



MOBILE DEVICES BUSINESS

**PRODUCT SAFETY AND COMPLIANCE
EMC LABORATORY**

EMC TEST REPORT

Test Report Number – 25080-1 WLAN-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:

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:

Name: Michael Roper

Title: Certification Manager

Date: 2012-07-24

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

Table of Contents

Test Report Details 3

Applicable Standards 3

Summary of Testing 4

General and Special Conditions 4

Equipment and Cable Configurations 4

Measuring Equipment and Calibration Information 5

Description of WLAN Transmitter 5

Measurement Procedures and Data 6

 Spectrum Bandwidth 6

 Measurement Procedure 6

 Measurement Results 6

 Peak Output Power 31

 Measurement Procedure 31

 Measurement Results 31

 Power Spectral Density 34

 Measurement Procedure 34

 Measurement Results 34

 Spurious RF Conducted Emissions 36

 Measurement Procedure 36

 Measurement Results 36

 AC Line Conducted Emissions 57

 Measurement Procedure 57

 Measurement Results 57

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 63.4 2003, RSS-210 Issue 8

In addition, testing was performed per FCC KDB publication number 558074.

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

| 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 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.

20 dB BW Test 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 20 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 20 dB bandwidth of the emission.

For 6 dB BW, test method from KDB 558074 was followed.

6 dB BW Settings

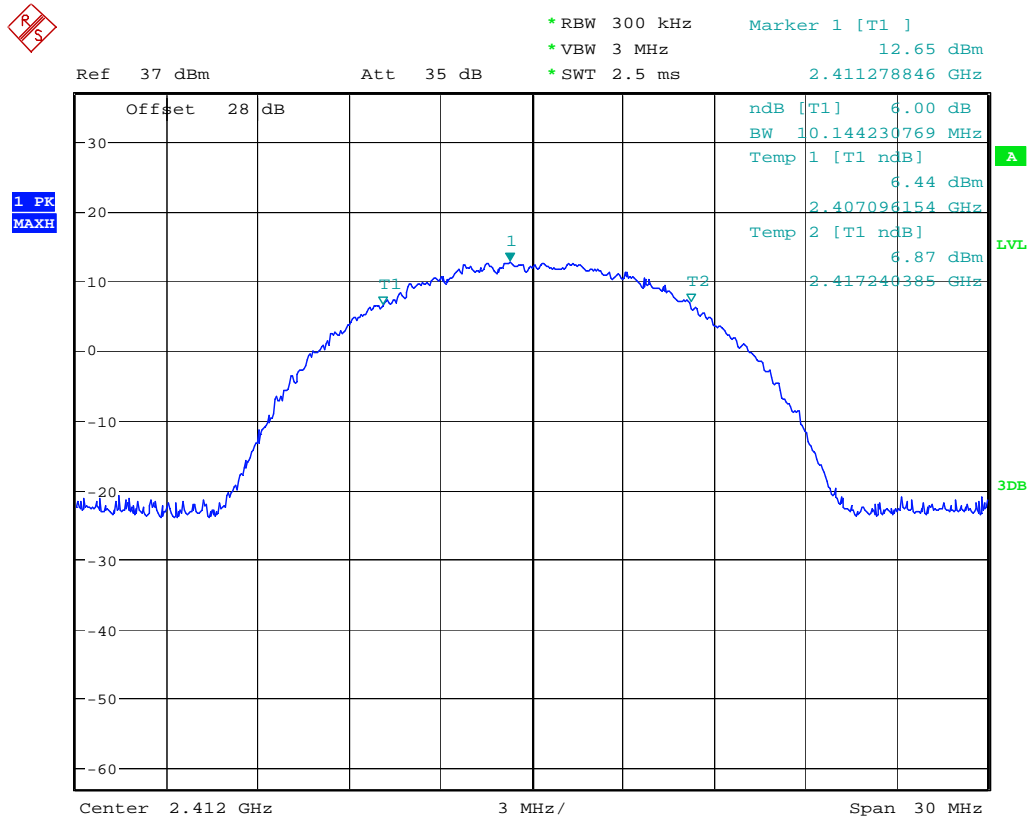
RBW = 300 kHz
VBW = 3 MHz
Detector = Peak
Trace = Max Hold
Sweep = Auto

All modes of operation and data rates were investigated. The test results shown below represent the worst case condition.

Measurement Results

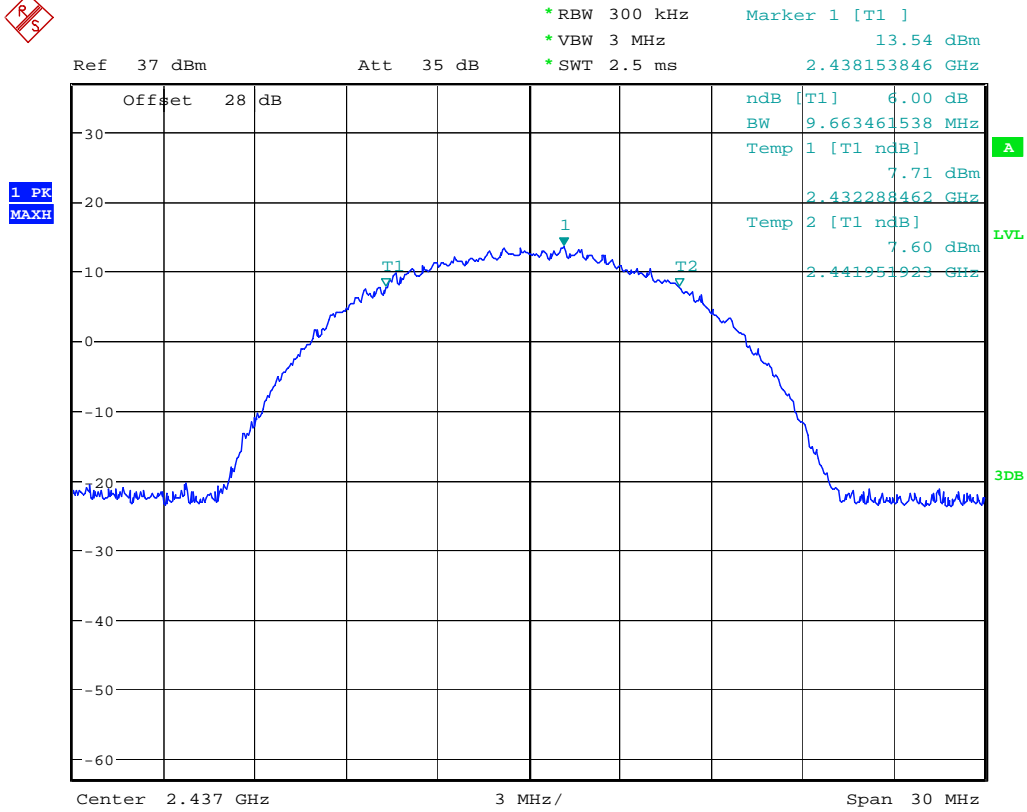
See attached

802.11b Mode



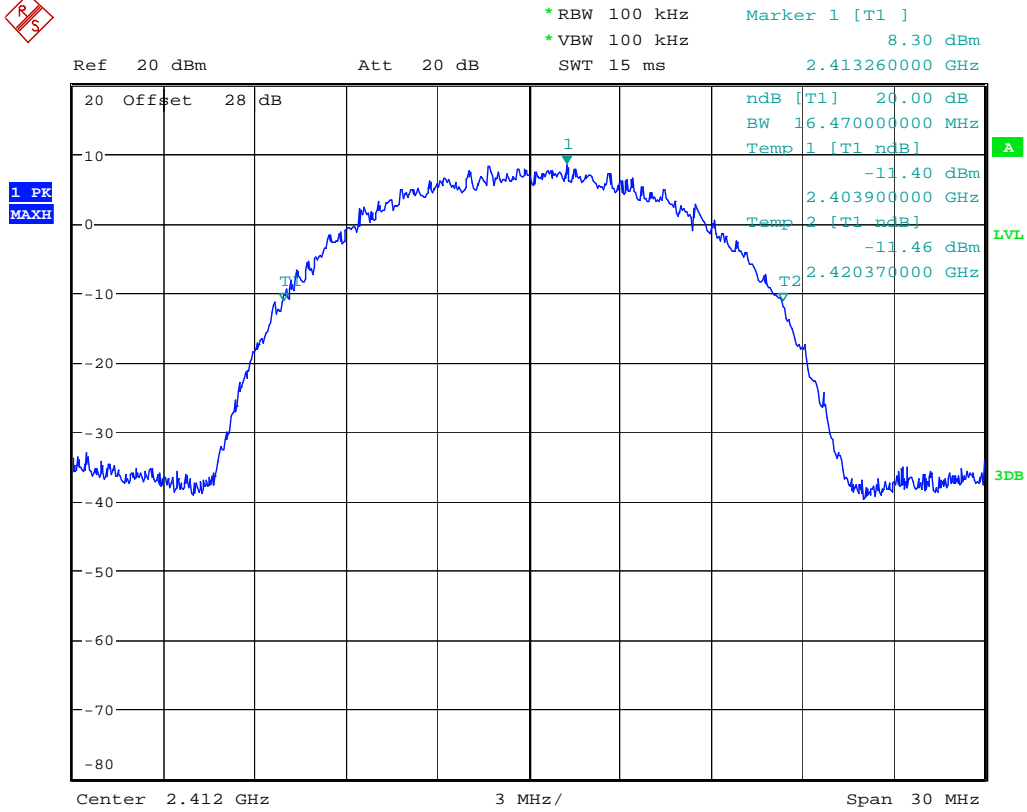
Date: 10.JUL.2012 12:47:27

6 dB Bandwidth Channel 1 @ 11Mbps



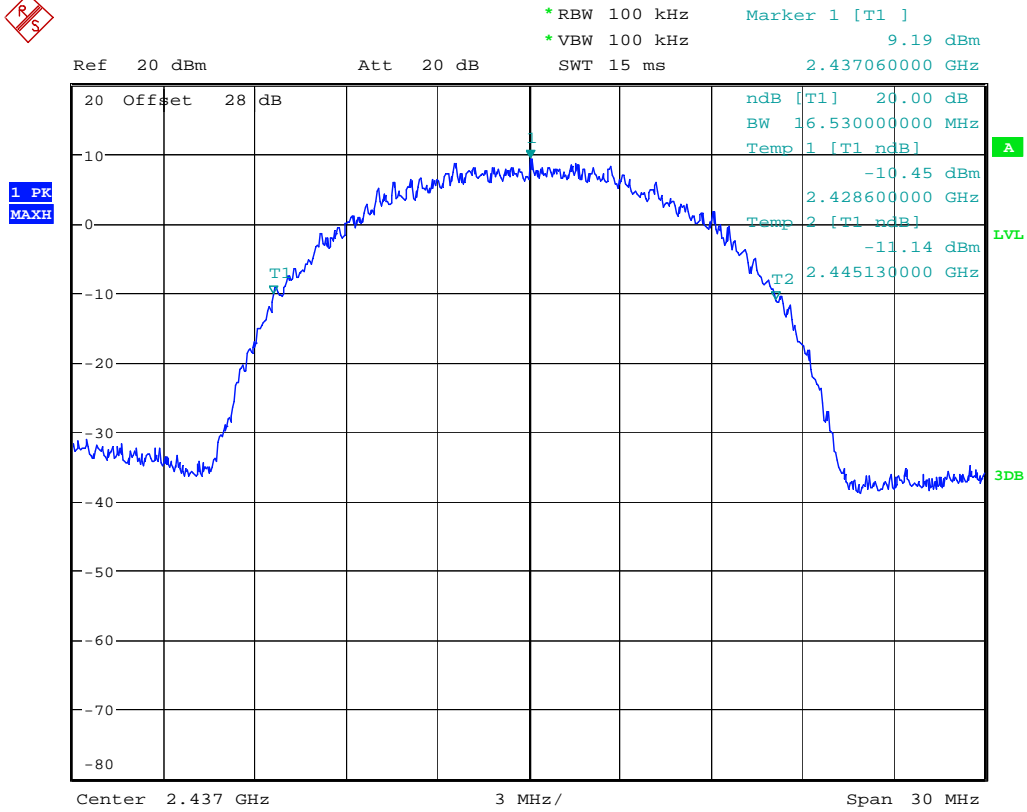
Date: 10.JUL.2012 12:48:28

6 dB Bandwidth Channel 6 @ 11Mbps



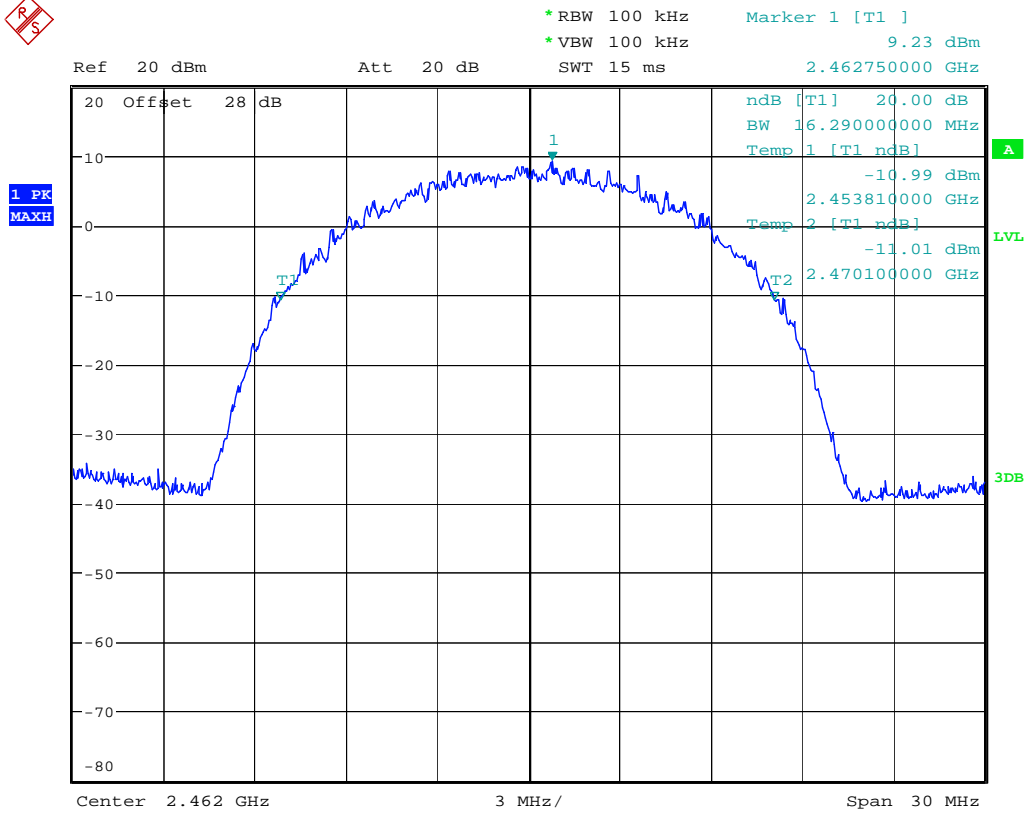
Date: 10.JUL.2012 10:10:19

20 dB Bandwidth Channel 1 @ 11Mbps



Date: 10.JUL.2012 10:09:13

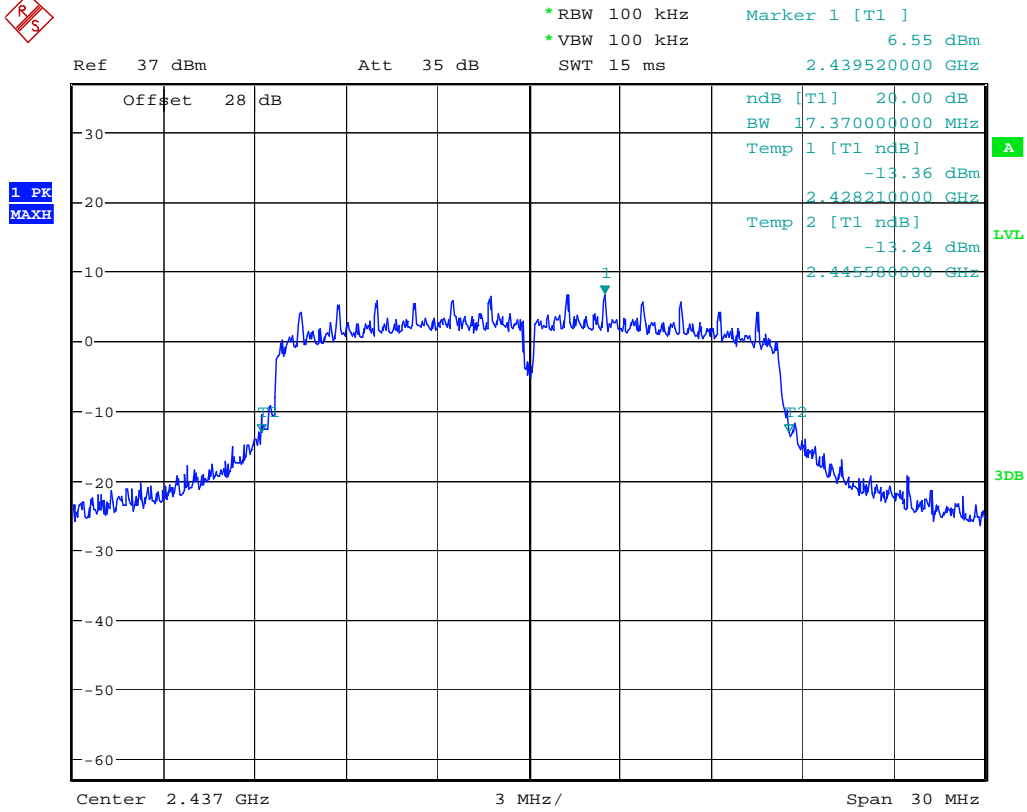
20 dB Bandwidth Channel 6 @ 11Mbps



Date: 10.JUL.2012 10:06:51

20 dB Bandwidth Channel 11 @ 11Mbps

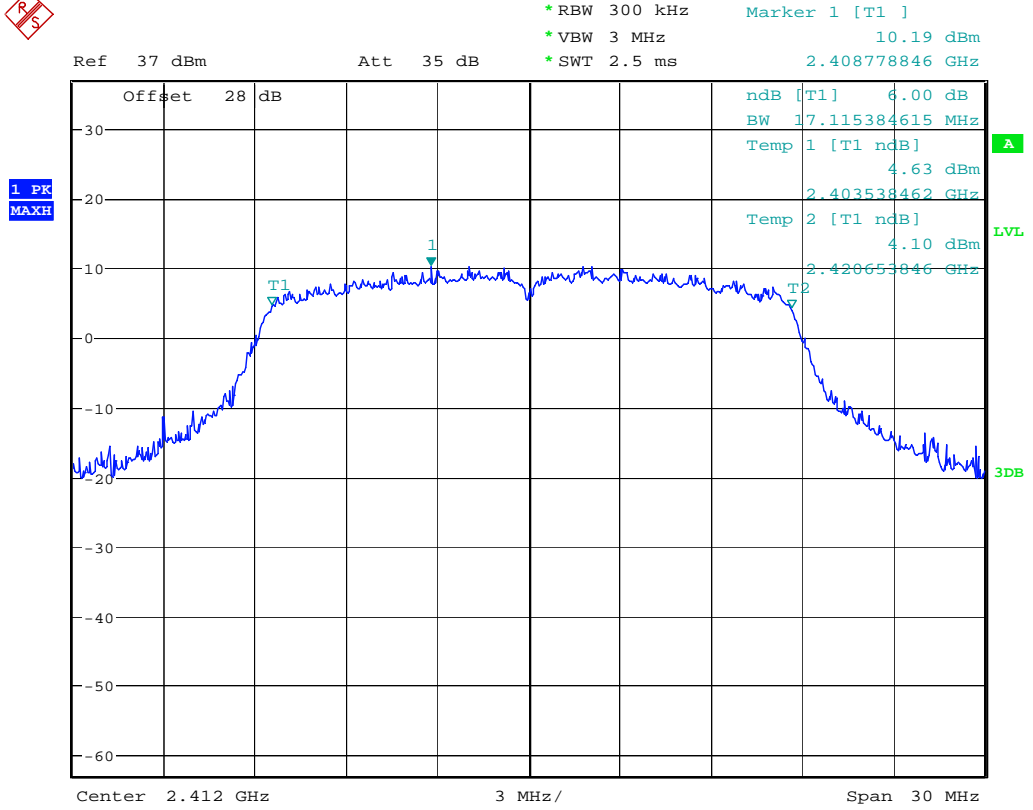
802.11g Mode



Date: 10.JUL.2012 12:59:55

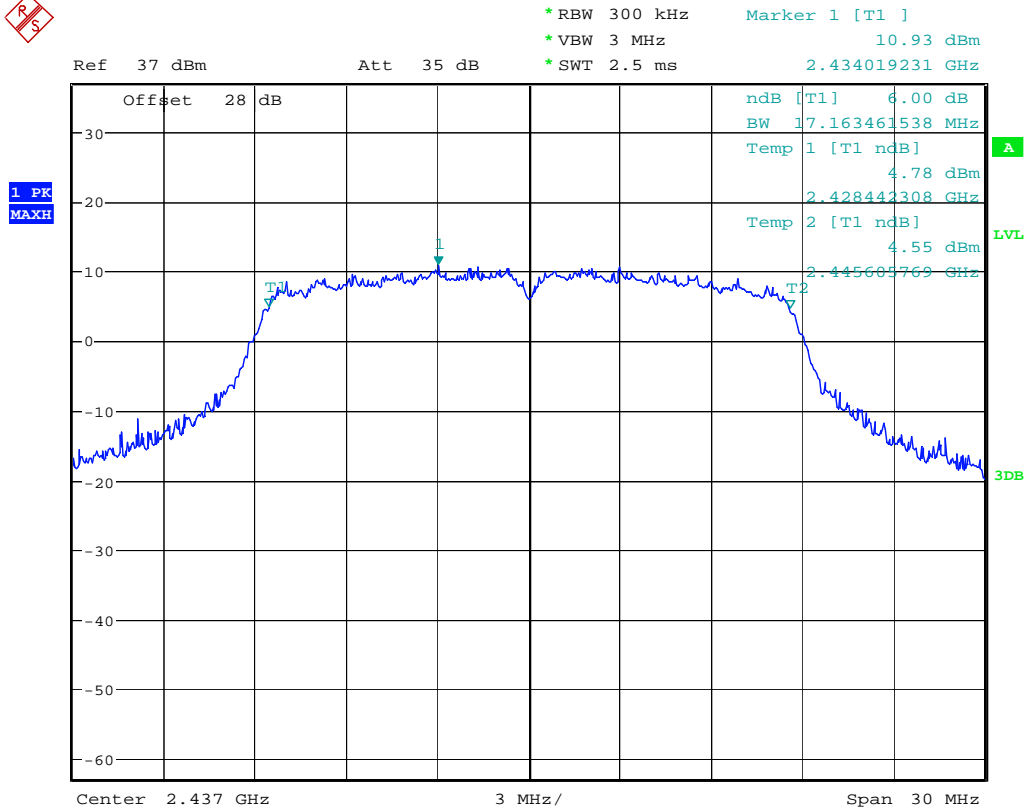
20 dB Bandwidth Channel 6 @ 6Mbps

802.11n 400ns GI Mode



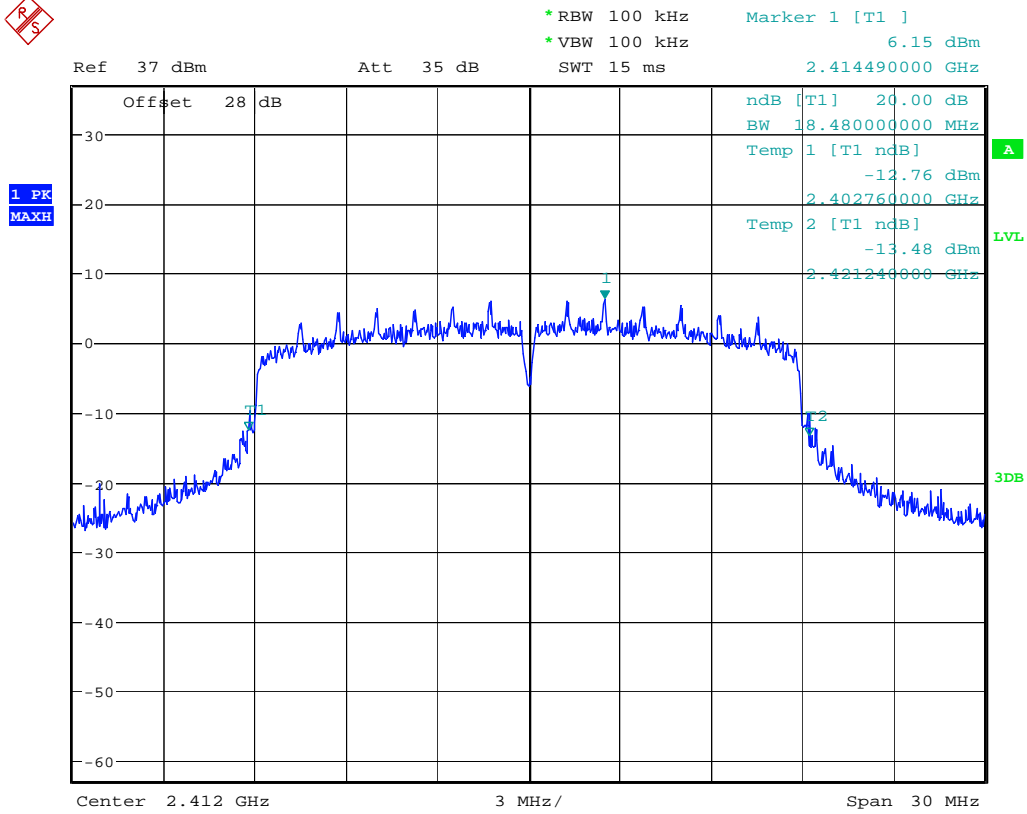
Date: 10.JUL.2012 12:54:00

6dB Bandwidth Channel 1 @ 7.2Mbps



Date: 10.JUL.2012 12:54:54

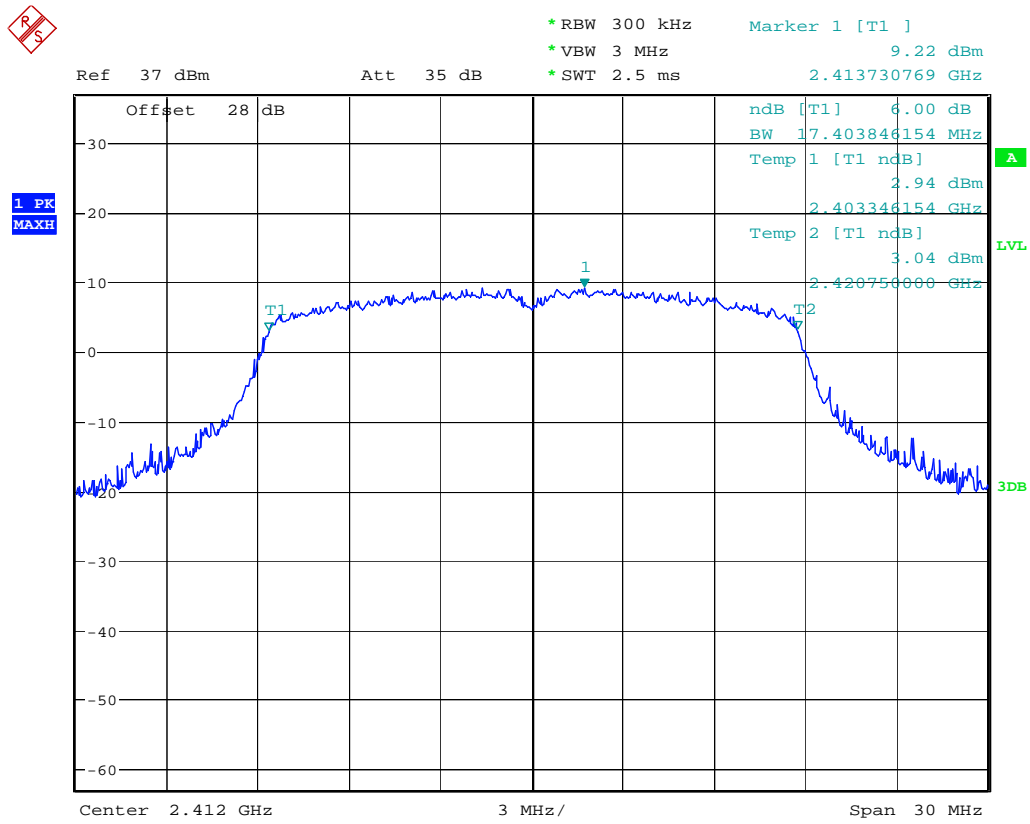
6dB Bandwidth Channel 6 @ 7.2Mbps



Date: 10.JUL.2012 13:01:16

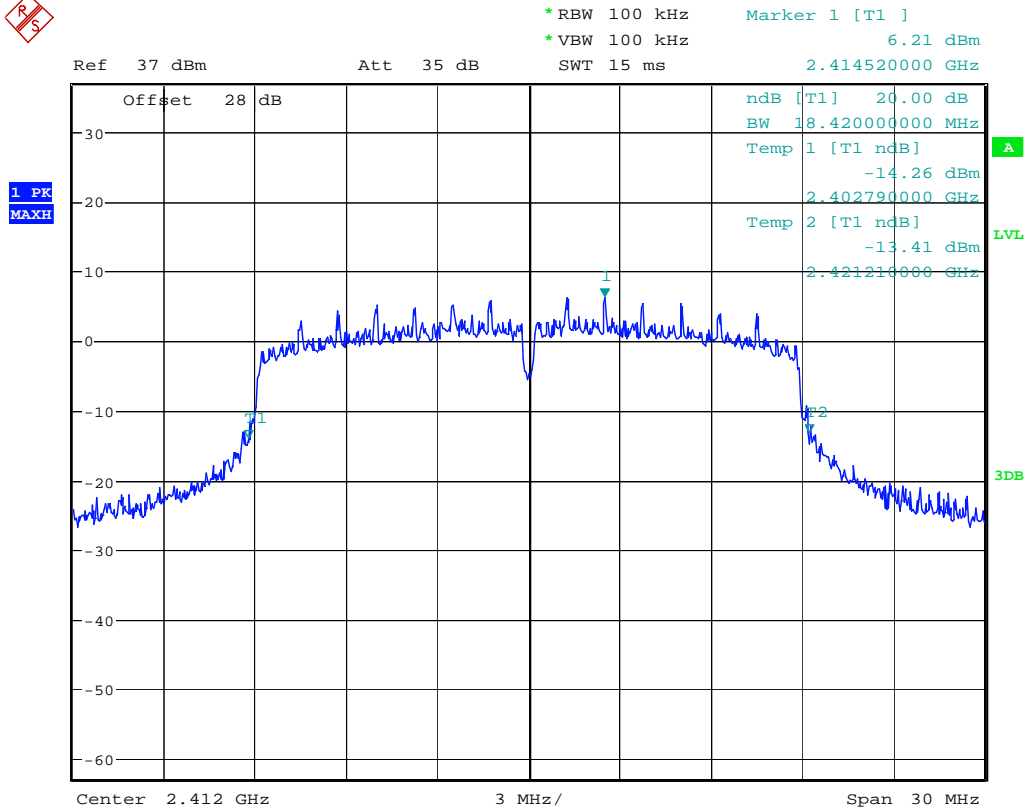
20dB Bandwidth Channel 1 @ 7.2Mbps

802.11n 800ns GI Mode



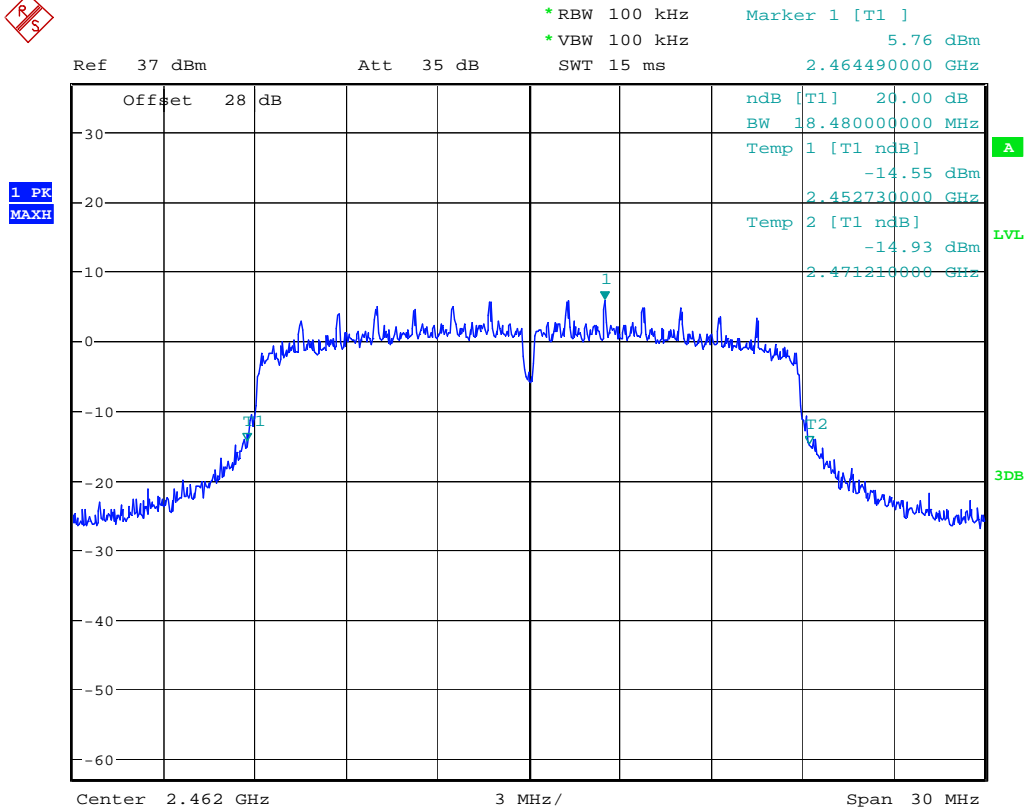
Date: 10.JUL.2012 12:56:43

6 dB Bandwidth Channel 1 @ 6.5Mbps



Date: 10.JUL.2012 13:03:19

20 dB Bandwidth Channel 1 @ 6.5Mbps



Date: 10.JUL.2012 13:04:28

20 dB Bandwidth Channel 11 @ 6.5Mbps

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 rates. 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 all data rates.

Measurement Results

See Attached

Initial average power measurements

| Channel | Average power (dBm) for <u>802.11b</u> Data Rates | | | |
|---------|---|--------|----------|---------|
| | 1 Mbps | 2 Mbps | 5.5 Mbps | 11 Mbps |
| 1 | 17.47 | 17.88 | 18.42 | 18.45 |
| 6 | 18.06 | 18.26 | 18.95 | 19.13 |
| 11 | 17.67 | 17.77 | 18.69 | 18.64 |

| Channel | Average power (dBm) for <u>802.11g</u> Data Rates | | | | | | | |
|---------|---|--------|---------|---------|---------|---------|---------|---------|
| | 6 Mbps | 9 Mbps | 12 Mbps | 18 Mbps | 24 Mbps | 36 Mbps | 48 Mbps | 54 Mbps |
| 1 | 17.23 | 17.15 | 16.86 | 16.99 | 15.5 | 15.66 | 14.05 | 13.91 |
| 6 | 17.86 | 17.81 | 17.55 | 17.55 | 15.81 | 15.86 | 14.37 | 14.35 |
| 11 | 17.02 | 16.94 | 17.11 | 17.18 | 15.41 | 15.35 | 14.03 | 13.87 |

| Channel | Average power (dBm) for <u>802.11n</u> Data Rates | | | | | | | |
|---------|---|-----------|-----------|-----------|-----------|-----------|---------|-----------|
| | 20 MHz BW, 400 ns GI | | | | | | | |
| | 7.2 Mbps | 14.4 Mbps | 21.7 Mbps | 28.9 Mbps | 43.3 Mbps | 57.8 Mbps | 65 Mbps | 72.2 Mbps |
| 1 | 17.22 | 16.88 | 16.91 | 15.36 | 15.19 | 13.91 | 13.76 | 12.89 |
| 6 | 17.55 | 17.16 | 17.3 | 15.66 | 15.61 | 14.18 | 14.1 | 13.23 |
| 11 | 16.75 | 16.73 | 16.82 | 15.15 | 15.18 | 13.63 | 13.68 | 12.63 |

| Channel | Average power (dBm) for <u>802.11n</u> Data Rates | | | | | | | |
|---------|---|---------|-----------|---------|---------|---------|-----------|---------|
| | 20 MHz BW, 800 ns GI | | | | | | | |
| | 6.5 Mbps | 13 Mbps | 19.5 Mbps | 26 Mbps | 39 Mbps | 52 Mbps | 58.5 Mbps | 65 Mbps |
| 1 | 17.21 | 16.86 | 16.92 | 15.49 | 15.32 | 13.92 | 13.96 | 12.93 |
| 6 | 17.67 | 17.32 | 17.35 | 15.81 | 15.75 | 14.32 | 14.18 | 13.28 |
| 11 | 16.78 | 16.84 | 16.91 | 15.24 | 15.42 | 13.71 | 13.77 | 12.79 |

Based on these initial measurements, it was determined that testing will be performed in the 11Mbps data rate for the 802.11b mode, the 6Mbps data rate for the 802.11g mode, 7.2Mbps data rate for 802.11n 400ns GI mode and 6.5Mbps data rate for 802.11n 800ns GI mode. Tables showing the peak power measurements for the all data rates follow.

The peak power was measured using the below settings.

RBW = 1 MHz

VBW = 3 MHz

Span = 10 MHz for "b" mode and 20 MHz for "g" and "n" mode.

Detector = Peak

Trace = Max Hold

Int BW = 6 dB BW measured for each mode.

| Channel | Peak power (dBm) for <u>802.11b</u> Data Rates | | | |
|---------|--|--------|----------|---------|
| | 1 Mbps | 2 Mbps | 5.5 Mbps | 11 Mbps |
| 1 | 19.28 | 19.97 | 21.67 | 22.62 |
| 6 | 19.93 | 20.3 | 22.41 | 23.46 |
| 11 | 19.58 | 19.9 | 22.07 | 22.97 |

| Channel | Peak power (dBm) for <u>802.11g</u> Data Rates | | | | | | | |
|---------|--|--------|---------|---------|---------|---------|---------|---------|
| | 6 Mbps | 9 Mbps | 12 Mbps | 18 Mbps | 24 Mbps | 36 Mbps | 48 Mbps | 54 Mbps |
| 1 | 22.61 | 22.6 | 22.42 | 22.6 | 21.07 | 21.26 | 19.62 | 19.66 |
| 6 | 23.16 | 23.13 | 23.04 | 23.11 | 21.38 | 21.42 | 19.98 | 19.87 |
| 11 | 22.38 | 22.26 | 22.68 | 22.69 | 20.96 | 20.81 | 19.56 | 19.47 |

| Channel | Peak power (dBm) for <u>802.11n</u> Data Rates | | | | | | | |
|---------|--|-----------|-----------|-----------|-----------|-----------|---------|-----------|
| | 20 MHz BW, 400 ns GI | | | | | | | |
| | 7.2 Mbps | 14.4 Mbps | 21.7 Mbps | 28.9 Mbps | 43.3 Mbps | 57.8 Mbps | 65 Mbps | 72.2 Mbps |
| 1 | 23.34 | 22.57 | 22.51 | 20.99 | 20.89 | 19.53 | 19.35 | 18.53 |
| 6 | 23.85 | 22.81 | 22.93 | 21.26 | 21.21 | 19.73 | 19.69 | 18.85 |
| 11 | 23.01 | 22.41 | 22.47 | 20.72 | 20.81 | 19.21 | 19.33 | 18.21 |

| Channel | Peak power (dBm) for <u>802.11n</u> Data Rates | | | | | | | |
|---------|--|---------|-----------|---------|---------|---------|-----------|---------|
| | 20 MHz BW, 800 ns GI | | | | | | | |
| | 6.5 Mbps | 13 Mbps | 19.5 Mbps | 26 Mbps | 39 Mbps | 52 Mbps | 58.5 Mbps | 65 Mbps |
| 1 | 22.64 | 22.38 | 22.35 | 21.04 | 20.82 | 19.44 | 19.38 | 18.59 |
| 6 | 22.95 | 22.84 | 22.82 | 21.11 | 21.25 | 19.77 | 19.7 | 18.82 |
| 11 | 22.08 | 22.36 | 22.32 | 20.82 | 20.87 | 19.24 | 19.22 | 18.29 |

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. A fully charged battery was used for the supply voltage.

The WLAN function of the EUT was enabled. Test method from KDB 558074 was followed.

The spectrum analyzer used the following settings:

1. Span = 10 MHz
2. VBW = 300 kHz
3. RBW= 100 kHz
4. Sweep = Auto
5. Detector function = peak
6. Trace = max hold

Bandwidth Correction factor = 10 Log (3 kHz/100 kHz) = -15.32 dB

The trace was allowed to stabilize. All modes of operation and data rates were investigated. The test results shown below represent the worst case condition.

Measurement Results

| 2412 MHz | | 2437MHz | | 2462MHz | |
|------------------|-------------------|------------------|-------------------|------------------|-------------------|
| Measured PSD dBm | Corrected PSD dBm | Measured PSD dBm | Corrected PSD dBm | Measured PSD dBm | Corrected PSD dBm |
| 9.39 | -5.93 | 9.56 | -5.76 | 10.65 | -4.67 |

802.11 b 11Mbps

| 2412 MHz | | 2437MHz | | 2462MHz | |
|------------------|-------------------|------------------|-------------------|------------------|-------------------|
| Measured PSD dBm | Corrected PSD dBm | Measured PSD dBm | Corrected PSD dBm | Measured PSD dBm | Corrected PSD dBm |
| 6.58 | -8.74 | 6.98 | -8.34 | 6.18 | -9.14 |

802.11 g 6Mbps

| 2412 MHz | | 2437MHz | | 2462MHz | |
|------------------|-------------------|------------------|-------------------|------------------|-------------------|
| Measured PSD dBm | Corrected PSD dBm | Measured PSD dBm | Corrected PSD dBm | Measured PSD dBm | Corrected PSD dBm |
| 6.57 | -8.75 | 6.93 | -8.39 | 6.16 | -9.16 |

802.11n(400ns) 7.2Mbps

| 2412 MHz | | 2437MHz | | 2462MHz | |
|------------------|-------------------|------------------|-------------------|------------------|-------------------|
| Measured PSD dBm | Corrected PSD dBm | Measured PSD dBm | Corrected PSD dBm | Measured PSD dBm | Corrected PSD dBm |
| 6.52 | -8.8 | 6.97 | -8.35 | 6.14 | -9.18 |

802.11n(800ns) 6.5Mbps

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.

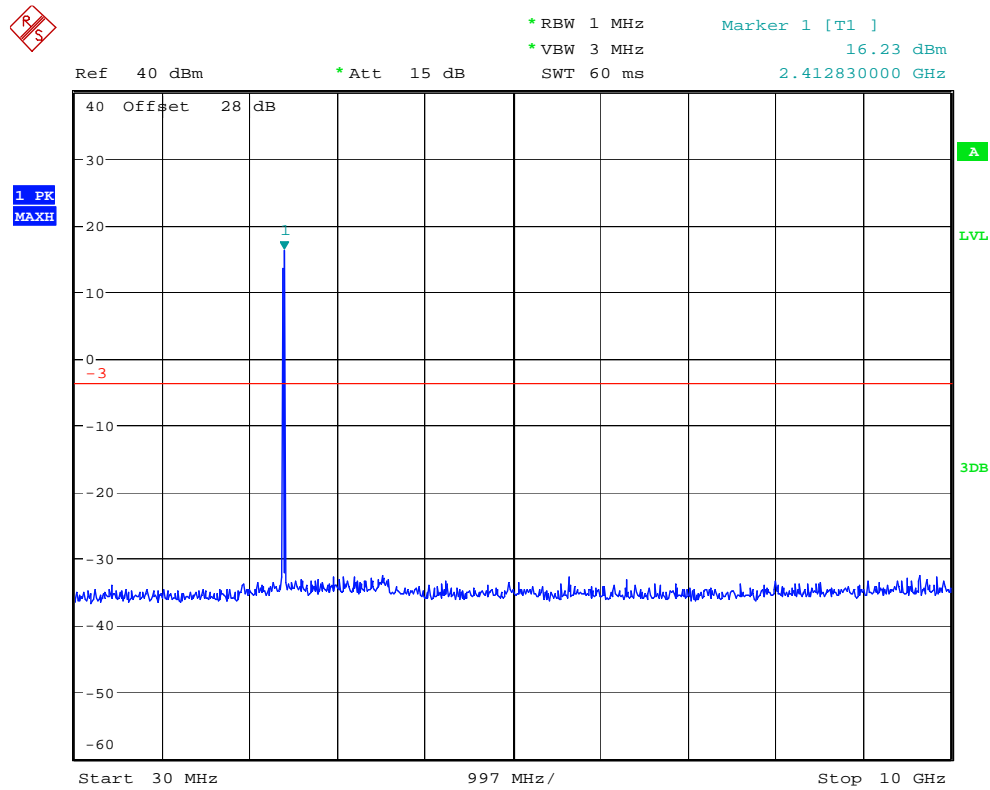
Test method from KDB 558074 was followed.

All modes of operation and data rates were investigated. The test results shown below represent the worst case condition.

Measurement Results

See attached:

802.11b Mode @ 11Mbps

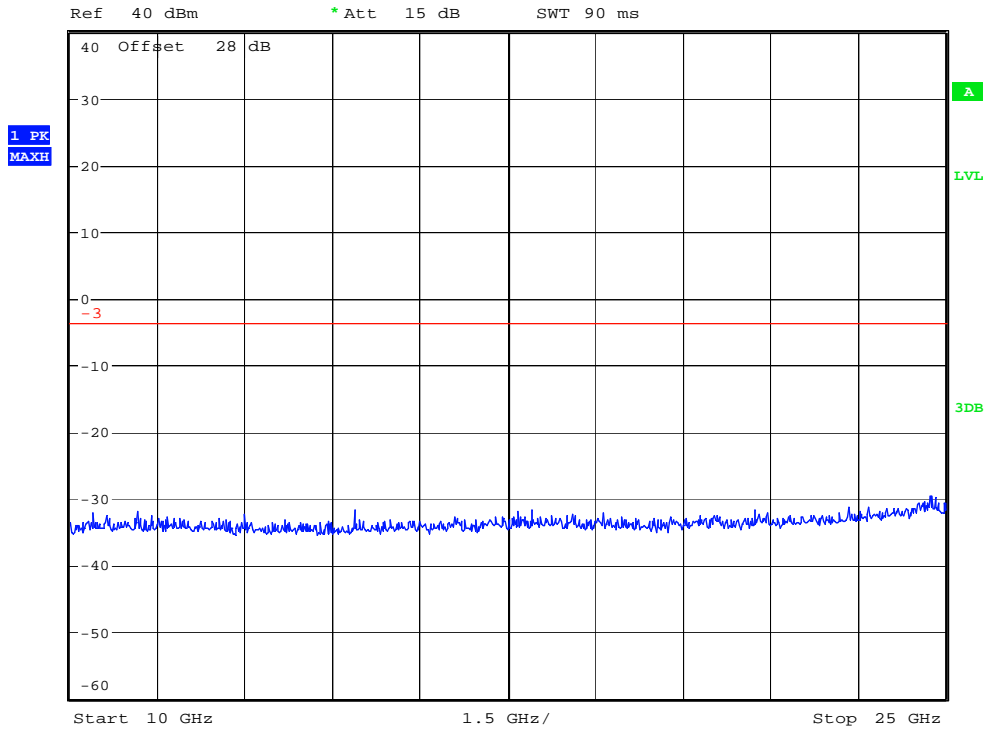


Date: 10.JUL.2012 13:31:35

Conducted Spurious Emissions 30MHz-10GHz (Low Channel)

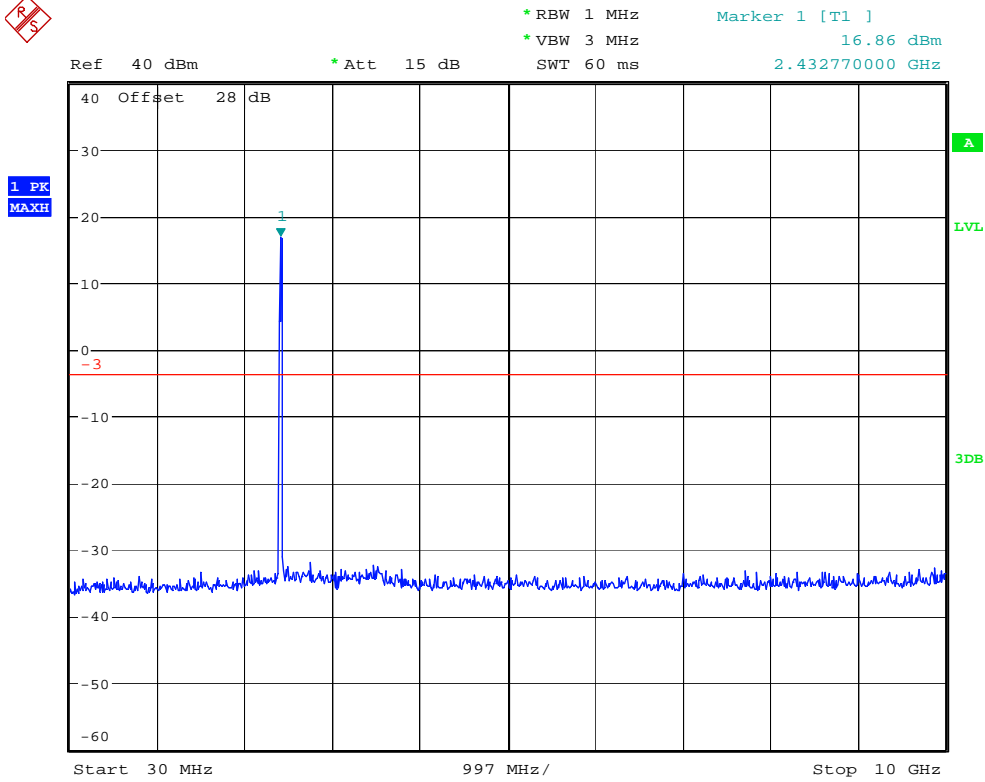


* RBW 1 MHz
* VBW 3 MHz
SWT 90 ms



Date: 10.JUL.2012 13:37:11

Conducted Spurious Emissions 10GHz-25GHz (Low Channel)

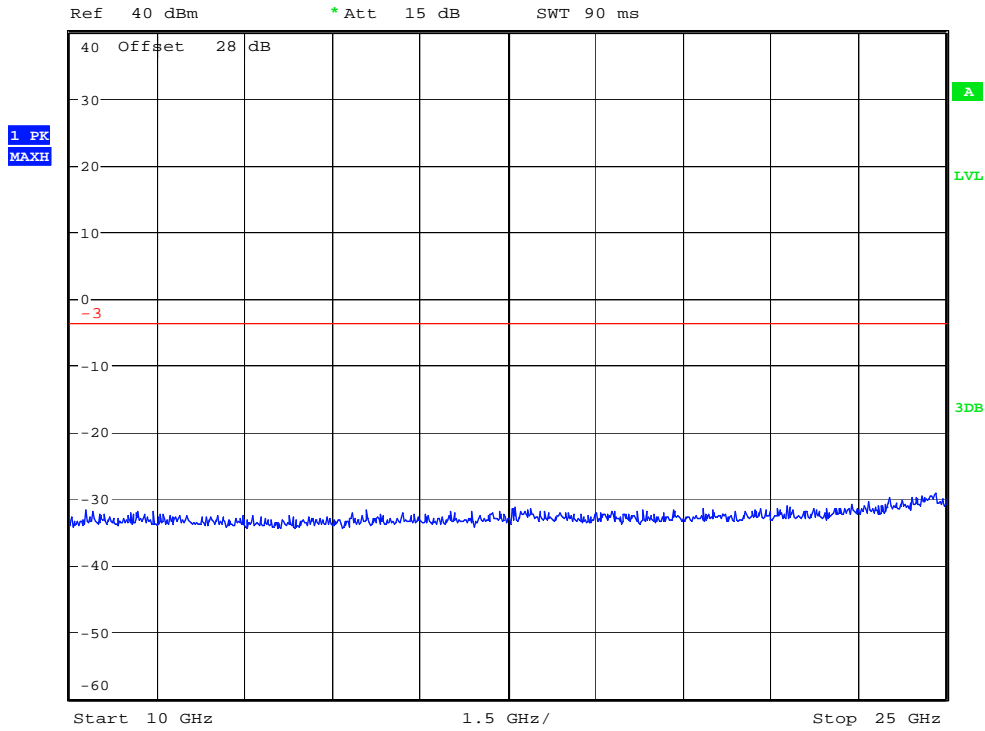


Date: 10.JUL.2012 13:33:20

Conducted Spurious Emissions 30MHz-10GHz (Mid Channel)

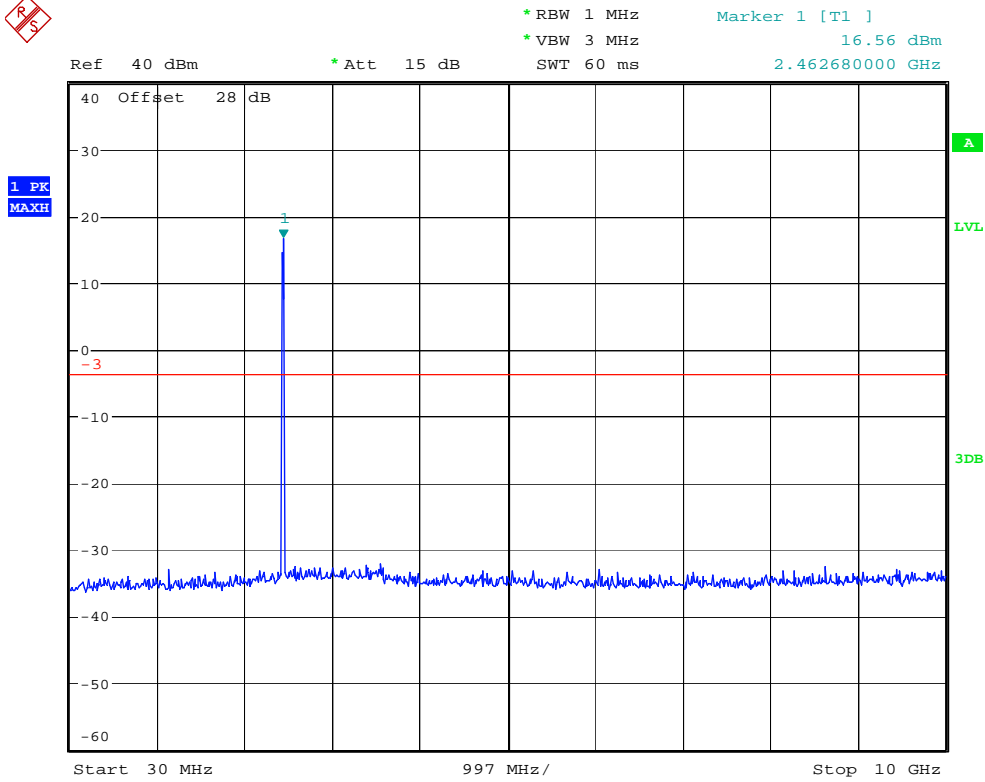


* RBW 1 MHz
* VBW 3 MHz
SWT 90 ms



Date: 10.JUL.2012 13:36:26

Conducted Spurious Emissions 10GHz-25GHz (Mid Channel)

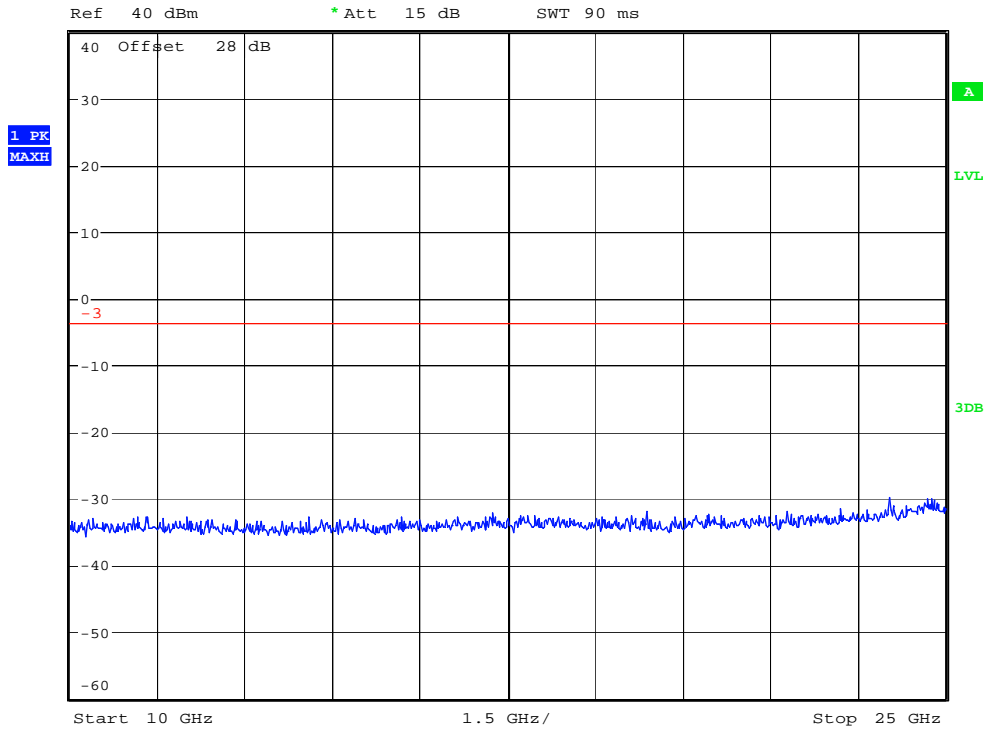


Date: 10.JUL.2012 13:34:40

Conducted Spurious Emissions 30MHz-10GHz (High Channel)



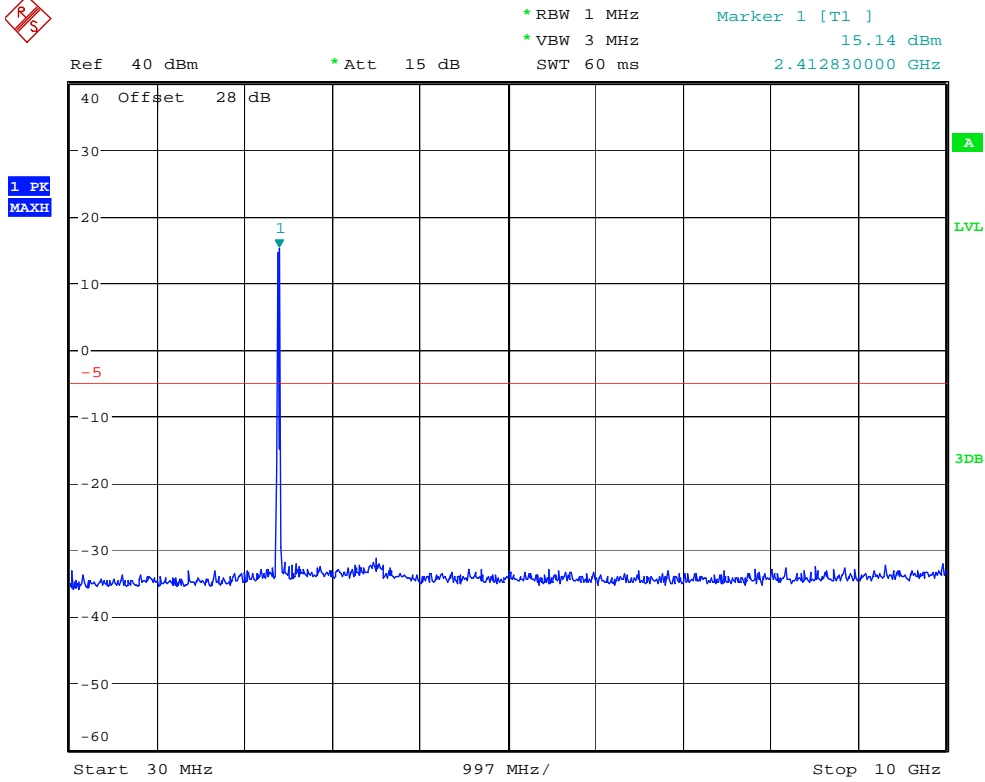
* RBW 1 MHz
* VBW 3 MHz
SWT 90 ms



Date: 10.JUL.2012 13:35:13

Conducted Spurious Emissions 10GHz-25GHz (High Channel)

802.11 g @ 6Mbps

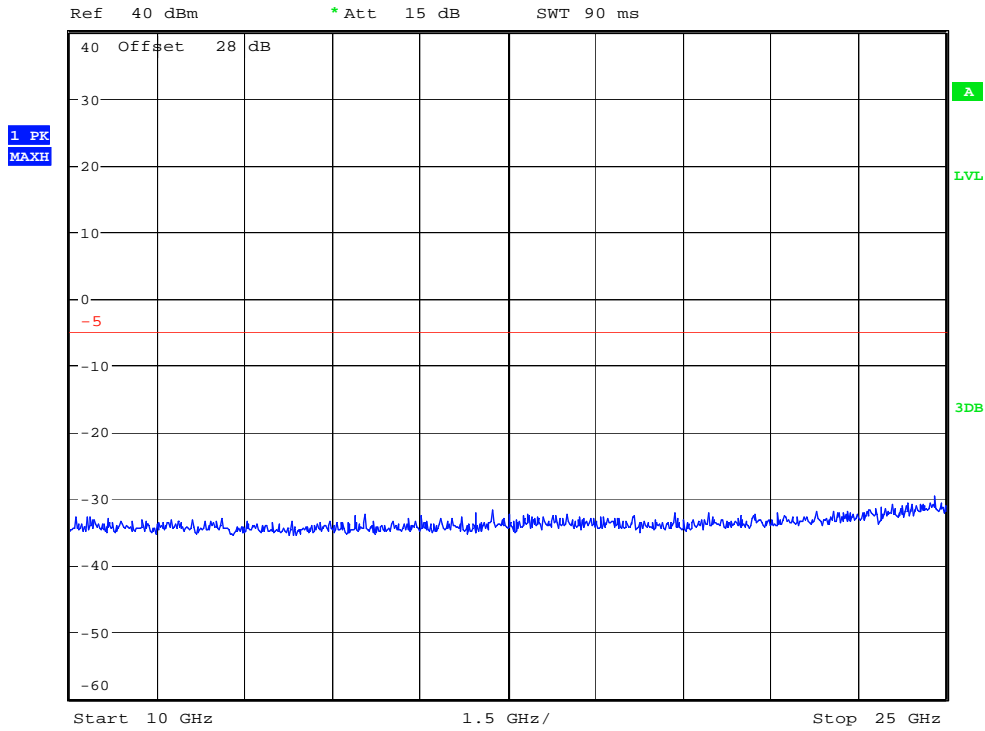


Date: 10.JUL.2012 13:39:25

Conducted Spurious Emissions 30MHz-10GHz (Low Channel)

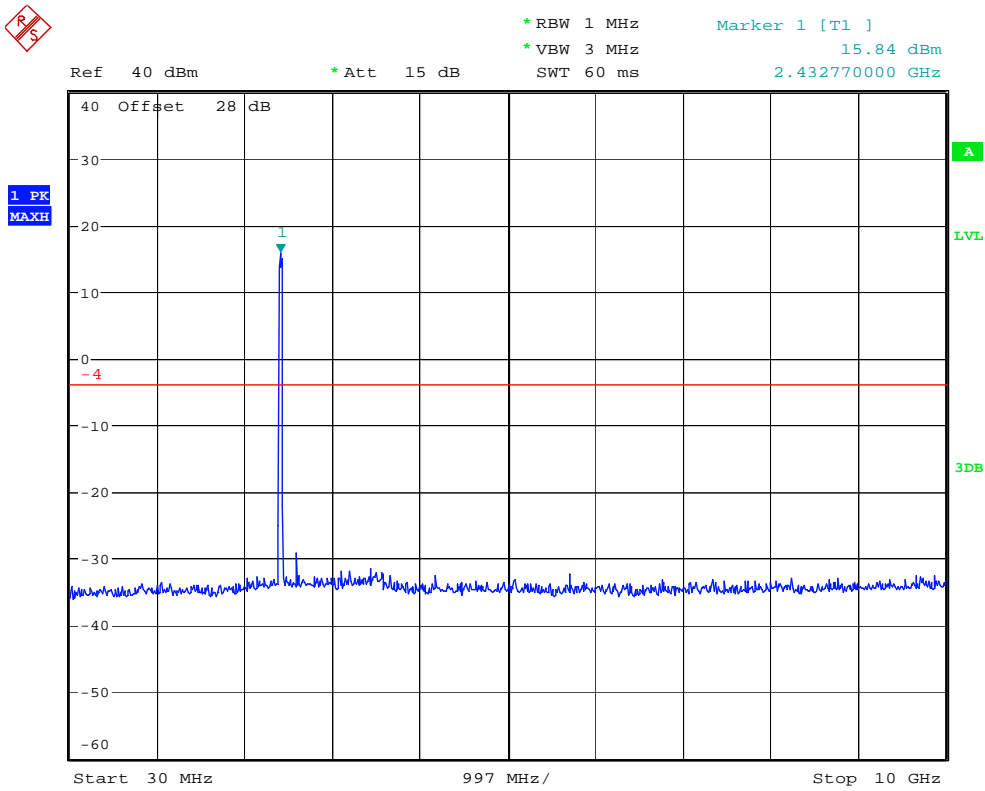


* RBW 1 MHz
* VBW 3 MHz
SWT 90 ms



Date: 10.JUL.2012 13:39:57

Conducted Spurious Emissions 10GHz-25GHz (Low Channel)

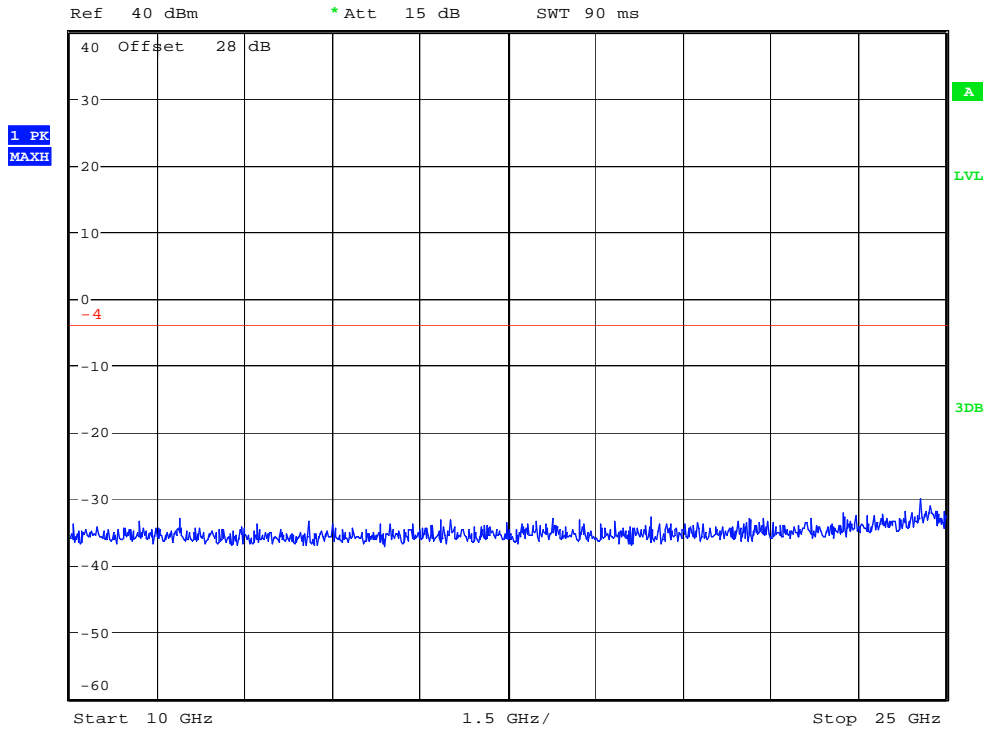


Date: 10.JUL.2012 13:41:10

Conducted Spurious Emissions 30MHz-10GHz (Mid Channel)

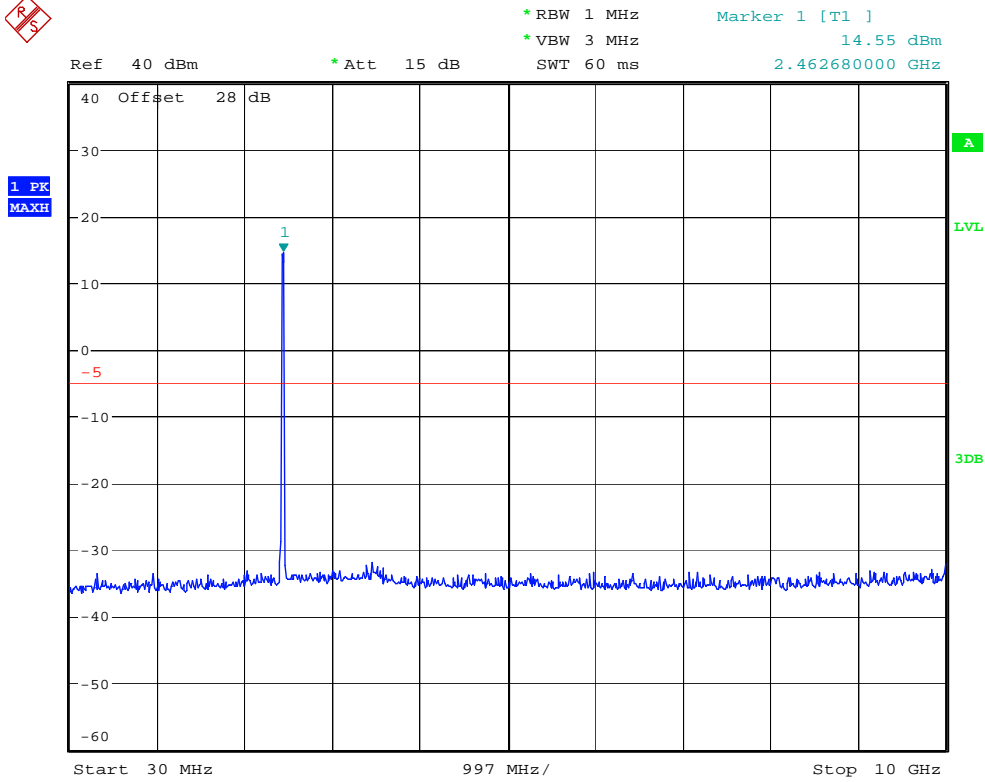


* RBW 1 MHz
* VBW 3 MHz
SWT 90 ms



Date: 10.JUL.2012 13:41:33

Conducted Spurious Emissions 10GHz-25GHz (Mid Channel)

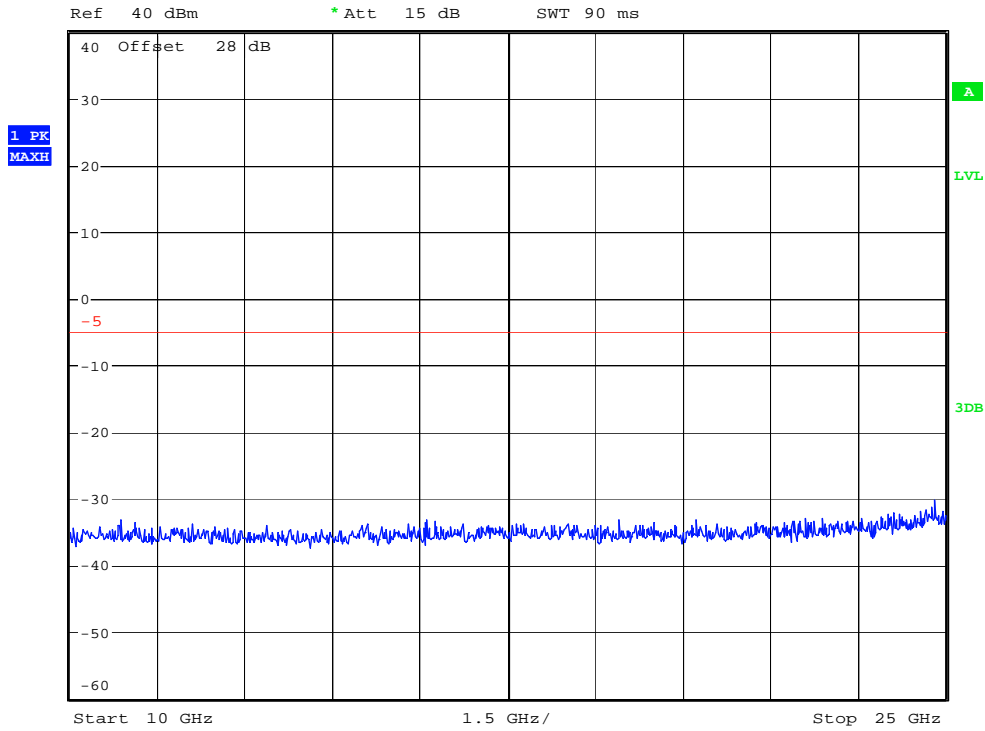


Date: 10.JUL.2012 13:42:15

Conducted Spurious Emissions 30MHz-10GHz (High Channel)



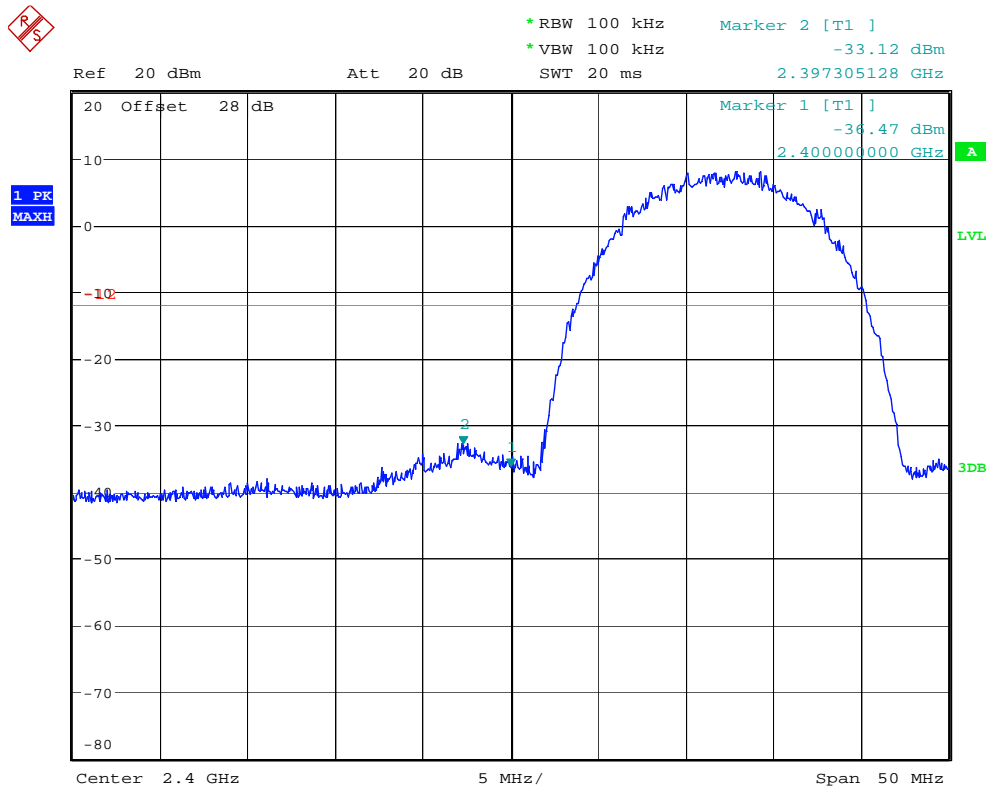
* RBW 1 MHz
* VBW 3 MHz
SWT 90 ms



Date: 10.JUL.2012 13:42:41

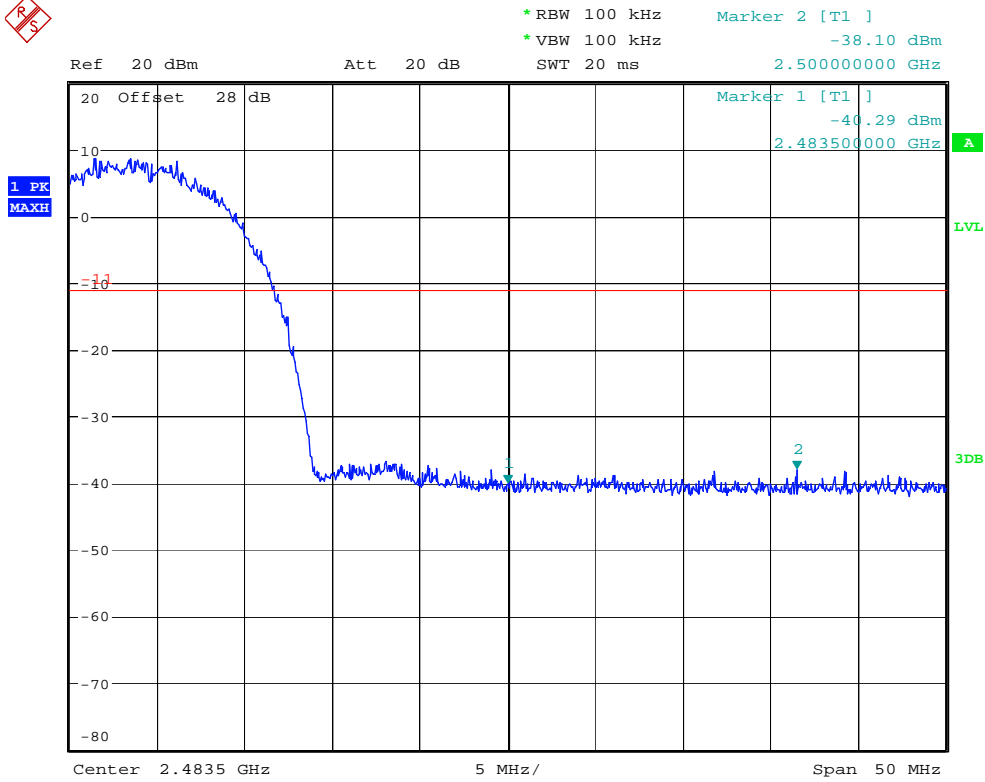
Conducted Spurious Emissions 10GHz-25GHz (High Channel)

802.11b @ 11Mbps Band edge



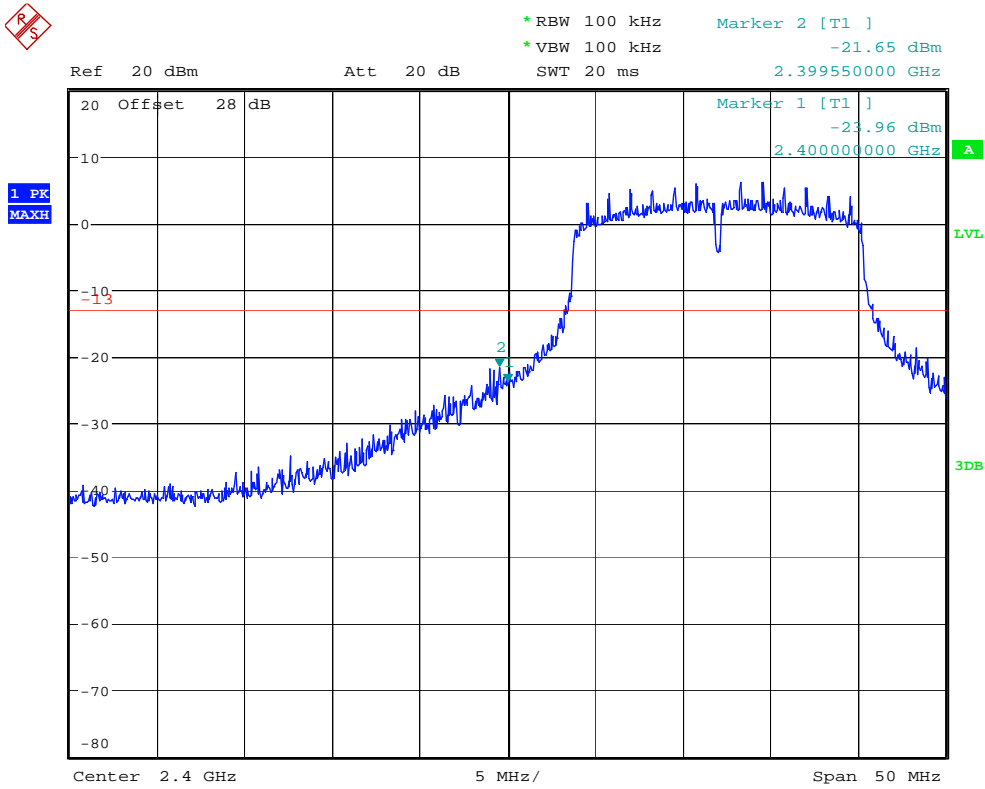
Date: 10.JUL.2012 13:48:35

Channel 1 – Lower Band Edge



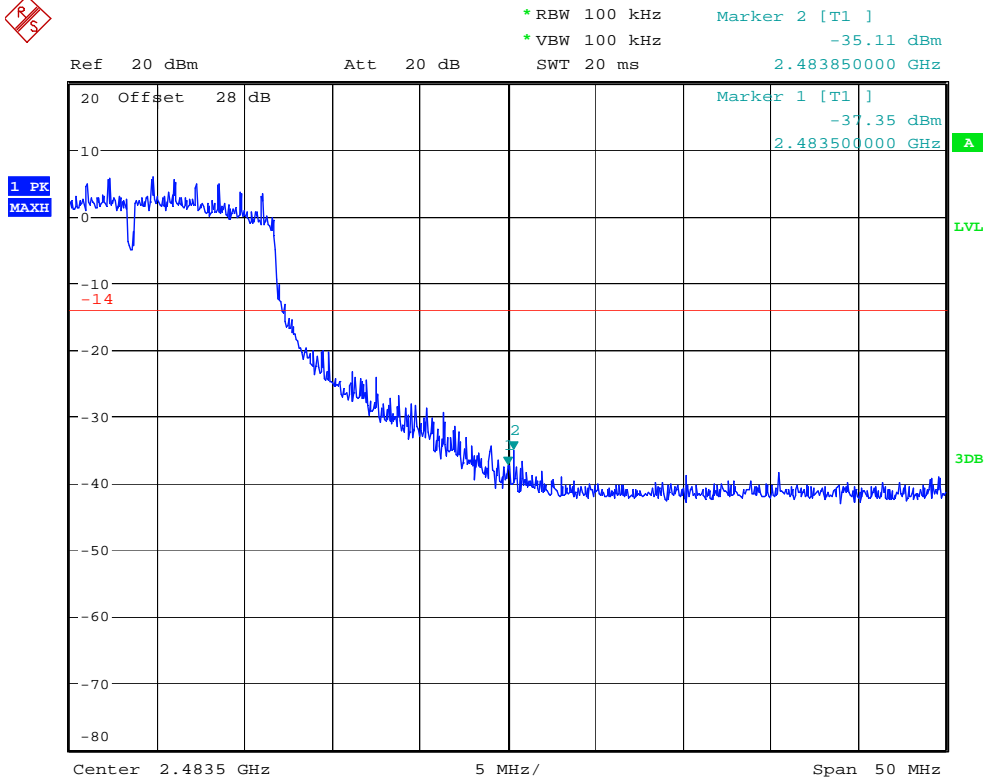
Date: 10.JUL.2012 13:51:58

Channel 11 – Upper Band Edge
802.11g @ 6Mbps Band Edge



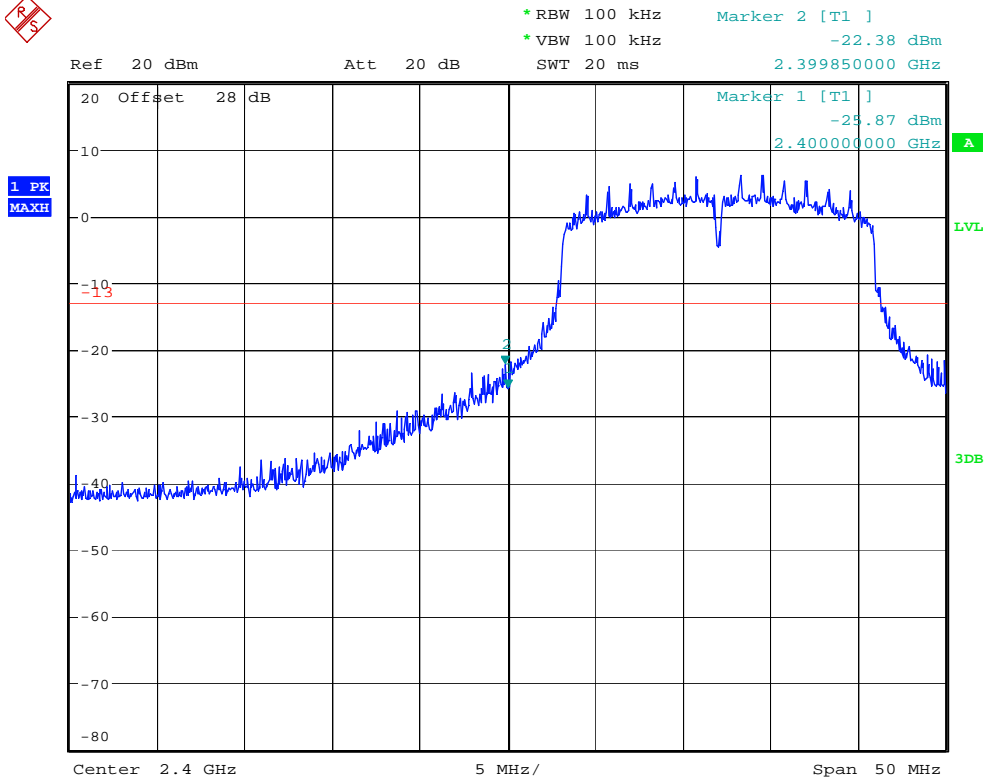
Date: 10.JUL.2012 13:54:36

Channel 1 – Lower Band Edge



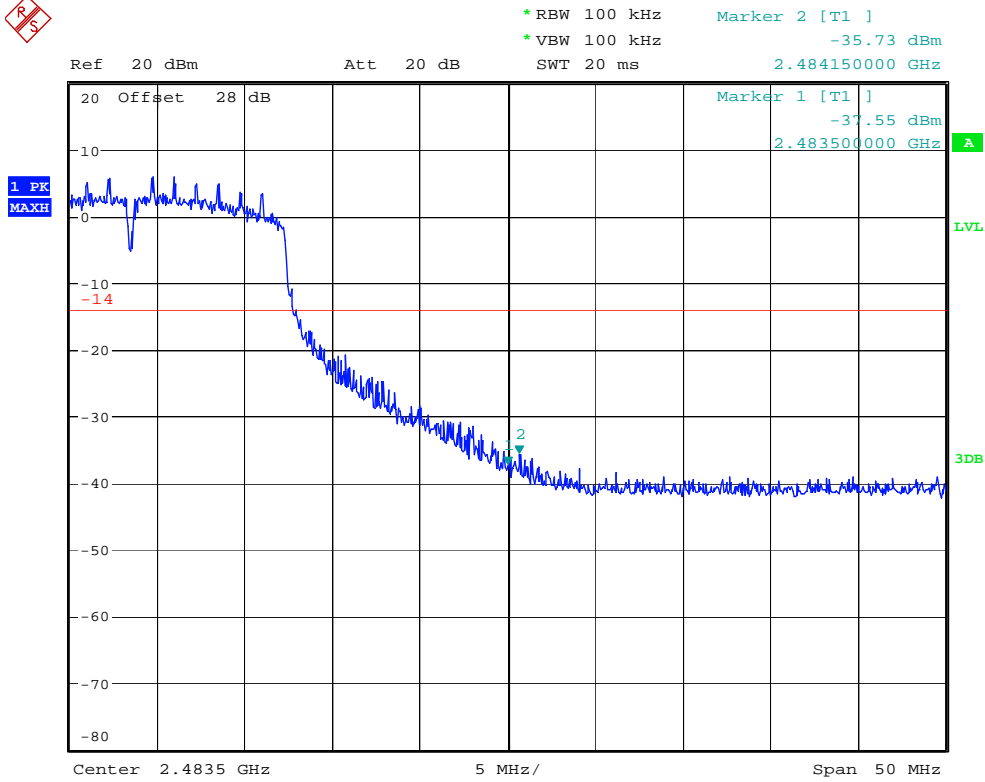
Date: 10.JUL.2012 13:57:32

Channel 11 – Upper Band Edge
802.11n 400ns GI @ 7.2Mbps Band Edge



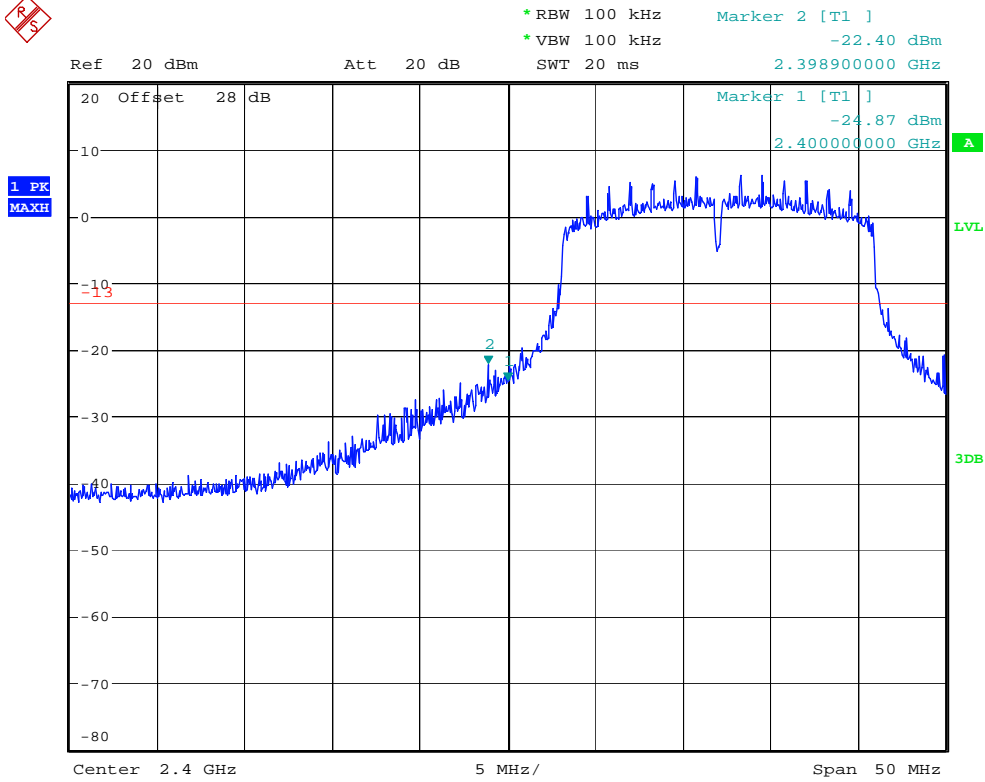
Date: 10.JUL.2012 13:59:12

Channel 1 – Lower Band Edge



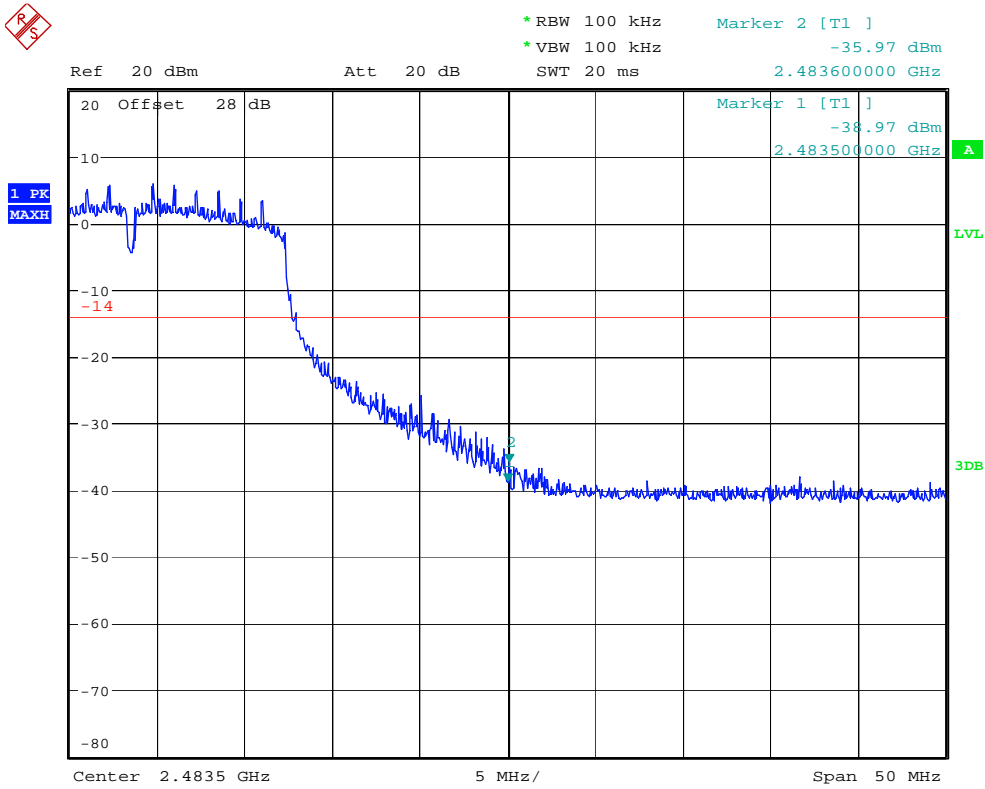
Date: 10.JUL.2012 14:01:08

Channel 11 – Upper Band Edge
802.11n 800ns GI @ 6.5Mbps Band Edge



Date: 10.JUL.2012 14:02:39

Channel 1 – Lower Band Edge



Date: 10.JUL.2012 14:06:10

Channel 11 – 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 .

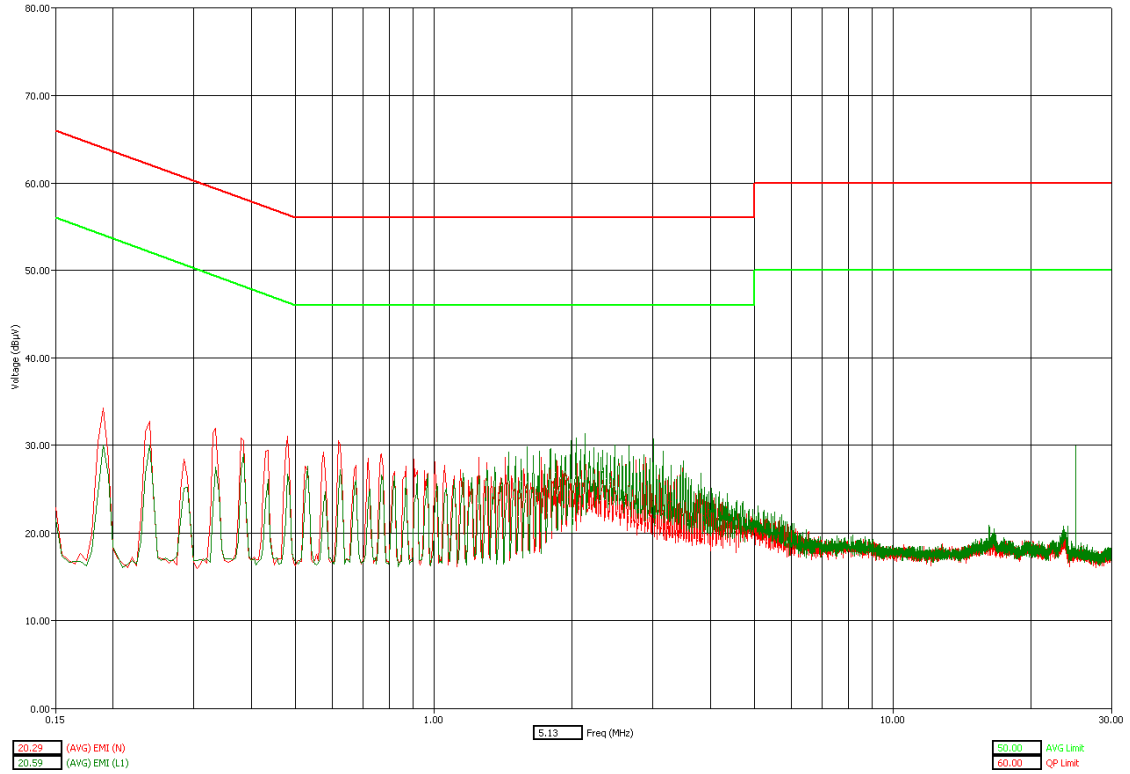
Detectors – Quasi Peak and Average Detector.

All modes of operation and data rates were investigated. The test results shown below represent the worst case condition.

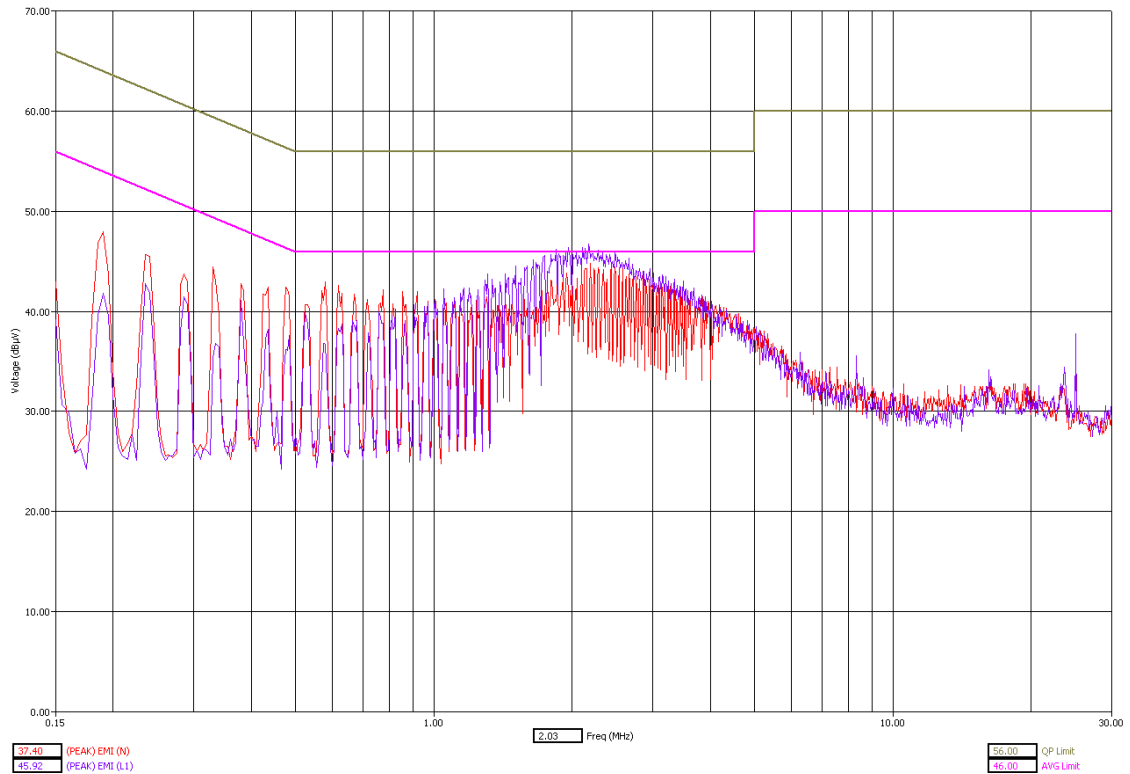
Measurement Results

See attached:

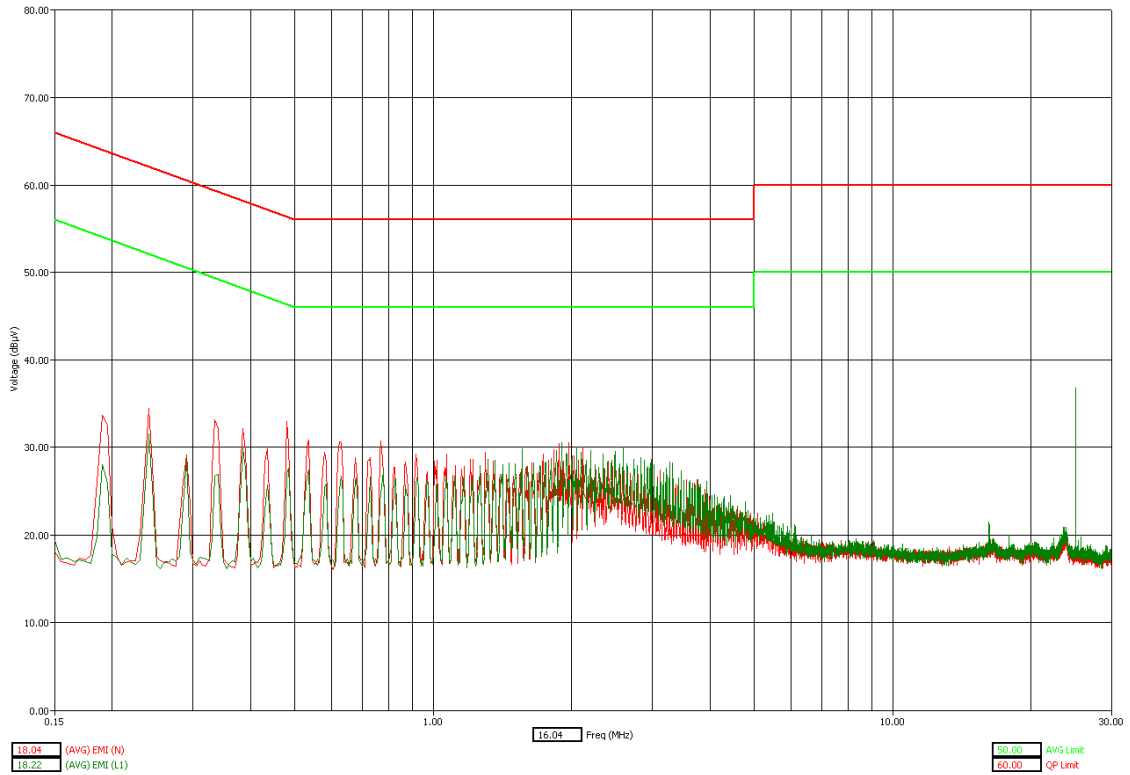
802.11b @ 11 Mbps



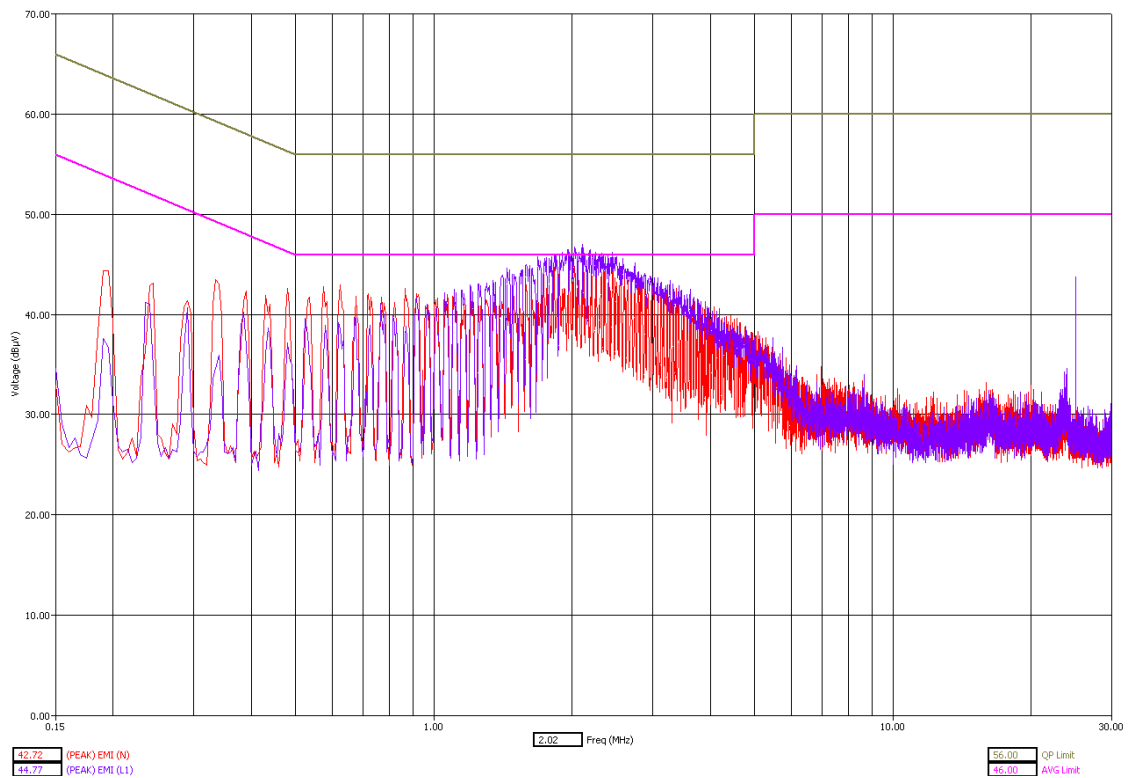
WLAN Channel 1 - Tx Mode – AVG Detector



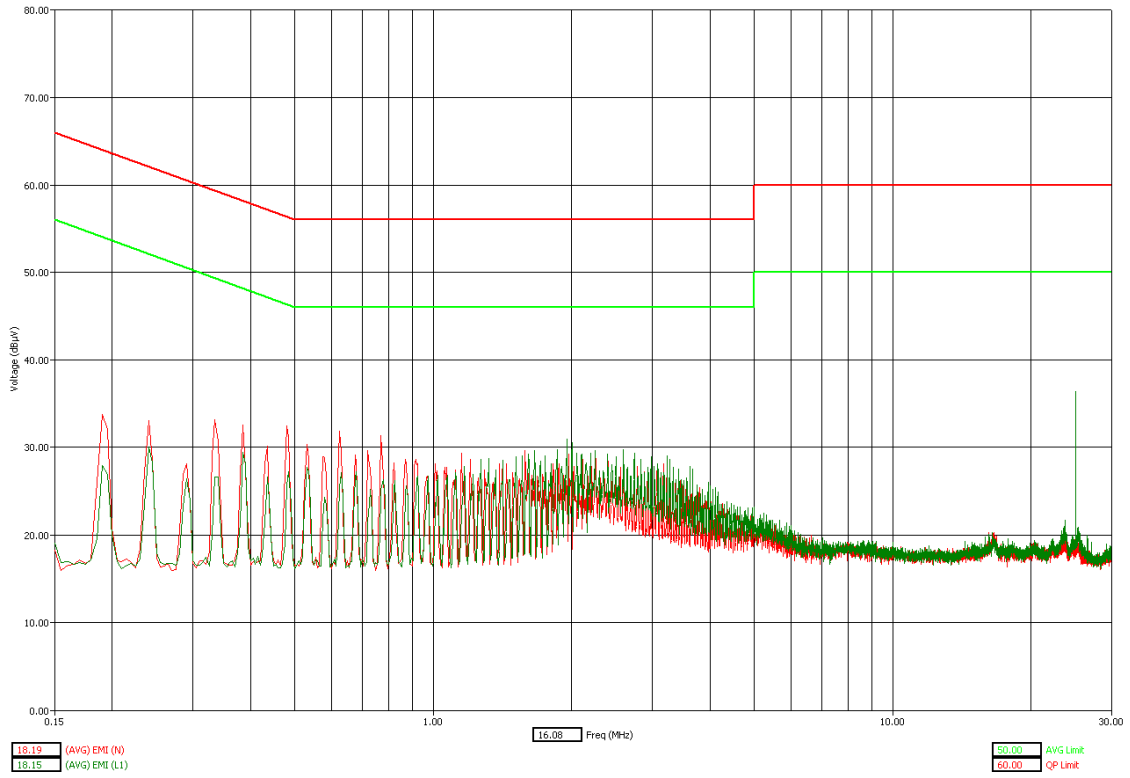
WLAN Channel 1 - Tx Mode – Peak Detector



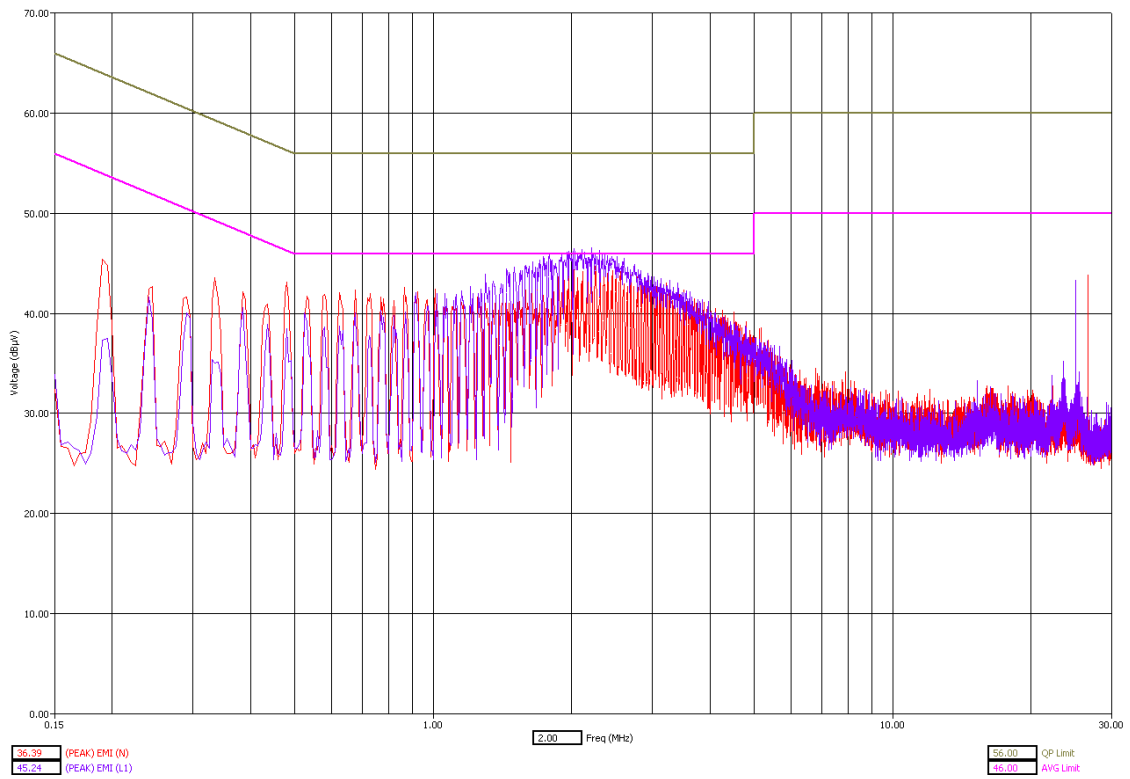
WLAN Channel 6 - Tx Mode - AVG Detector



WLAN Channel 6 - Tx Mode - Peak Detector

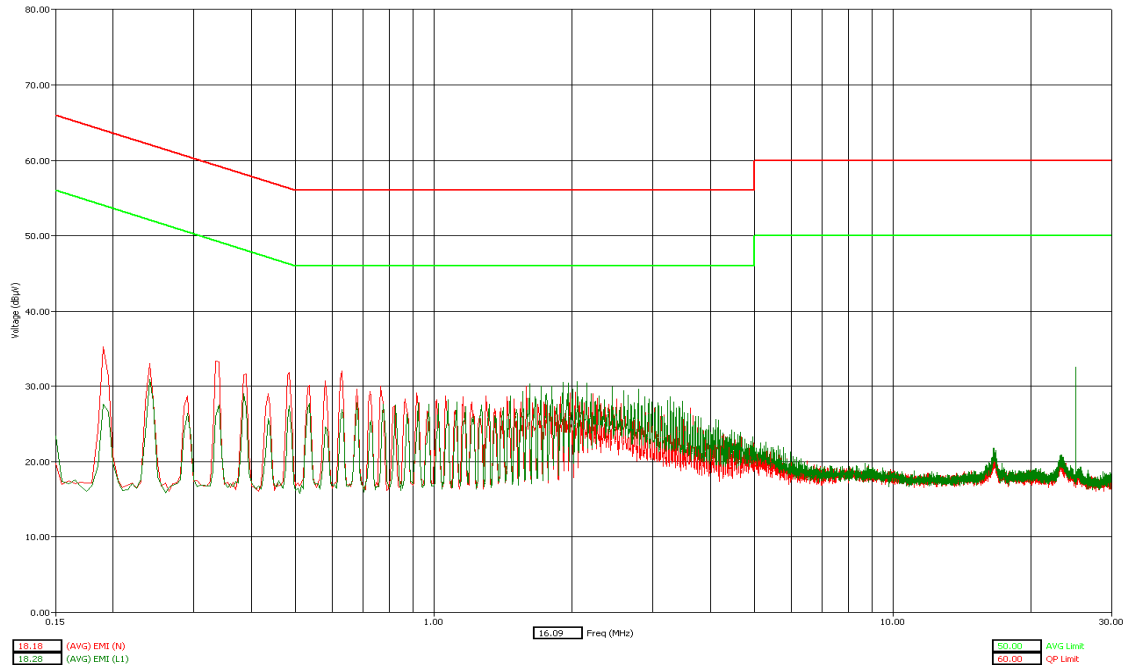


WLAN Channel 11 - Tx Mode - AVG Detector

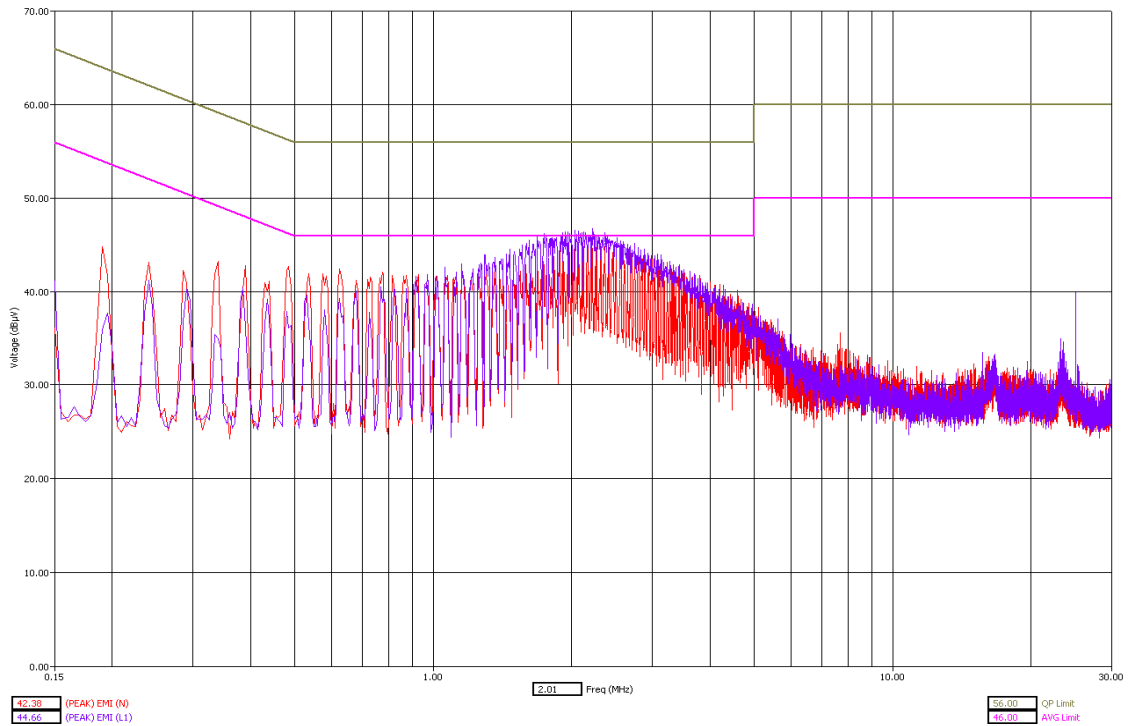


WLAN Channel 11 - Tx Mode - Peak Detector

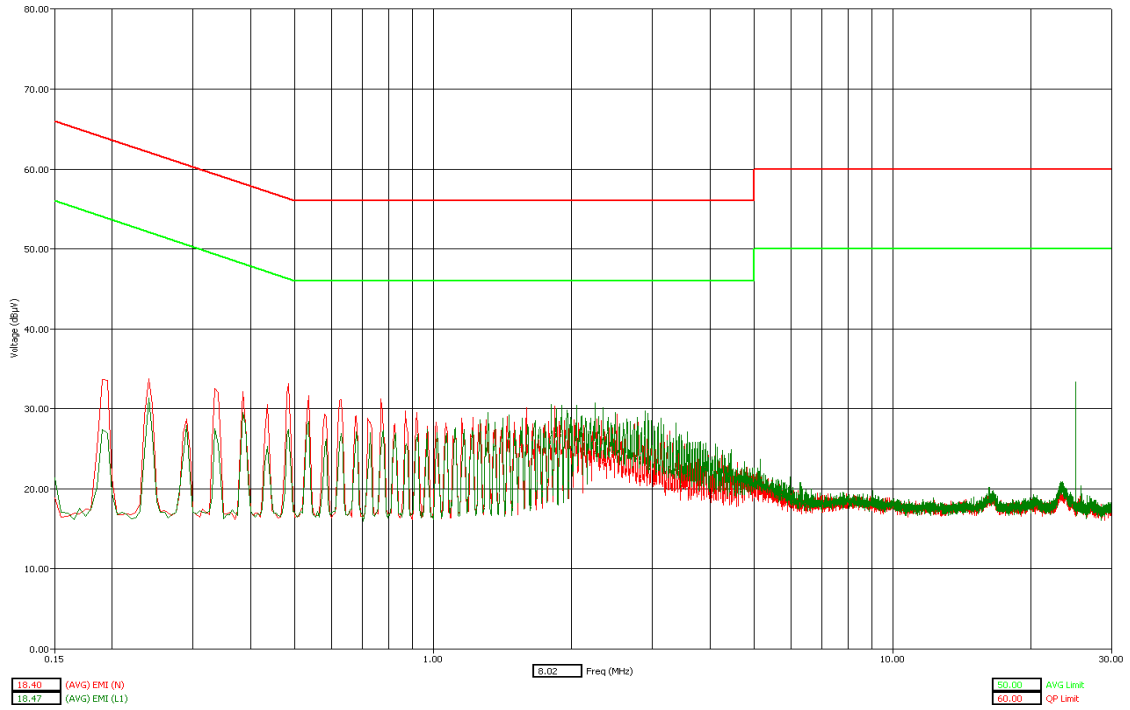
802.11g @ 6 Mbps



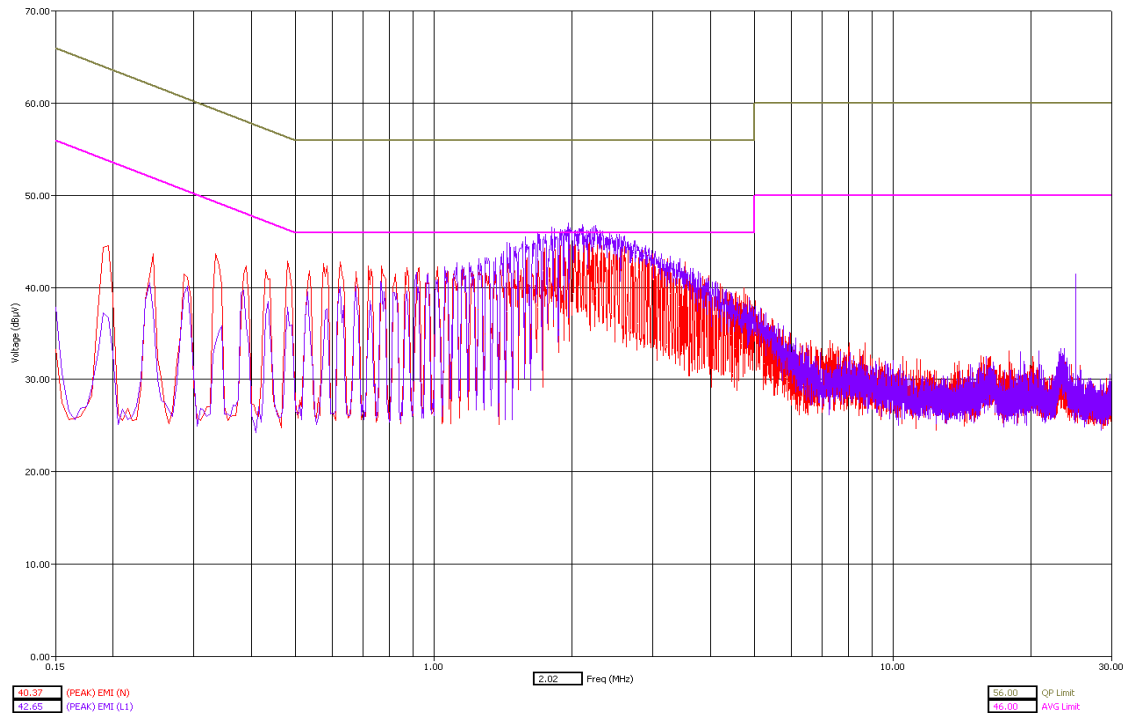
WLAN Channel 1 - Tx Mode – AVG Detector



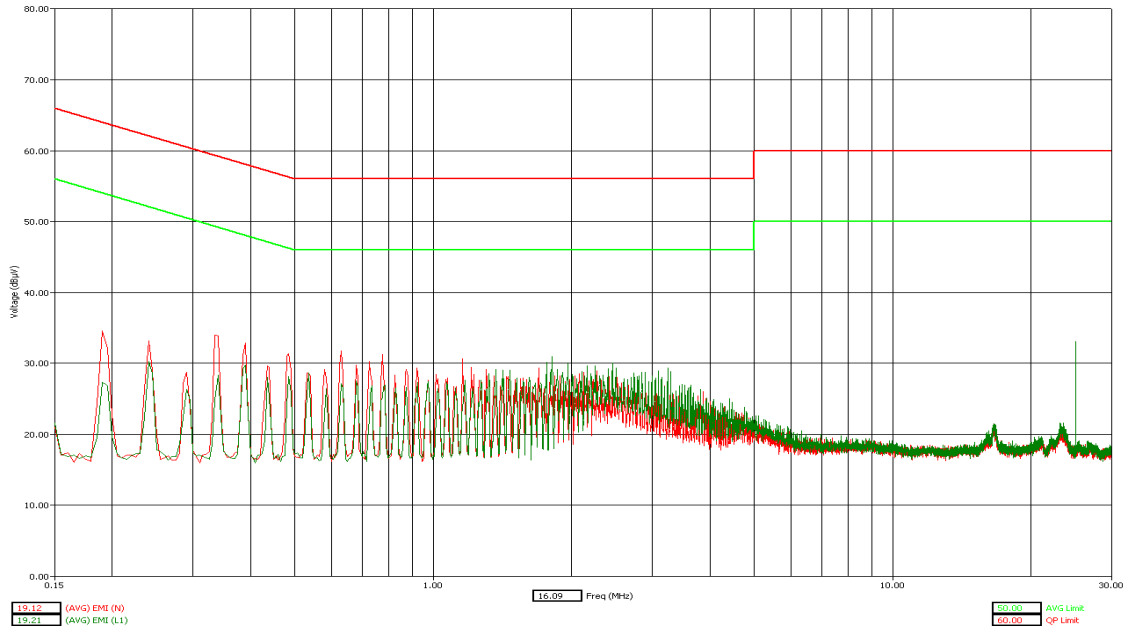
WLAN Channel 1 - Tx Mode – Peak Detector



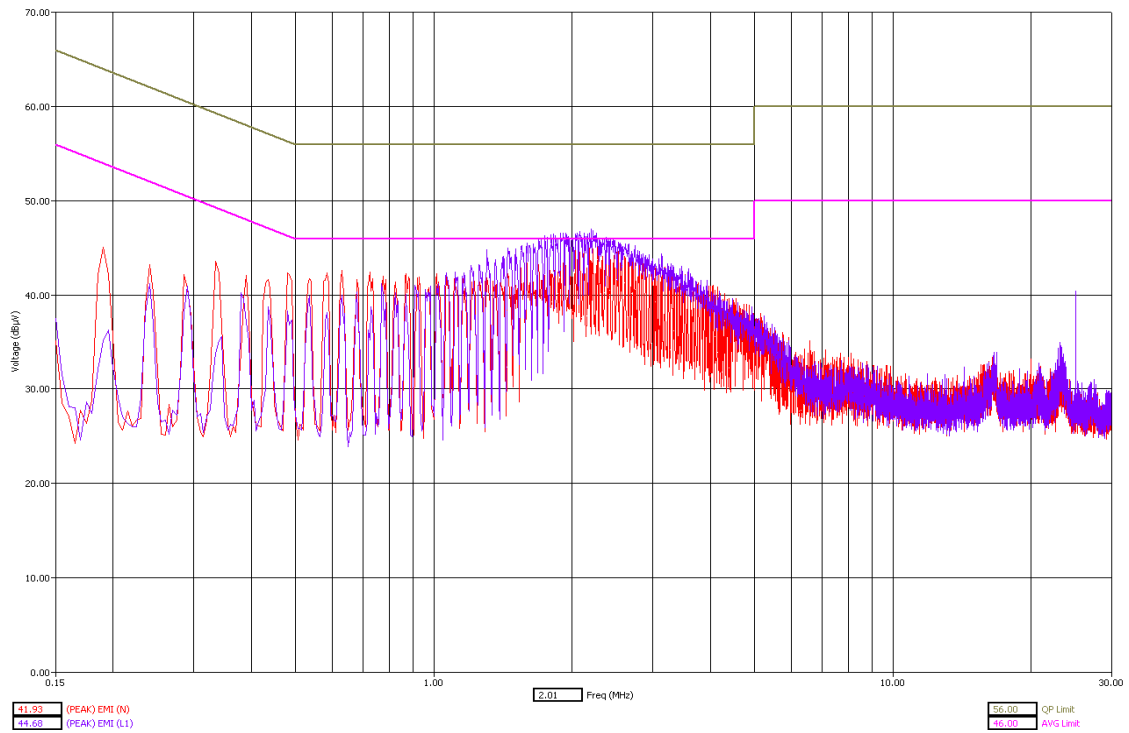
WLAN Channel 6 - Tx Mode - AVG Detector



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