MOTOROLA

PERSONAL COMMUNICATIONS SECTOR

PRODUCT SAFETY AND COMPLIANCE EMC LABORATORY

EMC TEST REPORT - Addendum

Test Report Number – 12580-2BT

Report Date – March 17, 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: 2004-03-17

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 1900, Bluetooth
Model Number:	A630
Serial Numbers:	004400-00-383352-0, 004400-00-383352-0
Testing Complete Date:	February 2, 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)

DA 00-705, “Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems” published by the Federal Communications Commission was also used in the testing of this product.

Summary of Testing

Test	Test Name	Pass/Fail
1	Carrier Frequency Separation	Pass
2	Number of Hopping Frequencies	Pass
3	Time of Occupancy (Dwell Time)	Pass
4	20 dB Bandwidth	Pass
5	Spurious RF Conducted Emissions	Pass
6	Field Strength of Spurious Emissions	Pass
7	Max Power	N/A
8	Band Edges	Pass
9	Conducted Spurious Emissions	Pass

Test	Test Name	Results
1	Carrier Frequency Separation	1.00MHz
2	Number of Hopping	79
3	Time of Occupancy (Dwell Time)	120.6 µs
4	20 dB Bandwidth	765 KHz
5	Spurious RF Conducted Emissions	See plots
6	Field Strength of Spurious Emissions	See plots
7	Max Power	0.718dBm
8	Band Edges	See plots
9	Conducted Spurious Emissions	See plots

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.

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 Name	Item Name Description	Model #	Serial Number	Calibration Due Date
HP	GSM Test Set	8922M	3639U01033	05/04/2004
HP	DCS/PCS MS Test Set	83220E	3524U01522	05/22/2004
Agilent	Power Supply	66311B	US38447252	10/24/2004
HP	EMC Analyzer	E7405	US40240219	04/04/2004
Weinschel	10dB Attenuator	AS-6	6675	10/14/2004
Gigatronics	Universal Power Meter	8651A	8650508	10/02/2004
KWM	1900MHz HP Filter	HPF-L-14768	8427-01	10/02/2004
KWM	800MHz HP Filter	HPF-L-14767	8427-02	08/15/2004
Thermotron	Environmental Chamber	S-4	31580	01/05/2005
Rohde Schwarz	EMI Test Receiver	ESI26	838786/010	04/29/2004
A.H. System	Horn Antenna	SAS200/571	365	12/17/2004
A.H. System	Horn Antenna	SAS200/571	265	04/29/2004
ETS	Log-Periodic Antenna	3148	1189	04/29/2004
ETS	Biconical Antenna	3110B	3369	04/29/2004
Hewlett Packard	QP Adapter	85650A	2811A01069	1/08/2005
Hewlett Packard	S/A Display	8566B	2542A12974	1/08/2005
Hewlett Packard	S/A	8566B	2637A03376	1/08/2005
Hewlett Packard	RF Preselector	85685A	2810A00692	1/08/2005
Rohde & Schwarz	S/A	FSEK20	DE2525315	1/09/2005
EMCO	Horn Antenna 1-18GHz	3115	2638	7/10/2004
EMCO	Horn Antenna 18-26.5GHz	3160-09	9904-1165	N/A*
Chase	Bi-Con Antenna 30-300MHz	VBA6106A	1246	6/23/2004
Chase	Log-Periodic Antenna	UPA6108	1120	6/23/2004

All equipment is on a one-year calibration cycle.

Description of Bluetooth Transmitter

The A630 cell phone offers Bluetooth as a feature. The Bluetooth spread-spectrum, frequency hopping transceiver is designed to operate between 2400 and 2483 MHz. The Bluetooth 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 Bluetooth transmitter, it is designed operate with other Bluetooth devices as defined by industrial standard. In this application, the device is battery-operated. Therefore conducted AC line emissions testing as described in CFR47, Part 15.207 was not necessary.

Measurement Procedures and Data

CARRIER FREQUENCY SEPARATION

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.

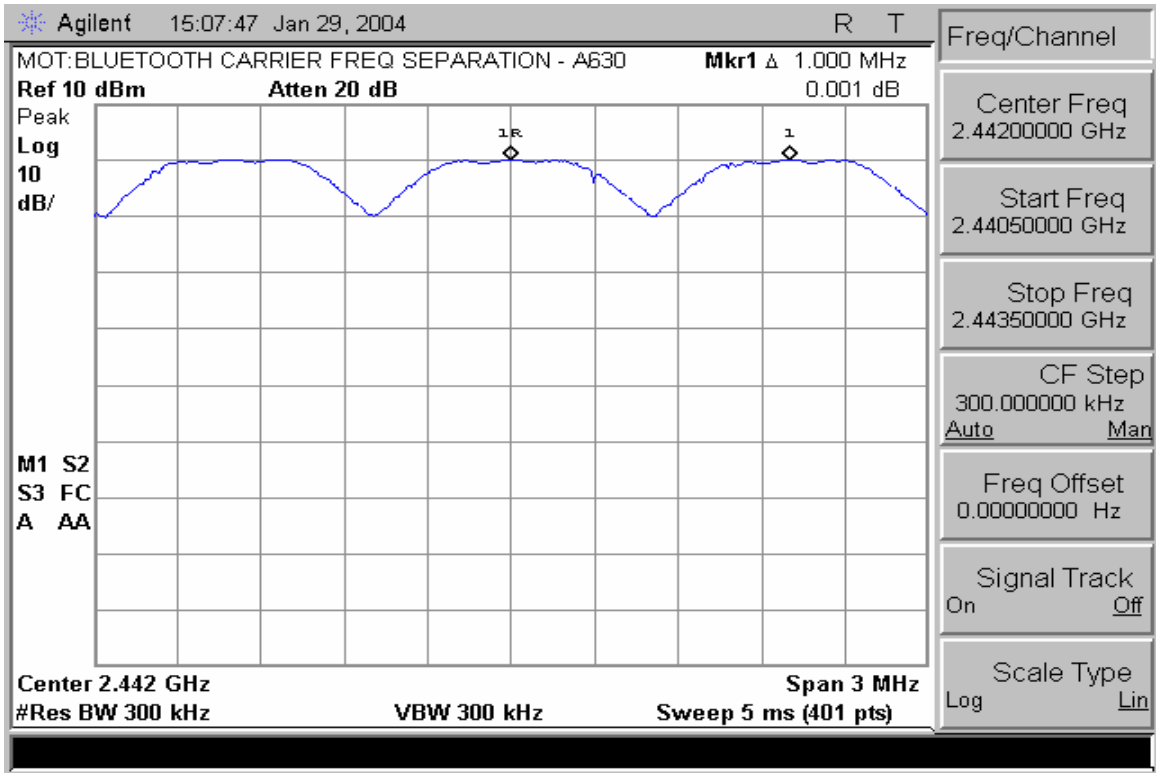
The Bluetooth transmitter of the A630 had its hopping function enabled. The following spectrum analyzer settings were used:

1. Span = wide enough to capture the peaks of two adjacent channels
2. Resolution (or IF) Bandwidth (RBW) ≥ 1% of the span
3. Video (or Average) Bandwidth (VBW) ≥ RBW
4. Sweep = auto
5. Detector function = peak
6. Trace = max hold

The trace was allowed to stabilize. The marker-delta function was used to determine the separation between the peaks of the adjacent channels.

Measurement Results

See attached.



Carrier Frequency Separation

NUMBER OF HOPPING FREQUENCIES

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.

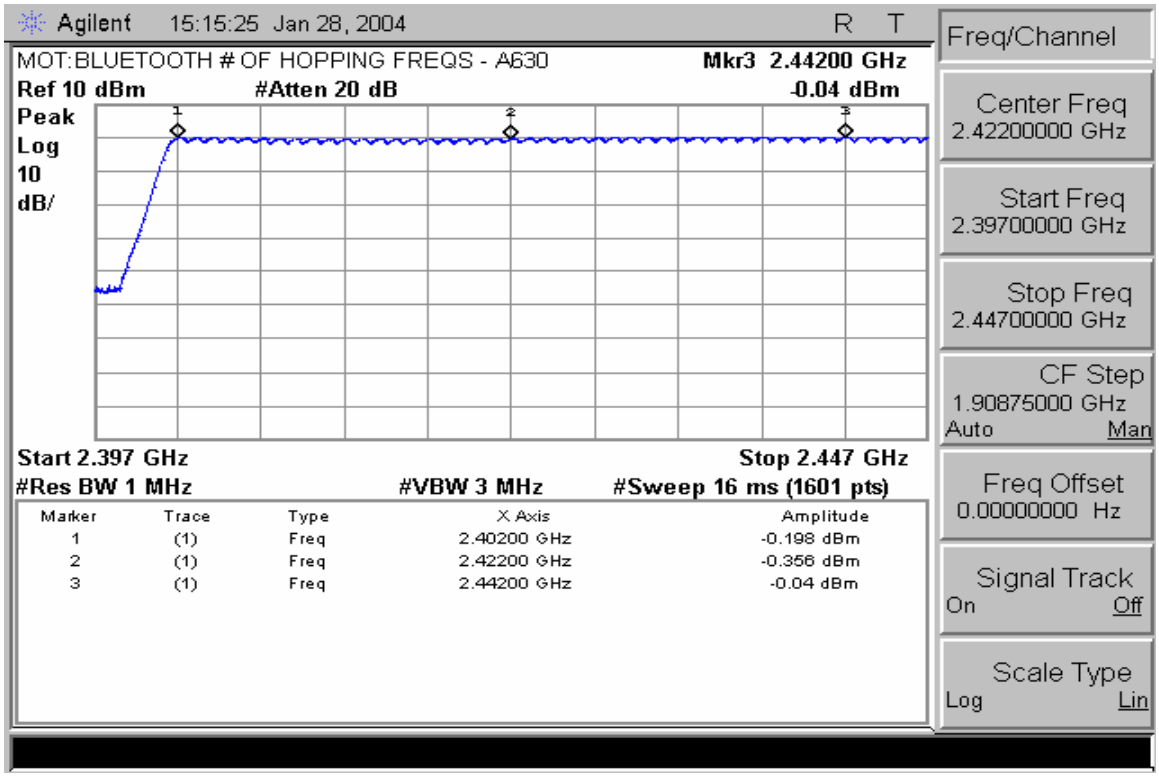
The Bluetooth frequency hopping function of the EUT was enabled. The spectrum analyzer used the following settings:

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

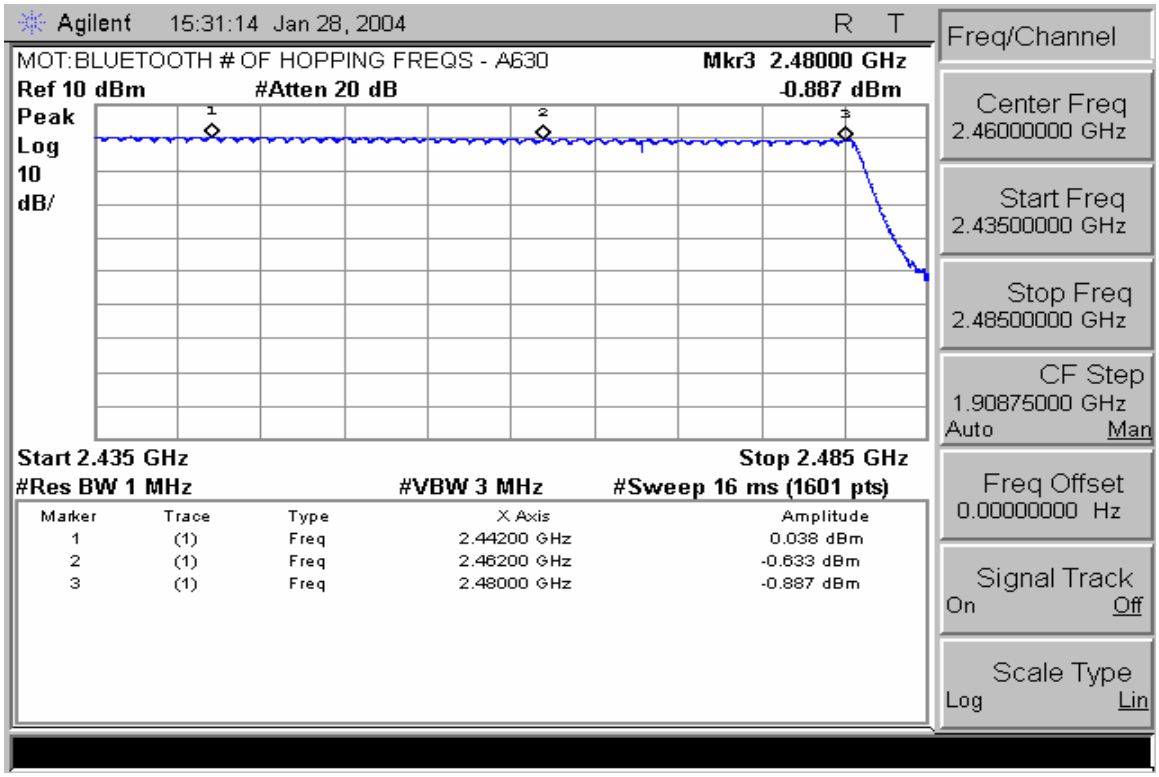
The trace was allowed to stabilize.

Measurement Results

See attached.



Number of Hopping Frequencies (Channels 2 – 42)



Number of Hopping Frequencies (Channels 42 – 80)

TIME OF OCCUPANCY (DWELL TIME)

CFR47 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.

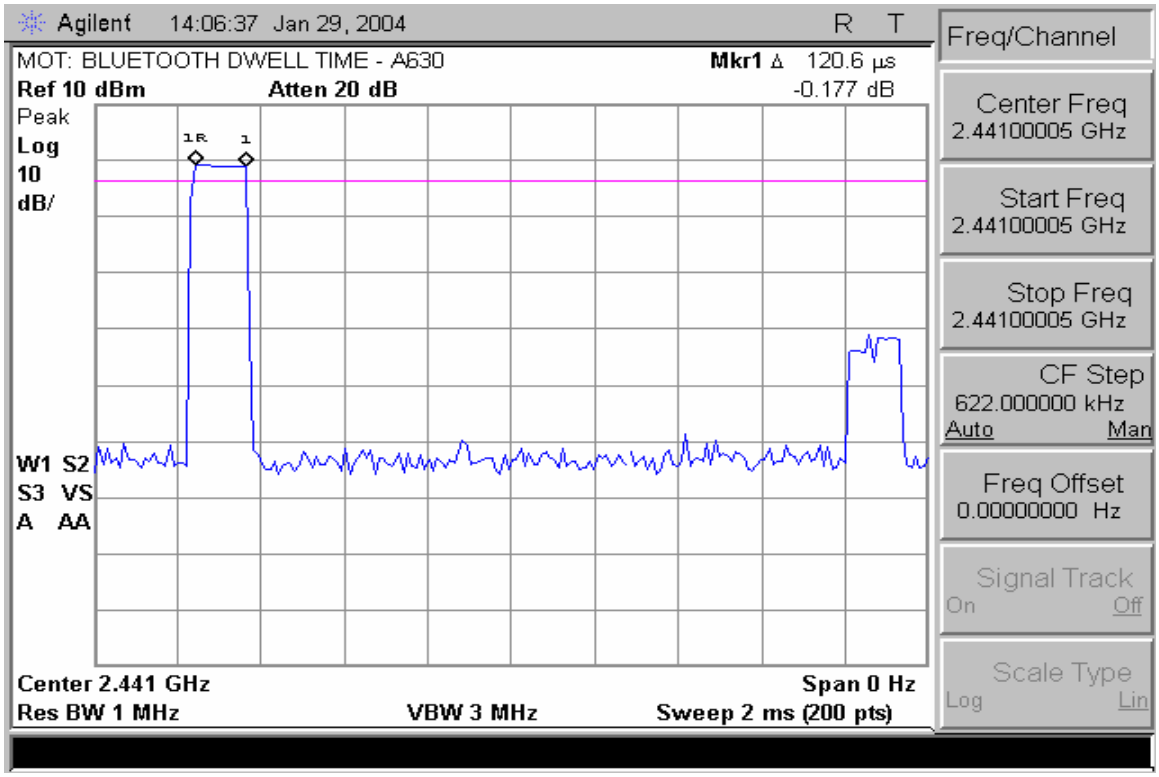
The Bluetooth hopping function of the EUT was enabled. The following spectrum analyzer settings were used:

1. Span = zero span, centered on a hopping channel
2. RBW = 1 MHz
3. VBW ≥ RBW
4. Sweep = as necessary to capture the entire dwell time per hopping channel
5. Detector function = peak
6. Trace = max hold

The marker-delta function was used to determine the dwell time.

Measurement Results

Attached


Agilent 14:06:37 Jan 29, 2004
R T
MOT: BLUETOOTH DWELL TIME - A630
Mkr1 Δ 120.6 µs
-0.177 dB
Ref 10 dBm
Atten 20 dB
Peak
Log
10
dB/
1R 1
W1 S2
S3 VS
A AA
Center 2.441 GHz
Res BW 1 MHz
VBW 3 MHz
Span 0 Hz
Sweep 2 ms (200 pts)
Freq/Channel
Center Freq
2.44100005 GHz
Start Freq
2.44100005 GHz
Stop Freq
2.44100005 GHz
CF Step
622.000000 kHz
Auto Man
Freq Offset
0.00000000 Hz
Signal Track
On Off
Scale Type
Log Lin

Dwell Time

20dB Bandwidth

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 Bluetooth frequency hopping function of the EUT was enabled. The spectrum analyzer used the following settings:

1. Span = approx. 2 to 3 times the 20dB bandwidth, centered on a hopping frequency
2. RBW ≥ 1% of the 20dB span
3. VBW ≥ RBW
4. Sweep = auto
5. Detector function = peak
6. 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 marker-delta function was used to measure 20dB down one side of the emission. The marker-delta function and marker was moved to the other side of the emission until it was even with the reference marker. The marker-delta reading at this point was the 20dB bandwidth of the emission.

Measurement Results

Attached

20 dB Bandwidth

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)

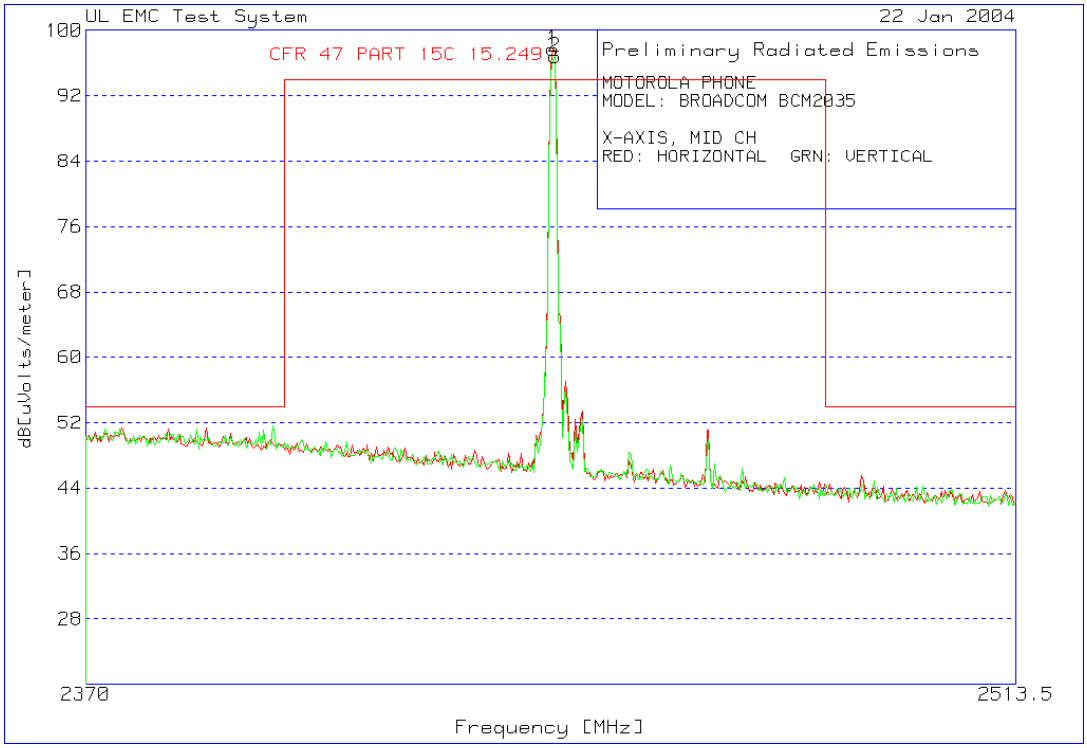
A fully charged battery was used for the supply voltage.

This data was taken at Underwriter's Laboratories.

Measurement Results

Attached

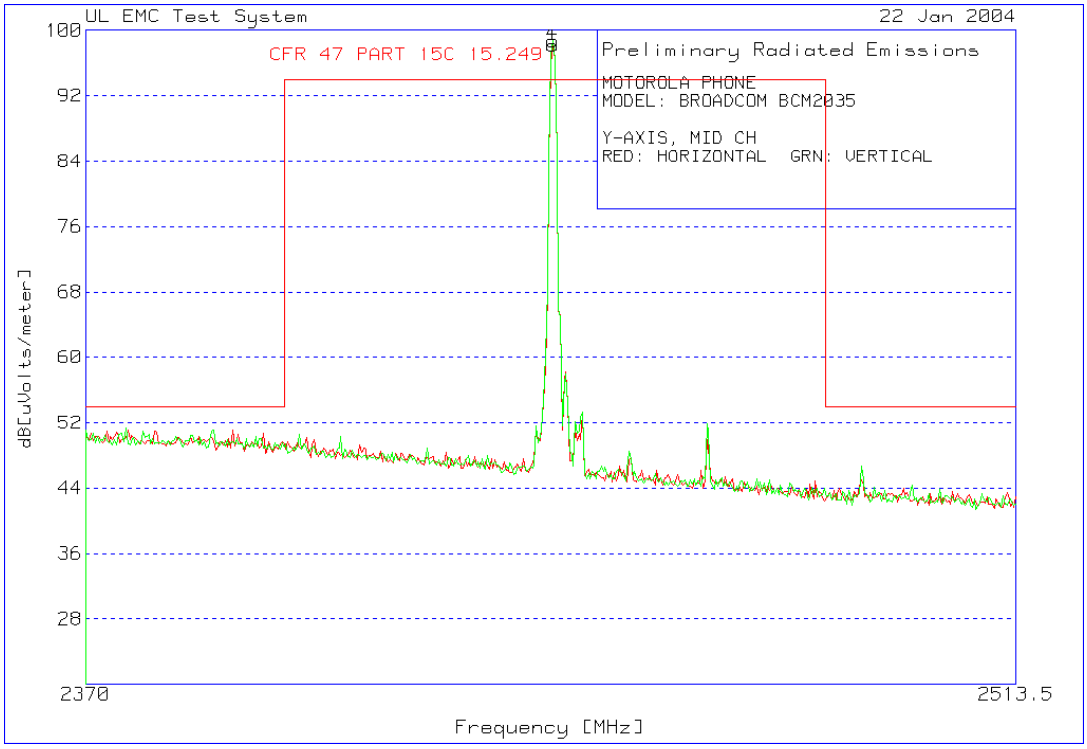
Band Edge X-Axis Low Channel



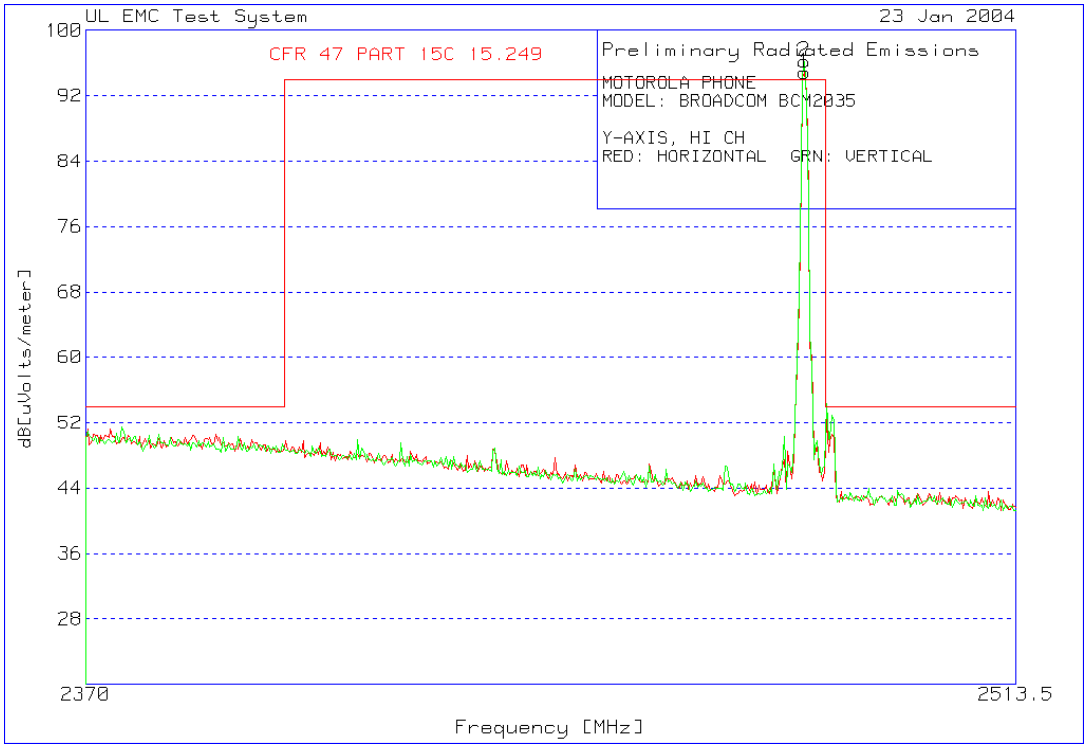
Band Edge X-Axis Middle Channel

Band Edge X-Axis High Channel

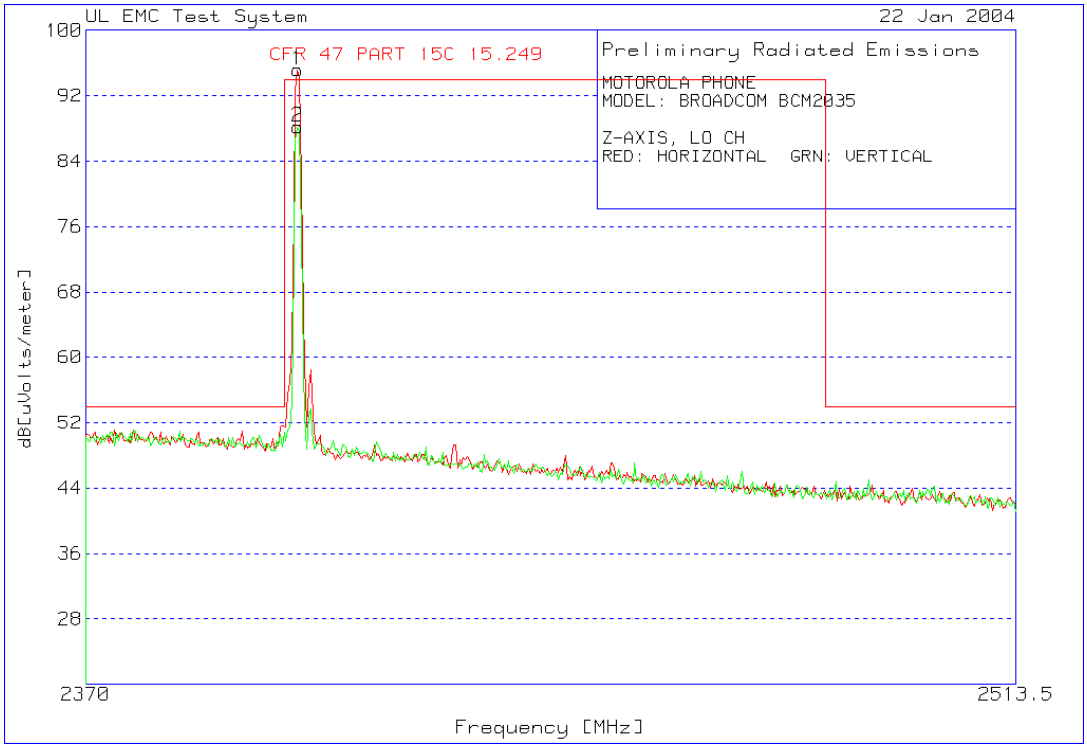
Band Edge Y-Axis Low Channel



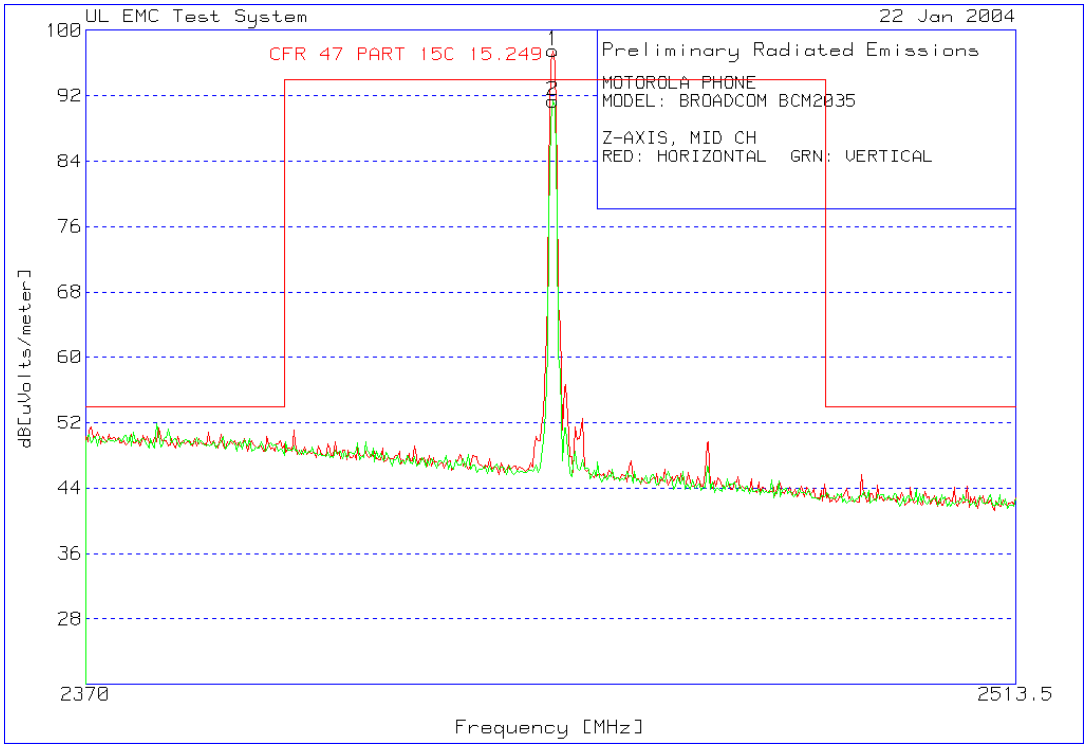
Band Edge Y-Axis Middle Channel



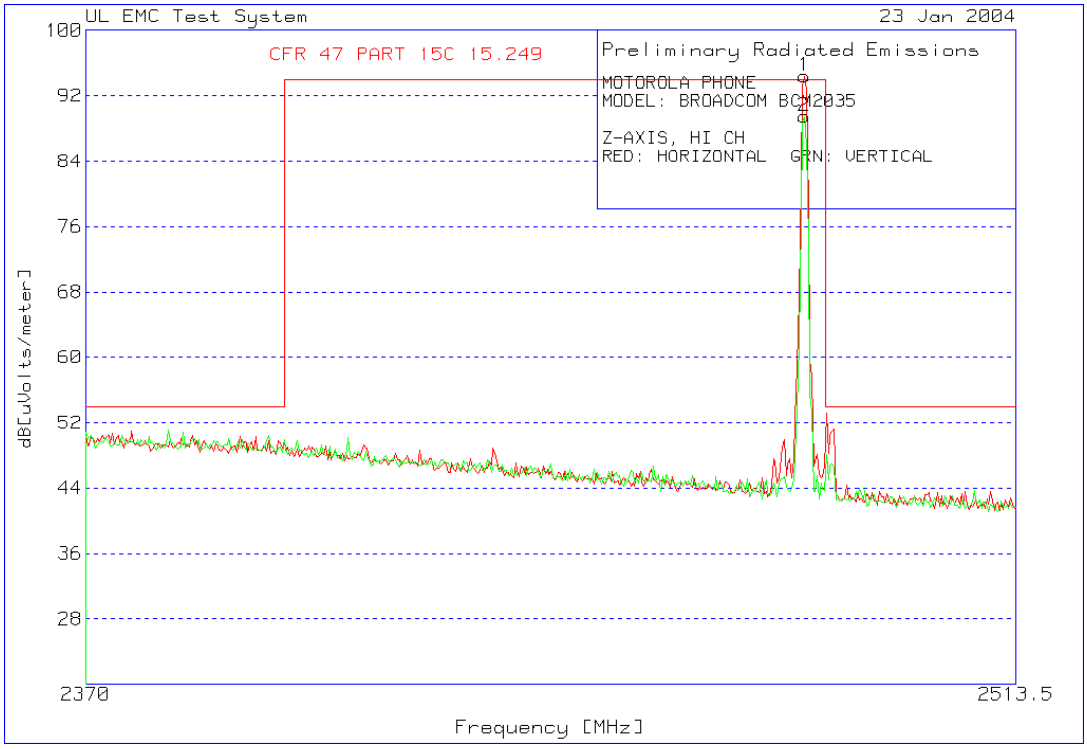
Band Edge Y-Axis High Channel



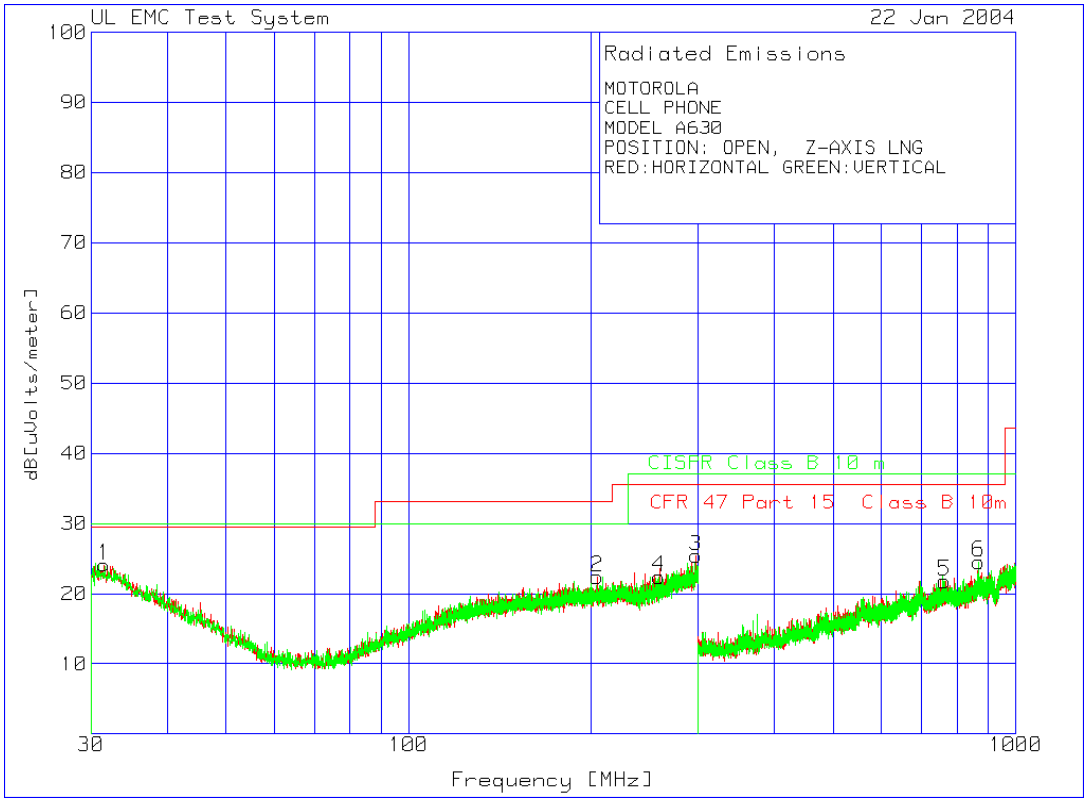
Band Edge Z-Axis Low Channel



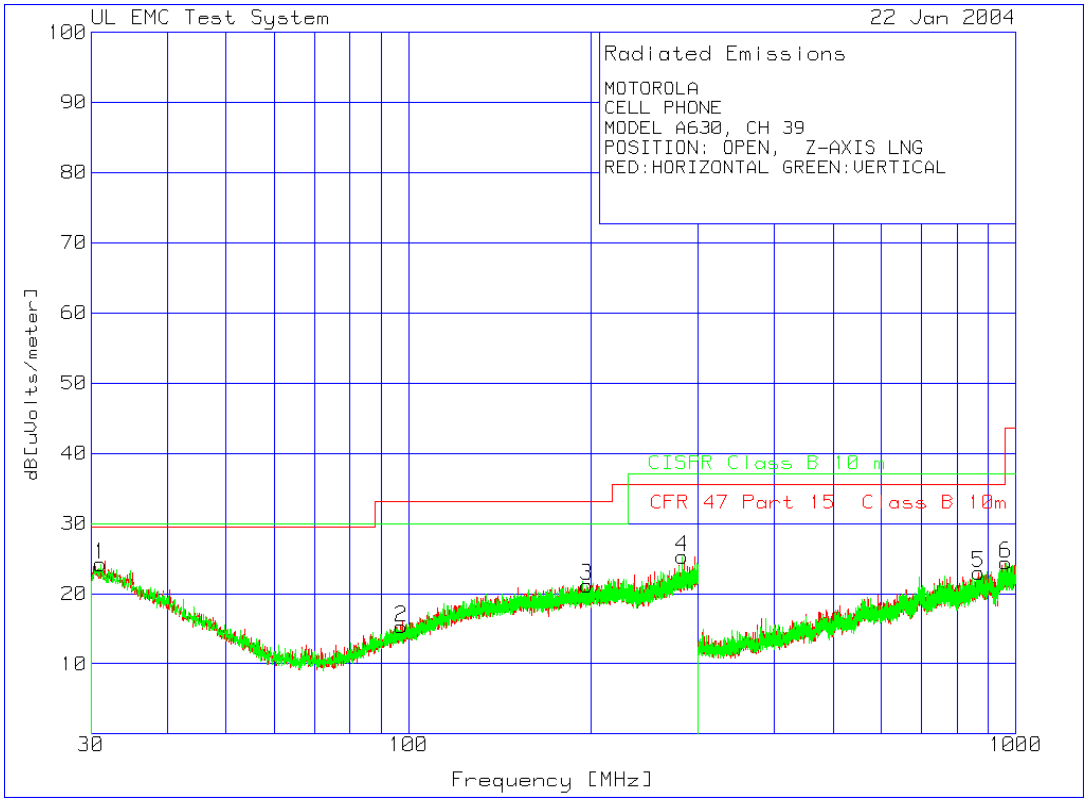
Band Edge Z-Axis Middle Channel



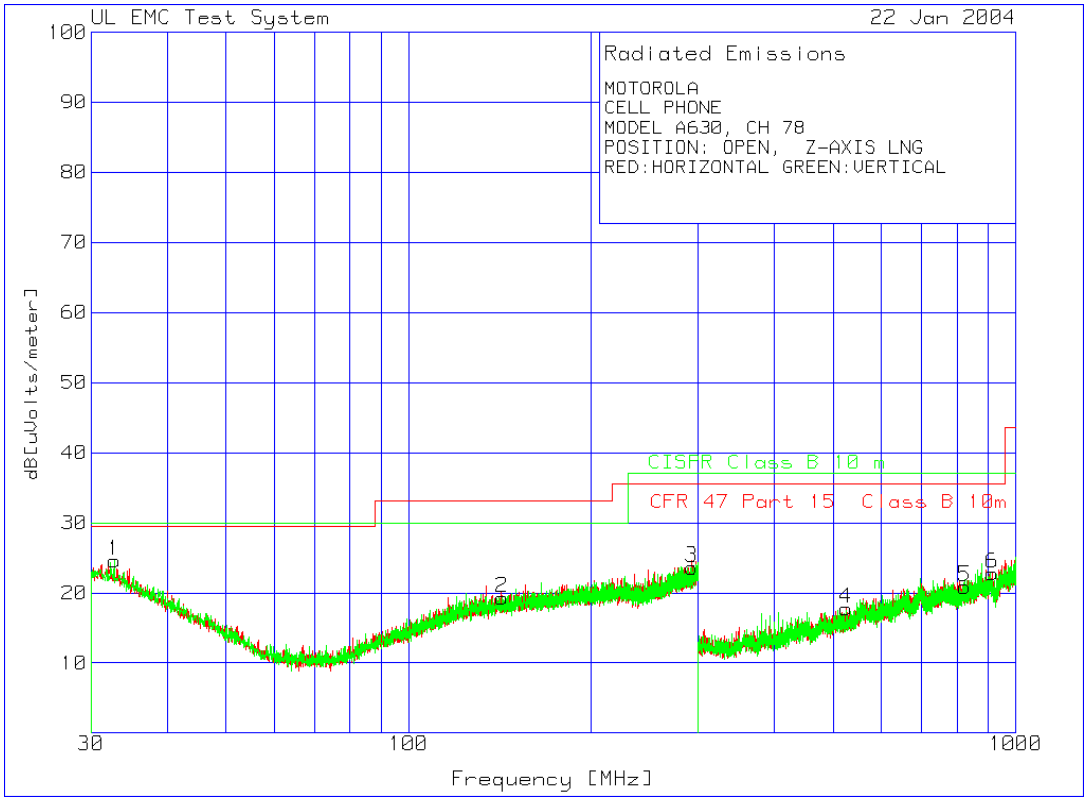
Band Edge Z-Axis High Channel



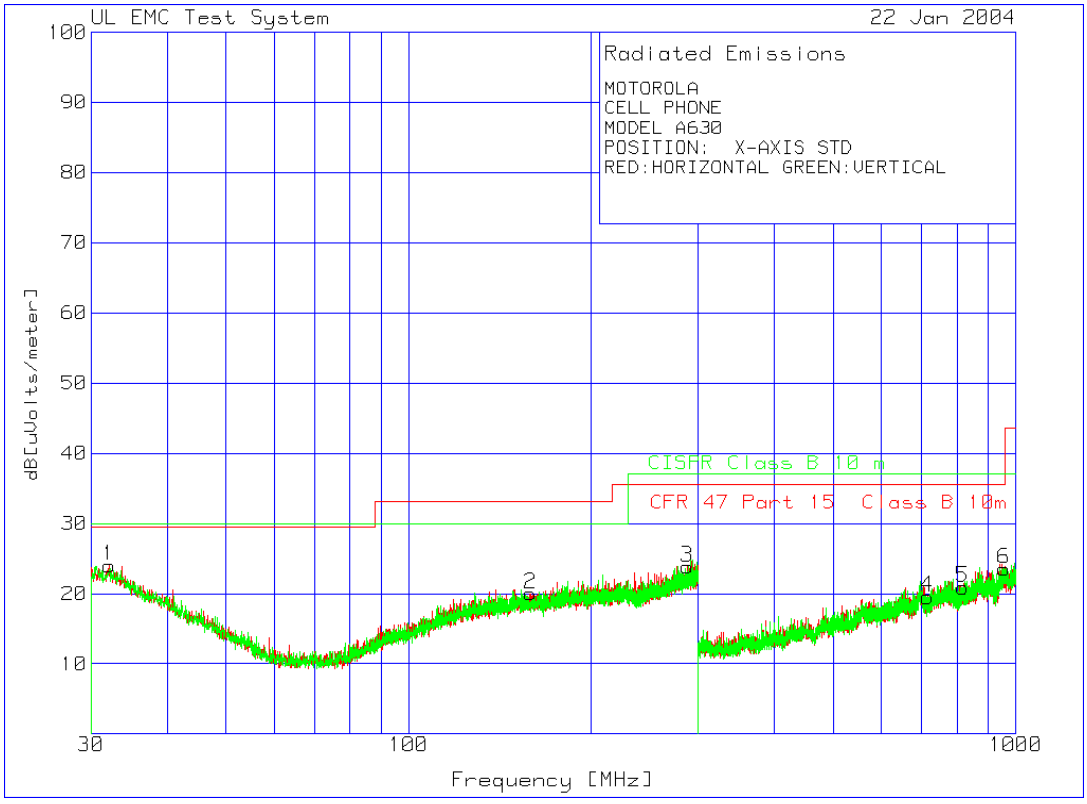
30MHz – 1000MHz Ch 0 Open Z-Axis



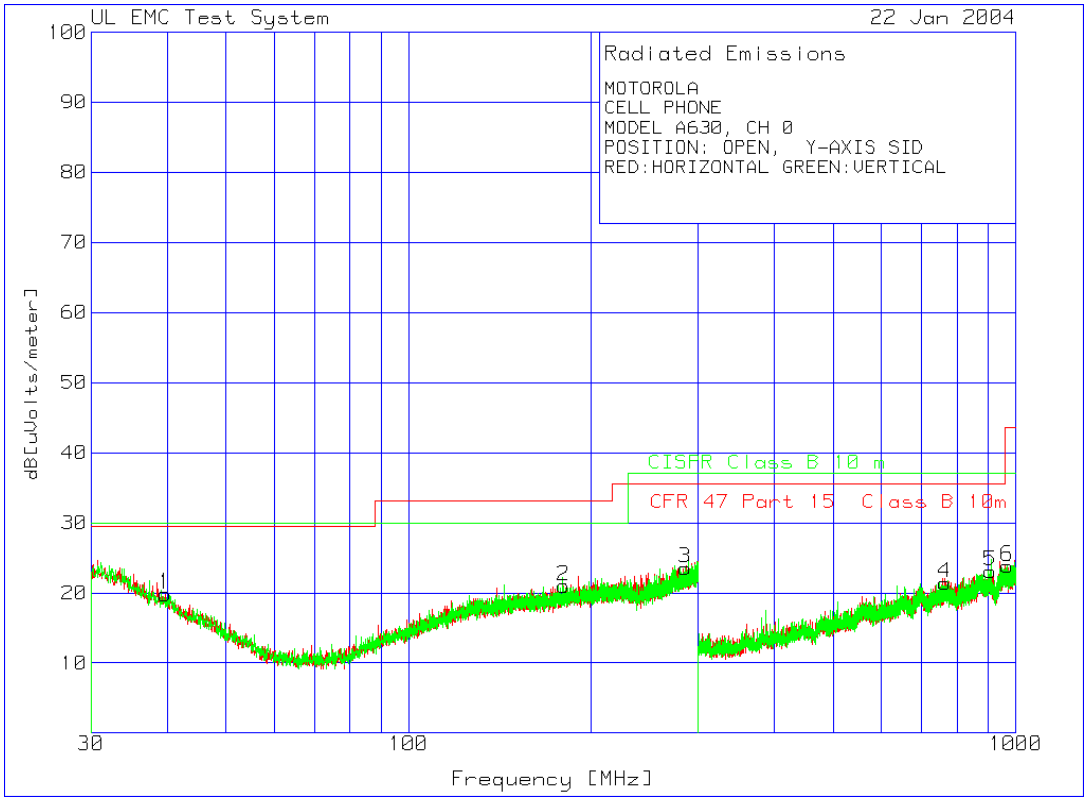
30MHz – 1000MHz Ch 39 Open Z-Axis



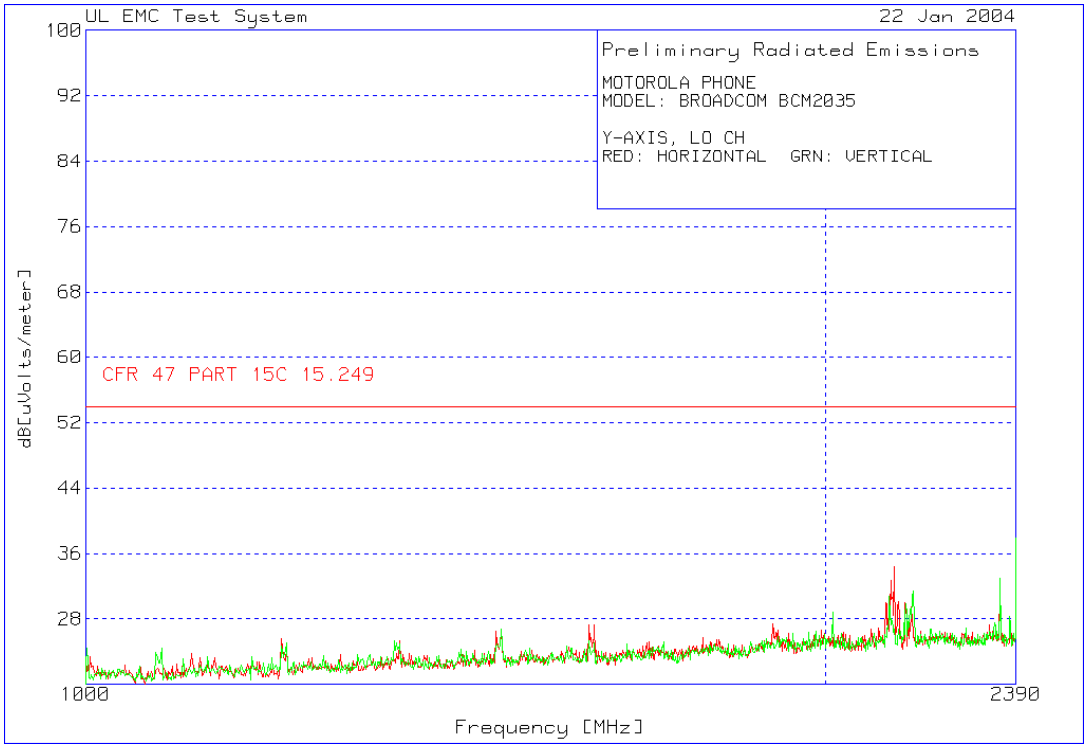
30MHz – 1000MHz Ch78 Open Z-Axis



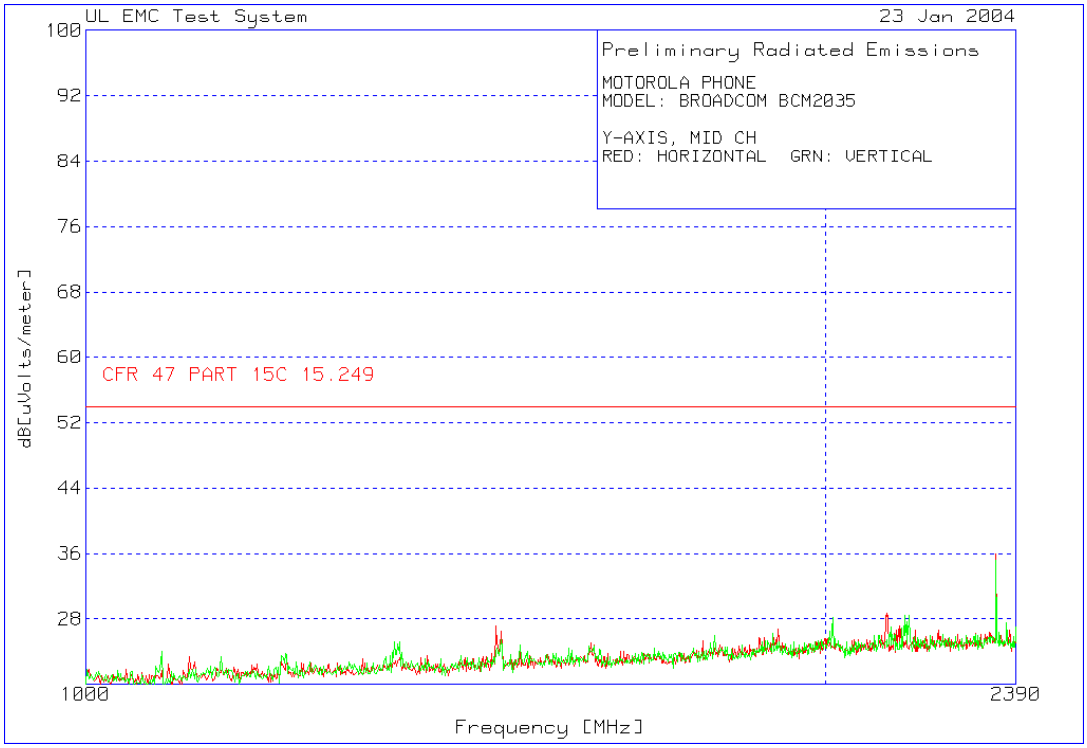
30MHz - 1000MHz Ch 0 X-Axis



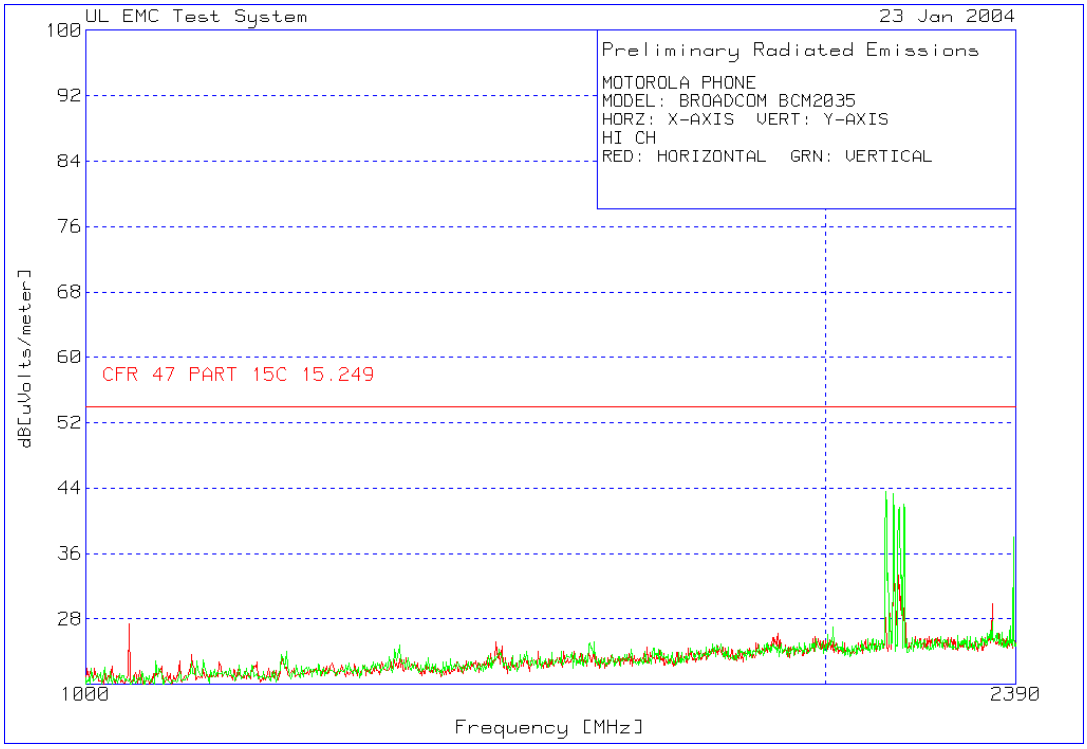
30MHz – 1000MHz Ch 0 Y-Axis



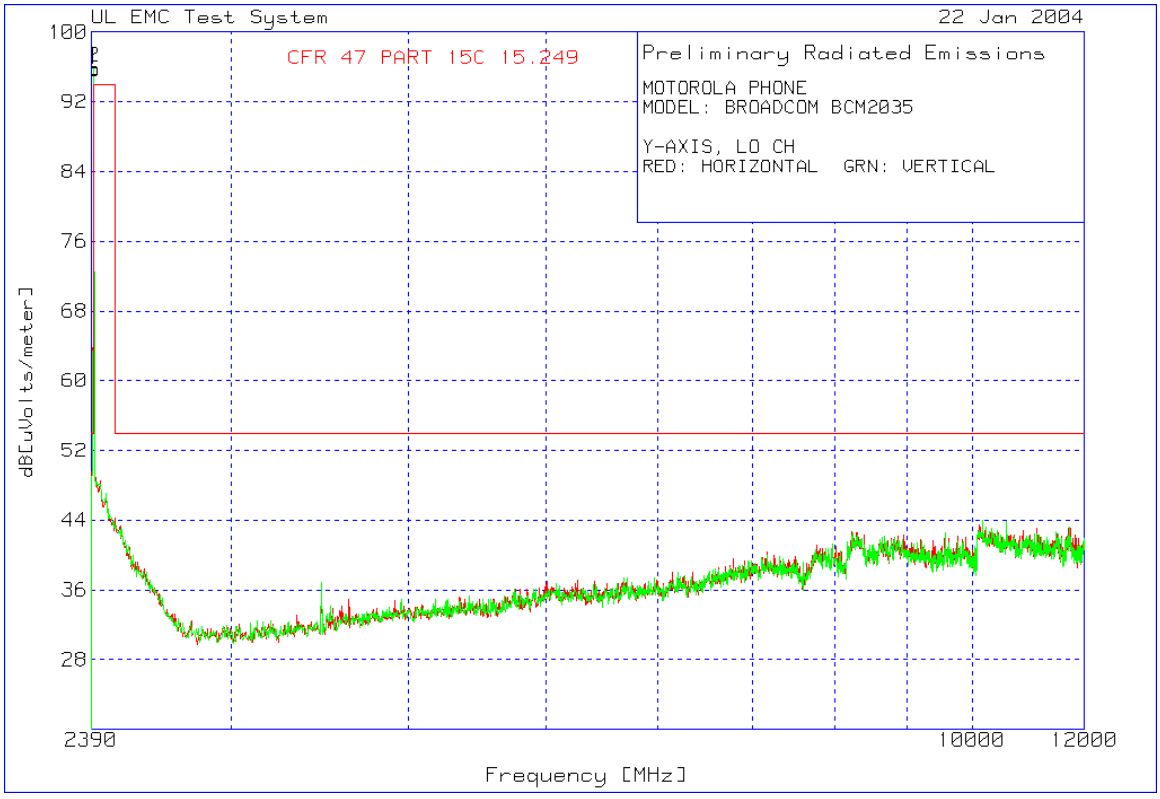
1-2.39GHz Y-Axis Low Channel



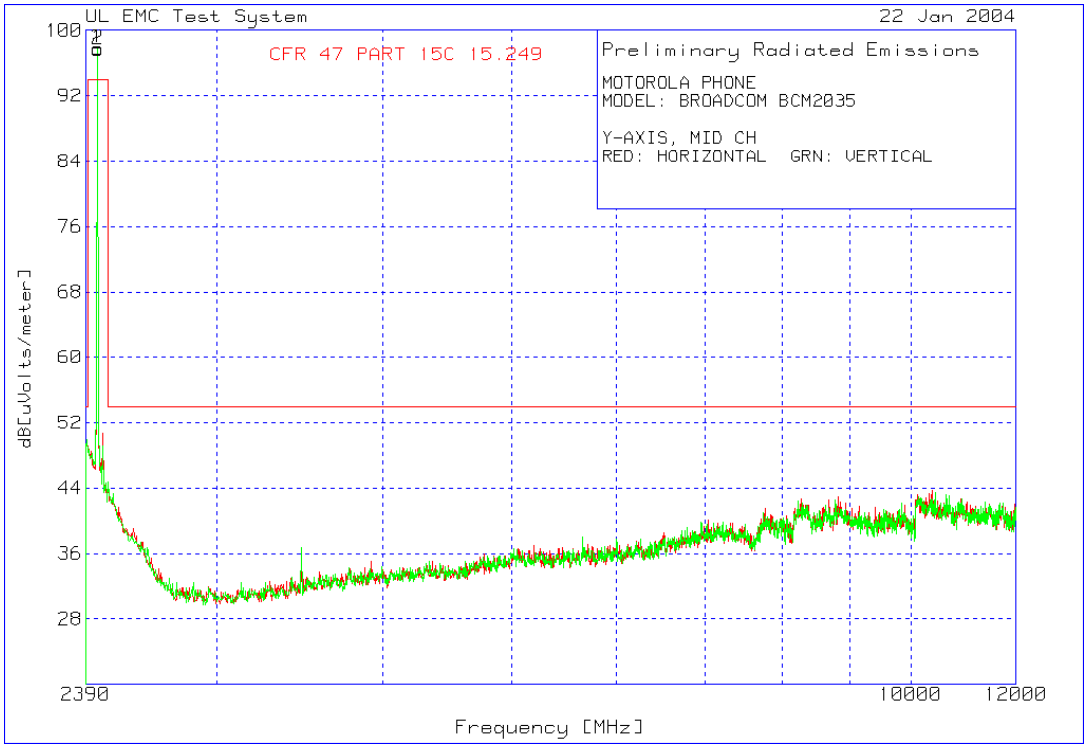
1-2.39GHz Y-Axis Middle Channel



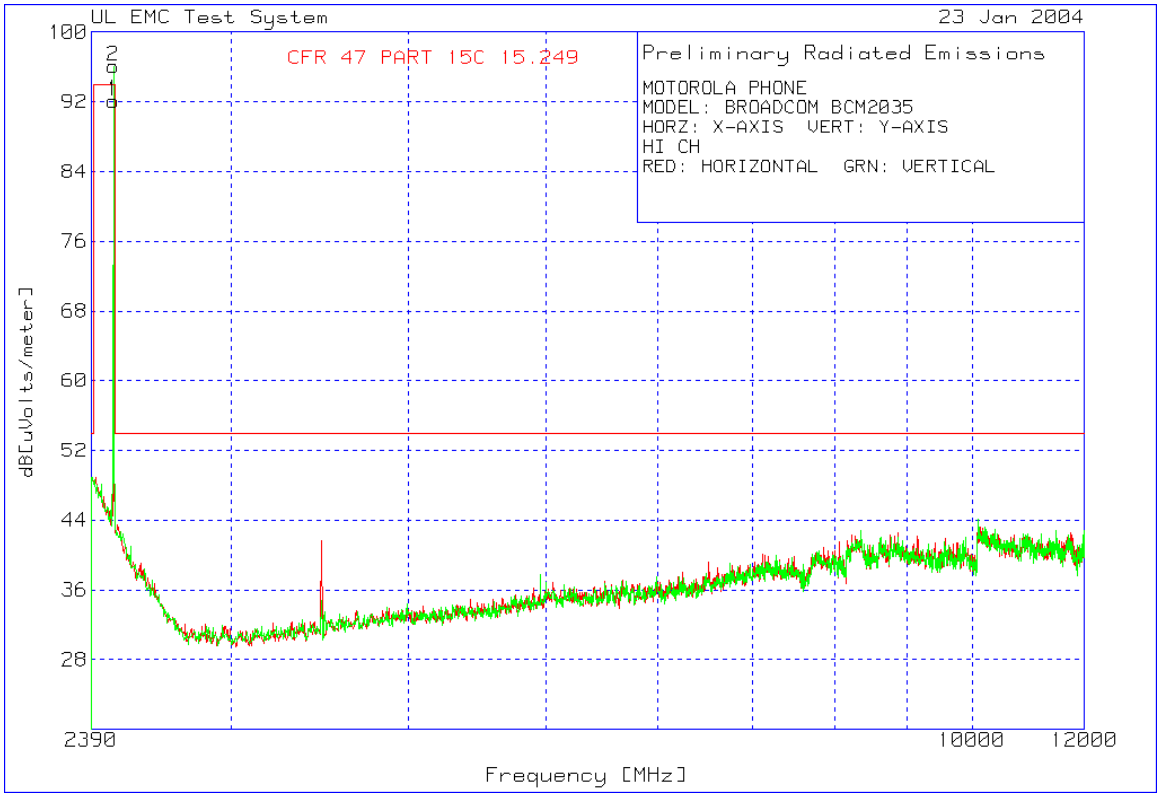
1-2.39GHz X-Axis Y-Axis High Channel



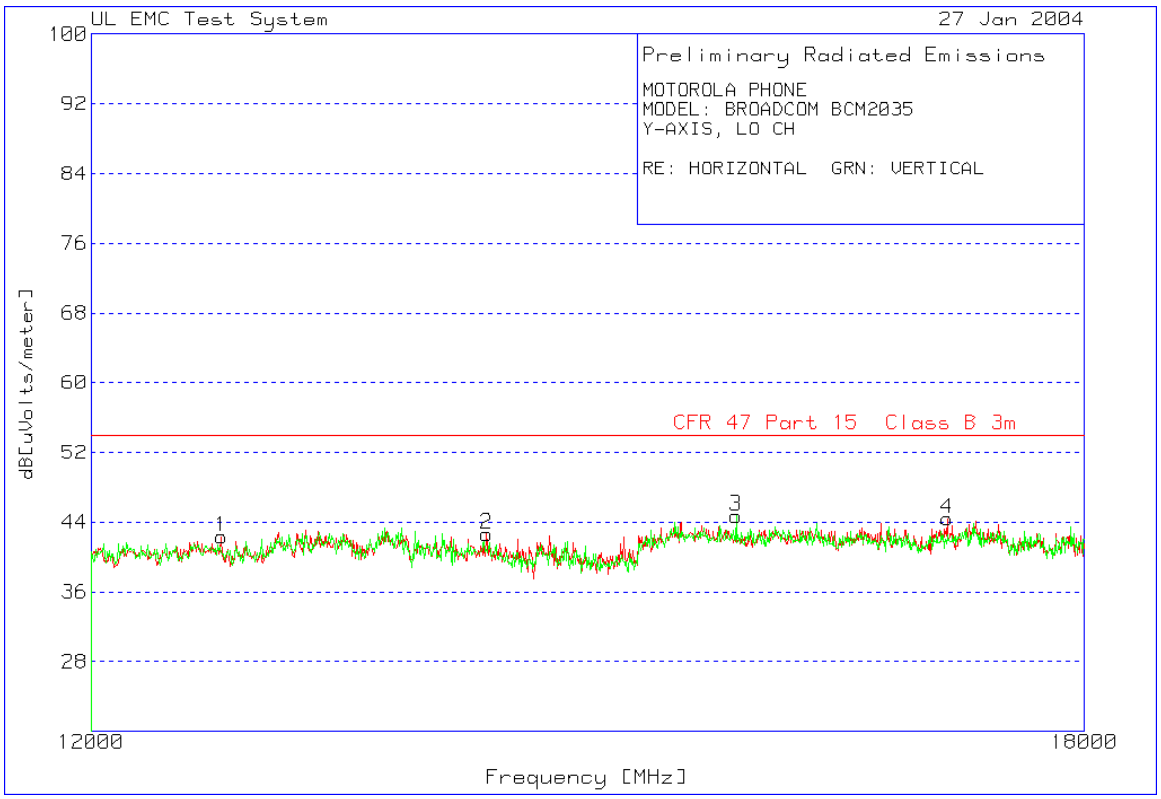
2.39GHz – 12GHz Y-Axis Low Channel



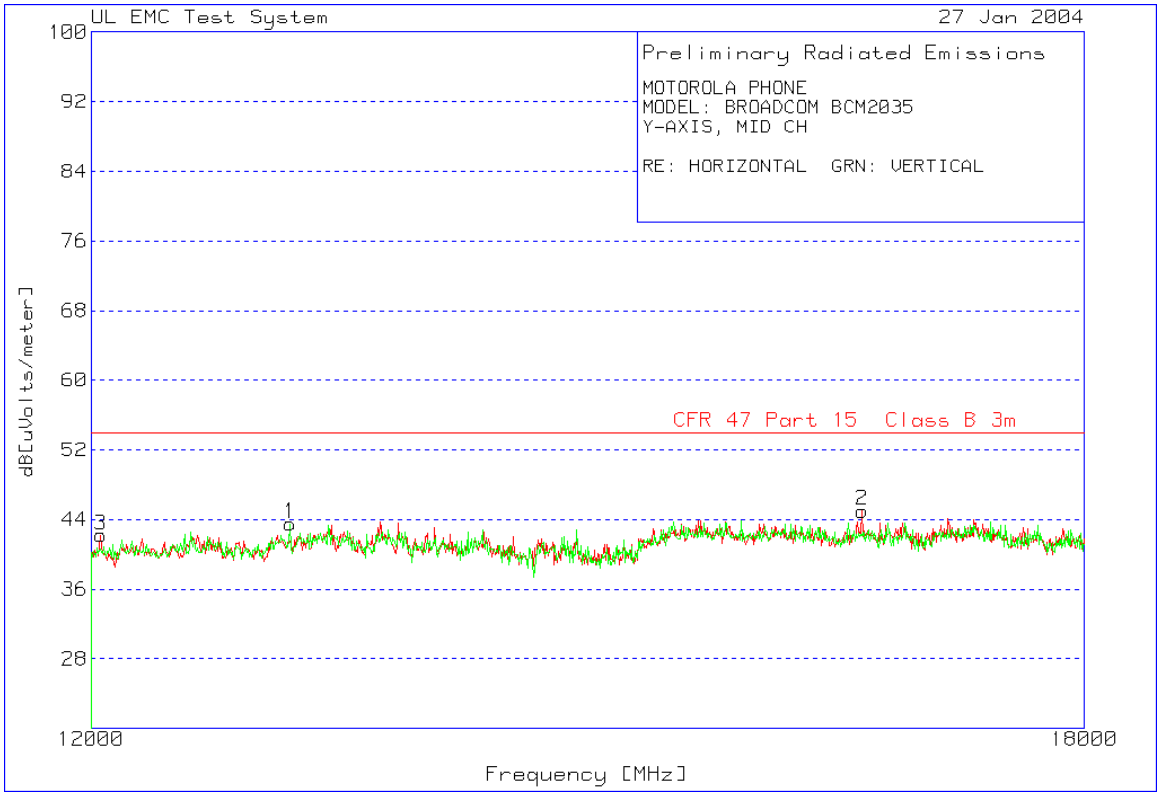
2.39GHz – 12GHz Y-Axis Middle Channel



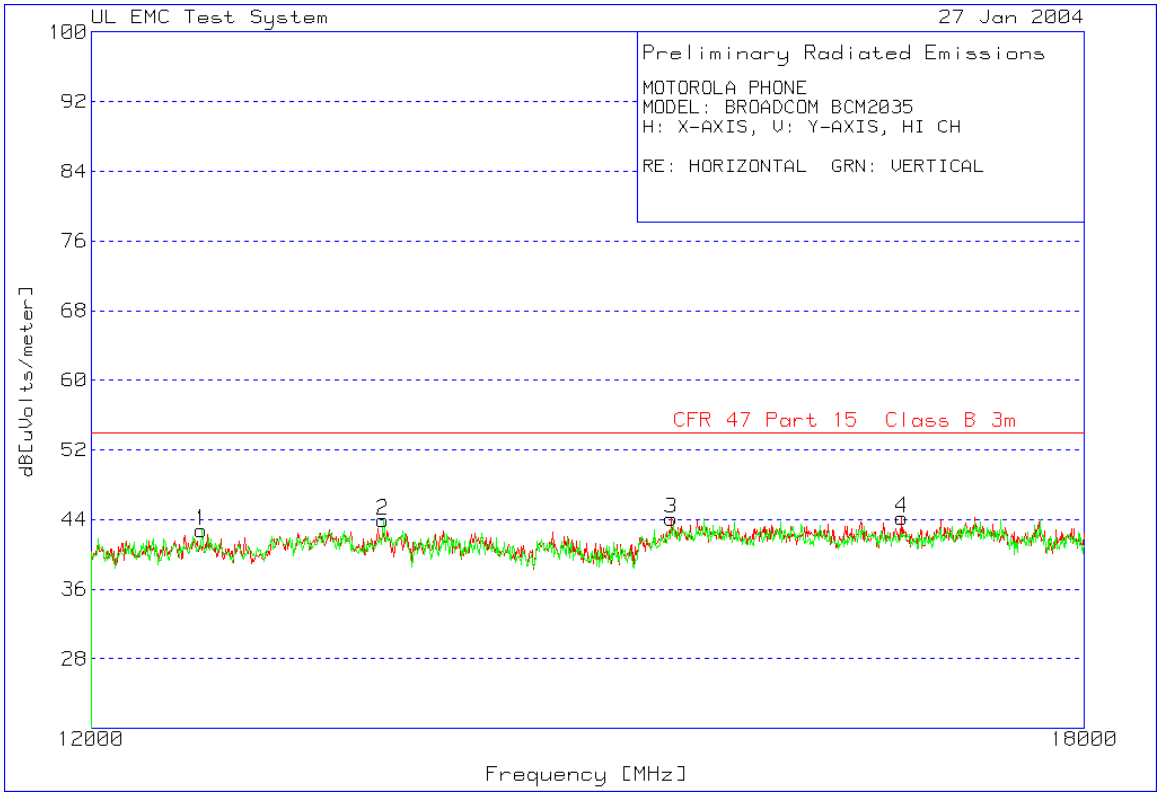
2.39GHz-12GHz Y-Axis High Channel



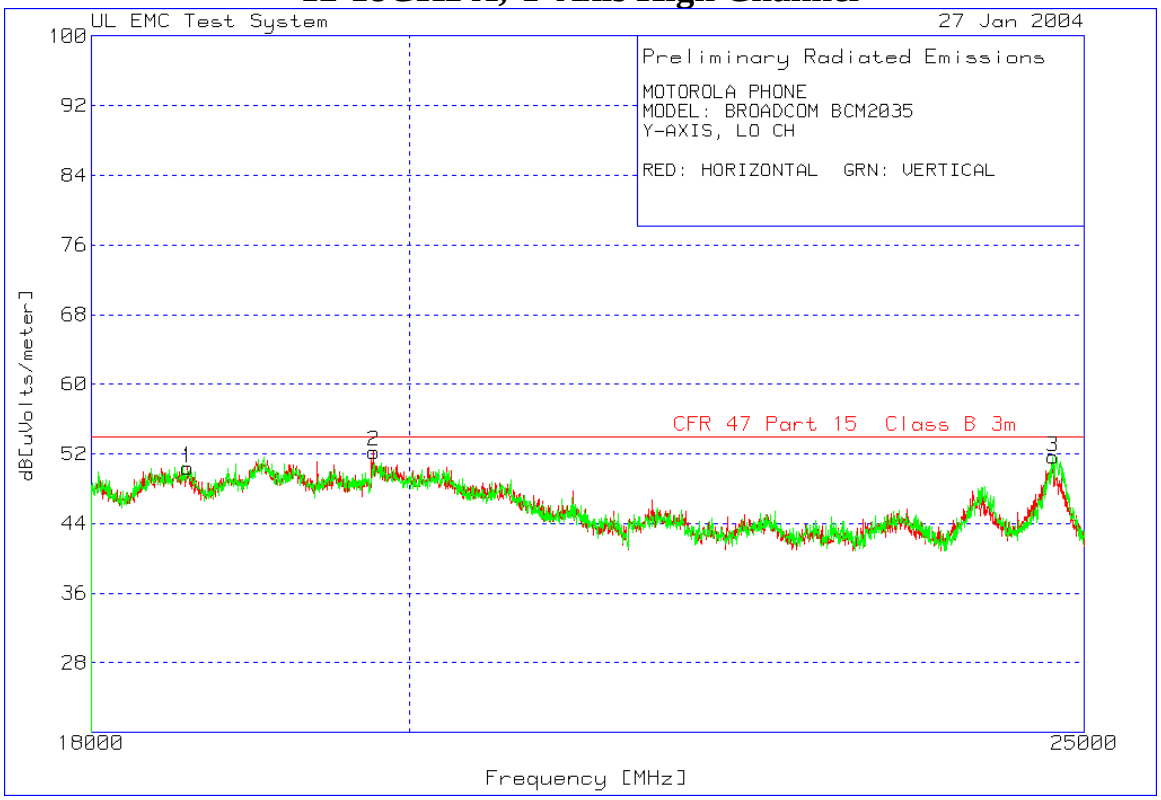
12-18GHz Y-Axis Low Channel



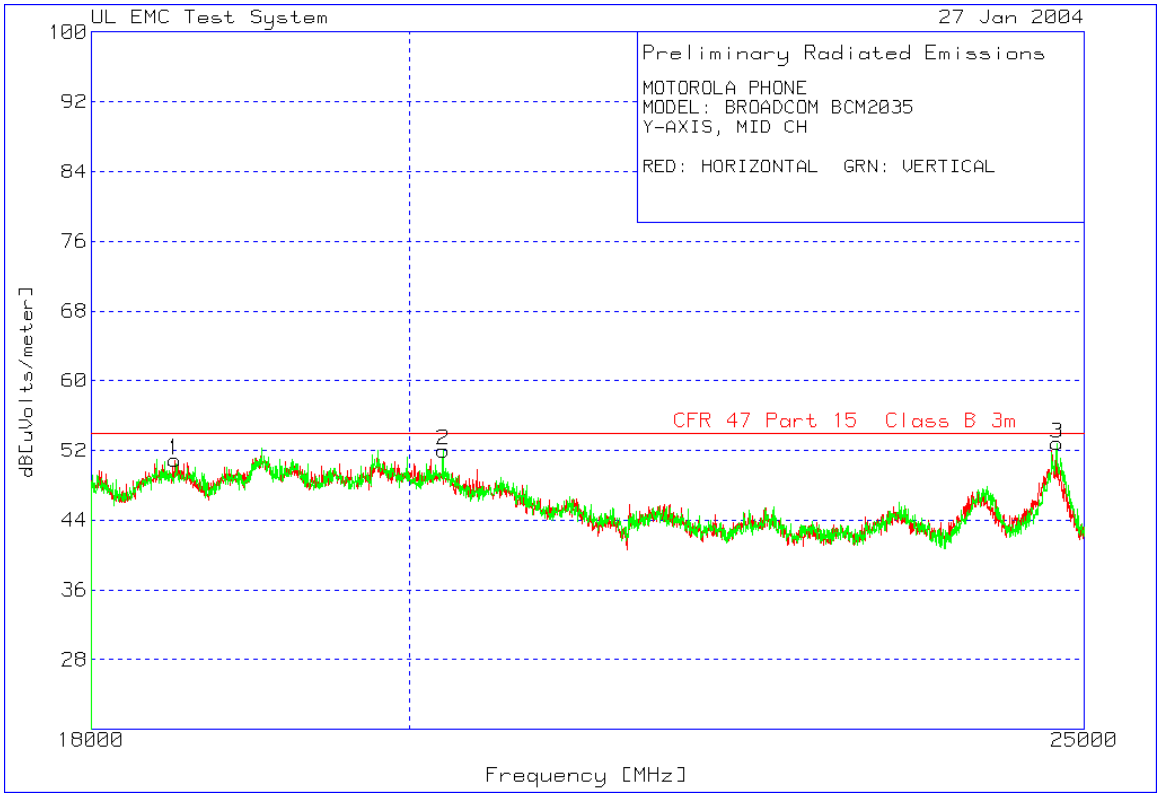
12-18GHz Y-Axis Middle Channel



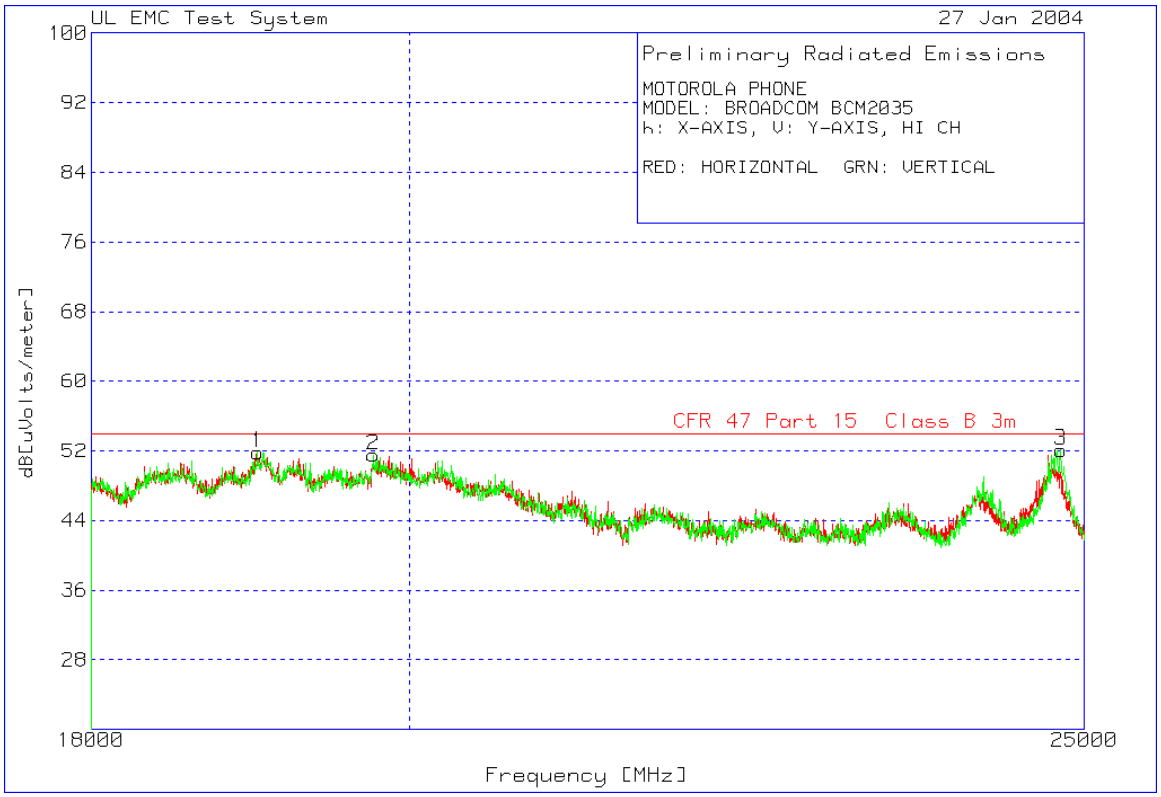
12-18GHz X, Y-Axis High Channel



18-25GHz Y-Axis Low Channel



18-25GHz Y-Axis Middle Channel



18-25 GHz Y-Axis High Channel

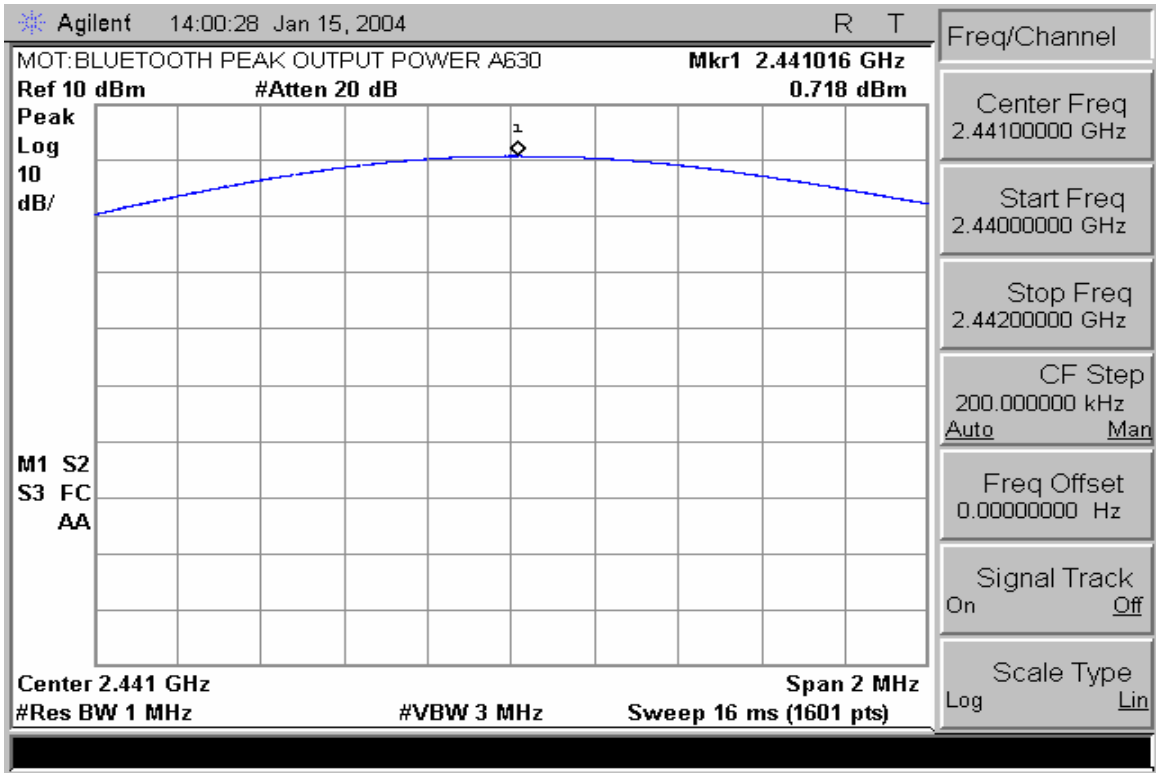
PEAK OUTPUT POWER

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



Peak Output Power

BAND-EDGE COMPLIANCE OF RF CONDUCTED EMISSIONS

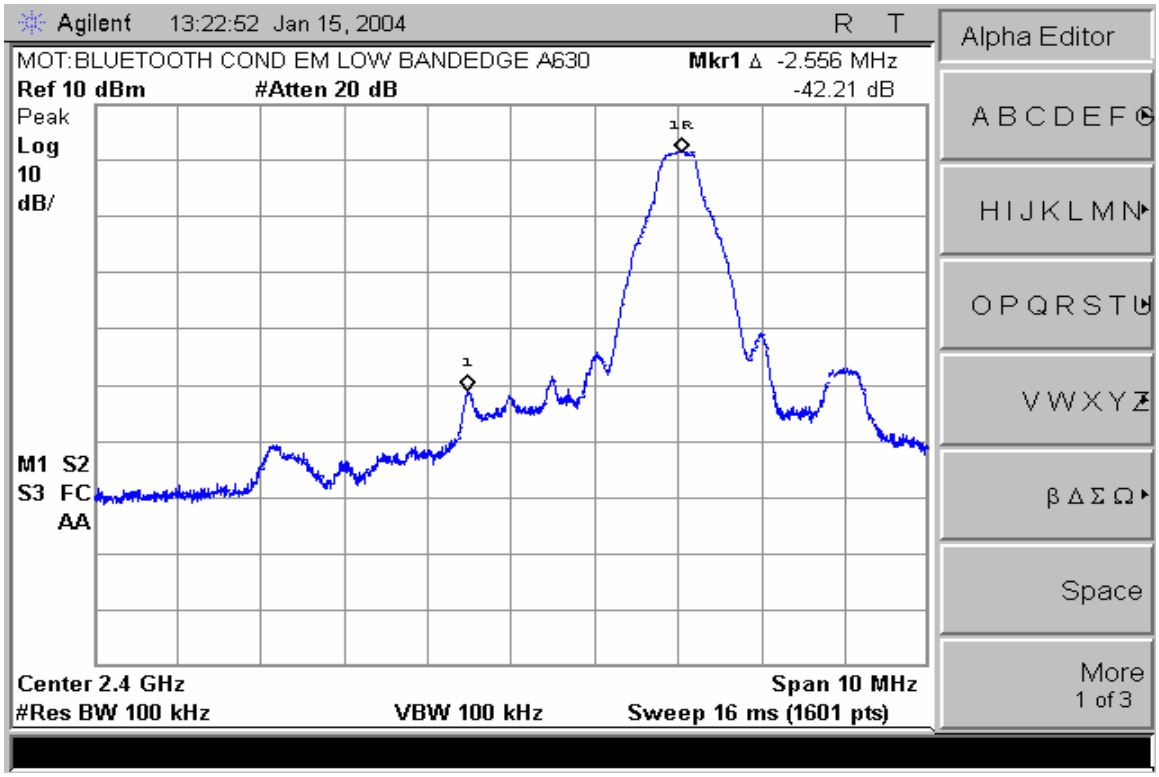
CFR 47 Part 15.247

Measurement Procedure

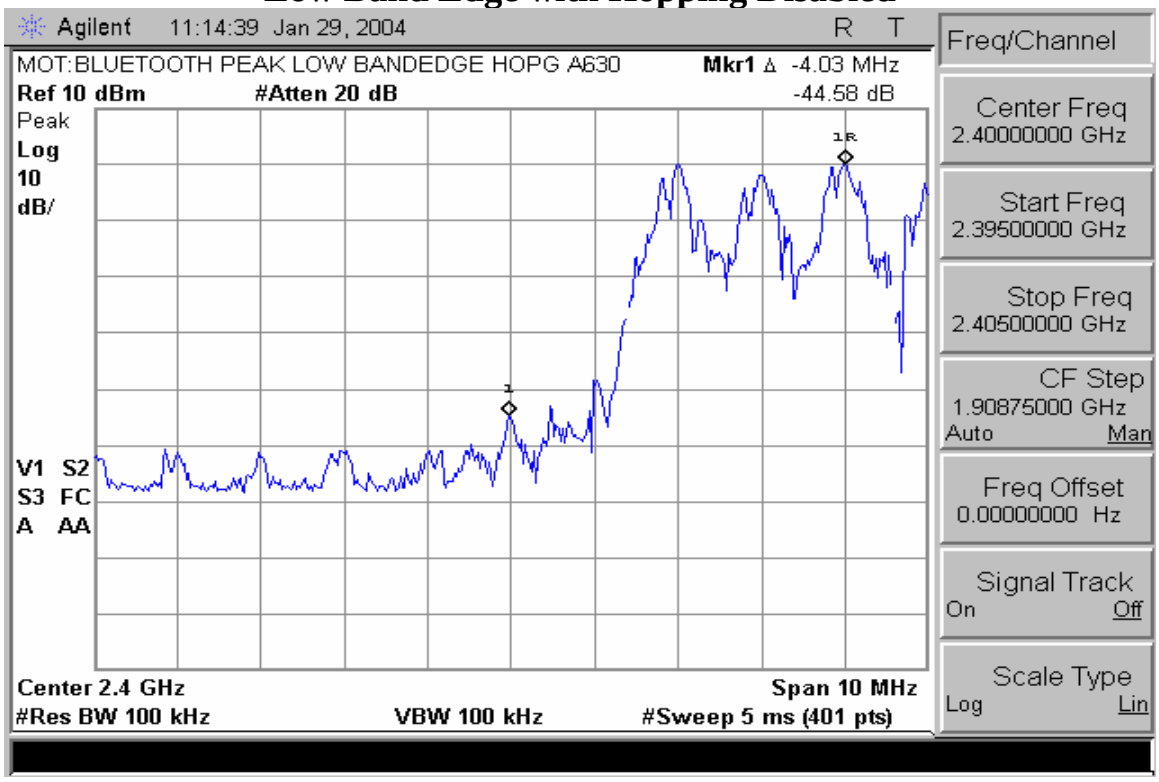
The RF output port of the Equipment-Under-Test is directly coupled to the input of the EMC analyzer through a specialized RF connector and a 10dB passive attenuator. A fully charged battery was used for the supply voltage.

Measurement Results

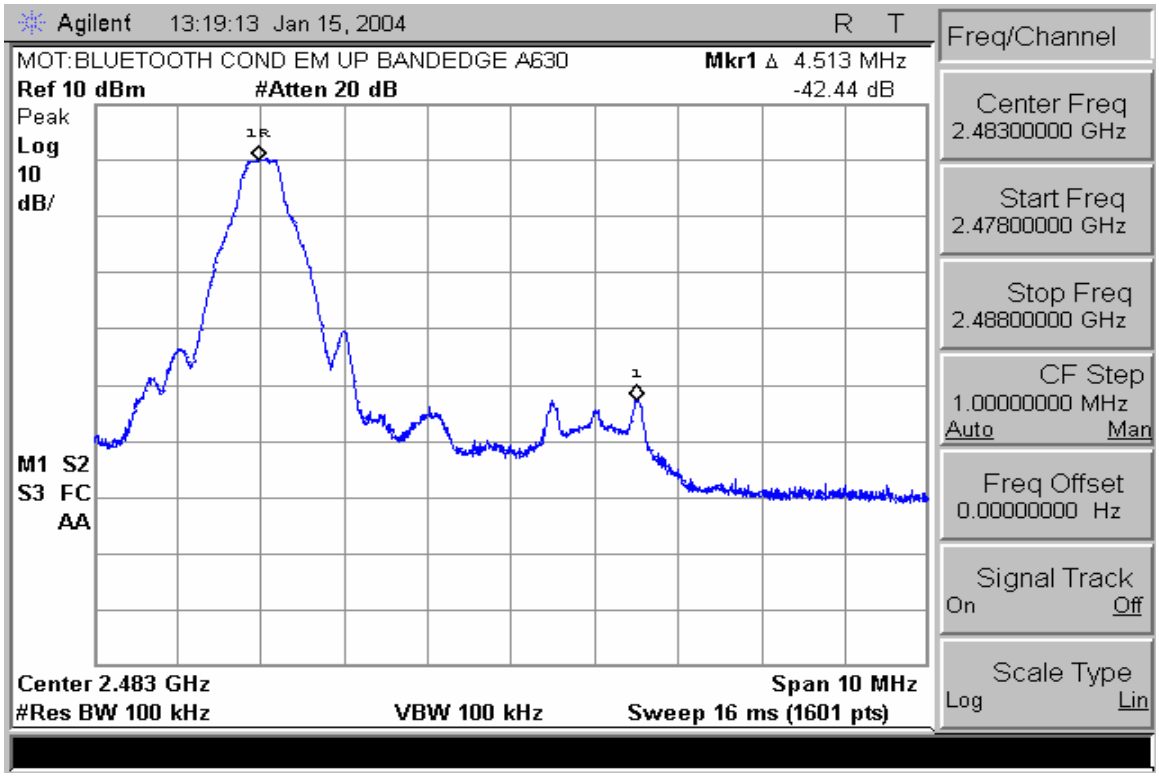
See Attached:



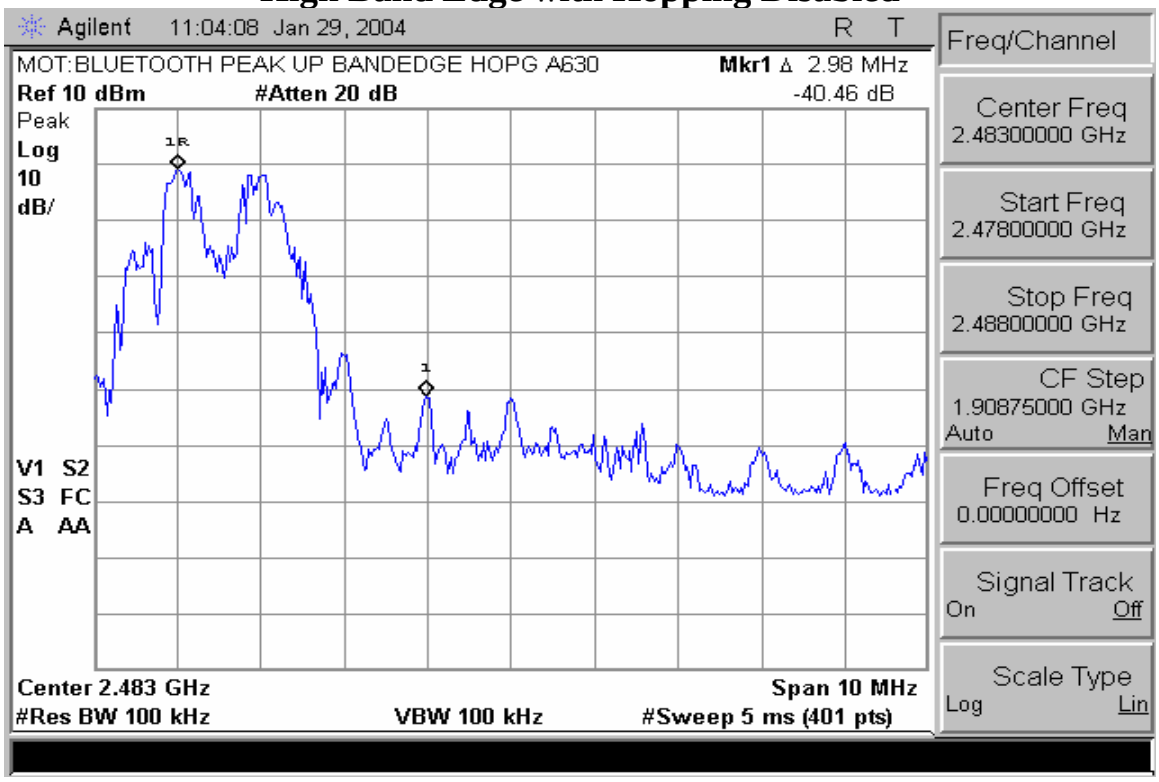
Low Band Edge with Hopping Disabled



Low Band Edge with Hopping Enabled



High Band Edge with Hopping Disabled



High Band Edge with Hopping Enabled

SPURIOUS RF CONDUCTED EMISSIONS

CFR 47 Part 15.247

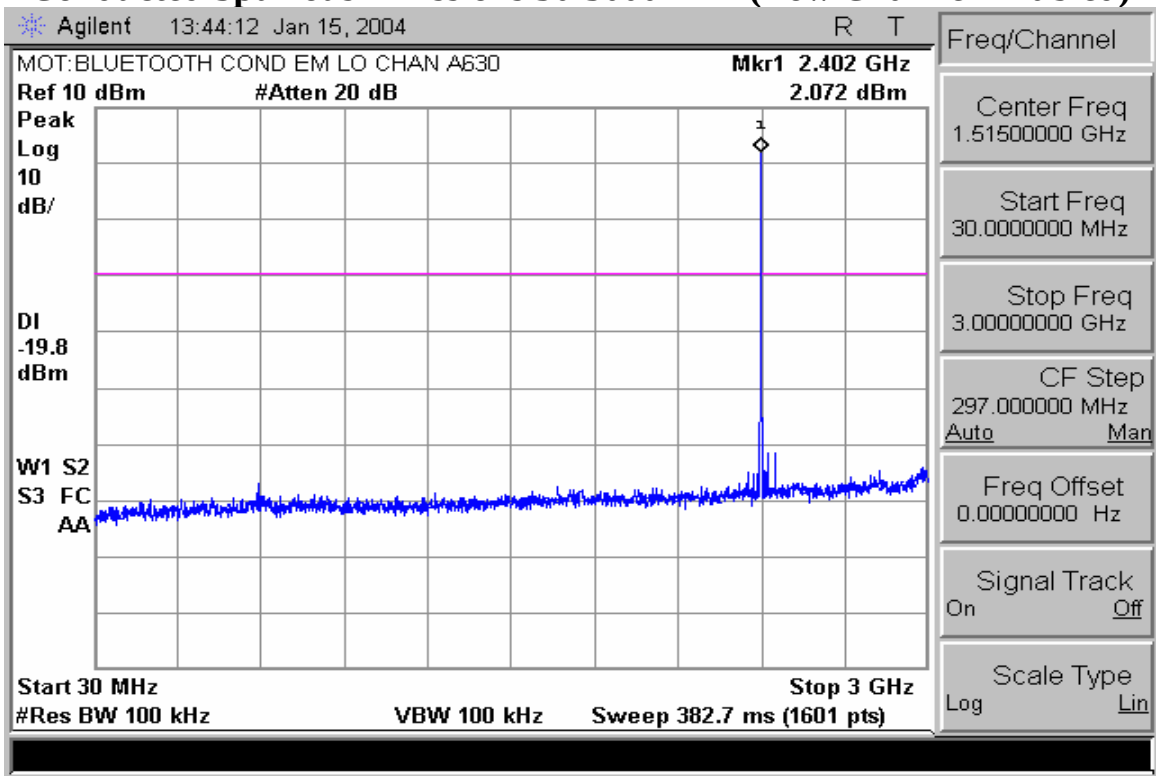
Measurement Procedure

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.

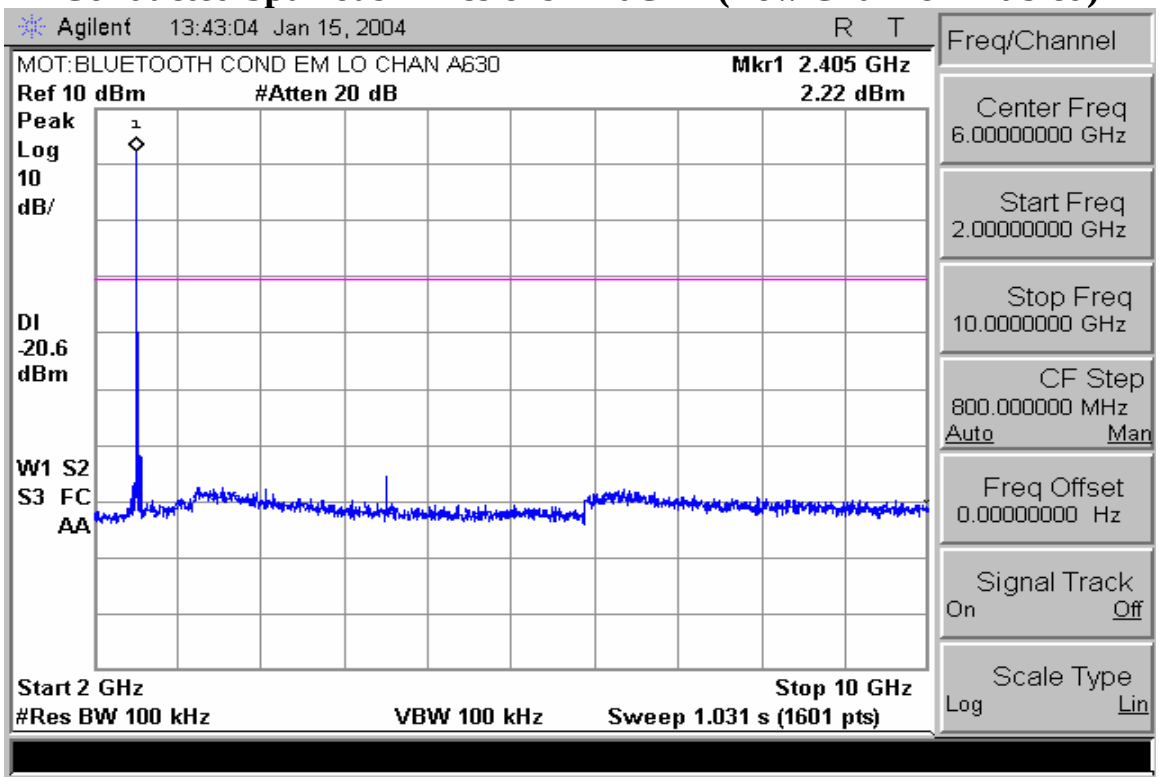
Measurement Results

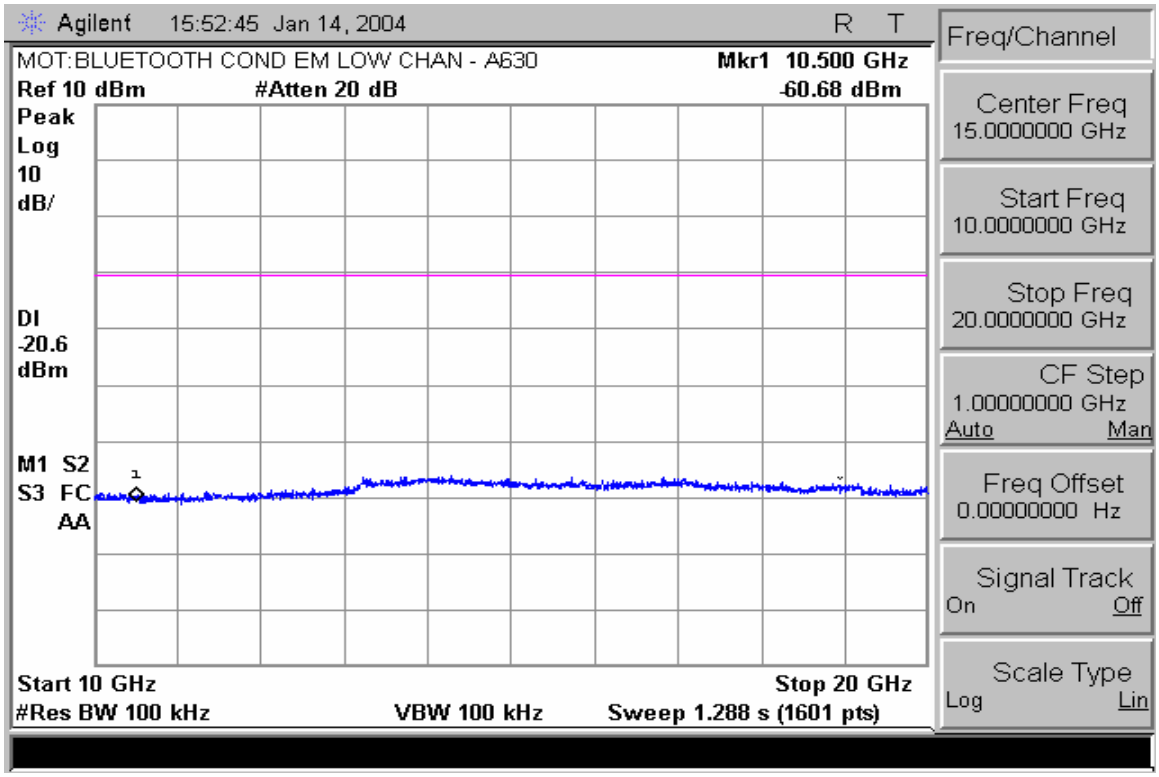
See attached:

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

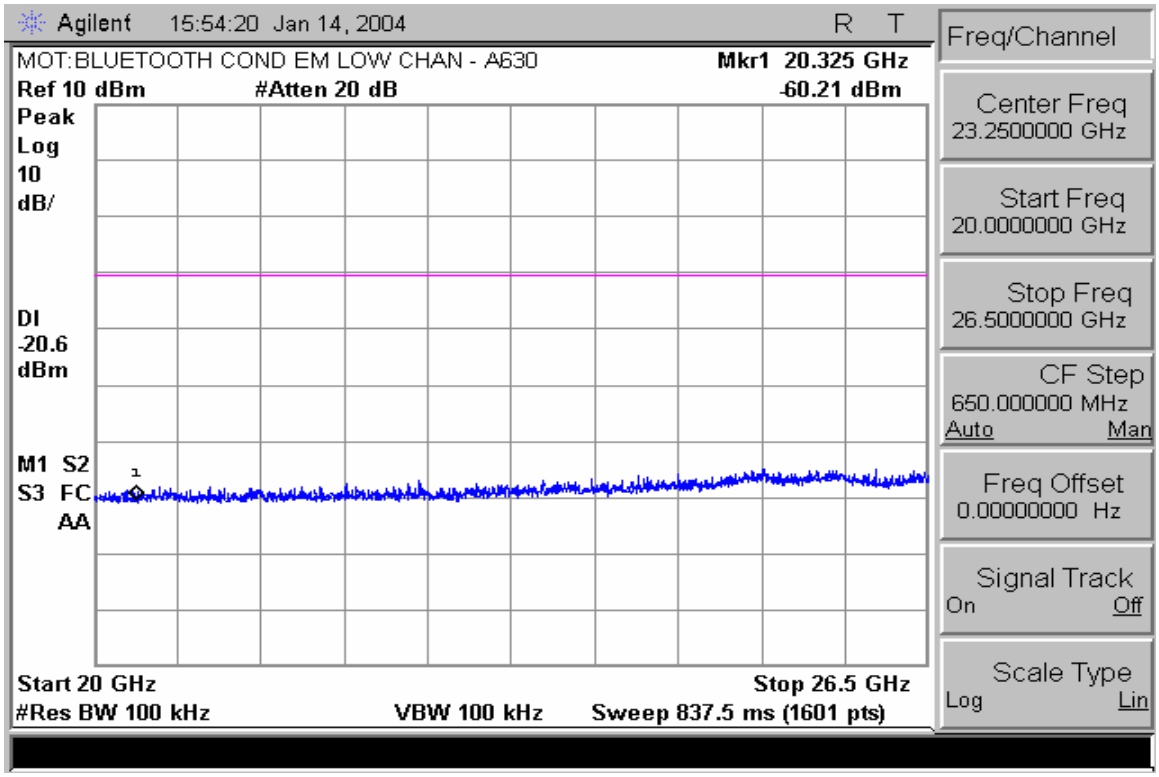


Conducted Spurious Emissions 2-10GHz (Low Channel Enabled)

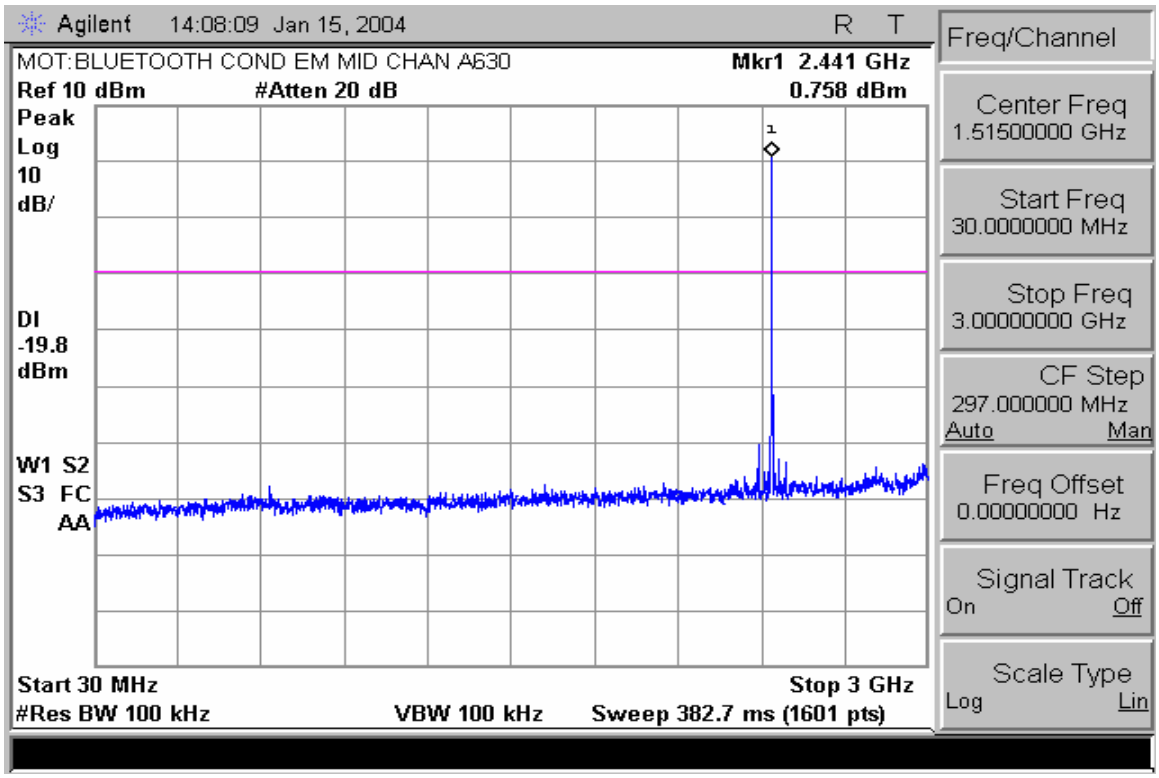




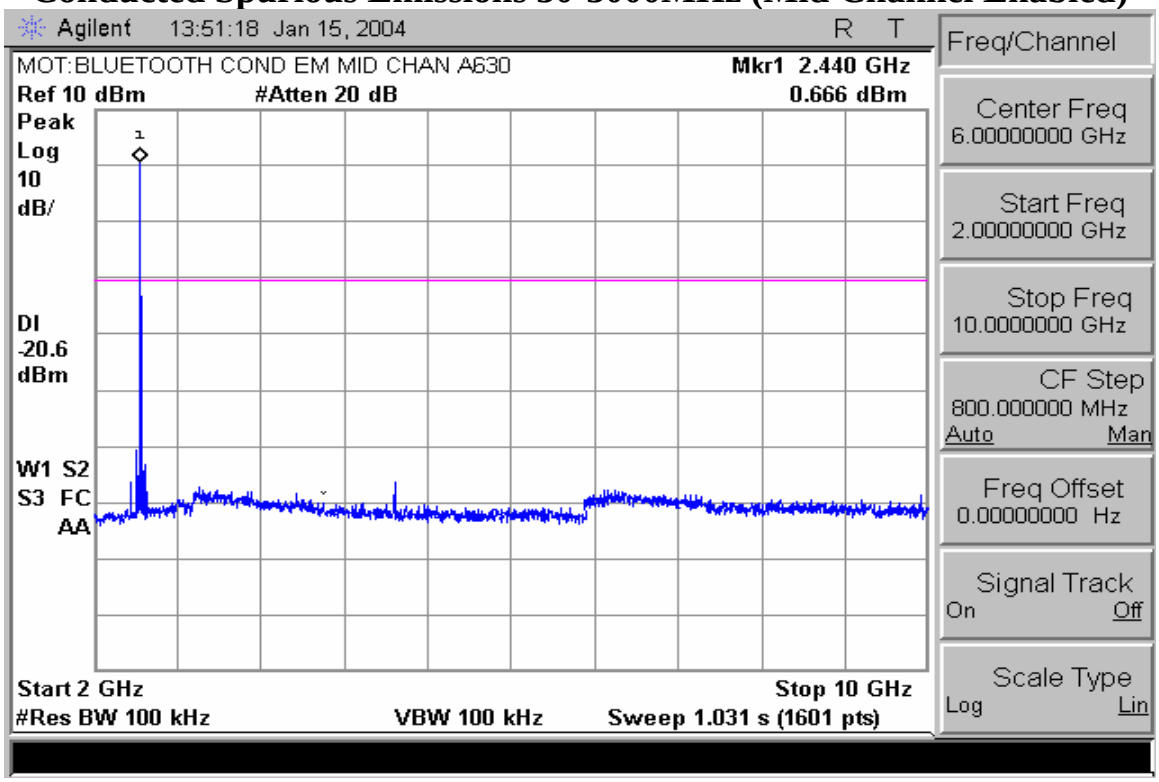
Conducted Spurious Emissions 10-20GHz (Low Channel Enabled)



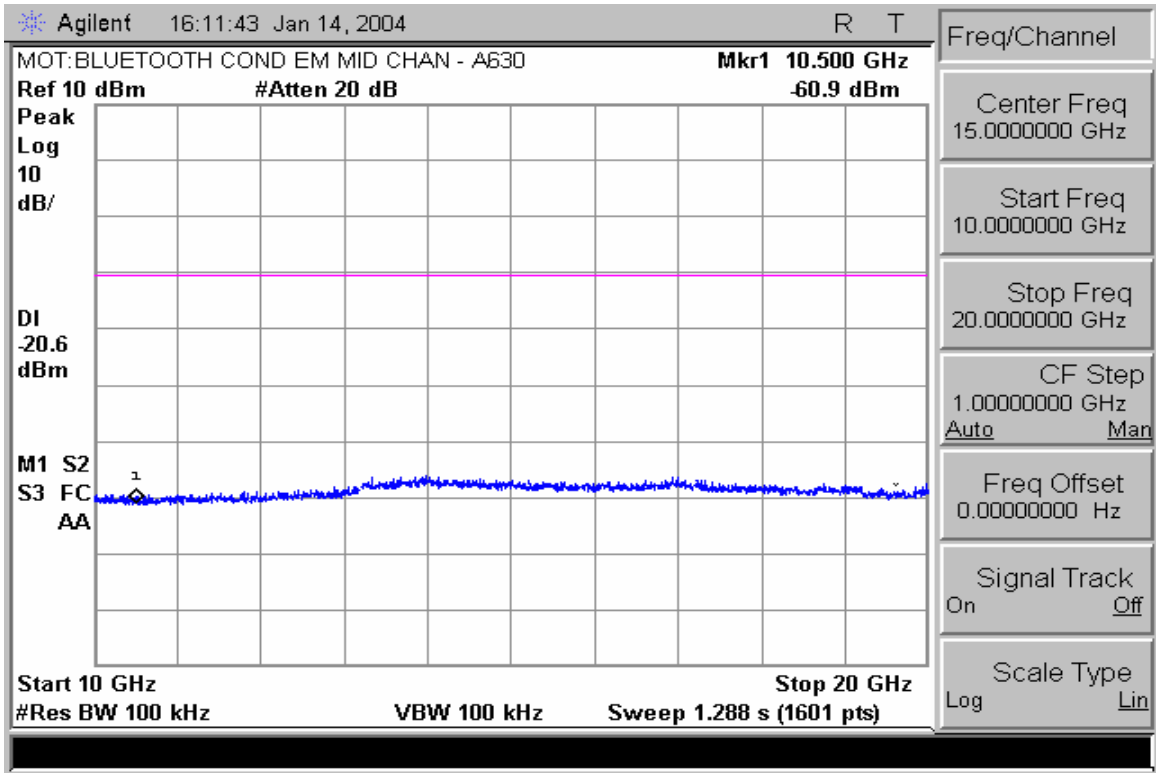
Conducted Spurious Emissions 20-26.5GHz (Low Channel Enabled)



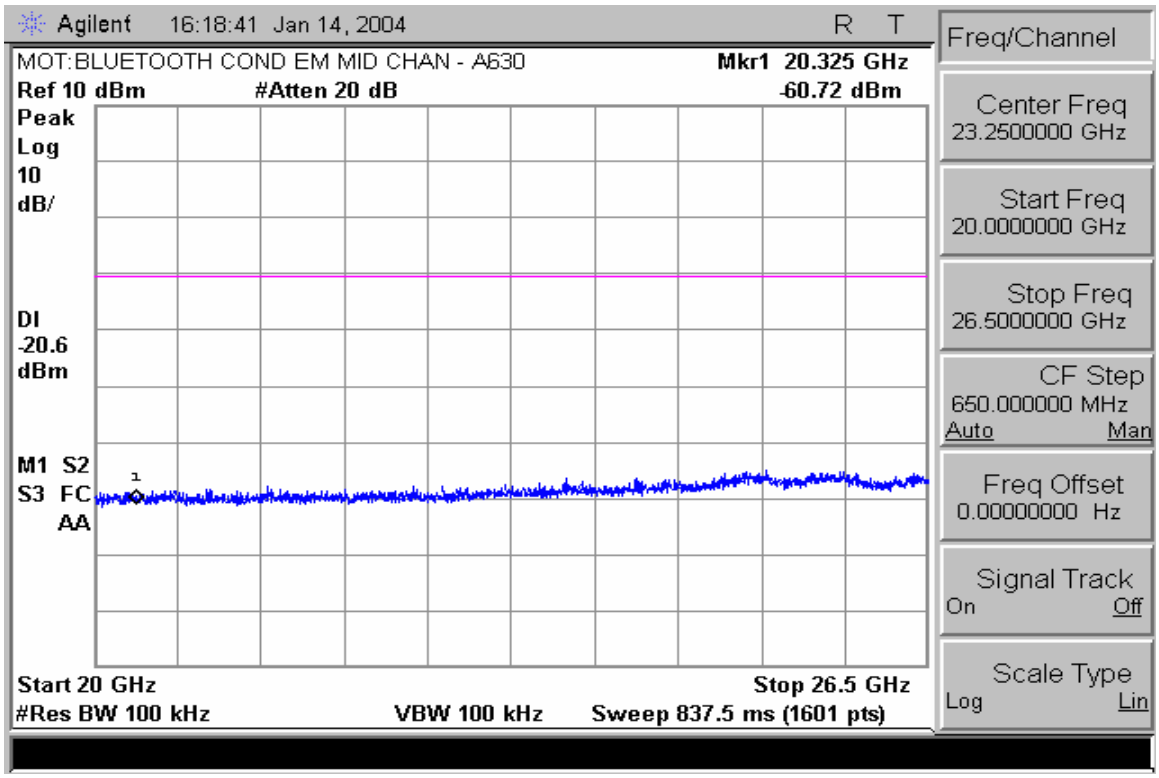
Conducted Spurious Emissions 30-3000MHz (Mid Channel Enabled)



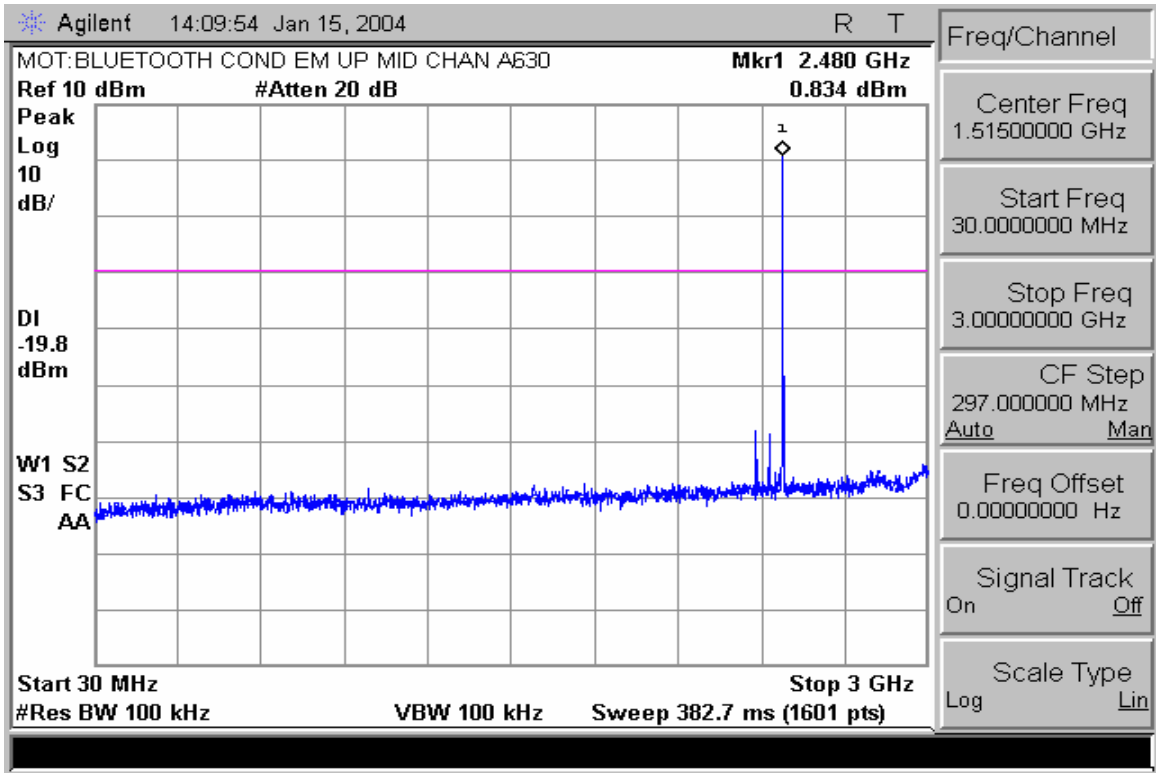
Conducted Spurious Emissions 2-10GHz (Mid Channel Enabled)



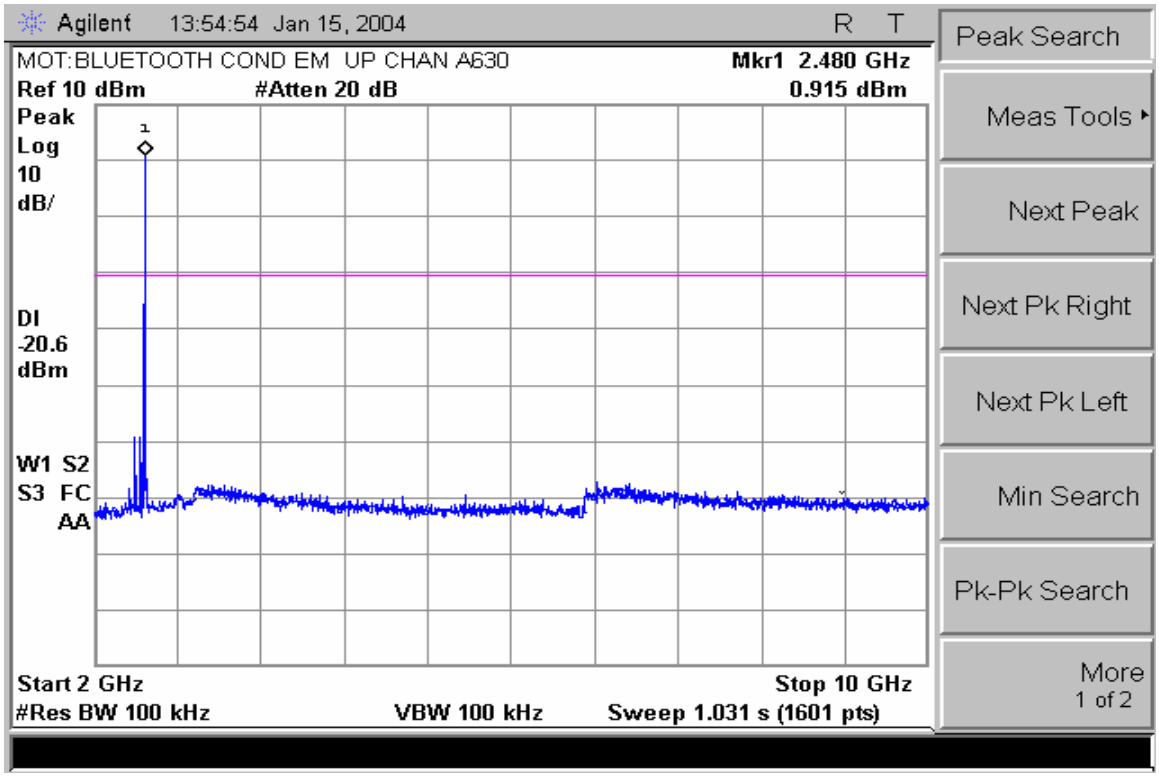
Conducted Spurious Emissions 10-20GHz (Mid Channel Enabled)



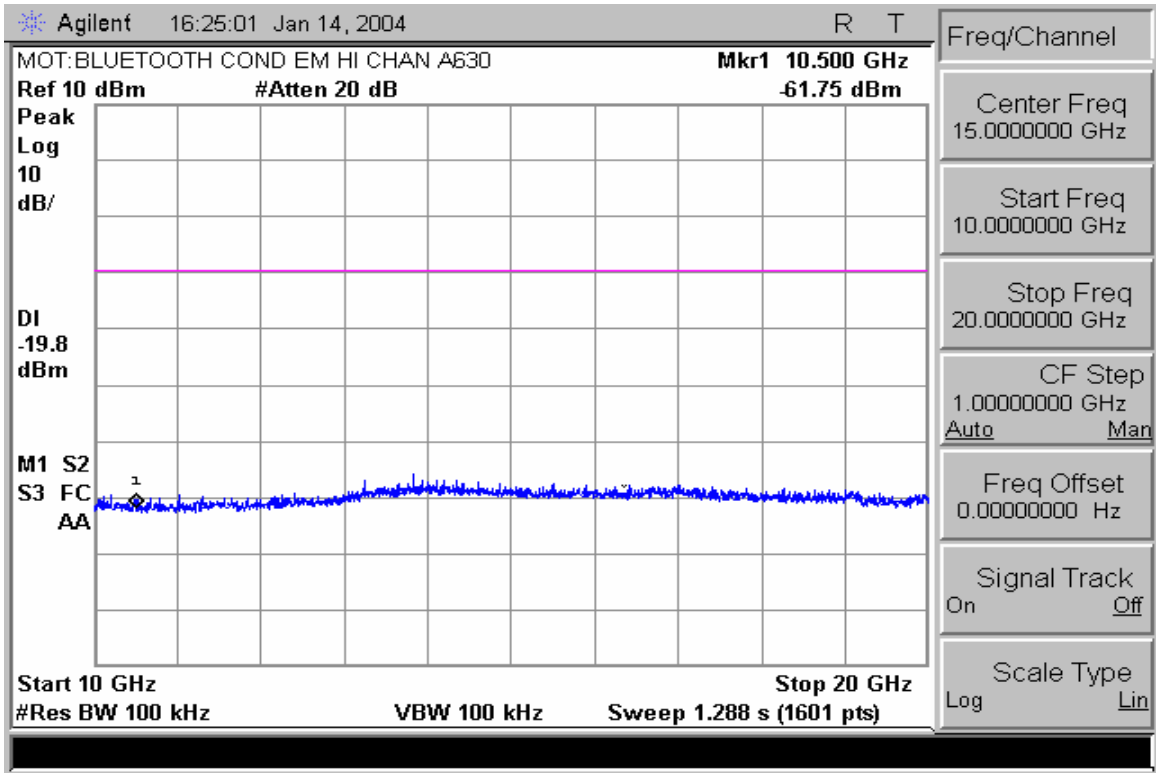
Conducted Spurious Emissions 20-26.5GHz (Mid Chan Enabled)



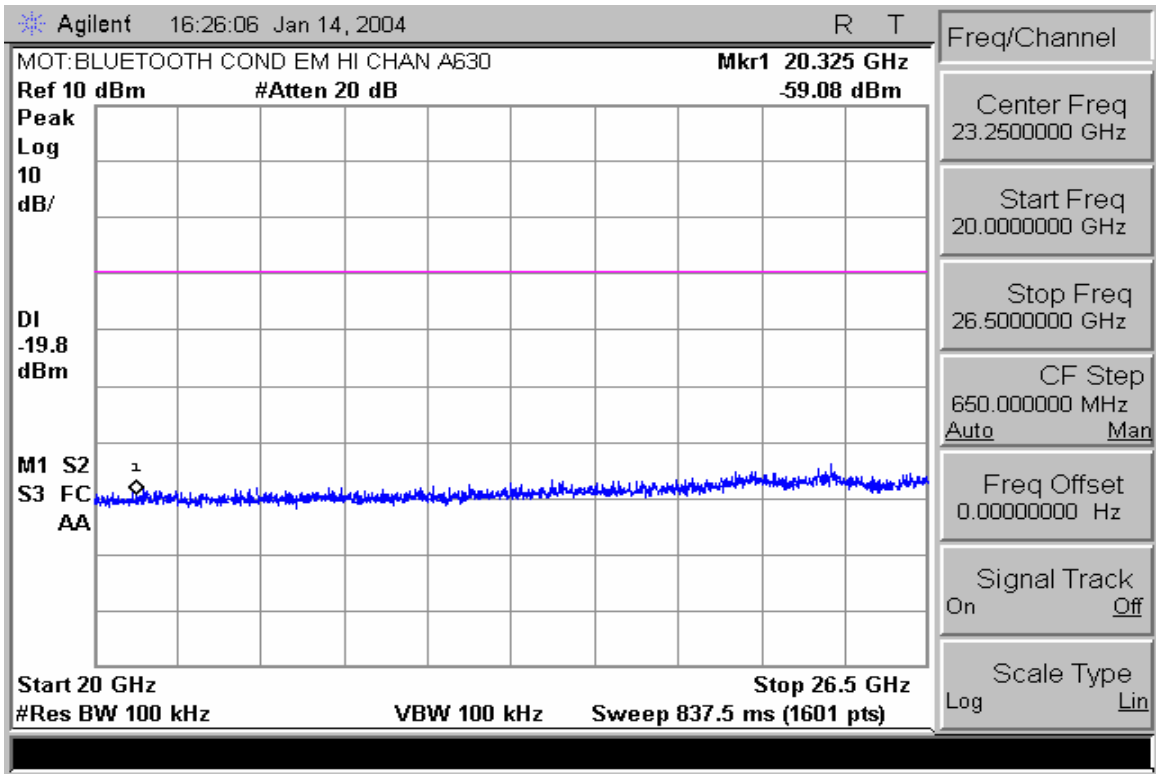
Conducted Spurious Emissions 30-3000MHz (High Channel Enabled)



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