Radio Intentional EMC Test Report: EDCS - 819049

For

CP-9951-C-K9, CP-9951-CL-K9, CP-9951-W-K9 & CP-9951-WL-K9

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: Dean Yarza
Approved By: Craig Mullis
Title: Regulatory Compliance Manager

This report replaces any previously entered test report under EDCS -819049

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, KDB Publication No. 558074& 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

21-Sept-2009

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

Dean Yarza

2.5 Equipment Assessed (EUT)

CP-9951-C-K9

2.6 EUT Description

Roundtable Business is the next generation of desktop phones.

Roundtable phones will comprise of the MuRata Texas Instruments Chipset for Bluetooth 2.1+EDR p/n: BRF6350 v2.11.

Report will be used to cover the following Models:

CP-9951-C-K9: Charcoal with Thick Handset

CP-9951-CL-K9: Charcoal with Thin Handset

CP-9951-W-K9: Charcoal with Thick Handset

CP-9951-WL-K9: Charcoal with Thin Handset

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: Systems using digital modulation techniques may operate in the 5725-5850MHz band. The minimum 6 dB bandwidth shall be at least 500 kHz. *(RSS-210 A8.2)*	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
Restricted Bandedge Measurements	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

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". GFSK, TT/4-DQPSK, and 8DPSK modes were all evaluated with results showing GFSK as the worst case mode of operation. The data collected determine that the orientation used for this report was determined "Worst Case".

4.1 Sample Details

Sample Number	Equipment Details	Serial Number	Part Number
S01	CP-9951	FCH13299H9G	68-3143-01 27*

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 Antenna, Gain = 0.44dBi (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.

Section 5: Modifications

5.1 Sample Modifications Performed During Assessment

No modifications were performed during assessment.

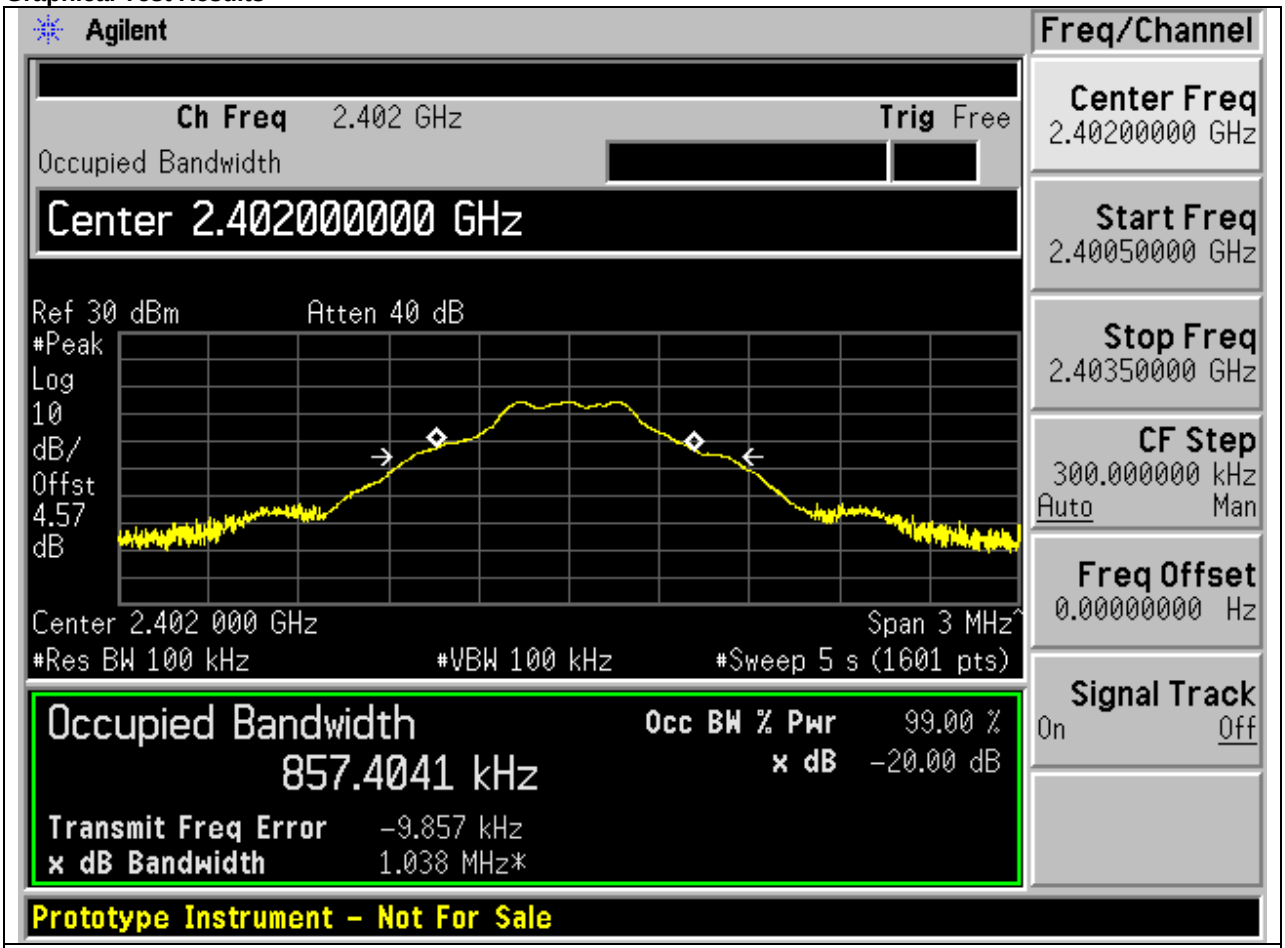
Appendix A: Formal Test Results

20dB Bandwidth: GFSK

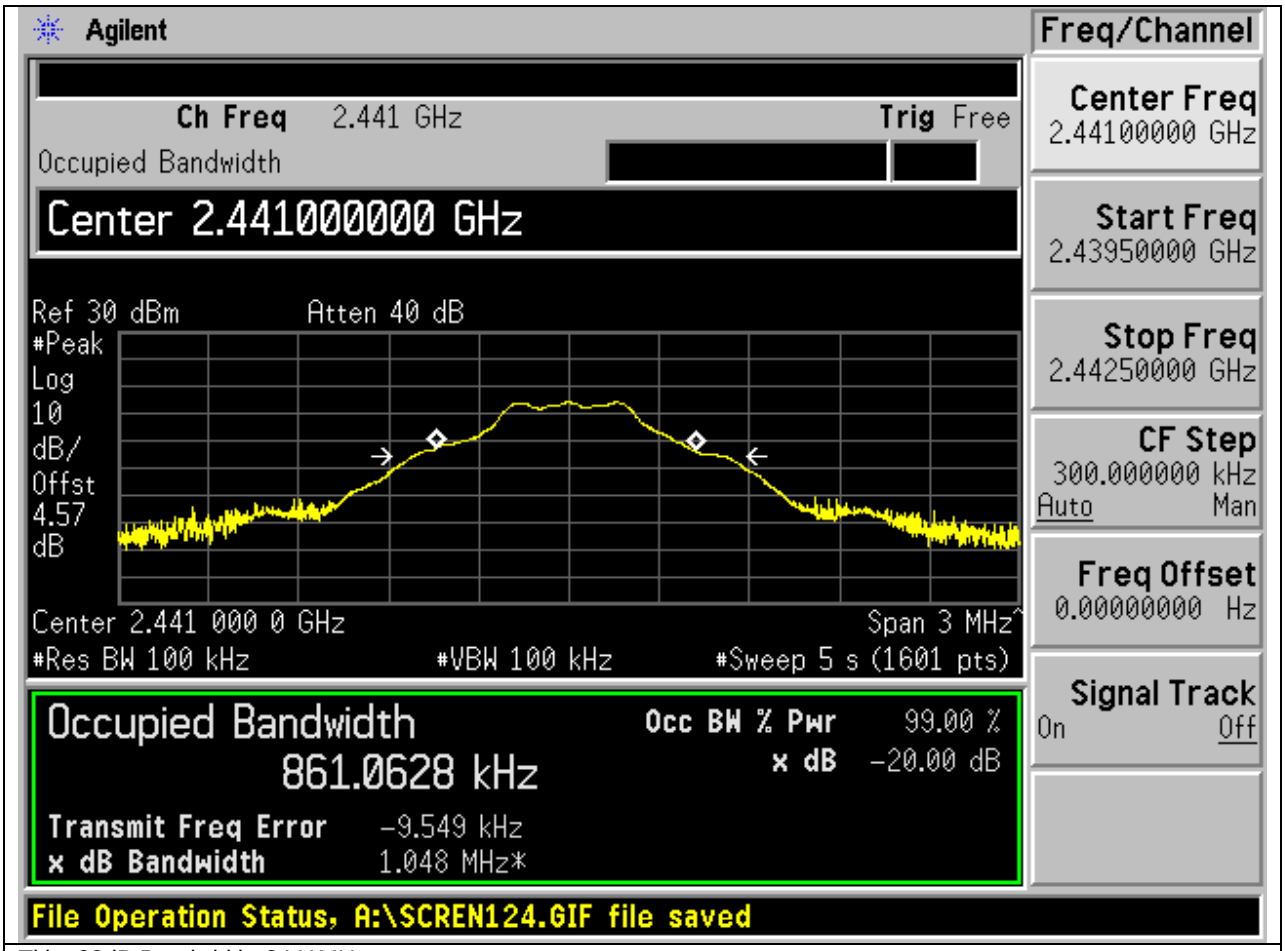
20dB bandwidth of a frequency hopping channel is the 2400-2483.5MHz with hopping stopped.

Frequency (MHz)	20dB Bandwidth (kHz)
2402	1038
2441	1048
2480	1041

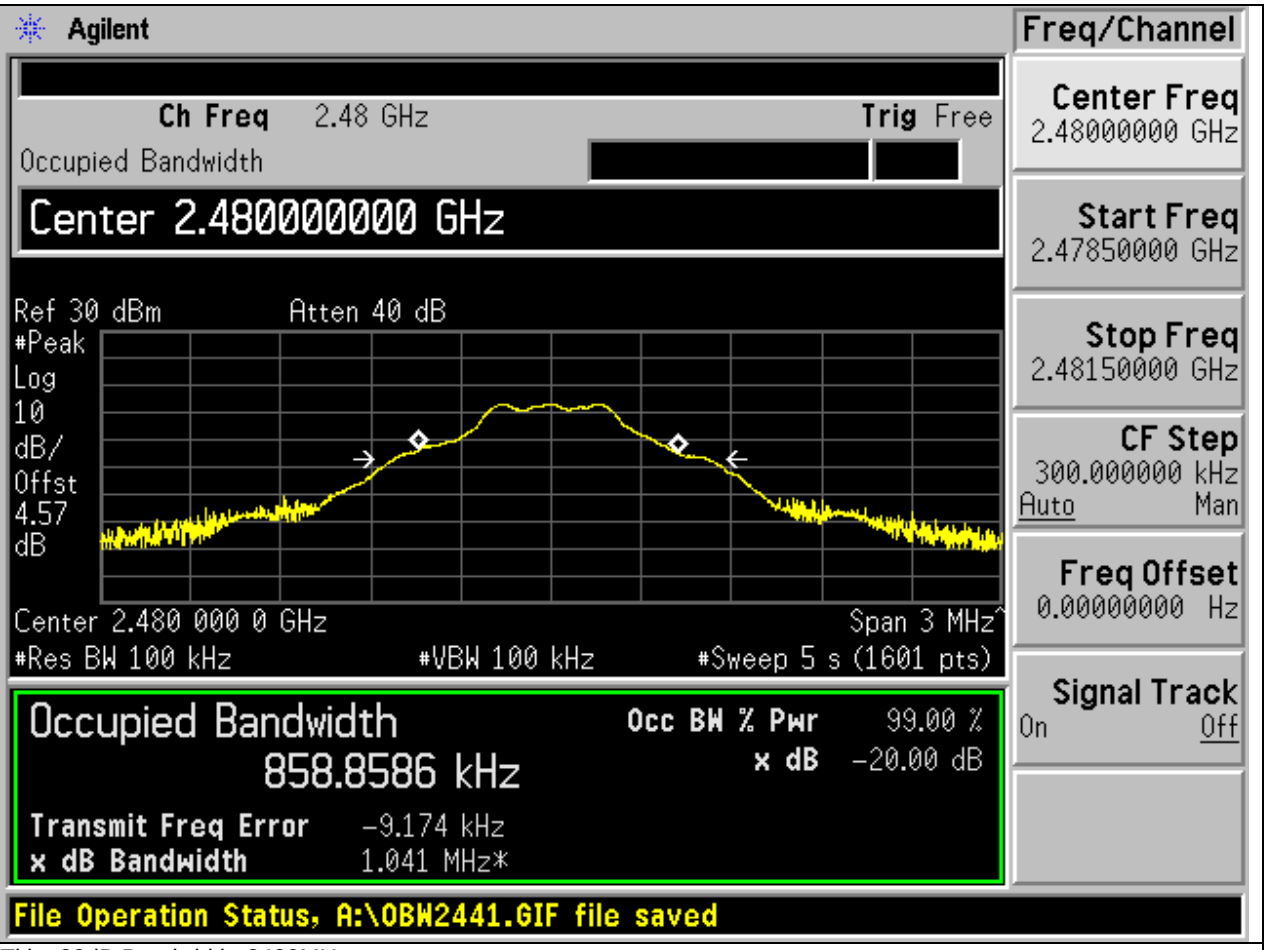
Graphical Test Results



Title: 20dB Bandwidth 2402MHz,



Title: 20dB Bandwidth 2441MHz ,



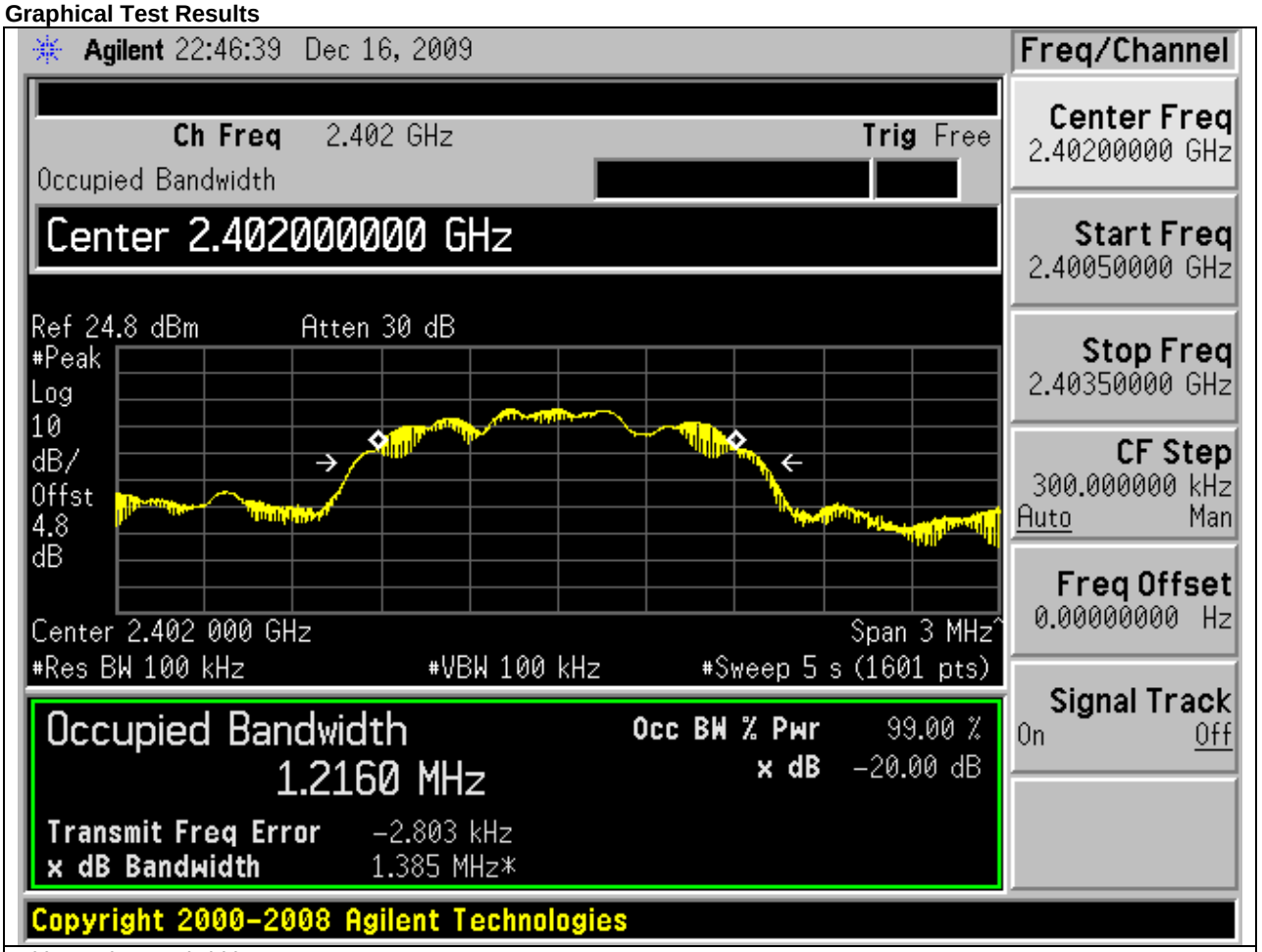
Title: 20dB Bandwidth 2480MHz

20dB Bandwidth: TT/4-DQPSK

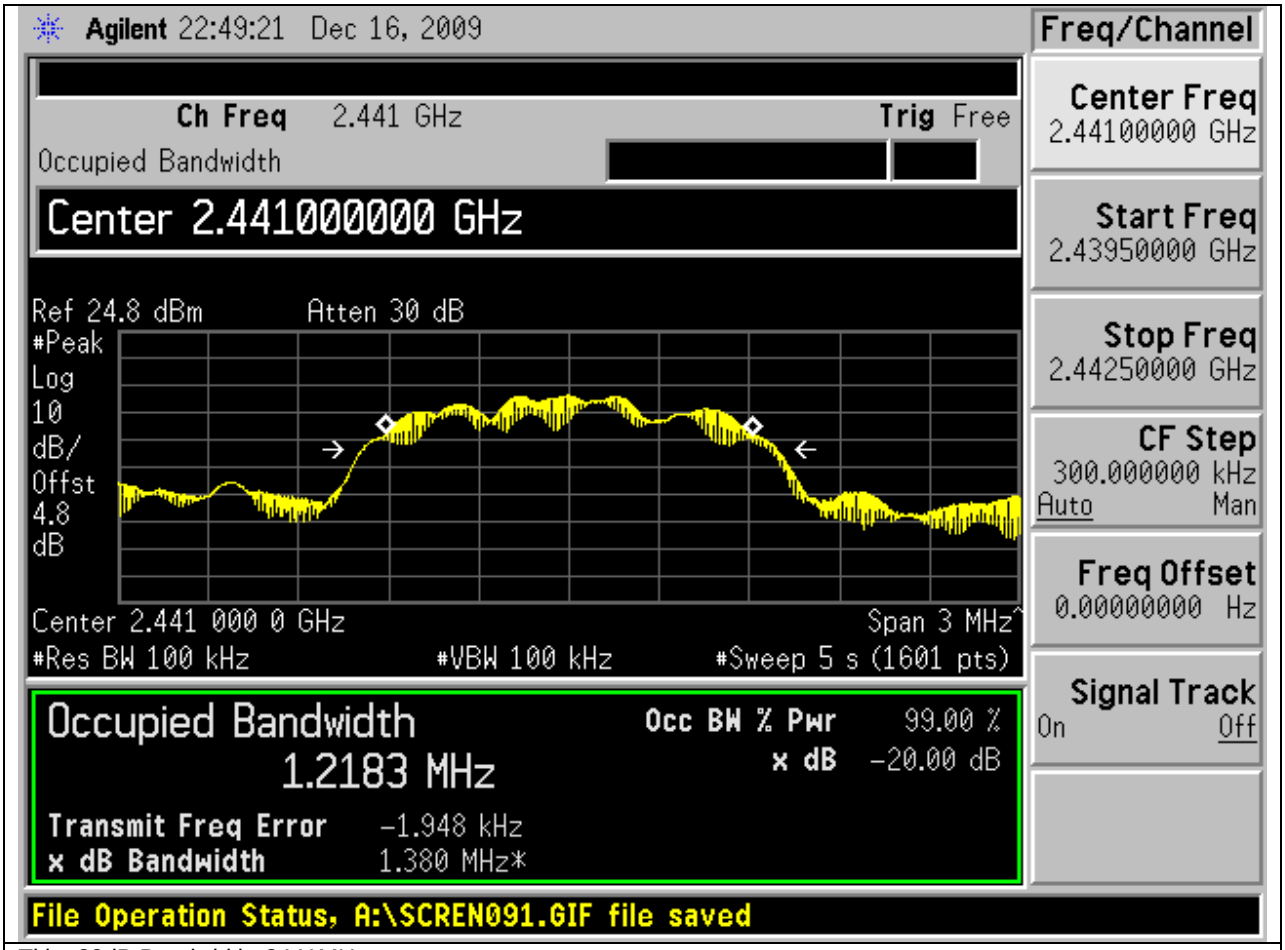
20dB bandwidth of a frequency hopping channel is the 2400-2483.5MHz with hopping stopped.

Frequency (MHz)	20dB Bandwidth (kHz)
2402	1385
2441	1380
2480	1381

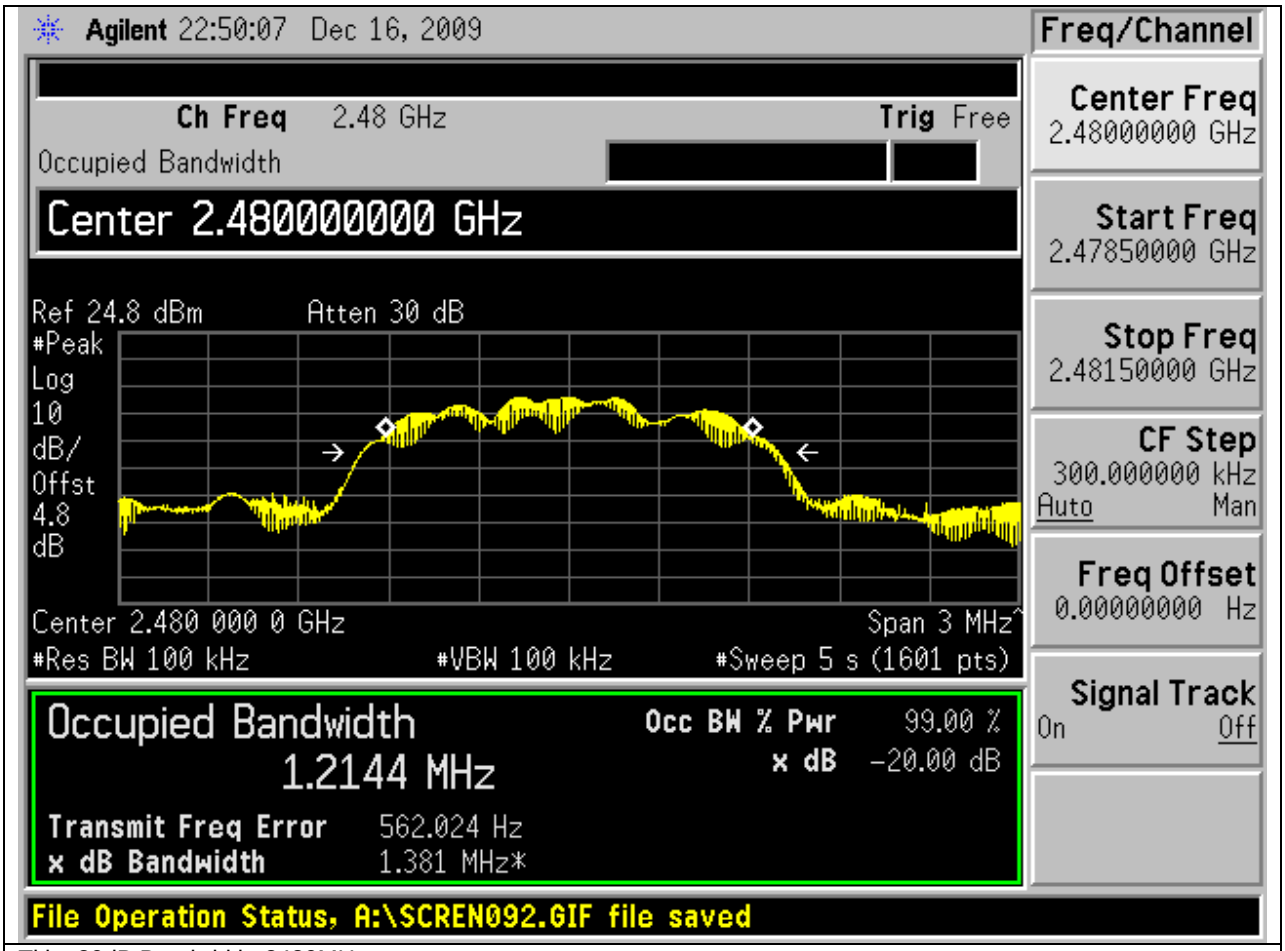
Graphical Test Results



Title: 20dB Bandwidth 2402MHz,



Title: 20dB Bandwidth 2441MHz ,



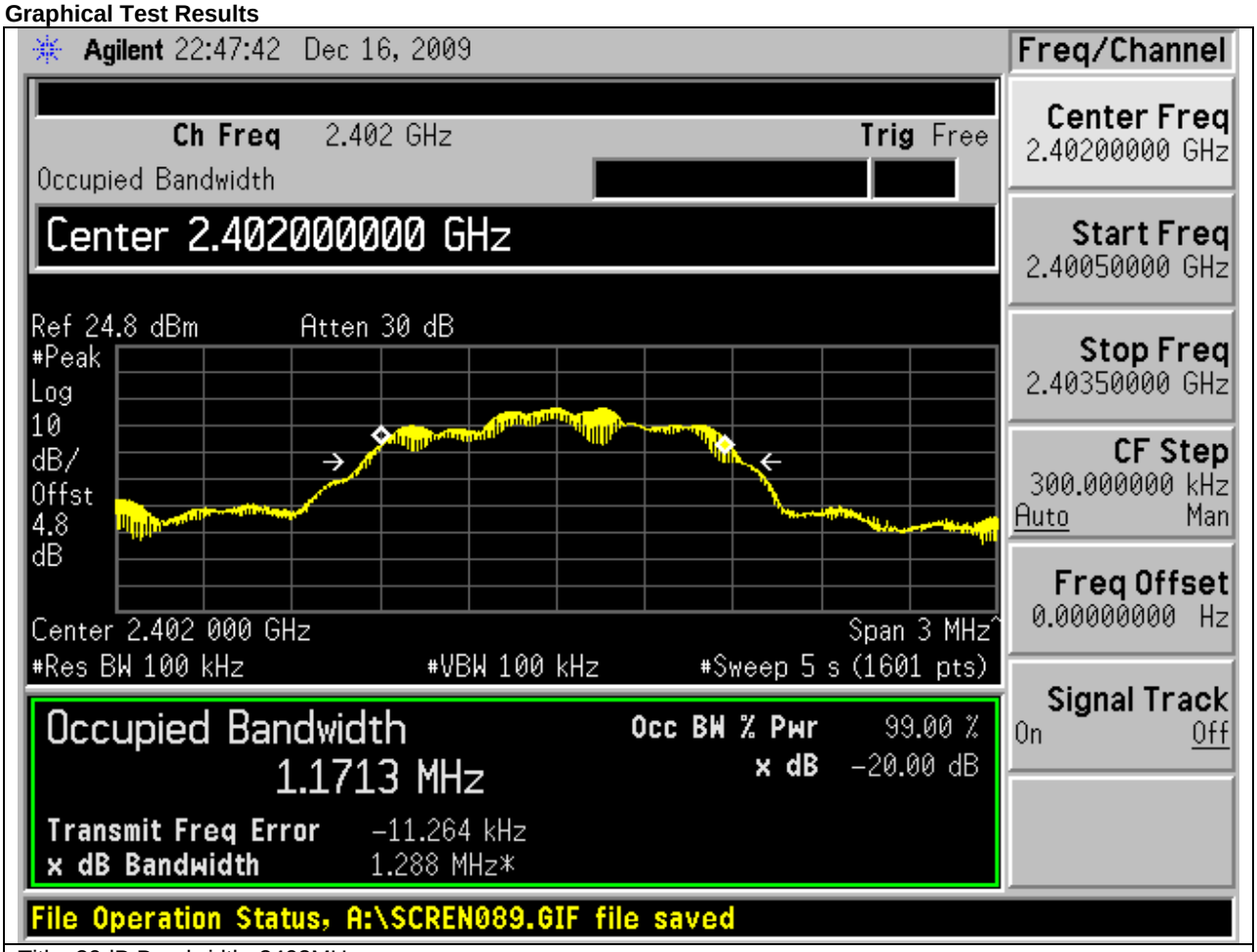
Title: 20dB Bandwidth 2480MHz

20dB Bandwidth: 8DPSK

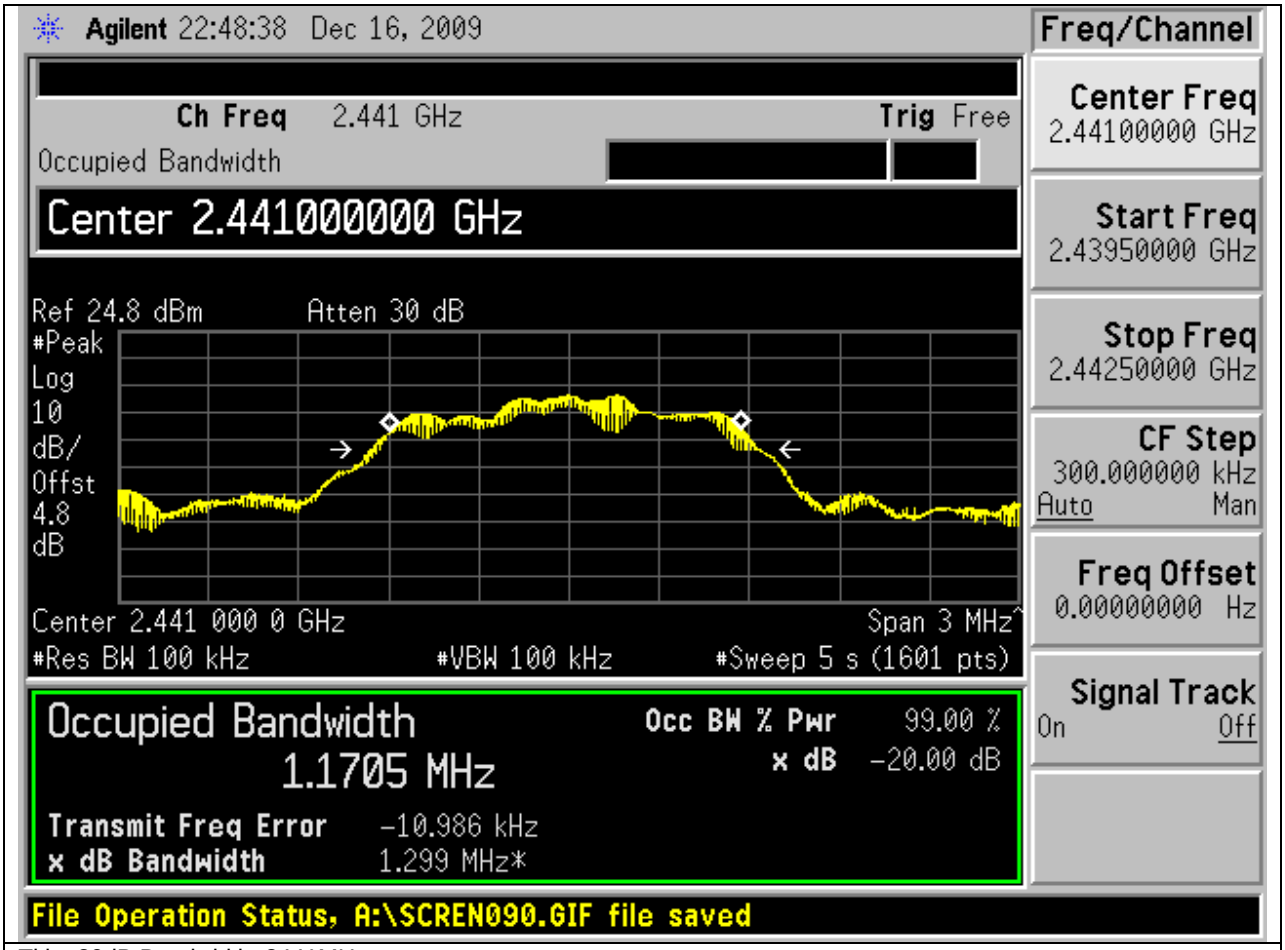
20dB bandwidth of a frequency hopping channel is the 2400-2483.5MHz with hopping stopped.

Frequency (MHz)	20dB Bandwidth (kHz)
2402	1288
2441	1299
2480	1301

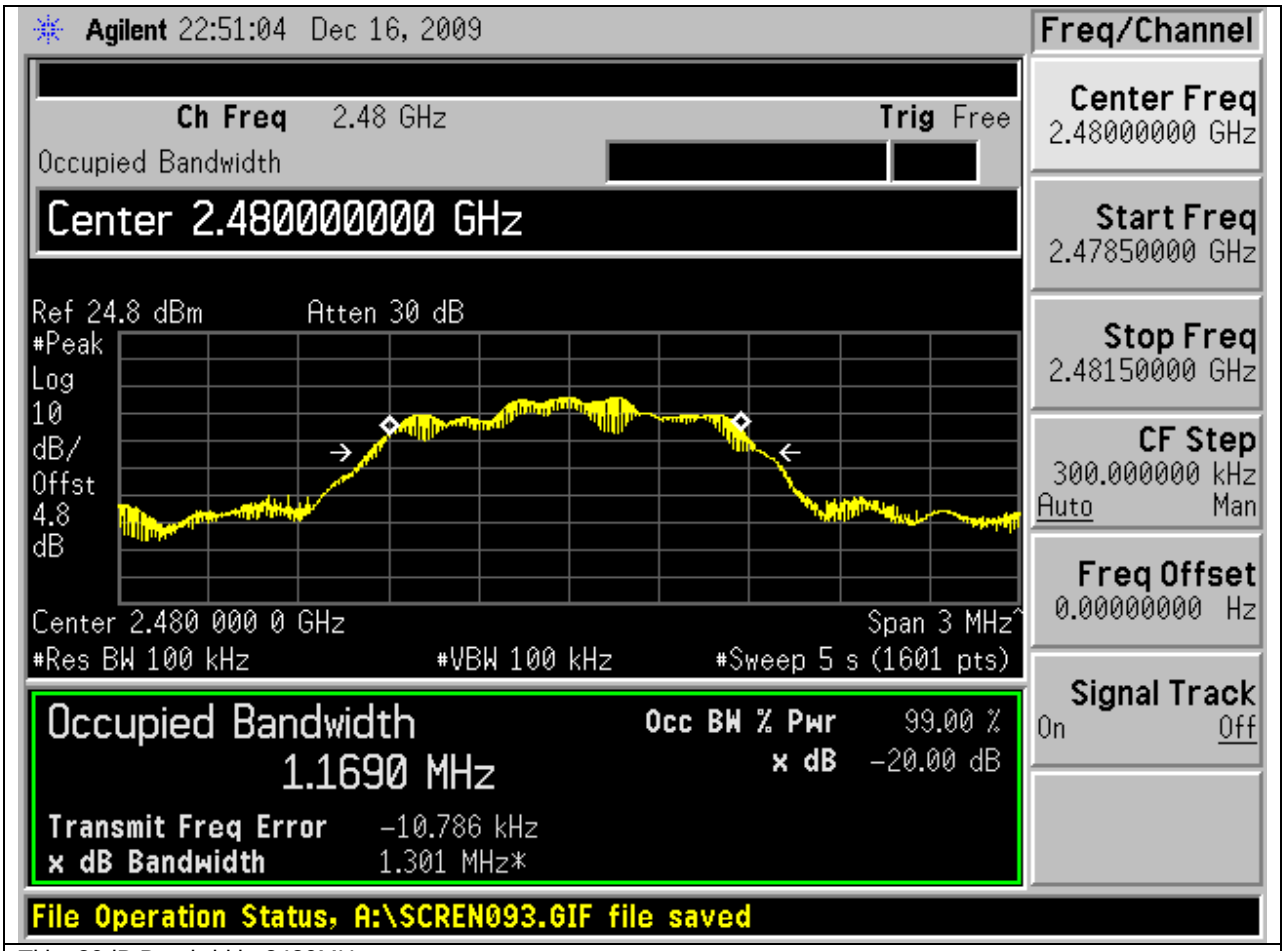
Graphical Test Results



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	4.63	30	-25.37
2441	4.38	30	-25.62
2480	4.27	30	-25.73

Anritsu
BlueTest2 Test Report

Test Set Serial Number: 000830002 Date: 10/7/2009

EUT Bluetooth Address: 0017E8A82A7F Time: 4:14:40 PM

Overall Result: PASS

Model: CP-9951G (Bluetooth Version 2.1)

SN: FCH13299H9G

Data Rate: DH1

TRM/CA/01/C (Output Power)

Packet Length Tested: GFSK

Hopping OFF	**Low**	**Med**	**High**
Average Power	4.57 dBm	4.31 dBm	4.20 dBm
Max Power	4.57 dBm	4.31 dBm	4.21 dBm
Min Power	4.56 dBm	4.30 dBm	4.19 dBm
Peak Power	4.63 dBm	4.38 dBm	4.27 dBm
Total Packets Failed	0	0	0
Total Packets Tested	10	10	10
Result	Pass	Pass	Pass

Measurement procedure as per KDB Publication No. 558074 power output option 1, peak power meter.

TRM/CA/01/C (Output Power)
Packet Length Tested: π/4-DQPSK

Hopping OFF	**Low**	**Med**	**High**
DPSK Max	1.47 dBm	1.35 dBm	1.00 dBm
DPSK Min	1.44 dBm	1.32 dBm	0.98 dBm
DPSK Avg	1.46 dBm	1.34 dBm	1.00 dBm
DPSK Pk	4.08 dBm	3.85 dBm	3.61 dBm
Total Packets Failed	0	0	0
Total Packets Tested	10	10	10
Result	Pass	Pass	Pass

TRM/CA/01/C (Output Power)
Packet Length Tested: 8DPSK

Hopping OFF	**Low**	**Med**	**High**
DPSK Max	0.65 dBm	0.58 dBm	0.20 dBm
DPSK Min	0.62 dBm	0.54 dBm	0.18 dBm
DPSK Avg	0.64 dBm	0.57 dBm	0.19 dBm
DPSK Pk	3.43 dBm	3.24 dBm	2.92 dBm
Total Packets Failed	0	0	0
Total Packets Tested	10	10	10
Result	Pass	Pass	Pass

Carrier Frequency Separation

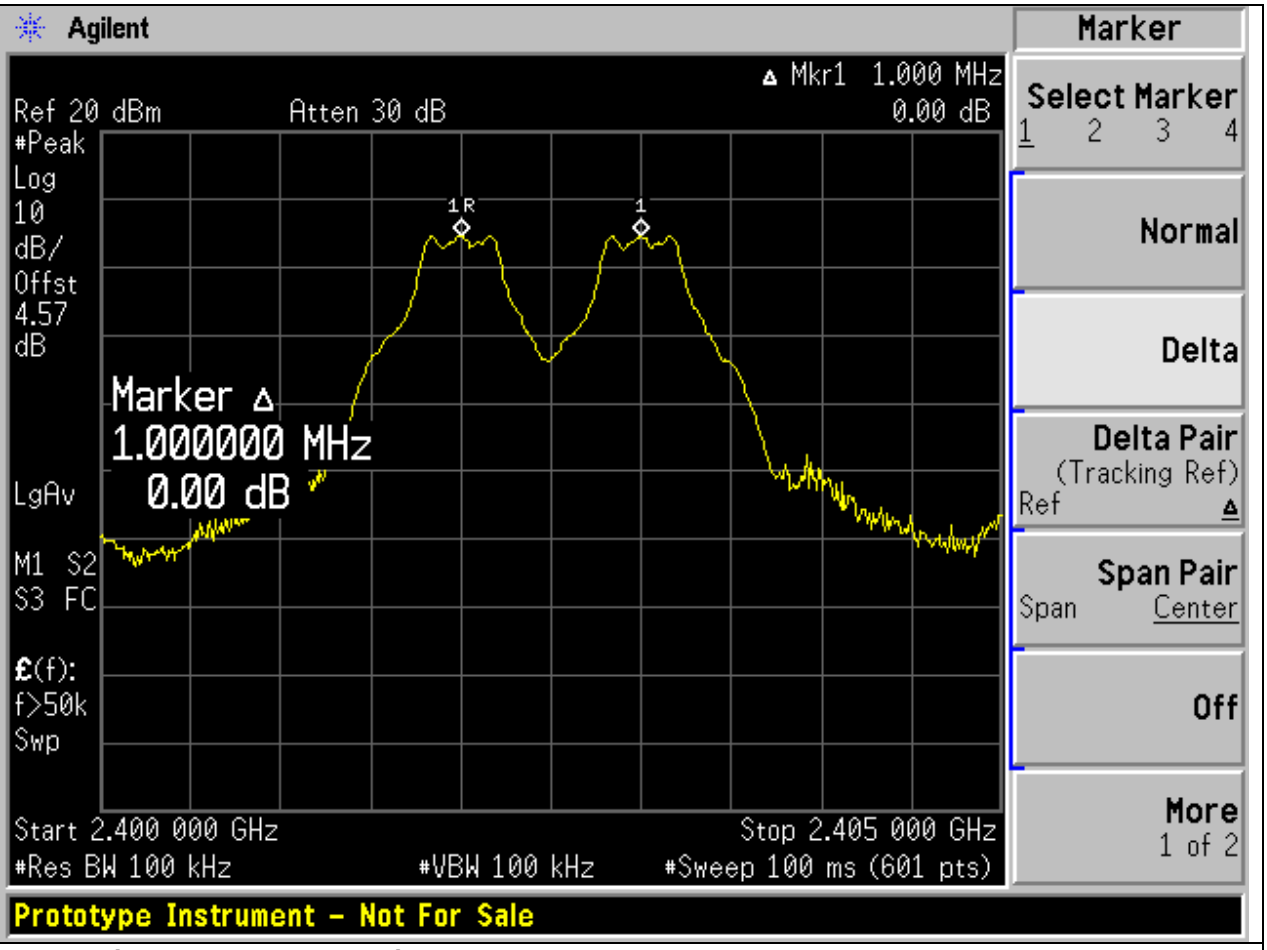
15.247 & RSS-210 A8.1:

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

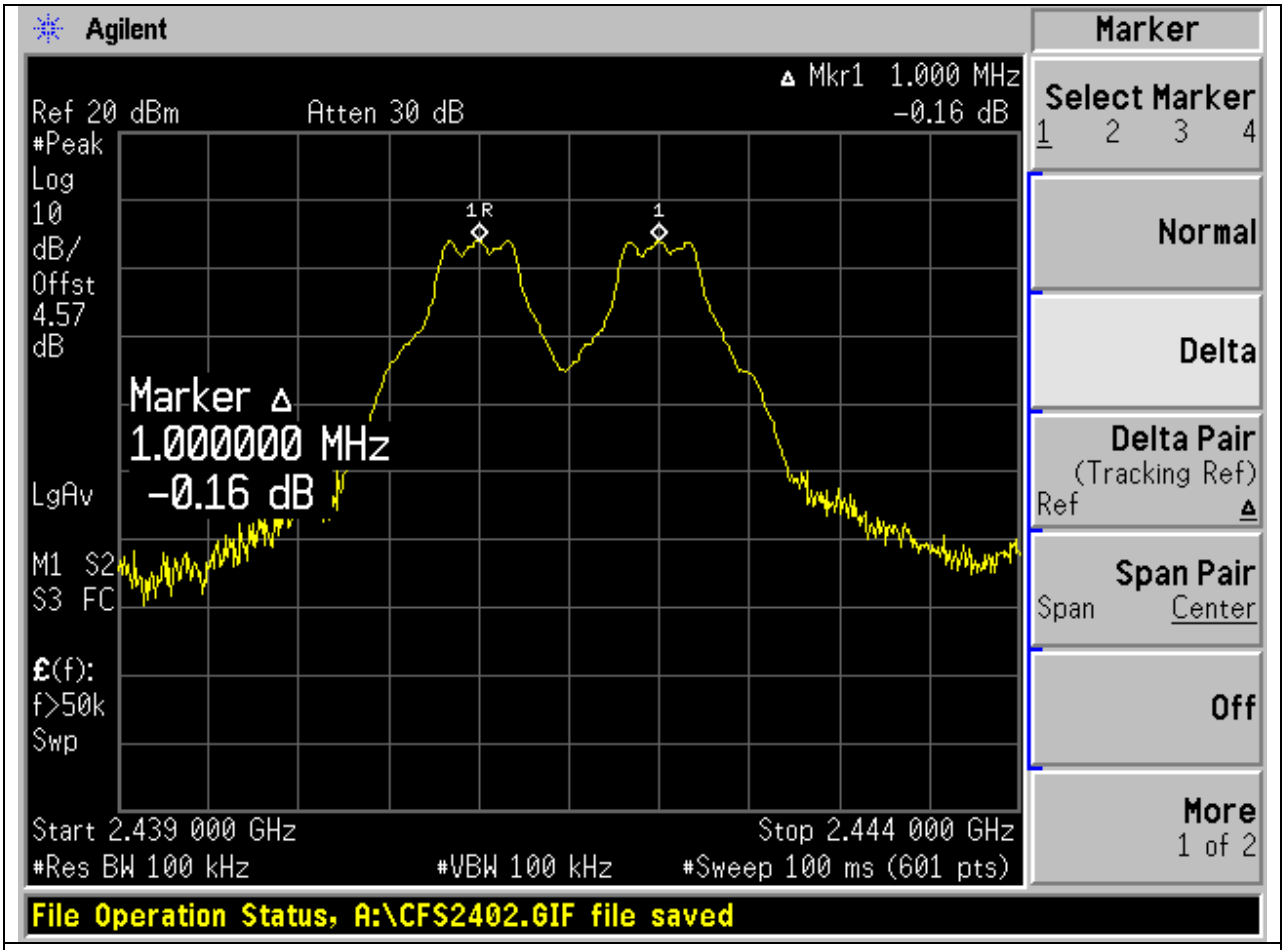
The smallest 20dB bandwidth for all channels is 1.038MHz. The minimum channel carrier frequencies separation is calculated as 2/3(1038) = 692kHz

Frequency (MHz)	Carrier Frequency Seperation (kHz)	Limit (kHz)	Margin (kHz)
2402	1000.00	692	-308.00
2441	1000.00	692	-308.00
2480	1000.00	692	-308.00

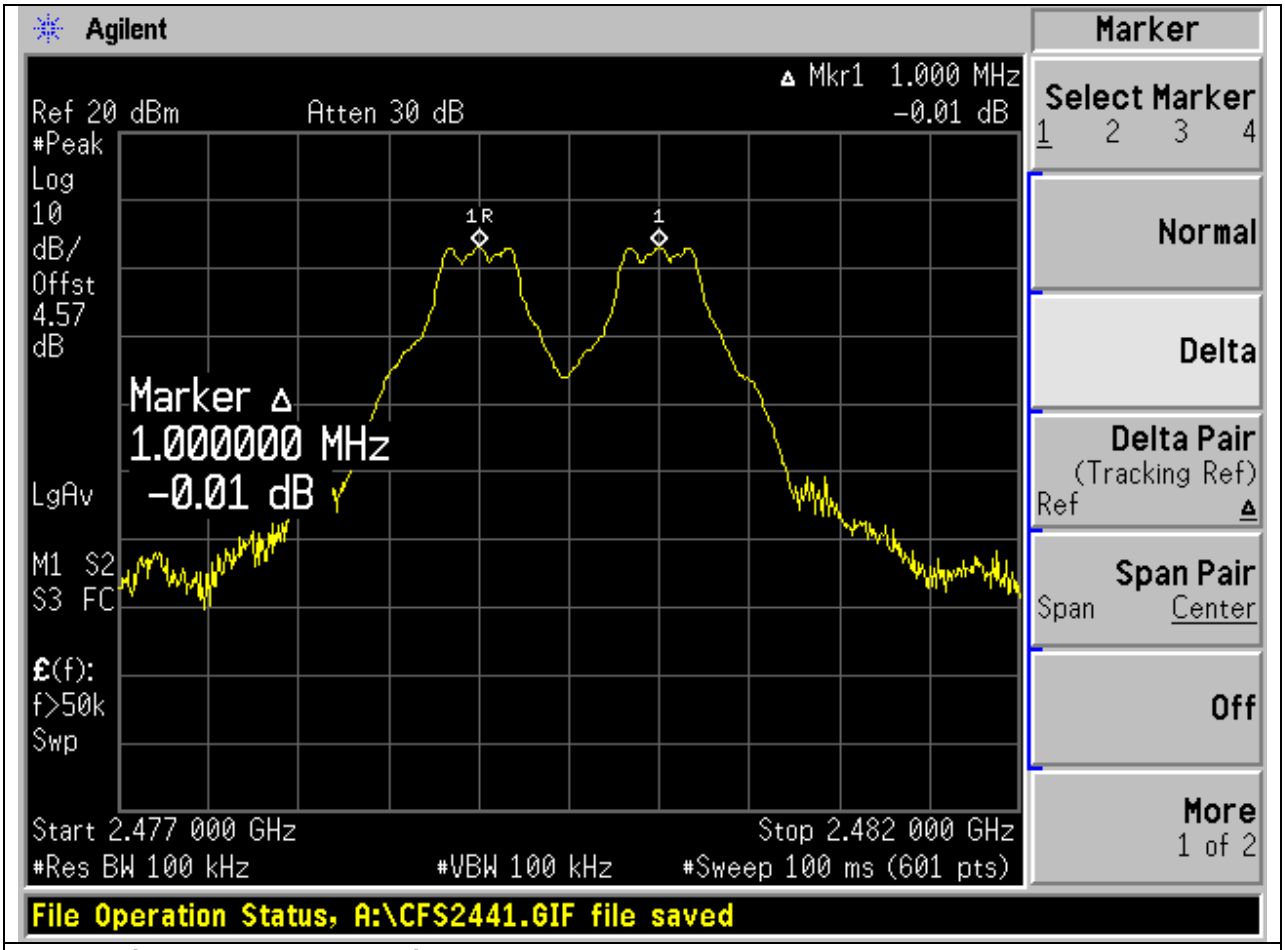
Graphical Test Results



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



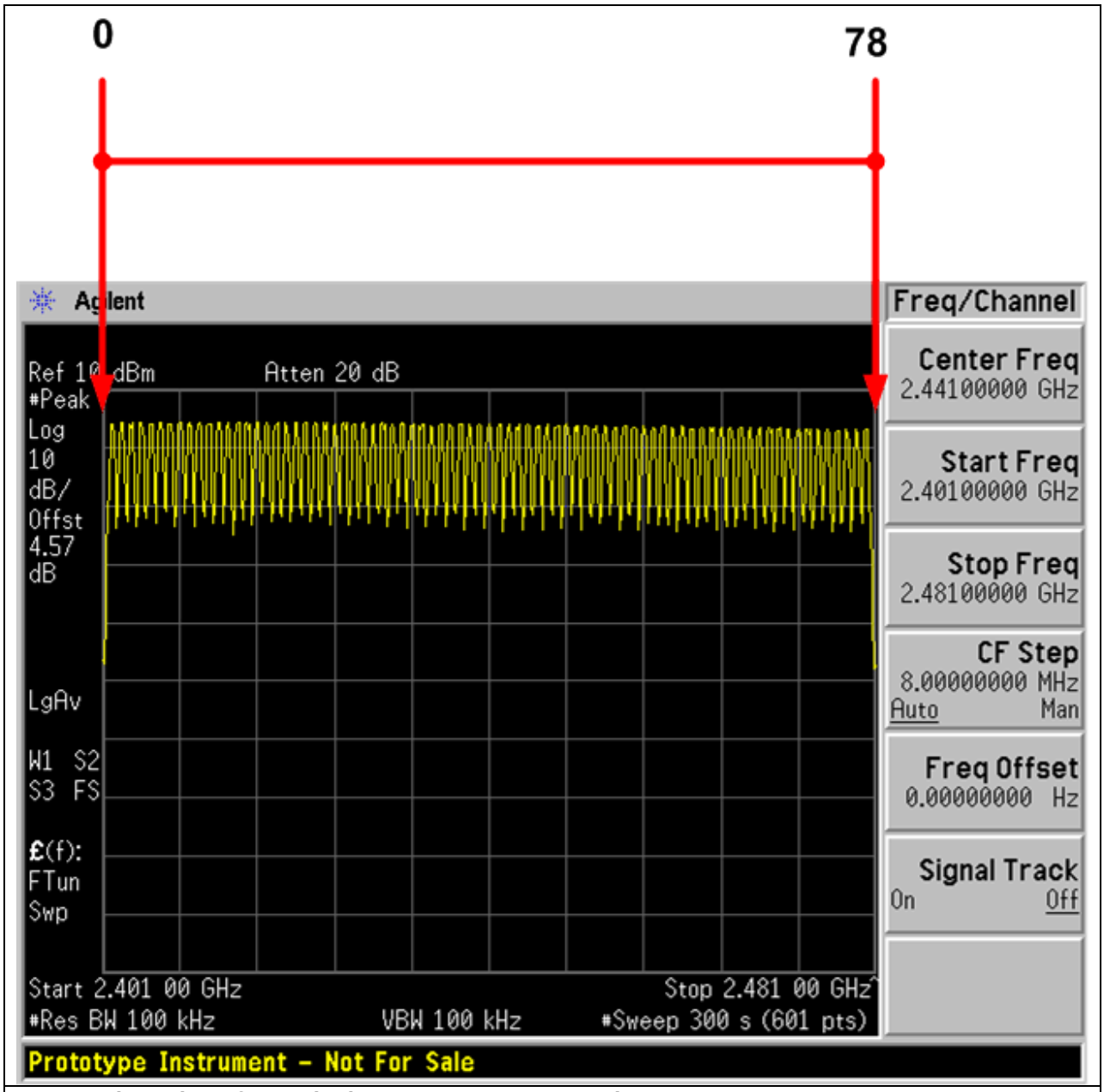
Title: **Carrier Frequency Separation at 2441 MHz**



Title: **Carrier Frequency Separation 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 DH1

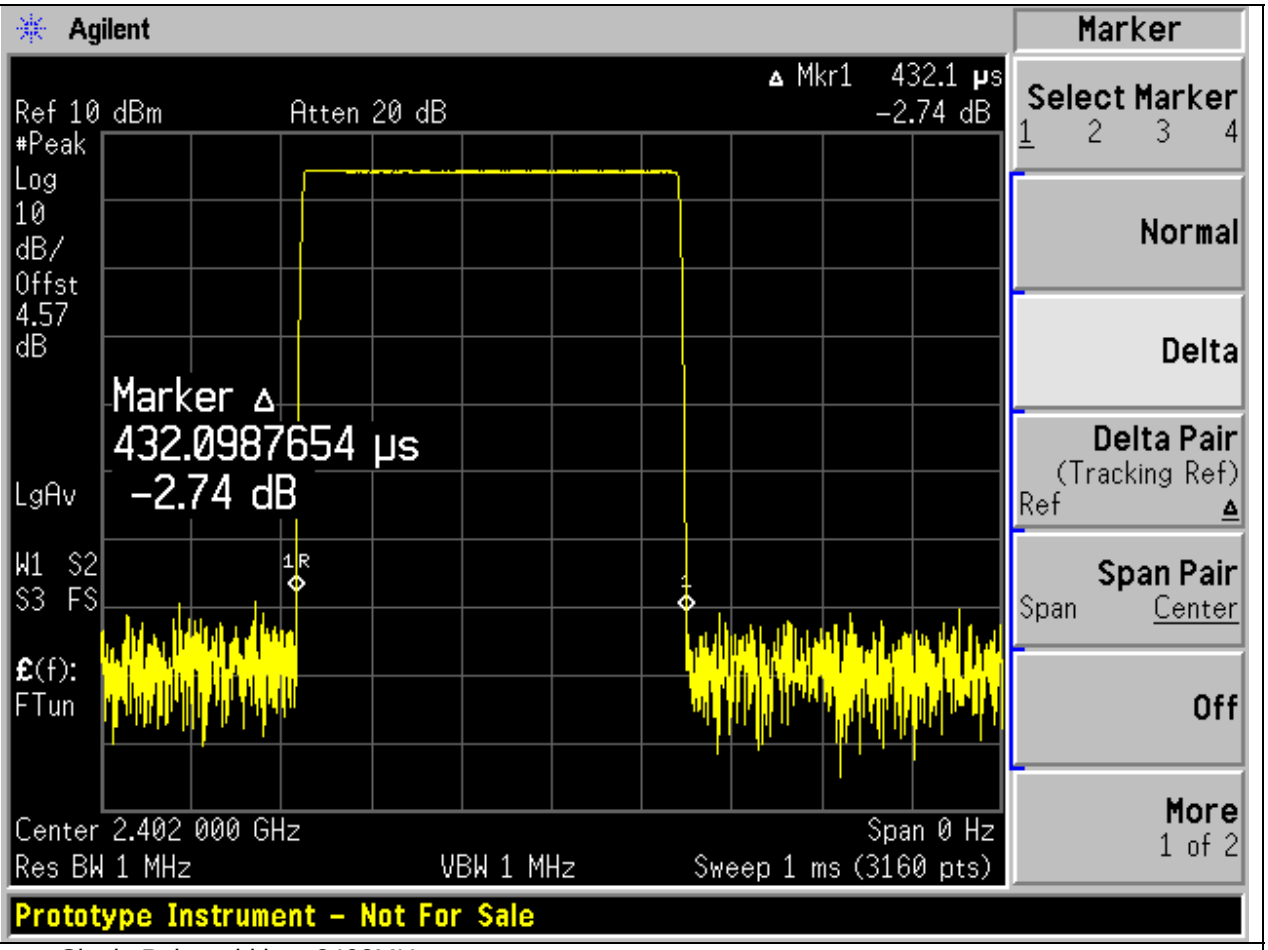
15.247 & RSS-210 A8.1:

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.

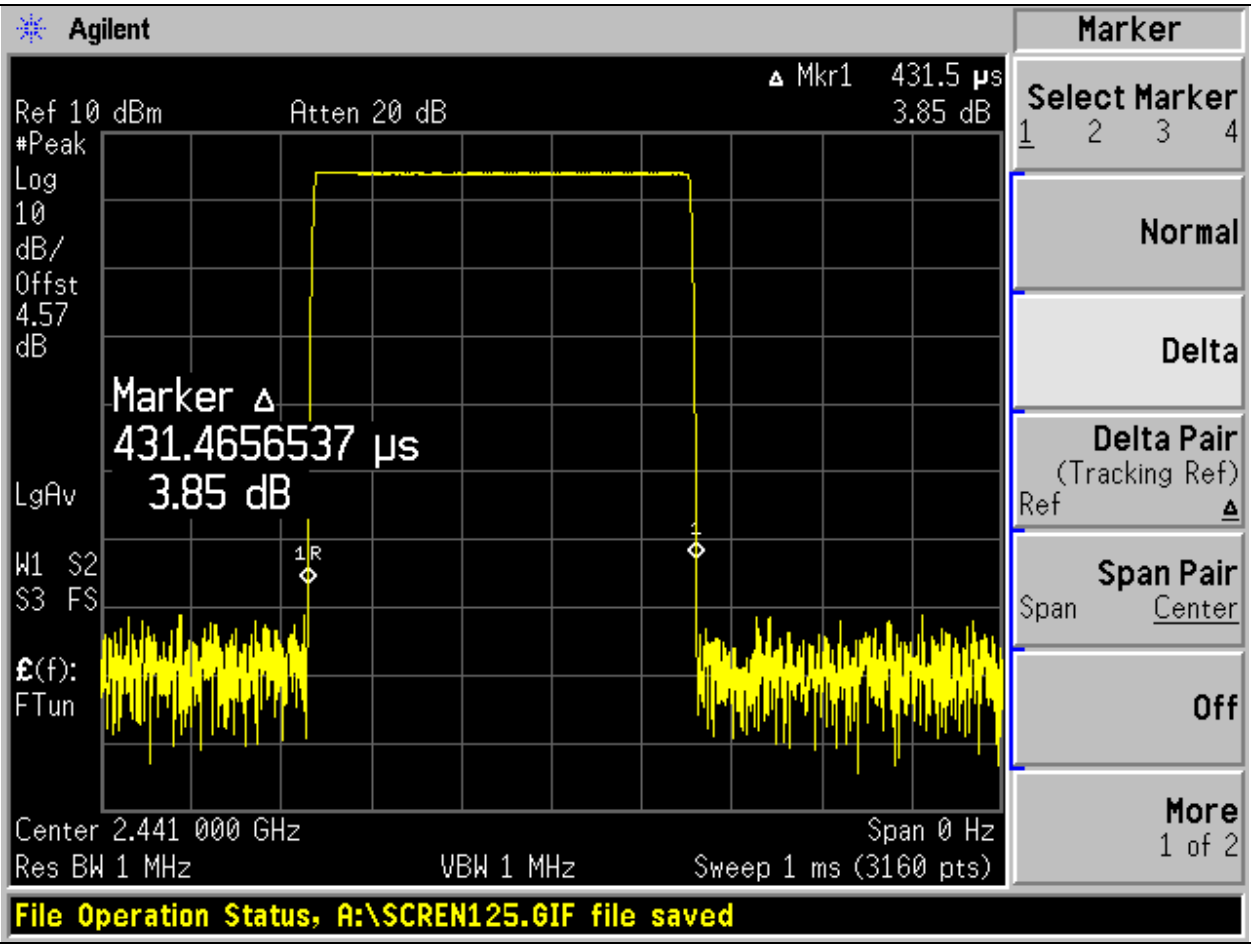
The total sweep time is 0.4(79) = 31.6 seconds.
Due to the number of hops in the 31.6s sweep we determined to reduce the sweep time to 3.16s, count the number of hops and multiply by 10. The total number of hops will be multiplied by the measured time of one pulse.

Example: Number of Hops in 3.16s = 32. Total Number of Hops in 31.6s = 32(10) = 320
Single Pulse Width = 0.0004321s. Time of Occupancy = 320(0.0004321) = 0.138s
Single Pulse Width = 0.00043147s. Time of Occupancy = 320(0.00043147) = 0.138s
Single Pulse Width = 0.00043178s. Time of Occupancy = 320(0.00043178) = 0.138s

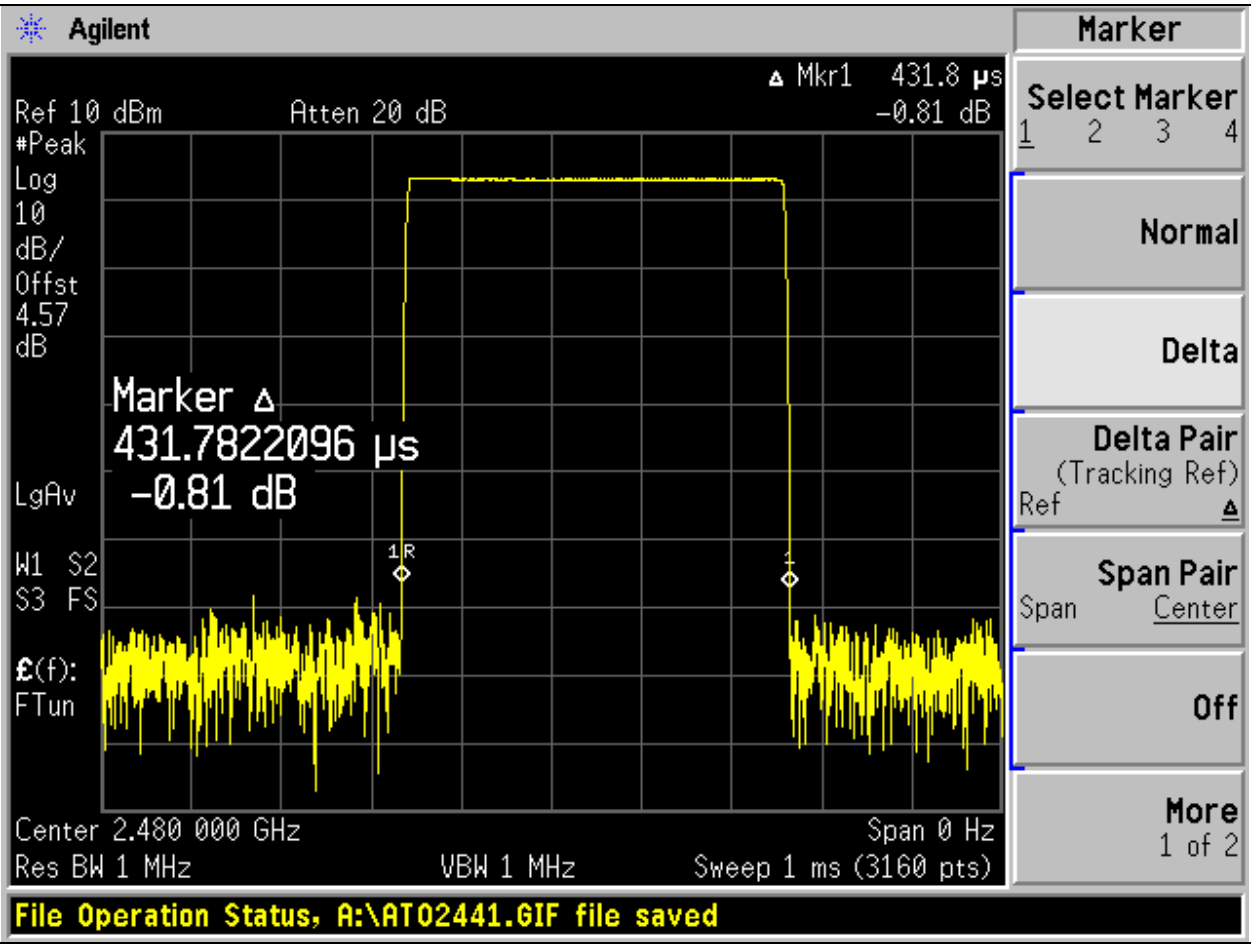
Frequency (MHz)	Time of Occupancy (sec)	Limit (sec)	Margin (sec)
2402	0.138	0.4	-0.262
2441	0.138	0.4	-0.262
2480	0.138	0.4	-0.262



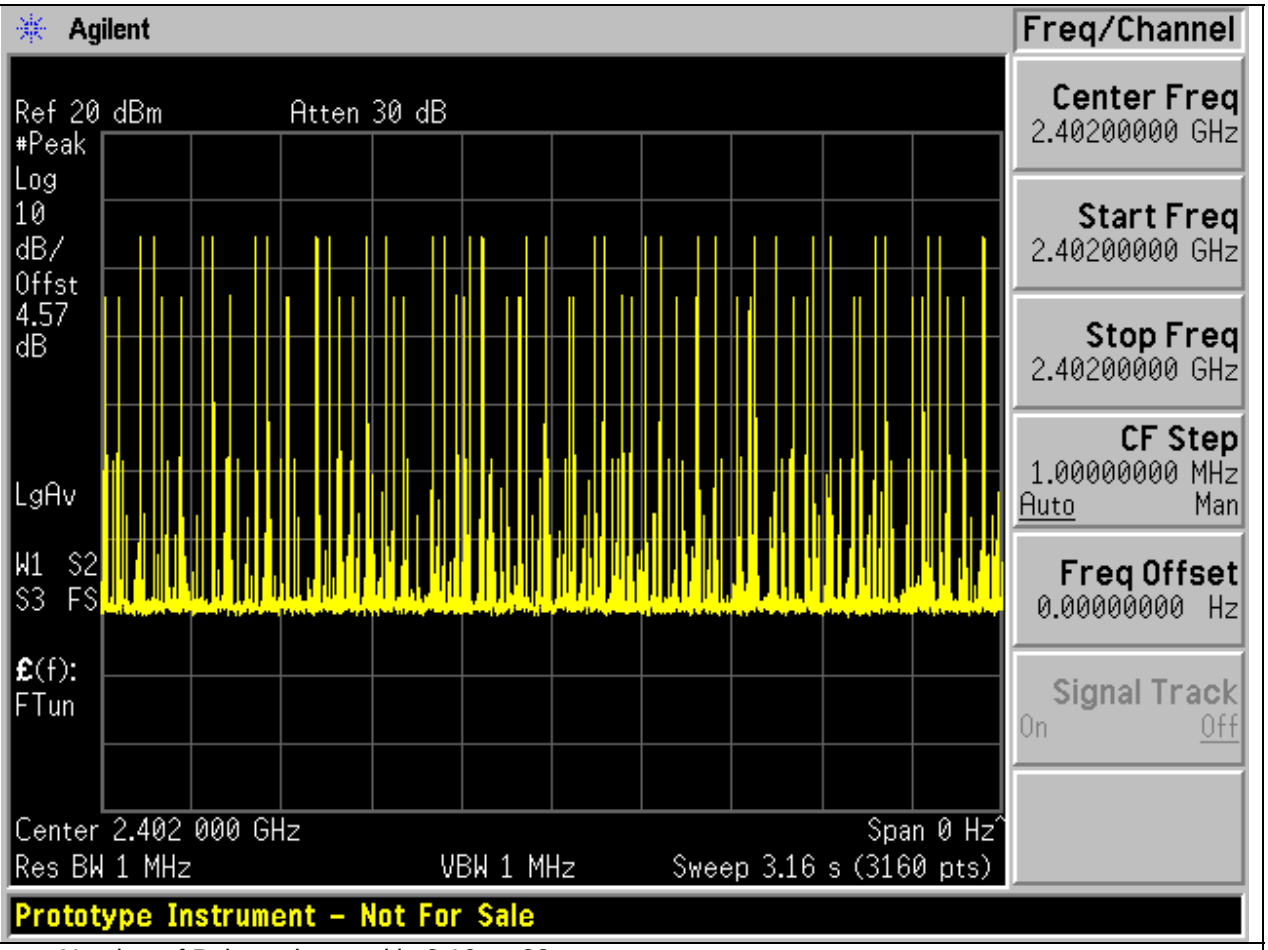
Title: Single Pulse width at 2402MHz



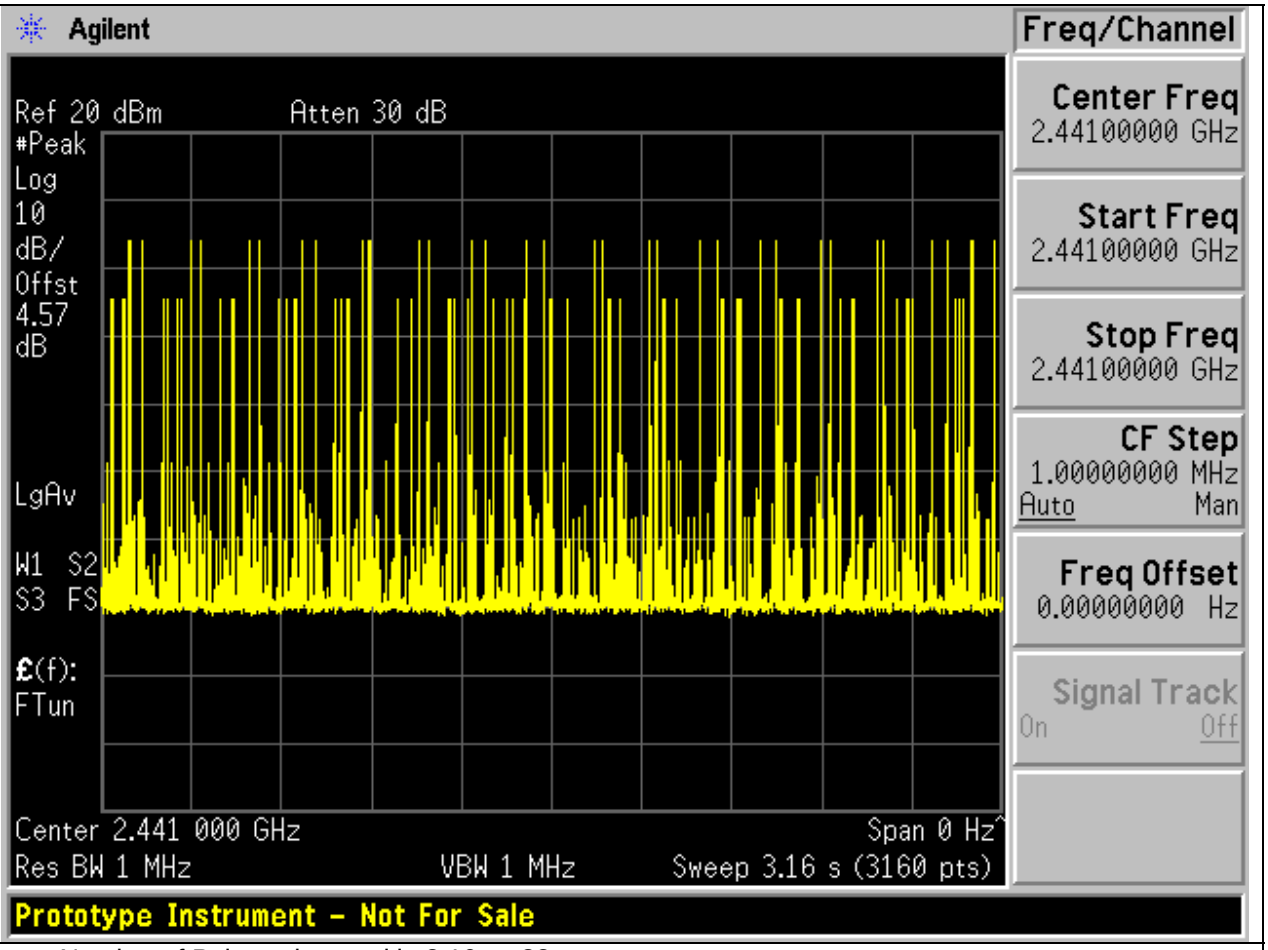
Title: Single Pulse width at 2441MHz



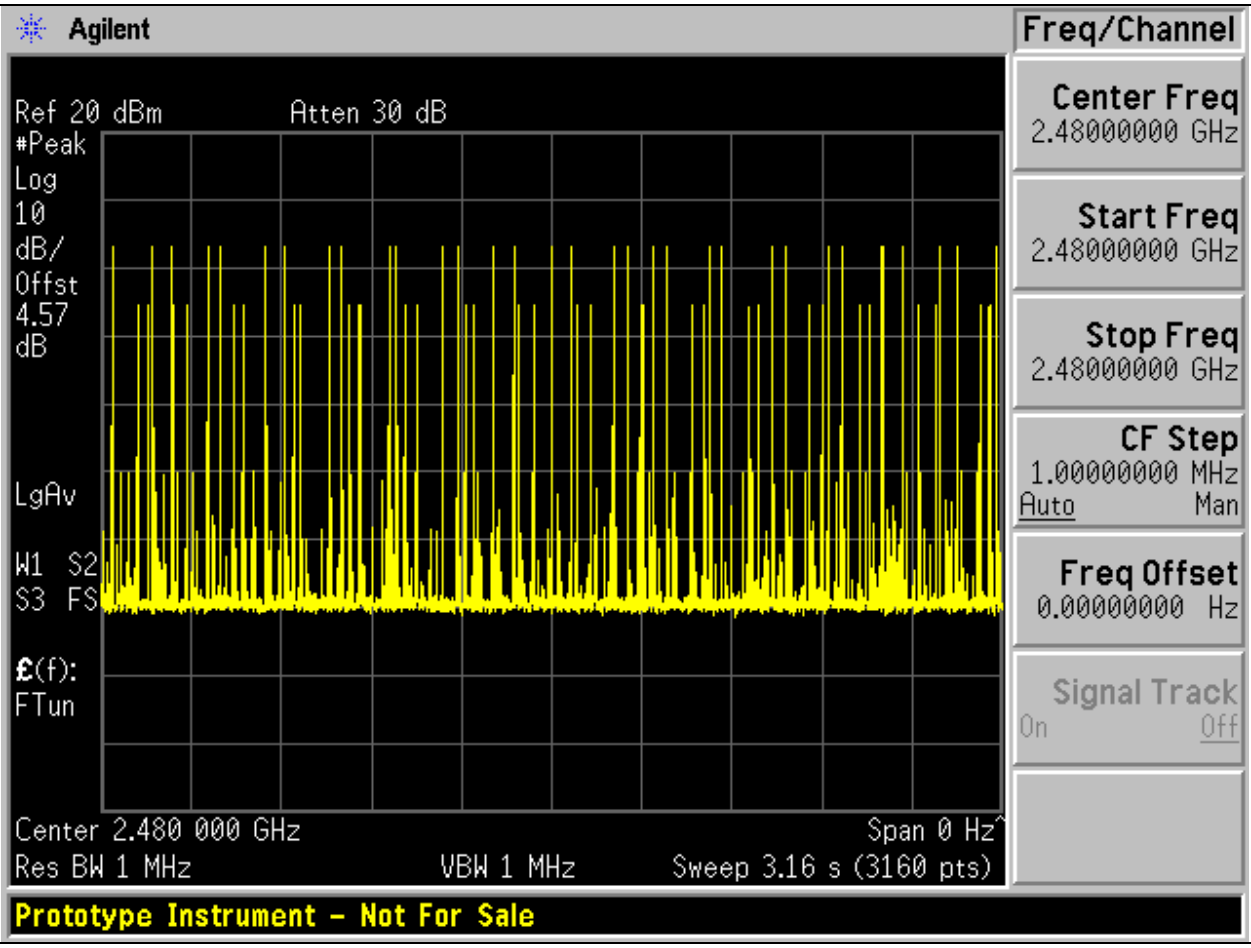
Title: Single Pulse width at 2480MHz



Title: Number of Pulses observed in 3.16s = 32



Title: Number of Pulses observed in 3.16s = 32



Title: Number of Pulses observed in 3.16s = 32

Average Time of Occupancy DH3

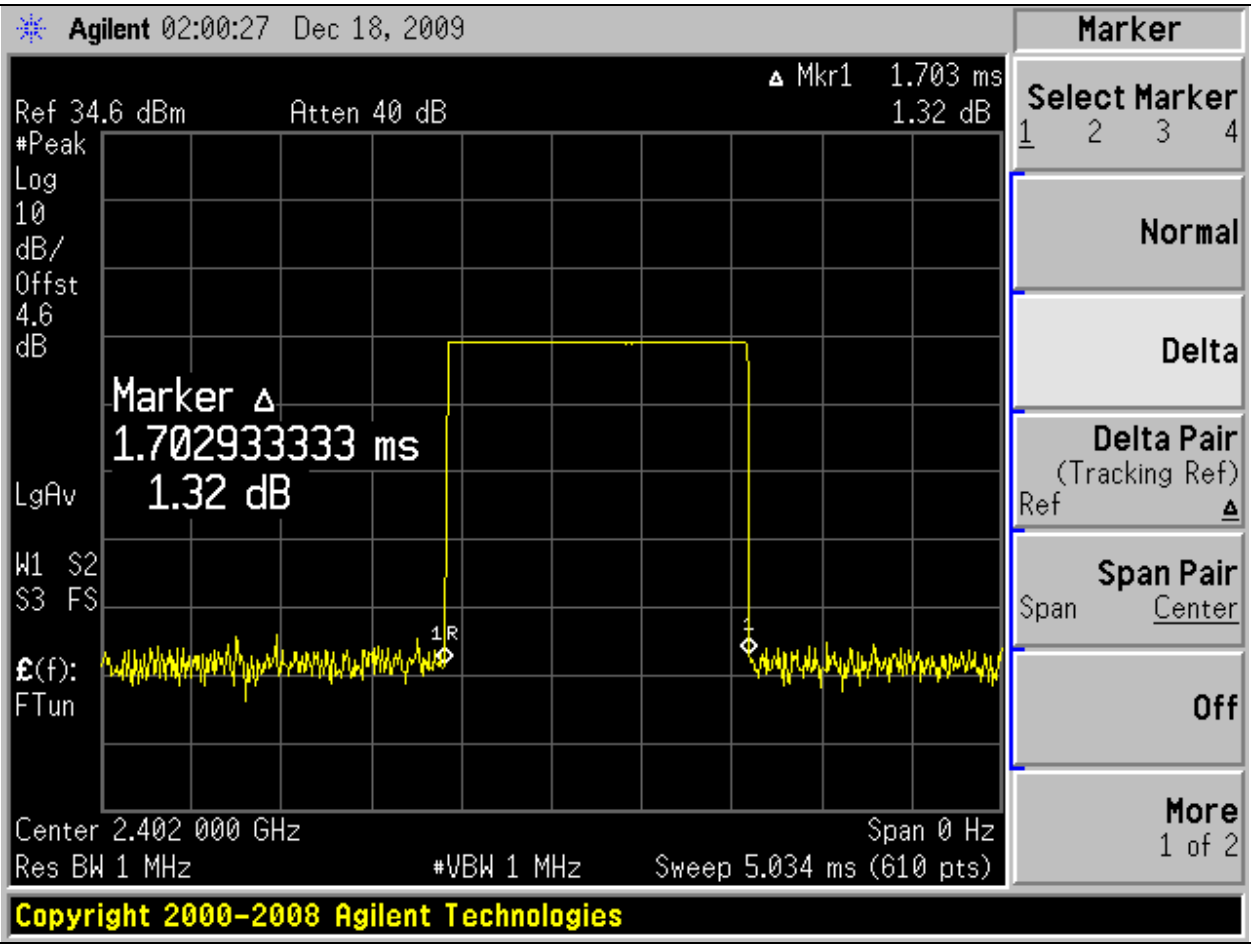
15.247 & RSS-210 A8.1:

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.

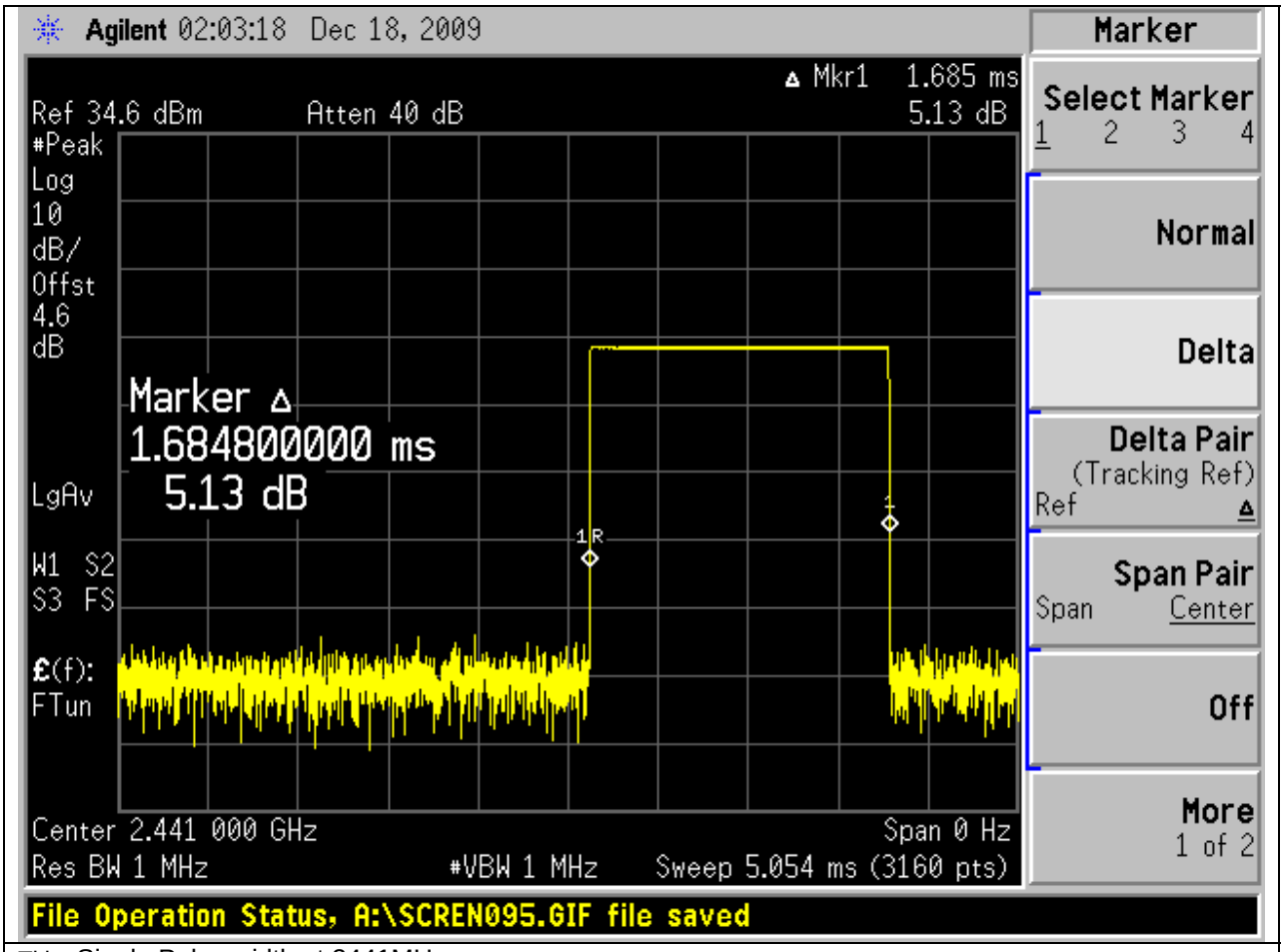
The total sweep time is 0.4(79) = 31.6 seconds.
Due to the number of hops in the 31.6s sweep we determined to reduce the sweep time to 3.16s, count the number of hops and multiply by 10. The total number of hops will be multiplied by the measured time of one pulse.

Example: Number of Hops in 3.16s = 32. Total Number of Hops in 31.6s = 32(10) = 320
Single Pulse Width = 0.00170s. Time of Occupancy = 130(0.00170) = 0.221s
Single Pulse Width = 0.00169s. Time of Occupancy = 170(0.00169) = 0.287s
Single Pulse Width = 0.00169s. Time of Occupancy = 180(0.00169) = 0.304s

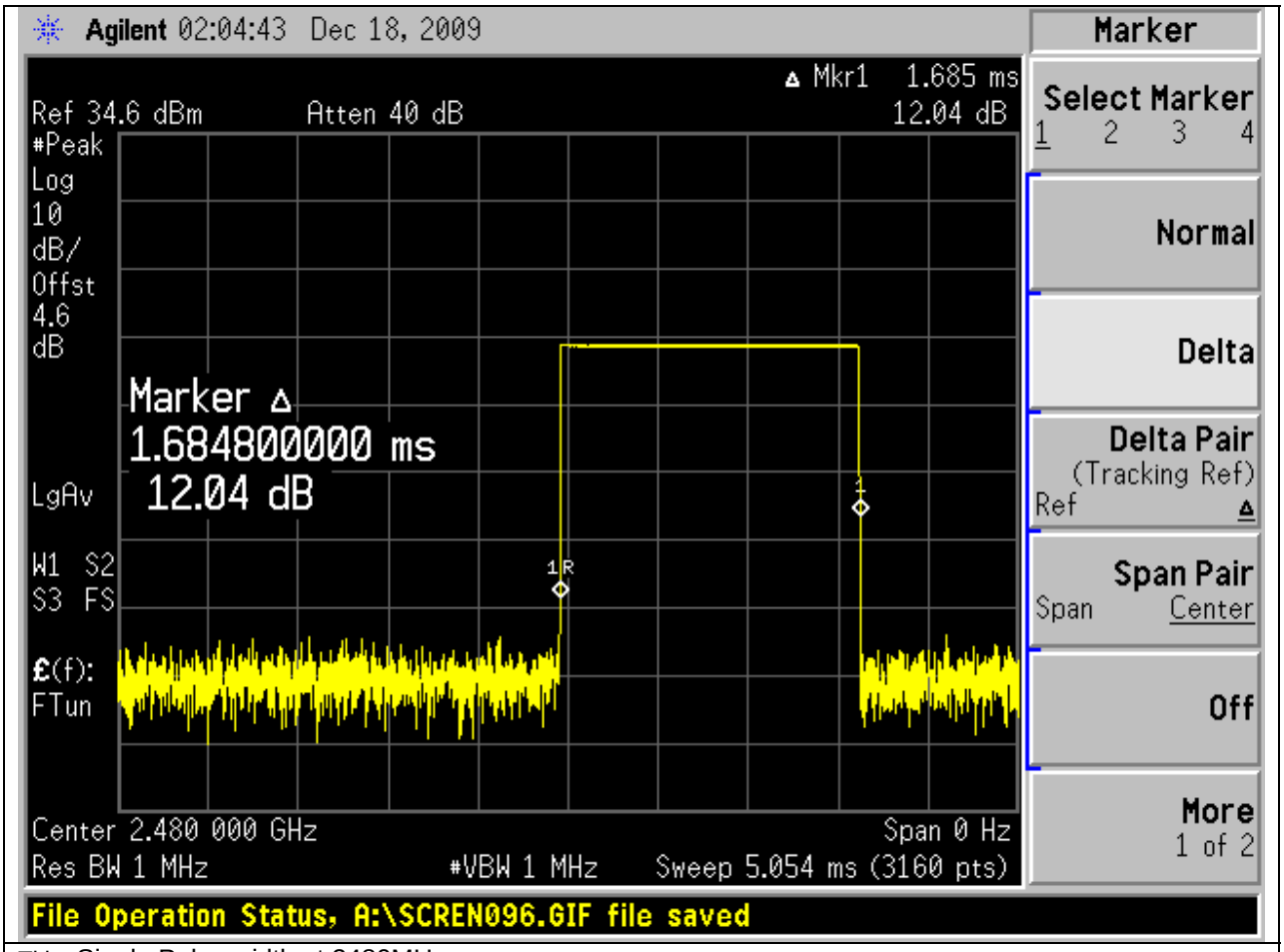
Frequency (MHz)	Time of Occupancy (sec)	Limit (sec)	Margin (sec)
2402	0.221	0.4	-0.179
2441	0.287	0.4	-0.113
2480	0.304	0.4	-0.096



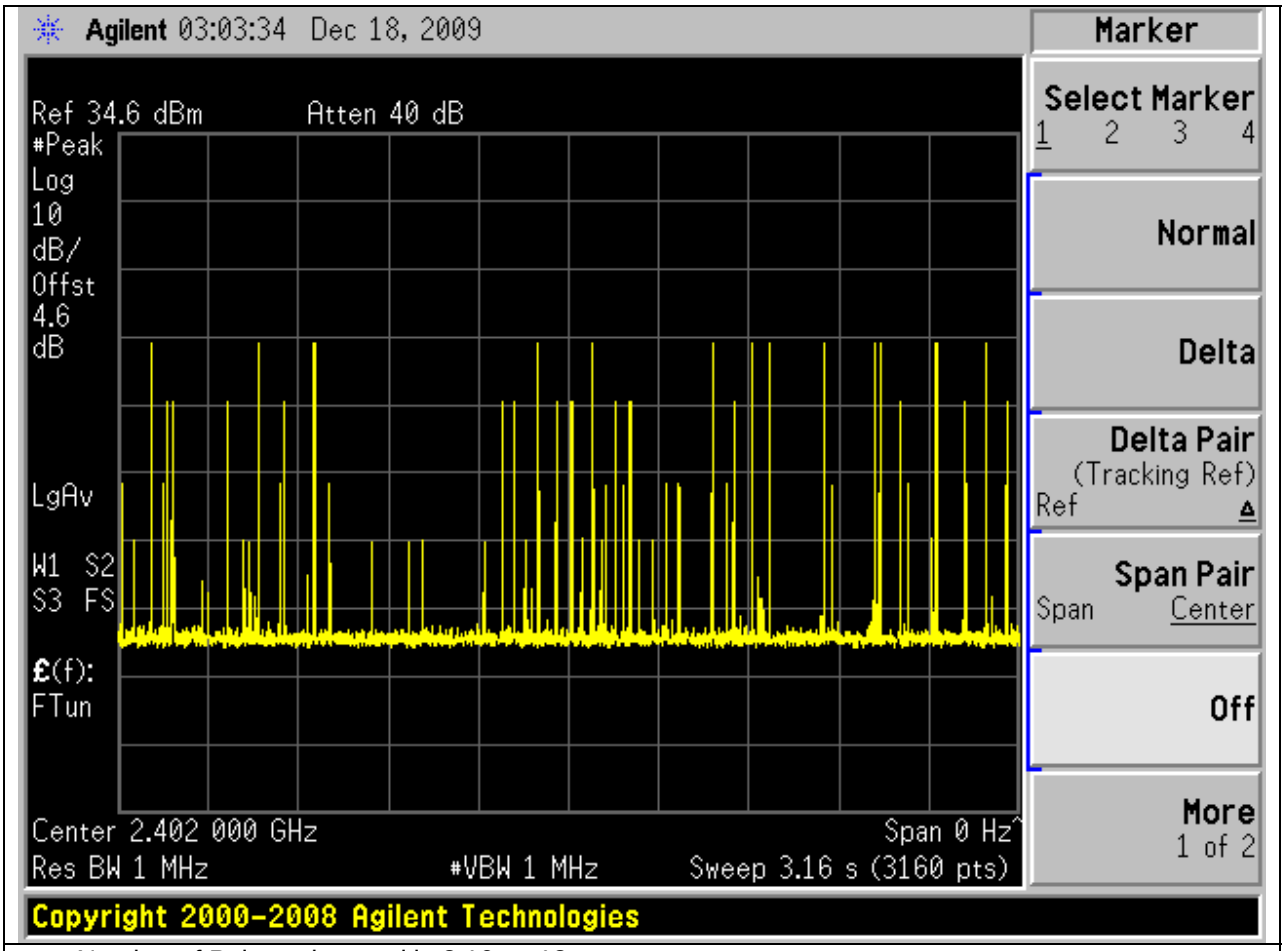
Title: Single Pulse width at 2402MHz



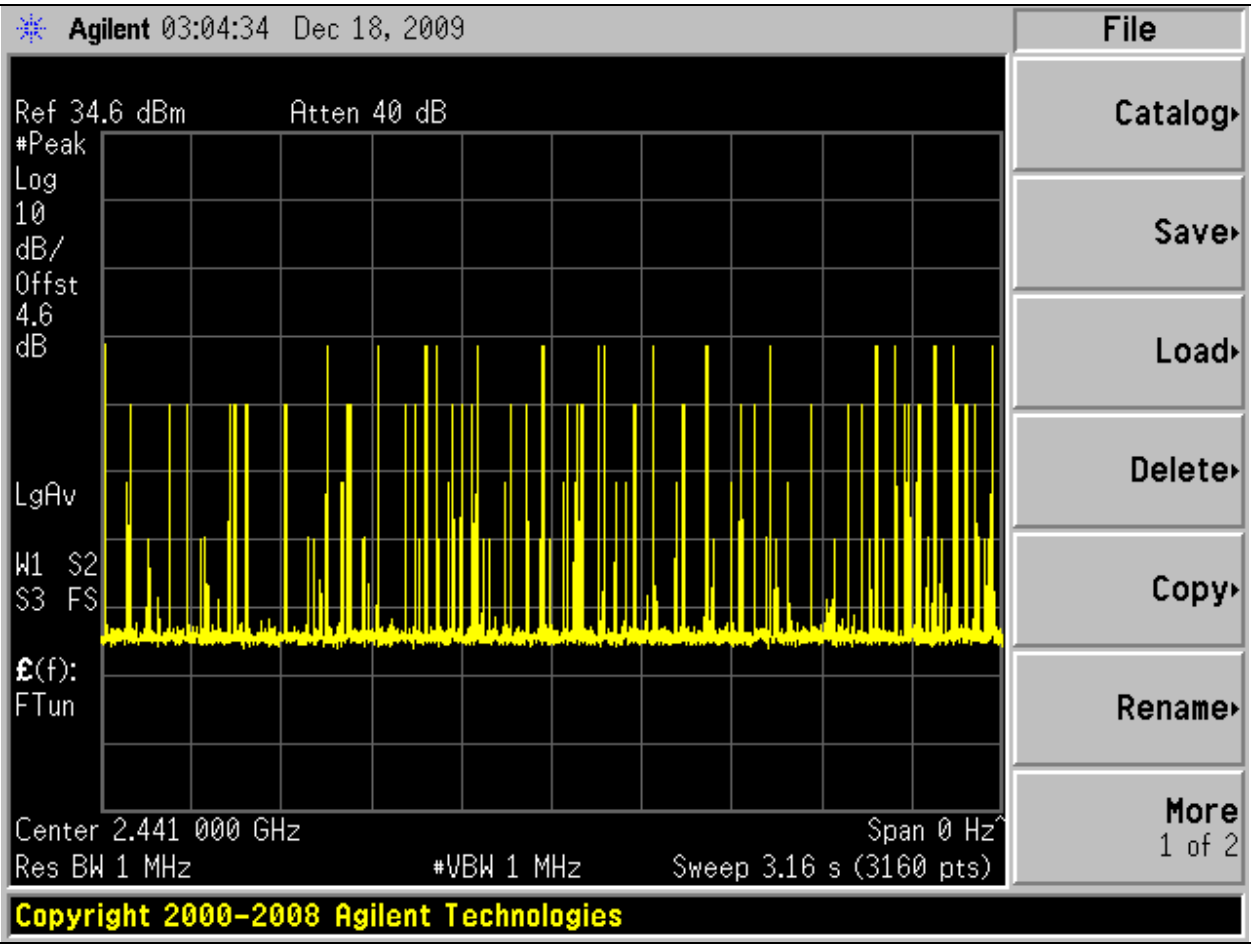
Title: Single Pulse width at 2441MHz



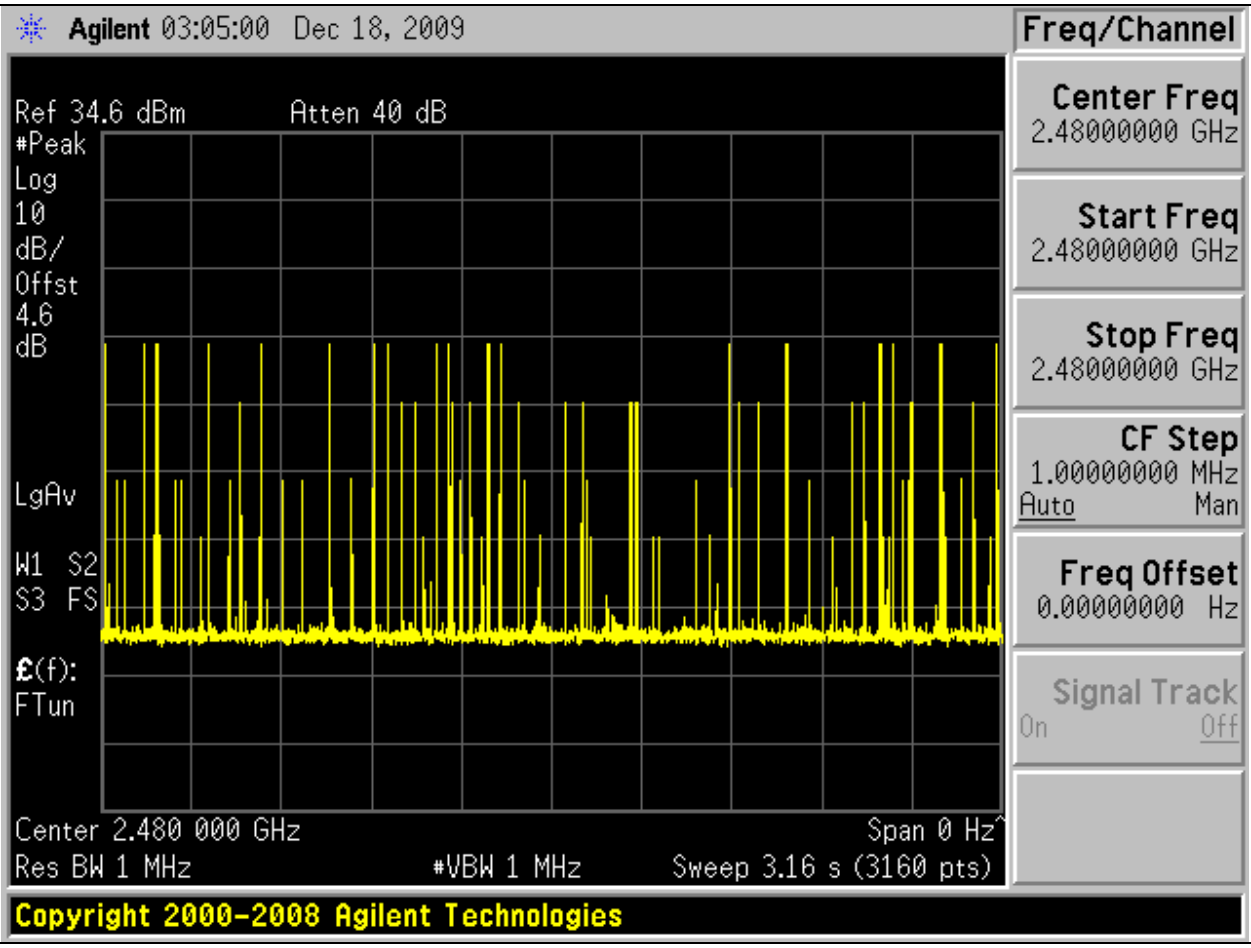
Title: Single Pulse width at 2480MHz



Title: Number of Pulses observed in 3.16s = 13



Title: Number of Pulses observed in 3.16s = 17



Title: Number of Pulses observed in 3.16s = 18

Average Time of Occupancy DH5

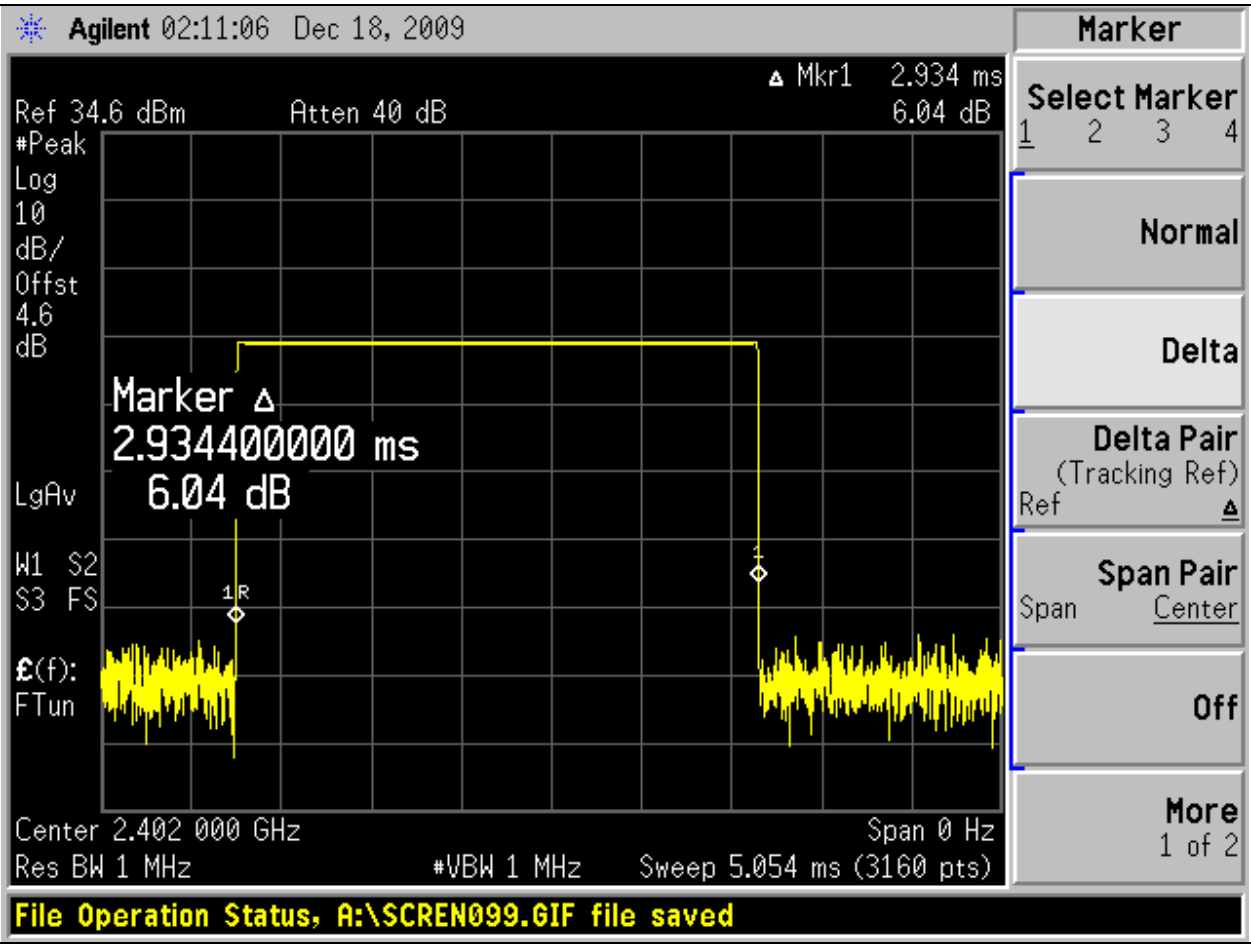
15.247 & RSS-210 A8.1:

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.

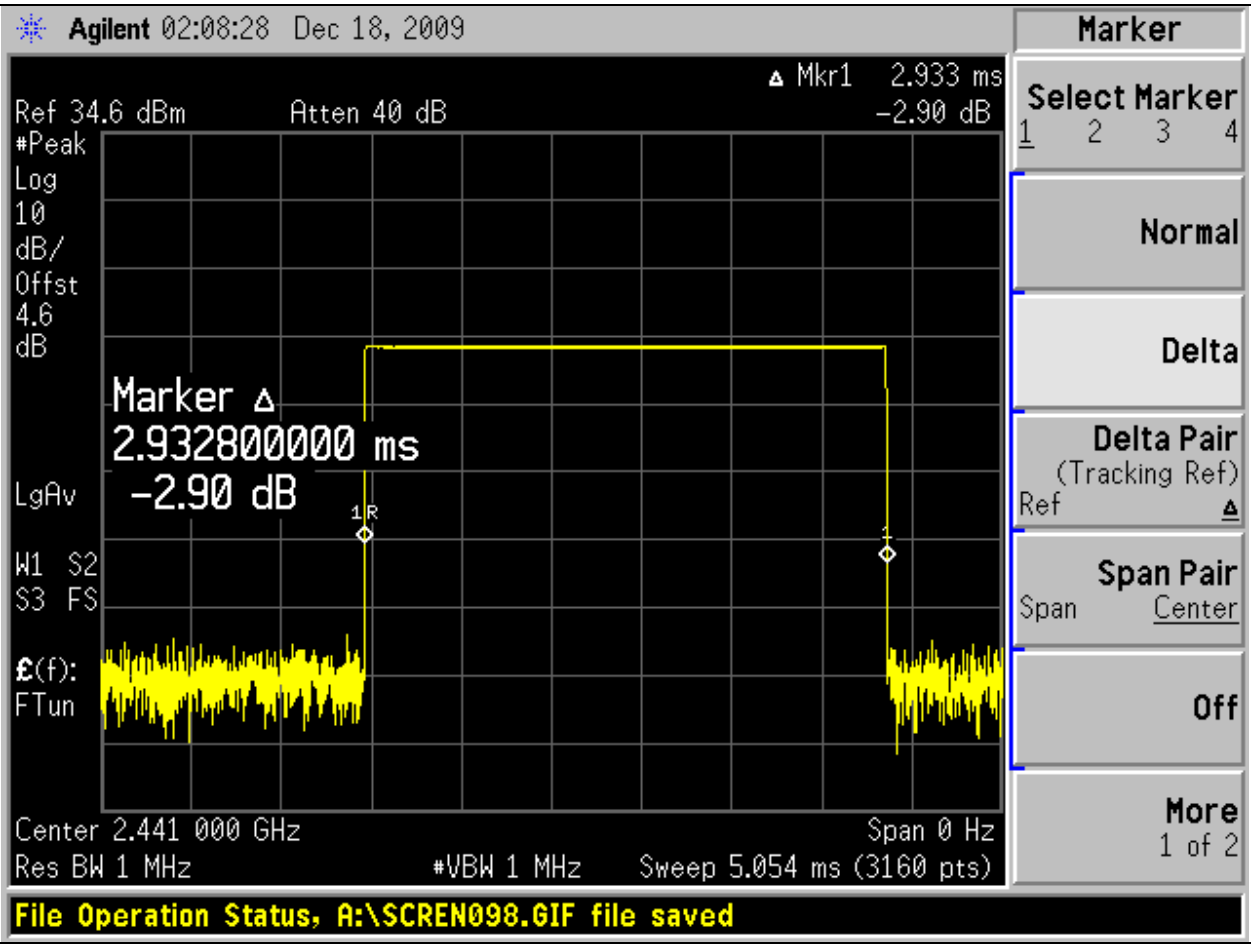
The total sweep time is 0.4(79) = 31.6 seconds.
Due to the number of hops in the 31.6s sweep we determined to reduce the sweep time to 3.16s, count the number of hops and multiply by 10. The total number of hops will be multiplied by the measured time of one pulse.

Example: Number of Hops in 3.16s = 32. Total Number of Hops in 31.6s = 32(10) = 320
Single Pulse Width = 0.00293s. Time of Occupancy = 110(0.00293s) = 0.322s
Single Pulse Width = 0.00293s. Time of Occupancy = 70(0.00293s) = 0.205s
Single Pulse Width = 0.00293s. Time of Occupancy = 100(0.00293s) = 0.293s

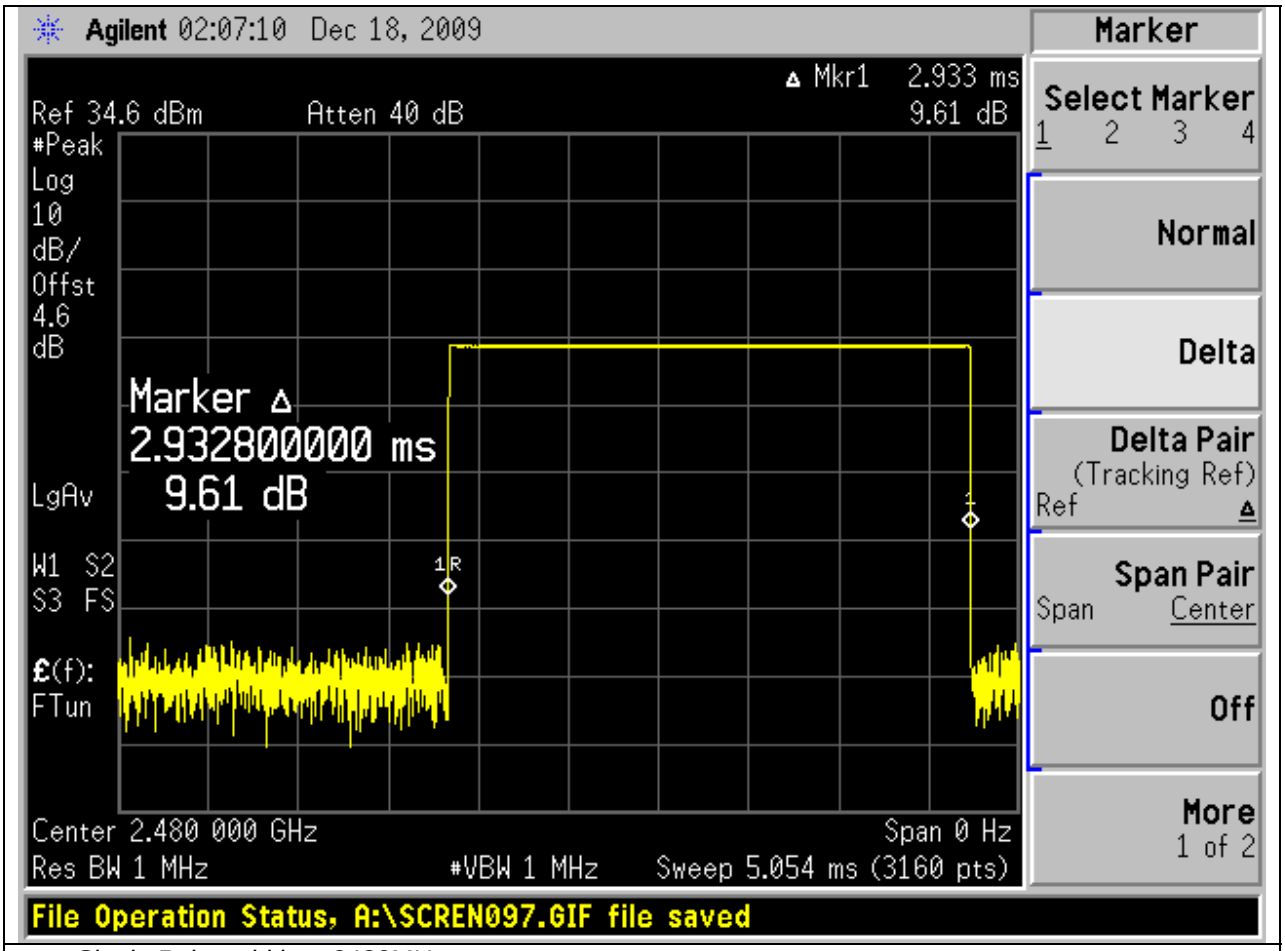
Frequency (MHz)	Time of Occupancy (sec)	Limit (sec)	Margin (sec)
2402	0.322	0.4	-0.078
2441	0.205	0.4	-0.195
2480	0.293	0.4	-0.107



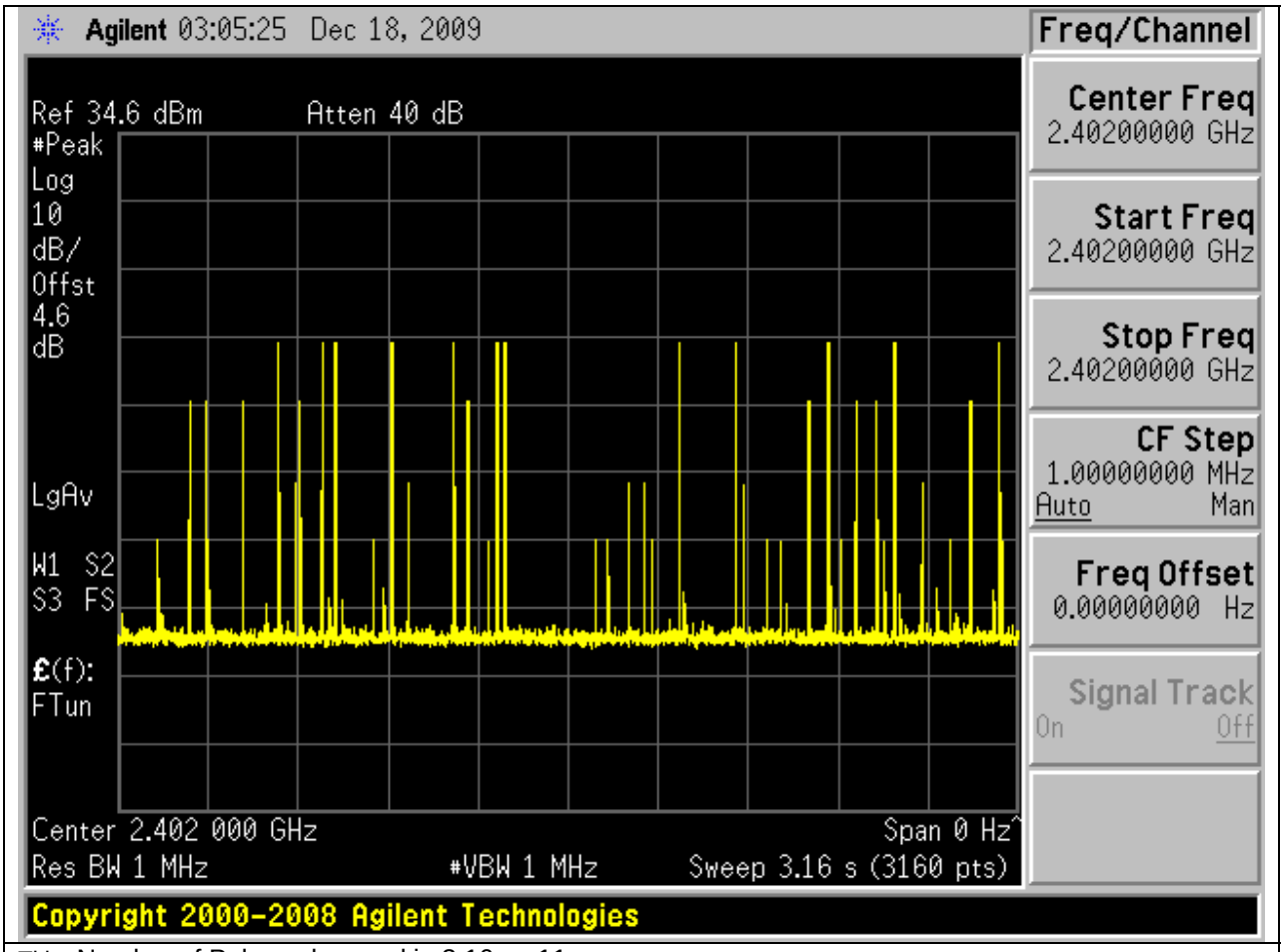
Title: Single Pulse width at 2402MHz



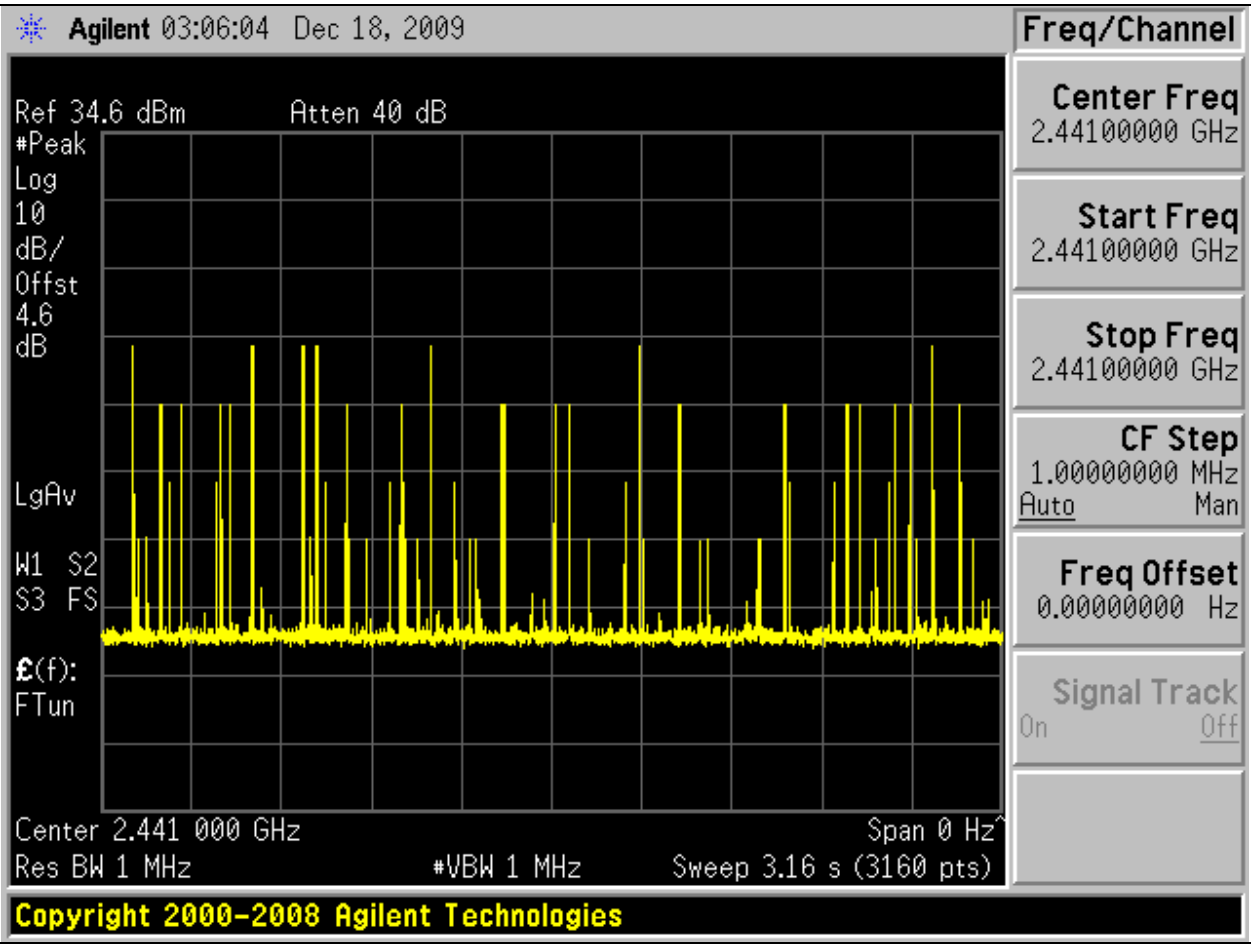
Title: Single Pulse width at 2441MHz



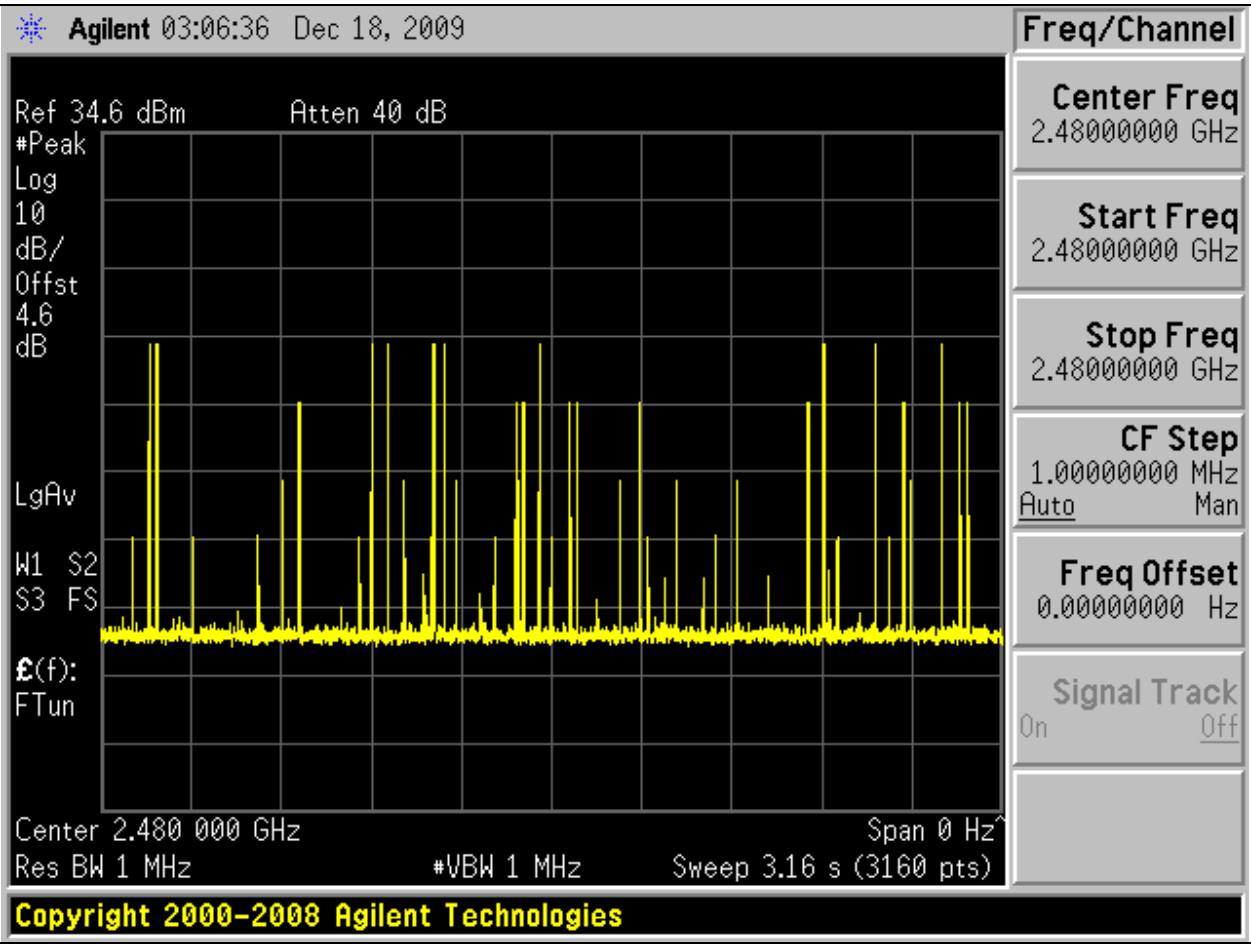
Title: Single Pulse width at 2480MHz



Title: Number of Pulses observed in 3.16s = 11



Title: Number of Pulses observed in 3.16s = 7



Title: Number of Pulses observed in 3.16s = 10

Power line Conducted emissions

Test Number: 37168	**Spec ID:** 1064			
Basic Standard	**Applied to**	**Class**	**Freq Range**	**Test Details / Comments**
CISPR22: Edition 5	AC Power Line	B	0.15MHz - 30MHz	For countries Using 100V/200V 50/60Hz +/- 20% e.g. VCCI: V- 3/2007.04.
Operating Mode	**Mode :** 1, AC Adapter Mode			
Power Input	110, 60Hz (+/-20%)			
Overall Result	Pass			
Comments	No further comments			
Deviation	There were no deviations from the specification			

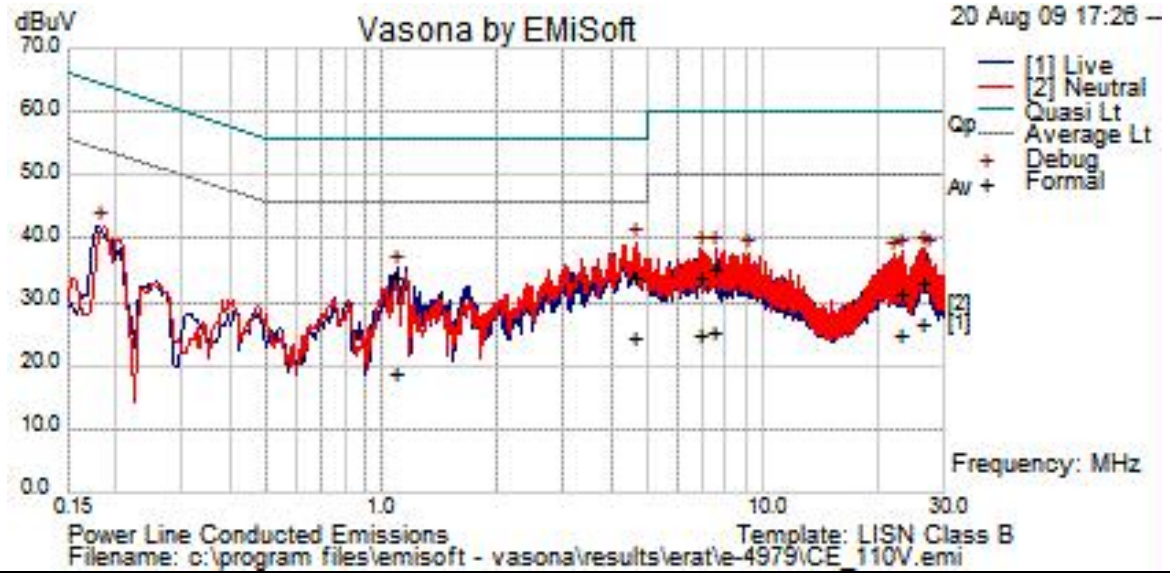
System Number	**Description**	**Samples**	**System under test**	**Support equipment**
1	AC Adapter Mode (Not all samples tested at once)	S01, S02, S03, S04, S05, S14, S15, S16, S17 and S18	☑	☐
3	Support Equipment	S06, S07, S08, S09, S10, S11, S12 and S13	☐	☑

Subtest Number: 37168 - 1		**Subtest Date:** 20-Aug-2009	
Engineer	Phillip Carranco		
Lab Information	Building B, Shield Room		
Subtest Results			
Line Under Test	[C] AC Mains		
Transducer	LISN		
Subtest Result	Pass		
Highest Frequency	30.0		
Lowest Frequency	0.15		
Comments on the above Test Results	No further comments		
Environmental Conditions:			
Temperature: within range of 54 to 95 F:	Yes		
Humidity: between 10 and 75%:	Yes		
Comments:			
Equipment used:			
Equipment No	Manufacturer	Model	Description
CIS002463	Fischer Custom Communications	FCC-801-M2-16	CDN, 2-LINE, 16A
CIS008097	Huber + Suhner	RG-223	RG-233 Cable 9m
CIS004924	Rohde & Schwarz	ESHS30	EMI Receiver (9KHz-30MHz)
CIS008185	Fischer Custom Communications	FCC-450B-2.4-N	Instrumentation Limiter

CIS008197	TTE	H613-150K-50-21378	Hi Pass Filter - 150KHz cutoff
CIS008471	Bird	5-T-MB	50 Ohm, 5W Terminator,Type BNC
CIS007036	HP	E7401A	Spectrum Analyzer
CIS019337	Fischer Custom Communications	FCC-LISN-50/250-50-2-01	LISN
CIS020766	Fischer Custom Communications	FCC-450B-2.4-N	Instrumentation Limiter
CIS023874	Fischer Custom Communications	FCC-LISN-PA-NEMA-5-15	Power Adaptor, Polarized 120VAC
CIS036033	York	CNE V	Comparison Noise Emitter
CIS039154	Midwest Microwave	CSY-BMBM-23-004-FS	4ft RG223 BNC Cable

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

Test Results Table

Frequency MHz	Raw dBuV	Cable Loss	Factors dB	Level dBuV	Measurement Type	Line	Limit dBuV	Margin dB	Pass /Fail	Comments
4.682	2.5	19.9	0	22.4	Av	N	46	-23.6	Pass	
4.682	12.1	19.9	0	32	Qp	N	56	-24	Pass	
1.101	12.1	19.9	0	32	Qp	L	56	-24	Pass	
26.754	3.7	20.2	0.5	24.4	Av	N	50	-25.6	Pass	
7.57	3.3	19.9	0.1	23.3	Av	N	50	-26.7	Pass	
7.57	13	19.9	0.1	33	Qp	N	60	-27	Pass	
23.403	2	20.5	0.4	22.9	Av	N	50	-27.1	Pass	
6.882	2.7	19.9	0.1	22.7	Av	N	50	-27.3	Pass	

Frequency MHz	Raw dBuV	Cable Loss	Factors dB	Level dBuV	Measurement Type	Line	Limit dBuV	Margin dB	Pass /Fail	Comments
6.882	12	19.9	0.1	32	Qp	N	60	-28	Pass	
26.754	10.2	20.2	0.5	30.9	Qp	N	60	-29.1	Pass	
1.101	-3.2	19.9	0	16.7	Av	L	46	-29.3	Pass	
23.403	8.5	20.5	0.4	29.3	Qp	N	60	-30.7	Pass	

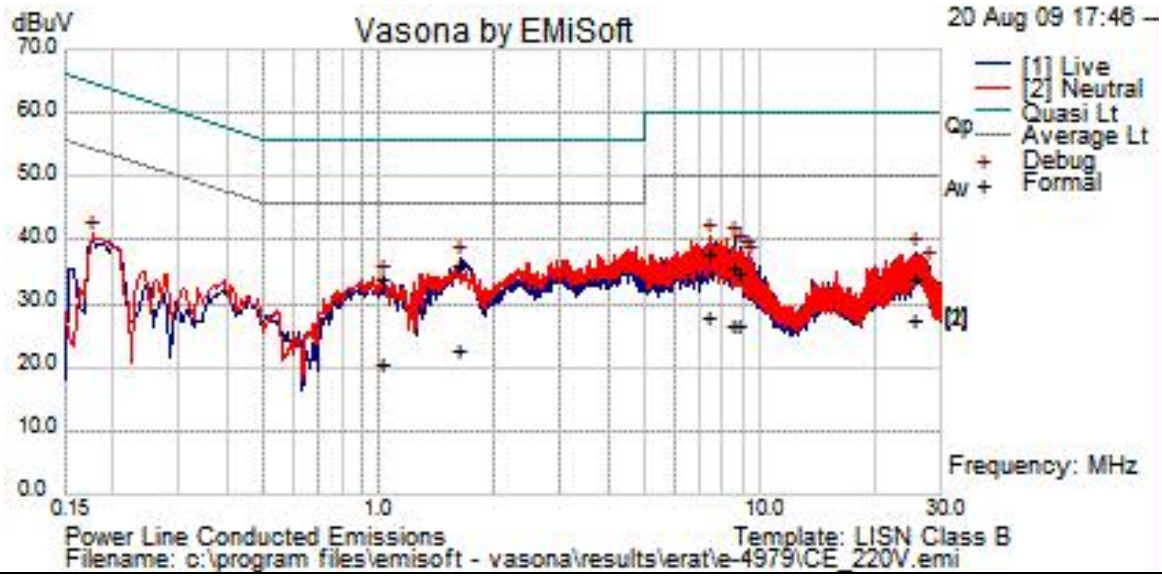
Conducted emissions

Test Number: 37169 **Spec ID:** 1237				
Basic Standard	**Applied to**	**Class**	**Freq Range**	**Test Details / Comments**
EN55022: 2006/ CISPR22 : Edition 5	AC Power Line	B	0.15MHz - 30MHz	230V 50Hz +/-20%.
Operating Mode	**Mode :** 1, AC Adapter Mode			
Power Input	220, 50Hz (+/-20%)			
Overall Result	Pass			
Comments	No further comments			
Deviation	There were no deviations from the specification			

System Number	**Description**	**Samples**	**System under test**	**Support equipment**
1	AC Adapter Mode (Not all samples tested at once)	S01, S02, S03, S04, S05, S14, S15, S16, S17 and S18	☑	☐
3	Support Equipment	S06, S07, S08, S09, S10, S11, S12 and S13	☐	☑

Subtest Number: 37169 - 1	**Subtest Date:** 20-Aug-2009
Engineer	Phillip Carranco
Lab Information	Building B, Shield Room
Subtest Results	
Line Under Test	[C] AC Mains
Transducer	LISN
Subtest Result	Pass
Highest Frequency	30.0
Lowest Frequency	0.15
Comments on the above Test Results	No further comments
Environmental Conditions:	
Temperature: within range of 54 to 95 F:	Yes
Humidity: between 10 and 75%:	Yes

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

Test Results Table

Frequency MHz	Raw dBuV	Cable Loss	Factors dB	Level dBuV	Measurement Type	Line	Limit dBuV	Margin dB	Pass /Fail	Comments
1.65	14.2	19.9	0	34.1	Qp	L	56	-21.9	Pass	
1.031	11.8	19.9	0	31.7	Qp	N	56	-24.3	Pass	
7.425	15.7	19.9	0.1	35.6	Qp	N	60	-24.4	Pass	
7.425	5.7	19.9	0.1	25.6	Av	N	50	-24.4	Pass	
25.661	4.8	20.2	0.5	25.4	Av	L	50	-24.6	Pass	
8.599	4.7	19.9	0.1	24.7	Av	L	50	-25.3	Pass	
8.94	4.7	19.9	0.1	24.6	Av	L	50	-25.4	Pass	
1.65	0.6	19.9	0	20.5	Av	L	46	-25.5	Pass	
8.599	13.6	19.9	0.1	33.6	Qp	L	60	-26.4	Pass	
8.94	12.6	19.9	0.1	32.5	Qp	L	60	-27.5	Pass	
1.031	-1.6	19.9	0	18.4	Av	N	46	-27.6	Pass	
25.661	11.4	20.2	0.5	32	Qp	L	60	-28	Pass	

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.

Conducted emissions

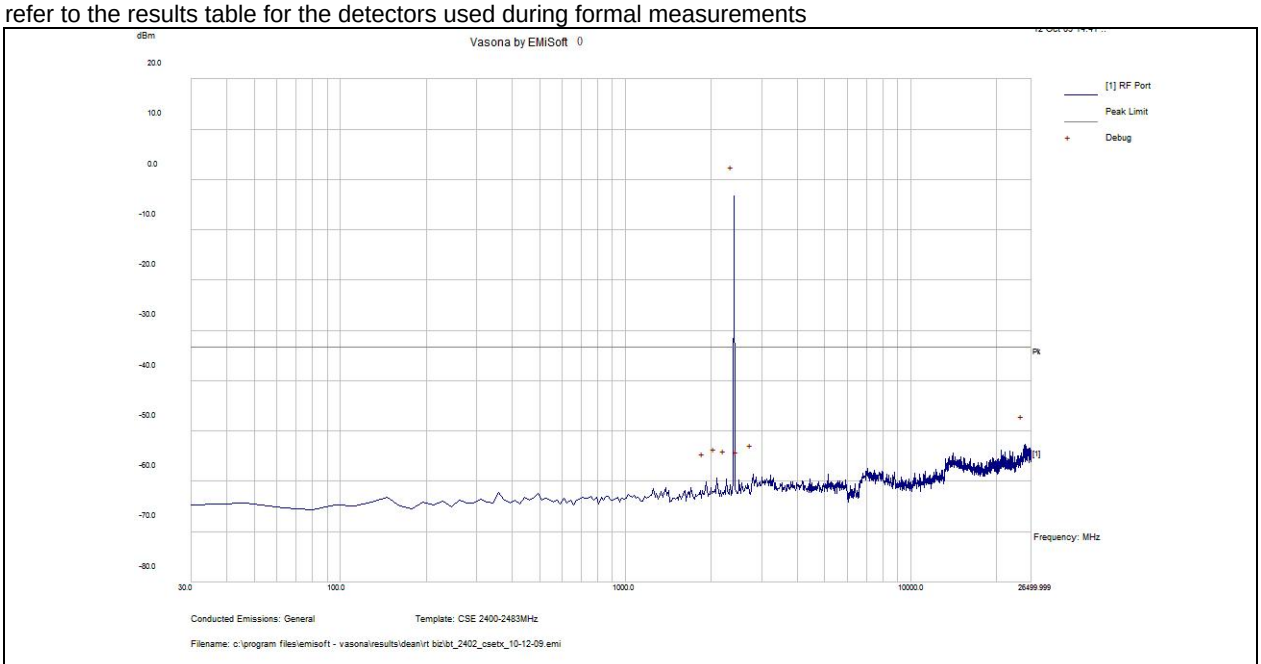
Test Number: 37520 **Spec ID:** 652				
Basic Standard	**Applied to**	**Class**	**Freq Range**	**Test Details / Comments**
Conducted Spurious Emissions	RF Ports	N/A	30MHz - xGHz	Also complies with RSS 210, LP0002, HKTA1039
Operating Mode	**Mode :** 1, Bluetooth Test Mode			
Power Input	48, DC (+/-20%)			
Overall Result	Pass			
Comments	No further comments			
Deviation	There were no deviations from the specification			

System Number	**Description**	**Samples**	**System under test**	**Support equipment**
1	Bluetooth Radio Test Sample	S01	☑	☐

Subtest Number: 37520 - 1	**Subtest Date:** 13-Oct-2009
Engineer	Dean Yarza
Lab Information	Building B, Shield Room
Subtest Results	
Line Under Test	[A] Antenna Port
Transducer	Direct
Subtest Result	Pass
Highest Frequency	26499.999
Lowest Frequency	30.0
Comments on the above Test Results	No further comments
Environmental Conditions:	
Temperature: within range of 54 to 95 F:	Yes
Humidity: between 10 and 75%:	Yes
Comments:	

Equipment used:			
Equipment No	Manufacturer	Model	Description
CIS002396	Omega	CT485B	Temp/Humidity Recorder
CIS008032	Coleman	RG-214	RG-214 Cable 2 ft
CIS006461	Rohde & Schwarz	SMY01	RF Synthesized Signal Generator, .009-1040MHz
CIS025716	HP	11500E	Radio testing cable 3.5mm
CIS034974	Midwest Microwave	ATT-0640-20-29M-02	Attenuator, 20dB, DC-40GHz
CIS040514	Agilent	E4440A	Precision Spectrum Analyzer
CIS041986	Murata Electronics	MXGS83RK3000	Special Radio Test Adaptor Cable
CIS043023	Anritsu	MT8852B-042	EDR Bluetooth Test Set
CIS044583	Mini-Circuits	ZFSC-2-10G	Splitter

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 Channel 2402MHz

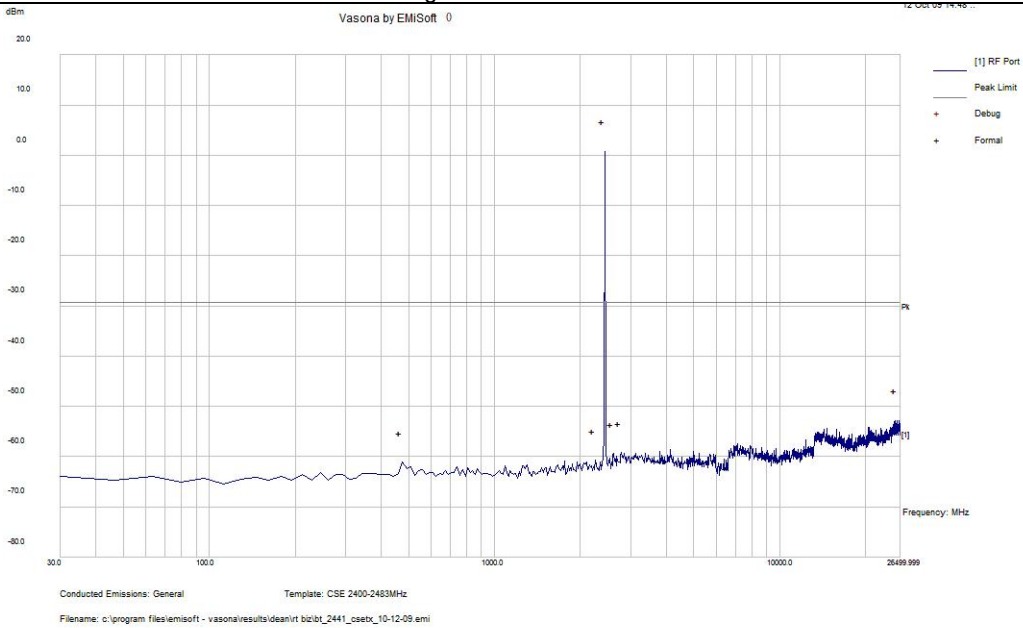
Test Results Table

Frequency MHz	Raw dBm	Cable Loss	Factors dB	Level dBm	Measurement Type	Line	Limit dBm	Margin dB	Pass /Fail	Comments
2402	-24.5	1.2	19.9	-3.4	Peak(Scan)	RF	-33.4	30	Fail	Fundamental
2805.435	-80	1.3	19.9	-58.7	Peak(Scan)	RF	-33.4	-25.4	Pass	
2094.316	-80.5	1.2	19.9	-59.4	Peak(Scan)	RF	-33.4	-26	Pass	
2257.656	-80.9	1.2	19.9	-59.8	Peak(Scan)	RF	-33.4	-26.5	Pass	
2509.666	-81.2	1.3	19.9	-60	Peak(Scan)	RF	-33.4	-26.7	Pass	
1916.446	-81.4	1.1	19.9	-60.5	Peak(Scan)	RF	-33.4	-27.1	Pass	

Subtest Number: 37520 - 2	**Subtest Date:** 13-Oct-2009
Engineer	Dean Yarza
Lab Information	Building B, Shield Room
Subtest Results	
Line Under Test	[A] Antenna Port
Transducer	Direct
Subtest Result	Pass
Highest Frequency	26499.999
Lowest Frequency	30.0
Comments on the above Test Results	No further comments
Environmental Conditions:	
Temperature: within range of 54 to 95 F:	Yes
Humidity: between 10 and 75%:	Yes

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 Channel 2441

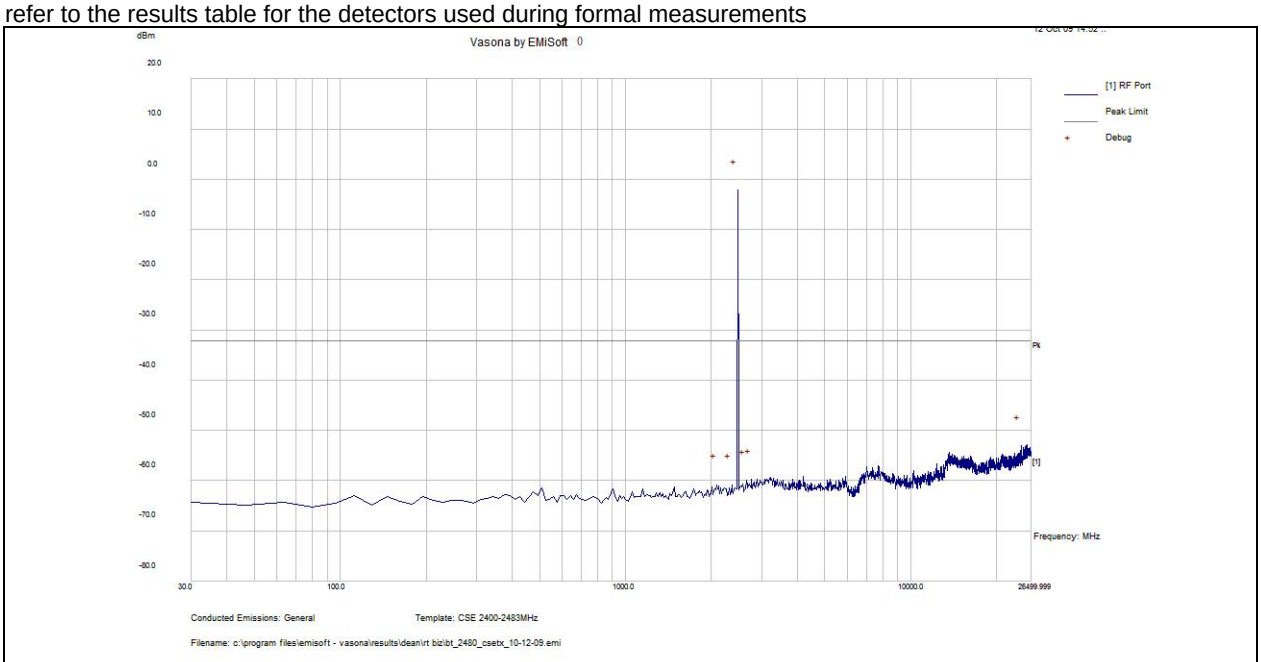
Test Results Table

Frequency MHz	Raw dBm	Cable Loss	Factors dB	Level dBm	Measurement Type	Line	Limit dBm	Margin dB	Pass /Fail	Comments
2441	-20.4	1.3	19.9	0.8	Peak(Scan)	RF	-29.2	30	Fail	Fundamental
25806.462	-74	0.9	20.4	-52.8	NA	RF	-29.2	-23.5	Pass	
2788.447	-80.5	1.3	19.9	-59.3	Peak(Scan)	RF	-29.2	-30	Pass	
2624.611	-80.7	1.2	19.9	-59.5	Peak(Scan)	RF	-29.2	-30.3	Pass	
2260.882	-81.9	1.2	19.9	-60.8	Peak(Scan)	RF	-29.2	-31.6	Pass	
476.385	-81.4	0.5	19.8	-61.1	Peak(Scan)	RF	-29.2	-31.9	Pass	

Subtest Number: 37520 - 3	**Subtest Date:** 13-Oct-2009
Engineer	Dean Yarza
Lab Information	Building B, Shield Room
Subtest Results	
Line Under Test	[A] Antenna Port
Transducer	Direct
Subtest Result	Pass
Highest Frequency	26499.999
Lowest Frequency	30.0
Comments on the above Test Results	No further comments
Environmental Conditions:	
Temperature: within range of 54 to 95 F:	Yes
Humidity: between 10 and 75%:	Yes

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 Channel 2480

Test Results Table

Frequency MHz	Raw dBm	Cable Loss	Factors dB	Level dBm	Measurement Type	Line	Limit dBm	Margin dB	Pass /Fail	Comments
2480	-23.3	1.3	19.9	-2.2	Peak(Scan)	RF	-32.2	30	Fail	Fundamental
24419.671	-74.4	0.8	20.4	-53.1	Peak(Scan)	RF	-32.2	-20.9	Pass	
2771.441	-81	1.3	19.9	-59.8	Peak(Scan)	RF	-32.2	-27.6	Pass	
2655.873	-81.1	1.2	19.9	-60	Peak(Scan)	RF	-32.2	-27.8	Pass	
2095.145	-82	1.2	19.9	-60.9	Peak(Scan)	RF	-32.2	-28.7	Pass	
2358.122	-82	1.2	19.9	-60.9	Peak(Scan)	RF	-32.2	-28.7	Pass	

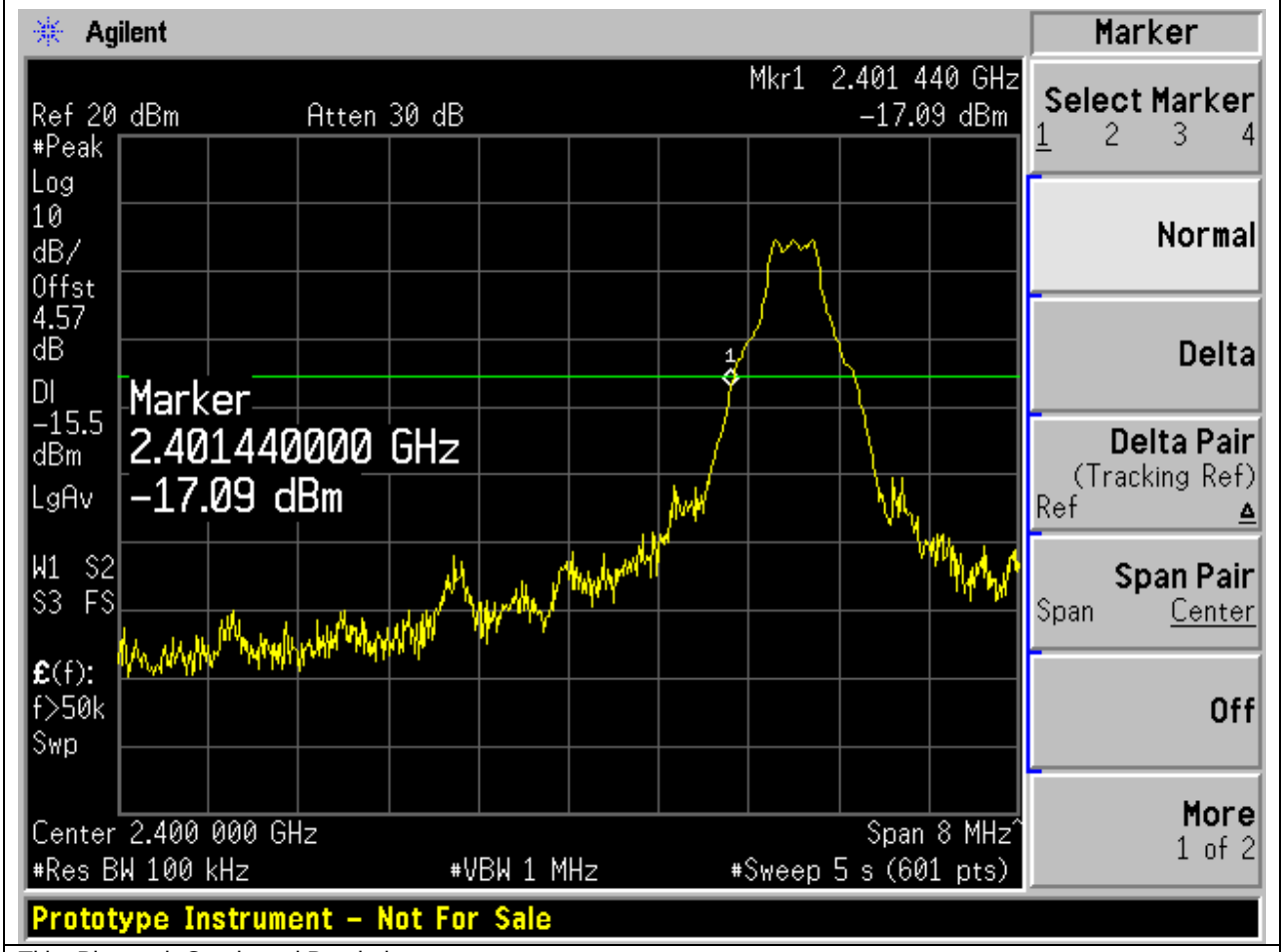
Conducted Band Edge Measurements

15.205 & RSS-210 sec2.7:

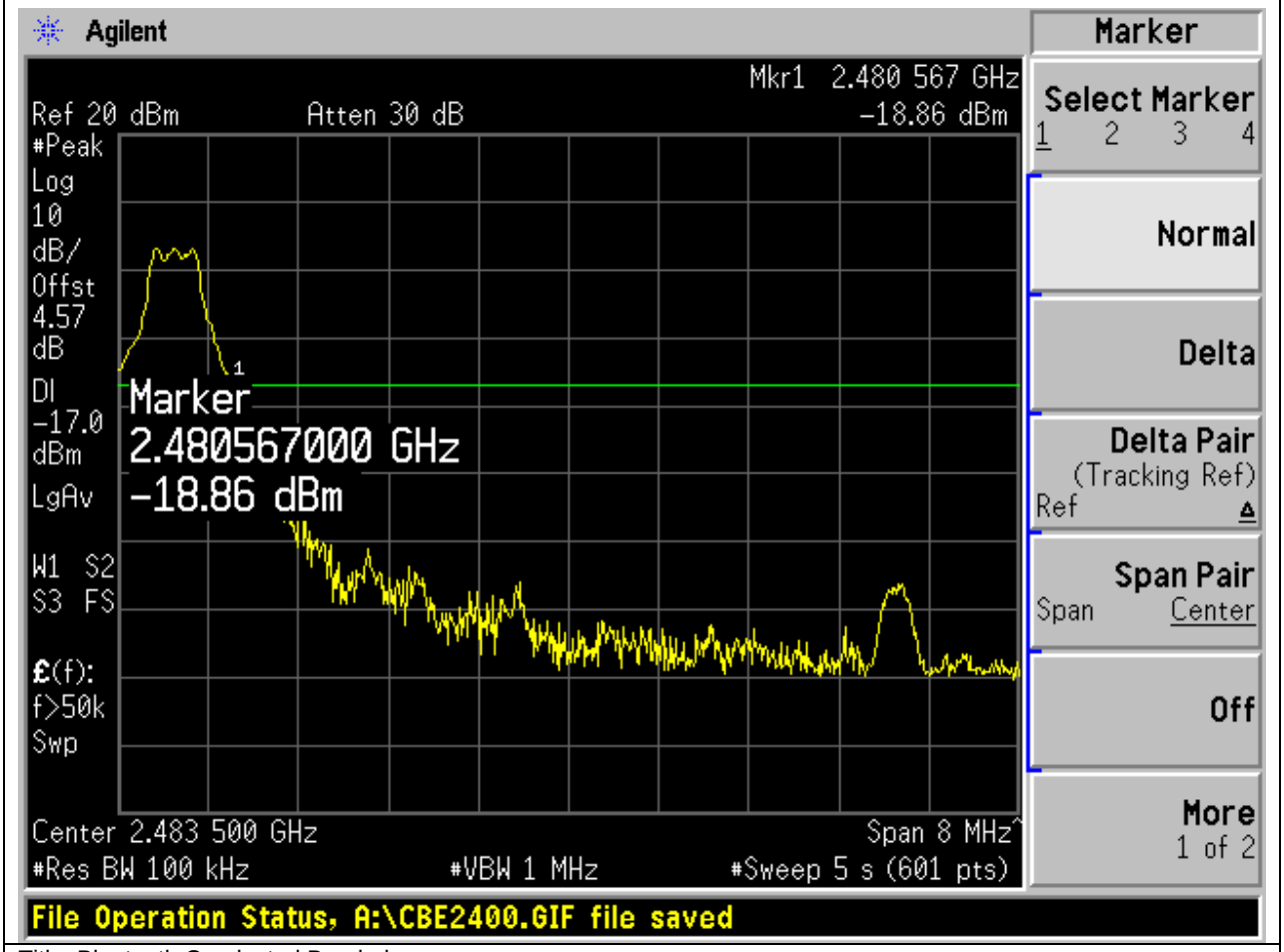
Conducted emissions which fall in the restricted bands, as defined in Sec. 15.205(a), must also comply with the radiated emission limits specified in Sec. 15.209(a).

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



Title: Bluetooth Conducted Bandedge

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).

Radiated emissions

Test Number: 37537 **Spec ID:** 647				
Basic Standard	**Applied to**	**Class**	**Freq Range**	**Test Details / Comments**
Radiated Spurious Emissions	Enclosure	B	30MHz - 26.5GHz	CFR47 Part 15.109CFR47 Part 15.247, RSS-210, LP0002 HKTA1039
Operating Mode	**Mode :** 1, Bluetooth Test Mode			
Power Input	48, DC (+/-20%)			
Overall Result	Pass			
Comments	No further comments			
Deviation	There were no deviations from the specification			

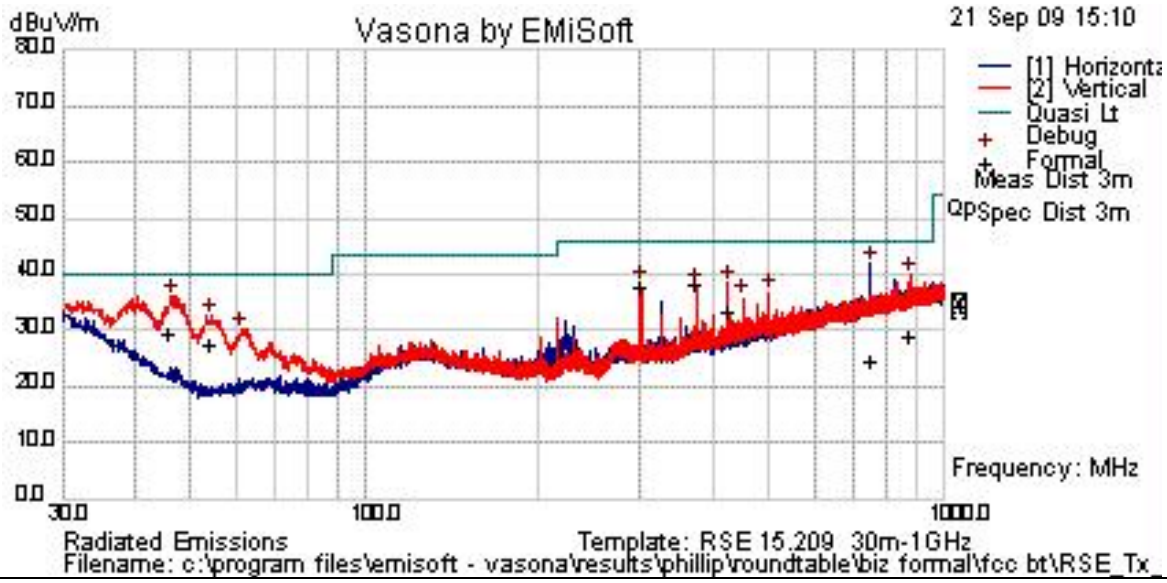
System Number	**Description**	**Samples**	**System under test**	**Support equipment**
1	Bluetooth Radio Test Sample	S01	☑	☐

Subtest Number: 37537 - 1		**Subtest Date:** 14-Oct-2009	
Engineer	Dean Yarza		
Lab Information	Building I, 5m Anechoic		
Subtest Results			
Subtest Title	Radiated Spurious Emissions: 30-1GHz		
Subtest Result	Pass		
Highest Frequency	1000.0		
Lowest Frequency	30.0		
Comments on the above Test Results	No further comments		
Environmental Conditions:			
Temperature: within range of 54 to 95 F:	Yes		
Humidity: between 10 and 75%:	Yes		
Comments:			
Equipment used:			
Equipment No	Manufacturer	Model	Description

CIS002119	EMC Test Systems	3115	Double Ridged Guide Horn Antenna
CIS008022	Huber + Suhner	SF106A	1 meter Sucoflex cable
CIS008024	Huber + Suhner	SF106A	3 meter Sucoflex cable
CIS005691	Miteq	NSP1800-25-S1	Broadband Preamplifier (1-18GHz)
CIS018314	EMC Test Systems	3115	Double Ridged Guide Horn Antenna
CIS021608	Micro-Coax	UFB142A-1-1572-200200	RF Coaxial Cable, to 40GHz, 157.2 in
CIS024201	Rohde & Schwarz	FSEK30	Spectrum Analyzer 20Hz - 40GHz
CIS027235	York	CNE V	Comparison Noise Emitter
CIS028072	Cisco	1840	18-40GHz EMI Test Head/Verification Fixture
CIS030443	Micro-Coax	UFB311A-0-1560-520520	RF Coaxial Cable, to 18GHz, 156 In.
CIS030666	Micro-Tronics	BRM50702-02	Band Reject Filter, Stop Band=2.4-2.5GHz
CIS033602	Midwest Microwave	CSY-NMNM-80-273001	RF Coaxial Cable, 27ft. to 18GHz
CIS035244	Klein Tools	926-8ME	Tape Measure
CIS039114	Sunol Sciences	JB1	Combination Antenna
CIS040523	Rohde & Schwarz	ESCI	EMI Test Receiver
CIS042000	Agilent	E4440A	Spectrum Analyzer
CIS008024	Huber + Suhner	SF106A	3 meter Sucoflex cable
CIS027235	York	CNE V	Comparison Noise Emitter
CIS030443	Micro-Coax	UFB311A-0-1560-520520	RF Coaxial Cable, to 18GHz, 156 In.
CIS033602	Midwest Microwave	CSY-NMNM-80-273001	RF Coaxial Cable, 27ft. to 18GHz
CIS035244	Klein Tools	926-8ME	Tape Measure
CIS039114	Sunol Sciences	JB1	Combination Antenna
CIS040523	Rohde & Schwarz	ESCI	EMI Test Receiver

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



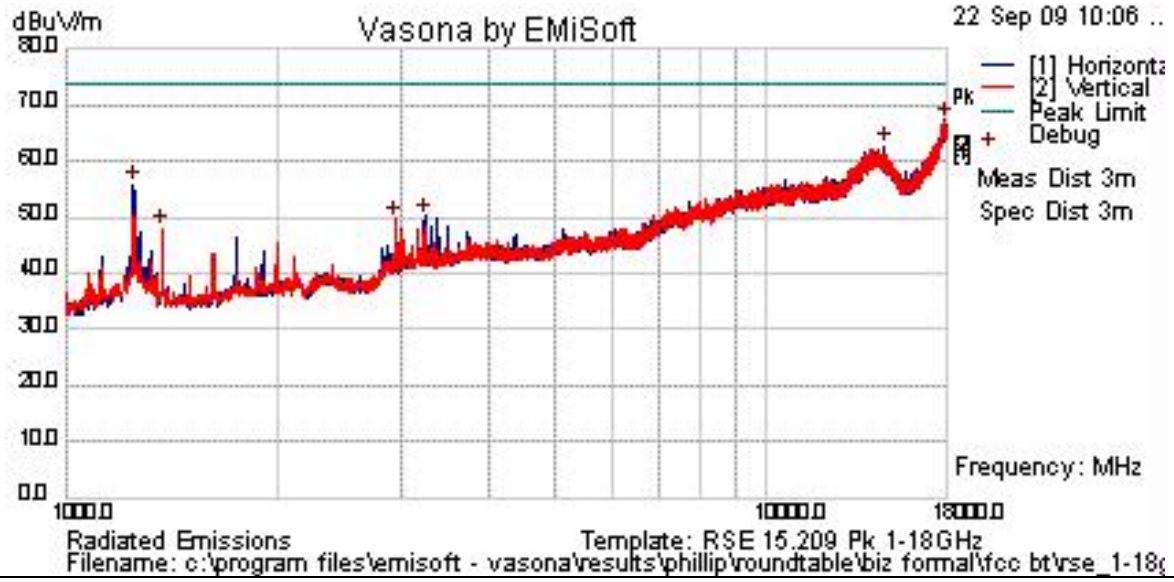
Title: Tx results, 30-1GHz (RBW/VBW = 120kHz QP detector)

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
375.007	21.5	1.6	15	38.1	Qp	V	124	101	46	-7.9	Pass	
300.002	22.8	1.5	13.4	37.7	Qp	V	151	55	46	-8.3	Pass	
46.08	19.5	0.5	9.5	29.6	Qp	V	132	238	40	-10.4	Pass	
54.267	20.2	0.6	6.9	27.7	Qp	V	116	99	40	-12.3	Pass	
424.934	15.1	1.7	16.4	33.2	Qp	V	108	58	46	-12.8	Pass	
874.952	4.2	2.5	22	28.8	Qp	V	241	104	46	-17.2	Pass	
749.615	1.6	2.3	20.7	24.7	Qp	H	338	234	46	-21.3	Pass	

Subtest Number: 37537 - 2		**Subtest Date:** 14-Oct-2009
Engineer	Dean Yarza	
Lab Information	Building I, 5m Anechoic	
Subtest Results		
Subtest Title	Radiated Spurious Emissions: 1-18GHz	
Subtest Result	Pass	
Highest Frequency	18000.0	
Lowest Frequency	1000.0	
Comments on the above Test Results	No further comments	
Environmental Conditions:		
Temperature: within range of 54 to 95 F:	Yes	
Humidity: between 10 and 75%:	Yes	

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



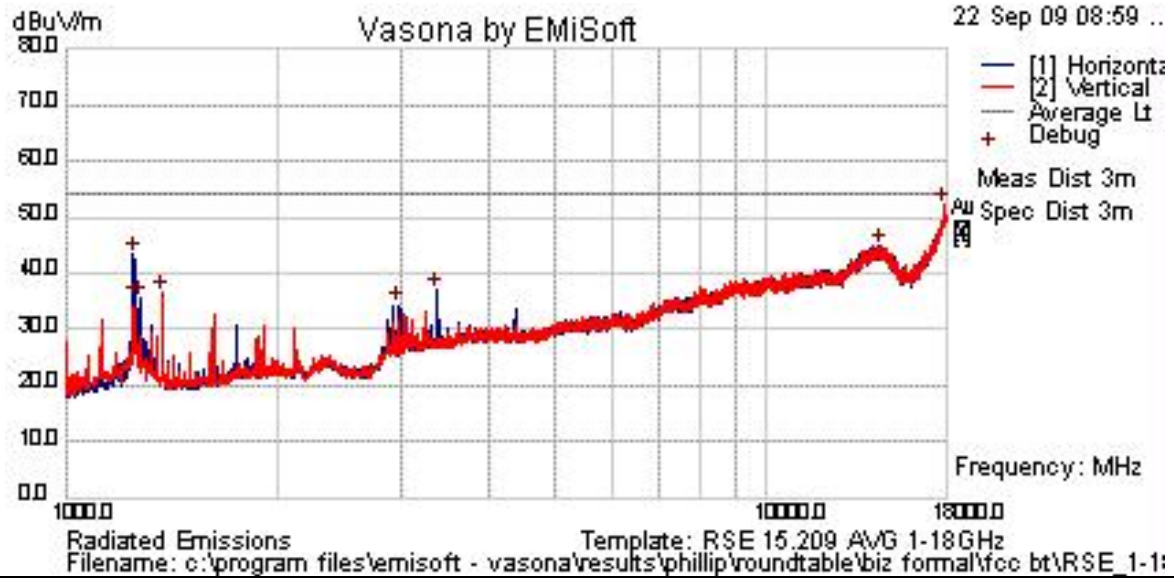
Title: Channel 0 (2402) - (RBW/VBW = 1MHz Peak detector)

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
17952.277	41.6	13.2	12.4	67.2	NA	H	100	0	74	-6.8	Pass	Noise Floor
14717.717	44.4	12	6.2	62.6	NA	H	100	0	74	-11.4	Pass	Noise Floor
1250.412	64.9	3.2	-7.4	60.7	Pk	H	101	240	74	-13.3	Pass	
3250.499	52.4	5.4	-3.5	54.4	Pk	H	140	220	74	-19.6	Pass	
1375.164	53.4	3.4	-7.1	49.7	Pk	V	111	157	74	-24.3	Pass	
2954.957	42	5.1	-4.4	42.8	Pk	V	103	257	74	-31.2	Pass	

Subtest Number: 37537 - 3		**Subtest Date:** 14-Oct-2009
Engineer	Dean Yarza	
Lab Information	Building I, 5m Anechoic	
Subtest Results		
Subtest Title	Radiated Spurious Emissions: 1-18GHz	
Subtest Result	Pass	
Highest Frequency	18000.0	
Lowest Frequency	1000.0	
Comments on the above Test Results	No further comments	
Environmental Conditions:		
Temperature: within range of 54 to 95 F:	Yes	
Humidity: between 10 and 75%:	Yes	

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



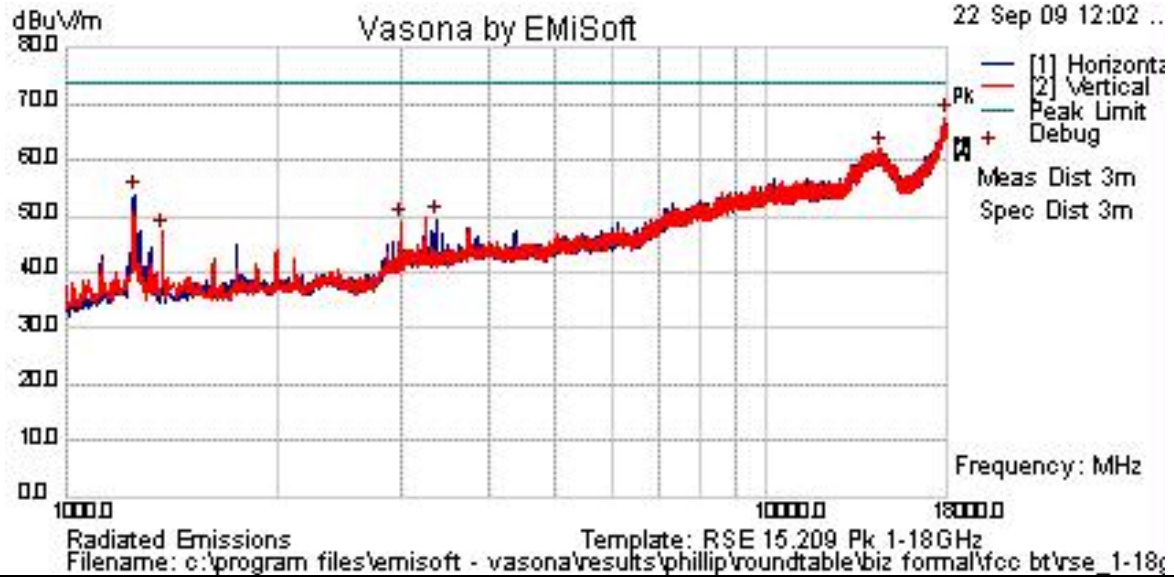
Title: Channel 0 (2402) - (RBW = 1MHz, VBW=10Hz Average detector)

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
17907.205	26.5	13.3	12.2	52	NA	V	100	0	54	-2	Pass	Noise Floor
14479.102	25.8	12.1	7	44.9	NA	V	100	0	54	-9.1	Pass	Noise Floor
1375.064	43.8	3.4	-7.1	40.1	Av	V	114	160	54	-13.9	Pass	
3374.815	36.5	5.5	-3.6	38.4	Av	H	100	172	54	-15.6	Pass	
1275.006	40.7	3.2	-7.2	36.7	Av	H	100	228	54	-17.3	Pass	
1258.535	40.6	3.2	-7.4	36.4	Av	H	100	225	54	-17.6	Pass	
1250.776	39.6	3.2	-7.4	35.4	Av	H	101	224	54	-18.6	Pass	

Subtest Number: 37537 - 4		**Subtest Date:** 14-Oct-2009
Engineer	Dean Yarza	
Lab Information	Building I, 5m Anechoic	
Subtest Results		
Subtest Title	Radiated Spurious Emissions: 1-18GHz	
Subtest Result	Pass	
Highest Frequency	18000.0	
Lowest Frequency	1000.0	
Comments on the above Test Results	No further comments	
Environmental Conditions:		
Temperature: within range of 54 to 95 F:	Yes	
Humidity: between 10 and 75%:	Yes	

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



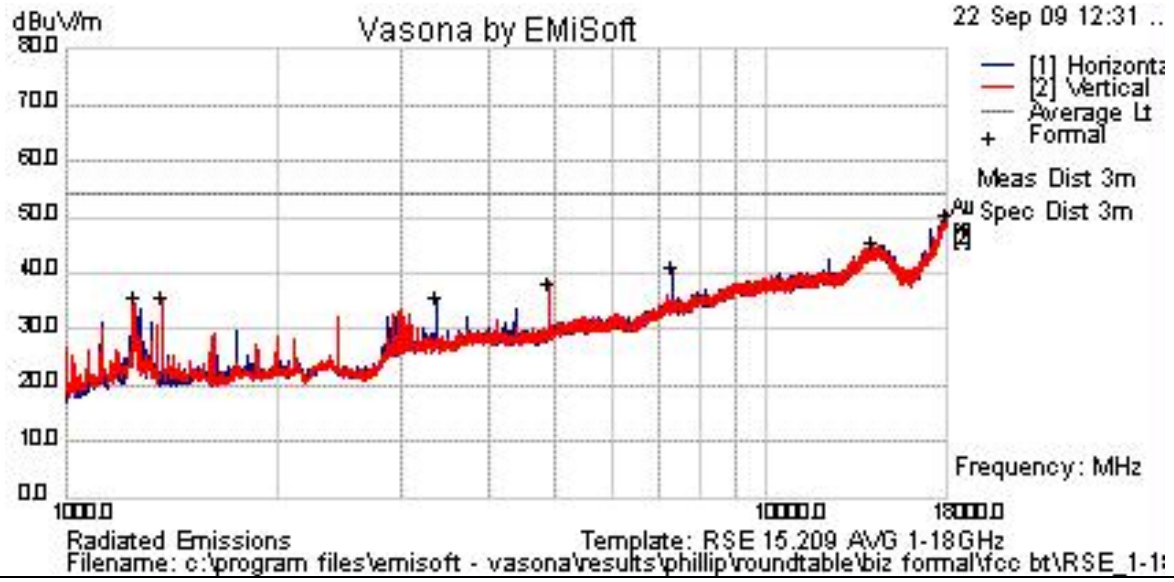
Title: Channel 39 (2441) - (RBW/VBW = 1MHz Peak detector)

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
17957.58	41.9	13.2	12.4	67.5	NA	V	100	0	74	-6.5	Pass	Noise Floor
14476.45	42.8	12.1	7	61.9	NA	H	100	0	74	-12.1	Pass	Noise Floor
1249.916	65.6	3.2	-7.4	61.4	Pk	H	102	233	74	-12.6	Pass	
2999.537	52.1	5.2	-3.9	53.3	Pk	V	103	166	74	-20.7	Pass	
3373.826	50	5.5	-3.6	51.9	Pk	H	100	170	74	-22.1	Pass	
1374.687	53.8	3.4	-7.1	50	Pk	V	156	158	74	-24	Pass	

Subtest Number: 37537 - 5		**Subtest Date:** 14-Oct-2009
Engineer	Dean Yarza	
Lab Information	Building I, 5m Anechoic	
Subtest Results		
Subtest Title	Radiated Spurious Emissions: 1-18GHz	
Subtest Result	Pass	
Highest Frequency	18000.0	
Lowest Frequency	1000.0	
Comments on the above Test Results	No further comments	
Environmental Conditions:		
Temperature: within range of 54 to 95 F:	Yes	
Humidity: between 10 and 75%:	Yes	

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



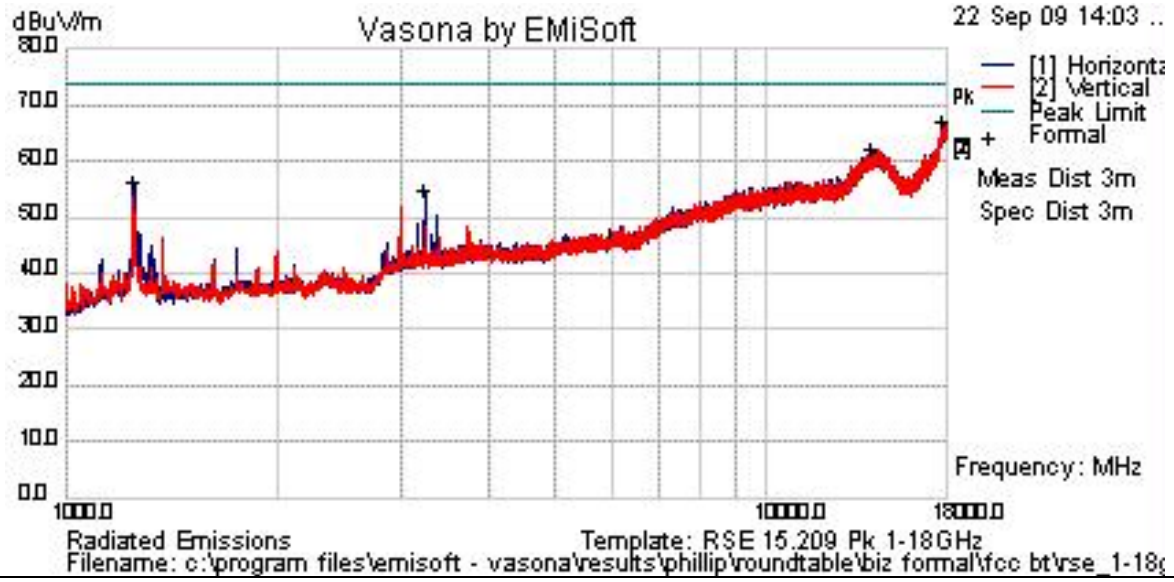
Title: Channel 39 (2441) - (RBW = 1MHz, VBW=10Hz Average detector)

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
17976.138	25	13.2	12.3	50.5	NA	H	100	0	54	-3.5	Pass	Noise Floor
14142.389	26.3	11.5	7.7	45.5	NA	V	100	0	54	-8.5	Pass	Noise Floor
1375.394	43	3.4	-7.1	39.3	Av	V	114	154	54	-14.7	Pass	
7322.522	28.2	8.2	1.2	37.6	Av	H	100	142	54	-16.4	Pass	
3373.638	35.2	5.5	-3.6	37.1	Av	H	155	165	54	-16.9	Pass	
4882.251	29.8	6.6	-3.5	32.9	Av	V	100	222	54	-21.1	Pass	
1249.997	36.4	3.2	-7.4	32.1	Av	V	100	165	54	-21.9	Pass	

Subtest Number: 37537 - 6		**Subtest Date:** 14-Oct-2009
Engineer	Dean Yarza	
Lab Information	Building I, 5m Anechoic	
Subtest Results		
Subtest Title	Radiated Spurious Emissions: 1-18GHz	
Subtest Result	Pass	
Highest Frequency	18000.0	
Lowest Frequency	1000.0	
Comments on the above Test Results	No further comments	
Environmental Conditions:		
Temperature: within range of 54 to 95 F:	Yes	
Humidity: between 10 and 75%:	Yes	

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



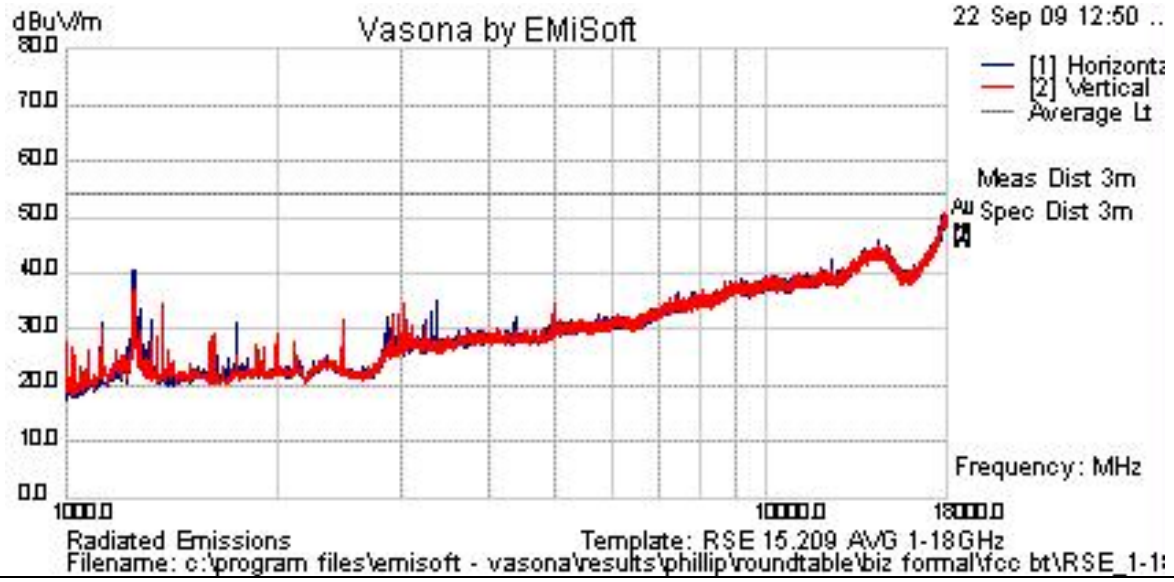
Title: Channel 78 (2480) - (RBW/VBW = 1MHz Peak detector)

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
17915.159	41.4	13.3	12.2	66.9	NA	H	100	0	74	-7.1	Pass	
14113.225	43	11.5	7.7	62.1	NA	H	100	0	74	-11.9	Pass	
1248.68	64.1	3.2	-7.4	59.9	Pk	H	100	225	74	-14.1	Pass	
3249.869	53.6	5.4	-3.5	55.5	Pk	H	106	198	74	-18.5	Pass	
3001.18	52.6	5.2	-3.9	53.9	Pk	V	102	166	74	-20.1	Pass	
1374.884	53.8	3.4	-7.1	50.1	Pk	V	157	158	74	-23.9	Pass	

Subtest Number: 37537 - 7		**Subtest Date:** 14-Oct-2009
Engineer	Dean Yarza	
Lab Information	Building I, 5m Anechoic	
Subtest Results		
Subtest Title	Radiated Spurious Emissions: 1-18GHz	
Subtest Result	Pass	
Highest Frequency	18000.0	
Lowest Frequency	1000.0	
Comments on the above Test Results	No further comments	
Environmental Conditions:		
Temperature: within range of 54 to 95 F:	Yes	
Humidity: between 10 and 75%:	Yes	

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



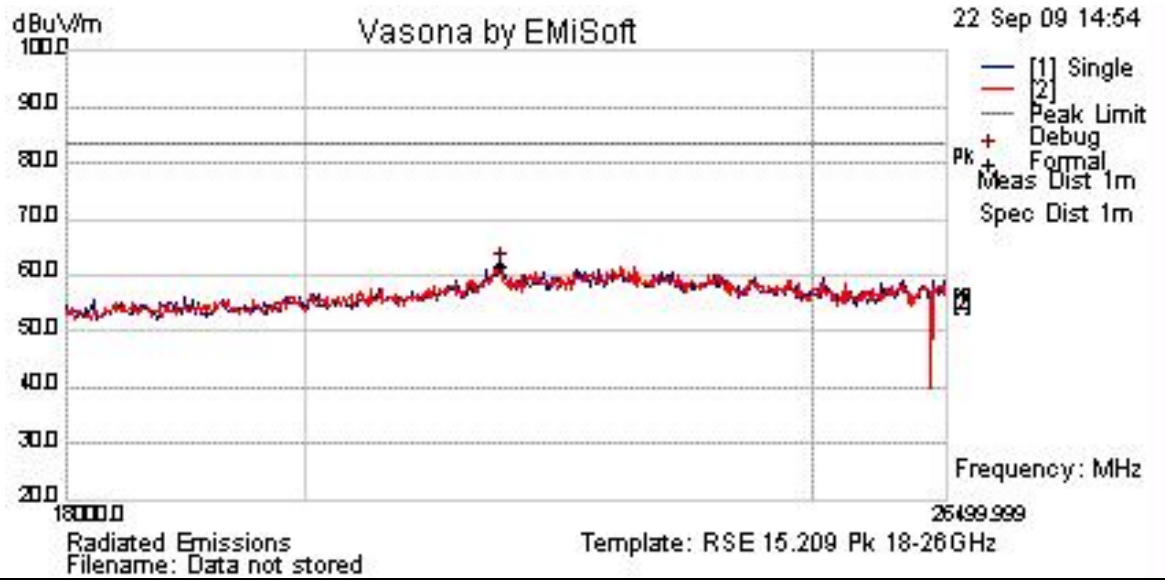
Title: Channel 78 (2480) - (RBW = 1MHz, VBW=10Hz Average detector)

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
17960.231	25.3	13.2	12.4	50.9	NA	V	100	0	54	-3.1	Pass	Noise Floor
14378.353	27	12	7	46	NA	H	100	0	54	-8	Pass	Noise Floor
1374.801	43.1	3.4	-7.1	39.4	Av	V	145	156	54	-14.6	Pass	
3374.521	35.6	5.5	-3.6	37.5	Av	H	102	176	54	-16.5	Pass	
3024.997	32	5.2	-4	33.1	Av	V	102	169	54	-20.9	Pass	
1248.647	36.6	3.2	-7.4	32.4	Av	H	102	225	54	-21.6	Pass	

Subtest Number: 37537 - 8		**Subtest Date:** 14-Oct-2009	
Engineer	Dean Yarza		
Lab Information	Building I, 5m Anechoic		
Subtest Results			
Subtest Title	Radiated Spurious Emissions: 18-26.5GHz		
Subtest Result	Pass		
Highest Frequency	26499.999		
Lowest Frequency	18000.0		
Comments on the above Test Results	No further comments		
Environmental Conditions:			
Temperature: within range of 54 to 95 F:	Yes		
Humidity: between 10 and 75%:	Yes		

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



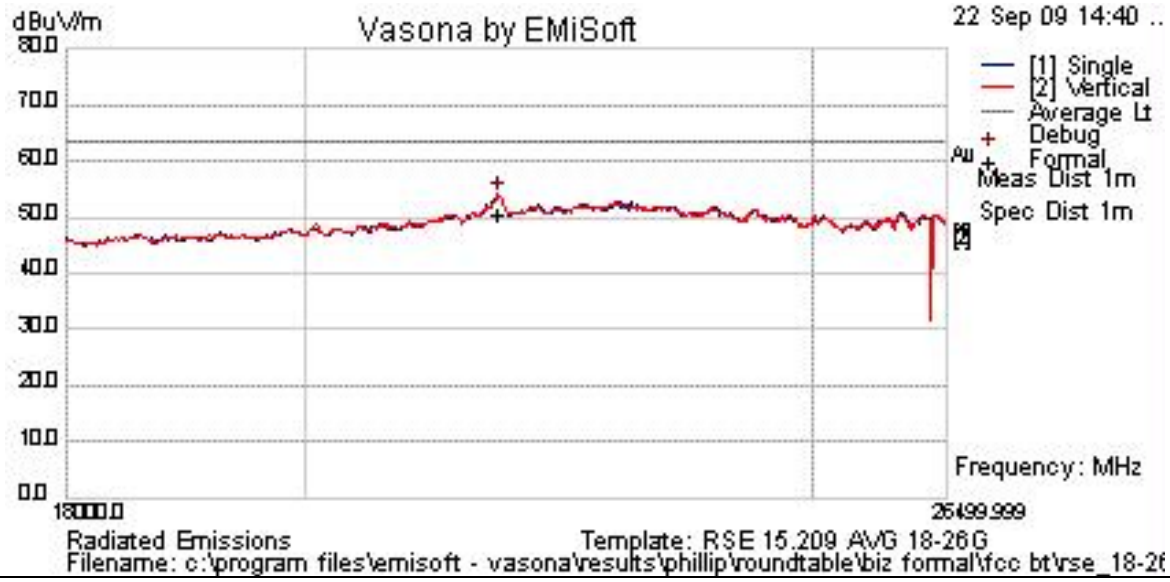
Title: Tx results, 18-26.5GHz (RBW/VBW = 1MHz Peak detector)

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
24166.152	42.2	0	17.5	59.7	Pk	H	100	180	83.5	-23.8	Pass	

Subtest Number: 37537 - 9	**Subtest Date:** 14-Oct-2009	
Engineer	Dean Yarza	
Lab Information	Building I, 5m Anechoic	
Subtest Results		
Subtest Title	Radiated Spurious Emissions: 18-26.5GHz	
Subtest Result	Pass	
Highest Frequency	26499.999	
Lowest Frequency	18000.0	
Comments on the above Test Results	No further comments	
Environmental Conditions:		
Temperature: within range of 54 to 95 F:	Yes	
Humidity: between 10 and 75%:	Yes	

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: Tx results, 18-26.5GHz (RBW = 1MHz, VBW=10Hz Average detector)

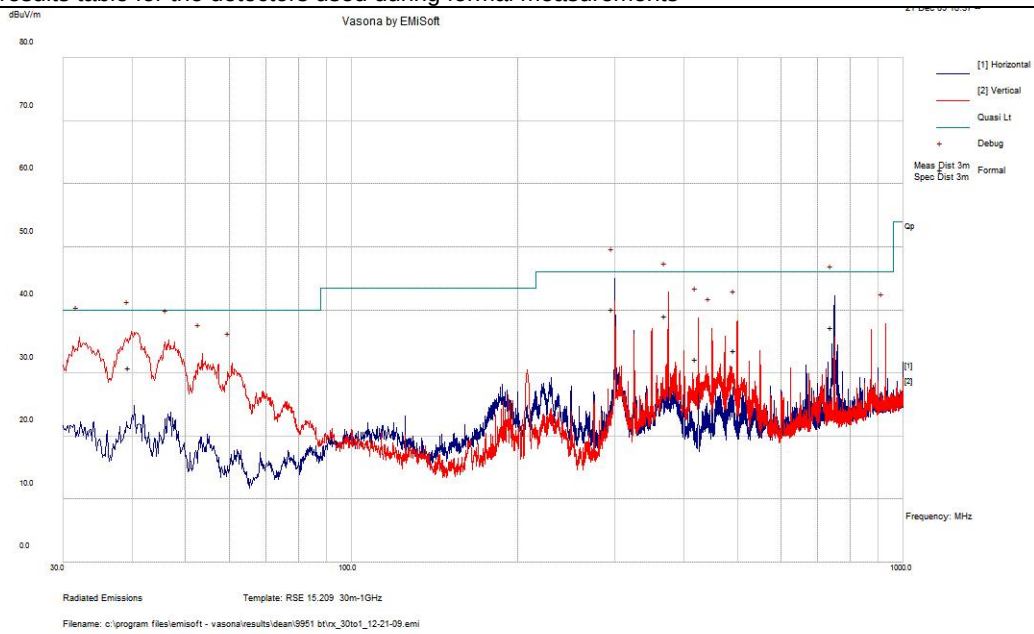
Test Results Table

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
21765.28	32.9	0	17.4	50.3	Av	V	100	180	63.5	-13.2	Pass	

Receiver Spurious emissions

Subtest Number: 38316 - 1		**Subtest Date:** 22-Dec-2009
Engineer	Dean Yarza	
Lab Information	Building I, 5m Anechoic	
Subtest Results		
Subtest Title	Receiver Spurious Emissions, 30-1GHz	
Subtest Result	Pass	
Highest Frequency	1000.0	
Lowest Frequency	30.0	
Comments on the above Test Results	No further comments	
Environmental Conditions:		
Temperature: within range of 54 to 95 F:	Yes	
Humidity: between 10 and 75%:	Yes	

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: Rx results, 30-1GHz (RBW/VBW = 120kHz QP detector)

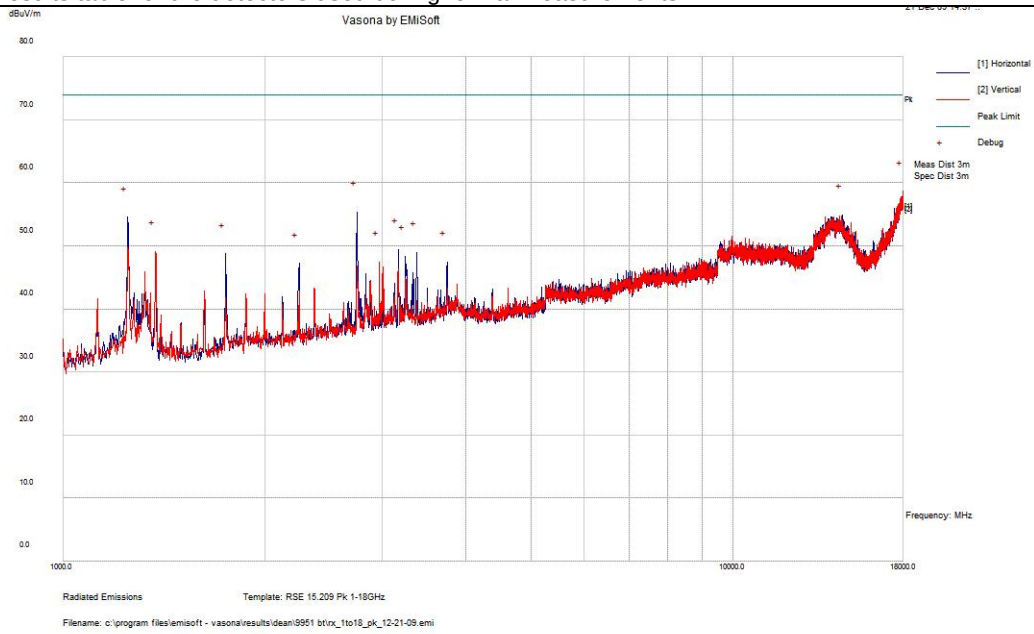
Test Results Table

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
300.009	26	0.9	13.3	40.2	Qp	V	167	152	46	-5.8	Pass	
375.002	23.1	1	15	39.1	Qp	V	145	156	46	-6.9	Pass	
750.451	15.2	1.4	20.5	37.2	Qp	H	161	199	46	-8.8	Pass	
39.887	17.1	0.3	13.5	30.9	Qp	V	100	0	40	-9.1	Pass	
499.933	14.7	1.2	17.7	33.5	Qp	V	107	95	46	-12.5	Pass	
425.01	14.8	1.1	16.4	32.2	Qp	V	208	60	46	-13.8	Pass	

Subtest Number: 38316 - 2		**Subtest Date:** 22-Dec-2009
Engineer	Dean Yarza	
Lab Information	Building I, 5m Anechoic	
Subtest Results		
Subtest Title	Receiver Spurious Emissions, 1-18GHz PK measurements	
Subtest Result	Pass	
Highest Frequency	18000.0	
Lowest Frequency	1000.0	
Comments on the above Test Results	No further comments	
Environmental Conditions:		
Temperature: within range of 54 to 95 F:	Yes	
Humidity: between 10 and 75%:	Yes	

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



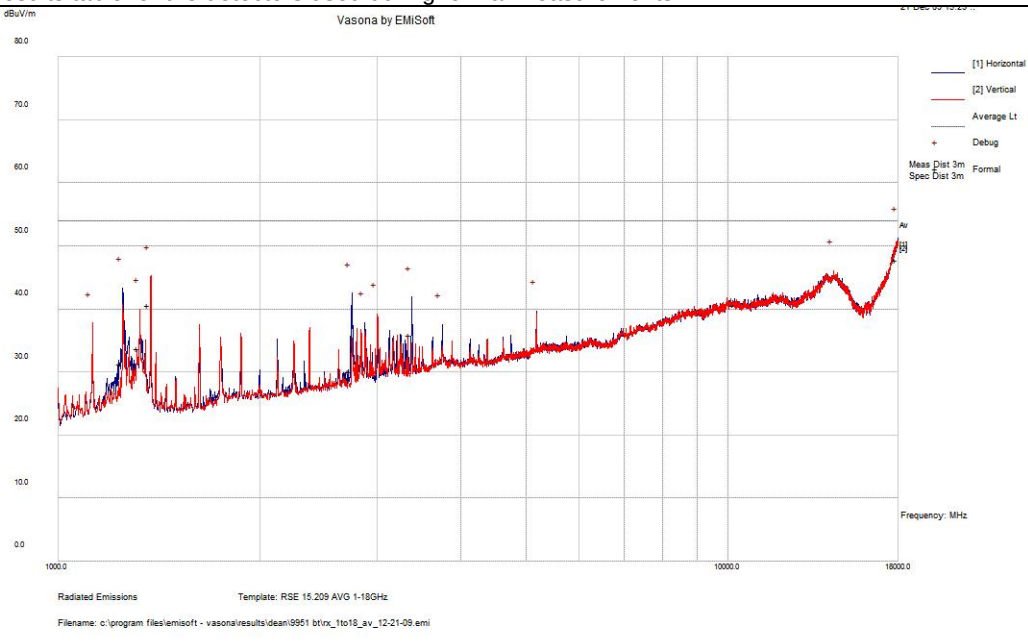
Title: Rx 1-18GHz - (RBW/VBW=1MHz PK detector)

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
17984.092	39	8.1	11.5	58.6	NA	V	125	0	74	-15.4	Pass	
2749.844	58.2	2.9	-5.8	55.3	NA	H	100	0	74	-18.7	Pass	
14606.363	41.4	7.3	6.1	54.9	NA	H	125	0	74	-19.1	Pass	
1249.22	60.9	1.9	-8.3	54.5	NA	H	100	0	74	-19.5	Pass	
3171.397	50.8	3.1	-4.4	49.4	NA	H	100	0	74	-24.6	Pass	
1373.83	55.1	2	-8	49.1	NA	V	125	0	74	-24.9	Pass	

Subtest Number: 38316 - 3		**Subtest Date:** 22-Dec-2009
Engineer	Dean Yarza	
Lab Information	Building I, 5m Anechoic	
Subtest Results		
Subtest Title	Receiver Spurious Emissions, 1-18GHz AV measurements	
Subtest Result	Pass	
Highest Frequency	18000.0	
Lowest Frequency	1000.0	
Comments on the above Test Results	No further comments	
Environmental Conditions:		
Temperature: within range of 54 to 95 F:	Yes	
Humidity: between 10 and 75%:	Yes	

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: Rx 1-18GHz - (RBW = 1MHz, VBW=10Hz Average detector)

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
17983.365	28.2	8.1	11.5	47.8	Av	H	122	317	54	-6.2	Pass	
1374.771	46.6	2	-8	40.6	Av	V	117	150	54	-13.4	Pass	
3376.226	37.2	3.2	-4.5	35.9	Av	H	108	170	54	-18.1	Pass	
1325.032	39.8	1.9	-8	33.7	Av	V	175	164	54	-20.3	Pass	
1250.102	37.6	1.9	-8.3	31.2	Av	H	143	196	54	-22.8	Pass	
2748.564	32.9	2.9	-5.8	30	Av	H	185	180	54	-24	Pass	

Radiated Band Edge Measurements

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).

Test Number: 38314 **Spec ID:** 648				
Basic Standard	**Applied to**	**Class**	**Freq Range**	**Test Details / Comments**
Restricted Bandedge Measurements	Enclosure	B	2.4GHz - 5.825GHz	CFR47 Part 15.205,CFR47 Part 15.209,LP002, RSS210HKTA1039
Operating Mode	**Mode :** 1, Bluetooth Test Mode			
Power Input	48, DC (+/-20%)			
Overall Result	Pass			
Comments	No further comments			
Deviation	There were no deviations from the specification			

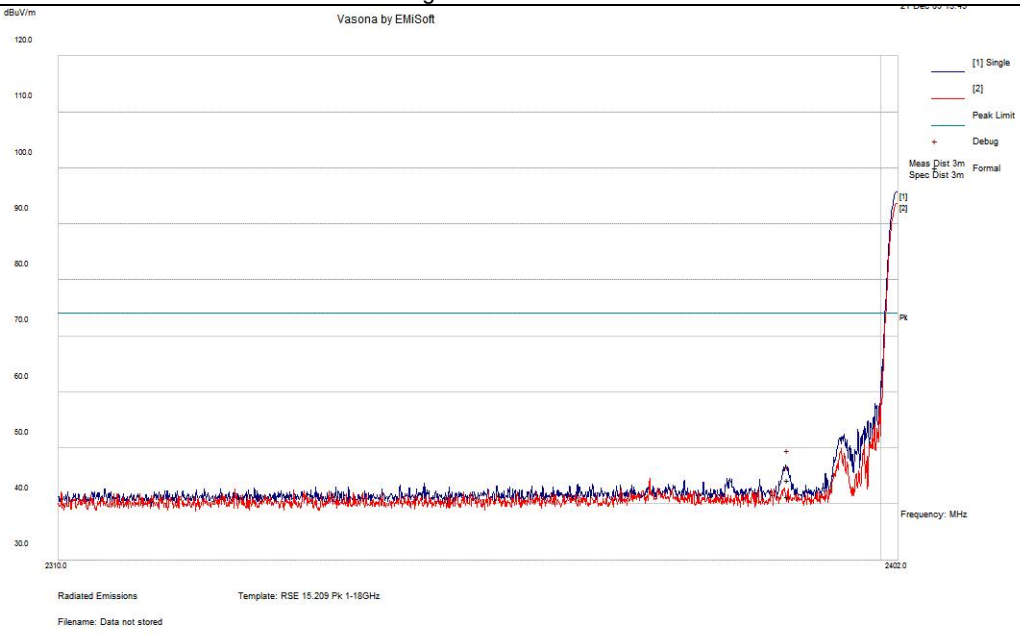
System Number	**Description**	**Samples**	**System under test**	**Support equipment**
1	WiFi Radio test sample	S01	☑	☐

Subtest Number: 38314 - 1		**Subtest Date:** 22-Dec-2009	
Engineer	Dean Yarza		
Lab Information	Building I, 5m Anechoic		
Subtest Results			
Subtest Title	Radiated Bandedge, PK measurements		
Subtest Result	Pass		
Highest Frequency	2402.0		
Lowest Frequency	2310.0		
Comments on the above Test Results	No further comments		
Environmental Conditions:			
Temperature: within range of 54 to 95 F:	Yes		
Humidity: between 10 and 75%:	Yes		
Comments:			
Equipment used:			
Equipment No	Manufacturer	Model	Description
CIS002119	EMC Test Systems	3115	Double Ridged Guide Horn Antenna
CIS008022	Huber + Suhner	SF106A	1 meter Sucoflex cable
CIS008024	Huber + Suhner	SF106A	3 meter Sucoflex cable
CIS005691	Miteq	NSP1800-25-S1	Broadband Preamplifier (1-18GHz)

CIS018314	EMC Test Systems	3115	Double Ridged Guide Horn Antenna
CIS021608	Micro-Coax	UFB142A-1-1572-200200	RF Coaxial Cable, to 40GHz, 157.2 in
CIS024201	Rohde & Schwarz	FSEK30	Spectrum Analyzer 20Hz - 40GHz
CIS027235	York	CNE V	Comparison Noise Emitter
CIS028072	Cisco	1840	18-40GHz EMI Test Head/Verification Fixture
CIS030443	Micro-Coax	UFB311A-0-1560-520520	RF Coaxial Cable, to 18GHz, 156 In.
CIS030666	Micro-Tronics	BRM50702-02	Band Reject Filter, Stop Band=2.4-2.5GHz
CIS033602	Midwest Microwave	CSY-NMNM-80-273001	RF Coaxial Cable, 27ft. to 18GHz
CIS035244	Klein Tools	926-8ME	Tape Measure
CIS039114	Sunol Sciences	JB1	Combination Antenna
CIS040523	Rohde & Schwarz	ESCI	EMI Test Receiver
CIS042000	Agilent	E4440A	Spectrum Analyzer
CIS008024	Huber + Suhner	SF106A	3 meter Sucoflex cable
CIS027235	York	CNE V	Comparison Noise Emitter
CIS030443	Micro-Coax	UFB311A-0-1560-520520	RF Coaxial Cable, to 18GHz, 156 In.
CIS033602	Midwest Microwave	CSY-NMNM-80-273001	RF Coaxial Cable, 27ft. to 18GHz
CIS035244	Klein Tools	926-8ME	Tape Measure
CIS039114	Sunol Sciences	JB1	Combination Antenna
CIS040523	Rohde & Schwarz	ESCI	EMI Test Receiver

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



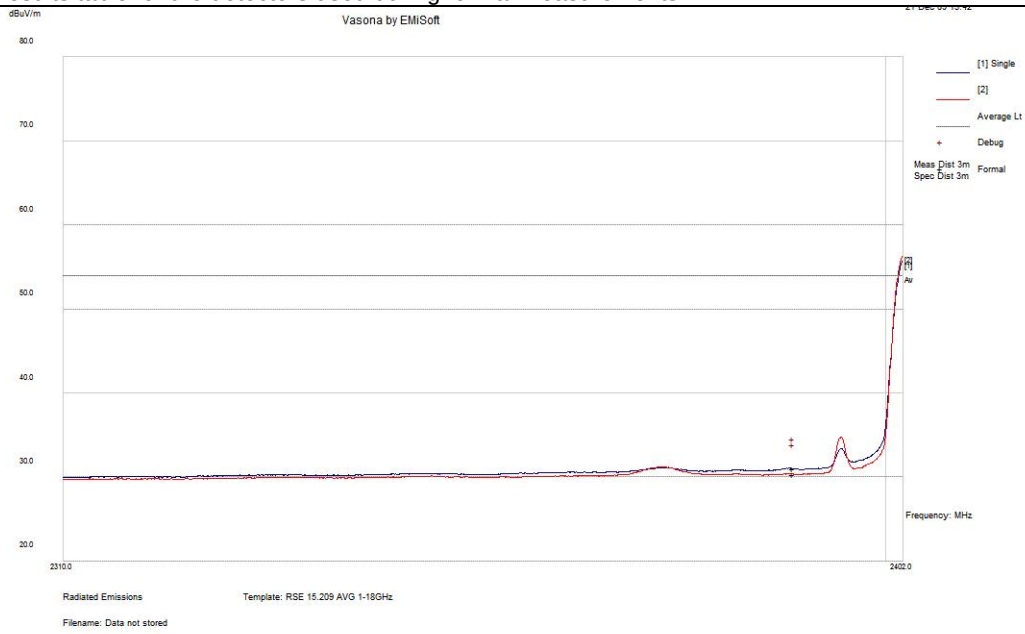
Title: Radiated Bandedge, PK measurements: 2402MHz

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
2390	47.6	2.6	-5.9	44.3	Peak(Scan)	H	99	55	74	-29.7	Pass	
2390	44.5	2.6	-5.9	41.3	Peak(Scan)	V	100	335	74	-32.7	Pass	

Subtest Number: 38314 - 2		**Subtest Date:** 22-Dec-2009
Engineer	Dean Yarza	
Lab Information	Building I, 5m Anechoic	
Subtest Results		
Subtest Title	Radiated Bandedge, AV measurements	
Subtest Result	Pass	
Highest Frequency	2402.0	
Lowest Frequency	2310.0	
Comments on the above Test Results	No further comments	
Environmental Conditions:		
Temperature: within range of 54 to 95 F:	Yes	
Humidity: between 10 and 75%:	Yes	

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: Radiated Bandedge, AV measurements: 2402MHz

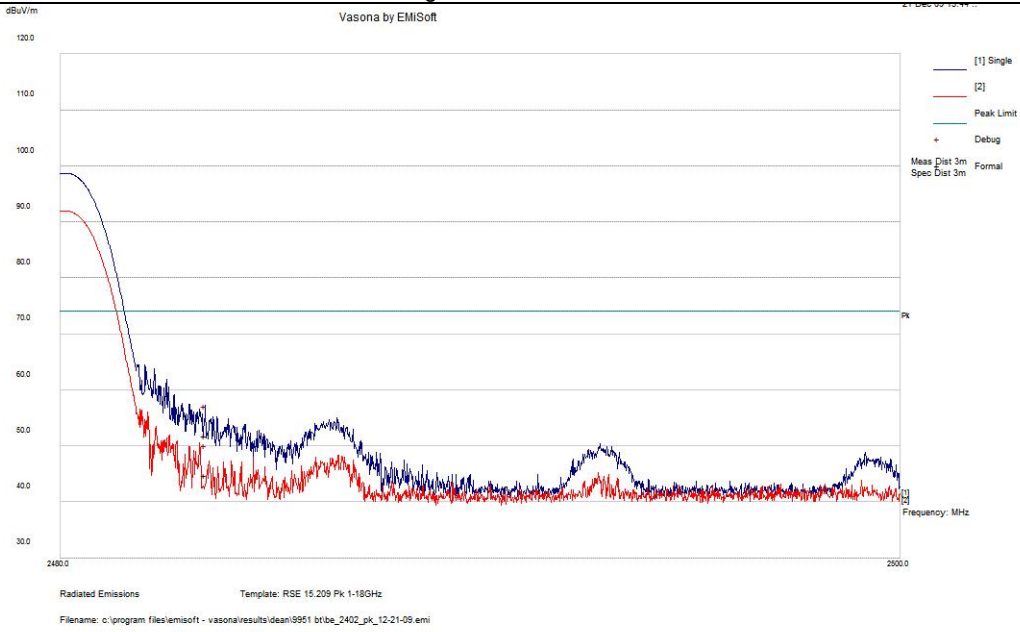
Test Results Table

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
2390	34.2	2.6	-5.9	31	Av	H	99	55	54	-23	Pass	
2390	33.5	2.6	-5.9	30.3	Av	V	100	335	54	-23.7	Pass	

Subtest Number: 38314 - 3	**Subtest Date:** 22-Dec-2009
Engineer	Dean Yarza
Lab Information	Building I, 5m Anechoic
Subtest Results	
Subtest Title	Radiated Bandedge, PK measurements
Subtest Result	Pass
Highest Frequency	2500.0
Lowest Frequency	2480.0
Comments on the above Test Results	No further comments
Environmental Conditions:	
Temperature: within range of 54 to 95 F:	Yes
Humidity: between 10 and 75%:	Yes

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: Radiated Bandedge, PK measurements: 2480MHz

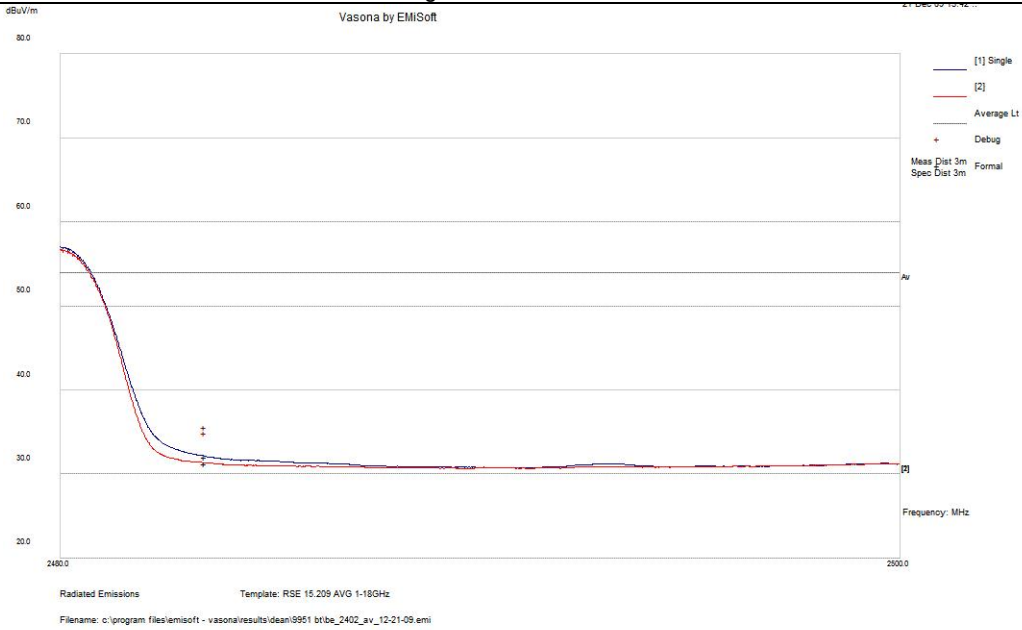
Test Results Table

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
2483.5	54.8	2.7	-5.8	51.7	Peak(Scan)	H	145	217	74	-22.3	Pass	
2483.5	47.8	2.7	-5.8	44.8	Peak(Scan)	V	115	169	74	-29.3	Pass	

Subtest Number: 38314 - 4	**Subtest Date:** 22-Dec-2009
Engineer	Dean Yarza
Lab Information	Building I, 5m Anechoic
Subtest Results	
Subtest Title	Radiated Bandedge, AV measurements
Subtest Result	Pass
Highest Frequency	2500.0
Lowest Frequency	2480.0
Comments on the above Test Results	No further comments
Environmental Conditions:	
Temperature: within range of 54 to 95 F:	Yes
Humidity: between 10 and 75%:	Yes

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

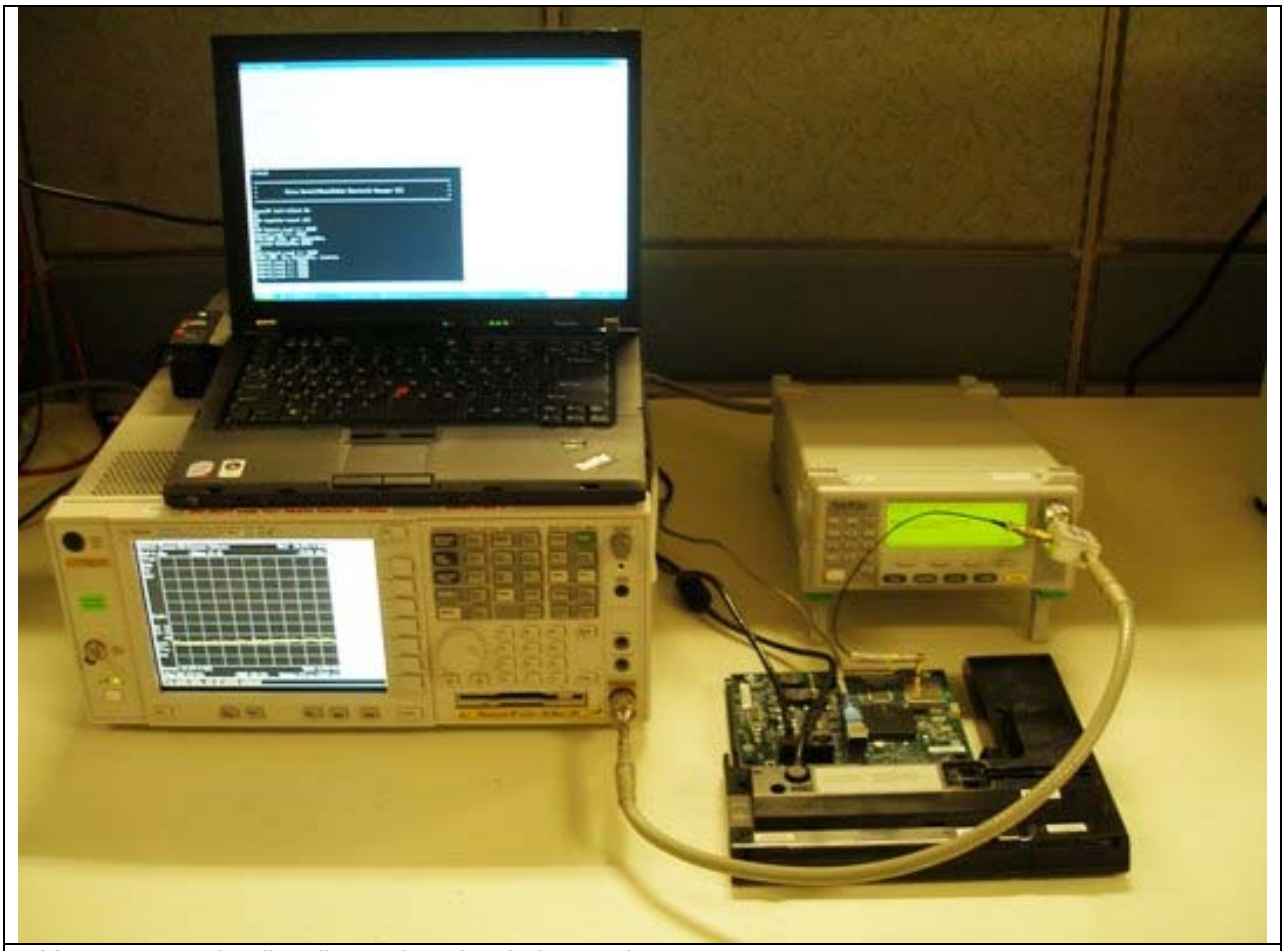


Title: Radiated Bandedge, AV measurements: 2480MHz

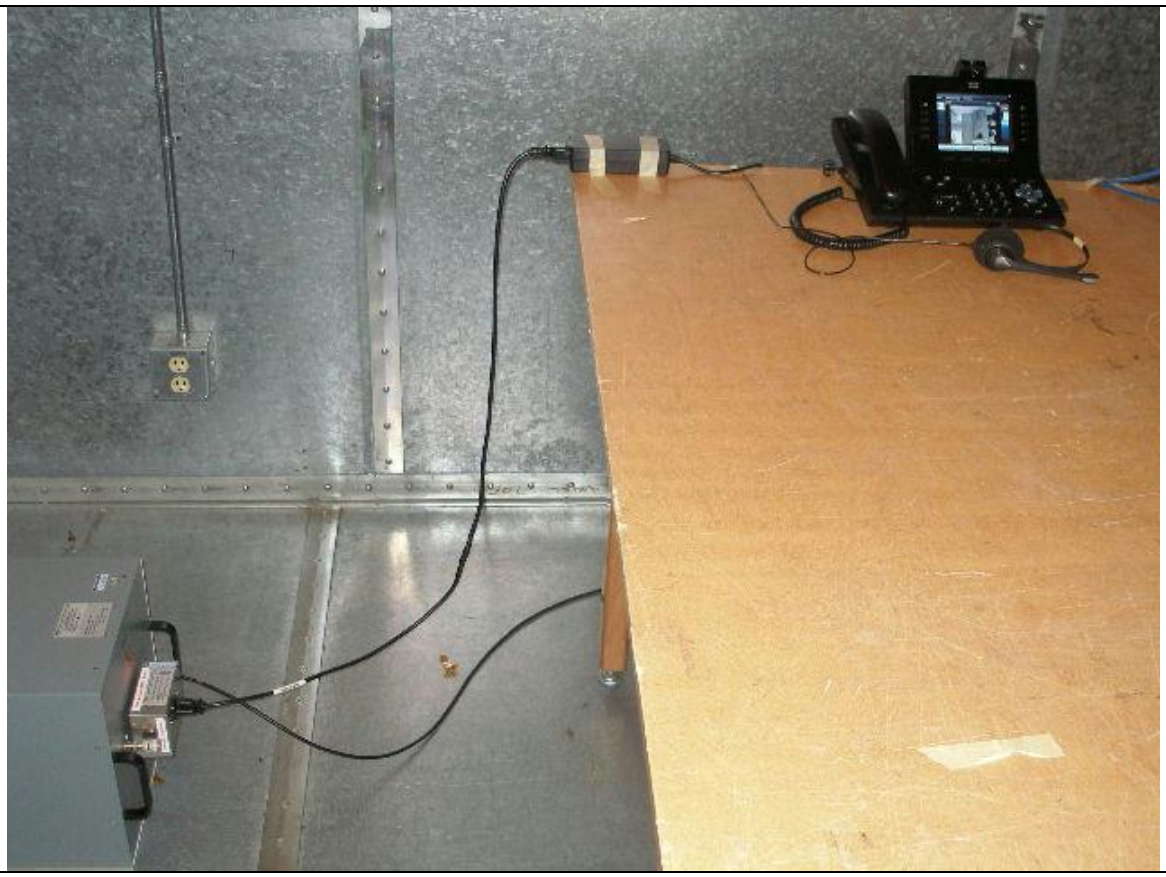
Test Results Table

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
2483.5	35.1	2.7	-5.8	32	Av	H	145	217	54	-22	Pass	
2483.5	34.3	2.7	-5.8	31.3	Av	V	115	169	54	-22.7	Pass	

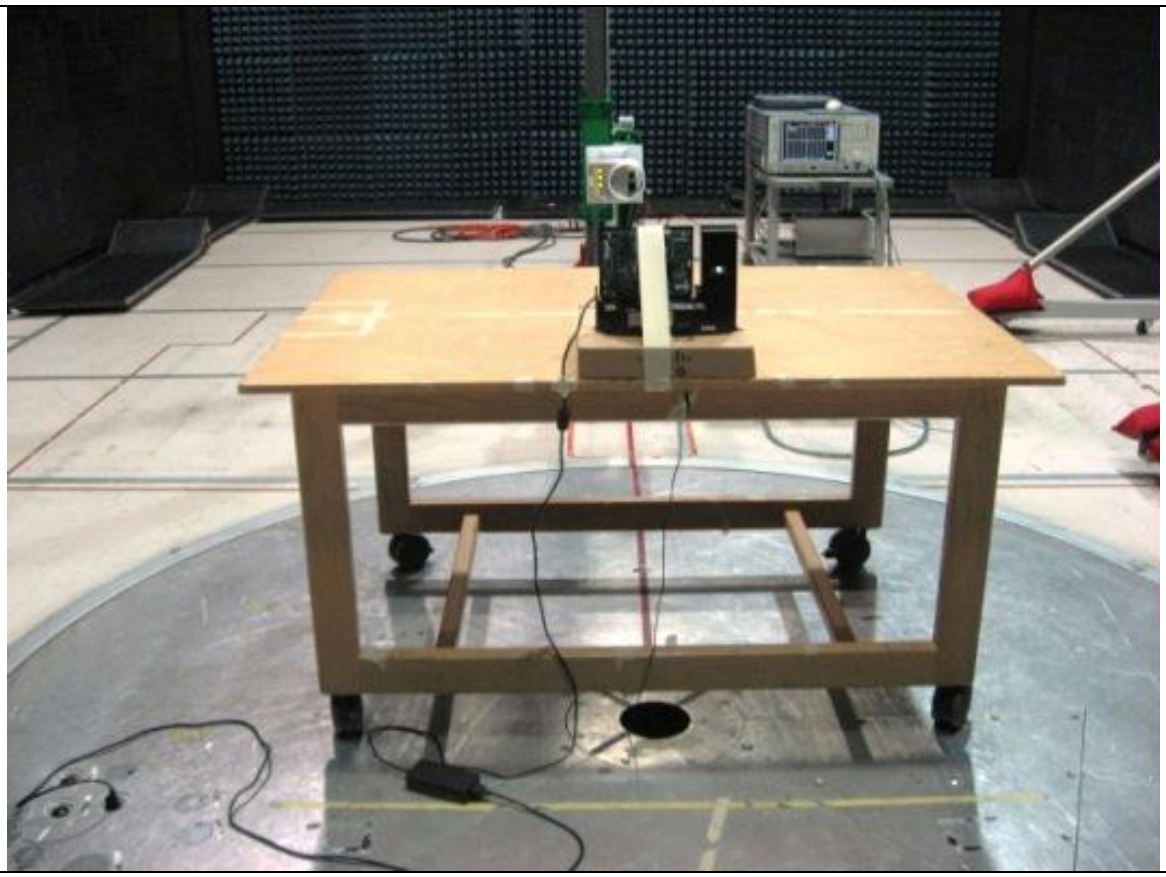
Physical Test arrangement Photographs:



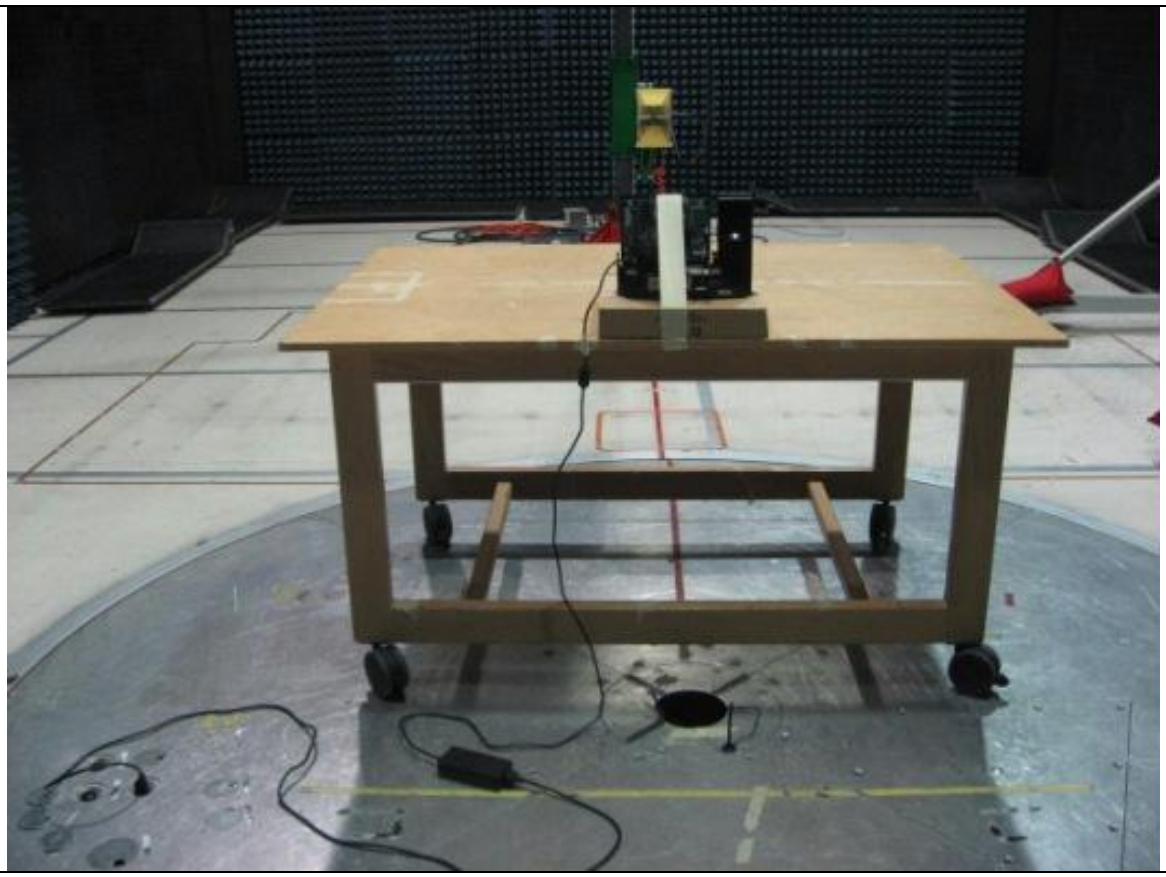
Title: Test setup for all Radio Conducted Emissions testing



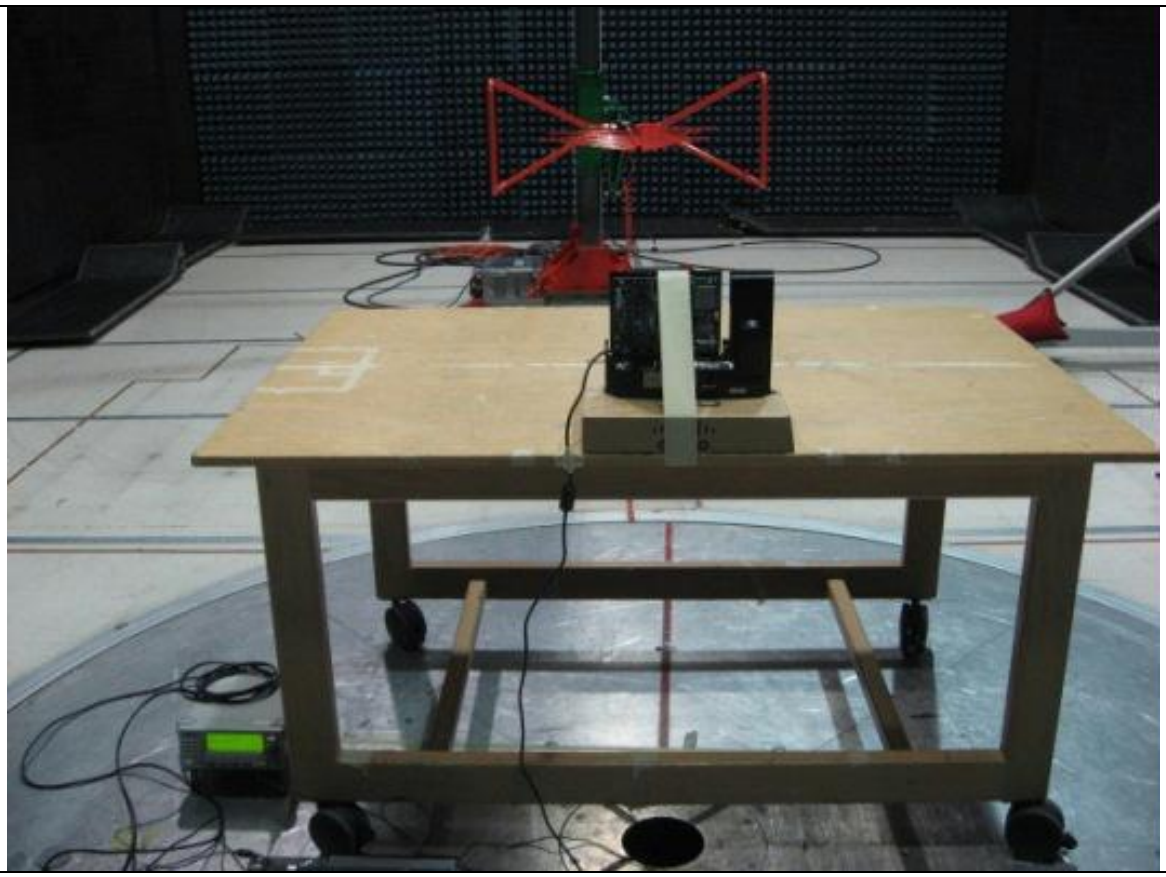
Title: Test setup for AC Power line Conducted Emissions testing



Title: Radiated Spurious Emissions test configuration: 18-26.5GHz



Title: Radiated Spurious Emissions test configuration: 1-18GHz



Title: Radiated Spurious Emissions test configuration: 30-1GHz

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	Test Number(s)
001937	Cisco/ NSA 5m Chamber	NSA 5m Chamber	06-DEC-08	06-DEC-09	[35606]
002119	EMC Test Systems/ 3115	Double Ridged Guide Horn Antenna	16-JUN-09	16-JUN-10	[37537]
002396	Omega/ CT485B	Temp/Humidity Recorder	29-MAY-09	29-MAY-10	[37520]
005691	Miteq/ NSP1800-25-S1	Broadband Preamplifier (1-18GHz)	12-OCT-09	12-OCT-10	[37537]
005972	HP/ 83712B	Synthesized CW Generator	29-JAN-09	29-JAN-10	[35630]
006461	Rohde & Schwarz/ SMY01	RF Synthesized Signal Generator, .009-1040MHz	29-JAN-09	29-JAN-10	[37520]
008022	Huber + Suhner/ SF106A	1 meter Sucoflex cable	03-DEC-08	03-DEC-09	[35606], [37537]
008024	Huber + Suhner/ SF106A	3 meter Sucoflex cable	11-NOV-08	11-NOV-09	[35606], [37537]
008032	Coleman/ RG-214	RG-214 Cable 2 ft	28-JUL-09	28-JUL-10	[37520]
008103	Cisco/ Unifield 5m Chamber	Unifield 5m Chamber	17-DEC-08	17-DEC-09	[35606]
018314	EMC Test Systems/ 3115	Double Ridged Guide Horn Antenna	Cal Not Required	N/A	[35606], [37537]
021608	Micro-Coax/ UFB142A-1-1572-200200	RF Coaxial Cable, to 40GHz, 157.2 in	06-OCT-09	06-OCT-10	[37537]
024201	Rohde & Schwarz/ FSEK30	Spectrum Analyzer 20Hz - 40GHz	21-NOV-08	21-NOV-09	[35606], [37537]
025716	HP/ 11500E	Radio testing cable 3.5mm	30-APR-09	30-APR-10	[37520]
025717	HP/ 11500E	Radio testing cable 3.5mm	30-APR-08	30-APR-09	[35630]
027235	York/ CNE V	Comparison Noise Emitter	Cal Not Required	N/A	[35606], [37537]
028072	Cisco/ 1840	18-40GHz EMI Test Head/Verification Fixture	06-OCT-09	06-OCT-10	[37537]
028072	Cisco/ 1840	18-40GHz EMI Test Head/Verification Fixture	07-OCT-08	07-OCT-09	[35606]
030443	Micro-Coax/ UFB311A-0-1560-520520	RF Coaxial Cable, to 18GHz, 156 In.	11-NOV-08	11-NOV-09	[35606], [37537]
030666	Micro-Tronics/ BRM50702-02	Band Reject Filter, Stop Band=2.4-2.5GHz	11-MAY-09	11-MAY-10	[37537]
031995	HP/ 83712B	Synthesized CW Signal Generator	17-DEC-08	17-DEC-09	[35606]
033602	Midwest Microwave/ CSY-NMNM-80-273001	RF Coaxial Cable, 27ft. to 18GHz	11-NOV-08	11-NOV-09	[35606], [37537]
033988	Agilent/ E4446A	PSA Spectrum Analyzer	12-NOV-08	12-NOV-09	[35630]

034074	Schaffner/ RSG 2000	Reference Spectrum Generator, 1-18GHz	Cal Not Required	N/A	[35606]
034974	Midwest Microwave/ ATT-0640-20-29M-02	Attenuator, 20dB, DC-40GHz	13-MAY-09	13-MAY-10	[37520]

Appendix D: Test Procedures

Measurements were made in accordance with

- FCC docket #:DA 00-0705,
- ET docket 96-8, KDB Publication No. 558074
- measurement method of spurious emission tolerance to the International Telecommunication Union (ITU) Recommendation SM329.
- ANSI PC63.10
- ANSI C63.4 2003