MOTOROLA MOBILITY

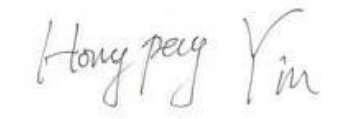
# PRODUCT SAFETY AND COMPLIANCE
# EMC LABORATORY

# EMC TEST REPORT - Addendum

**Test Report Number** –24935-1 BT

**Report Date** – 2012-03-16

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: 2012-03-26 to 2012-03-15

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: 2012-04-16

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

FCC Registration Number: 402854
IC Registration Number: 109AW-1

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

ilac-MRA UKAS TESTING

**UKAS Certificate Number: 2404**

# Table of Contents

# Test Report Details

| | |
|---|---|
| Tests Performed By: | Motorola (Beijing) Mobility Technologies Co., Ltd.<br>Asia Global Compliance Labs<br>No.1 Wang Jing East Road<br>Chao Yang District<br>Beijing, 100102, P. R. China<br>Phone: +86 10 8499 5891<br>FCC Registration Number: 402854<br>IC Registration Number: 109AW-1 |
| Tests Requested By: | Motorola Mobility Inc.<br>600 North US Hwy 45<br>Libertyville, IL 60048 |
| Product Type: | Cell phone with embedded Bluetooth |
| Signaling Capability: | GSM1900, EDGE1900, Bluetooth, 802.11b/802.11g/802.11n |
| IMEI: | 351915050001704 |
| FCC ID: | IHDT56NH1 |
| Project number: | 24935-1 |
| Testing Complete Date: | 2012-03-15 |

# 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.

FCC Public Notice 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 Cellular Phone hereinafter referred to as the Equipment under Test or EUT was tested using a fully charged model SNN5899A_EB20 1750mAh 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. 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 | 100036 | 11/08/10 |
| 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 $dB_i$. If transmitting antennas of directional gain greater than 6 $dB_i$ 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 $dB_i$.

The antenna employed by this transmitter is intended to be omni-directional, and thus will not exhibit directional gain in excess of 6 $dB_i$. 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.

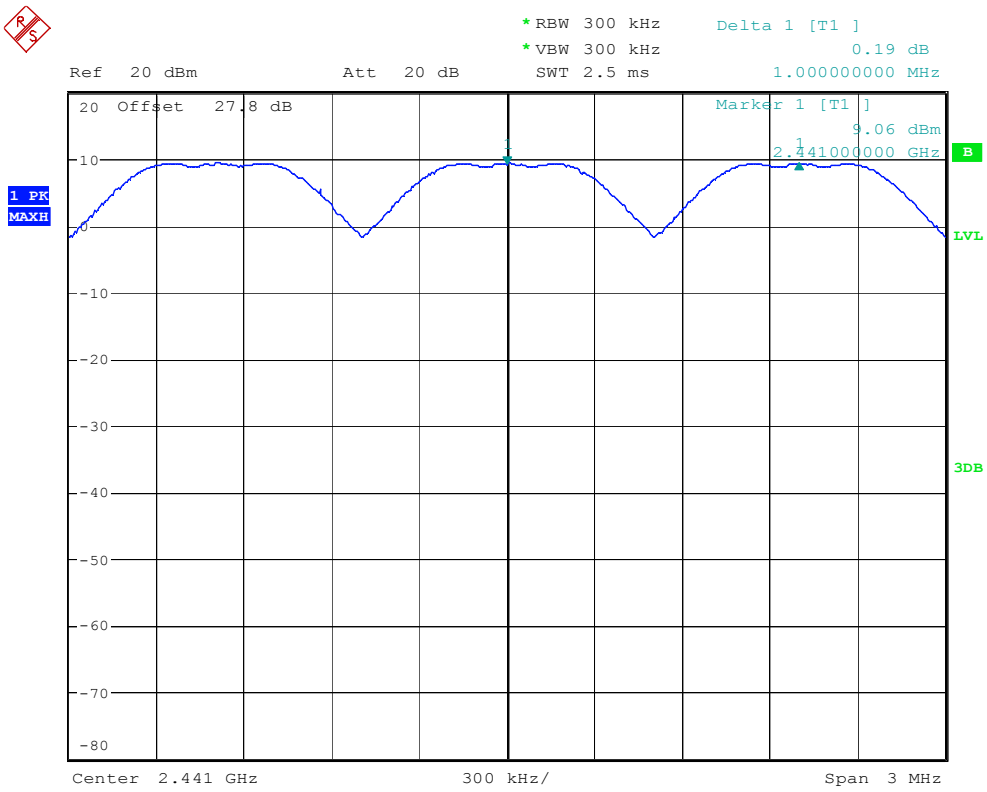
The Bluetooth transmitter of the EUT had its hopping function enabled. The following spectrum analyzer settings were used:

1. Span = wide enough to capture the peaks of two adjacent channels
2. Resolution (or IF) Bandwidth (RBW) ≥ 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.




Date: 29.FEB.2012 04:26:07

## 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.

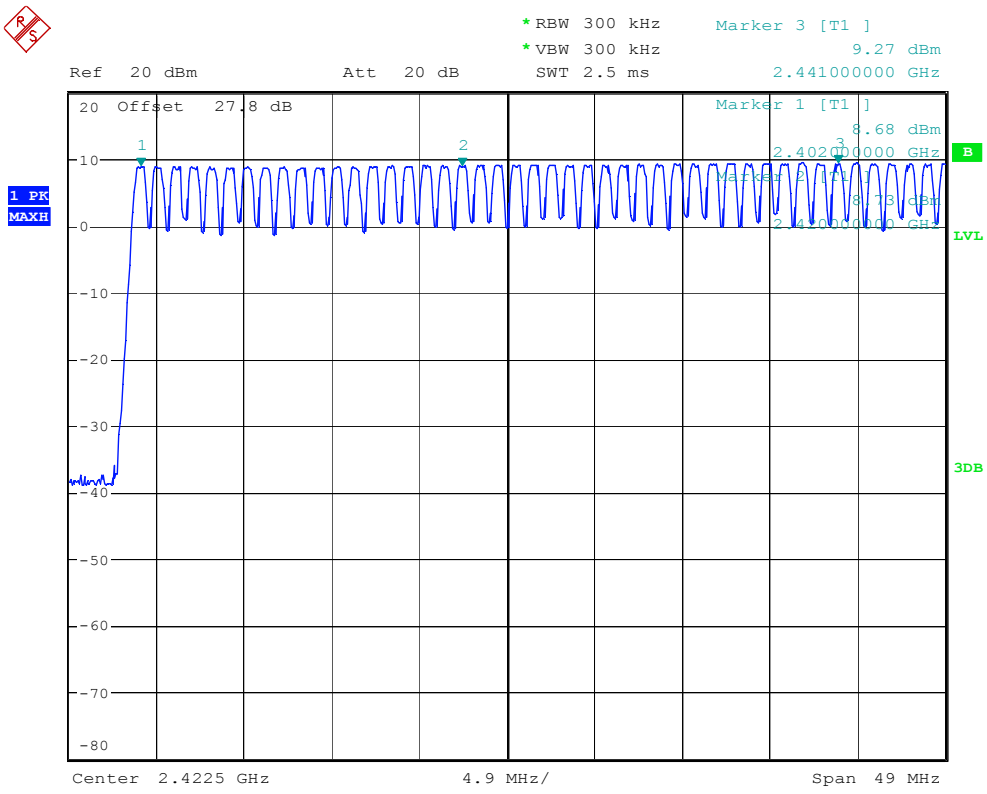
The Bluetooth frequency hopping function of the EUT was enabled. The spectrum analyzer used the following settings:

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

The trace was allowed to stabilize.

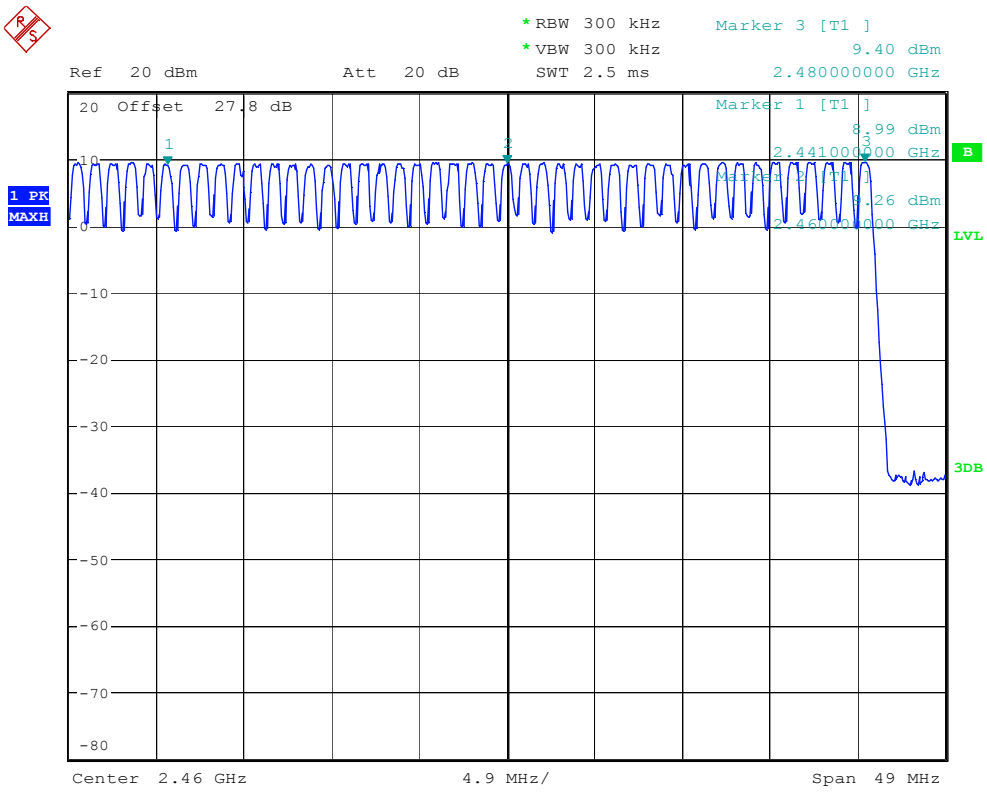
## Measurement Results

See attached.




Date: 29.FEB.2012 04:29:01

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




Date: 29.FEB.2012 04:30:56

**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.

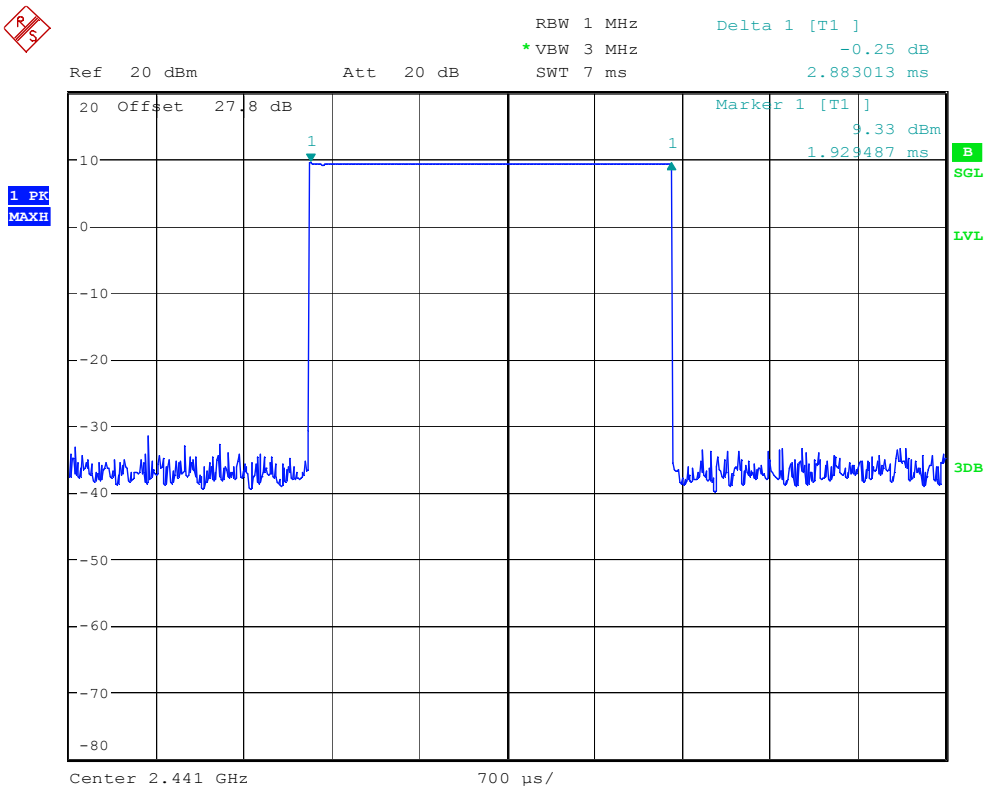
The Bluetooth hopping function of the EUT was enabled. The following spectrum analyzer settings were used:

1. Span = zero span, centered on a hopping channel
2. RBW = 1 MHz
3. VBW ≥ 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: 29.FEB.2012 04:37:19

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 ≥ 1% of the 20dB span
3. VBW ≥ RBW
4. Sweep = auto
5. Detector function = peak
6. Trace = max hold

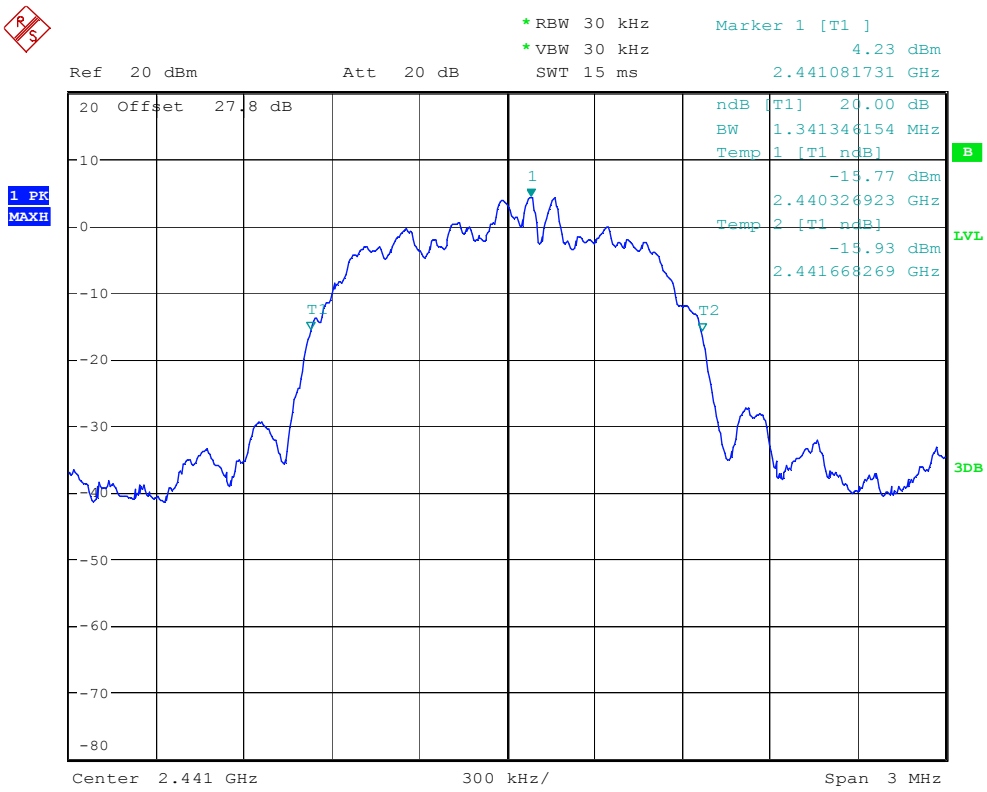
The trace was allowed to stabilize. The EUT was transmitting at its maximum data rate. The marker-to-peak function was used to set the marker to the peak of the emission. The n dB down function was used to measure 20dB down one side of the emission. The n dB down function and marker was moved to the 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: 29.FEB.2012 04:41:20

## 20dB Bandwidth




Date: 29.FEB.2012 21:18:10

## 20dB Bandwidth EDR Mode

## PEAK OUTPUT POWER

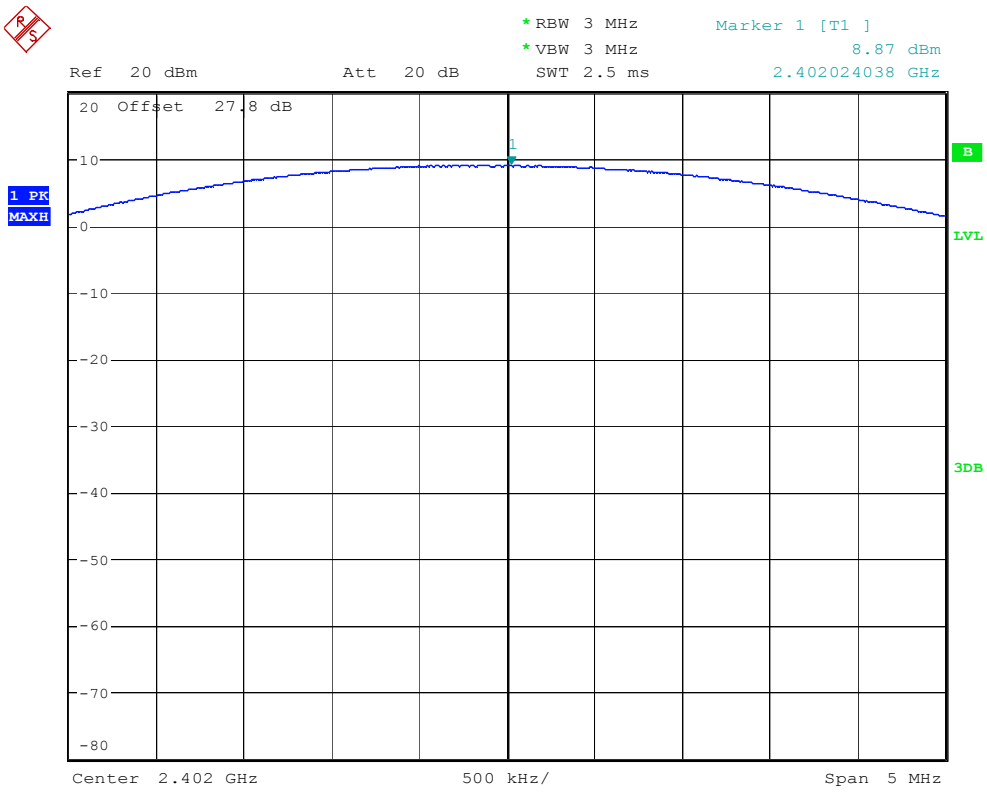
CFR 47 Part 15.247

## 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

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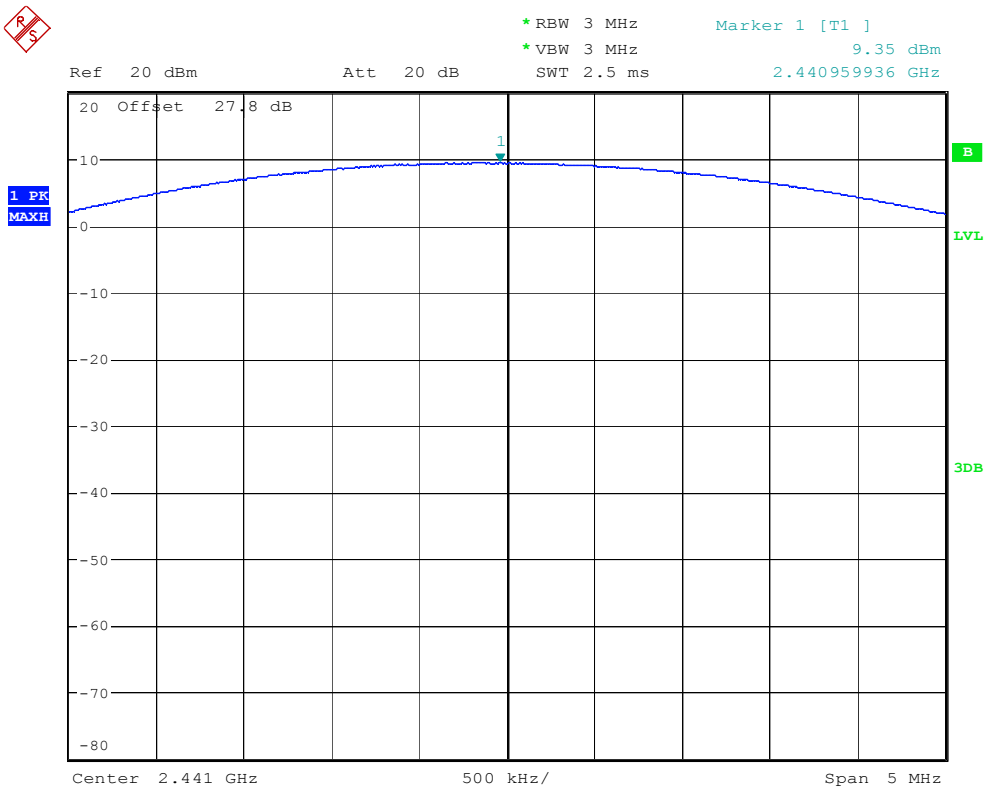
**Peak Output Power – Low Channel**

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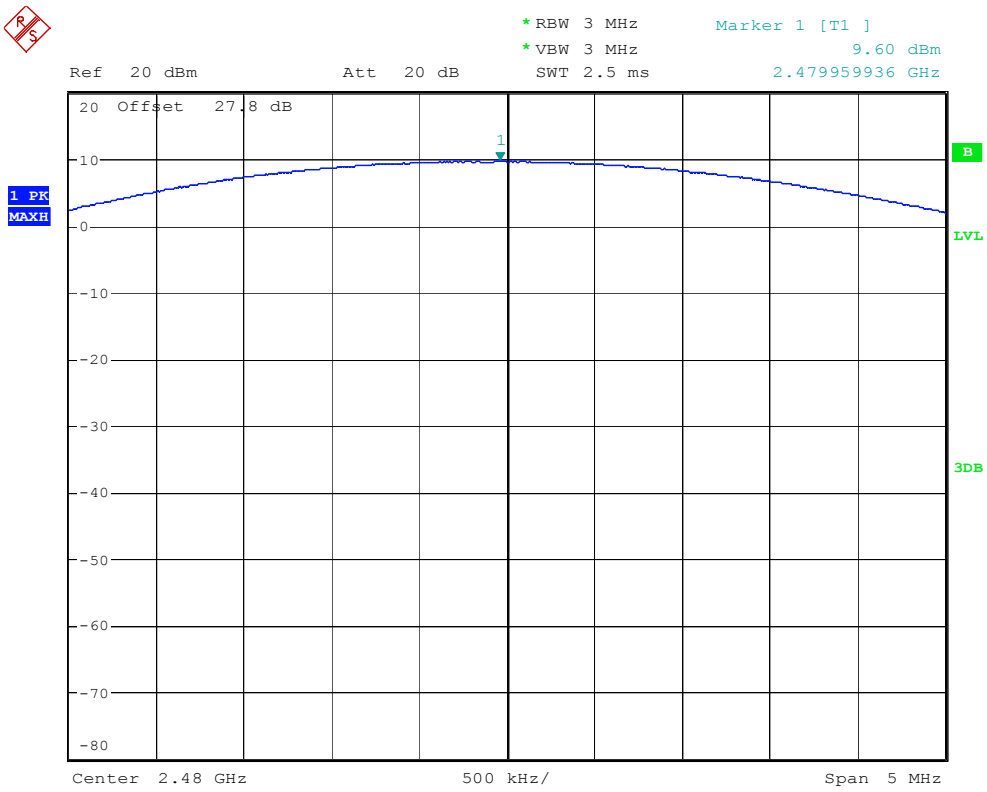
**Peak Output Power – Mid Channel**

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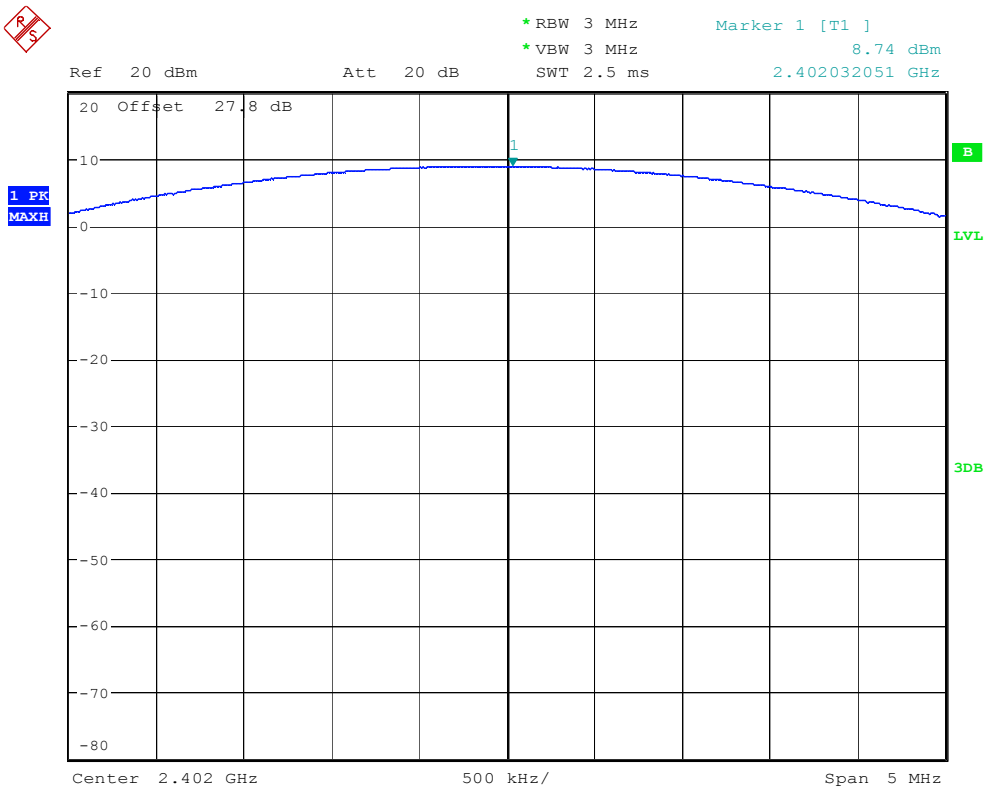
**Peak Output Power – High Channel**

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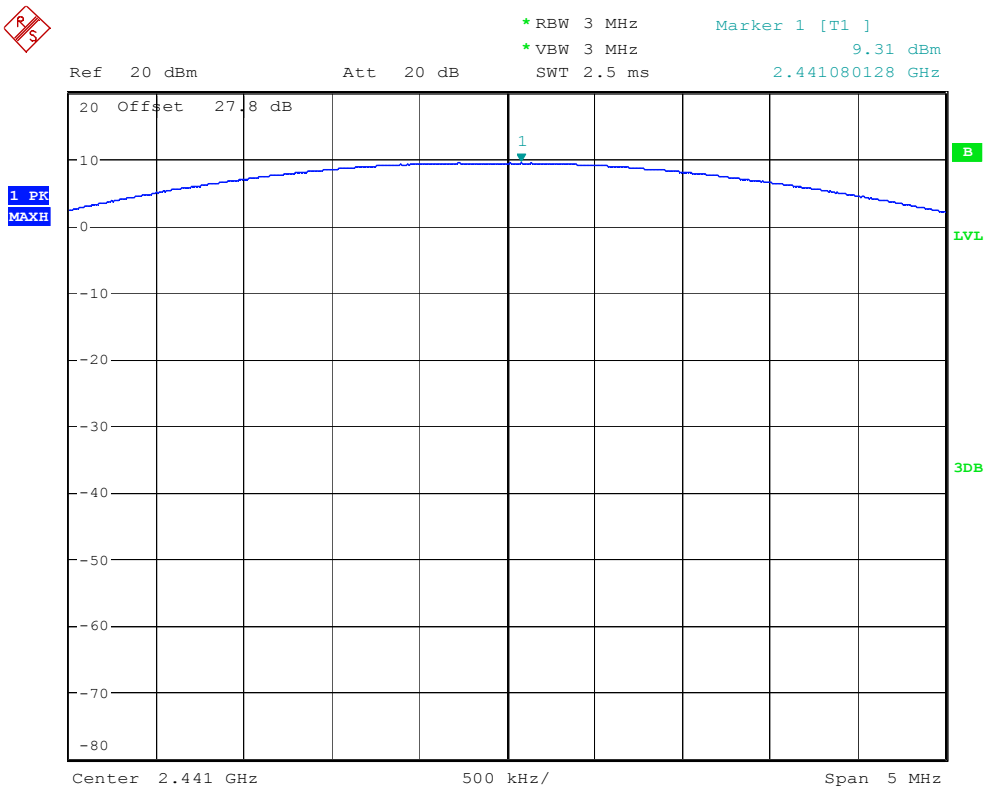
**Peak Output Power EDR Mode – Low Channel**

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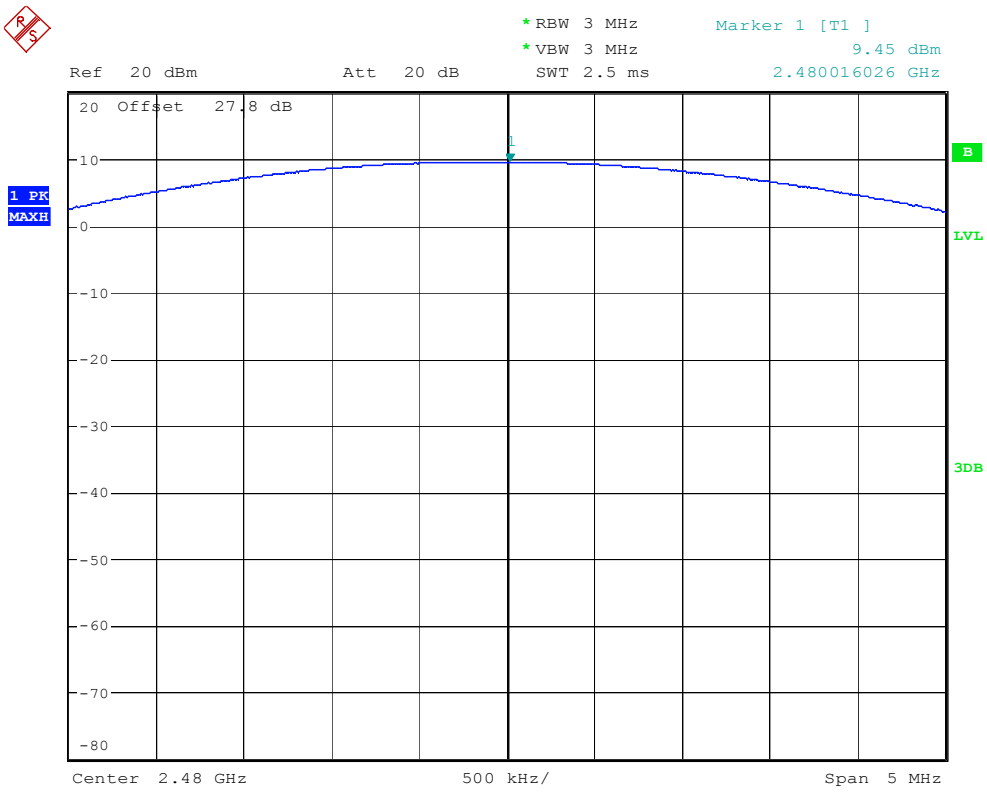
**Peak Output Power EDR Mode – Mid Channel**




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

# BAND-EDGE COMPLIANCE OF RF CONDUCTED EMISSIONS

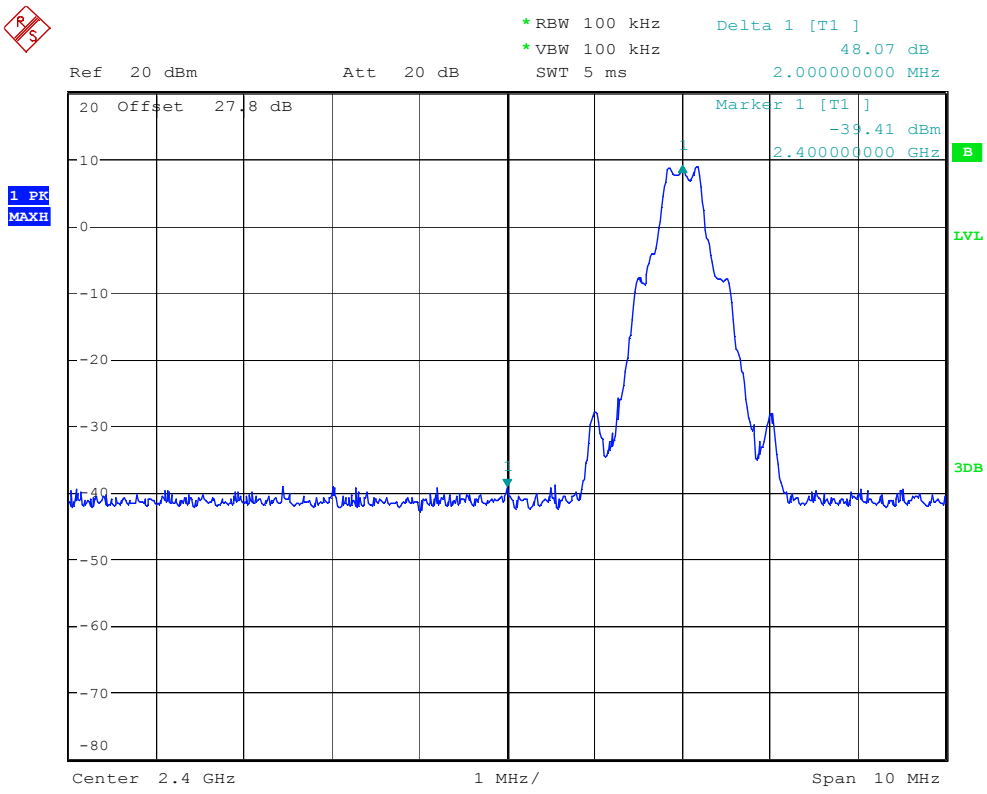
CFR 47 Part 15.247

## 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:

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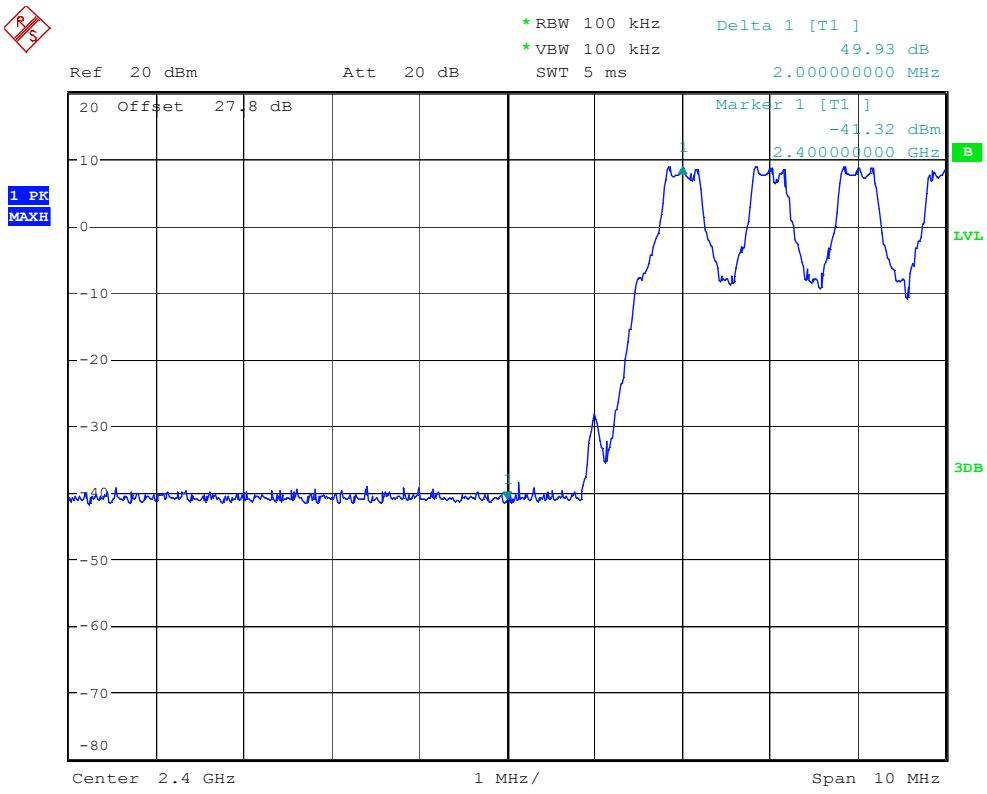
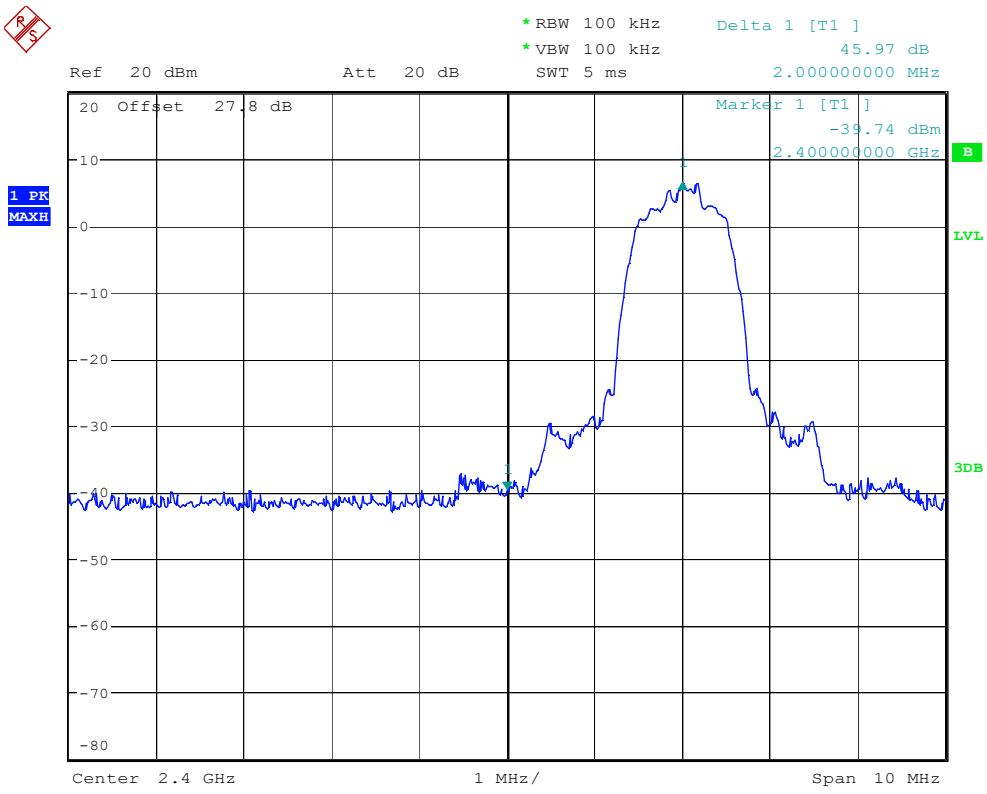
**Low Band edge with Hopping Disabled**




Date: 29.FEB.2012 04:55:49

**Low Band edge with Hopping Enabled**

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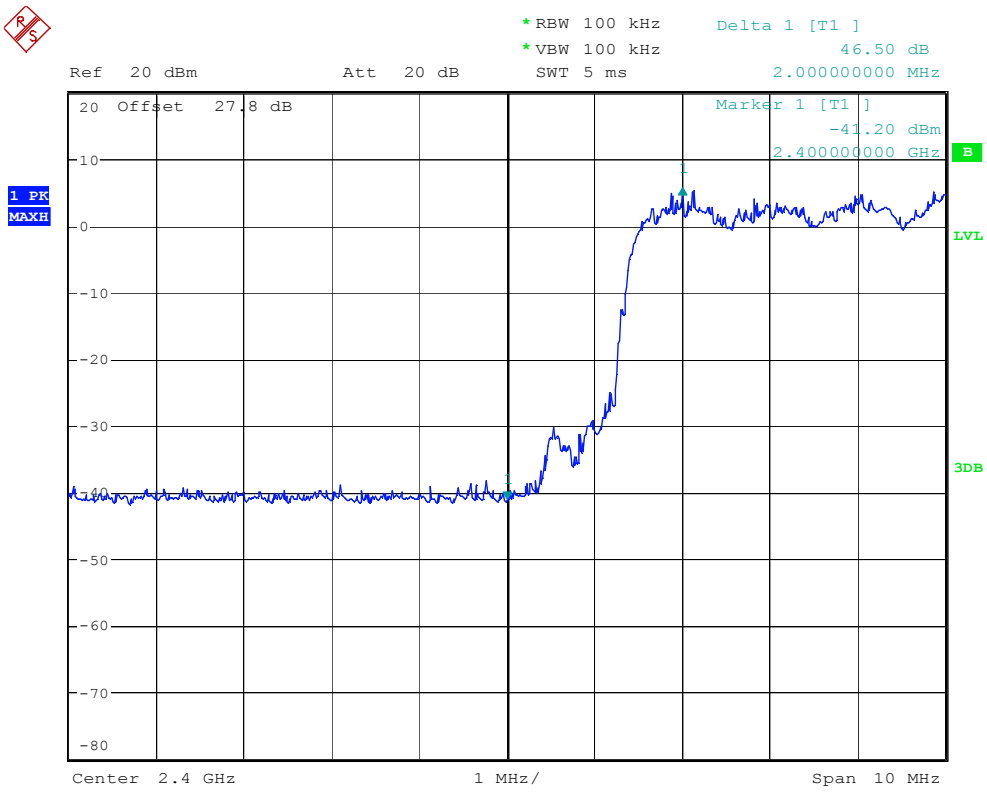
**Low Band Edge with Hopping Disabled (EDR MODE)**

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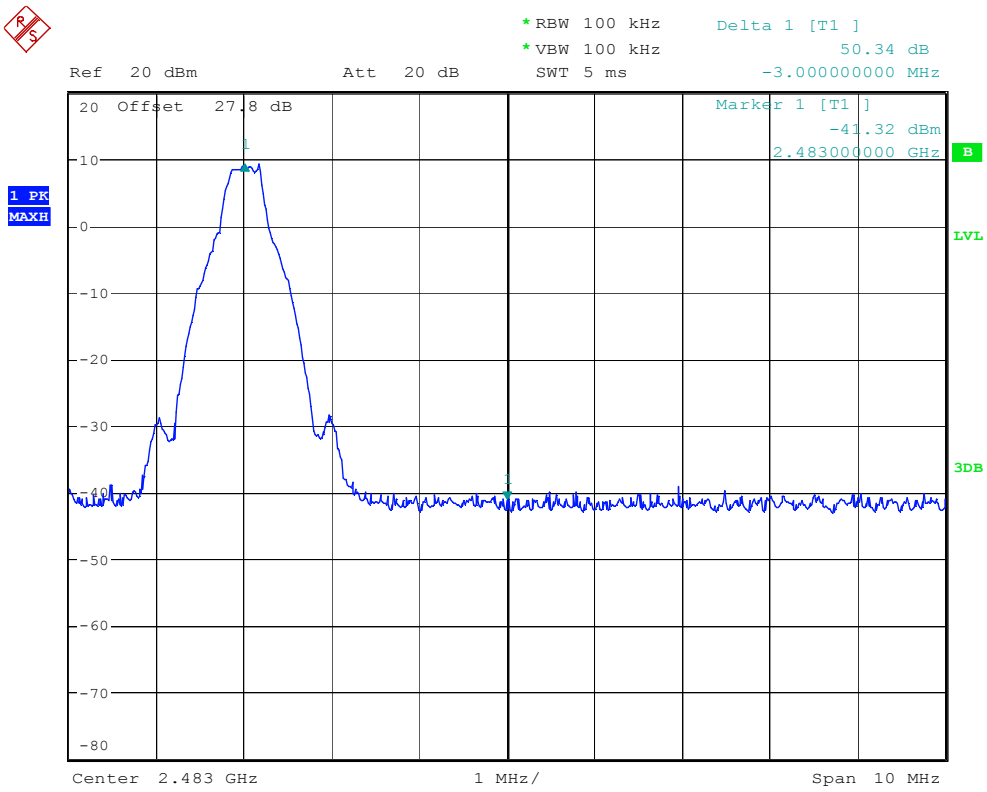
**Low Band Edge with Hopping Enabled (EDR MODE)**

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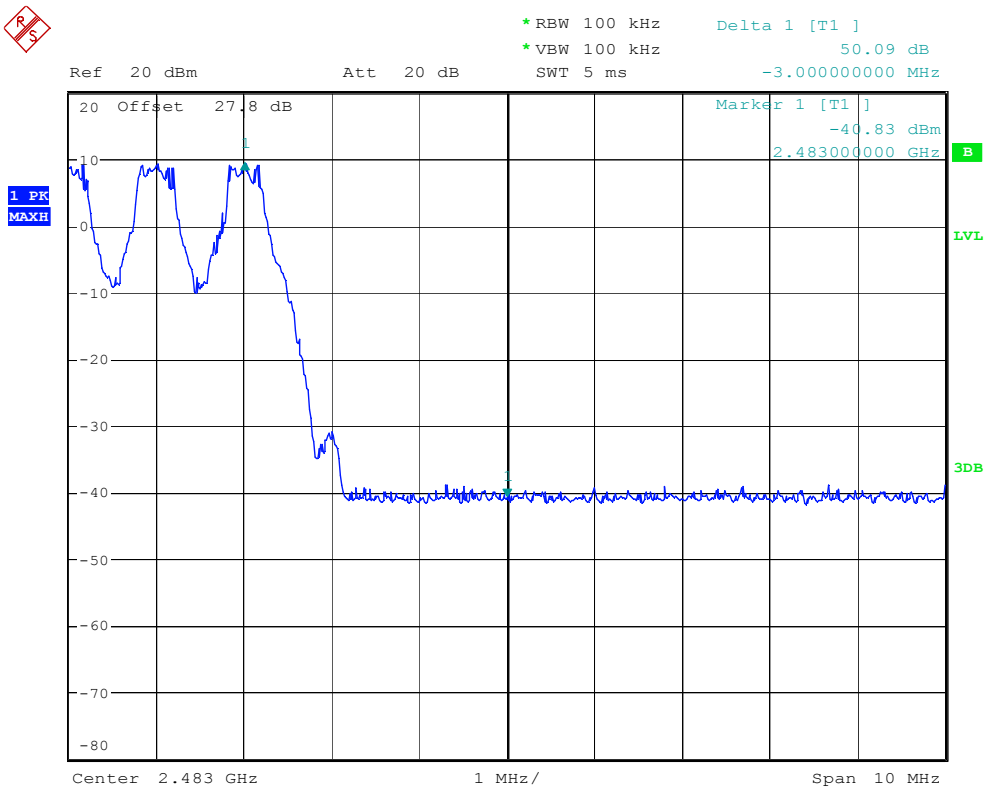
**High Band edge with Hopping Disabled**

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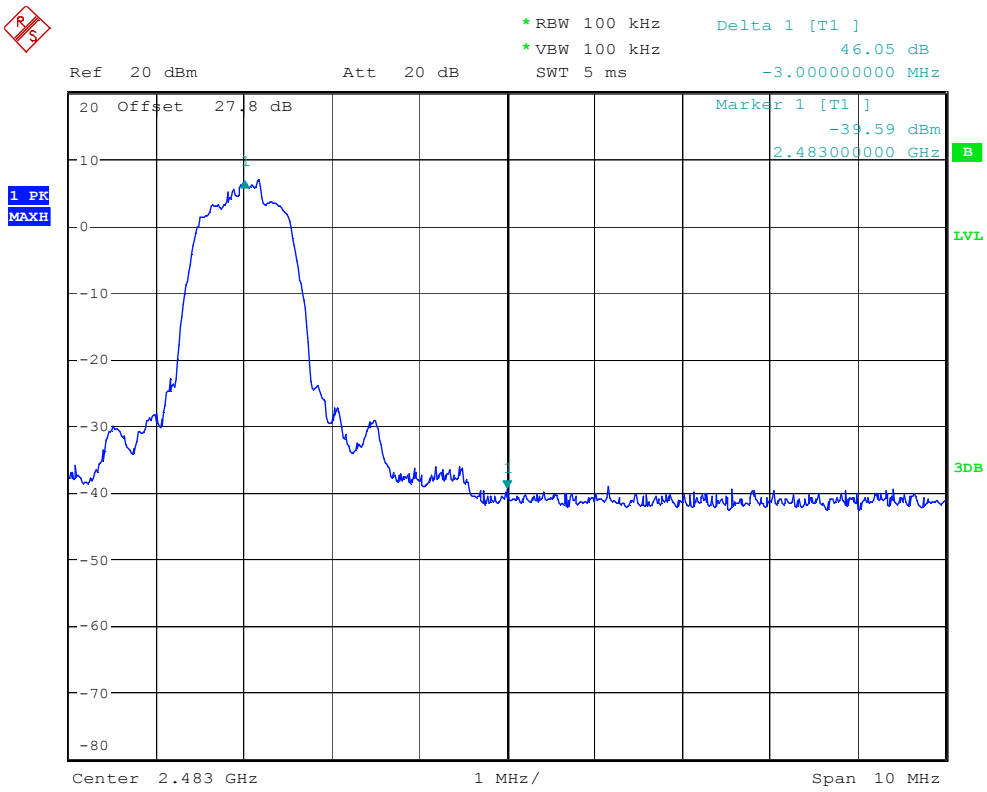
**High Band edge with Hopping Enabled**

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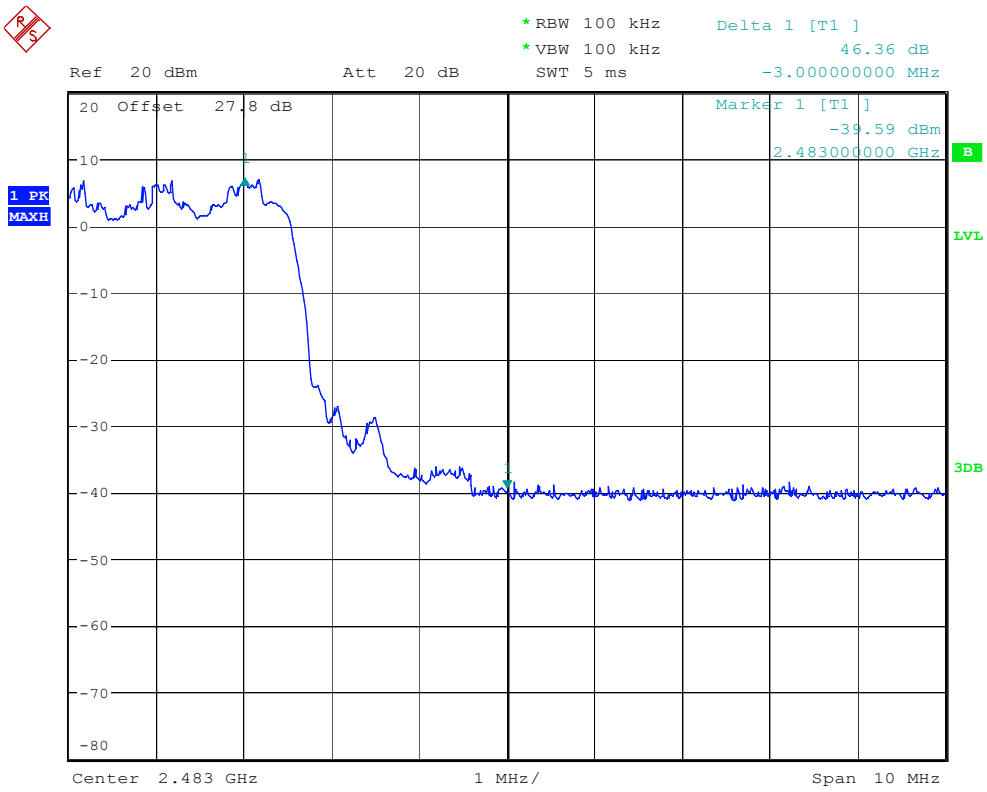
**High Band Edge with Hopping Disabled (EDR MODE)**




Date: 29.FEB.2012 21:39:15

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

# SPURIOUS RF CONDUCTED EMISSIONS

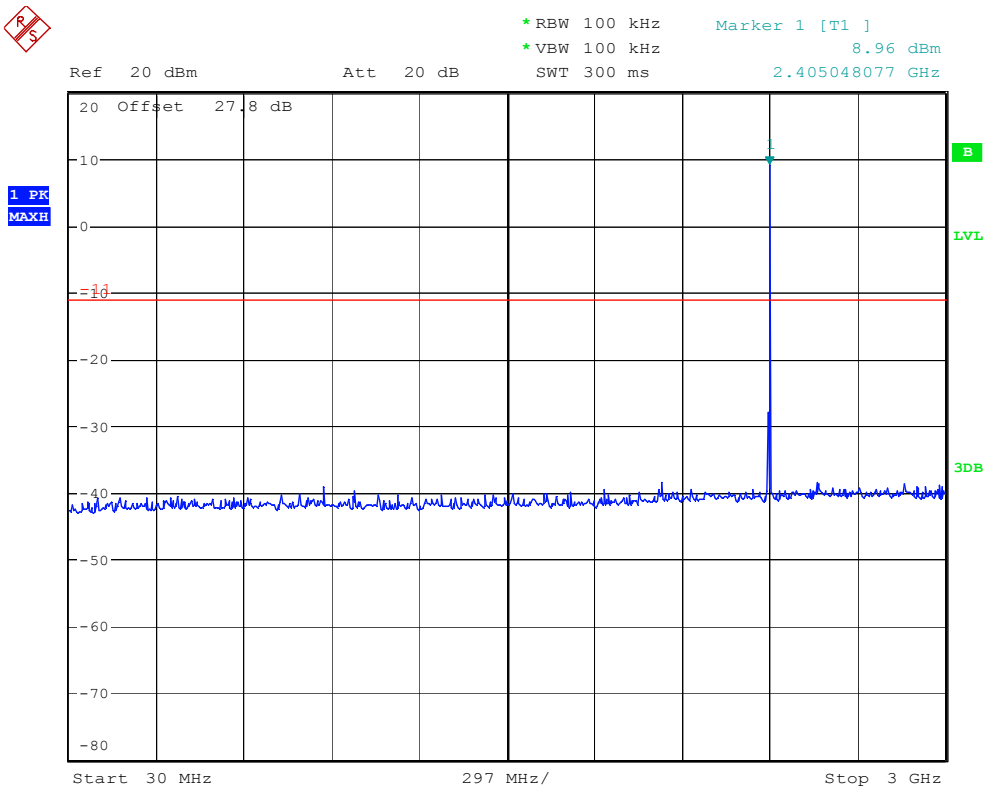
CFR 47 Part 15.247

## 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:

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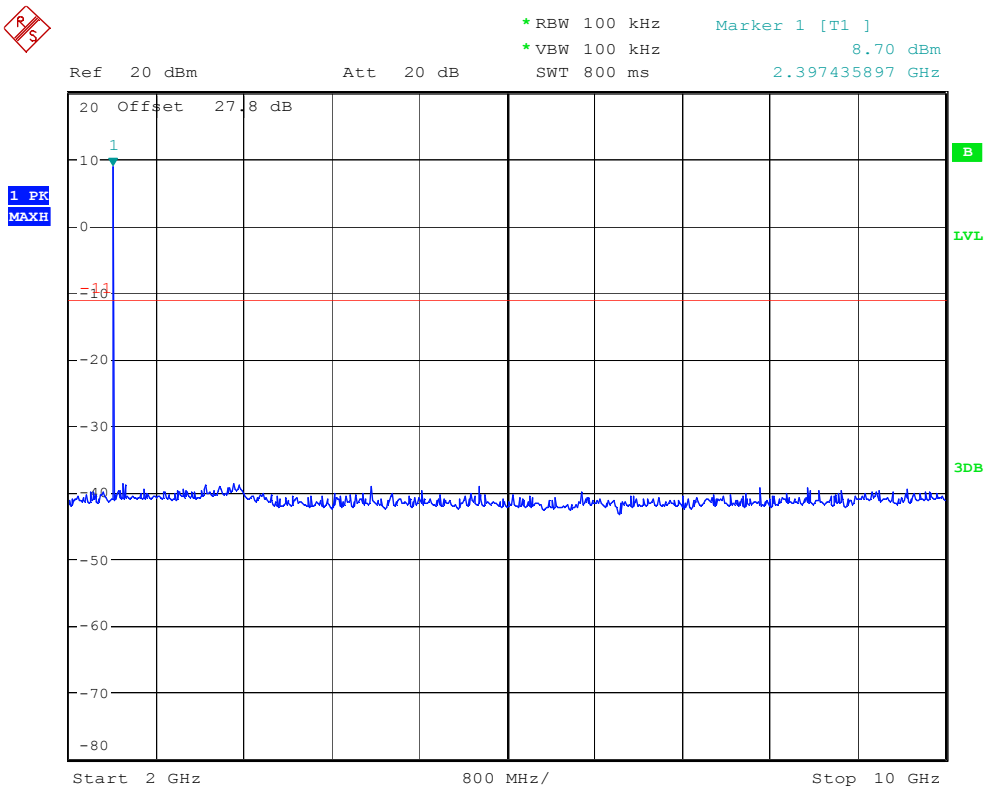
## Conducted Spurious Emissions 30-3000MHz (Low Channel Enabled)

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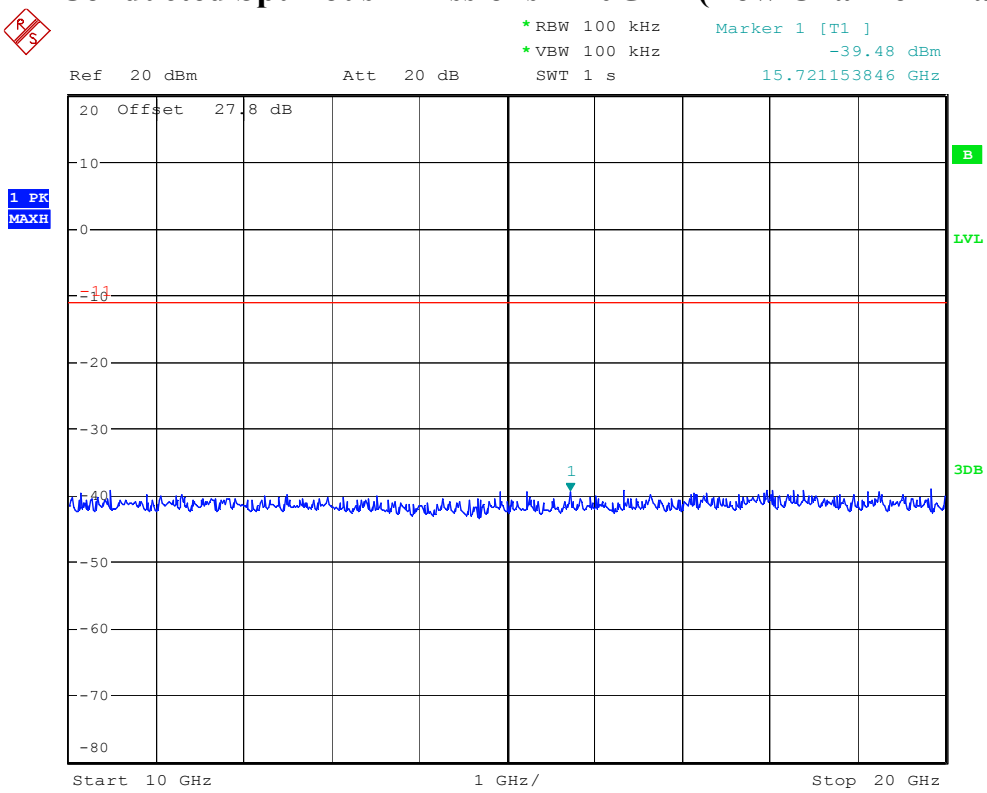
## Conducted Spurious Emissions 2-10GHz (Low Channel Enabled)

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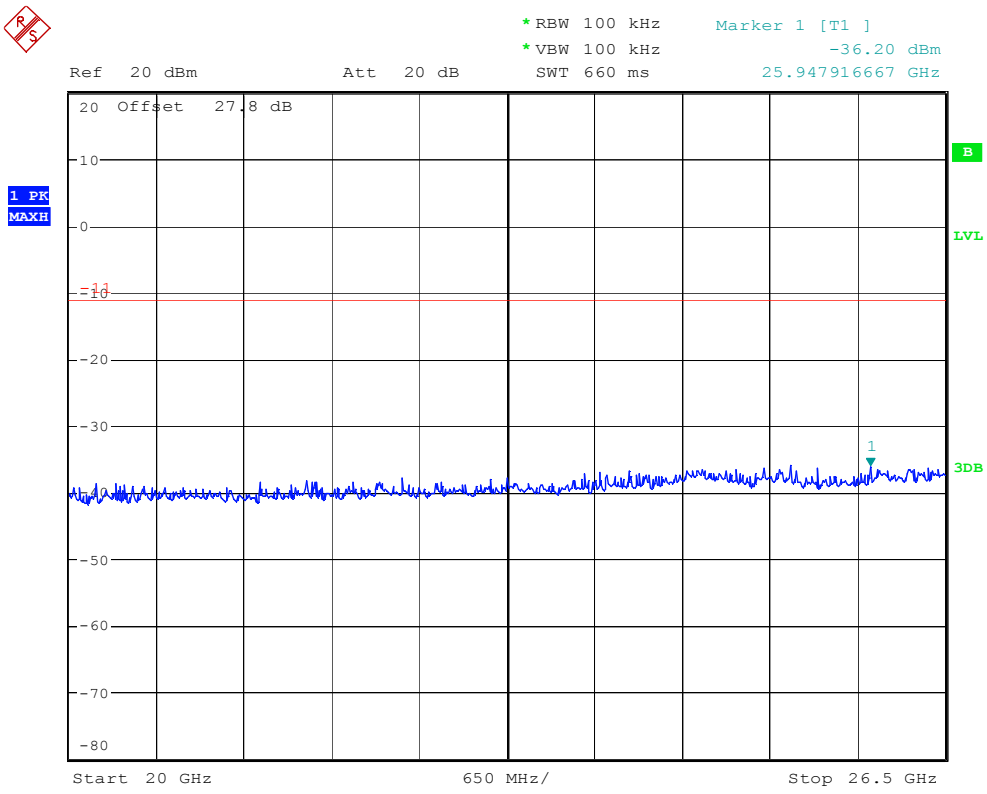
## Conducted Spurious Emissions 10-20GHz (Low Channel Enabled)

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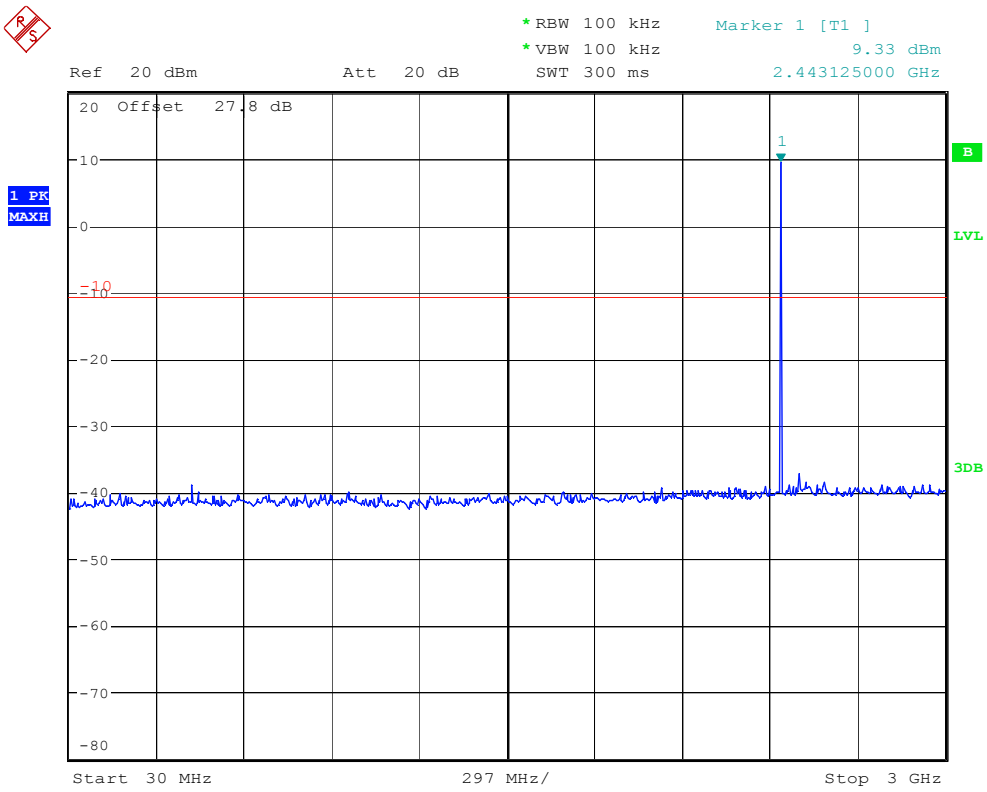
## Conducted Spurious Emissions 20-26.5GHz (Low Channel Enabled)

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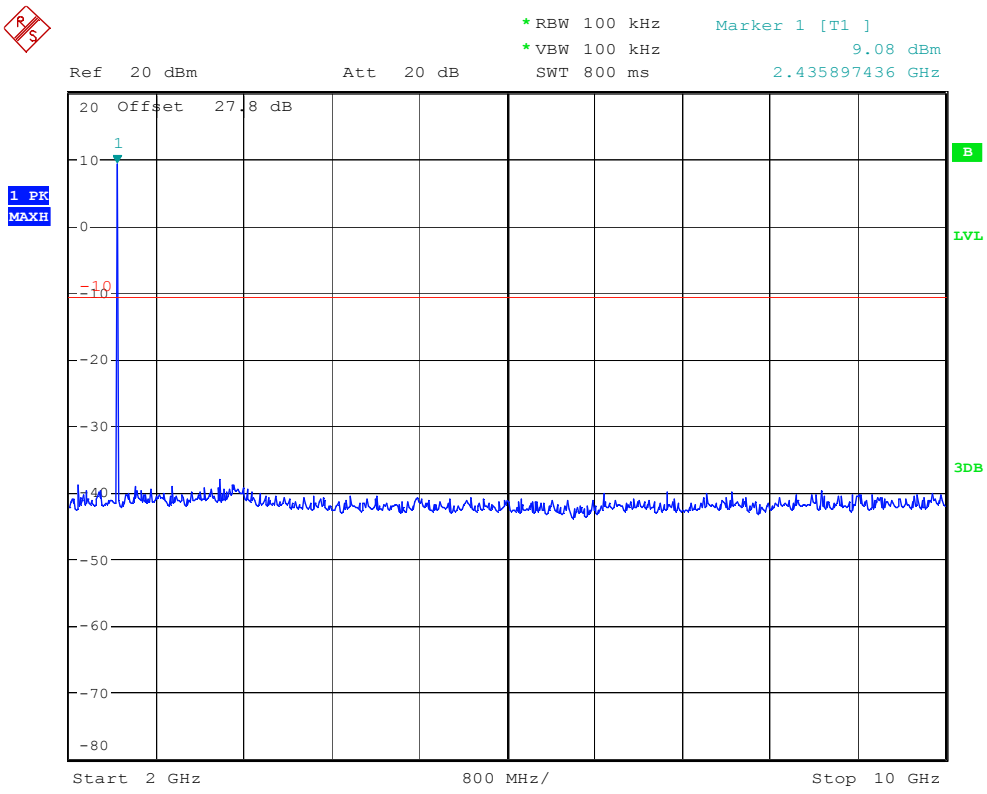
## Conducted Spurious Emissions 30-3000MHz (Mid Channel Enabled)

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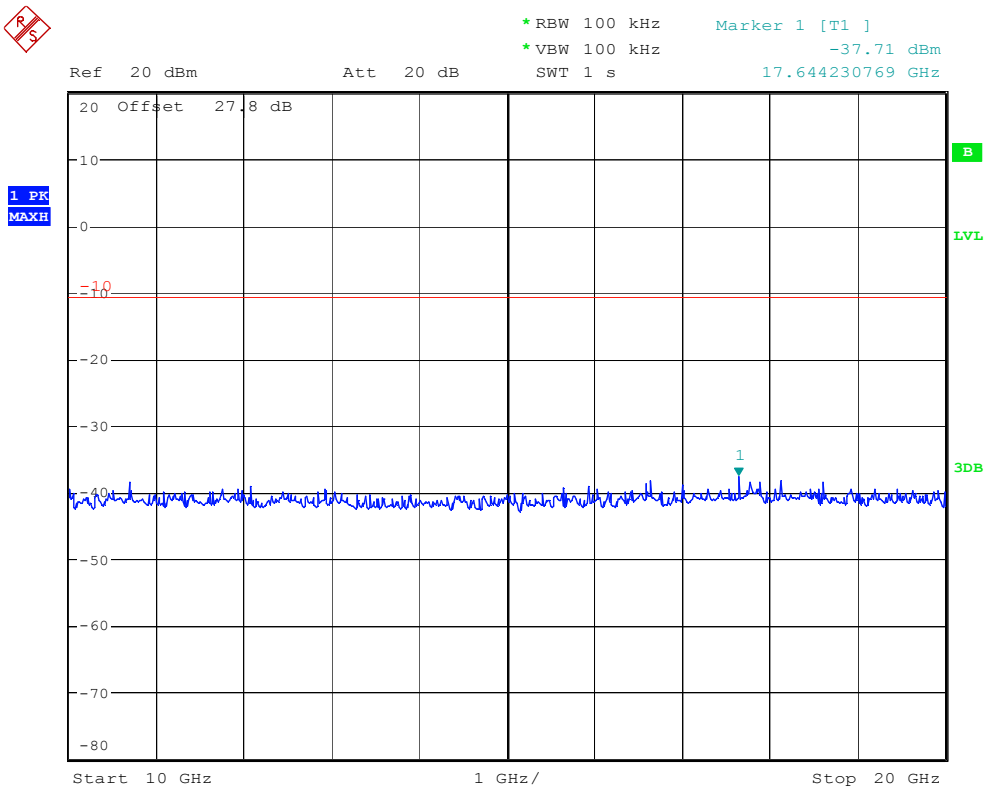
**Conducted Spurious Emissions 2-10GHz (Mid Channel Enabled)**

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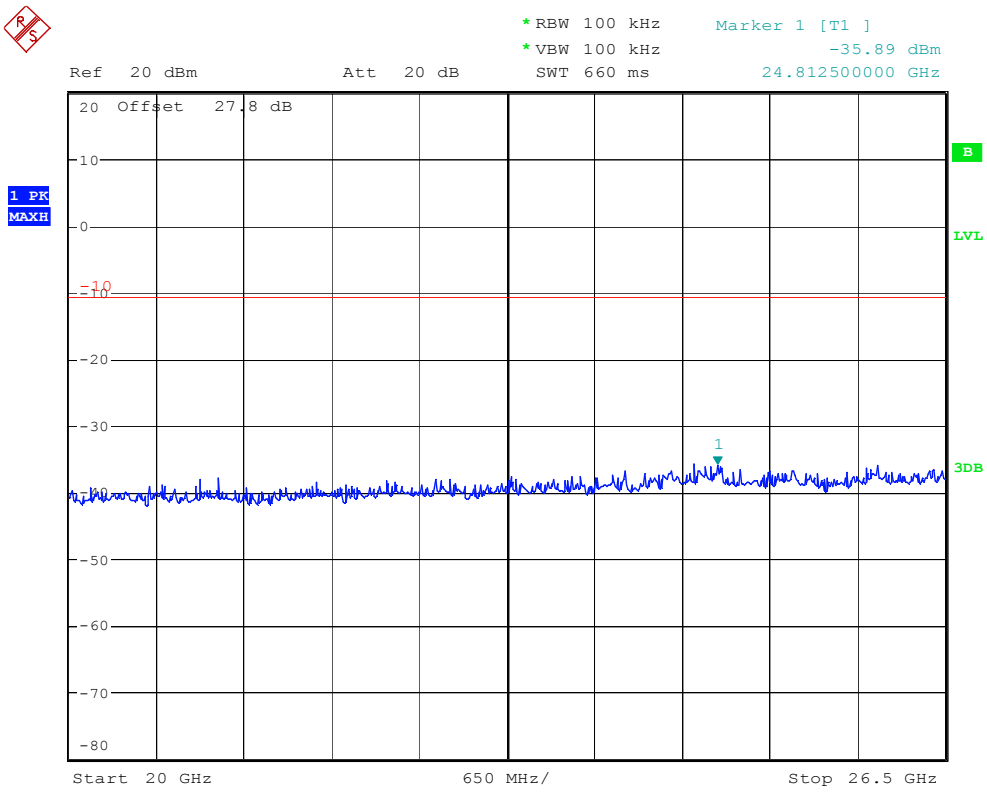
## Conducted Spurious Emissions 10-20GHz (Mid Channel Enabled)

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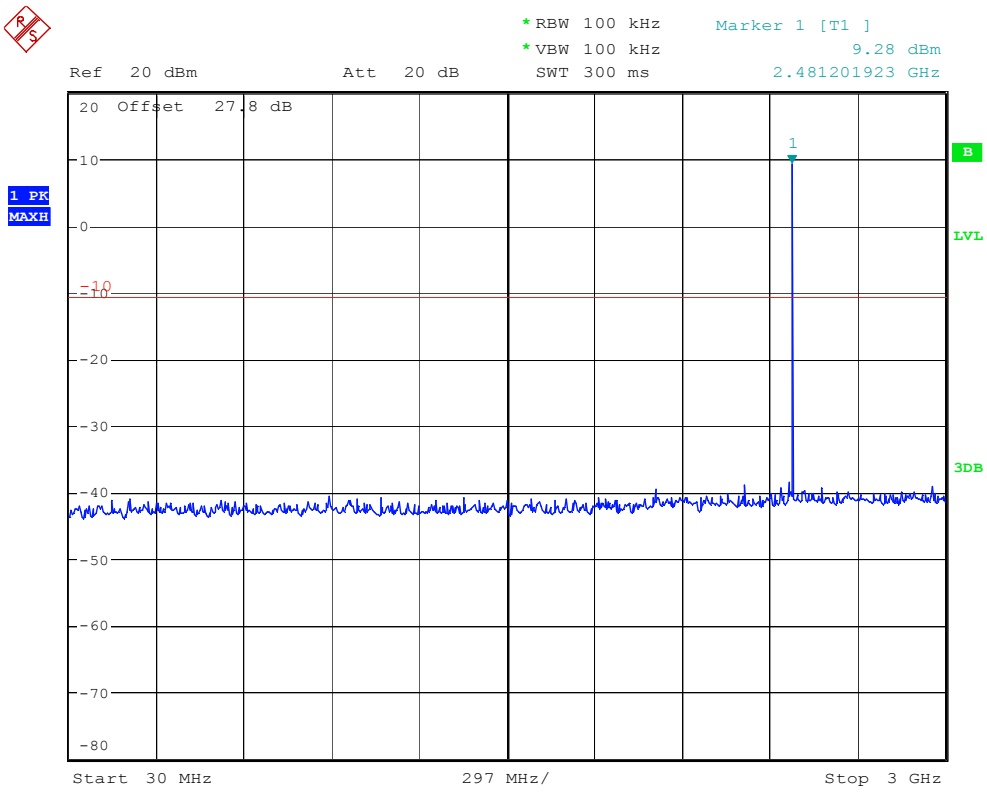
## Conducted Spurious Emissions 20-26.5GHz (Mid Channel Enabled)

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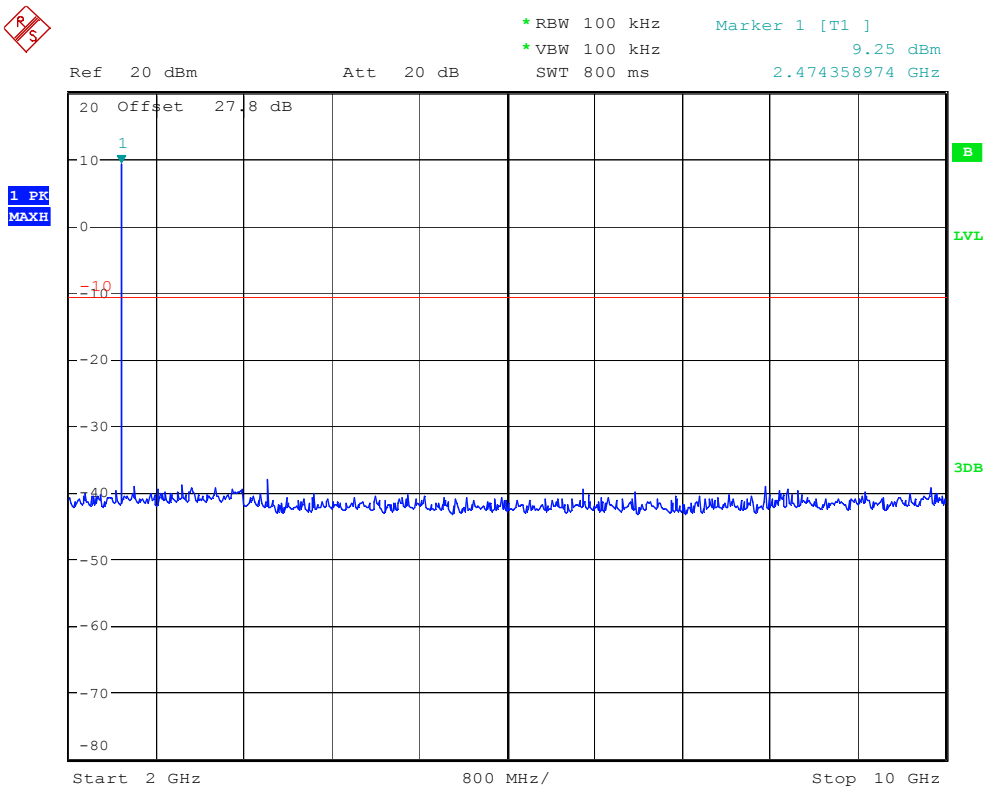
## Conducted Spurious Emissions 30-3000MHz (High Channel Enabled)

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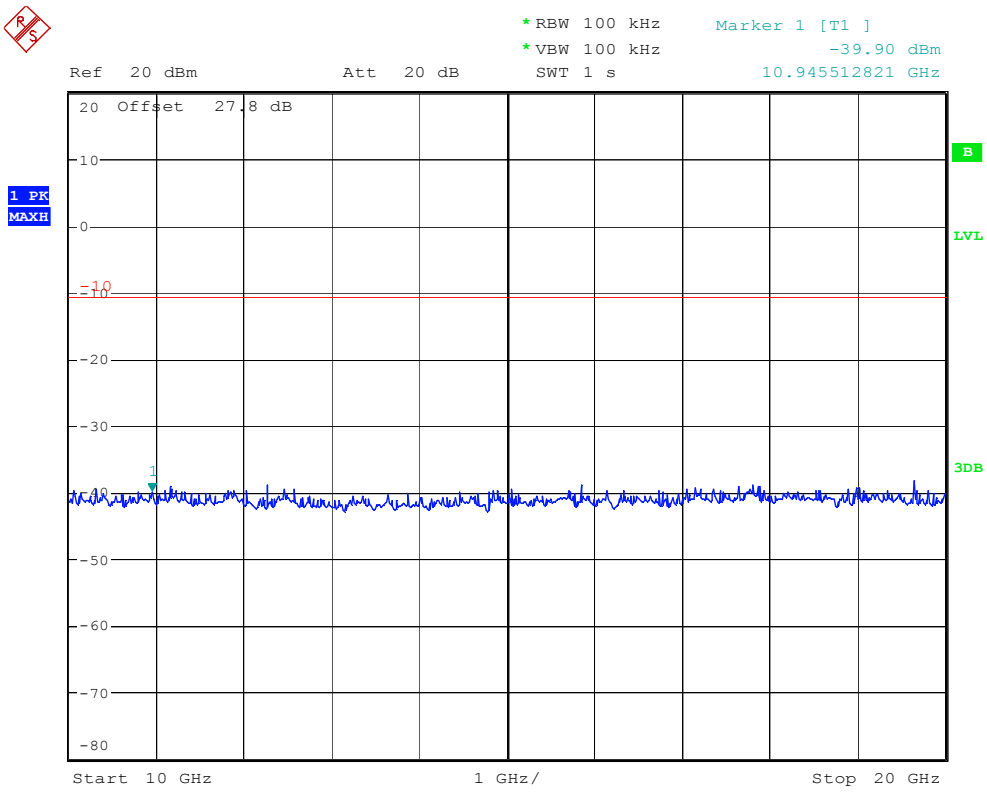
## Conducted Spurious Emissions 2-10GHz (High Channel Enabled)

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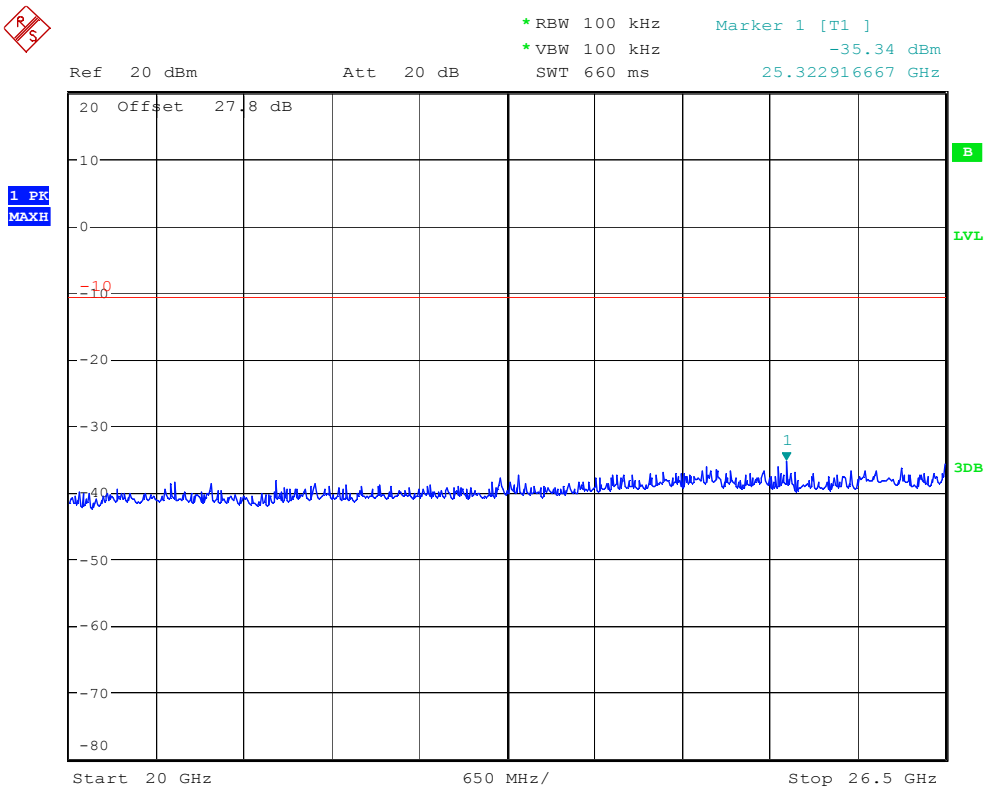
**Conducted Spurious Emissions 10-20GHz (High Channel Enabled)**




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

## AC LINE CONDUCTED

CFR 47 Part 15.207

## Measurement Procedure

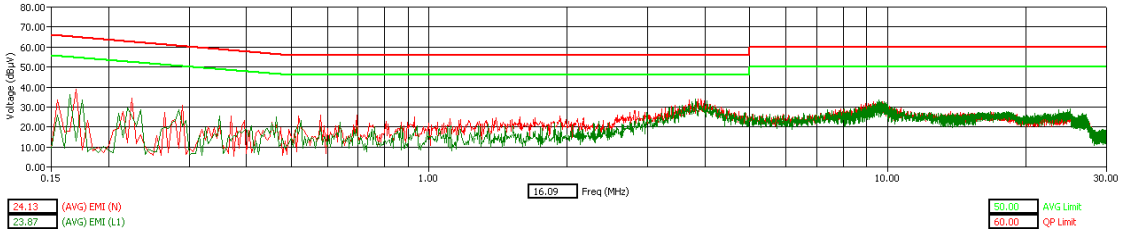
Measured levels of ac power line conducted emission shall be the radio-noise voltage from the line probe or across the 50 Ω LISN port, where permitted, terminated into a 50 Ω noise meter, or where permitted or required, the radio-noise current on the power line sensed by a current probe.

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.

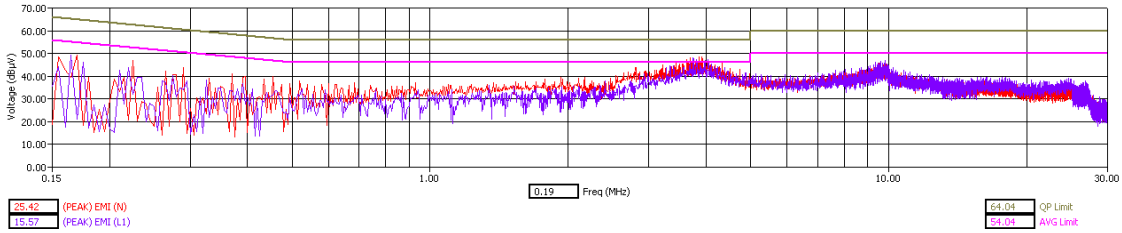
Detectors – Peak and Average Detector

## Measurement Results

See attached:




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




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

**End of Test Report**