



**MOTOROLA**

**MOBILE DEVICES BUSINESS**

**PRODUCT SAFETY AND COMPLIANCE  
EMC LABORATORY**

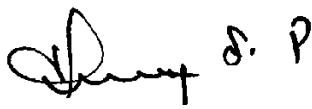
**EMC TEST REPORT**

**Test Report Number** – 18603-1BT

**Report Date** – June 14, 2006

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: 

Name: Thanigaiselvan Palaniswami

Title: EMC Engineer

Date: June 14, 2006

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THIS REPORT MUST NOT BE USED TO CLAIM PRODUCT ENDORSEMENT BY A2LA OR ANY AGENCY OF THE U.S. GOVERNMENT.

A2LA Certificate Number: 1651-01

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**Test Report Details**

Tests Performed By: Motorola Mobile Devices business (MDb)  
Product Safety and Compliance Group  
600 North US Hwy 45  
Libertyville, IL 60048  
PH (847) 523-6167 Fax (847) 523-4538  
Motorola MDb FRN: 0004321311  
FCC Registration Number: 316588  
Industry Canada Number: IC3908-1

Tests Requested By: Motorola Inc.  
Mobile Devices business  
600 North US Hwy 45  
Libertyville, IL 60048

Product Type: Cellular Phone

Signaling Capability: GSM 850, 1900, Bluetooth

FCC ID Number: IHDT56GW1

Serial Numbers: 004400013814692, 004400013814767,  
004400013814684, 004400013814718

Testing Complete Date: August 17, 2005

**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:

- 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 MHz
2	Number of Hopping	79
3	Time of Occupancy (Dwell Time)	2.96 ms
4	20 dB Bandwidth	1 MHz
5	Spurious RF Conducted Emissions	See plots
6	Field Strength of Spurious Emissions	See plots
7	Max Power	14.78 dBm
8	Band Edges	See plots
9	Conducted Spurious Emissions	See plots

**General and Special Conditions**

The Cellular Phone hereinafter referred to as the Equipment Under Test or 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 22° 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**

<b>Manufacturer</b>	<b>Equipment Type</b>	<b>Model No.</b>	<b>Serial Number</b>	<b>Cal. Due Date</b>
Rohde & Schwarz	Receiver	ESI26	838786/010	6/17/2006
Hewlett-Packard	EMC Analyzer	E7405A	US40240219	6/8/2006
AH Systems Inc	DRG Horn Antenna	SAS-200/571	265	5/25/2006
ETS	Log-Periodic Antenna	3148	1188	6/14/2006
ETS	Biconical Antenna	3110B	3370	2/16/2006
Attenuator	Weinschel	AS-6	6675	10/14/2005
Attenuator	Weinschel	AS-6	6677	11/4/2005
ETS	LISN	3810/2	00023630	6/15/06
ETS	LISN	3810/2	0010A02179	6/15/06

All equipment is on a one-year calibration cycle.

## **Description of Bluetooth Transmitter**

The EUT offers Bluetooth as a feature. The Bluetooth spread-spectrum, frequency hopping transceiver is designed to operate between 2400 and 2483.5 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.

The Bluetooth antenna gain is -2 dBi.

## **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.

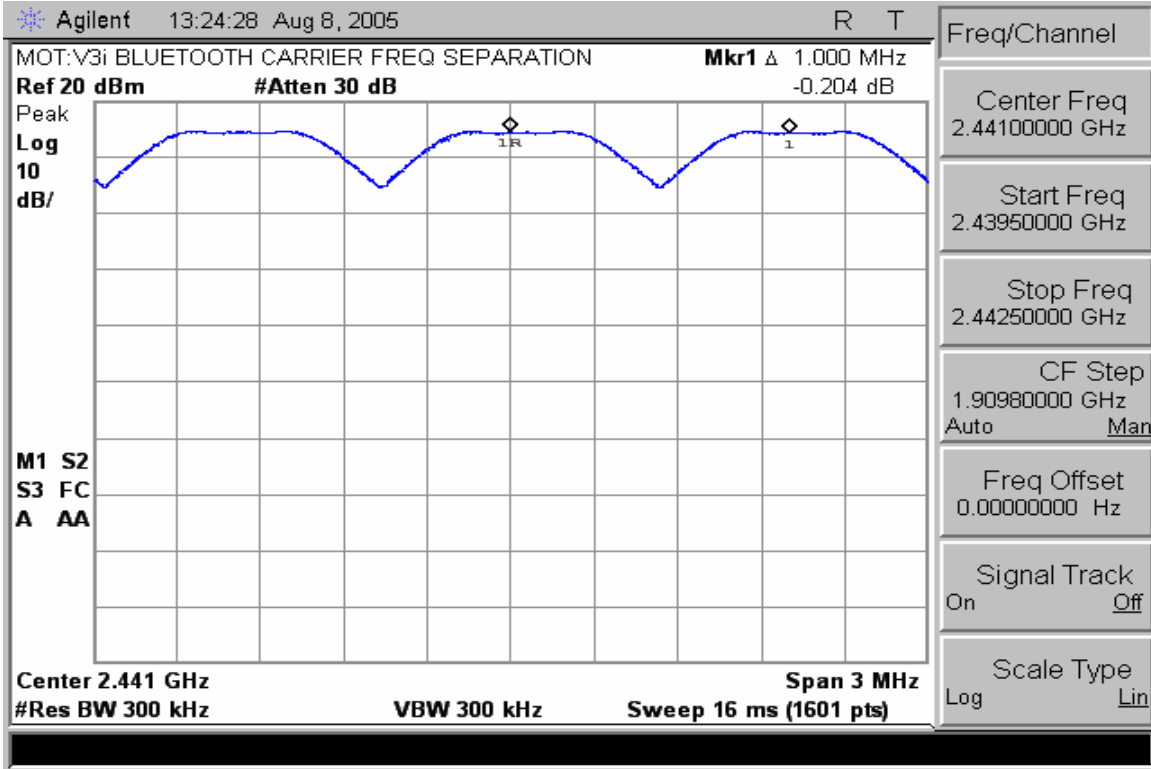
The Bluetooth transmitter of the EUT had its hopping function enabled. The following spectrum analyzer settings were used:

1. Span = wide enough to capture the peaks of two adjacent channels
2. Resolution (or IF) Bandwidth (RBW)  $\geq$  1% of the span
3. Video (or Average) Bandwidth (VBW)  $\geq$  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.

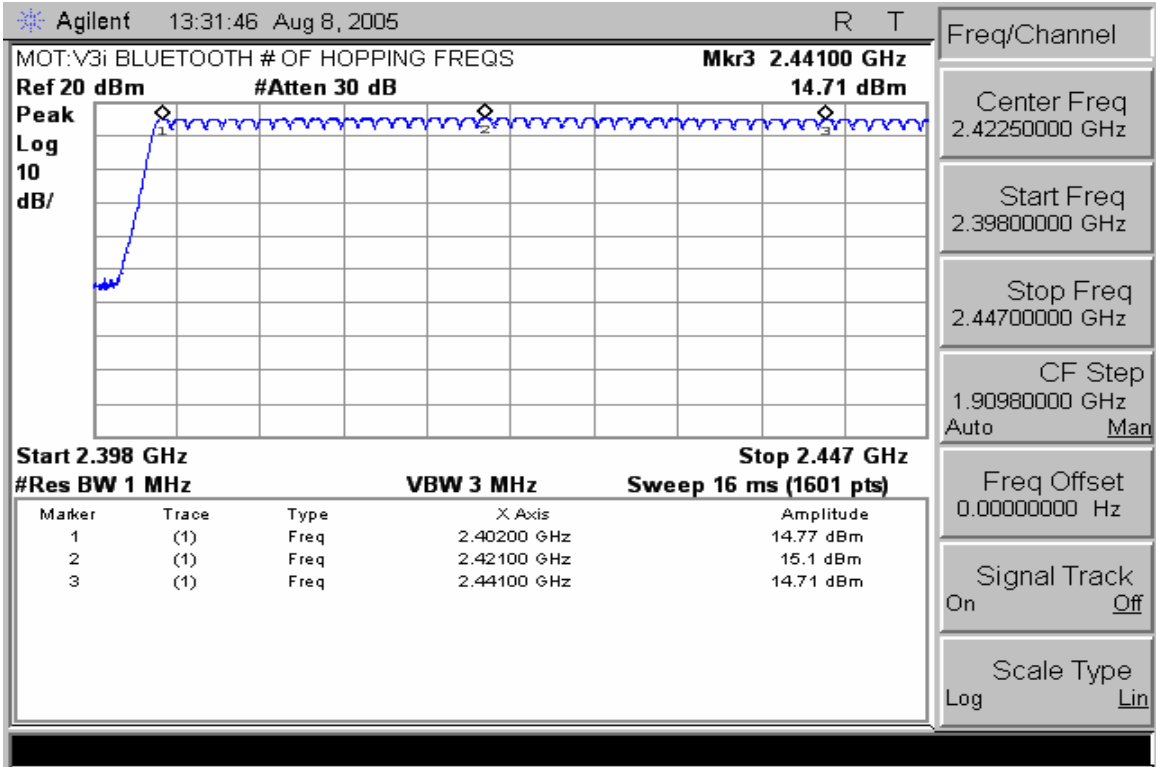
The Bluetooth frequency hopping function of the EUT was enabled. The spectrum analyzer used the following settings:

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

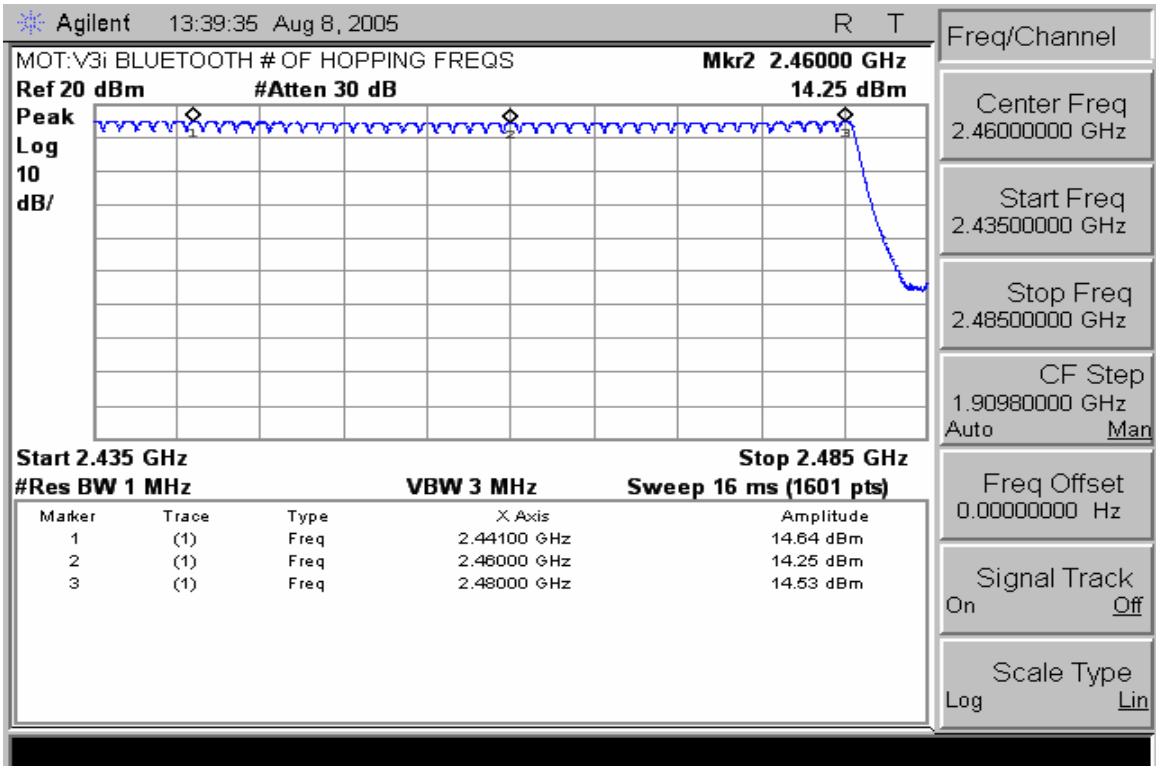
The trace was allowed to stabilize.

### **Measurement Results**

See attached.



**Number of Hopping Frequencies (Channels 0 – 39)**



**Number of Hopping Frequencies (Channels 39 – 78)**

**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.

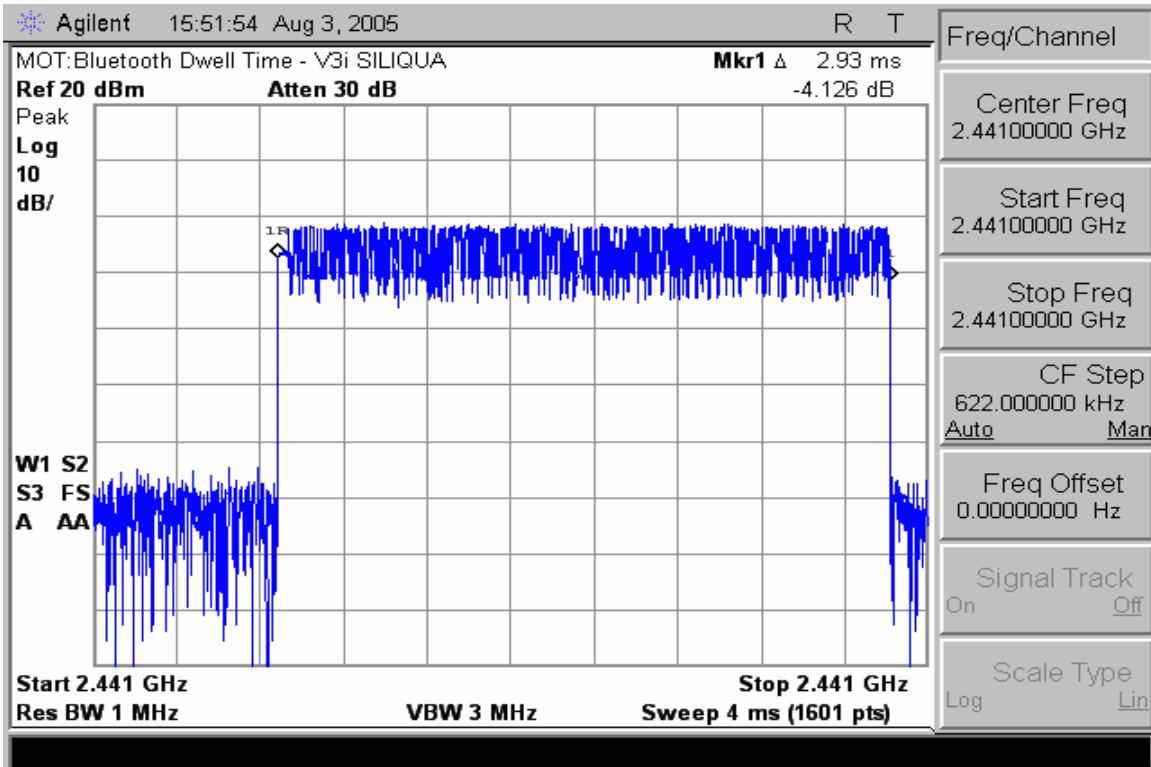
The Bluetooth hopping function of the EUT was enabled. The following spectrum analyzer settings were used:

1. Span = zero span, centered on a hopping channel
2. RBW = 1 MHz
3. VBW  $\geq$  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**

See attached



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.

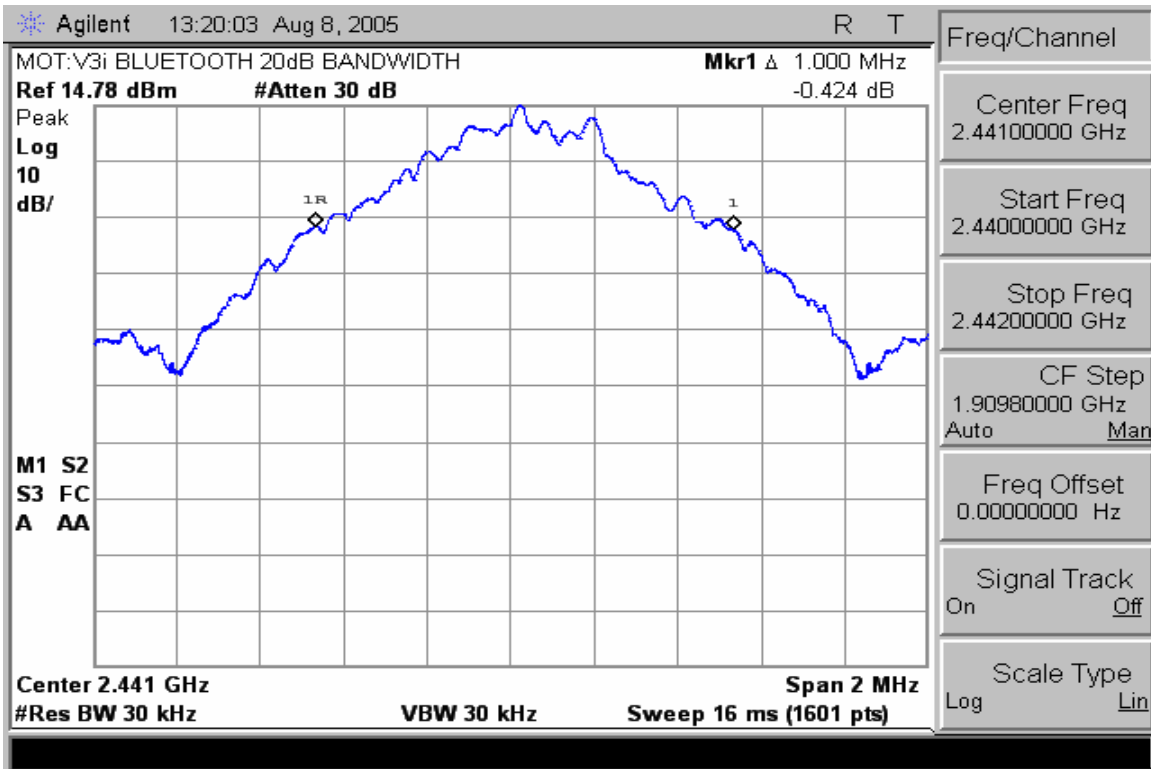
The Bluetooth frequency hopping function of the EUT was enabled. The spectrum analyzer used the following settings:

1. Span = approx. 2 to 3 times the 20dB bandwidth, centered on a hopping frequency
2. RBW  $\geq$  1% of the 20dB span
3. VBW  $\geq$  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**

See attached



### 20dB Bandwidth

**FIELD STRENGTH OF SPURIOUS EMISSIONS**

CFR Part 2.1053, 15.247

**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.

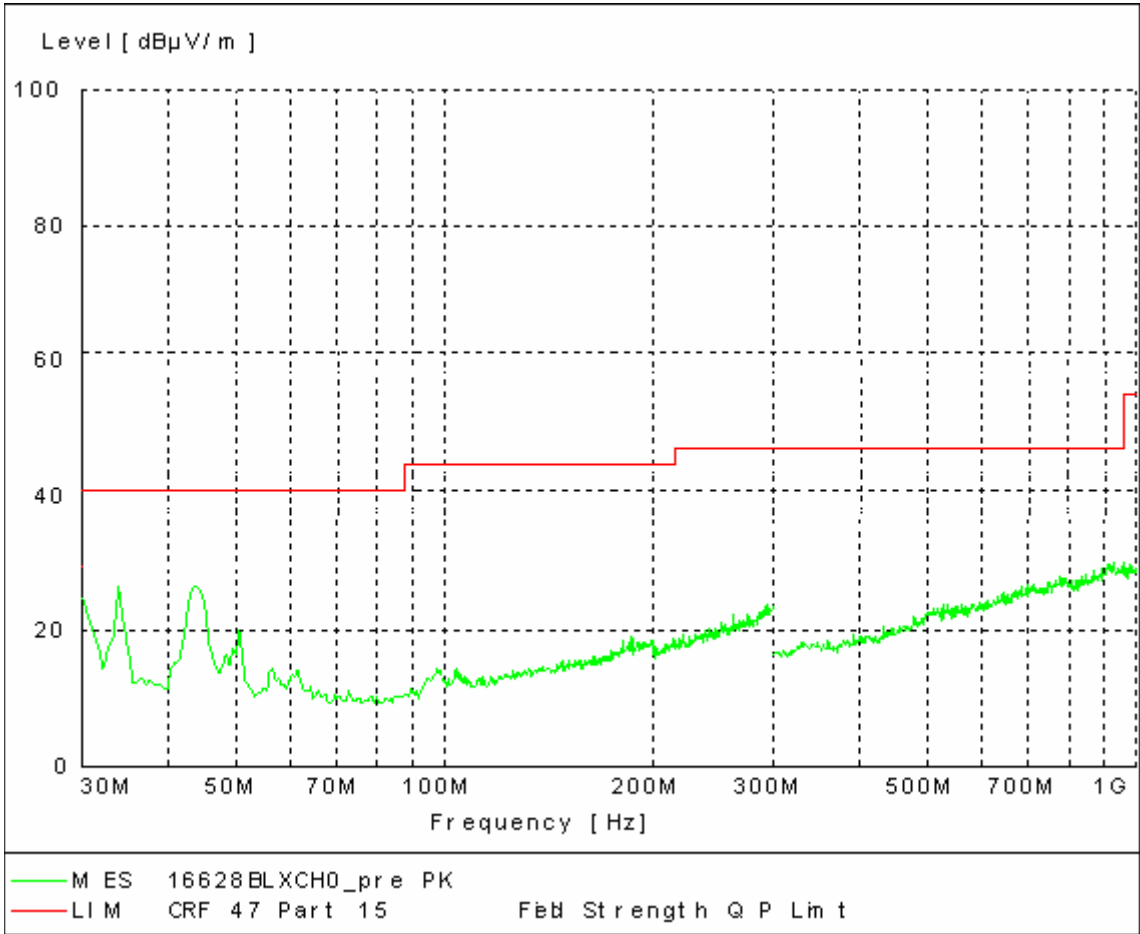
$$\text{Field Strength (dBuV/m)} = \text{EMI Receiver Level (dBuV)} + \text{Cable Loss (dB)} - \text{Amplifier Gain (dB)} + \text{Antenna Correction Factor (1/m)}$$

A fully charged battery was used for the supply voltage.

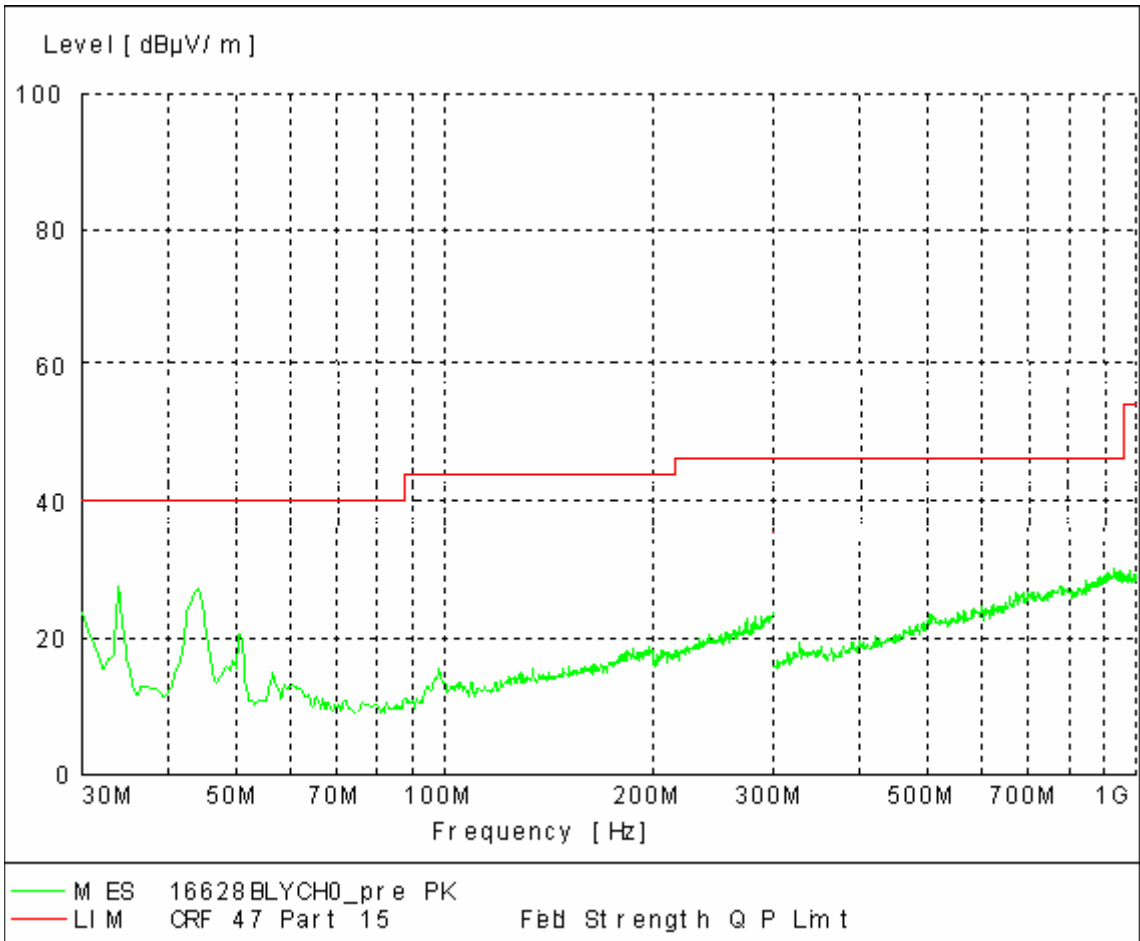
**Measurement Results**

See attached

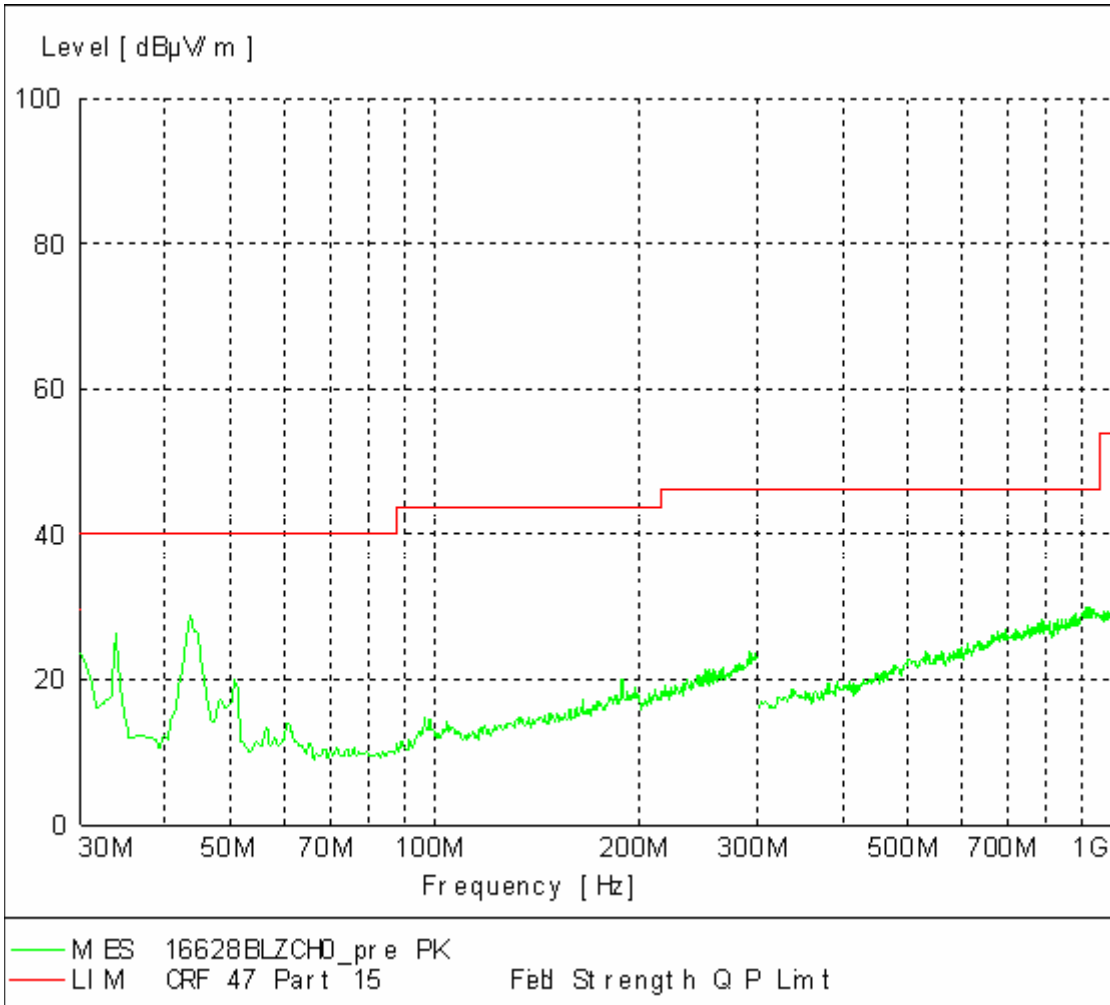
**Radiated Emissions  
CH 0 2402 MHz X-Axis  
GREEN HORIZONTAL AND VERTICAL**



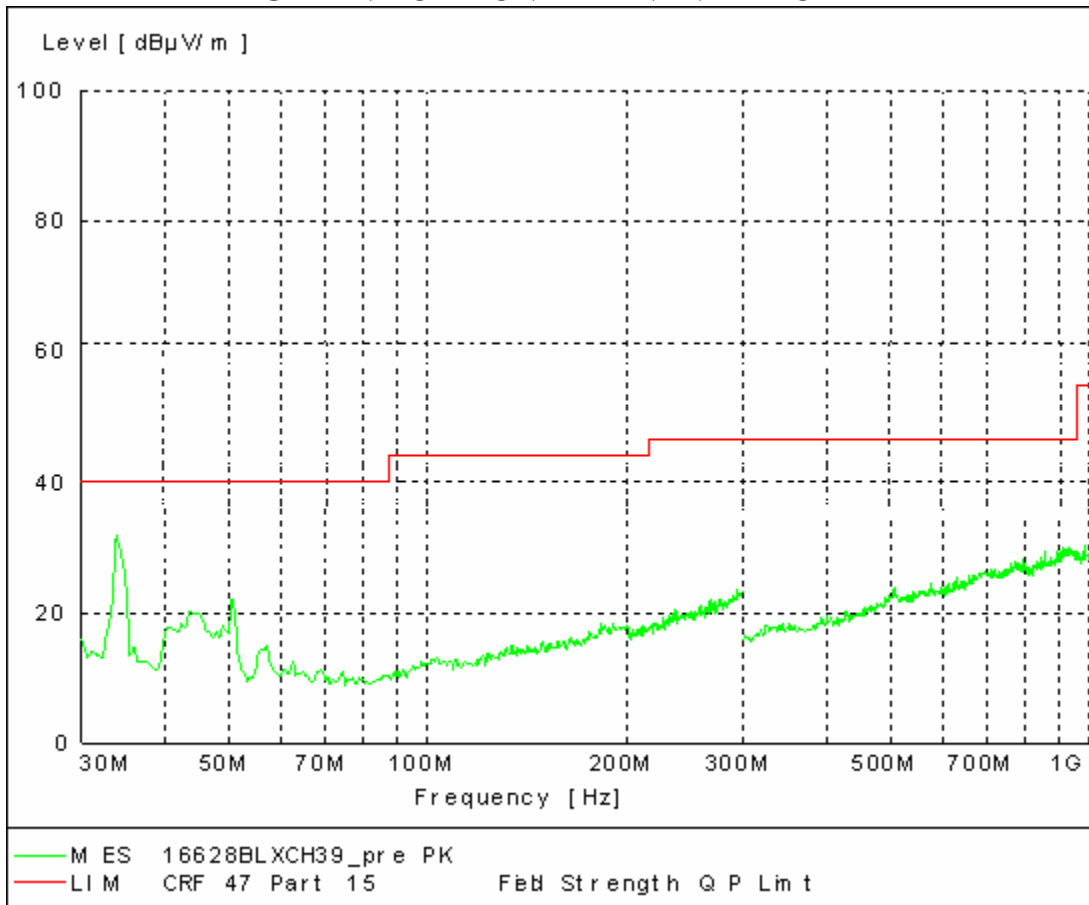
**Radiated Emissions**  
**CH 0 2402 MHz Y-Axis**  
**GREEN HORIZONTAL AND VERTICAL**



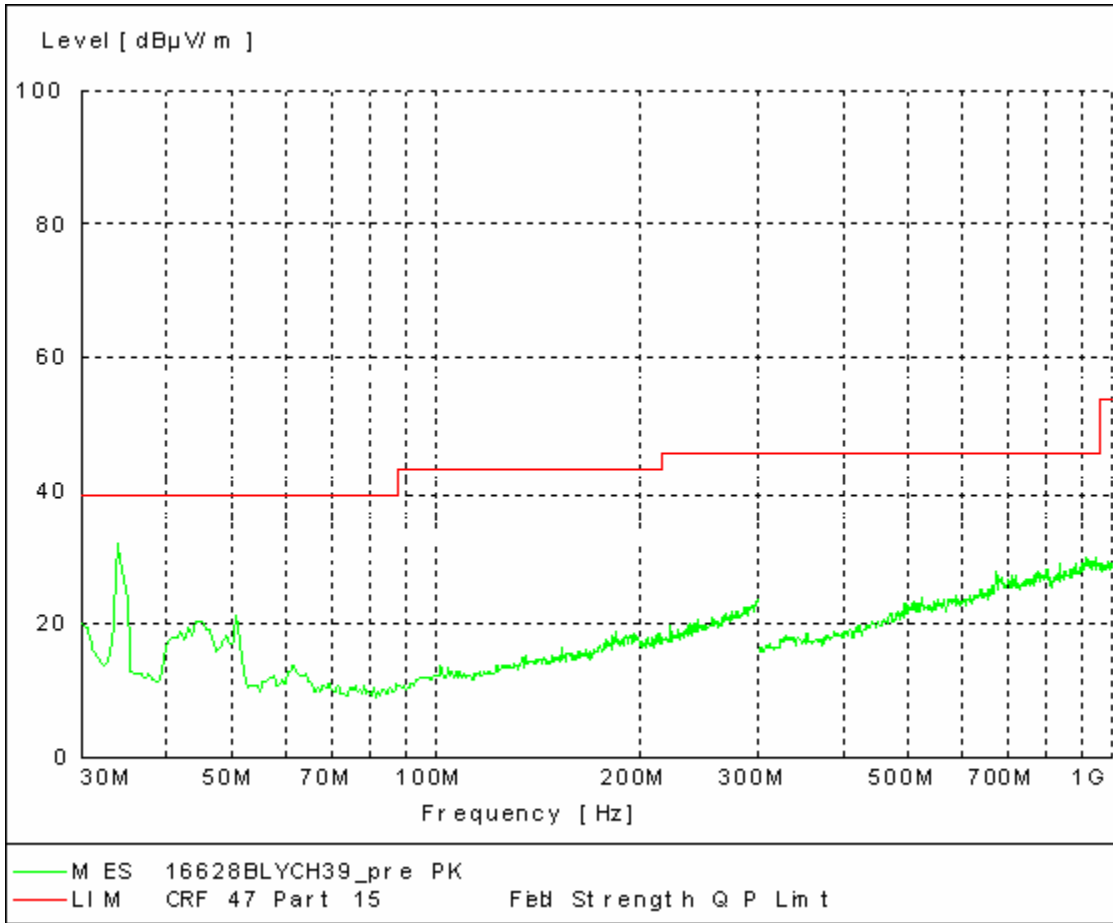
**Radiated Emissions  
CH 0 2402 MHz Z-Axis  
GREEN HORIZONTAL AND VERTICAL**



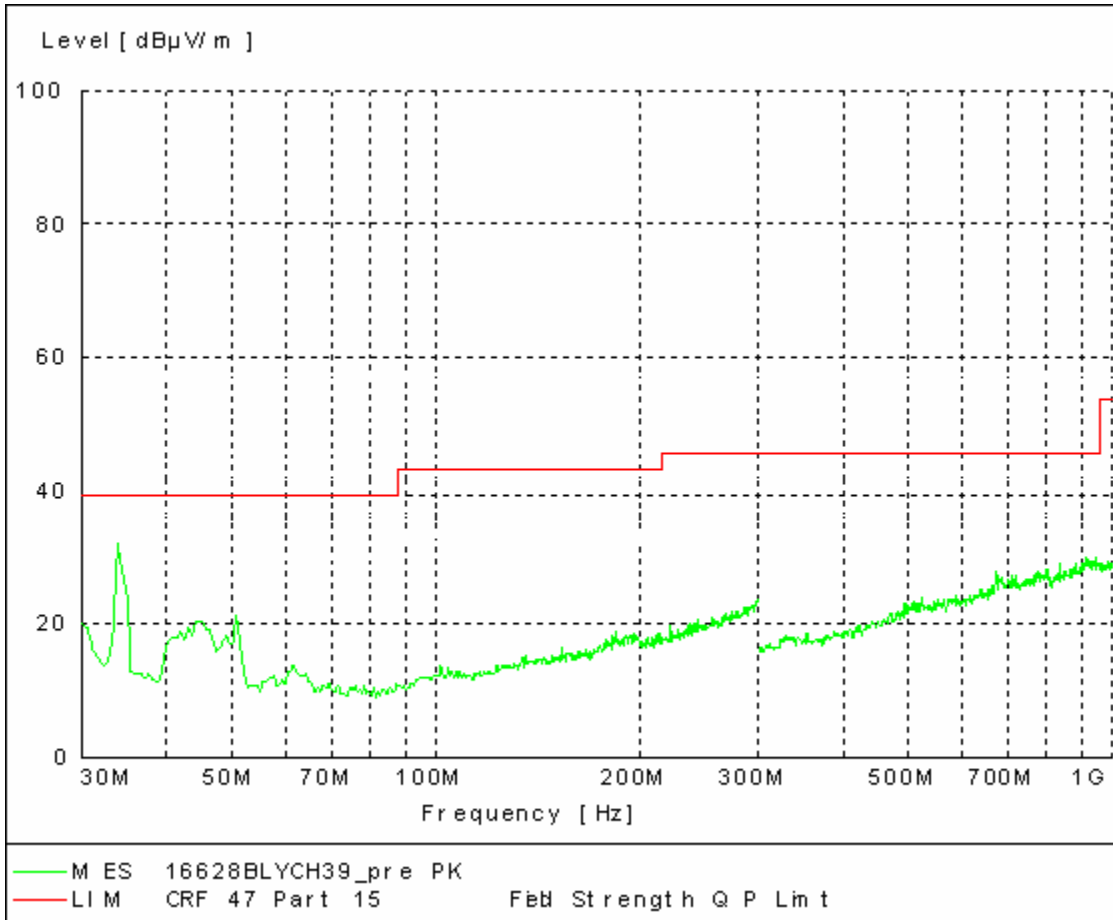
**Radiated Emissions  
CH 39 2442 MHz X-Axis  
GREEN HORIZONTAL AND VERTICAL**



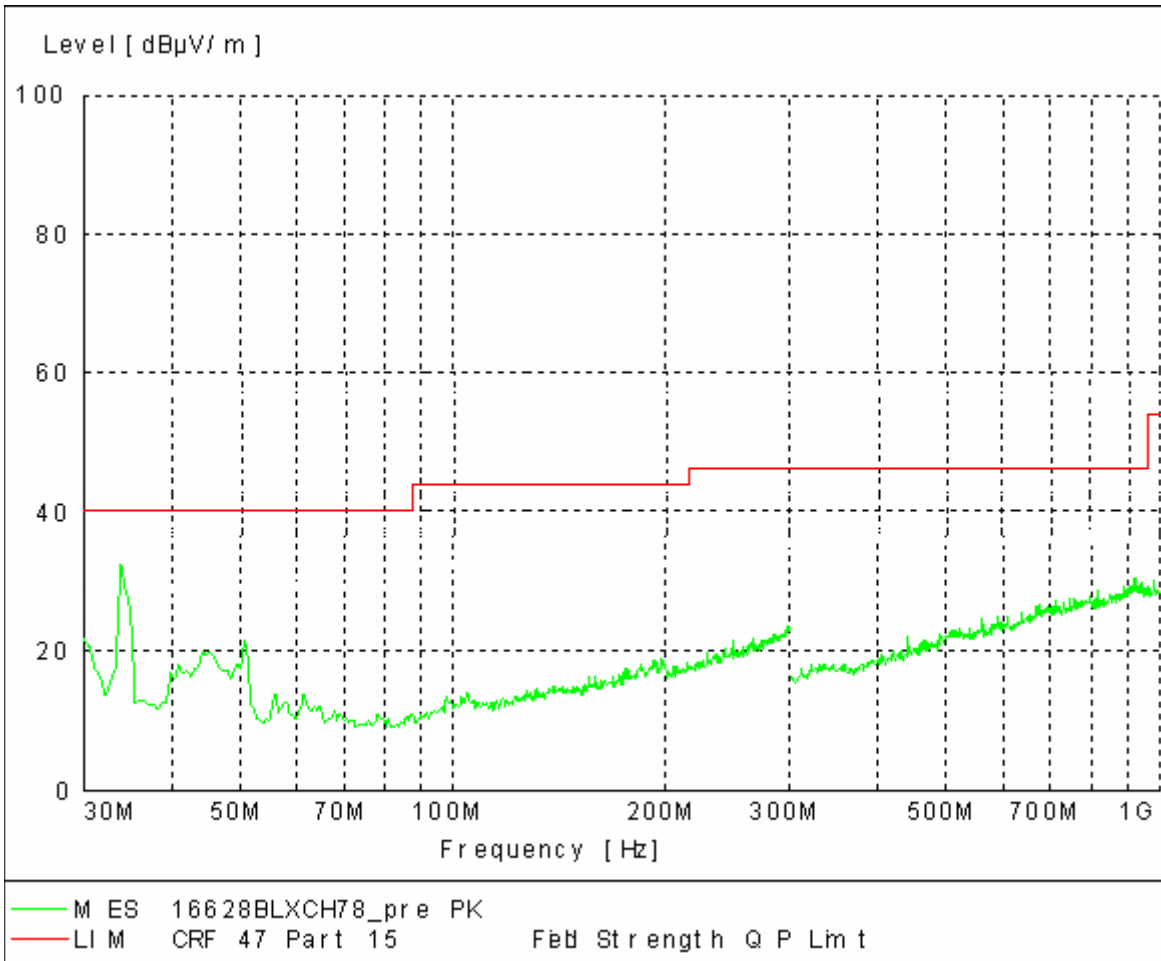
**Radiated Emissions  
CH 39 2442 MHz Y-Axis  
GREEN HORIZONTAL AND VERTICAL**



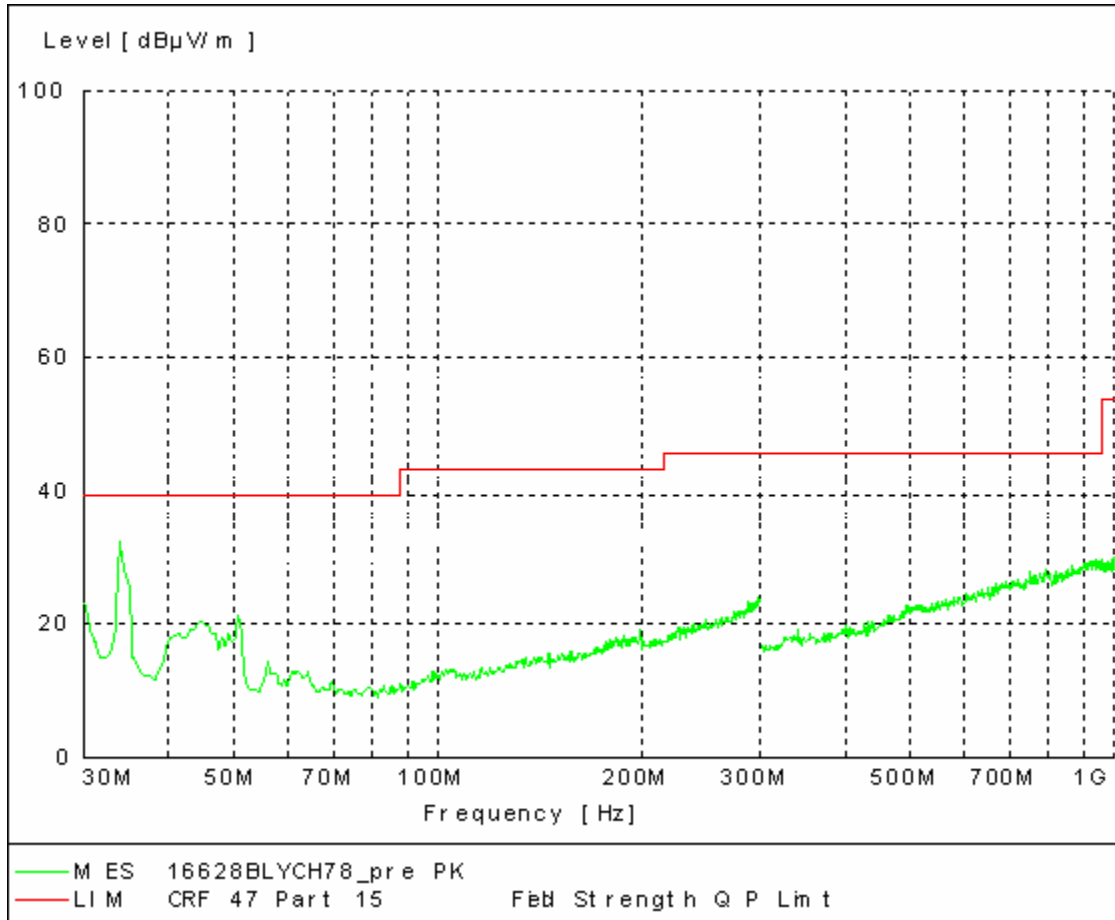
**Radiated Emissions  
CH 39 2442 MHz Z-Axis  
GREEN HORIZONTAL AND VERTICAL**



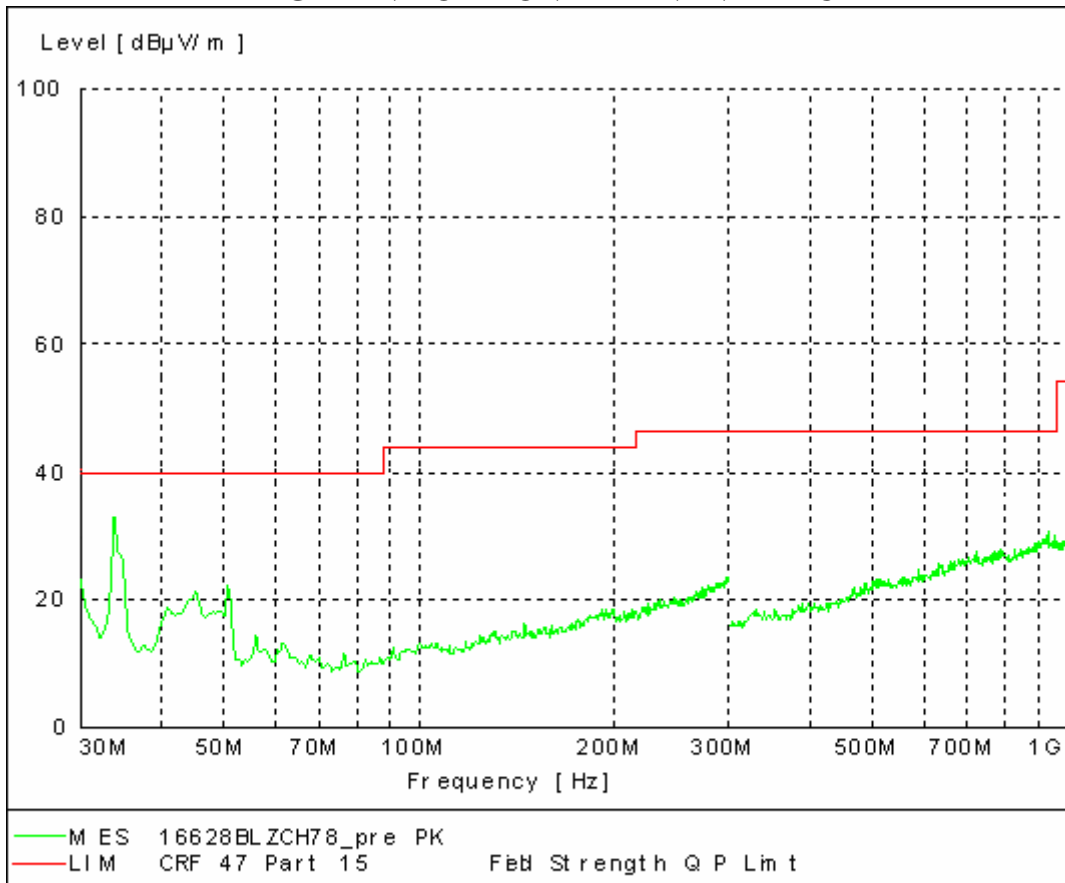
**Radiated Emissions  
CH 78 2480 MHz X-Axis  
GREEN HORIZONTAL AND VERTICAL**



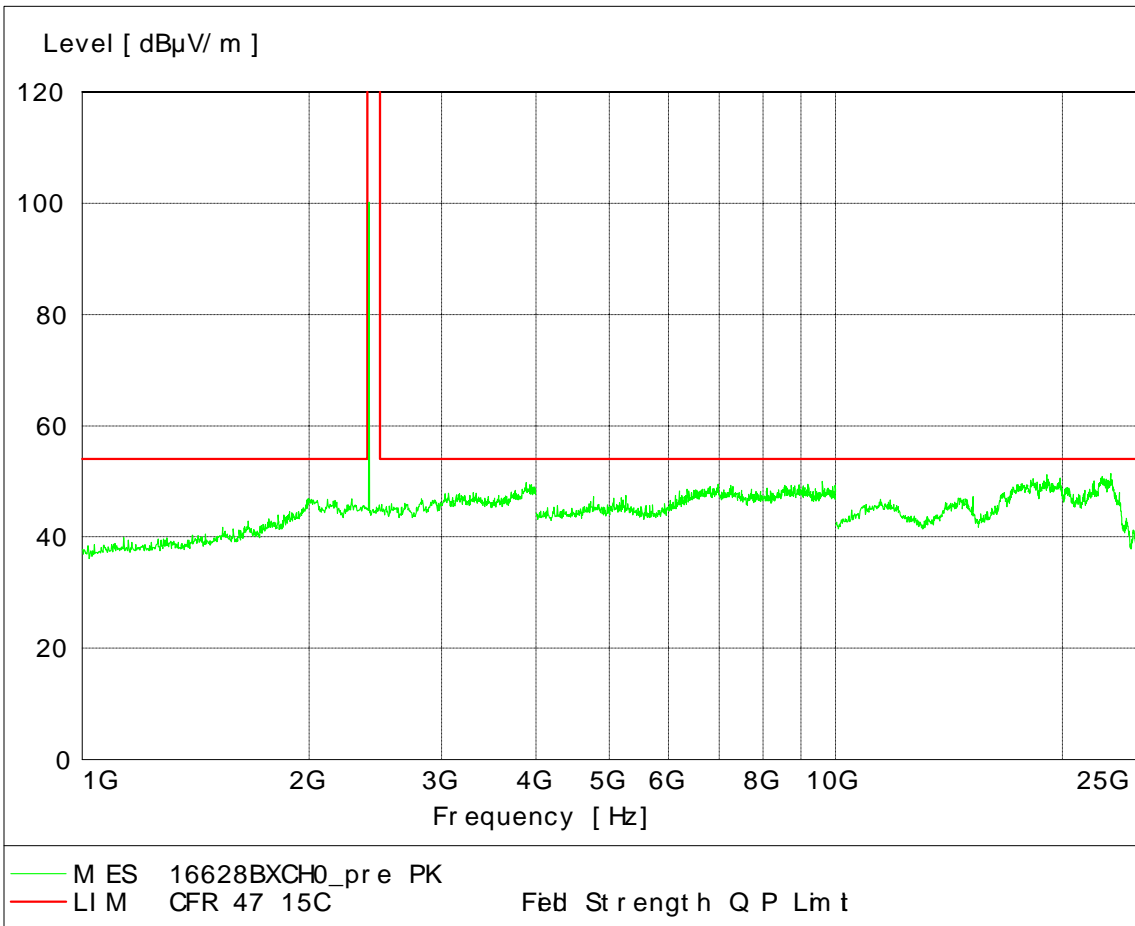
**Radiated Emissions  
CH 78 2480 MHz Y-Axis  
GREEN HORIZONTAL AND VERTICAL**



**Radiated Emissions  
CH 78 2480 MHz Z-Axis  
GREEN HORIZONTAL AND VERTICAL**

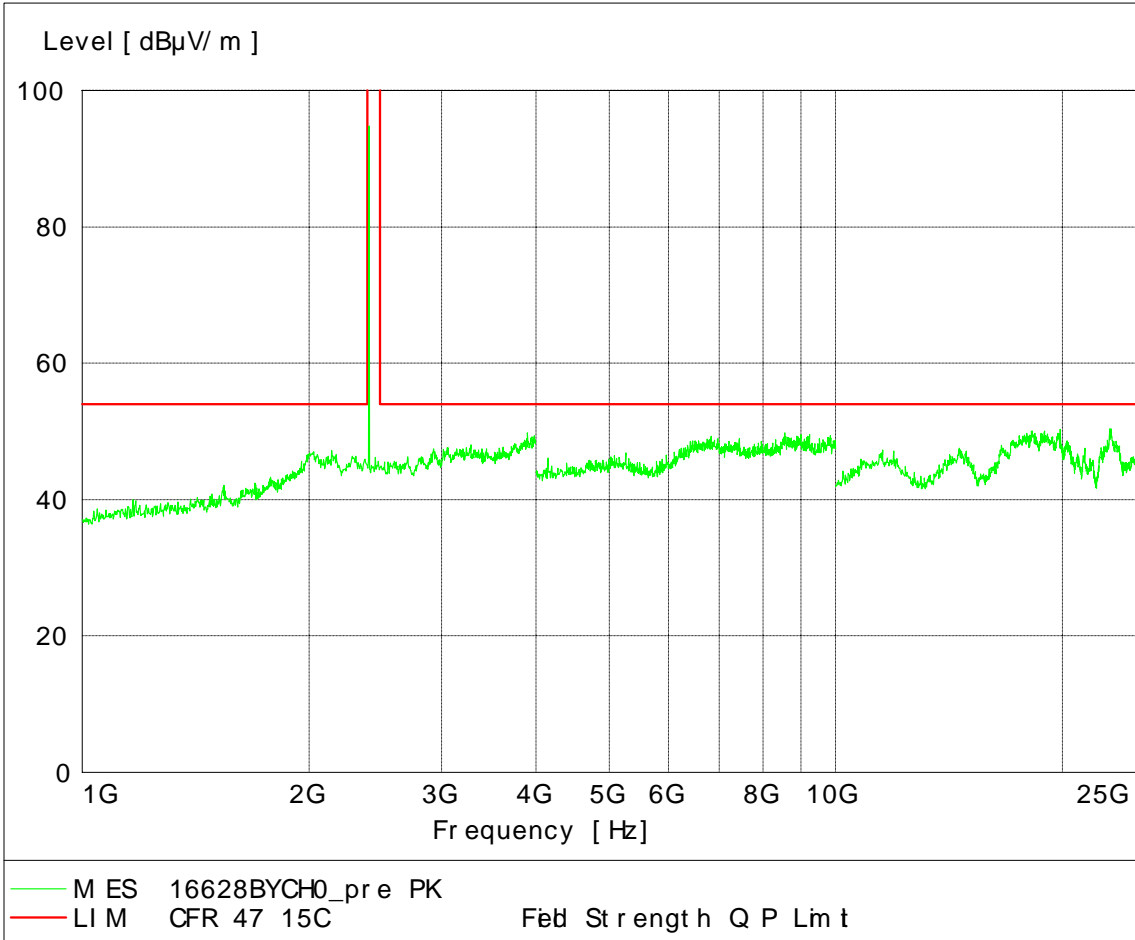


**Radiated Emissions  
CH 0 2402 MHz X-Axis  
GREEN HORIZONTAL AND VERTICAL**



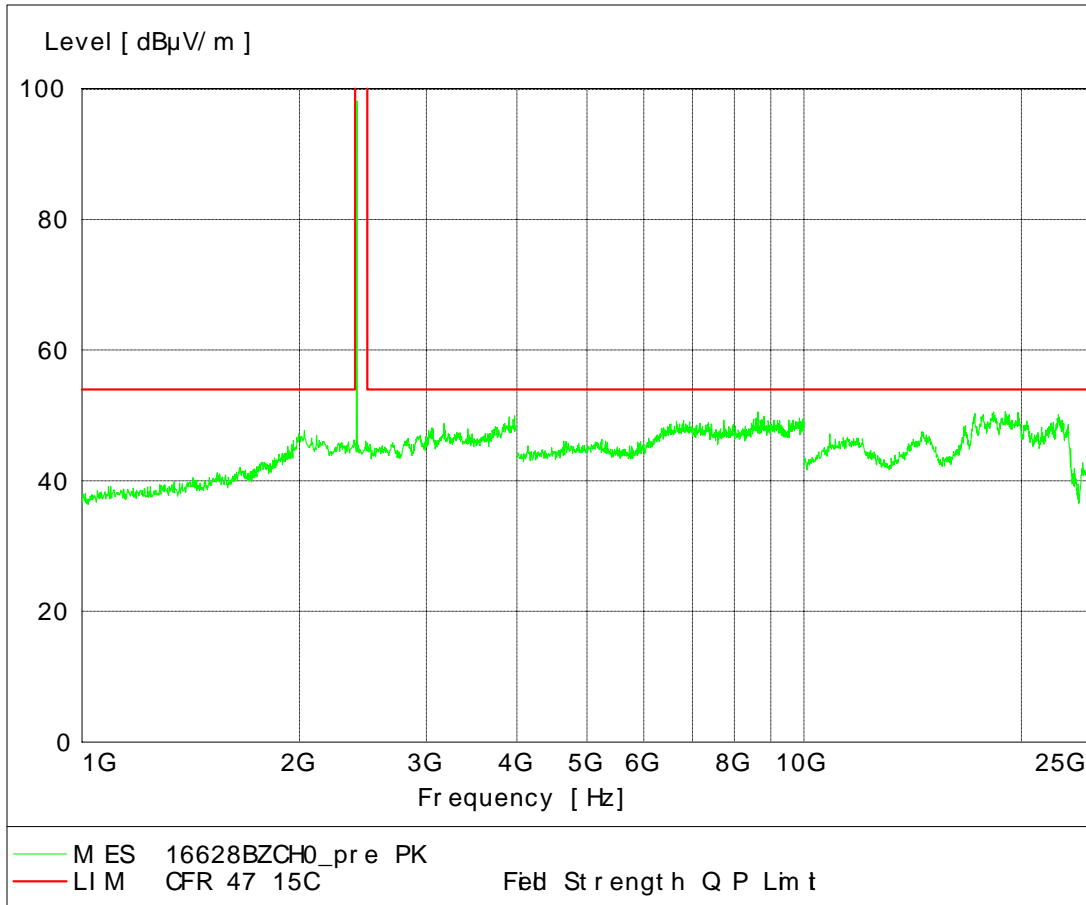
Frequency MHz	Measured dBµV/m	Detector Type	Limit dBµV/m
2400	100.18	Peak	99

**Radiated Emissions  
CH 0 2402MHz Y-Axis  
GREEN HORIZONTAL AND VERTICAL**



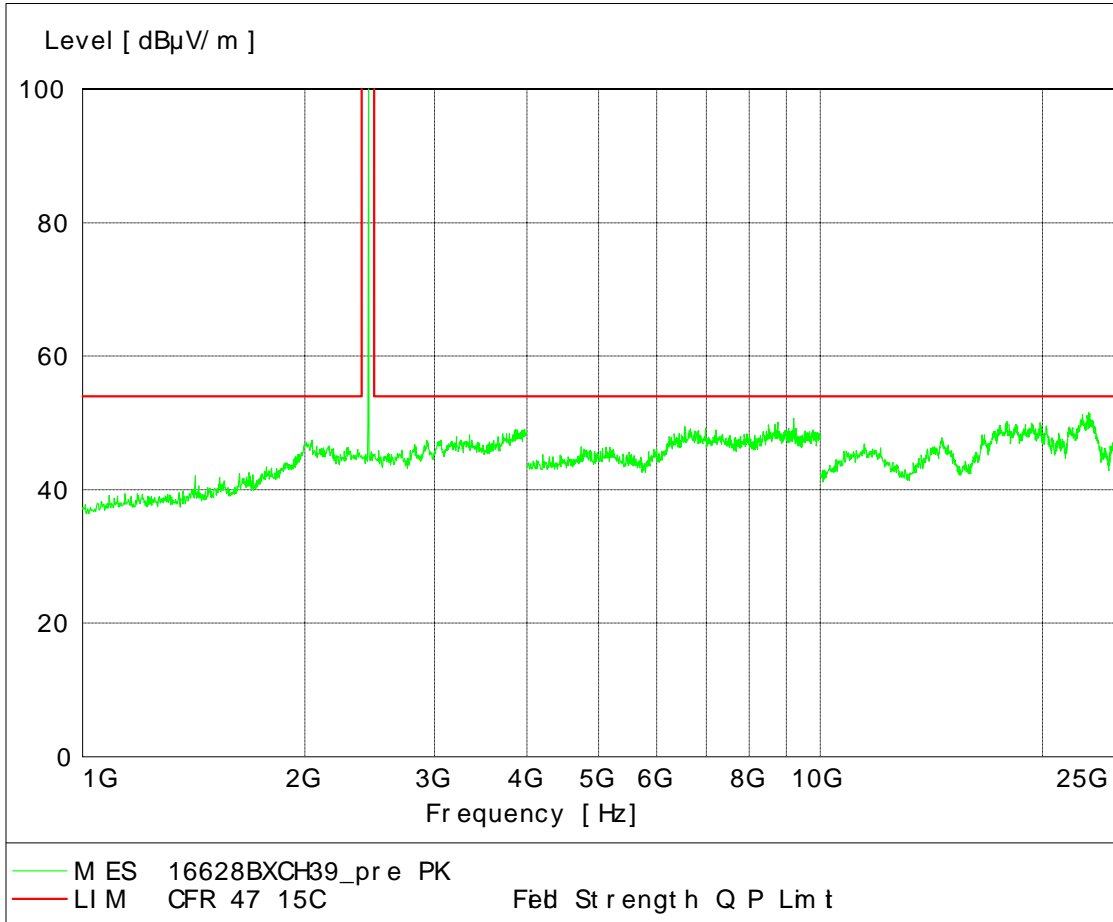
Frequency MHz	Measured dBµV/m	Detector Type	Limit dBµV/m
2400	94.84	Peak	99.9

**Radiated Emissions  
CH 0 2402 MHz Z-Axis  
GREEN HORIZONTAL AND VERTICAL**



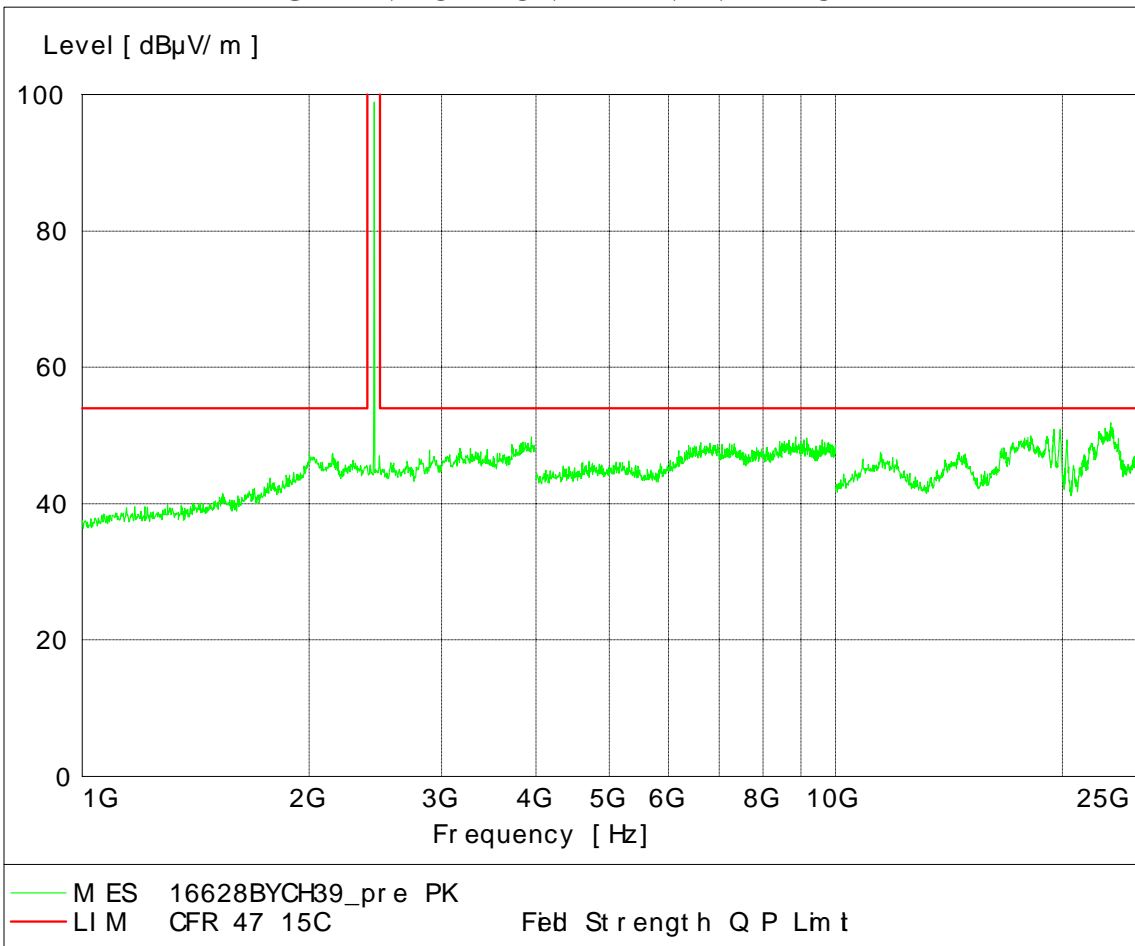
Frequency MHz	Measured dBµV/m	Detector Type	Limit dBµV/m
2400	98.14	Peak	99.9

**Radiated Emissions  
CH 39 2441 MHz X-Axis  
GREEN HORIZONTAL AND VERTICAL**



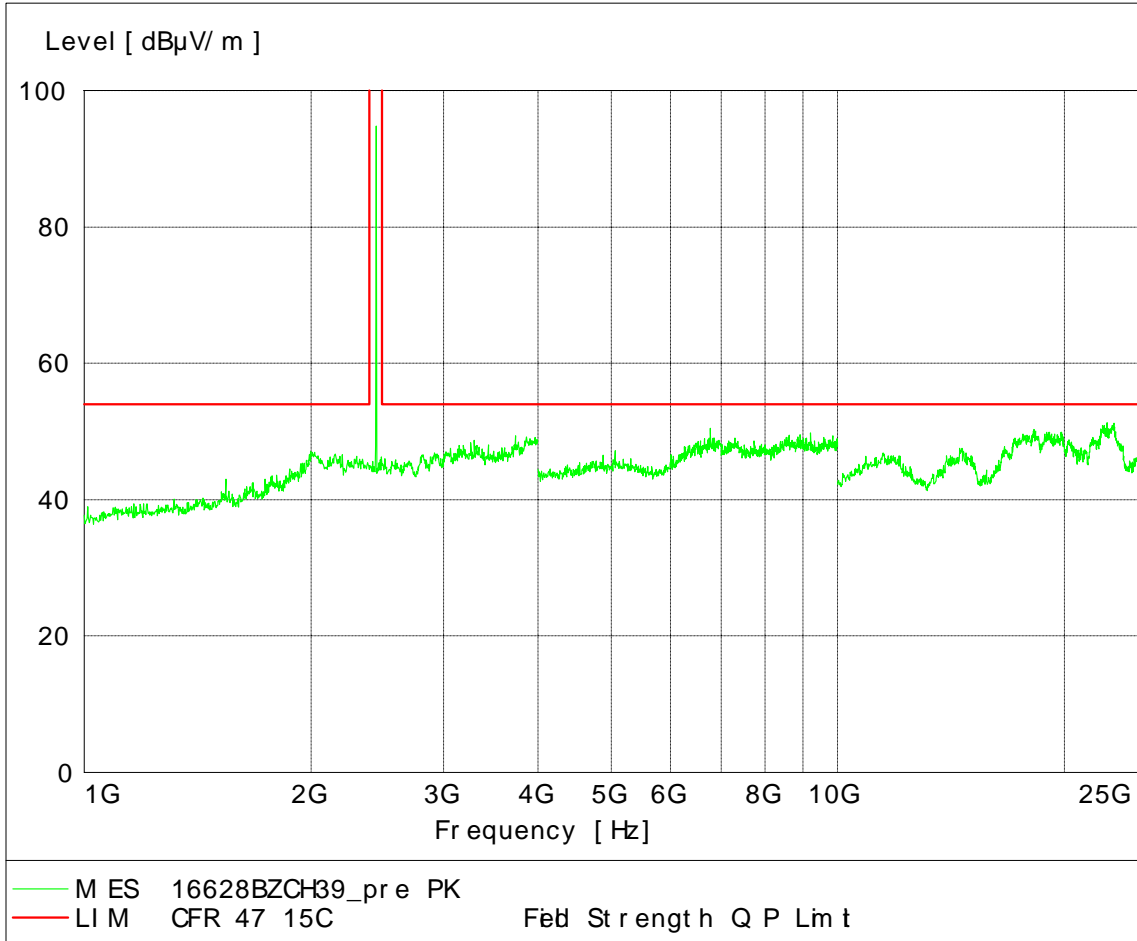
Frequency MHz	Measured dBµV/m	Detector Type	Limit dBµV/m
24408	101.86	Peak	999

**Radiated Emissions  
CH 39 2441 MHz Y-Axis  
GREEN HORIZONTAL AND VERTICAL**



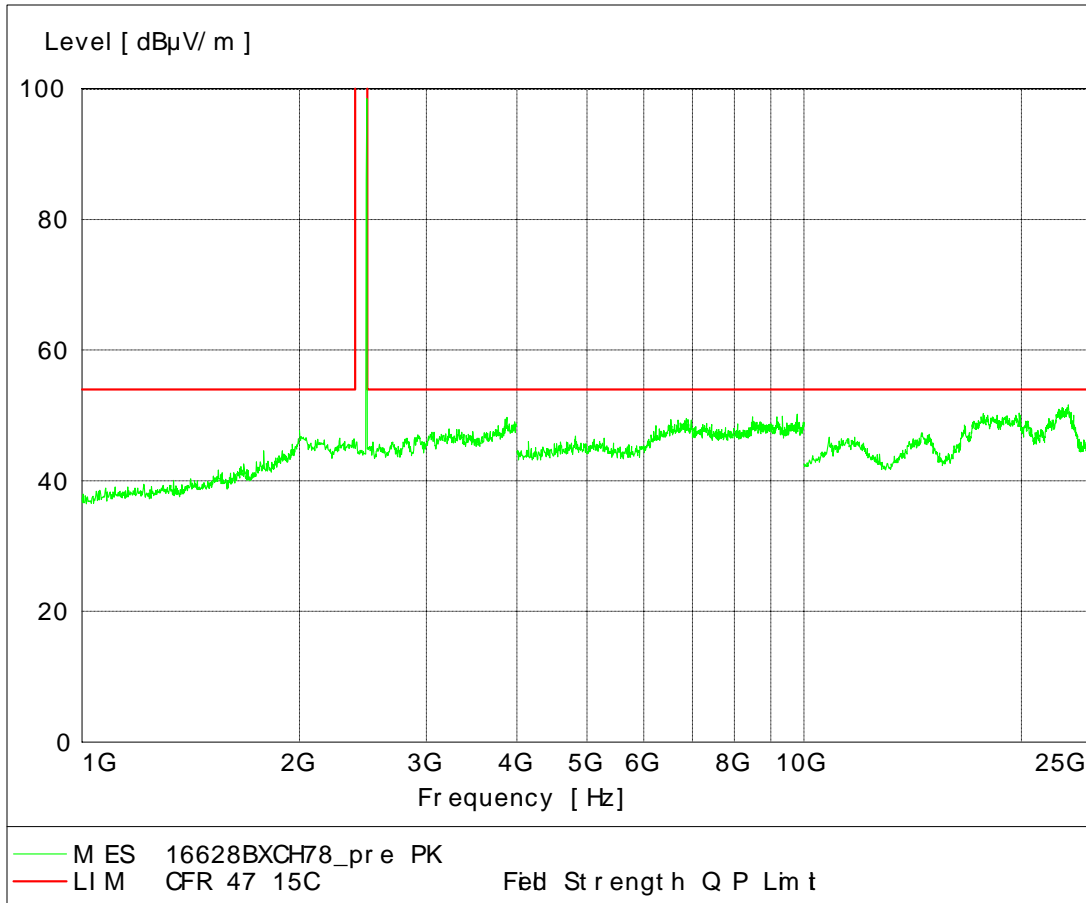
Frequency MHz	Measured dBµV/m	Detector Type	Limit dBµV/m
2440	98.93	Peak	99

**Radiated Emissions  
CH 39 2441 MHz Z-Axis  
GREEN HORIZONTAL AND VERTICAL**



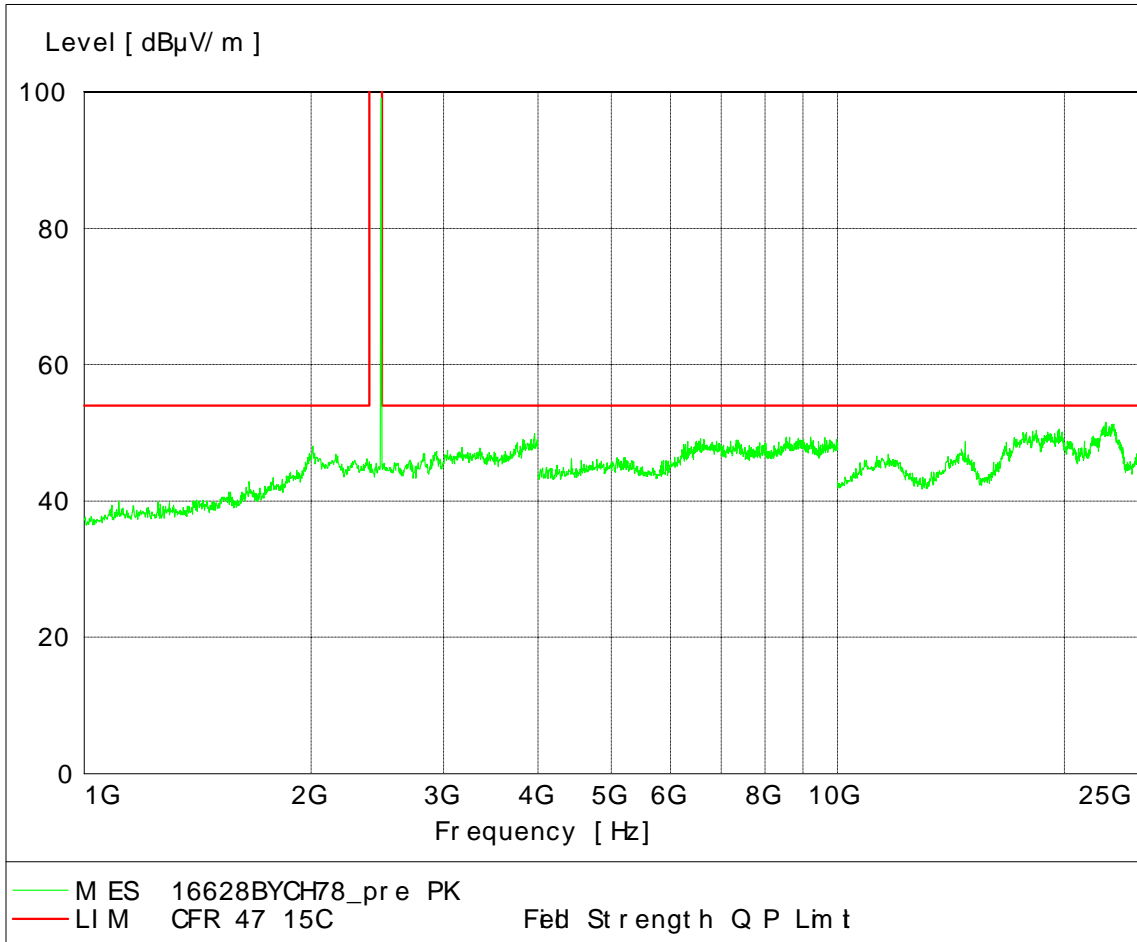
Frequency MHz	Measured dBµV/m	Detector Type	Limit dBµV/m
2441	94.76	Peak	99.9

**Radiated Emissions  
CH 78 2480 MHz X-Axis  
GREEN HORIZONTAL AND VERTICAL**



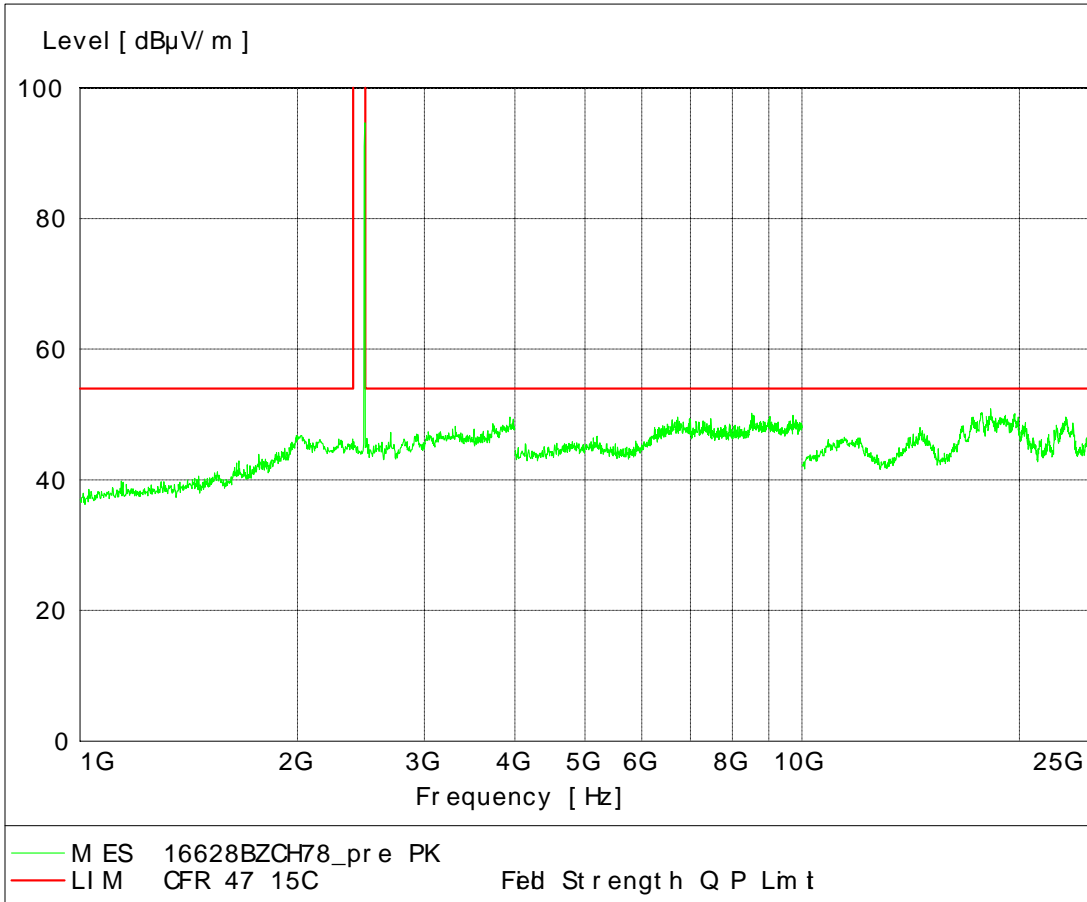
Frequency MHz	Measured dBµV/m	Detector Type	Limit dBµV/m
2477	85.99	Peak	99.9

**Radiated Emissions  
CH 78 2480 MHz Y-Axis  
GREEN HORIZONTAL AND VERTICAL**



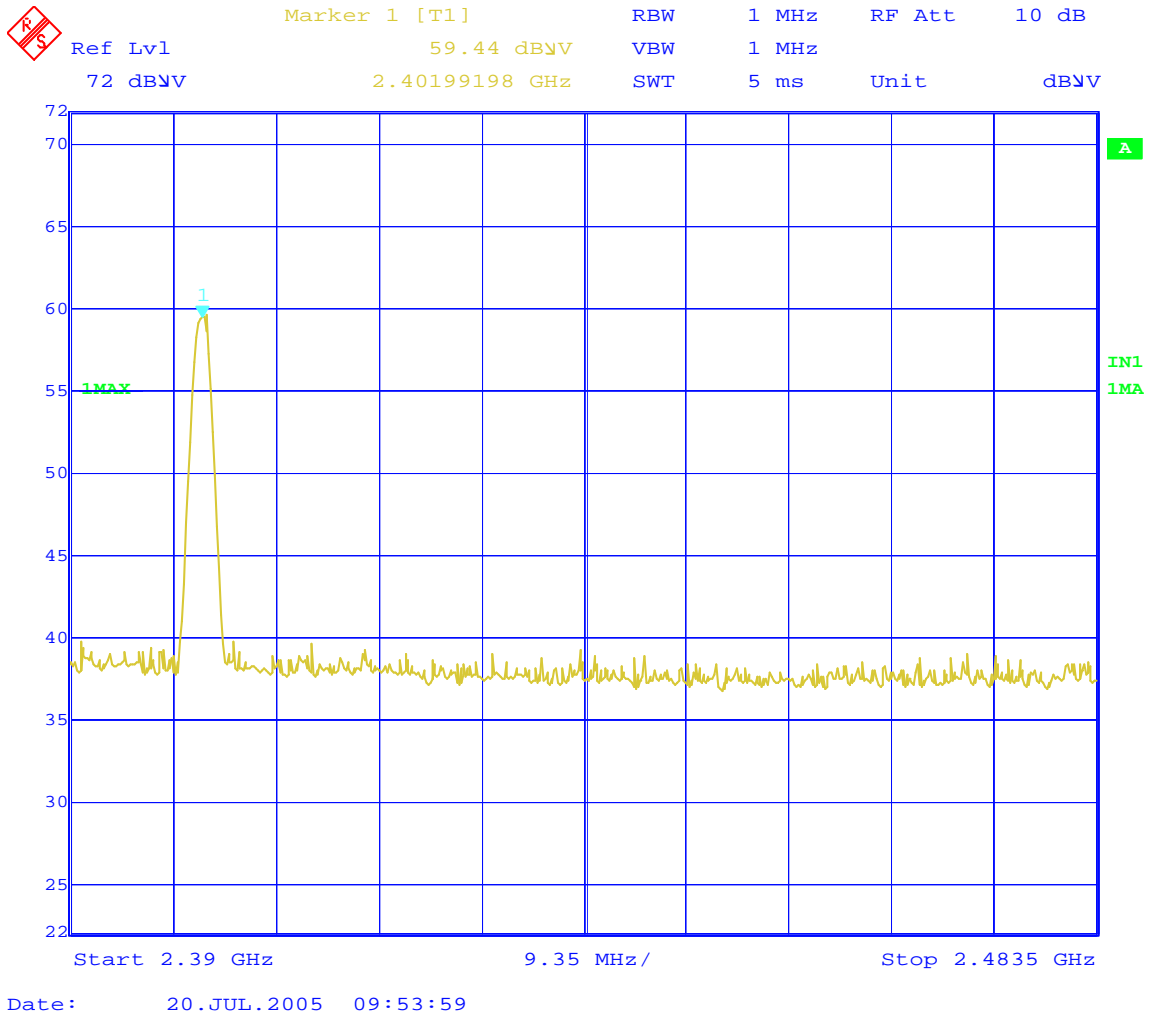
Frequency MHz	Measured dBµV/m	Detector Type	Limit dBµV/m
2477	89.41	Peak	99

**Radiated Emissions  
CH 78 2480 MHz Z-Axis  
GREEN HORIZONTAL AND VERTICAL**

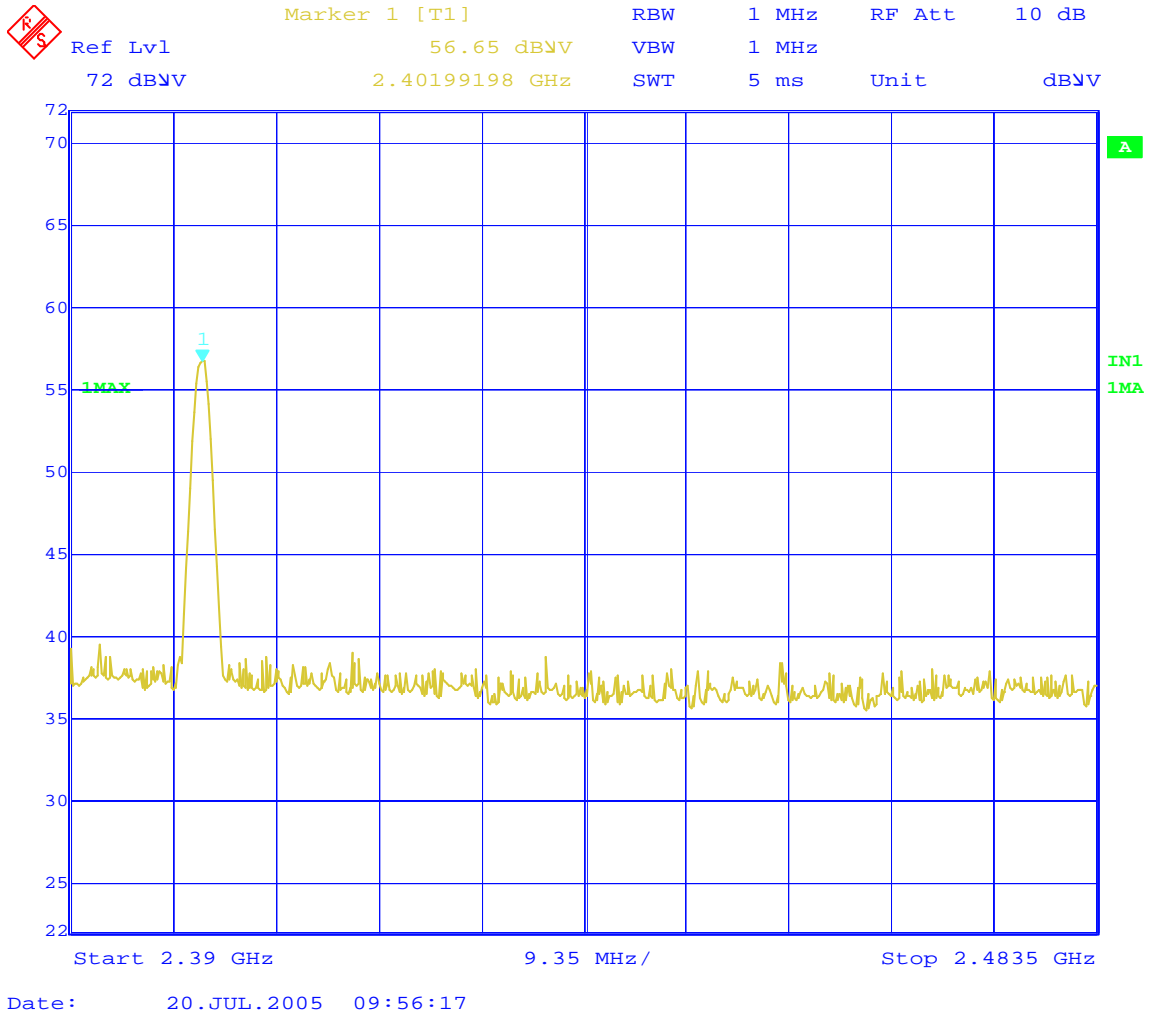


Frequency MHz	Measured dBµV/m	Detector Type	Limit dBµV/m
2477	91.00	Peak	99

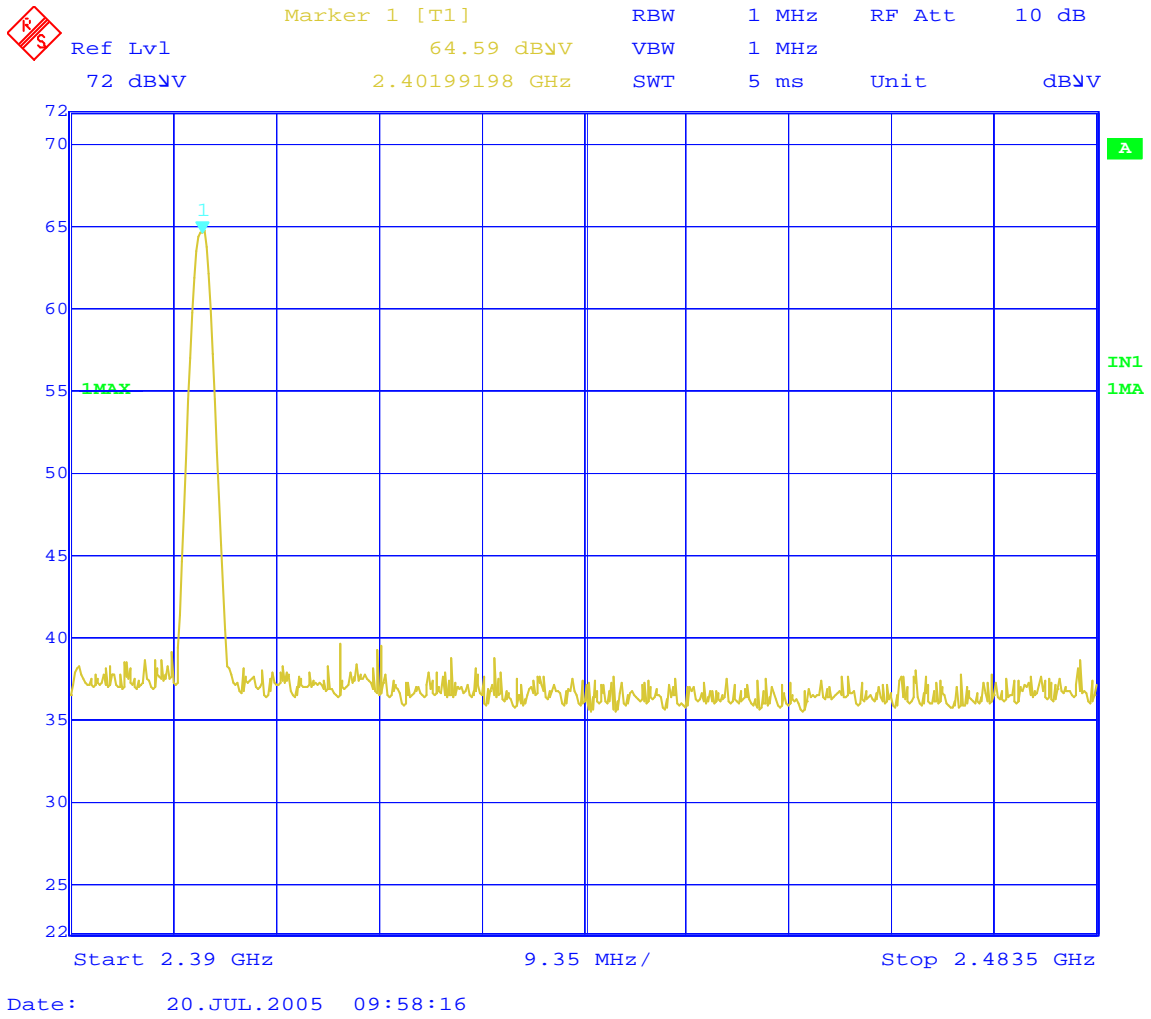
### Radiated Emissions Band Edge CH 0 2402 MHz X-Axis



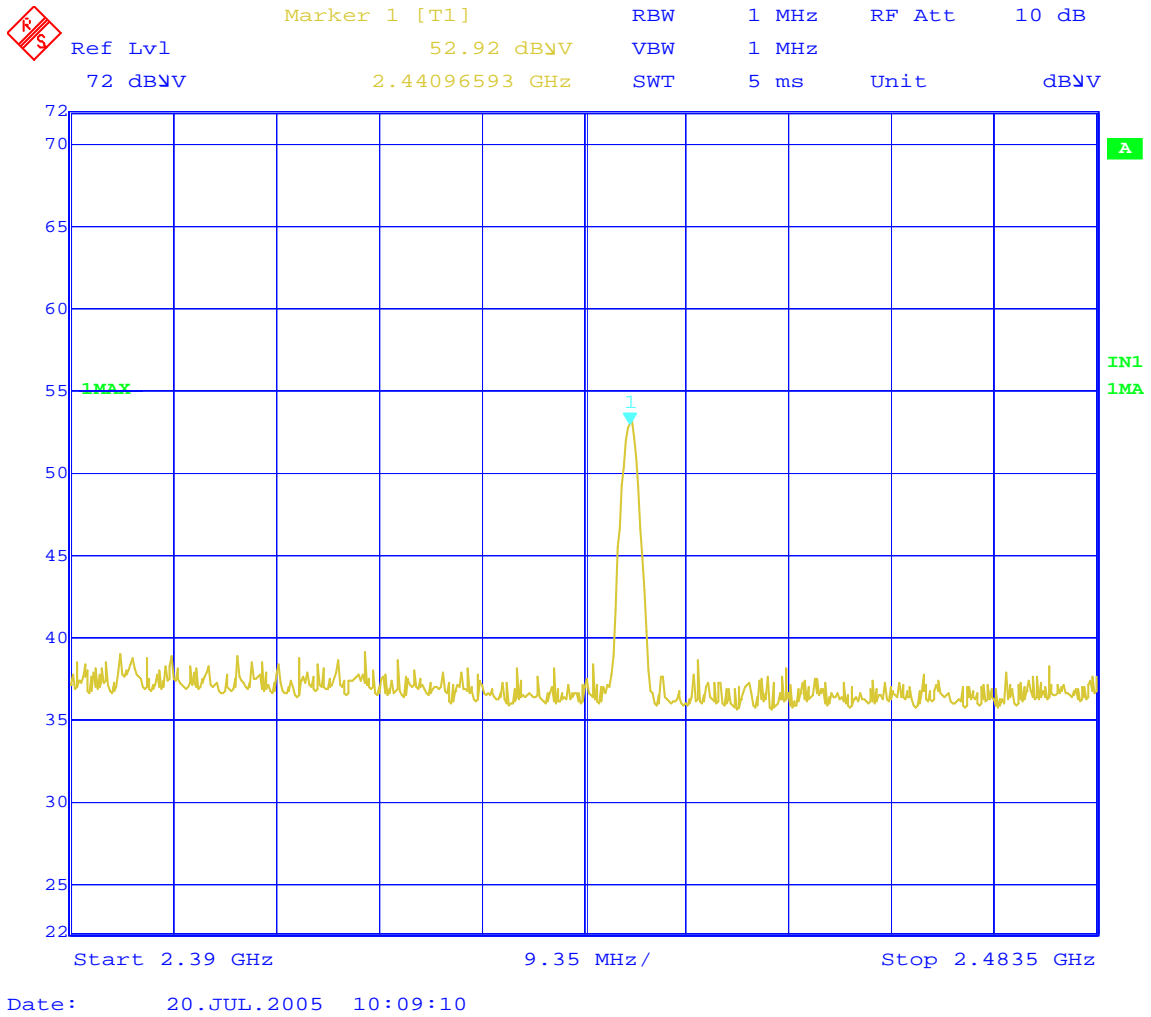
### Radiated Emissions Band Edge CH 0 2402 MHz Y-Axis



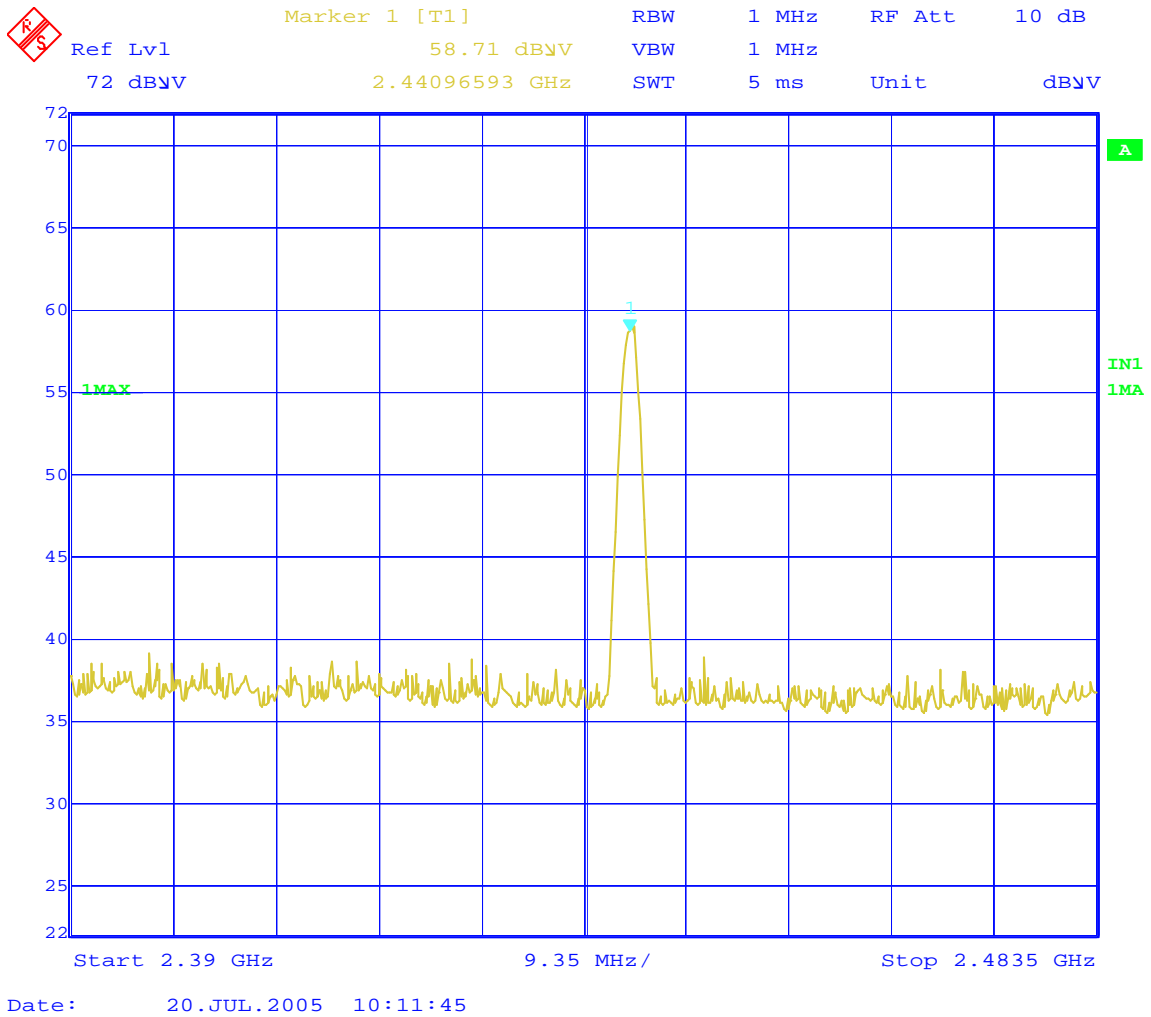
### Radiated Emissions Band Edge CH 0 2402 MHz Z-Axis



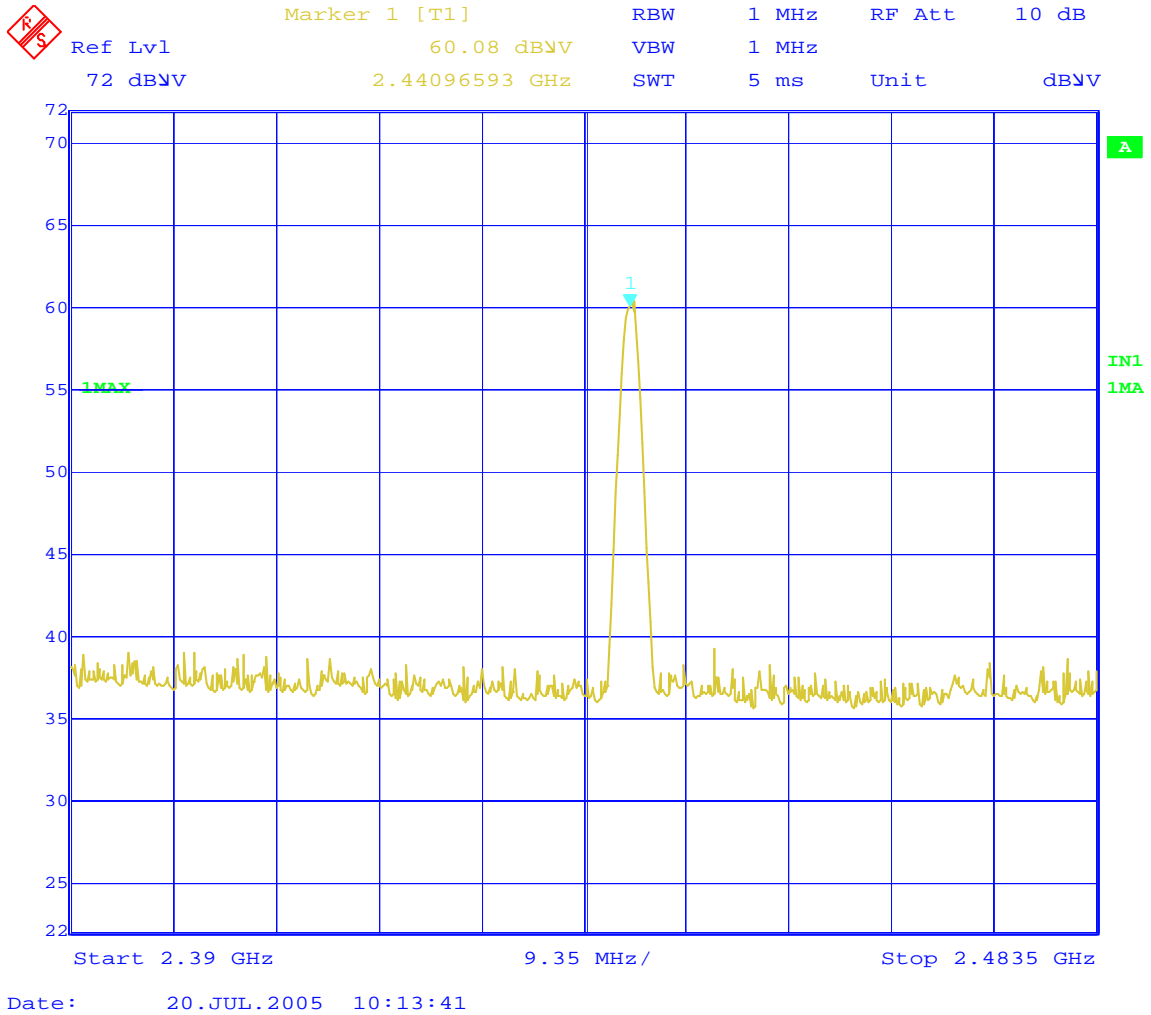
### Radiated Emissions Band Edge CH 39 2442 MHz X-Axis



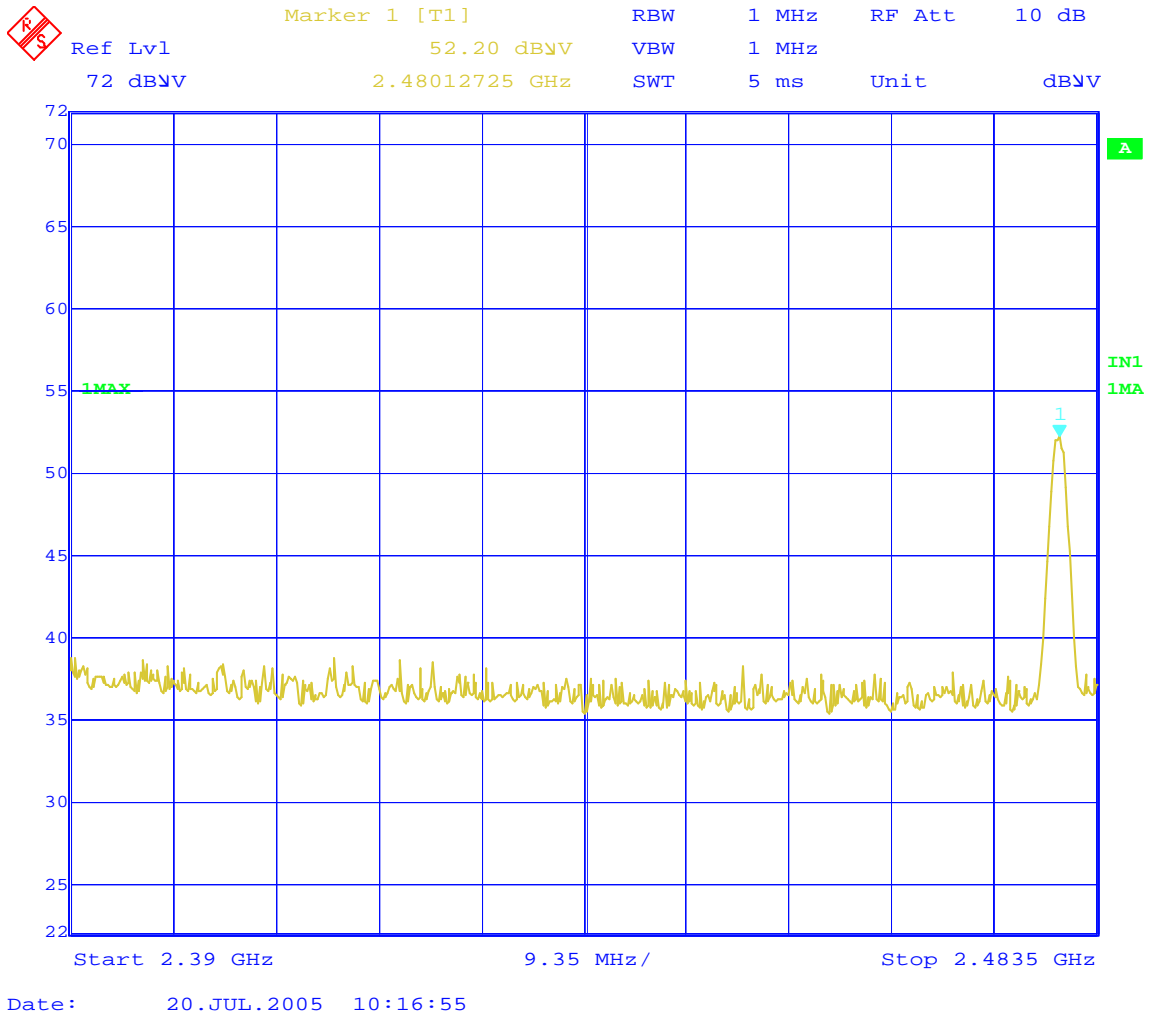
### Radiated Emissions Band Edge CH 39 2442 MHz Y-Axis



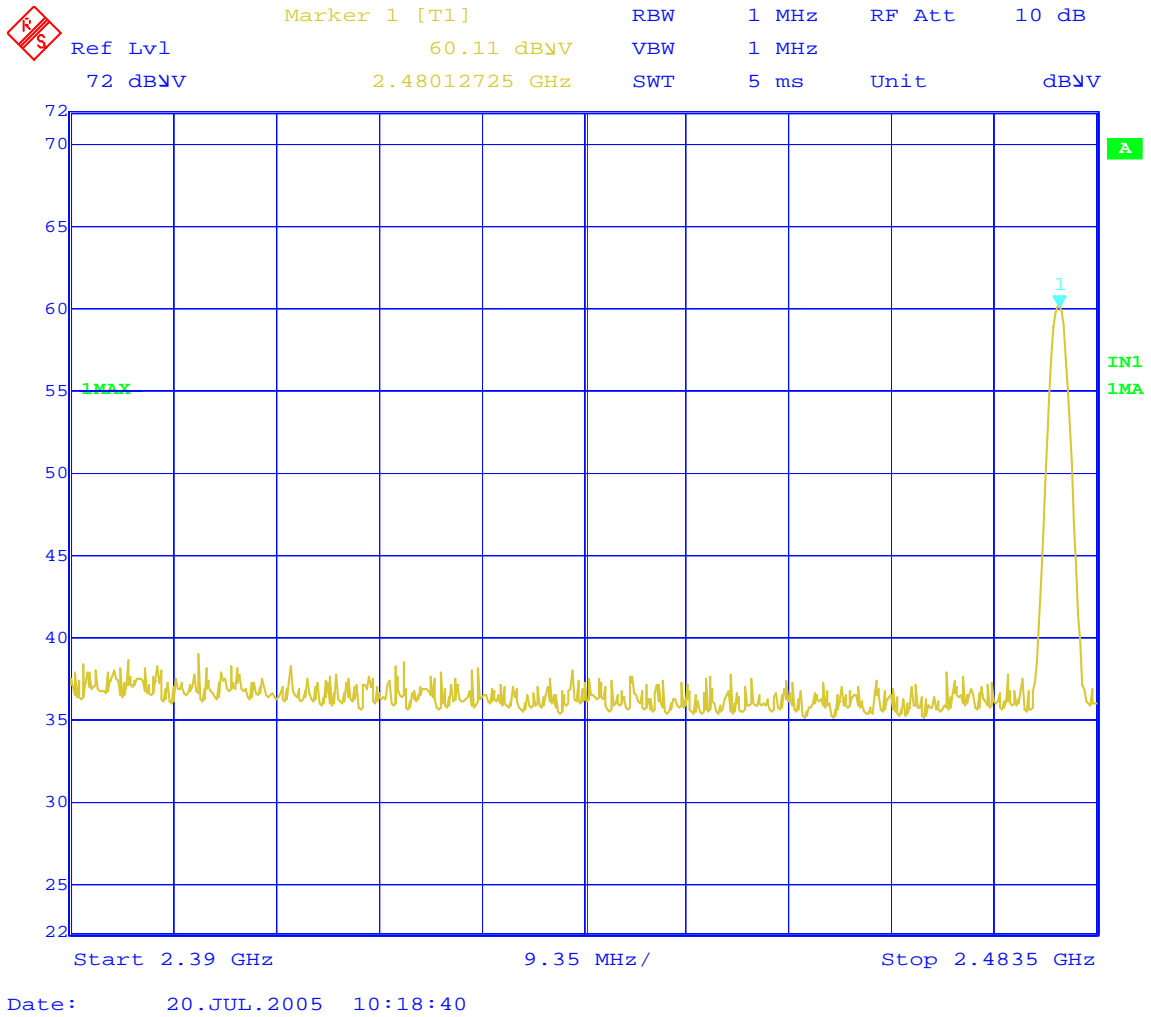
### Radiated Emissions Band Edge CH 39 2442 MHz Z-Axis



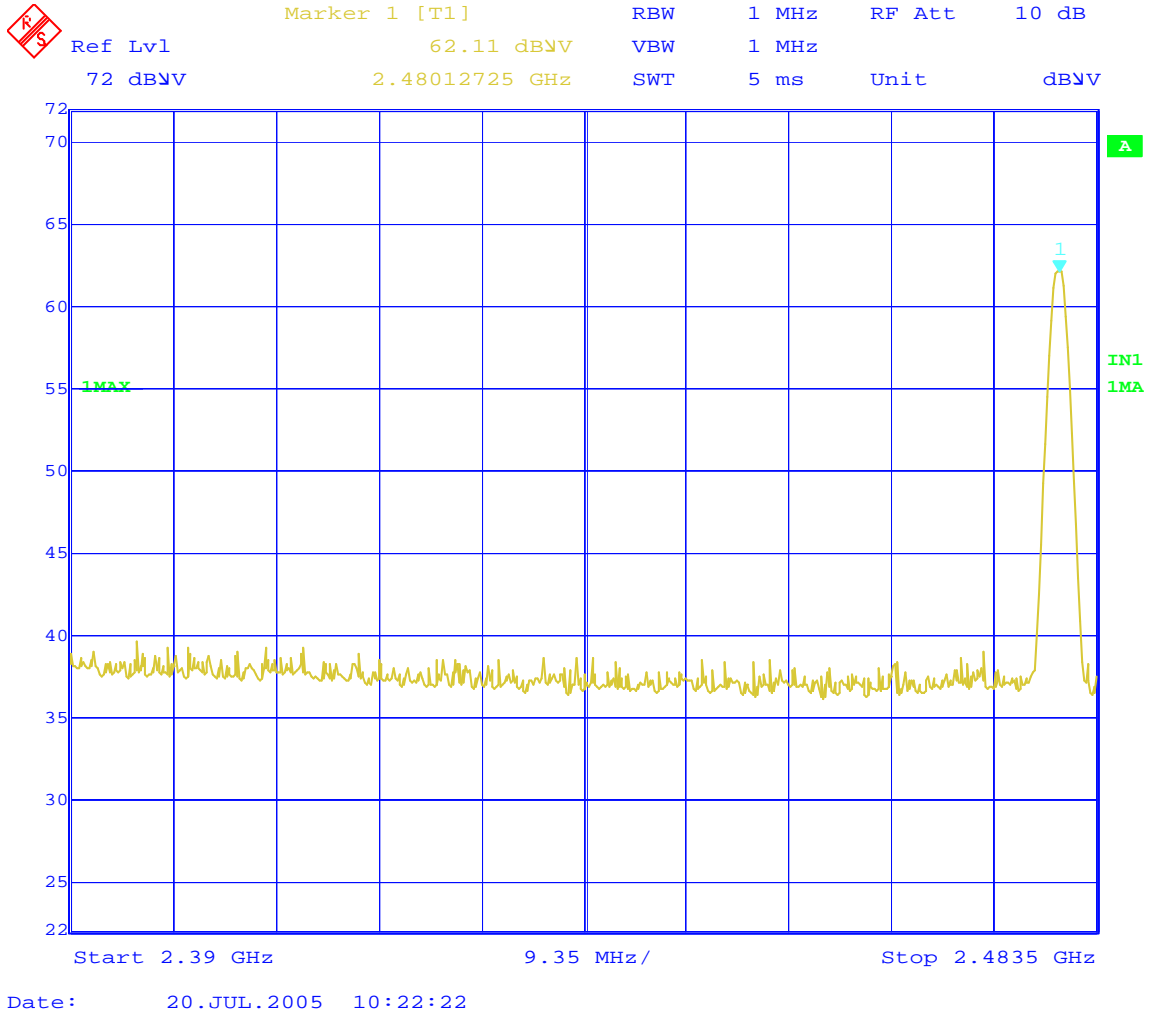
### Radiated Emissions Band Edge CH 78 2480 MHz X-Axis



### Radiated Emissions Band Edge CH 78 2480MHz Y-Axis



### Radiated Emissions Band Edge CH 78 2480 MHz Z-Axis



**PEAK OUTPUT POWER**

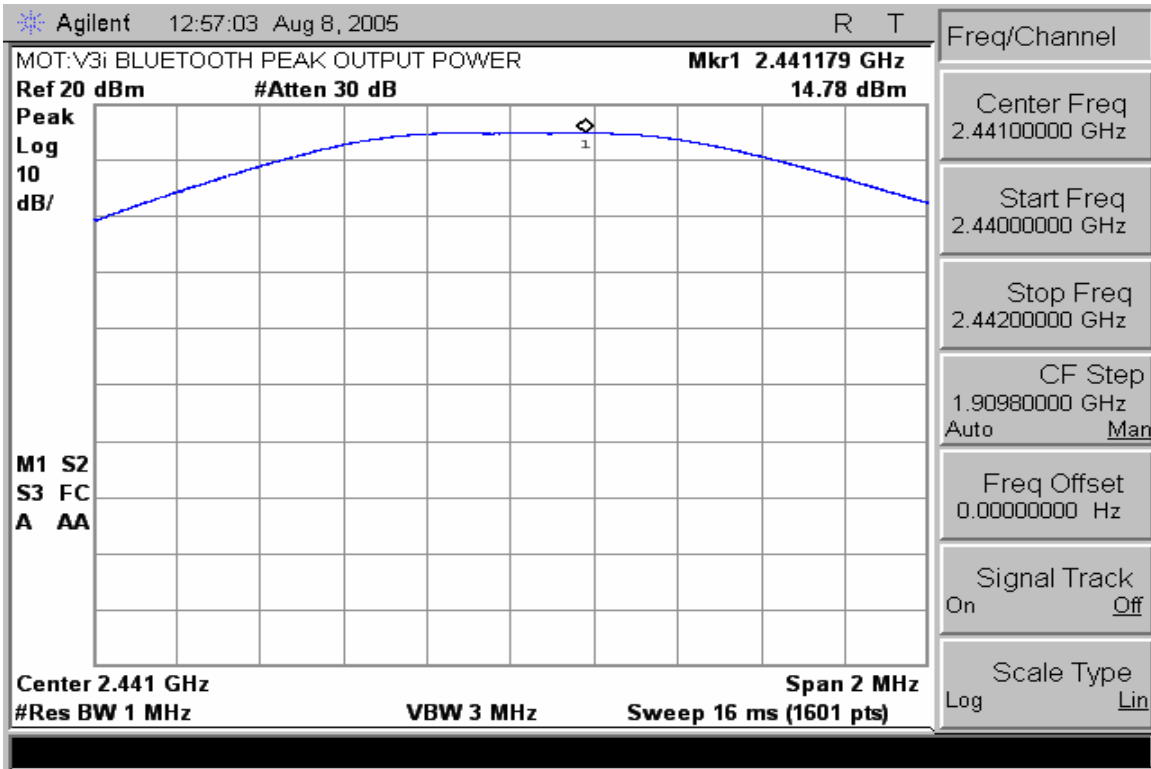
CFR 47 Part 15.247

**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**

See Attached



**Peak Output Power**

## **BAND-EDGE COMPLIANCE OF RF CONDUCTED EMISSIONS**

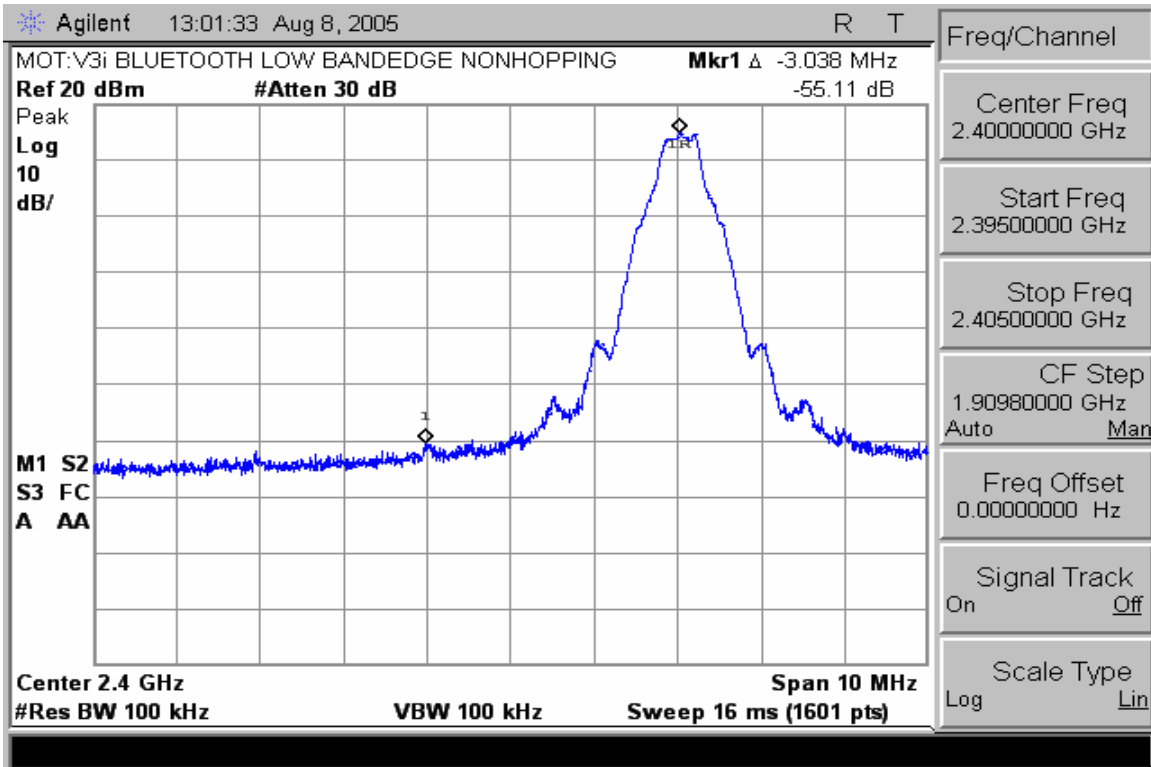
CFR 47 Part 15.247

### **Measurement Procedure**

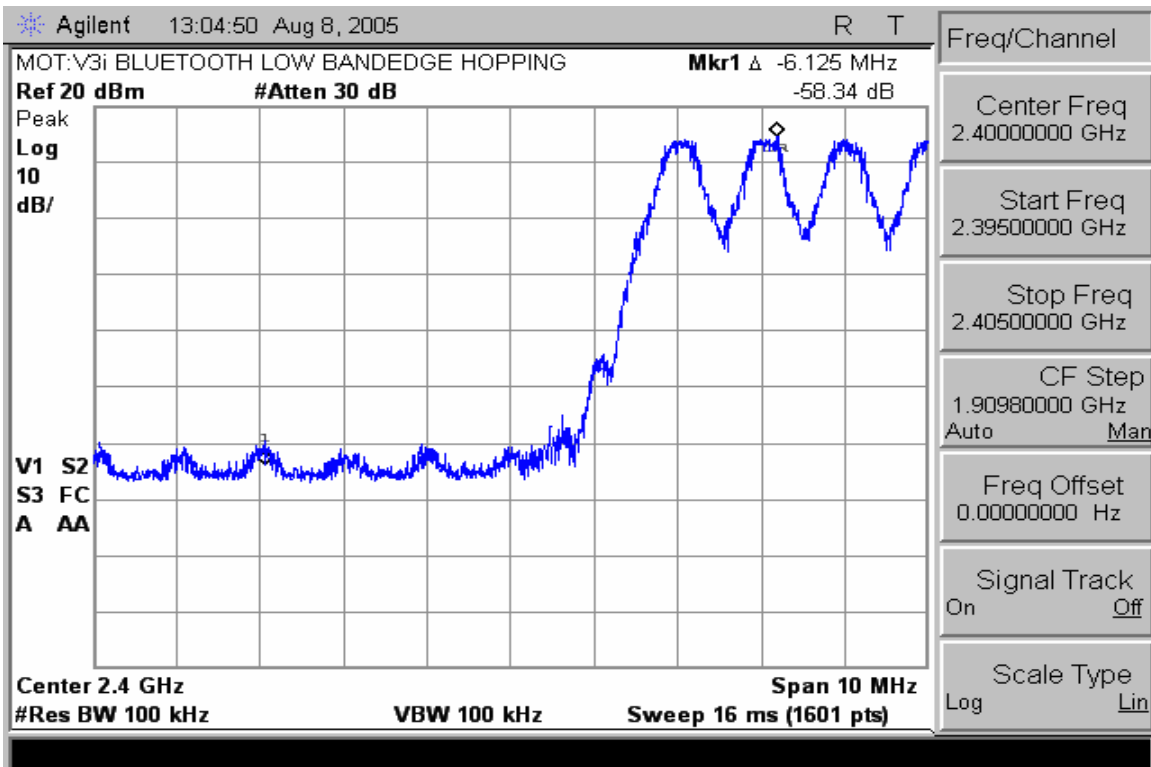
The RF output port of the Equipment-Under-Test is directly coupled to the input of the EMC analyzer through a specialized RF connector and a 10dB passive attenuator. A fully charged battery was used for the supply voltage.

### **Measurement Results**

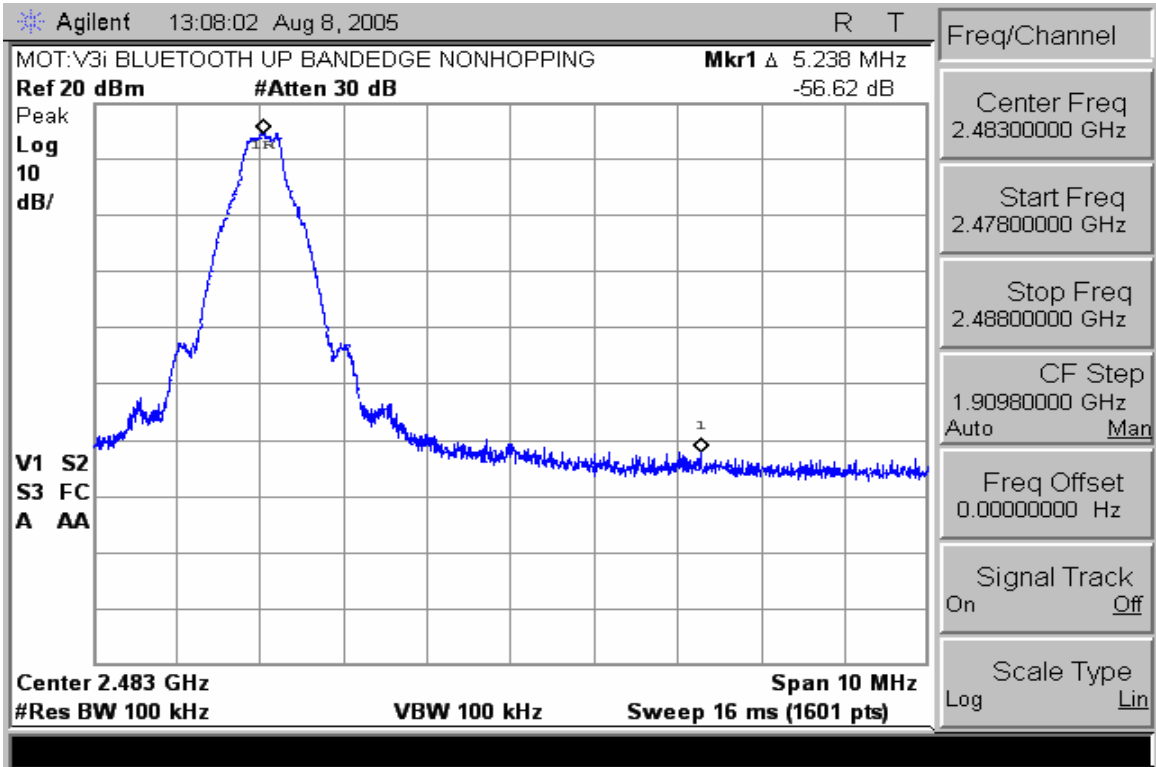
See Attached:



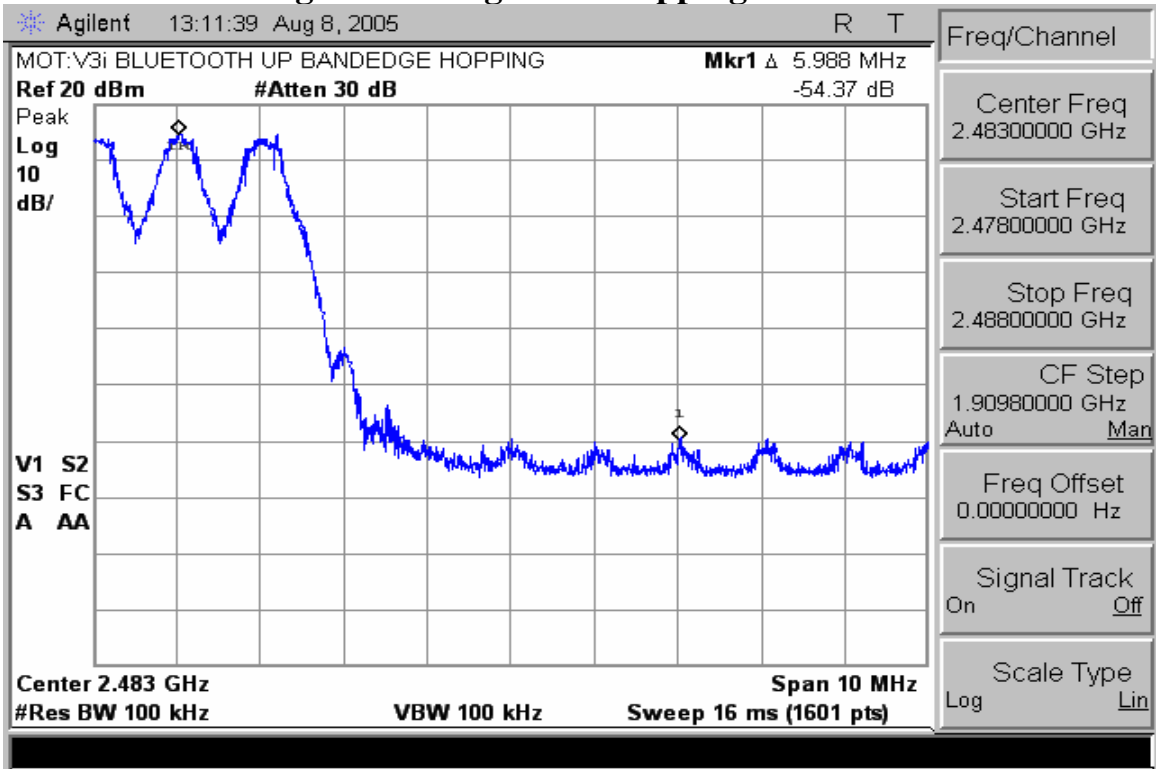
**Low Band Edge with Hopping Disabled**



**Low Band Edge with Hopping Enabled**



**High Band Edge with Hopping Disabled**



**High Band Edge with Hopping Enabled**

## **SPURIOUS RF CONDUCTED EMISSIONS**

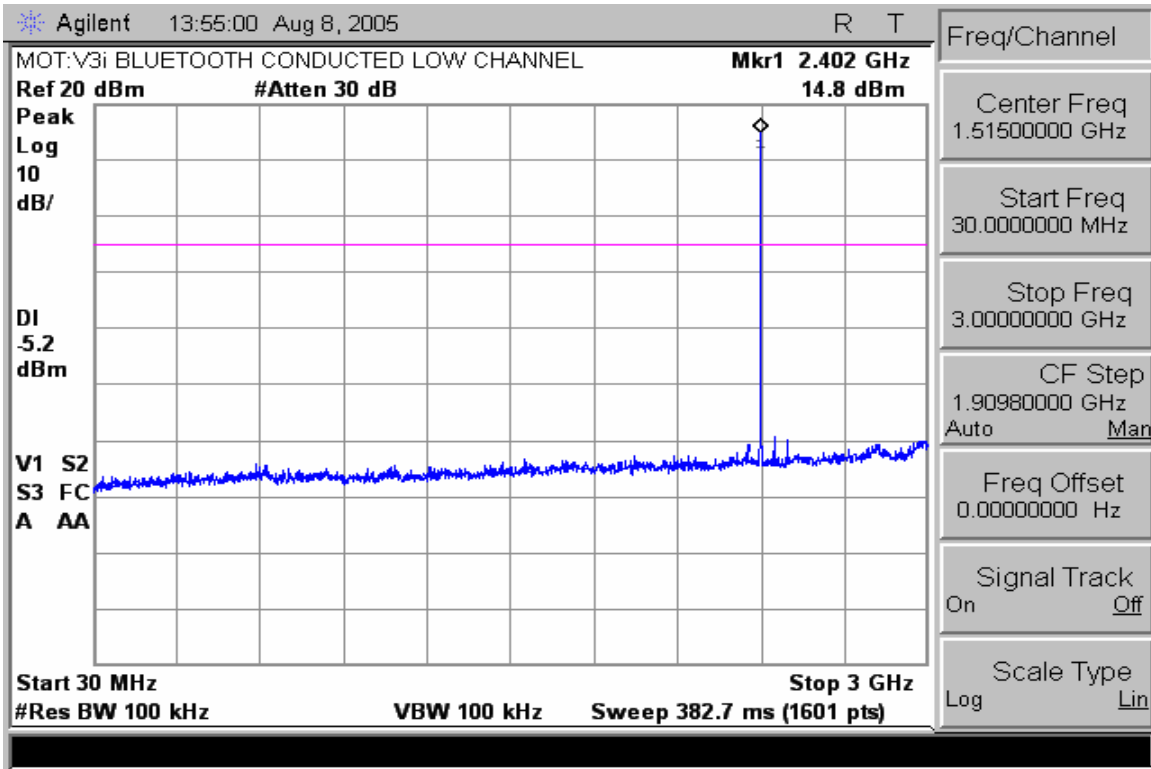
CFR 47 Part 15.247

### **Measurement Procedure**

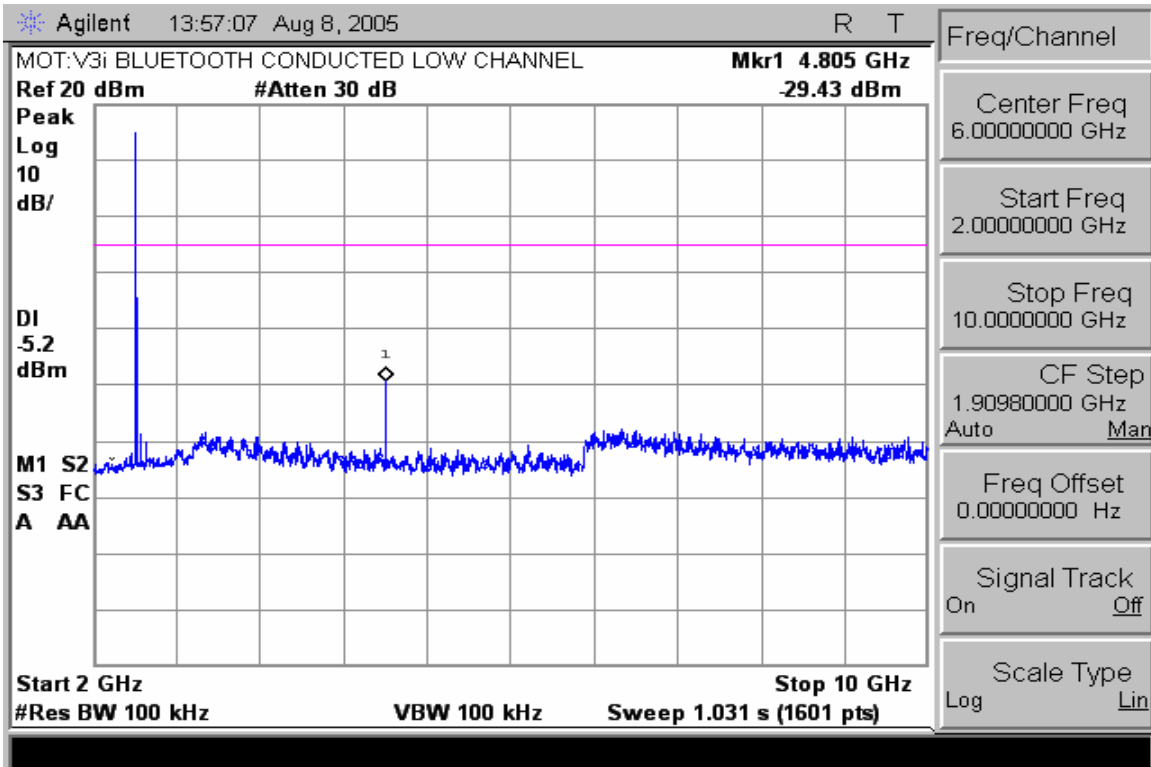
The RF output port of the Equipment-Under-Test is directly coupled to the input of the EMC analyzer through a specialized RF connector and a 10dB passive attenuator. A fully charged battery was used for the supply voltage.

### **Measurement Results**

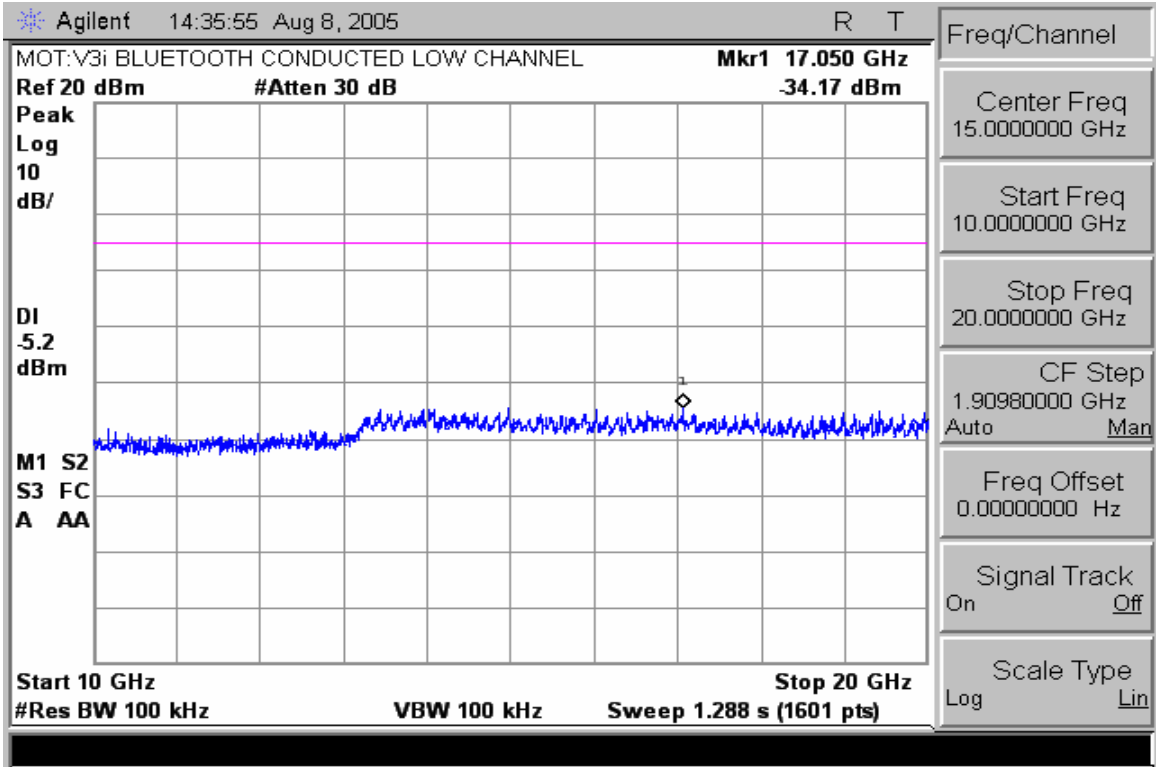
See attached:



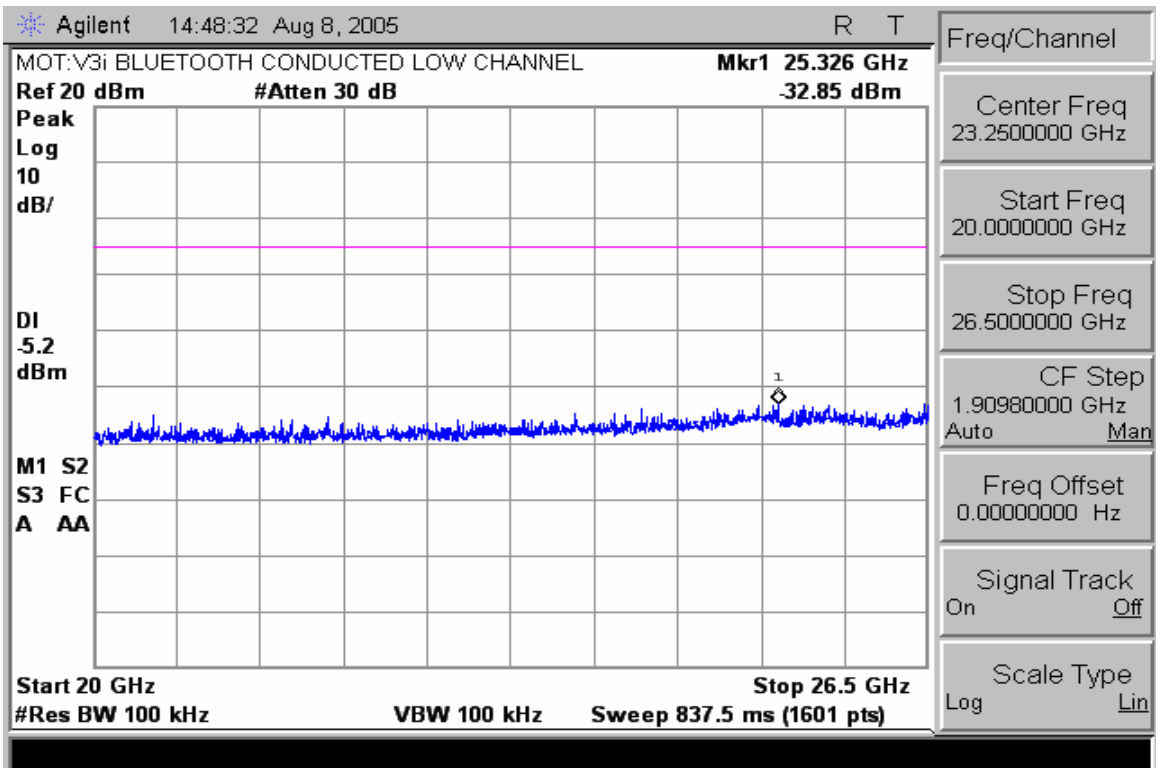
**Conducted Spurious Emissions 30-3000MHz (Low Channel)**



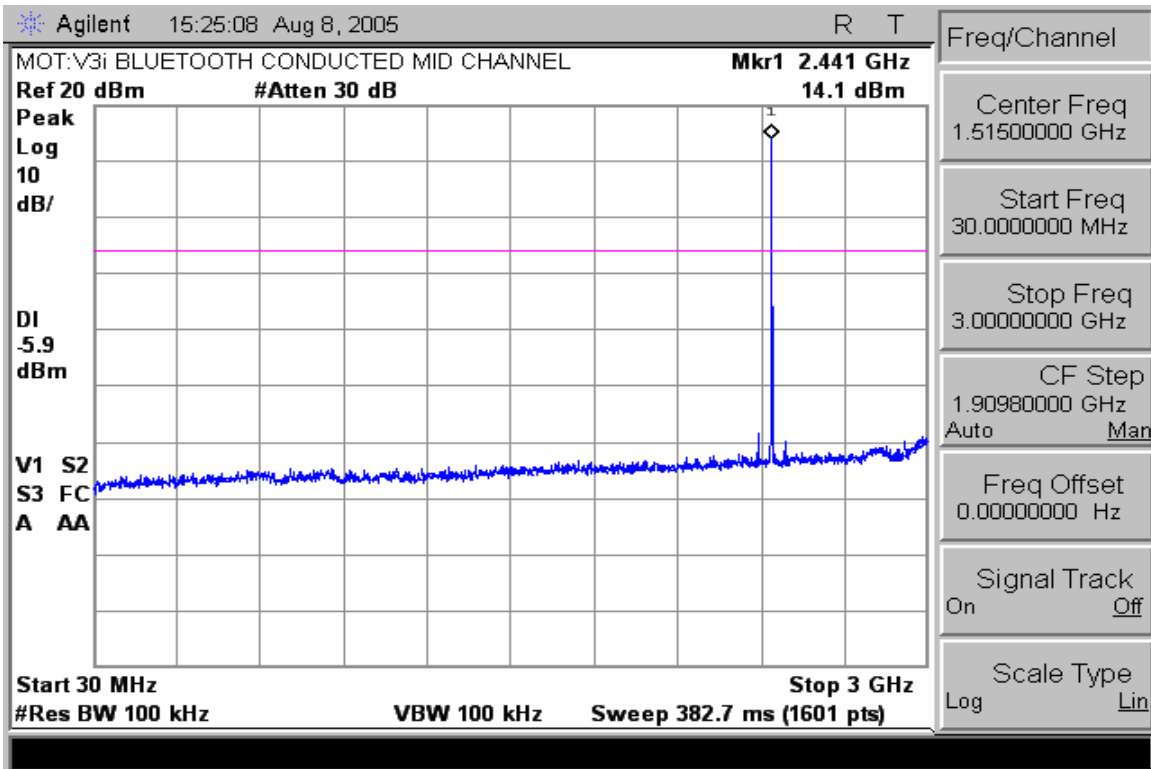
**Conducted Spurious Emissions 2-10GHz (Low Channel)**



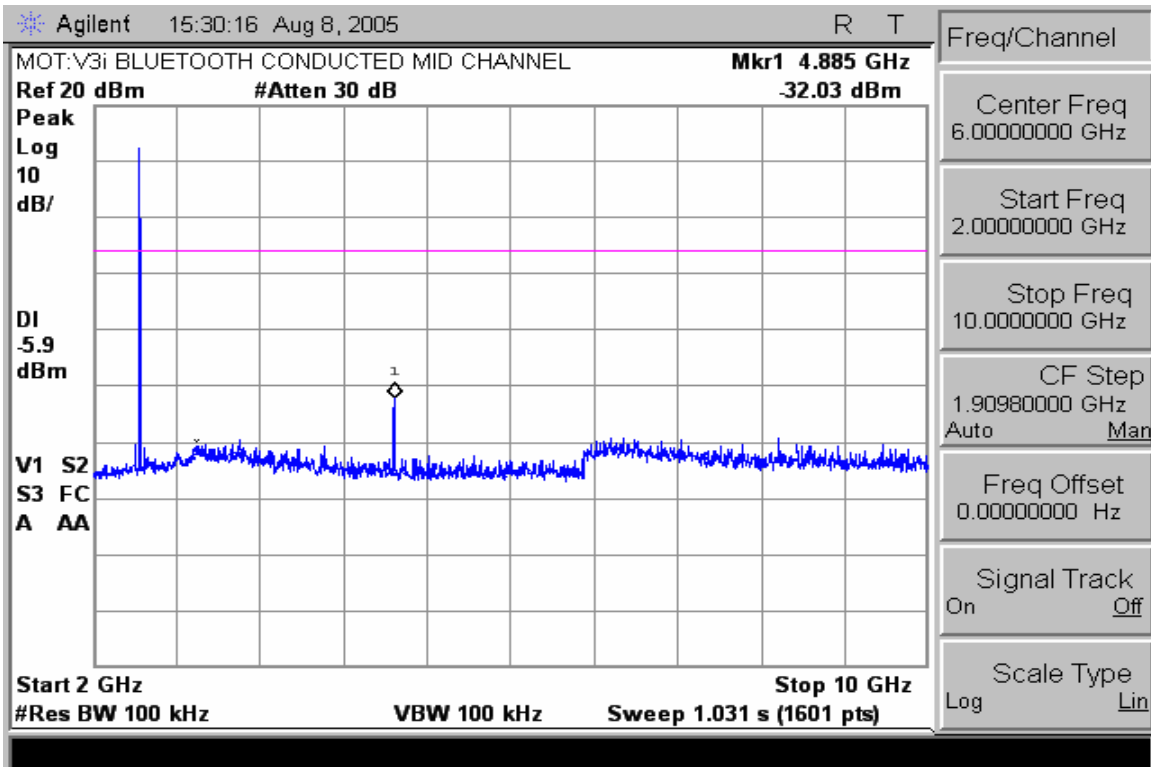
**Conducted Spurious Emissions 10-20GHz (Low Channel)**



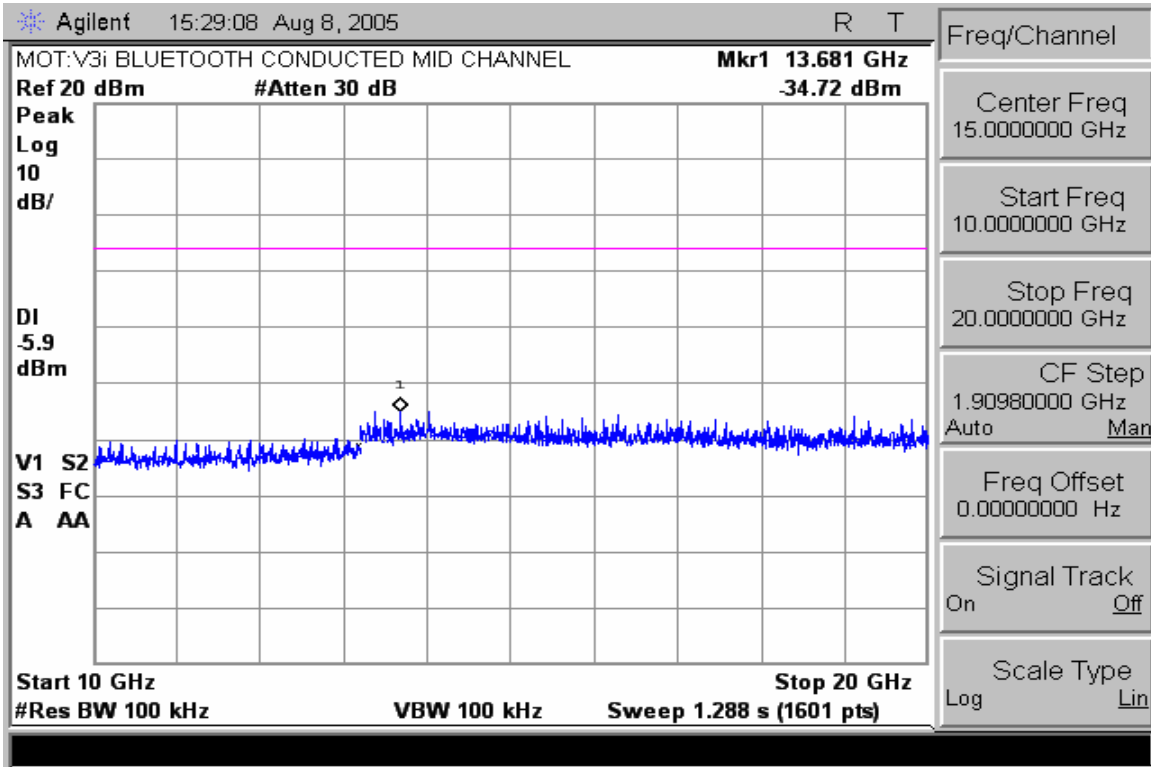
**Conducted Spurious Emissions 20-26.5GHz (Low Channel)**



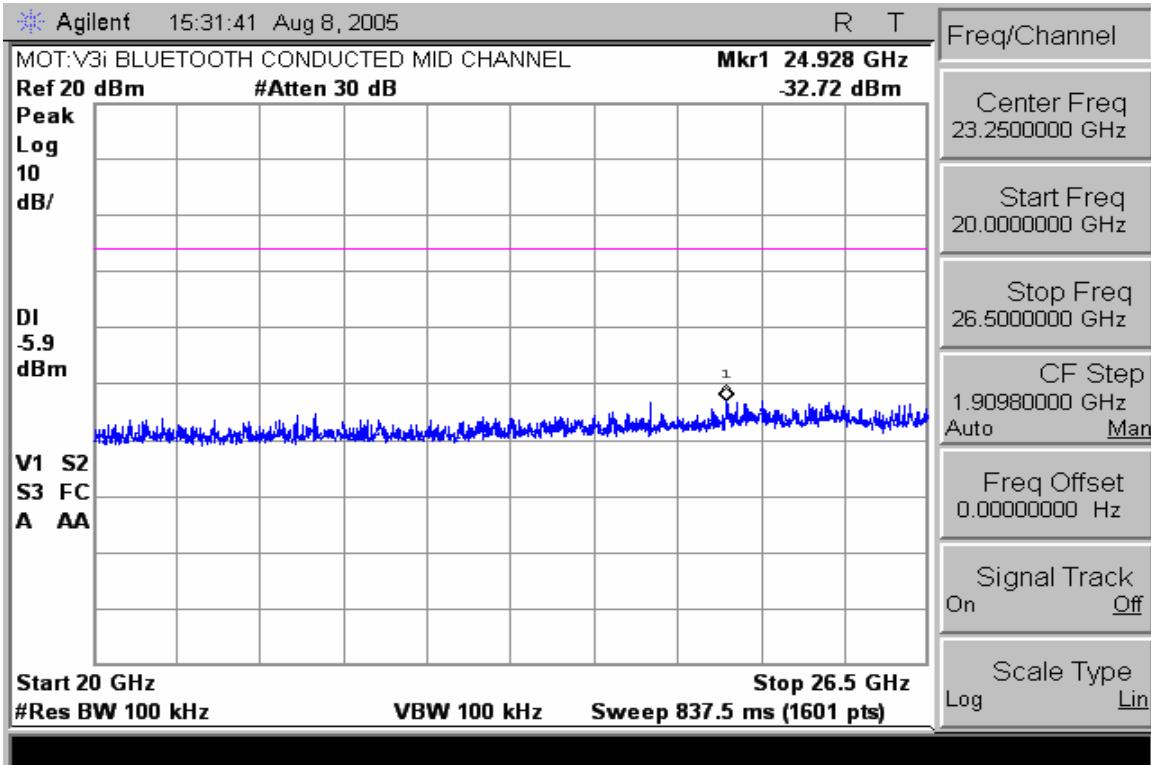
**Conducted Spurious Emissions 30-3000MHz (Mid Channel)**



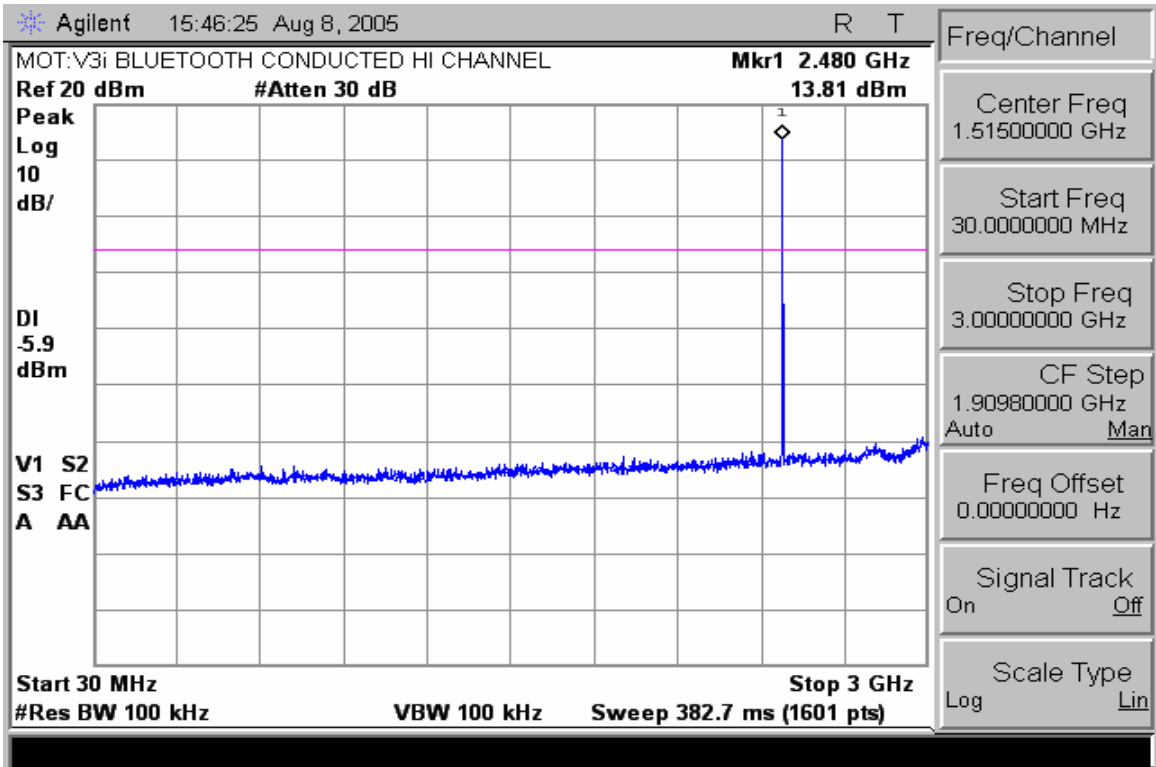
**Conducted Spurious Emissions 2-10GHz (Mid Channel)**



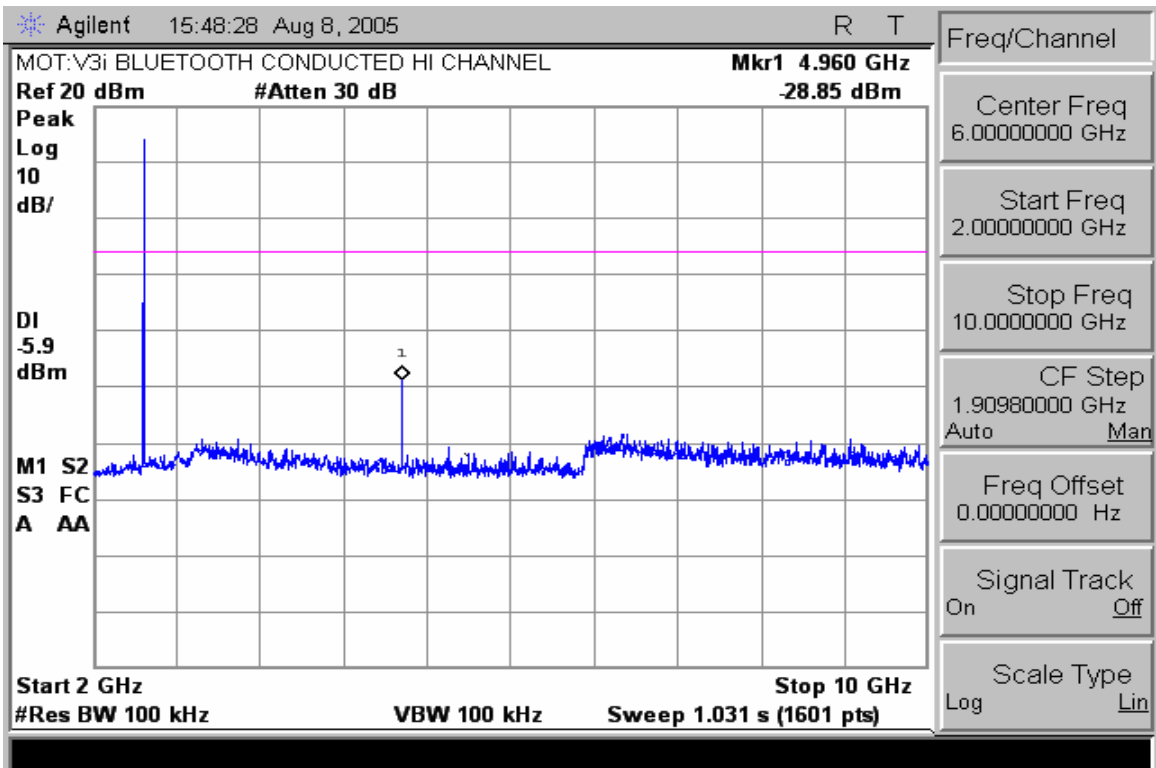
**Conducted Spurious Emissions 10-20GHz (Mid Channel)**



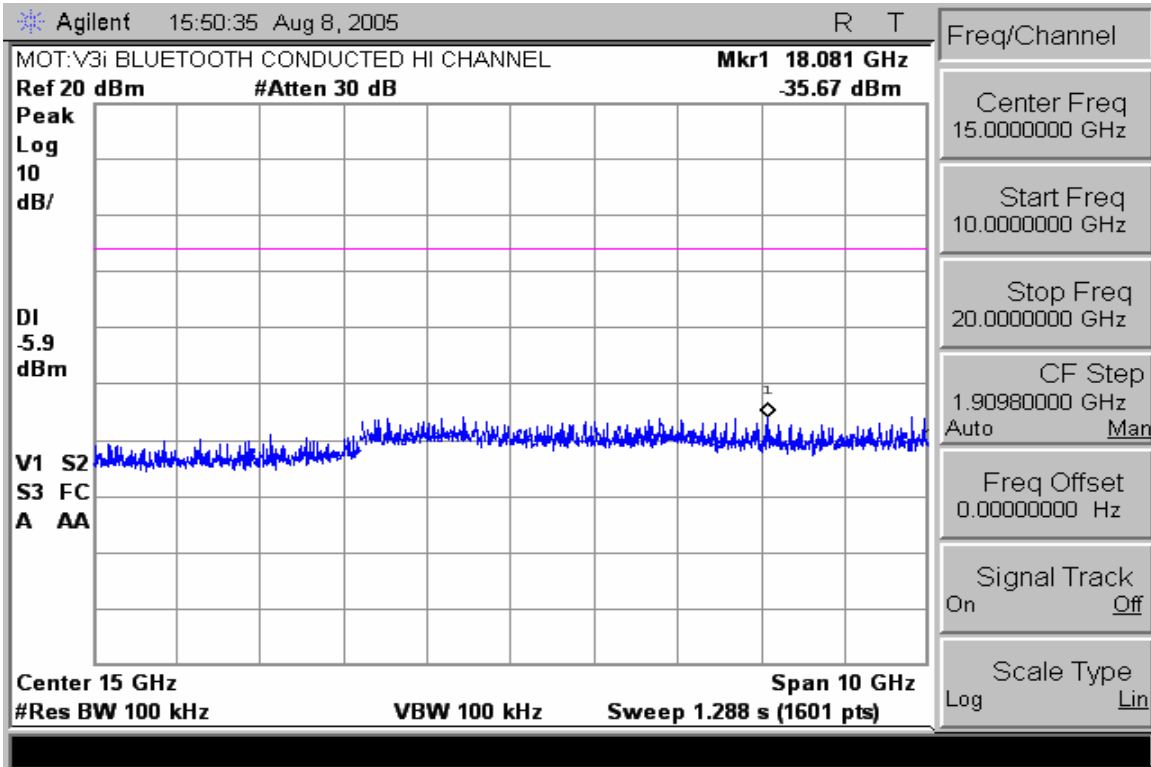
**Conducted Spurious Emissions 20-26.5GHz (Mid Channel)**



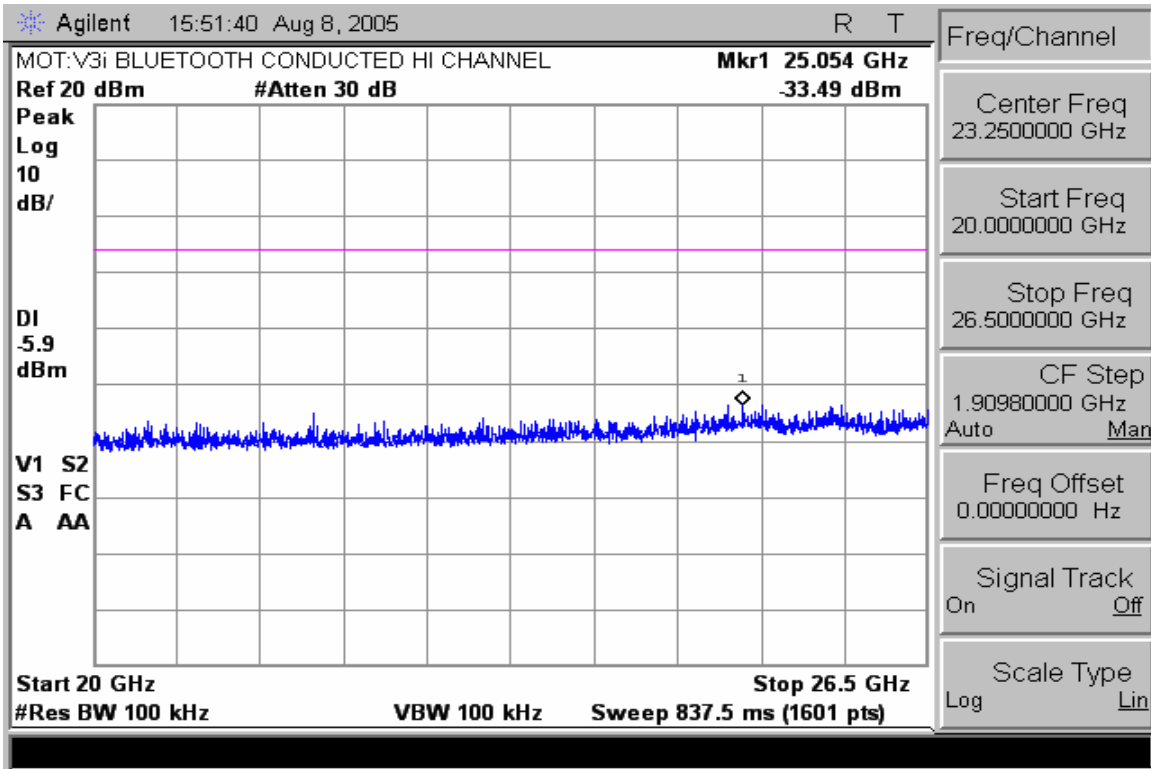
**Conducted Spurious Emissions 30-3000MHz (High Channel)**



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



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



**Conducted Spurious Emissions 20-26.5GHz (High Channel)**

**AC LINE CONDUCTED**

CFR 47 Part 15.207

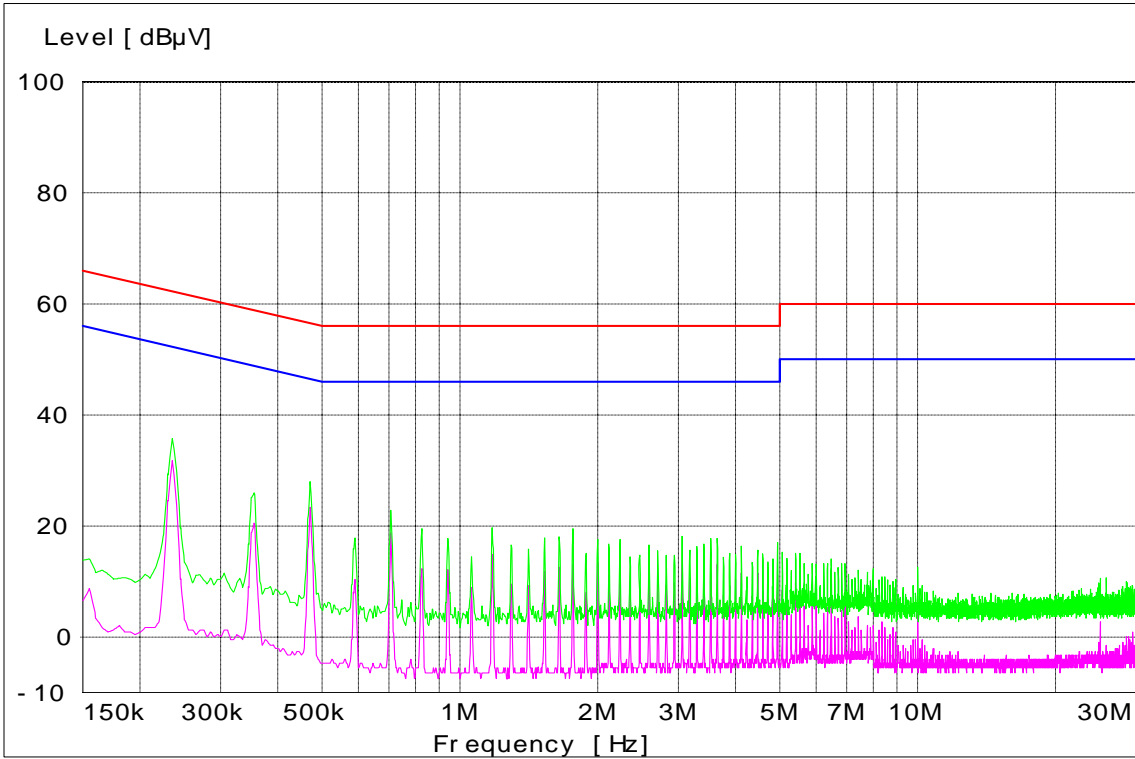
**Measurement Procedure**

Measured levels of ac power line conducted emission shall be the radio-noise voltage from the line probe or across the 50  $\Omega$  LISN port, where permitted, terminated into a 50  $\Omega$  noise meter, or where permitted or required, the radio-noise current on the power line sensed by a current probe.

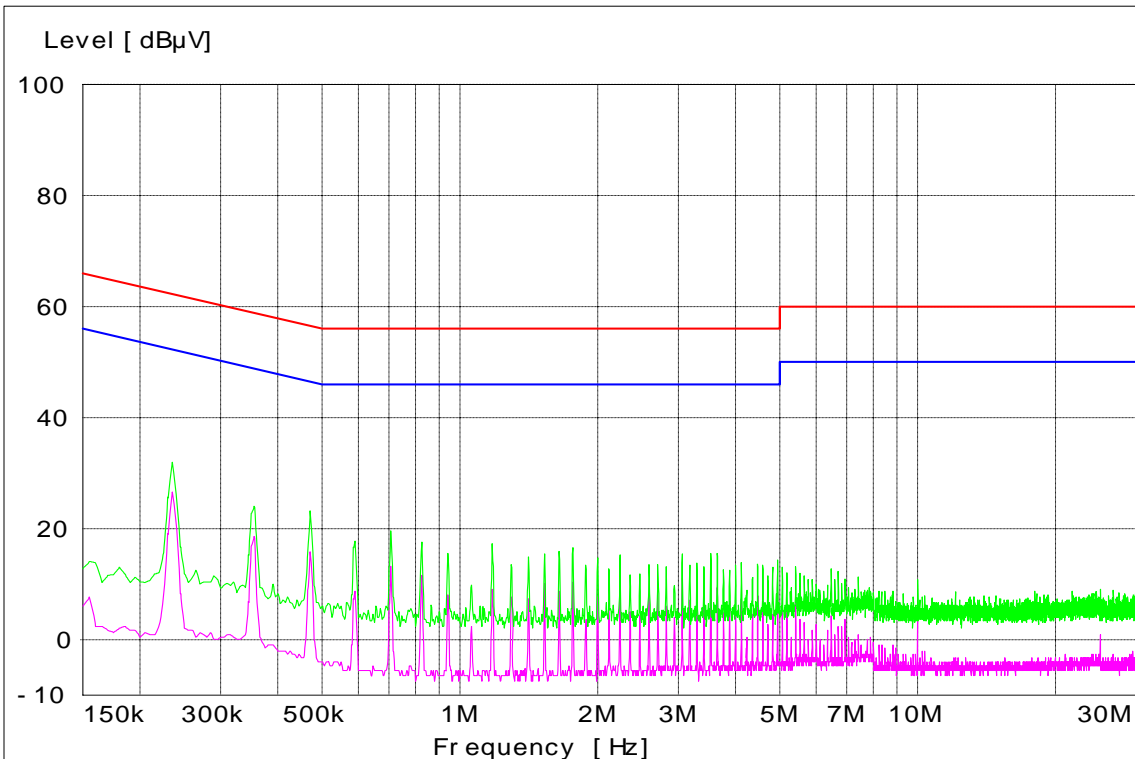
All radio-noise voltage and current measurements shall be made on each current-carrying conductor at the plug end of the EUT power cord or calibrated extension cord by the use of mating plugs and receptacles on the EUT and LISN. Equipment shall be tested with power cords that are normally supplied using an LISN, the 50  $\Omega$  measuring port is terminated by a 50  $\Omega$  radio-noise meter or a 50  $\Omega$  resistive load. All other ports are terminated in 50  $\Omega$ .

**Measurement Results**

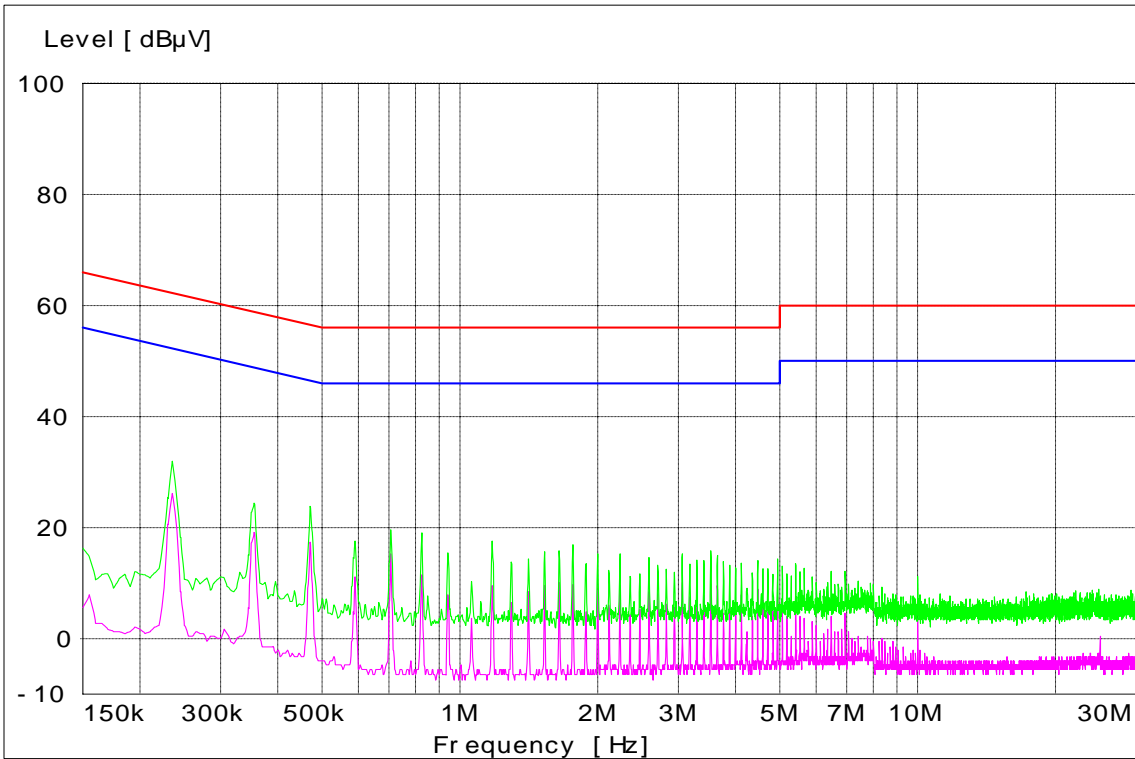
See attached:



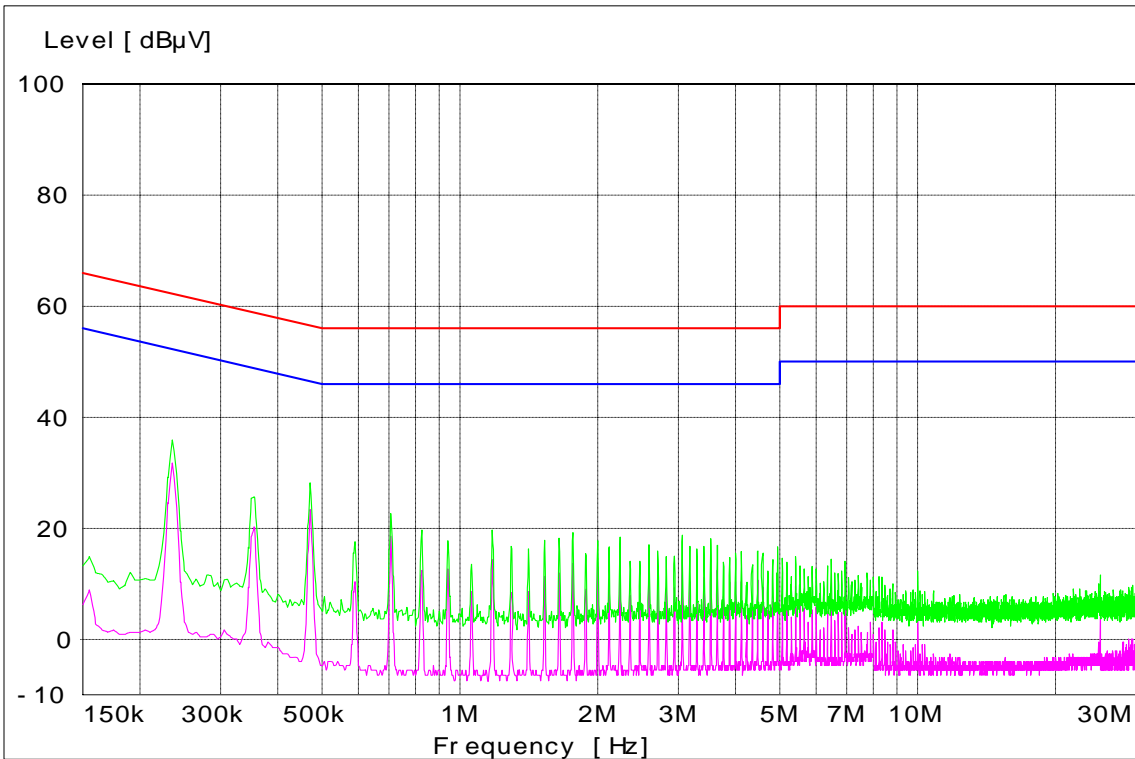
**Channel 0 – 2402 MHz - Tx Mode - Neutral Coupling Hopping**



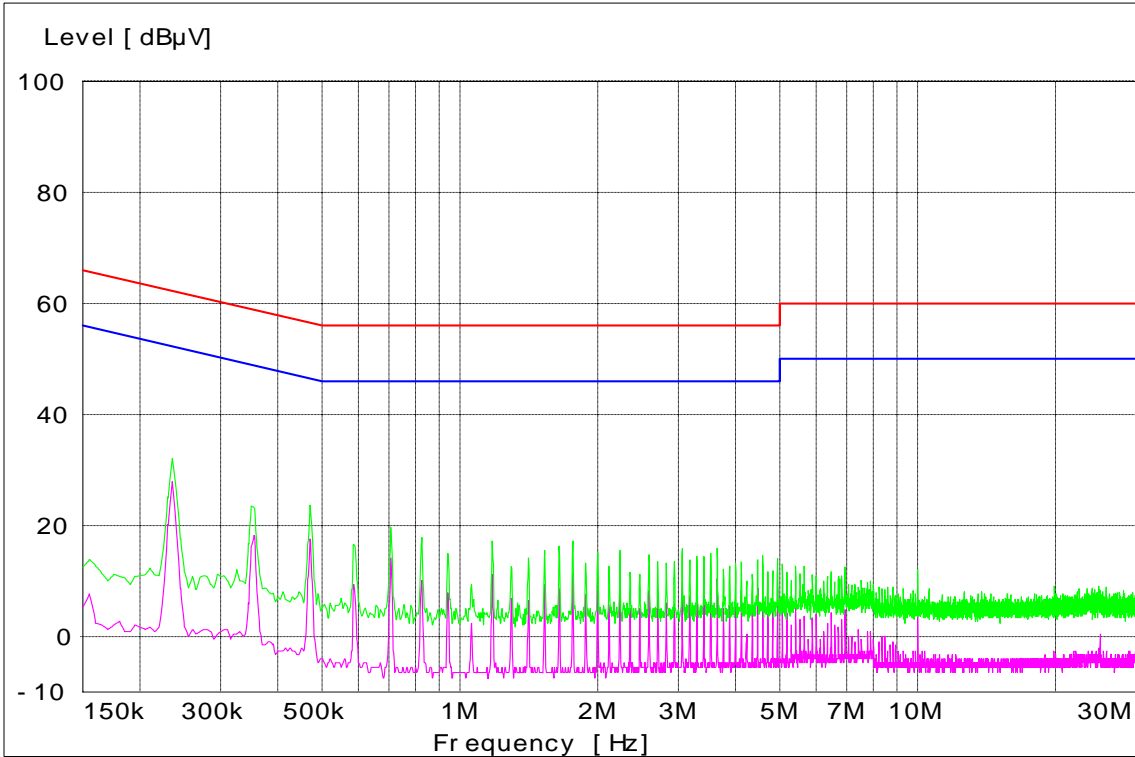
**Channel 0 – 2402 MHz - Tx Mode - Line Coupling Nonhopping**



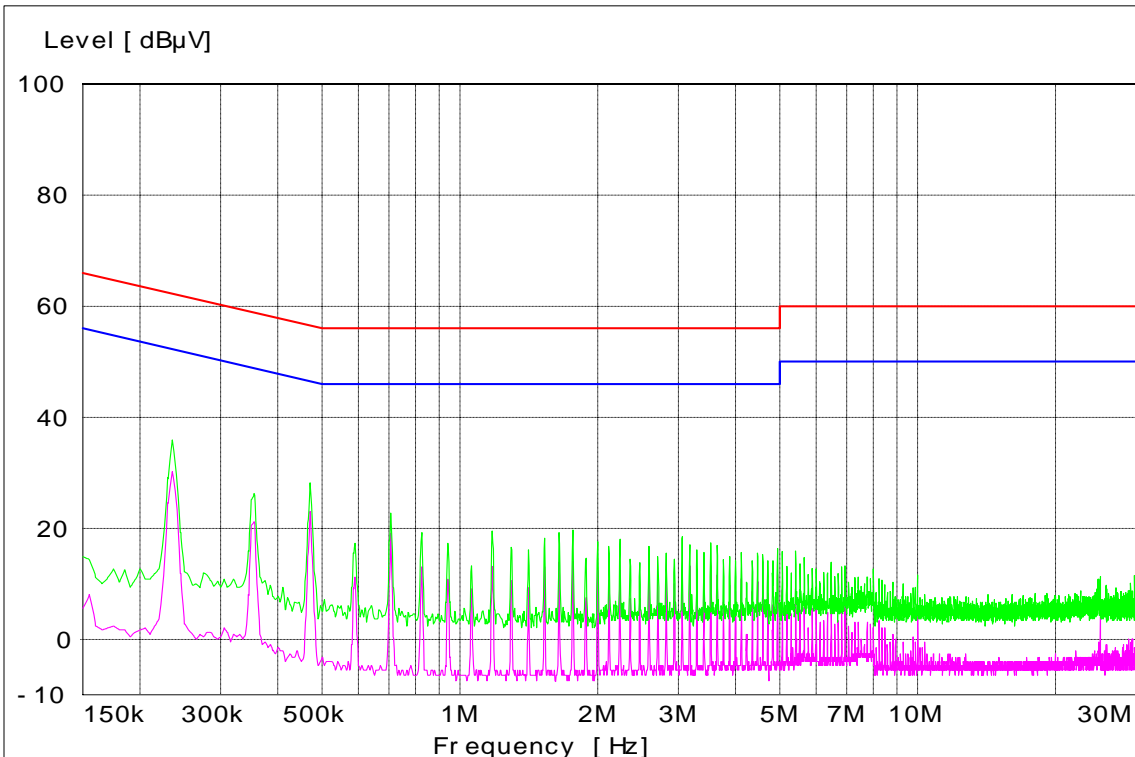
**Channel 39 – 2441 MHz - Tx Mode - Line Coupling Nonhopping**



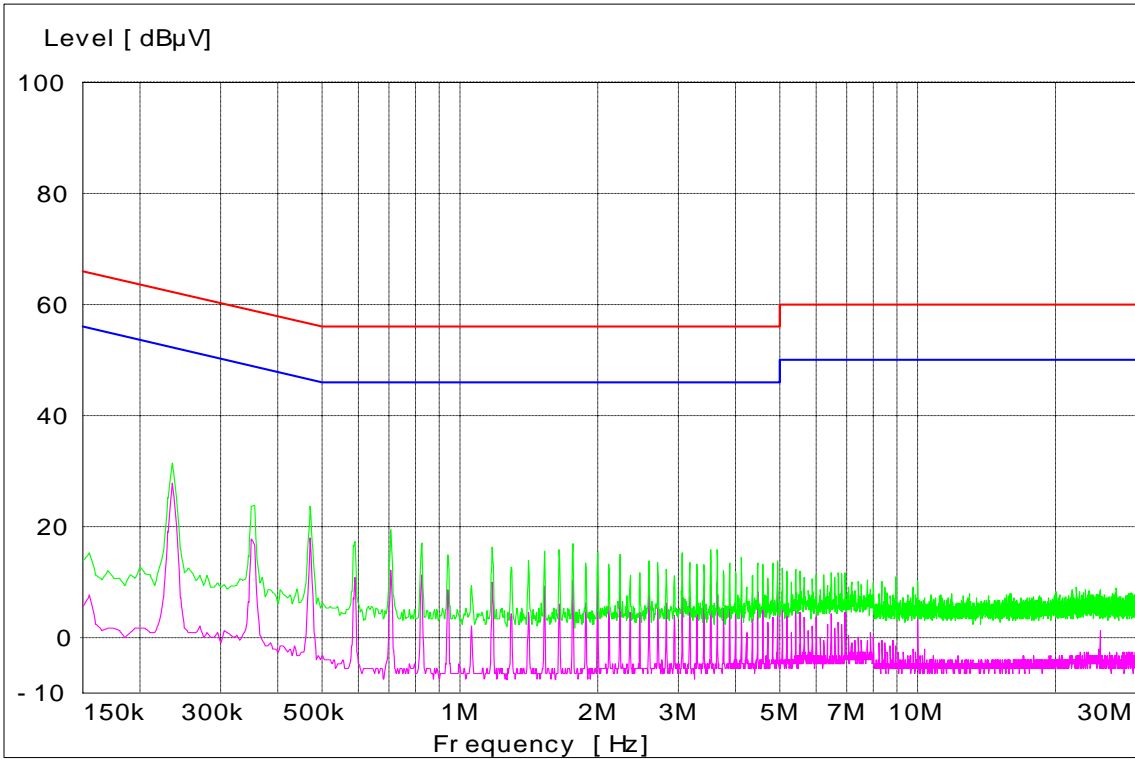
**Channel 39 – 2441 MHz - Tx Mode - Neutral Coupling Hopping**



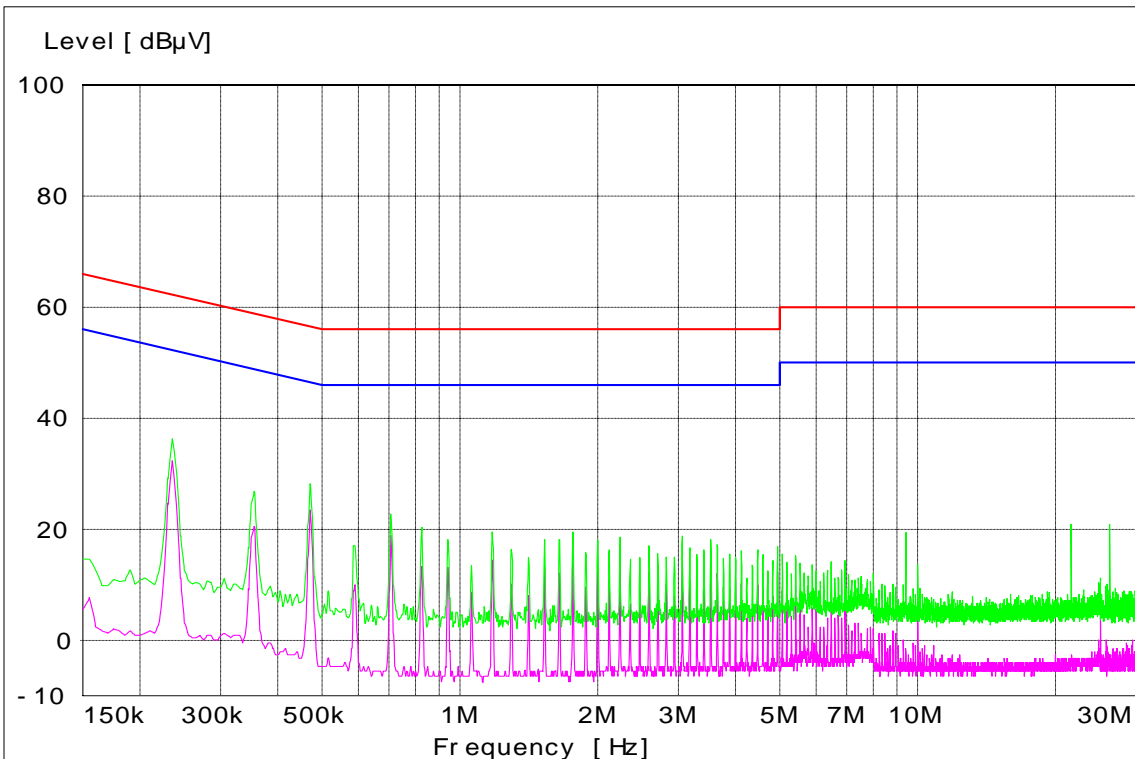
**Channel 78 – 2480 MHz - Tx Mode - Line Coupling Hopping**



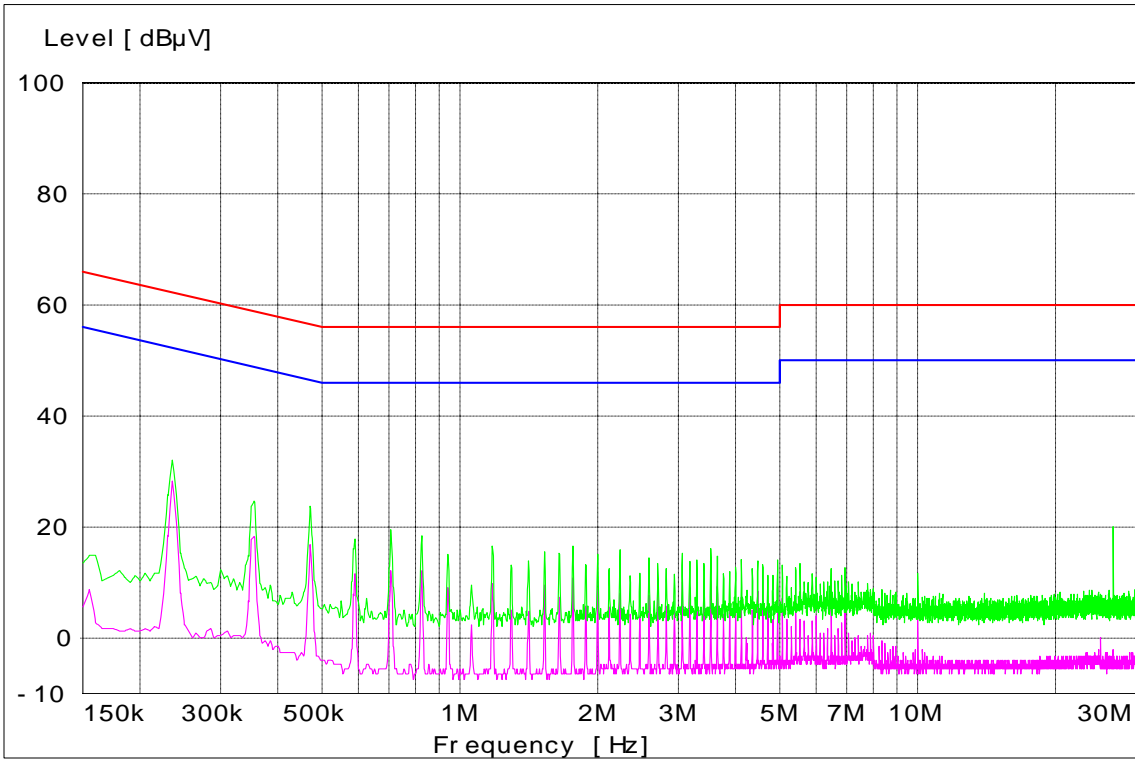
**Channel 78 – 2480 MHz - Tx Mode - Neutral Coupling Hopping**



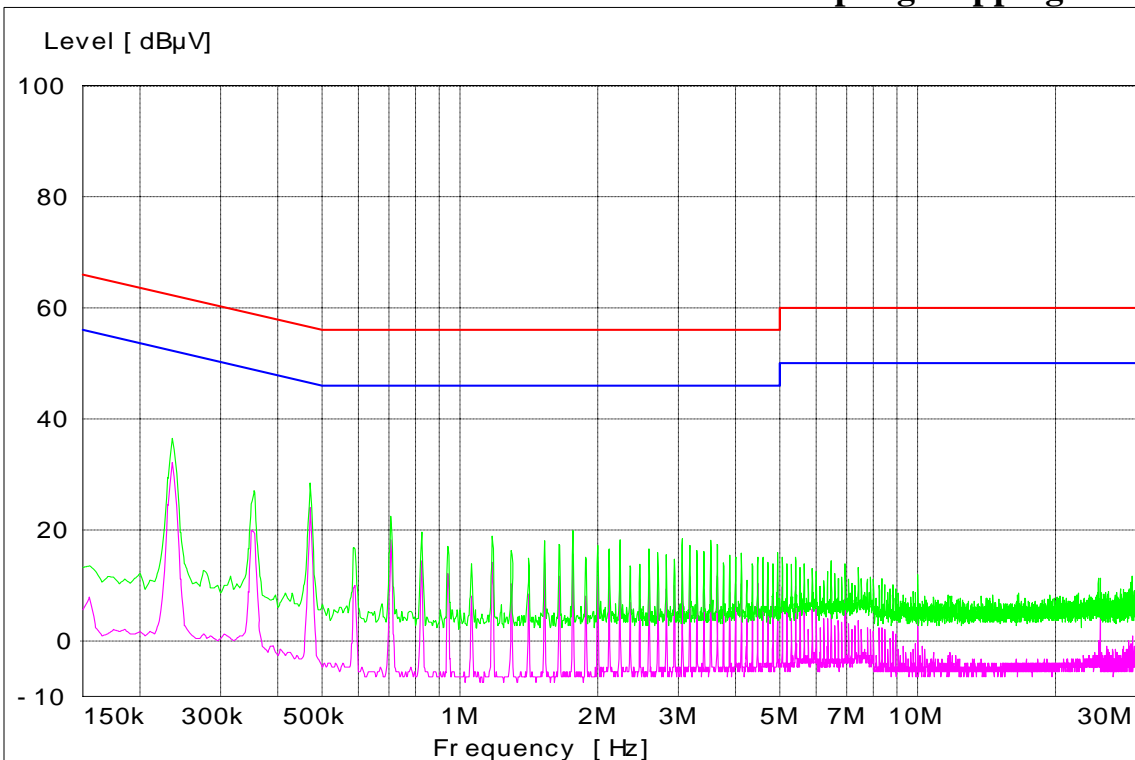
**Channel 0 – 2402 MHz - Tx Mode - Line Coupling Hopping**



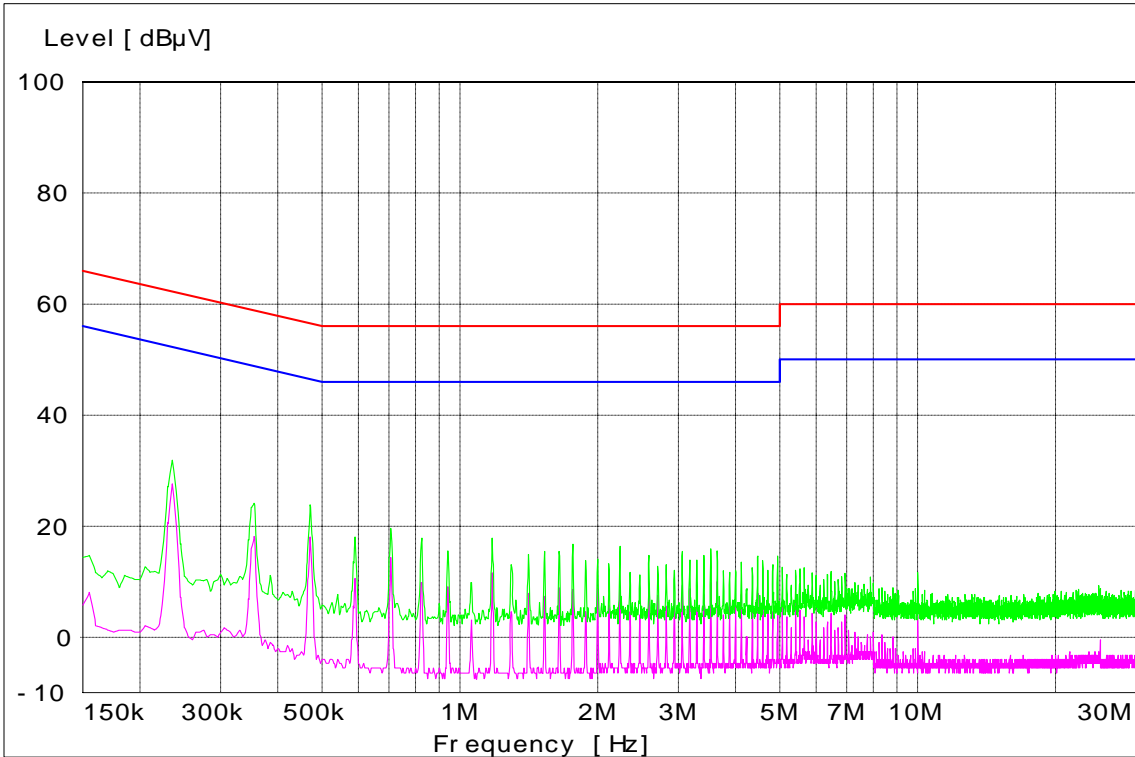
**Channel 0 – 2402 MHz - Tx Mode - Neutral Coupling Nonhopping**



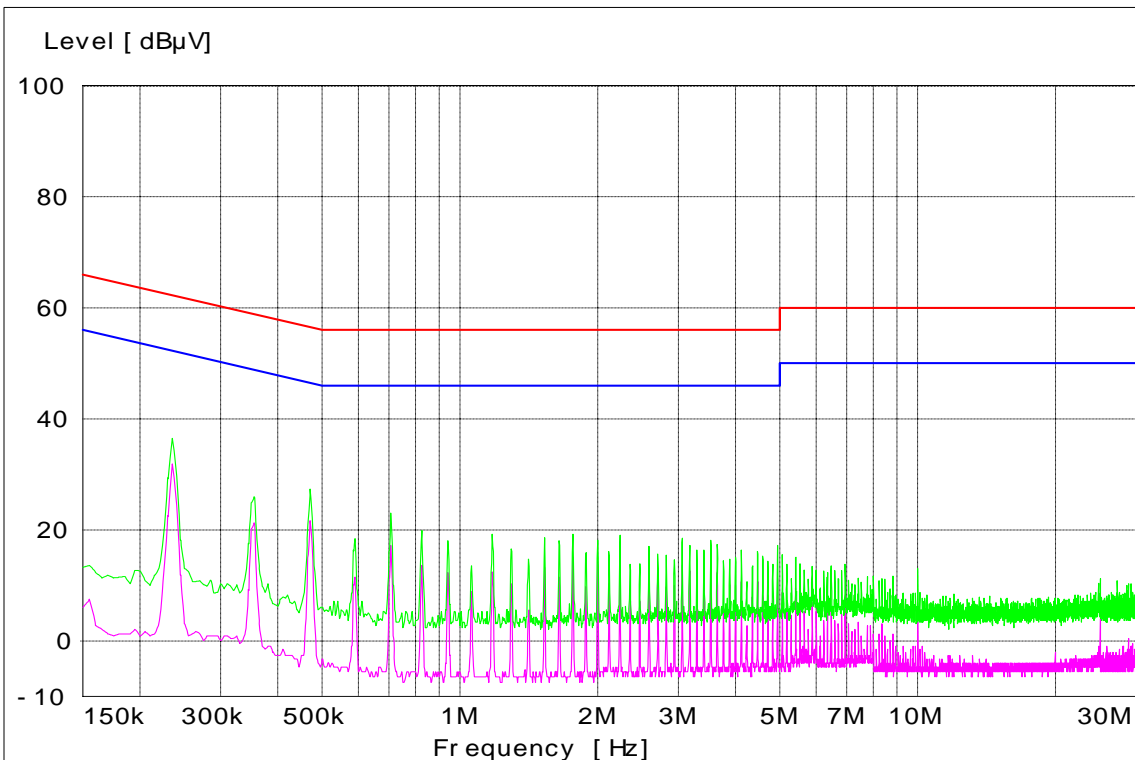
**Channel 39 – 2441 MHz - Tx Mode - Line Coupling Hopping**



**Channel 39 – 2441 MHz - Tx Mode - Neutral Coupling Nonhopping**



**Channel 78 – 2480 MHz - Tx Mode - Line Coupling Nonhopping**



**Channel 78 – 2480 MHz - Tx Mode - Neutral Coupling Nonhopping**

**End of Test Report**