FCC 47 CFR PART 15 SUBPART C AND ANSI C63.4:2003 TEST REPORT

For

WiFi Broadband Router

Model : CDW68AAM-U01

Data Applies To: WGR-8020

Trade Name : AMIT , ZALiP

Issued for

Advance Multimedia Internet Technology Inc.

No.28, Lane 31 , Sec. 1 , Huandong Rd. , Sinshih District , Tainan City 74146 , Taiwan

Issued by

Compliance Certification Services Inc.
Tainan Lab.
No.8,Jiucengling, Xinhua Dist., Tainan City 712, Taiwan (R.O.C.)
TEL: 886-6-580-2201
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Issued Date: October 11, 2012

Revision History

Rev.	Issue Date	Revisions	Effect Page	Revised By
00	February 13, 2012	Initial Issue	ALL	Sunny Chang
01	August 14, 2012	Update test data	Page 44-80; 163	Sunny Chang
02	October 11, 2012	Add test data	Page 82-85	Sunny Chang

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1. TEST REPORT CERTIFICATION

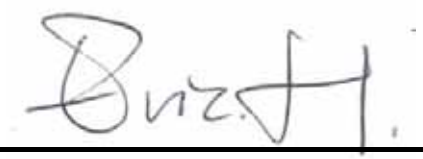
Applicant	：Advance Multimedia Internet Technology Inc.
Address	：No.28, Lane 31 , Sec. 1 , Huandong Rd. , Sinshih District , Tainan City 74146 , Taiwan
Manufacturer	：Advance Multimedia Internet Technology Inc.
Address	：No.28, Lane 31 , Sec. 1 , Huandong Rd. , Sinshih District , Tainan City 74146 , Taiwan
Equipment Under Test	：WiFi Broadband Router
Model Number	：CDW68AAM-U01
Data Applies To	：WGR-8020
Brand Name	：AMIT , ZALiP
Date of Test	：November 30, 2011 ~ December 31, 2011

APPLICABLE STANDARD	
Standard	**Test Result**
FCC Part 15 Subpart C AND ANSI C63.4:2003	PASS

WE HEREBY CERTIFY THAT: The above equipment has been tested by Compliance Certification Services Inc., and found compliance with the requirements set forth in the technical standards mentioned above. The results of testing in this report apply only to the product/system, which was tested. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.

Approved by: ***Reviewed by:***

Jeter Wu
Assistant Manager



Eric Huang
Assistant Section Manager

2. EUT DESCRIPTION

Product Name	WiFi Broadband Router
Model Number	CDW68AAM-U01
Data Applies To	WGR-8020
Brand Name	AMIT , ZALiP
Identify Number	T120109N03
Received Date	January 09, 2012
Frequency Range	IEEE 802.11b/g, 802.11n HT20 : 2412MHz~2462MHz IEEE 802.11n HT40 : 2422MHz~2452MHz IEEE 802.11a, IEEE 802.11n HT20 : 5745MHz~5805MHz IEEE 802.11n HT40 : 5745MHz~5805MHz
Transmit Power	IEEE 802.11b (2.4G) : 19.46 dBm IEEE 802.11g (2.4G) : 21.31 dBm IEEE 802.11n HT20 (2.4G) : 21.76 dBm IEEE 802.11n HT40 (2.4G) : 21.56 dBm IEEE 802.11a (5G) : 16.23 dBm IEEE 802.11n HT20 (5G) : 17.57 dBm IEEE 802.11n HT40 (5G) : 18.66 dBm
Channel Spacing	IEEE 802.11b/g, 802.11n HT20/HT40 (2.4G) : 5MHz IEEE 802.11a, 802.11n HT20 (5G) : 20MHz IEEE 802.11n HT40 (5G) : 10MHz
Channel Number	IEEE 802.11b/g, 802.11n HT20 (2.4G) : 11 Channels IEEE 802.11n HT40 (2.4G) : 7 Channels IEEE 802.11a, 802.11n HT20 (5G) : 4 Channels IEEE 802.11n HT40 (5G) : 6 Channels
Transmit Data Rate	IEEE 802.11b (2.4G) : 11, 5.5, 2, 1 Mbps IEEE 802.11g (2.4G) : 54, 48 ,36, 24, 18, 12, 9, 6 Mbps IEEE 802.11n HT20 (2.4G) : 130, 117, 104, 78, 65, 58.5, 52, 39, 26, 19.5, 13, 6.5 Mbps IEEE 802.11n HT40 (2.4G) : 300, 270, 243, 216, 162, 150, 135, 121.5, 108, 81, 54 , 40.5 , 27 , 13.5 Mbps IEEE 802.11a (5G) : 54, 48 ,36, 24, 18, 12, 9, 6 Mbps IEEE 802.11n HT20 (5G) : 195 , 175.5 , 156 , 130 , 117 , 104 , 78 , 65 , 58.5 , 52 , 39 , 26 , 19.5 , 13 , 6.5 Mbps IEEE 802.11n HT40 (5G) :450, 405, 364.5, 324, 300, 270, 243, 216, 162, 150, 135, 121.5, 108, 81, 54, 40.5, 27, 13.5 Mbps

Type of Modulation	IEEE 802.11b (2.4G) : DSSS (CCK, DQPSK, DBPSK) IEEE 802.11g (2.4G) : OFDM (64QAM, 16QAM, QPSK, BPSK) IEEE 802.11n HT20/40 (2.4G) : OFDM (64QAM, 16QAM, QPSK, BPSK) IEEE 802.11a (5G) : OFDM (64QAM, 16QAM, QPSK, BPSK) IEEE 802.11n HT20/40 (5G) : OFDM (64QAM, 16QAM, QPSK, BPSK)
Antenna Type	**Three antennas** **Detachable antenna** Manufacture: WIESON TECHNOLOGIES CO., LTD. Type: Dipole Antenna Model: GY121HT467-003 Gain: 2.4G: 2.28dBi (2TX2RX); 5G: 4.13dBi (3TX3RX) Connector: SMA MALE (RP) **Integrated antenna** Manufacture: WEISON TECHNOLOGIES CO., LTD. Type: Dipole Model: GY121HT467-007 Gain: 1.92dBi for 2.4GHz (2TX2RX), 3.57dBi for 5GHz (3TX3RX) Connector: SMA MALE(RP)
Power Rating	12Vdc; 1.5A(Powered from Adapter)
Power Source	**Powered from adapter** Brand: CWT Model: CAP018121 Input: 100-240Vac, 47-63Hz, 0.6A Output: 12Vdc, 1.5A
Test Voltage	120Vac, 60Hz

Remark :

1. *Client consigns only one model sample to test (Model Number: CDW68AAM-U01 (Black)).*
2. *The sample selected for test was engineering sample that approximated to production product and was provided by manufacturer.*
3. *For more details, please refer to the User's manual of the EUT.*
4. *This submittal(s) (test report) is intended for FCC ID: **PBLCDW68AAMU01** filing to comply with Section 15.207, 15.209 and 15.247 of the FCC Part 15, Subpart C Rules.*
5. *The listed models(WGR-8020)are all the same of the original model(CDW68AAM-U01), design, except for different models name and is just for the marketing purpose.*
6. *To add a series model is for business necessary. The different of the each model is shown as below:*

Model	CDW68AAM-U01 WGR-8020	
External Color	Black	White
Antenna	**【Detachable antenna*3】** 2.28dBi(2.4G) 4.13dBi(5G)	**【Integrated antenna*2 + Detachable antenna*1】** 1.92dBi(2.4G) 3.57dBi(5G)
Remark: More details, please refer to the EUT photo.		

3. DESCRIPTION OF TEST MODES

Conducted Emission / Radiated Emission Test (Below 1 GHz)

1. The following test modes were scanned during the preliminary test:

No.	Pre-Test Mode
1	TX Mode

2. After the preliminary scan, the following test mode was found to produce the highest emission level.

Final Test Mode		
Emission	Radiated Emission	TX Mode
	Conducted Emission	TX Mode

Remark : *Then, the above highest emission mode of the configuration of the EUT and cable was chosen for all final test items.*

Conducted / Radiated Emission Test (Above 1 GHz)

IEEE 802.11b, 802.11g, 802.11n HT20 mode

The EUT had been tested under operating condition.

There are three channels have been tested as following :

Channel	Frequency (MHz)
Low	2412
Middle	2437
High	2462

IEEE 802.11b mode : 1Mbps data rate (worst case) were chosen for full testing.

IEEE 802.11g mode : 6Mbps data rate (worst case) were chosen for full testing.

IEEE 802.11n HT20 mode : 6.5Mbps data rate (worst case) were chosen for full testing.

IEEE 802.11n HT40 mode

The EUT had been tested under operating condition.

There are three channels have been tested as following :

Channel	Frequency (MHz)
Low	2422
Middle	2437
High	2452

IEEE 802.11n HT40 mode : 13.5Mbps data rate (worst case) were chosen for full testing.

While all conducted test the spectrum / power meter was connected to the Booster RF-out for 2.4GHz and the chain 1 of WiFi module for 5GHz.

IEEE 802.11a, 802.11n HT20 mode

The EUT had been tested under operating condition.

There are three channels have been tested as following :

Channel	Frequency (MHz)
Low	5745
Middle	5785
High	5805

IEEE 802.11a mode : 6Mbps data rate (worst case) were chosen for full testing.

IEEE 802.11n HT20 mode : 13Mbps data rate (worst case) were chosen for full testing.

IEEE 802.11n HT40 mode

The EUT had been tested under operating condition.

There are three channels have been tested as following :

Channel	Frequency (MHz)
Low	5745
Middle	5785
High	5805

IEEE 802.11n HT40 mode : 27Mbps data rate (worst case) were chosen for full testing.

4. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.4: 2003 and FCC CFR 47, 15.207, 15.209 and 15.247.

5. FACILITIES AND ACCREDITATION

5.1 FACILITIES

All measurement facilities used to collect the measurement data are located at

No.8,Jiucengling, Xinhua Dist., Tainan City 712, Taiwan (R.O.C.)

The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI

C63.4 and CISPR Publication 22.

5.2 ACCREDITATIONS

Our laboratories are accredited and approved by the following accreditation body according to ISO/IEC 17025.

Taiwan	TAF

The measuring facility of laboratories has been authorized or registered by the following approval agencies.

Canada	Industry Canada
Germany	TUV NORD
Taiwan	BSMI
USA	FCC

Copies of granted accreditation certificates are available for downloading from our web site, http:///www.ccsrf.com

5.3 MEASUREMENT UNCERTAINTY

The following table is for the measurement uncertainty, which is calculated as per the document CISPR 16-4-2.

PARAMETER	UNCERTAINTY
Radiated Emission, 30 to 200 MHz Test Site : OATS-6	±3.38dB
Radiated Emission, 200 to 1000 MHz Test Site : OATS-6	±3.04dB
Radiated Emission, 1 to 26.5 GHz	± 3.20dB
Power Line Conducted Emission	± 2.01dB

Uncertainty figures are valid to a confidence level of 95%, K=2

6. SETUP OF EQUIPMENT UNDER TEST

SUPPORT EQUIPMENT

For RF test

No.	Product	Manufacturer	Model No.	Certify No.	Signal cable
1	Note Book	IBM	T43	DoC	Power cable, unshd, 1.6m

No.	Signal cable description	
A	DC Power	Unshielded, 1.6m, 1pcs
B	LAN Cable	Unshielded, 1.0m, 1pcs

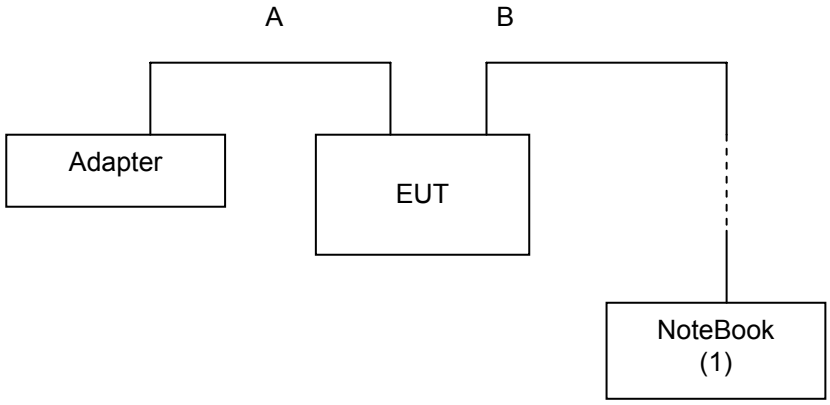
For EMI test

No.	Product	Manufacturer	Model No.	Certify No.	Signal cable
1	Note Book	IBM	R51	R33026	Power cable, unshd, 1.6m
2	Note Book	IBM	T43	DoC	Power cable, unshd, 1.6m
3	Note Book	IBM	R50E	DoC	Power cable, unshd, 1.6m
4	Flash Disk	Kingston	DTI/512	DoC	N/A
5	3G Modem	NOVATEL	Qualcomm 3G CDMA	PKRNVWMC727	N/A
6	HUB	BARRICAD	SMC7008BR	DoC	Power cable, unshd, 1.6m

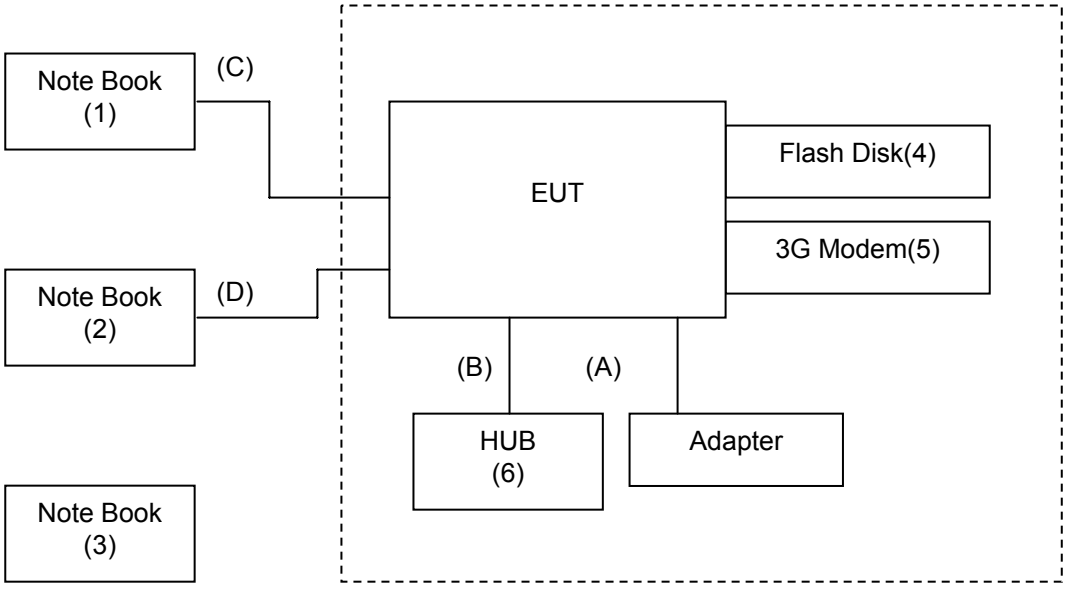
No.	Signal cable description	
A	DC Power	Unshielded, 1.6m, 1pcs
B	LAN	Unshielded, 2m, 3pcs
C	LAN	Unshielded, 10m, 1pcs
D	LAN	Unshielded, 10m, 1pcs

SETUP DIAGRAM FOR TESTS

For RF test



For EMI test



EUT OPERATING CONDITION

RF Setup (2.4G)

1. Set up all computers like the setup diagram.
2. The “Ralink QA Test Program for “RT5x9x QA” software was used for testing
   The EUT driver software installed in the host support equipment during testing was
   Ralink QA Test Program for “RT5x9x QA” Drive

TX Mode:

- ⇨ **Tx Mode:CCK 、OFDM、 HT MixMode** (Bandwidth: 20、40)
- ⇨ **Tx Data Rate: 1Mbps long** (IEEE 802.11b mode , TX)
  6Mbps (IEEE 802.11g mode , TX)
  13Mbps (IEEE 802.11n HT20 mode ,chain 0, chain 1 TX)
  27Mbps (IEEE 802.11n HT40 mode, chain 0, chain 1 TX**)**

Power control mode

Target Power: IEEE 802.11b Channel Low (2412MHz) =13
IEEE 802.11b Channel Middle (2437MHz) =13
IEEE 802.11b Channel High (2462MHz) = 13
Target Power: IEEE 802.11g Channel Low (2412MHz) = 13
IEEE 802.11g Channel Middle (2437MHz) = 13
IEEE 802.11g Channel High (2462MHz) = 13
Target Power: IEEE 802.11n HT20 Channel Low (2412MHz) = 13 **(Chain 0)**
IEEE 802.11 n HT20 Channel Middle (2437MHz) =13 **(Chain 0)**
IEEE 802.11 n HT20 Channel High (2462MHz) = 13 **(Chain 0)**
IEEE 802.11n HT20 Channel Low (2412MHz) = 1A **(Chain 1)**
IEEE 802.11 n HT20 Channel Middle (2437MHz) = 1A **(Chain 1)**
IEEE 802.11 n HT20 Channel High (2462MHz) = 1B **(Chain 1)**
Target Power: IEEE 802.11n HT40 Channel Low (2422MHz) = 13 **(Chain 0)**
IEEE 802.11 n HT40 Channel Middle (2437MHz) = 13 **(Chain 0)**
IEEE 802.11 n HT40 Channel High (2452MHz) = 13 **(Chain 0)**
IEEE 802.11n HT40 Channel Low (2422MHz) = 1A **(Chain 1)**
IEEE 802.11 n HT40 Channel Middle (2437MHz) = 1A **(Chain 1)**
IEEE 802.11 n HT40 Channel High (2452MHz) = 1A **(Chain 1)**

RX Mode：

MAC Address: FFFFFFFFFFFF

Start RX

3. All of the function are under run.
4. Start test.

Normal Link Setup

1. Set up all computers like the setup diagram.
2. All of the function are under run.
3. Notebook PC (2) ping 192.168.0.10 –t to Notebook PC (1).
4. Notebook PC (1) ping 192.168.0.20 –t to Notebook PC (2).
5. Notebook PC (1) ping 192.168.0.50 –t to Wireless Access Point (3).

Start test.

RF Setup (5G)

1. Set up all computers like the setup diagram.
2. The “Ralink QA Test Program for “RT3883QA” software was used for testing

   The EUT driver software installed in the host support equipment during testing was

   Ralink QA Test Program for “RT3883QA” Drive

TX Mode:

- ⇨ **Tx Mode: OFDM、 HT MixMode** (Bandwidth: 20、40)
- ⇨ **Tx Data Rate: 6Mbps** (IEEE 802.11a mode , TX)

  19.5Mbps (IEEE 802.11n HT20 mode ,chain 0, chain 1 , chain 2 TX)

  40.5Mbps (IEEE 802.11n HT40 mode, chain 0, chain 1 , chain 2 TX**)**

Power control mode

Target Power: IEEE 802.11a Channel Low (5745MHz) = 0E
IEEE 802.11a Channel Middle (5785MHz) = 0E
IEEE 802.11a Channel High (5805MHz) = 0F

Target Power: IEEE 802.11n HT20 Channel Low (5745MHz) = 0E **(Chain 0)**
IEEE 802.11 n HT20 Channel Middle (5785MHz) =0E **(Chain 0)**
IEEE 802.11 n HT20 Channel High (5805MHz) = 0F **(Chain 0)**
IEEE 802.11n HT20 Channel Low (5745MHz) = 0F **(Chain 1)**
IEEE 802.11 n HT20 Channel Middle (5785MHz) = 10 **(Chain 1)**
IEEE 802.11 n HT20 Channel High (5805MHz) = 10 **(Chain 1)**
IEEE 802.11n HT20 Channel Low (5745MHz) = 0F **(Chain 2)**
IEEE 802.11 n HT20 Channel Middle (5785MHz) = 0F **(Chain 2)**
IEEE 802.11 n HT20 Channel High (5805MHz) = 0F **(Chain 2)**

Target Power: IEEE 802.11n HT40 Channel Low (5745MHz) = 0E **(Chain 0)**
IEEE 802.11 n HT40 Channel Middle (5785MHz) = 0E **(Chain 0)**
IEEE 802.11 n HT40 Channel High (5805MHz) = 0F **(Chain 0)**
IEEE 802.11n HT40 Channel Low (5745MHz) = 0F **(Chain 1)**
IEEE 802.11 n HT40 Channel Middle (5785MHz) = 10 **(Chain 1)**
IEEE 802.11 n HT40 Channel High (5805MHz) = 10 **(Chain 1)**
EEE 802.11n HT40 Channel Low (5745MHz) = 0F **(Chain 2)**
IEEE 802.11 n HT40 Channel Middle (5785MHz) = 0F **(Chain 2)**
IEEE 802.11 n HT40 Channel High (5805MHz) = 0F **(Chain 2)**

RX Mode：

MAC Address: FFFFFFFFFFFF

Start RX

3. All of the function are under run.
4. Start test.

Normal Link Setup

1. Set up all computers like the setup diagram.
2. All of the function are under run.
3. Notebook PC (2) ping 192.168.0.10 –t to Notebook PC (1).
4. Notebook PC (1) ping 192.168.0.20 –t to Notebook PC (2).
5. Notebook PC (1) ping 192.168.0.50 –t to Wireless Access Point (3).

Start test.

7. FCC PART 15.247 REQUIREMENTS

7.1 6dB BANDWIDTH

LIMITS

§ 15.247(a) (2) For direct sequence systems, the minimum 6dB bandwidth shall be at least 500kHz.

TEST EQUIPMENT

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	R&S	FSEK 30	835253/002	SEP. 29, 2012

Remark: *Each piece of equipment is scheduled for calibration once a year.*

TEST SETUP

TEST PROCEDURE

The transmitter output was connected to a spectrum analyzer. The bandwidth of the fundamental frequency was measured by spectrum analyzer with 100 KHz RBW and 100 KHz VBW. The 6dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 6dB.

TEST RESULTS

IEEE 802.11b Mode

Channel	Channel Frequency (MHz)	6dB Bandwidth (kHz)	Minimum Limit (kHz)	Pass / Fail
Low	2412	12124	500	PASS
Middle	2437	11974	500	PASS
High	2462	11924	500	PASS

IEEE 802.11g Mode

Channel	Channel Frequency (MHz)	6dB Bandwidth (kHz)	Minimum Limit (kHz)	Pass / Fail
Low	2412	16633	500	PASS
Middle	2437	16633	500	PASS
High	2462	16633	500	PASS

IEEE 802.11n HT20 Mode

Channel	Channel Frequency (MHz)	6dB Bandwidth (kHz)		Minimum Limit (kHz)	Pass / Fail
		Chain 0	Chain1		
Low	2412	17735	17735	500	PASS
Middle	2437	17685	17685	500	PASS
High	2462	17735	17735	500	PASS

IEEE 802.11n HT40 Mode

Channel	Channel Frequency (MHz)	6dB Bandwidth (kHz)		Minimum Limit (kHz)	Pass / Fail
		Chain 0	Chain1		
Low	2422	36673	36473	500	PASS
Middle	2437	36703	36473	500	PASS
High	2452	36733	36673	500	PASS

IEEE 802.11a Mode

Channel	Channel Frequency (MHz)	6dB Bandwidth (kHz)	Minimum Limit (kHz)	Pass / Fail
Low	5745	16533	500	PASS
Middle	5785	16533	500	PASS
High	5805	16533	500	PASS

IEEE 802.11n HT20 Mode

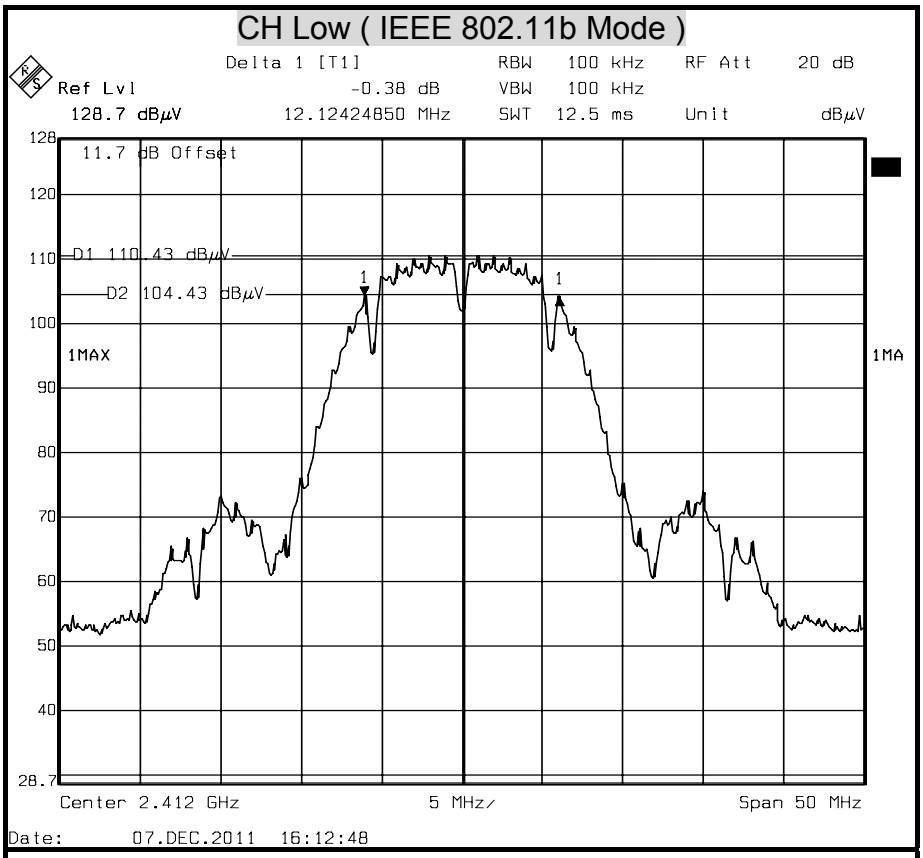
Channel	Channel Frequency (MHz)	6dB Bandwidth (kHz)			Minimum Limit (kHz)	Pass / Fail
		Chain 0	Chain1	Chain2		
Low	5745	17134	16533	16533	500	PASS
Middle	5785	17134	16533	16533	500	PASS
High	5805	17034	16834	16633	500	PASS

IEEE 802.11n HT40 Mode

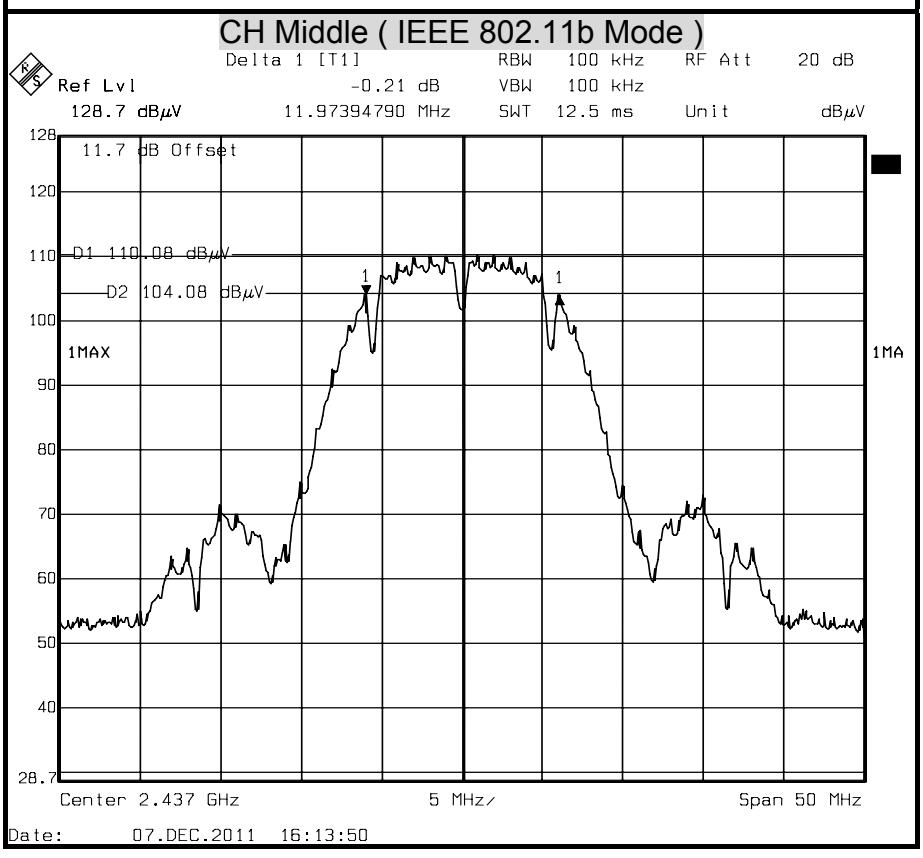
Channel	Channel Frequency (MHz)	6dB Bandwidth (kHz)			Minimum Limit (kHz)	Pass / Fail
		Chain 0	Chain1	Chain2		
Low	5745	36072	36072	36072	500	PASS
Middle	5785	36072	36072	36072	500	PASS
High	5805	36473	36072	35872	500	PASS

6dB BANDWIDTH (2.4G)

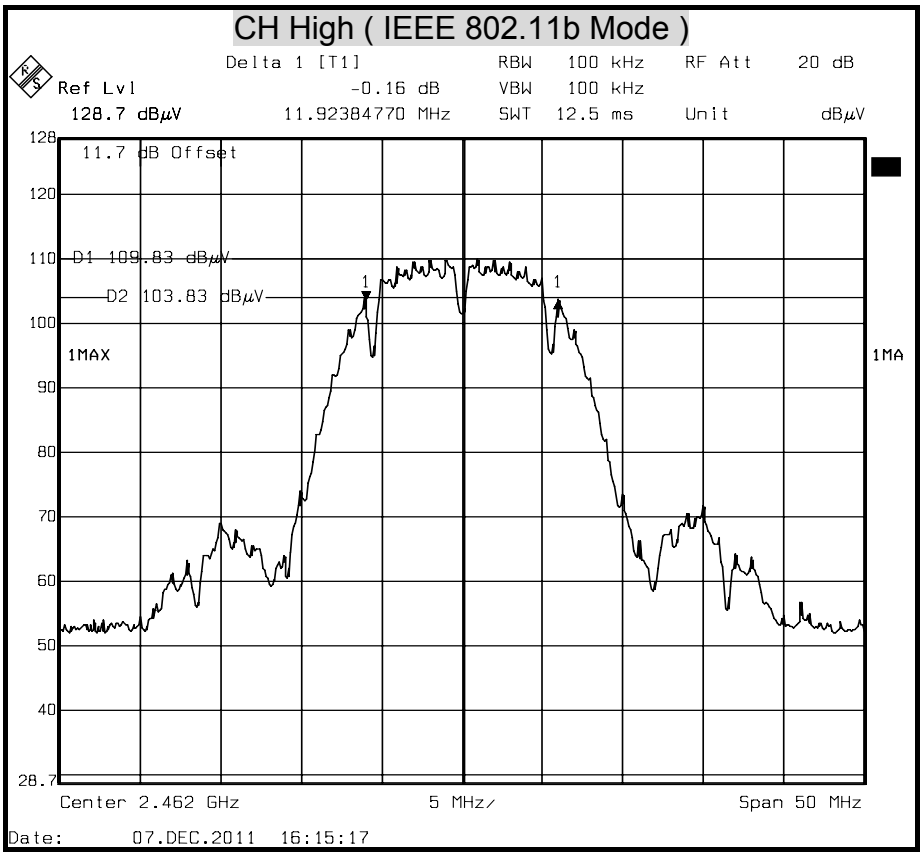
CH Low (IEEE 802.11b Mode)



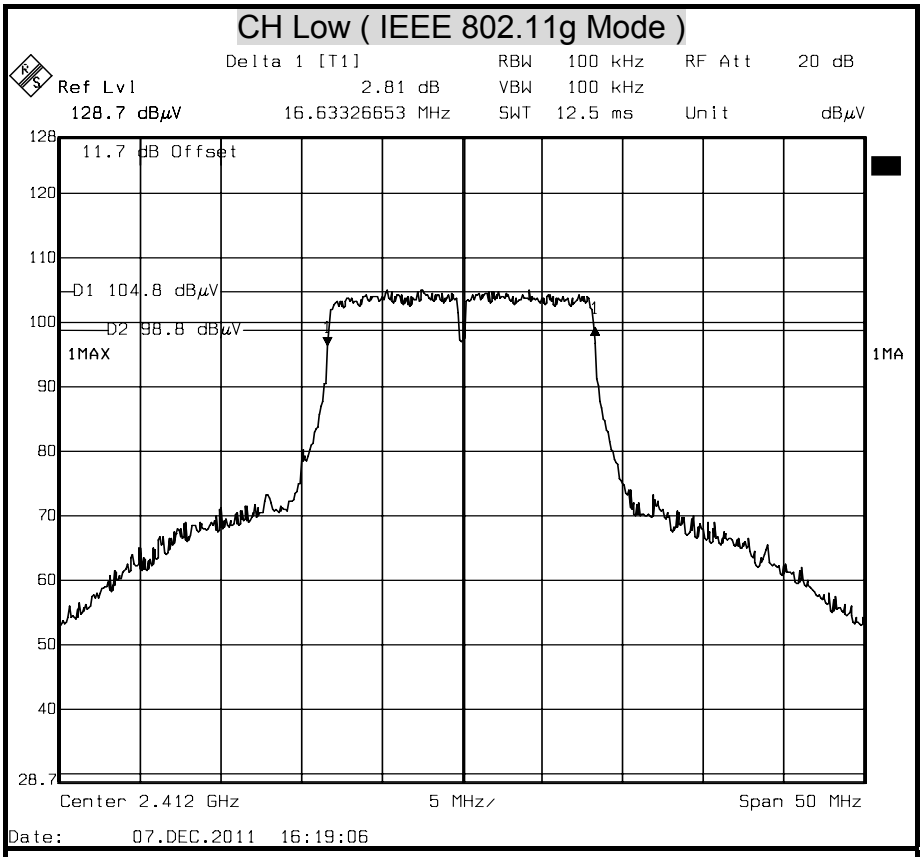
CH Middle (IEEE 802.11b Mode)



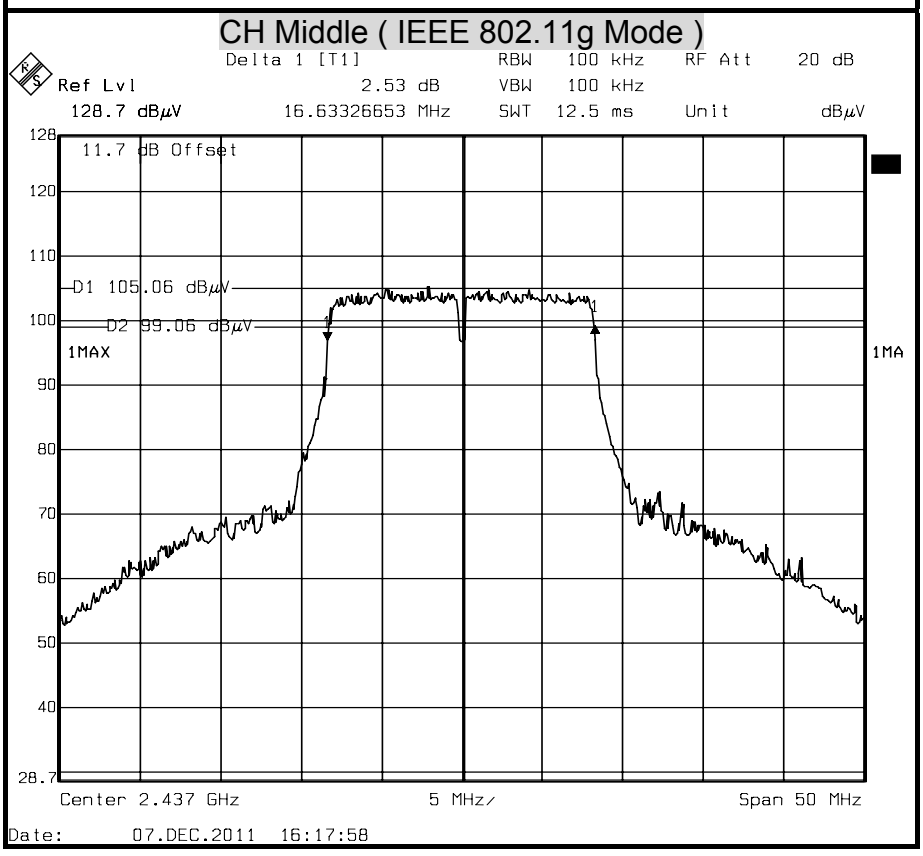
CH High (IEEE 802.11b Mode)



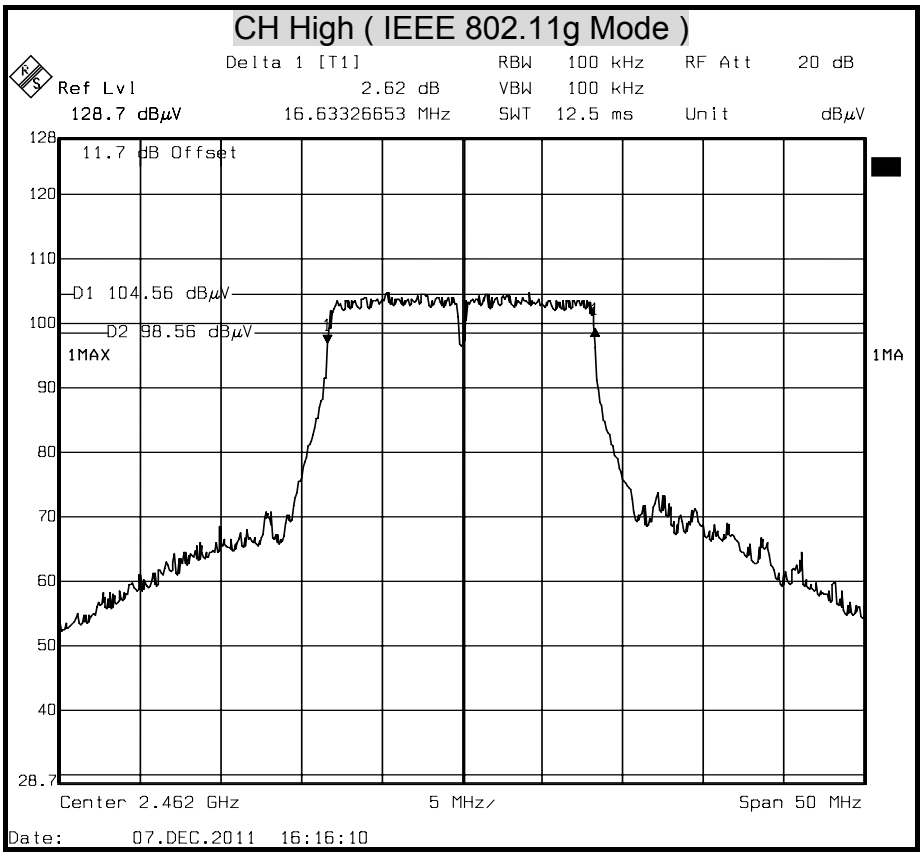
CH Low (IEEE 802.11g Mode)



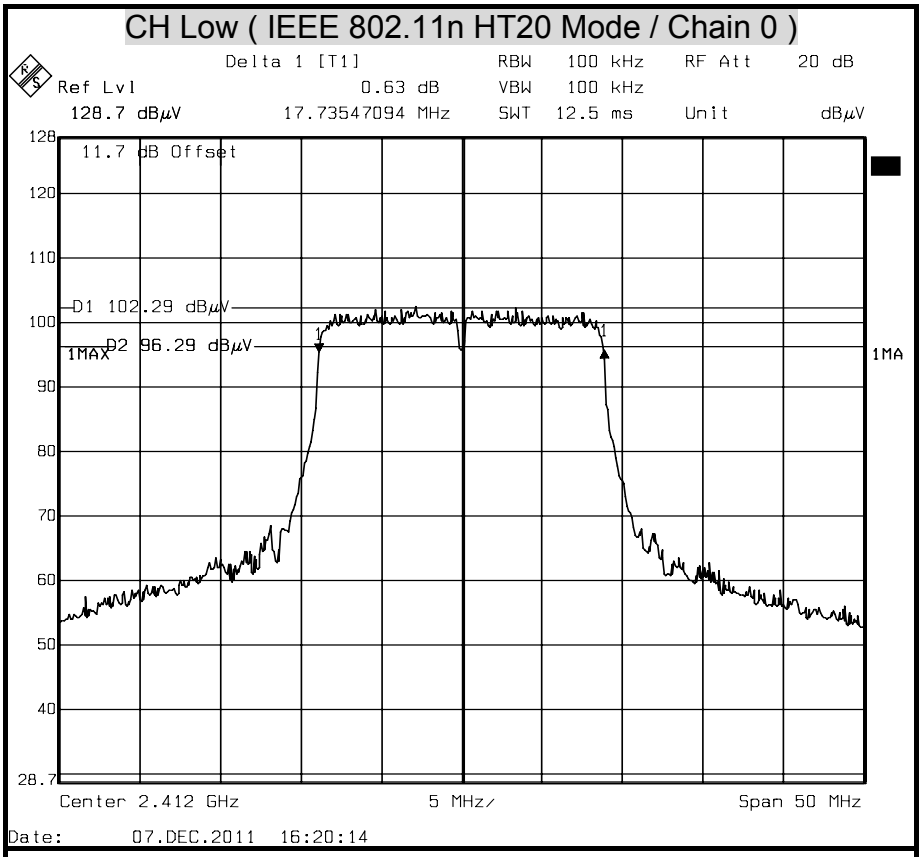
CH Middle (IEEE 802.11g Mode)



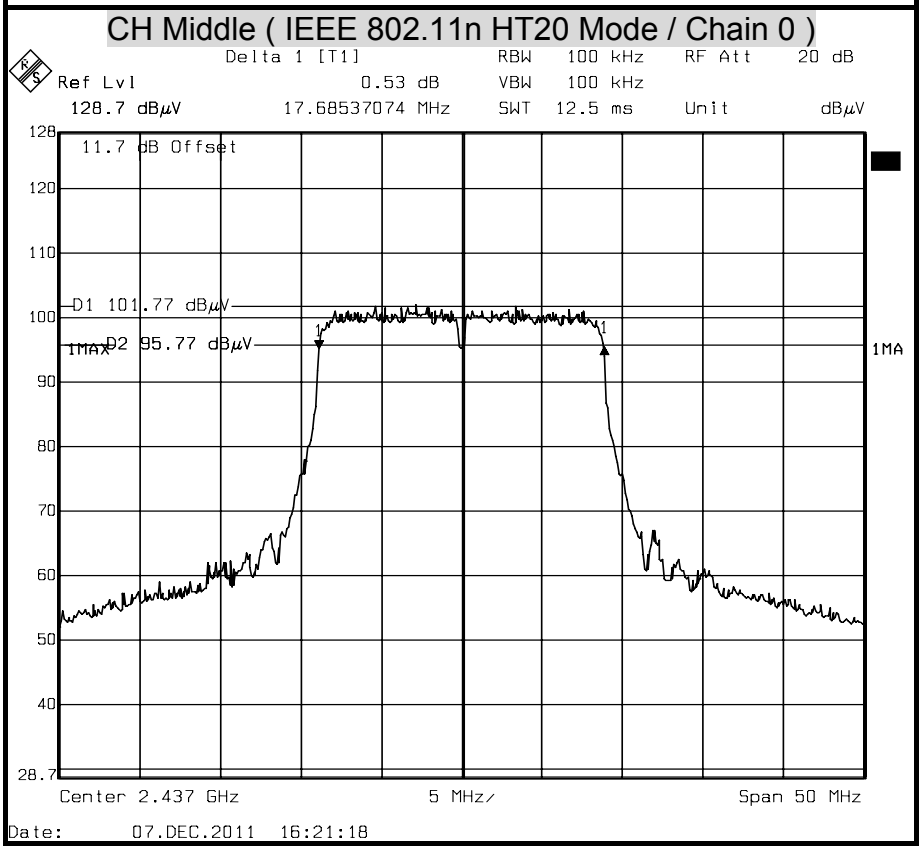
CH High (IEEE 802.11g Mode)



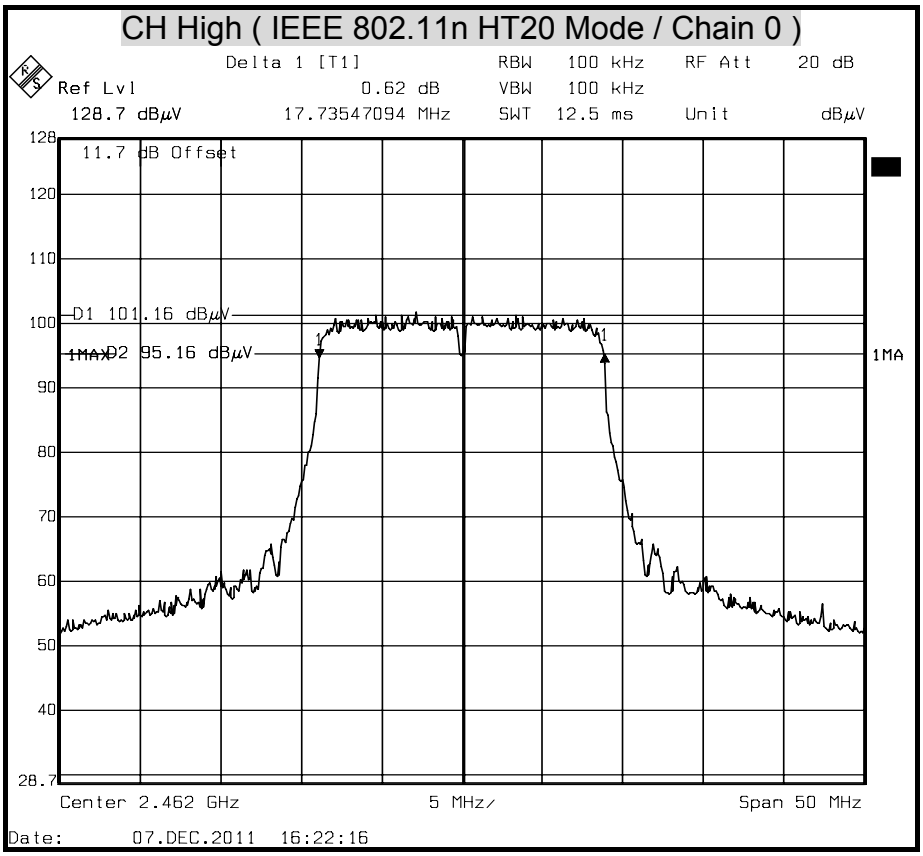
CH Low (IEEE 802.11n HT20 Mode / Chain 0)



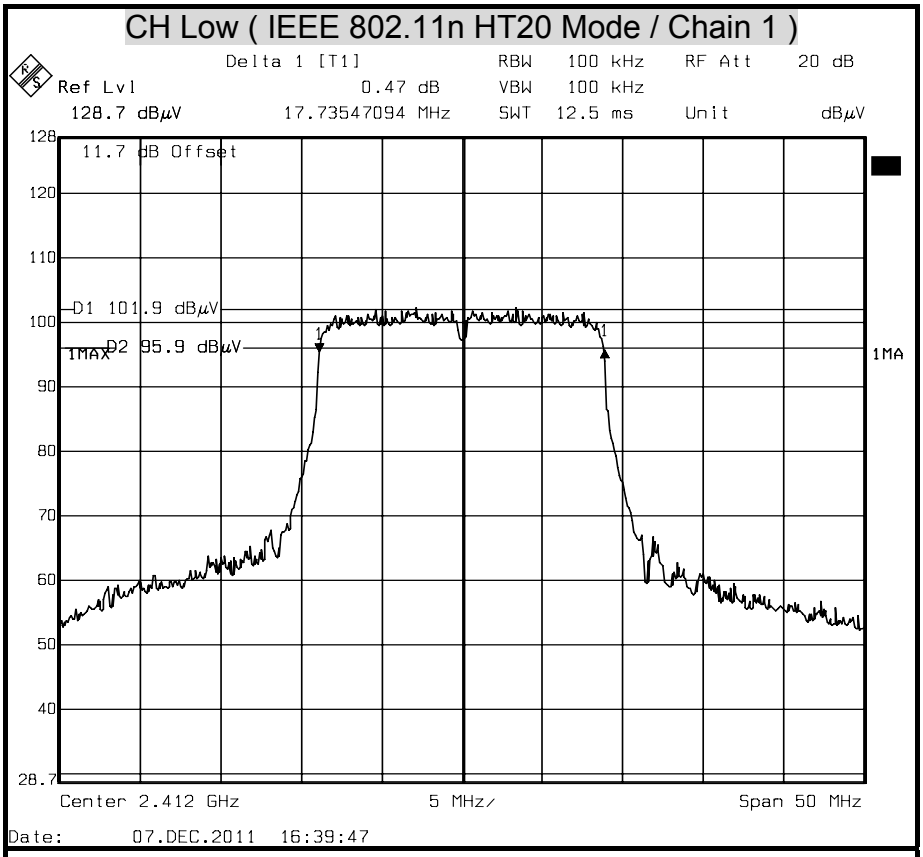
CH Middle (IEEE 802.11n HT20 Mode / Chain 0)



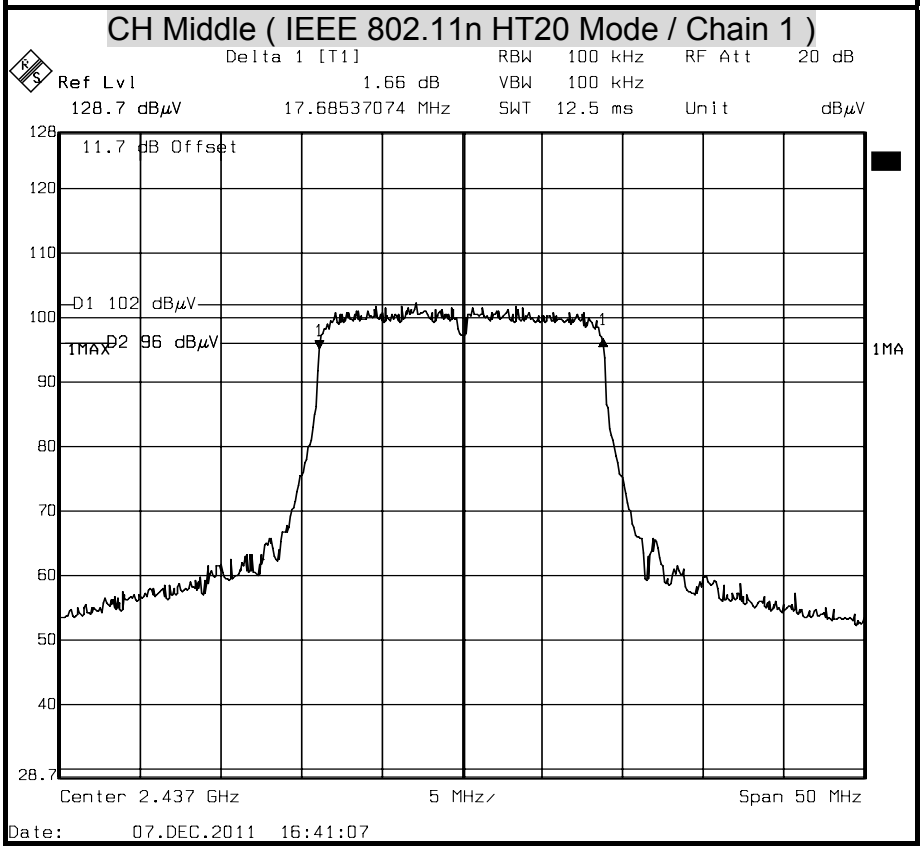
CH High (IEEE 802.11n HT20 Mode / Chain 0)



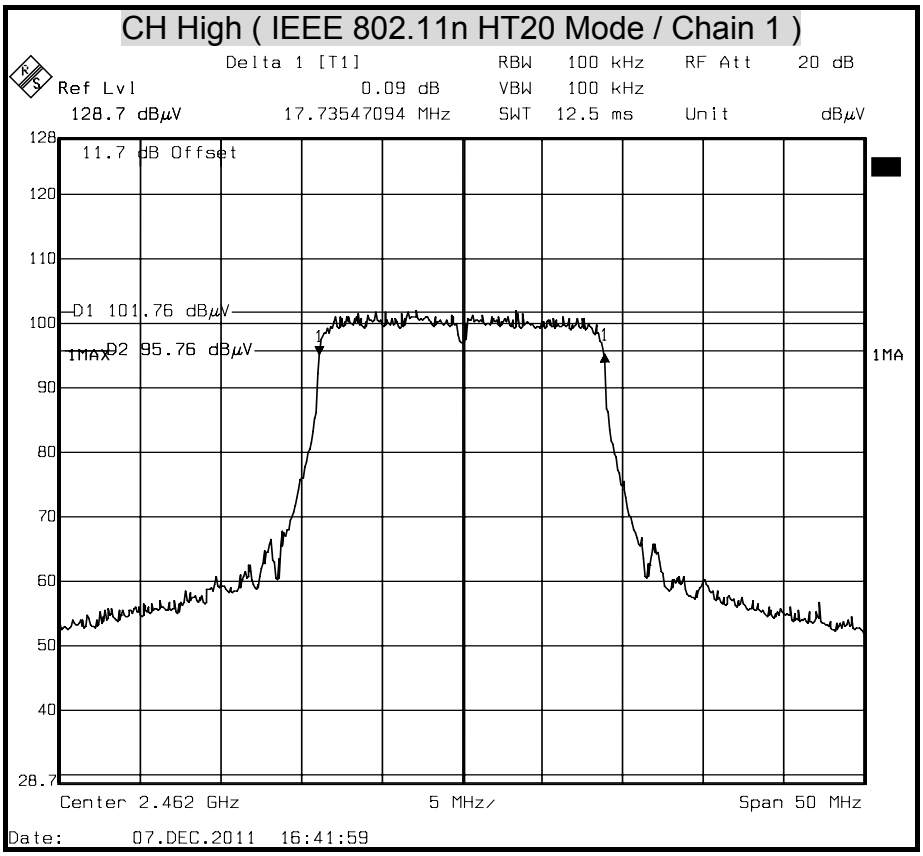
CH Low (IEEE 802.11n HT20 Mode / Chain 1)



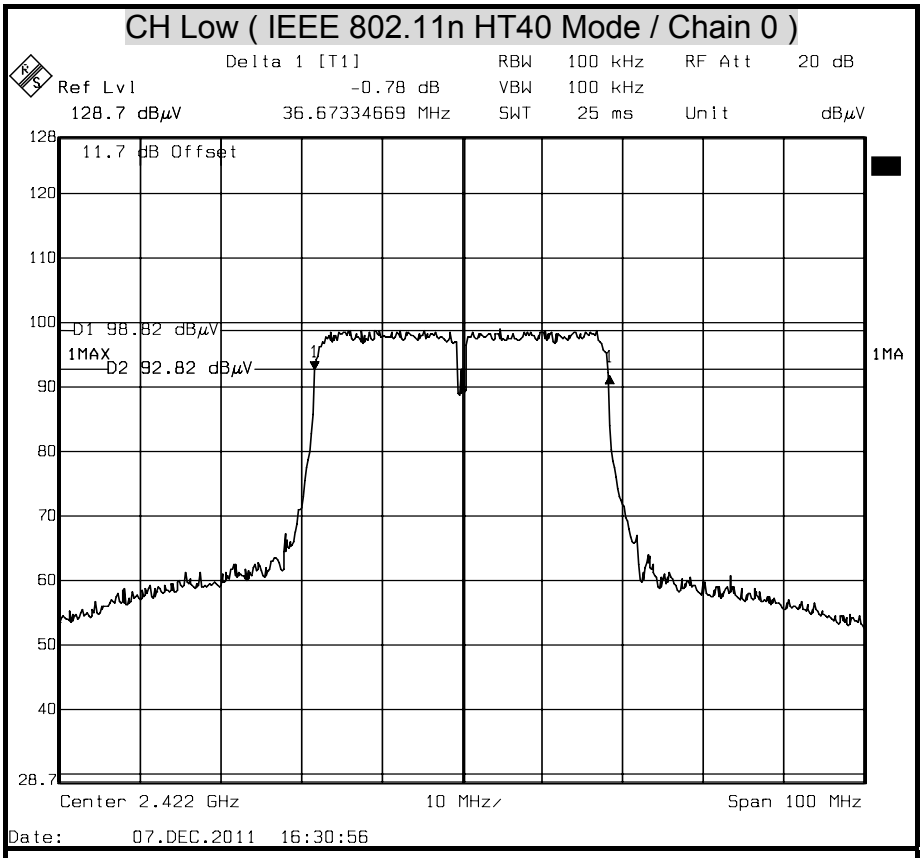
CH Middle (IEEE 802.11n HT20 Mode / Chain 1)



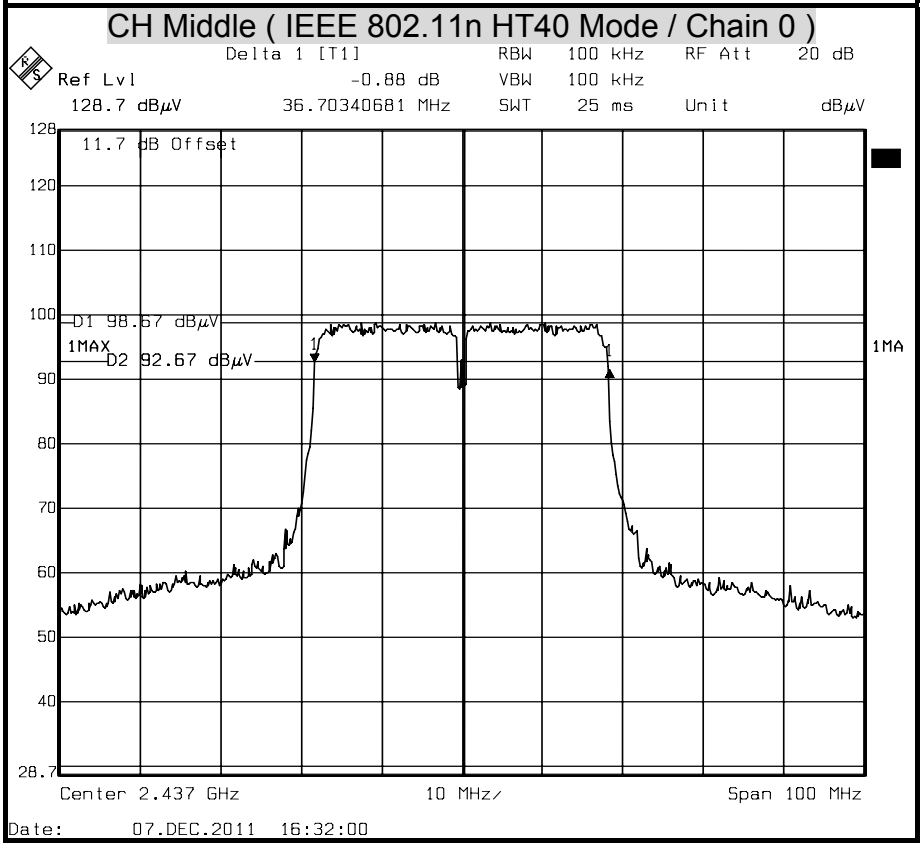
CH High (IEEE 802.11n HT20 Mode / Chain 1)

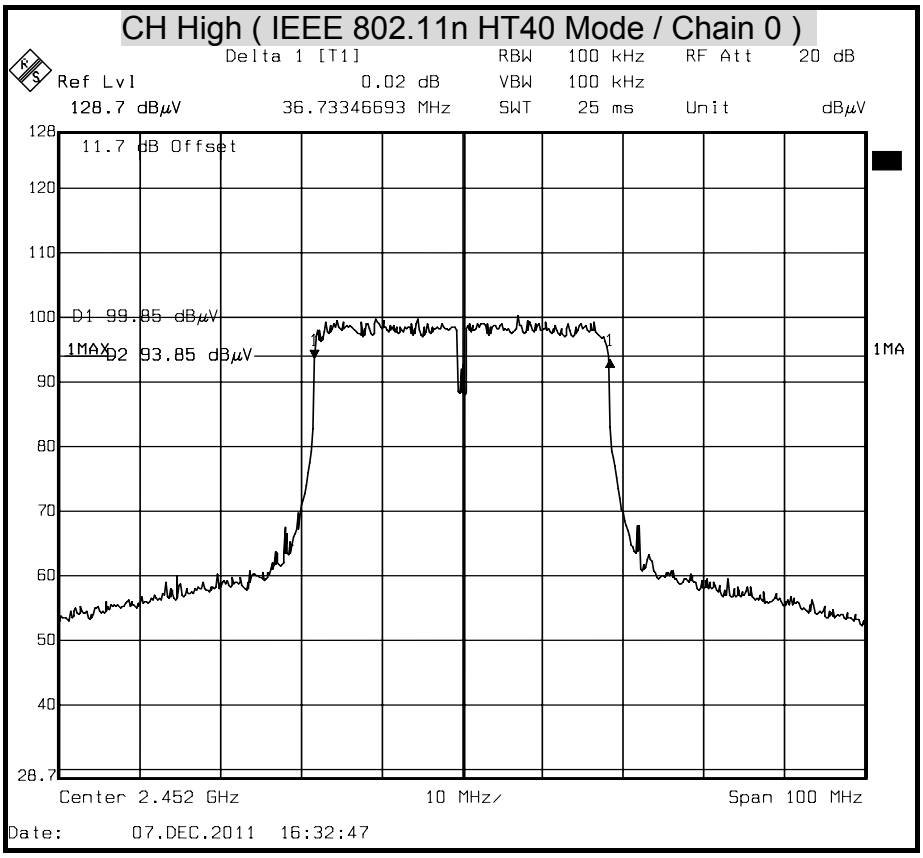


CH Low (IEEE 802.11n HT40 Mode / Chain 0)

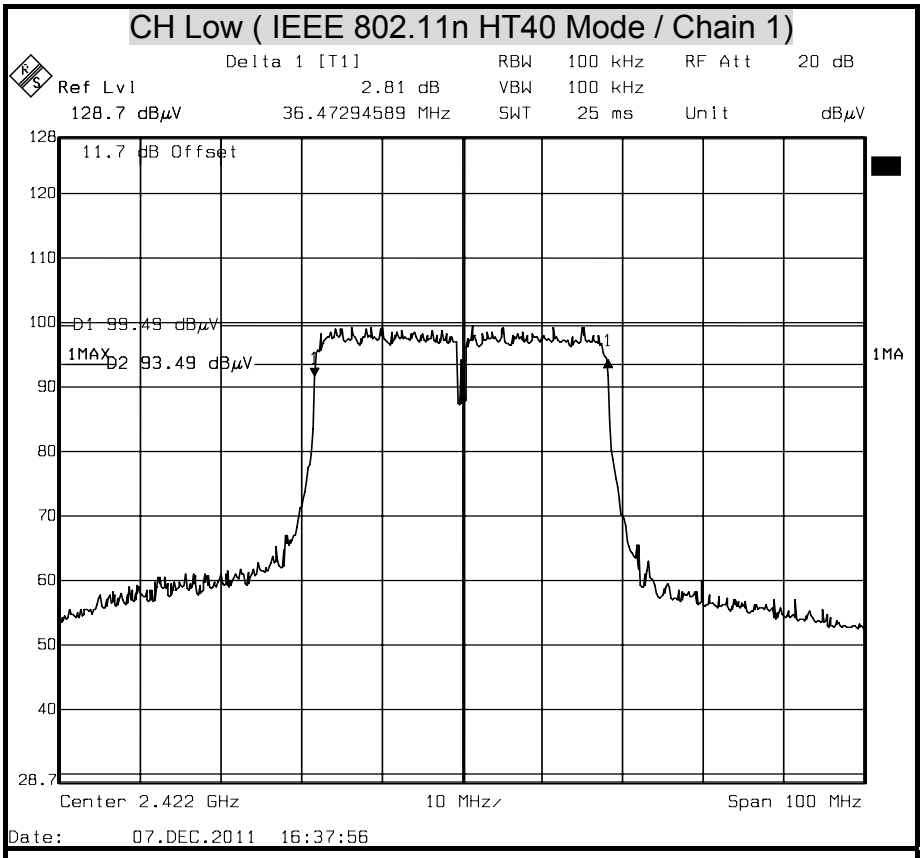


CH Middle (IEEE 802.11n HT40 Mode / Chain 0)

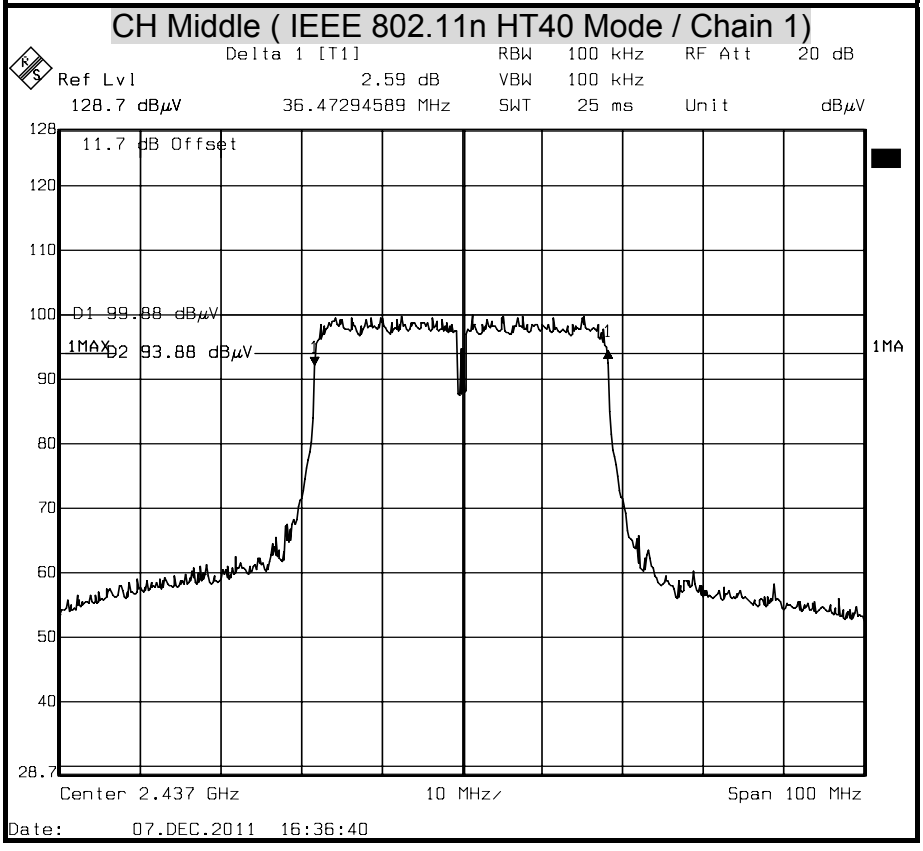




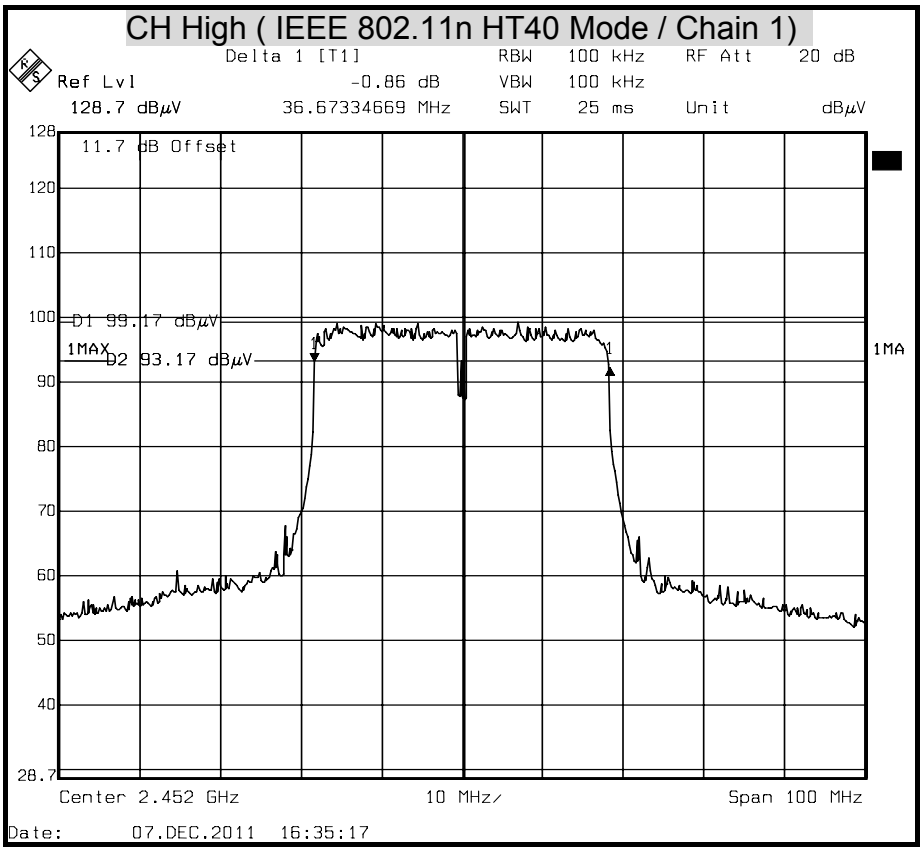
CH Low (IEEE 802.11n HT40 Mode / Chain 1)



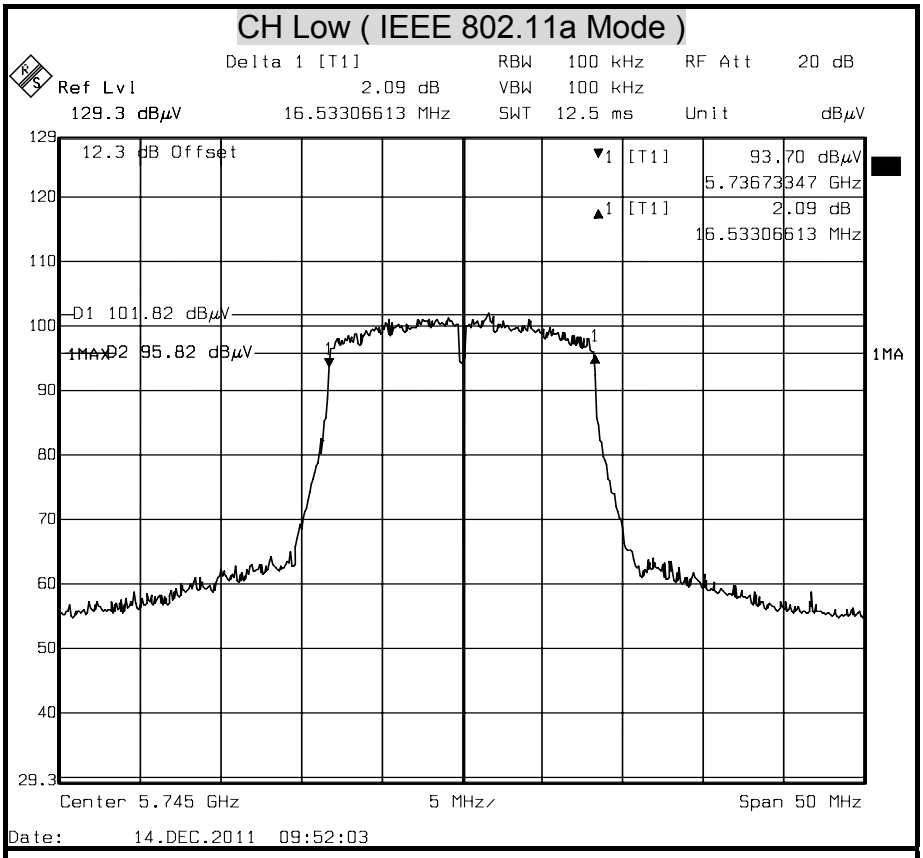
CH Middle (IEEE 802.11n HT40 Mode / Chain 1)

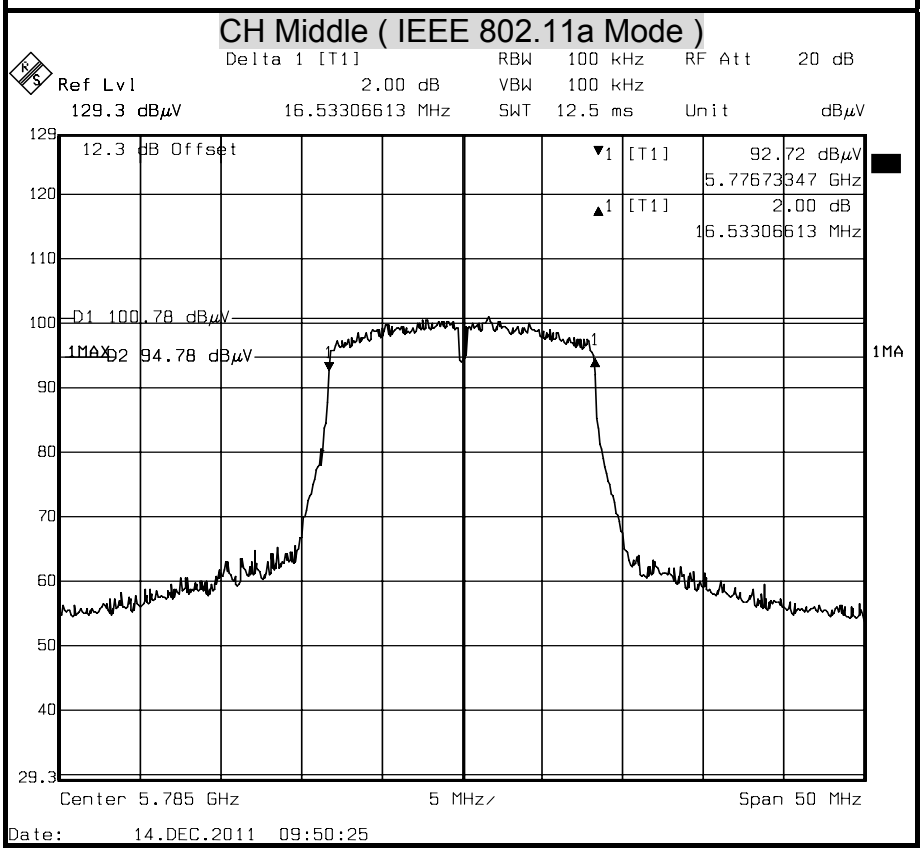


CH High (IEEE 802.11n HT40 Mode / Chain 1)

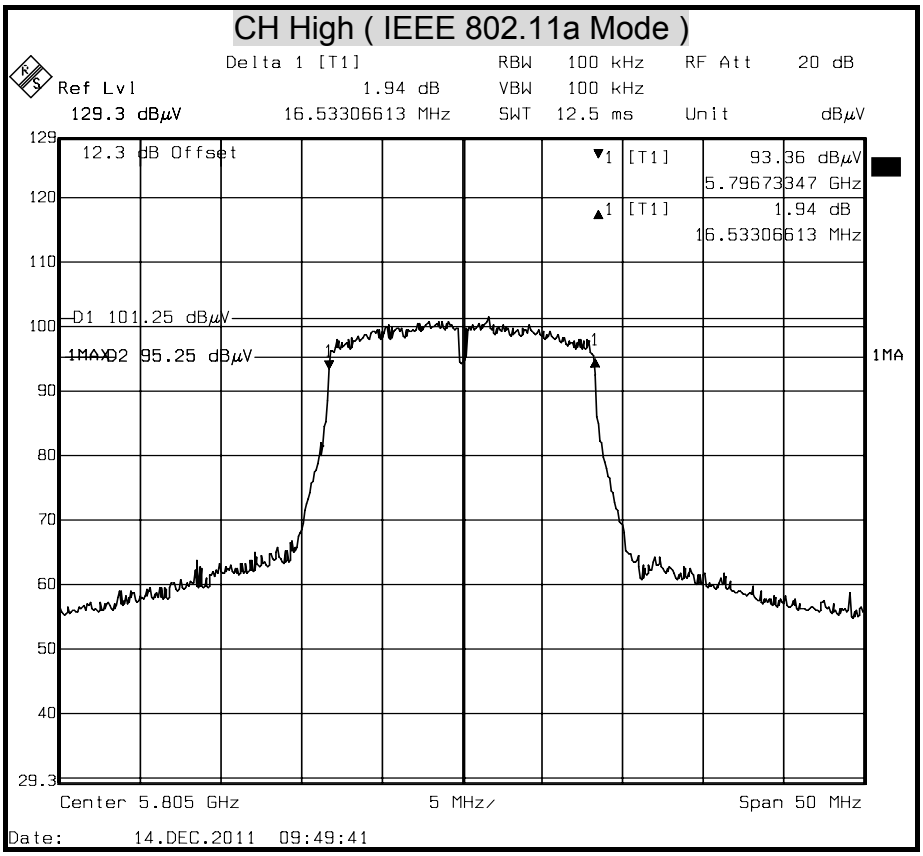


6dB BANDWIDTH (5G)

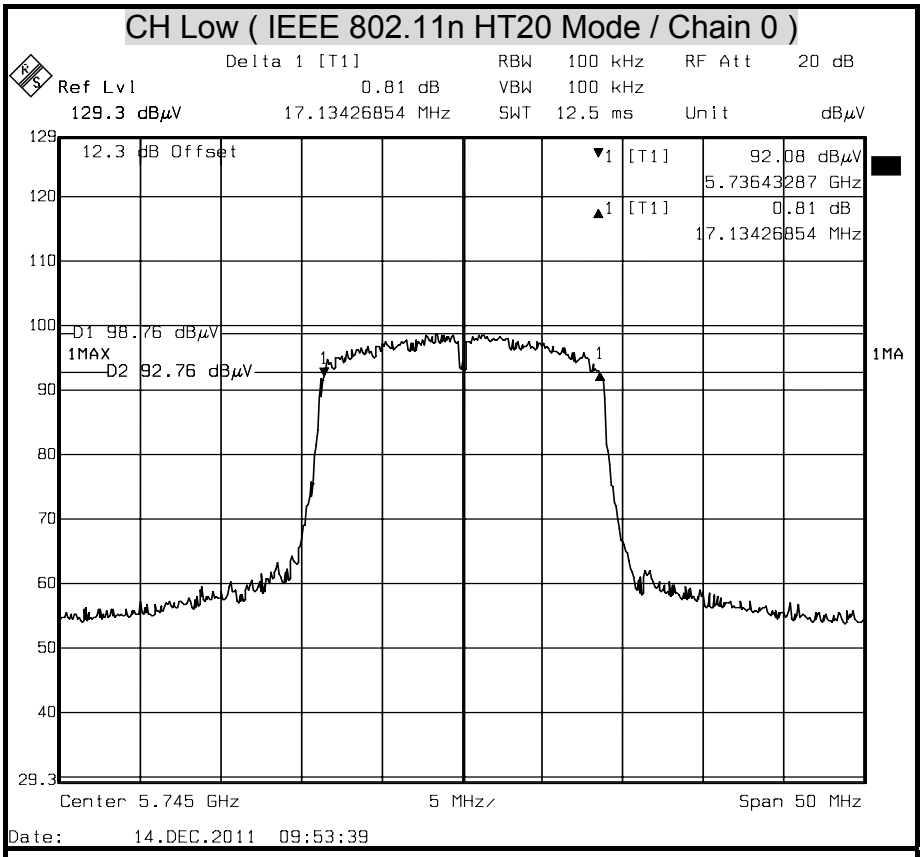




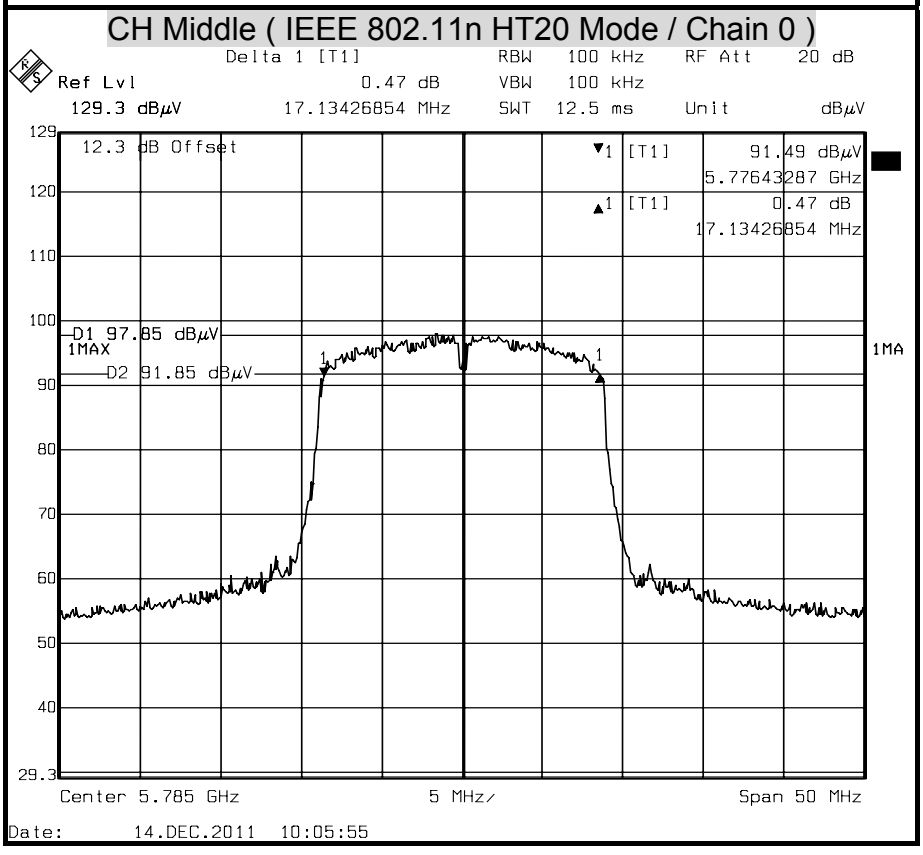
CH High (IEEE 802.11a Mode)



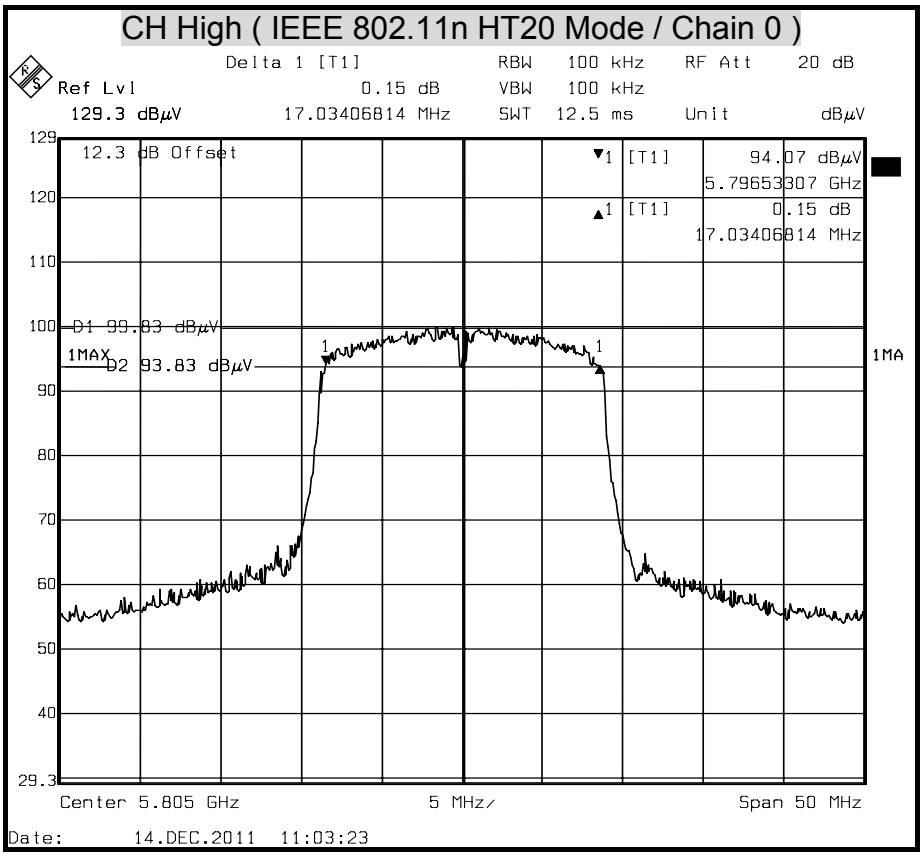
CH Low (IEEE 802.11n HT20 Mode / Chain 0)



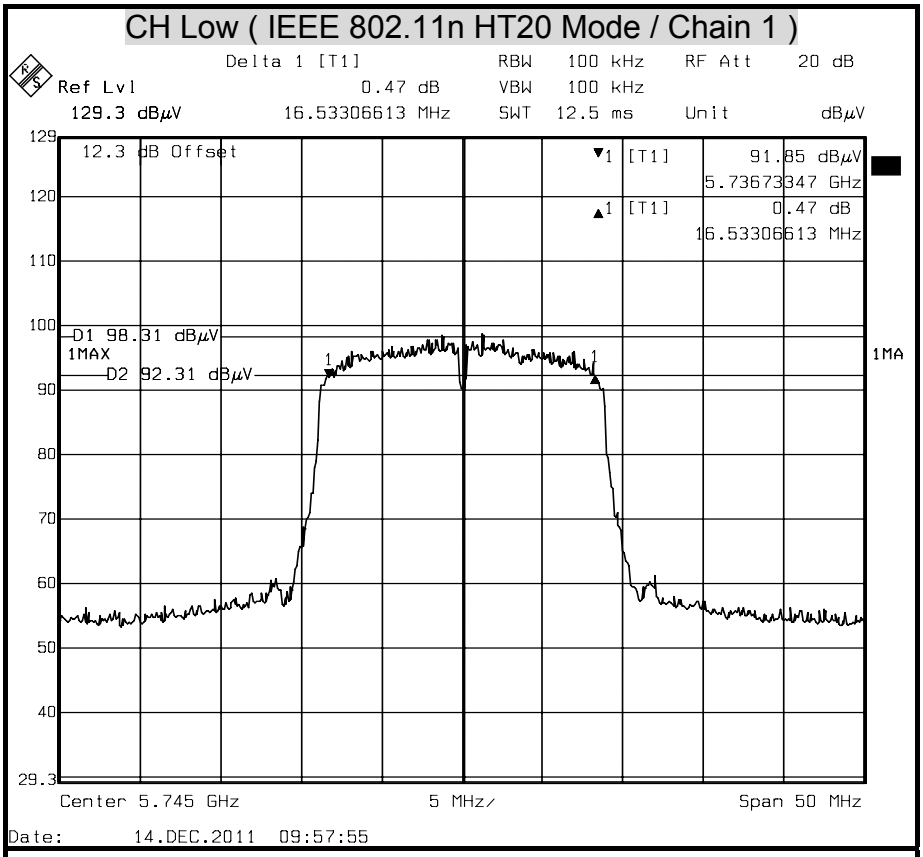
CH Middle (IEEE 802.11n HT20 Mode / Chain 0)



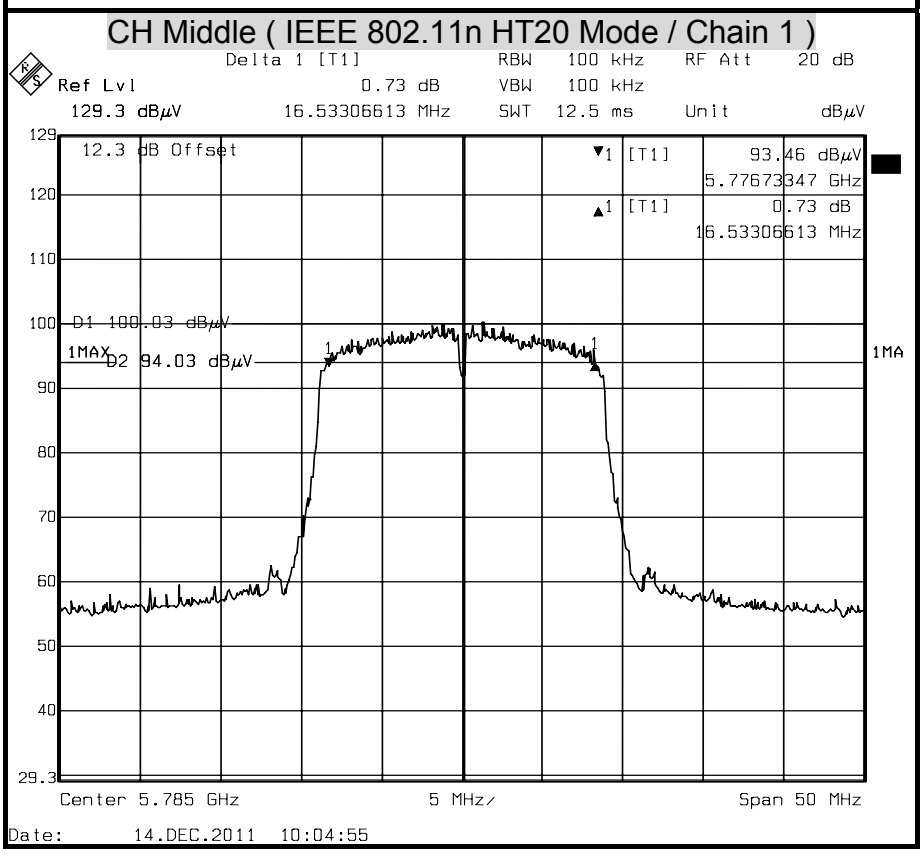
CH High (IEEE 802.11n HT20 Mode / Chain 0)



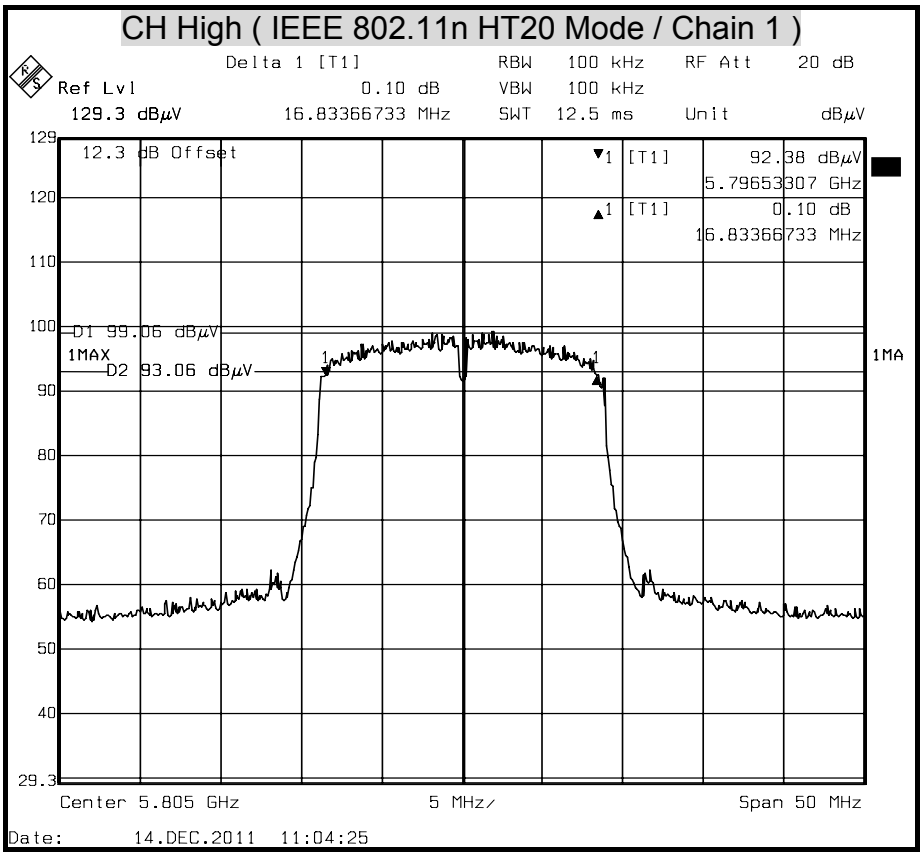
CH Low (IEEE 802.11n HT20 Mode / Chain 1)



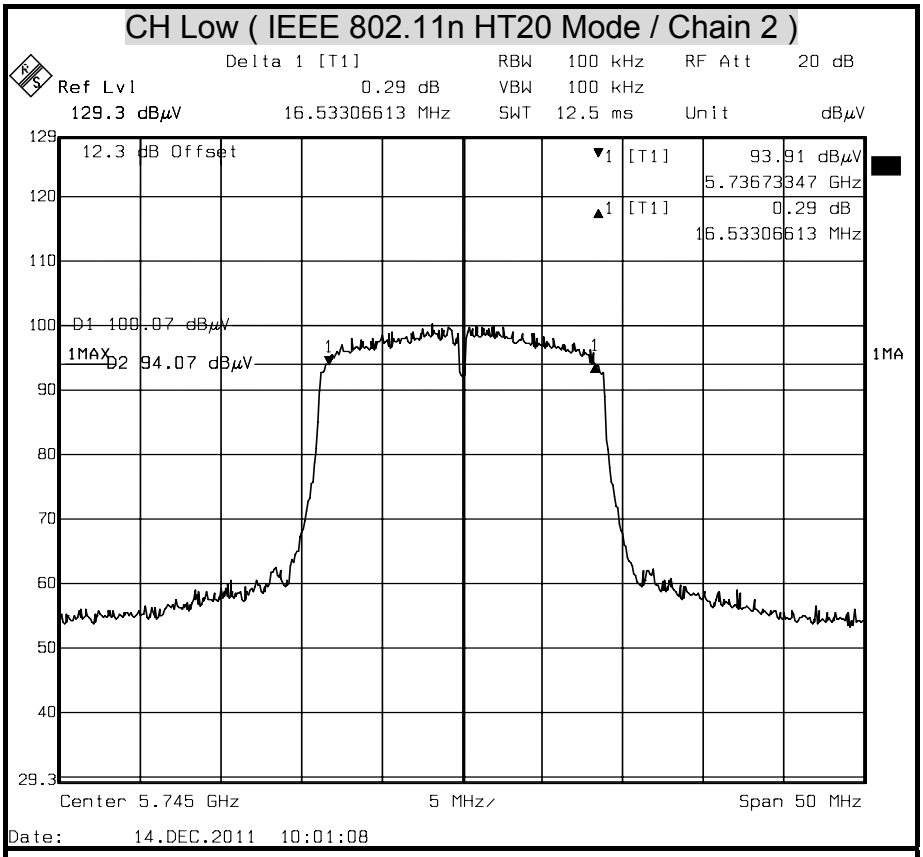
CH Middle (IEEE 802.11n HT20 Mode / Chain 1)



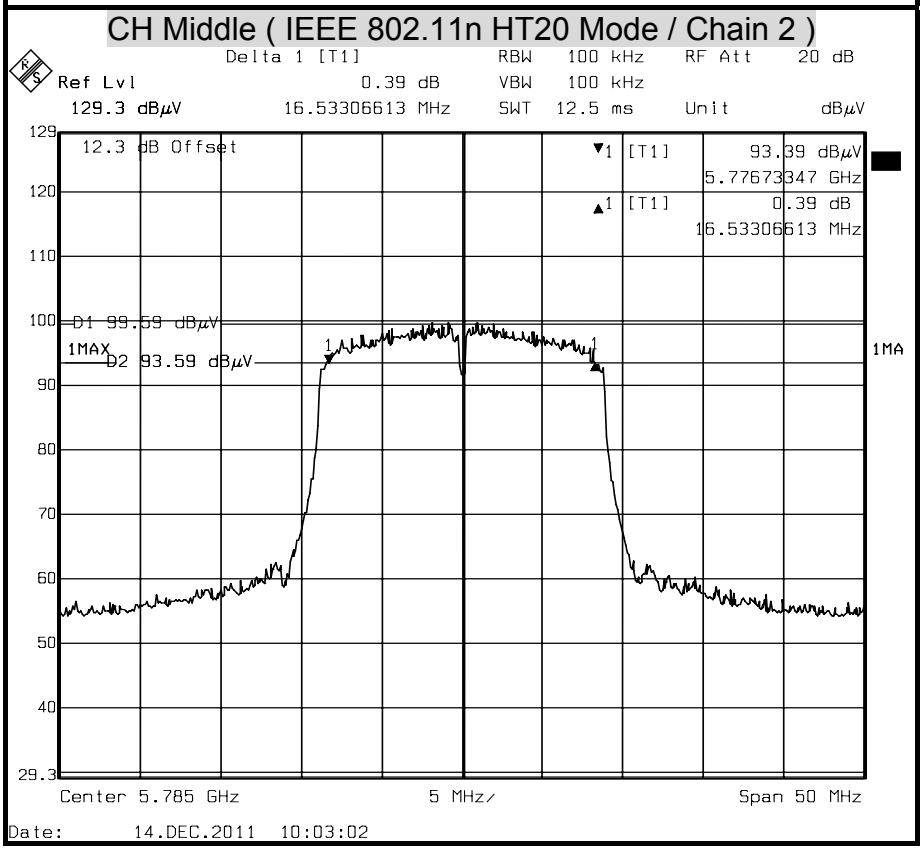
CH High (IEEE 802.11n HT20 Mode / Chain 1)



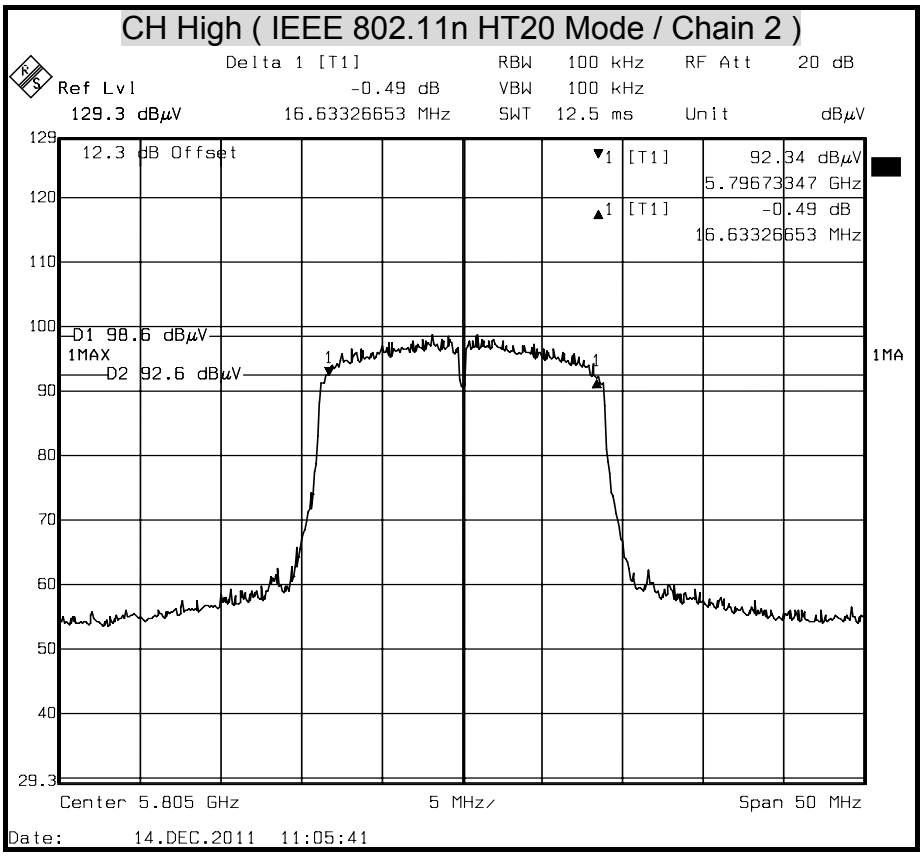
CH Low (IEEE 802.11n HT20 Mode / Chain 2)



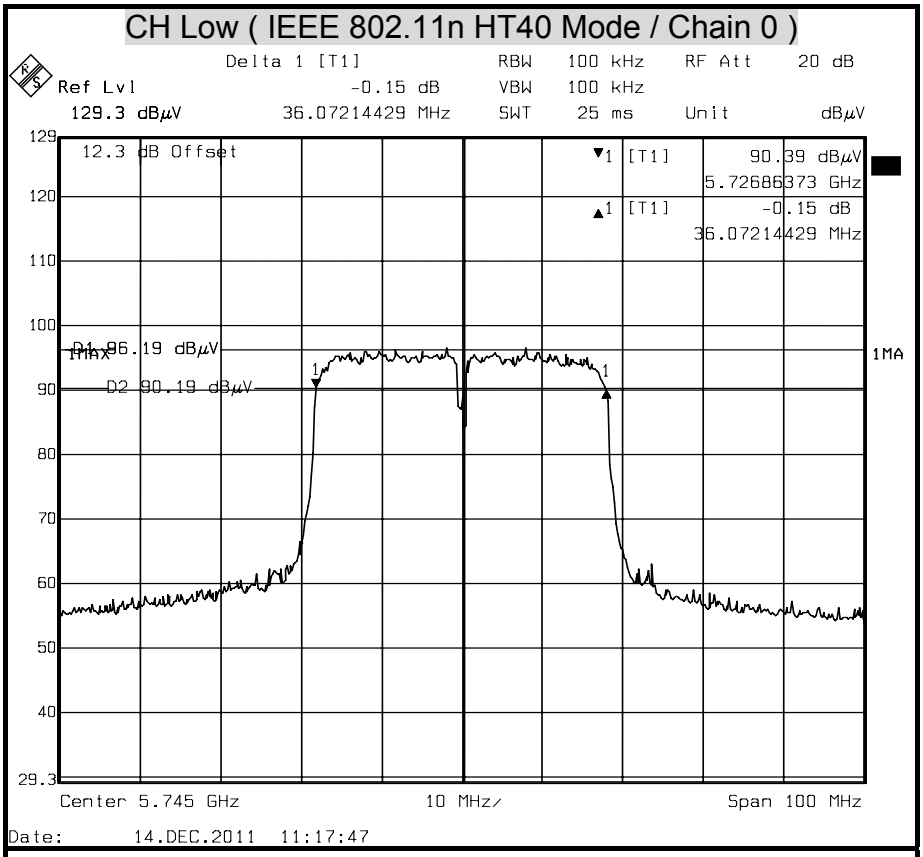
CH Middle (IEEE 802.11n HT20 Mode / Chain 2)



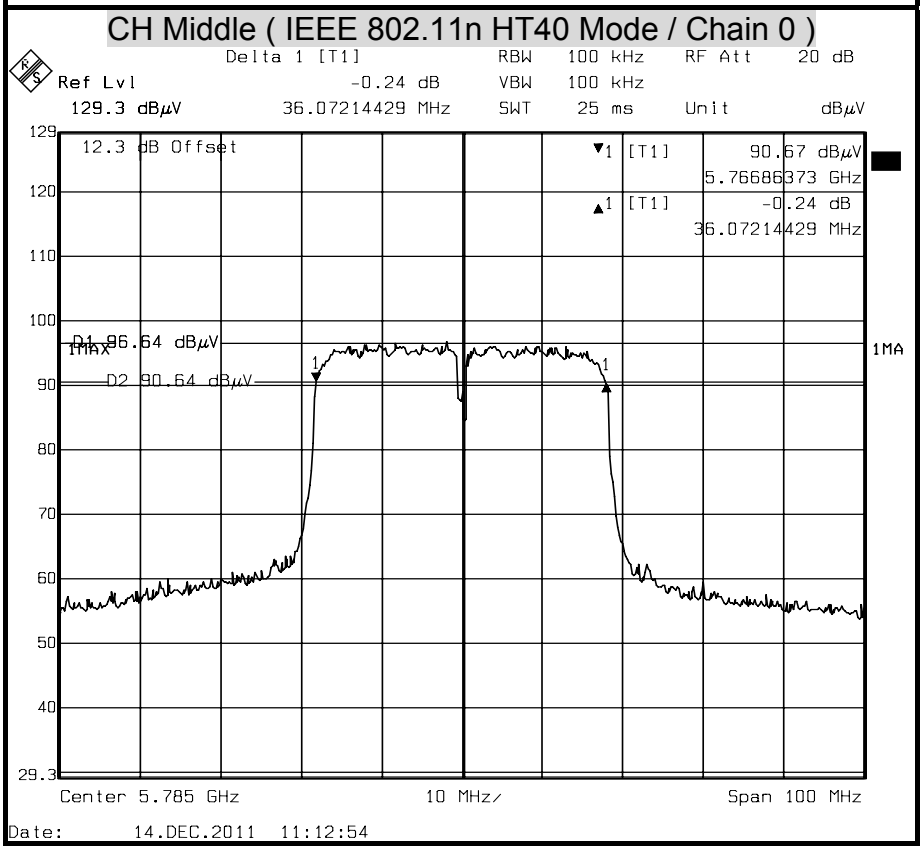
CH High (IEEE 802.11n HT20 Mode / Chain 2)



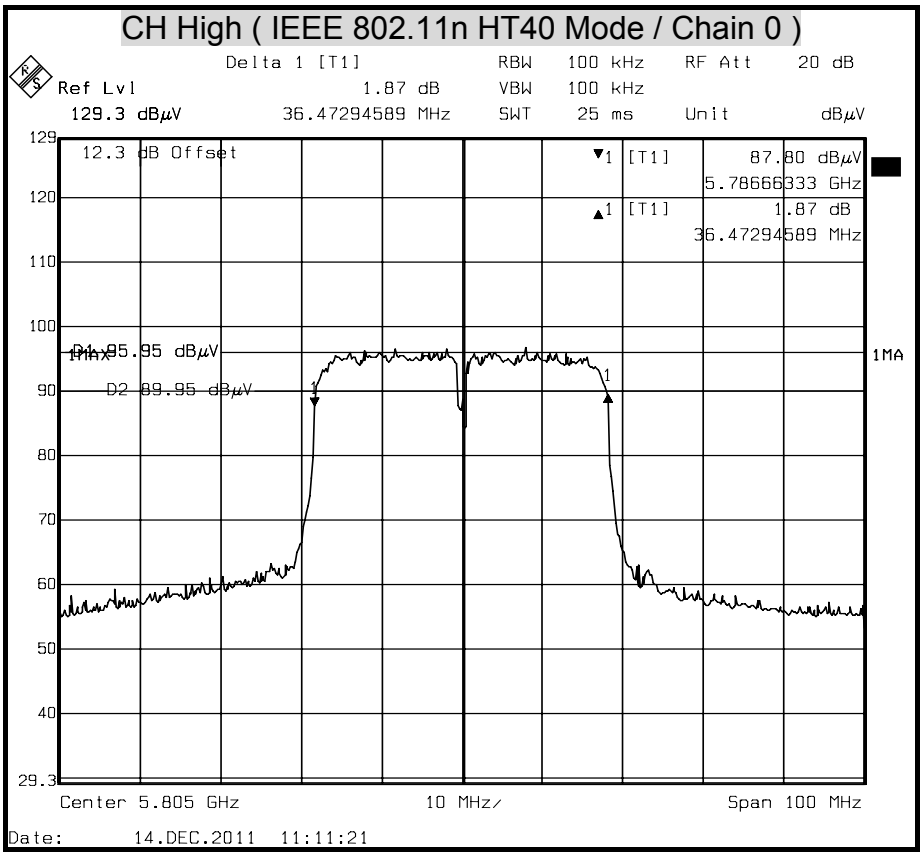
CH Low (IEEE 802.11n HT40 Mode / Chain 0)



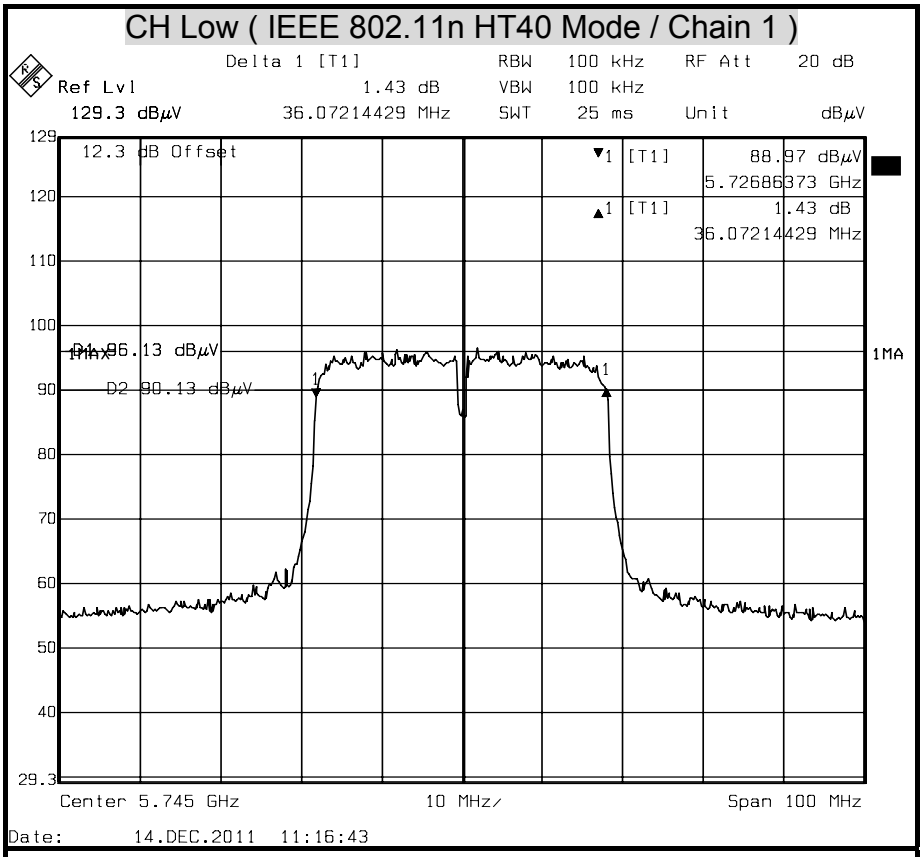
CH Middle (IEEE 802.11n HT40 Mode / Chain 0)



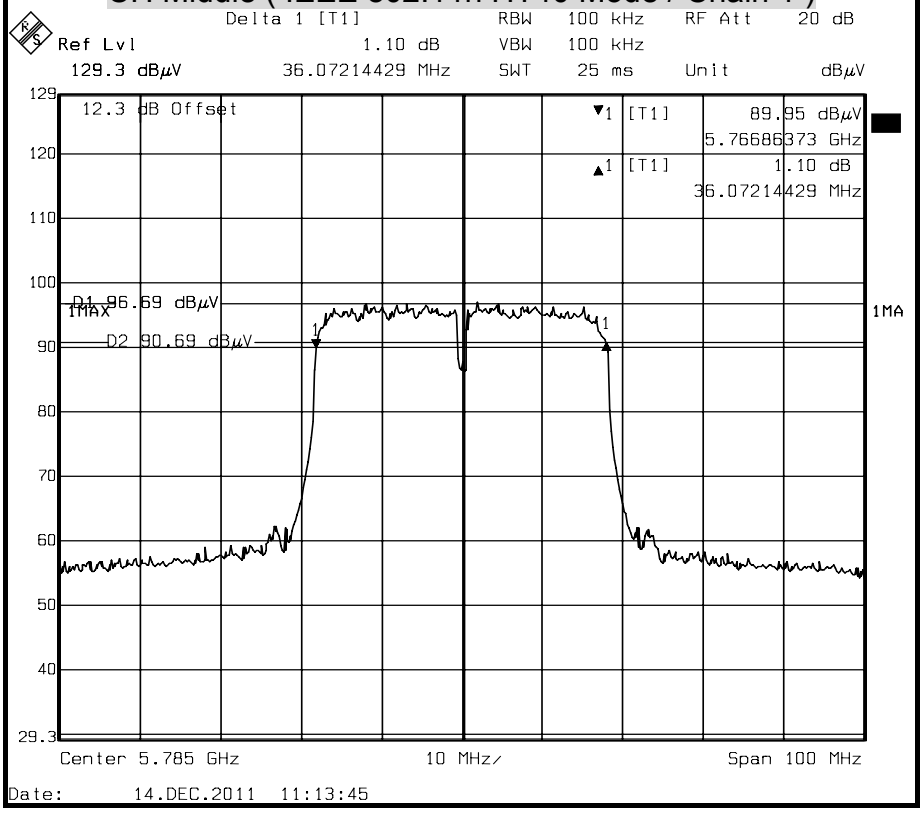
CH High (IEEE 802.11n HT40 Mode / Chain 0)



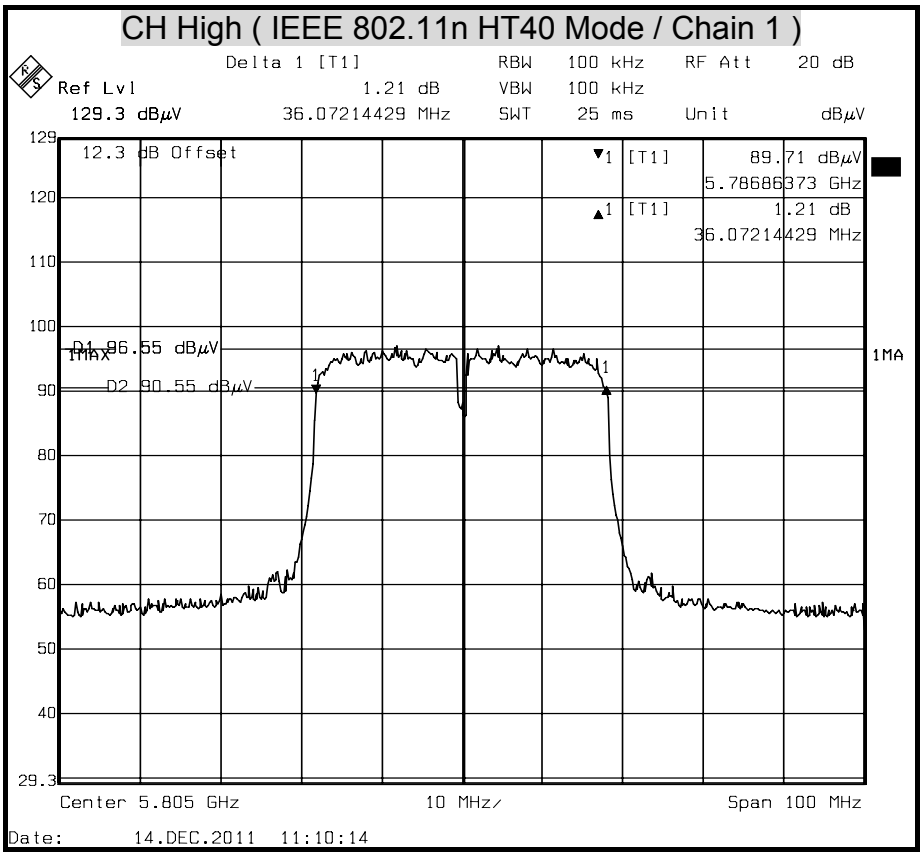
CH Low (IEEE 802.11n HT40 Mode / Chain 1)



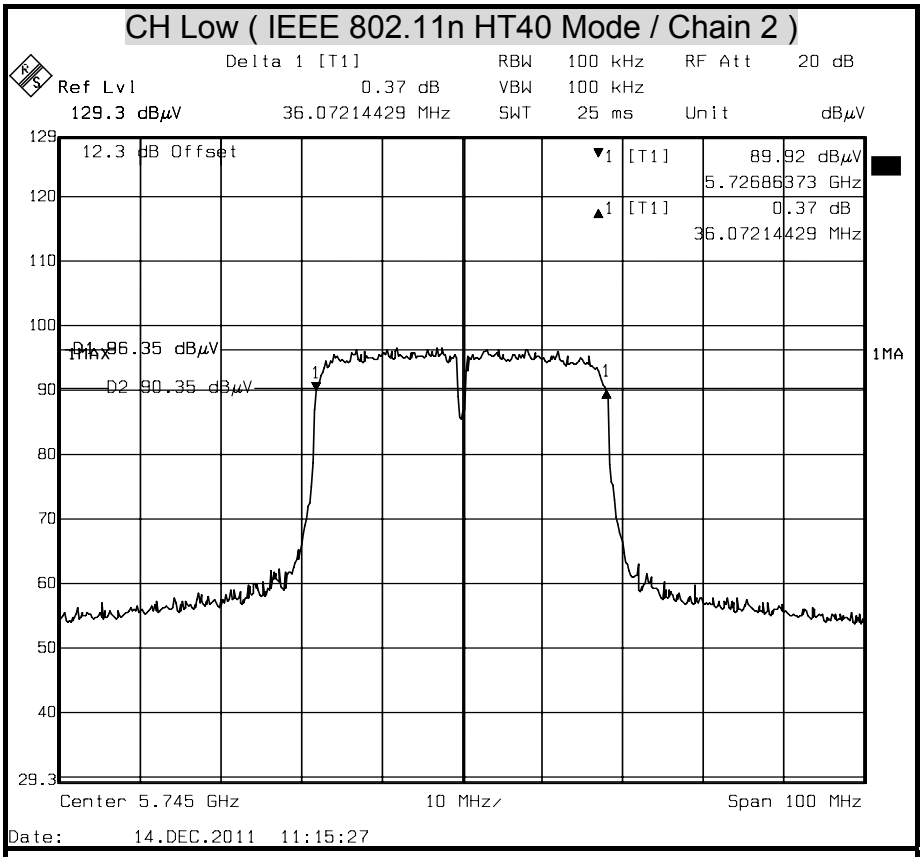
CH Middle (IEEE 802.11n HT40 Mode / Chain 1)



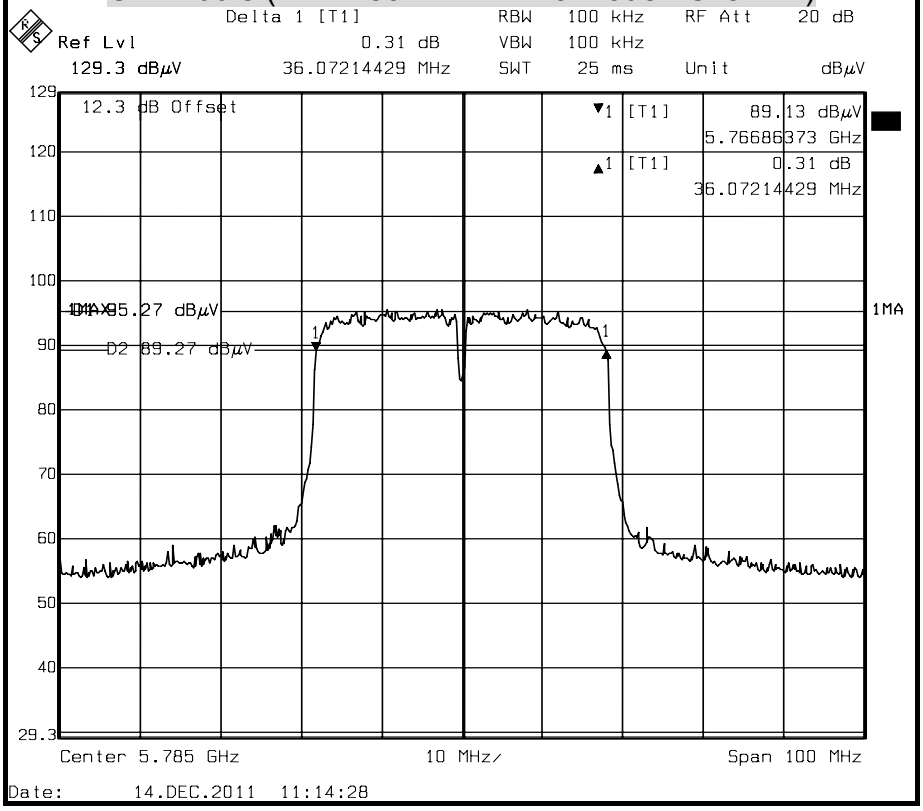
CH High (IEEE 802.11n HT40 Mode / Chain 1)



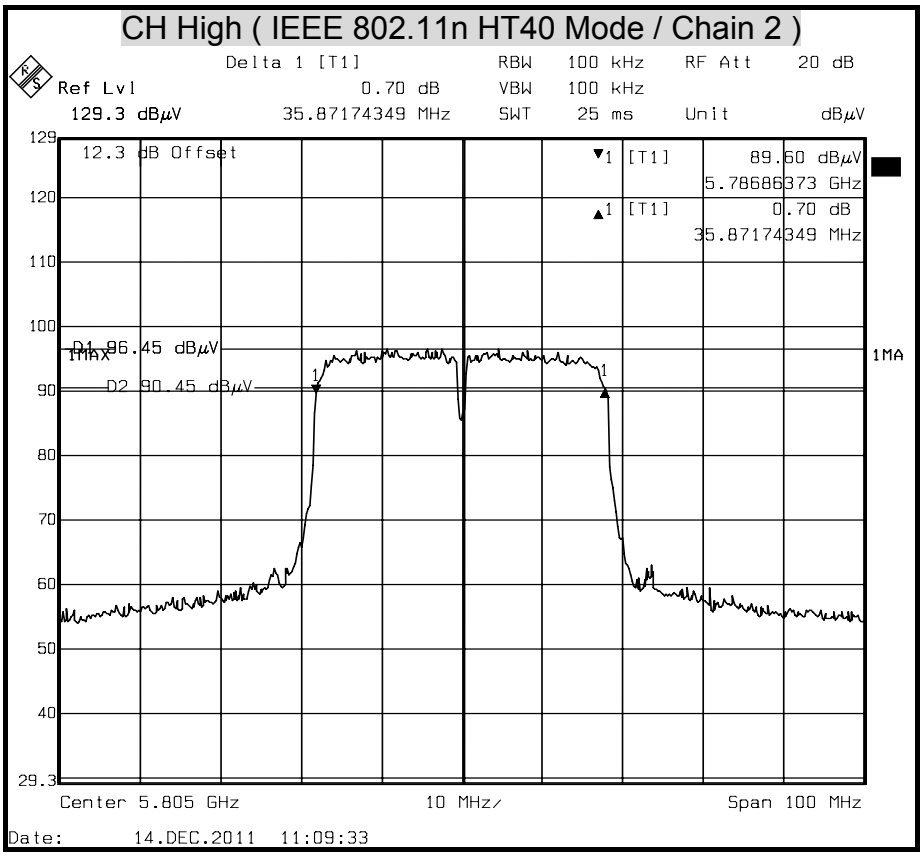
CH Low (IEEE 802.11n HT40 Mode / Chain 2)



CH Middle (IEEE 802.11n HT40 Mode / Chain 2)



CH High (IEEE 802.11n HT40 Mode / Chain 2)



7.2 MAXIMUM PEAK OUTPUT POWER

LIMITS

§ 15.247(b) The maximum peak output power of the intentional radiator shall not exceed the following :

§ 15.247(b) (3) For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands : 1 watt.

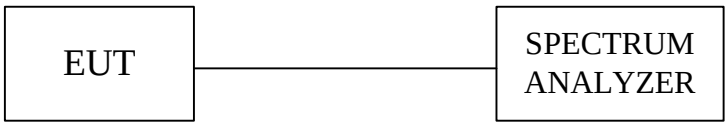
§ 15.247(b) (4) Except as shown in paragraphs (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used the peak output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1) or (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

TEST EQUIPMENT

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	FSU	FSEK 30	835253/002	SEP. 29, 2012

Remark: *Each piece of equipment is scheduled for calibration once a year.*

TEST SETUP



TEST PROCEDURE

The tests were performed in accordance with KDB 558074 5.2.1.2 and 5.2.2.1.

5.2.1.2 Measurement Procedure PK2:

1. This procedure provides an integrated measurement alternative when the maximum available RBW < EBW.
2. Set the RBW = 1 MHz.
3. Set the VBW = 3 MHz.
4. Set the span to a value that is 5-30 % greater than the EBW.
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Use the spectrum analyzer's integrated band power measurement function with band limits set equal to the EBW band edges(for some analyzers, this may require a manual overrideto ensure use of peak detector). If the spectrum analyzer does not have a band power function, sum the spectrum levels (in linear power units) at 1 MHz intervals extending across the EBW of the spectrum.

5.2.2.1 Measurement Procedure AVG1(power averaging over the EBW with slow sweep speed):

1. Set the analyzer span to 5-30% greater than the EBW.
2. Set the RBW = 1 MHz.
3. Set the VBW ≥ 3 MHz.
4. Detector = power average (RMS).
5. Ensure that the number of measurement points in the sweep ≥ 2 x (span/RBW).
6. Manually set the sweep time to: ≥10 x (number of measurement points in sweep) x (transmission symbol period).
7. Perform the measurement over a single sweep.
8. Use the spectrum analyzer's integrated band power measurement function with band limits set equal to the EBW band edges to determine the maximum conducted output power of the EUTover the EBW. Note: If the analyzer does not have a band power function, sum the spectral levels (in linear power units) at 1 MHz intervals extending across the entire EBW.

TEST RESULTS

IEEE 802.11b Mode

Channel	Channel Frequency (MHz)	Peak Power (dBm)	Peak Power Limit (dBm)	Pass / Fail
Low	2412	19.46	30	PASS
Middle	2437	18.97		PASS
High	2462	18.33		PASS

Remark: *At finial test to get the worst-case emission at 1Mbps.*

IEEE 802.11g Mode

Channel	Channel Frequency (MHz)	Peak Power (dBm)	Peak Power Limit (dBm)	Pass / Fail
Low	2412	21.31	30	PASS
Middle	2437	20.87		PASS
High	2462	20.57		PASS

Remark: *At finial test to get the worst-case emission at 6Mbps.*

IEEE 802.11n HT20 Mode

Channel	Channel Frequency (MHz)	Peak Power (dBm)		Peak Power Total	Peak Power Limit	Pass / Fail
		Chain 0	Chain 1	(dBm)	(dBm)	
Low	2412	18.29	19.16	21.76	30	PASS
Middle	2437	18.08	18.30	21.20		PASS
High	2462	17.44	18.32	20.91		PASS

Remark: *At finial test to get the worst-case emission at 6.5Mbps.*

IEEE 802.11n HT40 Mode

Channel	Channel Frequency (MHz)	Peak Power (dBm)		Peak Power (dBm)	Peak Power Limit	Pass / Fail
		Chain 0	Chain 0	(dBm)	(dBm)	
Low	2422	18.45	18.65	21.56	30	PASS
Middle	2437	18.09	18.46	21.29		PASS
High	2452	17.92	17.80	20.87		PASS

Remark: *At finial test to get the worst-case emission at 13.5Mbps.*

Antenna Gain1:	4.13	dBi				
Antenna Gain2:	4.13	dBi				
Array Gain=:	8.90	=	10*log	((10^(	4.13 /10)+	(10^(4.13 /10)))
Peak Power Limit:	27.10	=	30-	(	8.90 -6	)

IEEE 802.11a Mode

Channel	Channel Frequency (MHz)	Peak Power (dBm)	Peak Power Limit (dBm)	Pass / Fail
Low	5745	16.12	30	PASS
Middle	5785	16.08		PASS
High	5805	16.23		PASS

Remark: *At finial test to get the worst-case emission at 6Mbps.*

IEEE 802.11n HT20 Mode

Channel	Channel Frequency (MHz)	Peak Power (dBm)			Peak Power Total (dBm)	Peak Power Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Chain 2			
Low	5745	13.81	12.07	12.30	17.57	27.10	PASS
Middle	5785	13.41	12.36	11.61	17.29		PASS
High	5805	13.64	12.08	11.26	17.21		PASS

Remark: *At finial test to get the worst-case emission at 6.5Mbps.*

IEEE 802.11n HT40 Mode

Channel	Channel Frequency (MHz)	Peak Power (dBm)			Peak Power Total (dBm)	Peak Power Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Chain 2			
Low	5745	15.60	12.48	12.90	18.66	27.10	PASS
Middle	5785	15.30	13.09	12.25	18.52		PASS
High	5805	15.77	12.73	11.75	18.54		PASS

Remark: *At finial test to get the worst-case emission at 6.5Mbps.*

Average Power (2.4G)

802.11b Mode

Channel	Frequency (MHz)	Average Power (dBm)
Low	2412	16.79
Middle	2437	16.22
High	2462	15.69

802.11g Mode

Channel	Frequency (MHz)	Average Power (dBm)
Low	2412	15.31
Middle	2437	15.02
High	2462	14.65

802.11n HT20 Mode

Channel	Frequency (MHz)	Average Power Chain0 (dBm)	Average Power Chain1 (dBm)
Low	2412	12.30	12.79
Middle	2437	11.80	12.58
High	2462	11.66	12.17

802.11n HT40 Mode

Channel	Frequency (MHz)	Average Power Chain0 (dBm)	Average Power Chain1 (dBm)
Low	2422	11.78	12.82
Middle	2437	12.03	12.05
High	2452	11.48	12.00

Average Power (5G)

802.11a Mode

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)
Low	5745	8.60	0.0072
Middle	5785	8.82	0.0076
High	5805	9.15	0.0082

802.11n HT20 Mode

Channel	Frequency (MHz)	Chain 0 Output Power (dBm)	Chain 1 Output Power (dBm)	Chain 2 Output Power (dBm)	Total Output Power (dBm)	Output Power (W)
Low	5745	6.38	4.06	4.58	9.90	0.0098
Middle	5785	5.60	4.54	3.82	9.49	0.0089
High	5805	5.91	4.11	3.51	9.40	0.0087

802.11n HT40 Mode

Channel	Frequency (MHz)	Chain 0 Output Power (dBm)	Chain 1 Output Power (dBm)	Chain 2 Output Power (dBm)	Total Output Power (dBm)	Output Power (W)
Low	5745	7.70	4.87	4.95	10.82	0.0121
Middle	5785	7.76	5.12	4.47	10.80	0.0120
High	5805	7.98	4.90	3.89	10.73	0.0118

7.3 POWER SPECTRAL DENSITY

LIMITS

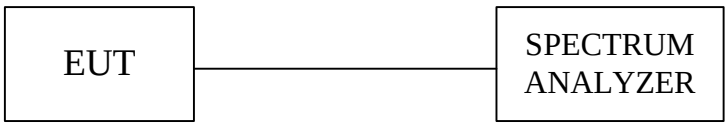
§ 15.247(e) For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

TEST EQUIPMENT

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	FSU	FSEK 30	835253/002	SEP. 29, 2012

Remark: *Each piece of equipment is scheduled for calibration once a year.*

TEST SETUP



TEST PROCEDURE

The transmitter output was connected to the spectrum analyzer, the bandwidth of the fundamental frequency was measured with the spectrum analyzer using RBW＝3KHz and VBW≧RBW, set sweep time＝span / 3KHz.

The power spectral density was measured and recorded.

The sweep time is allowed to be longer than span / 3KHz for a full response of the mixer in the spectrum analyzer.

TEST RESULTS

IEEE 802.11b Mode

Channel	Frequency (MHz)	Reading (dBm)	BWCF (dB)	PPSD (dBm)	Limit (dBm)	Margin (dB)	Pass / Fail
Low	2412	5.03	-15.2	-10.17	8.00	-18.17	PASS
Middle	2437	4.64	-15.2	-10.56	8.00	-18.56	PASS
High	2462	4.04	-15.2	-11.16	8.00	-19.16	PASS

Remark:

1. *At finial test to get the worst-case emission at 1Mbps.*
2. *The cable assembly insertion loss of 12.3dB (including 10 dB pad and 2.3 dB cable) was Entered as an offset in the spectrum analyzer to allow for direct reading of power.*

IEEE 802.11g Mode

Channel	Frequency (MHz)	Reading (dBm)	BWCF (dB)	PPSD (dBm)	Limit (dBm)	Margin (dB)	Pass / Fail
Low	2412	-0.08	-15.2	-15.28	8.00	-23.28	PASS
Middle	2437	-0.91	-15.2	-16.11	8.00	-24.11	PASS
High	2462	-0.89	-15.2	-16.09	8.00	-24.09	PASS

Remark:

1. *At finial test to get the worst-case emission at 6Mbps.*
2. *The cable assembly insertion loss of 12.3dB (including 10 dB pad and 2.3 dB cable) was Entered as an offset in the spectrum analyzer to allow for direct reading of power.*

IEEE 802.11n HT20 Mode

Channel	Frequency (MHz)	Reading Chain0 (dBm)	Reading Chain1 (dBm)	BWCF (dB)	PPSD Chain0 (dBm)	PPSD Chain1 (dBm)	PPSD Total (dBm)	Limit (dBm)	Margin (dB)	Pass / Fail
Low	2412	-3.44	-2.67	-15.2	-18.64	-17.87	-15.23	8.00	-23.23	PASS
Middle	2437	-4.18	-3.28	-15.2	-19.38	-18.48	-15.90	8.00	-23.90	PASS
High	2462	-4.58	-3.89	-15.2	-19.78	-19.09	-16.41	8.00	-24.41	PASS

Remark:

1. *At finial test to get the worst-case emission at 6.5Mbps.*
2. *The cable assembly insertion loss of 12.3dB (including 10 dB pad and 2.3 dB cable) was Entered as an offset in the spectrum analyzer to allow for direct reading of power.*

IEEE 802.11n HT40 Mode

Channel	Frequency (MHz)	Reading Chain0 (dBm)	Reading Chain1 (dBm)	BWCF (dB)	PPSD Chain0 (dBm)	PPSD Chain1 (dBm)	PPSD Total (dBm)	Limit (dBm)	Margin (dB)	Pass / Fail
Low	2422	-7.34	-5.76	-15.2	-22.54	-20.96	-18.67	8.00	-26.67	PASS
Middle	2437	-7.7	-6.13	-15.2	-22.90	-21.33	-19.03	8.00	-27.03	PASS
High	2452	-7.76	-6.27	-15.2	-22.96	-21.47	-19.14	8.00	-27.14	PASS

Remark:

1. *At finial test to get the worst-case emission at 13.5Mbps.*
2. *The cable assembly insertion loss of 12.3dB (including 10 dB pad and 2.3 dB cable) was Entered as an offset in the spectrum analyzer to allow for direct reading of power.*

Antenna Gain1:	4.13	dBi					
Antenna Gain2:	4.13	dBi					
Array Gain=:	8.90	=	10*log	((10^(	4.13	/10)+ (10^(4.13 /10)))	
PPSD Limit:	5.10	=	8-	(	8.90	-6)	

IEEE 802.11a Mode

Channel	Frequency (MHz)	Reading (dBm)	BWCF (dB)	PPSD (dBm)	Limit (dBm)	Margin (dB)	Pass / Fail
Low	5745	-3.9	-15.2	-19.10	8.00	-27.10	PASS
Middle	5785	-4.03	-15.2	-19.23	8.00	-27.23	PASS
High	5805	-3.6	-15.2	-18.80	8.00	-26.80	PASS

Remark:

1. At finial test to get the worst-case emission at 6Mbps.

2. The cable assembly insertion loss of 12.3dB (including 10 dB pad and 2.3 dB cable) was Entered as an offset in the spectrum analyzer to allow for direct reading of power.

IEEE 802.11n HT20 Mode

Channel	Frequency (MHz)	Reading Chain0 (dBm)	Reading Chain1 (dBm)	Reading Chain2 (dBm)	BWCF (dB)	PPSD Chain0 (dBm)	PPSD Chain1 (dBm)	PPSD Chain2 (dBm)	PPSD Total (dBm)	Limit (dBm)	Margin (dB)	Pass / Fail
Low	5745	-6.48	-8.1	-7.18	-15.2	-21.68	-23.30	-22.38	-17.63	5.10	-22.73	PASS
Middle	5785	-6.99	-7.59	-7.62	-15.2	-22.19	-22.79	-22.82	-17.82	5.10	-22.92	PASS
High	5805	-6.76	-7.87	-8.05	-15.2	-21.96	-23.07	-23.25	-17.95	5.10	-23.05	PASS

Remark:

1. At finial test to get the worst-case emission at 13Mbps.

2. The cable assembly insertion loss of 12.3dB (including 10 dB pad and 2.3 dB cable) was Entered as an offset in the spectrum analyzer to allow for direct reading of power.

IEEE 802.11n HT40 Mode

Channel	Frequency (MHz)	Reading Chain0 (dBm)	Reading Chain1 (dBm)	Reading Chain2 (dBm)	BWCF (dB)	PPSD Chain0 (dBm)	PPSD Chain1 (dBm)	PPSD Chain2 (dBm)	PPSD Total (dBm)	Limit (dBm)	Margin (dB)	Pass / Fail
Low	5745	-9.73	-10.98	-9.65	-15.2	-24.93	-26.18	-24.85	-20.51	5.10	-25.61	PASS
Middle	5785	-9.9	-10.25	-10.12	-15.2	-25.10	-25.45	-25.32	-20.52	5.10	-25.62	PASS
High	5805	-9.87	-10.66	-10.49	-15.2	-25.07	-25.86	-25.69	-20.76	5.10	-25.86	PASS

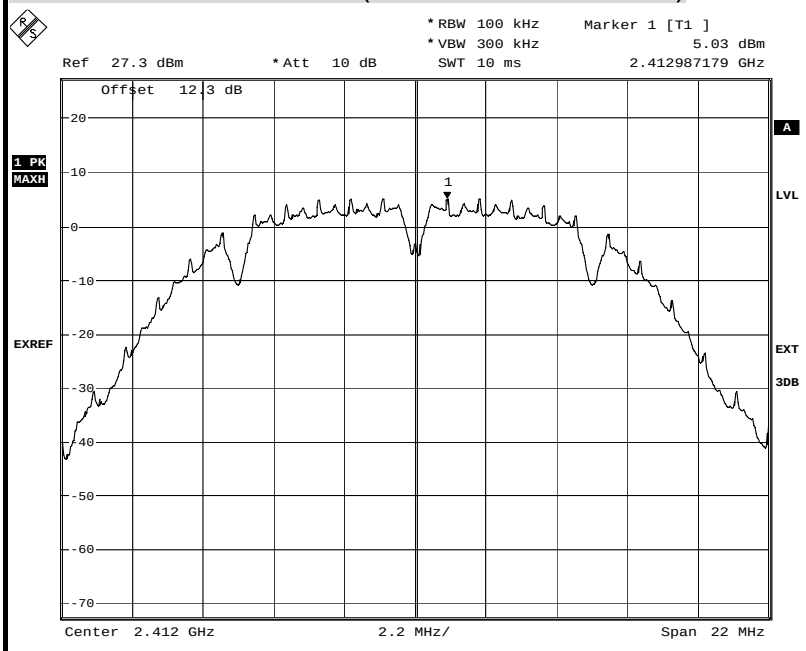
Remark:

1. At finial test to get the worst-case emission at 27Mbps.

2. The cable assembly insertion loss of 12.3dB (including 10 dB pad and 2.3 dB cable) was Entered as an offset in the spectrum analyzer to allow for direct reading of power.

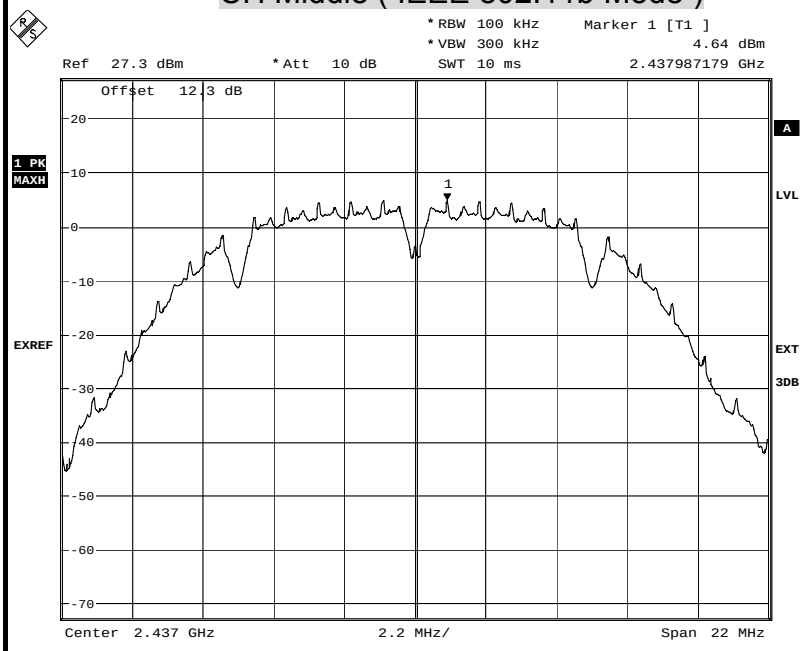
POWER SPECTRAL DENSITY (2.4G)

CH Low (IEEE 802.11b Mode)



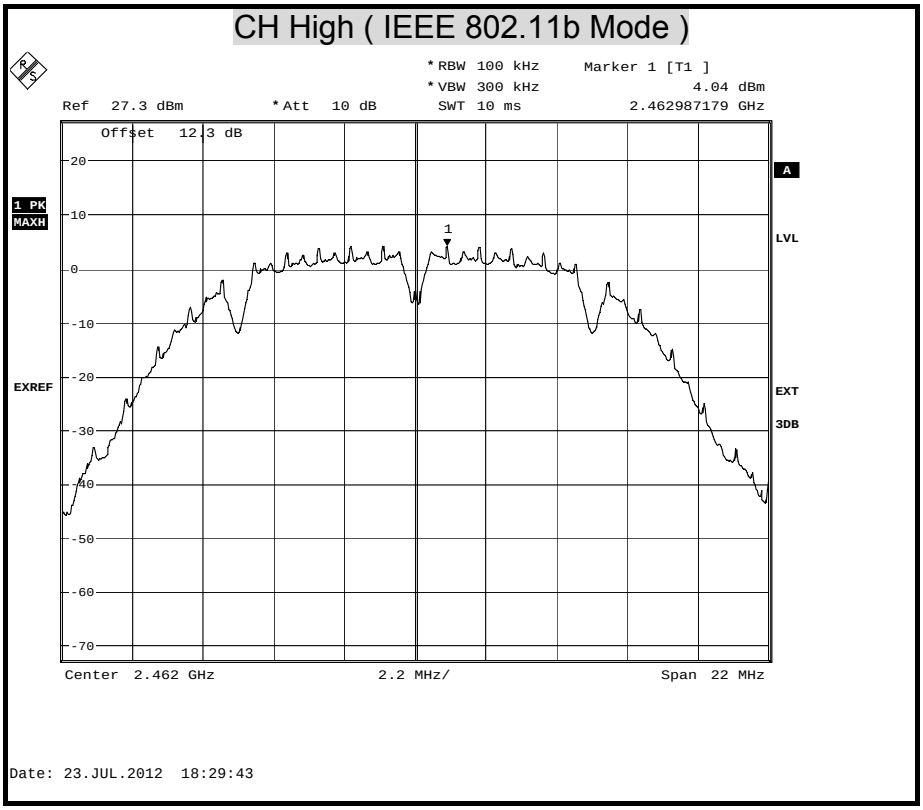
Date: 23.JUL.2012 18:28:56

CH Middle (IEEE 802.11b Mode)

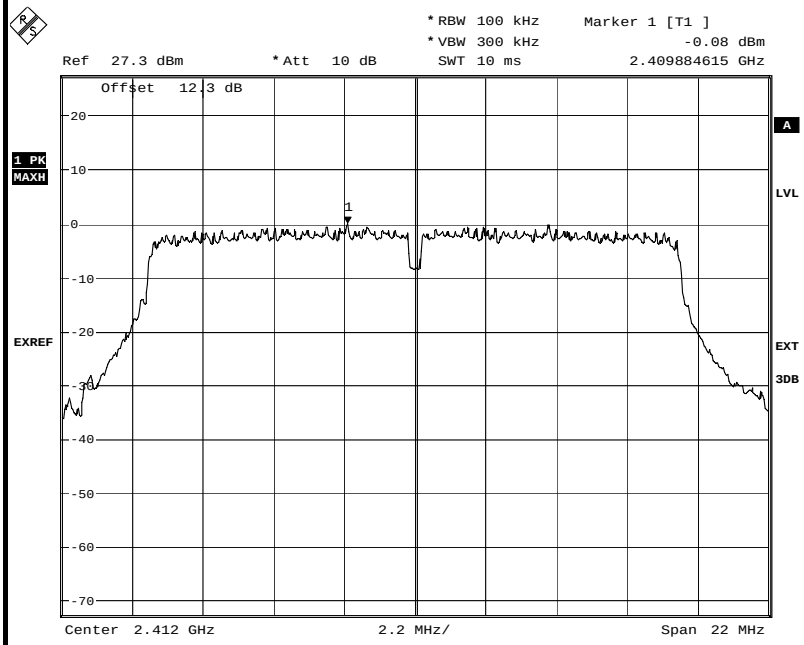


Date: 23.JUL.2012 18:29:20

CH High (IEEE 802.11b Mode)

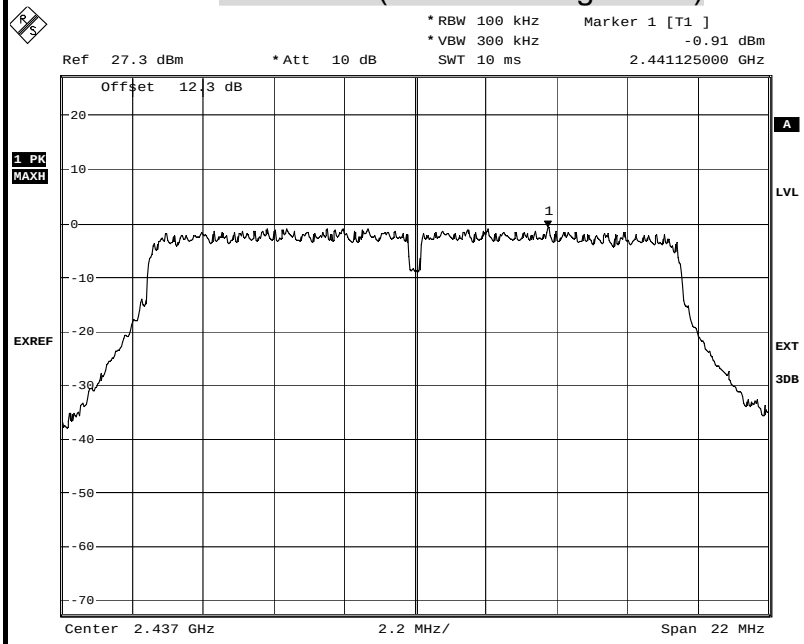


CH Low (IEEE 802.11g Mode)



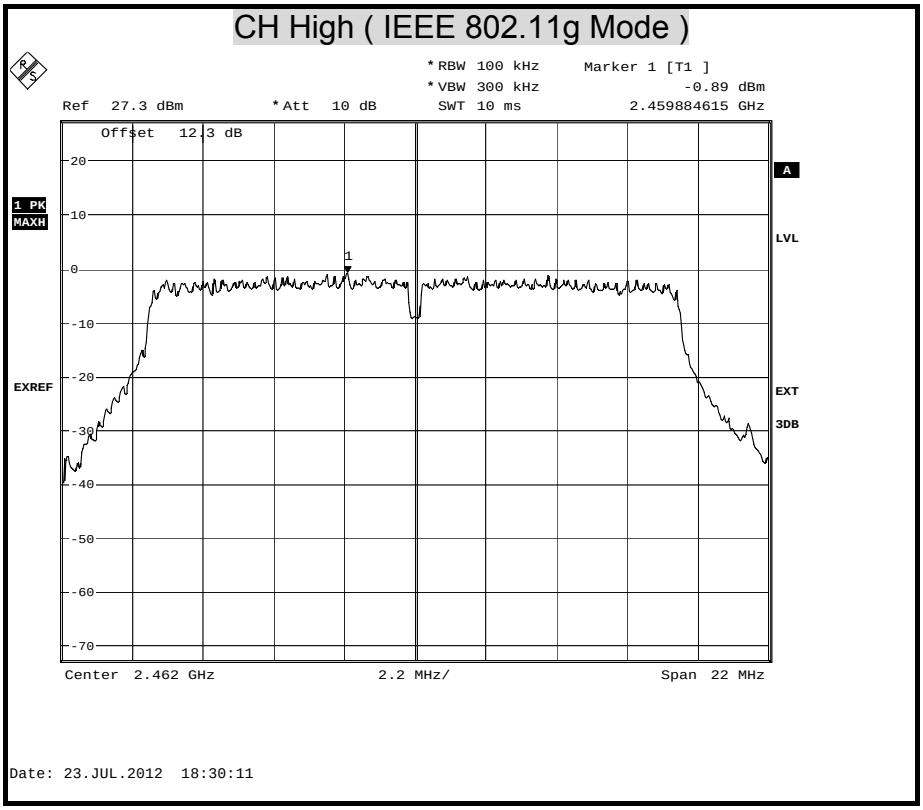
Date: 23.JUL.2012 18:30:51

CH Middle (IEEE 802.11g Mode)

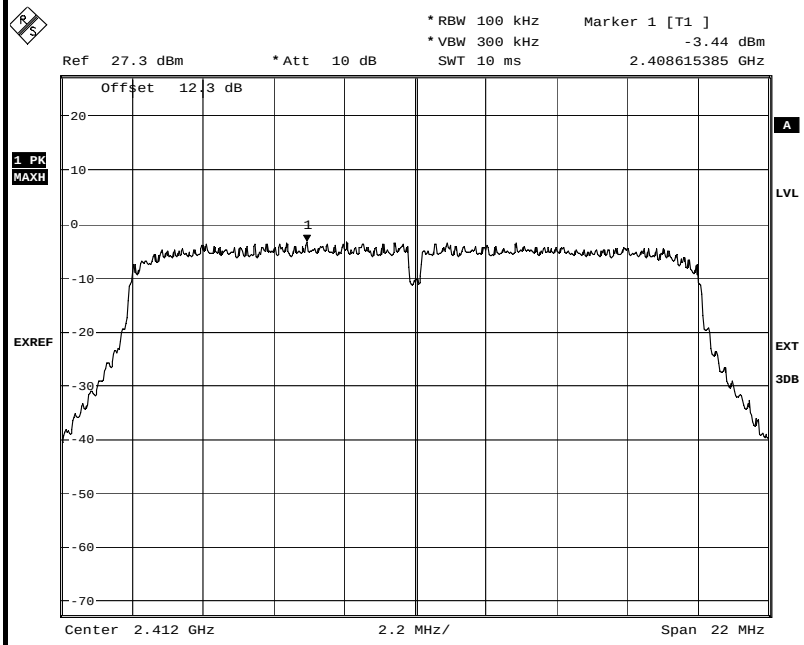


Date: 23.JUL.2012 18:30:33

CH High (IEEE 802.11g Mode)

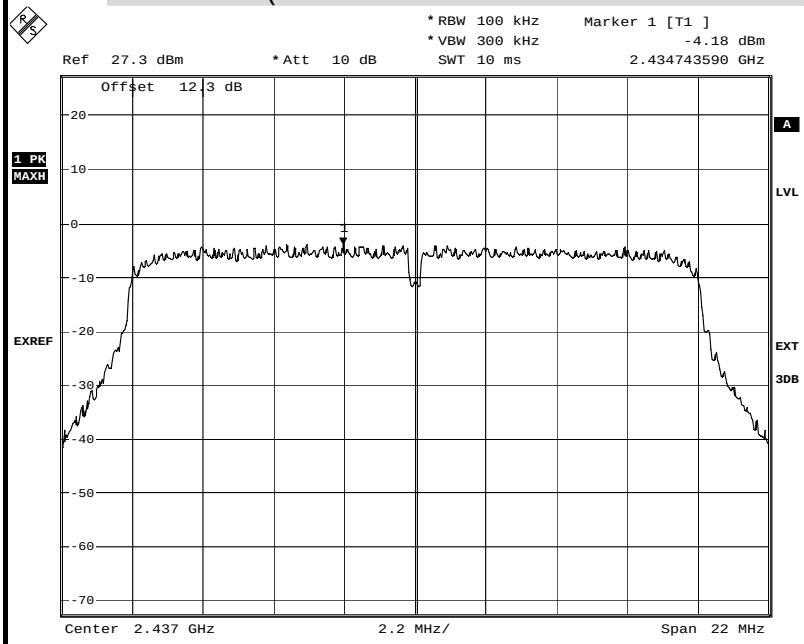


CH Low (IEEE 802.11n HT20 Mode / Chain 0)



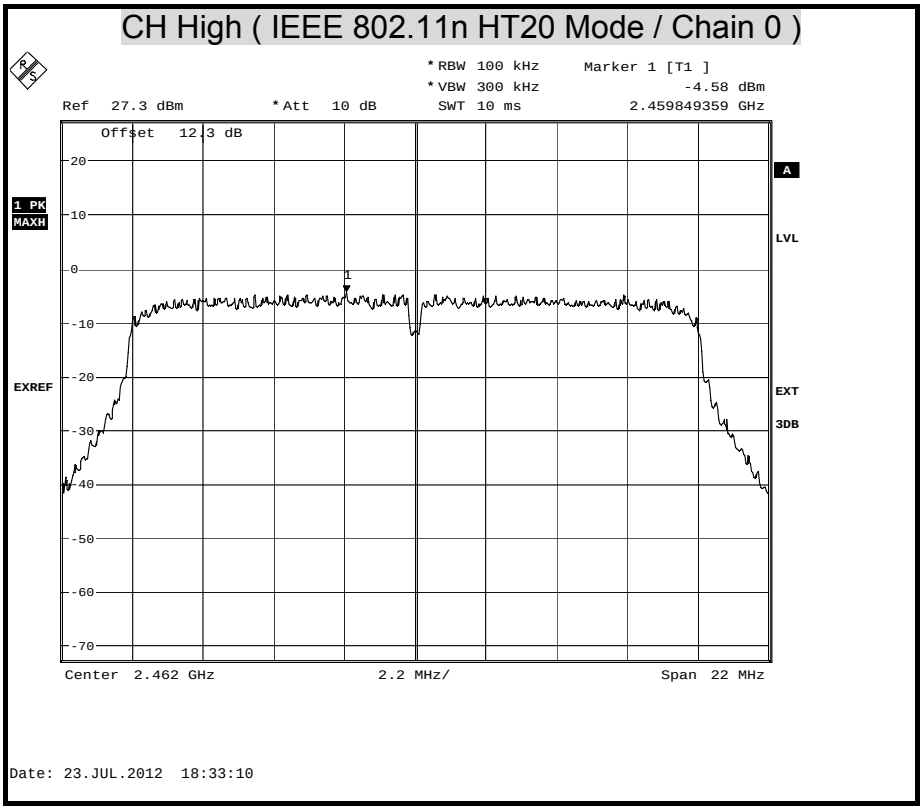
Date: 23.JUL.2012 18:32:25

CH Middle (IEEE 802.11n HT20 Mode / Chain 0)

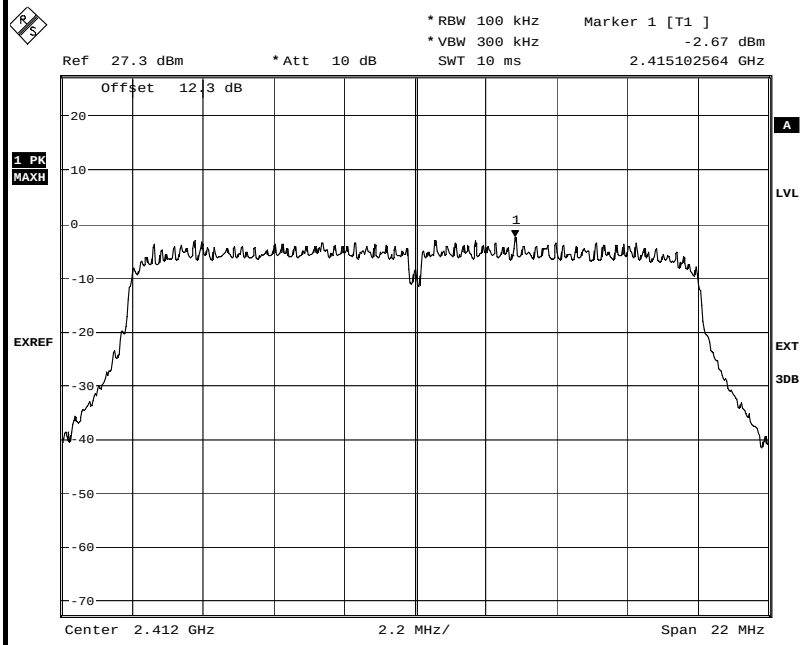


Date: 23.JUL.2012 18:32:46

CH High (IEEE 802.11n HT20 Mode / Chain 0)

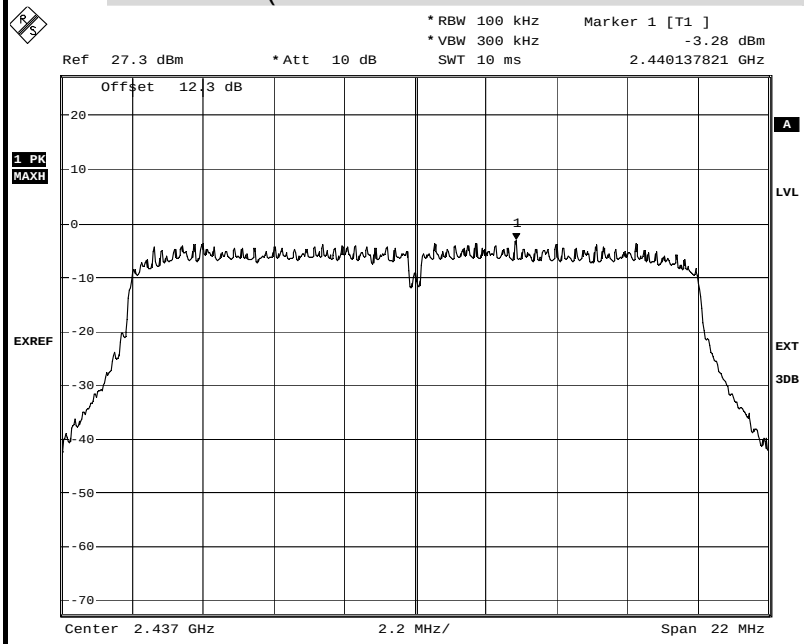


CH Low (IEEE 802.11n HT20 Mode / Chain 1)



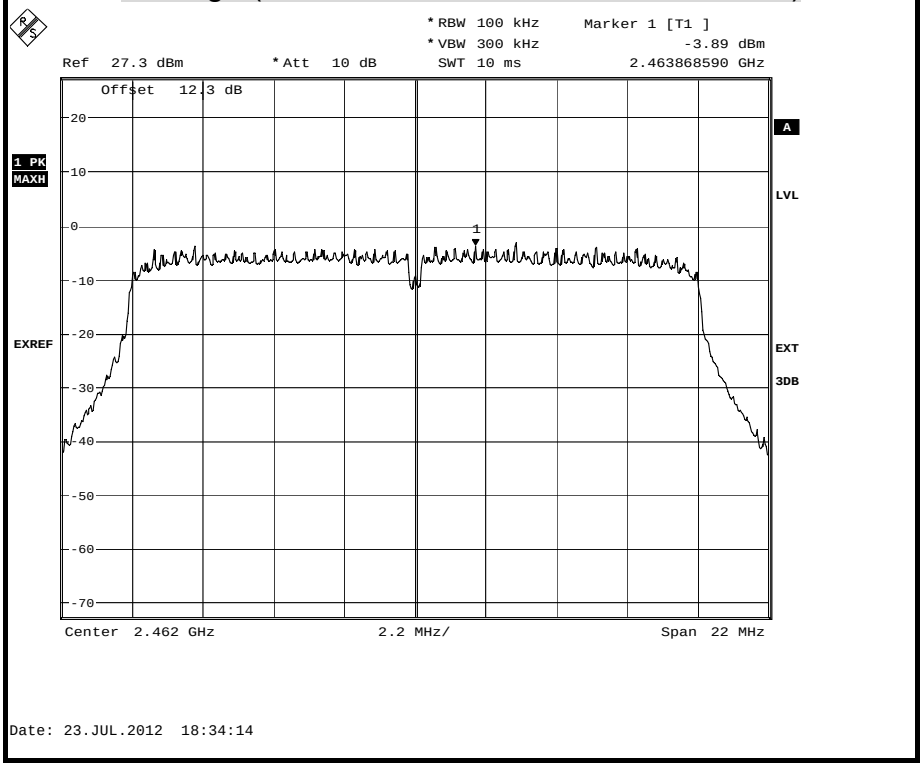
Date: 23.JUL.2012 18:35:08

CH Middle (IEEE 802.11n HT20 Mode / Chain 1)

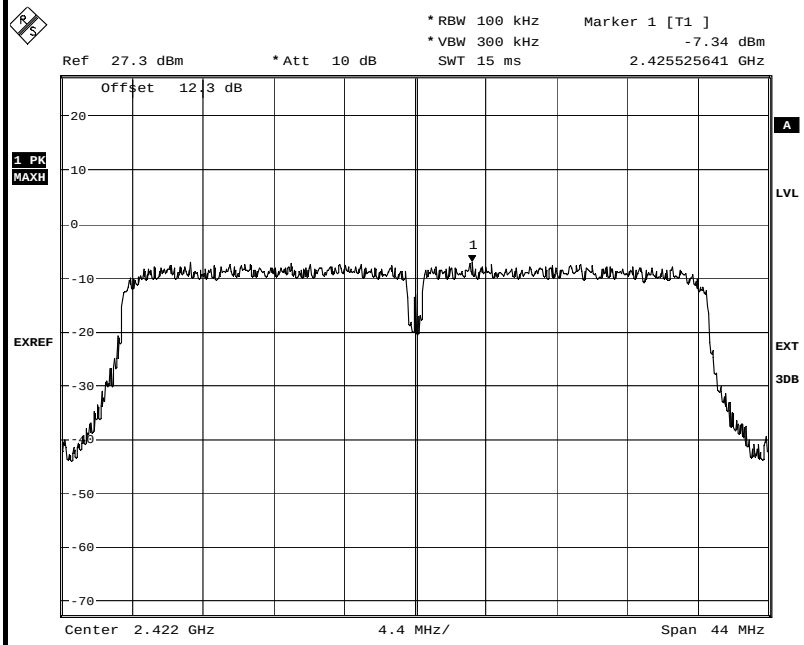


Date: 23.JUL.2012 18:34:37

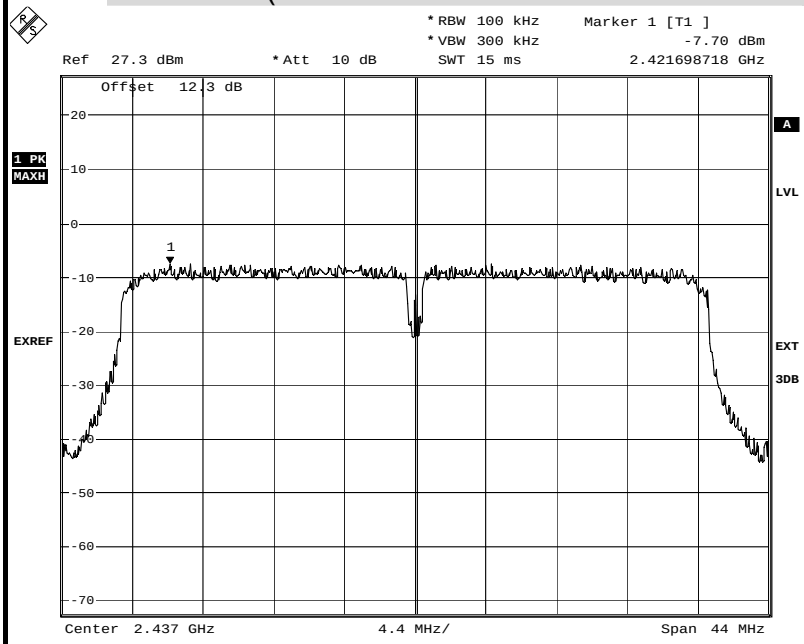
CH High (IEEE 802.11n HT20 Mode / Chain 1)



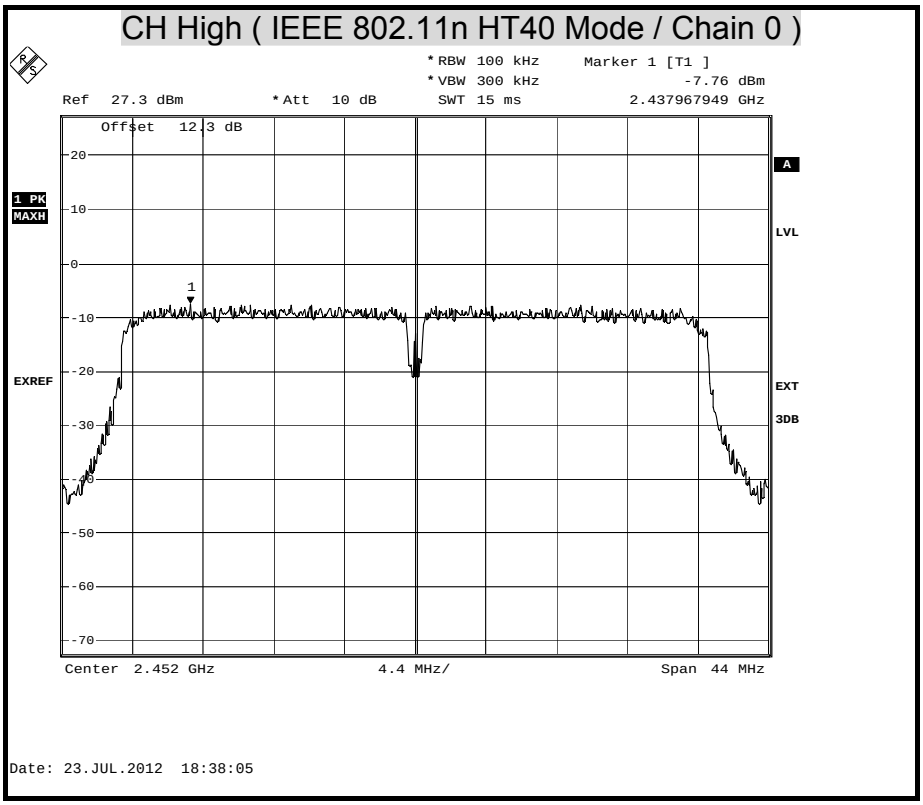
CH Low (IEEE 802.11n HT40 Mode / Chain 0)



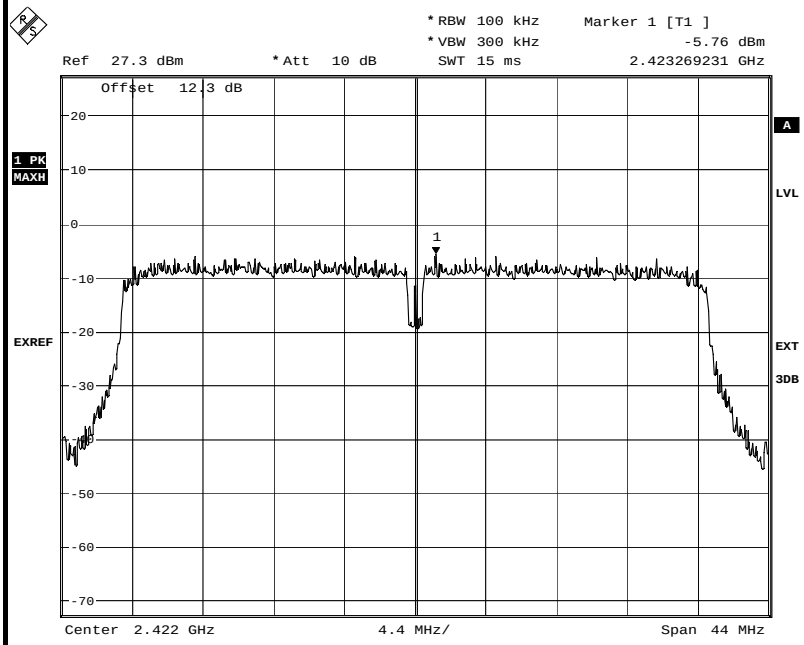
CH Middle (IEEE 802.11n HT40 Mode / Chain 0)



CH High (IEEE 802.11n HT40 Mode / Chain 0)

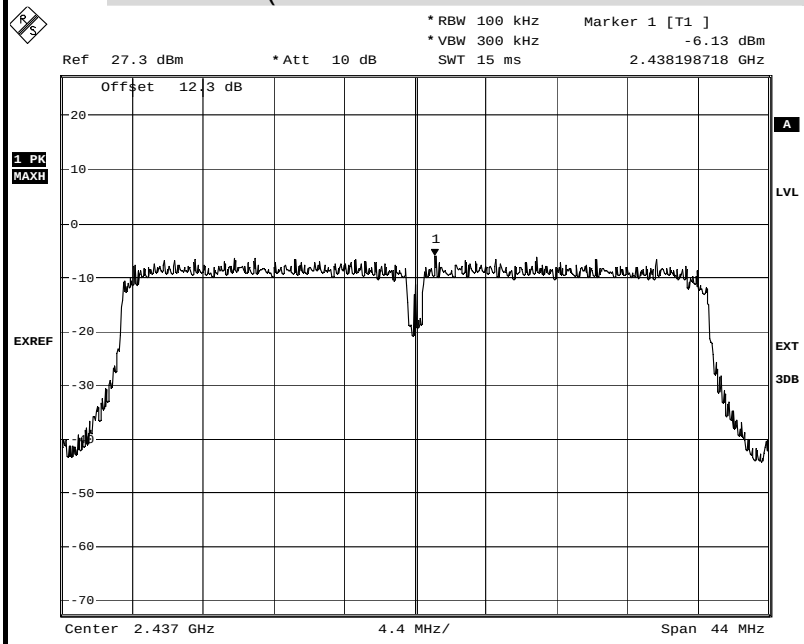


CH Low (IEEE 802.11n HT40 Mode / Chain 1)



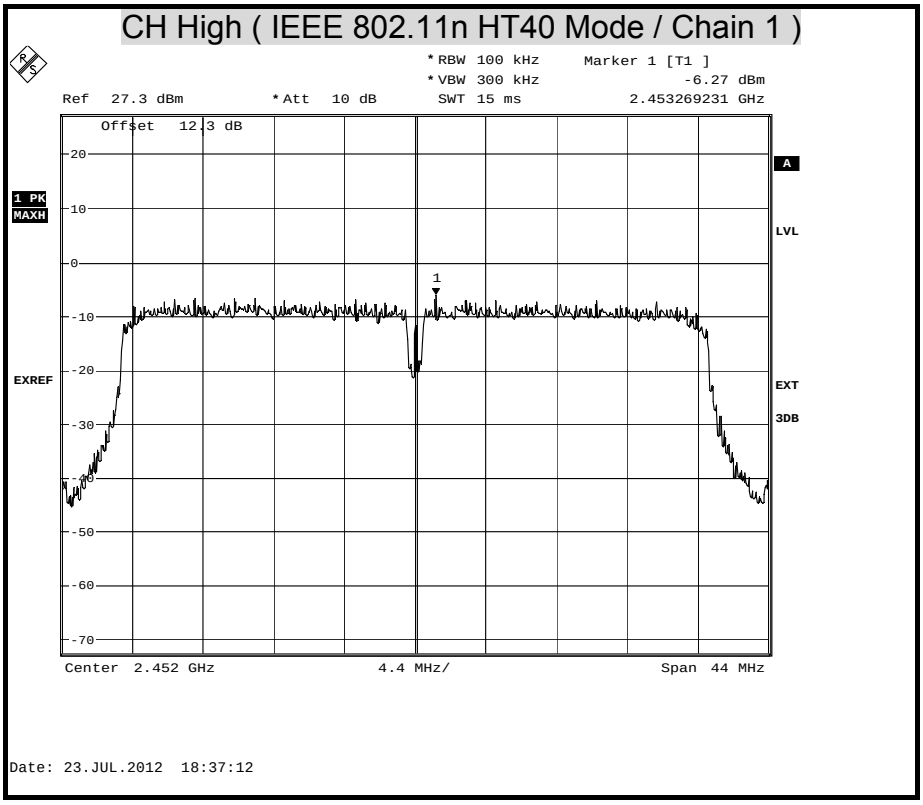
Date: 23.JUL.2012 18:36:24

CH Middle (IEEE 802.11n HT40 Mode / Chain 1)



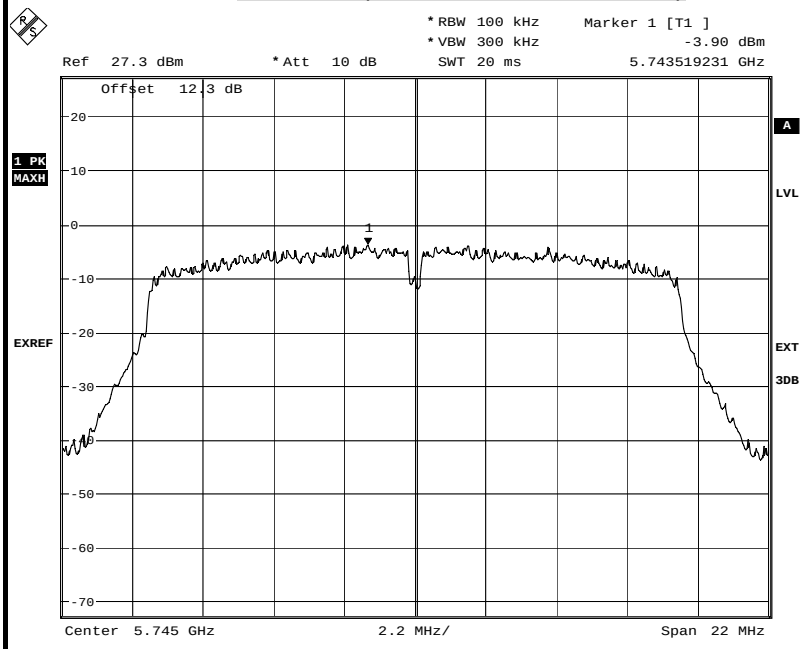
Date: 23.JUL.2012 18:36:47

CH High (IEEE 802.11n HT40 Mode / Chain 1)



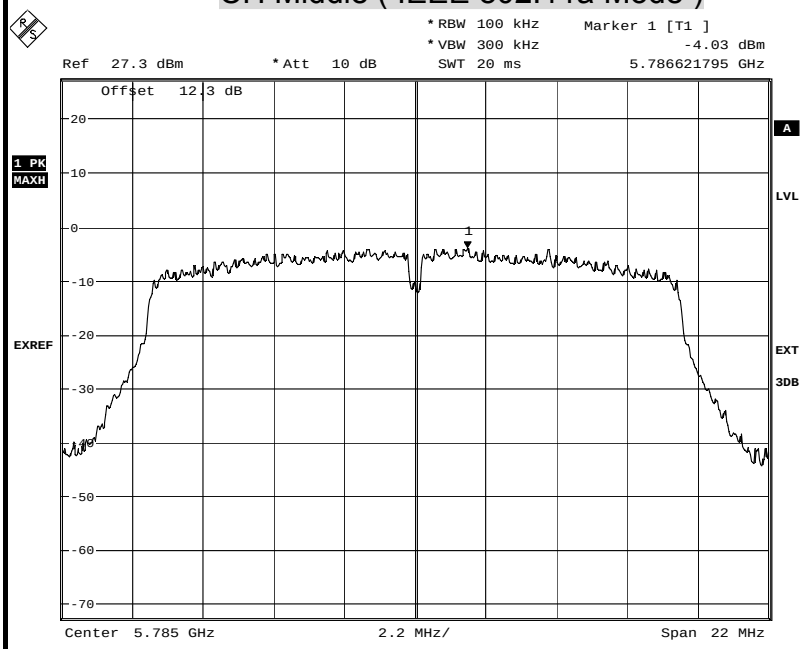
POWER SPECTRAL DENSITY (5G)

CH Low (IEEE 802.11a Mode)



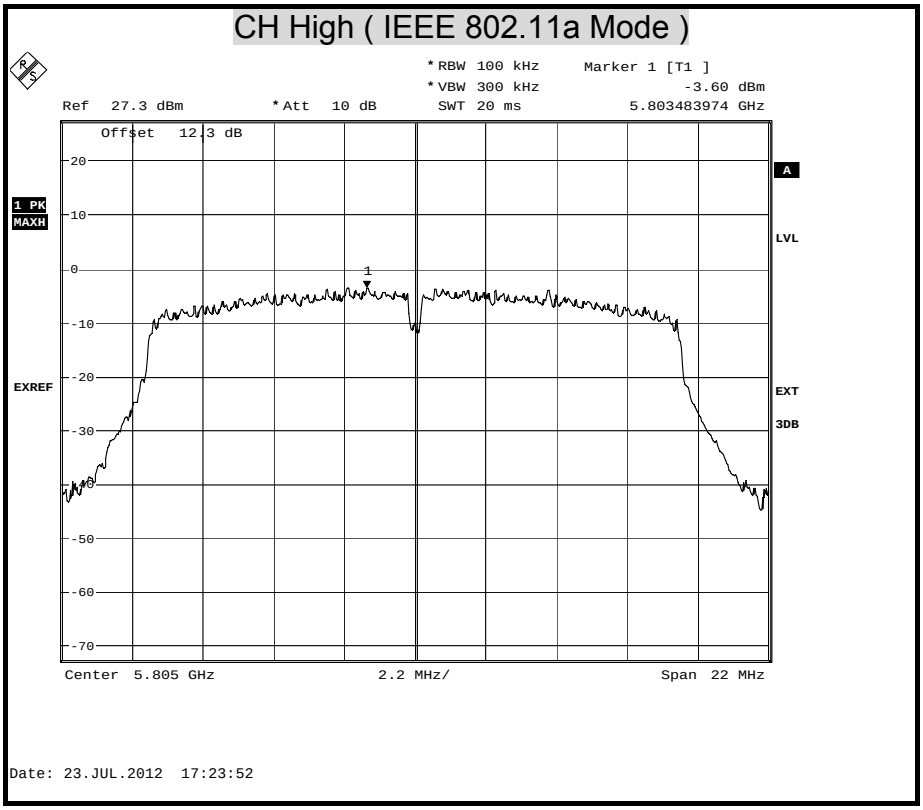
Date: 23.JUL.2012 17:24:57

CH Middle (IEEE 802.11a Mode)

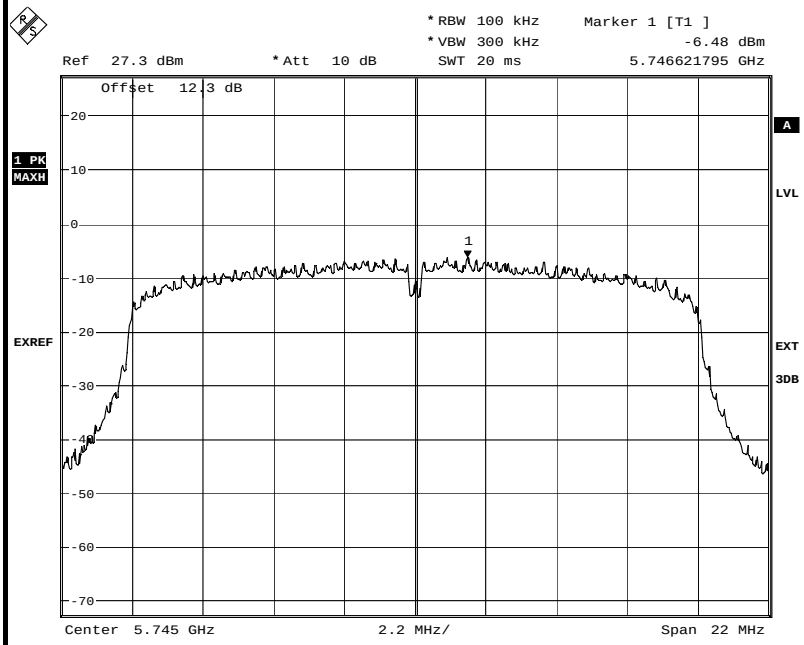


Date: 23.JUL.2012 17:24:24

CH High (IEEE 802.11a Mode)

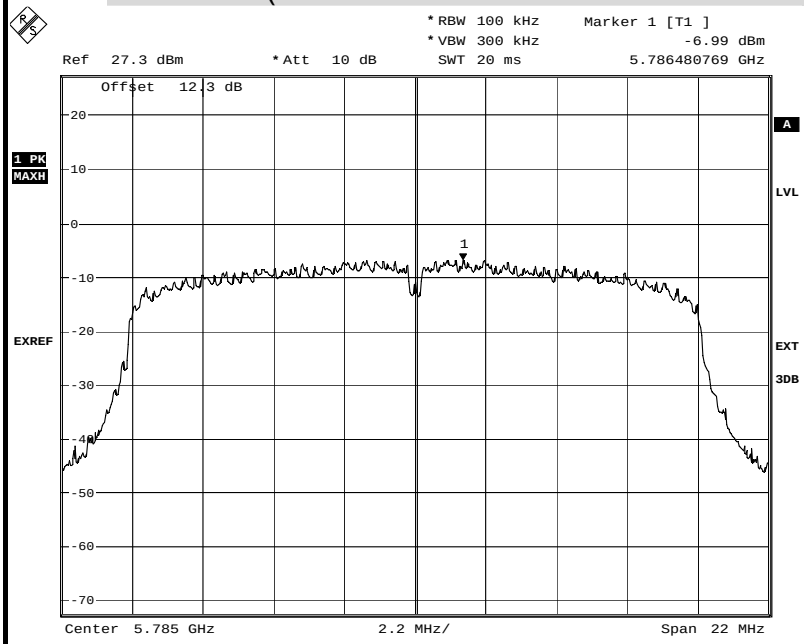


CH Low (IEEE 802.11n HT20 Mode / Chain 0)



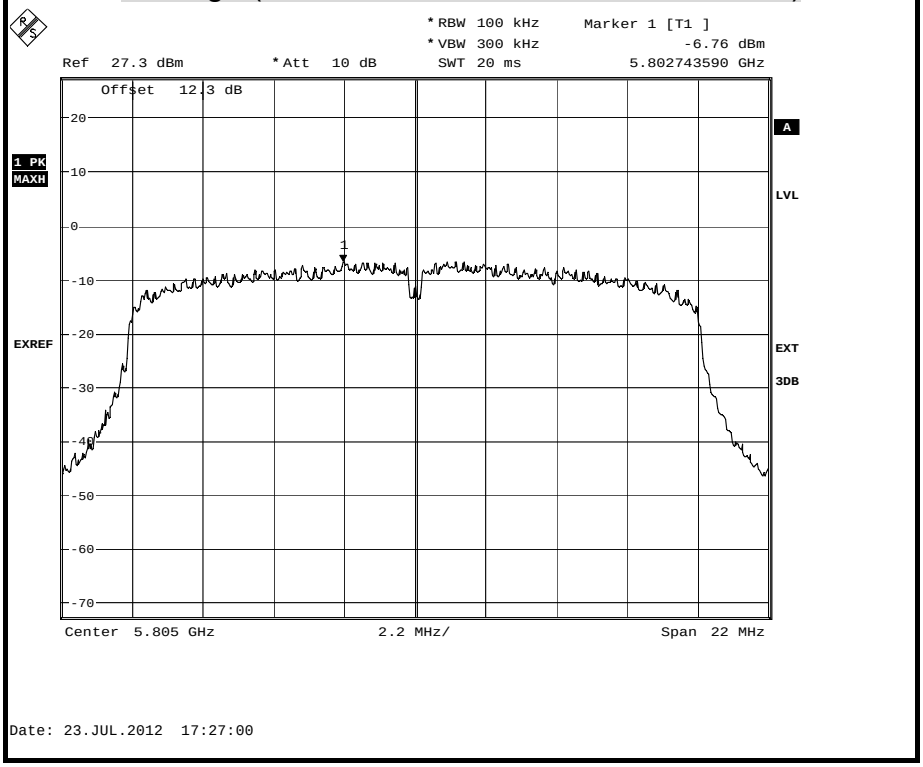
Date: 23.JUL.2012 17:25:58

CH Middle (IEEE 802.11n HT20 Mode / Chain 0)

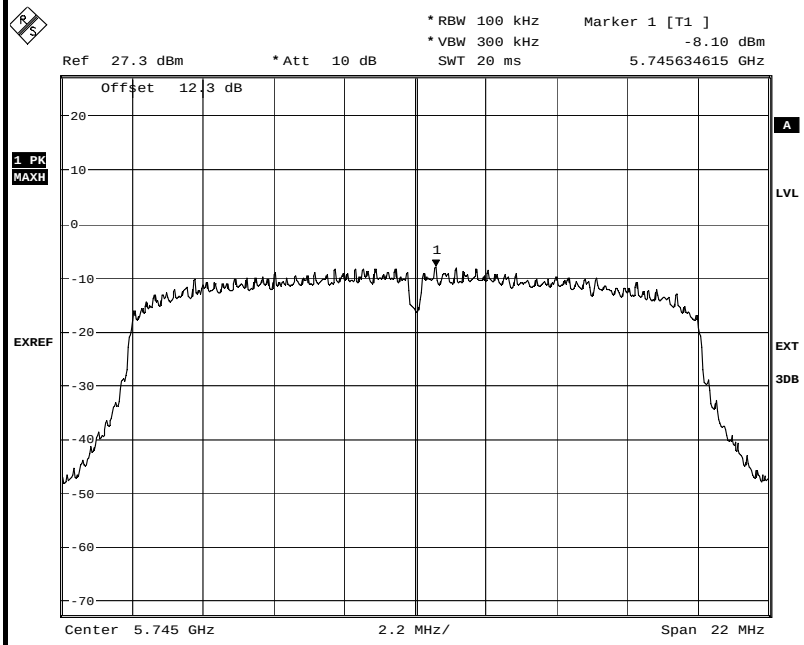


Date: 23.JUL.2012 17:26:34

CH High (IEEE 802.11n HT20 Mode / Chain 0)

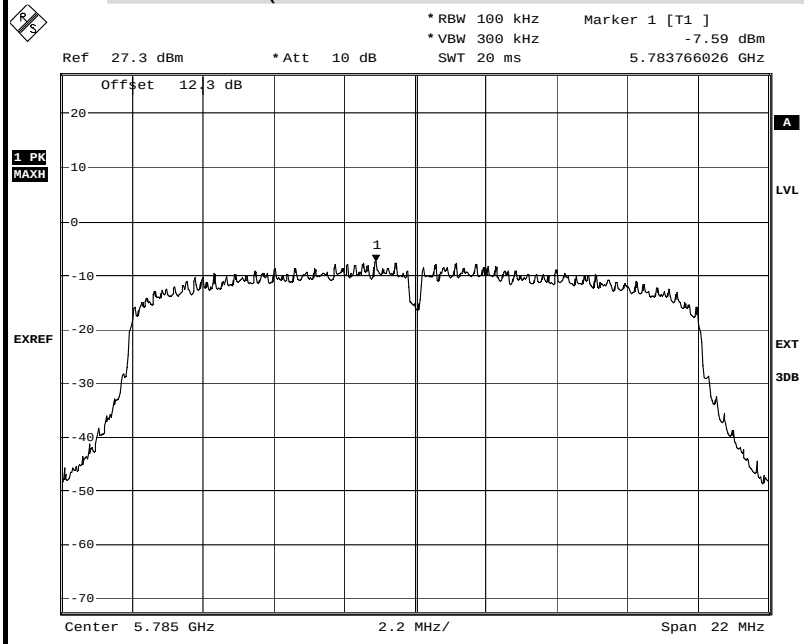


CH Low (IEEE 802.11n HT20 Mode / Chain 1)



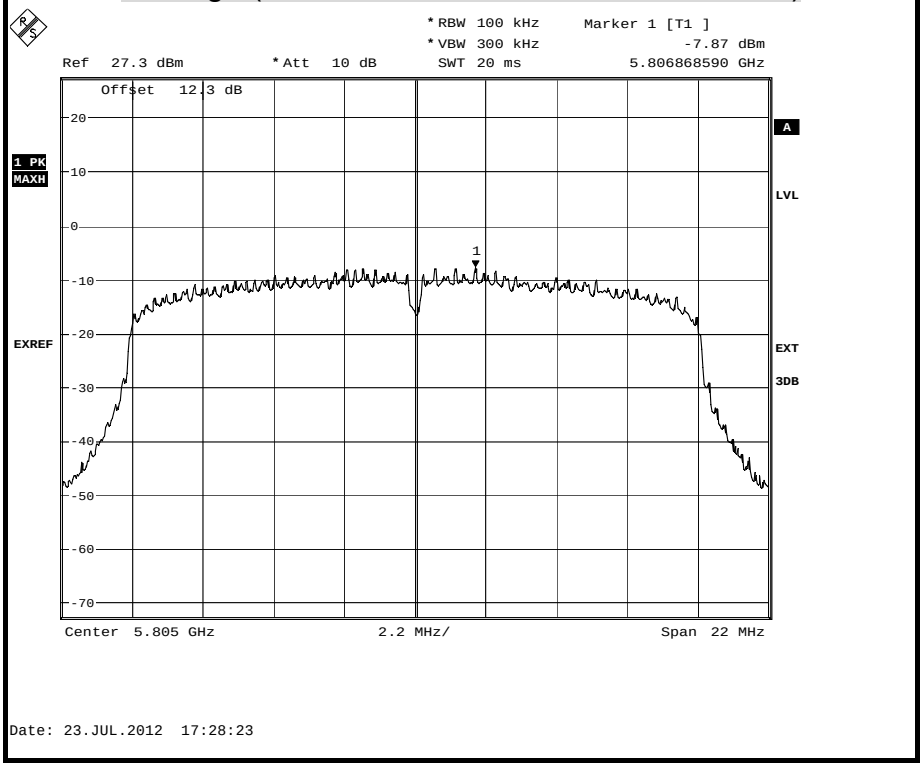
Date: 23.JUL.2012 17:29:23

CH Middle (IEEE 802.11n HT20 Mode / Chain 1)

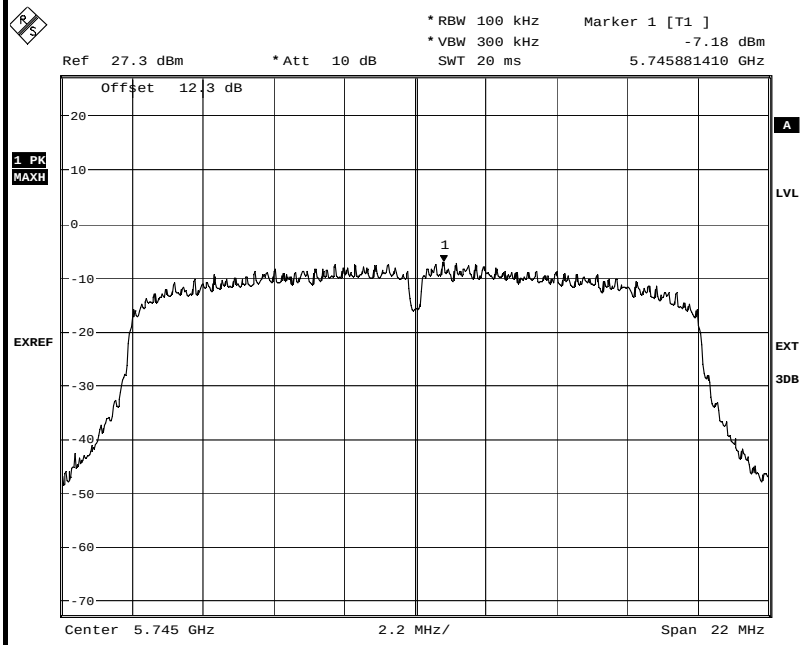


Date: 23.JUL.2012 17:28:52

CH High (IEEE 802.11n HT20 Mode / Chain 1)

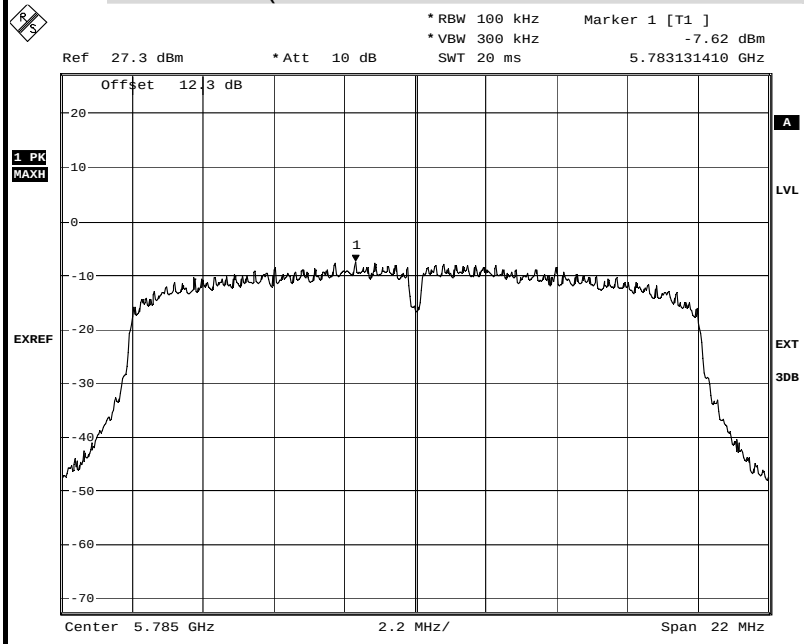


CH Low (IEEE 802.11n HT20 Mode / Chain 2)



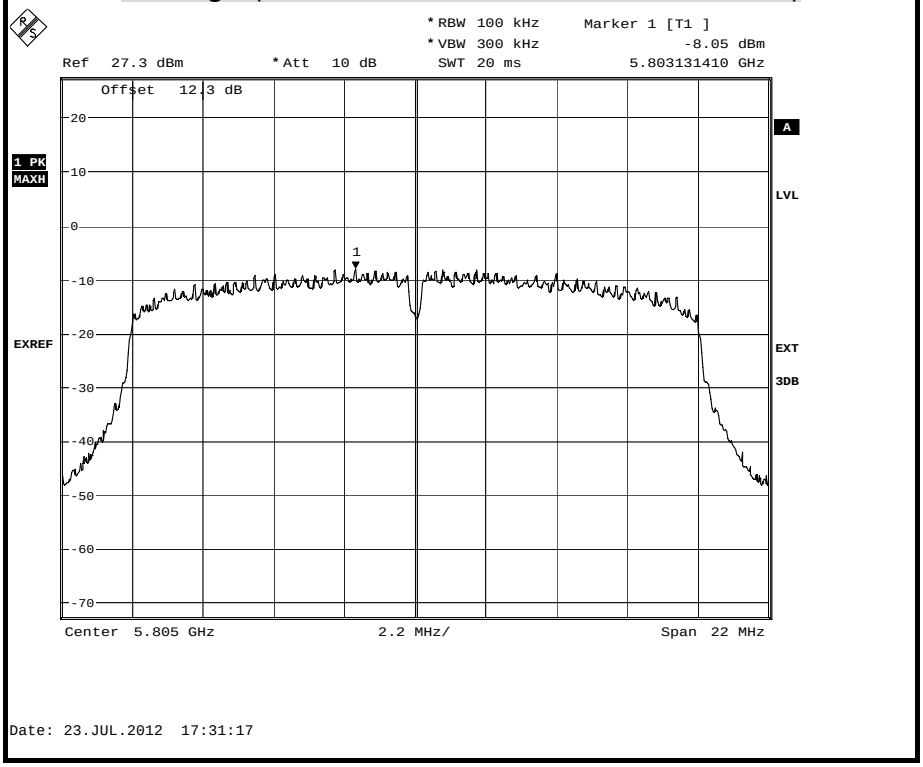
Date: 23.JUL.2012 17:30:32

CH Middle (IEEE 802.11n HT20 Mode / Chain 2)

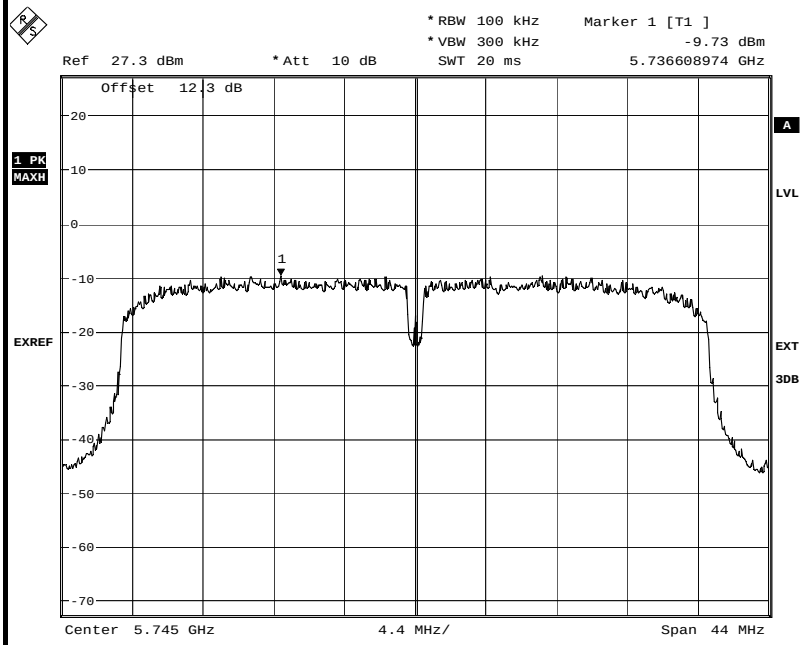


Date: 23.JUL.2012 17:30:53

CH High (IEEE 802.11n HT20 Mode / Chain 2)

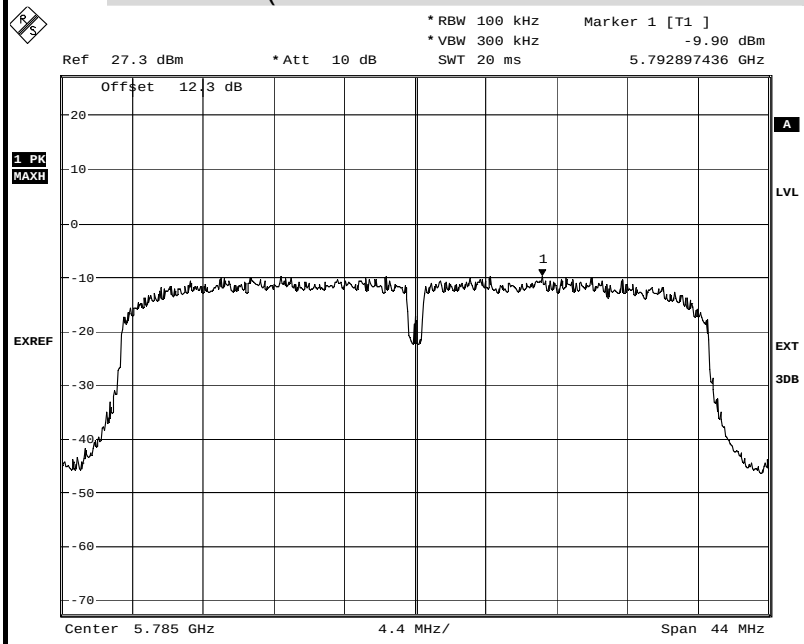


CH Low (IEEE 802.11n HT40 Mode / Chain 0)



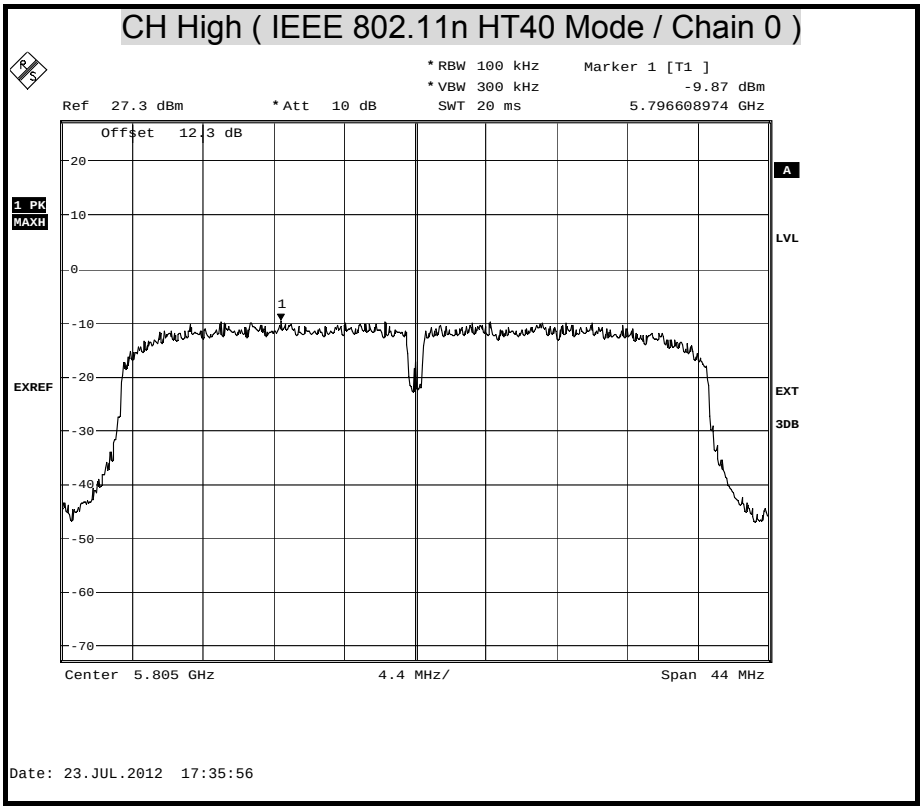
Date: 23.JUL.2012 17:37:05

CH Middle (IEEE 802.11n HT40 Mode / Chain 0)

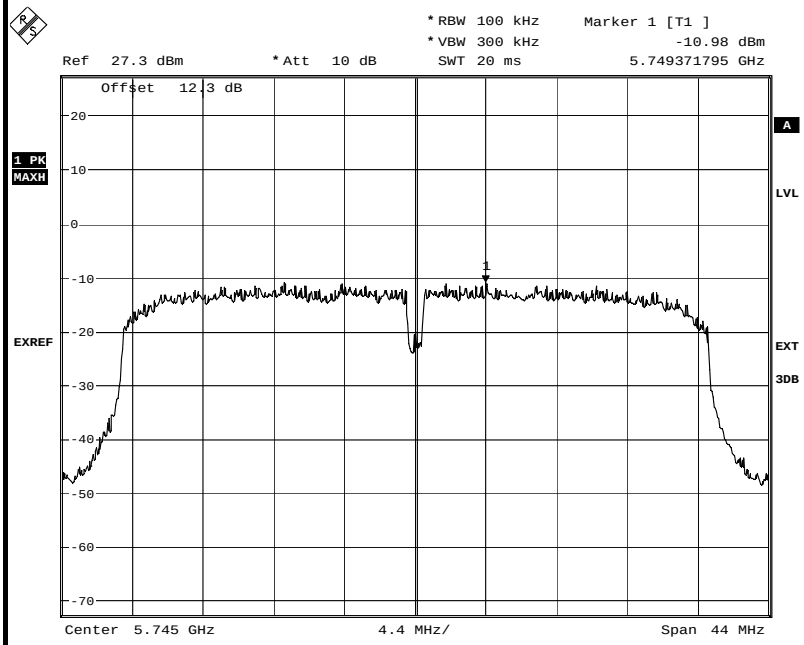


Date: 23.JUL.2012 17:36:29

CH High (IEEE 802.11n HT40 Mode / Chain 0)

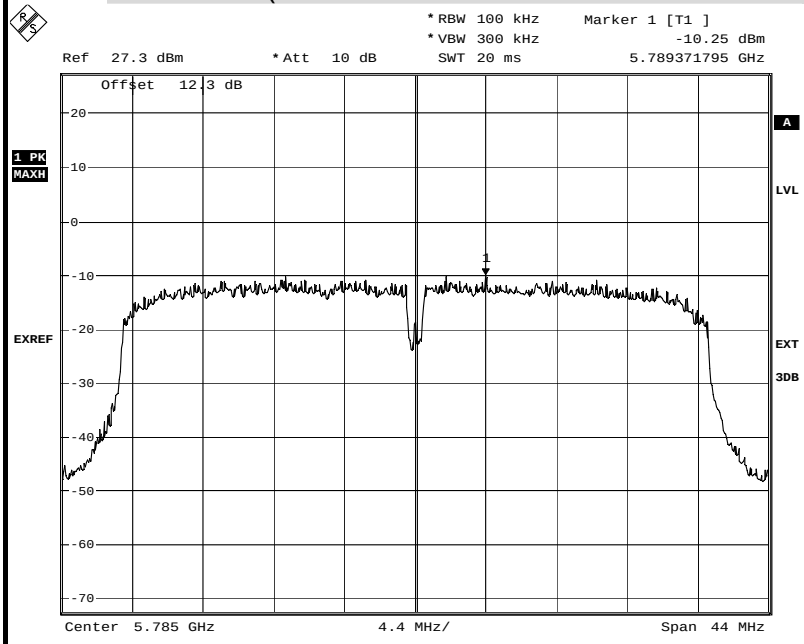


CH Low (IEEE 802.11n HT40 Mode / Chain 1)



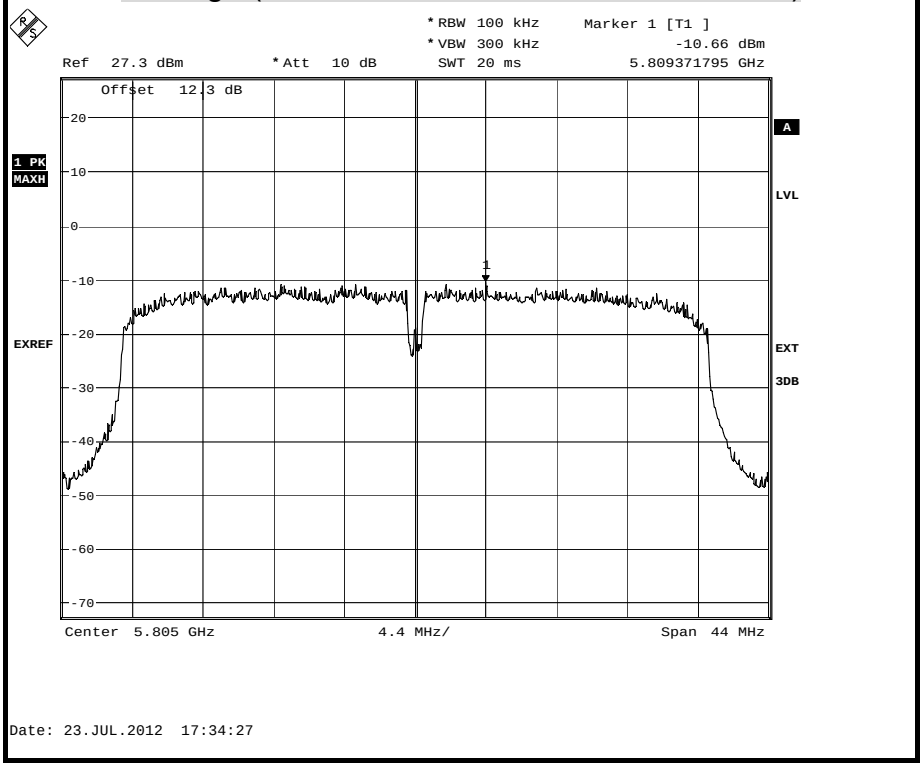
Date: 23.JUL.2012 17:33:50

CH Middle (IEEE 802.11n HT40 Mode / Chain 1)

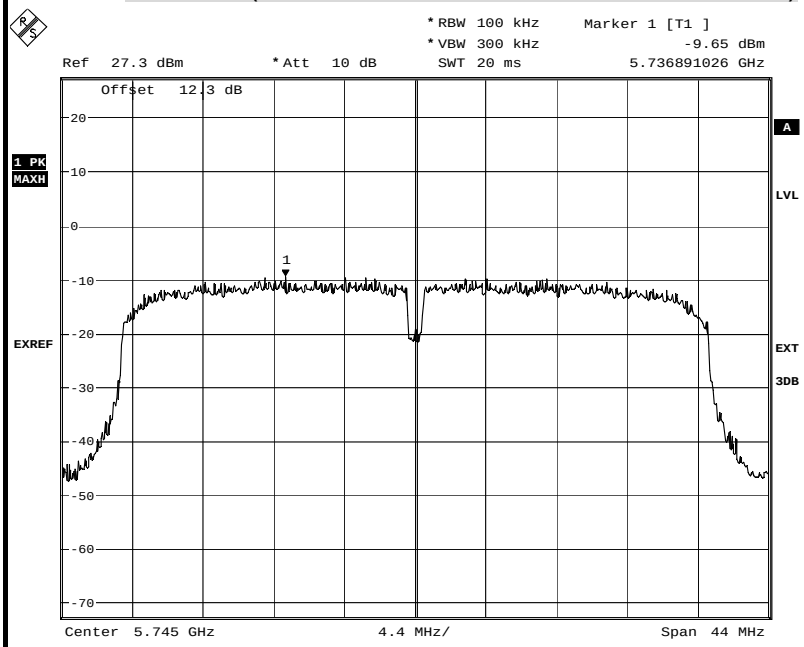


Date: 23.JUL.2012 17:34:10

CH High (IEEE 802.11n HT40 Mode / Chain 1)

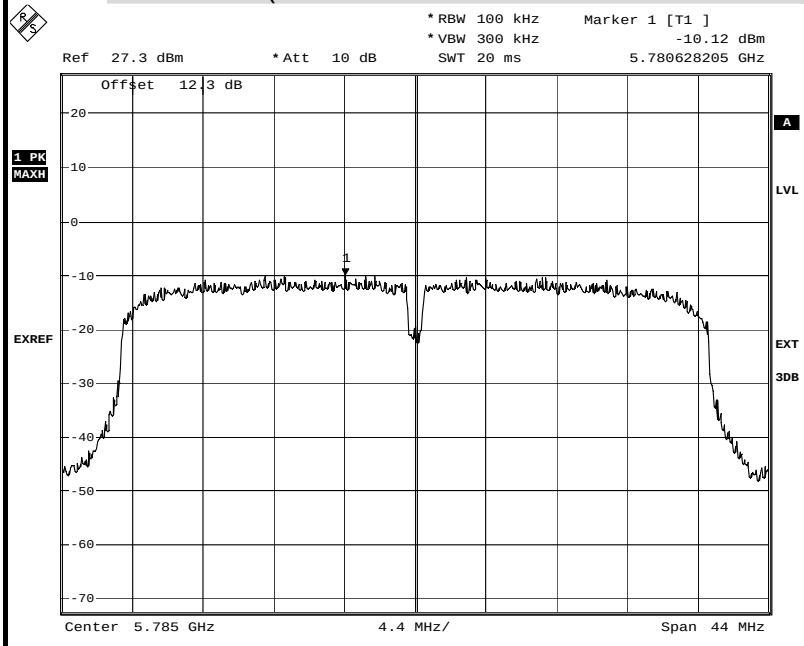


CH Low (IEEE 802.11n HT40 Mode / Chain 2)



Date: 23.JUL.2012 17:32:43

CH Middle (IEEE 802.11n HT40 Mode / Chain 2)



Date: 23.JUL.2012 17:32:26

CH High (IEEE 802.11n HT40 Mode / Chain 2)