MOTOROLA MOBILITY

MOBILE DEVICES BUSINESS

PRODUCT SAFETY AND COMPLIANCE
EMC LABORATORY

EMC TEST REPORT

Test Report Number –25080-1 BT-Conducted

Report Date – 2012-07-24

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: Jiakui Chen Name: Jiakui Chen

Title: EMC Project Manager Test: 2012-06-29 to 2012-07-24

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

Signature: Mike Roper Digitally signed by Roper Michael-AMR083 DN: cn=Roper Michael-AMR083 Date: 2012.08.30 20:29:06 +01'00' Name: Michael Roper

Title: Certification Manager Date: 2012-07-24

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

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

UKAS Certificate Number: 2404

Table of Contents

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: 402854 IC Registration Number: 109AW-1
Tests Requested By:	Motorola Mobility LLC 600 North US Hwy 45 Libertyville, IL 60048 United States
Product Type:	Cellular phone
Signaling Capability:	WCDMA 1900/1700, GSM/EDGE 1900/850, Bluetooth, 802.11b/802.11g/802.11n
IMEI:	352507050010832
FCC ID:	IHDT56NJ1
Project number:	25080-1
Testing Complete Date:	2012-07-24

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 3, RSS-210 Issue 8.

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 SNN5843A 1390mAh 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	FSU26	200353	03/13/2012
Rohde Schwarz	Receiver	ESCI	100650	03/13/2012
Agilent	Attenuator	8491A	MY39263202	NCR
Rohde Schwarz	LISN	ENV216	100375	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.

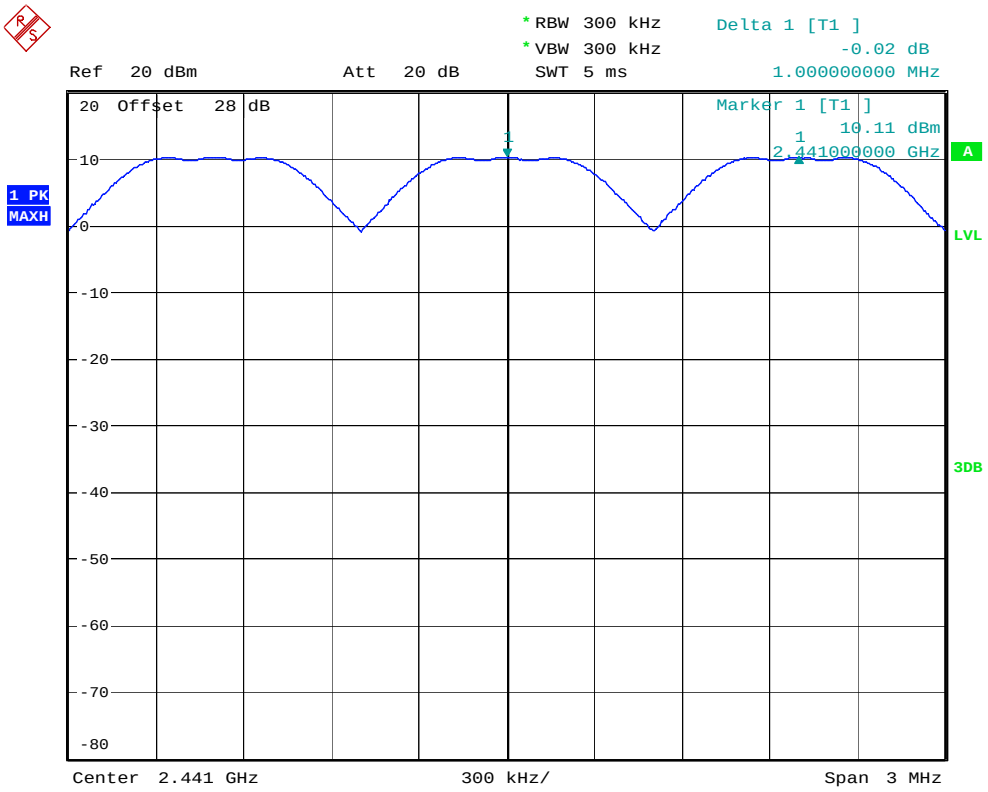
The Bluetooth transmitter of the EUT had its hopping function enabled. The following spectrum analyzer settings were used:

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.



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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.

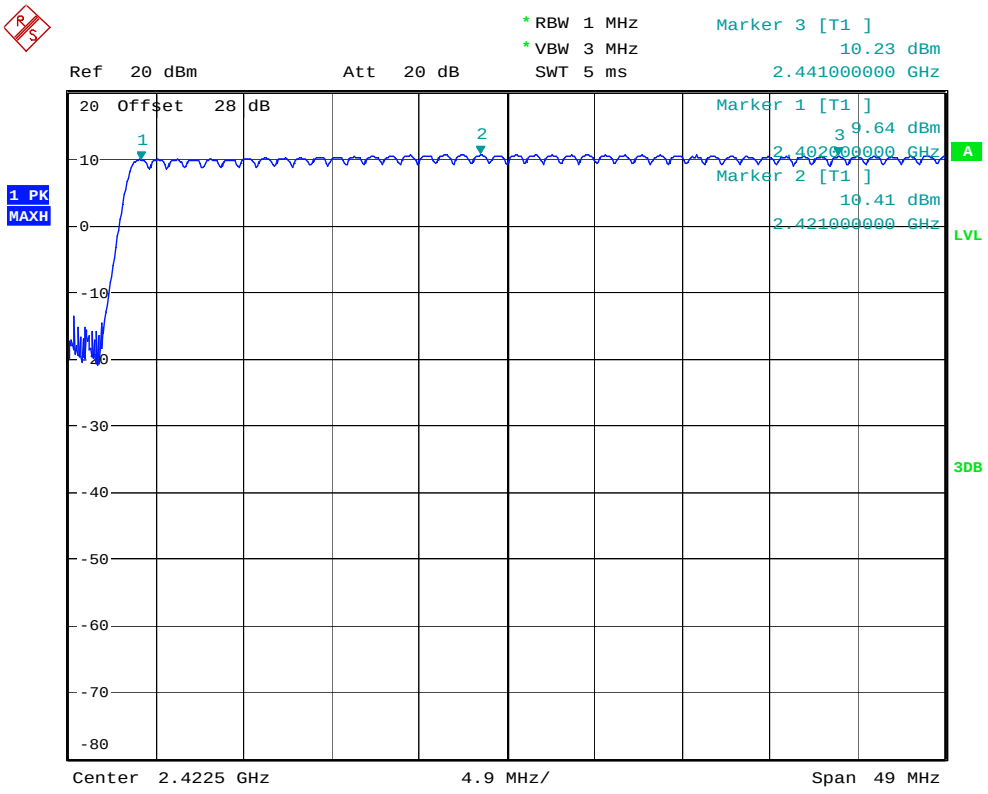
The Bluetooth frequency hopping function of the EUT was enabled. The spectrum analyzer used the following settings:

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.

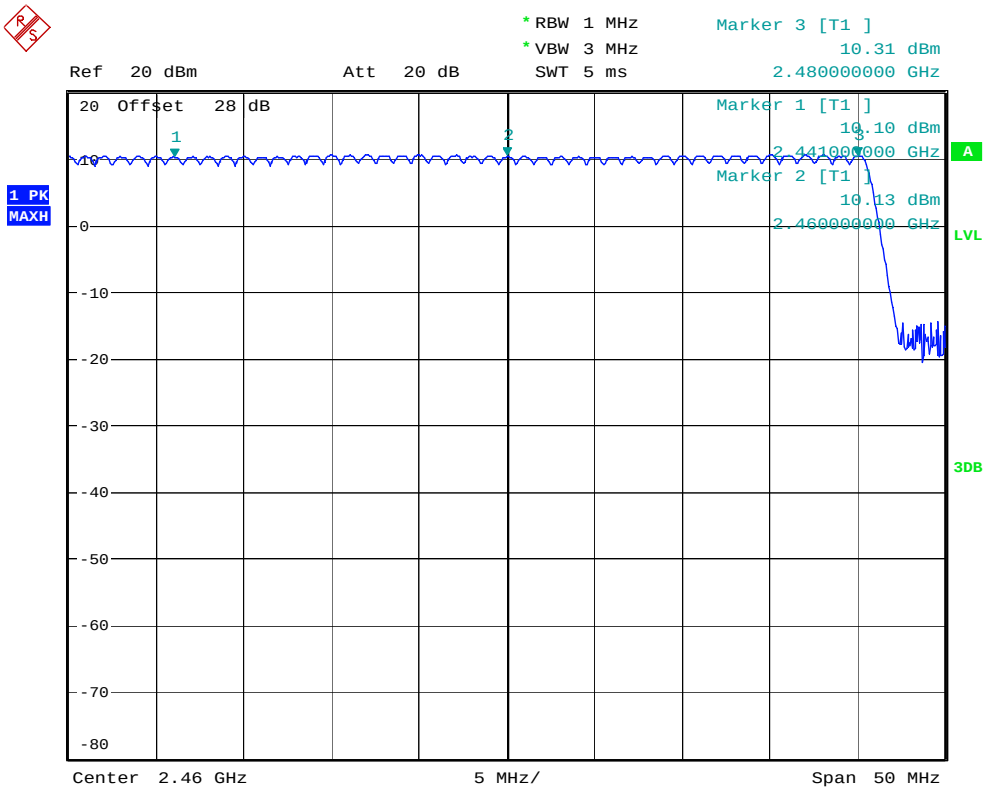
Measurement Results

See attached.



Date: 9.JUL.2012 16:48:51

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

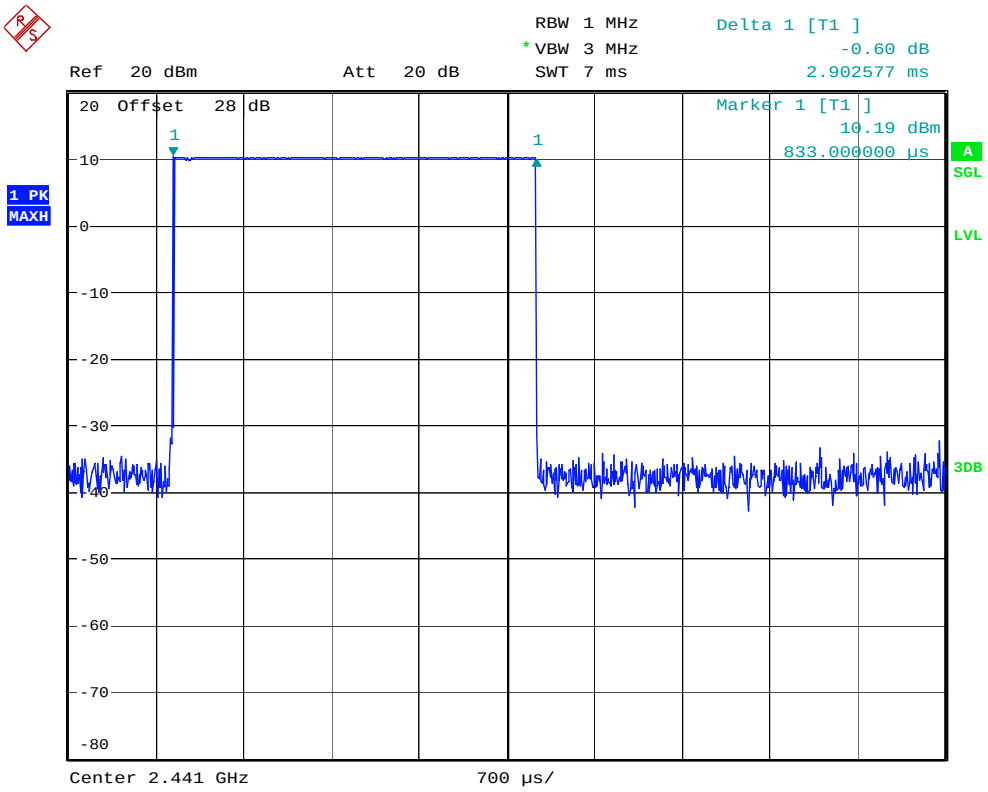
The Bluetooth hopping function of the EUT was enabled. The following spectrum analyzer settings were used:

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



Dwell Time DH5

Packet type	Time slot length (ms)	Dwell time (ms)	Limit	Conclusion
DH5	2.9	309.3	400	Pass

Bluetooth Time of Occupancy Calculation

Typically, Bluetooth 1x/EDR mode has a channel hopping rate of 1600 hops/s. Since 1x/EDR modes use 5 transmit and 1 receive slot, for a total of 6 slots, the Bluetooth transmitter is actually hopping at a rate of 1600/6=266.67 hops/s/slot

- 400ms × 79 hopping channels = 31.6 sec (Time of Occupancy Limit)
- Worst case BT has 266.67 hops/second (for 1x/EDR modes with DH5 operation)
- 266.67 hops/second / 79 channels = 3.38 hops/second (# of hops/second on one channel)
- 3.38 hops/second/channel × 31.6 seconds = 106.67 hops (# hops over a 31.6 second period)
- 106.67 hops × 2.9 ms/channel = 309.3 ms (worst case dwell time for one channel in 1x/EDR modes)

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.

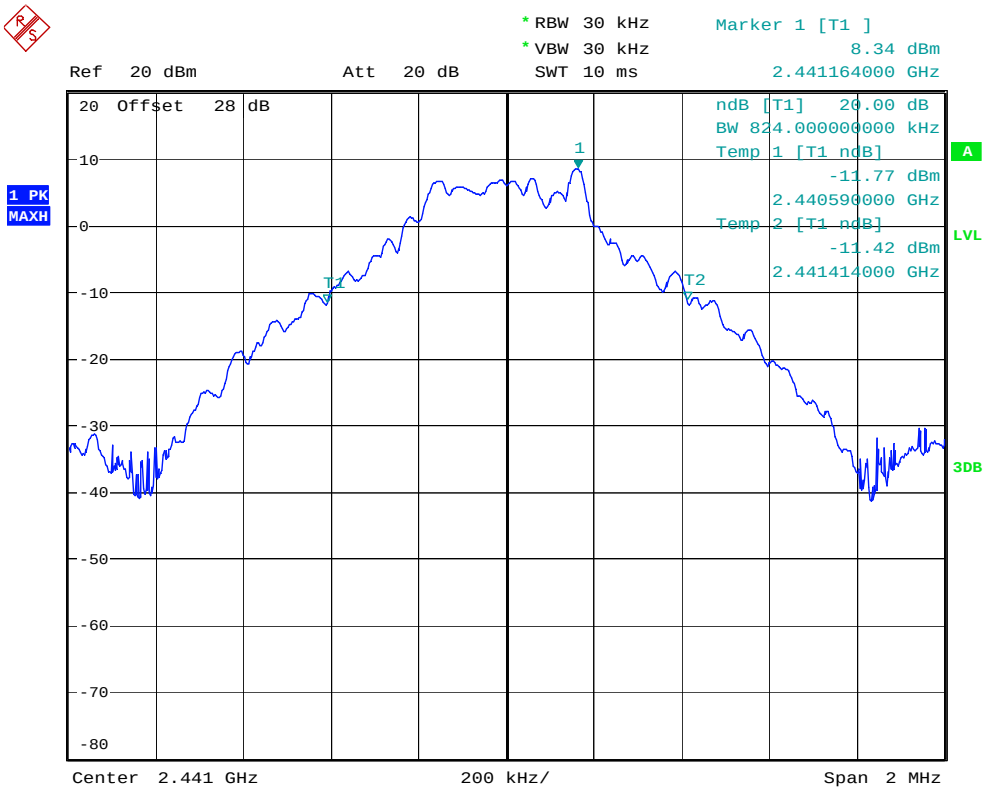
The Bluetooth frequency hopping function of the EUT was disabled. The spectrum analyzer used the following settings:

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



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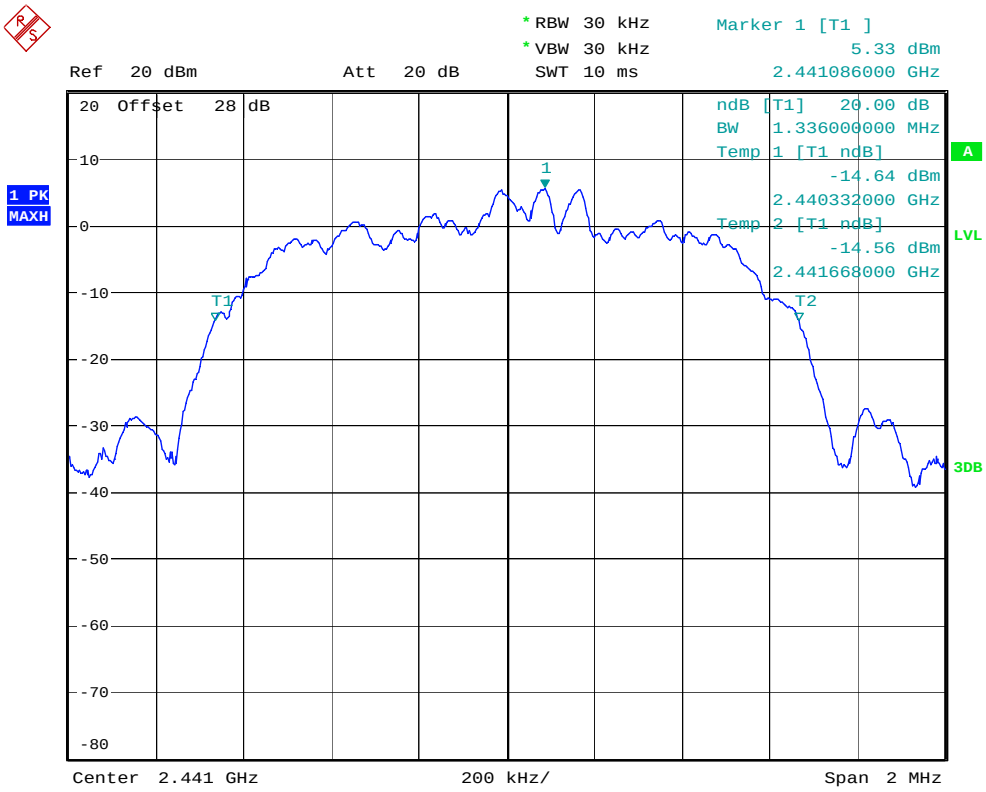
20dB Bandwidth



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20dB Bandwidth EDR Mode

PEAK OUTPUT POWER

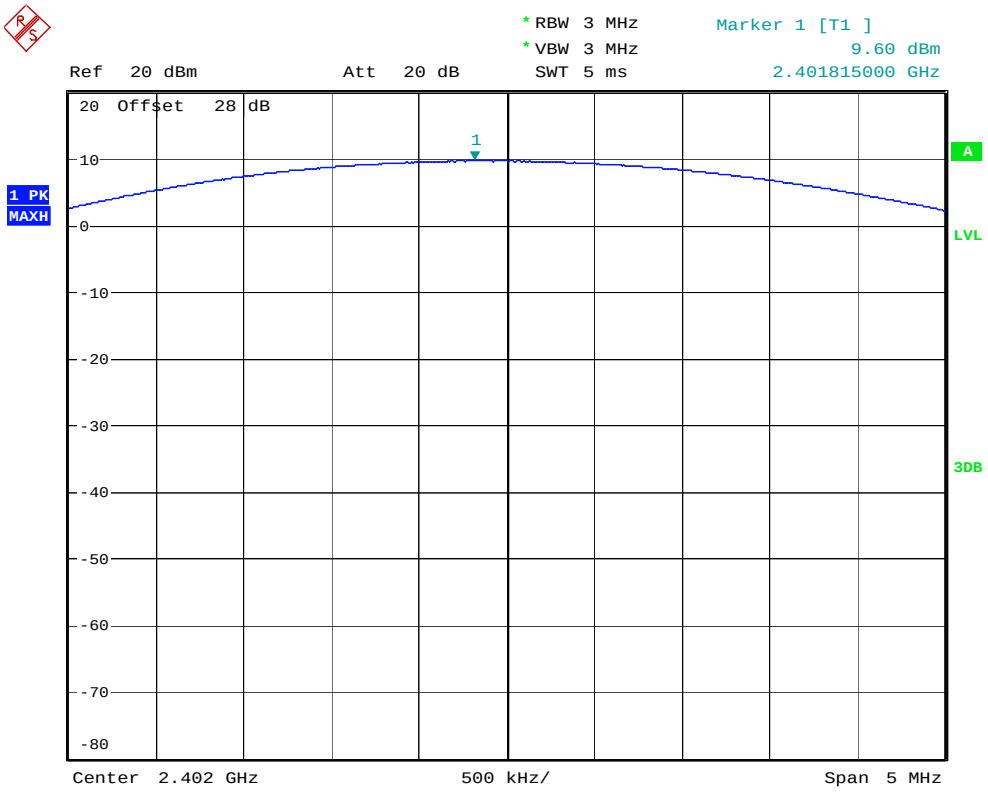
CFR 47 Part 15.247

Measurement Procedure

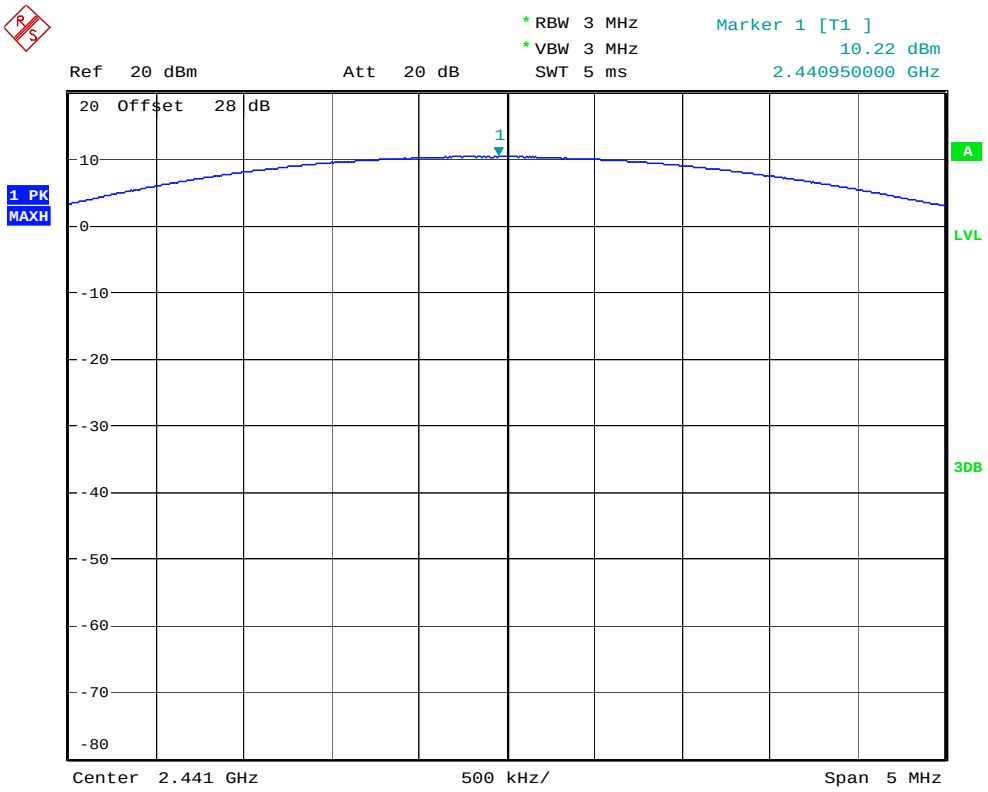
The RF output port of the Equipment-Under-Test is directly coupled to the input of the EMC analyzer through a specialized RF connector and a 20dB passive attenuator. A fully charged battery was used for the supply voltage. The peak output power was measured with the Hopping mode disabled.

Measurement Results

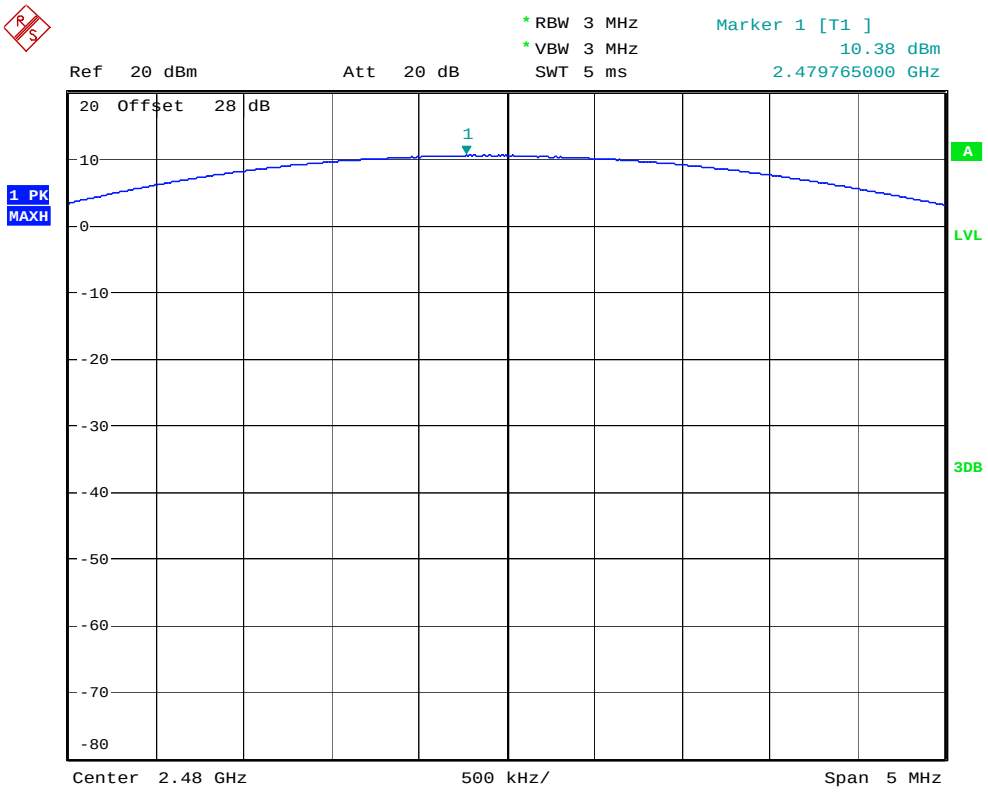
See Attached



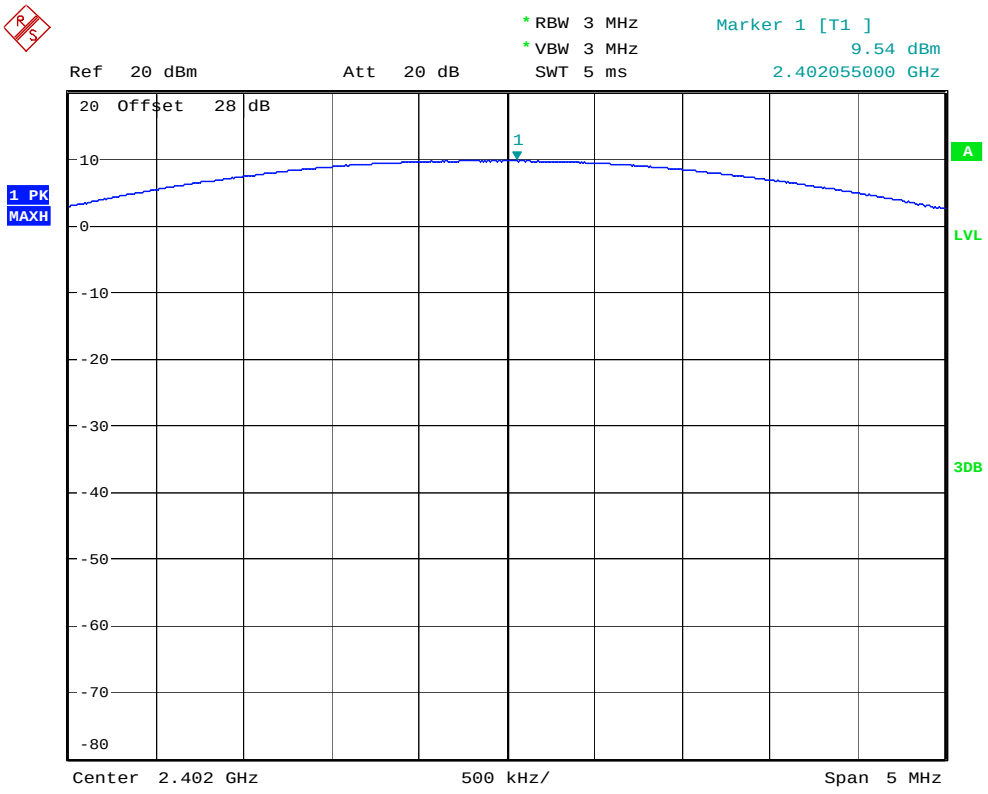
Peak Output Power – Low Channel



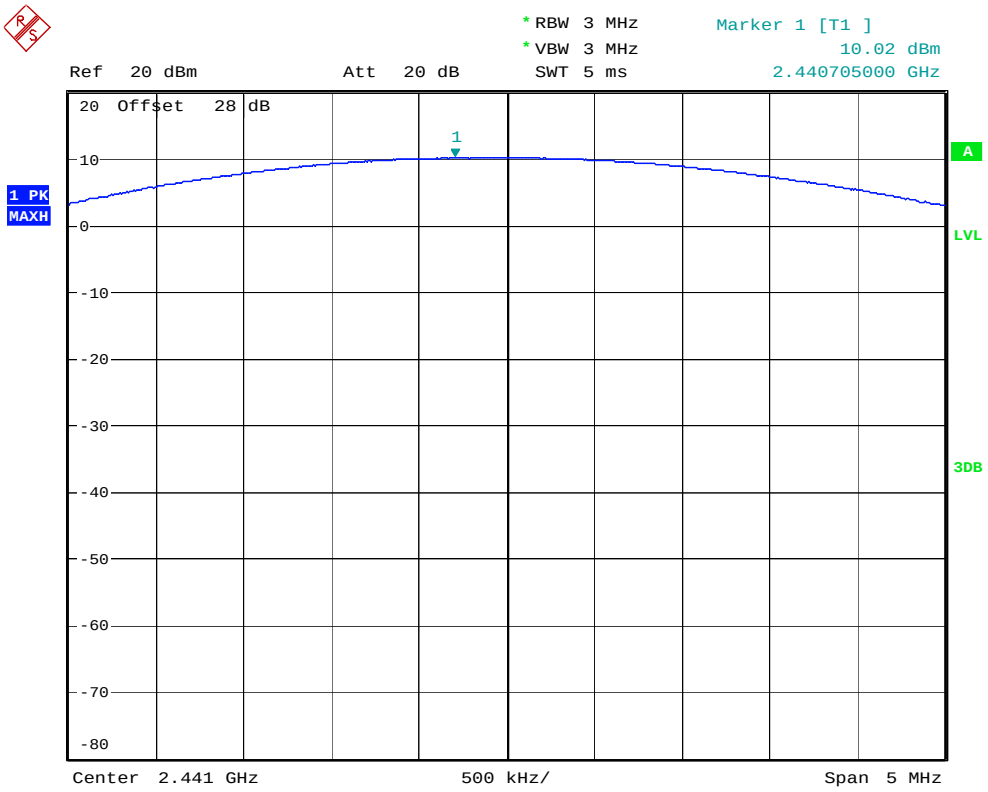
Peak Output Power – Mid Channel



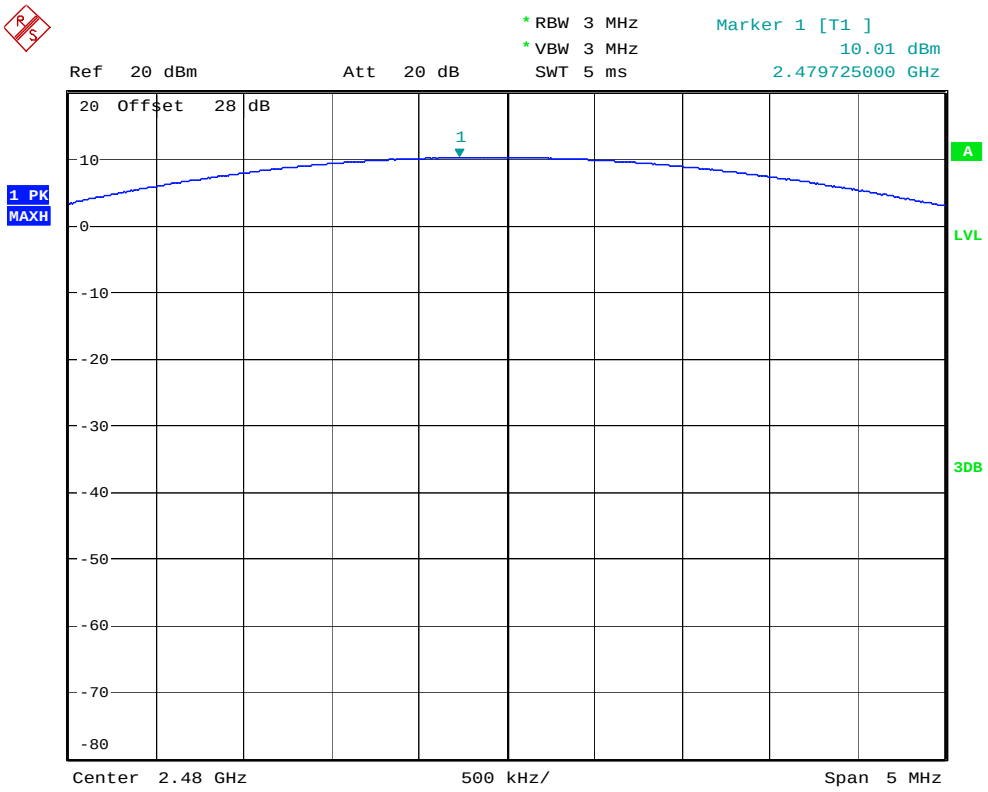
Peak Output Power – High Channel



Peak Output Power EDR Mode – Low Channel



Peak Output Power EDR Mode – Mid Channel



Peak Output Power EDR Mode – High Channel

BAND-EDGE COMPLIANCE OF RF CONDUCTED EMISSIONS

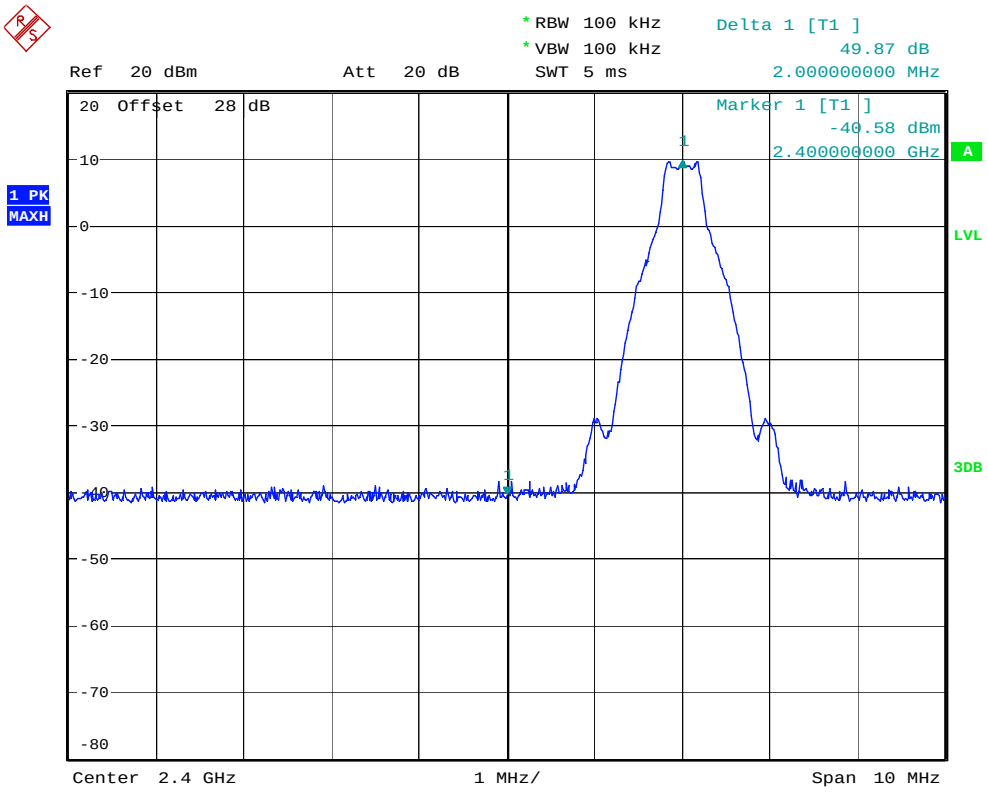
CFR 47 Part 15.247

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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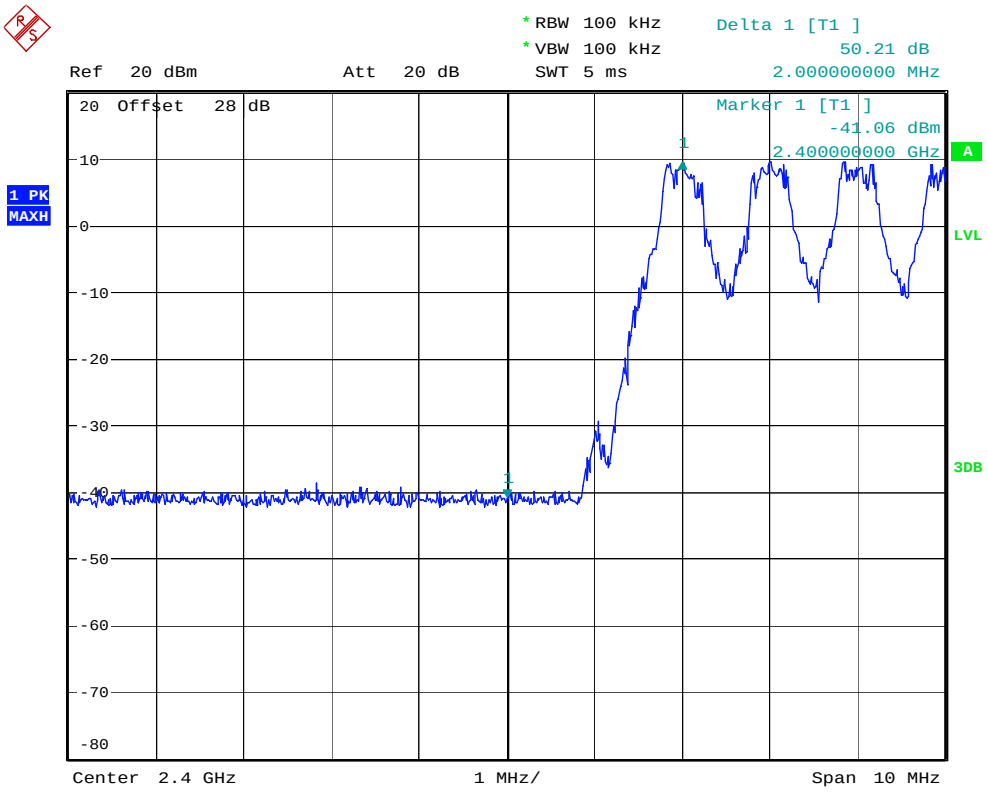
Low Band edge with Hopping Disabled



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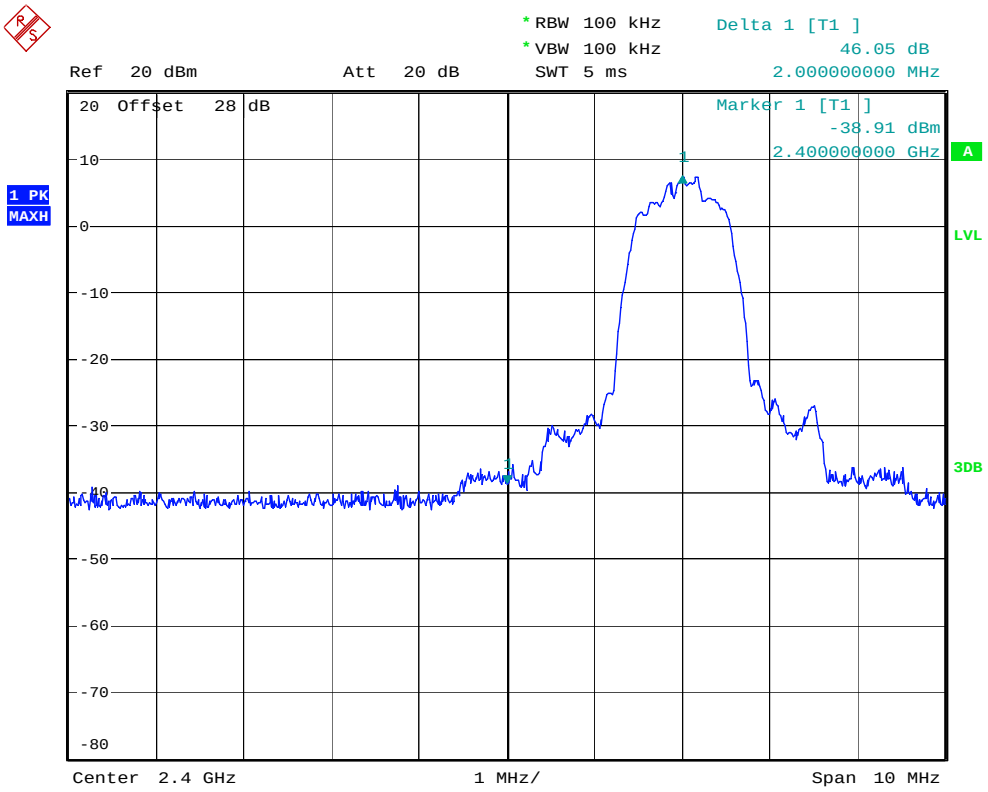
Low Band edge with Hopping Enabled



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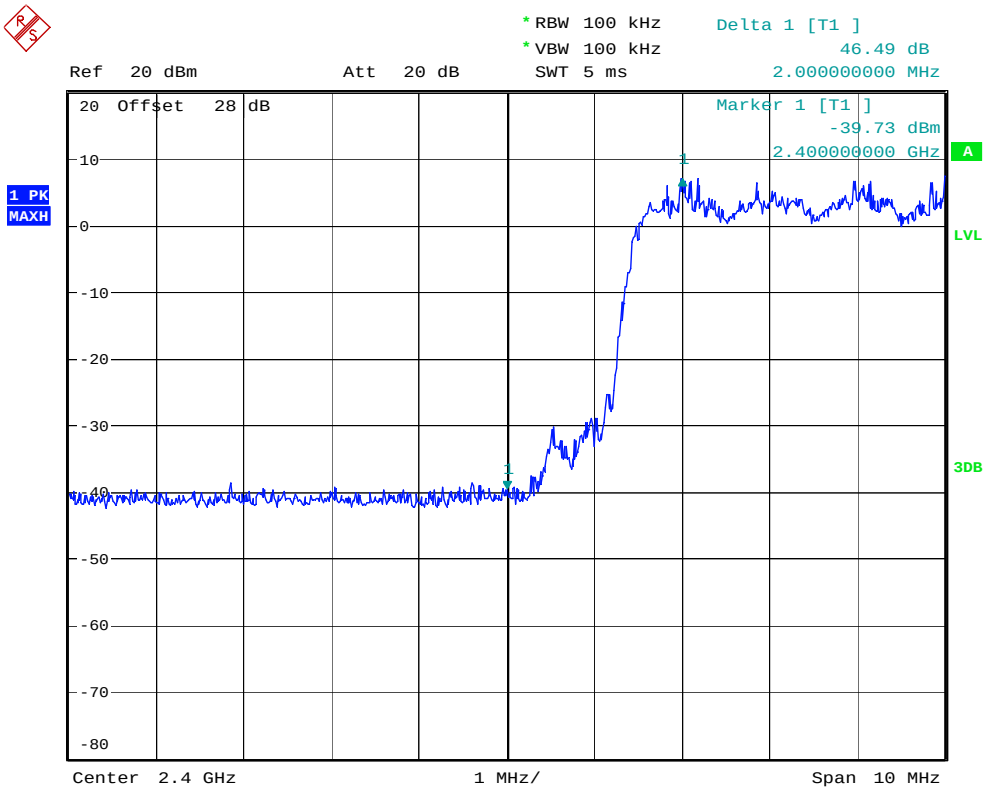
Low Band Edge with Hopping Disabled (EDR MODE)



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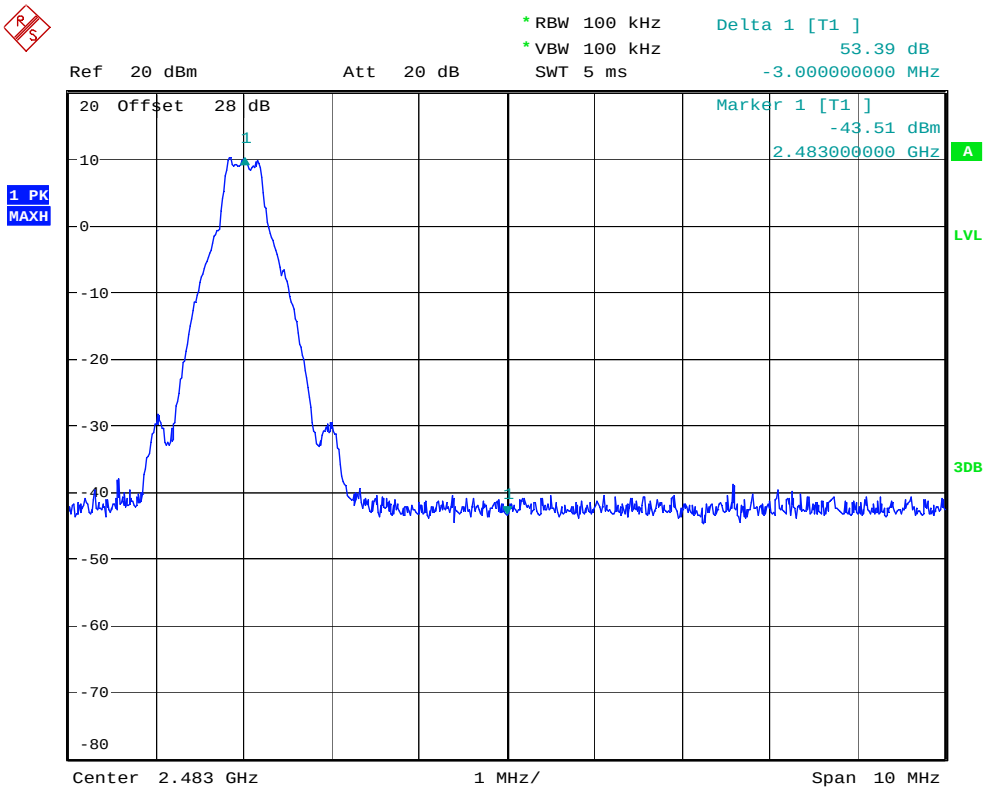
Low Band Edge with Hopping Enabled (EDR MODE)



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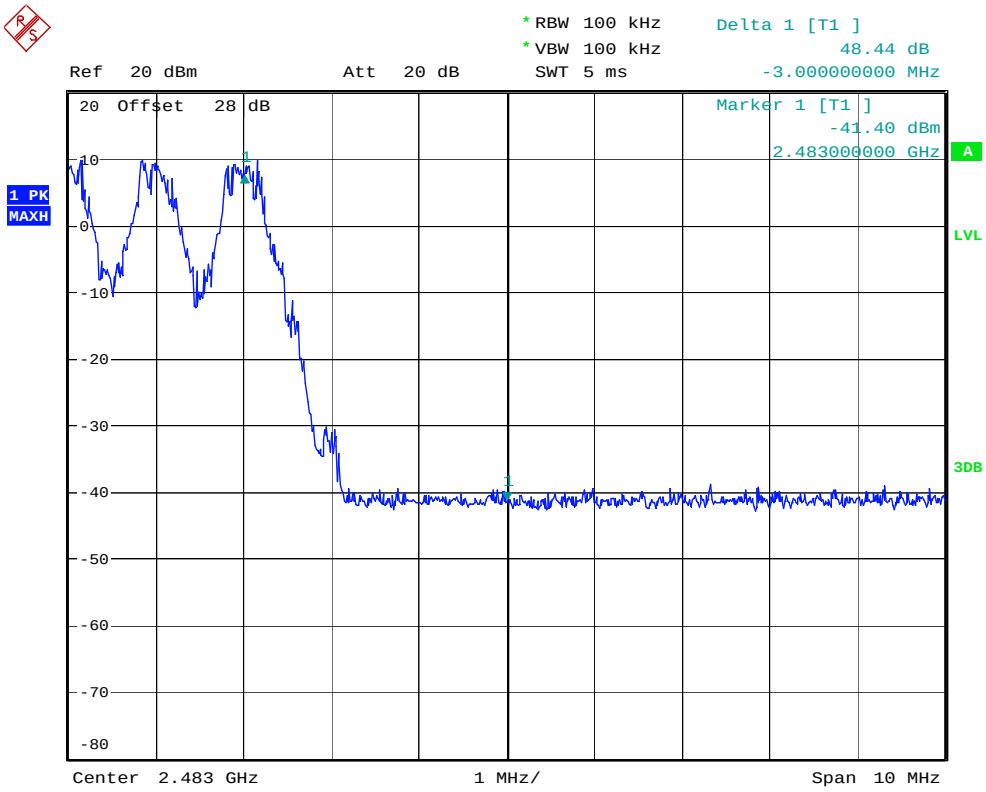
High Band edge with Hopping Disabled



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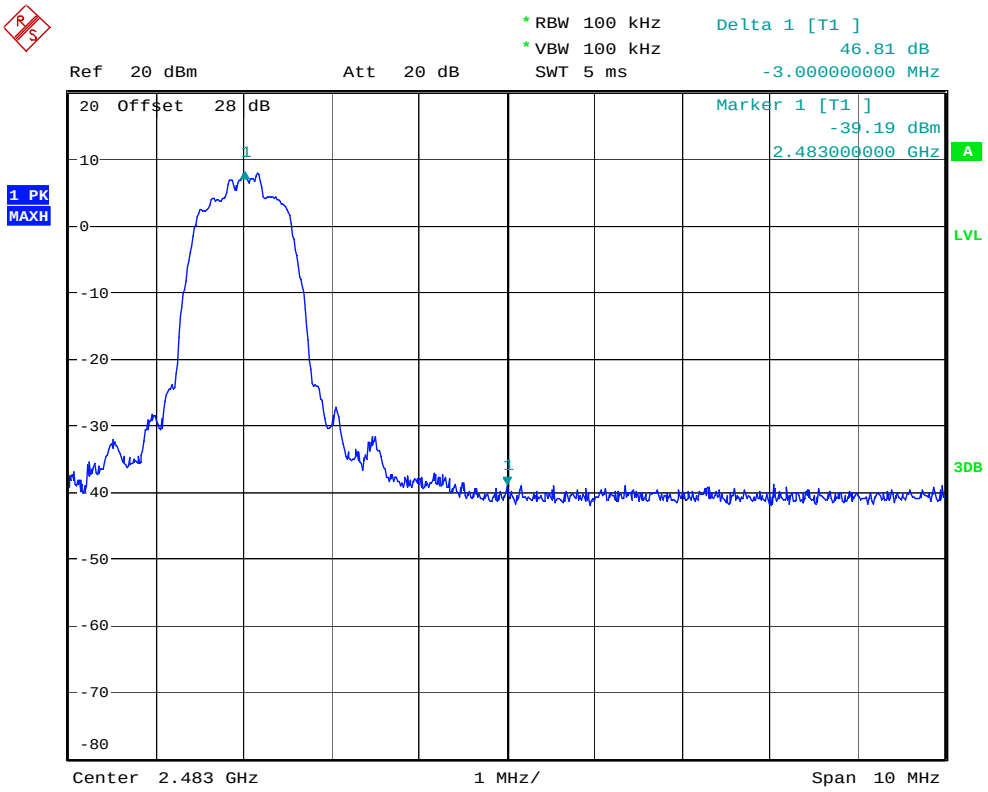
High Band edge with Hopping Enabled



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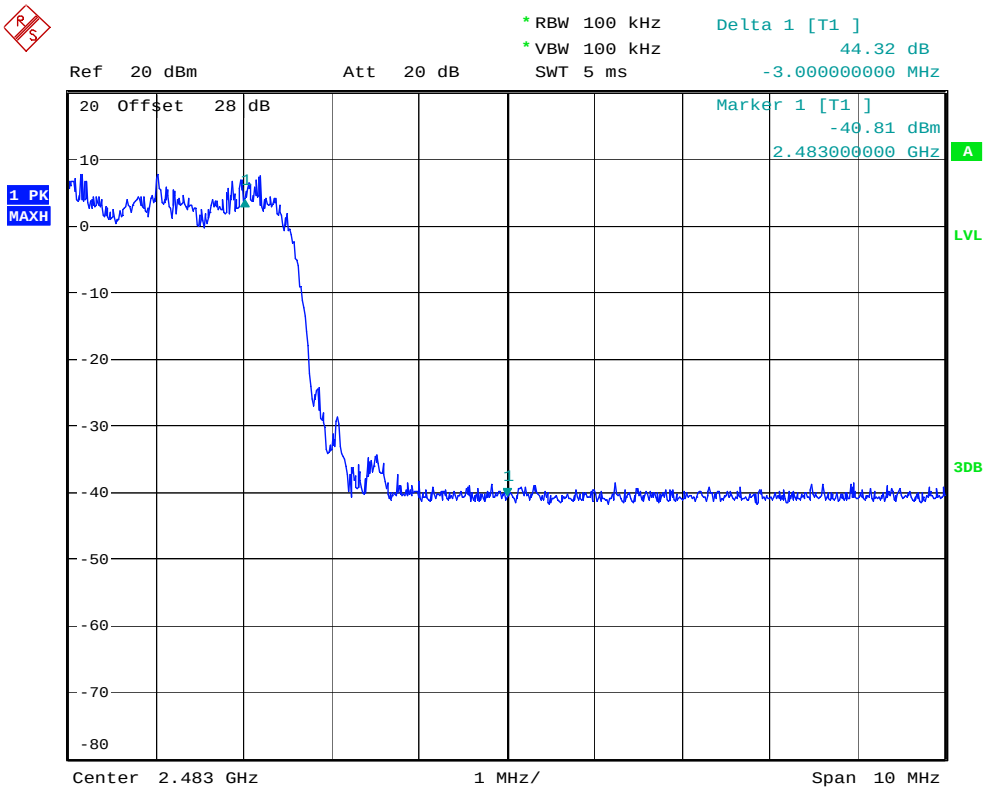
High Band Edge with Hopping Disabled (EDR MODE)



High Band Edge with Hopping Enabled (EDR MODE)

SPURIOUS RF CONDUCTED EMISSIONS

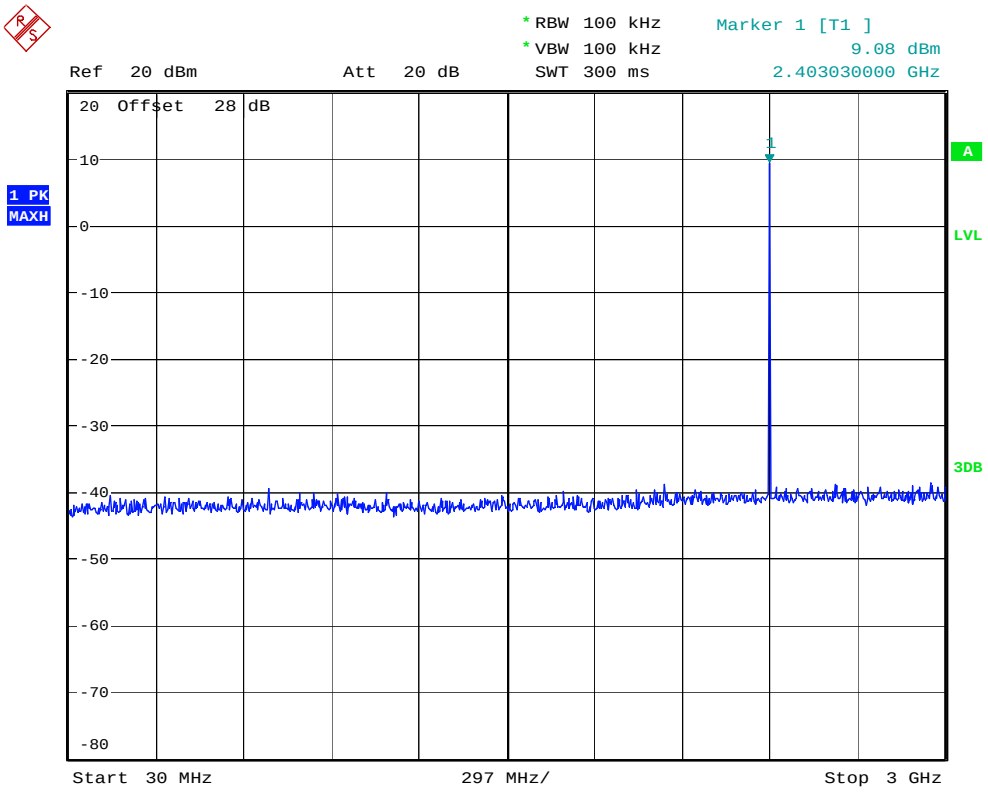
CFR 47 Part 15.247

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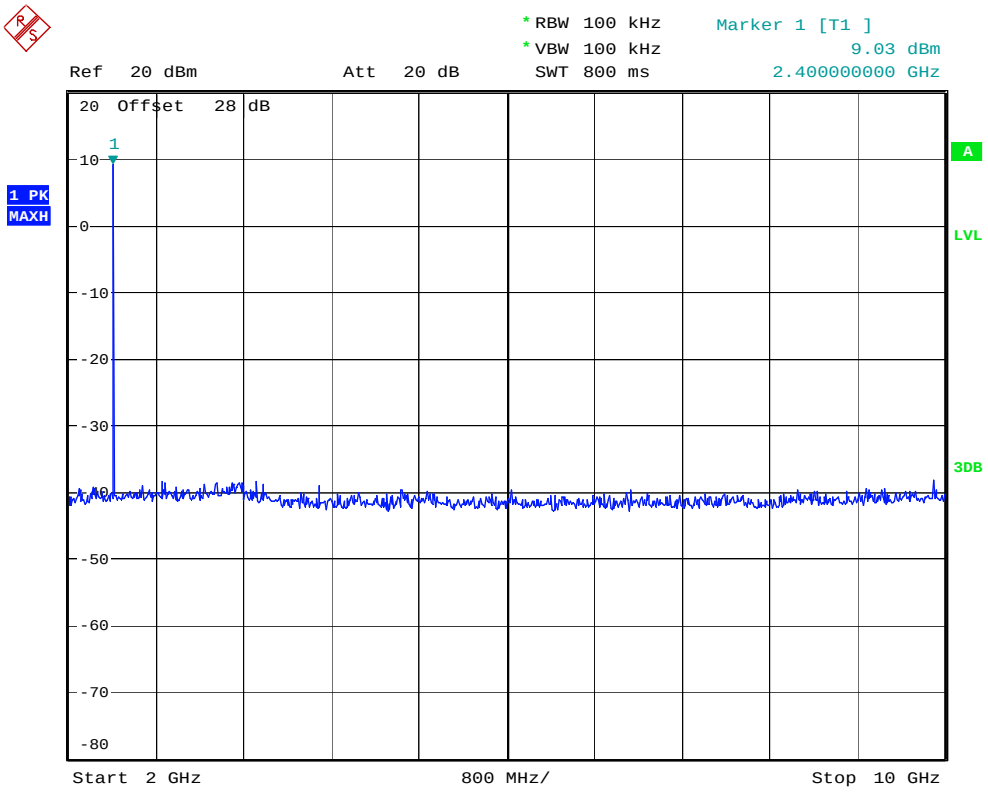
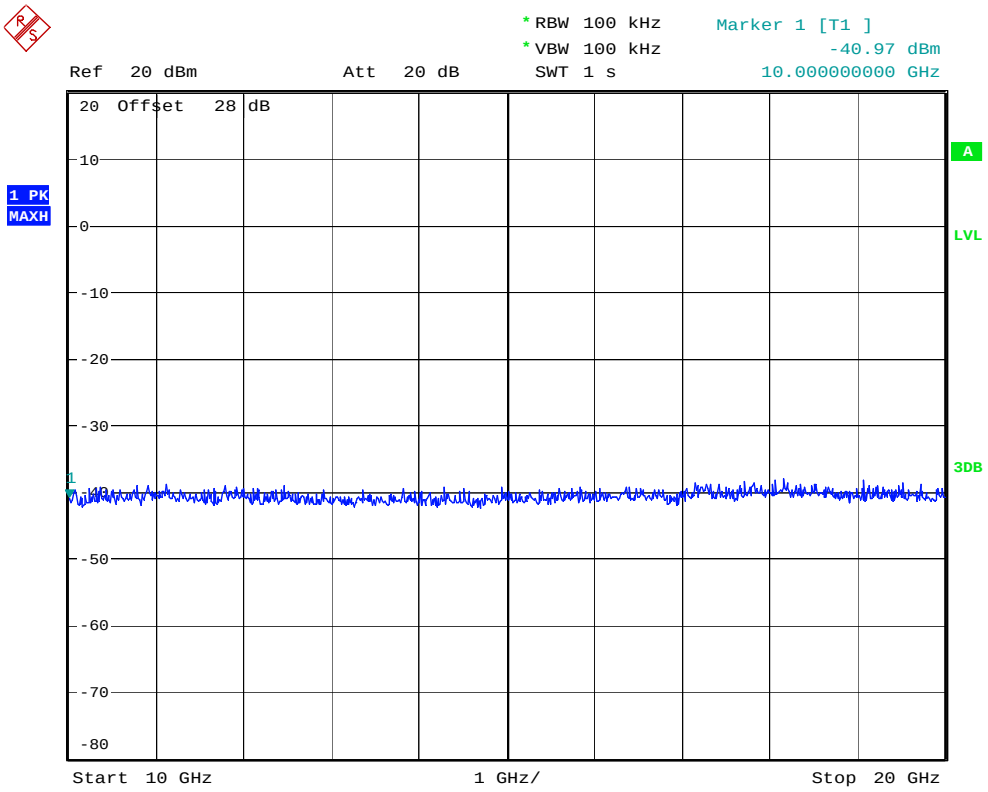
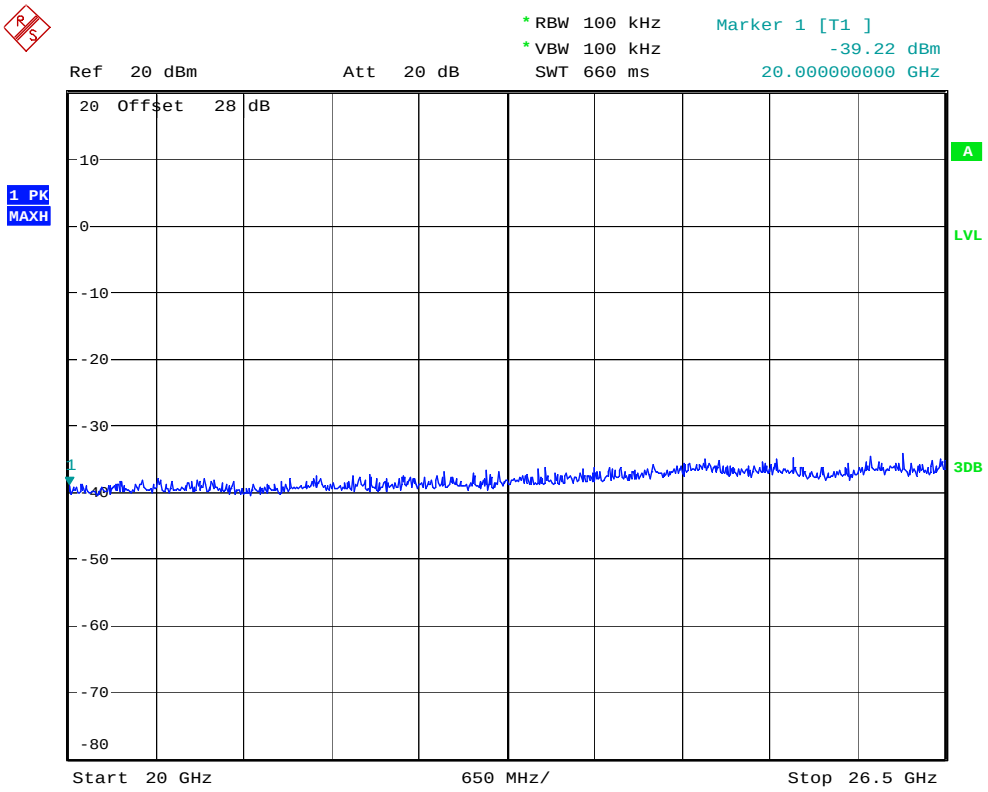
Conducted Spurious Emissions 30-3000MHz (Low Channel Enabled)



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



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



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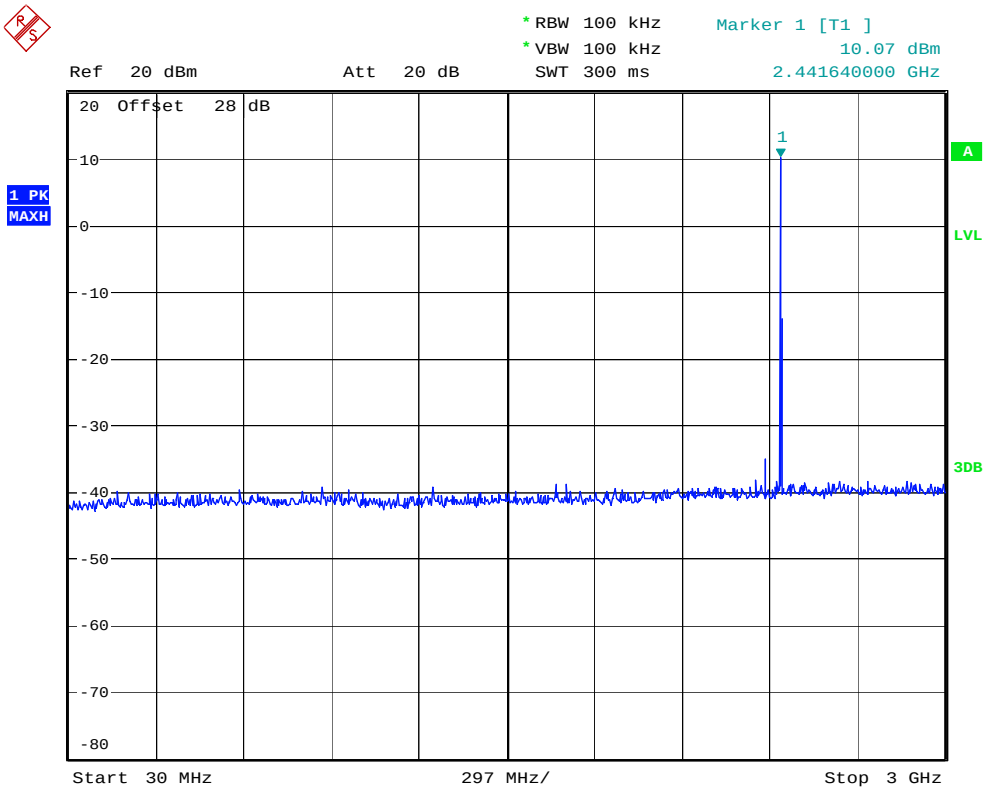
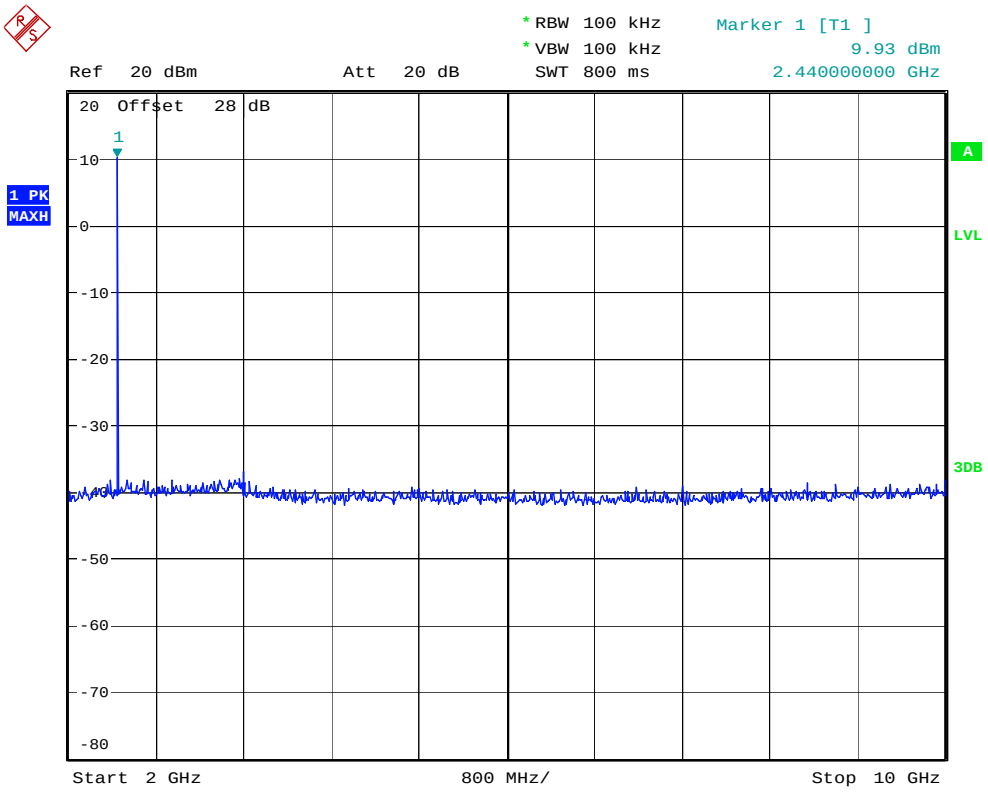
Conducted Spurious Emissions 20-26.5GHz (Low Channel Enabled)



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



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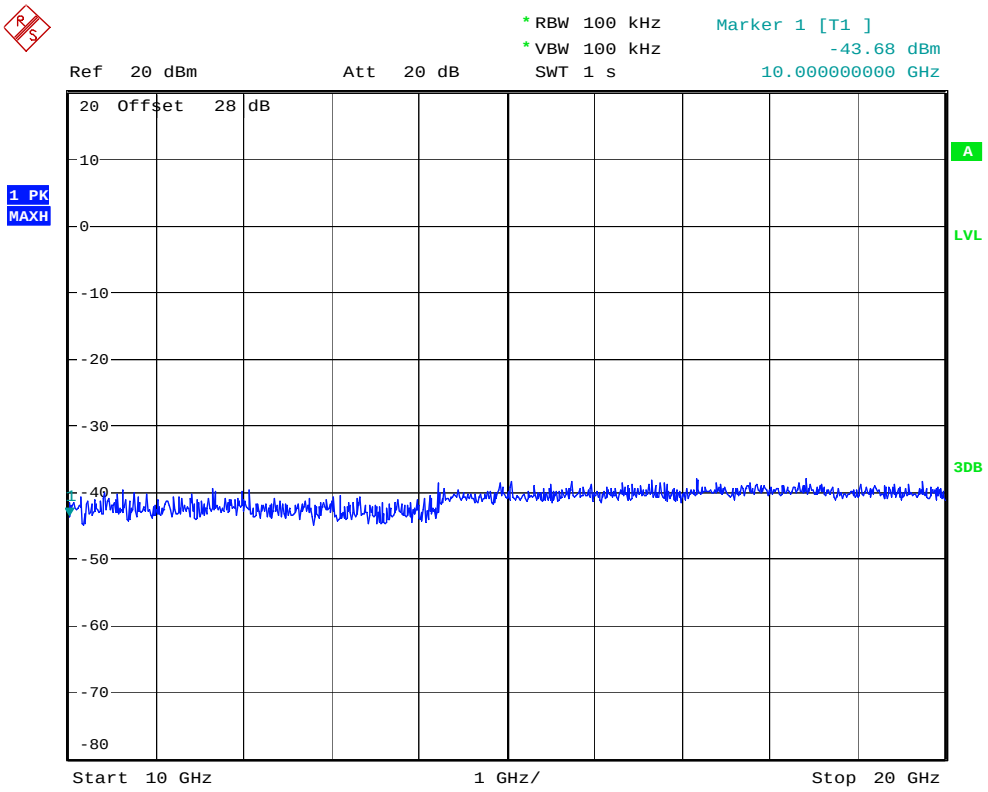
Conducted Spurious Emissions 2-10GHz (Mid Channel Enabled)



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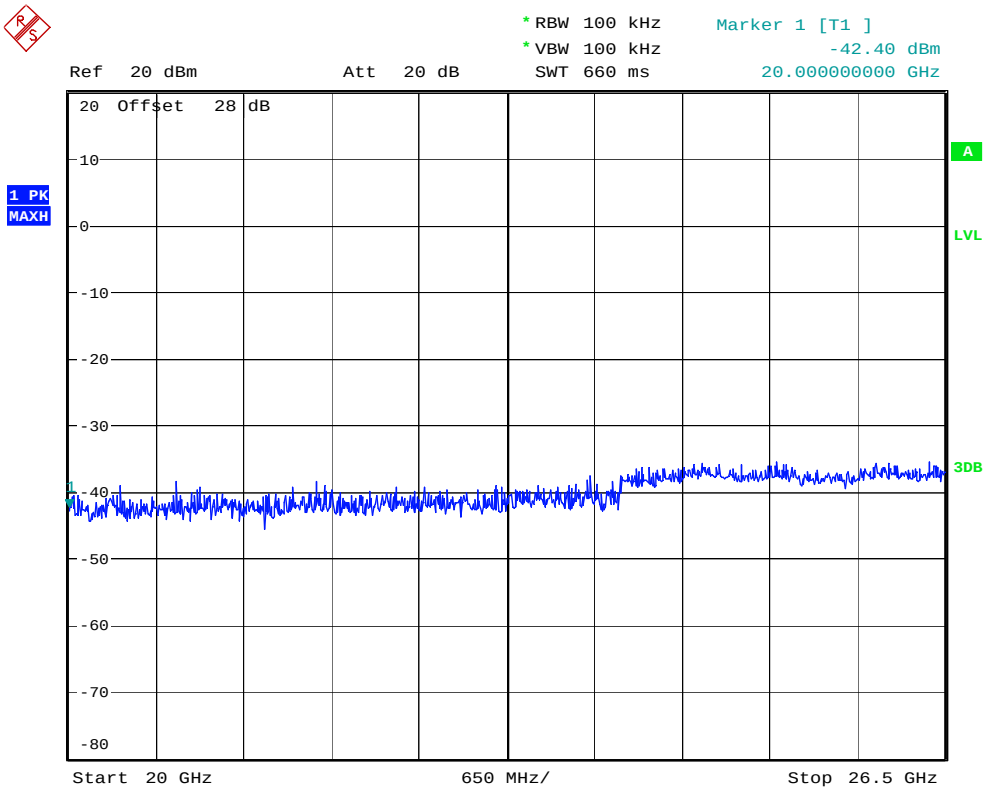
Conducted Spurious Emissions 10-20GHz (Mid Channel Enabled)



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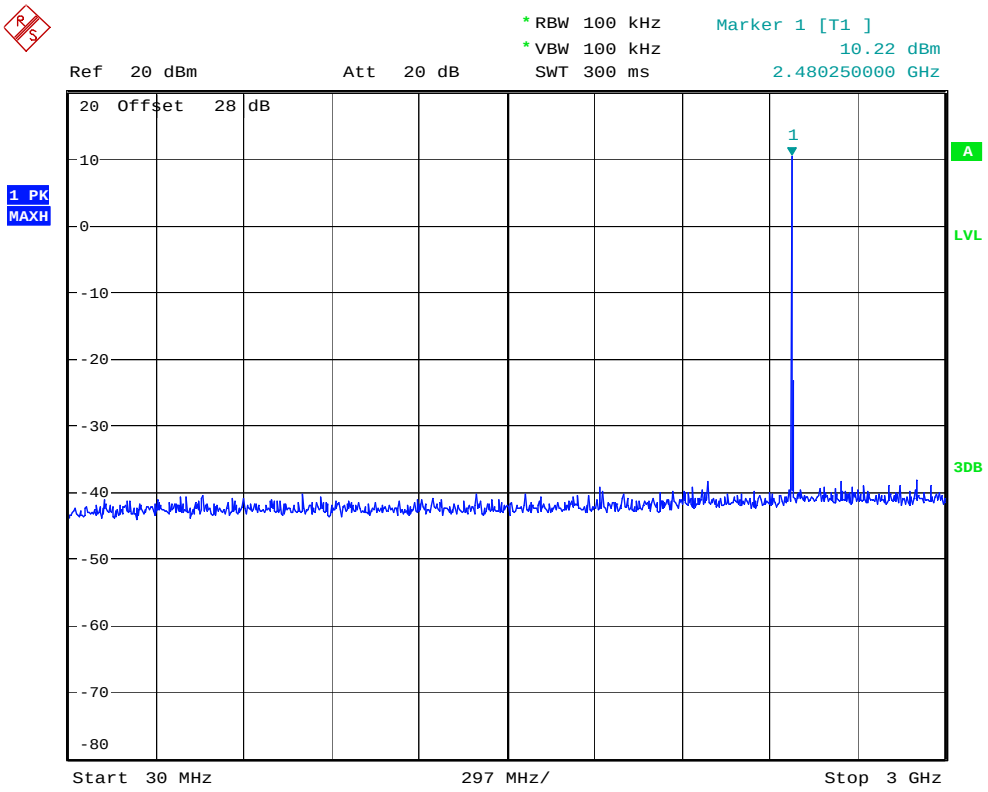
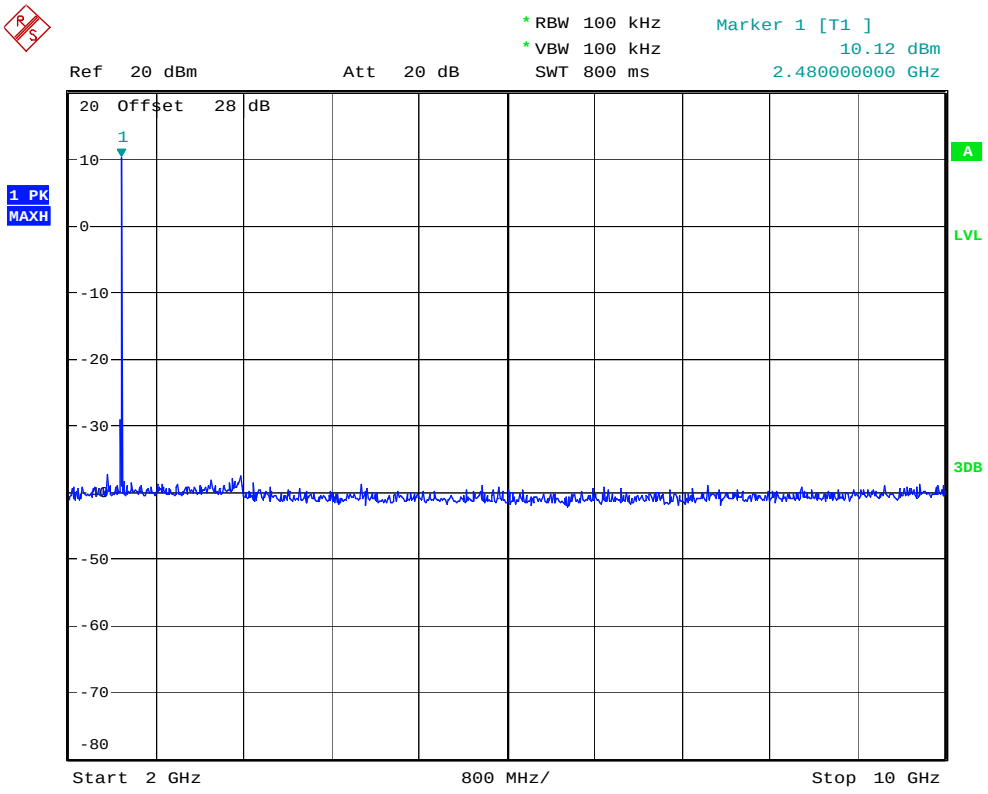
Conducted Spurious Emissions 20-26.5GHz (Mid Chan Enabled)



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



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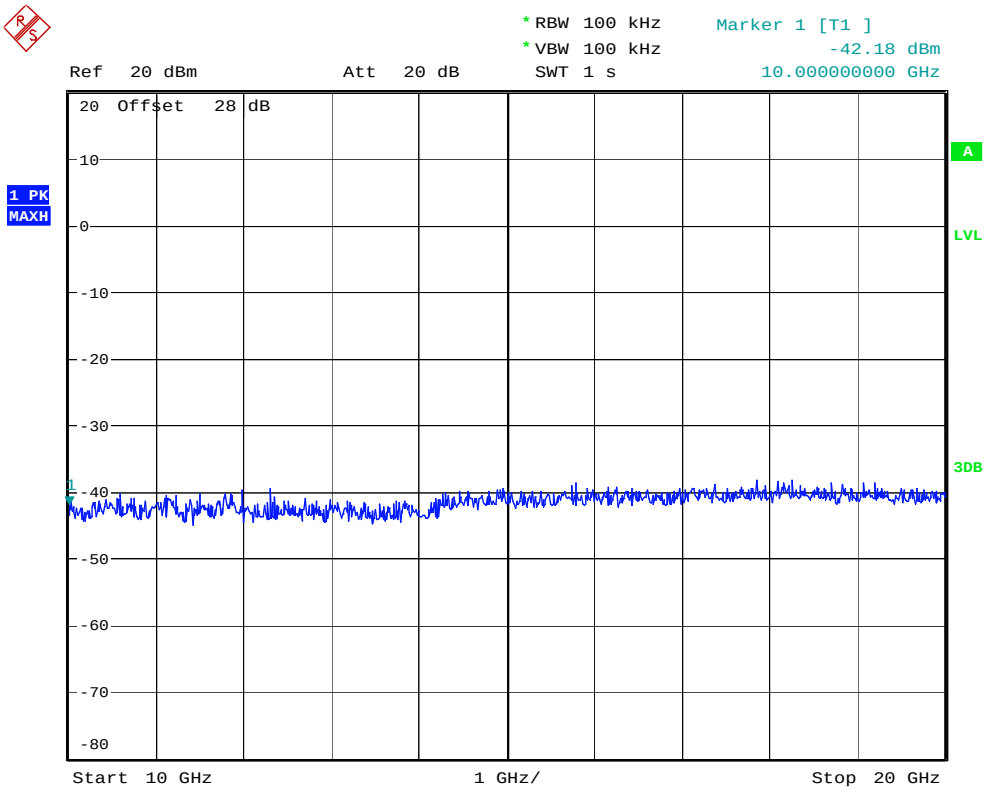
Conducted Spurious Emissions 2-10GHz (High Channel Enabled)



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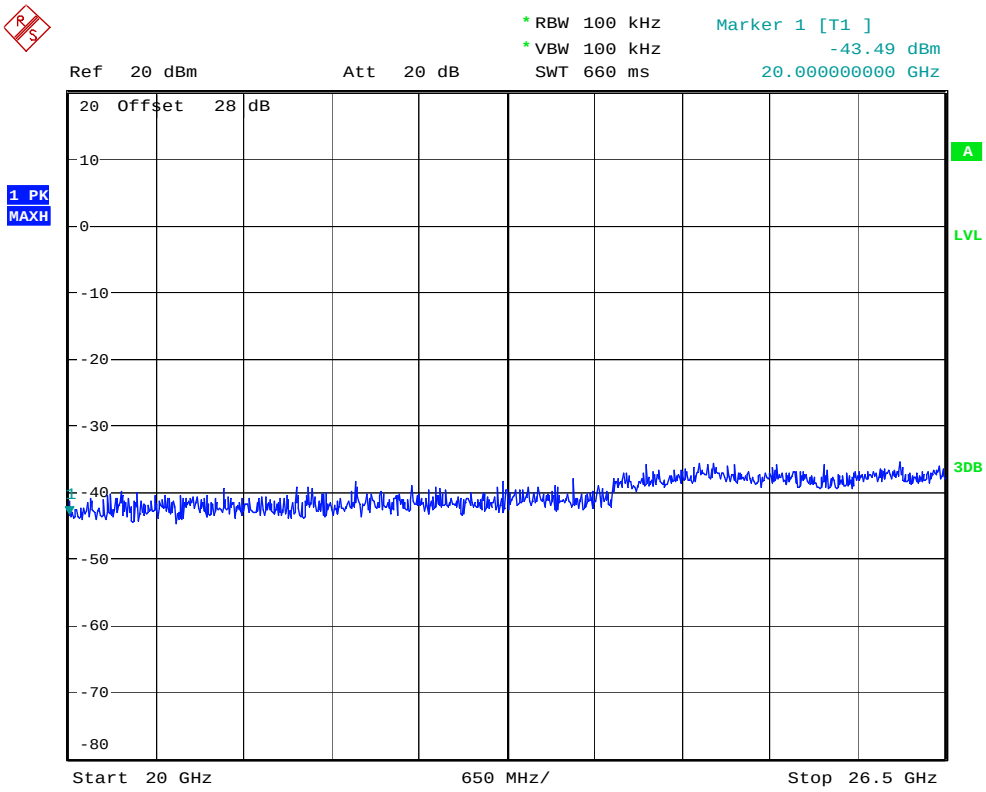
Conducted Spurious Emissions 10-20GHz (High Channel Enabled)



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

AC LINE CONDUCTED

CFR 47 Part 15.207

Measurement Procedure

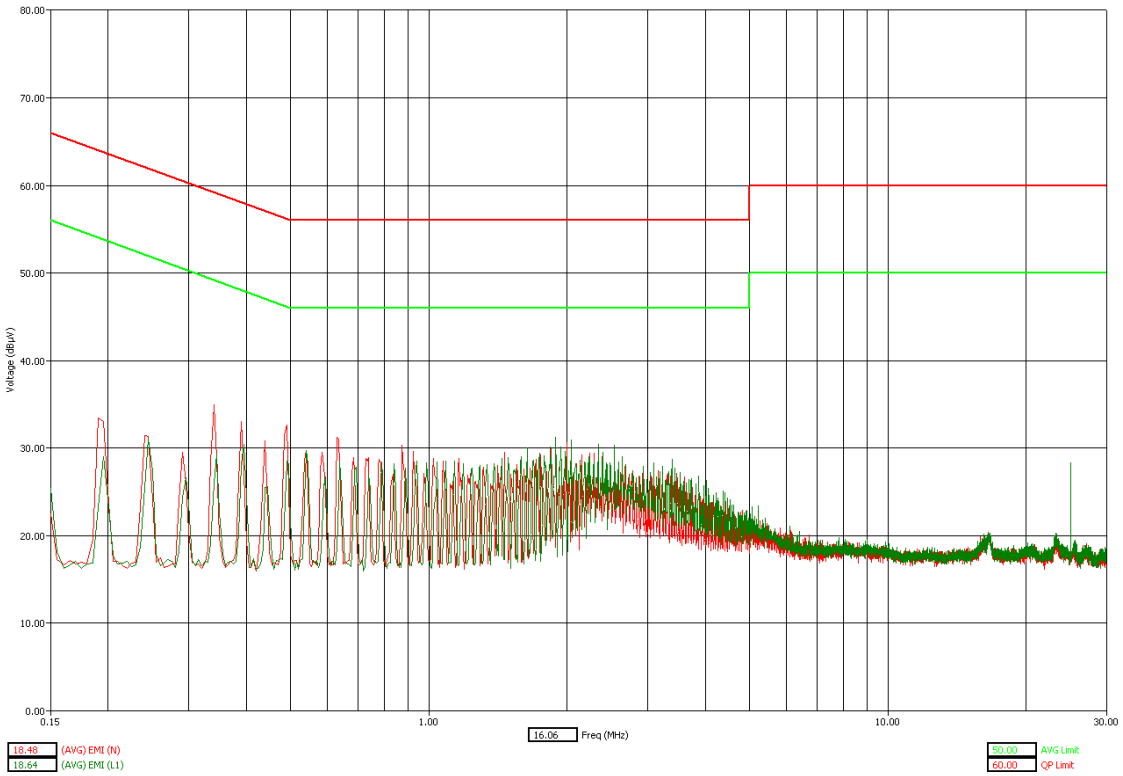
Measured levels of ac power line conducted emission shall be the radio-noise voltage from the line probe or across the 50 Ω LISN port, where permitted, terminated into a 50 Ω noise meter, or where permitted or required, the radio-noise current on the power line sensed by a current probe.

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.

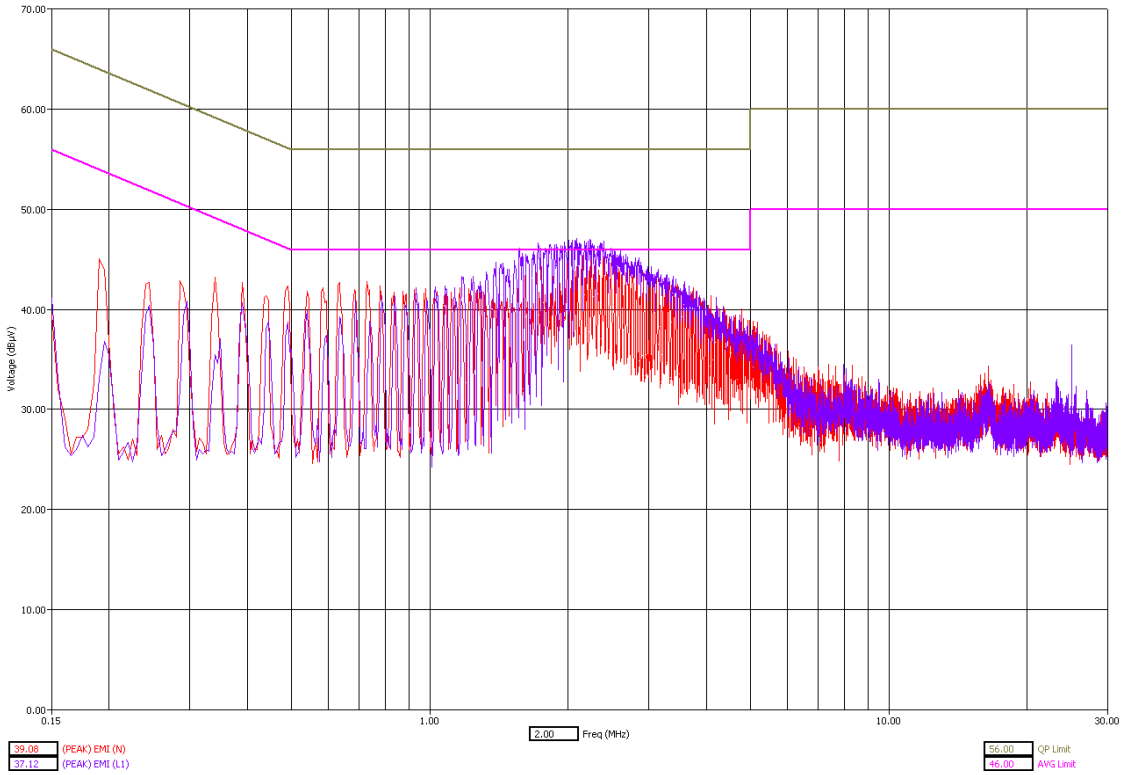
Detectors – Peak and Average Detector

Measurement Results

See attached:



Bluetooth – Hopping - Tx Mode – AVG Detector



Bluetooth – Hopping - Tx Mode – Peak Detector

End of Test Report