



**MOBILE DEVICES BUSINESS**

**PRODUCT SAFETY AND COMPLIANCE  
EMC LABORATORY**

**EMC TEST REPORT**

**Test Report Number** – 20991-1 BT

**Report Date** – September 26, 2007

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: Albert J. Patapack

Title: EMC Engineer

Date: September 26, 2007

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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: 2518-02

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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, GSM 1900, Bluetooth

FCC ID: IHDT56GM2

Serial Numbers: 356893010010856, 356893010010864,  
356893010011243, 356893010010880

Testing Complete Date: September 06, 2007

## **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

Applicable Standards: ANSI 63.4 2003

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	Max Power	N/A
7	Band Edges	Pass
8	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)	2.88 ms
4	20 dB Bandwidth	See plots
5	Spurious RF Conducted Emissions	See plots
6	Max Power	1.17 dBm
7	Band Edges	See plots
8	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>Calibration Due Date</b>
Rohde Schwarz	Receiver	ESI26	100001	5/02/2008
Hewlett Packard	EMC Analyzer	E7405	US39440191	1/24/2008
Attenuator	Weinschel	AS-6	6675	1/31/2008
Attenuator	Weinschel	AS-6	6677	6/21/2008
ETS	LISN	3810/2NM	62907	5/02/2008
ETS	LISN	3810/2NM	62912	5/02/2008

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 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 the industrial standard. In this application, the device is battery operated. The Bluetooth transmitter does support Bluetooth version 2.0+EDR.

The Bluetooth Antenna gain is - 4.5 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.

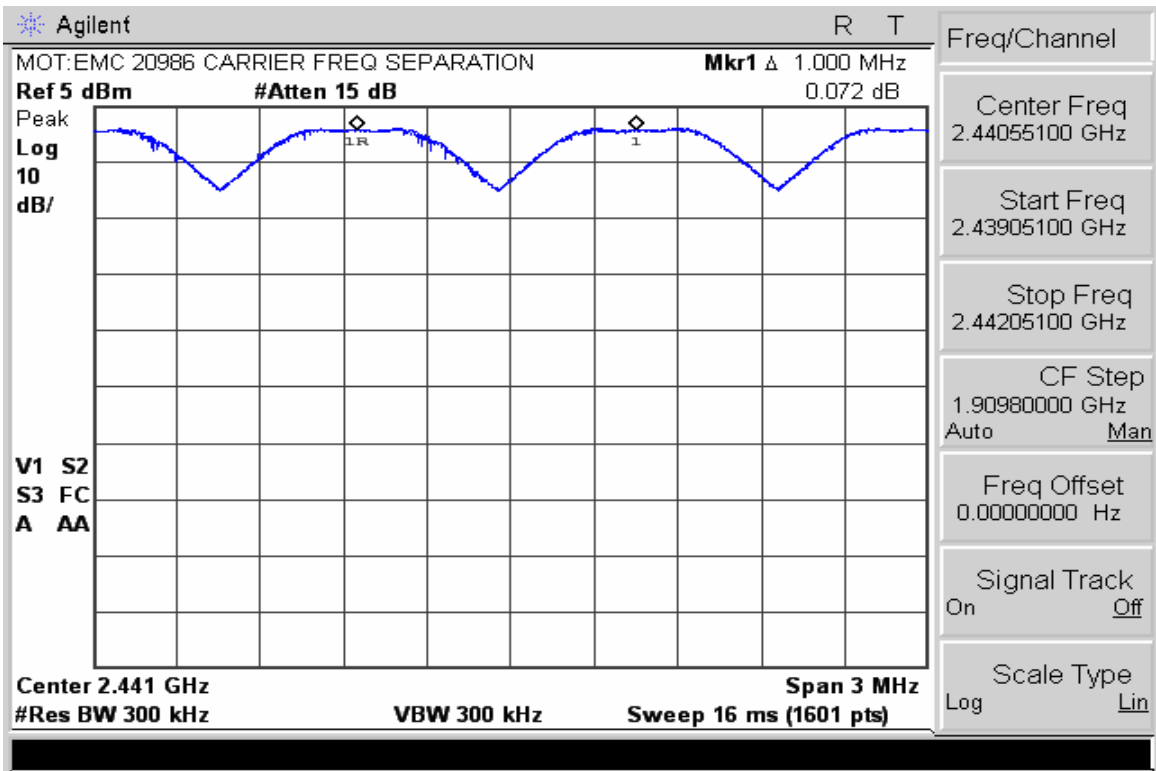
The Bluetooth transmitter of the EUT had its hopping function enabled. The following spectrum analyzer settings were used:

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.

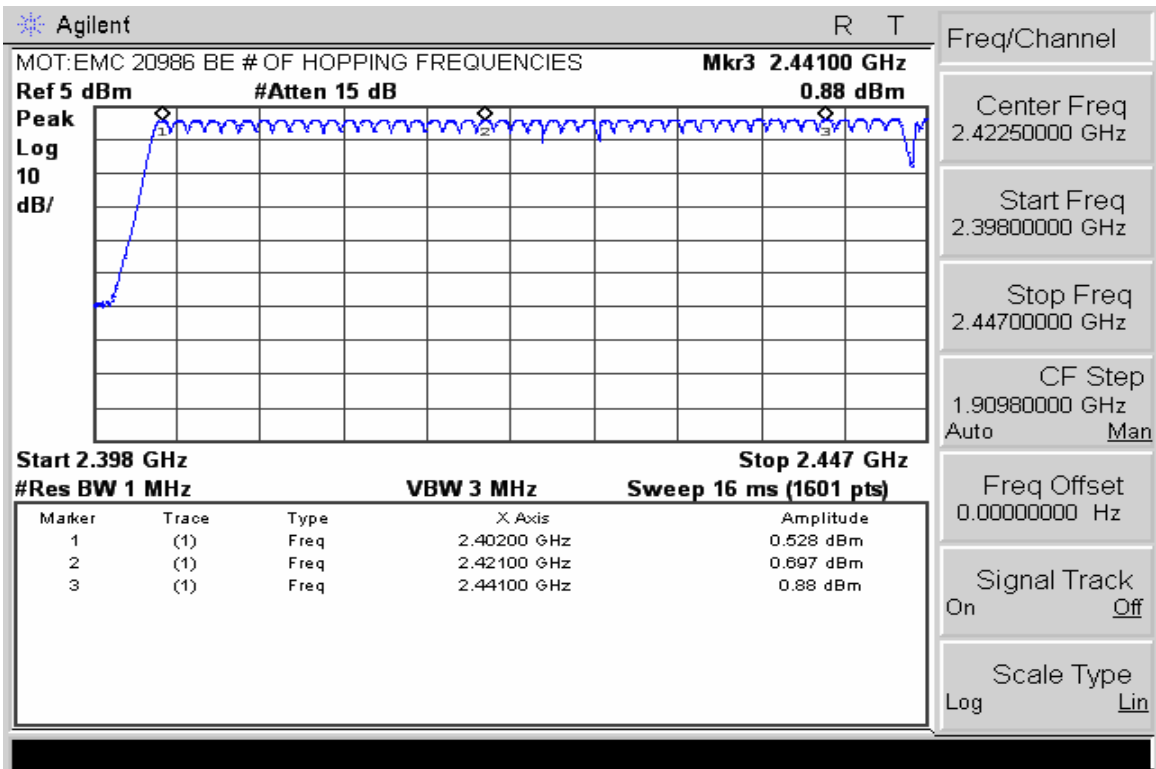
The Bluetooth frequency hopping function of the EUT was enabled. The spectrum analyzer used the following settings:

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

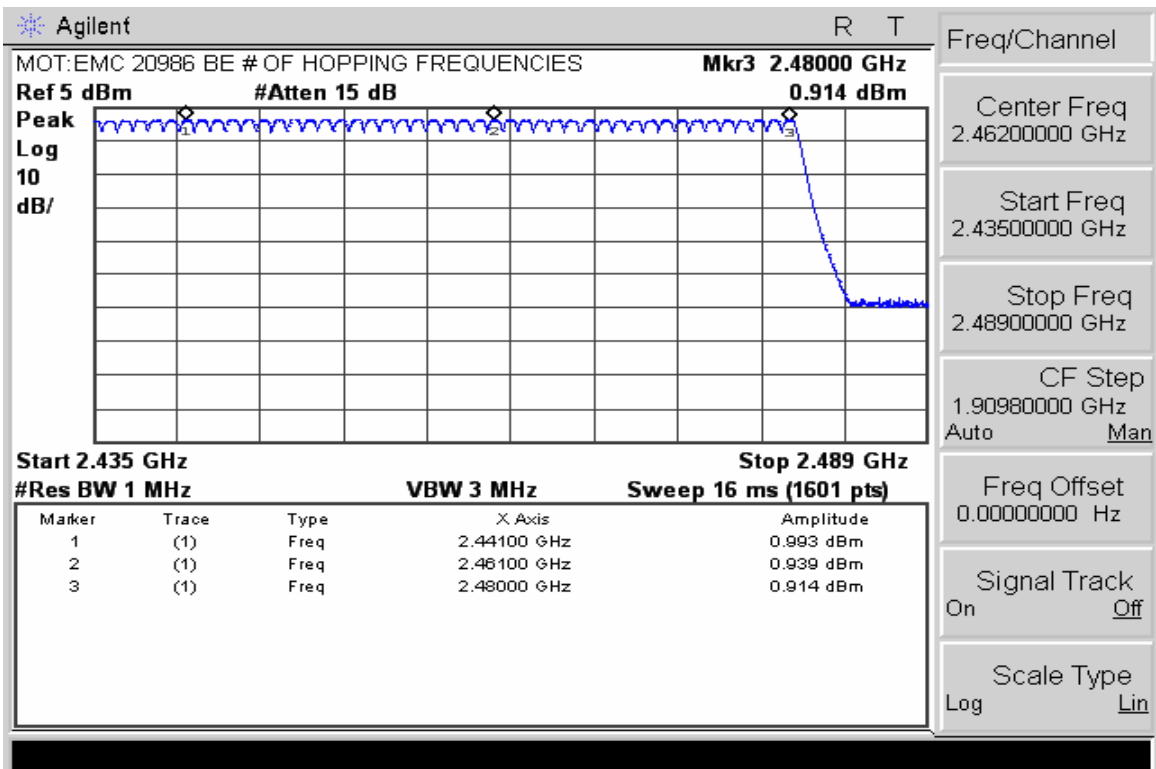
The trace was allowed to stabilize.

### **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.

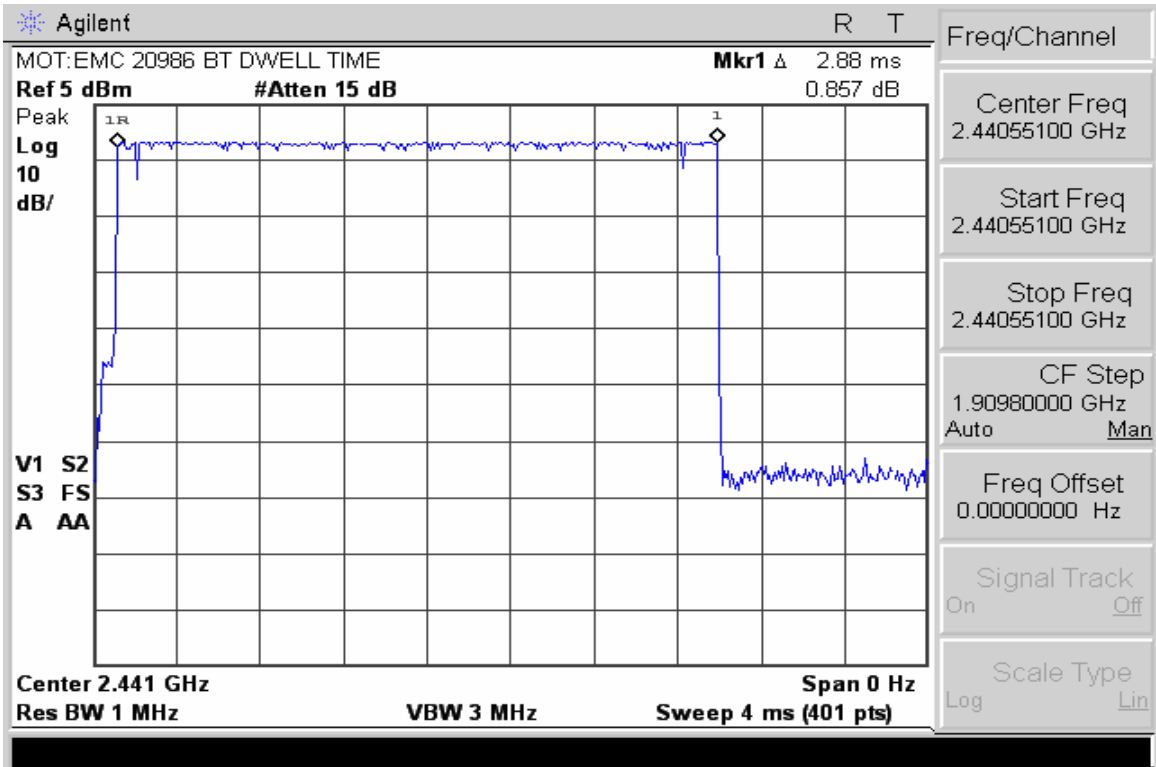
The Bluetooth hopping function of the EUT was enabled. The following spectrum analyzer settings were used:

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.

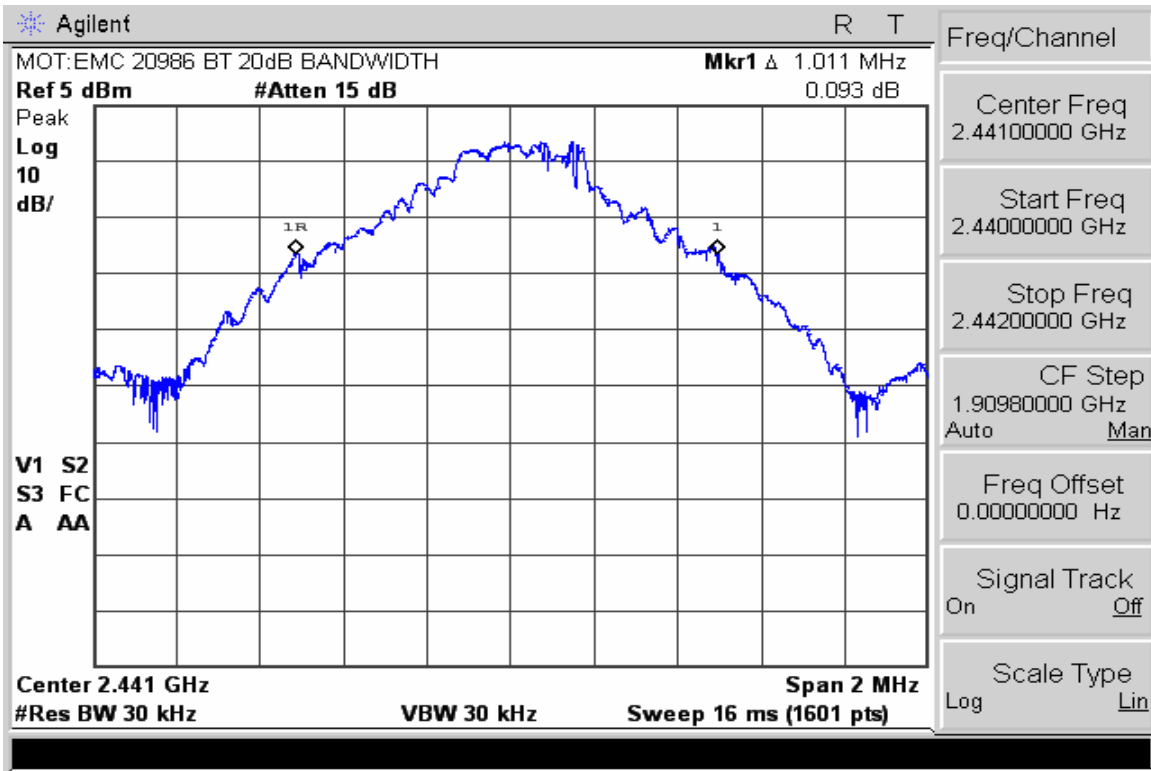
The Bluetooth frequency hopping function of the EUT was disabled. The spectrum analyzer used the following settings:

1. Span = 2MHz, centered on the center channel frequency
2. RBW  $\geq$  1% of the 20dB span
3. VBW  $\geq$  RBW
4. Sweep = auto
5. Detector function = peak
6. Trace = max hold

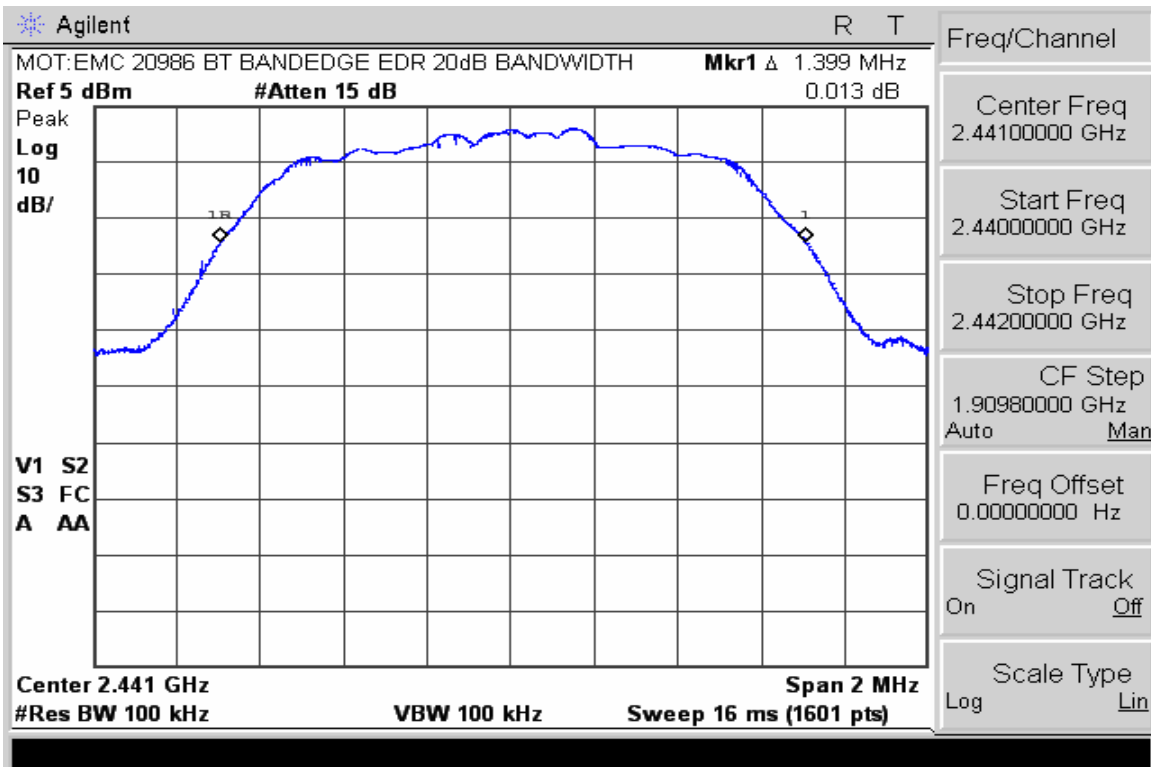
The trace was allowed to stabilize. The EUT was transmitting at its maximum data rate. The marker-to-peak function was used to set the marker to the peak of the emission. The marker-delta function was used to measure 20dB down one side of the emission. The marker-delta function and marker was moved to 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



20 dB Bandwidth (EDR Mode)

### PEAK OUTPUT POWER

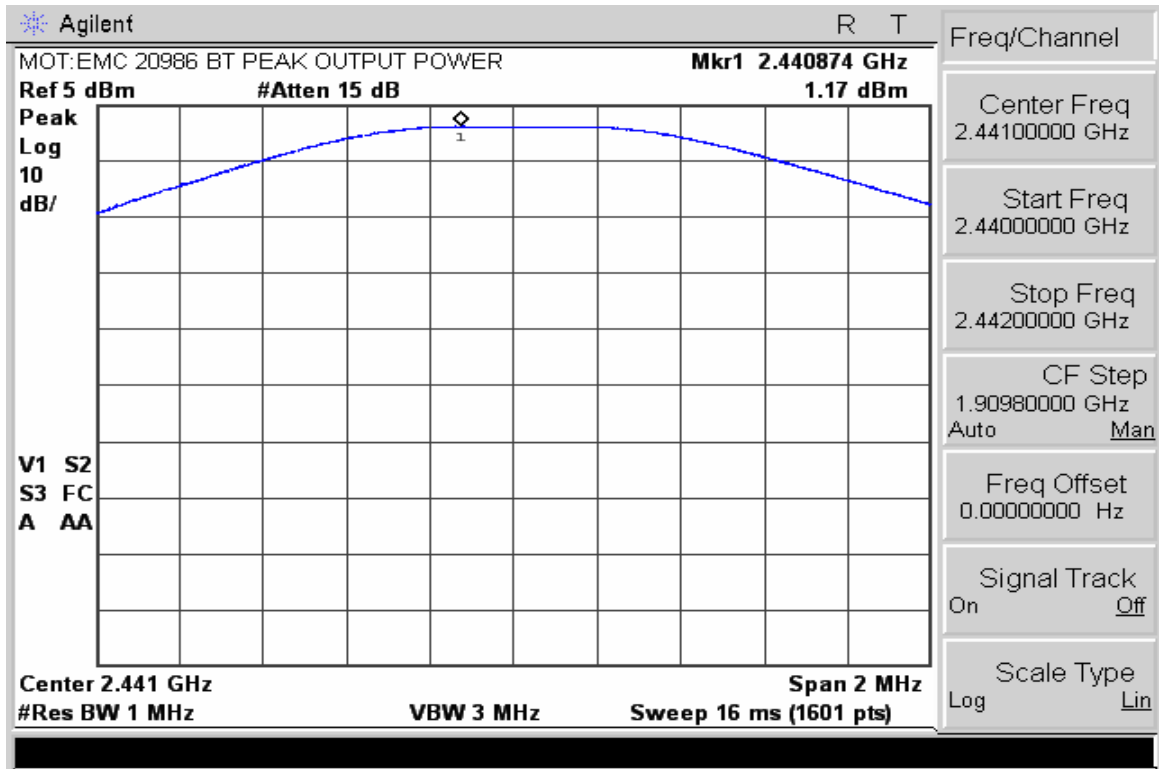
CFR 47 Part 15.247

#### 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**

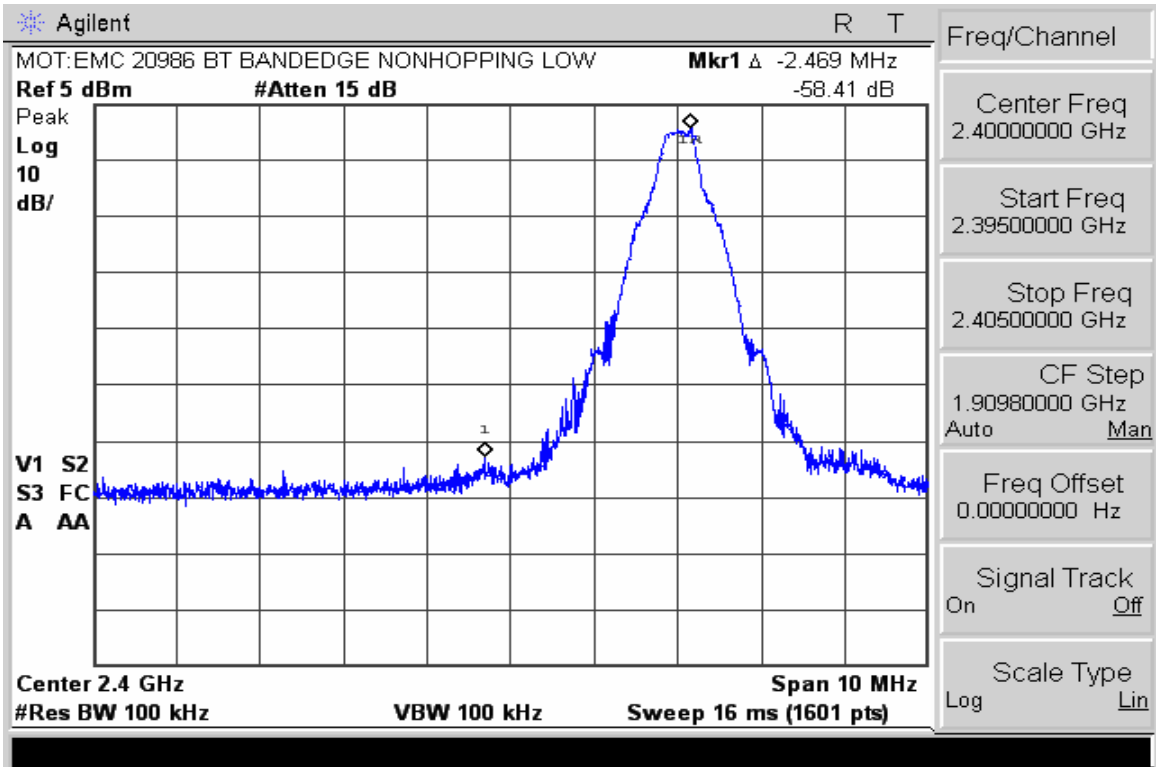
CFR 47 Part 15.247

### **Measurement Procedure**

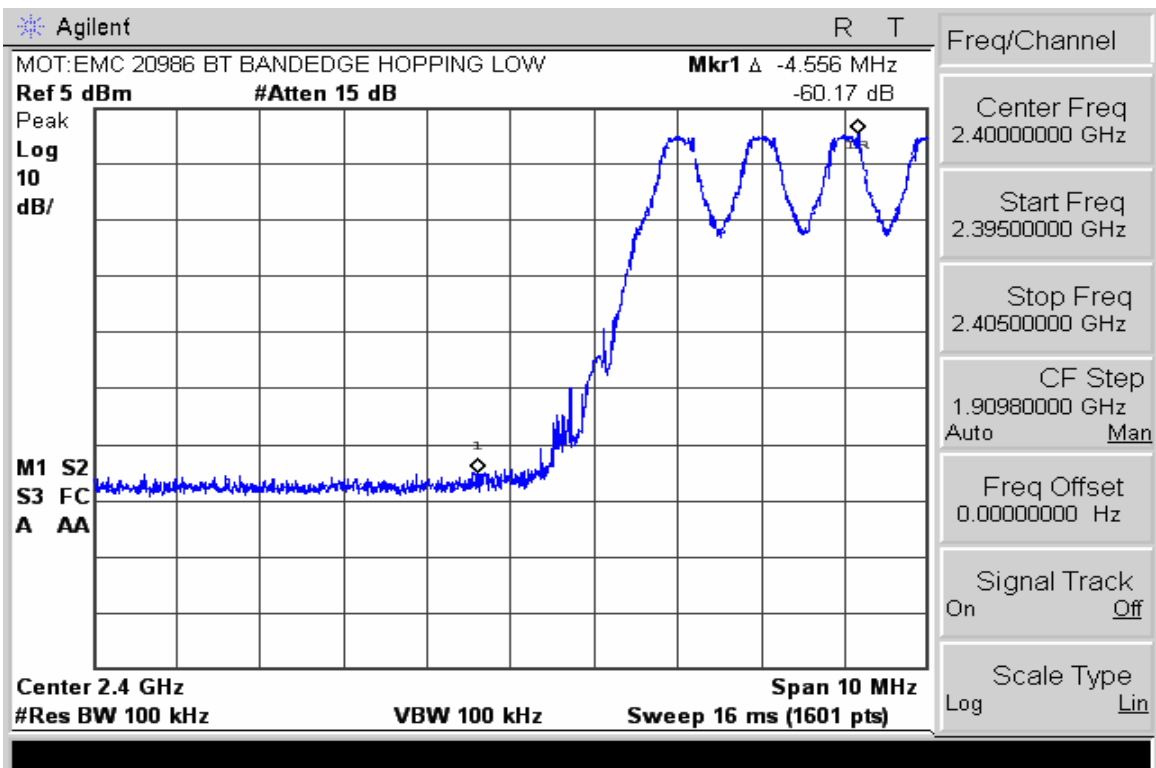
The RF output port of the Equipment-Under-Test is directly coupled to the input of the EMC analyzer through a specialized RF connector and a 10dB passive attenuator. A fully charged battery was used for the supply voltage.

### **Measurement Results**

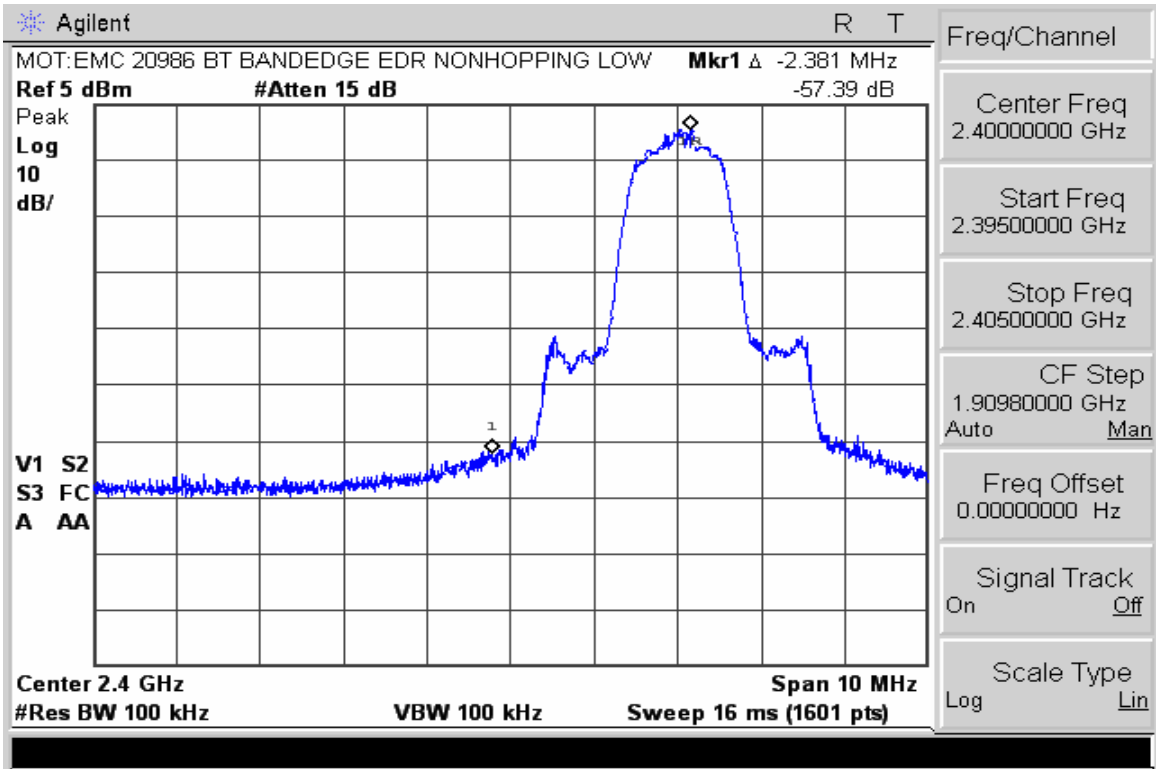
See Attached:



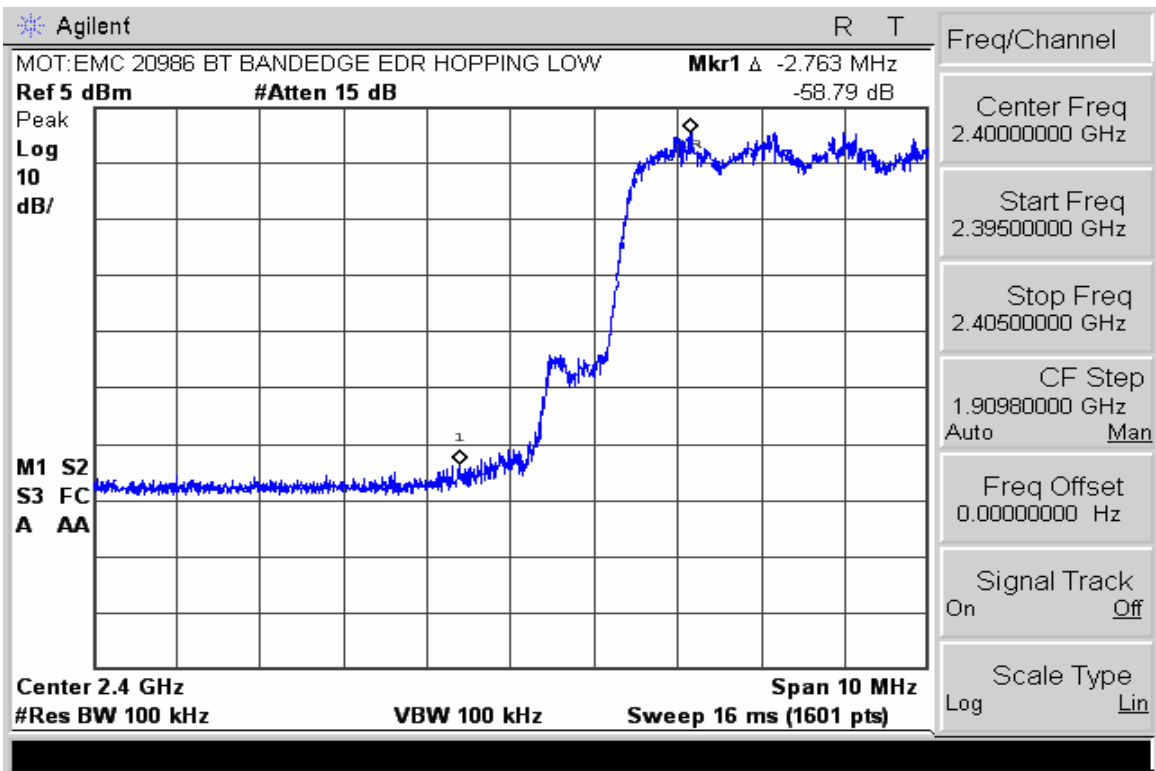
**Low Band Edge with Hopping Disabled**



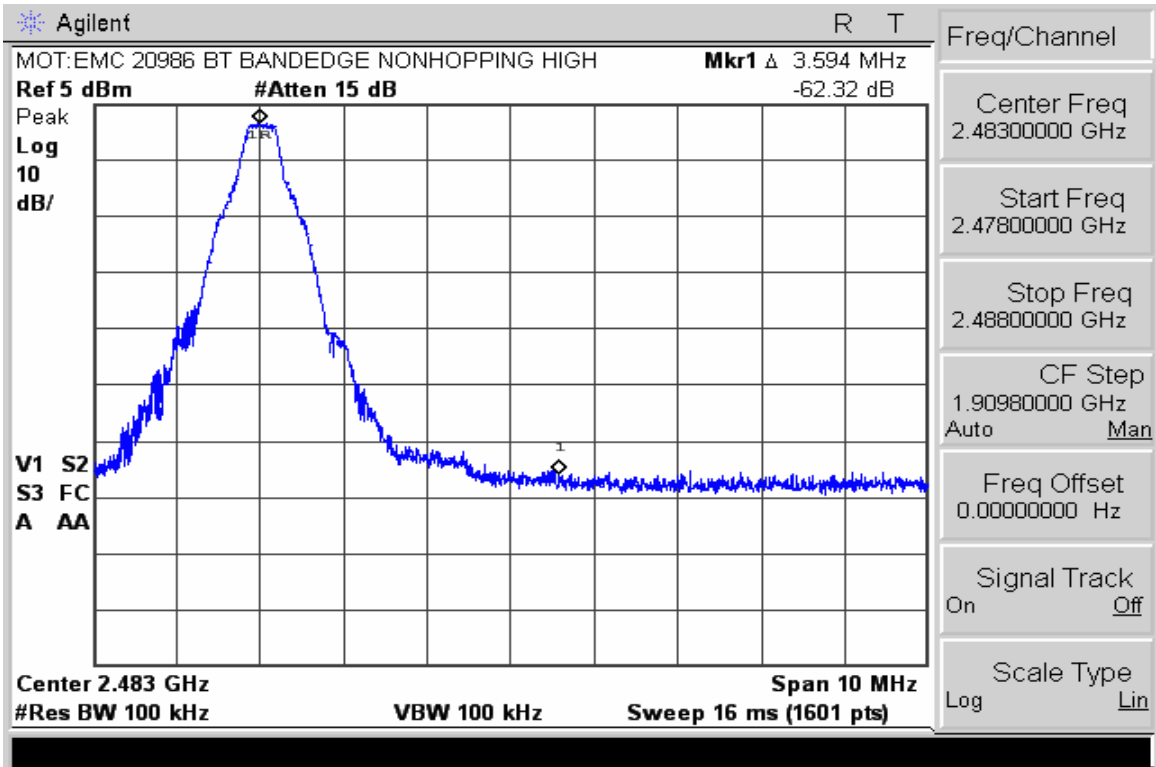
**Low Band Edge with Hopping Enabled**



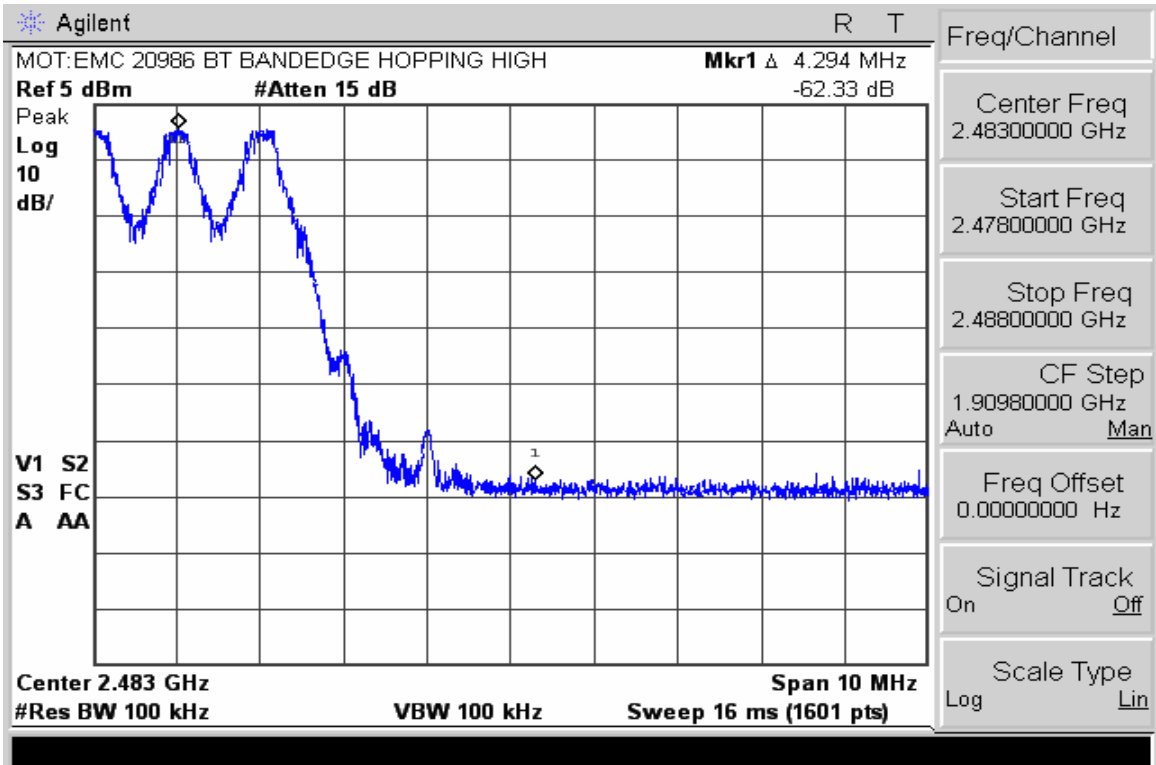
**Low Band Edge with Hopping Disabled (EDR MODE)**



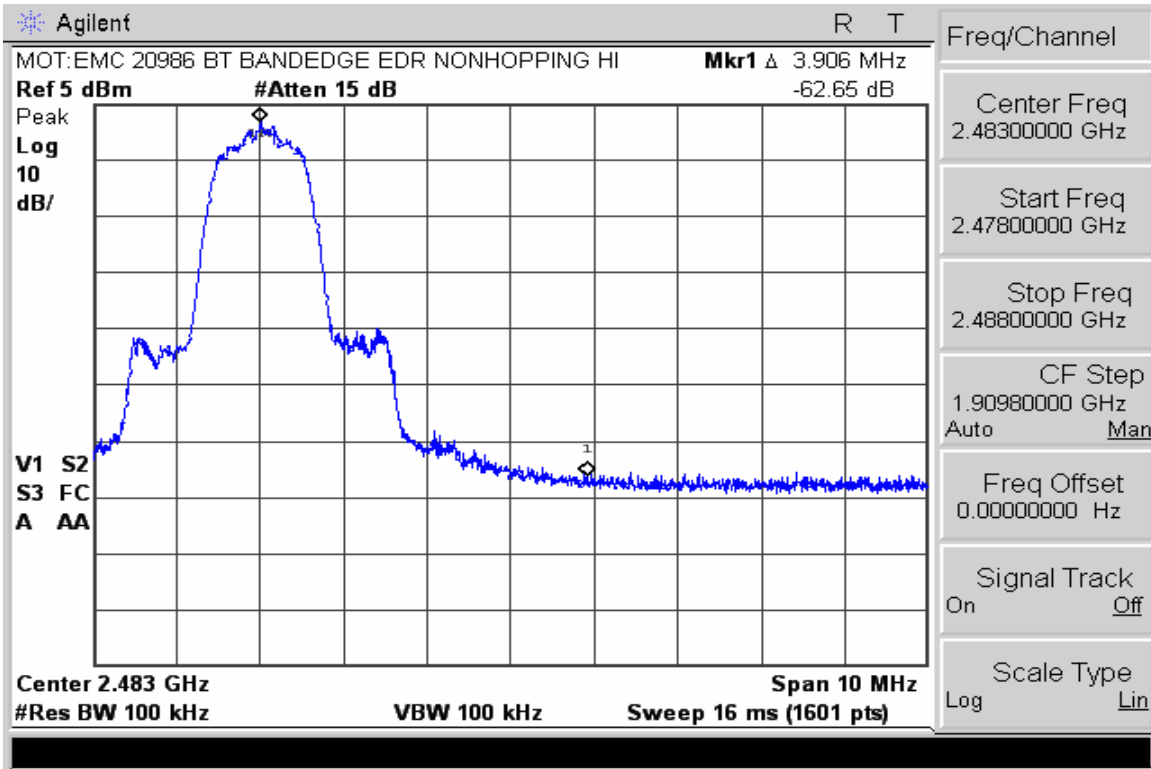
**Low Band Edge with Hopping Enabled (EDR MODE)**



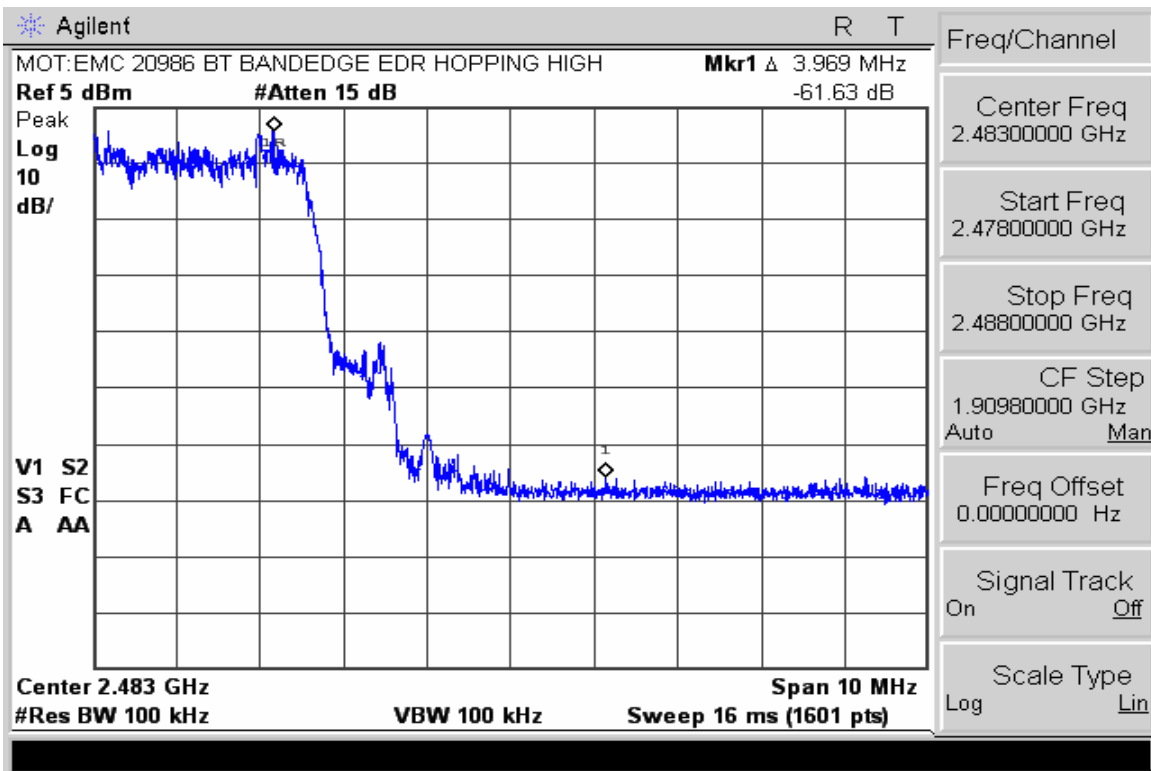
High Band Edge with Hopping Disabled



High Band Edge with Hopping Enabled



**High Band Edge with Hopping Disabled (EDR MODE)**



**High Band Edge with Hopping Enabled (EDR MODE)**

## **SPURIOUS RF CONDUCTED EMISSIONS**

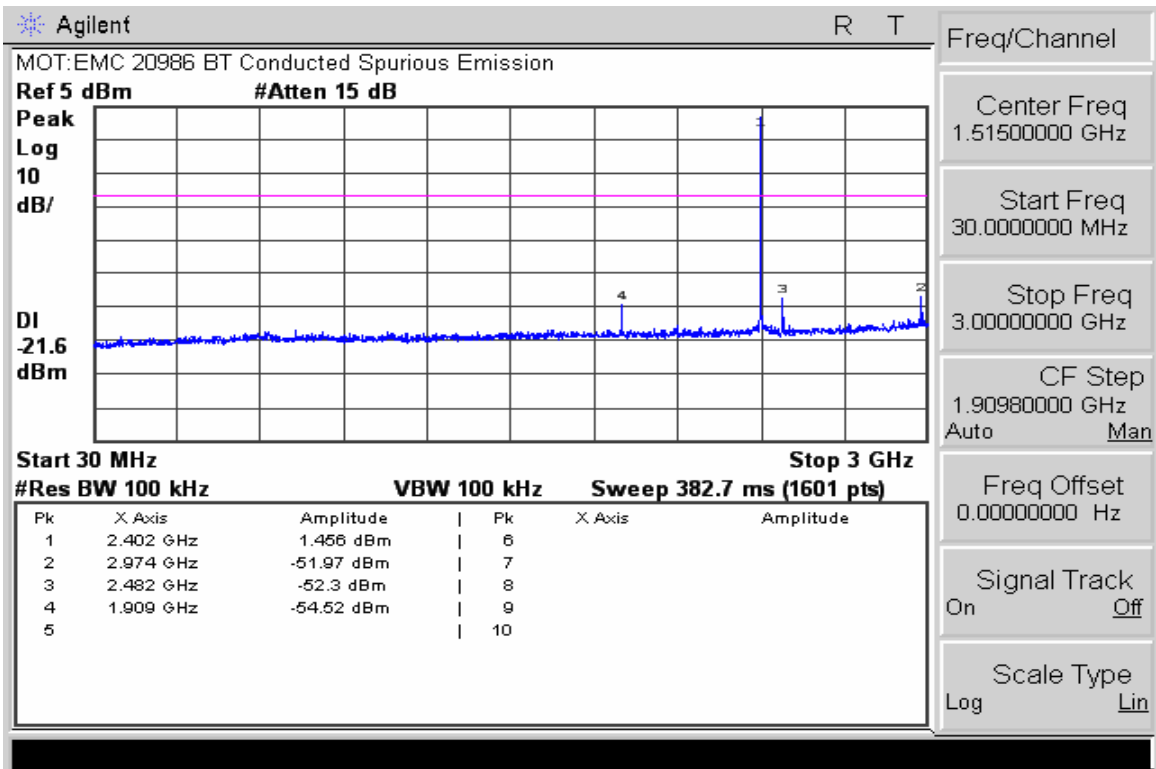
CFR 47 Part 15.247

### **Measurement Procedure**

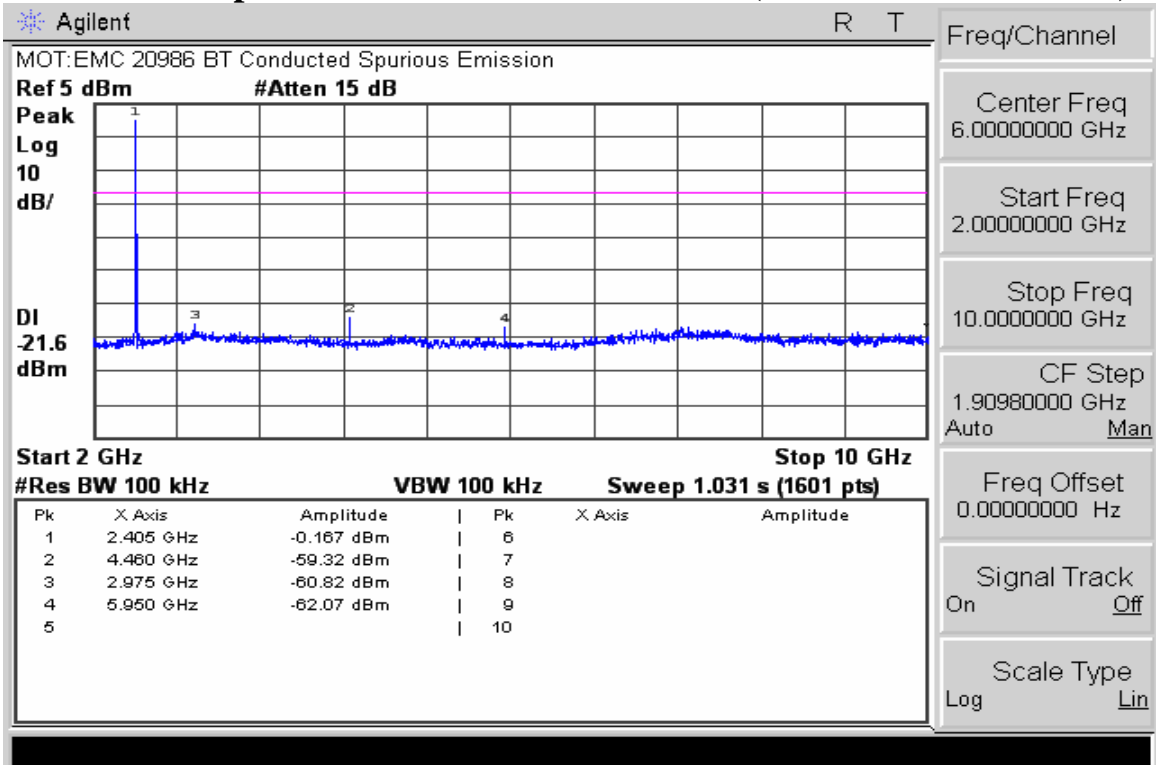
The RF output port of the Equipment-Under-Test is directly coupled to the input of the EMC analyzer through a specialized RF connector and a 10dB passive attenuator. A fully charged battery was used for the supply voltage.

### **Measurement Results**

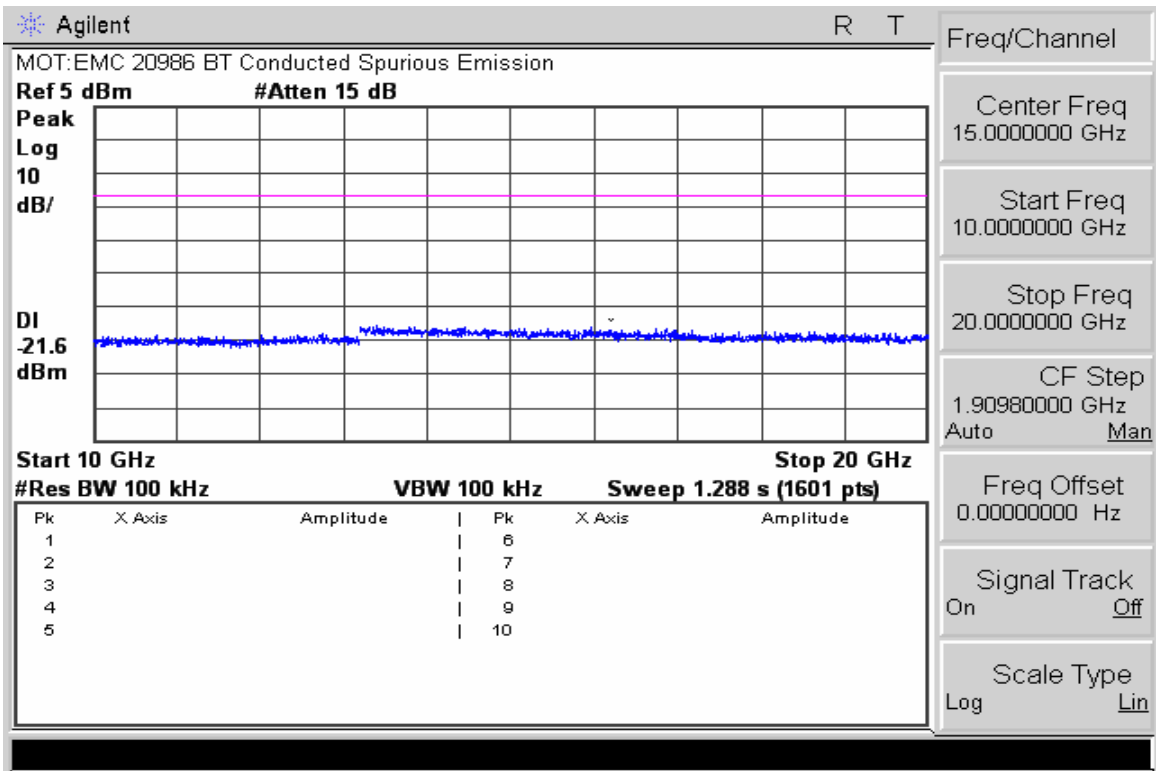
See attached:



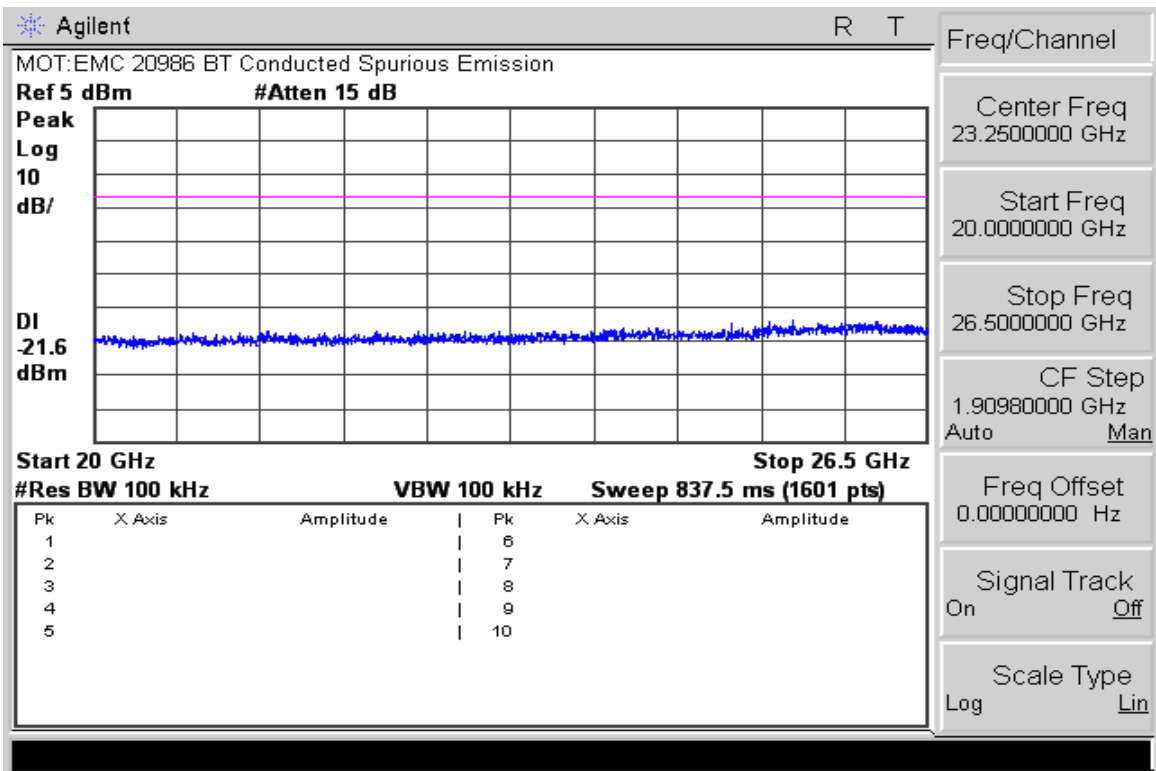
**Conducted Spurious Emissions 30-3000MHz (Low Channel Enabled)**



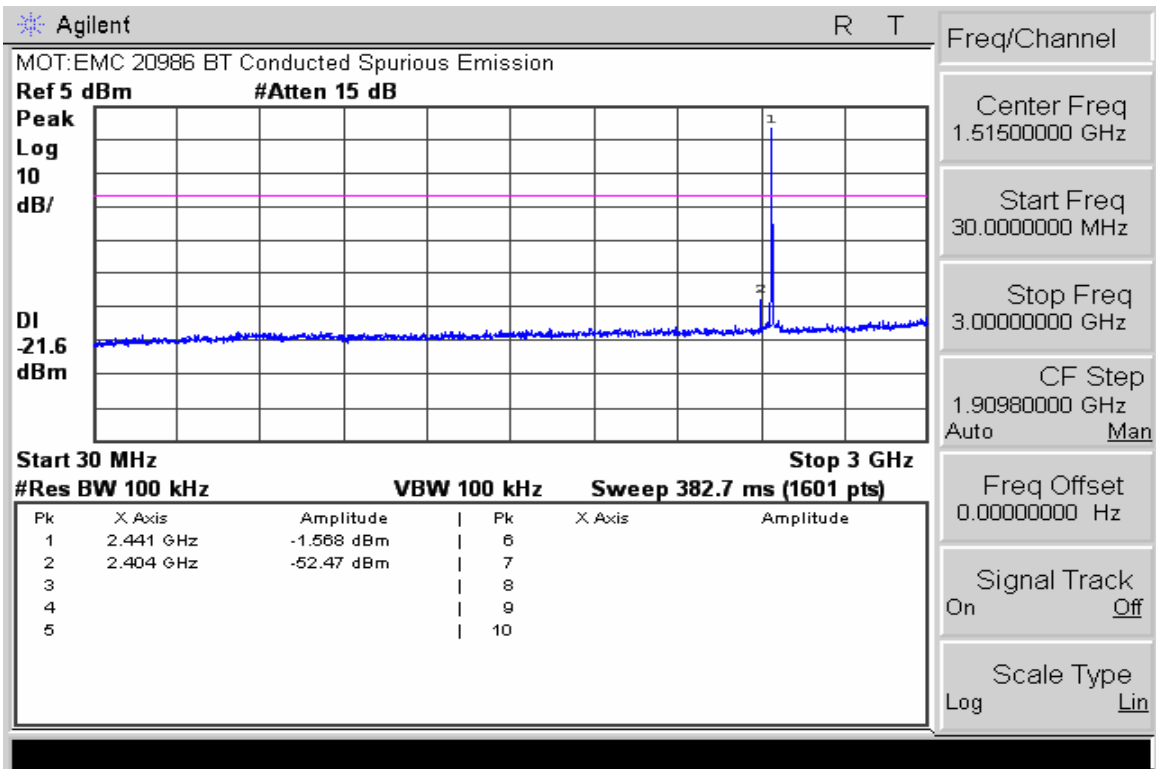
**Conducted Spurious Emissions 2-10GHz (Low Channel Enabled)**



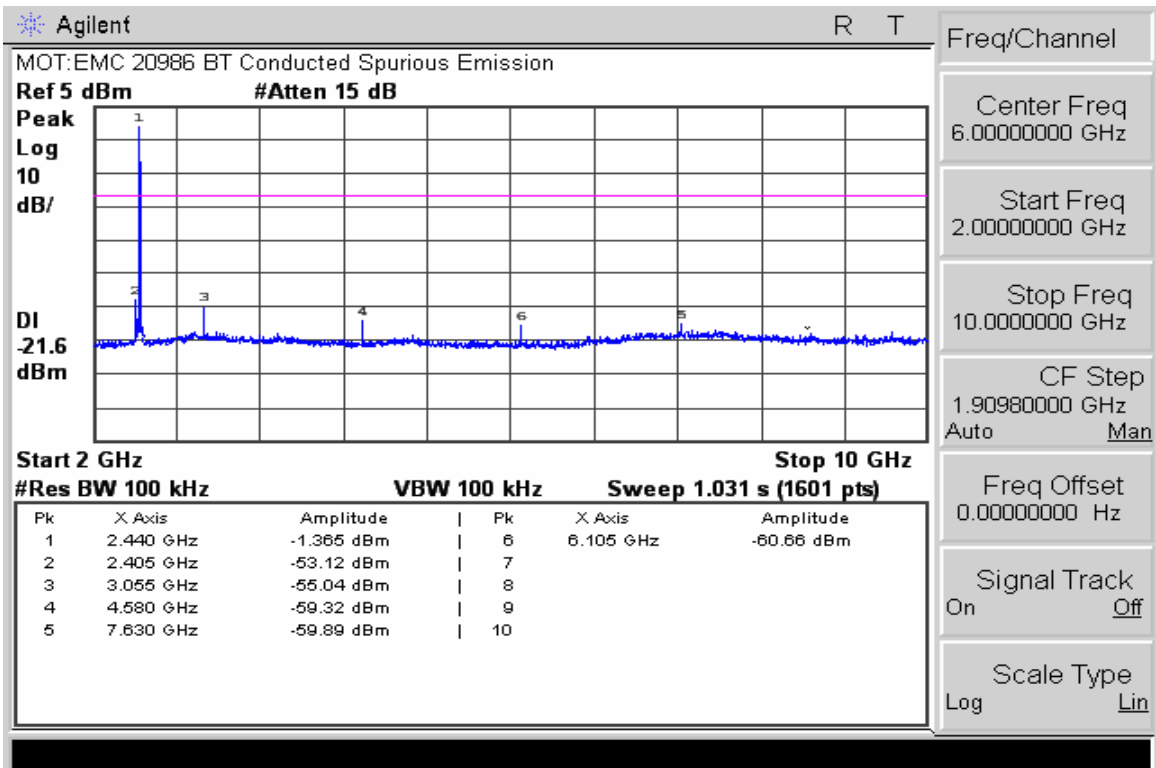
**Conducted Spurious Emissions 10-20GHz (Low Channel Enabled)**



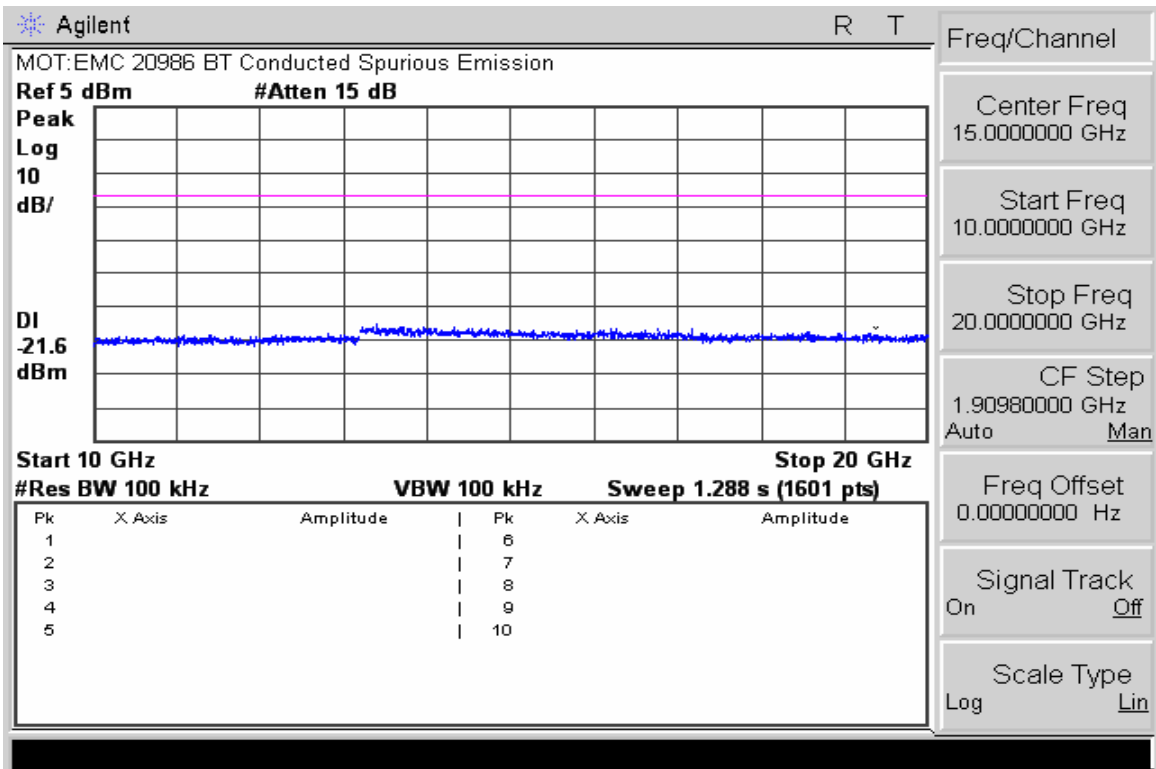
**Conducted Spurious Emissions 20-26.5GHz (Low Channel Enabled)**



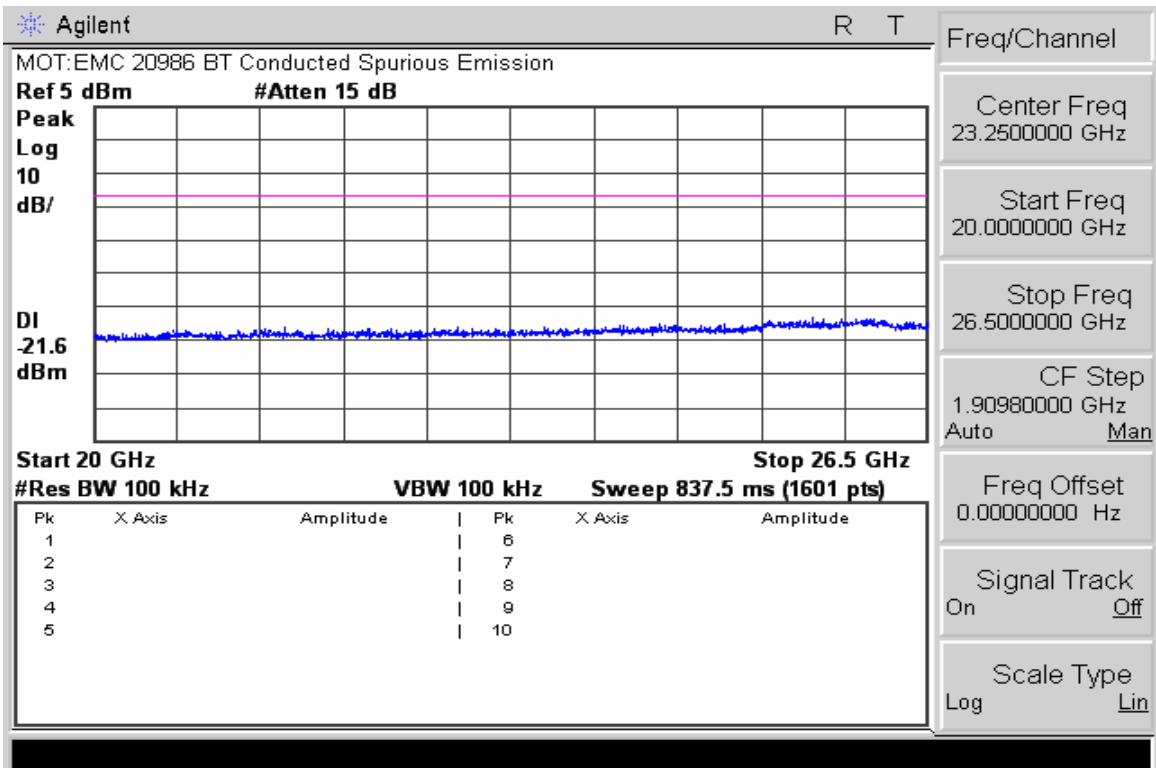
**Conducted Spurious Emissions 30-3000MHz (Mid Channel Enabled)**



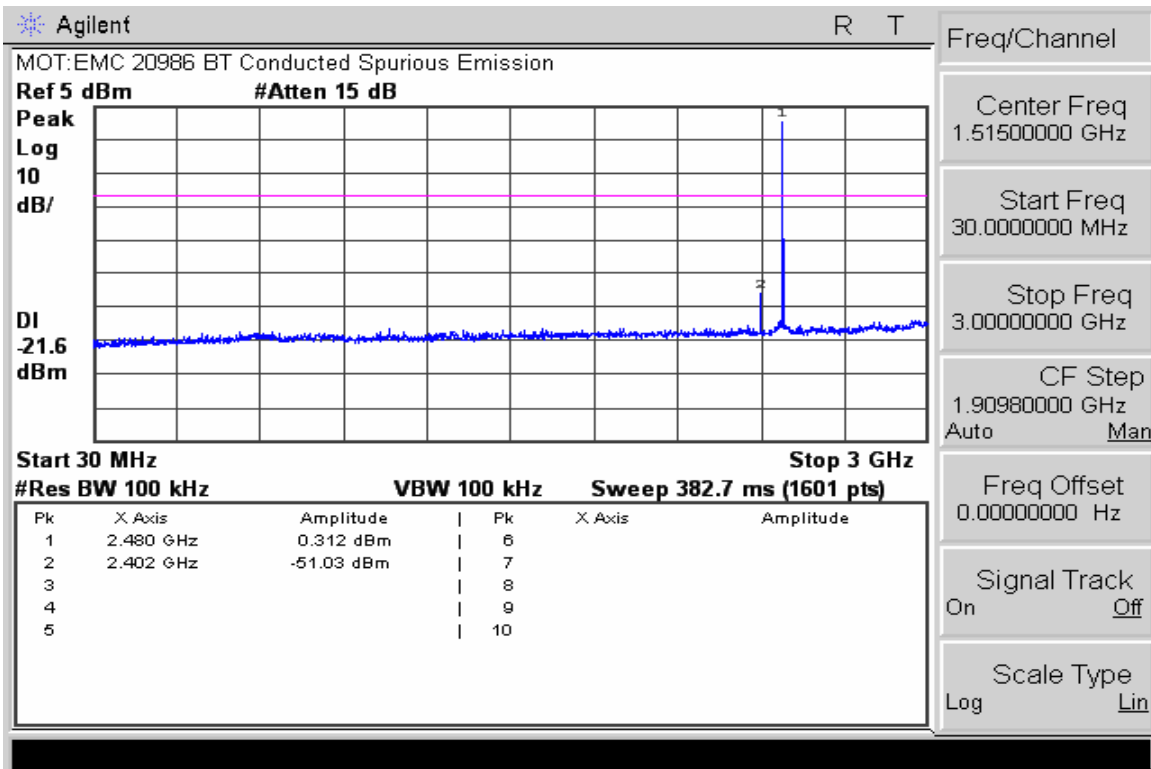
**Conducted Spurious Emissions 2-10GHz (Mid Channel Enabled)**



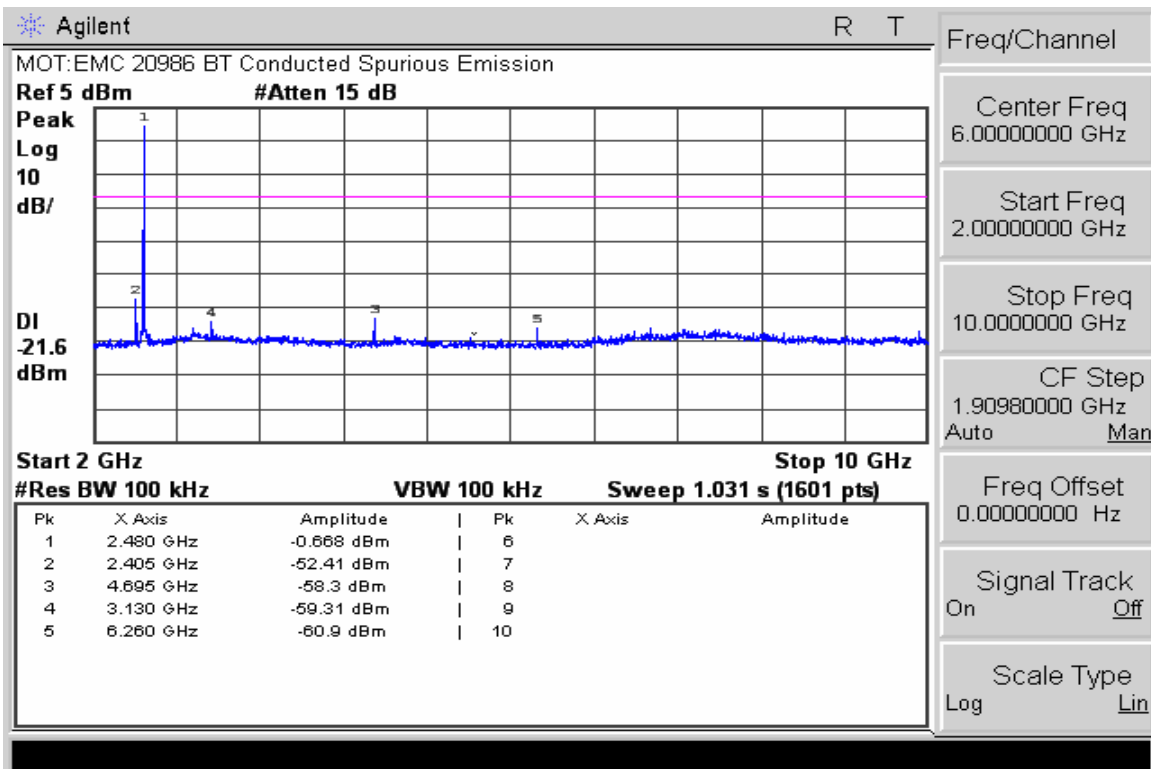
**Conducted Spurious Emissions 10-20GHz (Mid Channel Enabled)**



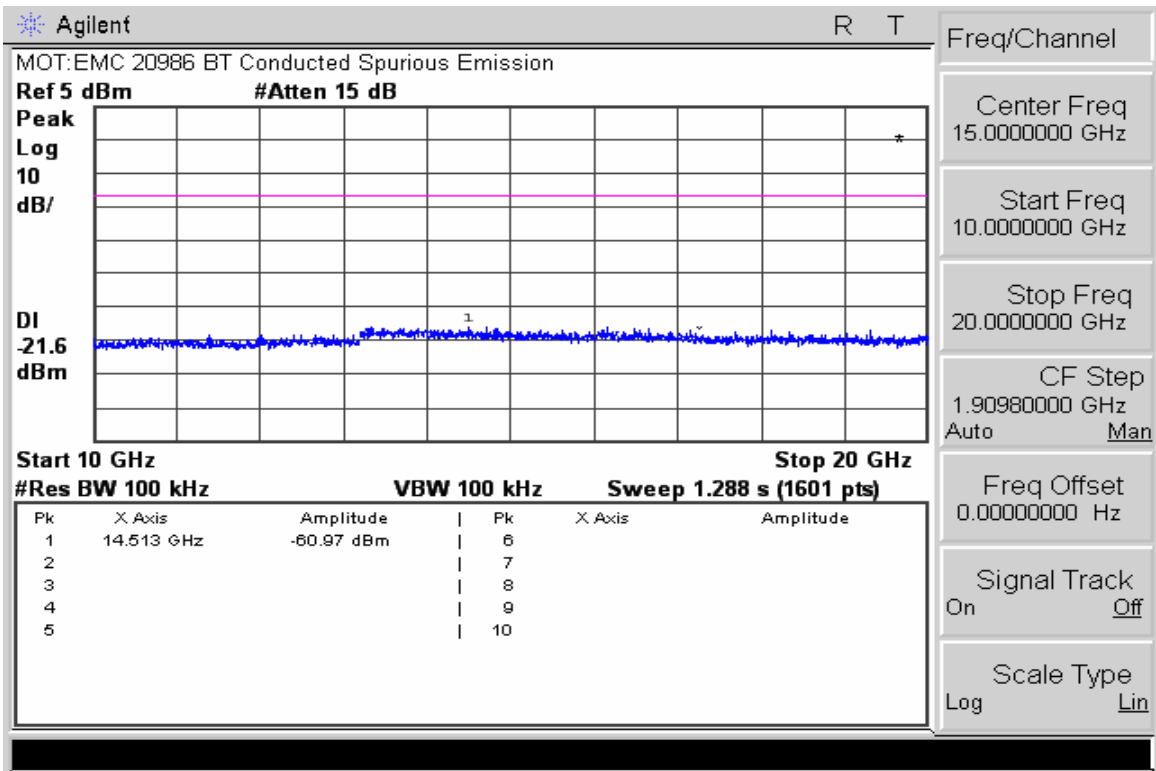
**Conducted Spurious Emissions 20-26.5GHz (Mid Chan Enabled)**



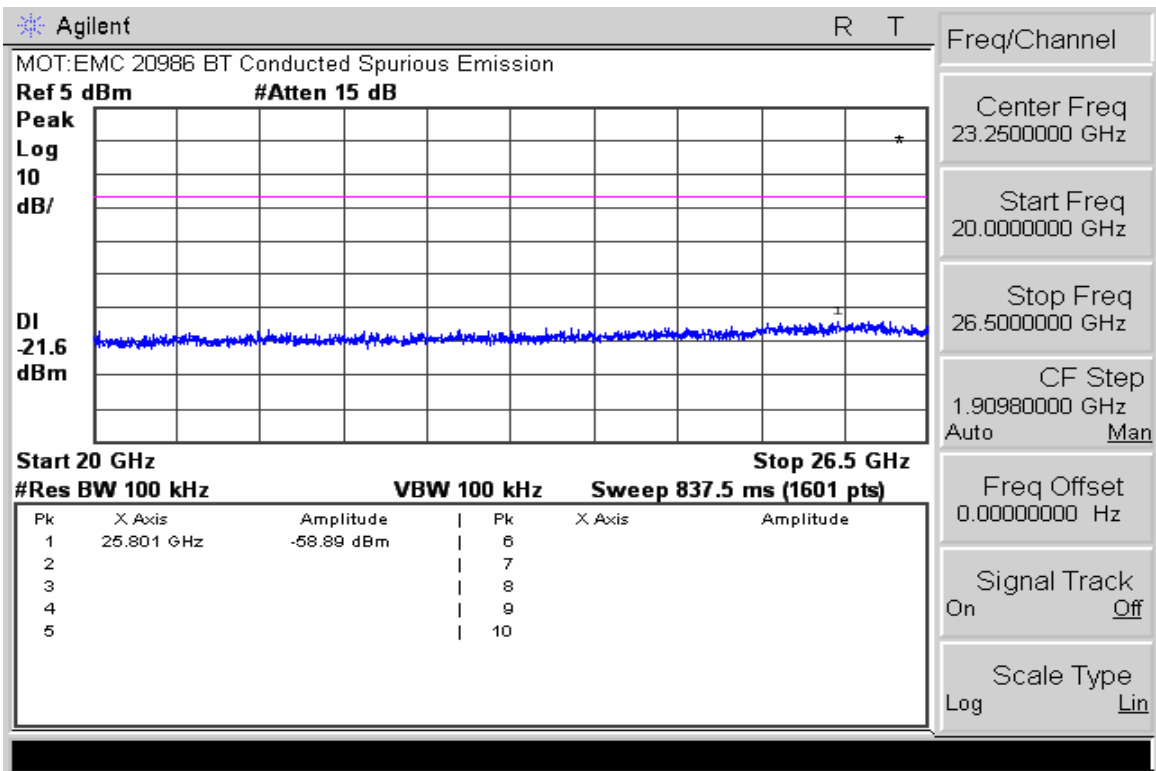
**Conducted Spurious Emissions 30-3000MHz (High Channel Enabled)**



**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)**

## **AC LINE CONDUCTED**

CFR 47 Part 15.207

### **Measurement Procedure**

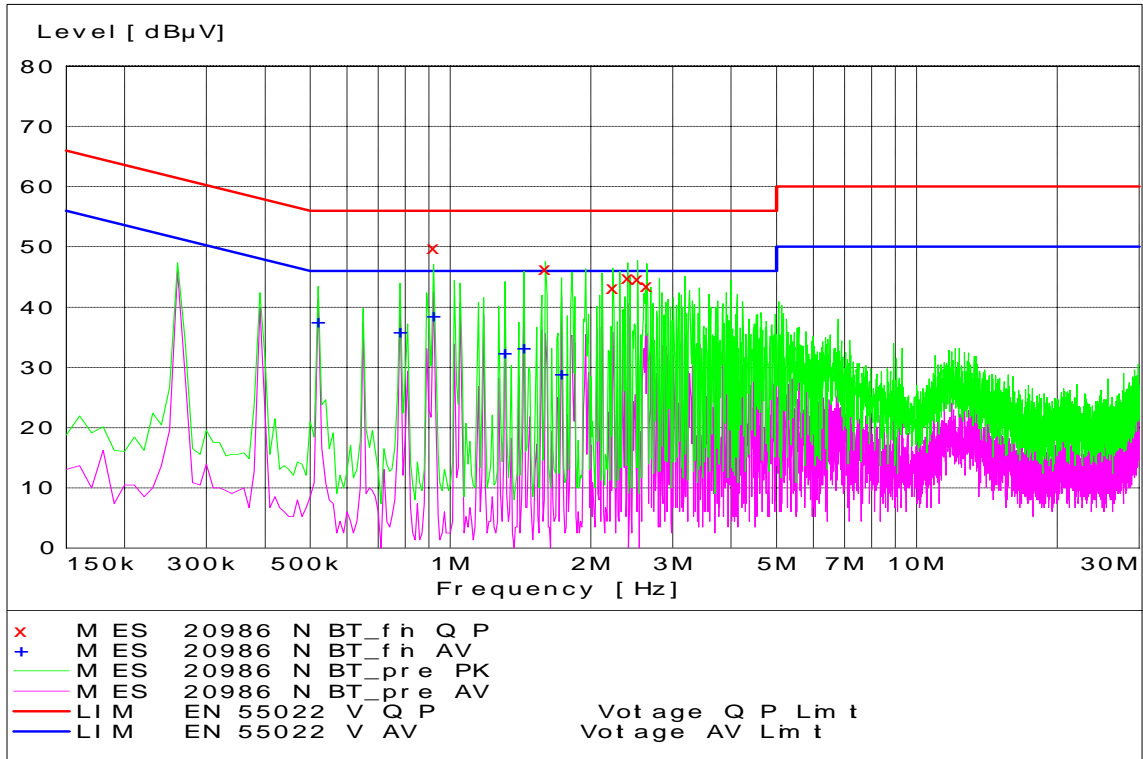
Measured levels of ac power line conducted emission shall be the radio-noise voltage from the line probe or across the 50  $\Omega$  LISN port, where permitted, terminated into a 50  $\Omega$  noise meter, or where permitted or required, the radio-noise current on the power line sensed by a current probe.

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  $\Omega$ .

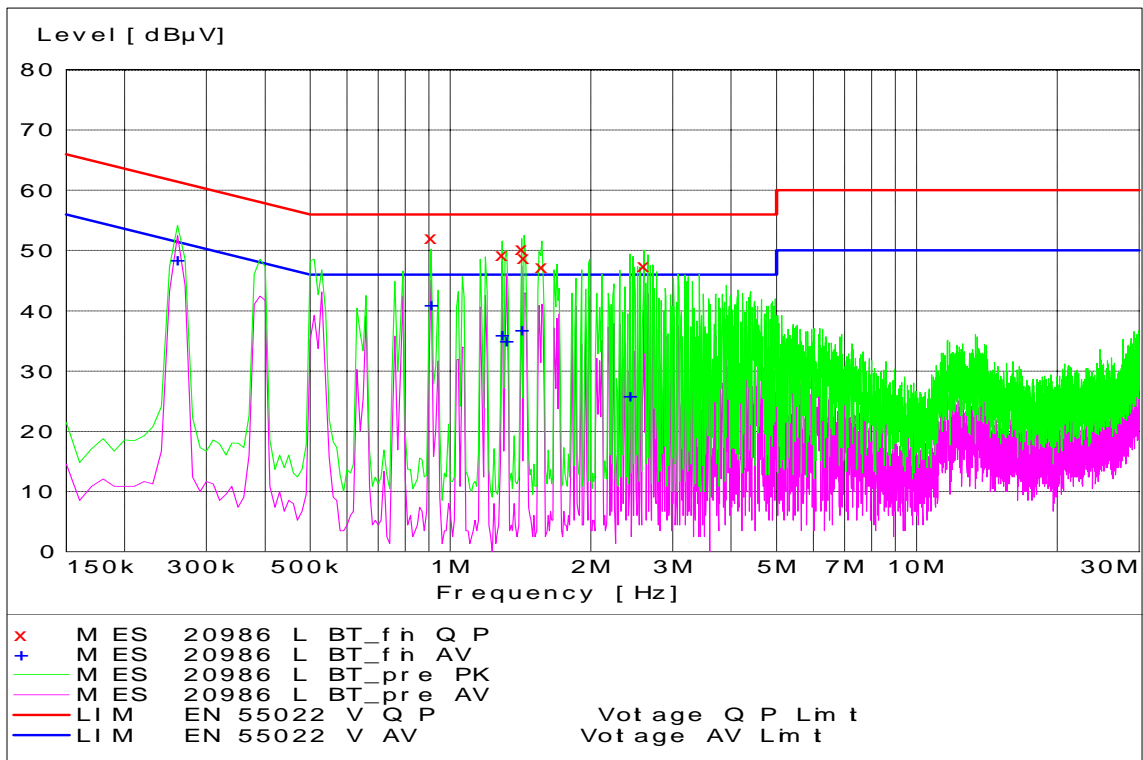
Detectors – Quasi Peak and Average Detector.

### **Measurement Results**

See attached:



**Bluetooth - Tx Mode - Neutral Coupling Hopping**



**Bluetooth - Tx Mode - Line Coupling Hopping**

**End of Test Report**