MOTOROLA

PERSONAL COMMUNICATIONS SECTOR

PRODUCT SAFETY AND COMPLIANCE EMC LABORATORY

EMC TEST REPORT - Addendum

Test Report Number –14583/14670-1WLAN

Report Date – November 10, 2004

The test results contained herein relate only to the model(s) identified. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical characteristics.

As the responsible EMC Engineer, I hereby declare that the equipment tested as specified in this report conforms to the requirements indicated.

Signature: Michael E. Hill Name: Michael E. Hill

Title: Senior Electrical Engineer Date: November 10, 2004

A2LA Certificate Number: 1846-01

A2LA ACCREDITED

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Test Report Details

Tests Performed By:	Motorola Personal Communications Sector Product Safety and Compliance Group 600 North US Hwy 45 Libertyville, IL 60048 PH (847) 523-6167 Fax (847) 523-4538 Motorola PCS FRN: 0004321311 FCC Registration Number: 316588 Industry Canada Number: IC3908
Radiated Emissions Performed By:	Underwriters Laboratories International EMC Services 333 Pfingsten RD Northbrook, IL 60062 Contact: Lubomir Madjarov (Tel) 847/664-3957 (Fax) 847/313-3957
Tests Requested By:	Motorola Inc. Personal Communications Sector 600 North US Hwy 45 Libertyville, IL 60048
Product Type:	Cellular Phone
Signaling Capability:	GSM 850/1900, WLAN, WLAN
Model Number:	MPx
Version:	SGUG0156AA
Serial Numbers:	004400007088451, 004400007088022, 004400007088485, 004400007088477, 004400007088816,004400007088840, 004400007546334
Testing Complete Date:	November 10, 2004

Applicable Standards

All tests and measurements indicated in this document were performed in accordance with the Code of Federal Regulations Title 47 Part 2, Sub-part J as well as the following parts:

__X__Part 15 Subpart C – Intentional Radiators
_____Part 22 Subpart H - Public Mobile Services
_____Part 24 - Personal Communications Services
_____ Part 90 - Private Land Mobile Radio Service

Applicable Standards: TIA EIA 137-A, TIA EIA 98-C, ANSI 63.4 2001, RSS-118 (AMPS), RSS-128 (TDMA), RSS-129 (CDMA), RSS-133 (PCS)

Summary of Testing

Test	Test Name	Pass/Fail
1	Antenna Gain (CFR47 Part 15.204)	Pass
2	Spectrum Bandwidth	Pass
3	Maximum Peak Output Power-Conducted (Part 15.247(b) (1))	Pass
4	Maximum Peak Output Power-Radiated (15.247 (b) (1))	Pass
5	Power Spectral Density (15.247(d))	Pass
6	Band Edge Compliance of Conducted Emissions (Part 15.247(c))	Pass
7	Band Edge Compliance of Radiated Emissions (Part 15/247(c))	N/A
8	Conducted Spurious Emissions (15.247 (c) (1))	Pass
9	Emissions Limitations (15.247(c))	

Test	Test Name	Results
1	Antenna Gain (CFR47 Part 15.204)	2.7dBi
2	Spectrum Bandwidth (6dB)	13.6MHz
3	Maximum Peak Output Power-Conducted (Part 15.247(b) (1))	14.14dBm
4	Maximum Peak Output Power-Radiated (15.247 (b) (1))	-9.18dBm
5	Power Spectral Density (15.247(d))	-3.44dBm
6	Band Edge Compliance of Conducted Emissions (Part 15.247(c))	(See graphs)
7	Band Edge Compliance of Radiated Emissions (Part 15/247(c))	(See graphs)
8	Conducted Spurious Emissions (15.247 (c) (1))	(See graphs)
9	Emissions Limitations (15.247(c))	

The margin with respect to the limit is the minimum margin for all modes and bands. ( ) indicates the margin at which the product exceeds the limit.

General and Special Conditions

The EUT was tested using a fully charged battery when applicable. Where a battery could not be used due to the need for a controlled variation of input voltage, an external power supply was utilized.

Special test S/W was used for these tests. In all tests, the WLAN was transmitting at 11Mbit/s (DSSS).

All testing was done in an indoor controlled environment with an average temperature of 22º C and relative humidity of 50%.

Equipment and Cable Configurations

The EUT was tested in a stand-alone configuration that is representative of typical use.

Measuring Equipment and Calibration Information

Manufacturer	Equipment Type	Model No.	Serial Number	Cal. Due Date
Rohde & Schwarz	Receiver	ESI26	838786/010	5/17/2005
Hewlett-Packard	EMC Analyzer	8593EM	3536A00118	10/2/2005
Hewlett-Packard	EMC Analyzer	7405	US39440191	11/13/2004
Miteq	Preamplifier 0.1-26.5GHz	NSP2650-NF-S	966350	1/8/2005
ETS	DRG Horn Antenna	3115	6222	10/4/2005
A.H. Systems Inc.	DRG Horn Antenna	SAS-2--/571	365	12/17/2004
ETS	Log-Periodic Antenna	3148	1188	3/5/2005
ETS	Biconical Antenna	3110B	3370	11/14/2004
Attenuator	Weinschel	AS-6	6675	10/14/2005
Attenuator	Weinschel	AS-6	6677	10/14/2005
Rohde & Schwarz	Mobile Test Set	CMD 80	DE29008	N/A
Hewlett-Packard	Signal Generator	83623B	3844A01195	6/20/2005
Thermotron	Environmental Chamber	S-4	31580	1/5/2005
Agilent	Power Meter	EE4418B	GB40206388	12/5/2004
Agilent	Power Sensor	E4412B	US38486321	11/23/2004
Hewlett-Packard	Pre-Amplifier	8447F	2805A03419	5/19/2005

U.L. Equipment

Hewlett Packard	QP Adapter	85650A	2811A01069	1/8/2005
Hewlett Packard	S/A Display	8566B	2542A12974	1/8/2005
Hewlett Packard	S/A	8566B	2637A03376	1/8/2005
Hewlett Packard	RF Preselector	85685A	2810A00692	1/8/2005
Rohde & Schwarz	S/A	FSEK20	DE2525315	1/9/2005
EMCO	Horn Antenna 1-18GHz	3115	2638	7/10/2005
EMCO	Horn Antenna 18-26.5GHz	3160-09	9904-1165	N/A*
Chase	Bi-Con Antenna 30-300MHz	VBA6106A	1246	6/23/2005
Chase	Log-Periodic Antenna	UPA6108	1120	6/23/2005

All equipment is on a one-year calibration cycle.

Description of WLAN Transmitter

The MPX cell phone offers WLAN as a feature. The WLAN direct sequence spread-spectrum transceiver is designed to operate between 2400 and 2483 MHz. The WLAN antenna is mounted on the PCB inside of the EUT. The antenna installation is permanent. For a more thorough description of the functionality please refer to Exhibit 12 of this package.

As a WLAN transmitter, it is designed operate with other WLAN devices as defined by industrial standard. In this application, the device is battery-operated.

Measurement Procedures and Data

Antenna Gain

CFR 47 Part 15.204

The antenna gain for the MPX WLAN antenna is 2.7dBi.

SPECTRUM BANDWIDTH

CFR 47 Part 15.247 (b)

Measurement Procedure

The RF output port of the Equipment-Under-Test is directly coupled to the input of the EMC analyzer through a specialized RF connector and a 20dB passive attenuator. A fully charged battery was used for the supply voltage.

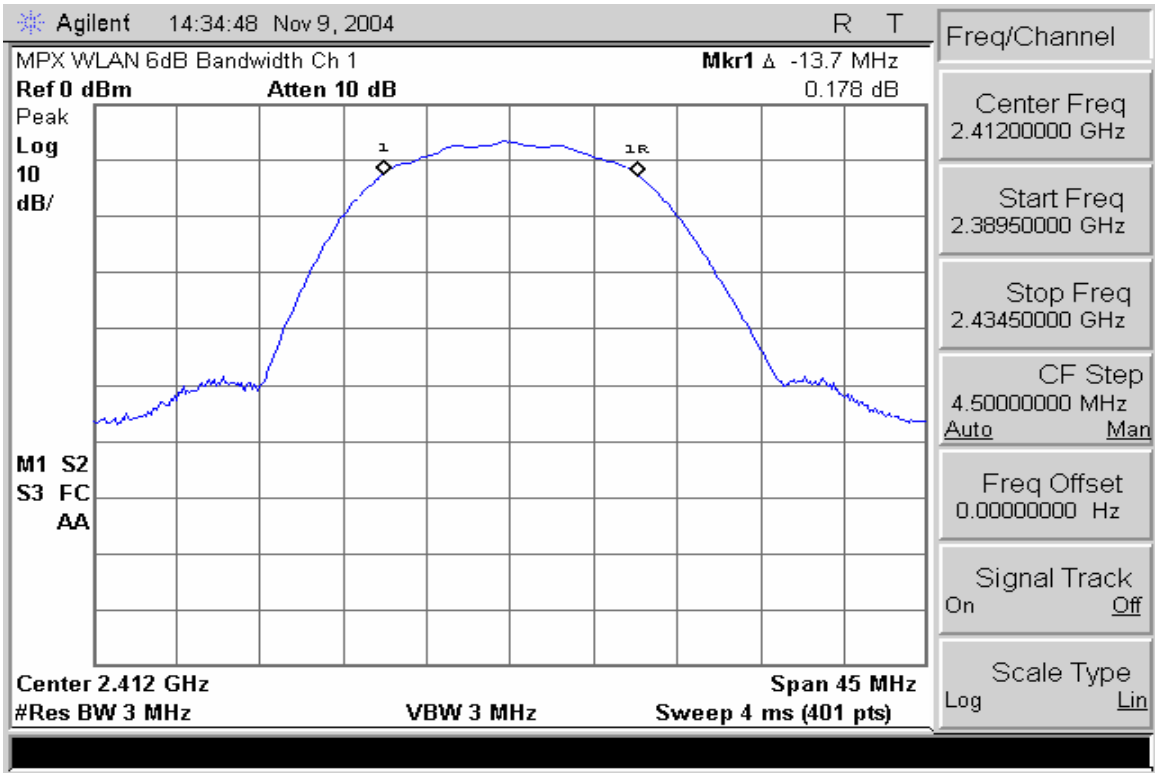
The WLAN DSSS was enabled. The spectrum analyzer used the following settings:

1. Span = the frequency band of operation
2. RBW ≥ 100kHz
3. VBW ≥ 100kHz
4. Sweep = Auto
5. Detector function = peak
6. Trace = max hold

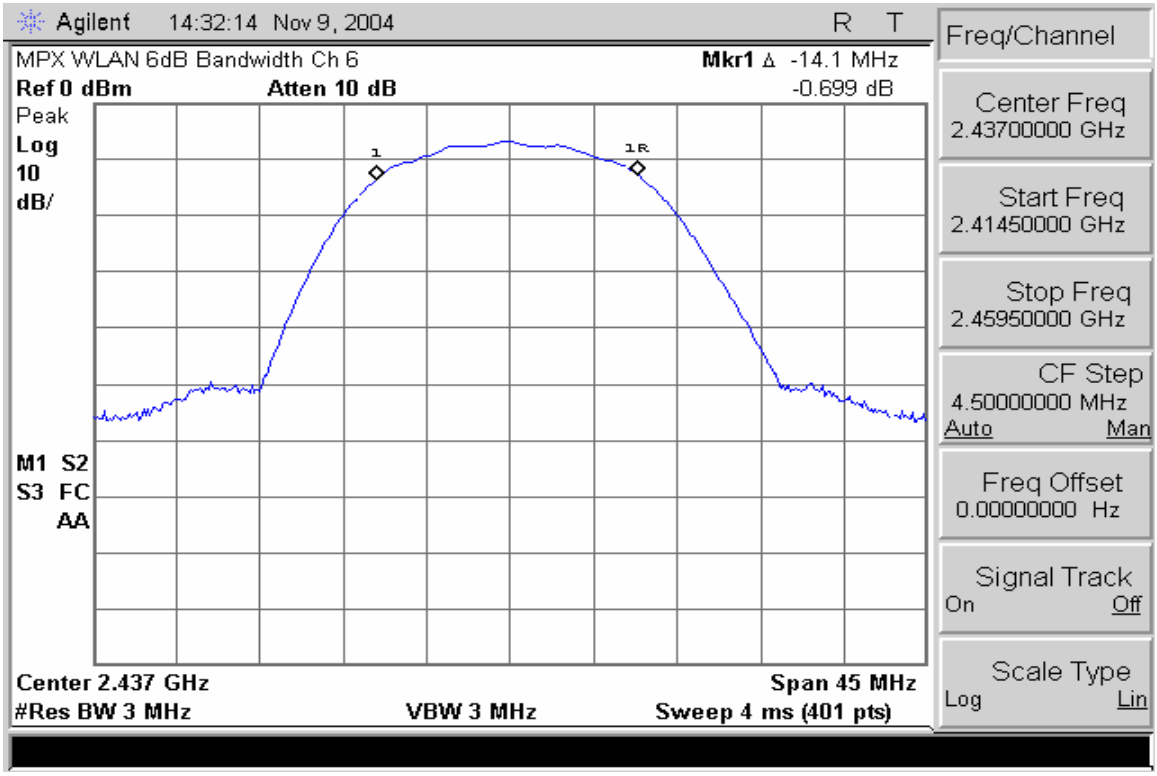
The trace was allowed to stabilize. 6 dB and 20 dB bandwidths were taken.

Measurement Results

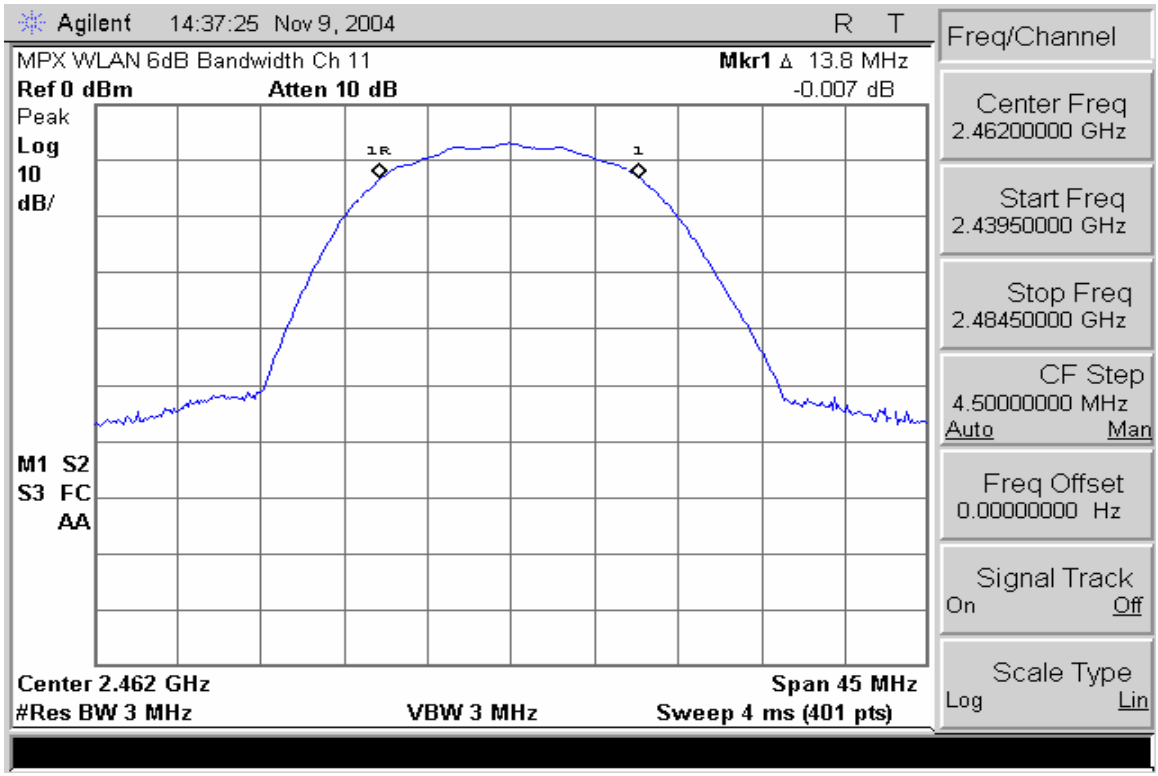
See attached.



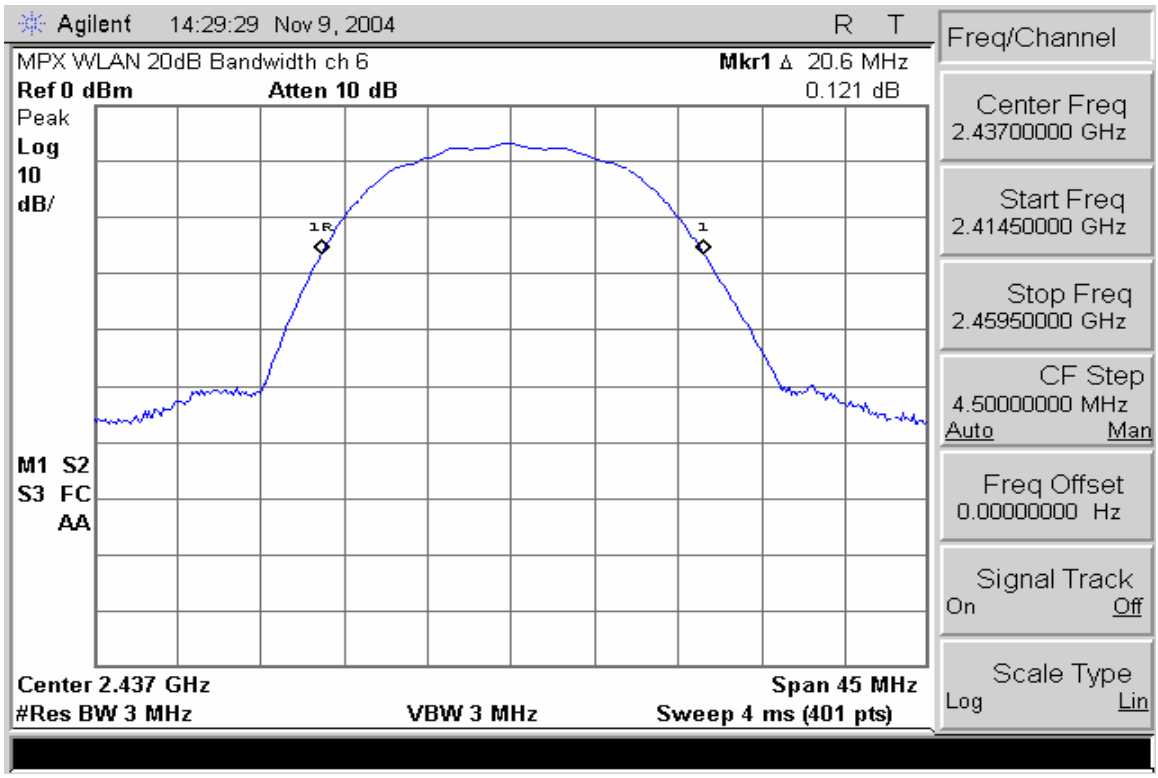
6dB Bandwidth Low Channel



6dB Bandwidth Mid Channel



6dB Bandwidth High Channel



20dB Bandwidth

MAXIMUM PEAK OUTPUT POWER (CONDUCTED)

CFR47 Part 15.247 (b) (1)

Measurement Procedure

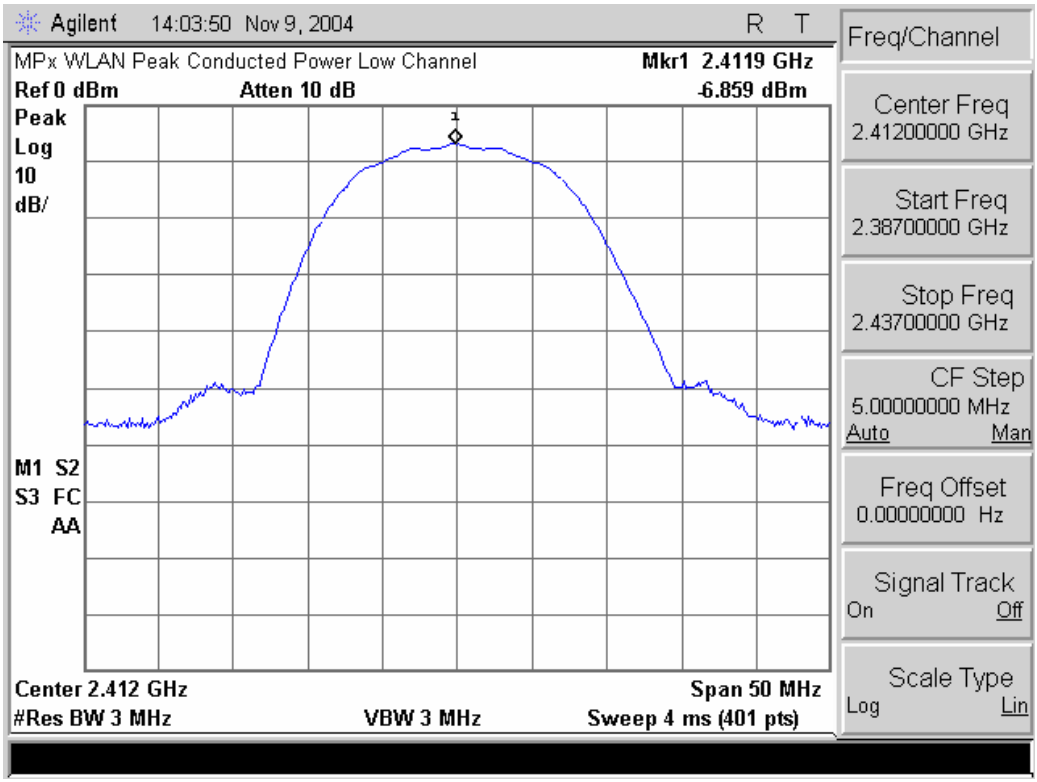
The RF output port of the Equipment-Under-Test is directly coupled to the input of the EMC analyzer through a specialized RF connector and a 20dB passive attenuator. A fully charged battery was used for the supply voltage.

The WLAN of the EUT was enabled. The following spectrum analyzer settings were used:

1. Span = 30MHz
2. RBW = 10 MHz
3. VBW ≥ RBW
4. Sweep = 5ms
5. Detector function = peak
6. Trace = max hold

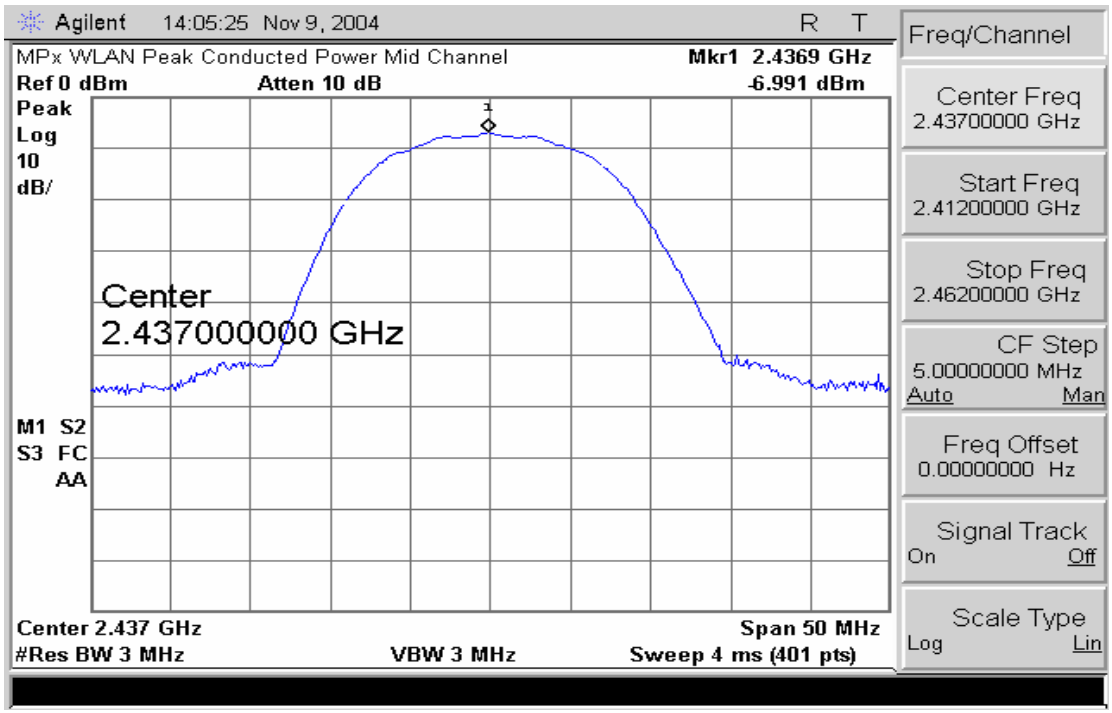
Measurement Results

Attached



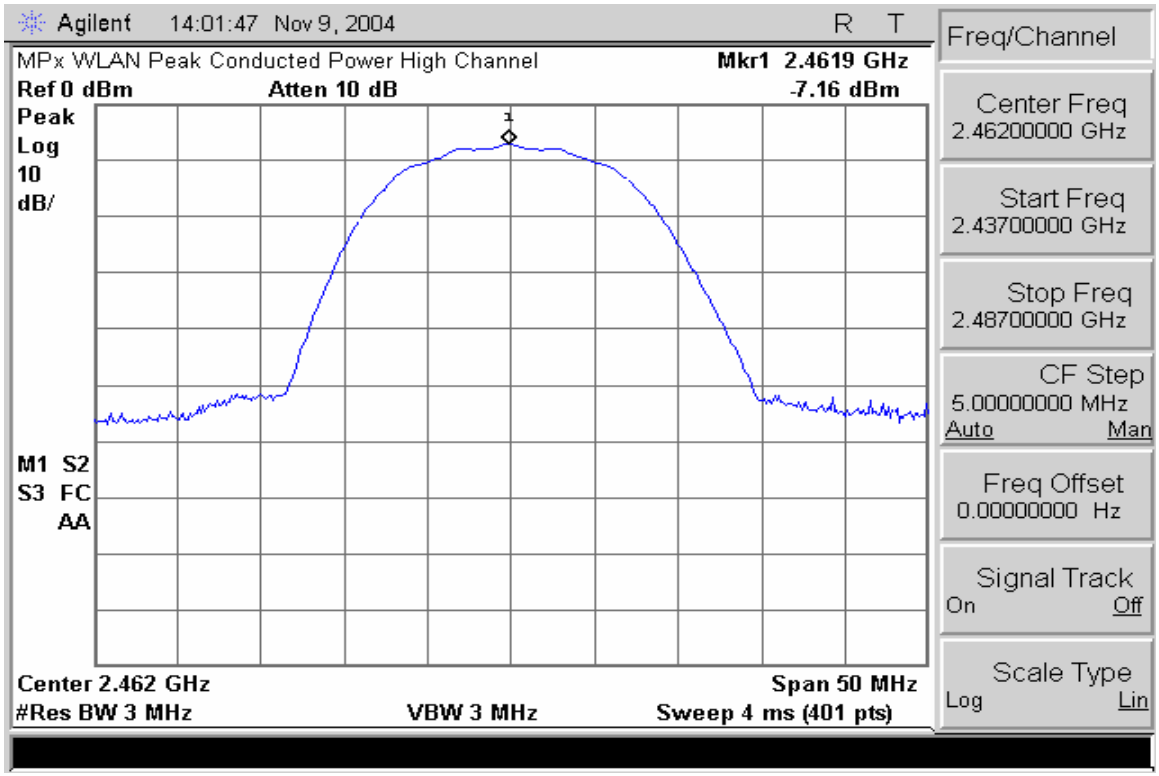
Maximum Peak Output Power DSSS System (Conducted) Low Channel

Adding the 21db of attenuator and cable loss, the maximum peak output power (conducted) of the WLAN low channel is **14.141dBm**.



Maximum Peak Output Power DSSS System (Conducted) Mid Channel

Adding the 21db of attenuator and cable loss, the maximum peak output power (conducted) of the WLAN mid channel is **14.009dBm**.



Maximum Peak Output Power DSSS System (Conducted) High Channel

Adding the 21db of attenuator and cable loss, the maximum peak output power (conducted) of the WLAN high channel is **13.84dBm**.

Maximum Peak Output Power (Radiated)

CFR 47 Part 15.247 (b) (1)

Measurement Procedure

The RF output port of the Equipment-Under-Test is directly coupled to the input of the EMC analyzer through a specialized RF connector and a 10dB passive attenuator. A fully charged battery was used for the supply voltage.

The WLAN DSSS function of the EUT was enabled. The spectrum analyzer used the following settings:

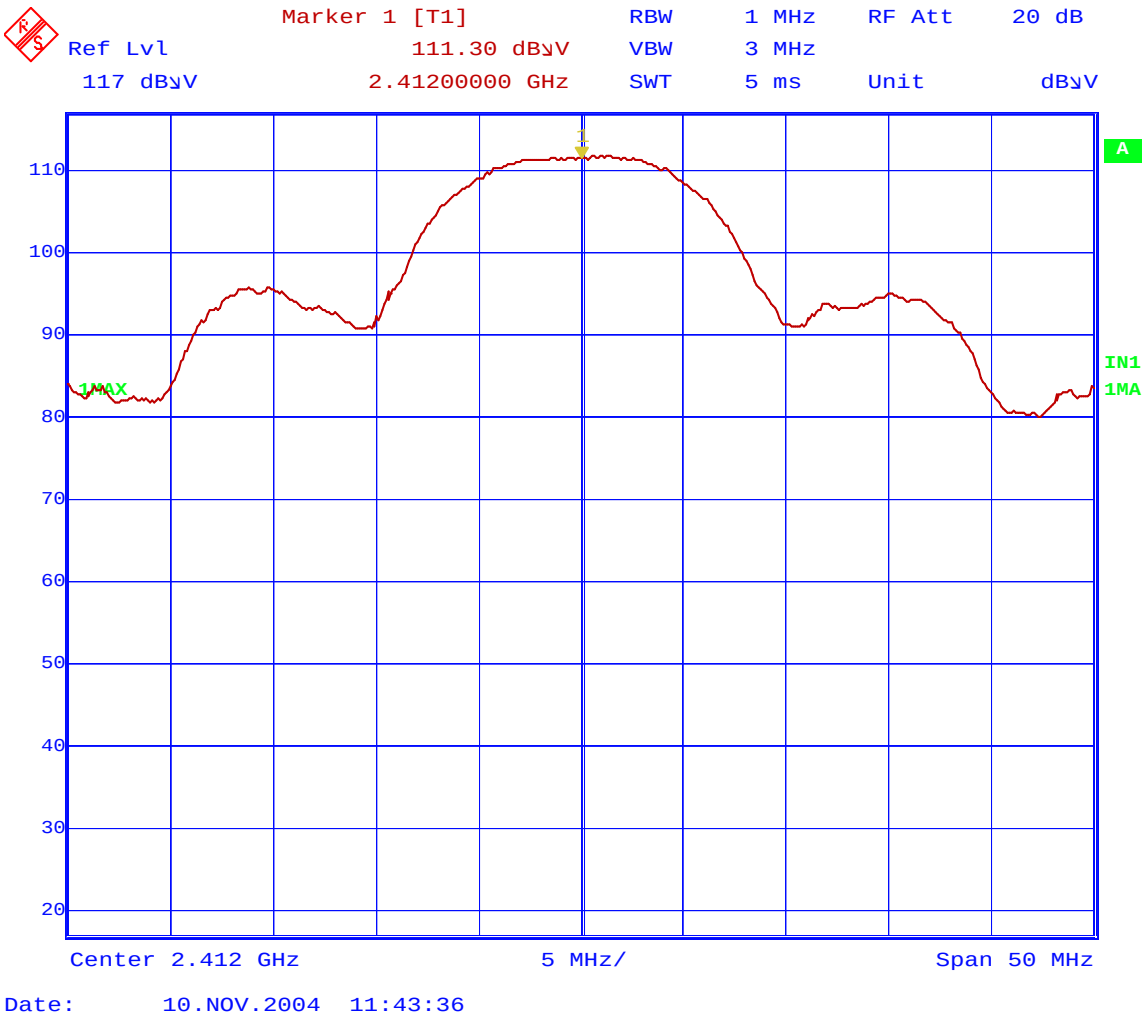
1. Span = approx. 2 to 3 times the 20dB bandwidth RBW ≥ 1% of the 20dB span
2. VBW ≥ RBW
3. Sweep = auto
4. Detector function = peak
5. Trace = max hold

The trace was allowed to stabilize. The EUT was transmitting at its maximum data rate. The marker-to-peak function was used to set the marker to the peak of the emission.

The preamplifier/cable loss factor for all cases equal is **-13.75dBm**.

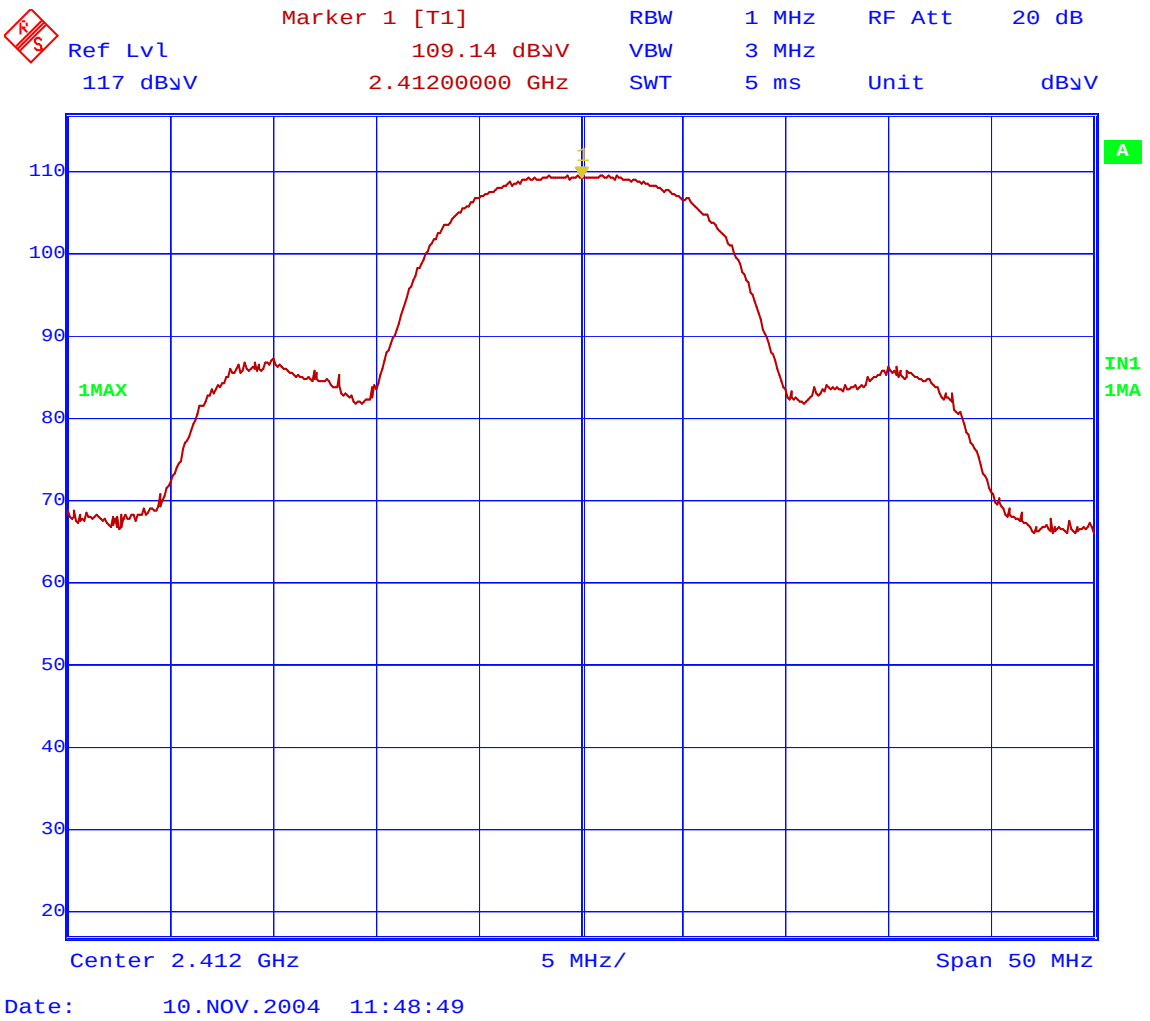
Measurement Results

Attached



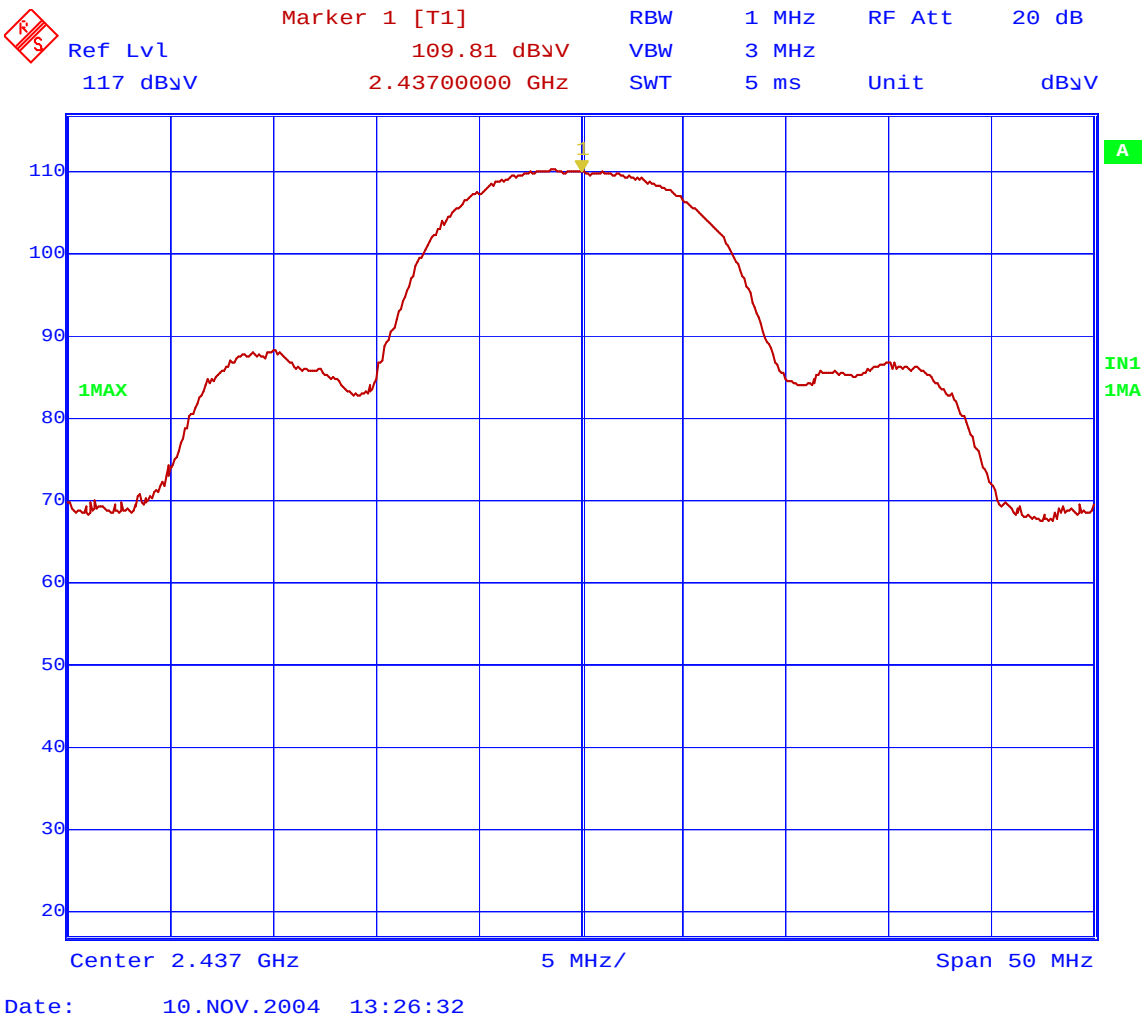
Maximum Peak Output Power Low Channel Horizontal Polarization

Converting the receiver output to dBm and adding the amplifier /cable loss factor of -13.75dBm gives a peak power of **-9.5dBm**.



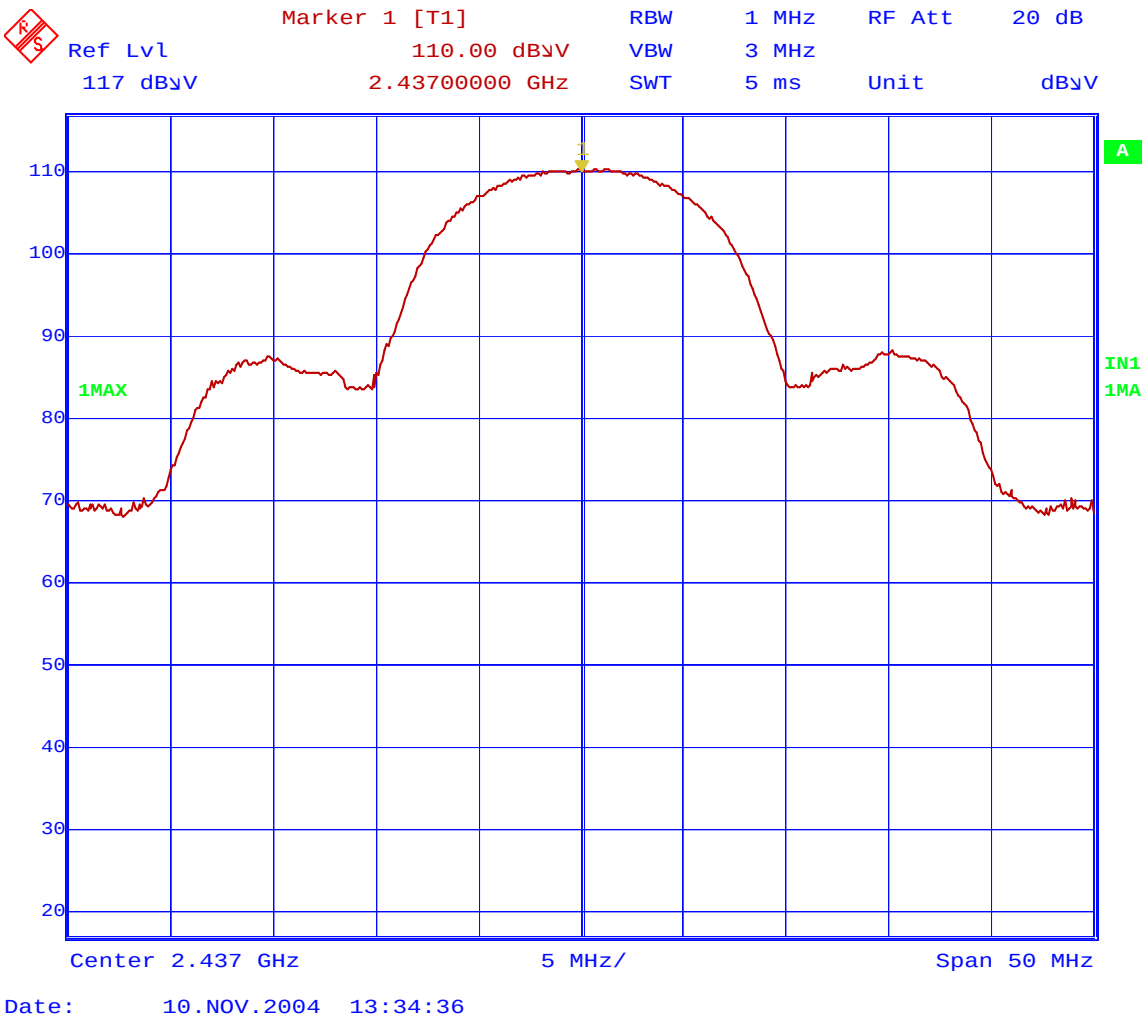
Maximum Peak Output Power Low Channel Vertical Polarization

Converting the receiver output to dBm and adding the amplifier /cable loss factor of -13.75dBm gives a peak power of **-11.61dBm**.



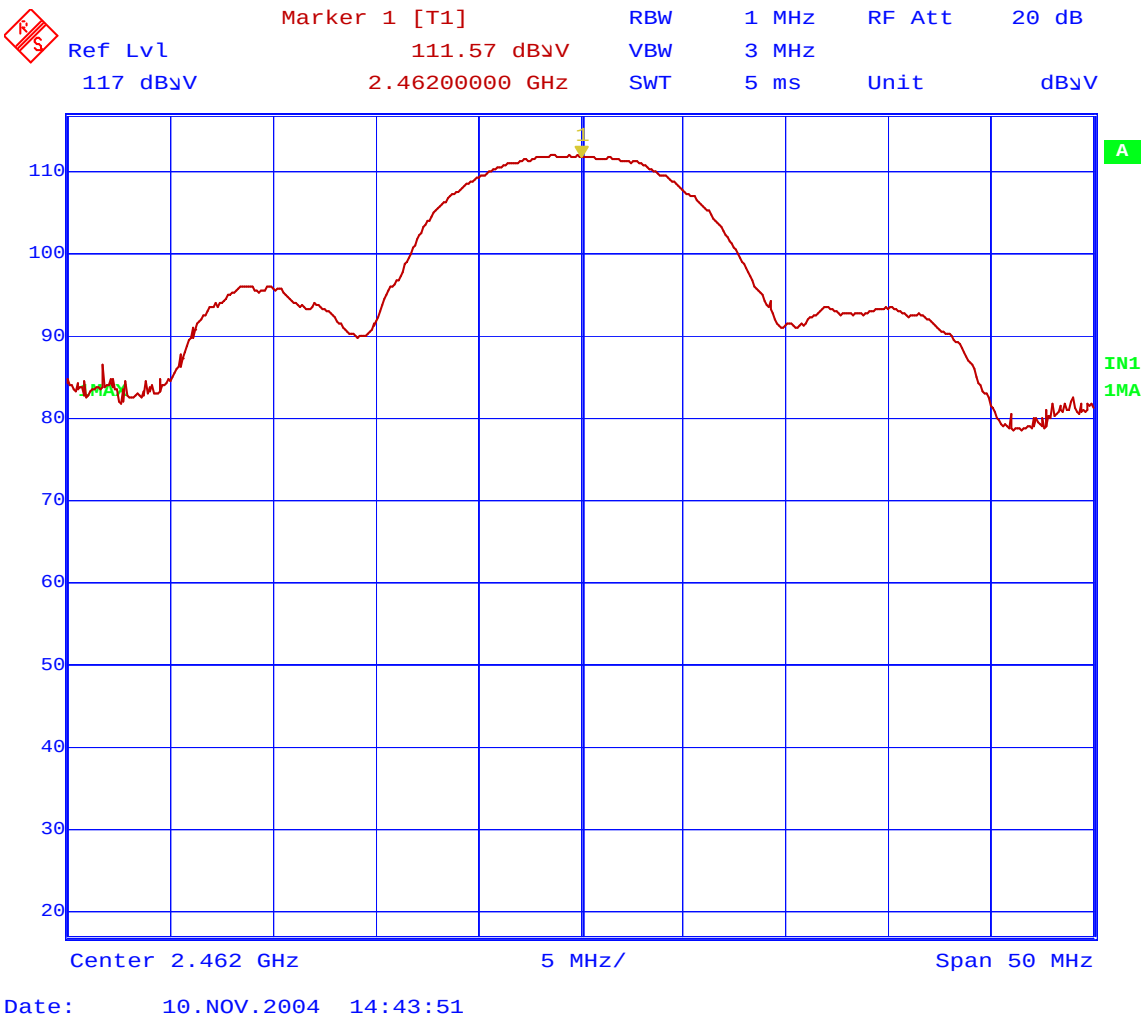
Maximum Peak Output Power Mid Channel Horizontal Polarization

Converting the receiver output to dBm and adding the amplifier /cable loss factor of -13.75dBm gives a peak power of **-10.94dBm**.



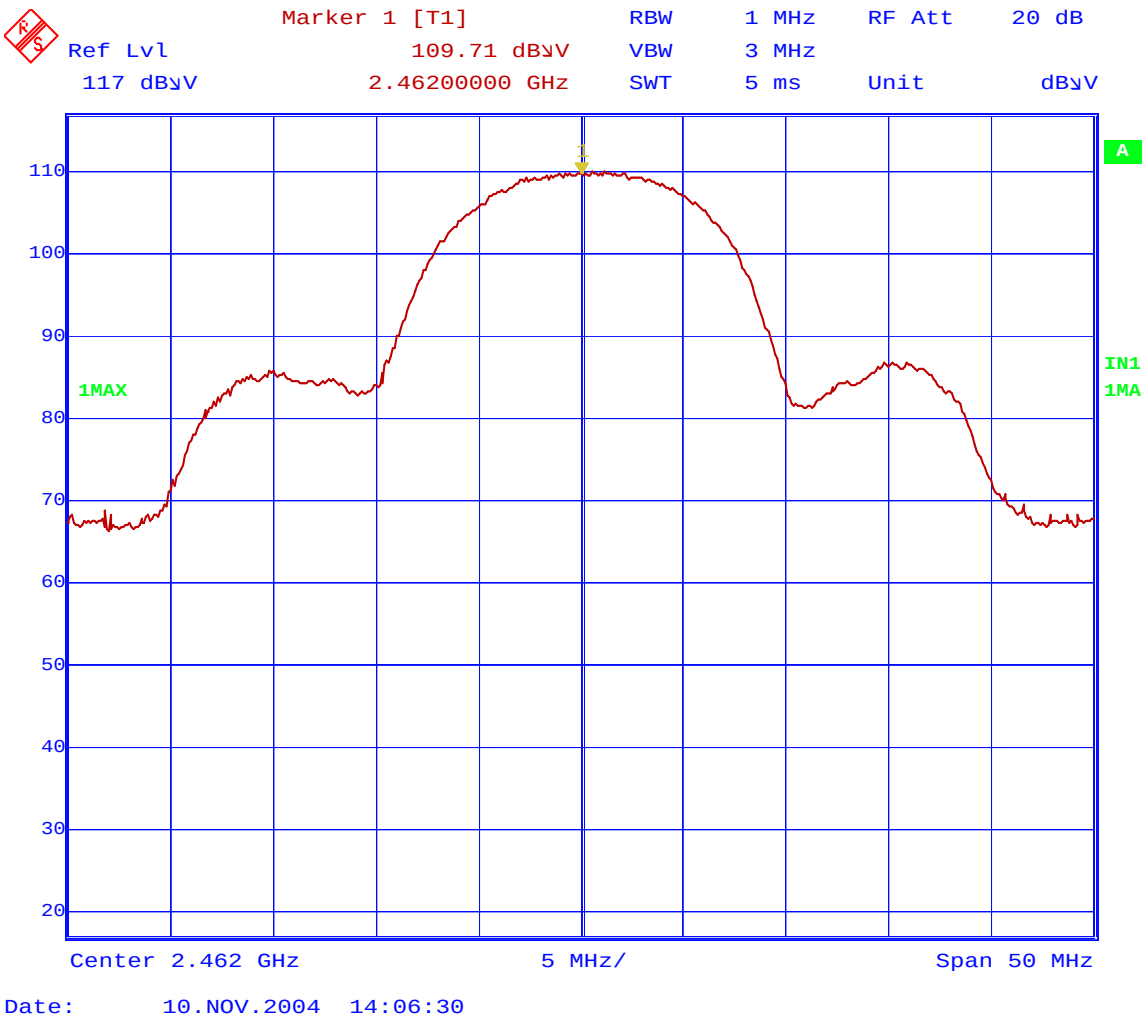
Maximum Peak Output Power Mid Channel Vertical Polarization

Converting the receiver output to dBm and adding the amplifier /cable loss factor of -13.75dBm gives a peak power of **-10.75dBm**.



Maximum Peak Output Power High Channel Horizontal Polarization

Converting the receiver output to dBm and adding the amplifier /cable loss factor of -13.75dBm gives a peak power of **-9.18dBm**.



Maximum Peak Output Power High Channel Vertical Polarization

Converting the receiver output to dBm and adding the amplifier /cable loss factor of -13.75dBm gives a peak power of **-11.04dBm**.

Power Spectral Density

CFR 47 Part 15.247 (d)

Measurement Procedure

The RF output port of the Equipment-Under-Test is directly coupled to the input of the EMC analyzer through a specialized RF connector and a 10dB passive attenuator. A fully charged battery was used for the supply voltage.

The WLAN DSSS function of the EUT was enabled. The spectrum analyzer used the following settings:

1. Span = 1.5MHz
2. VBW =3KHz
3. RBW=3kHz
4. Sweep = 500s
5. Detector function = peak
6. Trace = max hold

The trace was allowed to stabilize. The EUT was transmitting at its maximum data rate.

Measurement Results

2412 MHz	2437	2462
-3.44dBm	-3.35 dBm	-3.43 dBm

FIELD STRENGTH OF SPURIOUS EMISSIONS

CFR Part 2.1053, 15.249

Measurement Procedure

The Equipment-Under-Test is placed inside the semi-anechoic chamber on a wooden table at the turntable center. For each spurious frequency, the antenna mast is raised and lowered from 1 to 4 meters and the turntable is rotated 360 degrees to obtain a maximum reading on the spectrum analyzer. This is repeated for both horizontal and vertical polarizations of the receive antenna.

The Equipment-Under-Test is then replaced with a substitution antenna fed by a signal generator. With the signal generator tuned to a particular spurious frequency, the antenna mast is raised and lowered from 1 to 4 meters to obtain a maximum reading at the spectrum analyzer. The output of the signal generator is then adjusted until a reading identical to that obtained with the actual transmitter is achieved.

The power in dBm of each spurious emission is calculated by correcting the signal generator level for cable loss and gain of the substitution antenna referenced to a dipole.

The field strength of each radiated emission is calculated by correcting the EMI receiver level for cable loss, amplifier gain, and antenna correction factors.

Field Strength (dBuV/m) = EMI Receiver Level (dBuV) + Cable Loss (dB) - Amplifier Gain (dB) + Antenna Correction Factor (1/m)

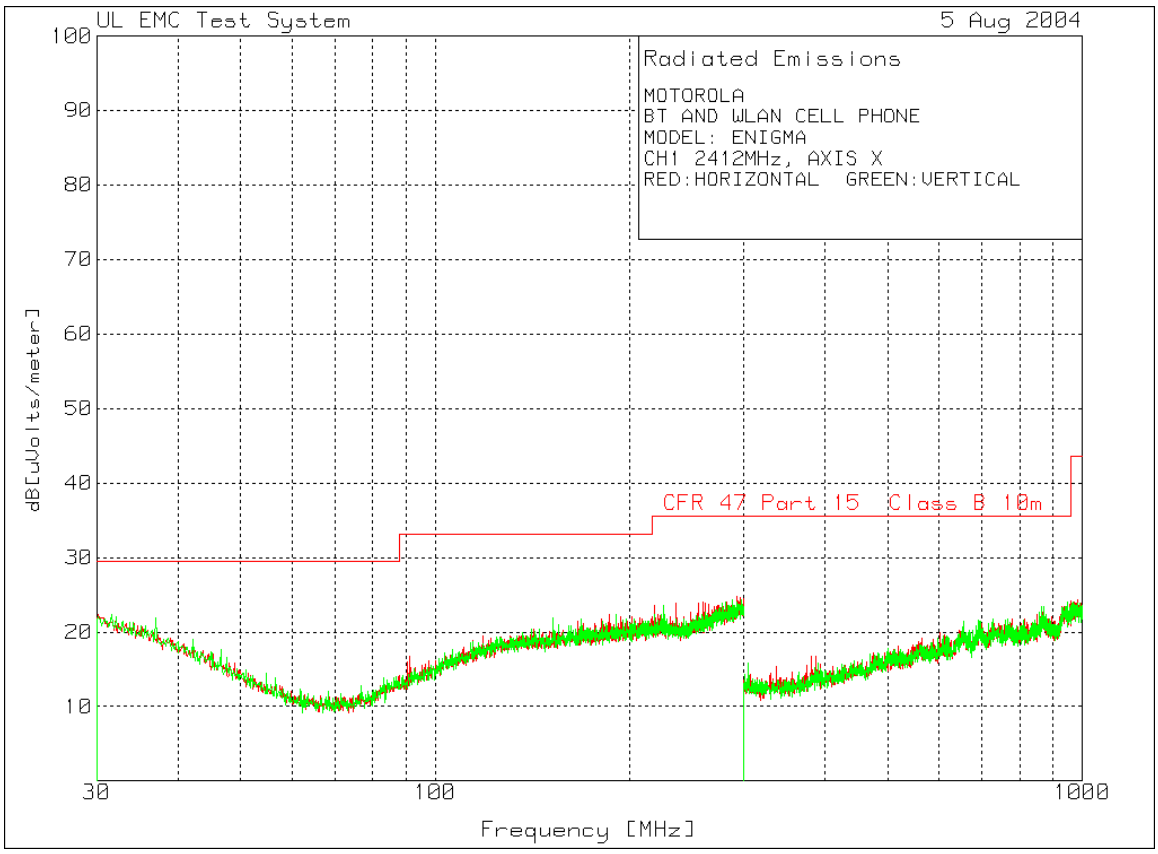
A fully charged battery was used for the supply voltage.

It was determined that Channel 1 was the representative worst case based on preliminary measurements. Consequently, radiated emissions data for the sweeps from 30MHz to 25GHz were made with the EUT configured for low channel operation.

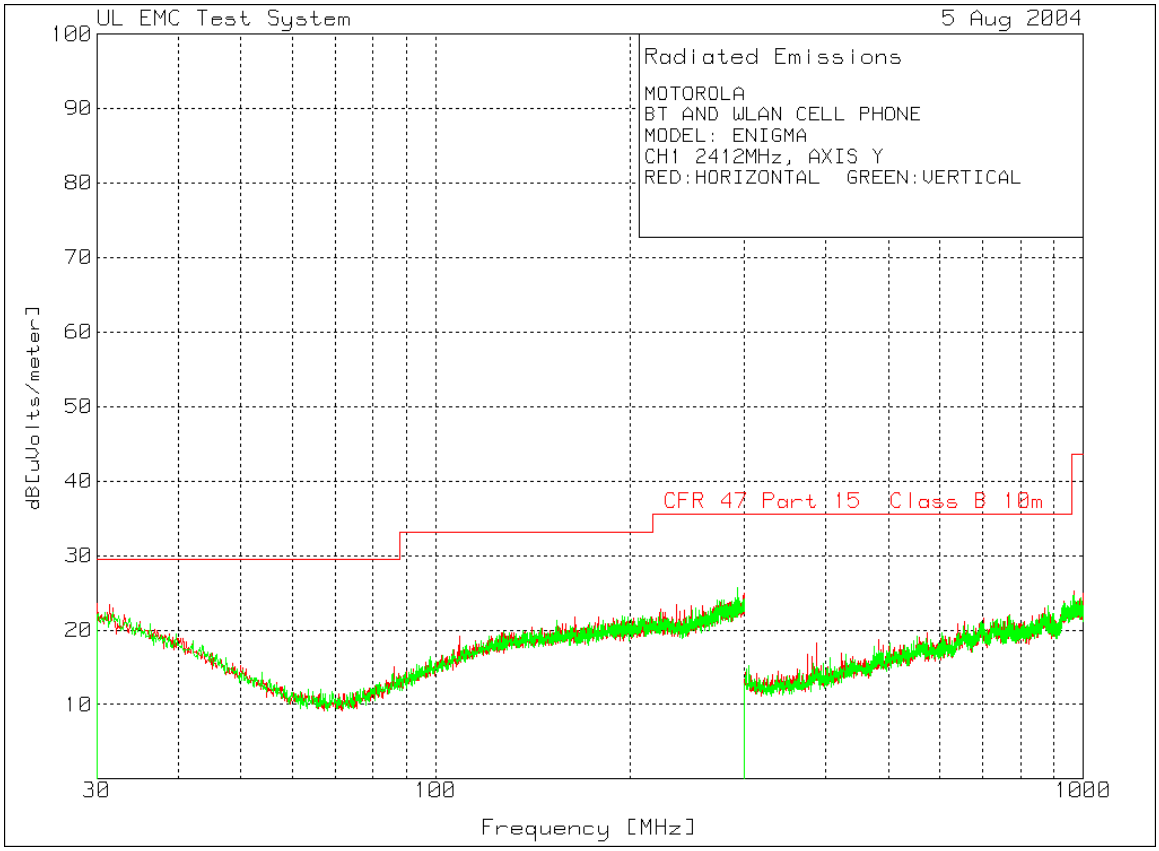
This data was taken at Underwriter's Laboratories.

Measurement Results

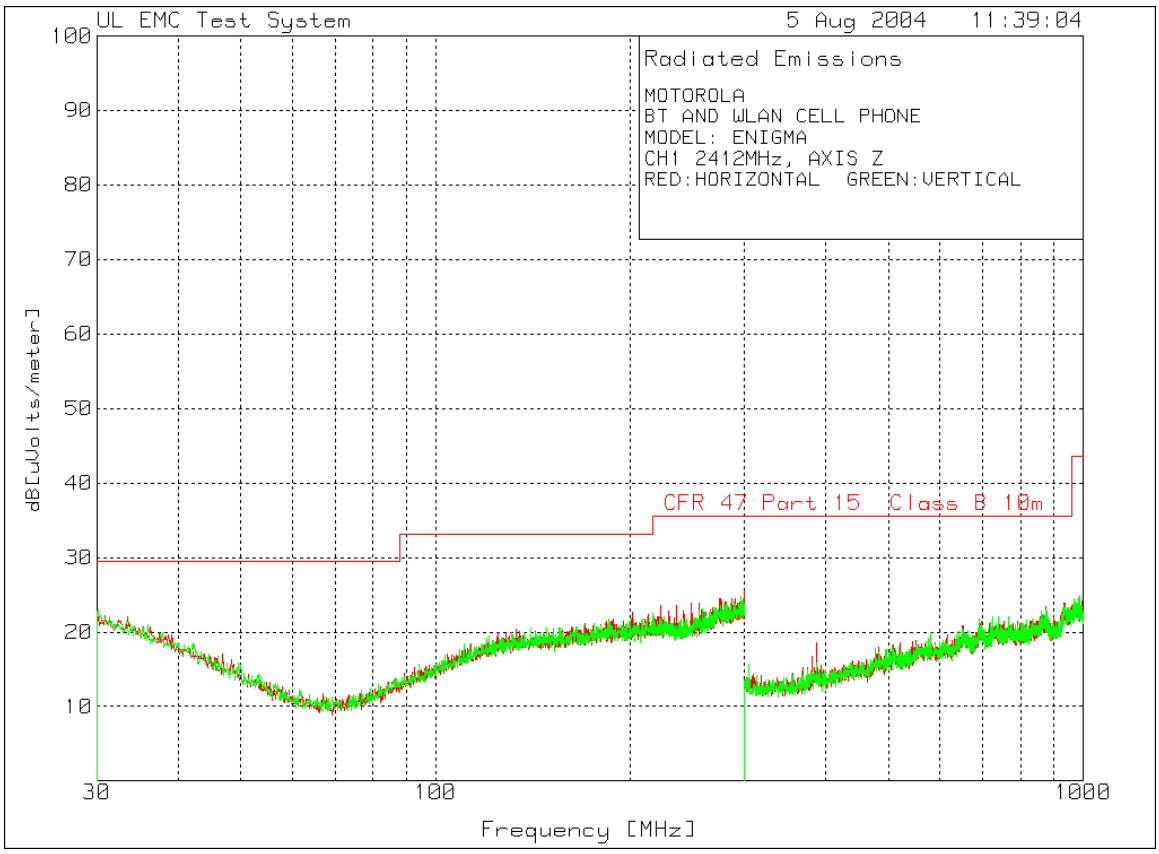
Attached



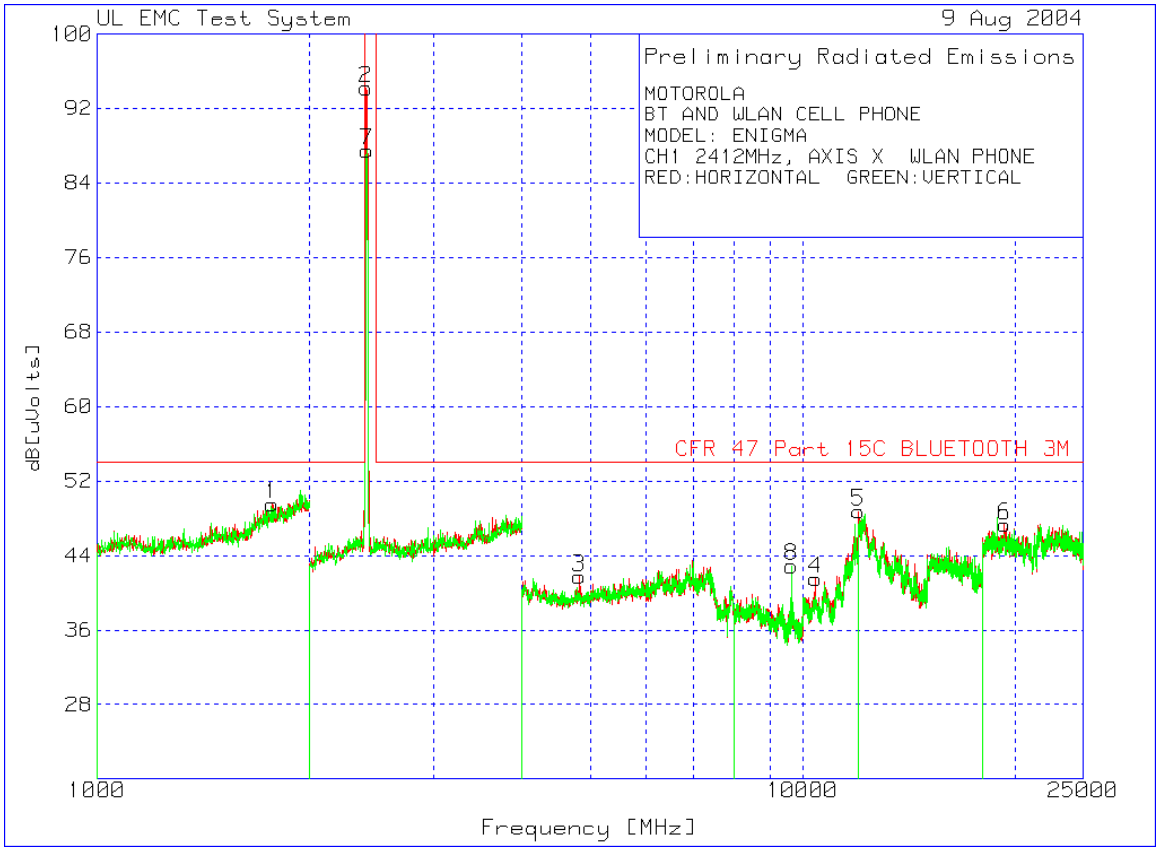
30 -1000MHz Low Channel Dual Polarization X-Axis



30 -1000MHz Low Channel Dual Polarization Y-Axis



30 -1000MHz Low Channel Dual Polarization Z-Axis

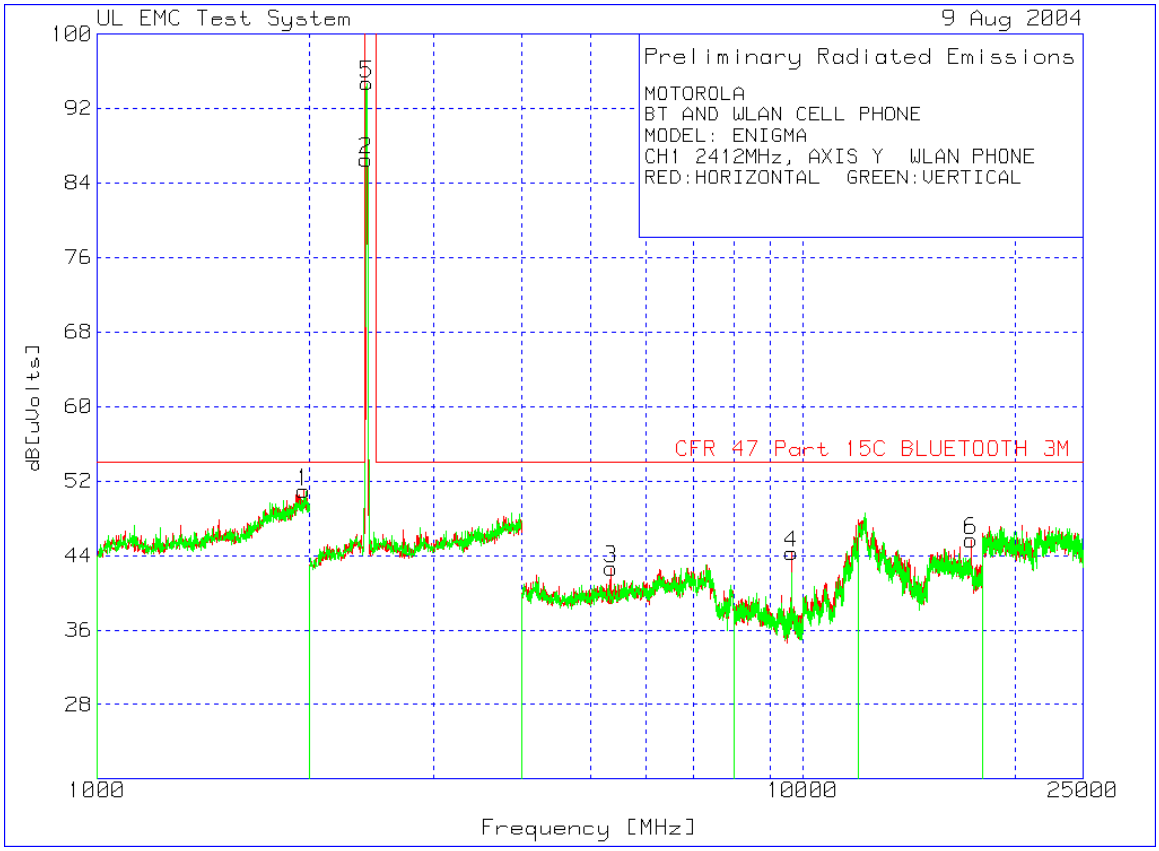


1-25GHz Low Channel X-Orientation

MOTOROLA
BT AND WLAN CELL PHONE
MODEL: ENIGMA
CH1 2412MHz, AXIS X WLAN PHONE
RED:HORIZONTAL GREEN:VERTICAL

Marker Number	Test Frequency [MHz]	Meter Reading [dB(uV)]	Detector Type	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level dB[uVolts]	Limit 1	Margin 1[dB]	Height [cm]	Polarity
1 - 2GHz 1000 - 2000MHz										
1	1769.539	20.18	pk	2.9	26.4	49.48	54	-4.52	150	Horz
2 - 4GHz 2000 - 4000MHz										
2	2408.818	69.1	pk	3.3	21.8	94.2	999	-904.8	149	Horz
4 - 8GHz 4000 - 8000MHz										
3	4824.825	65.31	pk	-51.3	27.7	41.71	54	-12.29	100	Horz
8 - 12GHz 8000 - 12000MHz										
4	10430.43	53.27	pk	-48.1	36.3	41.47	54	-12.53	100	Horz
12 - 18GHz 12000 - 18000MHz										
5	12000	50.54	pk	-41.2	39.4	48.74	54	-5.26	100	Horz
18-26.5GHz 18000 - 25000MHz										
6	19338.338	75.29	pk	-68.3	40.3	47.29	54	-6.71	100	Horz
2 - 4GHz 2000 - 4000MHz										
7	2412.826	62.39	pk	3.3	21.8	87.49	999	-911.51	150	Vert
8 - 12GHz 8000 - 12000MHz										
8	9645.646	55.31	pk	-48.8	36.4	42.91	54	-11.09	150	Vert

LIMIT 1: CFR 47 Part 15C BLUETOOTH 3M
LIMIT 2: NONE

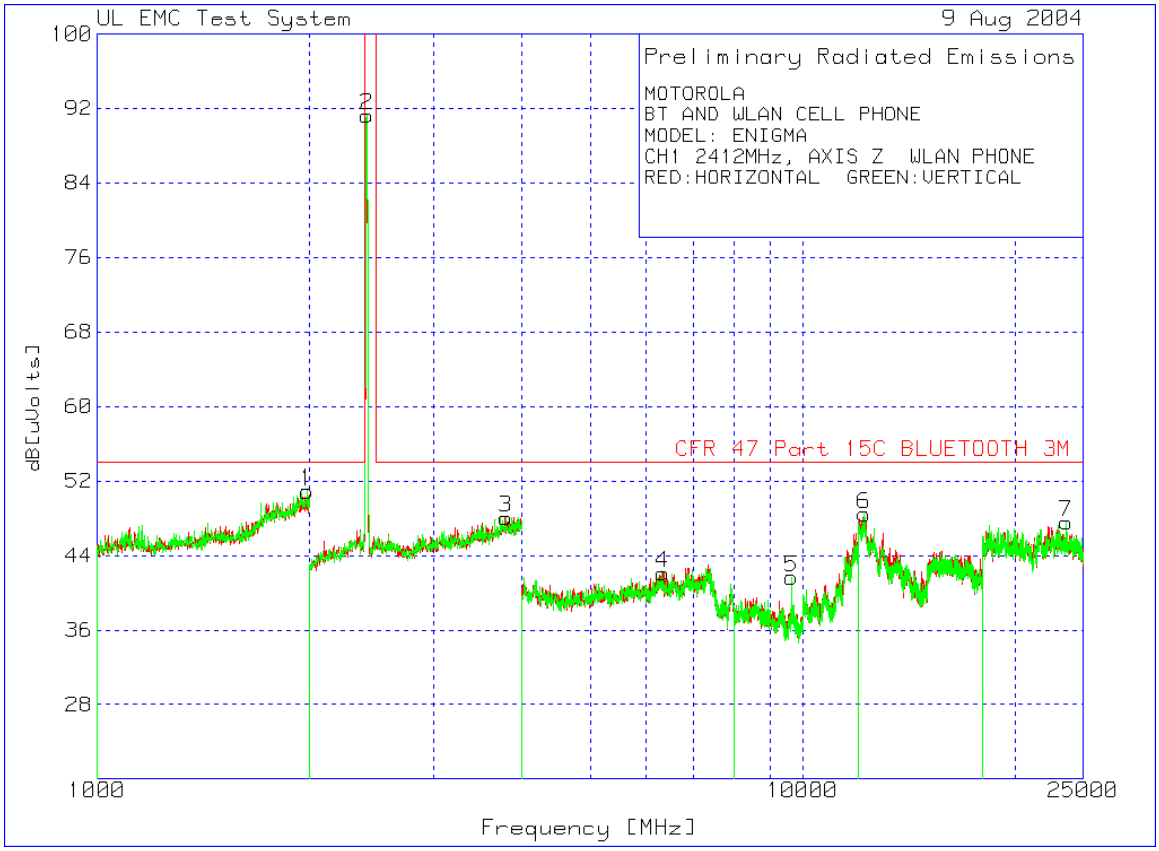


1-25GHz Low Channel Y-Orientation

MOTOROLA
BT AND WLAN CELL PHONE
MODEL: ENIGMA
CH1 2412MHz, AXIS Y WLAN PHONE
RED:HORIZONTAL GREEN:VERTICAL

Marker Number	Test Frequency [MHz]	Meter Reading [dB(uV)]	Detector Type	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level dB[uVolts]	Limit 1	Margin 1[dB]	Height [cm]	Polarity
1 - 2GHz 1000 - 2000MHz										
1	1961.924	20.53	pk	3.1	27.3	50.93	54	-3.07	150	Horz
2 - 4GHz 2000 - 4000MHz										
2	2408.818	61.42	pk	3.3	21.8	86.52	999	-912.48	100	Horz
4 - 8GHz 4000 - 8000MHz										
3	5357.357	65.54	pk	-50.9	28	42.64	54	-11.36	149	Horz
8 - 12GHz 8000 - 12000MHz										
4	9645.646	56.69	pk	-48.8	36.4	44.29	54	-9.71	149	Horz
12 - 18GHz 12000 - 18000MHz										
6	17339.34	47.39	pk	-41.8	40.1	45.69	54	-8.31	150	Horz
2 - 4GHz 2000 - 4000MHz										
5	2412.826	69.63	pk	3.3	21.8	94.73	999	-904.27	100	Vert

LIMIT 1: CFR 47 Part 15C BLUETOOTH 3M
LIMIT 2: NONE



1-25GHz Low Channel Z-Orientation

MOTOROLA
BT AND WLAN CELL PHONE
MODEL: ENIGMA
CH1 2412MHz, AXIS Z WLAN PHONE
RED:HORIZONTAL GREEN:VERTICAL

Marker Number	Test Frequency [MHz]	Meter Reading [dB(uV)]	Detector Type	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level dB[uVolts]	Limit 1	Margin 1[dB]	Height [cm]	Polarity
1 - 2GHz 1000 - 2000MHz										
1	1983.968	20.42	pk	3.1	27.4	50.92	54	-3.08	150	Horz
4 - 8GHz 4000 - 8000MHz										
4	6334.334	60.52	pk	-47.6	29.2	42.12	54	-11.88	100	Horz
2 - 4GHz 2000 - 4000MHz										
2	2412.826	66.15	pk	3.3	21.8	91.25	999	-907.75	100	Vert
3	3795.591	19.85	pk	4.1	24.1	48.05	54	-5.95	150	Vert
8 - 12GHz 8000 - 12000MHz										
5	9645.646	54.05	pk	-48.8	36.4	41.65	54	-12.35	150	Vert
12 - 18GHz 12000 - 18000MHz										
6	12234.234	49.95	pk	-40.9	39.4	48.45	54	-5.55	150	Vert
18-26.5GHz 18000 - 25000MHz										
7	23675.676	63.54	pk	-56.3	40.3	47.54	54	-6.46	150	Vert

LIMIT 1: CFR 47 Part 15C BLUETOOTH 3M
LIMIT 2: NONE

BAND-EDGE COMPLIANCE OF RF CONDUCTED EMISSIONS

CFR 47 Part 15.247

Measurement Procedure

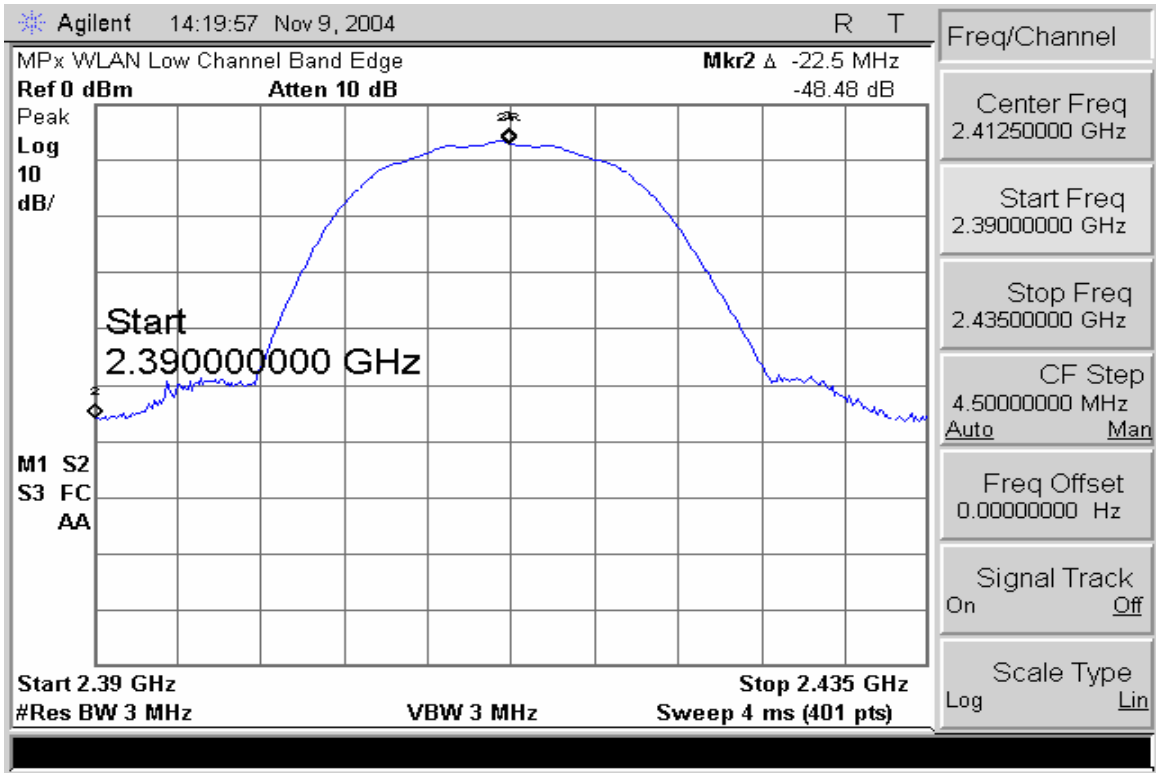
The RF output port of the Equipment-Under-Test is directly coupled to the input of the EMC analyzer through a specialized RF connector and a 10dB passive attenuator. A fully charged battery was used for the supply voltage.

The spectrum analyzer used the following settings:

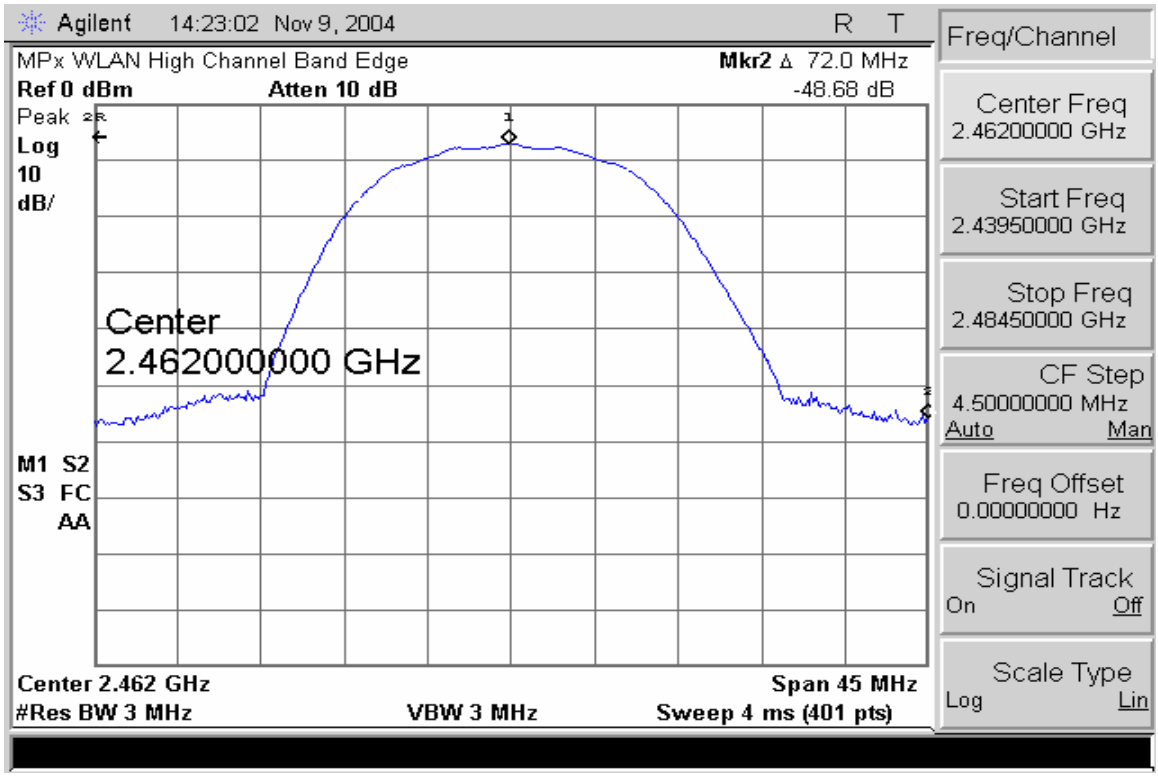
1. Span = the frequency band of operation
2. RBW ≥ 100kHz
3. VBW ≥ 100kHz
4. Sweep = 5ms
5. Detector function = peak
6. Trace = max hold

Measurement Results

See Attached:



Low Band Edge



High Band Edge

BAND-EDGE COMPLIANCE OF RF RADIATED EMISSIONS

CFR 47 Part 15.247 (c)

Measurement Procedure

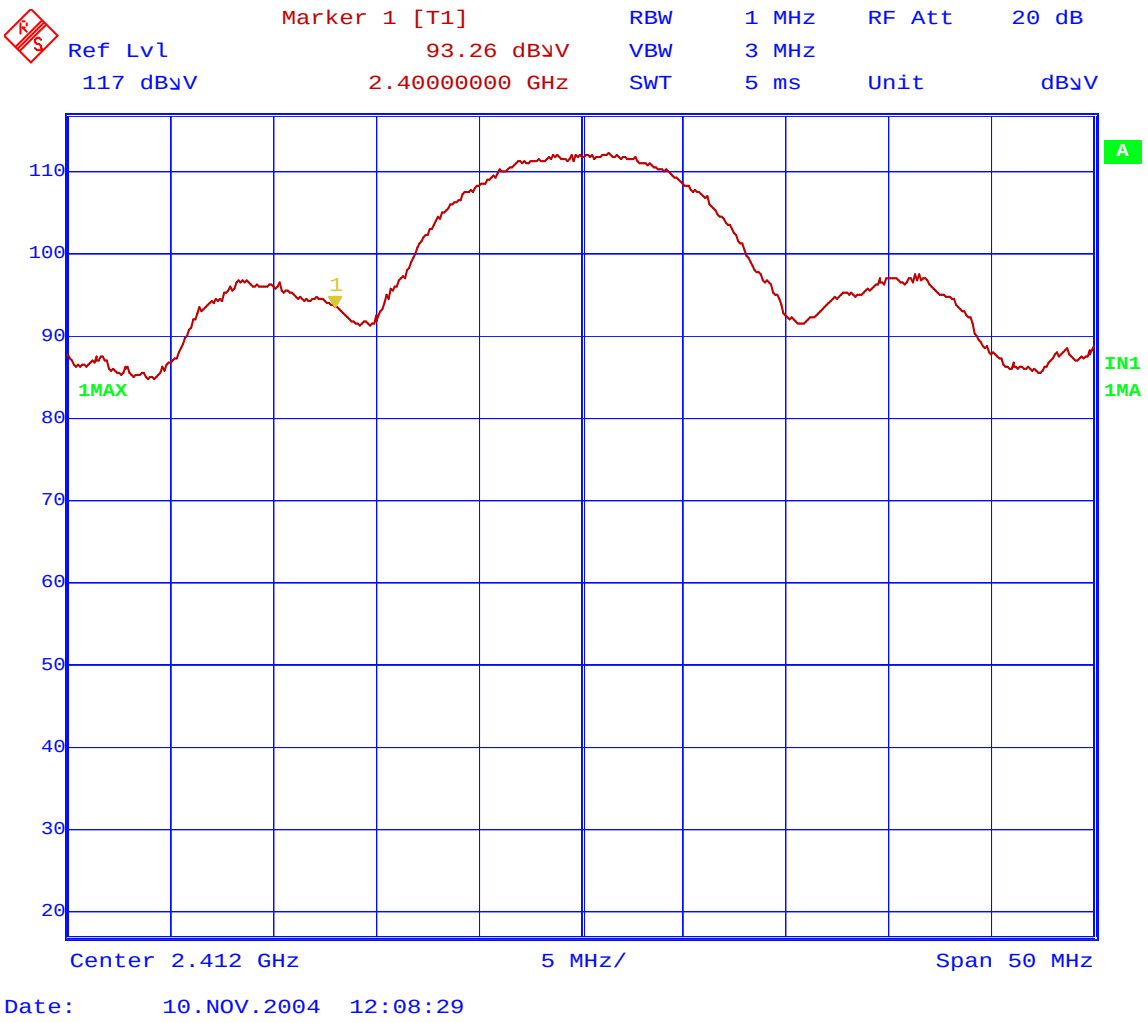
The RF output port of the Equipment-Under-Test is directly coupled to the input of the EMC analyzer through a specialized RF connector and a 10dB passive attenuator. A fully charged battery was used for the supply voltage.

The spectrum analyzer used the following settings:

1. Span = the frequency band of operation
2. RBW ≥ 100kHz
3. VBW ≥ 100kHz
4. Sweep = 5ms
5. Detector function = peak
6. Trace = max hold

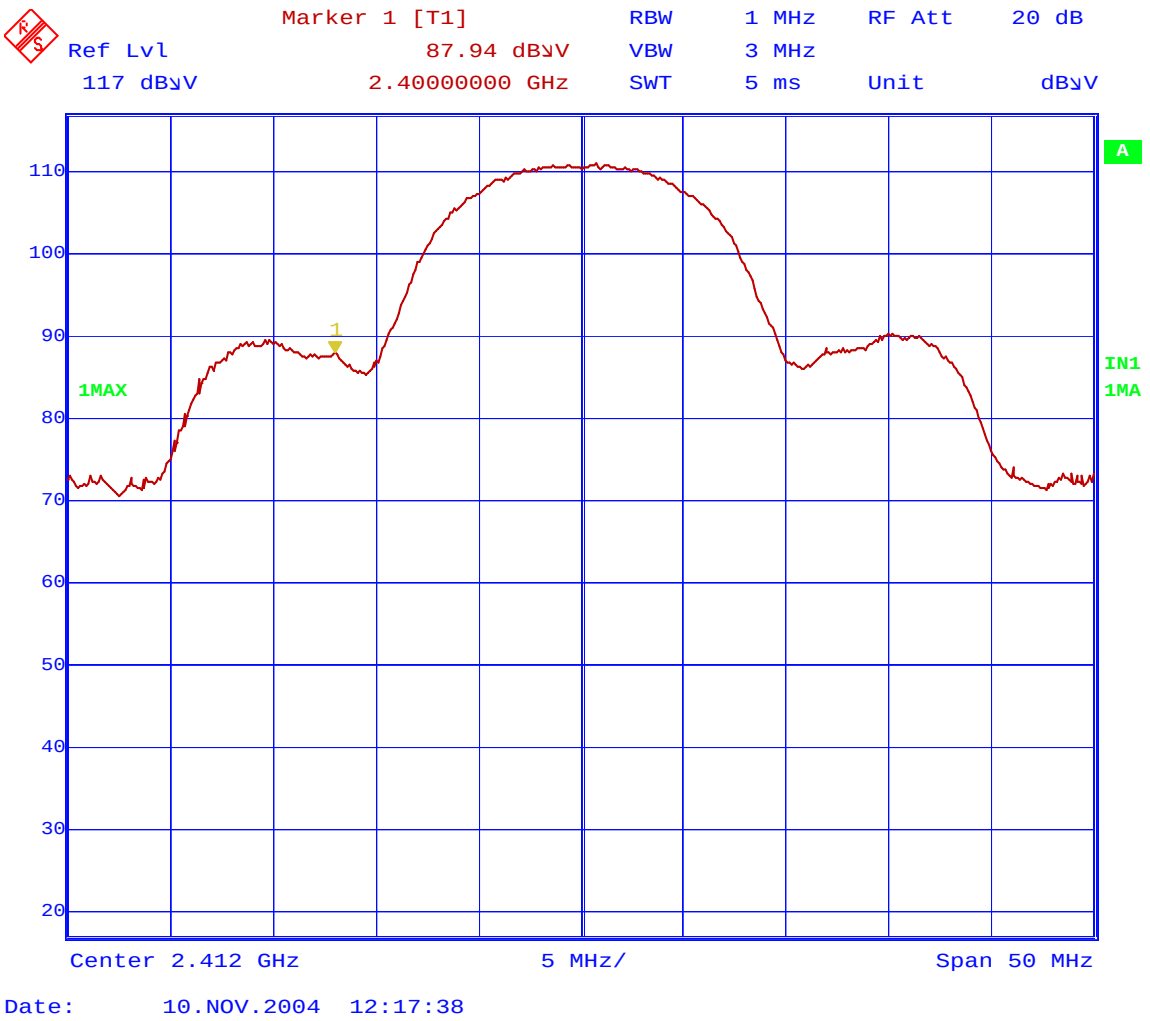
Measurement Results

See Attached:



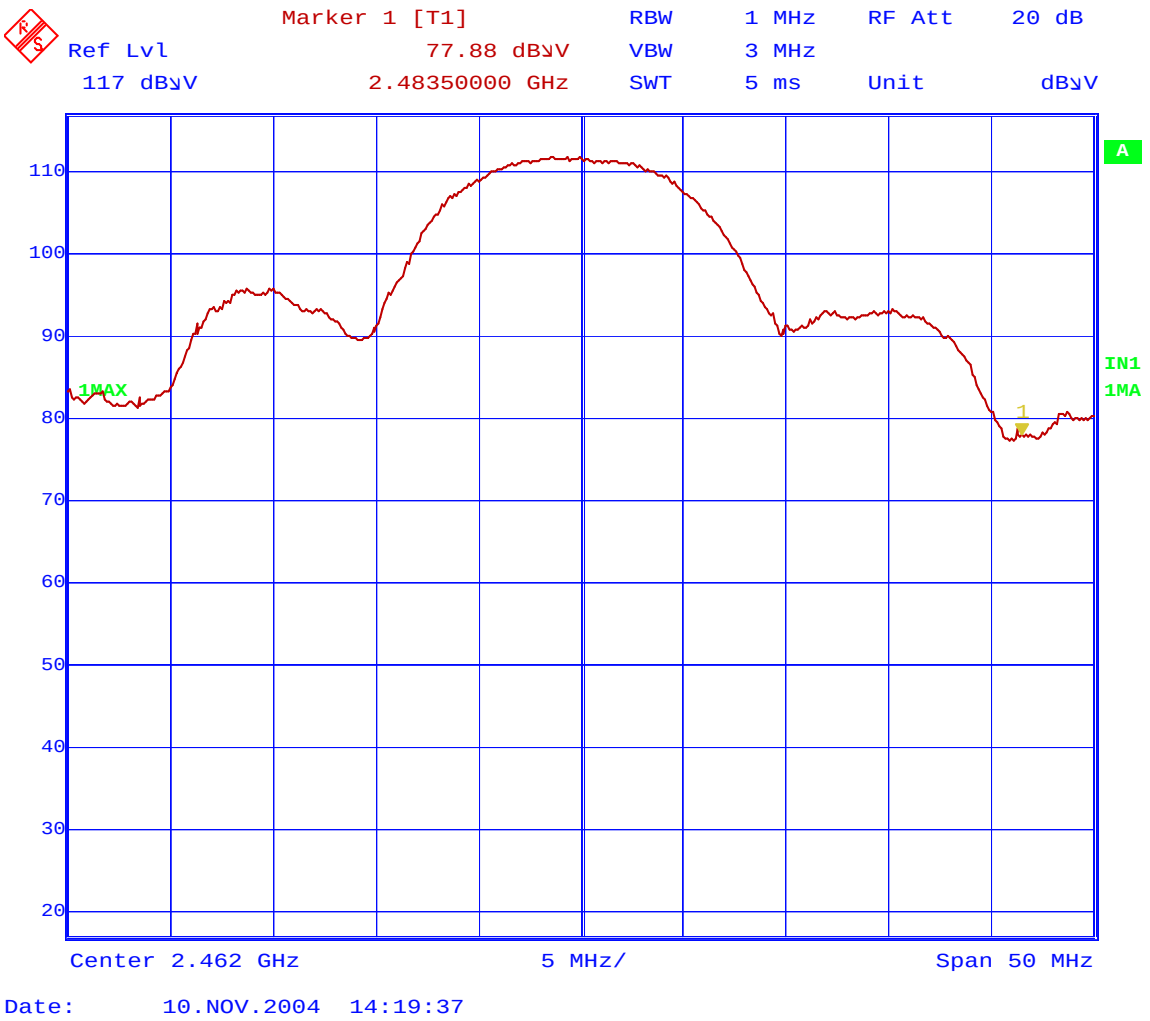
Radiated Lower Band Edge Horizontal Polarization

Converting the receiver output to dBm and adding the amplifier /cable loss factor of -13.75dBm gives a peak power of **-27.49dBm**.



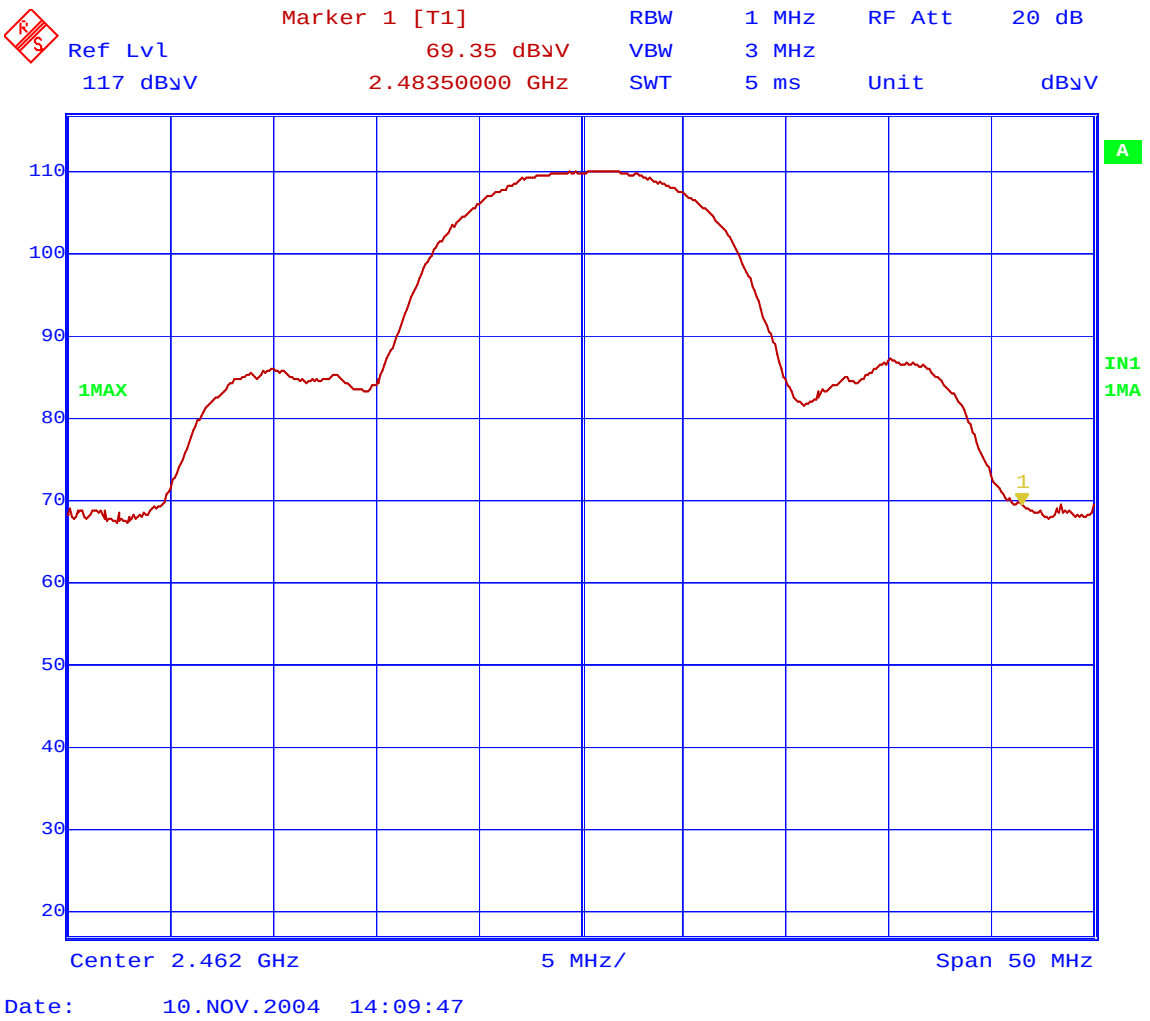
Radiated Lower Band Edge Vertical Polarization

Converting the receiver output to dBm and adding the amplifier /cable loss factor of -13.75dBm gives a peak power of **-32.81**.



Radiated Upper Band Edge Horizontal Polarization

Converting the receiver output to dBm and adding the amplifier /cable loss factor of -13.75dBm gives a peak power of **-42.87dBm**.



Radiated Upper Band Edge Vertical Polarization

Converting the receiver output to dBm and adding the amplifier /cable loss factor of -13.75dBm gives a peak power of **-51.4 dBm**.

SPURIOUS RF CONDUCTED EMISSIONS

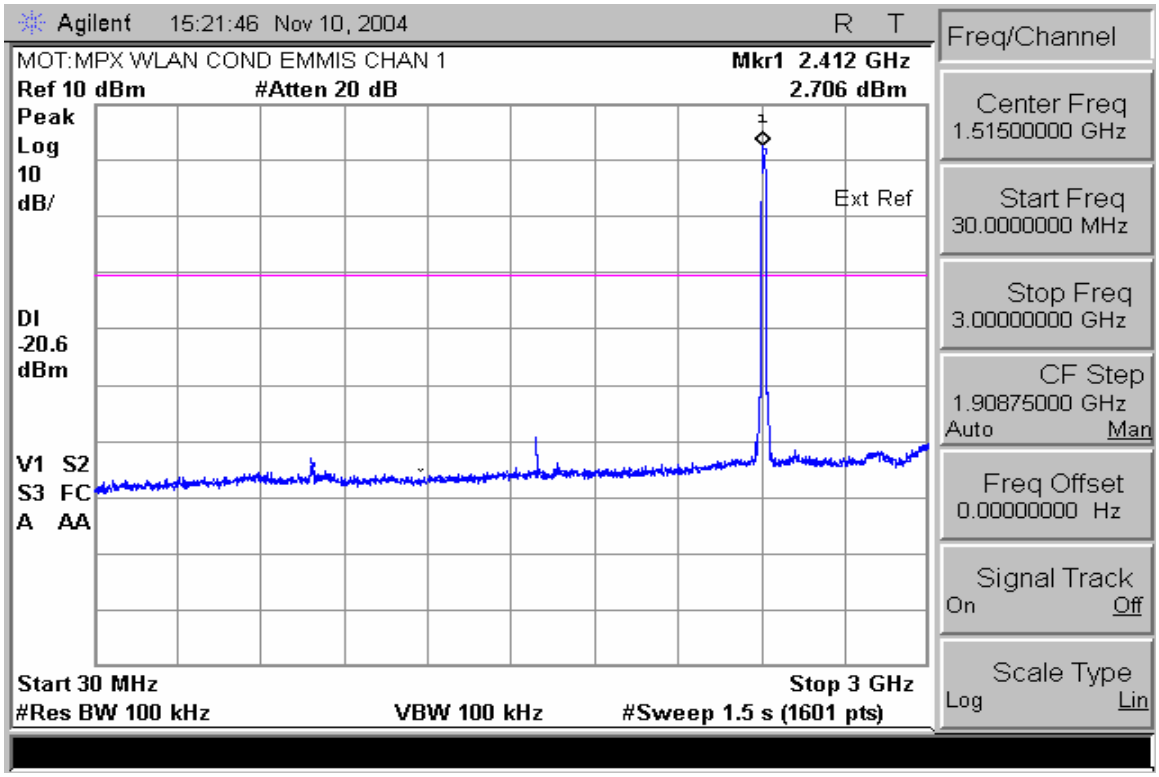
CFR 47 Part 15.247

Measurement Procedure

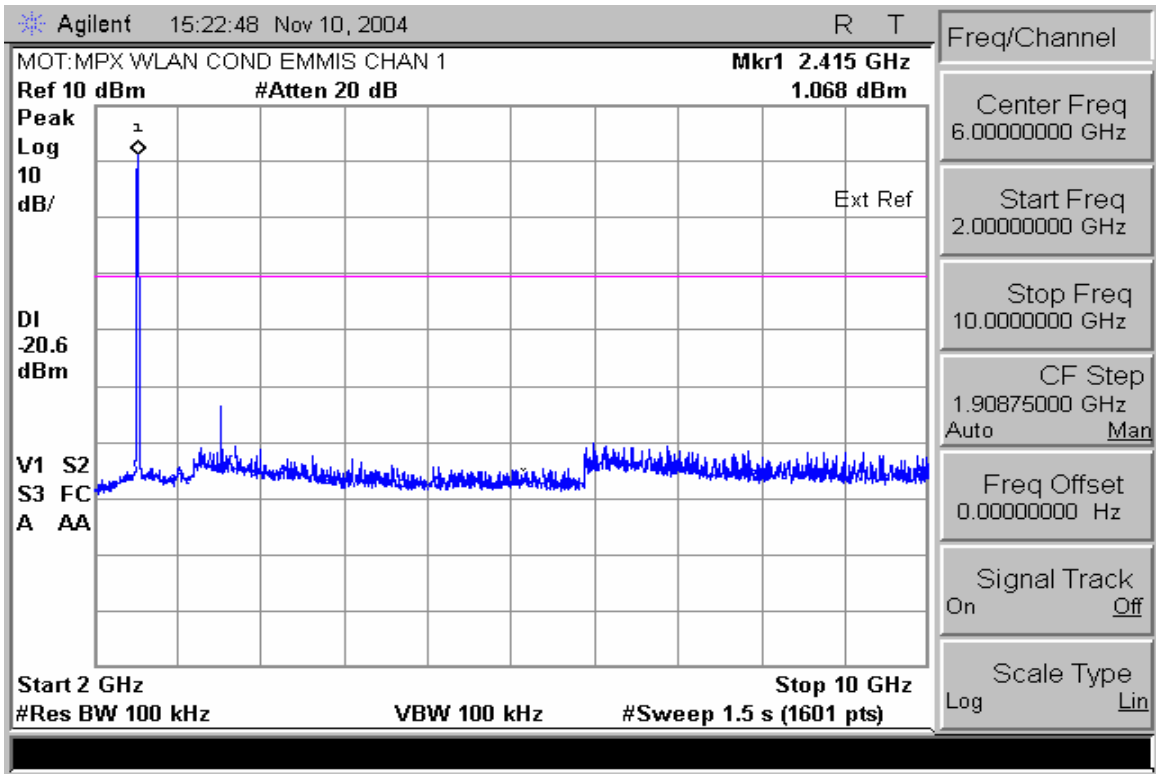
The RF output port of the Equipment-Under-Test is directly coupled to the input of the EMC analyzer through a specialized RF connector and a 10dB passive attenuator. A fully charged battery was used for the supply voltage.

Measurement Results

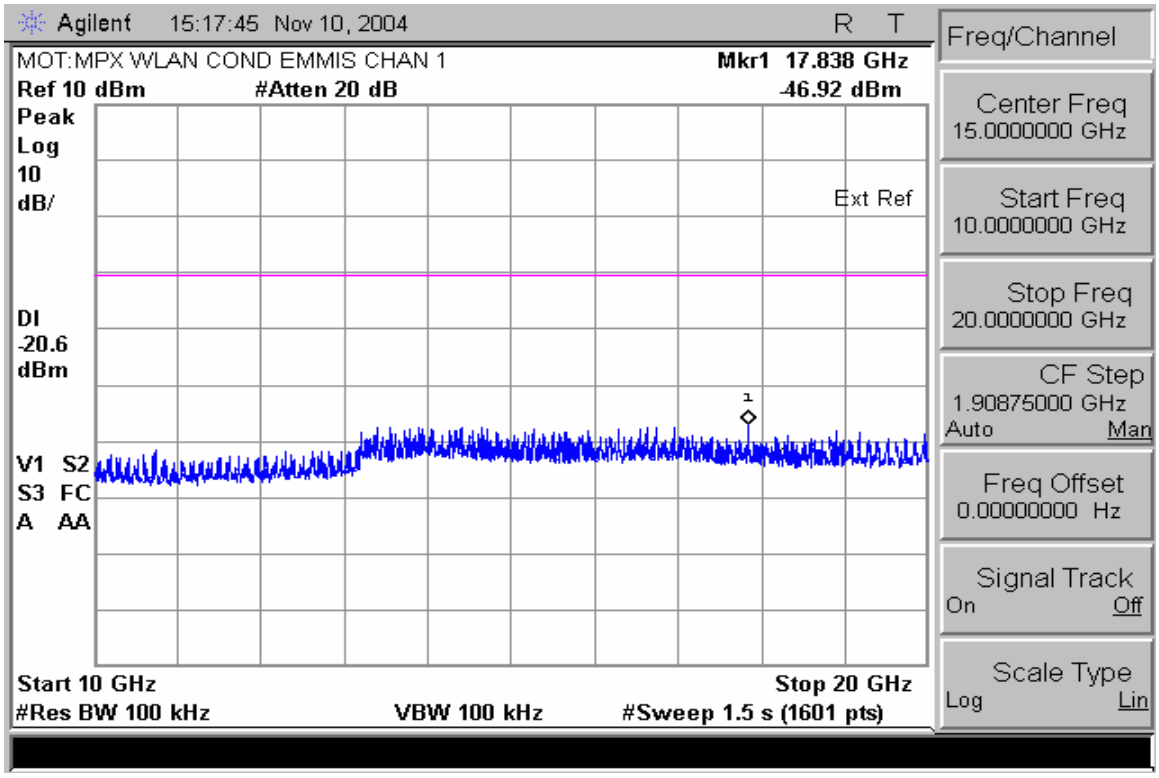
See attached:



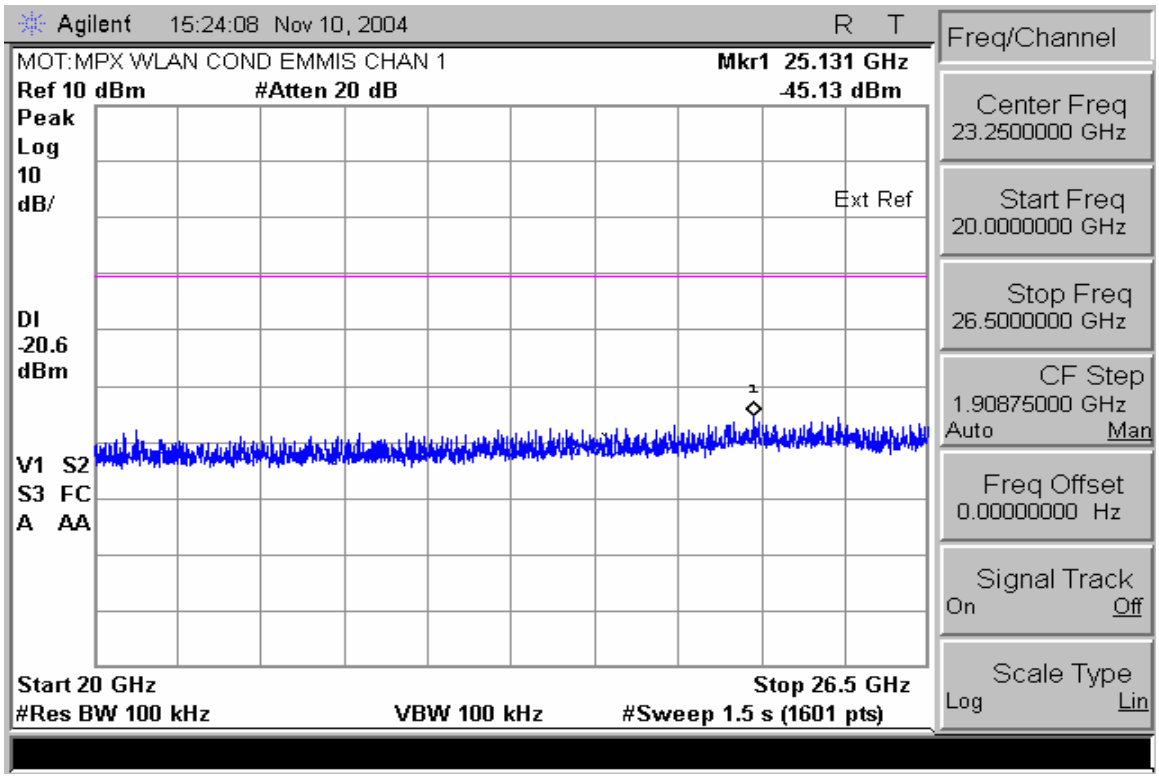
Conducted Spurious Emissions 30-3000MHz (Low Channel Enabled)



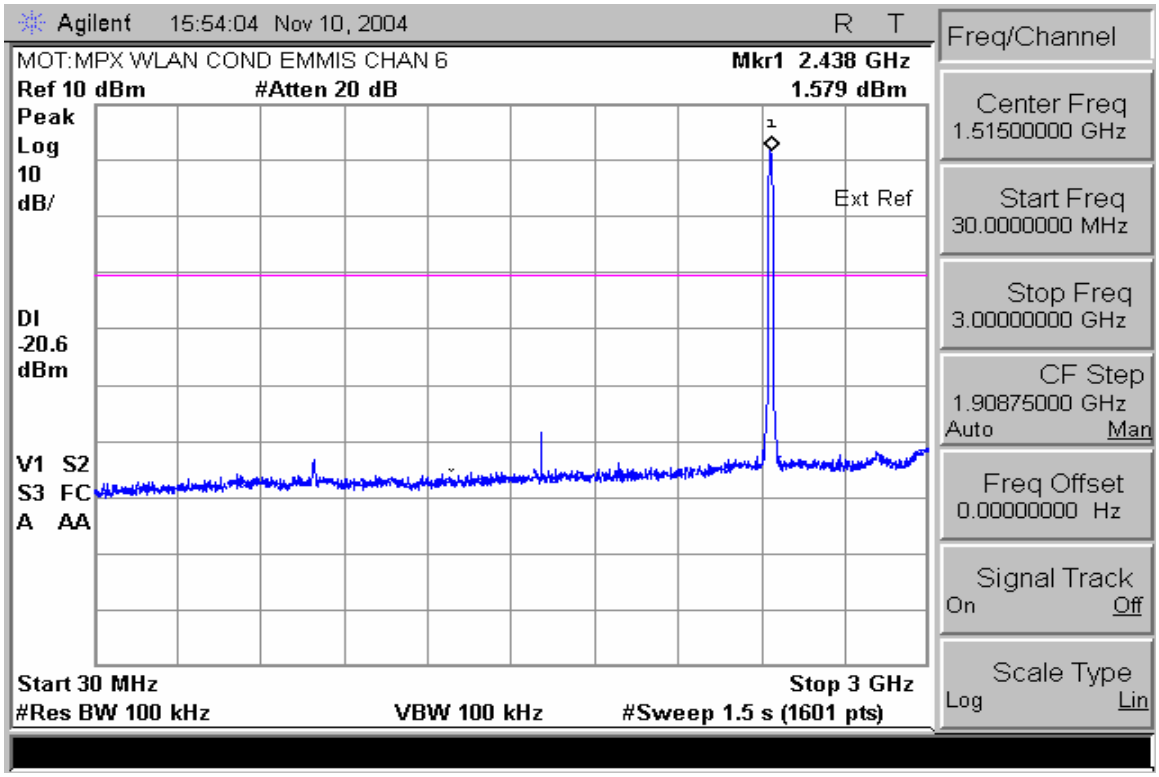
Conducted Spurious Emissions 2-10GHz (Low Channel Enabled)



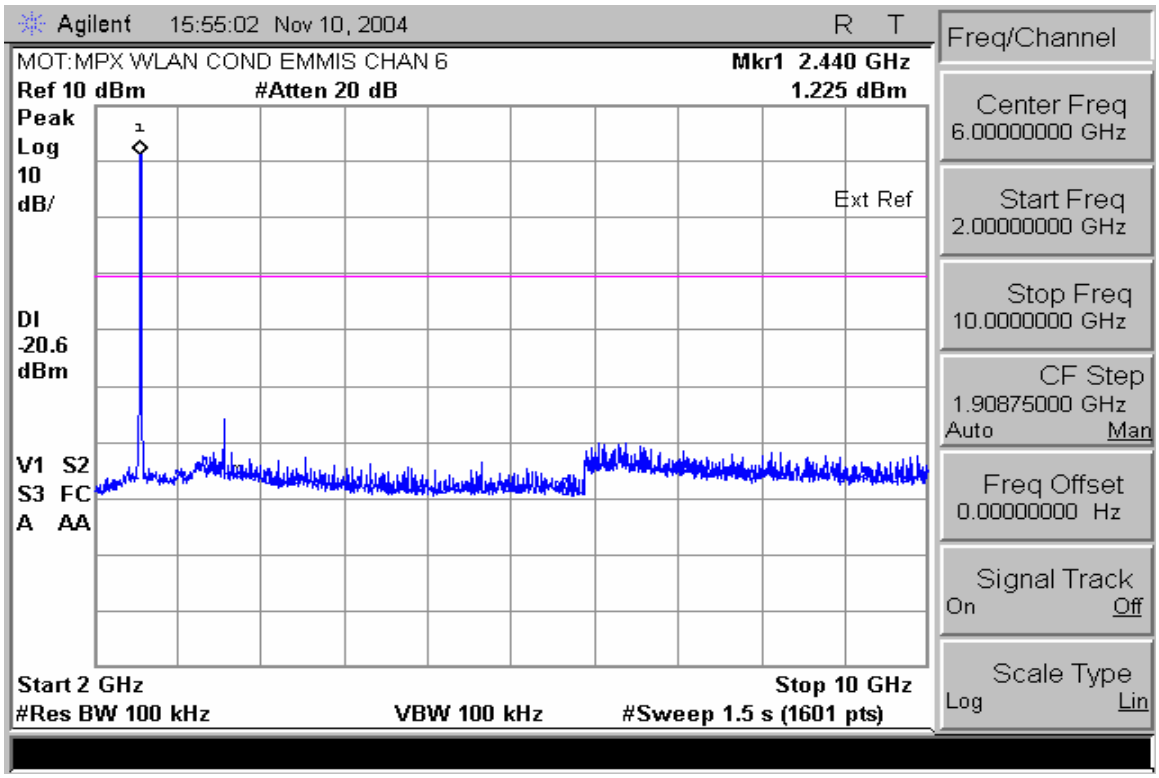
Conducted Spurious Emissions 10-20GHz (Low Channel Enabled)



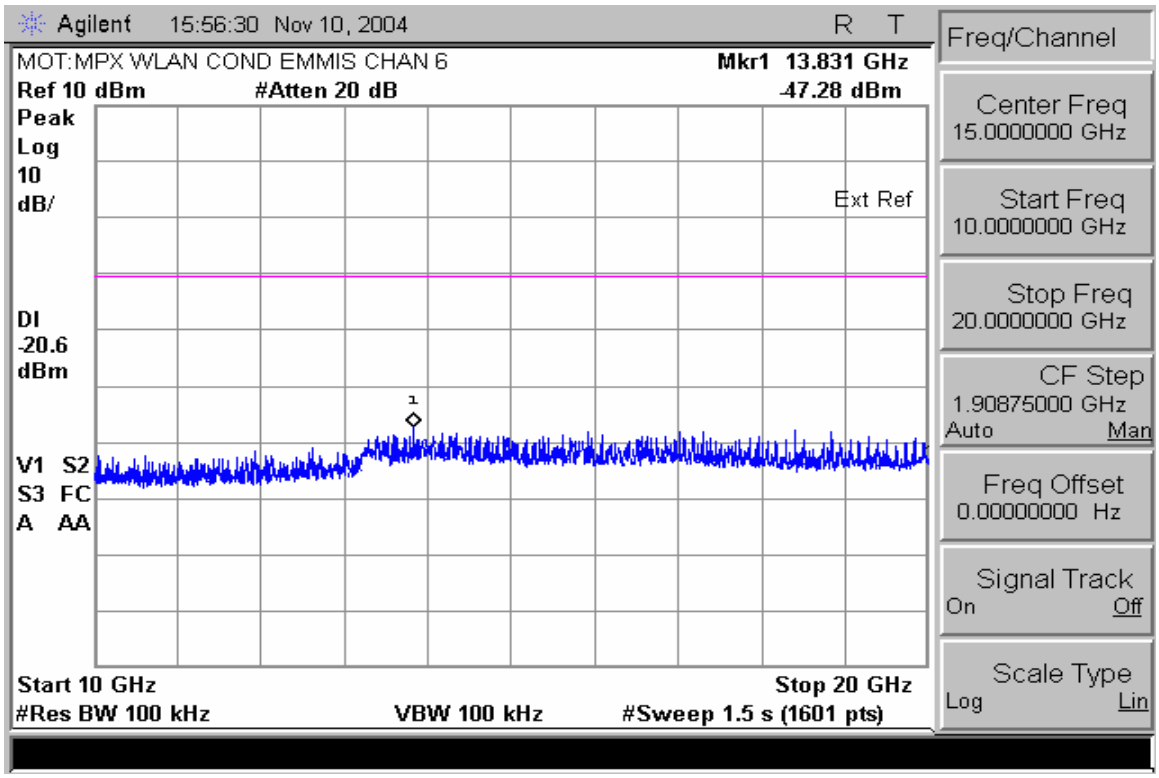
Conducted Spurious Emissions 20-26.5GHz (Low Channel Enabled)



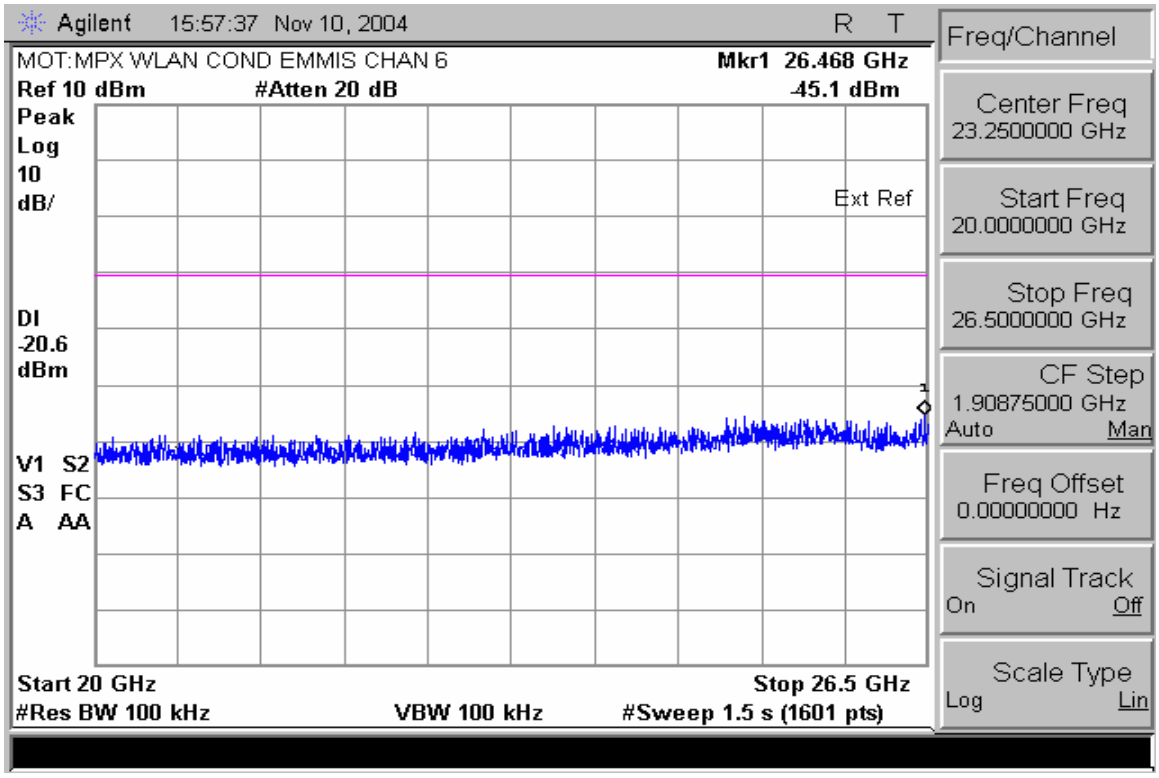
Conducted Spurious Emissions 30-3000MHz (Mid Channel Enabled)



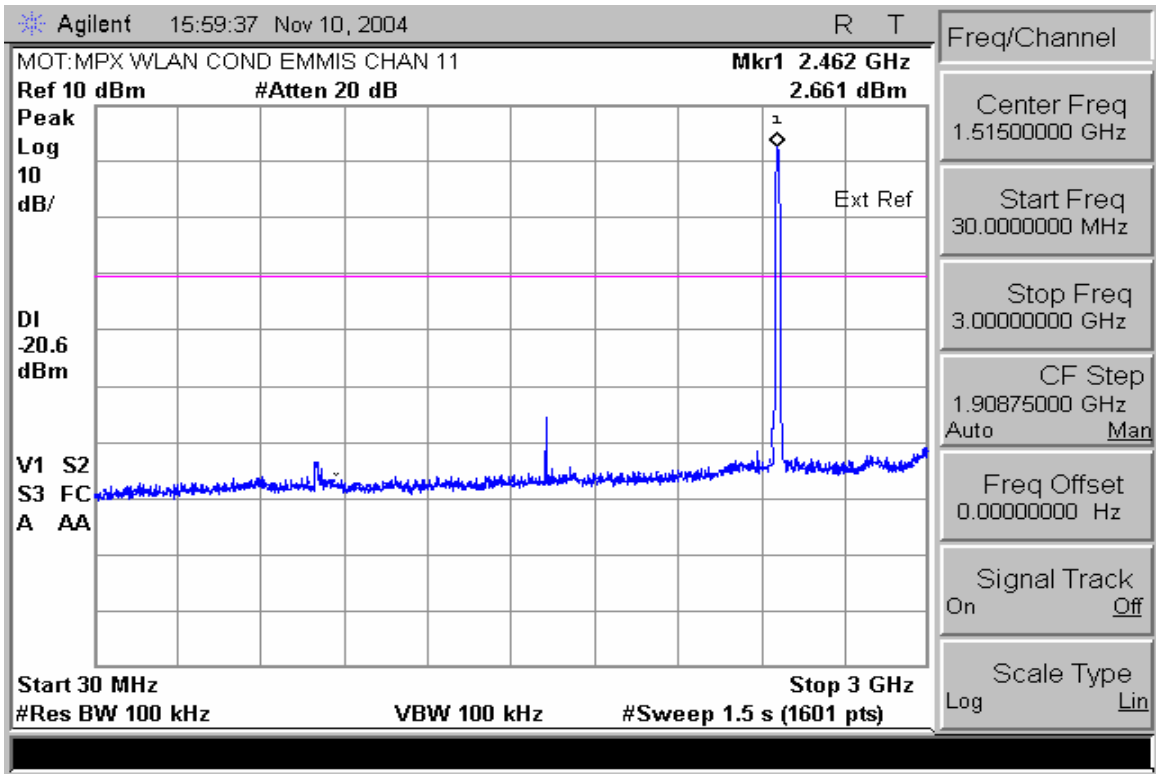
Conducted Spurious Emissions 2-10GHz (Mid Channel Enabled)



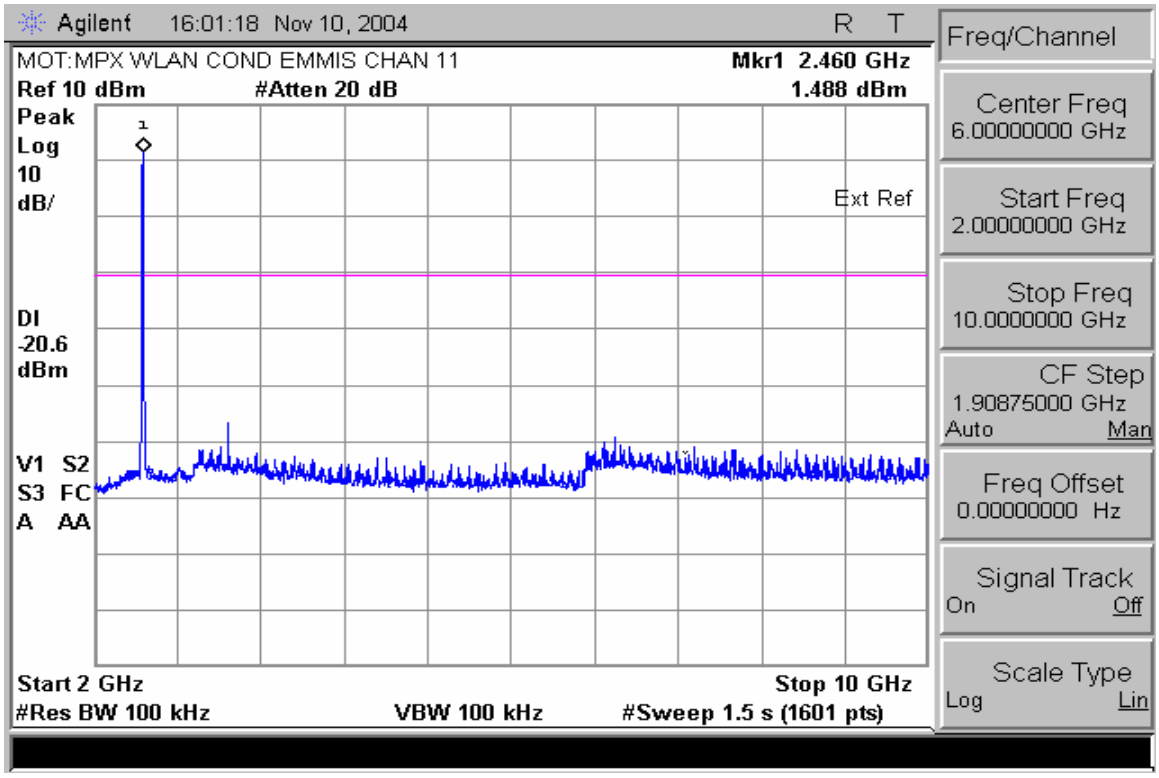
Conducted Spurious Emissions 10-20GHz (Mid Channel Enabled)



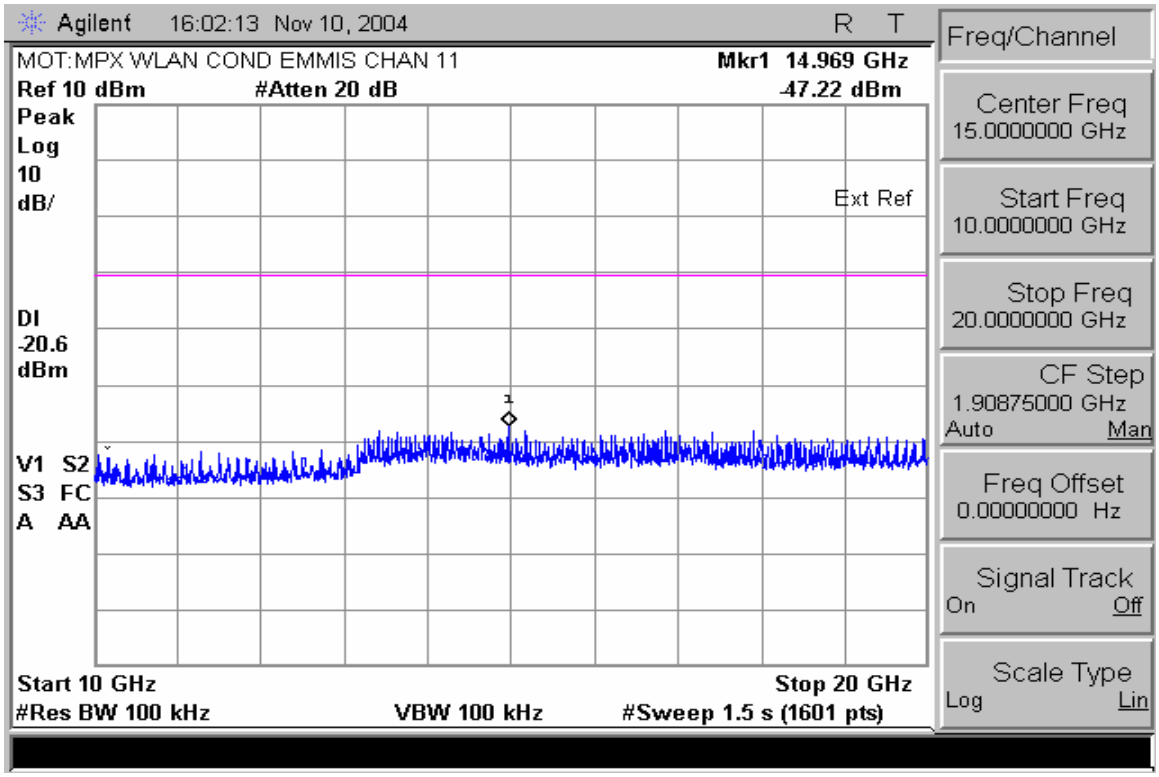
Conducted Spurious Emissions 20-26.5GHz (Mid Chan Enabled)



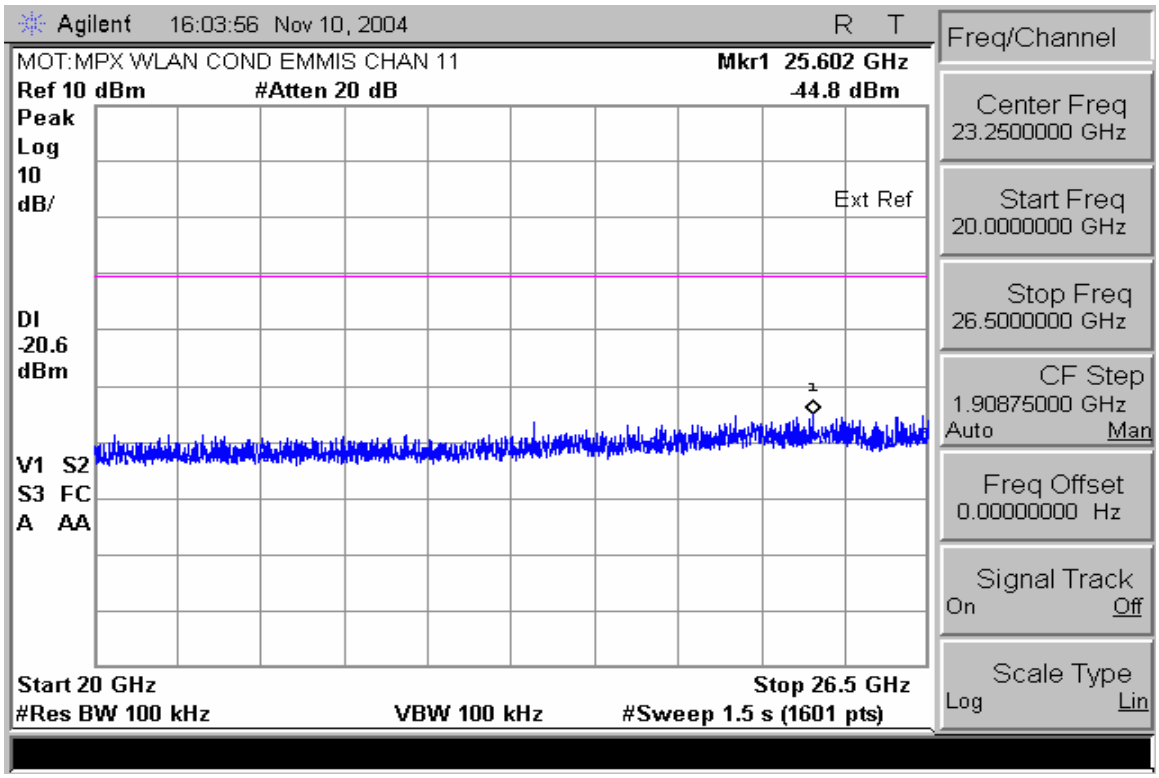
Conducted Spurious Emissions 30-3000MHz (High Channel Enabled)



Conducted Spurious Emissions 2-10GHz (High Channel Enabled)



Conducted Spurious Emissions 10-20GHz (High Channel Enabled)



Conducted Spurious Emissions 20-26.5GHz (High Chan Enabled)

End of Test Report