



**MOTOROLA**

**PRODUCT SAFETY AND COMPLIANCE  
EMC LABORATORY**

**EMC TEST REPORT**

**Test Report Number** – 24726-1 BT-Conducted

**Report Date** – 2011-10-12

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.

Signature:

Name: Hongpeng Yin

Title: EMC Project Manager

Test: 2011-09-20 to 2011-10-12

As the responsible test lab manager, I hereby declare that the model tested as specified in this report conforms to the requirements indicated.

Signature:

Name: Yilin Zhao

Title: Test Lab Manager

Date: 2011-10-12

This report must not be reproduced, except in full, without written approval from this laboratory.

FCC Registration Number: 177885

IC Registration Number: 109AW-1

ADR Testing Service location ADR BJ  
ISO/IEC-17025:2005 accredited by UKAS



**Table of Contents**

Test Report Details ..... 3

Applicable Standards ..... 4

Summary of Testing..... 4

General and Special Conditions..... 5

Equipment and Cable Configurations..... 5

Measuring Equipment and Calibration Information..... 5

Description of Bluetooth Transmitter ..... 5

    CARRIER FREQUENCY SEPARATION ..... 6

        Measurement Procedure..... 6

        Measurement Results ..... 6

            Carrier Frequency Separation ..... 7

    NUMBER OF HOPPING FREQUENCIES ..... 8

        Measurement Procedure..... 8

        Measurement Results ..... 8

    TIME OF OCCUPANCY (DWELL TIME)..... 11

        Measurement Procedure..... 11

        Measurement Results ..... 11

    20dB Bandwidth ..... 13

        Measurement Procedure..... 13

        Measurement Results ..... 13

    PEAK OUTPUT POWER ..... 15

        Measurement Procedure..... 15

        Measurement Results ..... 15

    BAND-EDGE COMPLIANCE OF RF CONDUCTED EMISSIONS ..... 21

        Measurement Procedure..... 21

        Measurement Results ..... 21

    SPURIOUS RF CONDUCTED EMISSIONS..... 29

        Measurement Procedure..... 29

        Measurement Results ..... 29

    AC LINE CONDUCTED ..... 41

        Measurement Procedure..... 41

        Measurement Results ..... 42

**Test Report Details**

Tests Performed By: Motorola (Beijing) Mobility Technologies Co.,  
Ltd.  
Asia Global Compliance Labs  
No.1 Wang Jing East Road  
Chao Yang District  
Beijing, 100102, P. R. China  
Phone: +86 10 8499 5891  
FCC Registration Number: 177885  
IC Registration Number: 109AW-1

Tests Performed By: ADR Testing Service  
Location Code: ADR LV  
Motorola Mobility Inc  
Product Safety and Compliance Group  
600 North US Hwy 45  
Libertyville, IL 60048  
FCC Registration Number: 316588  
Industry Canada Number: 109O-1

Tests Requested By: Motorola Mobility, Inc.  
600 North US Hwy 45  
Libertyville, IL 60048  
United States

Product Type: Cellular phone

Signaling Capability: CDMA 800/1900, CDMA 1X/EV-DO Release A,  
LTE Band 13, WCDMA 850/1900, GSM  
850/1900, HSDPA, HSUPA, EDGE, GPRS,  
Bluetooth LE+EDR, 802.11b/802.11g/802.11n

Note: The GSM/EDGE/WCDMA network  
functions have been disabled by firmware and  
are SIM locked for all US operators.

IMEI: 99000052951205

FCC ID: IHDP56MN1

Project number: 24726-1

Testing Complete Date: 2011-10-12

**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 C63.4-2003, RSS-Gen Issue 2, RSS-210 Issue 7.

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	AC Line Conducted Spurious Emissions	Pass

Test	Test Name	Results
1	Carrier Frequency Separation	1.00 MHz
2	Number of Hopping	79
3	Time of Occupancy (Dwell Time)	2.9 ms
4	20 dB Bandwidth	See plots
5	Spurious RF Conducted Emissions	See plots
6	Max Power	See plots
7	Band Edges	See plots
8	AC Line Conducted Spurious Emissions	See plots

**General and Special Conditions**

The Product utilizes an internal battery that is not removable. 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. The temperature and the relative humidity were maintained within the ANSI C63.4-2003 Standard requirements during the entire duration of testing.

**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	Date of calibration
Rohde Schwarz	Receiver	ESU40	200353	03/03/11
Rohde Schwarz	Receiver	ESCI	100650	03/08/11
Agilent	Attenuator	8491A	MY39263202	NCR
Rohde Schwarz	LISN	ENV216	100055	12/19/2010

All test equipment was within their calibration date during the time of testing. When equipment went out of calibration during testing it was replaced using a similar piece of calibrated equipment. All these equipments are listed in the equipment list. The LISI is on a two-year calibration cycle. All other equipments are 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 2402 and 2480 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.

**De Facto EIRP Limit – Pursuant 47 CFR 15.247(b)(4); RSS-210 Section A8.4.**

Criterion: The conducted output power limit of 1-watt is based on the use of antennas with directional gains that do not exceed 6 dB<sub>i</sub>. If transmitting antennas of directional gain greater than 6 dB<sub>i</sub> are used, the conducted output power from the intentional radiator shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dB<sub>i</sub>.

The antenna employed by this transmitter is intended to be omni-directional, and thus will not exhibit directional gain in excess of 6 dB<sub>i</sub>. The conducted power is less than the limits set forth (see elsewhere in this report for details).

## **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 20dB passive attenuator. A fully charged battery was used for the supply voltage.

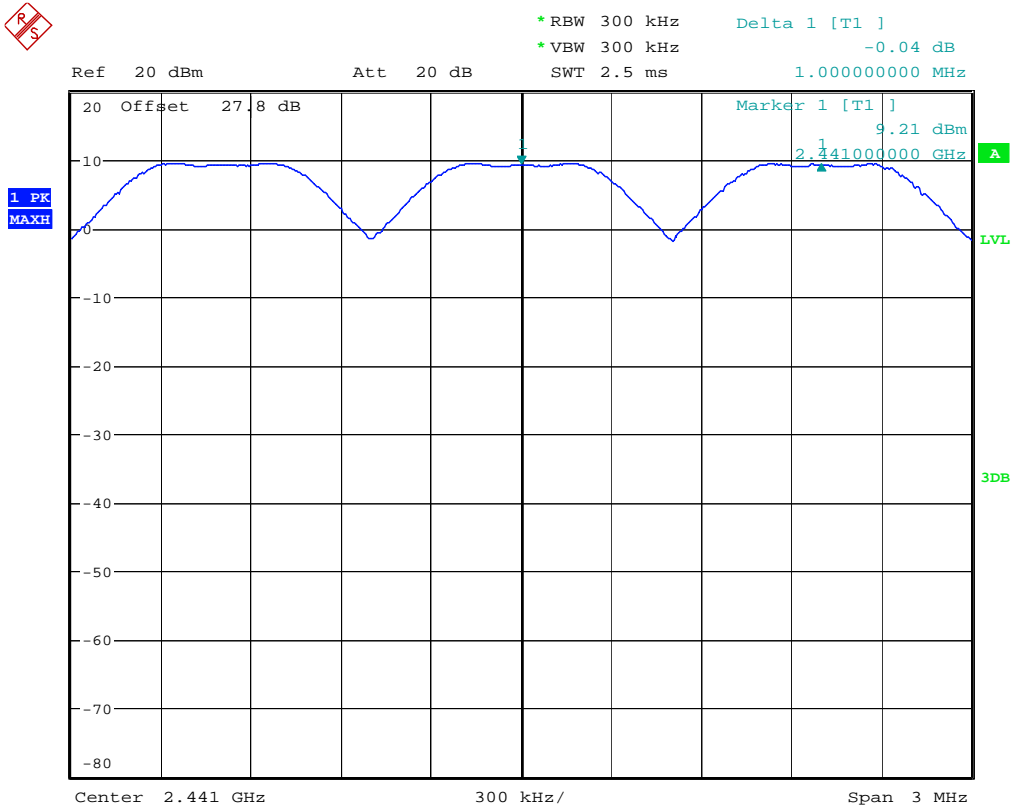
The Bluetooth transmitter of the EUT had its hopping function enabled. The following spectrum analyzer settings were used:

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.



Date: 21.SEP.2011 11:20:13

### 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 20dB passive attenuator. A fully charged battery was used for the supply voltage.

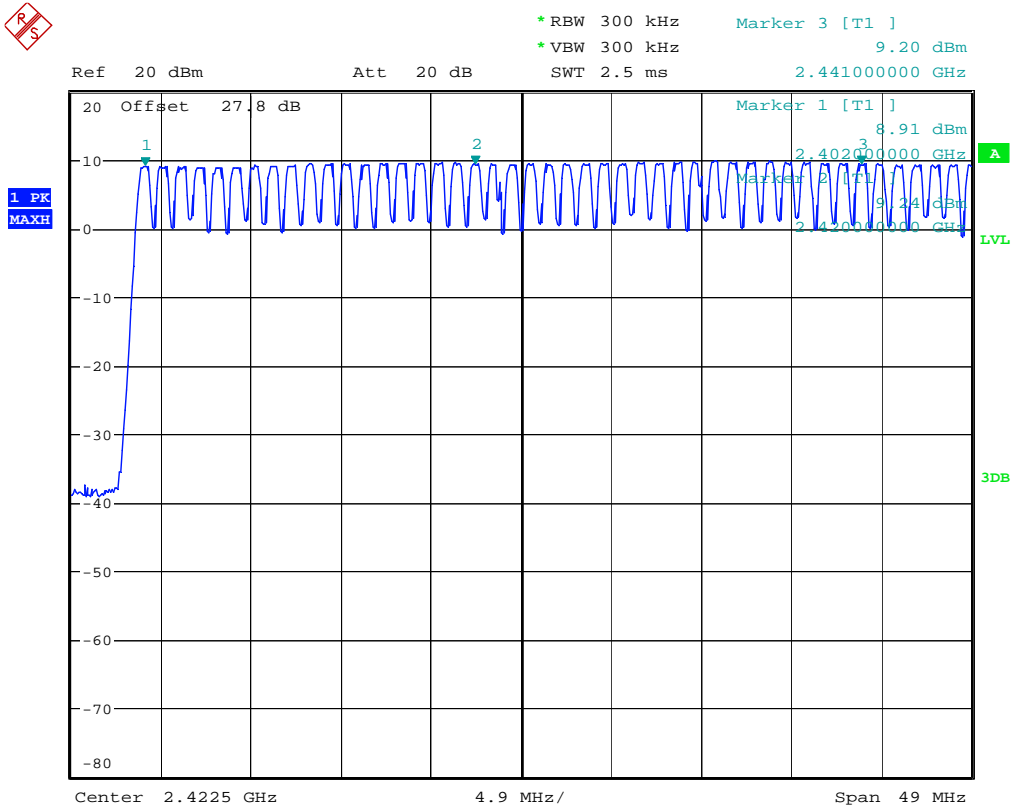
The Bluetooth frequency hopping function of the EUT was enabled. The spectrum analyzer used the following settings:

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.

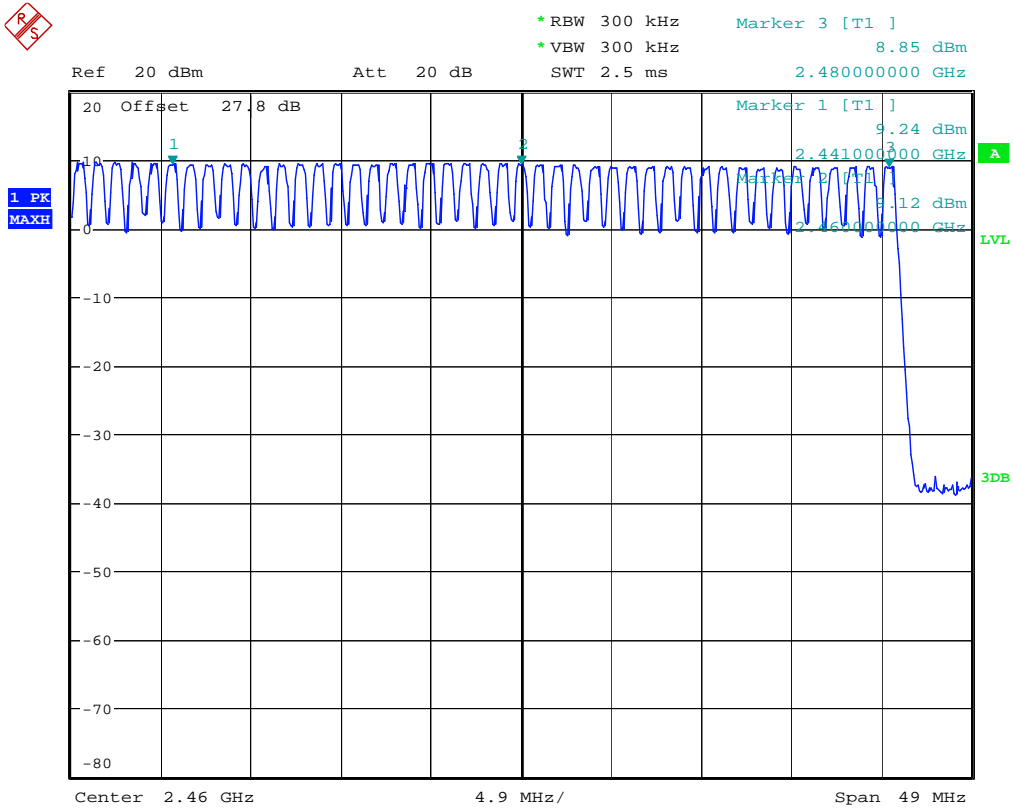
### **Measurement Results**

See attached.



Date: 21.SEP.2011 11:11:30

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



Date: 21.SEP.2011 11:16:31

### 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 20dB passive attenuator. A fully charged battery was used for the supply voltage.

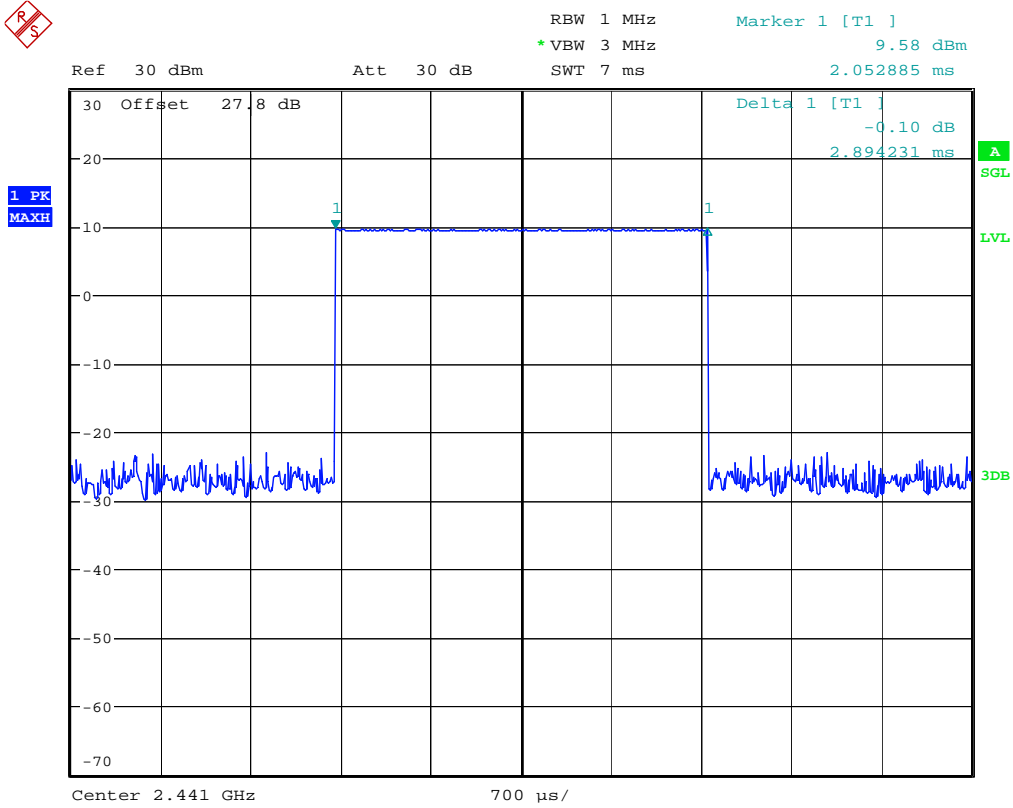
The Bluetooth hopping function of the EUT was enabled. The following spectrum analyzer settings were used:

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



Date: 21.SEP.2011 11:24:51

Dwell Time DH5

Packet type	Hop rate (1/s)	Time slot length (ms)	Dwell time (ms)	Limit	Conclusion
DH5	320	2.9	371.2	400	Pass

Note: Hop Rate = 1600/5 \* 1/s for DH5 packets = 320  
 Dwell Time = time slot length \* hop rate \* 0.4s

## **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 20dB passive attenuator. A fully charged battery was used for the supply voltage.

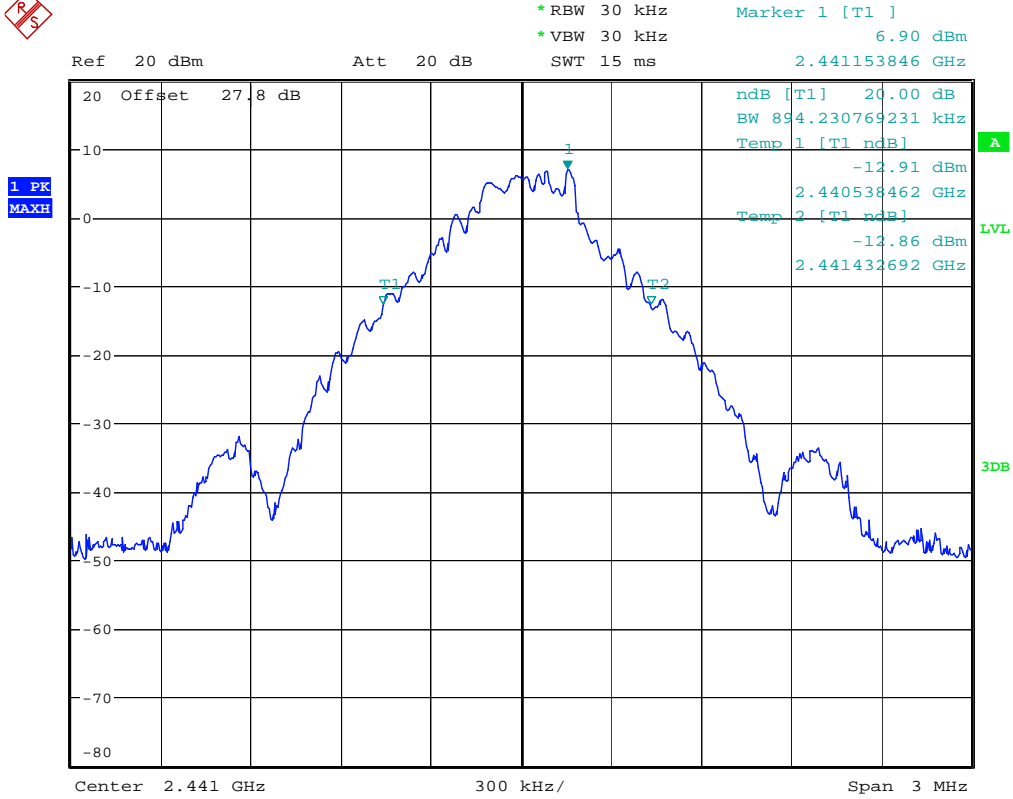
The Bluetooth frequency hopping function of the EUT was disabled. The spectrum analyzer used the following settings:

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 n dB down function was used to measure 20dB down one side of the emission. The n dB down function and marker was moved to the other side of the emission until it was even with the reference marker. The 20 dB down reading at this point was the 20dB bandwidth of the emission.

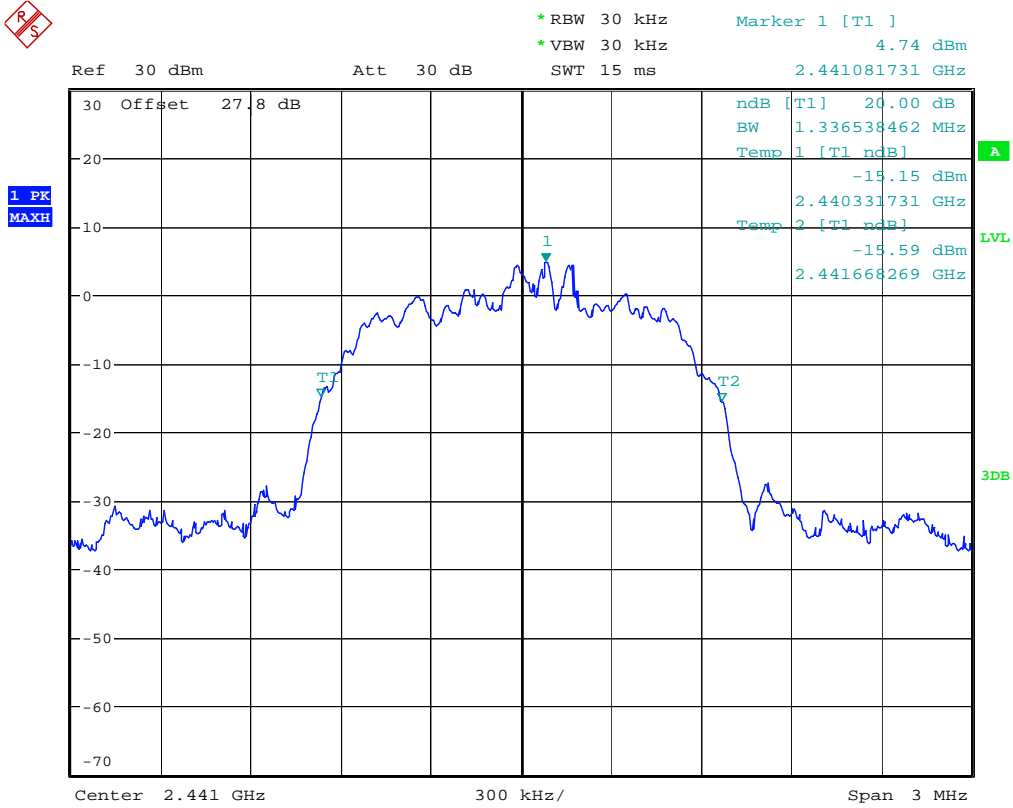
### **Measurement Results**

See Below



Date: 21.SEP.2011 11:06:48

### 20dB Bandwidth



Date: 21.SEP.2011 11:28:04

### 20dB Bandwidth EDR Mode

### PEAK OUTPUT POWER

CFR 47 Part 15.247

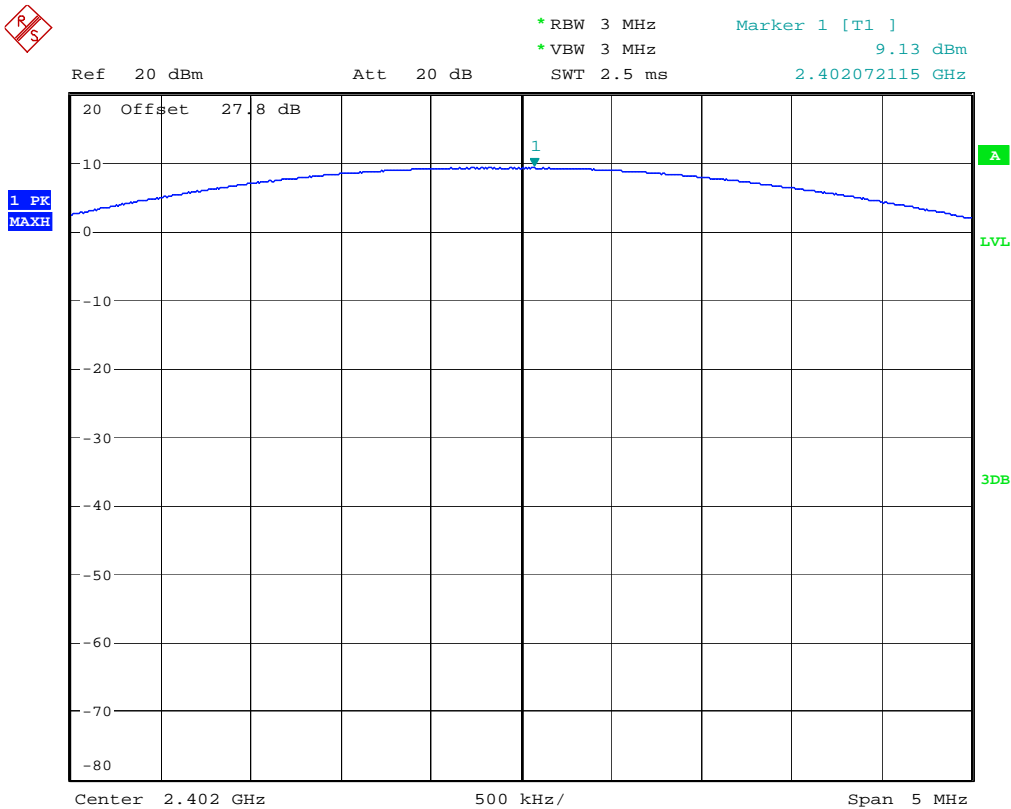
### Measurement Procedure

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 20dB passive attenuator. A fully charged battery was used for the supply voltage. The peak output power was measured with the Hopping mode disabled.

### Measurement Results

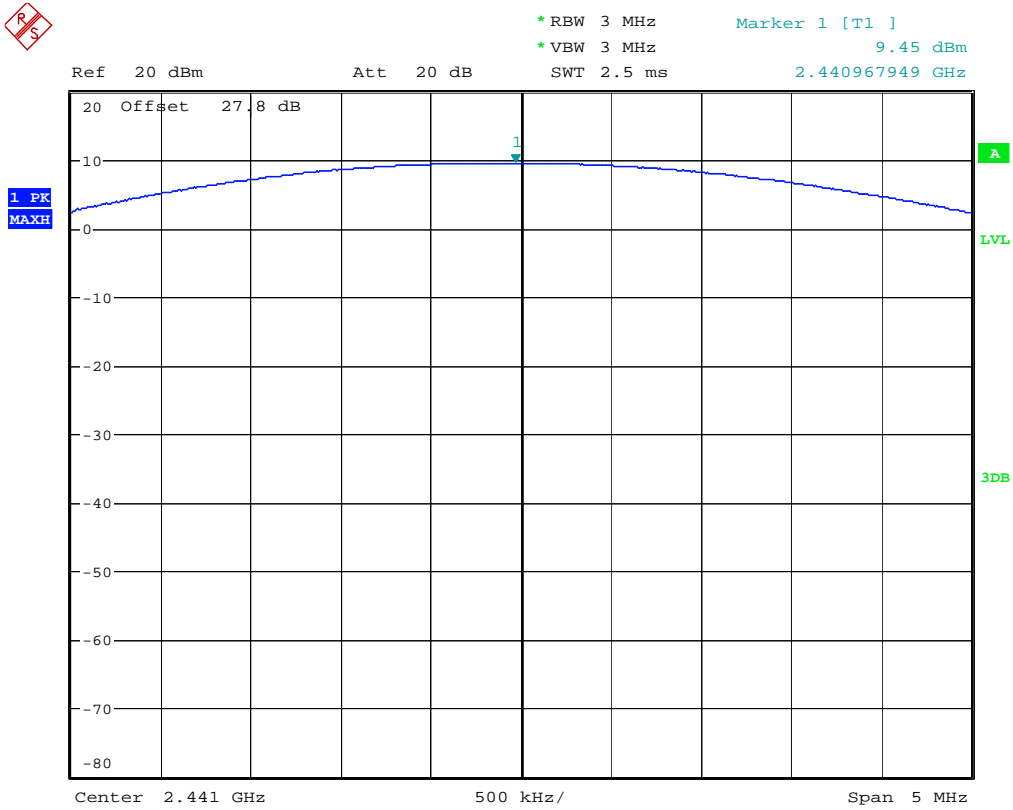
See Attached

	Channel / f <sub>c</sub> [MHz]	P [dBm]	P [mW]	limit [mW]	Result
<b>BDR Mode</b>	0 / 2402	9.13	8.18	1000	Passed
	39 / 2442	9.45	8.81	1000	Passed
	78 / 2480	9.13	8.18	1000	Passed
<b>EDR Mode</b>	0 / 2402	9.19	8.30	1000	Passed
	39 / 2442	9.47	8.85	1000	Passed
	78 / 2480	9.17	8.26	1000	Passed



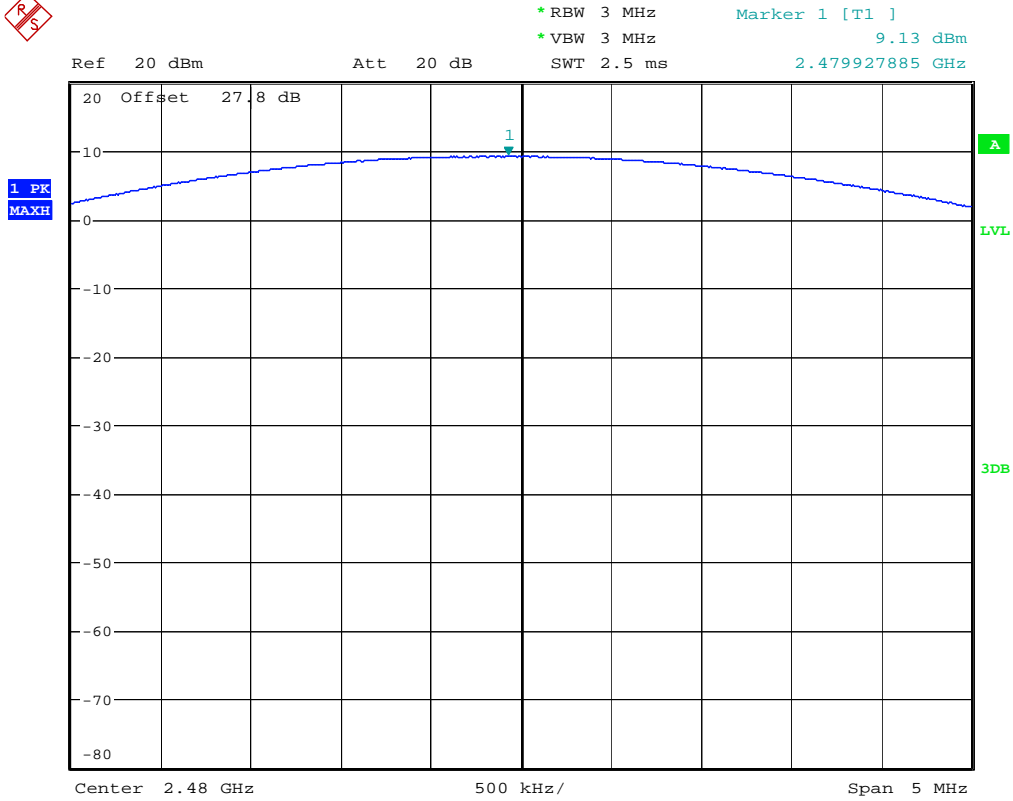
Date: 21.SEP.2011 11:30:06

**Peak Output Power – Low Channel**



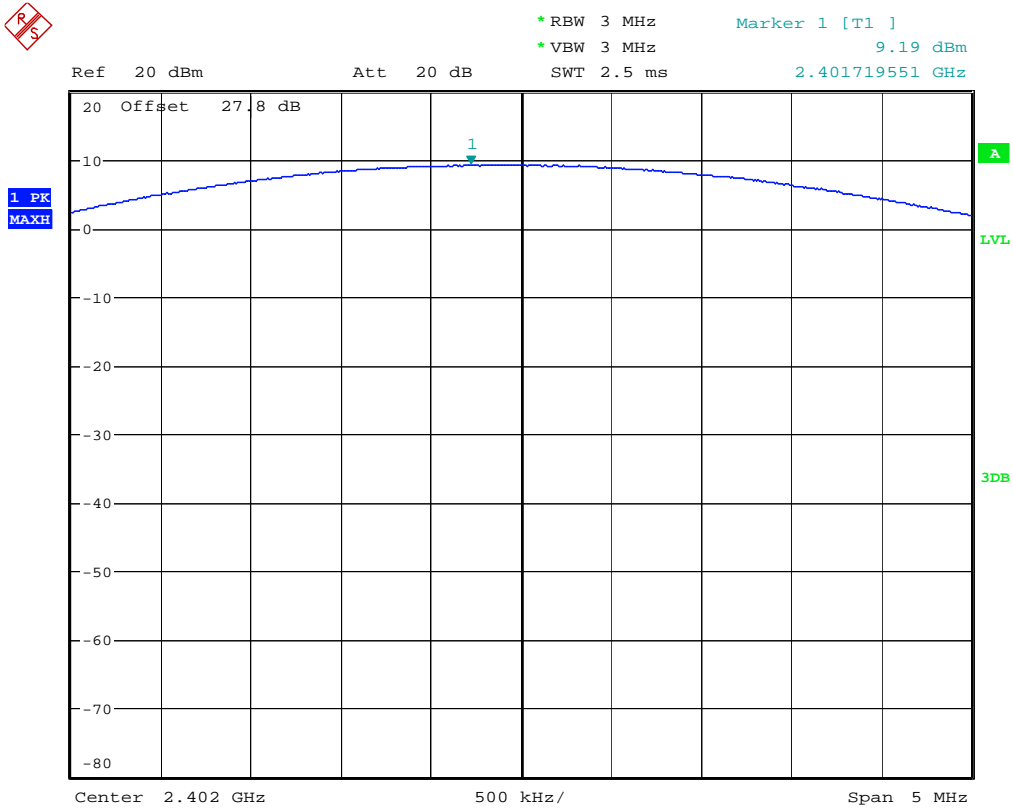
Date: 21.SEP.2011 11:31:02

### Peak Output Power – Mid Channel



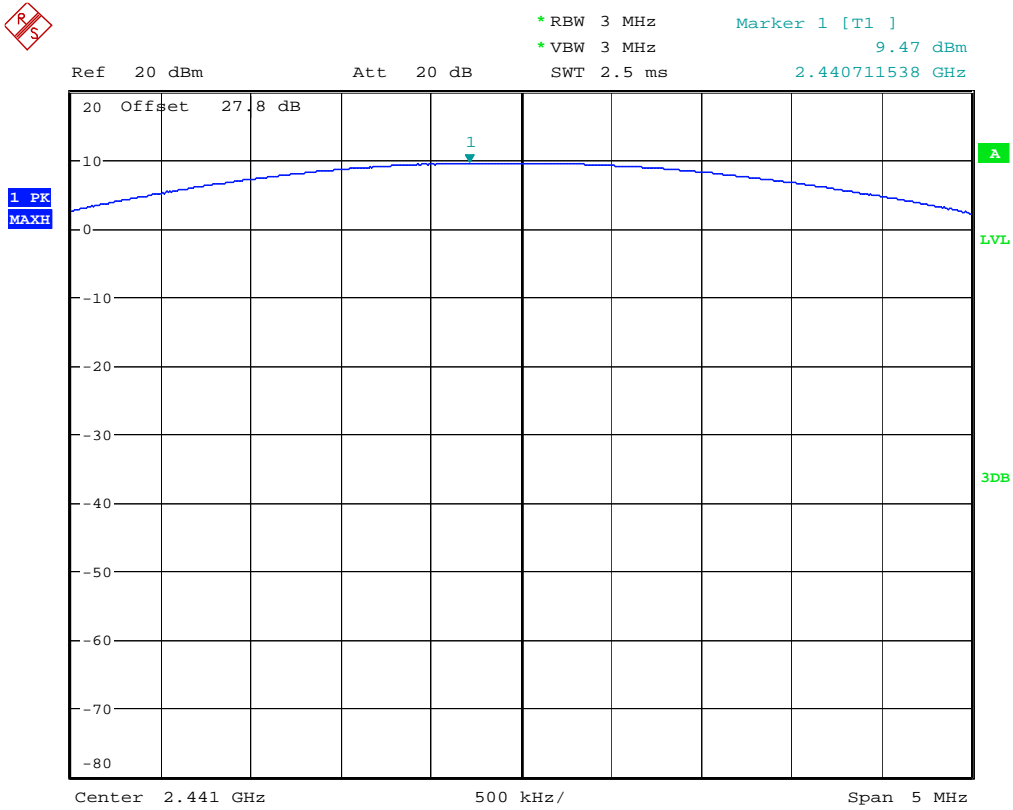
Date: 21.SEP.2011 11:31:50

### Peak Output Power – High Channel



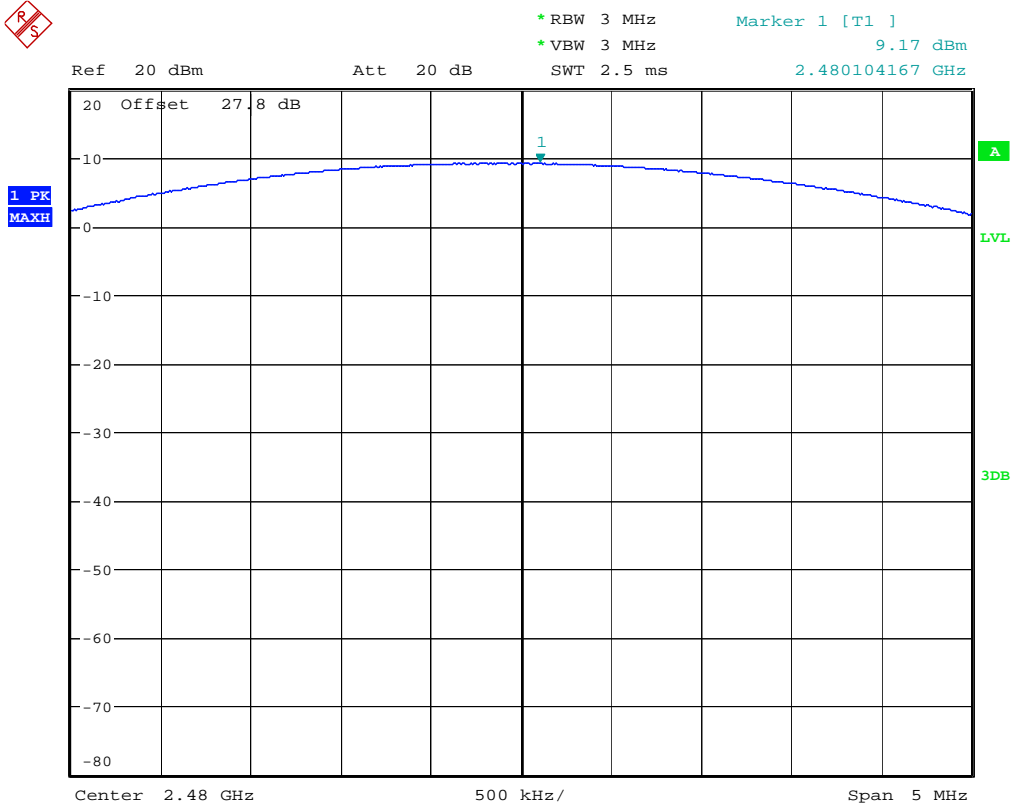
Date: 21.SEP.2011 11:32:56

### Peak Output Power EDR Mode – Low Channel



Date: 21.SEP.2011 11:33:38

### Peak Output Power EDR Mode – Mid Channel



Date: 21.SEP.2011 11:34:10

**Peak Output Power EDR Mode – High Channel**

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

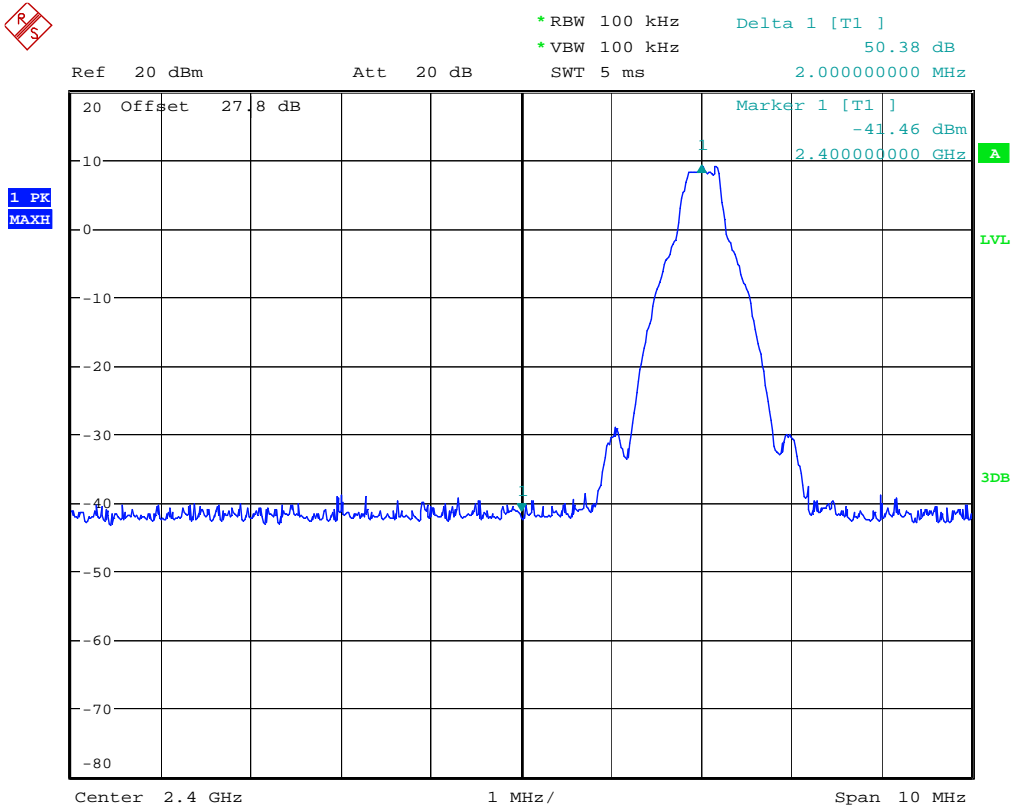
CFR 47 Part 15.247

**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 20dB passive attenuator. A fully charged battery was used for the supply voltage.

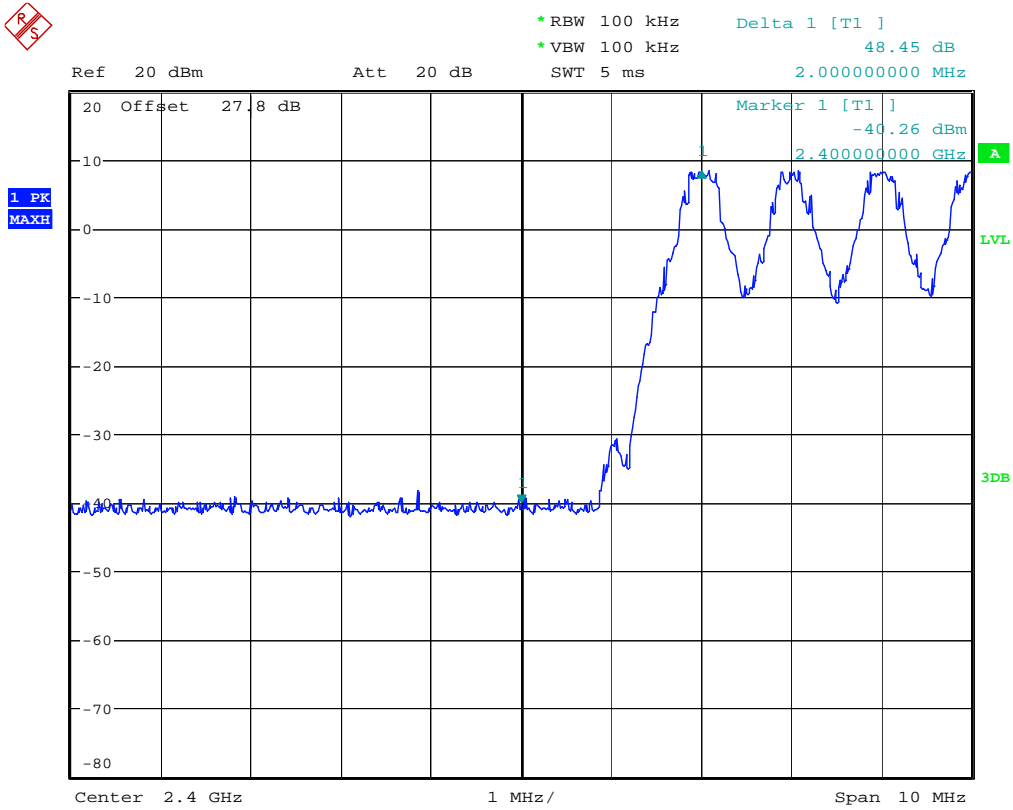
**Measurement Results**

See Attached:



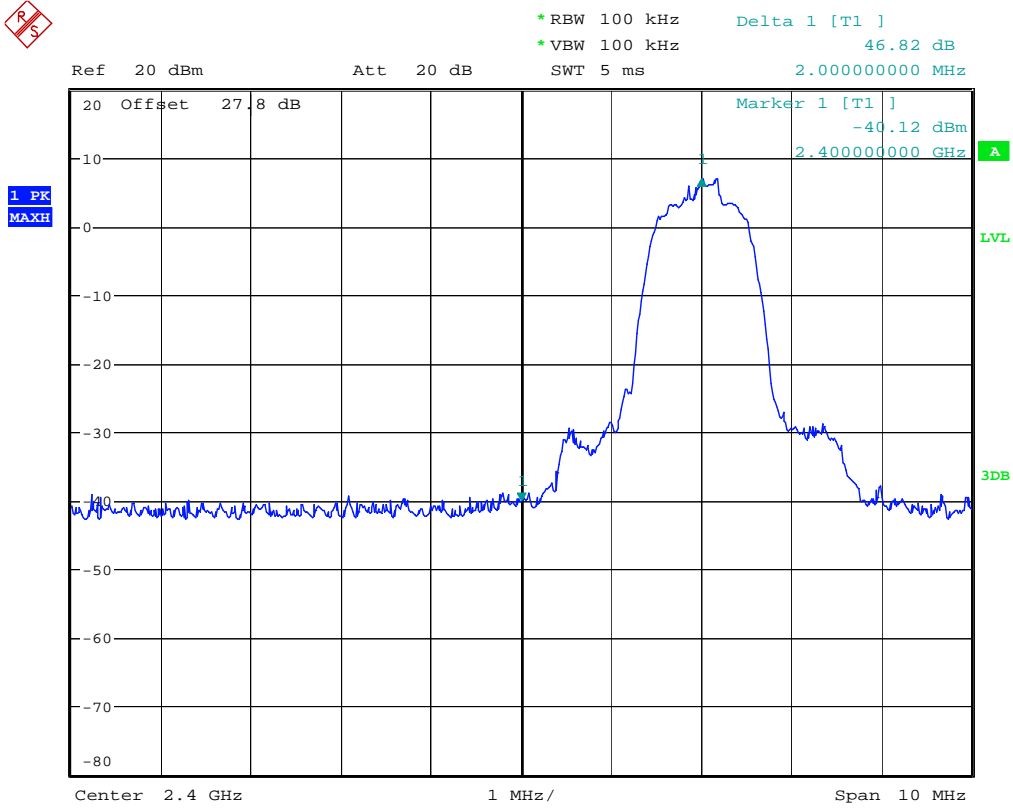
Date: 21.SEP.2011 11:36:43

### Low Band edge with Hopping Disabled



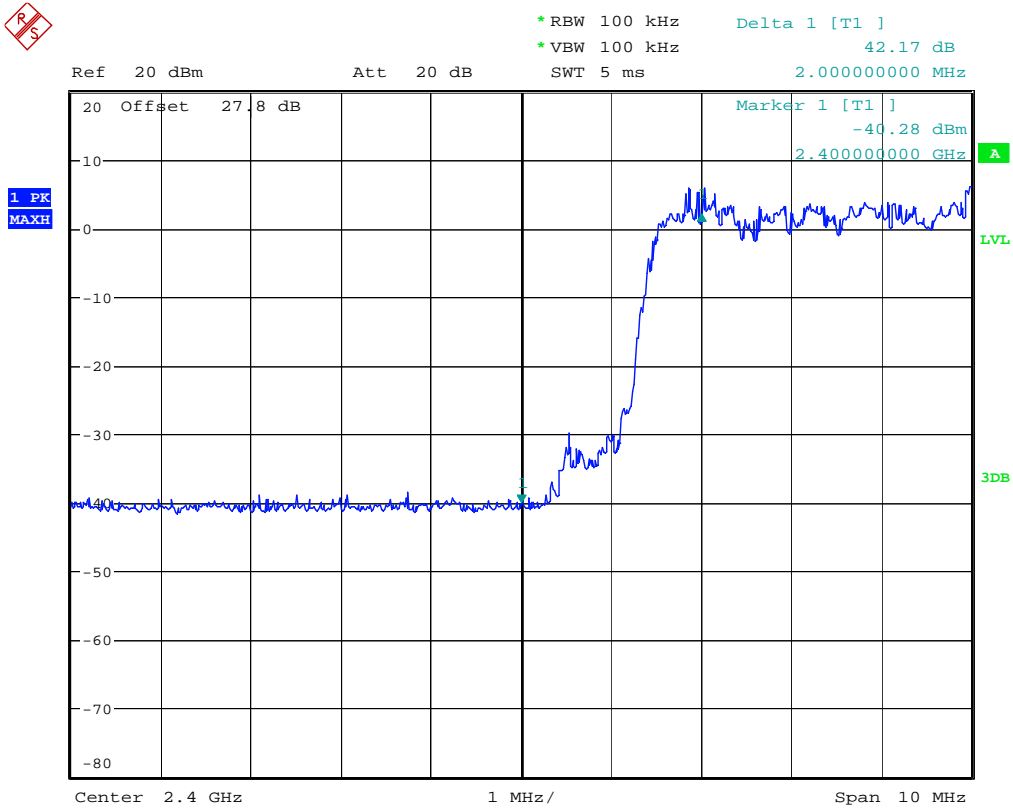
Date: 21.SEP.2011 11:50:22

### Low Band edge with Hopping Enabled



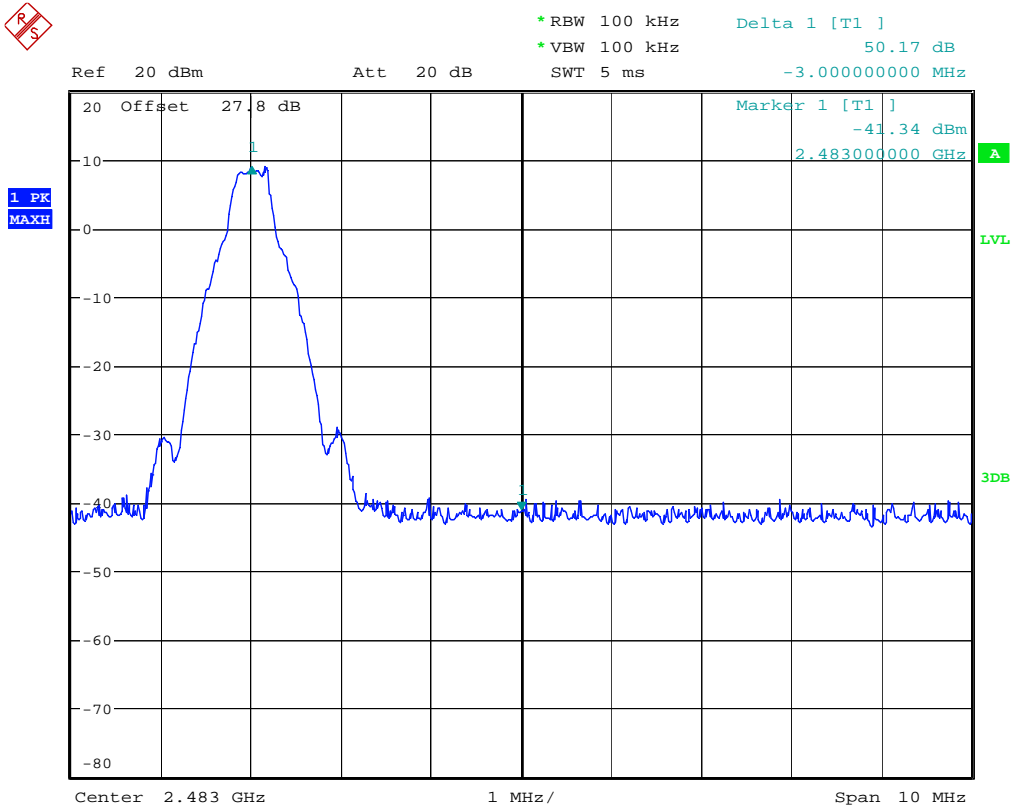
Date: 21.SEP.2011 11:40:20

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



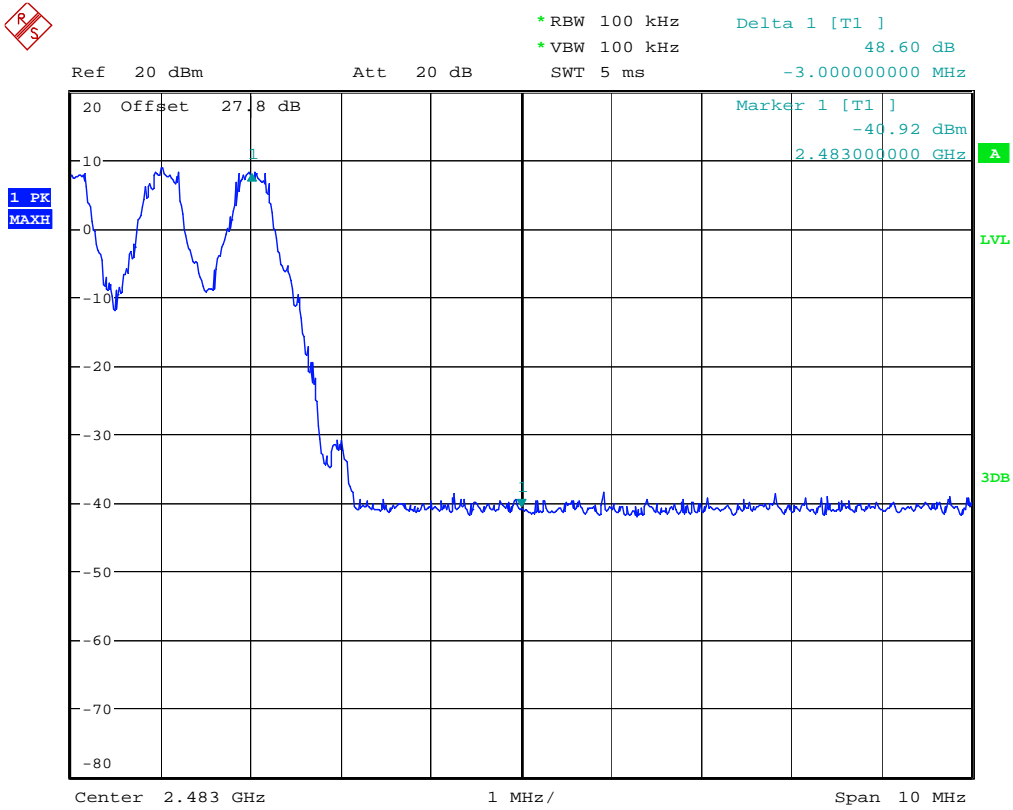
Date: 21.SEP.2011 11:48:19

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



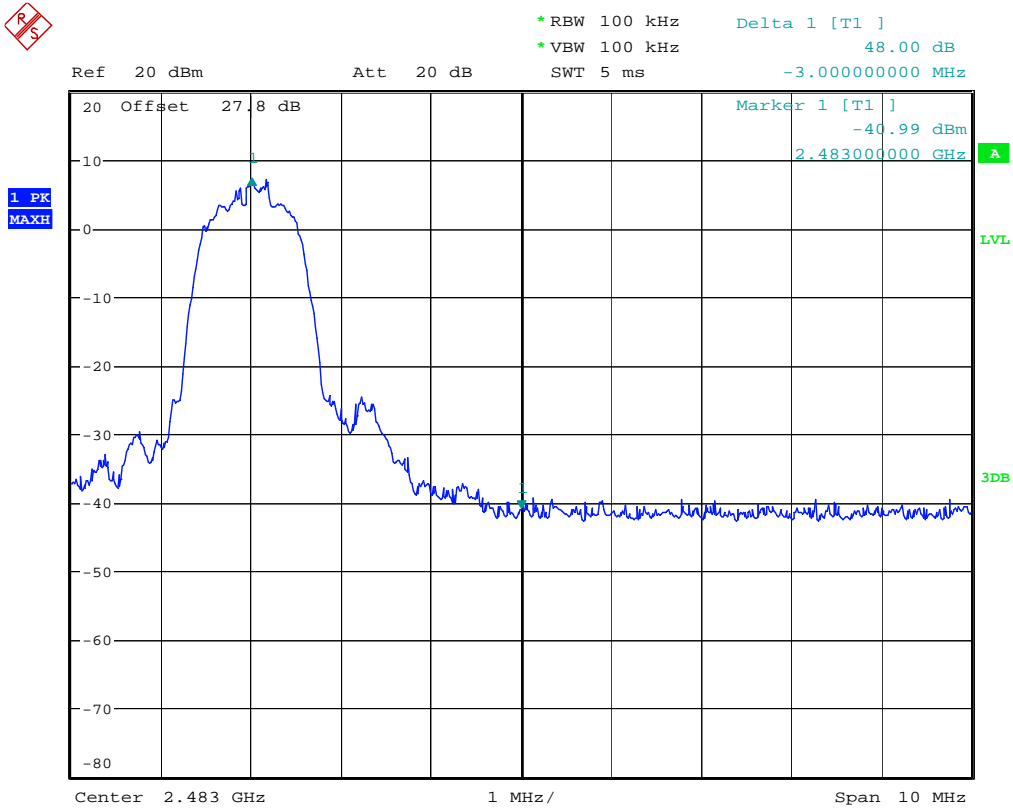
Date: 21.SEP.2011 11:38:22

### High Band edge with Hopping Disabled



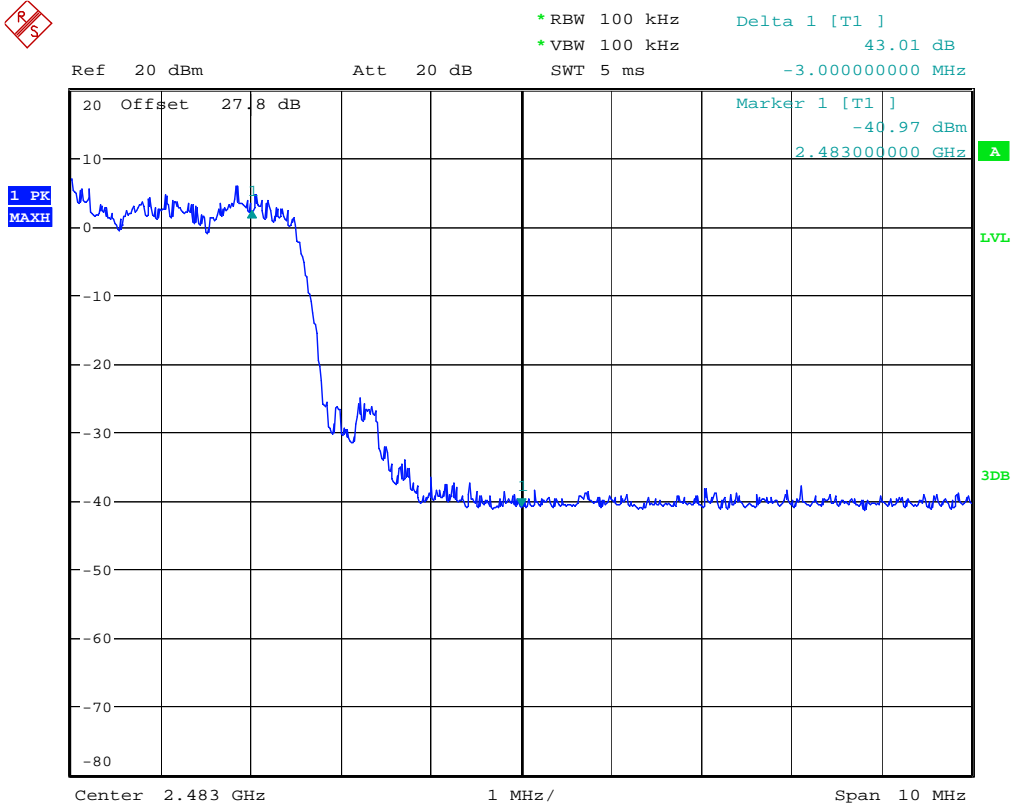
Date: 21.SEP.2011 11:52:16

### High Band edge with Hopping Enabled



Date: 21.SEP.2011 11:41:33

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



Date: 21.SEP.2011 11:45:19

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

**SPURIOUS RF CONDUCTED EMISSIONS**

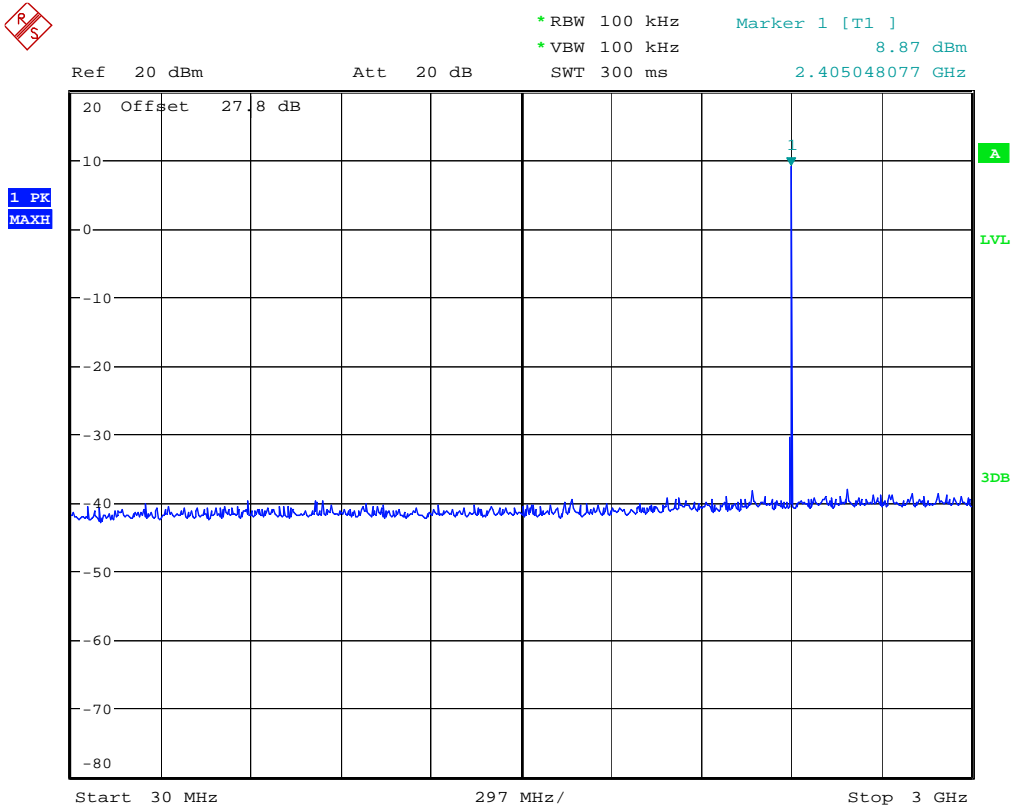
CFR 47 Part 15.247

**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 20dB passive attenuator. A fully charged battery was used for the supply voltage.

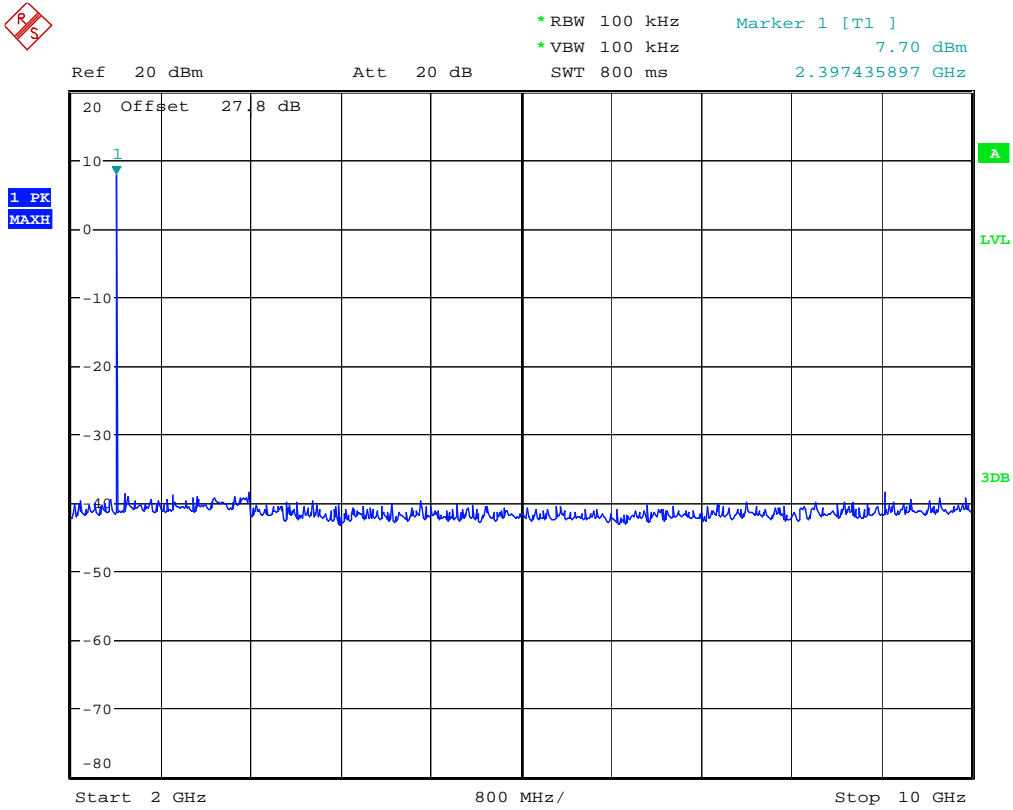
**Measurement Results**

See attached:



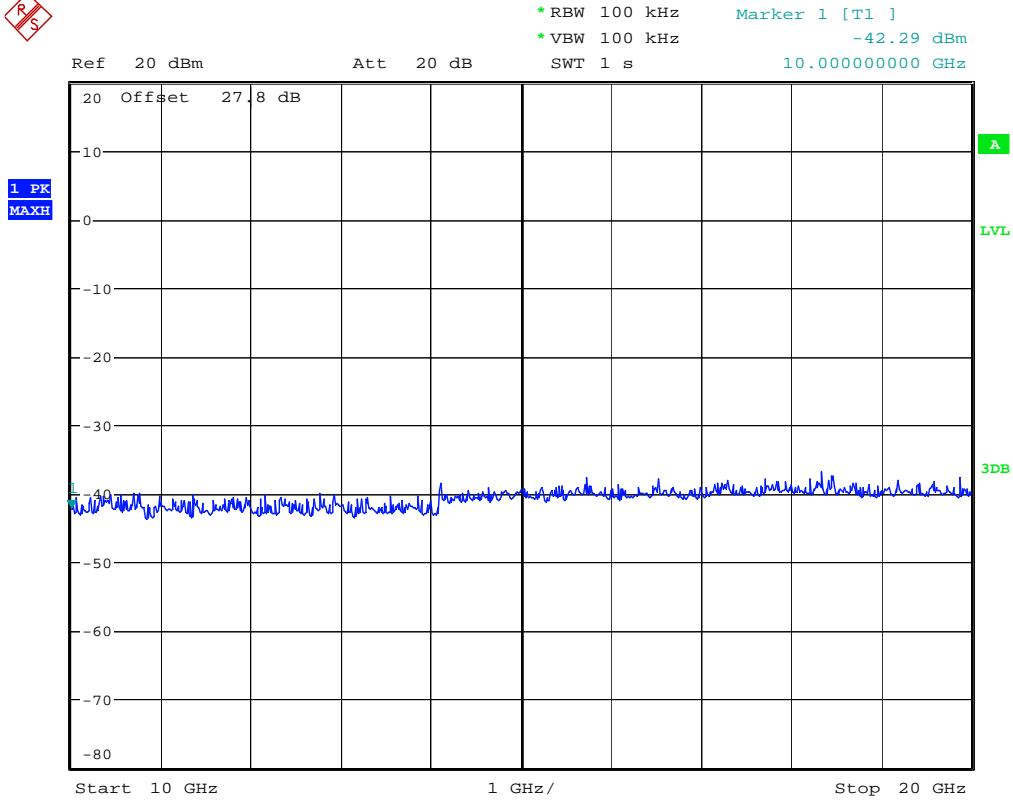
Date: 21.SEP.2011 12:27:56

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



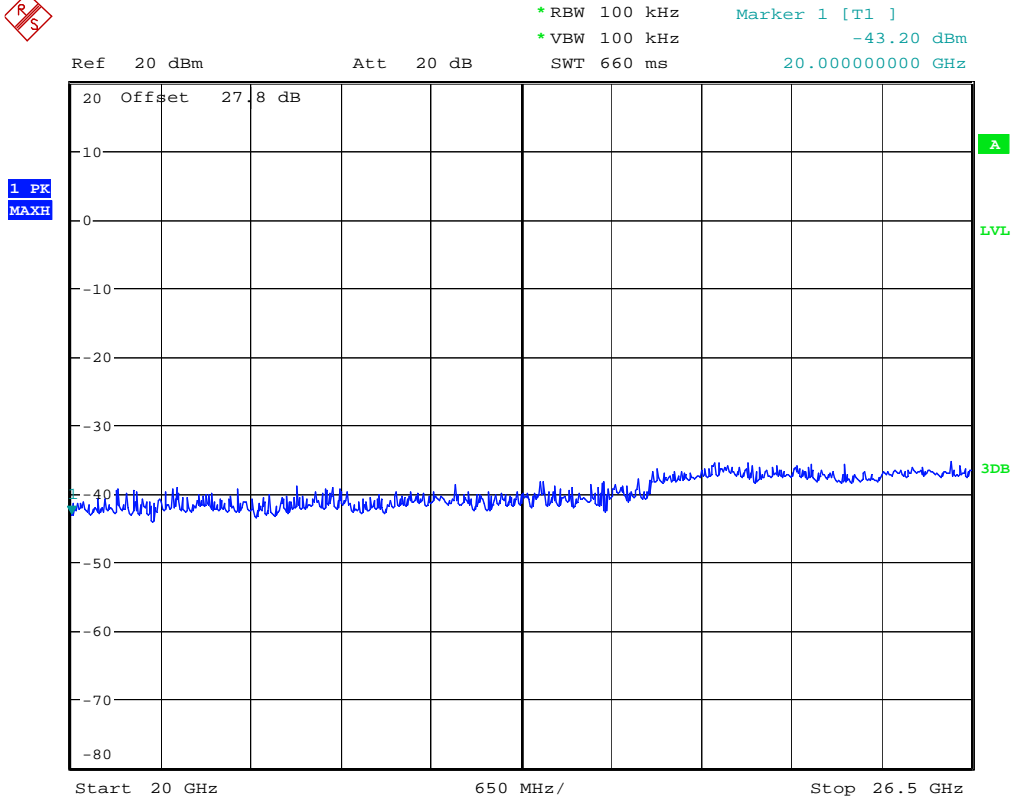
Date: 21.SEP.2011 12:28:52

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



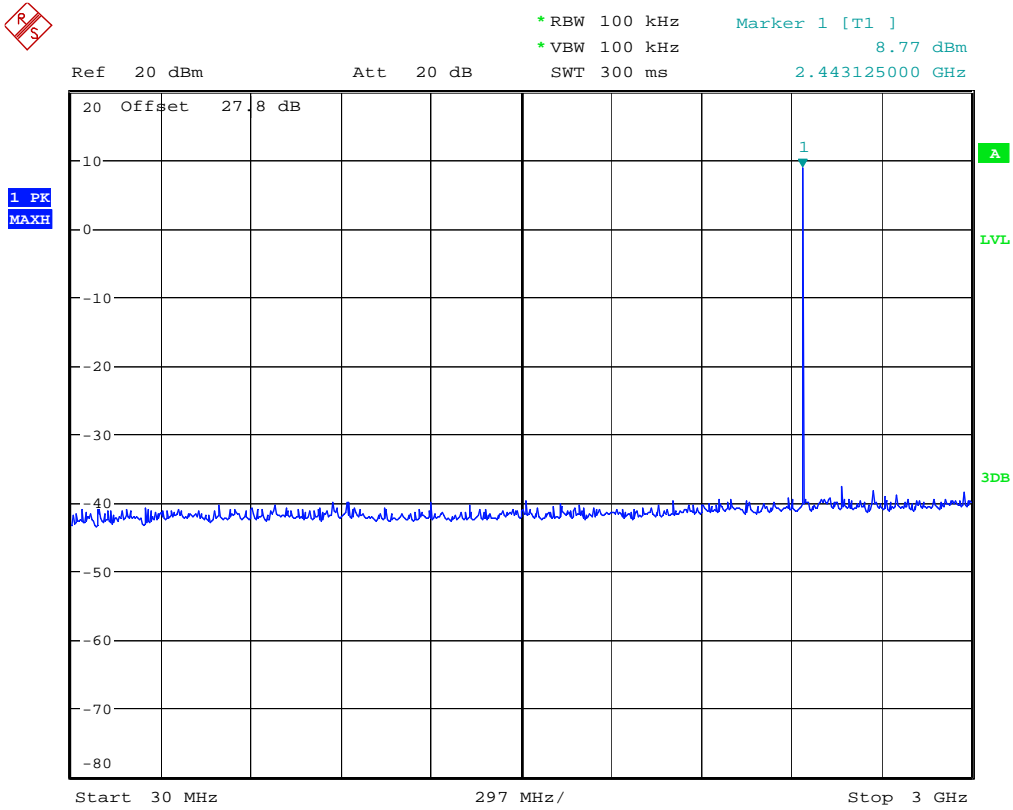
Date: 21.SEP.2011 12:29:30

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



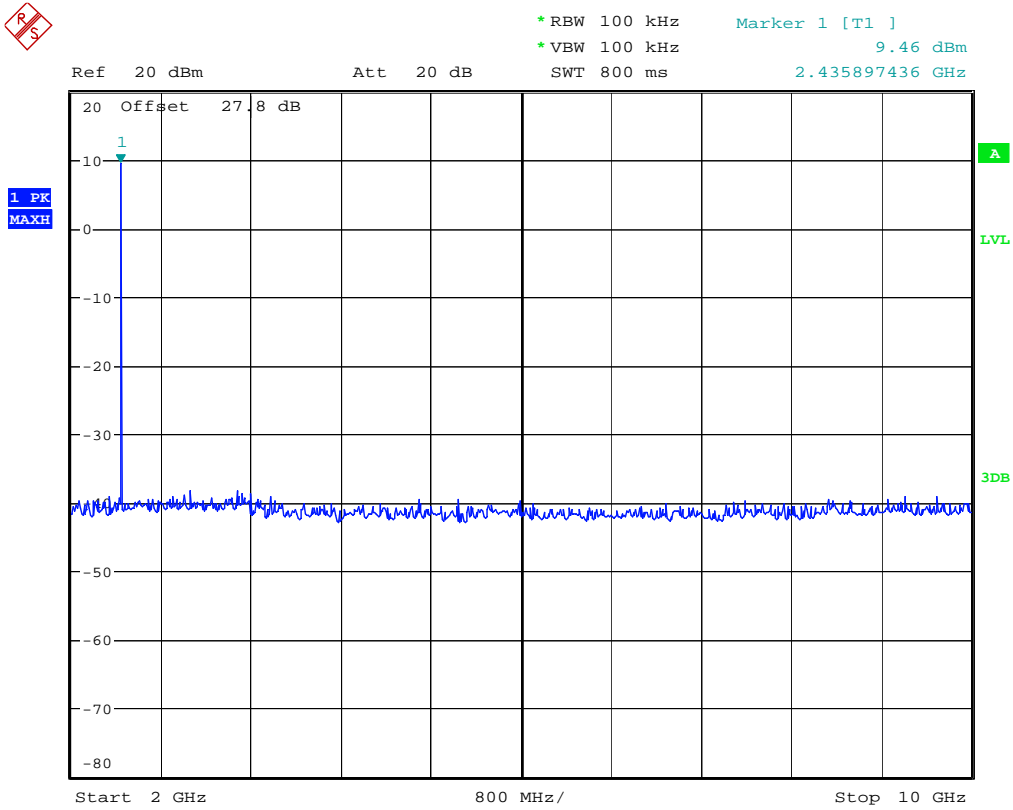
Date: 21.SEP.2011 12:30:05

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



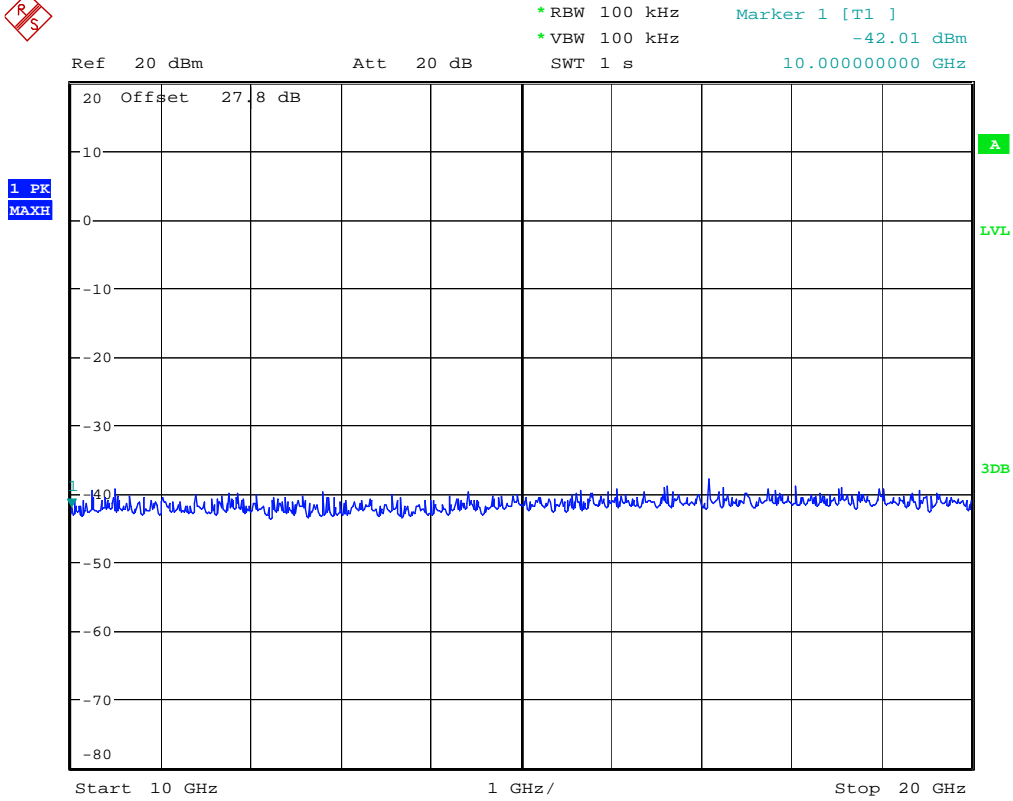
Date: 21.SEP.2011 12:30:51

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



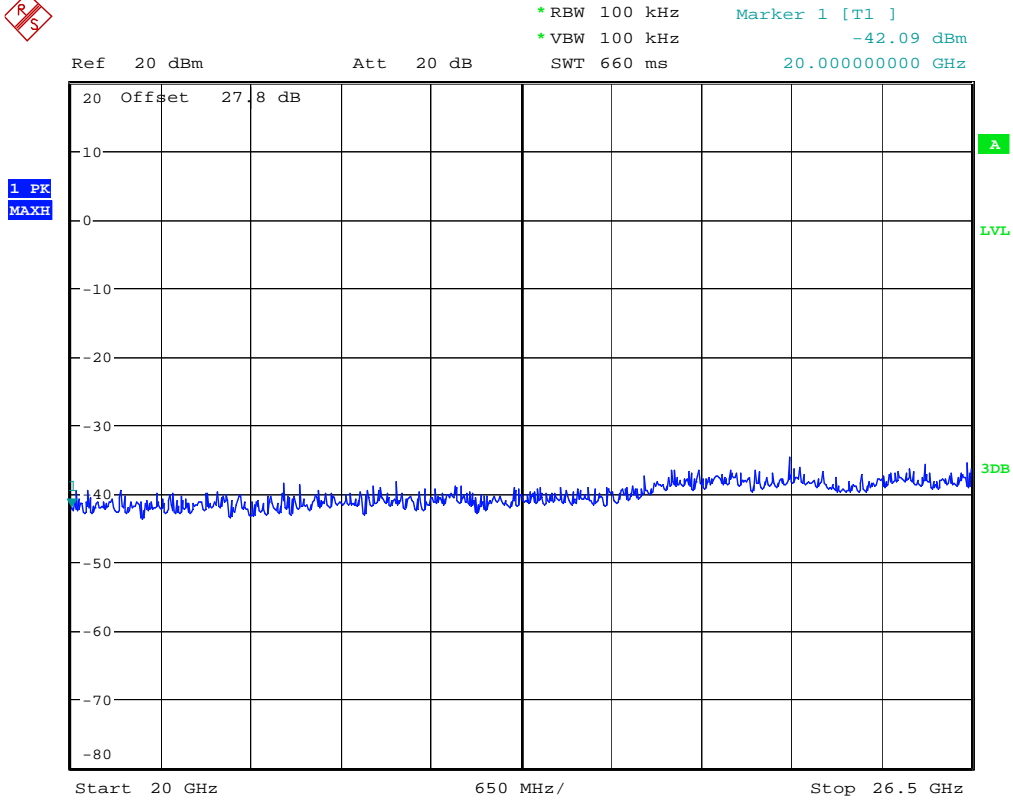
Date: 21.SEP.2011 12:31:21

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



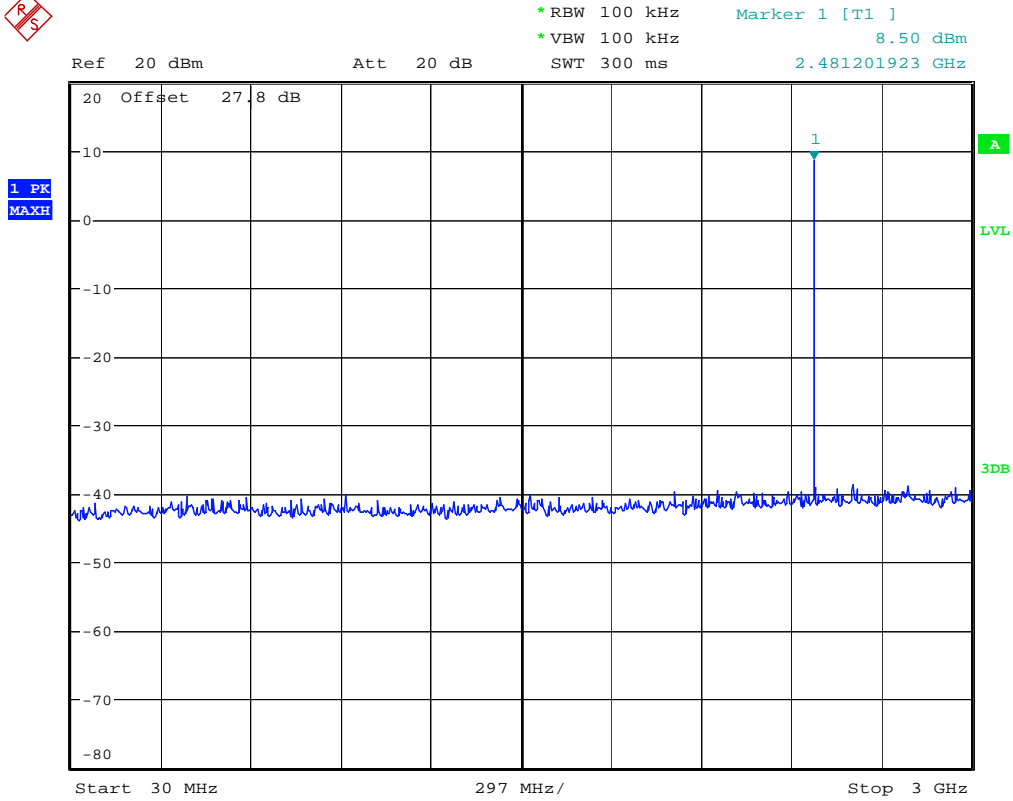
Date: 21.SEP.2011 12:31:33

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



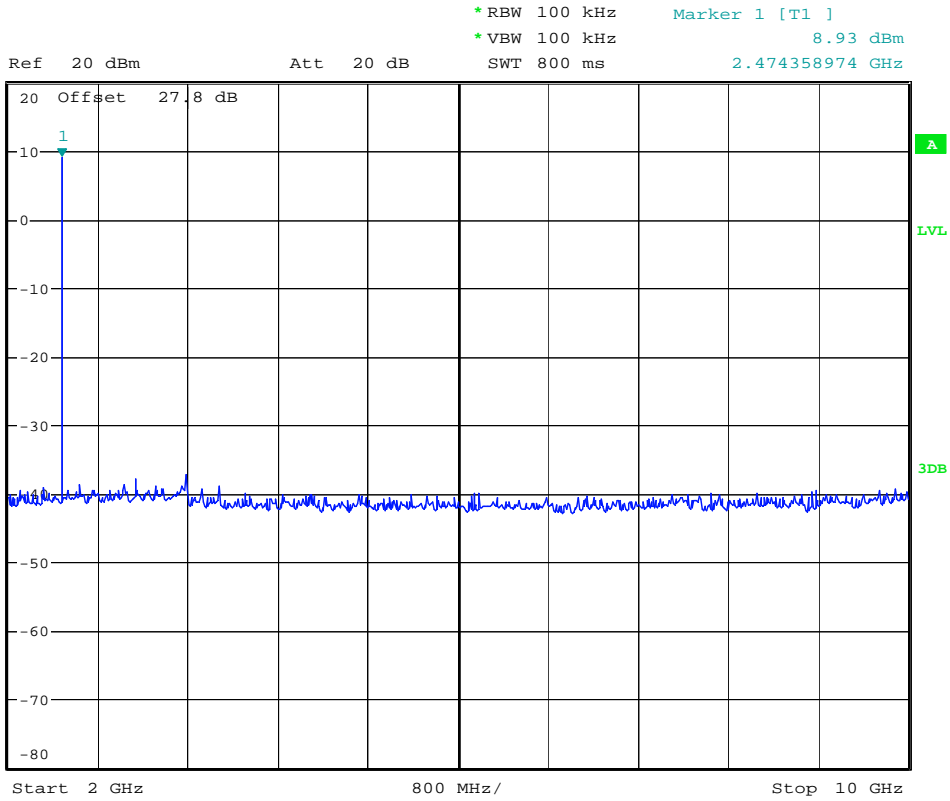
Date: 21.SEP.2011 12:31:47

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



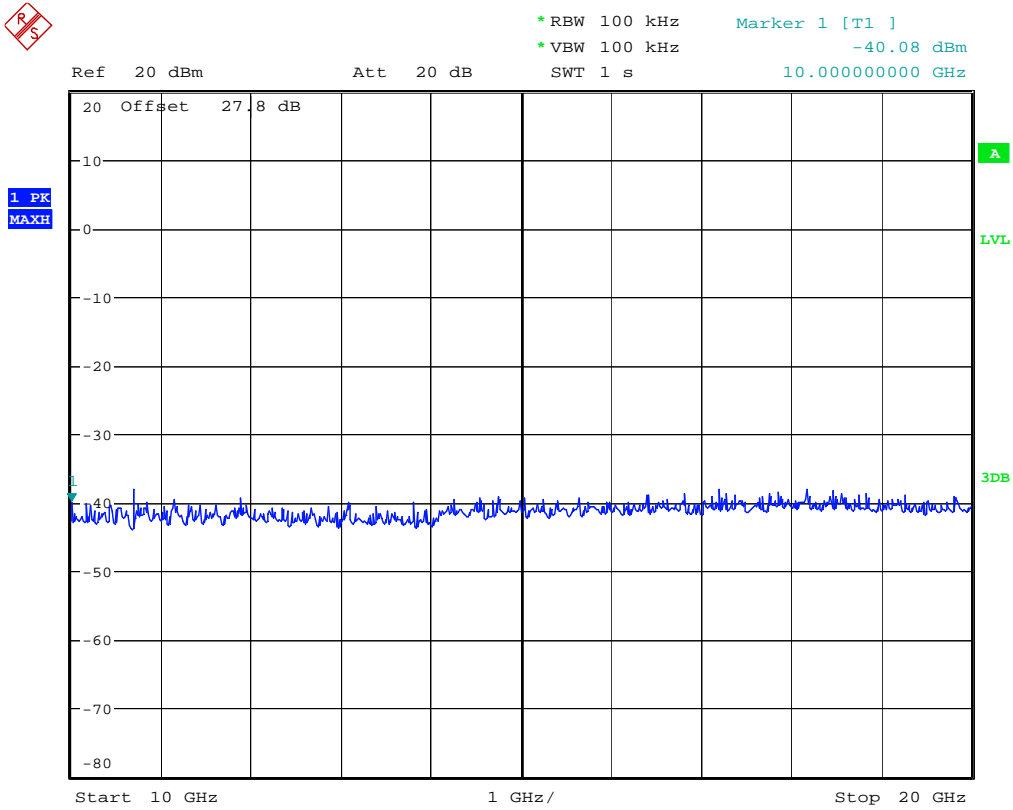
Date: 21.SEP.2011 12:32:21

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



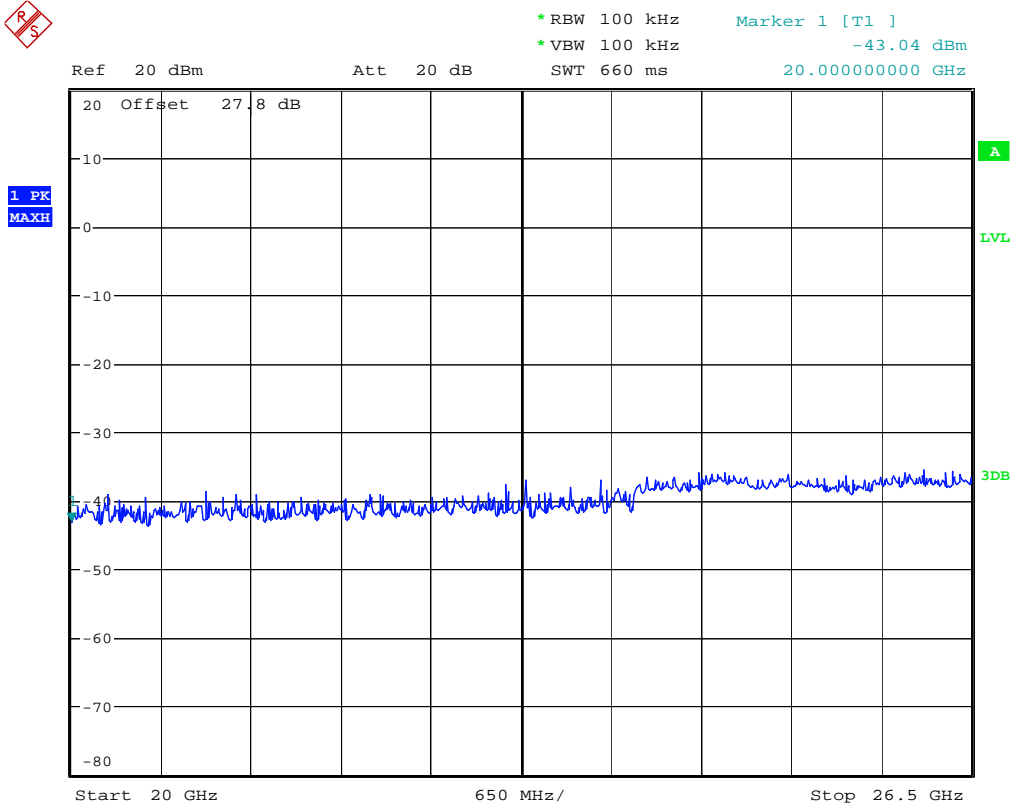
Date: 21.SEP.2011 12:32:54

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



Date: 21.SEP.2011 12:33:08

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



Date: 21.SEP.2011 12:33:34

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

**AC LINE CONDUCTED**

CFR 47 Part 15.207

**Measurement Procedure**

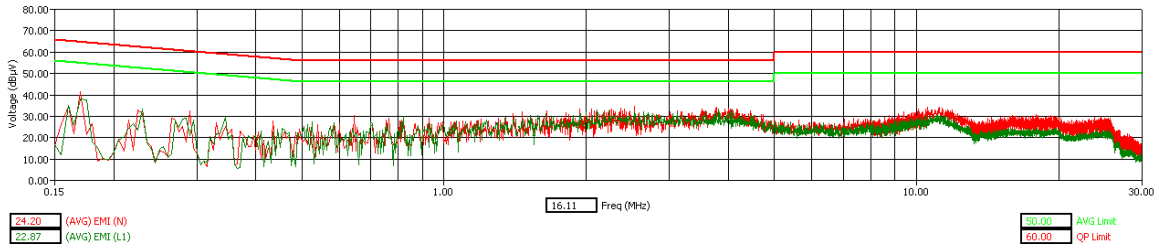
Measured levels of ac power line conducted emission shall be the radio-noise voltage from the line probe or across the 50 Ω LISN port, where permitted, terminated into a 50 Ω noise meter, or where permitted or required, the radio-noise current on the power line sensed by a current probe.

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 Ω measuring port is terminated by a 50 Ω radio-noise meter or a 50 Ω resistive load. All other ports are terminated in 50 Ω.

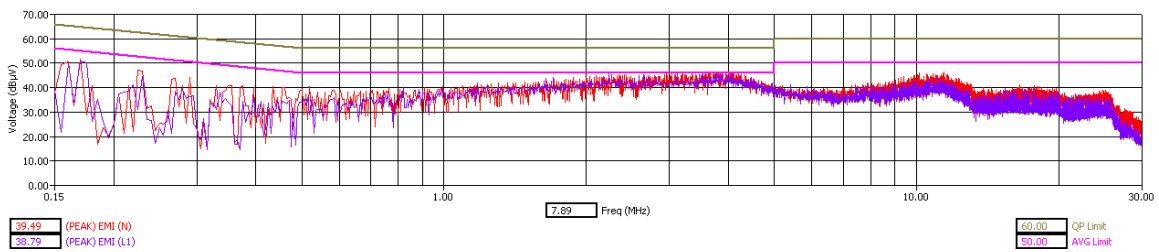
Detectors – Peak and Average Detector

**Measurement Results**

See attached:



**Bluetooth – Hopping - Tx Mode – AVG Detector**



**Bluetooth – Hopping - Tx Mode – Peak Detector**

**End of Test Report**