



**MOTOROLA**

**PRODUCT SAFETY AND COMPLIANCE  
EMC LABORATORY**

**EMC TEST REPORT - Addendum**

**Test Report Number** -24402-1 WLAN@5.2 GHz

**Report Date** -2011-03-26

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: Lei Yang

Title: EMC Project Manager

Test: 2011-03-07 to 2011-03-26

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: 2011-03-26

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

FCC Registration Number: 177885

IC Registration Number: 109AW-1

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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 8473 2610  
FCC Registration Number: 177885  
IC Registration Number: 109AW-1

Tests Requested By: Motorola Mobility, Inc.  
600 North US Hwy 45  
Libertyville, IL 60048  
United States

Product Type: Cell phone with embedded WLAN

Signaling Capability: WCDMA 850 & 1900, GSM 850 & 1900,  
EDGE 850 & 1900, Bluetooth, WLAN a/b/g/n

FCC ID: IHDP56LS2

IMEI: 356381040017992

Project number: 24402-1

Testing Complete Date: 2011-03-26

## **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 E – Unlicensed National Information Infrastructure Devices

Applicable Standards: ANSI 63.4 2003, RSS-210 Issue 8, DA 02-2138

**Summary of Testing**

Test	Test Name	Pass/Fail
1	26 dB Bandwidth	Pass
2	Peak Power	Pass
3	Peak Power Spectral Density	Pass
4	Peak Excursion ration	Pass
5	Frequency Stability	Pass
6	AC Line Conducted Emissions	Pass

Test	Test Name	Results
1	26 dB Bandwidth	Pass
2	Peak Power	Pass
3	Peak Power Spectral Density	Pass
4	Peak Excursion ration	Pass
5	Frequency Stability	Pass
6	AC Line Conducted Emissions	Pass

**General and Special Conditions**

The Cellular Phone hereinafter referred to as the Equipment under Test or EUT was tested using a fully charged 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	04/04/10
Rohde Schwarz	Receiver	ESCI	100650	04/09/10
Agilent	Attenuator	8491A	MY39263202	NCR
Rohde Schwarz	LISN	ENV216	100055	12/20/2010

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. All equipment is on a one-year calibration cycle.

**Description of WLAN Transmitter**

The EUT offers WLAN, operating in the 2.4 GHz and 5 GHz bands, as a feature. This report covers operation in the 5 GHz Sub band 1 only. 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 15.407(a) (1); RSS-210 Section A8.4.**

Criterion: The conducted output power limit of 50 mW or 4 dBm + 10 log B, where B is the 26-dB emission bandwidth in MHz is based on the use of antennas with directional gains that do not exceed 6 dB<sub>i</sub>. If transmitting antennas of directional gain greater than 6 dB<sub>i</sub> are used, the conducted output power and the peak power spectral density from the intentional radiator shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dB<sub>i</sub>.

The antenna employed by this transmitter is intended to be omni-directional, and thus will not exhibit directional gain in excess of 6 dB<sub>i</sub>. The conducted power is less than the limits set forth (see elsewhere in this report for details).

## **Measurement Procedures and Data**

### **26 dB Bandwidth**

#### **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.

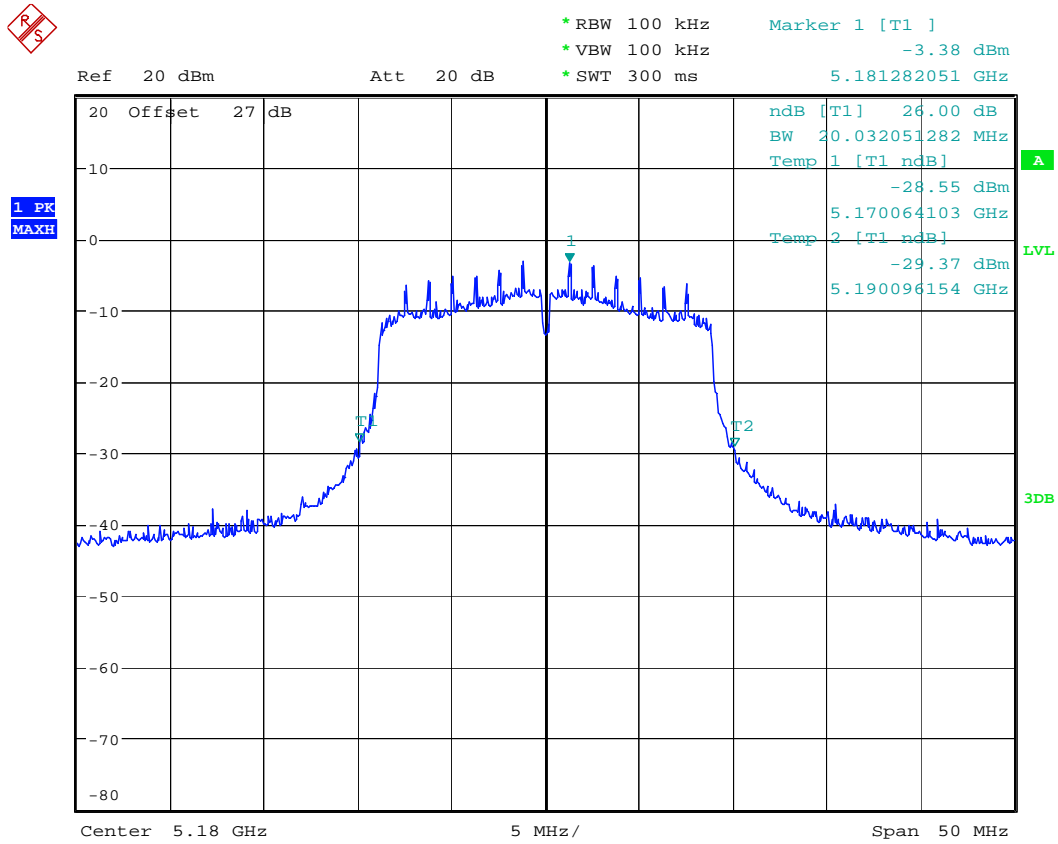
1. RBW  $\geq$  100 kHz
2. VBW  $\geq$  RBW
3. Sweep = auto
4. Detector function = peak
5. Trace = max hold

The trace was allowed to stabilize. The marker-to-peak function was used to set the marker to the peak of the emission. The marker-delta function was used to measure 26 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 26 dB bandwidth of the emission.

#### **Measurement Results**

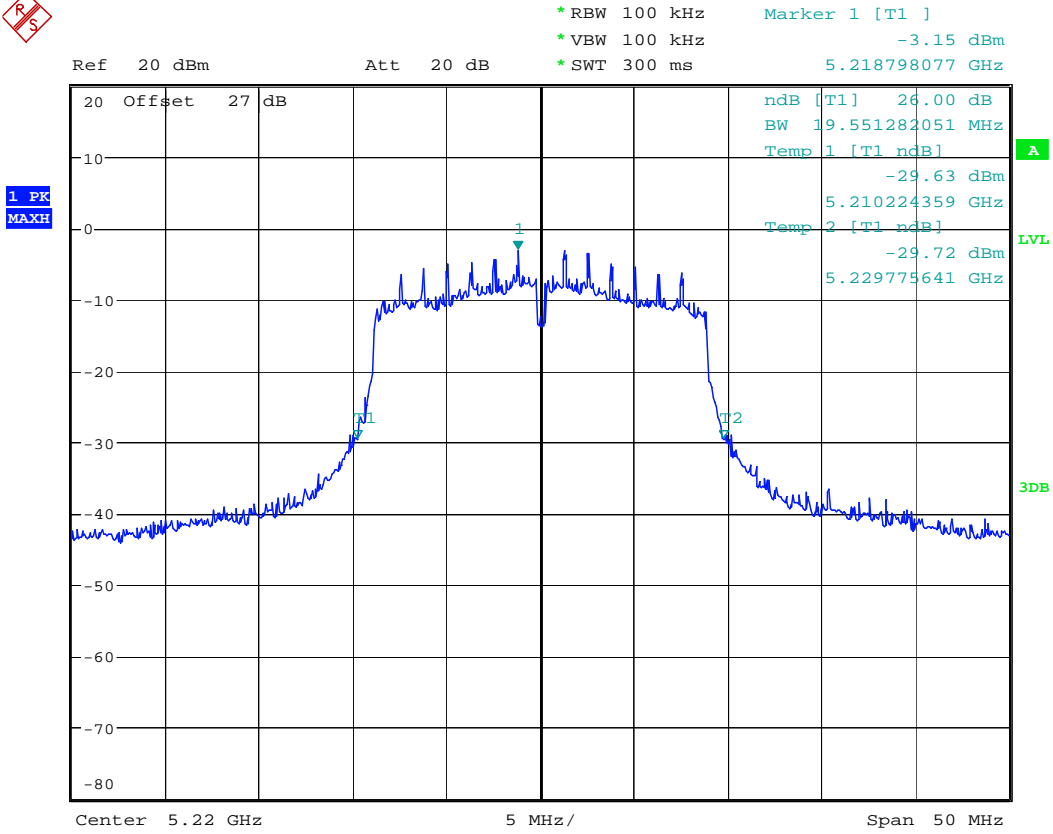
See attached

### 802.11 n Mode @ 6.5 Mbps



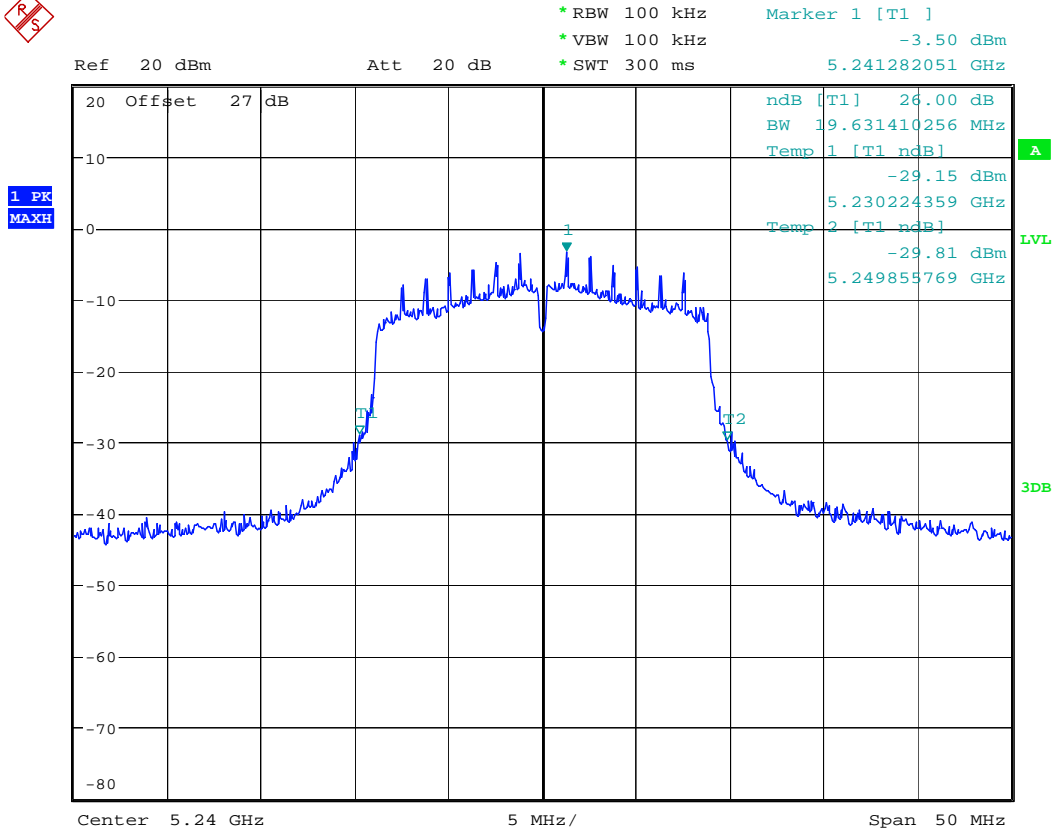
Date: 1.MAR.2011 07:09:03

### 26 dB Bandwidth Channel 36 @ 6.5 Mbps



Date: 1.MAR.2011 07:08:13

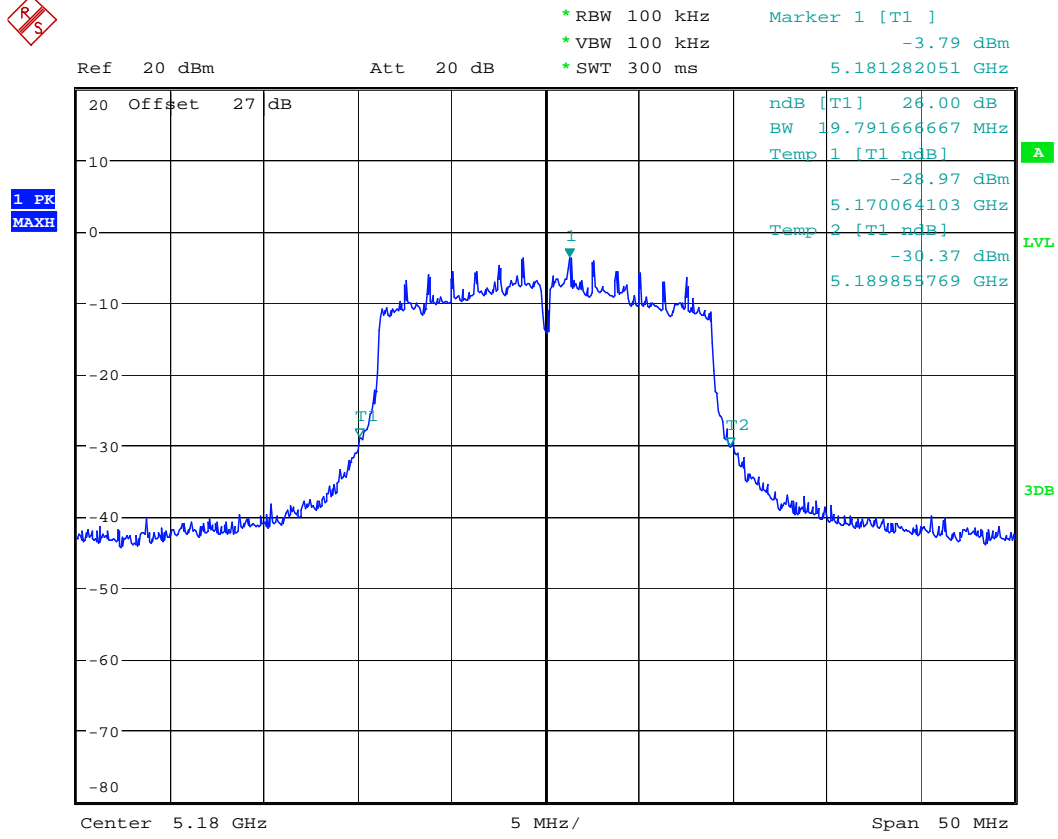
**26 dB Bandwidth Channel 44 @ 6.5 Mbps**



Date: 1.MAR.2011 07:07:35

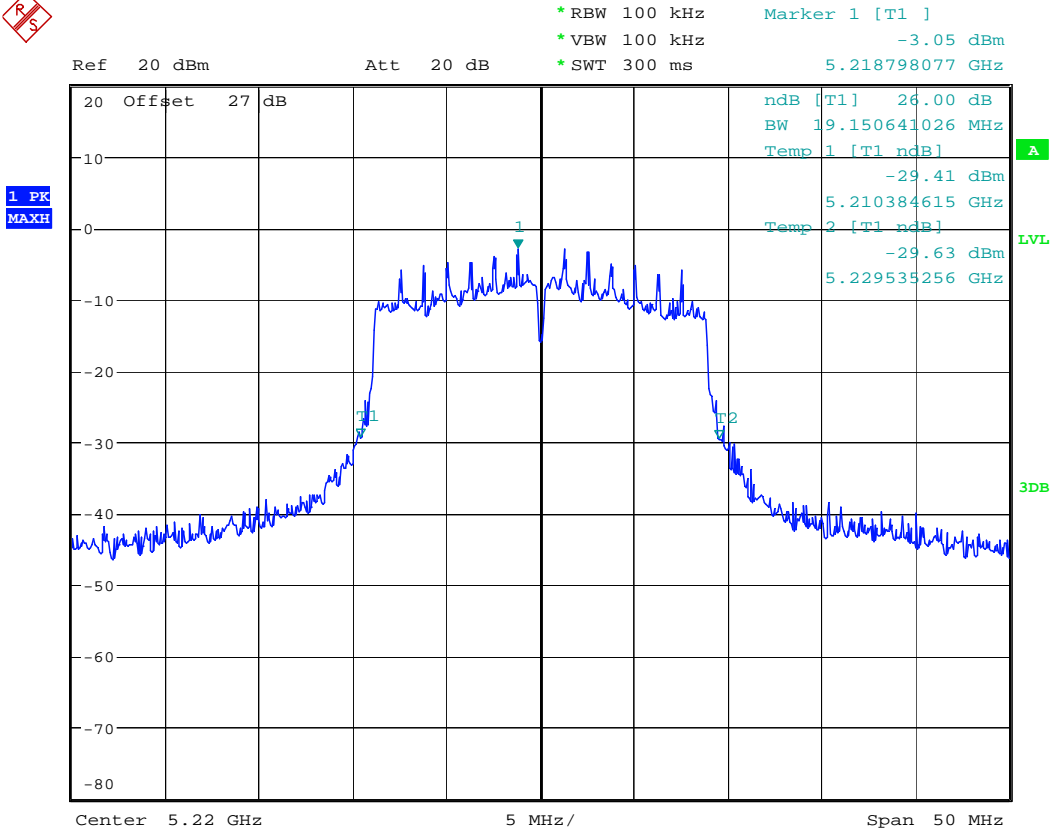
### 26 dB Bandwidth Channel 48 @ 6.5 Mbps

### 802.11 n Mode @ 43.3 Mbps



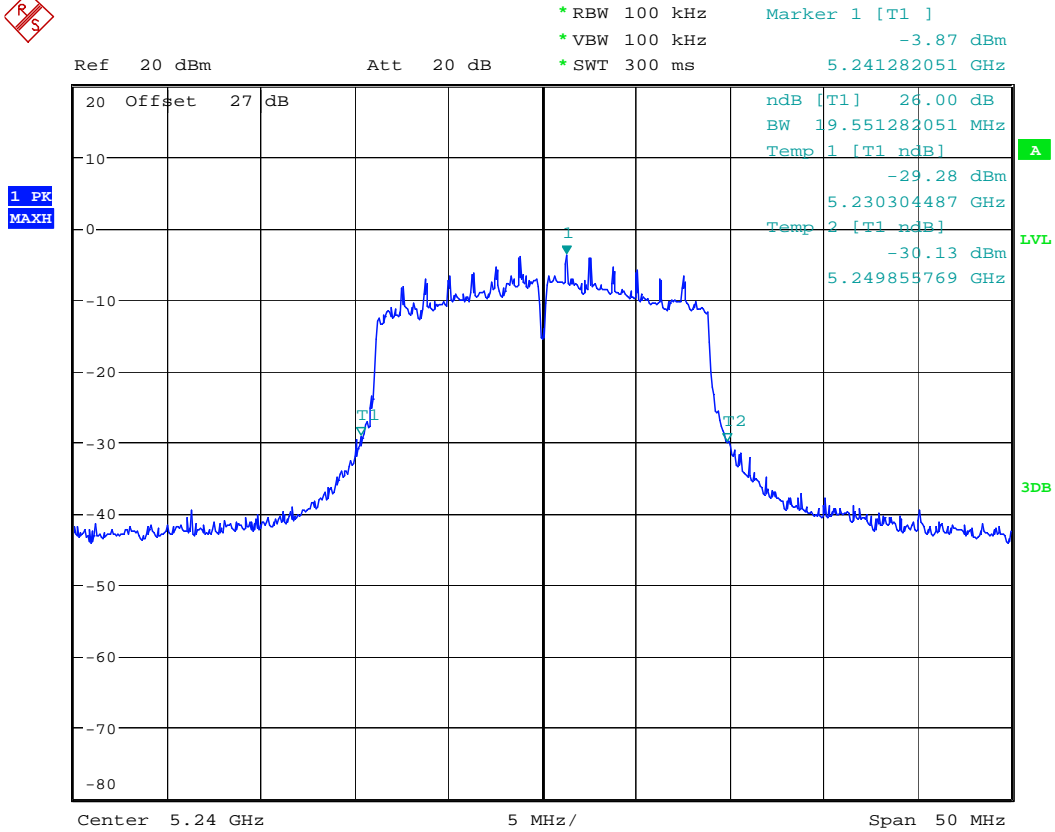
Date: 1.MAR.2011 07:03:53

### 26 dB Bandwidth Channel 36 @ 43.3 Mbps



Date: 1.MAR.2011 07:03:11

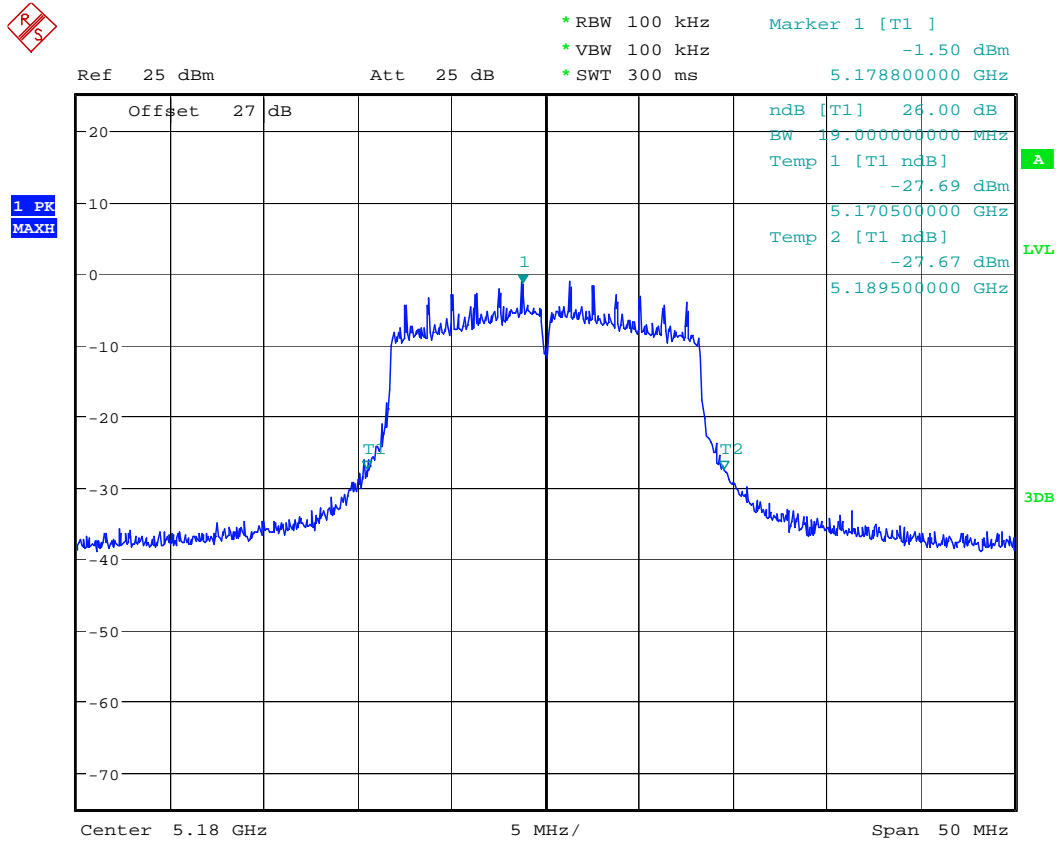
**26 dB Bandwidth Channel 44 @ 43.3 Mbps**



Date: 1.MAR.2011 07:02:40

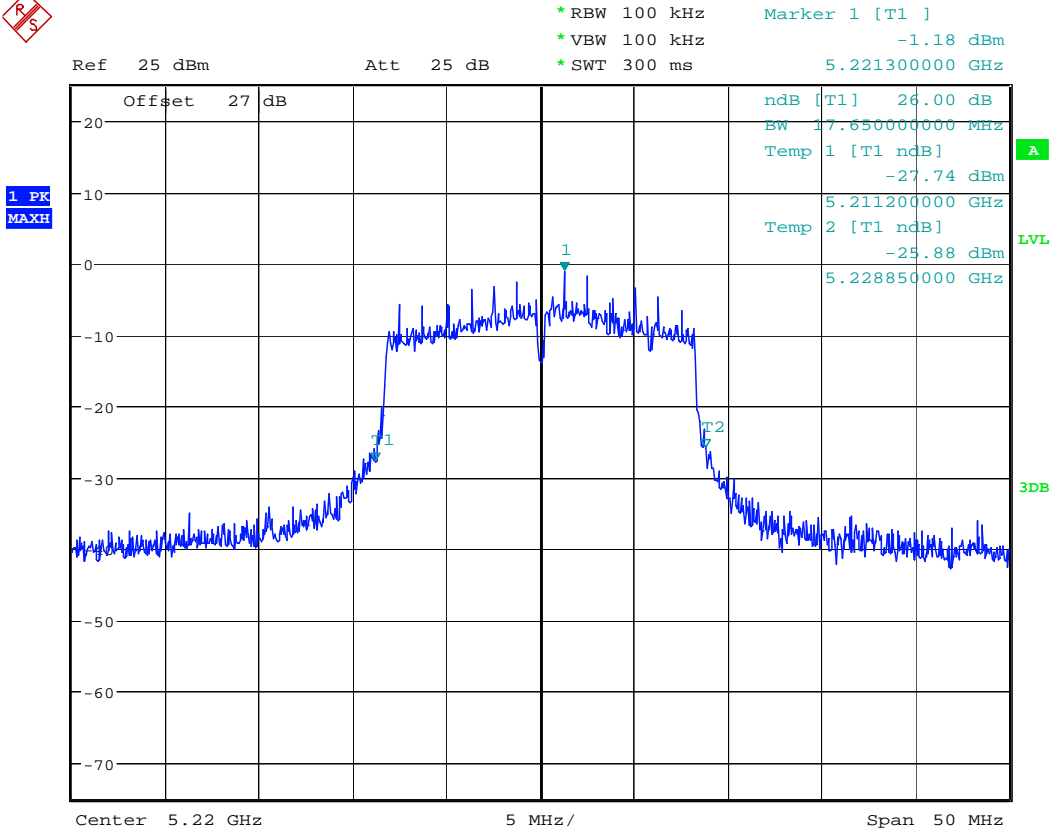
**26 dB Bandwidth Channel 48 @ 43.3 Mbps**

### 802.11 a Mode @ 12 Mbps



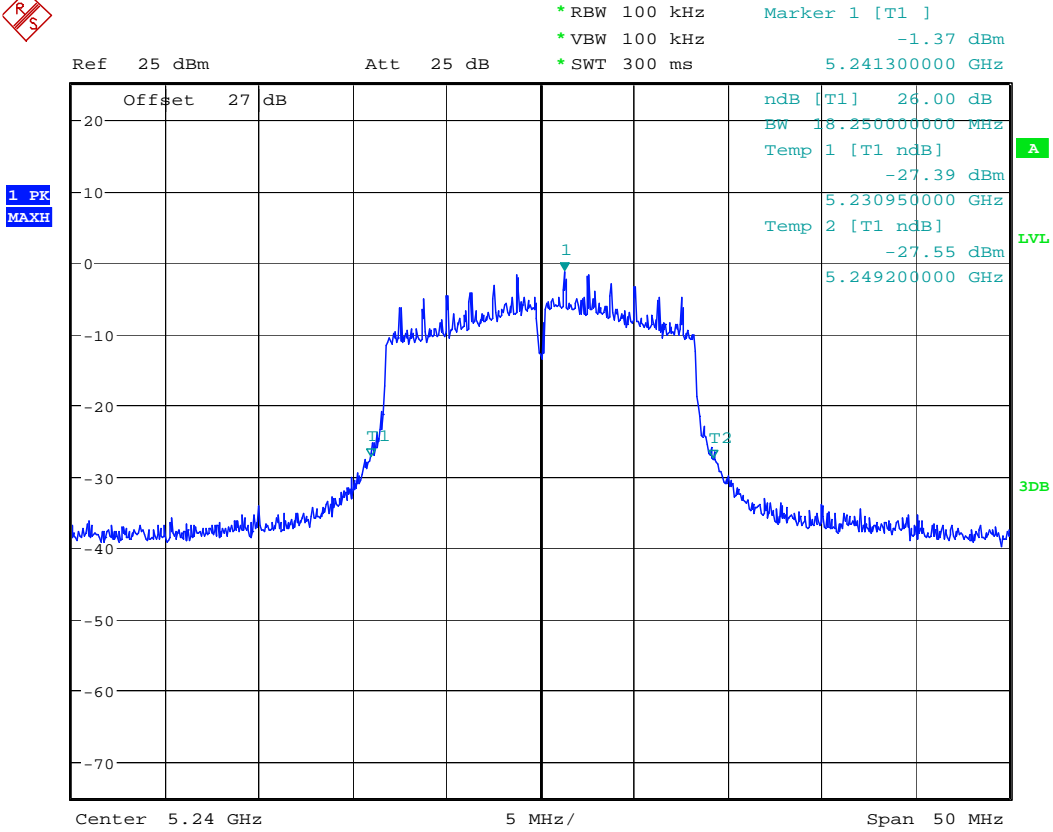
Date: 28.FEB.2011 07:13:46

### 26 dB Bandwidth Channel 36 @ 12 Mbps



Date: 28.FEB.2011 07:14:21

### 26 dB Bandwidth Channel 44 @ 12 Mbps



Date: 28.FEB.2011 07:15:14

### 26 dB Bandwidth Channel 48 @ 12 Mbps

## **PEAK OUTPUT POWER**

### **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 10dB 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. Then using the Method #1 of Public Notice DA 02-2138 for the testing

### **Measurement Results**

See Attached

Initial average power measurements in the 5 GHz band

**Average power (dBm) for 802.11n in 5 GHz**

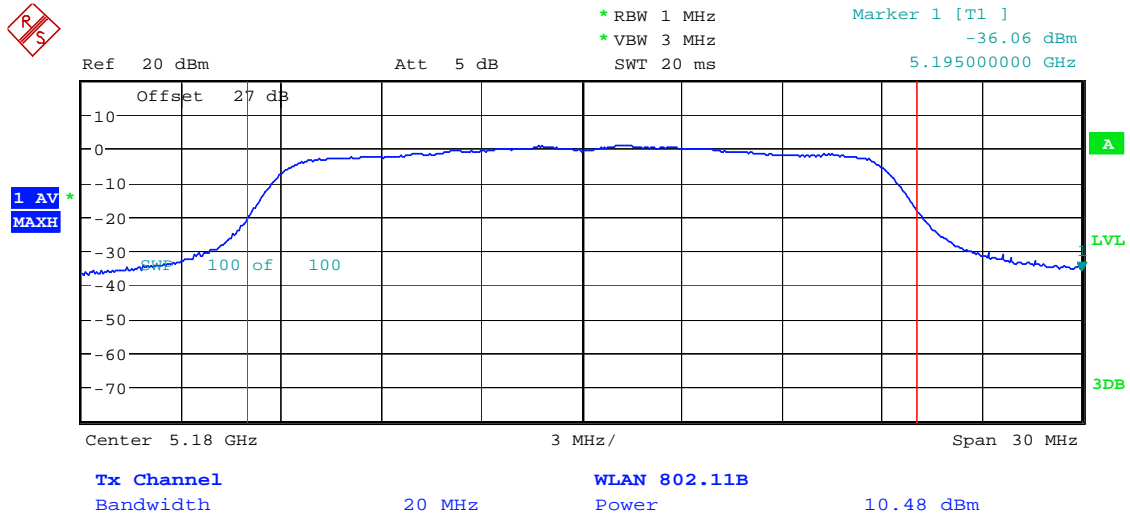
Freq	CH	20 MHz BW, 400 ns GI								20 MHz BW, 800 ns GI							
		7.2 Mbps	43.3 Mbps	21.7 Mbps	28.9 Mbps	43.3 Mbps	57.8 Mbps	65 Mbps	72.2 Mbps	6.5 Mbps	13 Mbps	19.5 Mbps	26 Mbps	39 Mbps	52 Mbps	58.5 Mbps	65 Mbps
5180	36	9.22	9.47	9.48	9.79	10.58	10.6	10.66	8.36	9.95	9.06	9.2	9.54	9.6	9.68	9.65	7.08
5200	40	9.25	9.38	9.55	9.83	10.75	10.77	10.34	8.52	9.04	9.14	9.3	9.5	9.49	9.53	9.61	7.18
5220	44	9.23	9.59	9.68	9.82	10.96	10.8	10.95	8.45	9.14	9.07	9.19	9.55	9.54	9.64	9.66	7.09
5240	48	9.13	9.39	9.57	9.72	10.9	10.95	10.94	8.41	9.05	9.2	9.26	9.56	9.57	9.6	9.63	7.3

**Average power (dBm) for 802.11a in 5 GHz**

Band	Freq	CH	20 MHz BW							
			6 Mbps	9 Mbps	12 Mbps	18 Mbps	24 Mbps	36 Mbps	48 Mbps	54 Mbps
UNII Subband 1 5180 to 5240	5180	36	10.96	10.93	11.14	11.14	11.13	11.03	11.12	10.73
	5200	40	10.87	10.99	10.93	10.71	11.06	11.05	11.04	10.9
	5220	44	10.9	11.07	11.06	10.74	11.13	11.13	11.03	10.98
	5240	48	10.88	11.04	10.85	10.64	10.89	11.06	10.85	10.91

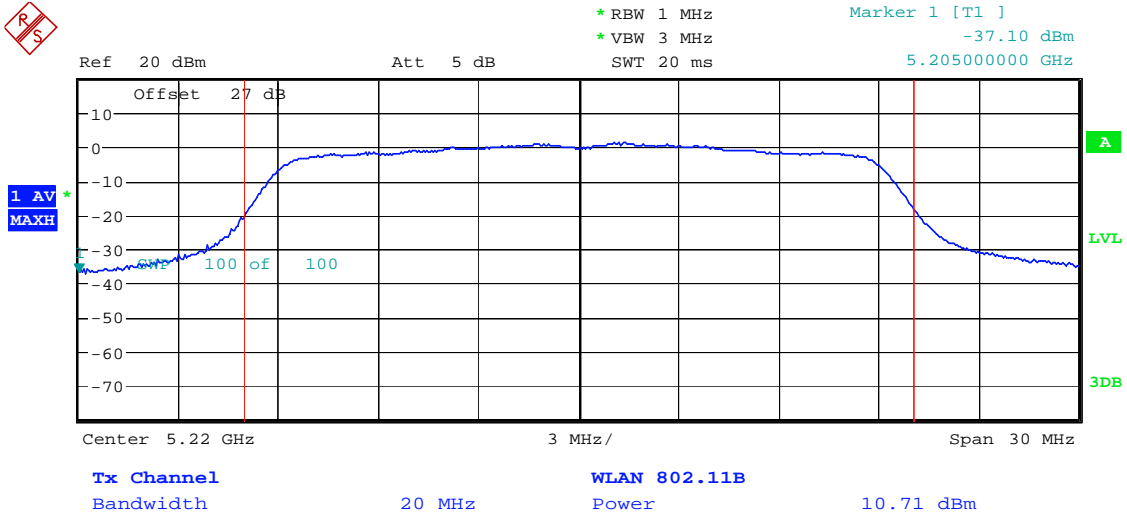
Based on these initial measurements, it was determined that testing were performed in the 43.3 Mbps data rate for the 802.11n 400ns GI mode and 6.5 Mbps data rate for 802.11n 800ns GI mode and 12 Mbps for the 802.11 a mode.

### 802.11 n @ 43.3 Mbps



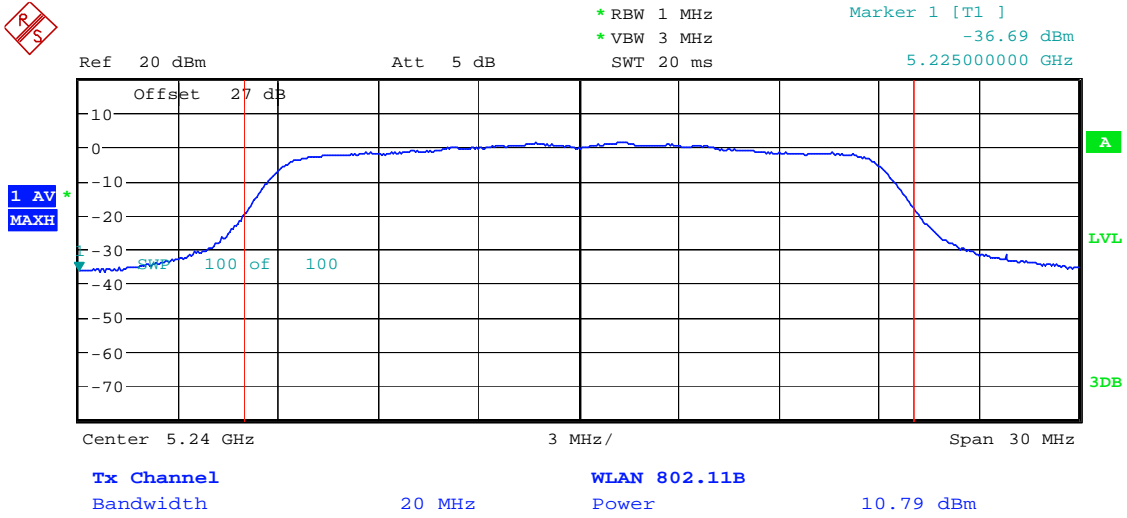
Date: 4.JAN.14502 06:31:19

### Max. Power Channel 36 @ 43.3 Mbps



Date: 4.JAN.14502 06:33:58

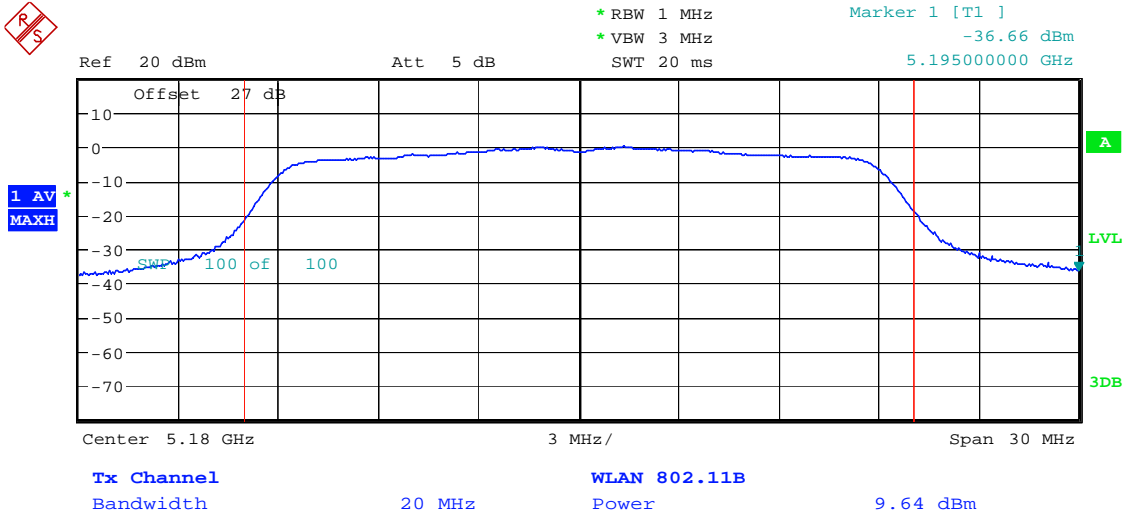
**Max. Power Channel 44 @ 43.3 Mbps**



Date: 4.JAN.14502 06:37:45

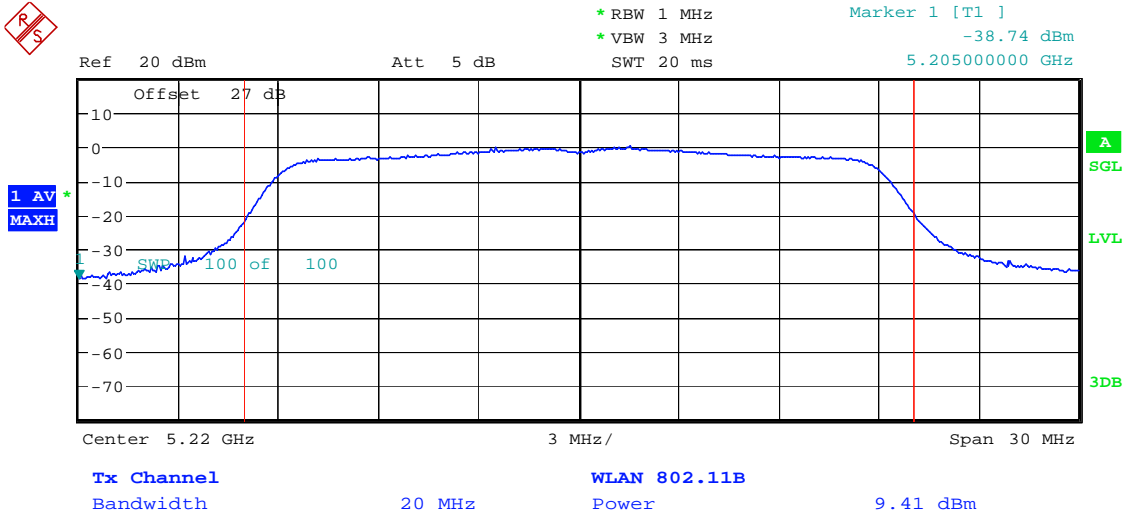
**Max. Power Channel 48 @ 43.3 Mbps**

**802.11 n 800ns GI band 1 @ 6.5 Mbps**



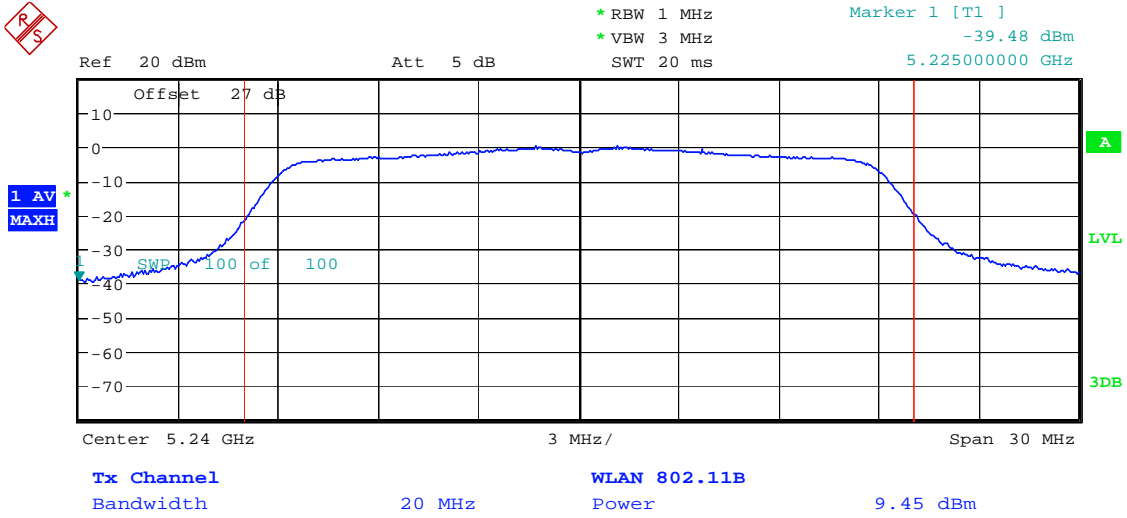
Date: 4.JAN.14502 06:40:43

**Max. Power Channel 36 @ 6.5 Mbps**



Date: 4.JAN.14502 06:41:33

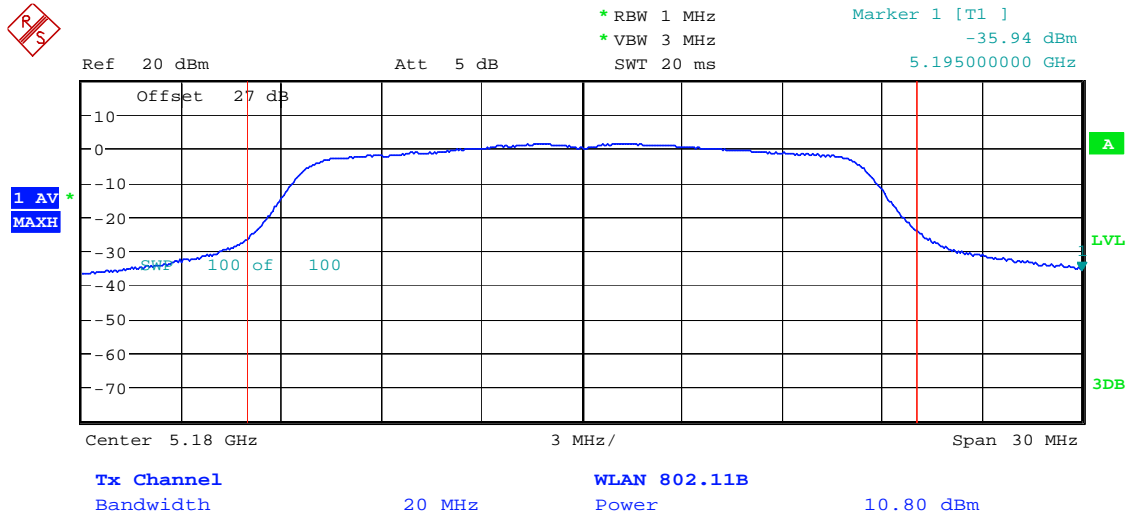
**Max. Power Channel 44 @ 6.5 Mbps**



Date: 4.JAN.14502 06:42:24

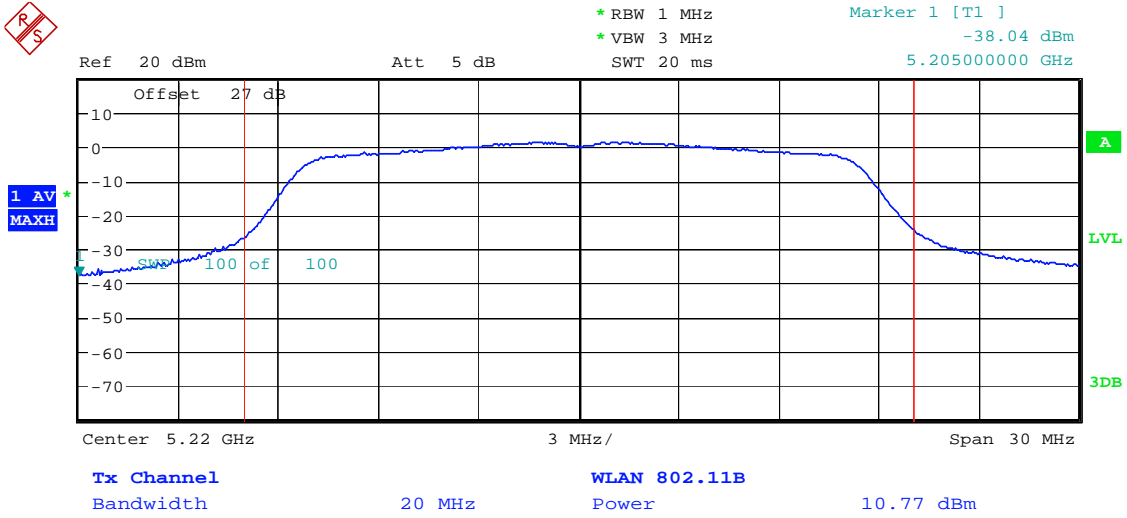
**Max. Power Channel 48 @ 6.5 Mbps**

**802.11 a @ 12 Mbps**



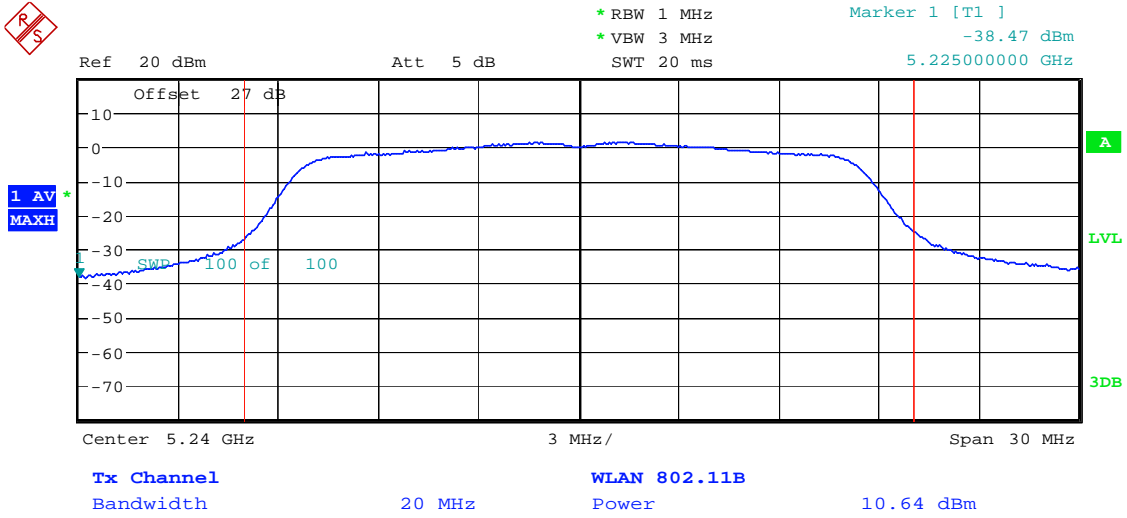
Date: 4.JAN.14502 06:28:02

**Max. Power Channel 36 @ 12 Mbps**



Date: 4.JAN.14502 06:19:57

**Max. Power Channel 44 @ 12 Mbps**



Date: 4.JAN.14502 06:29:04

**Max. Power Channel 48 @ 12 Mbps**

## Peak Power Spectral Density

### 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. Method #1 of Public Notice DA 02-2138 for the testing

The spectrum analyzer used the following settings:

1. Span = 25 MHz
2. VBW = 3 MHz
3. RBW= 1 MHz
4. Sweep = auto
5. Detector function = Peak Detector

The trace was allowed to stabilize.

### Measurement Results

5180 MHz	5220 MHz	5240 MHz
1.82	1.91	1.27

**802.11 n @ 6.5 Mbps**

5180 MHz	5220 MHz	5240 MHz
0.94	1.29	1.05

**802.11 n @ 43.3 Mbps**

5180 MHz	5220 MHz	5240 MHz
3.98	3.9	3.64

**802.11 a @ 12 Mbps**

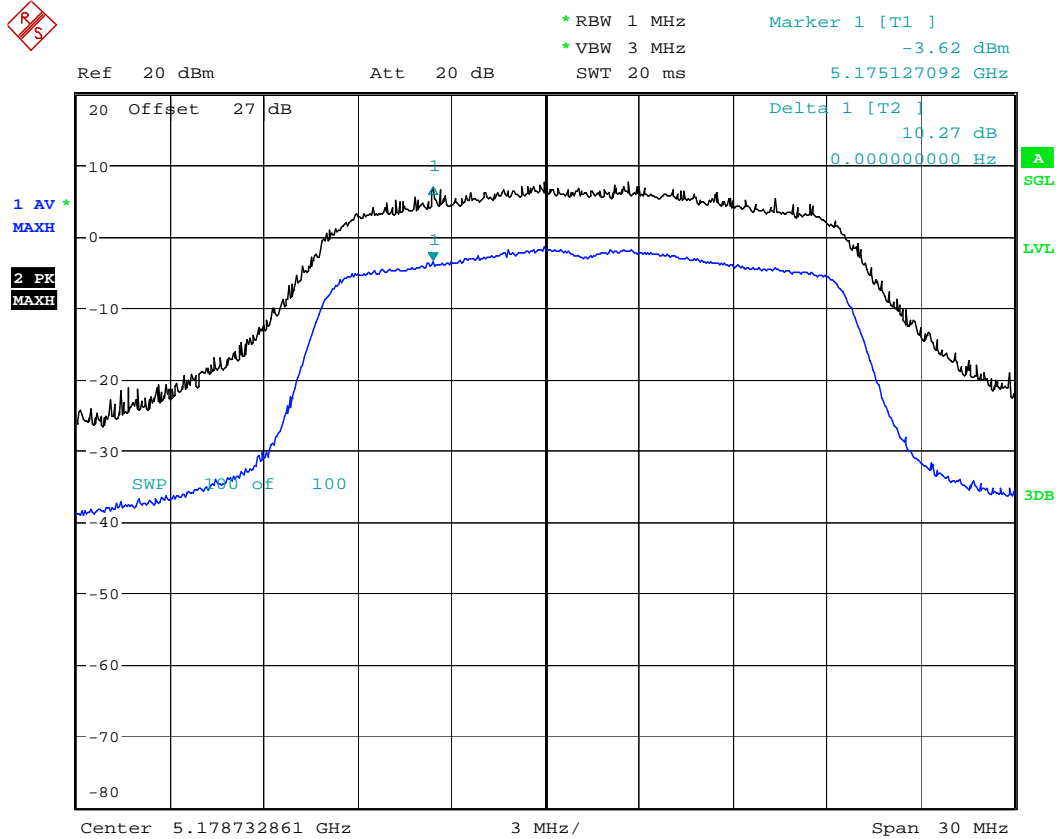
### Peak Excursion Ratio

### 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.

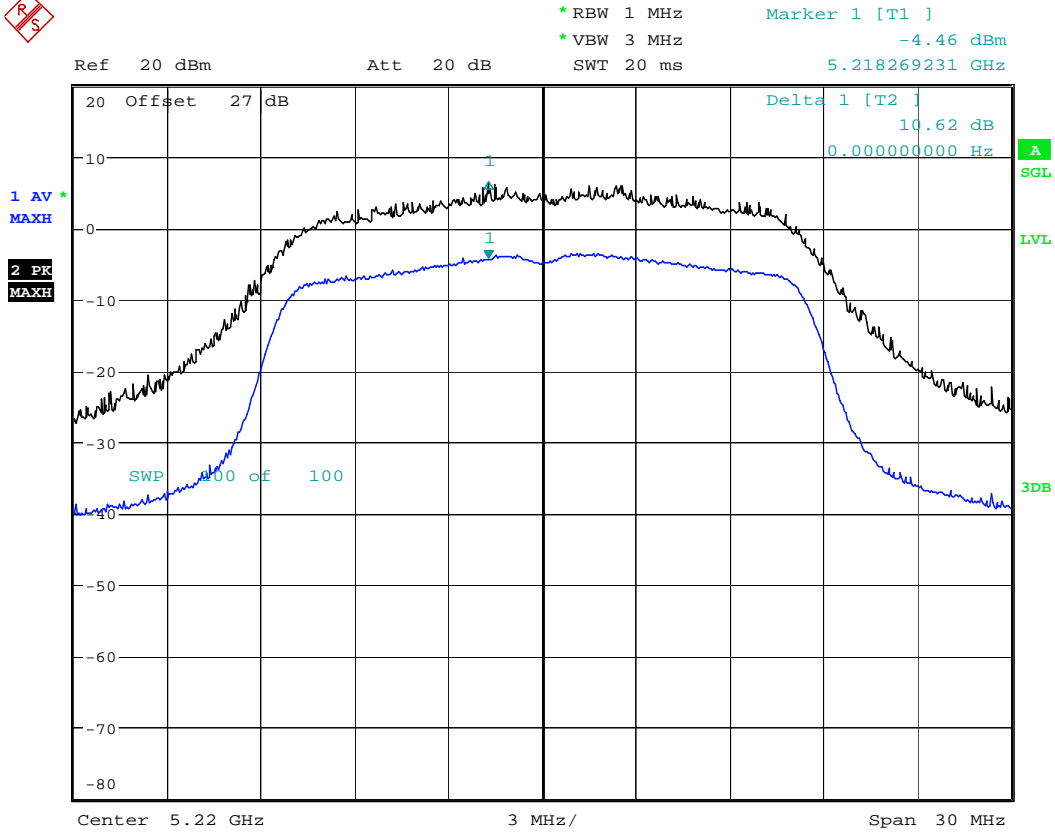
### Measurement Results

See attached



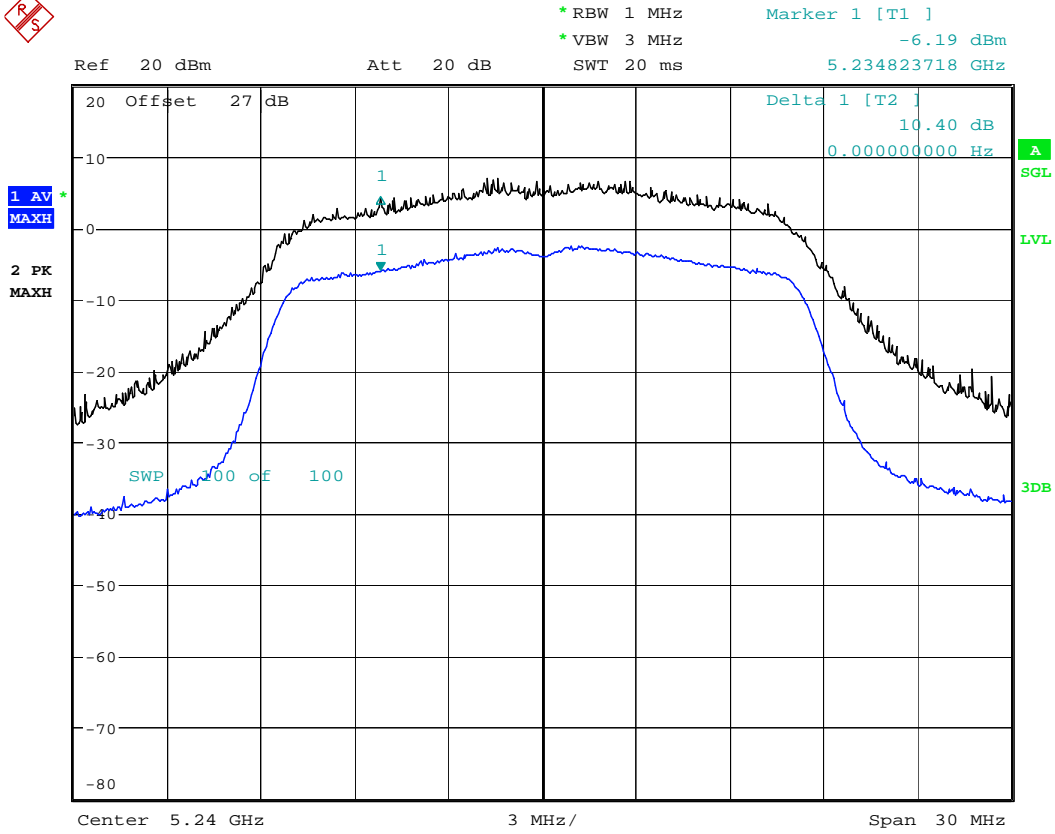
Date: 25.MAR.2011 22:23:36

### Peak Excursion Channel 36 @ 12 Mbps



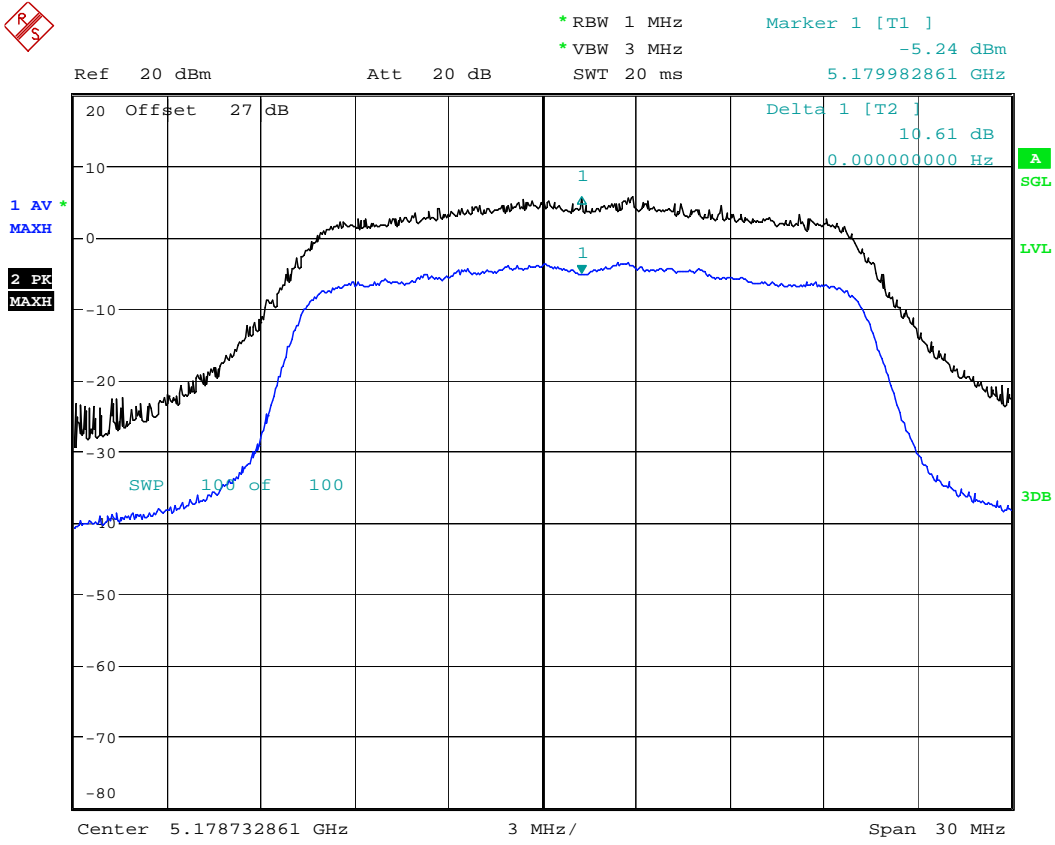
Date: 25.MAR.2011 23:00:33

**Peak Excursion Channel 44 @ 12 Mbps**



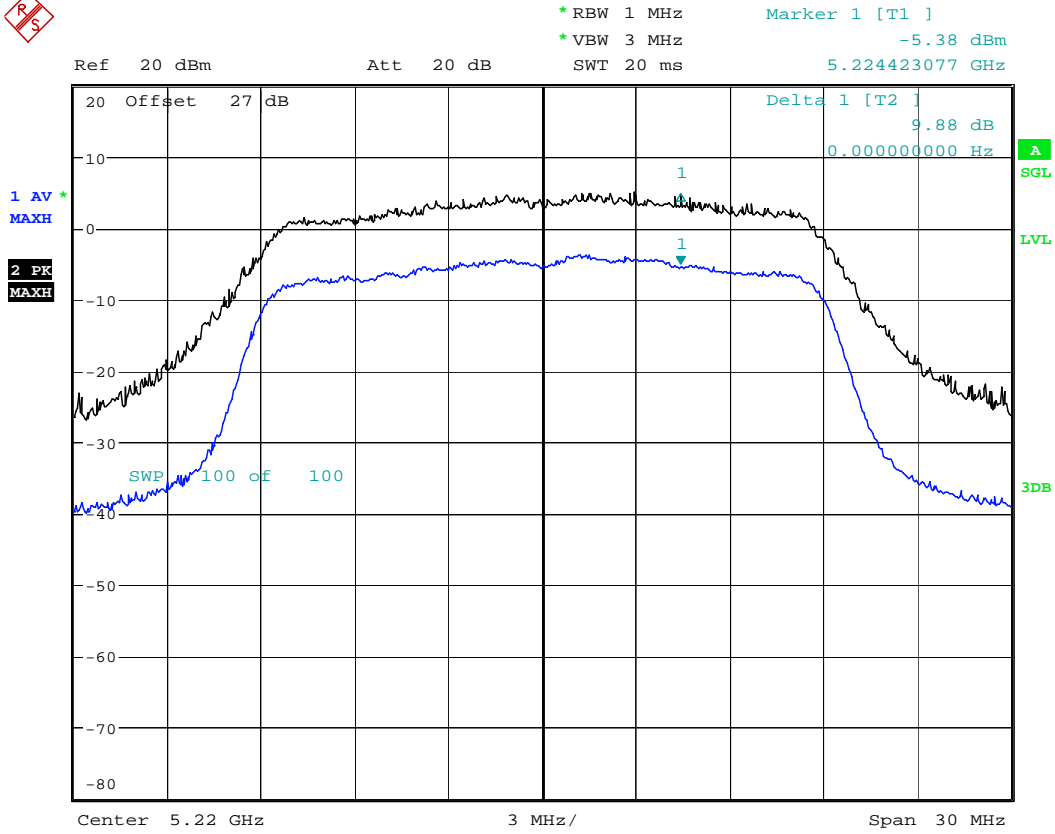
Date: 25.MAR.2011 22:21:32

**Peak Excursion Channel 48 @ 12 Mbps**



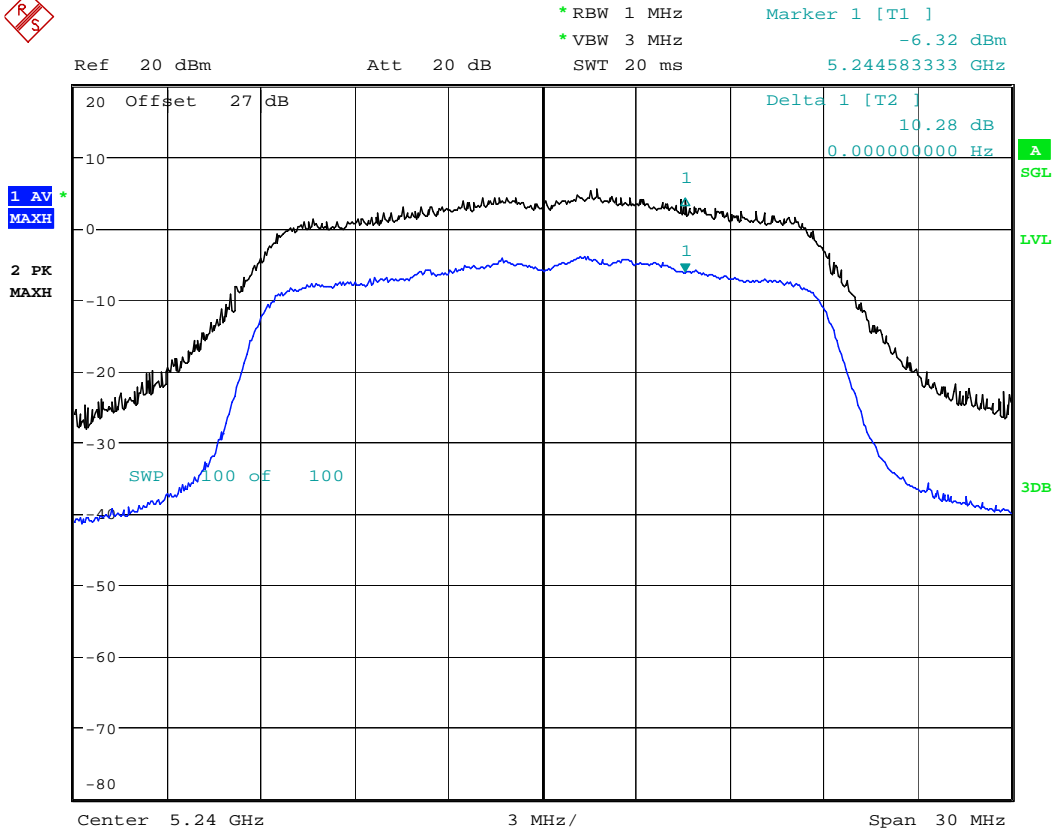
Date: 25.MAR.2011 22:31:36

**Peak Excursion Channel 36 @ 43.3 Mbps**



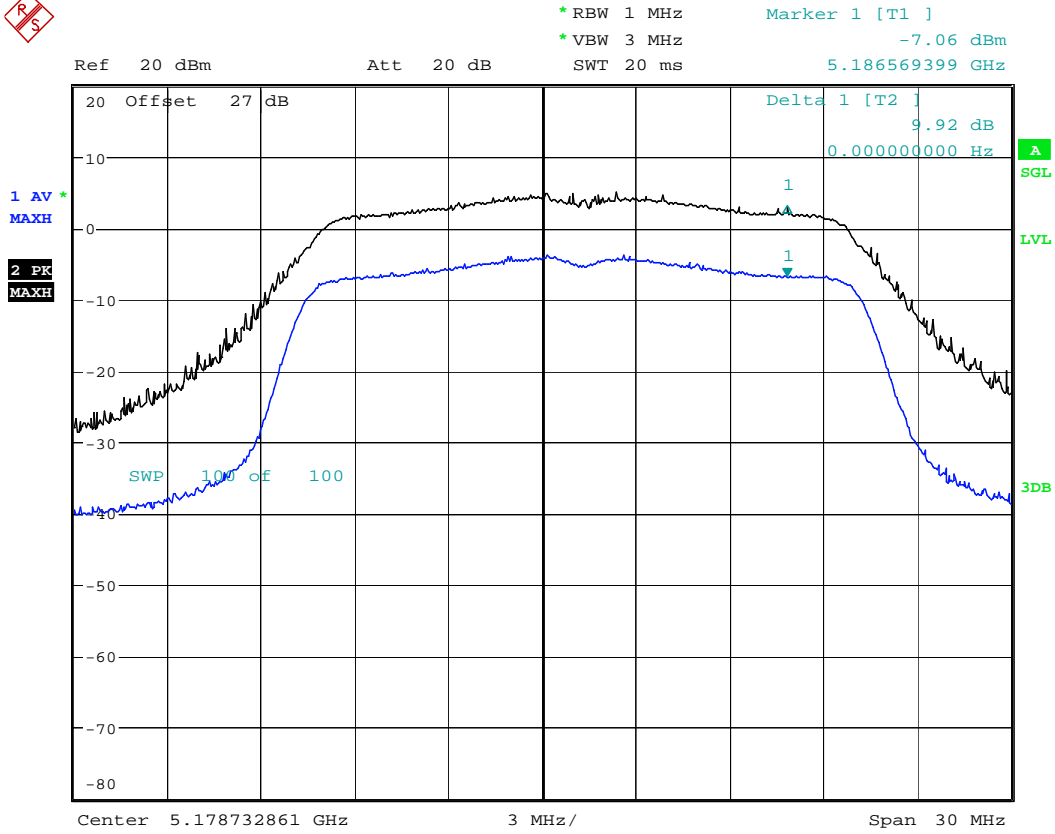
Date: 25.MAR.2011 22:32:48

**Peak Excursion Channel 44 @ 43.3 Mbps**



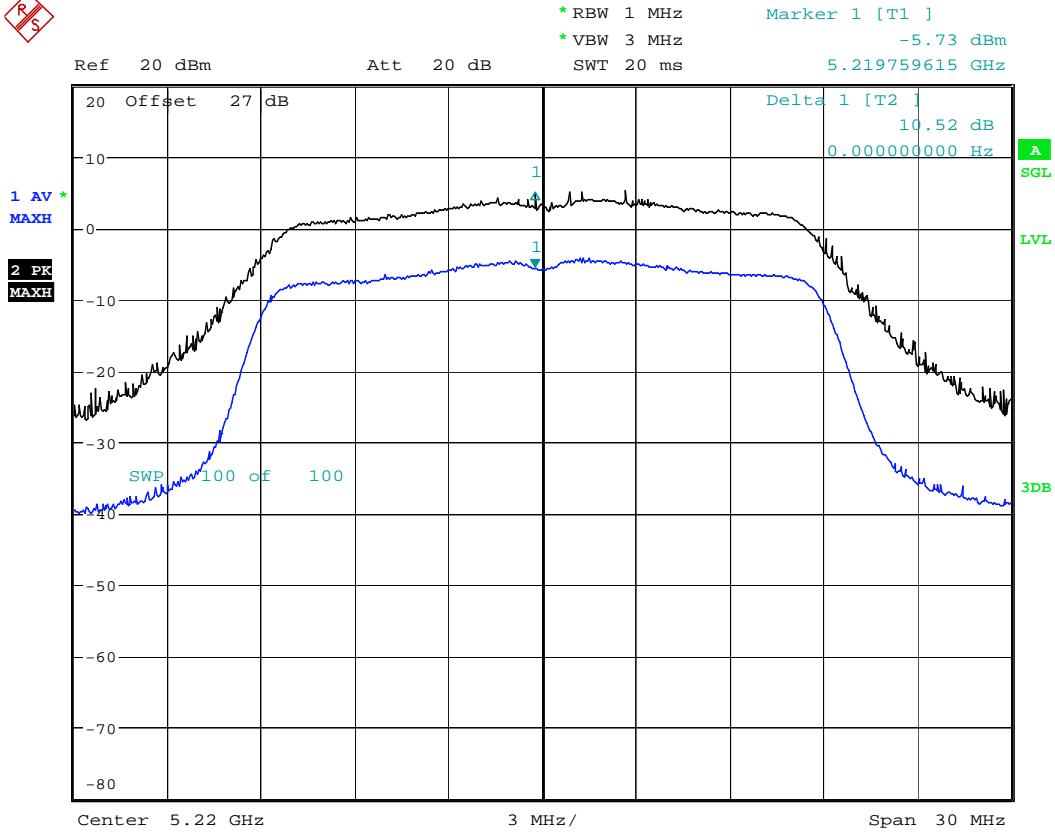
Date: 25.MAR.2011 22:34:52

**Peak Excursion Channel 48 @ 43.3 Mbps**



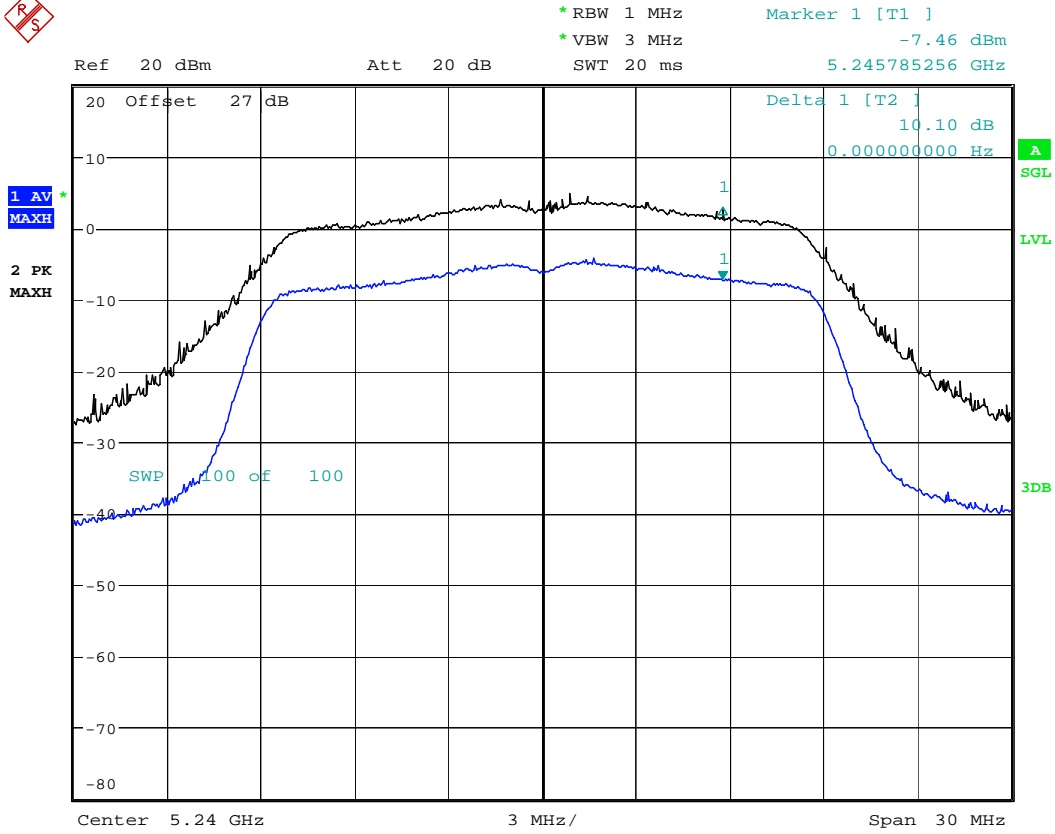
Date: 25.MAR.2011 22:44:40

**Peak Excursion Channel 36 @ 6.5 Mbps**



Date: 25.MAR.2011 22:43:24

**Peak Excursion Channel 44 @ 6.5 Mbps**



Date: 25.MAR.2011 22:42:12

**Peak Excursion Channel 48 @ 6.5 Mbps**

Frequency	Channel	Mode	Data Rate	Peak Excursion	Limit	Margin
5180	36	a	12	10.27	13	-2.73
5220	44	a	12	10.62	13	-2.38
5240	48	a	12	10.40	13	-2.60
						0.00
5180	36	n	43.3	10.61	13	-2.39
5220	44	n	43.3	9.88	13	-3.12
5240	48	n	43.3	10.28	13	-2.72
						0.00
5180	36	n	6.5	9.92	13	-3.08
5220	44	n	6.5	10.52	13	-2.48
5240	48	n	6.5	10.10	13	-2.90

## **FREQUENCY STABILITY**

### **Measurement Procedure**

The equipment under test is placed in an environmental chamber. The antenna port of the Equipment under Test is directly coupled to the input of the spectrum analyzer through a specialized RF connector. A power supply is attached as the primary voltage supply.

Frequency measurements are made at the extremes of the temperature range -30° C to +50° C and at intervals of 10° C with the primary supply voltage set to the nominal battery operating voltage. A period of time sufficient to stabilize all components of the equipment is allowed at each frequency measurement. The maximum variation of frequency is measured.

### **Measurement Results**

Attached

Temp	Channel	Mode	Data Rate	Frequency	Initial Frequency	Deviation
-30C	44	a	12	5220.165	5221.52	1.355
-20C	44	a	12	5220.165	5221.52	1.355
-10C	44	a	12	5220.16	5221.52	1.36
0C	44	a	12	5220.165	5221.52	1.355
10C	44	a	12	5220.125	5221.52	1.395
20C	44	a	12	5220.125	5221.52	1.395
30C	44	a	12	5220.12	5221.52	1.4
40C	44	a	12	5220.085	5221.52	1.435
50C	44	a	12	5220.085	5221.52	1.435
3.2V Batt end point	44	a	12	5220.165	5221.52	1.355

Temp	Channel	Mode	Data Rate	Frequency	Initial Frequency	Deviation
-30C	44	a	43.3	5220.165	5221.36	1.195
-20C	44	a	43.3	5220.165	5221.36	1.195
-10C	44	a	43.3	5220.165	5221.36	1.195
0C	44	a	43.3	5220.165	5221.36	1.195
10C	44	a	43.3	5220.165	5221.36	1.195
20C	44	a	43.3	5220.085	5221.36	1.275
30C	44	a	43.3	5220.12	5221.36	1.24
40C	44	a	43.3	5220.085	5221.36	1.275
50C	44	a	43.3	5220.085	5221.36	1.275
3.2V Batt end point	44	a	43.3	5220.085	5221.36	1.275

Temp	Channel	Mode	Data Rate	Frequency	Initial Frequency	Deviation
-30C	44	a	6.5	5220.165	5221.6	1.435
-20C	44	a	6.5	5220.165	5221.6	1.435
-10C	44	a	6.5	5220.165	5221.6	1.435
0C	44	a	6.5	5220.125	5221.6	1.475
10C	44	a	6.5	5220.165	5221.6	1.435
20C	44	a	6.5	5220.125	5221.6	1.475
30C	44	a	6.5	5220.085	5221.6	1.515
40C	44	a	6.5	5220.125	5221.6	1.475
50C	44	a	6.5	5220.085	5221.6	1.515
3.2V Batt end point	44	a	6.5	5220.085	5221.6	1.515

## **AC LINE CONDUCTED EMISSIONS**

### **Measurement Procedure**

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

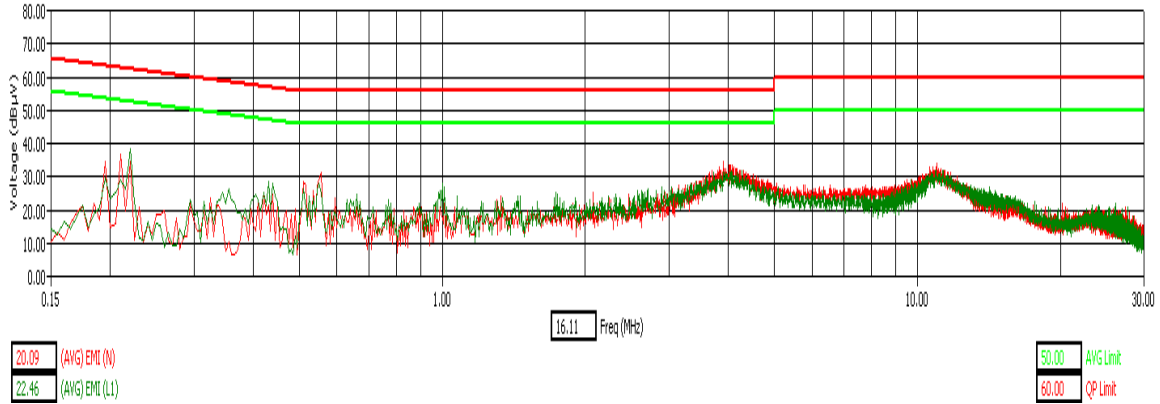
All radio-noise voltage and current measurements shall be made on each current-carrying conductor at the plug end of the EUT power cord or calibrated extension cord by the use of mating plugs and receptacles on the EUT and LISN. Equipment shall be tested with power cords that are normally supplied using an LISN, the 50  $\Omega$  measuring port is terminated by a 50  $\Omega$  radio-noise meter or a 50  $\Omega$  resistive load. All other ports are terminated in 50  $\Omega$ .

Detectors – Peak and Average Detector.

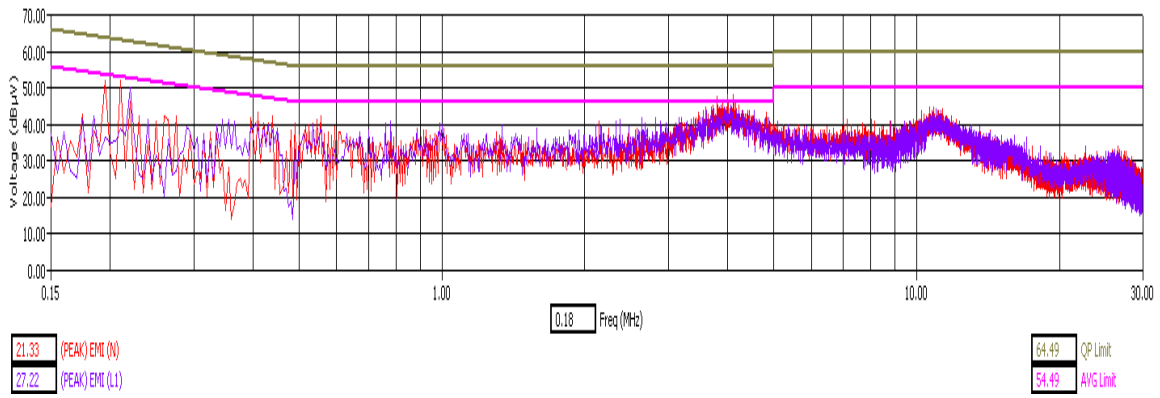
### **Measurement Results**

See attached:

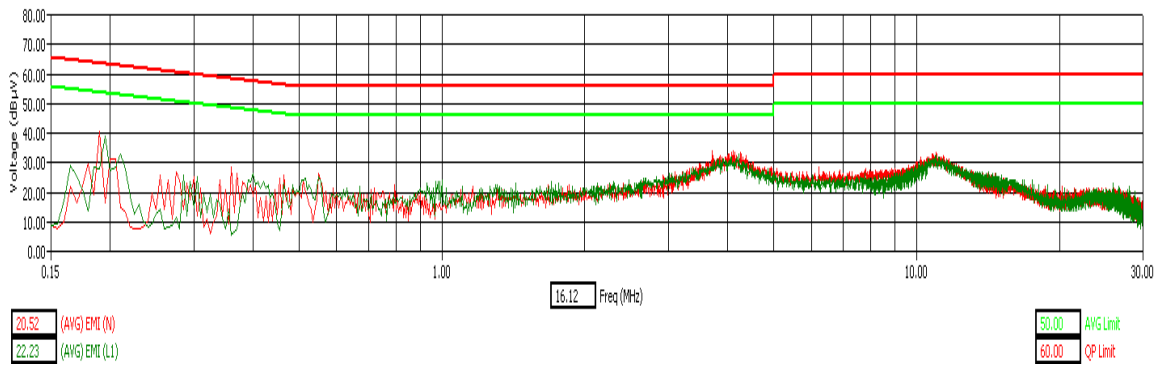
**802.11 n @ 6.5 Mbps**



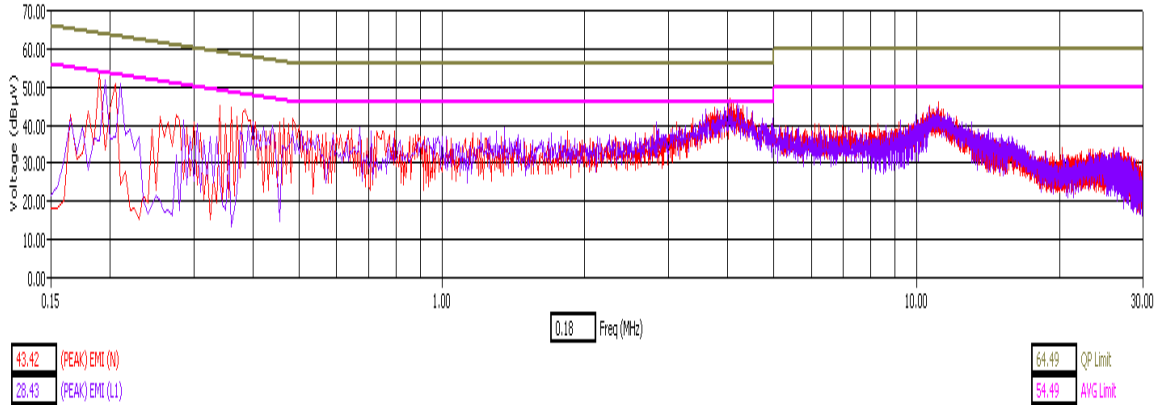
**WLAN Channel 36 - Tx Mode - AVG Detector**



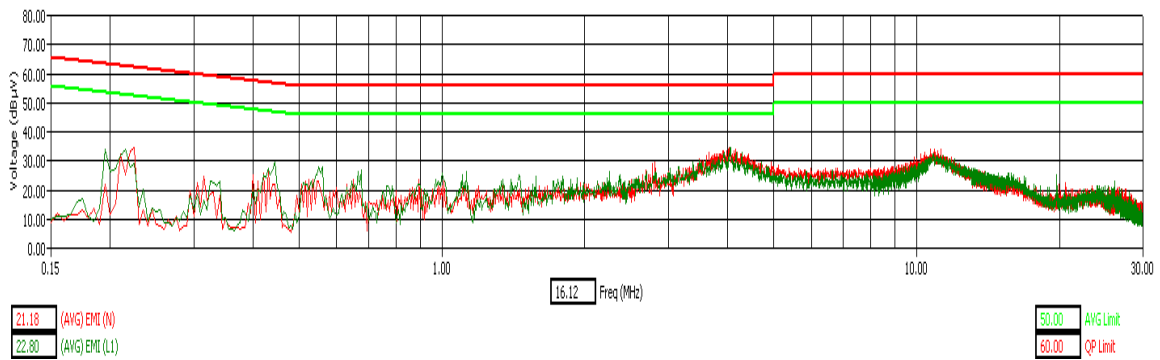
**WLAN Channel 36 - Tx Mode - Peak Detector**



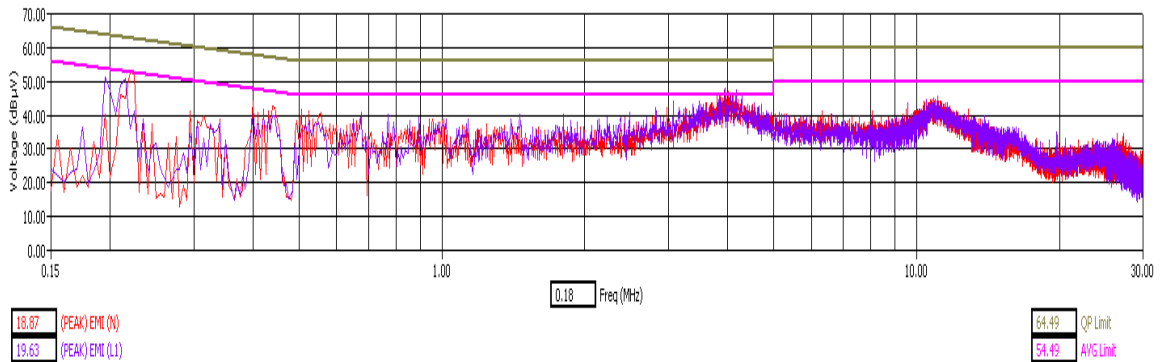
**WLAN Channel 44 - Tx Mode - AVG Detector**



**WLAN Channel 44 - Tx Mode - Peak Detector**

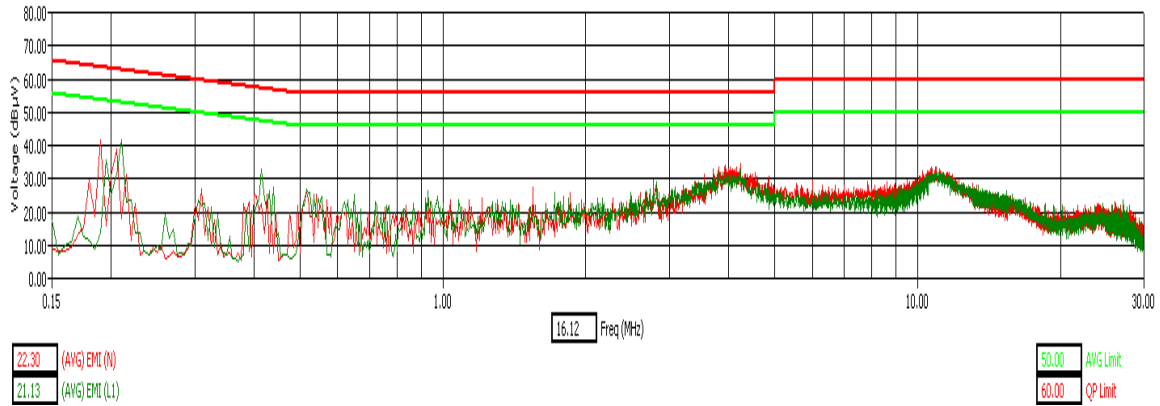


**WLAN Channel 48 - Tx Mode - AVG Detector**

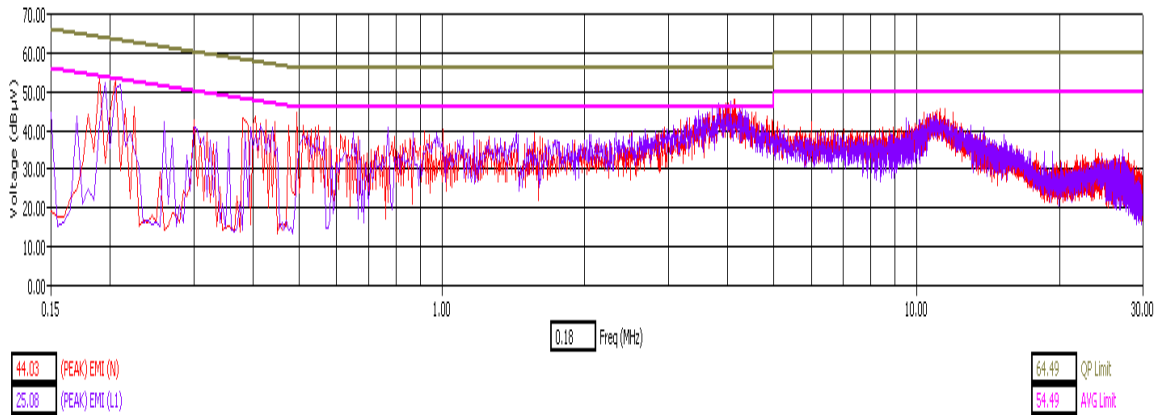


**WLAN Channel 48 - Tx Mode - Peak Detector**

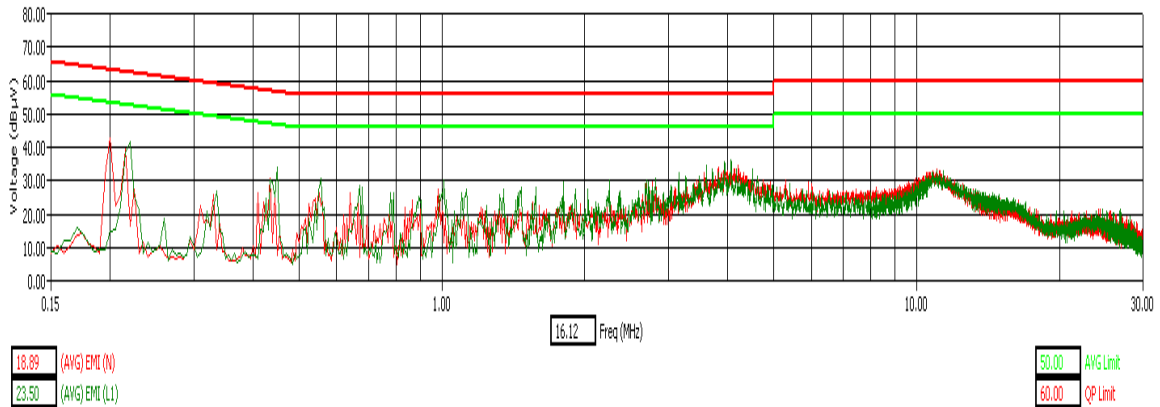
**802.11 n @ 43.3 Mbps**



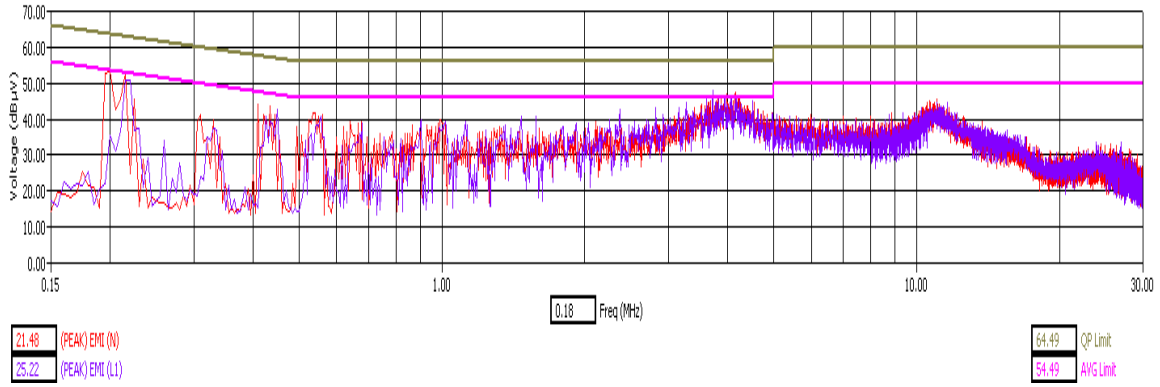
**WLAN Channel 36 - Tx Mode - AVG Detector**



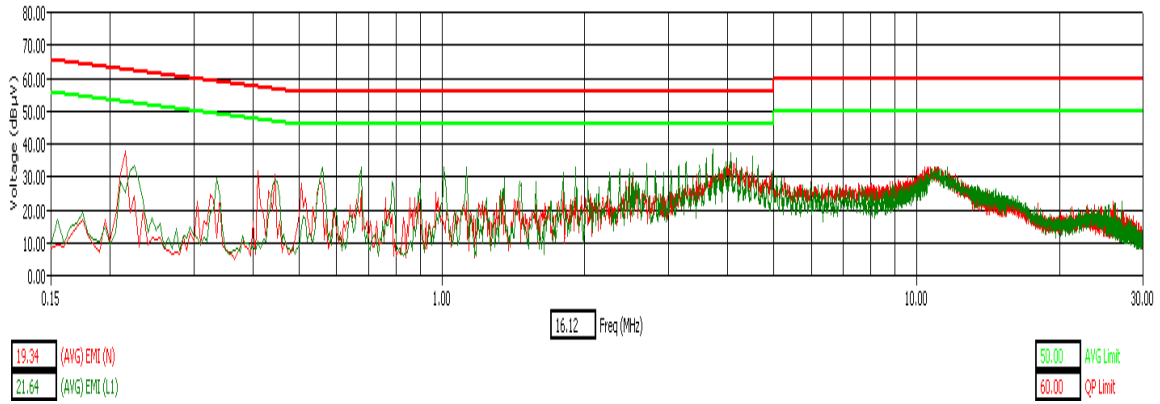
**WLAN Channel 36 - Tx Mode - Peak Detector**



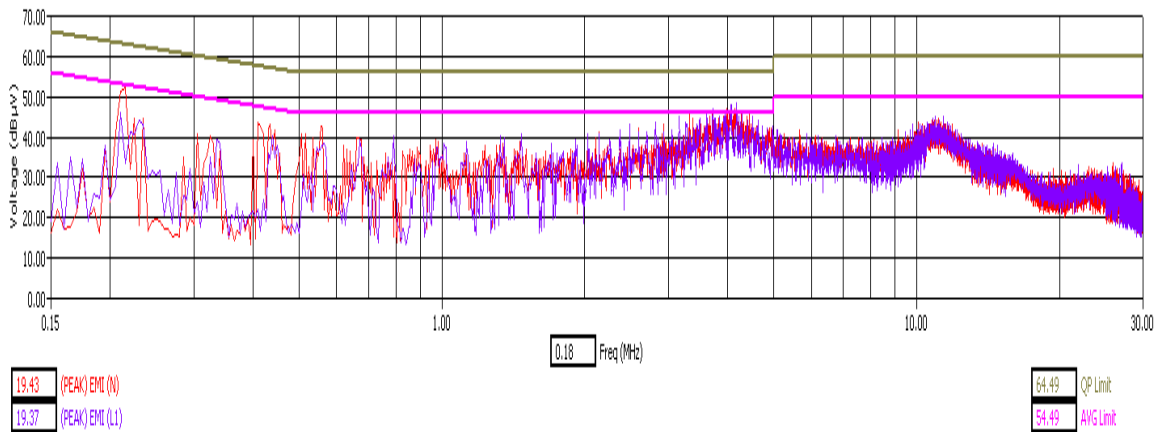
**WLAN Channel 44 - Tx Mode - AVG Detector**



**WLAN Channel 44 - Tx Mode - Peak Detector**

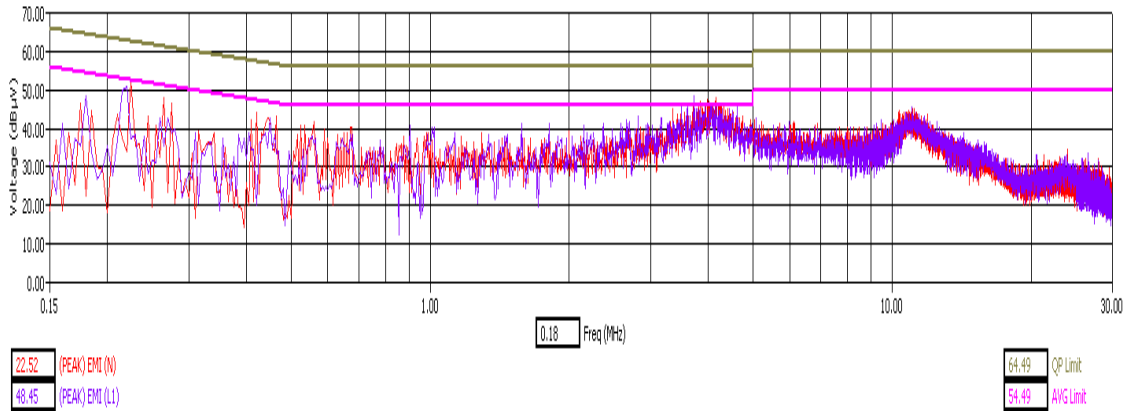


**WLAN Channel 48 - Tx Mode - AVG Detector**

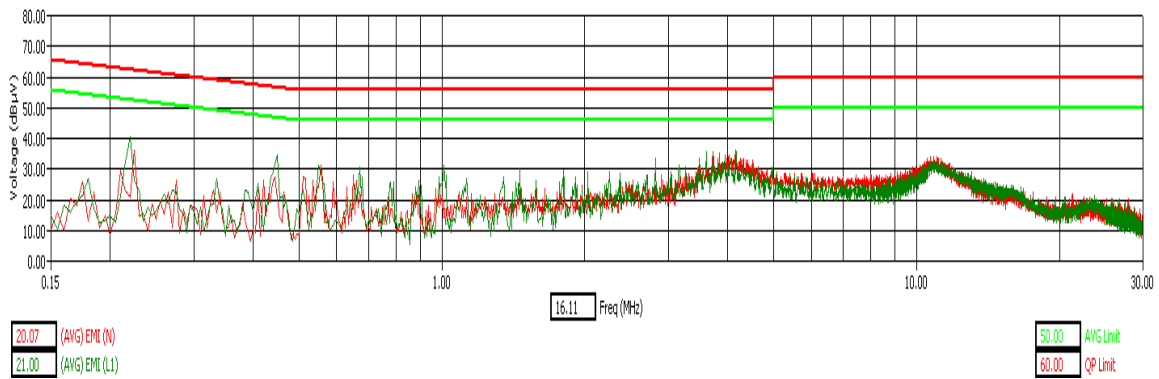


**WLAN Channel 48 - Tx Mode - Peak Detector**

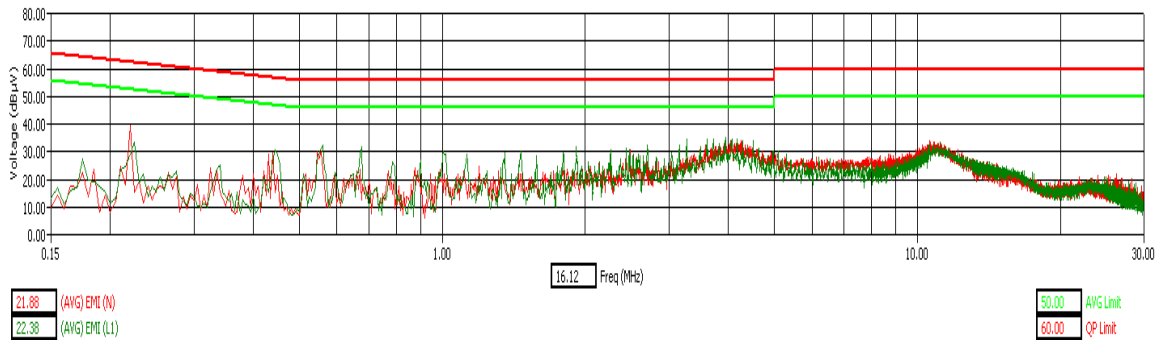
**802.11 a @ 12 Mbps**



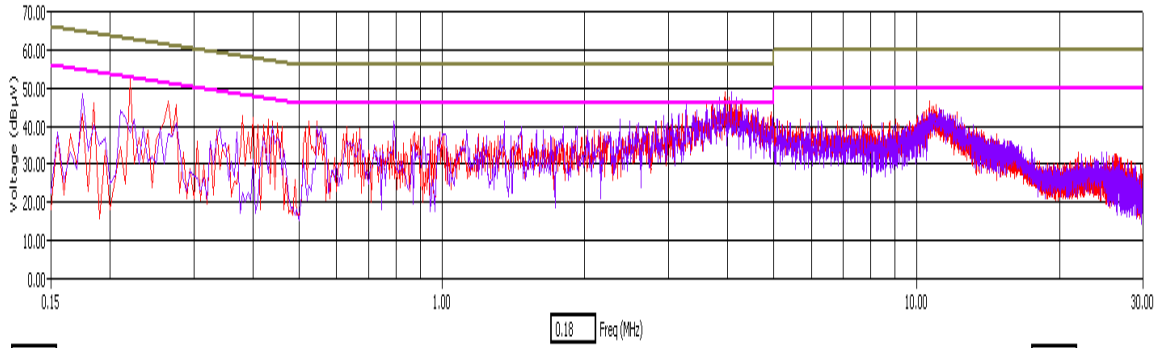
**WLAN Channel 36 - Tx Mode - AVG Detector**



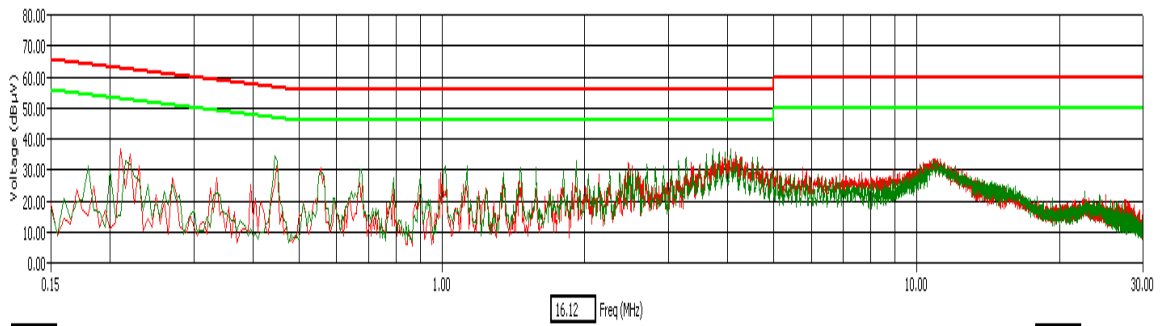
**WLAN Channel 36 - Tx Mode - Peak Detector**



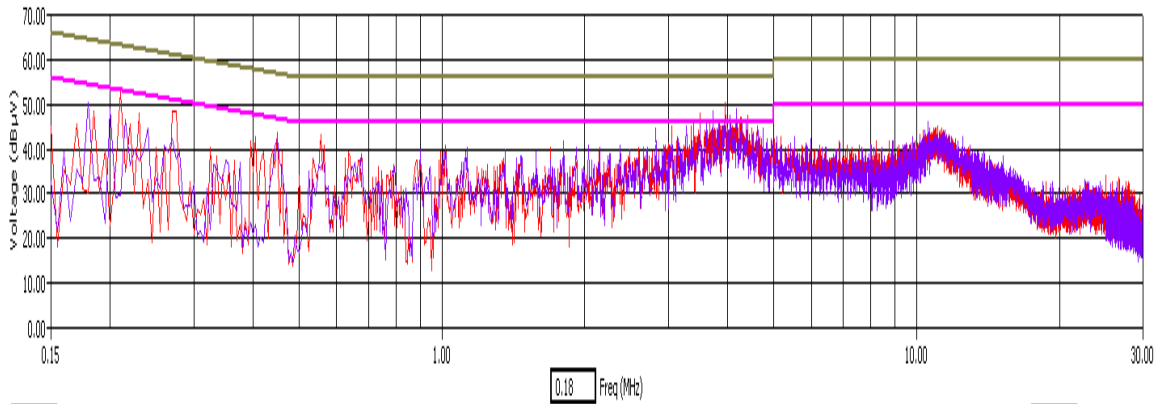
**WLAN Channel 44 - Tx Mode - AVG Detector**



**WLAN Channel 44 - Tx Mode - Peak Detector**



**WLAN Channel 48 - Tx Mode - AVG Detector**



**WLAN Channel 48 - Tx Mode - Peak Detector**

**End of Test Report**