MOTOROLA MOBILITY

PRODUCT SAFETY AND COMPLIANCE
EMC LABORATORY

EMC TEST REPORT - Addendum

Test Report Number –24983-1 WLAN

Report Date – 2012-04-13

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: Lei Yang Name: Lei Yang

Title: EMC Project Engineer Test: 2012-03-07 to 2012-03-27

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

Signature: Yilin Zhao Name: Yilin Zhao

Title: Test Lab Manager Date: 2012-04-20

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. No. 1 Wang Jing East Road Chao Yang District Beijing, 100102, P. R. China
Product Type:	Cell phone with embedded WLAN
Signaling Capability:	GSM850/1900, EDGE850/1900, WCDMA 850/1900, HSPA, Bluetooth, 802.11b/802.11g/802.11n
IMEI:	351633050007759
FCC ID:	IHDT56NH3
Project number:	24983-1
Testing Complete Date:	2012-03-27

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.

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

The Cellular Phone hereinafter referred to as the Equipment under Test or EUT was tested using a fully charged embedded 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	200432	11/22/11
Rohde Schwarz	Receiver	ESCI	100650	03/13/12
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 LISN is on a two-year calibration cycle. All other equipments are on a one-year calibration cycle.

Description of WLAN Transmitter

The EUT offers WLAN as a feature. The WLAN 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 WLAN transmitter, it is designed operate with other WLAN 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. A fully charged battery was used for the supply voltage.

The WLAN emission of the EUT was enabled. The spectrum analyzer used the following settings:

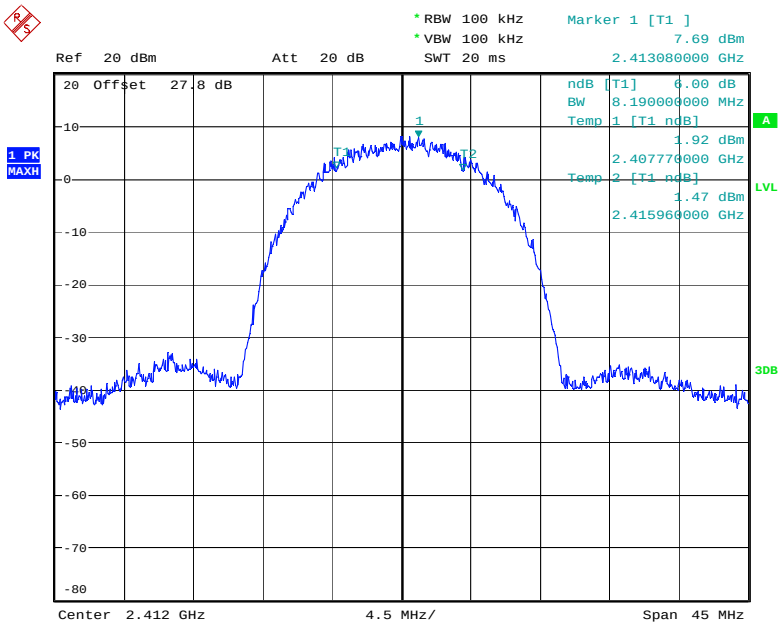
1. RBW ≥ 100 kHz
2. VBW ≥ RBW
3. Sweep = auto
4. Detector function = peak
5. Trace = max hold

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 n dB down function was used to measure 6 dB 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 6 dB down 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

802.11 b @ 11Mbps



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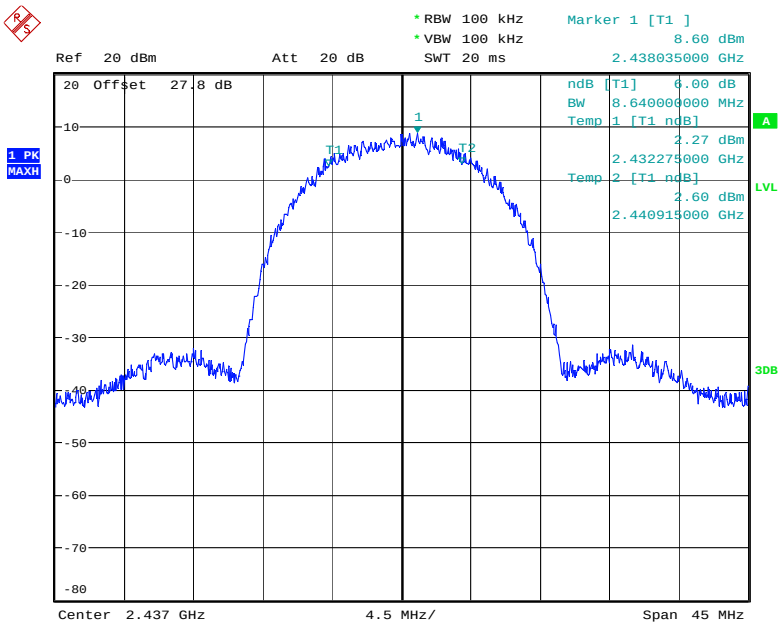
6dB Bandwidth Channel 1 @ 11 Mbps



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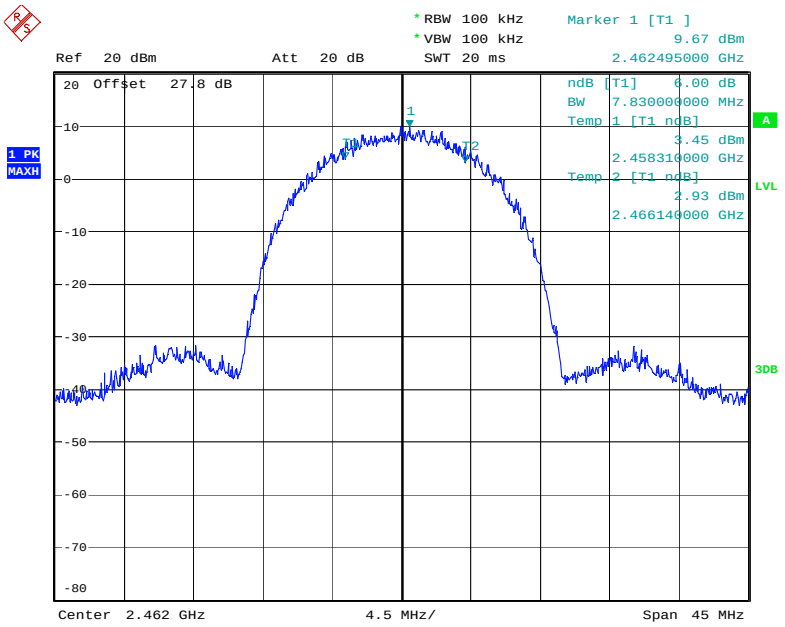
6dB Bandwidth Channel 6 @ 11 Mbps



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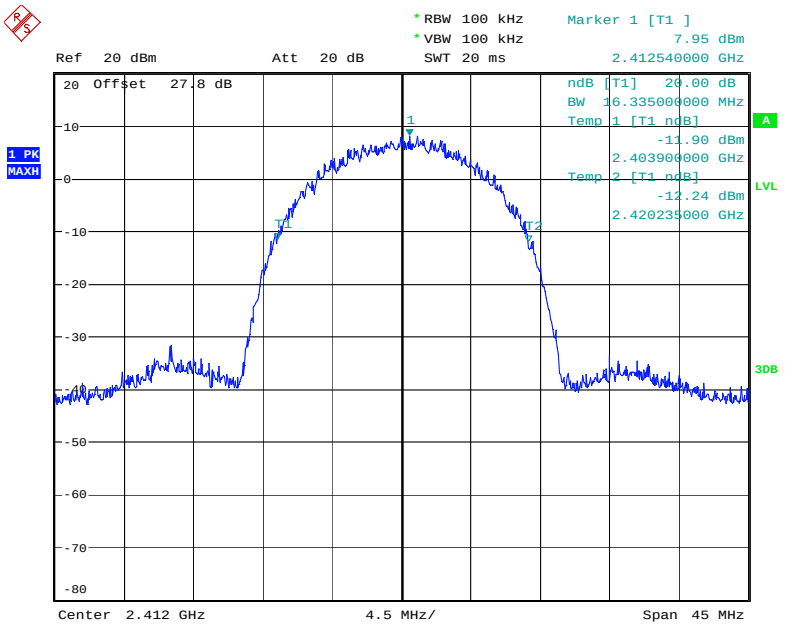
6dB Bandwidth Channel 11 @ 11 Mbps



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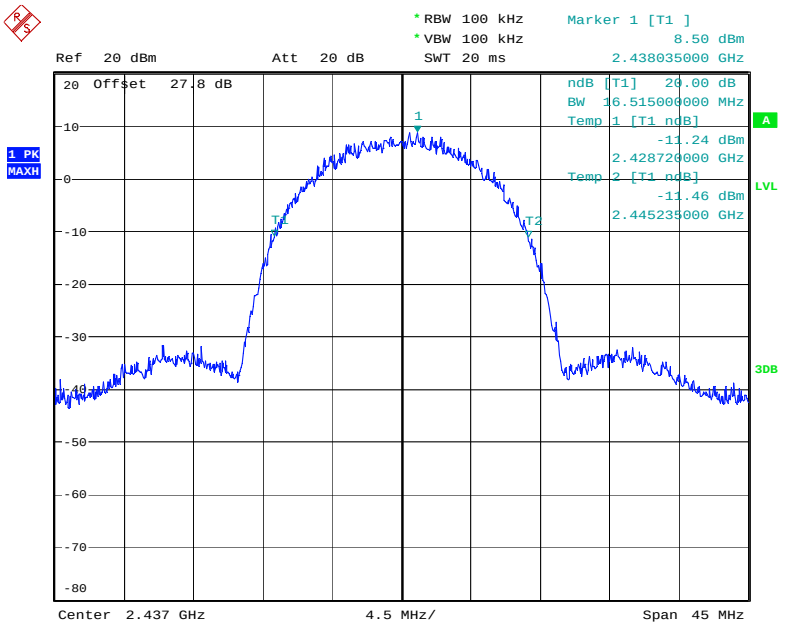

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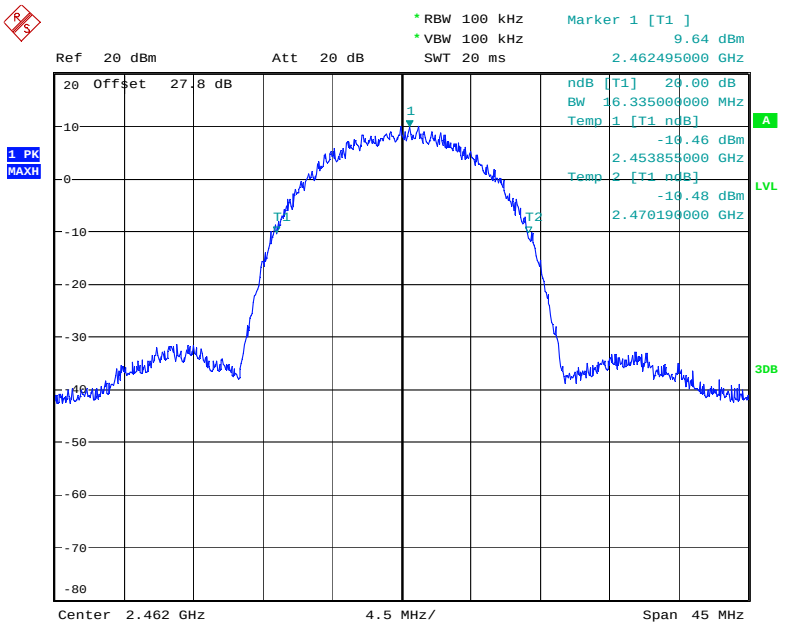

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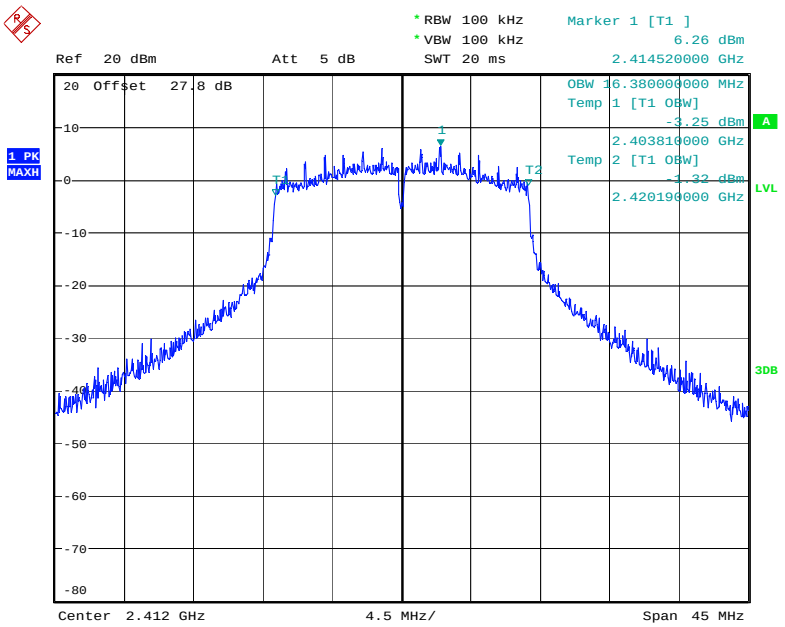
20dB Bandwidth Channel 11 @ 11 Mbps

802.11 g @ 9 Mbps



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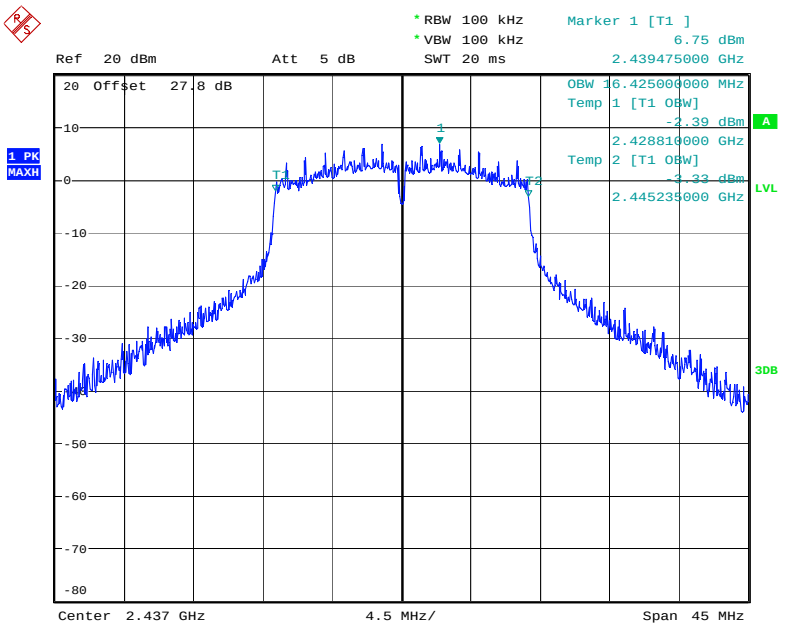
6dB Bandwidth Channel 1 @ 9 Mbps



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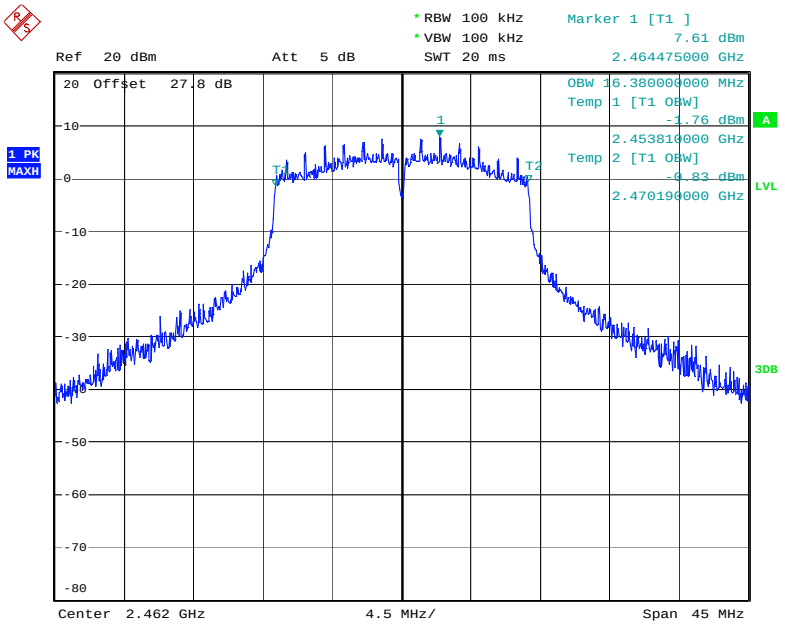
6dB Bandwidth Channel 6 @ 9 Mbps



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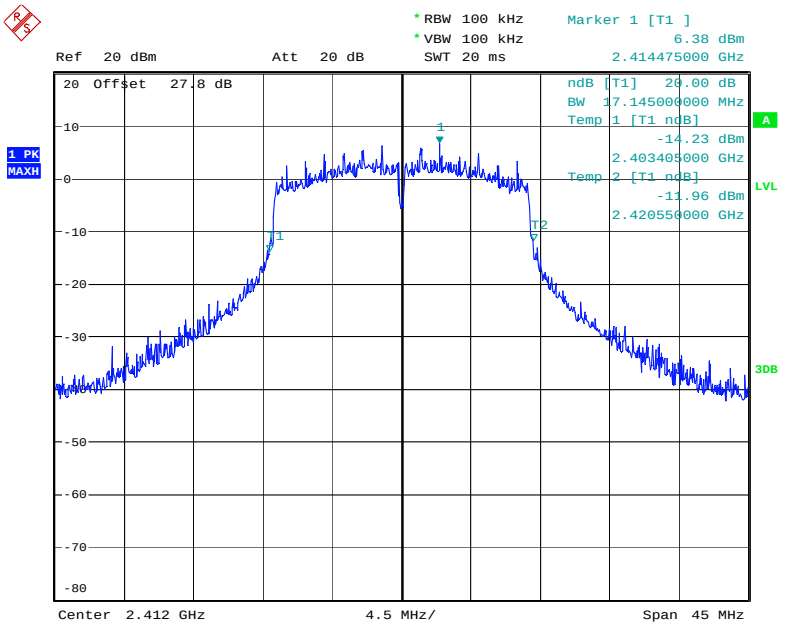

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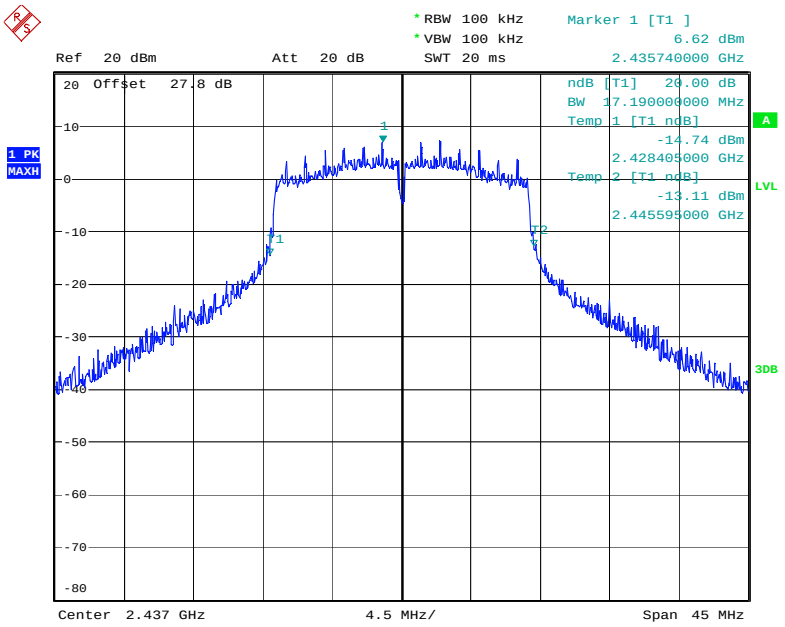
20dB Bandwidth Channel 1 @ 9 Mbps



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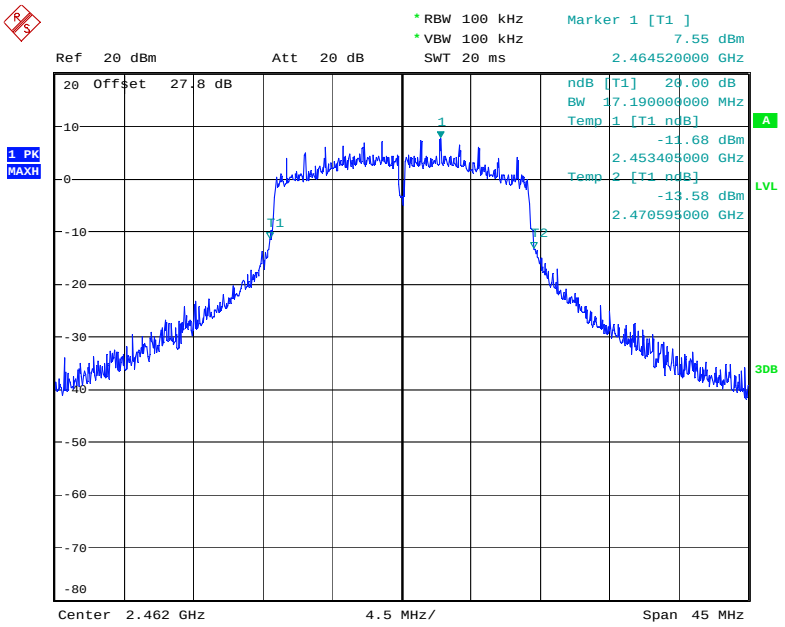
20dB Bandwidth Channel 6 @ 9 Mbps



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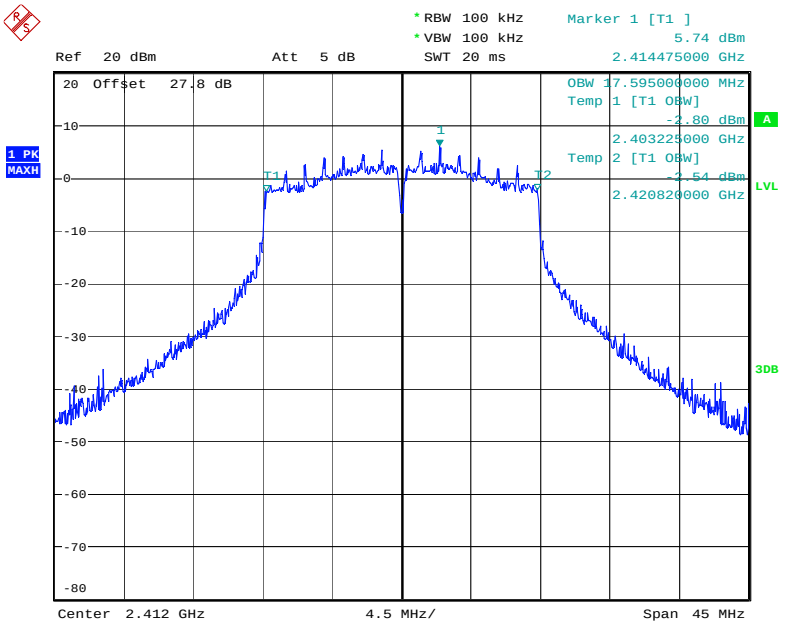
20dB Bandwidth Channel 11 @ 9 Mbps

802.11 n @ 21.7 Mbps



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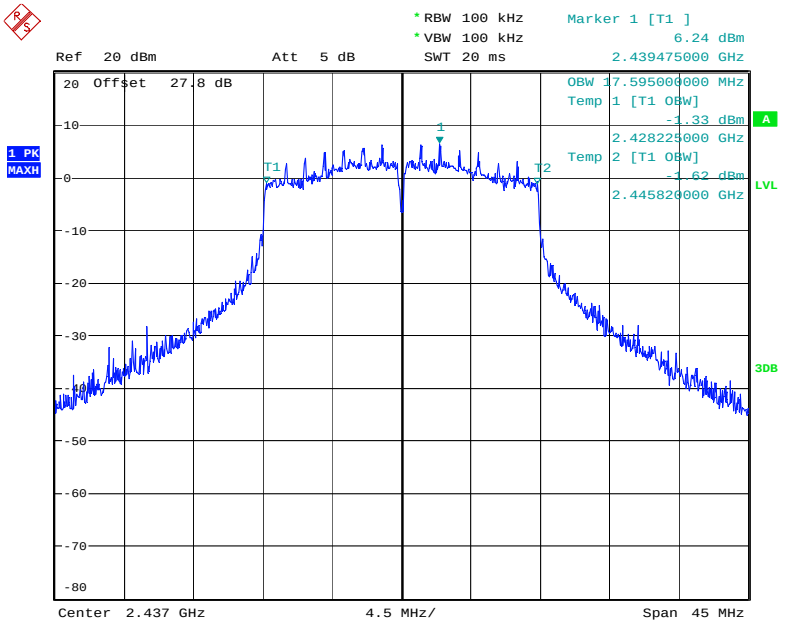
6dB Bandwidth Channel 1 @ 21.7 Mbps



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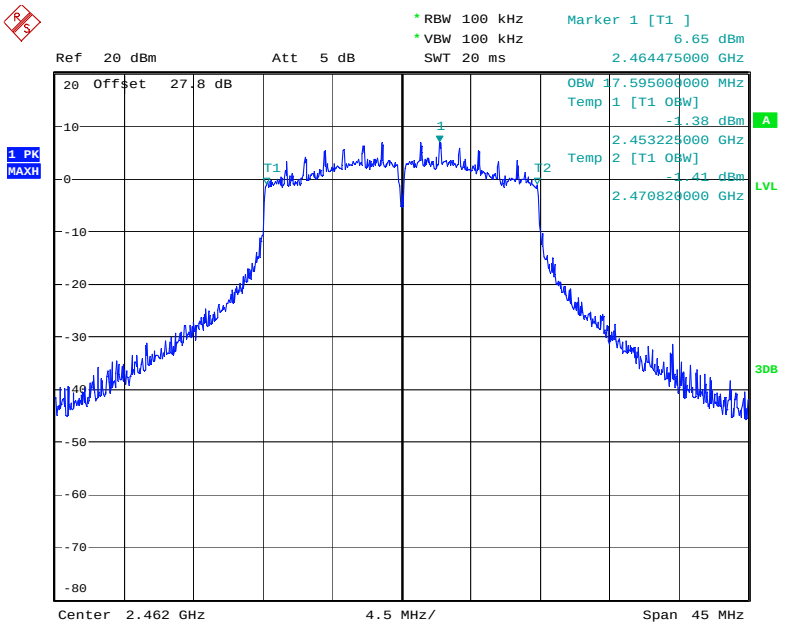
6dB Bandwidth Channel 6 @ 21.7 Mbps



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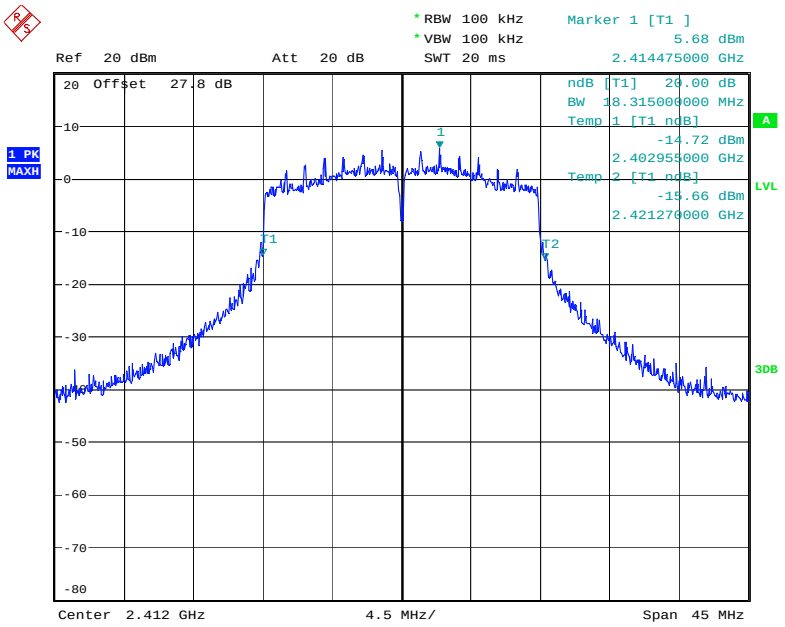

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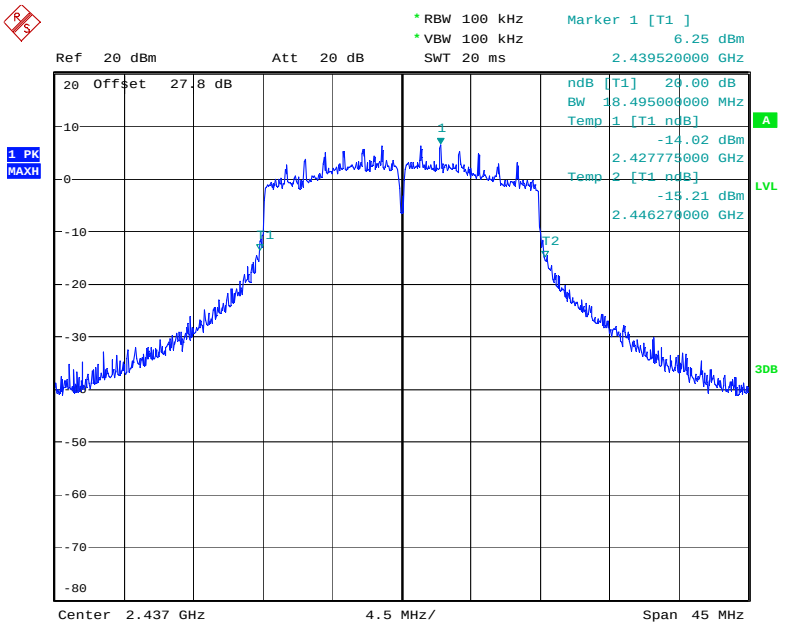
20dB Bandwidth Channel 1 @ 21.7 Mbps



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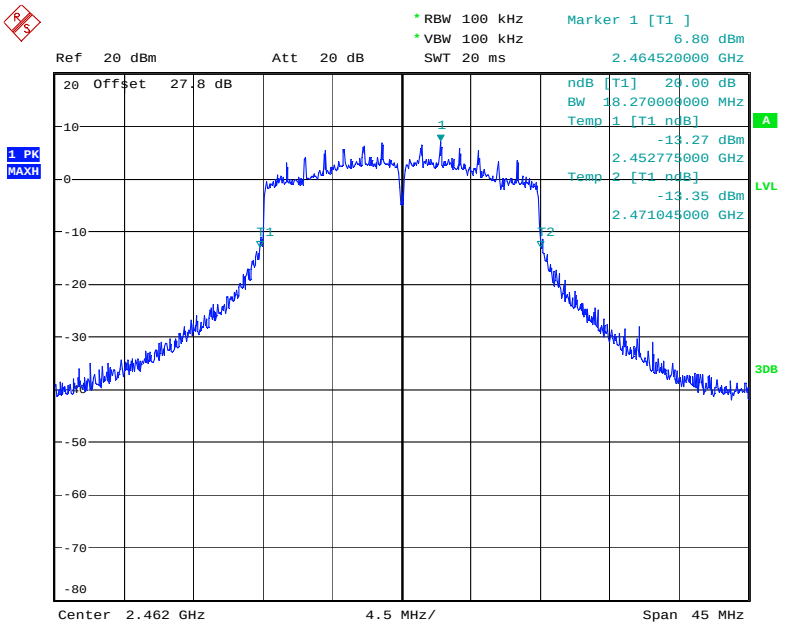
20dB Bandwidth Channel 6 @ 21.7 Mbps



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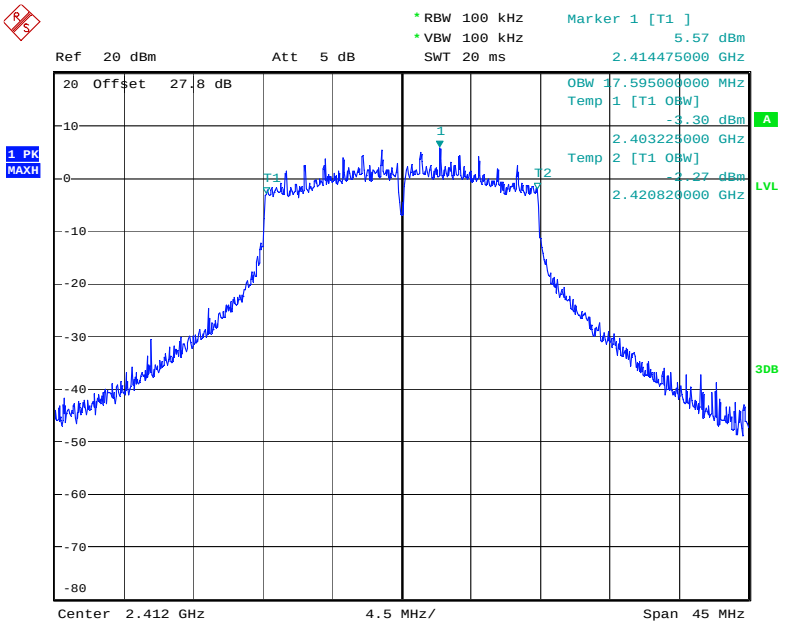
20dB Bandwidth Channel 11 @ 21.7 Mbps

802.11 n @ 19.5 Mbps



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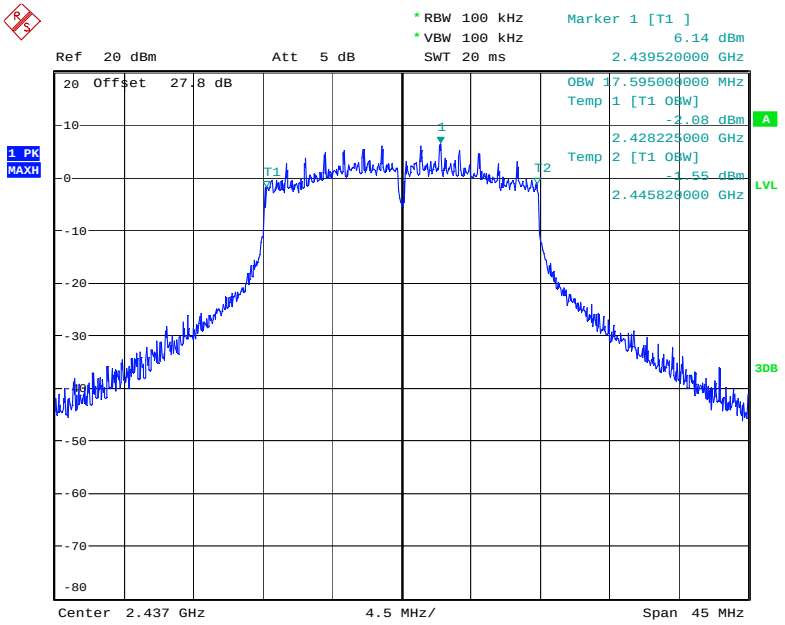
6dB Bandwidth Channel 1 @ 19.5 Mbps



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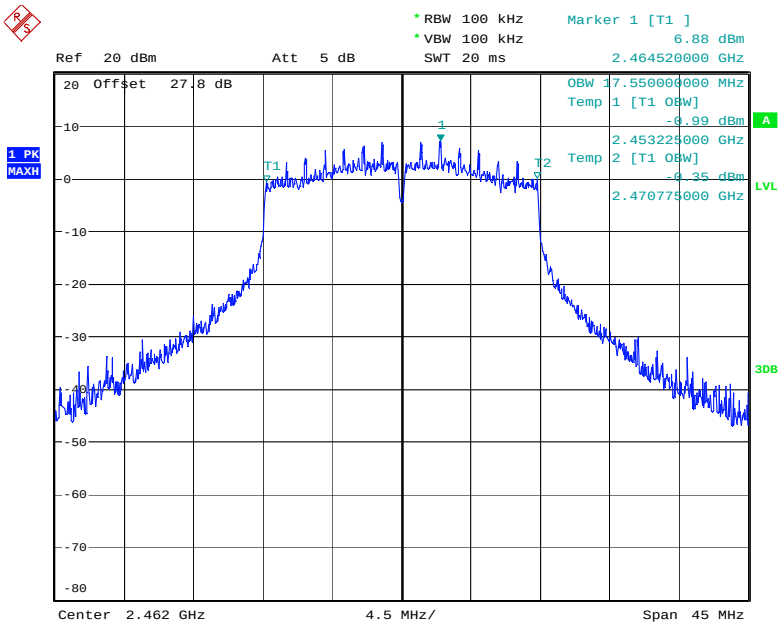
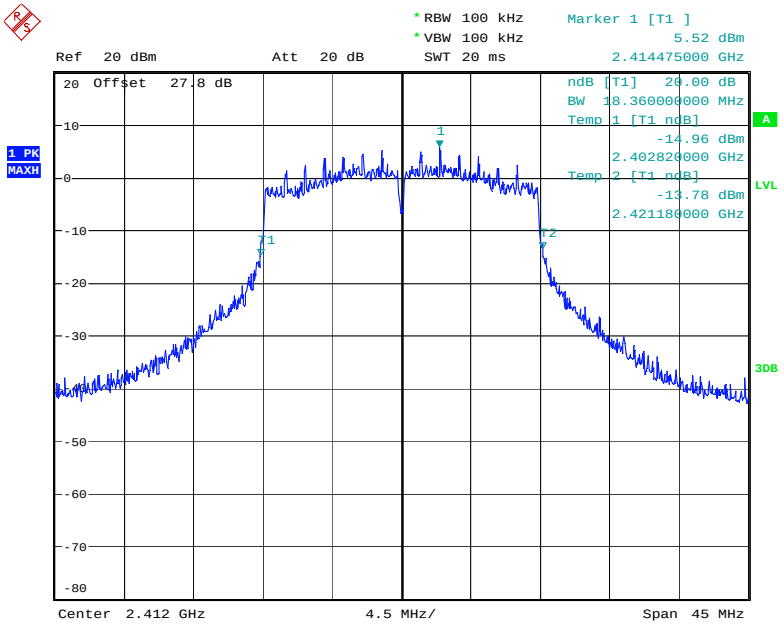
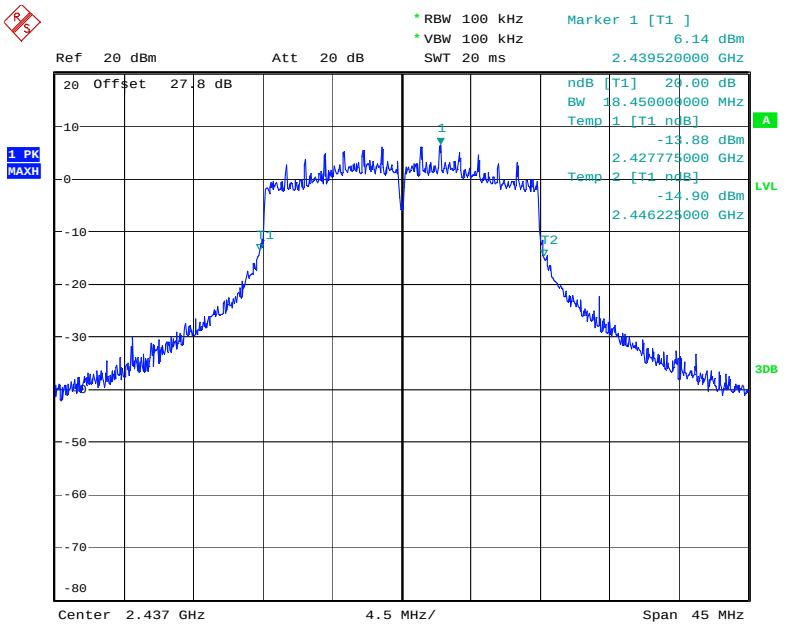
6dB Bandwidth Channel 6 @ 19.5 Mbps



6dB Bandwidth Channel 11 @ 19.5 Mbps



20dB Bandwidth Channel 1 @ 19.5 Mbps



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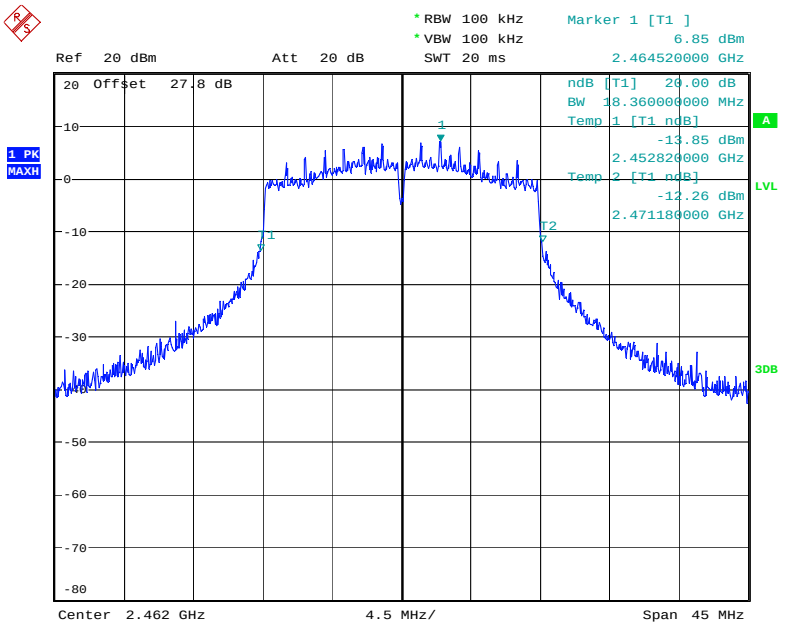
20dB Bandwidth Channel 6 @ 19.5 Mbps



Date: 27.MAR.2012 16:58:45

20dB Bandwidth Channel 11 @ 19.5 Mbps

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. A fully charged battery was used for the supply voltage. Initially, an average detector is used to measure power in the low, middle and high channels for all data rate. The average measurements are used to determine which data rate is to be fully tested for each supported mode. Using a peak detector, the power is then measured for the applicable data rates.

Measurement Results

See Attached

Initial average power measurements

Band	Frequency (MHz)	CH	Average power (dBm) for 802.11b in 2.4GHz Data Rates				Average power (dBm) for 802.11g in 2.4GHz Data Rates							
			1 Mbps	2 Mbps	5.5 Mbps	11 Mbps	6 Mbps	9 Mbps	12 Mbps	18 Mbps	24 Mbps	36 Mbps	48 Mbps	54 Mbps
WLAN (WIFI)	2412	1	17.15	17.3	18.34	18.53	17.77	17.67	17.18	17.37	15.81	15.79	14.52	14.55
	2437	6	17.52	17.64	18.72	18.87	18.48	18.54	18.11	17.88	16.65	16.41	15	15.25
	2462	11	17.91	17.97	19.2	19.26	18.76	18.78	18.4	18.42	16.86	16.87	15.46	15.49

Average power (dBm) for 802.11n in 2.4GHz															
20MHz BW, 400ns GI Data Rates								20MHz BW, 800ns GI Data Rates							
7.2 Mbps	14.4 Mbps	21.7 Mbps	28.9 Mbps	43.3 Mbps	57.8 Mbps	65 Mbps	72.2 Mbps	6.5 Mbps	13 Mbps	19.5 Mbps	26 Mbps	39 Mbps	52 Mbps	58.5 Mbps	65 Mbps
16.38	16.89	17.12	15.97	15.9	14.51	14.54	13.72	16.54	17.18	17.22	16.03	15.97	14.73	14.61	13.73
16.93	17.81	17.72	16.82	16.56	15.26	15.18	14.42	17.2	17.73	17.78	16.55	16.6	15.29	15.39	14.49
17.47	17.99	18.13	16.83	16.74	15.32	15.33	14.4	17.57	18.11	18.12	16.81	16.75	15.46	15.38	14.55

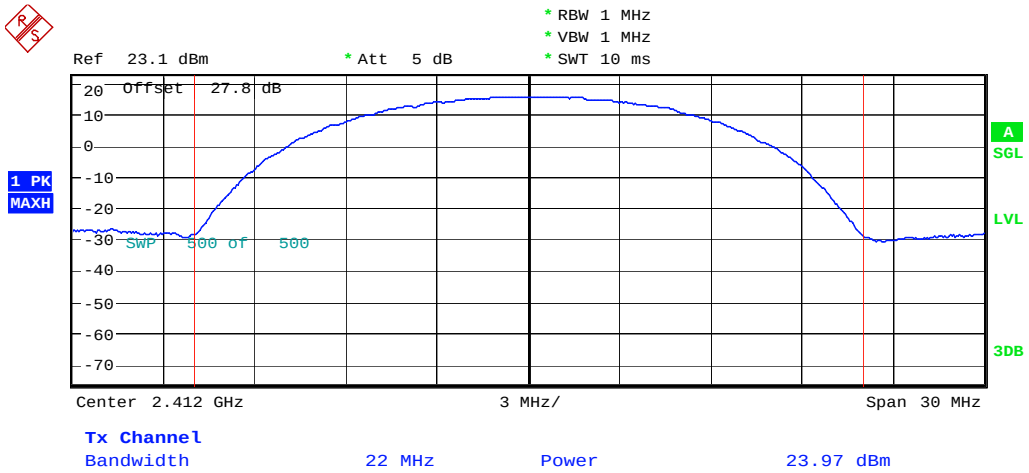
Initial peak power measurements

Band	Frequency (MHz)	CH	Peak power (dBm) for 802.11b in 2.4GHz Data Rates				Peak power (dBm) for 802.11g in 2.4GHz Data Rates							
			1 Mbps	2 Mbps	5.5 Mbps	11 Mbps	6 Mbps	9 Mbps	12 Mbps	18 Mbps	24 Mbps	36 Mbps	48 Mbps	54 Mbps
WLAN (WIFI)	2412	1	20.74	20.89	22.63	23.97	24.11	24.05	24.07	24.02	22.52	22.51	21.19	20.99
	2437	6	21.23	21.5	23.15	24.49	24.72	24.87	24.62	24.76	22.81	22.81	21.7	21.51
	2462	11	21.75	22.01	23.69	25.01	25.2	25.21	25.2	25.18	23.46	23.49	22.14	22.09

Peak power (dBm) for 802.11n in 2.4GHz															
20MHz BW, 400ns GI Data Rates								20MHz BW, 800ns GI Data Rates							
7.2 Mbps	14.4 Mbps	21.7 Mbps	28.9 Mbps	43.3 Mbps	57.8 Mbps	65 Mbps	72.2 Mbps	6.5 Mbps	13 Mbps	19.5 Mbps	26 Mbps	39 Mbps	52 Mbps	58.5 Mbps	65 Mbps
23.3	23.43	23.49	22.12	22.03	20.36	20.65	19.7	22.49	23.42	23.52	22.17	22.08	20.58	20.65	19.77
24.11	24.34	24.4	22.81	22.8	21.34	21.43	20.48	23.14	24.26	24.29	22.82	23.06	21.51	21.45	20.78
24.73	24.97	25.05	23.31	23.46	21.95	22.06	21.15	23.92	24.87	24.99	23.43	23.34	21.91	22.01	21.04

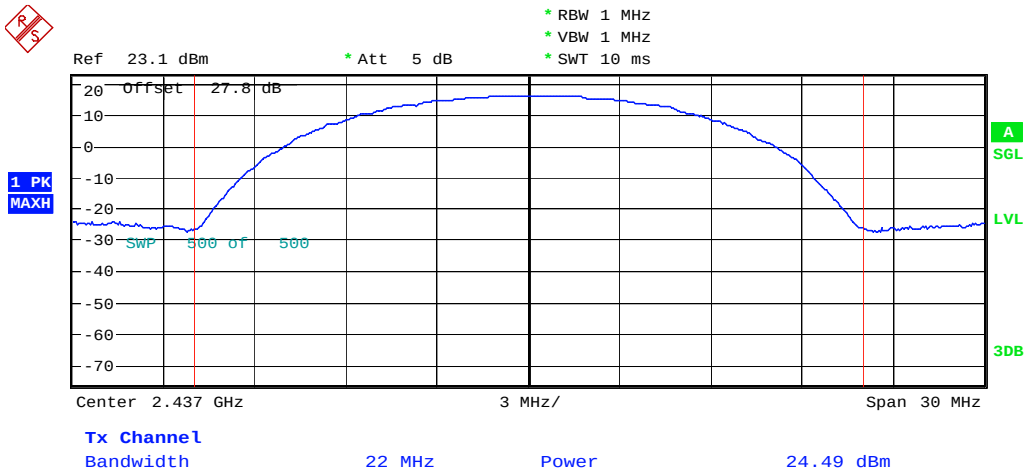
Based on these initial measurements, it was determined that testing will be performed in the 11Mbps data for the 802.11b mode, the 9Mbps data rate for the 802.11g mode, the 21.7Mbps data rate for 802.11n 400ns GI mode, the 19.5Mbps data rate for 802.11n 800ns GI mode. Plots showing the peak power measurements for the applicable data rates follow.

802.11 b @ 11 Mbps



Date: 27.MAR.2012 15:04:48

Max. Power Channel 1 @ 11 Mbps



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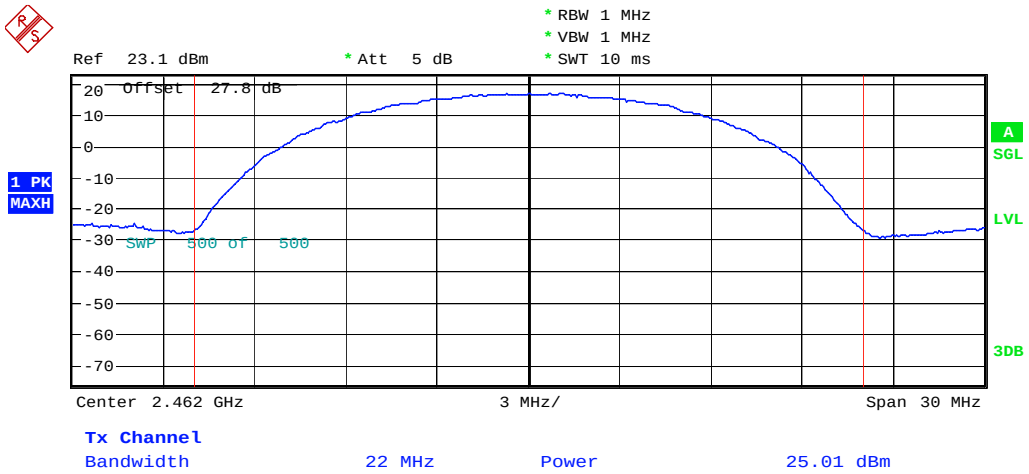
Max. Power Channel 6 @ 11 Mbps



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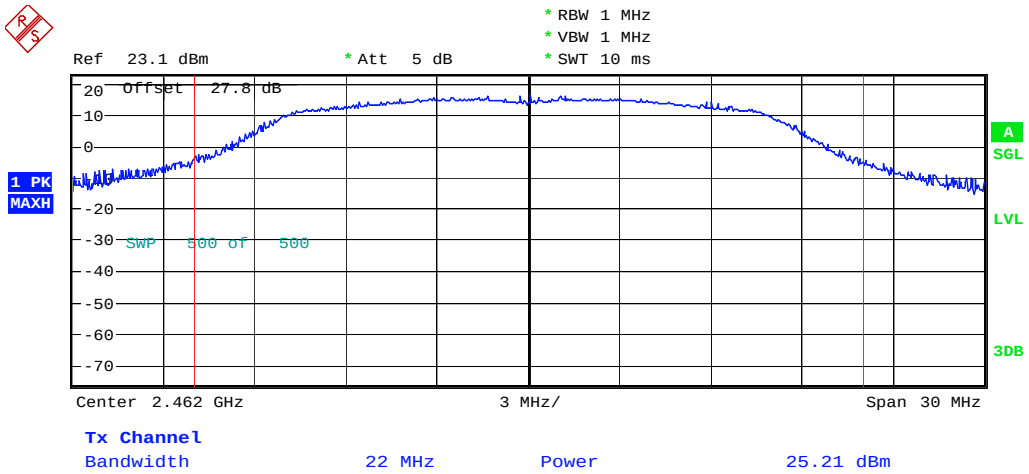
Max. Power Channel 11 @ 11 Mbps

802.11 g @ 9 Mbps



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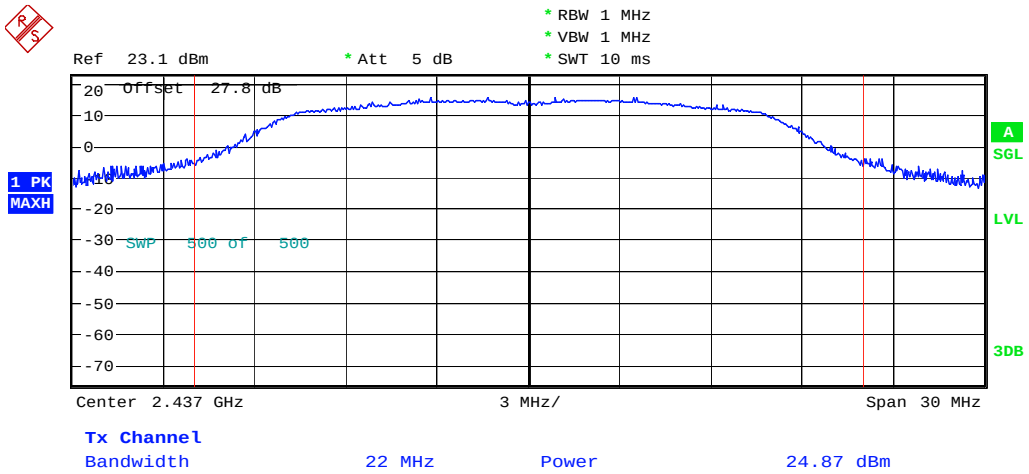

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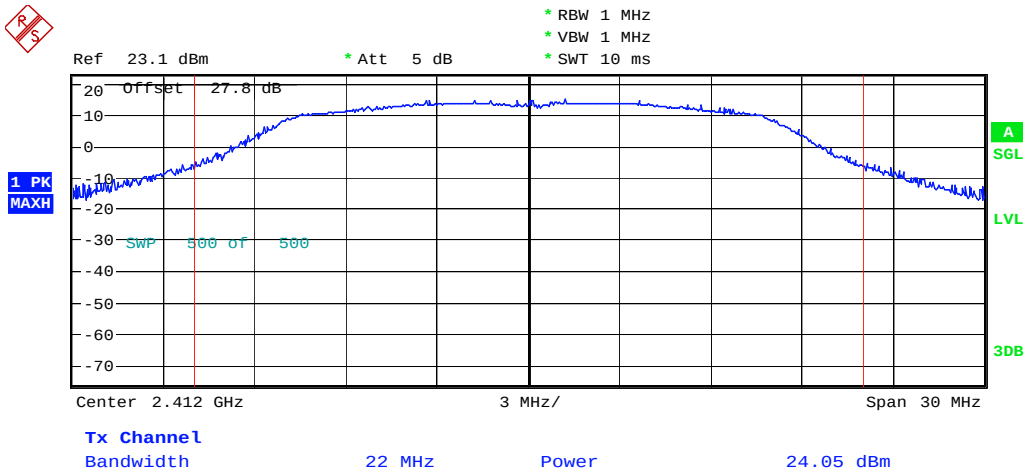
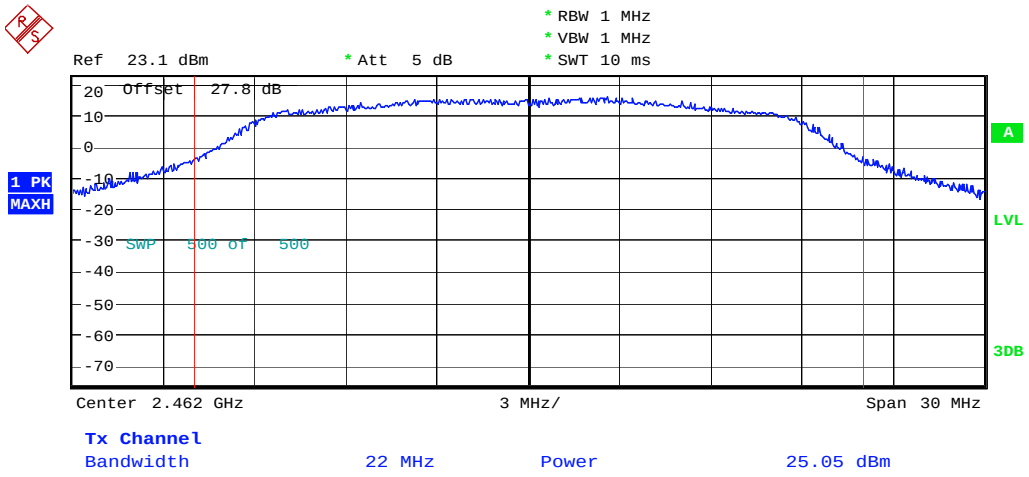
Max. Power Channel 6 @ 9 Mbps



Date: 27.MAR.2012 15:27:43

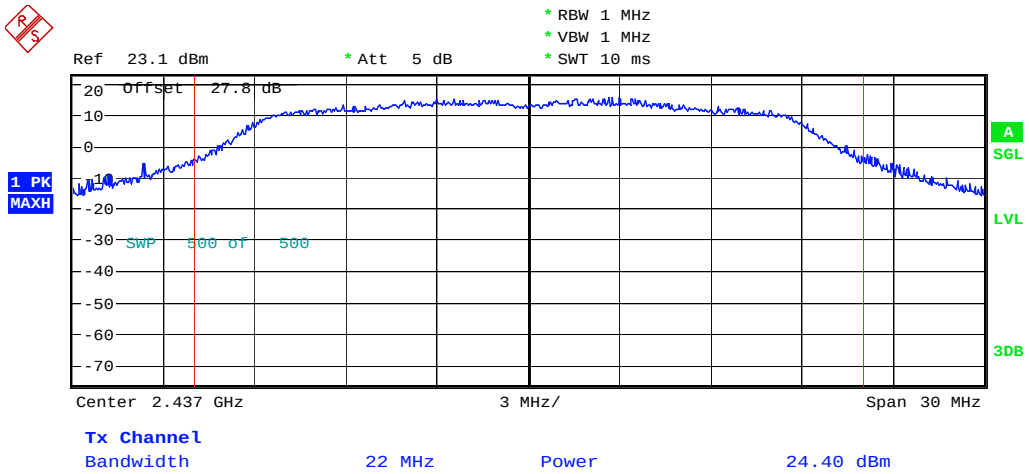
Max. Power Channel 11 @ 9 Mbps

802.11 n @ 21.7 Mbps



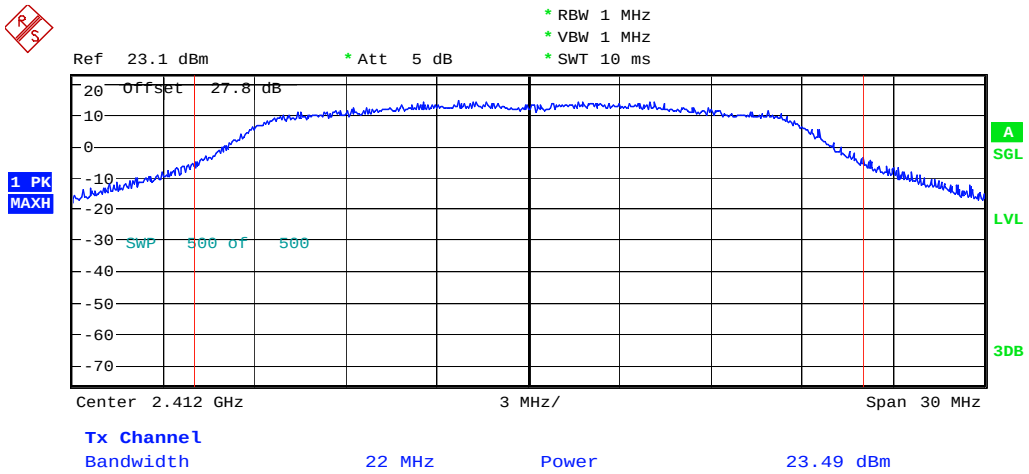
Date: 27.MAR.2012 15:47:40

Max. Power Channel 1 @ 21.7 Mbps



Date: 27.MAR.2012 15:52:53

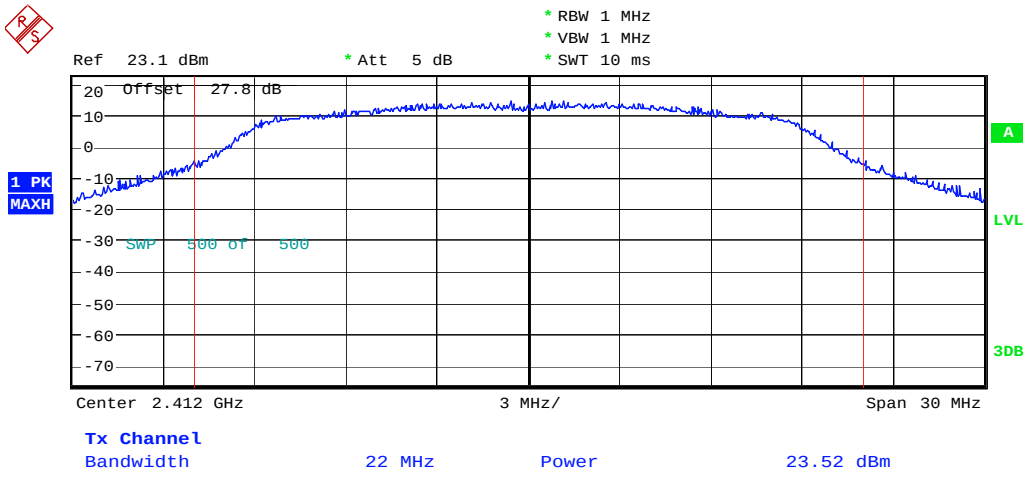
Max. Power Channel 6 @ 21.7 Mbps



Date: 27.MAR.2012 15:57:59

Max. Power Channel 11 @ 21.7 Mbps

802.11 n @ 19.5 Mbps



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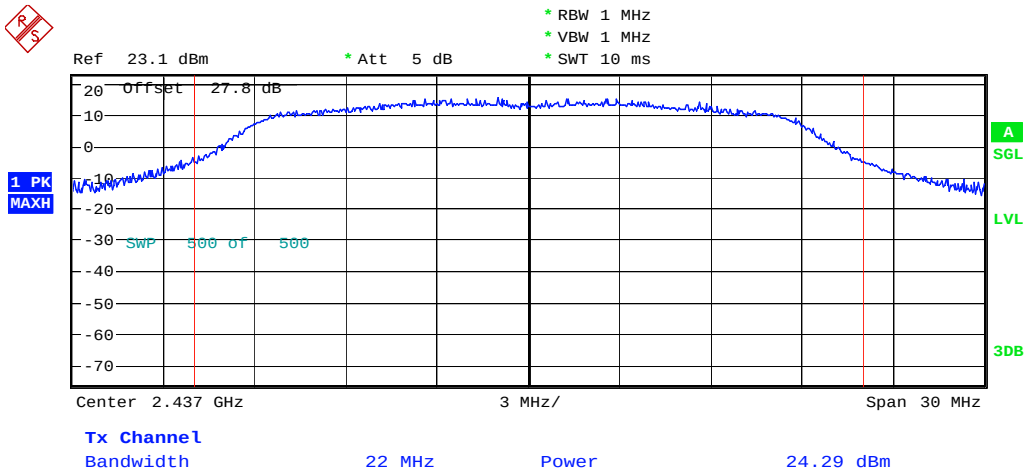
Max. Power Channel 1 @ 19.5 Mbps



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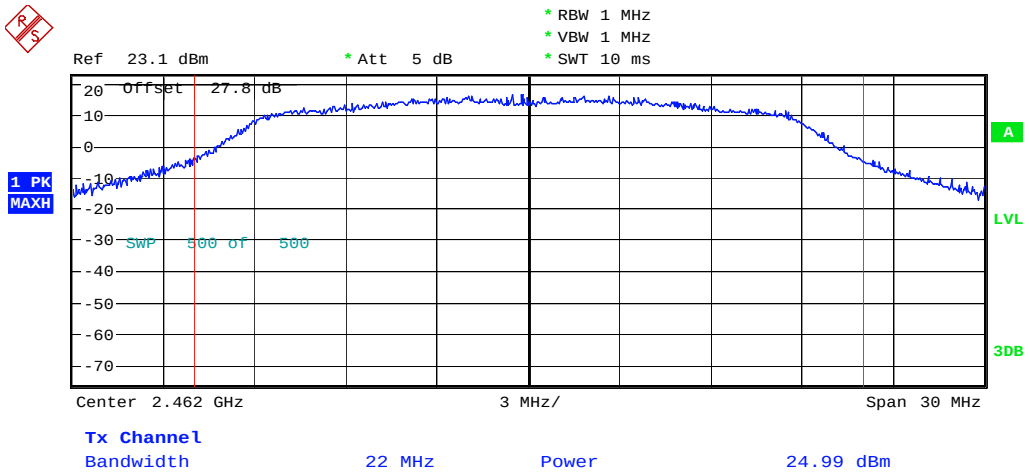
Max. Power Channel 6 @ 19.5 Mbps



Date: 27.MAR.2012 16:13:52

Max. Power Channel 11 @ 19.5 Mbps

Power Spectral Density

CFR 47 Part 15.247 (d)

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 WLAN DSSS function of the EUT was enabled. The spectrum analyzer used the following settings:

Span = 300kHz
VBW =30kHz
RBW=3kHz
Sweep = 50ms
Detector function = peak
Trace = max hold

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

Measurement Results

2412 MHz	2437MHz	2462MHz
-7.11 dBm	-5.11dBm	-4.20 dBm

802.11 b 11Mbps

2412 MHz	2437MHz	2462MHz
-15.11 dBm	-13.55 dBm	-12.81 dBm

802.11 g 9Mbps

2412 MHz	2437MHz	2462MHz
-15.31 dBm	-14.51 dBm	-12.94 dBm

802.11 n 400ns GI 21.5Mbps

2412 MHz	2437MHz	2462MHz
-13.35 dBm	-12.79 dBm	-12.48 dBm

802.11 n 800ns GI 19.5 Mbps

SPURIOUS RF CONDUCTED EMISSIONS

CFR 47 Part 15.247

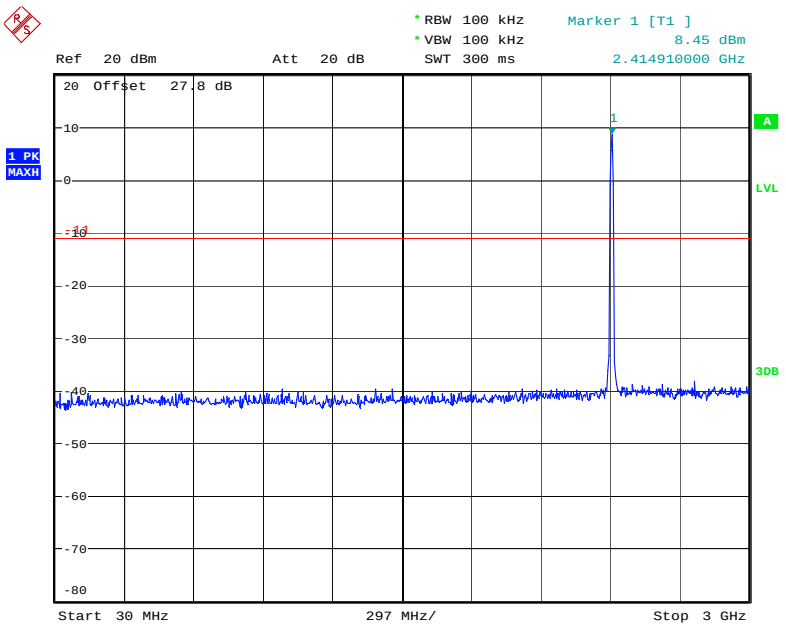
Measurement Procedure

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:

802.11 b @ 11 Mbps



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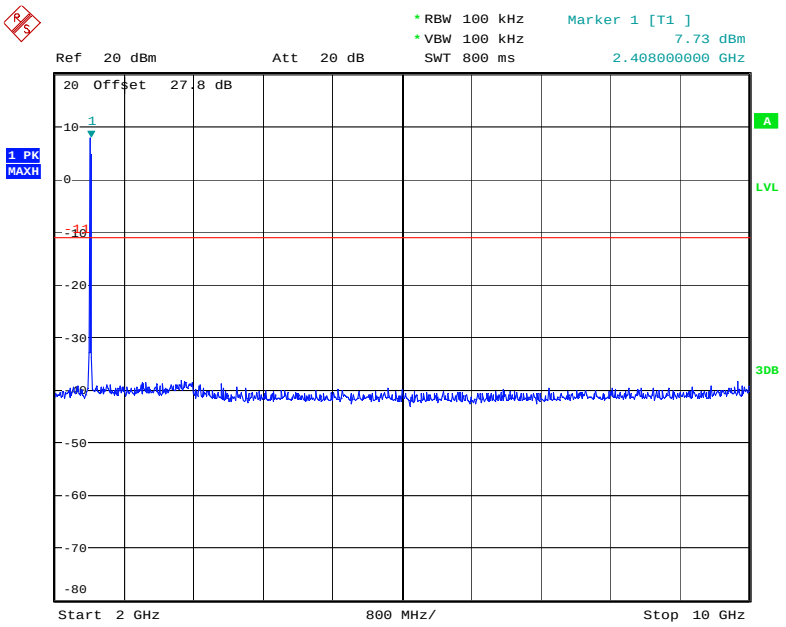
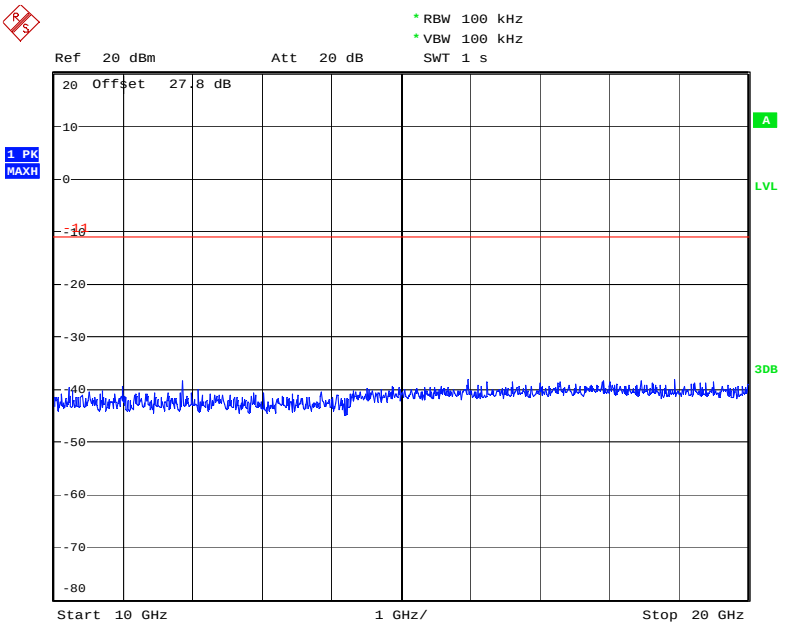
Conducted Spurious Emissions 30-3000MHz (Low Channel)



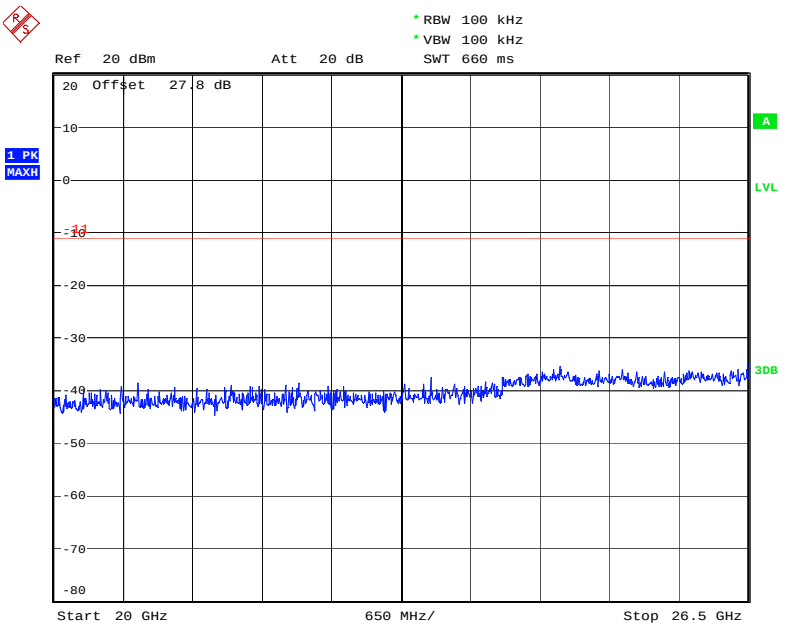
Date: 27.MAR.2012 17:16:36

Conducted Spurious Emissions 2-10GHz (Low Channel)



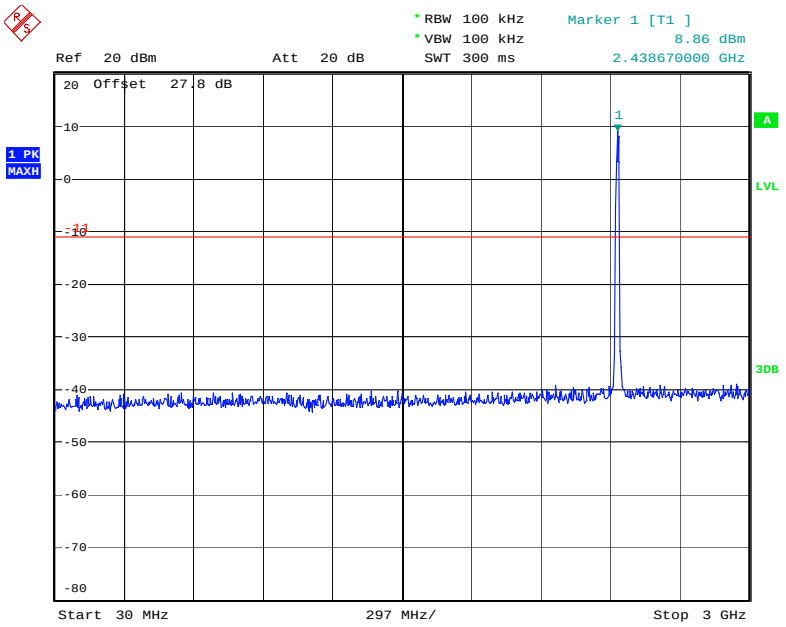
Date: 27.MAR.2012 17:17:12

Conducted Spurious Emissions 10-20GHz (Low Channel)



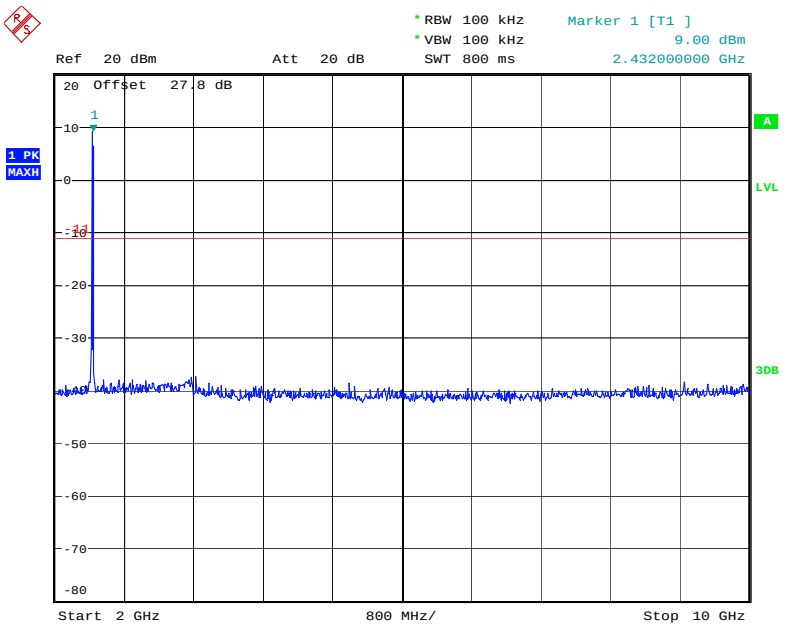
Date: 27.MAR.2012 17:17:45

Conducted Spurious Emissions 20-26.5GHz (Low Channel)



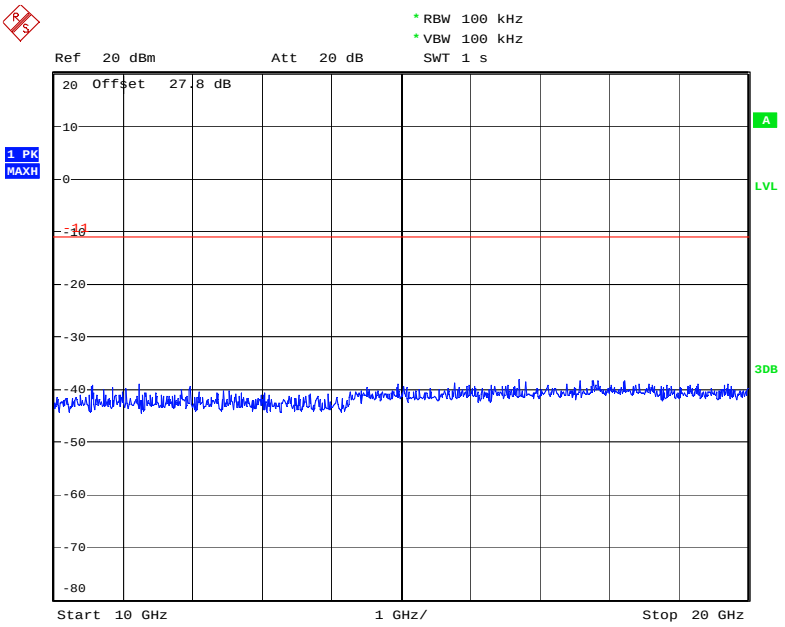
Date: 27.MAR.2012 17:19:16

Conducted Spurious Emissions 30-3000MHz (Mid Channel)



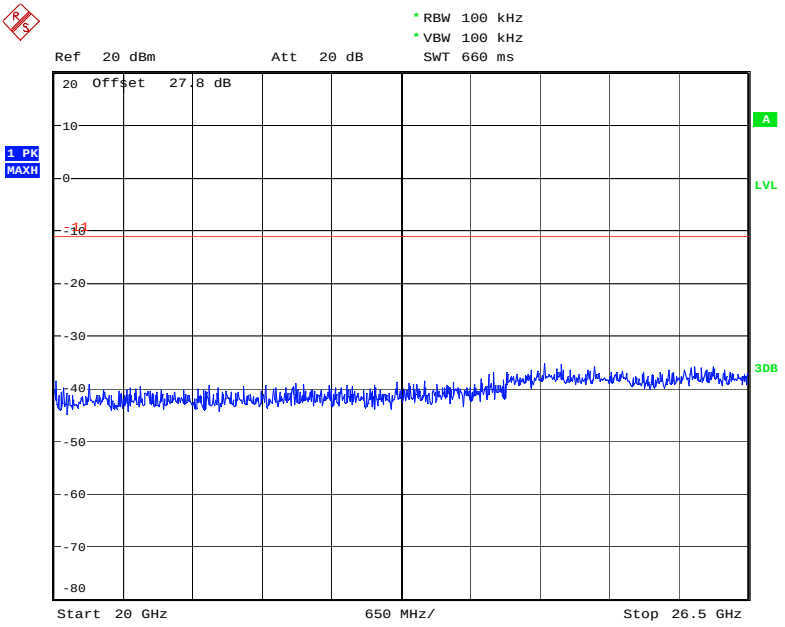
Date: 27.MAR.2012 17:21:12

Conducted Spurious Emissions 2-10GHz (Mid Channel)



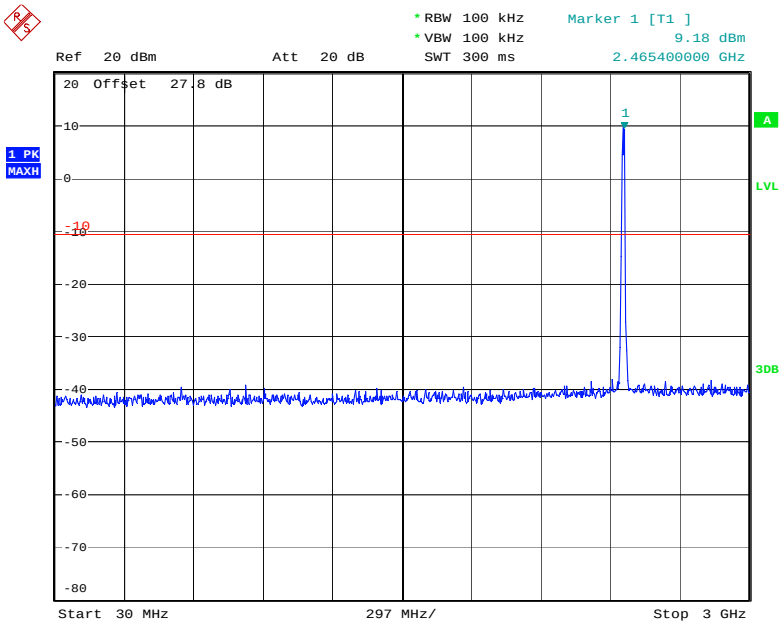
Date: 27.MAR.2012 17:21:37

Conducted Spurious Emissions 10-20GHz (Mid Channel)



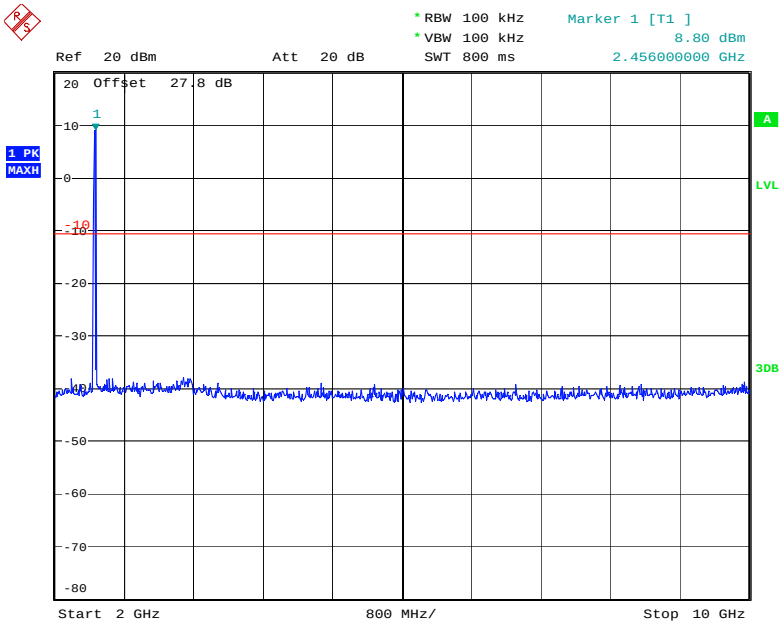
Date: 27.MAR.2012 17:21:59

Conducted Spurious Emissions 20-26.5GHz (Mid Channel)



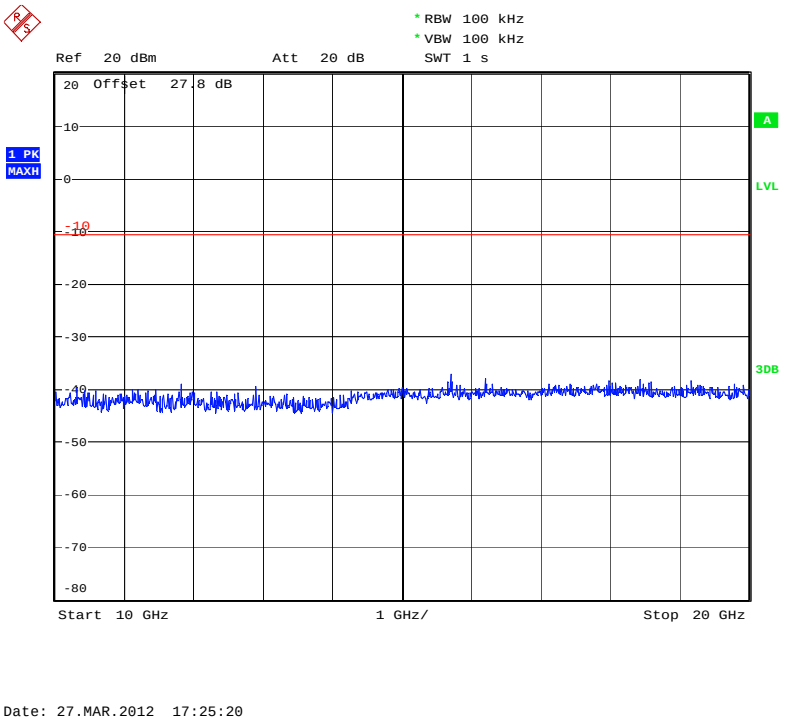
Date: 27.MAR.2012 17:23:46

Conducted Spurious Emissions 30-3000MHz (High Channel)

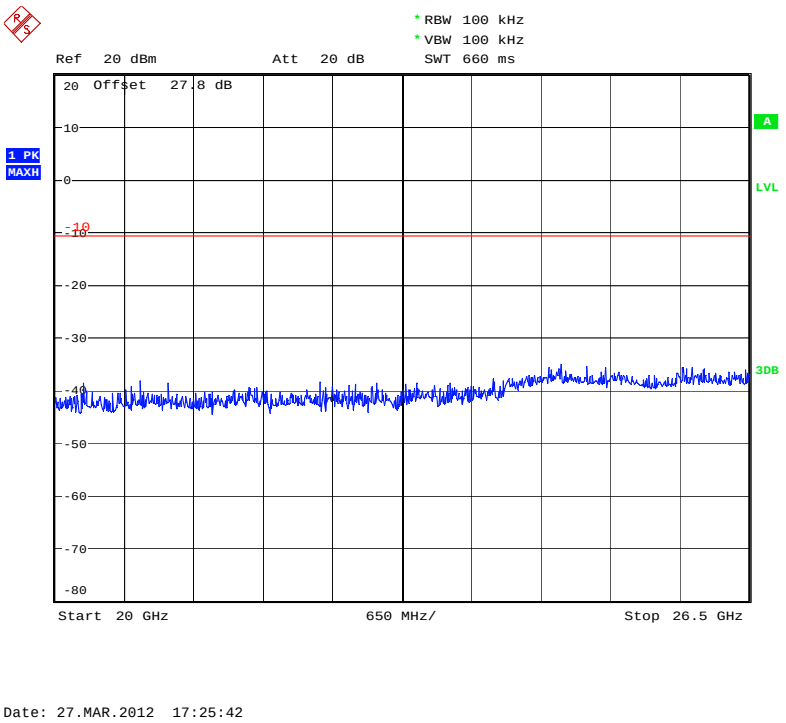


Date: 27.MAR.2012 17:24:45

Conducted Spurious Emissions 2-10GHz (High Channel)

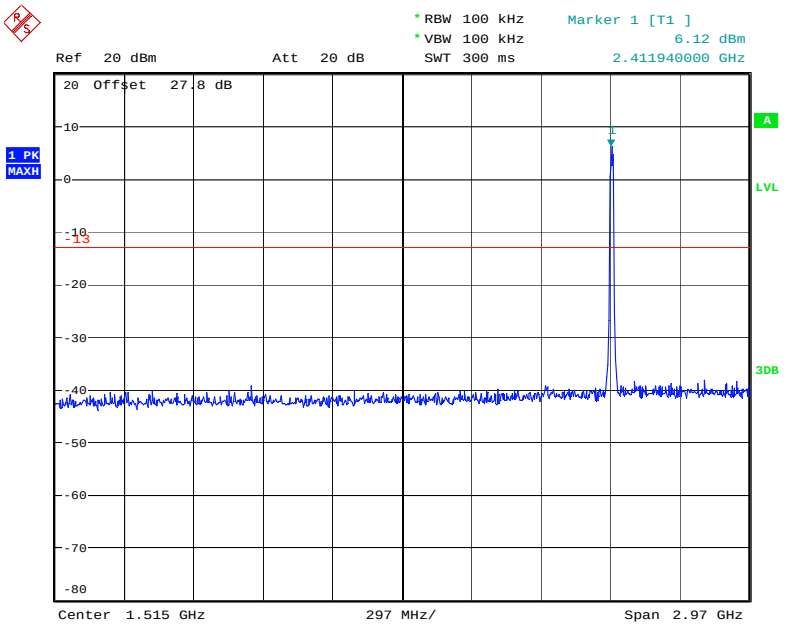


Conducted Spurious Emissions 10-20GHz (High Channel)



Conducted Spurious Emissions 20-26.5GHz (High Channel)

802.11 g @ 9 Mbps



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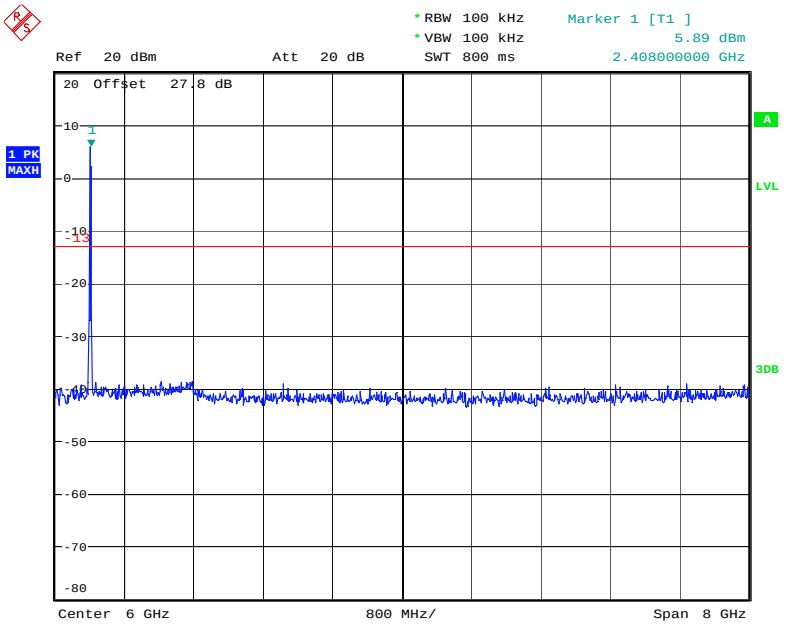
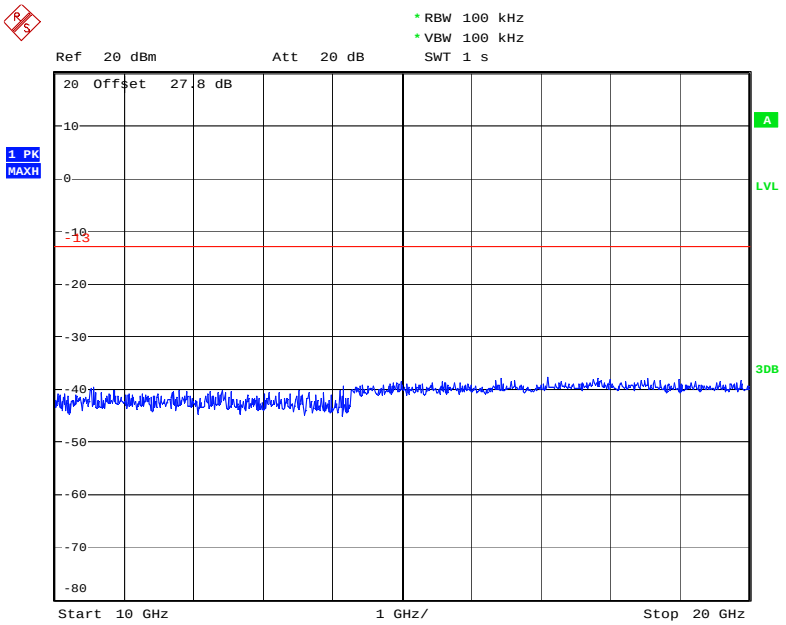
Conducted Spurious Emissions 30-3000MHz (Low Channel)



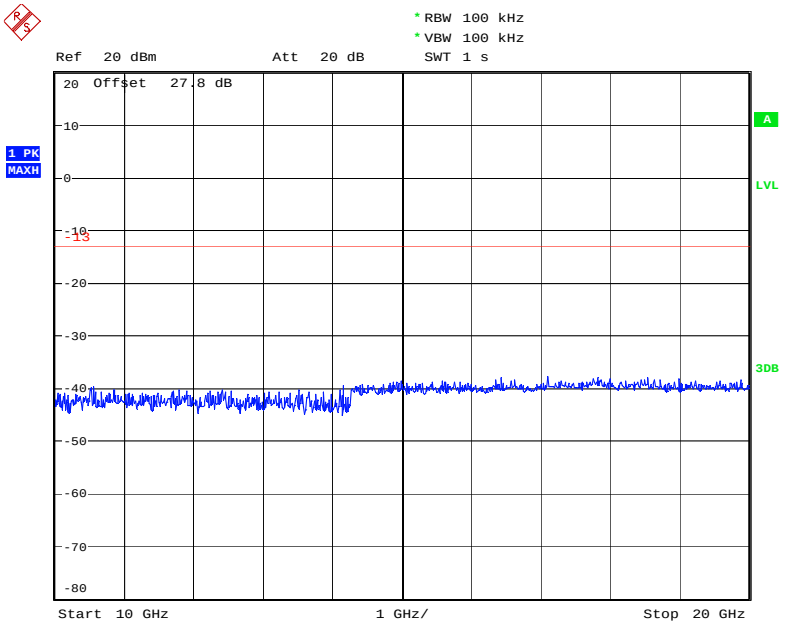
Date: 27.MAR.2012 17:35:18

Conducted Spurious Emissions 2-10GHz (Low Channel)



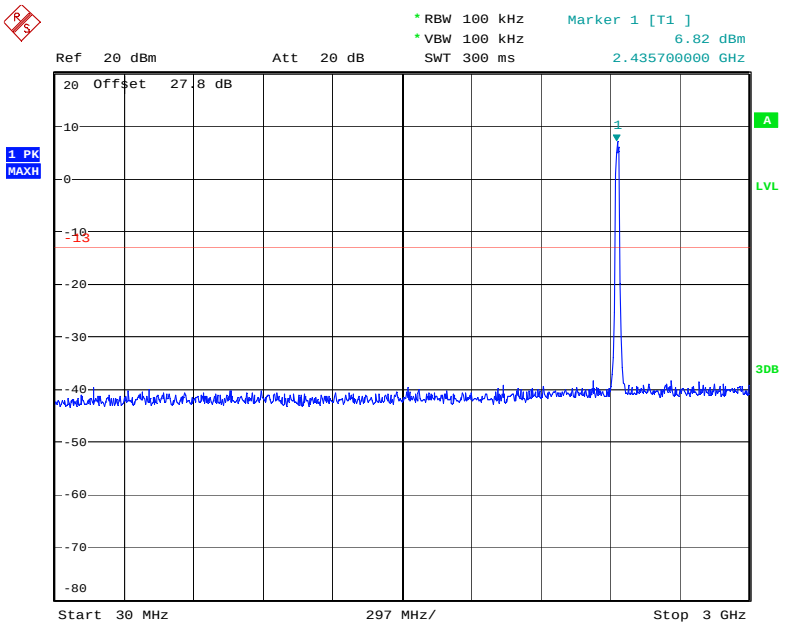
Date: 27.MAR.2012 17:36:46

Conducted Spurious Emissions 10-20GHz (Low Channel)



Date: 27.MAR.2012 17:36:46

Conducted Spurious Emissions 20-26.5GHz (Low Channel)



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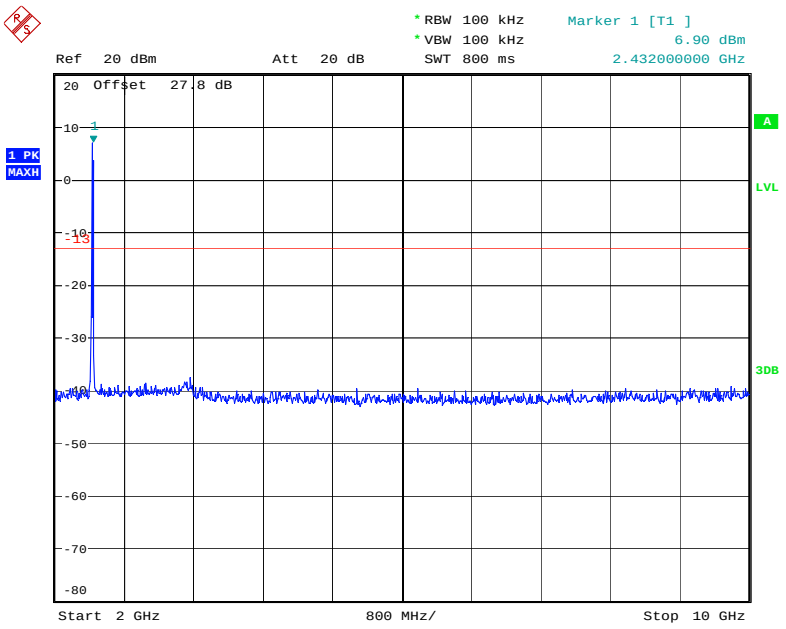
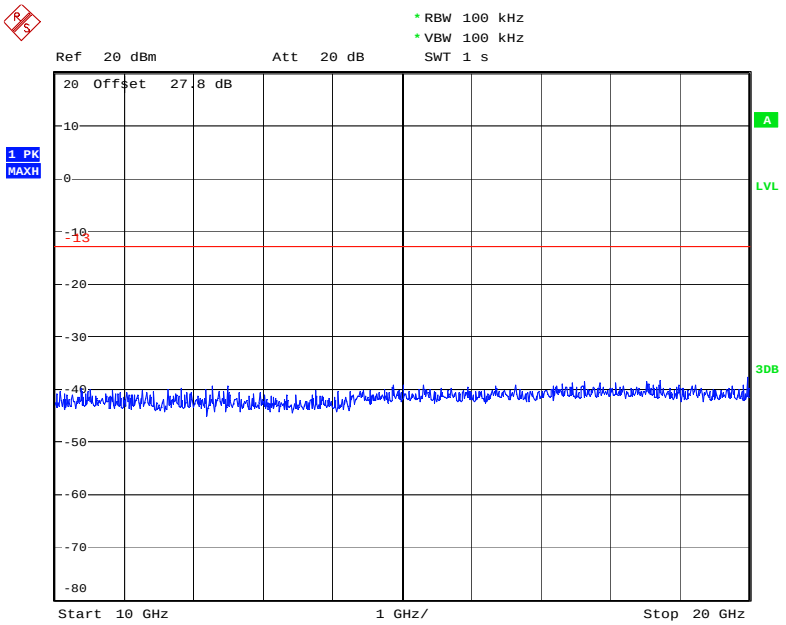
Conducted Spurious Emissions 30-3000MHz (Mid Channel)



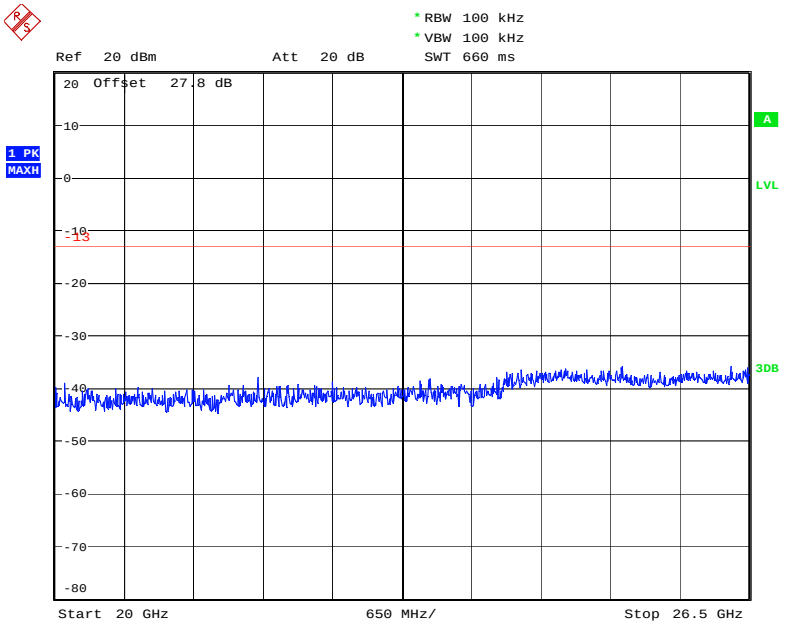
Date: 27.MAR.2012 17:40:39

Conducted Spurious Emissions 2-10GHz (Mid Channel)



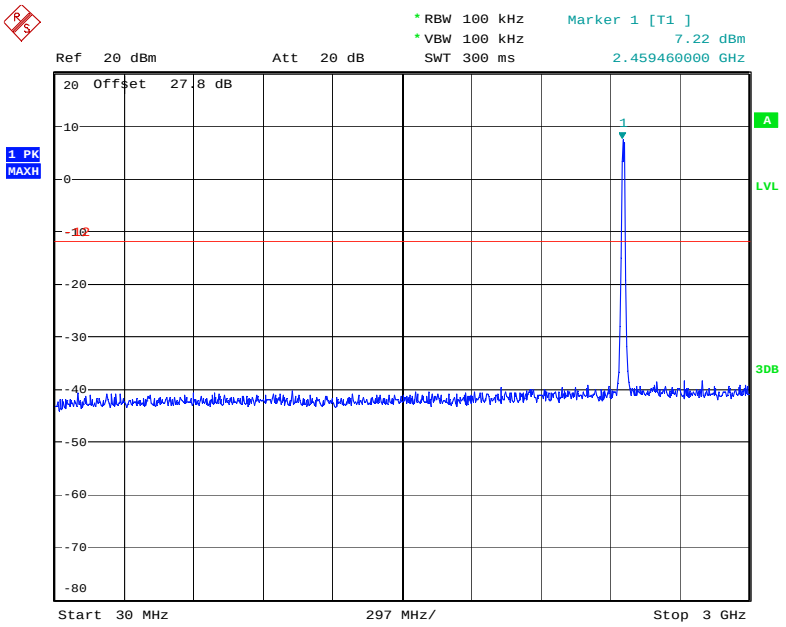
Date: 27.MAR.2012 17:40:54

Conducted Spurious Emissions 10-20GHz (Mid Channel)



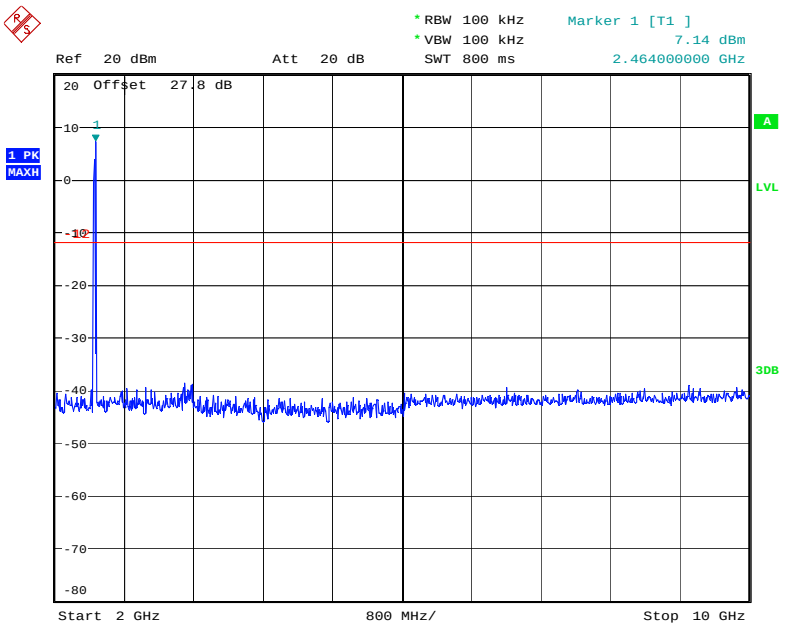
Date: 27.MAR.2012 17:41:10

Conducted Spurious Emissions 20-26.5GHz (Mid Channel)



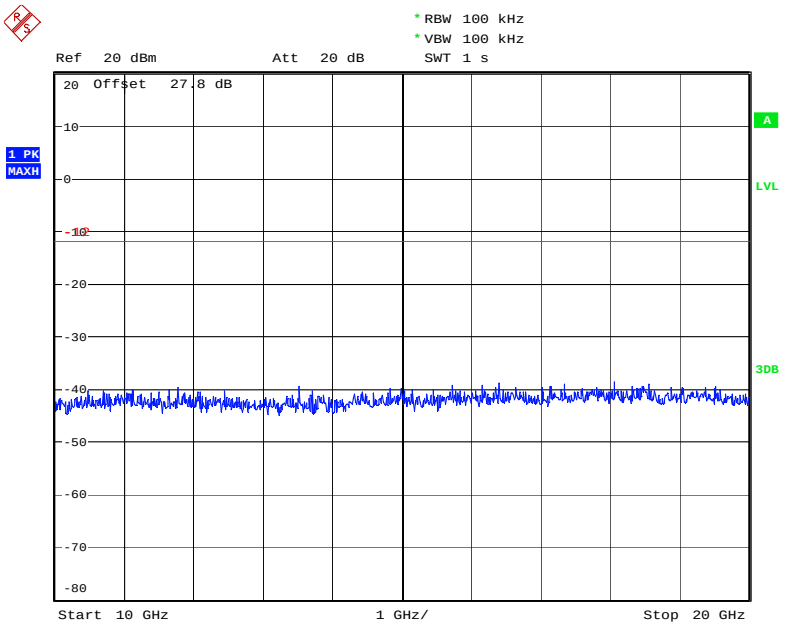
Date: 27.MAR.2012 17:42:10

Conducted Spurious Emissions 30-3000MHz (High Channel)



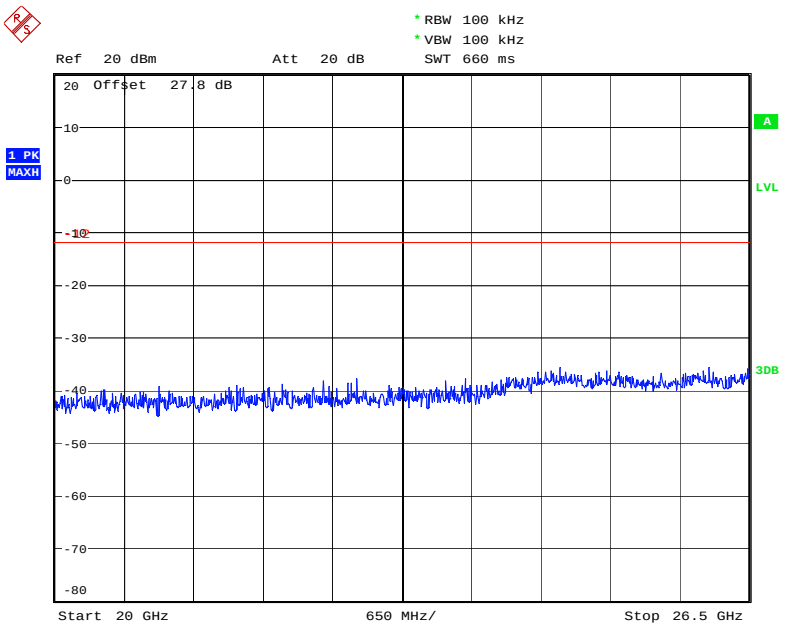
Date: 27.MAR.2012 17:42:37

Conducted Spurious Emissions 2-10GHz (High Channel)



Date: 27.MAR.2012 17:43:07

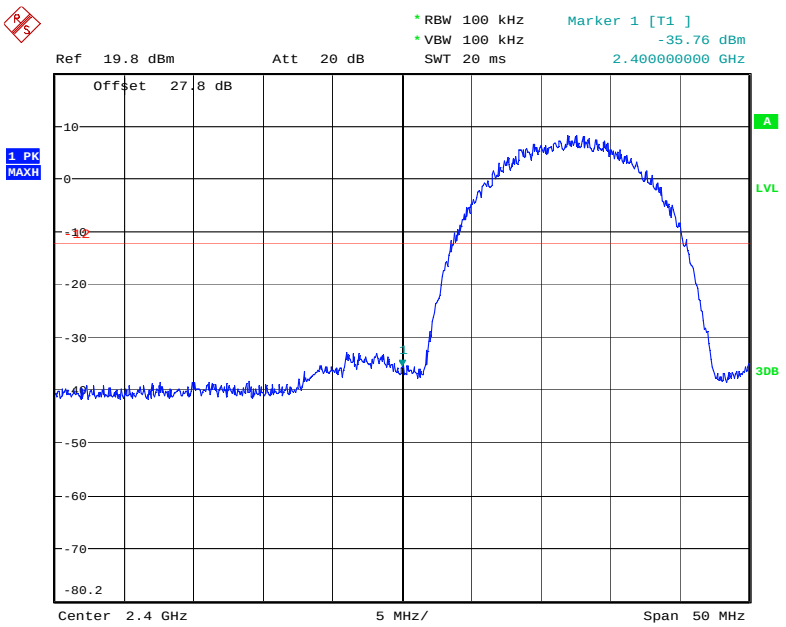
Conducted Spurious Emissions 10-20GHz (High Channel)



Date: 27.MAR.2012 17:43:19

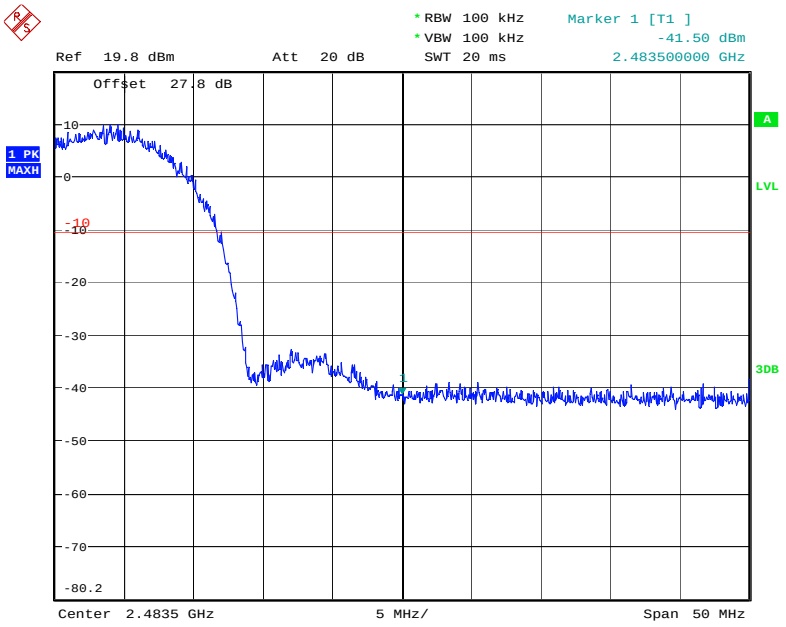
Conducted Spurious Emissions 20-26.5GHz (High Channel)

802.11 b @ 11 Mbps Band Edge



Date: 27.MAR.2012 17:45:42

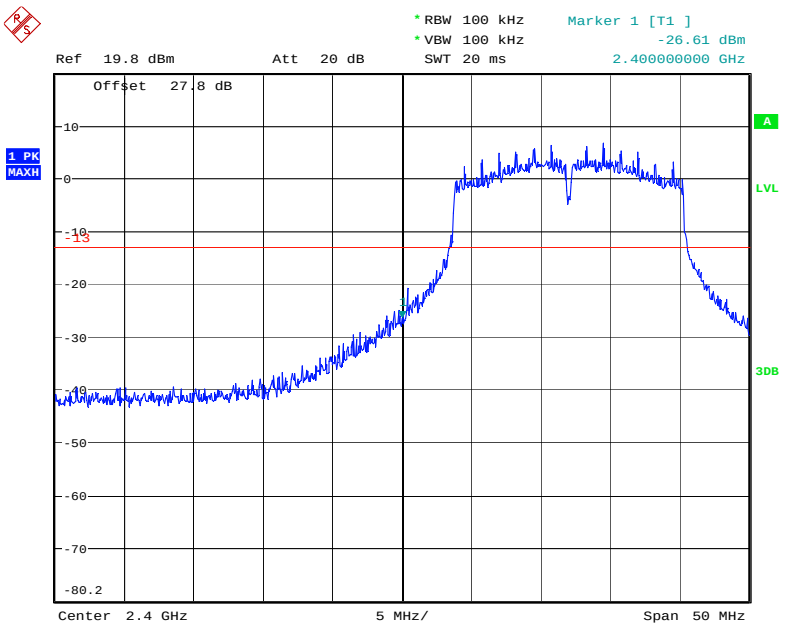
Channel 1 @ 11 Mbps – Lower Band Edge



Date: 27.MAR.2012 17:47:26

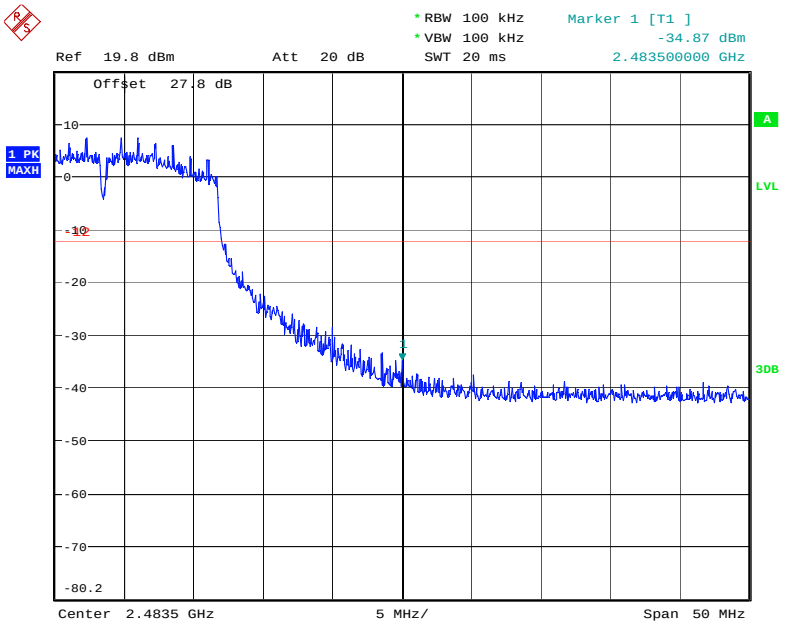
Channel 11 @ 11 Mbps – Upper Band Edge

802.11 g @ 9 Mbps Band Edge



Date: 27.MAR.2012 17:48:40

Channel 1 @ 9 Mbps – Lower Band Edge



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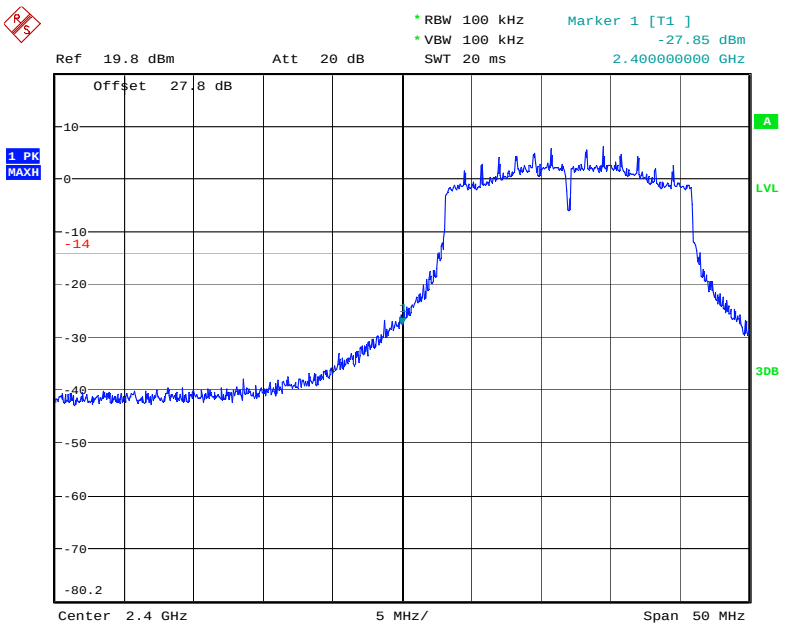
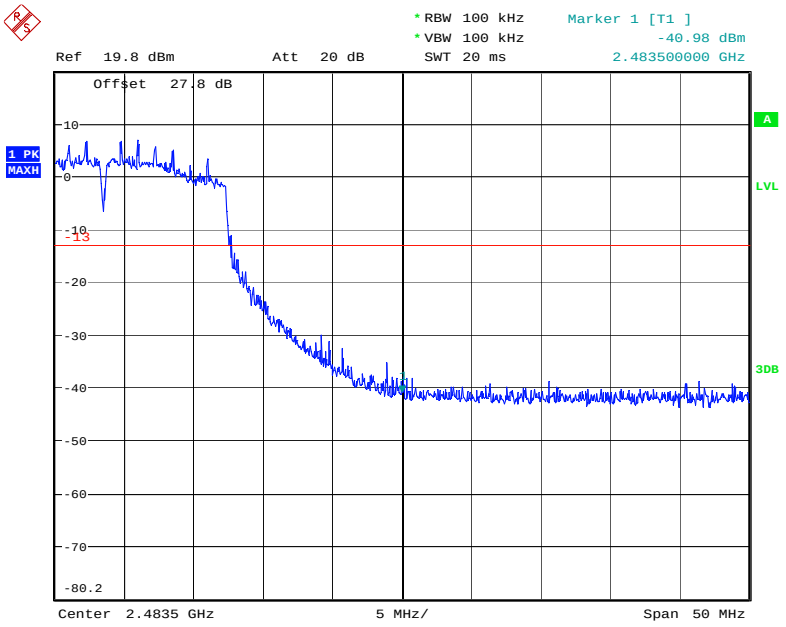
Channel 11 @ 9 Mbps – Upper Band Edge

802.11 n @ 21.7 Mbps Band Edge



Date: 27.MAR.2012 17:51:31

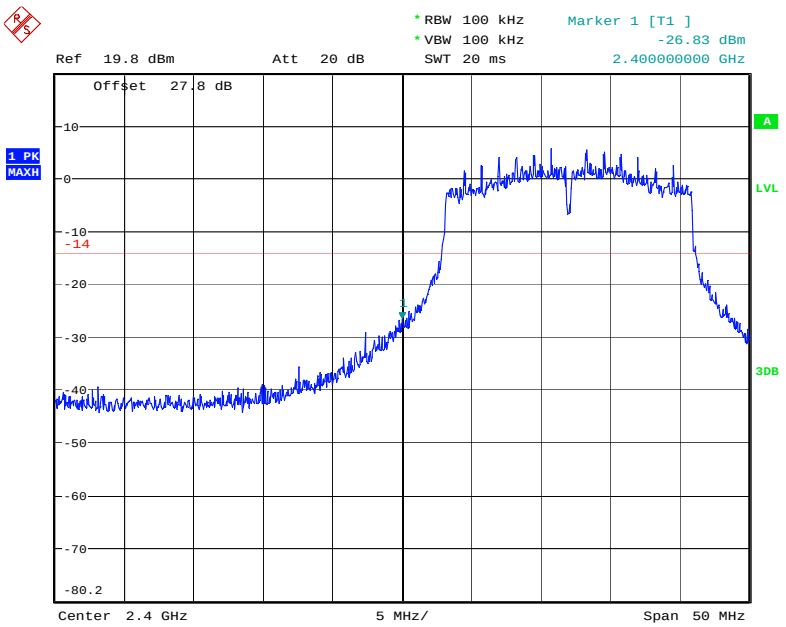
Channel 1 @ 21.7 Mbps – Lower Band Edge



Date: 27.MAR.2012 17:52:34

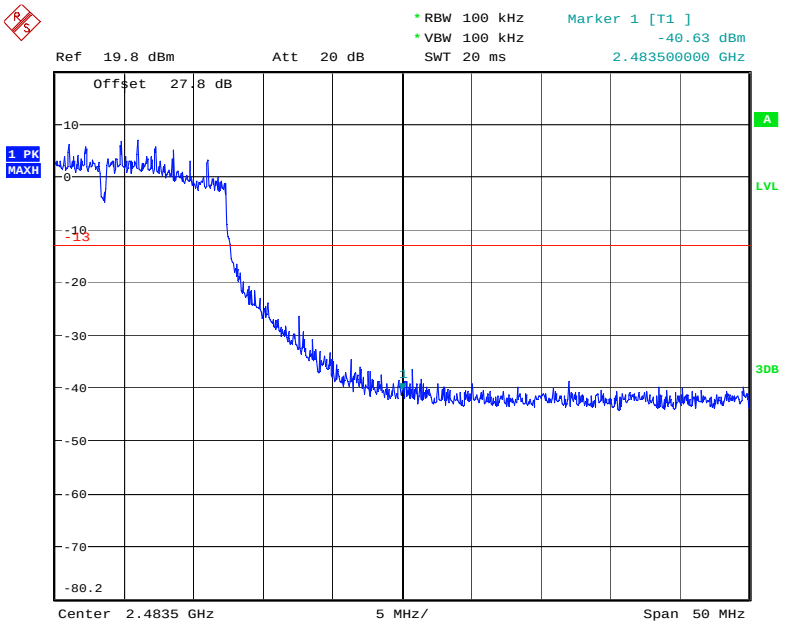
Channel 11 @ 21.7 Mbps – Upper Band Edge

802.11 n @ 19.5 Mbps Band Edge



Date: 27.MAR.2012 17:53:57

Channel 1 @ 19.5 Mbps – Lower Band Edge



Date: 27.MAR.2012 17:54:55

Channel 11 @ 19.5 Mbps – Upper Band Edge

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.

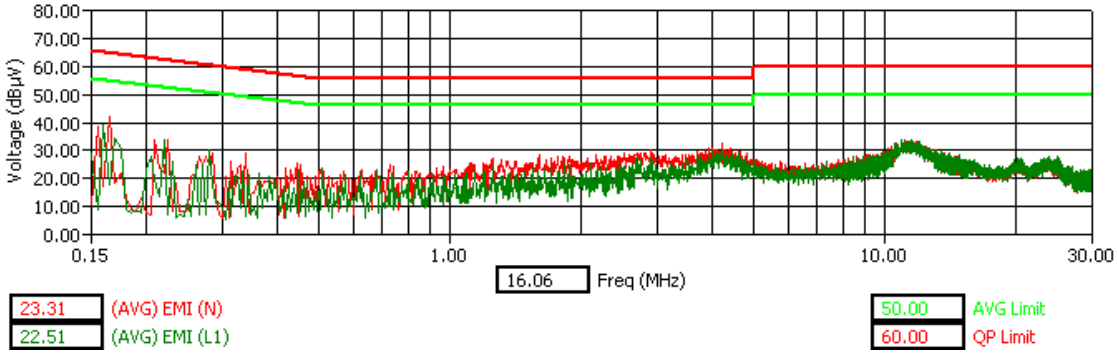
All radio-noise voltage and current measurements shall be made on each current-carrying conductor at the plug end of the EUT power cord or calibrated extension cord by the use of mating plugs and receptacles on the EUT and LISN. Equipment shall be tested with power cords that are normally supplied using 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 – Peak and Average Detector

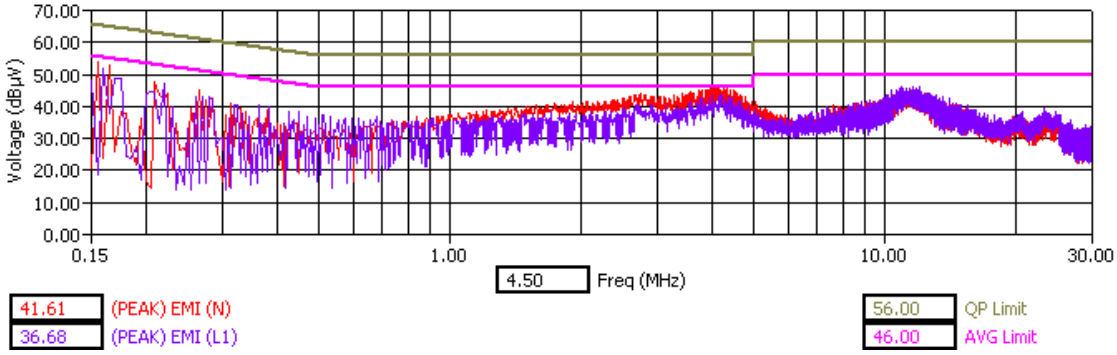
Measurement Results

See attached:

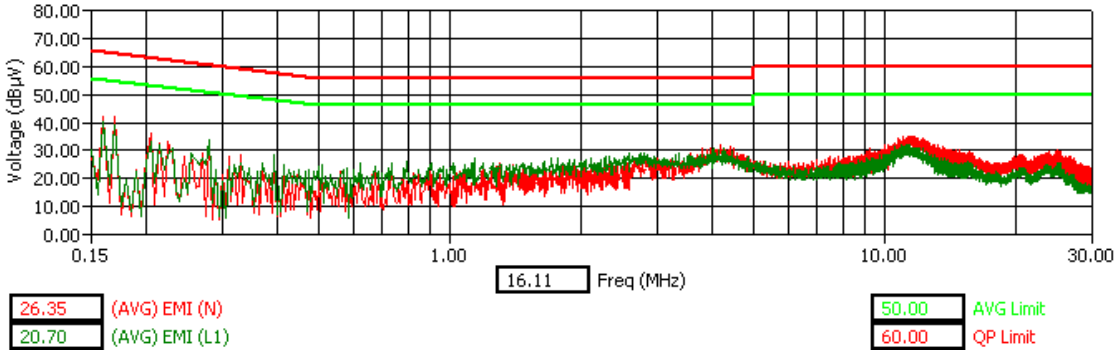
802.11b @ 11 Mbps



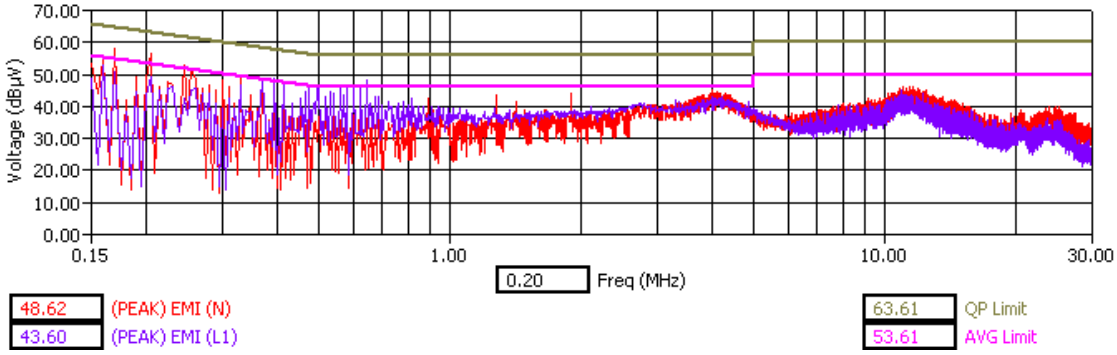
WLAN Channel 1 - Tx Mode – AVG Detector



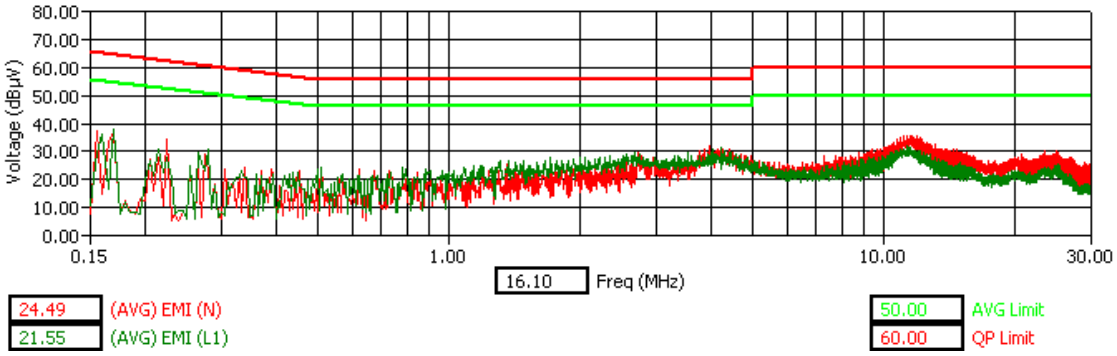
WLAN Channel 1 - Tx Mode – Peak Detector



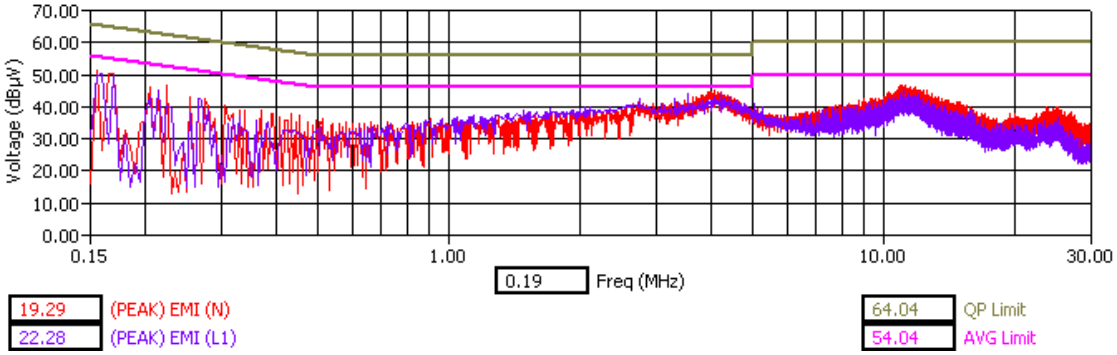
WLAN Channel 6 - Tx Mode - AVG Detector



WLAN Channel 6 - Tx Mode - Peak Detector

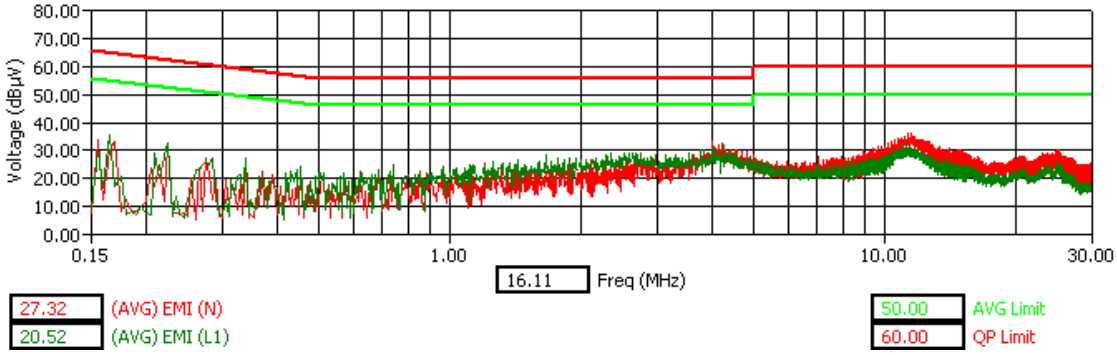


WLAN Channel 11 - Tx Mode - AVG Detector

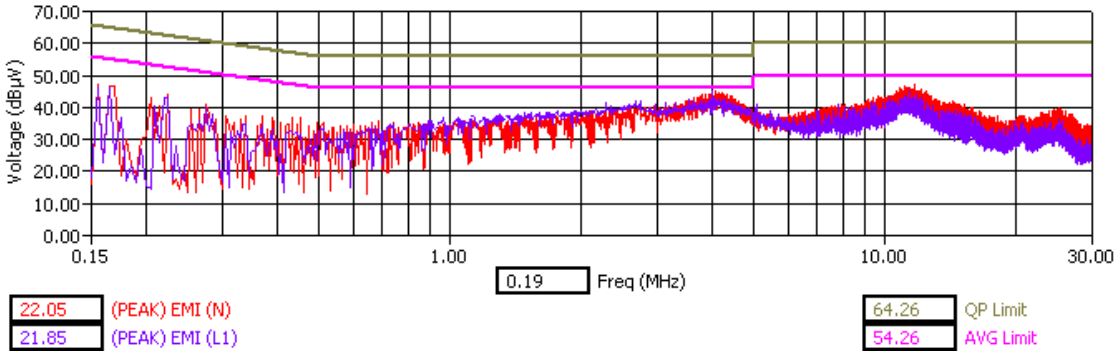


WLAN Channel 11 - Tx Mode - Peak Detector

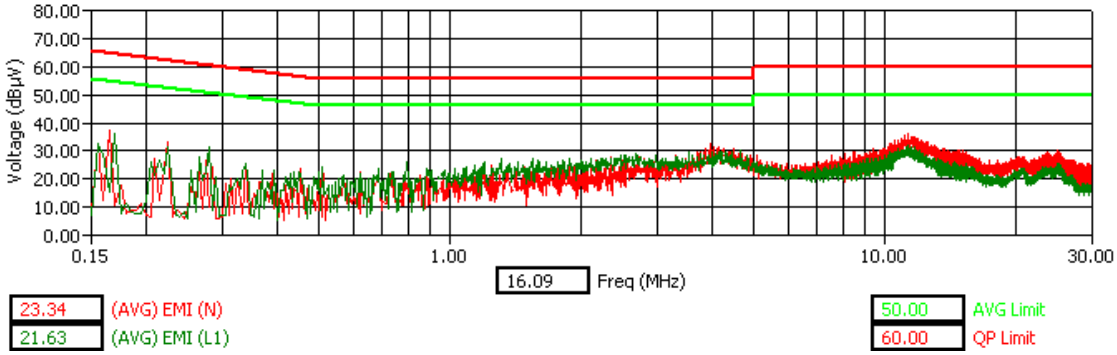
802.11g @ 9 Mbps



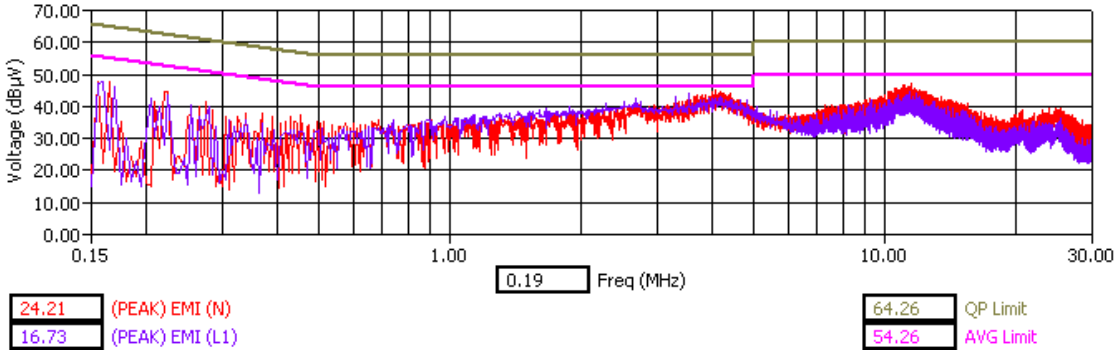
WLAN Channel 1 - Tx Mode – AVG Detector



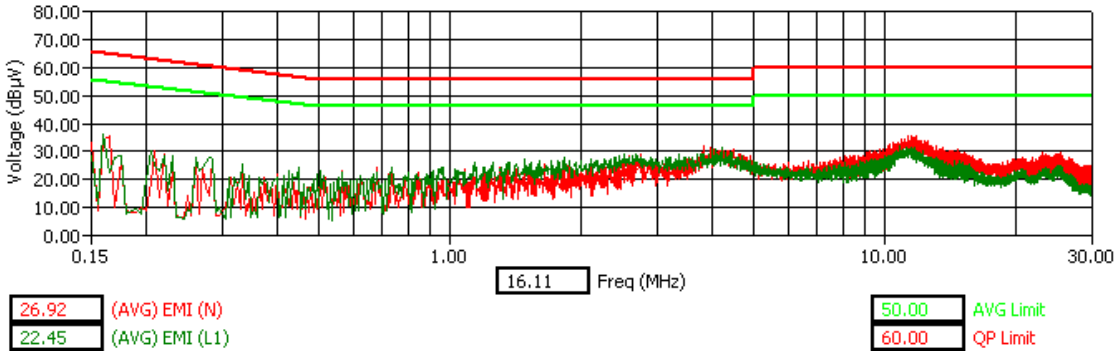
WLAN Channel 1 - Tx Mode – Peak Detector



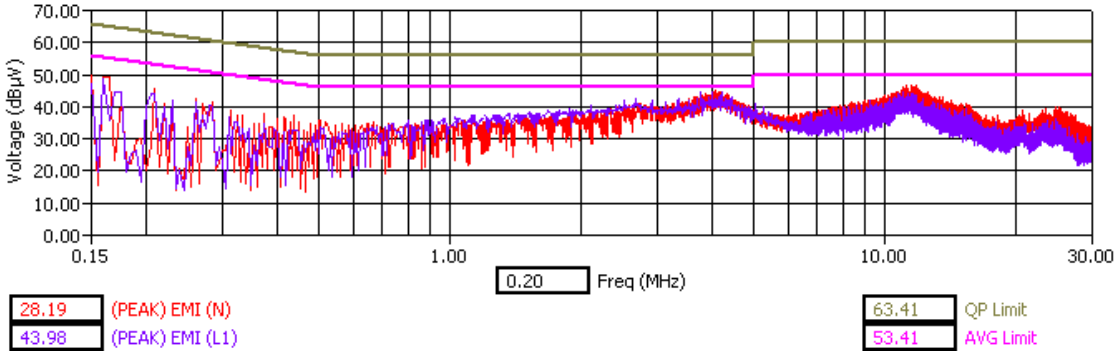
WLAN Channel 6 - Tx Mode - AVG Detector



WLAN Channel 6 - Tx Mode - Peak Detector



WLAN Channel 11 - Tx Mode - AVG Detector



WLAN Channel 11 - Tx Mode - Peak Detector

End of Test Report