

TEST REPORT

Report Number: 100900227DEN-003

Project Number: G100900227

Report Issue Date: 10/11/2012

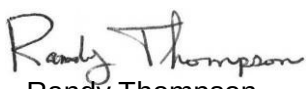
Product Designation: Model: ID:058

Standards: FCC Part 15 Subpart C (15.247)

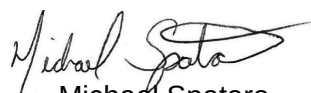
Tested by:
Intertek Testing Services NA, Inc.
1795 Dogwood St. Suite 200
Louisville, CO 80027

Client:
Echostar Technologies, LLC
90 Inverness Circle East
Englewood, CO 80112

Report prepared by


Randy Thompson
Senior EMC Project Engineer

Report reviewed by


Michael Spataro
Engineering Team Leader

This report is for the exclusive use of Intertek's Client and is provided pursuant to the agreement between Intertek and its Client. Intertek's responsibility and liability are limited to the terms and conditions of the agreement. Intertek assumes no liability to any party, other than to the Client in accordance with the agreement, for any loss, expense or damage occasioned by the use of this report. Only the Client is authorized to permit copying or distribution of this report and then only in its entirety. Any use of the Intertek name or one of its marks for the sale or advertisement of the tested material, product or service must first be approved in writing by Intertek. The observations and test results in this report are relevant only to the sample tested. This report by itself does not imply that the material, product, or service is or has ever been under an Intertek certification program.

TABLE OF CONTENTS

1	<i>Introduction and Conclusion</i>	3
2	<i>Test Summary</i>	4
3	<i>Description of Equipment Under Test</i>	6
4	<i>System setup including cable interconnection details, support equipment and simplified block diagram</i>	7
5	<i>Conducted Output Power</i>	9
6	<i>6dB Bandwidth</i>	51
7	<i>Power Spectral Density – PSD</i>	68
8	<i>Out-of-Band Antenna Conducted Emissions – Including Band Edge</i>	100
9	<i>Transmitter Radiated Spurious Emissions including Band Edge</i>	160
10	<i>AC Mains Conducted Emissions</i>	184
11	<i>Antenna Requirements</i>	191
12	<i>Measurement Uncertainty</i>	192
13	<i>Necessary Modifications</i>	193
14	<i>Revision History</i>	194

Intertek	
Report Number: 100900227DEN-003	Issued: 10/11/2012

1 Introduction and Conclusion

The tests indicated in section 2.0 were performed on the product constructed as described in section 3.0. The remaining test sections are the verbatim text from the actual data sheets used during the investigation. These test sections include the test name, the specified test Method, a list of the actual Test Equipment Used, documentation Photos, Results and raw Data. No additions, deviations, or exclusions have been made from the standard(s) unless specifically noted.

Based on the results of our investigation, we have concluded **the product tested complies with the requirements of the standard(s) indicated.** The results obtained in this test report pertain only to the item(s) tested.

1.1 Test Report Scope

This specific test report applies to the following Wi-Fi radio transceivers configured within the product under test:

- IEEE 802.11b/g/n HT20/HT40, 2400 – 2483.5 MHz
- IEEE 802.11a/n HT20/HT40, 5725 – 5850 MHz

The product was fully tested and passed all radio transceiver requirements. Refer to the following Intertek test reports for details:

- RF4CE Radio, 2.4GHz (Intertek Report 100900227DEN-001)
- Bluetooth Radio, 2.4GHz (Intertek Report 100900227DEN-002)
- Wi-Fi Radio IEEE 802.11b/g/n HT20/HT40, 2400 – 2483.5 MHz, IEEE 802.11a/n HT20/HT40, 5725 – 5850 MHz (Intertek Report 100900227DEN-003)
- Wi-Fi Radio IEEE 802.11a/n HT20/HT40, 5150 – 5250 MHz:
(Intertek Report 100900227DEN-004)
- Unintentional/ Receiver Mode of Operation (Intertek Report 100900227DEN-005)

1.2 Test Methodology

Both RF conducted port and radiated emissions measurements were performed according to the procedures in ANSI C63.10:2009 and the general procedures of FCC Parts 2 and 15 of CFR47. In addition, specific testing utilized the FCC Guidance documents defined in each specific test section. Radiated emissions tests were formed at an antenna-to-product distance of 3-meters.

1.3 Test Facility

Intertek Denver's testing facilities are located at 1795 Dogwood St. Suite 200 Louisville, CO 80027. The testing facility is ISO17025:2005 accredited by A2LA, our lab code is 2506.02, our VCCI registration numbers are. R-1643, C-1752 and T-1558, our FCC designation no. US1121 and our IC lab no. 2042N.

Testing contained in this test report may not be covered under the laboratories scope of accreditation. A note will be placed in the specific test section for testing not covered under the laboratories scope.

2 Test Summary

Test Section	Tests	FCC Reference	Test Date	Result
5	Emission Bandwidth (EBW)	15.247(b)(3)	09/25/2012 09/26/2012	Reference Only
5	RF Conducted Output Power	15.247(b)(3)	09/25/2012 09/26/2012	Complies
6	6dB Bandwidth	15.247(a)(2)	09/21/2012	Complies
7	Power Spectral Density (PSD)	15.247(e)	09/19/2012 09/21/2012 09/22/2012	Complies
8	Out-of-Band Antenna Conducted Emission	15.247(d)	09/18/2012 09/20/2012 09/21/2012	Complies
9	Transmitter Radiated Emissions	15.247(d) 15.209/ 15.205	9/22/2012	Complies
10	AC Line Conducted Emissions	15.207	9/25/2012	Complies Note 1
11	Antenna	15.203	N/A	Complies

Notes:

- 1) Product Receiver/Standby Mode of Operation: The product was tested and passed - refer to Intertek Report 100900227DEN-005 for details.

2.1 Radio Information (Specific to this test report)

Applicant	Echostar Technologies, LLC.
Model Number	ID:058
FCC Identifier.	DKNX34
IC Identifier	N/A
Product Use	Satellite Receiver
Modulation Technique	CCK, OFDM, MCS
Rated RF Output Power	187.5mW (22.73dBm)
Frequency Range	2400 – 2483.5 MHz 5725 – 5850 MHz
Number of Channels	IEEE 802.11b/g, 802.11n HT20 2400 – 2483.5 MHz 2412MHz, 2437MHz, 2462MHz IEEE 802.11n HT40 2400 – 2483.5 MHz 2422MHz, 2437MHz, 2452MHz IEEE 802.11a, 802.11n HT20 5725 – 5850 MHz 5745MHz, 5785MHz, 5825MHz IEEE 802.11n HT40 5725 – 5850 MHz 5755, 5795
Antenna Gain	Antenna 0: 3.1dBi @ 2.44GHz, 3.2dBi @ 5.2GHz Antenna 1: 2.0dBi @ 2.40GHz, 1.8dBi @ 5.2GHz
Manufacturer Name & Address	Echostar Technologies, LLC 90 Inverness Circle East Englewood, CO 80112

2.2 Product Channel Configurations

Channels in the 2400 – 2483.5 MHz Band					
Number	Frequency, MHz	a/ n HT20 mode		N HT40 mode	
1	2412	x	tested	---	---
3	2422	---	---	x	tested
6	2437	x	tested	x	tested
9	2452	---	---	x	tested
11	2462	x	tested	---	---

Channels in the 5725 – 5850 MHz Band					
Number	Frequency, MHz	a/ n HT20 mode		N HT40 mode	
149	5745	x	tested	---	---
151	5755	---	---	x	tested
153	5765	---	---	---	---
157	5785	x	tested	---	---
159	5795	---	---	x	tested
161	5805	---	---	---	---
165	5825	x	tested	---	---

Note: x = available channels

Intertek	
Report Number: 100900227DEN-003	Issued: 10/11/2012

3 Description of Equipment Under Test

Equipment Under Test			
Description	Manufacturer	Model Number	Serial Number
Advanced Satellite Receiver Set-Top Box	Echostar Technologies, LLC	ID:058	EMC1

Receive Date:	09/11/2012
Received Condition:	Good
Type:	Production Samples

Description of Equipment Under Test (provided by client)

The ID:058 is a satellite set-top box incorporating Sling place shifting technology designed to operate as a server in the whole home DVR system. The ID:058 has a RF4CE 2.4GHz Synkro solution to interface to a remote control , a Bluetooth Class 2 transceiver for supported accessories, and an 802.11a/b/g/n Wi-Fi transceiver for connection to the customer's internet wirelessly.

The RF4CE radio is located on the main board and uses a detachable antenna located on the back panel of the set-top box. The Bluetooth transceiver is on a separate PCB that is located within the front panel plastics. The Bluetooth transceiver uses a printed antenna. The 802.11a/b/g/n transceiver is located on the same PCB as the Bluetooth transceiver. The 802.11a/b/g/n transceiver uses two antennas that are attached via U.FL connectors and two different lengths of mini coax cable. These antennas are located within the front bezel assembly.

Removal of the Bluetooth and 802.11a/b/g/n transceivers does not alter the RF characteristics of the RF4CE transceiver. The ID:058 provides HDMI, Composite and Component A/V outputs as well as Ethernet, USB and eSATA.

For the purposes of this specific test report, the product supports the following data rates in the 2400 – 2483.5 MHz band:

- IEEE 802.11b: 1, 2, 5.5, 11 Mbps
- IEEE 802.11g: 6, 9, 12, 18, 24, 36, 48, 54Mbps
- IEEE 802.11n: MCS0, MCS1, MCS2, MCS3, MCS4, MCS5, MCS6, MCS7

For the purposes of this specific test report, the product supports the following data rates in the 5725 – 5850 MHz band:

- IEEE 802.11a: 6, 9, 12, 18, 24, 36, 48, 54 Mbps
- IEEE 802.11n: MCS0, MCS1, MCS2, MCS3, MCS4, MCS5, MCS6, MCS7

In 802.11n HT20 and 802.11n HT40 modes, the nominal bandwidth is 20MHz and 40MHz respectively.

Equipment Under Test Power Configuration			
Rated Voltage	Rated Current	Rated Frequency	Number of Phases
100-120VAC	0.5A	60Hz	1

Operating modes of the EUT: Intentional Tx Testing

No.	Descriptions of EUT Exercising
1	Product configured in transmit mode at full power, CW signal.
2	Product configured for continuous transmission, full power with modulation/data transfer enabled.
3	Product set up with all signal and I/O cable ports populated and terminated with either active or passive loads. Wi-Fi radio enabled, Ethernet data transfer, USB data transfer, and eSATA data transfer. Video output to all A/V connections.

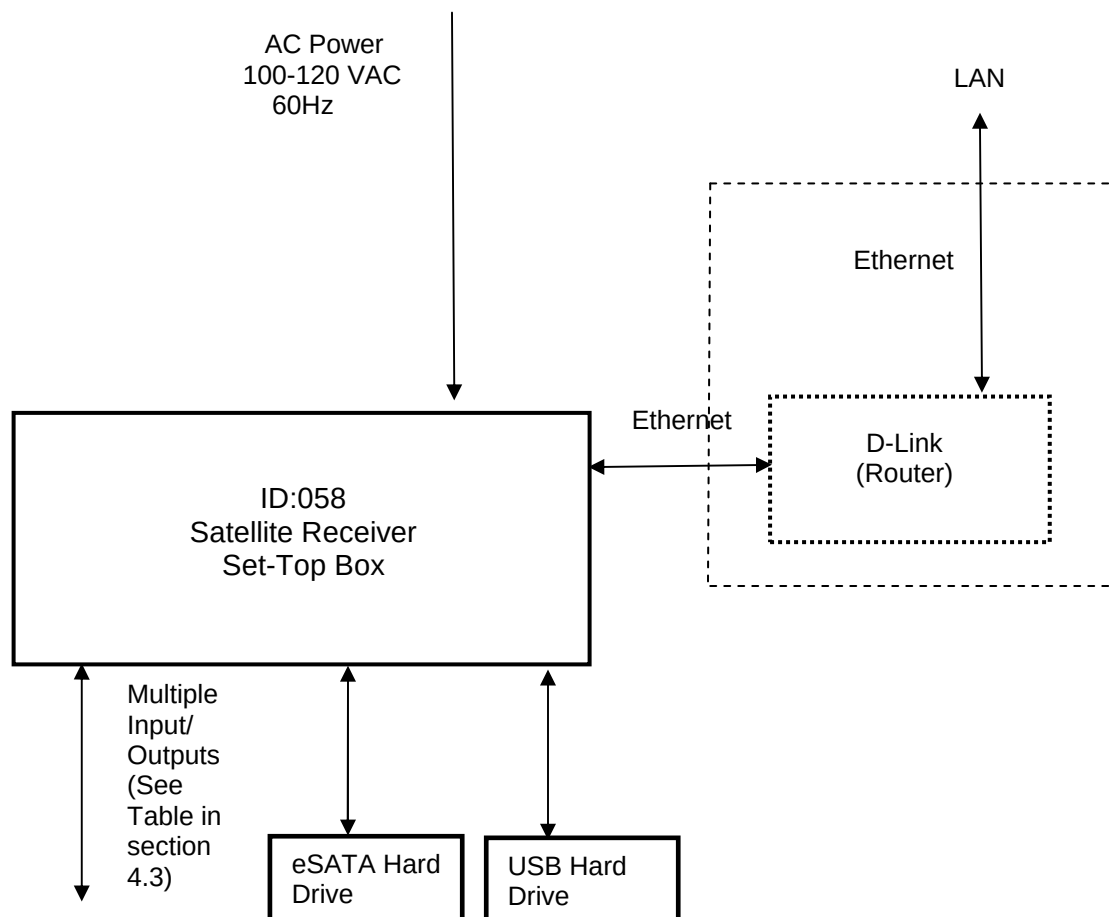
Note: The chosen mode of operation described above is dependent upon the specific test to be performed.

4 System setup including cable interconnection details, support equipment and simplified block diagram

4.1 Method:

Record the details of EUT cabling, document the support equipment, and show the interconnections in a block diagram.

4.2 EUT Block Diagram:



Note: Dashed lines indicate auxiliary/support equipment outside the test area

4.3 Support Data:

ID	Description/ Function	Shield Type	Length	Connector	Connection	Ferrites
1	AC Power	None	1 meter	AC	DE51 Power In	No
2	2x Ethernet	None	> 3 meter	RJ-45	Router/Switch	No
3	USB	Foil	< 1 meter	USB	USB Drive	No
4	Front Panel USB	Foil	< 1 meter	USB	Terminator	No
5	USB	Foil	< 1 meter	USB	Terminator	No
6	RCA A/V Outputs	Braid	1 meter	RCA	Matched Impedance Loads	No
7	HDMI Digital Video Out	Foil	1 meter	HDMI	EDIDI Simulation Box	No
8	RF Coax Cable	Braid	> 3 meter	Type F	Terminator	No
9	eSATA Cable	Braid	< 1 meter		eSATA Drive	No
10	Composite Video Out	Braid	< 1 meter	RCA	Terminator	No
11	Phone Cable	None	< 1 meter	RJ-11	Unterminated	No

Support Equipment			
Description	Manufacturer	Model Number	Serial Number
Router/Switch	D-Link	EBR-2310	-----

Note: All product ports were fully populated with appropriate cables. All cables were terminated with an active load or typical device/peripheral.

5 Conducted Output Power

5.1 Method

Unless otherwise stated no deviations were made from FCC Part 15.247(b)(3). Test methods comply with ANSI C63.10.

This testing was performed at Intertek Denver, located at 1795 Dogwood St. Suite 200, Louisville, CO 80027.

5.2 Test Equipment Used:

<u>Asset ID</u>	<u>Description</u>	<u>Manufacturer</u>	<u>Model</u>	<u>Serial</u>	<u>Cal Date</u>	<u>Cal Due</u>
DEN-073	EMI Receiver	RHODE & SCHWARZ	ESU 26	100265	1/11/2012	1/10/2013
E1	RF Conducted Port Cable	-----	45-7221-19	001	09/12/2012	09/12/2013
E2	RF Conducted Port Cable	-----	True Blue	001	09/12/2012	09/12/2013

5.3 Test Requirement

For the bands 2400 – 2483.5 GHz and 5725 – 5850 MHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 Watt (+30dBm).

The maximum output power is the total transmit power (power set to maximum) delivered to all antennas. Power must be summed across all antennas.

If transmitting antennas of directional gain greater than 6 dBi are used, the maximum conducted output power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

5.4 Test Procedure

The antenna port of the EUT was connected to the input port of a spectrum analyzer/power meter to measure the Maximum Conducted Transmitter Output Power.

The procedures described in FCC Publication 558074 (Guidelines for Compliance Measurements on DTS Operating Under 15.247), were used.

- Section 5.2.1.2, (Peak detection with max hold)

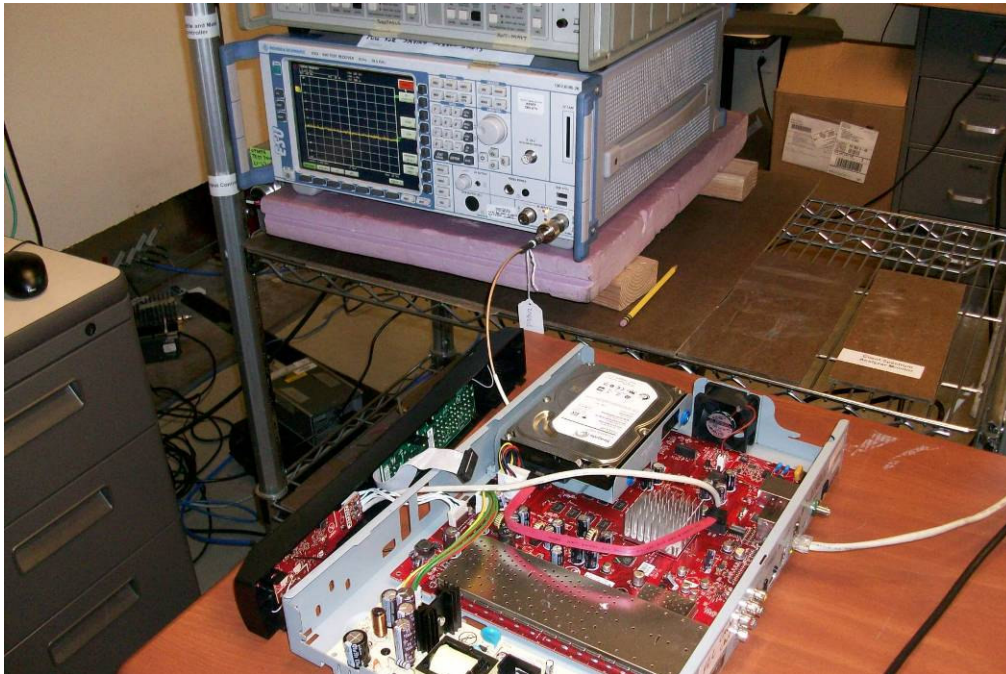
In addition, the procedures described in FCC Publication 662911 (Emissions Testing of Transmitters with Multiple Outputs in the Same Band) were used.

5.5 Results:

The sample tested was found to Comply.

5.6 Setup Photographs:

Conducted Output Power Test setup



5.7 Test Data Summary: 2400 – 2483.5 MHz Band

Conducted Output Power 2400 – 2483.5 MHz – Antenna 0 FCC Part 15.247(b)(3)

Channel	Frequency, MHz	Standard/ Data Rate	Conducted Power (Pk dBm)	Conducted Power Limit (dBm)	Plot
1	2412	802.11b, 5.5Mbps	22.73	27.0	x
		802.11g, 54Mbps	16.20	27.0	x
		802.11n HT20, MCS5	15.30	27.0	
3	2422	802.11n HT40, MCS0	12.80	27.0	x
6	2437	802.11b, 5.5Mbps	21.08	27.0	x
		802.11g, 54Mbps	15.61	27.0	x
		802.11n HT20, MCS7	14.40	27.0	x
		802.11n HT40, MCS0	12.58	27.0	
9	2452	802.11n HT40, MCS0		27.0	x
11	2462	802.11b, 5.5Mbps	18.91	27.0	x
		802.11g, 54Mbps	13.10	27.0	x
		802.11n HT20, MCS6	13.08	27.0	x

Note: The above conducted power limit was adjusted from 30dBm to 27dBm for a dual antenna product per MIMO guidelines.

Conducted Output Power 2400 – 2483.5 MHz – Antenna 1 FCC Part 15.247(b)(3)

Channel	Frequency, MHz	Standard/ Data Rate	Conducted Power (Pk dBm)	Conducted Power Limit (dBm)	Plot
1	2412	802.11b, 5.5Mbps	22.48	27.0	x
		802.11g, 54Mbps	14.67	27.0	x
		802.11n HT20, MCS5	14.66	27.0	
3	2422	802.11n HT40, MCS0	12.42	27.0	x
6	2437	802.11b, 5.5Mbps	21.56	27.0	x
		802.11g, 24Mbps	13.65	27.0	x
		802.11n HT20, MCS5	13.87	27.0	x
		802.11n HT40, MCS0	11.13	27.0	
9	2452	802.11n HT40, MCS0	11.34	27.0	x
11	2462	802.11b, 5.5Mbps	17.96	27.0	x
		802.11g, 54Mbps	10.76	27.0	x
		802.11n HT20, MCS5	11.86	27.0	x

Note: The above conducted power limit was adjusted from 30dBm to 27dBm for a dual antenna product per MIMO guidelines.

The above data summary tables represent the worst-case modulation/data rate combination.

Intertek	
Report Number: 100900227DEN-003	Issued: 10/11/2012

MIMO Calculations

Highest conducted power:

Antenna 0 = 22.73 dBm = 187.5 mW

Antenna 1 = 22.48 dBm = 177.1 mW

Sum = 364.6 mW

Maximum conducted output power per 15.247 (a)(3) = 1 W

Delta = -.6354 W

Intertek

Report Number: 100900227DEN-003

Issued: 10/11/2012

Test Data: 2400-2483.5MHz Band - Antenna 0

Channels 2400 to 2483.5 MHz - FCC Part 15.247(b)(3)(4) (RF Conducted Port Power – Antenna 0)

Modulation Mode	Tx Channel	Frequency (MHz)	Data Rate	Peak Conducted (dBm)	Cable Loss (dB)	Final Conducted (dBm)	Spec Limit dBm	Adjusted Limit MIMO(dBm)	Delta Limit	Test Result	EBW (MHz)	Plot
CCK Power Index = 16	1	2412	1	20.74	0.78	21.52	30	27	-5.48	Pass	13.89	
			2	20.72	0.78	21.50	30	27	-5.50	Pass	13.92	
			5.5	21.95	0.78	22.73	30	27	-4.27	Pass	13.90	x
			11	21.51	0.78	22.29	30	27	-4.71	Pass	13.91	
802.11b												
802.11b	6	2437	1	19.88	0.78	20.66	30	27	-6.34	Pass	13.91	
			2	19.35	0.78	20.13	30	27	-6.87	Pass	13.94	
			5.5	20.30	0.78	21.08	30	27	-5.92	Pass	13.95	
			11	20.07	0.78	20.85	30	27	-6.15	Pass	13.96	
802.11b												
802.11b	11	2462	1	18.03	0.78	18.81	30	27	-8.19	Pass	13.86	
			2	18.10	0.78	18.88	30	27	-8.12	Pass	13.91	
			5.5	18.13	0.78	18.91	30	27	-8.09	Pass	13.85	
			11	17.89	0.78	18.67	30	27	-8.33	Pass	13.90	
802.11b												
OFDM Power Index = 36	1	2412	6	15.42	0.78	16.20	30	27	-10.80	Pass	19.48	
			9	15.33	0.78	16.11	30	27	-10.89	Pass	19.55	
			12	15.29	0.78	16.07	30	27	-10.93	Pass	19.56	
			18	15.26	0.78	16.04	30	27	-10.96	Pass	19.49	
			24	15.41	0.78	16.19	30	27	-10.81	Pass	19.87	
			36	15.39	0.78	16.17	30	27	-10.83	Pass	19.88	
			48	15.37	0.78	16.15	30	27	-10.85	Pass	19.74	
			54	15.42	0.78	16.20	30	27	-10.80	Pass	19.51	x
802.11g												
802.11g	6	2437	6	14.69	0.78	15.47	30	27	-11.53	Pass	19.58	
			9	14.63	0.78	15.41	30	27	-11.59	Pass	19.51	
			12	14.58	0.78	15.36	30	27	-11.64	Pass	19.52	
			18	14.74	0.78	15.52	30	27	-11.48	Pass	19.52	
			24	14.77	0.78	15.55	30	27	-11.45	Pass	19.56	
			36	14.74	0.78	15.52	30	27	-11.48	Pass	19.49	
			48	14.79	0.78	15.57	30	27	-11.43	Pass	19.87	
			54	14.83	0.78	15.61	30	27	-11.39	Pass	19.78	
802.11g												
802.11g	11	2462	6	12.05	0.78	12.83	30	27	-14.17	Pass	19.48	
			9	12.11	0.78	12.89	30	27	-14.11	Pass	19.55	
			12	12.12	0.78	12.90	30	27	-14.10	Pass	19.49	
			24	12.21	0.78	12.99	30	27	-14.01	Pass	19.87	
			36	12.26	0.78	13.04	30	27	-13.96	Pass	19.61	
			48	12.27	0.78	13.05	30	27	-13.95	Pass	19.51	
			54	12.32	0.78	13.10	30	27	-13.90	Pass	19.52	
802.11g												

Intertek

Report Number: 100900227DEN-003

Issued: 10/11/2012

Modulation Mode	Tx Channel	Frequency (MHz)	Data Rate	Peak Conducted (dBm)	Cable Loss (dB)	Final Conducted (dBm)	Spec Limit dBm	Adjusted Limit MIMO(dBm)	Delta Limit	Test Result	EBW (MHz)	Plot
MCS Power Index = 36 802.11n HT20	1	2412	MCS0	14.18	0.78	14.96	30	27	-12.04	Pass	20.39	
			MCS1	14.21	0.78	14.99	30	27	-12.01	Pass	20.38	
			MCS2	14.33	0.78	15.11	30	27	-11.89	Pass	20.40	
			MCS3	14.20	0.78	14.98	30	27	-12.02	Pass	20.42	
			MCS4	14.35	0.78	15.13	30	27	-11.87	Pass	20.31	
			MCS5	14.52	0.78	15.30	30	27	-11.70	Pass	20.45	x
			MCS6	14.44	0.78	15.22	30	27	-11.78	Pass	20.48	
			MCS7	14.26	0.78	15.04	30	27	-11.96	Pass	20.45	
802.11n HT20	6	2437	MCS0	13.06	0.78	13.84	30	27	-13.16	Pass	20.48	
			MCS1	13.09	0.78	13.87	30	27	-13.13	Pass	20.45	
			MCS2	13.11	0.78	13.89	30	27	-13.11	Pass	20.36	
			MCS3	13.46	0.78	14.24	30	27	-12.76	Pass	20.39	
			MCS4	13.35	0.78	14.13	30	27	-12.87	Pass	20.41	
			MCS5	13.56	0.78	14.34	30	27	-12.66	Pass	20.38	
			MCS6	13.57	0.78	14.35	30	27	-12.65	Pass	20.40	
			MCS7	13.62	0.78	14.40	30	27	-12.60	Pass	20.40	
802.11n HT20	11	2462	MCS0	12.02	0.78	12.80	30	27	-14.20	Pass	20.38	
			MCS1	12.12	0.78	12.90	30	27	-14.10	Pass	20.40	
			MCS2	12.14	0.78	12.92	30	27	-14.08	Pass	20.44	
			MCS3	12.20	0.78	12.98	30	27	-14.02	Pass	20.48	
			MCS4	12.18	0.78	12.96	30	27	-14.04	Pass	20.45	
			MCS5	12.29	0.78	13.07	30	27	-13.93	Pass	20.39	
			MCS6	12.30	0.78	13.08	30	27	-13.92	Pass	20.40	
			MCS7	12.28	0.78	13.06	30	27	-13.94	Pass	20.47	

Intertek

Report Number: 100900227DEN-003

Issued: 10/11/2012

Modulation Mode	Tx Channel	Frequency (MHz)	Data Rate	Peak Conducted (dBm)	Cable Loss (dB)	Final Conducted (dBm)	Spec Limit dBm	Adjusted Limit MIMO(dBm)	Delta Limit	Test Result	EBW (MHz)	Plot
MCS Power Index = 40 802.11n HT40	3	2422	MCS0	12.02	0.78	12.80	30	27	-14.20	Pass	40.64	x
			MCS1	11.81	0.78	12.59	30	27	-14.41	Pass	40.61	
			MCS2	11.67	0.78	12.45	30	27	-14.55	Pass	40.65	
			MCS3	11.77	0.78	12.55	30	27	-14.45	Pass	40.59	
			MCS4	11.61	0.78	12.39	30	27	-14.61	Pass	40.68	
			MCS5	11.47	0.78	12.25	30	27	-14.75	Pass	40.68	
			MCS6	11.41	0.78	12.19	30	27	-14.81	Pass	40.59	
			MCS7	11.58	0.78	12.36	30	27	-14.64	Pass	40.61	
802.11n HT40	6	2437	MCS0	11.80	0.78	12.58	30	27	-14.42	Pass	40.59	
			MCS1	11.64	0.78	12.42	30	27	-14.58	Pass	40.68	
			MCS2	11.73	0.78	12.51	30	27	-14.49	Pass	40.68	
			MCS3	11.59	0.78	12.37	30	27	-14.63	Pass	40.58	
			MCS4	11.46	0.78	12.24	30	27	-14.76	Pass	40.61	
			MCS5	11.41	0.78	12.19	30	27	-14.81	Pass	40.55	
			MCS6	11.39	0.78	12.17	30	27	-14.83	Pass	40.57	
			MCS7	11.38	0.78	12.16	30	27	-14.84	Pass	40.59	
802.11n HT40	9	2452	MCS0	11.58	0.78	12.36	30	27	-14.64	Pass	40.64	
			MCS1	11.40	0.78	12.18	30	27	-14.82	Pass	40.62	
			MCS2	11.29	0.78	12.07	30	27	-14.93	Pass	40.71	
			MCS3	11.34	0.78	12.12	30	27	-14.88	Pass	40.59	
			MCS4	11.21	0.78	11.99	30	27	-15.01	Pass	40.63	
			MCS5	11.12	0.78	11.90	30	27	-15.10	Pass	40.59	
			MCS6	11.05	0.78	11.83	30	27	-15.17	Pass	40.68	
			MCS7	11.08	0.78	11.86	30	27	-15.14	Pass		

FCC Part 15.247(b)(3) Limit: 30dBm (1W)

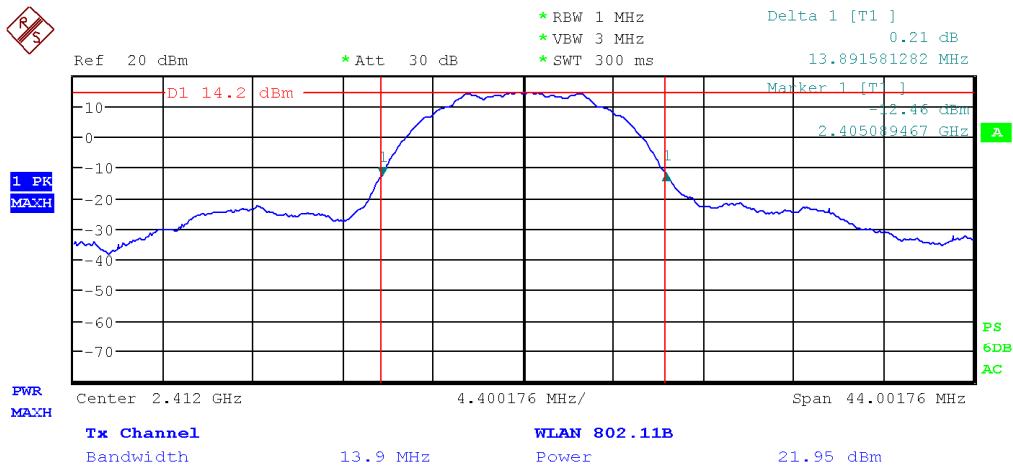
Adjusted Limit for dual antenna port per MIMO guidelines: 27dBm (0.5 W) per antenna port

The worst-case RF Conducted Power measurement was 802.11b CCK Modulation Mode, Channel 1:
22.73 dBm (-4.27 dBm under the limit).

5.8 Plots: 2400-2483.5MHz Band - Antenna 0

Channels 2400 to 2483.5 MHz - FCC Part 15.247(b)(3)(4) (RF Conducted Port Power – Antenna 0)

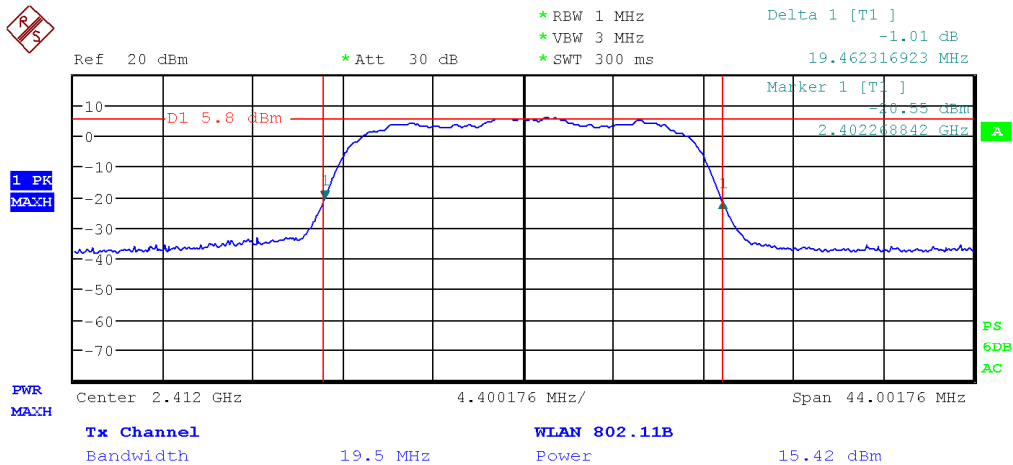
802.11b CCK Modulation Mode
Channel 1



CH0-

Date: 26.SEP.2012 10:58:45

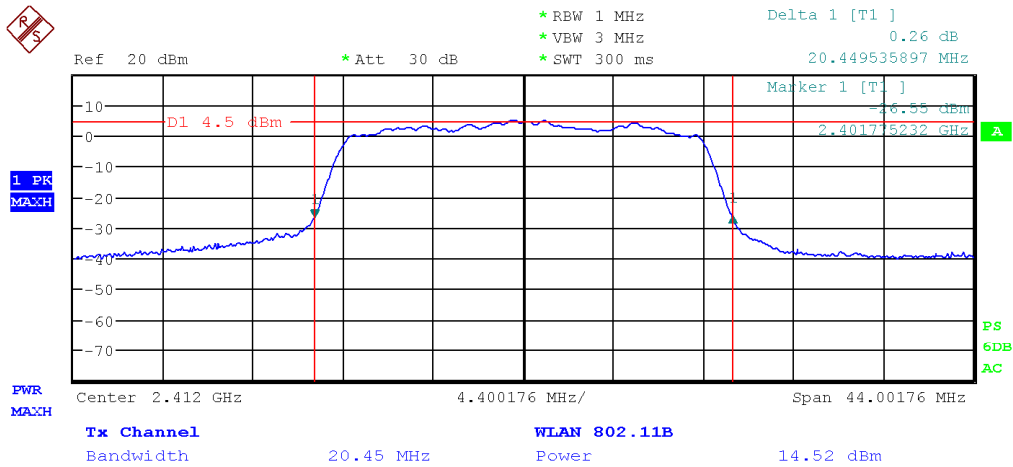
802.11g OFDM Modulation Mode Channel 1



CH0-

Date: 26.SEP.2012 10:53:09

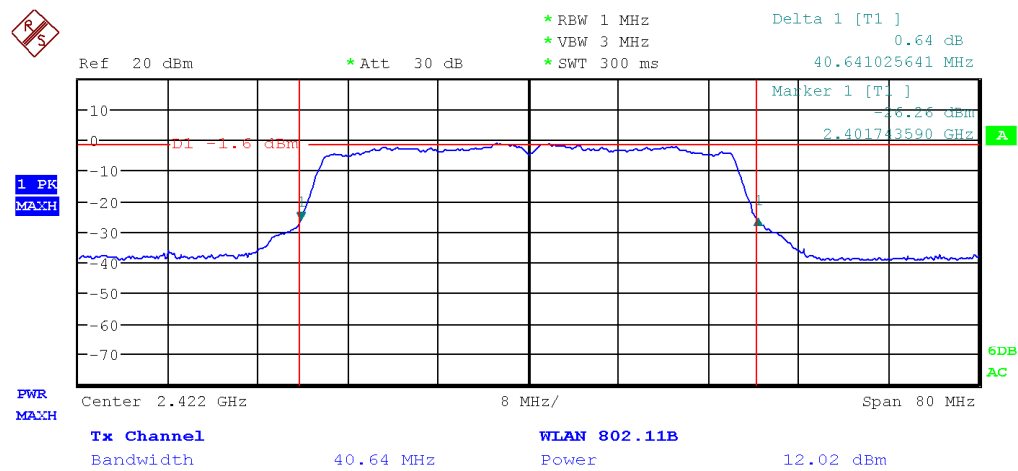
802.11n HT20 MCS Modulation Mode Channel 1



CH0-

Date: 26.SEP.2012 11:03:47

802.11n HT40 MCS Modulation Mode
Channel 3



CH0-
Date: 26.SEP.2012 11:22:45

The above plots represent the worst-case for all channels, modulation modes and data rates tested.

Intertek

Report Number: 100900227DEN-003

Issued: 10/11/2012

5.9 Test Data: 2400-2483.5MHz Band - Antenna 1

Channels 2400 to 2483.5 MHz - FCC Part 15.247(b)(3)(4)

FCC Part 15.247 – RF Conducted Port Power – Antenna 1

Modulation Mode	Tx Channel	Frequency (MHz)	Data Rate	Peak Conducted (dBm)	Cable Loss (dB)	Final Conducted (dBm)	Spec Limit dBm	Adjusted Limit MIMO(dBm)	Delta Limit	Test Result	EBW (MHz)	Plot
CCK Power Index = 16	1	2412	1	20.60	0.78	21.38	30	27	-5.62	Pass		
			2	20.58	0.78	21.36	30	27	-5.64	Pass		
			5.5	21.70	0.78	22.48	30	27	-4.52	Pass	13.96	x
			11	21.16	0.78	21.94	30	27	-5.06	Pass		
802.11b										Pass		
802.11b	6	2437	1	19.85	0.78	20.63	30	27	-6.37	Pass		
			2	19.89	0.78	20.67	30	27	-6.33	Pass		
			5.5	20.78	0.78	21.56	30	27	-5.44	Pass	13.82	
			11	20.45	0.78	21.23	30	27	-5.77	Pass		
										Pass		
802.11b	11	2462	1	17.09	0.78	17.87	30	27	-9.13	Pass		
			2	17.10	0.78	17.88	30	27	-9.12	Pass		
			5.5	17.18	0.78	17.96	30	27	-9.04	Pass	13.61	
			11	17.16	0.78	17.94	30	27	-9.06	Pass		

OFDM Power Index = 36	1	2412	6	13.50	0.78	14.28	30	27	-12.72	Pass		
			9	13.51	0.78	14.29	30	27	-12.71	Pass		
			12	13.49	0.78	14.27	30	27	-12.73	Pass		
			18	13.48	0.78	14.26	30	27	-12.74	Pass		
			24	13.54	0.78	14.32	30	27	-12.68	Pass		
			36	13.52	0.78	14.30	30	27	-12.70	Pass		
			48	13.54	0.78	14.32	30	27	-12.68	Pass		
			54	13.89	0.78	14.67	30	27	-12.33	Pass	19.40	x
802.11g												
802.11g	6	2437	6	12.83	0.78	13.61	30	27	-13.39	Pass		
			9	12.82	0.78	13.60	30	27	-13.40	Pass		
			12	12.79	0.78	13.57	30	27	-13.43	Pass		
			18	12.79	0.78	13.57	30	27	-13.43	Pass		
			24	12.88	0.78	13.66	30	27	-13.34	Pass		
			36	12.86	0.78	13.64	30	27	-13.36	Pass		
			48	12.79	0.78	13.57	30	27	-13.43	Pass		
			54	12.75	0.78	13.53	30	27	-13.47	Pass		
80-2.11g												
80-2.11g	11	2462	6	9.58	0.78	10.36	30	27	-16.64	Pass		
			9	9.58	0.78	10.36	30	27	-16.64	Pass		
			12	9.61	0.78	10.39	30	27	-16.61	Pass		
			24	9.61	0.78	10.39	30	27	-16.61	Pass		
			36	9.68	0.78	10.46	30	27	-16.54	Pass		
			48	9.64	0.78	10.42	30	27	-16.58	Pass		
			54	9.98	0.78	10.76	30	27	-16.24	Pass	19.39	

Intertek

Report Number: 100900227DEN-003

Issued: 10/11/2012

Modulation Mode	Tx Channel	Frequency (MHz)	Data Rate	Peak Conducted (dBm)	Cable Loss (dB)	Final Conducted (dBm)	Spec Limit dBm	Adjusted Limit MIMO(dBm)	Delta Limit	Test Result	EBW (MHz)	Plot
MCS Power Index = 36 802.11n HT20	1	2412	MCS0	13.71	0.78	14.49	30	27	-12.51	Pass		
			MCS1	13.68	0.78	14.46	30	27	-12.54	Pass		
			MCS2	13.69	0.78	14.47	30	27	-12.53	Pass		
			MCS3	13.76	0.78	14.54	30	27	-12.46	Pass		
			MCS4	13.74	0.78	14.52	30	27	-12.48	Pass		
			MCS5	13.88	0.78	14.66	30	27	-12.34	Pass	19.89	x
			MCS6	13.60	0.78	14.38	30	27	-12.62	Pass		
			MCS7	13.51	0.78	14.29	30	27	-12.71	Pass		
802.11n HT20	6	2437	MCS0	12.14	0.78	12.92	30	27	-14.08	Pass		
			MCS1	12.17	0.78	12.95	30	27	-14.05	Pass		
			MCS2	12.19	0.78	12.97	30	27	-14.03	Pass		
			MCS3	12.81	0.78	13.59	30	27	-13.41	Pass		
			MCS4	13.04	0.78	13.82	30	27	-13.18	Pass		
			MCS5	13.09	0.78	13.87	30	27	-13.13	Pass		
			MCS6	12.98	0.78	13.76	30	27	-13.24	Pass		
			MCS7	12.91	0.78	13.69	30	27	-13.31	Pass		
802.11n HT20	11	2462	MCS0	11.04	0.78	11.82	30	27	-15.18	Pass		
			MCS1	11.08	0.78	11.86	30	27	-15.14	Pass		
			MCS2	11.06	0.78	11.84	30	27	-15.16	Pass		
			MCS3	11.05	0.78	11.83	30	27	-15.17	Pass		
			MCS4	11.07	0.78	11.85	30	27	-15.15	Pass		
			MCS5	11.08	0.78	11.86	30	27	-15.14	Pass	19.96	
			MCS6	10.95	0.78	11.73	30	27	-15.27	Pass		
			MCS7	10.98	0.78	11.76	30	27	-15.24	Pass		

Intertek

Report Number: 100900227DEN-003

Issued: 10/11/2012

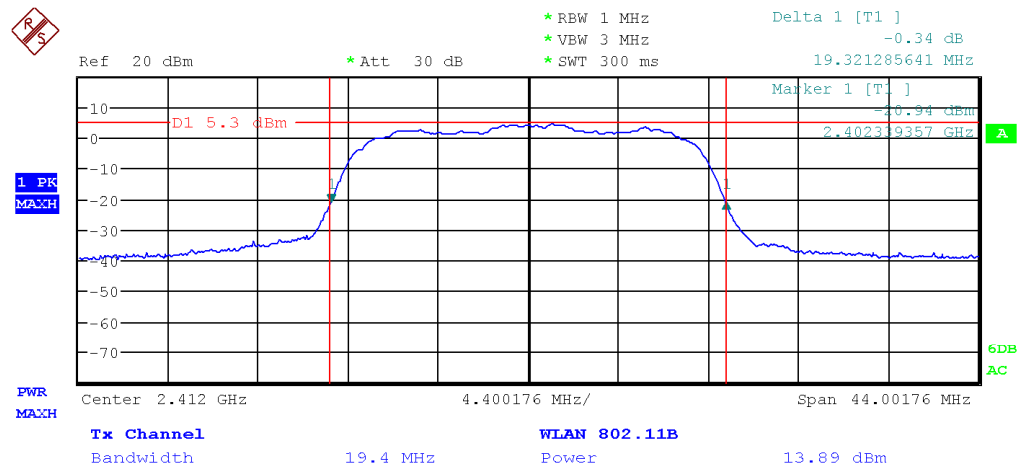
Modulation Mode	Tx Channel	Frequency (MHz)	Data Rate	Peak Conducted (dBm)	Cable Loss (dB)	Final Conducted (dBm)	Spec Limit dBm	Adjusted Limit MIMO(dBm)	Delta Limit	Test Result	EBW (MHz)	Plot
MCS Power Index = 40	3	2422	MCS0	11.64	0.78	12.42	30	27	-14.58	Pass	40.77	x
			MCS1	11.63	0.78	12.41	30	27	-14.59	Pass	40.75	
			MCS2	11.60	0.78	12.38	30	27	-14.62	Pass	40.62	
			MCS3	11.57	0.78	12.35	30	27	-14.65	Pass	40.71	
			MCS4	11.53	0.78	12.31	30	27	-14.69	Pass	40.69	
			MCS5	11.31	0.78	12.09	30	27	-14.91	Pass	40.71	
			MCS6	11.29	0.78	12.07	30	27	-14.93	Pass	40.69	
802.11n HT40												
			MCS7	10.35	0.78	11.13	30	27	-15.87	Pass	40.68	
	6	2437	MCS0	10.33	0.78	11.11	30	27	-15.89	Pass	40.76	
			MCS1	10.35	0.78	11.13	30	27	-15.87	Pass	40.73	
			MCS2	10.32	0.78	11.10	30	27	-15.90	Pass	40.68	
			MCS3	10.09	0.78	10.87	30	27	-16.13	Pass	40.68	
			MCS4	10.10	0.78	10.88	30	27	-16.12	Pass	40.59	
			MCS5	10.11	0.78	10.89	30	27	-16.11	Pass	40.61	
			MCS6	10.02	0.78	10.80	30	27	-16.20	Pass	40.72	
802.11n HT40			MCS7	10.09	0.78	10.87	30	27	-16.13	Pass	40.69	
	9	2452	MCS0	10.56	0.78	11.34	30	27	-15.66	Pass	40.90	
			MCS1	10.48	0.78	11.26	30	27	-15.74	Pass	40.76	
			MCS2	10.43	0.78	11.21	30	27	-15.79	Pass	40.72	
			MCS3	10.41	0.78	11.19	30	27	-15.81	Pass	40.72	
			MCS4	10.13	0.78	10.91	30	27	-16.09	Pass	40.62	
			MCS5	10.11	0.78	10.89	30	27	-16.11	Pass	40.71	
			MCS6	10.07	0.78	10.85	30	27	-16.15	Pass	40.59	
802.11n HT40			MCS7	10.05	0.78	10.83	30	27	-16.17	Pass	40.68	

FCC Part 15.247(b)(3) Limit: 30dBm (1W)

Adjusted Limit for dual antenna port per MIMO guidelines: 27dBm (0.5 W) per antenna port

The worst-case RF Conducted Power measurement was 802.11b CCK Modulation Mode, Channel 1:
22.48 dBm (-4.52 dBm under the limit)

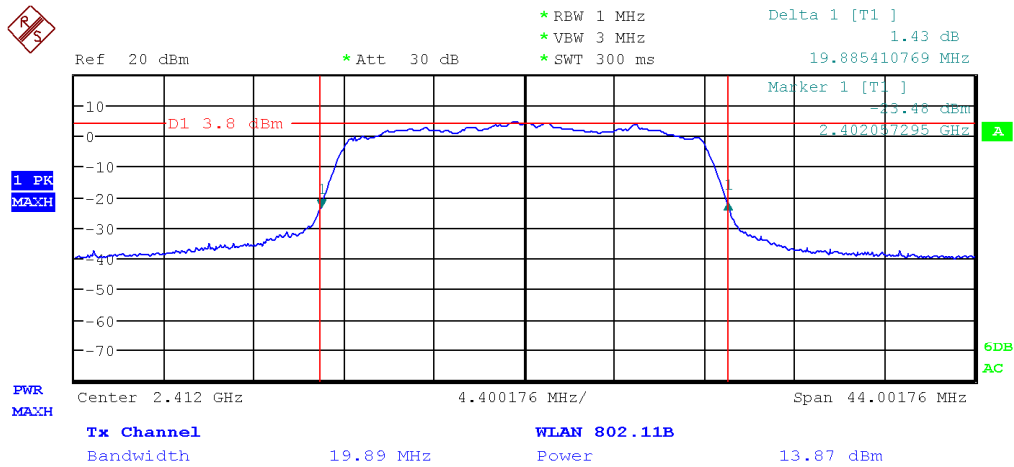
802.11g OFDM Modulation Mode Channel 1



CH0-

Date: 26.SEP.2012 13:30:29

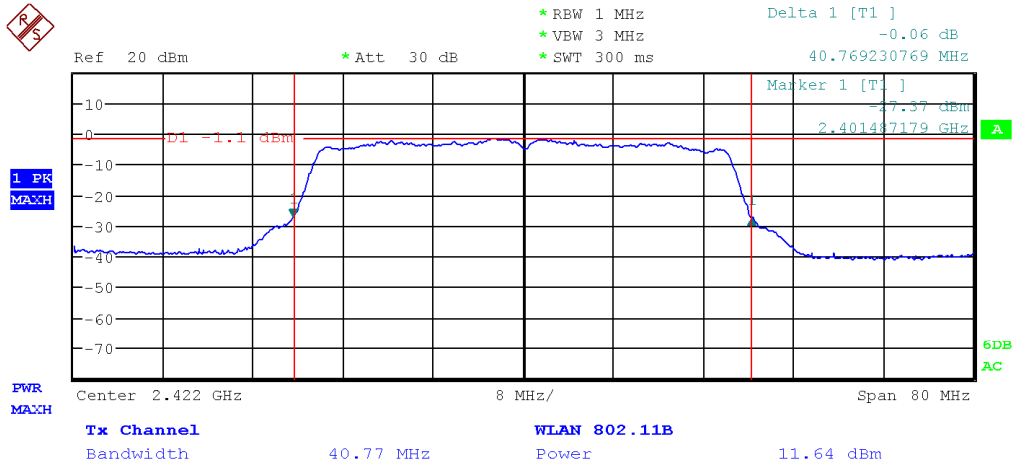
802.11n HT20 MCS Modulation Mode Channel 1



CH0-

Date: 26.SEP.2012 13:34:43

802.11n HT40 MCS Modulation Mode
Channel 3



CH0-

Date: 26.SEP.2012 13:39:49

The above plots represent the worst-case for all channels, modulation modes and data rates tested.

5.11 Test Data Summary: 5725 – 5850 MHz Band

Conducted Output Power 5725 – 5850 MHz – Antenna 0 FCC Part 15.247(b)(3)

Channel	Frequency, MHz	Standard/ Data Rate	Conducted Power (Peak dBm)	Conducted Power Limit (dBm)	Plot
149	5745	802.11a, 24Mbps	25.41	27.0	x
		802.11n HT20, MCS1	25.30	27.0	x
151	5755	802.11n HT40, MCS0	24.55	27.0	x
157	5785	802.11a, 9Mbps	23.86	27.0	x
		802.11n HT20, MCS0	24.29	27.0	x
159	5795	802.11n HT40, MCS0	24.25	27.0	x
165	5825	802.11a, 24Mbps	23.41	27.0	x
		802.11n HT20, MCS0	24.17	27.0	x

Note: Conducted Power limit adjusted from 30dBm to 27dBm for dual antenna port product per MIMO guidelines.

Conducted Output Power 5725 – 5850 MHz – Antenna 1 FCC Part 15.247(b)(3)

Channel	Frequency, MHz	Standard/ Data Rate	Conducted Power (Peak dBm)	Conducted Power Limit (dBm)	Plot
149	5745	802.11a, 6Mbps	25.10	27.0	x
		802.11n HT20, MCS3	25.54	27.0	x
151	5755	802.11n HT40, MCS0	24.41	27.0	x
157	5785	802.11a, 9Mbps	24.34	27.0	x
		802.11n HT20, MCS1	25.10	27.0	x
159	5795	802.11n HT40, MCS0	24.27	27.0	x
165	5825	802.11a, 9Mbps	23.87	27.0	x
		802.11n HT20, MCS0	24.52	27.0	x

Note: Conducted Power limit adjusted from 30dBm to 27dBm for dual antenna port product per MIMO guidelines.

The above data summary tables represent the worst-case modulation/data rate combination.

Intertek	
Report Number: 100900227DEN-003	Issued: 10/11/2012

MIMO Calculations

Highest conducted power:

Antenna 0 = 25.41 dBm = 347.6 mW

Antenna 1 = 25.54 dBm = 358.1 mW

Sum = 705.7 mW

Maximum conducted output power per 15.247 (a)(3) = 1 W

Delta = -.2943 W

Intertek

Report Number: 100900227DEN-003

Issued: 10/11/2012

5.12 Test Data: 5725-5850 MHz Band - Antenna 0

Channels in 5725 to 5850 MHz Band – FCC Part 15.247(b)(3)(4) (RF Conducted Port Power – Antenna 0)

Modulation Mode	Tx Channel	Frequency (MHz)	Data Rate	Peak Conducted (dBm)	Cable Loss (dB)	Final Conducted (dBm)	Spec Limit dBm	Adjusted Limit MIMO(dBm)	Delta Limit	Test Result	EBW (MHz)	Plot
OFDM Power Index = 3 802.11a	149	5745	6	23.59	1.76	25.35	30	27	-1.65	Pass	29.81	
			9	23.61	1.76	25.37	30	27	-1.63	Pass	29.81	
			12	23.59	1.76	25.35	30	27	-1.65	Pass	29.81	
			18	23.61	1.76	25.37	30	27	-1.63	Pass	29.81	
			24	23.65	1.76	25.41	30	27	-1.59	Pass	29.81	x
			36	23.51	1.76	25.27	30	27	-1.73	Pass	29.81	
			48	23.49	1.76	25.25	30	27	-1.75	Pass	29.81	
			54	23.50	1.76	25.26	30	27	-1.74	Pass	29.81	
802.11a	157	5785	6	22.06	1.78	23.84	30	27	-3.16	Pass	29.48	
			9	22.08	1.78	23.86	30	27	-3.14	Pass	29.48	x
			12	22.06	1.78	23.84	30	27	-3.16	Pass	29.48	
			18	22.07	1.78	23.85	30	27	-3.15	Pass	29.48	
			24	22.07	1.78	23.85	30	27	-3.15	Pass	29.48	
			36	22.07	1.78	23.85	30	27	-3.15	Pass	29.48	
			48	22.00	1.78	23.78	30	27	-3.22	Pass	29.48	
			54	21.97	1.78	23.75	30	27	-3.25	Pass	29.48	
802.11a	165	5825	6	21.63	1.81	23.44	30	27	-3.56	Pass	29.72	
			9	21.60	1.81	23.41	30	27	-3.59	Pass	29.72	x
			12	21.59	1.81	23.40	30	27	-3.60	Pass	29.72	
			18	21.61	1.81	23.42	30	27	-3.58	Pass	29.72	
			24	21.60	1.81	23.41	30	27	-3.59	Pass	29.72	
			36	21.49	1.81	23.30	30	27	-3.70	Pass	29.72	
			48	21.49	1.81	23.30	30	27	-3.70	Pass	29.72	
			54	21.49	1.81	23.30	30	27	-3.70	Pass	29.72	

Intertek

Report Number: 100900227DEN-003

Issued: 10/11/2012

Modulation Mode	Tx Channel	Frequency (MHz)	Data Rate	Peak Conducted (dBm)	Cable Loss (dB)	Final Conducted (dBm)	Spec Limit dBm	Adjusted Limit MIMO(dBm)	Delta Limit	Test Result	EBW (MHz)	Plot
MCS Power Index = 3 802.11n HT20	149	5745	MCS0	23.52	1.76	25.28	30	27	-1.72	Pass	28.90	
			MCS1	23.54	1.76	25.30	30	27	-1.70	Pass	28.90	x
			MCS2	23.52	1.76	25.28	30	27	-1.72	Pass	28.90	
			MCS3	23.51	1.76	25.27	30	27	-1.73	Pass	28.90	
			MCS4	23.45	1.76	25.21	30	27	-1.79	Pass	28.90	
			MCS5	23.45	1.76	25.21	30	27	-1.79	Pass	28.90	
			MCS6	23.38	1.76	25.14	30	27	-1.86	Pass	28.90	
			MCS7	23.32	1.76	25.08	30	27	-1.92	Pass	28.90	
802.11n HT20	157	5785	MCS0	22.51	1.78	24.29	30	27	-2.71	Pass	31.16	x
			MCS1	22.39	1.78	24.17	30	27	-2.83	Pass	31.16	
			MCS2	22.41	1.78	24.19	30	27	-2.81	Pass	31.16	
			MCS3	22.48	1.78	24.26	30	27	-2.74	Pass	31.16	
			MCS4	22.33	1.78	24.11	30	27	-2.89	Pass	31.16	
			MCS5	22.37	1.78	24.15	30	27	-2.85	Pass	31.16	
			MCS6	22.27	1.78	24.05	30	27	-2.95	Pass	31.16	
			MCS7	22.27	1.78	24.05	30	27	-2.95	Pass	31.16	
802.11n HT20	165	5825	MCS0	22.36	1.81	24.17	30	27	-2.83	Pass	26.12	x
			MCS1	23.38	1.81	25.19	30	27	-1.81	Pass	26.12	
			MCS2	22.38	1.81	24.19	30	27	-2.81	Pass	26.12	
			MCS3	22.43	1.81	24.24	30	27	-2.76	Pass	26.12	
			MCS4	22.31	1.81	24.12	30	27	-2.88	Pass	26.12	
			MCS5	22.42	1.81	24.23	30	27	-2.77	Pass	26.12	
			MCS6	22.25	1.81	24.06	30	27	-2.94	Pass	26.12	
			MCS7	22.24	1.81	24.05	30	27	-2.95	Pass	26.12	

Intertek

Report Number: 100900227DEN-003

Issued: 10/11/2012

Modulation Mode	Tx Channel	Frequency (MHz)	Data Rate	Peak Conducted (dBm)	Cable Loss (dB)	Final Conducted (dBm)	Spec Limit dBm	Adjusted Limit MIMO(dBm)	Delta Limit	Test Result	EBW (MHz)	Plot
MCS Power Index = 3	151	5755	MCS0	22.79	1.76	24.55	30	27	-2.45	Pass	40.76	x
			MCS1	22.47	1.76	24.23	30	27	-2.77	Pass	40.76	
			MCS2	22.48	1.76	24.24	30	27	-2.76	Pass	40.76	
			MCS3	22.60	1.76	24.36	30	27	-2.64	Pass	40.76	
			MCS4	22.45	1.76	24.21	30	27	-2.79	Pass	40.76	
			MCS5	22.37	1.76	24.13	30	27	-2.87	Pass	40.76	
			MCS6	22.29	1.76	24.05	30	27	-2.95	Pass	40.76	
802.11n HT40			MCS7	22.07	1.76	23.83	30	27	-3.17	Pass	40.76	
	159	5795	MCS0	22.46	1.79	24.25	30	27	-2.75	Pass	40.67	x
			MCS1	22.36	1.79	24.15	30	27	-2.85	Pass	40.67	
			MCS2	22.17	1.79	23.96	30	27	-3.04	Pass	40.67	
			MCS3	22.30	1.79	24.09	30	27	-2.91	Pass	40.67	
			MCS4	22.15	1.79	23.94	30	27	-3.06	Pass	40.67	
			MCS5	22.07	1.79	23.86	30	27	-3.14	Pass	40.67	
			MCS6	21.96	1.79	23.75	30	27	-3.25	Pass	40.67	
802.11n HT40			MCS7	21.93	1.79	23.72	30	27	-3.28	Pass	40.67	

FCC Part 15.247(b)(3) Limit: 30dBm (1W)

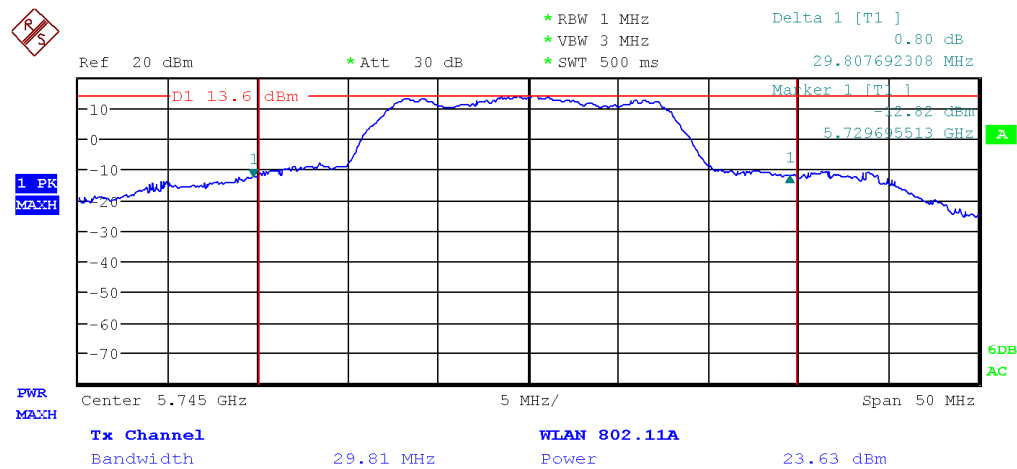
Adjusted limit for dual antenna port per MIMO guidelines: 27dBm (0.5 W) per antenna port

The worst-case RF Conducted Power measurement was 802.11a OFDM Modulation Mode, Channel 149: 25.41 dBm (-1.59 dBm under the limit)

5.13 Plots: 5725-5850 MHz Band - Antenna 0

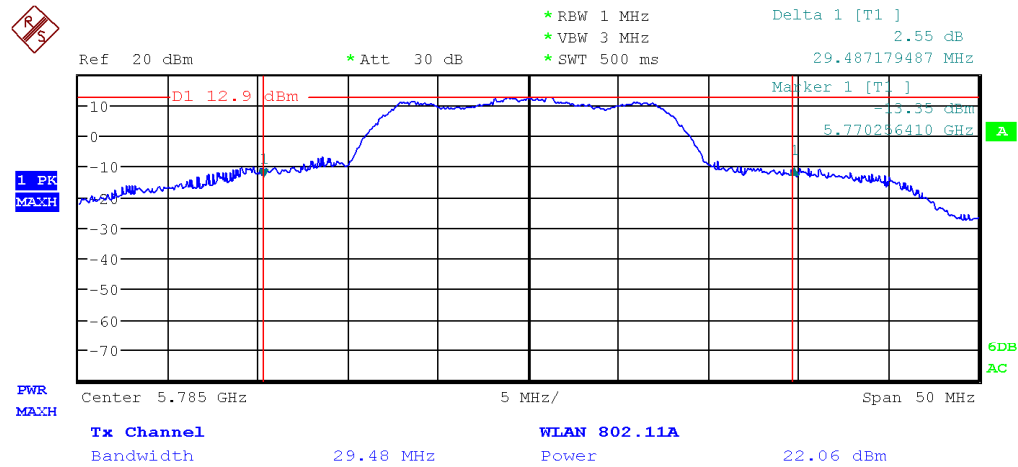
Channels in 5725 to 5850 MHz Band – FCC Part 15.247(b)(3)(4)
(RF Conducted Port Power – Antenna 0)

802.11a OFDM Modulation Mode
Channel 149



CH0-
Date: 26.SEP.2012 16:52:53

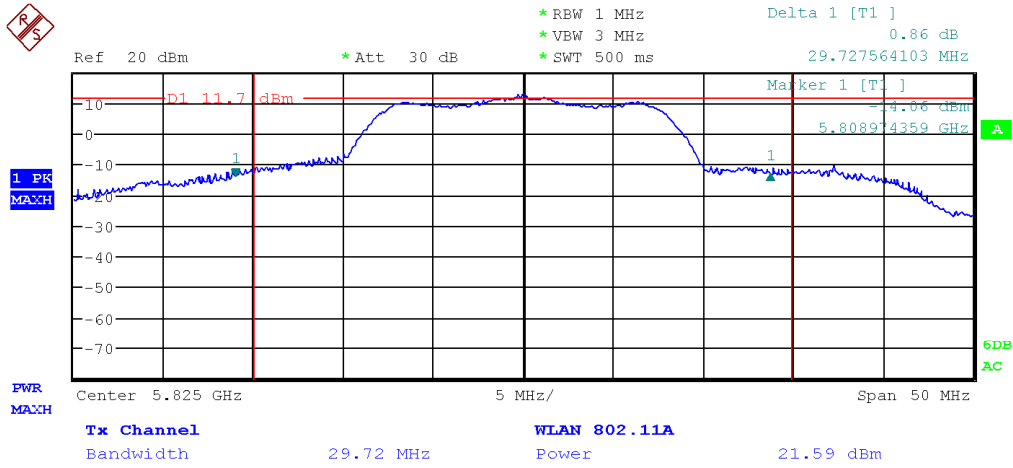
Channel 157



CH0-

Date: 26.SEP.2012 16:59:28

Channel 165

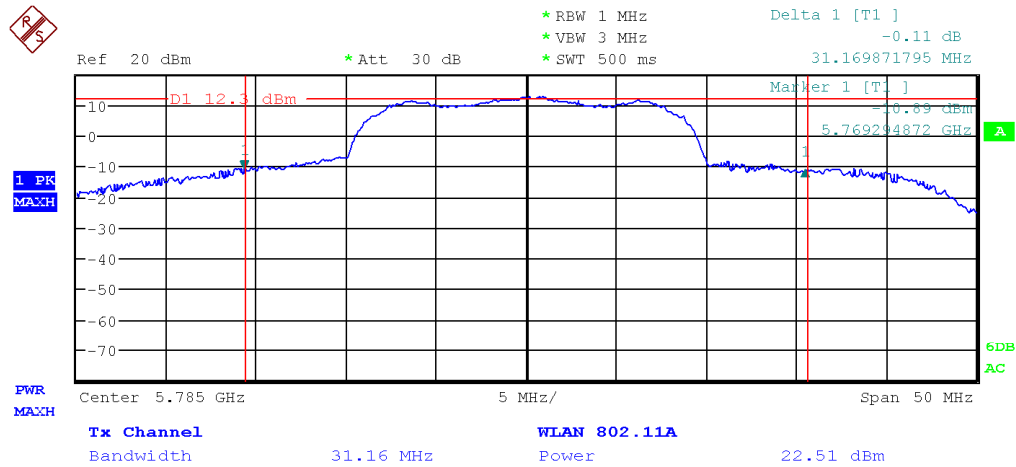


CH0-

Date: 26.SEP.2012 17:08:18

802.11n HT20 MCS Modulation Mode

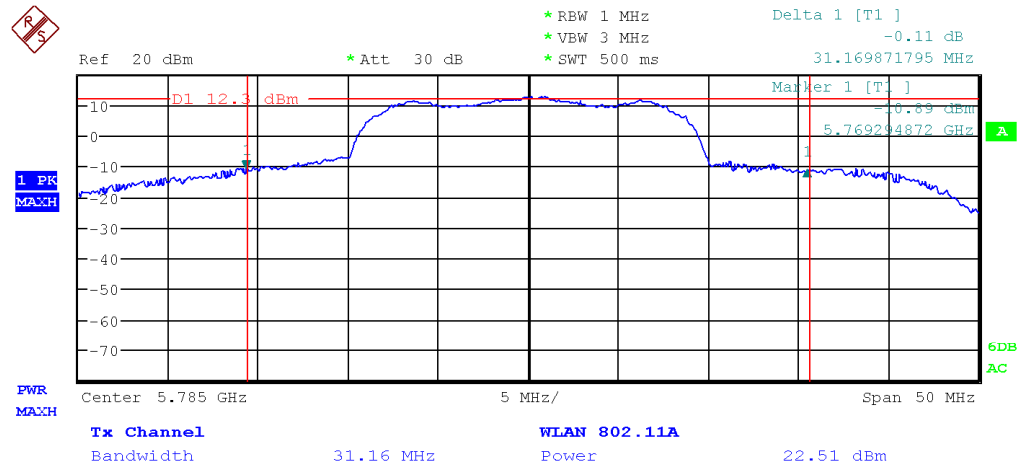
Channel 149



CH0-

Date: 26.SEP.2012 17:04:14

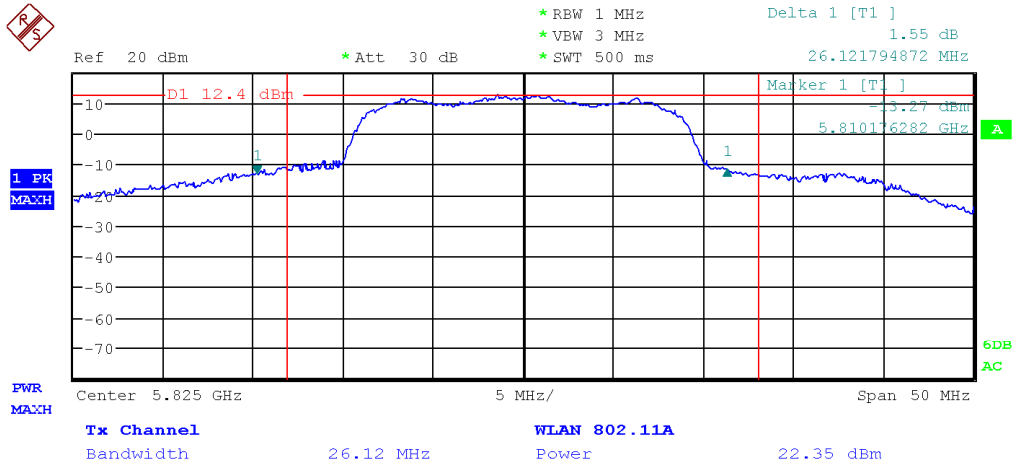
Channel 157



CH0-

Date: 26.SEP.2012 17:04:14

Channel 165

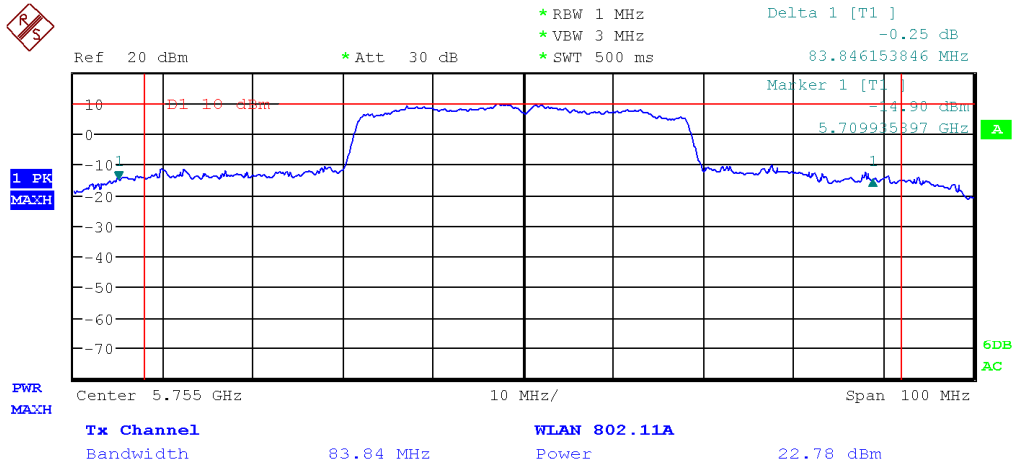


CH0-

Date: 26.SEP.2012 17:12:01

802.11n HT40 MCS Modulation Mode

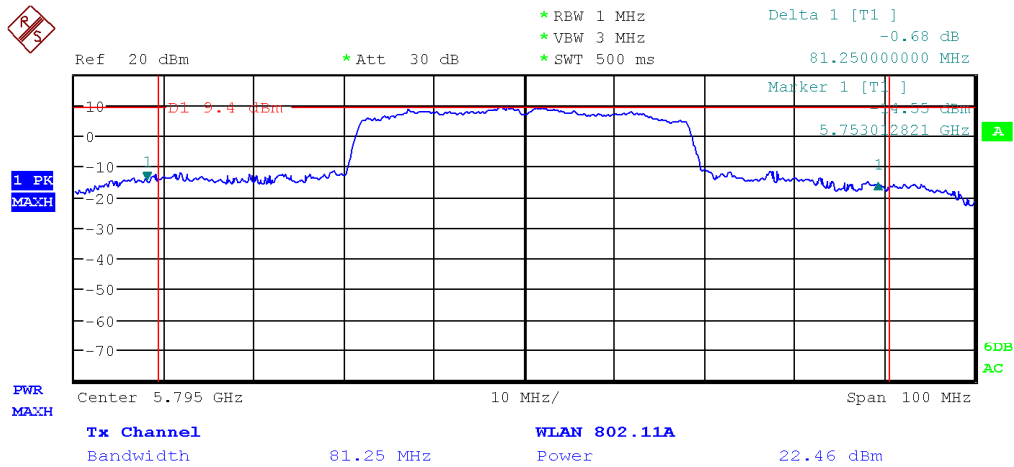
Channel 151



CH0-

Date: 26.SEP.2012 17:18:54

Channel 159



CH0-

Date: 26.SEP.2012 17:22:43

The above plots represent the worst-case for all channels, modulation modes and data rates tested.

Intertek

Report Number: 100900227DEN-003

Issued: 10/11/2012

5.14 Test Data: 5725-5850 MHz Band - Antenna 1

Channels in 5725 to 5850 MHz Band – FCC Part 15.247(b)(3)(4) (RF Conducted Port Power – Antenna 1)

Modulation Mode	Tx Channel	Frequency (MHz)	Data Rate	Peak Conducted (dBm)	Cable Loss (dB)	Final Conducted (dBm)	Spec Limit dBm	Adjusted Limit MIMO(dBm)	Delta Limit	Test Result	EBW (MHz)	Plot
OFDM Power Index = 6 802.11a	149	5745	6	23.34	1.76	25.10	30	27	-1.90	Pass	30.14	x
			9	23.31	1.76	25.07	30	27	-1.93	Pass	30.14	
			12	23.32	1.76	25.08	30	27	-1.92	Pass	30.14	
			18	23.30	1.76	25.06	30	27	-1.94	Pass	30.14	
			24	23.28	1.76	25.04	30	27	-1.96	Pass	30.14	
			36	23.17	1.76	24.93	30	27	-2.07	Pass	30.14	
			48	23.18	1.76	24.94	30	27	-2.06	Pass	30.14	
			54	23.17	1.76	24.93	30	27	-2.07	Pass	30.14	
802.11a	157	5785	6	22.48	1.78	24.26	30	27	-2.74	Pass	34.46	
			9	22.56	1.78	24.34	30	27	-2.66	Pass	34.46	x
			12	22.50	1.78	24.28	30	27	-2.72	Pass	34.46	
			18	22.48	1.78	24.26	30	27	-2.74	Pass	34.46	
			24	22.46	1.78	24.24	30	27	-2.76	Pass	34.46	
			36	22.41	1.78	24.19	30	27	-2.81	Pass	34.46	
			48	22.36	1.78	24.14	30	27	-2.86	Pass	34.46	
			54	22.46	1.78	24.24	30	27	-2.76	Pass	34.46	
802.11a	165	5825	6	22.05	1.81	23.86	30	27	-3.14	Pass	37.82	
			9	22.06	1.81	23.87	30	27	-3.13	Pass	37.82	x
			12	22.05	1.81	23.86	30	27	-3.14	Pass	37.82	
			18	22.05	1.81	23.86	30	27	-3.14	Pass	37.82	
			24	22.06	1.81	23.87	30	27	-3.13	Pass	37.82	
			36	21.98	1.81	23.79	30	27	-3.21	Pass	37.82	
			48	21.95	1.81	23.76	30	27	-3.24	Pass	37.82	
			54	21.95	1.81	23.76	30	27	-3.24	Pass	37.82	

Intertek

Report Number: 100900227DEN-003

Issued: 10/11/2012

Modulation Mode	Tx Channel	Frequency (MHz)	Data Rate	Peak Conducted (dBm)	Cable Loss (dB)	Final Conducted (dBm)	Spec Limit dBm	Adjusted Limit MIMO(dBm)	Delta Limit	Test Result	EBW (MHz)	Plot
MCS Power Index = 6	149	5745	MCS0	23.75	1.76	25.51	30	27	-1.49	Pass	34.05	
			MCS1	23.77	1.76	25.53	30	27	-1.47	Pass	34.05	
			MCS2	23.75	1.76	25.51	30	27	-1.49	Pass	34.05	
			MCS3	23.78	1.76	25.54	30	27	-1.46	Pass	34.05	
			MCS4	20.68	1.76	22.44	30	27	-4.56	Pass	34.05	
			MCS5	23.70	1.76	25.46	30	27	-1.54	Pass	34.05	
			MCS6	23.63	1.76	25.39	30	27	-1.61	Pass	34.05	
802.11n HT20			MCS7	23.56	1.76	25.32	30	27	-1.68	Pass	34.05	
	157	5785	MCS0	23.31	1.78	25.09	30	27	-1.91	Pass	32.53	
			MCS1	23.32	1.78	25.10	30	27	-1.90	Pass	32.53	x
			MCS2	23.30	1.78	25.08	30	27	-1.92	Pass	32.53	
			MCS3	23.30	1.78	25.08	30	27	-1.92	Pass	32.53	
			MCS4	23.21	1.78	24.99	30	27	-2.01	Pass	32.53	
			MCS5	23.21	1.78	24.99	30	27	-2.01	Pass	32.53	
			MCS6	23.20	1.78	24.98	30	27	-2.02	Pass	32.53	
802.11n HT20			MCS7	23.13	1.78	24.91	30	27	-2.09	Pass	32.53	
	165	5825	MCS0	22.71	1.81	24.52	30	27	-2.48	Pass	34.86	x
			MCS1	22.66	1.81	24.47	30	27	-2.53	Pass	34.86	
			MCS2	22.65	1.81	24.46	30	27	-2.54	Pass	34.86	
			MCS3	22.64	1.81	24.45	30	27	-2.55	Pass	34.86	
			MCS4	22.59	1.81	24.40	30	27	-2.60	Pass	34.86	
			MCS5	22.61	1.81	24.42	30	27	-2.58	Pass	34.86	
			MCS6	22.57	1.81	24.38	30	27	-2.62	Pass	34.86	
802.11n HT20			MCS7	22.46	1.81	24.27	30	27	-2.73	Pass	34.86	

Intertek

Report Number: 100900227DEN-003

Issued: 10/11/2012

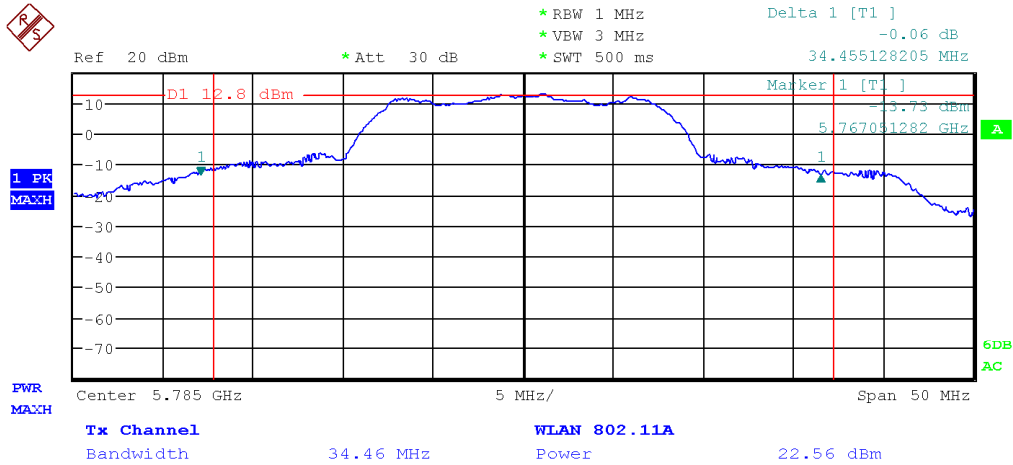
Modulation Mode	Tx Channel	Frequency (MHz)	Data Rate	Peak Conducted (dBm)	Cable Loss (dB)	Final Conducted (dBm)	Spec Limit dBm	Adjusted Limit MIMO(dBm)	Delta Limit	Test Result	EBW (MHz)	Plot
MCS Power Index = 6	151	5755	MCS0	22.65	1.76	24.41	30	27	-2.59	Pass	48.62	x
			MCS1	22.51	1.76	24.27	30	27	-2.73	Pass	48.62	
			MCS2	22.37	1.76	24.13	30	27	-2.87	Pass	48.62	
			MCS3	22.47	1.76	24.23	30	27	-2.77	Pass	48.62	
			MCS4	22.36	1.76	24.12	30	27	-2.88	Pass	48.62	
			MCS5	22.27	1.76	24.03	30	27	-2.97	Pass	48.62	
			MCS6	22.15	1.76	23.91	30	27	-3.09	Pass	48.62	
802.11n HT40			MCS7	22.12	1.76	23.88	30	27	-3.12	Pass	48.62	
	159	5795	MCS0	22.48	1.79	24.27	30	27	-2.73	Pass	48.30	x
			MCS1	22.34	1.79	24.13	30	27	-2.87	Pass	48.30	
			MCS2	22.19	1.79	23.98	30	27	-3.02	Pass	48.30	
			MCS3	22.35	1.79	24.14	30	27	-2.86	Pass	48.30	
			MCS4	22.19	1.79	23.98	30	27	-3.02	Pass	48.30	
			MCS5	22.10	1.79	23.89	30	27	-3.11	Pass	48.30	
			MCS6	22.00	1.79	23.79	30	27	-3.21	Pass	48.30	
802.11n HT40			MCS7	21.98	1.79	23.77	30	27	-3.23	Pass	48.30	

FCC Part 15.247(b)(3) Limit: 30dBm (1W)

Adjusted limit for dual antenna port per MIMO guidelines: 27dBm (0.5 W) per antenna port

The worst-case RF Conducted Power measurement was 802.11n HT20 MCS Modulation Mode, Channel 149: 25.54 dBm (-1.46 dBm under the limit)

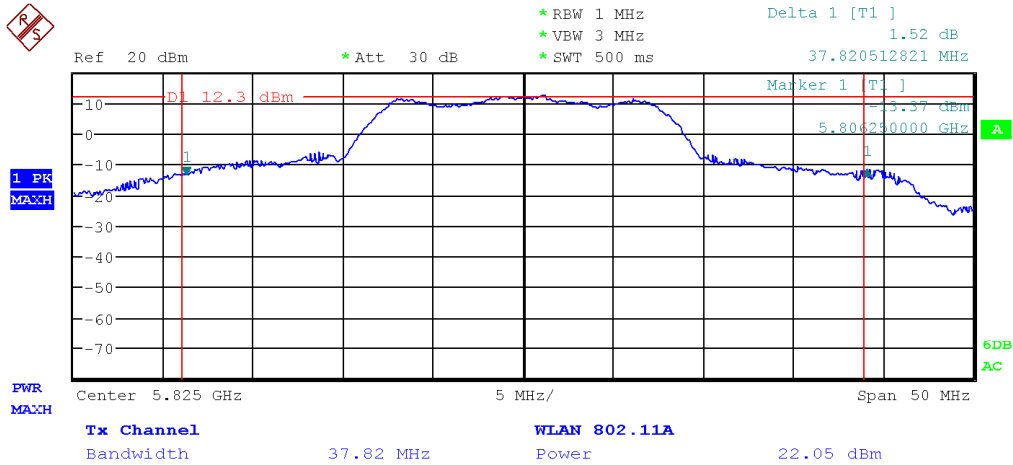
Channel 157



CH0-

Date: 26.SEP.2012 14:35:36

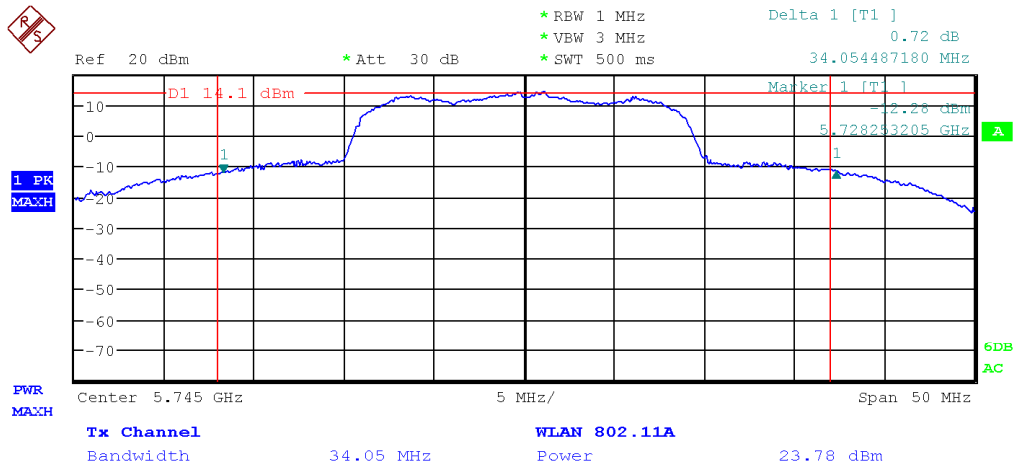
Channel 165



CH0-

Date: 26.SEP.2012 14:44:14

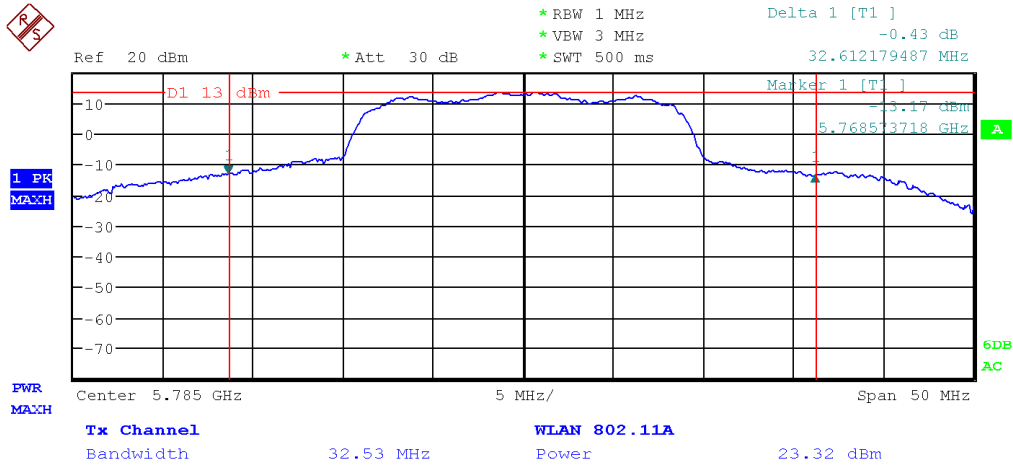
802.11n HT20 MCS Modulation Mode Channel 149



CH0-

Date: 26.SEP.2012 14:30:27

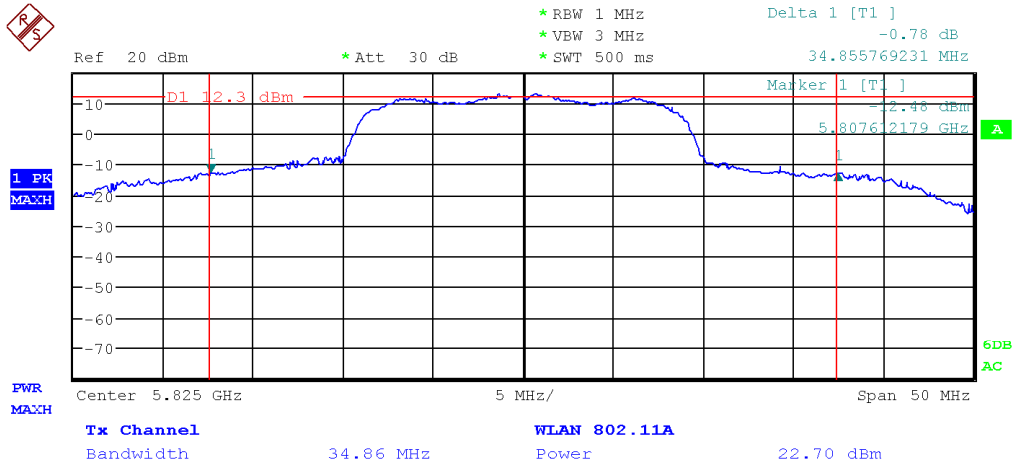
Channel 157



CH0-

Date: 26.SEP.2012 14:39:42

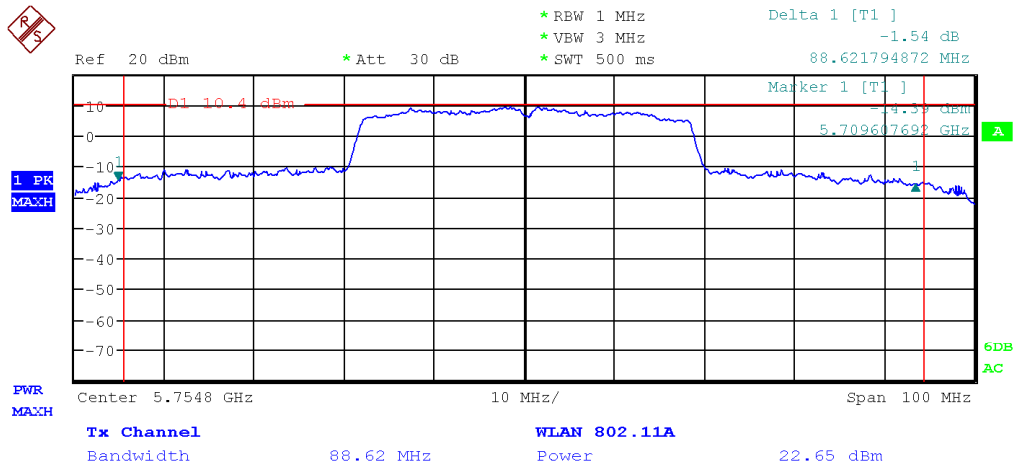
Channel 165



CH0-

Date: 26.SEP.2012 14:47:20

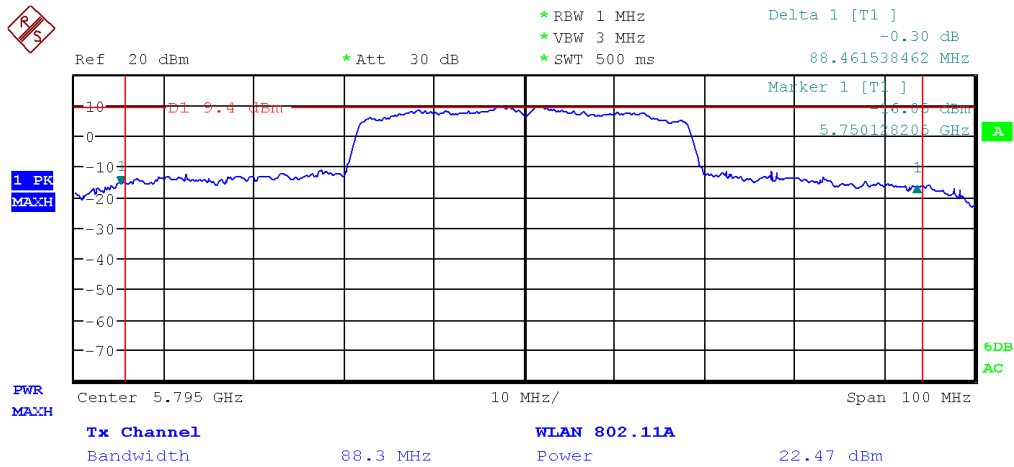
802.11n HT40 MCS Modulation Mode Channel 151



CH0-

Date: 26.SEP.2012 14:53:39

Channel 159



CH0-

Date: 26.SEP.2012 14:57:40

The above plots represent the worst-case channel, modulation and data rate tested.

6 6dB Bandwidth

6.1 Method

Unless otherwise stated no deviations were made from FCC Part 15.247(a)(2).

This testing was performed at Intertek Denver, located at 1795 Dogwood St. Suite 200, Louisville, CO 80027.

6.2 Test Equipment Used:

<u>Asset ID</u>	<u>Description</u>	<u>Manufacturer</u>	<u>Model</u>	<u>Serial</u>	<u>Cal Date</u>	<u>Cal Due</u>
18913	Spectrum Analyzer	Hewlett-Packard	E7405A	My44211889	7/16/2012	7/16/2013
E2	RF Conducted Port Cable	-----	True Blue	001	09/12/2012	09/13/2013
18648	Environmental Chamber	Envirotronics	51-2024508	---	VBV	VBV
18940	Thermometer	Fluke	52II	90550018	05/19/2012	05/19/2013

6.3 Test Requirements:

For the bands 2400 – 2483.5 GHz and 5725 – 5850 MHz, the minimum 6dB Bandwidth of the Fundamental shall be at least 500 kHz.

6.4 Test Procedure:

The antenna port of the product was connected to the input of the spectrum analyzer. For each RF output channel investigated, the spectrum analyzer center frequency was set to the channel carrier. A peak output reading was taken and a display line was drawn 6 dB lower than peak level. The 6dB bandwidth was determined from where the channel output spectrum intersected the display line.

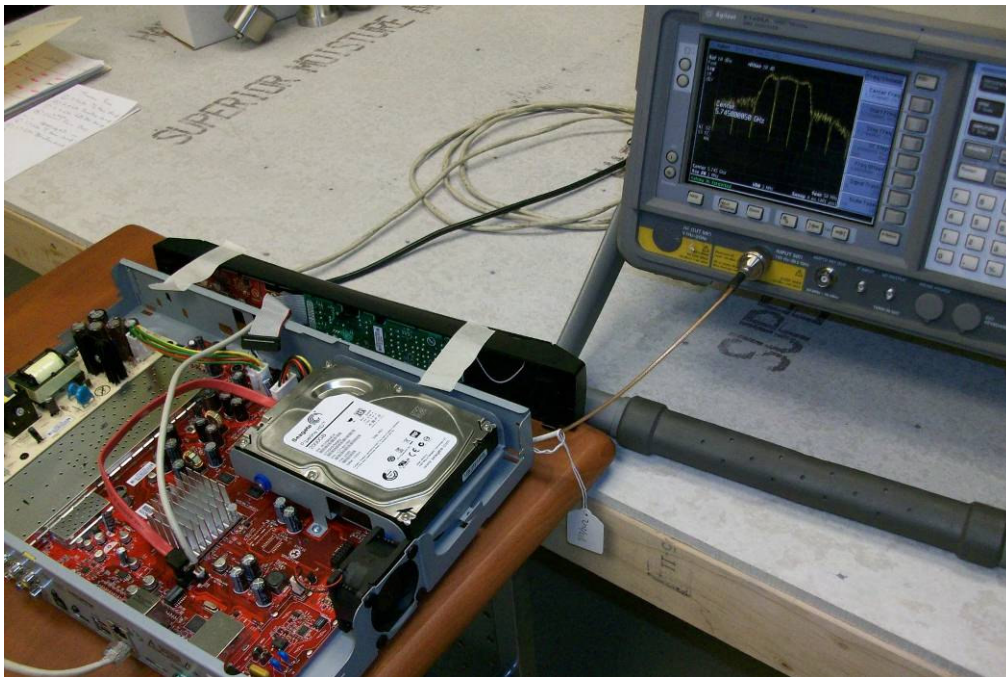
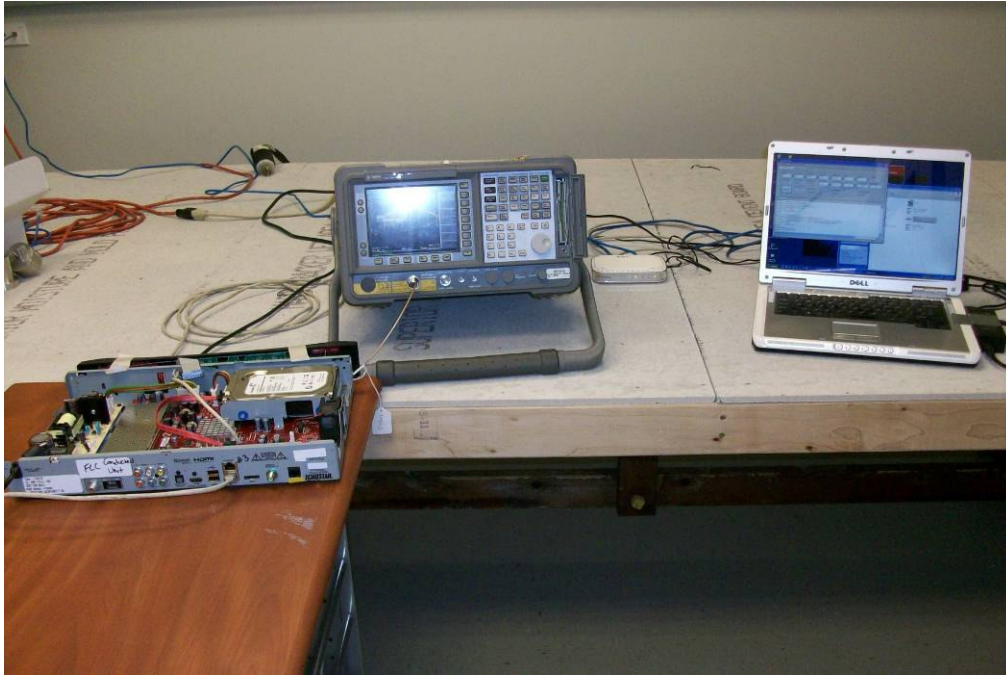
The procedures described in FCC Publication 558074 (Guidelines for Compliance Measurements on DTS Operating Under 15.247), were used.

6.5 Test Results:

The sample tested was found to Comply.

6.6 Setup Photographs:

6dB Bandwidth - Test setup



6.7 Test Data Summary: 2400-2483.5 MHz Band

6dB Bandwidth 2400 – 2483.5 MHz – Antenna 0

FCC Part 15.247(a)(2)

Channel	Frequency, MHz	Standard/ Data Rate	6dB Bandwidth (MHz)	6dB Bandwidth Limit (kHz)	Plot
1	2412	802.11b, 5.5Mbps	8.37	≥ 500kHz	x
		802.11g, 54Mbps	15.38	≥ 500kHz	x
		802.11n HT20, MCS5	15.67	≥ 500kHz	
3	2422	802.11n HT40, MCS0	36.73	≥ 500kHz	x
6	2437	802.11b, 5.5Mbps	8.56	≥ 500kHz	x
		802.11g, 54Mbps	14.52	≥ 500kHz	x
		802.11n HT20, MCS7	15.57	≥ 500kHz	x
		802.11n HT40, MCS0	36.63	≥ 500kHz	
9	2452	802.11n HT40, MCS0	36.73	≥ 500kHz	x
11	2462	802.11b, 5.5Mbps	8.46	≥ 500kHz	x
		802.11g, 54Mbps	15.29	≥ 500kHz	x
		802.11n HT20, MCS6	16.83	≥ 500kHz	x

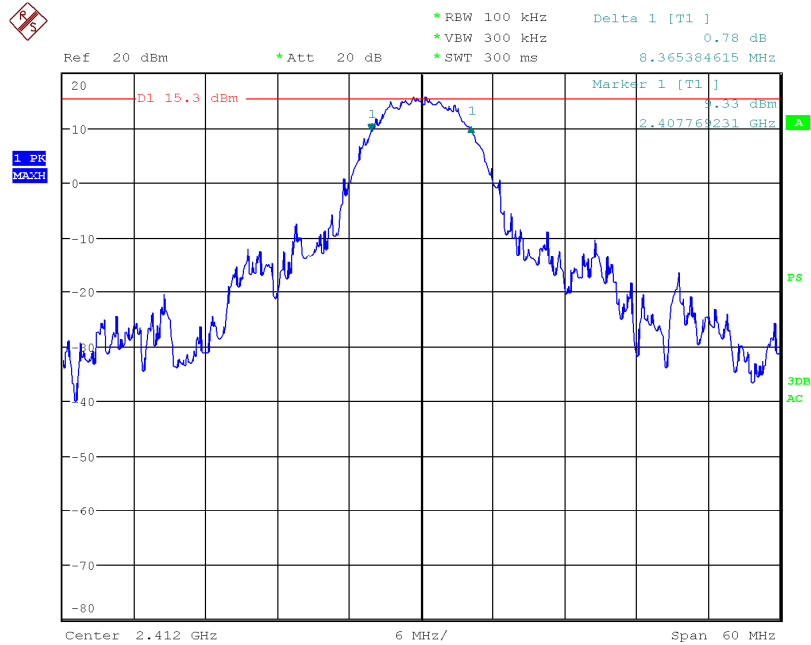
Note: Since the 6dB Bandwidth is >> specification requirement, this test was not repeated for Antenna 1.

6.8 Test Data/Plots: 2400-2483.5 MHz Band

Channels 2400 to 2483.5 MHz - FCC Part 15.247(a)(2) (6dB Bandwidth)

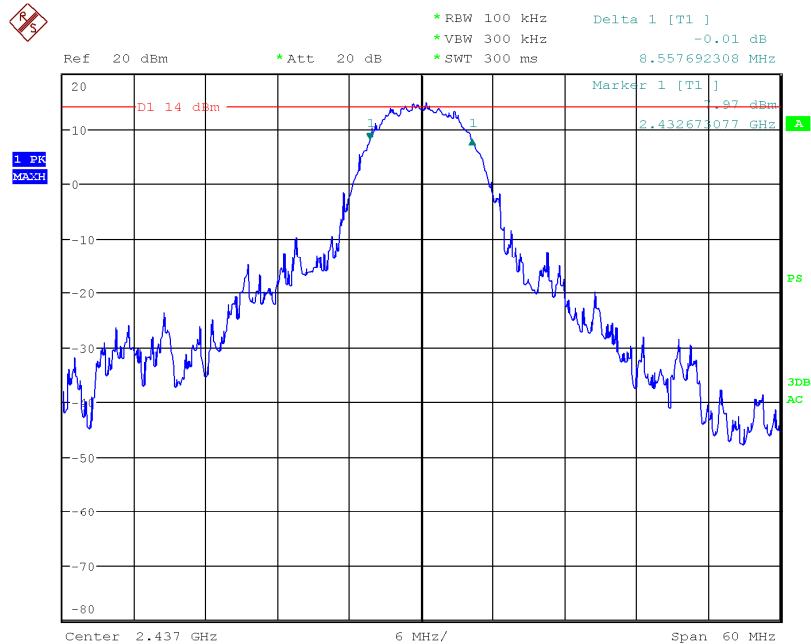
802.11b – CCK Modulation Mode

*Channel 1



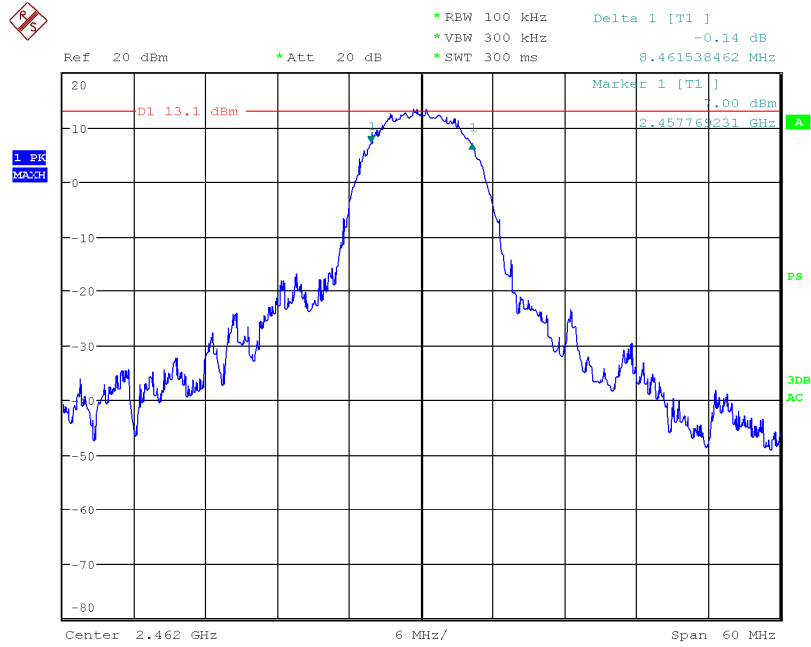
Date: 18.SEP.2012 14:52:51

Channel 6



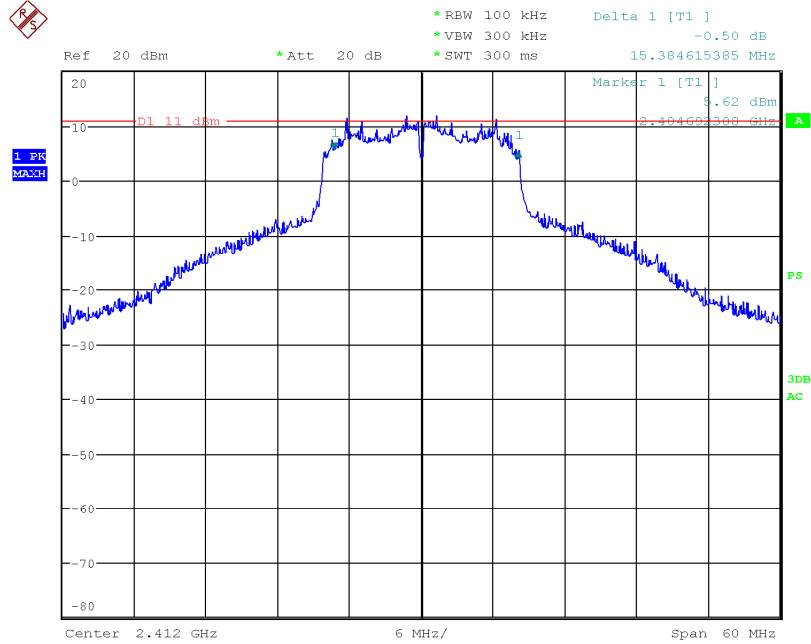
Date: 18.SEP.2012 15:00:17

Channel 11



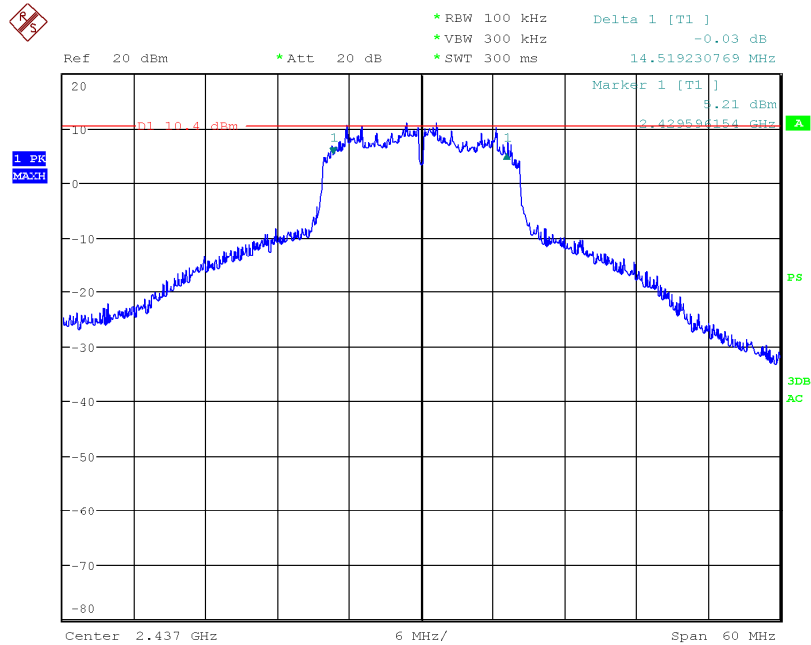
Date: 18.SEP.2012 15:04:42

802.11g – OFDM Modulation Mode Channel 1



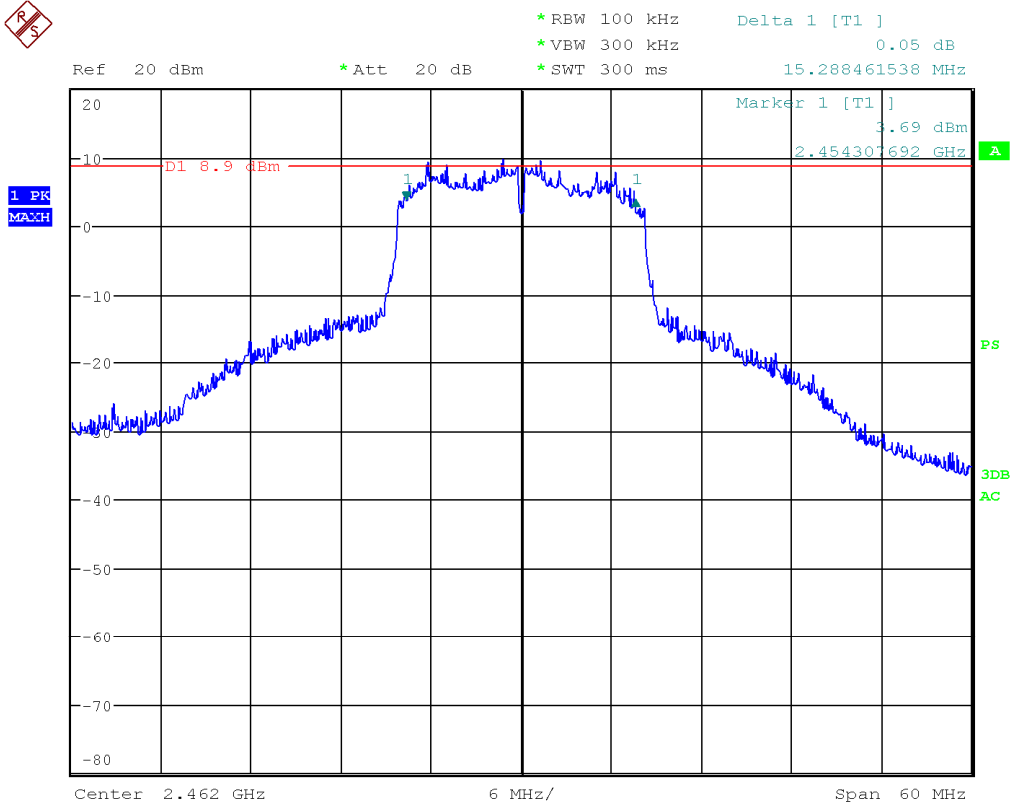
Date: 18.SEP.2012 15:13:34

Channel 6



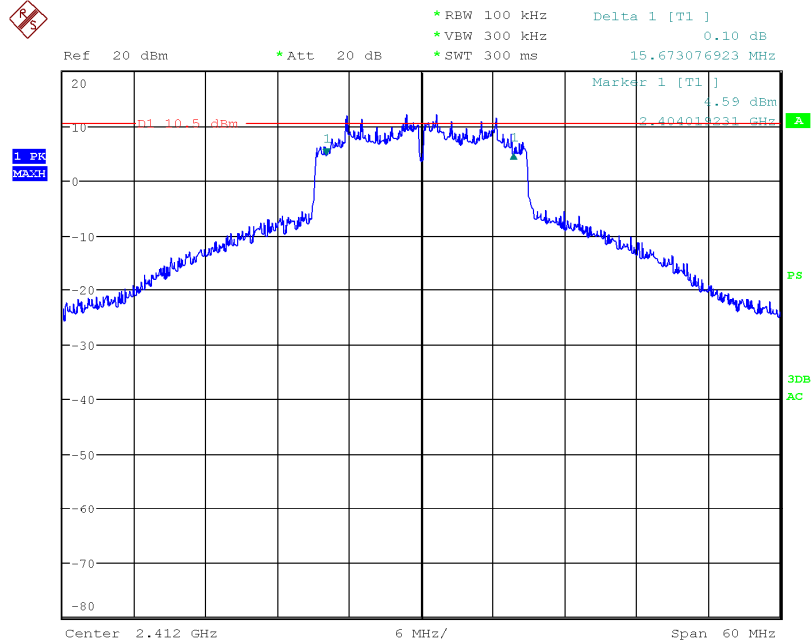
Date: 18.SEP.2012 15:19:01

Channel 11



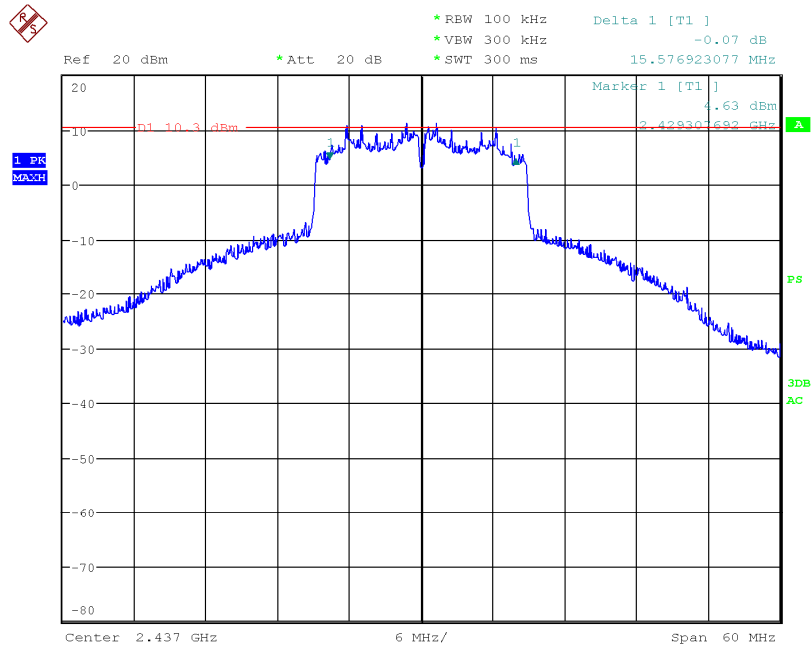
Date: 18.SEP.2012 15:22:51

802.11n HT20 MCS Modulation Mode Channel 1



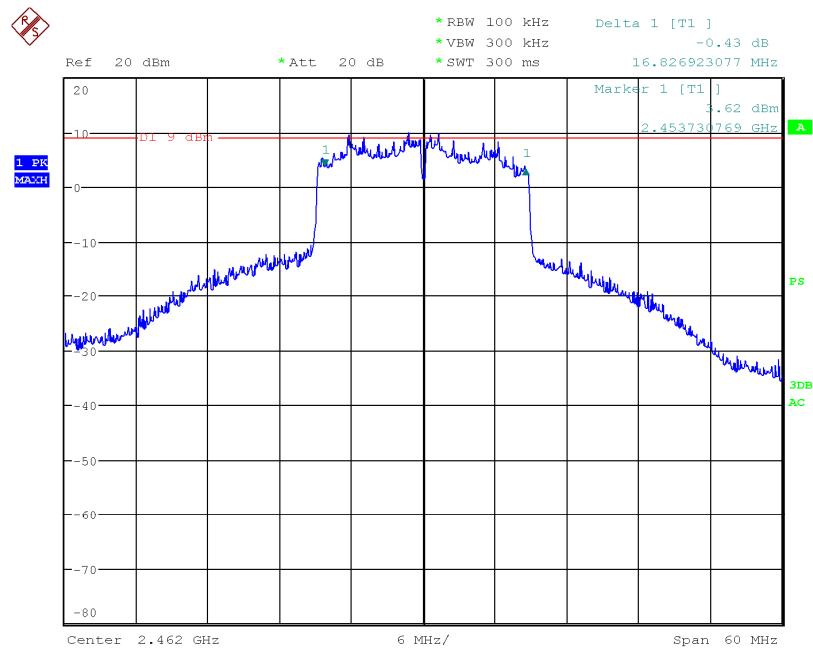
Date: 18.SEP.2012 15:27:02

Channel 6

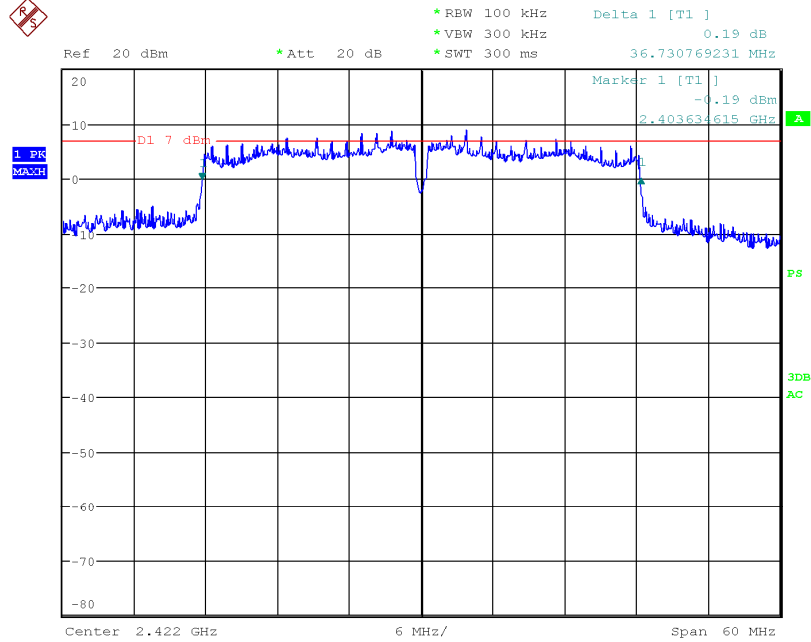


Date: 18.SEP.2012 15:30:13

Channel 11

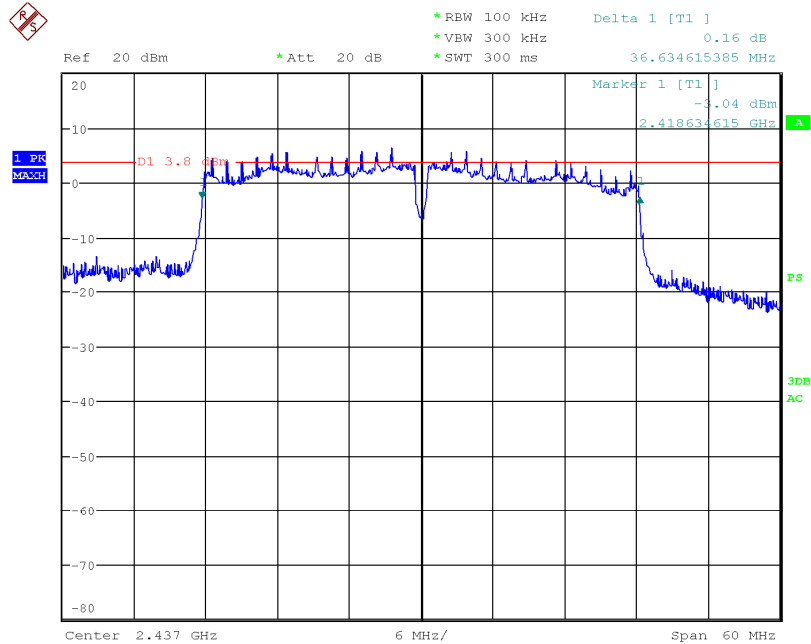


Date: 18.SEP.2012 15:38:27

802.11n HT40 MCS Modulation Mode
Channel 3

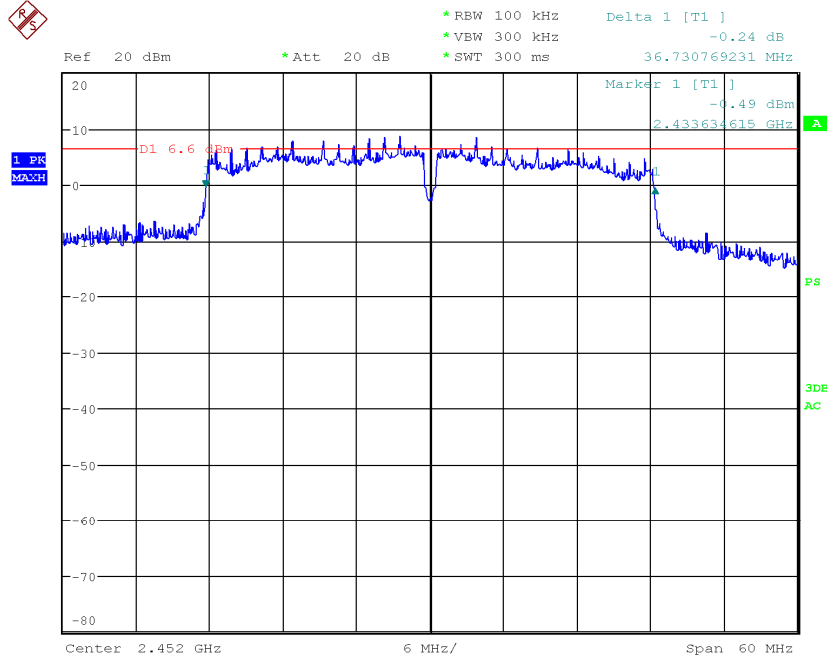
Date: 18.SEP.2012 15:53:10

Channel 6



Date: 18.SEP.2012 15:55:50

Channel 9



Date: 18.SEP.2012 15:58:39

FCC Part 15.247(a)(2) 6dB Bandwidth Specification: Minimum 6dB BW > 500kHz

Worst-case 6dB Bandwidth Measurement: 802.11b – CCK Modulation Mode, Channel 1 (8.365MHz)

6.9 Test Data Summary: 5725-5850 MHz Band

6dB Bandwidth 5725 – 5850 MHz – Antenna 0 FCC Part 15.247(a)(2)

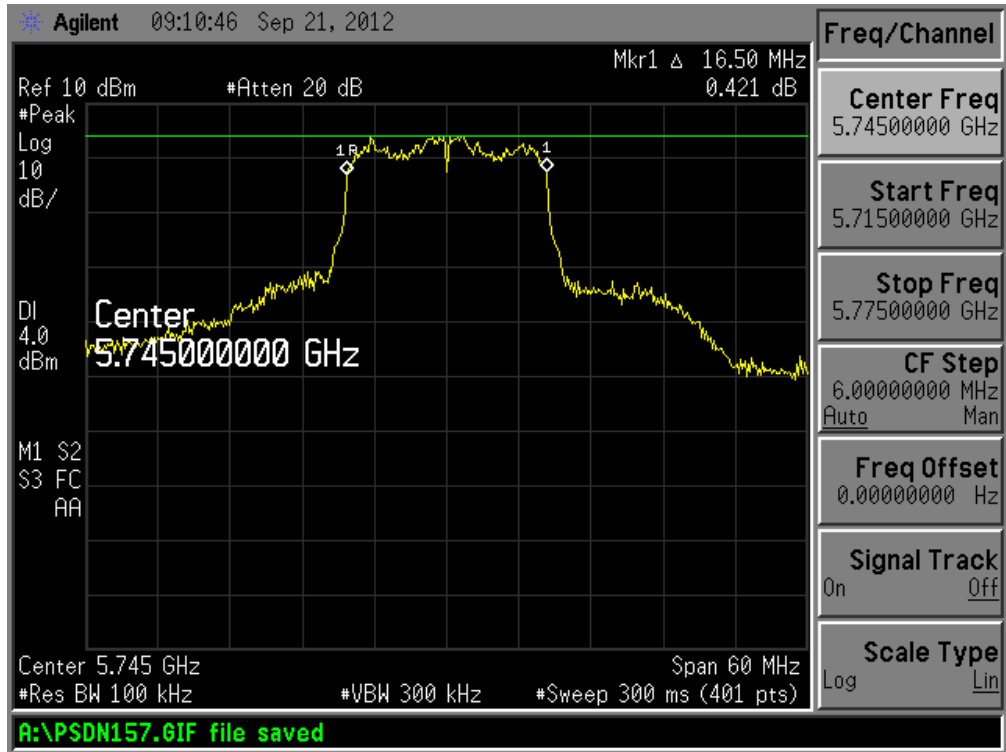
Channel	Frequency, MHz	Standard/ Data Rate	6dB Bandwidth (MHz)	6dB Bandwidth Limit (kHz)	Plot
149	5745	802.11a, 6Mbps	16.50	≥ 500kHz	x
		802.11n HT20, MCS3	16.80	≥ 500kHz	x
151	5755	802.11n HT40, MCS0	36.60	≥ 500kHz	x
157	5785	802.11a, 9Mbps	15.90	≥ 500kHz	x
		802.11n HT20, MCS1	16.05	≥ 500kHz	x
159	5795	802.11n HT40, MCS0	36.30	≥ 500kHz	x
165	5825	802.11a, 9Mbps	15.90	≥ 500kHz	x
		802.11n HT20, MCS0	16.80	≥ 500kHz	x

Note: Since the 6dB Bandwidth is >> specification requirement, this test was not repeated for Antenna 1.

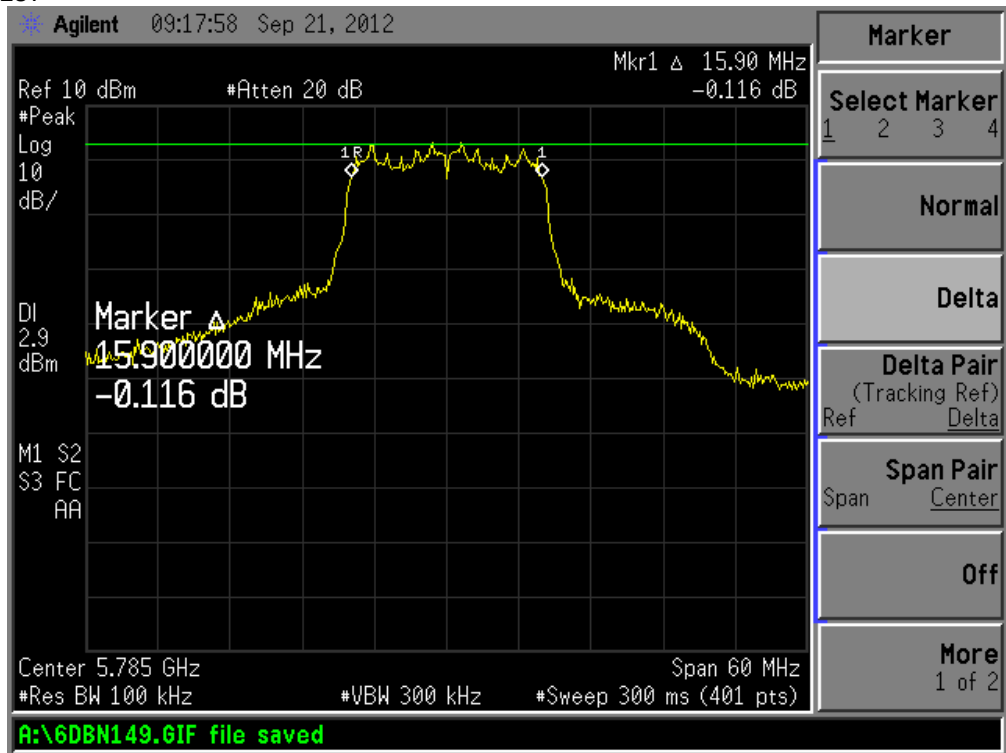
6.10 Test Data/Plots: 5725-5850 MHz Band

Channels 5725 to 5850 MHz - FCC Part 15.247(a)(2)
(6dB Bandwidth)

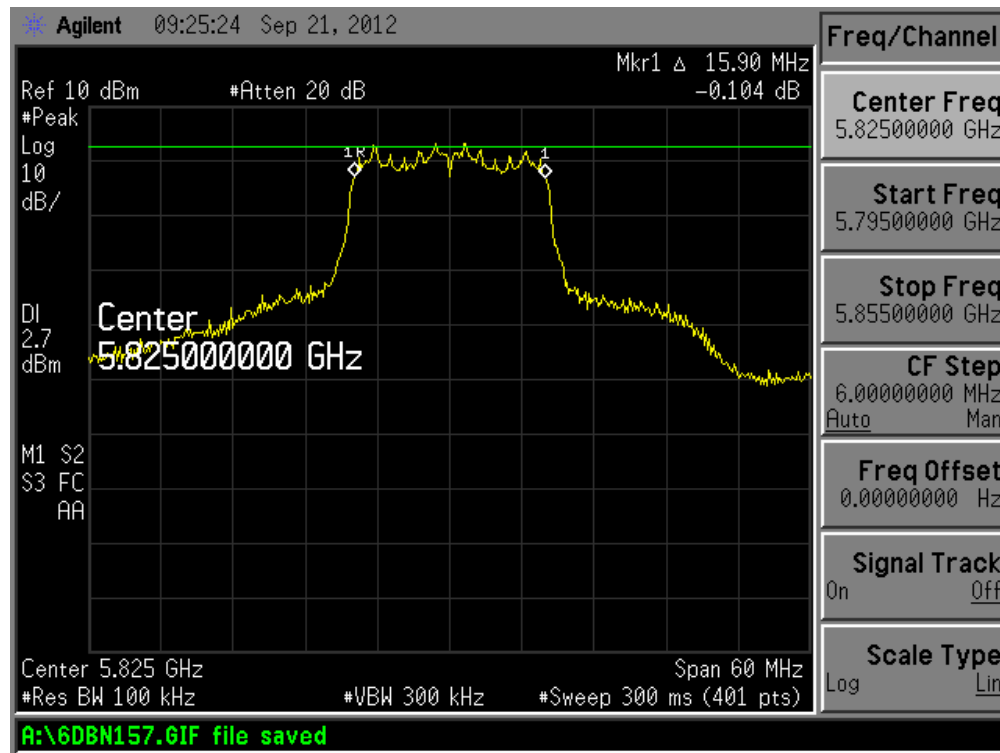
802.11a – OFDM Modulation Mode
Channel 149

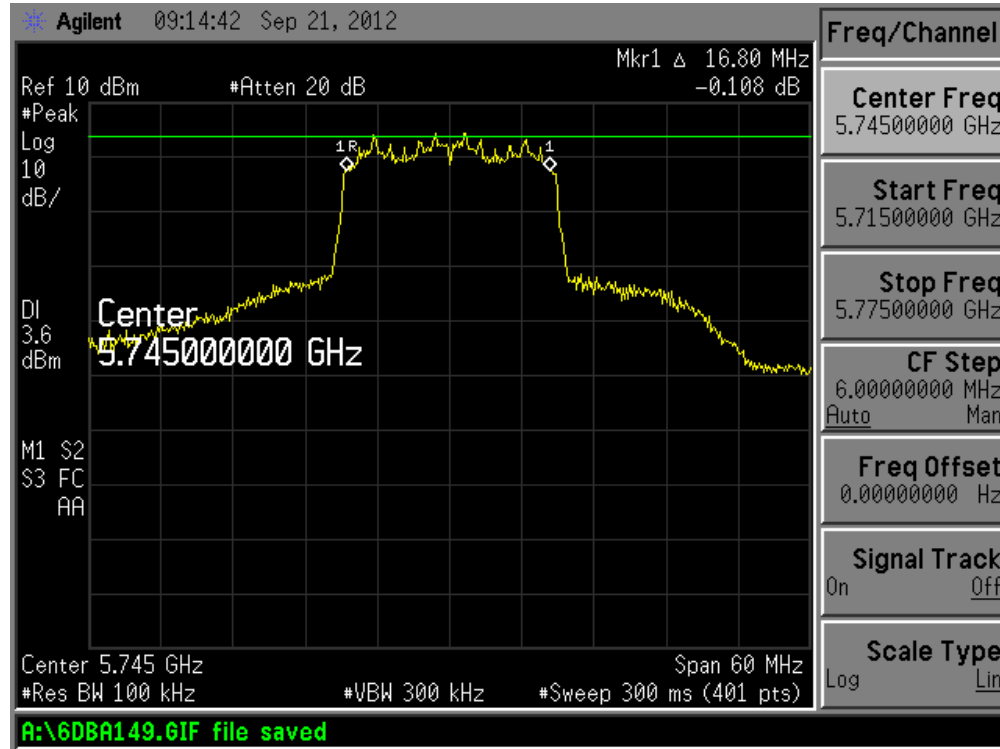


*Channel 157

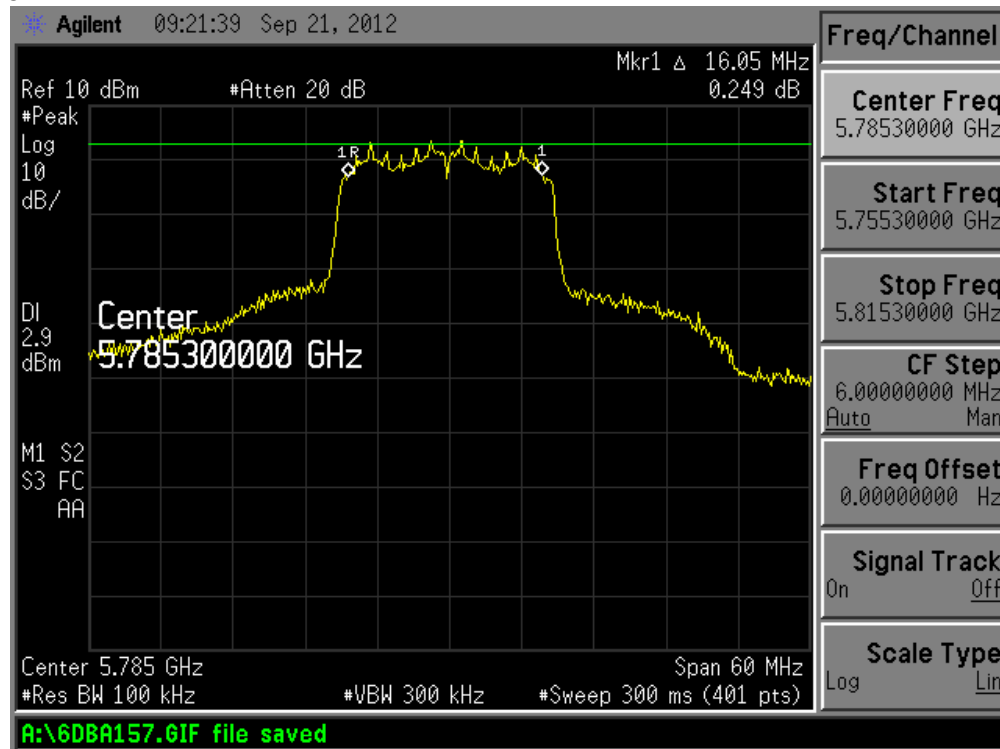


Channel 165

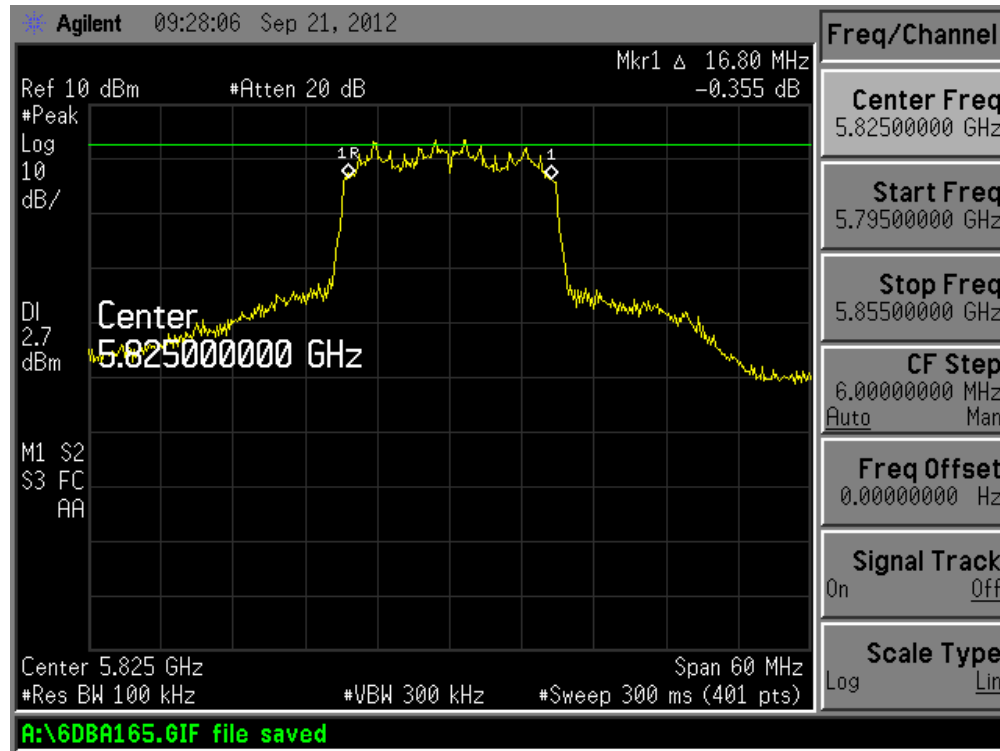


802.11n HT20 – MCS Modulation Mode
Channel 149

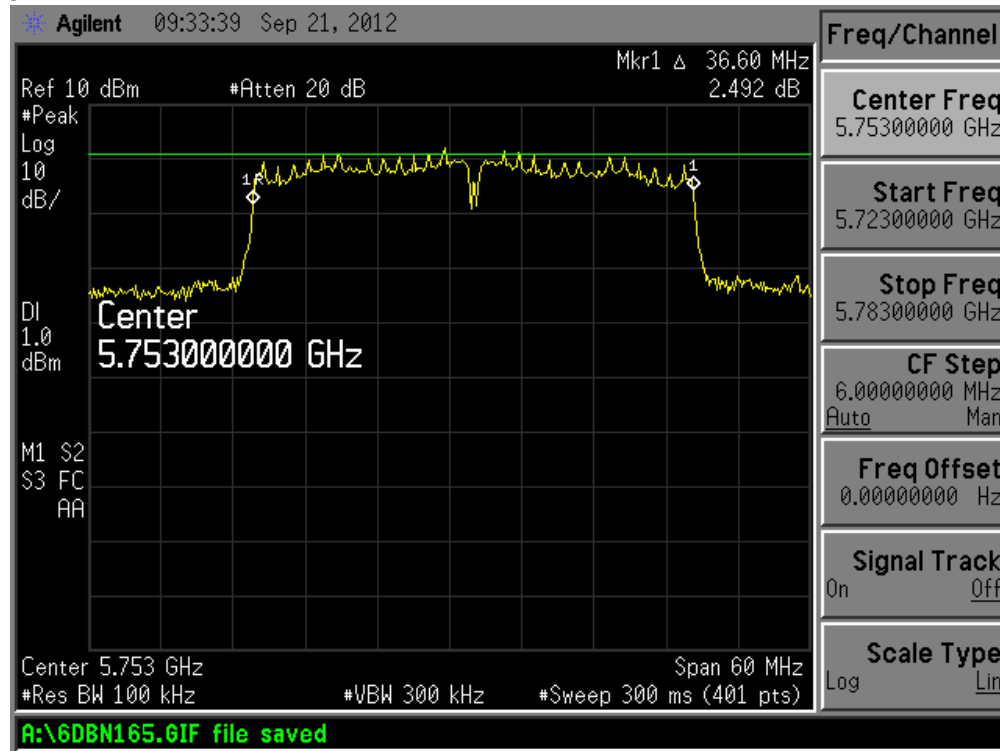
Channel 157



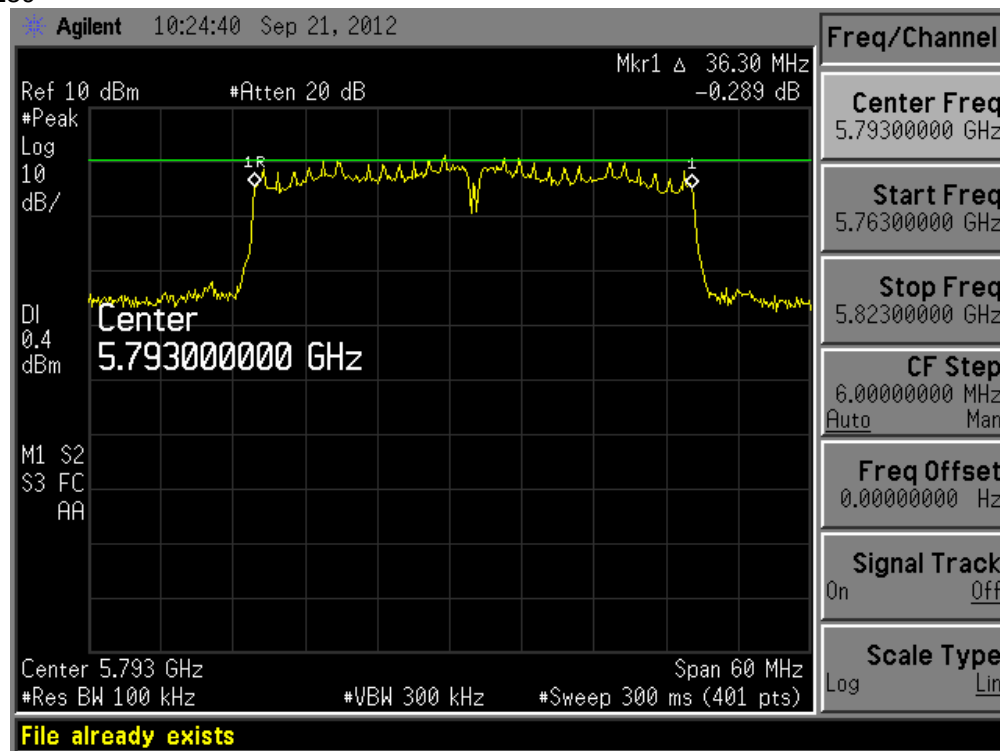
Channel 165



802.11n HT40 MCS Modulation Mode
Channel 151



Channel 159



FCC Part 15.247(a)(2) 6dB Bandwidth Specification: Minimum 6dB BW > 500kHz

Worst-case 6dB Bandwidth Measurement: 802.11a – OFDM Modulation Mode, Channel 157: (15.90MHz)

7 Power Spectral Density – PSD

7.1 Method

Unless otherwise stated no deviations were made from FCC Part 15.247(e).

This testing was performed at Intertek Denver, located at 1795 Dogwood St. Suite 200, Louisville, CO 80027.

7.2 Test Equipment Used:

<u>Asset ID</u>	<u>Description</u>	<u>Manufacturer</u>	<u>Model</u>	<u>Serial</u>	<u>Cal Date</u>	<u>Cal Due</u>
18913	Spectrum Analyzer	Hewlett-Packard	E7405A	My44211889	7/16/2012	7/16/2013
E1	RF Conducted Port Cable	-----	45-7221-19	001	09/12/2012	09/12/2013

7.3 Test Requirements:

For the bands 2400 – 2483.5 GHz and 5725 – 5850 MHz within digitally modulated systems (DTS) products, the power spectral density conducted from the intentional radiator to the antenna should not be greater than +8 dBm in any 3 kHz band during any time interval of continuous transmission.

7.4 Test Procedure:

The antenna port of the EUT was connected to the input port of a spectrum analyzer to measure the Power Spectral Density (PSD).

The procedures described in ANSI C63.10:2009 and FCC Publication 558074 (Guidelines for Compliance Measurements on DTS Operating Under 15.247), were used.

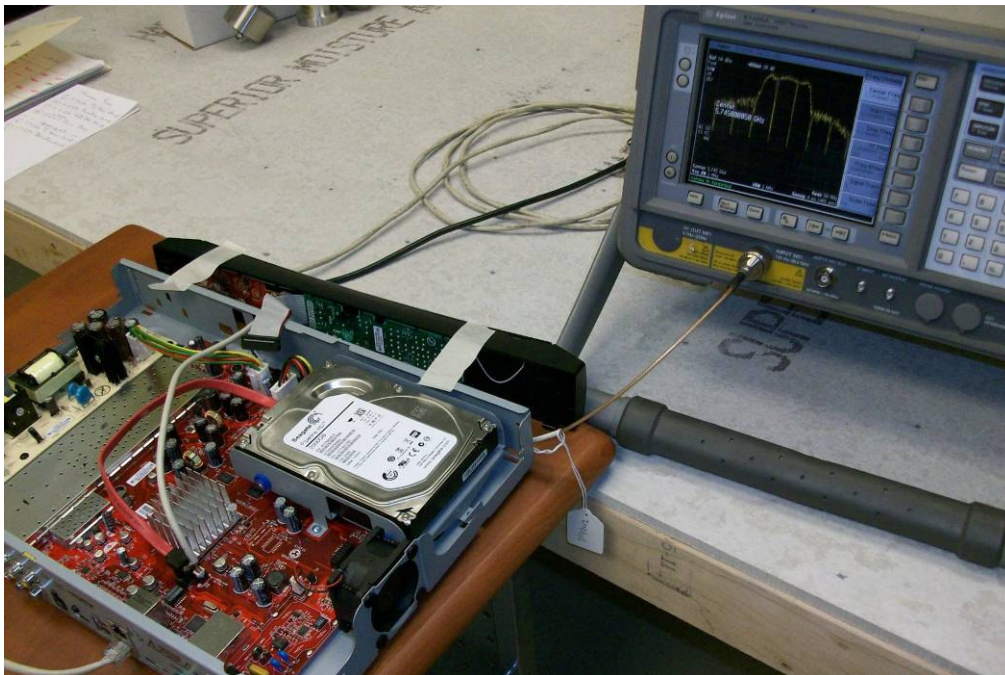
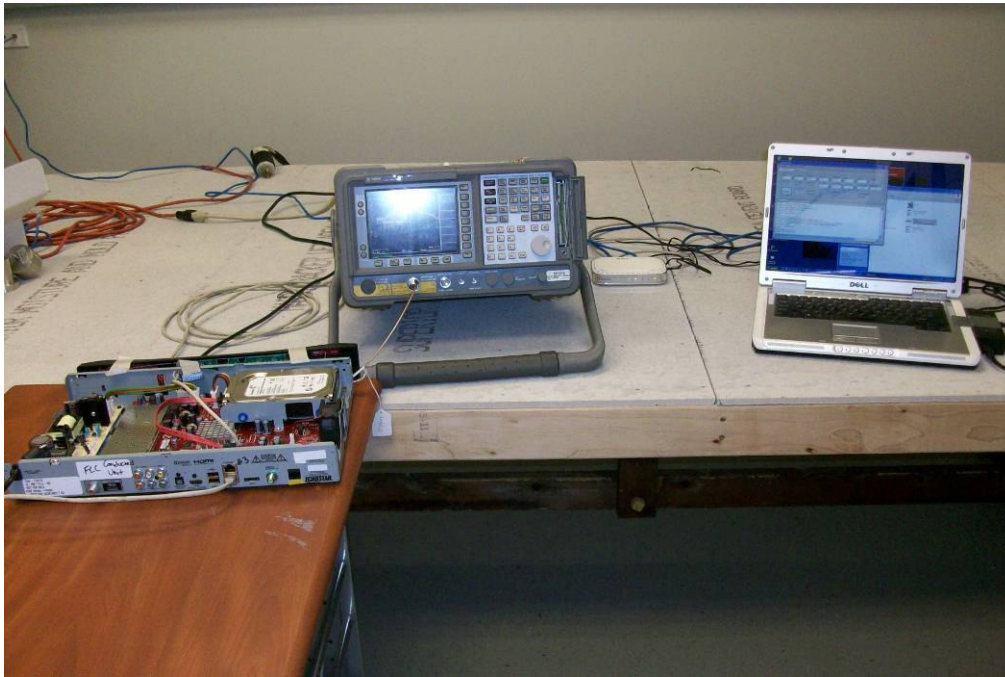
In addition, the procedures described in FCC Publication 662911 (Emissions Testing of Transmitters with Multiple Outputs in the Same Band) were used.

7.5 Test Results:

The sample tested was found to Comply.

7.6 Setup Photographs:

Power Spectral Density - Test setup



7.7 Test Data Summary: 2400-2483.5 MHz Band

Power Spectral Density 2400 – 2483.5 MHz – Antenna 0 FCC Part 15.247(e)

Channel	Frequency, MHz	Standard/ Data Rate	PSD (Peak dBm)	PSD Limit (dBm)	Plot
1	2412	802.11b, 5.5Mbps	4.78	8.0	x
		802.11g, 54Mbps	-3.39	8.0	x
		802.11n HT20, MCS5	-6.63	8.0	x
3	2422	802.11n HT40, MCS0	-9.58	8.0	x
6	2437	802.11b, 5.5Mbps	4.39	8.0	x
		802.11g, 54Mbps	-4.13	8.0	x
		802.11n HT20, MCS7	-7.19	8.0	x
		802.11n HT40, MCS0	-12.36	8.0	x
9	2452	802.11n HT40, MCS0	-12.56	8.0	x
11	2462	802.11b, 5.5Mbps	3.87	8.0	x
		802.11g, 54Mbps	-4.50	8.0	x
		802.11n HT20, MCS6	-7.61	8.0	x

Note: PSD measurement above corrected for dual antenna port product.

Power Spectral Density 2400 – 2483.5 MHz – Antenna 1 FCC Part 15.247(e)

Channel	Frequency, MHz	Standard/ Data Rate	PSD (Peak dBm)	PSD Limit (dBm)	Plot
1	2412	802.11b, 5.5Mbps	4.53	8.0	x
		802.11g, 54Mbps	-3.53	8.0	x
		802.11n HT20, MCS5	-6.72	8.0	x
3	2422	802.11n HT40, MCS0	-12.56	8.0	x
6	2437	802.11b, 5.5Mbps	3.91	8.0	x
		802.11g, 54Mbps	-4.18	8.0	x
		802.11n HT20, MCS7	-7.32	8.0	x
		802.11n HT40, MCS0	-16.00	8.0	x
9	2452	802.11n HT40, MCS0	-12.35	8.0	x
11	2462	802.11b, 5.5Mbps	2.28	8.0	x
		802.11g, 54Mbps	-9.23	8.0	x
		802.11n HT20, MCS6	-8.66	8.0	x

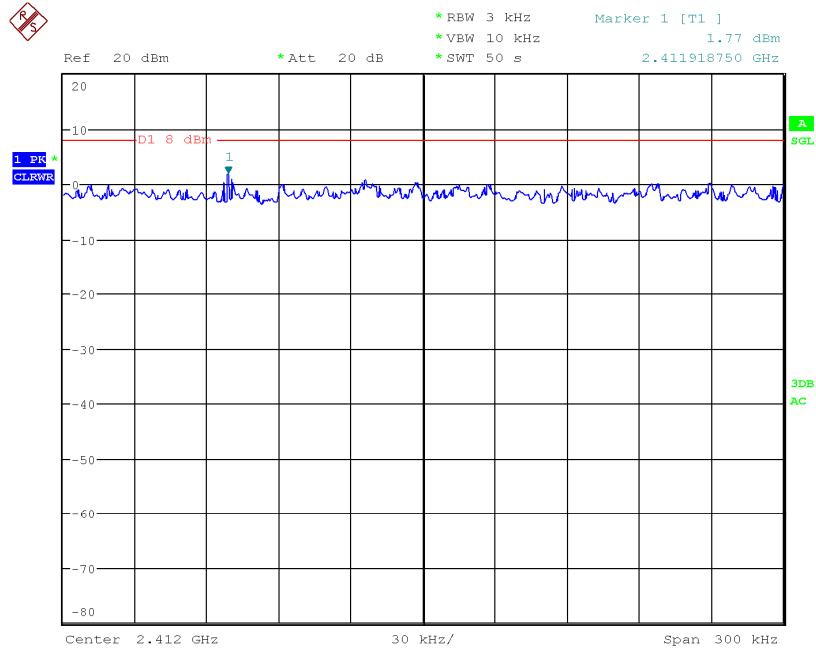
Note: PSD measurement above corrected for dual antenna port product.

7.8 Test Data/Plots: 2400-2483.5 MHz - Antenna 0

Channels 2400 to 2483.5 MHz - FCC Part 15.247(e) (Power Spectral Density – PSD – Antenna 0)

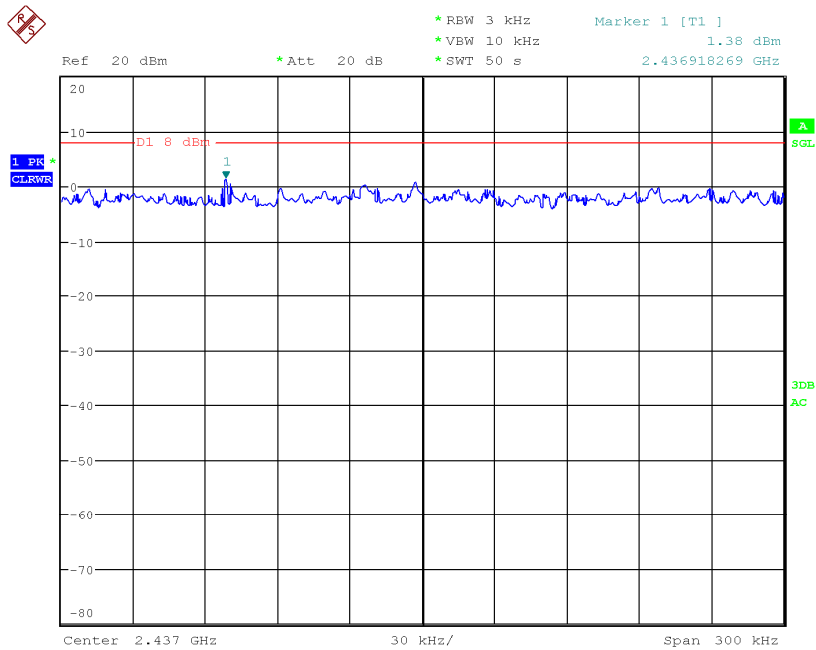
802.11b – CCK Modulation Mode

*Channel 1



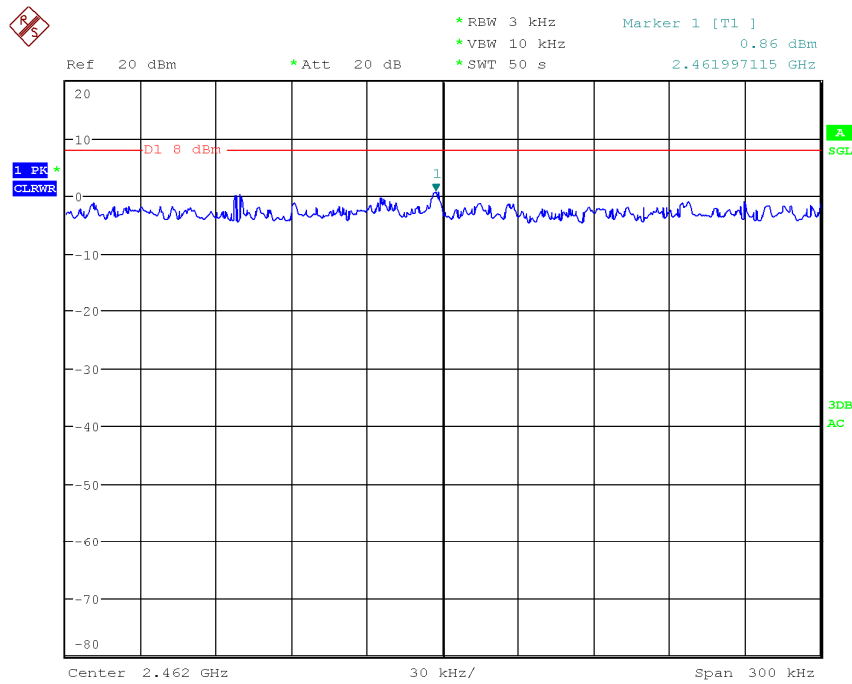
Date: 19.SEP.2012 13:41:14

Channel 6



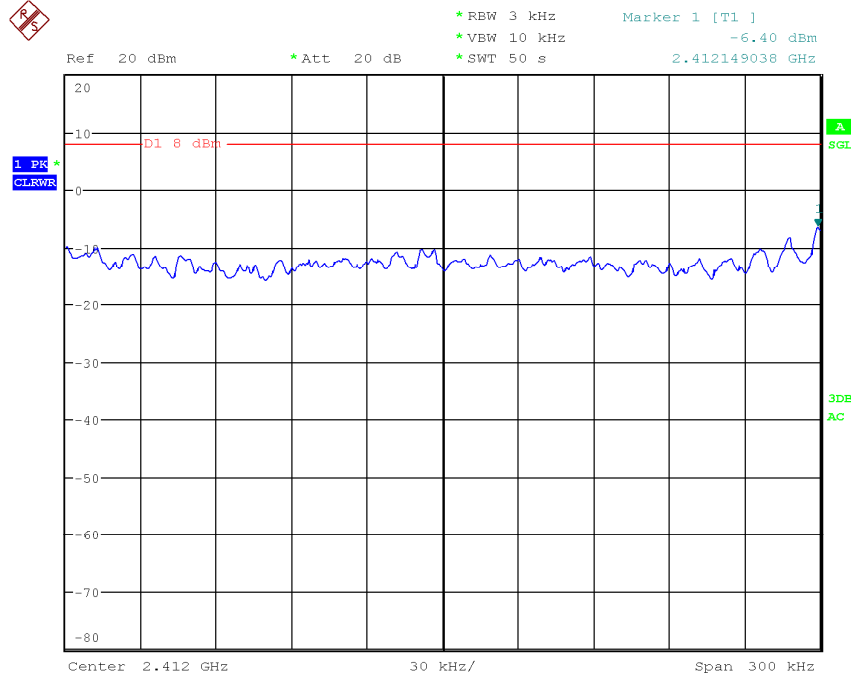
Date: 19.SEP.2012 13:51:16

Channel 11



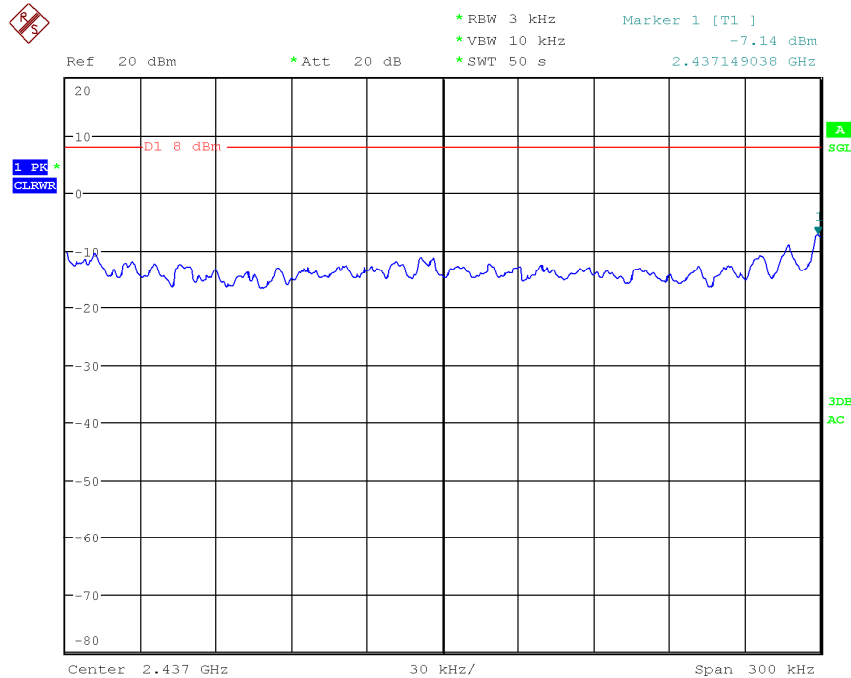
Date: 19.SEP.2012 14:00:16

802.11g – OFDM Modulation Mode Channel 1



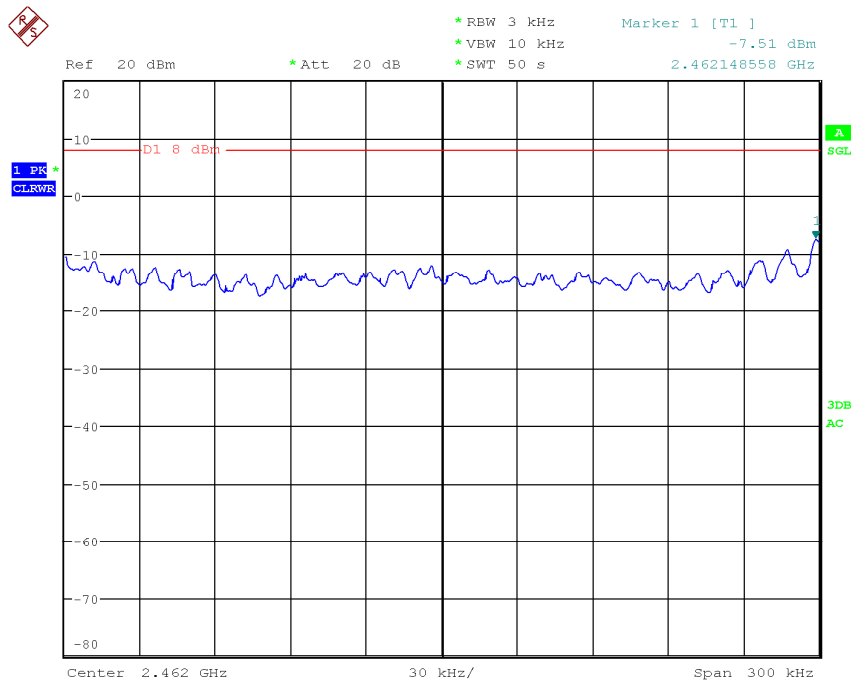
Date: 19.SEP.2012 13:43:51

Channel 6



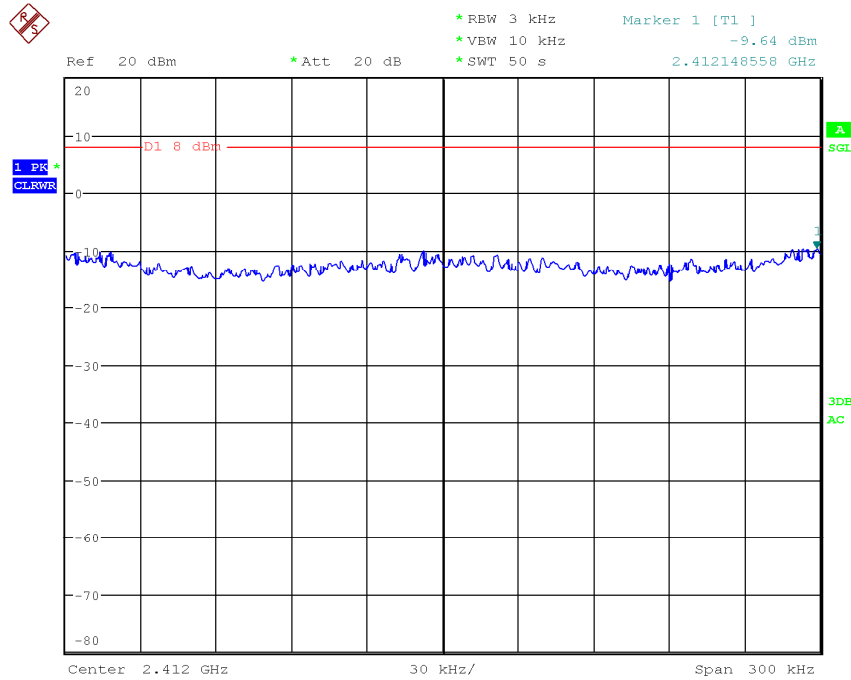
Date: 19.SEP.2012 13:53:17

Channel 11



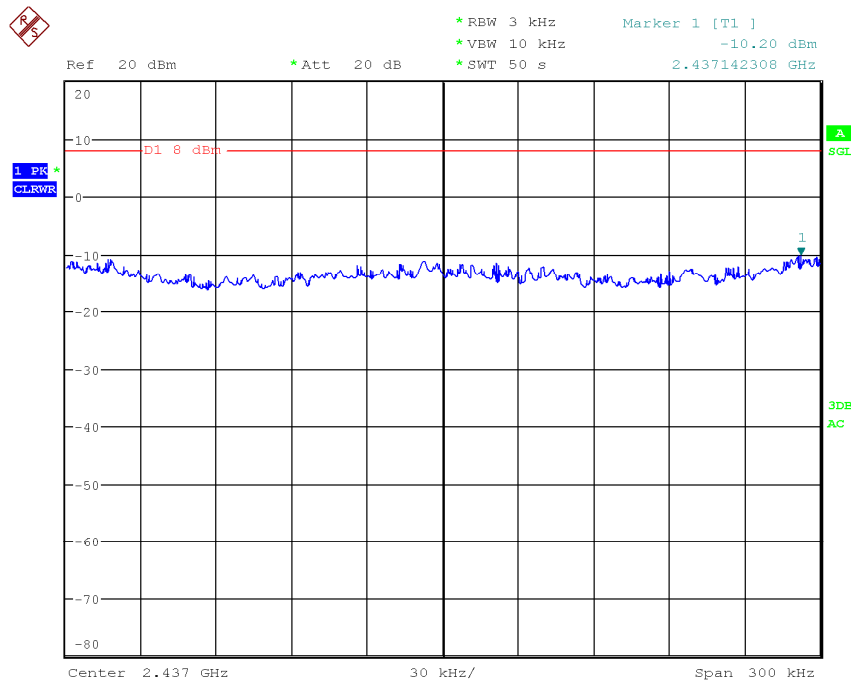
Date: 19.SEP.2012 14:02:07

802.11n HT20 MCS Modulation Mode Channel 1



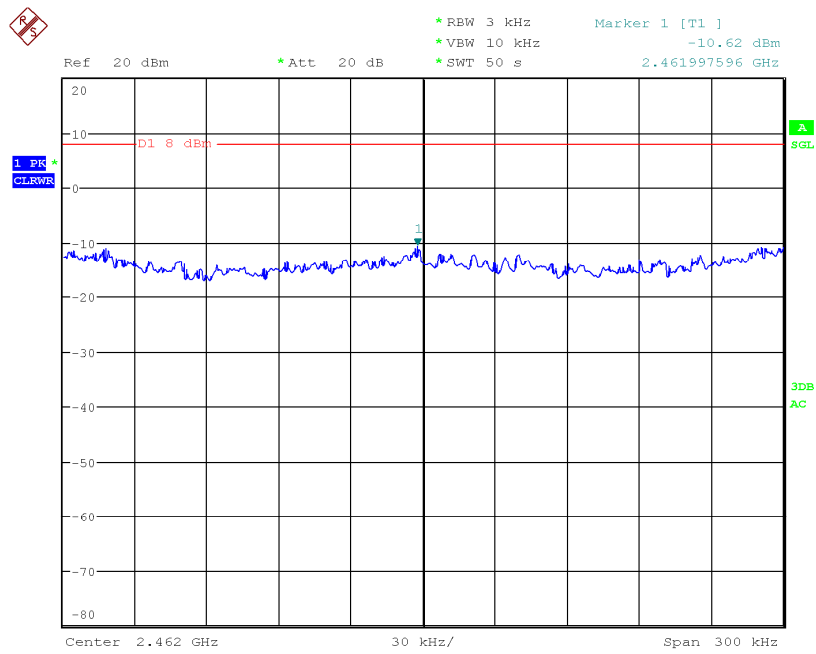
Date: 19.SEP.2012 13:46:03

Channel 6



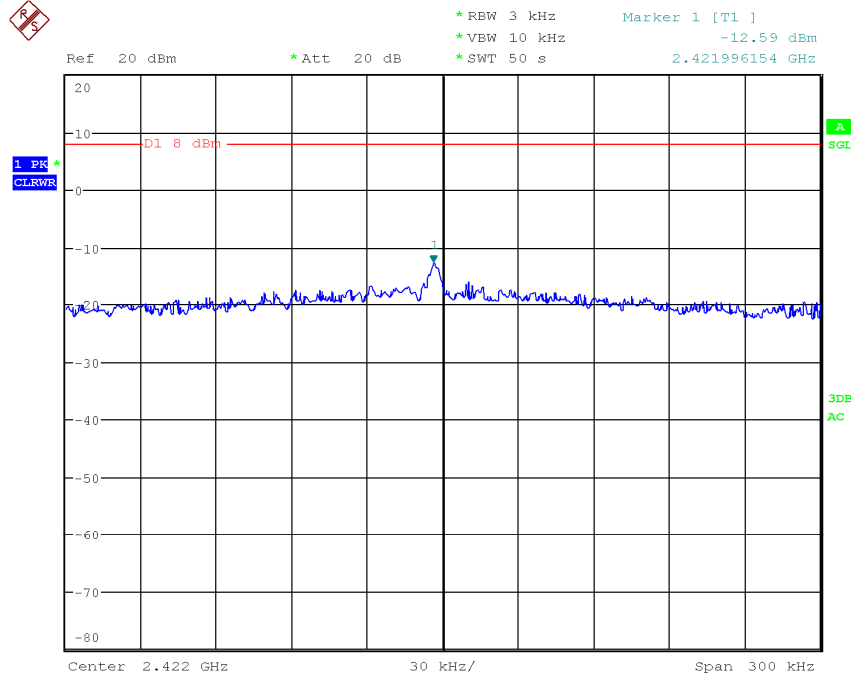
Date: 19.SEP.2012 13:55:07

Channel 11



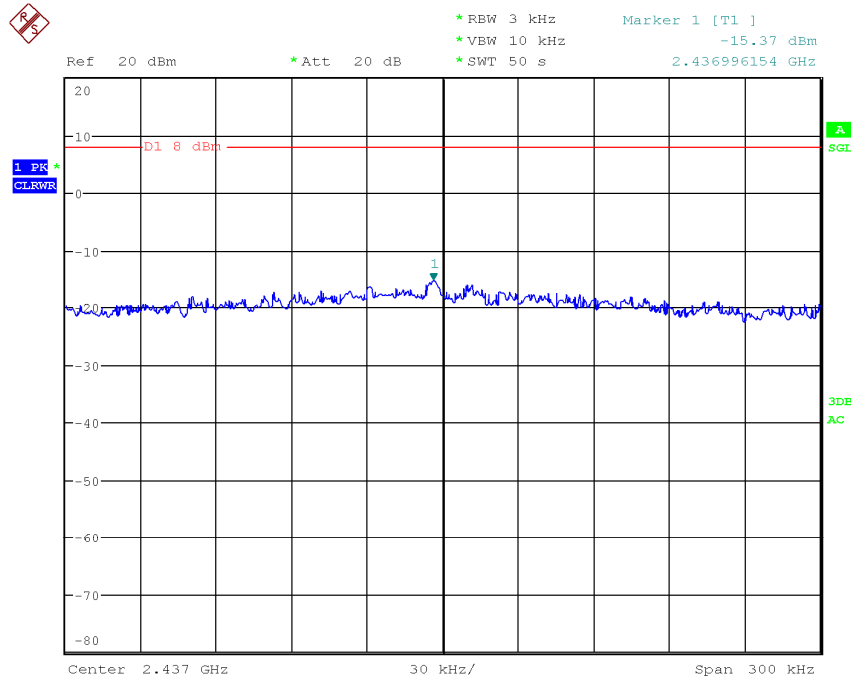
Date: 19.SEP.2012 14:04:06

802.11n HT40 MCS Modulation Mode Channel 3



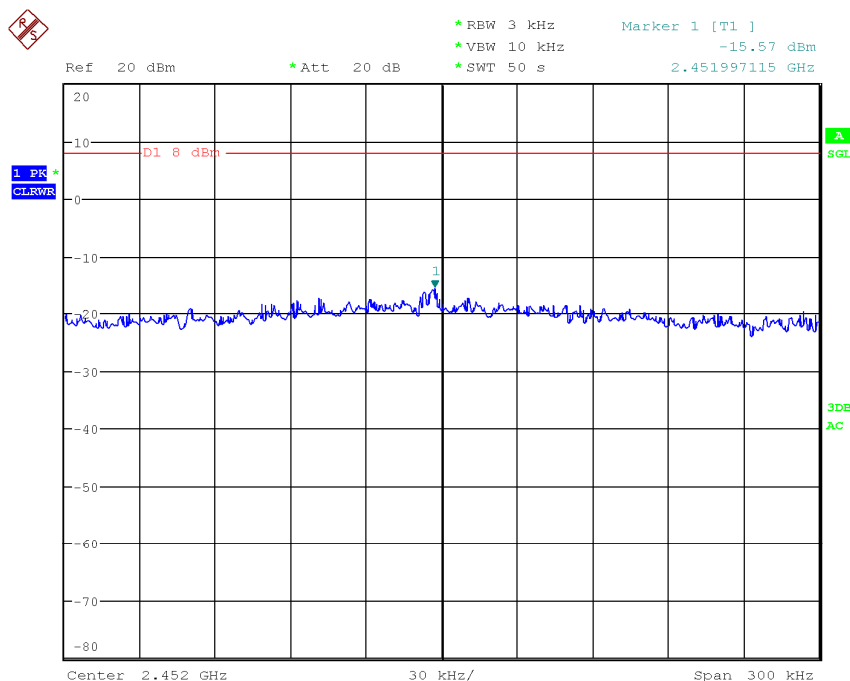
Date: 19.SEP.2012 13:48:24

Channel 6



Date: 19.SEP.2012 13:57:45

Channel 9



Date: 19.SEP.2012 14:08:58

Per FCC Guidance Document: 662911 D01 Multiple Transmitter Output: 10/25/2011

“In-Band Power Spectral Density (PSD) Measurements” – Method 2

Measure and add 10 log(N) dB to each spectrum value before comparing to the emissions limit. Summing the spectra across the outputs is not required.

There are (2) antenna ports on the product under test. Therefore, 10 log(2) dB = 3.01dB

The worst-case measured PSD: Channel 1, CCK Modulation Mode (1.77dBm)

Therefore, 1.77dBm + 3.01 dBm = 4.78dBm (3.22dB under the limit)

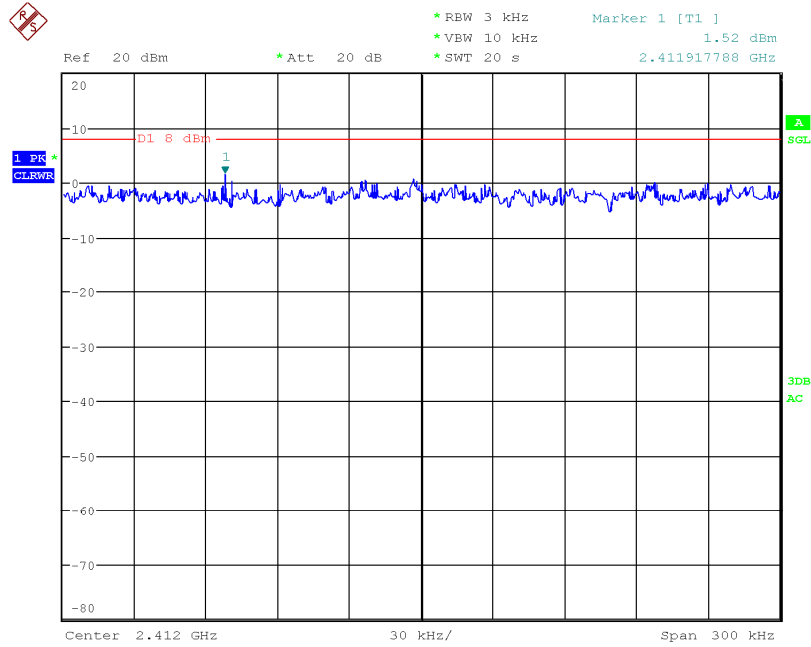
FCC 15.247(e) PSD Limit: +8.00 dBm in 3kHz band

7.9 Test Data/Plots: 2400-2483.5 MHz - Antenna 1

Channels 2400 to 2483.5 MHz - FCC Part 15.247(e) (Power Spectral Density – PSD – Antenna 1)

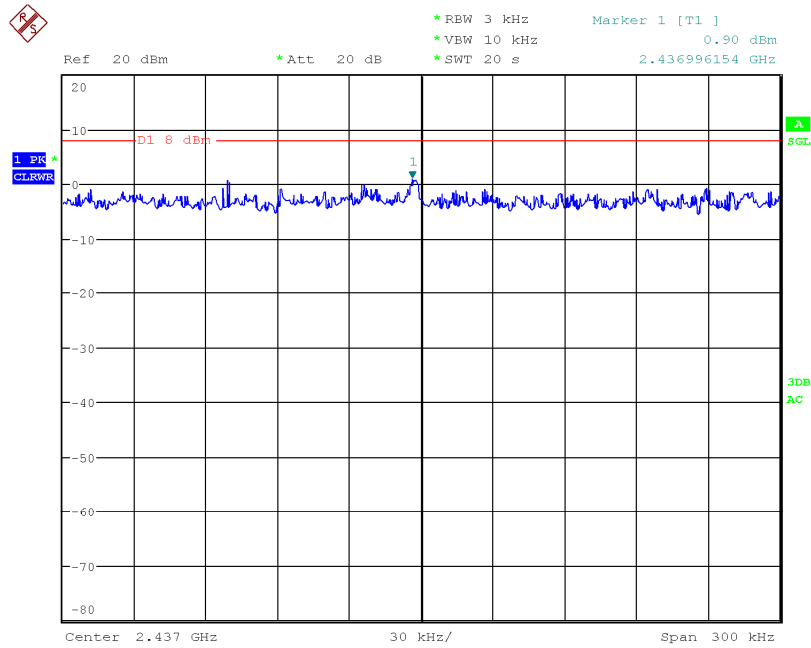
802.11b – CCK Modulation Mode

*Channel 1



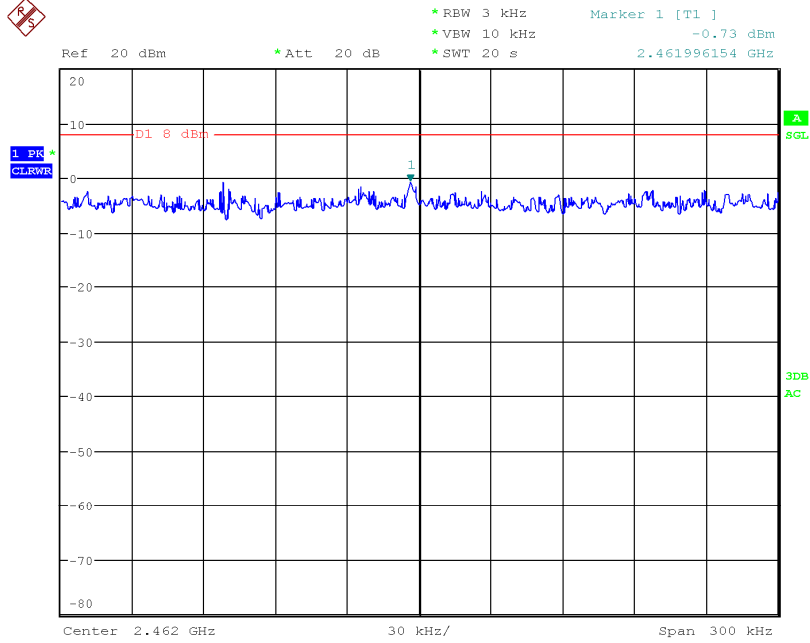
Date: 19.SEP.2012 08:52:23

Channel 6



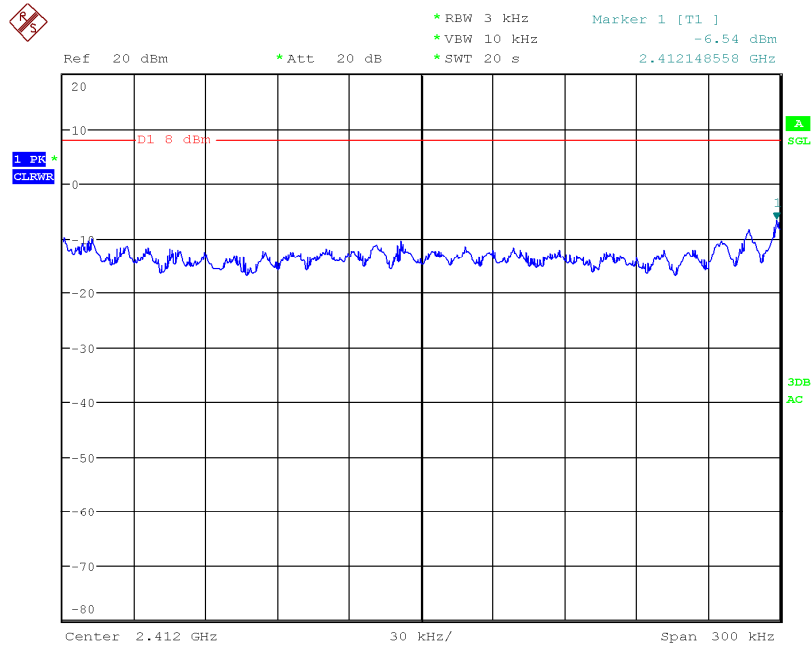
Date: 19.SEP.2012 08:55:38

Channel 11



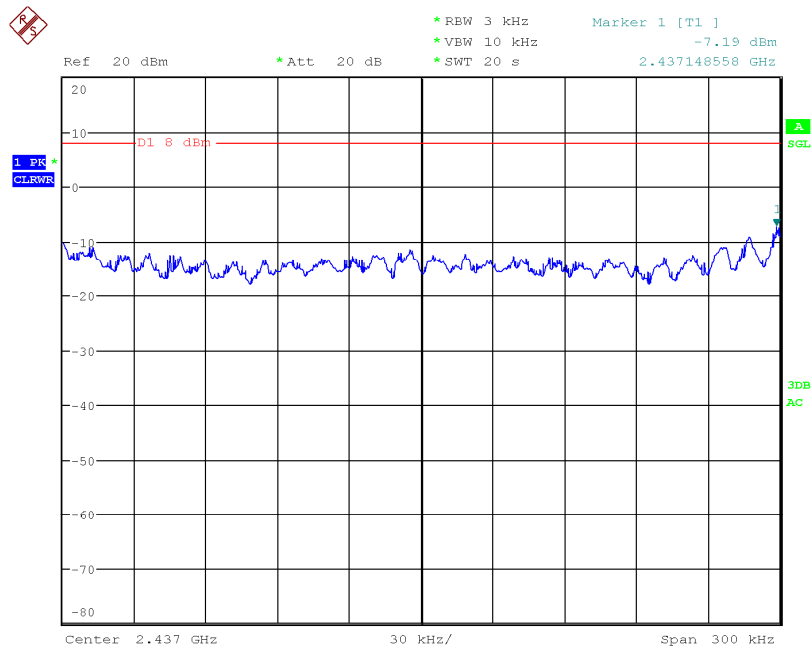
Date: 19.SEP.2012 09:00:39

802.11g – OFDM Modulation Mode Channel 1



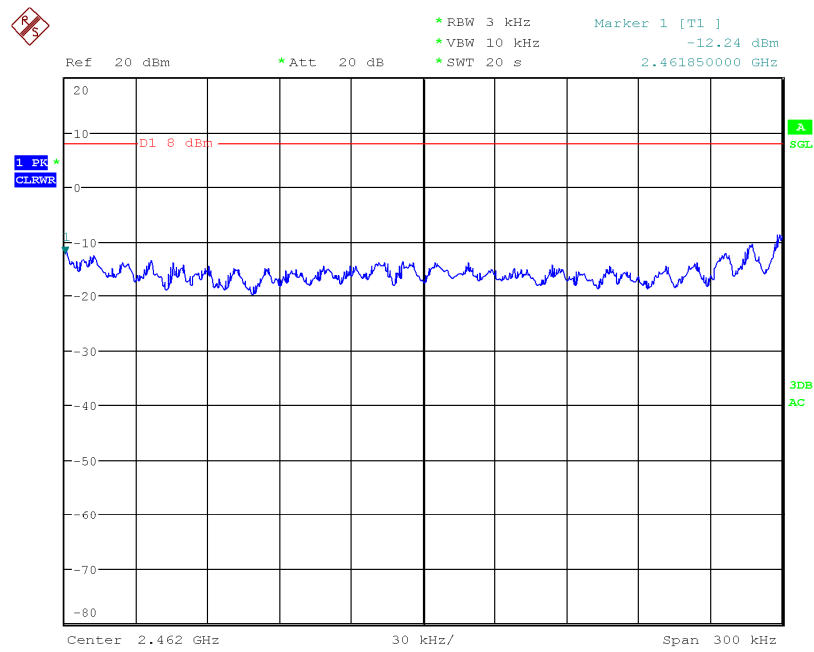
Date: 19.SEP.2012 09:02:40

Channel 6



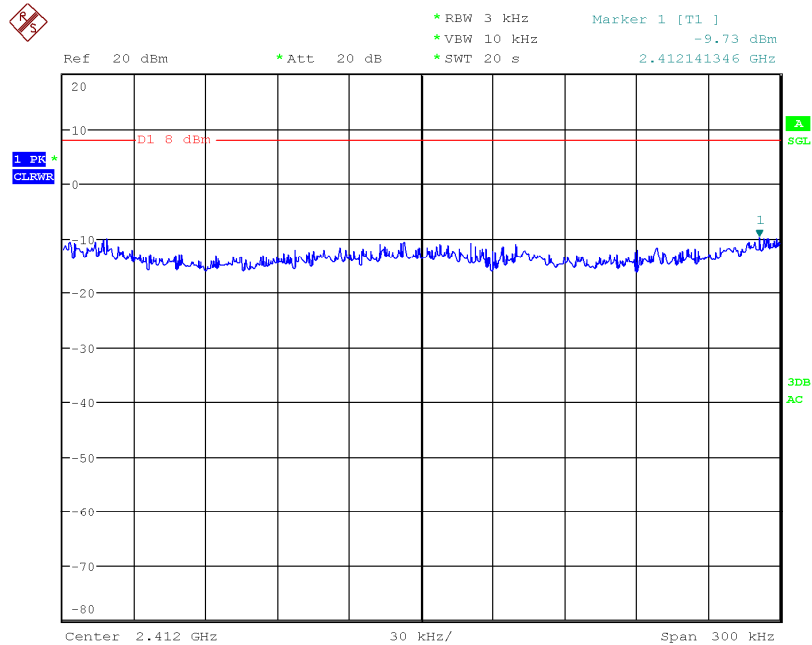
Date: 19.SEP.2012 09:04:17

Channel 11



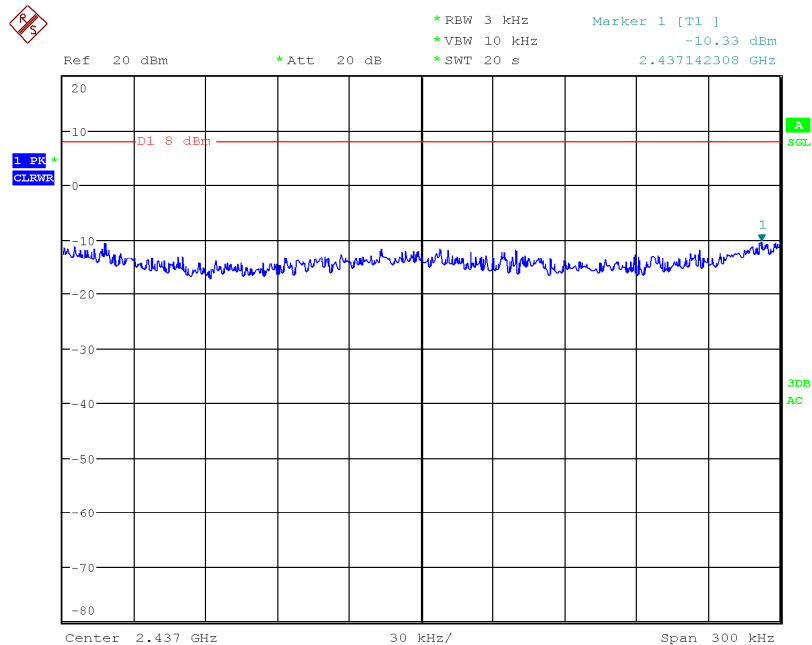
Date: 19.SEP.2012 09:05:43

802.11n HT20 MCS Modulation Mode Channel 1



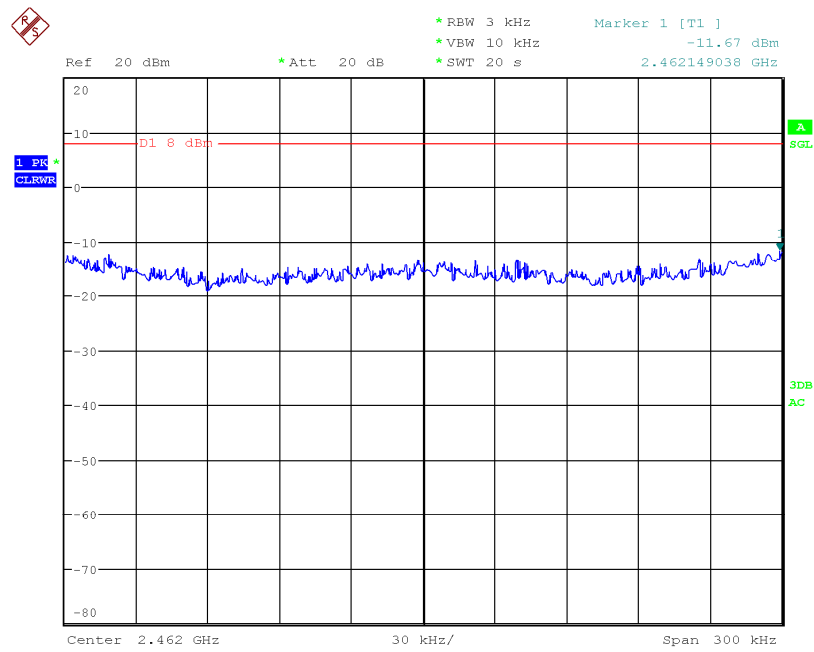
Date: 19.SEP.2012 09:08:05

Channel 6



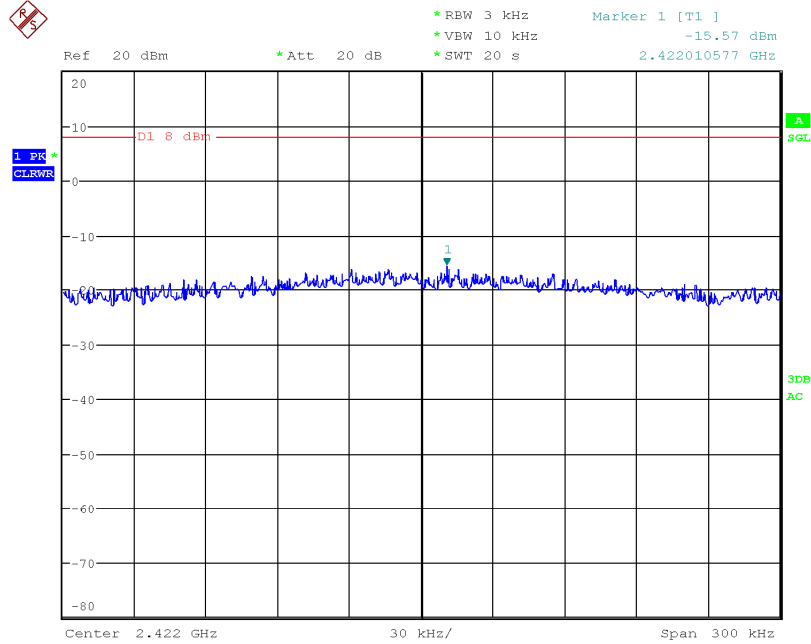
Date: 19.SEP.2012 09:10:22

Channel 11



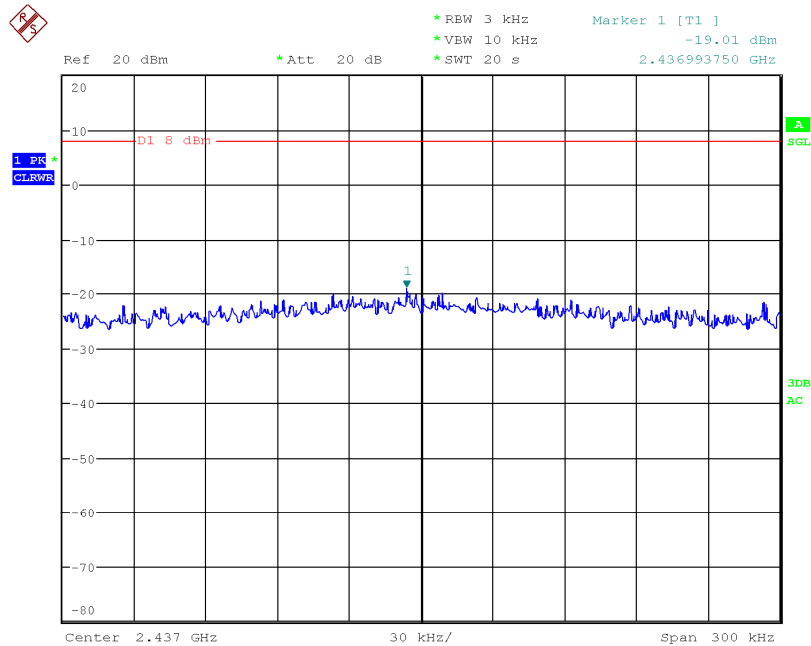
Date: 19.SEP.2012 09:13:29

802.11n HT40 MCS Modulation Mode Channel 3



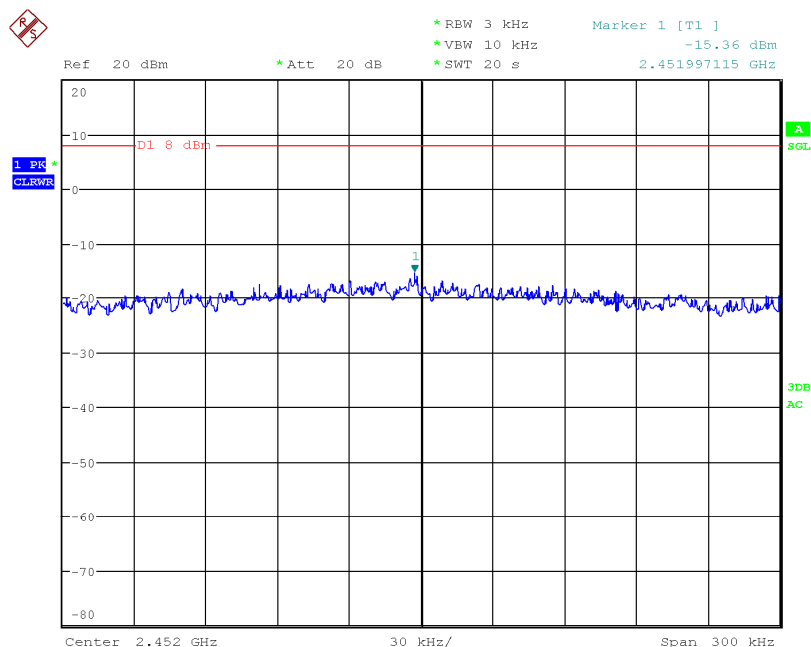
Date: 19.SEP.2012 09:17:04

Channel 6



Date: 19.SEP.2012 09:23:52

Channel 9



Date: 19.SEP.2012 09:26:34

Per FCC Guidance Document: 662911 D01 Multiple Transmitter Output: 10/25/2011

“In-Band Power Spectral Density (PSD) Measurements” – Method 2

Measure and add $10 \log(N)$ dB to each spectrum value before comparing to the emissions limit.
 Summing the spectra across the outputs is not required.

There are (2) antenna ports on the product under test. Therefore, $10 \log(2)$ dB = 3.01dB

The worst-case measured PSD: 802.11b – CCK Modulation Mode , Channel 1 (1.52dBm)

Therefore, 1.52dBm + 3.01 dBm = 4.53dBm (3.47dB under the limit)

FCC 15.247(e) PSD Limit: +8.00 dBm in 3kHz band

7.10 Test Data Summary: 5725-5850 MHz Band

Power Spectral Density 5725 – 5850 MHz – Antenna 0 FCC Part 15.247(e)

Channel	Frequency, MHz	Standard/ Data Rate	PSD (Peak dBm)	PSD Limit (dBm)	Plot
149	5745	802.11a, 6Mbps	-7.32	8.0	x
		802.11n HT20, MCS3	-7.34	8.0	x
151	5755	802.11n HT40, MCS0	-13.52	8.0	x
157	5785	802.11a, 9Mbps	-8.81	8.0	x
		802.11n HT20, MCS1	-7.59	8.0	x
159	5795	802.11n HT40, MCS0	-10.17	8.0	x
165	5825	802.11a, 9Mbps	-7.56	8.0	x
		802.11n HT20, MCS0	-8.78	8.0	x

Note: PSD measurement above corrected for dual antenna port product per MIMO guidelines.

Power Spectral Density 5725 – 5850 MHz – Antenna 1 FCC Part 15.247(e)

Channel	Frequency, MHz	Standard/ Data Rate	PSD (Peak dBm)	PSD Limit (dBm)	Plot
149	5745	802.11a, 6Mbps	-8.92	8.0	x
		802.11n HT20, MCS3	-8.74	8.0	x
151	5755	802.11n HT40, MCS0	-8.29	8.0	x
157	5785	802.11a, 9Mbps	-9.08	8.0	x
		802.11n HT20, MCS1	-9.82	8.0	x
159	5795	802.11n HT40, MCS0	-8.98	8.0	x
165	5825	802.11a, 9Mbps	-9.60	8.0	x
		802.11n HT20, MCS0	-9.60	8.0	x

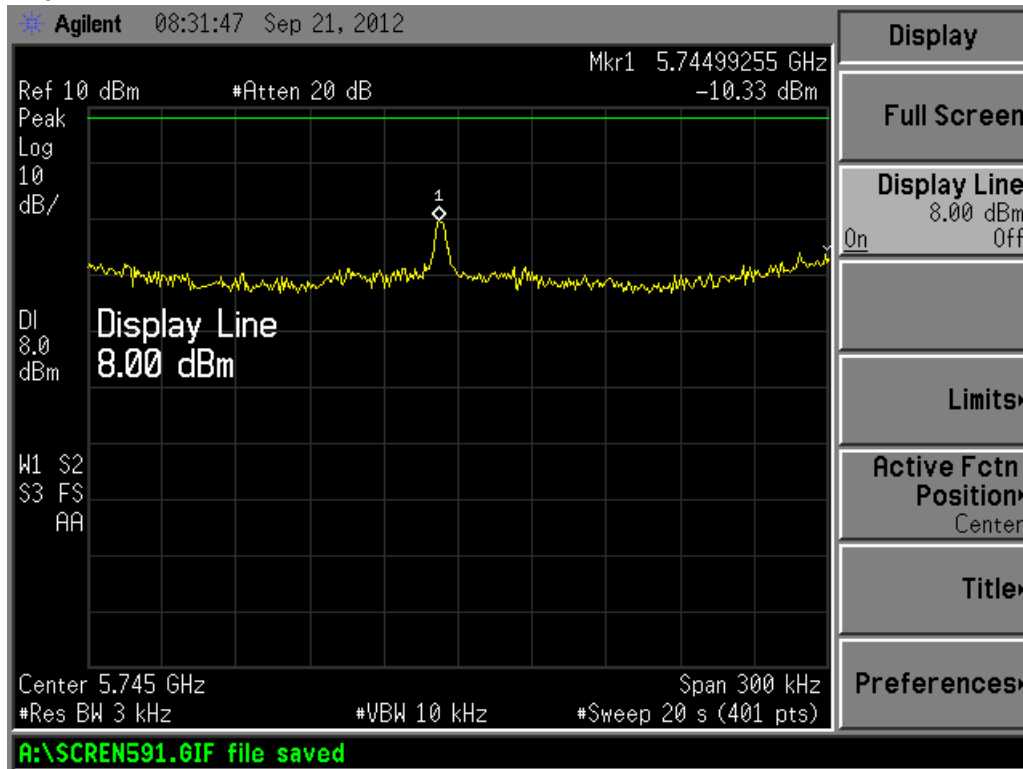
Note: PSD measurement above corrected for dual antenna port product per MIMO guidelines.

7.11 Test Data/Plots: 5725-5850 MHz - Antenna 0

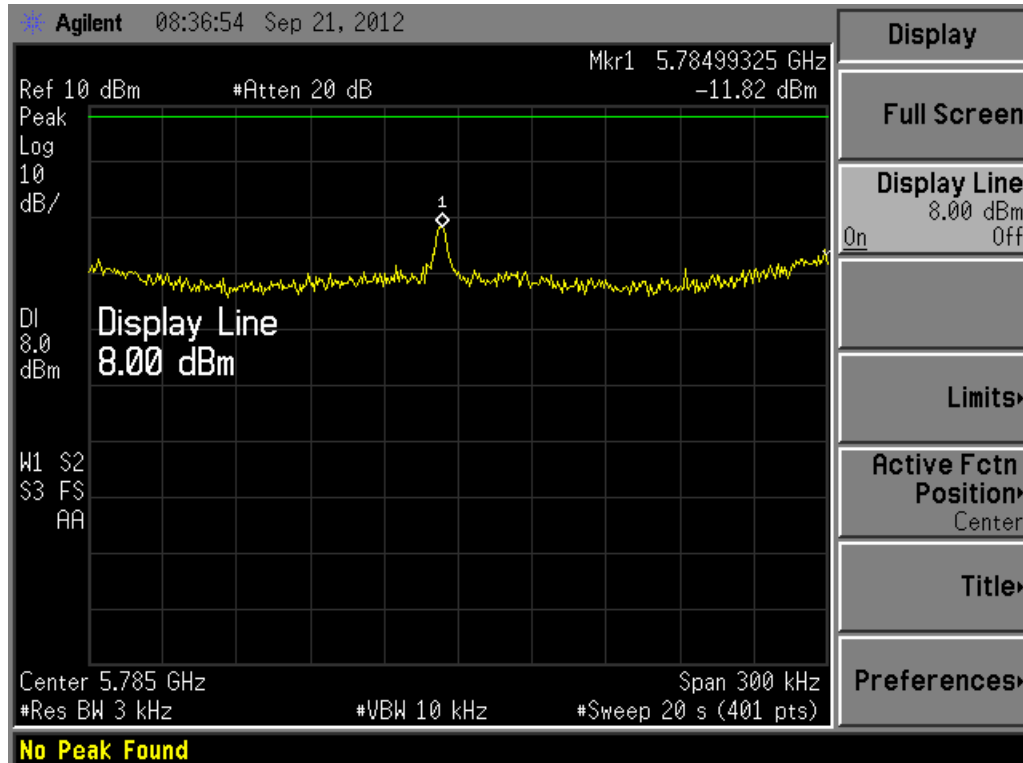
Channels 5725 to 5850 MHz - FCC Part 15.247(e)
(Power Spectral Density – PSD – Antenna 0)

802.11a – OFDM Modulation Mode

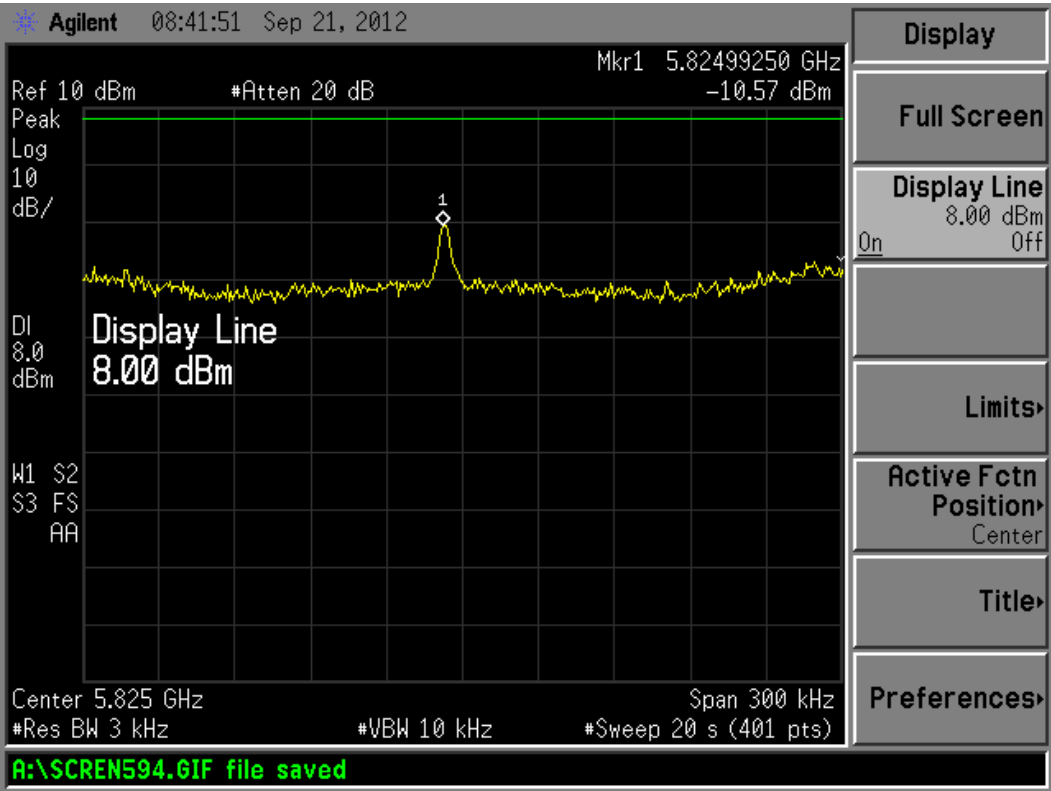
*Channel 149



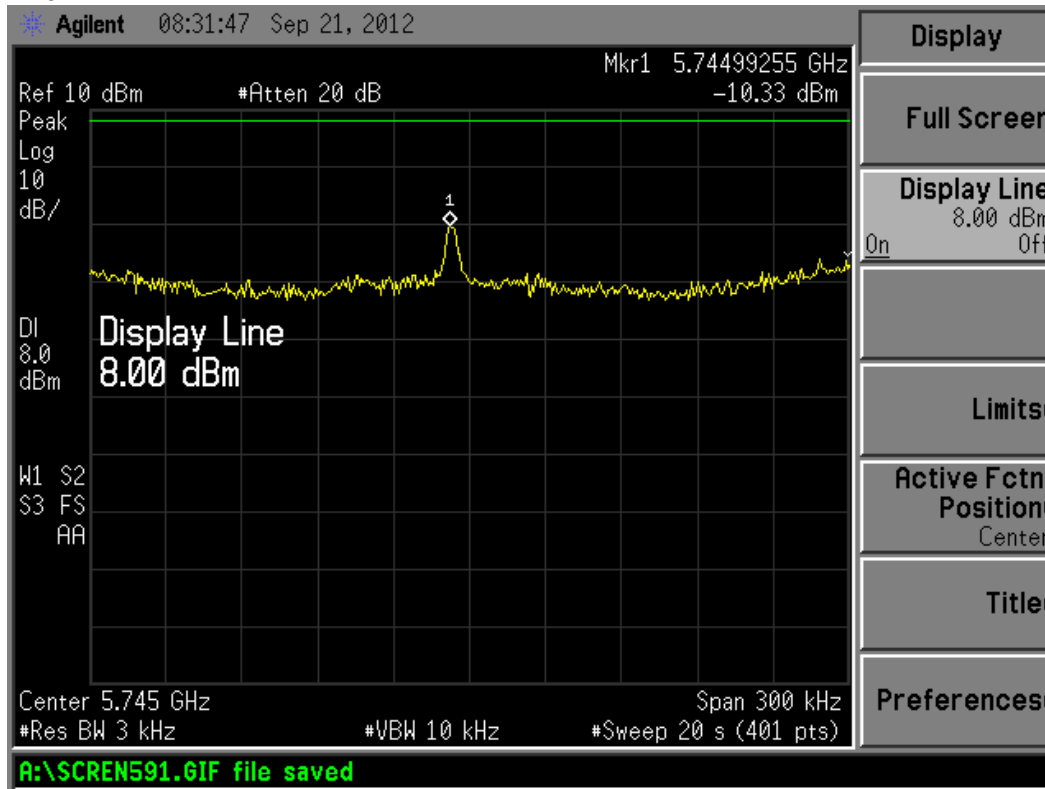
Channel 157



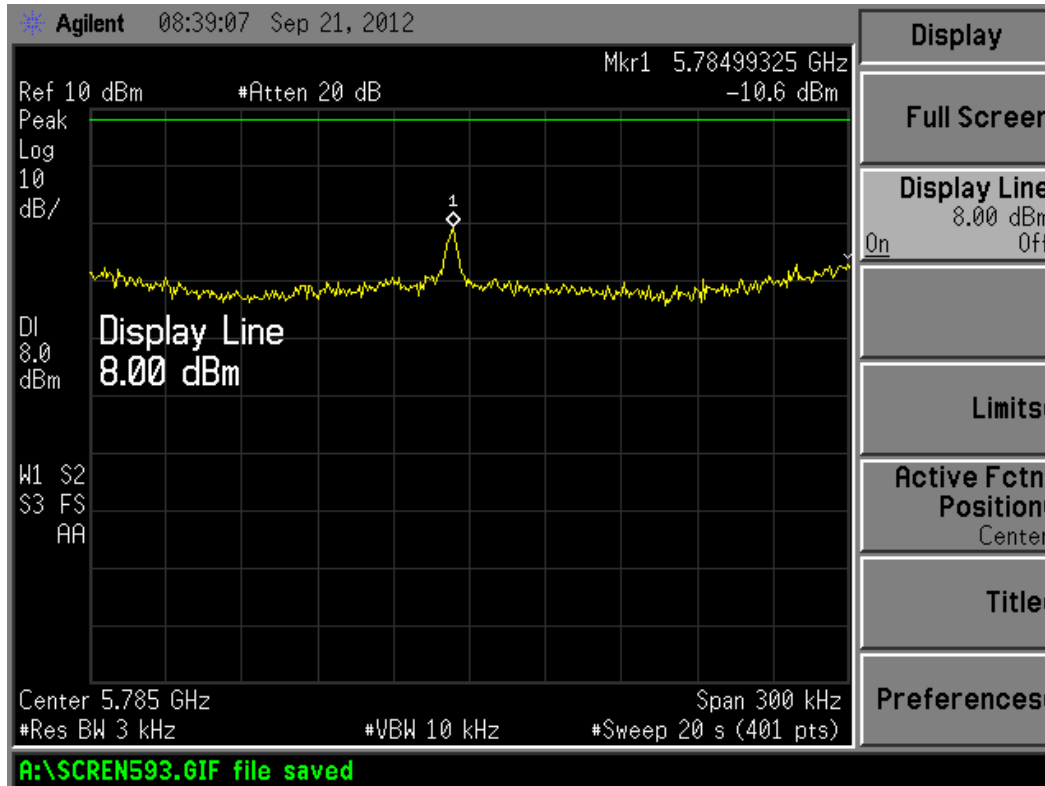
Channel 165



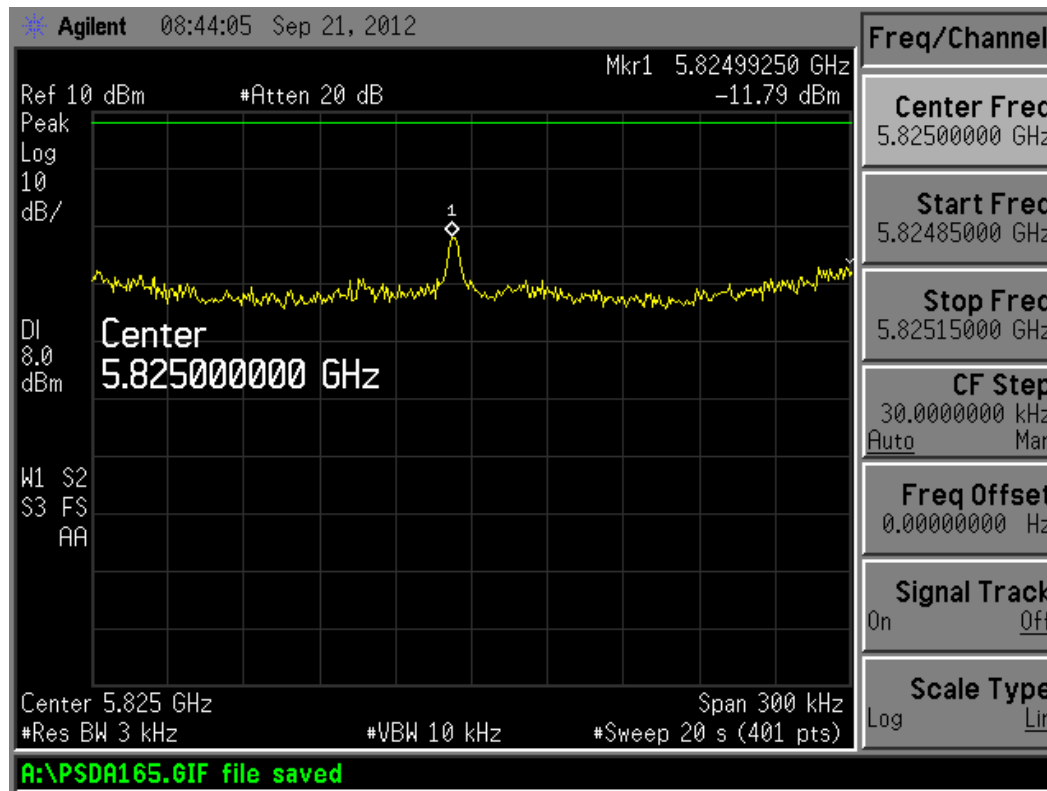
802.11n HT20 – MCS Modulation Mode
Channel 149



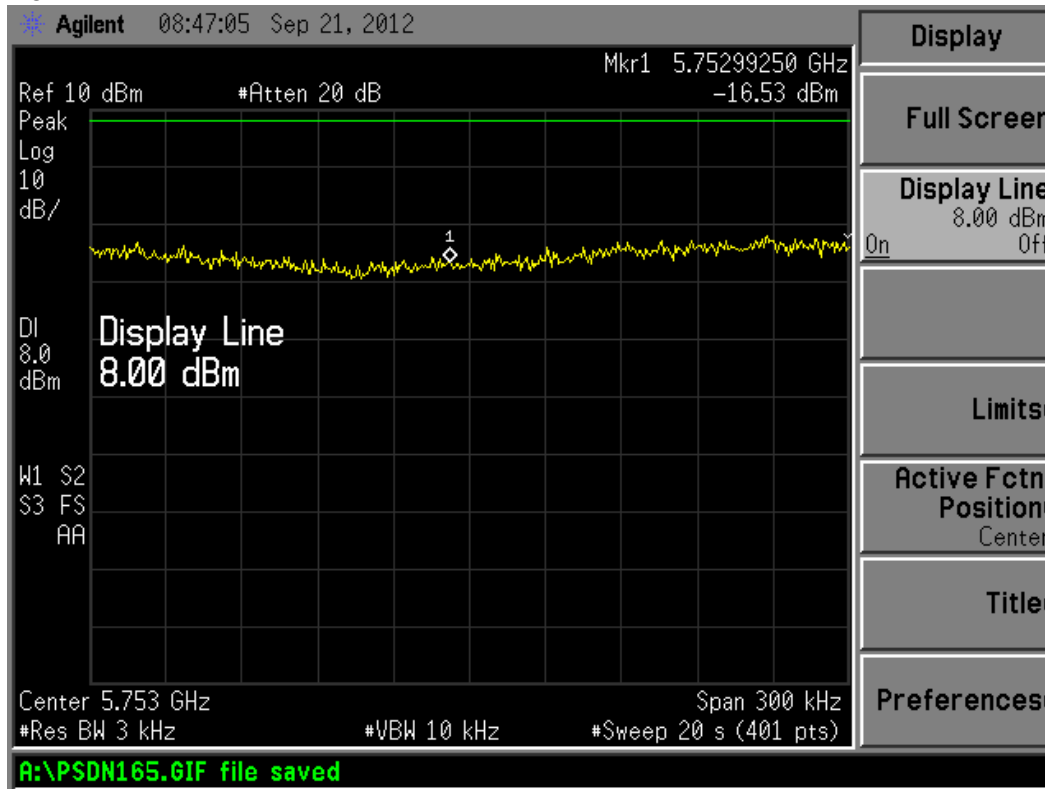
Channel 157



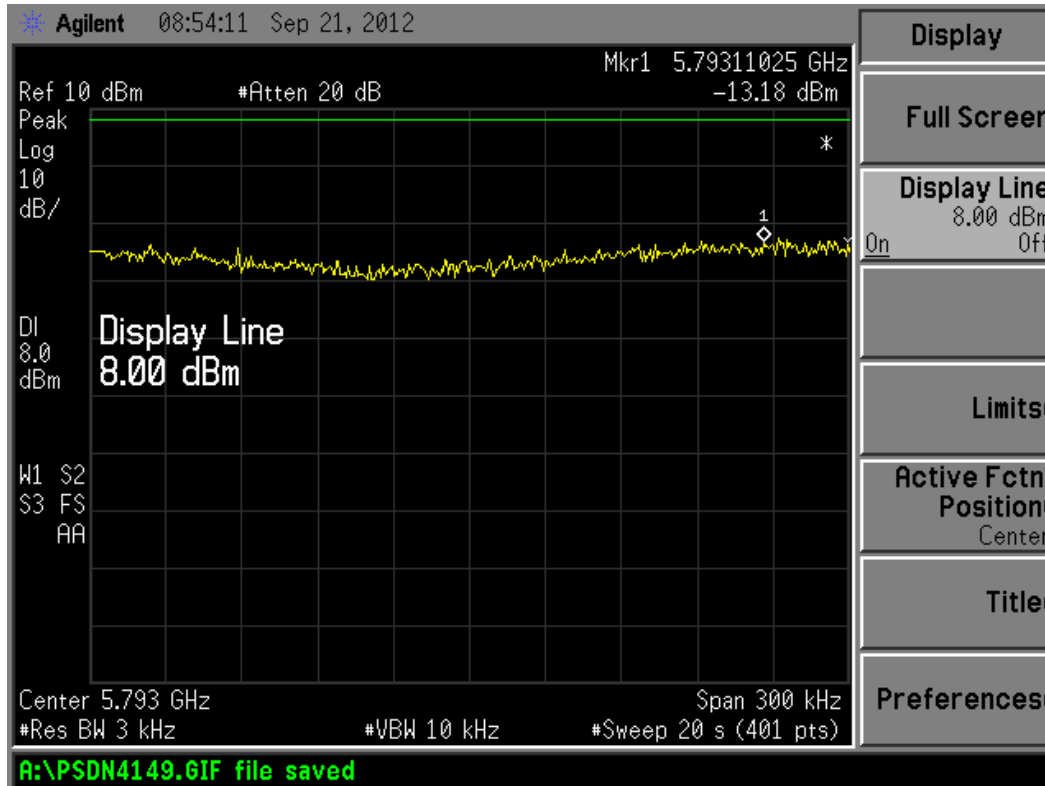
Channel 165



802.11n HT40 MCS Modulation Mode
Channel 151



Channel 159



Intertek	
Report Number: 100900227DEN-003	Issued: 10/11/2012

Per FCC Guidance Document: 662911 D01 Multiple Transmitter Output: 10/25/2011

“In-Band Power Spectral Density (PSD) Measurements” – Method 2

Measure and add 10 log(N) dB to each spectrum value before comparing to the emissions limit.
Summing the spectra across the outputs is not required.

There are (2) antenna ports on the product under test. Therefore, $10 \log(2) \text{ dB} = 3.01 \text{ dB}$

The worst-case measured PSD: 802.11a – OFDM Modulation Mode, Channel 149 (-10.32 dBm)

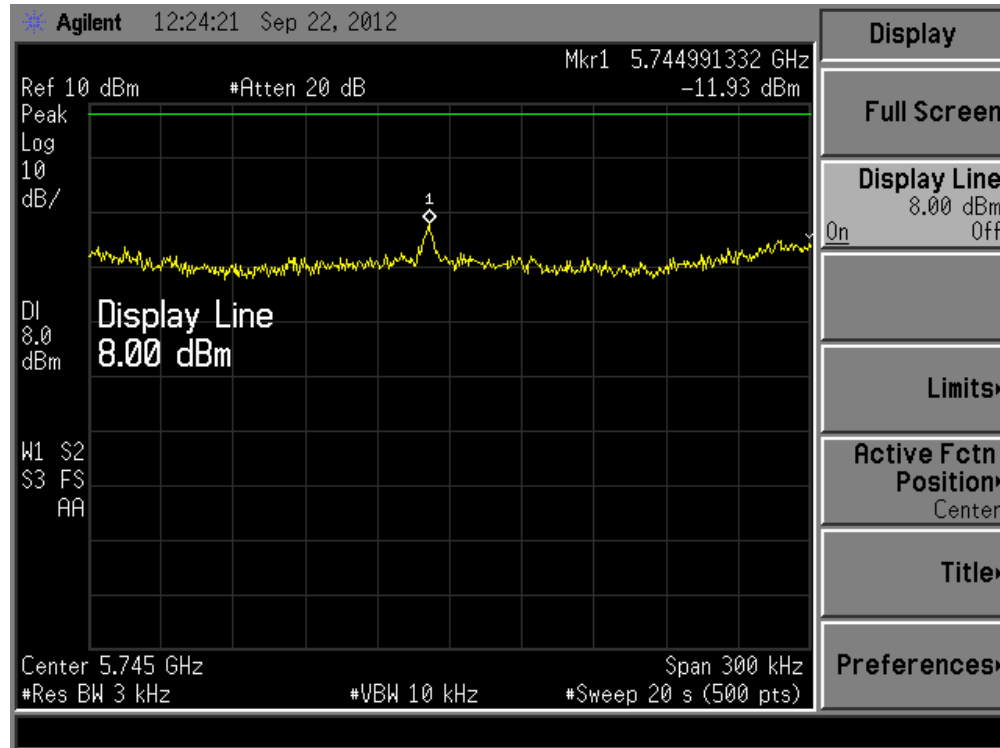
Therefore, $-10.32 \text{ dBm} + 3.01 \text{ dBm} = -7.32 \text{ dBm}$ (15.32 dB under the limit)

FCC 15.247(e) PSD Limit: +8.00 dBm in 3kHz band

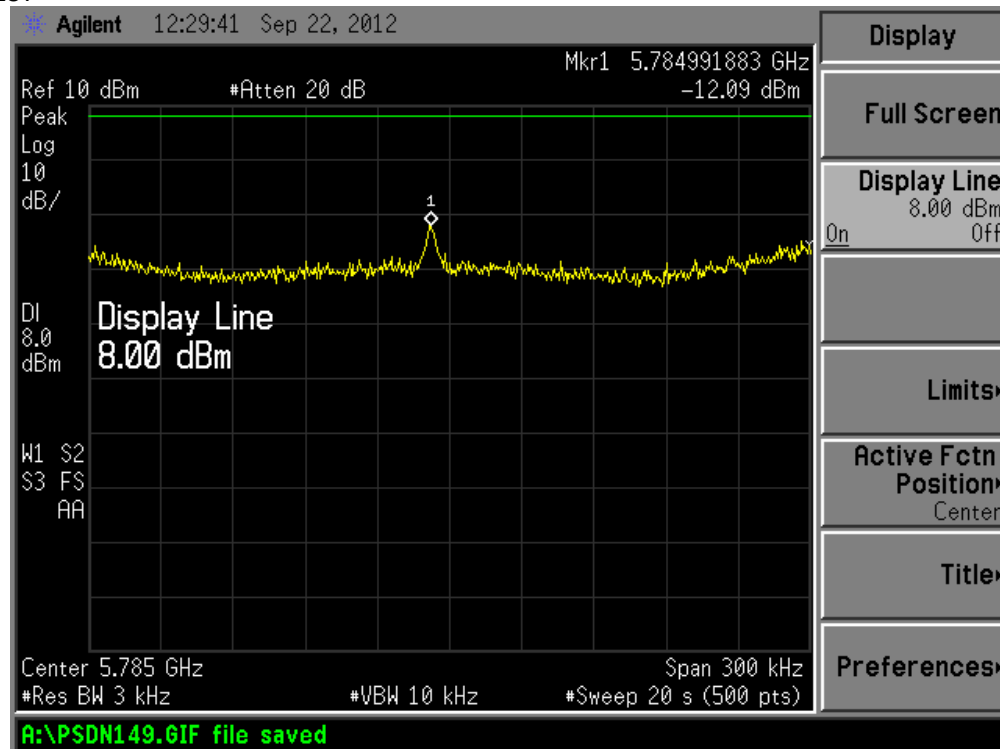
7.12 Test Data/Plots: 5725-5850 MHz - Antenna 1

Channels 5725 to 5850 MHz - FCC Part 15.247(e) (Power Spectral Density – PSD – Antenna 1)

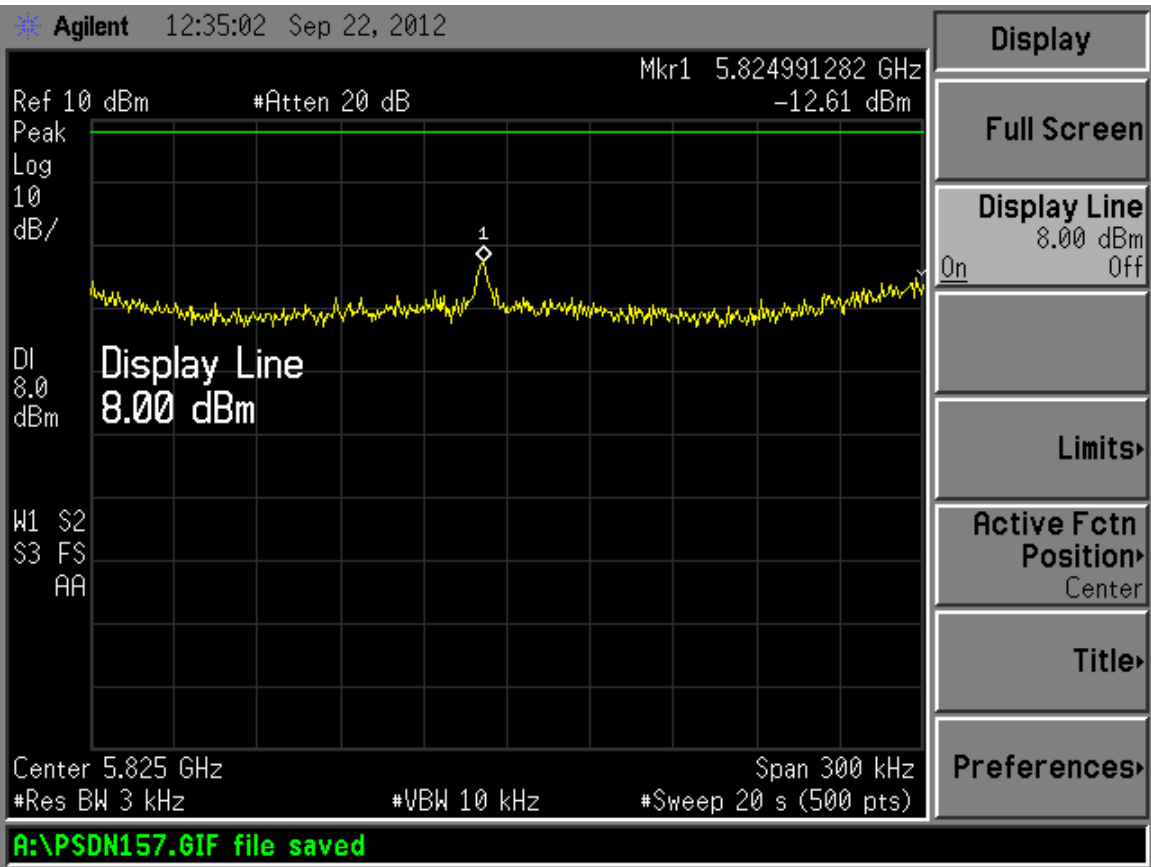
802.11a – OFDM Modulation Mode
Channel 149

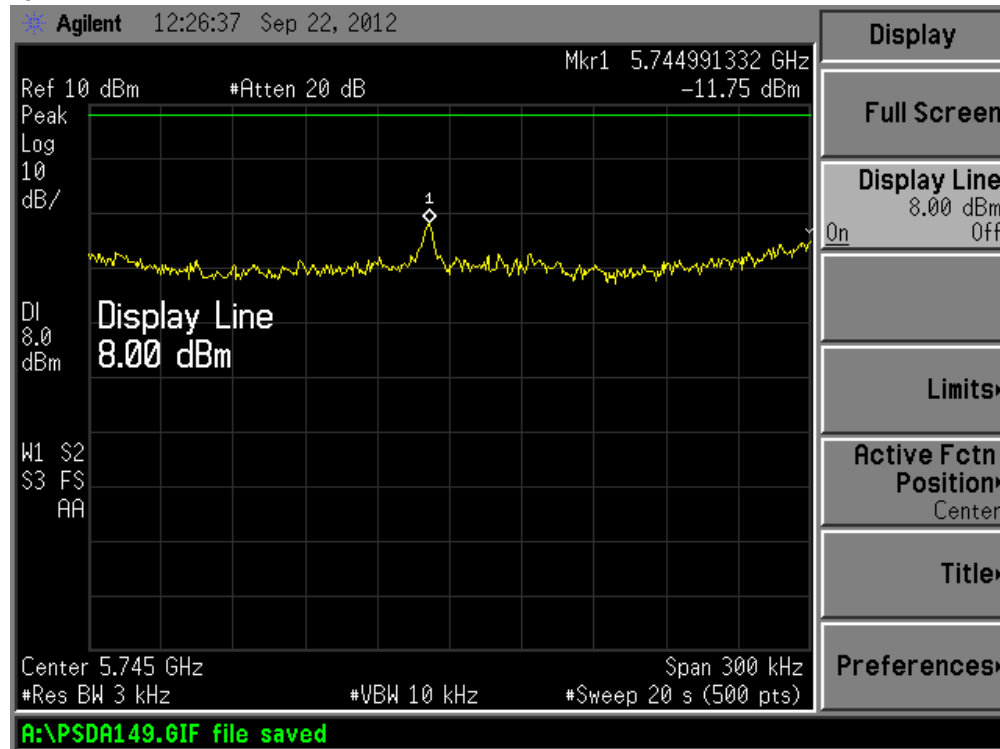


Channel 157

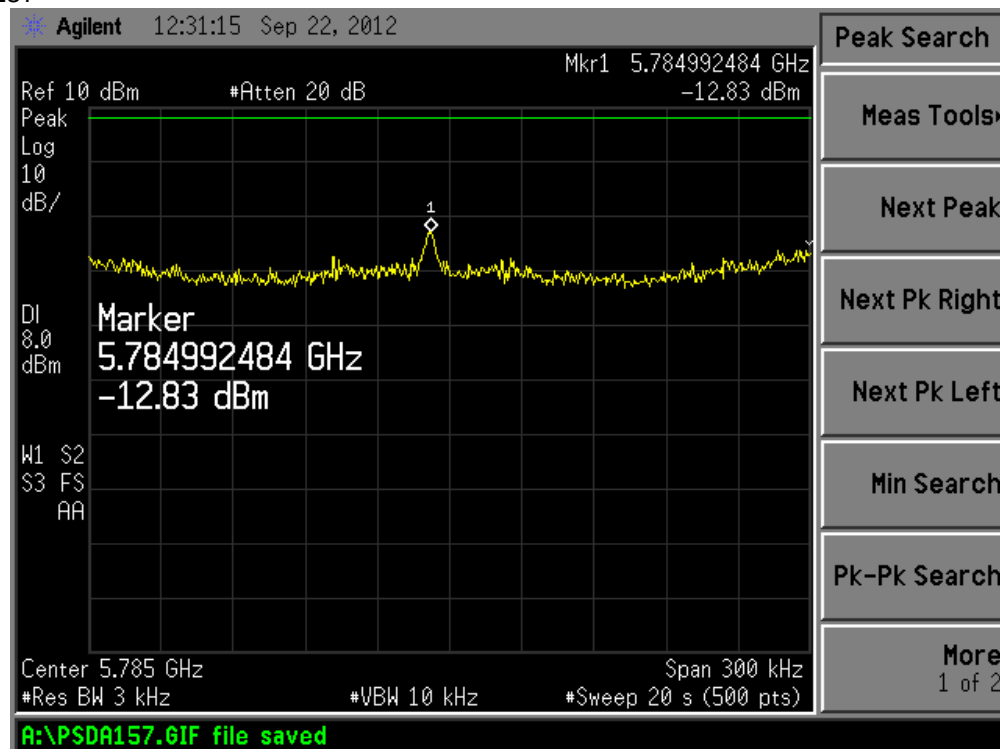


Channel 165

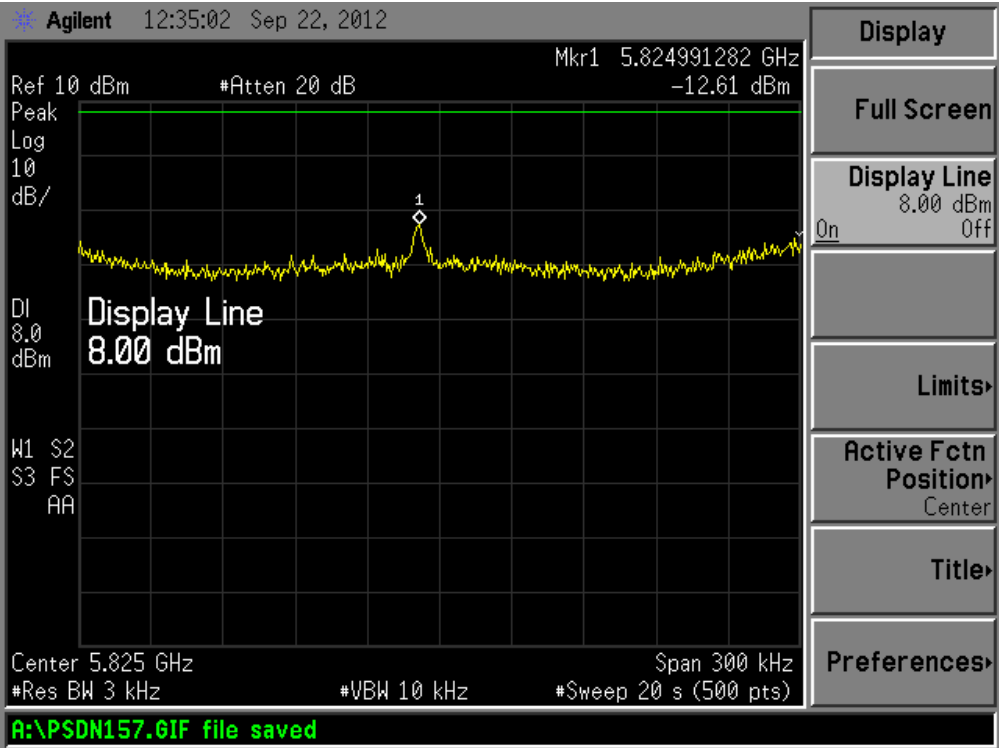


802.11n HT20 – MCS Modulation Mode
Channel 149

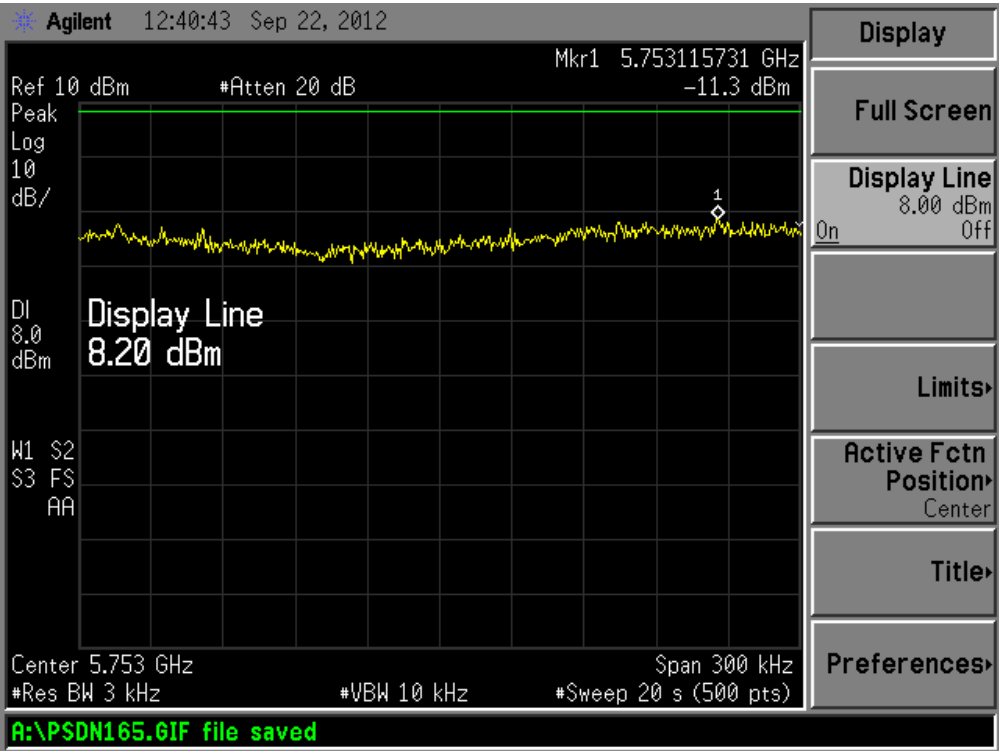
Channel 157



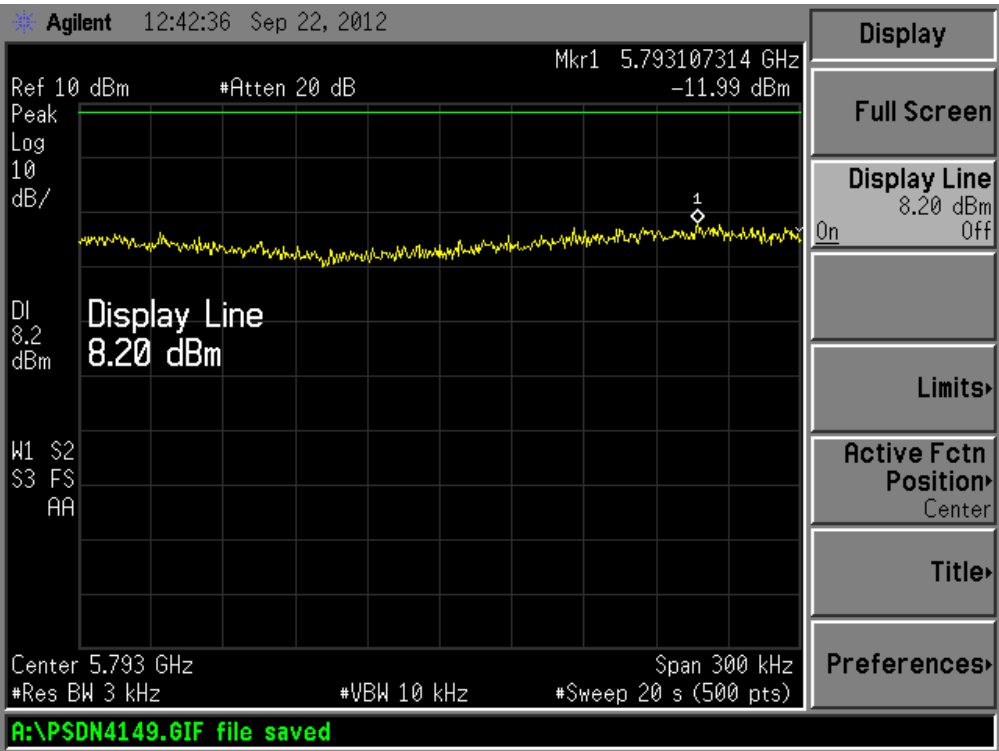
Channel 165



802.11n HT40 MCS Modulation Mode
*Channel 151



Channel 159



Intertek	
Report Number: 100900227DEN-003	Issued: 10/11/2012

Per FCC Guidance Document: 662911 D01 Multiple Transmitter Output: 10/25/2011

“In-Band Power Spectral Density (PSD) Measurements” – Method 2

Measure and add 10 log(N) dB to each spectrum value before comparing to the emissions limit.

Summing the spectra across the outputs is not required.

There are (2) antenna ports on the product under test. Therefore, $10 \log(2) \text{ dB} = 3.01 \text{ dB}$

The worst-case measured PSD: 802.11n HT40 MCS Modulation Mode, Channel 149 (-11.3 dBm)

Therefore, $-11.3 \text{ dBm} + 3.01 \text{ dB} = -8.29 \text{ dBm}$ (-16.29 dB under the limit)

FCC 15.247(e) PSD Limit: +8.00 dBm in 3kHz band

Intertek	
Report Number: 100900227DEN-003	Issued: 10/11/2012

8 Out-of-Band Antenna Conducted Emissions – Including Band Edge

8.1 Method

Unless otherwise stated no deviations were made from FCC Part 15.247(d).

This testing was performed at Intertek Denver, located at 1795 Dogwood St. Suite 200, Louisville, CO 80027.

8.2 Test Equipment Used:

<u>Asset ID</u>	<u>Description</u>	<u>Manufacturer</u>	<u>Model</u>	<u>Serial</u>	<u>Cal Date</u>	<u>Cal Due</u>
E1	RF Conducted Port Cable	-----	45-7221-19	001	09/12/2012	09/12/2013
18913	Spectrum Analyzer	Hewlett-Packard	E7405A	My44211889	7/16/2012	7/16/2013

8.3 Test Requirement:

For transmitters operating in the 2400-2483.5MHz and 5725 – 5850 MHz bands, In any 100 kHz bandwidth outside the EUT pass-band, the RF power shall be at least 20dBc (peak) or 30 dBc (average) below that of the maximum in-band 100 kHz fundamental emission.

8.4 Test Procedure:

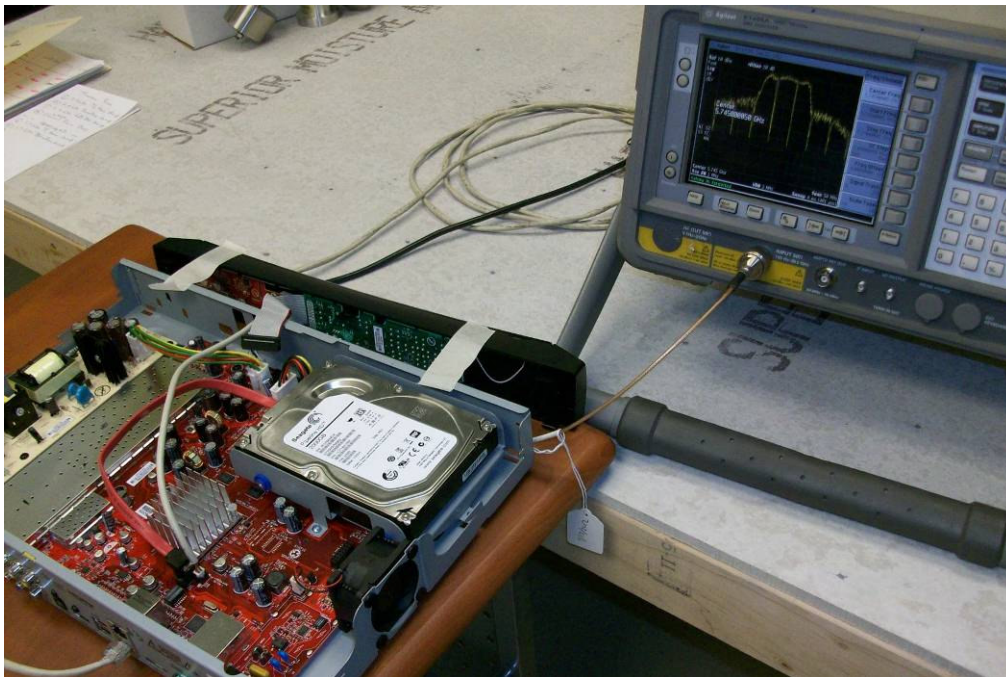
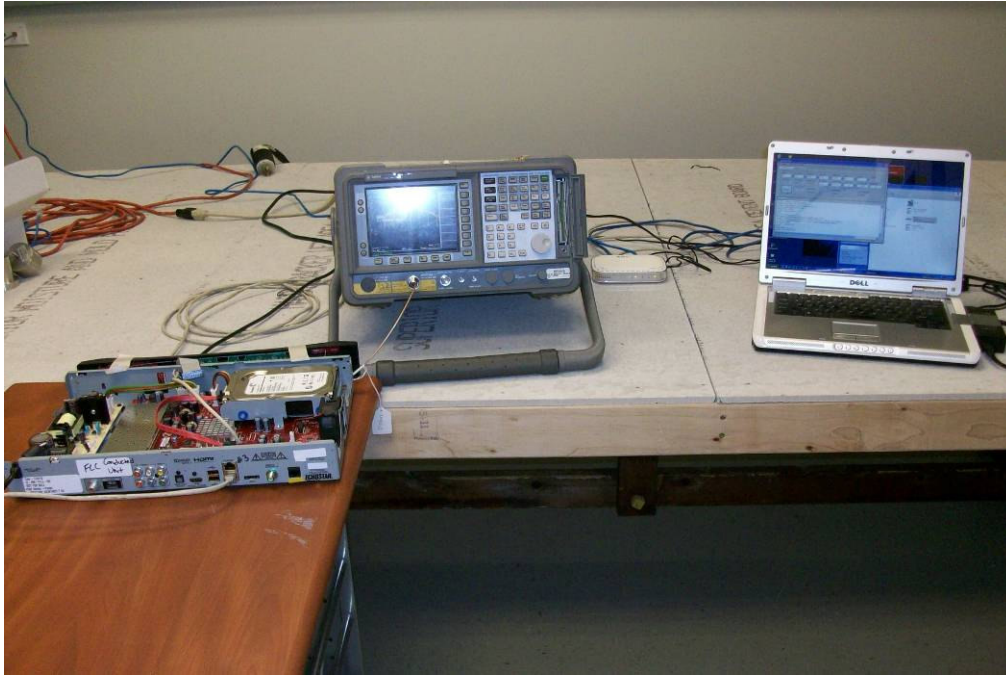
A spectrum analyzer/receiver was connected to the antenna port of the transmitter. The spectrum analyzer/receiver Resolution Bandwidth was set to 100kHz. The out-of-band emissions were measured from 30 MHz to 26 GHz for the low, middle and high channels. Measurements included band edge measurements.

8.5 Test Results:

The sample tested was found to Comply.

8.6 Setup Photographs:

Out-of-Band Antenna Conducted Emissions - Test setup



Intertek

Report Number: 100900227DEN-003

Issued: 10/11/2012

8.7 Test Data Summary: 2400-2483.5 MHz Band - Antenna 0

Out-of-Band Conducted Emissions 2400 – 2483.5 MHz – Antenna 0 FCC Part 15.247(d)

Channel	Frequency, MHz	Standard/ Data Rate	Scan Range	Plot
1	2412	802.11b, 5.5Mbps	30 MHz – 26 GHz	x
		802.11g, 54Mbps	30 MHz – 26 GHz	x
		802.11n HT20, MCS5	30 MHz – 26 GHz	
3	2422	802.11n HT40, MCS0	30 MHz – 26 GHz	x
6	2437	802.11b, 5.5Mbps	30 MHz – 26 GHz	x
		802.11g, 54Mbps	30 MHz – 26 GHz	x
		802.11n HT20, MCS7	30 MHz – 26 GHz	x
		802.11n HT40, MCS0	30 MHz – 26 GHz	
9	2452	802.11n HT40, MCS0	30 MHz – 26 GHz	x
11	2462	802.11b, 5.5Mbps	30 MHz – 26 GHz	x
		802.11g, 54Mbps	30 MHz – 26 GHz	x
		802.11n HT20, MCS6	30 MHz – 26 GHz	x

Note: All out-of-band emissions were at least 30dB below the in-band fundamental.

Out-of-Band Conducted Spurious Emissions at the Band Edge – Antenna 0

Channel	Frequency, MHz	Standard/ Data Rate	Scan Range	Pass ≥ 20dBc	Plot
1	2412	802.11b, 5.5Mbps	Lower Band Edge 2400 MHz	yes	x
		802.11g, 54Mbps	Lower Band Edge 2400 MHz	yes	x
		802.11n HT20, MCS5	Lower Band Edge 2400 MHz	yes	x
3	2422	802.11n HT40, MCS0	Lower Band Edge 2400 MHz	yes	x
9	2452	802.11n HT40, MCS0	Upper Band Edge 2483.5 MHz	yes	x
11	2462	802.11b, 5.5Mbps	Upper Band Edge 2483.5 MHz	yes	x
		802.11g, 54Mbps	Upper Band Edge 2483.5 MHz	yes	x
		802.11n HT20, MCS6	Upper Band Edge 2483.5 MHz	yes	x

Note: All band edge emissions were at least 20dB below the in-band fundamental.

Note: The above table represents the worst-case band edge measurements of all bands and modulation/data modes.

Intertek

Report Number: 100900227DEN-003

Issued: 10/11/2012

8.8 Test Data Summary: 2400-2483.5 MHz Band - Antenna 1

Out-of-Band Conducted Emissions 2400 – 2483.5 MHz – Antenna 1 FCC Part 15.247(d)

Channel	Frequency, MHz	Standard/ Data Rate	Scan Range	Plot
1	2412	802.11b, 5.5Mbps	30 MHz – 26 GHz	x
		802.11g, 54Mbps	30 MHz – 26 GHz	x
		802.11n HT20, MCS5	30 MHz – 26 GHz	
3	2422	802.11n HT40, MCS0	30 MHz – 26 GHz	x
6	2437	802.11b, 5.5Mbps	30 MHz – 26 GHz	x
		802.11g, 54Mbps	30 MHz – 26 GHz	x
		802.11n HT20, MCS7	30 MHz – 26 GHz	x
		802.11n HT40, MCS0	30 MHz – 26 GHz	
9	2452	802.11n HT40, MCS0	30 MHz – 26 GHz	x
11	2462	802.11b, 5.5Mbps	30 MHz – 26 GHz	x
		802.11g, 54Mbps	30 MHz – 26 GHz	x
		802.11n HT20, MCS6	30 MHz – 26 GHz	x

Note: All out-of-band emissions were at least 30dB below the in-band fundamental.

Out-of-Band Conducted Spurious Emissions at the Band Edge – Antenna 1

Channel	Frequency, MHz	Standard/ Data Rate	Scan Range	Pass ≥ 20dBc	Plot
1	2412	802.11b, 5.5Mbps	Lower Band Edge 2400 MHz	yes	x
		802.11g, 54Mbps	Lower Band Edge 2400 MHz	yes	x
		802.11n HT20, MCS5	Lower Band Edge 2400 MHz	yes	x
3	2422	802.11n HT40, MCS0	Lower Band Edge 2400 MHz	yes	x
9	2452	802.11n HT40, MCS0	Upper Band Edge 2483.5 MHz	yes	x
11	2462	802.11b, 5.5Mbps	Upper Band Edge 2483.5 MHz	yes	x
		802.11g, 54Mbps	Upper Band Edge 2483.5 MHz	yes	x
		802.11n HT20, MCS6	Upper Band Edge 2483.5 MHz	yes	x

Note: All band edge emissions were at least 20dB below the in-band fundamental.

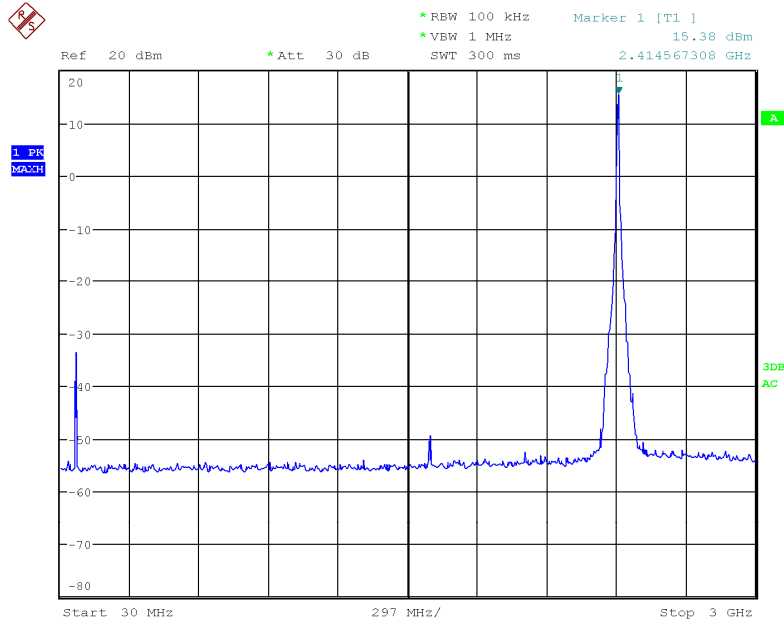
Note: The above table represents the worst-case band edge measurements of all bands and modulation/data modes.

8.9 Test Data/Plots: 2400-2483.5 MHz - Antenna 0

Channels 2400 to 2483.5 MHz - FCC Part 15.247(d) (RF Conducted Spurious Emissions – Antenna Port 0)

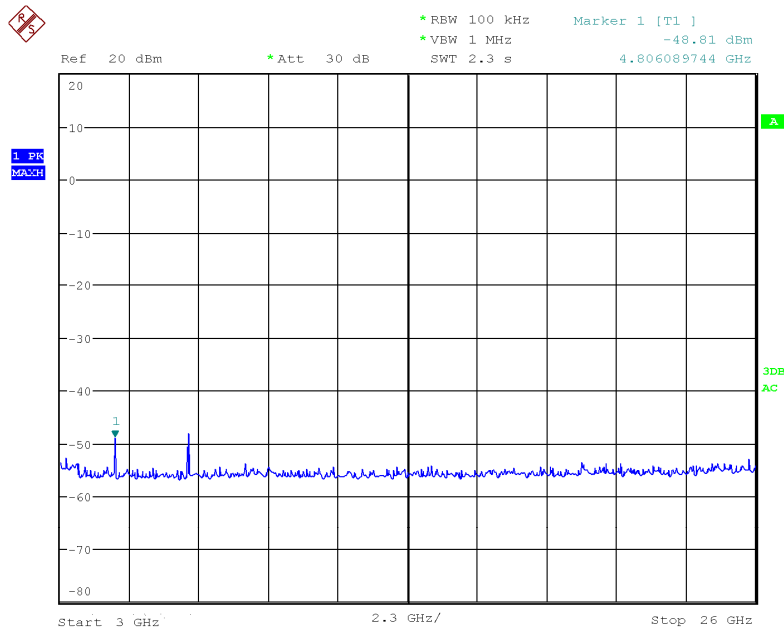
802.11b – CCK Modulation Mode

Channel 1



CH0-

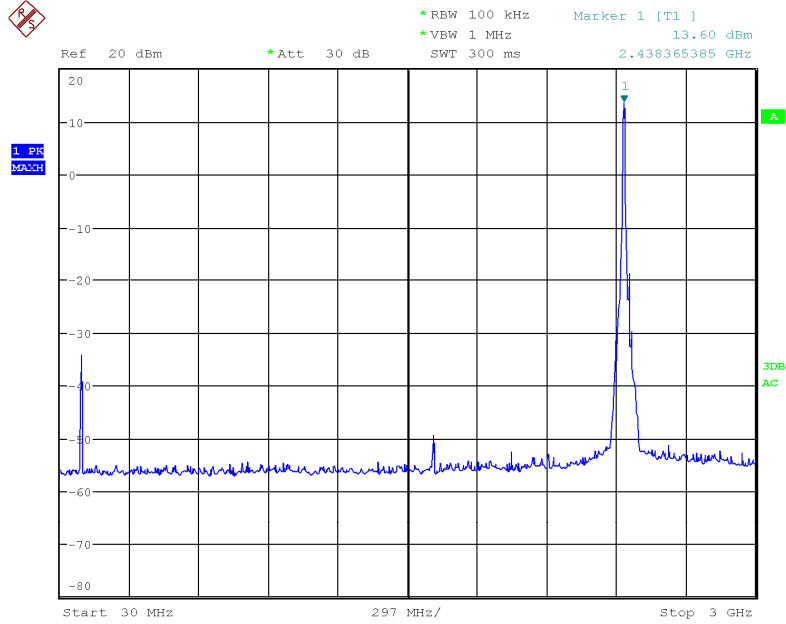
Date: 20.SEP.2012 15:42:44



CH0-

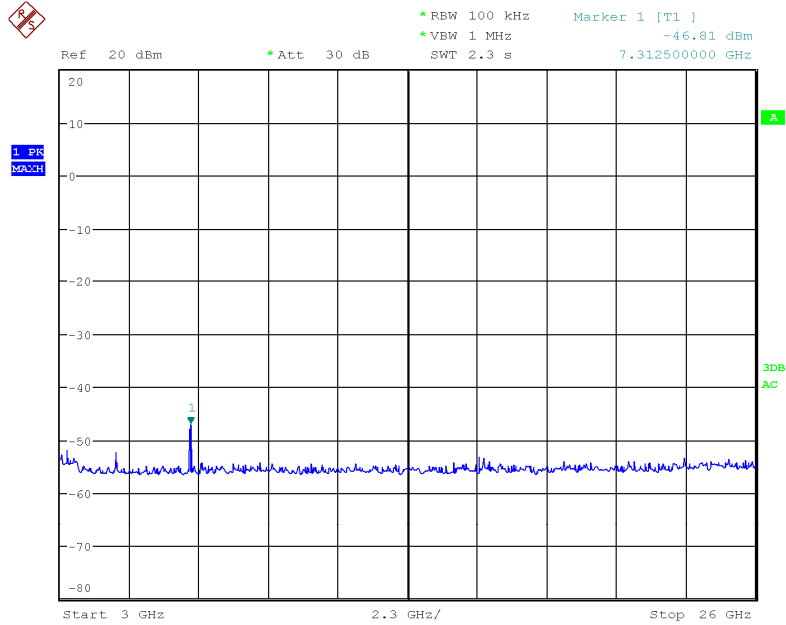
Date: 20.SEP.2012 15:44:20

Channel 6



CH0-

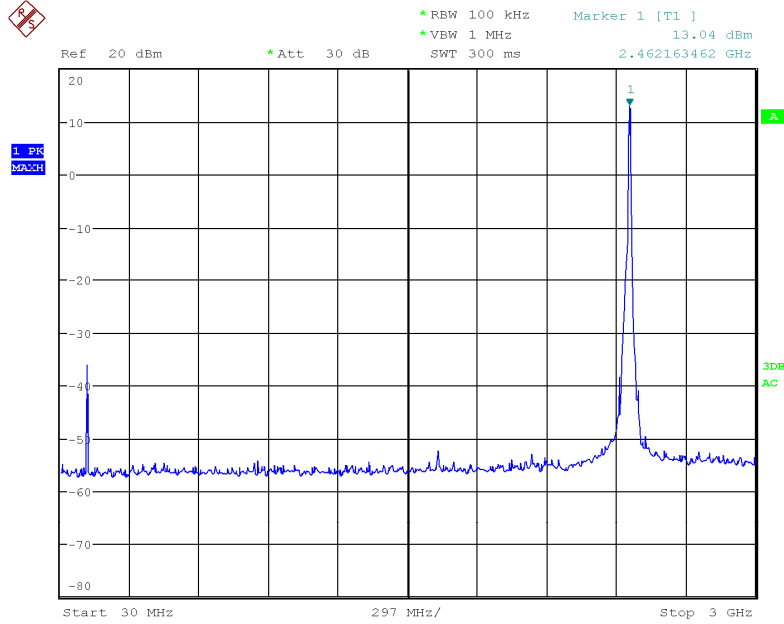
Date: 20.SEP.2012 15:54:25



CH0-

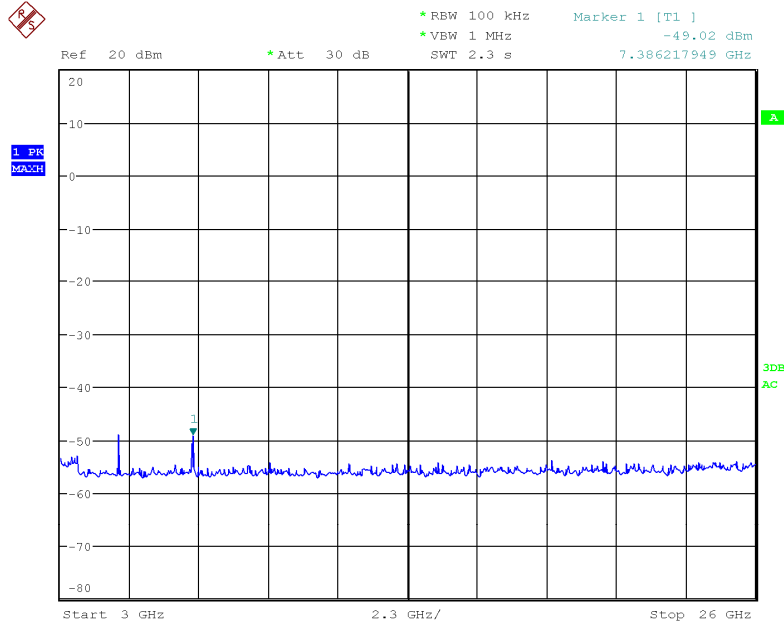
Date: 20.SEP.2012 15:55:54

Channel 11



CH0-

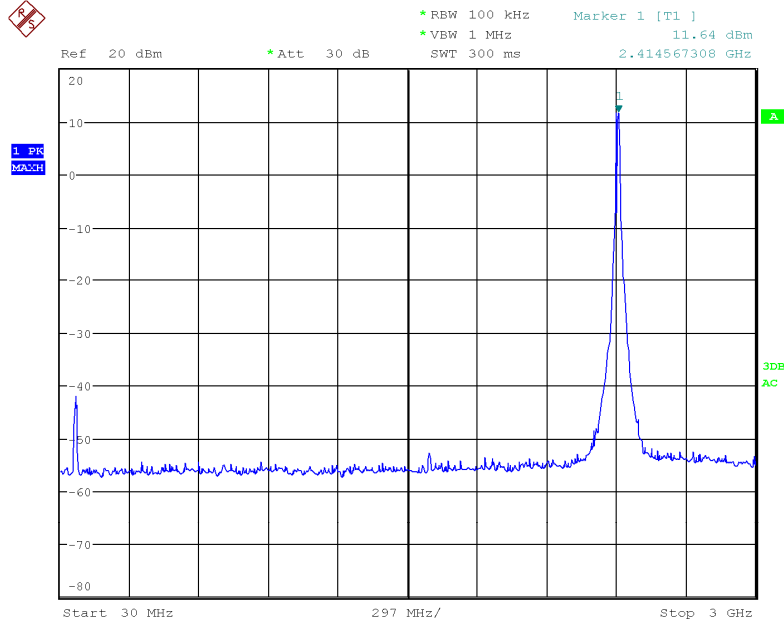
Date: 20.SEP.2012 16:05:18



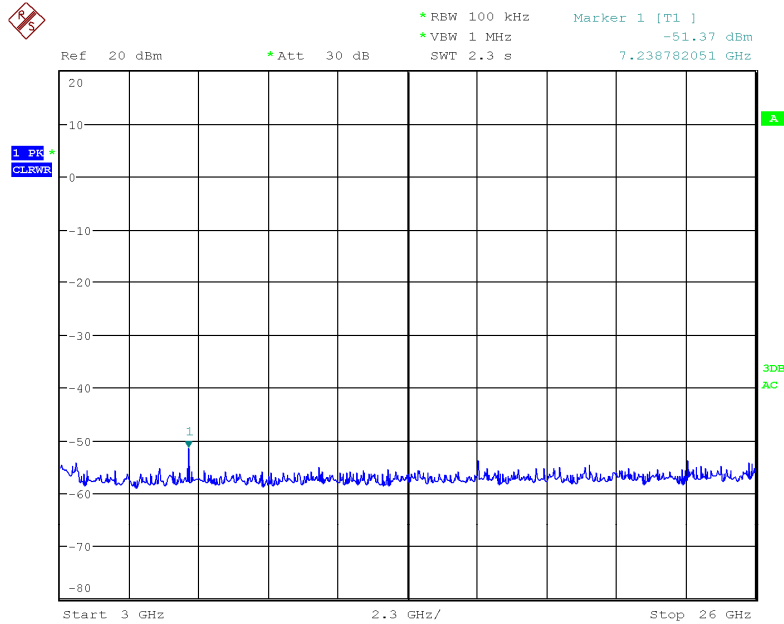
CH0-

Date: 20.SEP.2012 16:06:05

802.11g – OFDM Modulation Mode Channel 1

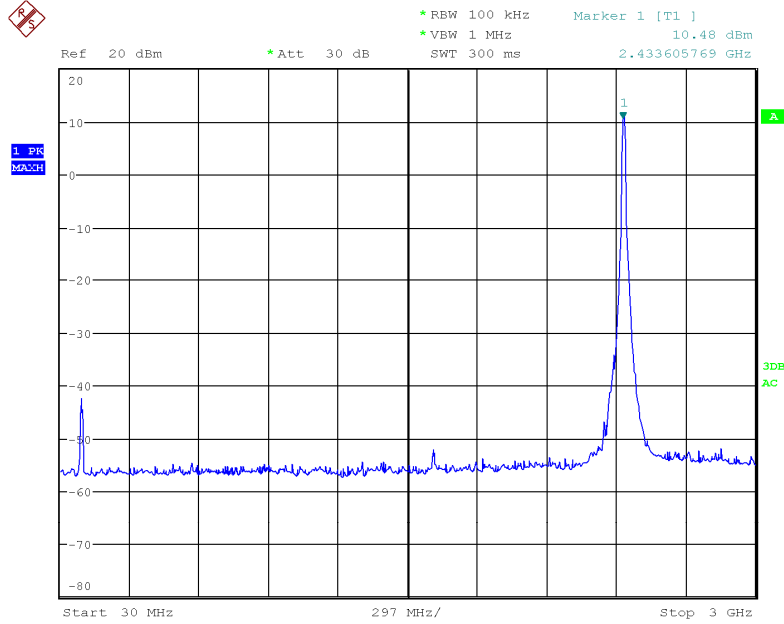


CH0-
Date: 20.SEP.2012 15:45:51



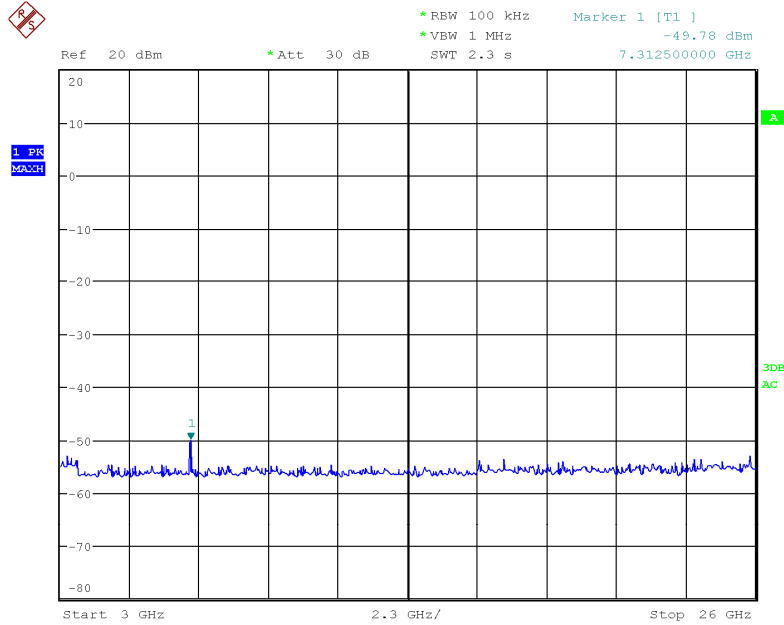
CH0-
Date: 20.SEP.2012 15:47:11

Channel 6



CH0-

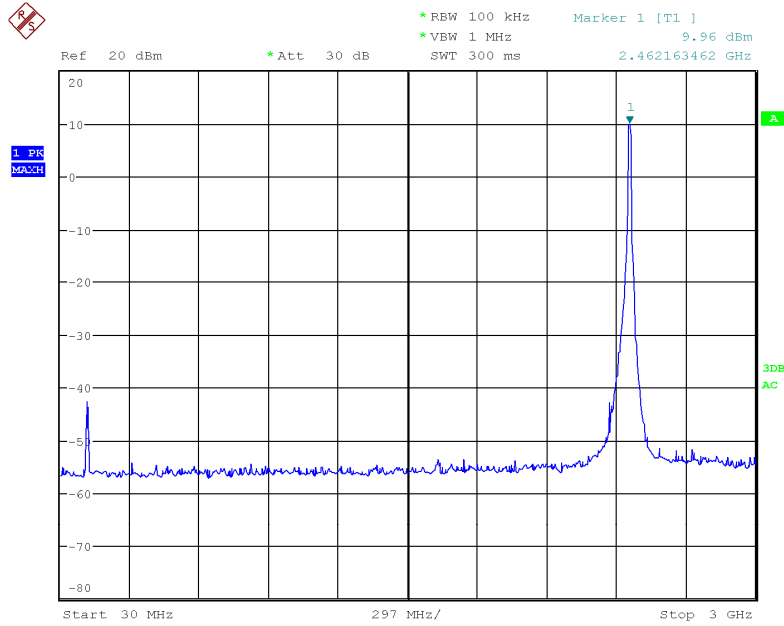
Date: 20.SEP.2012 15:57:09



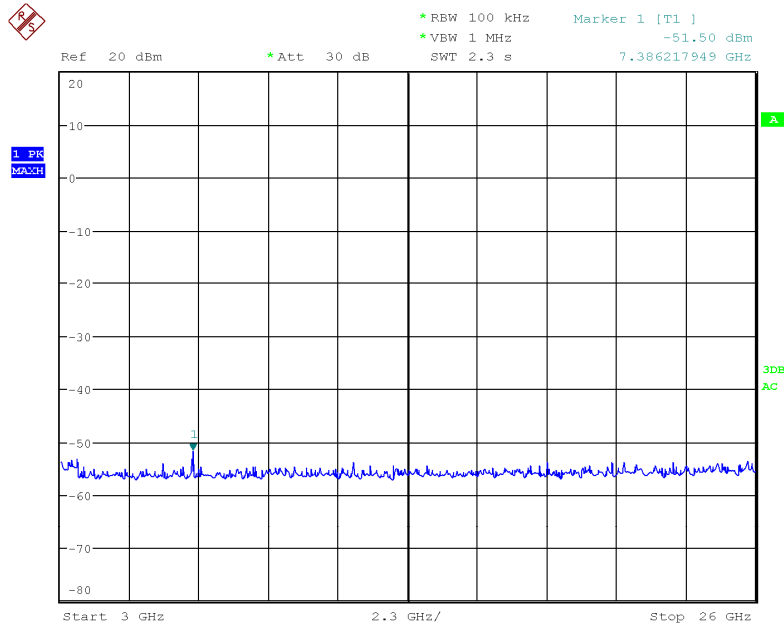
CH0-

Date: 20.SEP.2012 15:58:16

Channel 11

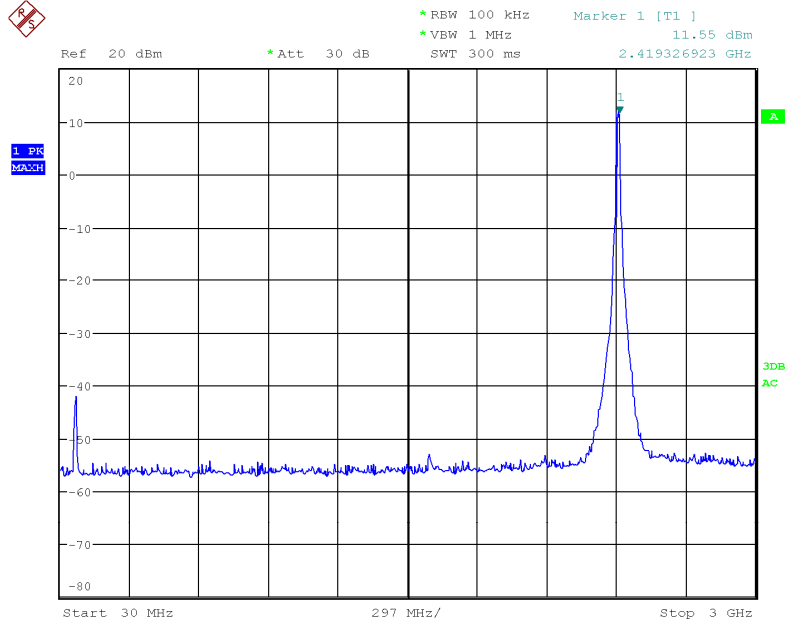


CH0-
 Date: 20.SEP.2012 16:07:48



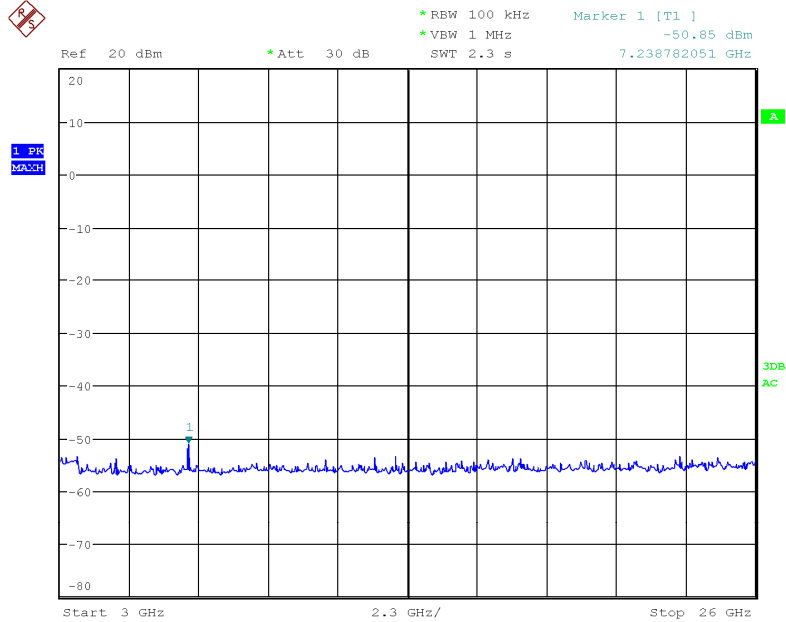
CH0-
 Date: 20.SEP.2012 16:10:06

802.11n HT20 MCS Modulation Mode
Channel 1



CH0-

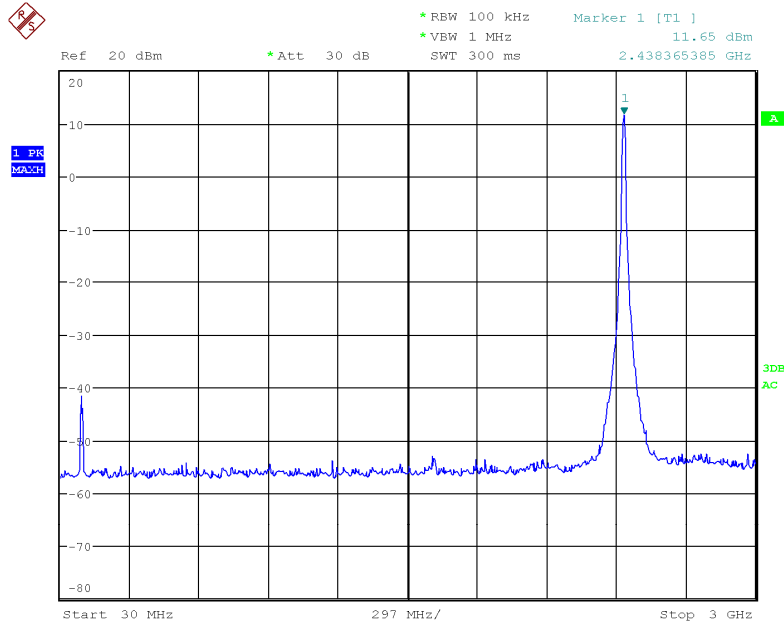
Date: 20.SEP.2012 15:48:28



CH0-

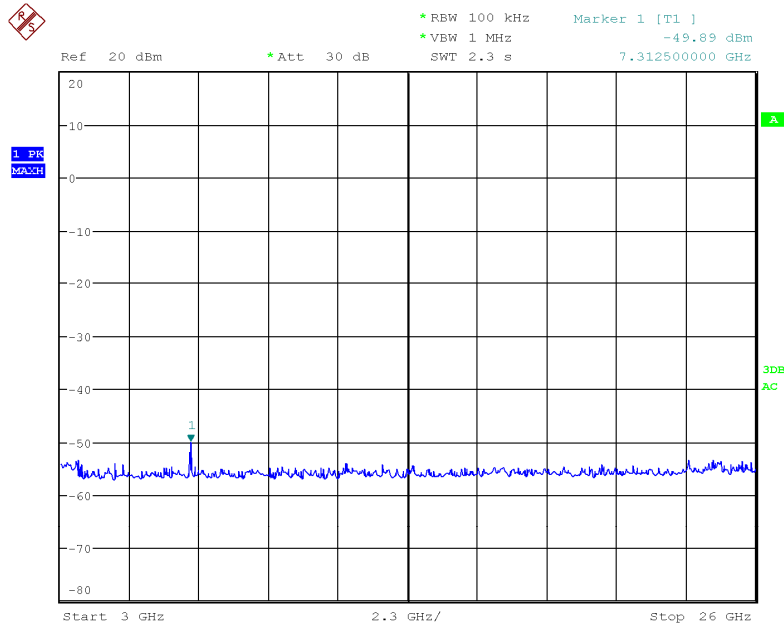
Date: 20.SEP.2012 15:50:09

Channel 6



CH0-

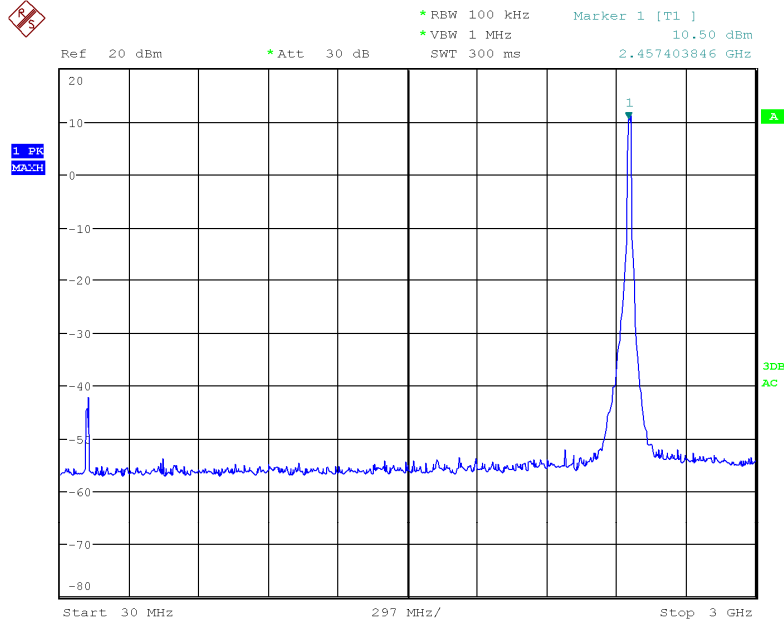
Date: 20.SEP.2012 15:59:54



CH0-

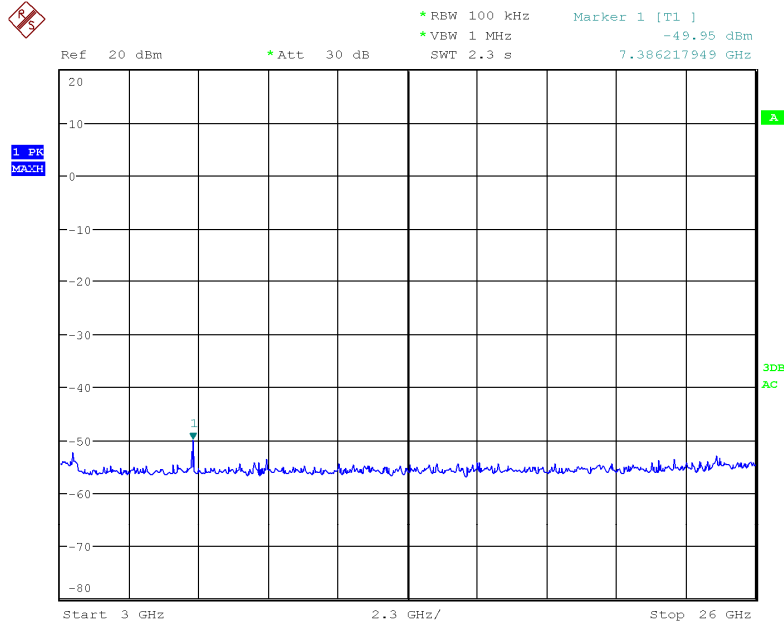
Date: 20.SEP.2012 16:01:09

Channel 11



CH0-

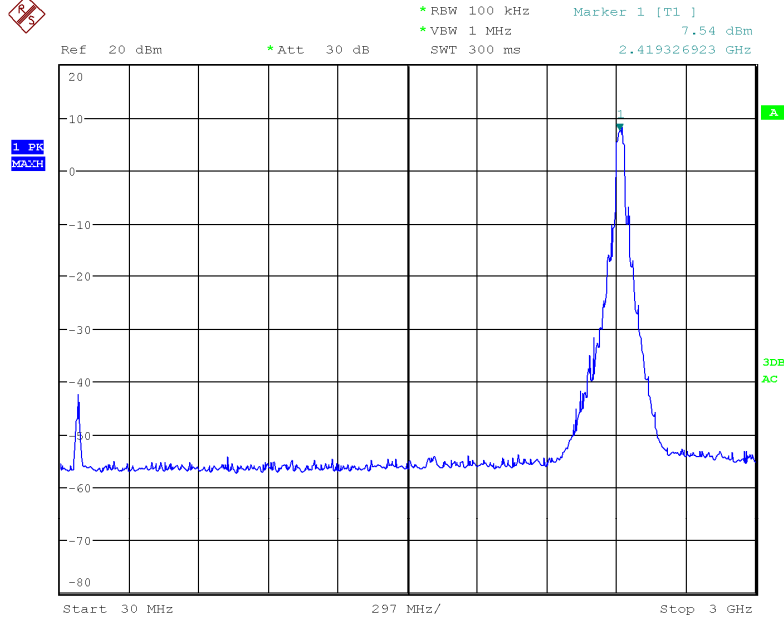
Date: 20.SEP.2012 16:12:54



CH0-

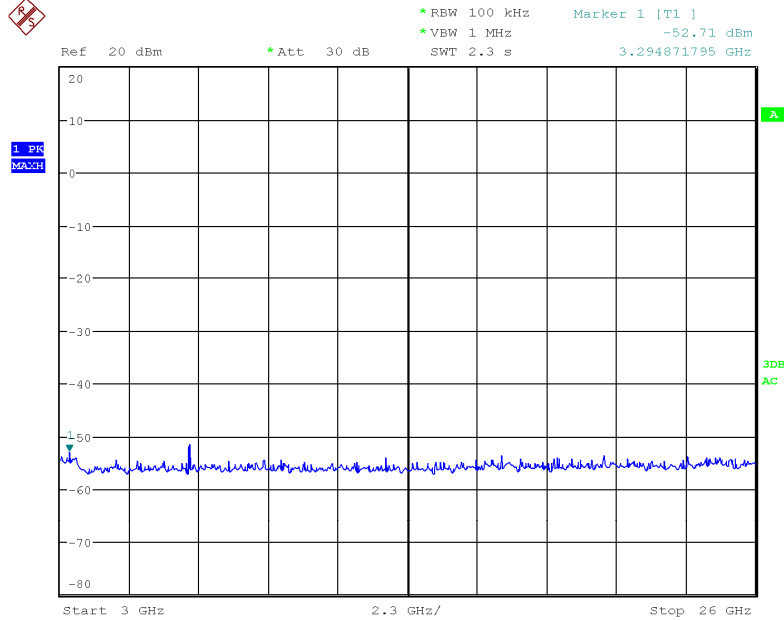
Date: 20.SEP.2012 16:14:03

802.11n HT40 MCS Modulation Mode
Channel 3



CH0-

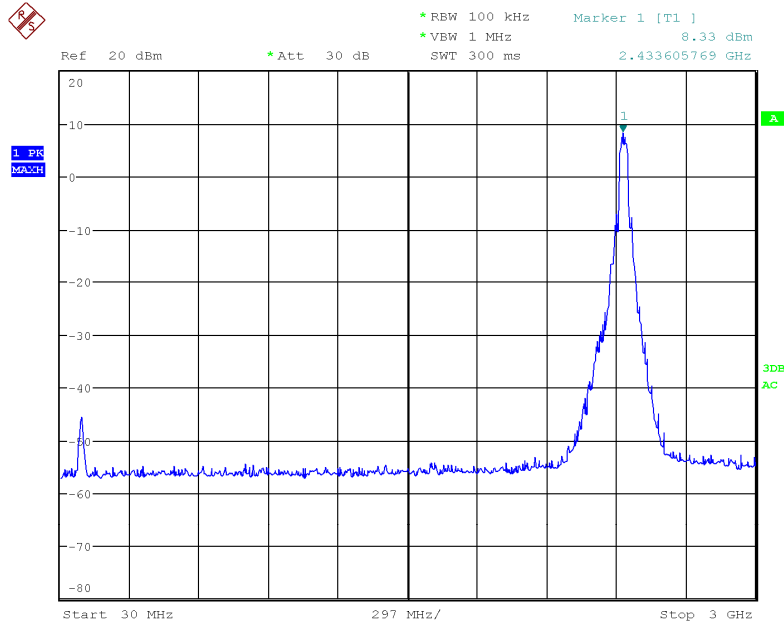
Date: 20.SEP.2012 15:51:33



CH0-

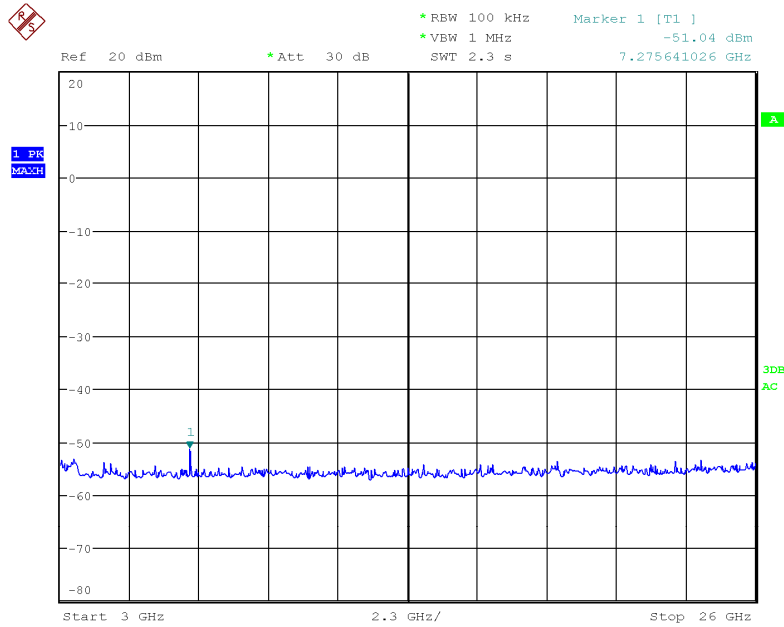
Date: 20.SEP.2012 15:52:27

Channel 6



CH0-

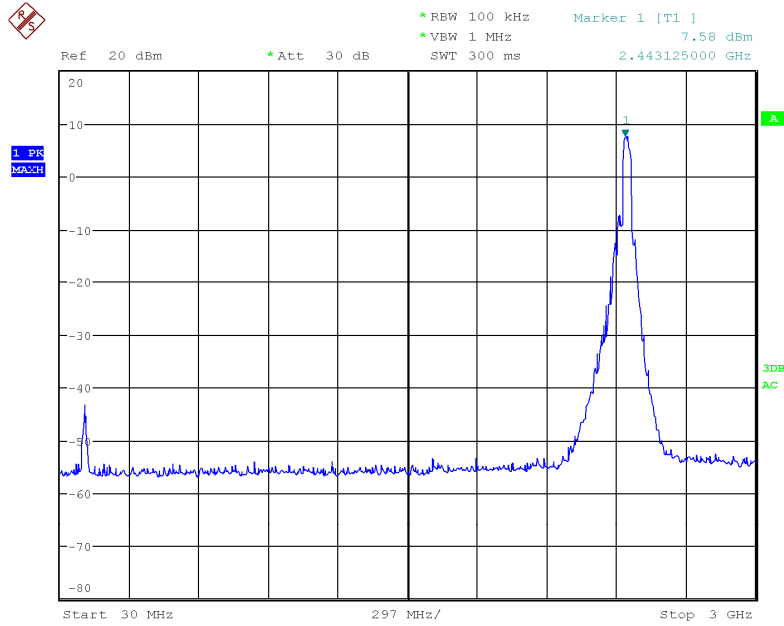
Date: 20.SEP.2012 16:02:37



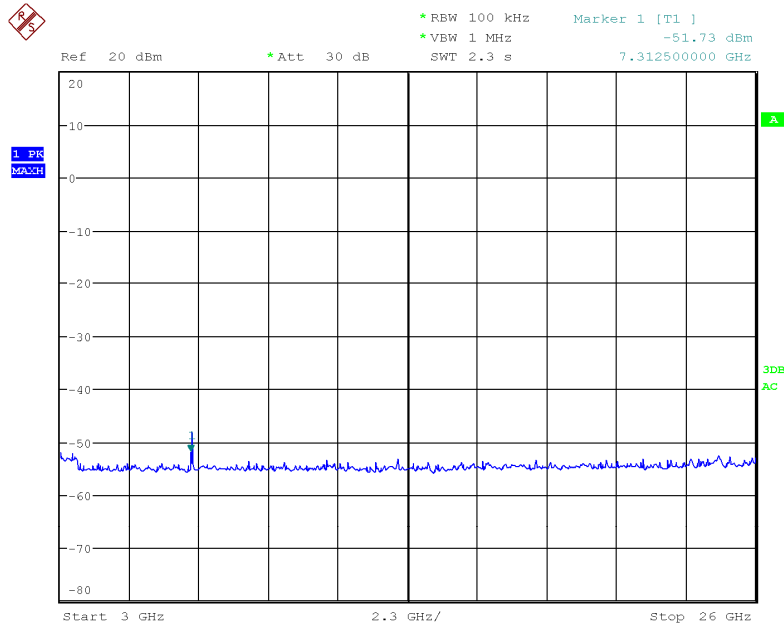
CH0-

Date: 20.SEP.2012 16:03:33

Channel 9



CH0-
 Date: 20.SEP.2012 16:16:03



CH0-
 Date: 20.SEP.2012 16:25:27

FCC Part 15.247(d) RF Conducted Spurious Emissions Specification: $\geq 20\text{dBc}$

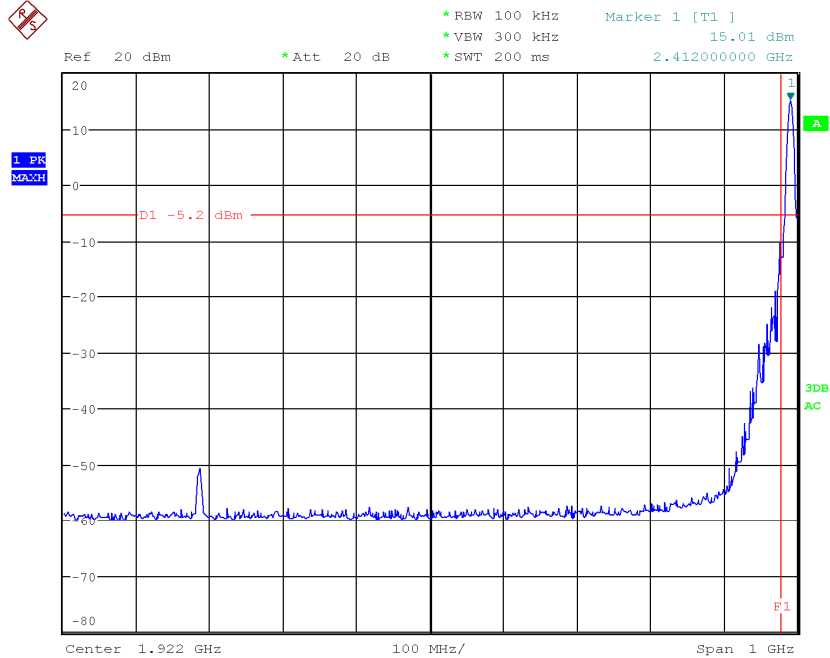
Result: All RF Conducted Spurious Emissions $> 40\text{dBc}$

8.10 Test Data/Plots – Band Edge: 2400-2483.5 MHz - Antenna 0

Channels 2400 to 2483.5 MHz - FCC Part 15.247(d) (RF Conducted Band Edge Spurious Emissions – Antenna Port 0)

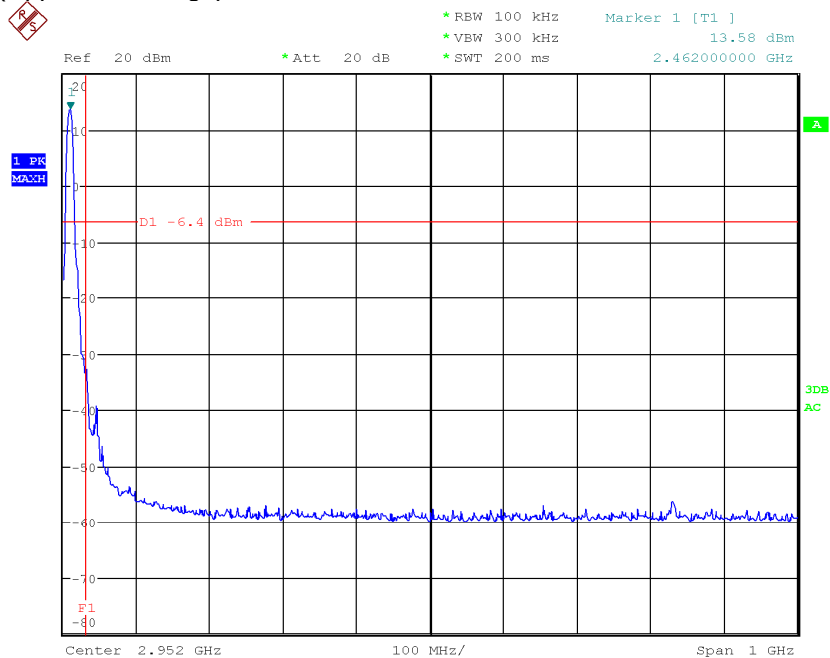
802.11b – CCK Modulation Mode

Channel 1 (Lower Band Edge)



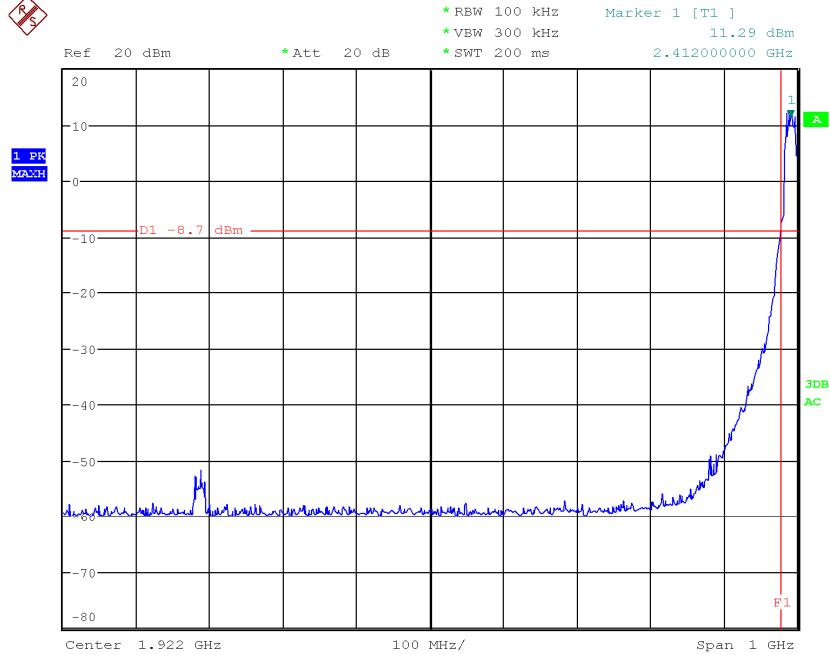
Date: 19.SEP.2012 12:56:20

Channel 11 (Upper Band Edge)



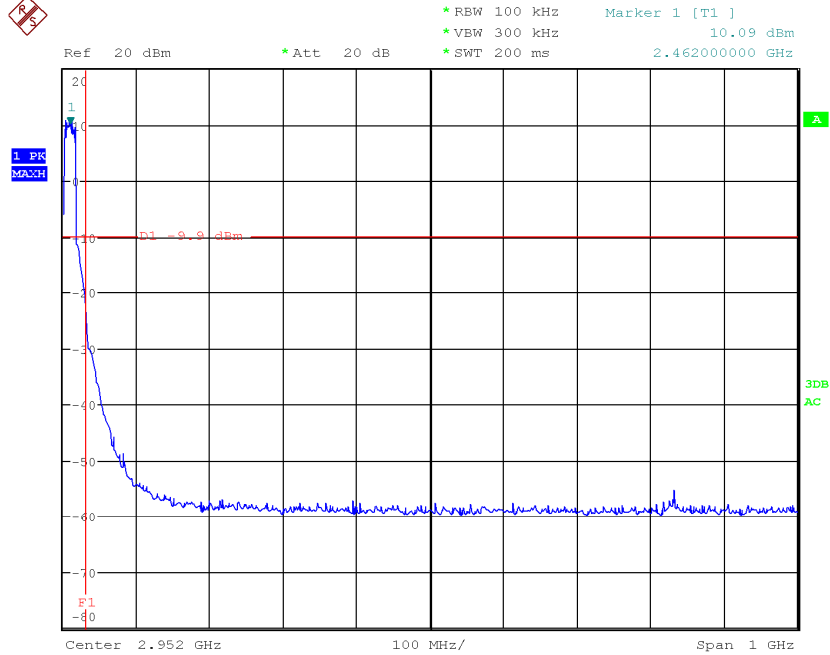
Date: 19.SEP.2012 13:21:09

802.11g – OFDM Modulation Mode
Channel 1 (Lower Band Edge)

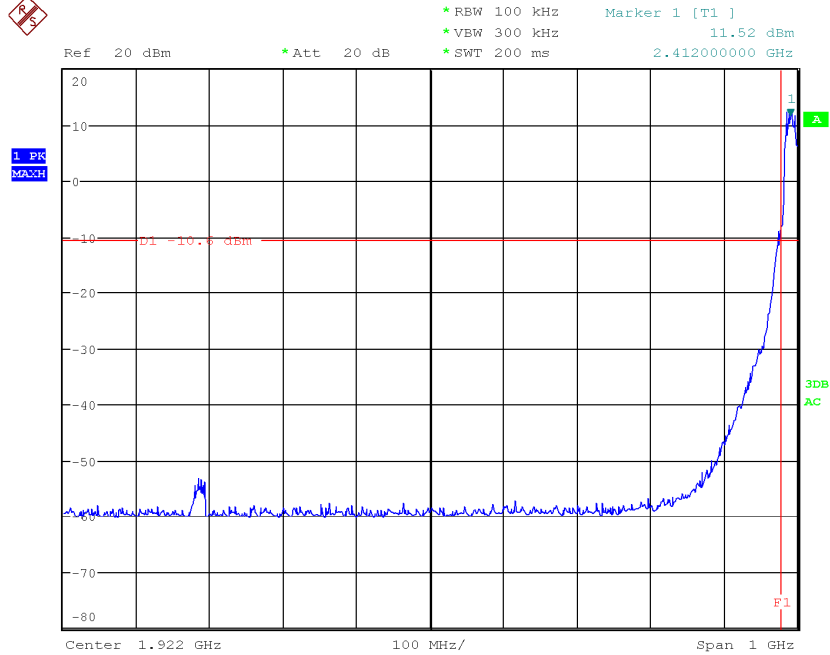


Date: 19.SEP.2012 12:58:42

Channel 11 (Upper Band Edge)

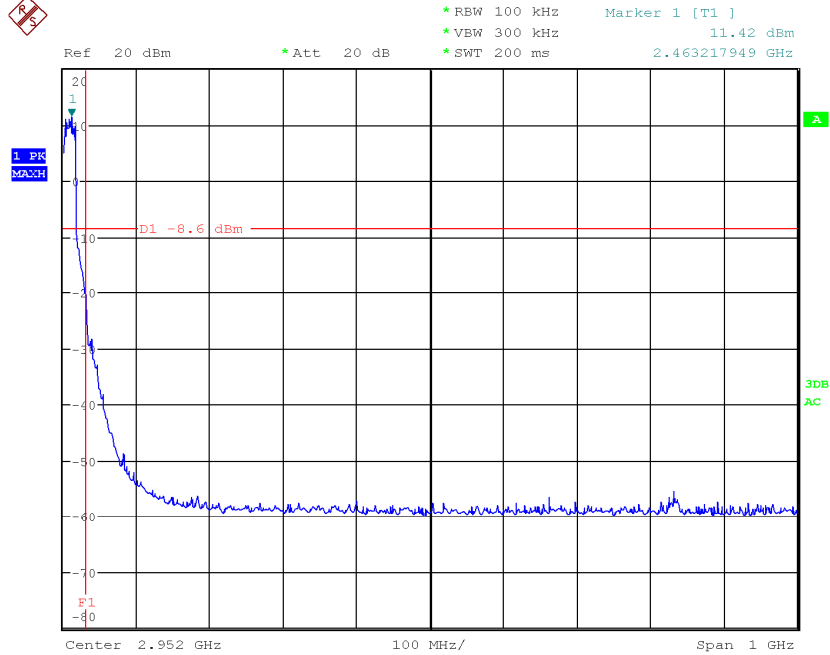


Date: 19.SEP.2012 13:19:39

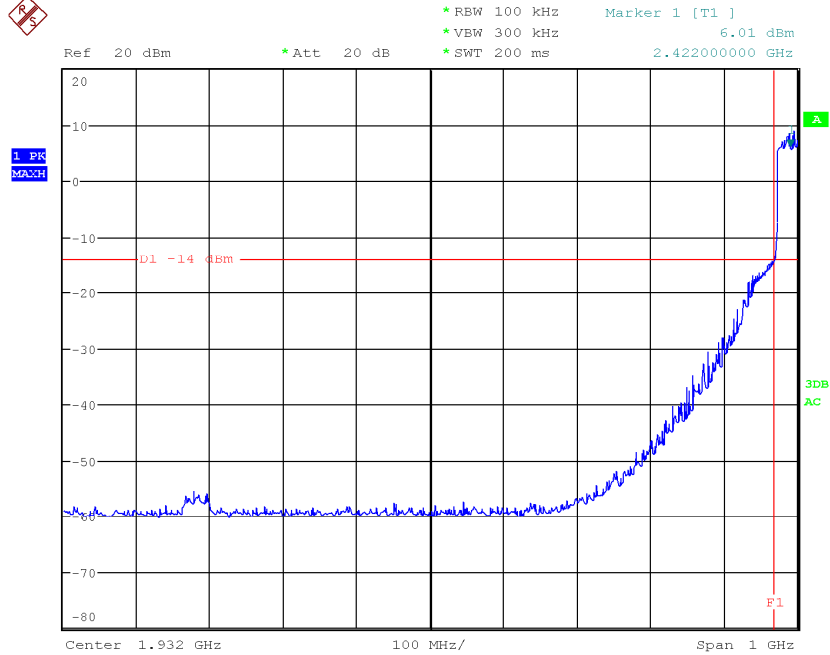
802.11n HT20 MCS Modulation Mode
Channel 1 (Lower Band Edge)

Date: 19.SEP.2012 13:00:42

Channel 11 (Upper Band Edge)

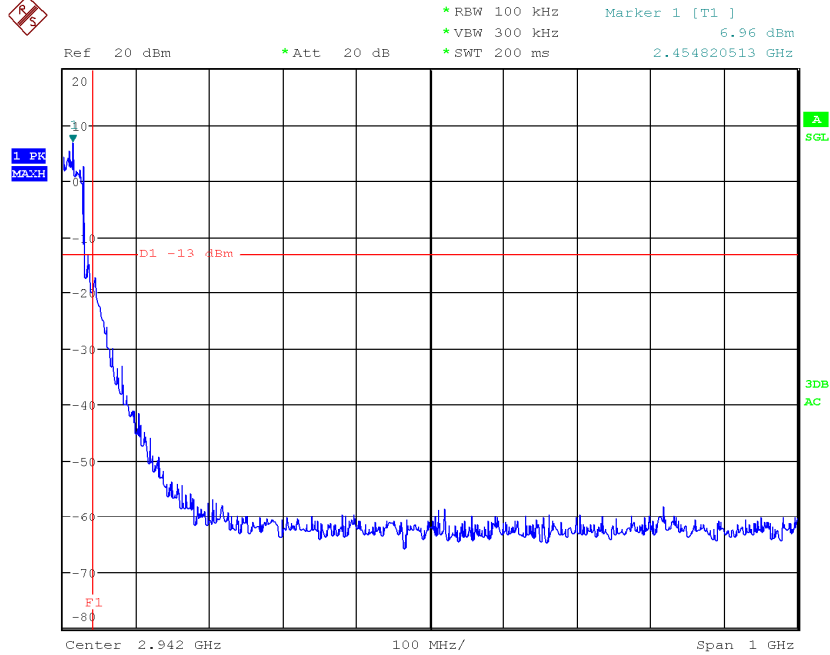


Date: 19.SEP.2012 13:17:48

802.11n HT40 MCS Modulation Mode
Channel 3 (Lower Band Edge)

Date: 19.SEP.2012 13:03:13

Channel 9 (Upper Band Edge)



Date: 19.SEP.2012 13:14:25

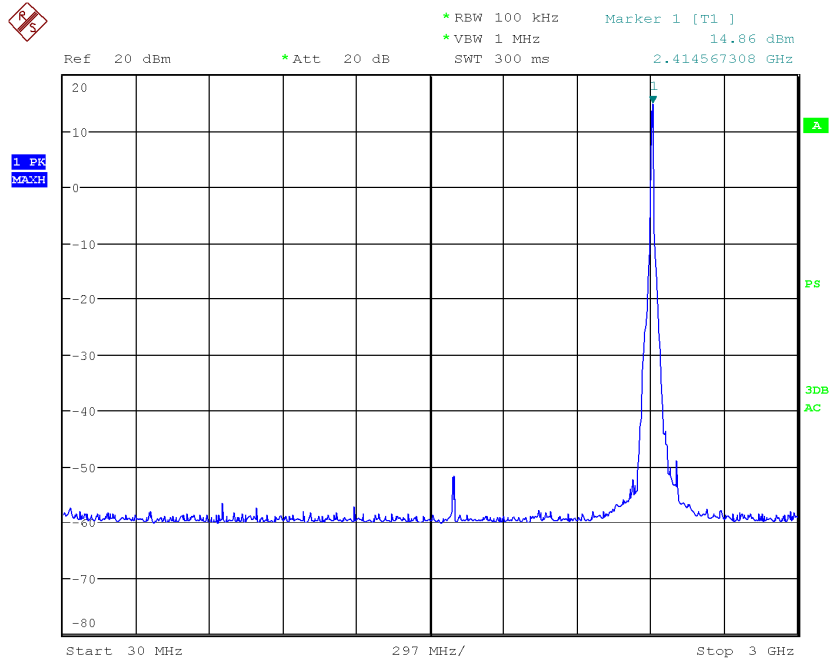
FCC Part 15.247(d) RF Conducted Spurious Band Edge Emissions Specification: $\geq 20\text{dBc}$

8.11 Test Data/Plots: 2400-2483.5 MHz - Antenna 1

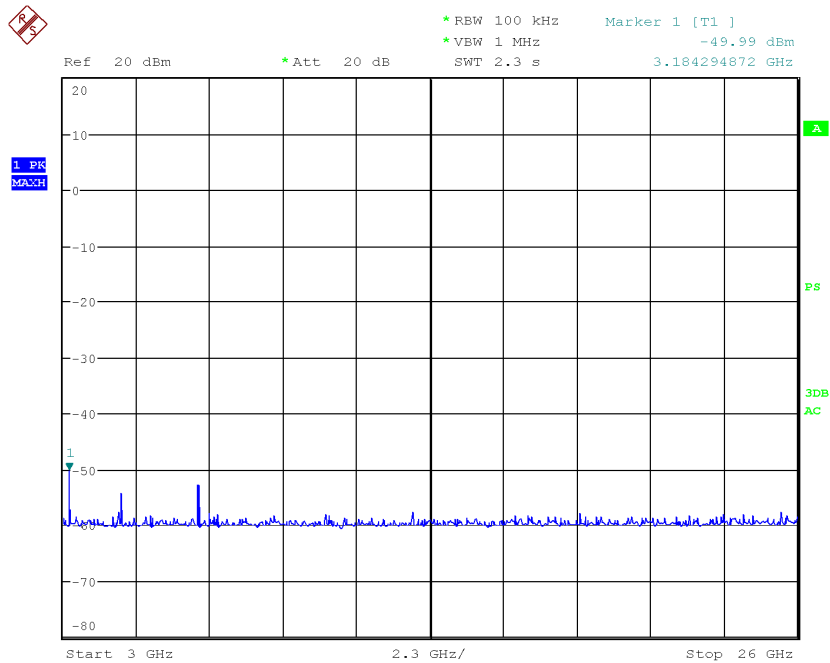
Channels 2400 to 2483.5 MHz - FCC Part 15.247(d) (RF Conducted Spurious Emissions – Antenna Port 1)

802.11b – CCK Modulation Mode

Channel 1

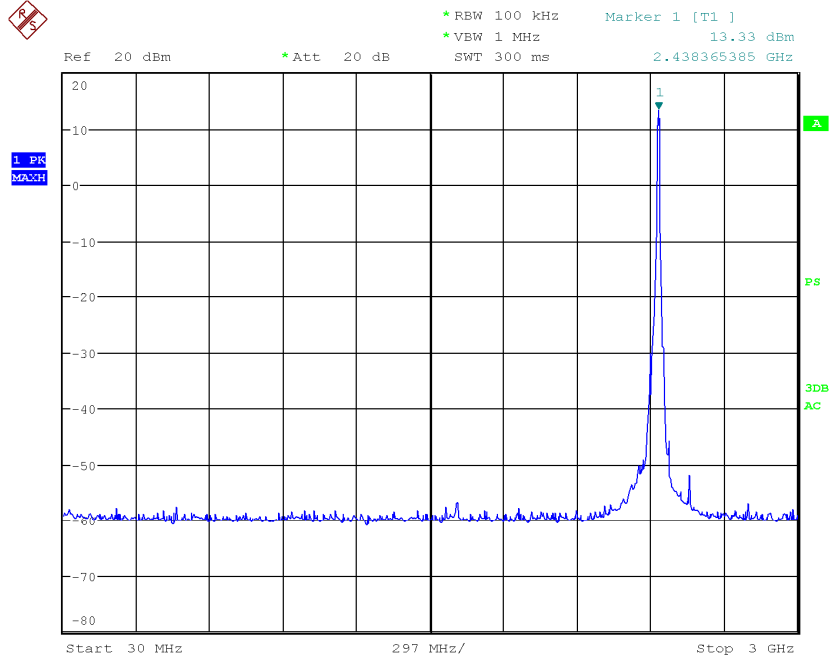


Date: 18.SEP.2012 13:10:19

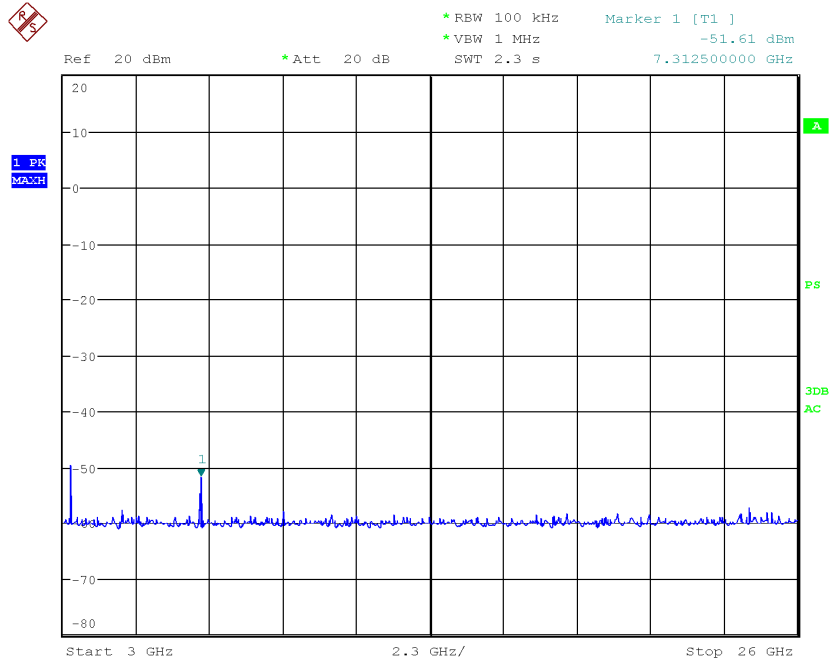


Date: 18.SEP.2012 13:11:37

Channel 6

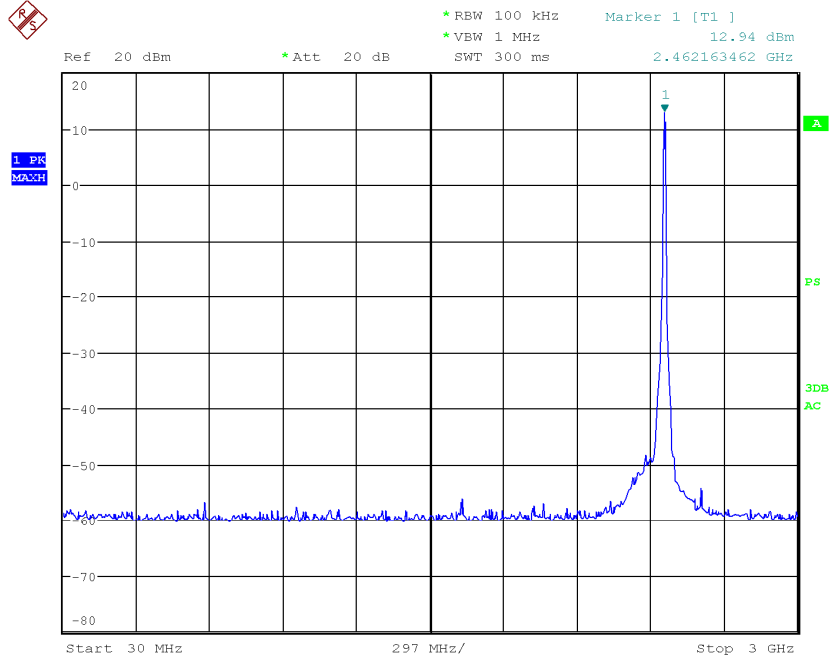


Date: 18.SEP.2012 13:19:52

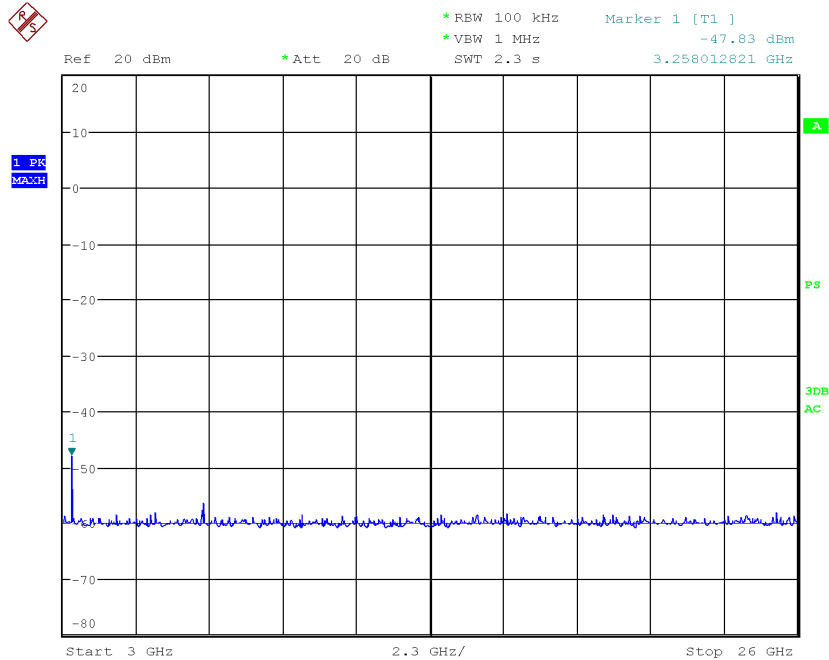


Date: 18.SEP.2012 13:20:48

Channel 11

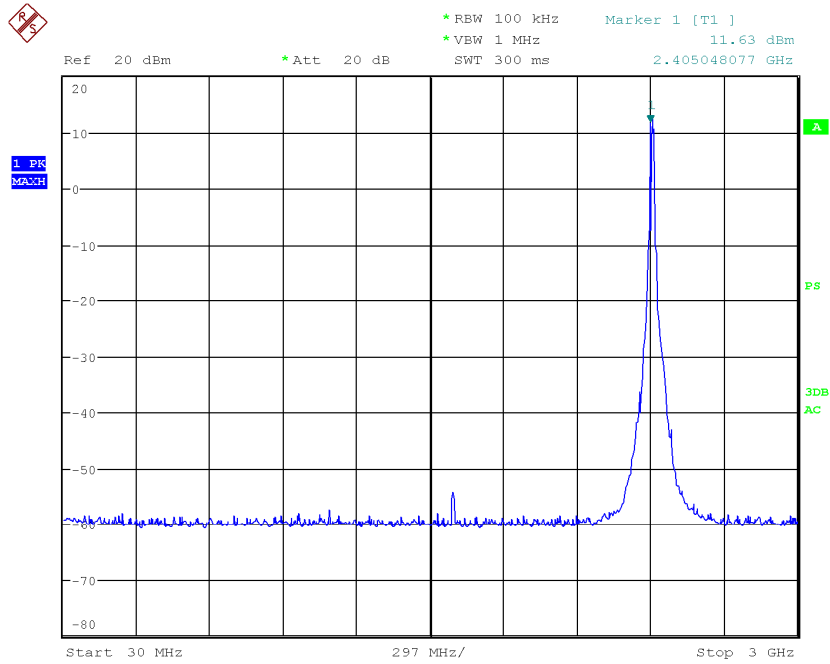


Date: 18.SEP.2012 13:24:29

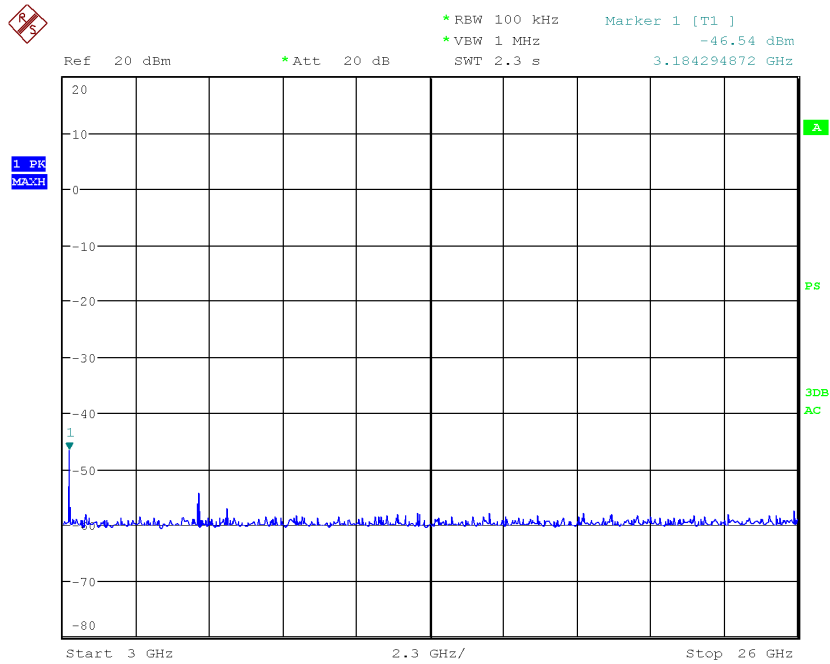


Date: 18.SEP.2012 13:37:17

802.11g – OFDM Modulation Mode Channel 1

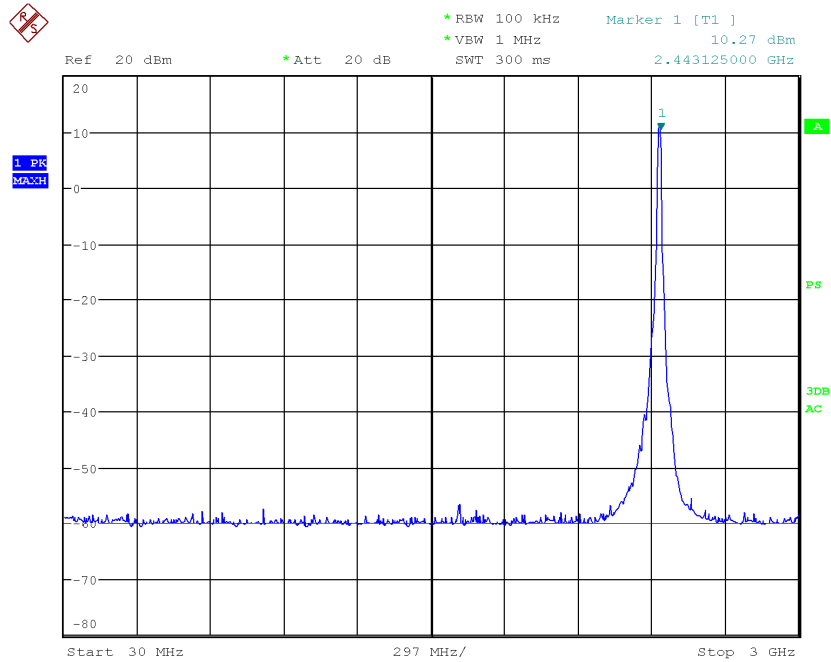


Date: 18.SEP.2012 13:28:54

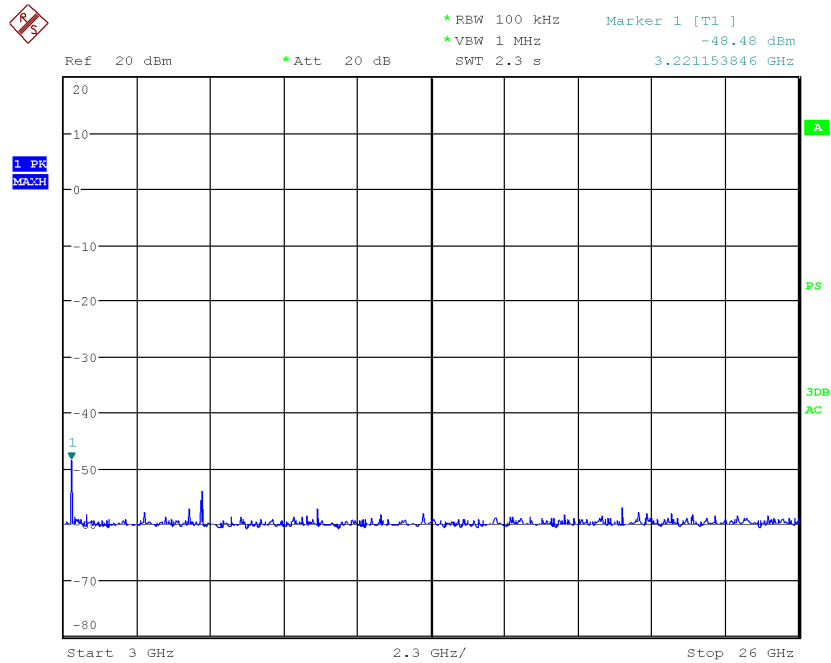


Date: 18.SEP.2012 13:30:06

Channel 6

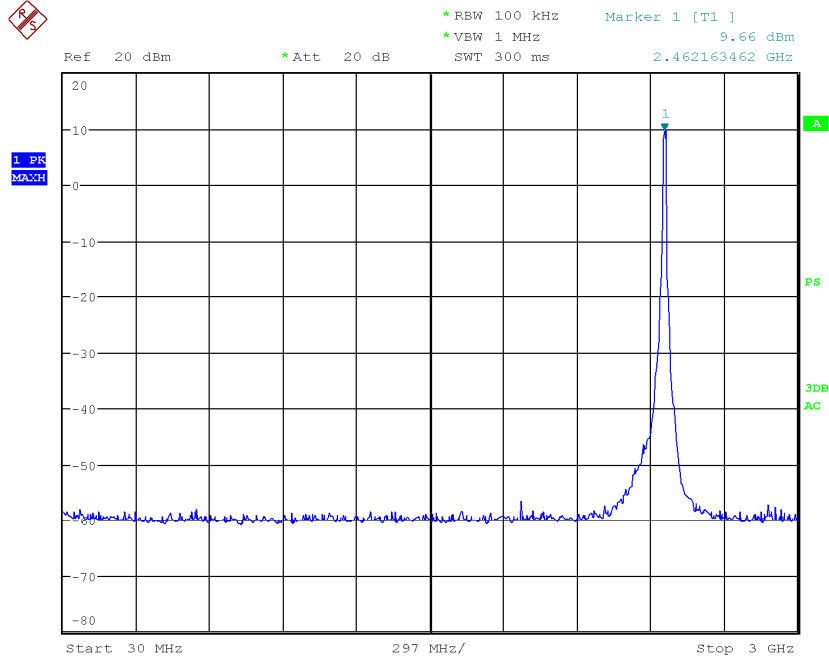


Date: 18.SEP.2012 13:32:59

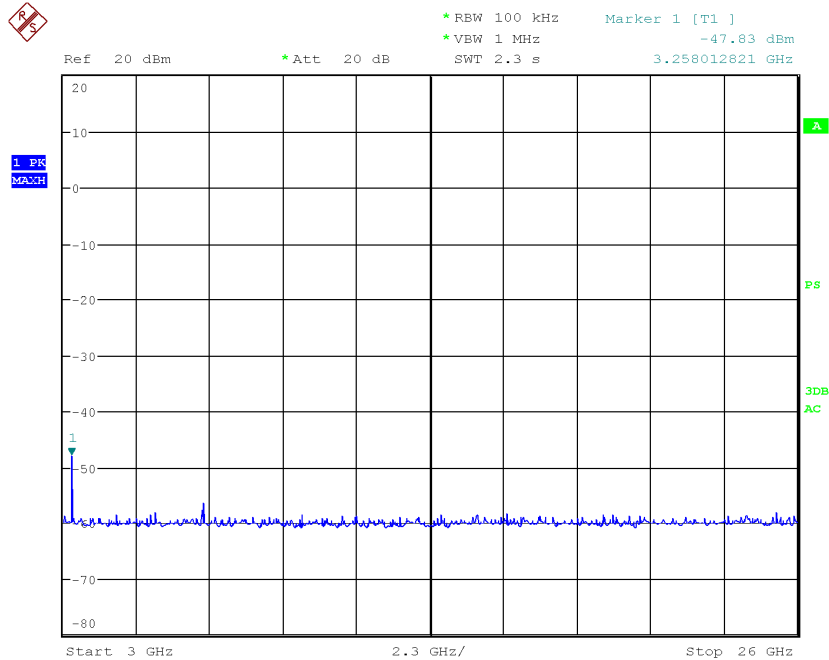


Date: 18.SEP.2012 13:34:09

Channel 11

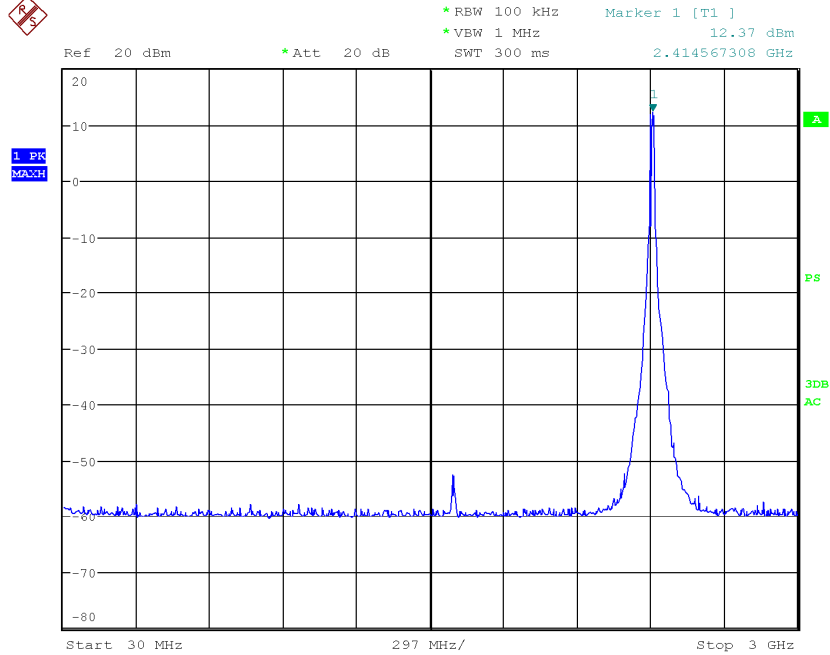


Date: 18.SEP.2012 13:36:28

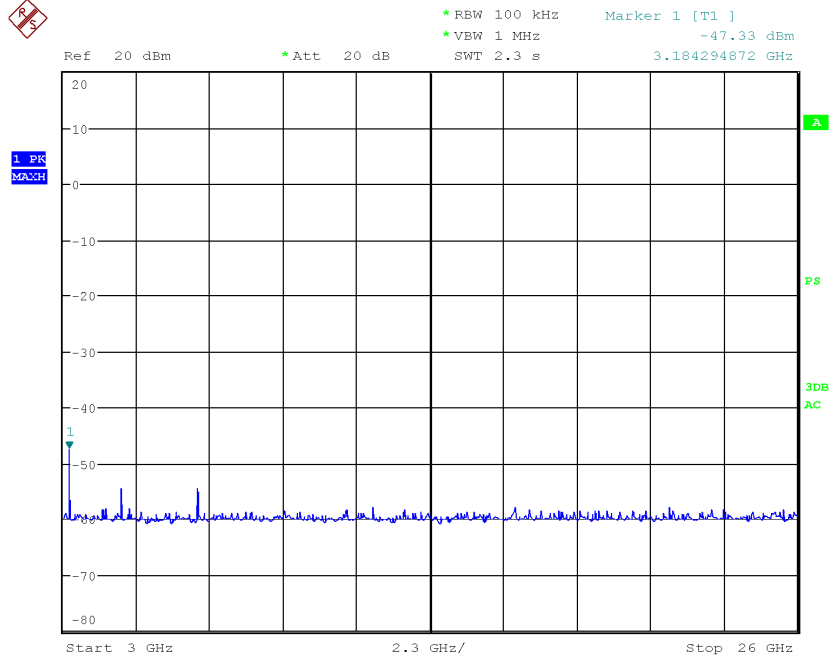


Date: 18.SEP.2012 13:37:17

802.11n HT20 MCS Modulation Mode Channel 1

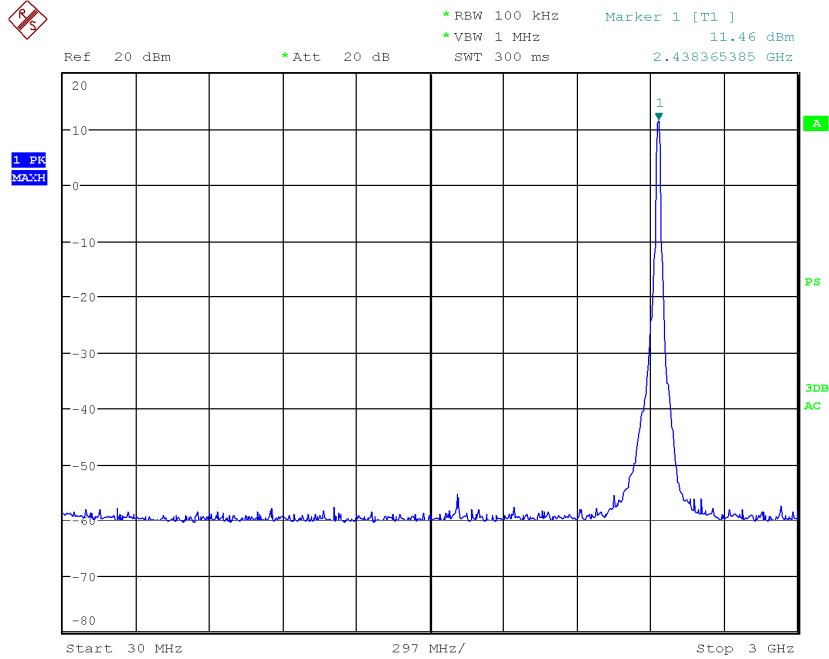


Date: 18.SEP.2012 13:42:24

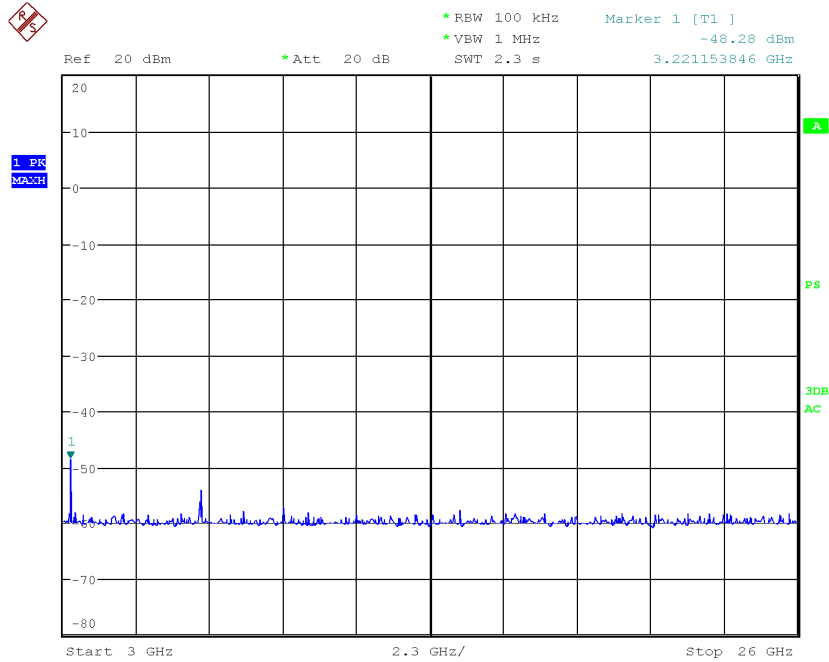


Date: 18.SEP.2012 13:43:17

Channel 6

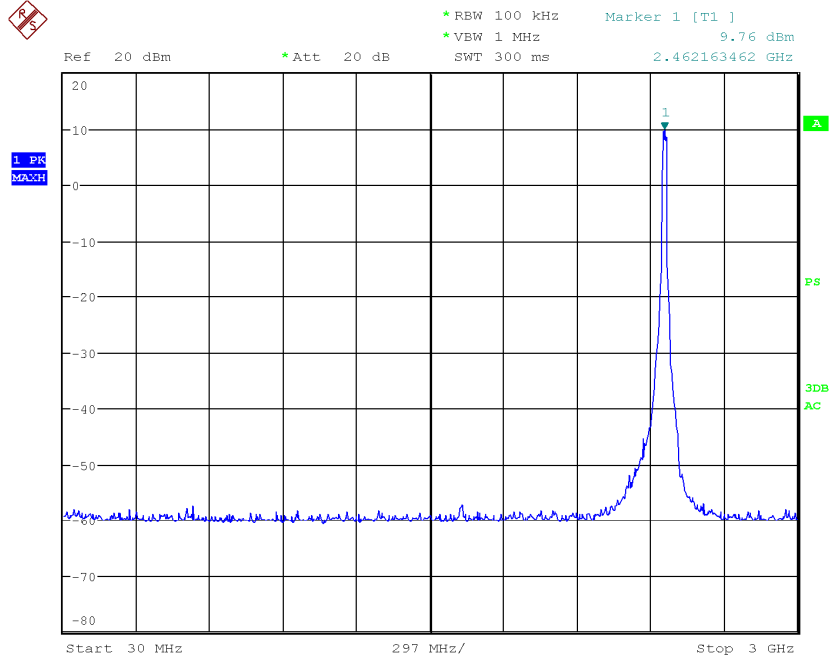


Date: 18.SEP.2012 13:46:25

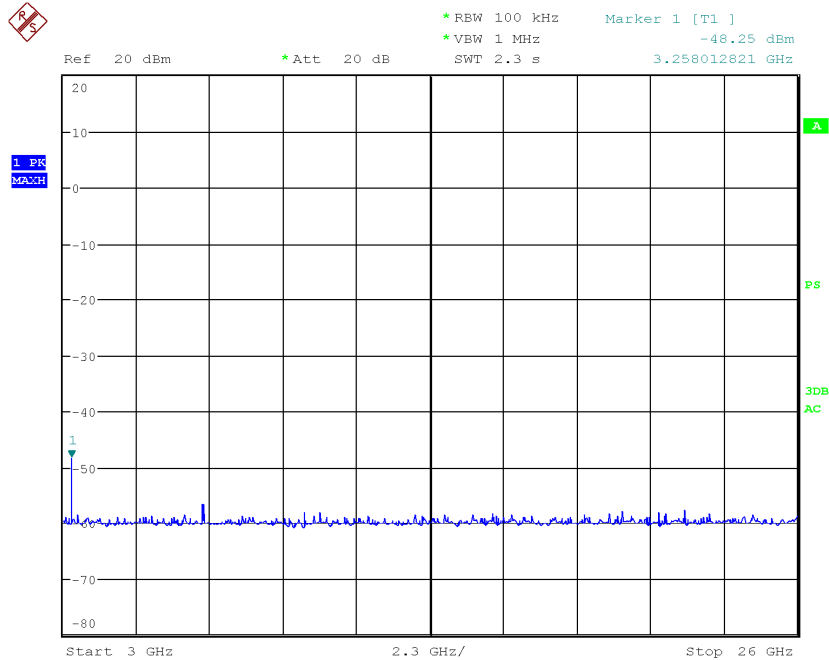


Date: 18.SEP.2012 13:47:22

Channel 11

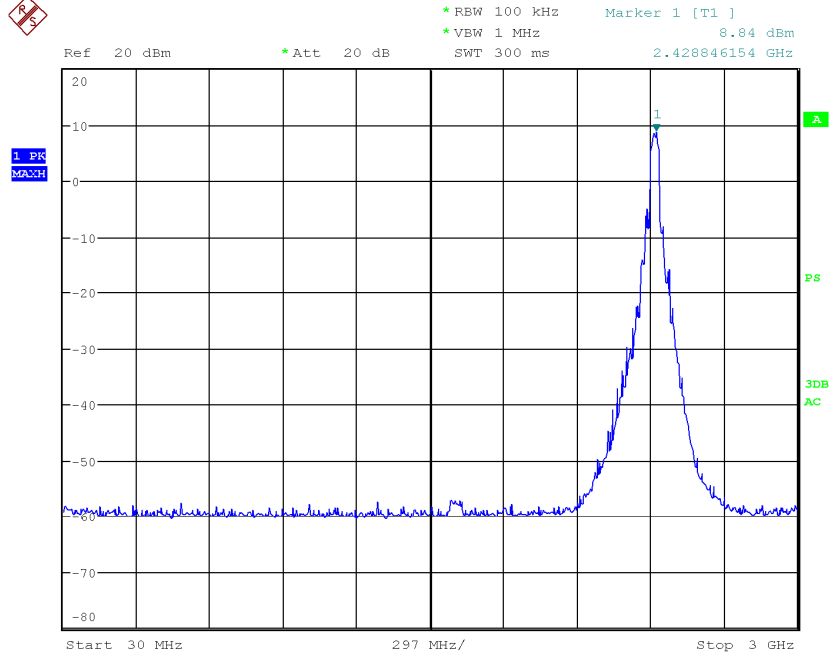


Date: 18.SEP.2012 13:49:59

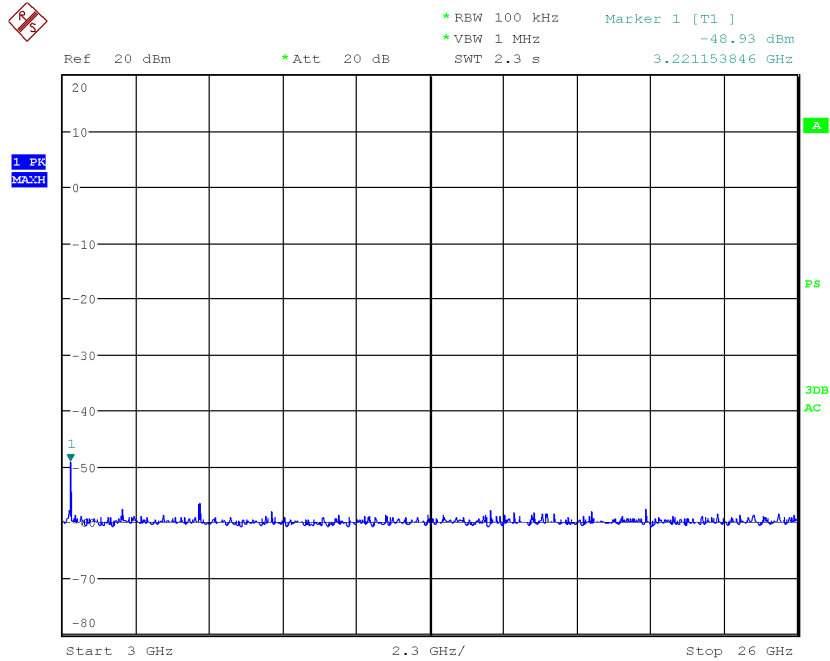


Date: 18.SEP.2012 13:50:51

802.11n HT40 MCS Modulation Mode Channel 3

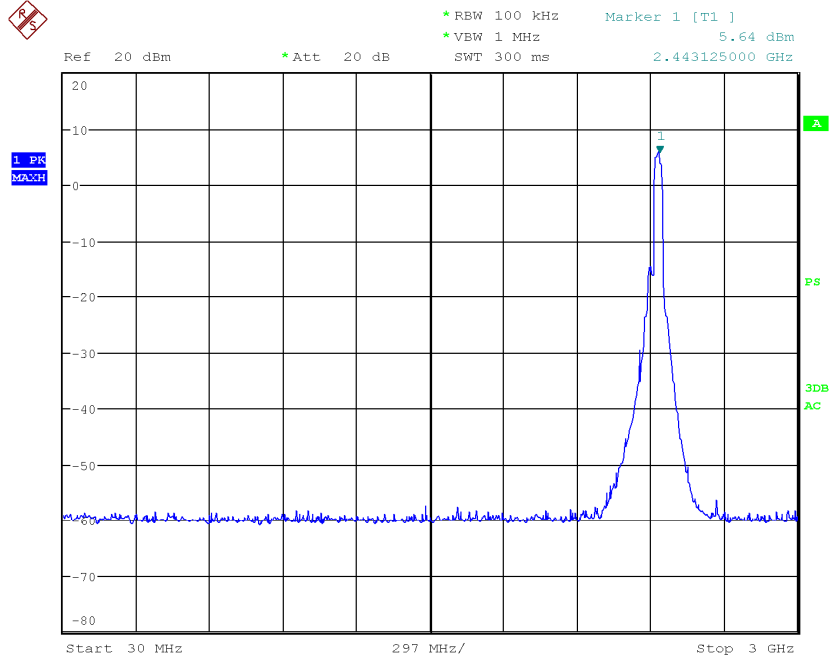


Date: 18.SEP.2012 14:15:08

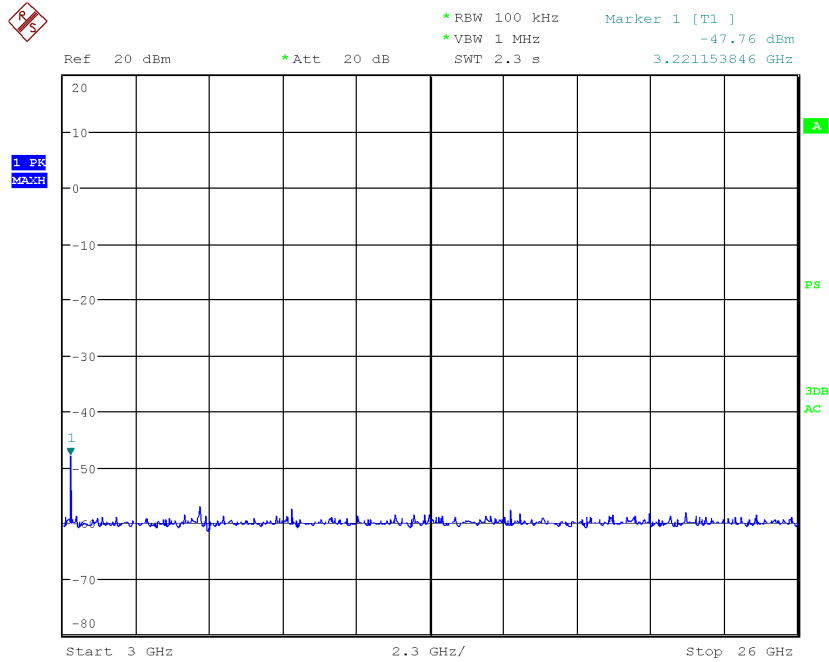


Date: 18.SEP.2012 14:15:49

Channel 6

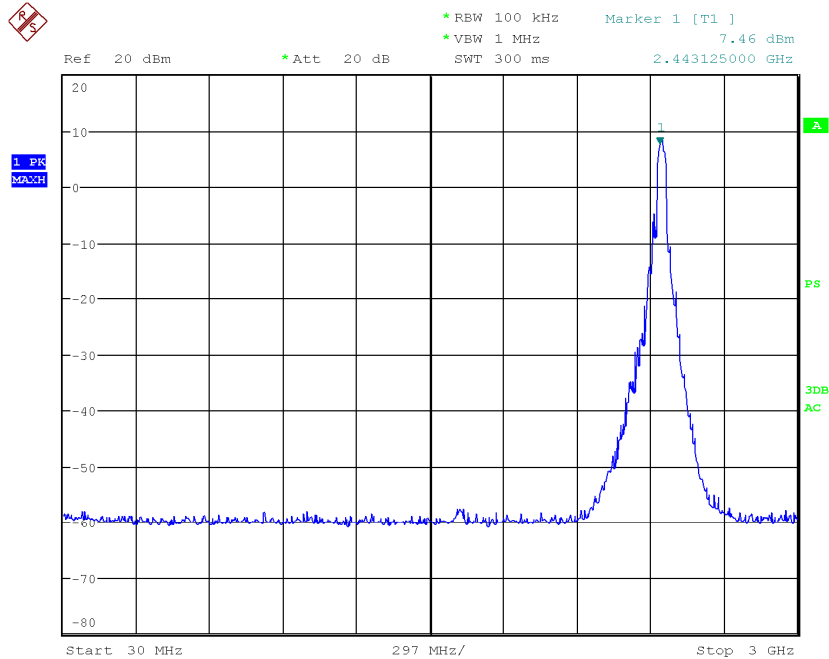


Date: 18.SEP.2012 14:17:59

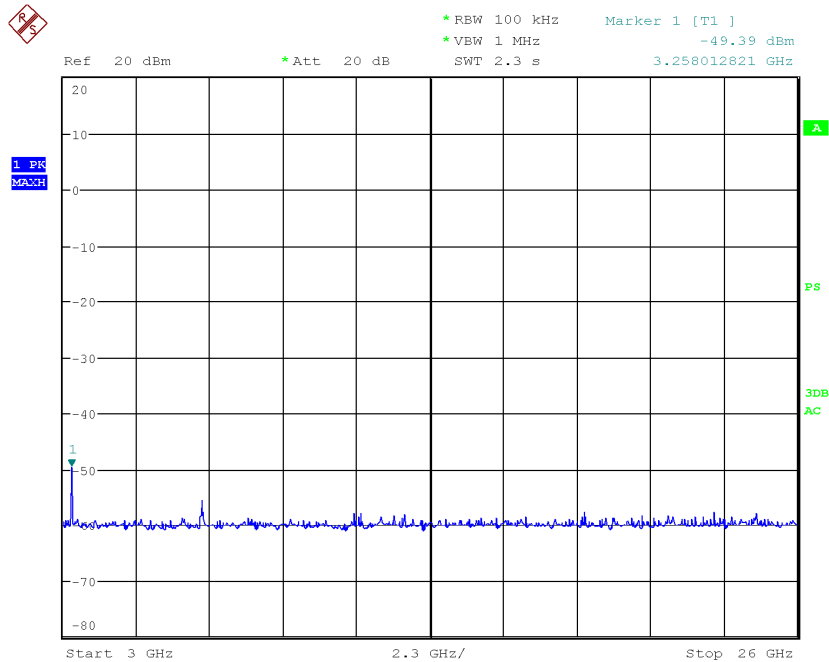


Date: 18.SEP.2012 14:18:45

Channel 9



Date: 18.SEP.2012 14:20:40



Date: 18.SEP.2012 14:21:26

FCC Part 15.247(d) RF Conducted Spurious Emissions Specification: $\geq 20\text{dBc}$

Result: All RF Conducted Spurious Emissions $> 40\text{dBc}$

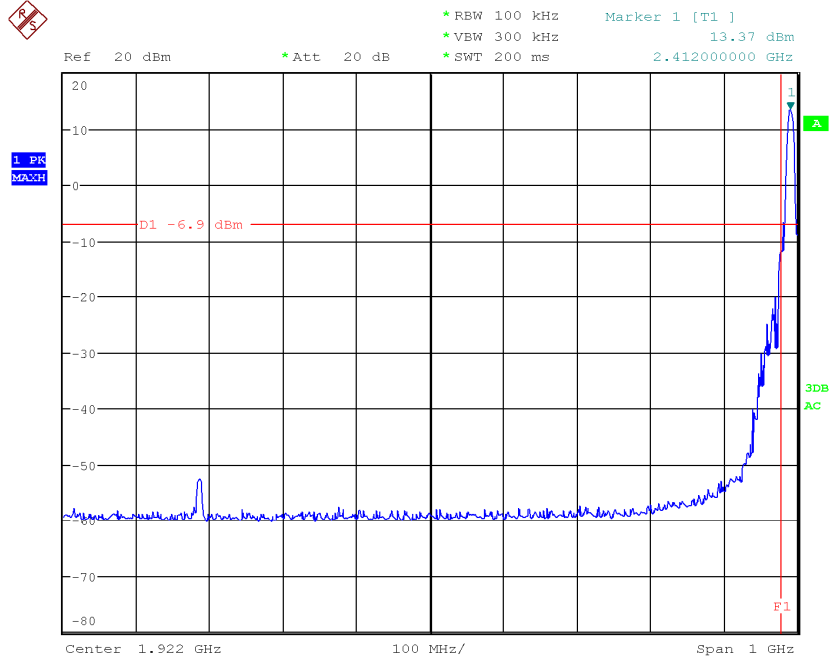
8.12 Test Data/Plots – Band Edge: 2400-2483.5 MHz - Antenna 1

Channels 2400 to 2483.5 MHz - FCC Part 15.247(d)

(RF Conducted Band Edge Spurious Emissions – Antenna Port 1)

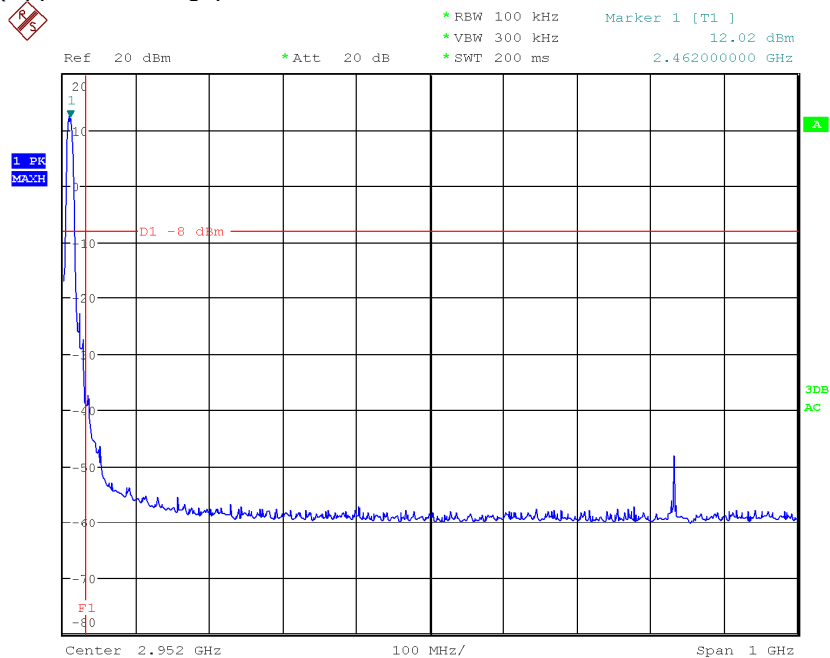
802.11b – CCK Modulation Mode

Channel 1 (Lower Band Edge)



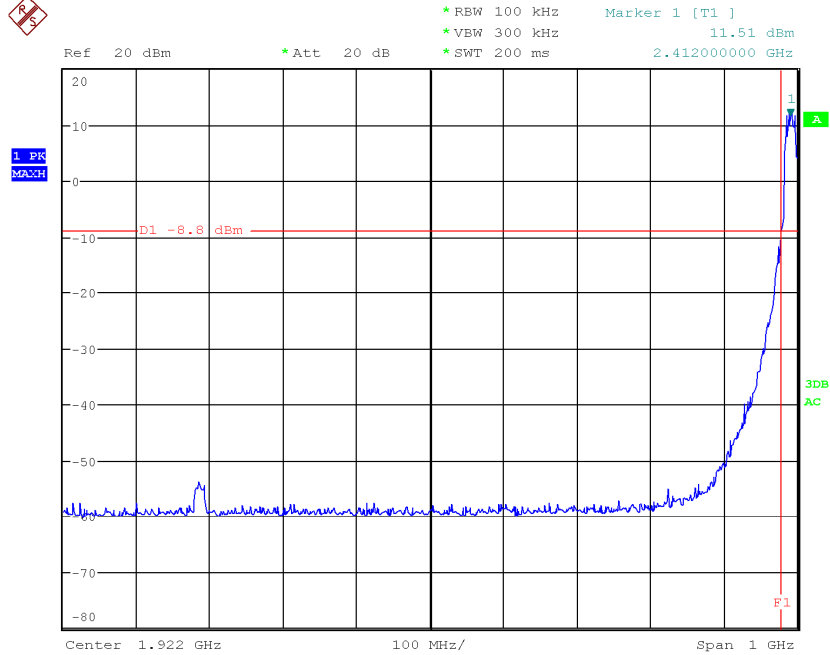
Date: 19.SEP.2012 11:14:03

Channel 11 (Upper Band Edge)



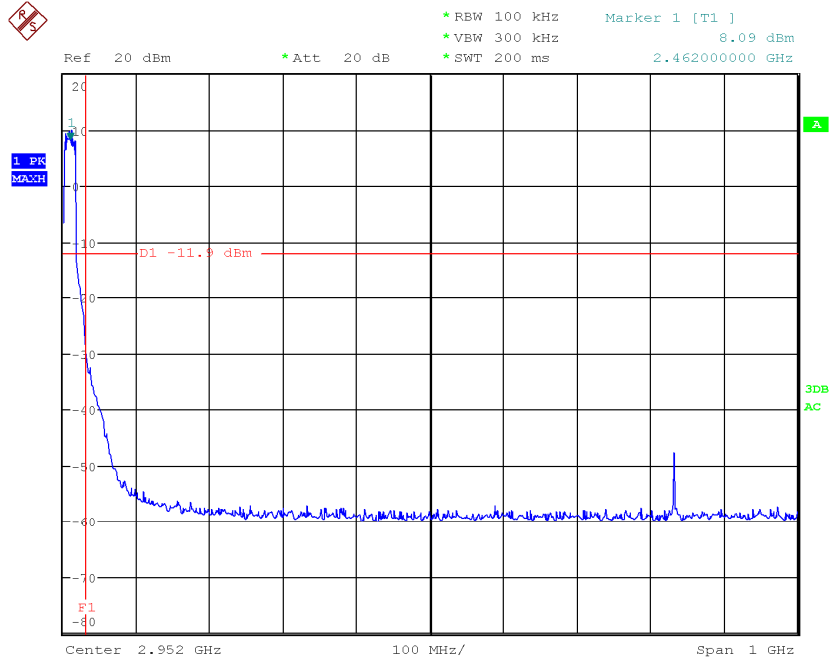
Date: 19.SEP.2012 11:16:17

802.11g – OFDM Modulation Mode Channel 1 (Lower Band Edge)



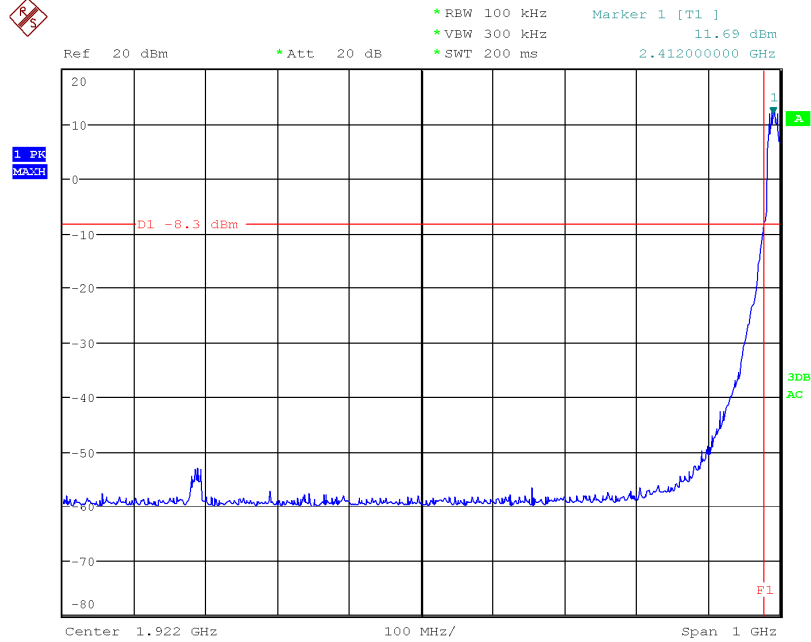
Date: 19.SEP.2012 11:09:54

Channel 11 (Upper Band Edge)



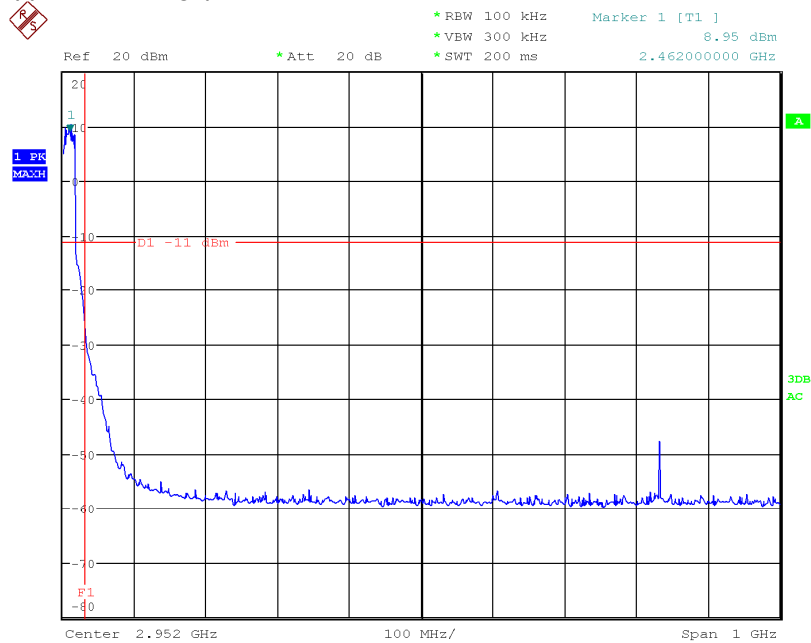
Date: 19.SEP.2012 11:11:45

802.11n HT20 MCS Modulation Mode Channel 1 (Lower Band Edge)

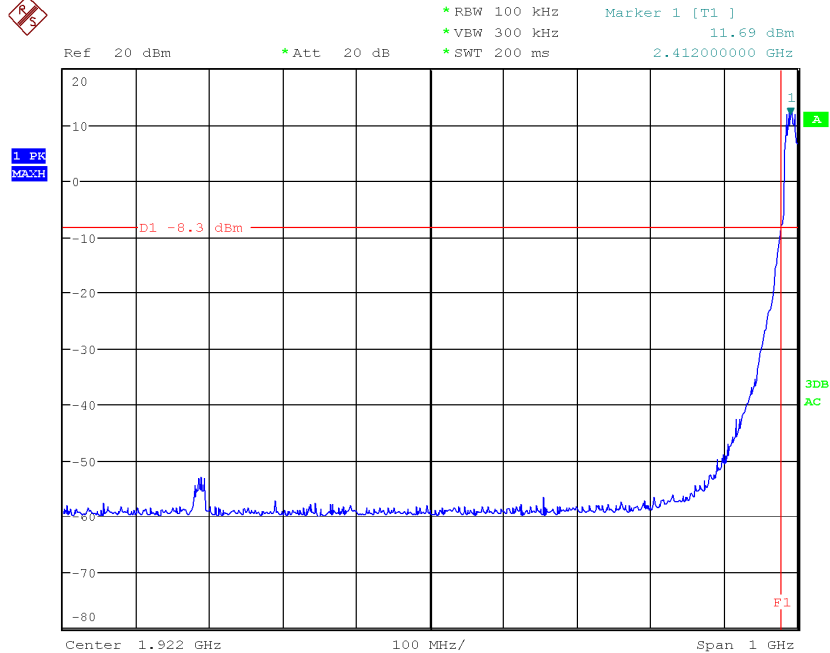


Date: 19.SEP.2012 11:00:58

Channel 11 (Upper Band Edge)

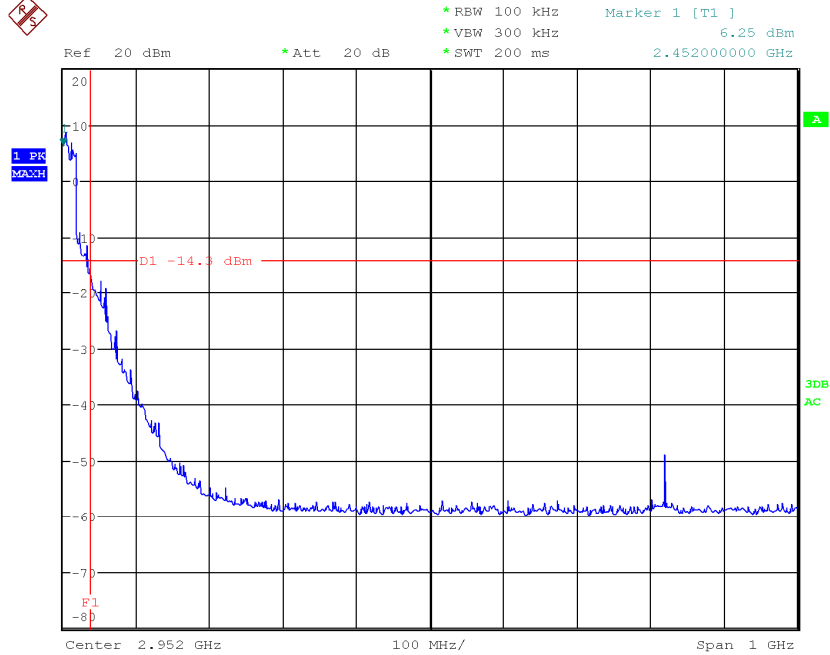


Date: 19.SEP.2012 11:04:15

802.11n HT40 MCS Modulation Mode
Channel 3 (Lower Band Edge)

Date: 19.SEP.2012 11:00:58

Channel 7 (Upper Band Edge)



Date: 19.SEP.2012 10:57:27

FCC Part 15.247(d) RF Conducted Spurious Band Edge Emissions Specification: $\geq 20\text{dBc}$

Intertek

Report Number: 100900227DEN-003

Issued: 10/11/2012

8.13 Test Data Summary: 5725-5850 MHz Band - Antenna 0

Out-of-Band Conducted Emissions 5725 – 5850 MHz – Antenna 0 FCC Part 15.247(d)

Channel	Frequency, MHz	Standard/ Data Rate	Scan Range	Pass ≥ 20dBc	Plot
149	5745	802.11a, 6Mbps	30 MHz – 26 GHz	yes	x
		802.11n HT20, MCS3	30 MHz – 26 GHz	yes	x
151	5755	802.11n HT40, MCS0	30 MHz – 26 GHz	yes	x
157	5785	802.11a, 9Mbps	30 MHz – 26 GHz	yes	x
		802.11n HT20, MCS1	30 MHz – 26 GHz	yes	x
159	5795	802.11n HT40, MCS0	30 MHz – 26 GHz	yes	x
165	5825	802.11a, 9Mbps	30 MHz – 26 GHz	yes	x
		802.11n HT20, MCS0	30 MHz – 26 GHz	yes	x

Note: All out-of-band emissions were at least 30dB below the in-band fundamental.

Out-of-Band Conducted Spurious Emissions at the Band Edge – Antenna 0

Channel	Frequency, MHz	Standard/ Data Rate	Scan Range	Pass ≥ 20dBc	Plot
149	5745	802.11a, 6Mbps	30 MHz – 26 GHz Lower Band Edge	yes	x
		802.11n HT20, MCS3	30 MHz – 26 GHz Lower Band Edge	yes	x
151	5755	802.11n HT40, MCS0	30 MHz – 26 GHz Lower Band Edge	yes	x
159	5795	802.11n HT40, MCS0	30 MHz – 26 GHz Upper Band Edge	yes	x
165	5825	802.11a, 9Mbps	30 MHz – 26 GHz Upper Band Edge	yes	x
		802.11n HT20, MCS0	30 MHz – 26 GHz Upper Band Edge	yes	x

Note: All band edge emissions were at least 20dB below the in-band fundamental.

Note: The above table represents the worst-case band edge measurements of all bands and modulation/data modes.

8.14 Test Data Summary: 5725-5850 MHz Band - Antenna 1

Out-of-Band Conducted Emissions 5725 – 5850 MHz – Antenna 1 FCC Part 15.247(d)

Channel	Frequency, MHz	Standard/ Data Rate	Scan Range	Pass ≥ 20dBc	Plot
149	5745	802.11a, 6Mbps	30 MHz – 26 GHz	yes	x
		802.11n HT20, MCS3	30 MHz – 26 GHz	yes	x
151	5755	802.11n HT40, MCS0	30 MHz – 26 GHz	yes	x
157	5785	802.11a, 9Mbps	30 MHz – 26 GHz	yes	x
		802.11n HT20, MCS1	30 MHz – 26 GHz	yes	x
159	5795	802.11n HT40, MCS0	30 MHz – 26 GHz	yes	x
165	5825	802.11a, 9Mbps	30 MHz – 26 GHz	yes	x
		802.11n HT20, MCS0	30 MHz – 26 GHz	yes	x

Note: All out-of-band emissions were at least 30dB below the in-band fundamental.

Out-of-Band Conducted Spurious Emissions at the Band Edge – Antenna 1

Channel	Frequency, MHz	Standard/ Data Rate	Scan Range	Pass ≥ 20dBc	Plot
149	5745	802.11a, 6Mbps	30 MHz – 26 GHz Lower Band Edge	yes	x
		802.11n HT20, MCS3	30 MHz – 26 GHz Lower Band Edge	yes	x
151	5755	802.11n HT40, MCS0	30 MHz – 26 GHz Lower Band Edge	yes	x
159	5795	802.11n HT40, MCS0	30 MHz – 26 GHz Upper Band Edge	yes	x
165	5825	802.11a, 9Mbps	30 MHz – 26 GHz Upper Band Edge	yes	x
		802.11n HT20, MCS0	30 MHz – 26 GHz Upper Band Edge	yes	x

Note: All band edge emissions were at least 20dB below the in-band fundamental.

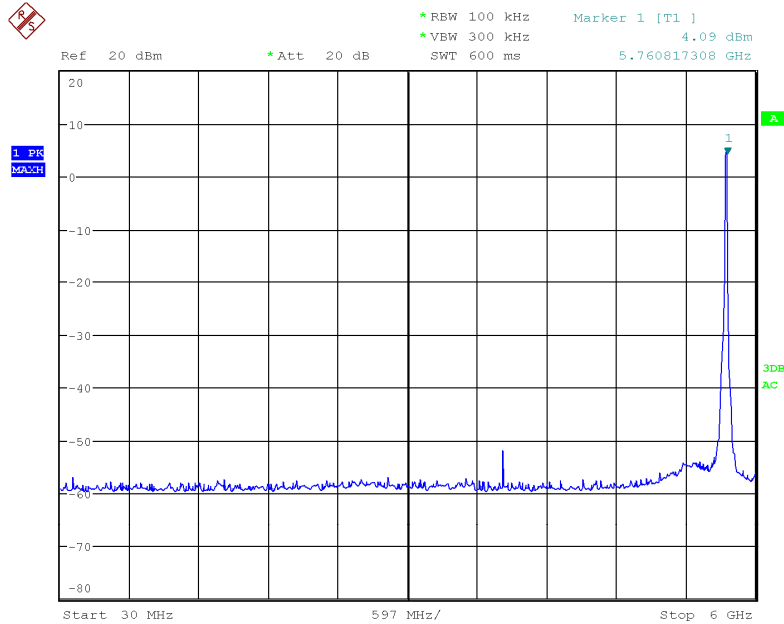
Note: The above table represents the worst-case band edge measurements of all bands and modulation/data modes.

8.15 Test Data/Plots: 5725-5850 MHz - Antenna 0

Channels 5725 to 5850 MHz - FCC Part 15.247(d) (RF Conducted Spurious Emissions – Antenna Port 0)

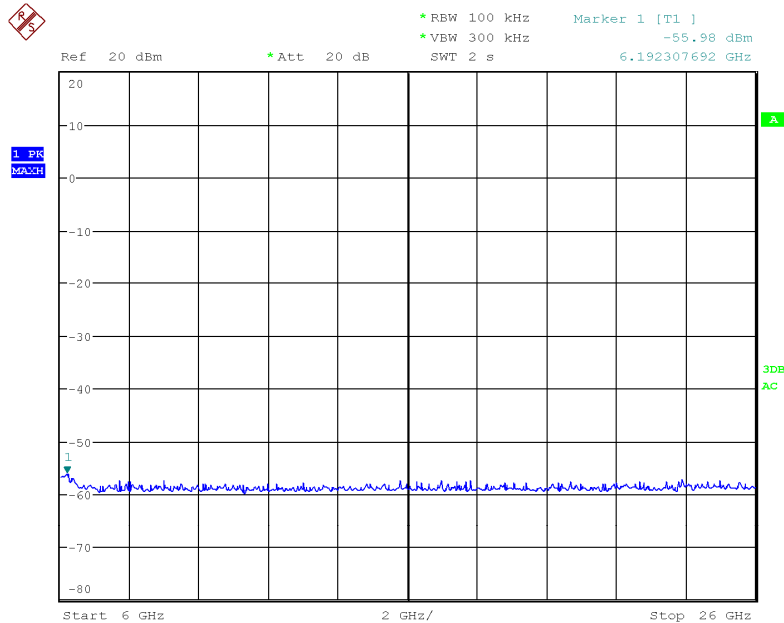
802.11a – OFDM Modulation Mode

Channel 149



CH0-

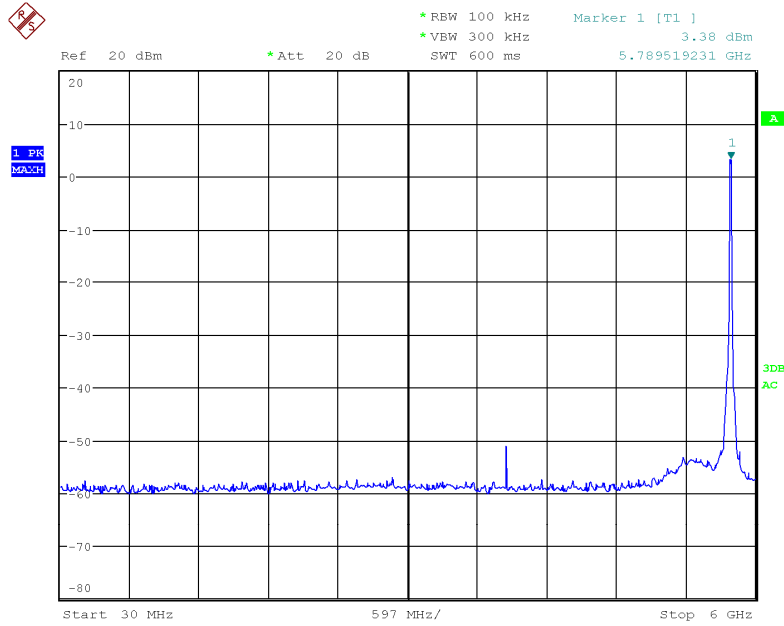
Date: 20.SEP.2012 19:48:09



CH0-

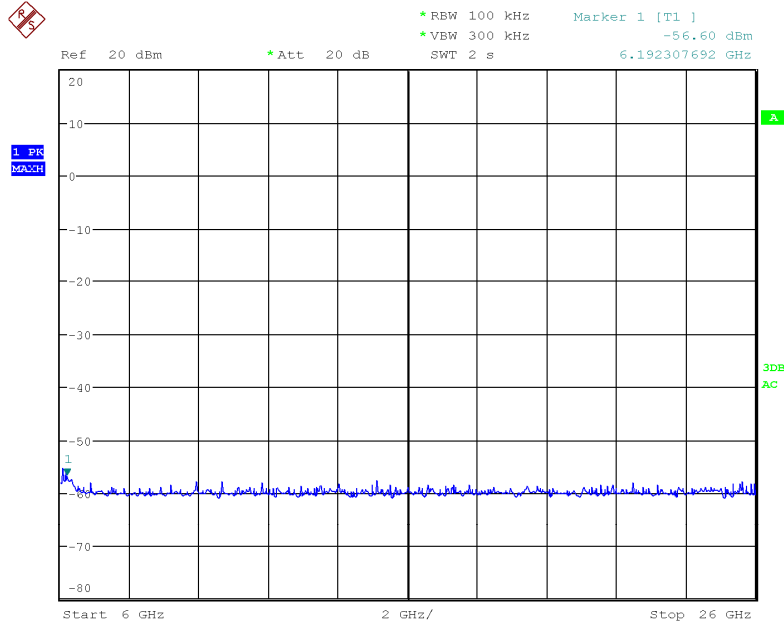
Date: 20.SEP.2012 19:53:13

Channel 157



CH0-

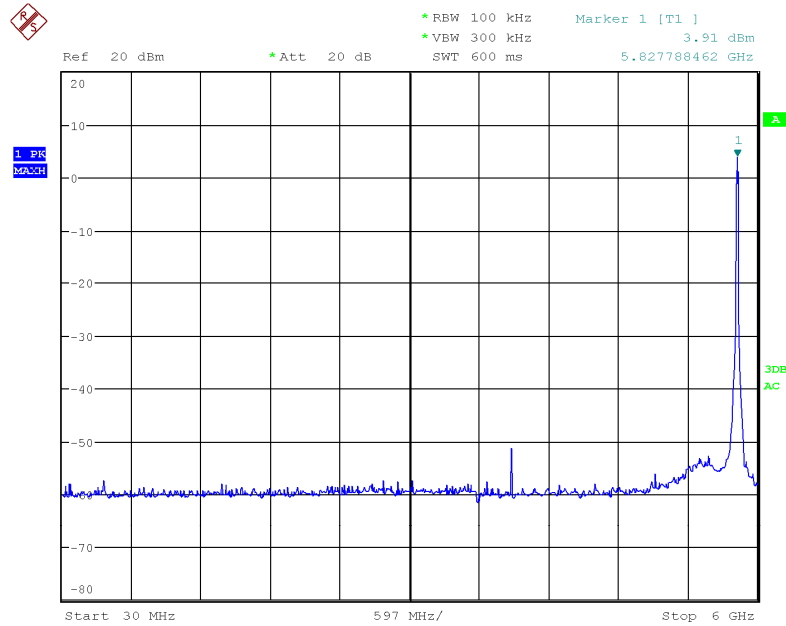
Date: 20.SEP.2012 20:02:14



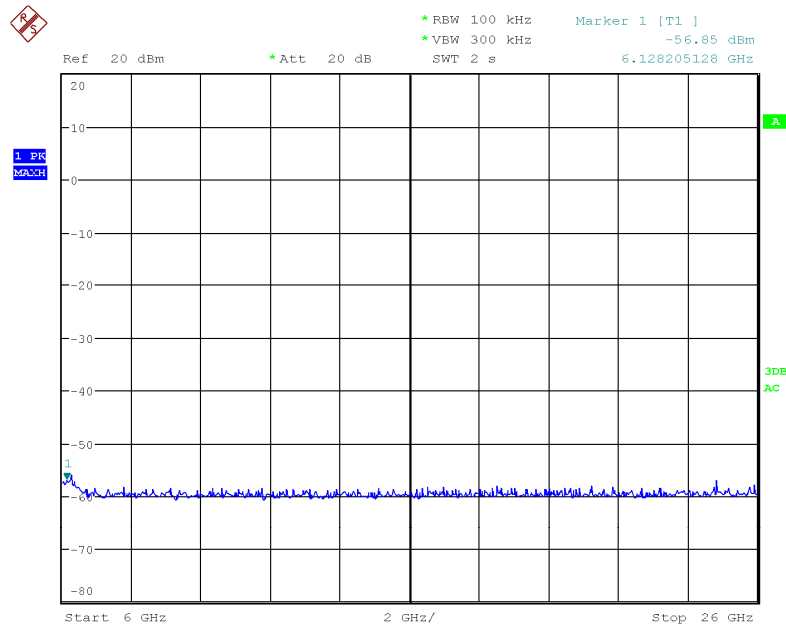
CH0-

Date: 20.SEP.2012 20:03:01

Channel 165

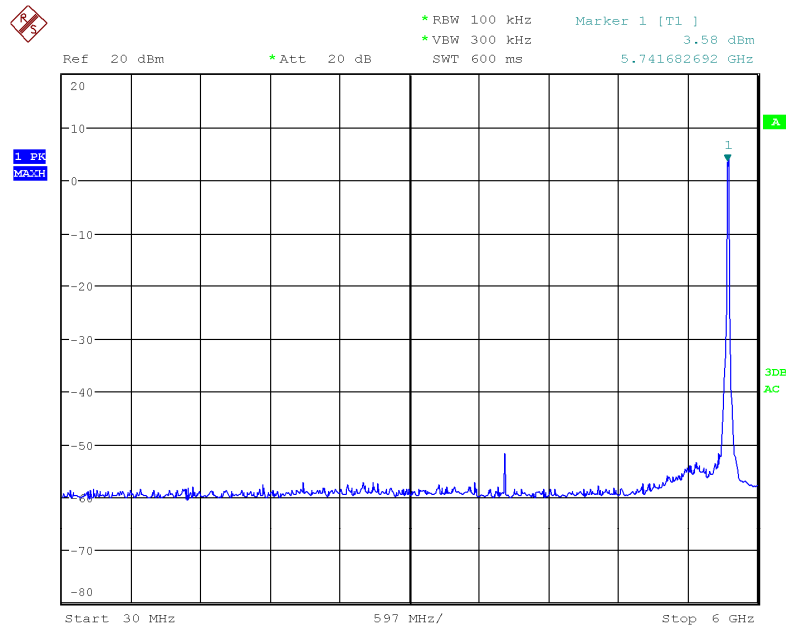


CH0-
 Date: 20.SEP.2012 20:06:49



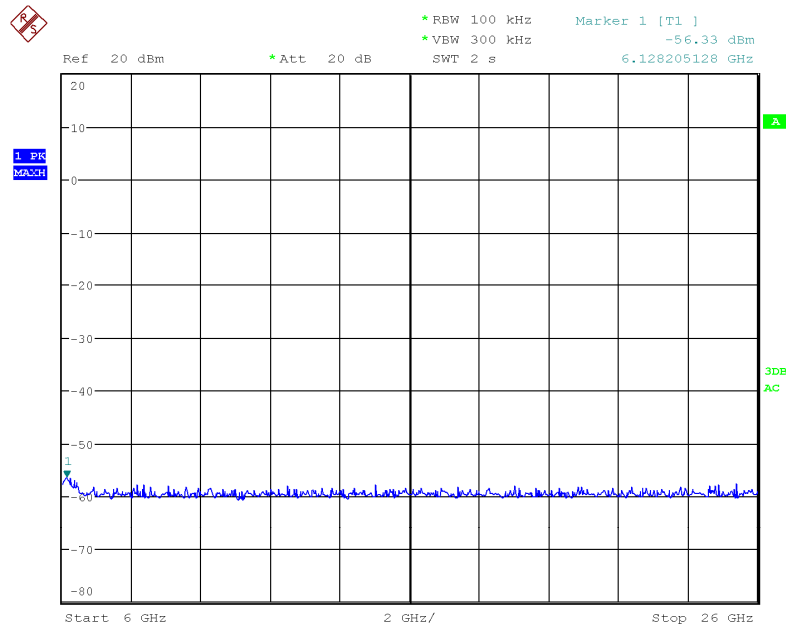
CH0-
 Date: 20.SEP.2012 20:07:57

802.11n HT20 – MCS Modulation Mode Channel 149



CH0-

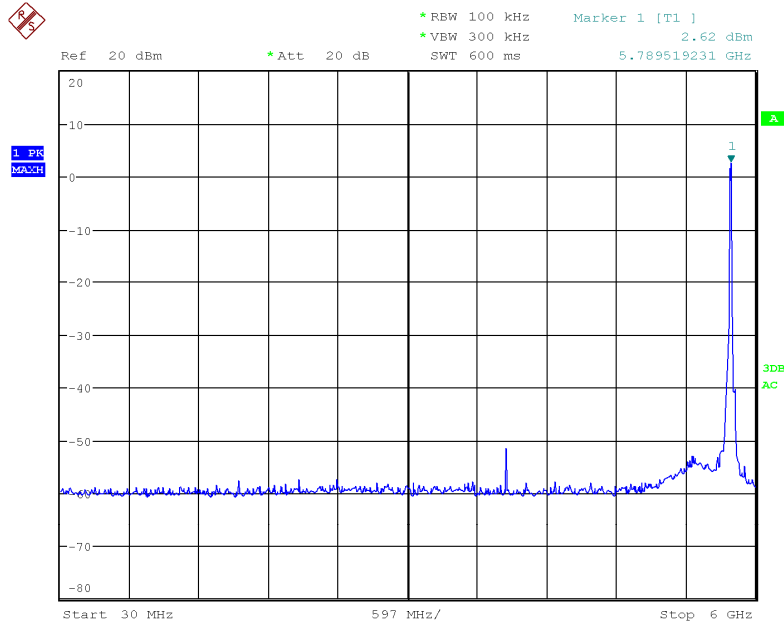
Date: 20.SEP.2012 19:55:35



CH0-

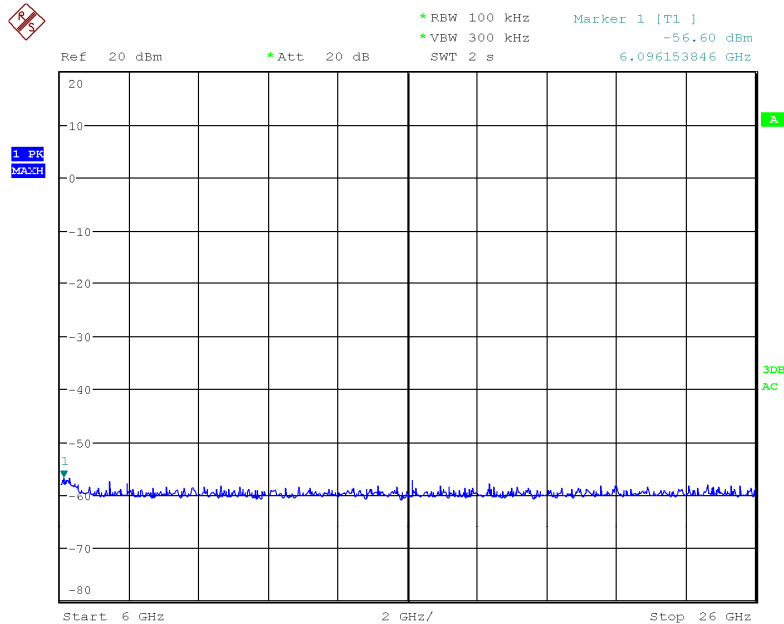
Date: 20.SEP.2012 19:56:51

Channel 157



CH0-

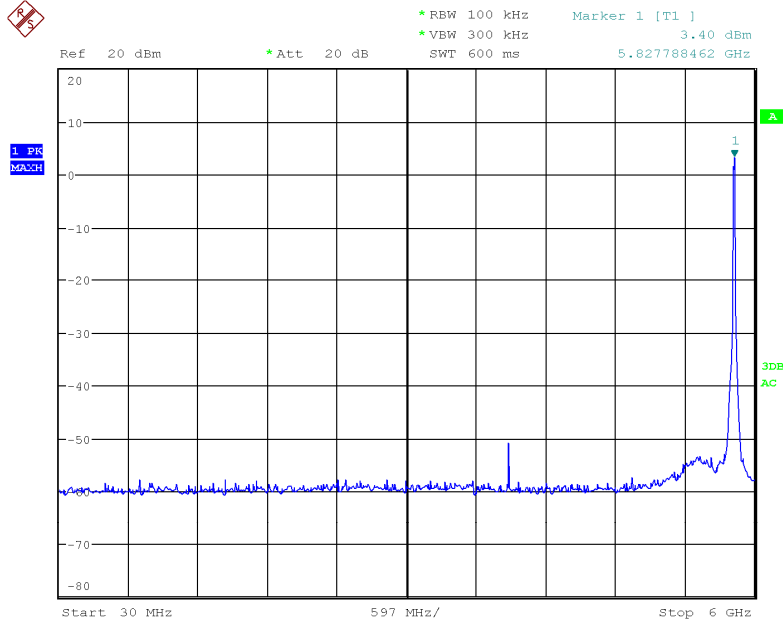
Date: 20.SEP.2012 20:04:14



CH0-

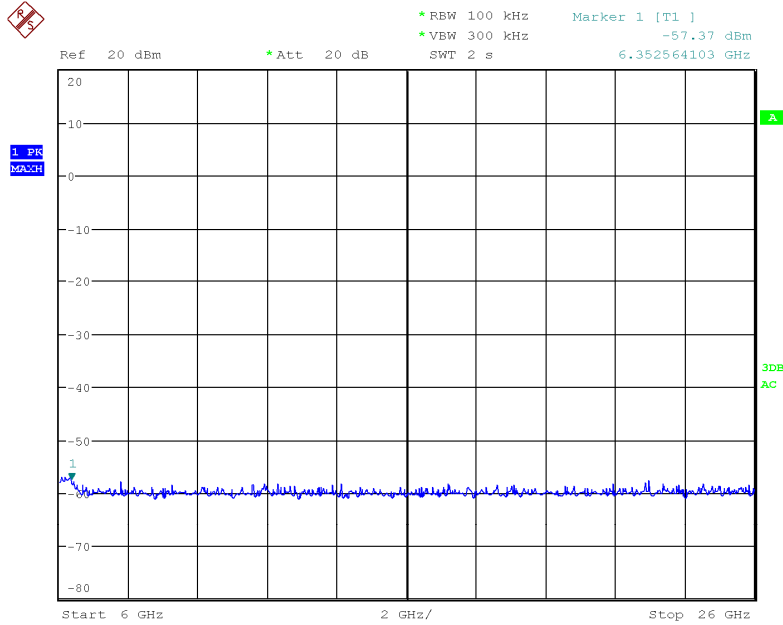
Date: 20.SEP.2012 20:05:02

Channel 165



CH0-

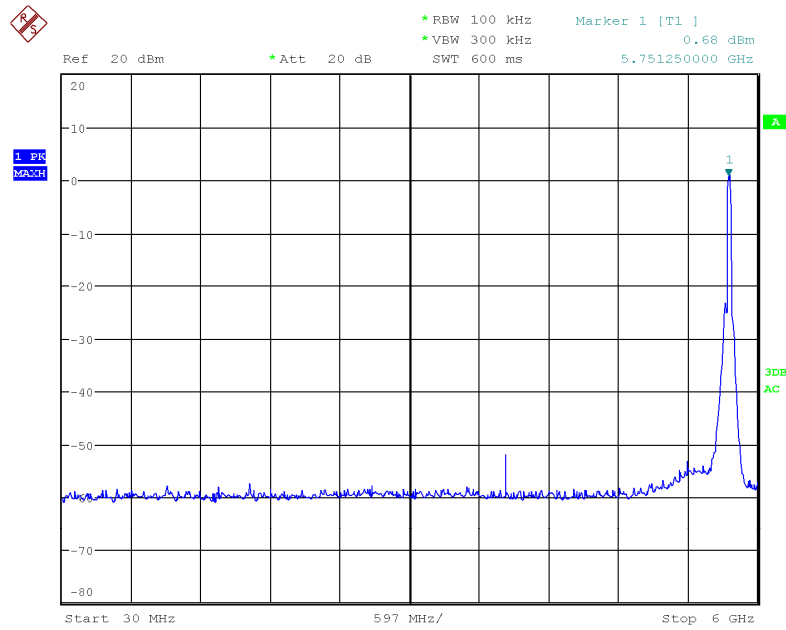
Date: 20.SEP.2012 20:09:08



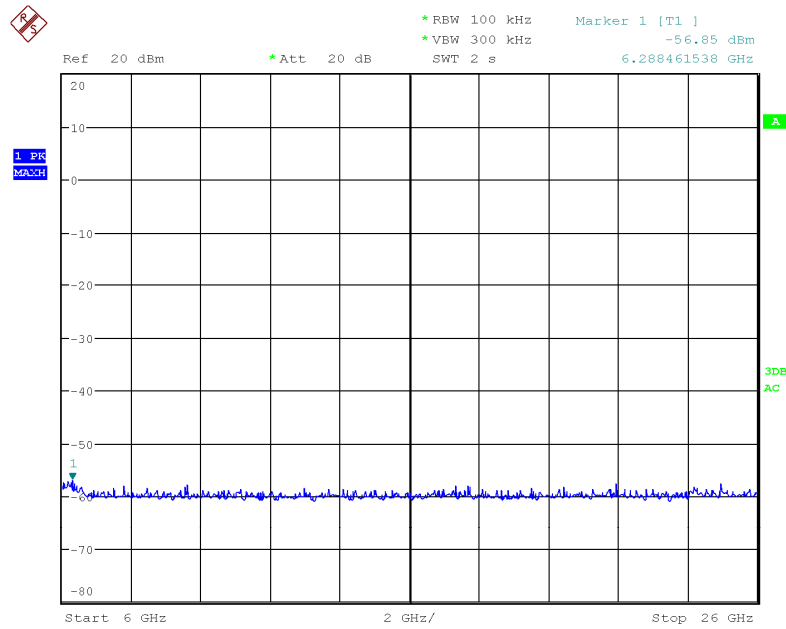
CH0-

Date: 20.SEP.2012 20:10:03

802.11n HT40 MCS Modulation Mode Channel 151

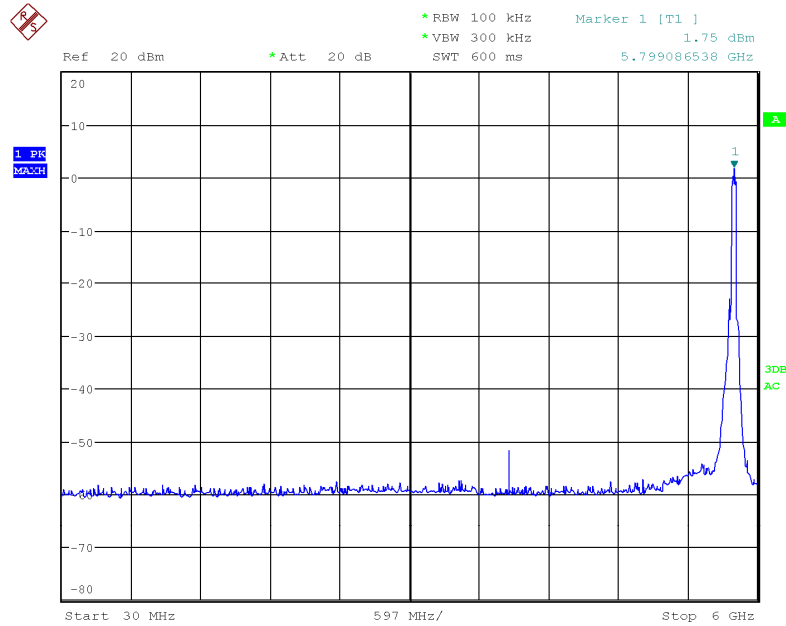


CH0-
Date: 20.SEP.2012 20:12:22

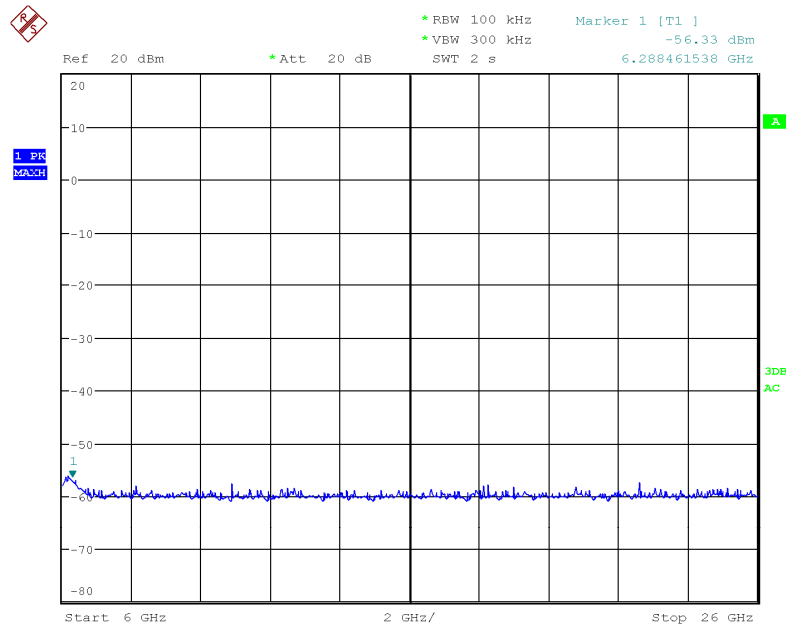


CH0-
Date: 20.SEP.2012 20:13:11

Channel 159



CH0-
 Date: 20.SEP.2012 20:14:38



CH0-
 Date: 20.SEP.2012 20:15:20

FCC Part 15.247(d) RF Conducted Spurious Emissions Specification: $\geq 20\text{dBc}$

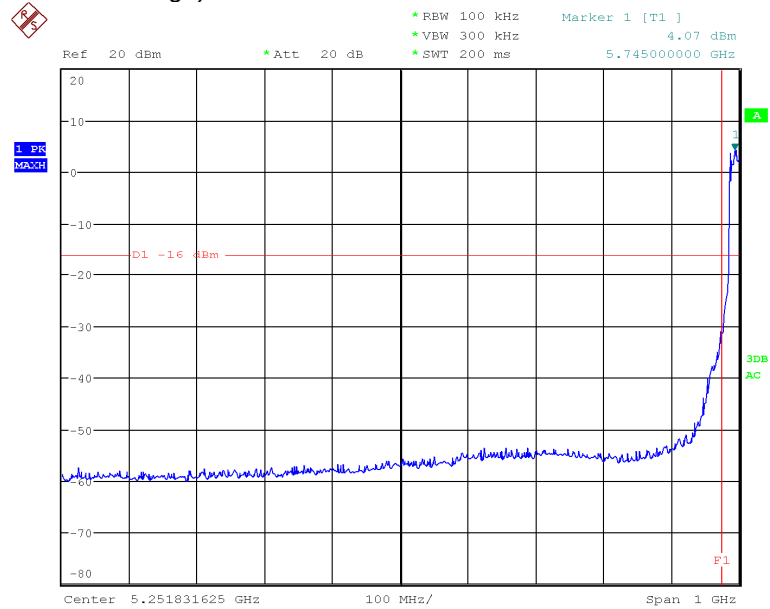
Result: All RF Conducted Spurious Emissions $> 40\text{dBc}$

8.16 Test Data/Plots – Band Edge: 5725-5850 MHz - Antenna 0**Channels 5725 to 5850 MHz - FCC Part 15.247(d)**

(RF Conducted Band Edge Spurious Emissions – Antenna Port 0)

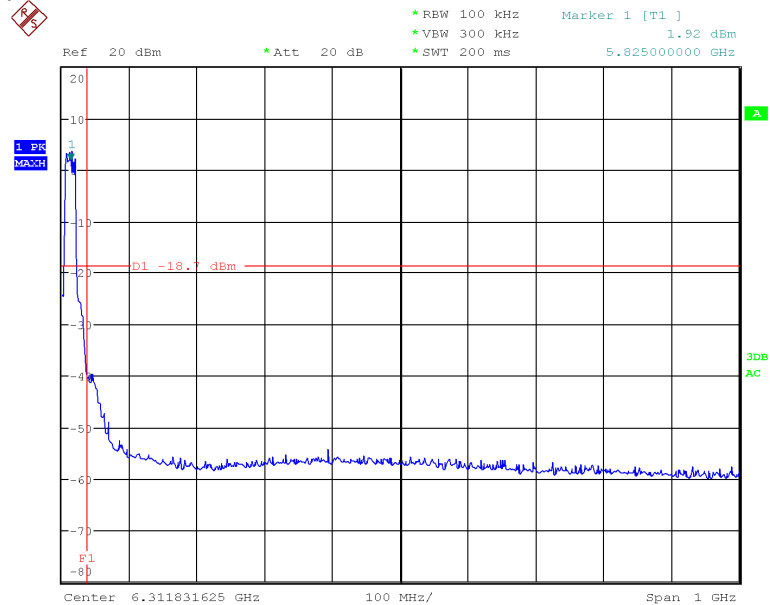
802.11a – OFDM Modulation Mode

Channel 149 (Lower Band Edge)



CH0-

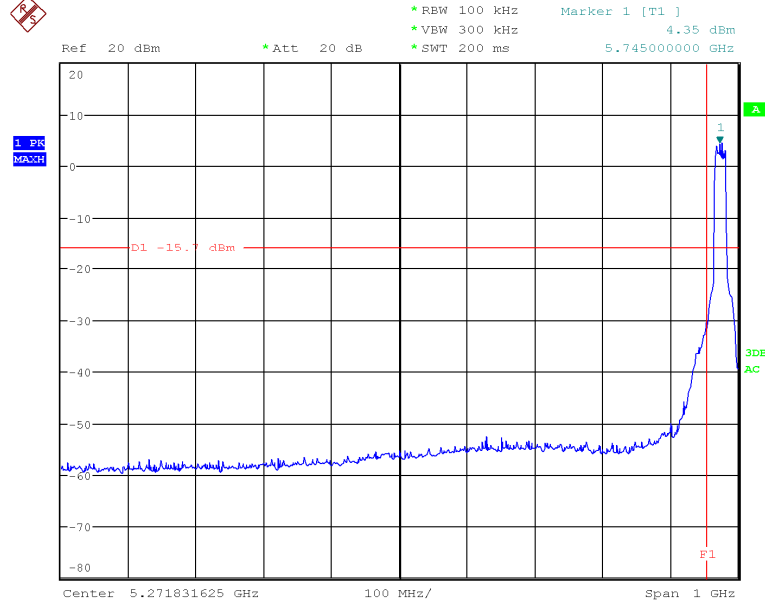
Date: 20.SEP.2012 20:29:46

Channel 165 (Upper Band Edge)

CH0-

Date: 20.SEP.2012 20:34:05

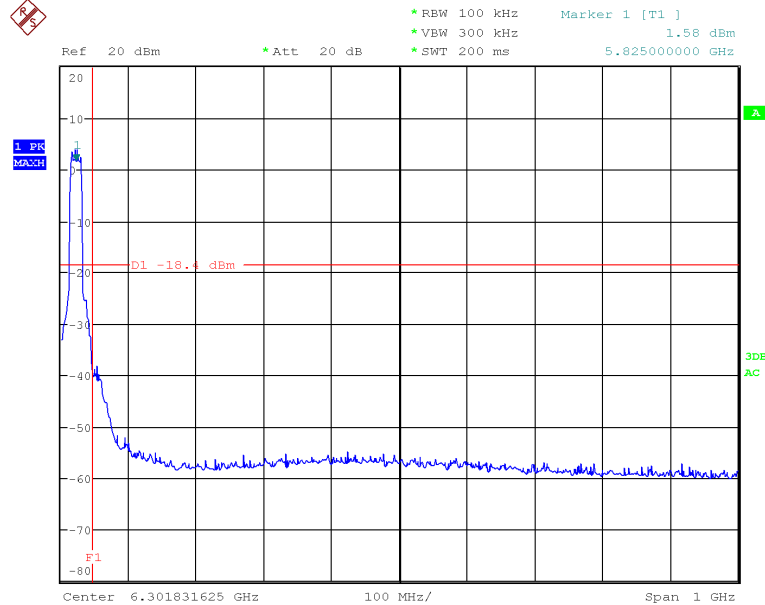
802.11n HT20 – MCS Modulation Mode
Channel 149 (Lower Band Edge)



CH0-

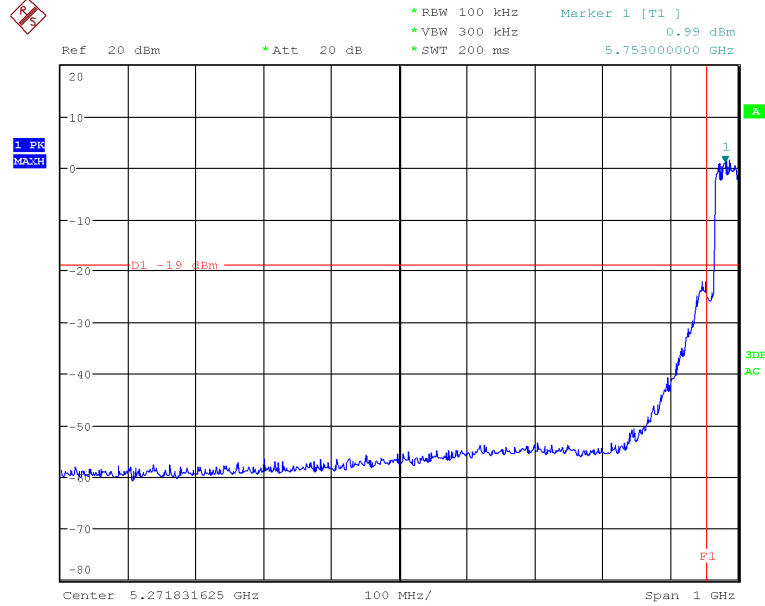
Date: 20.SEP.2012 20:43:18

Channel 165 (Upper Band Edge)



CH0-

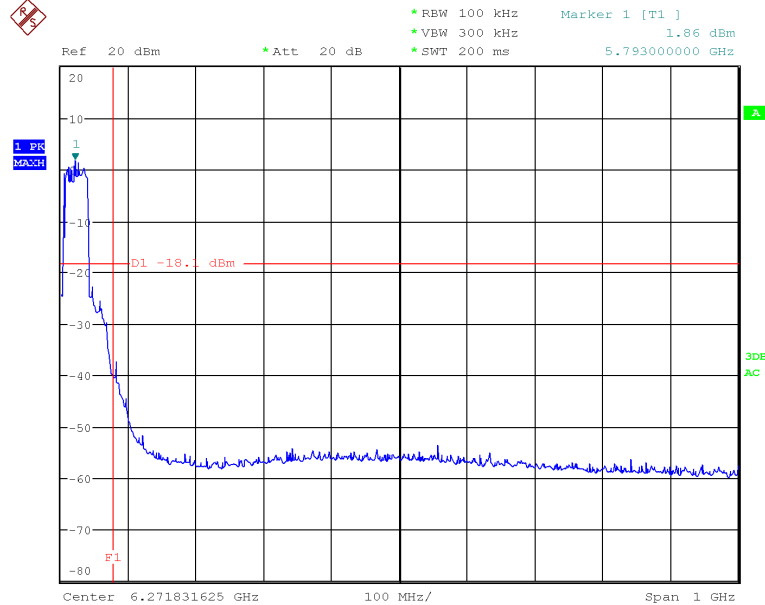
Date: 20.SEP.2012 20:46:13

802.11n HT40 MCS Modulation Mode
Channel 151 (Lower Band Edge)

CH0-

Date: 20.SEP.2012 20:50:50

Channel 159 (Upper Band Edge)



CH0-

Date: 20.SEP.2012 20:54:04

FCC Part 15.247(d) RF Conducted Spurious Band Edge Emissions Specification: $\geq 20\text{dBc}$

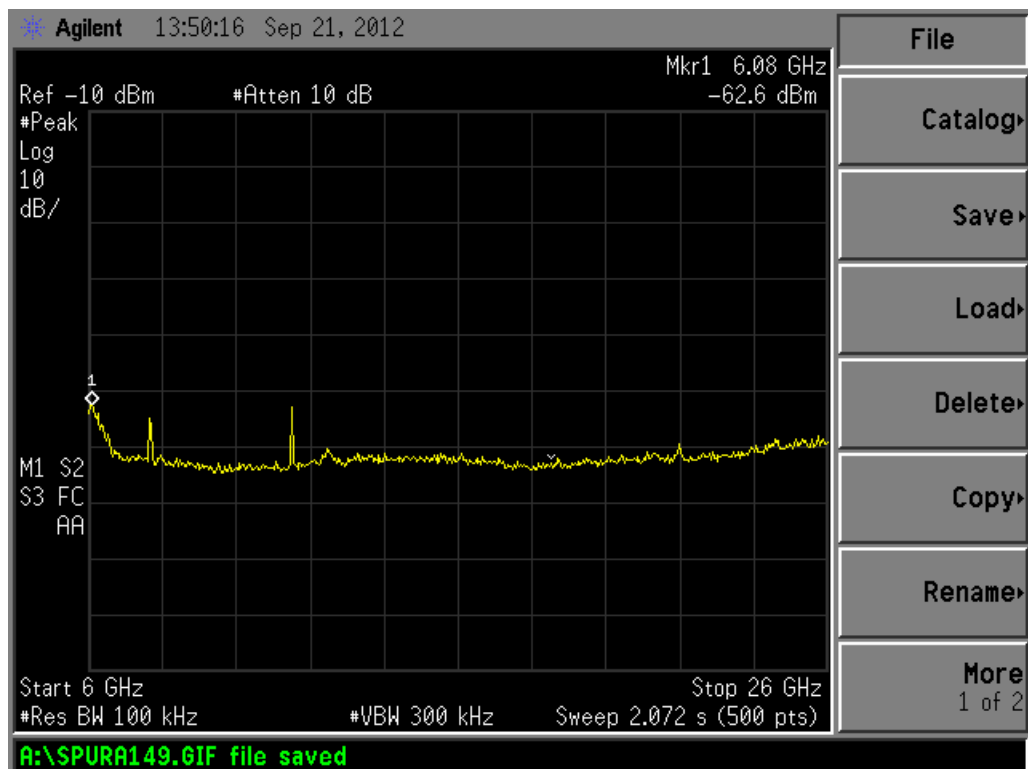
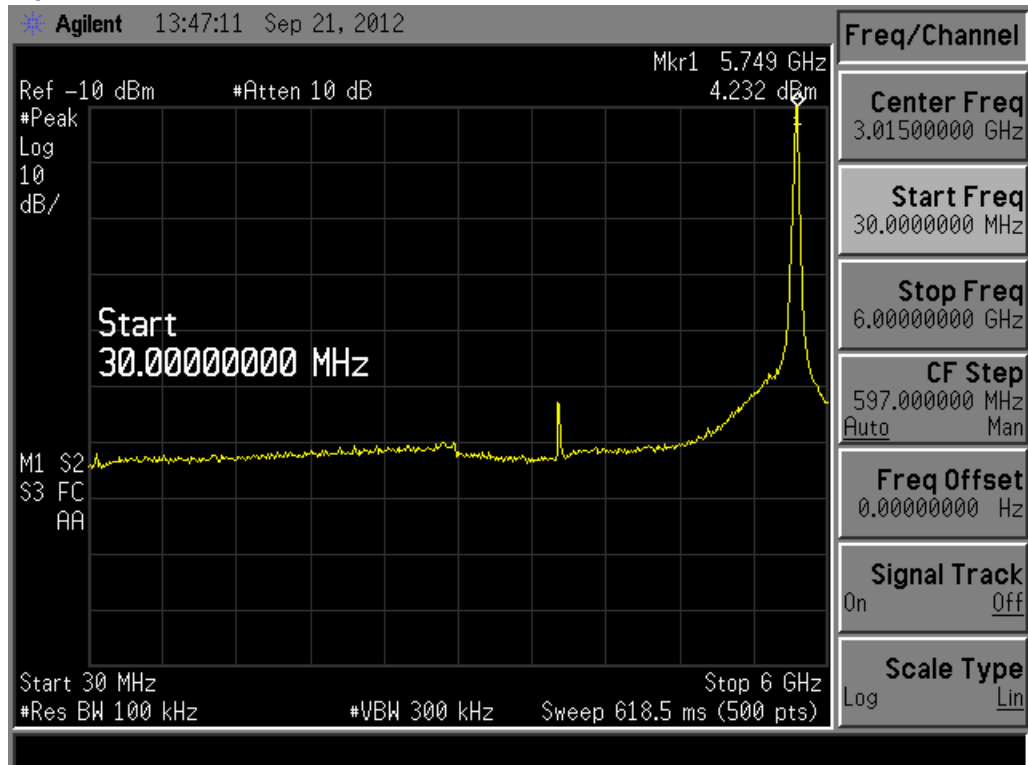
8.17 Test Data/Plots: 5725-5850 MHz - Antenna 1

Channels 5725 to 5850 MHz - FCC Part 15.247(d)

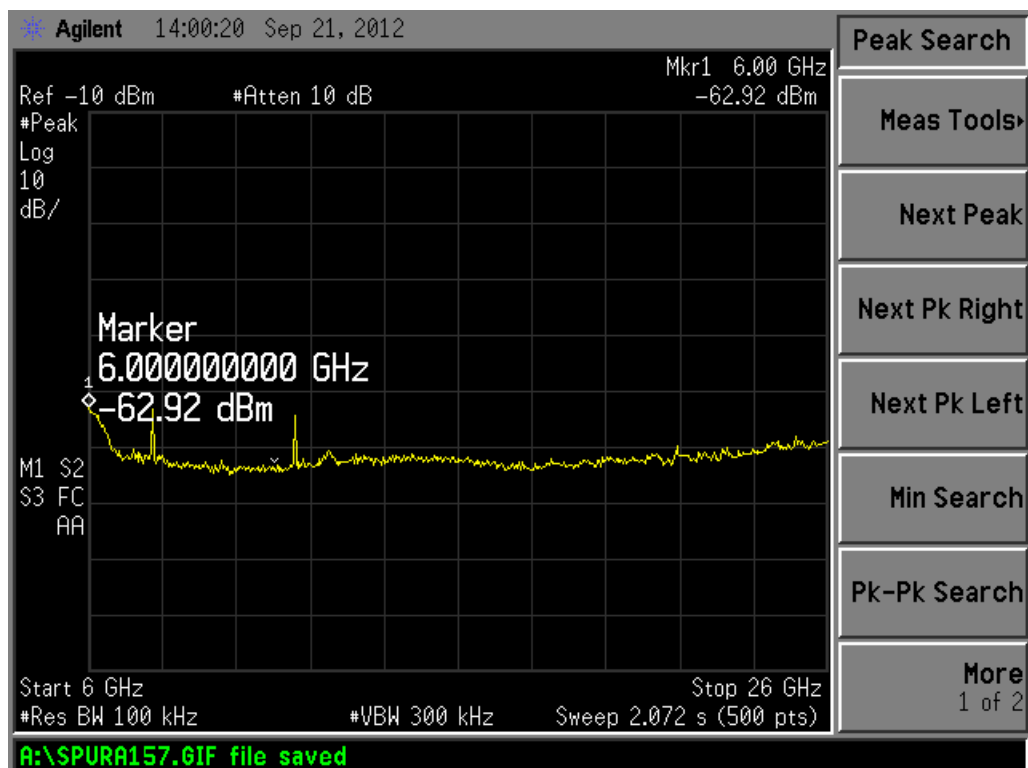
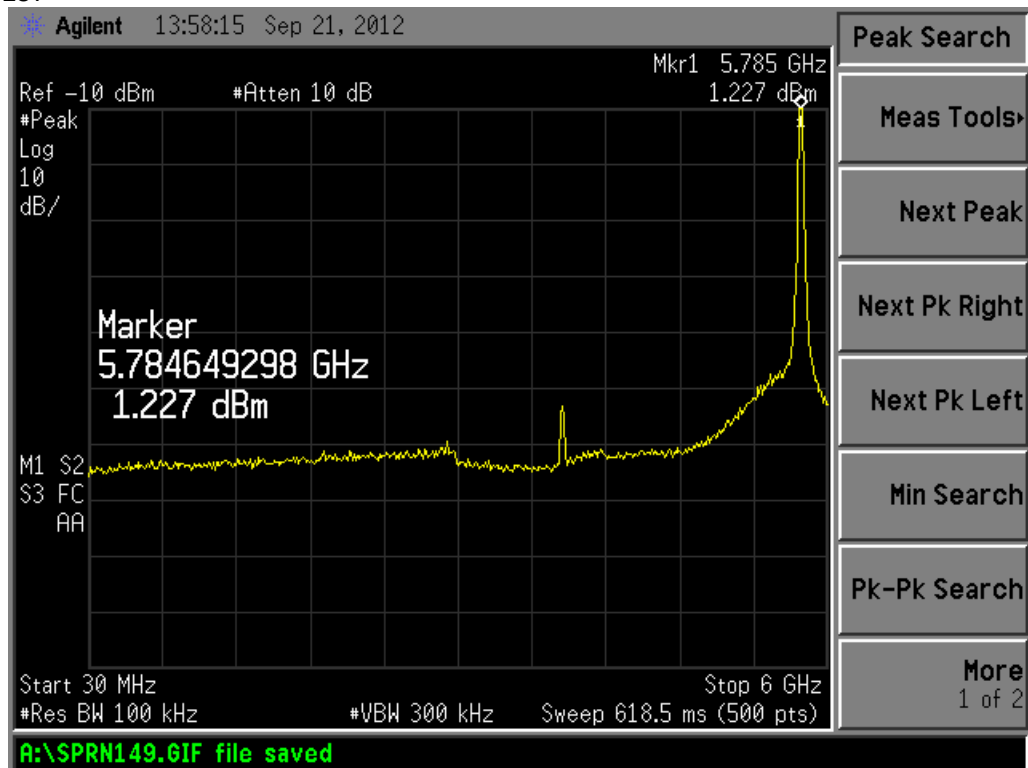
(RF Conducted Spurious Emissions – Antenna Port 1)

802.11a – OFDM Modulation Mode

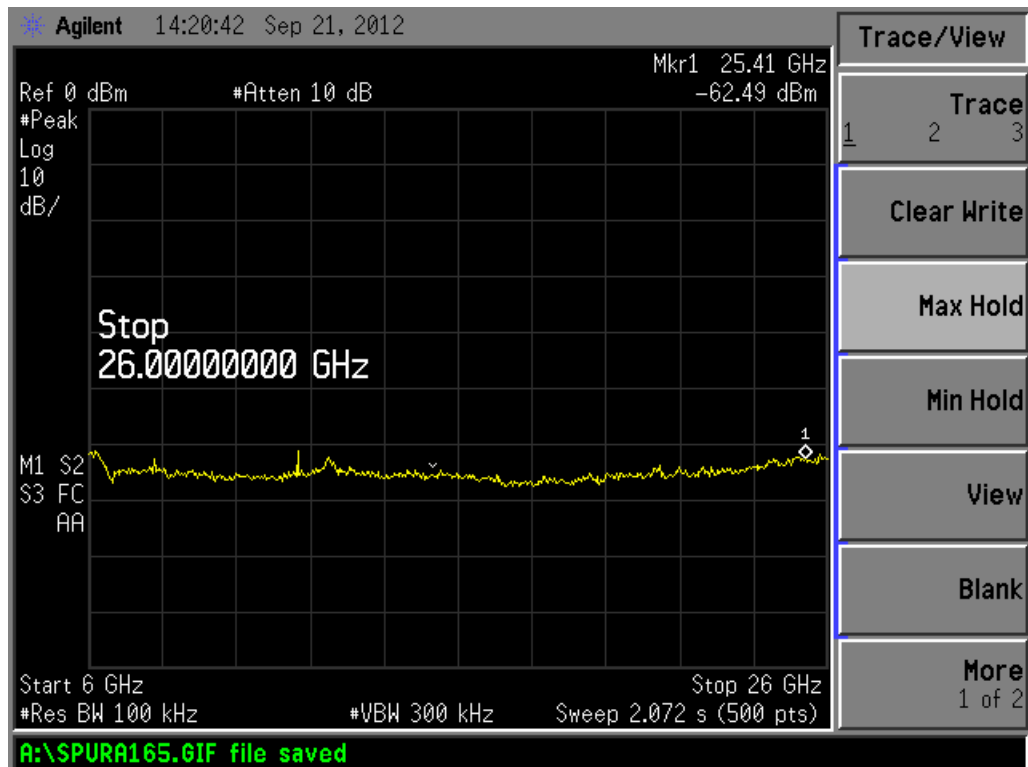
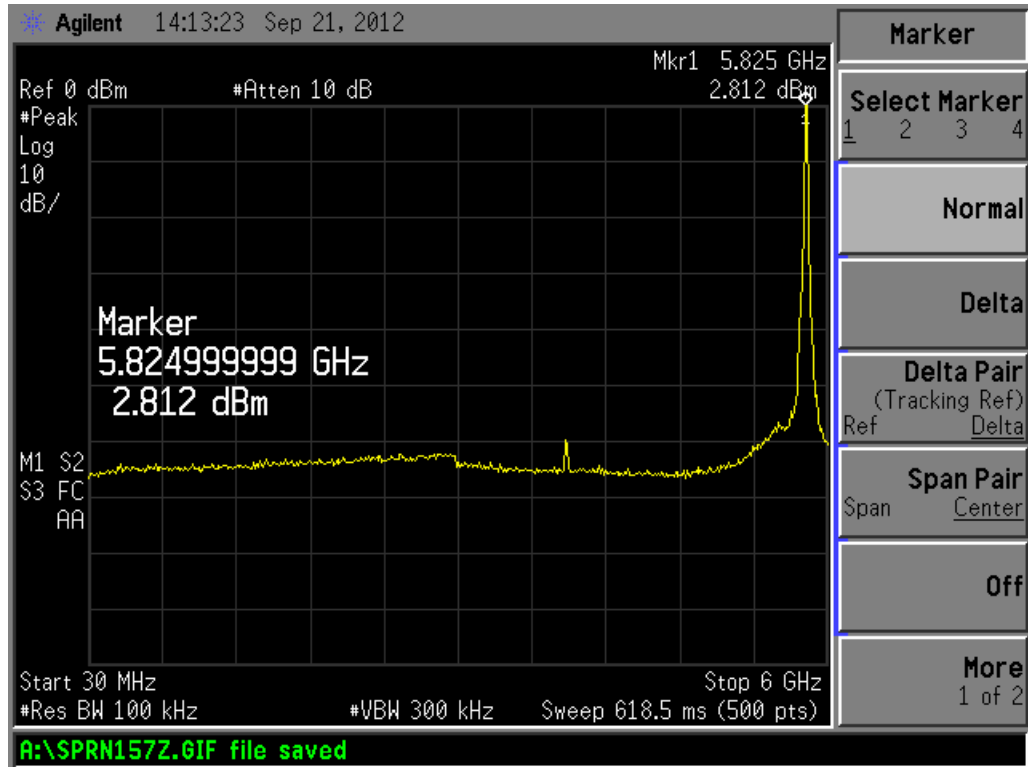
Channel 149



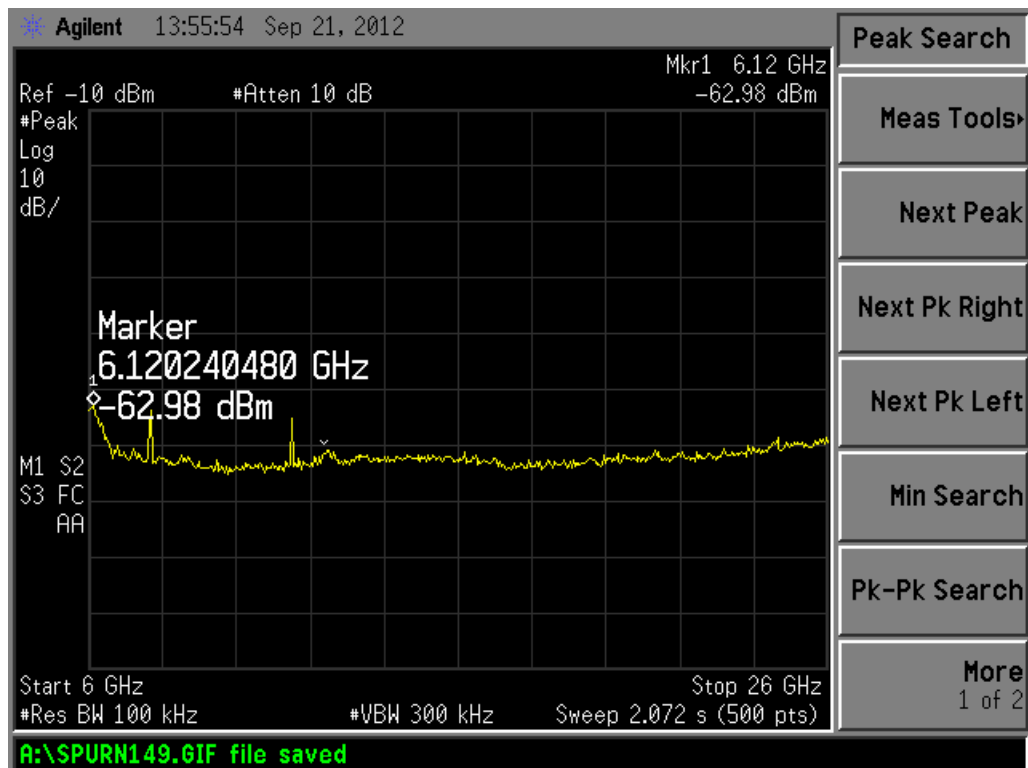
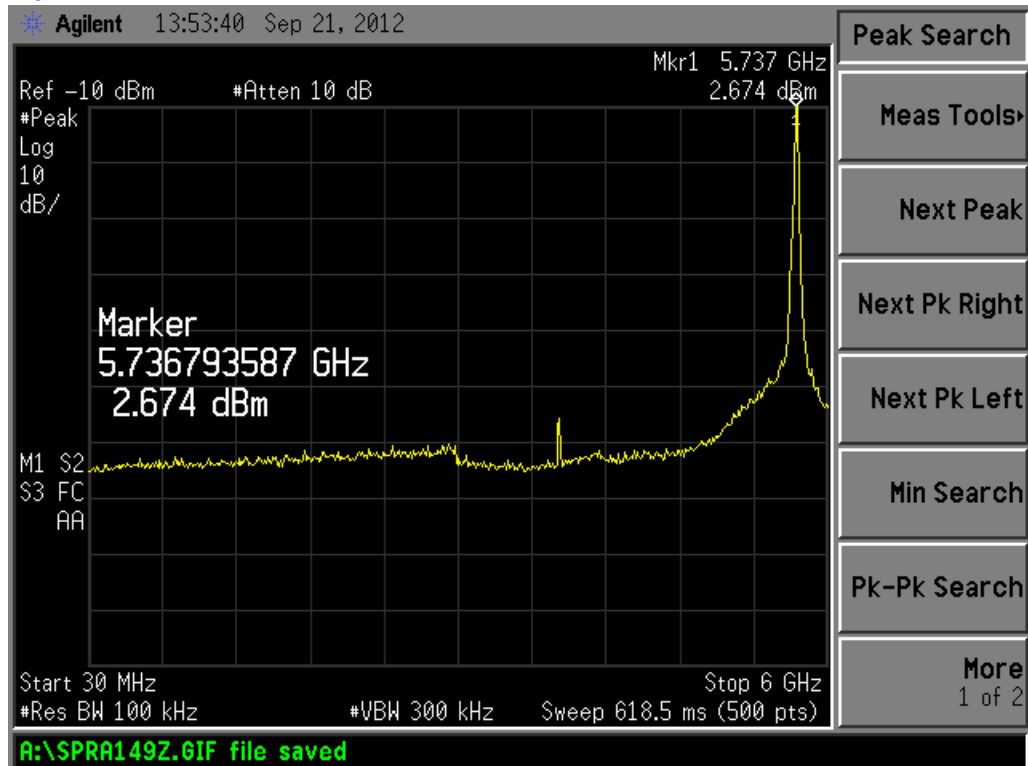
Channel 157



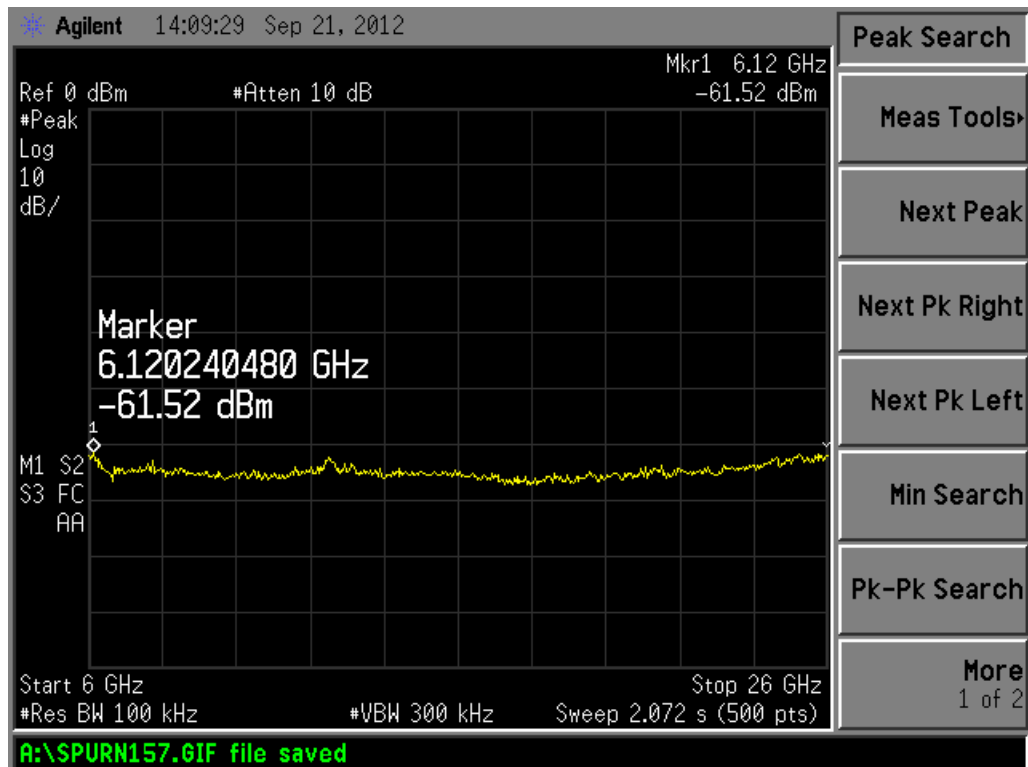
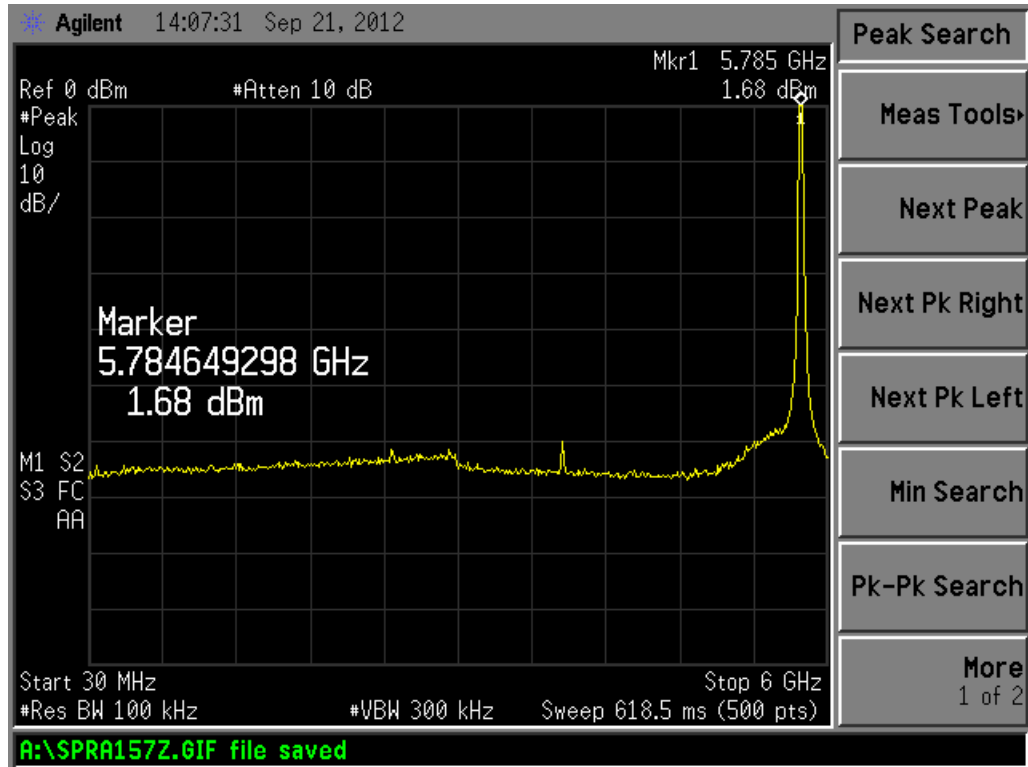
Channel 165



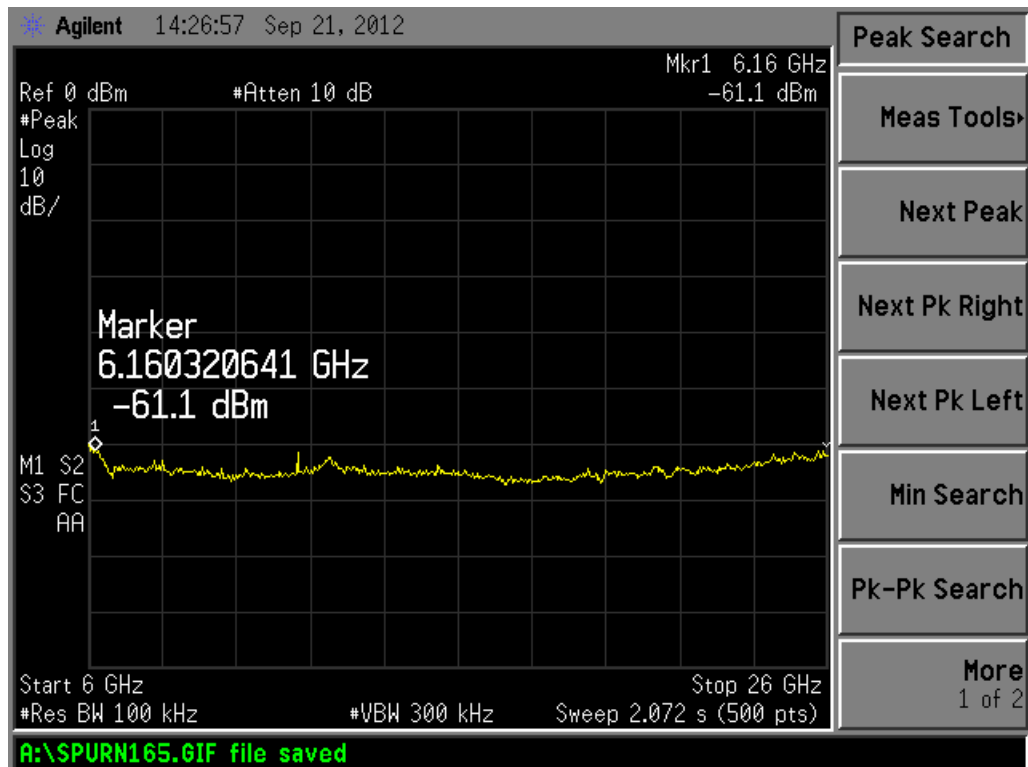
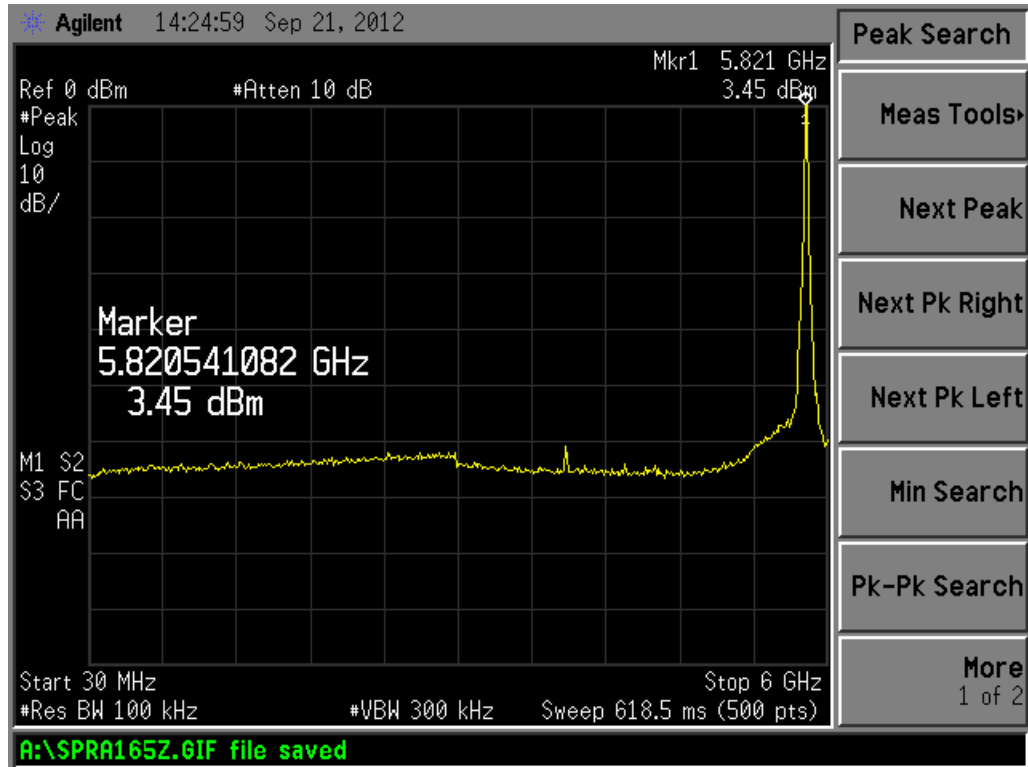
802.11n HT20 – MCS Modulation Mode
Channel 149



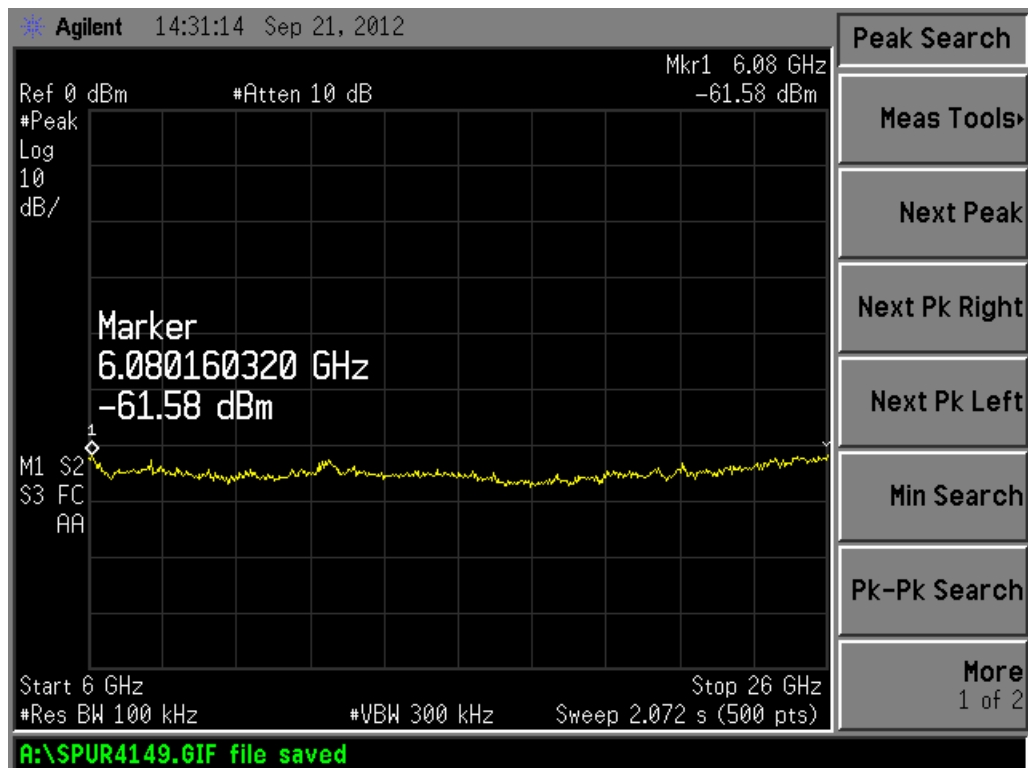
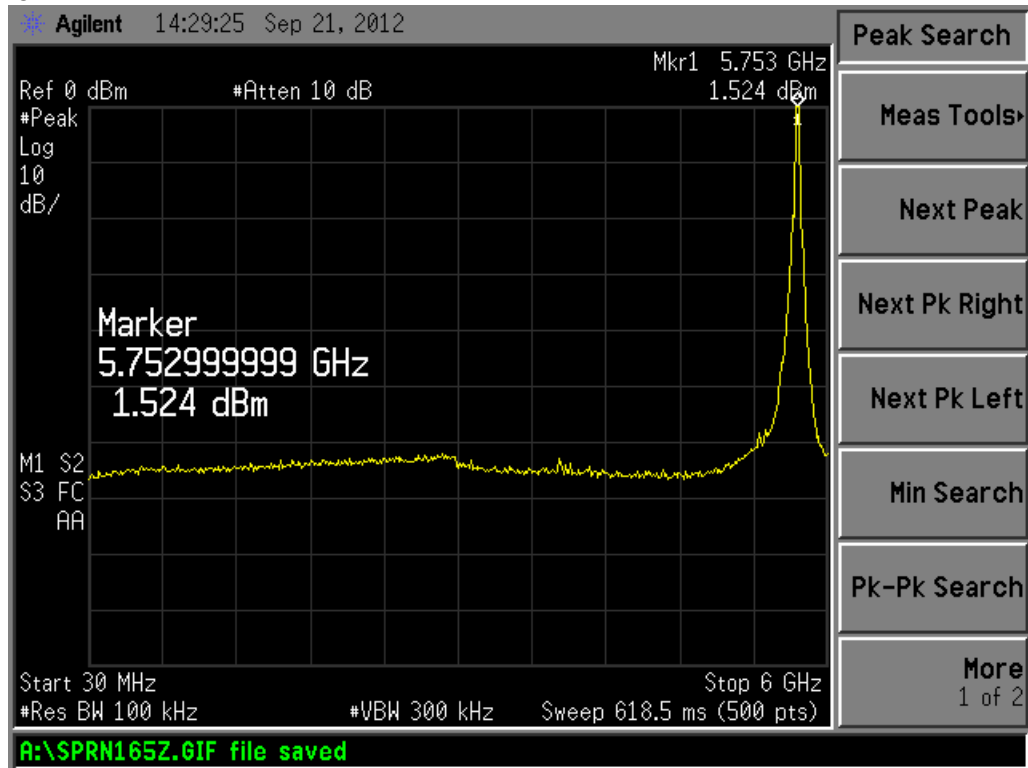
Channel 157



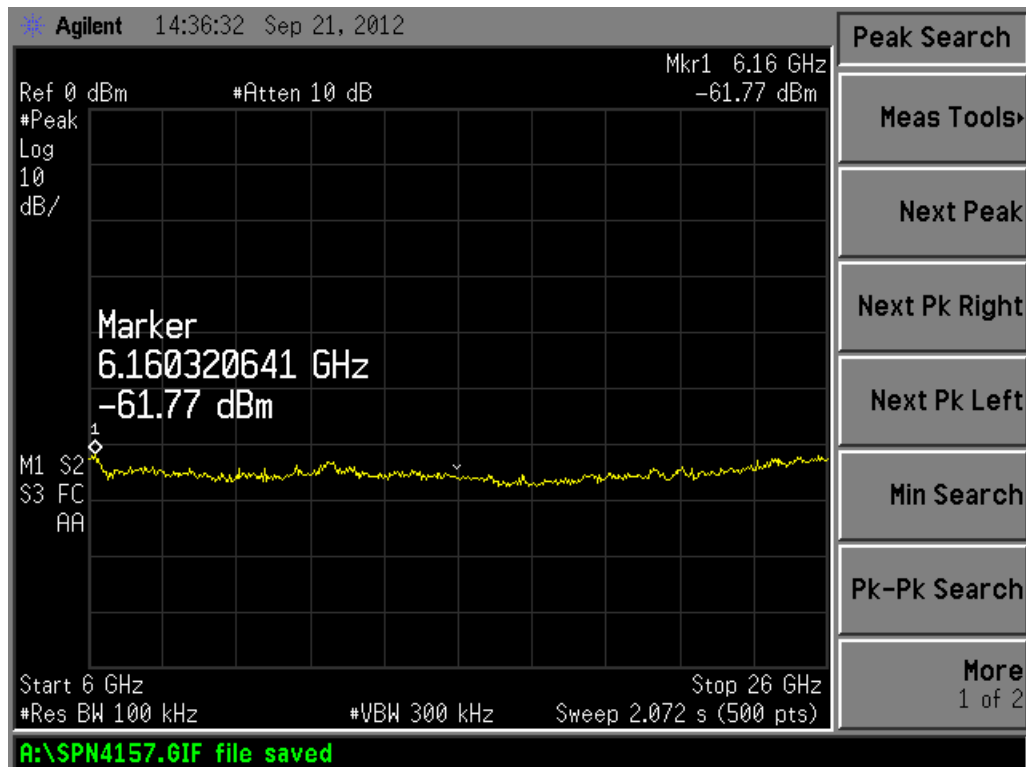
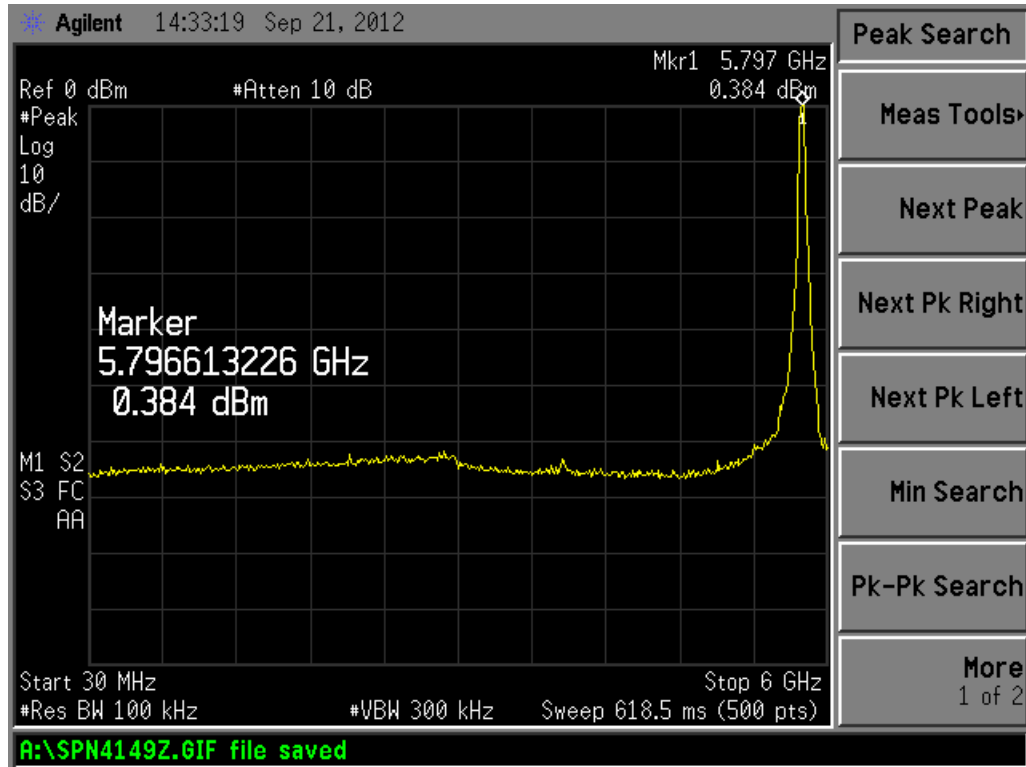
Channel 165



802.11n HT40 MCS Modulation Mode
Channel 151



Channel 159



FCC Part 15.247(d) RF Conducted Spurious Emissions Specification: $\geq 20\text{dBc}$

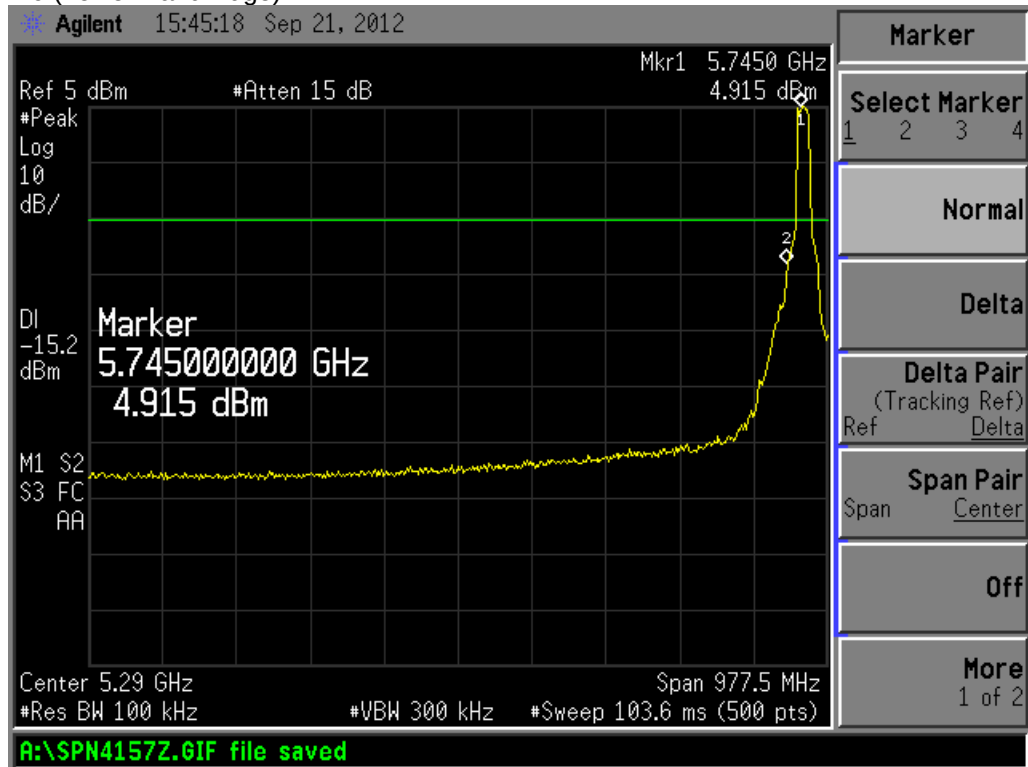
Result: All RF Conducted Spurious Emissions $> 40\text{dBc}$

8.18 Test Data/Plots – Band Edge: 5725-5850 MHz - Antenna 1**Channels 5725 to 5850 MHz - FCC Part 15.247(d)**

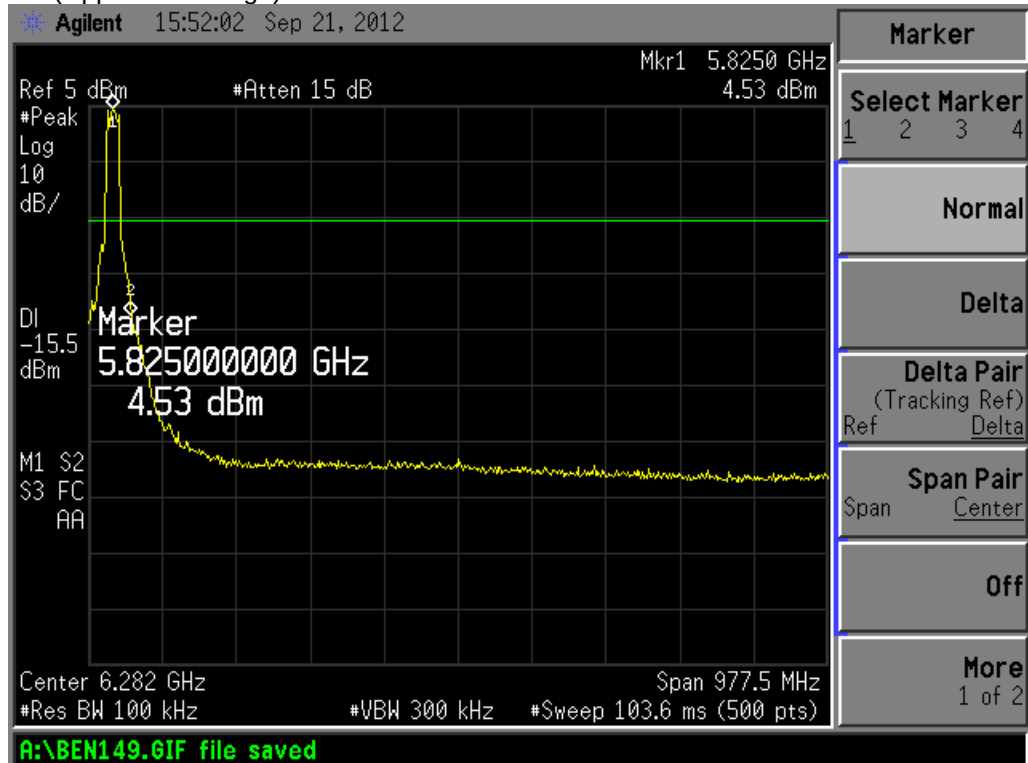
(RF Conducted Band Edge Spurious Emissions – Antenna Port 1)

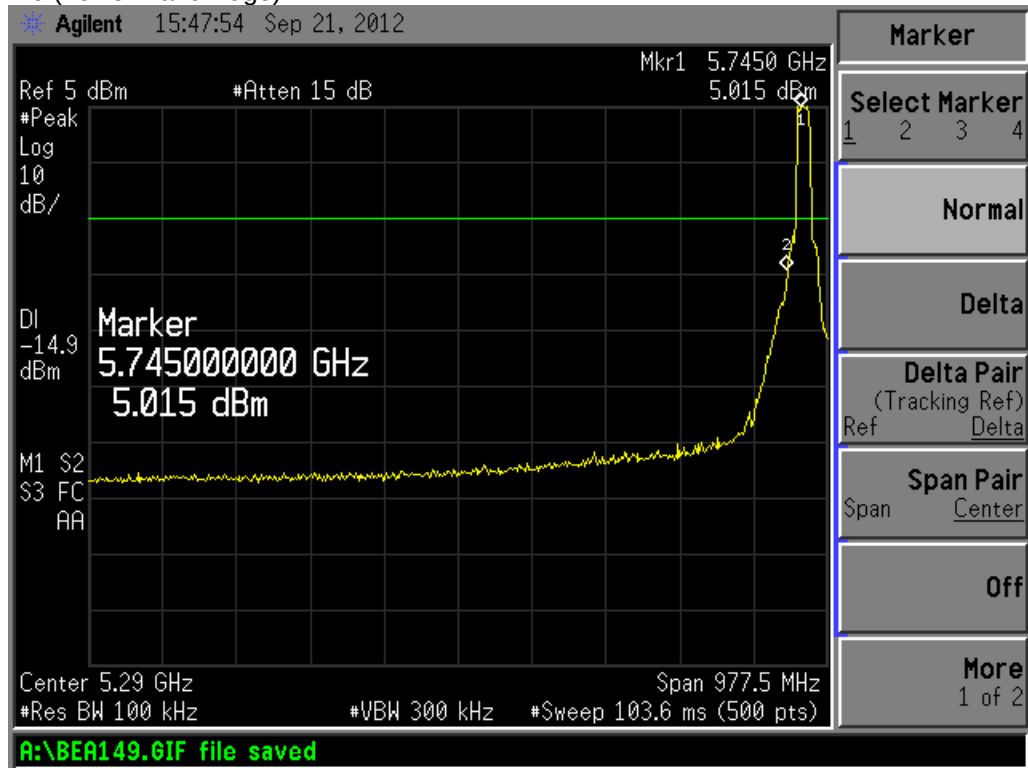
802.11a – OFDM Modulation Mode

Channel 149 (Lower Band Edge)

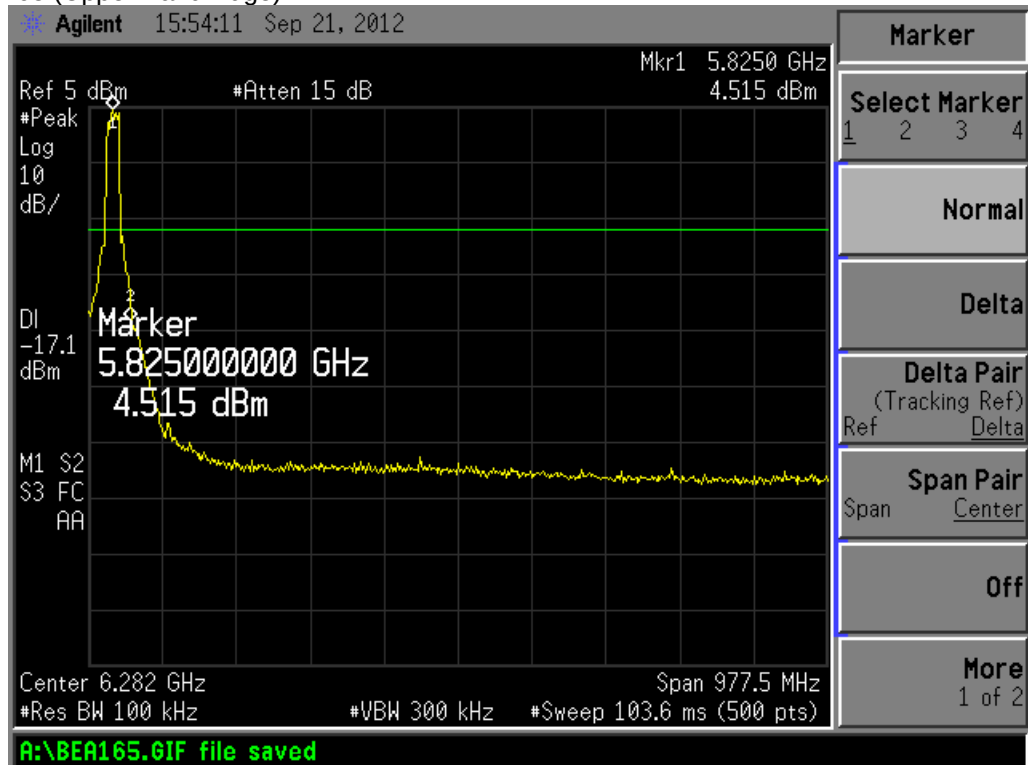


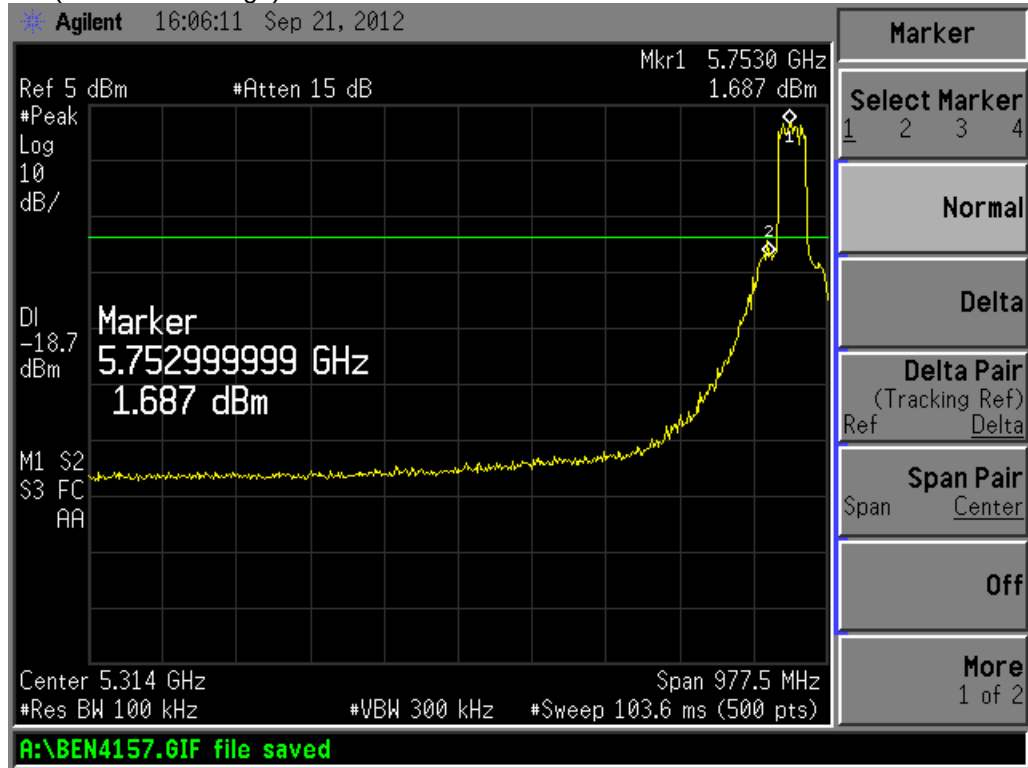
Channel 165 (Upper Band Edge)



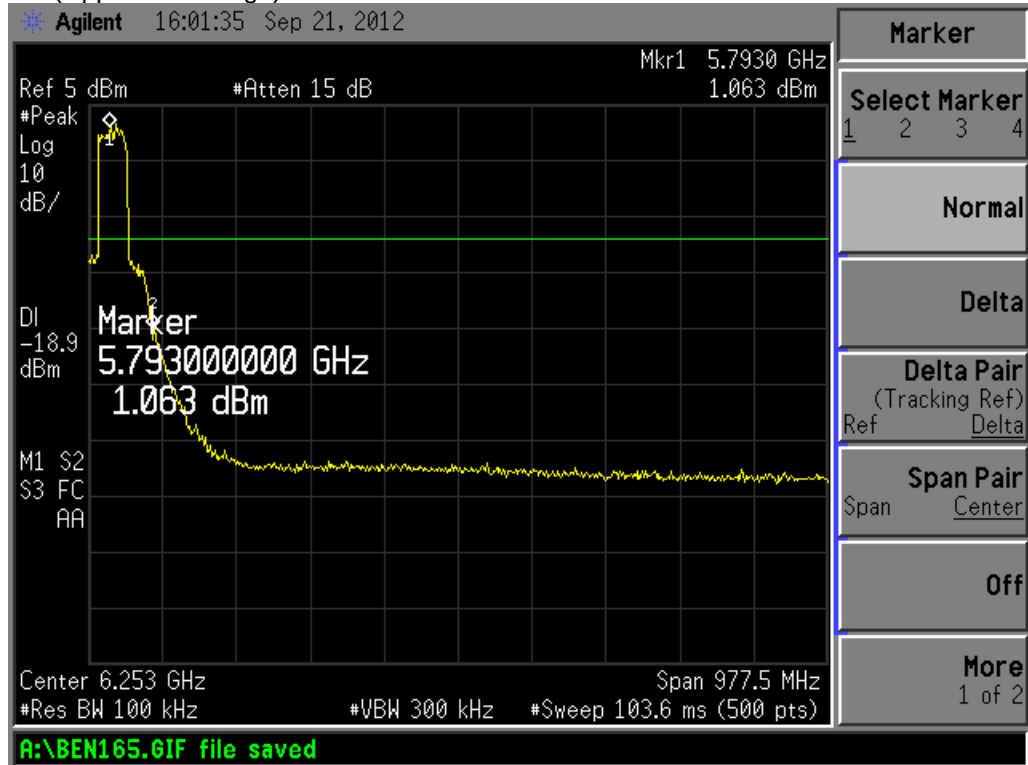
802.11n HT20 – MCS Modulation Mode
Channel 149 (Lower Band Edge)

Channel 165 (Upper Band Edge)



802.11n HT40 MCS Modulation Mode
Channel 151 (Lower Band Edge)

Channel 159 (Upper Band Edge)

FCC Part 15.247(d) RF Conducted Spurious Band Edge Emissions Specification: $\geq 20\text{dBc}$

Intertek	
Report Number: 100900227DEN-003	Issued: 10/11/2012

9 Transmitter Radiated Spurious Emissions including Band Edge

9.1 Method

Unless otherwise stated no deviations were made from FCC Part 15.407(b)(1)(6)(7) and FCC Part 15.209/205.

This testing was performed at Intertek Denver, located at 1795 Dogwood St. Suite 200, Louisville, CO 80027.

9.2 Test Equipment Used:

<u>Asset ID</u>	<u>Description</u>	<u>Manufacturer</u>	<u>Model</u>	<u>Serial</u>	<u>Cal Date</u>	<u>Cal Due</u>
DEN-073	EMI Receiver	RHODE & SCHWARZ	ESU 26	100265	1/11/2012	1/10/2013
18887	Horn Antenna 1-18GHz	EMCO	3115	9205-3886	2/28/2012	2/27/2013
18900	RF Pre-Amplifier (4-8 GHz)	Avantek	AFT97-8434-10F	1007	6/7/2012	6/7/2013
18901	RF Pre-Amplifier (8-16 GHz)	Avantek	AWT-18037	1002	6/7/2012	6/7/2013
18906	Amplifier (1-4 GHz)	Mini-Circuits Lab	ZHL-42	N052792-2	6/7/2012	6/7/2013
18912	9 kHz- 1.3GHz Pre Amp	Hewlett-Packard	8447F	3113A05545	6/6/2012	6/6/2013
19936	Bilog Antenna 30MHz - 6GHz	Sunol Sciences	JB6	A050707-1	11/15/2011	11/14/2012
SW-6	Software for Radiated and Conducted emissions.	Intertek	OATS vba	V. 3.0	VBV	VBV
18805	Harmonic Mixer	HP	11970K	2332A01280	10/4/2010	10/4/2012
18806	Harmonic Mixer	HP	11970A	3003A07640	10/15/2010	10/15/2012
18913	Spectrum Analyzer	Hewlett-Packard	E7405A	My44211889	7/16/2012	7/16/2013

9.3 Test Requirement:

Radiated emissions which fall in the restricted bands, as defined in FCC Part 15.205(a), must also comply with the radiated emission limits specified in Part 15.209(a) and Part 15.205(c). Measurements in the restricted bands include both peak detector and average detector measurements. Measurements in non-restricted bands include peak detector measurements.

For transmitters operating in the 5.15–5.25 GHz band: all emissions outside of the 5.15–5.25 GHz band shall not exceed an EIRP of –27 dBm/MHz.

Note: This corresponds to a peak field strength level of 68.3 dB(μV/m) at 3-meter test distance when measured with a 1 MHz resolution bandwidth.

Unwanted emissions below 1GHz must comply with the general field strength limits defined in FCC Part 15.209, when measured with a quasi-peak detector.

9.4 Test Procedure:

The Resolution Bandwidth is 100 kHz or greater for frequencies 30 MHz -1000 MHz and 1 MHz for frequencies above 1000 MHz.

The EUT is placed on a plastic turntable that is 80 cm in height. If the EUT attaches to peripherals, they are connected and operational (as typical as possible). During testing, all cables are manipulated to produce worst-case emissions. The signal is maximized by rotating the turntable through a 360° rotation. The antenna height is varied from 1-4 meters. Both vertical and horizontal antenna configurations are utilized in the testing.

Intertek	
Report Number: 100900227DEN-003	Issued: 10/11/2012

Radiated emissions are taken at 3-meter antenna-to-product test distance for all measurements.

Data is included for the worst-case configuration (the configuration which resulted in the highest emission levels).

The procedures described in the FCC Publication 789033 (Guidelines for Compliance Testing of U-NII Devices), were used.

- FCC Part 15.407 G)

9.5 Test Results:

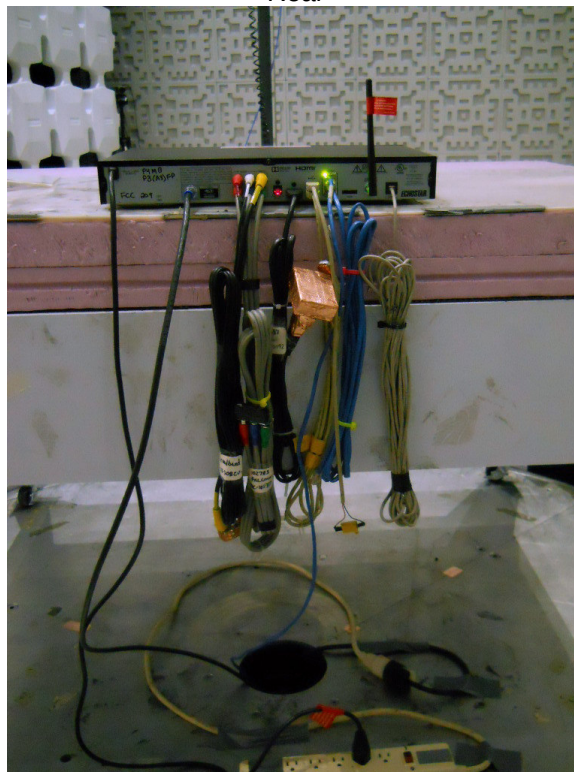
The sample tested was found to Comply.

9.6 Setup Photographs:

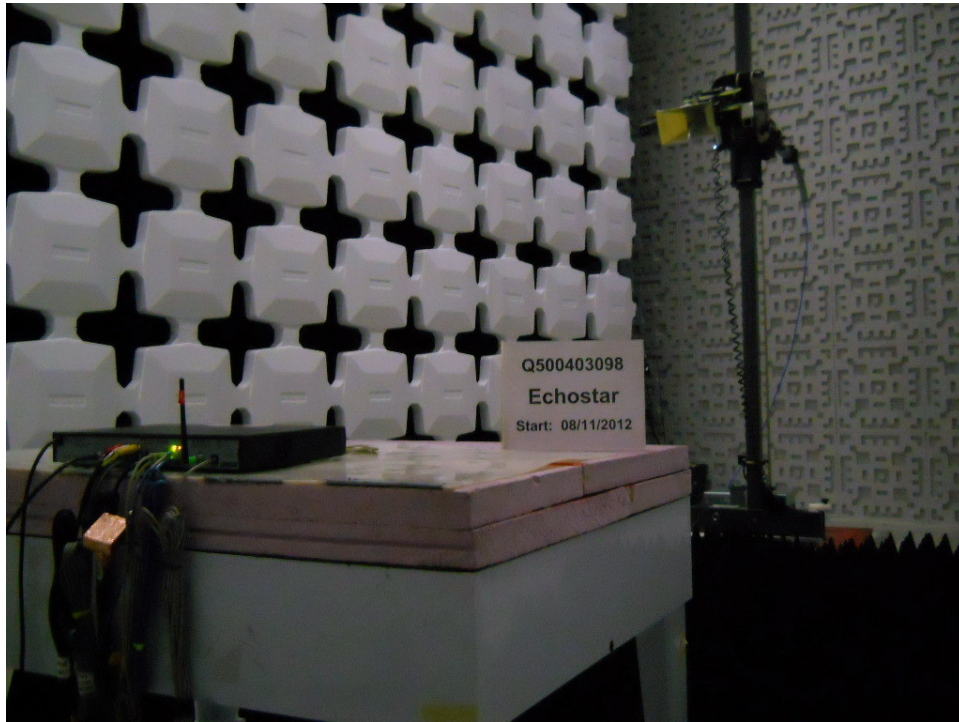
Transmitter Radiated Emissions - Test setup Front



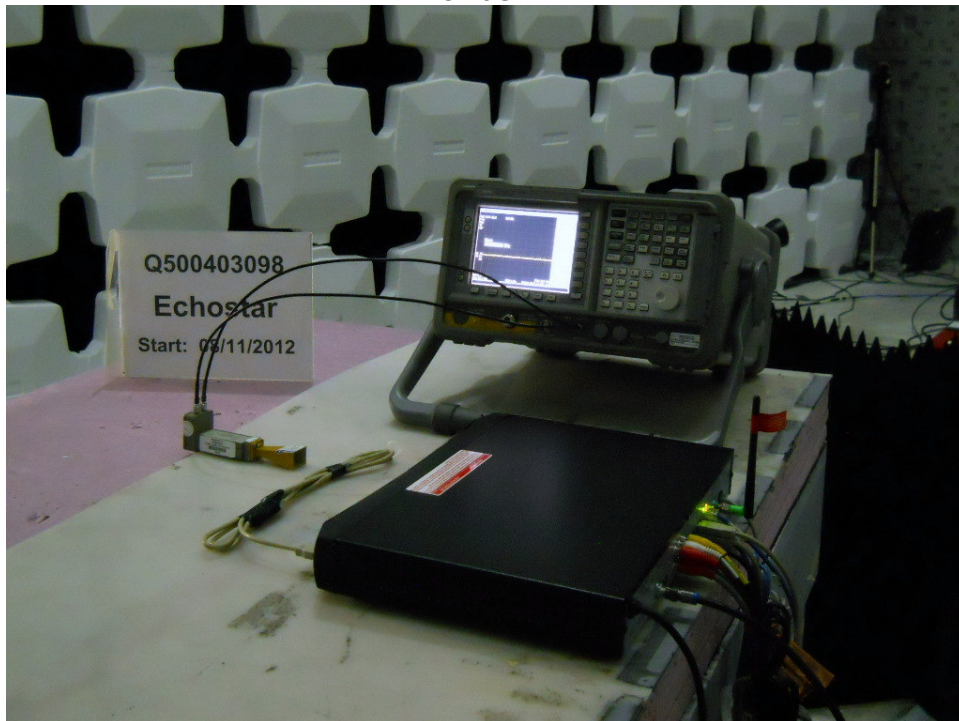
Rear



Antenna Setups
1-18 GHz



18-40GHz



9.7 Test Data – 802.11b Band B

9.7.1 Radiated Harmonics in Restricted Bands – 802.11b

Test Report #:	100900227DEN-004	Test Area:	CC1		Temperature:		C
Test Method:		Test Date:			Relative Humidity:		%
EUT Model #:	ID:058	EUT Power:	120V / 60Hz		Air Pressure:		kPa
EUT Serial #:	EMC1					Page:	
Manufacturer:	Echostar				Level Key		
EUT Description:	Advanced Satellite Receiver Set-Top Box				Pk - Peak	Nb - Narrow Band	
Notes:					Qp - QuasiPeak	Bb - Broad Band	
					Av - Average		

FREQ	LEVEL	DET	CABLE	ANT	PREAMP	ATTEN	FINAL	POL	HGT	AZ	Limit	DELTA1	RBW
<u>MHz</u>	<u>dBuV</u>	Qp Av Pk	+ [dB]	+ [dB/m]	- [dB]	+ [dB]	= [dBuV]	(V/H)	(m)	(DEG)	15.209 >1GHz	15.209 >1GHz	(MHz)

Radiated Harmonics

802.11b

Low Channel - Ant 0

4820.0	49.99	Pk	5.17	33.47	38.93	0.43	50.13	H	1.76	351.0	74.0	- 23.87	1.000
4820.0	39.35	Av	5.17	33.47	38.93	0.43	39.49	H	1.76	351.0	54.0	- 14.51	1.000
4820.0	49.94	Pk	5.17	33.47	38.93	0.43	50.08	V	1.44	29.0	74.0	- 23.92	1.000
4820.0	40.08	Av	5.17	33.47	38.93	0.43	40.22	V	1.44	29.0	54.0	- 13.78	1.000
12050.0	42.15	Pk	8.73	39.81	45.60	0.00	45.08	V	1.00	360.0	74.0	- 28.92	1.000
12050.0	28.13	Av	8.73	39.81	45.60	0.00	31.07	H	1.00	360.0	54.0	- 22.93	1.000
12050.0	42.19	Pk	8.73	39.81	45.60	0.00	45.13	V	1.00	0.0	74.0	- 28.87	1.000
12050.0	28.13	Av	8.73	39.81	45.60	0.00	31.07	V	1.00	0.0	54.0	- 22.93	1.000
19296.0	34.81	Pk	0.00	22.22	0.00	0.00	57.03	V			74.0	- 16.97	1.000
19296.0	0.76	Av	0.00	22.22	0.00	0.00	22.98	V			54.0	- 31.02	1.000
19296.0	34.35	Pk	0.00	22.22	0.00	0.00	56.57	V			74.0	- 17.43	1.000
19296.0	0.63	Av	0.00	22.22	0.00	0.00	22.85	V			54.0	- 31.15	1.000

Low Channel - Ant 1

4820.0	56.10	Pk	5.17	33.47	38.93	0.43	56.24	H	1.93	342.0	74.0	- 17.76	1.000
4820.0	47.87	Av	5.17	33.47	38.93	0.43	48.01	H	1.93	342.0	54.0	- 5.99	1.000
4820.0	54.58	Pk	5.17	33.47	38.93	0.43	54.72	V	1.59	15.0	74.0	- 19.28	1.000
4820.0	46.33	Av	5.17	33.47	38.93	0.43	46.47	V	1.59	15.0	54.0	- 7.53	1.000
12050.0	41.86	Pk	8.73	39.81	45.60	0.00	52.21	H	1.00	360.0	74.0	- 21.79	1.000
12050.0	28.11	Av	8.73	39.81	45.60	0.00	38.46	H	1.00	360.0	54.0	- 15.54	1.000
12050.0	42.64	Pk	8.73	39.81	45.60	0.00	52.99	V	1.00	0.0	74.0	- 21.01	1.000
12050.0	28.12	Av	8.73	39.81	45.60	0.00	38.47	V	1.00	0.0	54.0	- 15.53	1.000

Mid Channel - Ant 0

4875.0	49.23	Pk	5.19	33.57	38.85	0.42	49.57	H	2.51	358.0	74.0	- 24.43	1.000
4876.0	38.72	Av	5.19	33.57	38.85	0.42	39.06	H	2.51	358.0	54.0	- 14.94	1.000
4876.0	47.96	Pk	5.19	33.57	38.85	0.42	48.30	V	1.93	27.0	74.0	- 25.70	1.000
4876.0	36.35	Av	5.19	33.57	38.85	0.42	36.69	V	1.93	27.0	54.0	- 17.31	1.000
7314.0	51.94	Pk	6.46	36.73	39.25	0.48	56.35	V	1.44	12.0	74.0	- 17.65	1.000

Intertek

Report Number: 100900227DEN-003

Issued: 10/11/2012

FREQ	LEVEL	DET	CABLE	ANT	PREAMP	ATTEN	FINAL	POL	HGT	AZ	Limit	DELTA1	RBW
<u>MHz</u>	<u>dBuV</u>	<u>Qp</u> <u>Av</u> <u>Pk</u>	<u>+</u> [dB]	<u>+</u> <u>[dB/m]</u>	<u>-</u> [dB]	<u>+</u> [dB]	<u>=</u> <u>[dBuV]</u>	(V/H)	(m)	(DEG)	15.209 >1GHz	15.209 >1GHz	(MHz)
7314.0	44.42	Av	6.46	36.73	39.25	0.48	48.83	V	1.44	12.0	54.0	- 5.17	1.000
7314.0	51.76	Pk	6.46	36.73	39.25	0.48	56.17	H	1.32	32.0	74.0	- 17.83	1.000
7314.0	43.93	Av	6.46	36.73	39.25	0.48	48.34	H	1.32	32.0	54.0	- 5.66	1.000
12190.0	40.98	Pk	8.81	40.57	45.62	0.00	44.74	H	1.00	360.0	74.0	- 29.26	1.000
12190.0	27.85	Av	8.81	40.57	45.62	0.00	31.61	H	1.00	360.0	54.0	- 22.39	1.000
12190.0	41.55	Pk	8.81	40.57	45.62	0.00	45.31	V	1.00	360.0	74.0	- 28.69	1.000
12190.0	27.86	Av	8.81	40.57	45.62	0.00	31.62	V	1.00	360.0	54.0	- 22.38	1.000
19504.0	34.88	Pk	0.00	22.10	0.00	0.00	56.98	V			74.0	- 17.02	1.000
19504.0	1.47	Av	0.00	22.10	0.00	0.00	23.57	V			54.0	- 30.43	1.000
19504.0	33.87	Pk	0.00	22.10	0.00	0.00	55.97	V			74.0	- 18.03	1.000
19504.0	0.57	Av	0.00	22.10	0.00	0.00	22.67	V			54.0	- 31.33	1.000

Mid Channel - Ant 1

4875.0	60.34	Pk	5.19	33.57	38.85	0.42	60.68	H	1.90	341.0	74.0	- 13.32	1.000
4876.0	53.00	Av	5.19	33.57	38.85	0.42	53.34	H	1.90	341.0	54.0	- 0.66	1.000
4876.0	58.94	Pk	5.19	33.57	38.85	0.42	59.28	V	1.55	3.0	74.0	- 14.72	1.000
4876.0	51.40	Av	5.19	33.57	38.85	0.42	51.74	V	1.55	3.0	54.0	- 2.26	1.000
7314.0	46.85	Pk	6.46	36.73	39.25	0.48	51.26	H	1.84	358.0	74.0	- 22.74	1.000
7314.0	37.17	Av	6.46	36.73	39.25	0.48	41.58	H	1.84	358.0	54.0	- 12.42	1.000
7314.0	48.54	Pk	6.46	36.73	39.25	0.48	52.95	V	1.53	32.0	74.0	- 21.05	1.000
7314.0	39.58	Av	6.46	36.73	39.25	0.48	43.99	V	1.53	32.0	54.0	- 10.01	1.000
12190.0	41.60	Pk	8.81	40.57	45.62	0.00	45.36	H	1.00	360.0	74.0	- 28.64	1.000
12190.0	27.87	Av	8.81	40.57	45.62	0.00	31.63	H	1.00	360.0	54.0	- 22.37	1.000
12190.0	41.11	Pk	8.81	40.57	45.62	0.00	44.87	V	1.00	360.0	74.0	- 29.13	1.000
12190.0	27.87	Av	8.81	40.57	45.62	0.00	31.63	V	1.00	360.0	54.0	- 22.37	1.000

High Channel - Ant 0

4926.0	49.74	Pk	5.23	33.68	38.74	0.41	50.32	H	2.46	335.0	74.0	- 23.68	1.000
4926.0	41.14	Av	5.23	33.68	38.74	0.41	41.72	H	2.46	335.0	54.0	- 12.28	1.000
4926.0	49.25	Pk	5.23	33.68	38.74	0.41	49.83	V	1.92	0.0	74.0	- 24.17	1.000
4926.0	38.57	Av	5.23	33.68	38.74	0.41	39.15	V	1.92	0.0	54.0	- 14.85	1.000
7389.0	52.68	Pk	6.50	36.82	39.20	0.48	57.29	H	1.35	36.0	74.0	- 16.71	1.000
7389.0	44.93	Av	6.50	36.82	39.20	0.48	49.54	H	1.35	36.0	54.0	- 4.46	1.000
7389.0	53.07	Pk	6.50	36.82	39.20	0.48	57.68	V	1.39	4.0	74.0	- 16.32	1.000
7389.0	45.43	Av	6.50	36.82	39.20	0.48	50.04	V	1.39	4.0	54.0	- 3.96	1.000
12315.0	41.88	Pk	8.88	41.72	45.65	0.00	46.84	H	1.00	360.0	74.0	- 27.16	1.000
12315.0	27.90	Av	8.88	41.72	45.65	0.00	32.85	H	1.00	0.0	54.0	- 21.15	1.000
12315.0	41.53	Pk	8.88	41.72	45.65	0.00	46.48	V	1.00	360.0	74.0	- 27.52	1.000
12315.0	27.90	Av	8.88	41.72	45.65	0.00	32.85	V	1.00	360.0	54.0	- 21.15	1.000
19704.0	34.31	Pk	0.00	21.90	0.00	0.00	56.21	V			74.0	- 17.79	1.000
19704.0	0.36	Av	0.00	21.90	0.00	0.00	22.26	V			54.0	- 31.74	1.000
19704.0	34.14	Pk	0.00	21.90	0.00	0.00	56.04	H			74.0	- 17.96	1.000
19704.0	0.91	Av	0.00	21.90	0.00	0.00	22.81	H			54.0	- 31.19	1.000
22167.0	34.46	Pk	0.00	21.23	0.00	0.00	55.69	V			74.0	- 18.31	1.000
22167.0	0.38	Av	0.00	21.23	0.00	0.00	21.61	V			54.0	- 32.39	1.000
22167.0	34.46	Pk	0.00	21.23	0.00	0.00	55.69	H			74.0	- 18.31	1.000
22167.0	0.38	Av	0.00	21.23	0.00	0.00	21.61	H			54.0	- 32.39	1.000

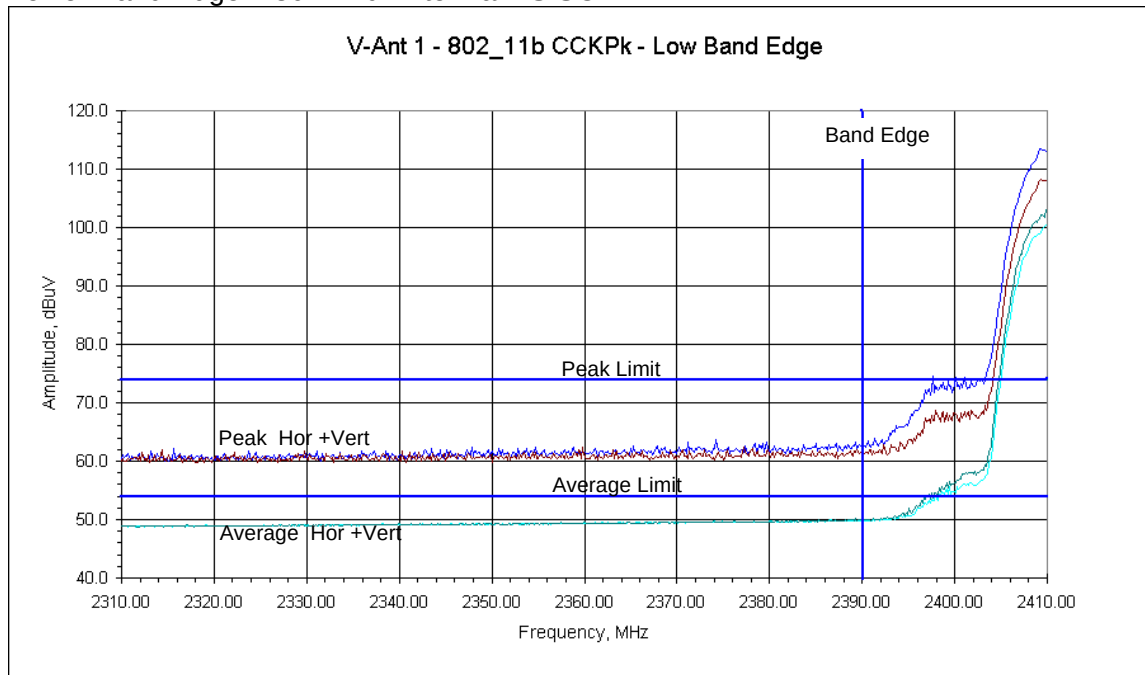
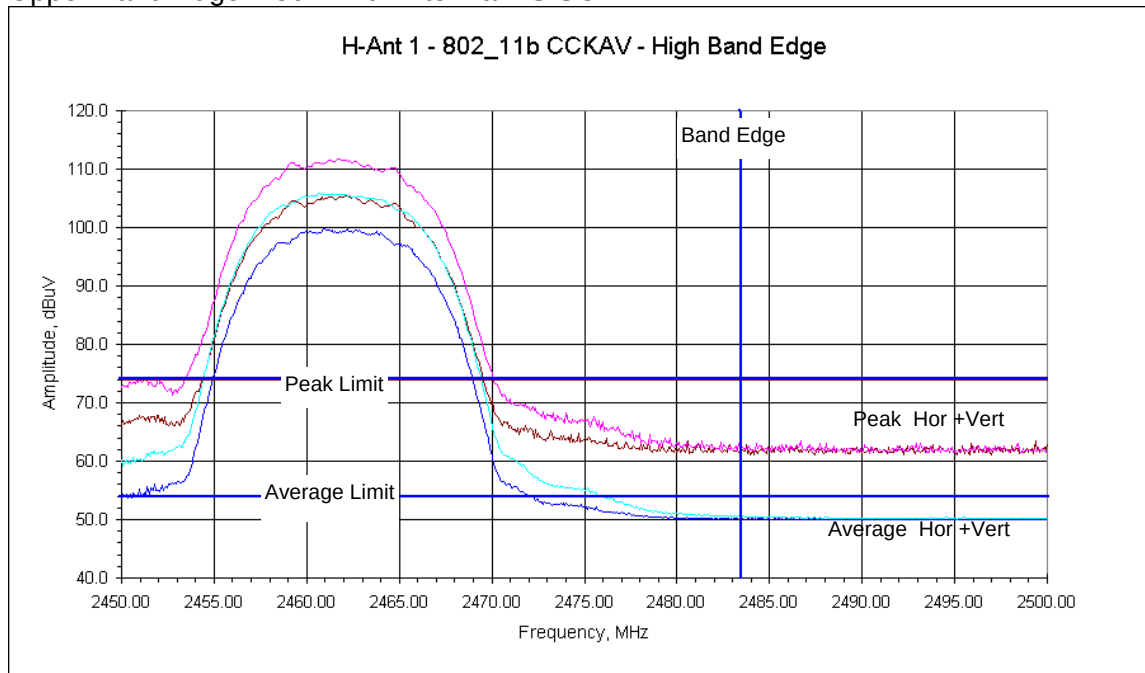
High Channel - Ant 1

Intertek

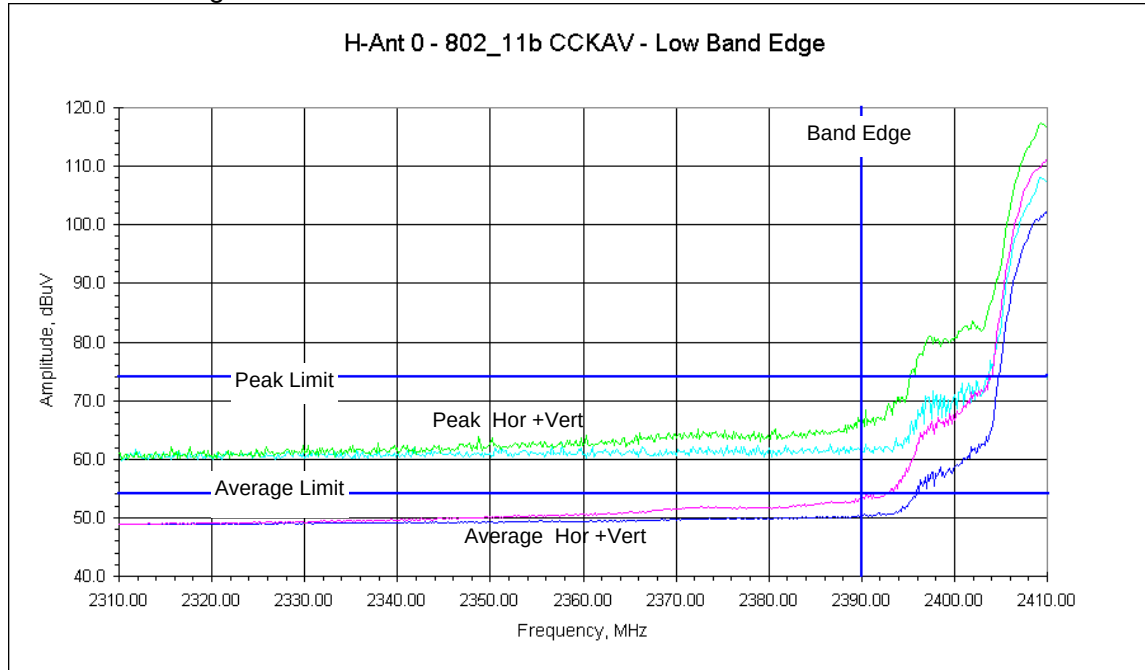
Report Number: 100900227DEN-003

Issued: 10/11/2012

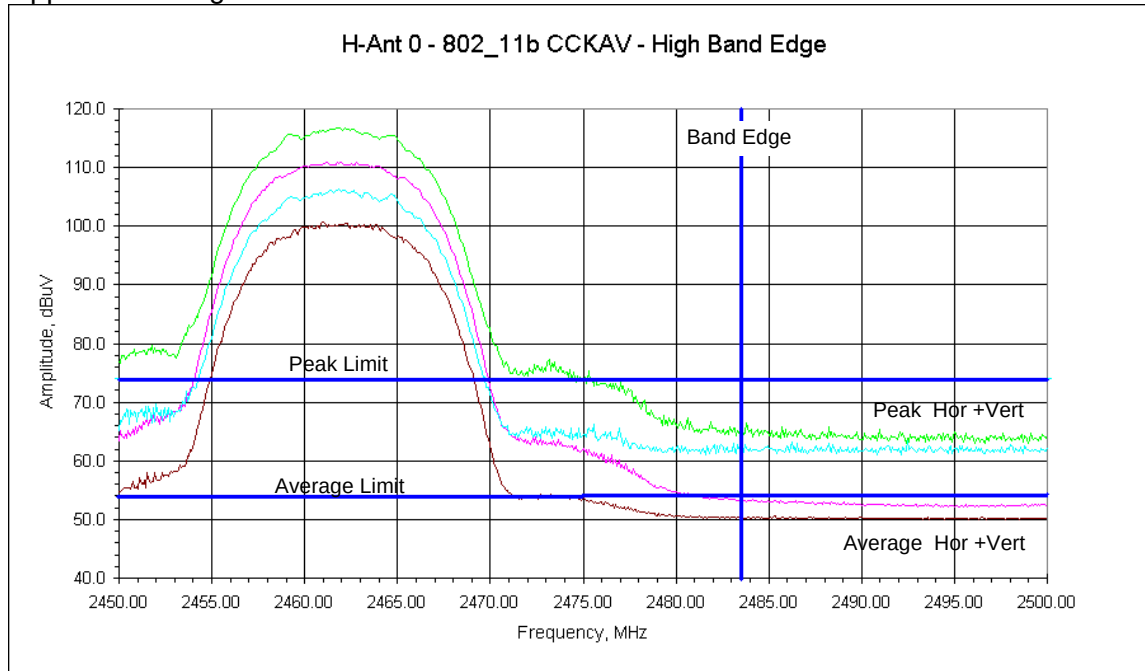
FREQ	LEVEL	DET	CABLE	ANT	PREAMP	ATTEN	FINAL	POL	HGT	AZ	Limit	DELTA1	RBW
<u>MHz</u>	<u>dBuV</u>	Qp Av Pk	+ [dB]	+ [dB/m]	- [dB]	+ [dB]	= [dBuV]	(V/H)	(m)	(DEG)	15.209 >1GHz	15.209 >1GHz	(MHz)
4926.0	51.46	Pk	5.23	33.68	38.74	0.41	52.04	H	1.83	336.0	74.0	- 21.96	1.000
4926.0	43.96	Av	5.23	33.68	38.74	0.41	44.54	H	1.83	336.0	54.0	- 9.46	1.000
4926.0	51.34	Pk	5.23	33.68	38.74	0.41	51.92	V	1.00	25.0	74.0	- 22.08	1.000
4926.0	44.14	Av	5.23	33.68	38.74	0.41	44.72	V	1.00	25.0	54.0	- 9.28	1.000
7389.0	47.14	Pk	6.50	36.82	39.20	0.48	51.75	H	2.26	72.0	74.0	- 22.25	1.000
7389.0	37.61	Av	6.50	36.82	39.20	0.48	42.22	H	2.26	72.0	54.0	- 11.78	1.000
7389.0	47.96	Pk	6.50	36.82	39.20	0.48	52.57	V	2.73	345.0	74.0	- 21.43	1.000
7389.0	38.49	Av	6.50	36.82	39.20	0.48	43.10	V	2.73	345.0	54.0	- 10.90	1.000
12315.0	41.09	Pk	8.88	41.72	45.65	0.00	46.04	H	1.00	0.0	74.0	- 27.96	1.000
12315.0	27.90	Av	8.88	41.72	45.65	0.00	32.85	H	1.00	0.0	54.0	- 21.15	1.000
12315.0	41.53	Pk	8.88	41.72	45.65	0.00	46.48	V	1.00	360.0	74.0	- 27.52	1.000
12315.0	27.90	Av	8.88	41.72	45.65	0.00	32.85	V	1.00	360.0	54.0	- 21.15	1.000

9.7.2 Band Edge in Restricted Bands – 802.11b Band B**Lower Band Edge – 802.11b Antenna 1 SISO****Upper Band Edge – 802.11b Antenna 1 SISO**

Lower Band Edge – 802.11b Antenna 0 SISO



Upper Band Edge – 802.11b Antenna 0 SISO



9.8 Test Data – 802.11g Band B

9.8.1 Radiated Harmonics in Restricted Bands – 802.11g

Test Report #:	100900227DEN-004	Test Area:	CC1	Temperature:		C
Test Method:		Test Date:		Relative Humidity:		%
EUT Model #:	ID:058	EUT Power:	120V / 60Hz	Air Pressure:		kPa
EUT Serial #:	EMC1				Page:	
Manufacturer:	Echostar			Level Key		
EUT Description:	Advanced Satellite Receiver Set-Top Box			Pk - Peak	Nb - Narrow Band	
Notes:	Average Limit			Qp - QuasiPeak	Bb - Broad Band	
				Av - Average		

FREQ	LEVEL	DET	CABLE	ANT	PREAMP	ATTEN	FINAL	POL	HGT	AZ	Limit	DELTA1	RBW
<u>MHz</u>	<u>dBuV</u>	<u>Qp</u> <u>Av</u> <u>Pk</u>	+ [dB]	+ [dB/m]	- [dB]	+ [dB]	= [dBuV]	(V/H)	(m)	(DEG)	15.209 >1GHz	15.209 >1GHz	(MHz)

Radiated Harmonics

802.11g - OFDM

Low Ch - Both Ant

4820.0	57.96	Pk	5.17	33.47	38.93	0.43	58.10	H	1.93	340.0	74.0	- 15.90	1.000
4820.0	45.23	Av	5.17	33.47	38.93	0.43	45.37	H	1.93	340.0	54.0	- 8.63	1.000
4820.0	57.24	Pk	5.17	33.47	38.93	0.43	57.38	V	1.00	20.0	74.0	- 16.62	1.000
4820.0	44.95	Av	5.17	33.47	38.93	0.43	45.09	V	1.00	20.0	54.0	- 8.91	1.000
12050.0	41.65	Pk	8.88	41.72	45.60	0.00	46.65	V	1.00	360.0	74.0	- 27.35	1.000
12050.0	27.89	Av	8.88	41.72	45.60	0.00	32.89	V	1.00	360.0	54.0	- 21.11	1.000
12050.0	41.97	Pk	8.88	41.72	45.60	0.00	46.97	H	1.00	0.0	74.0	- 27.03	1.000
12050.0	27.91	Av	8.88	41.72	45.60	0.00	32.91	H	1.00	0.0	54.0	- 21.09	1.000
19280.0	34.49	Pk	0.00	22.22	0.00	0.00	56.71	V			74.0	- 17.29	1.000
19280.0	0.36	Av	0.00	22.22	0.00	0.00	22.58	V			54.0	- 31.42	1.000
19280.0	34.47	Pk	0.00	22.22	0.00	0.00	56.69	V			74.0	- 17.31	1.000
19280.0	0.36	Av	0.00	22.22	0.00	0.00	22.58	V			54.0	- 31.42	1.000

Mid Ch - Both Ant

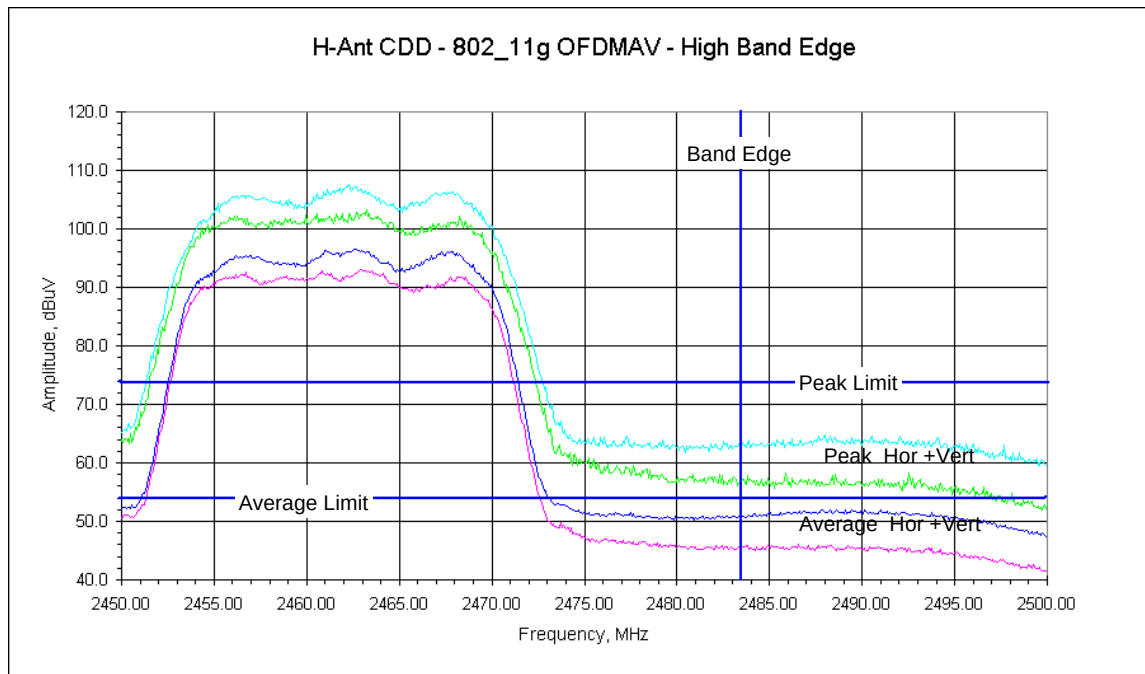
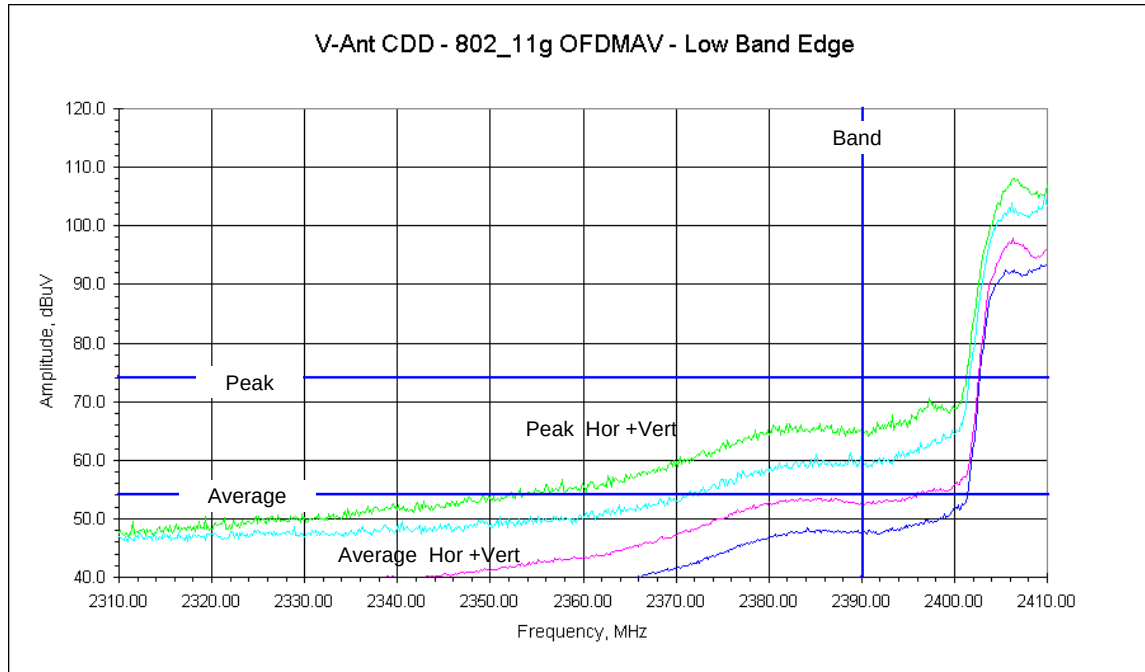
4876.0	56.22	Pk	5.20	33.58	38.84	0.42	56.58	H	1.90	339.0	74.0	- 17.42	1.000
4876.0	42.68	Av	5.20	33.58	38.84	0.42	43.04	H	1.90	339.0	54.0	- 10.96	1.000
4876.0	54.23	Pk	5.20	33.58	38.84	0.42	54.59	V	1.04	14.0	74.0	- 19.41	1.000
4876.0	41.07	Av	5.20	33.58	38.84	0.42	41.43	V	1.04	14.0	54.0	- 12.57	1.000
7314.0	54.60	Pk	6.46	36.74	39.23	0.48	59.05	H	1.38	357.0	74.0	- 14.95	1.000
7314.0	41.87	Av	6.46	36.74	39.23	0.48	46.32	H	1.38	357.0	54.0	- 7.68	1.000
7314.0	53.04	Pk	6.46	36.74	39.23	0.48	57.49	V	1.43	45.0	74.0	- 16.51	1.000
7314.0	40.42	Av	6.46	36.74	39.23	0.48	44.87	V	1.43	45.0	54.0	- 9.13	1.000
12190.0	41.47	Pk	8.81	40.57	45.62	0.00	45.23	H	1.00	0.0	74.0	- 28.77	1.000
12190.0	27.87	Av	8.81	40.57	45.62	0.00	31.63	H	1.00	0.0	54.0	- 22.37	1.000
12190.0	41.60	Pk	8.81	40.57	45.62	0.00	45.36	V	1.00	360.0	74.0	- 28.64	1.000
12190.0	27.87	Av	8.81	40.57	45.62	0.00	31.63	V	1.00	360.0	54.0	- 22.37	1.000
19504.0	34.00	Pk	0.00	22.10	0.00	0.00	56.10	V			74.0	- 17.90	1.000
19504.0	0.24	Av	0.00	22.10	0.00	0.00	22.34	V			54.0	- 31.66	1.000
19504.0	34.36	Pk	0.00	22.10	0.00	0.00	56.46	H			74.0	- 17.54	1.000

Intertek

Report Number: 100900227DEN-003

Issued: 10/11/2012

FREQ	LEVEL	DET	CABLE	ANT	PREAMP	ATTEN	FINAL	POL	HGT	AZ	Limit	DELTA1	RBW
<u>MHz</u>	<u>dBuV</u>	Qp Av Pk	+ [dB]	+ [dB/m]	- [dB]	+ [dB]	= [dBuV]	(V/H)	(m)	(DEG)	15.209 >1GHz	15.209 >1GHz	(MHz)
19504.0	0.27	Av	0.00	22.10	0.00	0.00	22.37	H			54.0	- 31.63	1.000
High Ch - Both Ant													
4926.0	53.34	Pk	5.22	33.68	38.75	0.41	53.90	V	1.47	16.0	74.0	- 20.10	1.000
4926.0	39.45	Av	5.22	33.68	38.75	0.41	40.01	V	1.47	16.0	54.0	- 13.99	1.000
4926.0	54.28	Pk	5.22	33.68	38.75	0.41	54.84	H	1.91	346.0	74.0	- 19.16	1.000
4926.0	40.80	Av	5.22	33.68	38.75	0.41	41.36	H	1.91	346.0	54.0	- 12.64	1.000
7389.0	53.68	Pk	6.50	36.82	39.19	0.48	58.29	H	1.32	310.0	74.0	- 15.71	1.000
7389.0	41.04	Av	6.50	36.82	39.19	0.48	45.65	H	1.32	310.0	54.0	- 8.35	1.000
7389.0	52.17	Pk	6.50	36.82	39.19	0.48	56.78	V	1.42	8.0	74.0	- 17.22	1.000
7389.0	40.11	Av	6.50	36.82	39.19	0.48	44.72	V	1.42	8.0	54.0	- 9.28	1.000
12315.0	41.68	Pk	8.88	41.72	45.65	0.00	46.63	H	1.00	0.0	74.0	- 27.37	1.000
12315.0	27.90	Av	8.88	41.72	45.65	0.00	32.85	H	1.00	0.0	54.0	- 21.15	1.000
12315.0	41.21	Pk	8.88	41.72	45.65	0.00	46.16	V	1.00	360.0	74.0	- 27.84	1.000
12315.0	27.89	Av	8.88	41.72	45.65	0.00	32.84	V	1.00	360.0	54.0	- 21.16	1.000
19704.0	35.69	Pk	0.00	21.90	0.00	0.00	57.59	V			74.0	- 16.41	1.000
19704.0	0.56	Av	0.00	21.90	0.00	0.00	22.46	V			54.0	- 31.54	1.000
19704.0	34.23	Pk	0.00	21.90	0.00	0.00	56.13	H			74.0	- 17.87	1.000
19704.0	0.27	Av	0.00	21.90	0.00	0.00	22.17	H			54.0	- 31.83	1.000
22167.0	34.46	Pk	0.00	21.23	0.00	0.00	55.69	V			74.0	- 18.31	1.000
22167.0	0.38	Av	0.00	21.23	0.00	0.00	21.61	V			54.0	- 32.39	1.000
22167.0	34.46	Pk	0.00	21.23	0.00	0.00	55.69	H			74.0	- 18.31	1.000
22167.0	0.38	Av	0.00	21.23	0.00	0.00	21.61	H			54.0	- 32.39	1.000

9.8.2 Band Edge in Restricted Bands – 802.11g Band B

9.9 Test Data – 802.11n HT20 Band B

9.9.1 Radiated Harmonics in Restricted Bands

Test Report #:	100900227DEN-004	Test Area:	CC1	Temperature:		C
Test Method:		Test Date:		Relative Humidity:		%
EUT Model #:	ID:058	EUT Power:	120V / 60Hz	Air Pressure:		kPa
EUT Serial #:	EMC1				Page:	
Manufacturer:	Echostar			Level Key		
EUT Description:	Advanced Satellite Receiver Set-Top Box			Pk - Peak	Nb - Narrow Band	
Notes:				Qp - QuasiPeak	Bb - Broad Band	
				Av - Average		

FREQ	LEVEL	DET	CABLE	ANT	PREAMP	ATTEN	FINAL	POL	HGT	AZ	Limit	DELTA1	RBW
<u>MHz</u>	<u>dBuV</u>	<u>Qp</u> <u>Av</u> <u>Pk</u>	+ [dB]	+ [dB/m]	- [dB]	+ [dB]	= [dBuV]	(V/H)	(m)	(DEG)	15.209 >1GHz	15.209 >1GHz	(MHz)

Radiated Harmonics

802.11n(20)

Low Ch - Both Ant

4819.0	59.31	Pk	5.17	33.47	38.93	0.43	59.45	H	1.92	357.0	74.0	- 14.55	1.000
4819.0	46.51	Av	5.17	33.47	38.93	0.43	46.65	H	1.92	357.0	54.0	- 7.35	1.000
4819.0	58.59	Pk	5.17	33.47	38.93	0.43	58.73	V	1.00	15.0	74.0	- 15.27	1.000
4819.0	45.40	Av	5.17	33.47	38.93	0.43	45.54	V	1.00	15.0	54.0	- 8.46	1.000
12050.0	41.40	Pk	8.73	39.81	45.60	0.00	44.34	H	1.00	0.0	74.0	- 29.66	1.000
12050.0	28.10	Av	8.73	39.81	45.60	0.00	31.04	H	1.00	0.0	54.0	- 22.96	1.000
12050.0	41.84	Pk	8.73	39.81	45.60	0.00	44.78	V	1.00	360.0	74.0	- 29.22	1.000
12050.0	28.10	Av	8.73	39.81	45.60	0.00	31.04	V	1.00	360.0	54.0	- 22.96	1.000
19280.0	34.25	Pk	0.00	22.22	0.00	0.00	56.47	V			74.0	- 17.53	1.000
19280.0	0.39	Av	0.00	22.22	0.00	0.00	22.61	V			54.0	- 31.39	1.000
19280.0	33.62	Pk	0.00	22.22	0.00	0.00	55.84	H			74.0	- 18.16	1.000
19280.0	0.39	Av	0.00	22.22	0.00	0.00	22.61	H			54.0	- 31.39	1.000

Mid Ch - Both Ant

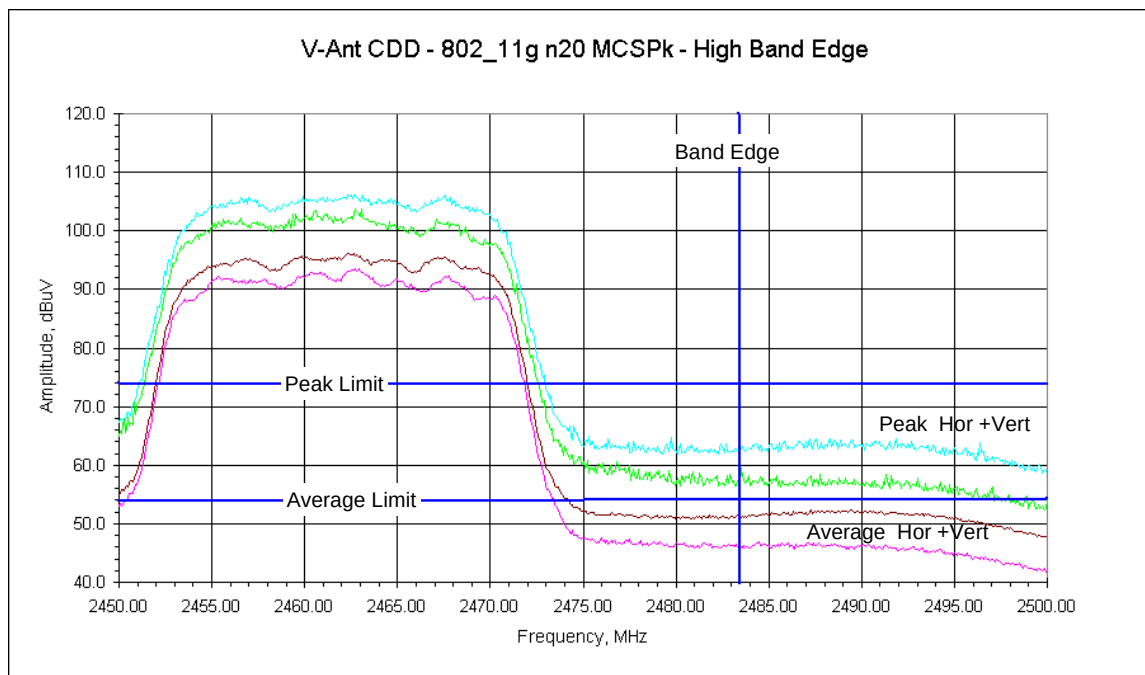
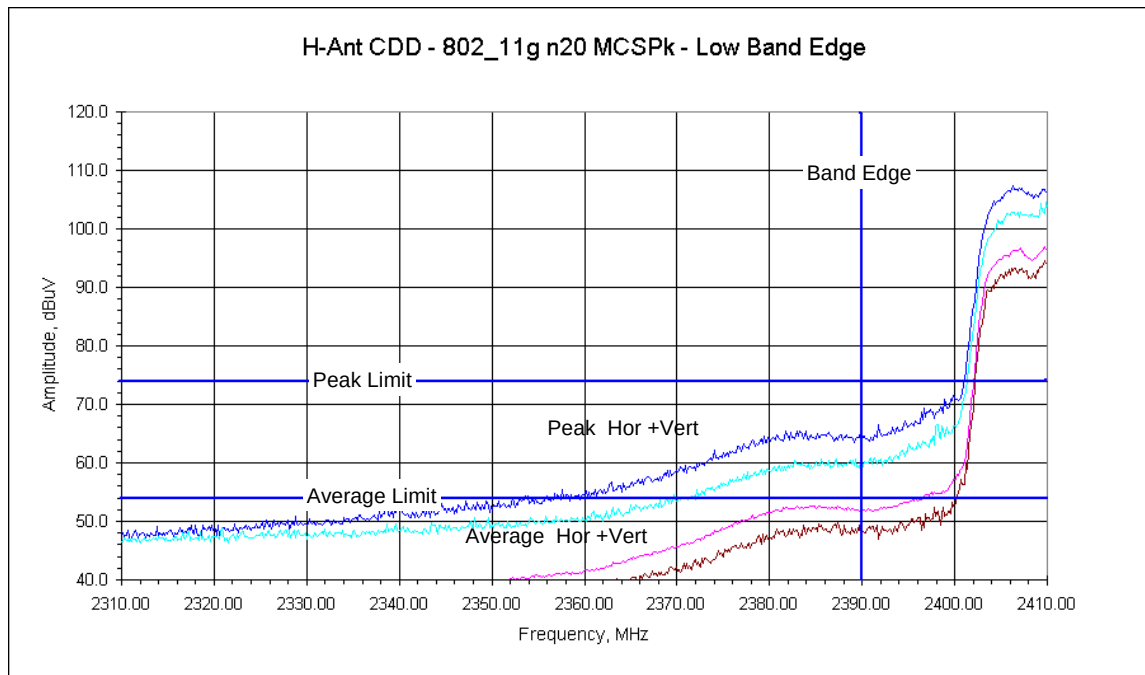
4876.0	61.01	Pk	5.20	33.58	38.84	0.42	61.37	H	1.88	340.0	74.0	- 12.63	1.000
4876.0	47.64	Av	5.20	33.58	38.84	0.42	48.00	H	1.88	340.0	54.0	- 6.00	1.000
4876.0	55.53	Pk	5.20	33.58	38.84	0.42	55.89	V	1.56	6.0	74.0	- 18.11	1.000
4876.0	42.21	Av	5.20	33.58	38.84	0.42	42.57	V	1.56	6.0	54.0	- 11.43	1.000
7314.0	55.84	Pk	6.46	36.74	39.23	0.48	60.28	H	1.37	350.0	74.0	- 13.72	1.000
7314.0	41.54	Av	6.46	36.74	39.23	0.48	45.98	H	1.37	350.0	54.0	- 8.02	1.000
7314.0	53.08	Pk	6.46	36.74	39.23	0.48	57.52	V	1.42	47.0	74.0	- 16.48	1.000
7314.0	39.09	Av	6.46	36.74	39.23	0.48	43.53	V	1.42	47.0	54.0	- 10.47	1.000
12190.0	40.97	Pk	8.81	40.57	45.62	0.00	44.73	H	1.00	0.0	74.0	- 29.27	1.000
12190.0	27.84	Av	8.81	40.57	45.62	0.00	31.60	H	1.00	0.0	54.0	- 22.40	1.000
12190.0	42.00	Pk	8.73	39.81	45.62	0.00	44.92	V	1.00	360.0	74.0	- 29.08	1.000
12190.0	28.10	Av	8.73	39.81	45.62	0.00	31.02	V	1.00	360.0	54.0	- 22.98	1.000
19504.0	35.06	Pk	0.00	22.10	0.00	0.00	57.16	V			74.0	- 16.84	1.000
19504.0	0.27	Av	0.00	22.10	0.00	0.00	22.37	V			54.0	- 31.63	1.000
19504.0	34.50	Pk	0.00	22.10	0.00	0.00	56.60	H			74.0	- 17.40	1.000

Intertek

Report Number: 100900227DEN-003

Issued: 10/11/2012

FREQ	LEVEL	DET	CABLE	ANT	PREAMP	ATTEN	FINAL	POL	HGT	AZ	Limit	DELTA1	RBW
<u>MHz</u>	<u>dBuV</u>	Qp Av Pk	+ [dB]	+ [dB/m]	- [dB]	+ [dB]	= [dBuV]	(V/H)	(m)	(DEG)	15.209 >1GHz	15.209 >1GHz	(MHz)
19504.0	0.25	Av	0.00	22.10	0.00	0.00	22.35	H			54.0	- 31.65	1.000
High Ch - Both Ant													
4926.0	50.65	Pk	5.22	33.68	38.75	0.41	51.21	H	1.90	347.0	74.0	- 22.79	1.000
4926.0	36.57	Av	5.22	33.68	38.75	0.41	37.13	H	1.90	347.0	54.0	- 16.87	1.000
4926.0	49.73	Pk	5.22	33.68	38.75	0.41	50.29	V	1.00	2.0	74.0	- 23.71	1.000
4926.0	36.25	Av	5.22	33.68	38.75	0.41	36.81	V	1.00	2.0	54.0	- 17.19	1.000
12315.0	41.57	Pk	8.88	41.72	45.65	0.00	46.52	H	1.00	360.0	74.0	- 27.48	1.000
12315.0	27.90	Av	8.88	41.72	45.65	0.00	32.85	H	1.00	360.0	54.0	- 21.15	1.000
12315.0	40.96	Pk	8.88	41.72	45.65	0.00	45.91	V	1.00	0.0	74.0	- 28.09	1.000
12315.0	27.89	Av	8.88	41.72	45.65	0.00	32.84	V	1.00	0.0	54.0	- 21.16	1.000
19704.0	34.44	Pk	0.00	21.90	0.00	0.00	56.34	V			74.0	- 17.66	1.000
19704.0	0.01	Av	0.00	21.90	0.00	0.00	21.92	V			54.0	- 32.08	1.000
19704.0	33.74	Pk	0.00	21.90	0.00	0.00	55.64	H			74.0	- 18.36	1.000
19704.0	0.01	Av	0.00	21.90	0.00	0.00	21.91	H			54.0	- 32.09	1.000
22167.0	34.46	Pk	0.00	21.23	0.00	0.00	55.69	V			74.0	- 18.31	1.000
22167.0	0.38	Av	0.00	21.23	0.00	0.00	21.61	V			54.0	- 32.39	1.000
22167.0	34.46	Pk	0.00	21.23	0.00	0.00	55.69	H			74.0	- 18.31	1.000
22167.0	0.38	Av	0.00	21.23	0.00	0.00	21.61	H			54.0	- 32.39	1.000

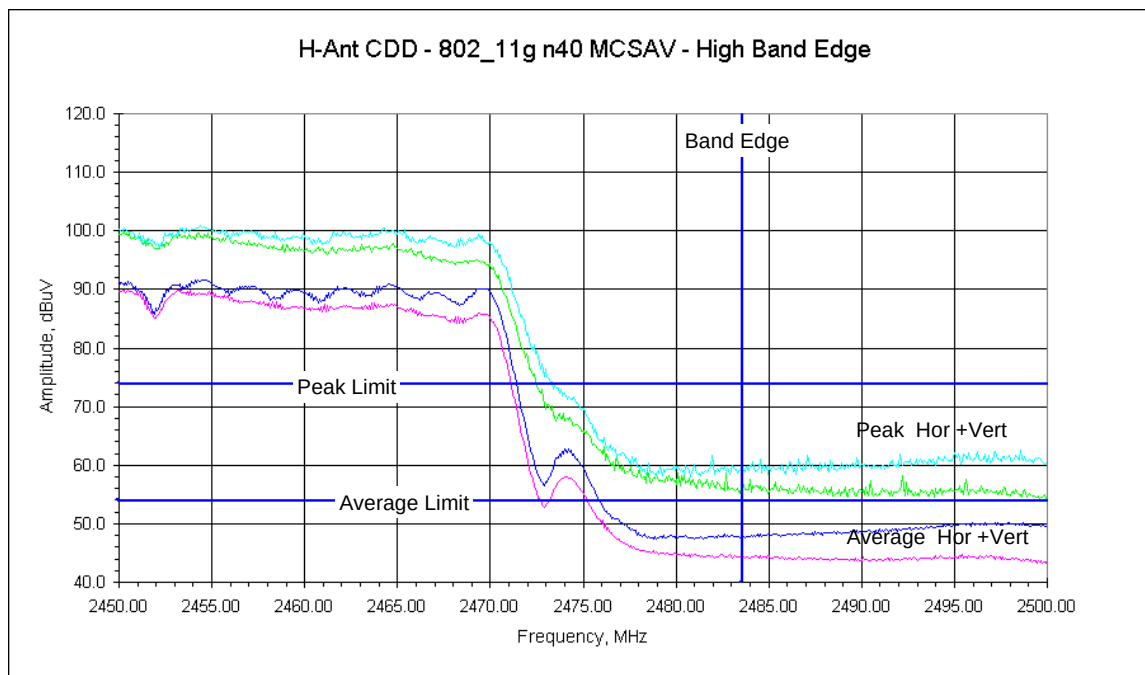
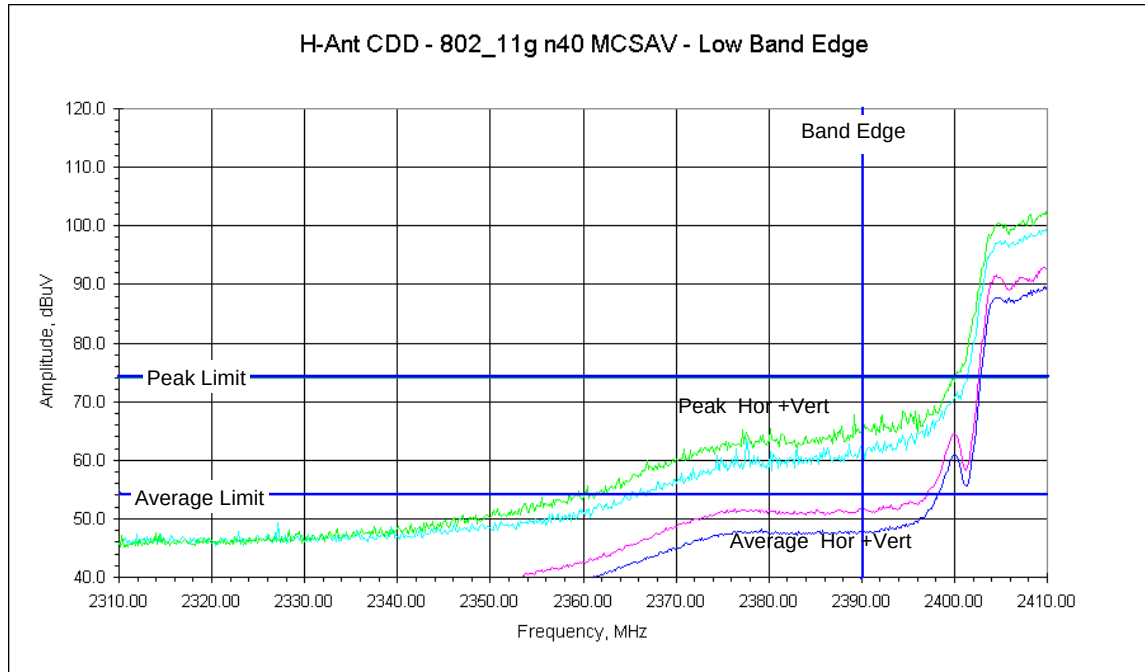
9.9.2 Band Edge in Restricted Bands – 802.11n HT20 Band B

Intertek

Report Number: 100900227DEN-003

Issued: 10/11/2012

FREQ	LEVEL	DET	CABLE	ANT	PREAMP	ATTEN	FINAL	POL	HGT	AZ	Limit	DELTA1	RBW
<u>MHz</u>	<u>dBuV</u>	Qp Av Pk	+ [dB]	+ [dB/m]	- [dB]	+ [dB]	= [dBuV]	(V/H)	(m)	(DEG)	15.209 >1GHz	15.209 >1GHz	(MHz)
19504.0	34.07	Pk	0.00	22.14	0.00	0.00	56.21	V			74.0	- 17.79	1.000
19504.0	0.25	Av	0.00	22.14	0.00	0.00	22.39	V			54.0	- 31.61	1.000
19504.0	35.19	Pk	0.00	22.14	0.00	0.00	57.33	H			74.0	- 16.67	1.000
19504.0	0.22	Av	0.00	22.14	0.00	0.00	22.36	H			54.0	- 31.64	1.000
High Ch - Both Ant													
7355.7	52.82	Pk	6.48	36.78	39.16	0.48	57.41	H	1.42	358.7	74.0	- 16.59	1.000
7355.7	39.45	Av	6.48	36.78	39.16	0.48	44.04	H	1.42	358.7	54.0	- 9.96	1.000
7354.1	50.14	Pk	6.48	36.78	39.16	0.48	54.73	V	1.45	39.0	74.0	- 19.27	1.000
7354.1	37.20	Av	6.48	36.78	39.16	0.48	41.79	V	1.45	39.0	54.0	- 12.21	1.000
12260.0	41.04	Pk	8.85	41.22	45.63	0.00	45.49	H	1.00	360.0	74.0	- 28.51	1.000
12260.0	27.89	Av	8.85	41.22	45.63	0.00	32.33	H	1.00	360.0	54.0	- 21.67	1.000
12260.0	42.24	Pk	8.85	41.22	45.63	0.00	46.68	V	1.00	0.0	74.0	- 27.32	1.000
12260.0	27.91	Av	8.85	41.22	45.63	0.00	32.35	V	1.00	0.0	54.0	- 21.65	1.000
19616.0	33.00	Pk	0.00	21.98	0.00	0.00	54.98	V			74.0	- 19.02	1.000
19616.0	0.01	Av	0.00	21.98	0.00	0.00	22.00	V			54.0	- 32.00	1.000
19616.0	32.50	Pk	0.00	21.98	0.00	0.00	54.48	H			74.0	- 19.52	1.000
19616.0	0.02	Av	0.00	21.98	0.00	0.00	22.00	H			54.0	- 32.00	1.000
22068.0	34.16	Pk	0.00	21.33	0.00	0.00	55.49	V			74.0	- 18.51	1.000
22068.0	0.38	Av	0.00	21.33	0.00	0.00	21.71	V			54.0	- 32.29	1.000
22068.0	34.16	Pk	0.00	21.33	0.00	0.00	55.49	H			74.0	- 18.51	1.000
22068.0	0.38	Av	0.00	21.33	0.00	0.00	21.71	H			54.0	- 32.29	1.000

9.10.2 Band Edge in Restricted Bands – 802.11n HT40 Band B

9.11 Test Data – 802.11a Band A

9.11.1 Radiated Harmonics in Restricted Bands – 802.11a

Test Report #:	100900227DEN-004	Test Area:	CC1	Temperature:		C
Test Method:		Test Date:		Relative Humidity:		%
EUT Model #:	ID:058	EUT Power:	120V / 60Hz	Air Pressure:		kPa
EUT Serial #:	EMC1				Page:	
Manufacturer:	Echostar			Level Key		
EUT Description:	Advanced Satellite Receiver Set-Top Box			Pk - Peak	Nb - Narrow Band	
Notes:				Qp - QuasiPeak	Bb - Broad Band	
				Av - Average		

FREQ	LEVEL	DET	CABLE	ANT	PREAMP	ATTEN	FINAL	POL	HGT	AZ	Limit	DELTA1	RBW
MHz	dBuV	Qp Av Pk	+ [dB]	+ [dB/m]	- [dB]	+ [dB]	= [dBuV]	(V/H)	(m)	(DEG)	dBuV/m	15.209 >1GHz	(MHz)

802.11a

Low Ch - CDD

11490.0	52.09	Pk	8.46	39.14	46.96	0.99	53.72	H	1.38	324.0	74.0	- 20.28	1.00
11490.0	36.86	Av	8.46	39.14	46.96	0.99	38.49	H	1.38	324.0	54.0	- 15.51	1.00
11490.0	53.93	Pk	8.46	39.14	46.96	0.99	55.56	V	1.48	344.0	74.0	- 18.44	1.00
11490.0	38.56	Av	8.46	39.14	46.96	0.99	40.19	V	1.48	344.0	54.0	- 13.81	1.00

No harmonics were found above 18GHz. The following are noise floor measurements.

22980.0	33.91	Pk	0.00	21.38	0.00	0.00	55.29	V			74.0	- 18.71	1.00
22980.0	- 0.51	Av	0.00	21.38	0.00	0.00	20.87	V			54.0	- 33.13	1.00
22980.0	32.53	Pk	0.00	21.38	0.00	0.00	53.91	H			74.0	- 20.09	1.00
22980.0	- 0.54	Av	0.00	21.38	0.00	0.00	20.84	H			54.0	- 33.16	1.00

Mid Ch - CDD

11570.0	52.69	Pk	8.49	39.26	46.74	0.99	54.68	H	1.47	334.0	74.0	- 19.32	1.00
11570.0	36.86	Av	8.49	39.26	46.74	0.99	38.85	H	1.47	334.0	54.0	- 15.15	1.00
11570.0	55.12	Pk	8.49	39.26	46.74	0.99	57.11	V	1.54	350.0	74.0	- 16.89	1.00
11570.0	39.32	Av	8.49	39.26	46.74	0.99	41.31	V	1.54	350.0	54.0	- 12.69	1.00

Mid Ch - Ant 0

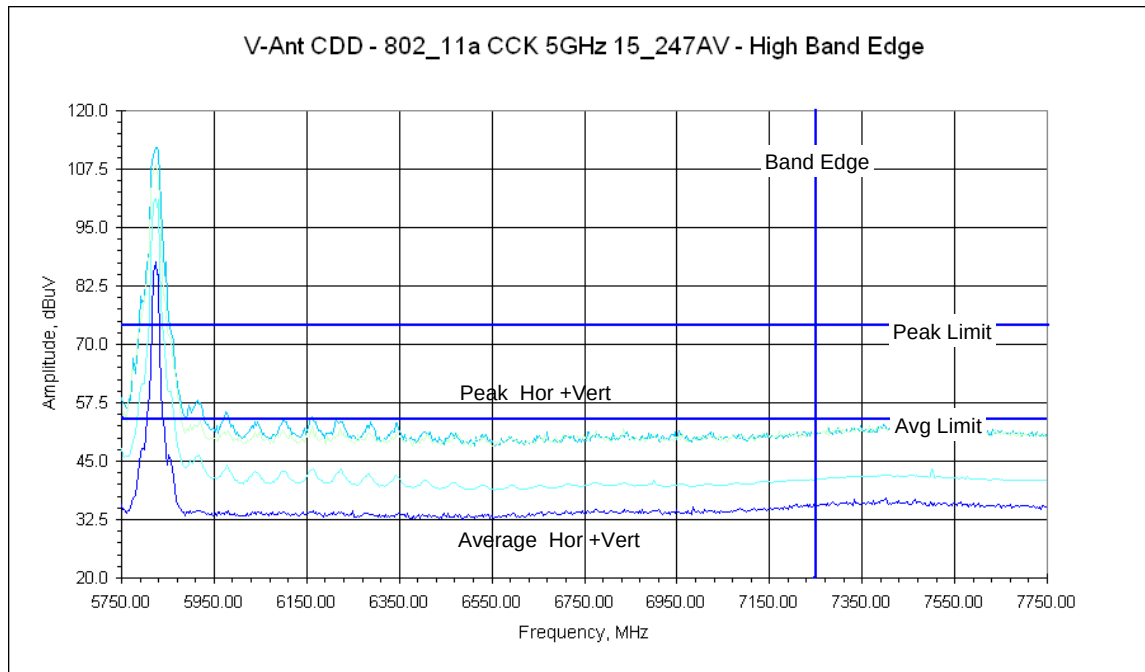
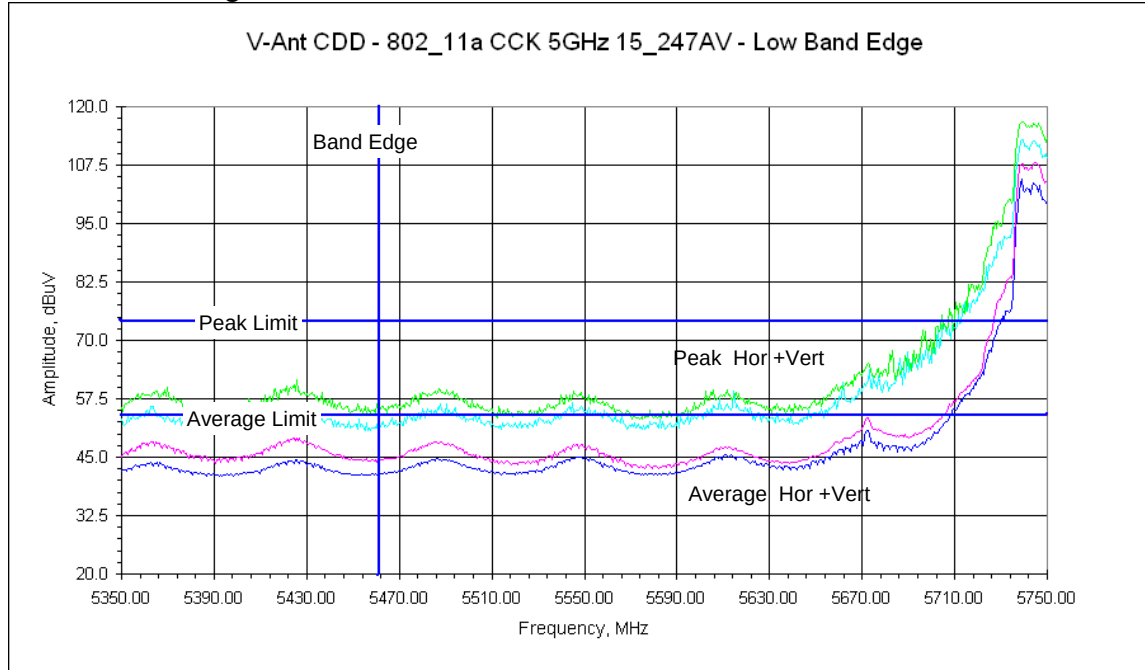
11570.0	43.14	Pk	8.49	39.26	46.74	0.99	45.13	H	1.75	4.0	74.0	- 28.87	1.00
11570.0	30.04	Av	8.49	39.26	46.74	0.99	32.03	H	1.75	4.0	54.0	- 21.97	1.00
11570.0	42.32	Pk	8.49	39.26	46.74	0.99	44.31	V	1.49	255.0	74.0	- 29.69	1.00
11570.0	28.66	Av	8.49	39.26	46.74	0.99	30.65	V	1.49	255.0	54.0	- 23.35	1.00

Mid Ch - Ant 1

11570.0	54.10	Pk	8.49	39.26	46.74	0.99	56.09	H	1.43	346.0	74.0	- 17.91	1.00
11570.0	39.54	Av	8.49	39.26	46.74	0.99	41.53	H	1.43	346.0	54.0	- 12.47	1.00
11570.0	54.88	Pk	8.49	39.26	46.74	0.99	56.87	V	1.75	0.0	74.0	- 17.13	1.00
11570.0	39.38	Av	8.49	39.26	46.74	0.99	41.37	V	1.75	0.0	54.0	- 12.63	1.00

High Ch - CDD

11650.0	55.55	Pk	8.53	39.29	46.53	0.99	57.82	H	1.43	348.0	74.0	- 16.18	1.00
11650.0	39.31	Av	8.53	39.29	46.53	0.99	41.58	H	1.43	348.0	54.0	- 12.42	1.00
11650.0	55.72	Pk	8.53	39.29	46.53	0.99	57.99	V	1.52	357.0	74.0	- 16.01	1.00
11650.0	39.99	Av	8.53	39.29	46.53	0.99	42.26	V	1.52	357.0	54.0	- 11.74	1.00

9.11.2 Band Edge in Restricted Bands – 802.11a Band A

9.12 Test Data – 802.11n HT20 Band A

9.12.1 Radiated Harmonics in Restricted Bands

Test Report #:	100900227DEN-004	Test Area:	CC1	Temperature:		C
Test Method:		Test Date:		Relative Humidity:		%
EUT Model #:	ID:058	EUT Power:	120V / 60Hz	Air Pressure:		kPa
EUT Serial #:	EMC1				Page:	
Manufacturer:	Echostar			Level Key		
EUT Description:	Advanced Satellite Receiver Set-Top Box			Pk - Peak	Nb - Narrow Band	
Notes:				Qp - QuasiPeak	Bb - Broad Band	
				Av - Average		

FREQ	LEVEL	DET	CABLE	ANT	PREAMP	ATTEN	FINAL	POL	HGT	AZ	Limit	DELTA1	RBW
MHz	dBuV	Qp Av Pk	+ [dB]	+ [dB/m]	- [dB]	+ [dB]	= [dBuV]	(V/H)	(m)	(DEG)	dBuV/m	15.209 >1GHz	(MHz)

802.11n(20) - CDD

Low Ch

11490.0	51.23	Pk	8.46	39.14	46.96	0.99	52.86	H	1.37	324.0	74.0	- 21.14	1.00
11490.0	37.08	Av	8.46	39.14	46.96	0.99	38.71	H	1.37	324.0	54.0	- 15.29	1.00
11490.0	50.83	Pk	8.46	39.14	46.96	0.99	52.46	V	1.76	3.0	74.0	- 21.54	1.00
11490.0	36.46	Av	8.46	39.14	46.96	0.99	38.09	V	1.76	3.0	54.0	- 15.91	1.00

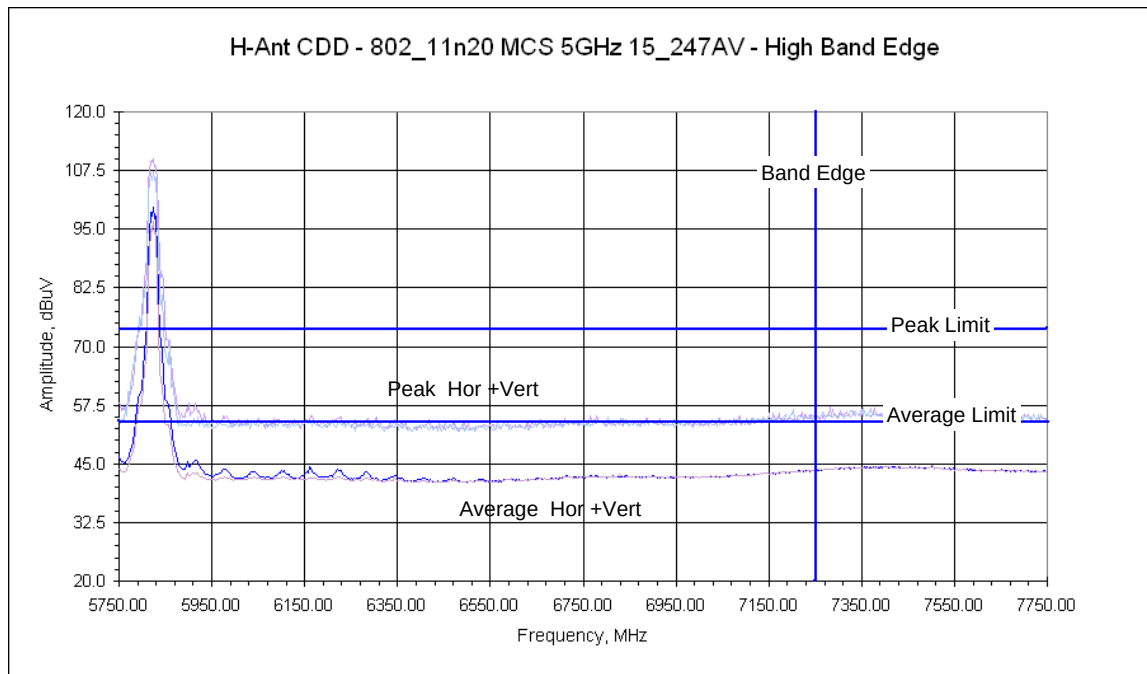
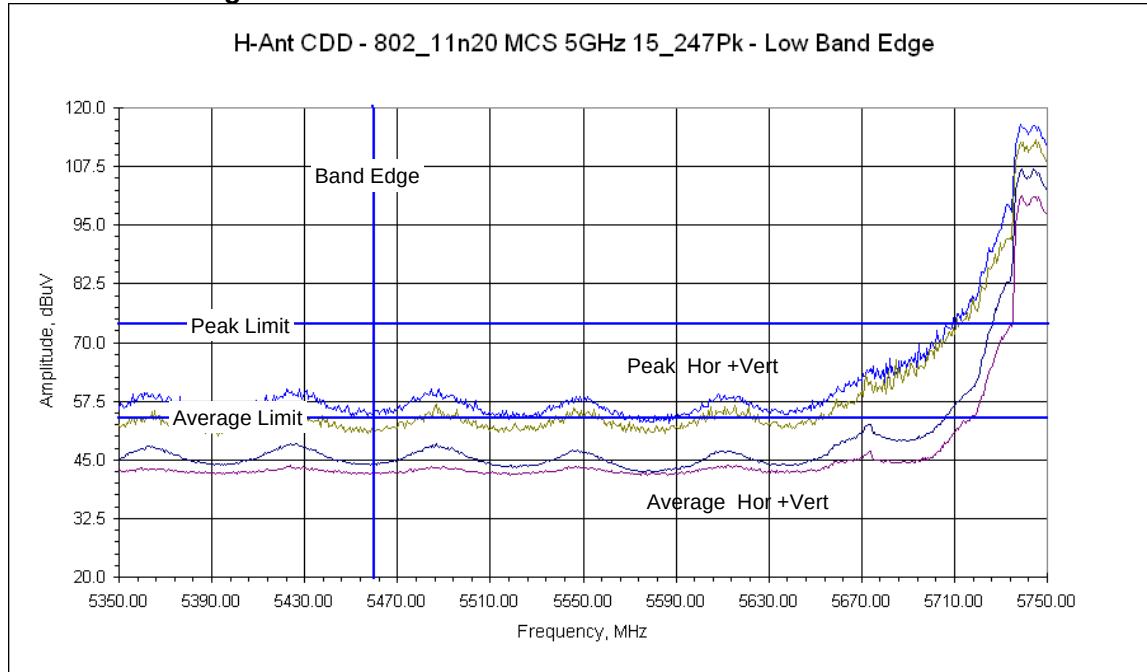
Mid Ch

11570.0	49.96	Pk	8.49	39.26	46.74	0.99	51.95	H	1.36	327.0	74.0	- 22.05	1.00
11570.0	36.47	Av	8.49	39.26	46.74	0.99	38.46	H	1.36	327.0	54.0	- 15.54	1.00
11570.0	50.97	Pk	8.49	39.26	46.74	0.99	52.96	V	1.56	356.0	74.0	- 21.04	1.00
11570.0	37.62	Av	8.49	39.26	46.74	0.99	39.61	V	1.56	356.0	54.0	- 14.39	1.00

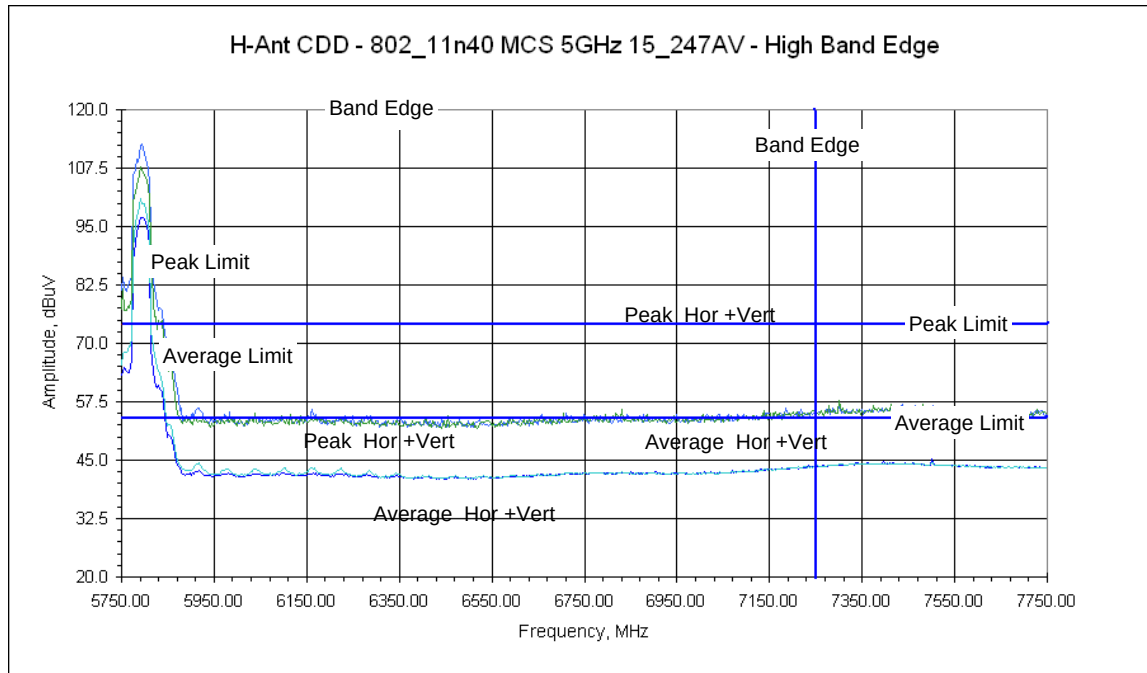
High Ch

11650.0	53.56	Pk	8.53	39.29	46.53	0.99	55.83	H	1.39	350.0	74.0	- 18.17	1.00
11650.0	38.67	Av	8.53	39.29	46.53	0.99	40.94	H	1.39	350.0	54.0	- 13.06	1.00
11650.0	54.55	Pk	8.53	39.29	46.53	0.99	56.82	V	1.30	354.0	74.0	- 17.18	1.00
11650.0	40.22	Av	8.53	39.29	46.53	0.99	42.49	V	1.30	354.0	54.0	- 11.51	1.00

9.12.2 Band Edge in Restricted Bands – 802.11n HT20 Band A



9.13.2 Band Edge in Restricted Bands – 802.11n HT40 Band A



Example calculation:

Measured Level		Transducer, Cable Loss & Amplifier corrections		Corrected Reading	Specification Limit		Corrected Reading		Delta Specification
(dBμV)	+	(dB)	=	(dBμV/m)	(dBμV/m)	-	(dBμV/m)	=	
14.0		14.9		28.9	40.0		28.9		-11.1

Notes: None

Deviations, Additions, or Exclusions: None

10 AC Mains Conducted Emissions

10.1 Method

Unless otherwise stated no deviations were made from FCC Part 15.207.

This testing was performed at Intertek Denver, located at 1795 Dogwood St. Suite 200, Louisville, CO 80027.

10.2 Test Equipment Used:

<u>Asset ID</u>	<u>Description</u>	<u>Manufacturer</u>	<u>Model</u>	<u>Serial</u>	<u>Cal Date</u>	<u>Cal Due</u>
18885	Transient Limiter	Hewlett-Packard	11947A	3107A00700	5/3/2012	5/3/2013
DEN-073	EMI Receiver	RHODE & SCHWARZ	ESU 26	100265	1/11/2012	1/10/2013
18914	Single Phase LISN	EMCO	3816/NM	9408-1003	4/5/2012	4/5/2013
SW-6	Software for Radiated and Conducted emissions.	Intertek	OATS vba	V. 2.0	VBV	VBV

10.3 Test Requirement:

The product must pass the AC Conducted average and quasi-peak Class B Limits defined in FCC Part 15.207.

10.4 Test Procedure:

Measurements are carried out using quasi-peak and average detector receivers in accordance with CISPR 16. An AMN is required to provide a pre-determined impedance at all frequencies across the power feed at the point of measurement of terminal voltage and also to provide isolation of the circuit under test from the ambient noise on the power lines. An AMN as defined in CISPR 16 shall be used. The EUT is located so that the distance between the boundary of the EUT and the closest surface of the AMN is 0.8m.

Where a flexible mains cord is provided by the manufacturer, this shall be 1m long or if in excess of 1m, the excess cable is folded back and forth as far as possible so as to form a bundle not exceeding 0.4m in length.

The EUT is arranged and connected with cables terminated in accordance with the product specification.

Conducted disturbance is measured between the phase lead and the reference ground, and between the neutral lead and the reference ground. Both measured values are reported.

The EUT, where intended for tabletop use, is placed on a table whose top is 0.8m above the ground plane. A vertical, metal reference plane is placed 0.4m from the EUT. The vertical metal reference-plane is at least 2m by 2m. The EUT shall be kept at least 0.8m from any other metal surface or other ground plane not being part of the EUT. The table is constructed of non-conductive materials. Its dimensions are 1m by 1.5m, but may be extended for larger EUT.

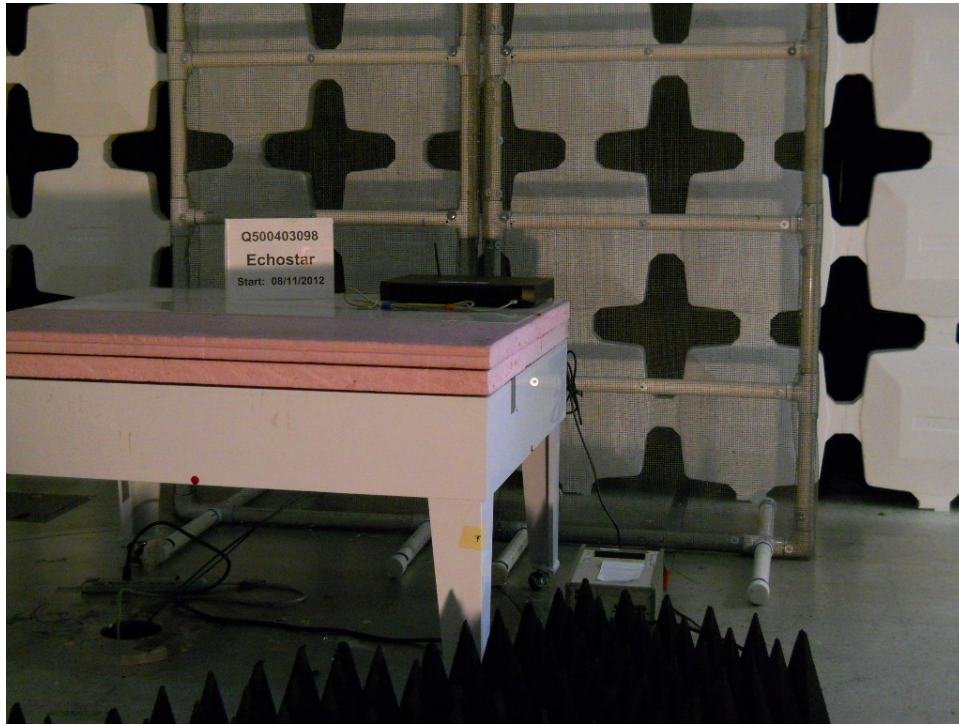
Equipment setup for conducted disturbance tests followed the guidelines of ANSI C63.4.

10.5 Test Results:

The sample tested was found to Comply.

10.6 Setup Photographs:

Test Setup – Conducted Emissions (Front View)

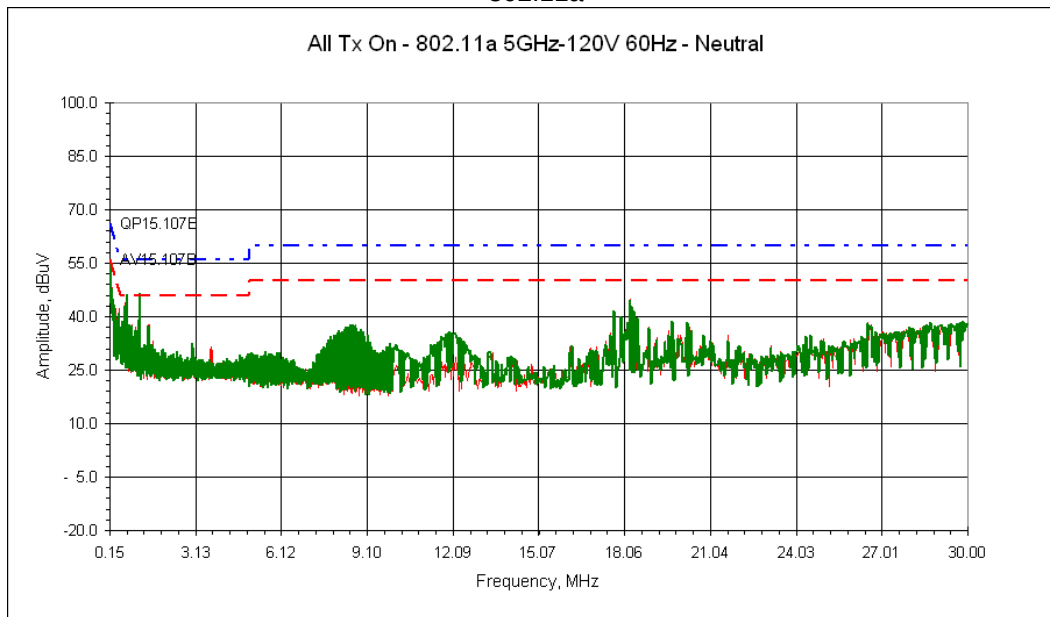


Test Setup – Conducted Emissions (Side View)

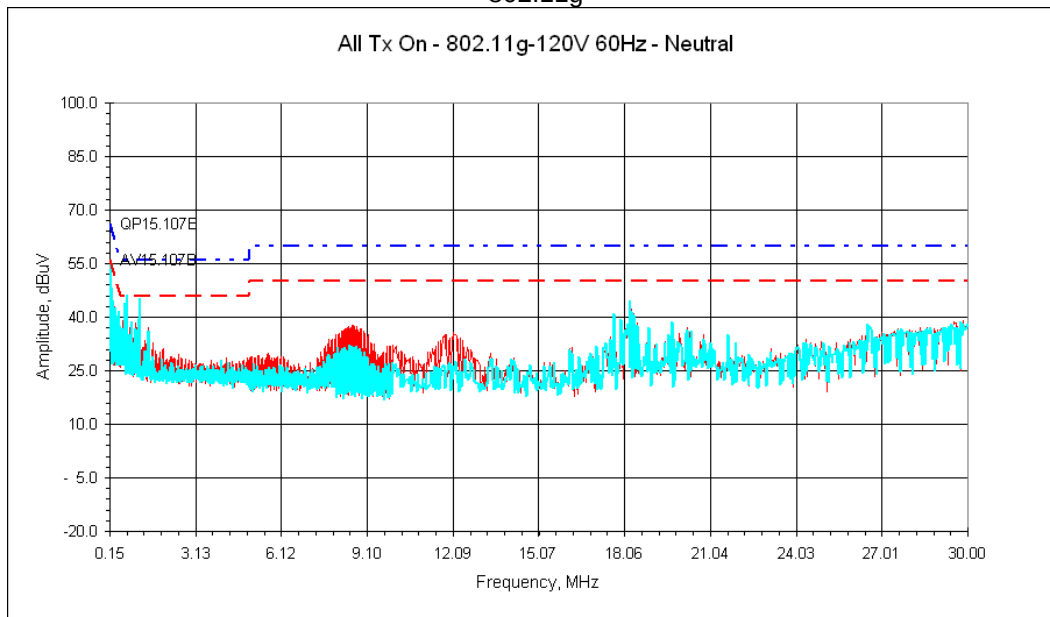


10.7 Plots: Tx Enabled Conducted Emissions

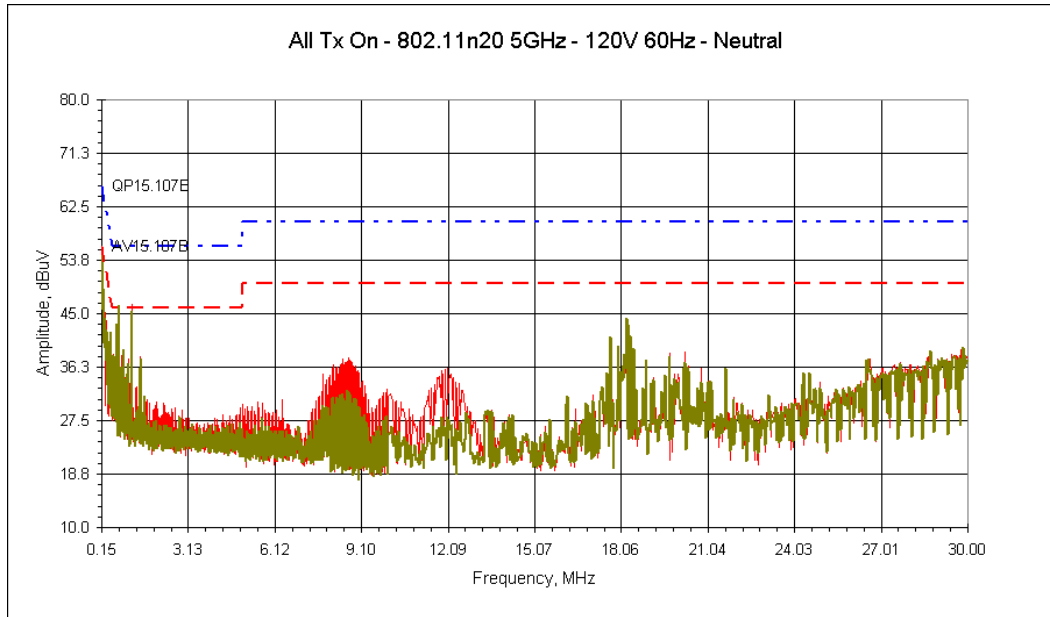
Conducted Emissions – FCC 15.207 (150 kHz to 30 MHz)
802.11a



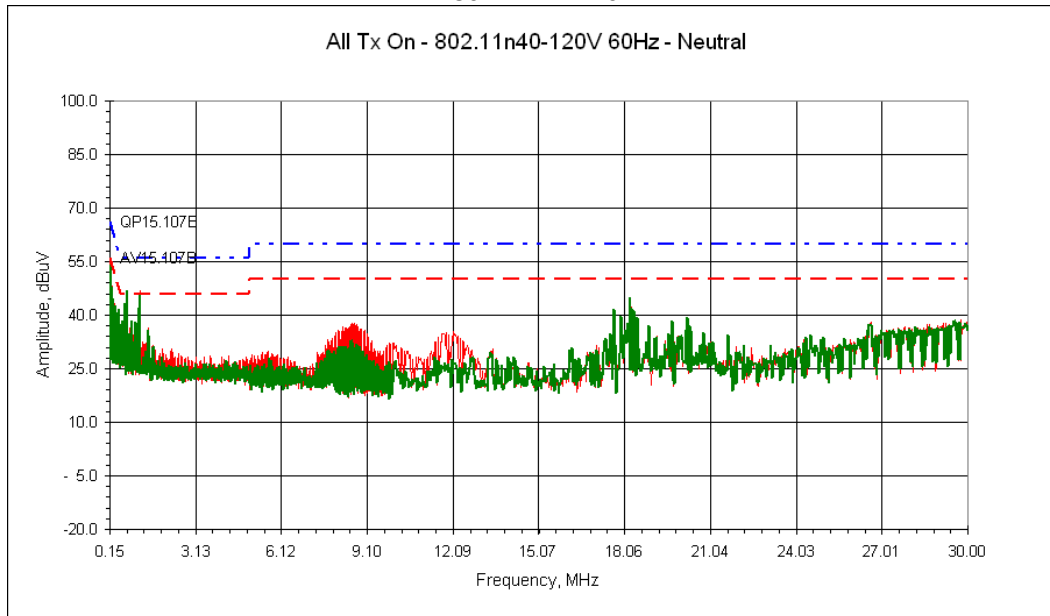
802.11g



802.11n HT20



802.11n HT40

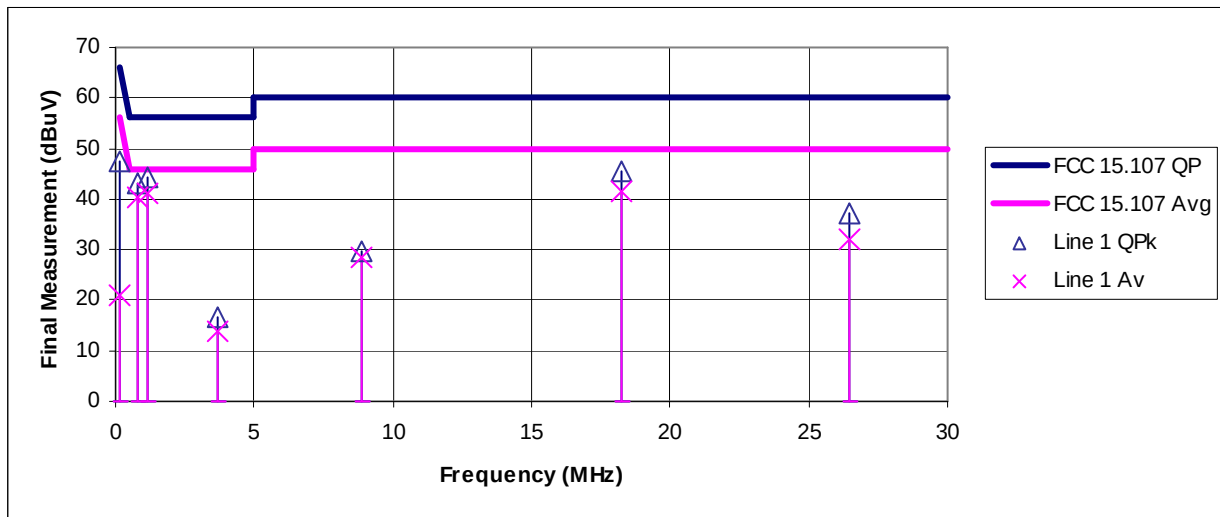


Note: Peak measurements plotted against FCC 15.207 Average & Quasi-Peak Limit

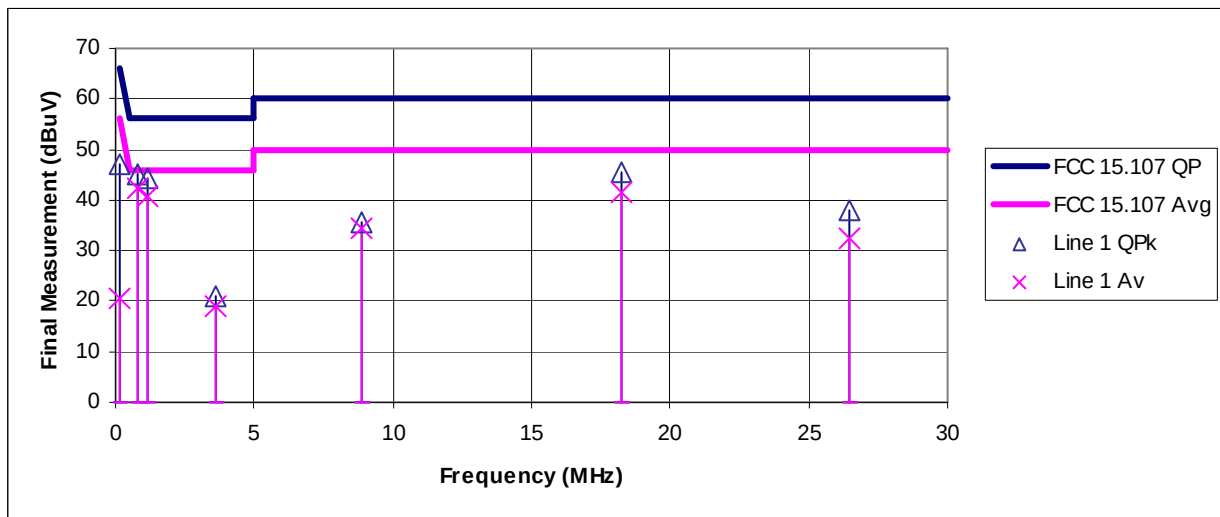
Plots: Final Quasi-Peak and Average Measurements

Conducted Emissions – FCC 15.207 (150 kHz to 30 MHz)

Line 1



Neutral



10.8 Test Data: Tx Enabled Conducted Emissions

Conducted Electromagnetic Emissions

Test Report #: 100900227DEN-001	Test Area: CC1 Radiated	Temperature: 22.4 °C
Test Method: FCC Part 15.207	Test Date: 9/25/2012	Relative Humidity: 20.2 %
EUT Model #: ID:058	EUT Power: 120VAC/60Hz	Air Pressure: 83.69 kPa
EUT Serial #: EMC1		
Manufacturer: Echostar		
EUT Description: Advanced Satellite Receiver		

Notes: **Product configured for Tx mode - modulated - worst-case data**

No significant difference seen between modulations of the 802.11 radio. All measurements taken with 802.11n HT20 modulation.

Level Key	
Pk – Peak	Nb – Narrow Band
Qp – QuasiPeak	Bb – Broad Band
Av - Average	

FREQ	LEVEL	DET	CABLE	LISN	PREAMP	ATTEN	FINAL	TEST POINT	DELTA1	DELTA2	RBW
<u>MHz</u>	<u>dBuV</u>	Qp Av Pk	+ [dB]	+ [dB/m]	- [dB]	+ [dB]	= [dBuV]	Other - N - L1 - L2 - L3	QP 15.107B	AV 15.107B	(MHz)
0.151	37.43	Qp	0.10	0.04	0.00	9.95	47.52	Line 1	- 18.41	NA	0.009
0.151	10.92	Av	0.10	0.04	0.00	9.95	21.01	Line 1	NA	- 34.92	0.009
0.760	33.00	Qp	0.21	0.03	0.00	9.97	43.21	Line 1	- 12.79	NA	0.009
0.760	30.10	Av	0.21	0.03	0.00	9.97	40.31	Line 1	NA	- 5.69	0.009
1.189	34.16	Qp	0.20	0.03	0.00	9.97	44.36	Line 1	- 11.64	NA	0.009
1.189	31.07	Av	0.20	0.03	0.00	9.97	41.27	Line 1	NA	- 4.73	0.009
3.684	6.45	Qp	0.30	0.04	0.00	9.97	16.76	Line 1	- 39.24	NA	0.009
3.684	3.63	Av	0.30	0.04	0.00	9.97	13.94	Line 1	NA	- 32.06	0.009
8.848	19.15	Qp	0.50	0.10	0.00	9.99	29.74	Line 1	- 30.26	NA	0.009
8.848	17.88	Av	0.50	0.10	0.00	9.99	28.47	Line 1	NA	- 21.53	0.009
18.243	34.12	Qp	1.10	0.19	0.00	10.02	45.42	Line 1	- 14.58	NA	0.009
18.243	30.06	Av	1.10	0.19	0.00	10.02	41.36	Line 1	NA	- 8.64	0.009
26.488	25.89	Qp	1.20	0.17	0.00	10.04	37.30	Line 1	- 22.70	NA	0.009
26.488	20.76	Av	1.20	0.17	0.00	10.04	32.17	Line 1	NA	- 17.83	0.009
0.151	36.93	Qp	0.10	0.04	0.00	9.95	47.02	Line 2	- 18.91	NA	0.009
0.151	10.44	Av	0.10	0.04	0.00	9.95	20.53	Line 2	NA	- 35.40	0.009
0.760	34.72	Qp	0.21	0.02	0.00	9.97	44.92	Line 2	- 11.08	NA	0.009
0.760	32.09	Av	0.21	0.02	0.00	9.97	42.29	Line 2	NA	- 3.71	0.009
1.189	33.94	Qp	0.20	0.02	0.00	9.97	44.14	Line 2	- 11.86	NA	0.009
1.189	30.54	Av	0.20	0.02	0.00	9.97	40.74	Line 2	NA	- 5.26	0.009
3.624	10.77	Qp	0.30	0.03	0.00	9.97	21.08	Line 2	- 34.92	NA	0.009
3.624	8.76	Av	0.30	0.03	0.00	9.97	19.07	Line 2	NA	- 26.93	0.009
8.848	24.88	Qp	0.50	0.11	0.00	9.99	35.47	Line 2	- 24.53	NA	0.009
8.848	23.91	Av	0.50	0.11	0.00	9.99	34.50	Line 2	NA	- 15.50	0.009
18.243	34.11	Qp	1.10	0.19	0.00	10.02	45.42	Line 2	- 14.58	NA	0.009
18.243	30.02	Av	1.10	0.19	0.00	10.02	41.33	Line 2	NA	- 8.67	0.009
26.488	26.35	Qp	1.20	0.26	0.00	10.04	37.85	Line 2	- 22.15	NA	0.009
26.488	21.06	Av	1.20	0.26	0.00	10.04	32.56	Line 2	NA	- 17.44	0.009

Intertek	
Report Number: 100900227DEN-003	Issued: 10/11/2012

Example calculation:

Measured Level	+	Transducer, Cable Loss & Amplifier corrections	=	Corrected Reading	Specification Limit	-	Corrected Reading	=	Delta Specification
(dBμV)		(dB)		(dBμV/m)	(dBμV/m)		(dBμV/m)		
14.0		14.9		28.9	40.0		28.9		-11.1

Notes: No significant difference seen between modulations of the 802.11 radio. All measurements taken with 802.11n HT20 modulation.

Deviations, Additions, or Exclusions: None

Intertek	
Report Number: 100900227DEN-003	Issued: 10/11/2012

11 Antenna Requirements

11.1 Method

Unless otherwise stated no deviations were made from FCC Part 15.203..

This testing was performed at Intertek Denver, located at 1795 Dogwood St. Suite 200, Louisville, CO 80027.

11.2 Results:

The sample tested was found to comply.

The product incorporates internal embedded antennas with U.FL compatible cable connectors.
The user has no direct access to the antennas.

12 Measurement Uncertainty

The measured value related to the corresponding limit will be used to decide whether the equipment meets the requirements.

The measurement uncertainty figures were calculated and correspond to a coverage factor of $k = 2$, providing a confidence level of respectively 95.45 % in the case where the distributions characterizing the actual measurement uncertainties are normal (Gaussian).

Measurement uncertainty Table

Parameter	Uncertainty $\pm$	Notes
Radiated emissions, 10kHz to 1000 MHz	4.4 dB	
Radiated emissions, 1 to 18 GHz	4.7 dB	
AC mains Conducted emissions, 9kHz to 30 MHz	3.14 dB	
Disturbance Power 30 to 1000 MHz	3.3 dB	
Telecom Port Conducted emissions, Voltage 150 kHz to 30 MHz	3.11 dB	

13 Necessary Modifications

The following Power Indices were necessary for compliance:

Band B – 2GHz

802.11b

Both Antennas: PI=16

802.11g

Both Antennas: PI=36

802.11n HT20

Both Antennas: PI=36

802.11n HT40

Both Antennas: PI=40

Band A – 5GHz

802.11a

Both Antennas: PI=6

802.11n HT20

Both Antennas: PI=6

802.11n HT40

Both Antennas: PI=6

Power index factors were not optimized per antenna. The software didn't allow for individual power index factors assigned to each antenna. Only one power index factor was allowed to set both antennas.

Intertek	
Report Number: 100900227DEN-003	Issued: 10/11/2012

14 Revision History

Revision Level	Date	Report Number	Notes
0	10/10/2012	100900227DEN-003	Original Issue