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

For

300+300Mbps Gigabit Server Router

Model : GS293d

Trade Name : E-TOP

Issued for

E-Top Network Technology Inc.

No. 82 , Gongye 2nd Rd., Tainan City 70955, Taiwan, R.O.C.

Issued by

Compliance Certification Services Inc.
Tainan Lab.
No.8,Jiucengling, Xinhua Dist., Tainan City 712, Taiwan (R.O.C.)
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Issued Date: March 01, 2012

Revision History

Rev.	Issue Date	Revisions	Effect Page	Revised By
00	February 08, 2012	Initial Issue	ALL	Sunny Chang
01	March 01, 2012	Update test Procedure and data	Page 9; 40-62; 145-148; 155	Sunny Chang

TABLE OF CONTENTS

TITLE PAGE NO.

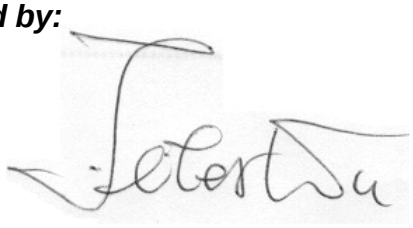
1. TEST REPORT CERTIFICATION

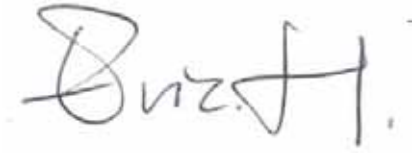
Applicant	：E-Top Network Technology Inc.
Address	：No. 82 , Gongye 2nd Rd., Tainan City 70955, Taiwan, R.O.C.
Manufacturer	：E-Top Network Technology Inc.
Address	：No. 82 , Gongye 2nd Rd., Tainan City 70955, Taiwan, R.O.C.
Equipment Under Test	：300+300Mbps Gigabit Server Router
Model Number	：GS293d
Brand Name	：E-TOP
Date of Test	：December 21, 2011 ~ March 01, 2012

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	300+300Mbps Gigabit Server Router
Model Number	GS293d
Brand Name	E-TOP
Identify Number	T11120230801
Received Date	December 02, 2011
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 ~ 5825MHz IEEE 802.11n HT40 : 5755MHz ~ 5815MHz
Transmit Power	IEEE 802.11b (2412MHz 2462MHz) : 19.12 dBm IEEE 802.11g (2412MHz 2462MHz) : 20.11 dBm IEEE 802.11n HT20 (2412MHz 2462MHz) : 21.69 dBm IEEE 802.11n HT40 (2422MHz 2452MHz) : 21.06 dBm IEEE 802.11a (5745MHz ~ 5825MHz) : 21.97 dBm IEEE 802.11n HT20 (5745MHz ~ 5825MHz) : 20.71 dBm IEEE 802.11n HT40 (5755MHz ~ 5815MHz) : 21.36 dBm
Channel Spacing	IEEE 802.11b/g, 802.11n HT20/HT40 : 5MHz IEEE 802.11a, 802.11n HT20 : 20MHz IEEE 802.11n HT40 : 40MHz
Channel Number	IEEE 802.11b/g, 802.11n HT20 : 11 Channels IEEE 802.11n HT40 : 7 Channels IEEE 802.11a, 802.11n HT20 : 5 Channels IEEE 802.11n HT40 : 6 Channels
Transmit Data Rate	IEEE 802.11b : 11, 5.5, 2, 1 Mbps IEEE 802.11g : 54, 48 ,36, 24, 18, 12, 9, 6 Mbps IEEE 802.11n HT20 : 20 :130,117,104,78, 65, 58.5, 52, 39, 26, 19.5, 13, 6.5 Mbps IEEE 802.11n HT40 : 300, 270,243, 216,162 ,135, 121.5, 108, 81, 54, 40.5, 27, 13.5 Mbps IEEE 802.11a : 54, 48 ,36, 24, 18, 12, 9, 6 Mbps
Type of Modulation	IEEE 802.11b : DSSS (CCK, DQPSK, DBPSK) IEEE 802.11g : OFDM (64QAM, 16QAM, QPSK, BPSK) IEEE 802.11n HT20/40 : OFDM (64QAM, 16QAM, QPSK, BPSK) IEEE 802.11a : OFDM (64QAM, 16QAM, QPSK, BPSK)

Antenna Type	**Two antennas (2TX2RX)** Manufacture: YONG-SHUN TECH. CO., LTD. Type: Co-linear dipole structure Model: AN-151RRSU00 Gain: 5dBi for 2.4GHz, 5dBi for 5GHz Connector: Reverse SMA PLUG
Power Rating	12Vdc; 1A(Powered from Adapter)
Power Source	**Powered from adapter** Model: JKY36-SP1201000 Input: 100-240Vac, 50/60Hz, 0.5A Output: 12Vdc, 1000mA
Test Voltage	120Vac, 60Hz

Remark :

1. *The sample selected for test was engineering sample that approximated to production product and was provided by manufacturer.*
2. *For more details, please refer to the User's manual of the EUT.*
3. *This submittal(s) (test report) is intended for FCC ID: **U6A-GS293D** filing to comply with Section 15.207, 15.209 and 15.247 of the FCC Part 15, Subpart C Rules.*
4. *To add a series model is for business necessary. The different of the each model is shown as bellows:*

Company Name/Address	Brand name	Model	Product Name
E-Top Network Technology Inc. No. 82 ,Gongye 2nd Rd.,Tainan City 70955, Taiwan, R.O.C.	E-TOP	GS293d	300+300Mbps Gigabit Server Router
Amigo Technology Inc. 5F., No.83, Lane 77, Xing-Ai Road, Neihu Dist., Taipei City 114, Taiwan (R.O.C.)	Amigo	GS293d	300+300Mbps Gigabit Server Router
Sapido Technology Inc. No. 383., Sec. 2, Minsheng Rd., West Central District, Tainan 700, Taiwan, R.O.C.	SAPIDO	GR-1736	Simultaneous Dualband Wireless N Gigabit Router - All Broadbands

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.

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	5825

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	5755
Middle	5795
High	5815

IEEE 802.11n HT40 mode : 27Mbps 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.

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 , 15.247 and KDB 558074.

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, 1.2m, 1pcs
B	LAN Cable	Unshielded, 1.0m, 1pcs

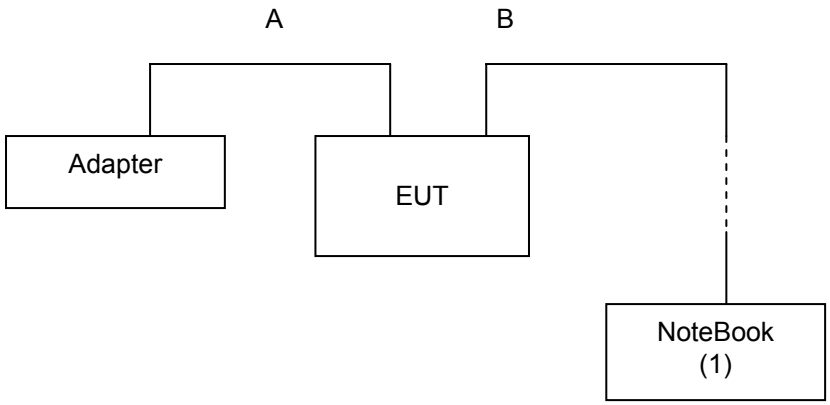
For EMI test

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

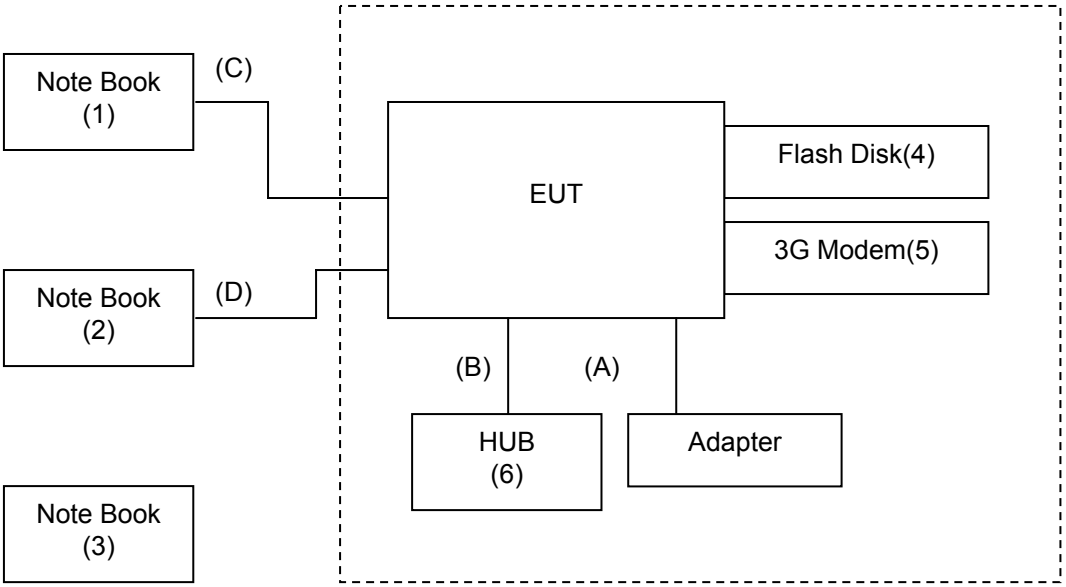
No.	Signal cable description	
A	DC Power	Unshielded, 1.2m, 1pcs
B	LAN	Unshielded, 2.0m, 3pcs
C	LAN	Unshielded, 10m, 1pcs
D	LAN	Unshielded, 10m, 1pcs

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. Reset equipment and burn in the test program “MP_Test”.
3. The “Realtek Test Program for “RTL819x ” software was used for testing
   The EUT driver software installed in the host support equipment during testing was Realtek Test Program for RTL819x Drive

(1)TX Mode:

- ⇨ **IC Type: RTL_8192C+D**
- ⇨ **Mode:2.4G/DaulMac**
- ⇨ **Dev:WLAN1**
- ⇨ **Test Item :Continuous TX**
- ⇨ **Channel:1(2412MHz)、3(2422MHz)、6(2437MHz)、9(2452MHz)、11(2462MHz)**
- ⇨ **TX POWER: follow “Power Control”**
- ⇨ **Antenna: B、G Mode ANT A, HT20、HT40 Mode ANT AB**
- ⇨ **Tx Data : 1Mbps long** (IEEE 802.11b mode ,ANT A TX)
  6Mbps (IEEE 802.11g mode , ANT A TX)
  13Mbps (IEEE 802.11n HT20 mode , ANT A, ANT B TX)
  27Mbps (IEEE 802.11n HT40 mode, ANT A, ANT B TX**)**
- ⇨ **Bandwith: B 1MHz、G 6MHz、HT20 20MHz, HT40 40MHz**
- ⇨ **Start**

Power control

Target Power: IEEE 802.11b Channel Low (2412MHz) = 45 **(ANT A)**
IEEE 802.11b Channel Middle (2437MHz) =45 **(ANT A)**
IEEE 802.11b Channel High (2462MHz) = 45 **(ANT A)**

Target Power: IEEE 802.11g Channel Low (2412MHz) = 47 **(ANT A)**
IEEE 802.11g Channel Middle (2437MHz) = 47 **(ANT A)**
IEEE 802.11g Channel High (2462MHz) = 47 **(ANT A)**

Target Power: IEEE 802.11n HT20 Channel Low (2412MHz) = 45 **(ANT A)**
IEEE 802.11 n HT20 Channel Middle (2437MHz) = 45 **(ANT A)**
IEEE 802.11 n HT20 Channel High (2462MHz) = 45 **(ANT A)**
IEEE 802.11n HT20 Channel Low (2412MHz) = 45 **(ANT B)**
IEEE 802.11 n HT20 Channel Middle (2437MHz) =45 **(ANT B)**
IEEE 802.11 n HT20 Channel High (2462MHz) = 45 **(ANT B)**

Target Power: IEEE 802.11n HT40 Channel Low (2422MHz) = 43 **(ANT A)**
IEEE 802.11 n HT40 Channel Middle (2437MHz) = 45 **(ANT A)**
IEEE 802.11 n HT40 Channel High (2452MHz) = 44 **(ANT A)**
IEEE 802.11n HT40 Channel Low (2422MHz) = 43 **(ANT B)**
IEEE 802.11 n HT40 Channel Middle (2437MHz) = 45 **(ANT B)**
IEEE 802.11 n HT40 Channel High (2452MHz) = 44 **(ANT B)**

(2) RX Mode：

Test Item packets RX
Start RX

(3) 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. Reset equipment and burn in the test program “MP_Test”.
3. The “Realtek Test Program for “RTL8192 ” software was used for testing
   The EUT driver software installed in the host support equipment during testing was Realtek Test Program for RTL819x Drive

(1)TX Mode:

- ⇨ **IC Type: RTL_8192C+D**
- ⇨ **Mode:5G/DualMac**
- ⇨ **Dev:WLAN0**
- ⇨ **Test Item :Continuous TX**
- ⇨ **TX POWER: follow “Power Control”**
- ⇨ **Antenna: A Mode , HT20、HT40 Mode AB**
- ⇨ **Tx Data : 6Mbps** (IEEE 802.11a mode , TX)
  13Mbps (IEEE 802.11n HT20 mode ,Chain 0, Chain 1 TX)
  27Mbps (IEEE 802.11n HT40 mode, Chain 0, Chain 1 TX**)**
- ⇨ **Bandwith: A、HT20 20MHz, HT40 40MHz**
- ⇨ **Start**

Target Power: IEEE 802.11a Channel Low (5745MHz) = **15**
IEEE 802.11a Channel Middle (5785MHz) = **15**
IEEE 802.11a Channel High (5825MHz) = **15**

Target Power: IEEE 802.11n HT20 Channel Low (5745MHz) = **12 (Chain 0)**
IEEE 802.11 n HT20 Channel Middle (5785MHz) = **12 (Chain 0)**
IEEE 802.11 n HT20 Channel High (5825MHz) = **12 (Chain 0)**
IEEE 802.11n HT20 Channel Low (5745MHz) = **08 (Chain 1)**
IEEE 802.11 n HT20 Channel Middle (5785MHz) = **08 (Chain 1)**
IEEE 802.11 n HT20 Channel High (5825MHz) = **08 (Chain 1)**

Target Power: IEEE 802.11n HT40 Channel Low (5755MHz) = **14 (Chain 0)**
IEEE 802.11 n HT40 Channel Middle (5795MHz) = **14 (Chain 0)**
IEEE 802.11n HT40 Channel High (5815MHz) = **14 (Chain 0)**
IEEE 802.11 n HT40 Channel Low (5755MHz) = **10 (Chain 1)**
IEEE 802.11n HT40 Channel Middle (5795MHz) = **10 (Chain 1)**
IEEE 802.11 n HT40 Channel High (5815MHz) = **10 (Chain 1)**

(2) RX Mode：

Test Item packets RX
Start RX

(3) Normal Link Setup

6. Set up all computers like the setup diagram.
7. All of the function are under run.
8. Notebook PC (2) ping 192.168.0.10 –t to Notebook PC (1).
9. Notebook PC (1) ping 192.168.0.20 –t to Notebook PC (2).
10. 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

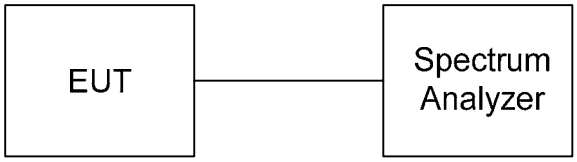
§ 15.247(a) (2) For direct sequence systems, the minimum 6dB bandwidth shall be at least 500kHz.

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	10096.15	500	PASS
Middle	2437	10096.15	500	PASS
High	2462	10096.15	500	PASS

IEEE 802.11g Mode

Channel	Channel Frequency (MHz)	6dB Bandwidth (kHz)	Minimum Limit (kHz)	Pass / Fail
Low	2412	16586.54	500	PASS
Middle	2437	16586.54	500	PASS
High	2462	16586.54	500	PASS

IEEE 802.11n HT20 Mode

Channel	Channel Frequency (MHz)	6dB Bandwidth (kHz)		Minimum Limit (kHz)	Pass / Fail
		Chain 0	Chain1		
Low	2412	17788.46	17788.44	500	PASS
Middle	2437	17788.46	17708.33	500	PASS
High	2462	17788.46	17788.46	500	PASS

IEEE 802.11n HT40 Mode

Channel	Channel Frequency (MHz)	6dB Bandwidth (kHz)		Minimum Limit (kHz)	Pass / Fail
		Chain 0	Chain1		
Low	2422	36698.72	36551.87	500	PASS
Middle	2437	36602.56	36615.97	500	PASS
High	2452	36442.31	36442.31	500	PASS

IEEE 802.11a Mode

Channel	Channel Frequency (MHz)	6dB Bandwidth (kHz)	Minimum Limit (kHz)	Pass / Fail
Low	5745	16633.27	500	PASS
Middle	5785	16633.27	500	PASS
High	5825	16633.27	500	PASS

IEEE 802.11n HT20 Mode

Channel	Channel Frequency (MHz)	6dB Bandwidth (kHz)		Minimum Limit (kHz)	Pass / Fail
		Chain 0	Chain1		
Low	5745	17835.67	17835.67	500	PASS
Middle	5785	17835.67	17835.67	500	PASS
High	5825	17835.67	17835.67	500	PASS

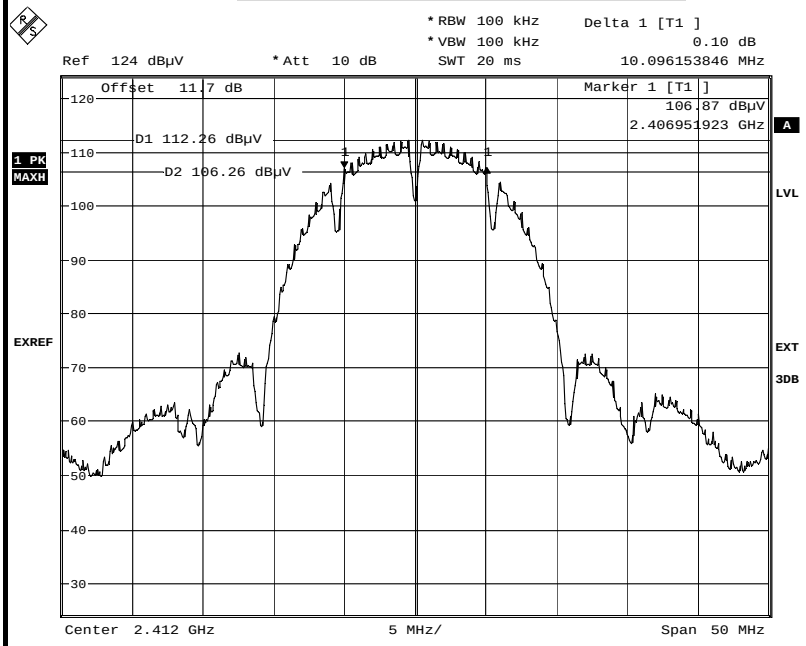
IEEE 802.11n HT40 Mode

Channel	Channel Frequency (MHz)	6dB Bandwidth (kHz)		Minimum Limit (kHz)	Pass / Fail
		Chain 0	Chain1		
Low	5755	36673.35	36472.95	500	PASS
Middle	5795	36673.35	36673.35	500	PASS
High	5815	36673.35	36472.95	500	PASS

6dB BANDWIDTH

(2.4GHz)

CH Low (IEEE 802.11b Mode)



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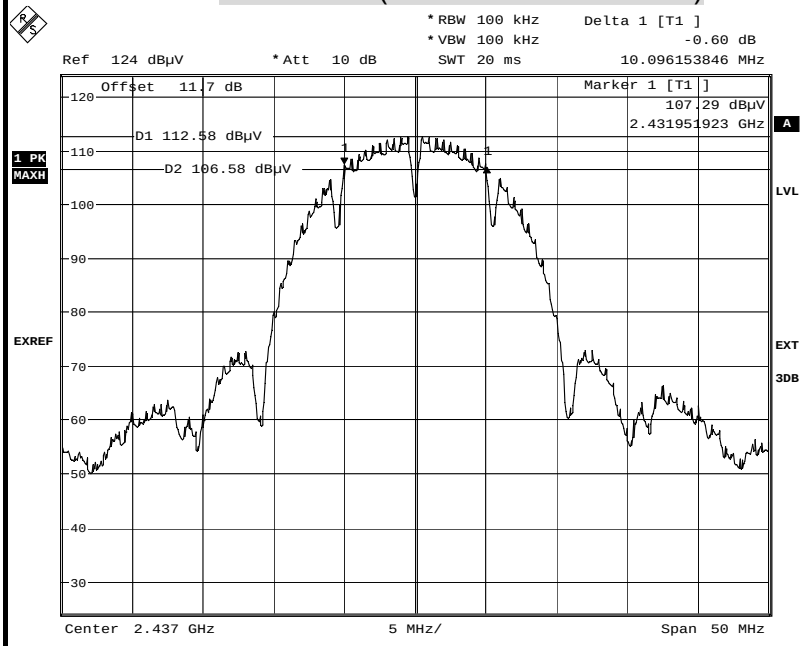

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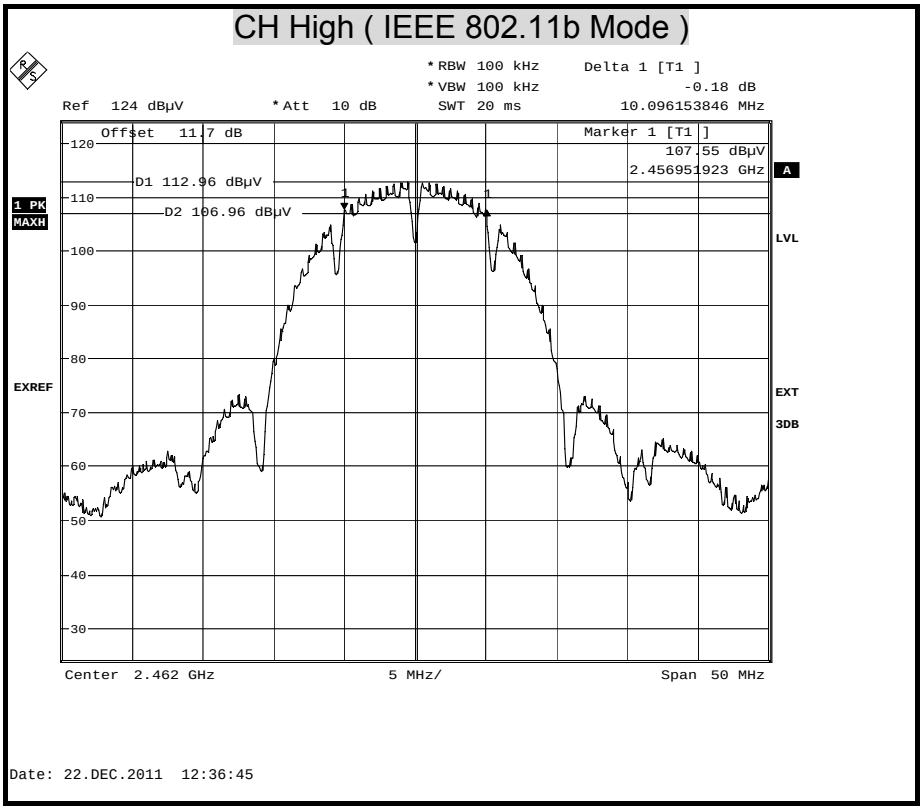

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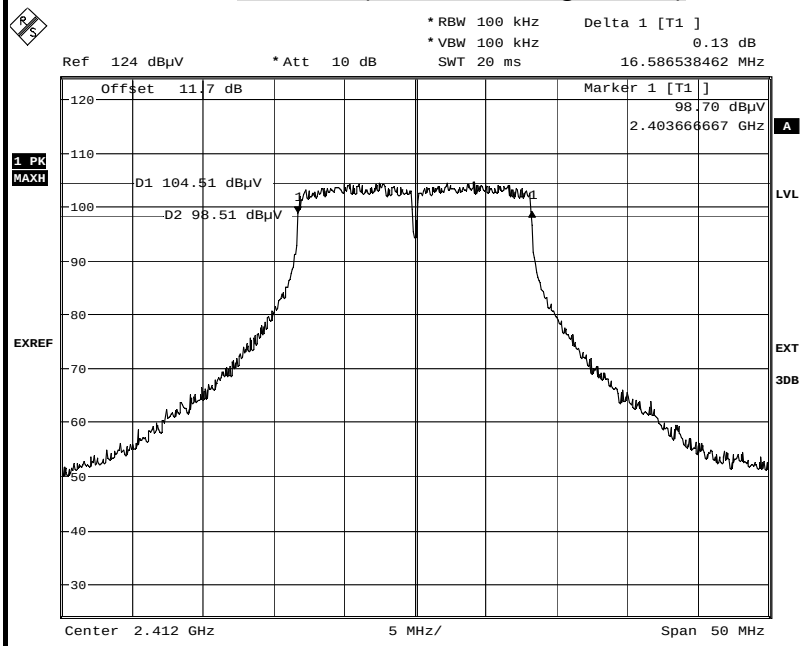

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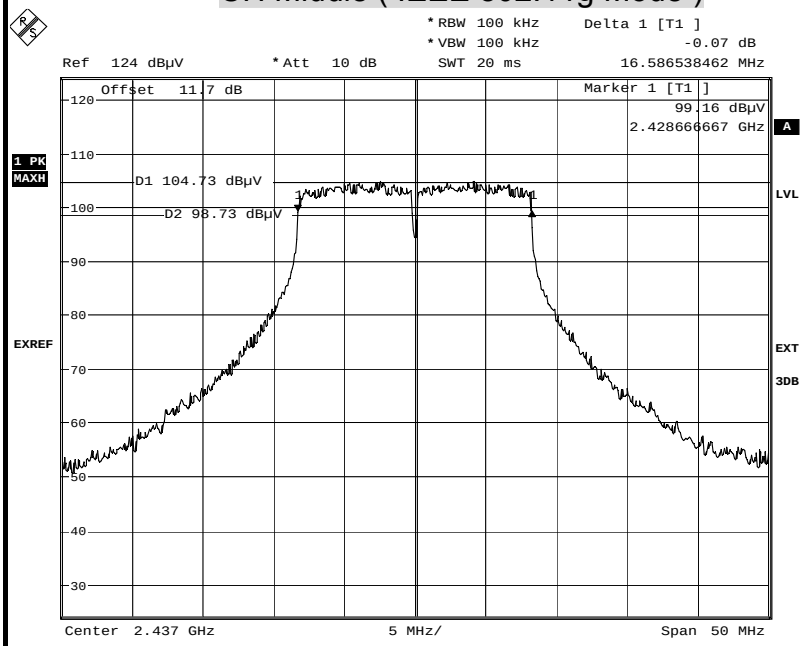
CH Middle (IEEE 802.11g Mode)



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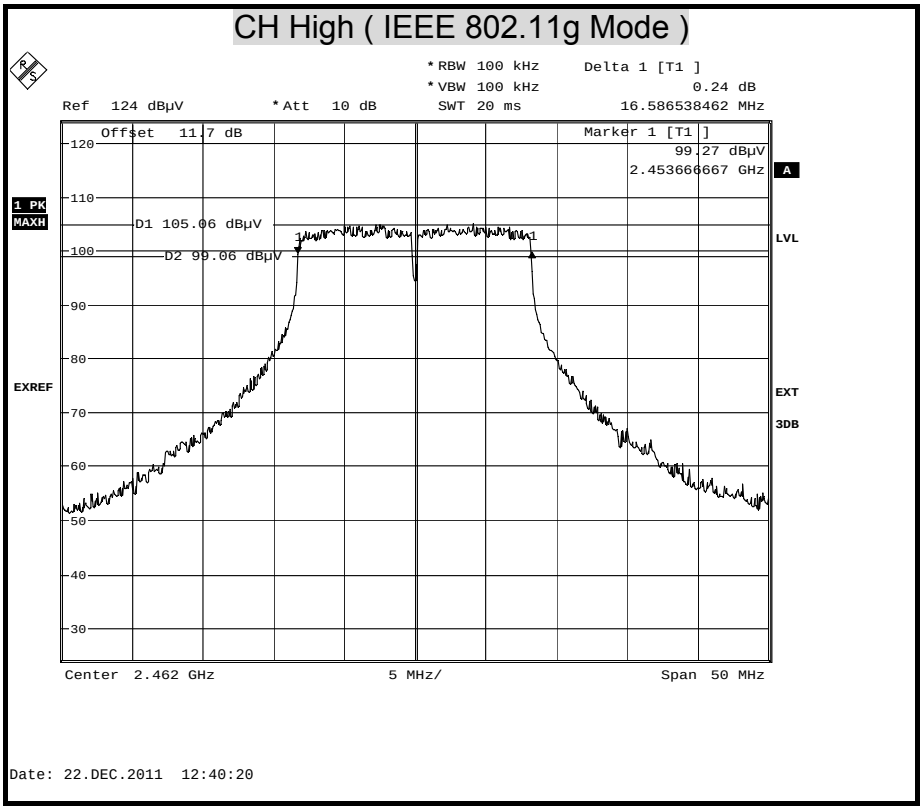

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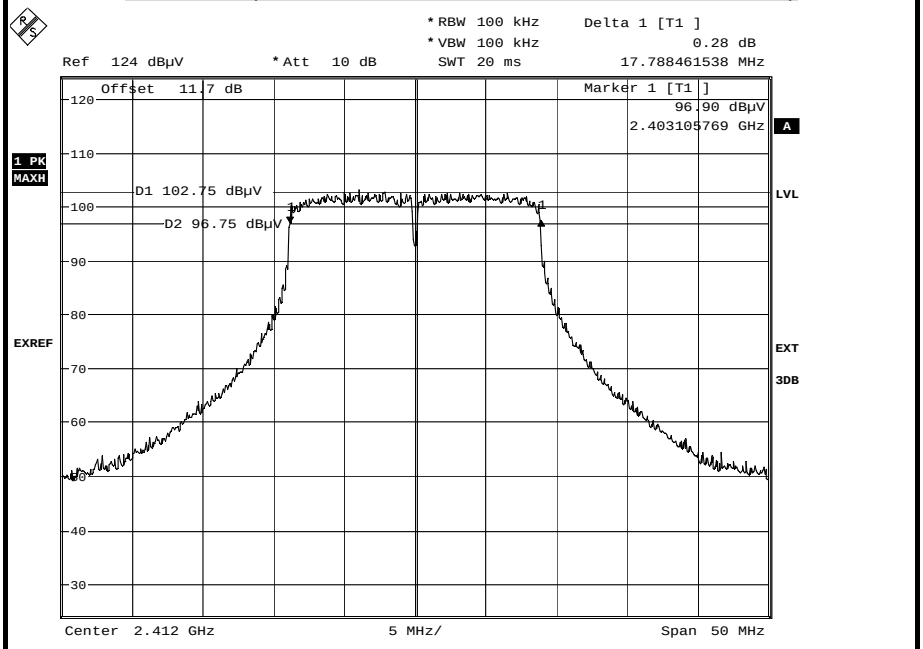

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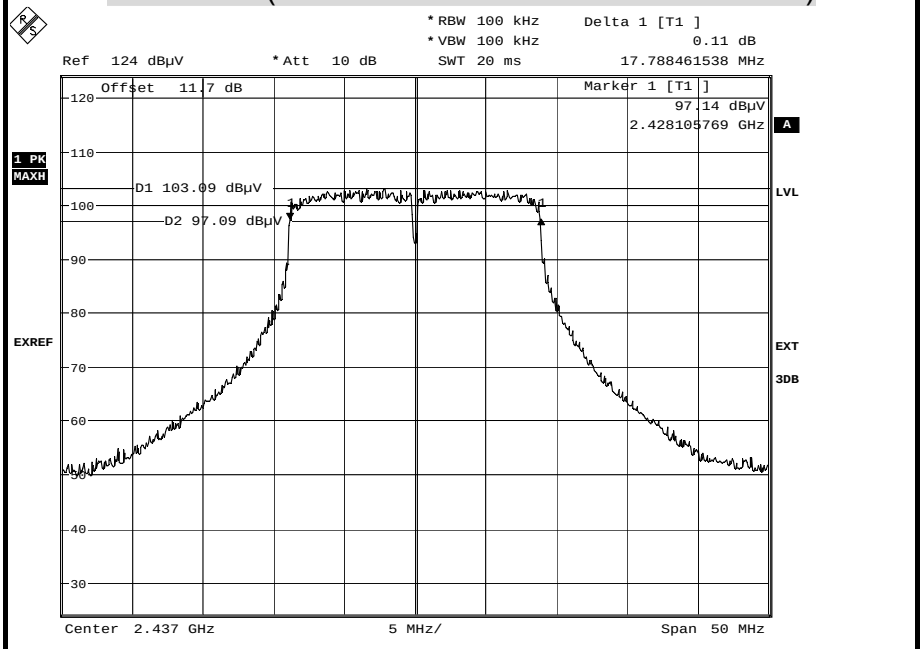

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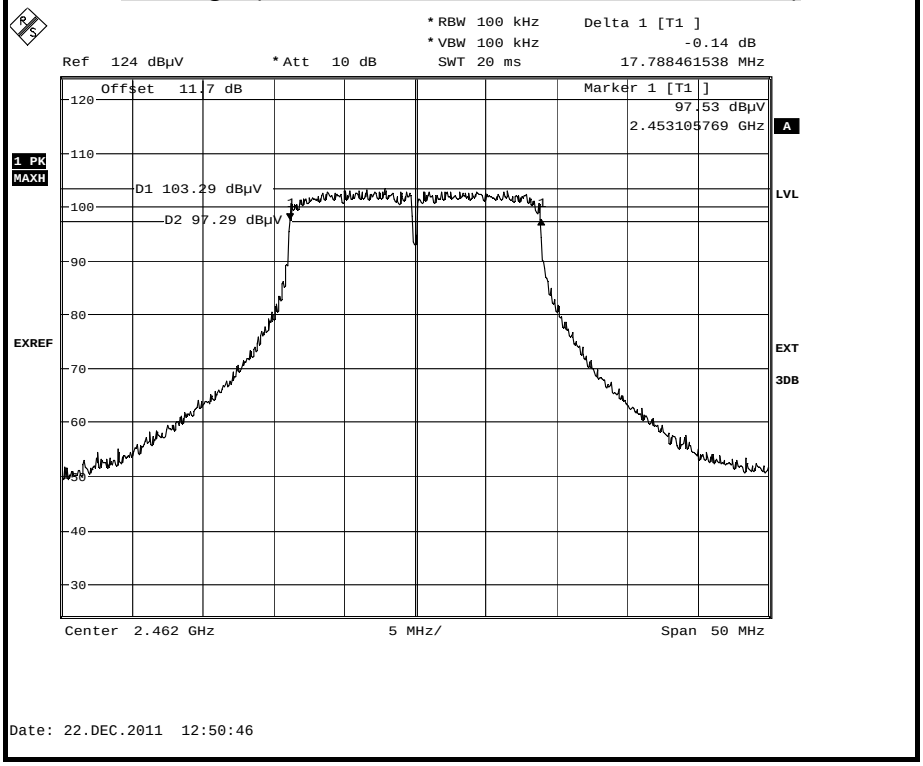
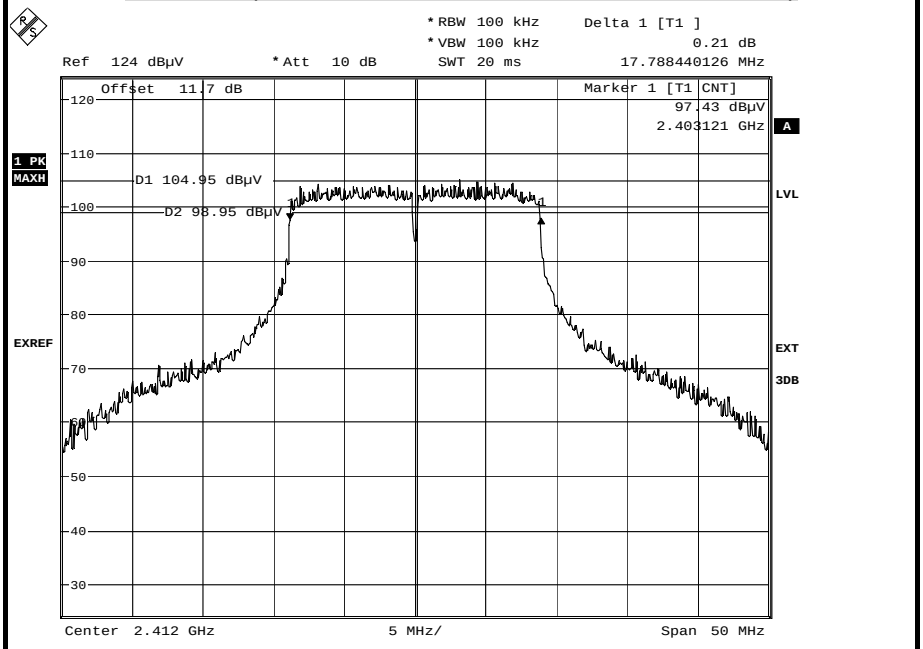


CH Low (IEEE 802.11n HT20 Mode / Chain 1)



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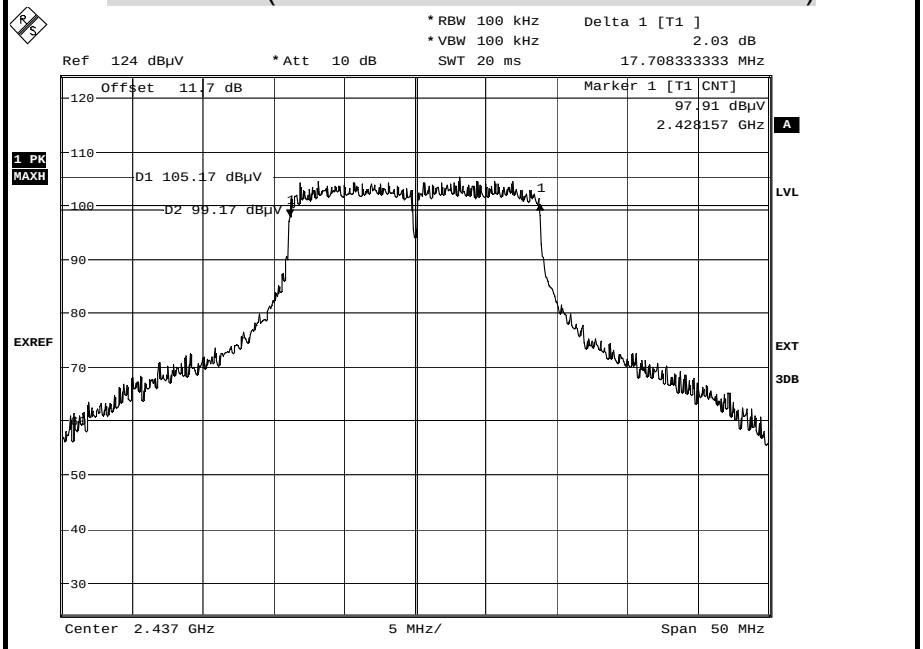
CH Middle (IEEE 802.11n HT20 Mode / Chain 1)



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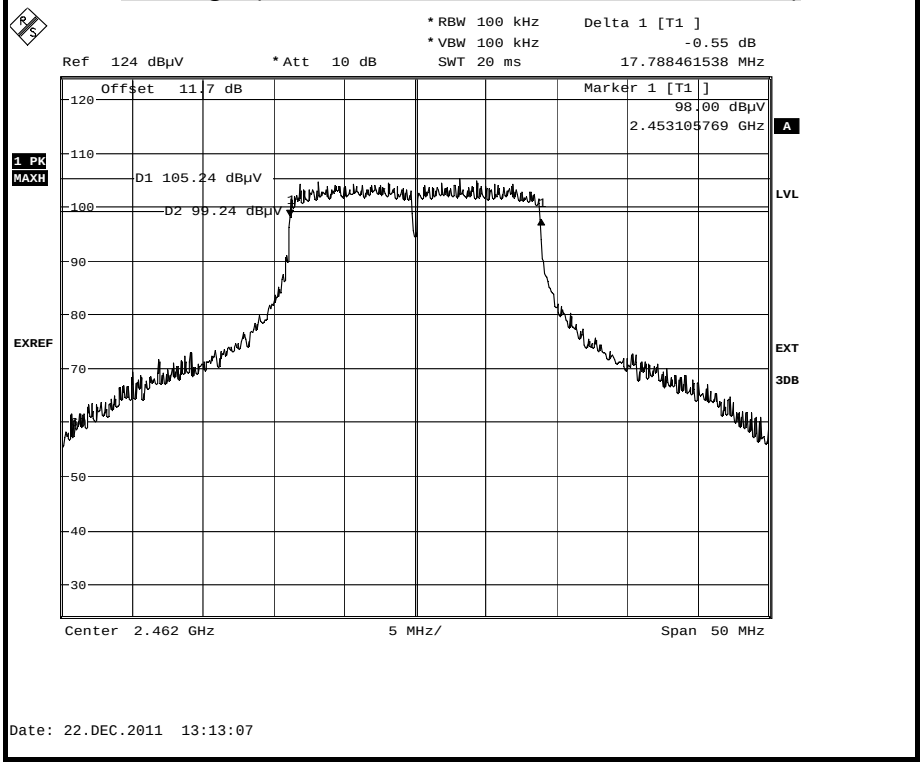
CH High (IEEE 802.11n HT20 Mode / Chain 1)



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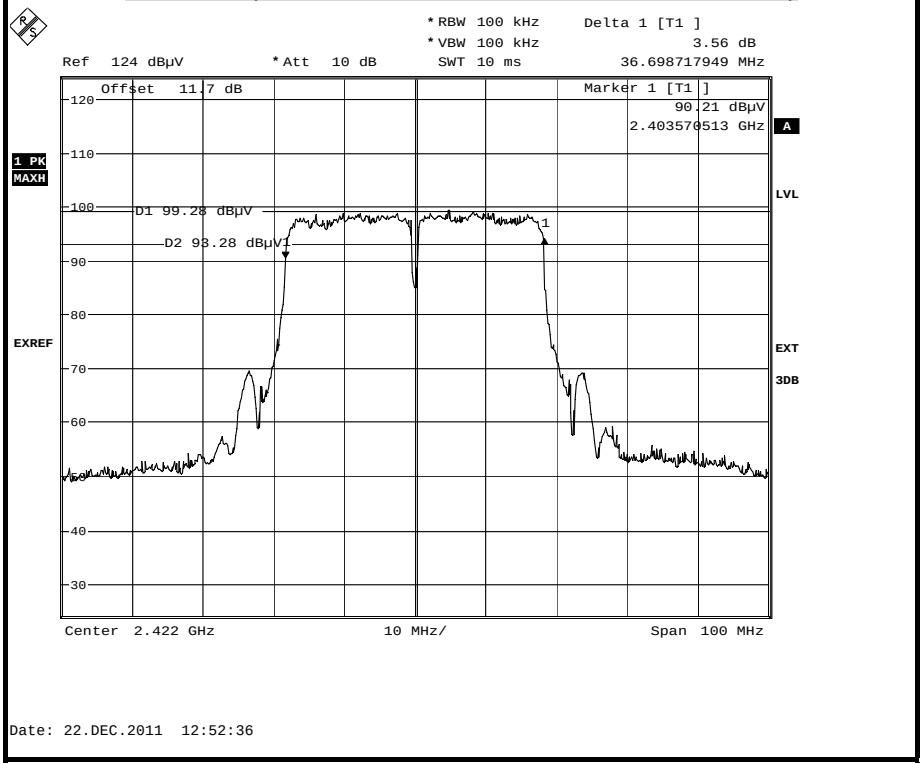

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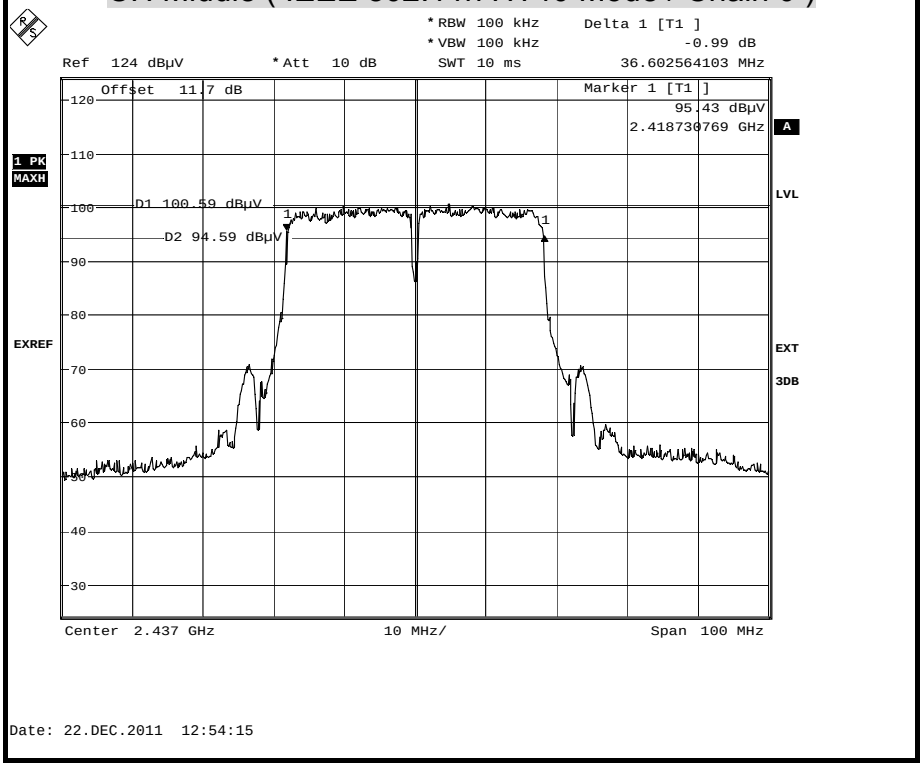

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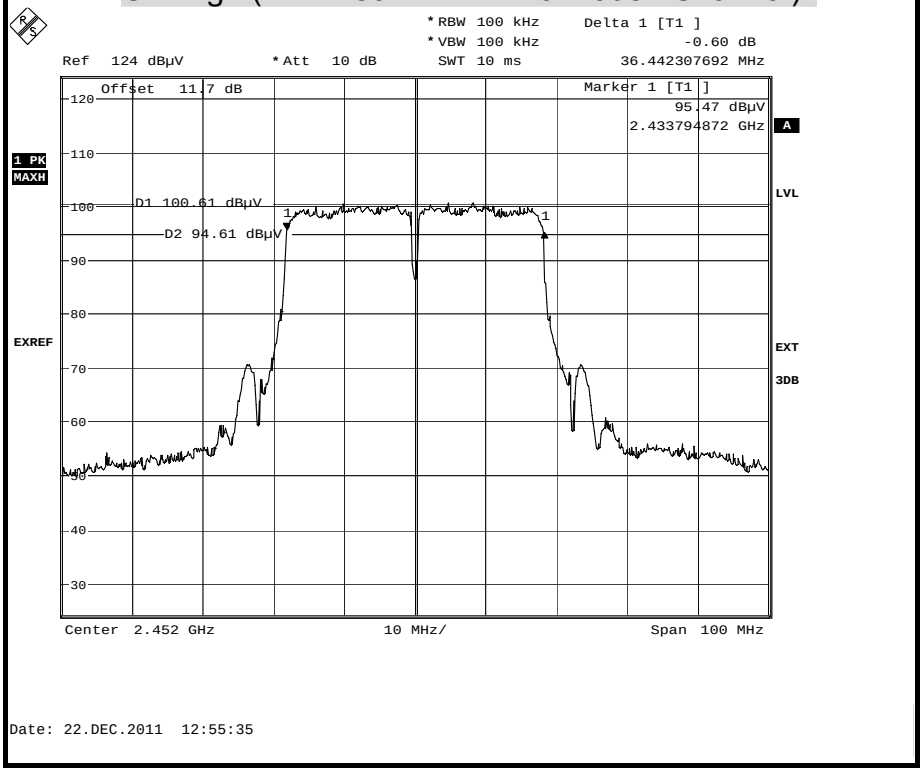

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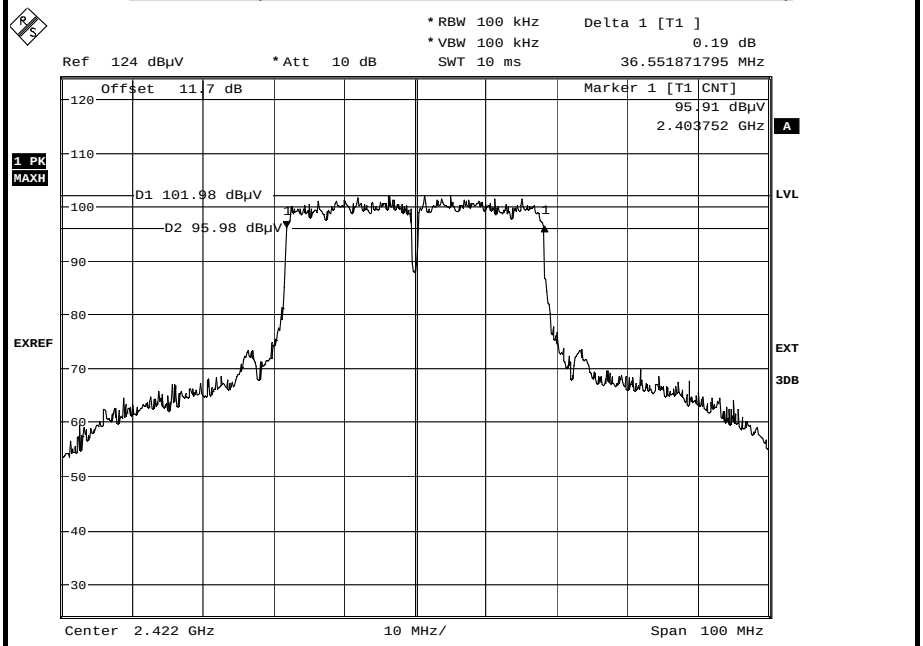

Date: 22.DEC.2011 13:02:32

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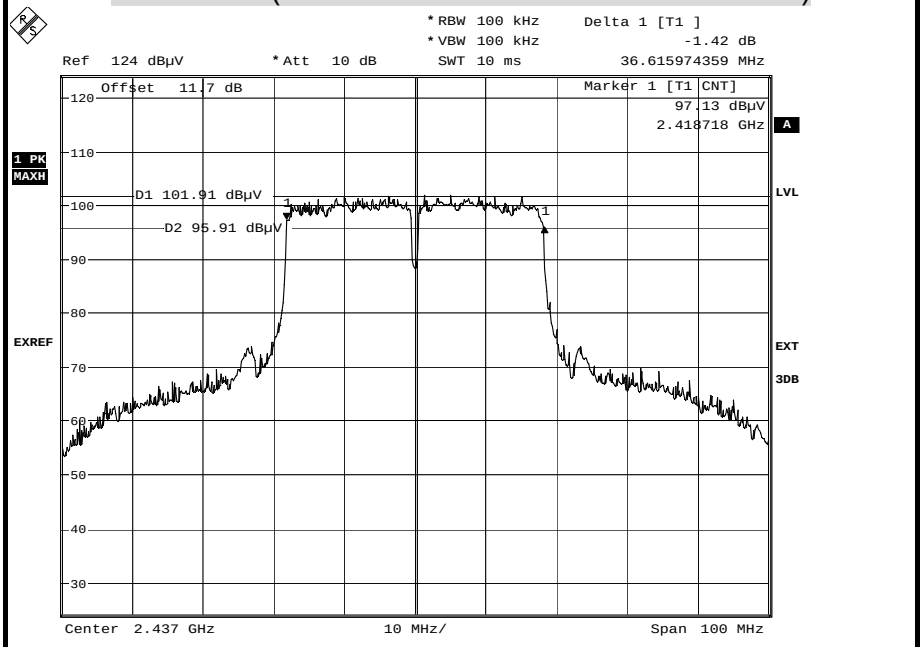

Date: 22.DEC.2011 13:01:48

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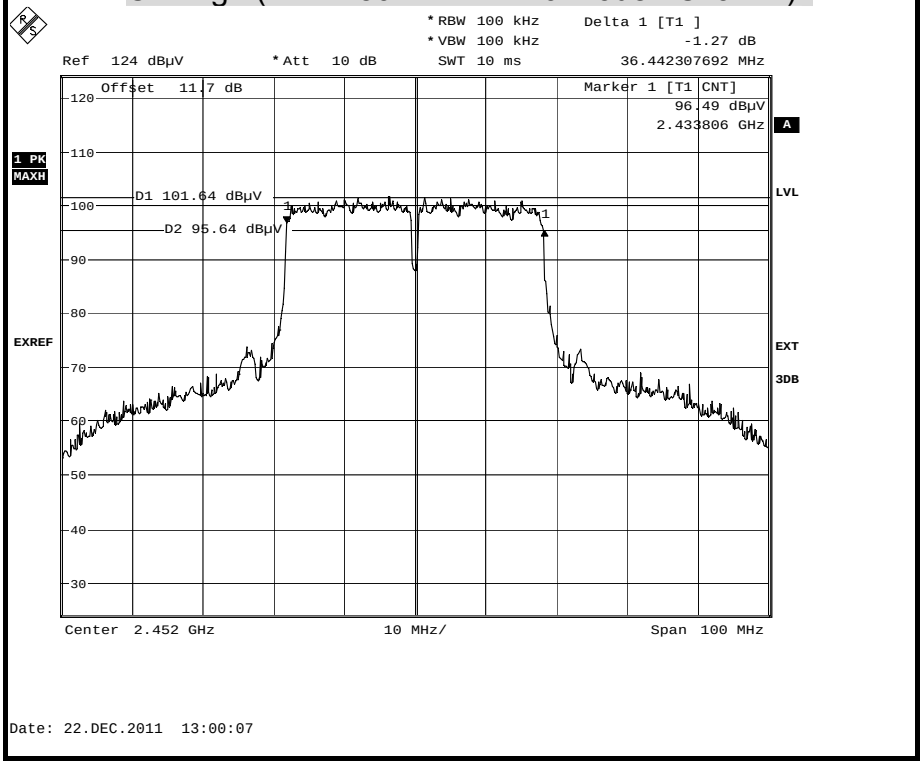
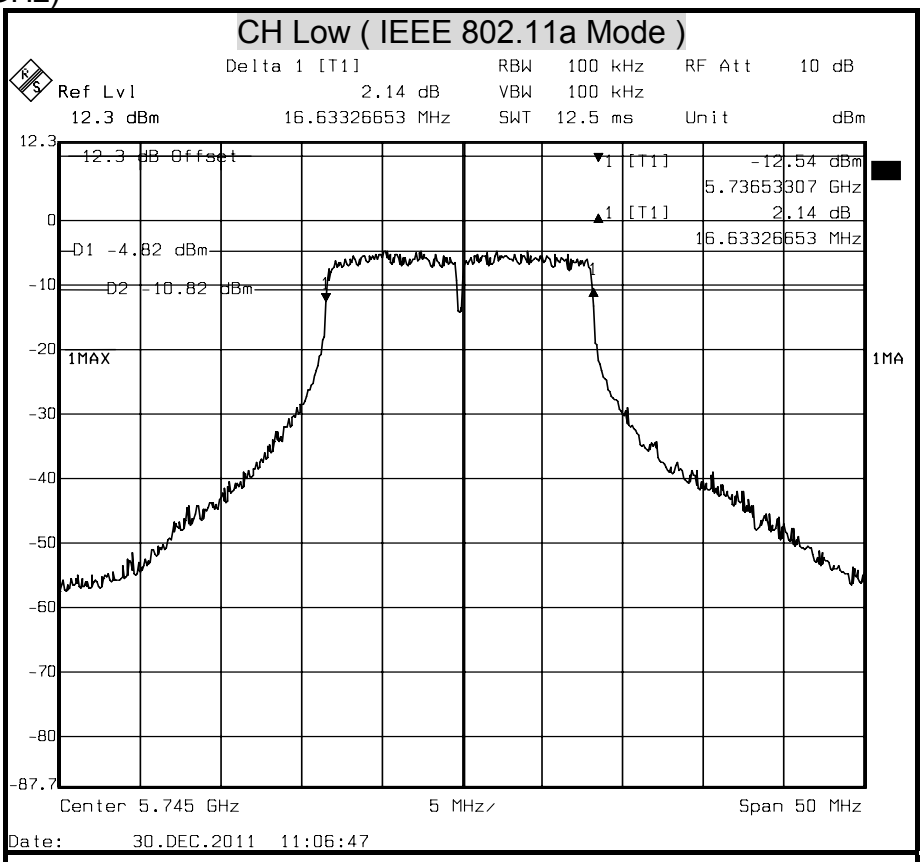


(5GHz)

CH Low (IEEE 802.11a Mode)



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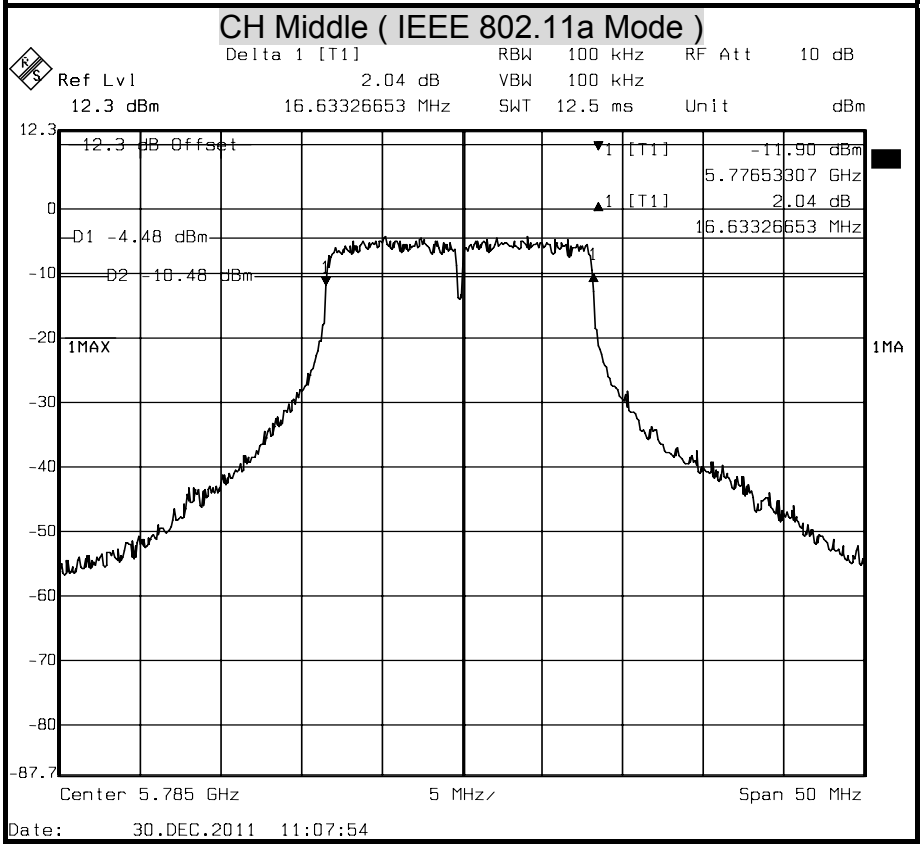

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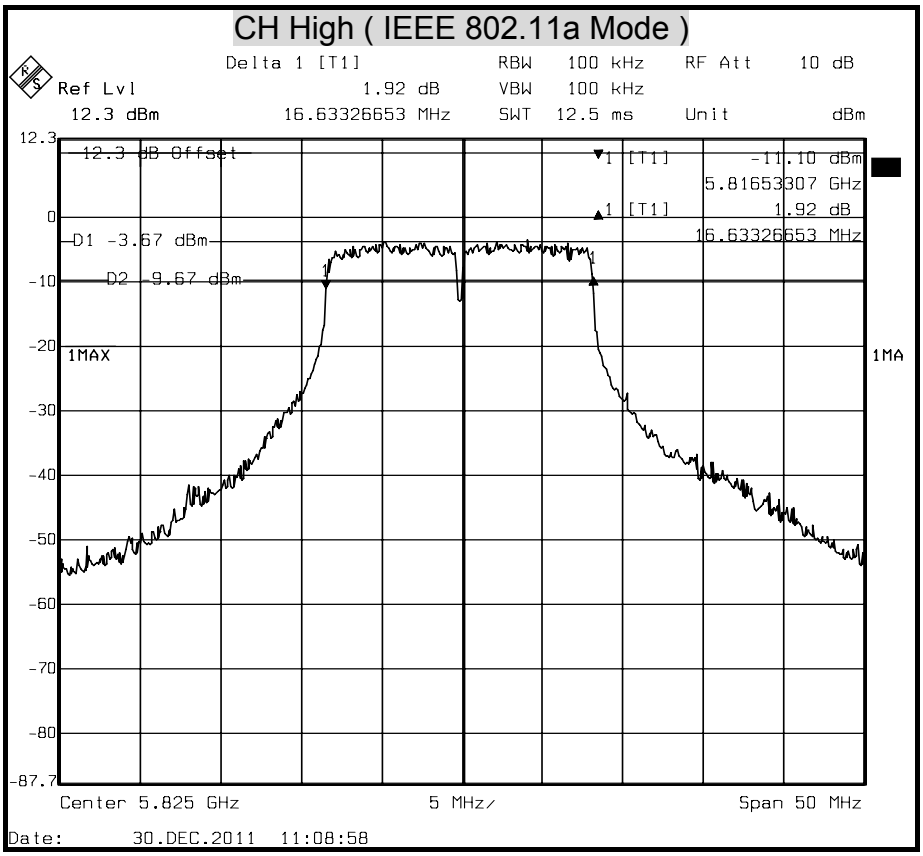
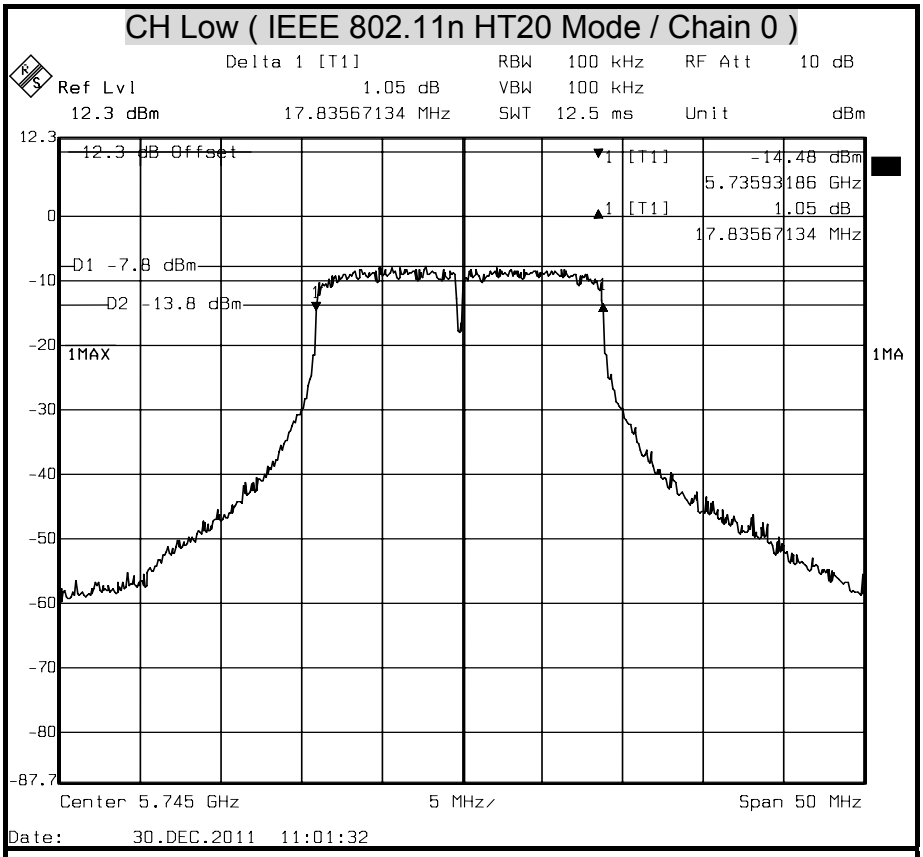


CH Low (IEEE 802.11n HT20 Mode / Chain 0)



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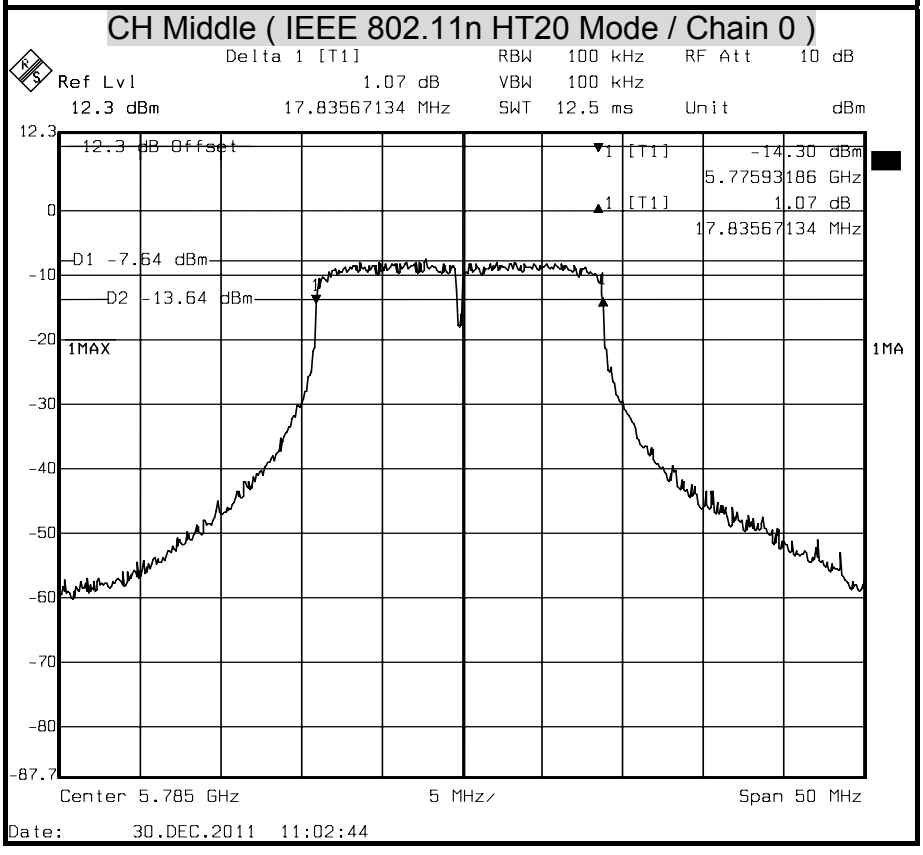

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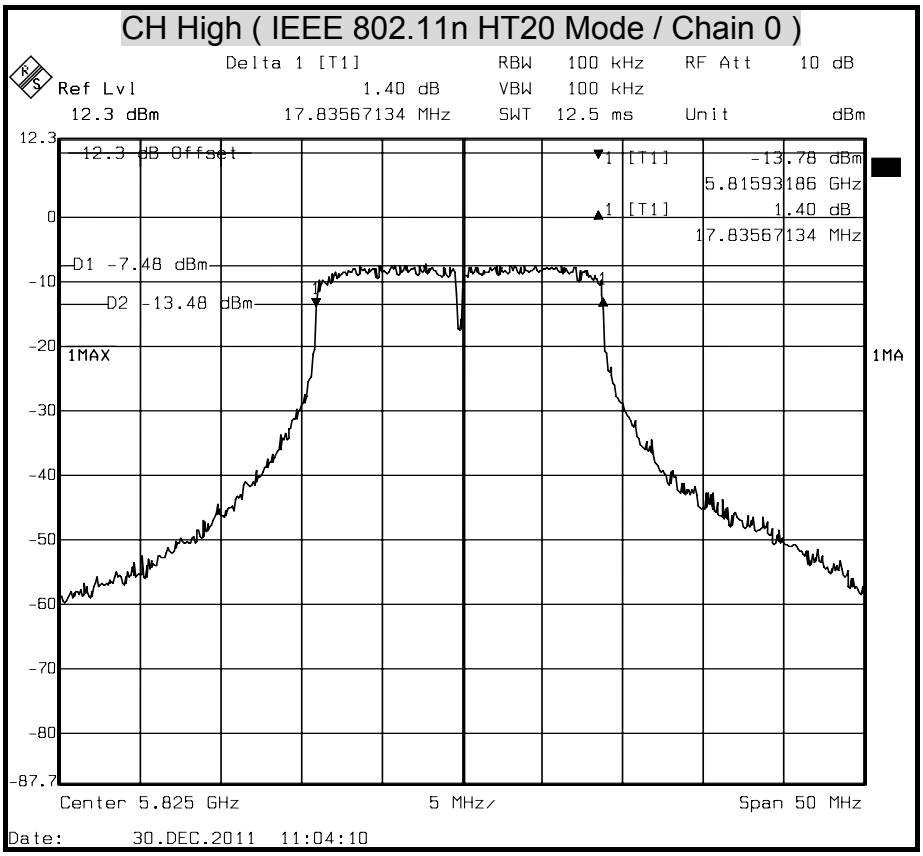
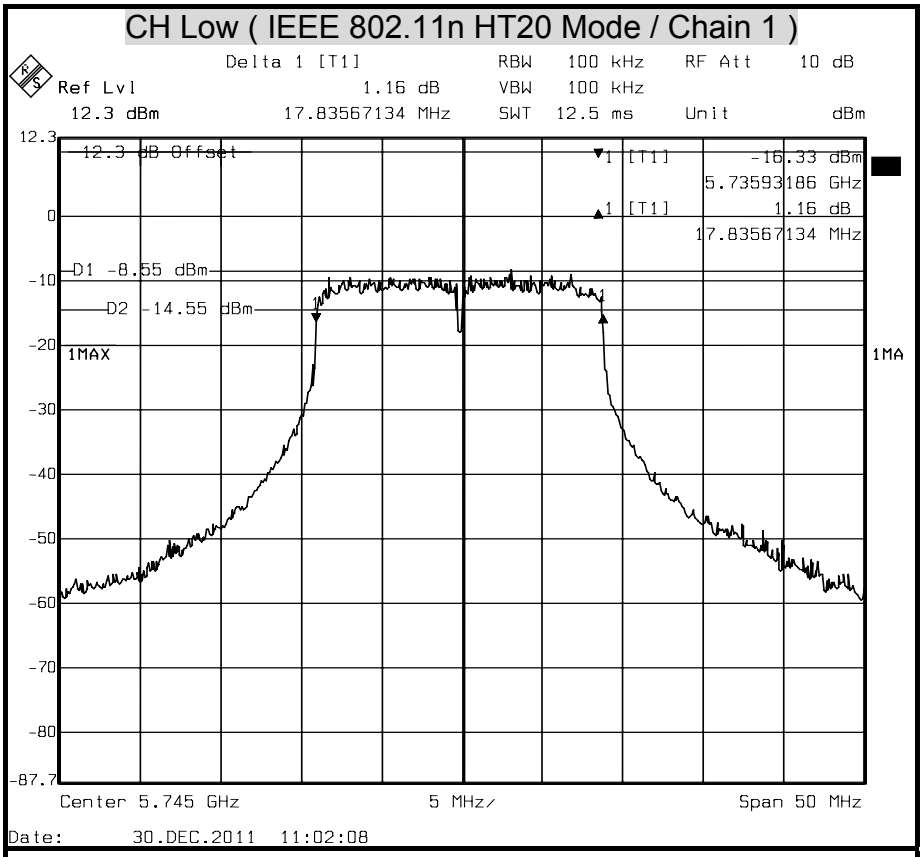
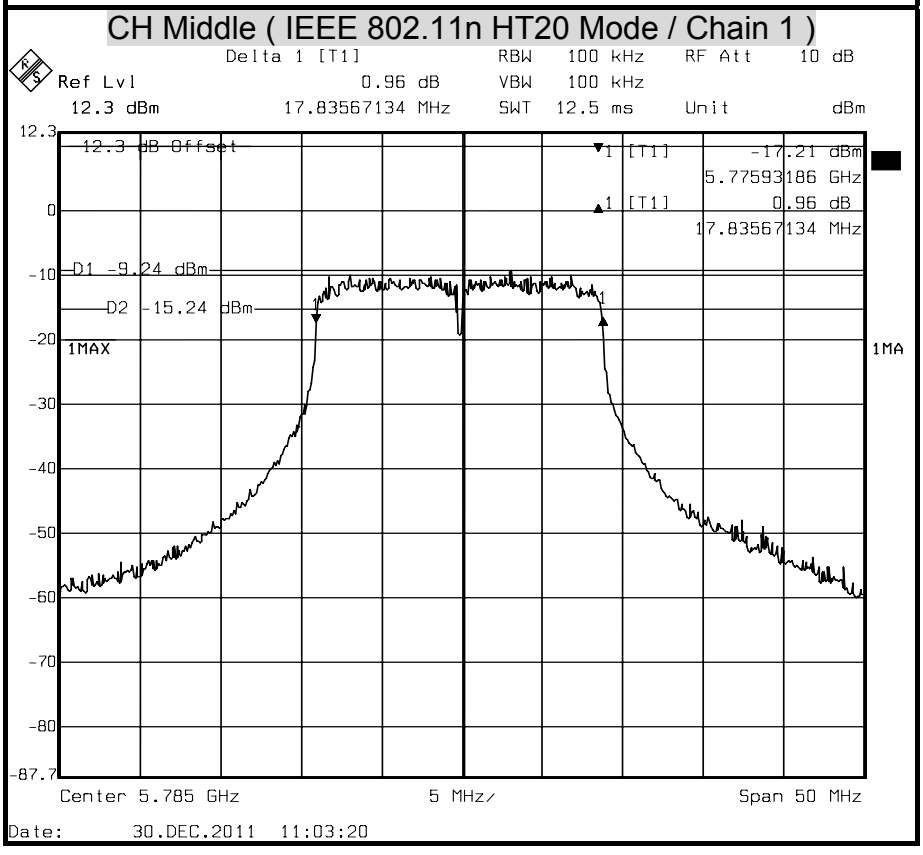


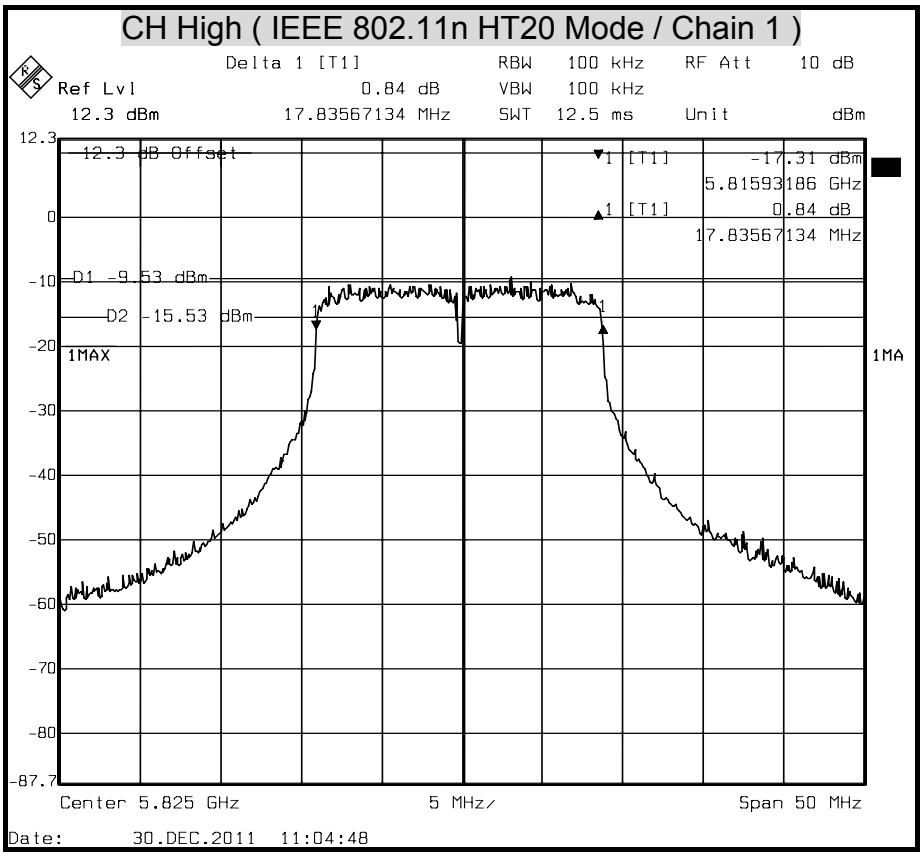
CH Low (IEEE 802.11n HT20 Mode / Chain 1)



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



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



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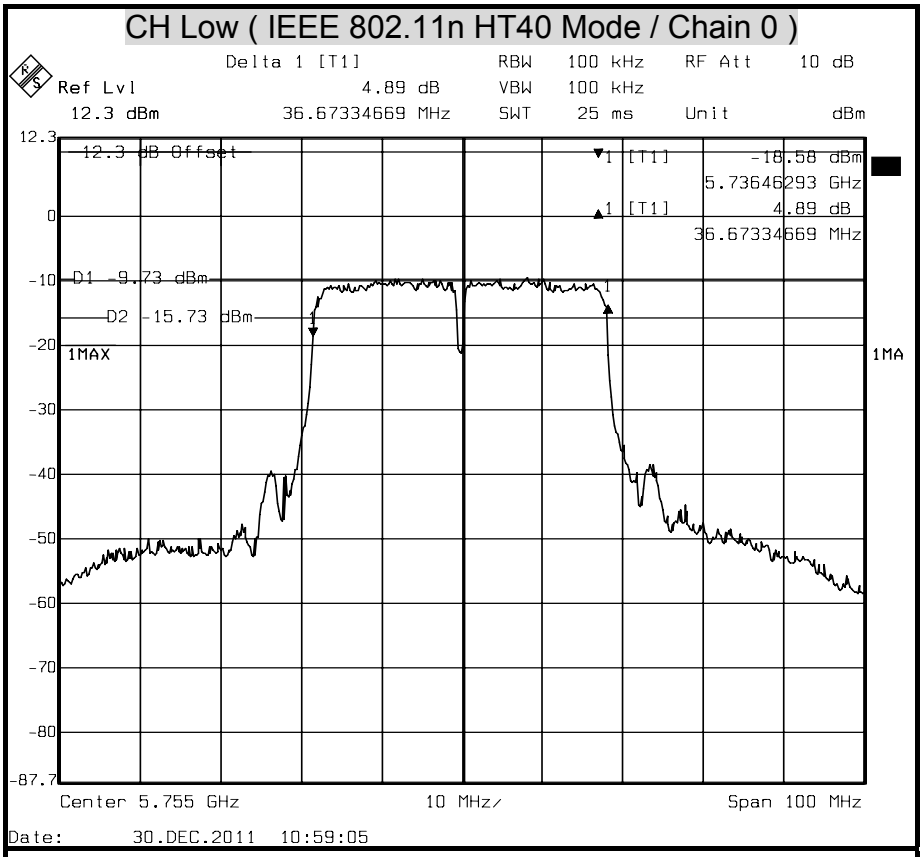
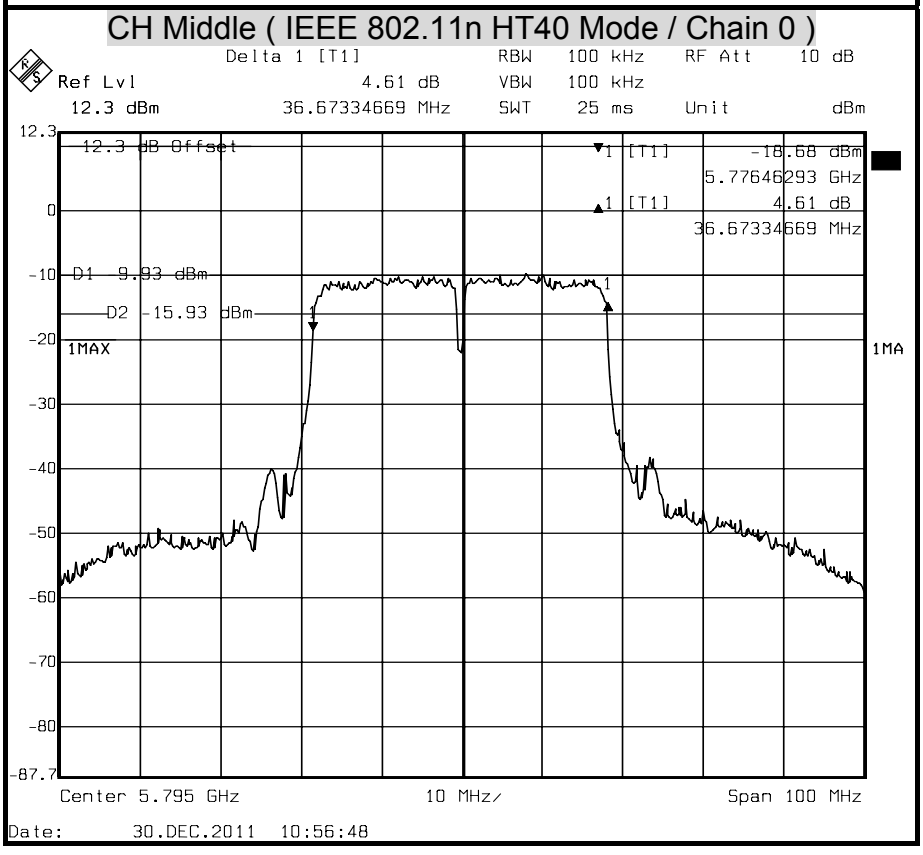
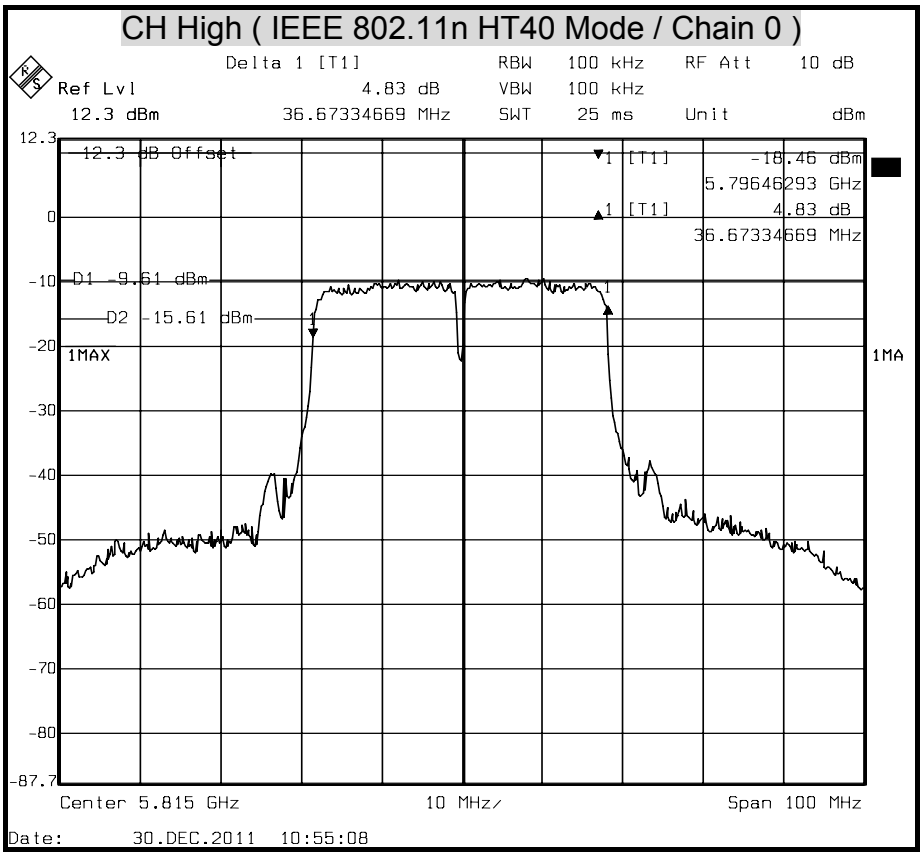


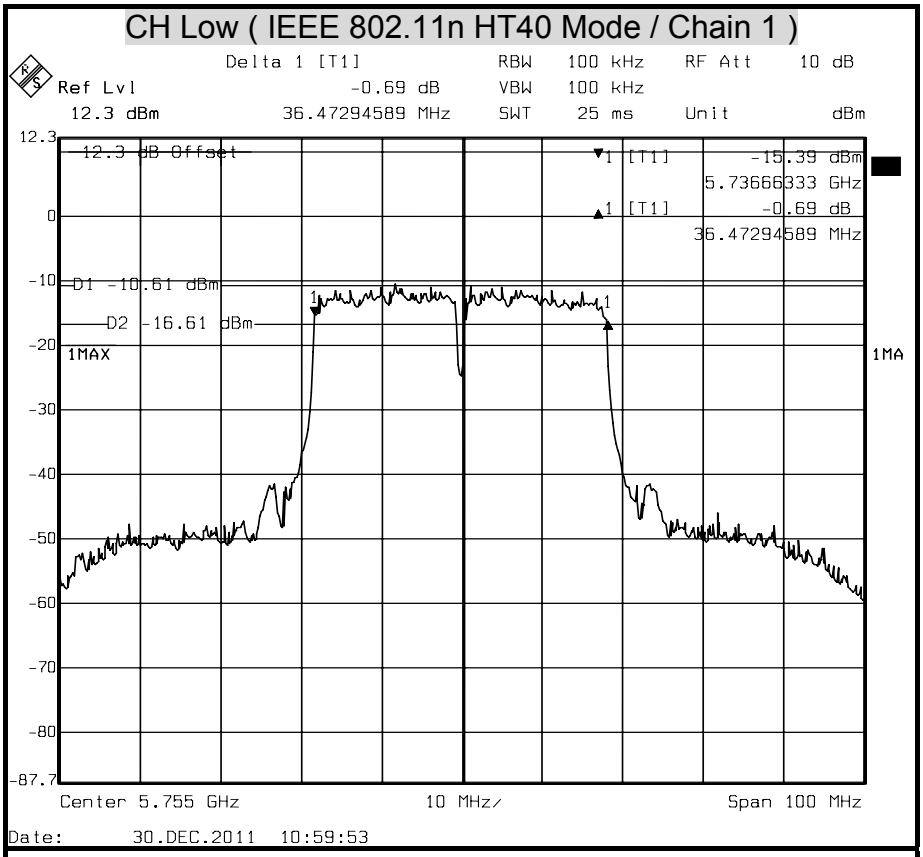
CH Middle (IEEE 802.11n HT40 Mode / Chain 0)



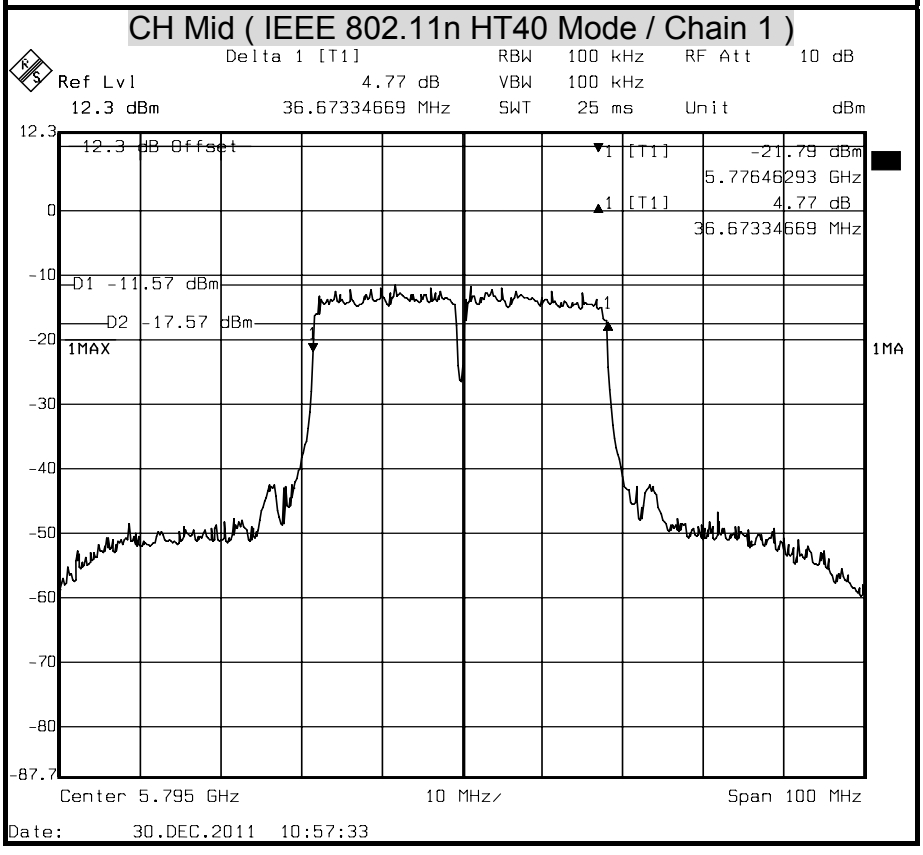
CH High (IEEE 802.11n HT40 Mode / Chain 0)



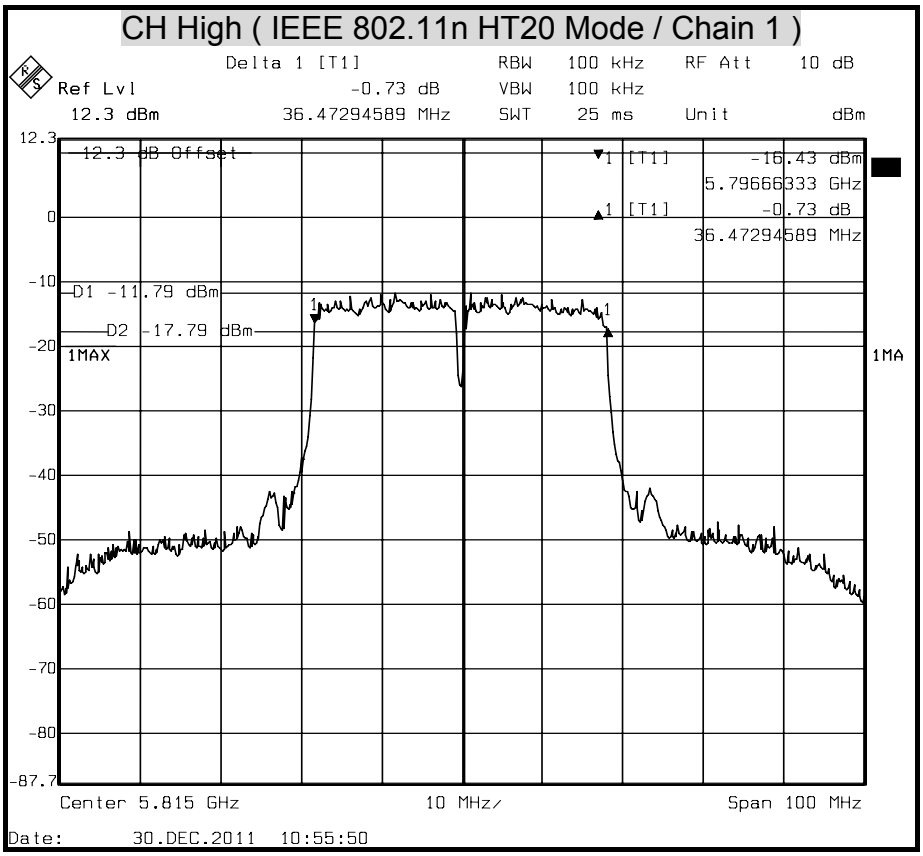
CH Low (IEEE 802.11n HT40 Mode / Chain 1)



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



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



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.

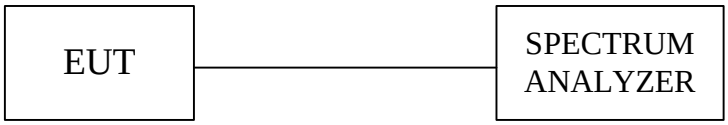
§ 15.247(b) (4) Except as shown in paragraphs (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used the peak output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1) or (b)(2), and (b)(3) of this section, as appropriate,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

Antenna Gain1:	5	dBi						
Antenna Gain2:	5	dBi						
Array Gain=:	8.01	=	10*log	((10^(	5	/10)+	(10^(	5 /10)))
Peak Power Limit:	27.99	=	30-	(	8.01	-6	)	

IEEE 802.11b Mode

Channel	Channel Frequency (MHz)	Peak Power (dBm)	Peak Power Limit (dBm)	Pass / Fail
Low	2412	18.72	30	PASS
Middle	2437	18.96		PASS
High	2462	19.12		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	19.65	30	PASS
Middle	2437	19.93		PASS
High	2462	20.11		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			
Low	2412	18.51	18.84	21.69	27.99	PASS
Middle	2437	17.49	18.81	21.21		PASS
High	2462	17.79	18.67	21.26		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	16.22	17.55	19.95	27.99	PASS
Middle	2437	17.60	18.46	21.06		PASS
High	2452	16.52	18.35	20.54		PASS

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

Antenna Gain1:	5	dBi	
Antenna Gain2:	5	dBi	
Array Gain=:	8.01	=	10*log ((10^(5 /10)+ (10^(5 /10)))
Peak Power Limit:	27.99	=	30- (8.01 -6)

IEEE 802.11a Mode

Channel	Channel Frequency (MHz)	Peak Power (dBm)	Peak Power Limit (dBm)	Pass / Fail
Low	5745	21.02	30	PASS
Middle	5785	21.49		PASS
High	5825	21.97		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			
Low	5745	18.54	16.57	20.68	27.99	PASS
Middle	5785	18.84	15.58	20.52		PASS
High	5825	19.44	14.75	20.71		PASS

Remark: *At finial test to get the worst-case emission at 13Mbps.*

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			
Low	5755	18.83	17.25	21.12	27.99	PASS
Middle	5795	19.30	16.84	21.25		PASS
High	5815	19.66	16.47	21.36		PASS

Remark: *At finial test to get the worst-case emission at 27Mbps.*

Average Power

802.11b Mode

Channel	Frequency (MHz)	Average Power (dBm)
Low	2412	15.72
Middle	2437	15.94
High	2462	16.08

802.11g Mode

Channel	Frequency (MHz)	Average Power Chain0 (dBm)
Low	2412	12.57
Middle	2437	12.85
High	2462	13.08

802.11n HT20 Mode

Channel	Frequency (MHz)	Average Power Chain0 (dBm)	Average Power ChainB (dBm)
Low	2412	11.79	11.78
Middle	2437	10.42	11.60
High	2462	11.68	11.67

802.11n HT40 Mode

Channel	Frequency (MHz)	Average Power Chain0 (dBm)	Average Power ChainB (dBm)
Low	2422	9.35	10.27
Middle	2437	10.75	11.38
High	2452	9.07	10.34

802.11a Mode

Channel	Frequency (MHz)	Average Power (dBm)	Average Power (W)
Low	5745	11.52	0.0142
Middle	5785	12.01	0.0159
High	5825	12.63	0.0183

802.11n HT20 Mode

Channel	Frequency (MHz)	Average Power Chain0 (dBm)	Average Power Chain1 (dBm)	Total Average Power (dBm)	Total Average Power (W)
Low	5745	8.97	7.70	11.39	0.0138
Middle	5785	9.45	6.68	11.29	0.0135
High	5825	9.75	5.88	11.24	0.0133

802.11n HT40 Mode

Channel	Frequency (MHz)	Average Power Chain0 (dBm)	Average Power Chain1 (dBm)	Total Average Power (dBm)	Total Average Power (W)
Low	5755	9.59	7.98	11.87	0.0154
Middle	5795	9.93	7.55	11.91	0.0155
High	5815	10.38	7.11	12.06	0.0161

7.3 POWER SPECTRAL DENSITY

LIMITS

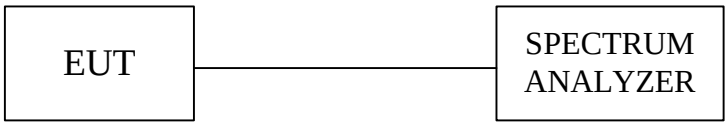
§ 15.247(e) For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

TEST EQUIPMENT

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	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 tests were performed in accordance with KDB 558074 5.3.1.

5.3.1 Measurement Procedure PKPSD:

1. Use this procedure when the maximum peak conducted output power in the fundamental emission is used to demonstrate compliance.
2. Set the RBW = 100 kHz.
3. Set the VBW ≥ 300 kHz.
4. Set the span to 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 peak marker function to determine the maximum power level in any 100 kHz band segment within the fundamental EBW.
10. Scale the observed power level to an equivalent value in 3 kHz by adjusting (reducing) the measured power by a bandwidth correction factor (BWCF) where BWCF = 10log(3 kHz/100 kHz= -15.2 dB).11.The resulting peak PSD level must be ≤ 8 dBm.

TEST RESULTS

IEEE 802.11b Mode

Channel	Frequency (MHz)	Reading (dBm)	BWCF (dB)	PPSD (dBm)	Limit (dBm)	Margin (dB)	Result
Low	2412	6.67	-15.2	-8.53	8.00	-16.53	PASS
Middle	2437	7.09	-15.2	-8.11	8.00	-16.11	PASS
High	2462	7.19	-15.2	-8.01	8.00	-16.01	PASS

Remark:

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

2. The cable assembly insertion loss of 11.7dB (including 10 dB pad and 1.7 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)	Result
Low	2412	-1.08	-15.2	-16.28	8.00	-24.28	PASS
Middle	2437	-0.75	-15.2	-15.95	8.00	-23.95	PASS
High	2462	-0.58	-15.2	-15.78	8.00	-23.78	PASS

Remark:

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

2. The cable assembly insertion loss of 11.7dB (including 10 dB pad and 1.7 dB cable) was Entered as an offset in the spectrum analyzer to allow for direct reading of power.

Antenna Gain1:	5	dBi					
Antenna Gain2:	5	dBi					
Array Gain=:	8.01	=	10*log	((10^(	5	/10)+ (10^(	5 /10)))
PPSD Limit:	5.99	=	8-	(	8.01	-6	)

IEEE 802.11n HT20 Mode

Channel	Frequency (MHz)	Reading (dBm)		BWCF dB)	PPSD dBm)			Limit (dBm)	Margin (dB)	Result
		Chain0	Chain1		Chain0	Chain1	Total			
Low	2412	-5.51	-3.47	-15.2	-20.71	-18.67	-16.56	5.99	-22.55	PASS
Middle	2437	-6.14	-2.97	-15.2	-21.34	-18.17	-16.46	5.99	-22.45	PASS
High	2462	-5.28	-4.03	-15.2	-20.48	-19.23	-16.80	5.99	-22.79	PASS

Remark:

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

2. The cable assembly insertion loss of 11.7dB (including 10 dB pad and 1.7 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 (dBm)		BWCF dB)	PPSD dBm)			Limit (dBm)	Margin (dB)	Result
		Chain0	Chain1		Chain0	Chain1	Total			
Low	2422	-10.06	-8.21	-15.2	-25.26	-23.41	-21.23	5.99	-27.22	PASS
Middle	2437	-9.32	-7.68	-15.2	-24.52	-22.88	-20.61	5.99	-26.60	PASS
High	2452	-10.18	-7.48	-15.2	-25.38	-22.68	-20.81	5.99	-26.80	PASS

Remark:

1. At finial test to get the worst-case emission at 13.5Mbps.

2. The cable assembly insertion loss of 11.7dB (including 10 dB pad and 1.7 dB cable) was Entered as an offset in the spectrum analyzer to allow for direct reading of power.

Antenna Gain1:	5	dBi					
Antenna Gain2:	5	dBi					
Array Gain=:	8.01	=	10*log	((10^(	5	/10)+ (10^(	5 /10)))
PPSD Limit:	5.99	=	8-	(	8.01	-6	)

IEEE 802.11a Mode

Channel	Channel Frequency (MHz)	Final RF Power Level in 3KHz BW (dBm)	Minimum Limit (dBm)	Pass / Fail
Low	5745	-17.96	8	PASS
Middle	5785	-18.05		PASS
High	5825	-17.76		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	Channel Frequency (MHz)	Final RF Power Level in 3KHz BW (dBm)			Minimum Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Total		
Low	5745	-18.87	-22.16	-17.20	5.99	PASS
Middle	5785	-19.52	-23.31	-18.00		PASS
High	5825	-19.01	-22.19	-17.30		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	Channel Frequency (MHz)	Final RF Power Level in 3KHz BW (dBm)			Minimum Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Total		
Low	5755	-23.33	-25.76	-21.37	5.99	PASS
Middle	5795	-24.15	-26.22	-22.05		PASS
High	5815	-23.17	-26.35	-21.46		PASS

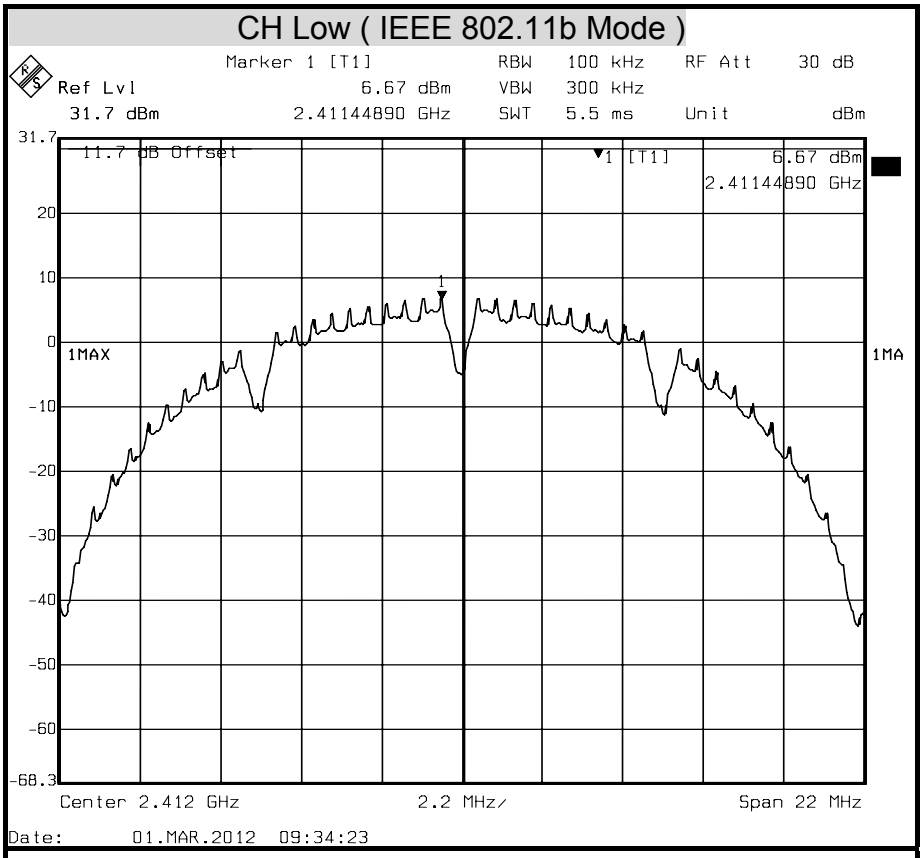
Remark:

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

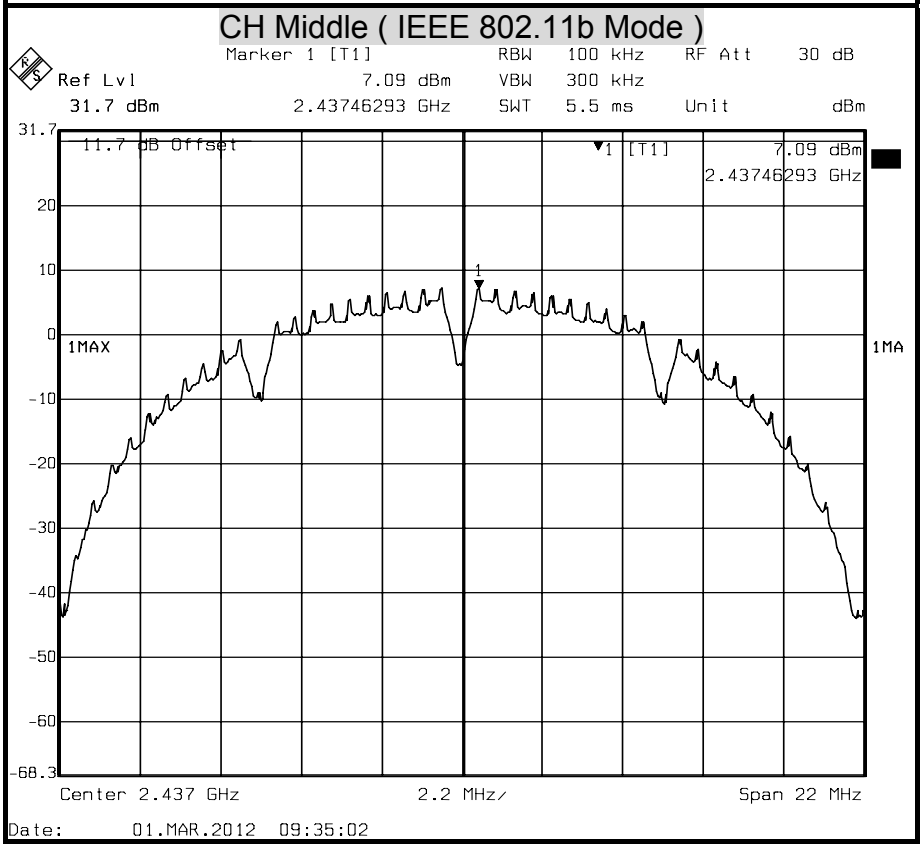
2. The cable assembly insertion loss of 12.3dB (including 10 dB pad and 2.3 dB cable) was Entered as an offset in the spectrum analyzer to allow for direct reading of power.

POWER SPECTRAL DENSITY

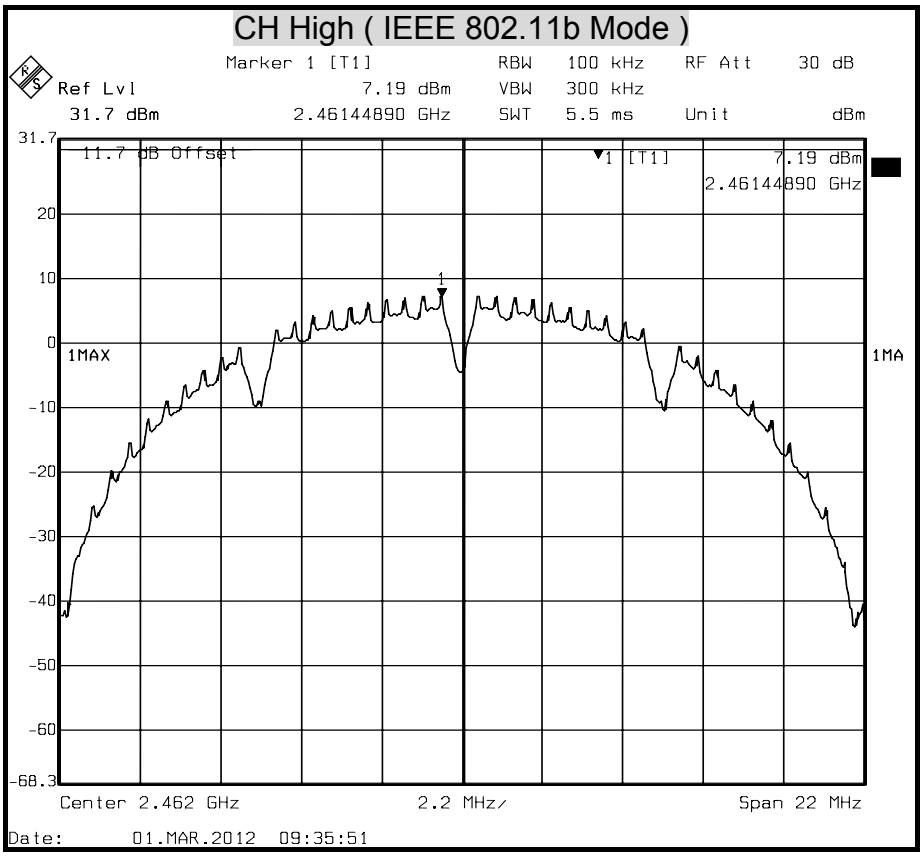
CH Low (IEEE 802.11b Mode)



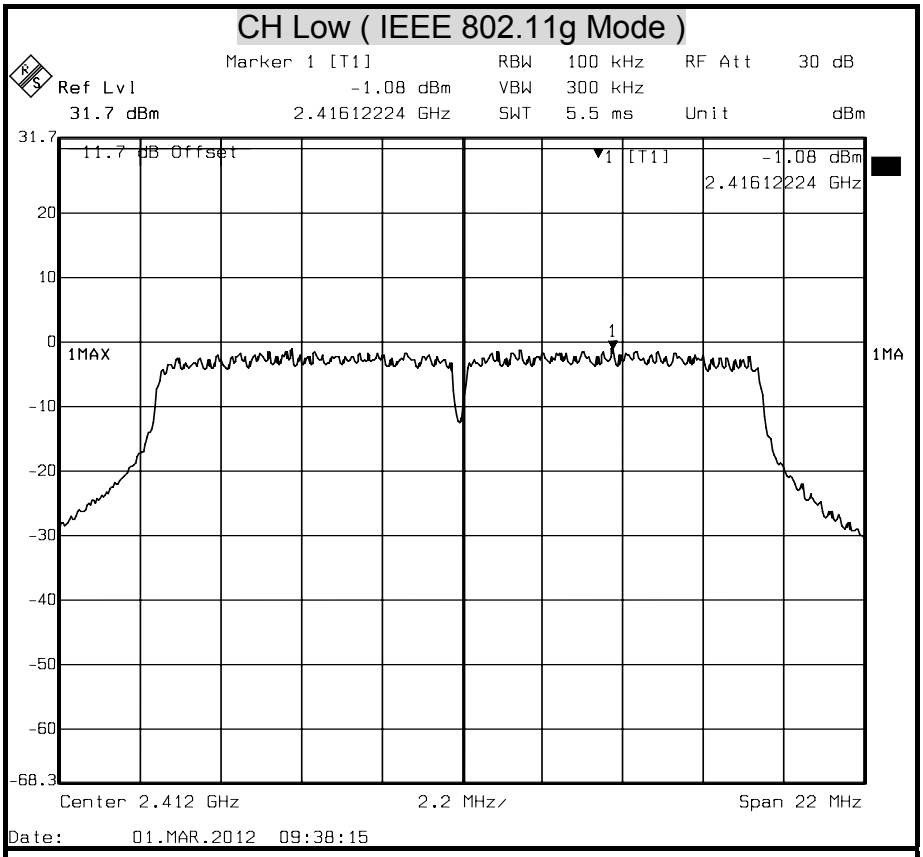
CH Middle (IEEE 802.11b Mode)



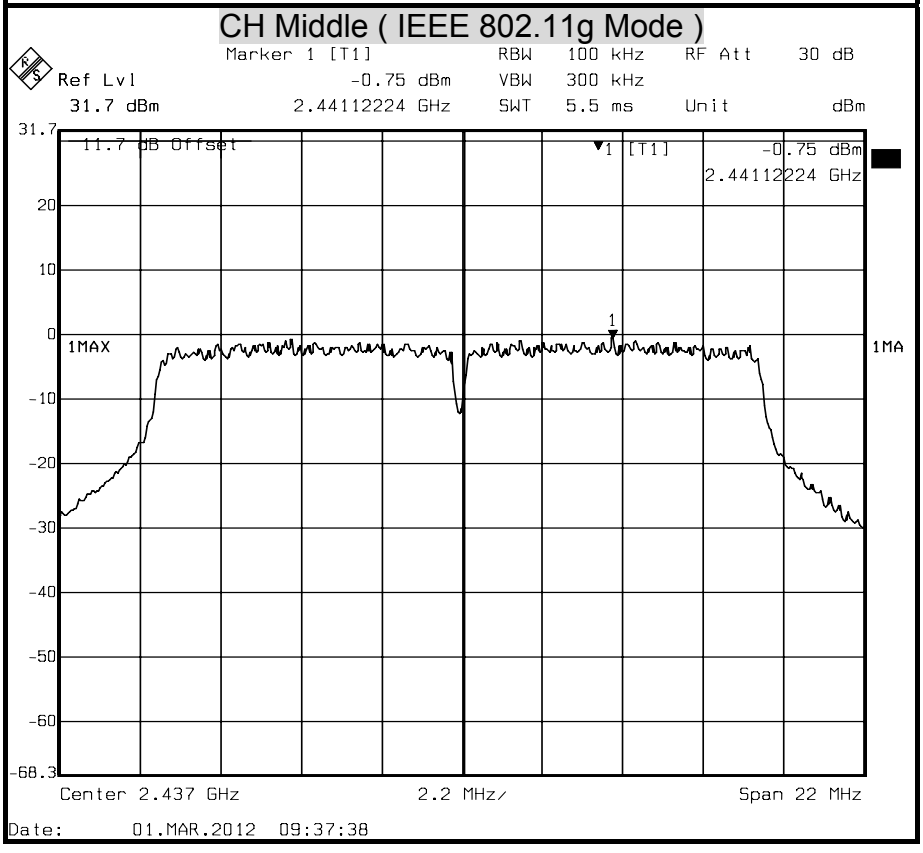
CH High (IEEE 802.11b Mode)



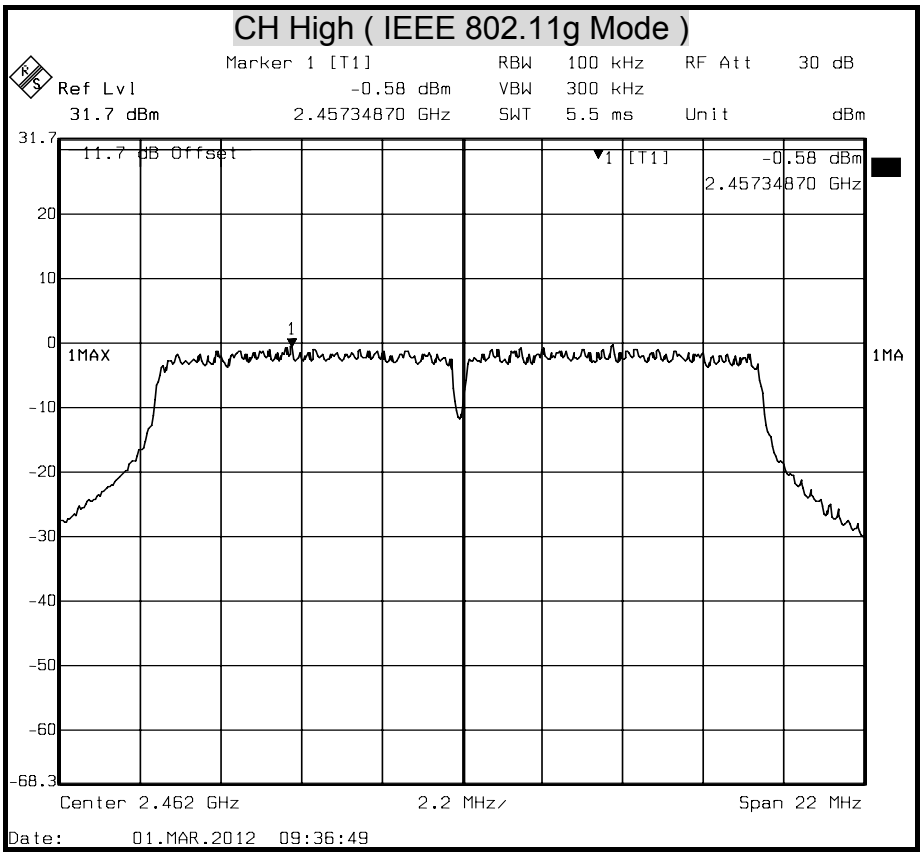
CH Low (IEEE 802.11g Mode)



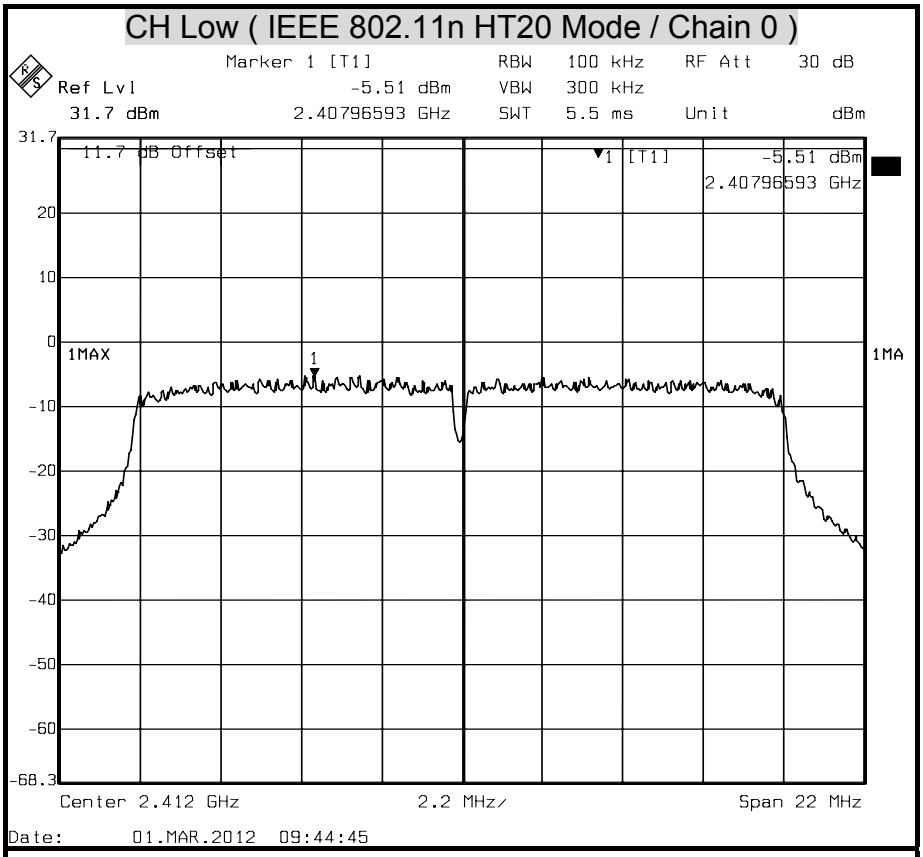
CH Middle (IEEE 802.11g Mode)



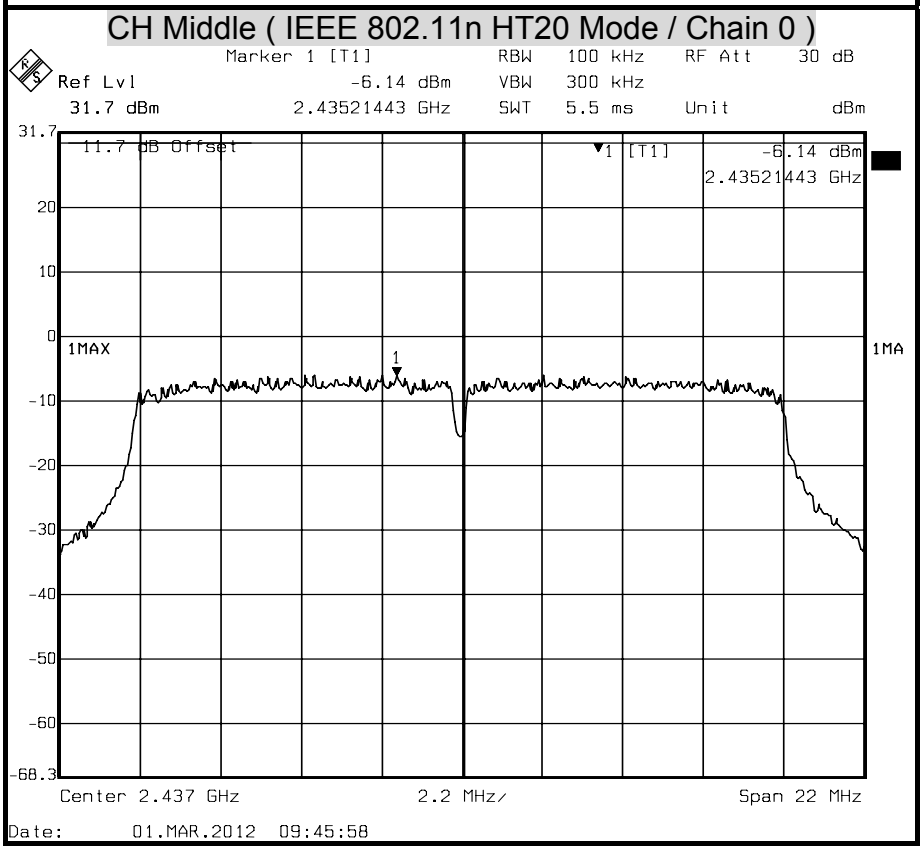
CH High (IEEE 802.11g Mode)



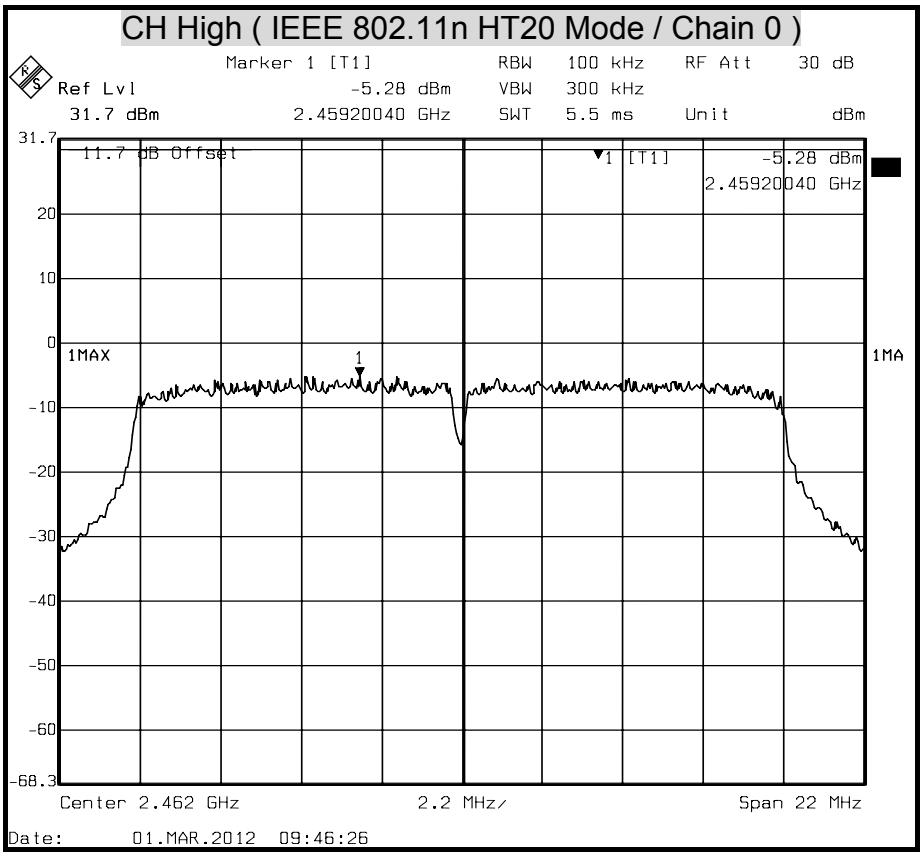
CH Low (IEEE 802.11n HT20 Mode / Chain 0)



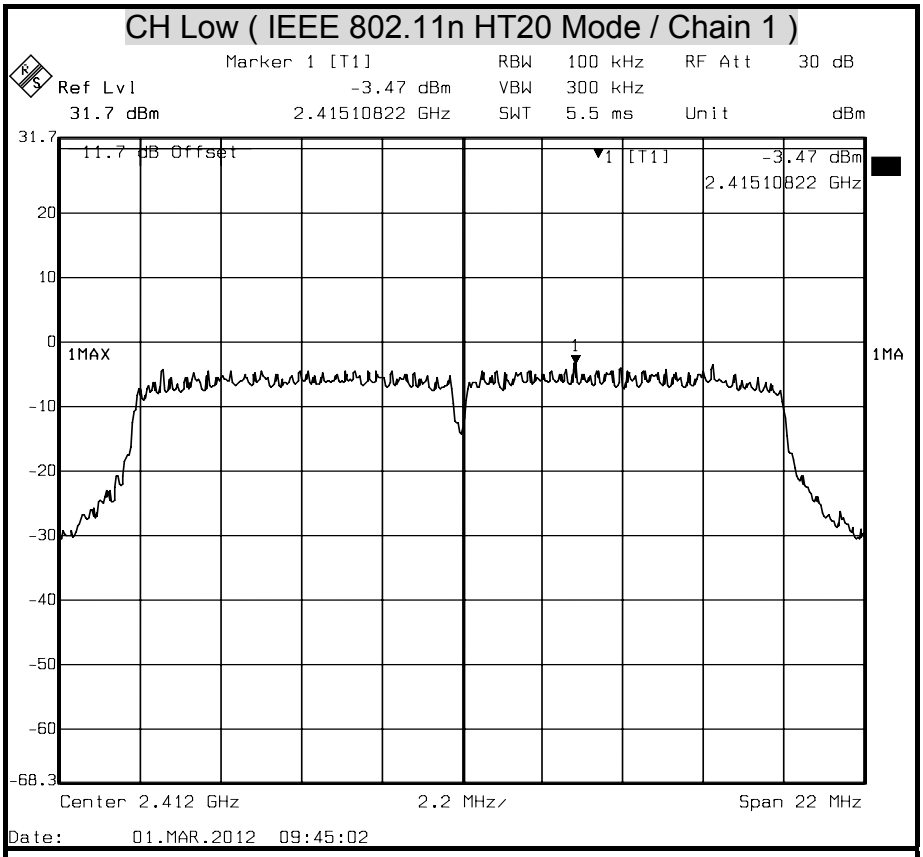
CH Middle (IEEE 802.11n HT20 Mode / Chain 0)



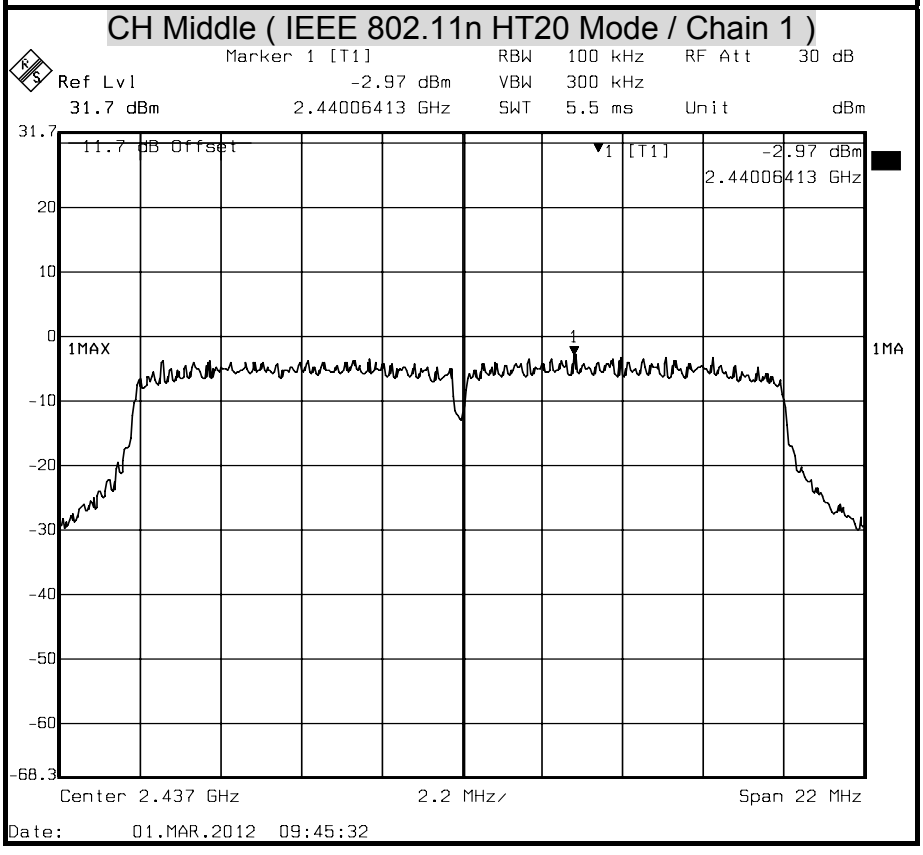
CH High (IEEE 802.11n HT20 Mode / Chain 0)



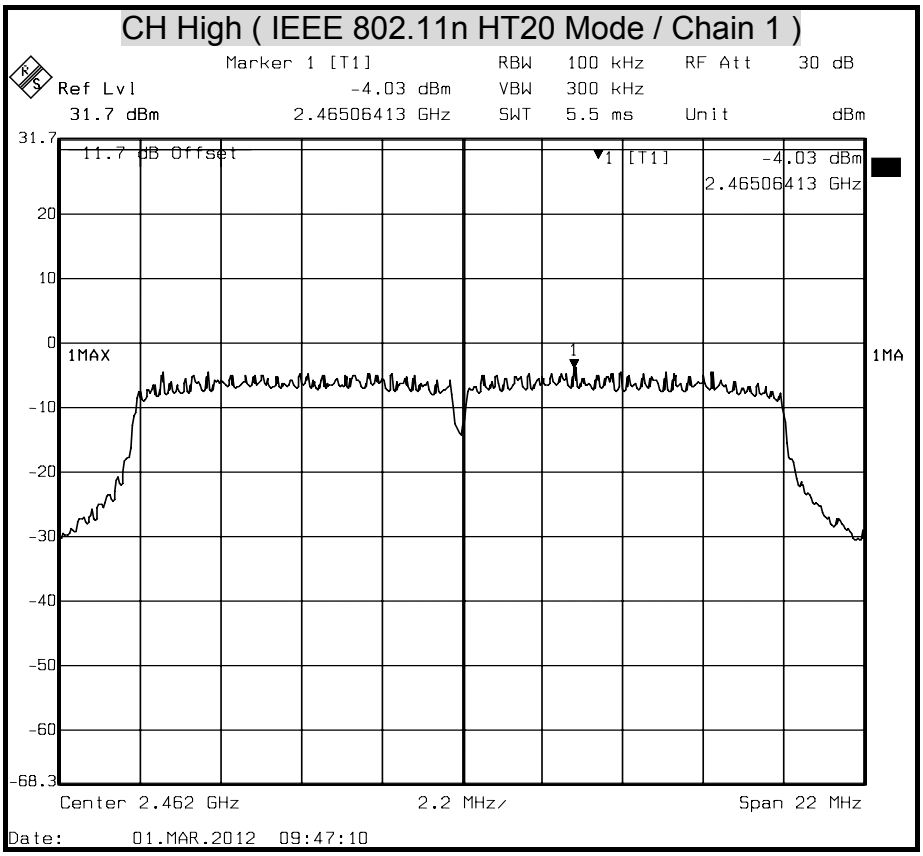
CH Low (IEEE 802.11n HT20 Mode / Chain 1)



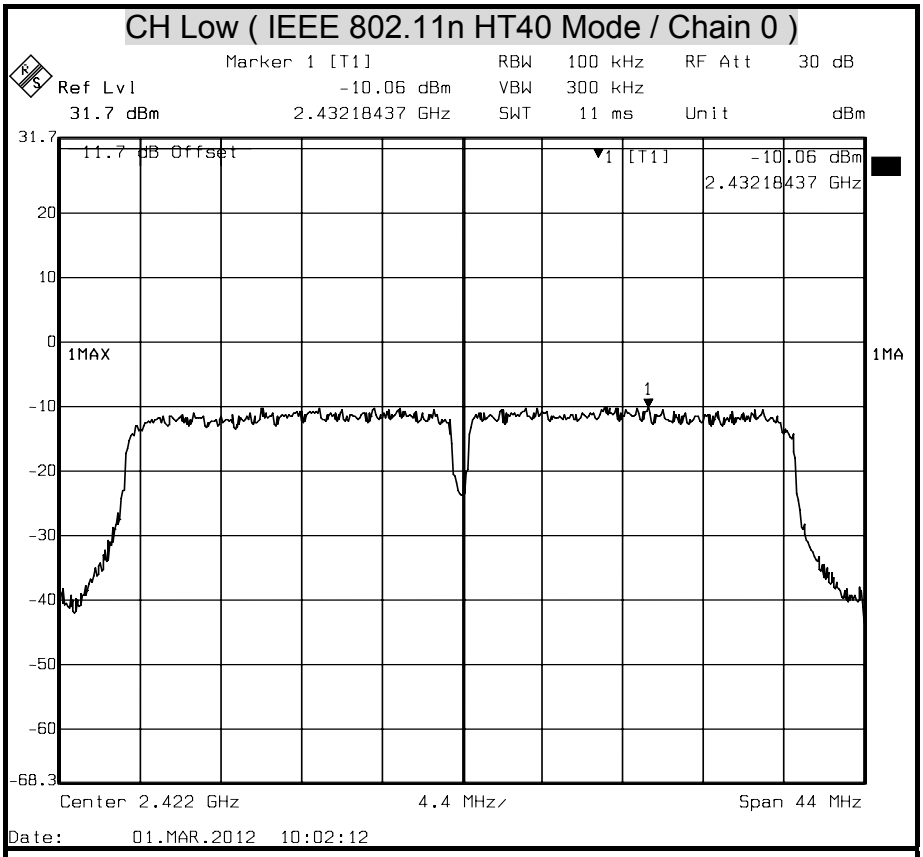
CH Middle (IEEE 802.11n HT20 Mode / Chain 1)



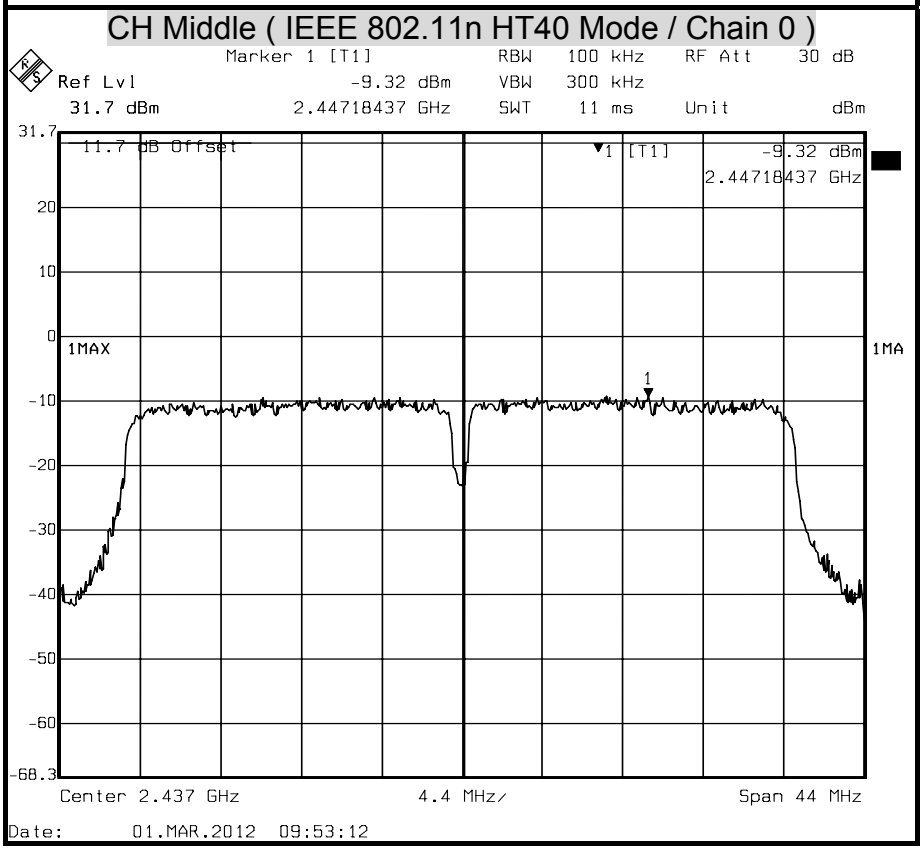
CH High (IEEE 802.11n HT20 Mode / Chain 1)



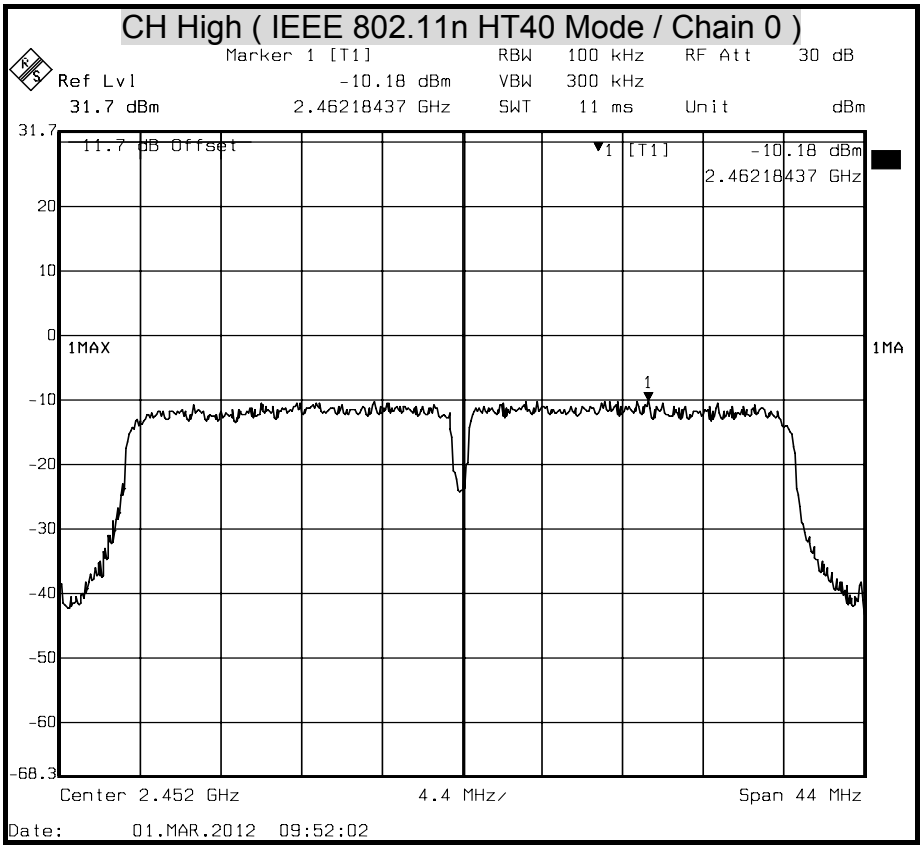
CH Low (IEEE 802.11n HT40 Mode / Chain 0)



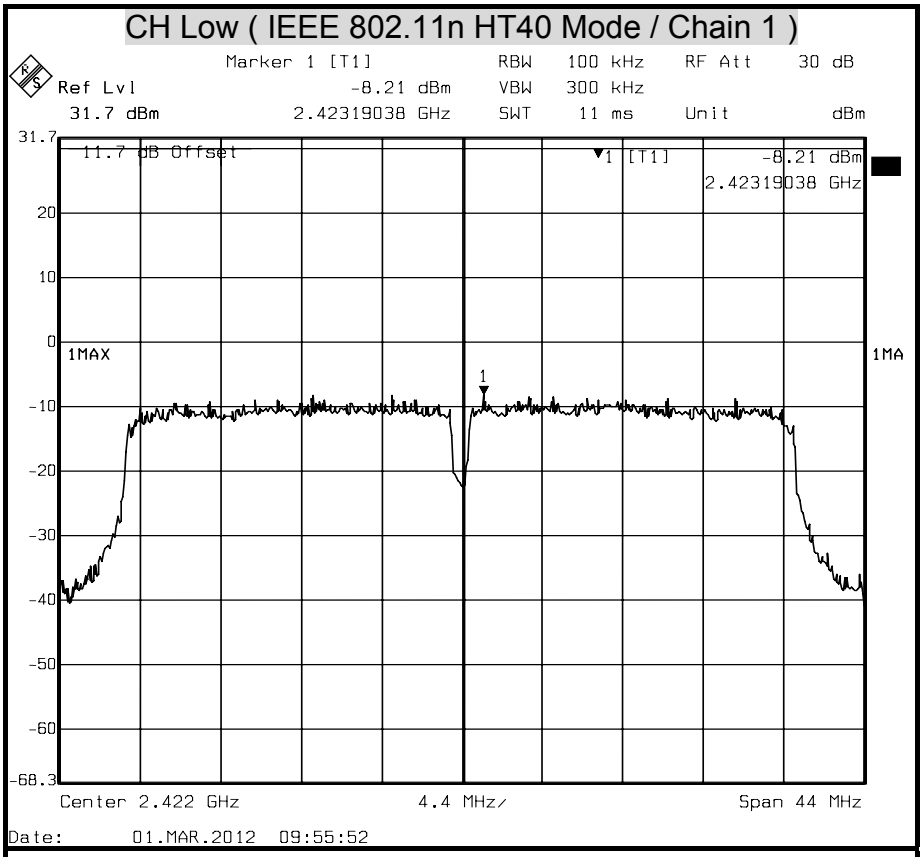
CH Middle (IEEE 802.11n HT40 Mode / Chain 0)



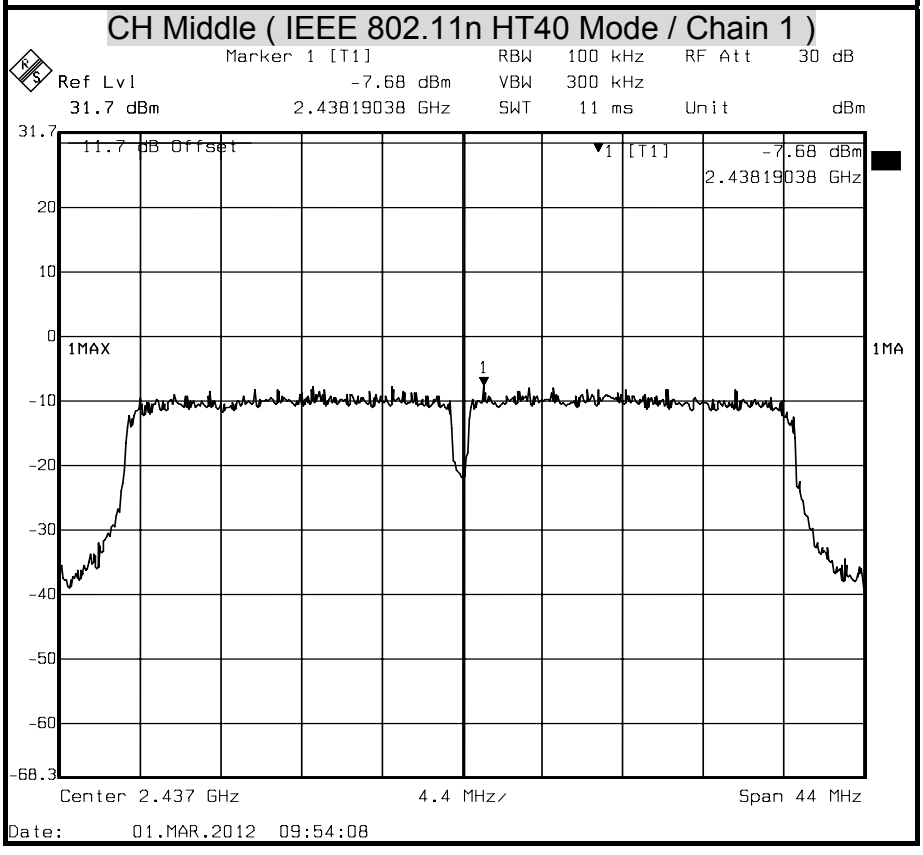
CH High (IEEE 802.11n HT40 Mode / Chain 0)



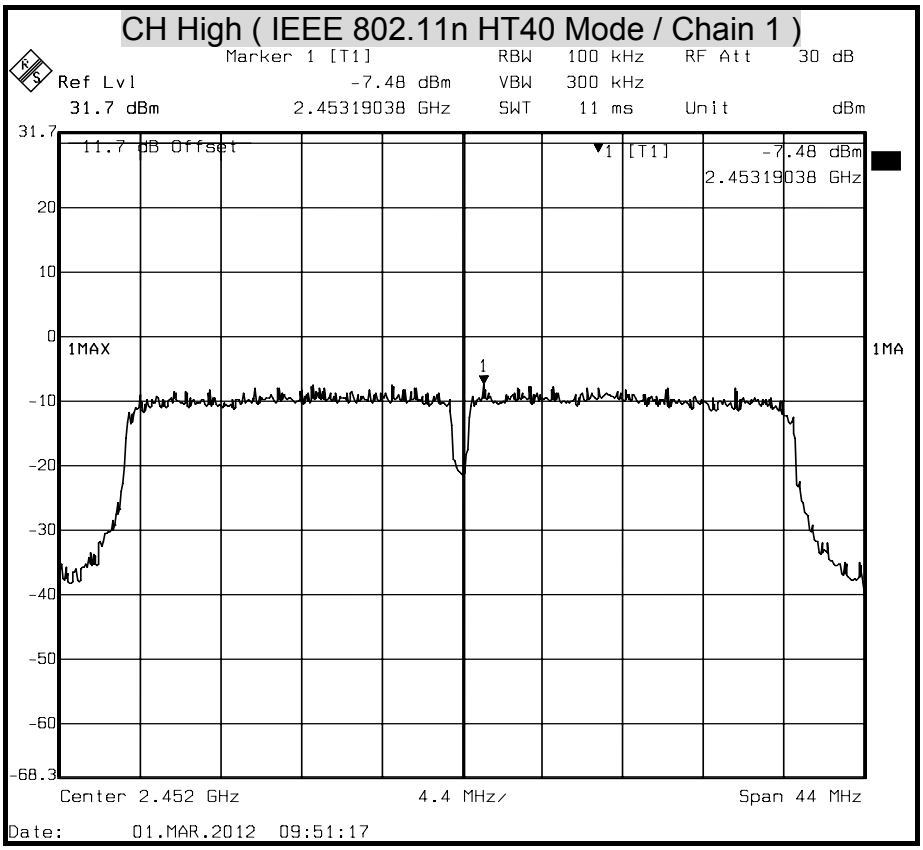
CH Low (IEEE 802.11n HT40 Mode / Chain 1)



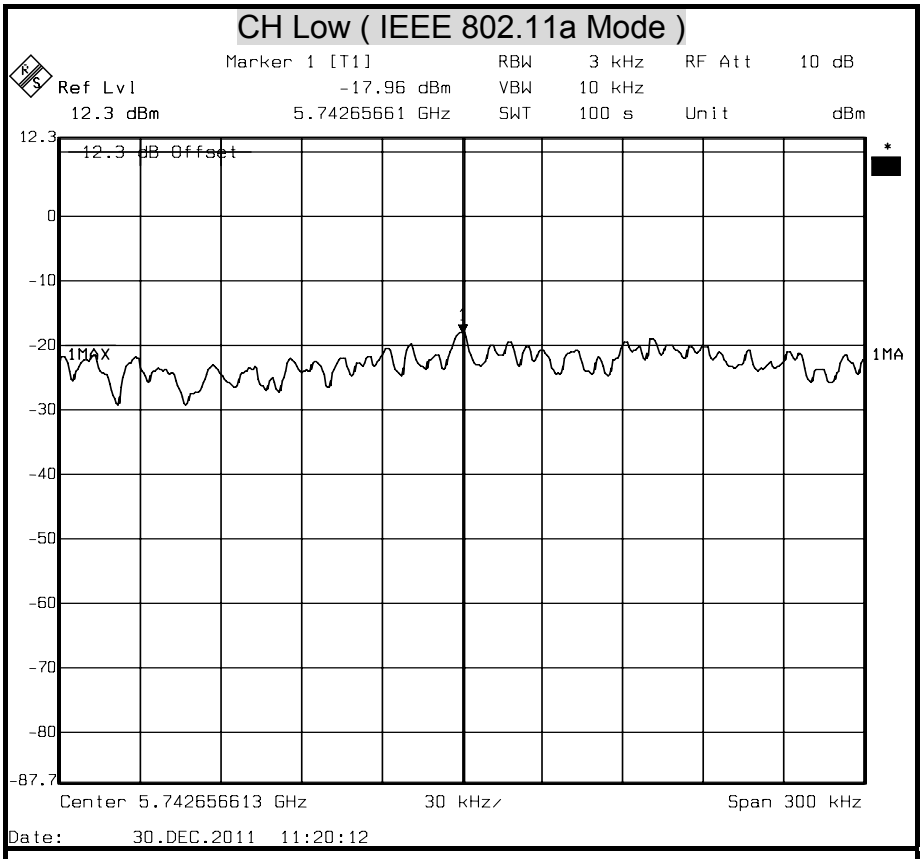
CH Middle (IEEE 802.11n HT40 Mode / Chain 1)



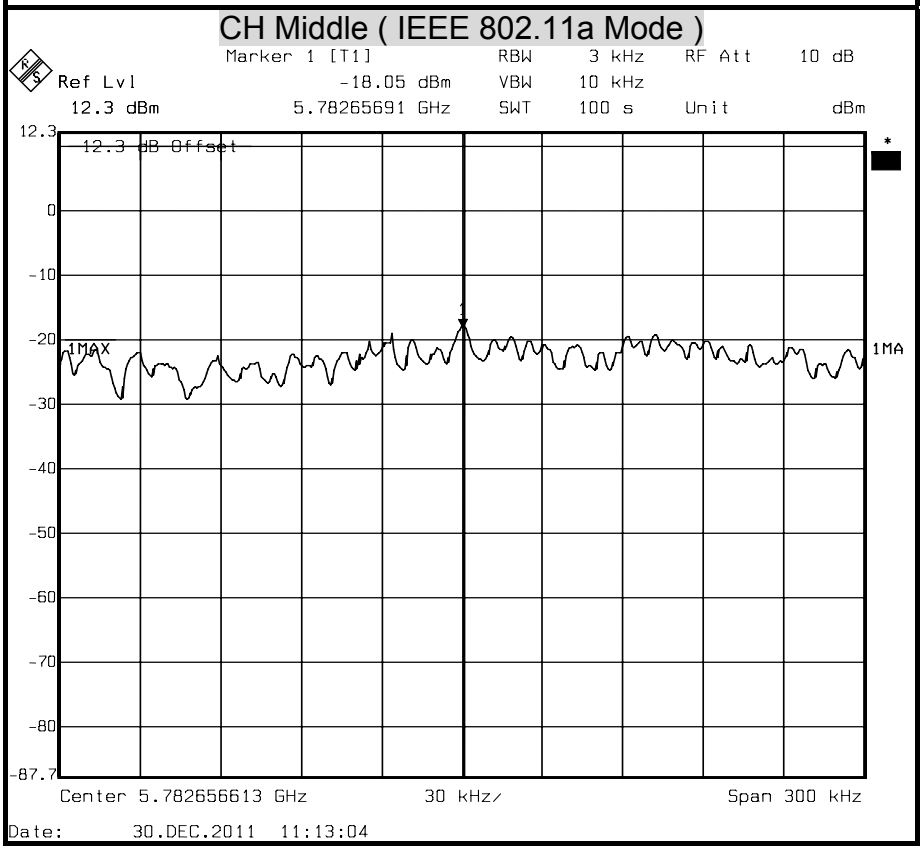
CH High (IEEE 802.11n HT40 Mode / Chain 1)



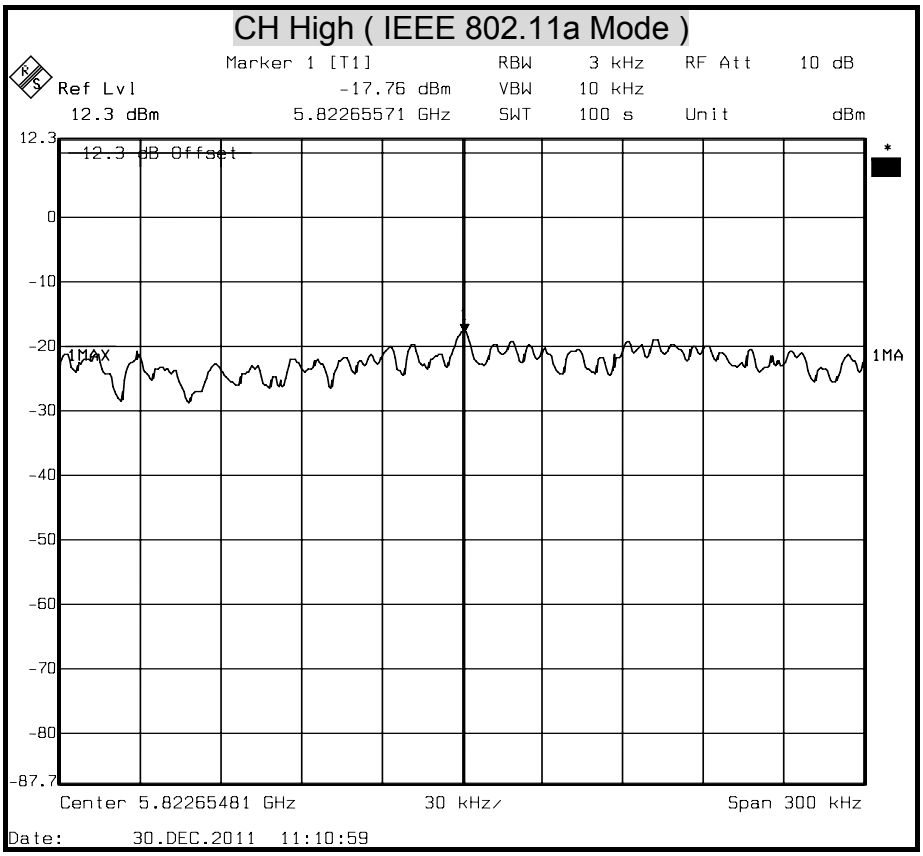
CH Low (IEEE 802.11a Mode)



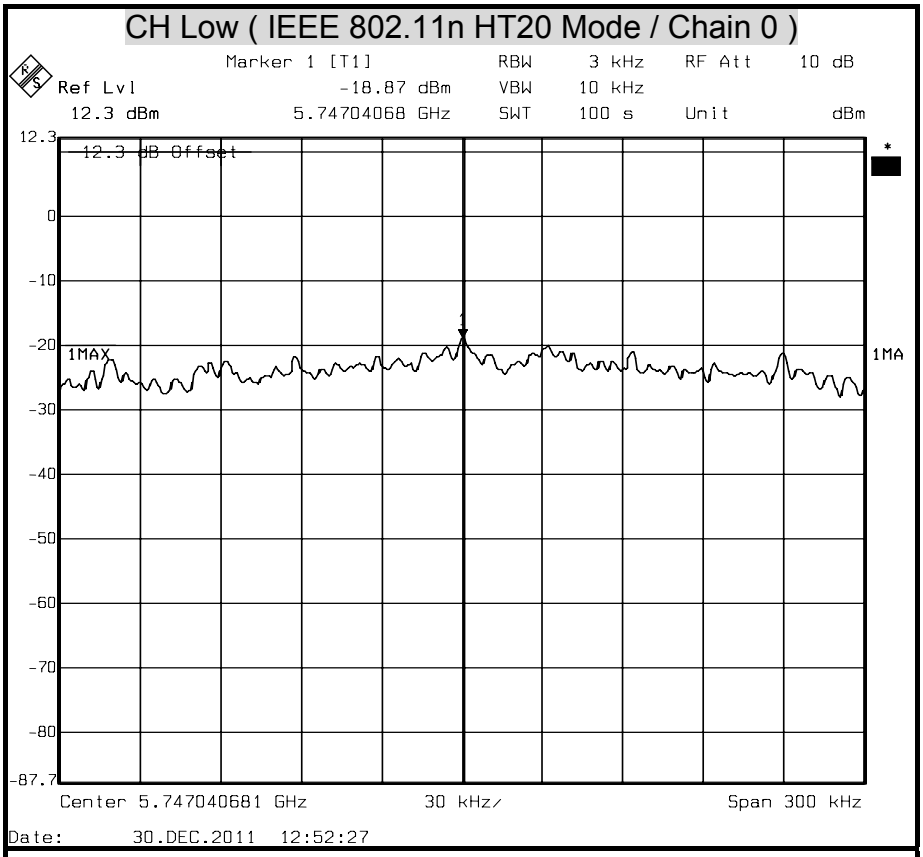
CH Middle (IEEE 802.11a Mode)



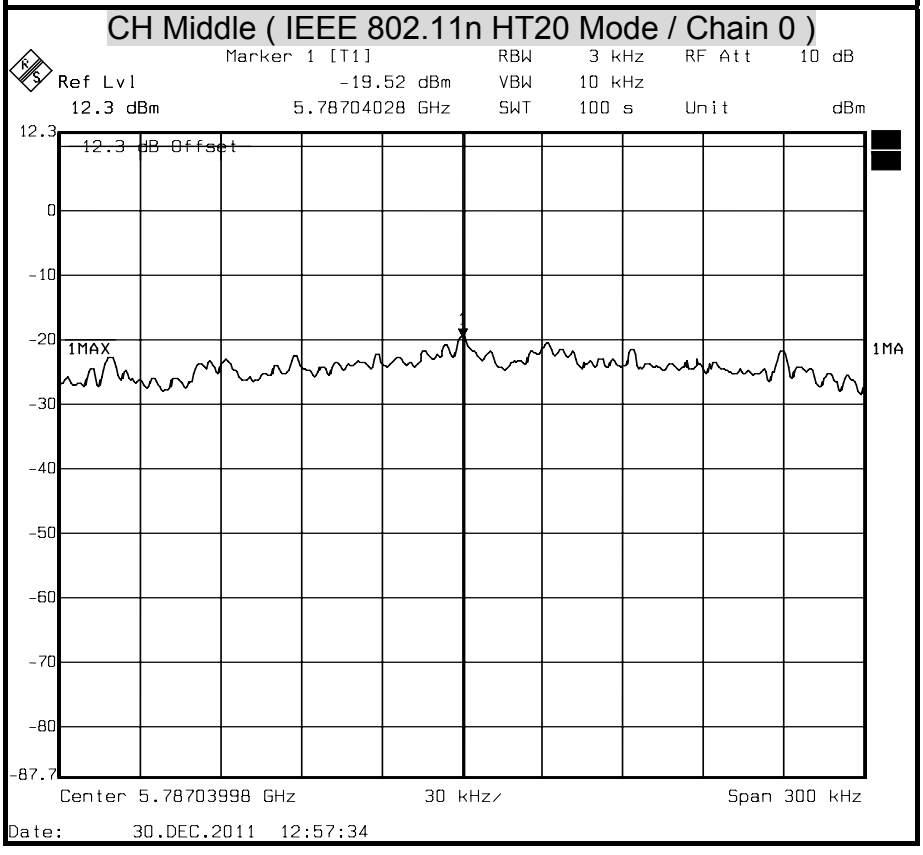
CH High (IEEE 802.11a Mode)



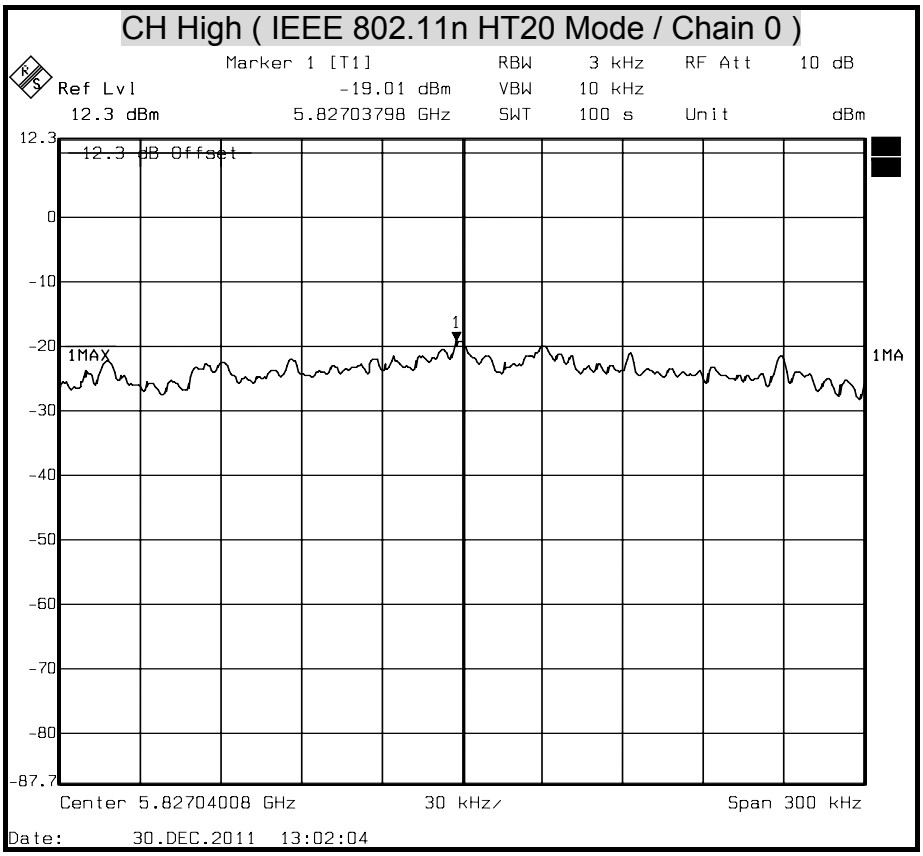
CH Low (IEEE 802.11n HT20 Mode / Chain 0)



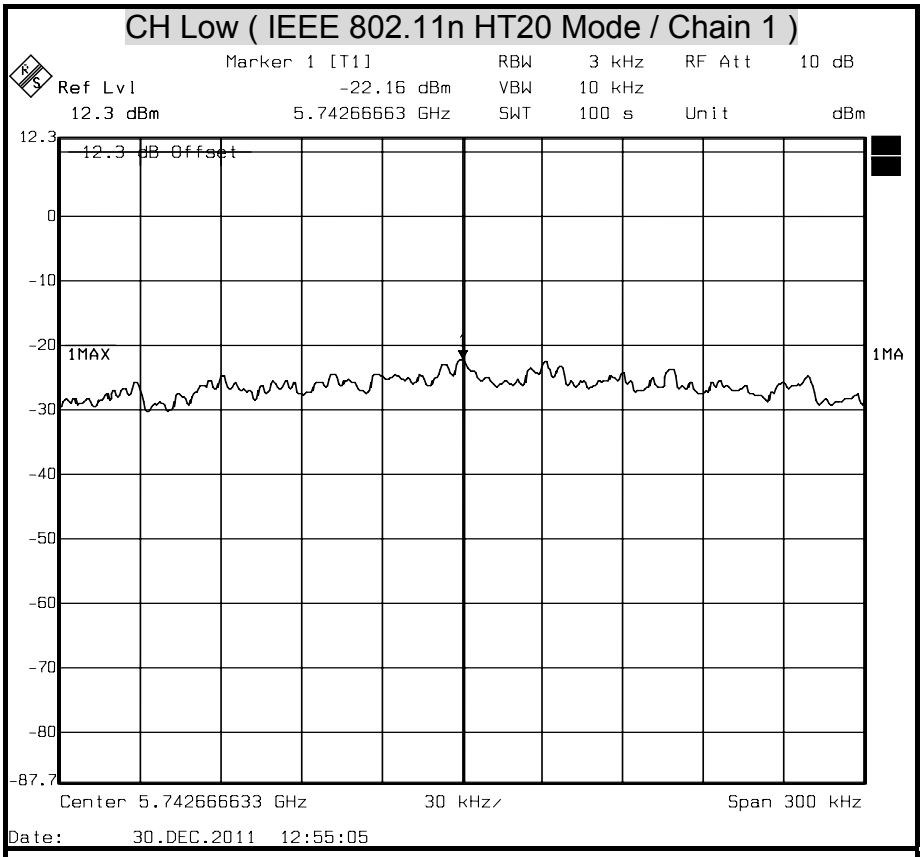
CH Middle (IEEE 802.11n HT20 Mode / Chain 0)



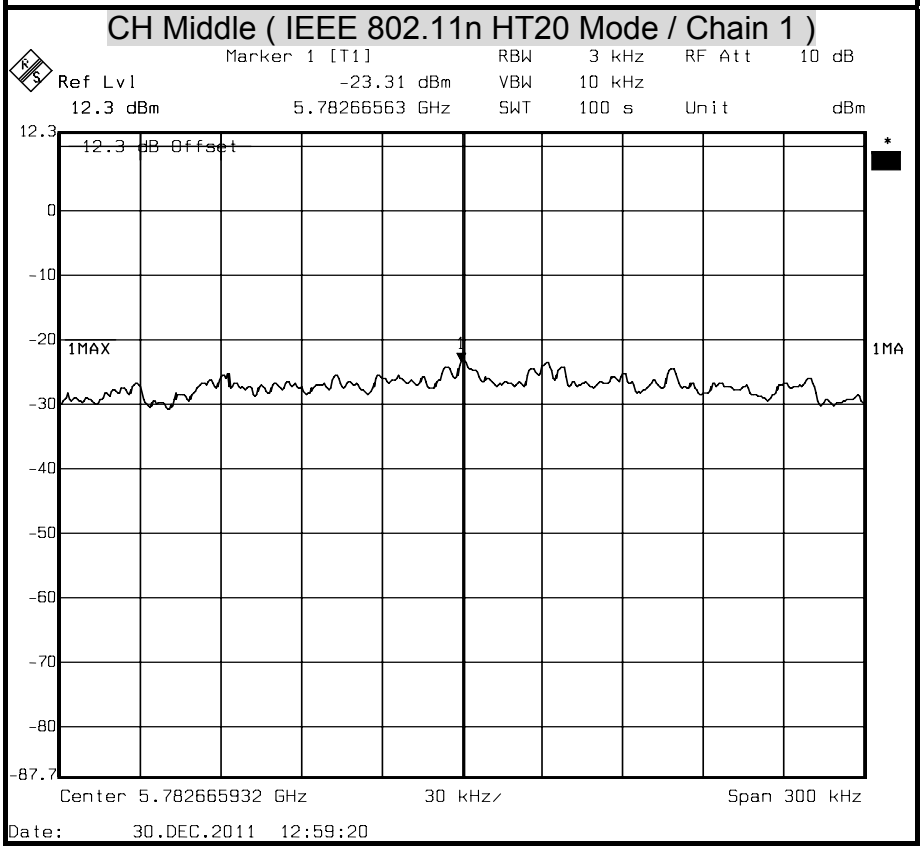
CH High (IEEE 802.11n HT20 Mode / Chain 0)

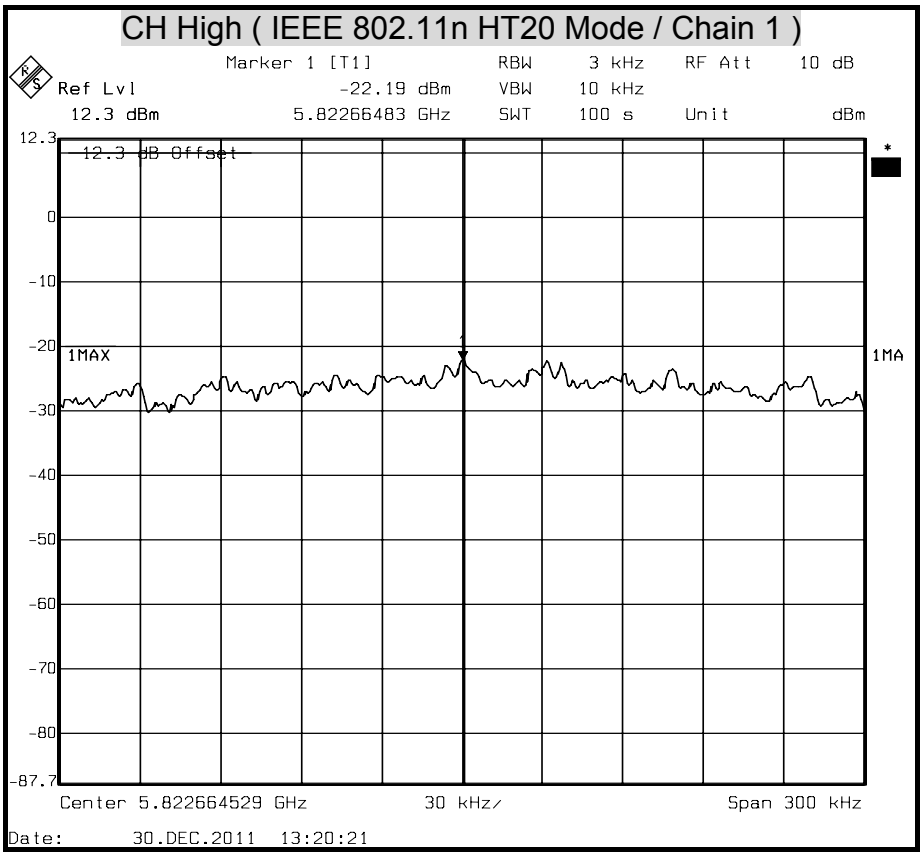


CH Low (IEEE 802.11n HT20 Mode / Chain 1)

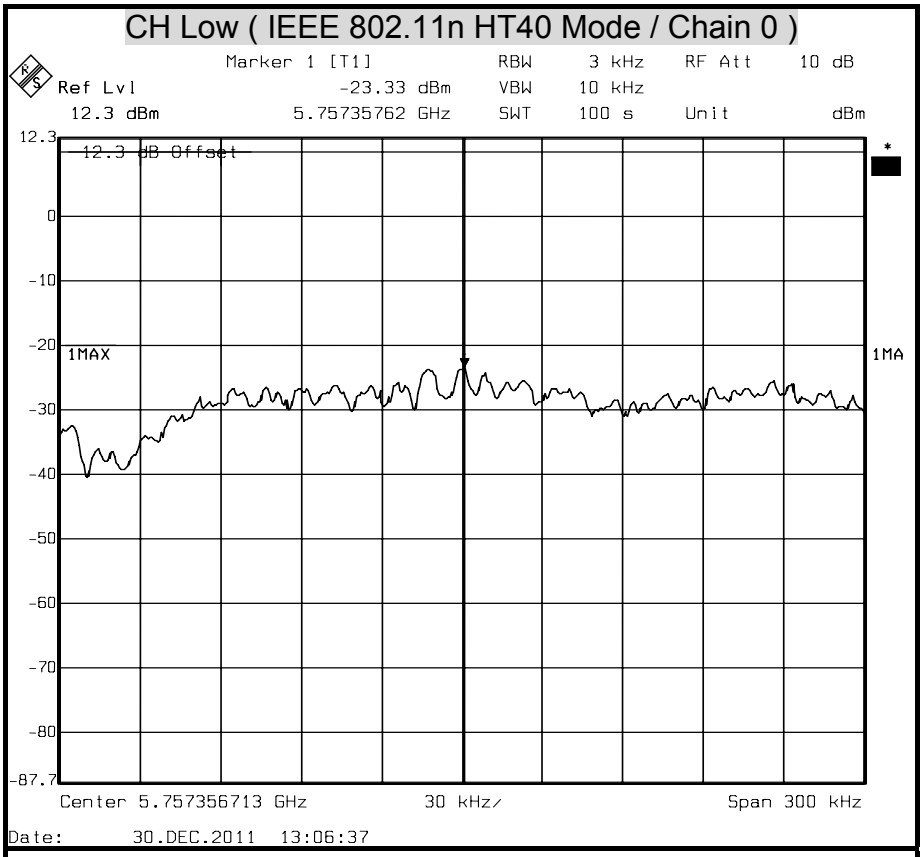


CH Middle (IEEE 802.11n HT20 Mode / Chain 1)

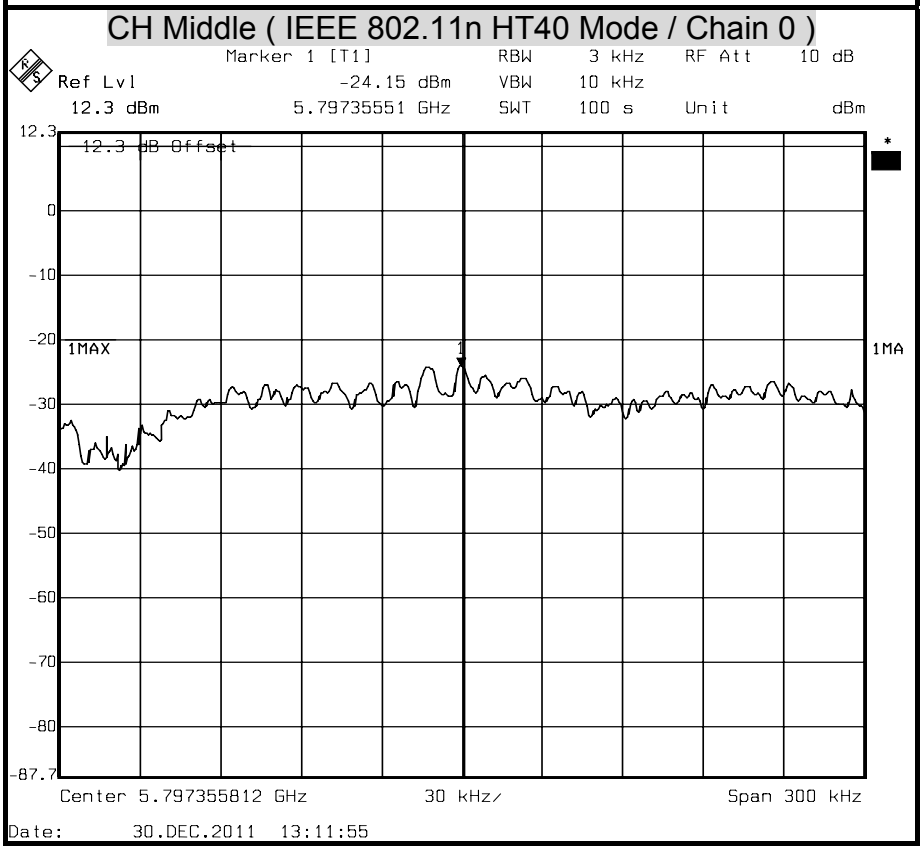


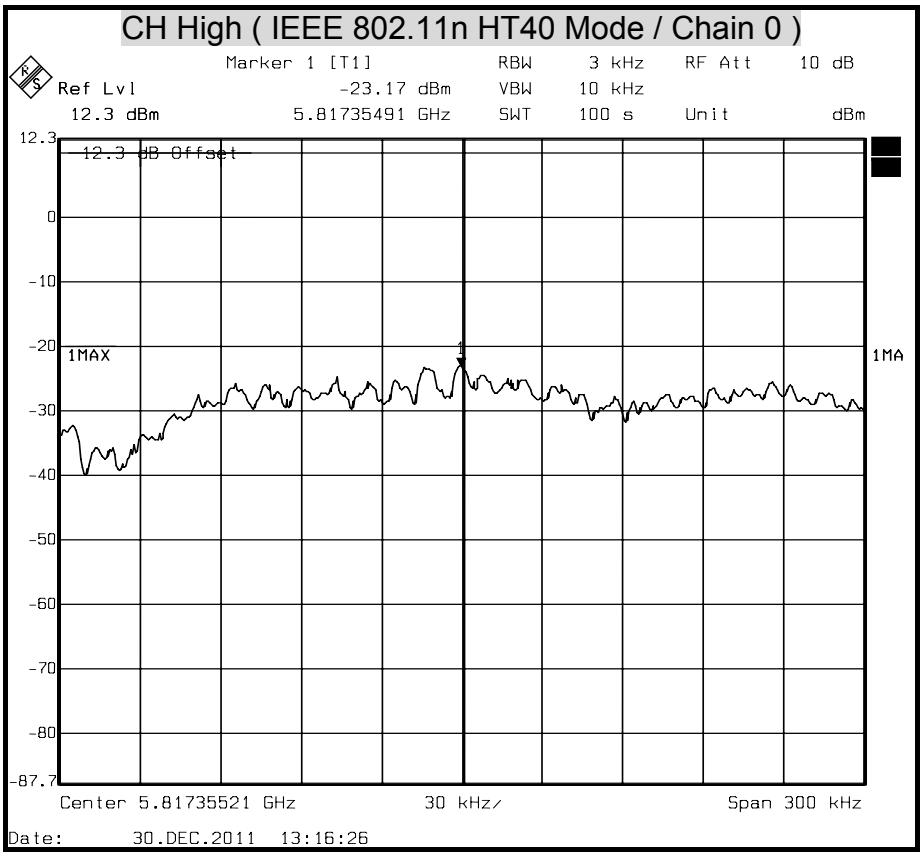


CH Low (IEEE 802.11n HT40 Mode / Chain 0)

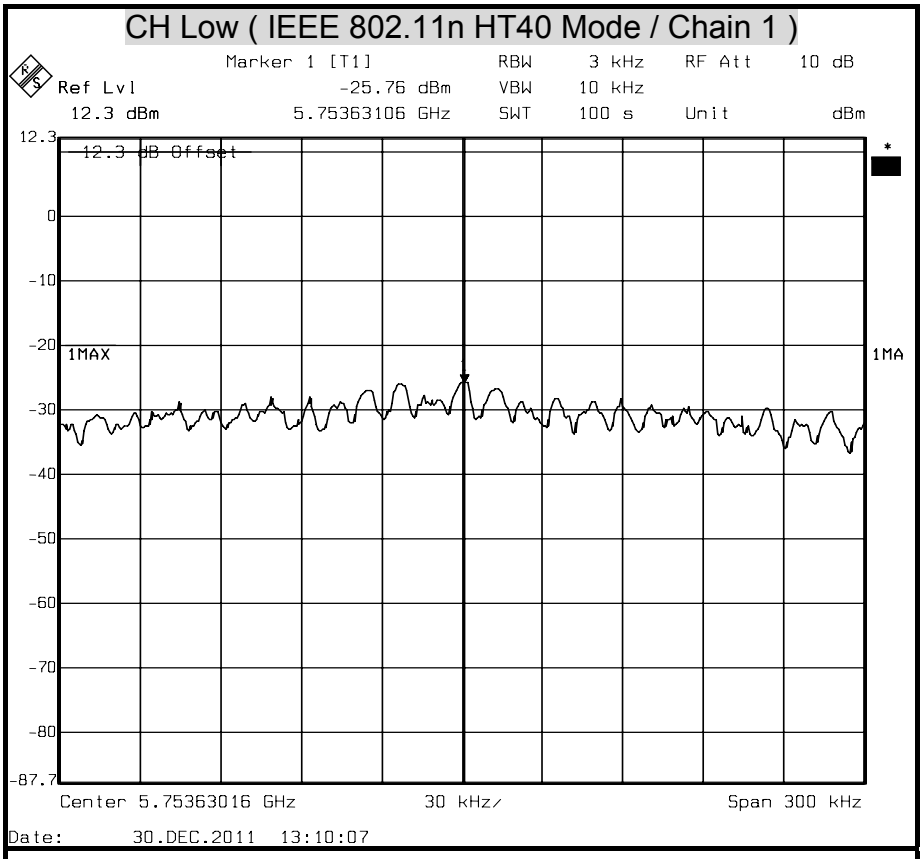


CH Middle (IEEE 802.11n HT40 Mode / Chain 0)





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



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