Radio Intentional EMC Test Report: EDCS - 1217623

For

CP-DX650 Bluetooth Module

Against the following Specifications :

47 CFR 15.247

RSS-210

RSS-102

Cisco Systems

EMC Laboratory

170 West Tasman Drive

San Jose, CA 95134

Author: Phillip Carranco
Approved By: Dilip Patel
Title: Regulatory Compliance Manager

This report replaces any previously entered test report under EDCS - 1217623

This test report has been electronically authorized and archived using the CISCO Engineering Document Control system.

Section 1: Overview

Test Summary

The samples were assessed against the tests detailed in section 3 under the requirements of the following standards:

Emissions:
CFR47 Part 15.247
RSS-210
RSS102

Notes:

1) Measurements were made in accordance with FCC docket #:DA 00-0705, ET docket 96-8 measurement method of spurious emission tolerance to the International Telecommunication Union (ITU) Recommendation SM329.

Section 2: Assessment Information

2.1 General

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

With regard to this assessment, the following points should be noted:

a) The results contained in this report relate only to the items tested and were obtained in the period between the date of the initial assessment and the date of issue of the report. Manufactured products will not necessarily give identical results, due to production tolerances and measurement uncertainties.

b) The apparatus was set up and exercised using the configuration and modes of operation defined in this report only.

c) Where relevant, the apparatus was only assessed using the susceptibility criteria defined in this report and the Test Assessment Plan (TAP).

d) All testing was performed under the following environmental conditions:

Temperature	15°C to 35°C (54°F to 95°F)
Atmospheric Pressure	860mbar to 1060mbar (25.4" to 31.3")
Humidity	10% to 75*%

e) All AC testing was performed at one or more of the following supply voltages:
110V (+/-10%) 60Hz
220V (+/-10%) 50 or 60Hz

f) Cisco Systems, Inc. is accredited by the American Association for Laboratory Accreditation (A2LA). The scope of accreditation, certificate number 1178-01 is referenced in appendix C, along with further details.

2.2 Start Date of Testing

29-Oct-2012

2.3 Report Issue Date

Cisco Systems, Inc. uses an electronic system to issue, store and control the revision of test reports. This system is called the Engineering Document Control System (EDCS). The actual report issue date is embedded into the original file on EDCS. Any copies of this report, either electronic or paper, that are not on EDCS must be considered uncontrolled

2.4 Testing facilities

This assessment was performed by:

Testing Laboratory

Cisco Systems, Inc.,
170 West Tasman Drive
San Jose, CA 95134,
USA

Registration Numbers for Industry Canada

Cisco System Site	Site Identifier
Building P, 10m Chamber	Company #: 4624-2
Building P, 5m Chamber	Company #: 4624-1
Building N, 5m Chamber	Company #: 6111
Building I, 5m Chamber	Company #: 6112

Test Engineers

Phillip Carranco

2.5 Equipment Assessed (EUT)

CP-DX650

2.6 EUT Description

The CP-DX650 is the next generation 1080p Video Endpoint with key expansion module support. This new generation of desktop phone incorporates an Android based operating system. Three USB ports, one micro OTG USB port, one higher powered USB-proprietary connector combination (AUX) and one standard USB Port. Support HDMI with a maximum external resolution of 1920 x 1200, also includes a single 3.5mm headset jack.

WiFi (802.11 A/B/G/N) & Bluetooth 3.0 capabilities. (System operating at Bluetooth ver 2.1 + EDR)

Murata module, LBEH1ZNSXC-526, supports for 802.11/a/b/g/n + Bluetooth 3.0 module

SDIO interface to WLAN – Omap4 SD host controller port 5

PCM (McBSP1) interface to Bluetooth

WiFi + BT chip - Marvell 88W8787

Clocks – 38.4MHz 20ppm for main clock, 32.768KHz sleep clock

Supports 802.11i security standard

Coexistence between WiFi and BT with one antenna to both connected to the 2.4GHz radios

Single antenna for 2.4 and 5GHz bands with diplex inside the module

Up to 72Mbps (20 MHz channel)

2.7 Scope of Assessment

Tests have been performed in accordance with the relevant Test and Assessment Plan (TAP), a copy of which is contained in Appendix F of this report, and the relevant Cisco Systems, Inc. radio test procedures (EDCS-420238). This test report may not cover all of the tests highlighted in the test plan.

2.8 Units of Measurement

The units of measurements defined in the appendices are reported in specific terms, which are test dependent. Where radiated measurements are concerned these are defined at a particular distance. Basic voltage measurements are defined in units of [dBuV]

As an example, the basic calculation for all measurements is as follows:

Emission level [dBuV] = Indicated voltage level [dBuV] + Cable Loss [dB] + Other correction factors [dB]

The combinations of correction factors are dependent upon the exact test configurations [see test equipment lists for further details] and may include:-

Antenna Factors, Pre Amplifier Gain, LISN Loss, Pulse Limiter Loss and Filter Insertion Loss..

Note: to convert the results from dBuV/m to uV/m use the following formula:-

Level in uV/m = Common Antilogarithm [(X dBuV/m)/20] = Y uV/m

2.9 Report Template Control No.

EDCS#: 703456

Section 3: Result Summary

3.1 Results Summary Table

Conducted emissions

Basic Standard	Test Details / Comments	Result
Peak Output Power	15.247: The maximum conducted output power of the intentional radiator for systems using digital modulation in the 2400-2483.5MHz band shall not exceed 1 Watt (30dBm). If transmitting antennas of directional gain greater than 6 dBi are used, the maximum conducted output power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. (*RSS-210 A8.4)*	Pass
20dB Bandwidth	15.247: For frequency hopping systems according to a.1hopping channel carrier frequencies that are separated by 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater	Pass
Conducted Spurious Emissions	15.247: In any 100 kHz bandwidth outside the frequency band in which the digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 30 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power.(*RSS-210 A8.5)*	Pass
Restricted Bandedge Measurements	Conducted emissions which fall in the restricted bands, as defined in Sec. 15.205(a), must also comply with the radiated emission limits specified in Sec. 15.209(a). (*RSS-210 Sec2.7)*	Pass

Radiated emissions

Basic Standard	Test Details / Comments	Result
Radiated Spurious and Harmonic Emissions	Radiated emissions which fall in the restricted bands, as defined in Sec. 15.205(a), must also comply with the radiated emission limits specified in Sec. 15.209(a). (*RSS-210 Sec2.7)*	Pass

* SAR measurements to reported in separate report

Section 4: Sample Details

Note: Each sample was evaluated to ensure that its condition was suitable to be used as a test sample prior to the commencement of testing. During preliminary testing all three planes (X,Y & Z) were evaluated to determine "Worst Case". The data collected determine that the orientation used for this report was demined "Worst Case".

4.1 Sample Details

Sample Number	Equipment Details	Serial Number	Part Number
S01	CP-DX650	FCH1627A5AU	73-15144-01

The following antennas were evaluated as part of this testing process. The antennas listed reflect the maximum gain allowed for each family type of antenna:

Fixed internal Amphenol Dual Band Antenna, Gain = 4.3dBi (no external antenna can be used.)

4.2 System Details

System #	Description	Samples
1	Bluetooth Radio Test Sample	S01

4.3 Mode of Operation Details

Mode#	Description	Comments
1	Bluetooth Test Mode	System is connected to the MT8852B Bluetooth Tester and placed in a continuous Tx Mode with Hopping Turned ON or OFF per test requirements.

4.4 Test Mode Description

4.4.1 Modulation Type

Test Mode	Modulation
A	GFSK
B	π/4-DQPSK
C	8-DPSK

Test Channel	Frequency (MHz)
Low	2402
Middle	2441
High	2480

4.4.2 Test Mode and Worse Case Determination

Item	Test Item	Test Mode	Test Frequency (MHz)
1	Output Power	A	2402, 2441, 2480
		B	2402, 2441, 2480
		C	2402, 2441, 2480
	Worst Case	Mode A (Note: 1)	
2	Conducted Emissions	A	2402, 2441, 2480
3	Out of Band Conducted Emissions	A	2402, 2441, 2480
4.1	Number of Channels	A	2420 - 2480
4.2	Channel Seperation	A	2402, 2441, 2480
4.3	Dwell Time	A	2402, 2441, 2480
5.1	Radiated Emissions below 1GHz		
5.2	Radiated Emissions above 1GHz		2402, 2441, 2480

Note 1: Worse case is determined as the modulation with Highest Output Power

Section 5: Modifications

5.1 Sample Modifications Performed During Assessment

No modifications were performed during assessment.

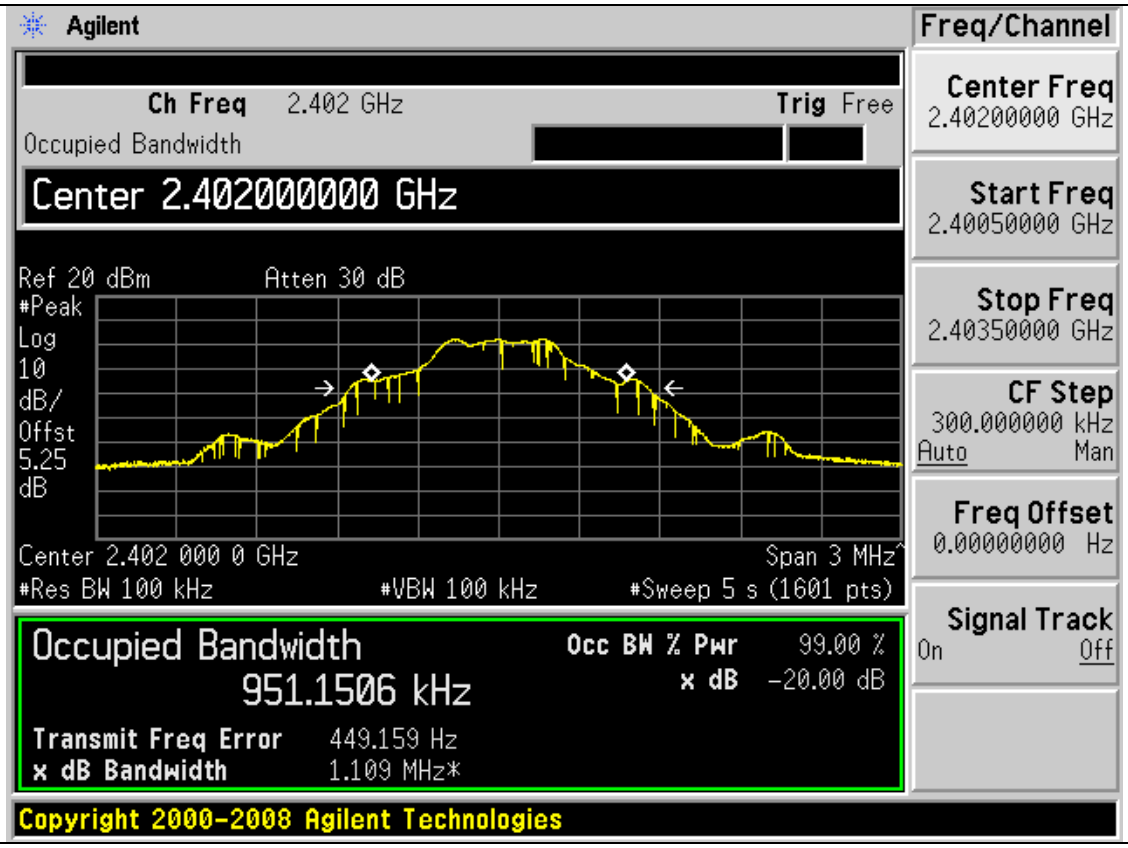
Appendix A: Formal Test Results

20dB Bandwidth

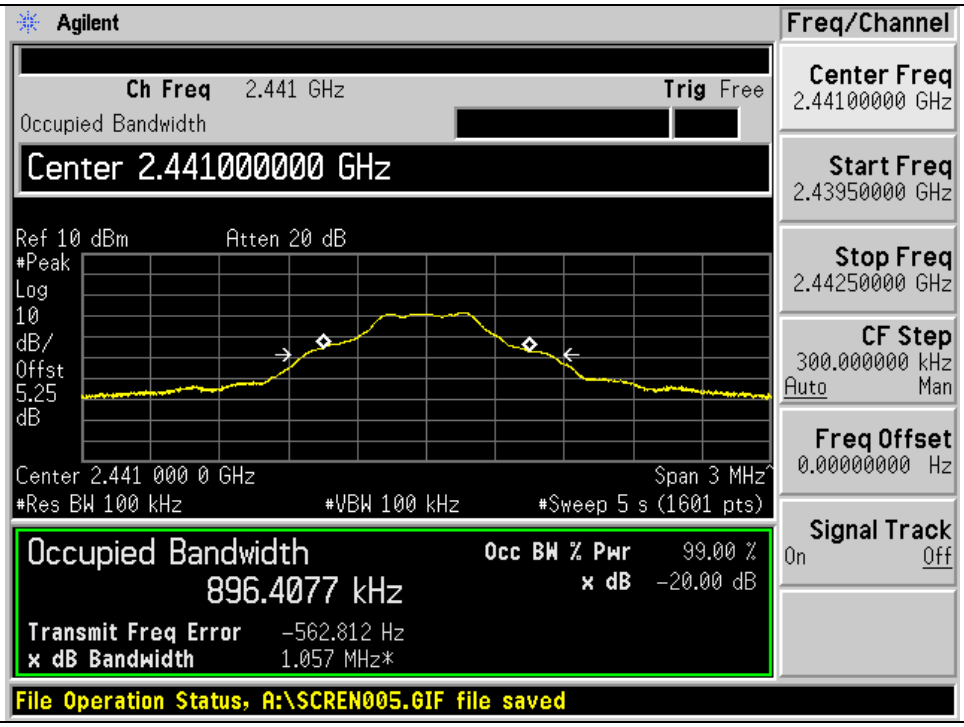
20dB bandwidth of a frequency hopping channel is the 2400-2483.5MHz with hopping stopped.

Frequency (MHz)	20dB Bandwidth (kHz)
2402	1109
2441	1057
2480	1110

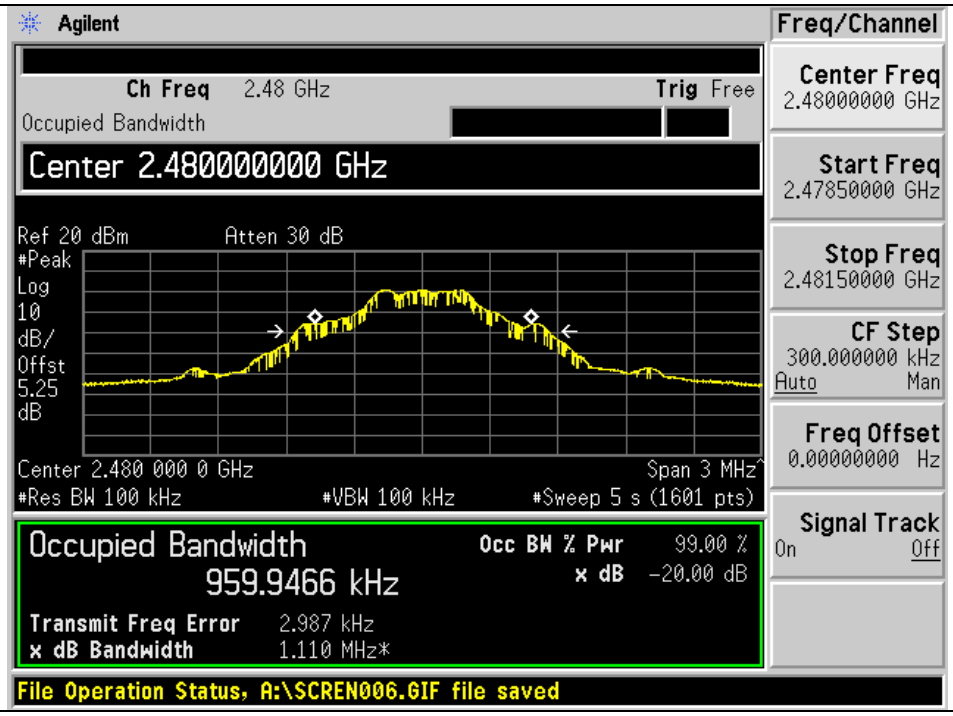
Graphical Test Results



Title: 20dB Bandwidth 2402MHz



Title: 20dB Bandwidth 2441MHz



Title: 20dB Bandwidth 2480MHz

Peak Output Power

15.247 & RSS-210 A8.4:

The maximum conducted output power of the intentional radiator for systems using frequency hopping systems in the 2400-2483.5MHz band shall not exceed 1 Watt (30dBm). If transmitting antennas of directional gain greater than 6 dBi are used, the maximum conducted output power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Frequency (MHz)	Peak Output Power (dBm)	Limit (dBm)	Margin (dB)
2402	9.12	30	-20.88
2441	8.72	30	-21.28
2480	8.25	30	-21.75

Anritsu
BlueTest2 Test Report

Test Set Serial Number: 000830002 Date: 12/10/2012
EUT Bluetooth Address: 00376DEA00AB Time: 3:14:47 PM

Overall Result: PASS

Model: CP-DX650-K9
Serial: FCH1627A5AU

TRM/CA/01/C (Output Power)
Packet Length Tested: DH1

Hopping OFF	**Low**	**Med**	**High**	**Limits**
Average Power	9.02 dBm	8.62 dBm	8.14 dBm	
Max Power	9.03 dBm	8.63 dBm	8.15 dBm	< 20.00 dBm
Min Power	9.02 dBm	8.62 dBm	8.14 dBm	> -6.00 dBm
Peak Power	9.12 dBm	8.72 dBm	8.25 dBm	< 23.00 dBm
Total Packets Failed	0	0	0	
Total Packets Tested	50	50	50	
Result	Pass	Pass	Pass	

Operating Mode: π/4-DQPSK

Frequency (MHz)	Peak Output Power (dBm)	Limit (dBm)	Margin (dB)
2402	7.81	30	-22.19
2441	7.46	30	-22.54
2480	7.19	30	-22.81

Operating Mode: 8DPSK

Frequency (MHz)	Peak Output Power (dBm)	Limit (dBm)	Margin (dB)
2402	8.15	30	-21.85
2441	7.80	30	-22.20
2480	7.43	30	-22.57

Anritsu
BlueTest2 Test Report

Test Set Serial Number: 000830002 Date: 12/1/2012
EUT Bluetooth Address: 00376D03DE28 Time: 4:05:54 PM

Overall Result: PASS

CP-DX650 Output Power Measurements for: π/4-DQPSK: 2-DH3& 8-DPSK3-DH3

TRM/CA/10/C (EDR Relative Transmit Power)

2Mbps Packet Length: 2-DH3, 3Mbps Packet Length: 3-DH3

2Mbits/sec **EUT Max**

Hopping OFF	**Low**	**Med**	**High**	**Limits**
Max difference	-2.48 dB	-0.14 dB	-0.16 dB	Max: 1.00 dB
Min difference	-0.14 dB	-0.13 dB	-0.15 dB	Min: -4.00 dB
Avg difference	-0.35 dB	-0.14 dB	-0.16 dB	
GFSK Max	5.48 dBm	5.10 dBm	4.92 dBm	
GFSK Min	5.47 dBm	5.09 dBm	4.91 dBm	
GFSK Avg	5.48 dBm	5.10 dBm	4.92 dBm	
GFSK Pk	5.58 dBm	5.21 dBm	5.02 dBm	
DPSK Max	5.34 dBm	4.96 dBm	4.76 dBm	
DPSK Min	2.98 dBm	4.95 dBm	4.75 dBm	
DPSK Avg	5.12 dBm	4.96 dBm	4.76 dBm	

DPSK Pk	7.81 dBm	7.46 dBm	7.19 dBm	
Result	Pass	Pass	Pass	

3Mbits/sec **EUT Max**

Hopping OFF	**Low**	**Med**	**High**	**Limits**
Max difference	-0.15 dB	-0.14 dB	-0.17 dB	Max: 1.00 dB
Min difference	-0.14 dB	-0.14 dB	-0.16 dB	Min: -4.00 dB
Avg difference	-0.15 dB	-0.14 dB	-0.16 dB	
GFSK Max	5.48 dBm	5.11 dBm	4.93 dBm	
GFSK Min	5.47 dBm	5.10 dBm	4.92 dBm	
GFSK Avg	5.48 dBm	5.11 dBm	4.93 dBm	
GFSK Pk	5.58 dBm	5.21 dBm	5.02 dBm	
DPSK Max	5.33 dBm	4.96 dBm	4.76 dBm	
DPSK Min	5.32 dBm	4.95 dBm	4.75 dBm	
DPSK Avg	5.33 dBm	4.96 dBm	4.76 dBm	
DPSK Pk	8.15 dBm	7.80 dBm	7.43 dBm	
Result	Pass	Pass	Pass	

---- Report End ----

Carrier Frequency Seperation

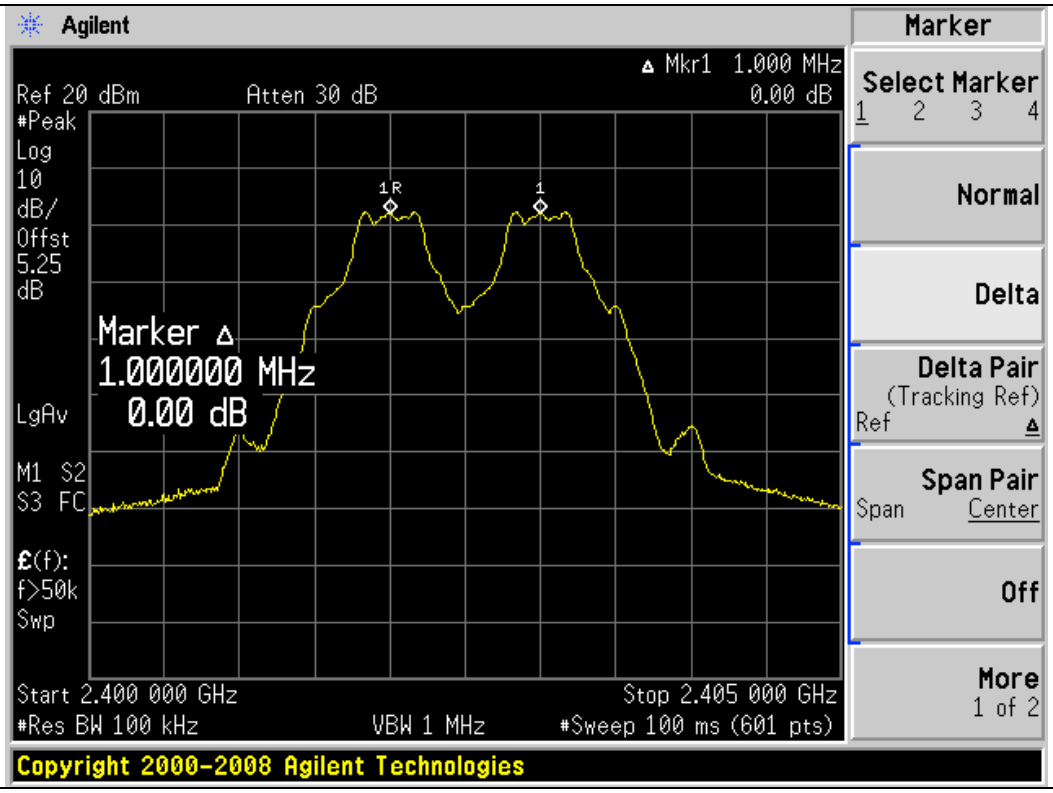
15.247 & RSS-210 A8.1:

For frequency hopping systems operating in the 2400-2483.5MHz band may have hopping channel frequencies that are seperated by 25kHz or two-thirds of the 20dB bandwidth of the hopping cahnnel, whichever is greater, provided the system operates with an output power no greater than 0.125W.

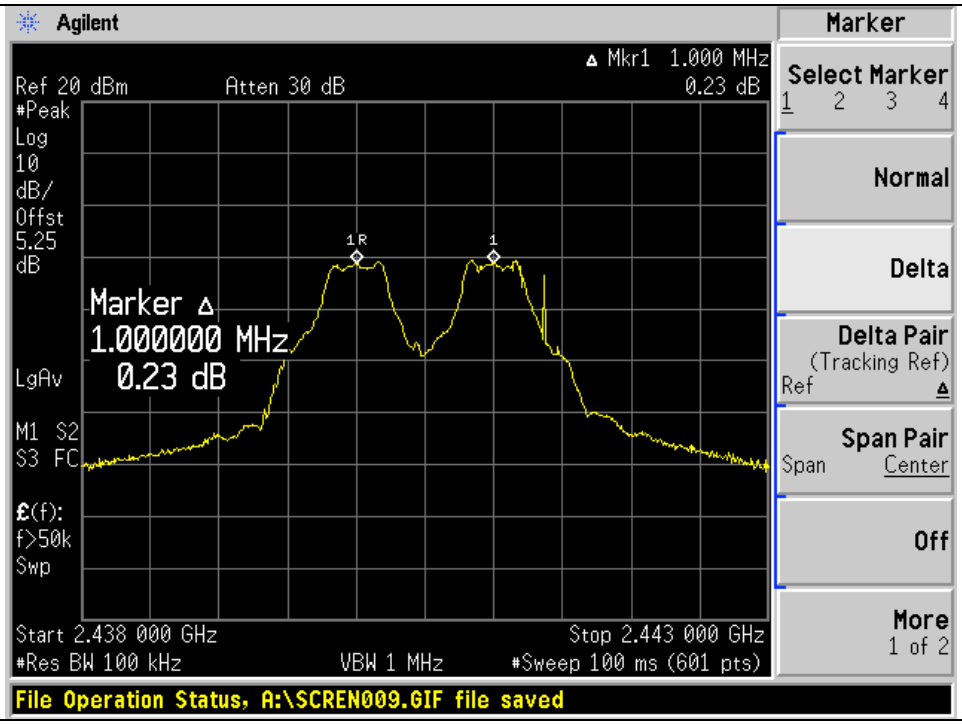
The largest 20dB bandwidth for all channels is 1.110MHz. The minimum channel carrier frequencies seperation is calculated as 2/3(1110) = 740.00kHz

Frequency (MHz)	Carrier Frequency Seperation (kHz)	Limit (kHz)	Margin (kHz)
2402	1000.00	740	-260.00
2441	1000.00	740	-260.00
2480	1000.00	740	-260.00

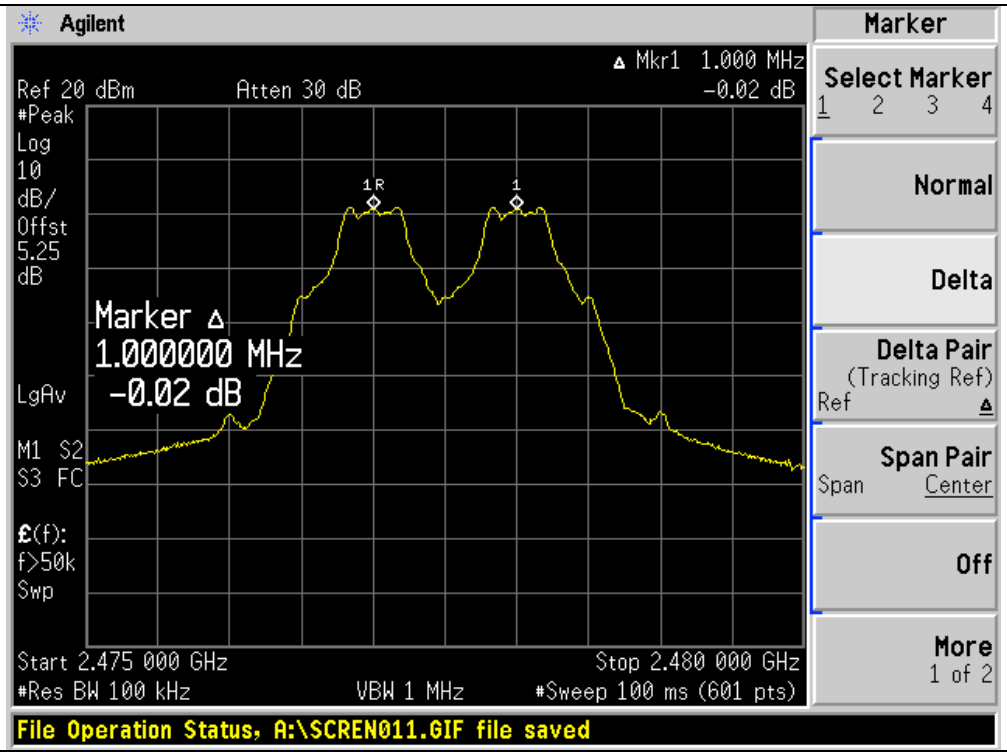
Graphical Test Results



Title: **Carrier Frequency Speration at 2402 MHz**



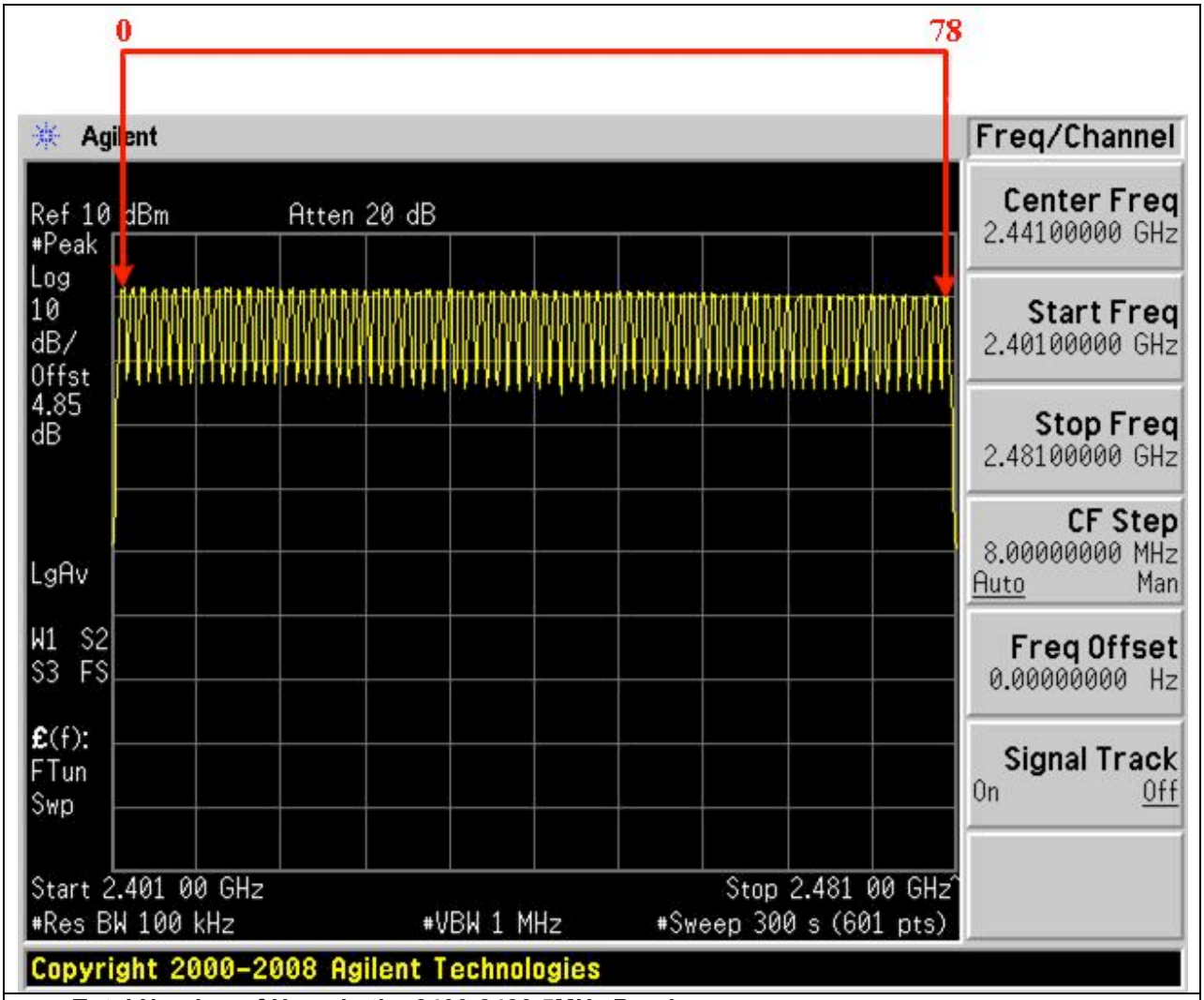
Title: **Carrier Frequency Speration at 2441 MHz**



Title: **Carrier Frequency Speration at 2480 MHz**

Number of Hopping Frequencies

Total number of hopping frequencies is the 2400-2483.5MHz Band = 79 Channels



Title: **Total Number of Hops in the 2400-2483.5MHz Band**

Average Time of Occupancy

15.247 & RSS-210 A8.1:

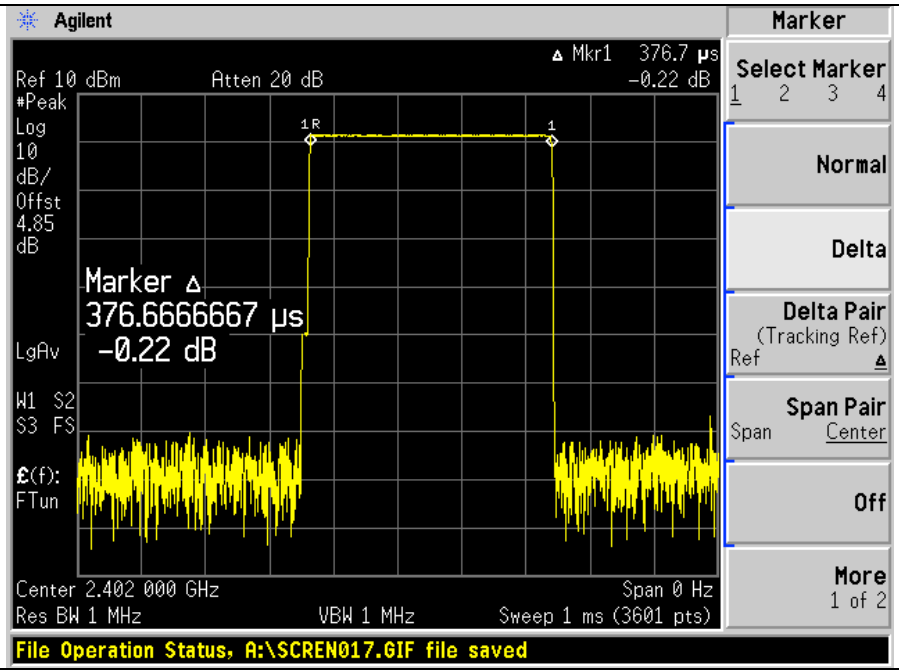
Frequency hopping systems operating in the band 2400-2483.5MHz shall use at least 15 hopping channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

The total sweep time is 0.4(79) = 31.6 seconds.
Due to the number of hops in the 31.6s sweep we determined to reduce the sweep time to 3.16s, count the number of hops and multiply by 10. The total number of hops will be multiplied by the measured time of one pulse.

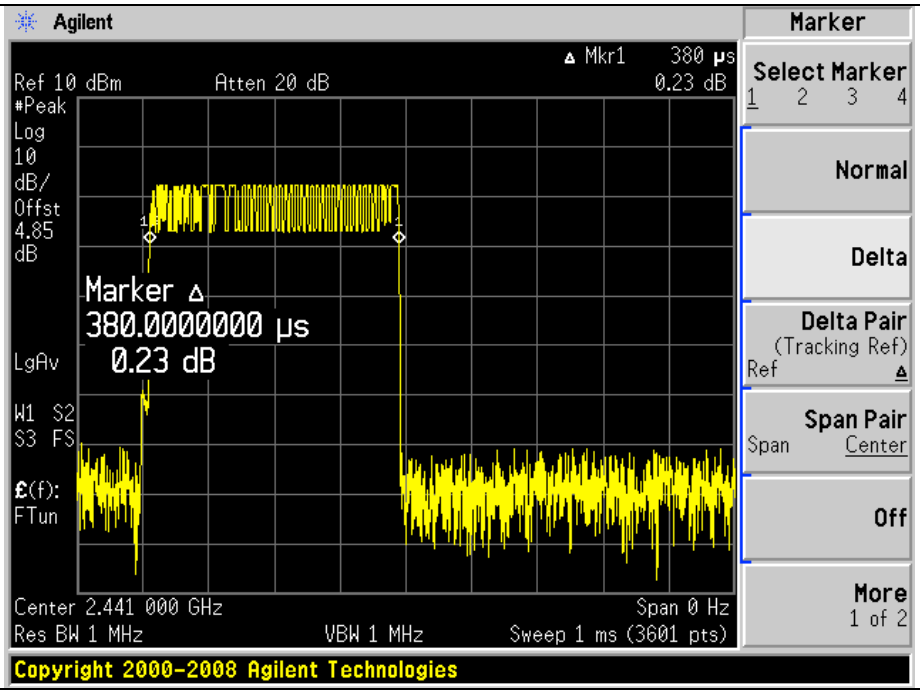
Example: Number of Hops in 3.16s = 31. Total Number of Hops in 31.6s = 31(10) = 310
Single Pulse Width = 0.00018012s. Time of Occupancy = 310(0.00018012) = 0.0558s

Data Rate: DH1
2402MHz Dwell Time: 376.6666667µs x 260 = 97.933ms = 0.09793 sec
2441MHz Dwell Time: 380.0 µs x 230 = 87.400ms = 0.0874 sec
2480MHz Dwell Time: 376.3888889 µs x 190 = 71.513ms = 0.071513sec

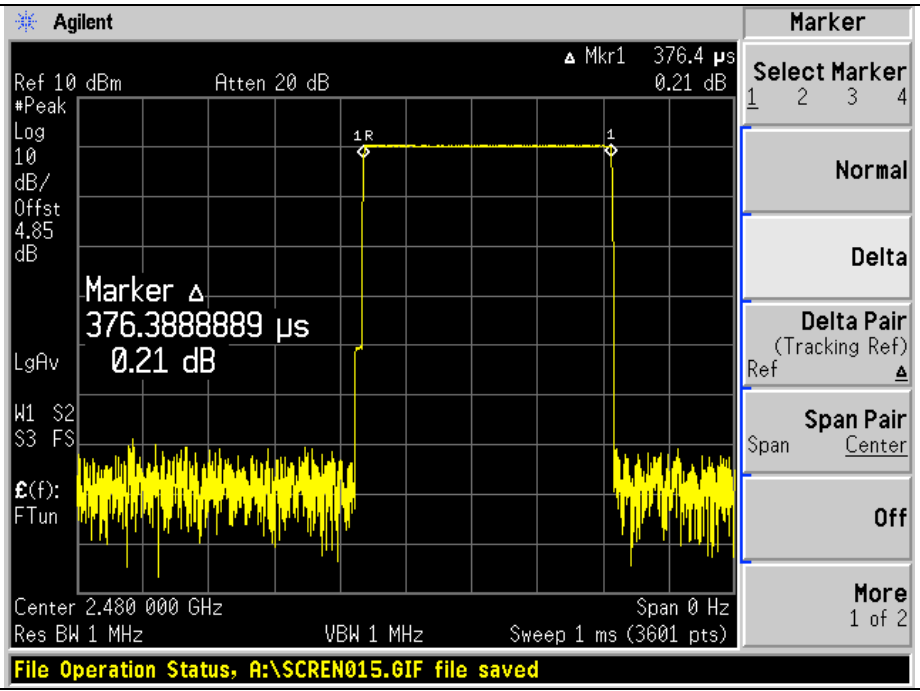
Frequency (MHz)	Time of Occupancy (sec)	Limit (sec)	Margin (sec)
2402	0.10	0.4	-0.30
2441	0.09	0.4	-0.31
2480	0.07	0.4	-0.33



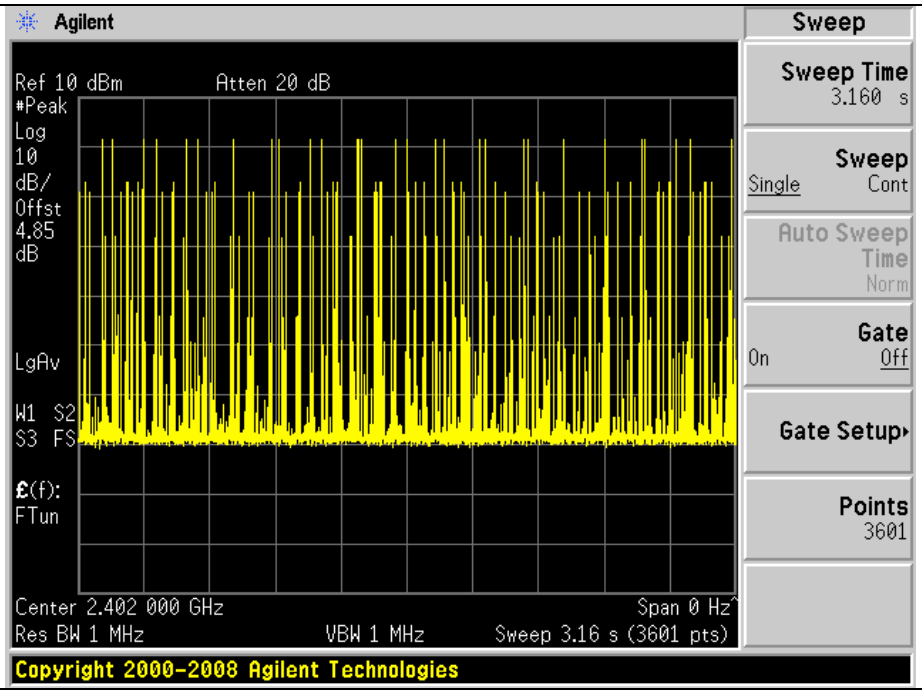
Title: **Single Pulse width at 2402MHz**



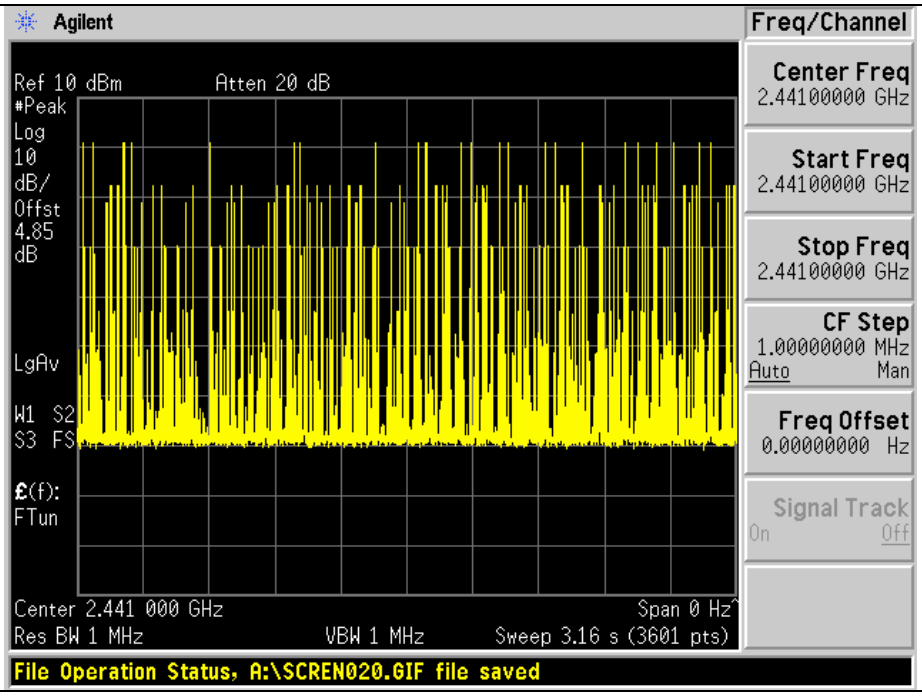
Title: **Single Pulse width at 2441MHz**



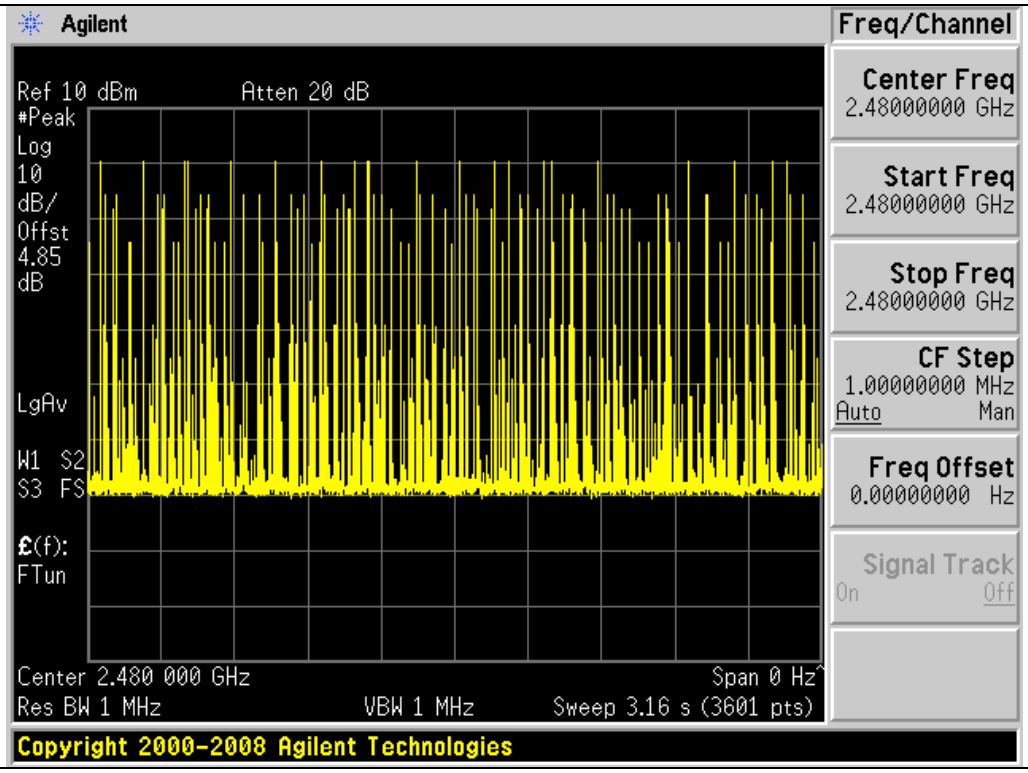
Title: **Single Pulse width at 2480MHz**



Title: **Number of Pulses observed in 3.16s = 26**



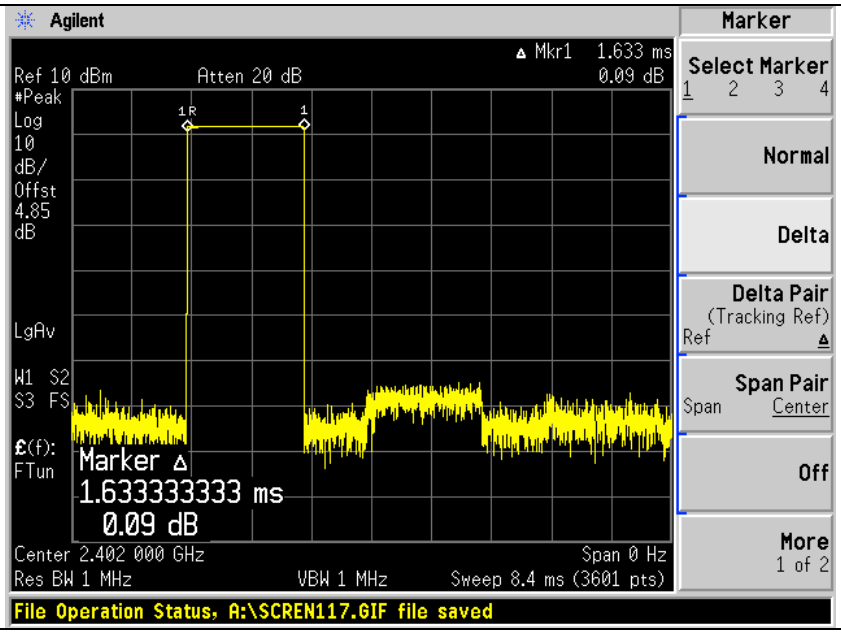
Title: **Number of Pulses observed in 3.16s =23**



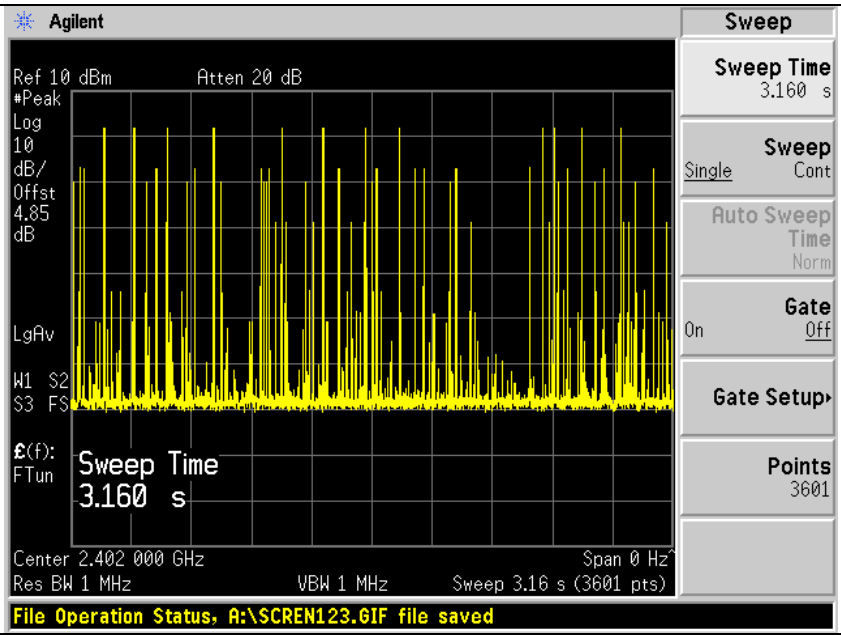
Title: **Number of Pulses observed in 3.16s = 19**

Data Rate: DH3
2402MHz Dwell Time: 1.633ms x 120 = 195.996ms = 0.195996 sec
2441MHz Dwell Time: 1.633ms x 90 = 146.97ms = 0.14697 sec
2480MHz Dwell Time: 1.633ms x 110 = 179.63ms = 0.179.63sec

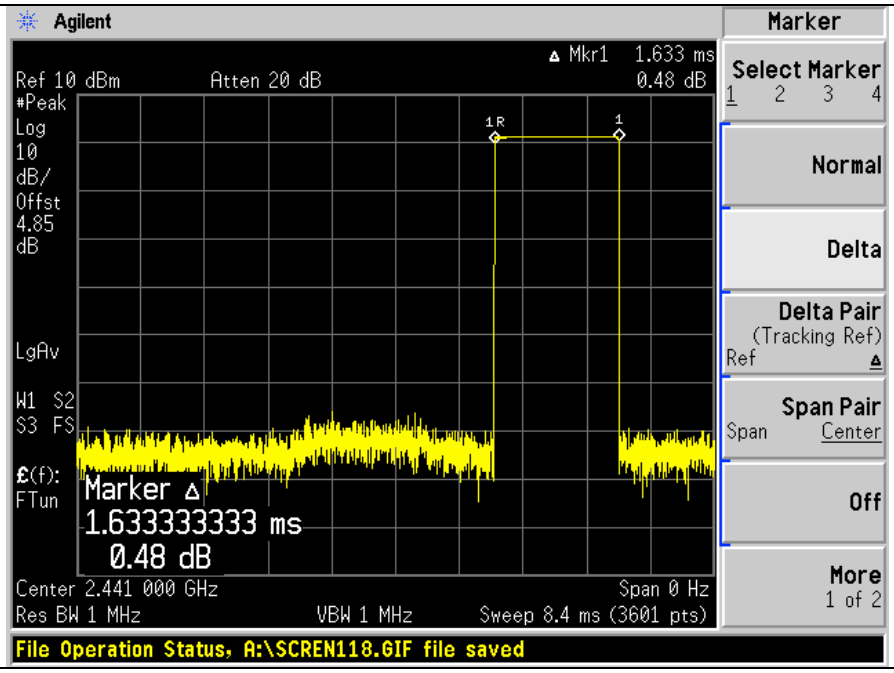
Frequency (MHz)	Time of Occupancy (sec)	Limit (sec)	Margin (sec)
2402	0.20	0.4	-0.20
2441	0.15	0.4	-0.25
2480	0.18	0.4	-0.22



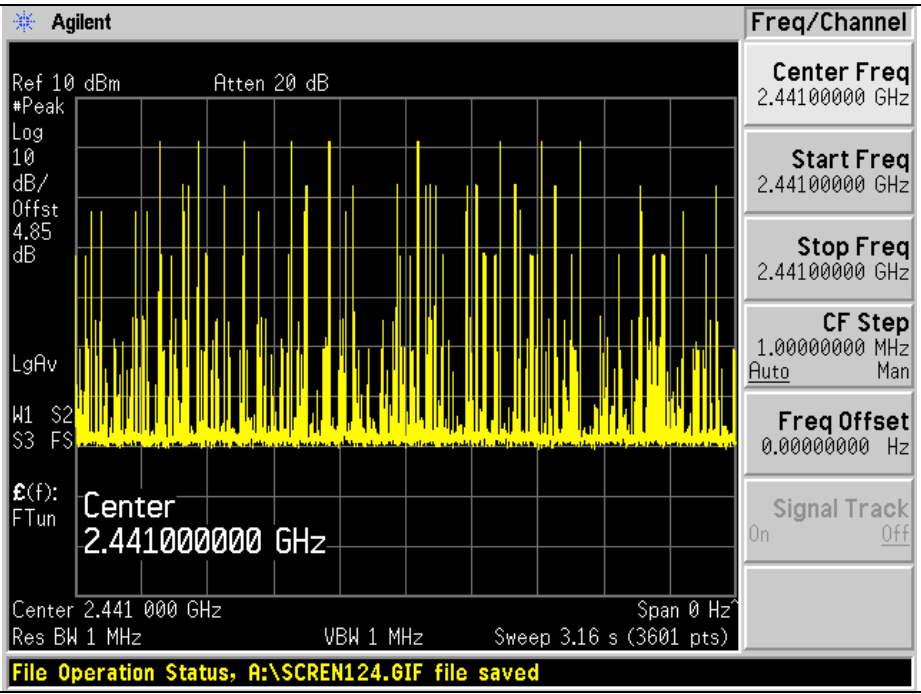
Title: **Single Pulse width at 2402MHz**



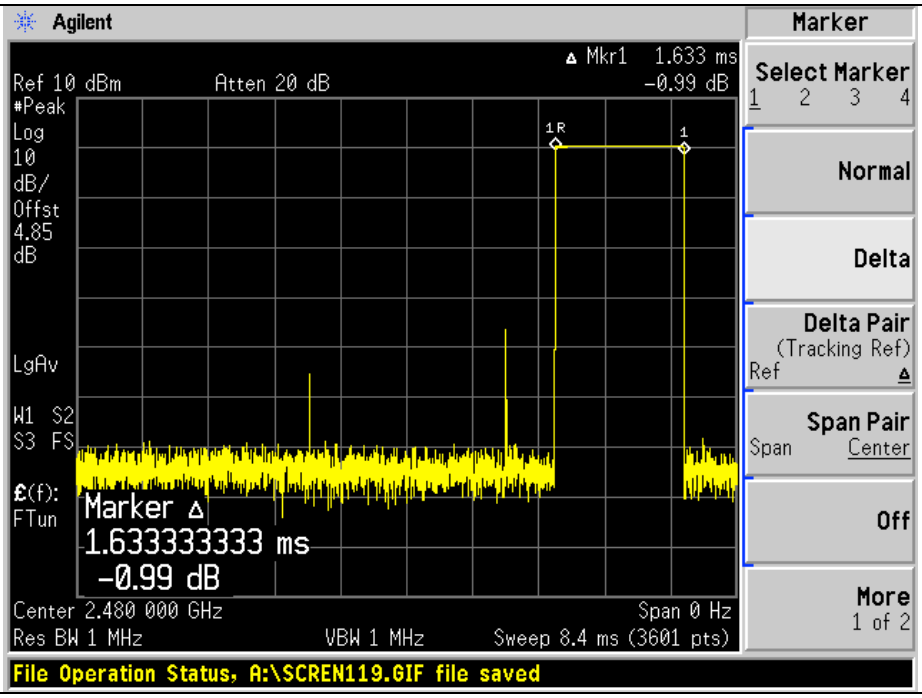
Title: **Number of Pulses observed in 3.16s = 12**



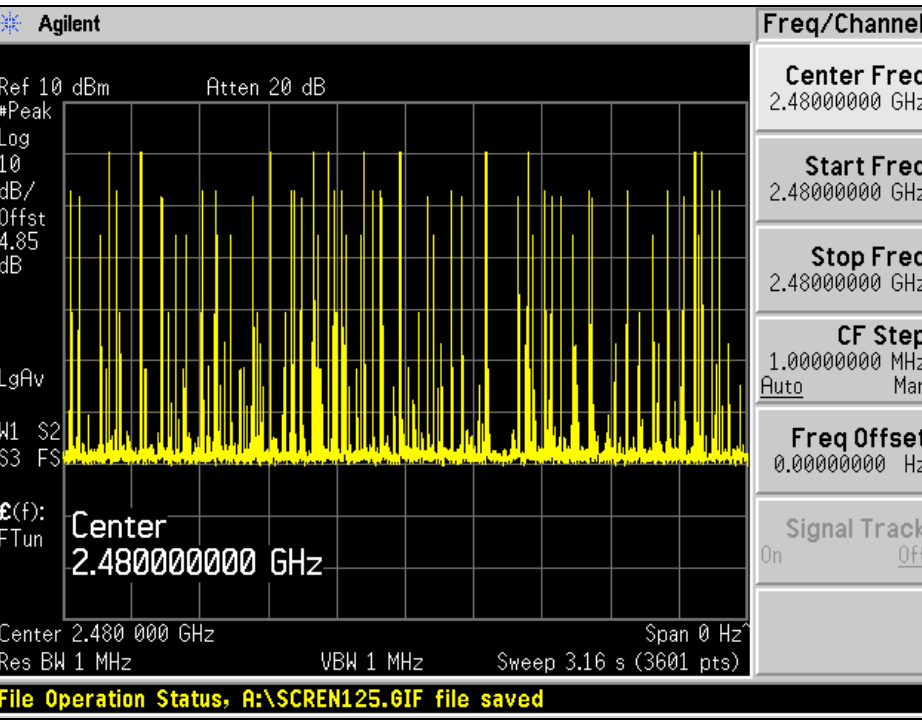
Title: **Single Pulse width at 2441MHz**



Title: **Number of Pulses observed in 3.16s = 9**



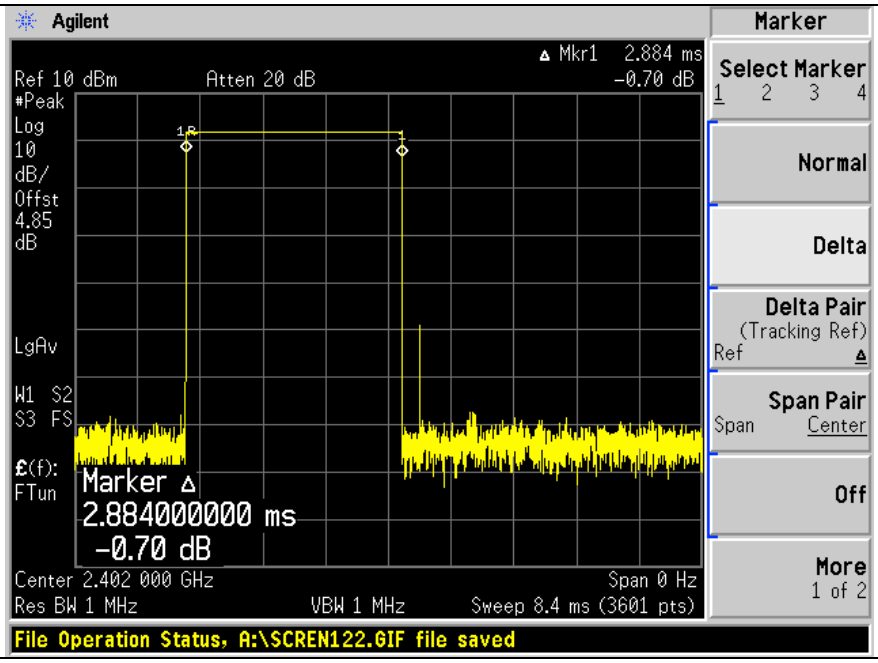
Title: **Single Pulse width at 2480MHz**



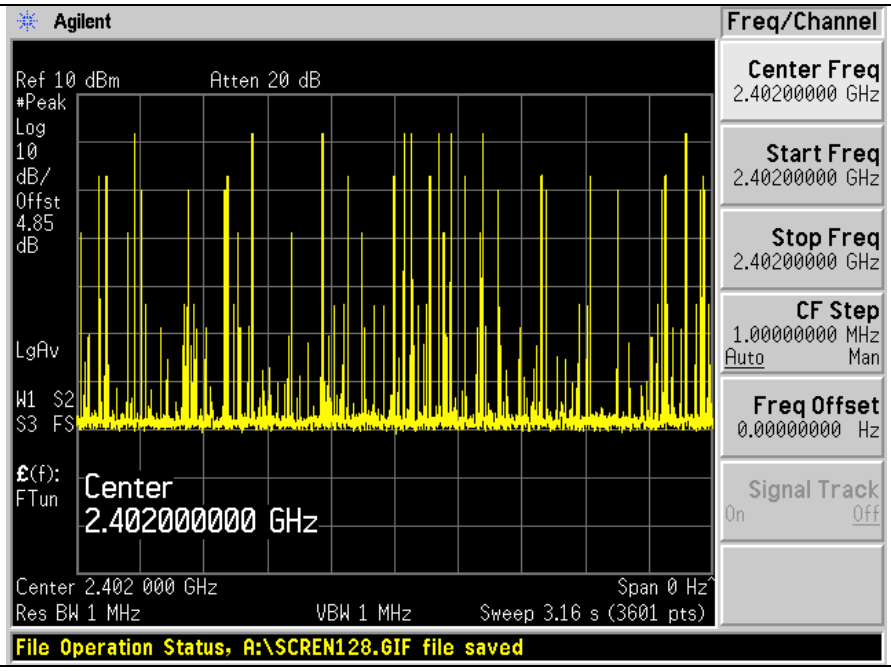
Title: **Number of Pulses observed in 3.16s = 11**

Data Rate: DH5
2402MHz Dwell Time: 2.844ms x 90 = 255.96ms = 0.25596 sec
2441MHz Dwell Time: 2.844ms x 110 = 312.84ms = 0.31284 sec
2480MHz Dwell Time: 2.844ms x 80 = 227.52ms = 0.22752sec

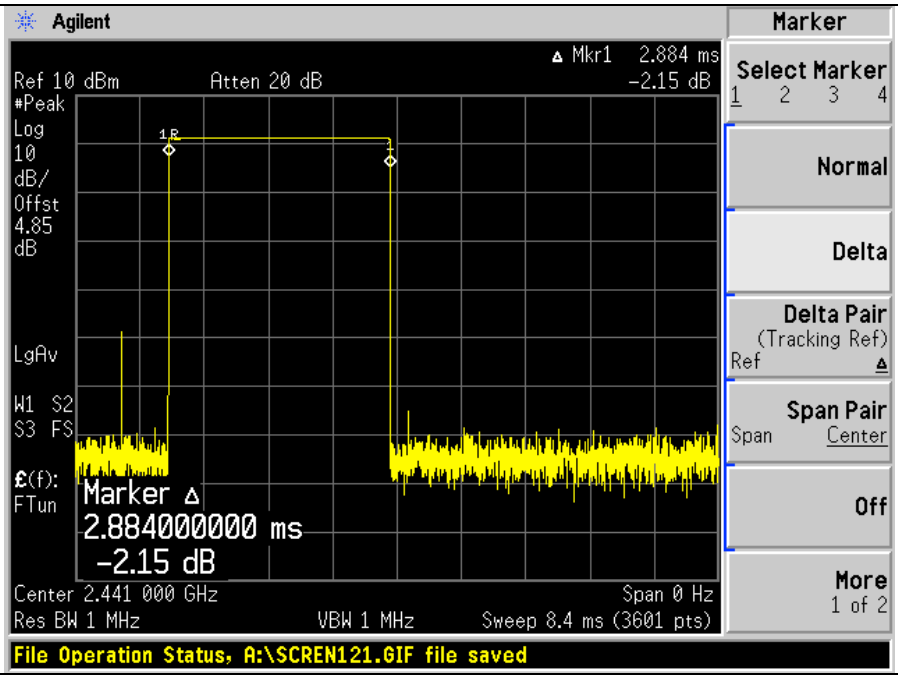
Frequency (MHz)	Time of Occupancy (sec)	Limit (sec)	Margin (sec)
2402	0.26	0.4	-0.14
2441	0.31	0.4	-0.09
2480	0.23	0.4	-0.17



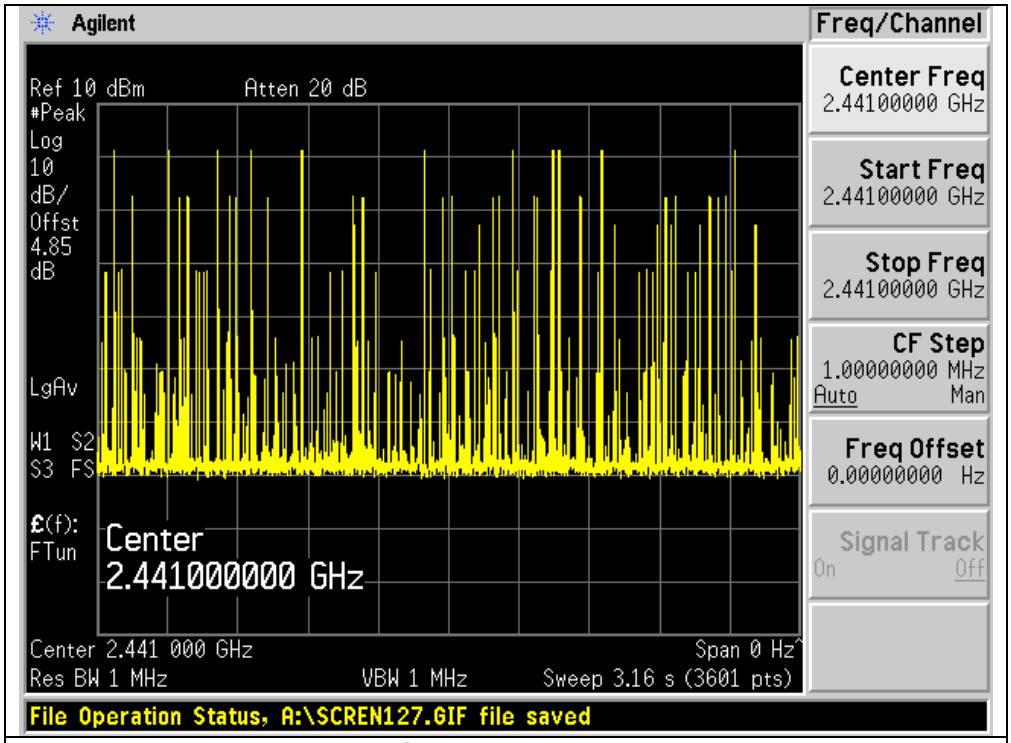
Title: **Single Pulse width at 2402MHz**



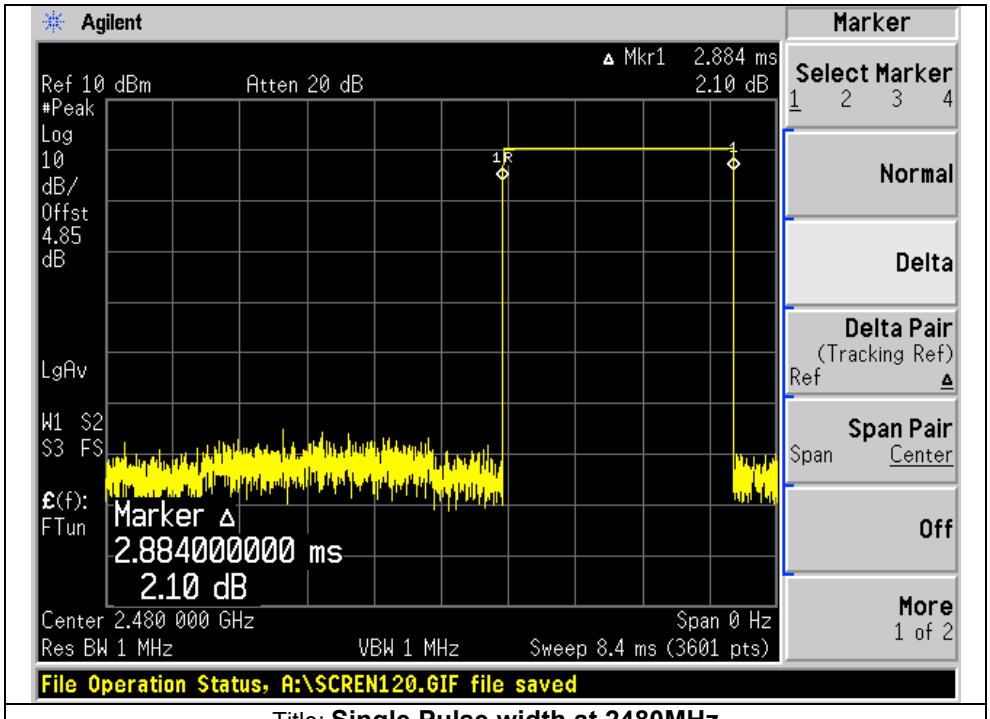
Title: **Number of Pulses observed in 3.16s = 9**



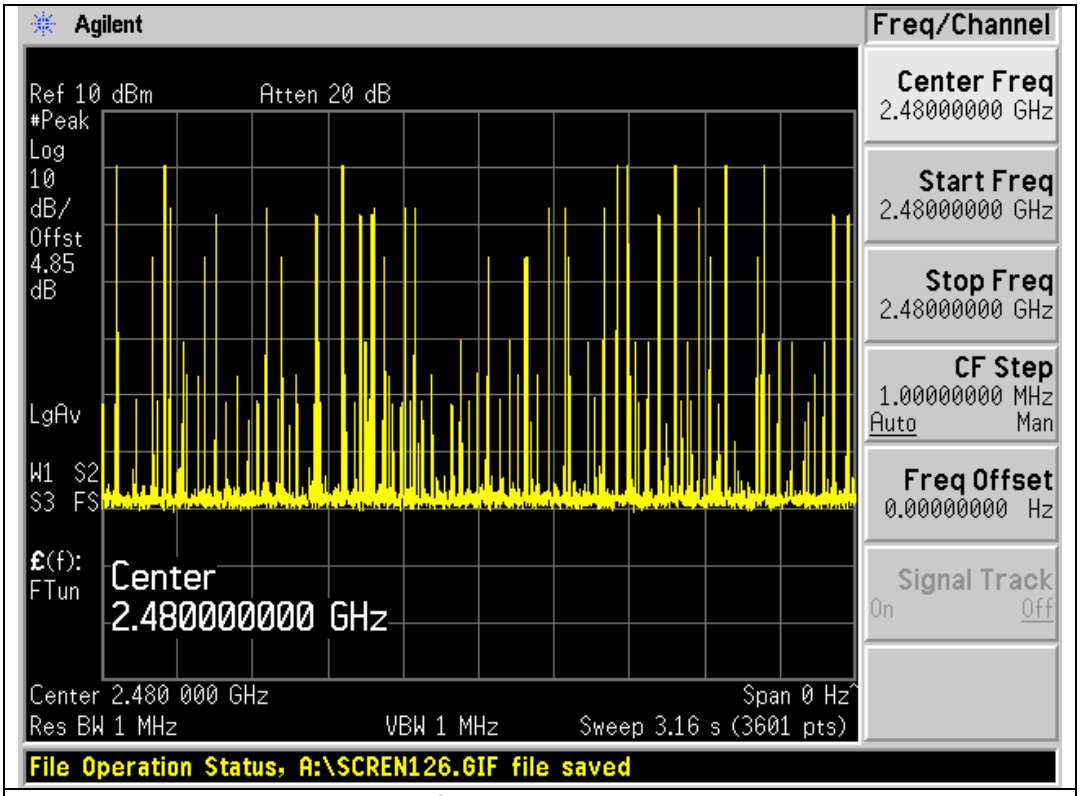
Title: **Single Pulse width at 2441MHz**



Title: **Number of Pulses observed in 3.16s = 11**



Title: **Single Pulse width at 2480MHz**



Title: **Number of Pulses observed in 3.16s = 11**

Conducted Spurious emissions

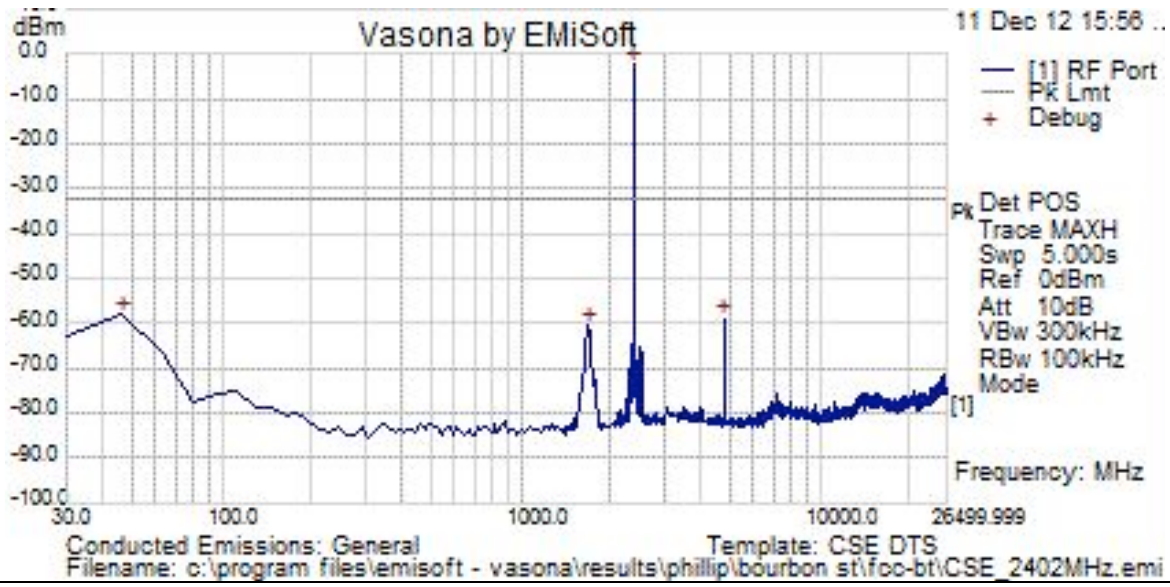
15.247 & RSS-210 A8.5:

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum moduled device is operating, the radio frequency power that is produced by the intentional radiator shall be at least 30 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power.

Test Results

Graphical Test Results for 2402MHz:

Note that the data displayed on the plots detailed in this appendix were measured using a 'Peak Detector'. Please refer to the results table for the detectors used during formal measurements



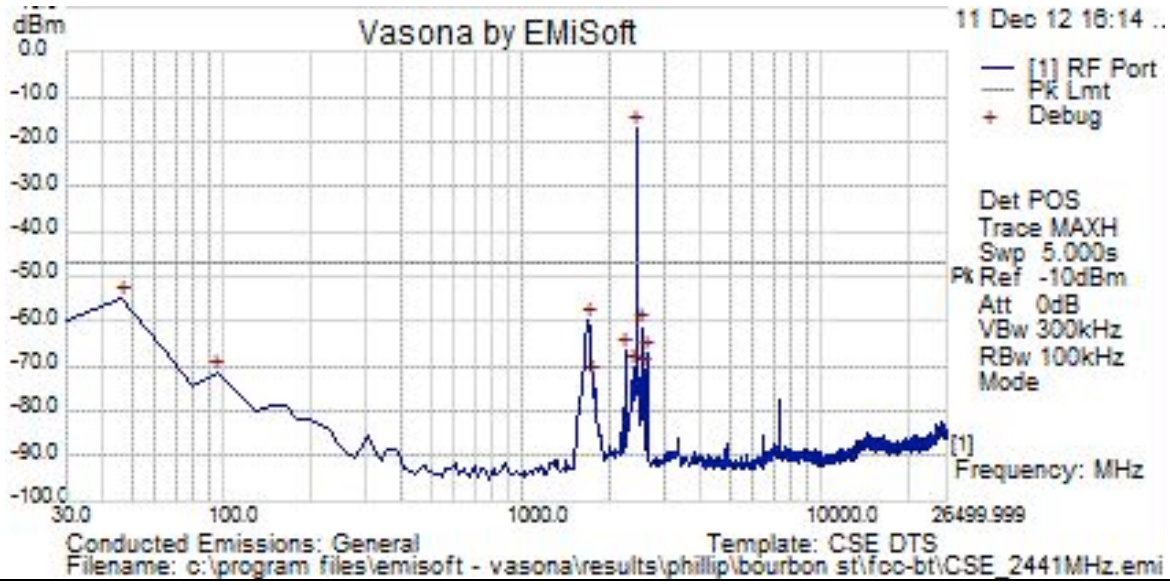
Title: Test Results from 30MHz - 26.5GHz for 2402MHz

Test Results Table

Frequency MHz	Raw dBm	Cable Loss	Factors dB	Level dBm	Measurement Type	Line	Limit dBm	Margin dBm	Pass /Fail	Comments
2395.756	-3.8	1.4	0	-2.4	Peak(Scan)	RF	-32.4	30	Fail	Tx Signal
1684.82	-61.8	1.2	0	-60.6	Peak(Scan)	RF	-32.4	-28.2	Pass	
46.401	-58.1	0.1	0	-58	Peak(Scan)	RF	-32.4	-25.6	Pass	
4811.191	-61.1	2	0	-59.1	Peak(Scan)	RF	-32.4	-26.7	Pass	

Graphical Test Results for 2441MHz:

Note that the data displayed on the plots detailed in this appendix were measured using a 'Peak Detector'. Please refer to the results table for the detectors used during formal measurements



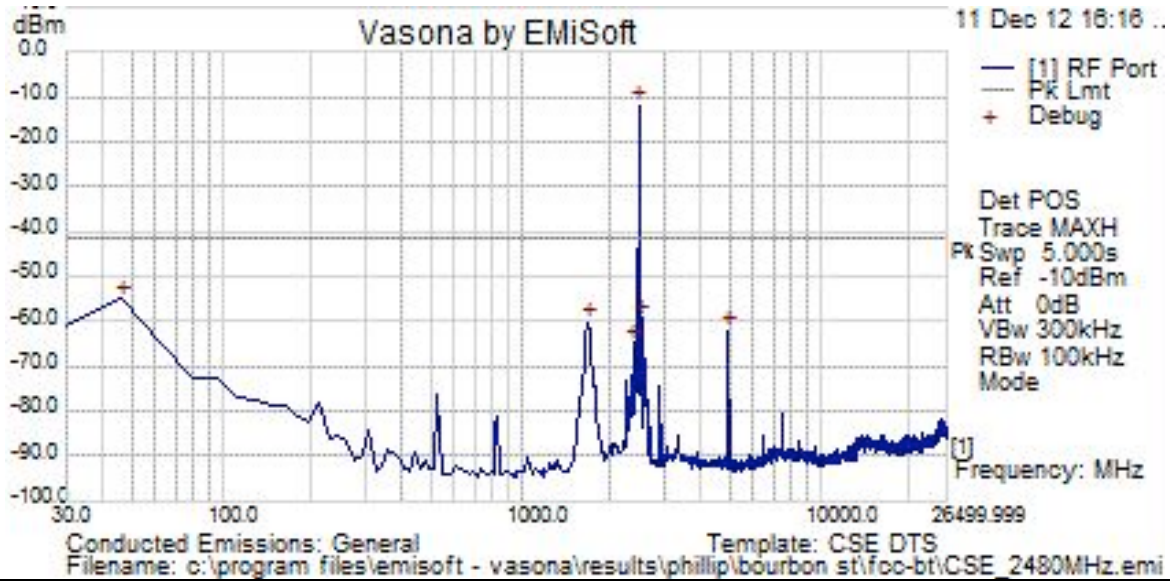
Title: Test Results from 30MHz - 26.5GHz for 2441MHz

Test Results Table

Frequency MHz	Raw dBm	Cable Loss	Factors dB	Level dBm	Measurement Type	Line	Limit dBm	Margin dBm	Pass /Fail	Comments
2445.387	-18.5	1.5	0	-17	Peak(Scan)	RF	-47	30	Fail	
46.544	-55	0.1	0	-55	Peak(Scan)	RF	-47	-8	Pass	
1684.375	-61.2	1.2	0	-60	Peak(Scan)	RF	-47	-13	Pass	
2528.106	-62.9	1.5	0	-61.4	Peak(Scan)	RF	-47	-14.4	Pass	
2246.862	-68	1.4	0	-66.6	Peak(Scan)	RF	-47	-19.6	Pass	
2643.912	-68.6	1.5	0	-67.1	Peak(Scan)	RF	-47	-20.2	Pass	

Graphical Test Results for 2480MHz:

Note that the data displayed on the plots detailed in this appendix were measured using a 'Peak Detector'. Please refer to the results table for the detectors used during formal measurements



Title: Test Results from 30MHz - 26.5GHz for 2480MHz

Test Results Table

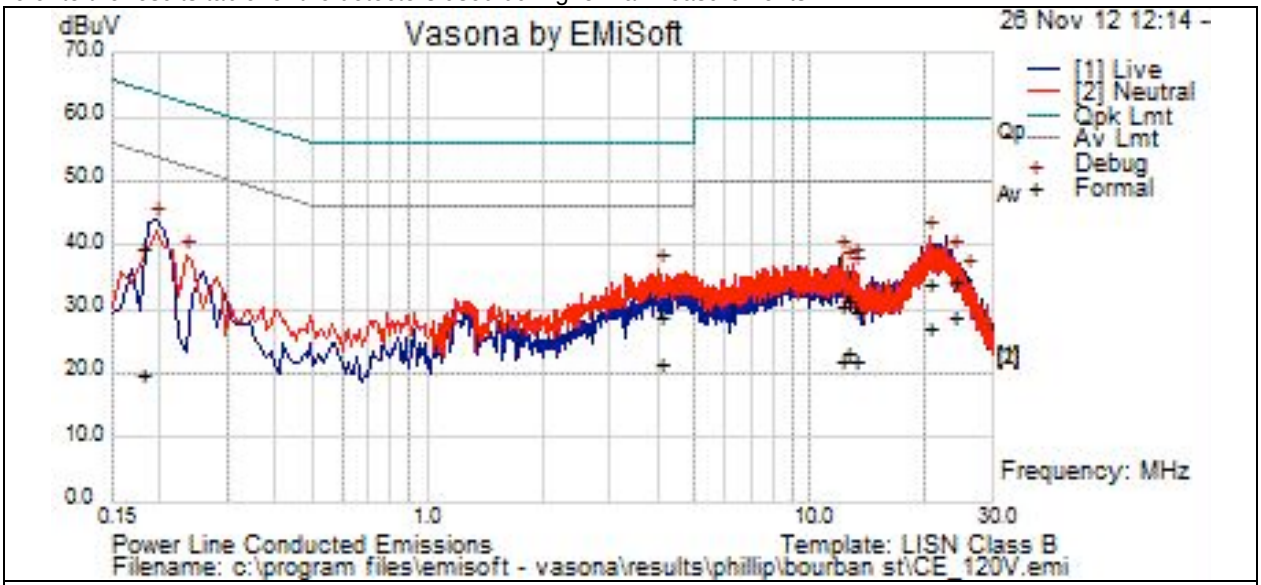
Frequency MHz	Raw dBm	Cable Loss	Factors dB	Level dBm	Measurement Type	Line	Limit dBm	Margin dBm	Pass /Fail	Comments
2478.475	-13.3	1.6	0	-11.7	Peak(Scan)	RF	-41.7	30	Fail	Tx Signal
46.544	-55.2	0.1	0	-55.1	Peak(Scan)	RF	-41.7	-13.4	Pass	
2528.106	-60.8	1.5	0	-59.3	Peak(Scan)	RF	-41.7	-17.5	Pass	
1684.375	-61.4	1.2	0	-60.1	Peak(Scan)	RF	-41.7	-18.4	Pass	
4960.037	-64.2	2.2	0	-62	Peak(Scan)	RF	-41.7	-20.2	Pass	
2395.756	-66.4	1.4	0	-65	Peak(Scan)	RF	-41.7	-23.3	Pass	

Conducted Emissions for AC Adapter:

Test Number: 113492 **Spec ID:** 484				
Basic Standard	**Applied to**	**Class**	**Freq Range**	**Test Details / Comments**
CFR47 Part 15: 2008 (CAN/CSA-CISPR 22-02)	AC Power Line	B	0.15MHz - 30MHz	U.S line voltages must be used (e.g. 110V/ 208V 60Hz).
Operating Mode	**Mode :** 1, Adapter Mode			
Power Input	110, 60Hz (+/-20%)			
Overall Result	Pass			
Comments	No further comments			
Deviation	There were no deviations from the specification			

Graphical Test Results

Note that the data displayed on the plots detailed in this appendix were measured using a 'Peak Detector'. Please refer to the results table for the detectors used during formal measurements



Title: Conducted Emissions Test Results from 150k - 30MHz

Test Results Table

Frequency MHz	Raw dBuV	Cable Loss	Factors dB	Level dBuV	Measurement Type	Line	Limit dBuV	Margin dB	Pass /Fail	Comments
23.664	7.5	21	0.2	28.6	Av	L	50	-21.4	Pass	
20.566	6.5	20.4	0.2	27.1	Av	N	50	-22.9	Pass	
4.035	1.5	20	0	21.6	Av	N	46	-24.4	Pass	

Frequency MHz	Raw dBuV	Cable Loss	Factors dB	Level dBuV	Measurement Type	Line	Limit dBuV	Margin dB	Pass /Fail	Comments
0.1799	18.6	21	0	39.6	Qp	L	64.5	-24.9	Pass	
23.664	13.4	21	0.2	34.5	Qp	L	60	-25.5	Pass	
20.566	13.2	20.4	0.2	33.8	Qp	N	60	-26.2	Pass	
12.47	2.7	20.2	0.1	23.1	Av	N	50	-26.9	Pass	
4.035	8.5	20	0	28.6	Qp	N	56	-27.4	Pass	
13.054	1.4	20.3	0.1	21.8	Av	N	50	-28.2	Pass	
12.136	1.5	20.2	0.1	21.8	Av	N	50	-28.2	Pass	
12.47	10.8	20.2	0.1	31.2	Qp	N	60	-28.8	Pass	
12.136	10	20.2	0.1	30.3	Qp	N	60	-29.7	Pass	
13.054	9.1	20.3	0.1	29.5	Qp	N	60	-30.5	Pass	
0.1799	-1.2	21	0	19.8	Av	L	54.5	-34.7	Pass	

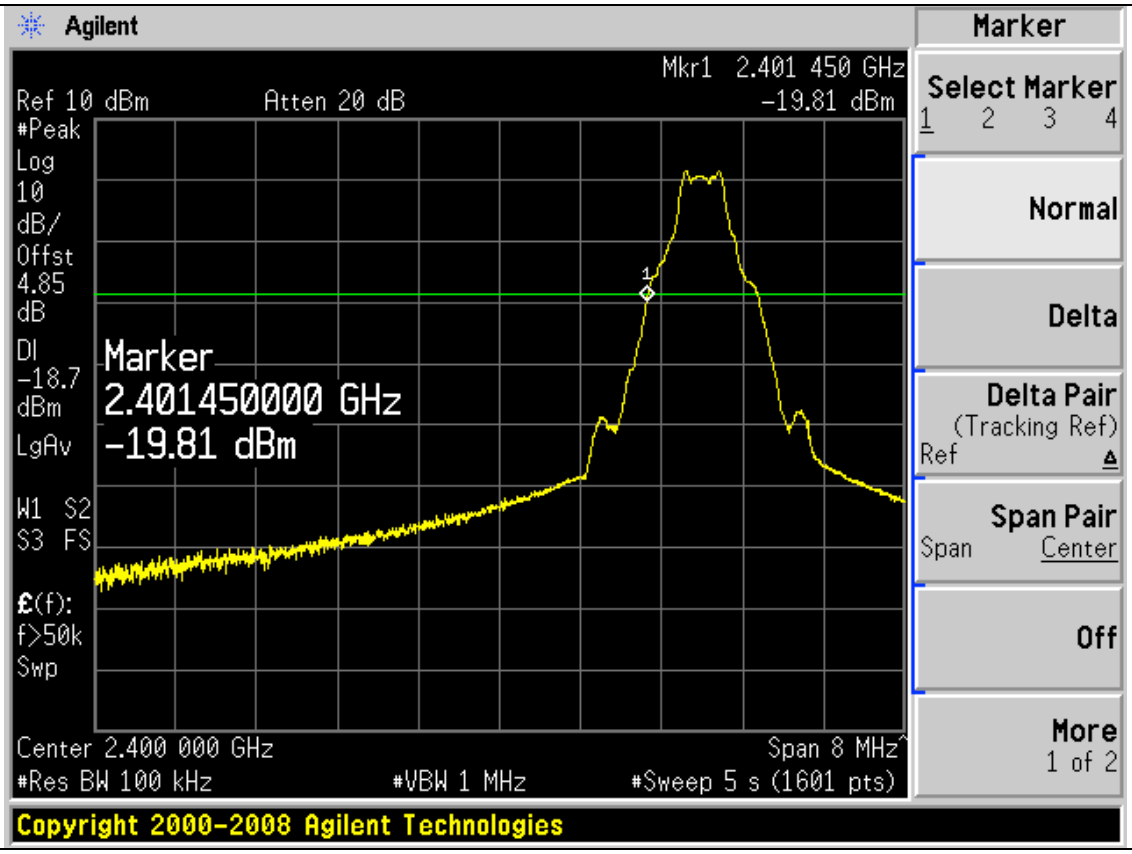
Conducted Band Edge Measurements

15.205 & RSS-210 sec2.7:

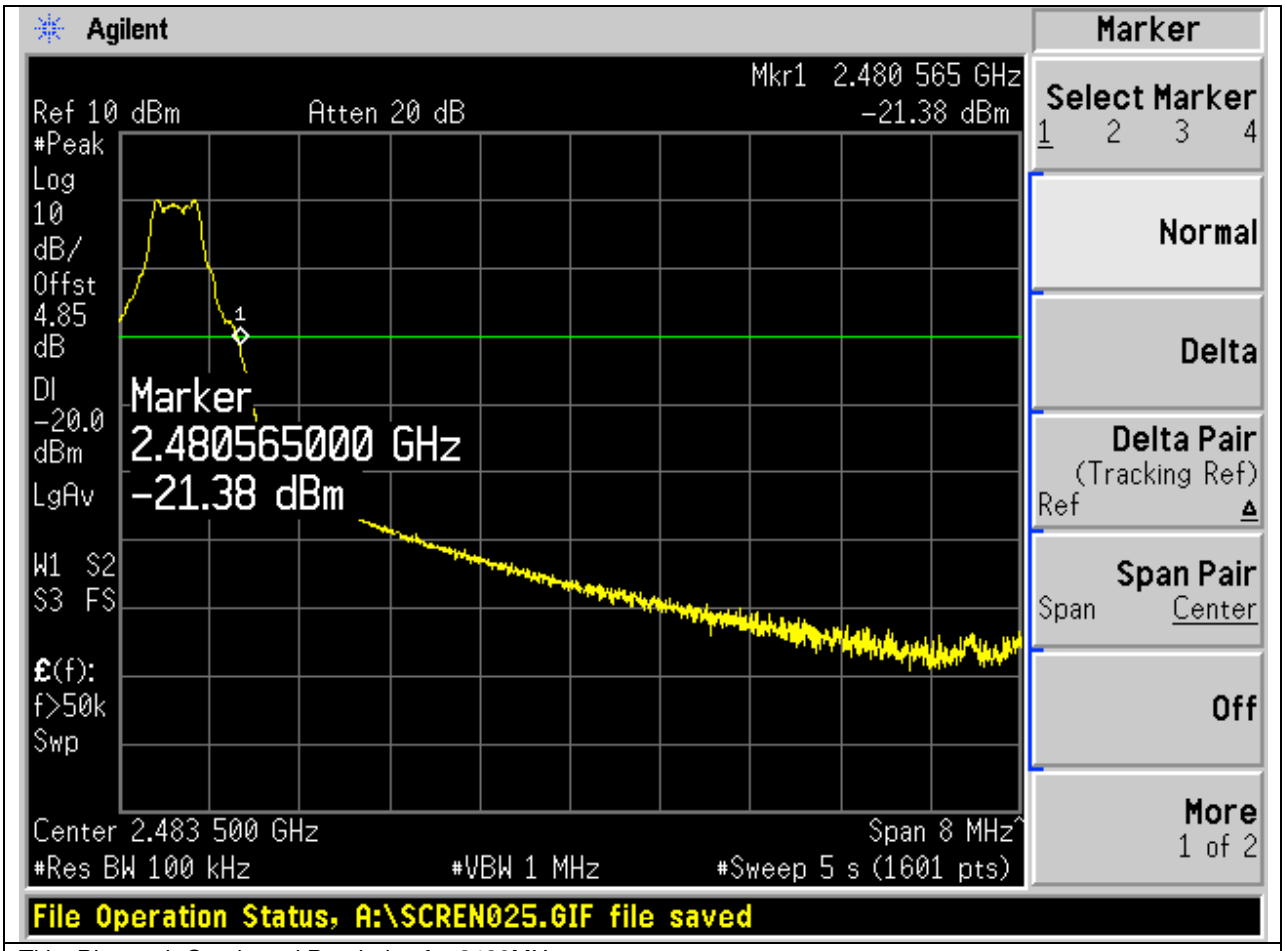
Conducted emissions which fall in the restricted bands, as defined in Sec. 15.205(a), must also comply with the radiated emission limits specified in Sec. 15.209(a).

Graphical Test Results

Note that the data displayed on the plots detailed in this appendix were measured using a 'Peak Detector'. Please refer to the results table for the detectors used during formal measurements



Title: Bluetooth Conducted Bandedge for 2402MHz



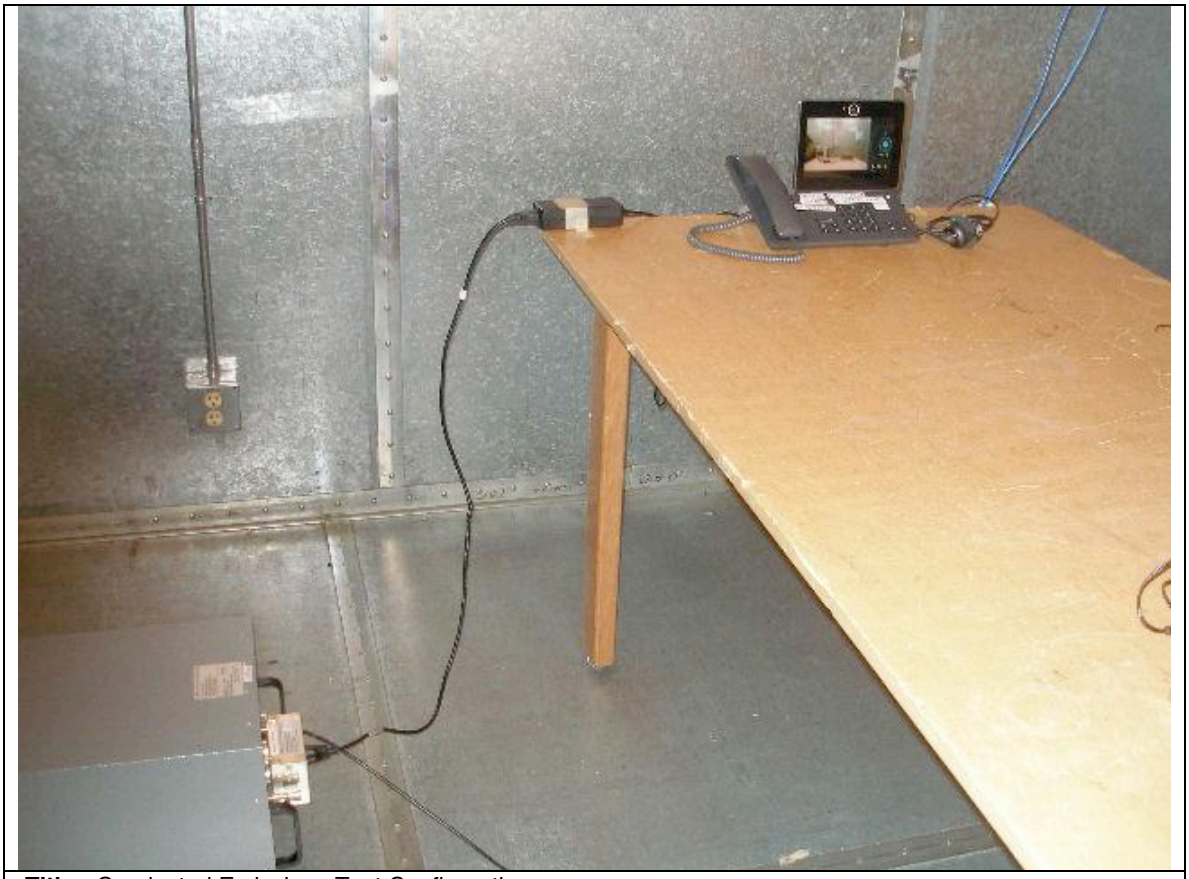
Title: Bluetooth Conducted Bandedge for 2480MHz

Physical Test arrangement Photograph:

Title: Bluetooth Bench Setup

Comments on the above Photograph:

No further comments



Title: Conducted Emissions Test Configuration

Radiated Spurious and Harmonics Emissions

15.205 & RSS-210 sec2.7:

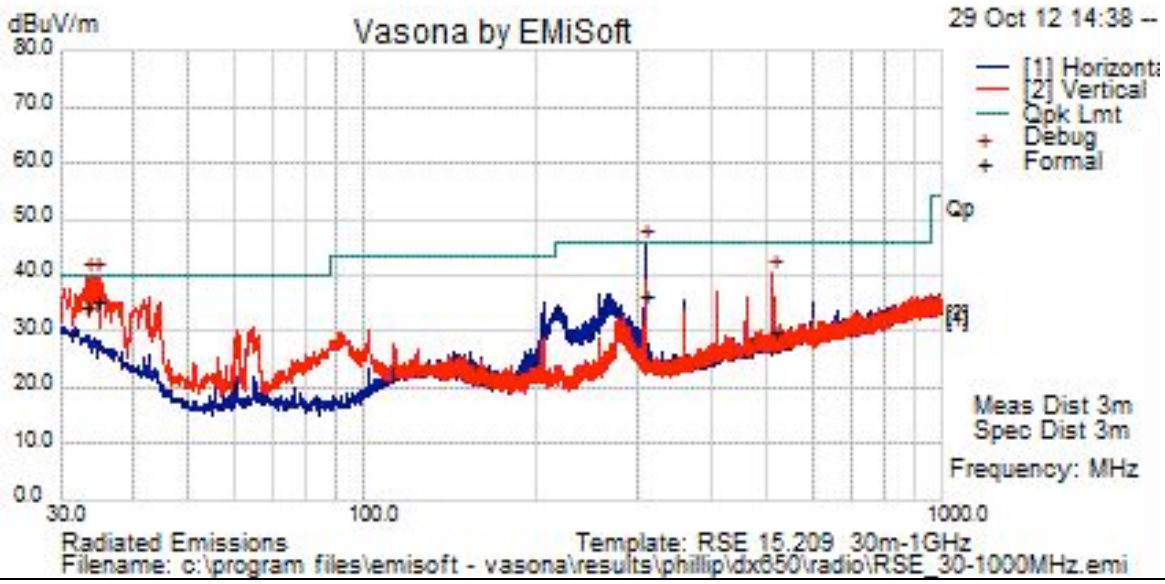
Radiated emissions which fall in the restricted bands, as defined in Sec. 15.205(a), must also comply with the radiated emission limits specified in Sec. 15.209(a).

Note 1: Device under test is placed in a Continuous Tx Mode with Hopping Sequence Turned "OFF"

Note 2: For Testing performed above 1GHz a Notch Filer (Micro-Tronics BRM50702) is used. Correction factors are factored into the test results.

Graphical Test Results 30 – 1000MHz:

Note that the data displayed on the plots detailed in this appendix were measured using a 'Peak Detector'. Please refer to the results table for the detectors used during formal measurements



Title: Test Results for 30 - 1000MHz

Test Results Table

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
34.38	16.9	0.5	18	35.4	Qp	V	110	66	40	-4.6	Pass	
33.179	14.9	0.5	18.9	34.3	Qp	V	105	38	40	-5.7	Pass	
307.047	21.2	1.6	13.6	36.4	Qp	H	103	97	46	-9.6	Pass	
511.908	10	2.1	17.8	29.8	Qp	V	101	148	46	-16.2	Pass	

15.205 / RSS-210 2.7: Radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

Using Vasona, configure the spectrum analyzer as shown below (be sure to enter all losses between the transmitter output and the spectrum analyzer). Place the radio in continuous transmit mode.

Span:	1GHz – 15 GHz
Reference Level:	80 dBuV
Attenuation:	10 dB
Sweep Time:	Coupled
Resolution Bandwidth:	1MHz
Video Bandwidth:	1 MHz for peak, 10 Hz for average
Detector:	Peak

Terminate the access Point RF ports with 50 ohm loads.

Maximize Turntable (find worst case table angle), Maximize Antenna (find worst case height)

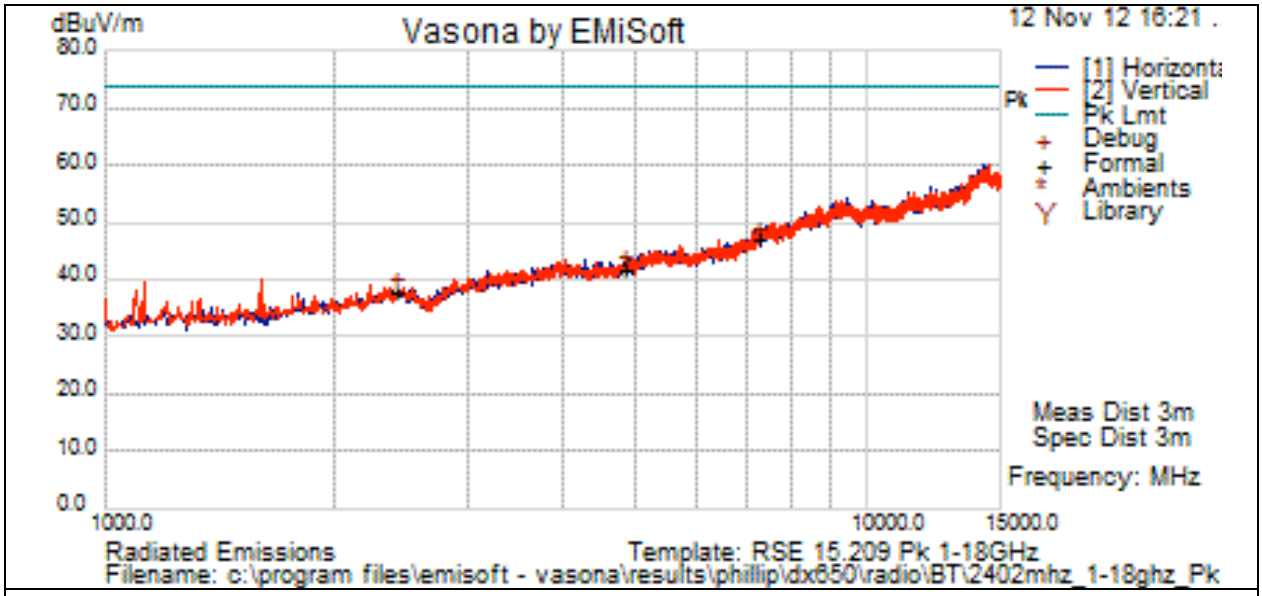
Save 2 plots: 1) Average Plot (Vertical and Horizontal), Limit= 54dBuV/m @3m
2) Peak plot (Vertical and Horizontal), Limit = 74dBuV/m @3m

This report represents the worst case data for all supported operating modes and antennas. System was evaluated up to 40GHz but there were no measurable emissions above 15 GHz.

Note: A Notch Filter was used during formal testing from 1 – 15GHz to help prevent the front end of the analyzer from over loading. The Notch filters used are designed to suppress Tx fundamental frequency but do not effect harmonics of the fundamental frequency from being measured

Graphical Test Results for 2402MHz: 1 – 15GHz (Peak)

Note that the data displayed on the plots detailed in this appendix were measured using a 'Peak Detector'. Please refer to the results table for the detectors used during formal measurements



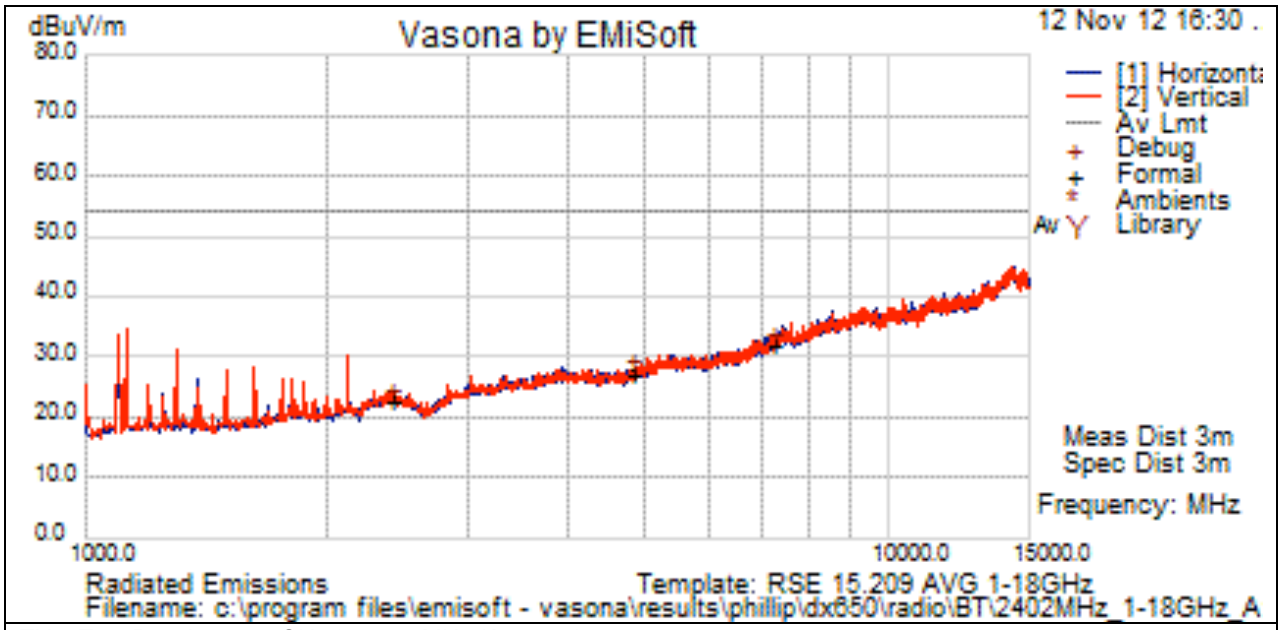
Title: Test Results 1 - 15GHz for 2402MHz (Peak)

Test Results Table

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
2402.01	38.4	4.6	-5.1	37.9	Pk	H	99	360	74	-36.1	Pass	Tx Signal
4804.023	38.9	6.7	-3.6	41.9	Pk	H	99	360	74	-32.1	Pass	
7206.008	37.7	8.8	0.4	46.9	Pk	H	99	360	74	-27.1	Pass	

Graphical Test Results for 2402MHz: 1 – 15GHz (Average)

Note that the data displayed on the plots detailed in this appendix were measured using a 'Peak Detector'. Please refer to the results table for the detectors used during formal measurements



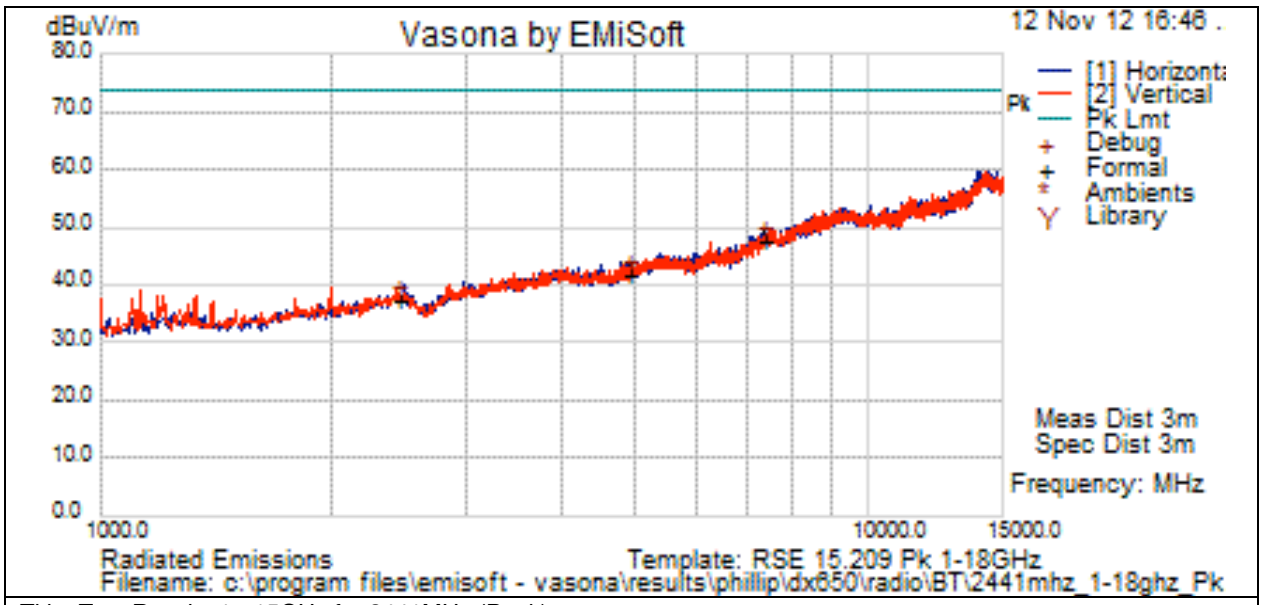
Title: Test Results 1 - 15GHz for 2402MHz (Average)

Test Results Table

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
2402.012	22.8	4.6	-5.1	22.4	Av	H	99	360	54	-31.7	Pass	Tx Signal
4804.039	24	6.7	-3.6	27	Av	H	99	360	54	-27	Pass	
7206.017	22.5	8.8	0.4	31.7	Av	H	99	360	54	-22.3	Pass	

Graphical Test Results for 2441MHz: 1 – 15GHz (Peak)

Note that the data displayed on the plots detailed in this appendix were measured using a 'Peak Detector'. Please refer to the results table for the detectors used during formal measurements



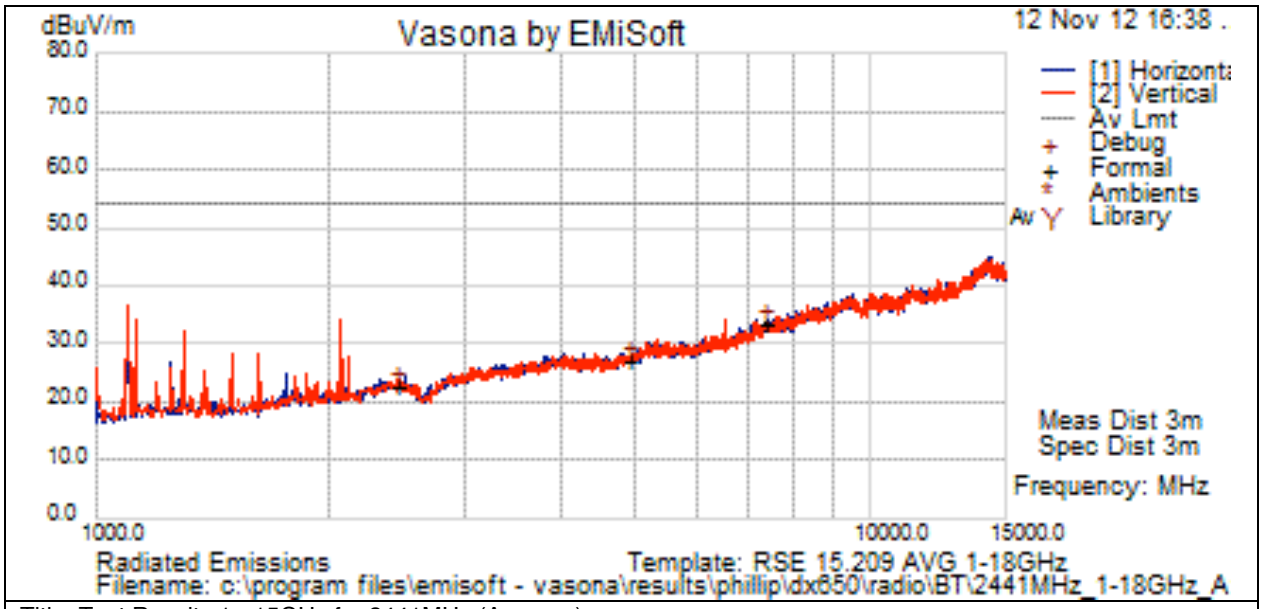
Title: Test Results 1 - 15GHz for 2441MHz (Peak)

Test Results Table

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
2441.013	38	4.6	-5.2	37.4	Pk	H	99	360	74	-36.6	Pass	Tx Signal
4882.015	38.5	6.8	-3.7	41.5	Pk	H	99	360	74	-32.5	Pass	
7323.017	37.6	8.8	1.1	47.5	Pk	H	99	360	74	-26.5	Pass	

Graphical Test Results for 2441MHz: 1 – 15GHz (Average)

Note that the data displayed on the plots detailed in this appendix were measured using a 'Peak Detector'. Please refer to the results table for the detectors used during formal measurements



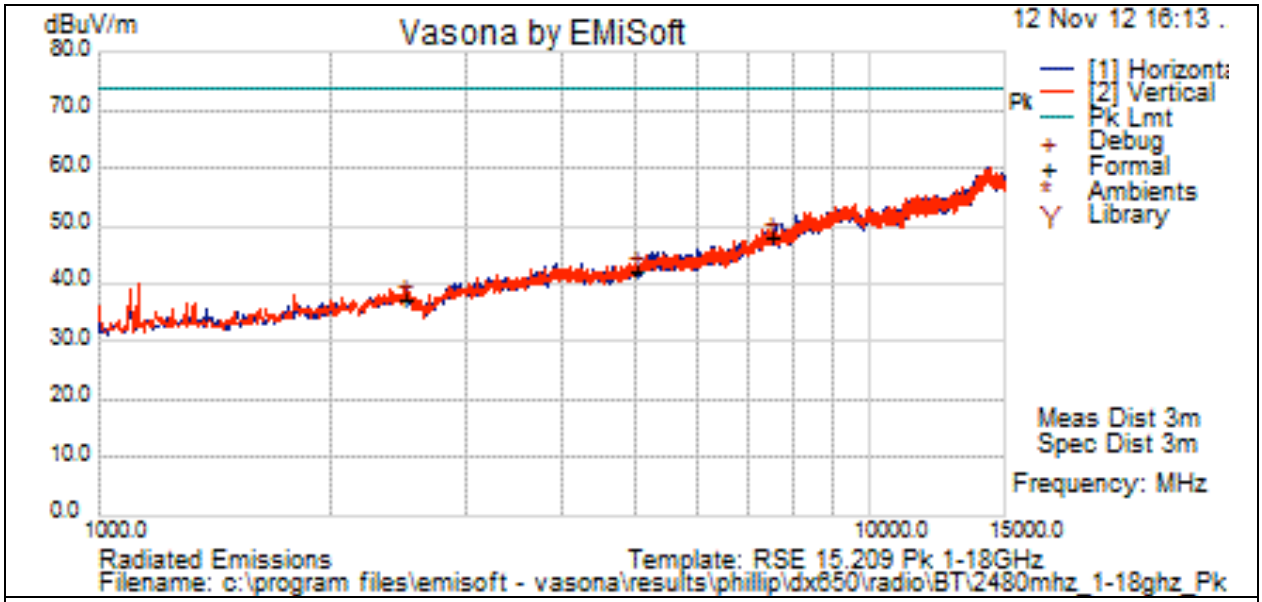
Title: Test Results 1 - 15GHz for 2441MHz (Average)

Test Results Table

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
2441.08	23.4	4.6	-5.2	22.8	Av	H	99	360	54	-31.2	Pass	Tx Signal
4882.004	23.8	6.8	-3.7	26.9	Av	H	99	360	54	-27.1	Pass	
7323.003	23.5	8.8	1.1	33.5	Av	H	99	360	54	-20.5	Pass	

Graphical Test Results for 2480MHz: 1 – 15GHz (Peak)

Note that the data displayed on the plots detailed in this appendix were measured using a 'Peak Detector'. Please refer to the results table for the detectors used during formal measurements



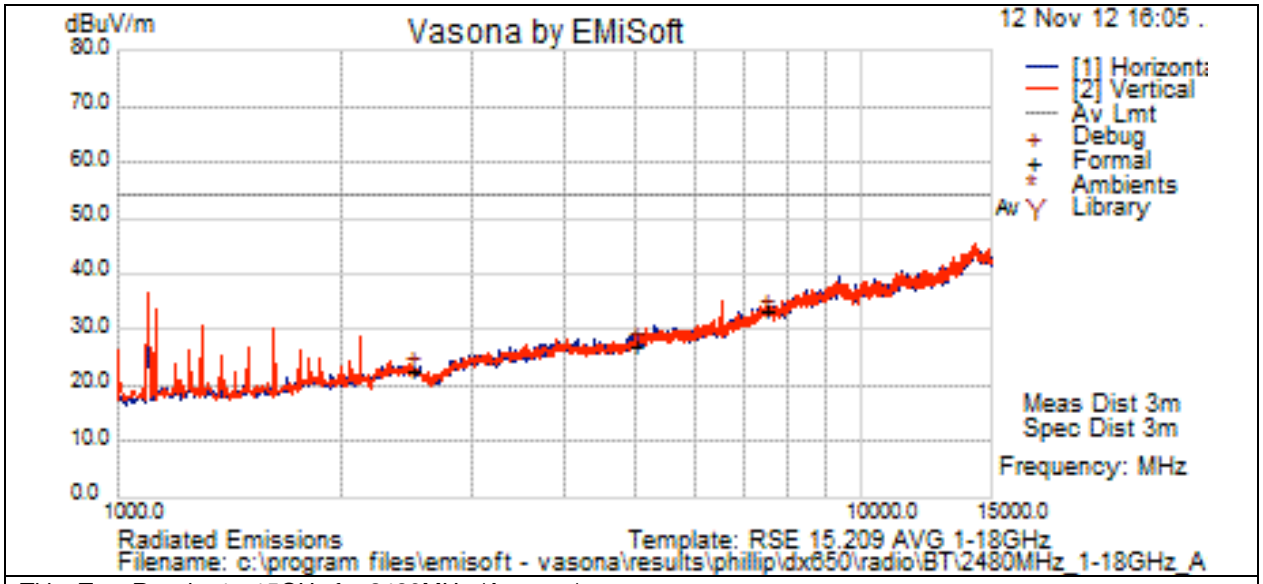
Title: Test Results 1 - 15GHz for 2480MHz (Peak)

Test Results Table

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
2480.008	37.7	4.6	-5.1	37.2	Pk	H	99	360	74	-36.8	Pass	Tx Signal
4960.003	39	6.8	-3.7	42.1	Pk	H	99	360	74	-31.9	Pass	
7440.003	37.7	8.9	1.4	48	Pk	H	99	360	74	-26	Pass	

Graphical Test Results for 2480MHz: 1 – 15GHz (Average)

Note that the data displayed on the plots detailed in this appendix were measured using a 'Peak Detector'. Please refer to the results table for the detectors used during formal measurements

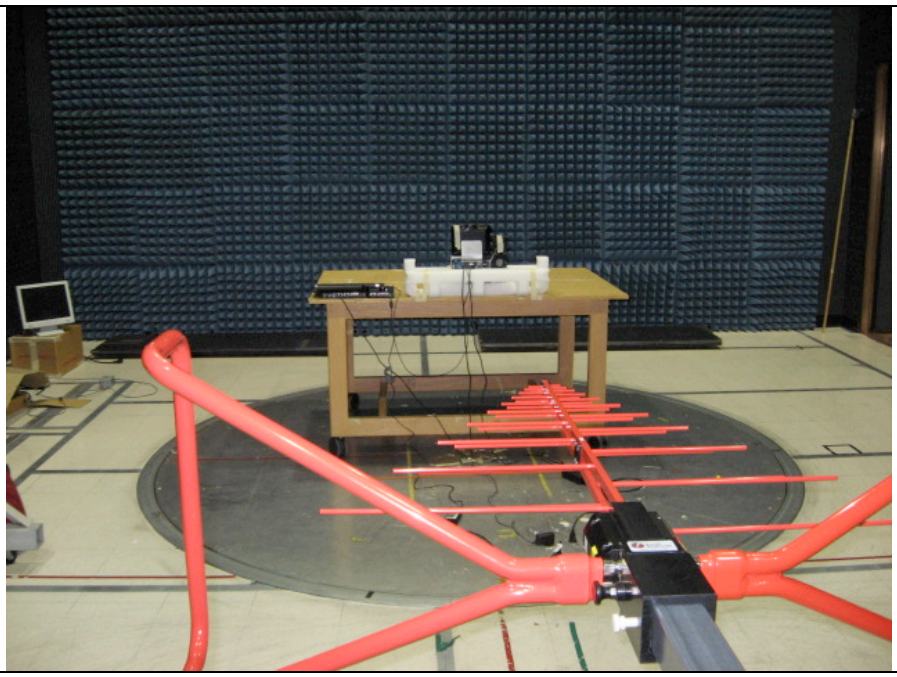


Title: Test Results 1 - 15GHz for 2480MHz (Average)

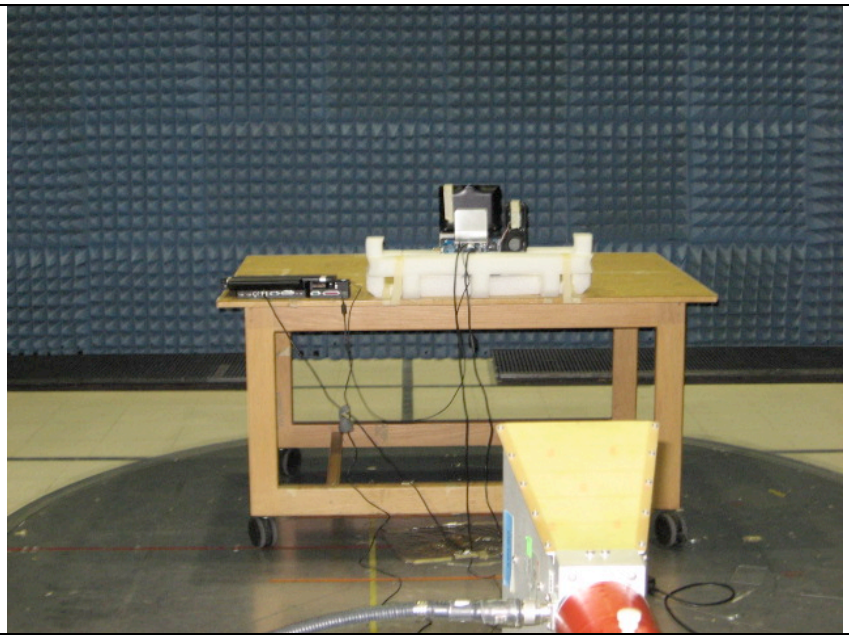
Test Results Table

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
2480.008	23.3	4.6	-5.1	22.8	Av	H	99	360	54	-31.2	Pass	Tx Signal
4960.023	23.8	6.8	-3.7	27	Av	H	99	360	54	-27.1	Pass	
7440.018	22.8	8.9	1.4	33.1	Av	H	99	360	54	-20.9	Pass	

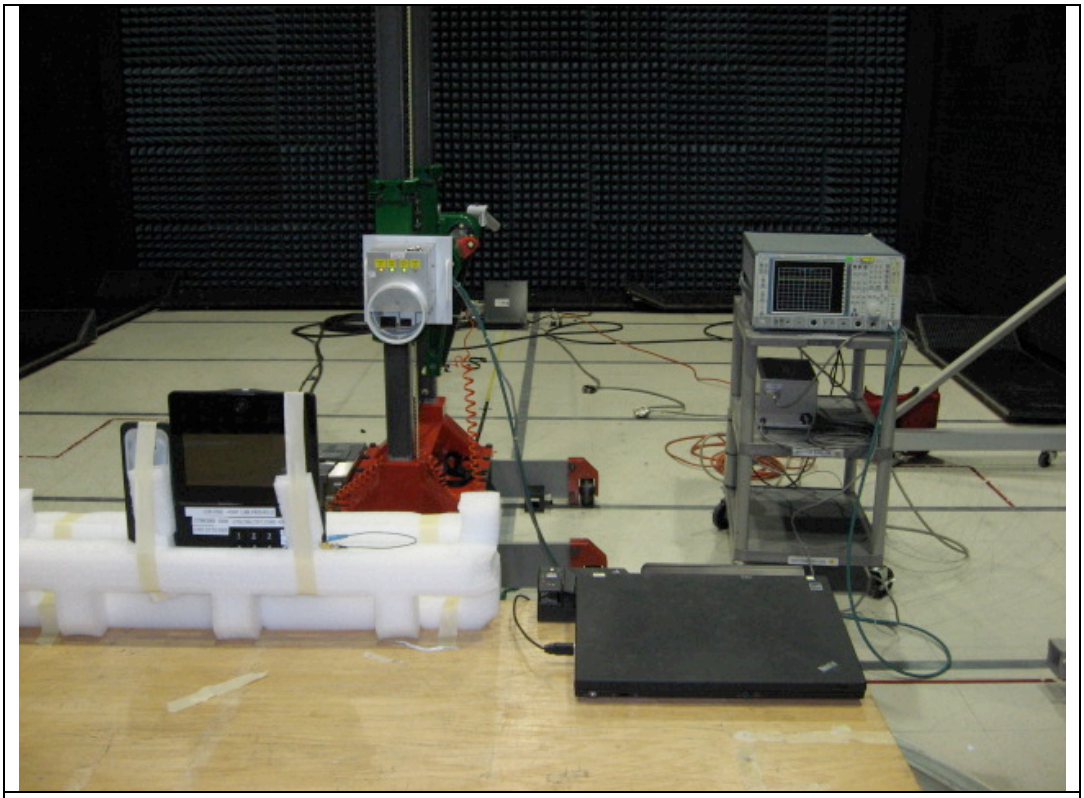
Physical Test arrangement Photos:



Title: Radiated Test Configuration from 30M - 1000MHz



Title: Radiated Test Configuration from 1 - 18GHz



Title: Radiated Spurious Emissions Test Configuration from 18 - 26.5GHz

Appendix B: Abbreviation Key and Definitions

The following table defines abbreviations used within this test report.

Abbreviation	Description	Abbreviation	Description
EMC	Electro Magnetic Compatibility	°F	Degrees Fahrenheit
EMI	Electro Magnetic Interference	°C	Degrees Celsius
EUT	Equipment Under Test	Temp	Temperature
ITE	Information Technology Equipment	S/N	Serial Number
TAP	Test Assessment Schedule	Qty	Quantity
ESD	Electro Static Discharge	emf	Electromotive force
EFT	Electric Fast Transient	RMS	Root mean square
EDCS	Engineering Document Control System	Qp	Quasi Peak
Config	Configuration	Av	Average
CIS#	Cisco Number (unique identification number for Cisco test equipment)	Pk	Peak
Cal	Calibration	kHz	Kilohertz ($1x10^3$)
EN	European Norm	MHz	MegaHertz ($1x10^6$)
IEC	International Electro technical Commission	GHz	Gigahertz ($1x10^9$)
CISPR	International Special Committee on Radio Interference	H	Horizontal
CDN	Coupling/Decoupling Network	V	Vertical
LISN	Line Impedance Stabilization Network	dB	decibel
PE	Protective Earth	V	Volt
GND	Ground	kV	Kilovolt ($1x10^3$)
L1	Line 1	μV	Microvolt ($1x10^{-6}$)
L2	Line2	A	Amp
L3	Line 3	μA	Micro Amp ($1x10^{-6}$)
DC	Direct Current	mS	Milli Second ($1x10^{-3}$)
RAW	Uncorrected measurement value, as indicated by the measuring device	μS	Micro Second ($1x10^{-6}$)
RF	Radio Frequency	μS	Micro Second ($1x10^{-6}$)
SLCE	Signal Line Conducted Emissions	m	Meter
Meas dist	Measurement distance	Spec dist	Specification distance
N/A or NA	Not Applicable	SL	Signal Line (or Telecom Line)
P	Power Line	L	Live Line
N	Neutral Line	R	Return
S	Supply	AC	Alternating Current

Appendix C: Test Equipment Used to perform the test

Equip#	Manufacturer/ Model	Description	Last Cal	Next Due
035095	Micro-Coax/ UFA147A-0-0180-110200	RF Coaxial Cable, to 40 GHz, 18 in	25-OCT-12	25-OCT-13
040514	Agilent (E4440A)	Precision Spectrum Analyzer	12-NOV-12	12-NOV-13
041985	Murata Electronics/ MXGS83RK3000	Special Radio Test Adaptor Cable	29-MAY-12	29-MAY-13
041986	Murata Electronics/ MXGS83RK3000	Special Radio Test Adaptor Cable	29-MAY-12	29-MAY-13
043023	Anritsu (MT8852B-042)	EDR Bluetooth Test Set	14-SEP-12	14-SEP-13
044583	Mini-Circuits (ZFSC-2-10G)	Splitter	06-JUL-12	06-JUL-13
002119	EMC Test Systems/ 3115	Double Ridged Guide Horn Antenna	07-AUG-12	07-AUG-13
005691	Miteq/ NSP1800-25-S1	Broadband Preamplifier (1-18GHz)	31-JAN-12	31-JAN-13
008022	Huber + Suhner/ SF106A	1 meter Sucoflex cable	16-DEC-12	16-DEC-13
008024	Huber + Suhner/ SF106A	3 meter Sucoflex cable	05-NOV-12	05-NOV-13
024201	Rohde & Schwarz/ FSEK30	Spectrum Analyzer 20Hz - 40GHz	30-NOV-12	30-NOV-13
028072	Cisco/ 1840	18-40GHz EMI Test Head/Verification Fixture	15-FEB-12	15-FEB-13
030443	Micro-Coax/ UFB311A-0-1560-520520	RF Coaxial Cable, to 18GHz, 156 In.	05-NOV-12	05-NOV-13
033602	Midwest Microwave/ CSY-NMNM-80-273001	RF Coaxial Cable, 27ft. to 18GHz	05-NOV-12	05-NOV-13
042000	Agilent/ E4440A	Spectrum Analyzer	29-JUN-12	29-JUN-13
045051	Rohde & Schwarz/ ESCI	EMI Test Receiver	02-NOV-12	02-NOV-13
045588	Sunol Sciences/ JB1	Combination Antenna, 30MHz-2GHz	12-DEC-11	12-DEC-12
030666	Micro-Tronics BRM50702-02	Band Reject Filter, Stop Band=2.4-2.5GHz	30-MAY-12	30-MAY-13

Appendix D: Test Procedures

Measurements were made in accordance with

- FCC docket #:DA 00-0705,
- ET docket 96-8, measurement method of spurious emission tolerance to the International Telecommunication Union (ITU) Recommendation SM329.
- ANSI C63.10
- ANSI C63.4