Intentional Radiator Test Report

Test Standards:
FCC Part 15.247 (Subpart C – Intentional Radiators)
Industry Canada RSS-210, Issue 8

Prepared For:
Socket Mobile, Inc.
39700 Eureka Drive
Newark, CA 94560

Equipment Under Test:
Handheld Computer

Model:
HANDHELD PC

M/N:
SoMo 655

Prepared by:

44366 S. Grimmer Blvd.
Fremont, CA 94538
USA

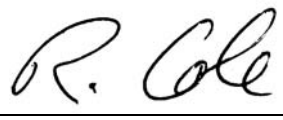
TABLE OF CONTENTS

1.0 CUSTOMER INFORMATION

Test Laboratory: FCC registration number	EMCE Engineering 44366 S. Grimmer Blvd. Fremont, CA 94538 USA Tel: 510-490-4307 Fax: 510-490-3441 bob@universalcompliance.com 743299
Customer:	Socket Mobile, Inc. 39700 Eureka Drive Newark, CA 94560 Tel: 510-744-2700 Fax:510-744-2701
Contact Person:	Tim Miller
Receipt of EUT:	5/1/12
Test plan reference:	FCC Part 2, 15 (15.247) / IC RSS-210, Issue 8
Test Site ID	US5291. Industry Canada 3324A
FCC ID:	LUB655-1
IC #:	2529A-6551
Date of testing:	5/1/12 – 6/24/12
Date of Report:	6/24/12

The tests listed in this report have been completed to demonstrate compliance to the CFR 47 Section 15.247, as well as Industry Canada Radio Standard RSS-210, Issue 8.

Contents approved:


Name: Bob Cole Title: President

2.0 EUT AND ACCESSORY INFORMATION

EUT description

The EUT is a Socket Mobile, Inc. Handheld Computer, M/N: SoMo 655.

Model Numbers Represented

SoMo 655

EUT and accessories

The table below lists all EUTs and accessories used in the tests. Later in this report, only numbers in the last column are used to refer to the devices in each test.

Software

The computers were equipped with test software provided by the customer. The software was used to control the EUT in the tests.

	Name	Type	S/N	Number
EUT	SoMo 655	Handheld PC	N/A	E0001
Accessories	Laptop Computer	HP M/N: dv4000	3882A744	S0001
Software	CRS	BlueTest	N/A	N/A

EUT Modes

Bluetooth v2.0
Bluetooth EDR Class 2

Number of Frequencies to be examined (CFR 47, 15.31(m)):

79 total, 3 frequencies examined (2042, 2441, 2480 MHz).

EUT Information

Product Specification	Description
Model Name	HANDHELD PC
Type of Modulation	FHSS
Number of Channels	79
Operating Frequency Range	2480 – 2483.5 MHz
Type of Equipment	Portable
Extreme Operating Temperature Range	-20 C – 55 C
Extreme Operating Voltage Range	N/A – Battery Powered
Type of Antenna	Integral
Antenna Gain (dBi)	1.042 (WiFi), 2.087 (Bluetooth)
Transmitter Method of Frequency Generation	Synthesized
Transmitter Aggregate Data Rate	>250kbps
Transmitter Duty Type	Intermittant
Continuous Operation for Testing Purposes?	Yes

3.0 SUMMARY OF TEST RESULTS

CFR 47, 15.247:200 Section #	RSS 210 Issue 8 Section #	Description	Results
15.203		Antenna Requirement	PASSED
15.205	RSS 210 (A8.5)	Restricted Band of Operation	N/A
15.207 (a)	RSS Gen 7.2.2	Conducted Emission Voltage	N/A
15.247 (a)(1)	RSS 210 (A8.1b)	Channel Separation	PASSED
15.247 (a)(1)	RSS 210 (A8.1e)	Number of Hopping Channels	PASSED
15.247 (1)(ii)	RSS 210 (8.1d)	Dwell Time	PASSED
	RSS 210 (A8.1)	Occupied Bandwidth	PASSED
15.247 (a)(1)	RSS 210 (A8.2)	Bandwidth	PASSED
15.247 (b)	RSS 210 (A8.4(2))	Output Power	PASSED
15.247 (b)	RSS 210 (A8.4(4))	De Facto EIRP Limit	N/A
15.247 (4)(i)	RSS 210 (A8.4)(5))	Point-to-Point Operation	N./A
15.247 (c)	RSS 210 (A8.5)	Band-Edge Compliance of RF Emissions	PASSED
15.247 (d)	RSS 210 (A8.5)	Conducted Spurious Emissions	PASSED
15.247d: 15.209	RSS 210 (A8.5)	Radiated Spurious Emissions	PASSED
15.247e	RSS 210 (A8.2(b))	Power Spectral Density	N/A
15.247f	RSS 210 (A8.3)	Hybrid System Requirement	N/A
15.247g	RSS 210 (A8.1)	Hopping Capability	PASSED
15.247h	RSS 210 (A8.1)	Hopping Coordination Requirement	PASSED
15.247i	RSS Gen (5.5)	RF Exposure Requirement	PASSED
	RSS Gen (4.8)	Receiver Spurious Emissions	PASSED

PASS The EUT passed that particular test.
FAIL The EUT failed that particular test.
N/A Not Applicable due to product type.

4.0 STANDARDS AND MEASUREMENT METHODS

The tests were performed in guidance of CFR 47 section 15.247, FCC Public Notice DA 00-705 (March 30, 2000), FCC Report & Order 97-114 (April 10, 1997), Industry Canada RSS-210 Issue 8, and ANSI C63.4 (2009). Deviations, modifications or clarifications (if any) to above mentioned documents are written in each section under "Test method". For the test equipment, see device list in the end of this test.

4.1 Selection of operation mode for tests

Before tests, all operation modes and modulation patterns were tried. The worst case was selected for each test and those results reported.

5.0 TEST SETUPS

To fulfill all requirements for the testing, total of two different test setups were used. One EUT was used, unmodified for radiated tests.

SMA connector added in place of internal antenna for Antenna Conducted measurements.

Setup A (Antenna Conducted measurements)

Operational description

ANTENNA CONDUCTED EMISSIONS MEASUREMENTS

The EUT was connected to the Laptop Computer through the serial port (COM1), the antenna bypassed and the SMA Cable connected to the Spectrum Analyzer. This setup was used for the *PEAK POWER OUTPUT, 20 dB BW, BAND-EDGE COMPLIANCE, and RESTRICTED BAND* measurements.

Block Diagram

The solid lines are coaxial cables and the dashed lines are either EUT insertion to the test board or control cables between test setup devices. The measurement results were adjusted with the attenuation of the coaxial cable.

Setup B (Radiated measurements)

Operational description

RADIATED EMISSIONS MEASUREMENTS

This setup was used in radiated emissions measurements.

The EUT was tested in 3 orthogonal orientations.

Worst case data is presented.

THIS SETUP USED FOR RADIATED SPURIOUS EMISSIONS:

Note: A high –pass filter is used for the Radiated Spurious emissions above 2.4835 GHz. A pass-thru connector is used for Radiated Spurious emissions measurements from 30 MHz – 2.4 GHz.

6.0 ENGINEERING EVALUATION RESULTS

6.1 Antenna Requirement

Requirement(s): CFR 47, 15.203:

An intentional radiator shall be designed such that no antenna other than that furnished by the responsible party shall be used with the device.

Antenna requirement must meet one of the following:

- Antenna must be permanently attached to the device.
- Antenna must use unique type of connector to attach to the device.
- Device must be professionally installed. Installer shall be responsible for insuring the the correct antenna is installed with the device.

The WiFi and Bluetooth antennas each are a printed trace, integral to the PCB.

WiFi antenna -	Gain = 1.042 dBi Type = PCB trace
Bluetooth Antenna -	Gain = 2.087 dBi Type = PCB Trace

6.2 Conducted Emissions Voltage

Requirement(s): CFR47, 15.207a, RSS Gen 7.2.2

Except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 µH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

CFR47, 15.207c waives the requirement for battery powered devices:

Measurements to demonstrate compliance with the conducted limits are not required for devices which only employ battery power for operation and which do not operate from the AC power lines or contain provisions for operation while connected to the AC power lines. Devices that include, or make provisions for, the use of battery chargers which permit operating while charging, AC adapters or battery eliminators or that connect to the AC power lines indirectly, obtaining their power through another device which is connected to the AC power lines, shall be tested to demonstrate compliance with the conducted limits.

AC Line Conducted Emissions Measurement 150 kHz – 30 MHz

EUT	HANDHELD PC
Test setup	
Temp, Humidity, Air Pressure	
Date of Measurement	
Measured by	Bob Cole
Result	

CLASS B LIMIT

Frequency Band (MHz)	EN 55022 B Limit (dBµV/m	Detector
0.15 – 0.5	66 to 56	QP
0.5 – 5.0	56	QP
5.0 – 30.0	60	QP

Not Applicable – Battery Powered EUT

6.3 Channel Separation

Requirement(s): 15.247(a)(1), RSS 210(A8.2)

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

CF Separation

EUT	HANDHELD COMPUTER
Test setup	A (conducted – hopping enabled)
Temp, Humidity, Air Pressure	57º F, 30.96
Test Method	DA 00-705
Date of Measurement	5/22/12
Measured by	Bob Cole
Result	PASSED

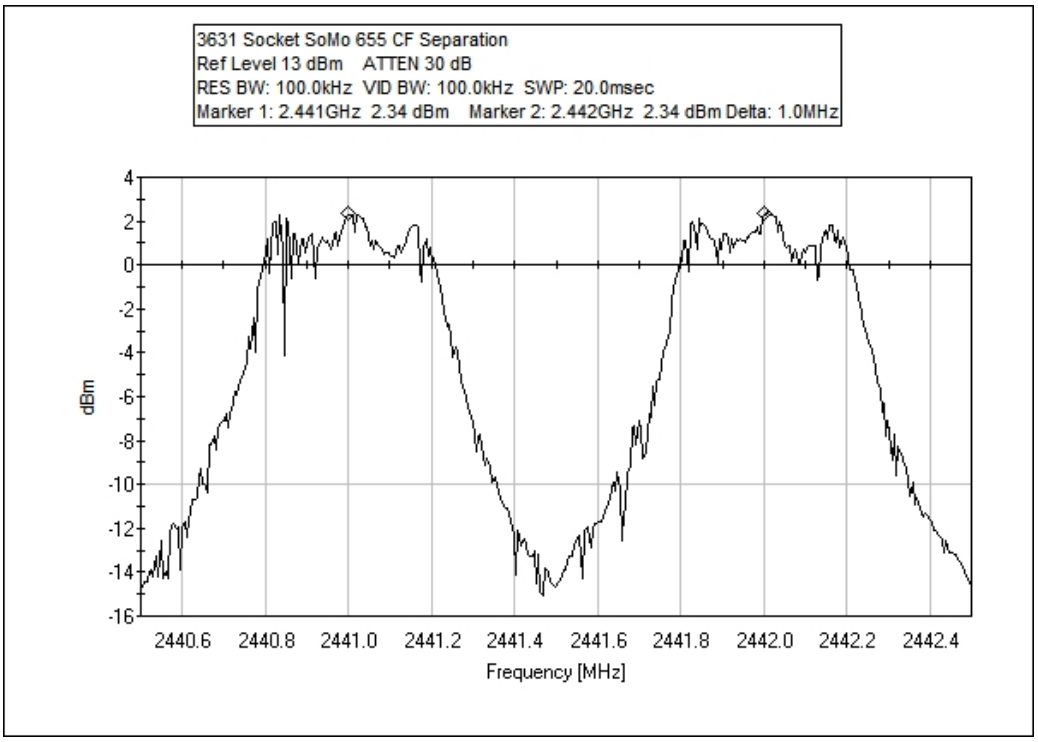
- The EUT was set to low, mid, and high channels at maximum RF Power output. The spectrum analyzer was connected directly to the antenna output.
- Conducted Emissions Measurement Uncertainty: The uncertainty of the measurement with a confidence factor of approx. 95% (normal distribution) with a coverage factor of 2, in the range of 30 MHz – 26.2 GHz, is +/- 1.5 dB

CENTER FREQUENCY SEPARATION LIMITS

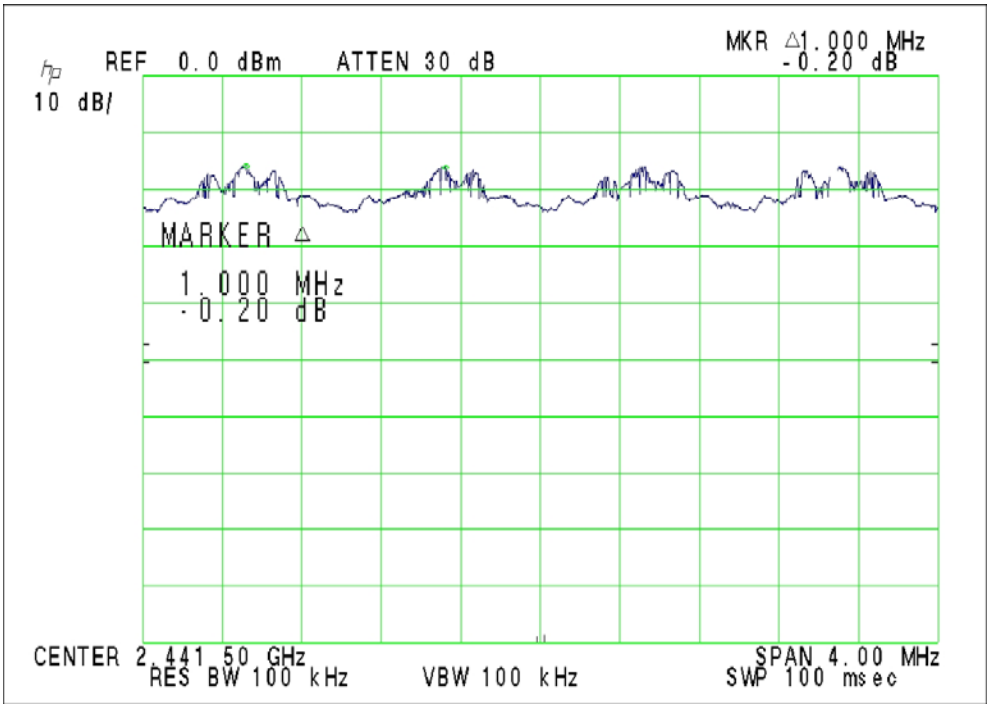
EUT Channel	Limit (MHz)	Test results (MHz)
2402 - 2480	>0.855 (GFSK)	1.0
2402 - 2480	>0.815 (DQPSK)	1.0

Freq. Band	Test Type	RBW	VBW
2400 – 2483.5	CF Separation	100 kHz	100kHz

Center Frequency Separation – GFSK



Center Frequency Separation – DQPSK



6.4 20 dB Bandwidth

20 dB BANDWIDTH AND RSS 210, Issue 8 99% BANDWIDTH REQUIREMENT

EUT	HANDHELD PC
Test setup	A (conducted)
Temp, Humidity, Air Pressure	68º F, 31.47
Date of Measurement	5/22/12
Measured by	Bob Cole
Result	PASSED

EUT operation mode

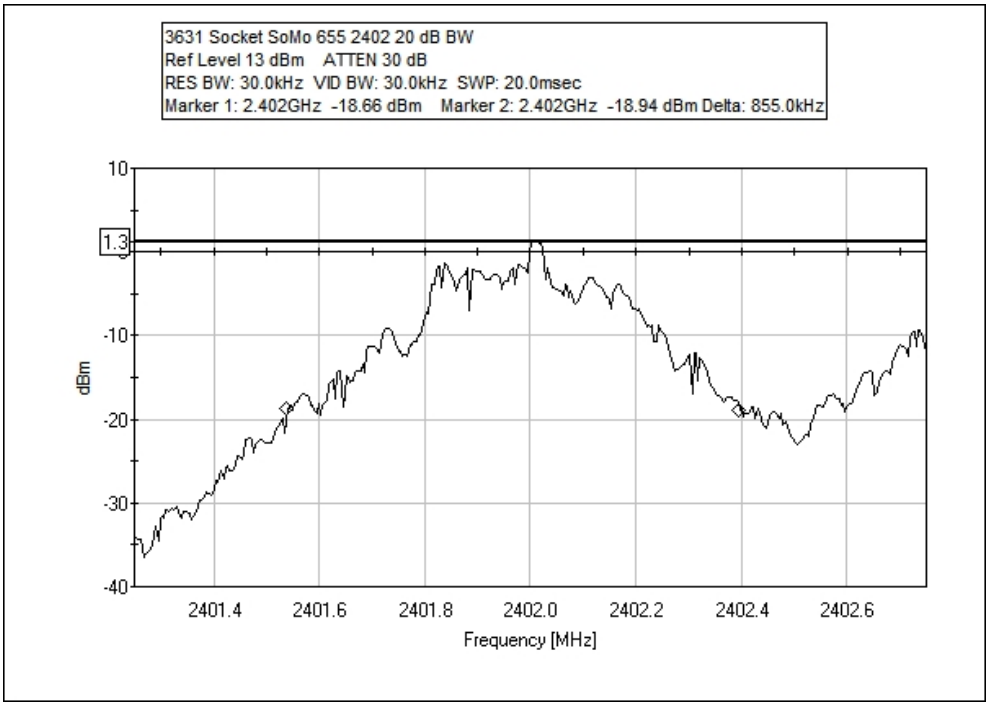
EUT operation mode	Hopping Enabled
EUT channel	
EUT TX power level	Maximum

20 dB BANDWIDTH LIMITS / 99% BANDWIDTH COMPLIANCE

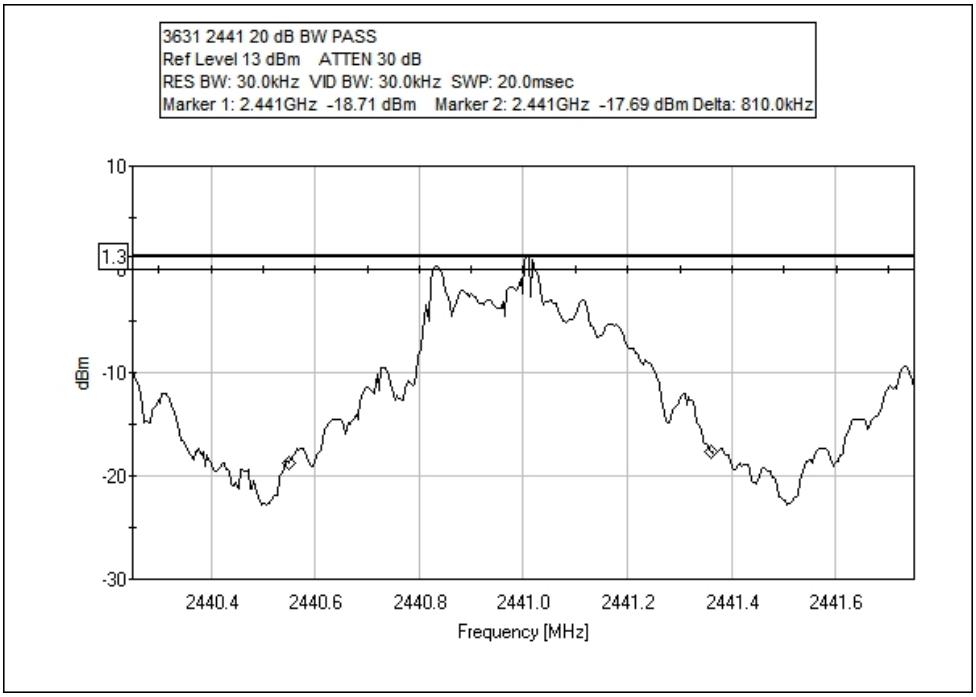
EUT Channel	Limit (MHz)	Test results (MHz)
2402 GFSK		.855
2441 GFSK		.810
2480 GFSK		.855
2402 DQPSK		1.224
2441 DQPSK		1.230
2480 DQPSK		1.223

Freq. Band	Test Type	RBW	VBW
2400 – 2483.5	20 dB BW	30 kHz	30 kHz

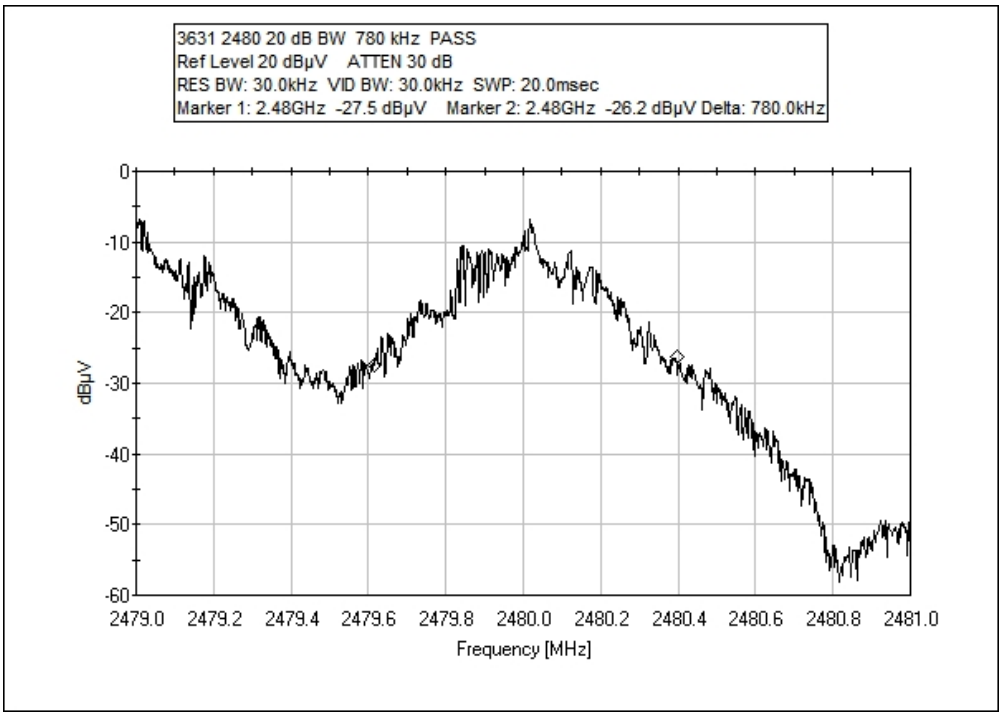
20 dB BW 2402 MHz - GFSK



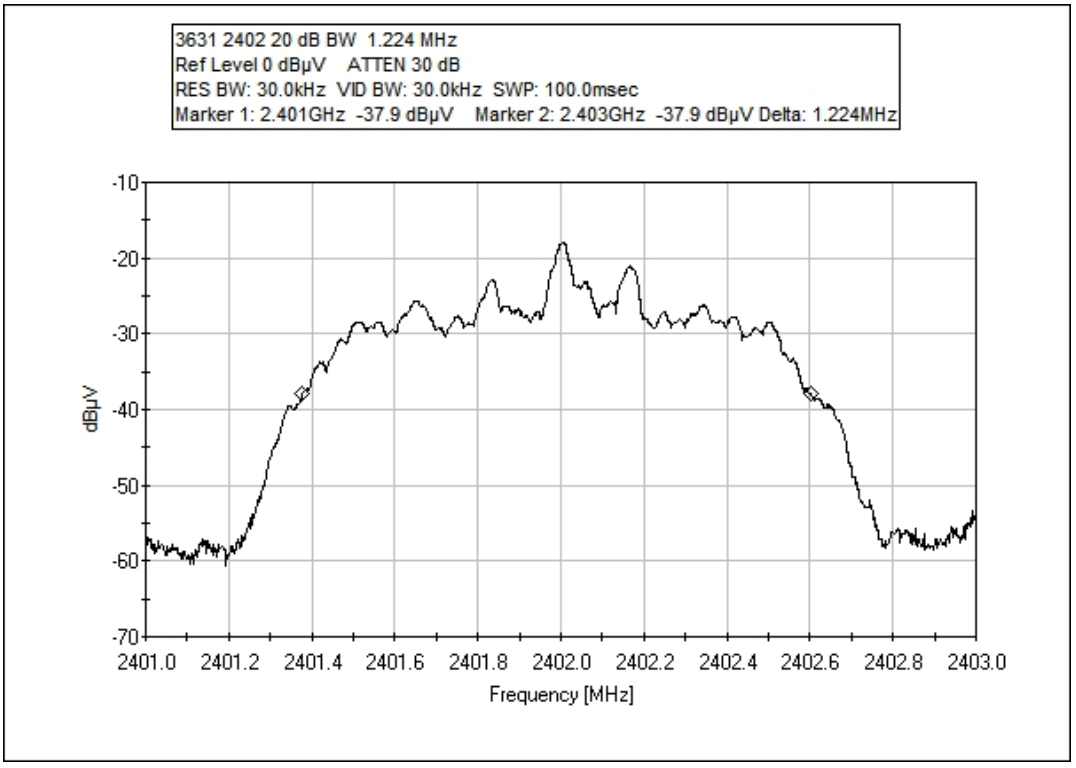
20 dB BW 2441Hz - GFSK



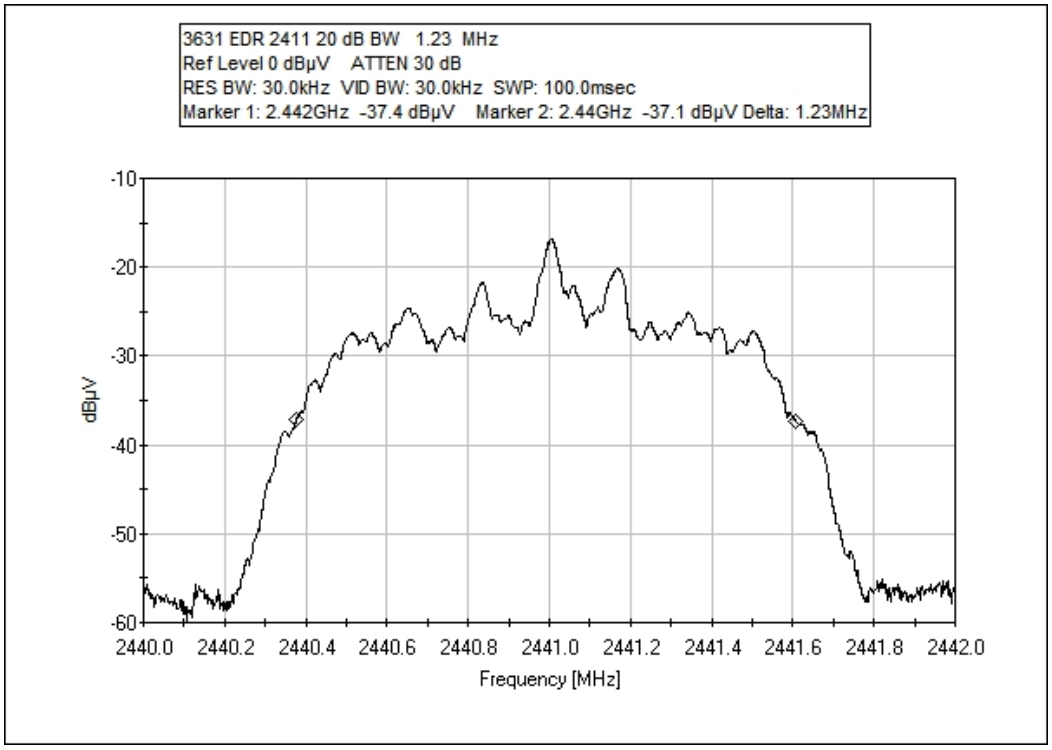
20 dB BW 2480 MHz - GFSK



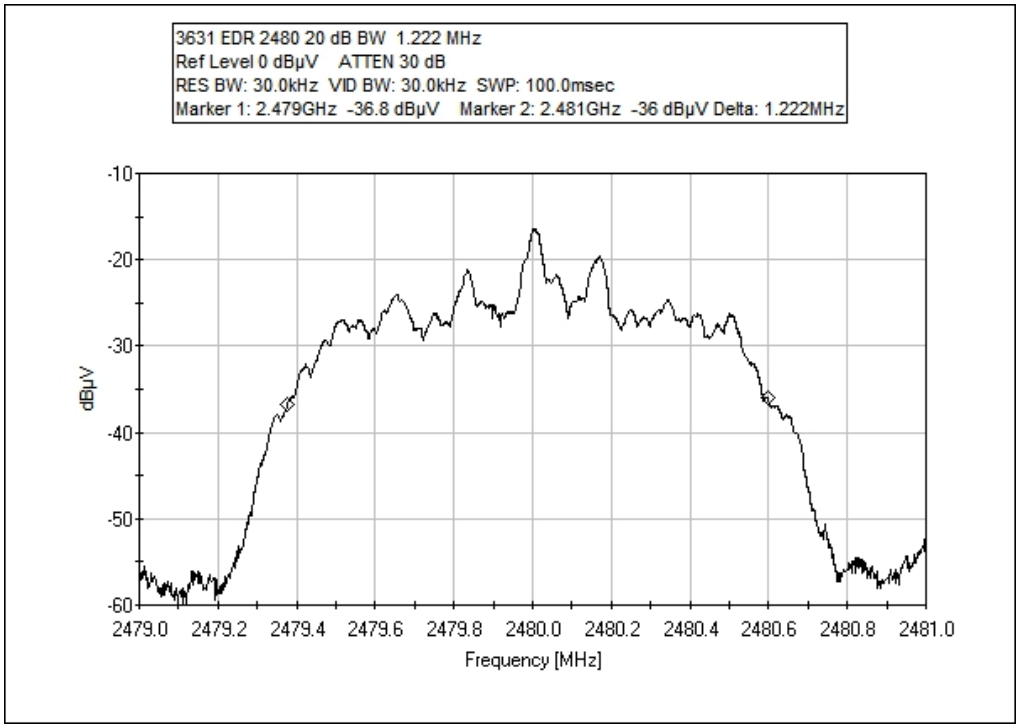
20 dB BW 2402 MHz – DQFSK



20 dB BW 2441Hz – DQFSK



20 dB BW 2480 MHz – DQFSK



6.5 Number of Hopping Frequencies

Requirement(s): CFR47, 15.247(a)(1)(iii), RSS210(A8.1)

Frequency hopping systems in the 2400–2483.5 MHz band shall use at least 15 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. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

Number of Hopping Frequencies

EUT	HANDHELD COMPUTER
Test setup	A (conducted – hopping enabled)
Temp, Humidity, Air Pressure	75º F, 30.92
Date of Measurement	6/2/12
Measured by	Bob Cole
Result	PASSED

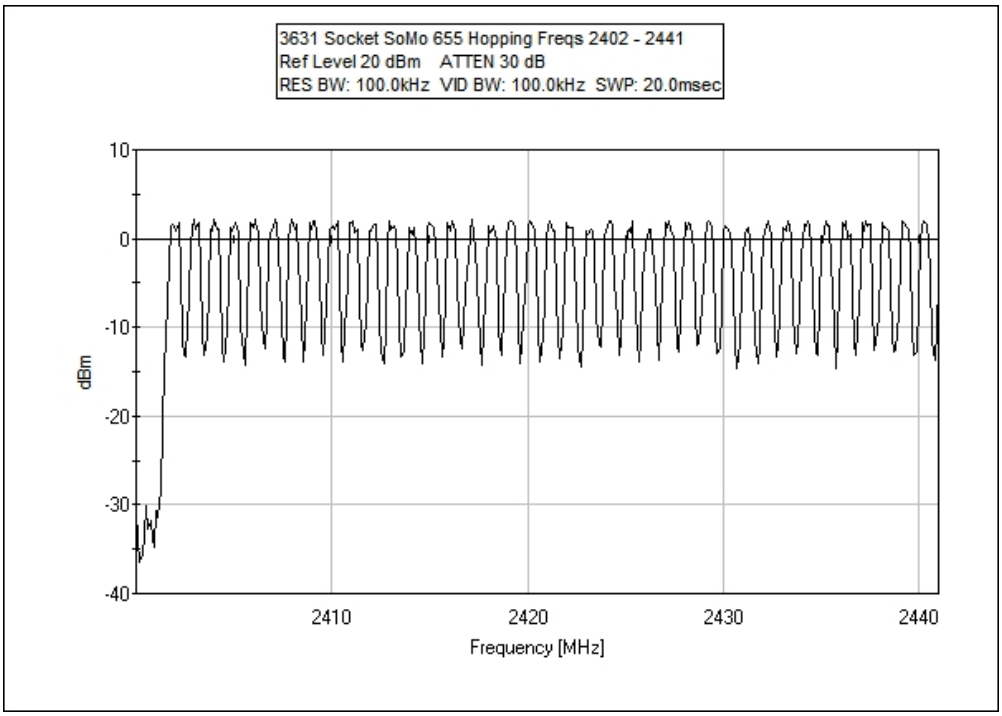
Limits and results

NUMBER OF HOPPING FREQUENCIES

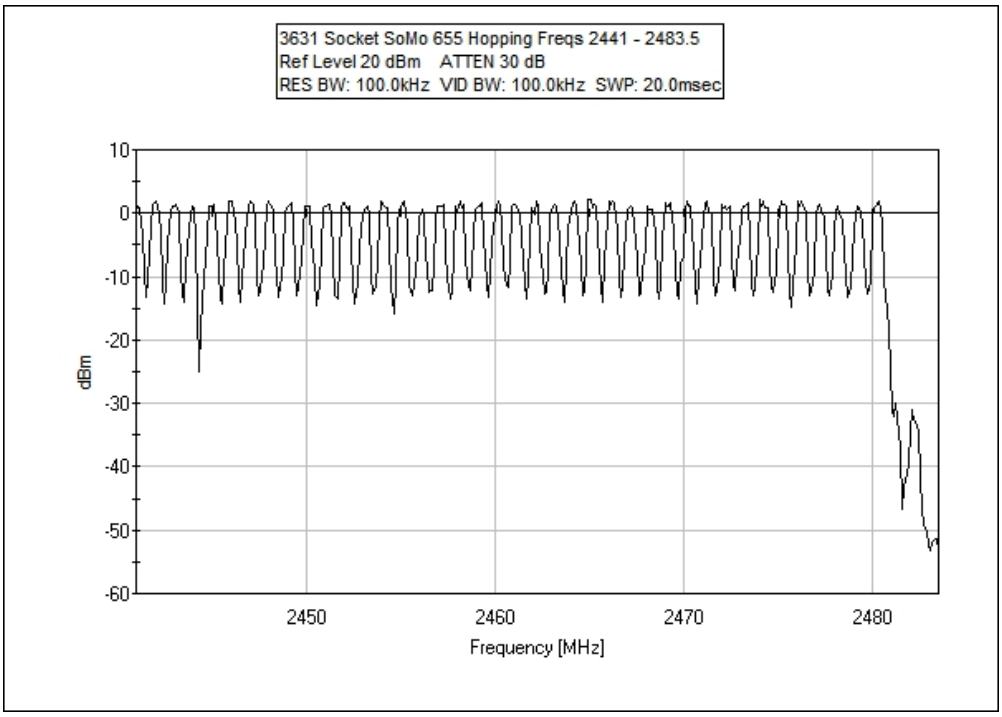
EUT Channel	Limit (MHz)	Test results (MHz)
2-80	>/= 15	79

Freq. Band	Test Type	RBW	VBW
2400 – 2483.5		30 kHz	30 kHz

Number of Hopping Frequencies (2402 – 2441)



Number of Hopping Frequencies (2441 – 2480)



6.6 Time of Occupancy

Requirement(s): CFR47, 15.247(a)(1)(iii), RSS210(A8.1)

Frequency hopping systems in the 2400–2483.5 MHz band shall use at least 15 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. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

Time of Occupancy

EUT	HANDHELD COMPUTER
Test setup	N/A
Temp, Humidity, Air Pressure	N/A
Date of Measurement	N/A
Measured by	Bob Cole
Result	PASSED – see Bluetooth Specification below

Limits and results

Time of Occupancy

EUT Channel	Limit	Test results
Any	400 ms per 30 second of operation	PASSED *See description that follows*

There are five hopping sequences (section 11, Bluetooth Spec. 1.1):

1) A **page hopping sequence** with 32 unique wake-up frequencies distributed equally over the 79 MHz, with a period length of 32; The basic slot time can be 312.5 uS or 625 uS. Min. hop repeat rate = 32*.3125mS = 10mS.
2) A **page response sequence (page scan)** covering 32 unique response frequencies that all are in a one-to-one correspondence to the current page hopping sequence. The master and slave use different rules to obtain the same sequence. The basic slot time can be 312.5 uS or 625 uS and the period is 1.28s.
3) An **inquiry sequence** with 32 unique wake-up frequencies distributed equally over the 79 MHz, with a period length of 32; The basic slot time can be 312.5 uS or 625 uS. Min. hop repeat rate = 32*.3125mS = 10mS.
4) An **inquiry response sequence (inquiry scan)** covering 32 unique response frequencies that all are in a one-to-one correspondence to the current inquiry hopping sequence. The basic slot time can be 312.5 uS or 625 uS and the period is 1.28s.
5) A **channel hopping sequence** which has a very long period length, which does not show repetitive patterns over a short time interval, but which distributes the hop frequencies equally over the 79

MHz during a short time interval; The basic slot time is 625 uS.

Worst case dwell times (largest dwell value) would be found with #5, the Channel Hopping (or data) sequence. The other hopping sequences may short shorter time sequences; however they are not repeated as often and hence have a lower overall dwell or duty cycle.

In normal transactions one may see occasional short periods between a chosen frequency due to inquiry and page scans possibly be interleaved during data transactions. It's my understanding that this would not create a dwell cycle result worse than the Channel hopping or data sequence.

Channel Hopping Sequence (Data sequence) Dwell Calculation

Cycle time for complete hopping sequence of a 79 hop cycle (data transmission mode) =

(1.1) Time slot period * 79 slots = 625uS * 79 = 49.375 mS

See page below from Bluetooth spec. Rev 1.1, section 2, for a depiction of the hopping sequence versus packet size. Figure 2.1 shows a DH1 cycle. Figure 2.2 shows a DH1, DH3 and DH5 sequence (resp.).

Every time slot has a frequency assignment, and the frequency used for a packet remains the same as the slot it started in, if the packet is longer than one time slot.

For a DH1 packet this does not have an impact. The channel selector steps thru the entire list of 79 pseudo-random channels and then start over from the beginning.

For a DH5 (5 Slot packet), the starting frequency will be used for all 5 time slots (f(k) in this example), and 4 following frequencies will not be used during that hopping cycle. Therefore instead of stepping sequential thru the 79 frequency channel list, only every 5th channel is used. Each time the 79 frequency channel list is started, is it a new randomized list of 79 channels. The probability that it will use the same frequency channel in the next list is 1/5.

Therefore even though the DH5 is at one frequency for 5 times longer than a DH1 packet, it repeats itself 1/5 as often, with the effective dwell time (averaged over a long period over a long period of time – for instance the 30 sec FCC dwell test) being the same.

For the "duty cycle correction factor", my "read" of the FCC doc says that one should take the "worst" 100mS period found, in contrast to the average 30 sec dwell time just mentioned. As a result the DH1 and DH5 numbers for the 100 mS dwell case will be different. For a worst case DH5 packet sequence, the same frequency channel could appear in two successive 79 channel sequences.

DH1 calculation: DH1 uses 1 time slot of 0.625 mS per hopping cycle.

Dwell time per 100mS – since one 79 hop sequence is approx 50mS, there will be approx. two hop sequences in 100 mS (more accurately 100/49.375).

(1.2) DH1 dwell time = 0.625 mS * (100ms/49.375mS) = 1.26 mS (per 100 mS)

DH5 calculation: DH5 uses 5 time slots of 0.625 mS per hopping cycle.

Dwell time per 100mS – since one 79 hop sequence is approx 50mS and there could be two appearances of a frequency channel in 100 mS (more accurately 100mms/49.375ms).

(1.3) DH5 dwell time =5* 0.625 mS * (100ms/49.375mS) = 6.3 mS (per 100 mS)

Using the FCC duty cycle correction factor:

(1.4) DH1 Dwell correction =
20 log (DH1 dwell time/100mS) = 20 log (0.0126) = -38 dB

(1.5) DH5 Dwell correction =
20 log (DH5 dwell time/100mS) = 20 log (0.0633) = -24 dB

Therefore the worst case duty cycle adjustment condition will be for the DH5 packet.

The calculation shows us that we can subtract 24 dB from our 2nd harmonic measurement to compensate for this duty cycle adjustment.

6.7 Peak Output Power

Requirement(s): CFR47, 15.247(b)(1), RSS210(A8.4)

The maximum peak conducted output power of the intentional radiator shall not exceed the following:

For frequency hopping systems operating in the 2400–2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725–5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400–2483.5 MHz band: 0.125 watts.

Peak Output Power

EUT	HANDHELD PC
Test setup	A (conducted)
Temp, Humidity, Air Pressure	67º F, 30.97
Date of Measurement	5/26/12
Measured by	Bob Cole
Result	PASSED

- The EUT was set to low, mid, and high channels at maximum RF Power output. The spectrum analyzer was connected directly to the antenna output.
- Conducted Emissions Measurement Uncertainty: The uncertainty of the measurement with a confidence factor of approx. 95% (normal distribution) with a coverage factor of 2, in the range of 30 MHz – 26.2 GHz, is +/- 1.5 dB

PEAK OUTPUT POWER – Bluetooth GFSK
dBuV – dBm conversion: -107 dB

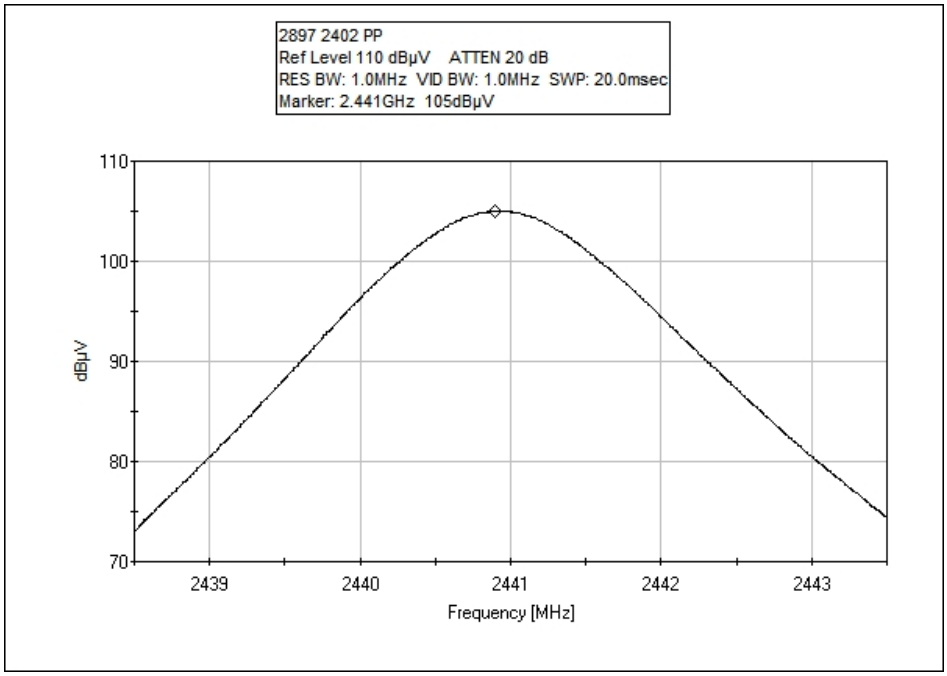
EUT Channel Info	Limit (dBm)	Test results (dBm)
2402	30.0	-2.0
2441	30.0	-2.0
2480	30.0	-0.8

PEAK OUTPUT POWER – Bluetooth DQPSK

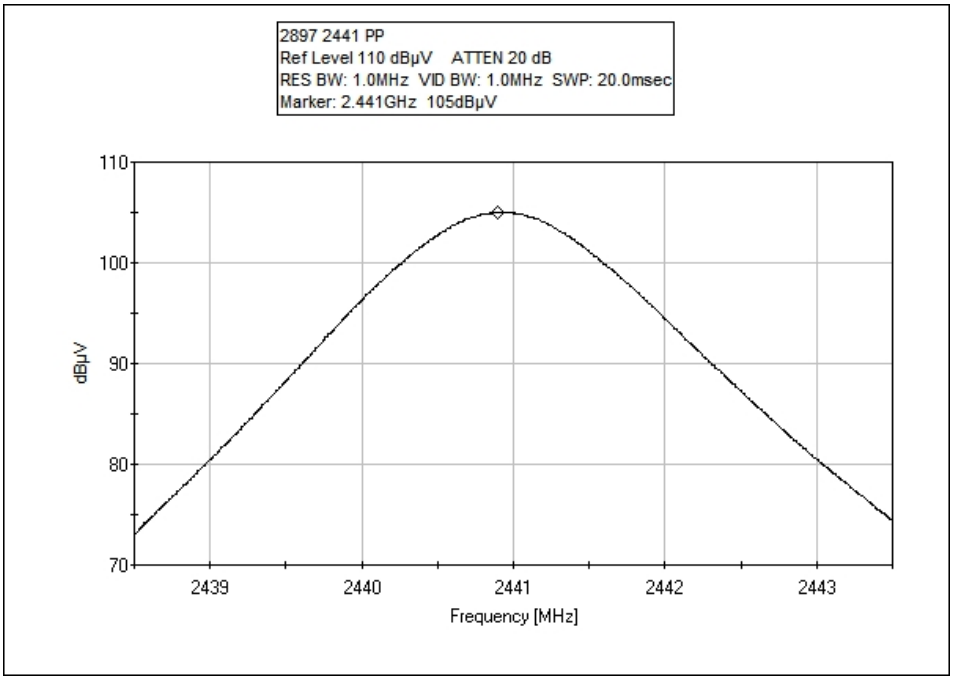
EUT Channel Info	Limit (dBm)	Test results (dBm)
2402	30.0	1.0
2441	30.0	0.6
2480	30.0	0.1

Freq. Band	Test Type	RBW	VBW
2402 – 2480	GFSK Peak Power	1 MHz	1 MHz
2402 – 2480	DQPSK Peak Power	3 MHz	3MHz

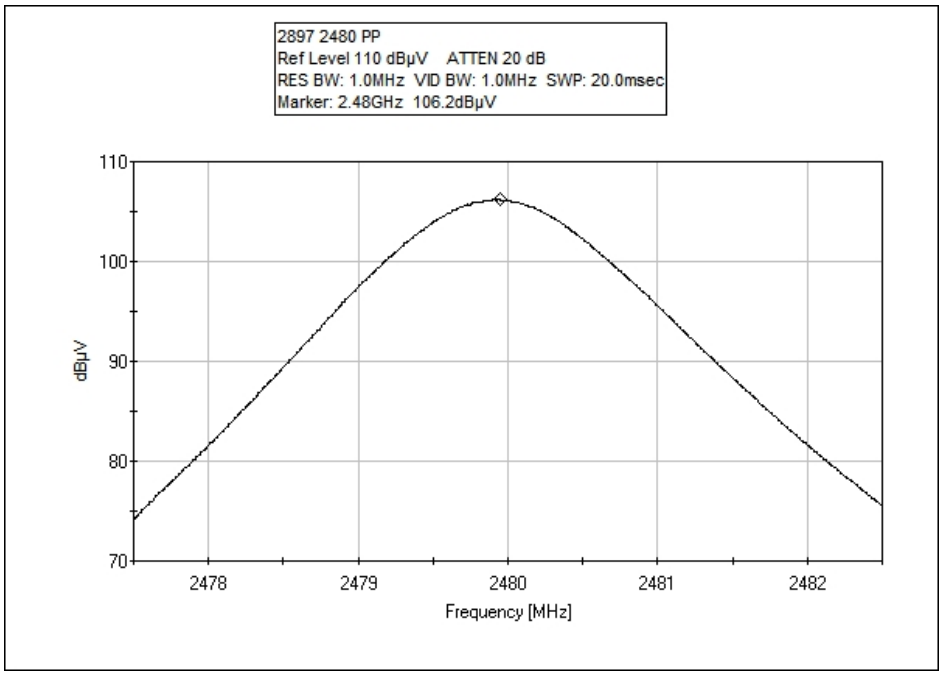
Peak Output Power 2402 MHz - GFSK



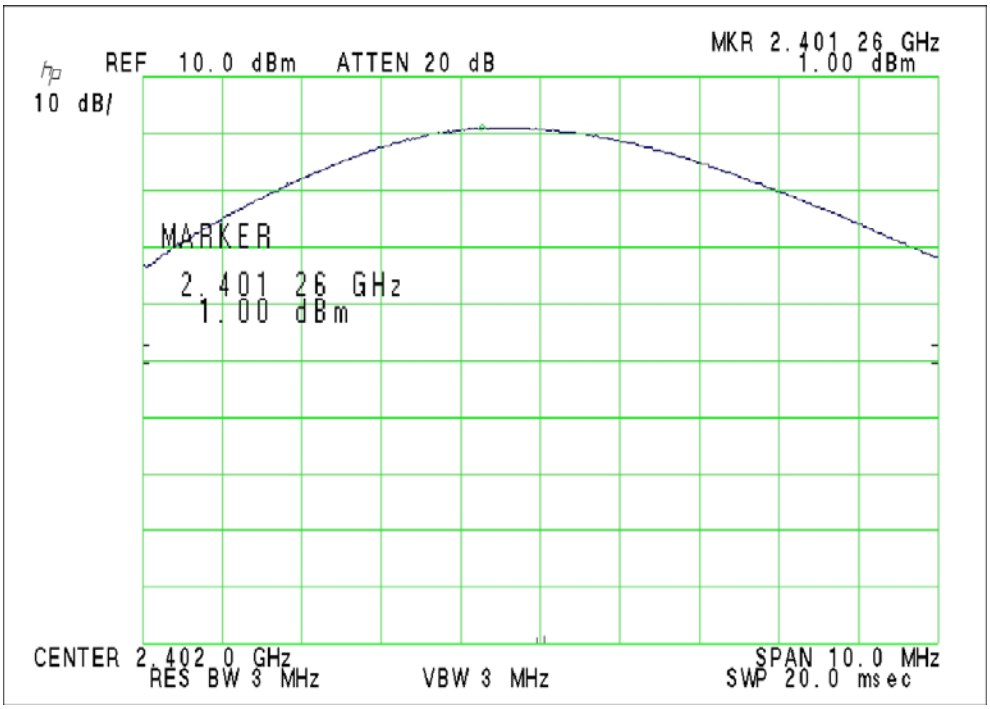
Peak Output Power 2441 MHz - GFSK



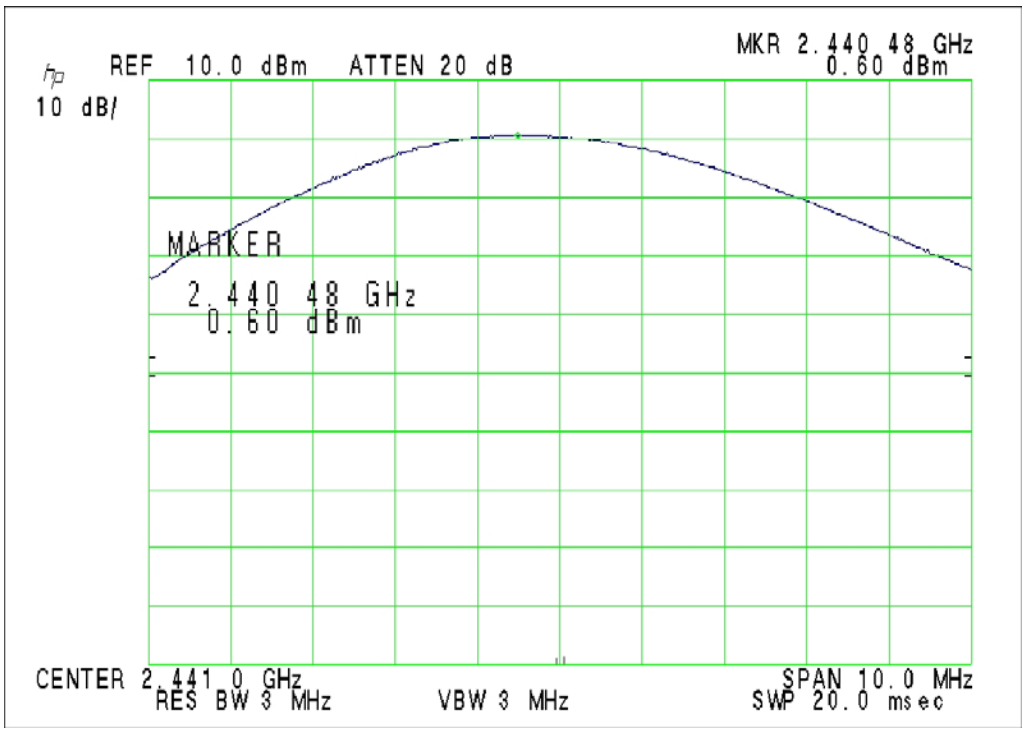
Peak Output Power 2480 MHz - GFSK



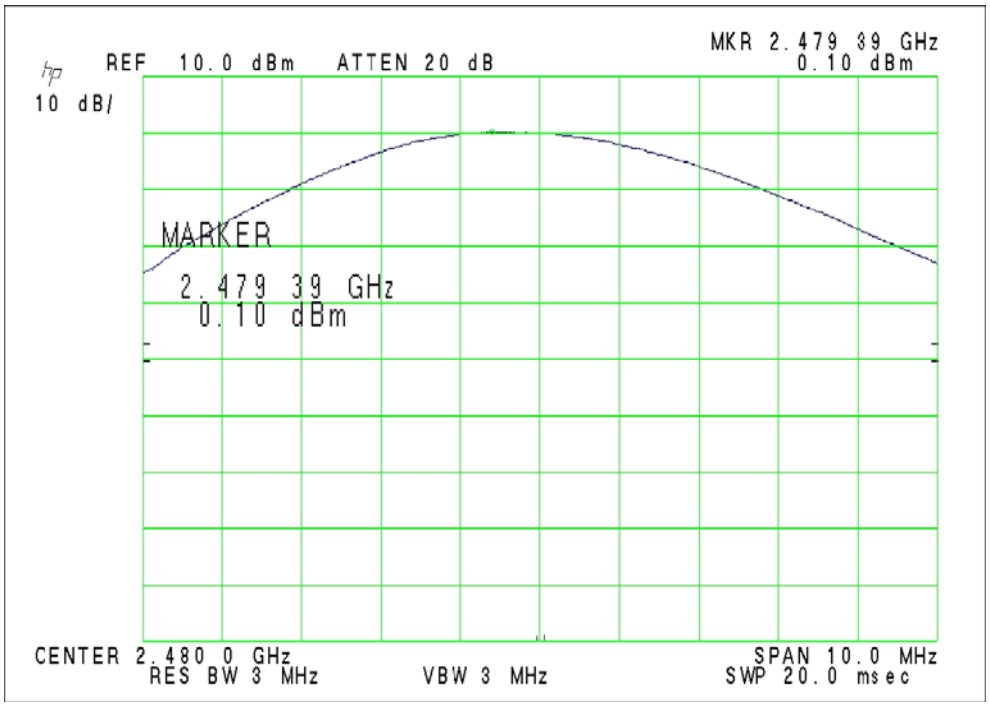
Peak Output Power 2402 MHz – DQPSK



Peak Output Power 2441 MHz - DQPSK



Peak Output Power 2480 MHz – DQPSK



6.8 ANTENNA CONDUCTED SPURIOUS EMISSIONS

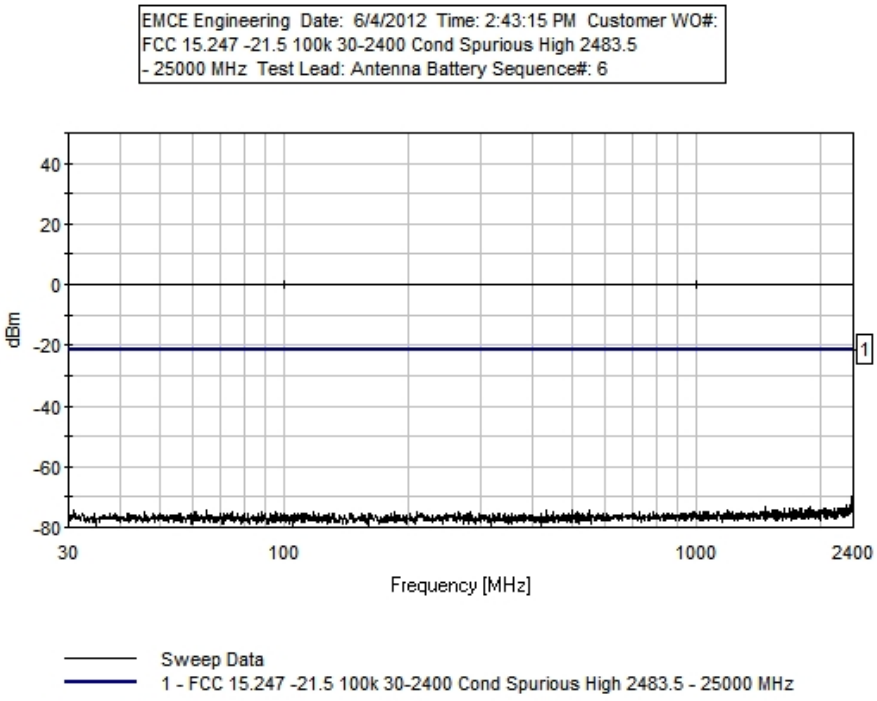
EUT	HANDHELD PC
Test setup	A (conducted)
Temp, Humidity, Air Pressure	67° F, 30.97
Date of Measurement	6/4/12
Measured by	Bob Cole
Result	PASSED

Requirement: CFR47, 15.247(d), RSS210(A8.5)

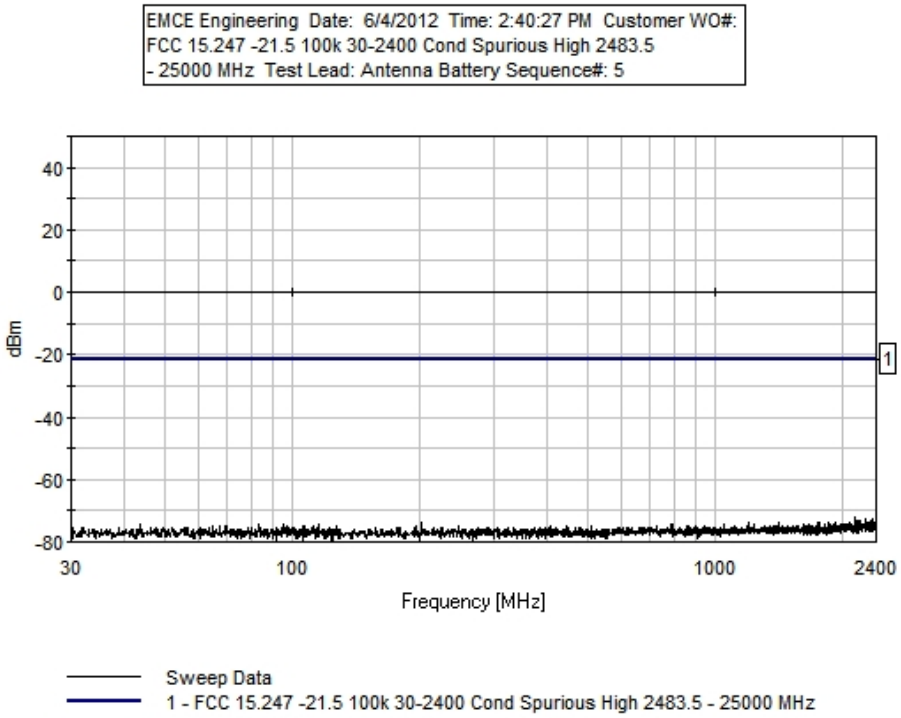
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits.

Freq. Band	Test Type	RBW	VBW
2400 – 2483.5	15.247(d)	100 kHz	100 kHz

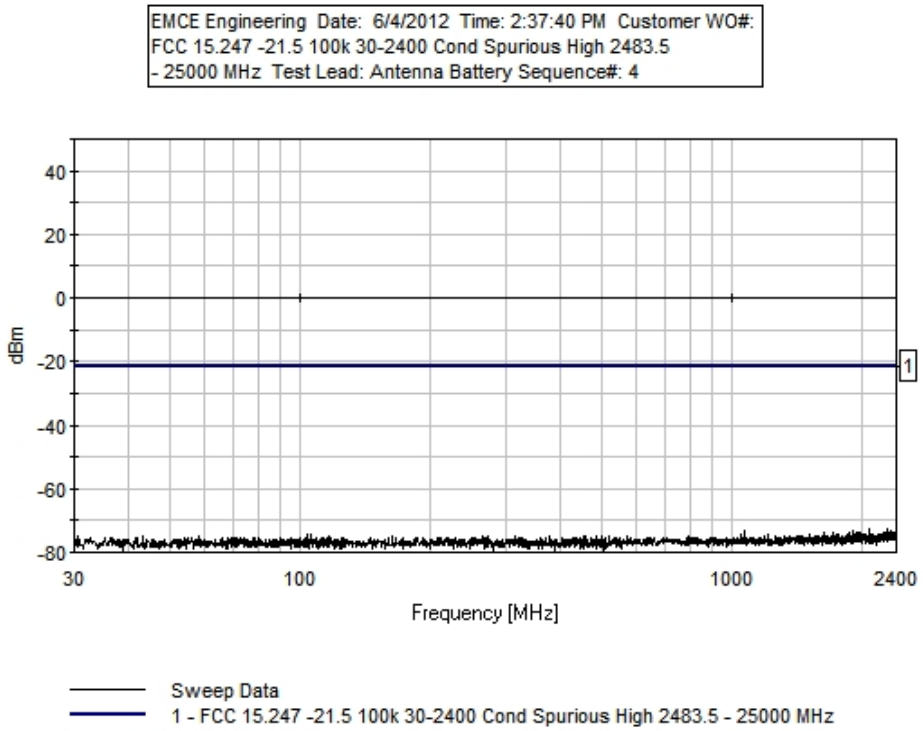
30 – 2400 MHz Transmit Frequency: 2402 MHz



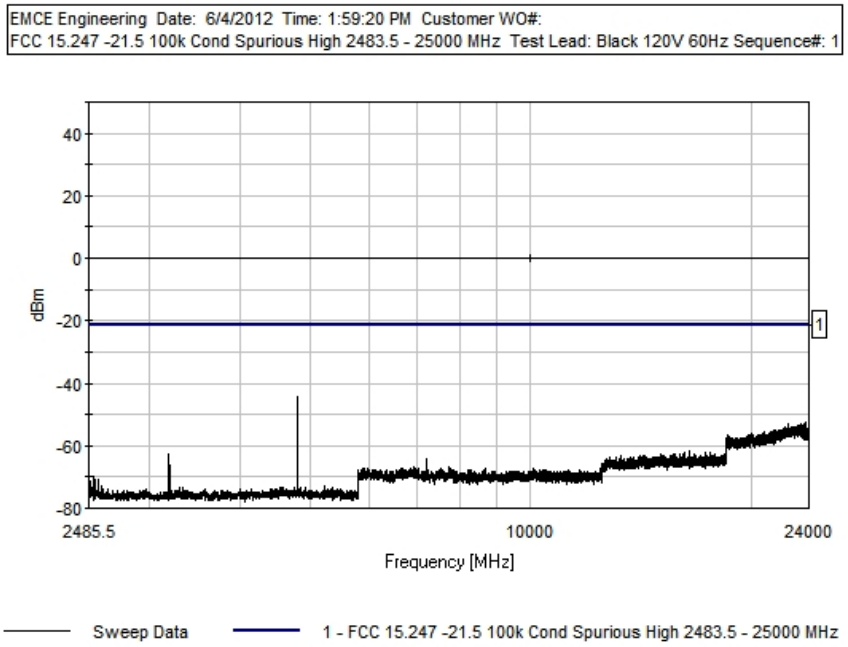
30 – 2400 MHz Transmit Frequency: 2441 MHz



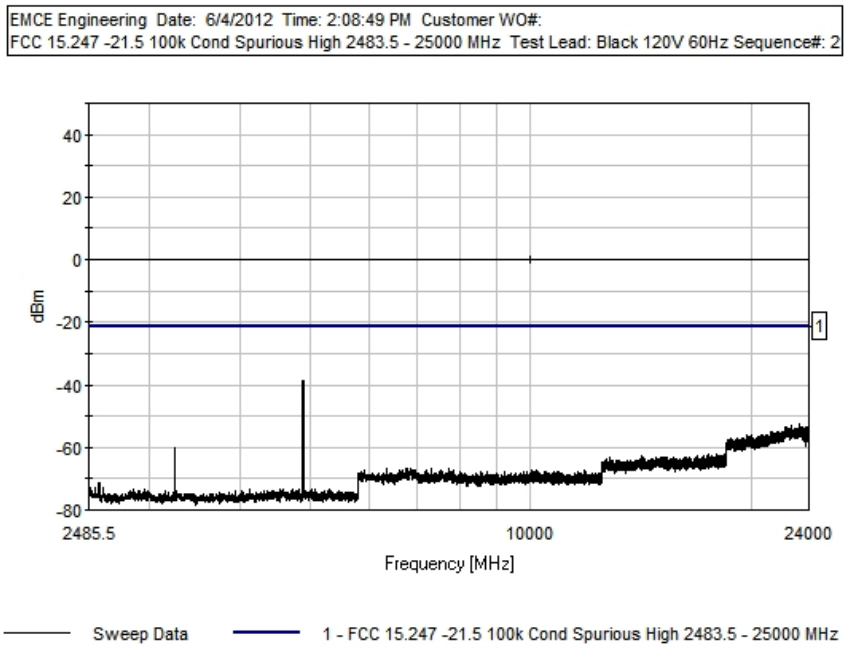
30 – 2400 MHz Transmit Frequency: 2480 MHz



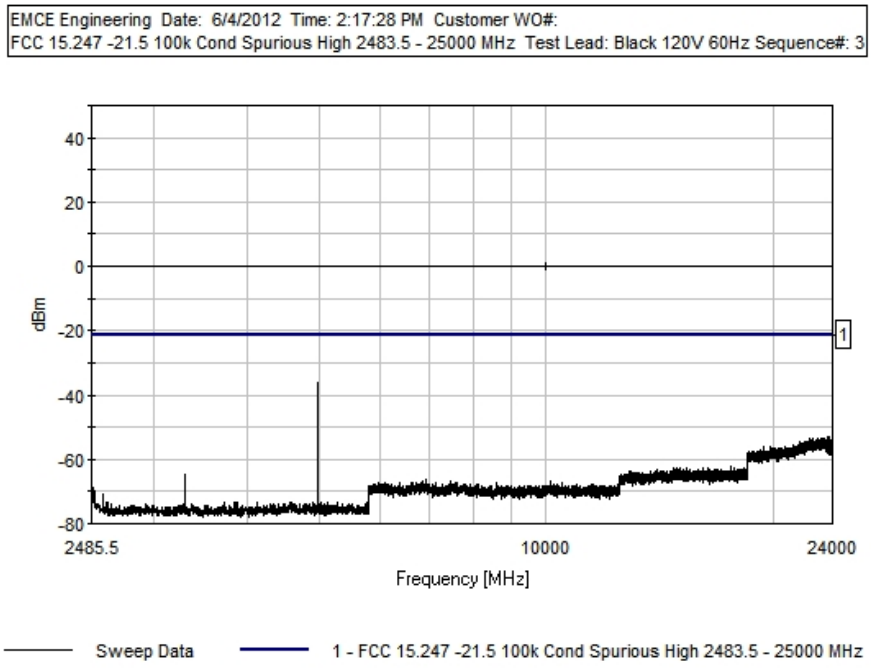
2483.5 – 25000 MHz Transmit Frequency: 2402 MHz



30 – 2400 MHz Transmit Frequency: 2441 MHz



2483.5 – 25000 MHz Transmit Frequency: 2480 MHz



6.9 Radiated Emissions – Restricted Bands

Requirement(s): CFR47, 15.247(d), 15.209, RSS210(2.2, A8.5)

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

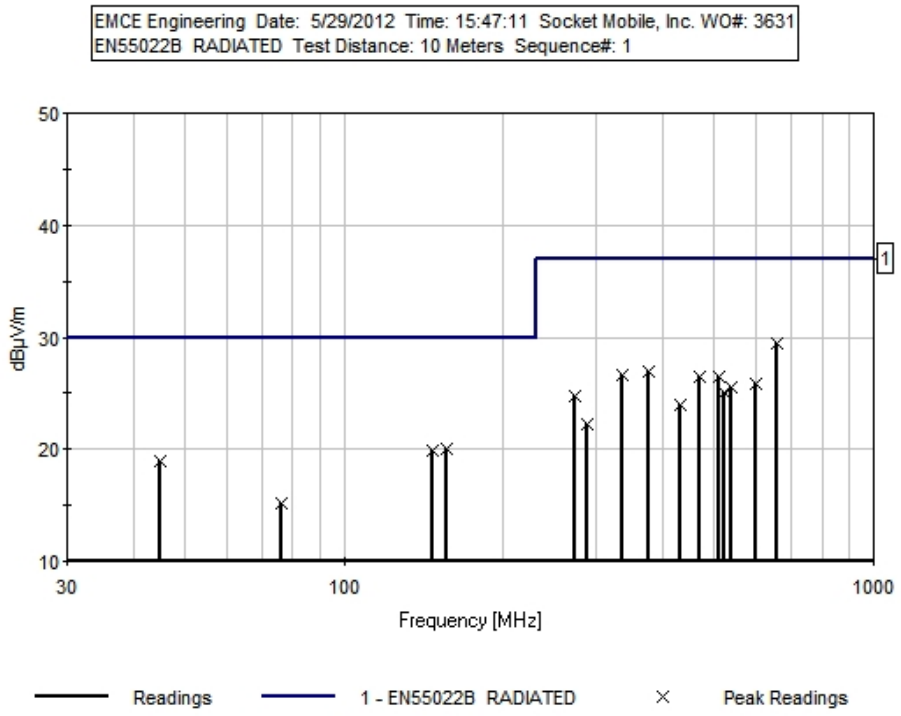
Restricted Band Measurements

EUT	HANDHELD PC
Test setup	B (Radiated)
Temp, Humidity, Air Pressure	68º F, 30.02
Date of Measurement	12/21/09
Measured by	Bob Cole
Result	PASSED

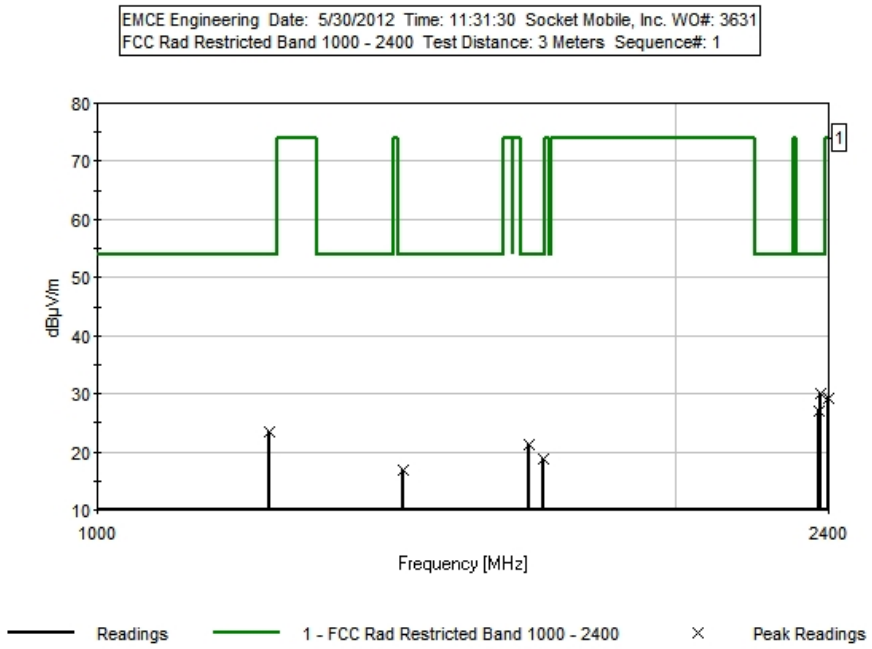
Restricted Band Measurements were taken, using a Peak detector, over the frequency band of 30 - 1000 MHz, and using an Average Detector over the bands of 1000 – 2400 MHz, and 2483.5 – 25000 MHz, in both horizontal and vertical polarizations. All measurements were repeated with the EUT operating at 2402, 2441, and 2480 MHz. Worst case data is presented in this report.

Freq. Band	Test Type	RBW	VBW
30 - 1000	Peak	120kHz	100kHz
1000 - 25000	Peak	1MHz	1 MHz
1000 - 25000	Average	1 MHz	10 Hz

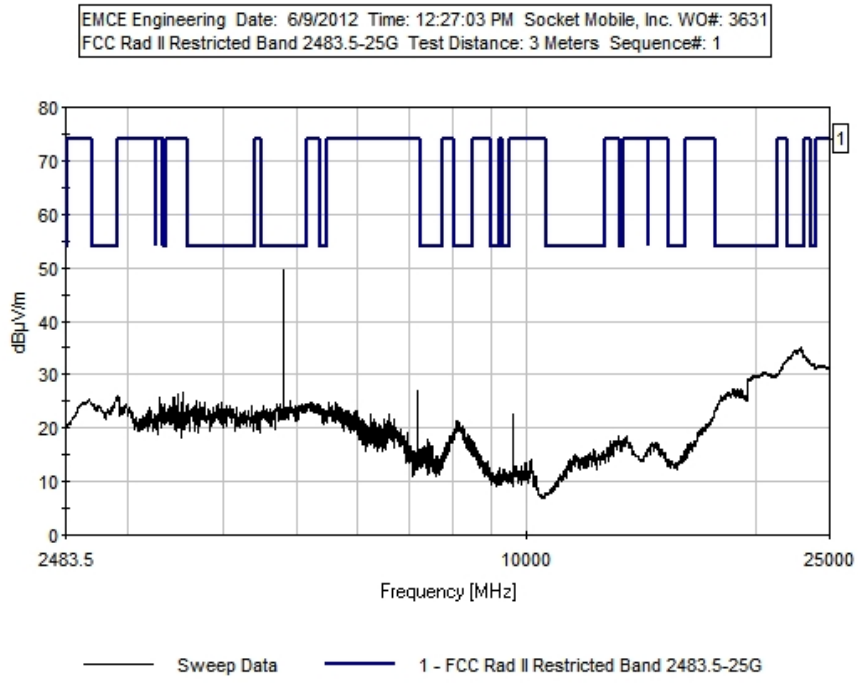
Restricted Band Spurious Radiated Emissions Transmit Frequency 2402 MHz 30 - 1000 MHz Quasi - PEAK DETECTOR [DQPSK]



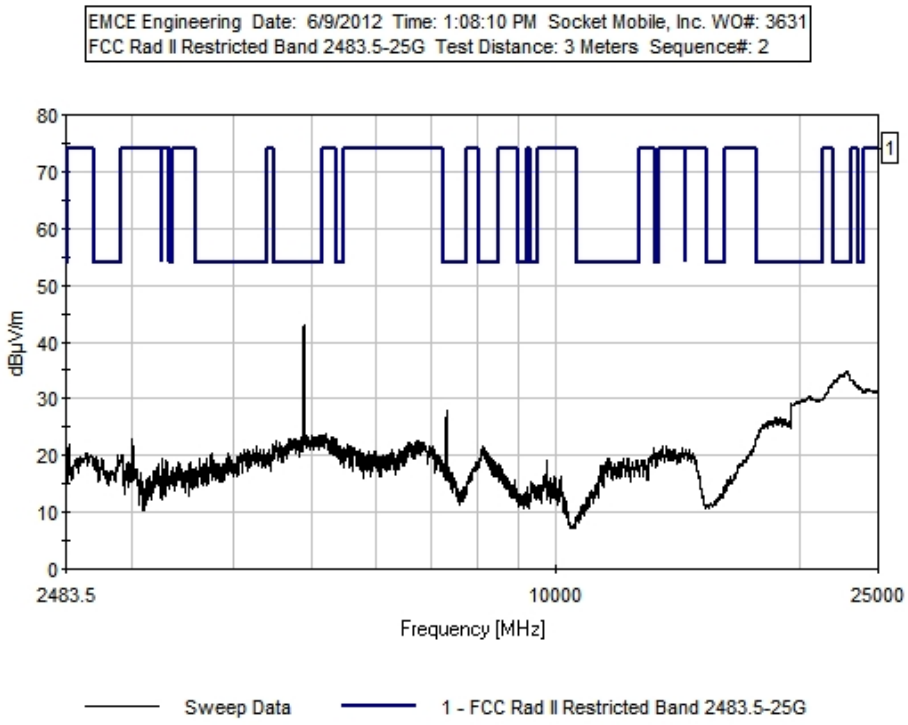
Restricted Band Spurious Radiated Emissions Transmit Frequency 2402 MHz 1000 - 2400 MHz AVERAGE DETECTOR [GFSK]



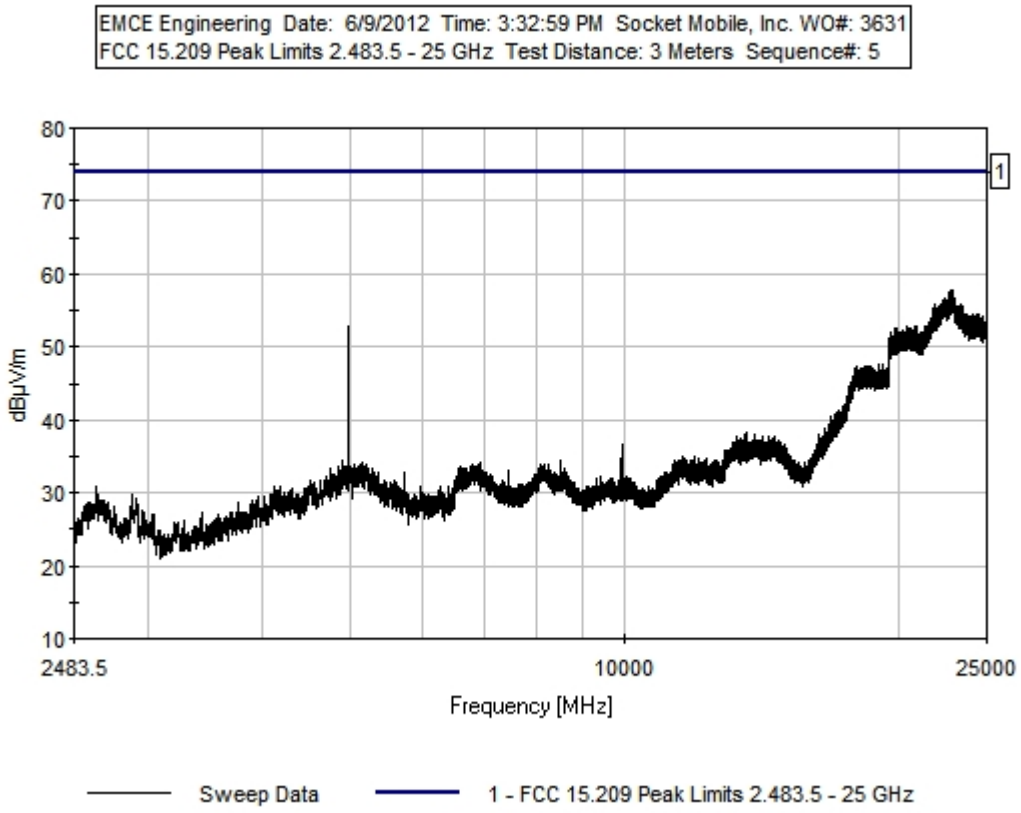
Restricted Band Spurious Radiated Emissions Transmit Frequency 2402 MHz 2483.5 - 25000 MHz [GFSK]



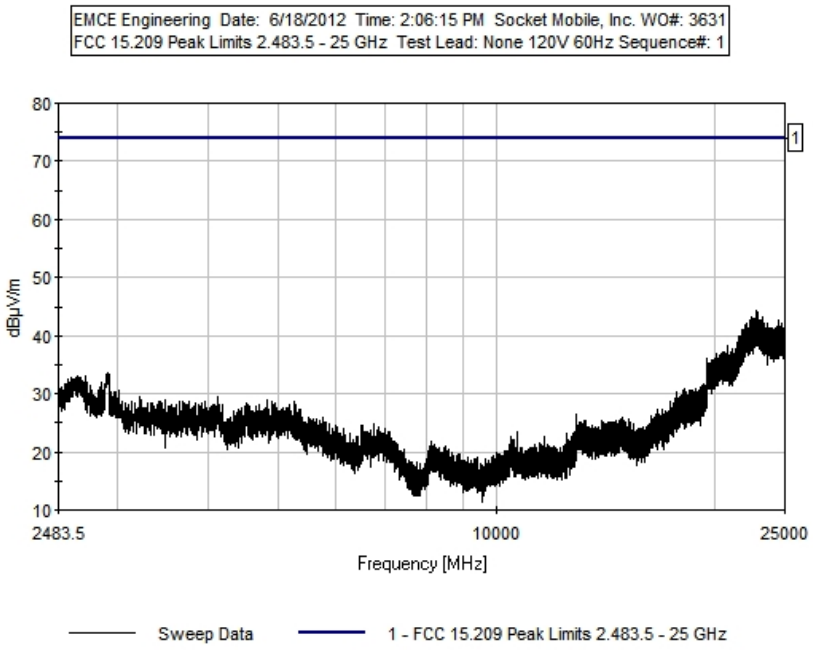
Restricted Band Spurious Radiated Emissions Transmit Frequency 2441 MHz 2483.5 - 25000 MHz [GFSK]



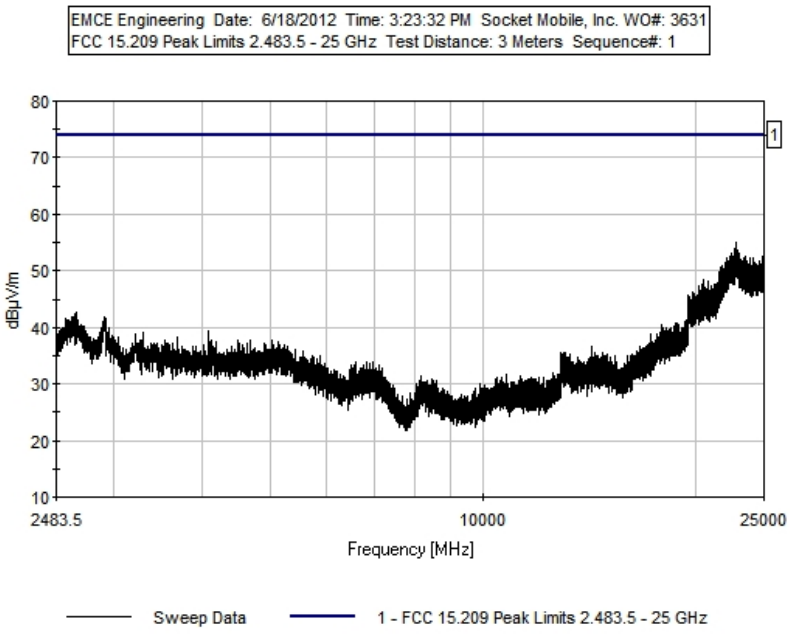
Restricted Band Spurious Radiated Emissions Transmit Frequency 2480 MHz 2483.5 - 25000 MHz [GFSK]



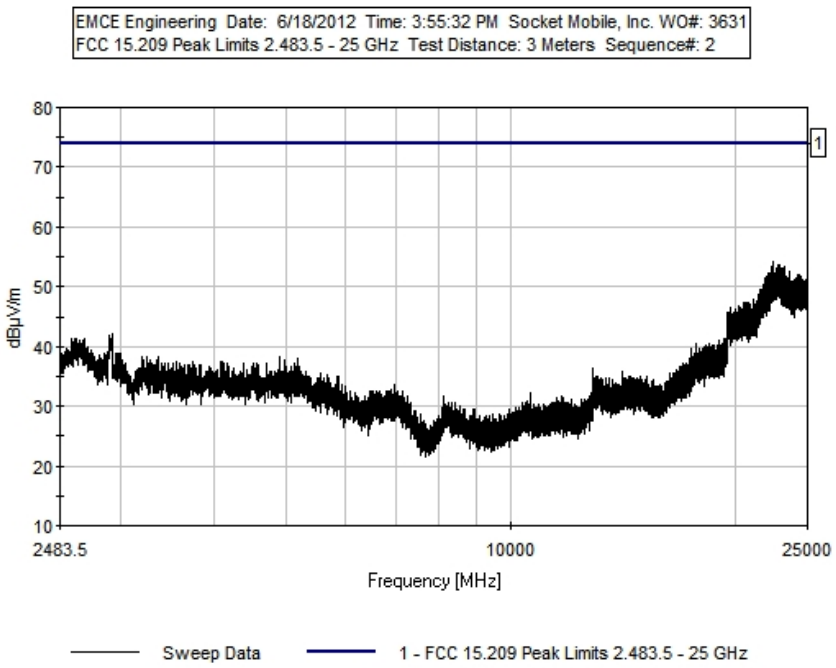
Restricted Band Spurious Radiated Emissions Transmit Frequency 2402 MHz 2483.5 - 25000 MHz [DQPSK]



Restricted Band Spurious Radiated Emissions Transmit Frequency 2441 MHz 2483.5 - 25000 MHz [DQPSK]



Restricted Band Spurious Radiated Emissions Transmit Frequency 2480 MHz 2483.5 - 25000 MHz [DQPSK]



BAND-EDGE COMPLIANCE

Band-Edge compliance [CFR 47, 15.247c(1) and RSS-210 6.2.2(o)]

EUT	**HANDHELD COMPUTER**
Temp, Humidity, Air Pressure	59º F, 30.72
Date of Measurement	6/5/12
Test Method	DA 00-705
Measured by	Bob Cole
Result	PASSED

EUT operation mode

EUT operation mode	Hopping Enabled / Disabled
EUT channel	2, 80
EUT TX power level	Maximum

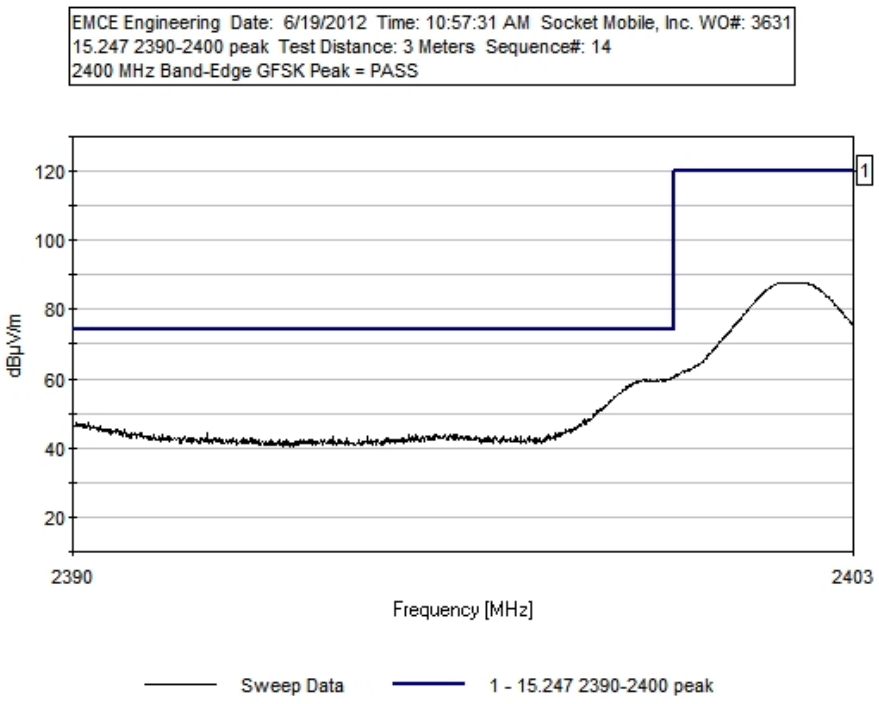
Limits and results

BAND-EDGE COMPLIANCE

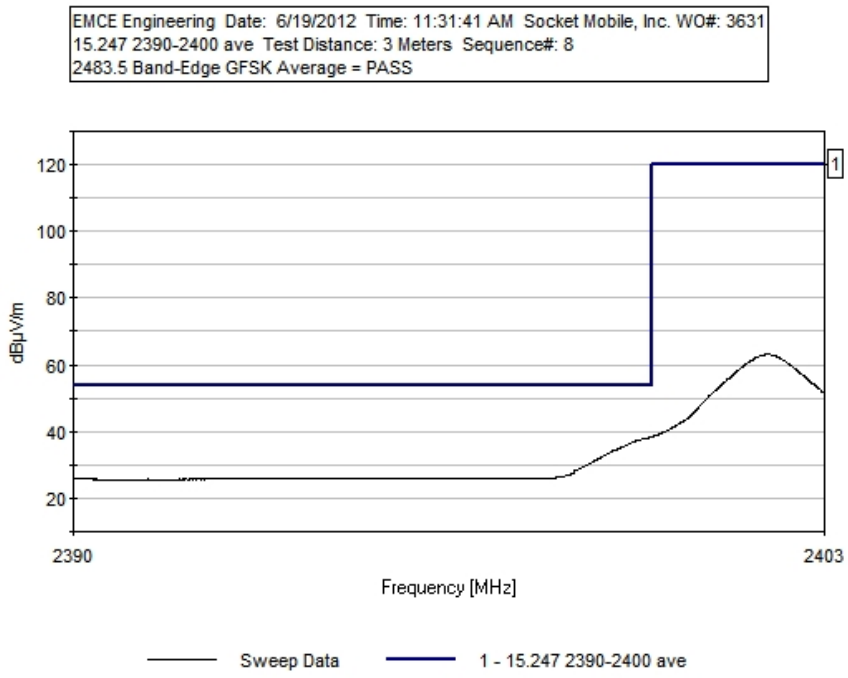
Channel	Limit (dBuV)	Results
GFSK 2	Average 54	PASS
GFSK 2	Peak 74	PASS
GSFK 80	Average 54	PASS
GFSK 80	Peak 74	PASS
DQPSK 2	Average 54	PASS
DQPSK 2	Peak 74	PASS
DQPFK 80	Average 54	PASS
DQPSK 80	Peak 74	PASS

Freq. Band	Test Type	RBW	VBW
1000 - 25000	Peak	1MHz	1 MHz
1000 - 25000	Average	1 MHz	10 Hz
1000 - 25000	Delta	100 kHz	100 kHz

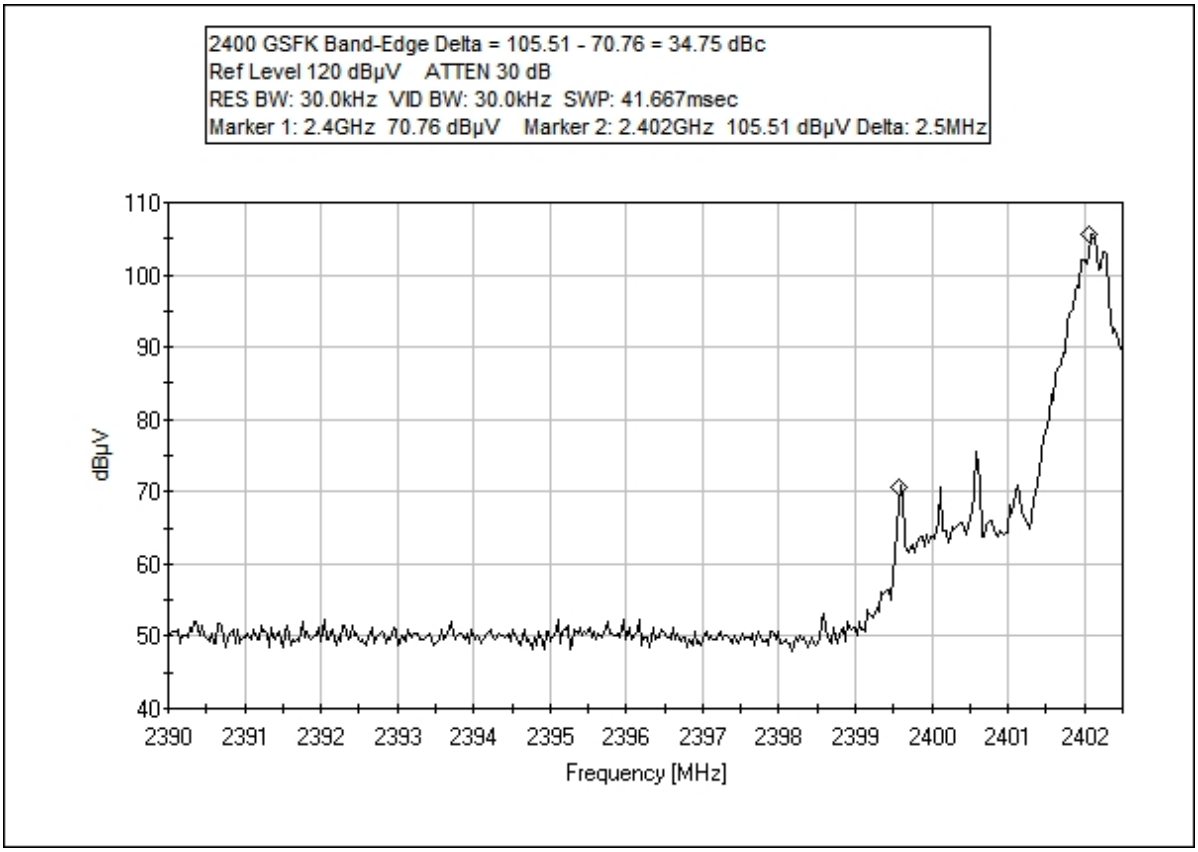
GSFK 2400 MHz Band-Edge Compliance (Peak)



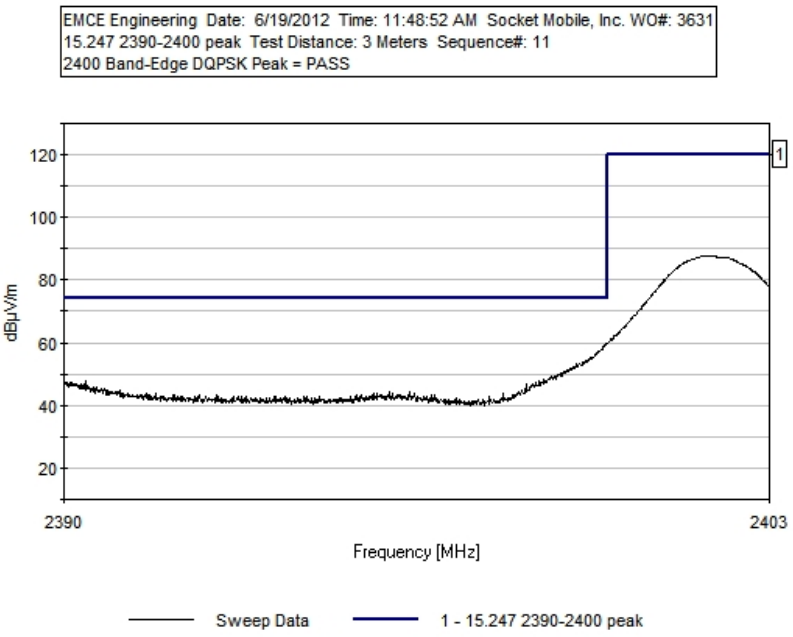
GSFK 2400 MHz Band-Edge Compliance (Average)



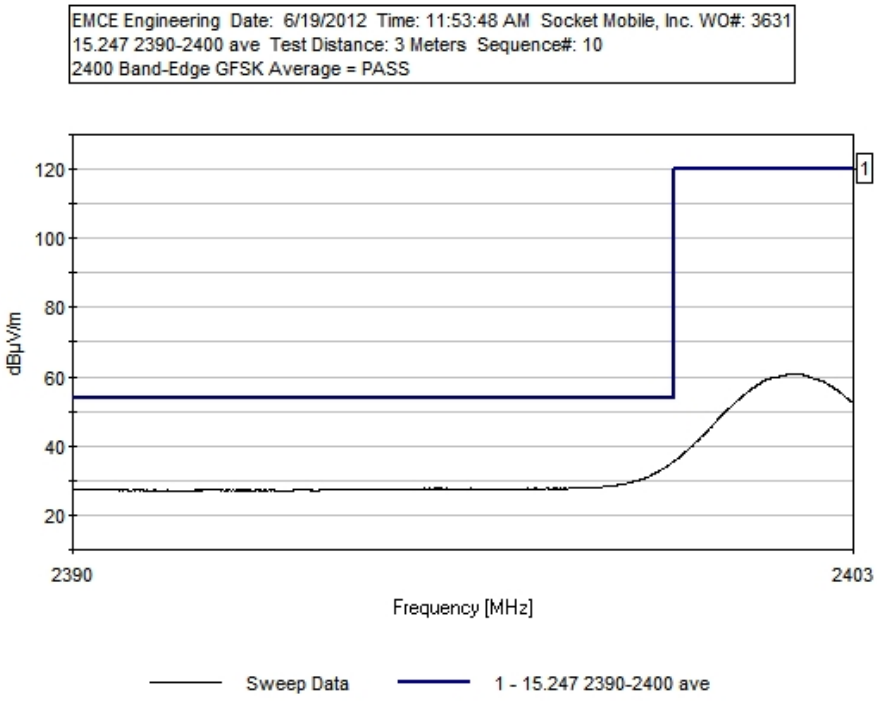
GSFK 2400 MHz Band-Edge Compliance (Delta)



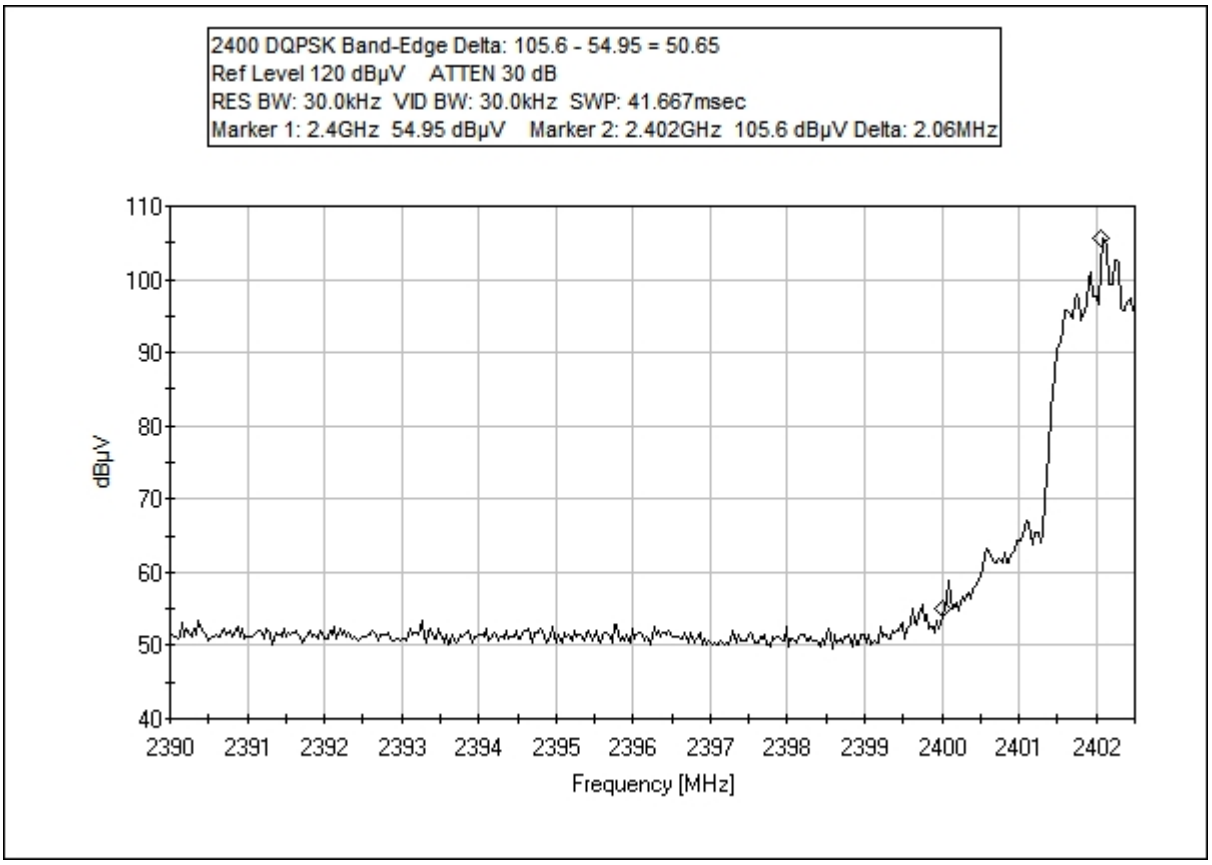
DQPSK 2400 MHz Band-Edge Compliance (Peak)



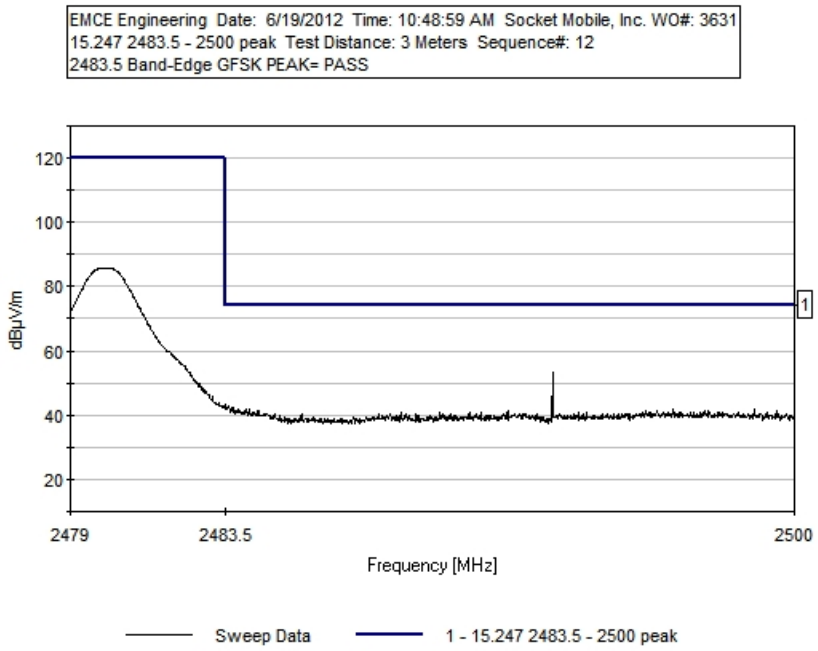
DQPSK 2400 MHz Band-Edge Compliance (Average)



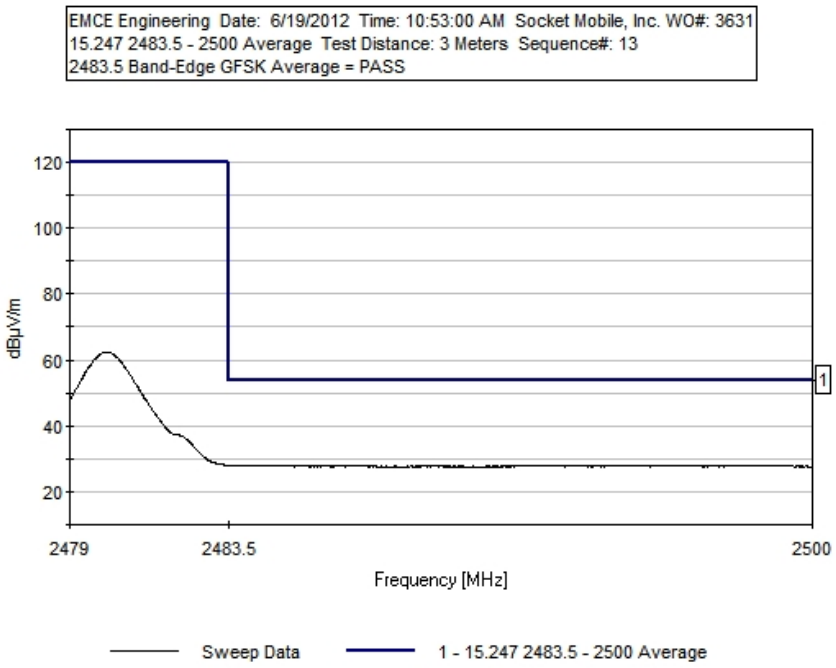
DQPSK 2400 MHz Band-Edge Compliance (Delta)



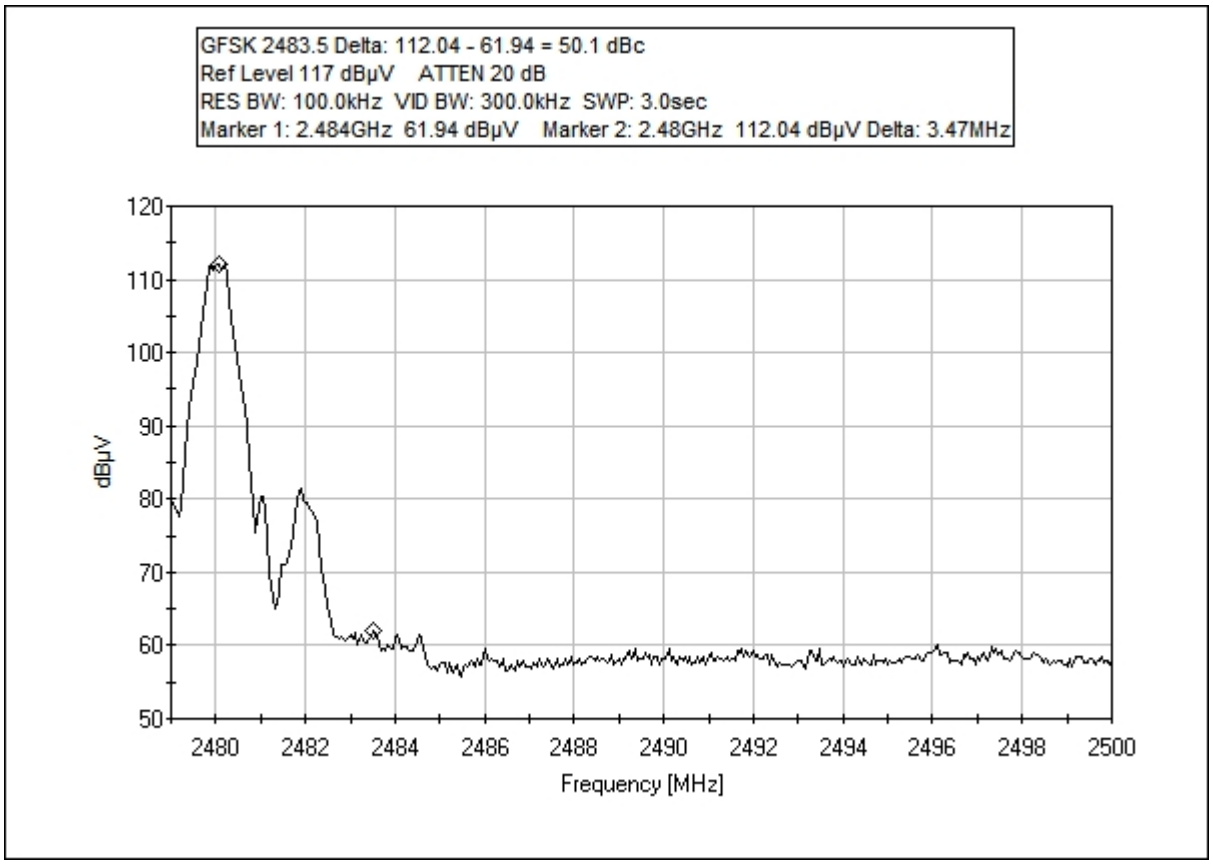
GSFK 2483.5 MHz Band-Edge Compliance (Peak)



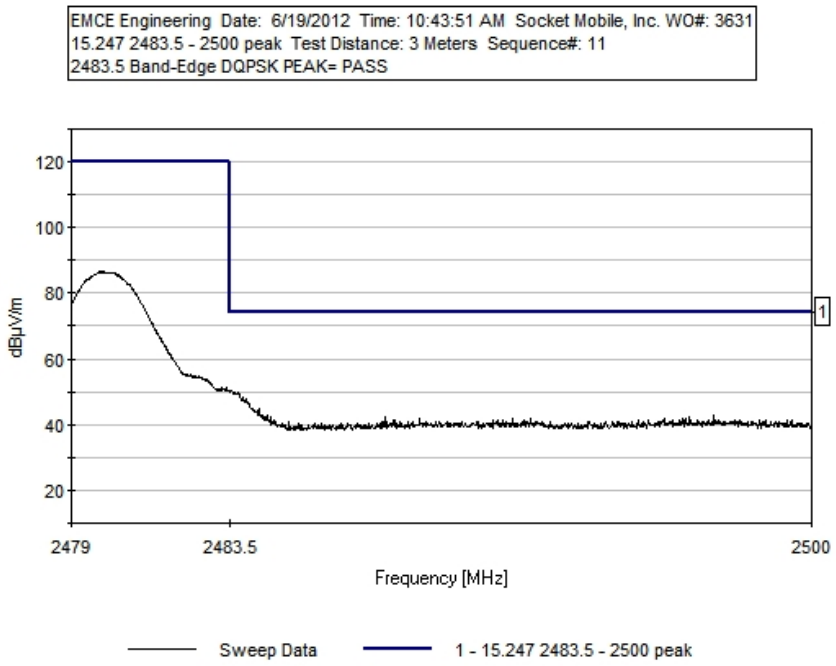
GSFK 2483.5 MHz Band-Edge Compliance (Average)



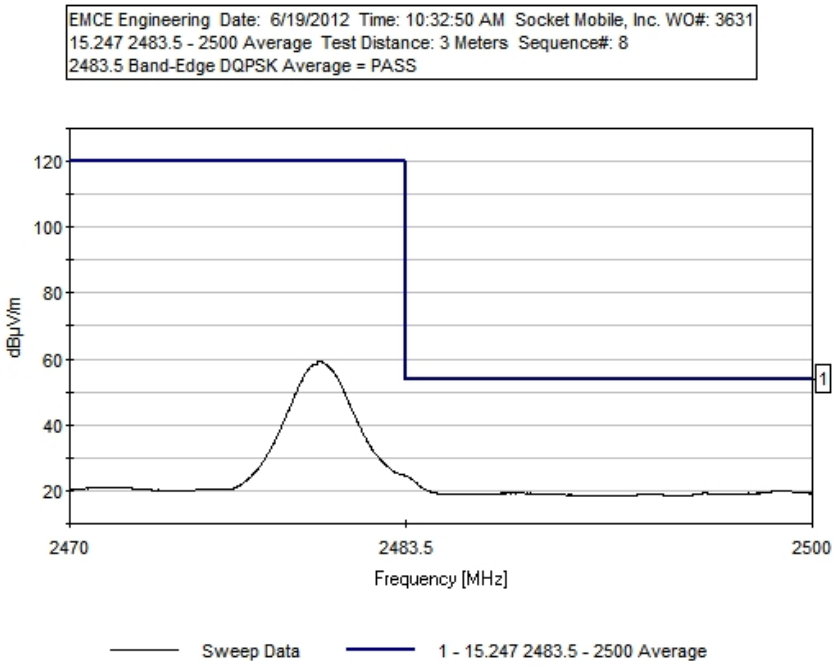
GSFK 2483.5 MHz Band-Edge Compliance (Delta)



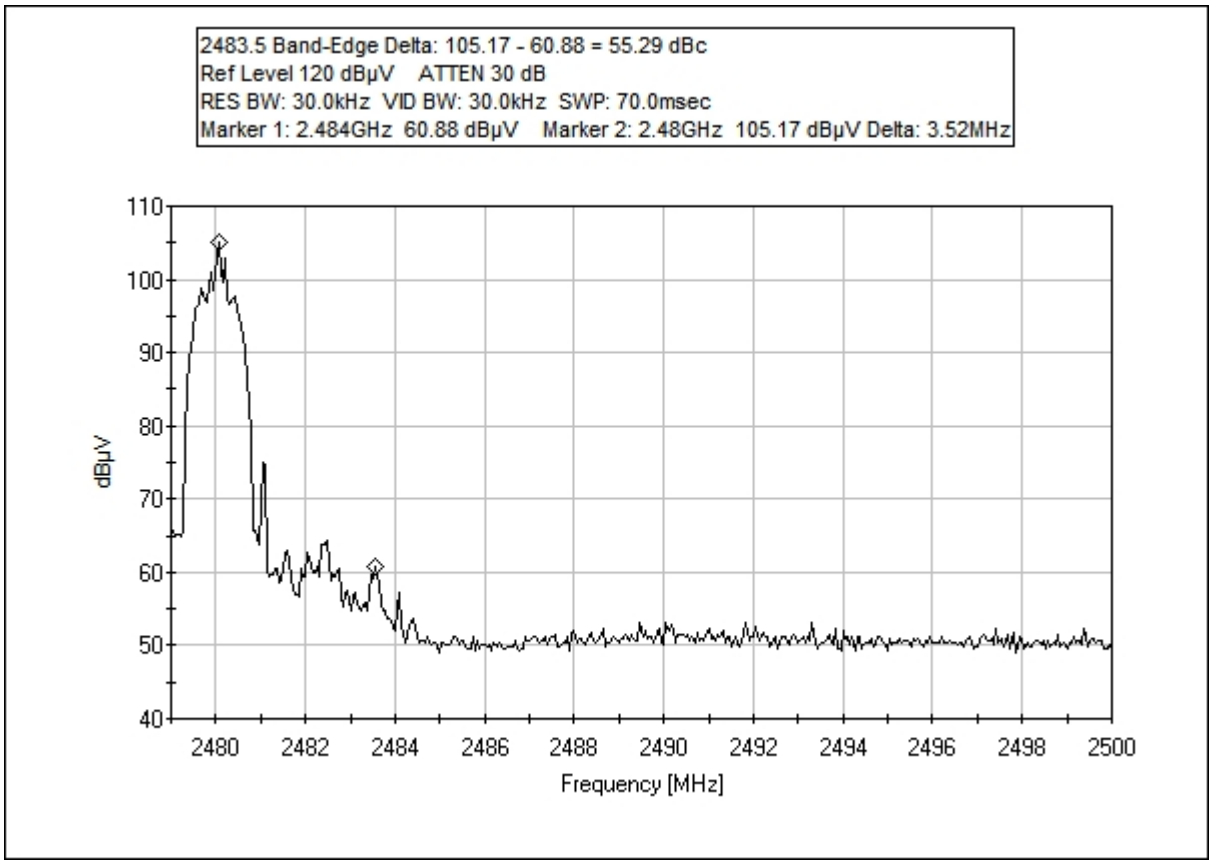
DQPSK 2483.5 MHz Band-Edge Compliance (Peak)



DQPSK 2483.5 MHz Band-Edge Compliance (Average)



DQPSK 2483.5 MHz Band-Edge Compliance (Delta)

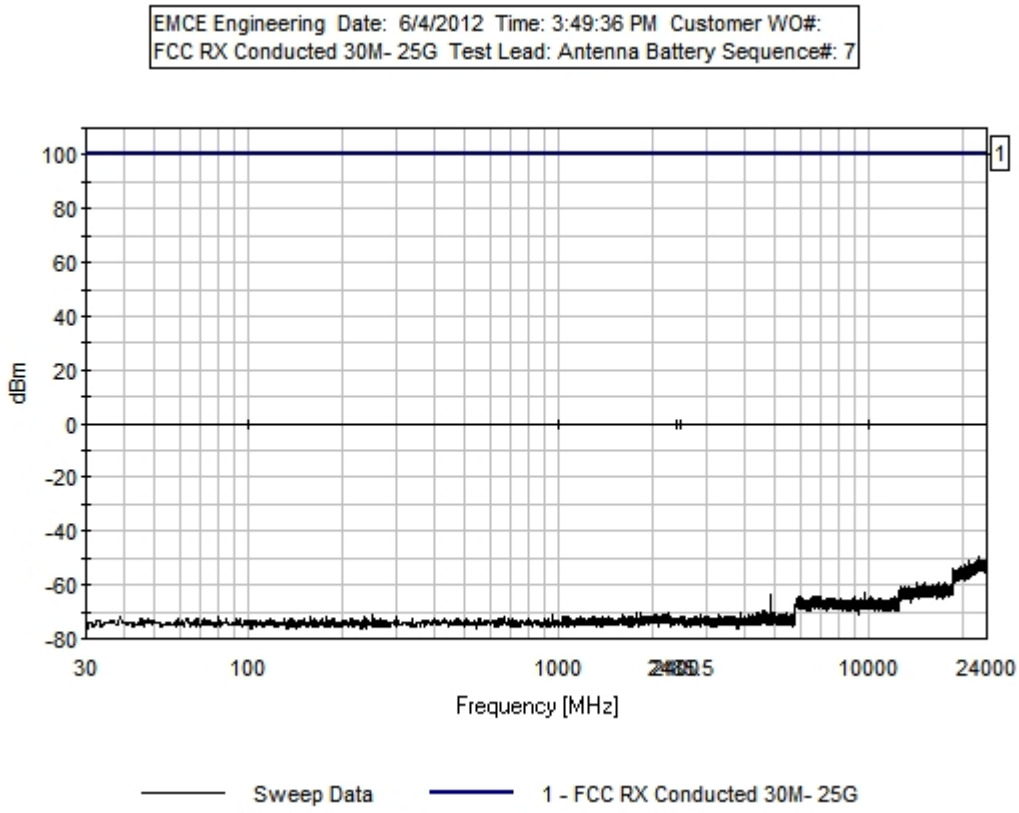


5.10 RECEIVE MODE EMISSIONS MEASUREMENT

Requirement(s): RSS Gen (4.8)

The receiver shall be operated in the normal receive mode near the mid-point of the band over which the receiver is designed to operate.
Unless otherwise specified in the applicable RSS, the radiated emission measurement is the standard measurement method (with the device's antenna in place) to measure receiver spurious emissions.
Radiated emission measurements are to be performed using a calibrated open-area test site. As an alternative, the conducted measurement method may be used when the antenna is detachable. In such a case, the receiver spurious signal may be measured at the antenna port.
If the receiver is super-regenerative, stabilize it by coupling to it an unmodulated carrier on the receiver frequency (antenna conducted measurement) or by transmitting an unmodulated carrier on the receiver frequency from an antenna in the proximity of the receiver (radiated measurement). Taking care not to overload the receiver, vary the amplitude and frequency of the stabilizing signal to obtain the highest level of the spurious emissions from the receiver.
For either method, the search for spurious emissions shall be from the lowest frequency internally generated or used in the receiver (e.g. local oscillator, intermediate or carrier frequency), or 30 MHz, whichever is the higher, to at least 3 times the highest tuneable or local oscillator frequency, whichever is the higher, without exceeding 40 GHz.

Receive Mode Spurious emissions 30 – 25000 MHz



7.0 TEST EQUIPMENT

Antenna Conducted Measurements:

Equipment	Type	Manufacturer	Calibration Date	Calibration Due Date
EMI Analyzer System	84125B	Hewlett-Packard	5/1/12	5/1/14
Spectrum Analyzer	8566B	Hewlett-Packard	5/2/12	5/2/14
Pre-Amp	83051A	Hewlett-Packard	5/1 /12	5/1 13
Pre-Amp	83017A	Hewlett-Packard	5/1 /12	5/1 /13
Pre-Amp	8744D	Hewlett-Packard	5/2/12	5/2/13
Horn Antenna	SAS 200/571	AH Systems	2/19/12	2/19/13
Cable	0.25 meters	Murata	5/1 12	5/10/13

Spurious RF radiated emissions:

Equipment	Type	Manufacturer	Calibration Date	Calibration Due Date
EMI Analyzer System	84125B	Hewlett-Packard	5/1/12	5/1/14
Spectrum Analyzer	8566B	Hewlett-Packard	5/2/12	5/2/14
Antenna	JB6 BiConiLog	Sunol Sciences	2/15/12	2/15/14
Pre-Amp	83051A	Hewlett-Packard	5/1 /12	5/1 /13
Pre-Amp	83017A	Hewlett-Packard	5/1 /12	5/1 /13
Pre-Amp	8744D	Hewlett-Packard	5/2/12	5/2/13
Horn Antenna	SAS 200/571	AH Systems	2/19/12	2/19/13
Cable	N – N (30 Meters)	EMCE	5/1 /12	5/1 /13