



PRODUCT SAFETY AND COMPLIANCE EMC LABORATORY

EMC TEST REPORT - Addendum

Test Report Number – 24935-1 Bluetooth Low Energy

Report Date – 2012-03-31

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: 2012-03-30 to 2012-03-31

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: 2012-03-31

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



UKAS Certificate Number: 2404

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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, Inc.
Mobile Devices Business
600 North US Hwy 45
Libertyville, IL 60048

Product Type : Cell phone with embedded Bluetooth

Signaling Capability: GSM 1900, EDGE1900, Bluetooth,
802.11b/802.11g/802.11n

FCC ID: IHDT56NH1

Serial Numbers: 351915050000128

Testing Complete Date: March 31, 2011

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, RSS-210 Issue 8

Summary of Testing

Test	Test Name	Pass/Fail
1	Spectrum Bandwidth	Pass
2	Peak Power	Pass
3	Power Spectral Density	Pass
4	Spurious RF Conducted Emissions	Pass
5	AC Line Conducted Emissions	Pass

Test	Test Name	Results
1	Spectrum Bandwidth	See plots
2	Peak Power	See plots
3	Power Spectral Density	See tables
4	Spurious RF Conducted Emissions	See plots
5	AC Line Conducted Emissions	See Plots

General and Special Conditions

This product utilizes an internal battery that is not removable. When applicable, EMC testing was performed with the internal battery fully charged.

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

Equipment	Model/type	Serial number	Operational range	Date of calibration
EMI analyzers	ESU 40	100036	20 Hz – 40 GHz	11.11.2011
Pre Amplifiers	PA-02-0001:	2007343	(10 kHz – 3 GHz)	07.04.2011
	PA-02-218	2007344	3 GHz – 18 GHz	07.04.2011
	PA-02-5	2007345	18 GHz – 40 GHz	07.04.2011
Radio com. Tester	CMU 200	112790	GSM 850/900/1800/1900 IS95, UMTS, CDMA, Bluetooth	N/A
Band Reject Filter	WRCD	N/A	GSM 850/900/1800/1900 IS95, UMTS, CDMA	N/A
	4N45-24241/3/6	N/A	WLAN	N/A

The antennas used in the various tests are listed in the below table. The log-periodic antenna is used as communication and link establishment antenna for Bluetooth.

Antenna	Type	Serial number	Operational range	Date of calibration
Hybrid-log periodic	TDK HLP 3003C	130408	30 MHz – 3 GHz	11.14.2011
Double ridged Horn	TDK HRN0118	130376	1 GHz – 18 GHz	01.22.2011
Double ridged Horn	ETS HRN3116	00071938	18 GHz – 40 GHz	07.13.2011
Loop antenna	FMZB 1513	1513-105	9KHz - 30MHz	01.27.2012

Note that the hybrid antenna and horn antenna are on a three-year calibration cycle. All other equipments are on a one-year calibration cycle.

Description of Bluetooth Transmitter

The Equipment Under Test (EUT) offers Bluetooth LE + EDR as a feature. This report covers Bluetooth LE operation only. The Bluetooth LE + EDR spread-spectrum, 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 LE transmitter, it is designed operate with other Bluetooth LE 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

Spectrum 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. The fully charged internal battery was used for the supply voltage.

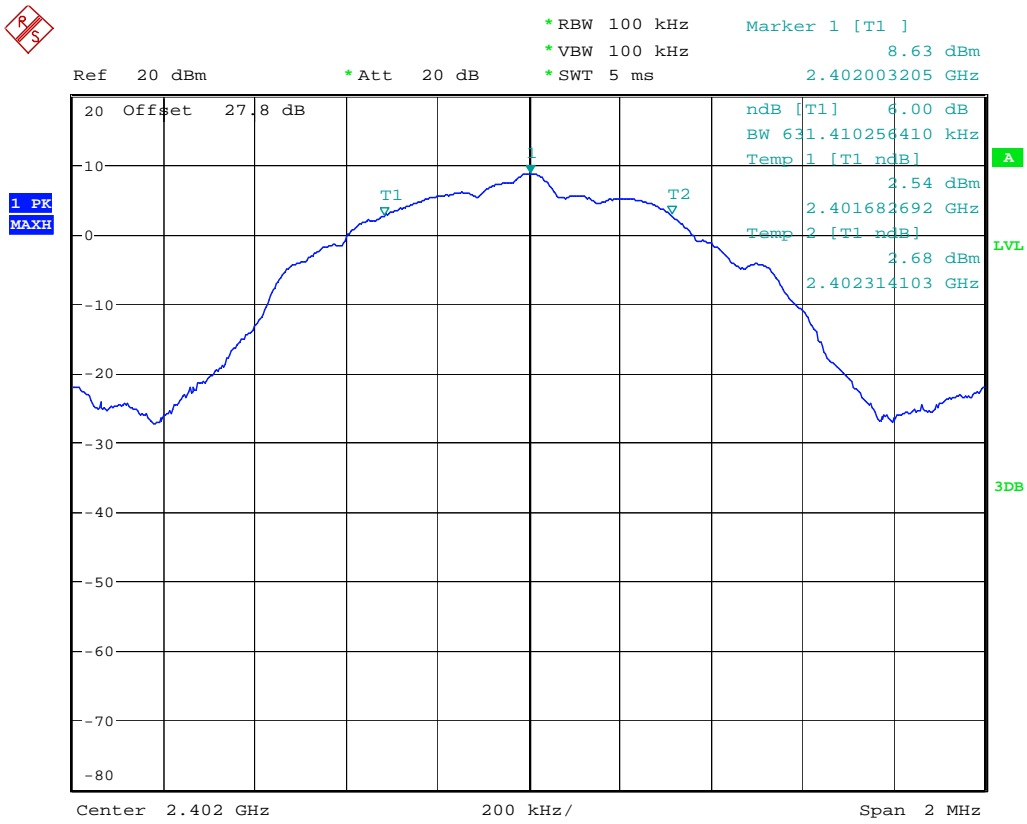
The Bluetooth frequency hopping function of the EUT was enabled. The spectrum analyzer used the following settings:

1. RBW \geq 100 kHz
2. VBW \geq RBW
3. Sweep = auto
4. Detector function = peak
5. 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 6 dB 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 6 dB bandwidth of the emission. The same procedure was repeated for 20 dB bandwidth.

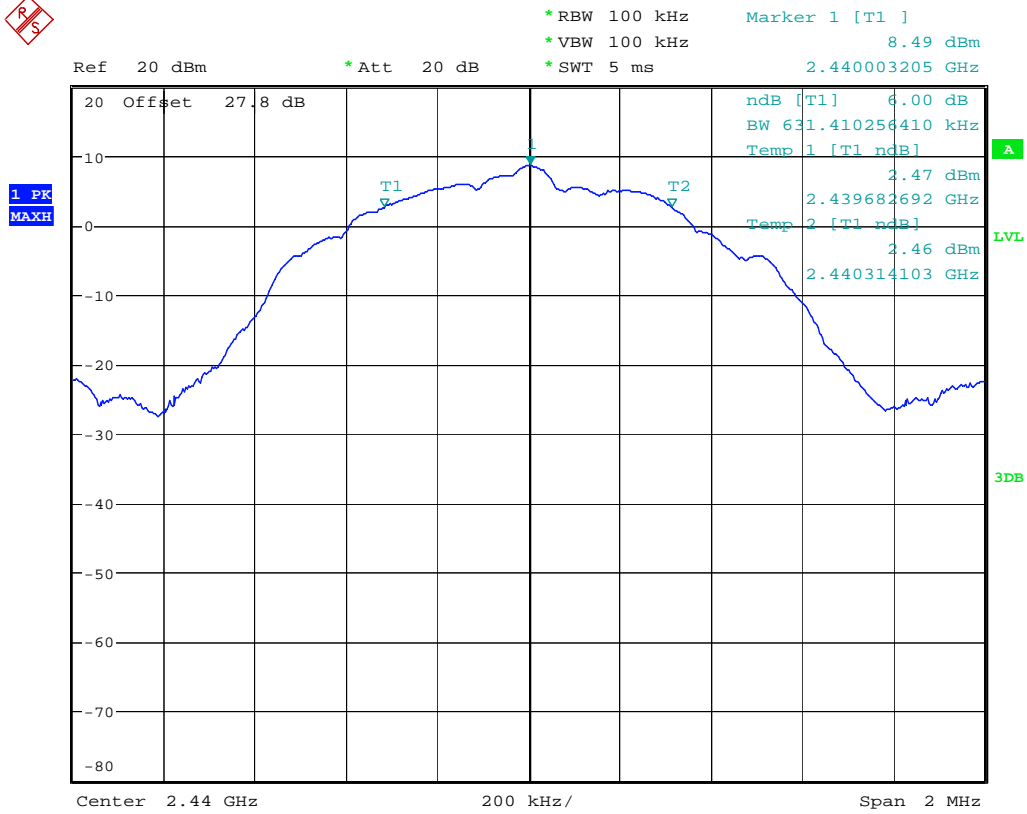
Measurement Results

See attached



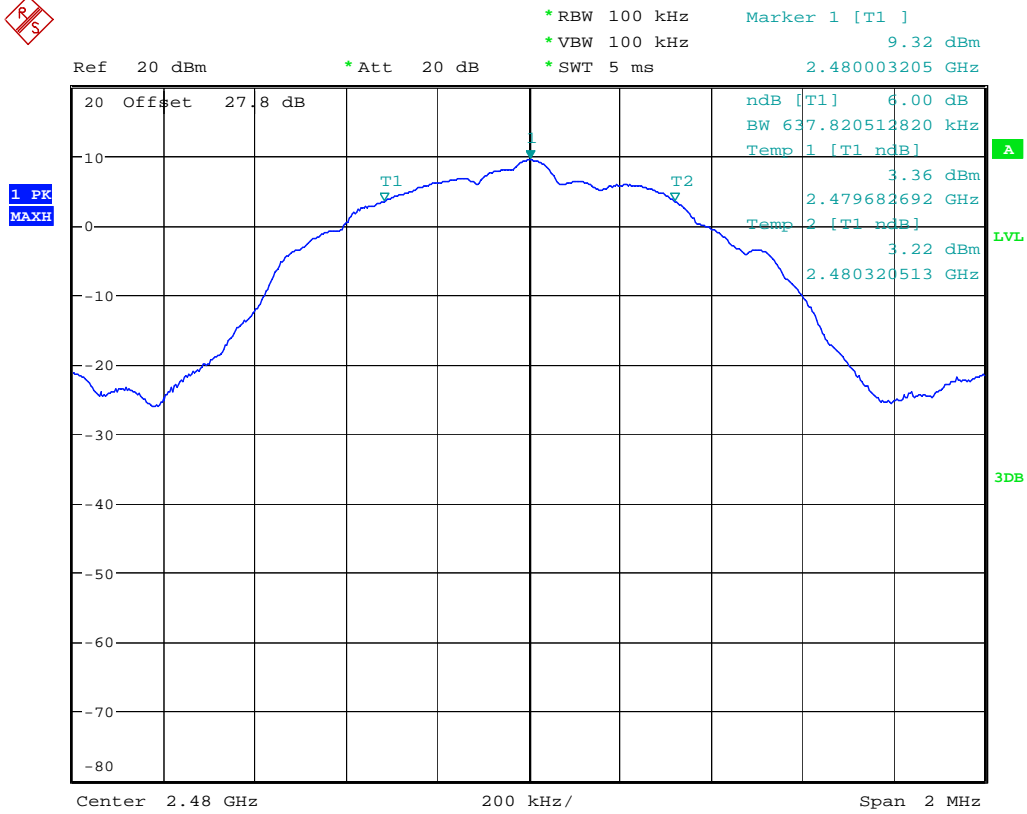
Date: 30.MAR.2012 10:37:34

6 dB Bandwidth Low Channel



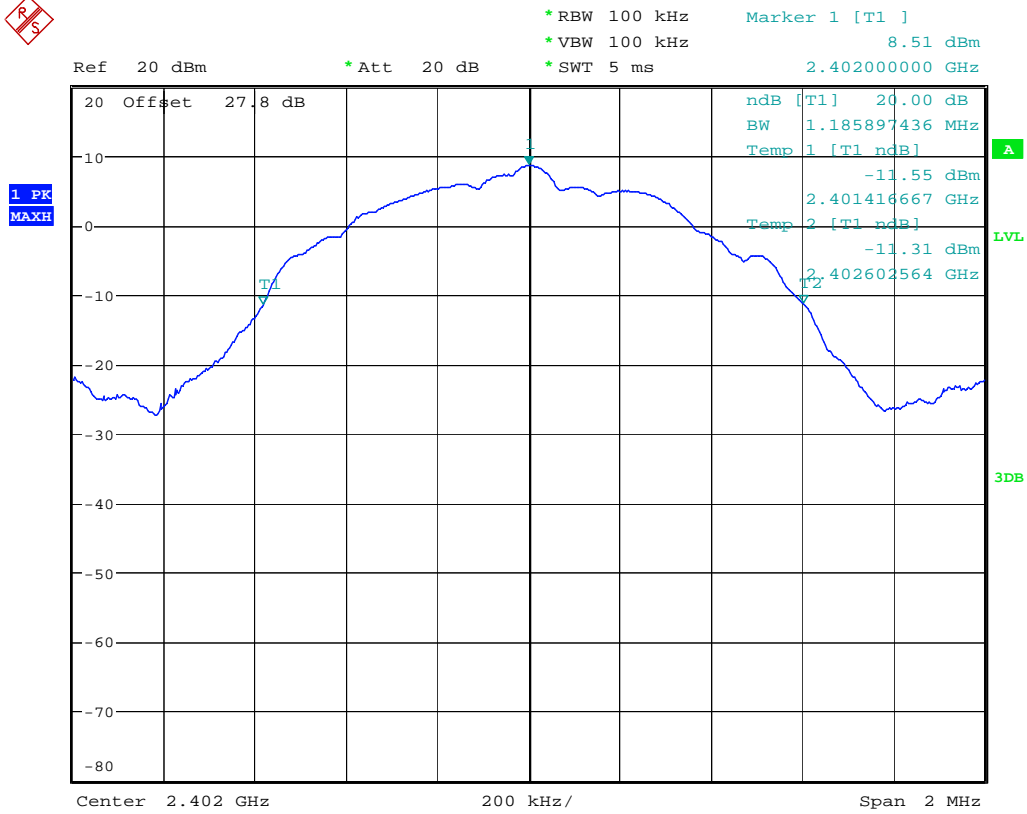
Date: 30.MAR.2012 10:41:32

6 dB Bandwidth Middle Channel



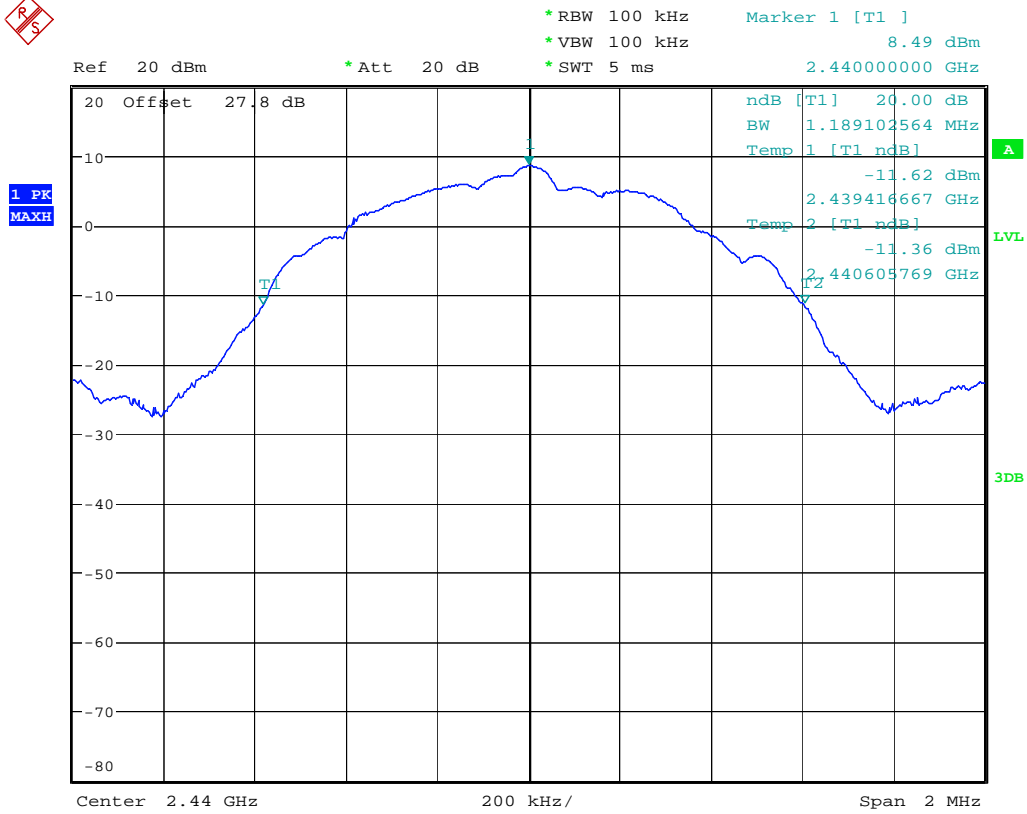
Date: 30.MAR.2012 10:43:33

6 dB Bandwidth High Channel



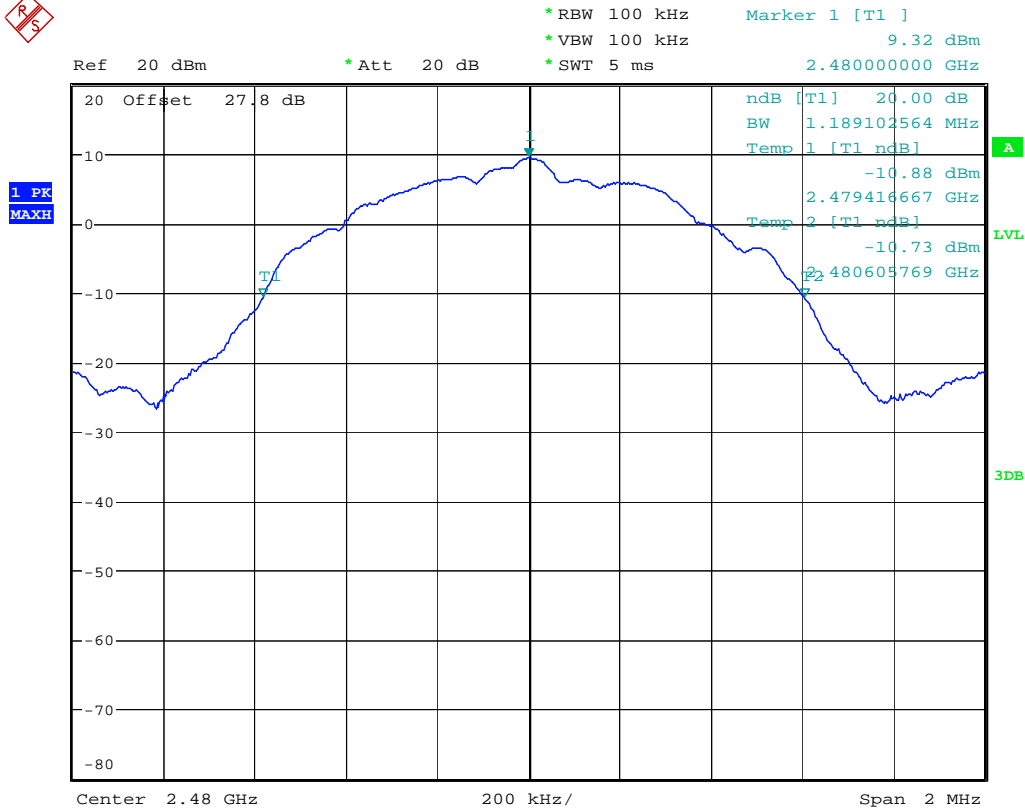
Date: 30.MAR.2012 10:38:43

20 dB Bandwidth Low Channel



Date: 30.MAR.2012 10:40:44

20 dB Bandwidth Middled Channel



Date: 30.MAR.2012 10:44:29

20 dB Bandwidth High Channel

PEAK OUTPUT POWER

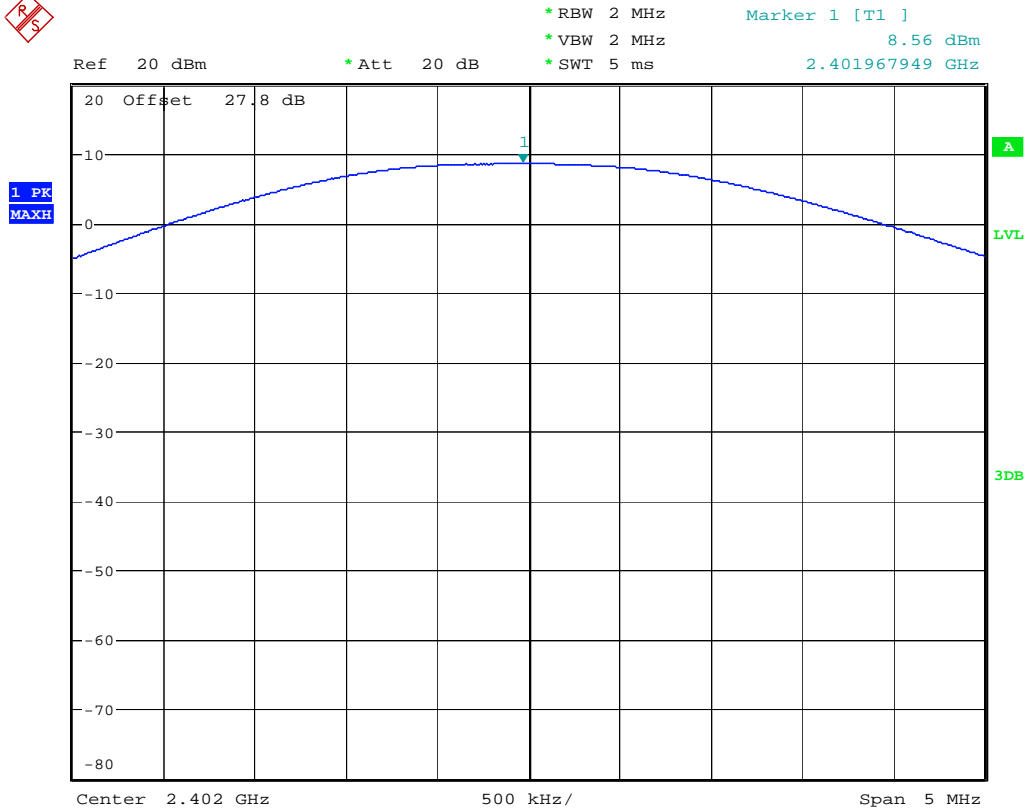
CFR 47 Part 15.247

Measurement Procedure

The RF output port of the Equipment-Under-Test is directly coupled to the input of the Spectrum analyzer through a specialized RF connector and a 20dB passive attenuator. The fully charged internal battery was used for the supply voltage. The power is then measured using a peak detector,

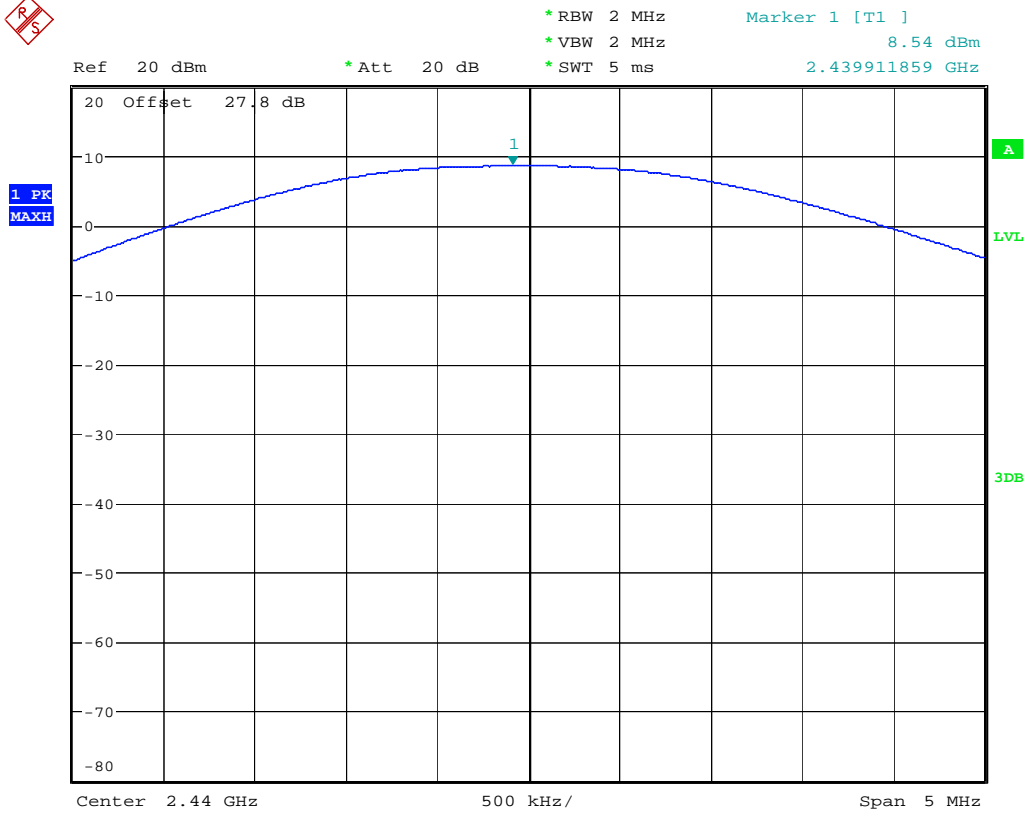
Measurement Results

See Attached



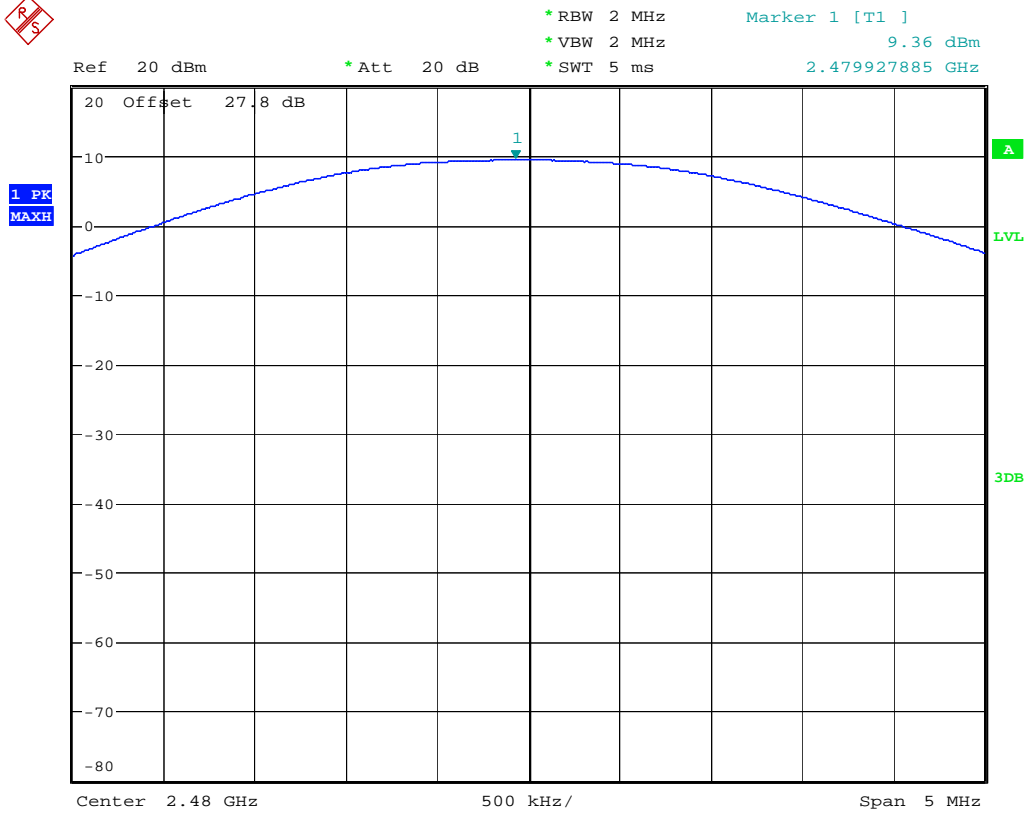
Date: 30.MAR.2012 10:48:34

Max. Power Low Channel



Date: 30.MAR.2012 10:47:29

Max. Power Middle Channel



Date: 30.MAR.2012 10:46:07

Max. Power High Channel

Power Spectral Density

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. The fully charged internal battery was used for the supply voltage.

The BT LE function of the EUT was enabled. The spectrum analyzer used the following settings:

1. Span = 300 kHz
2. VBW =30 kHz
3. RBW=3 kHz
4. Sweep = 50 ms
5. Detector function = peak
6. Trace = max hold

The trace was allowed to stabilize. The EUT was transmitting at its maximum data rate.

Measurement Results

2402 MHz	2440 MHz	2480 MHz
7.36	7.34	8.17

SPURIOUS RF CONDUCTED EMISSIONS

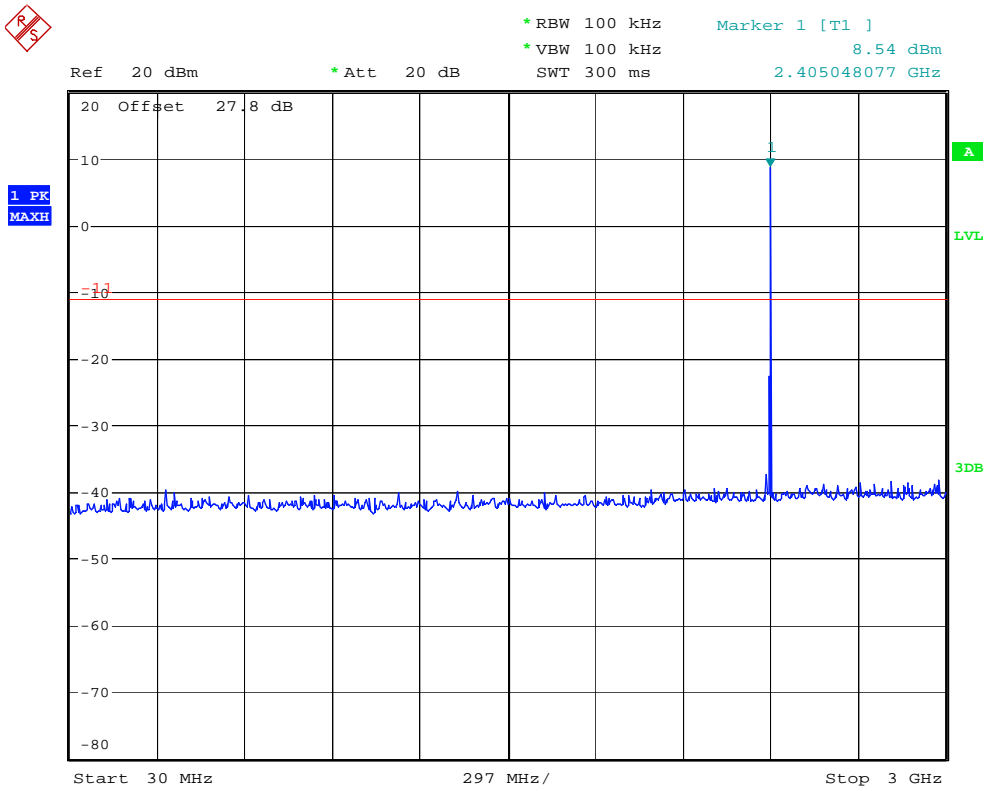
CFR 47 Part 15.247

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. The fully charged internal battery was used for the supply voltage.

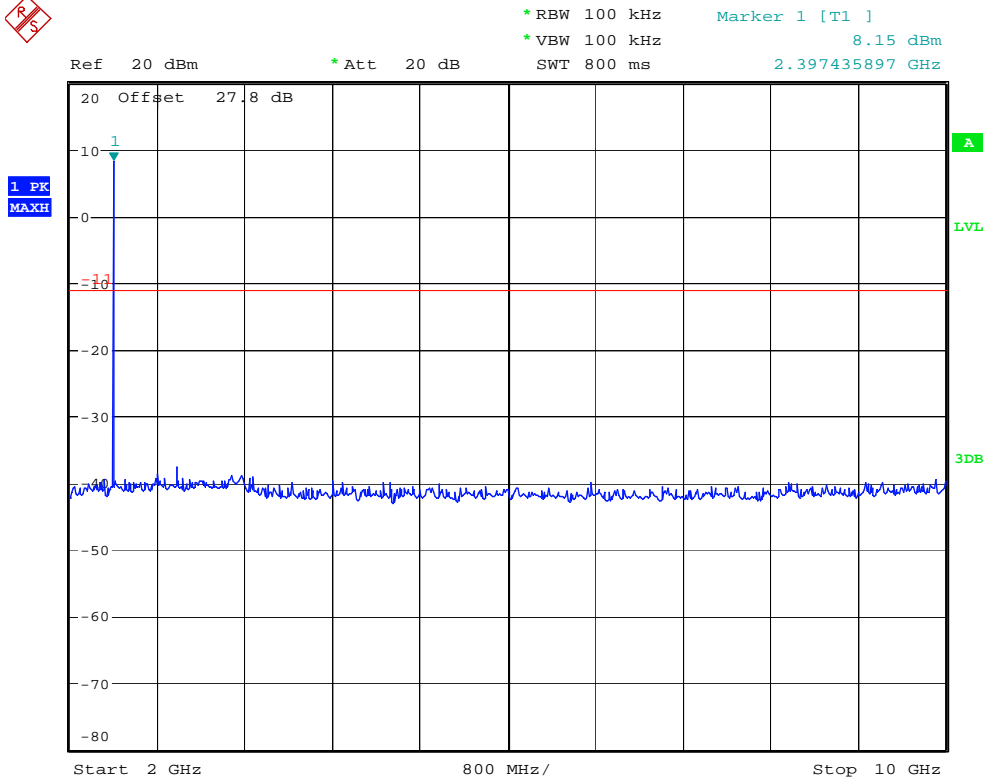
Measurement Results

See attached:



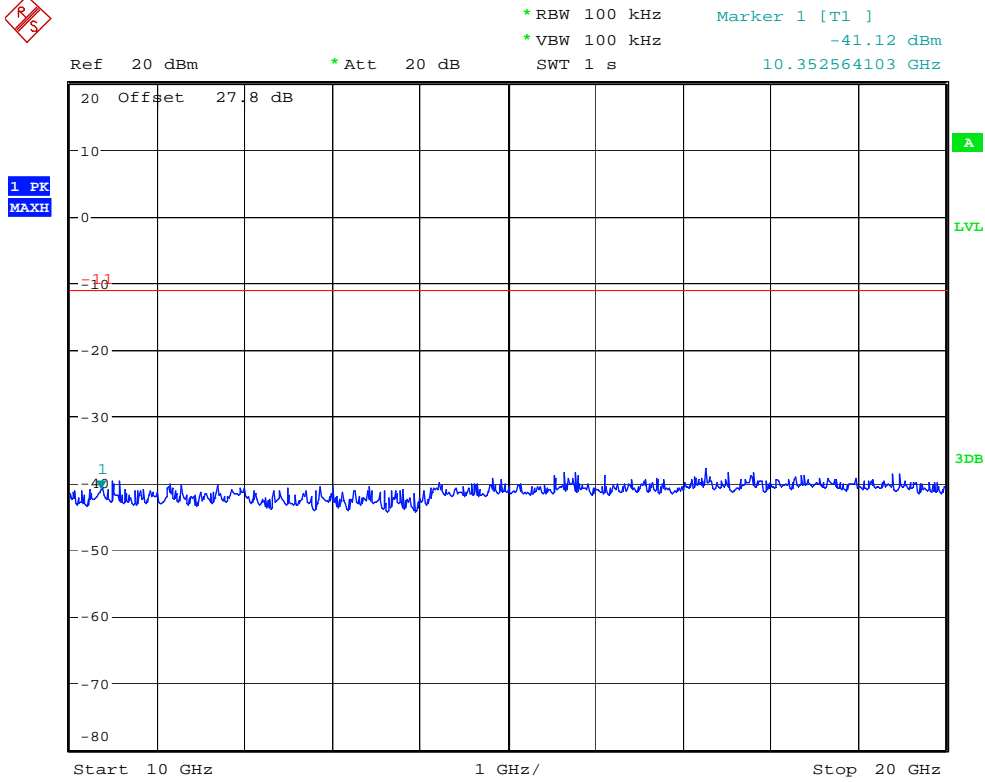
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Conducted Spurious Emissions 30-3000 MHz (Low Channel)



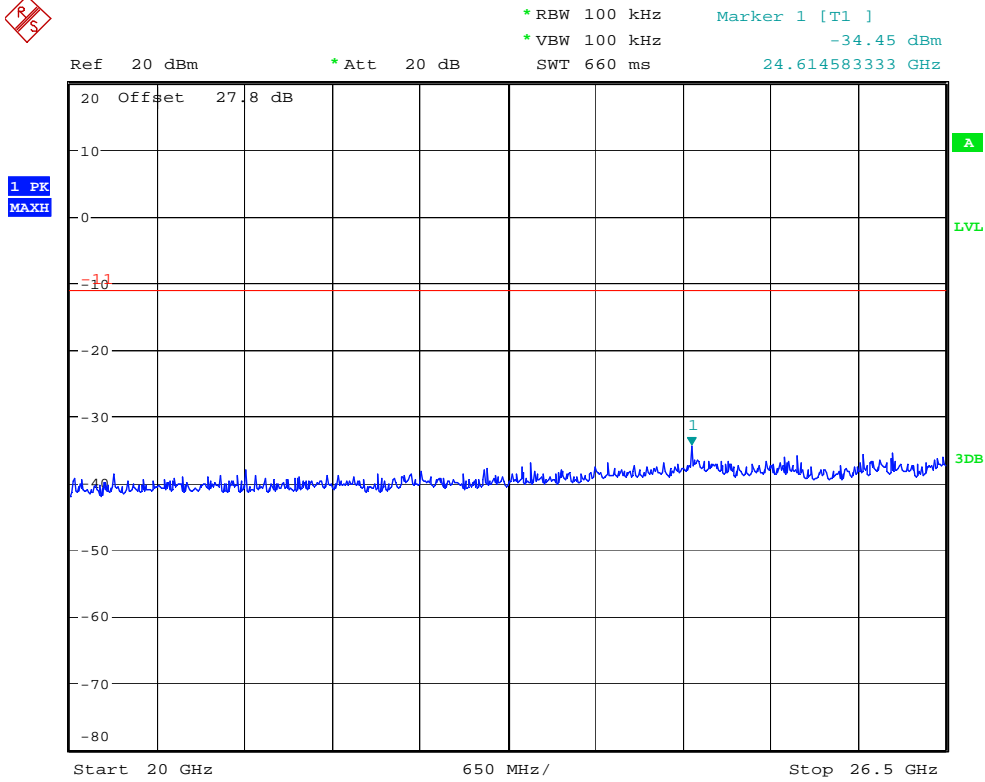
Date: 30.MAR.2012 10:54:51

Conducted Spurious Emissions 2-10 GHz (Low Channel)



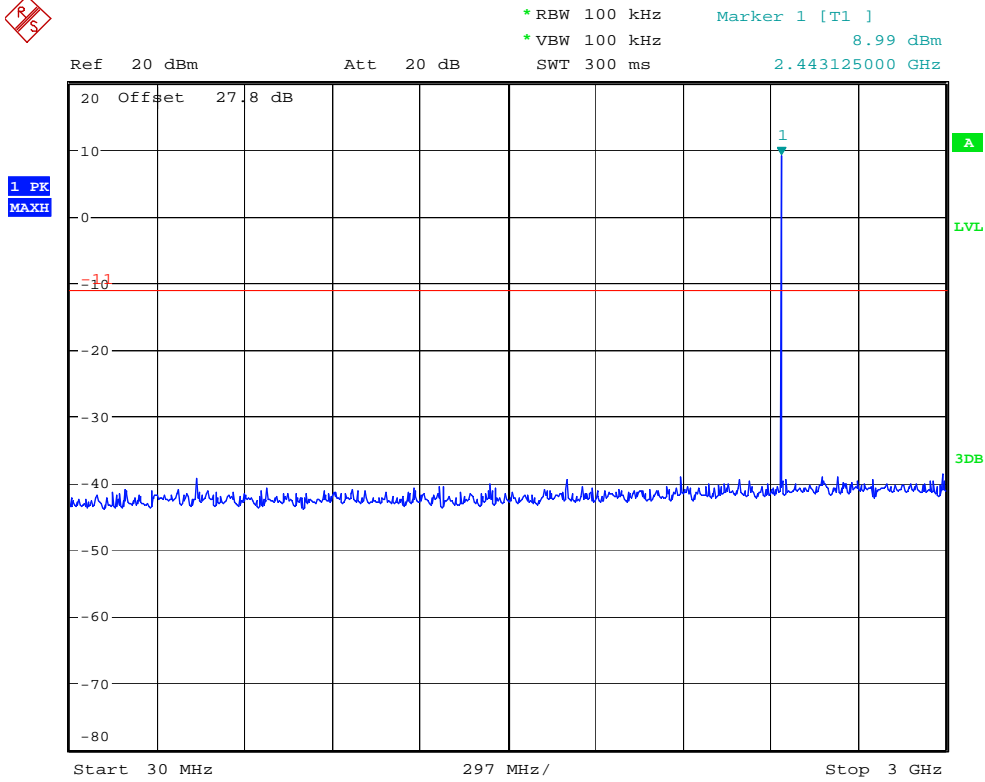
Date: 30.MAR.2012 10:55:26

Conducted Spurious Emissions 10-20 GHz (Low Channel)



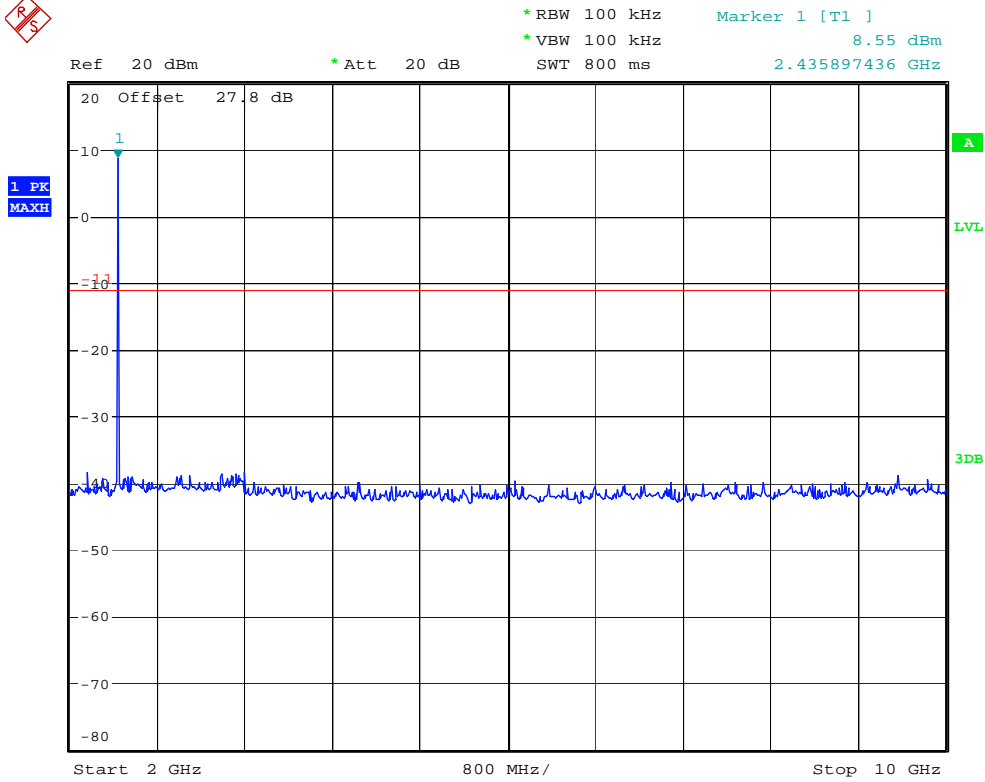
Date: 30.MAR.2012 10:56:09

Conducted Spurious Emissions 20-26.5 GHz (Low Channel)



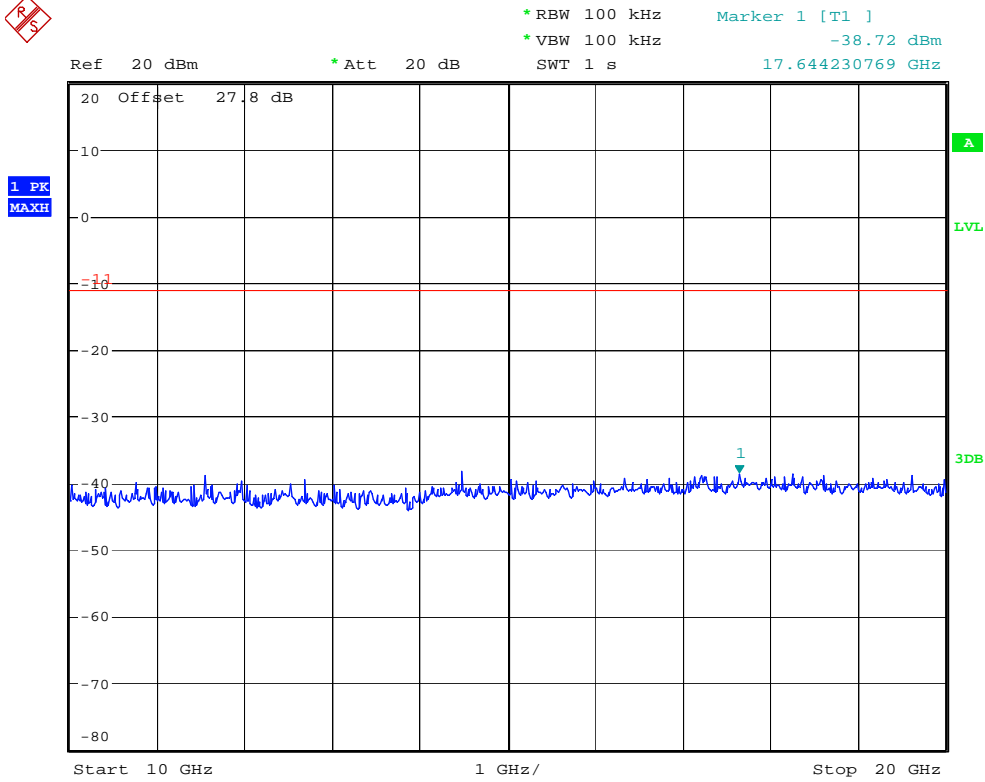
Date: 31.MAR.2012 14:10:30

Conducted Spurious Emissions 30-3000 MHz (Mid Channel)



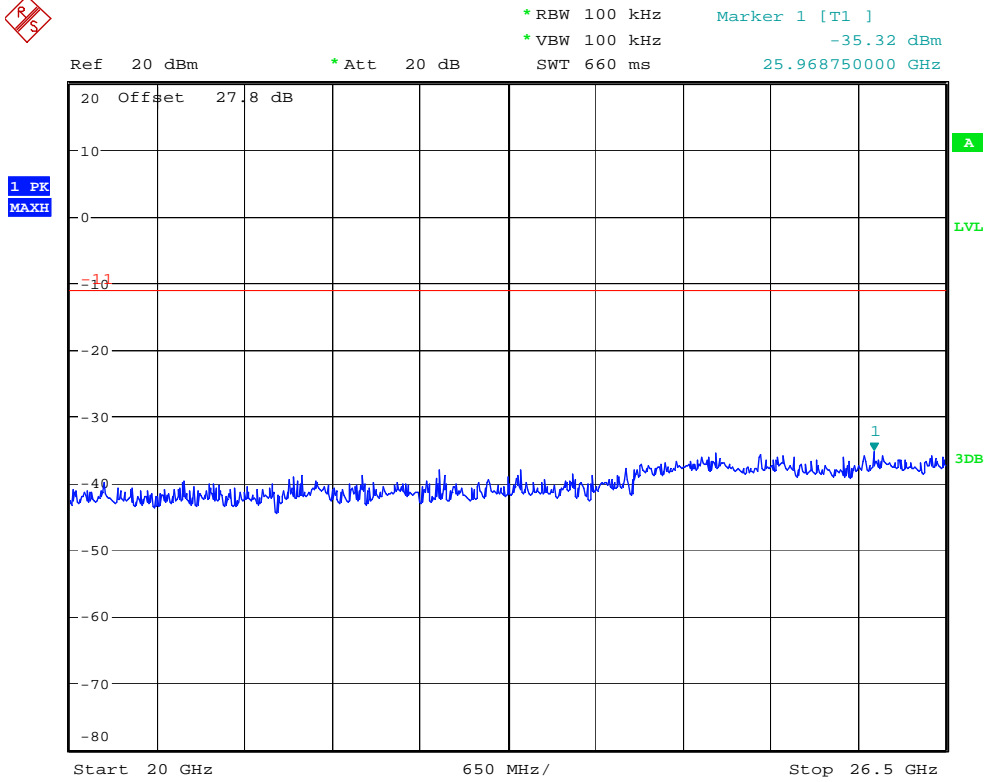
Date: 30.MAR.2012 11:04:08

Conducted Spurious Emissions 2-10 GHz (Mid Channel)



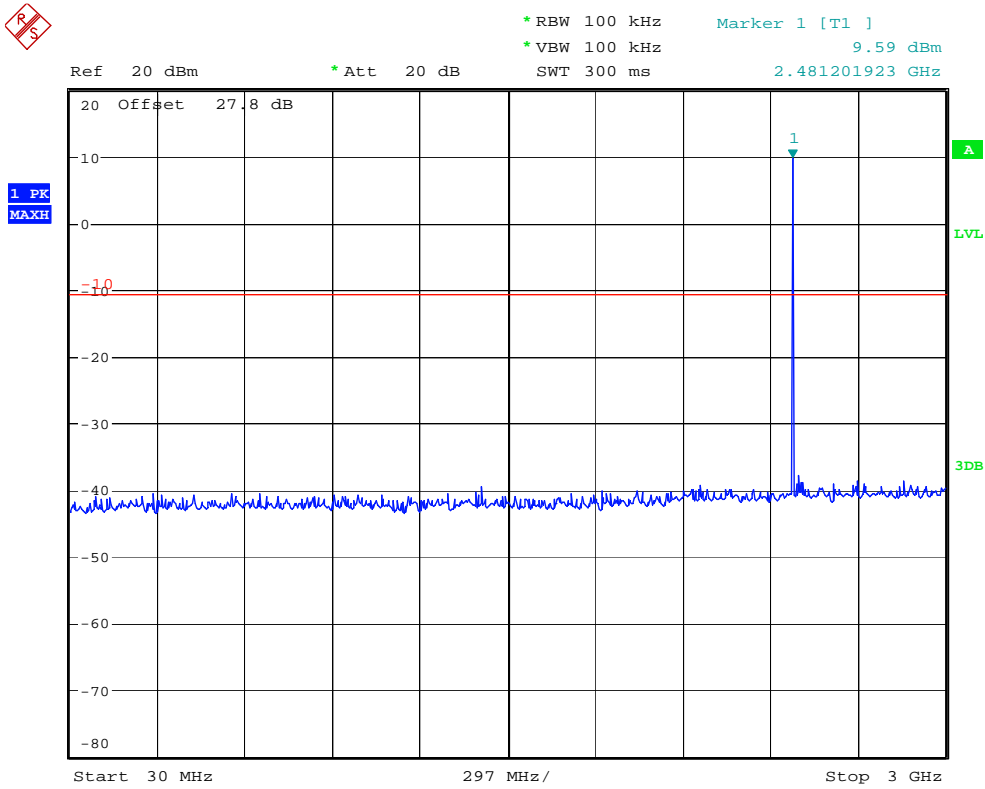
Date: 30.MAR.2012 11:04:40

Conducted Spurious Emissions 10-20 GHz (Mid Channel)



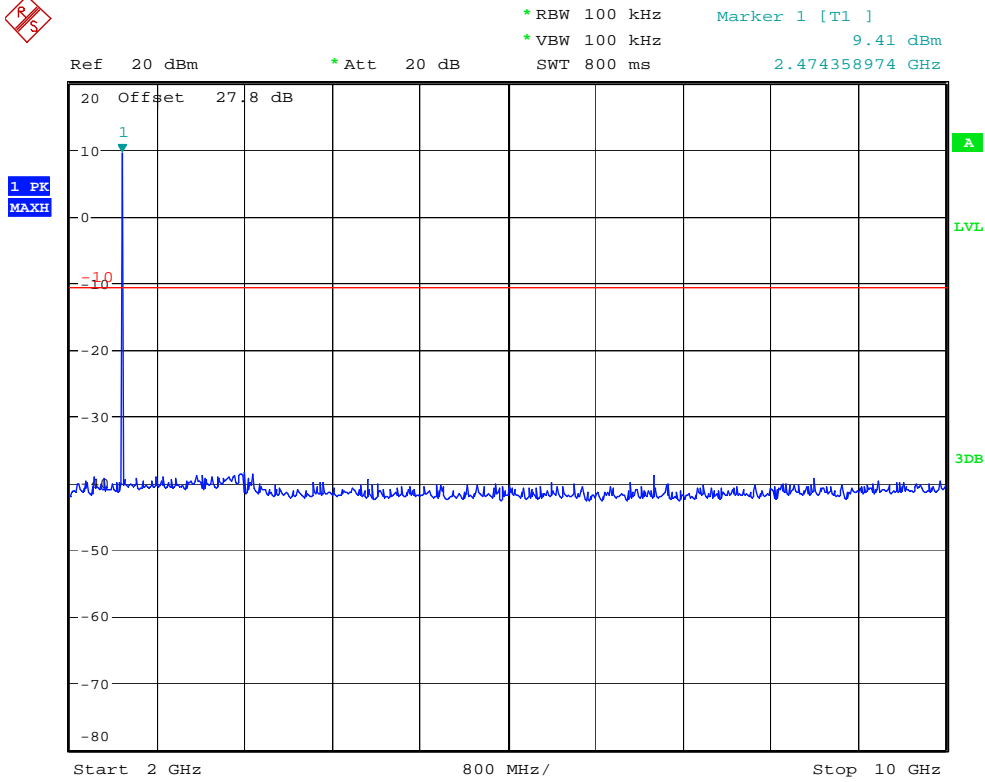
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Conducted Spurious Emissions 20-26.5 GHz (Mid Channel)



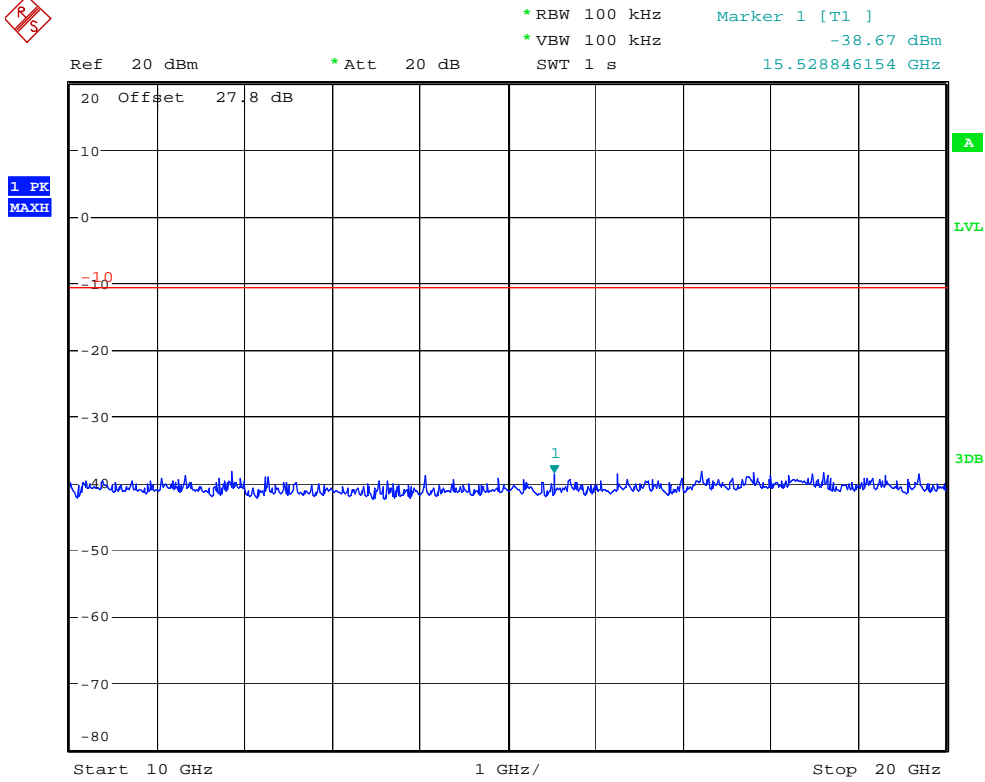
Date: 30.MAR.2012 11:06:58

Conducted Spurious Emissions 30-3000 MHz (High Channel)



Date: 30.MAR.2012 11:07:58

Conducted Spurious Emissions 2-10 GHz (High Channel)



Date: 30.MAR.2012 11:08:43

Conducted Spurious Emissions 10-20 GHz (High Channel)

AC LINE CONDUCTED EMISSIONS

CFR 47 Part 15.207

Measurement Procedure

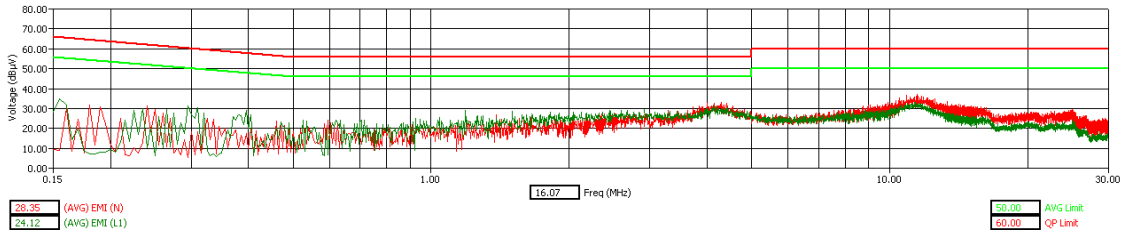
Measured levels of ac power line conducted emission shall be the radio-noise voltage from the line probe or across the 50 Ω LISN port, where permitted, terminated into a 50 Ω noise meter, or where permitted or required, the radio-noise current on the power line sensed by a current probe.

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 .

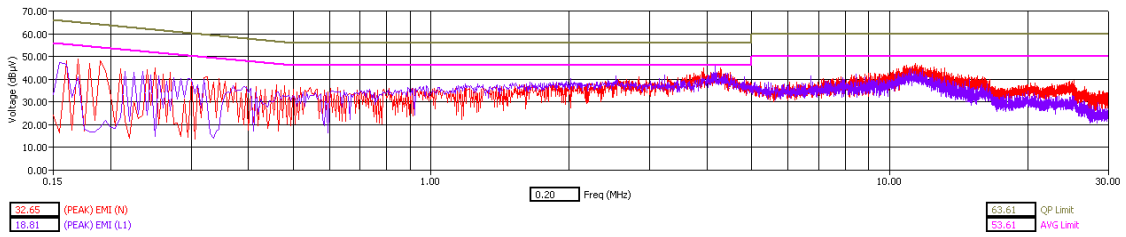
Detectors – Quasi Peak and Average Detector.

Measurement Results

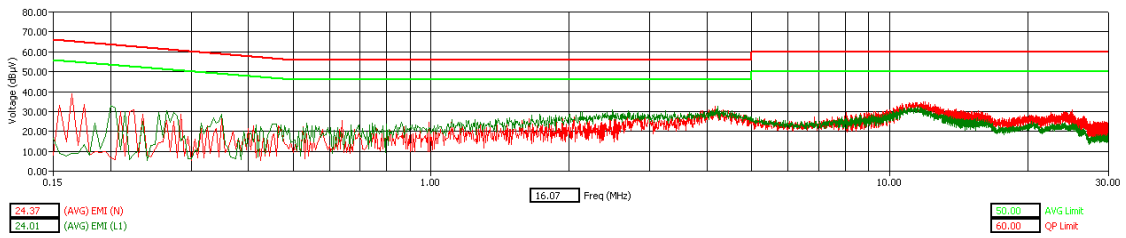
See attached:



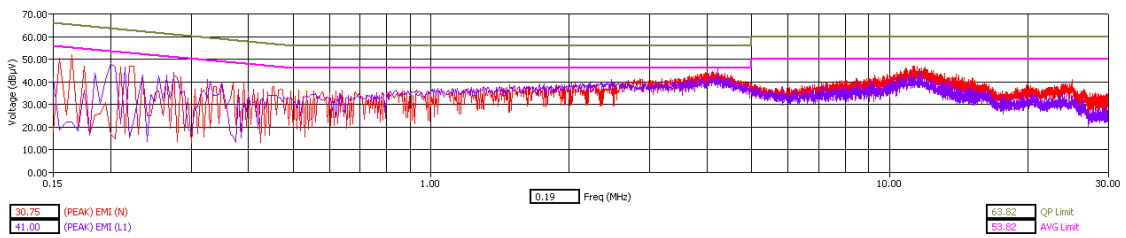
Low Channel - Tx Mode – AVG Detector



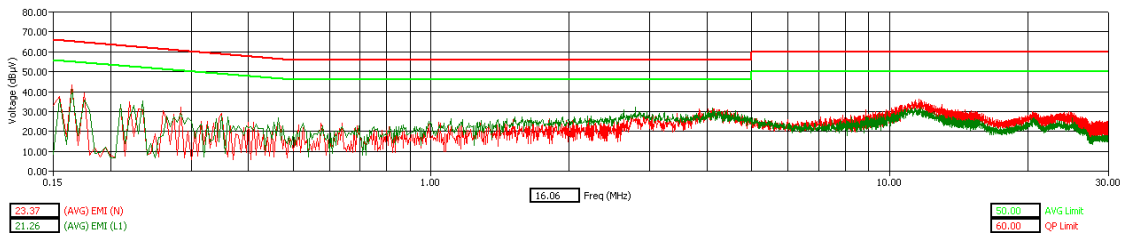
Low Channel - Tx Mode – Peak Detector



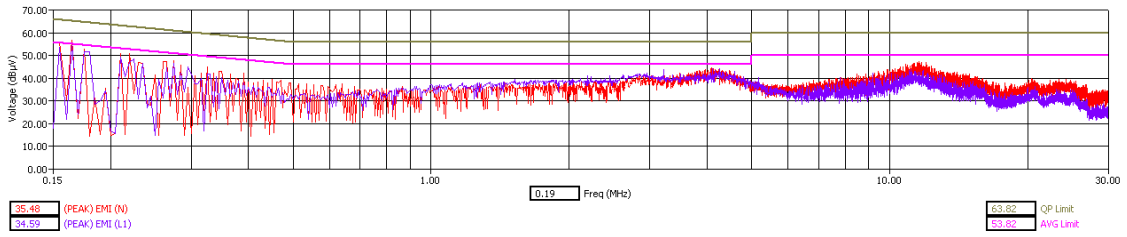
Mid Channel - Tx Mode - AVG Detector



Mid Channel - Tx Mode - Peak Detector



High Channel - Tx Mode - AVG Detector



High Channel - Tx Mode - Peak Detector

End of Test Report