



**MOTOROLA MOBILITY**

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EMC LABORATORY**

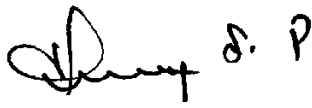
**EMC TEST REPORT**

**Test Report Number** – 24391-1 WLAN @ 5.2 GHz

**Report Date** – March 30, 2011

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.

As the responsible EMC Engineer, I hereby declare that the equipment tested as specified in this report conforms to the requirements indicated.

Signature: 

Name: Thanigaiselvan Palaniswami

Title: EMC Engineer

Date: March 30, 2011

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

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**Test Report Details**

Tests Performed By: ADR Testing Service  
 Location Code: ADR LV  
 Motorola Mobility Inc  
 Product Safety and Compliance Group  
 600 North US Hwy 45  
 Libertyville, IL 60048  
 FCC Registration Number: 316588  
 Industry Canada Number: 109O-1

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

Product Type: Hand Held Device

Signaling Capability: WCDMA 850/1900, GSM 850/1900, HSUPA,  
 HSDPA, EDGE, Bluetooth, 802.11a/b/g/n

FCC ID: IHDT56ME1

Serial Numbers: LHBA230122, LEGE250011, 99000052000852,  
 99000052000854.

Testing Complete Date: March 30, 2011

**Applicable Standards**

All tests and measurements indicated in this document were performed in accordance with the Code of Federal Regulations Title 47 Part 2, Sub-part J as well as the following parts:

  X   Part 15 Subpart E – Unlicensed National Information Infrastructure Devices

Applicable Standards: ANSI 63.4 2003, RSS-210 Issue 7, 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**

This product utilizes an internal battery that is not removable. All testing was done using a fully charged battery. 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	Calibration Due Date
Rohde Schwarz	Receiver	ESI26	100001	9/23/11
Agilent	Signal Analyzer	N9020A	US46470586	12/18/11
Attenuator	Weinschel	AS-6	6675	NCR
Attenuator	Weinschel	AS-6	6677	NCR
ETS	LISN	3810/2	00062907	9/08/2011
ETS	LISN	3810/2	00062912	9/08/2011

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 10dB passive attenuator. A fully charged battery was used for the supply voltage.

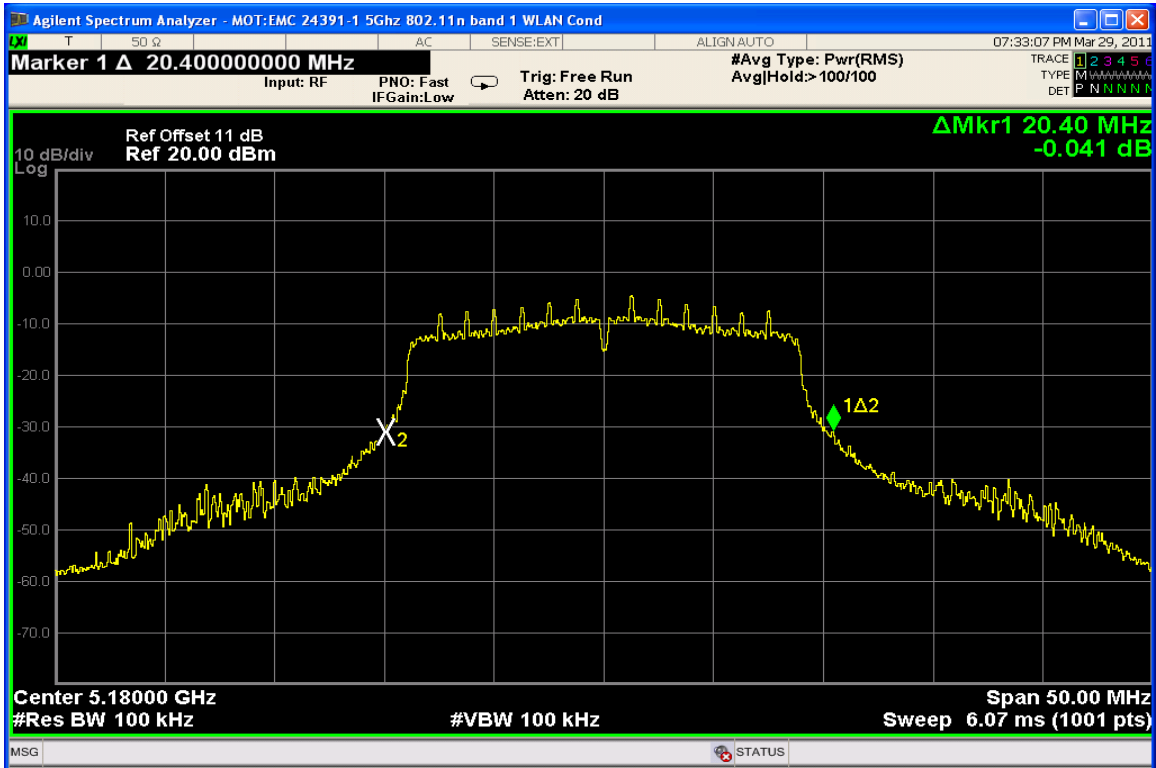
1. RBW  $\geq$  100 kHz
2. VBW  $\geq$  RBW
3. Sweep = auto
4. Detector function = peak
5. Trace = max hold

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.

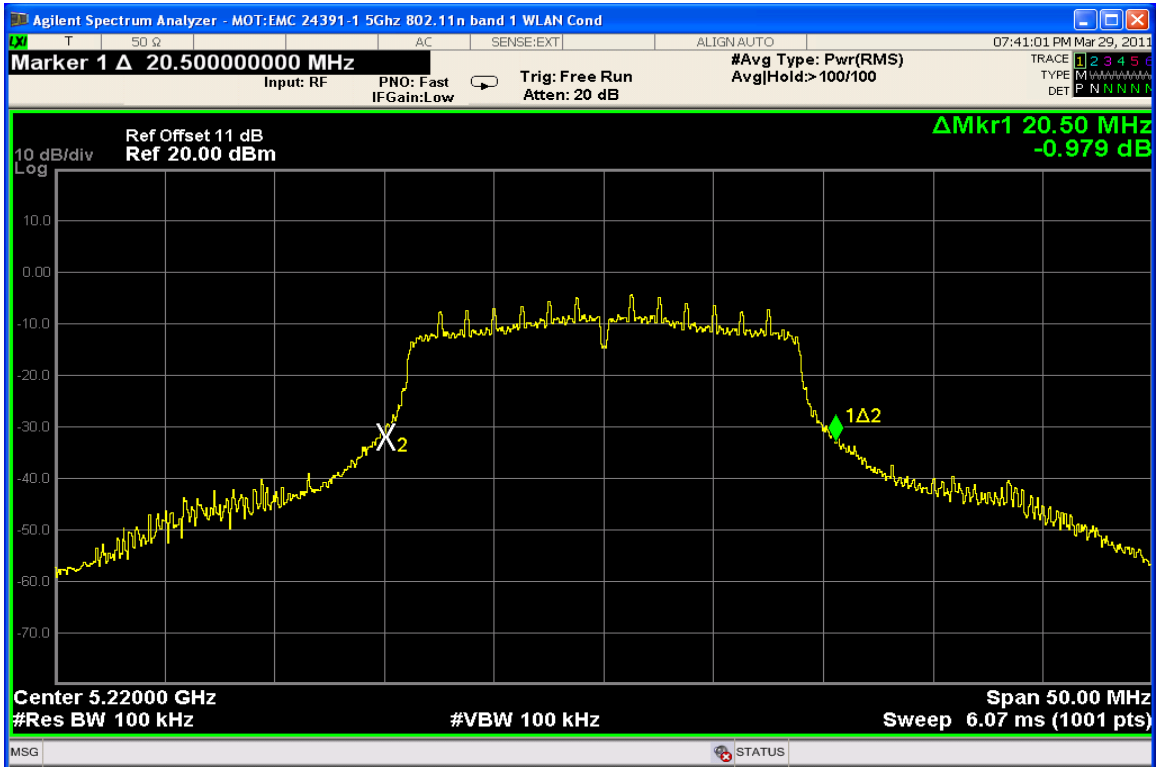
#### **Measurement Results**

See attached

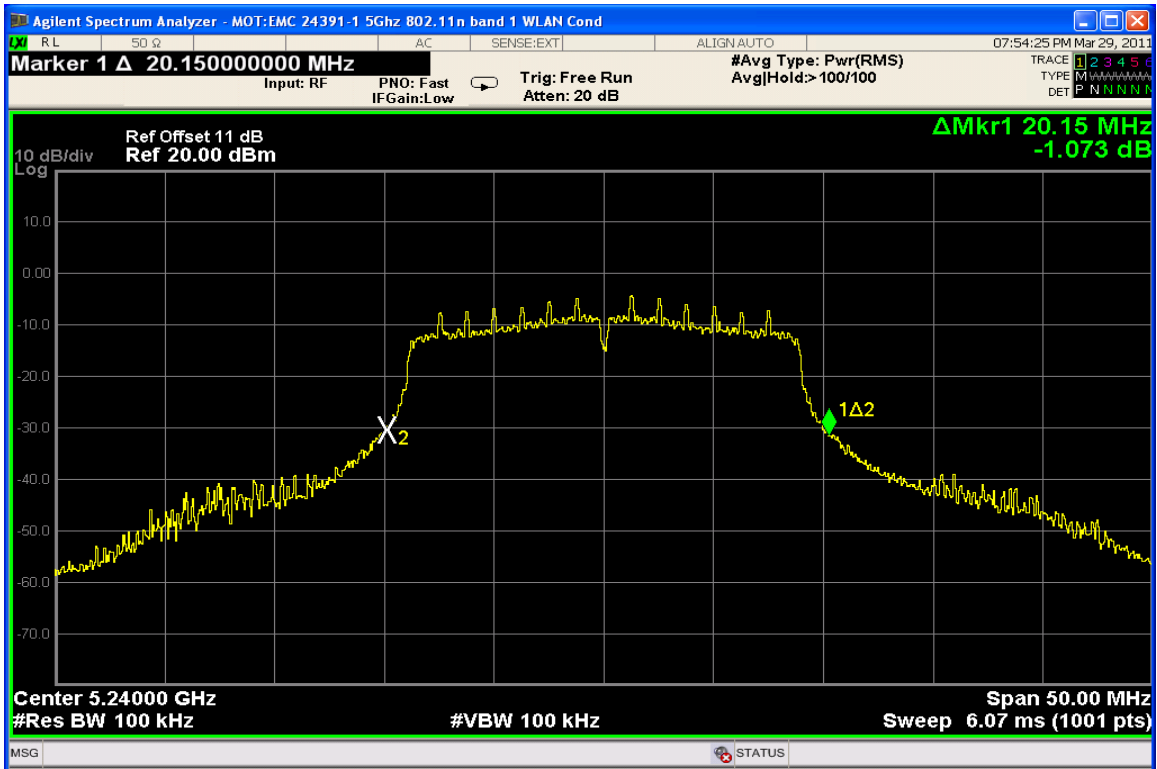
**802.11 n Mode @ 6.5 Mbps**



**26 dB Bandwidth Channel 36 @ 6.5 Mbps**

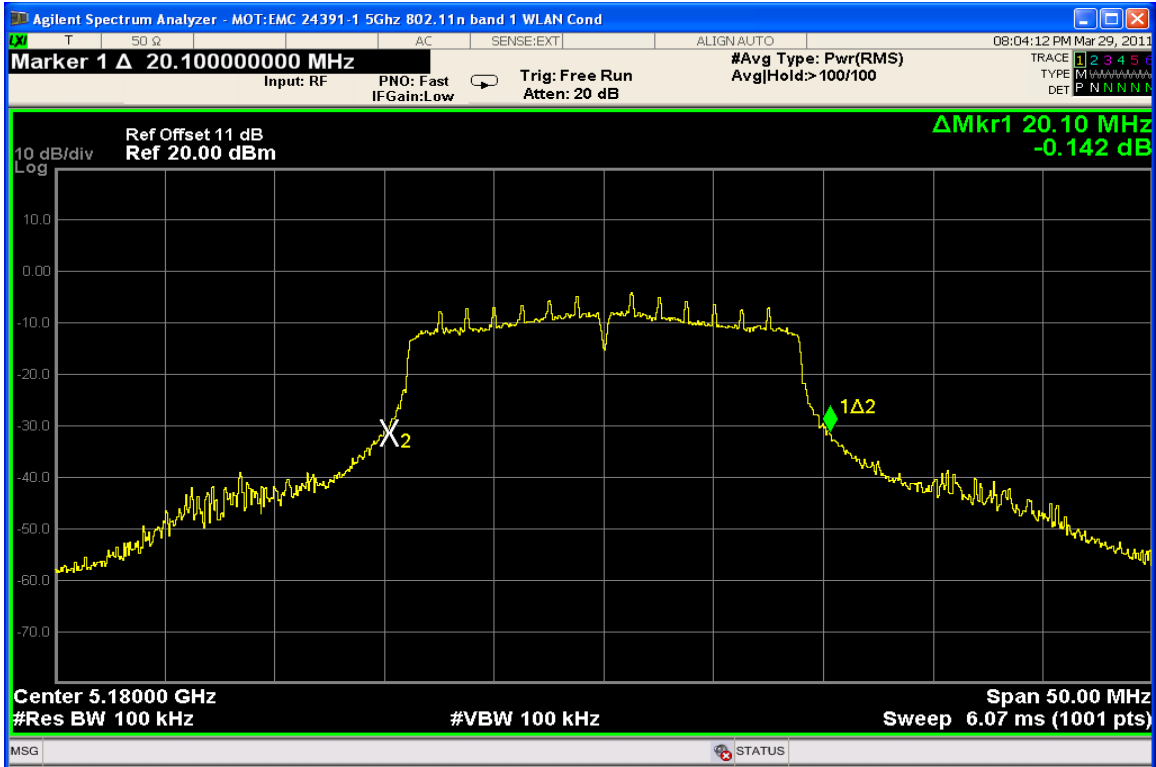


**26 dB Bandwidth Channel 44 @ 6.5 Mbps**

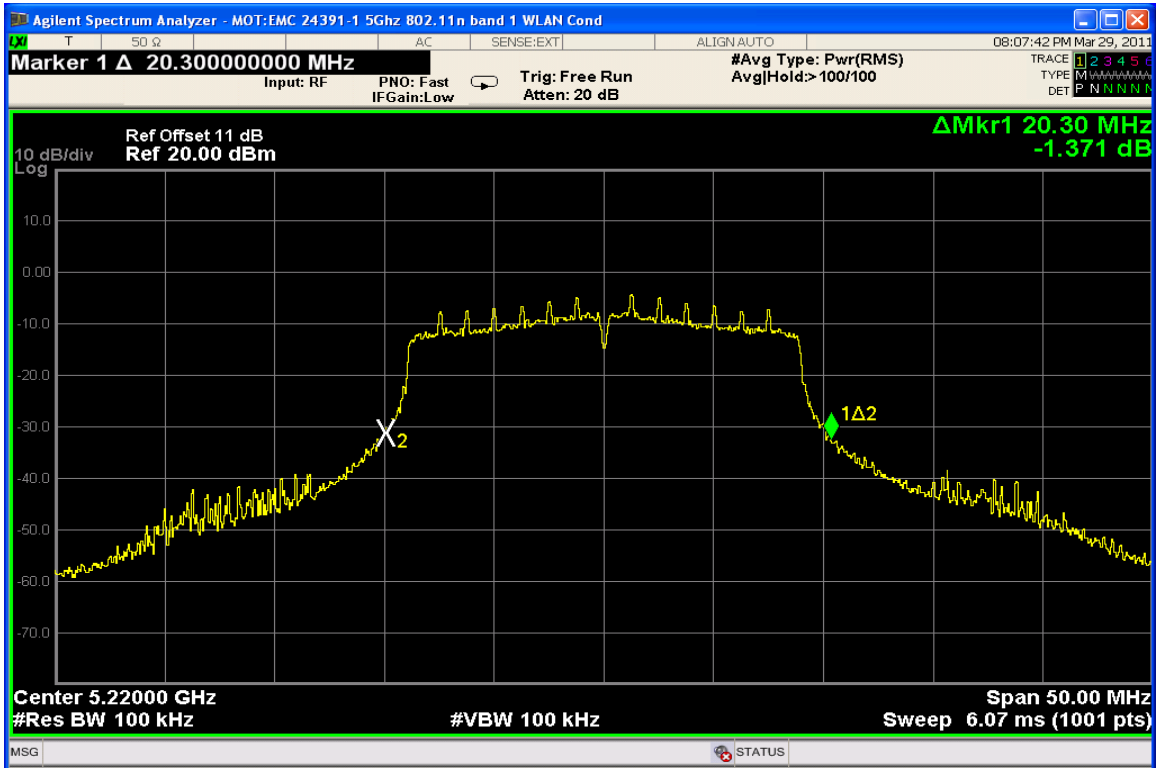


26 dB Bandwidth Channel 48 @ 6.5 Mbps

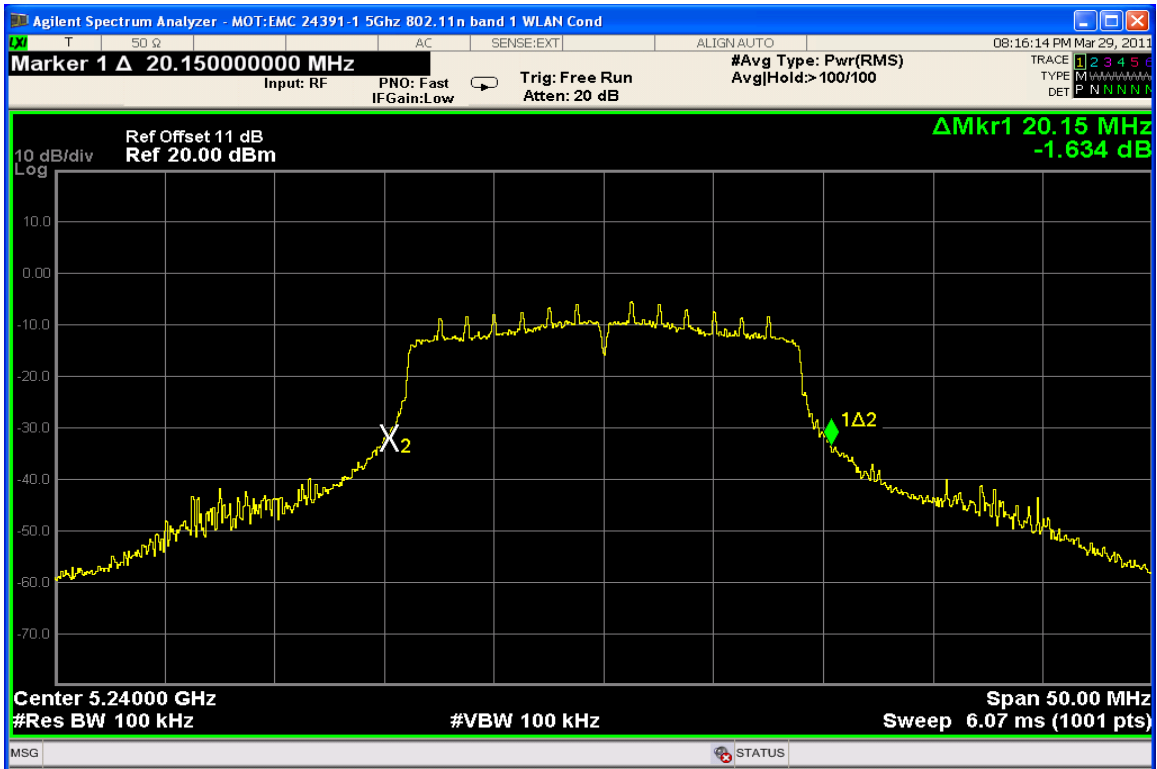
### 802.11 n Mode @ 14.4 Mbps



26 dB Bandwidth Channel 36 @ 14.4 Mbps

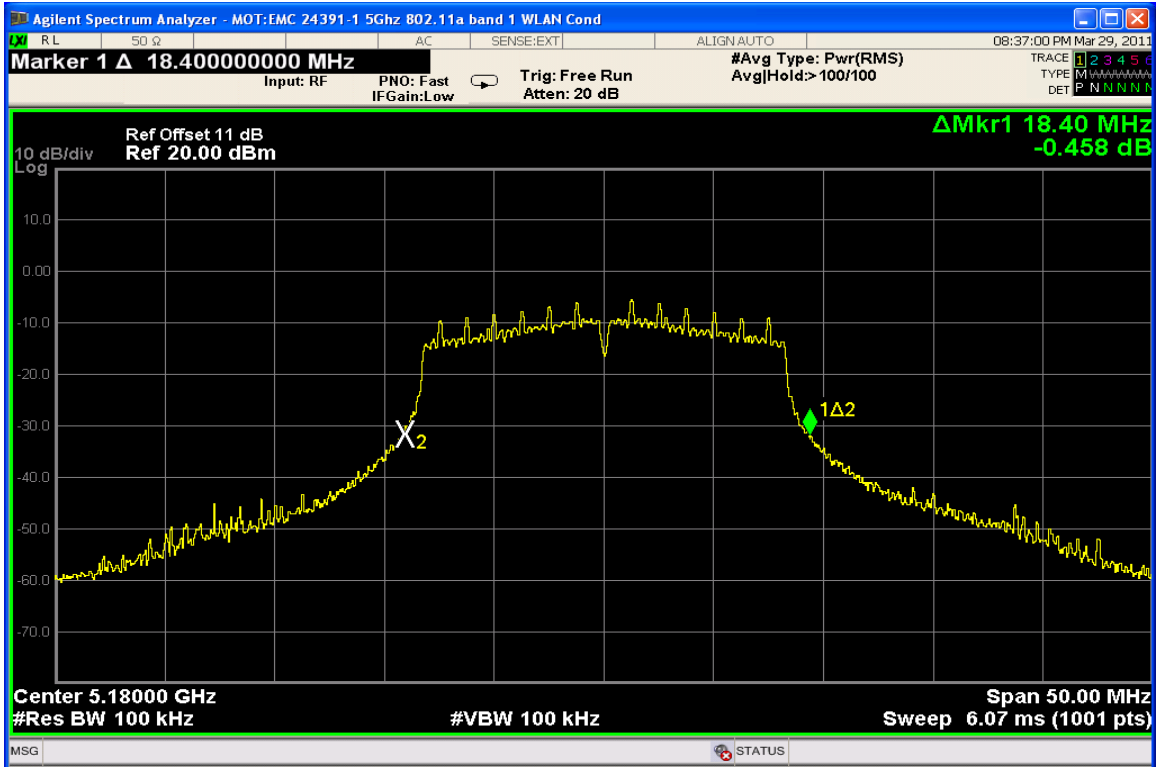


26 dB Bandwidth Channel 44 @ 14.4 Mbps



26 dB Bandwidth Channel 48 @ 14.4 Mbps

**802.11 a Mode @ 12 Mbps**



**26 dB Bandwidth Channel 36 @ 12 Mbps**



**26 dB Bandwidth Channel 44 @ 12 Mbps**



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. Using Method 1 of DA 02-2138, the peak transmit power is then measured for the applicable data rates.

### **Measurement Results**

See Attached

Initial average power measurements in the 5 GHz band

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

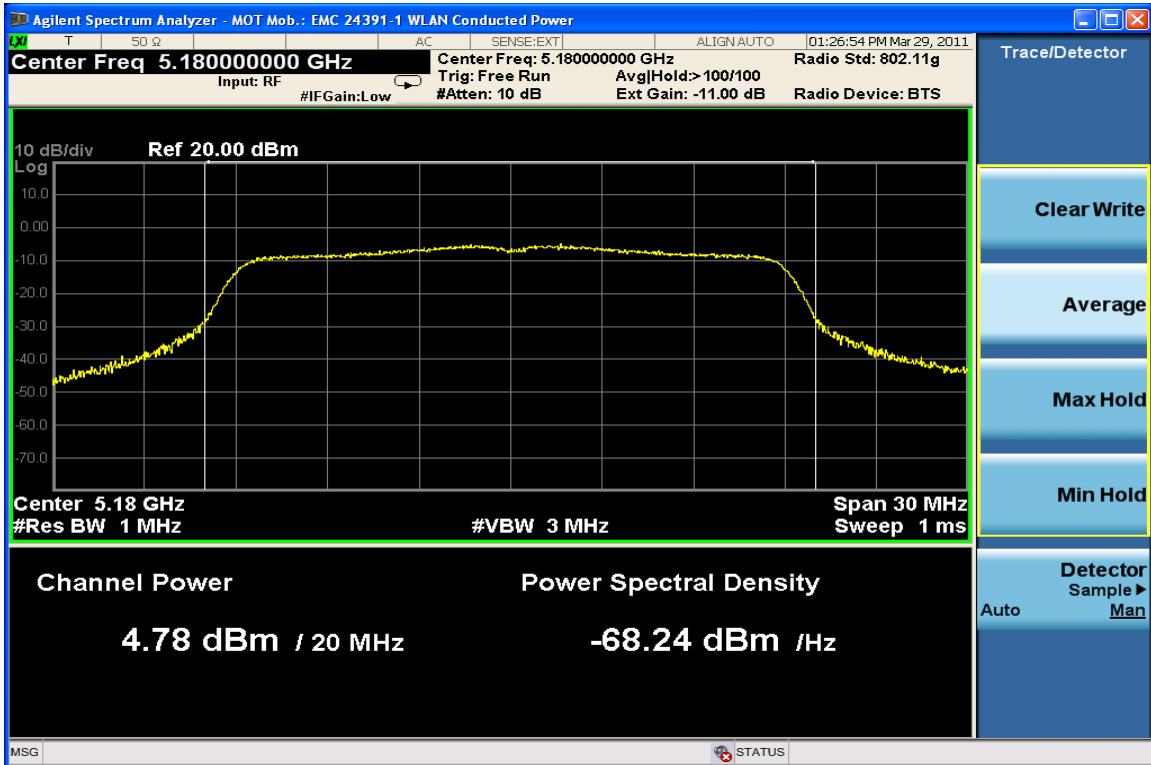
Freq	CH	20 MHz BW, 400 ns GI								20 MHz BW, 800 ns GI							
		7.2 Mbps	14.4 Mbps	21.7 Mbps	28.9 Mbps	43.3 Mbps	57.8 Mbps	65 Mbps	72.2 Mbps	6.5 Mbps	13 Mbps	19.5 Mbps	26 Mbps	39 Mbps	52 Mbps	58.5 Mbps	65 Mbps
		5180	36	4.56	4.26	4.29	4.29	4.30	4.25	4.25	4.09	4.39	4.34	4.34	4.43	4.36	4.28
5200	40	4.31	4.27	4.19	4.22	4.25	4.19	4.32	4.32	4.25	4.29	4.21	4.28	4.26	4.17	4.14	4.16
5220	44	4.40	4.36	4.33	4.38	4.32	4.25	4.29	4.24	4.42	4.43	4.40	4.46	4.52	4.30	4.29	4.31
5240	48	4.84	4.29	4.29	4.34	4.23	4.24	4.21	4.11	4.35	4.25	4.21	4.28	4.20	4.18	4.09	4.10

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

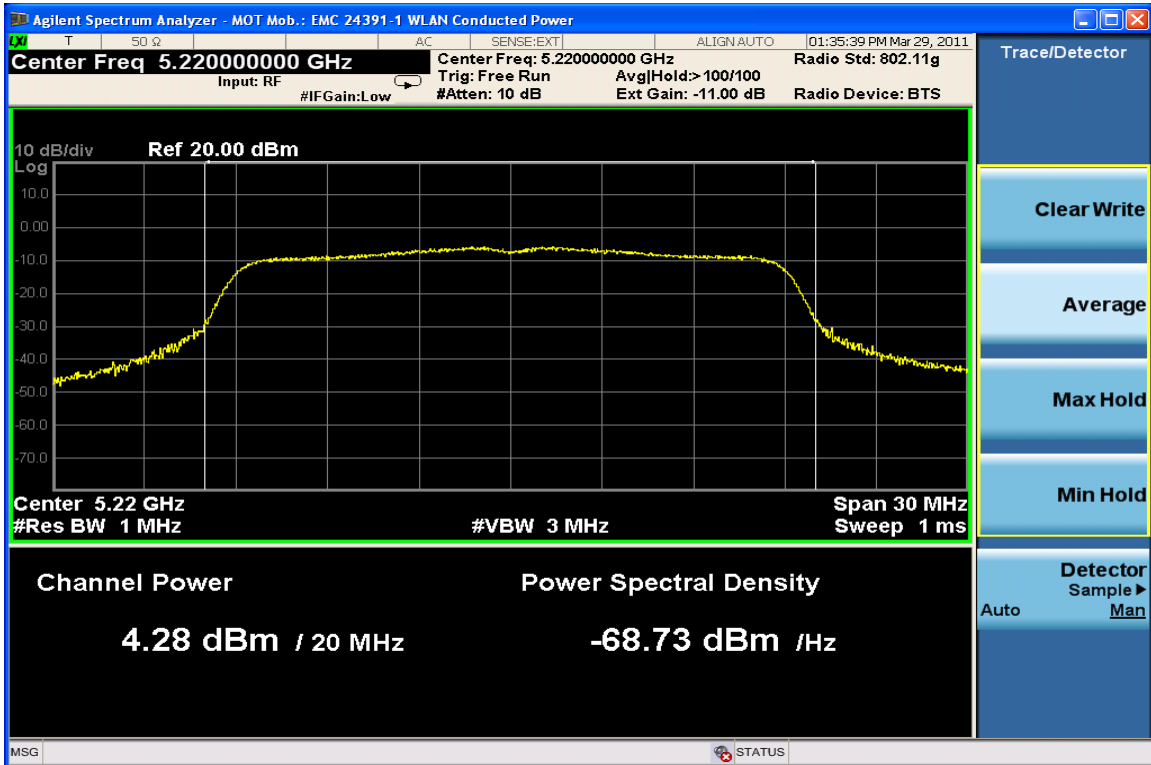
Band	Freq	CH	20 MHz BW							
			6 Mbps	9 Mbps	12 Mbps	18 Mbps	24 Mbps	36 Mbps	48 Mbps	54 Mbps
			UNII Subband 1	5180	36	5.33	5.33	5.35	5.29	5.54
5180 to 5240	5200	40	4.22	4.28	3.70	3.63	4.19	4.14	3.42	3.44
	5220	44	3.69	3.86	3.81	3.79	3.66	3.78	3.51	3.46
	5240	48	4.02	3.94	3.91	3.89	3.61	3.57	3.61	3.57

Based on these initial measurements, it was determined that testing will be performed in the 14.4 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. Plots showing the peak power measurements for the applicable data rates follow.

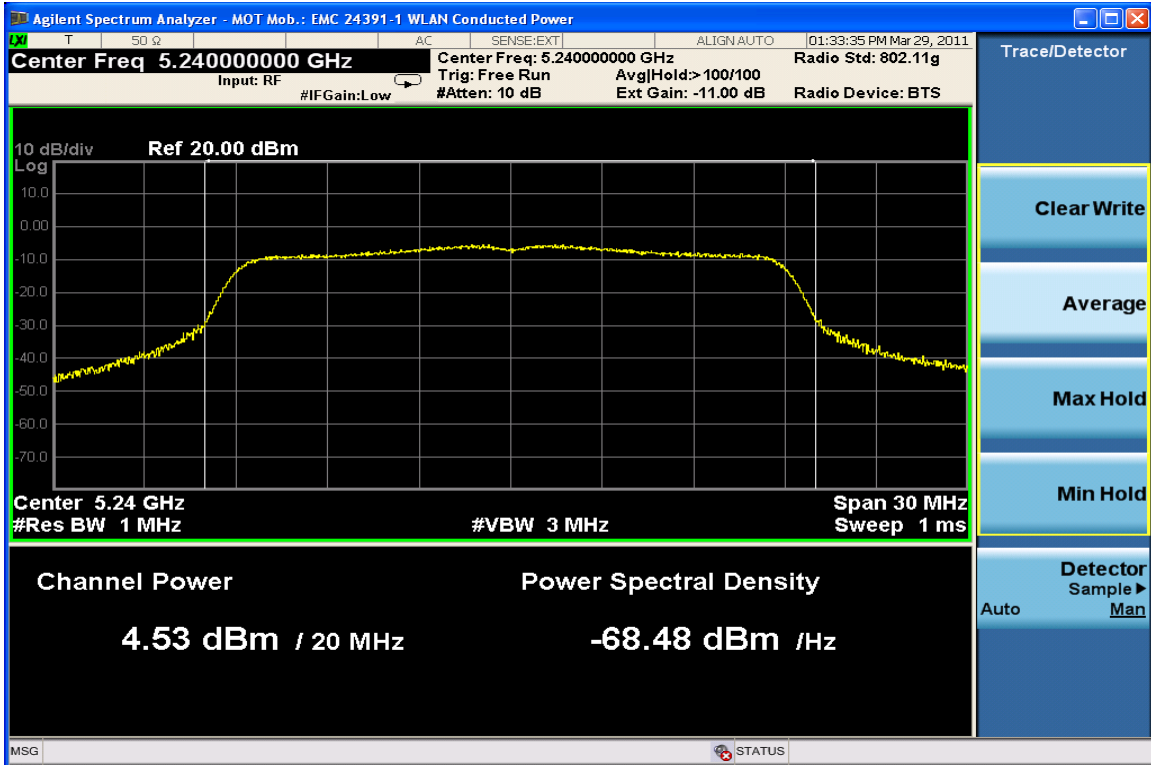
**802.11n (800ns) @ 6.5 Mbps**



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

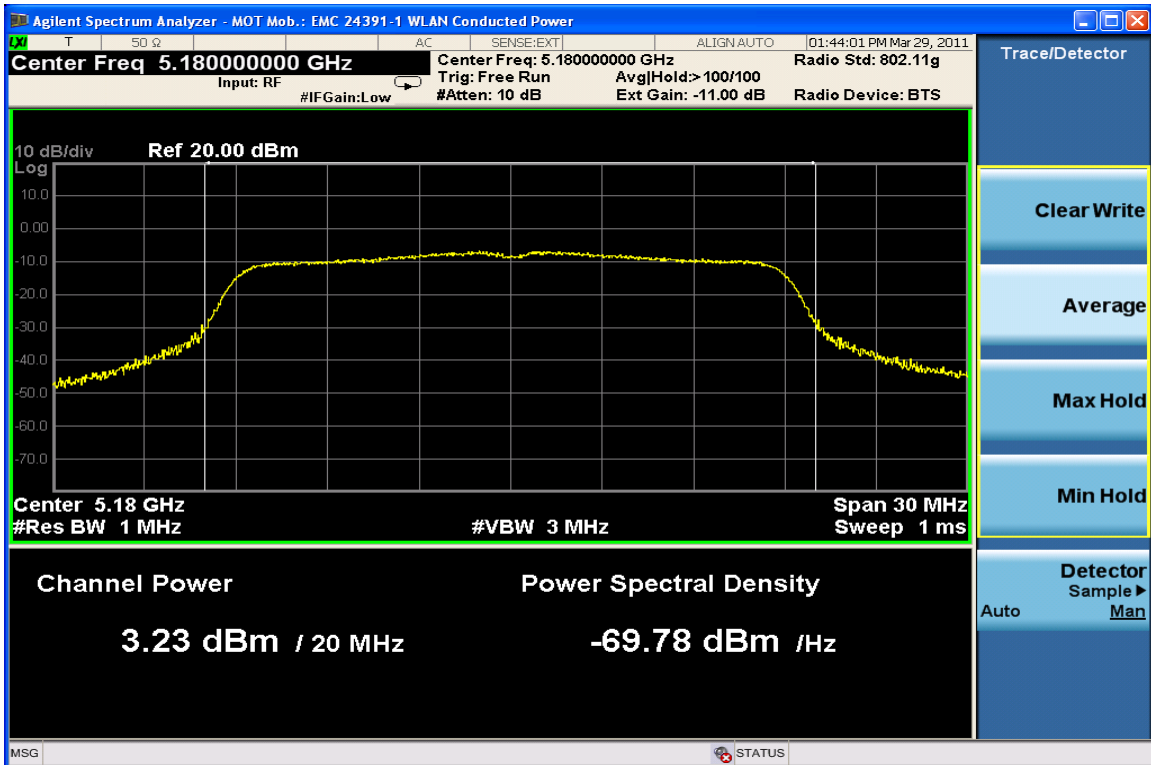


**Max. Power Channel 44 @ 6.5 Mbps**

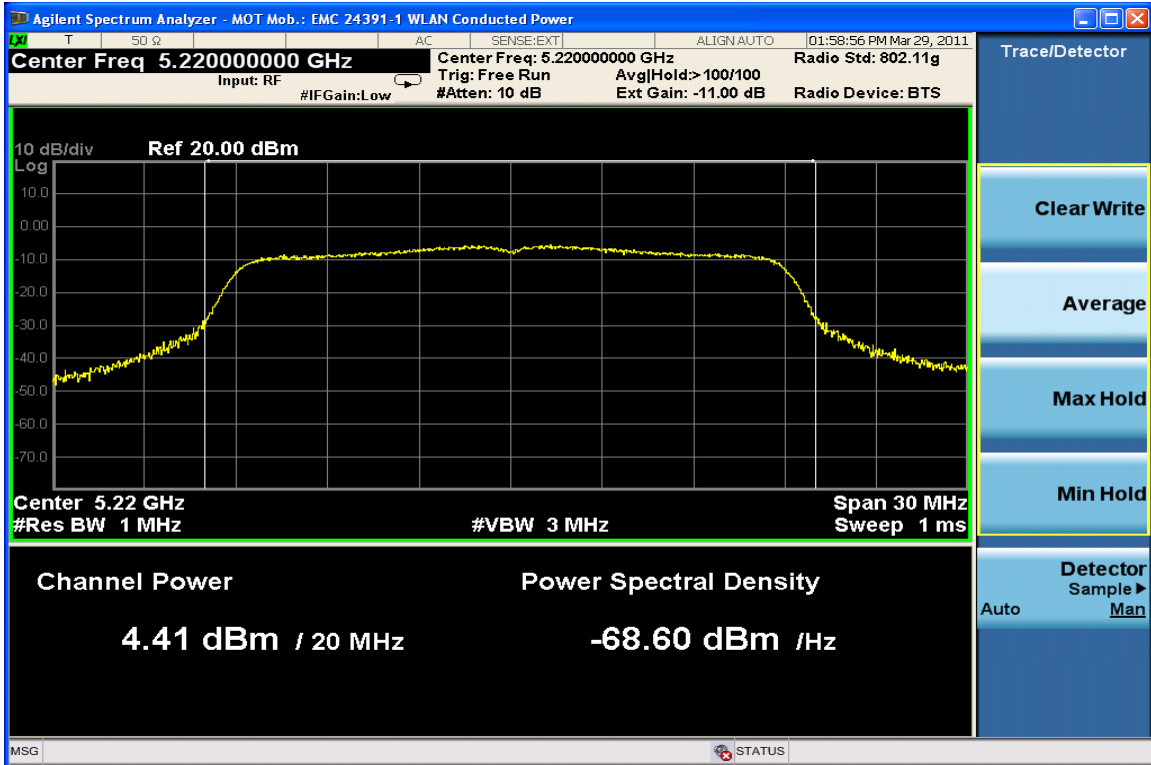


Max. Power Channel 48 @ 6.5 Mbps

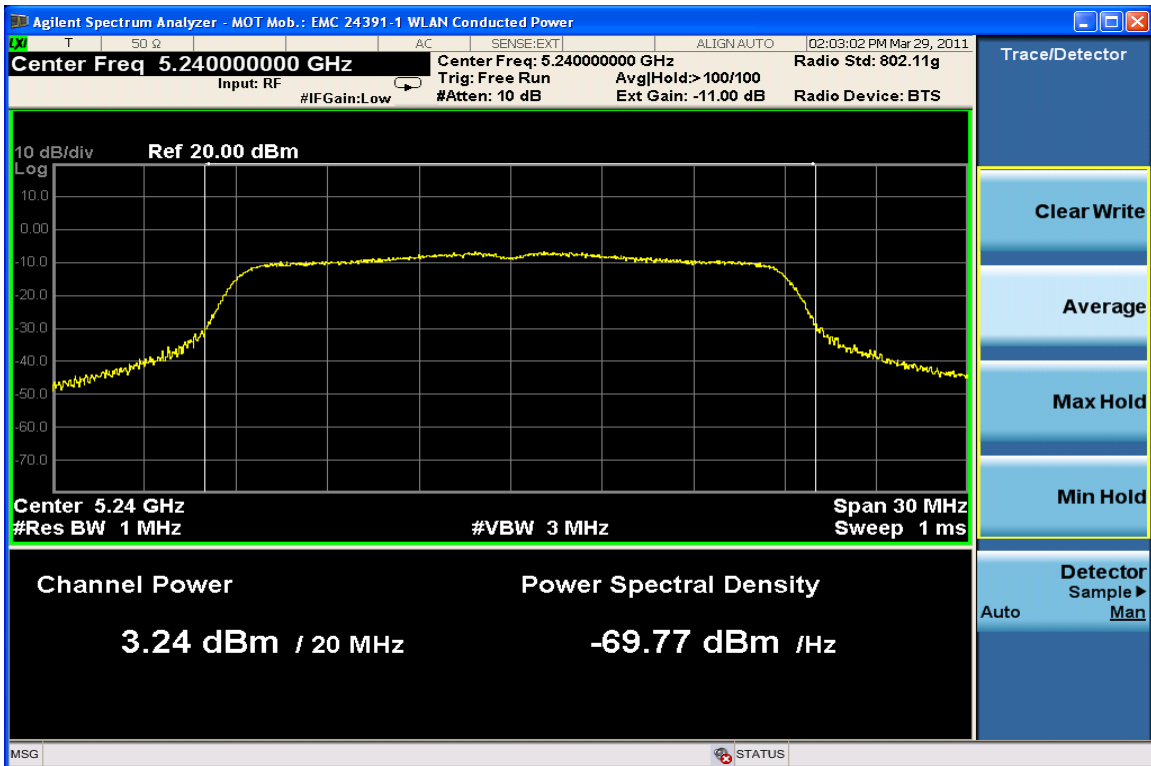
**802.11n (400ns) @ 14.4 Mbps**



Max. Power Channel 36 @ 14.4 Mbps

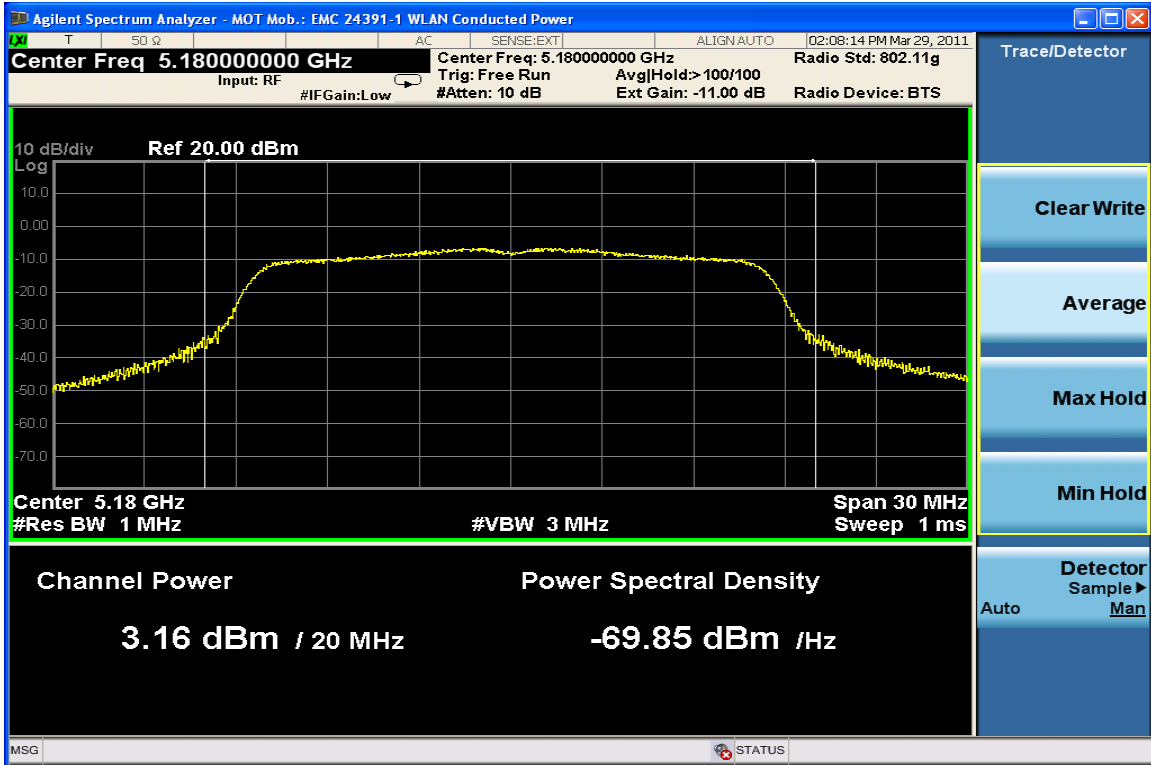


Max. Power Channel 44 @ 14.4 Mbps

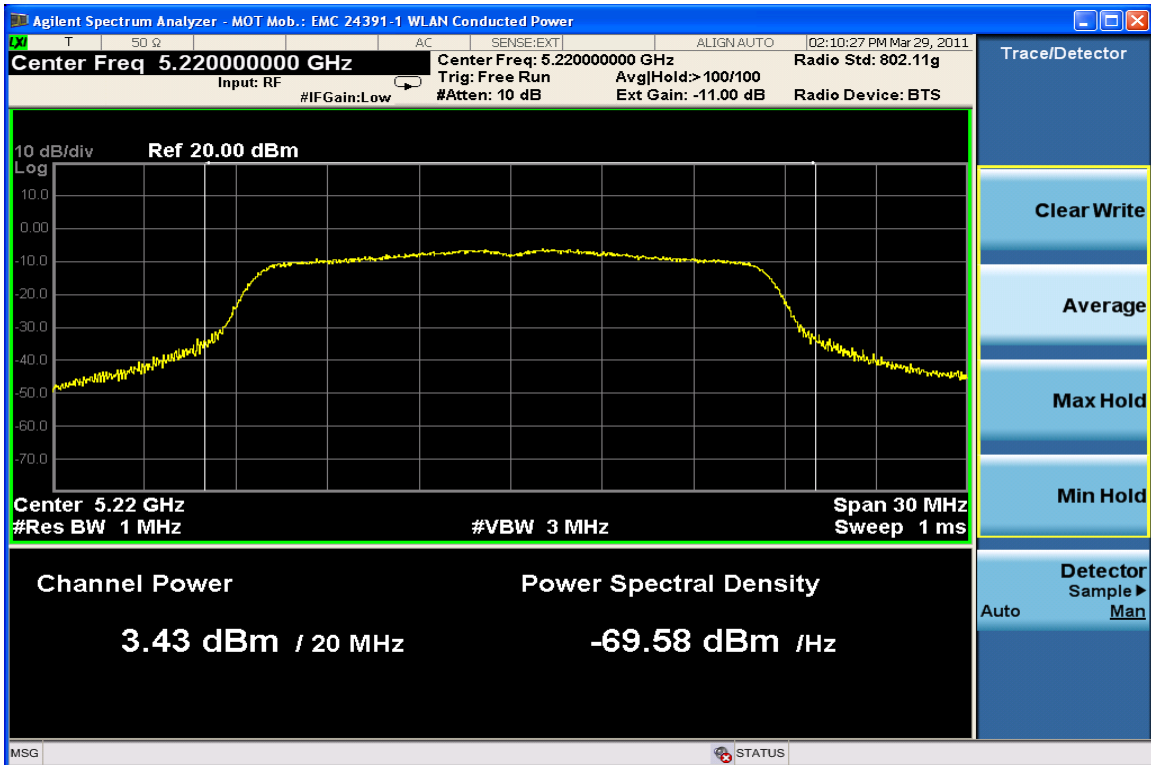


Max. Power Channel 48 @ 14.4 Mbps

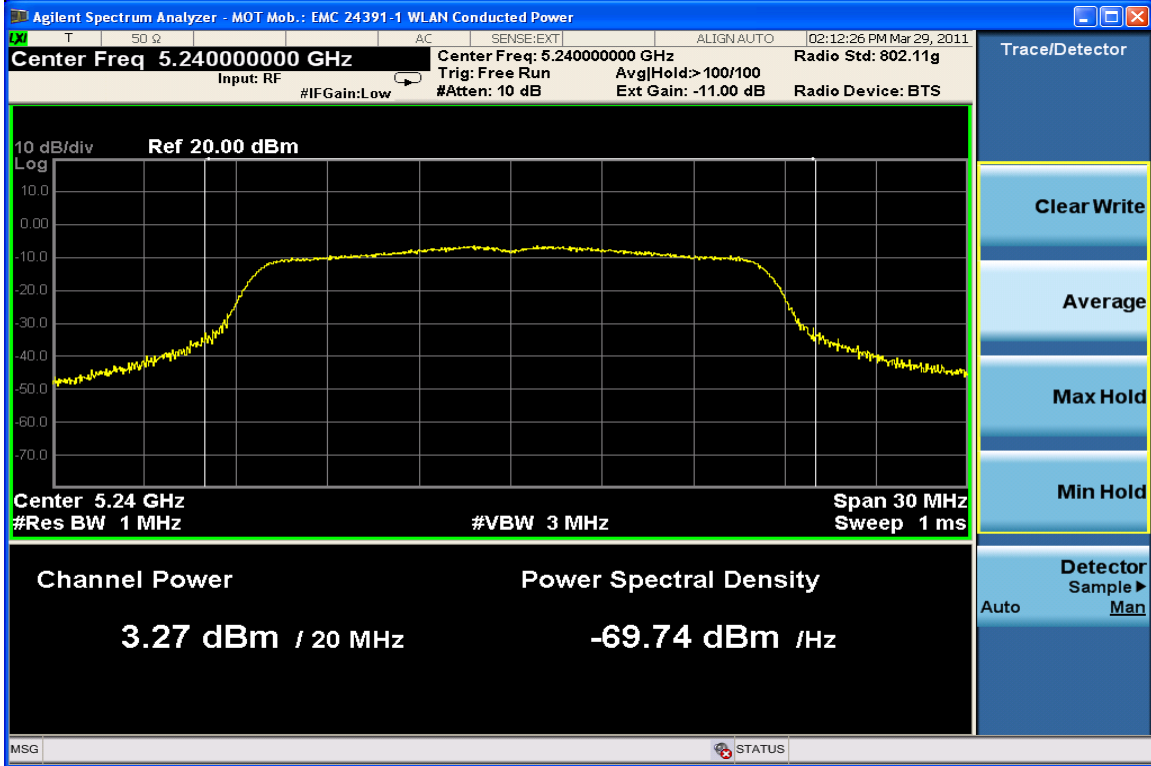
**802.11a @ 12 Mbps**



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



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



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 10dB passive attenuator. A fully charged battery was used for the supply voltage. Method 1 of DA 02-2138 was used for this measurement.

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**

<b>5180 MHz</b>	<b>5220 MHz</b>	<b>5240 MHz</b>
3.086	2.972	2.874

**802.11 n @ 6.5 Mbps**

<b>5180 MHz</b>	<b>5220 MHz</b>	<b>5240 MHz</b>
2.824	3.349	2.746

**802.11 n @ 14.4 Mbps**

<b>5180 MHz</b>	<b>5220 MHz</b>	<b>5240 MHz</b>
3.333	3.162	3.207

**802.11 a @ 12 Mbps**

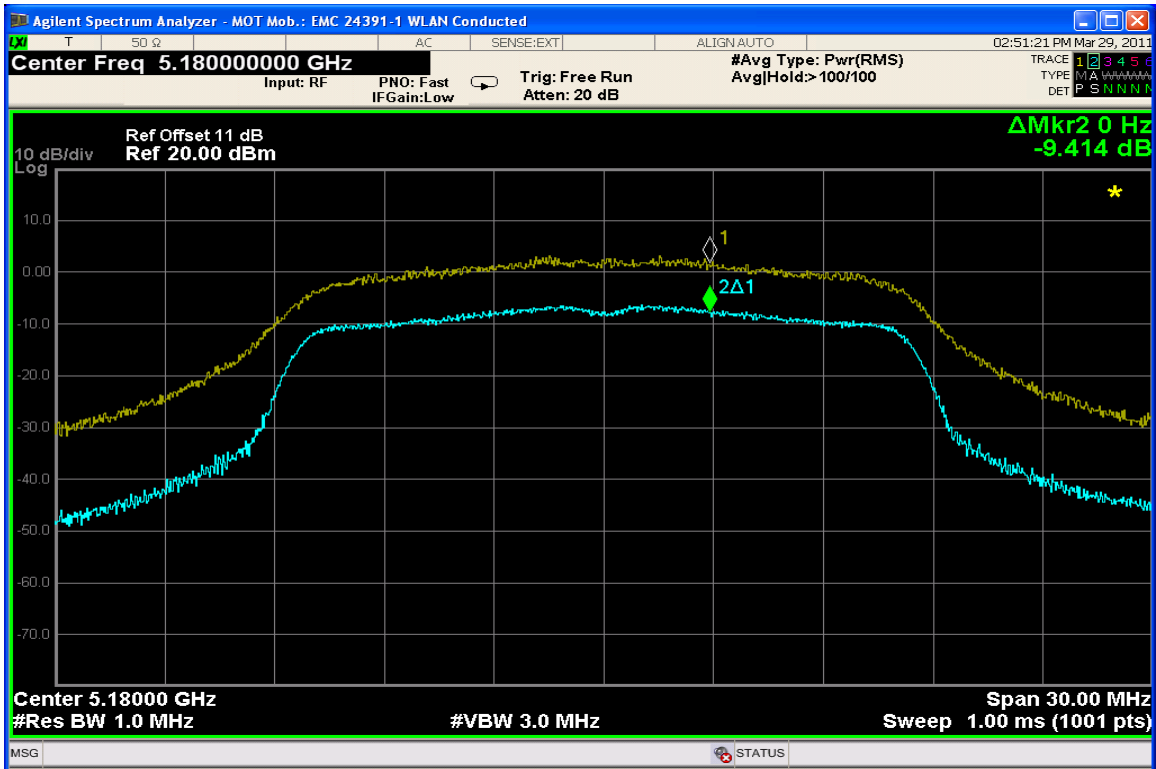
## **Peak Excursion Ratio**

### **Measurement Procedure**

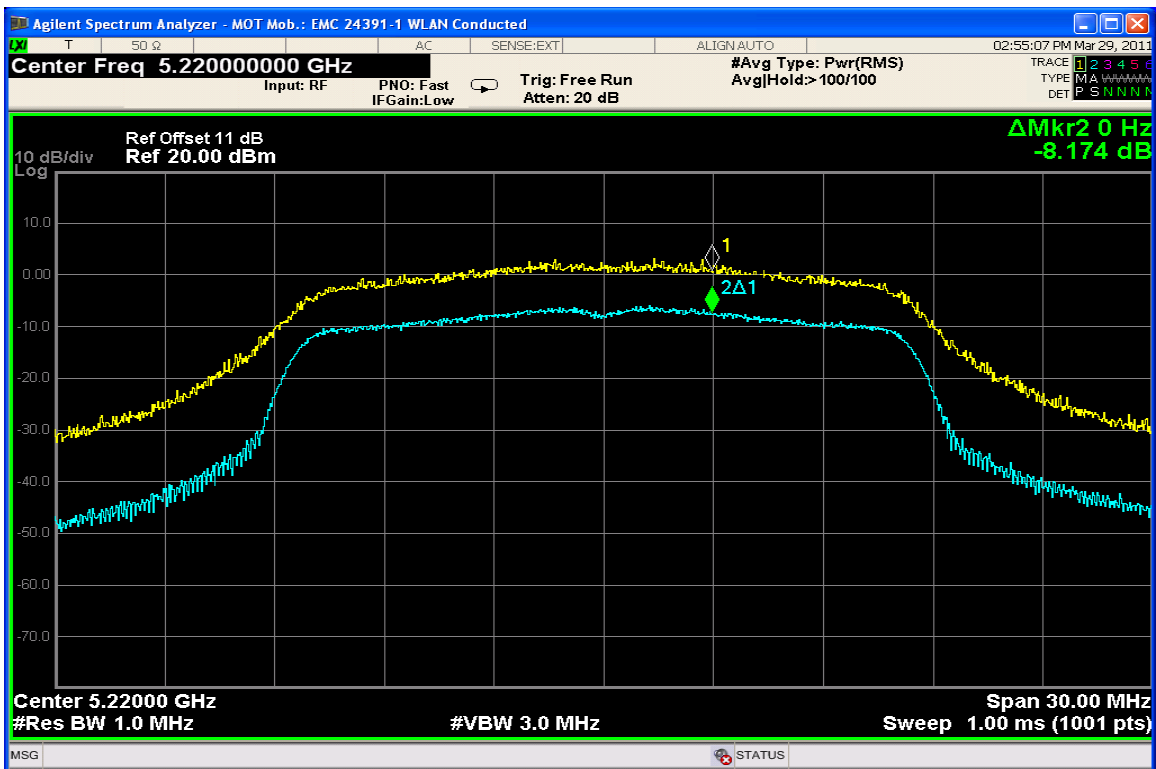
The RF output port of the Equipment-Under-Test is directly coupled to the input of the EMC analyzer through a specialized RF connector and a 10dB passive attenuator. A fully charged battery was used for the supply voltage.

### **Measurement Results**

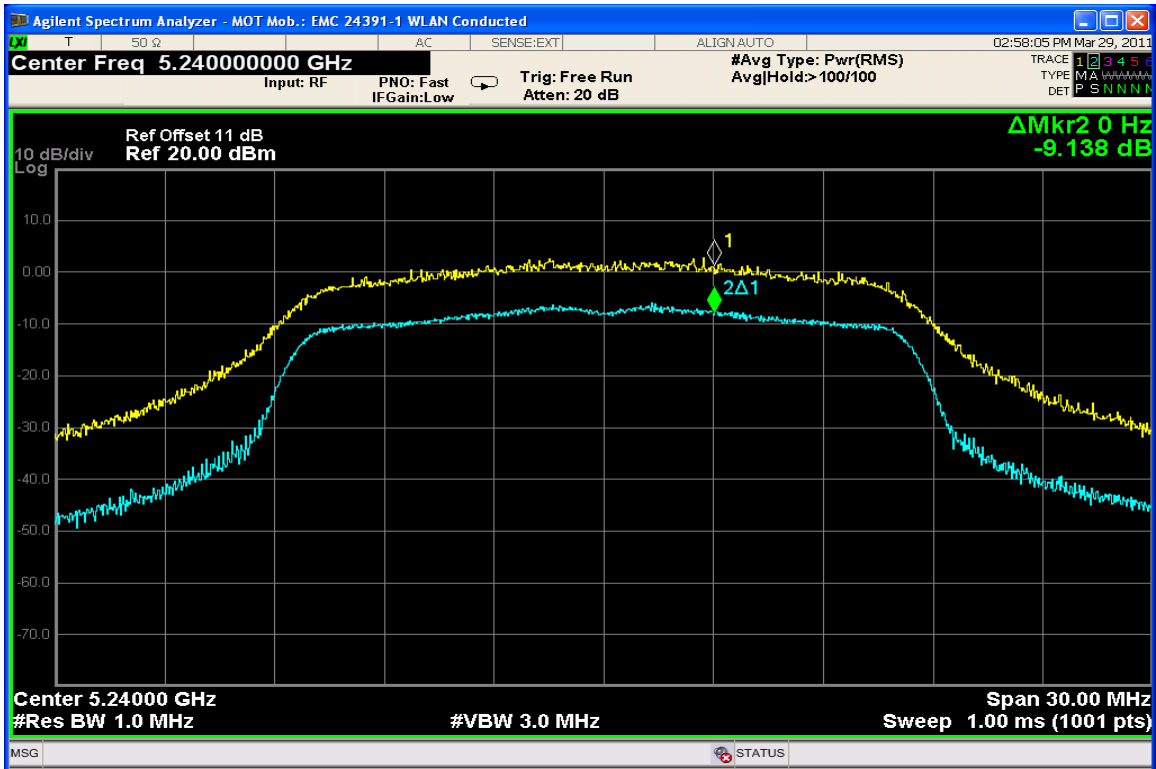
**See attached**



**Peak Excursion Ch. 36 @ 12Mbps**



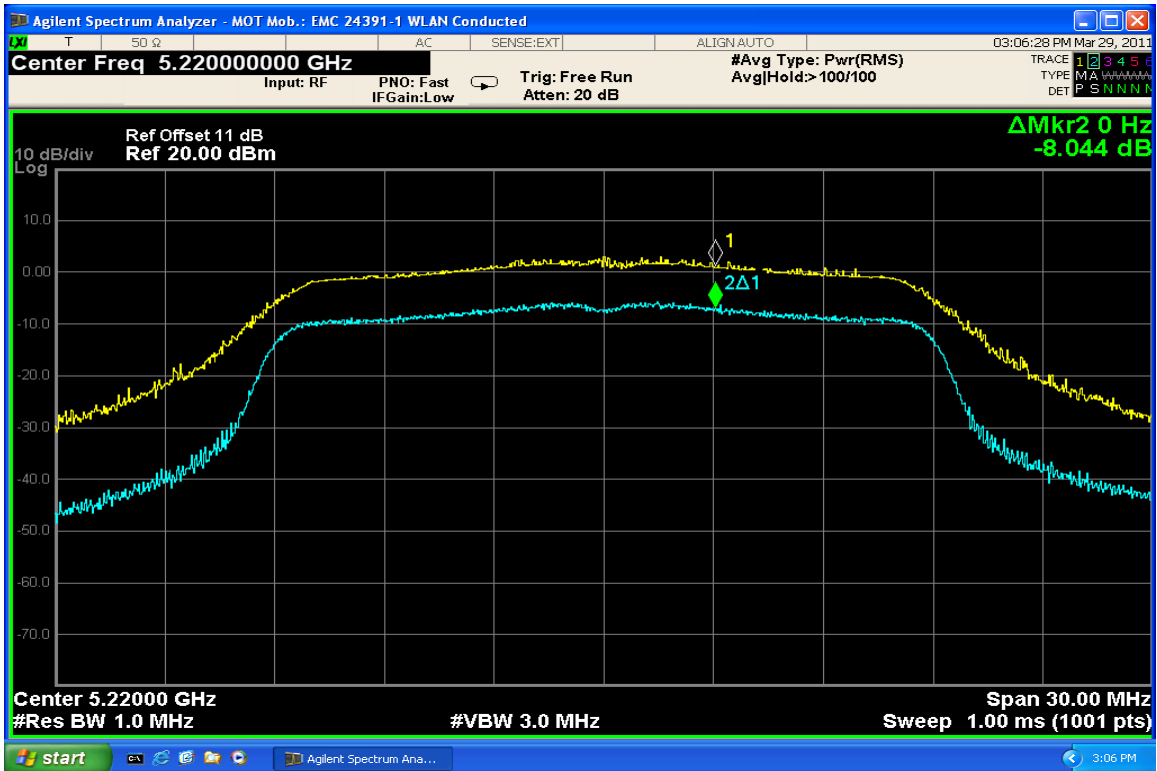
**Peak Excursion Ch. 44 @ 12Mbps**



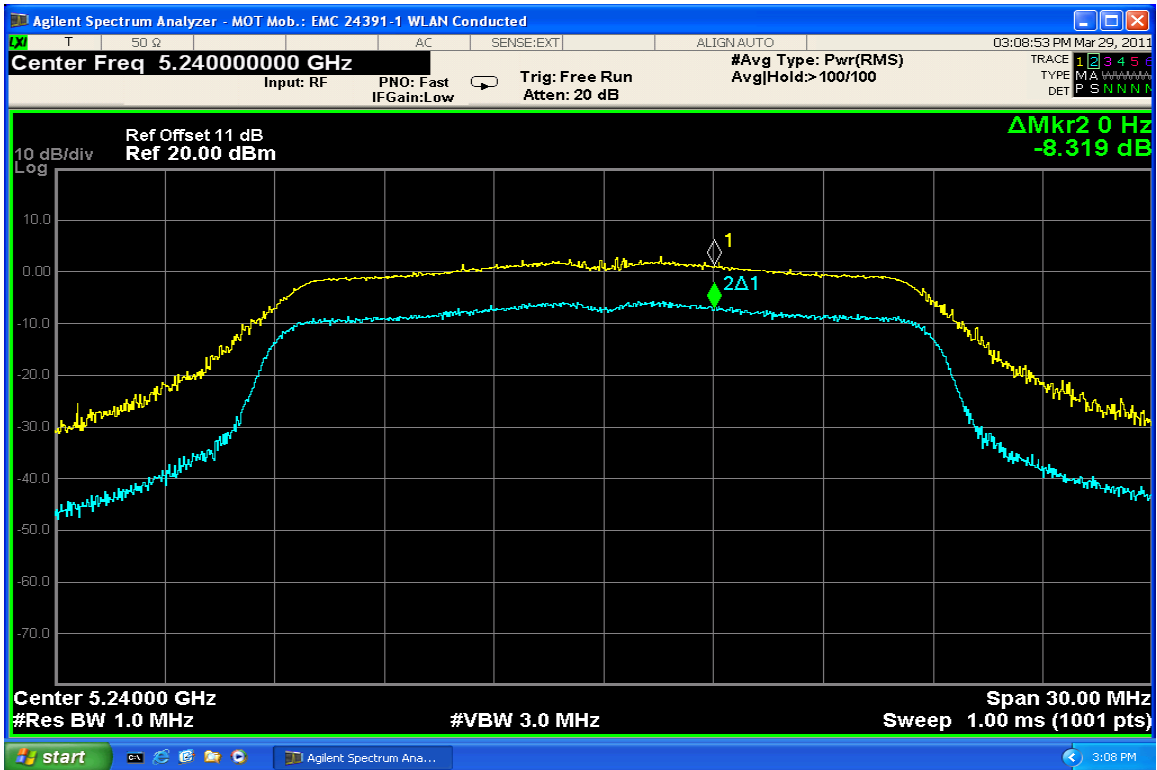
**Peak Excursion Ch. 48 @ 12Mbps**



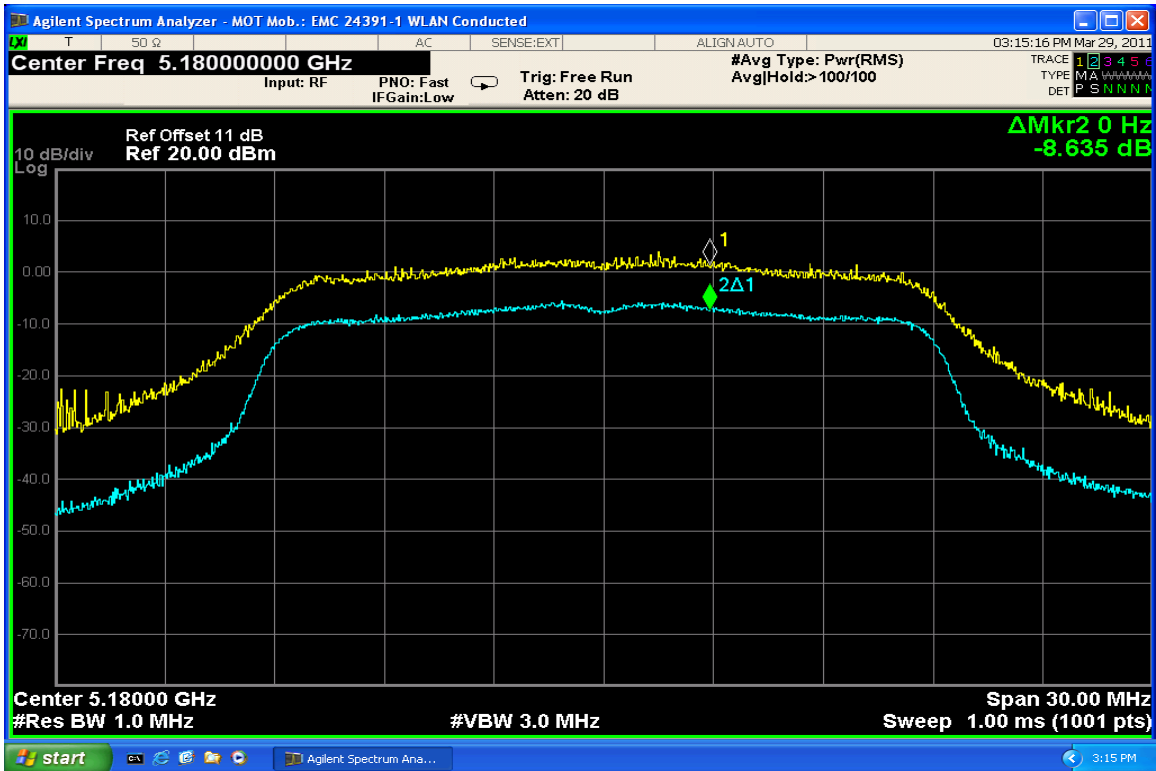
**Peak Excursion Ch. 36 @ 6.5Mbps**



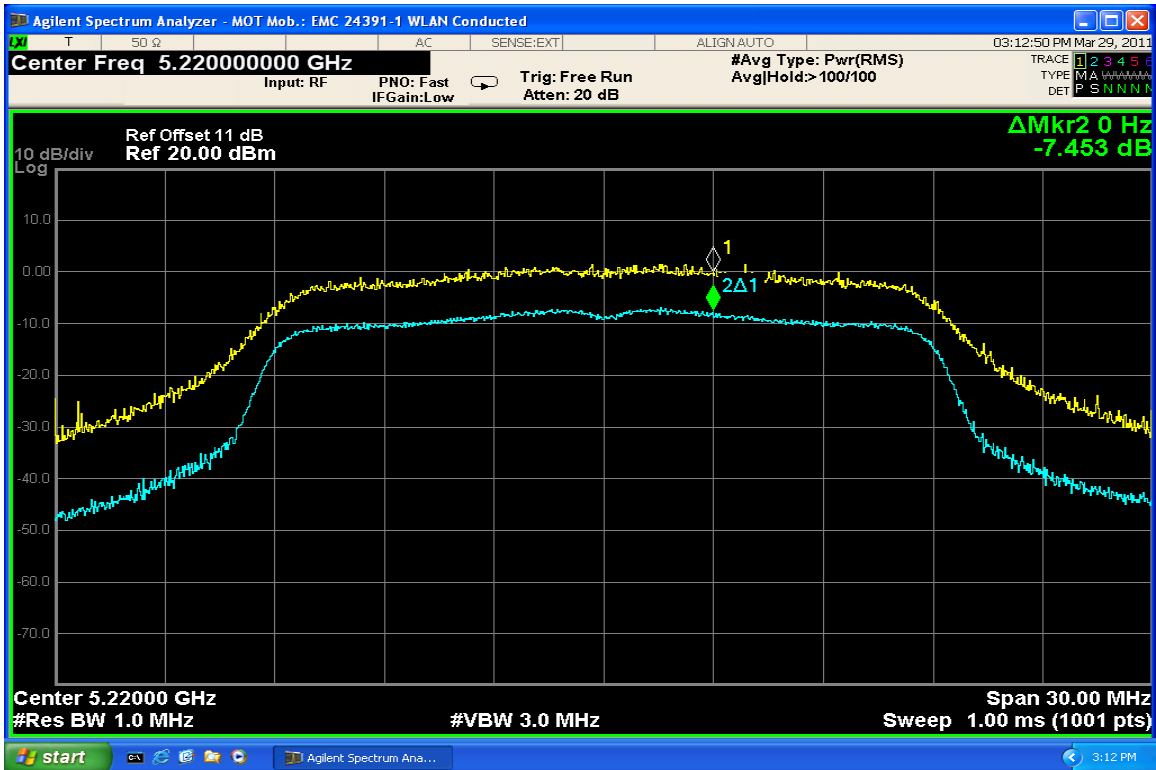
**Peak Excursion Ch. 44 @ 6.5Mbps**



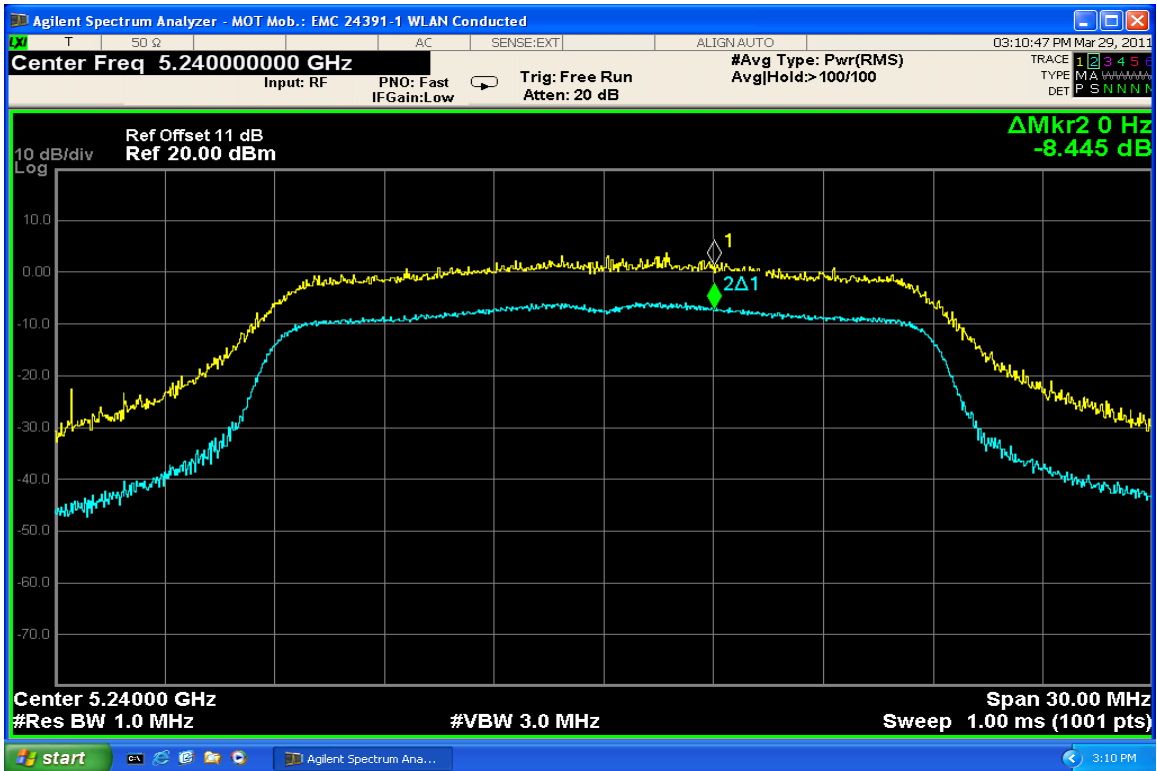
**Peak Excursion Ch. 48 @ 6.5Mbps**



**Peak Excursion Ch. 36 @ 14.4Mbps**



**Peak Excursion Ch. 44 @ 14.4Mbps**



**Peak Excursion Ch. 48 @ 14.4Mbps**

## **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  $-30^{\circ}\text{C}$  to  $+50^{\circ}\text{C}$  and at intervals of  $10^{\circ}\text{C}$  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
-30 C	44	a	12	5218.59	5218.65	0.06
-20 C	44	a	12	5220.9	5218.65	-2.25
-10 C	44	a	12	5218.98	5218.65	-0.33
0 C	44	a	12	5221.59	5218.65	-2.94
10 C	44	a	12	5221.74	5218.65	-3.09
20 C	44	a	12	5218.65	5218.65	0
30 C	44	a	12	5218.32	5218.65	0.33
40 C	44	a	12	5218.65	5218.65	0
50 C	44	a	12	5218.65	5218.65	0
20 C @ 6.4 V Batt end point	44	a	12	5218.56	5218.65	0.09

Temp	Channel	Mode	Data Rate	Frequency	Initial Frequency	Deviation
-30 C	44	n	6.5	5221.8	5220.33	-1.47
-20 C	44	n	6.5	5220.6	5220.33	-0.27
-10 C	44	n	6.5	5223.06	5220.33	-2.73
0 C	44	n	6.5	5218.74	5220.33	1.59
10 C	44	n	6.5	5218.44	5220.33	1.89
20 C	44	n	6.5	5220.33	5220.33	0
30 C	44	n	6.5	5219.85	5220.33	0.48
40 C	44	n	6.5	5220.75	5220.33	-0.42
50 C	44	n	6.5	5218.8	5220.33	1.53
20 C @ 6.4 V Batt end point	44	n	6.5	5218.11	5220.33	2.22

Temp	Channel	Mode	Data Rate	Frequency	Initial Frequency	Deviation
-30 C	44	n	14.4	5221.38	5219.46	-1.92
-20 C	44	n	14.4	5221.59	5219.46	-2.13
-10 C	44	n	14.4	5221.8	5219.46	-2.34
0 C	44	n	14.4	5218.77	5219.46	0.69
10 C	44	n	14.4	5221.62	5219.46	-2.16
20 C	44	n	14.4	5219.46	5219.46	0
30 C	44	n	14.4	5221.83	5219.46	-2.37
40 C	44	n	14.4	5219.64	5219.46	-0.18
50 C	44	n	14.4	5221.47	5219.46	-2.01
20 C @ 6.4 V Batt end point	44	n	14.4	5221.35	5219.46	-1.89

## **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.

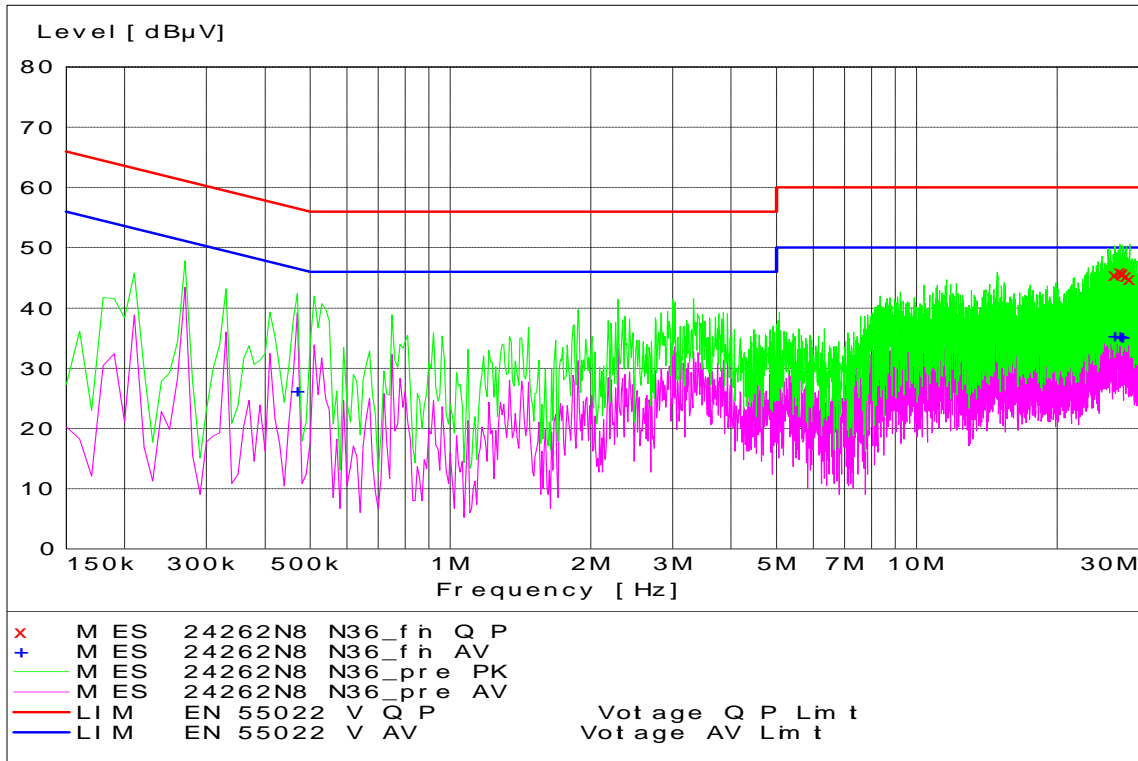
All radio-noise voltage and current measurements shall be made on each current-carrying conductor at the plug end of the EUT power cord or calibrated extension cord by the use of mating plugs and receptacles on the EUT and LISN. Equipment shall be tested with power cords that are normally supplied using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

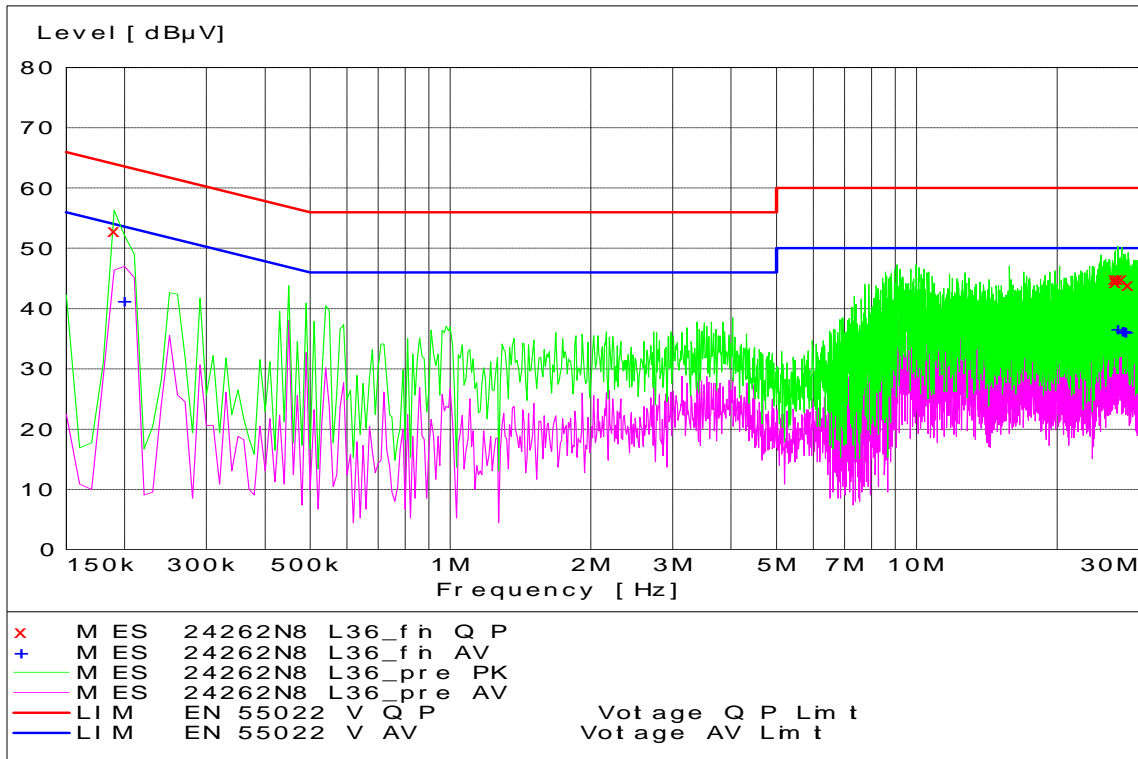
### **Measurement Results**

See attached:

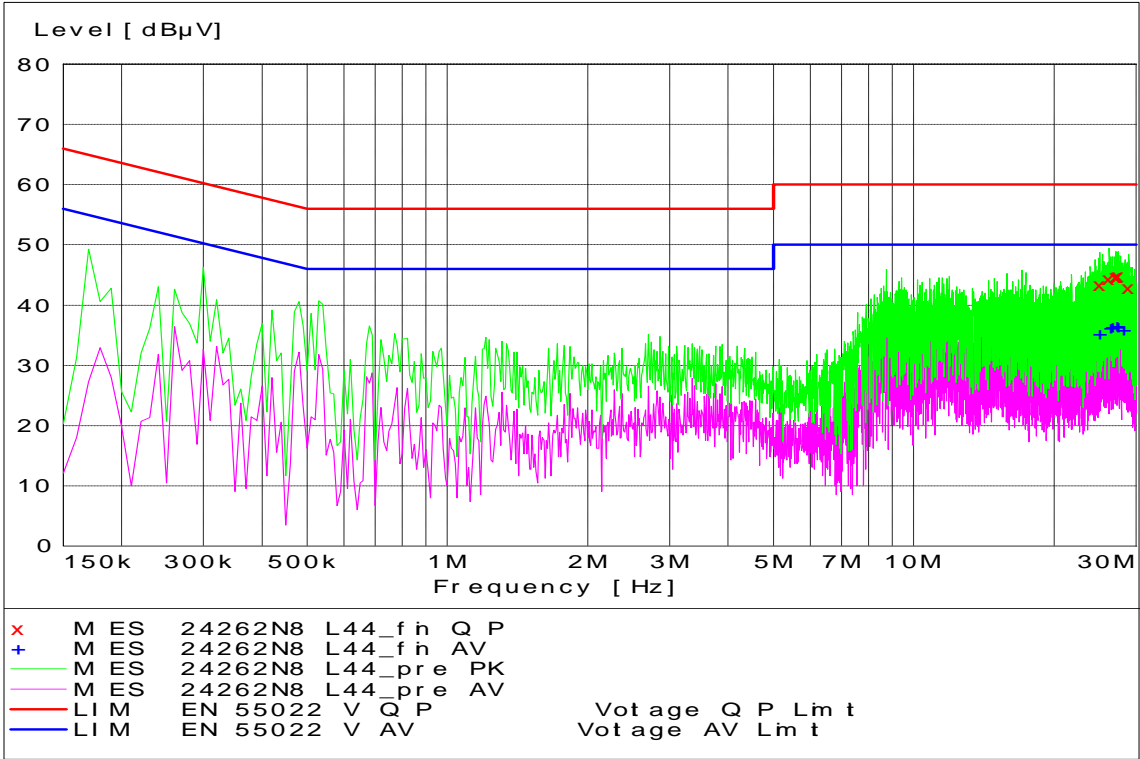
**802.11 n @ 6.5 Mbps**



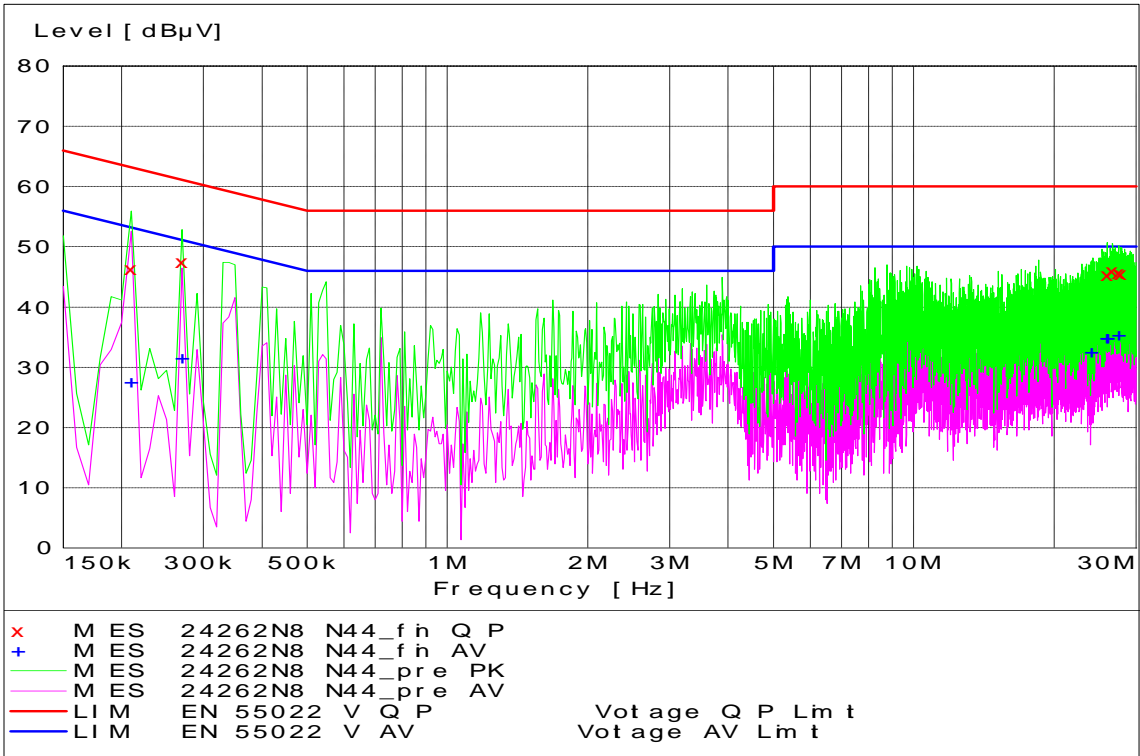
**WLAN Channel 36 - Tx Mode - Neutral Coupling**



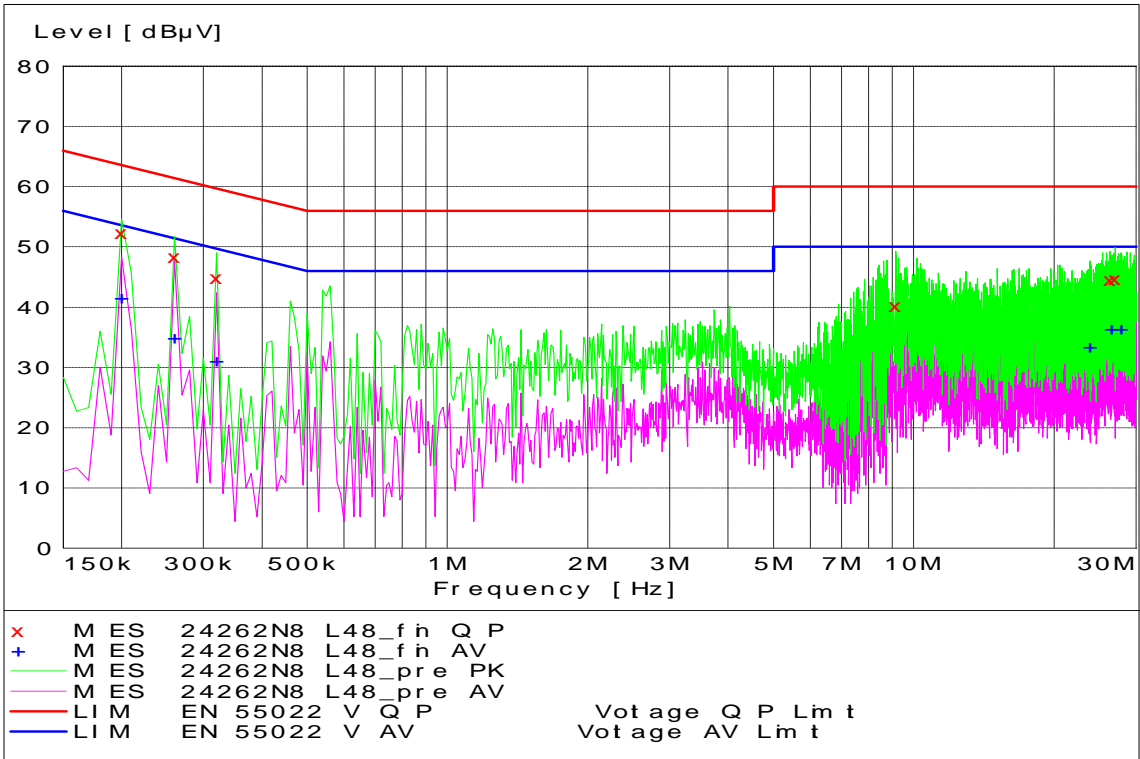
**WLAN Channel 36 - Tx Mode - Line Coupling**



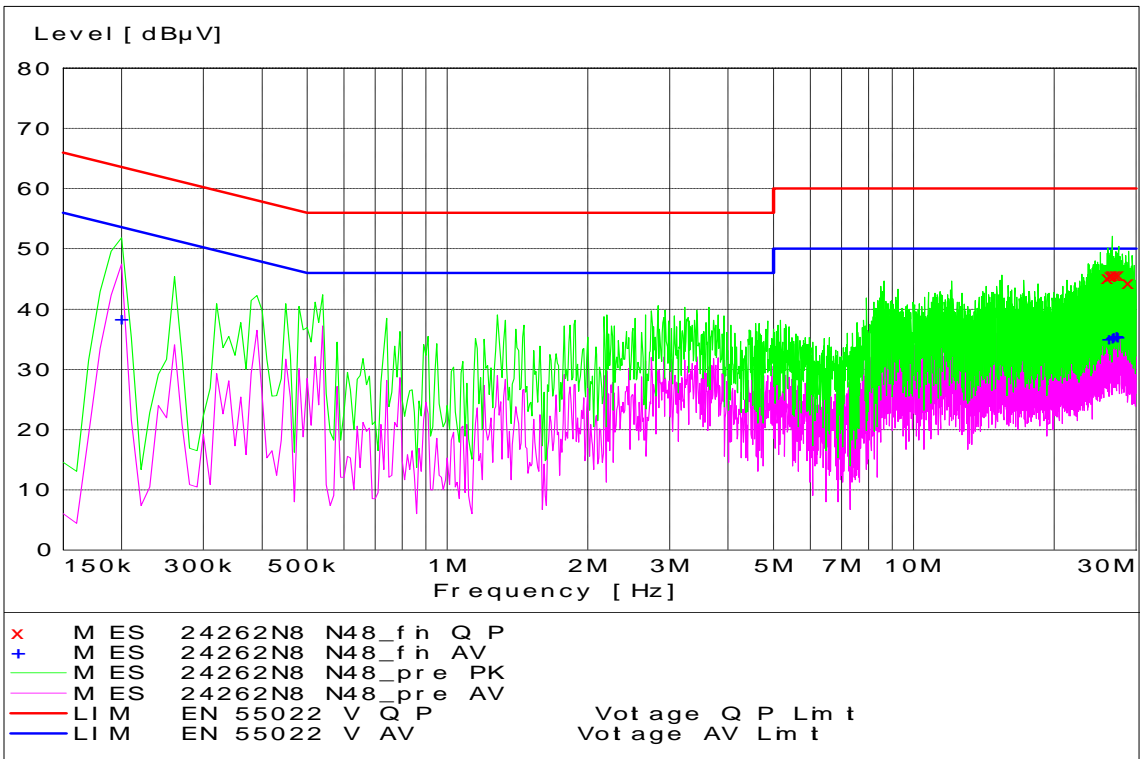
**WLAN Channel 44 - Tx Mode - Line Coupling**



**WLAN Channel 44 - Tx Mode - Neutral Coupling**

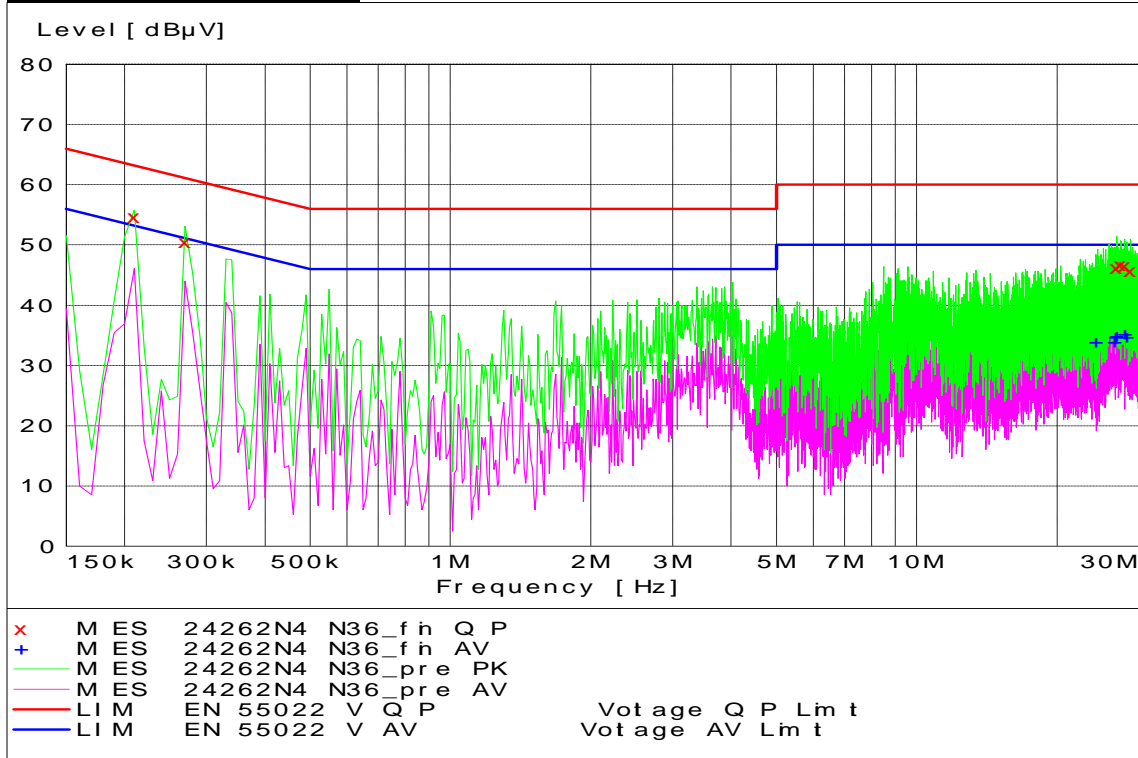


**WLAN Channel 48 - Tx Mode - Line Coupling**

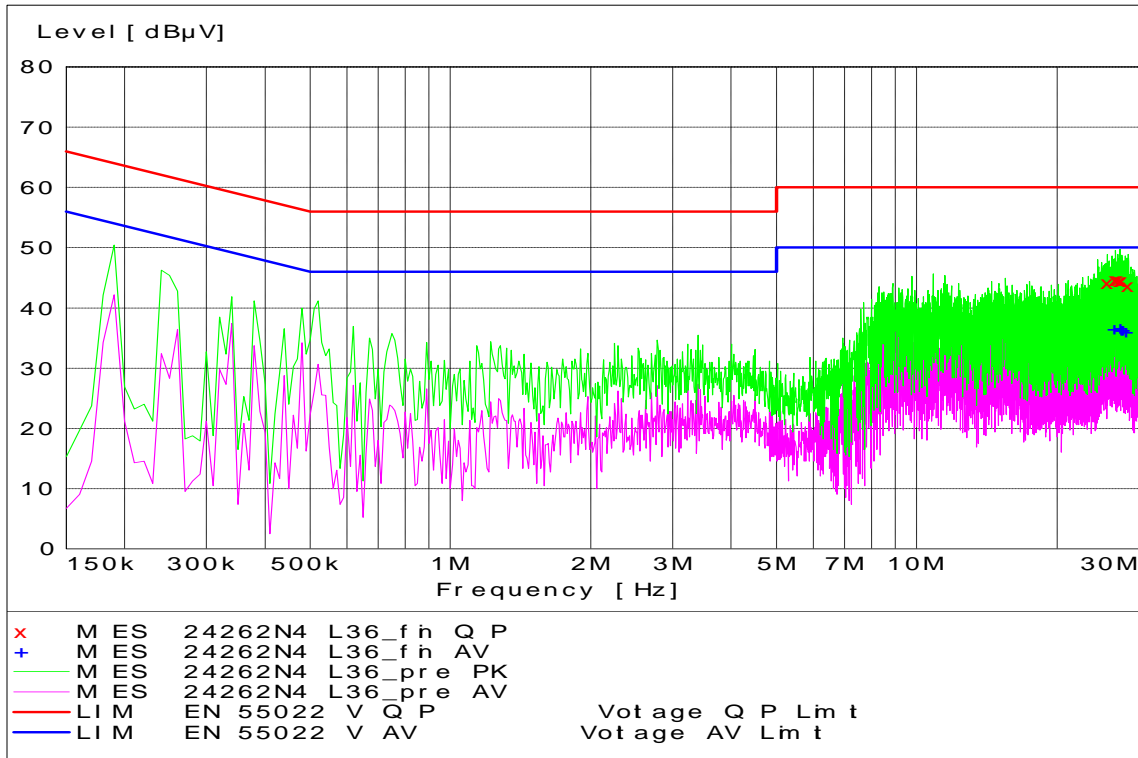


**WLAN Channel 48 - Tx Mode - Neutral Coupling**

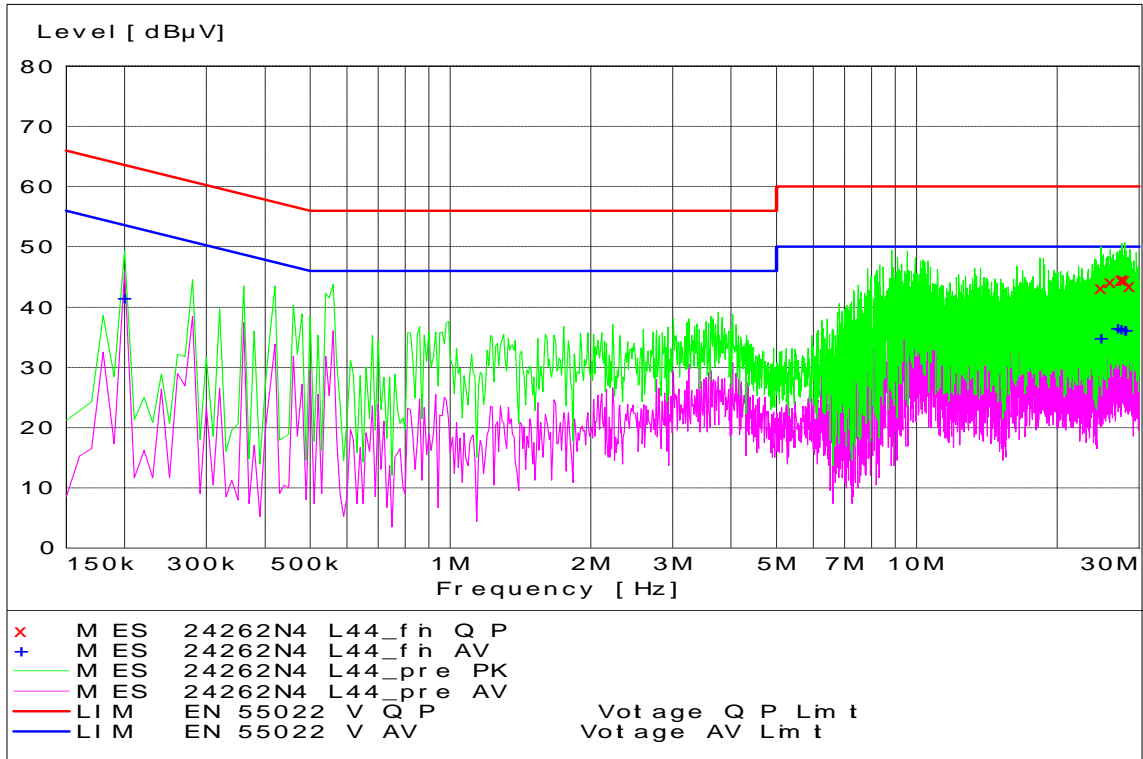
**802.11 n @ 14.4 Mbps**



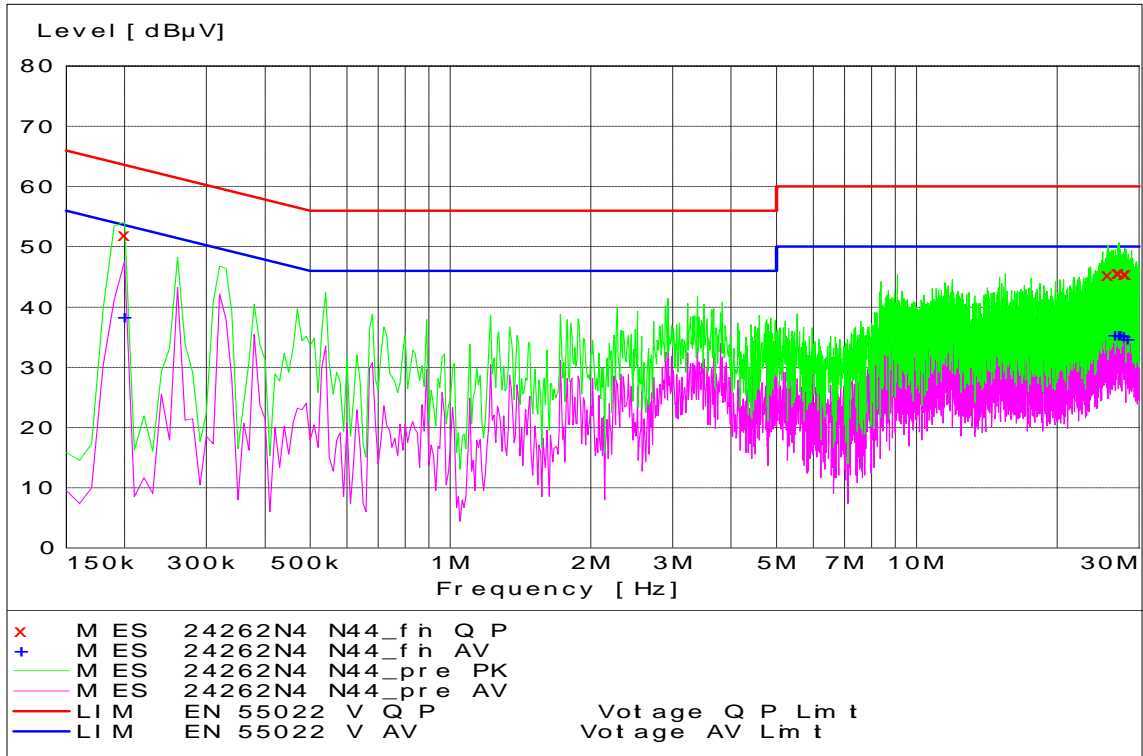
**WLAN Channel 36 - Tx Mode - Neutral Coupling**



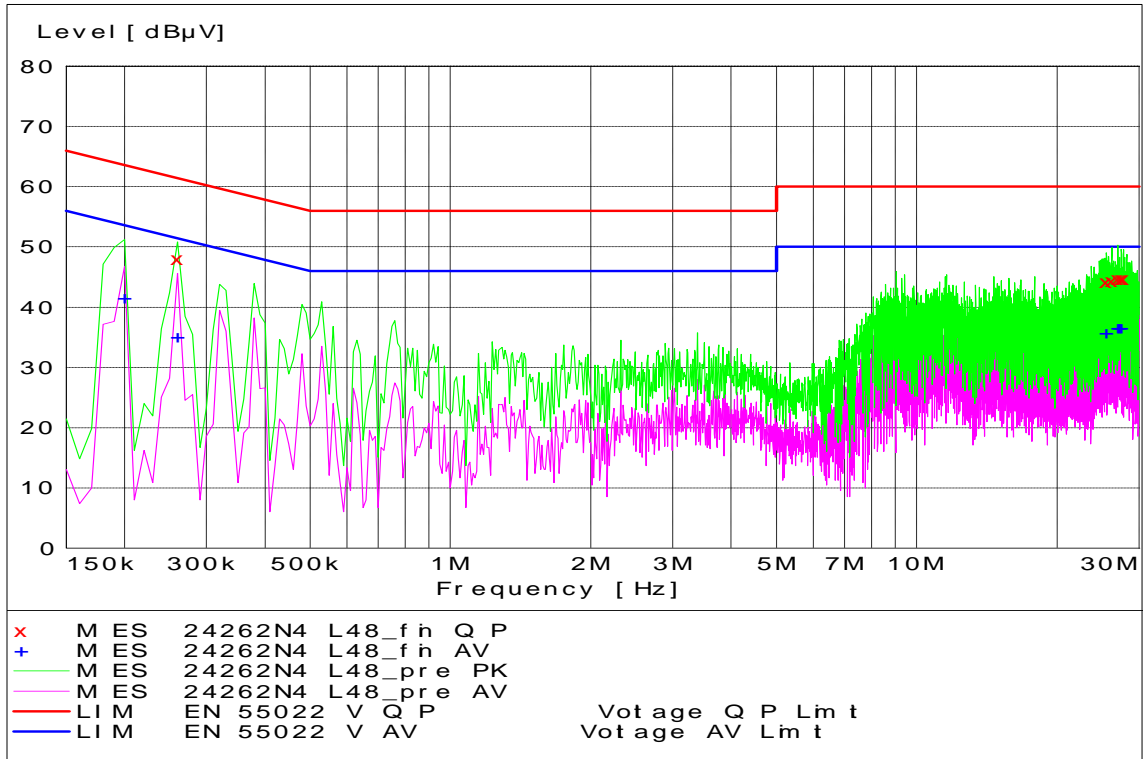
**WLAN Channel 36 - Tx Mode - Line Coupling**



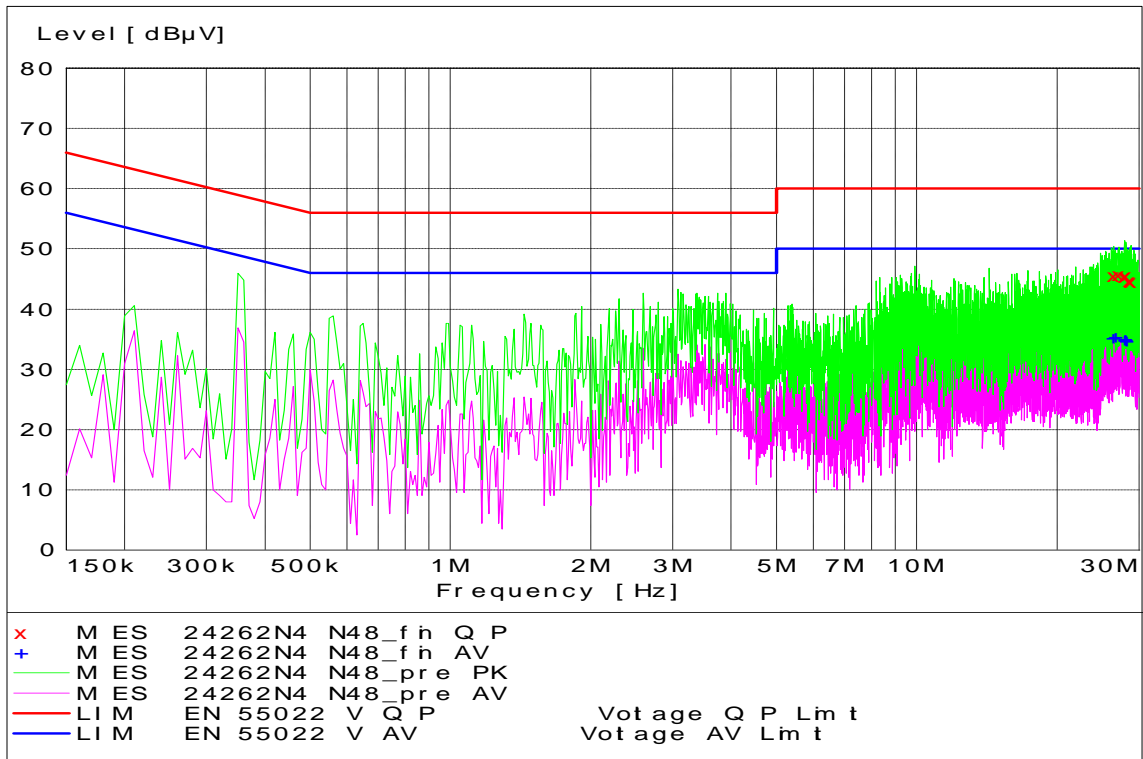
**WLAN Channel 44 - Tx Mode - Line Coupling**



**WLAN Channel 44 - Tx Mode - Neutral Coupling**

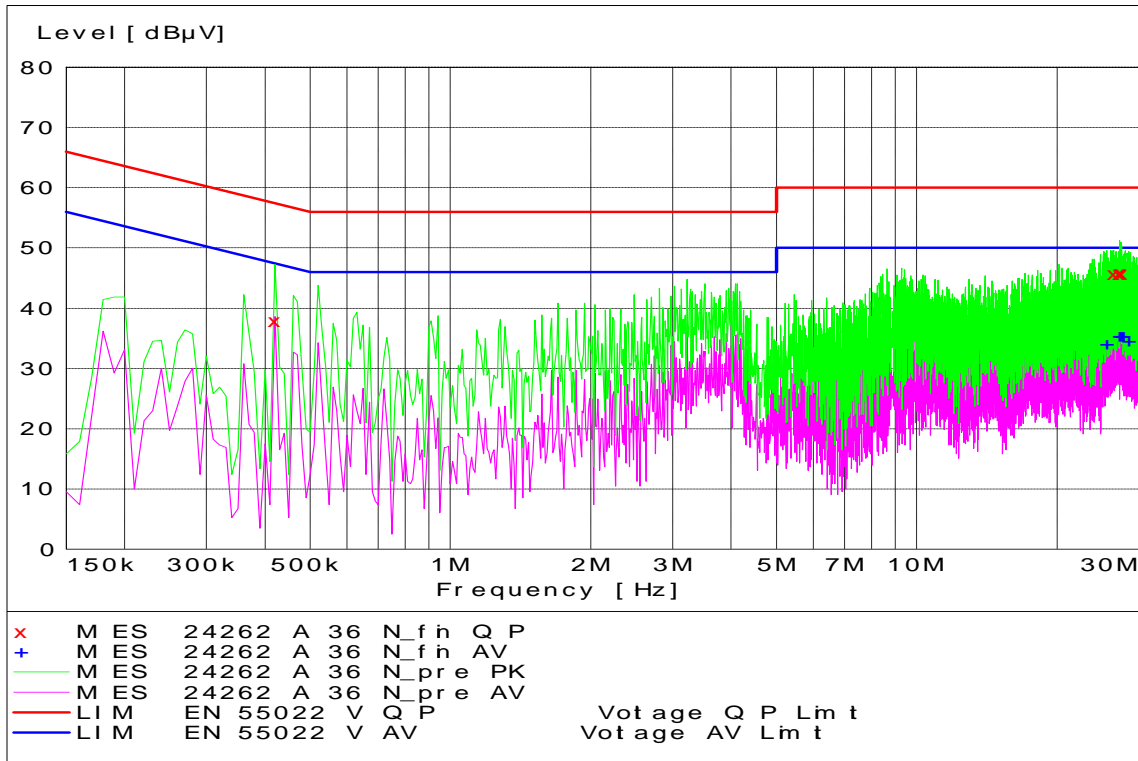


**WLAN Channel 48 - Tx Mode - Line Coupling**

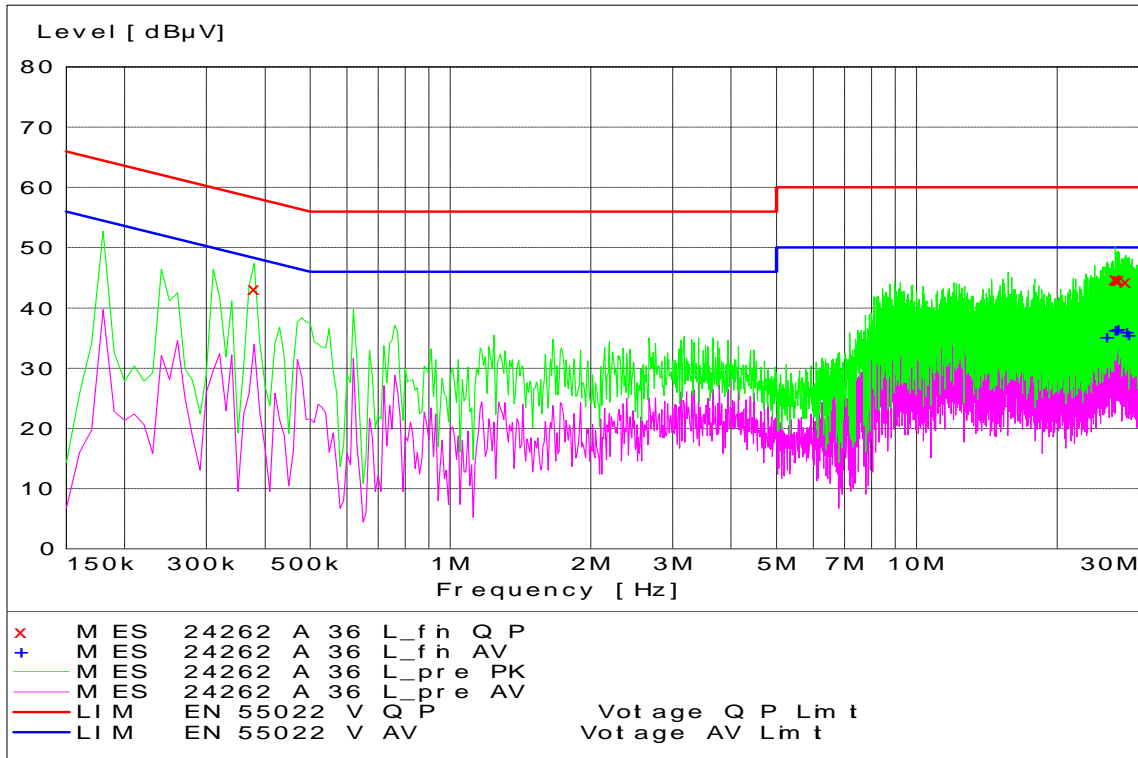


**WLAN Channel 48 - Tx Mode - Neutral Coupling**

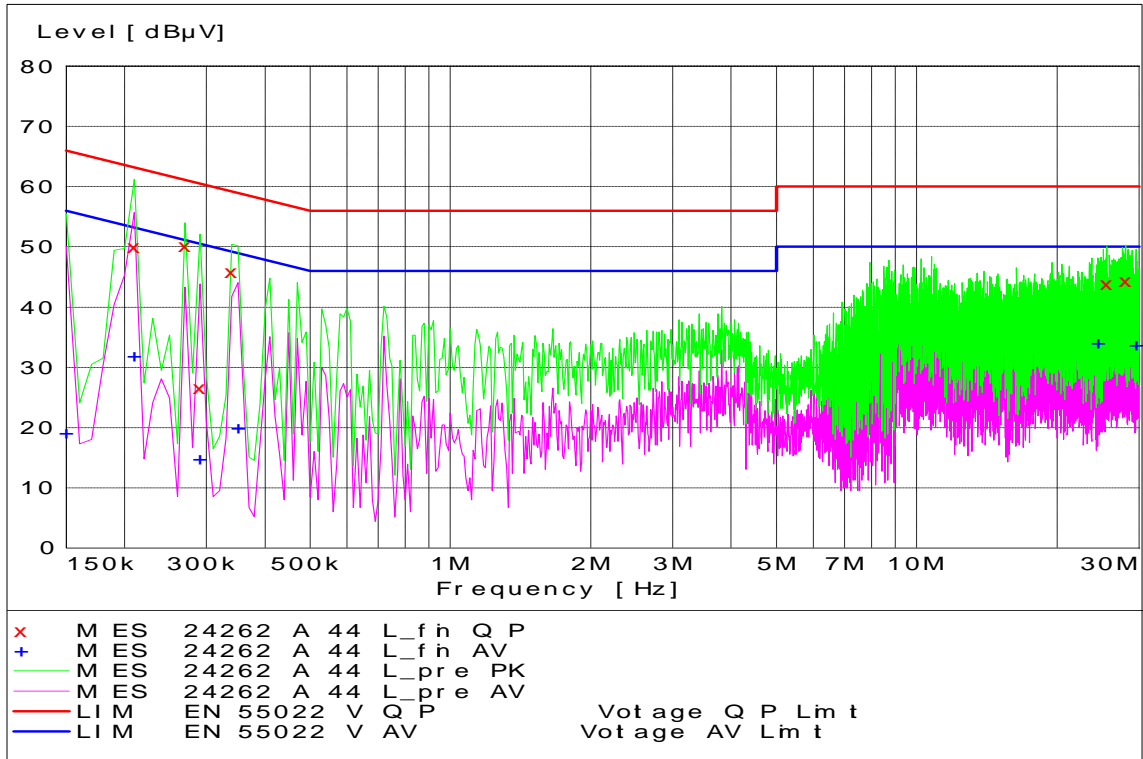
**802.11 a @ 12 Mbps**



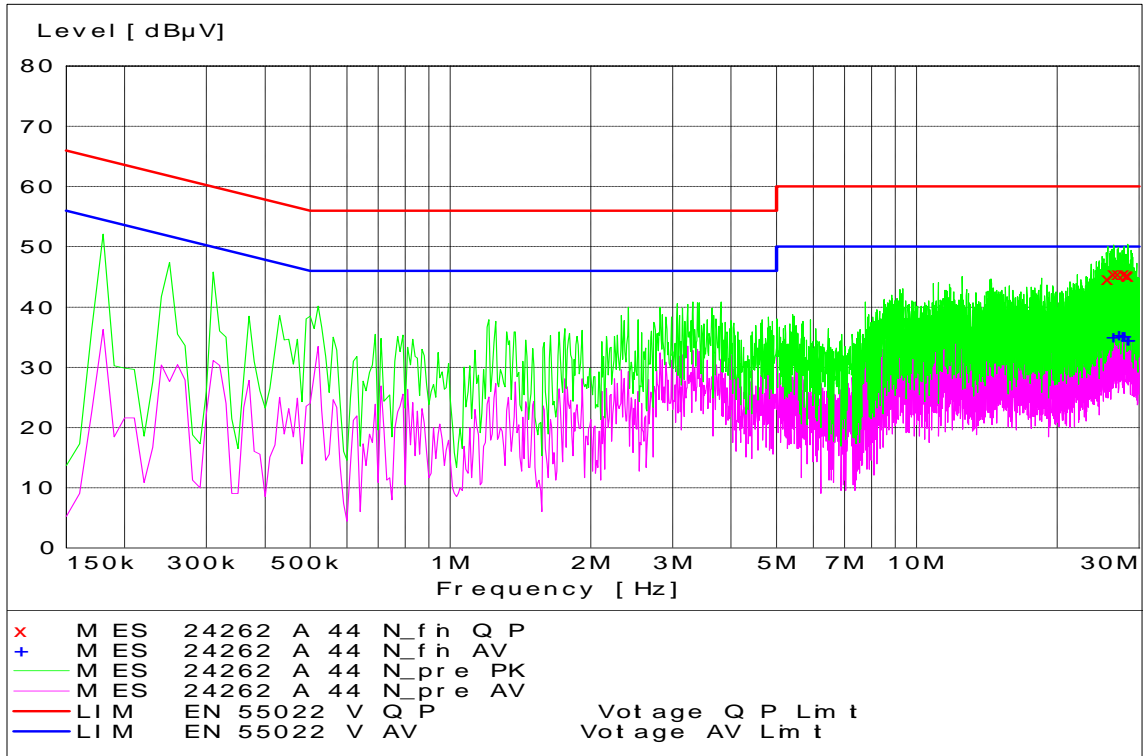
**WLAN Channel 36 - Tx Mode - Neutral Coupling**



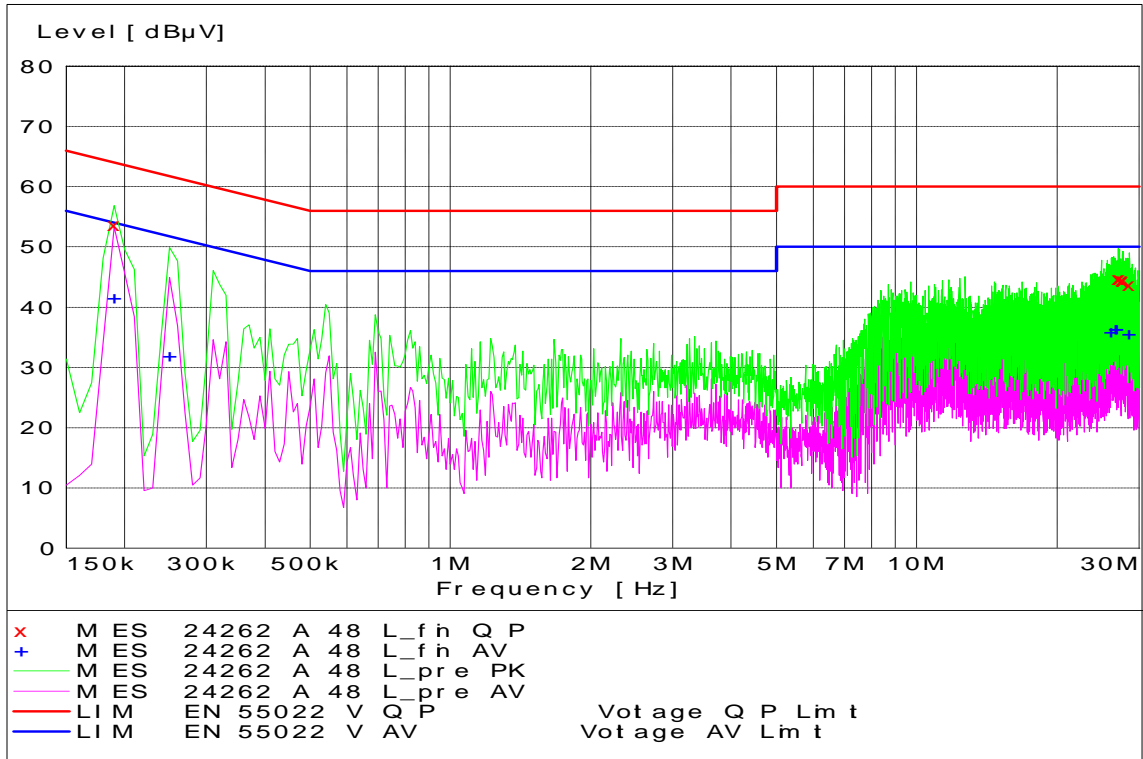
**WLAN Channel 36 - Tx Mode - Line Coupling**



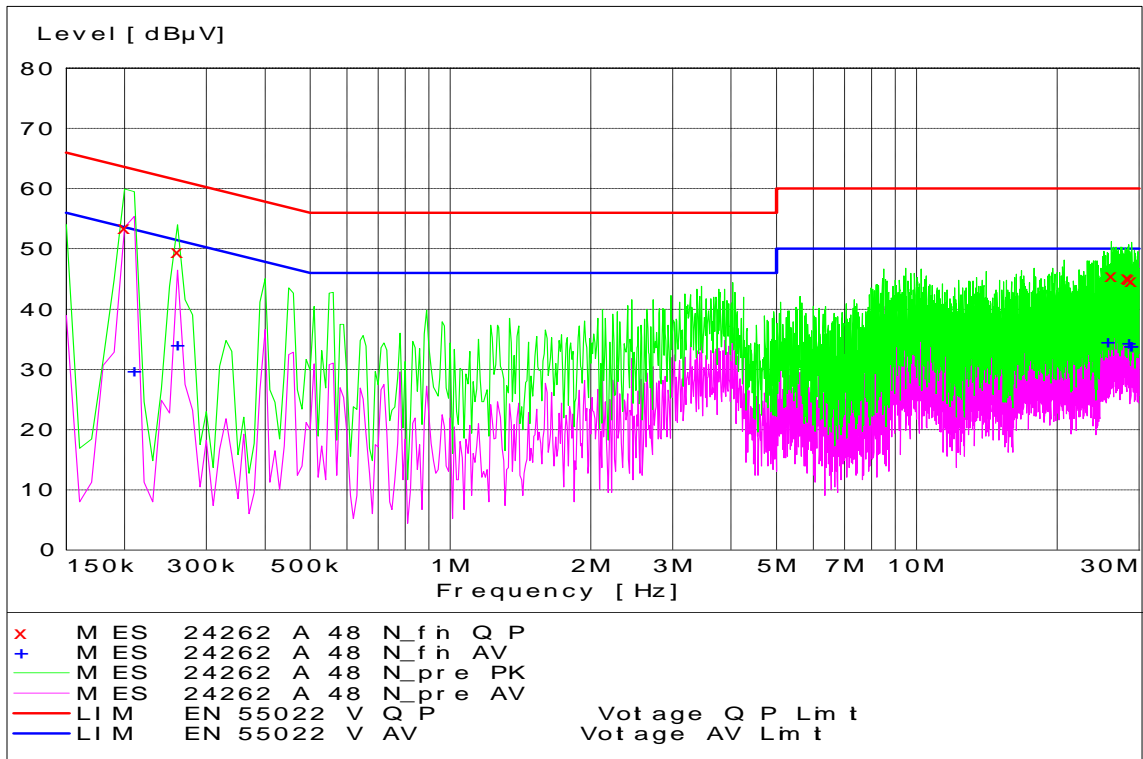
**WLAN Channel 44 - Tx Mode - Line Coupling**



**WLAN Channel 44 - Tx Mode - Neutral Coupling**



**WLAN Channel 48 - Tx Mode - Line Coupling**



**WLAN Channel 48 - Tx Mode - Neutral Coupling**

**End of Test Report**