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

For

11n Dual-Band USB Dongle

Model : WU318d

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.)
TEL: 886-6-580-2201
FAX: 886-6-580-2202

Issued Date: April 03, 2012

Testing Laboratory
1109

Revision History

Rev.	Issue Date	Revisions	Effect Page	Revised By
00	December 15, 2011	Initial Issue	ALL	Sunny Chang
01	March 02, 2012	Delete MPE	Page 156	Sunny Chang
02	April 03, 2012	Add test data	ALL	Sunny Chang

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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 ：11n Dual-Band USB Dongle

Model Number ：WU318d

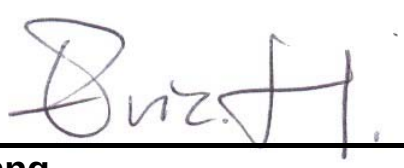
Brand Name ：E-TOP

Date of Test ：September 28, 2011 ~ December 01, 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	11n Dual-Band USB Dongle
Model Number	WU318d
Brand Name	E-TOP
Identify Number	T110914407
Received Date	September 14, 2011
Frequency Range	IEEE 802.11a, IEEE 802.11n HT20 : 5745MHz ~ 5825MHz IEEE 802.11n HT40 : 5755MHz ~ 5815MHz IEEE 802.11b/g, 802.11n HT20 : 2412MHz～2462MHz IEEE 802.11n HT40 : 2422MHz～2452MHz
Transmit Power	IEEE 802.11a : 14.23 dBm (26.485mW) IEEE 802.11n HT20 : 14.70 dBm (29.51209mW) IEEE 802.11n HT40 : 8.08 dBm (6.426877mW) IEEE 802.11b : 18.48 dBm (70.4693mW) IEEE 802.11g : 25.49 dBm (353.997mW) IEEE 802.11n HT20 : 28.63 dBm (730.206mW) IEEE 802.11n HT40 : 27.75 dBm (596.074mW)
Channel Spacing	IEEE 802.11a, 802.11n HT20 : 20MHz IEEE 802.11n HT40 : 5MHz IEEE 802.11b/g, 802.11n HT20/HT40 : 5MHz
Channel Number	IEEE 802.11a, 802.11n HT20 : 5 Channels IEEE 802.11n HT40 : 6 Channels IEEE 802.11b/g, 802.11n HT20 : 11 Channels IEEE 802.11n HT40 : 7 Channels
Transmit Data Rate	IEEE 802.11a : 54, 48 ,36, 24, 18, 12, 9, 6 Mbps 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 : 65, 58.5, 52, 39, 26, 19.5, 13, 6.55 Mbps IEEE 802.11n HT40 : 150 ,135, 121.5, 108, 81, 54, 40.5, 27, 13.5 Mbps
Type of Modulation	IEEE 802.11a : OFDM (64QAM, 16QAM, QPSK, BPSK) 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)
Antenna Type	**Two antennas (2TX2RX)** Manufacture: Master Wave Tech. Co., Ltd. Type: PCB antenna Gain: 2dBi for 2.4GHz & 3dBi for 5GHz

Power Rating	5Vdc
RF Exposure Evaluation	Since the EUT is classed portable device, and the maximum peak power is 28.63 dBm (>13.6dBm), the MPE evaluation is not required and has SAR consideration applied.
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-WU318D** 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	WU318d	11n Dual-Band USB Dongle
Amigo Technology Inc. 5F., No.63, Lane 77, Xing-Ai Road, Neihu Dist., Taipei City 114, Taiwan (R.O.C.)	Amigo	WU318d	11n Dual-Band USB Dongle
Sapido Technology Inc. No. 383., Sec. 2, Minsheng Rd., West Central District, Tainan 700, Taiwan, R.O.C.	SAPIDO	AU-4515; AU-5015	Wireless N Dual-band USB Adapter

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 802.11a, 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.

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 : 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	2422
Middle	2437
High	2452

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 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	N/A	---

For EMI test

No.	Product	Manufacturer	Model No.	Certify No.	Signal cable
1	Note Book	IBM	R51	R33026	Power cable, unshd, 1.6m

No.	Signal cable description	
A	N/A	---

SETUP DIAGRAM FOR TESTS

EUT & peripherals setup diagram is shown in appendix setup photos.

EUT OPERATING CONDITION

RF Setup (2.4G)

1. Set up all computers like the setup diagram.
2. The “Realtek 11n Dual MAC 9xD USB WLAN NIC Massproduction Kit” software was used for testing
3. MAC , select [DMSP] from the command list.
4. Setting , Testing item select [Continuous Tx] from the command list.
5. Setting , Modulation select [2_4G] from the command list.

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) = **48**
IEEE 802.11b Channel Middle (2437MHz) = **46**
IEEE 802.11b Channel High (2462MHz) = **45**

Target Power: IEEE 802.11g Channel Low (2412MHz) = **57**
IEEE 802.11g Channel Middle (2437MHz) = **55**
IEEE 802.11g Channel High (2462MHz) = **53**

Target Power: IEEE 802.11n HT20 Channel Low (2412MHz) = **57 (Chain 1)**
IEEE 802.11 n HT20 Channel Middle (2437MHz) = **55 (Chain 1)**
IEEE 802.11 n HT20 Channel High (2462MHz) = **54 (Chain 1)**
IEEE 802.11n HT20 Channel Low (2412MHz) = **57 (Chain 2)**
IEEE 802.11 n HT20 Channel Middle (2437MHz) = **55 (Chain 2)**
IEEE 802.11 n HT20 Channel High (2462MHz) = **54 (Chain 2)**

Target Power: IEEE 802.11n HT40 Channel Low (2422MHz) = **54 (Chain 1)**
IEEE 802.11 n HT40 Channel Middle (2437MHz) = **54 (Chain 1)**
IEEE 802.11 n HT40 Channel High (2452MHz) = **54 (Chain 1)**
IEEE 802.11n HT40 Channel Low (2422MHz) = **54 (Chain 2)**
IEEE 802.11 n HT40 Channel Middle (2437MHz) = **54 (Chain 2)**
IEEE 802.11 n HT40 Channel High (2452MHz) = **54 (Chain 2)**

RX Mode：

Start RX

6. All of the function are under run.
7. 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 “Realtek 11n Dual MAC 9xD USB WLAN NIC Massproduction Kit” software was used for testing
3. MAC , select [DMSP] from the command list.
4. Setting , Testing item select [Continuous Tx] from the command list.
5. Setting , Modulation select [5G] from the command list.

TX Mode:

⇨ **Tx Mode:CCK 、OFDM、 HT MixMode** (Bandwidth: 20、40)

⇨ **Tx Data Rate: 6Mbps** (IEEE 802.11a mode , TX)
13Mbps (IEEE 802.11n HT20 mode ,, chain 1 TX)
27Mbps (IEEE 802.11n HT40 mode, chain 0, chain 1 TX**)**

Power control mode

Target Power: IEEE 802.11a Channel Low (5745MHz) = **38**
IEEE 802.11a Channel Middle (5785MHz) = **38**
IEEE 802.11a Channel High (5825MHz) = **38**

Target Power: IEEE 802.11n HT20 Channel Low (5745MHz) = **36 (Chain 0)**
IEEE 802.11 n HT20 Channel Middle (5785MHz) = **36 (Chain 0)**
IEEE 802.11 n HT20 Channel High (5825MHz) = **36 (Chain 0)**
IEEE 802.11n HT20 Channel Low (5745MHz) = **36 (Chain 1)**
IEEE 802.11 n HT20 Channel Middle (5785MHz) = **36 (Chain 1)**
IEEE 802.11 n HT20 Channel High (5825MHz) = **36 (Chain 1)**

Target Power: IEEE 802.11n HT40 Channel Low (5755MHz) = **34 (Chain 0)**
IEEE 802.11 n HT40 Channel Middle (5795MHz) = **34 (Chain 0)**
IEEE 802.11 n HT40 Channel High (5815MHz) = **34 (Chain 0)**
IEEE 802.11n HT40 Channel Low (5755MHz) = **34 (Chain 1)**
IEEE 802.11n HT40 Channel Middle (5795MHz) = **34 (Chain 1)**
IEEE 802.11 n HT40 Channel High (5815MHz) = **34 (Chain 1)**

RX Mode：

Start RX

6. All of the function are under run.
7. 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

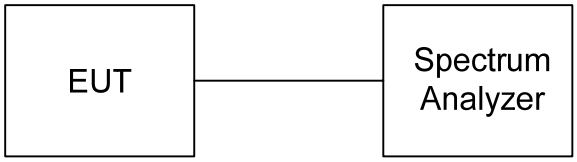
§ 15.247(a) (2) For direct sequence systems, the minimum 6dB bandwidth shall be at least 500kHz.

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 802.11a Mode

Channel	Channel Frequency (MHz)	6dB Bandwidth (kHz)	Minimum Limit (kHz)	Pass / Fail
Low	5745	16633	500	PASS
Middle	5785	16633	500	PASS
High	5825	16633	500	PASS

IEEE 802.11n HT20 Mode

Channel	Channel Frequency (MHz)	6dB Bandwidth (kHz)		Minimum Limit (kHz)	Pass / Fail
		Chain 0	Chain1		
Low	5745	17836	17836	500	PASS
Middle	5785	17836	17836	500	PASS
High	5825	17936	17836	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	36473	500	PASS
Middle	5795	36673	36473	500	PASS
High	5815	36673	36473	500	PASS

IEEE 802.11b Mode

Channel	Channel Frequency (MHz)	6dB Bandwidth (kHz)	Minimum Limit (kHz)	Pass / Fail
Low	2412	10321	500	PASS
Middle	2437	10321	500	PASS
High	2462	10321	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	16583	500	PASS

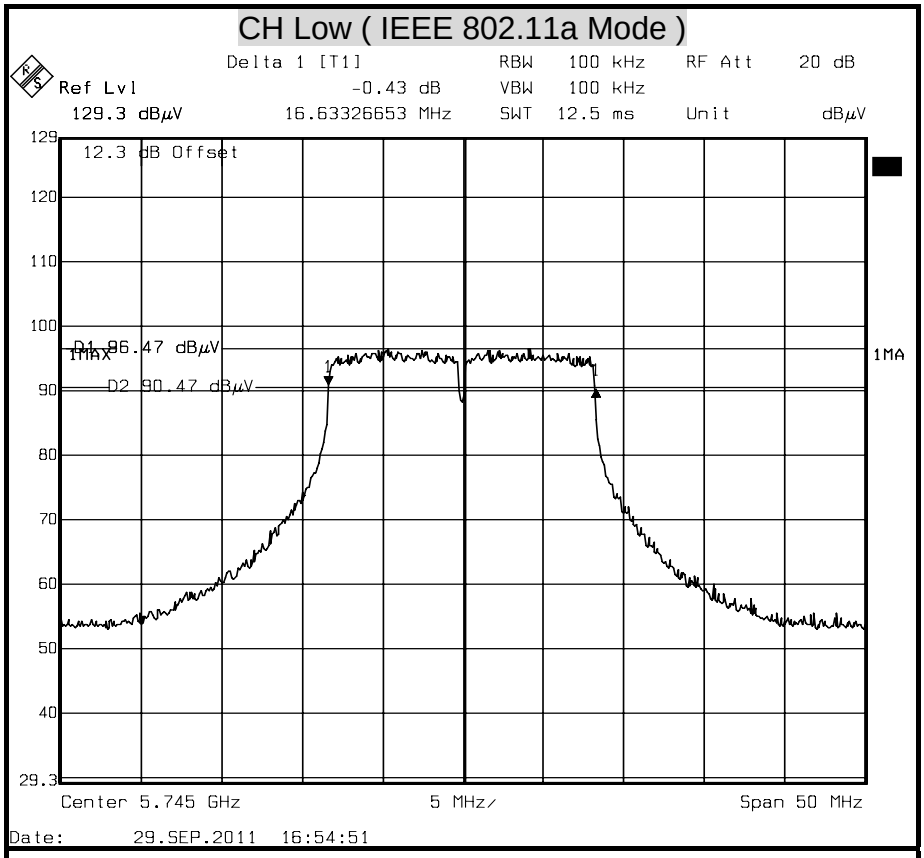
IEEE 802.11n HT20 Mode

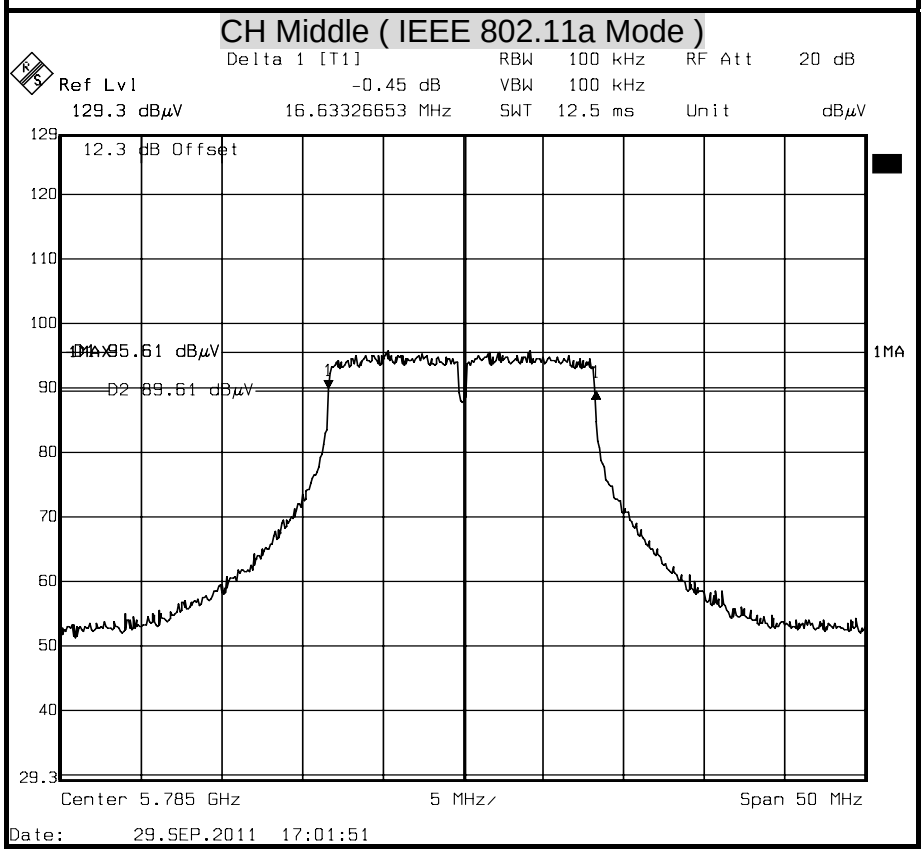
Channel	Channel Frequency (MHz)	6dB Bandwidth (kHz)		Minimum Limit (kHz)	Pass / Fail
		Chain 0	Chain1		
Low	2412	17935	17735	500	PASS
Middle	2437	17835	17935	500	PASS
High	2462	17935	17735	500	PASS

IEEE 802.11n HT40 Mode

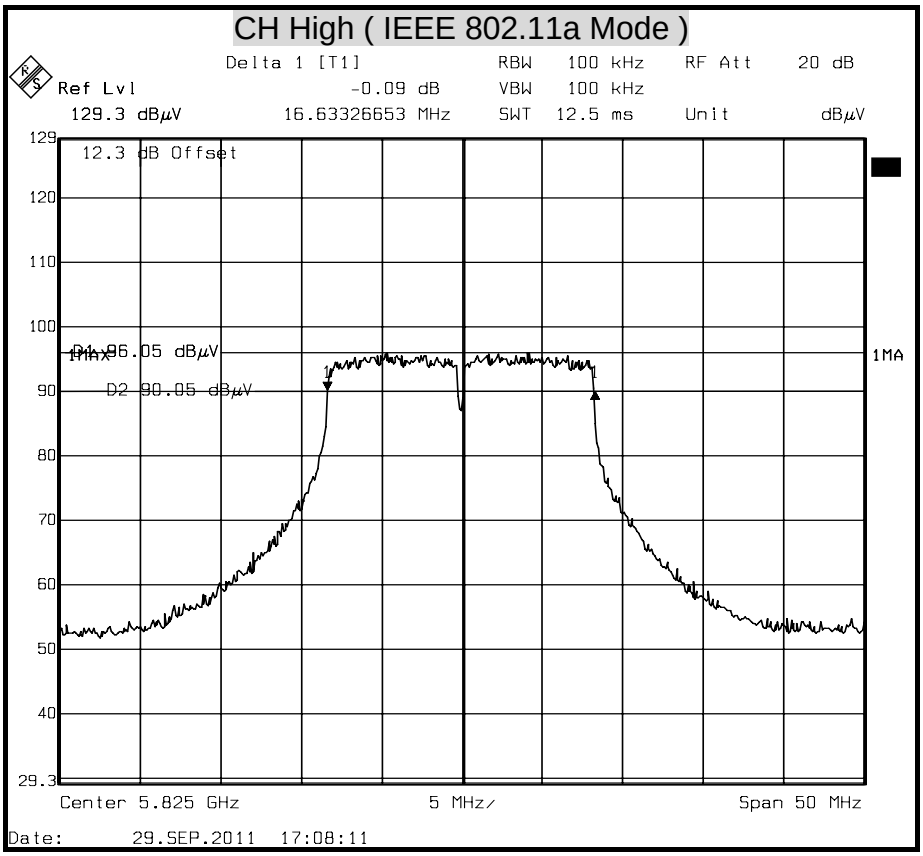
Channel	Channel Frequency (MHz)	6dB Bandwidth (kHz)		Minimum Limit (kHz)	Pass / Fail
		Chain 0	Chain1		
Low	2422	36673	36673	500	PASS
Middle	2437	36673	36272	500	PASS
High	2452	36472	36673	500	PASS

6dB BANDWIDTH





CH High (IEEE 802.11a Mode)



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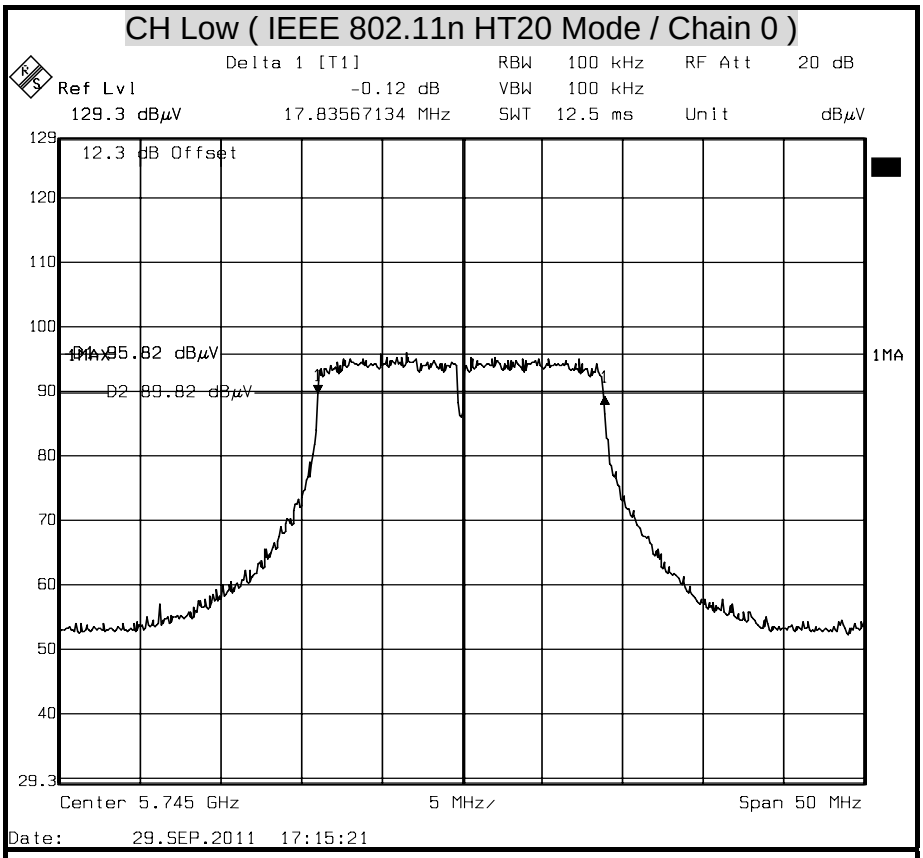

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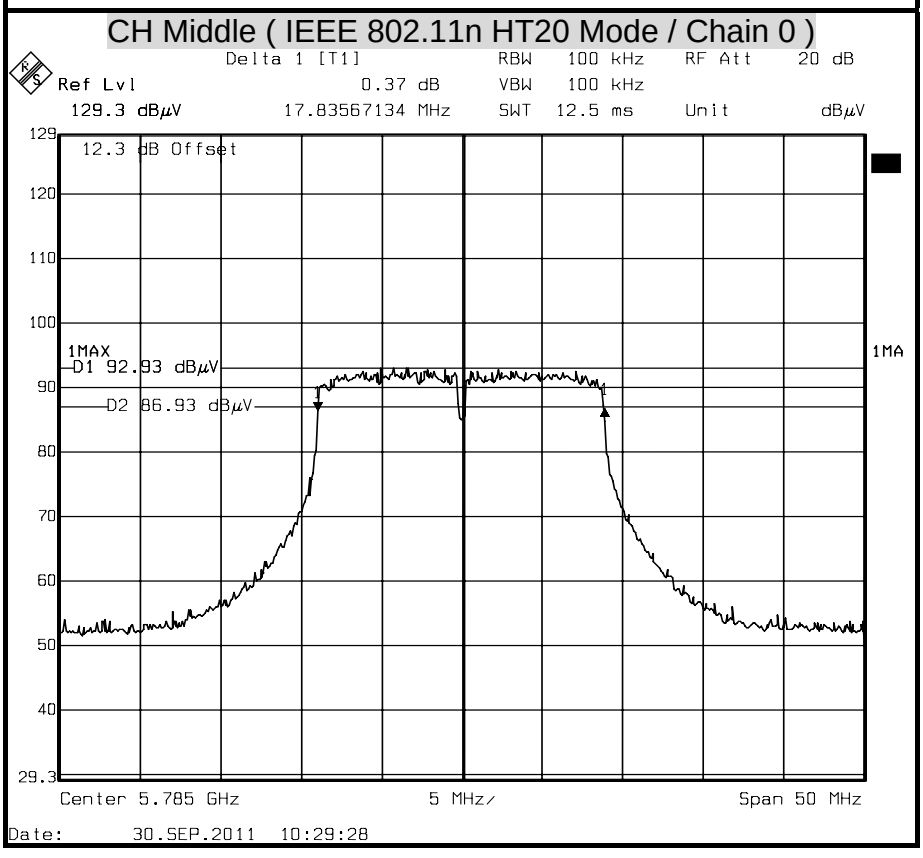
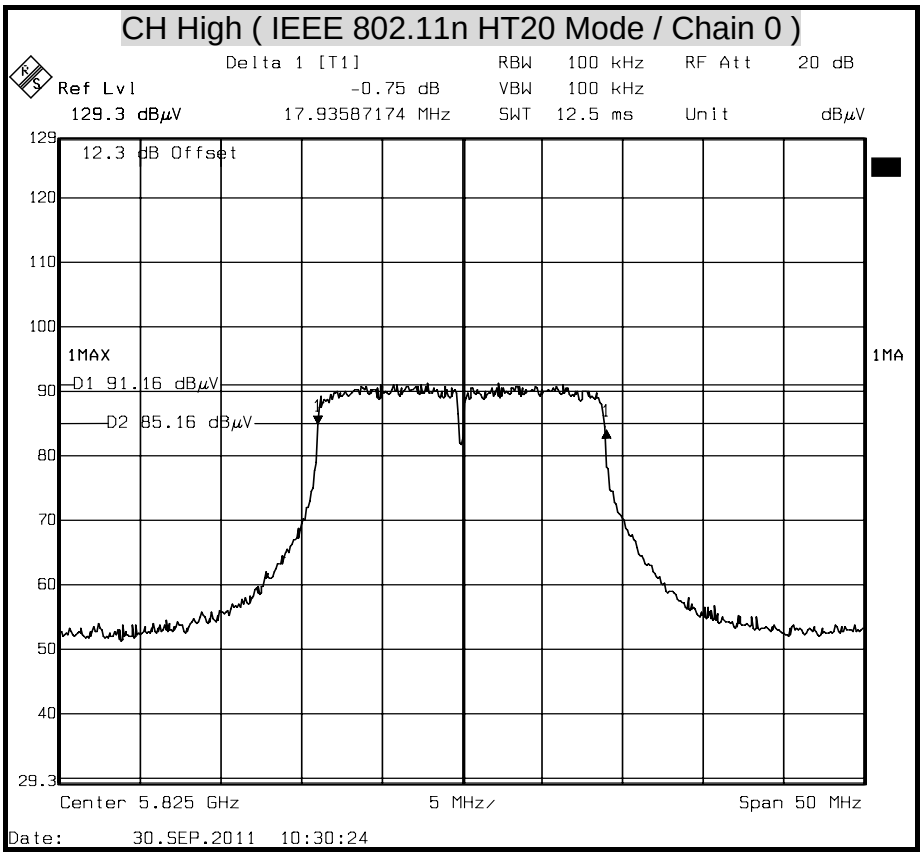
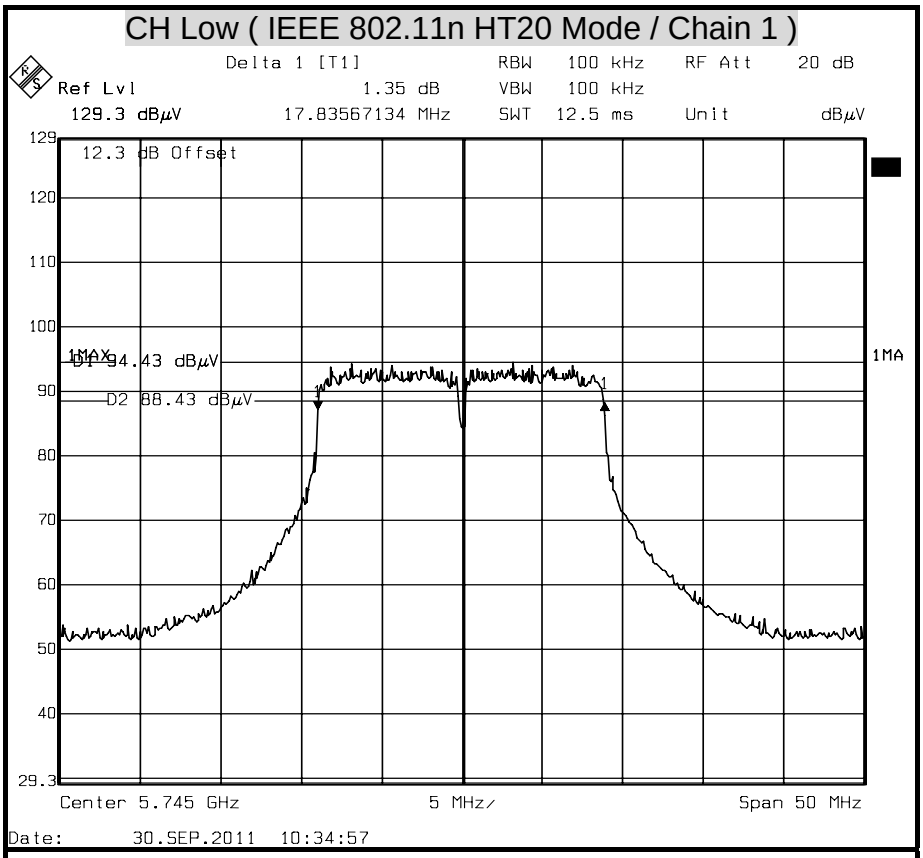


CH High (IEEE 802.11n HT20 Mode / Chain 0)



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



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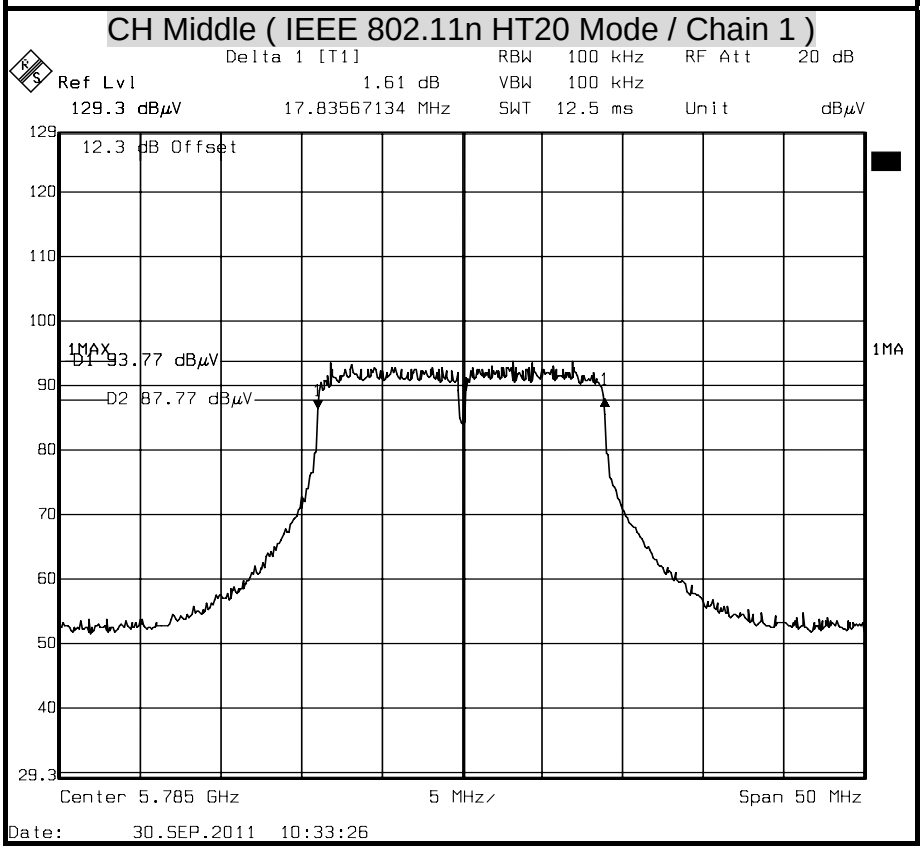

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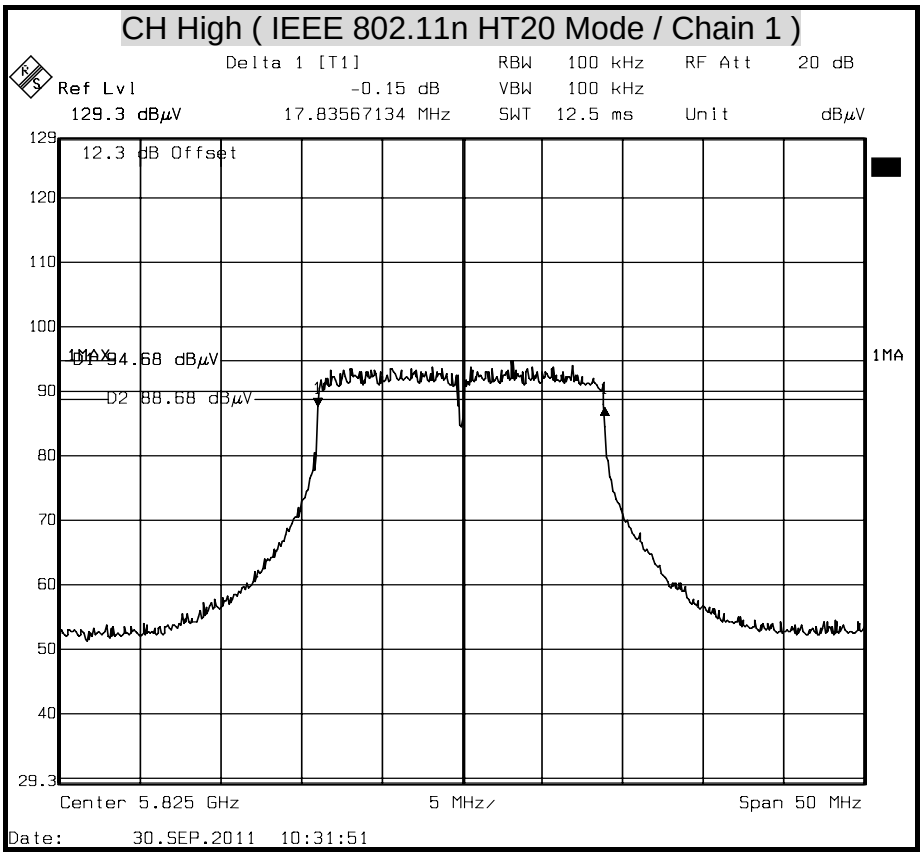

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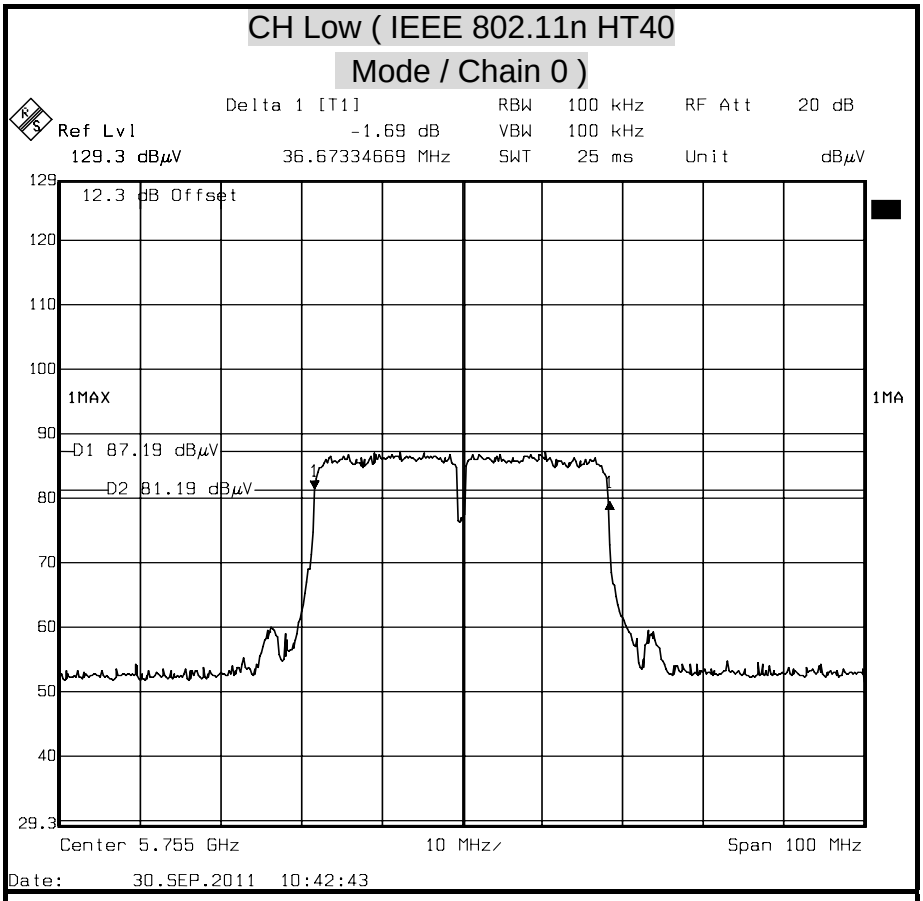
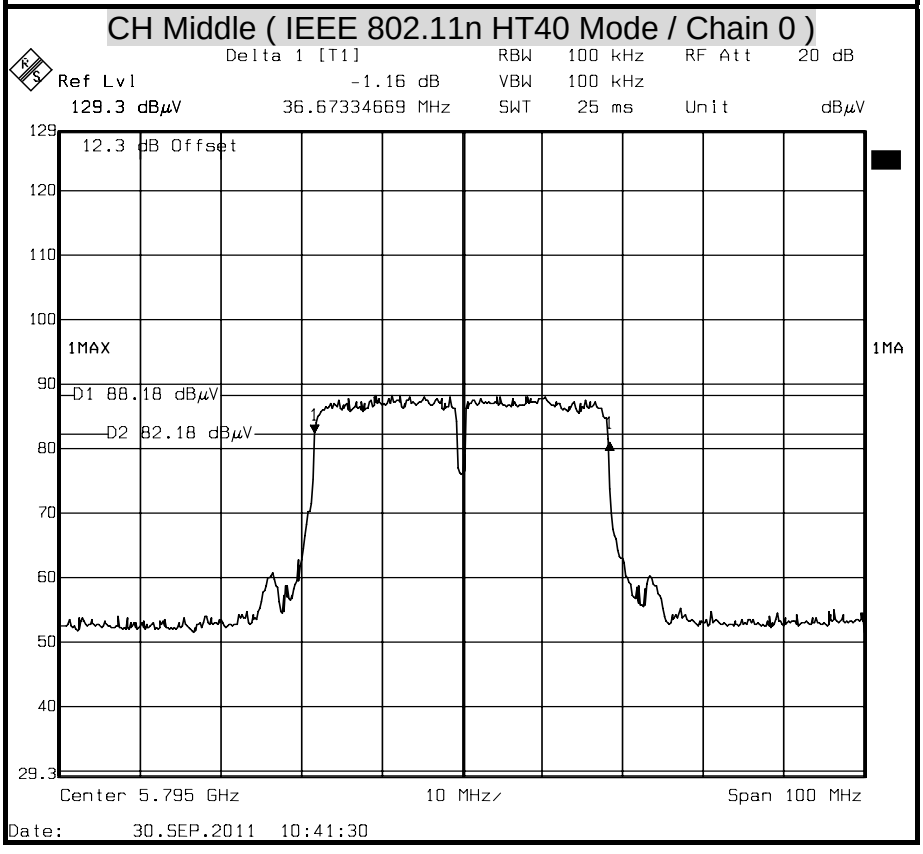
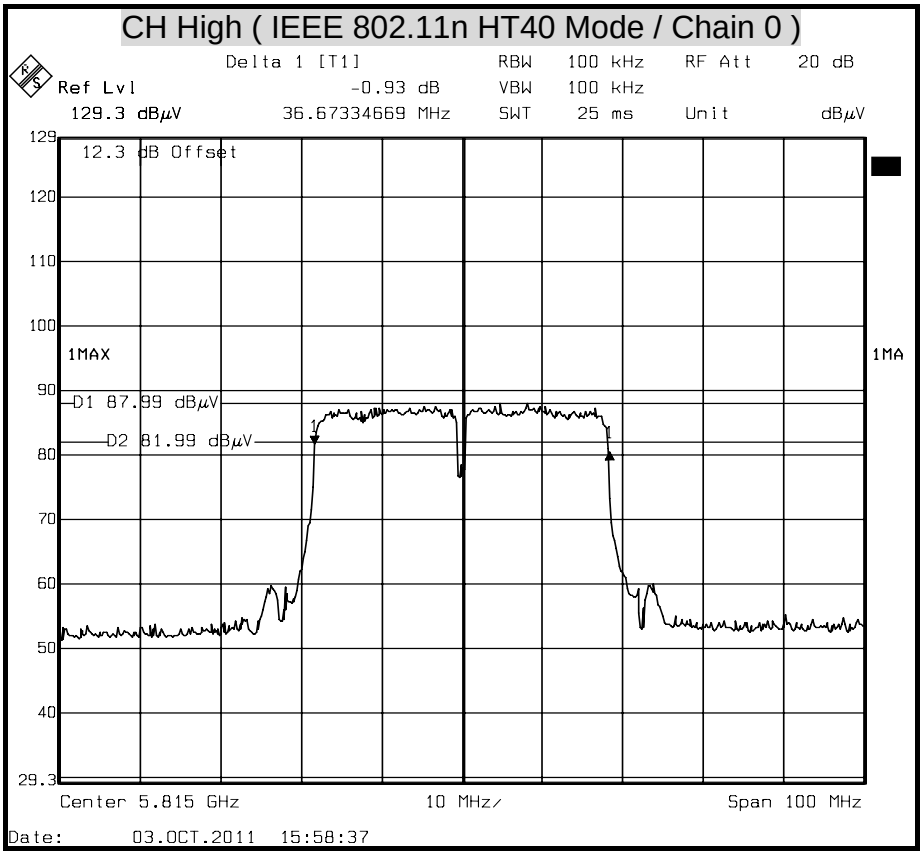


CH Middle (IEEE 802.11n HT40 Mode / Chain 0)



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



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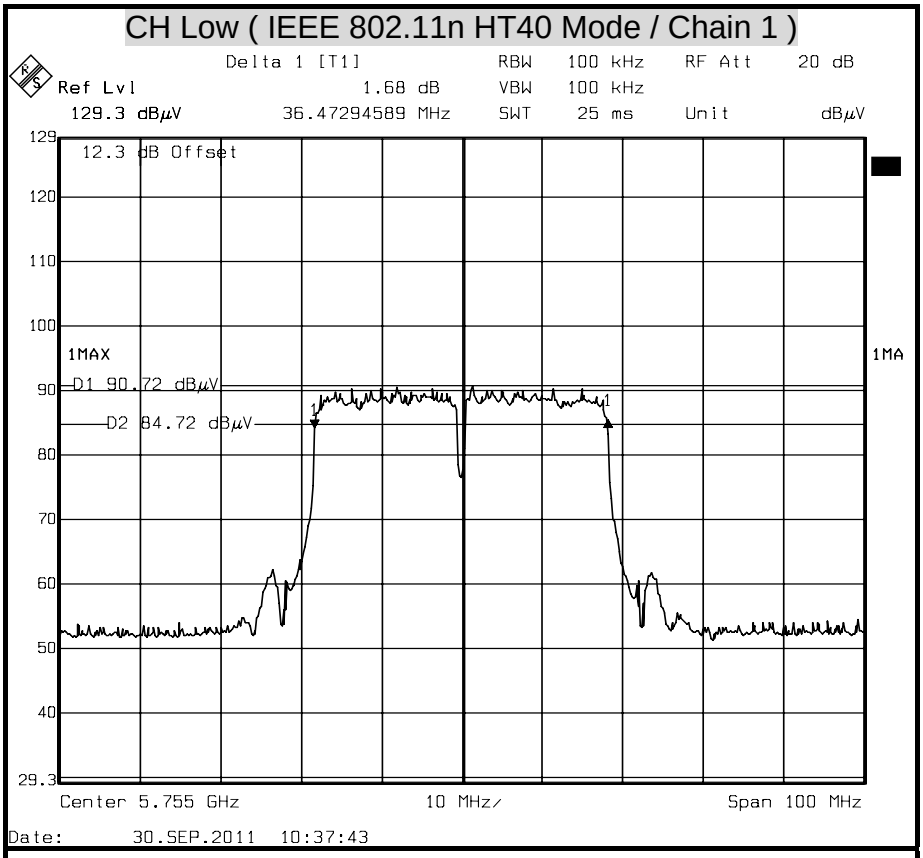

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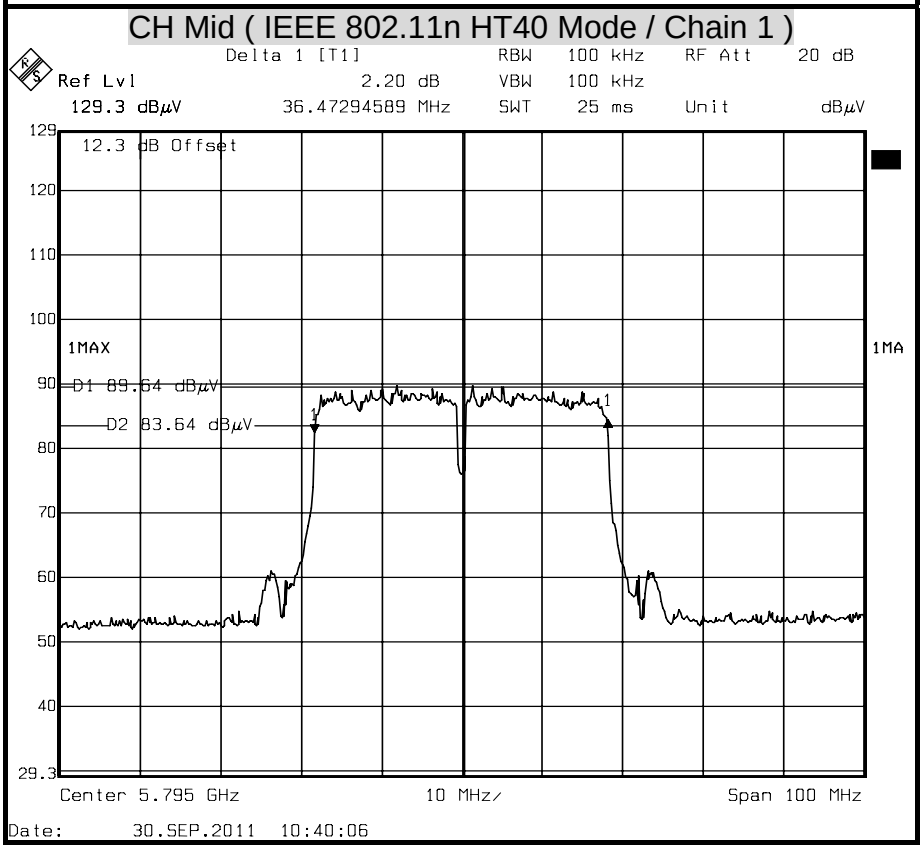

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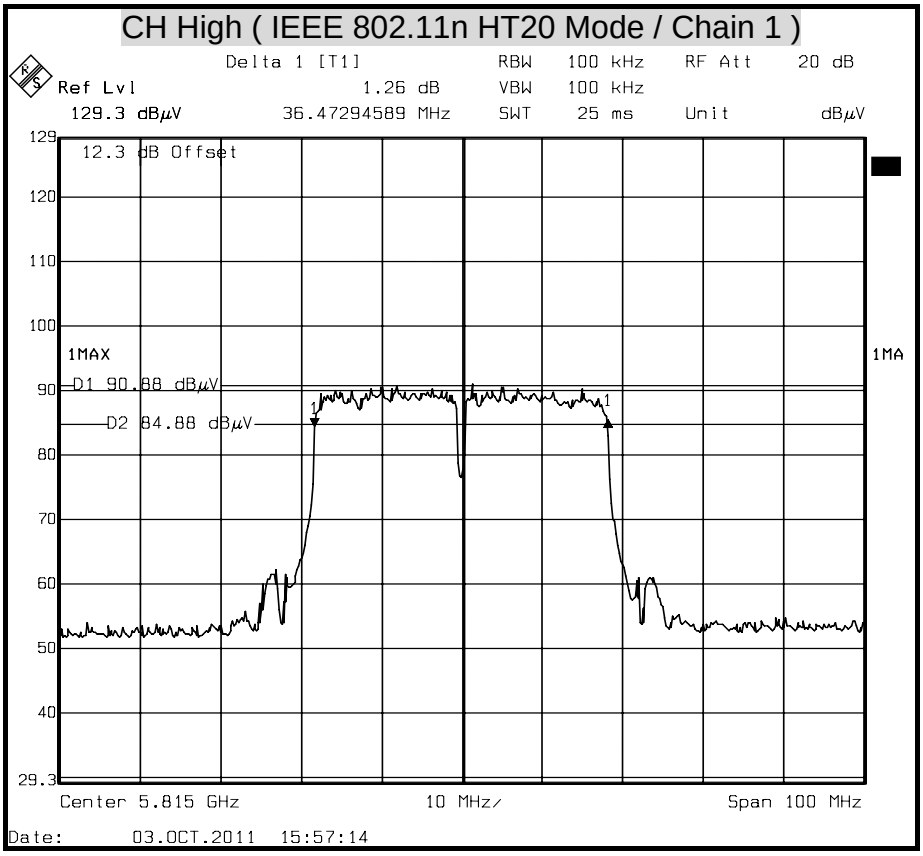
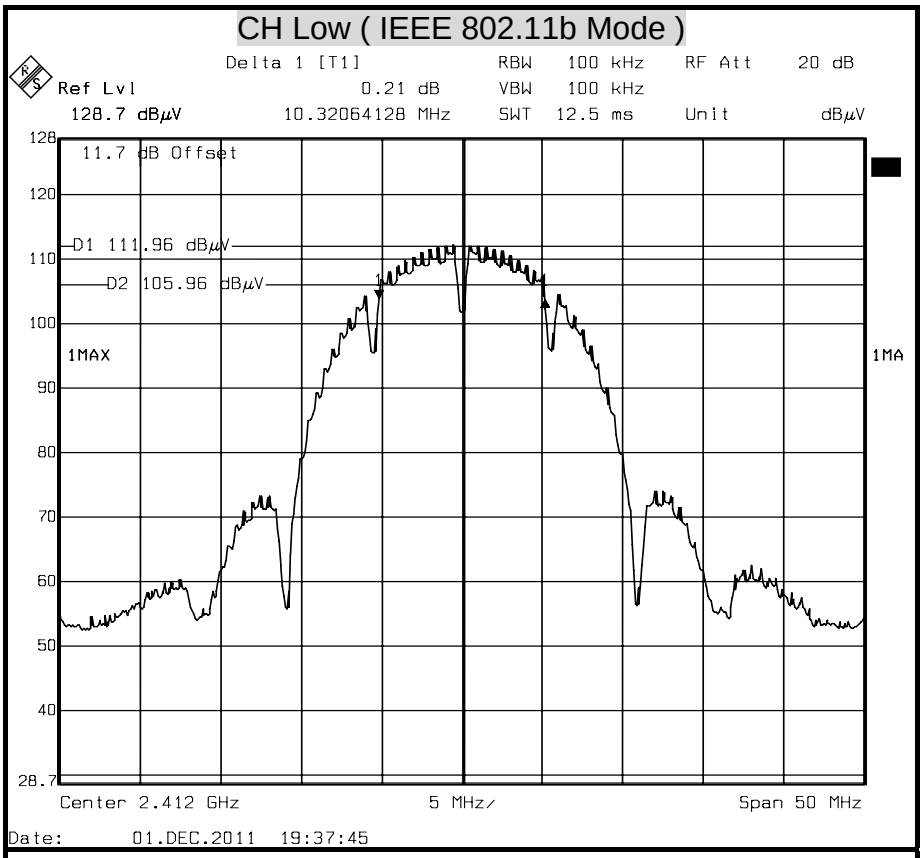
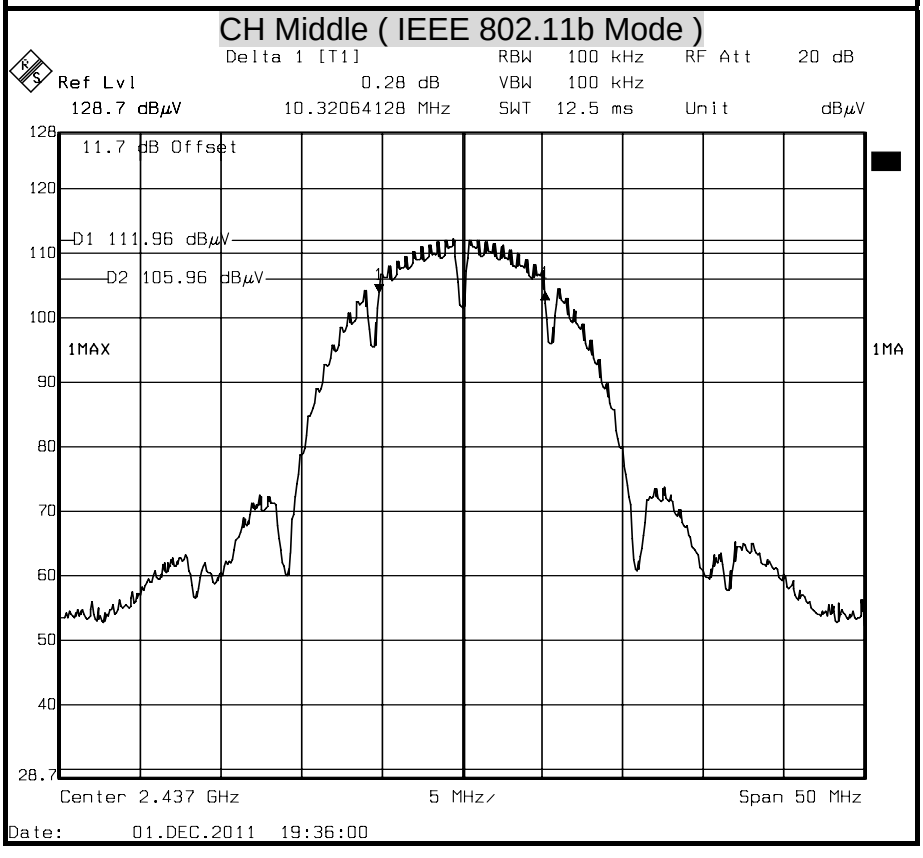


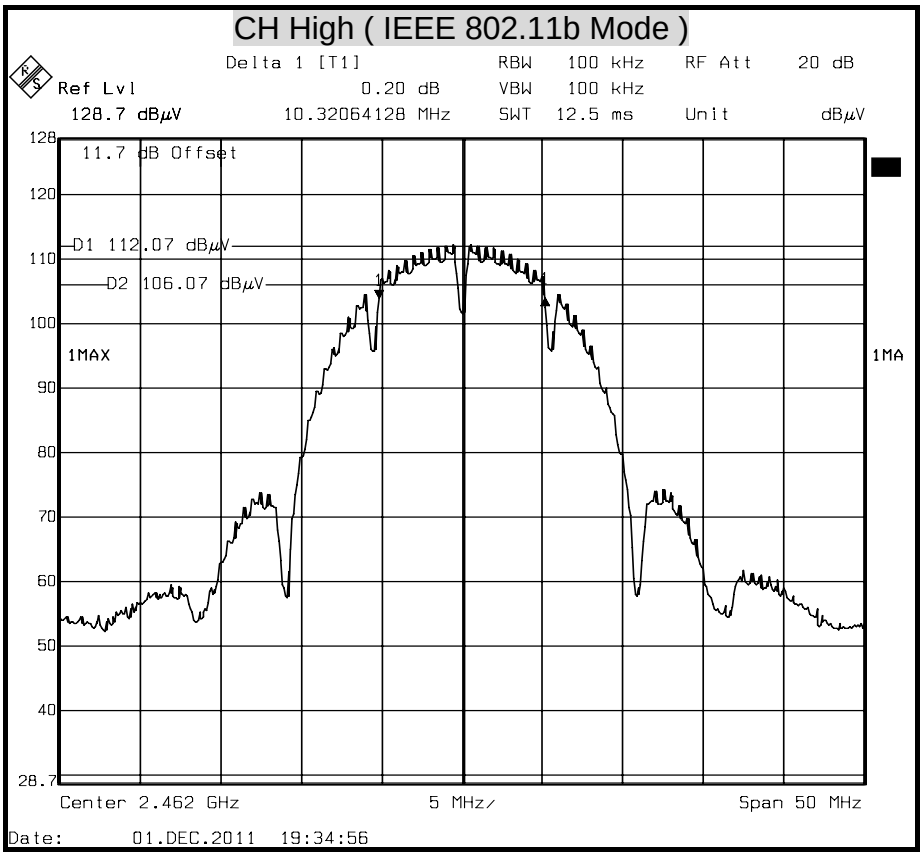
CH Low (IEEE 802.11b Mode)



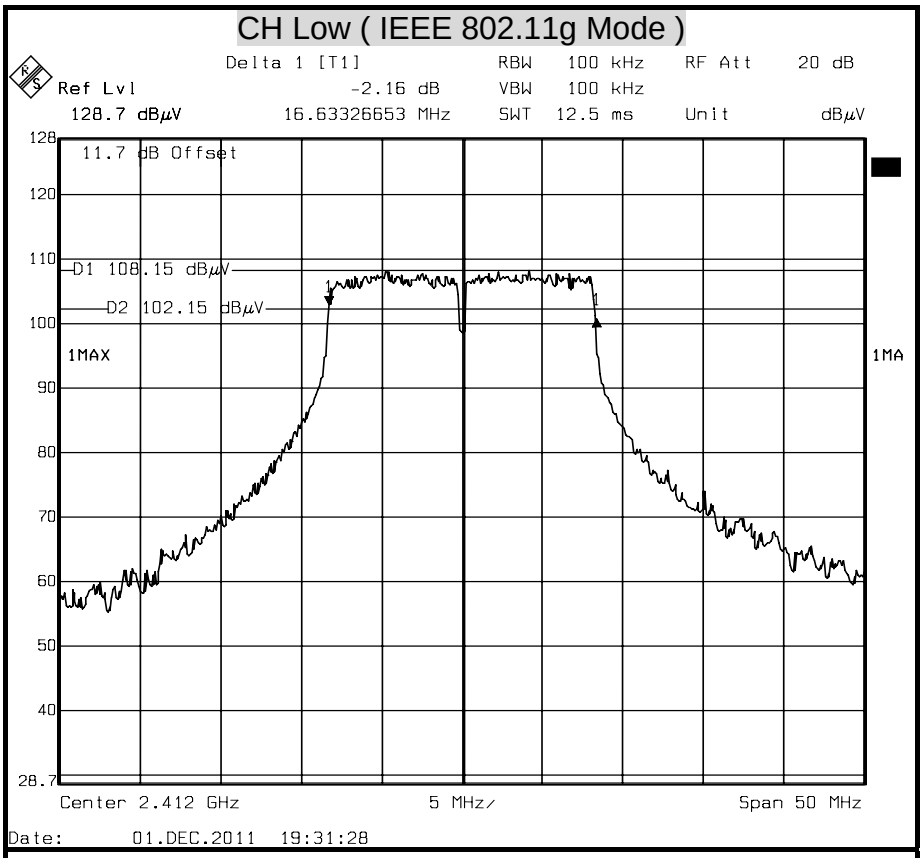
CH Middle (IEEE 802.11b Mode)



CH High (IEEE 802.11b Mode)



CH Low (IEEE 802.11g Mode)



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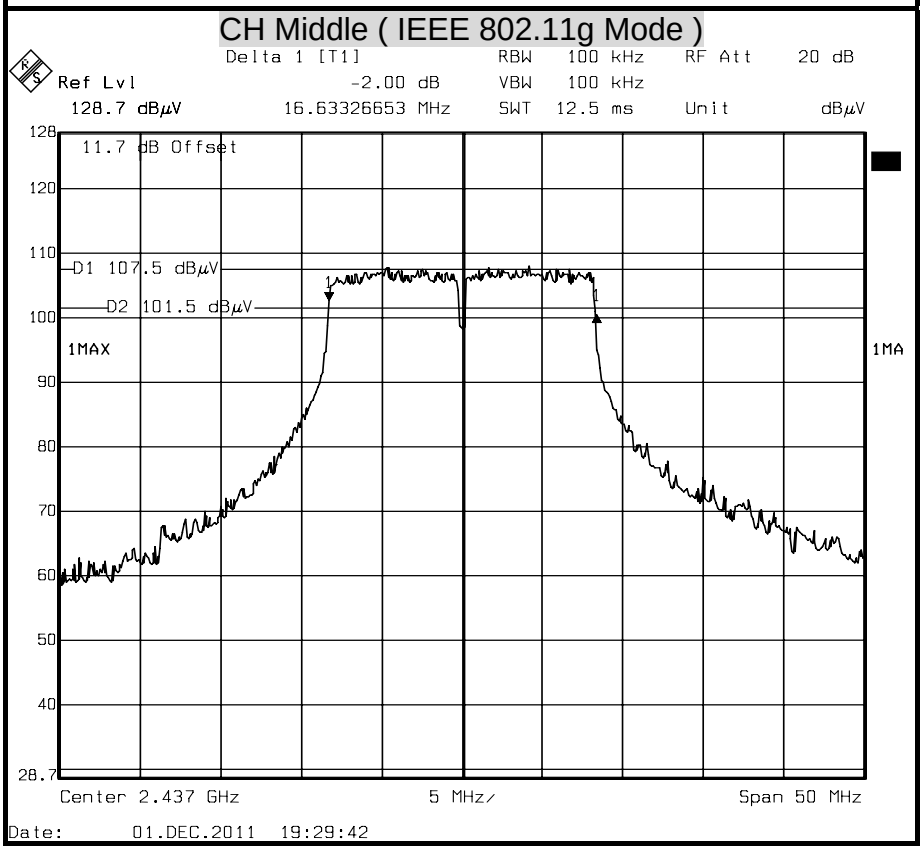

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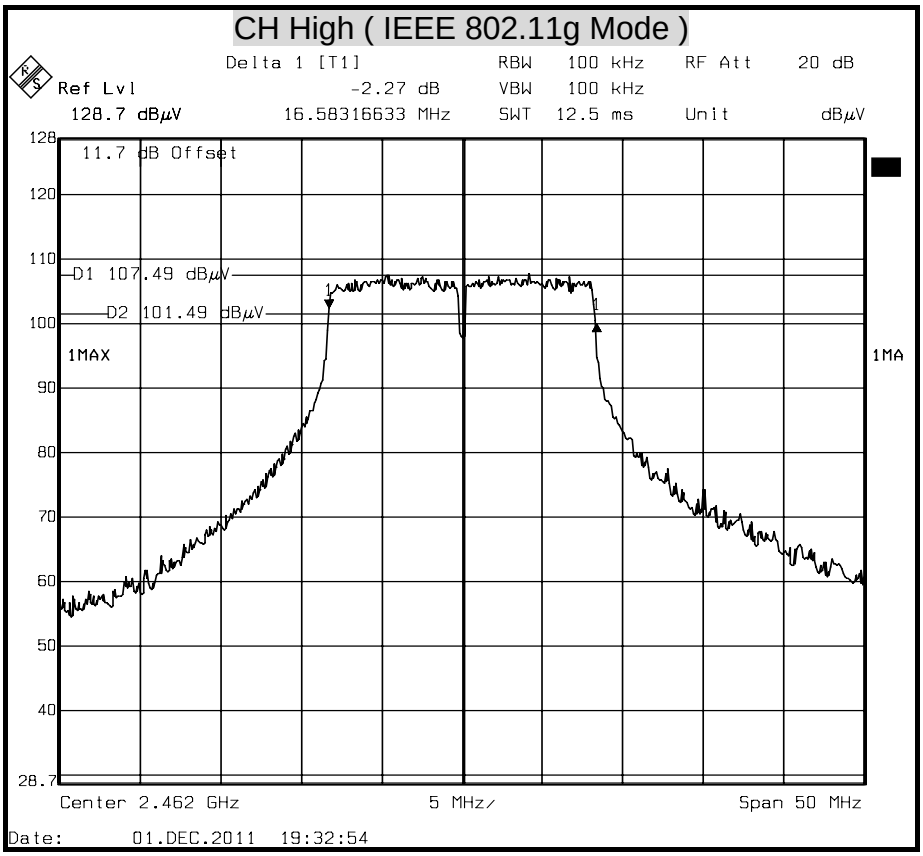
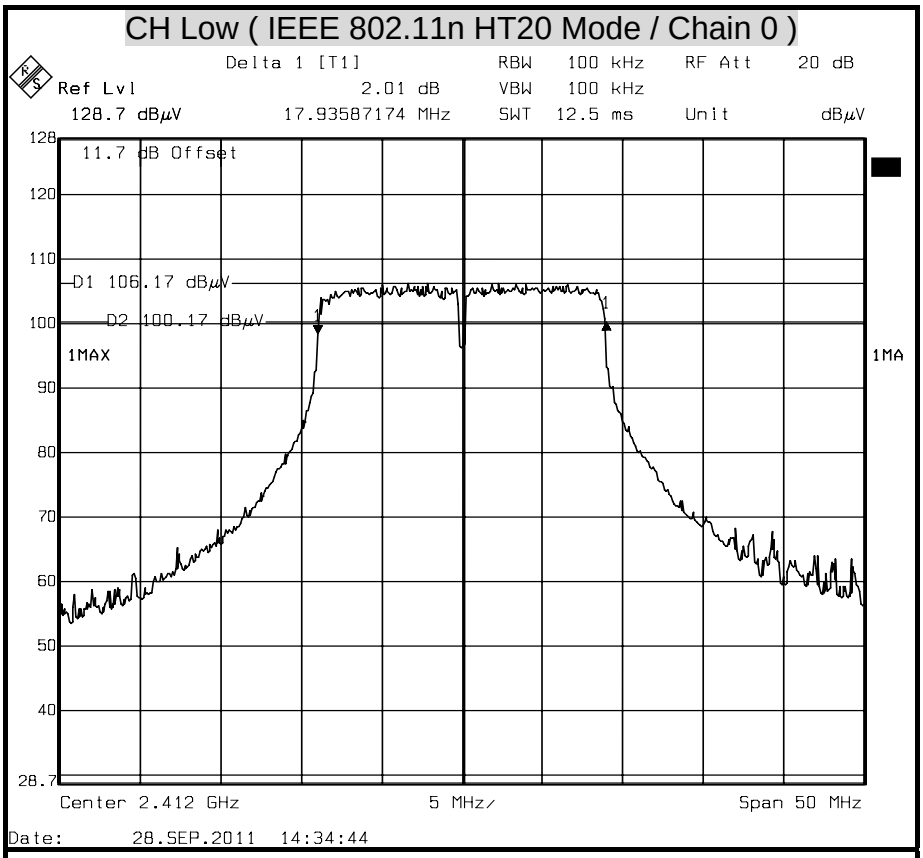


CH Low (IEEE 802.11n HT20 Mode / Chain 0)



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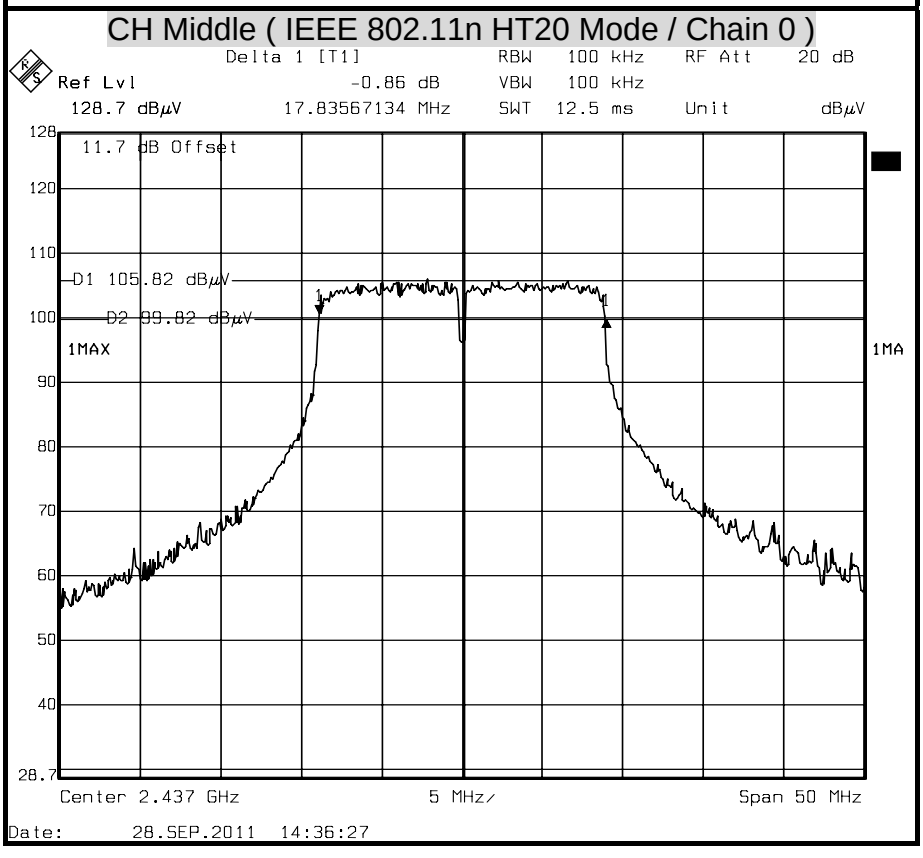

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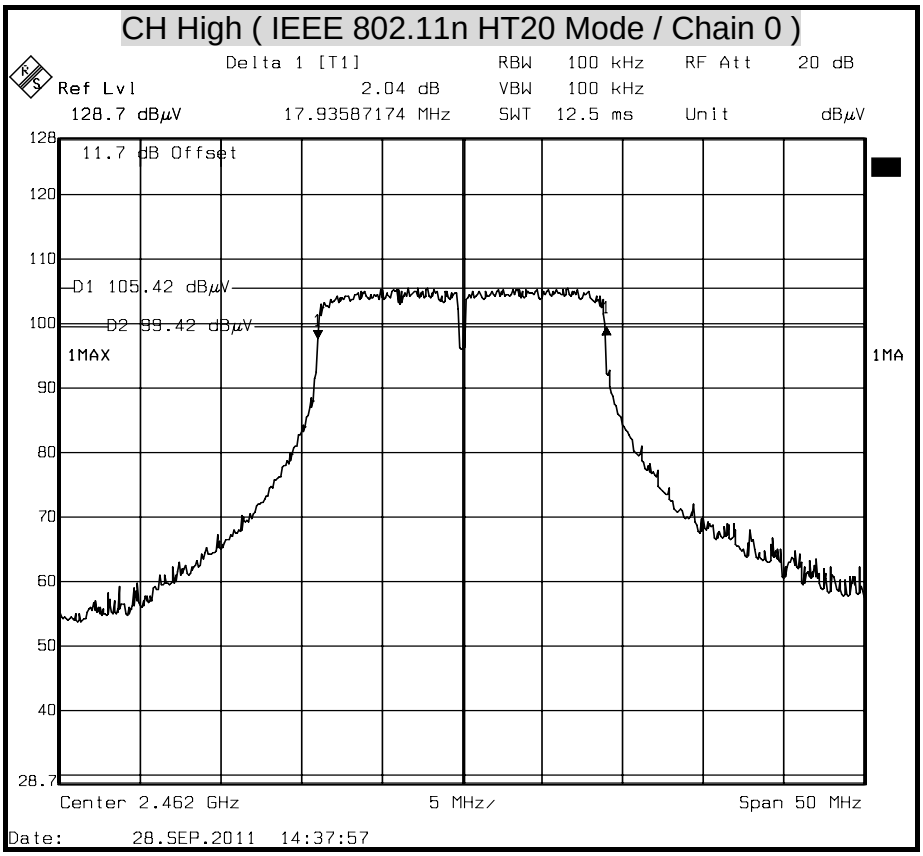

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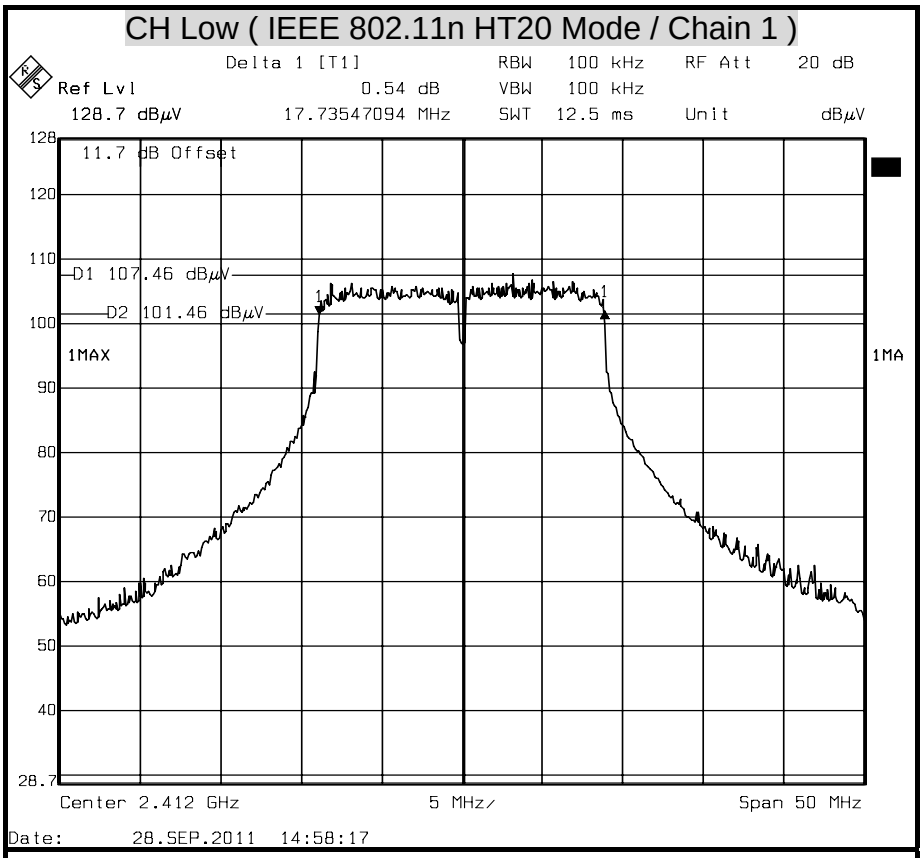

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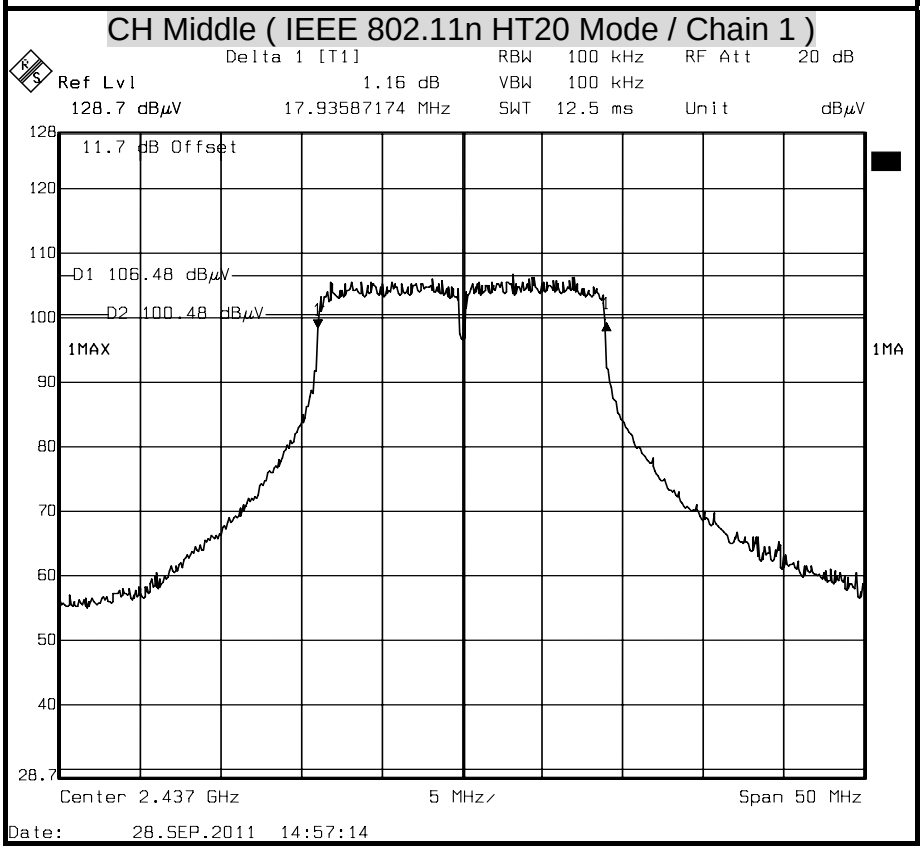

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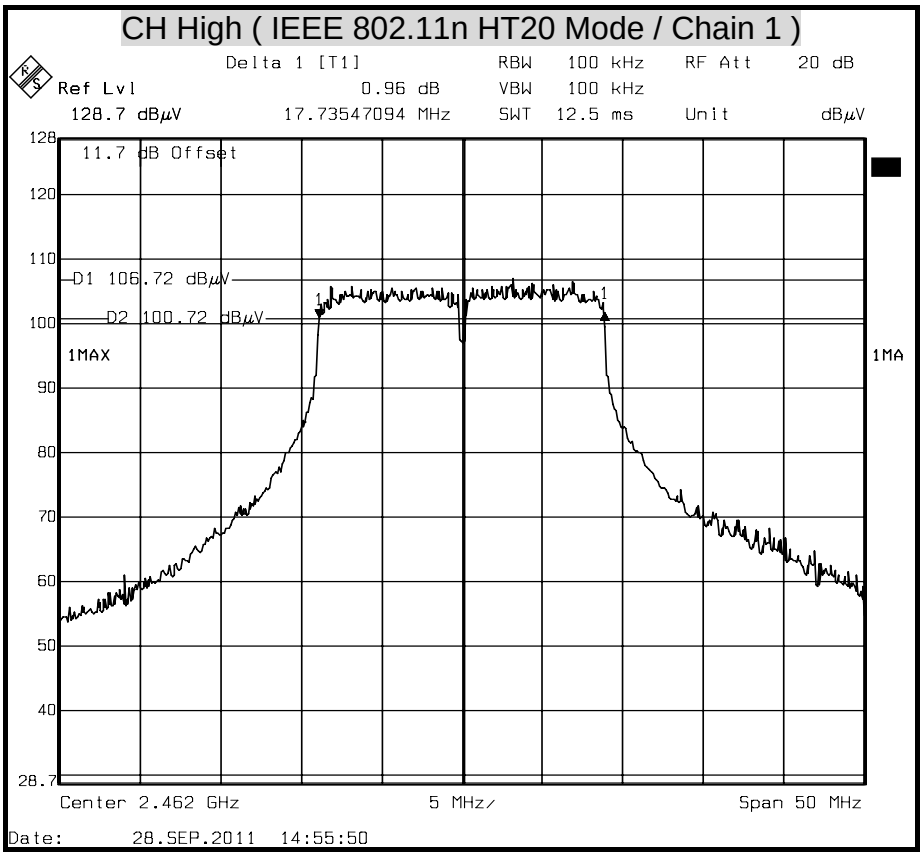

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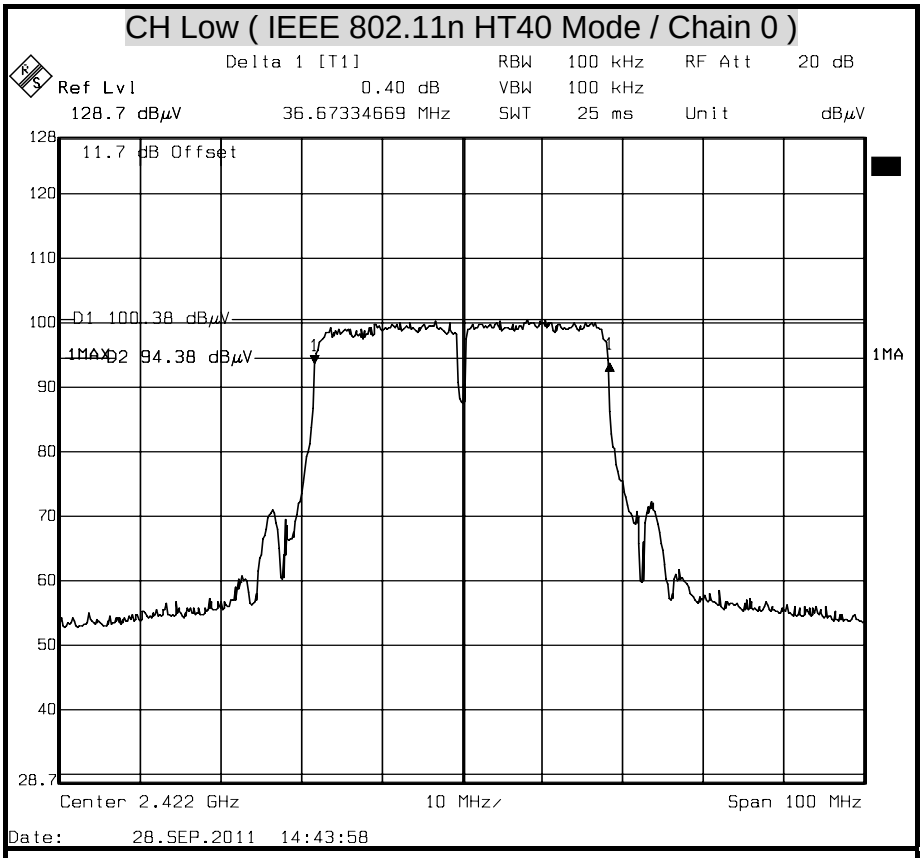
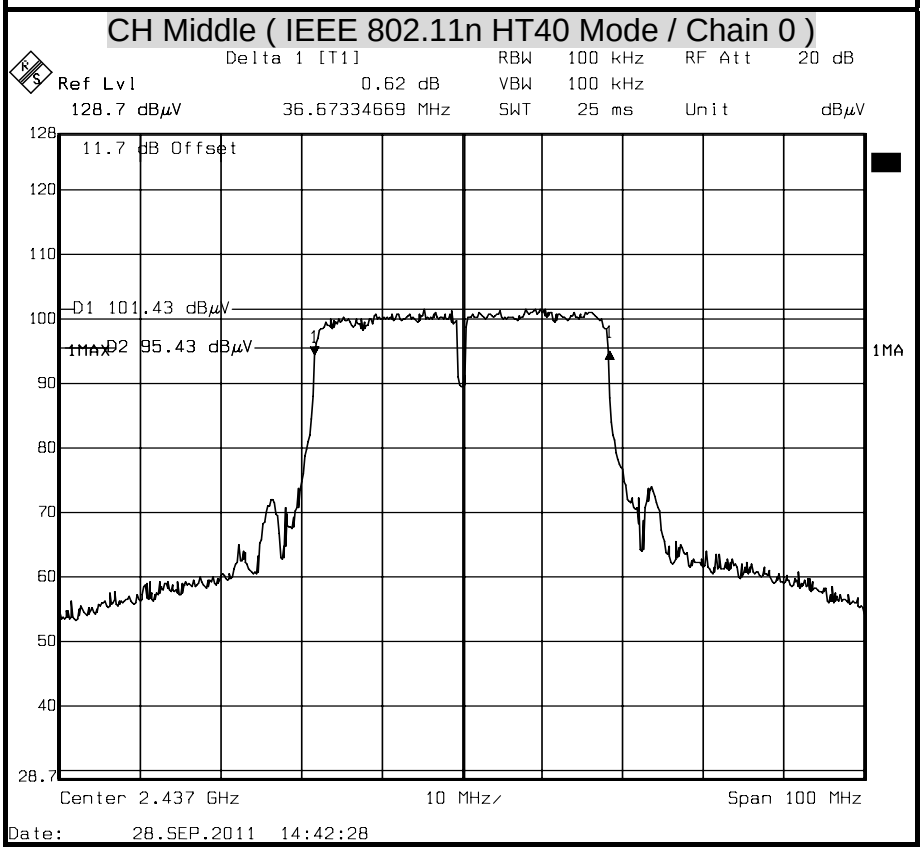
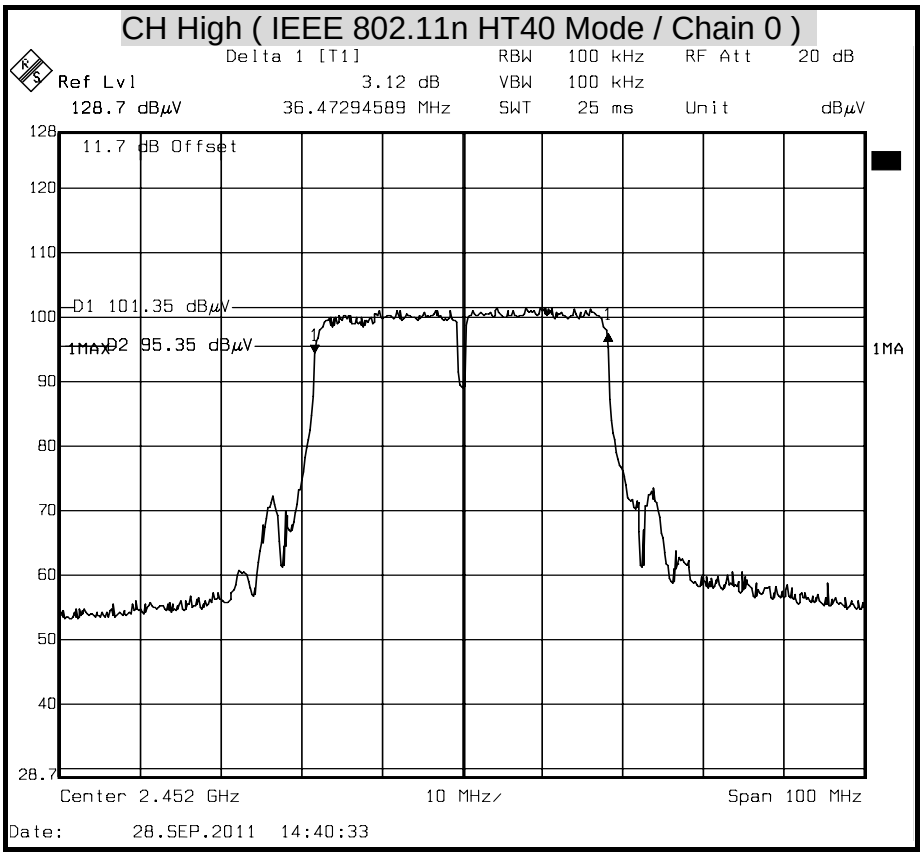


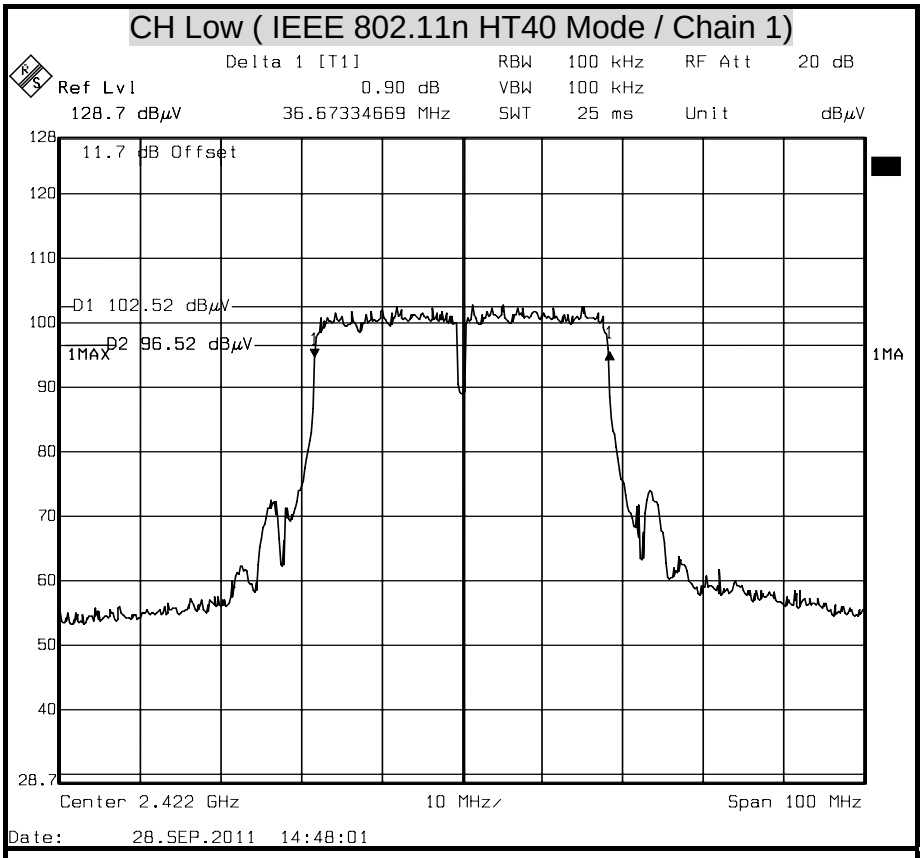
CH Middle (IEEE 802.11n HT40 Mode / Chain 0)



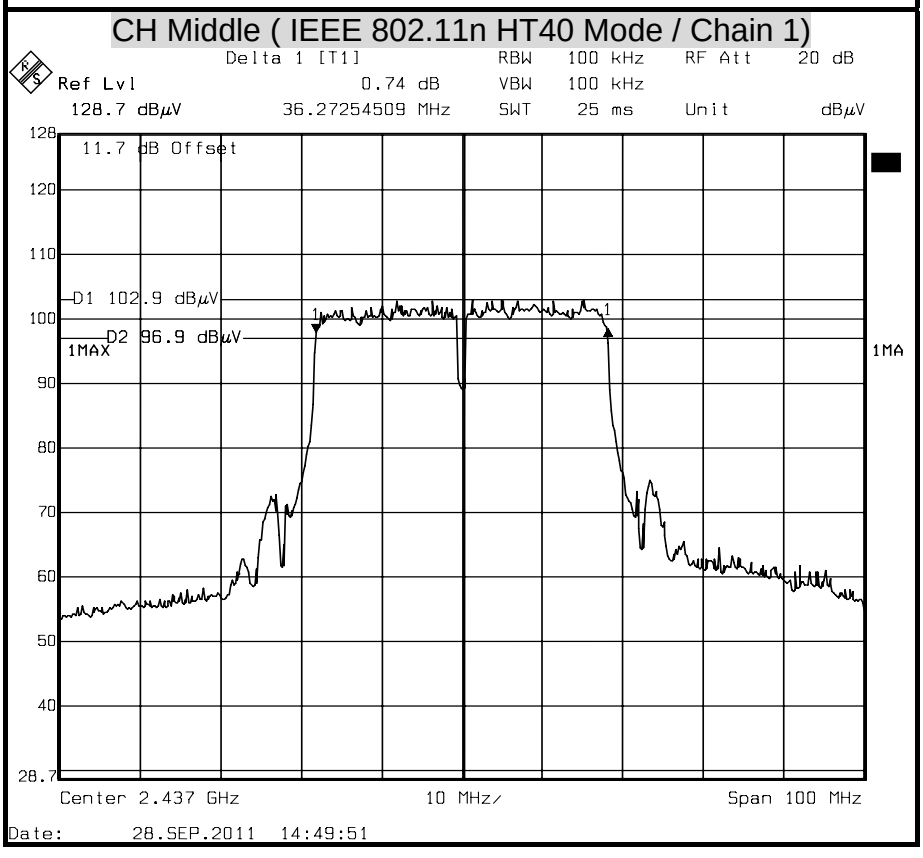
CH High (IEEE 802.11n HT40 Mode / Chain 0)



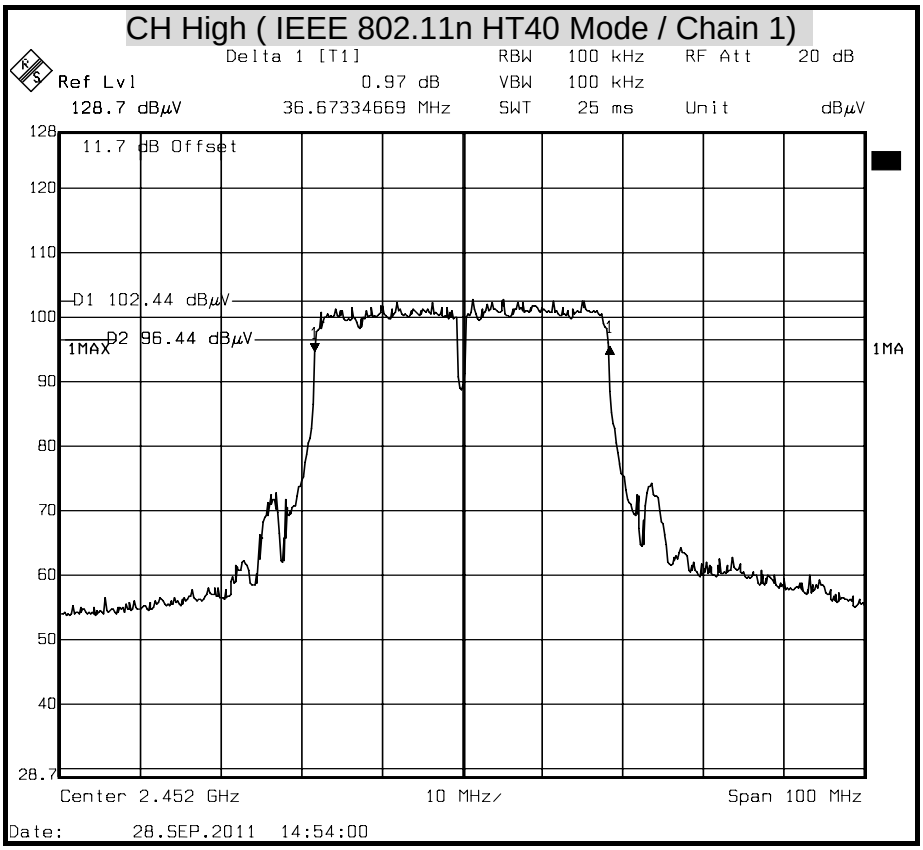
CH Low (IEEE 802.11n HT40 Mode / Chain 1)



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



CH High (IEEE 802.11n HT40 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.

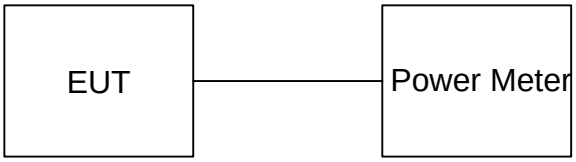
§ 15.247(b) (4) Except as shown in paragraphs (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used the peak output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1) or (b)(2), and (b)(3) of this section, as appropriate, 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
Power Meter	Anritsu	ML2487A	6K00003888	MAY 30, 2012

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

TEST SETUP



TEST PROCEDURE

The transmitter output is connected to the Power Meter. The Power Meter is set to the peak power detection.

TEST RESULTS

Antenna Gain1:	3	dBi	
Antenna Gain2:	3	dBi	
Array Gain=:	6.01	=	10*log ((10^(3 /10)+ (10^(3 /10)))
Peak Power Limit:	29.99	=	30- (6.01 -6)

IEEE 802.11a Mode

Channel	Channel Frequency (MHz)	Peak Power (dBm)	Peak Power Limit (dBm)	Pass / Fail
Low	5745	14.23	30	PASS
Middle	5785	13.76	30	PASS
High	5825	13.48	30	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	12.08	11.26	14.70	29.99	PASS
Middle	5785	10.86	10.16	13.53		PASS
High	5825	10.47	10.26	13.38		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	2.24	5.46	7.15	29.99	PASS
Middle	5795	4.90	5.24	8.08		PASS
High	5815	4.97	5.01	8.00		PASS

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

IEEE 802.11b Mode

Channel	Channel Frequency (MHz)	Peak Power (dBm)	Peak Power Limit (dBm)	Pass / Fail
Low	2412	18.28	30	PASS
Middle	2437	18.48	30	PASS
High	2462	18.46	30	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	25.49	30	PASS
Middle	2437	25.28	30	PASS
High	2462	24.84	30	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	25.81	25.43	28.63	30	PASS
Middle	2437	25.34	25.31	28.34	30	PASS
High	2462	24.98	25.35	28.18	30	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 (dBm)	Peak Power Limit	Pass / Fail
		Chain 0	Chain 0	(dBm)	(dBm)	
Low	2422	23.64	25.06	27.42	30	PASS
Middle	2437	24.09	25.31	27.75	30	PASS
High	2452	24.18	25.13	27.69	30	PASS

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

7.3 POWER SPECTRAL DENSITY

LIMITS

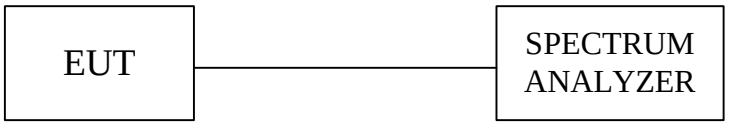
§ 15.247(e) For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

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 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

Antenna Gain1:	3	dBi							
Antenna Gain2:	3	dBi							
Array Gain=:	6.01	=	10*log	((10^(	3	/10)+	(10^(	3	/10)))
PPSD Limit:	7.99	=	8-	(	6.01	-6	)		

IEEE 802.11a Mode

Channel	Channel Frequency (MHz)	Final RF Power Level in 3KHz BW (dBm)	Minimum Limit (dBm)	Pass / Fail
Low	5745	-25.39	8	PASS
Middle	5785	-27.29		PASS
High	5825	-27.16		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	-28.09	-27.88	-24.97	7.99	PASS
Middle	5785	-29.61	-27.79	-25.60		PASS
High	5825	-27.63	-28.21	-24.90		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	-30.27	-31.87	-27.99	7.99	PASS
Middle	5795	-34.25	-33.26	-30.72		PASS
High	5815	-34.68	-32.10	-30.19		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.r.

Combined Mode

Channel		Channel Frequency (MHz)	Final RF Power Level in 3KHz BW (dBm)	Minimum Limit (dBm)	Pass / Fail
802.11n HT20 Combined mode	Low	5745	-24.96	7.99	PASS
	Middle	5785	-25.86	7.99	PASS
	High	5825	-25.42	7.99	PASS
802.11n HT40 Combined mode	Low	5755	-28.71	7.99	PASS
	Middle	5795	-30.11	7.99	PASS
	High	5815	-30.18	7.99	PASS

IEEE 802.11b Mode

Channel	Channel Frequency (MHz)	Final RF Power Level in 3KHz BW (dBm)	Minimum Limit (dBm)	Pass / Fail
Low	2412	-14.11	8	PASS
Middle	2437	-14.23	8	PASS
High	2462	-14.11	8	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	Channel Frequency (MHz)	Final RF Power Level in 3KHz BW (dBm)	Minimum Limit (dBm)	Pass / Fail
Low	2412	-13.23	8	PASS
Middle	2437	-13.01	8	PASS
High	2462	-13.55	8	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.

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	2412	-15.36	-14.50	-11.90	8	PASS
Middle	2437	-15.56	-14.72	-12.11	8	PASS
High	2462	-13.67	-14.14	-10.89	8	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	Channel Frequency (MHz)	Final RF Power Level in 3KHz BW (dBm)			Minimum Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Total		
Low	2422	-20.44	-19.61	-16.99	8	PASS
Middle	2437	-19.80	-19.05	-16.40	8	PASS
High	2452	-19.09	-19.52	-16.29	8	PASS

Remark:

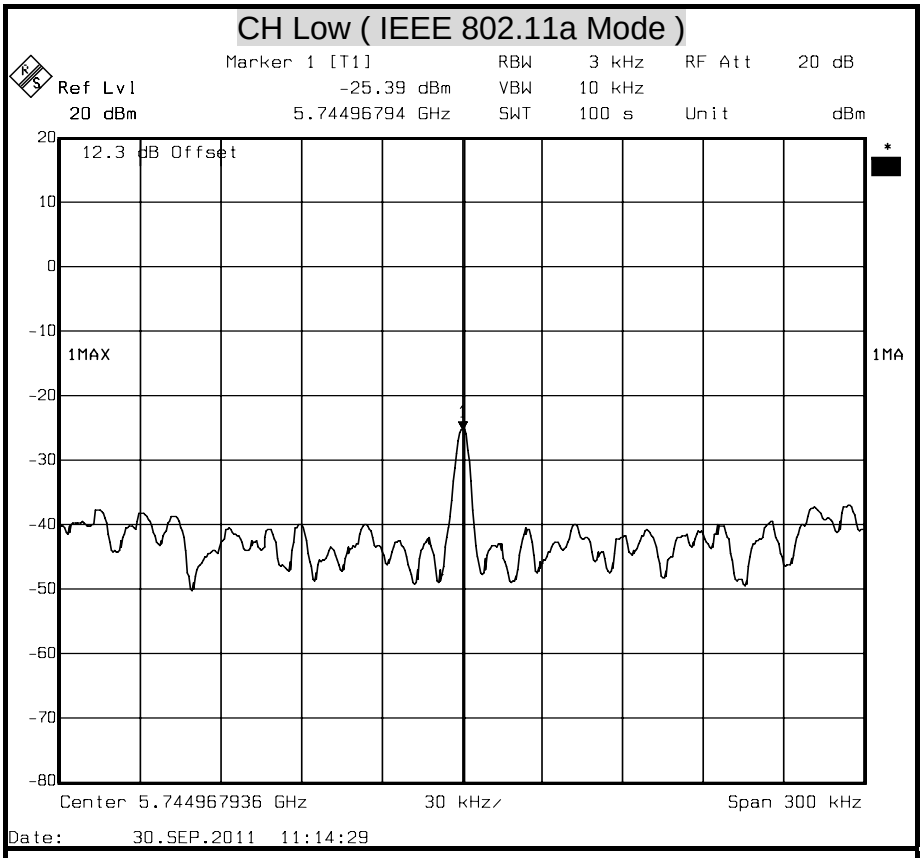
1. At finial test to get the worst-case emission at 27Mbps.

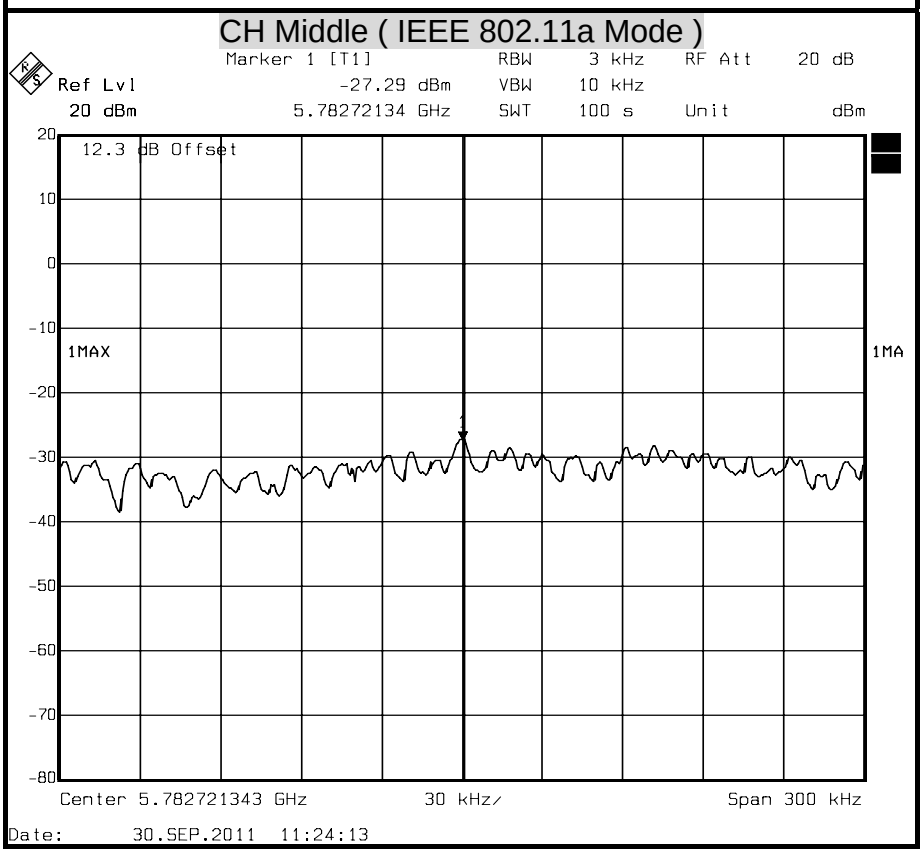
2. The cable assembly insertion loss of 11.7dB (including 10 dB pad and 1.7 dB cable) was Entered as an offset in the spectrum analyzer to allow for direct reading of power.

Combined mode

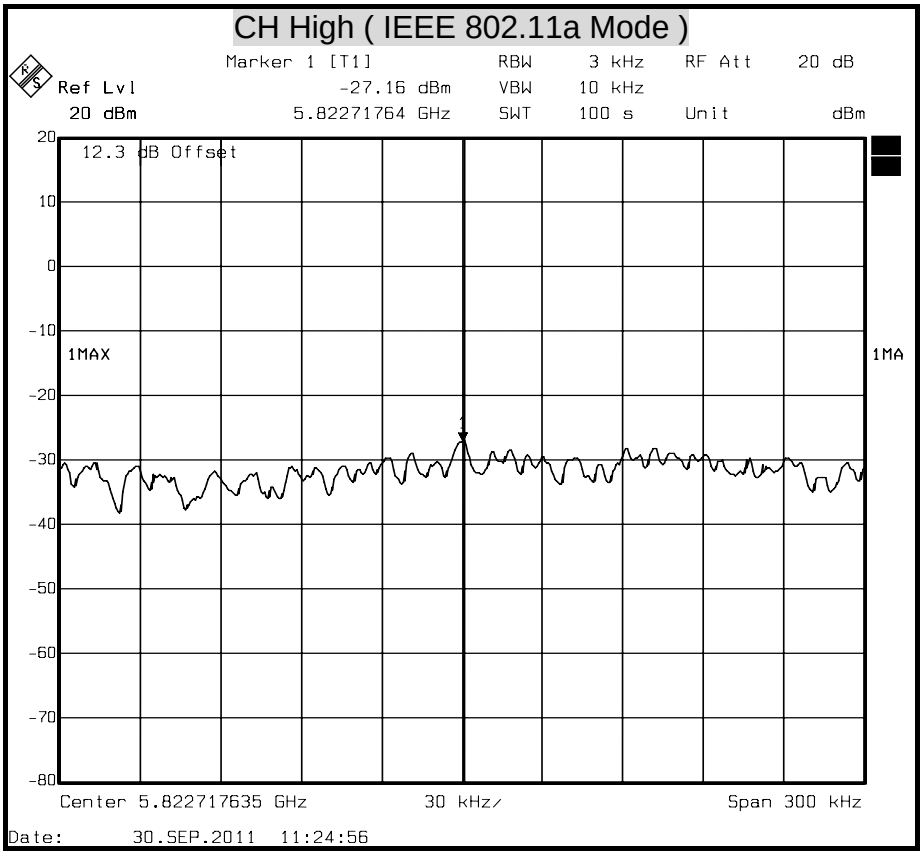
Channel		Channel Frequency (MHz)	Final RF Power Level in 3KHz BW (dBm)	Maximum Limit (dBm)	Pass / Fail
802.11n HT20 Combined mode	CH Low	2412	-11.49	8.00	PASS
	CH Middle	2437	-11.79		
	CH High	2462	-11.08		
802.11n HT40 Combined mode	CH Low	2422	-17.19	8.00	PASS
	CH Middle	2437	-16.48		
	CH High	2452	-16.14		

POWER SPECTRAL DENSITY

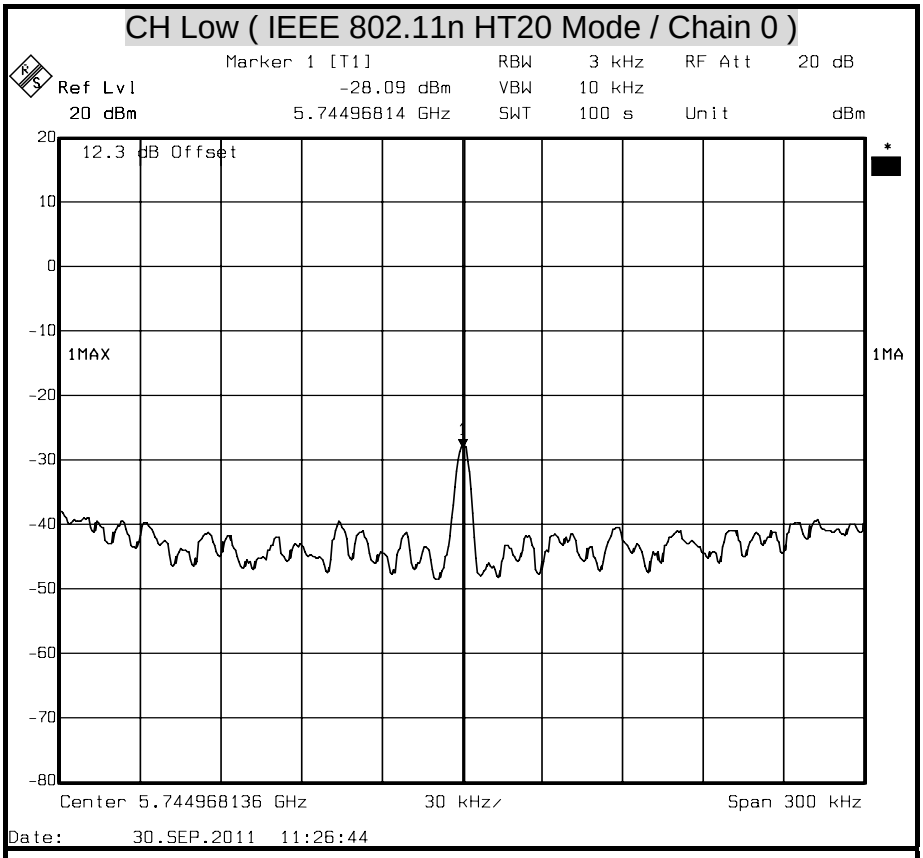




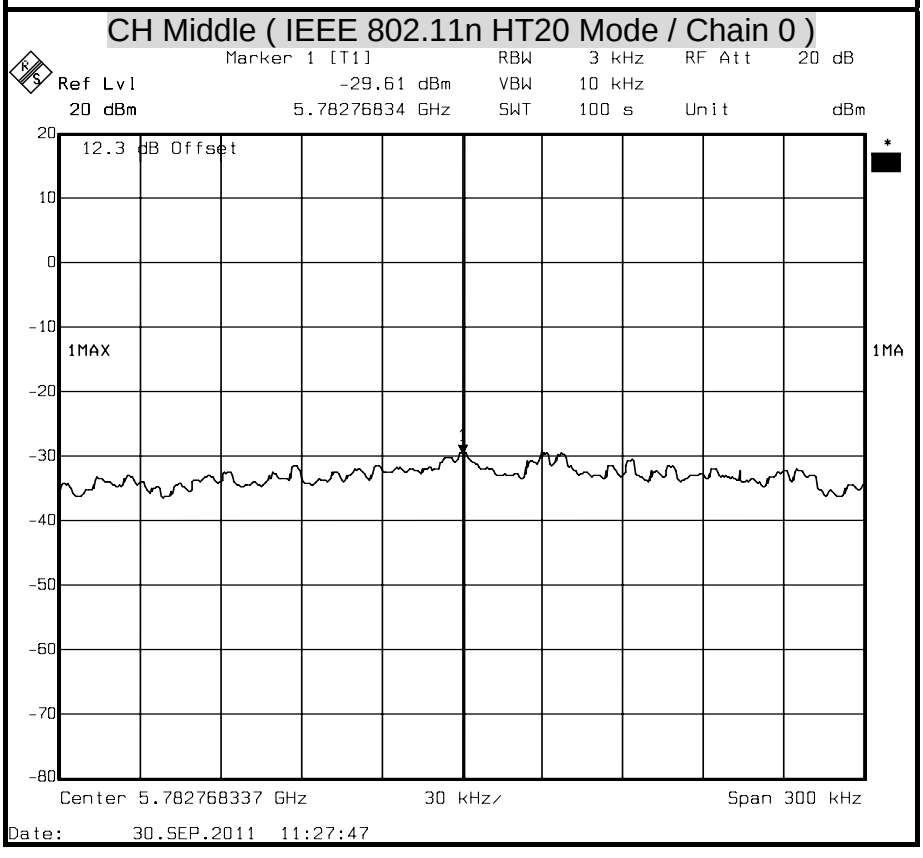
CH High (IEEE 802.11a Mode)



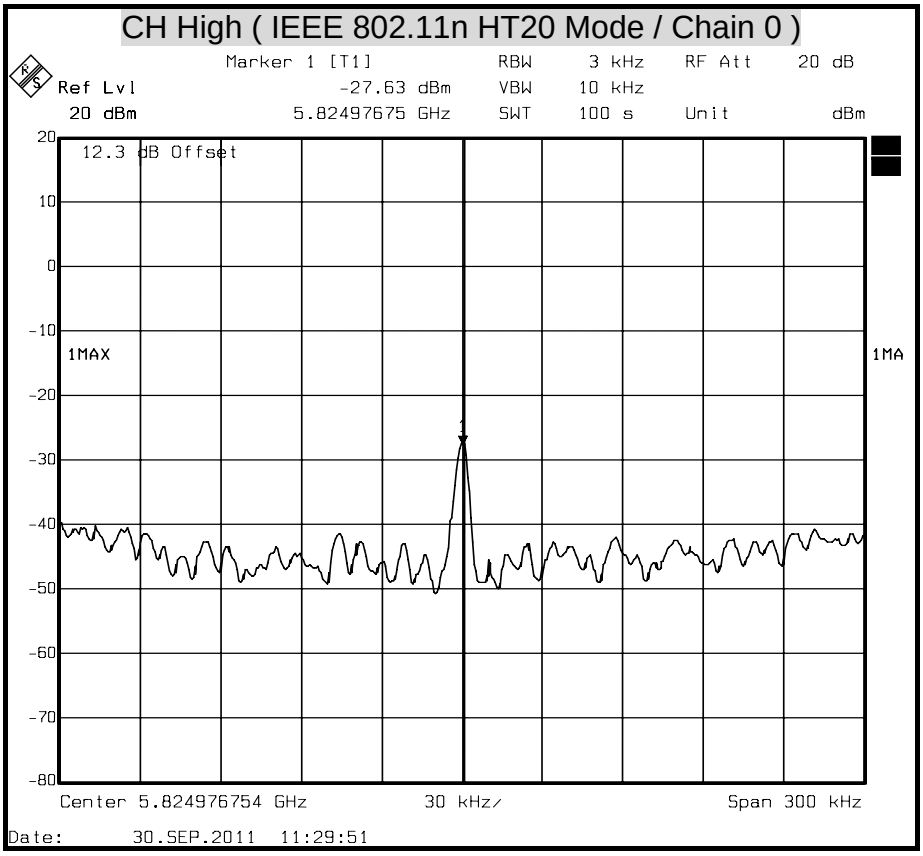
CH Low (IEEE 802.11n HT20 Mode / Chain 0)



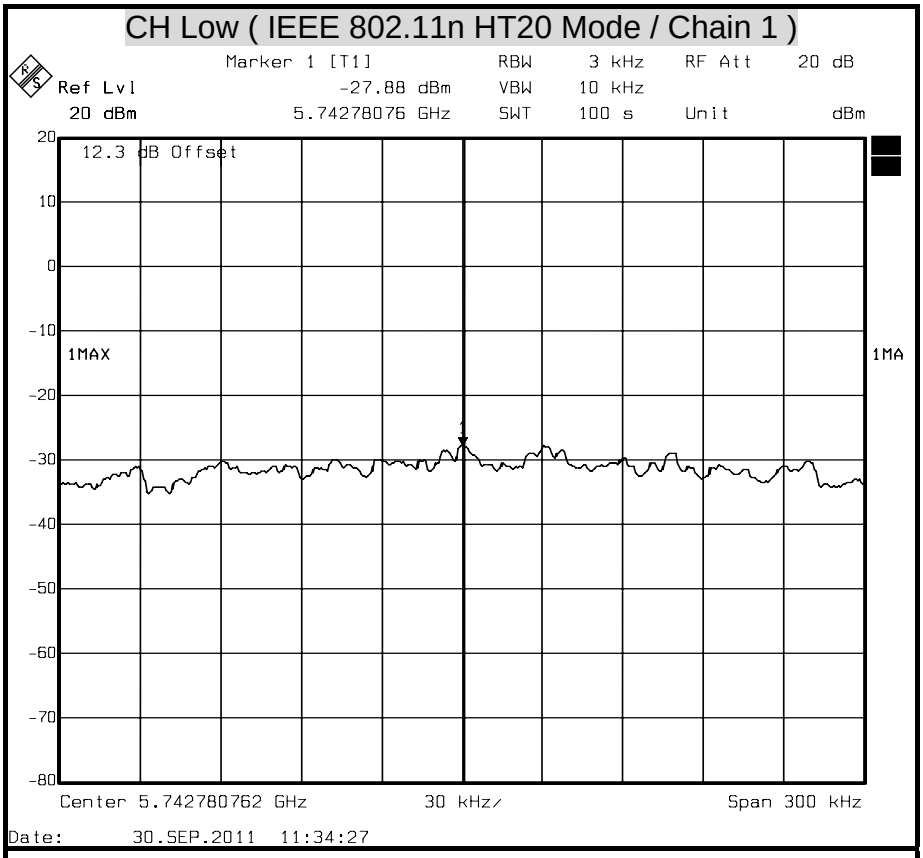
CH Middle (IEEE 802.11n HT20 Mode / Chain 0)



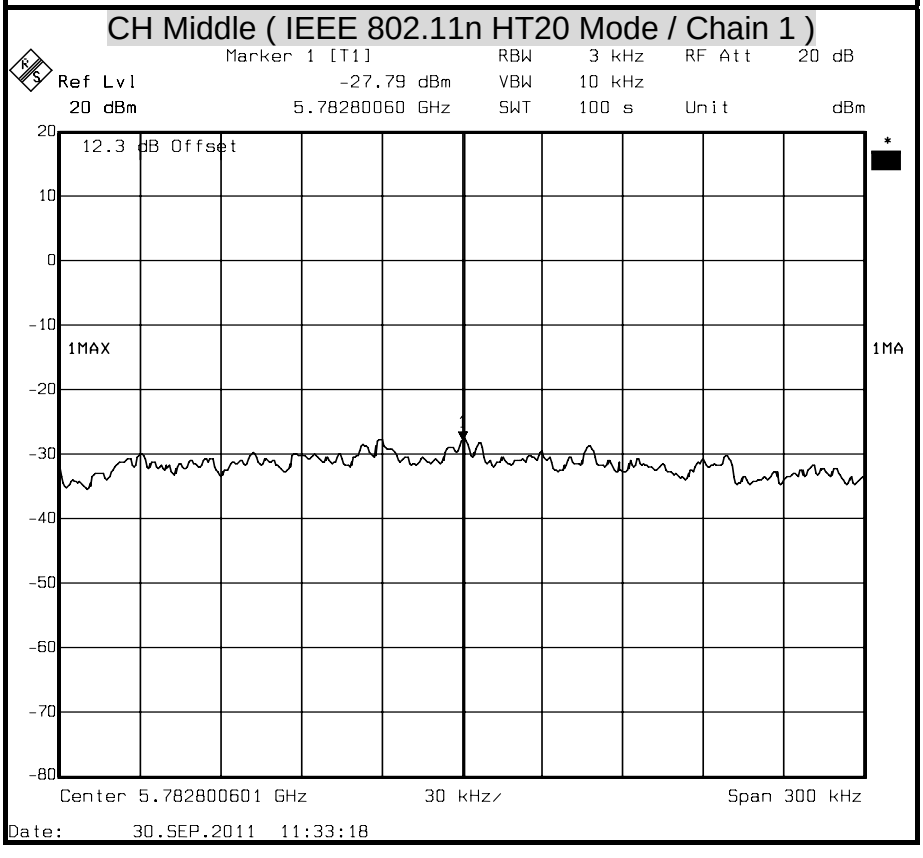
CH High (IEEE 802.11n HT20 Mode / Chain 0)



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



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



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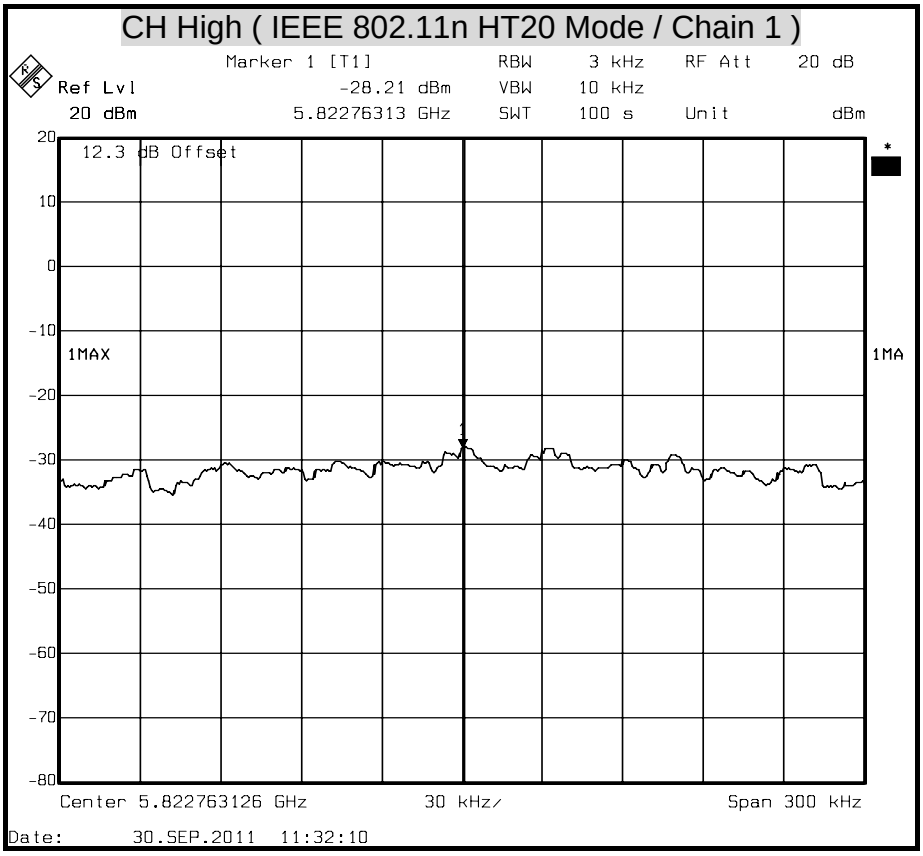
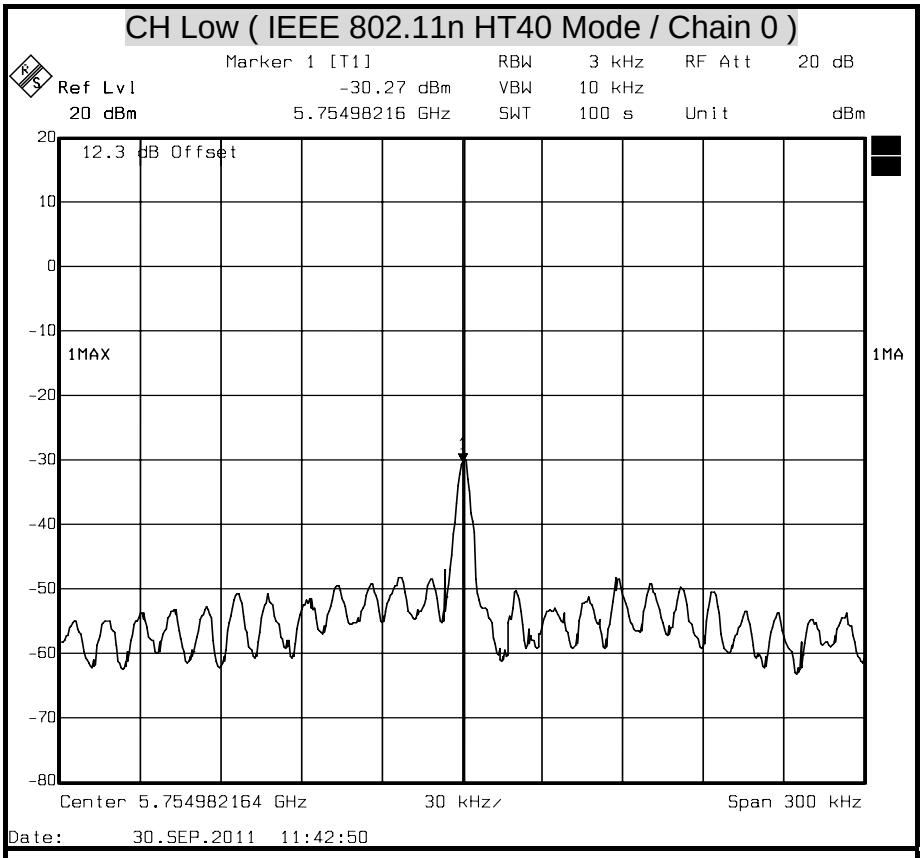
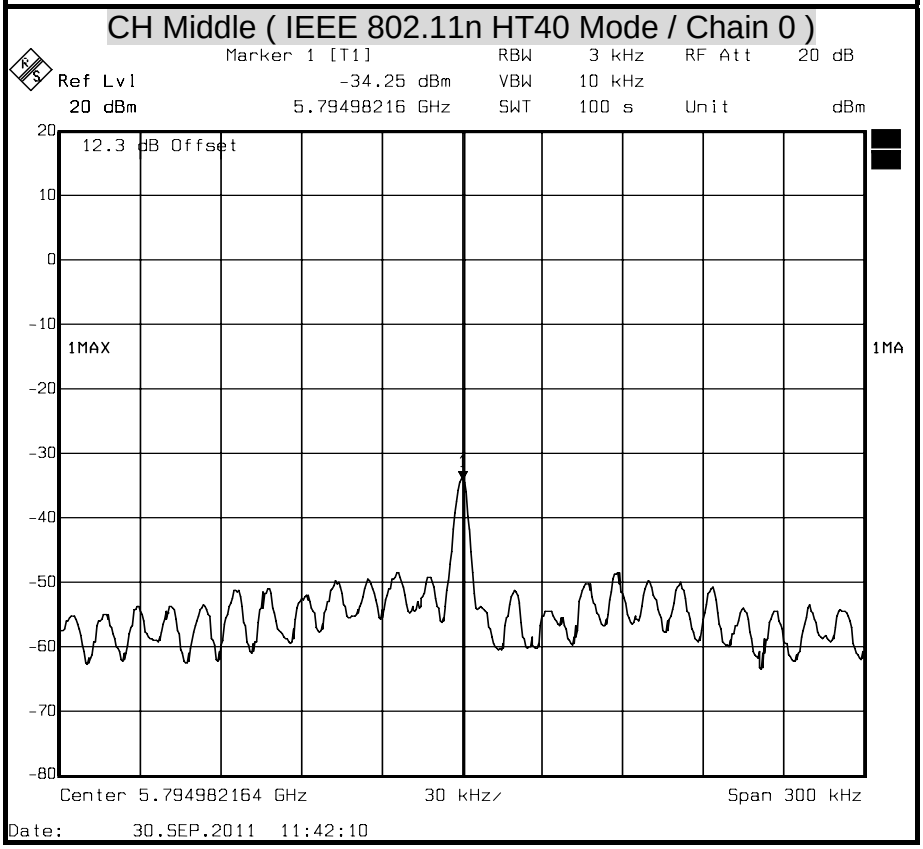


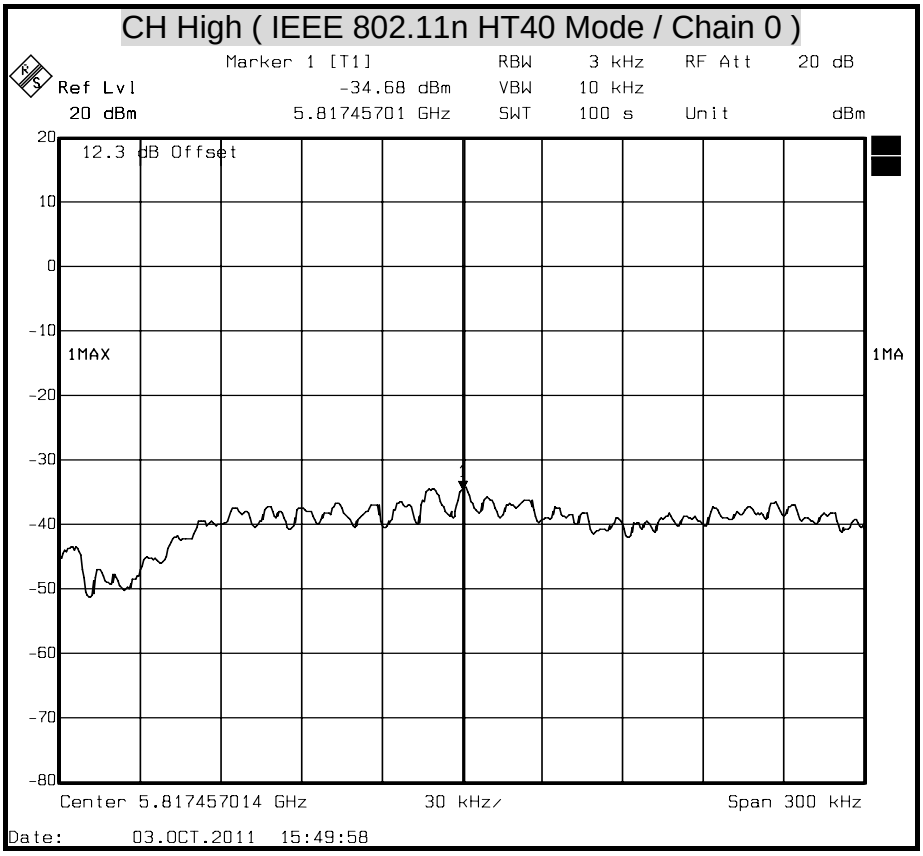
CH Low (IEEE 802.11n HT40 Mode / Chain 0)



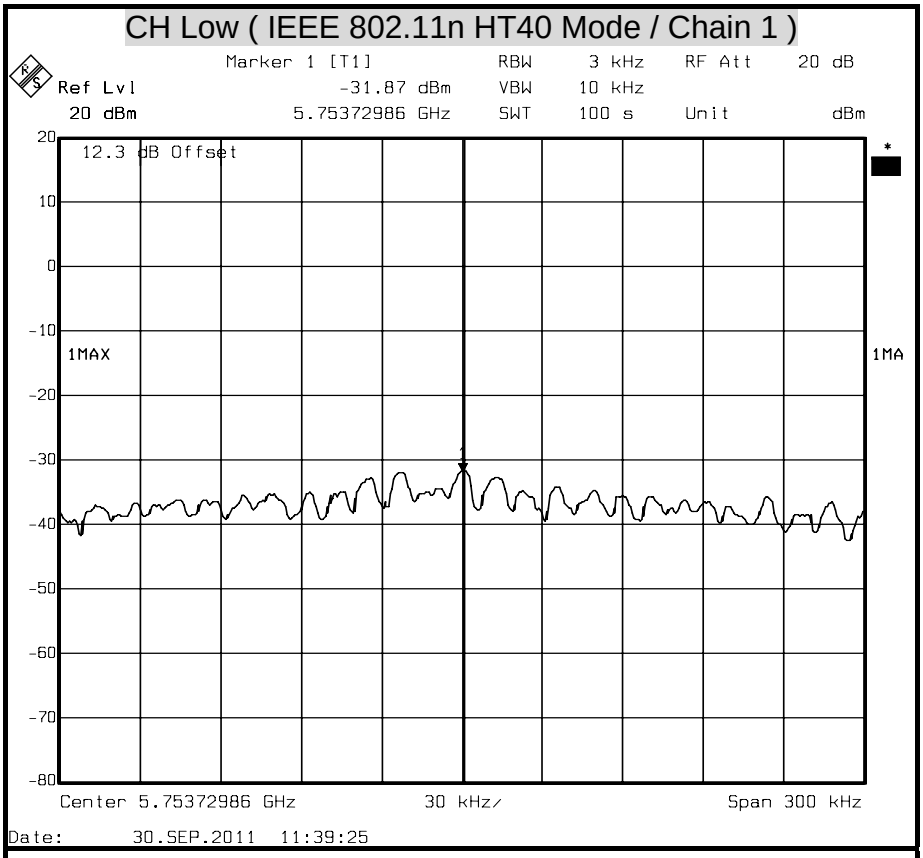
CH Middle (IEEE 802.11n HT40 Mode / Chain 0)



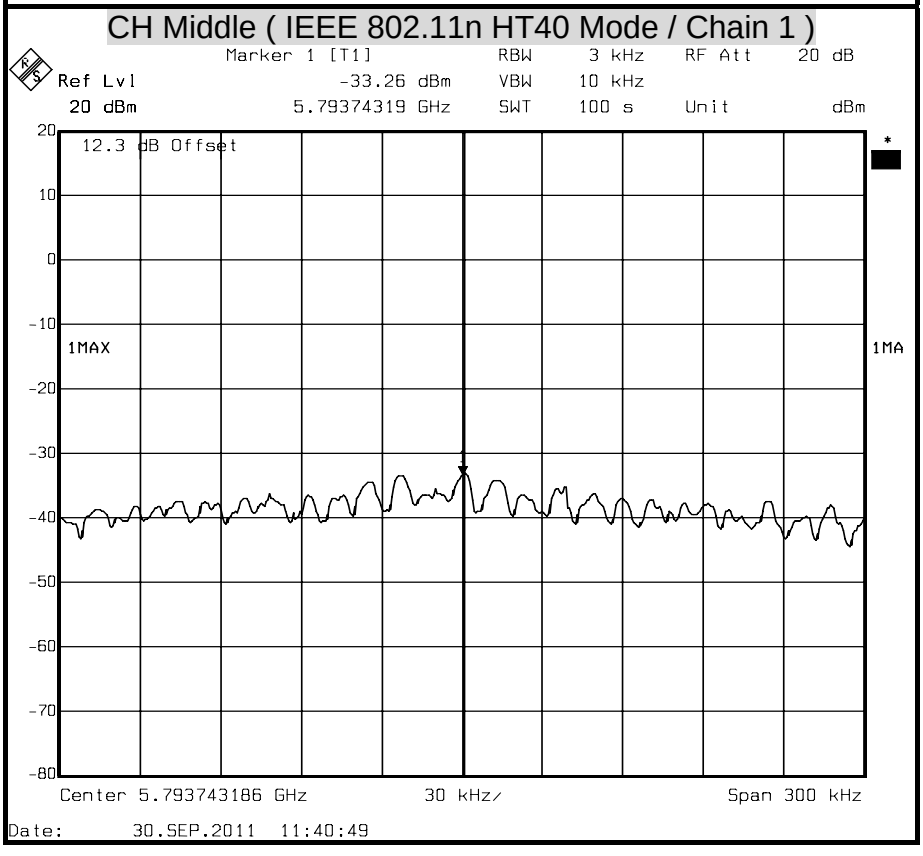
CH High (IEEE 802.11n HT40 Mode / Chain 0)



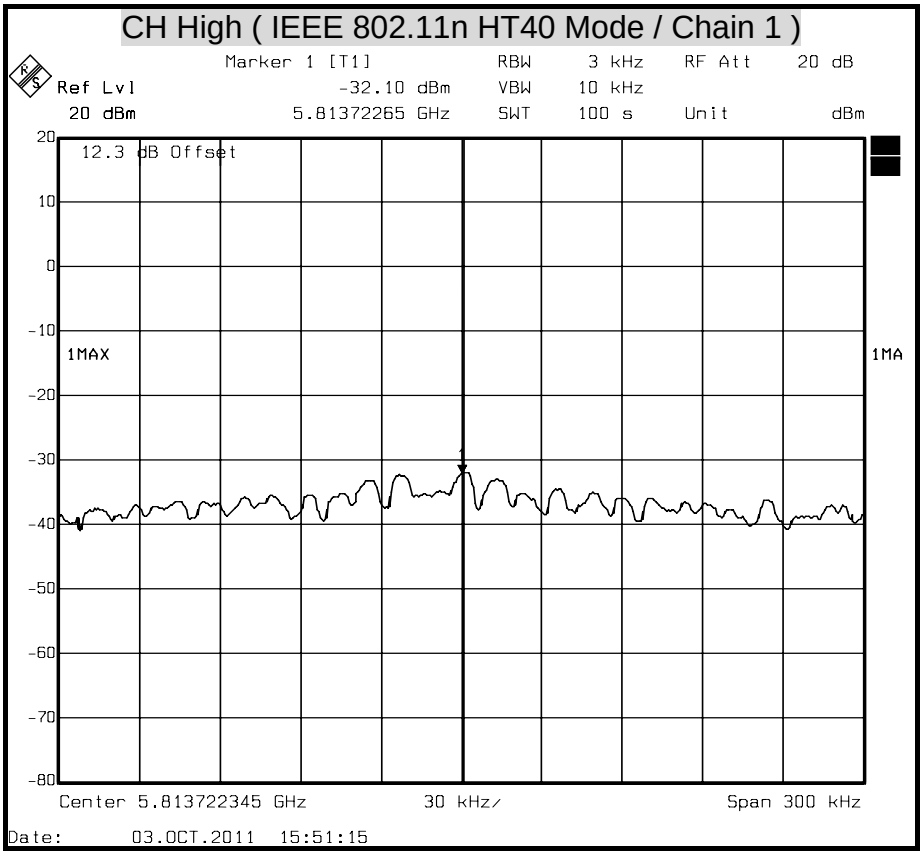
CH Low (IEEE 802.11n HT40 Mode / Chain 1)



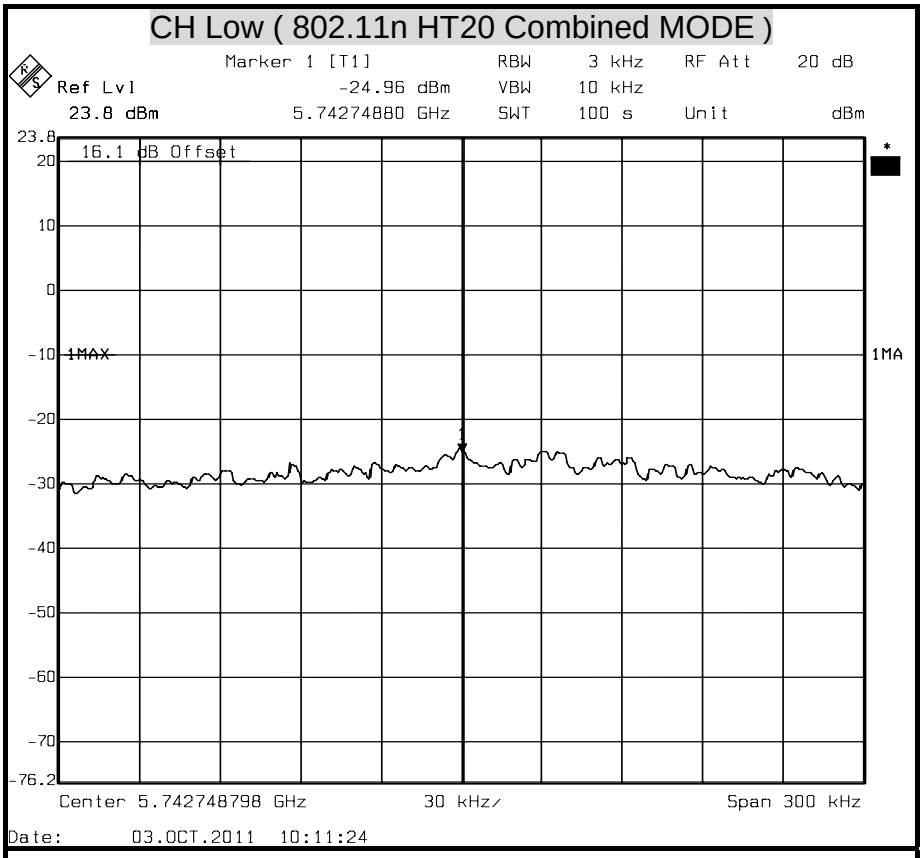
CH Middle (IEEE 802.11n HT40 Mode / Chain 1)



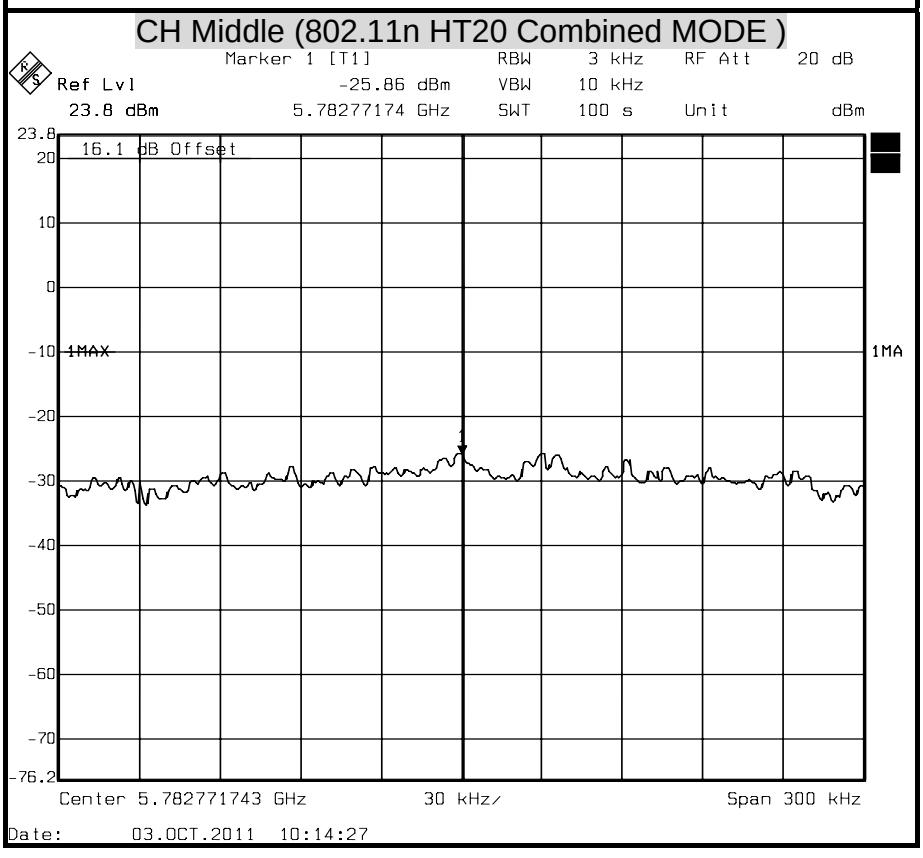
CH High (IEEE 802.11n HT40 Mode / Chain 1)



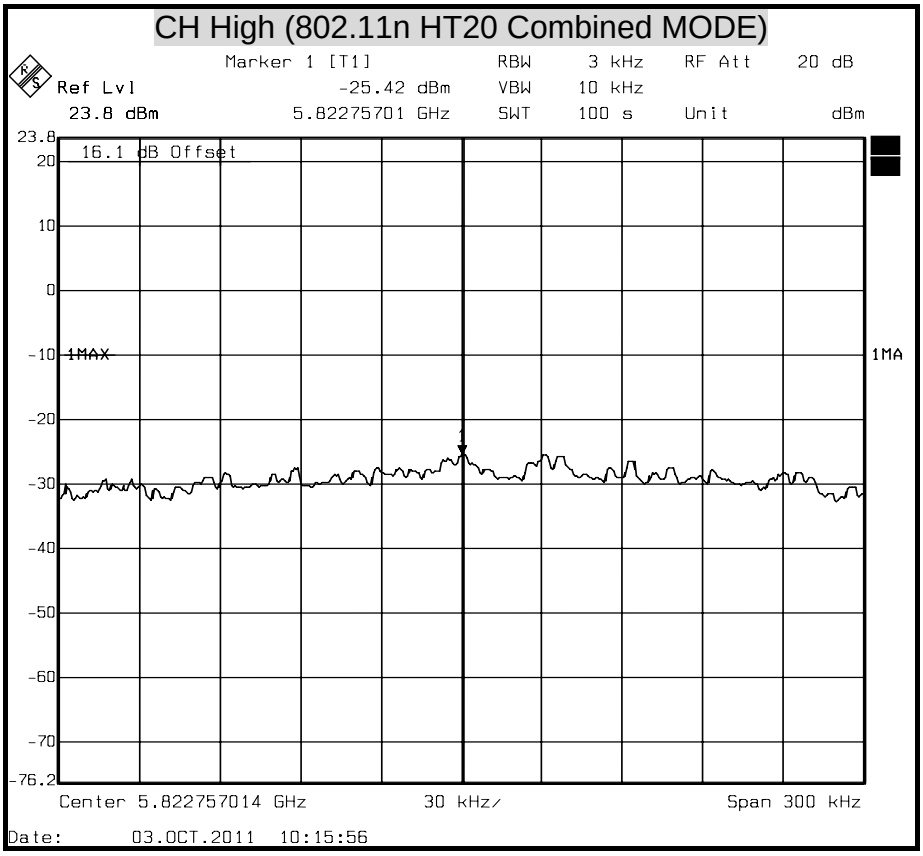
CH Low (802.11n HT20 Combined MODE)



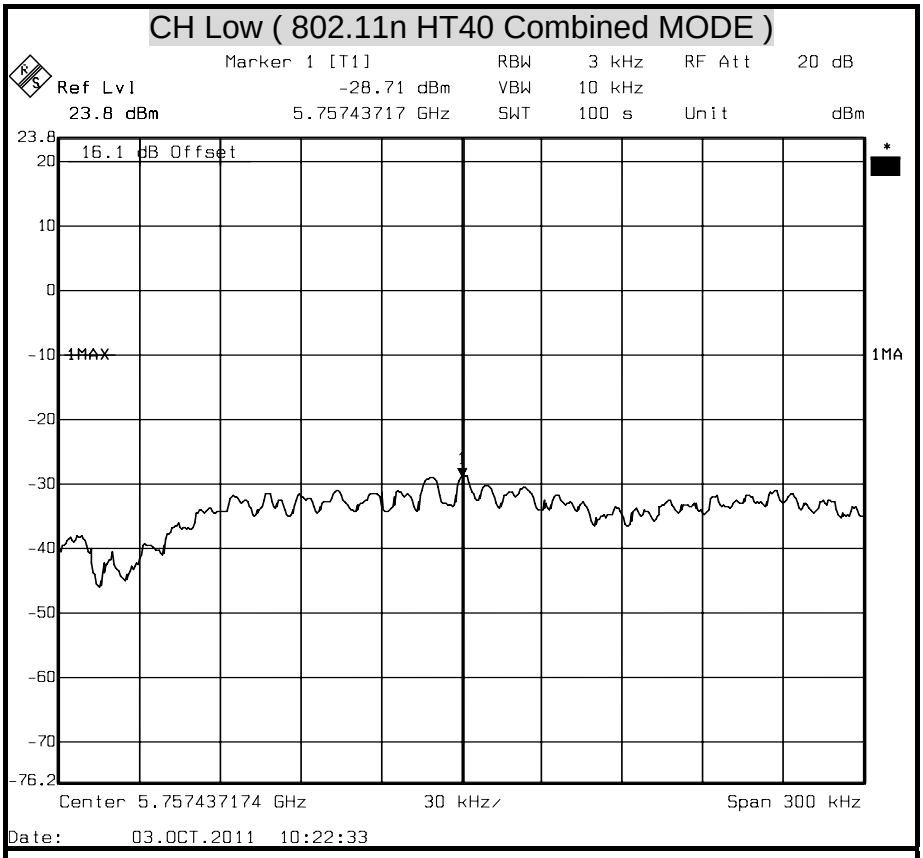
CH Middle (802.11n HT20 Combined MODE)



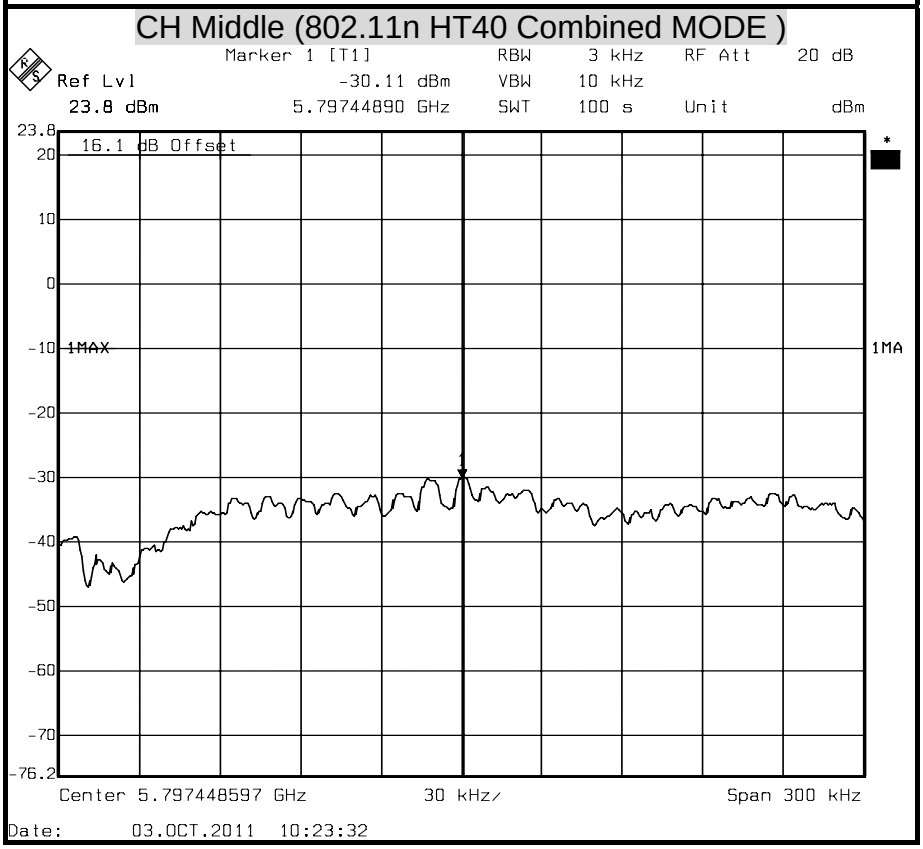
CH High (802.11n HT20 Combined MODE)



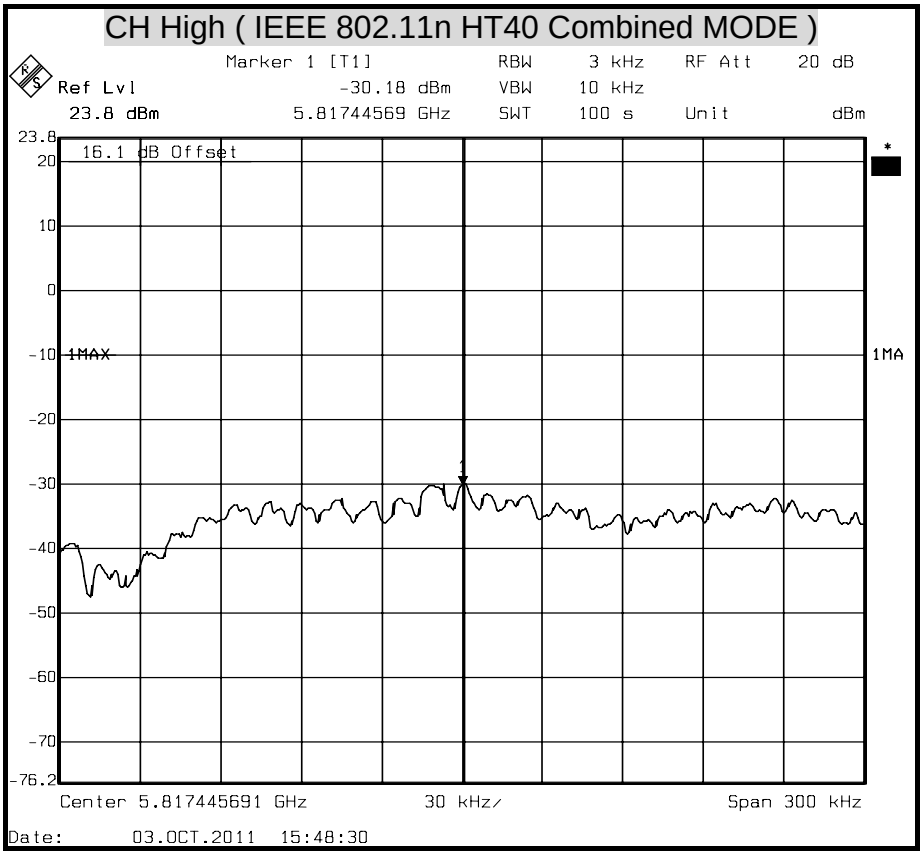
CH Low (802.11n HT40 Combined MODE)



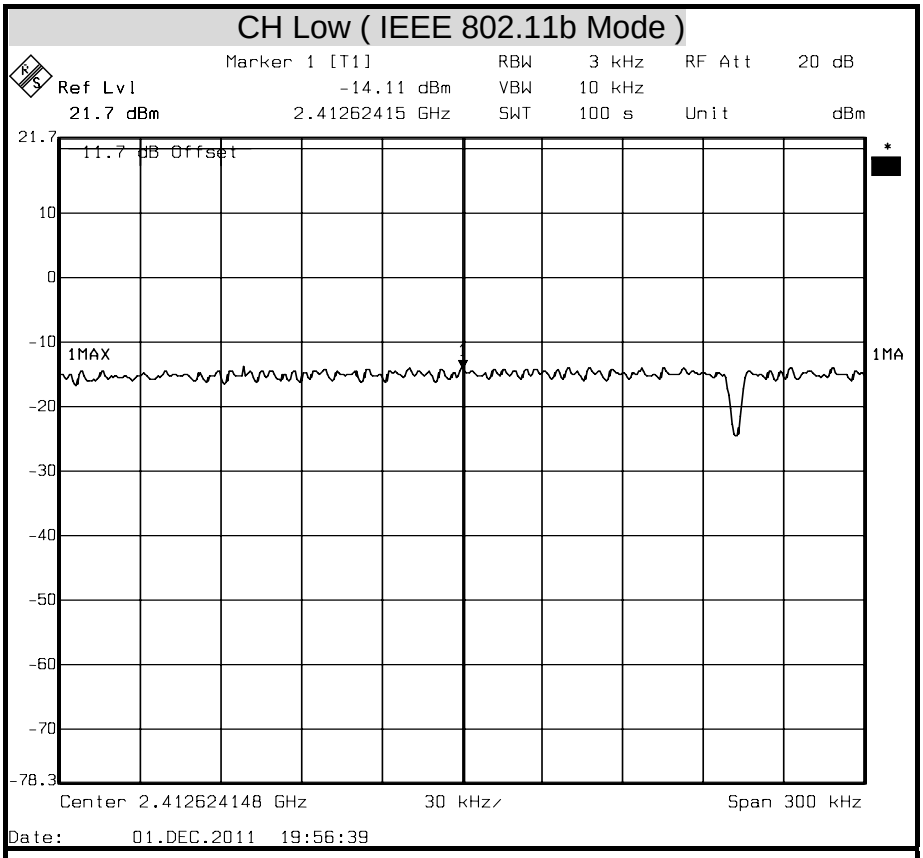
CH Middle (802.11n HT40 Combined MODE)



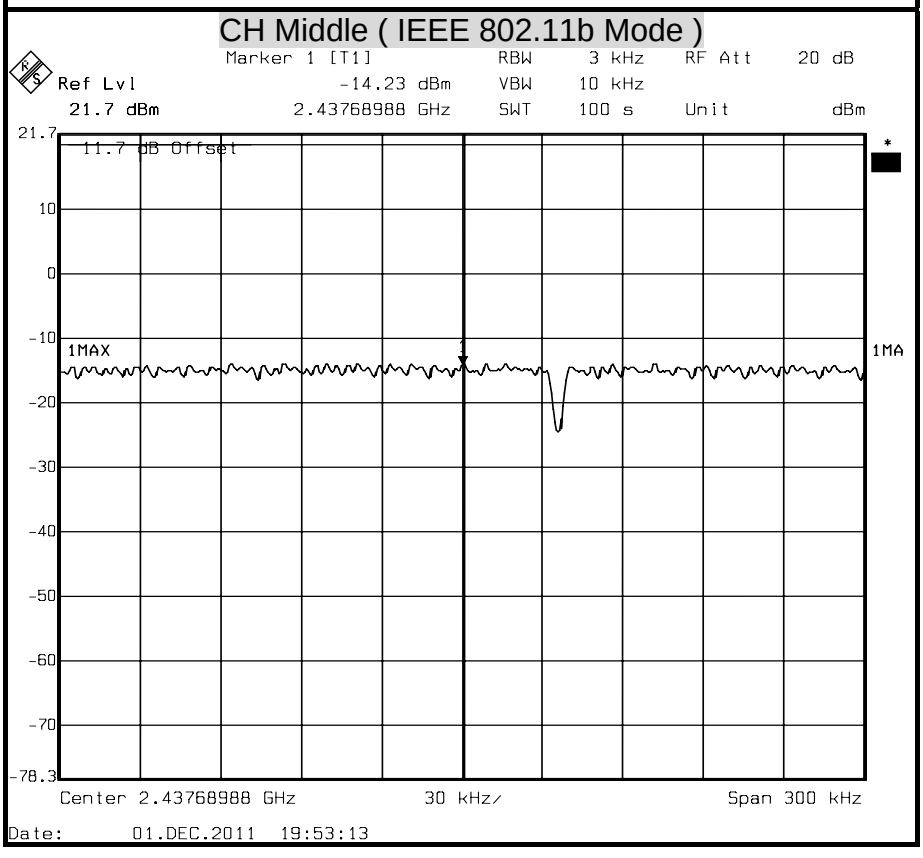
CH High (IEEE 802.11n HT40 Combined MODE)



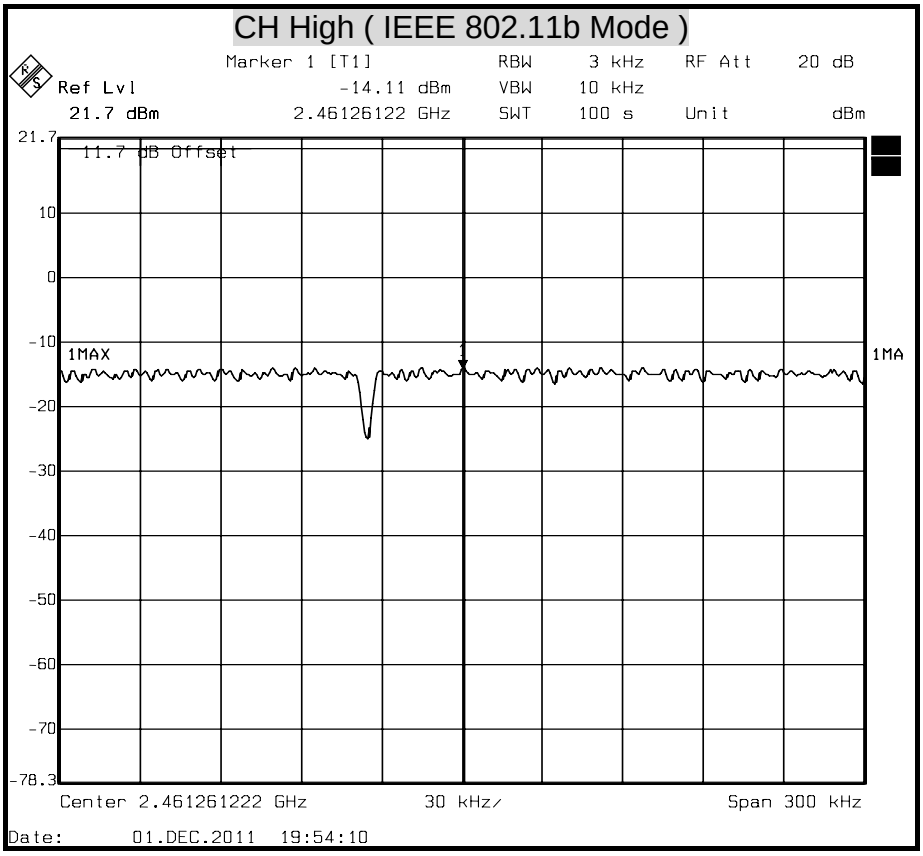
CH Low (IEEE 802.11b Mode)



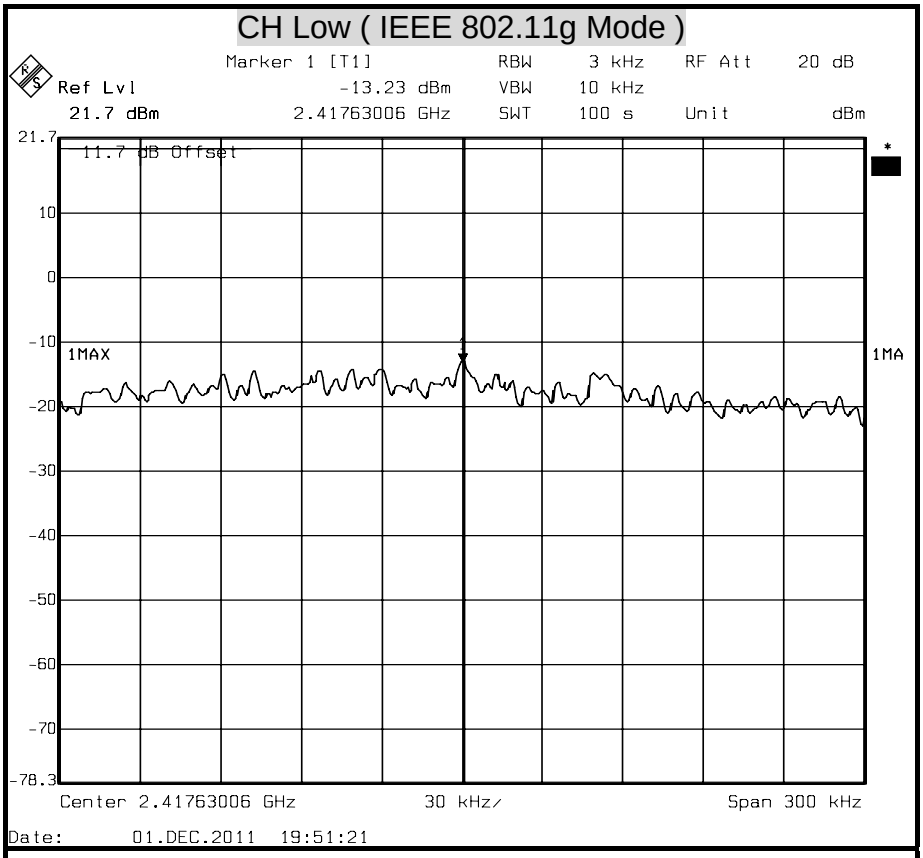
CH Middle (IEEE 802.11b Mode)



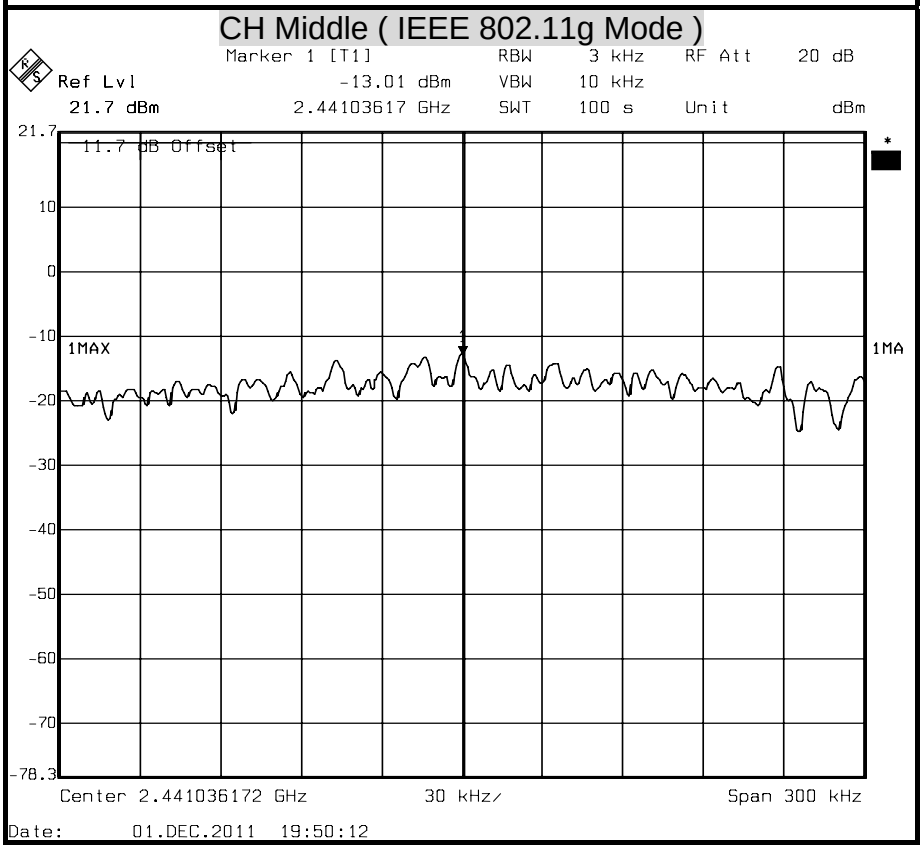
CH High (IEEE 802.11b Mode)



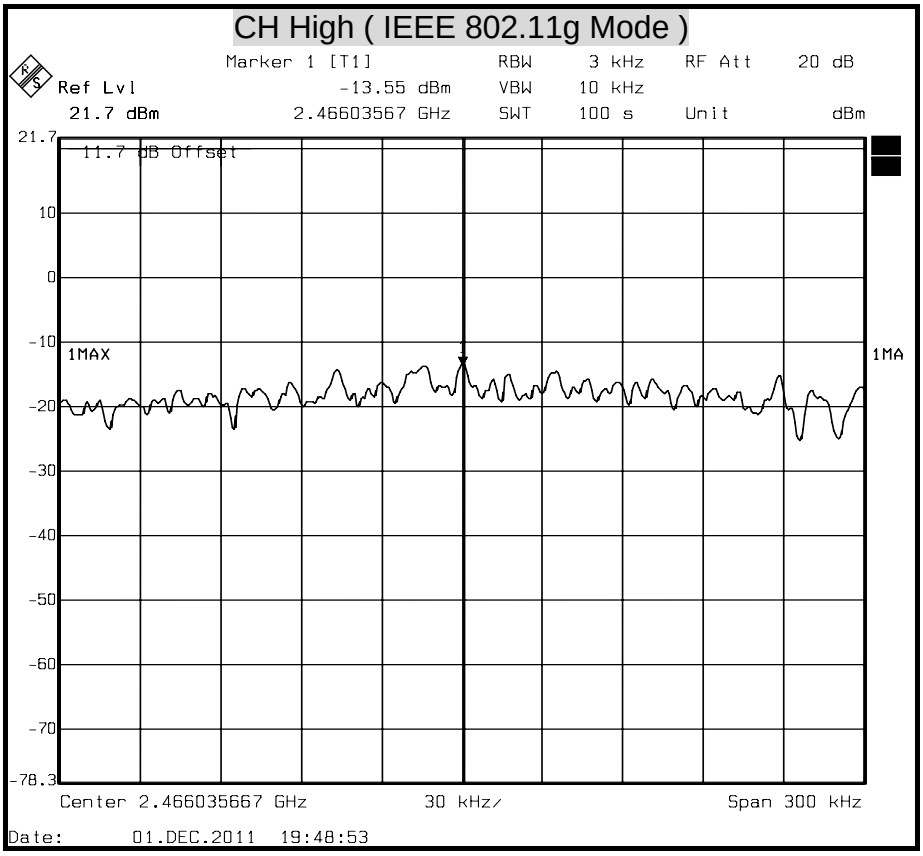
CH Low (IEEE 802.11g Mode)



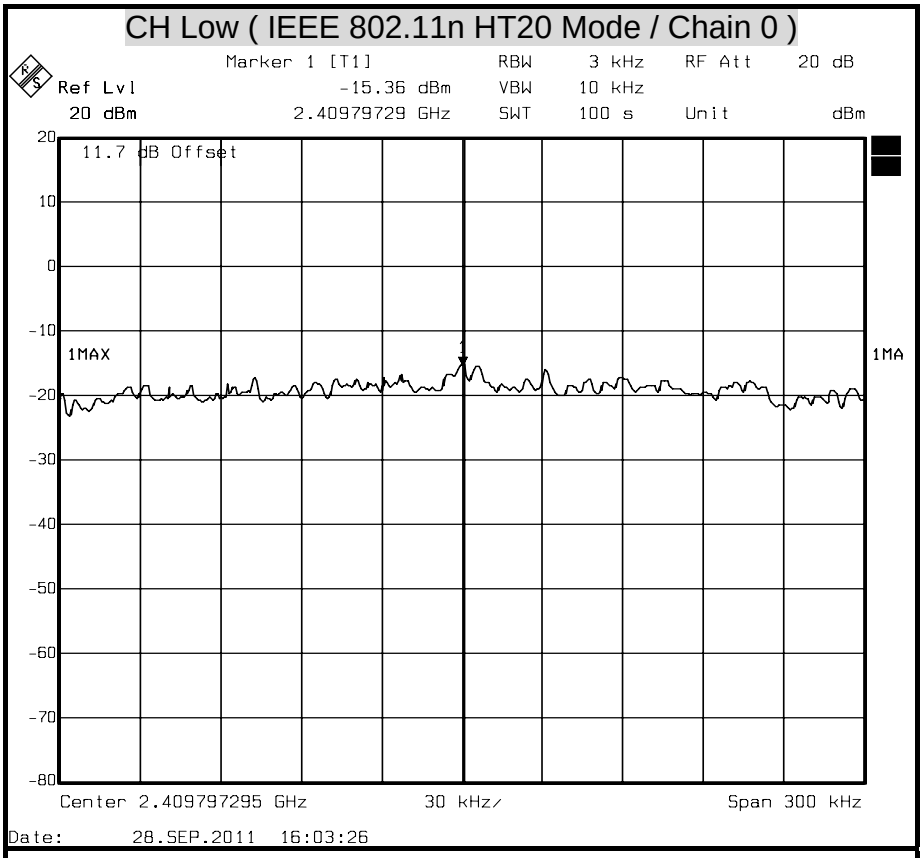
CH Middle (IEEE 802.11g Mode)



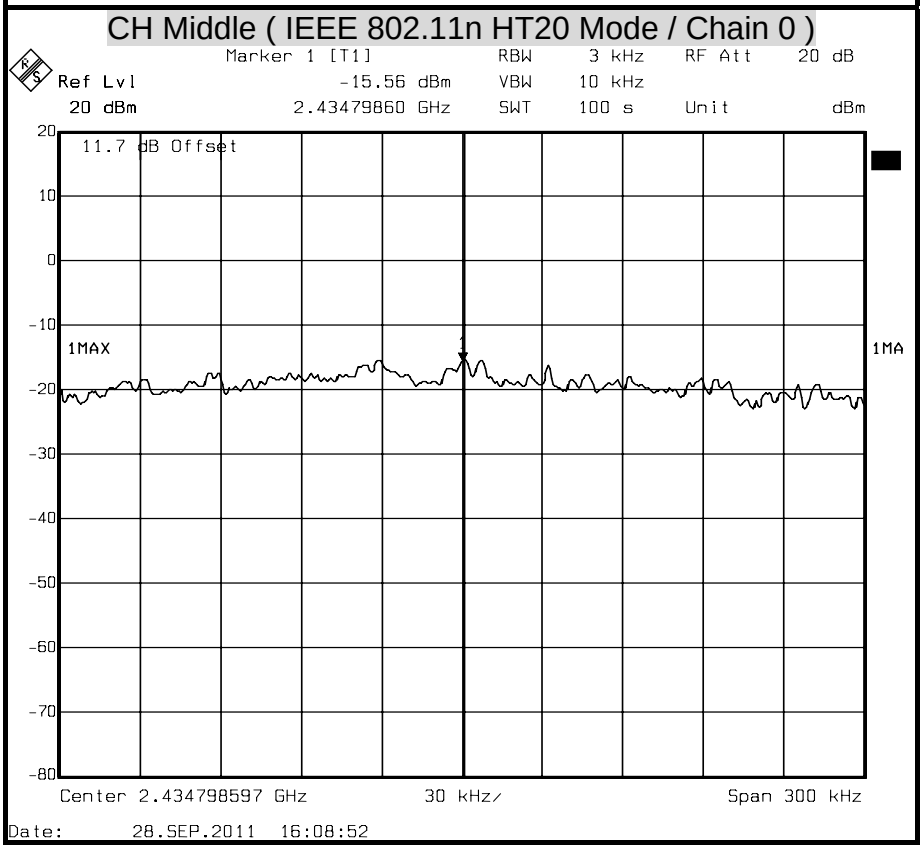
CH High (IEEE 802.11g Mode)



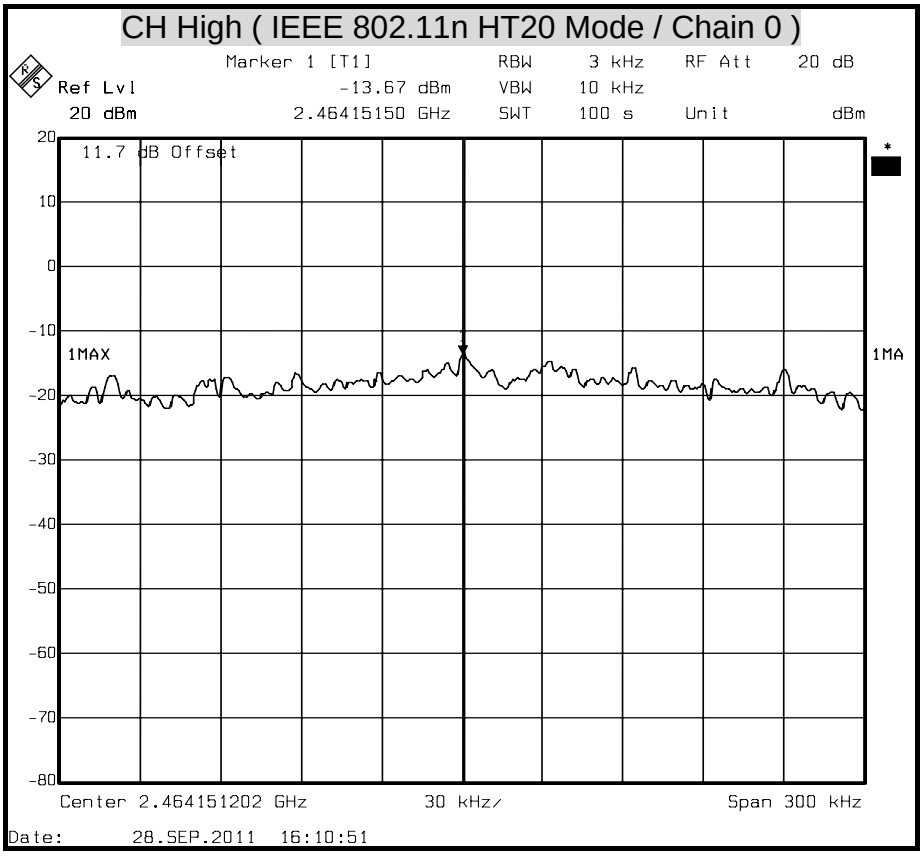
CH Low (IEEE 802.11n HT20 Mode / Chain 0)



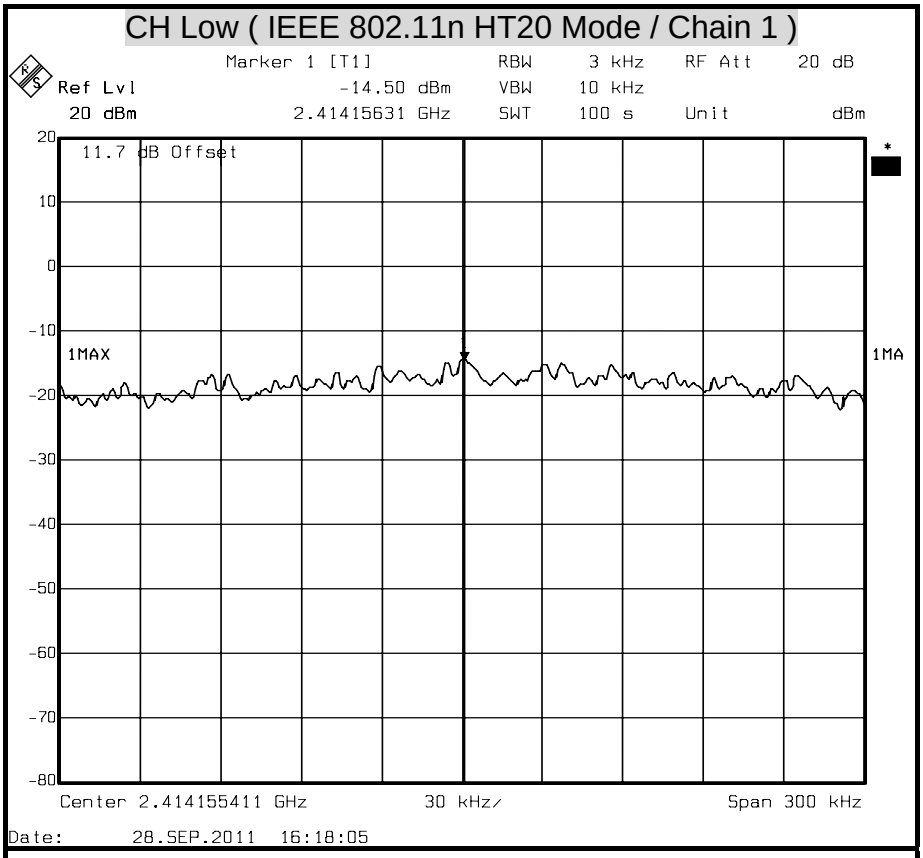
CH Middle (IEEE 802.11n HT20 Mode / Chain 0)



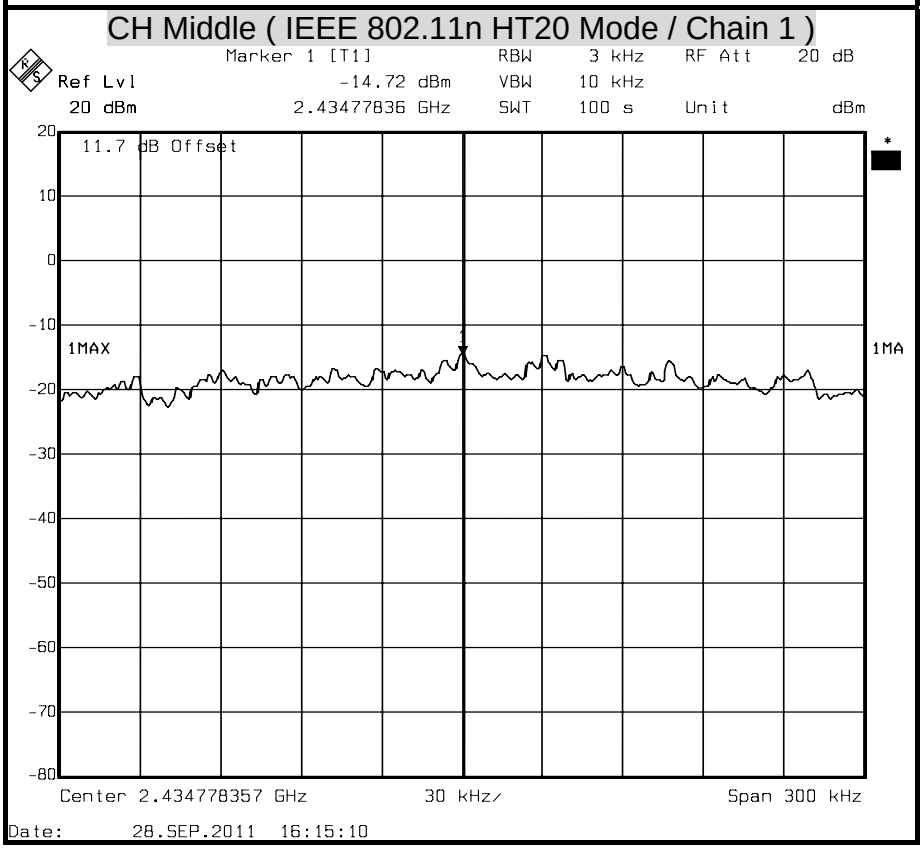
CH High (IEEE 802.11n HT20 Mode / Chain 0)



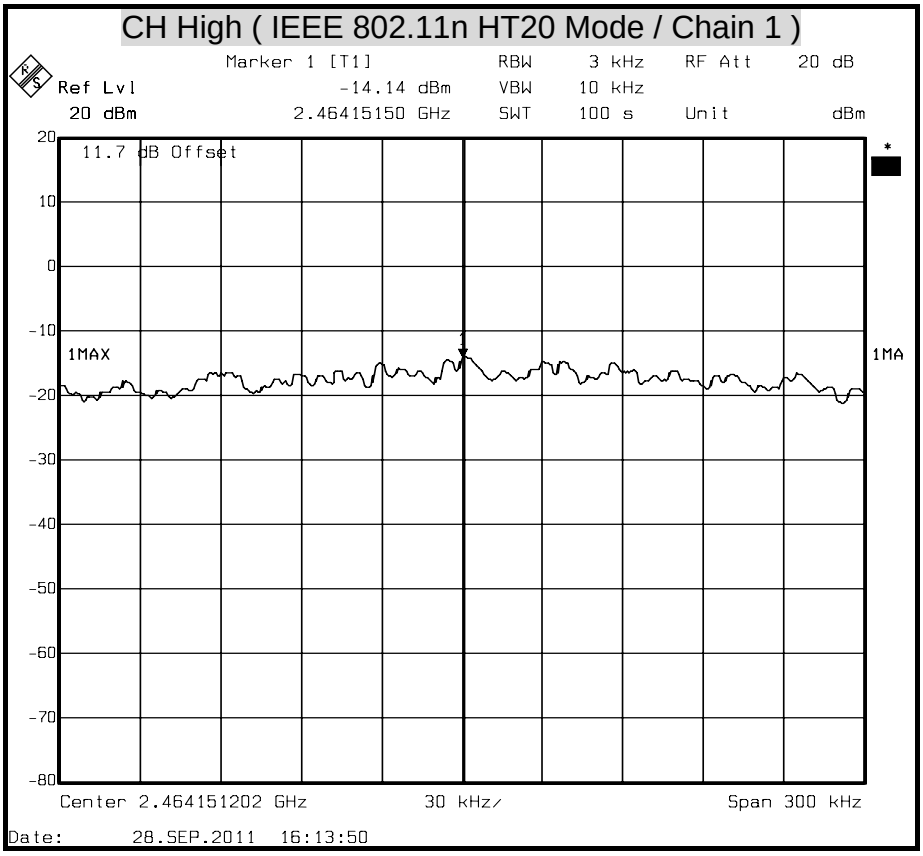
CH Low (IEEE 802.11n HT20 Mode / Chain 1)



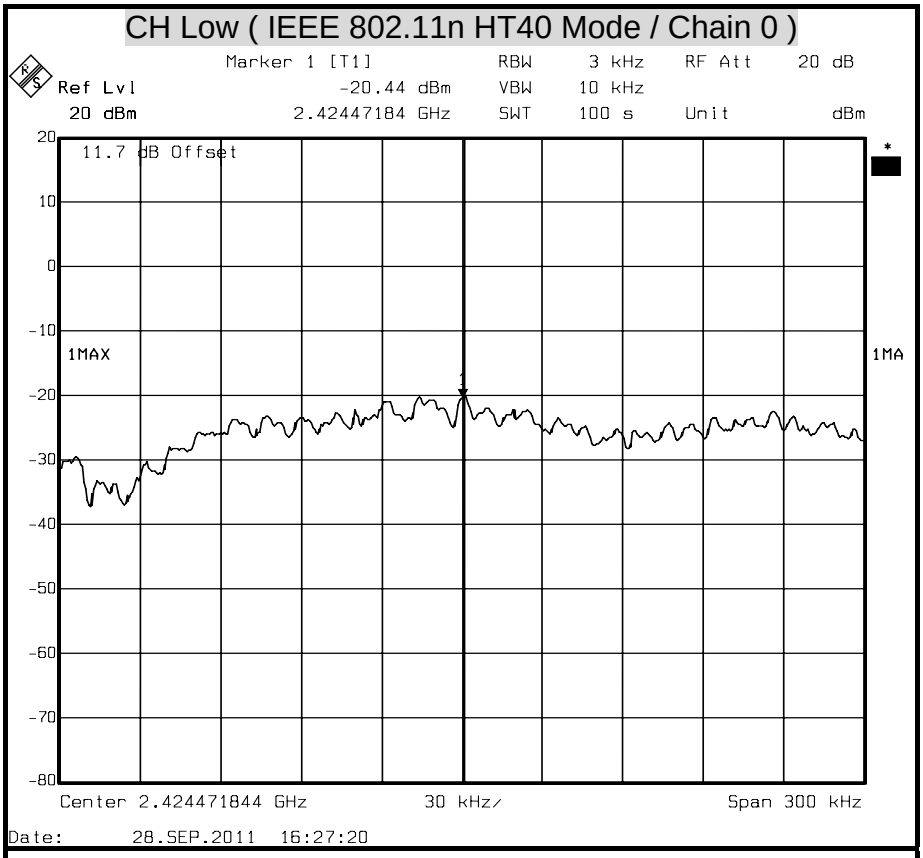
CH Middle (IEEE 802.11n HT20 Mode / Chain 1)



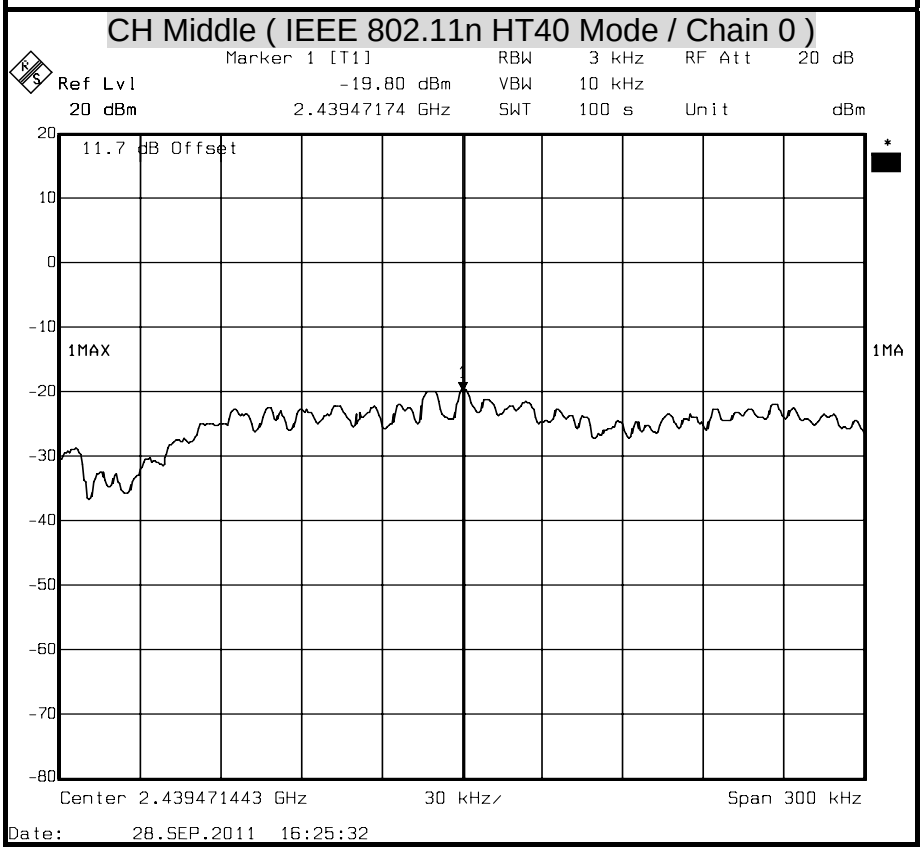
CH High (IEEE 802.11n HT20 Mode / Chain 1)



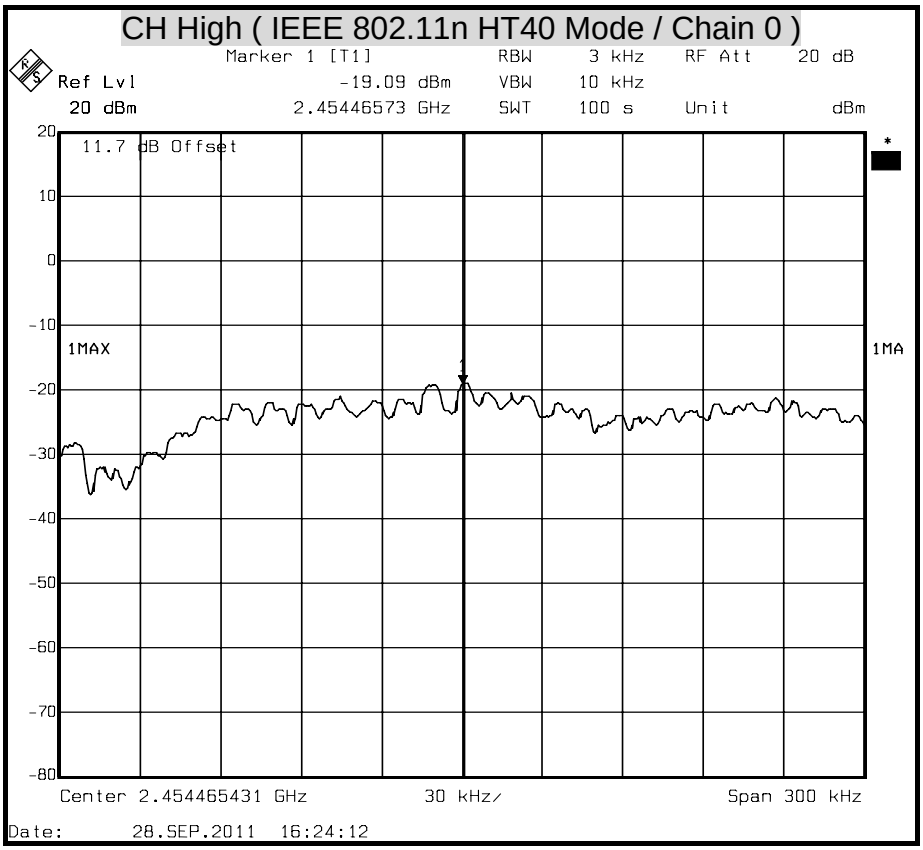
CH Low (IEEE 802.11n HT40 Mode / Chain 0)



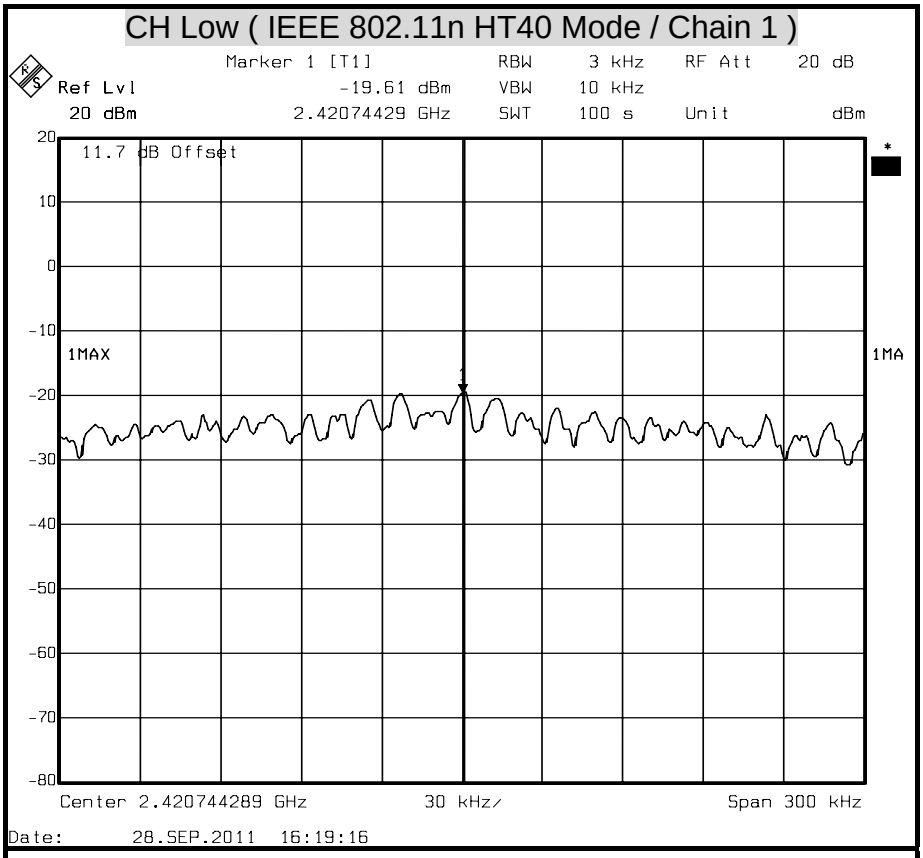
CH Middle (IEEE 802.11n HT40 Mode / Chain 0)



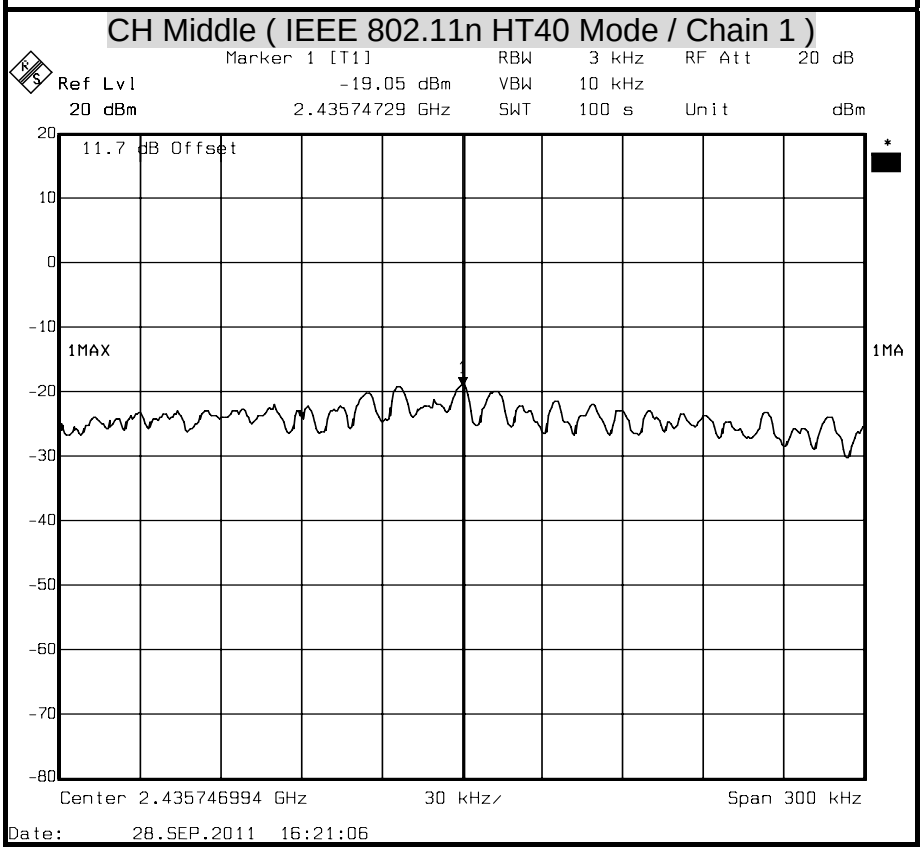
CH High (IEEE 802.11n HT40 Mode / Chain 0)



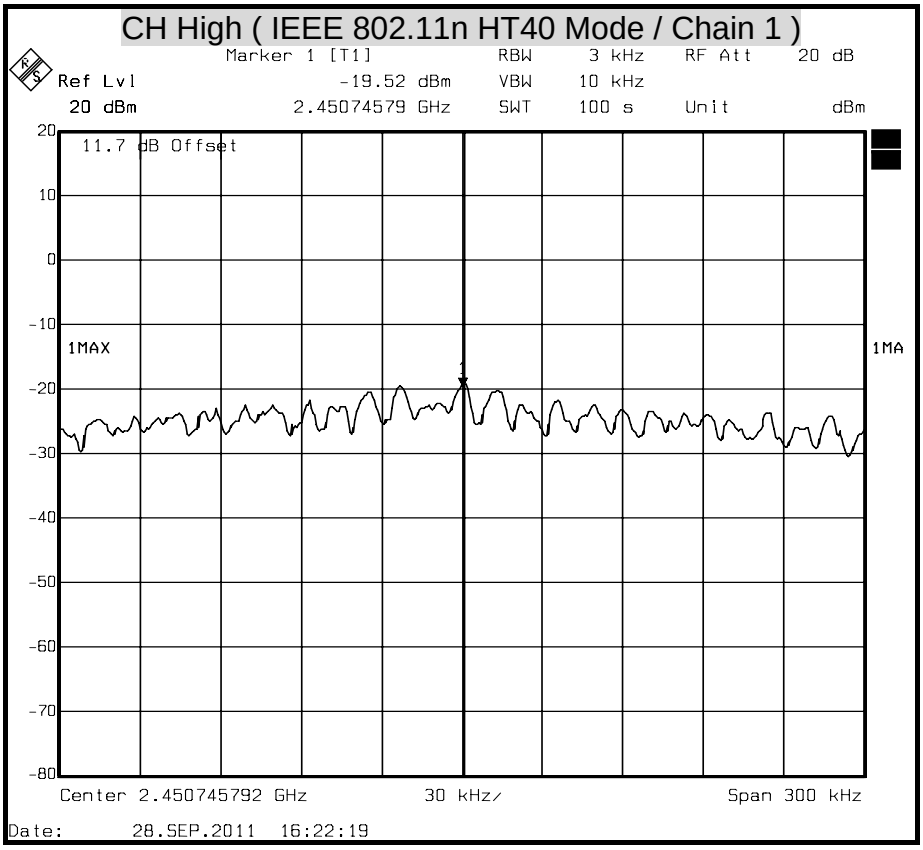
CH Low (IEEE 802.11n HT40 Mode / Chain 1)



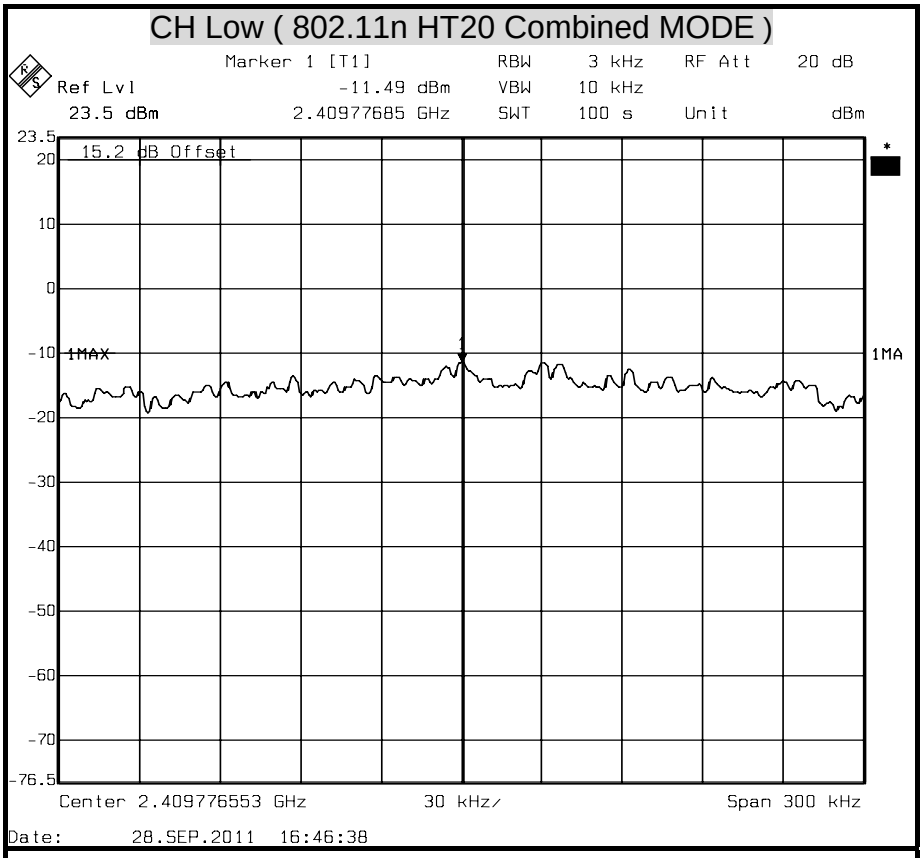
CH Middle (IEEE 802.11n HT40 Mode / Chain 1)



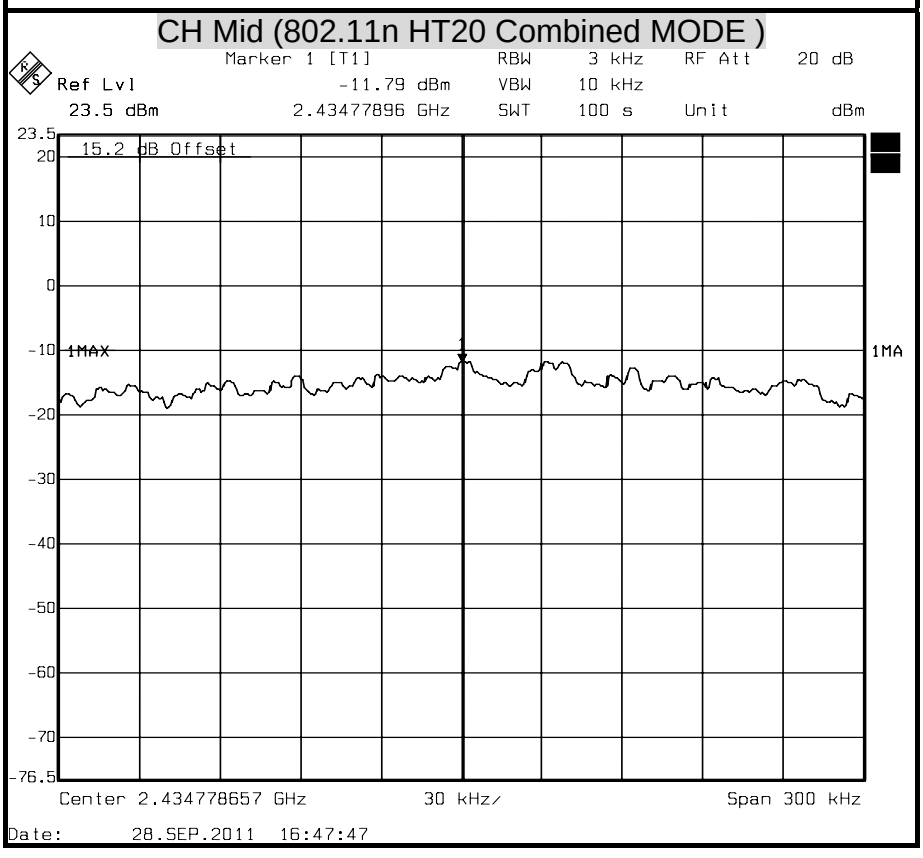
CH High (IEEE 802.11n HT40 Mode / Chain 1)



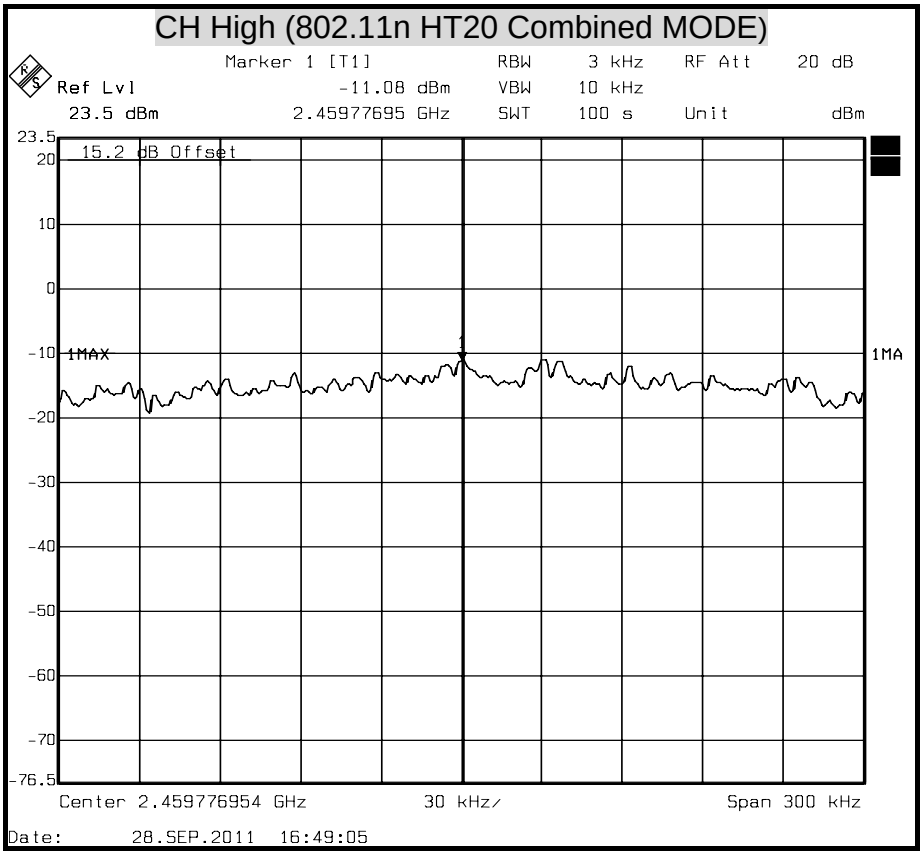
CH Low (802.11n HT20 Combined MODE)



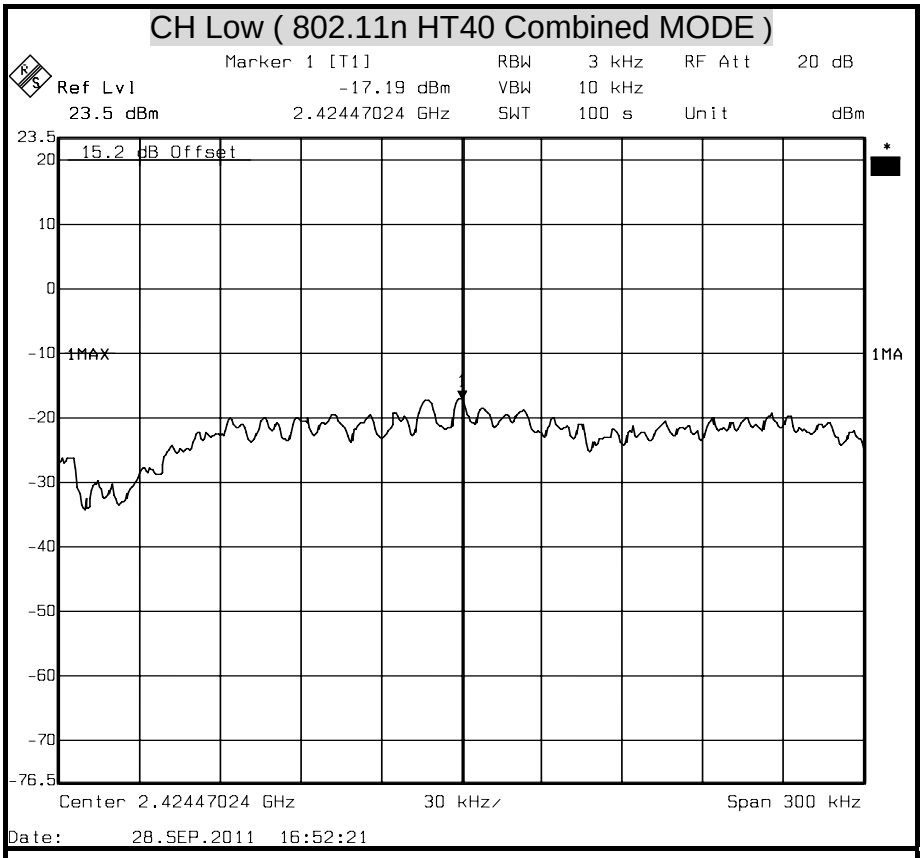
CH Mid (802.11n HT20 Combined MODE)



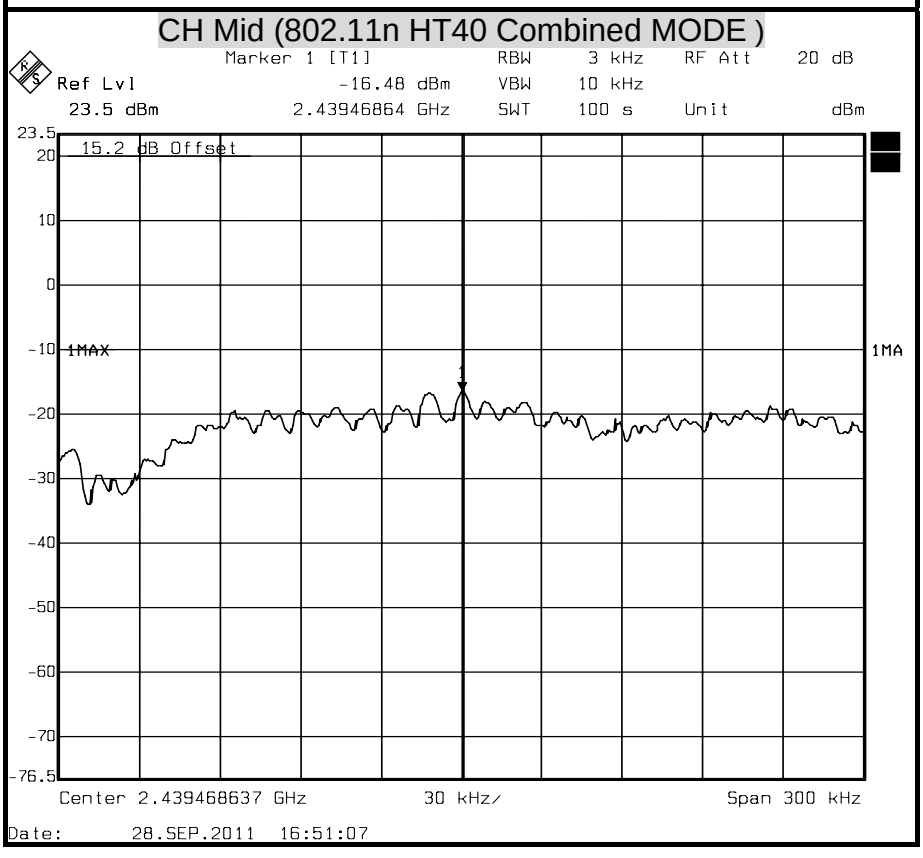
CH High (802.11n HT20 Combined MODE)



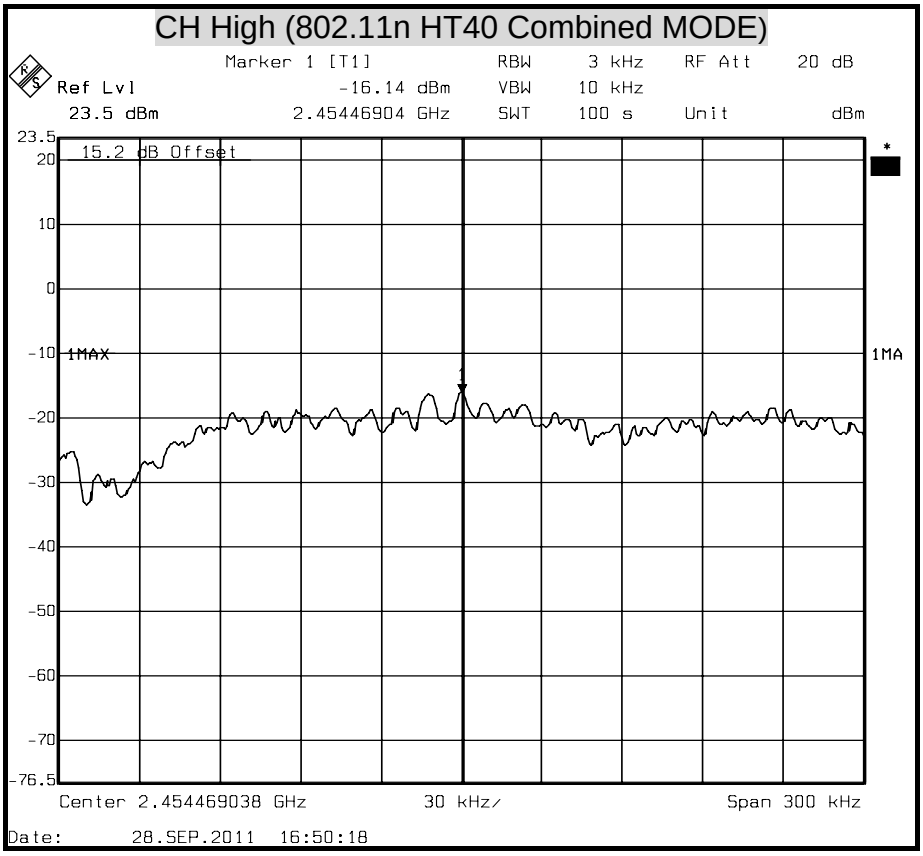
CH Low (802.11n HT40 Combined MODE)



CH Mid (802.11n HT40 Combined MODE)



CH High (802.11n HT40 Combined MODE)



7.4 CONDUCTED SPURIOUS EMISSION

LIMITS

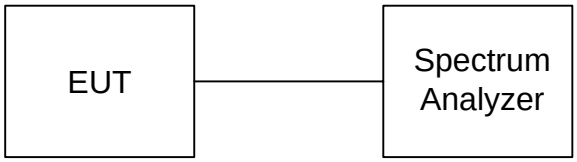
§ 15.247(d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

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 is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 100 kHz.

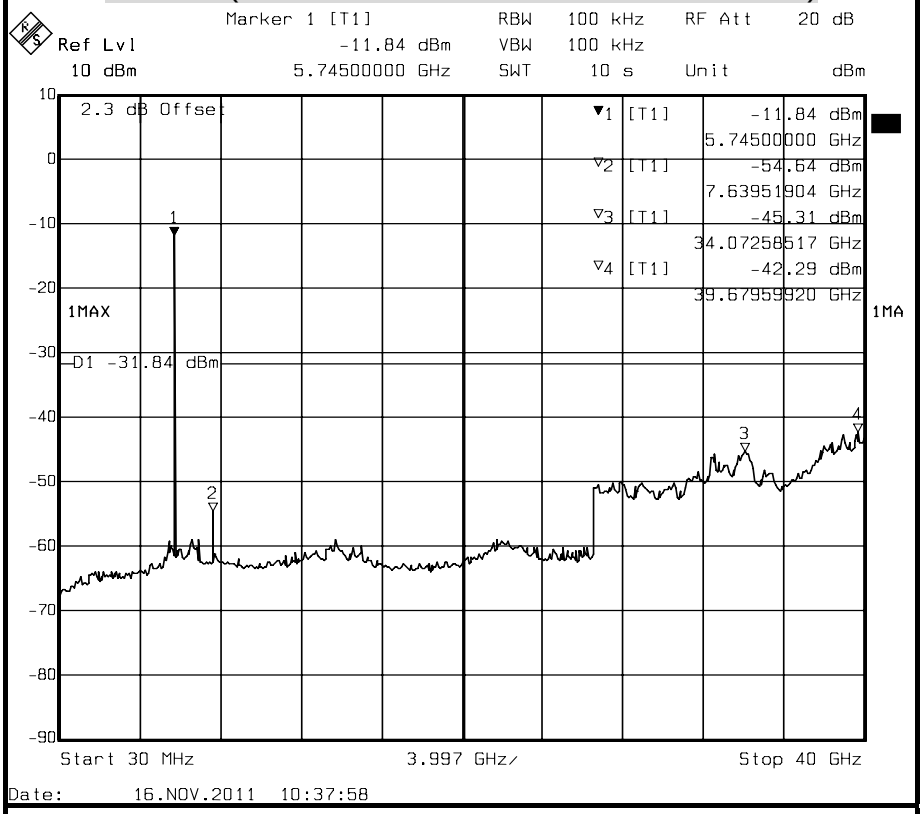
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in the 2.4 GHz band.

The spectrum from 30 MHz to 40 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in the 5.0 GHz band.

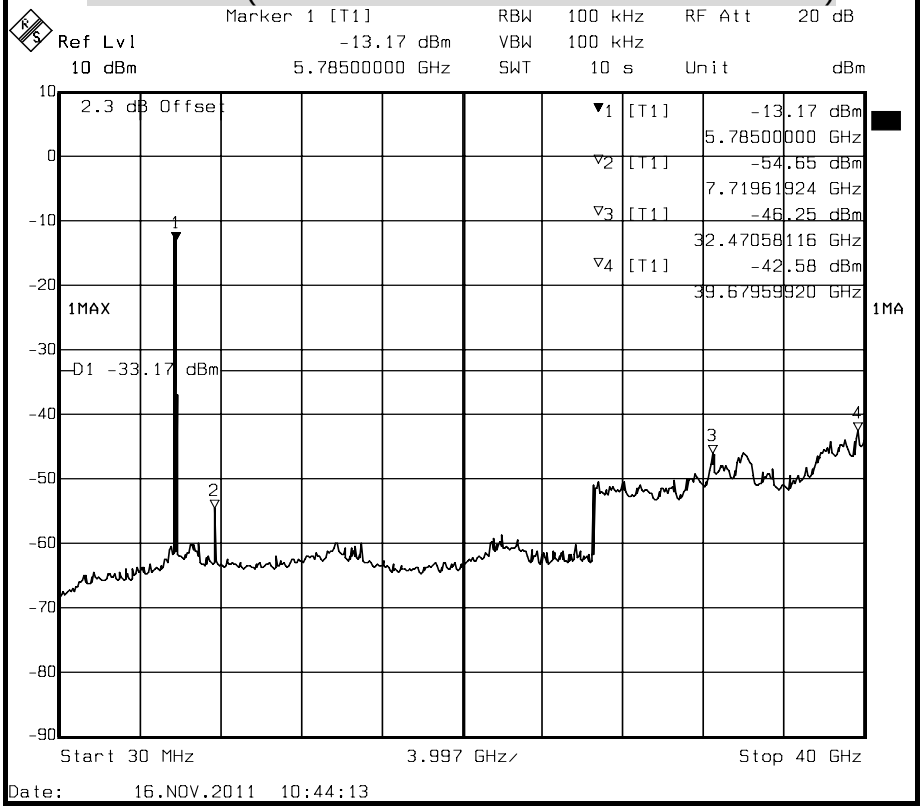
TEST RESULTS

OUT-OF-BAND SPURIOUS EMISSIONS-CONDUCTED MEASUREMENT

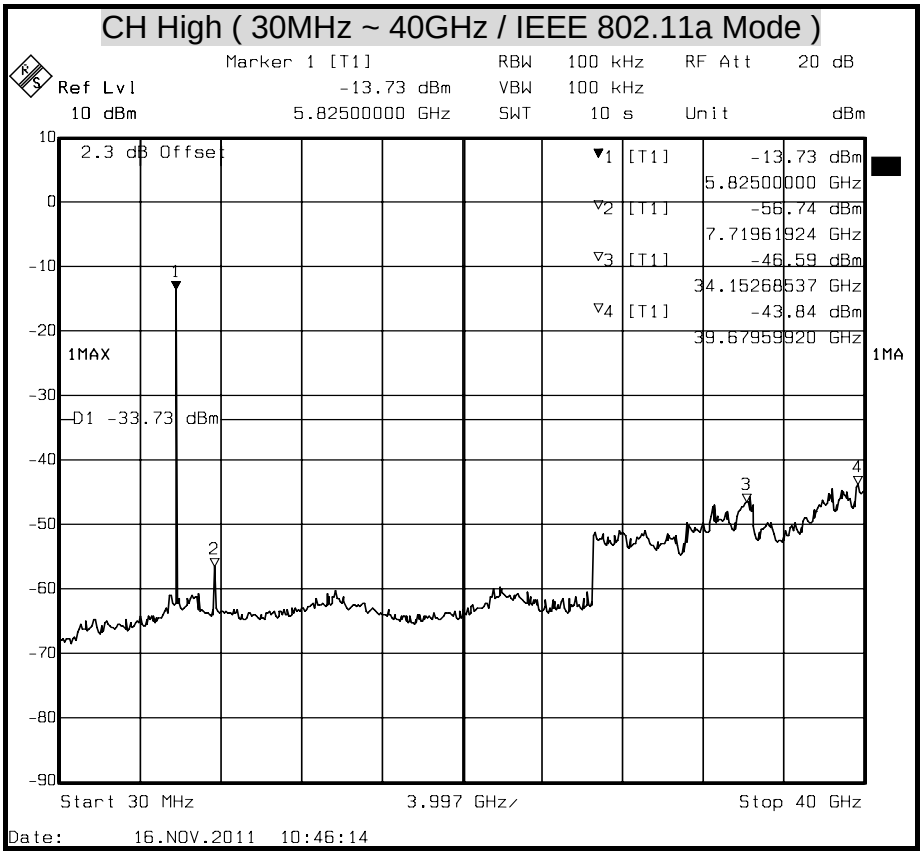
CH Low (30MHz ~ 40GHz / IEEE 802.11a Mode)



CH Middle (30MHz ~ 40GHz / IEEE 802.11a Mode)

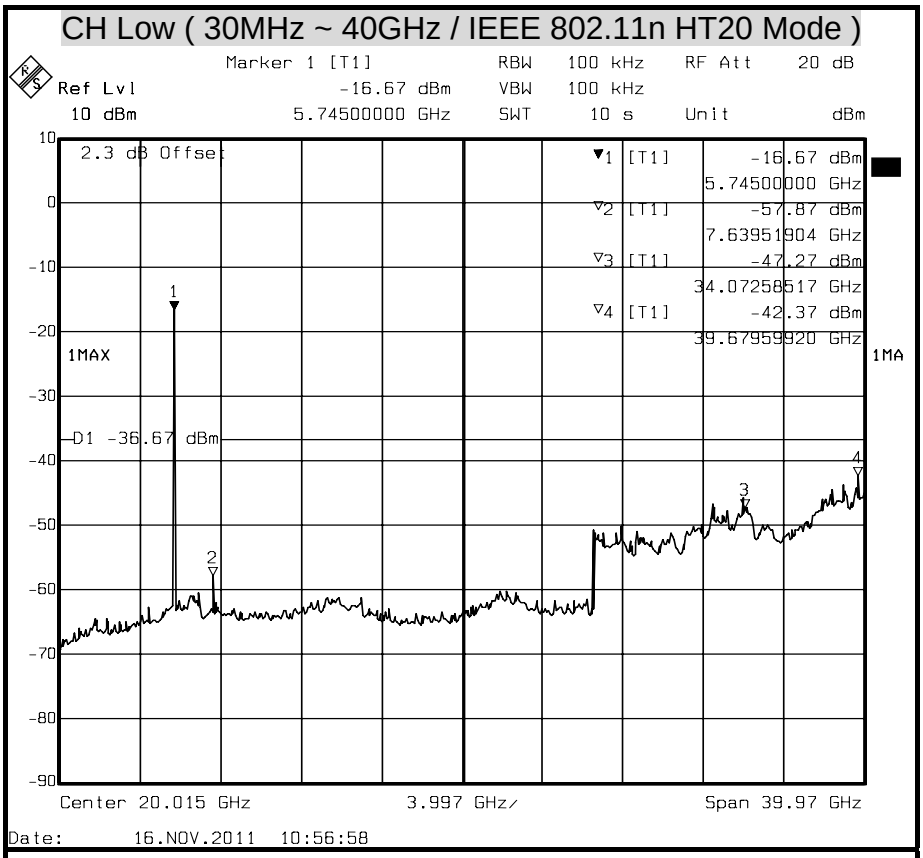


CH High (30MHz ~ 40GHz / IEEE 802.11a Mode)

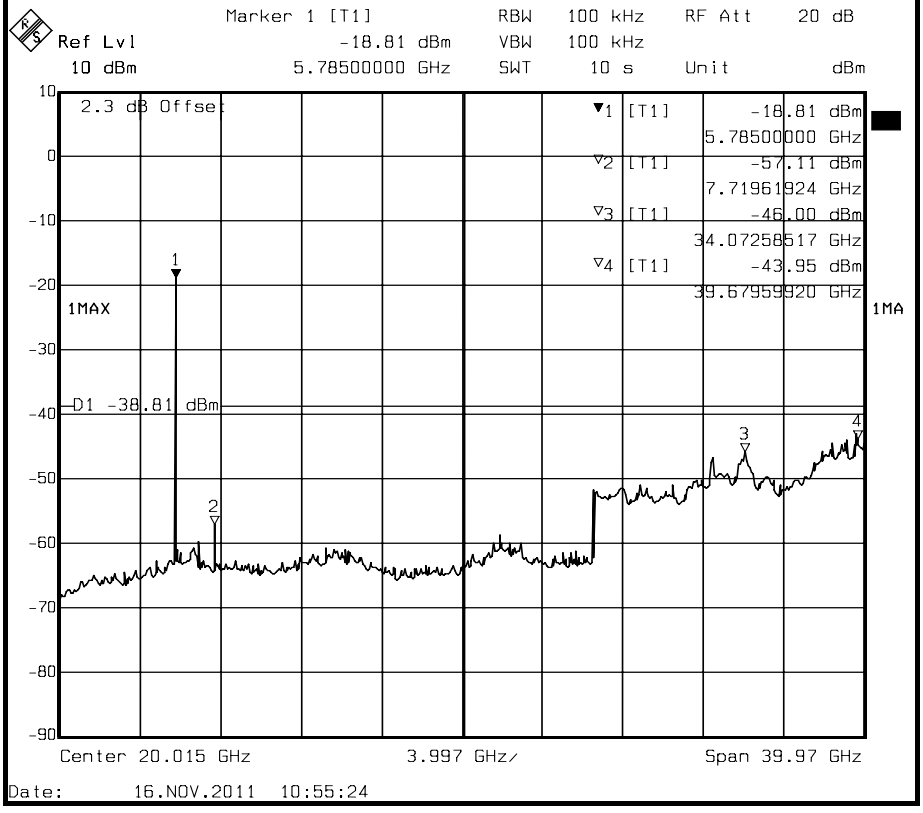


(IEEE 802.11n HT20 Mode / Chain 0)

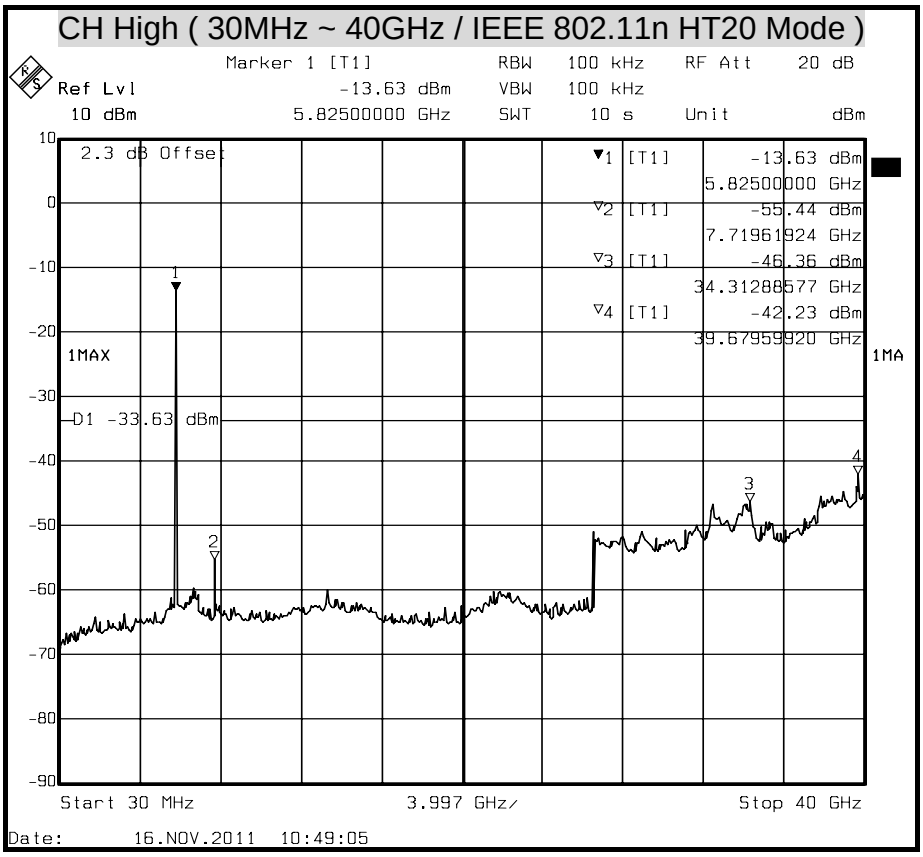
CH Low (30MHz ~ 40GHz / IEEE 802.11n HT20 Mode)



CH Middle (30MHz ~ 40GHz / IEEE 802.11n HT20 Mode)

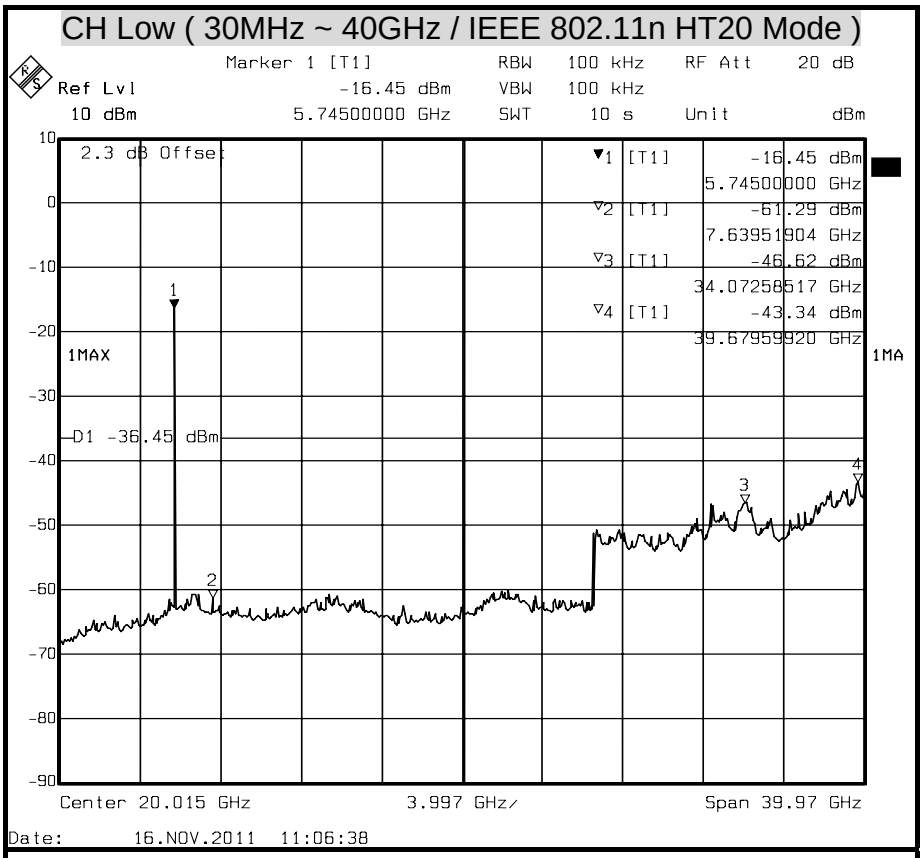


CH High (30MHz ~ 40GHz / IEEE 802.11n HT20 Mode)

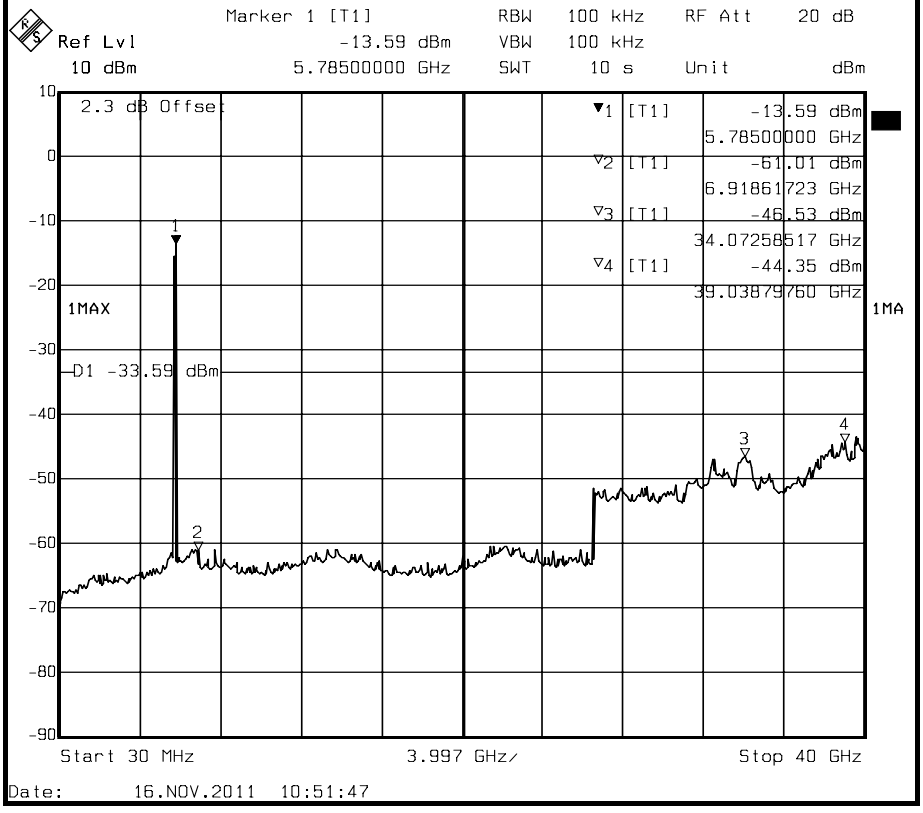


(IEEE 802.11n HT20 Mode / Chain 1)

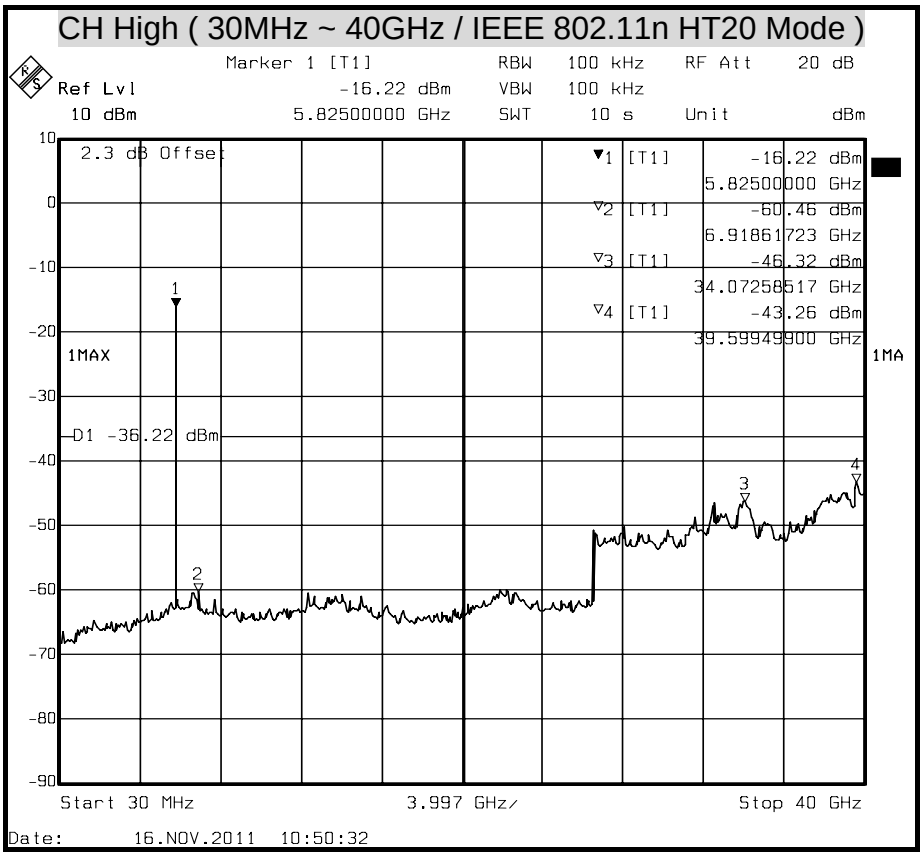
CH Low (30MHz ~ 40GHz / IEEE 802.11n HT20 Mode)



CH Middle (30MHz ~ 40GHz / IEEE 802.11n HT20 Mode)

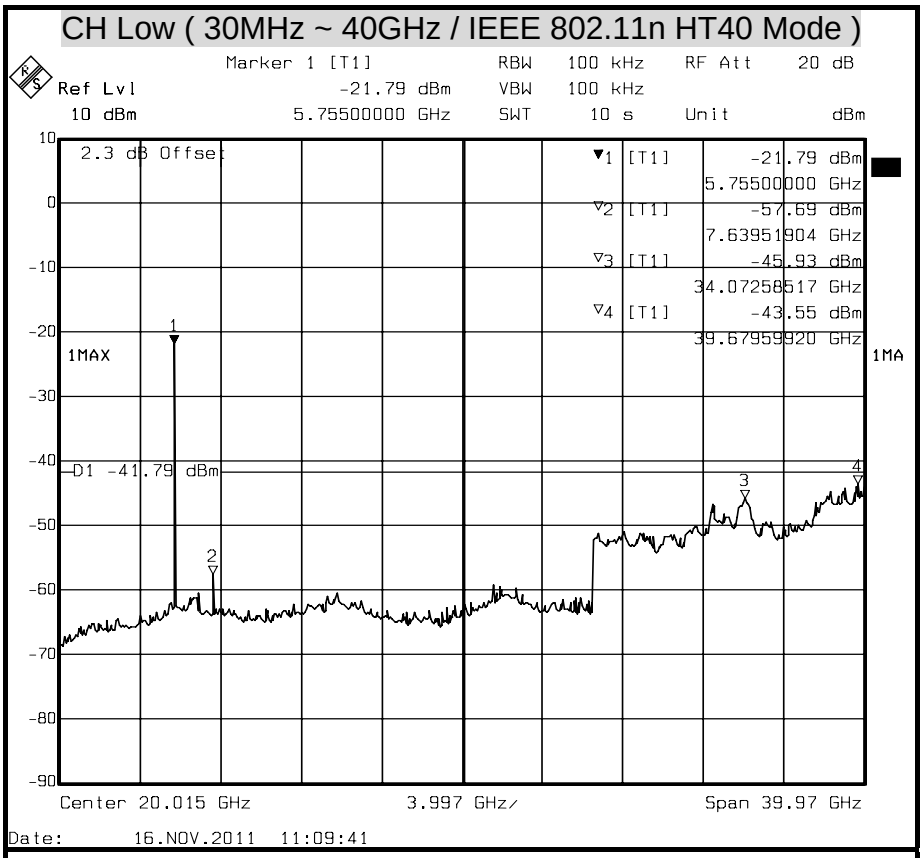


CH High (30MHz ~ 40GHz / IEEE 802.11n HT20 Mode)



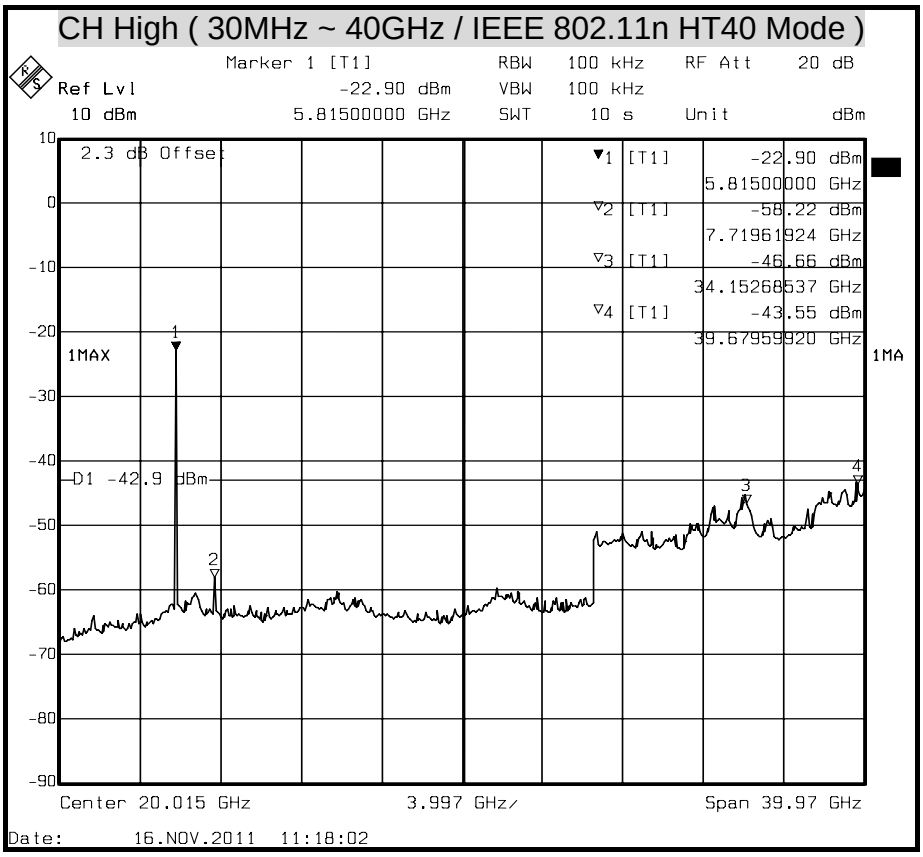
(IEEE 802.11n HT40 Mode / Chain 0)

CH Low (30MHz ~ 40GHz / IEEE 802.11n HT40 Mode)



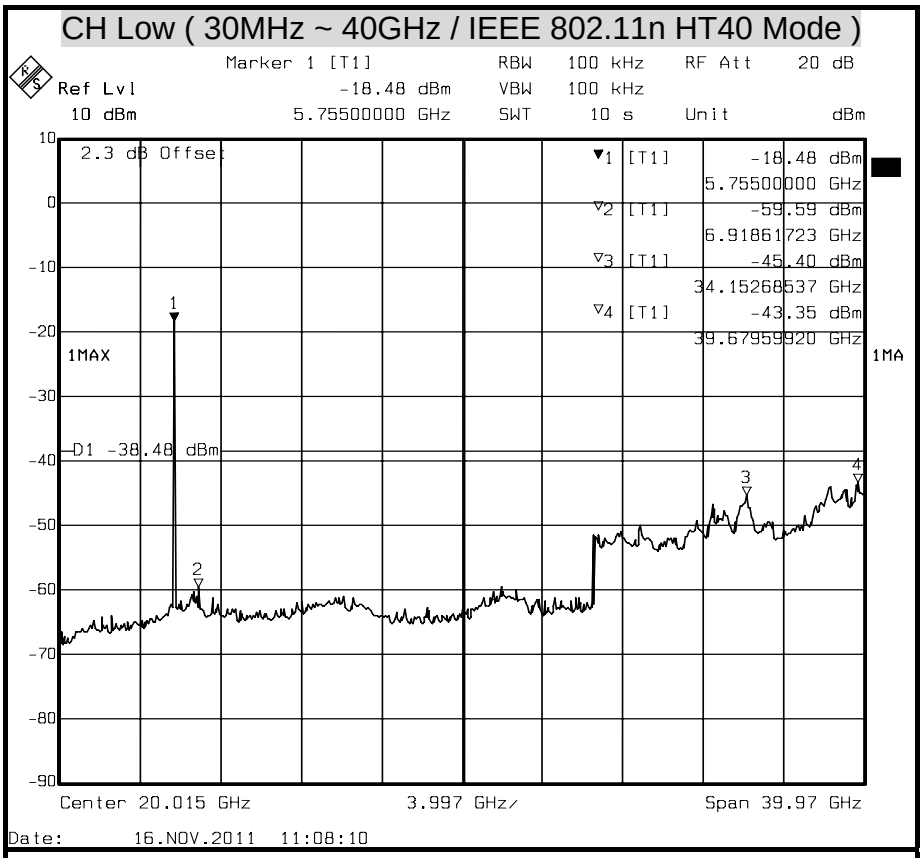
CH Middle (30MHz ~ 40GHz / IEEE 802.11n HT40 Mode)

CH High (30MHz ~ 40GHz / IEEE 802.11n HT40 Mode)



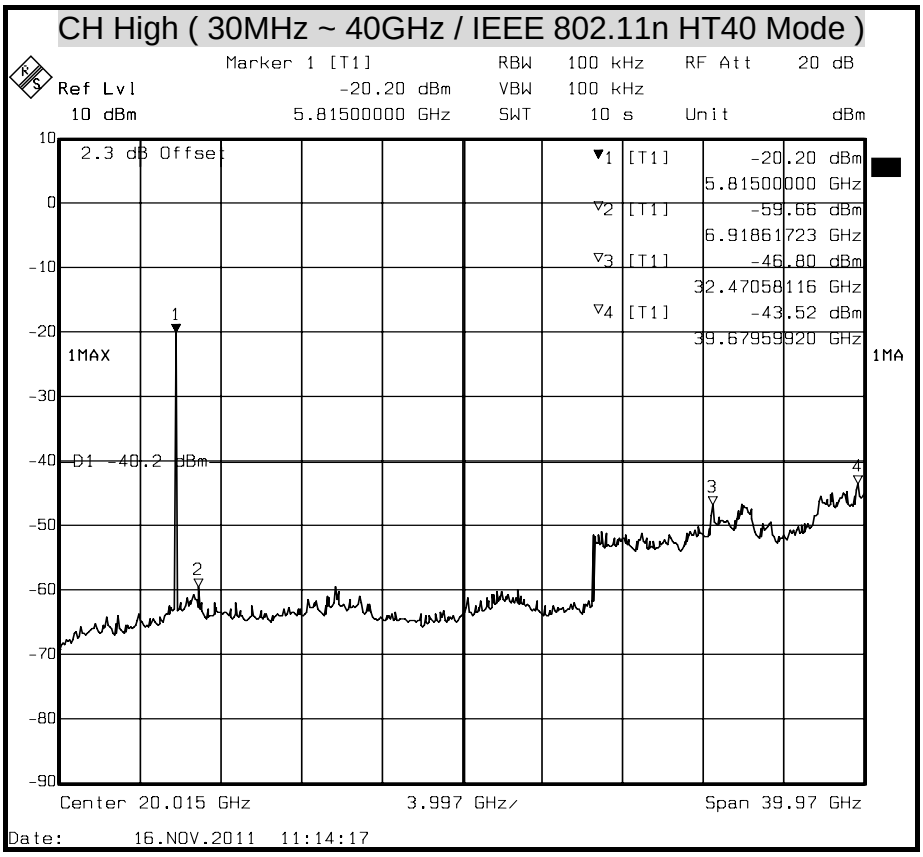
(IEEE 802.11n HT40 Mode / Chain 1)

CH Low (30MHz ~ 40GHz / IEEE 802.11n HT40 Mode)



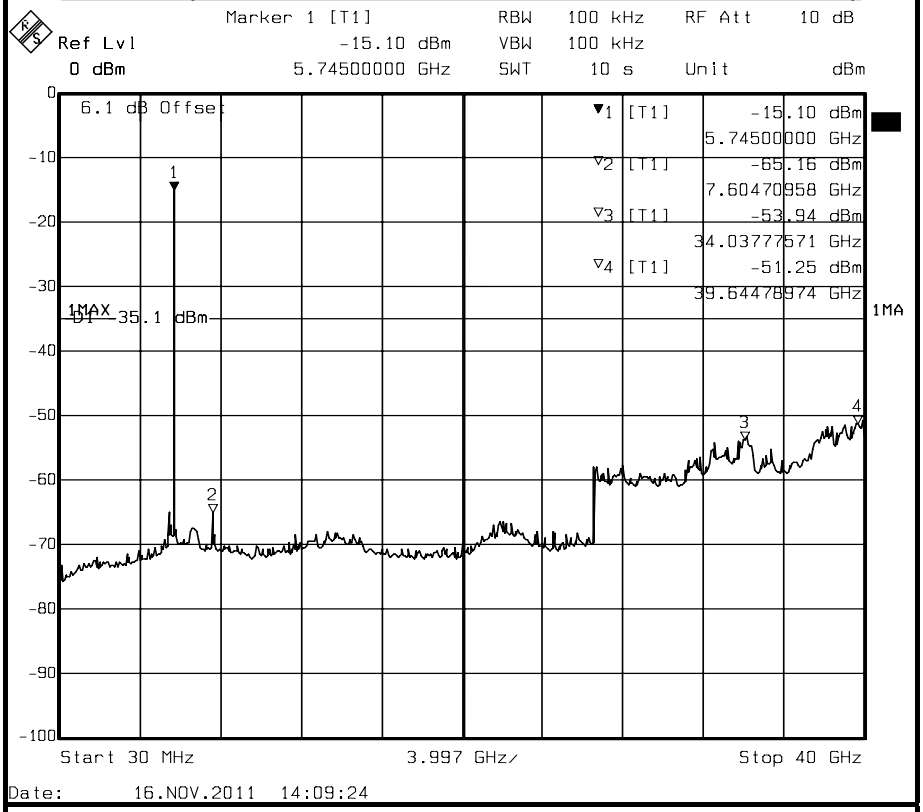
CH Middle (30MHz ~ 40GHz / IEEE 802.11n HT40 Mode)

CH High (30MHz ~ 40GHz / IEEE 802.11n HT40 Mode)

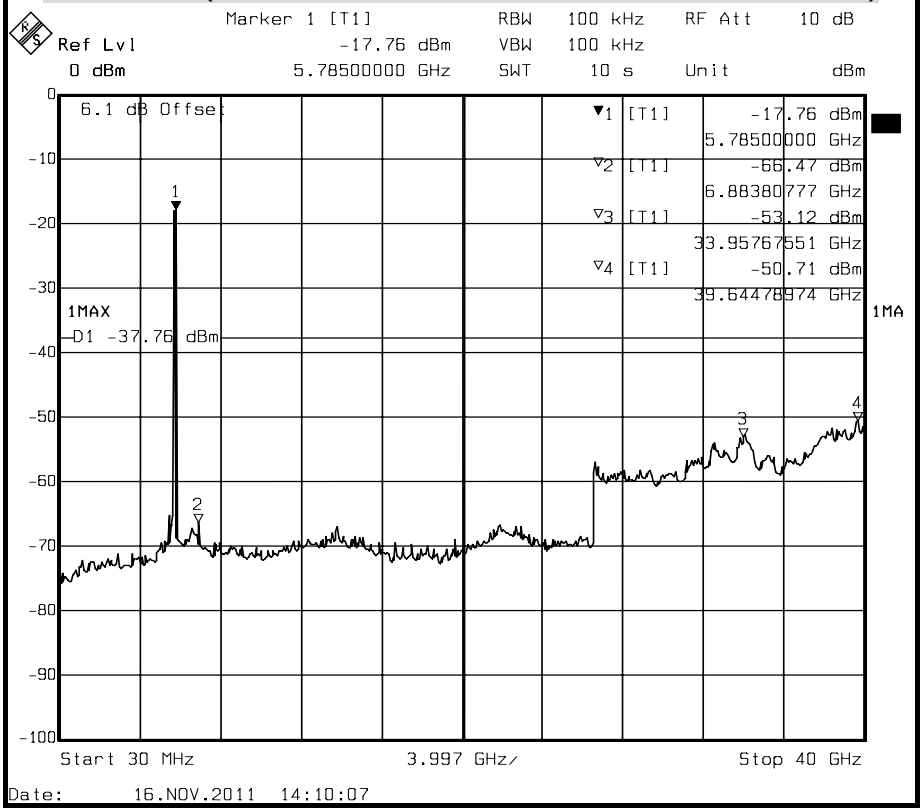


(IEEE 802.11n HT20 Combined Mode)

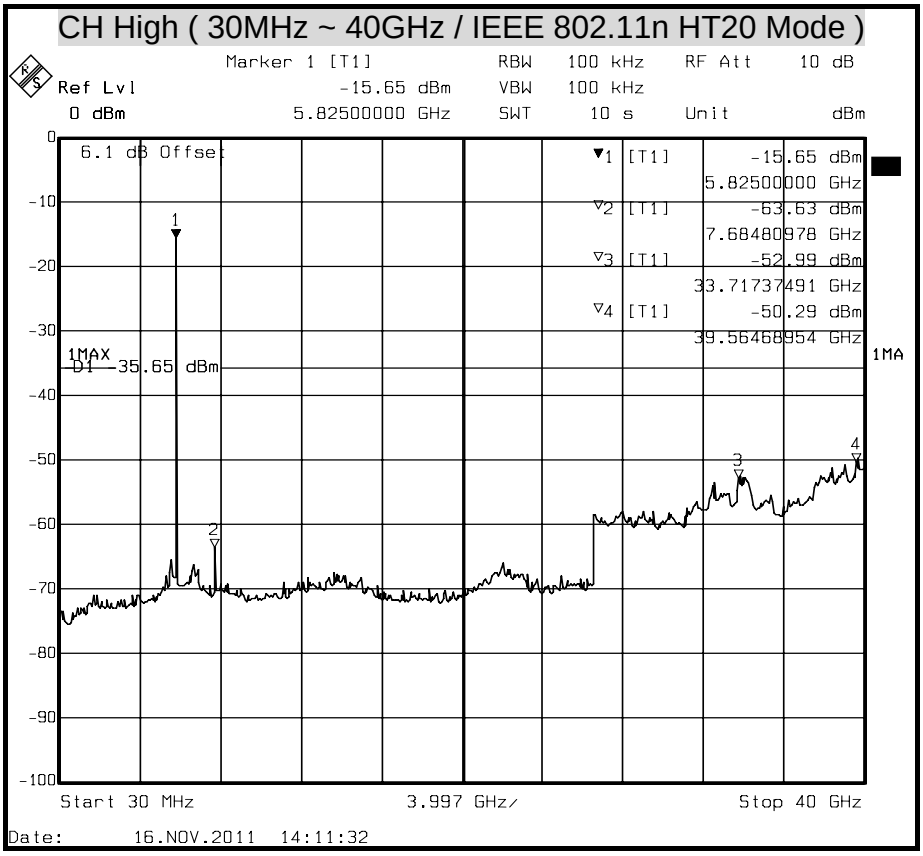
CH Low (30MHz ~ 40GHz / IEEE 802.11n HT20 Mode)



CH Middle (30MHz ~ 40GHz / IEEE 802.11n HT20 Mode)

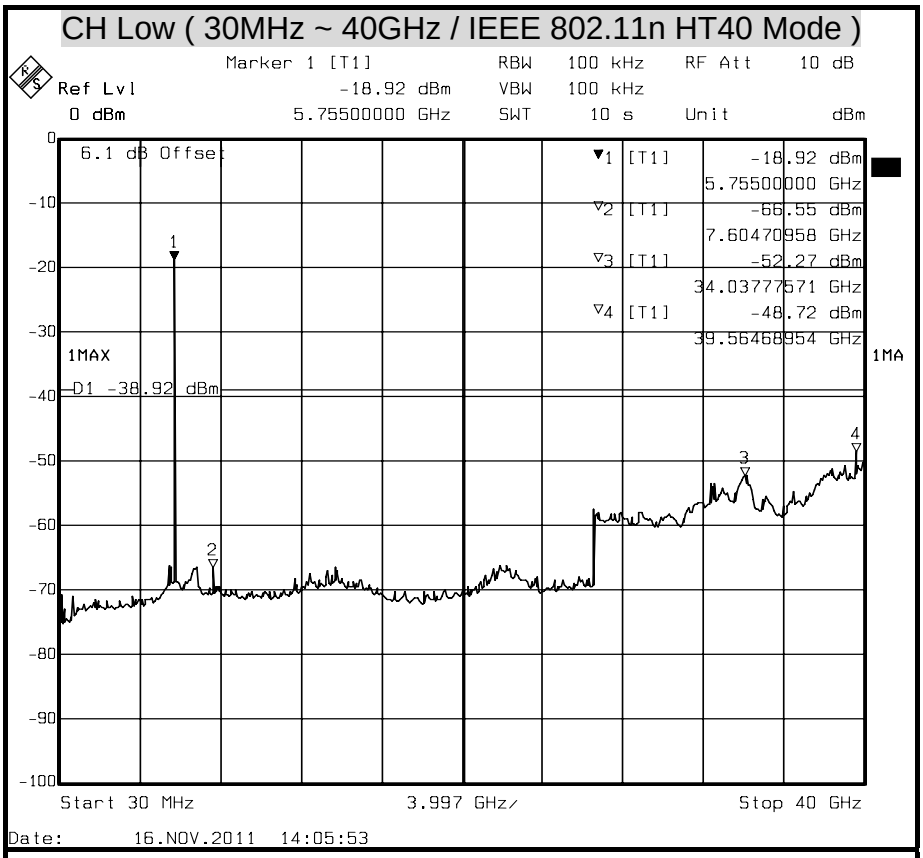


CH High (30MHz ~ 40GHz / IEEE 802.11n HT20 Mode)

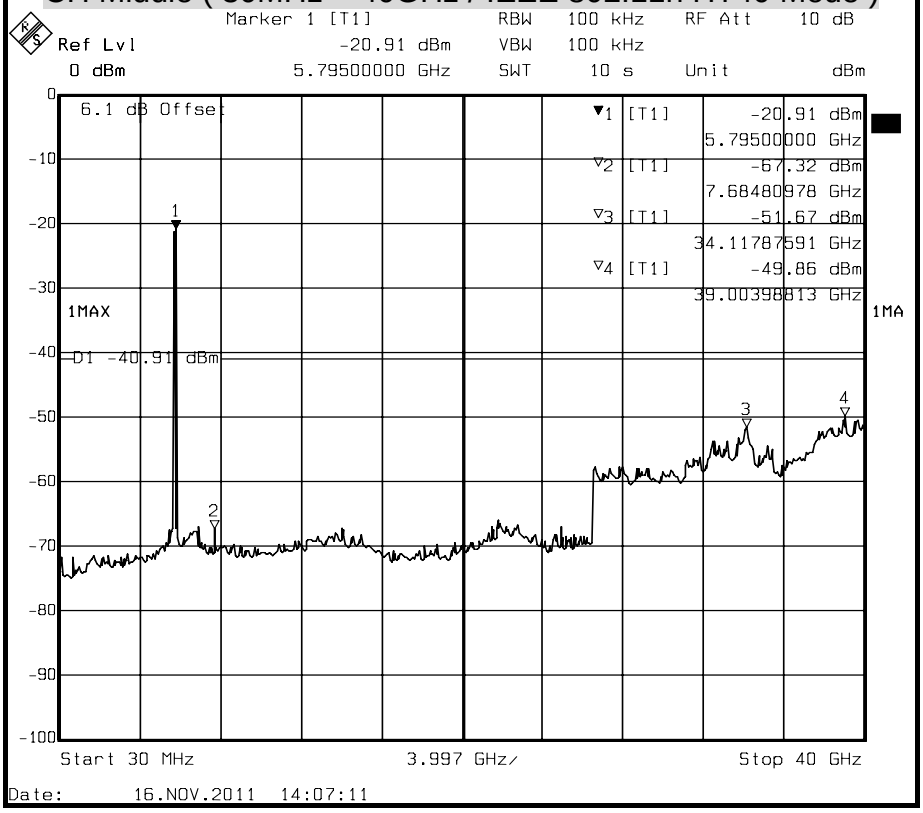


(IEEE 802.11n HT40 Combined Mode)

CH Low (30MHz ~ 40GHz / IEEE 802.11n HT40 Mode)



CH Middle (30MHz ~ 40GHz / IEEE 802.11n HT40 Mode)



CH High (30MHz ~ 40GHz / IEEE 802.11n HT40 Mode)