equipment Under Test and Modification State

Serial No: 004401-64-001017-5 / Test Configuration A

2.5.4 Date of Test/Verification

May 20, 2011

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

Ambient Temperature	26°C
Relative Humidity	35%
ATM Pressure	1012 mbar

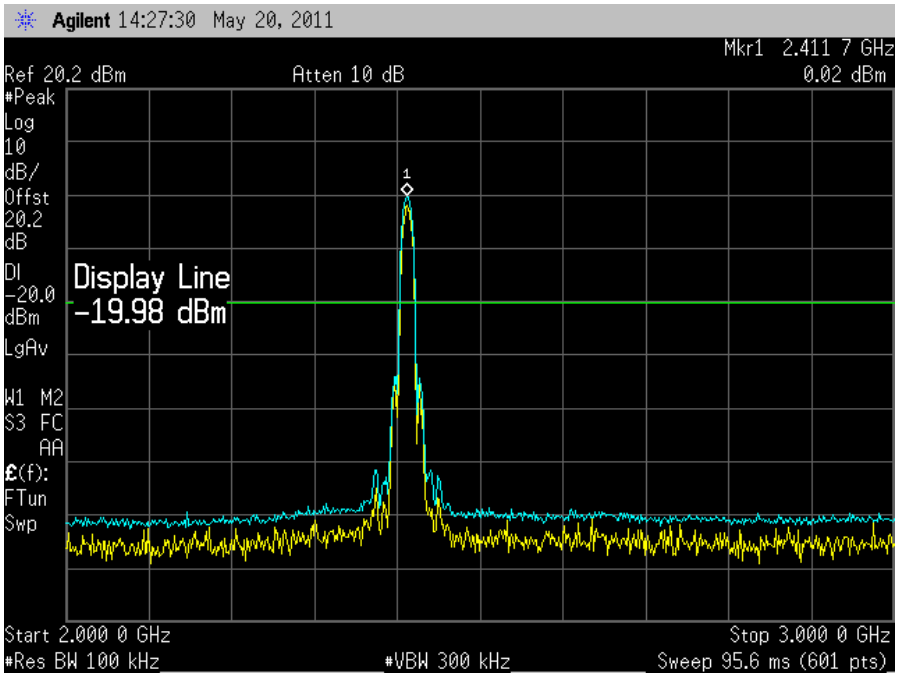
2.5.7 Additional Observations

- This is a conducted test.
- An offset of 20.2dB was added to compensate for the external attenuator and cable used.
- RBW is 100kHz.
- VBW is 3X RBW.
- Sweep is auto.
- Detector is peak.
- Trace is max hold.

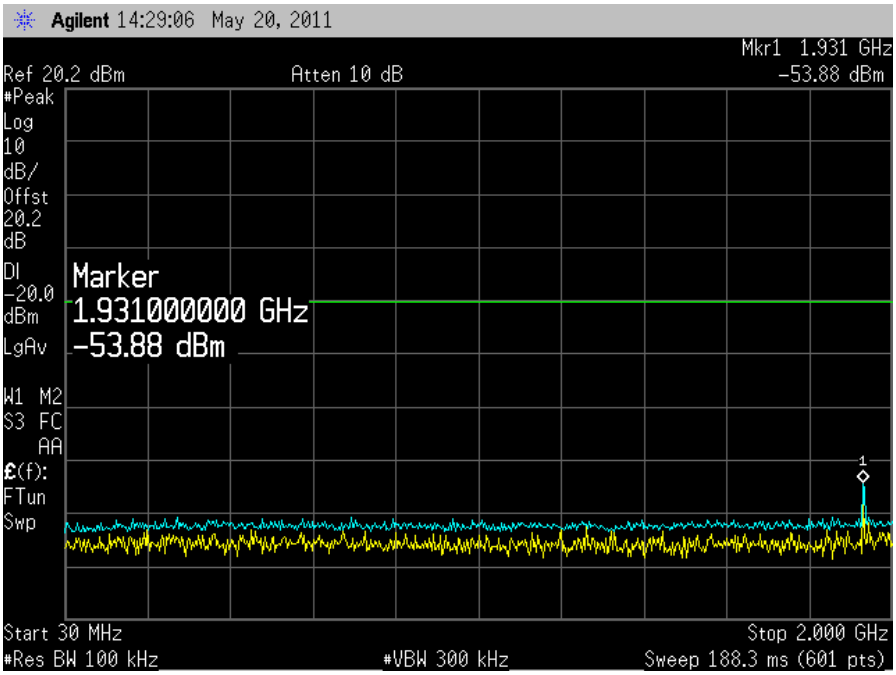
- Initial scan was performed to determine the highest level of the desired power within the band. Limit (display line) was drawn 20dB below this level.
- Spectrum was searched from 30MHz up to 25GHz.

2.5.8 Test Results

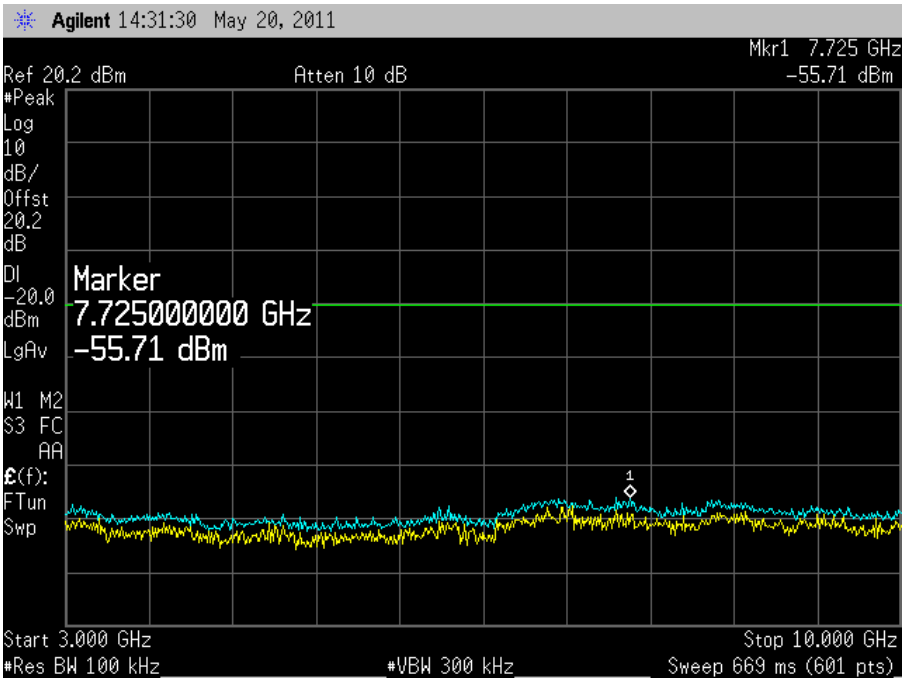
See attached plots.



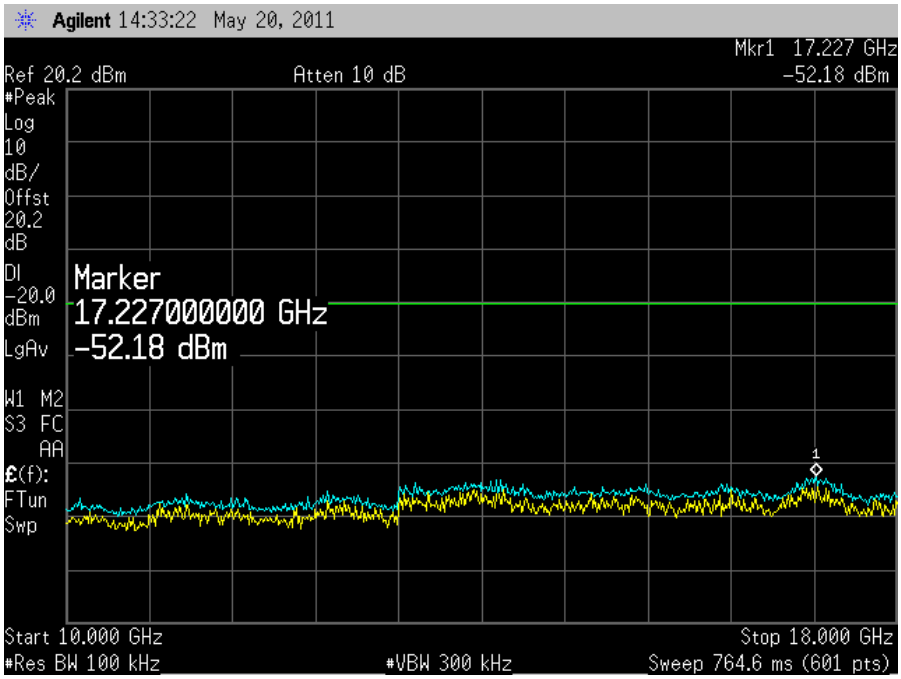
Low Channel (2 to 3GHz)



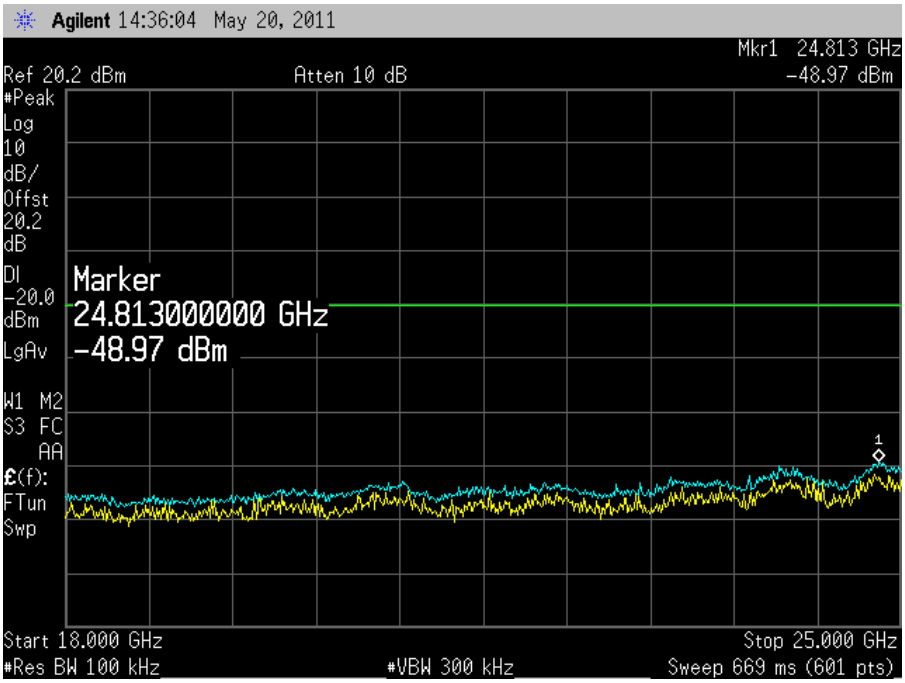
Low Channel (30MHz to 2GHz)



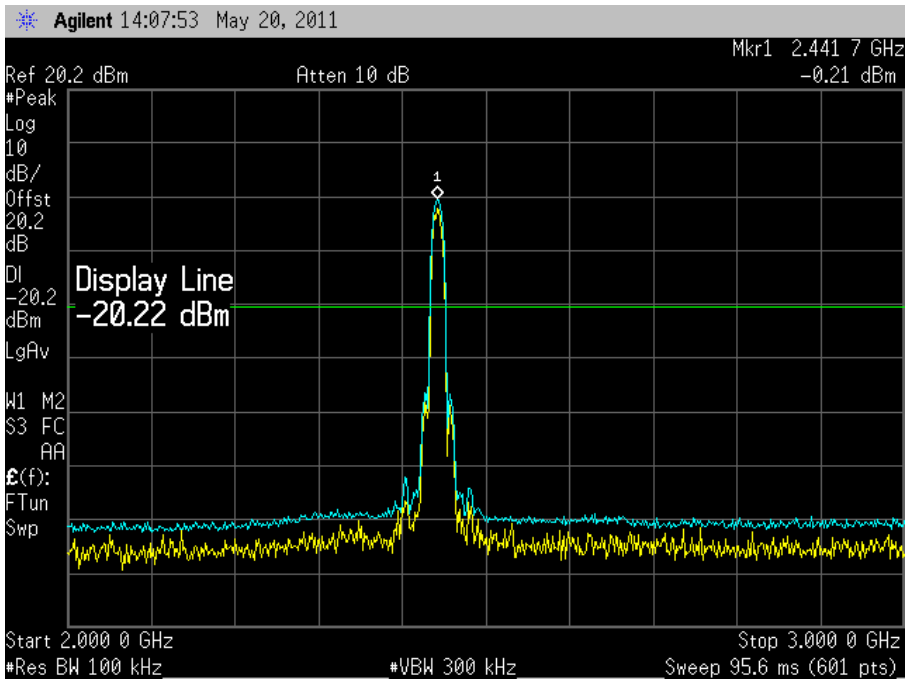
Low Channel (3GHz to 10GHz)



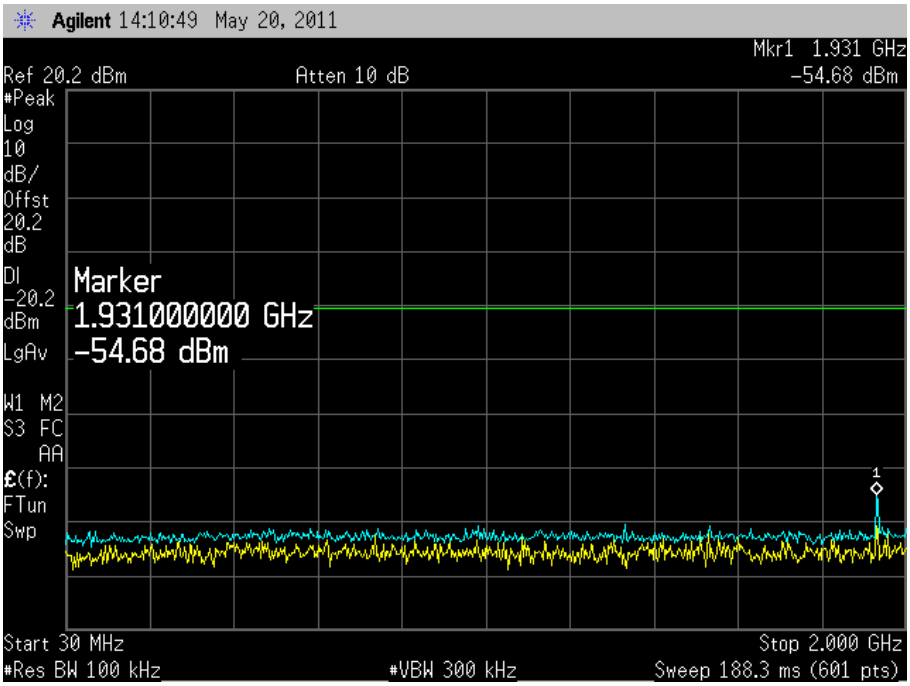
Low Channel (10GHz to 18GHz)



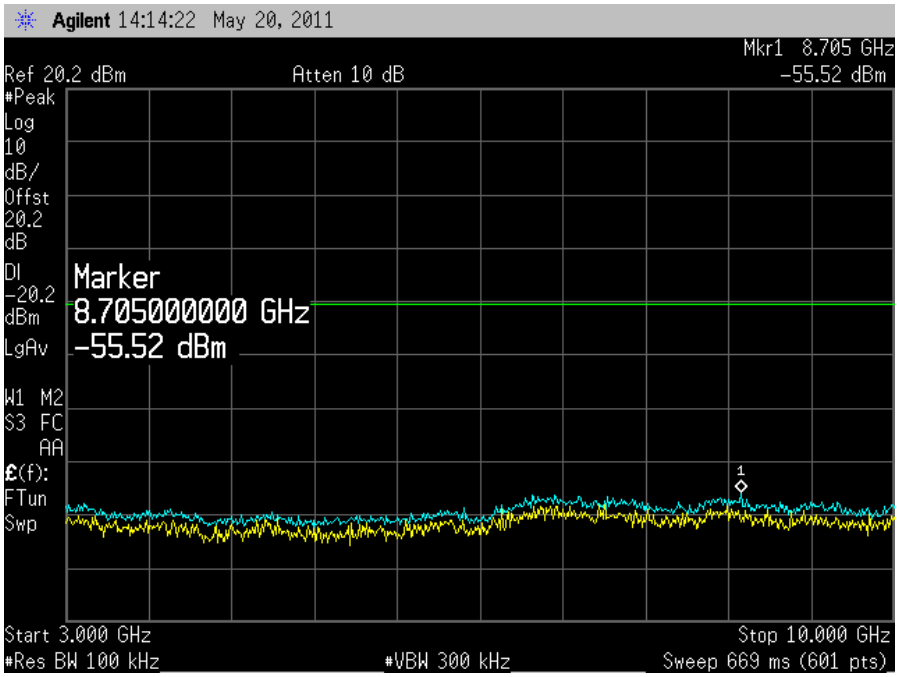
Low Channel (18GHz to 25GHz)



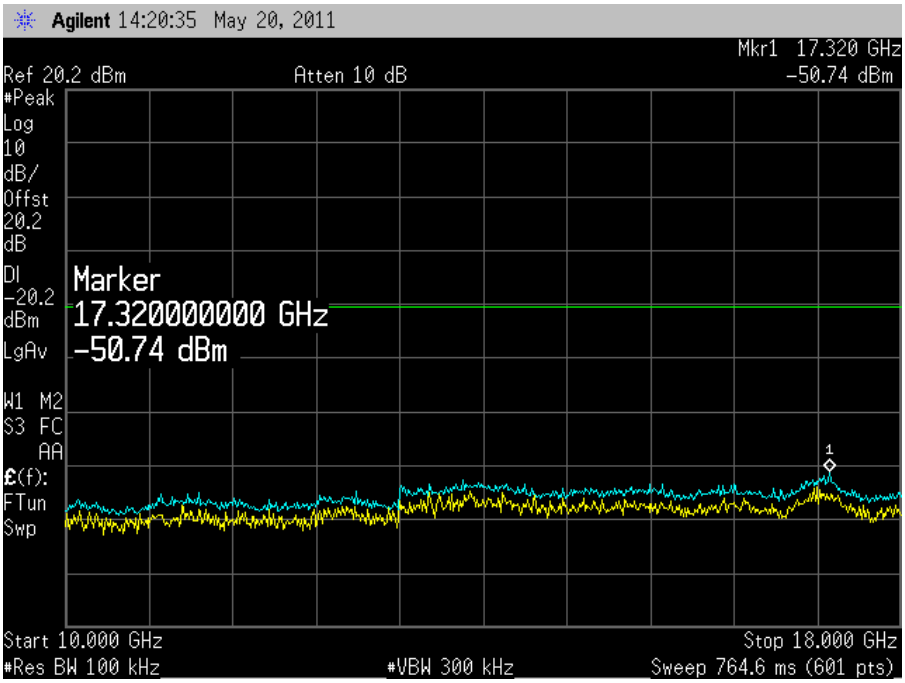
Mid Channel (2 to 3GHz)



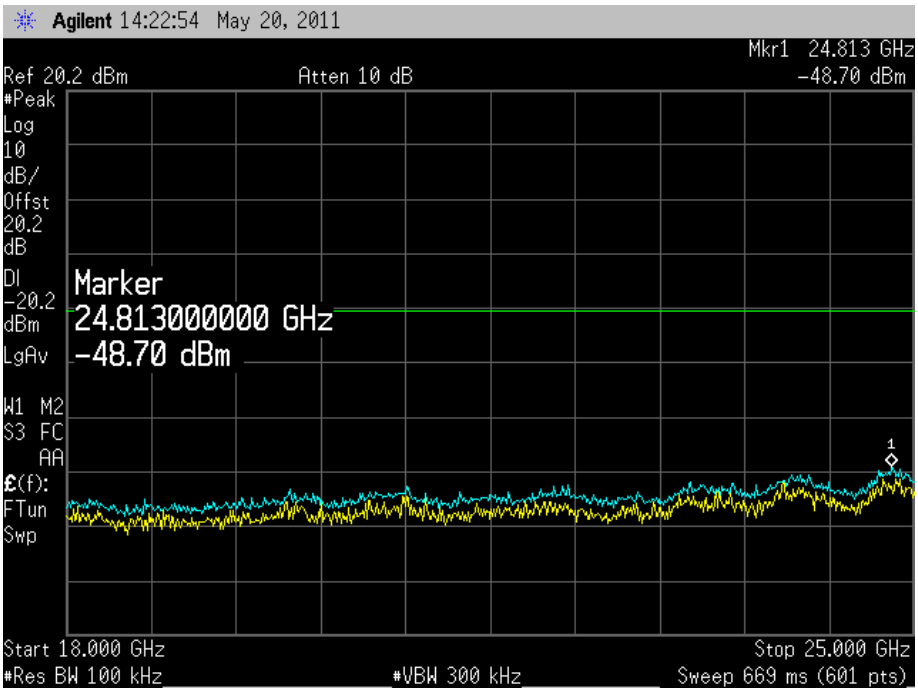
Mid Channel (30MHz to 2GHz)



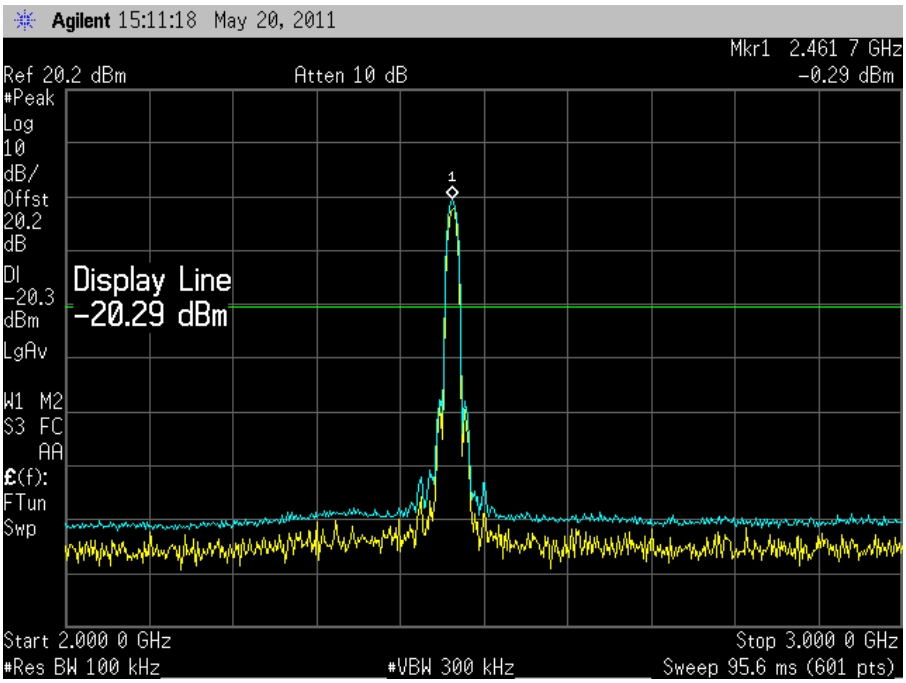
Mid Channel (3GHz to 10GHz)



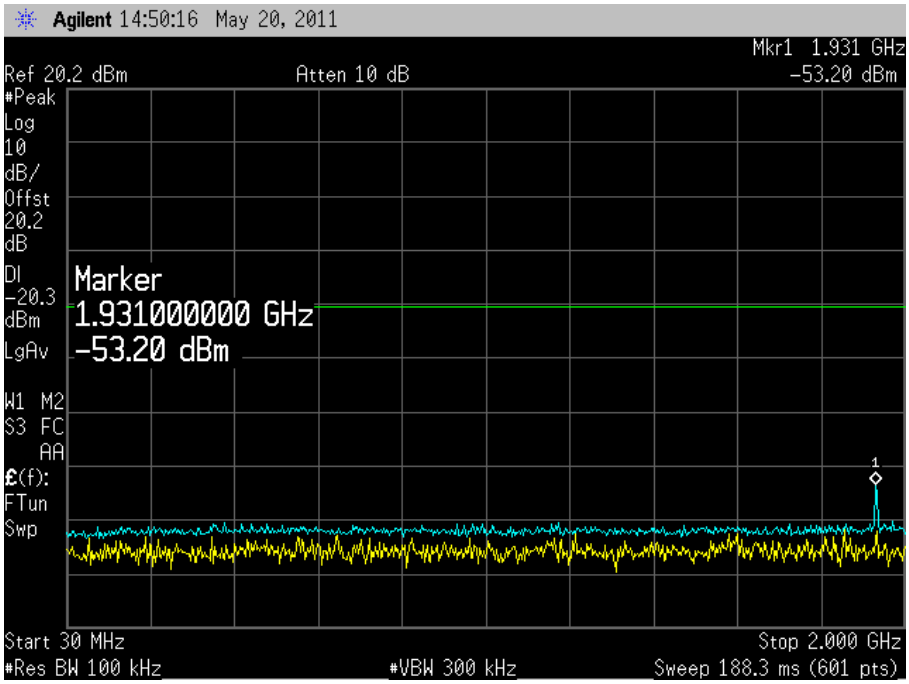
Mid Channel (10GHz to 18GHz)



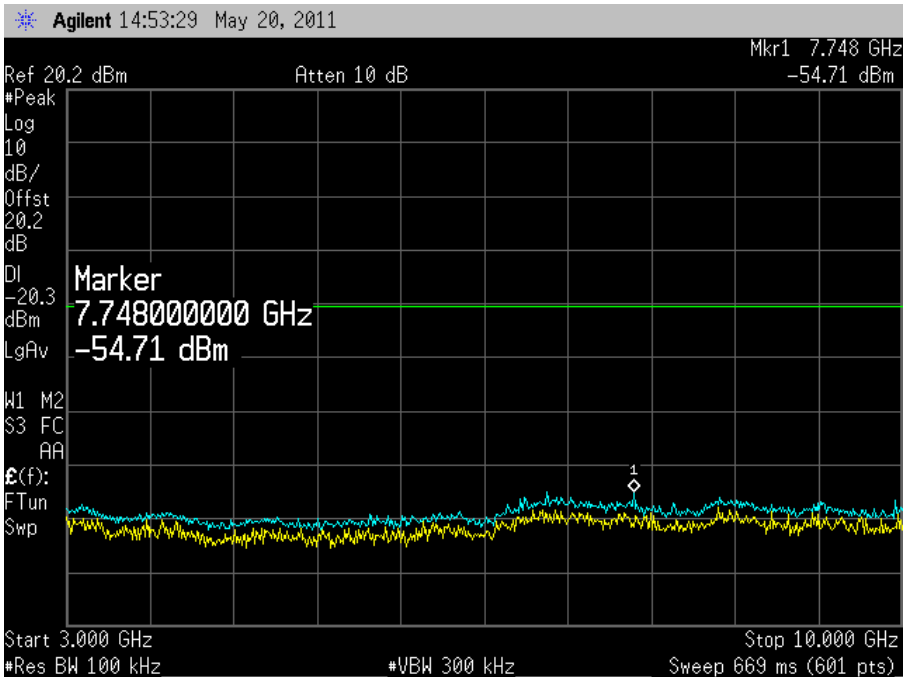
Mid Channel (18GHz to 25GHz)



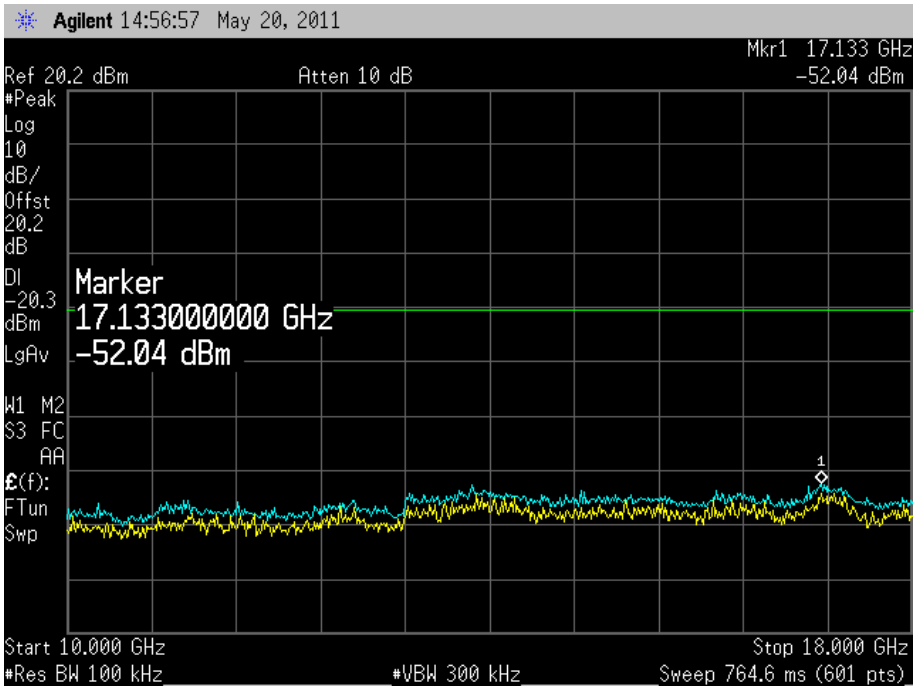
High Channel (2 to 3GHz)



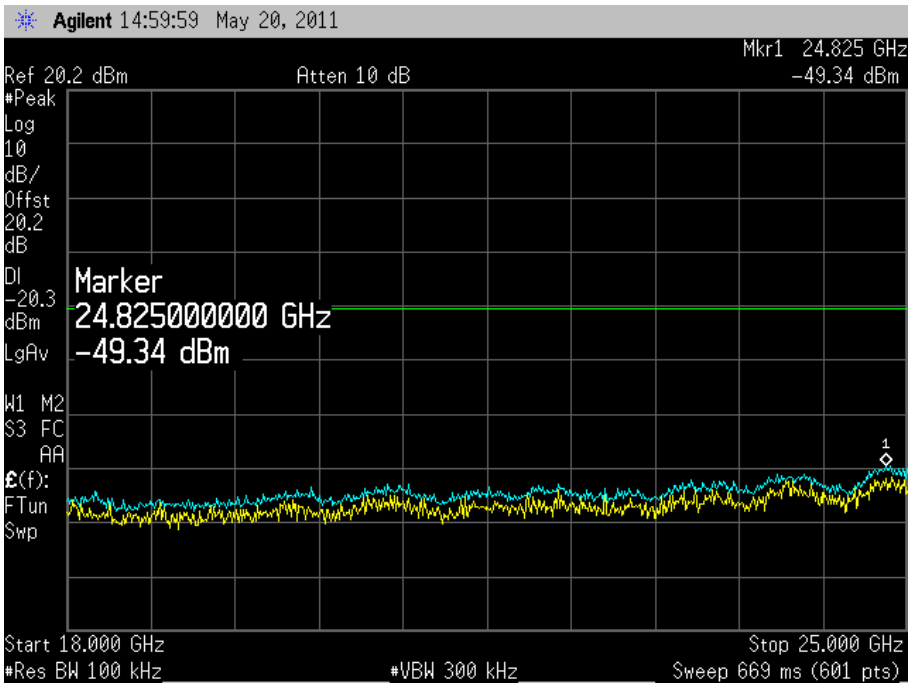
High Channel (30MHz to 2GHz)



High Channel (3GHz to 10GHz)



High Channel (10GHz to 18GHz)



High Channel (18GHz to 25GHz)

2.6 BAND-EDGE COMPLIANCE OF RF CONDUCTED EMISSIONS

2.6.1 Specification Reference

Part 15 Subpart C §15.247(d)

2.6.2 Standard Applicable

See previous test.

2.6.3 Equipment Under Test and Modification State

Serial No: 004401-64-001017-5 / Test Configuration A

2.6.4 Date of Test/Verification

May 23, 2011

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

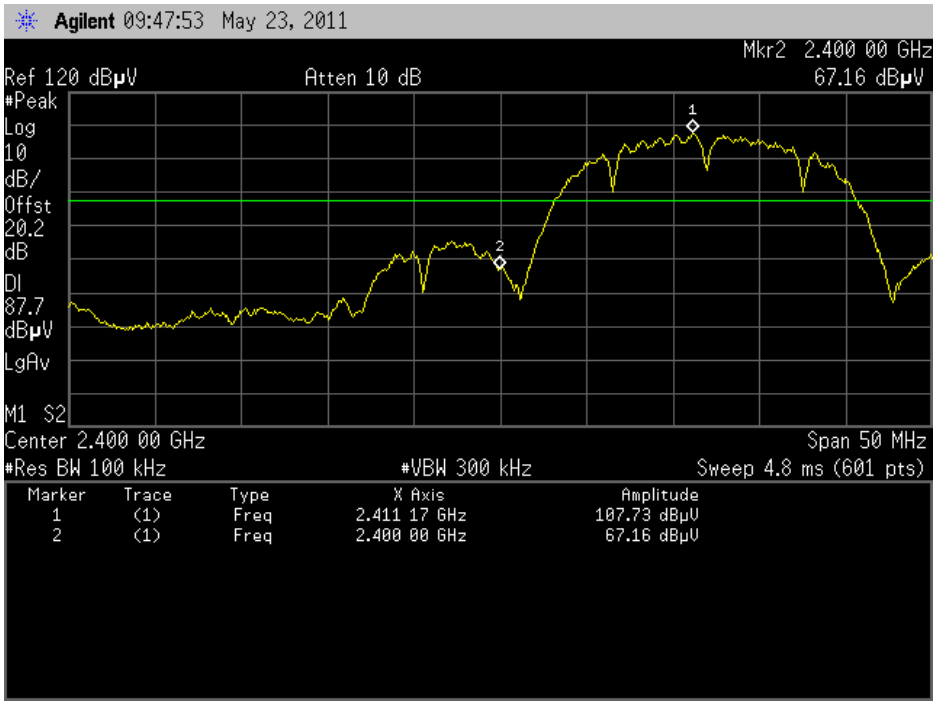
Ambient Temperature	26°C
Relative Humidity	35%
ATM Pressure	1012 mbar

2.6.7 Additional Observations

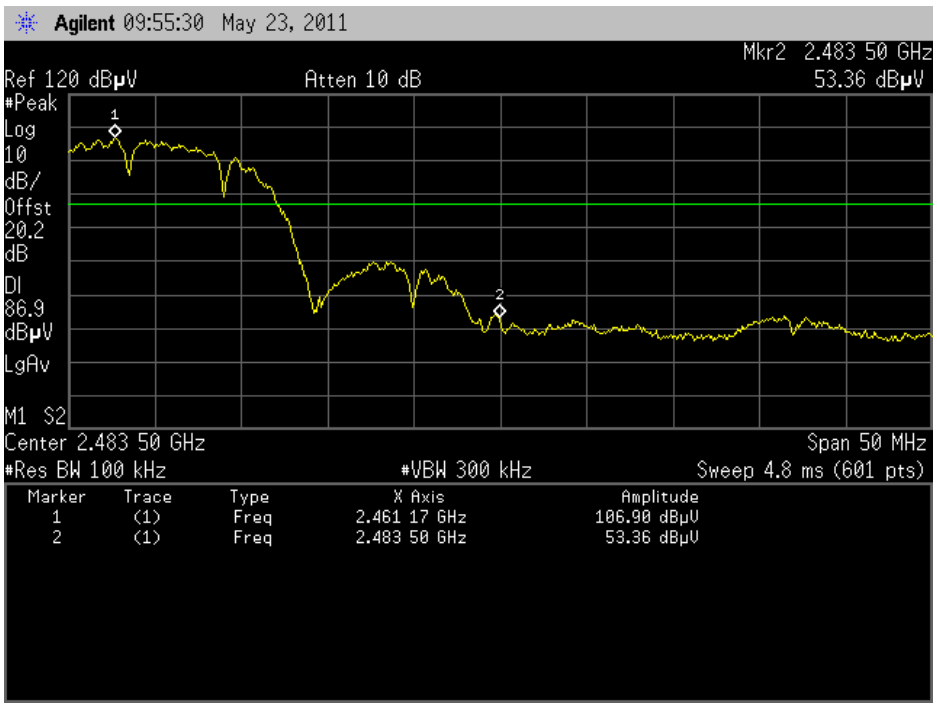
- Setup is identical to “Out-of-Band Emissions – Conducted“ test (previous test).
- Band-edge (2400MHz and 2483.5MHz) emissions were verified in this test.
- The spectrum analyzer was centred on the band-edge frequency while setting the EUT to the corresponding transmit channel (i.e. Low Channel for lower band-edge).
- Limit is 20dB below the highest level of the desired power within the band.

2.6.8 Test Results

See attached plots.



Lower Band-Edge



Higher Band-Edge

2.7 SPURIOUS RADIATED EMISSIONS

2.7.1 Specification Reference

Part 15 Subpart C §15.247(d)

2.7.2 Standard Applicable

(d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

2.7.3 Equipment Under Test and Modification State

Serial No: 004401-64-001017-5 / Test Configuration B

2.7.4 Date of Test/Verification

June 16 and 17, 2011

2.7.5 Test Equipment Used

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

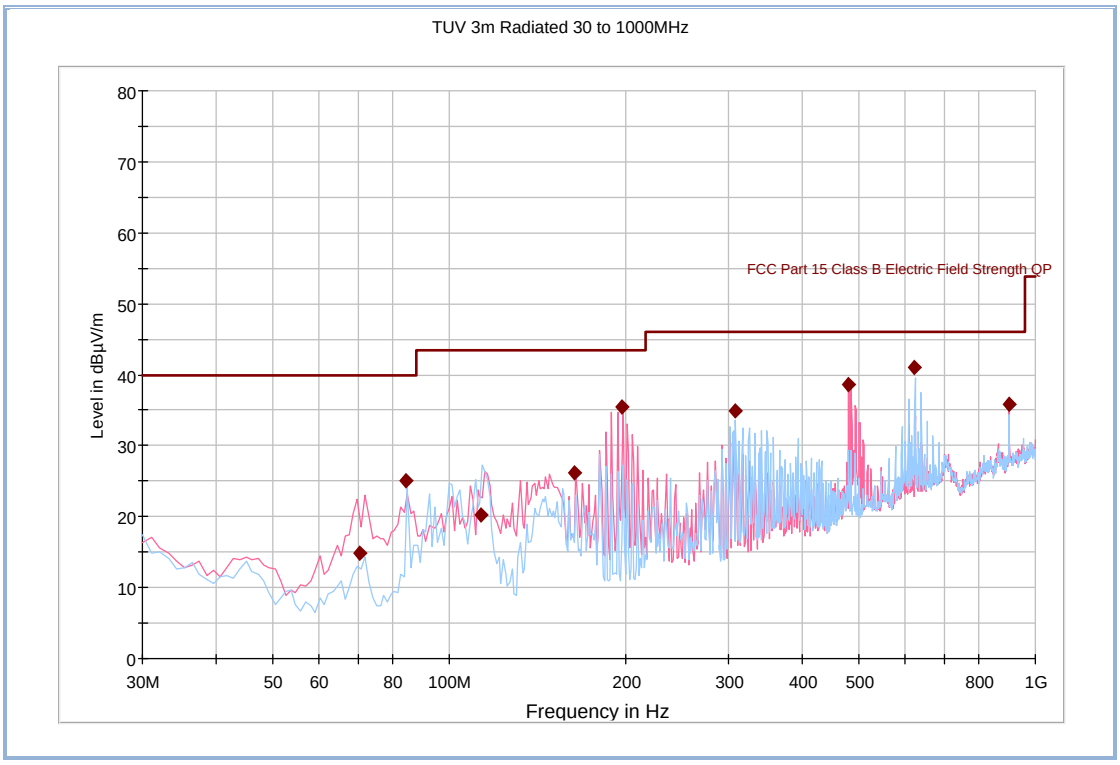
2.7.6 Environmental Conditions

Ambient Temperature	28°C
Relative Humidity	34%
ATM Pressure	1008 mbar

2.7.7 Additional Observations

- This is a radiated test. The spectrum was searched from 30MHz to the 10th harmonic (25GHz).
- Both AC and battery mode verified. Worst case presented.
- There are no emissions found that do not comply to the restricted bands defined in FCC Part 15 Subpart C, 15.205 or Part 15.247(d).
- Measurement was done using EMC32 V8.51 automated software. Reported level is the actual level with all the correction factors factored in. Correction Factor column is for informational purposes only.

2.7.8 Test Results Below 1GHz

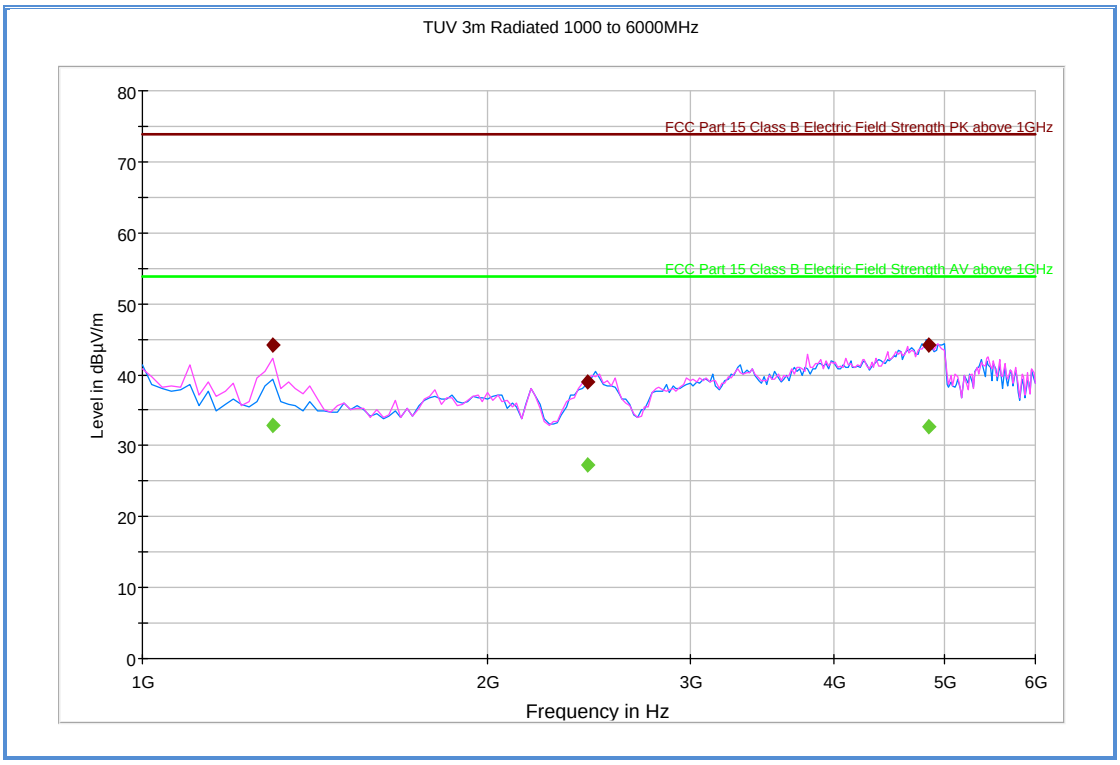


Quasi Peak Data

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
70.313333	14.9	1000.0	120.000	150.0	V	106.0	-22.8	25.1	40.0
84.486667	25.1	1000.0	120.000	386.0	H	189.0	-22.4	15.0	40.0
113.226667	20.2	1000.0	120.000	380.0	H	213.0	-21.2	23.3	43.5
163.842222	26.1	1000.0	120.000	100.0	V	269.0	-18.5	17.4	43.5
196.613333	35.4	1000.0	120.000	100.0	V	337.0	-17.9	8.1	43.5
307.186667	34.9	1000.0	120.000	100.0	H	352.0	-13.5	11.1	46.0
478.951111	38.6	1000.0	120.000	111.0	V	6.0	-7.7	7.4	46.0
622.055556	41.0	1000.0	120.000	121.0	H	347.0	-4.6	5.0	46.0
900.004444	35.8	1000.0	120.000	198.0	V	194.0	-0.4	10.2	46.0

Test Notes: No significant difference when the EUT is in standby/receive mode compared to what is presented. Only the worst channel presented (Low Channel).

2.7.9 Test Results Above 1GHz (Standby Mode/Receive Mode)



Peak Data

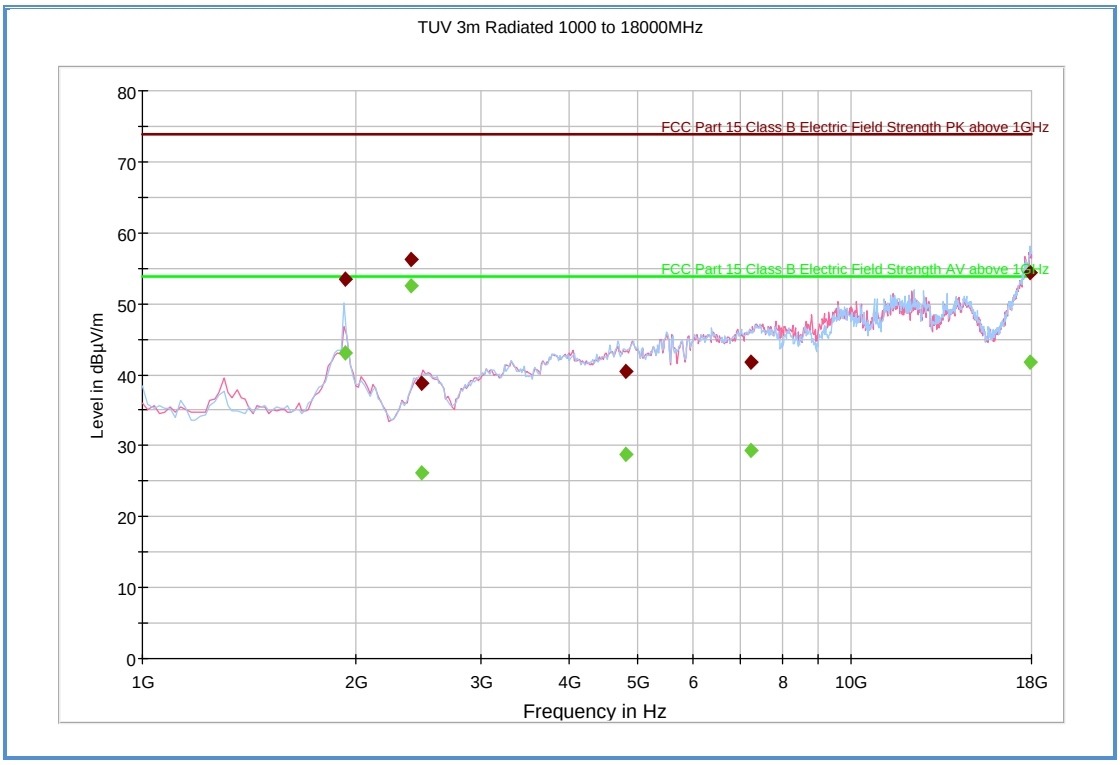
Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1300.180000	44.2	100.0	1000.000	100.0	V	347.0	1.6	29.7	73.9
2444.700000	39.0	100.0	1000.000	278.0	V	37.0	7.8	34.9	73.9
4840.380000	44.1	100.0	1000.000	100.0	H	13.0	20.1	29.8	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)
1300.180000	32.9	100.0	1000.000	100.0	V	347.0	1.6	21.0	53.9
2444.700000	27.4	100.0	1000.000	278.0	V	37.0	7.8	26.5	53.9
4840.380000	32.6	100.0	1000.000	100.0	H	13.0	20.1	21.3	53.9

Test Notes: No other spurious emissions observed above 1GHz when the EUT is on standby/receive mode. Only the worst channel presented (Low Channel).

2.7.10 Test Results Above 1GHz (Low Channel including Band Edges)



Peak Data

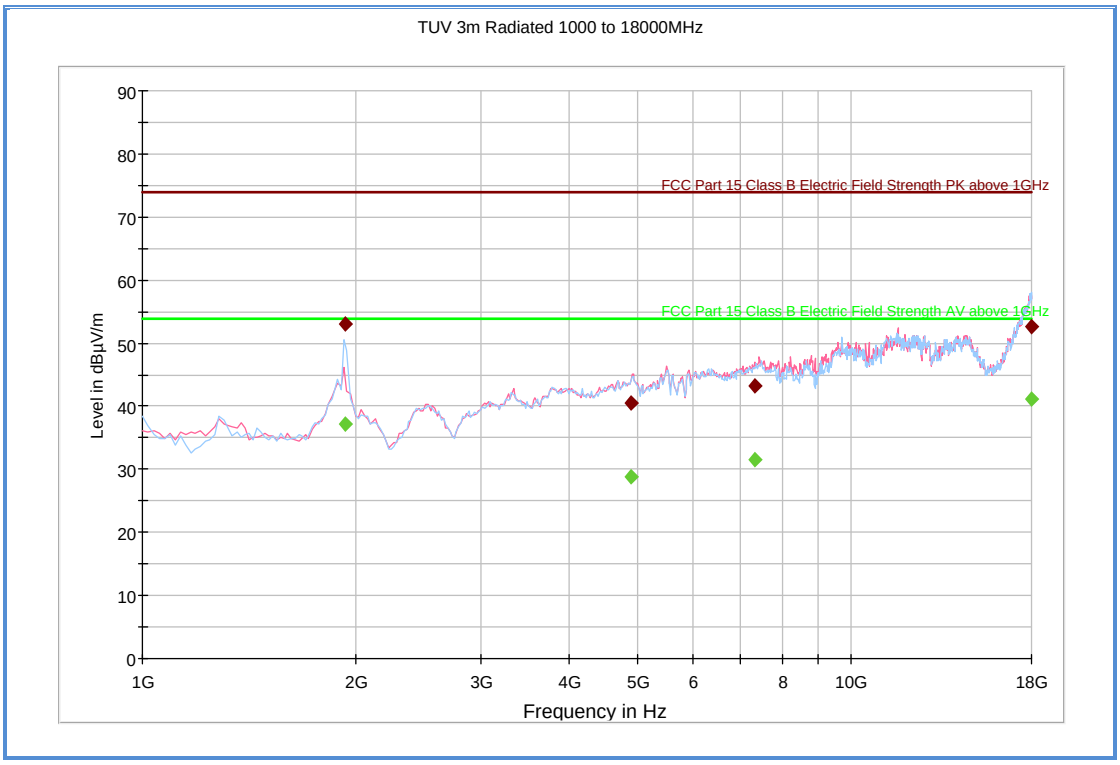
Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1932.135556	53.5	100.0	1000.000	105.0	H	38.0	-0.3	20.4	73.9
2400.000000	56.2	100.0	1000.000	100.0	H	40.0	7.5	17.7	73.9
2483.500000	38.8	100.0	1000.000	128.0	V	321.0	8.0	35.1	73.9
4821.255556	40.5	100.0	1000.000	321.0	H	221.0	4.6	33.4	73.9
7227.433333	41.7	100.0	1000.000	277.0	V	86.0	10.5	32.2	73.9
17922.22444	54.3	100.0	1000.000	365.0	H	278.0	33.7	19.6	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)
1932.135556	43.1	100.0	1000.000	105.0	H	38.0	-0.3	10.8	53.9
2400.000000	52.6	100.0	1000.000	100.0	H	40.0	7.5	1.3	53.9
2483.500000	26.1	100.0	1000.000	128.0	V	321.0	8.0	27.8	53.9
4821.255556	28.8	100.0	1000.000	321.0	H	221.0	4.6	25.1	53.9
7227.433333	29.3	100.0	1000.000	277.0	V	86.0	10.5	24.6	53.9
17922.22444	41.8	100.0	1000.000	365.0	H	278.0	33.7	12.1	53.9

Test Notes: Measurement was performed with a 2.4GHz notch filter. Band edge measurements were performed with the notch filter removed.

2.7.11 Test Results Above 1GHz (Mid Channel)



Peak Data

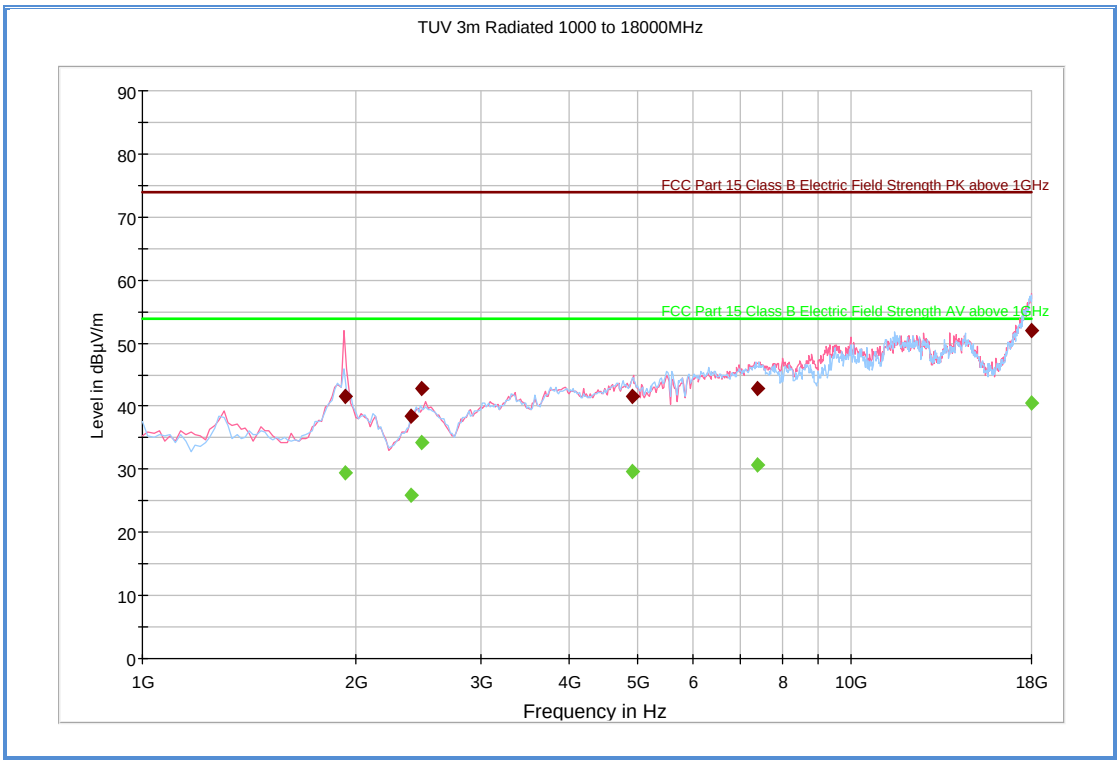
Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1932.175556	53.0	100.0	1000.000	227.0	H	28.0	-0.3	20.9	73.9
4894.091111	40.6	100.0	1000.000	106.0	V	328.0	4.9	33.3	73.9
7329.717778	43.3	100.0	1000.000	172.0	V	341.0	11.1	30.6	73.9
17978.33111	52.5	100.0	1000.000	270.0	H	96.0	33.8	21.4	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)
1932.175556	37.1	100.0	1000.000	227.0	H	28.0	-0.3	16.8	53.9
4894.091111	28.9	100.0	1000.000	106.0	V	328.0	4.9	25.0	53.9
7329.717778	31.4	100.0	1000.000	172.0	V	341.0	11.1	22.5	53.9
17978.33111	41.1	100.0	1000.000	270.0	H	96.0	33.8	12.8	53.9

Test Notes: Measurement was performed with a 2.4GHz notch filter. Band edge measurements were performed with the notch filter removed, however no emissions were observed (noise floor).

2.7.12 Test Results Above 1GHz (High Channel including Band Edges)



Peak Data

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1932.335556	41.5	100.0	1000.000	219.0	V	79.0	-0.3	32.4	73.9
2400.000000	38.5	100.0	1000.000	130.0	H	15.0	7.5	35.4	73.9
2483.500000	42.8	100.0	1000.000	105.0	V	46.0	8.0	31.1	73.9
4924.908889	41.5	100.0	1000.000	288.0	V	168.0	5.1	32.4	73.9
7387.184444	42.9	100.0	1000.000	100.0	V	166.0	11.2	31.0	73.9
17998.66000	52.0	100.0	1000.000	261.0	V	109.0	33.9	21.9	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)
1932.335556	29.5	100.0	1000.000	219.0	V	79.0	-0.3	24.4	53.9
2400.000000	25.9	100.0	1000.000	130.0	H	15.0	7.5	28.0	53.9
2483.500000	34.2	100.0	1000.000	105.0	V	46.0	8.0	19.7	53.9
4924.908889	29.8	100.0	1000.000	288.0	V	168.0	5.1	24.1	53.9
7387.184444	30.7	100.0	1000.000	100.0	V	166.0	11.2	23.2	53.9
17998.66000	40.4	100.0	1000.000	261.0	V	109.0	33.9	13.5	53.9

Test Notes: Measurement was performed with a 2.4GHz notch filter. Band edge measurements were performed with the notch filter removed.

2.8 POWER SPECTRAL DENSITY

2.8.1 Specification Reference

Part 15 Subpart C §15.247(e)

2.8.2 Standard Applicable

(e) For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

2.8.3 Equipment Under Test and Modification State

Serial No: 004401-64-001017-5 / Test Configuration A

2.8.4 Date of Test/Verification

May 23, 2011

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

Ambient Temperature	26°C
Relative Humidity	35%
ATM Pressure	1012 mbar

2.8.7 Additional Observations

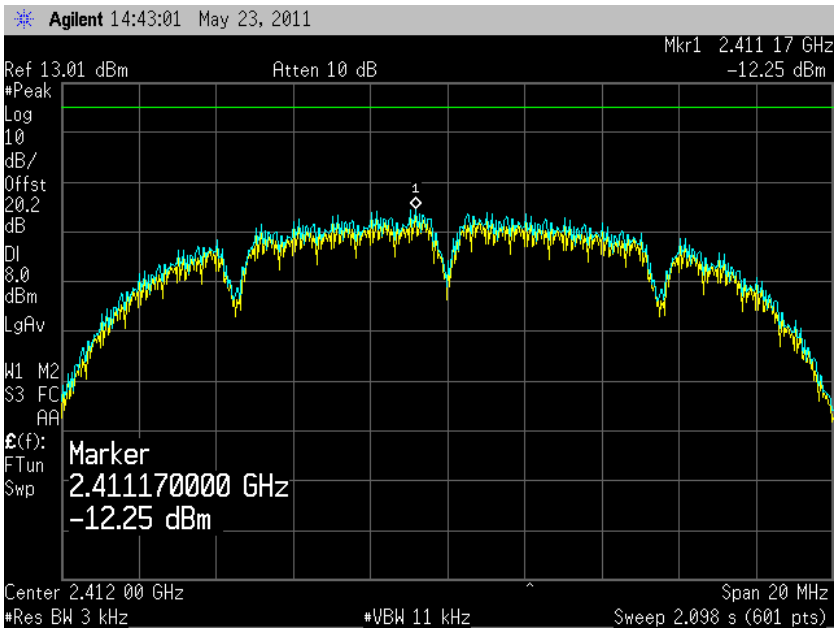
- This is a conducted test.
- An offset of 20.2dB was added to compensate for the external attenuator and cable used.
- RBW is 3kHz.
- VBW is 3X RBW.
- Detector is peak.
- Trace is max hold.
- A initial scan was performed with a span wide enough to capture the entire channel emission.
- From this scan the peak emission is determined.
- The peak is centred and zoomed in.
- Sweep time is calculated based from the new span.
- PSD is the max peak measured during this scan.

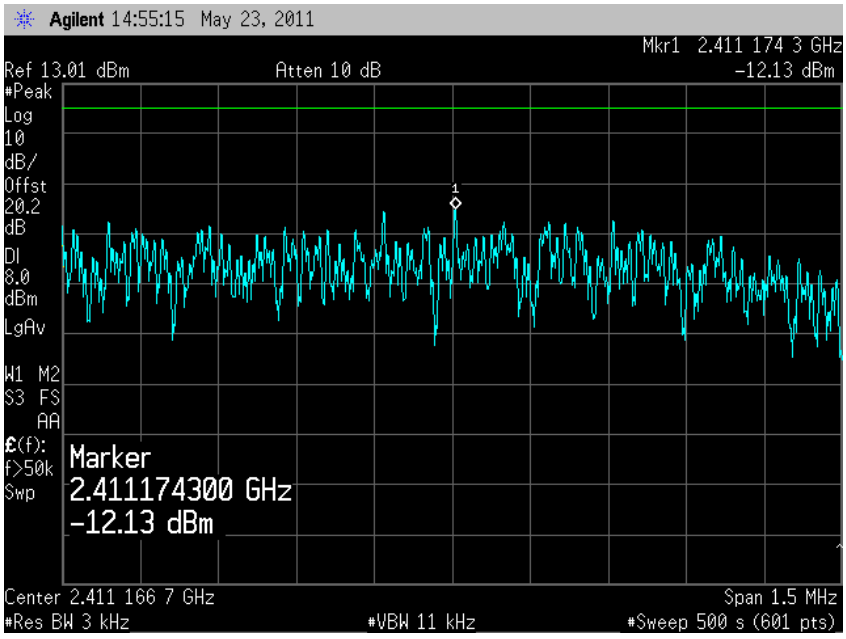
2.8.8 Test Results

See attached table and plots.

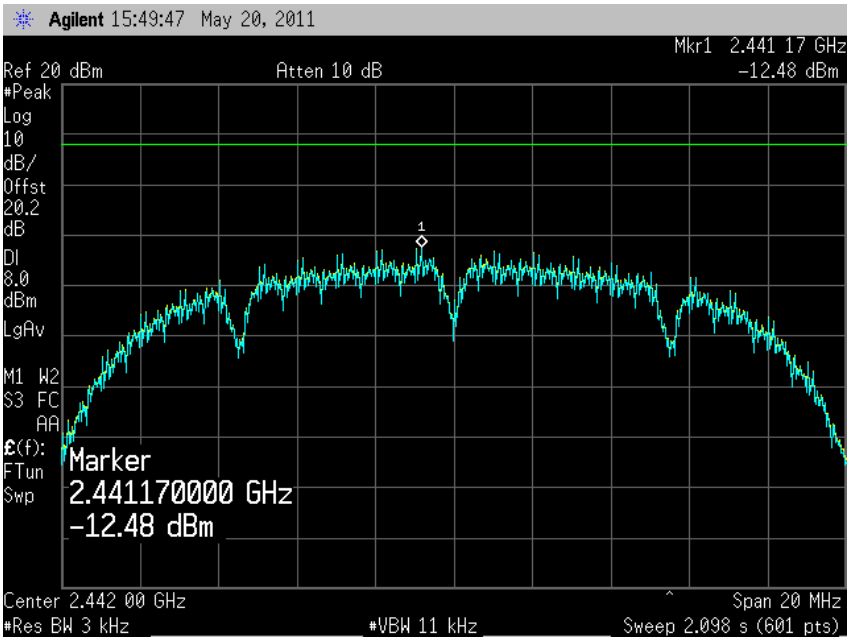
Channel Frequency (MHz)	RF Power Spectral Density (dBm)	Limit (dBm)	Pass/Fail
2412	-12.13	8	Pass
2442	-12.33	8	Pass
2462	-12.40	8	Pass

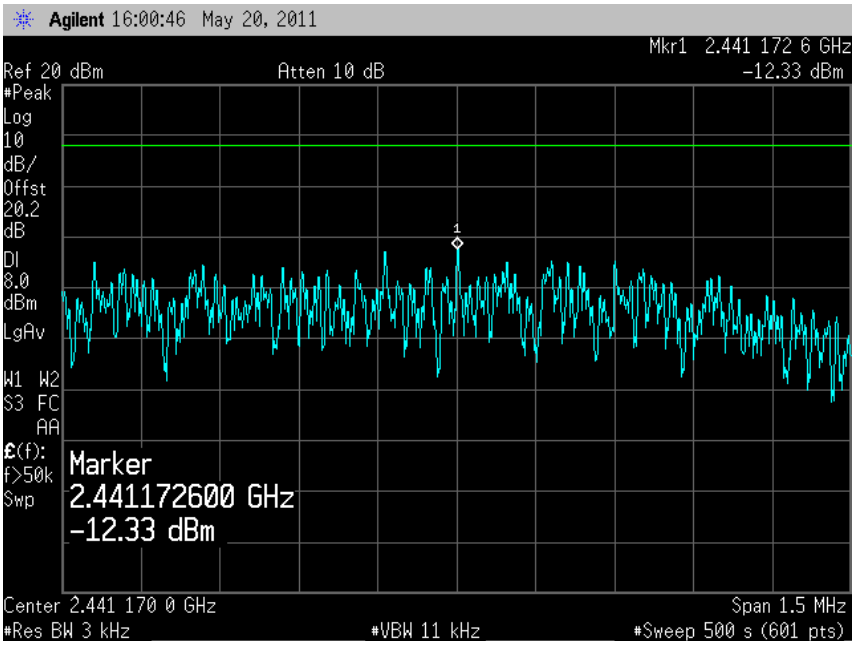
TÜV SÜD AMERICA INC 10040 Mesa Rim Road San Diego, CA 92121-2912 Phone: 858 678 1400 FAX: 858 546 0364


Agilent 14:43:01 May 23, 2011
Mkr1 2.411 17 GHz
Ref 13.01 dBm
Atten 10 dB
-12.25 dBm
#Peak
Log
10
dB/
Offst
20.2
dB
Dl
8.0
dBm
LgAv
W1 M2
S3 FC
AA
£(f):
FTun
Swp
Marker
2.411170000 GHz
-12.25 dBm
Center 2.412 00 GHz
Span 20 MHz
#Res BW 3 kHz
#VBW 11 kHz
Sweep 2.098 s (601 pts)

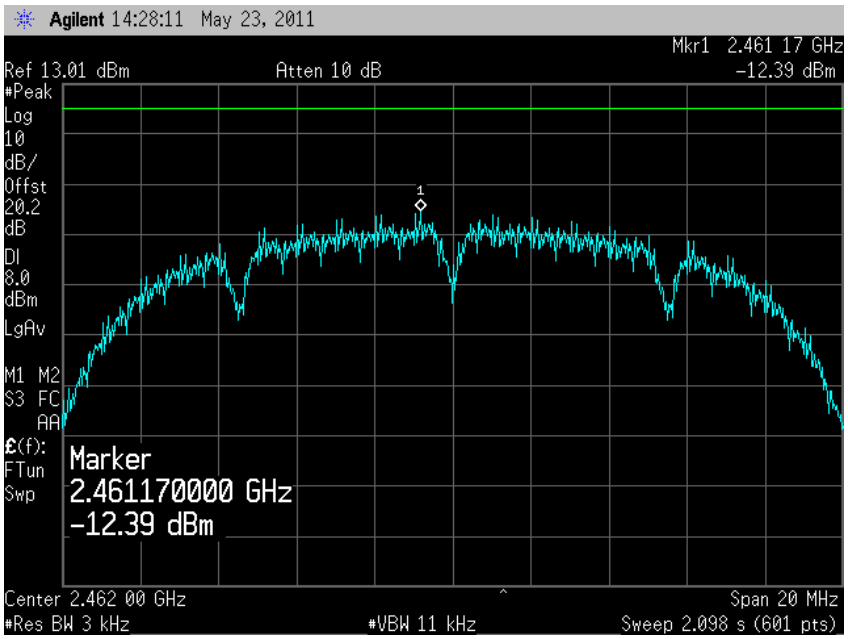

Agilent 14:55:15 May 23, 2011
Mkr1 2.411 174 3 GHz
Ref 13.01 dBm
Atten 10 dB
-12.13 dBm
#Peak
Log
10
dB/
Offst
20.2
dB
Dl
8.0
dBm
LgAv
W1 M2
S3 FS
AA
£(f):
f>50k
Swp
Marker
2.411174300 GHz
-12.13 dBm
Center 2.411 166 7 GHz
Span 1.5 MHz
#Res BW 3 kHz
#VBW 11 kHz
#Sweep 500 s (601 pts)

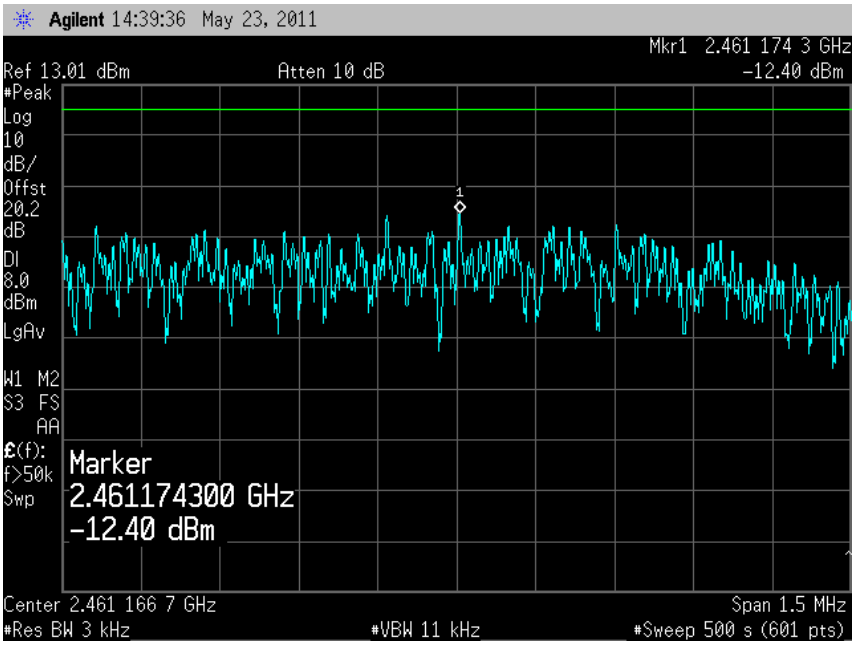
Low Channel


Agilent 15:49:47 May 20, 2011
Mkr1 2.441 17 GHz
Ref 20 dBm
Atten 10 dB
-12.48 dBm
#Peak
Log
10
dB/
Offst
20.2
dB
Dl
8.0
dBm
LgAv
M1 W2
S3 FC
AA
£(f):
FTun
Swp
Marker
2.441170000 GHz
-12.48 dBm
Center 2.442 00 GHz
Span 20 MHz
#Res BW 3 kHz
#VBW 11 kHz
Sweep 2.098 s (601 pts)


Agilent 16:00:46 May 20, 2011
Mkr1 2.441 172 6 GHz
Ref 20 dBm
Atten 10 dB
-12.33 dBm
#Peak
Log
10
dB/
Offst
20.2
dB
Dl
8.0
dBm
LgAv
W1 W2
S3 FC
AA
£(f):
f>50k
Swp
Marker
2.441172600 GHz
-12.33 dBm
Center 2.441 170 0 GHz
Span 1.5 MHz
#Res BW 3 kHz
#VBW 11 kHz
#Sweep 500 s (601 pts)

Mid Channel





High Channel

SECTION 3

TEST EQUIPMENT USED

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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
1002	Bilog Antenna	3142C	00058717	EMCO	11/04/10	11/04/11
1043/1044	EMI Test Receiver	ESMI	848926/003	Rhode & Schwarz	07/15/10	07/15/11
6528	EMI Test Receiver	ESCS 30	847793/001	Rhode & Schwarz	02/25/11	02/25/11
8633	20dB Attenuator	CAT-20	N/A	MCL HAT-20	06/30/10	06/30/11
1171	LISN	FCC-LISN-50-25-2	0871	Fischer Custom Comm.	03/03/11	03/03/12
1040	EMI Test Receiver	ESIB40	100292	Rhode & Schwarz	07/06/10	07/06/11
1049	EMI Test Receiver	ESU	100133	Rhode & Schwarz	Verified by 1040	
6815	2.4GHz Band Notch Filter	BRM50702	008	Micro-Tronics	Verified by 1040	
1051	DRWH Antenna	3115	9408-4329	EMCO	11/02/10	11/02/11
1016	Pre-amplifier	PAM-0202	187	PAM	01/04/11	01/04/12
08628	Pre-amplifier	QLJ01182835-JO	8986002	Quinstar Tech. Inc.	06/28/10	06/28/11
08543	High-Freq cable	Micropore 19057793	147650/4	United Microwave Products	06/25/10	06/25/11
1173	Low-loss coaxial cable	Nokia Kabel RG213	N/A	Chase London	04/15/11	04/15/12
6600	Power Meter	437B	3125U19308	Hewlett Packard	05/18/11	05/18/12
6534	Power Sensor	8481A	1926A27807	Hewlett Packard	03/26/11	03/26/12
6672	DC Power Supply	E3611A	KR73012637	Hewlett Packard	Verified by 7514	
6455	DC Power Supply	E3611A	3125U19308	Hewlett Packard	Verified by 7514	
7536	DC Power Supply	6012B	N/A		Verified by 7514	
7514	Multimeter	34410A	MY45002624	Agilent	07/14/10	07/14/11
	Test Software	EMC32	V8.51	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	0.45	0.26	0.07
2	Cables	Rectangular	0.50	0.29	0.08
3	EUT Setup	Rectangular	1.00	0.58	0.33
			Combined Uncertainty (u_c):		0.67
			Coverage Factor (k):		2
			Expanded Uncertainty:		1.39

3.2.2 Radiated Measurements

	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	0.41	0.24	0.06
5	Site	Rectangular	2.00	1.15	1.33
6	EUT Setup	Rectangular	1.00	0.58	0.33
			Combined Uncertainty (u_c):		1.38
			Coverage Factor (k):		2
			Expanded Uncertainty:		2.79

SECTION 4

PHOTOGRAPHS

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4.1 ADDITIONAL PHOTOGRAPHS OF EQUIPMENT UNDER TEST (EUT)

Antenna test port for conducted measurement

Side showing Ethernet port and power port

SECTION 5

DIAGRAM OF TEST SETUP

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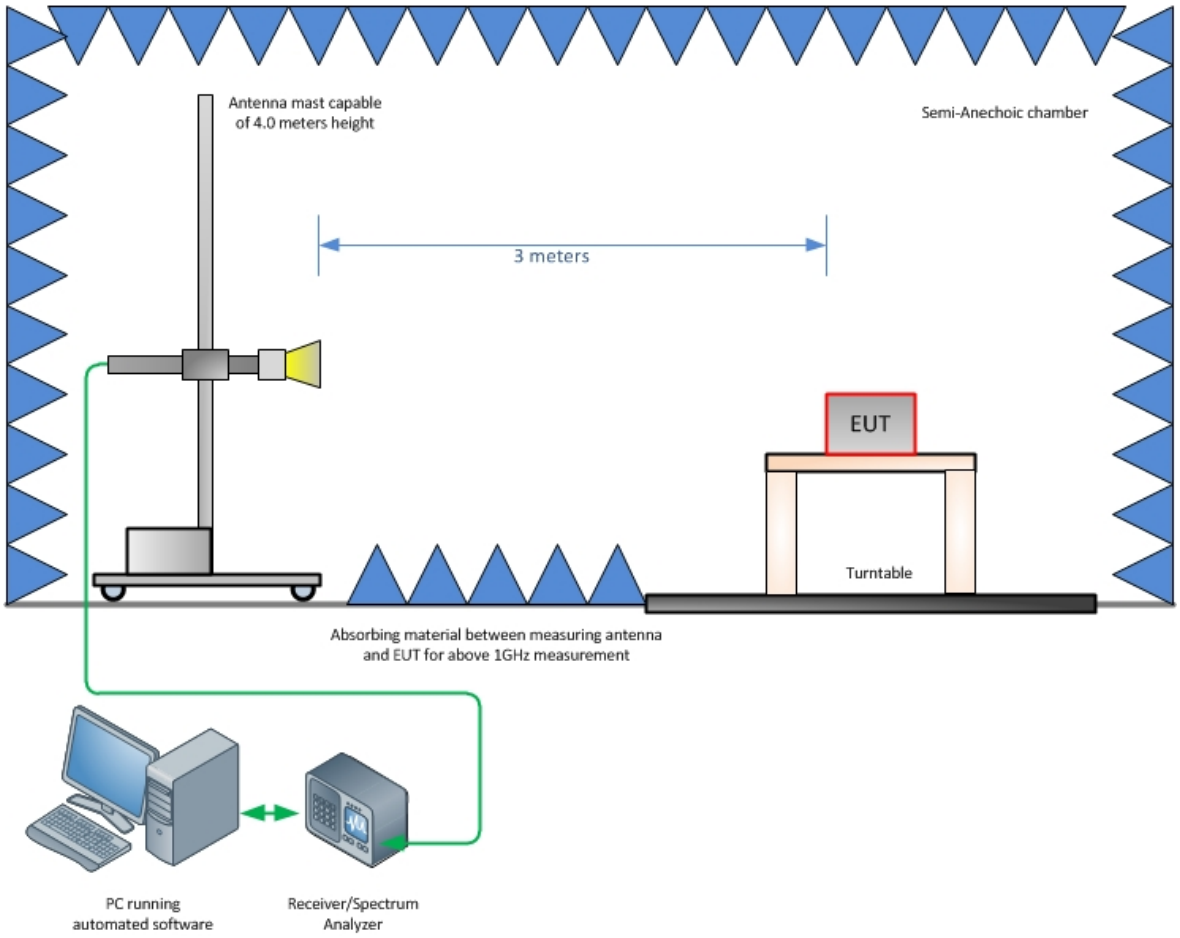
5.1 TEST SETUP DIAGRAM



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SECTION 6

ACCREDITATION, DISCLAIMERS AND COPYRIGHT

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