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

For

3T3R Wireless-N Dual Band Gigabit Router

Model : N450R

Data Applies To: N450R Series , N450R-FCC , Hotspot Series , Hotspot-450 , Hotspot-300

Trade Name : Air Live

Issued for

OvisLink Corp.

5F , No.6, Lane 130 , Min-Chuan Rd., Hsin-Tien Dist., New Taipei City 231 , Taiwan

Issued by

Compliance Certification Services Inc.
Tainan Lab.
No.8,Jiucengling, Xinhua Dist., Tainan City 712, Taiwan (R.O.C.)
TEL: 886-6-580-2201
FAX: 886-6-580-2202

Issued Date: January 10, 2012

Testing Laboratory
1109

Revision History

Rev.	Issue Date	Revisions	Effect Page	Revised By
00	January 10, 2012	Initial Issue	ALL	Sunny Chang

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TITLE PAGE NO.

1. TEST REPORT CERTIFICATION

Applicant ：OvisLink Corp.

Address ：5F , No.6, Lane 130 , Min-Chuan Rd., Hsin-Tien Dist., New Taipei City 231 , Taiwan

Equipment Under Test ：3T3R Wireless-N Dual Band Gigabit Router

Model Number ：N450R

Data Applies To ：N450R Series , N450R-FCC , Hotspot Series , Hotspot-450 , Hotspot-300

Brand Name ：Air Live

Date of Test ：November 30, 2011 ~ December 31, 2011

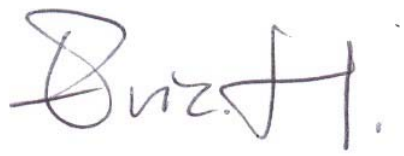
APPLICABLE STANDARD	
Standard	**Test Result**
FCC Part 15 Subpart C AND ANSI C63.4:2003	PASS

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

Approved by:

Jeter Wu
Assistant Manager

Reviewed by:



Eric Huang
Assistant Section Manager

2. EUT DESCRIPTION

Product Name	3T3R Wireless-N Dual Band Gigabit Router
Model Number	N450R
Data Applies To	N450R Series , N450R-FCC , Hotspot Series , Hotspot-450 , Hotspot-300
Brand Name	Air Live
Identify Number	T120109N03
Received Date	January 09, 2012
Frequency Range	IEEE 802.11b/g, 802.11n HT20 : 2412MHz～2462MHz IEEE 802.11n HT40 : 2422MHz～2452MHz IEEE 802.11a, IEEE 802.11n HT20 : 5745MHz ~ 5805MHz IEEE 802.11n HT40 : 5745MHz ~ 5805MHz
Transmit Power	IEEE 802.11b : 19.02 dBm IEEE 802.11g : 23.26 dBm IEEE 802.11n HT20 : 23.74 dBm IEEE 802.11n HT40 : 22.80 dBm IEEE 802.11a : 21.76 dBm IEEE 802.11n HT20 : 23.09 dBm IEEE 802.11n HT40 : 23.41 dBm
Channel Spacing	IEEE 802.11b/g, 802.11n HT20/HT40 : 5MHz IEEE 802.11a, 802.11n HT20 : 20MHz IEEE 802.11n HT40 : 10MHz
Channel Number	IEEE 802.11b/g, 802.11n HT20 : 11 Channels IEEE 802.11n HT40 : 7 Channels IEEE 802.11a, 802.11n HT20 : 4 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 : 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, 150, 135, 121.5, 108, 81, 54 , 40.5 , 27 , 13.5 Mbps IEEE 802.11a : 54, 48 ,36, 24, 18, 12, 9, 6 Mbps IEEE 802.11n HT20 : 195 , 175.5 , 156 , 130 , 117 , 104 , 78 , 65 , 58.5 , 52 , 39 , 26 , 19.5 , 13 , 6.5 Mbps IEEE 802.11n HT40 :450, 405, 364.5, 324, 300, 270, 243, 216, 162, 150, 135, 121.5, 108, 81, 54, 40.5, 27, 13.5 Mbps

Type of Modulation	IEEE 802.11b : 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	**Three antennas (3TX3RX)** Manufacture: WIESON TECHNOLOGIES CO., LTD. Name: SMA DUAL BAND ANTENNA Type: Dipole Antenna Model: GY121HT467-003 Gain: 2.4G: 2.28dBi (2TX2RX) 5G: 4.13dBi (3TX3RX) Connector: SMA MALE (RP)
Power Rating	12Vdc; 1.5A(Powered from Adapter)
Power Source	**Powered from adapter** Brand: CWT Model: CAP018121 Input: 100-240Vac, 47-630Hz, 0.6A Output: 12Vdc, 1.5A
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: **ODMN450R** filing to comply with Section 15.207, 15.209 and 15.247 of the FCC Part 15, Subpart C Rules.*
4. *The listed models(N450R Series , N450R-FCC , Hotspot Series , Hotspot-450 , Hotspot-300)are all the same of the original model(N450R), design, except for different models name and is just for the marketing purpose.*

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	5805

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

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

IEEE 802.11n HT40 mode

The EUT had been tested under operating condition.

There are three channels have been tested as following :

Channel	Frequency (MHz)
Low	5745
Middle	5785
High	5805

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

IEEE 802.11b, 802.11g, 802.11n HT20 mode

The EUT had been tested under operating condition.

There are three channels have been tested as following :

Channel	Frequency (MHz)
Low	2412
Middle	2437
High	2462

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

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

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

IEEE 802.11n HT40 mode

The EUT had been tested under operating condition.

There are three channels have been tested as following :

Channel	Frequency (MHz)
Low	2422
Middle	2437
High	2452

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

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

4. TEST METHODOLOGY

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

5. FACILITIES AND ACCREDITATION

5.1 FACILITIES

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

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

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

C63.4 and CISPR Publication 22.

5.2 ACCREDITATIONS

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

Taiwan	TAF

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

Canada	Industry Canada
Germany	TUV NORD
Taiwan	BSMI
USA	FCC

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

5.3 MEASUREMENT UNCERTAINTY

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

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

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

6. SETUP OF EQUIPMENT UNDER TEST

SUPPORT EQUIPMENT

For RF test

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

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

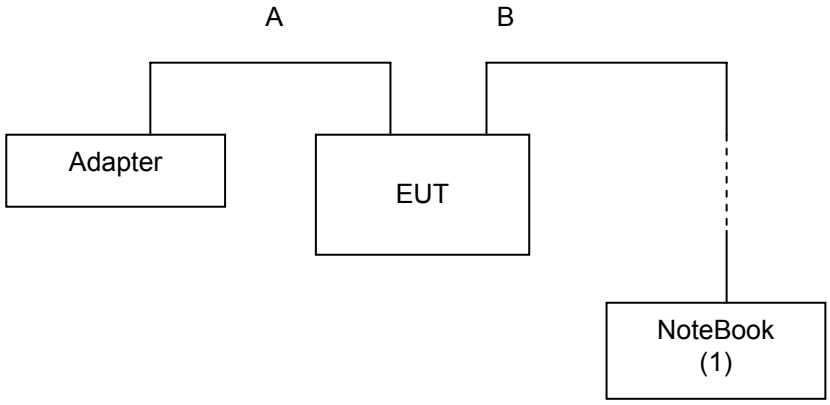
For EMI test

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

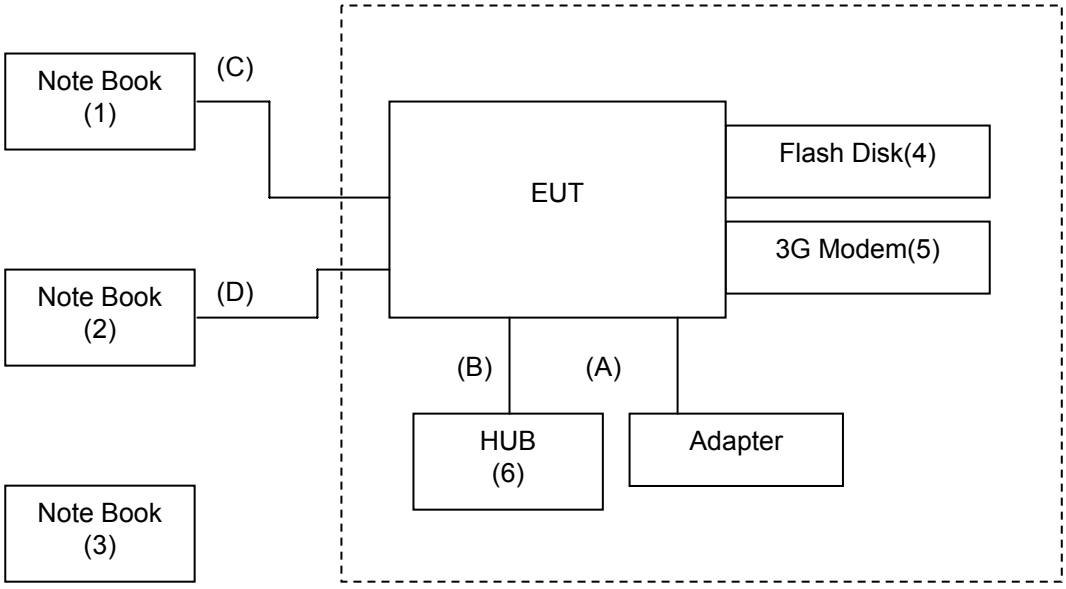
No.	Signal cable description	
A	DC Power	Unshielded, 1.6m, 1pcs
B	LAN	Unshielded, 2m, 3pcs
C	LAN	Unshielded, 10m, 1pcs
D	LAN	Unshielded, 10m, 1pcs

SETUP DIAGRAM FOR TESTS

For RF test



For EMI test



EUT OPERATING CONDITION

RF Setup (2.4G)

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

TX Mode:

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

Power control mode

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

RX Mode：

MAC Address: FFFFFFFFFFFF

Start RX

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

Normal Link Setup

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

Start test.

RF Setup (5G)

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

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

   Ralink QA Test Program for “RT3883QA” Drive

TX Mode:

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

⇨ **Tx Data Rate: 6Mbps** (IEEE 802.11a mode , TX)

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

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

Power control mode

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

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

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

RX Mode：

MAC Address: FFFFFFFFFFFF

Start RX

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

Normal Link Setup

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

Start test.

7. FCC PART 15.247 REQUIREMENTS

7.1 6dB BANDWIDTH

LIMITS

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

TEST EQUIPMENT

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

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

TEST SETUP

TEST PROCEDURE

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

TEST RESULTS

IEEE 802.11b Mode

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

IEEE 802.11g Mode

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

IEEE 802.11n HT20 Mode

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

IEEE 802.11n HT40 Mode

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

IEEE 802.11a Mode

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

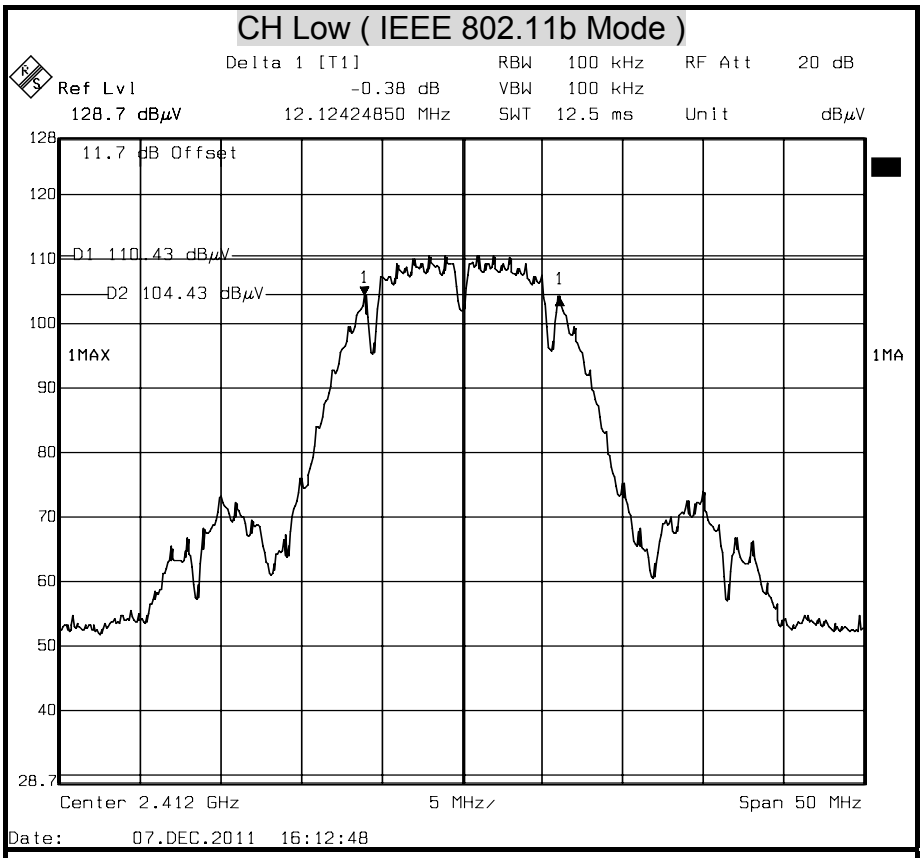
IEEE 802.11n HT20 Mode

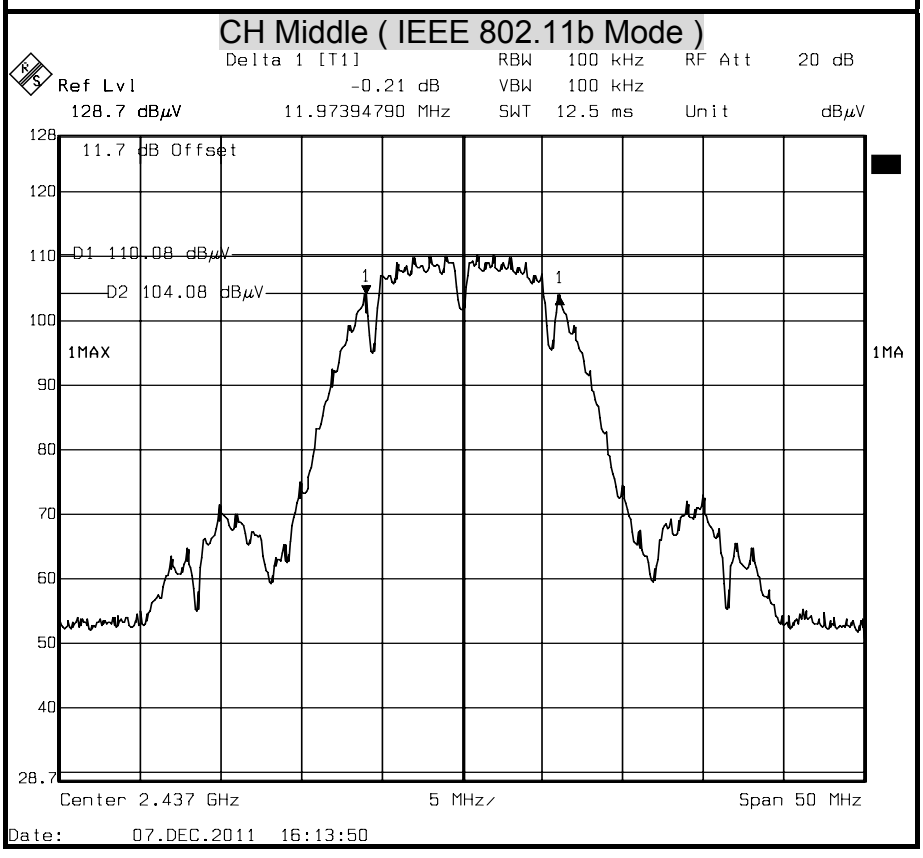
Channel	Channel Frequency (MHz)	6dB Bandwidth (kHz)			Minimum Limit (kHz)	Pass / Fail
		Chain 0	Chain1	Chain2		
Low	5745	17134	16533	16533	500	PASS
Middle	5785	17134	16533	16533	500	PASS
High	5805	17034	16834	16633	500	PASS

IEEE 802.11n HT40 Mode

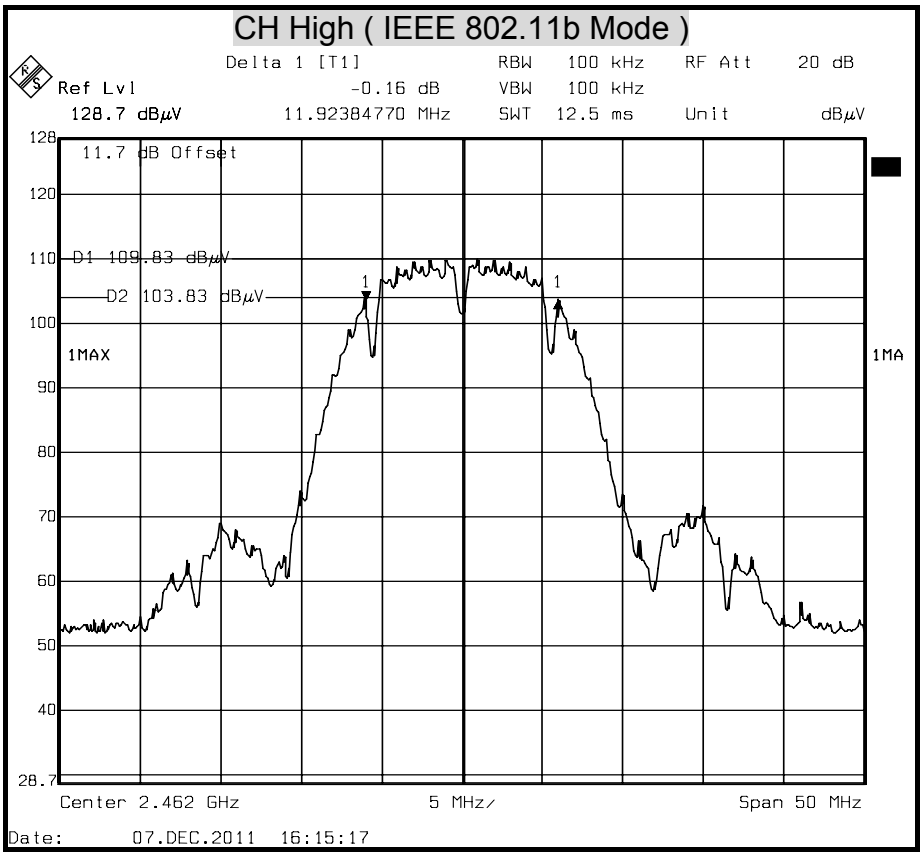
Channel	Channel Frequency (MHz)	6dB Bandwidth (kHz)			Minimum Limit (kHz)	Pass / Fail
		Chain 0	Chain1	Chain2		
Low	5745	36072	36072	36072	500	PASS
Middle	5785	36072	36072	36072	500	PASS
High	5805	36473	36072	35872	500	PASS

6dB BANDWIDTH

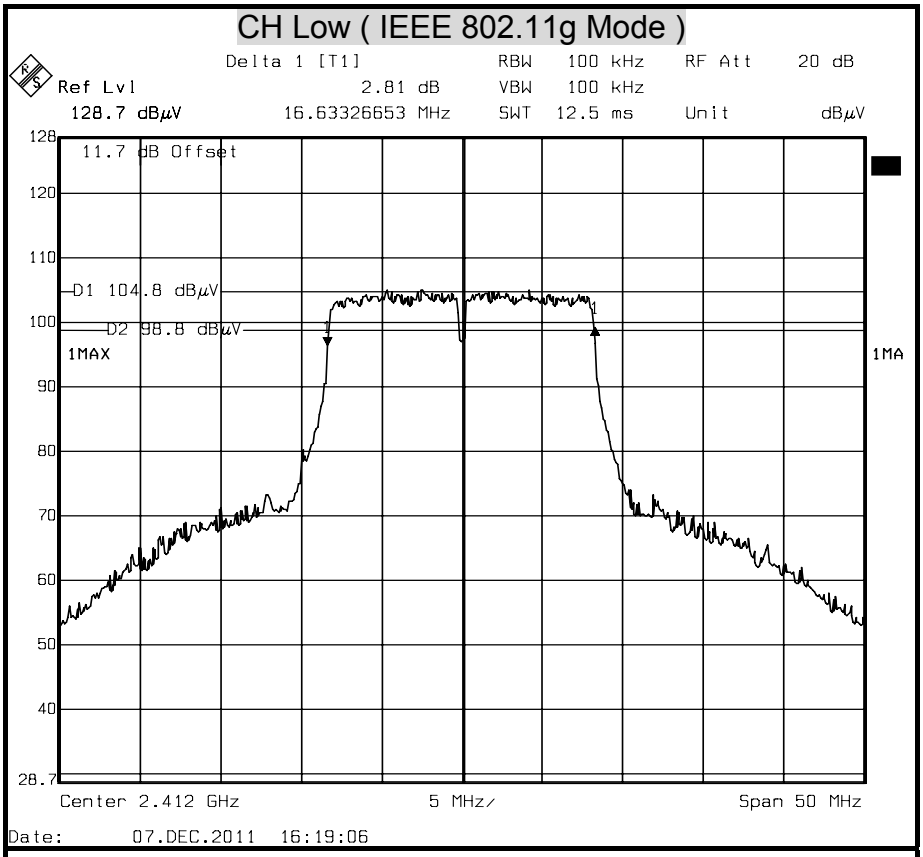




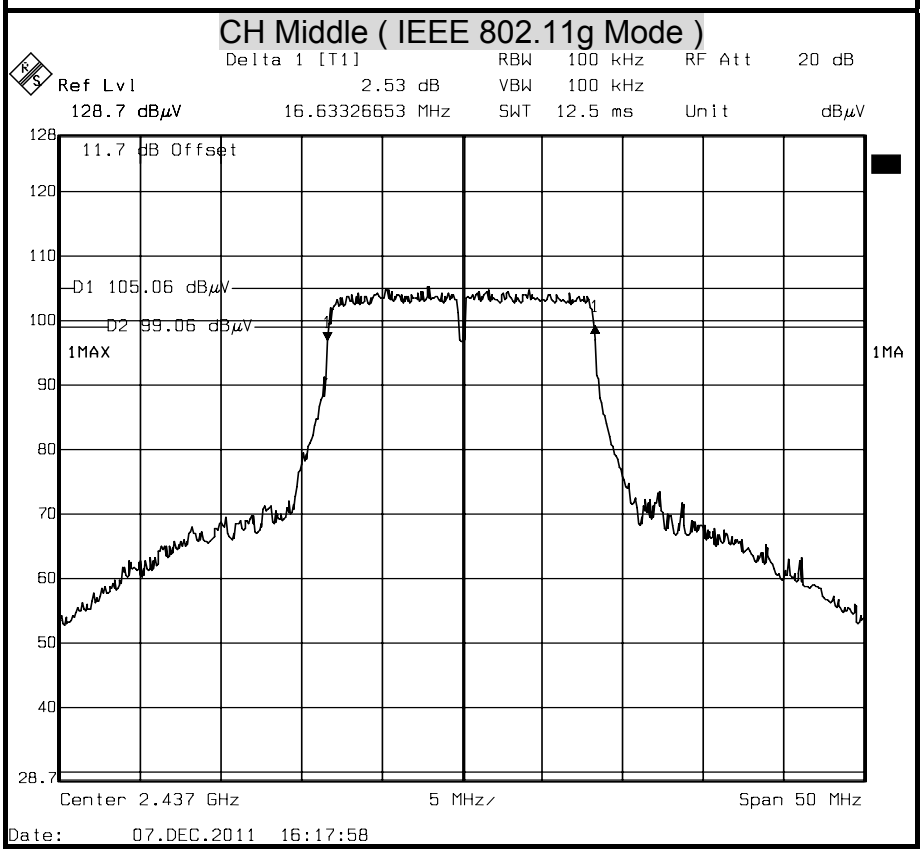
CH High (IEEE 802.11b Mode)



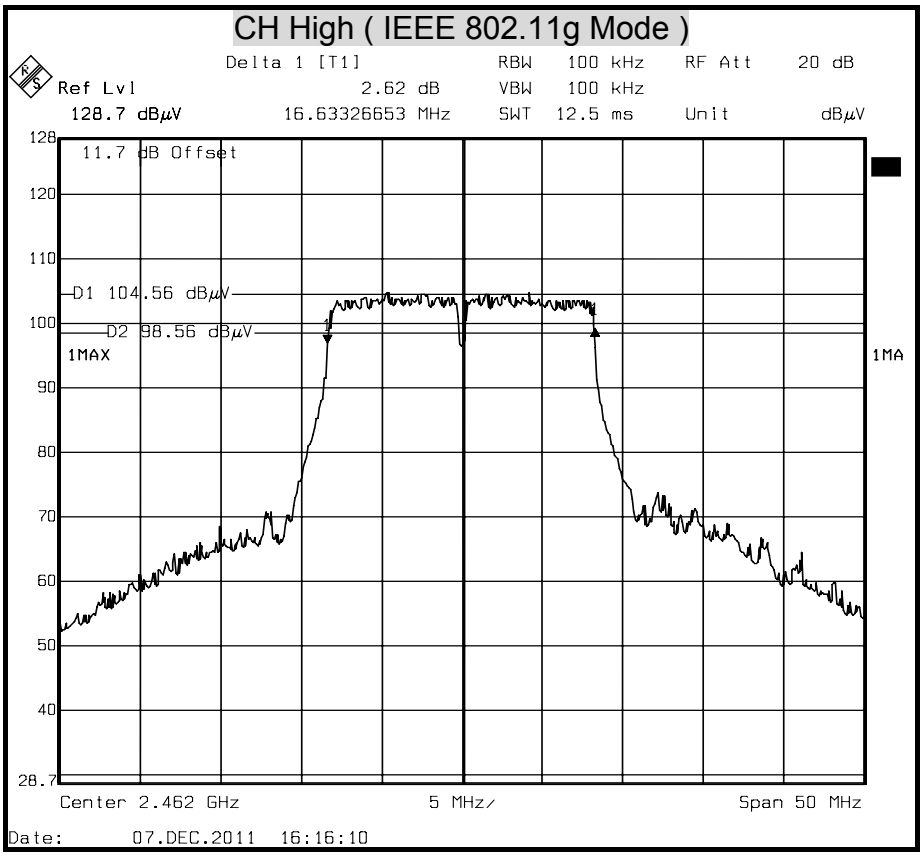
CH Low (IEEE 802.11g Mode)



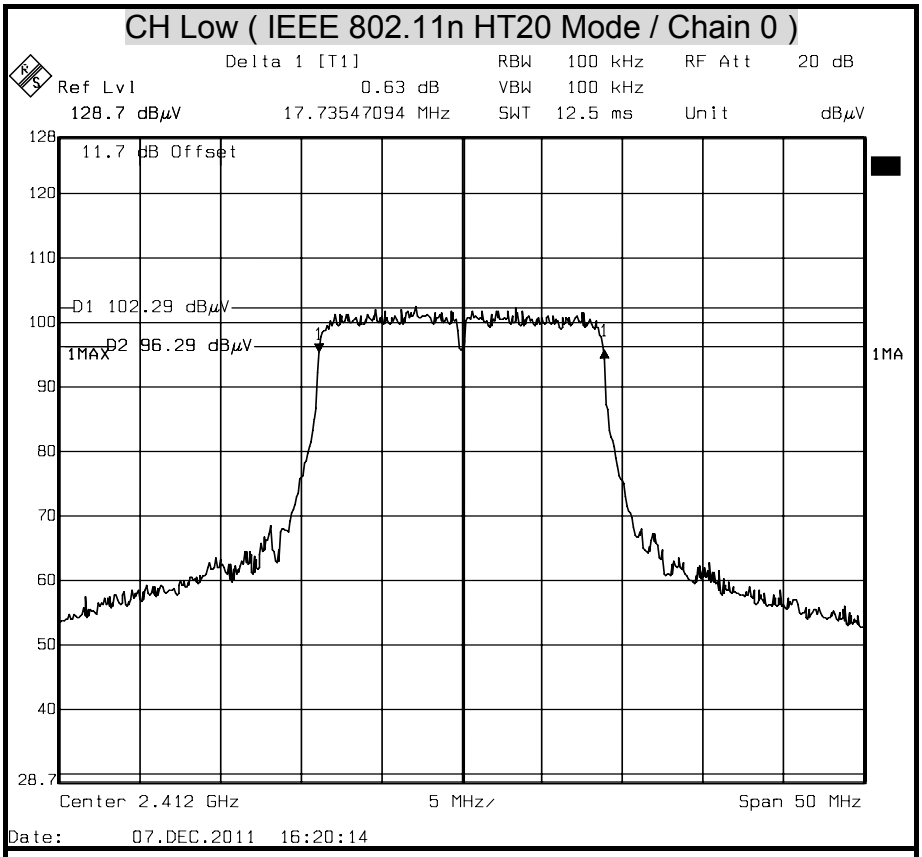
CH Middle (IEEE 802.11g Mode)



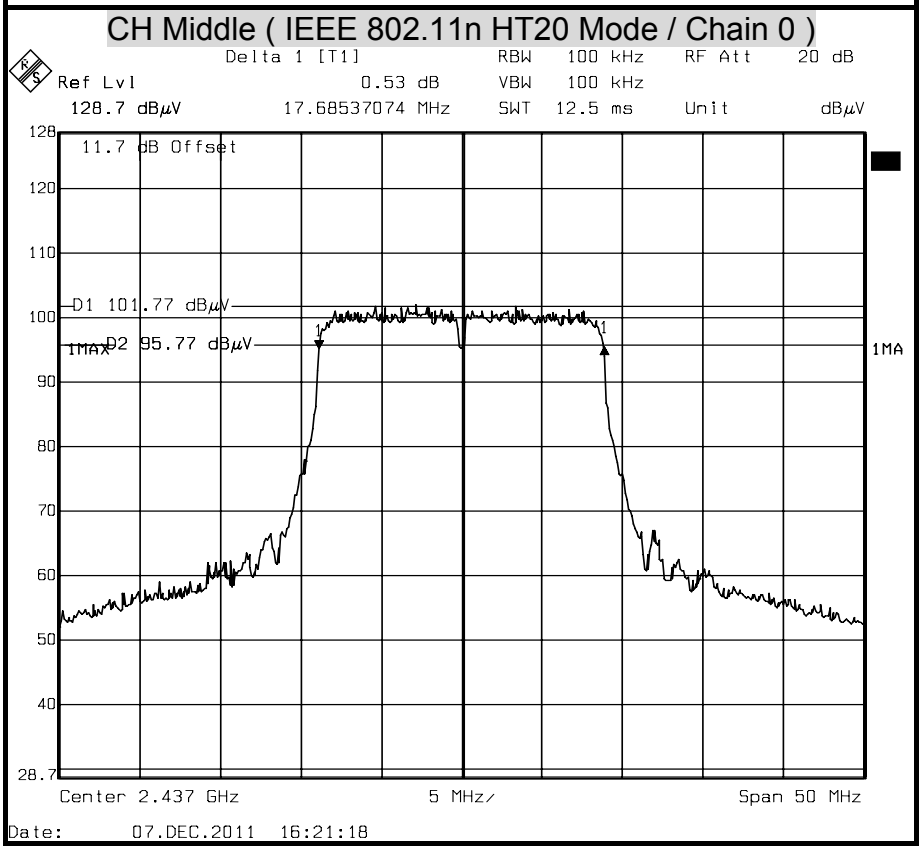
CH High (IEEE 802.11g Mode)

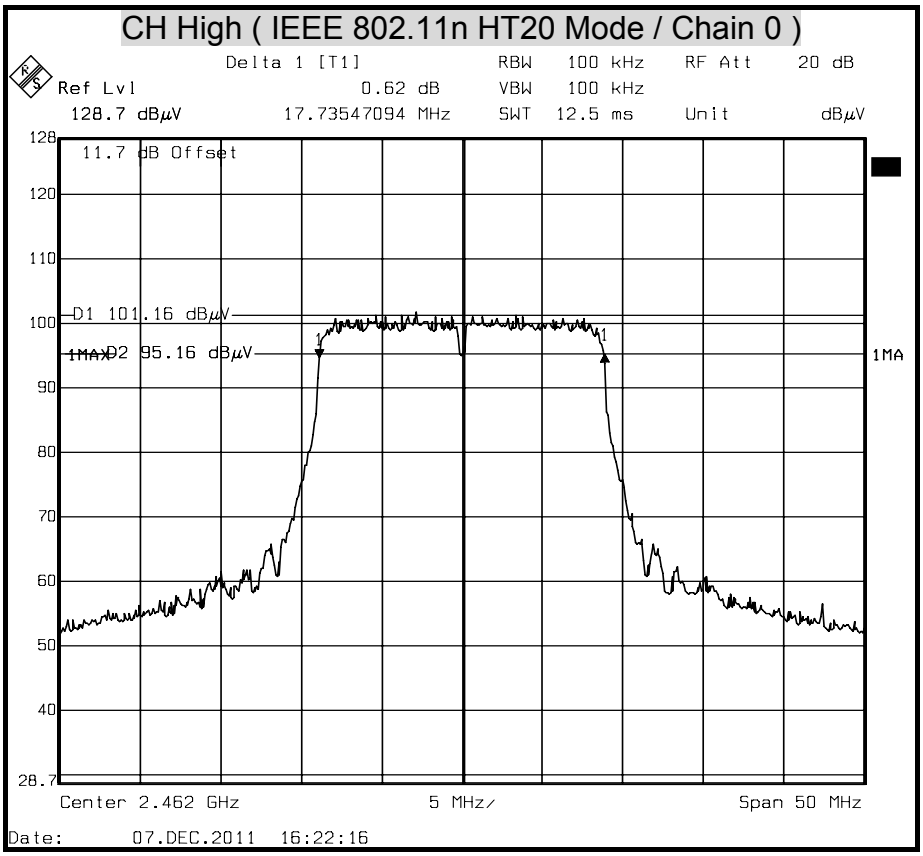


CH Low (IEEE 802.11n HT20 Mode / Chain 0)



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





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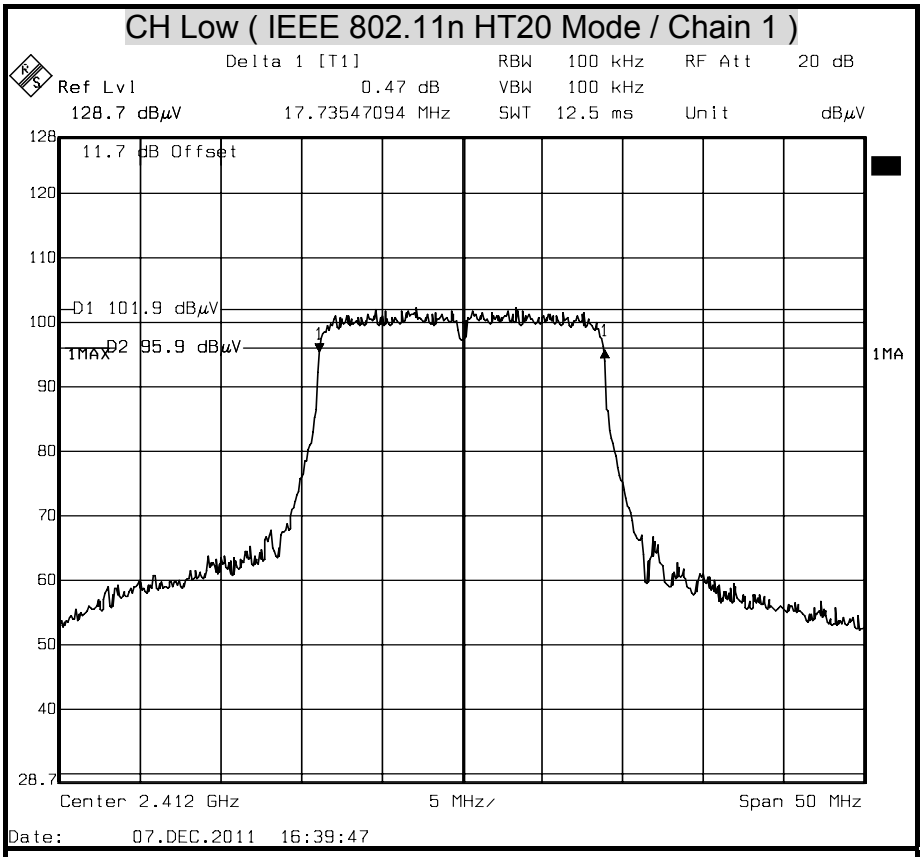
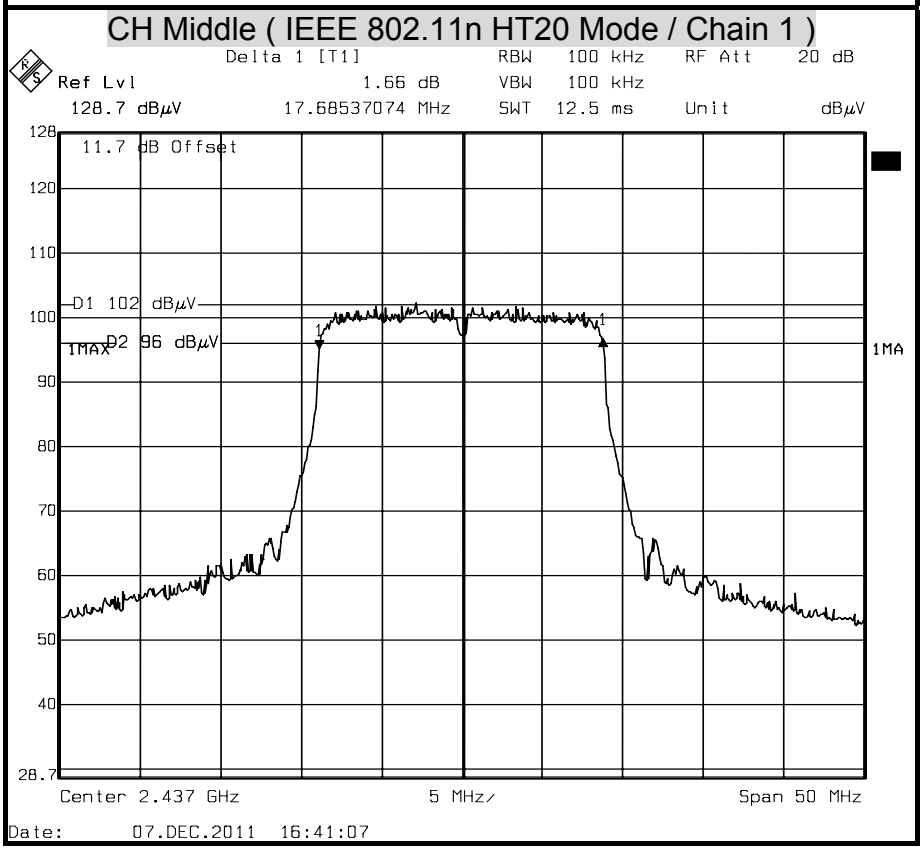


CH Middle (IEEE 802.11n HT20 Mode / Chain 1)



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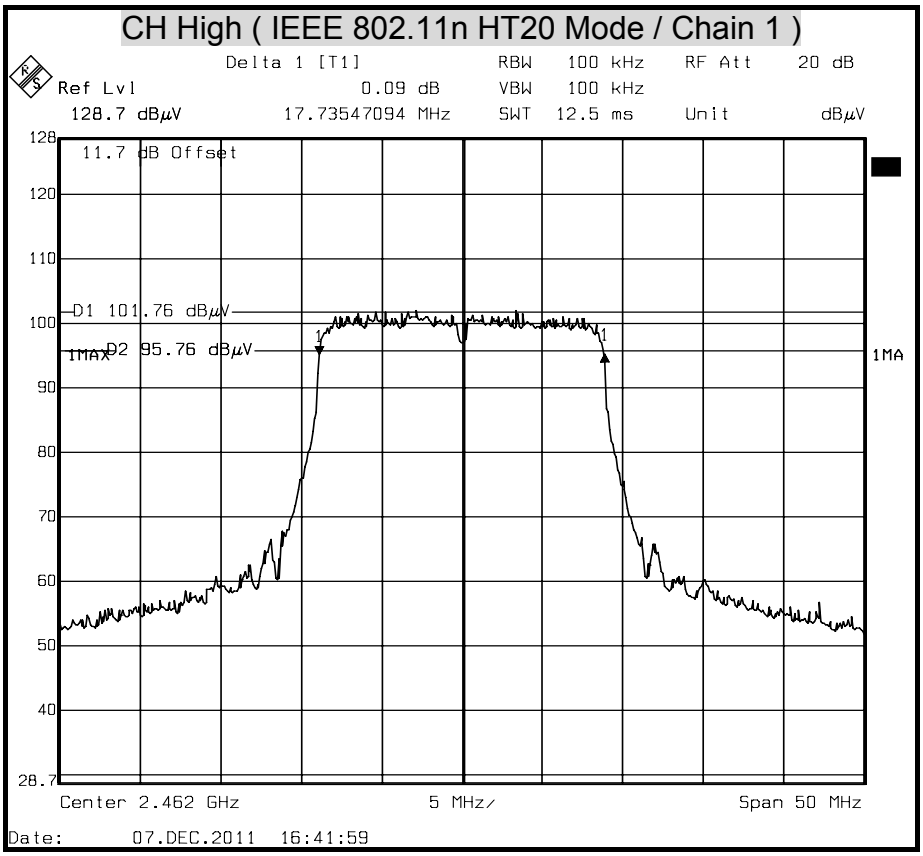
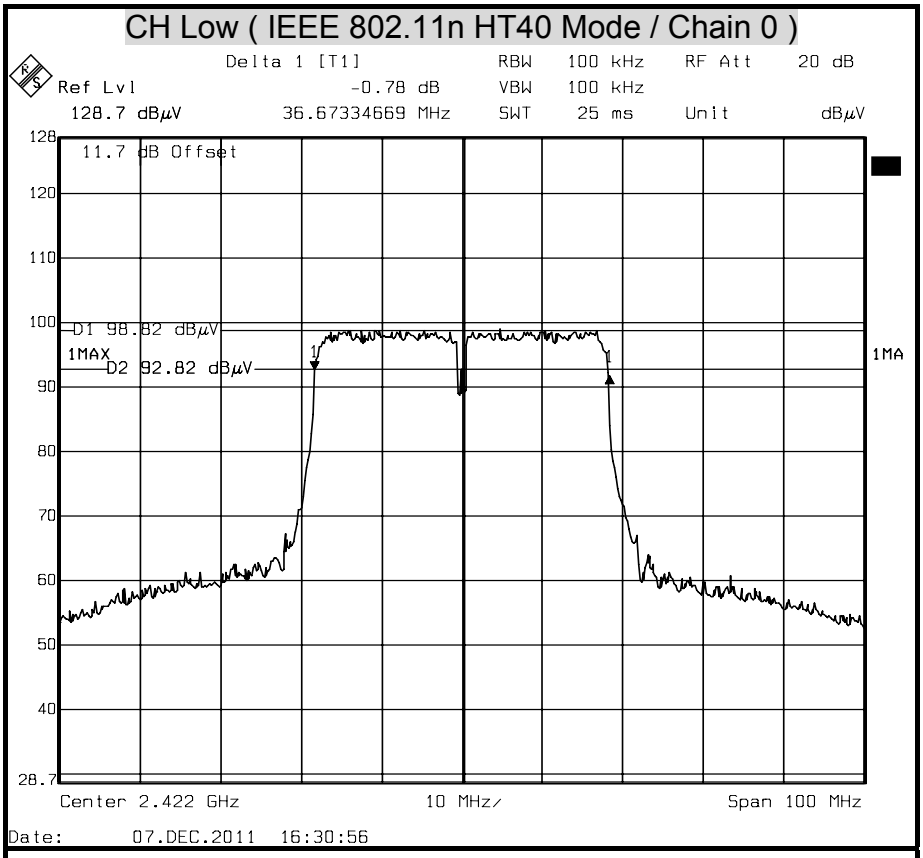
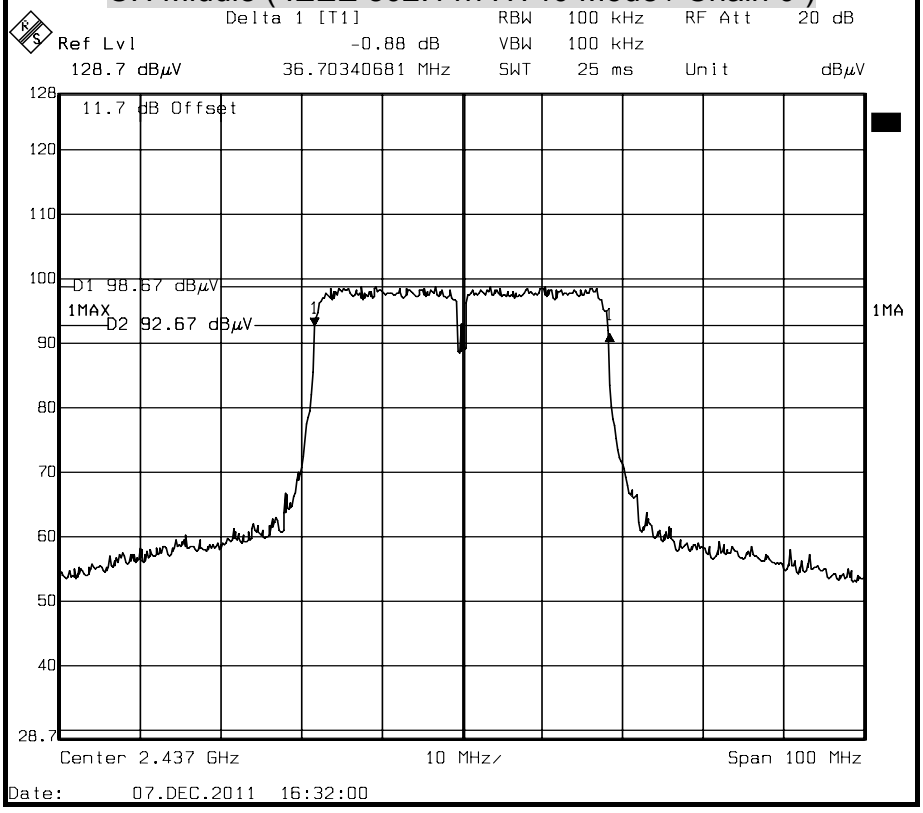
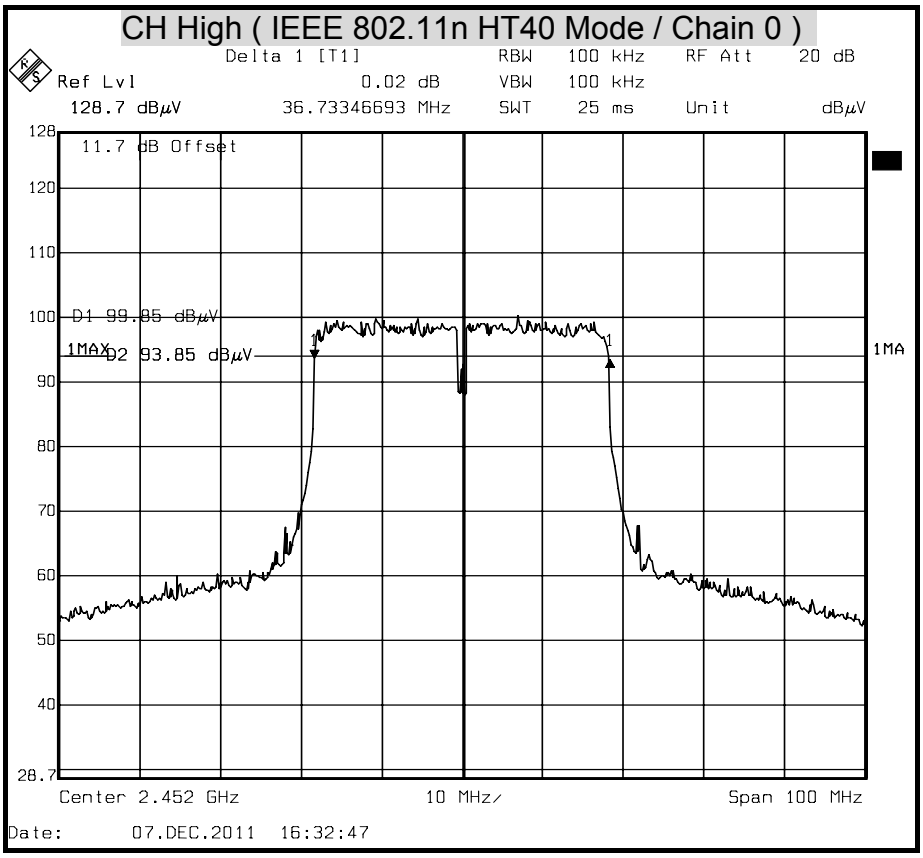


CH Low (IEEE 802.11n HT40 Mode / Chain 0)

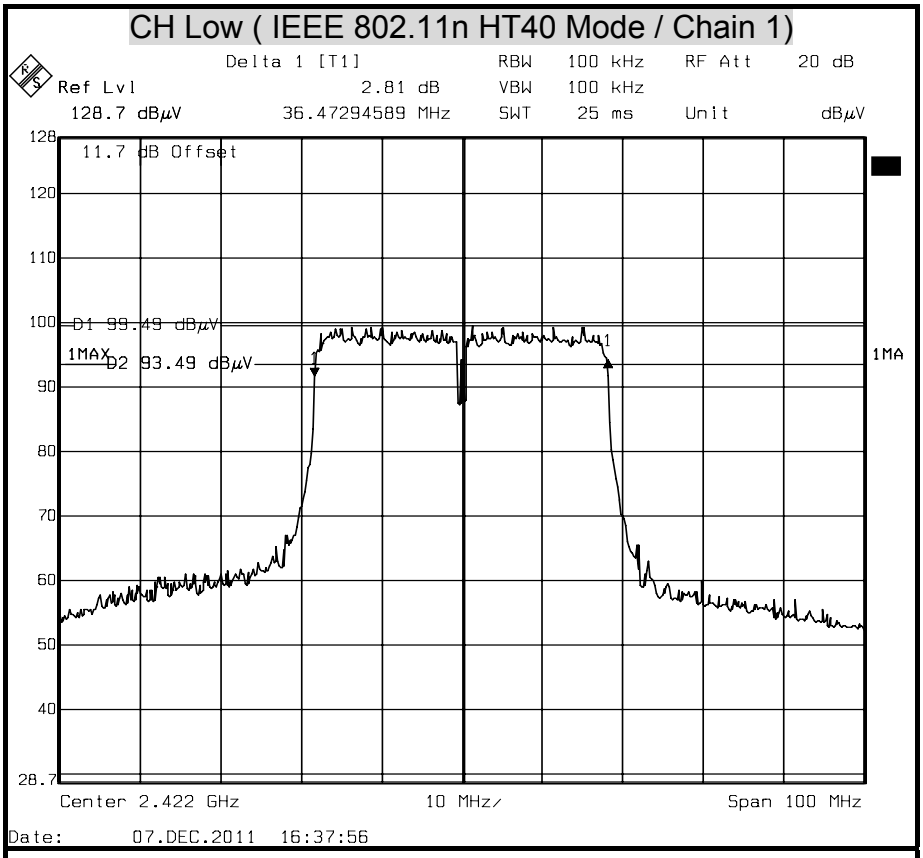


CH Middle (IEEE 802.11n HT40 Mode / Chain 0)

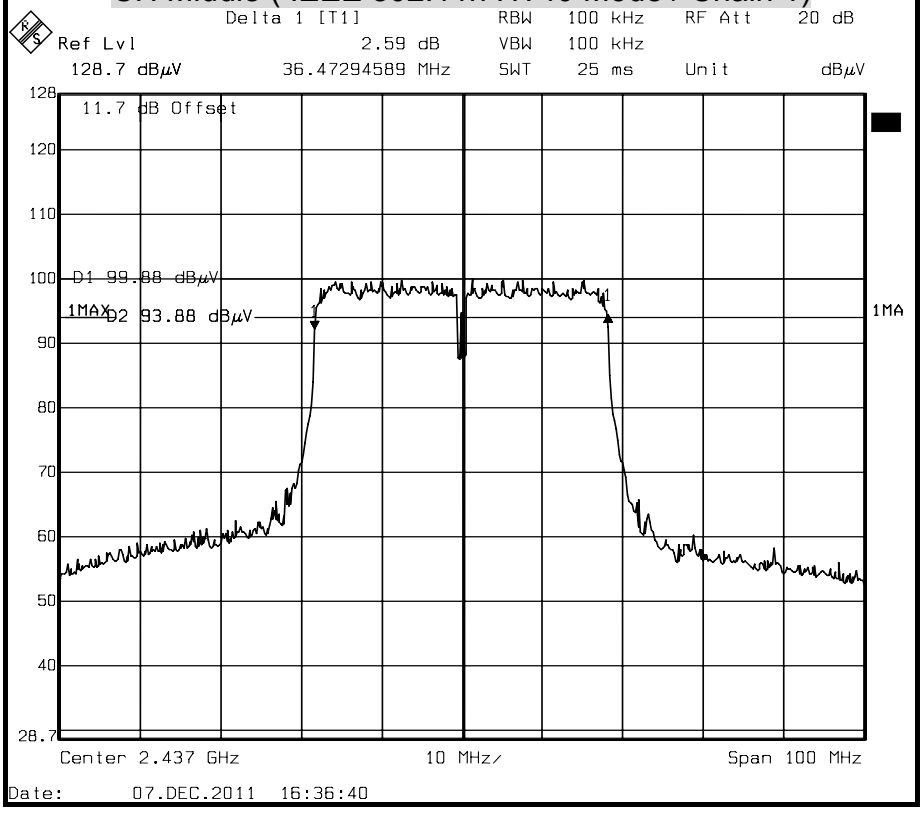




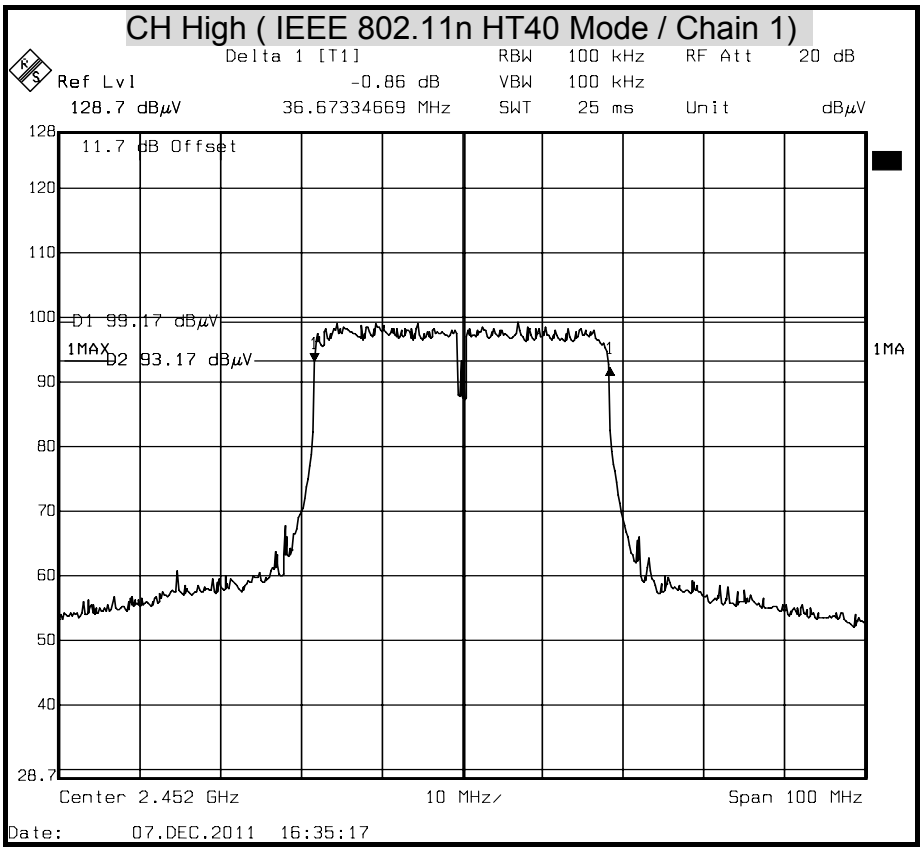
CH Low (IEEE 802.11n HT40 Mode / Chain 1)



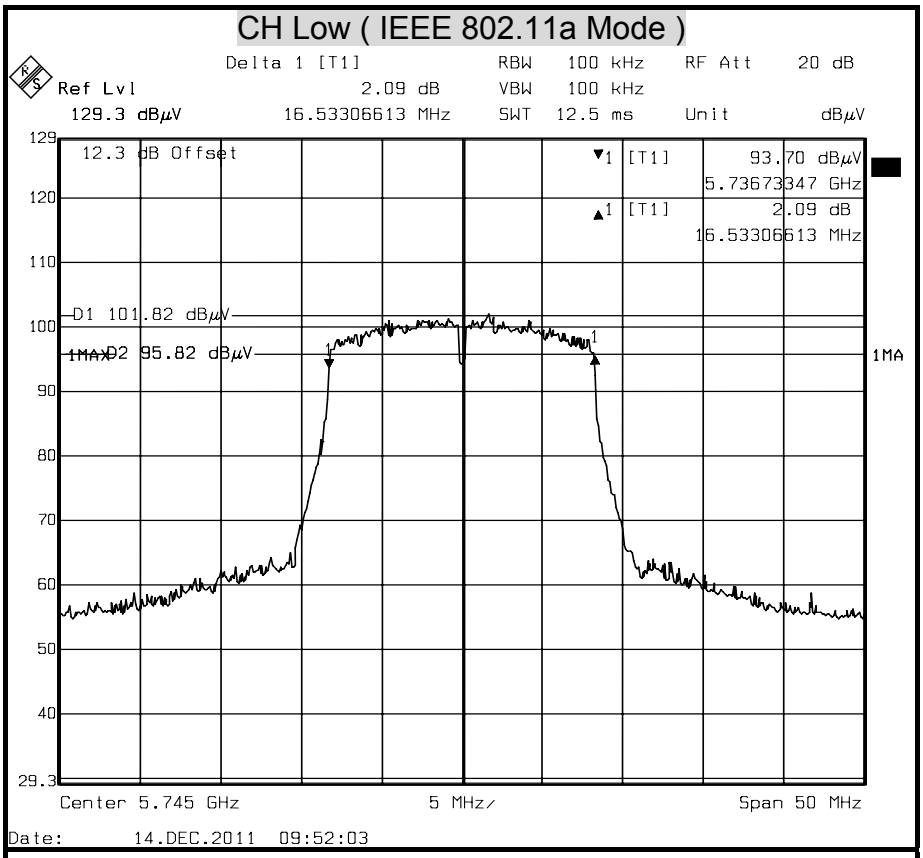
CH Middle (IEEE 802.11n HT40 Mode / Chain 1)



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



CH Low (IEEE 802.11a Mode)



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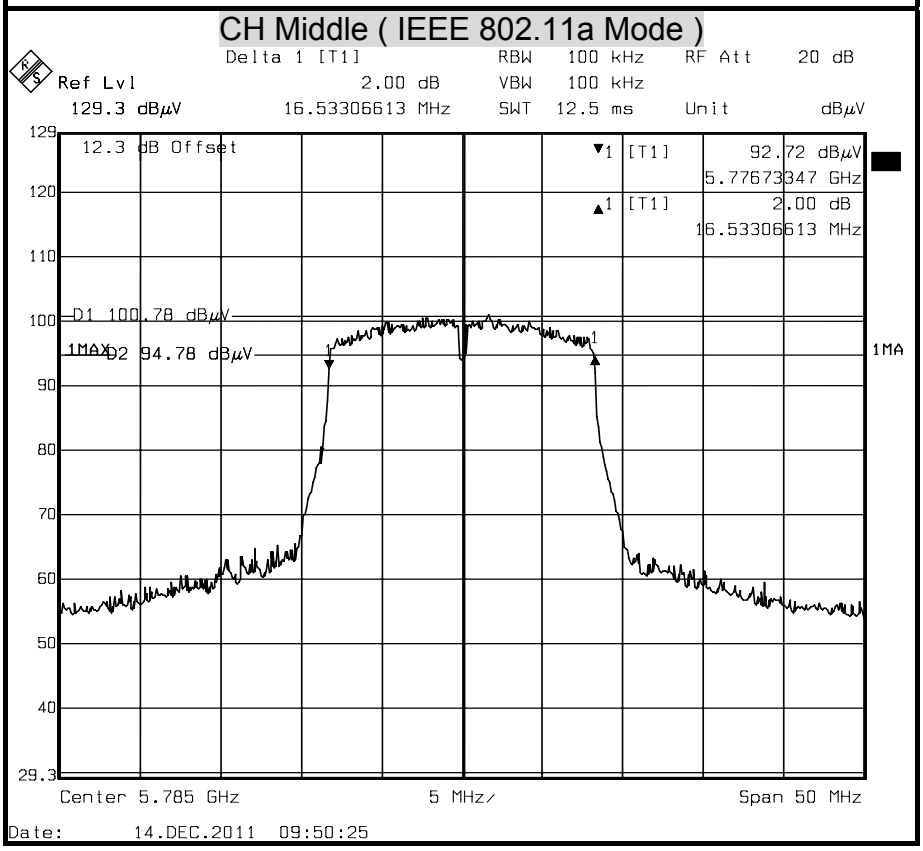
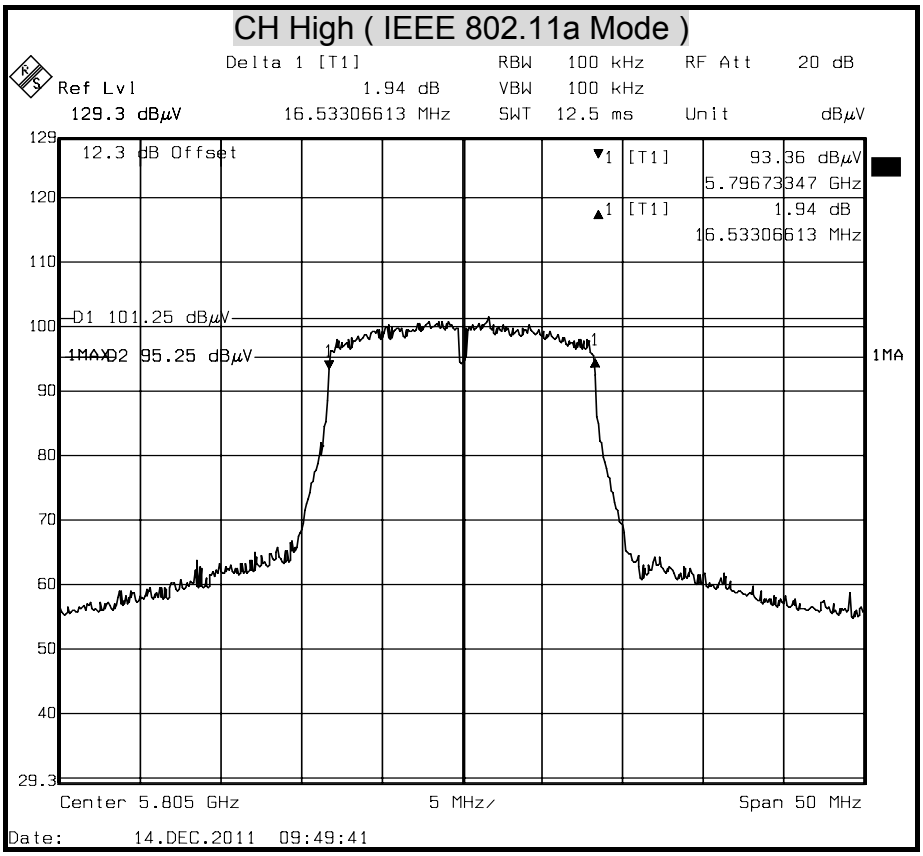


CH High (IEEE 802.11a Mode)



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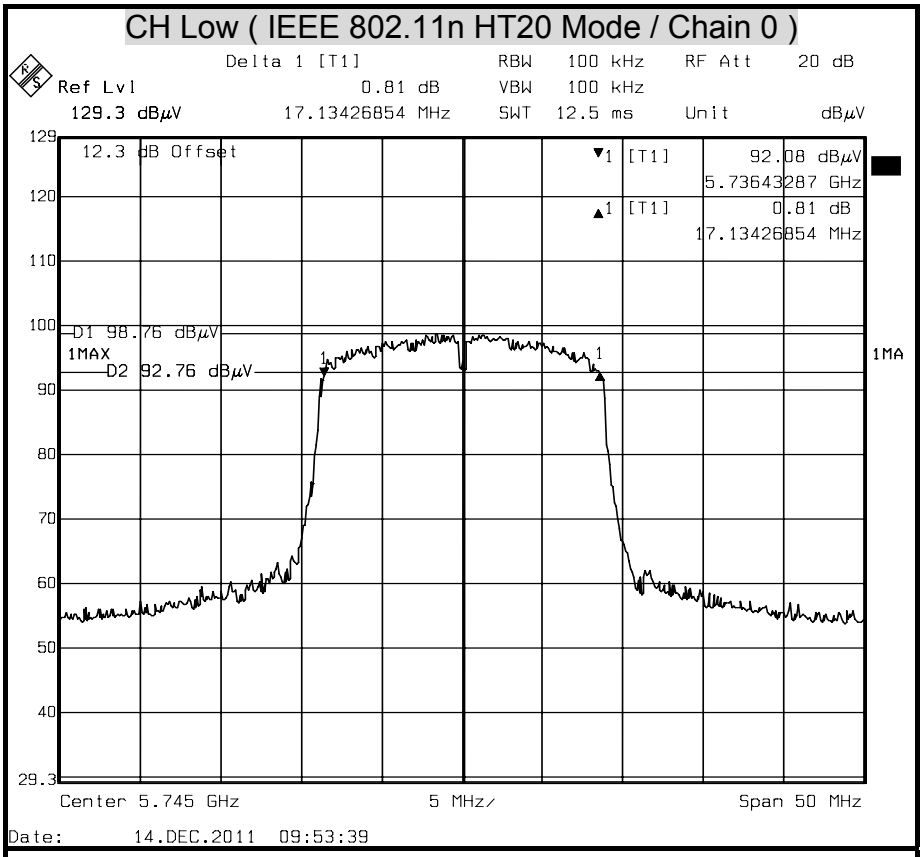

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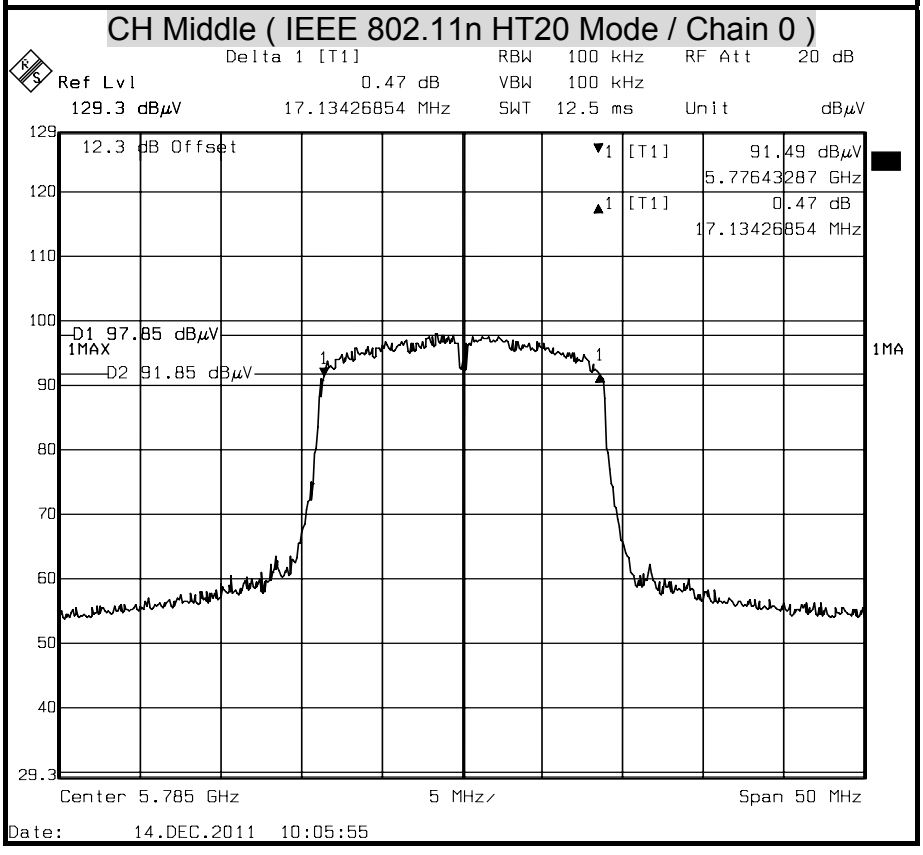

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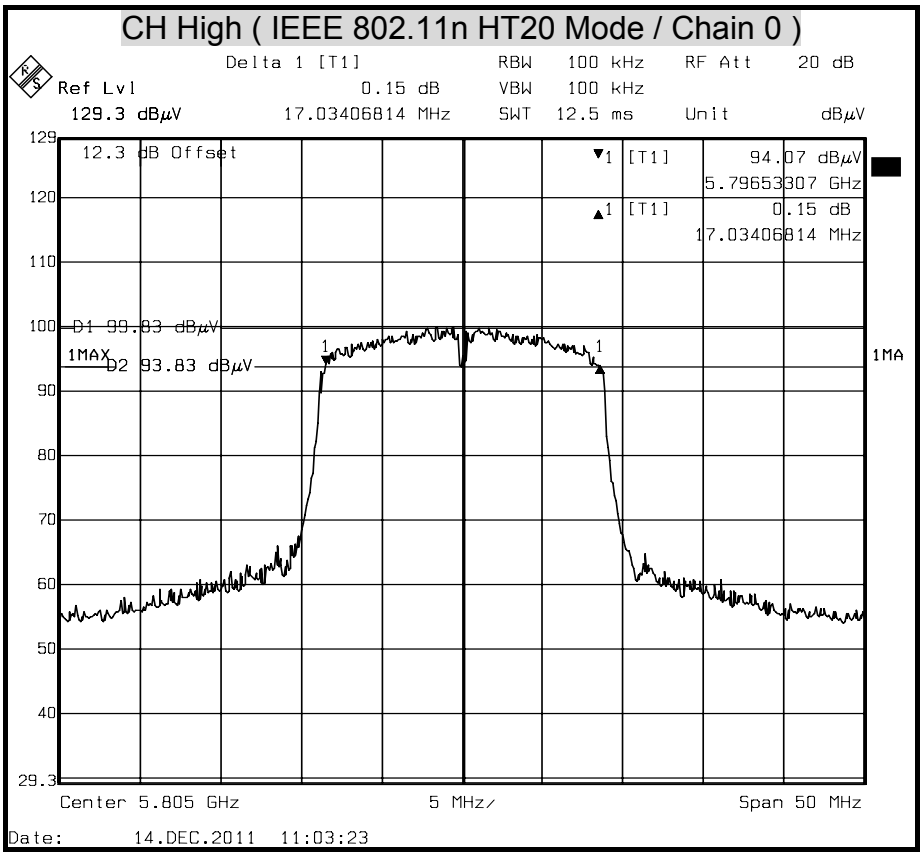

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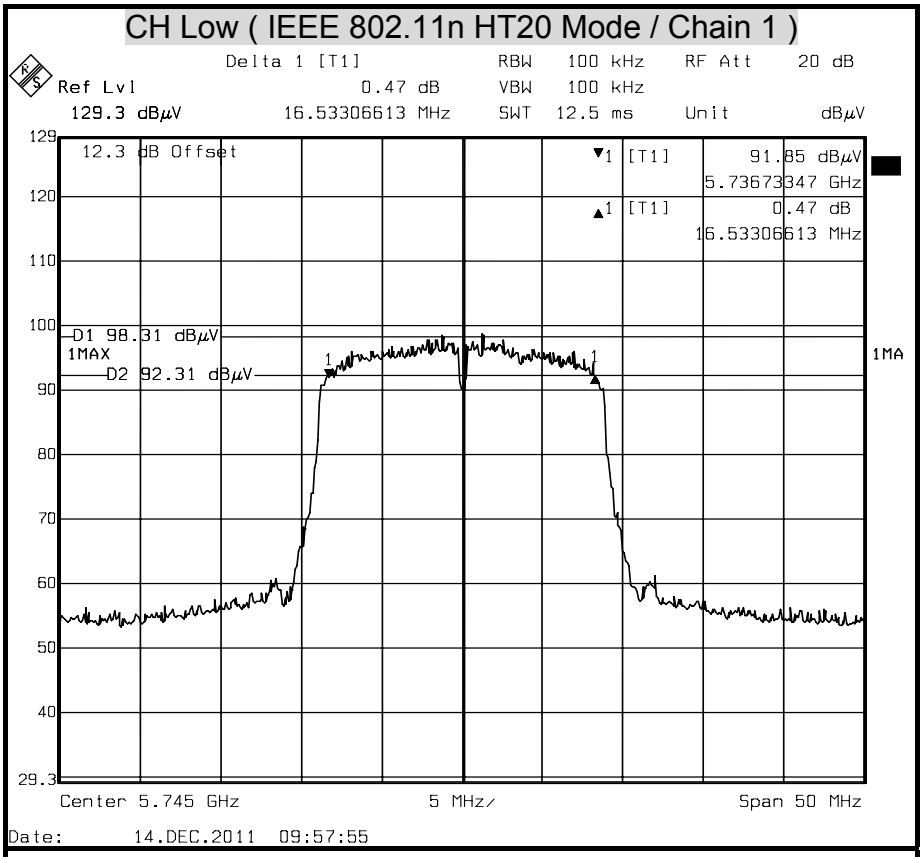

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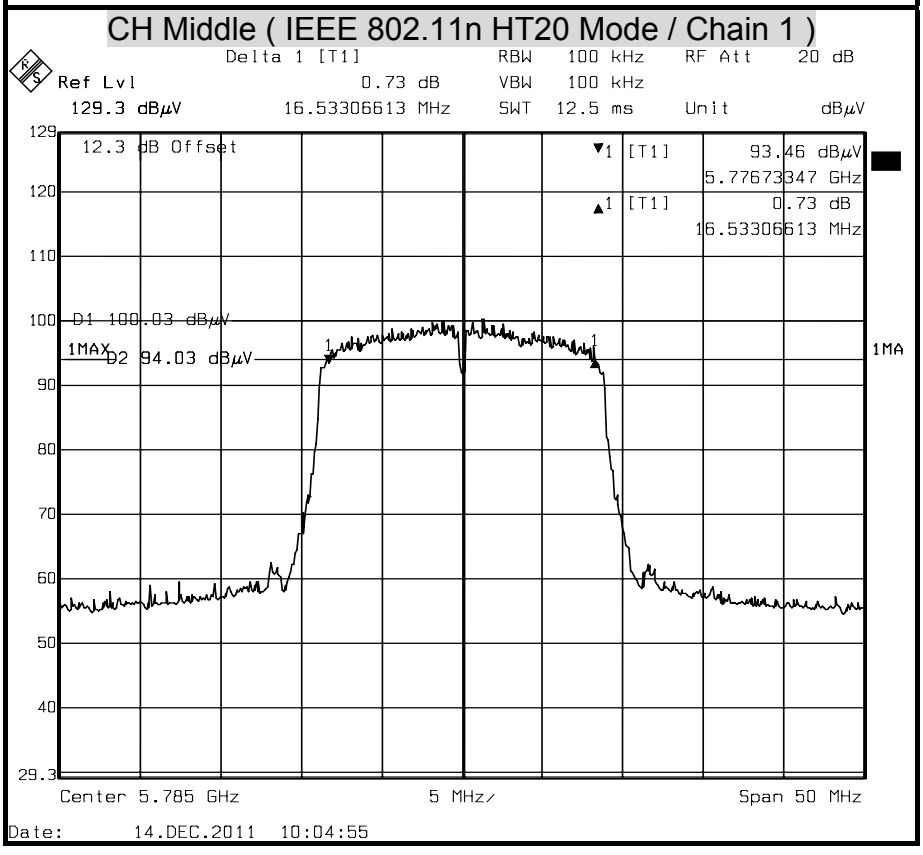

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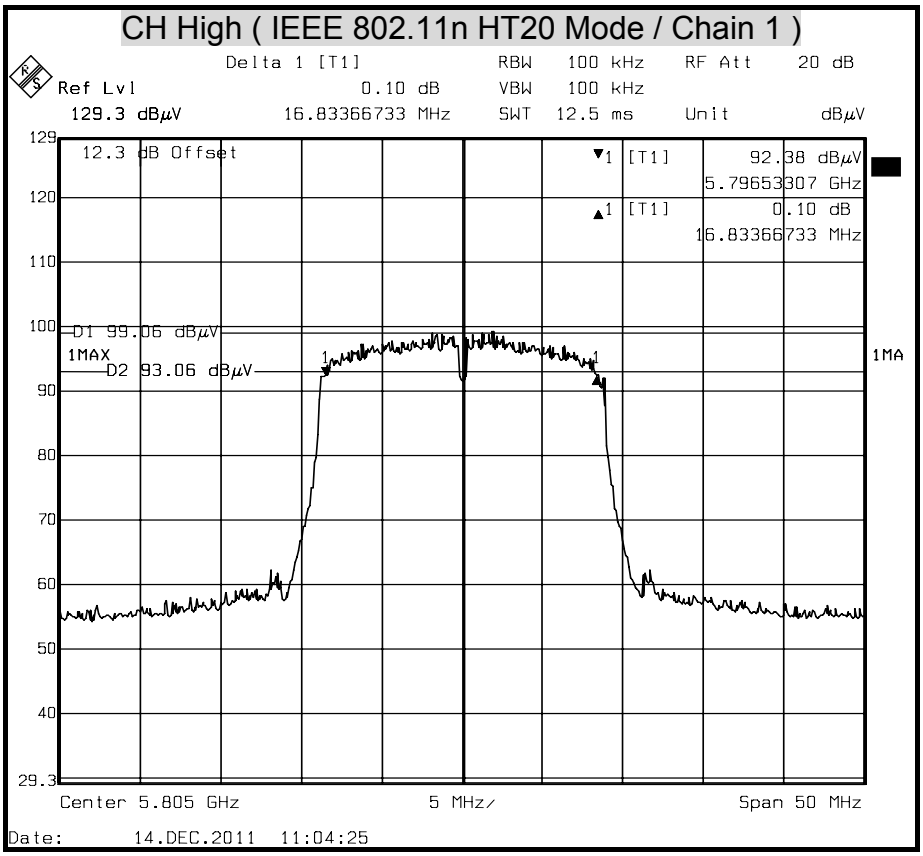

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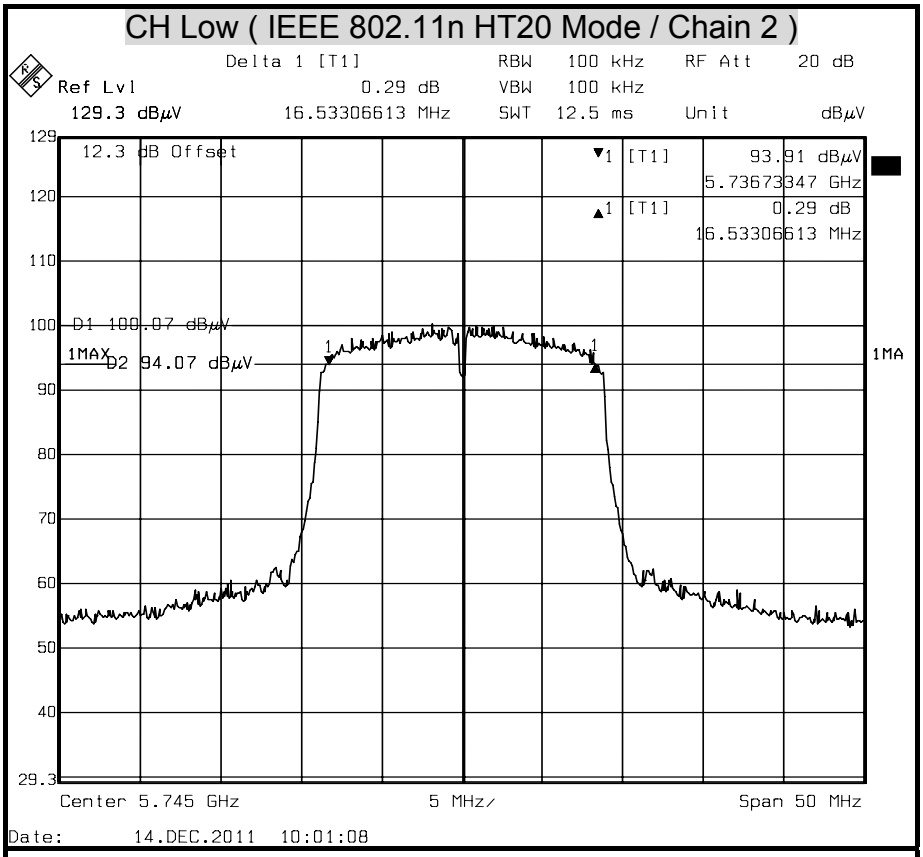
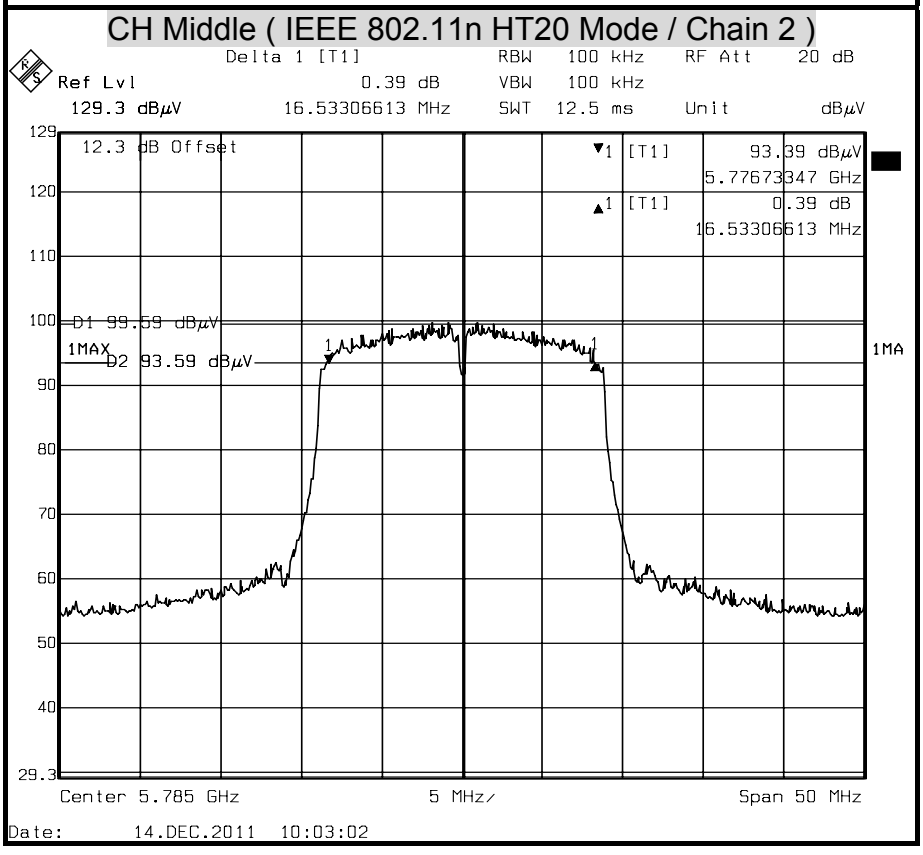


CH Middle (IEEE 802.11n HT20 Mode / Chain 2)



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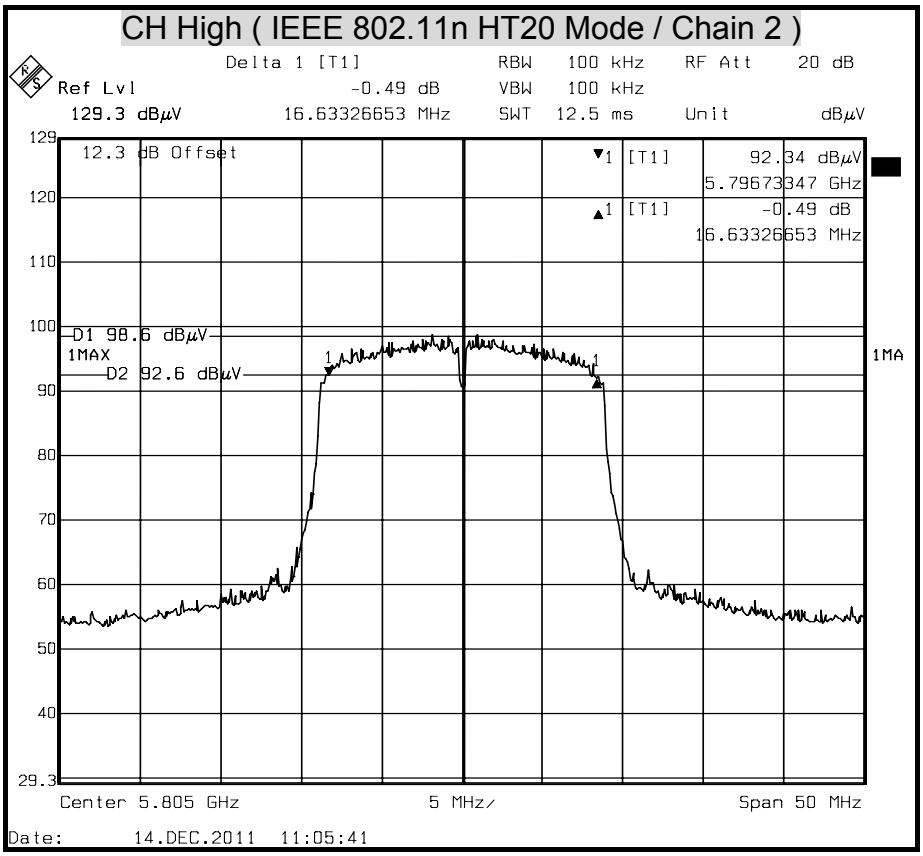

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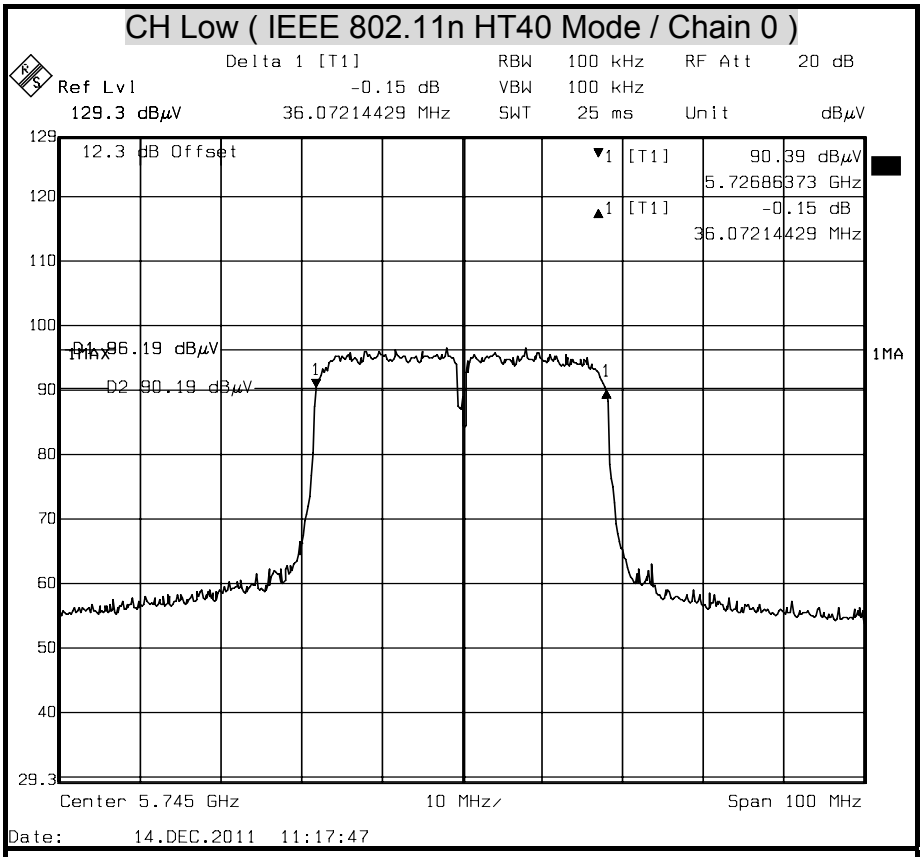

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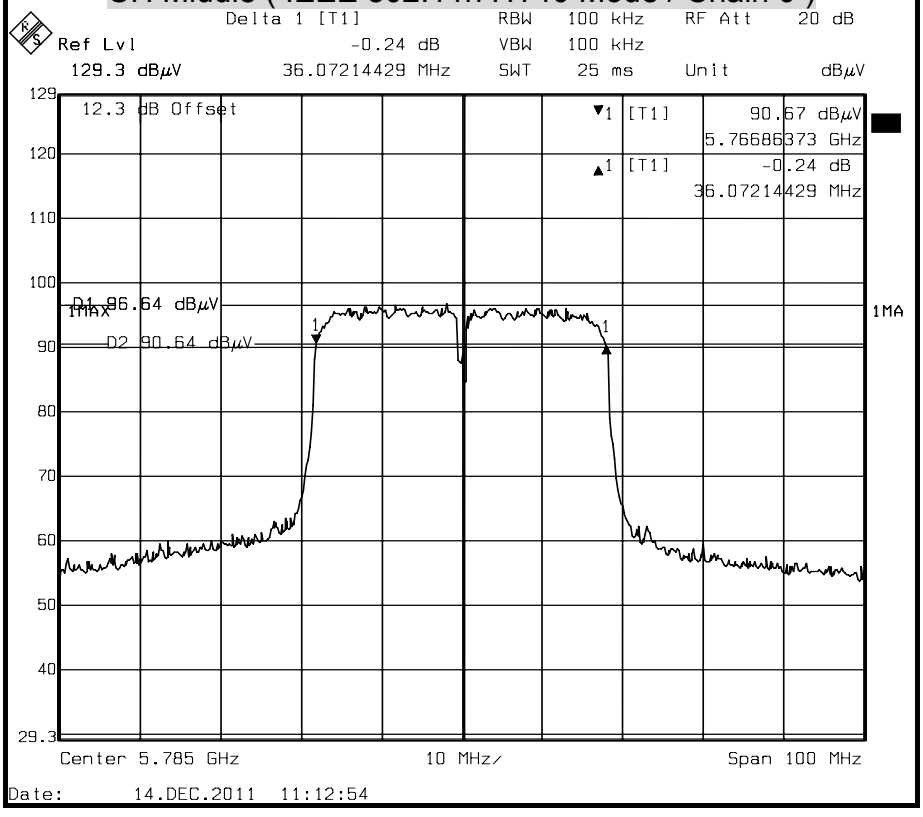
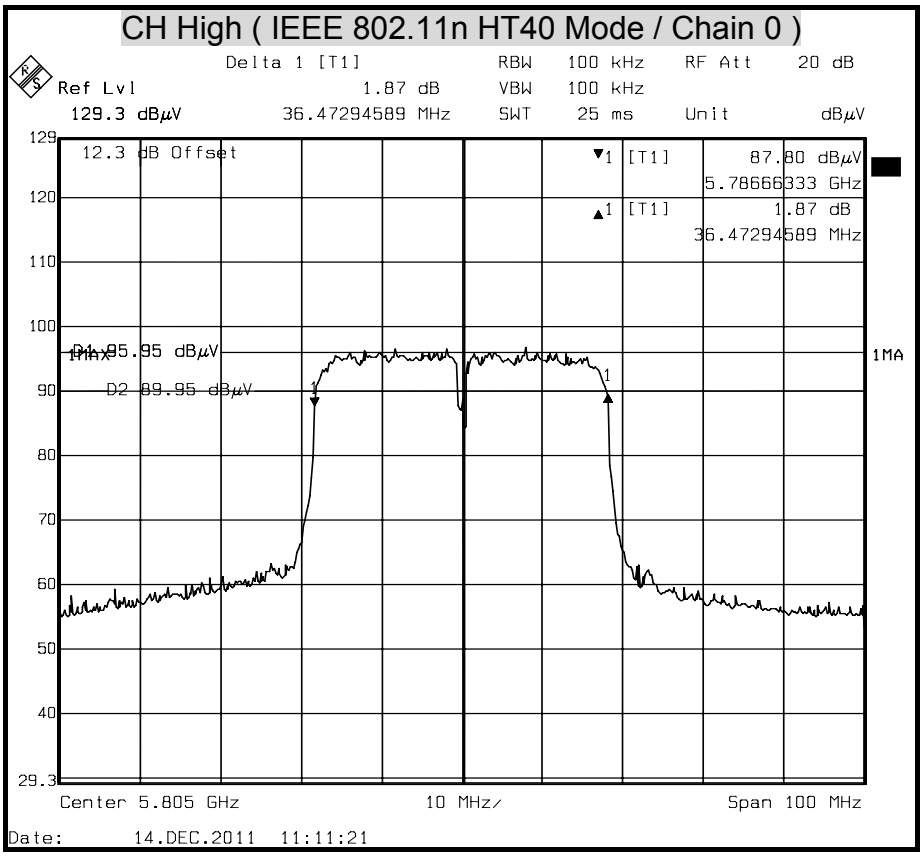
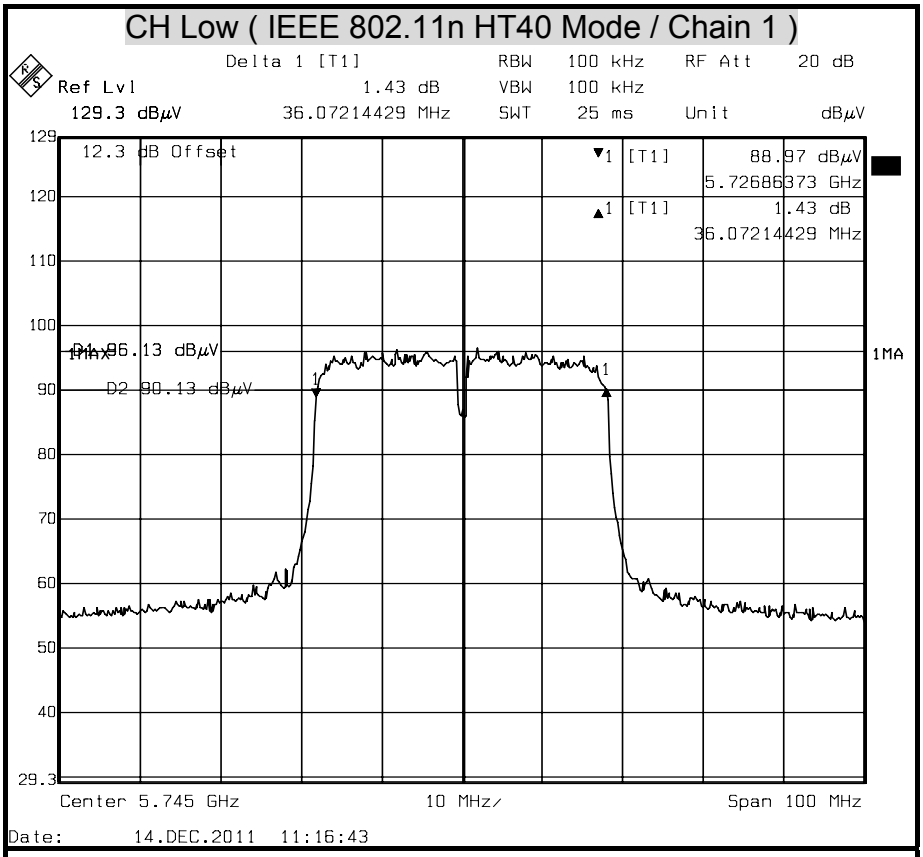


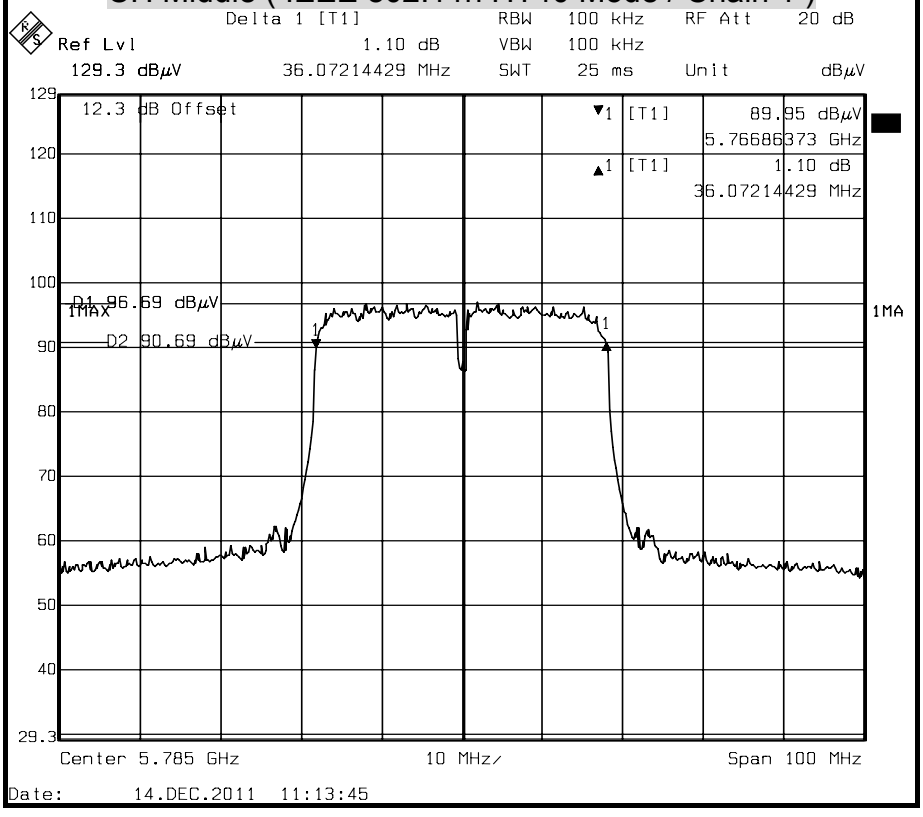
CH High (IEEE 802.11n HT40 Mode / Chain 0)

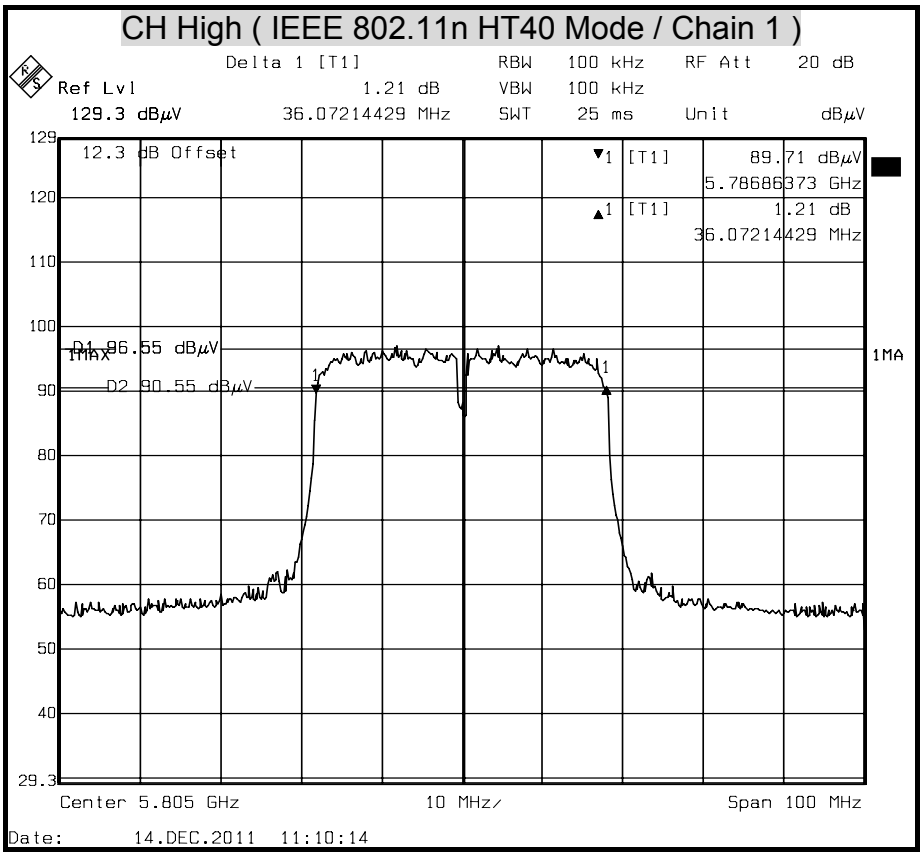


CH Low (IEEE 802.11n HT40 Mode / Chain 1)

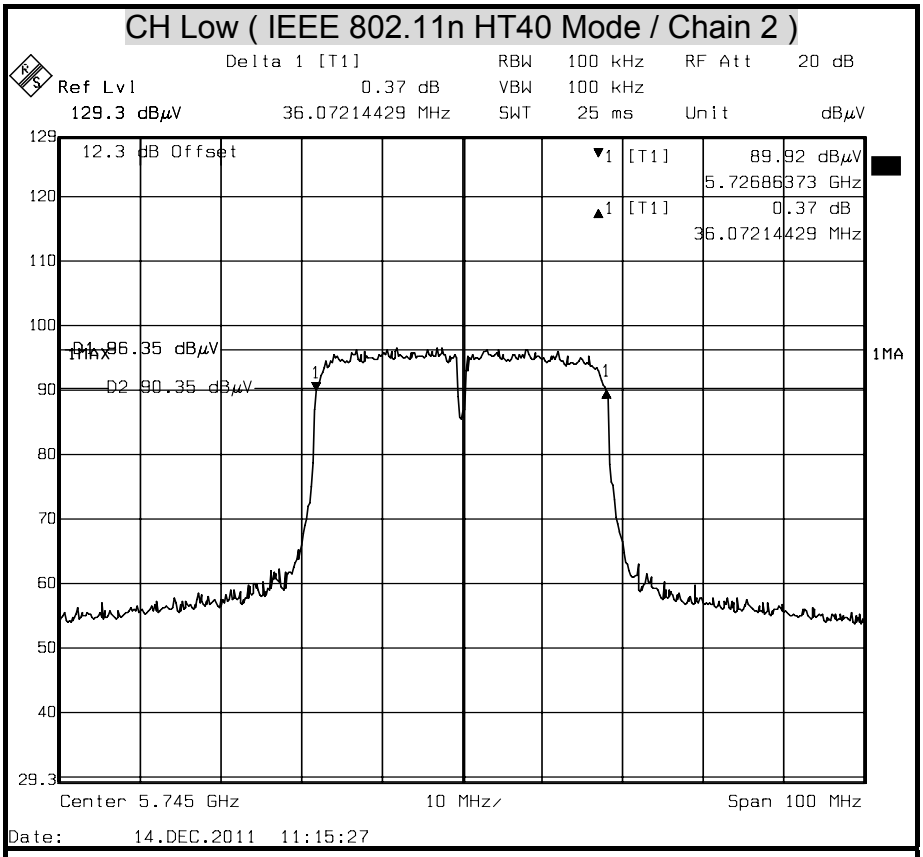


CH Middle (IEEE 802.11n HT40 Mode / Chain 1)

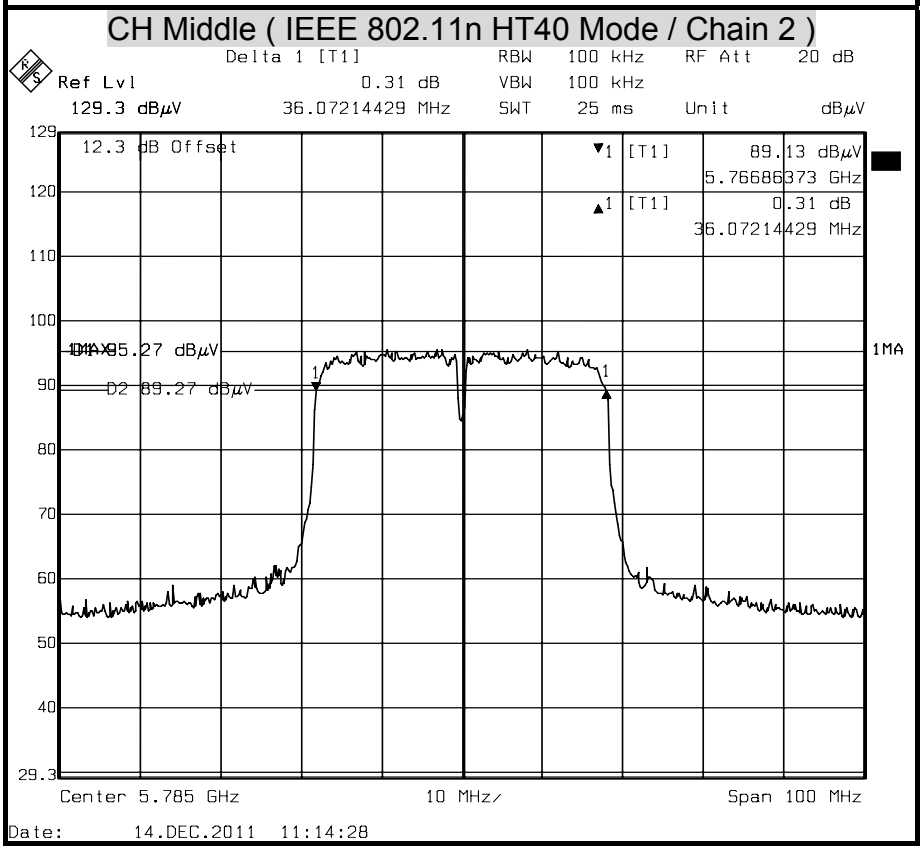




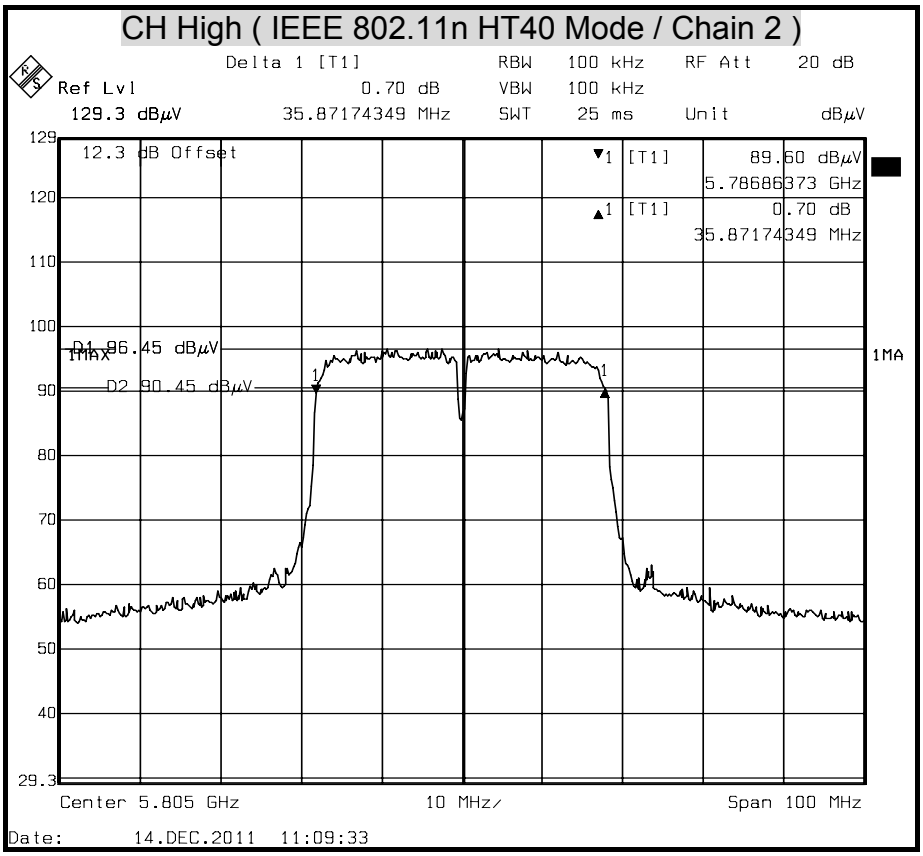
CH Low (IEEE 802.11n HT40 Mode / Chain 2)



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



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



7.2 MAXIMUM PEAK OUTPUT POWER

LIMITS

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

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

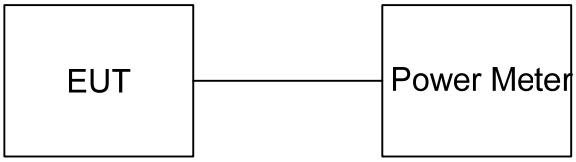
§ 15.247(b) (4) Except as shown in paragraphs (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used the peak output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1) or (b)(2), and (b)(3) of this section, as appropriate,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

TEST EQUIPMENT

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
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

IEEE 802.11b Mode

Channel	Channel Frequency (MHz)	Peak Power (dBm)	Peak Power Limit (dBm)	Pass / Fail
Low	2412	19.02	30	PASS
Middle	2437	18.85		PASS
High	2462	18.55		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	23.17	30	PASS
Middle	2437	23.19		PASS
High	2462	23.26		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	21.03	20.18	23.64	30	PASS
Middle	2437	20.38	20.92	23.67		PASS
High	2462	21.24	20.16	23.74		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	19.45	20.10	22.80	30	PASS
Middle	2437	19.39	19.72	22.57		PASS
High	2452	19.17	19.52	22.36		PASS

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

Antenna Gain1:	4.13	dBi	
Antenna Gain2:	4.13	dBi	
Array Gain=:	7.14	=	10*log ((10^(4.13 /10)+ (10^(4.13 /10)))
Peak Power Limit:	28.86	=	30- (7.14 -6)

IEEE 802.11a Mode

Channel	Channel Frequency (MHz)	Peak Power (dBm)	Peak Power Limit (W)	Pass / Fail
Low	5745	21.76	1	PASS
Middle	5785	21.34	1	PASS
High	5805	21.13	1	PASS

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

IEEE 802.11n HT20 Mode

Channel	Channel Frequency (MHz)	Peak Power (dBm)			Peak Power Total (dBm)	Peak Power Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Chain 2			
Low	5745	18.72	18.06	18.16	23.09	28.86	PASS
Middle	5785	17.63	18.10	17.34	22.47	28.86	PASS
High	5805	17.52	17.64	17.19	22.23	28.86	PASS

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

IEEE 802.11n HT40 Mode

Channel	Channel Frequency (MHz)	Peak Power (dBm)			Peak Power Total (dBm)	Peak Power Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Chain 2			
Low	5745	19.33	18.01	18.47	23.41	28.86	PASS
Middle	5785	18.90	18.72	17.65	23.23	28.86	PASS
High	5805	18.46	18.09	18.49	23.12	28.86	PASS

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

Average Power

802.11b Mode

Channel	Frequency (MHz)	Average Power (dBm)
Low	2412	16.61
Middle	2437	16.37
High	2462	16.06

802.11g Mode

Channel	Frequency (MHz)	Average Power (dBm)
Low	2412	13.52
Middle	2437	13.47
High	2462	13.32

802.11n HT20 Mode

Channel	Frequency (MHz)	Average Power Chain0 (dBm)	Average Power Chain1 (dBm)
Low	2412	11.32	11.02
Middle	2437	11.27	10.41
High	2462	11.12	10.61

802.11n HT40 Mode

Channel	Frequency (MHz)	Average Power Chain0 (dBm)	Average Power Chain1 (dBm)
Low	2422	10.36	11.00
Middle	2437	10.23	10.78
High	2452	10.13	10.33

802.11a Mode

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)
Low	5745	12.04	0.0160
Middle	5785	11.22	0.0132
High	5805	11.38	0.0137

802.11n HT20 Mode

Channel	Frequency (MHz)	Chain 0 Output Power (dBm)	Chain 1 Output Power (dBm)	Chain 2 Output Power (dBm)	Total Output Power (dBm)	Output Power (W)
Low	5745	9.17	8.37	8.28	13.40	0.0219
Middle	5785	8.05	8.42	7.38	12.74	0.0188
High	5805	7.99	7.87	7.23	12.48	0.0177

802.11n HT40 Mode

Channel	Frequency (MHz)	Chain 0 Output Power (dBm)	Chain 1 Output Power (dBm)	Chain 2 Output Power (dBm)	Total Output Power (dBm)	Output Power (W)
Low	5745	9.64	8.32	8.90	13.76	0.0238
Middle	5785	8.67	9.06	7.90	13.34	0.0216
High	5805	8.38	8.51	7.77	13.00	0.0200

7.3 POWER SPECTRAL DENSITY

LIMITS

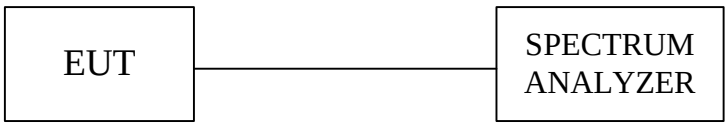
§ 15.247(e) For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

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

IEEE 802.11b Mode

Channel	Channel Frequency (MHz)	Final RF Power Level in 3KHz BW (dBm)	Minimum Limit (dBm)	Pass / Fail
Low	2412	-14.37	8	PASS
Middle	2437	-15.17	8	PASS
High	2462	-15.24	8	PASS

Remark:

1. *At finial test to get the worst-case emission at 1Mbps.*
2. *The cable assembly insertion loss of 10.5dB (including 10 dB pad and 0.5 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	-16.60	8	PASS
Middle	2437	-16.52	8	PASS
High	2462	-16.25	8	PASS

Remark:

1. *At finial test to get the worst-case emission at 6Mbps.*
2. *The cable assembly insertion loss of 10.5dB (including 10 dB pad and 0.5 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	-17.42	-15.68	-13.45	8	PASS
Middle	2437	-17.91	-16.44	-14.10		PASS
High	2462	-17.61	-16.39	-13.95		PASS

Remark:

1. At finial test to get the worst-case emission at 6.5Mbps.

2. The cable assembly insertion loss of 10.5dB (including 10 dB pad and 0.5 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	-18.89	-15.99	-14.19	8	PASS
Middle	2437	-19.13	-16.68	-14.72		PASS
High	2452	-19.31	-16.37	-14.59		PASS

Remark:

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

2. The cable assembly insertion loss of 10.5dB (including 10 dB pad and 0.5 dB cable) was Entered as an offset in the spectrum analyzer to allow for direct reading of power.

Antenna Gain1:	4.13	dBi					
Antenna Gain2:	4.13	dBi					
Array Gain=:	7.14	=	10*log	((10^(	4.13	/10)+	(10^(4.13 /10)))
PPSD Limit:	6.86	=	8-	(	7.14	-6	)

IEEE 802.11a Mode

Channel	Channel Frequency (MHz)	Final RF Power Level in 3KHz BW (dBm)	Minimum Limit (dBm)	Pass / Fail
Low	5745	-20.38	8	PASS
Middle	5785	-20.90		PASS
High	5805	-20.46		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	Chain 2	Total	(dBm)	
Low	5745	-21.01	-23.82	-22.19	-17.42	6.86	PASS
Middle	5785	-24.29	-23.53	-23.40	-18.95		PASS
High	5805	-22.30	-23.36	-24.93	-18.63		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

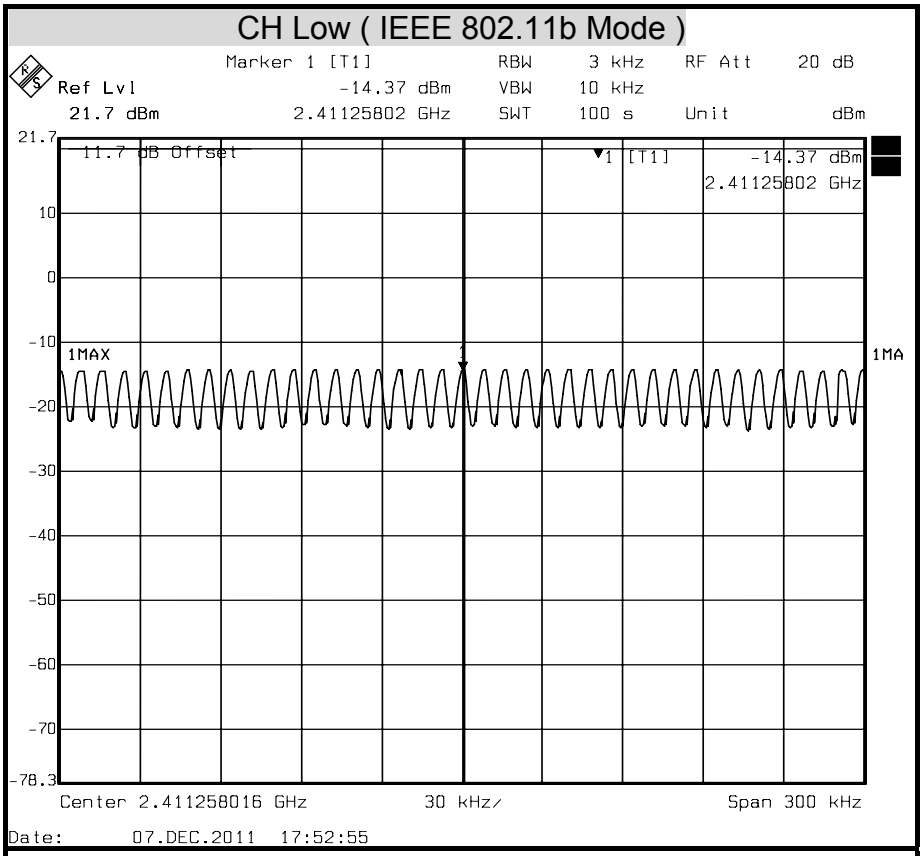
Channel	Channel Frequency (MHz)	Final RF Power Level in 3KHz BW (dBm)				Minimum Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Total	(dBm)	
Low	5745	-22.72	-25.81	-25.68	-19.72	6.86	PASS
Middle	5785	-23.66	-26.10	-26.89	-20.55		PASS
High	5805	-23.98	-26.36	-26.82	-20.76		PASS

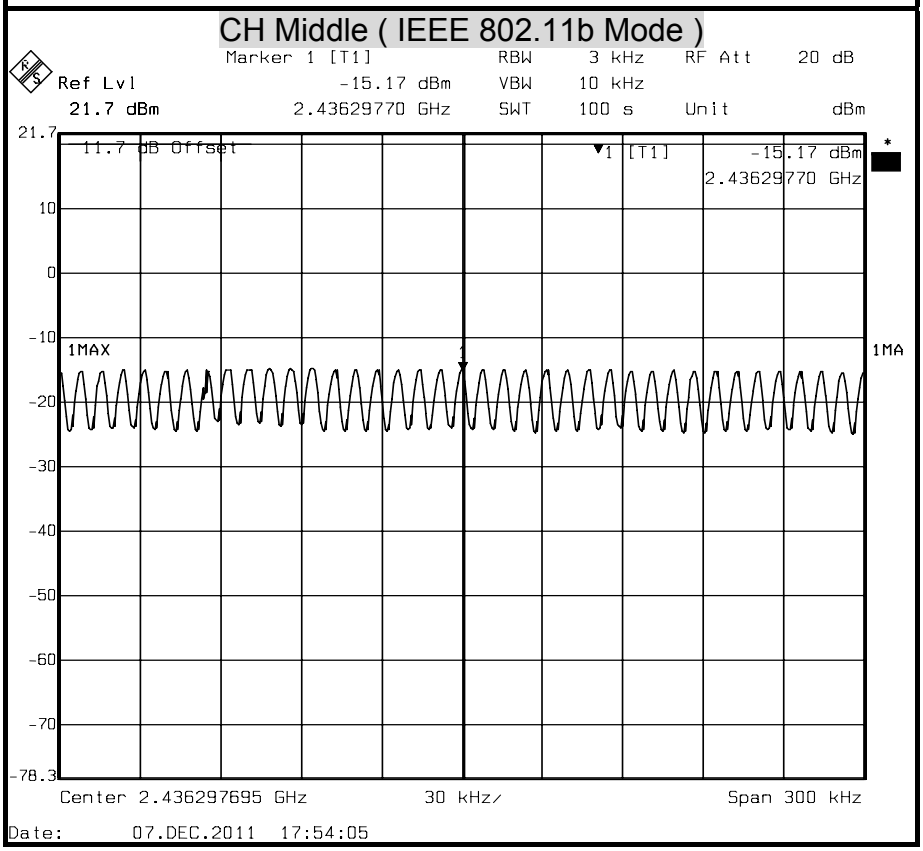
Remark:

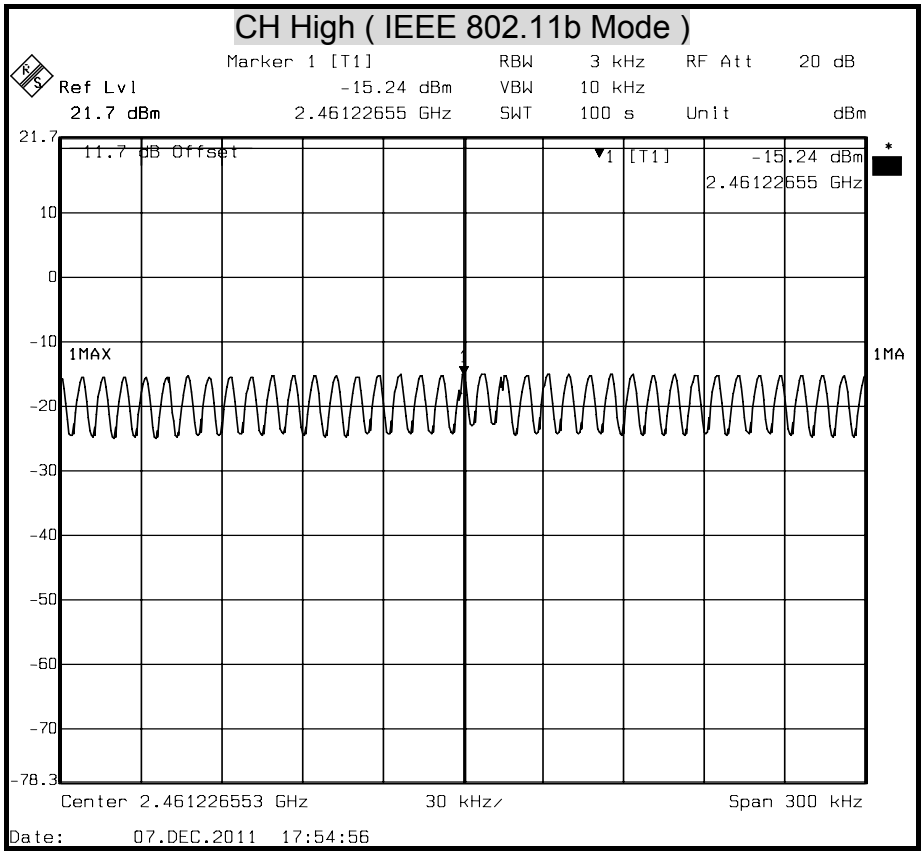
1. At finial test to get the worst-case emission at 27Mbps.

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.

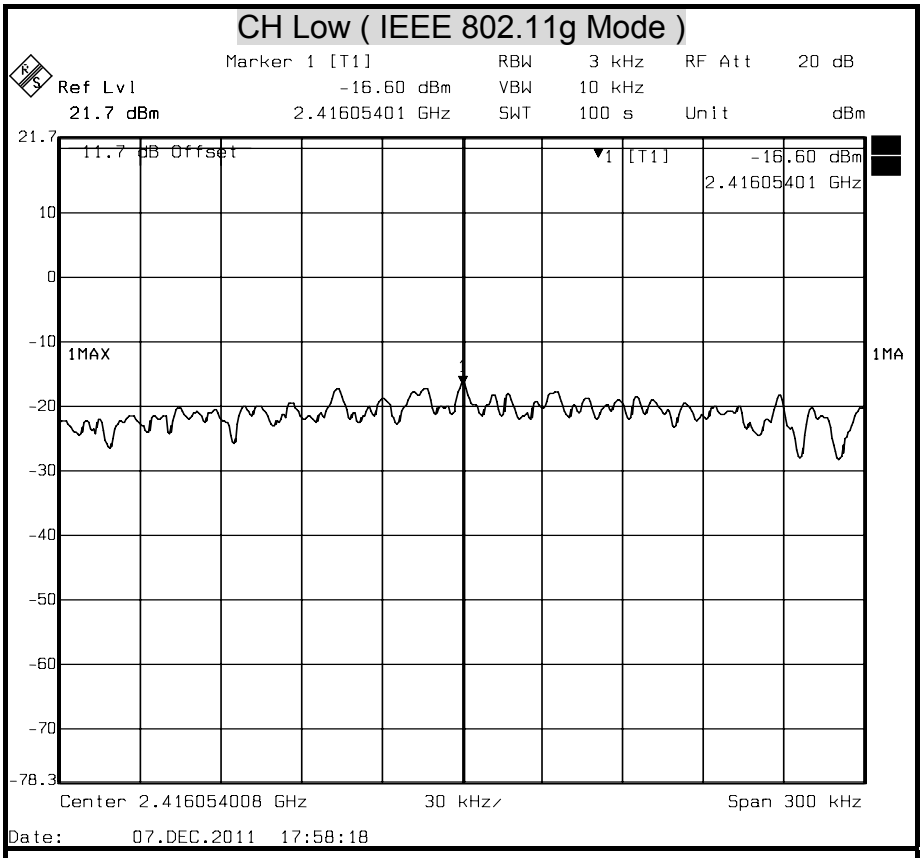
POWER SPECTRAL DENSITY



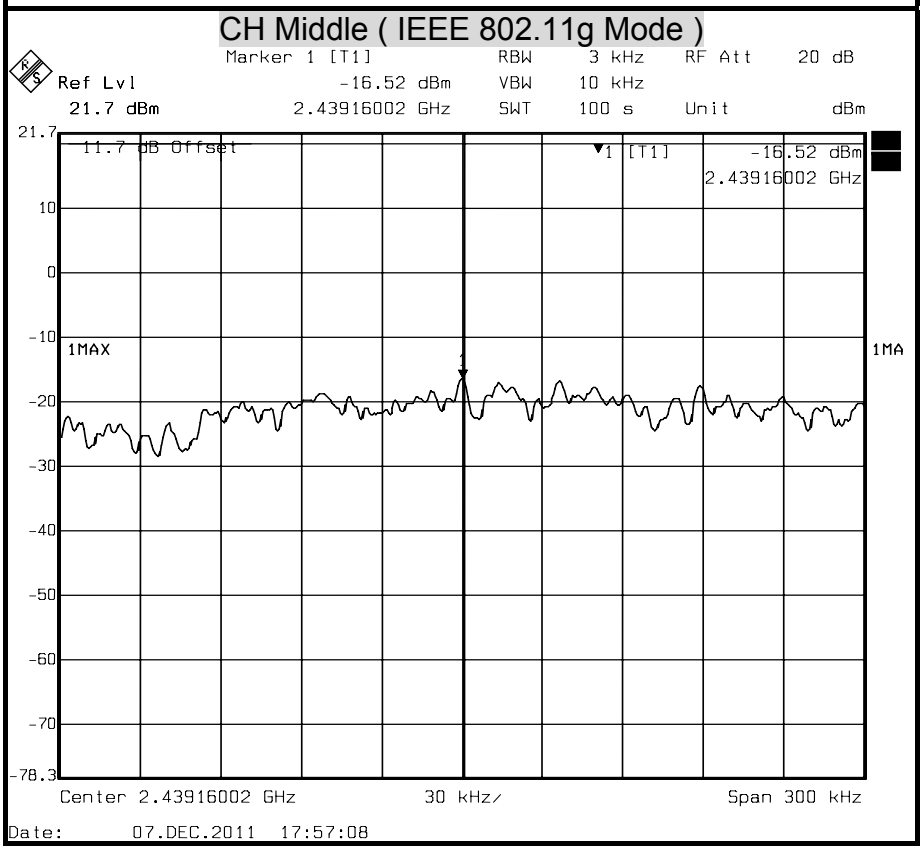




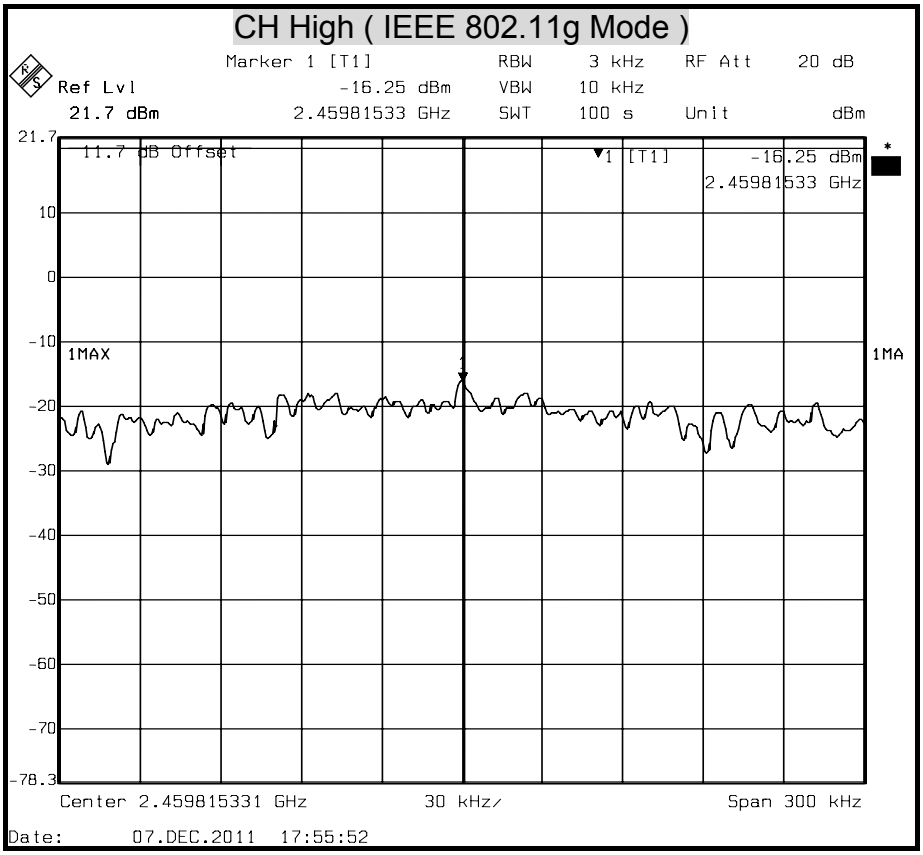
CH Low (IEEE 802.11g Mode)



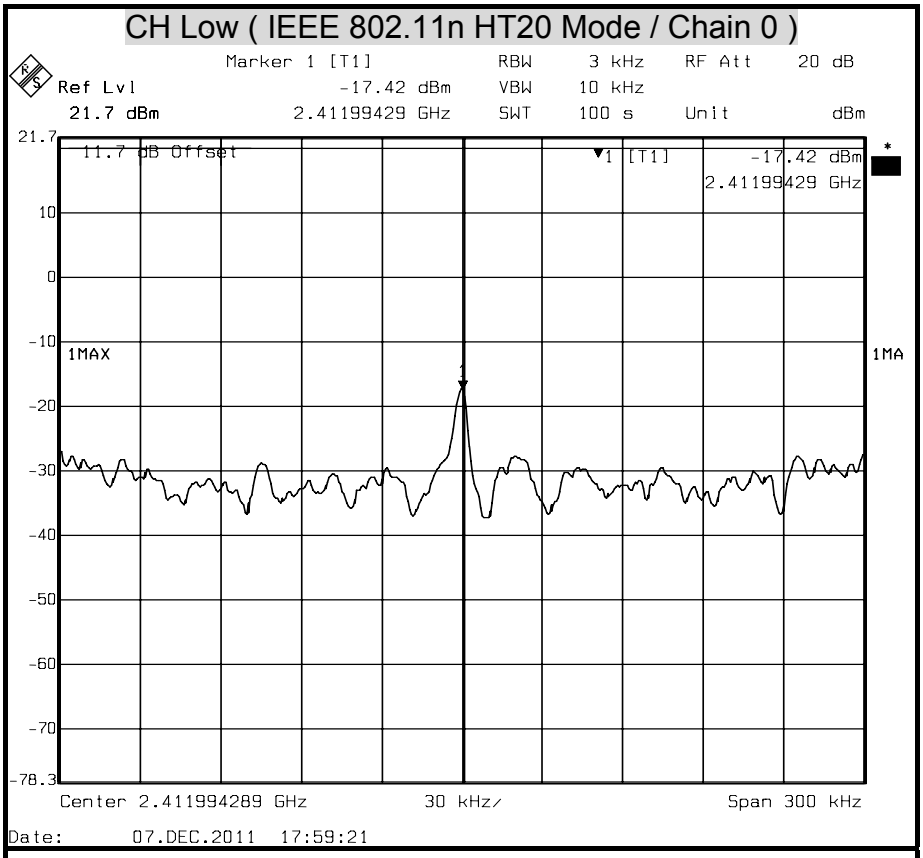
CH Middle (IEEE 802.11g Mode)



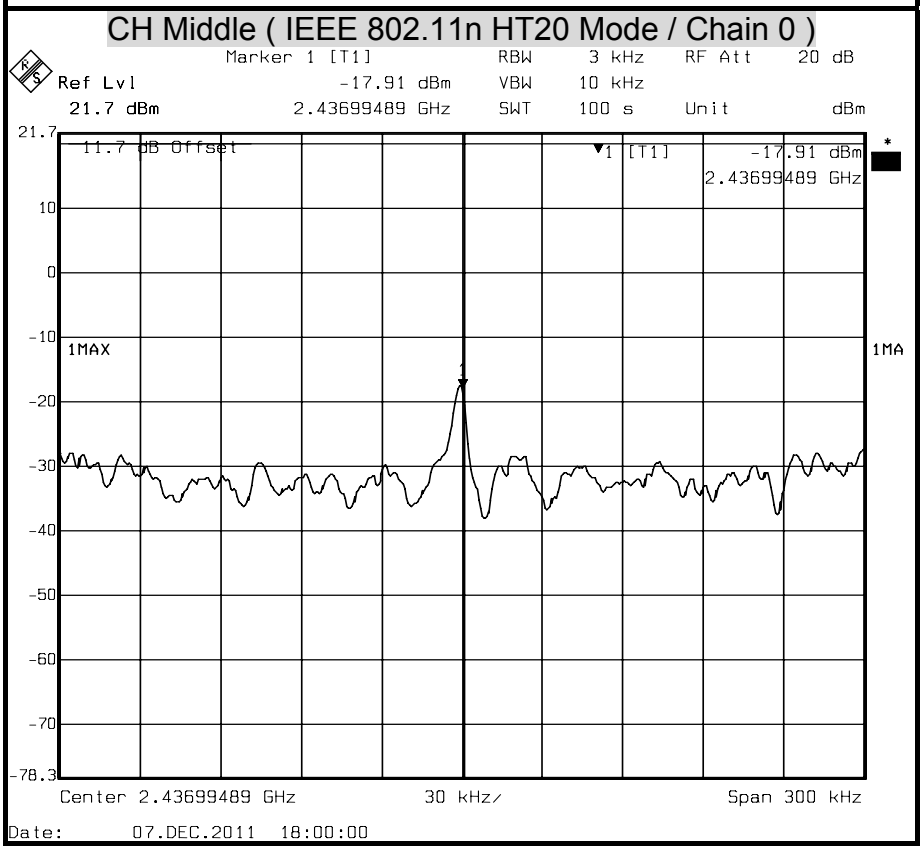
CH High (IEEE 802.11g Mode)



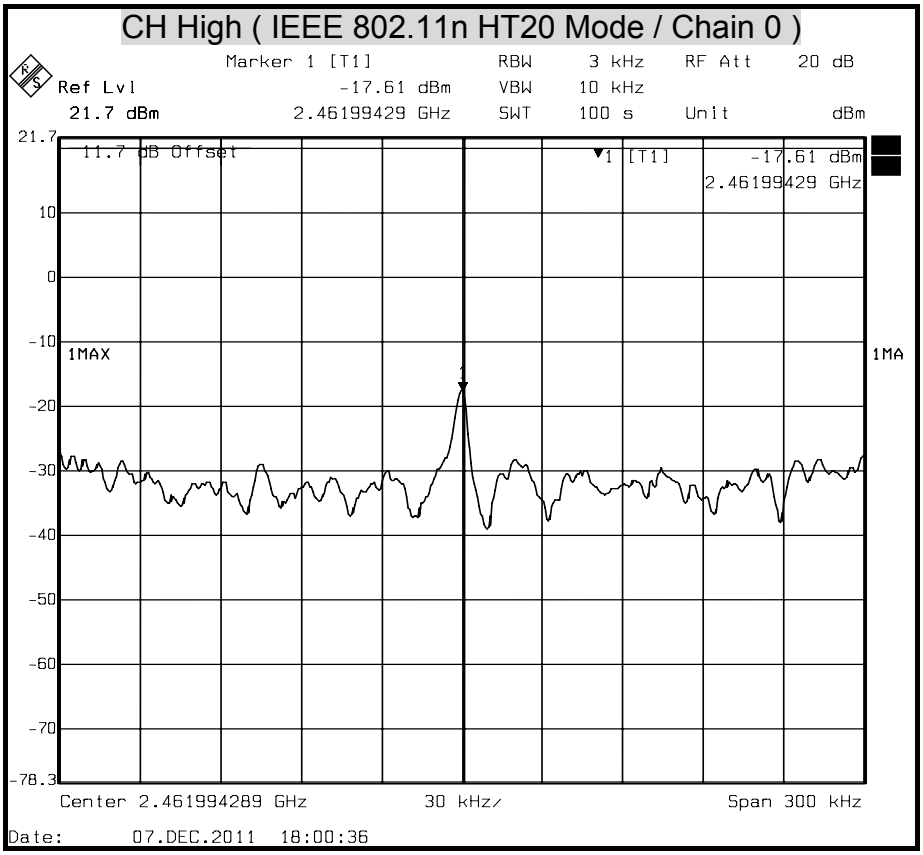
CH Low (IEEE 802.11n HT20 Mode / Chain 0)



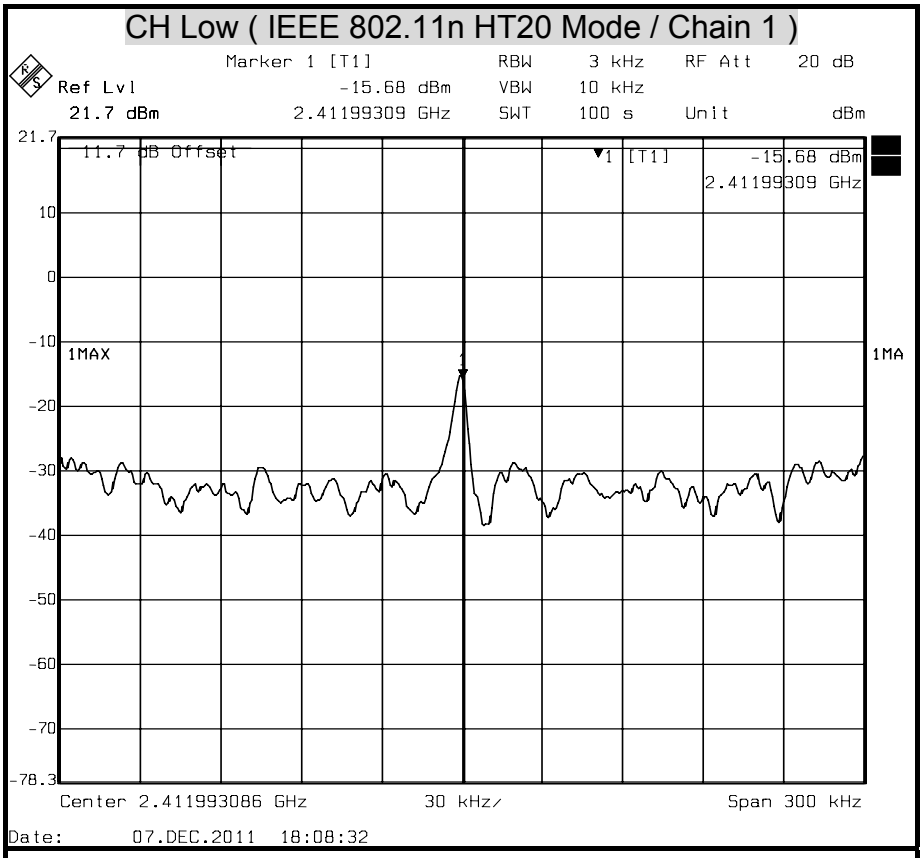
CH Middle (IEEE 802.11n HT20 Mode / Chain 0)



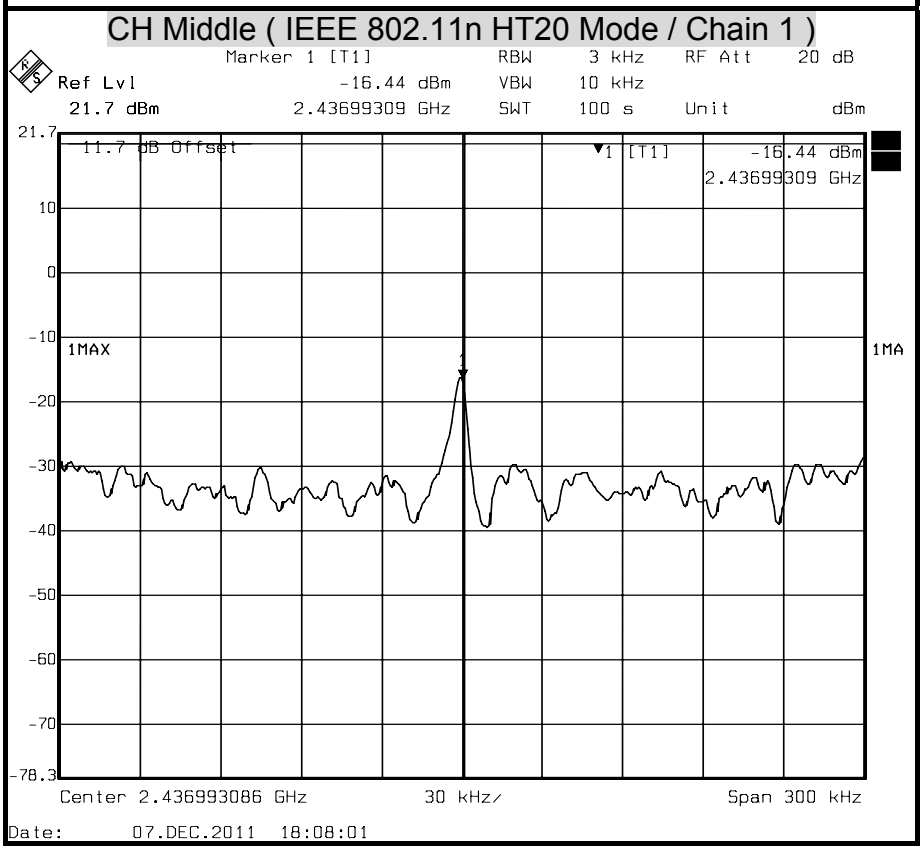
CH High (IEEE 802.11n HT20 Mode / Chain 0)



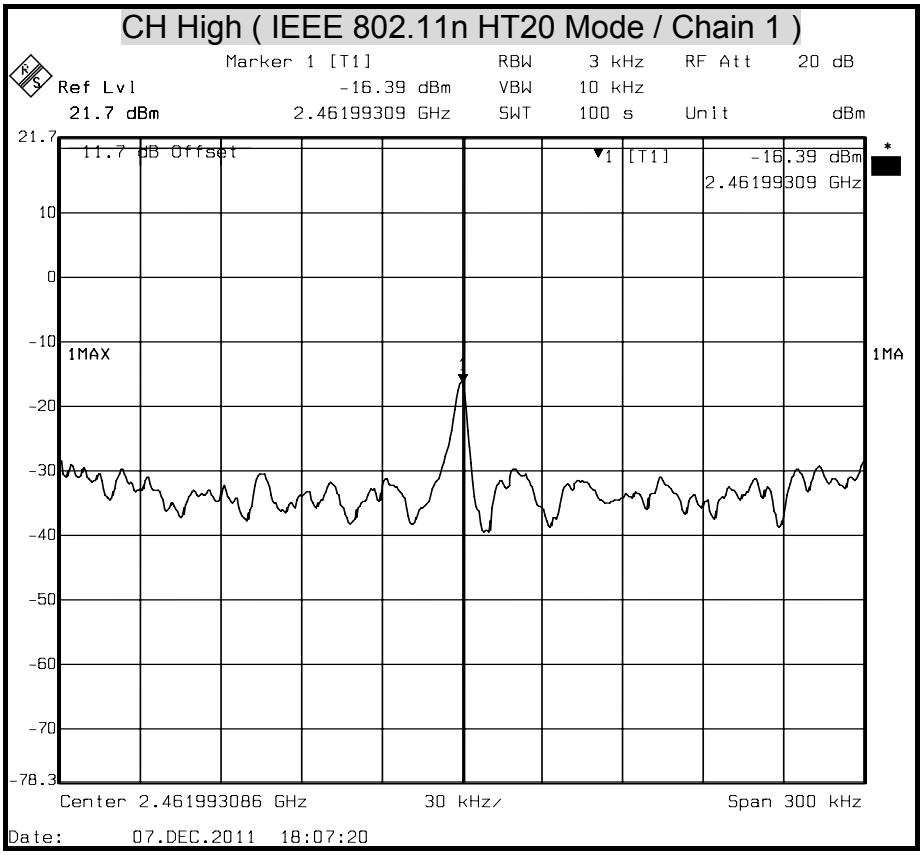
CH Low (IEEE 802.11n HT20 Mode / Chain 1)



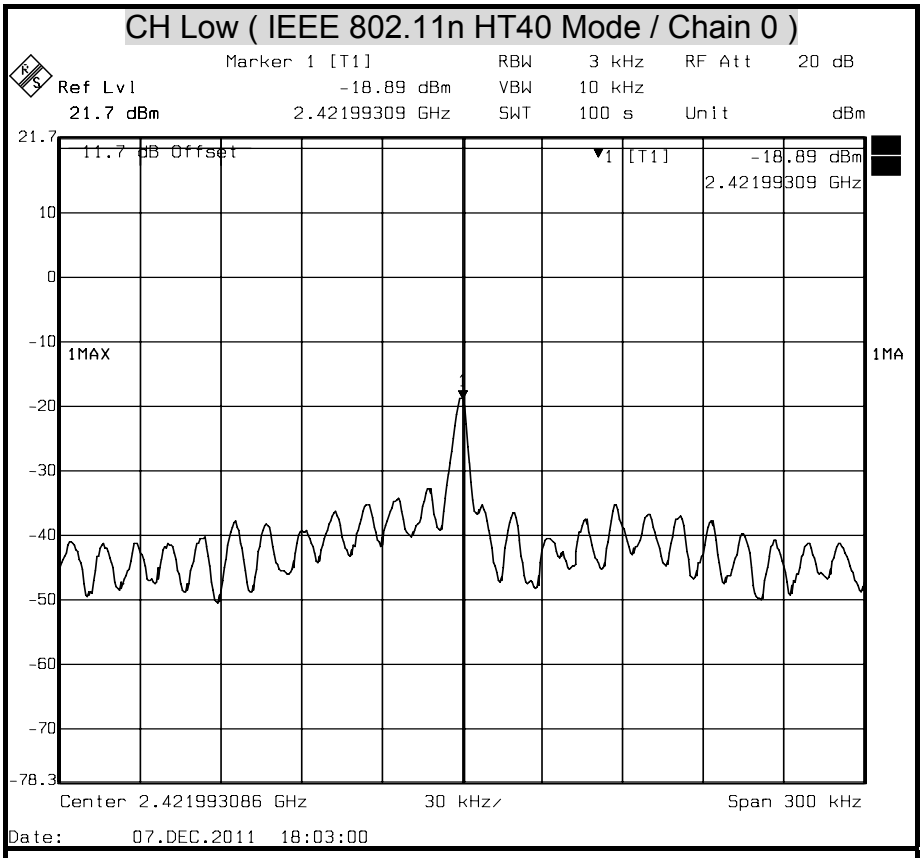
CH Middle (IEEE 802.11n HT20 Mode / Chain 1)



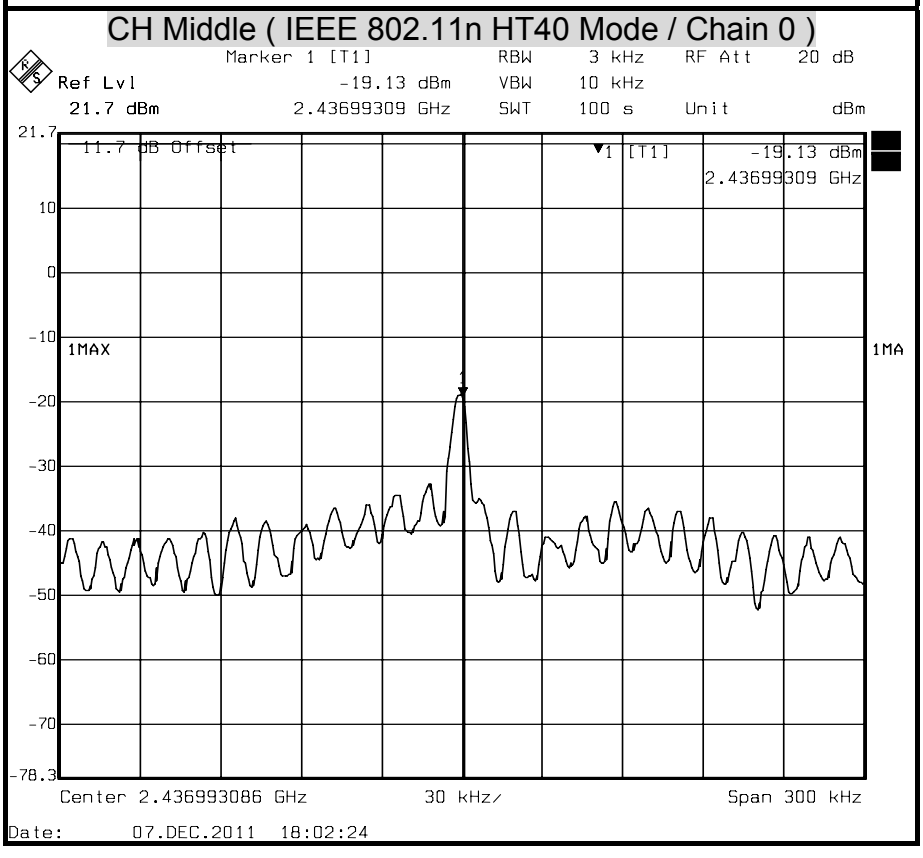
CH High (IEEE 802.11n HT20 Mode / Chain 1)



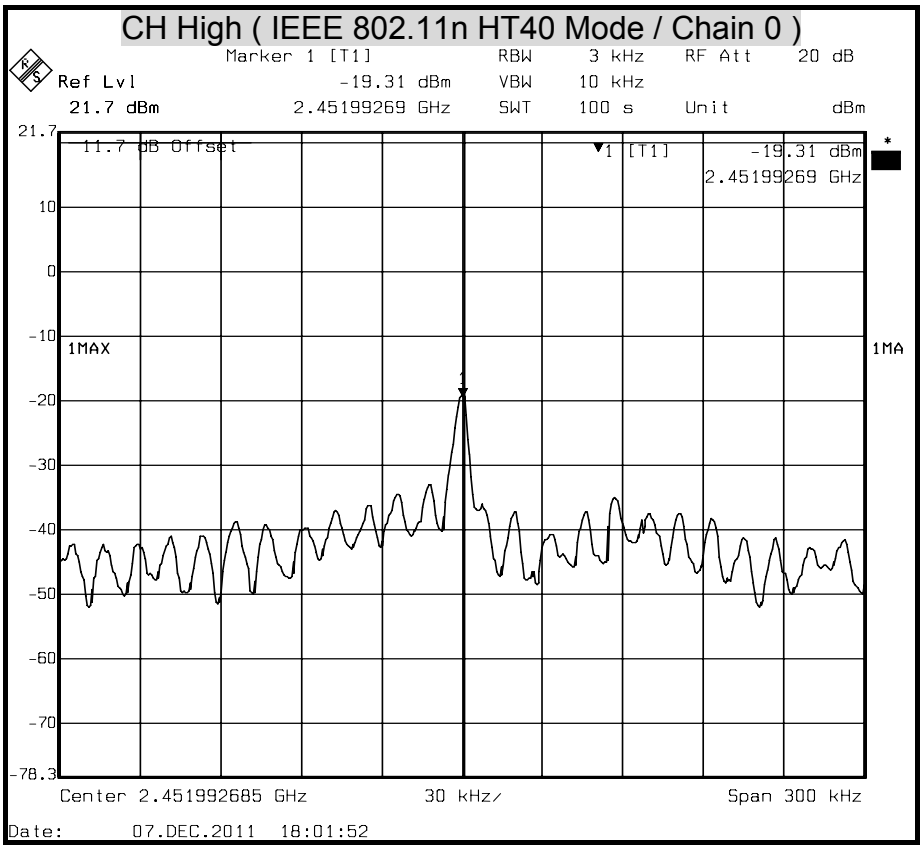
CH Low (IEEE 802.11n HT40 Mode / Chain 0)



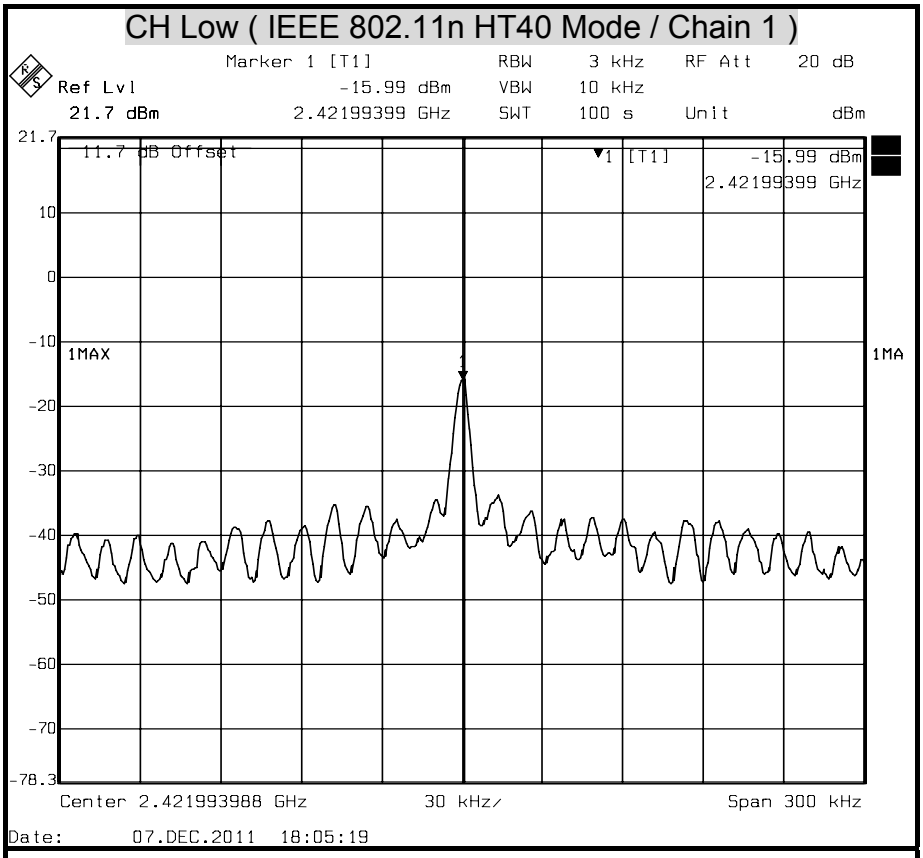
CH Middle (IEEE 802.11n HT40 Mode / Chain 0)



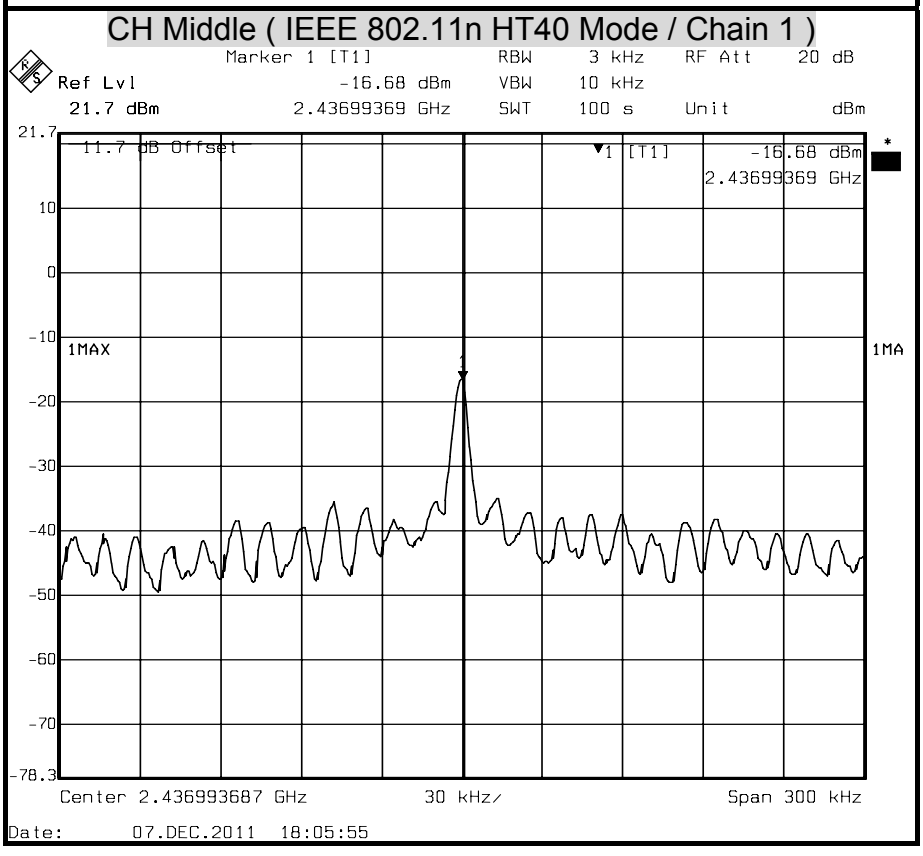
CH High (IEEE 802.11n HT40 Mode / Chain 0)

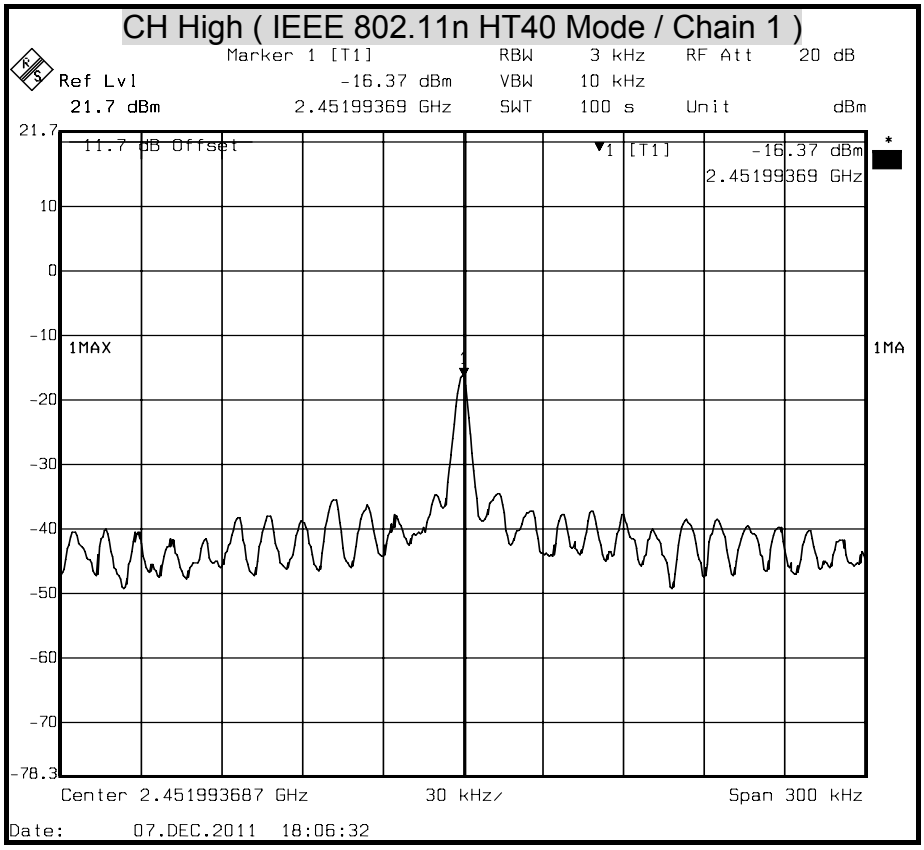


CH Low (IEEE 802.11n HT40 Mode / Chain 1)

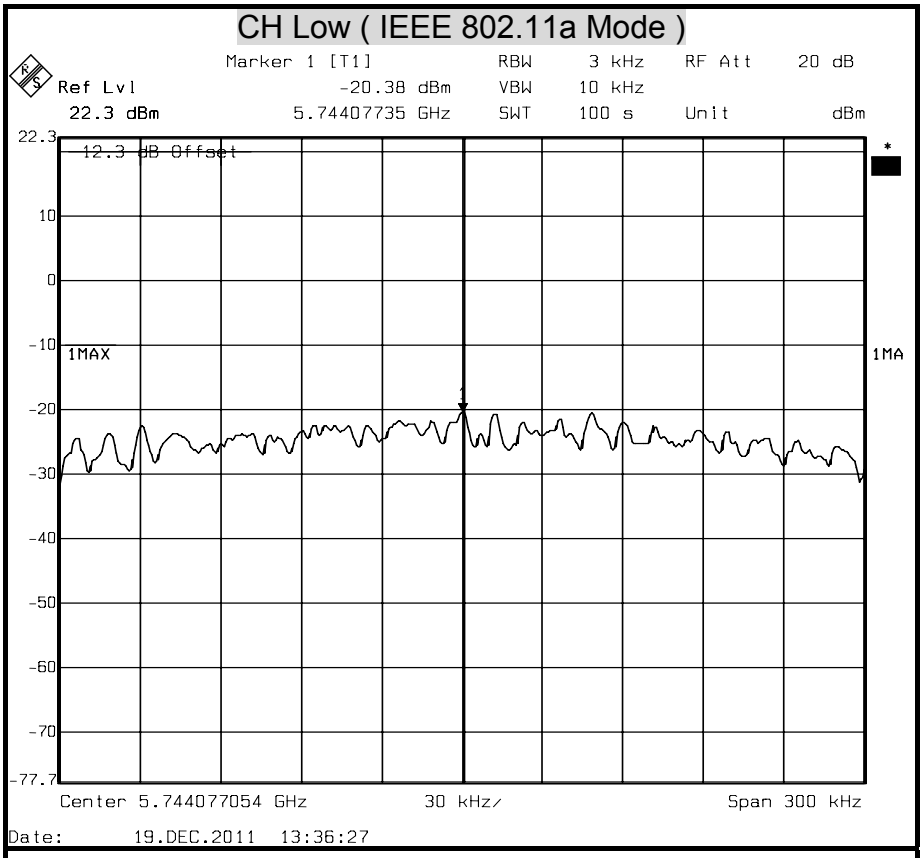


CH Middle (IEEE 802.11n HT40 Mode / Chain 1)

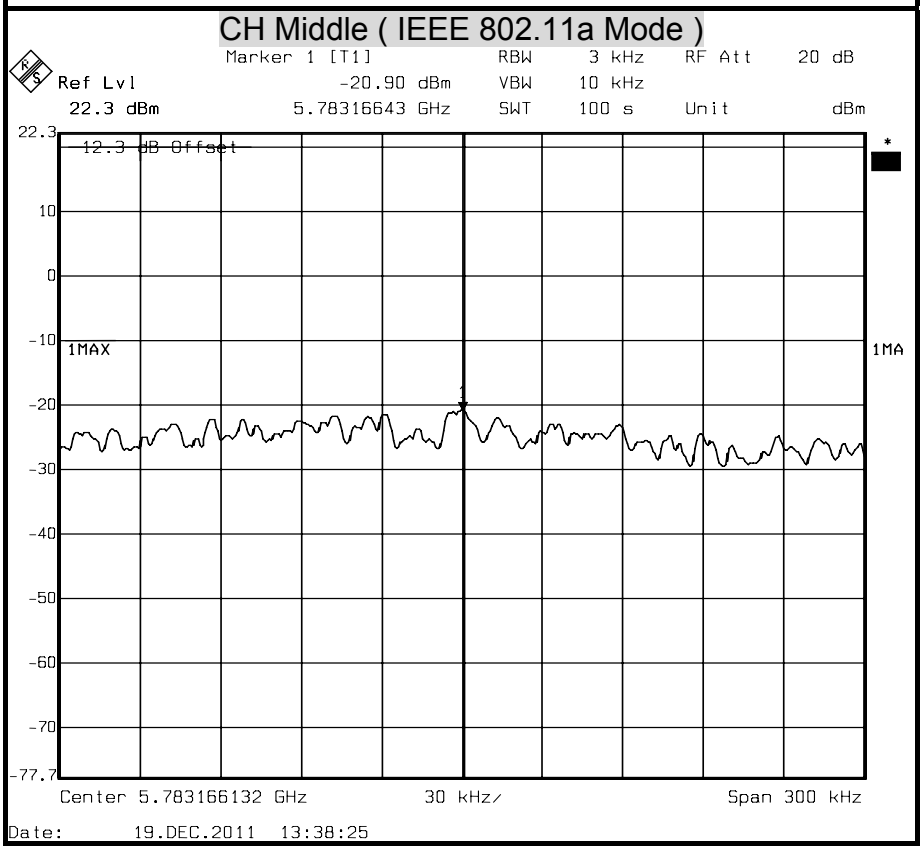


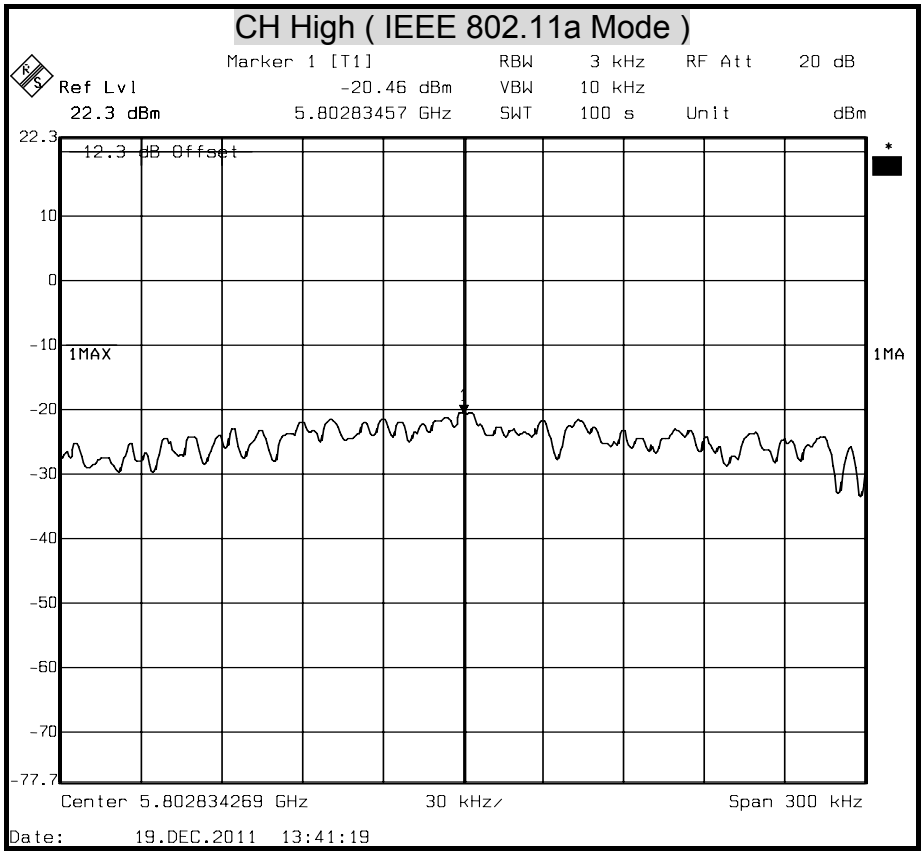


CH Low (IEEE 802.11a Mode)

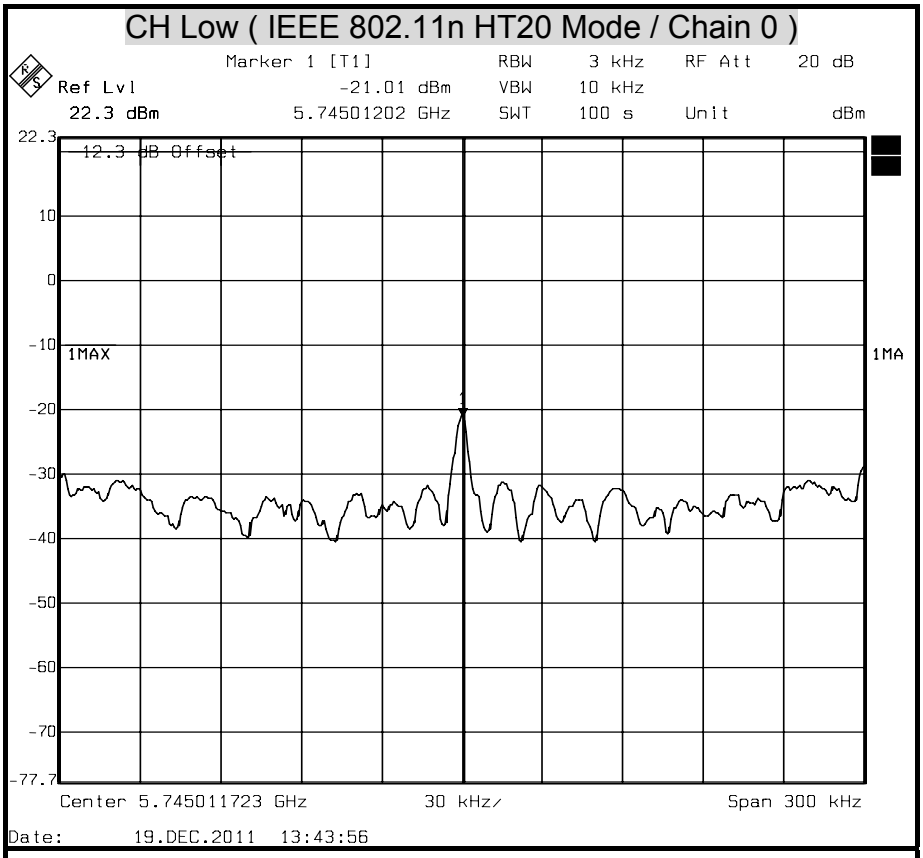


CH Middle (IEEE 802.11a Mode)

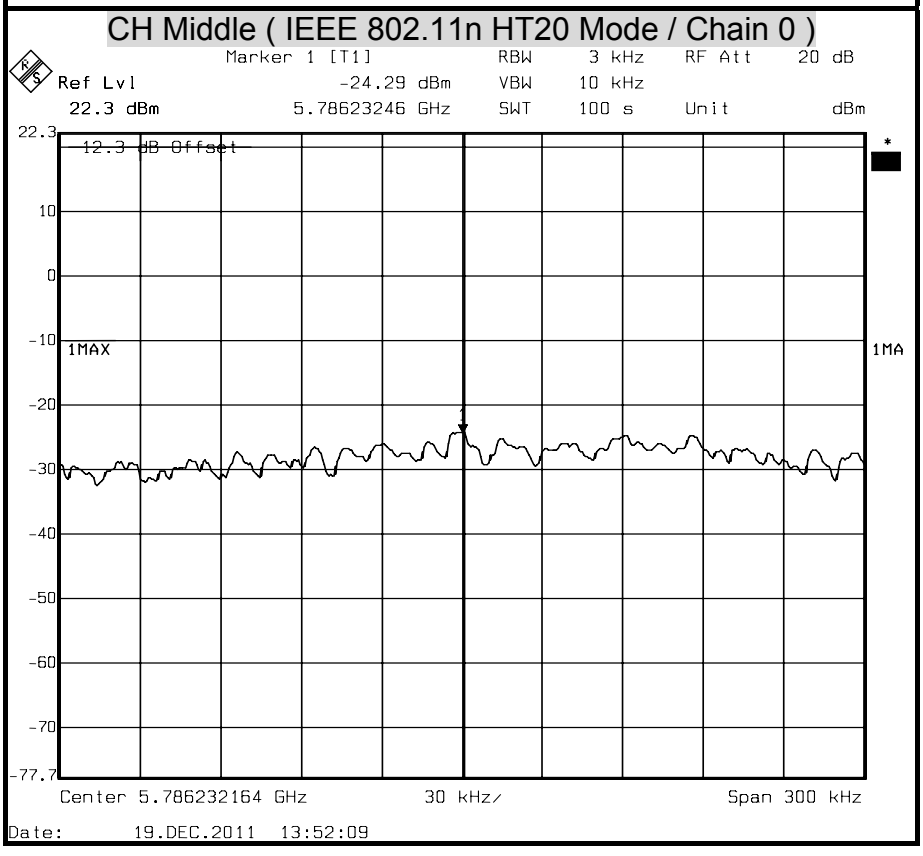


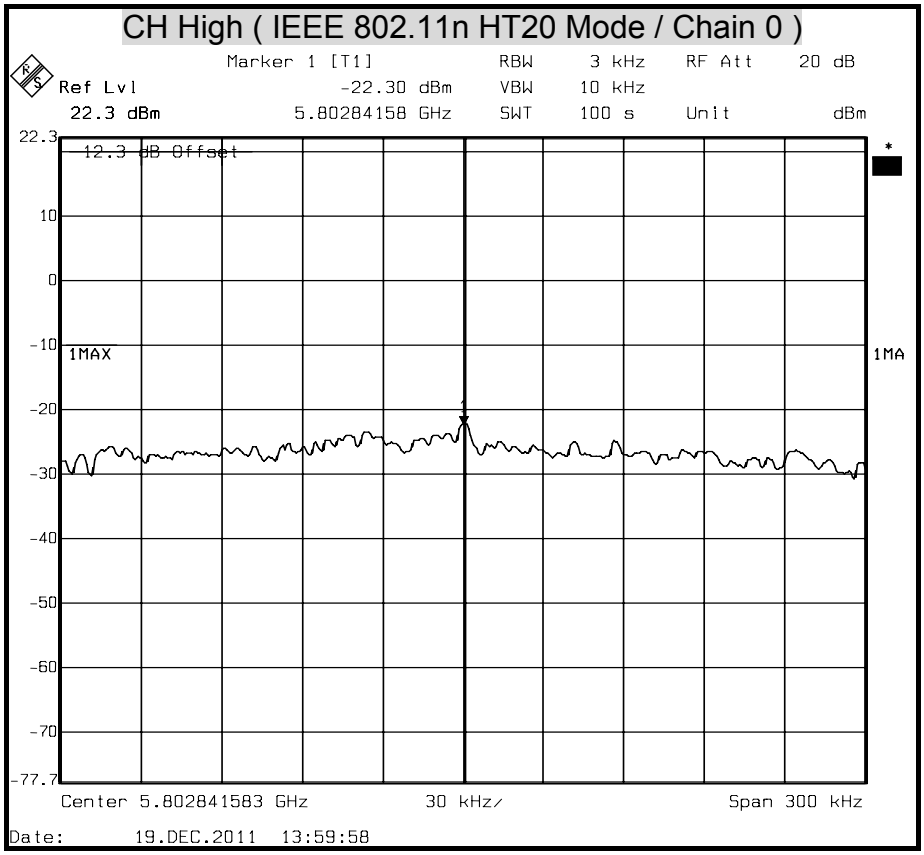


CH Low (IEEE 802.11n HT20 Mode / Chain 0)

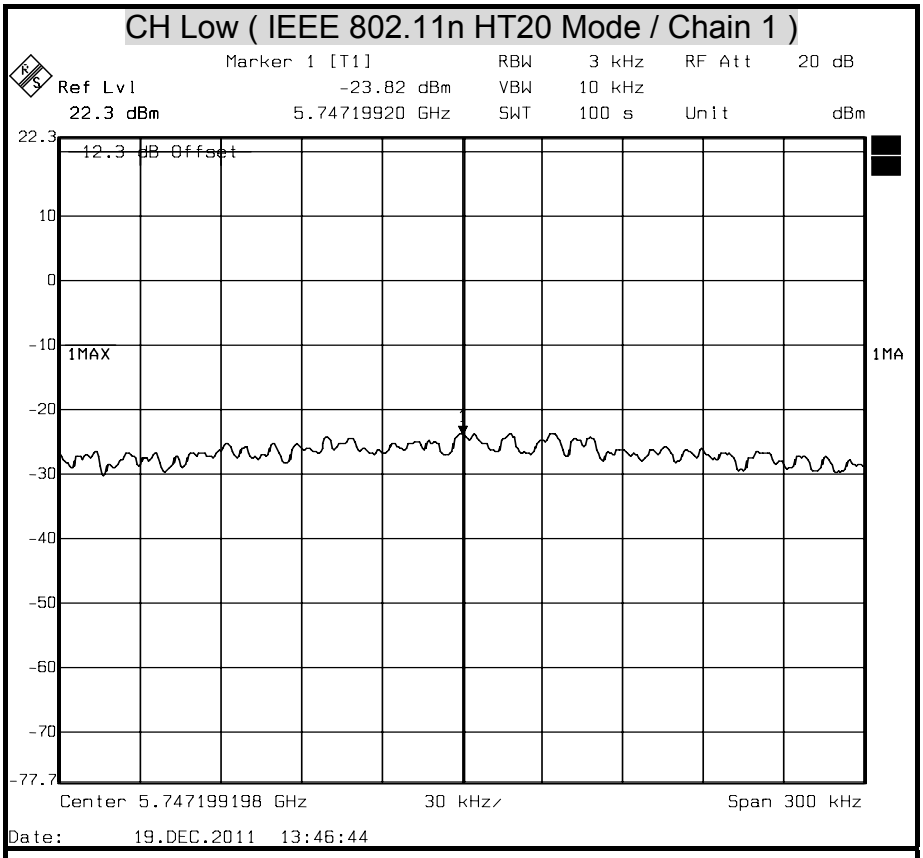


CH Middle (IEEE 802.11n HT20 Mode / Chain 0)

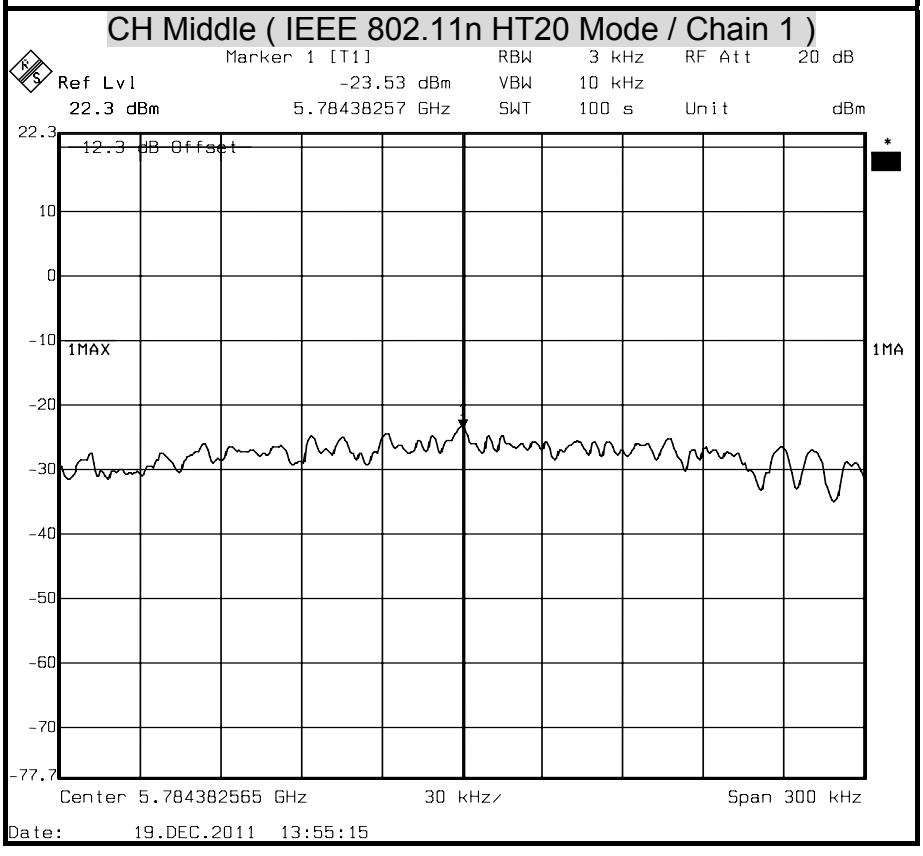


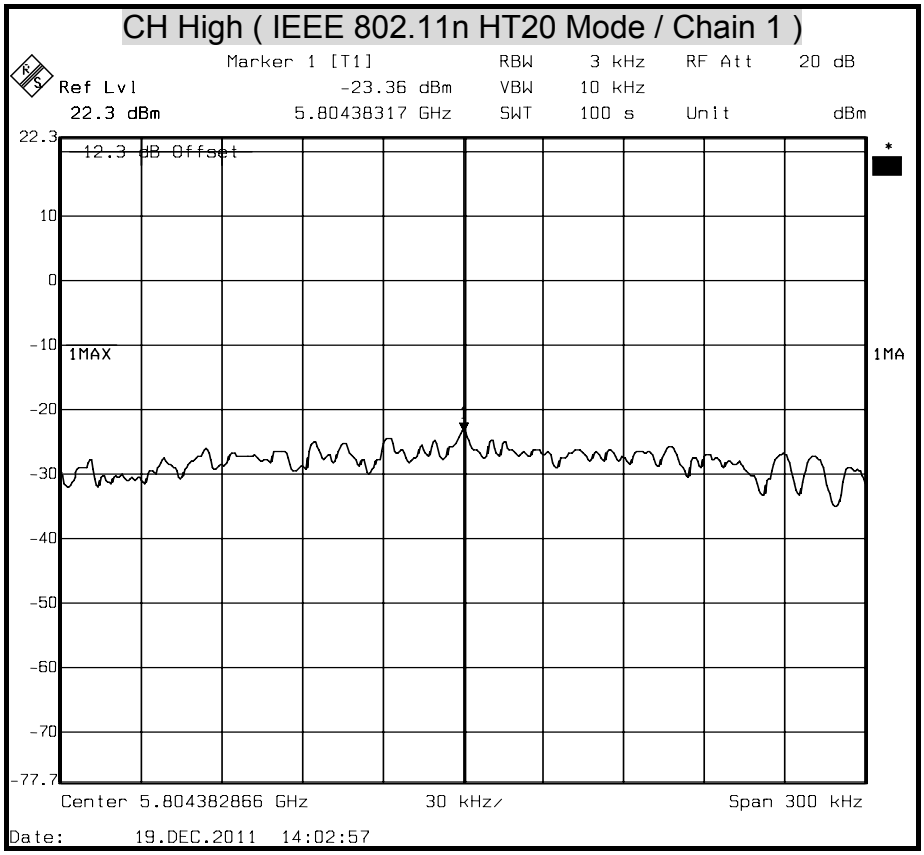


CH Low (IEEE 802.11n HT20 Mode / Chain 1)

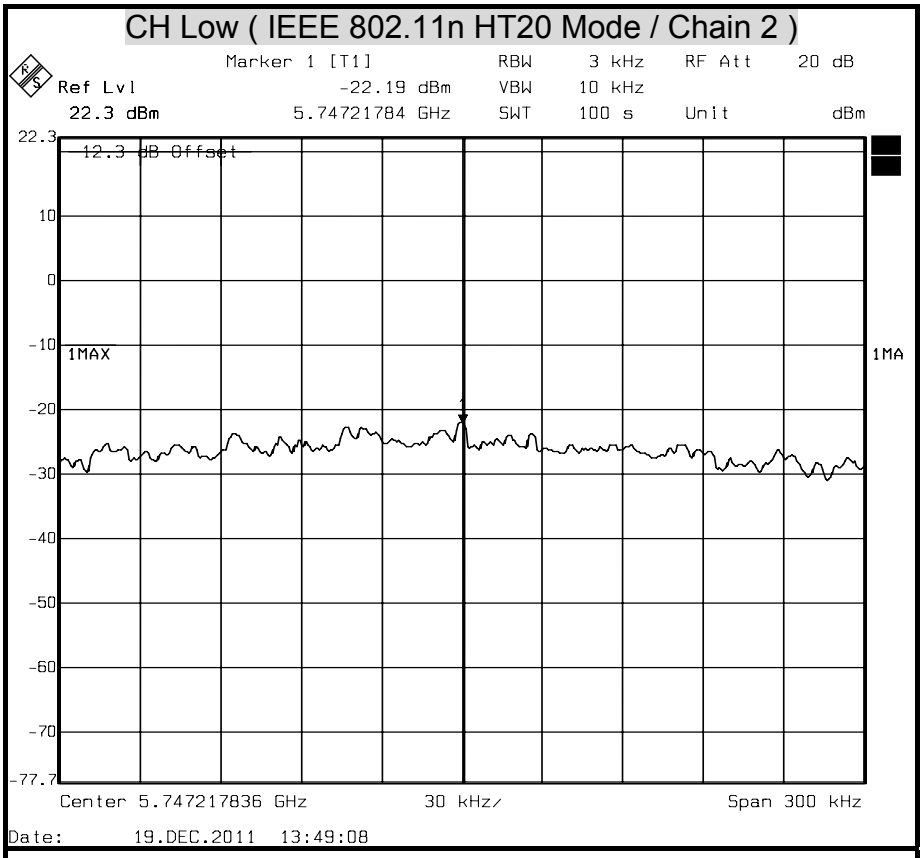


CH Middle (IEEE 802.11n HT20 Mode / Chain 1)

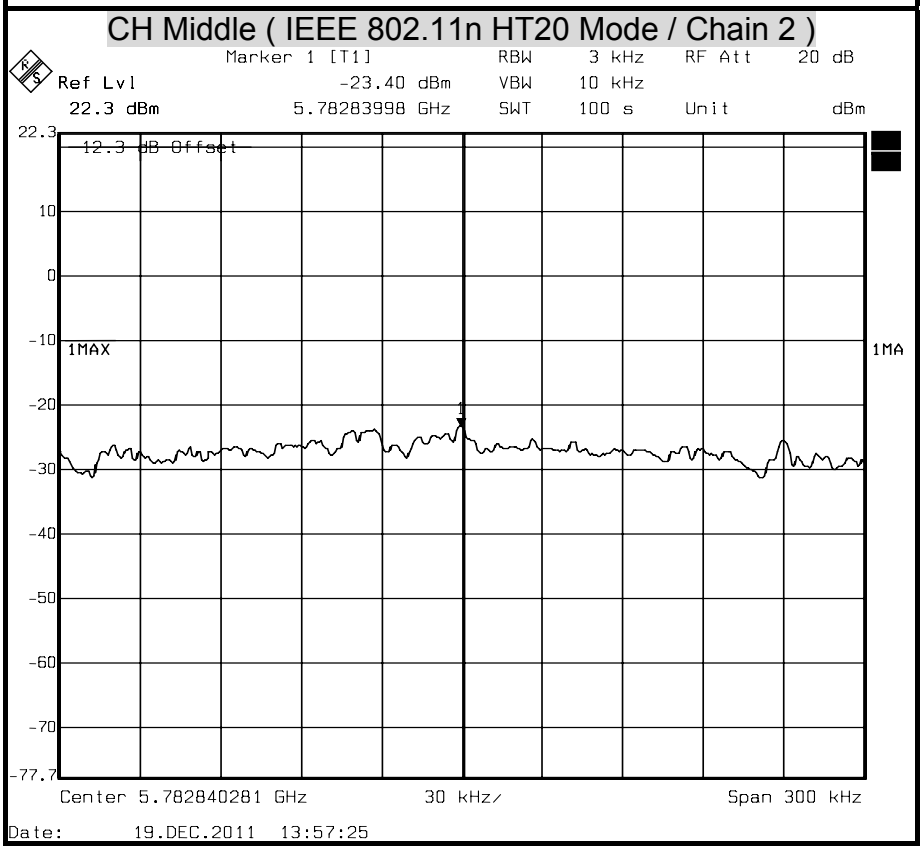




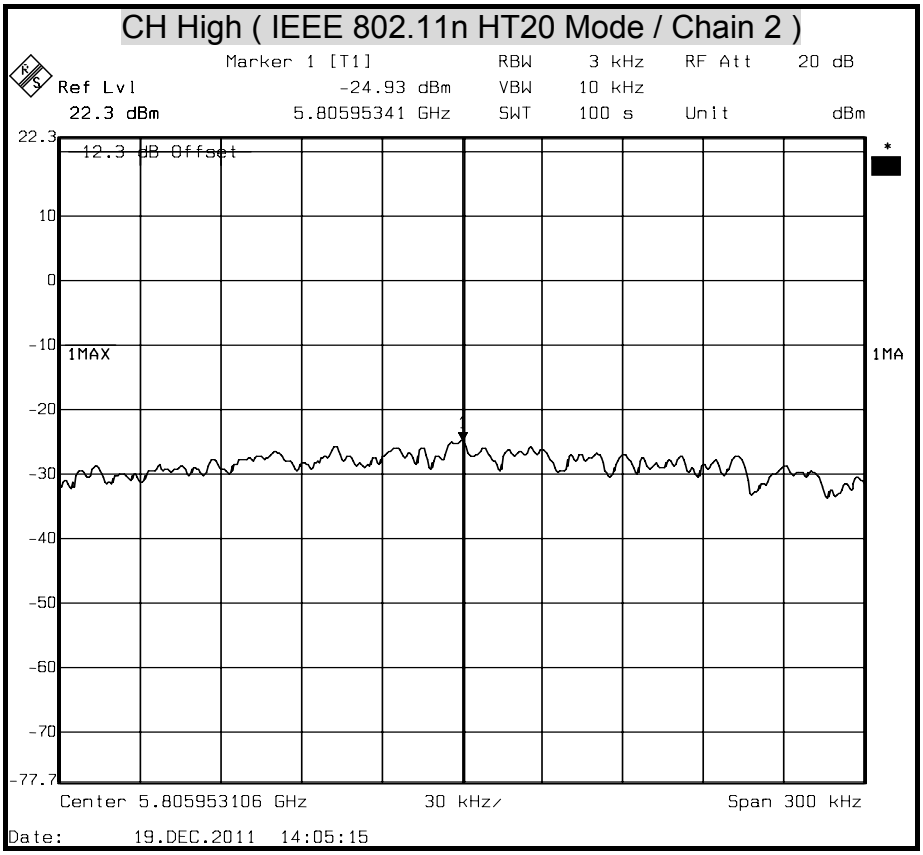
CH Low (IEEE 802.11n HT20 Mode / Chain 2)



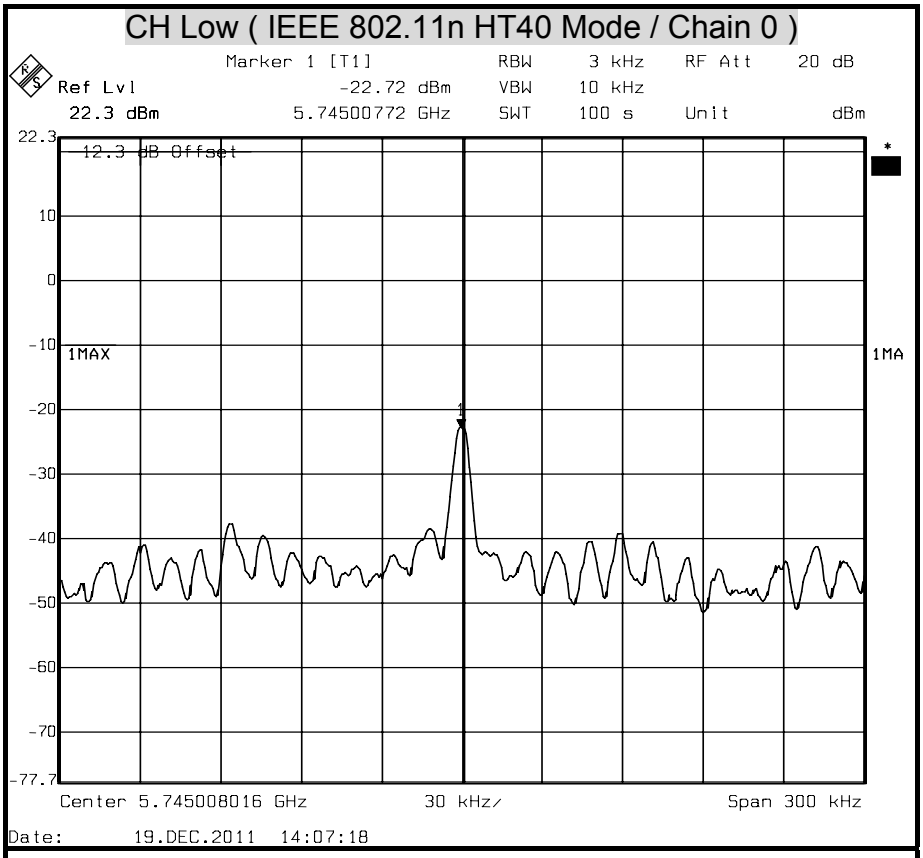
CH Middle (IEEE 802.11n HT20 Mode / Chain 2)



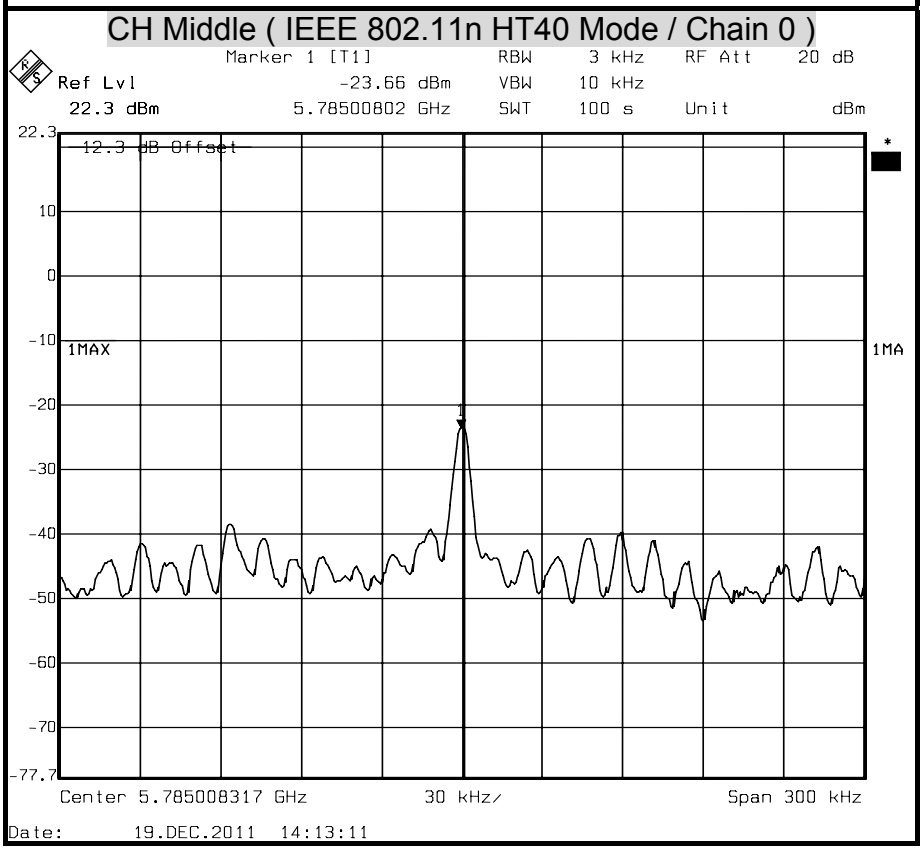
CH High (IEEE 802.11n HT20 Mode / Chain 2)

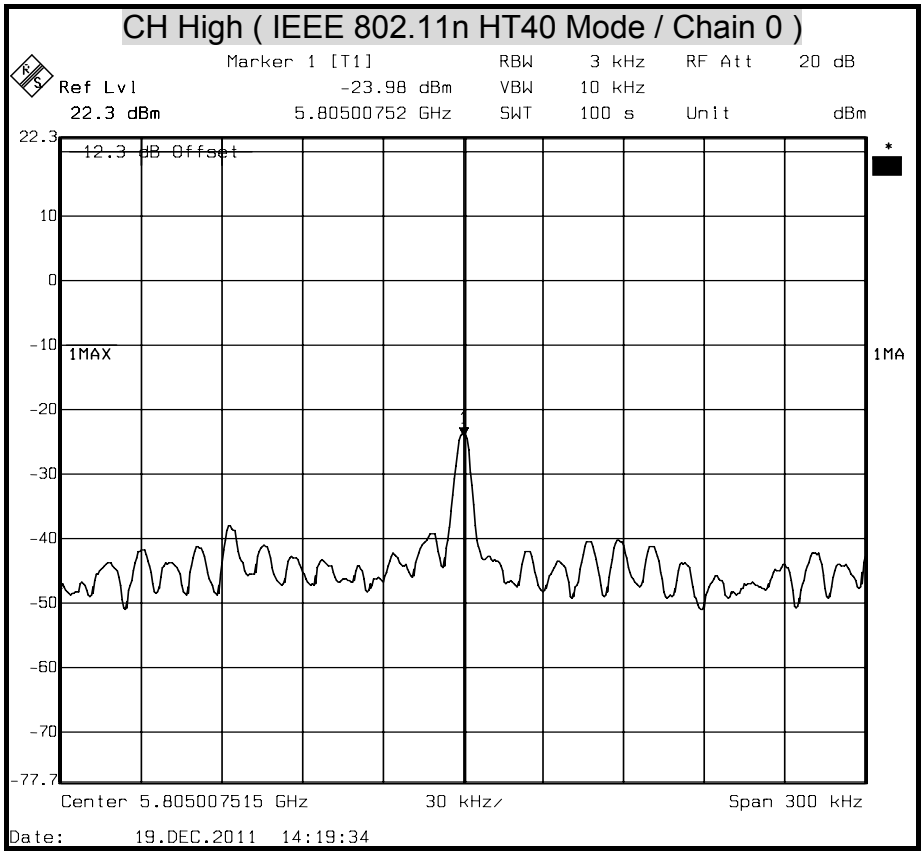


CH Low (IEEE 802.11n HT40 Mode / Chain 0)

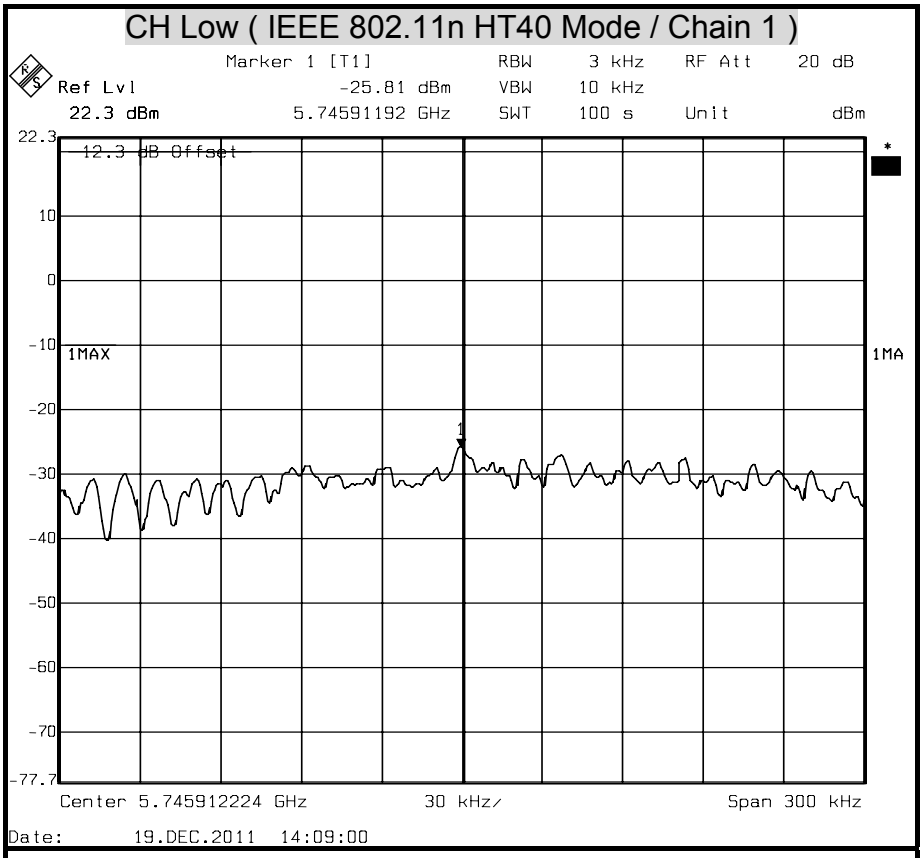


CH Middle (IEEE 802.11n HT40 Mode / Chain 0)

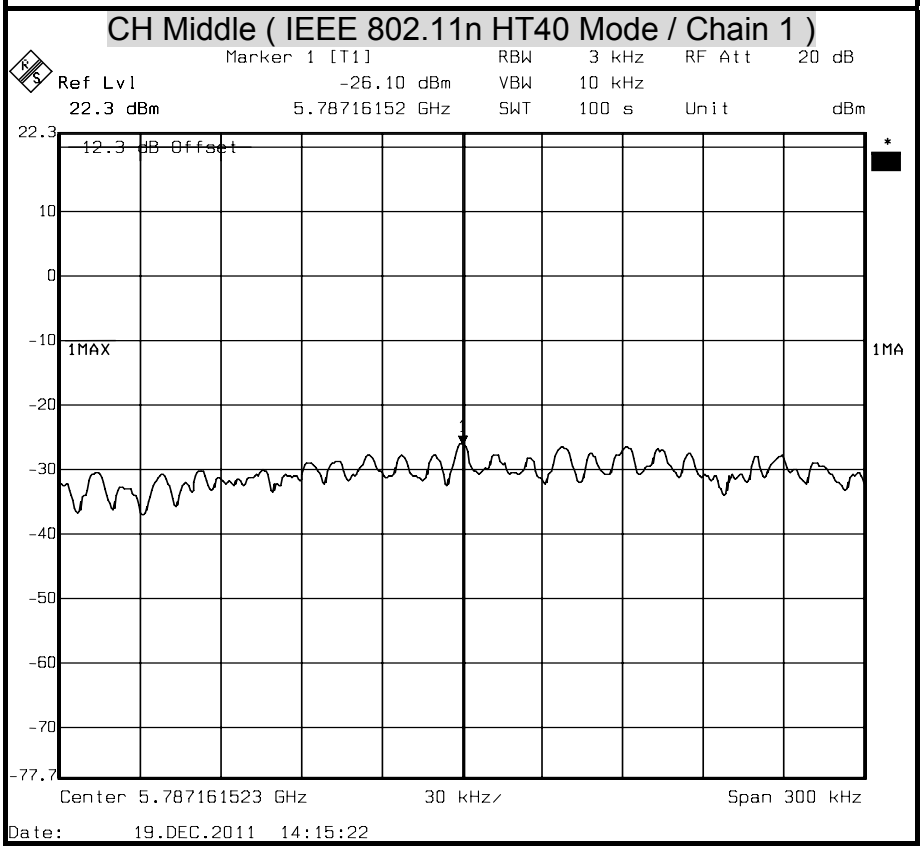


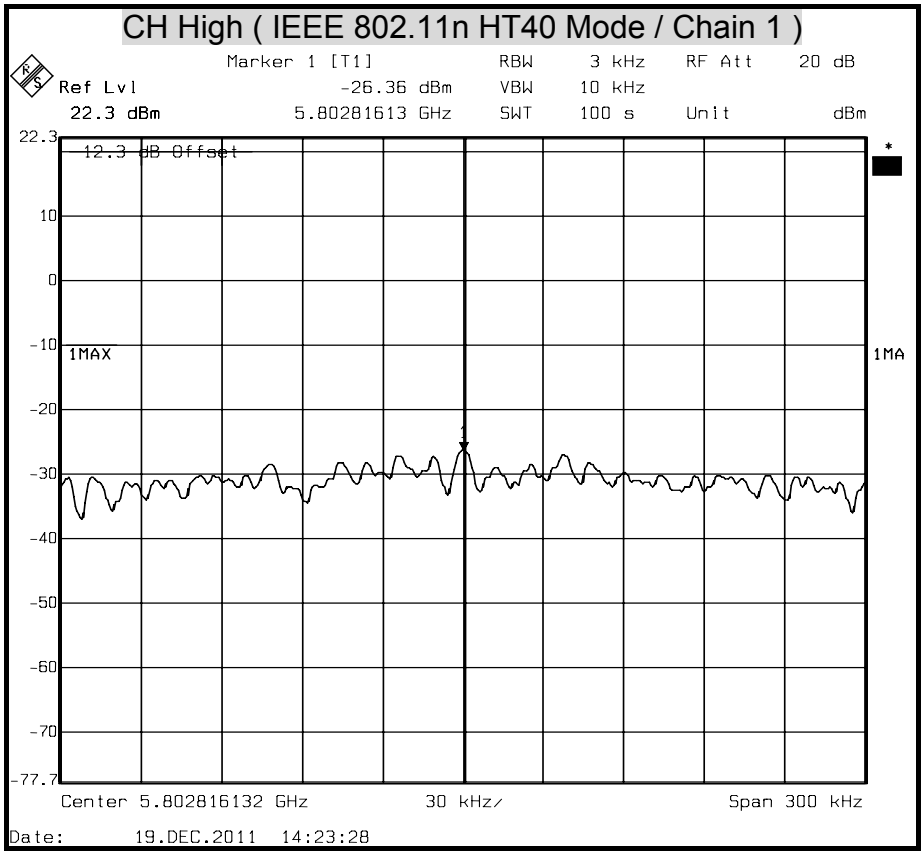


CH Low (IEEE 802.11n HT40 Mode / Chain 1)

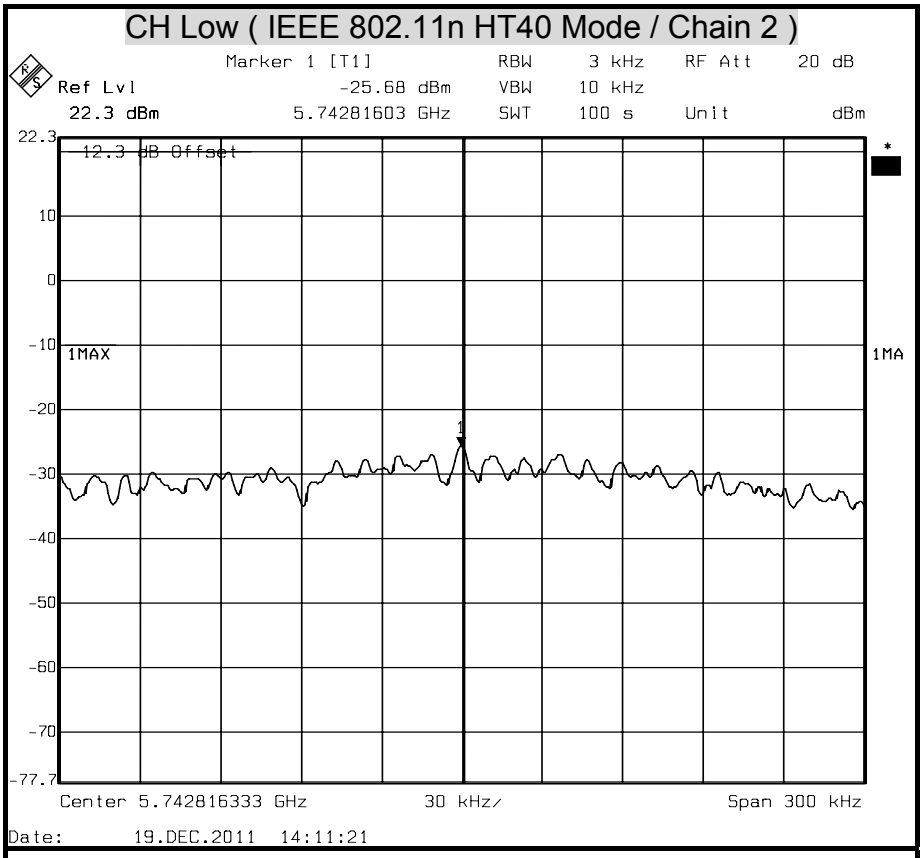


CH Middle (IEEE 802.11n HT40 Mode / Chain 1)

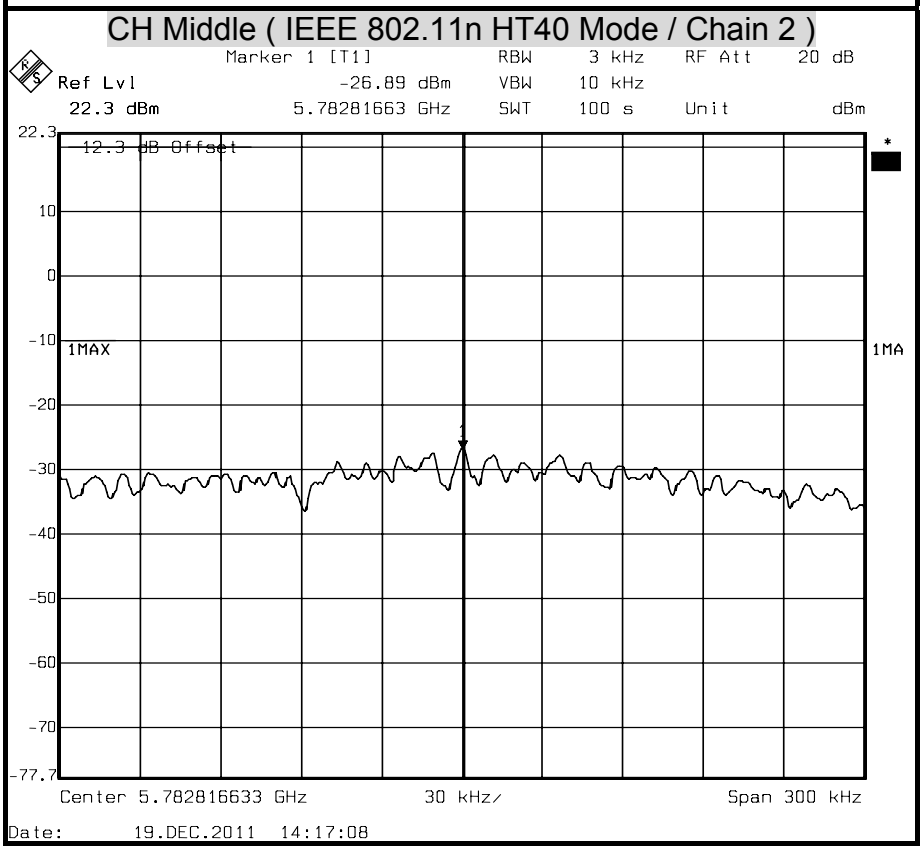


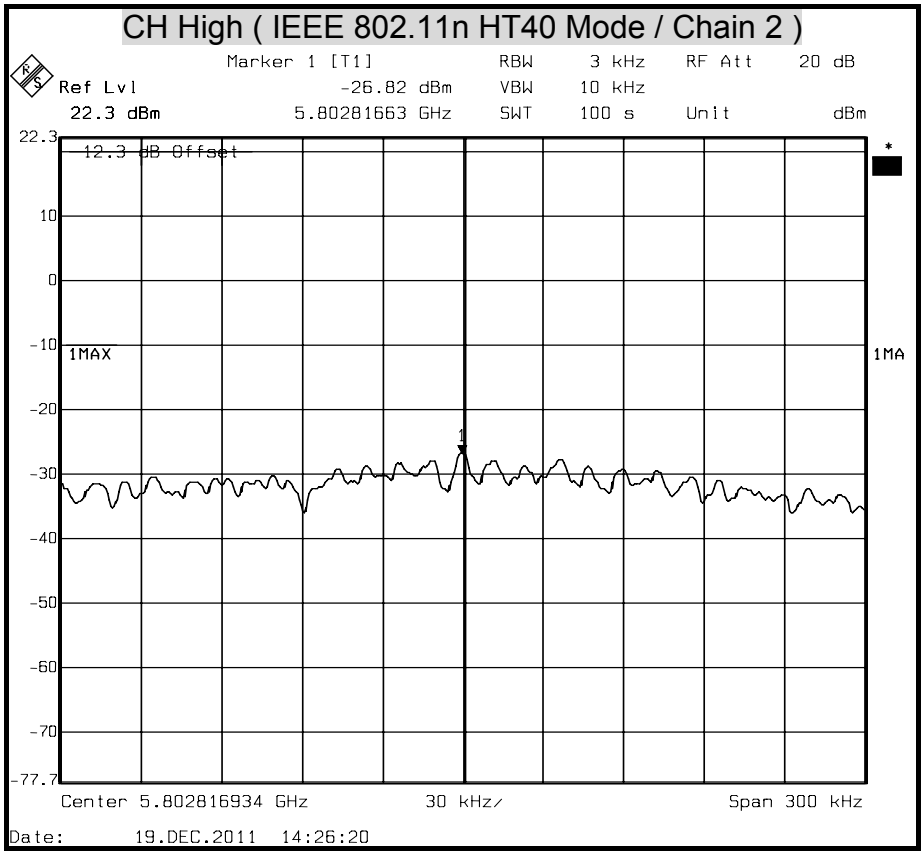


CH Low (IEEE 802.11n HT40 Mode / Chain 2)



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





7.4 CONDUCTED SPURIOUS EMISSION

LIMITS

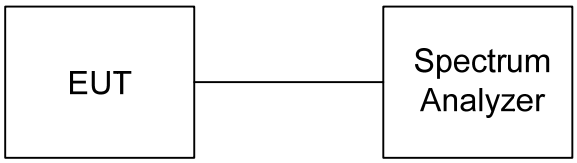
§ 15.247(d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that 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.

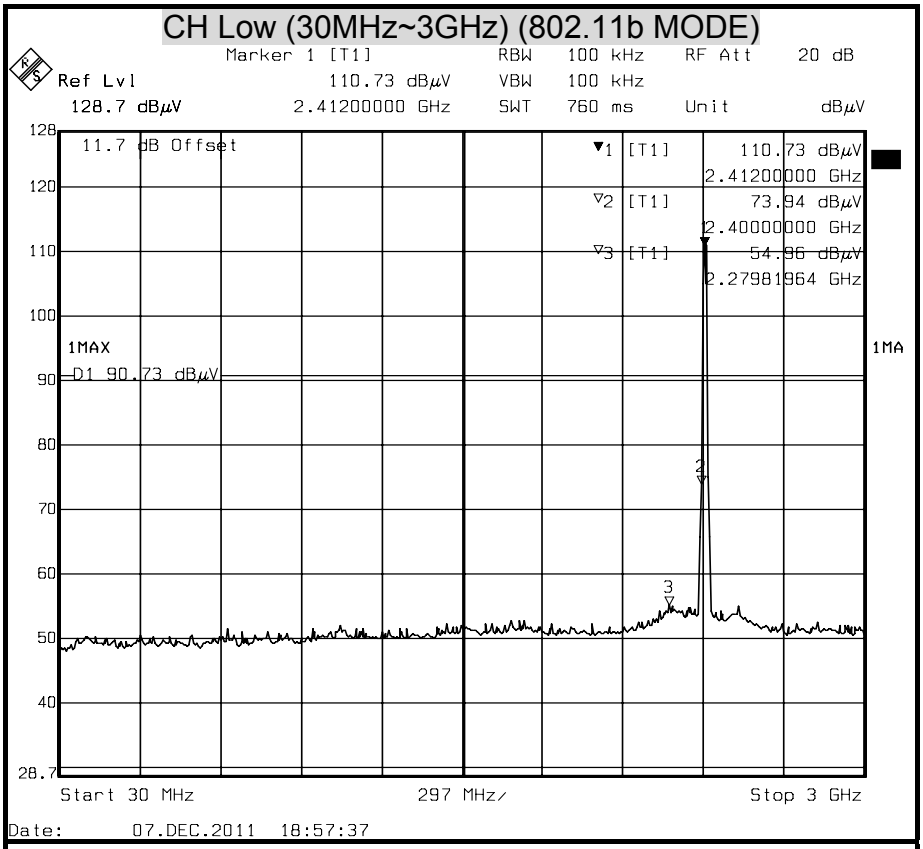
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in the 2.4 GHz band.

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.

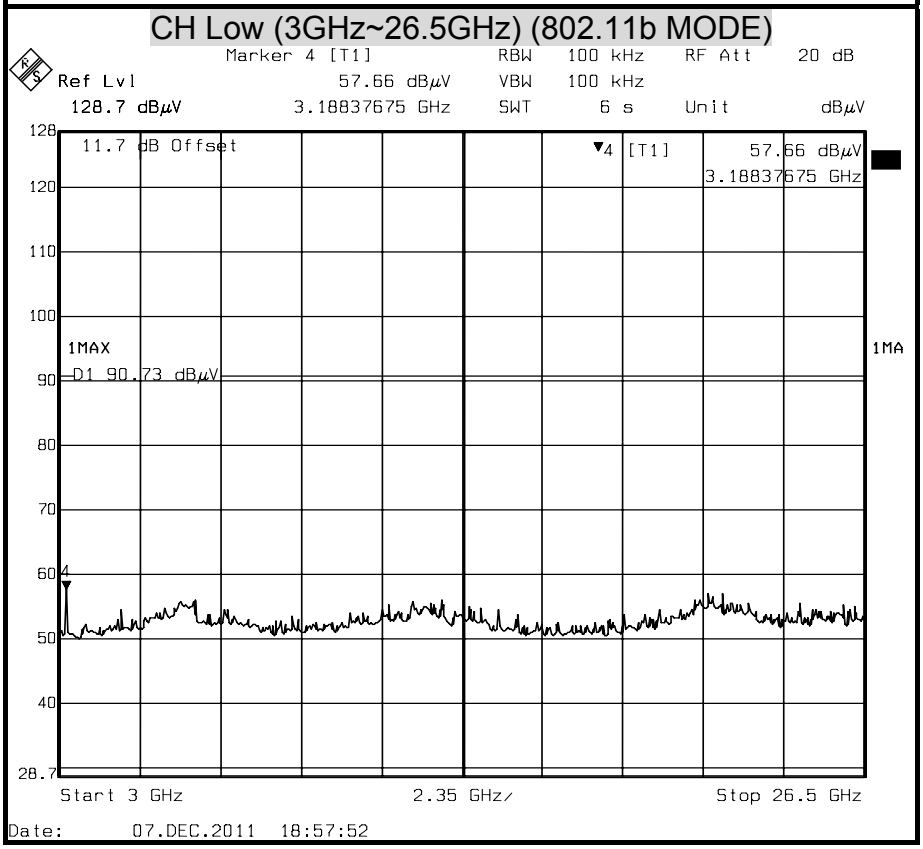
TEST RESULTS

OUT-OF-BAND SPURIOUS EMISSIONS-CONDUCTED MEASUREMENT
(802.11b MODE)

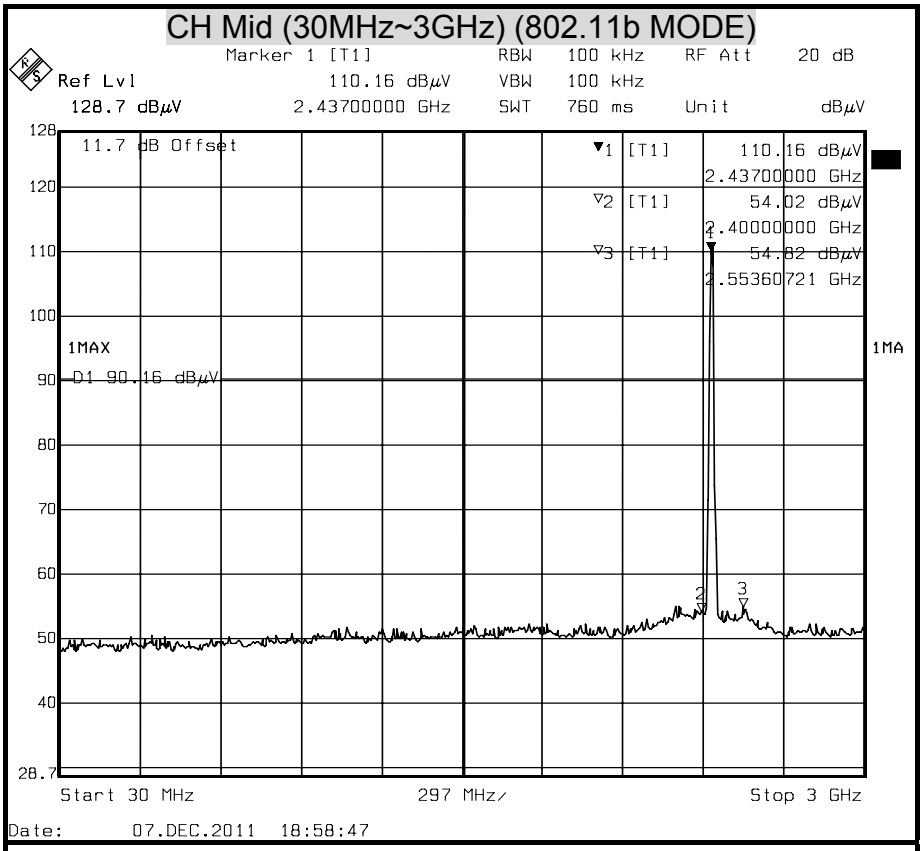
CH Low (30MHz~3GHz) (802.11b MODE)



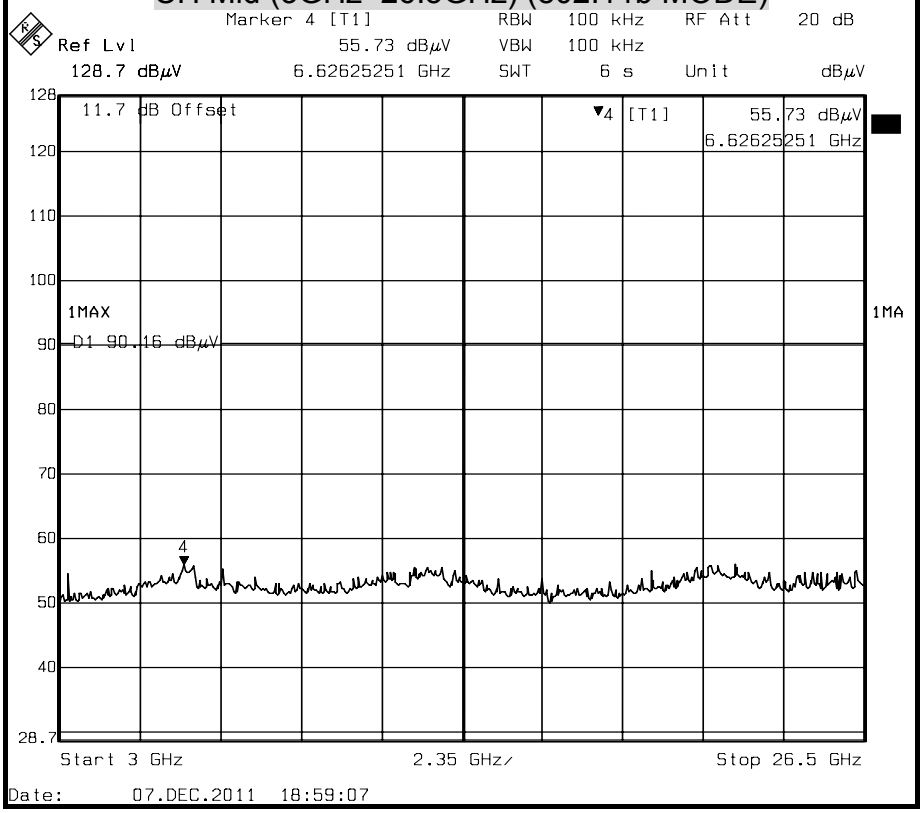
CH Low (3GHz~26.5GHz) (802.11b MODE)



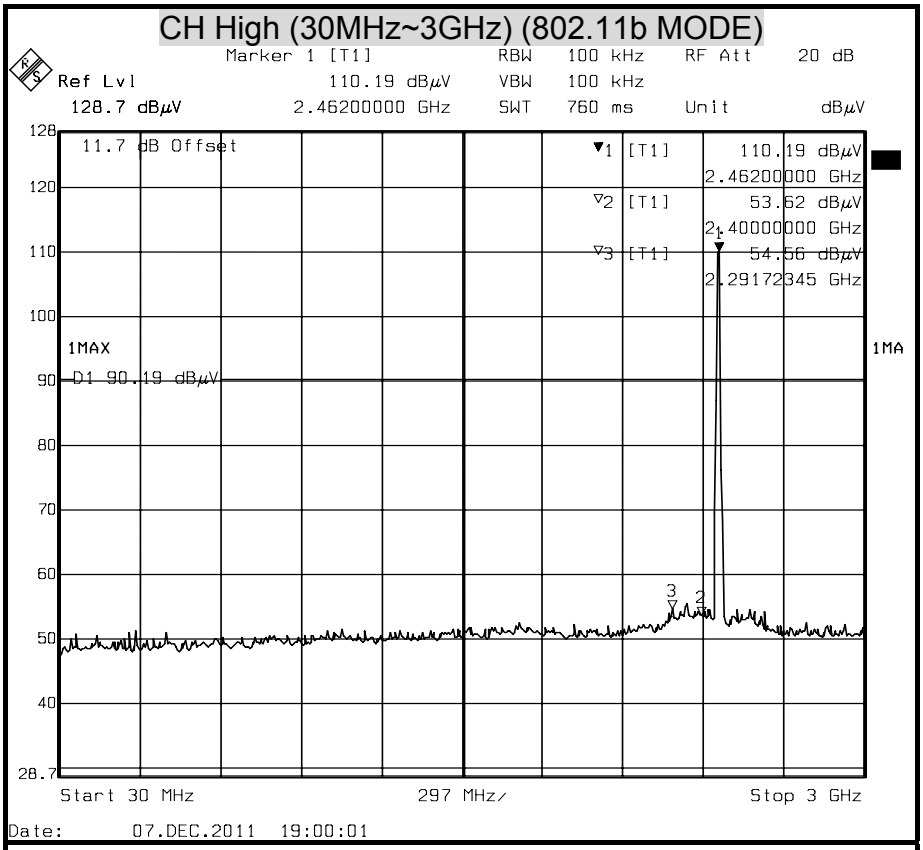
CH Mid (30MHz~3GHz) (802.11b MODE)



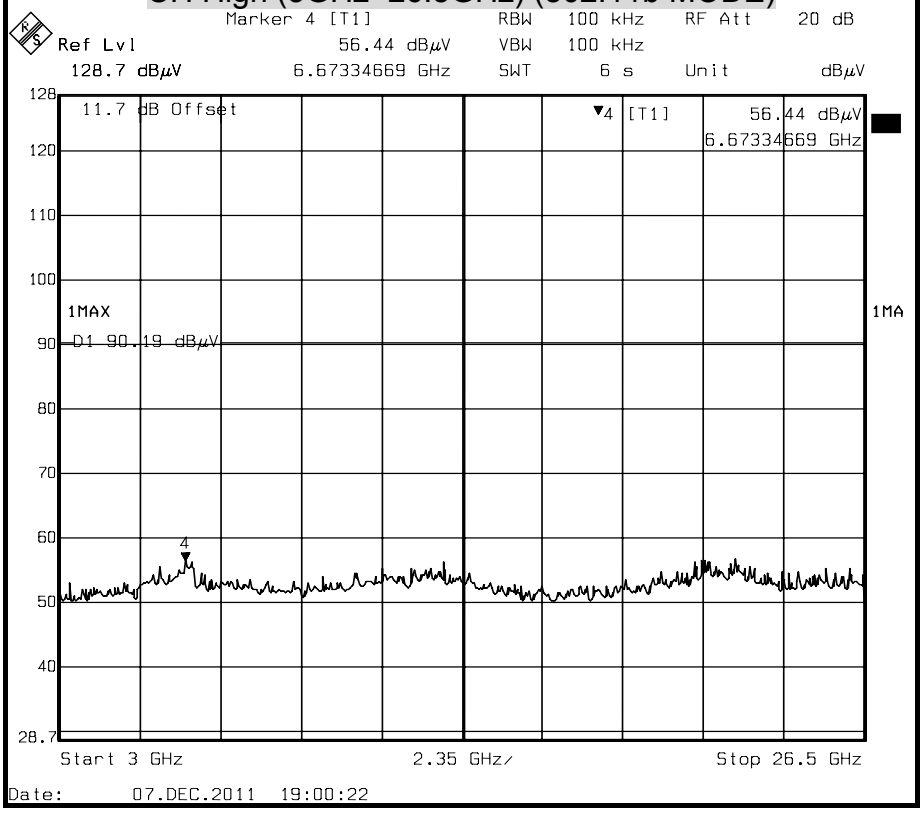
CH Mid (3GHz~26.5GHz) (802.11b MODE)



CH High (30MHz~3GHz) (802.11b MODE)

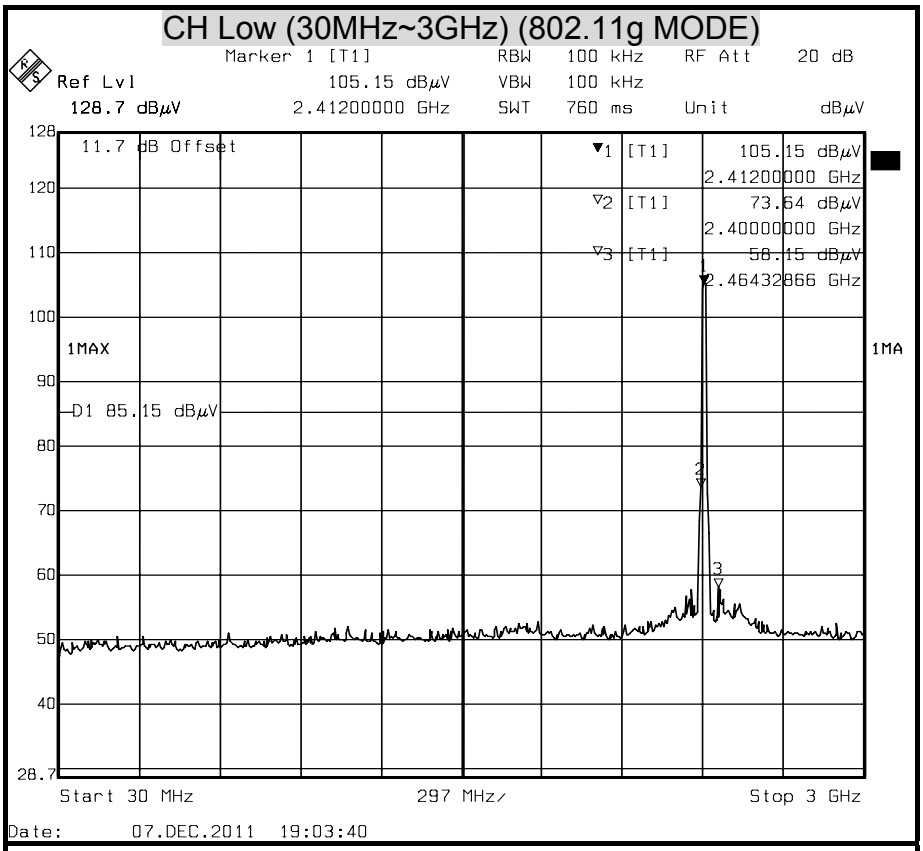


CH High (3GHz~26.5GHz) (802.11b MODE)

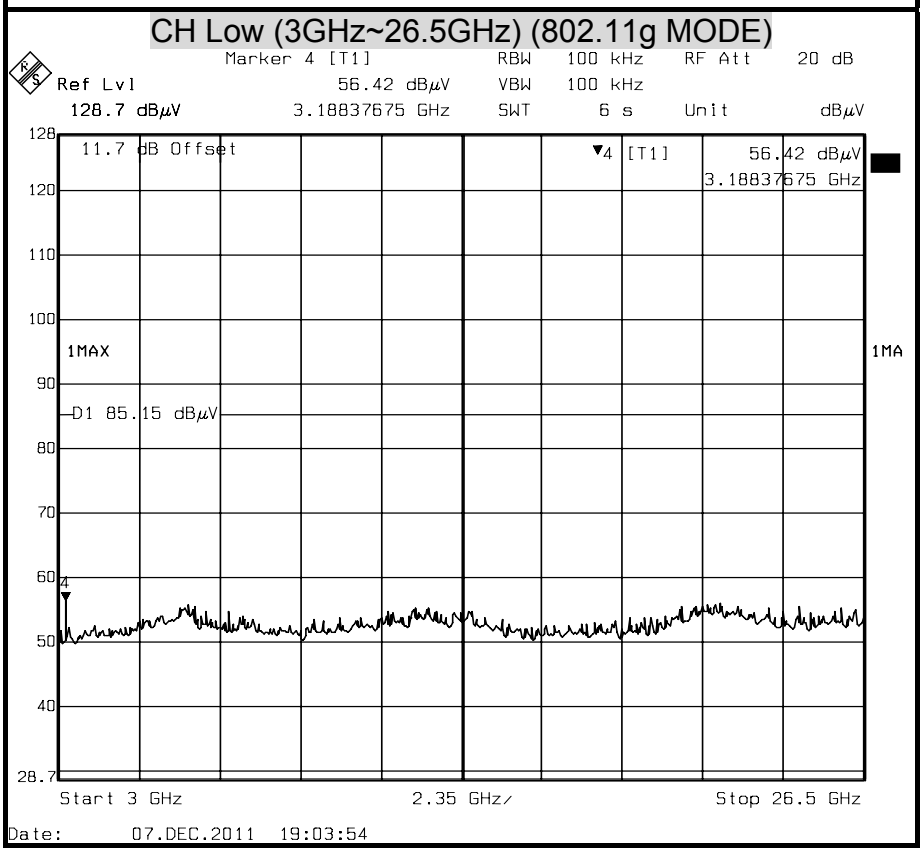


OUT-OF-BAND SPURIOUS EMISSIONS-CONDUCTED MEASUREMENT
(802.11g MODE)

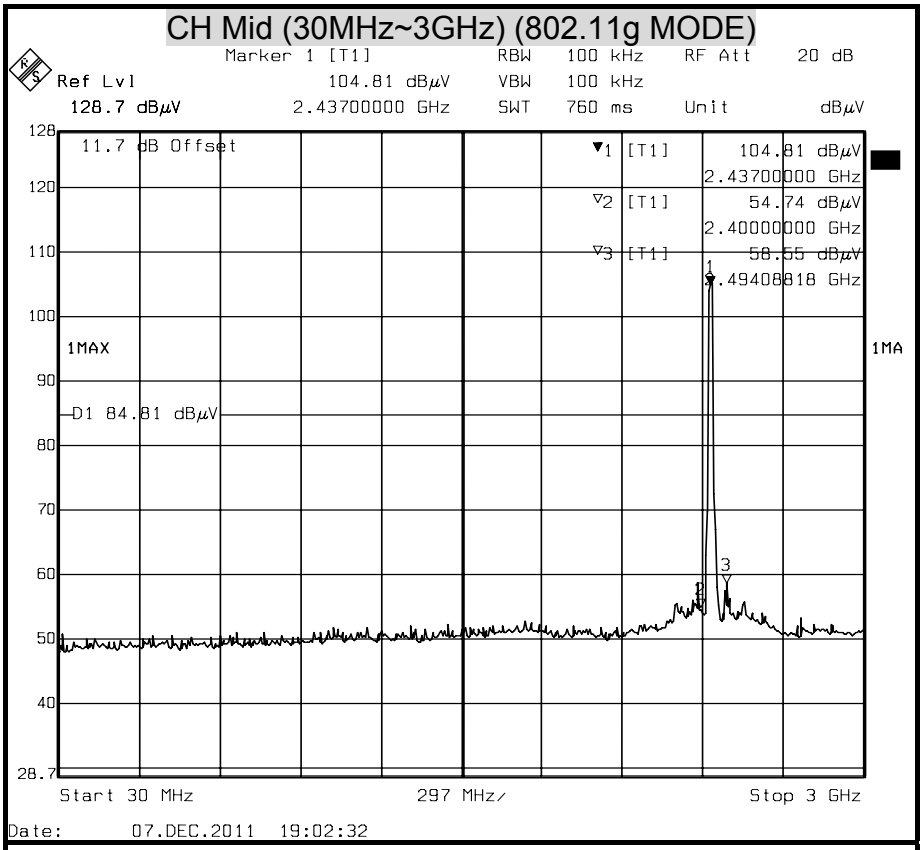
CH Low (30MHz~3GHz) (802.11g MODE)



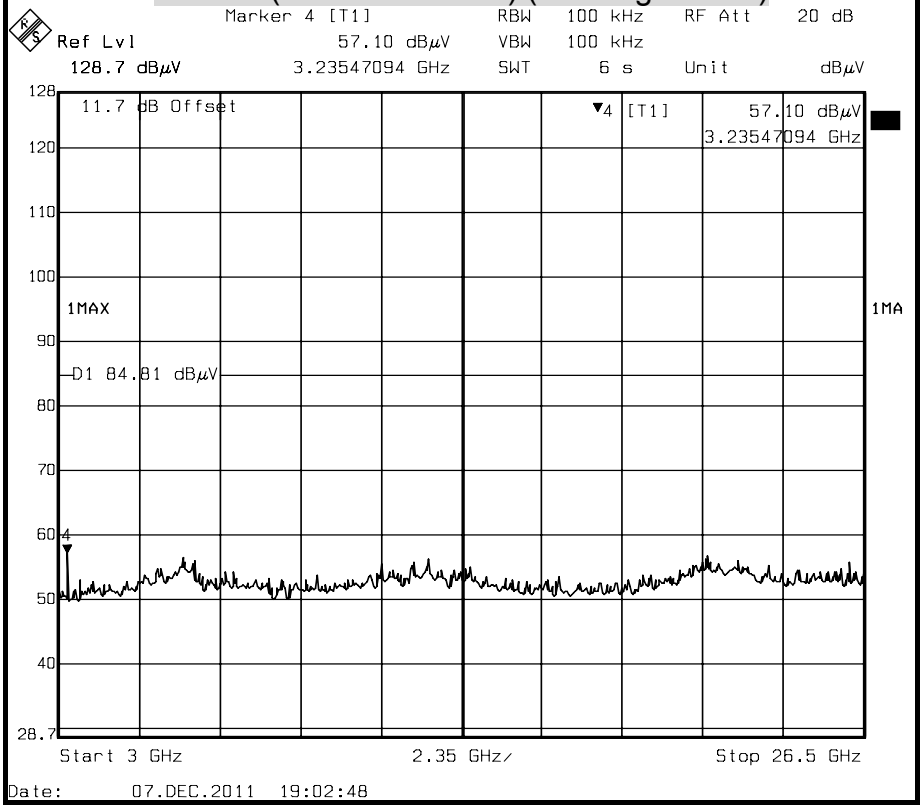
CH Low (3GHz~26.5GHz) (802.11g MODE)



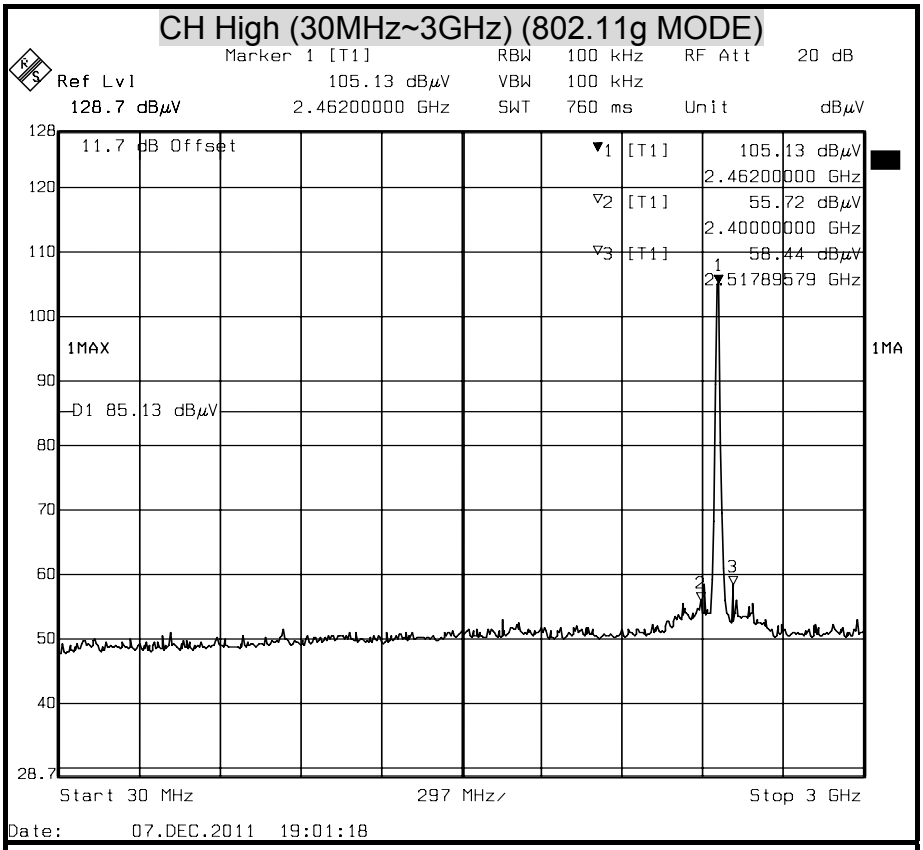
CH Mid (30MHz~3GHz) (802.11g MODE)



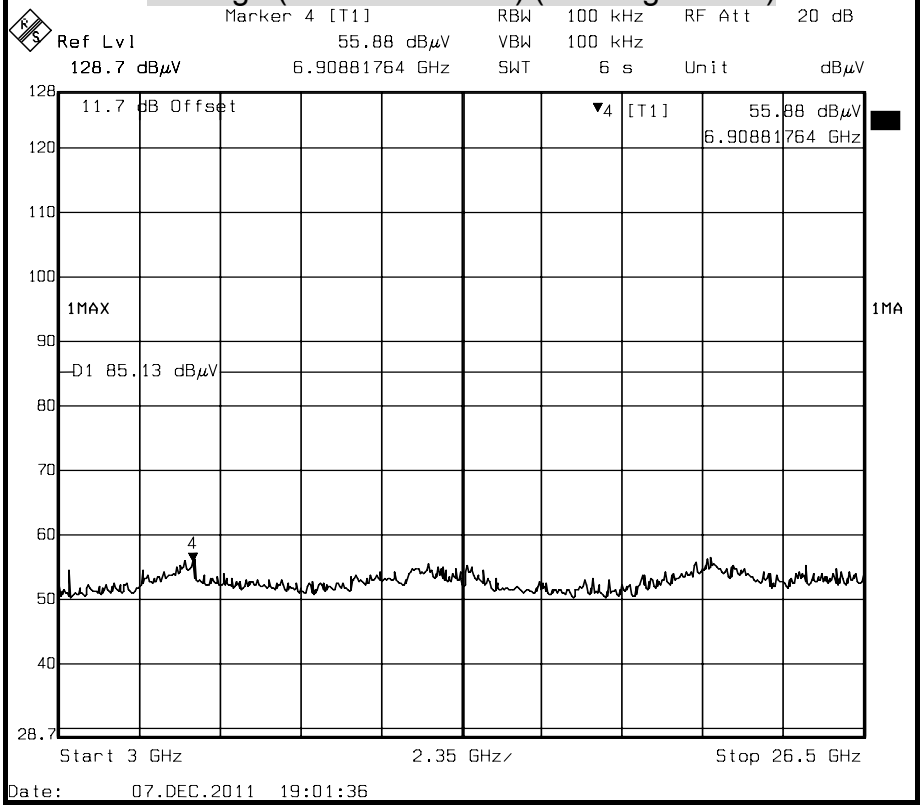
CH Mid (3GHz~26.5GHz) (802.11g MODE)



CH High (30MHz~3GHz) (802.11g MODE)

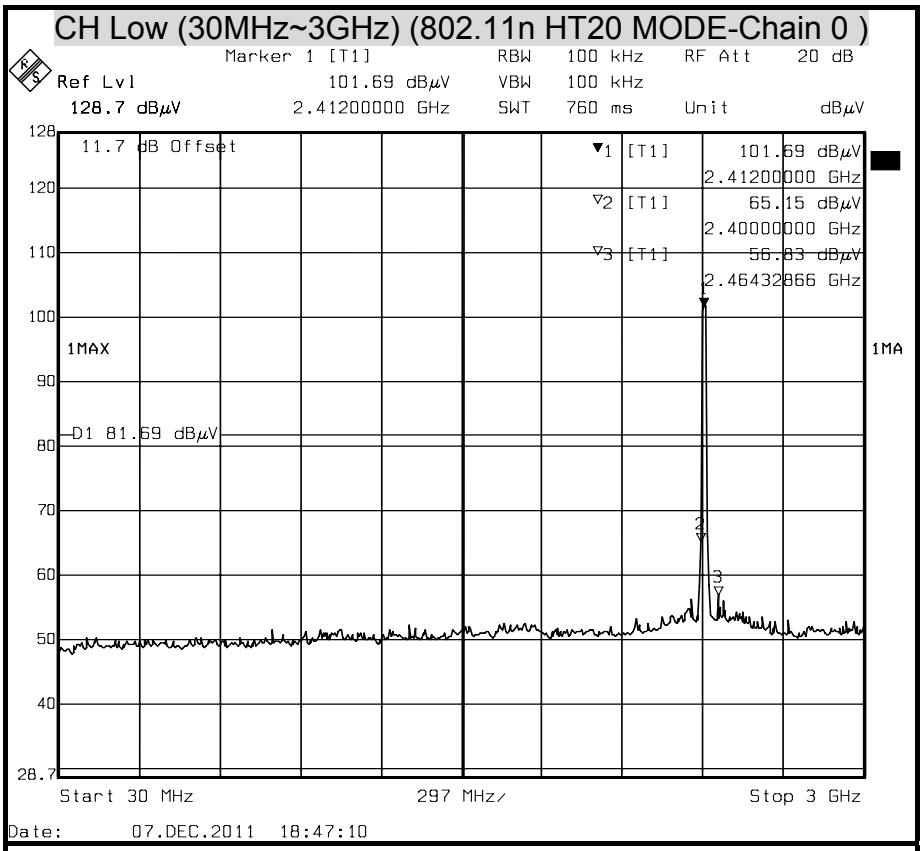


CH High (3GHz~26.5GHz) (802.11g MODE)

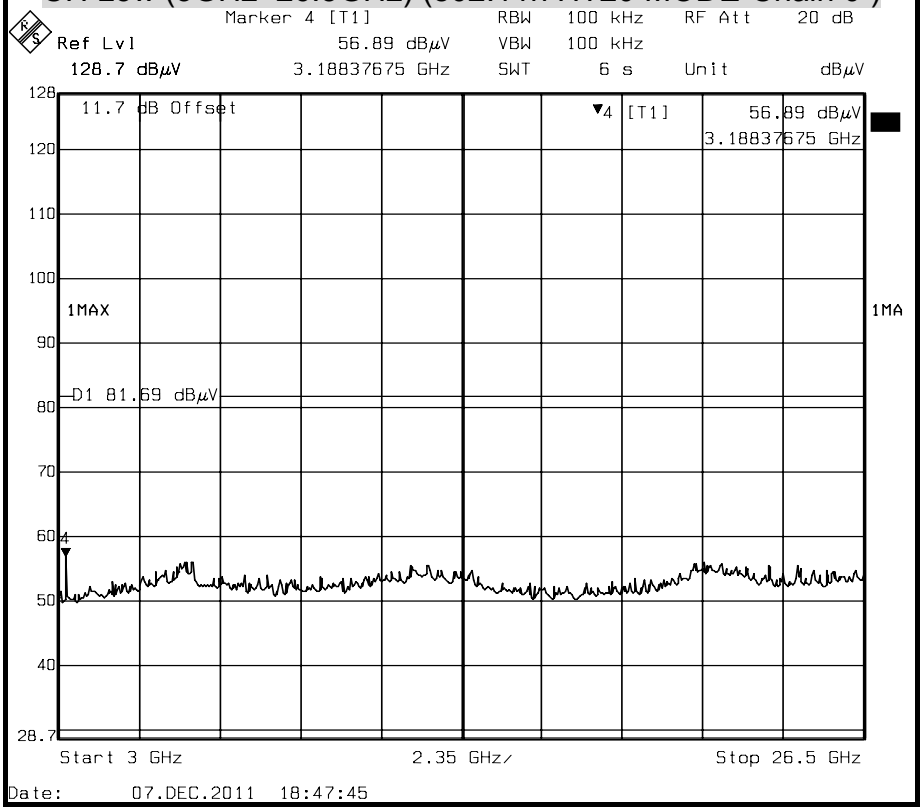


OUT-OF-BAND SPURIOUS EMISSIONS-CONDUCTED MEASUREMENT
(802.11n HT20 MODE)

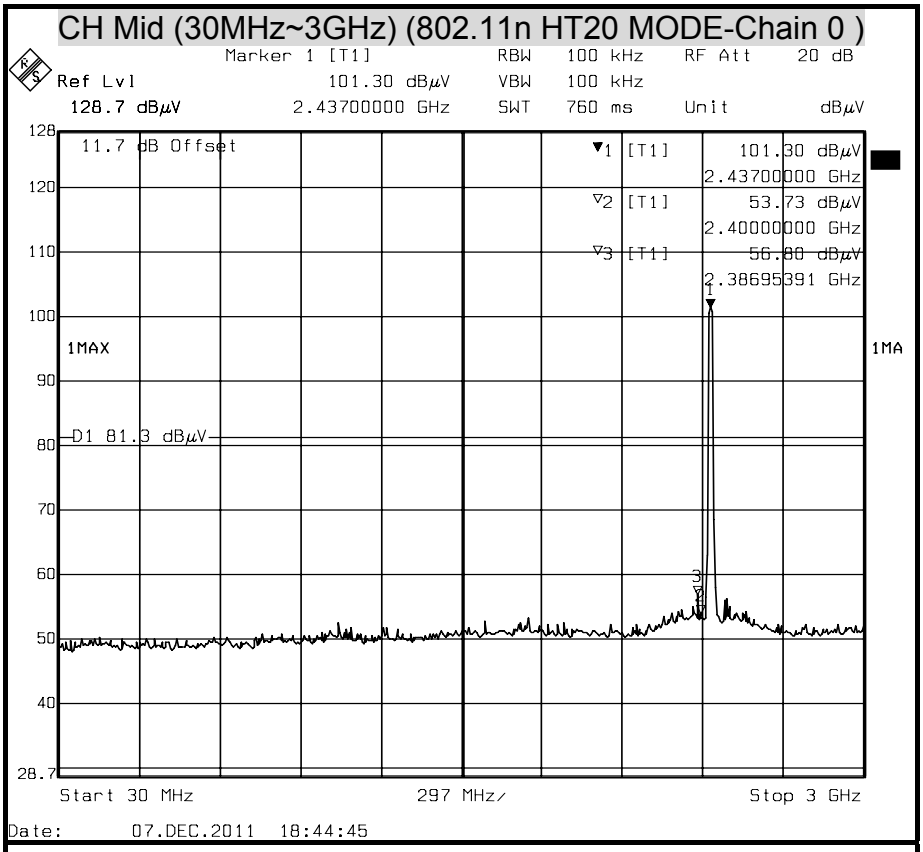
CH Low (30MHz~3GHz) (802.11n HT20 MODE-Chain 0)



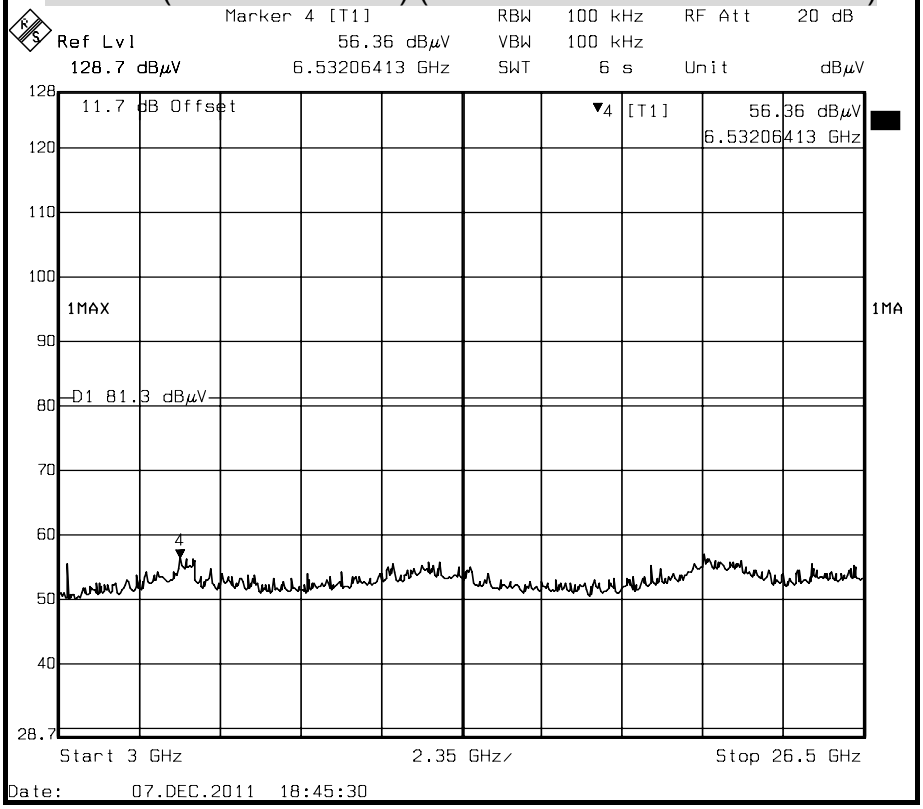
CH Low (3GHz~26.5GHz) (802.11n HT20 MODE-Chain 0)



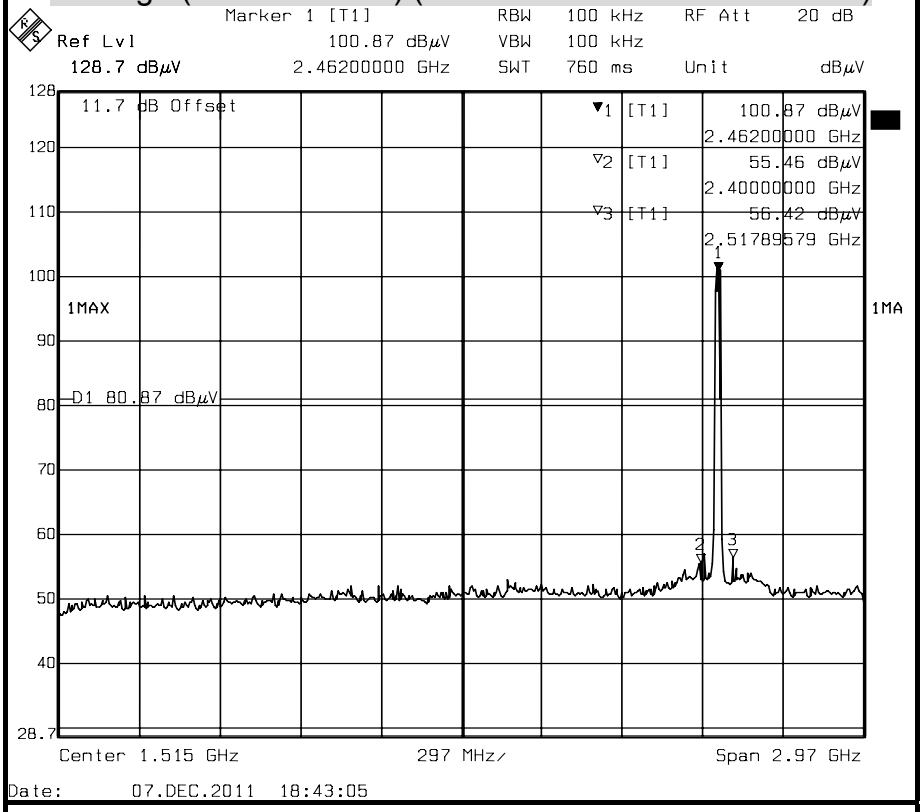
CH Mid (30MHz~3GHz) (802.11n HT20 MODE-Chain 0)



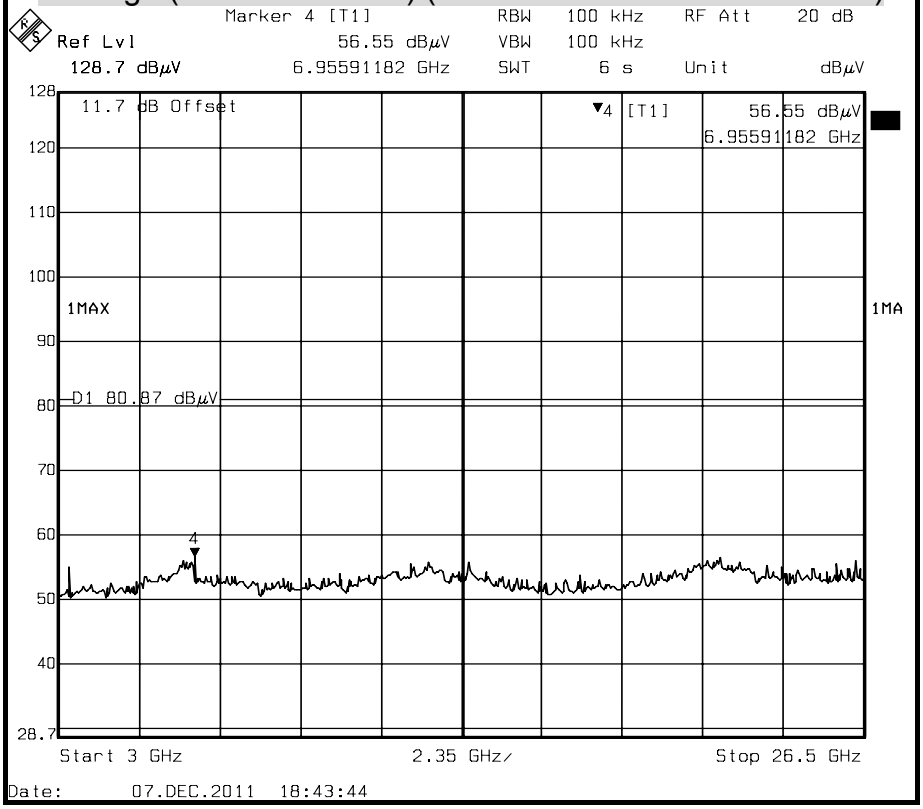
CH Mid (3GHz~26.5GHz) (802.11n HT20 MODE-Chain 0)



CH High (30MHz~3GHz) (802.11n HT20 MODE-Chain 0)

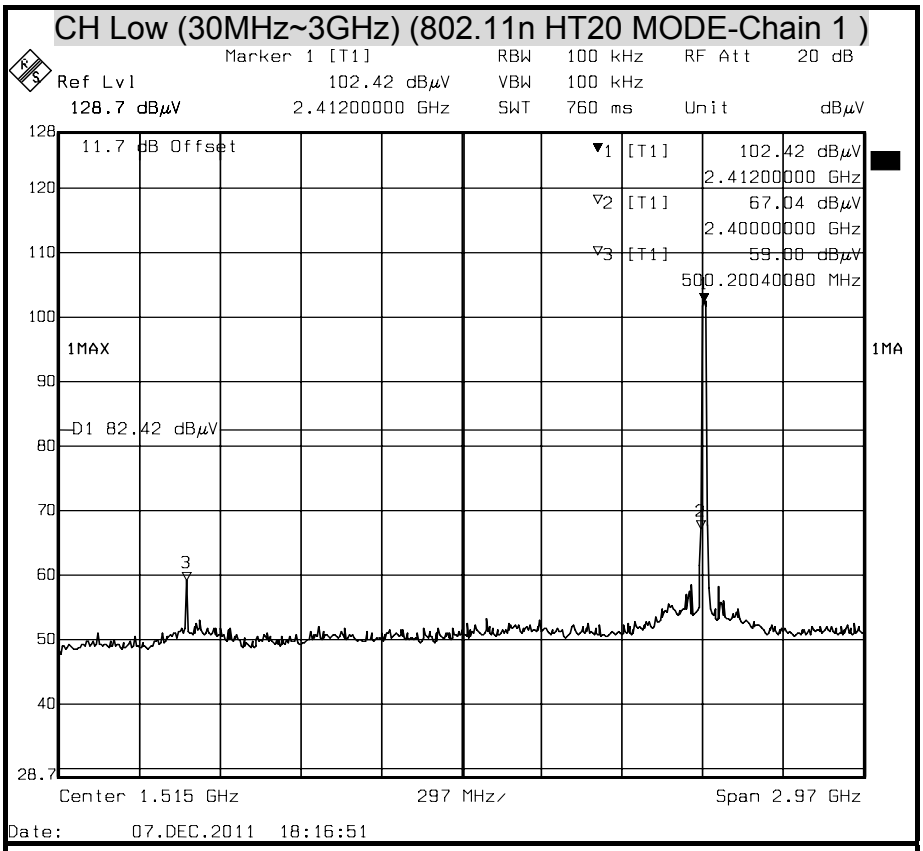


CH High (3GHz~26.5GHz) (802.11n HT20 MODE-Chain 0)

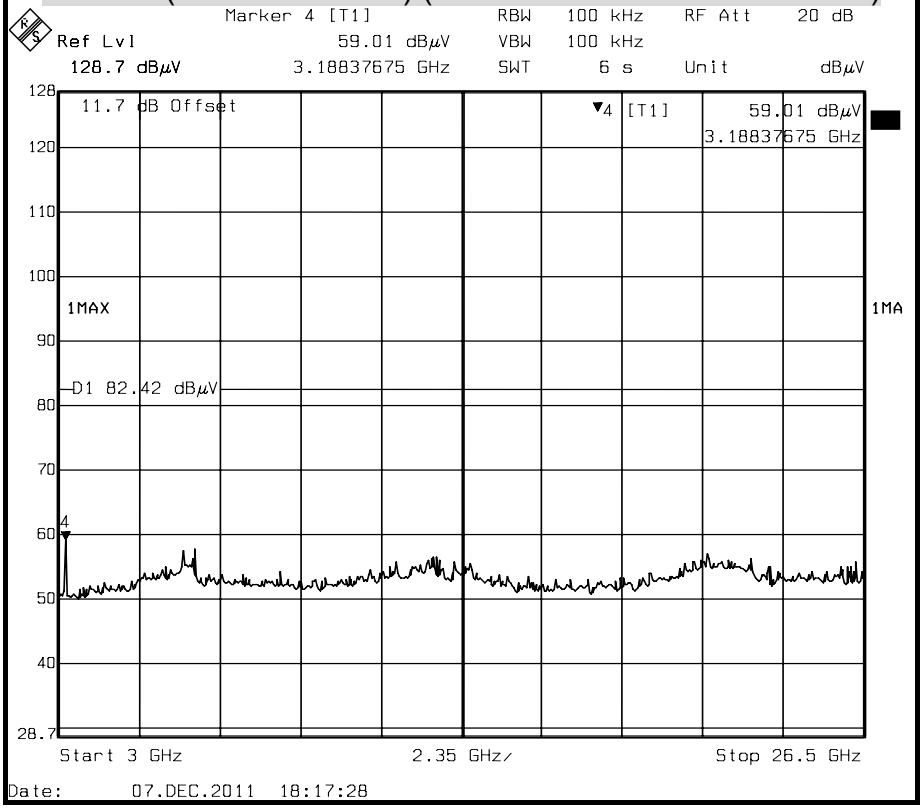


OUT-OF-BAND SPURIOUS EMISSIONS-CONDUCTED MEASUREMENT
(802.11n HT20 MODE)

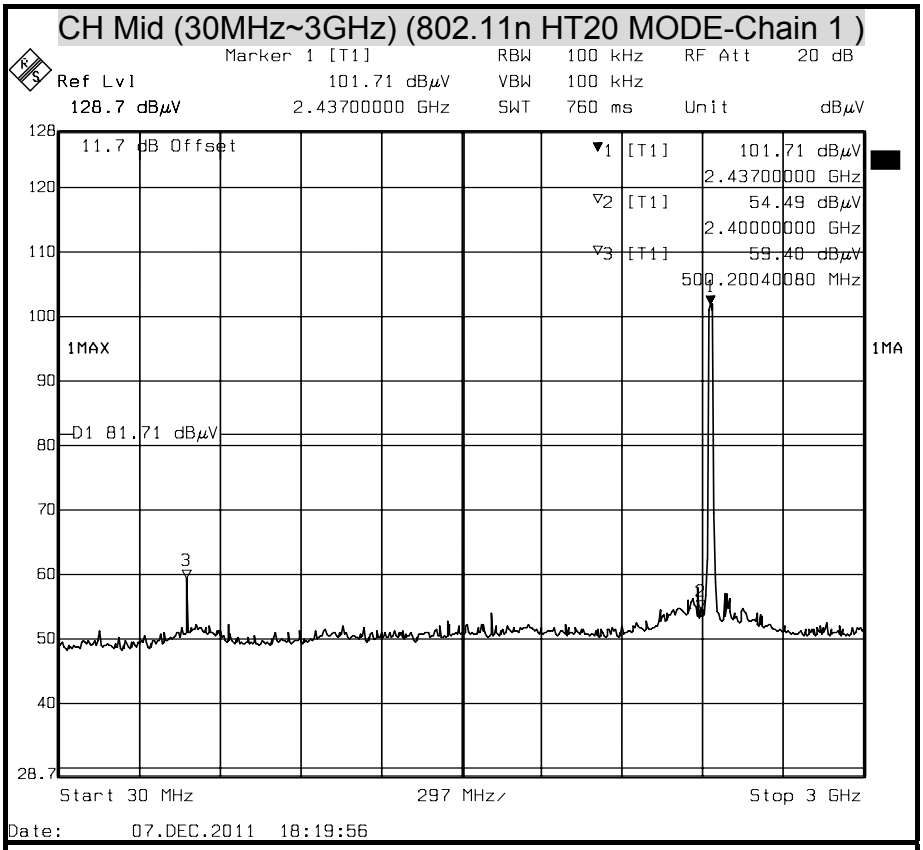
CH Low (30MHz~3GHz) (802.11n HT20 MODE-Chain 1)



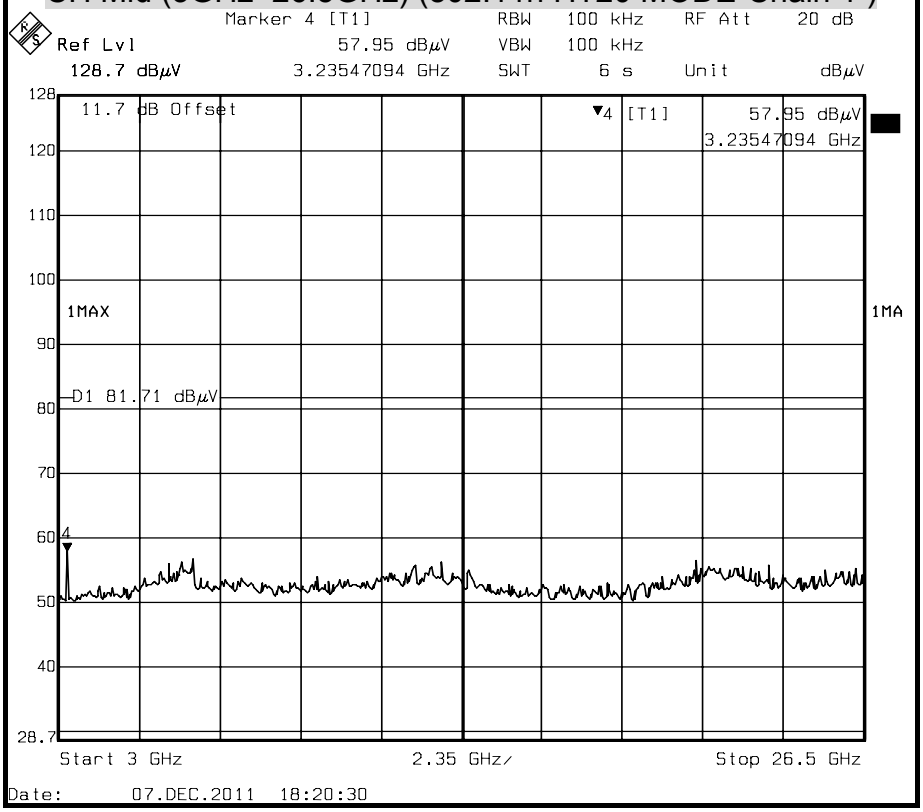
CH Low (3GHz~26.5GHz) (802.11n HT20 MODE-Chain 1)



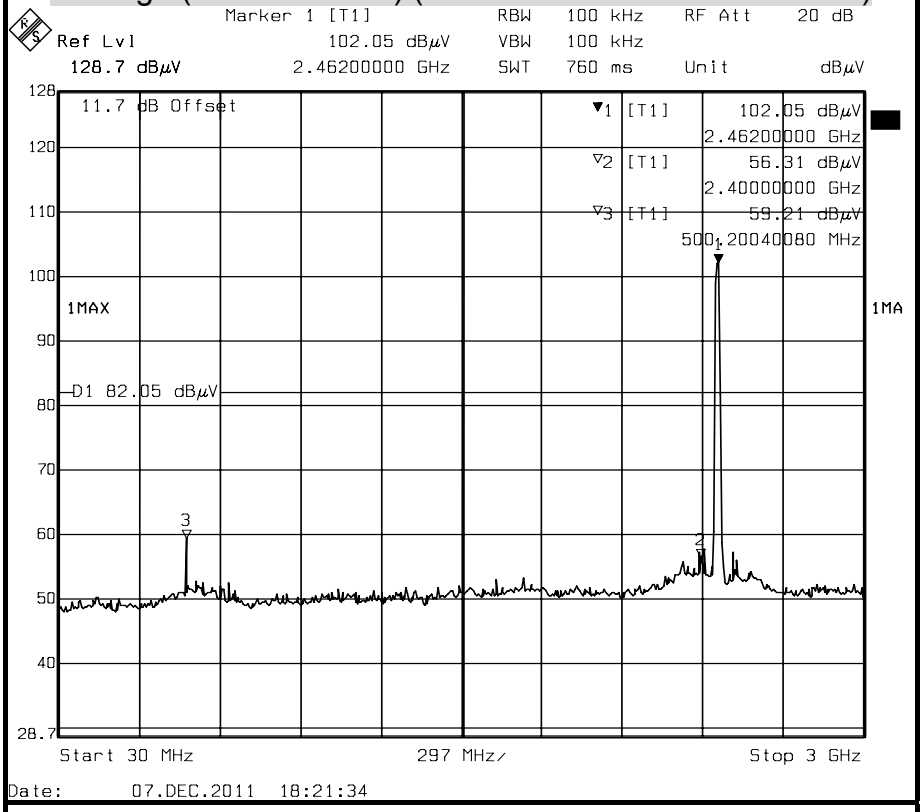
CH Mid (30MHz~3GHz) (802.11n HT20 MODE-Chain 1)



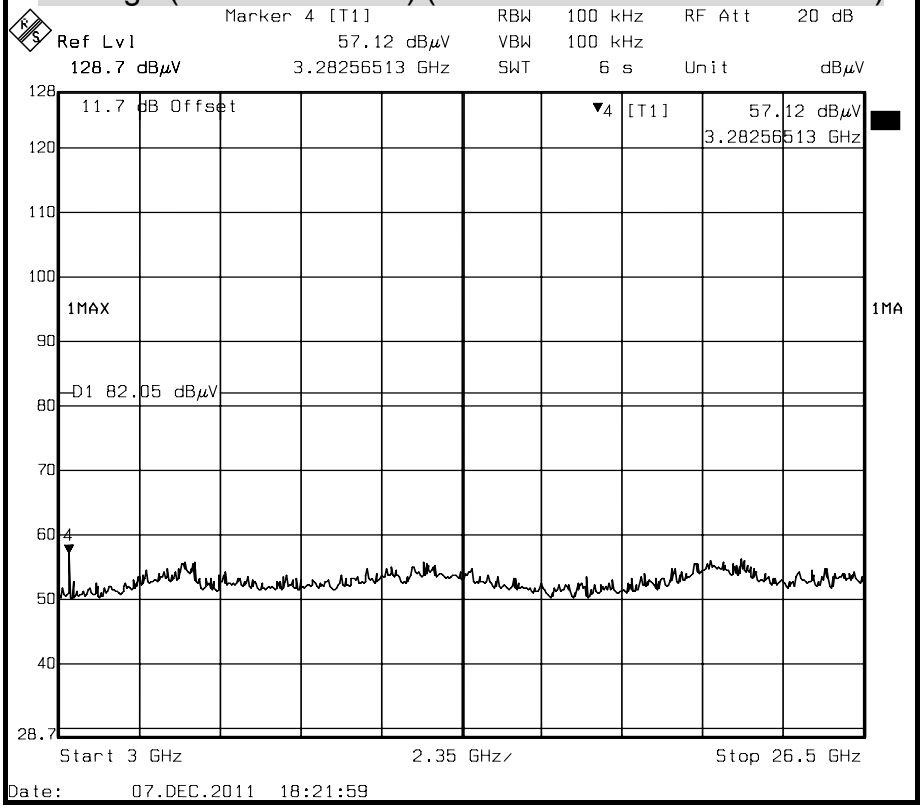
CH Mid (3GHz~26.5GHz) (802.11n HT20 MODE-Chain 1)



CH High (30MHz~3GHz) (802.11n HT20 MODE-Chain 1)

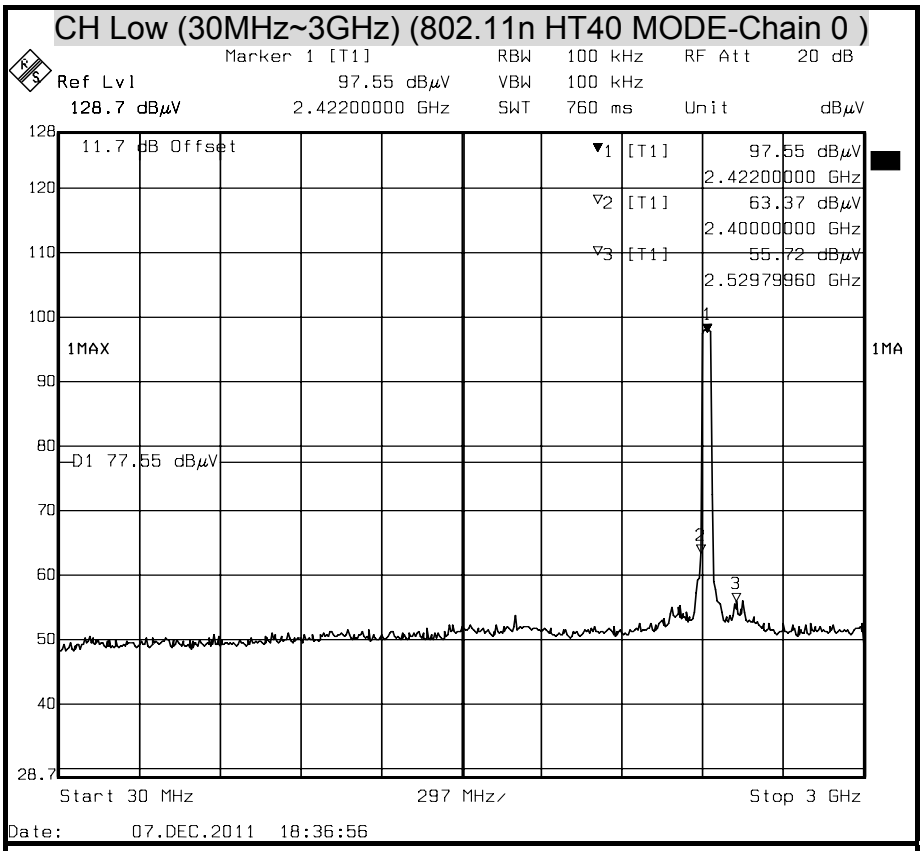


CH High (3GHz~26.5GHz) (802.11n HT20 MODE-Chain 1)

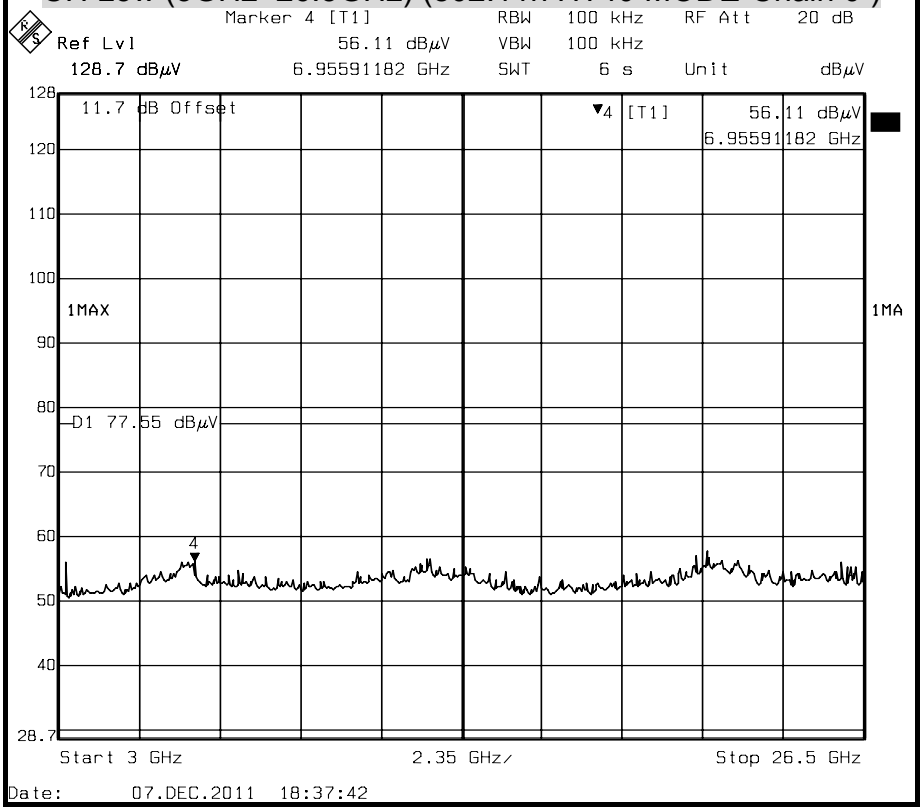


OUT-OF-BAND SPURIOUS EMISSIONS-CONDUCTED MEASUREMENT
(802.11n HT40 MODE)

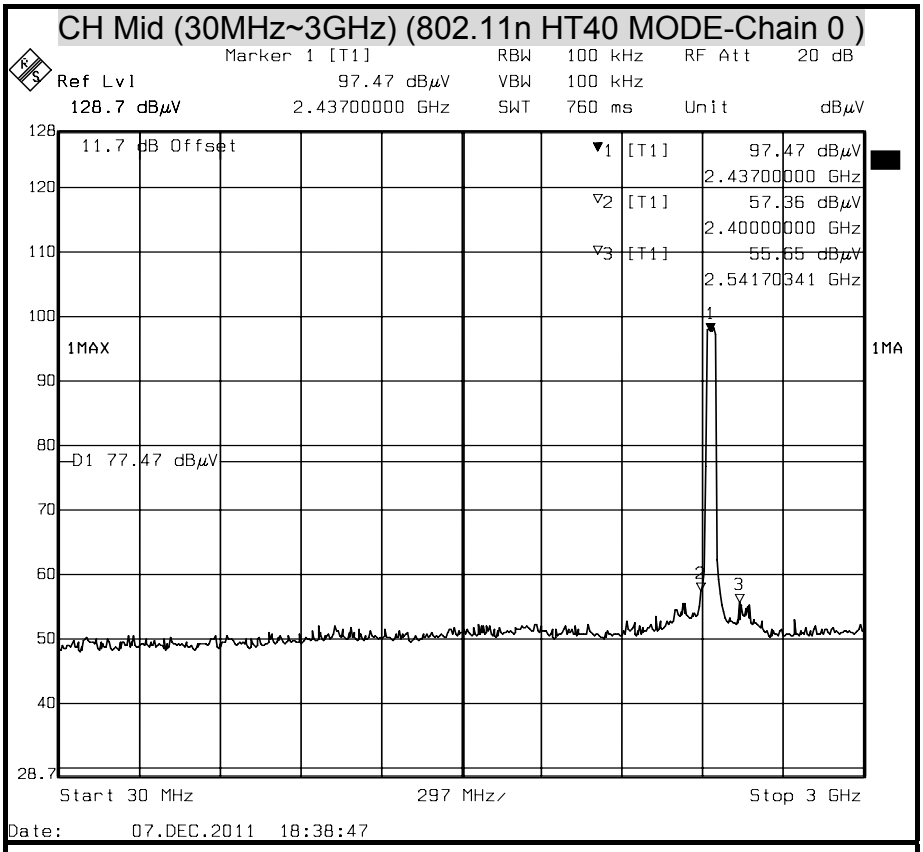
CH Low (30MHz~3GHz) (802.11n HT40 MODE-Chain 0)



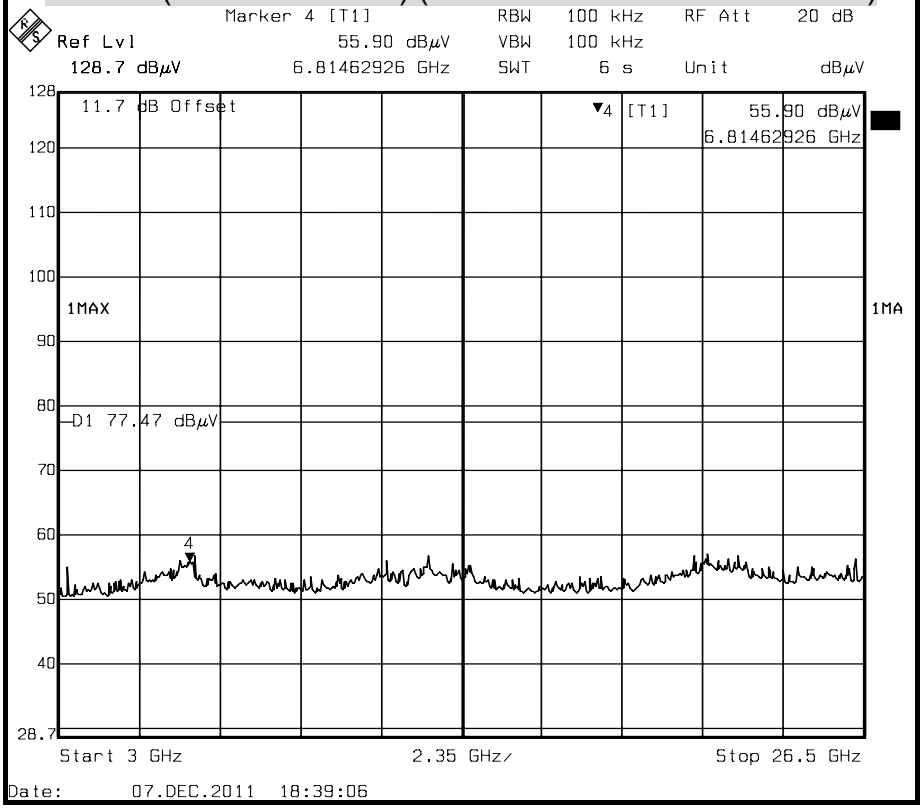
CH Low (3GHz~26.5GHz) (802.11n HT40 MODE-Chain 0)



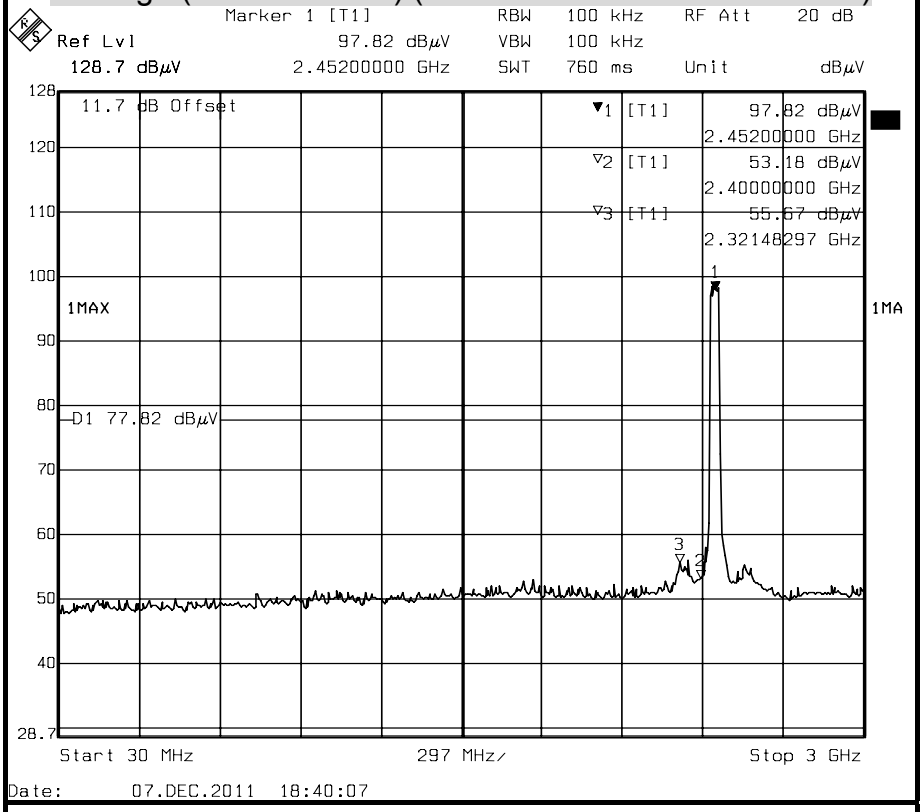
CH Mid (30MHz~3GHz) (802.11n HT40 MODE-Chain 0)



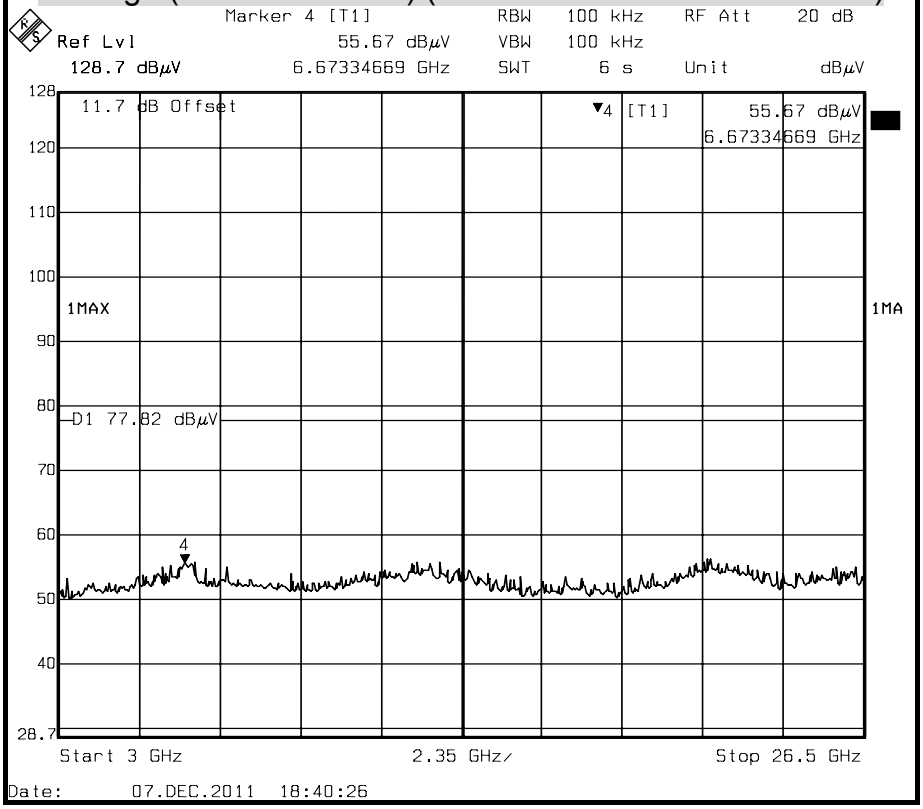
CH Mid (3GHz~26.5GHz) (802.11n HT40 MODE-Chain 0)



CH High (30MHz~3GHz) (802.11n HT40 MODE-Chain 0)

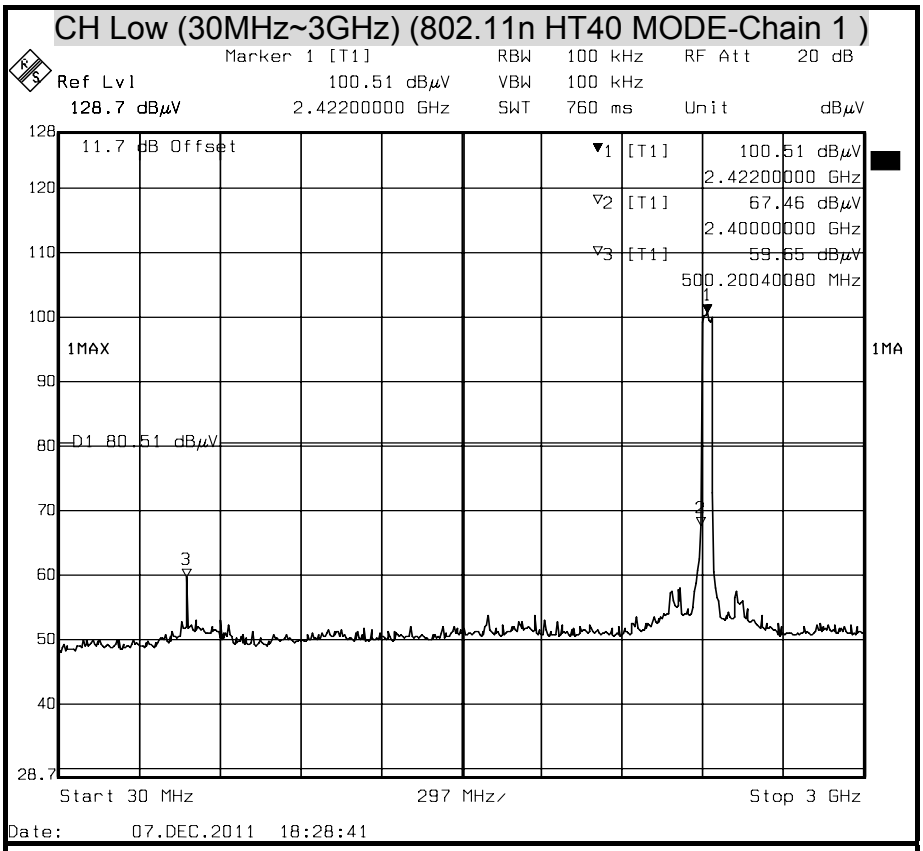


CH High (3GHz~26.5GHz) (802.11n HT40 MODE-Chain 0)

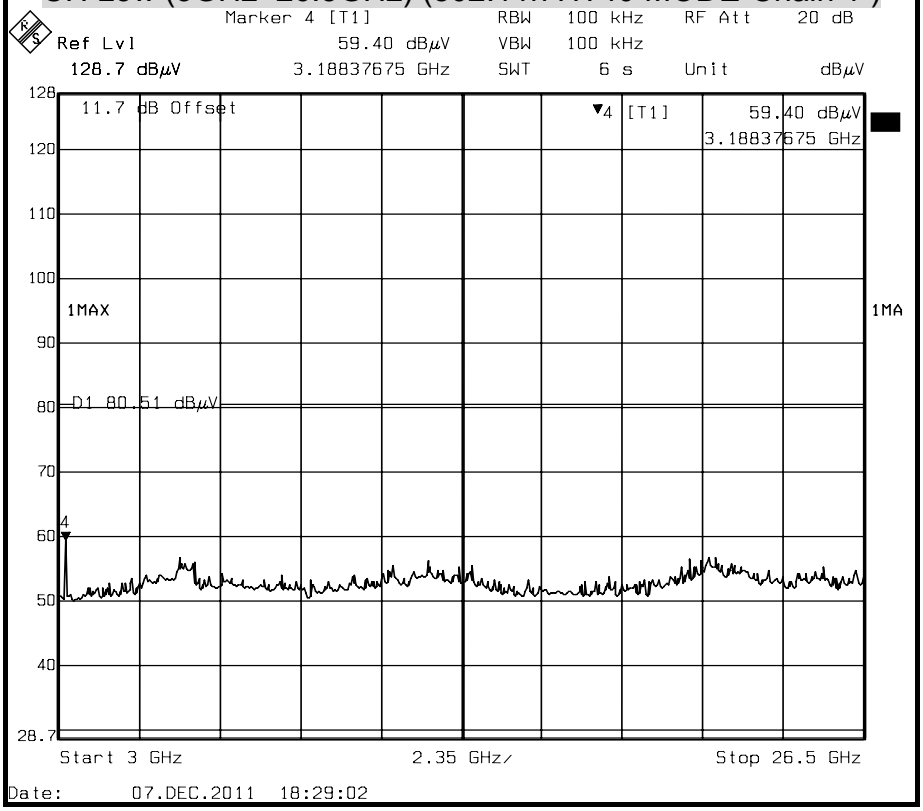


OUT-OF-BAND SPURIOUS EMISSIONS-CONDUCTED MEASUREMENT
(802.11n HT40 MODE)

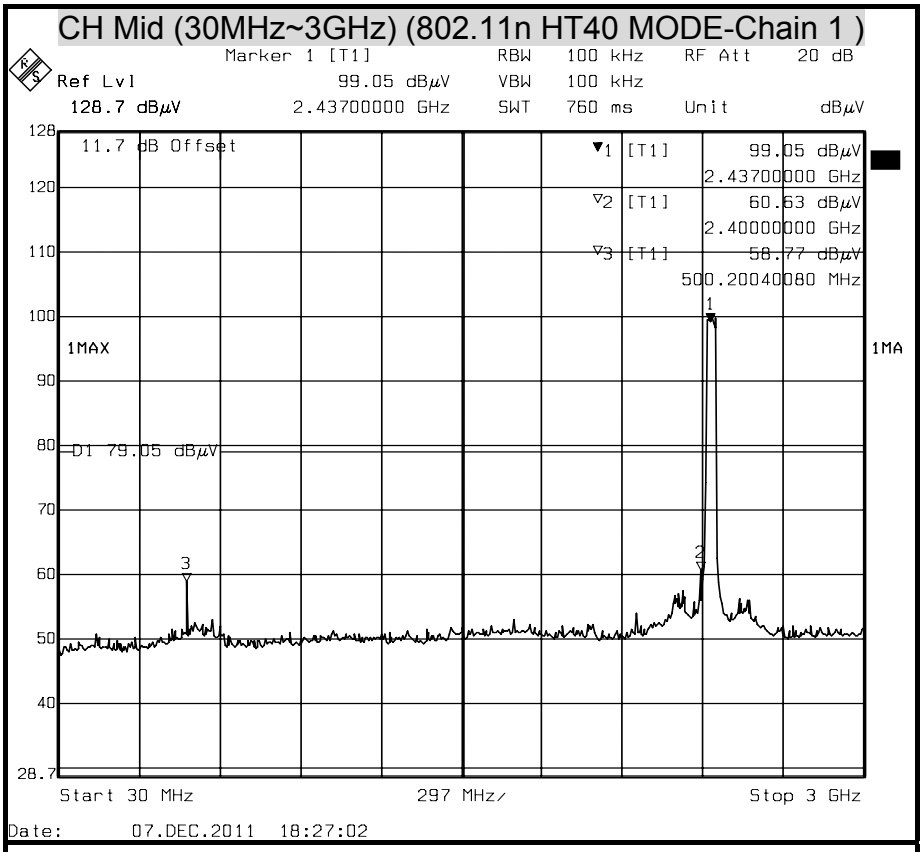
CH Low (30MHz~3GHz) (802.11n HT40 MODE-Chain 1)



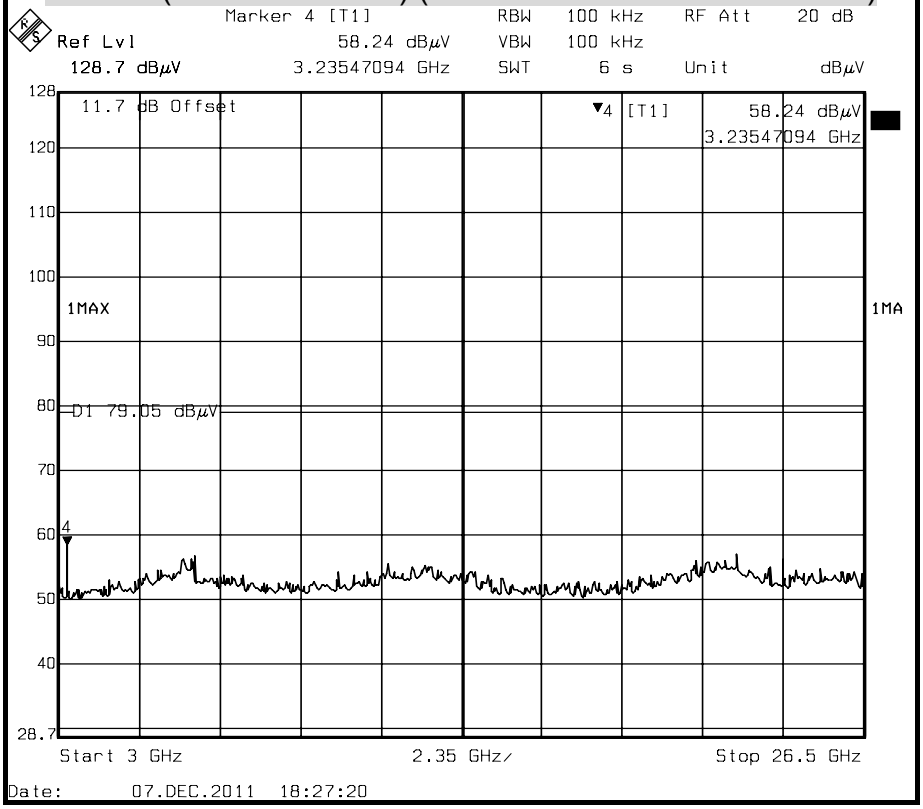
CH Low (3GHz~26.5GHz) (802.11n HT40 MODE-Chain 1)



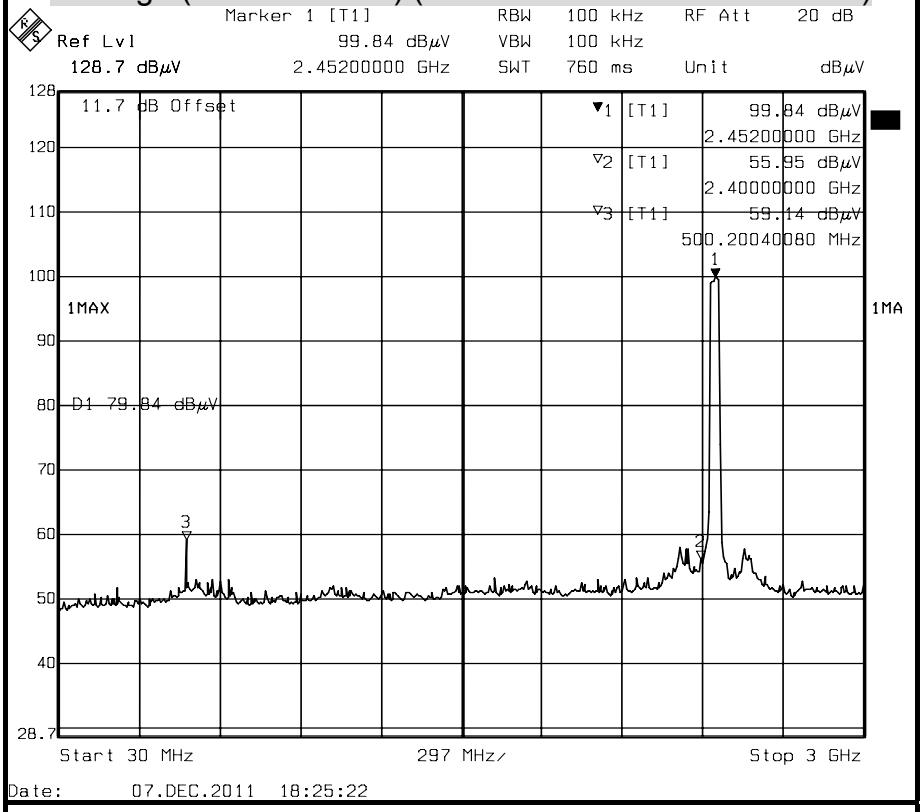
CH Mid (30MHz~3GHz) (802.11n HT40 MODE-Chain 1)



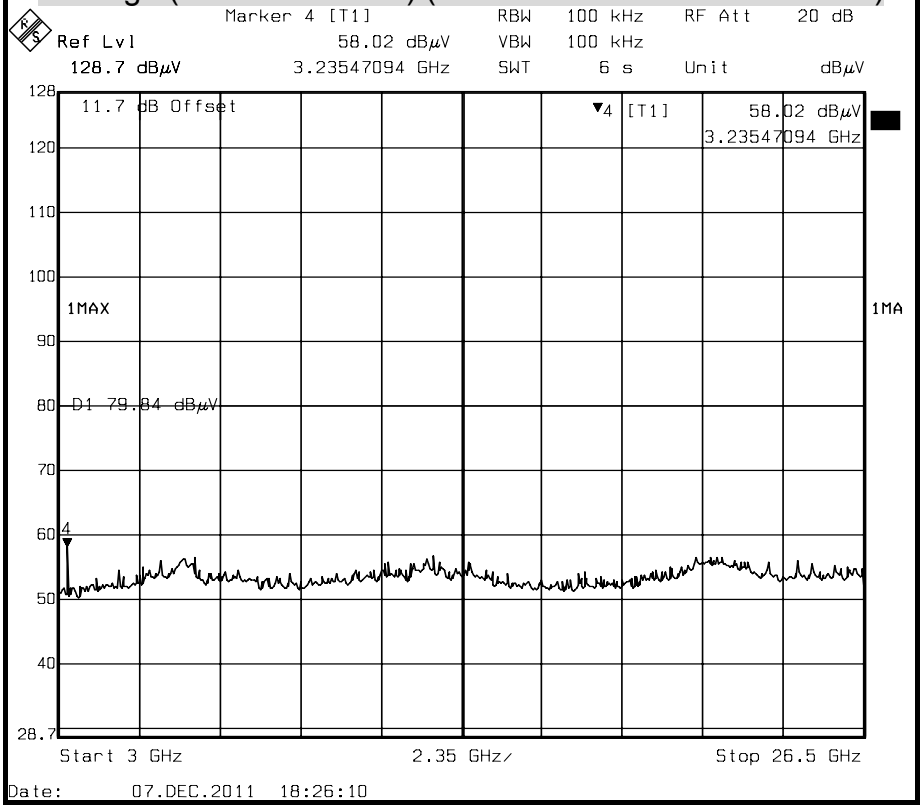
CH Mid (3GHz~26.5GHz) (802.11n HT40 MODE-Chain 1)



CH High (30MHz~3GHz) (802.11n HT40 MODE-Chain 1)

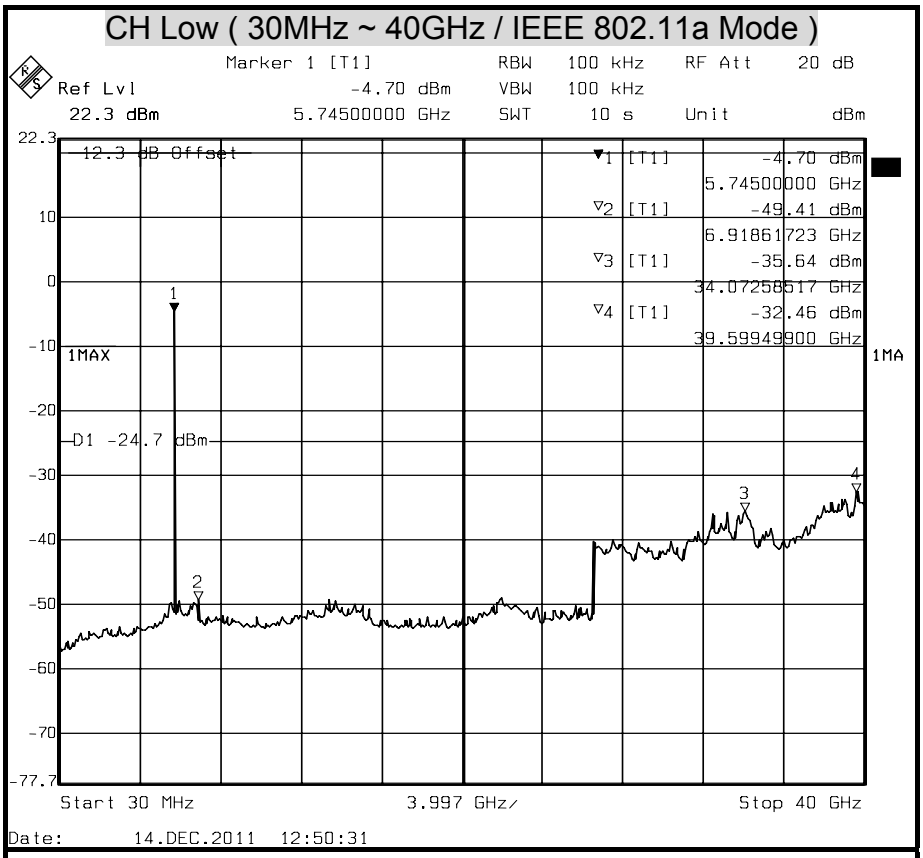


CH High (3GHz~26.5GHz) (802.11n HT40 MODE-Chain 1)



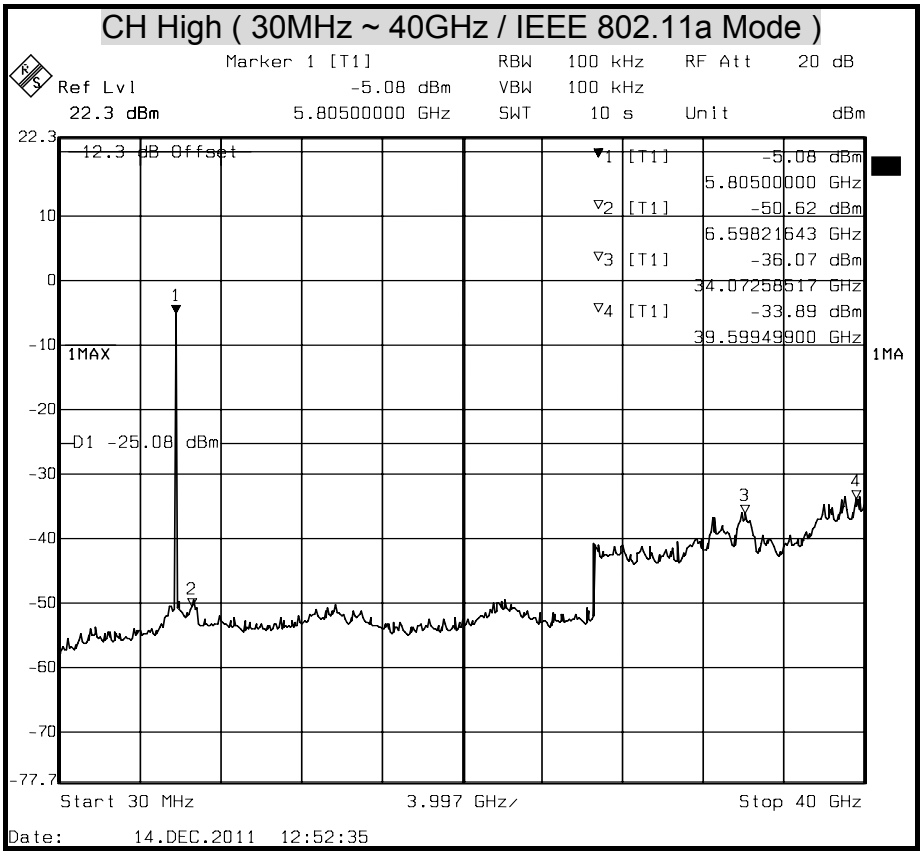
OUT-OF-BAND SPURIOUS EMISSIONS-CONDUCTED MEASUREMENT
(802.11a MODE)

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



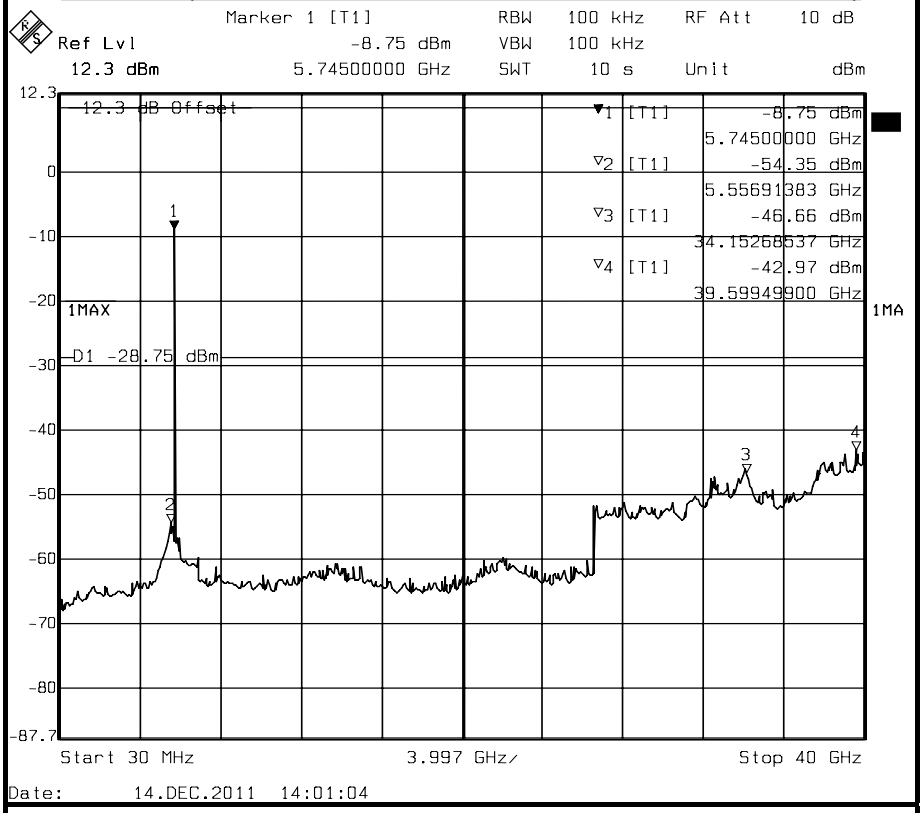
CH Middle (30MHz ~ 40GHz / IEEE 802.11a Mode)

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

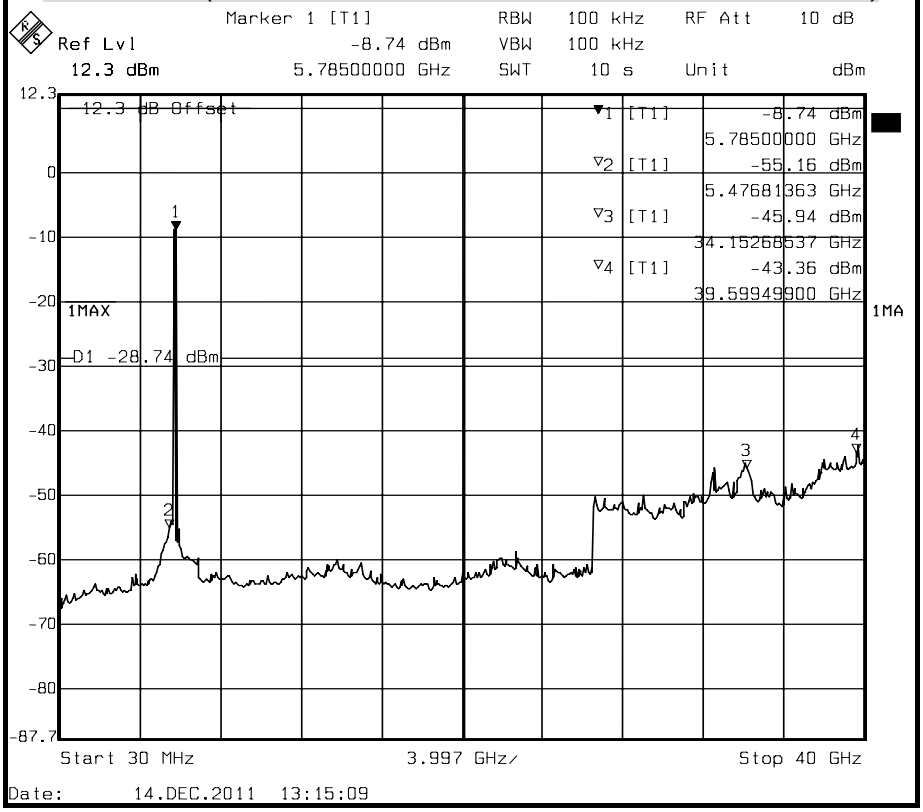


OUT-OF-BAND SPURIOUS EMISSIONS-CONDUCTED MEASUREMENT
(IEEE 802.11n HT20 Mode / Chain 0)

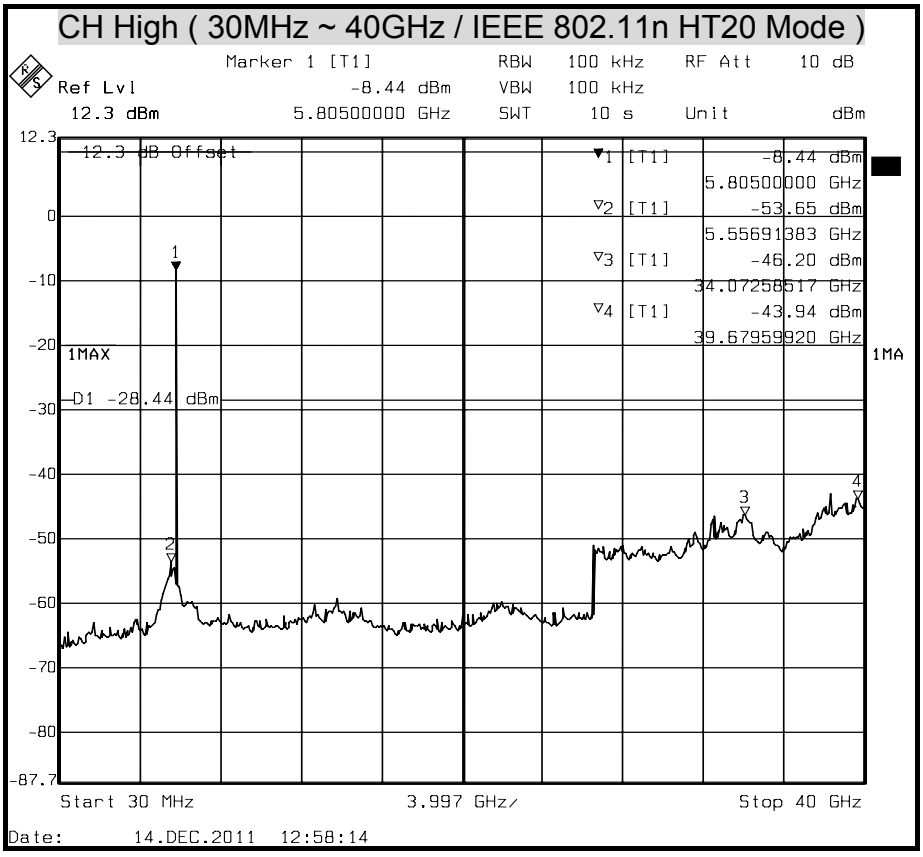
CH Low (30MHz ~ 40GHz / IEEE 802.11n HT20 Mode)



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

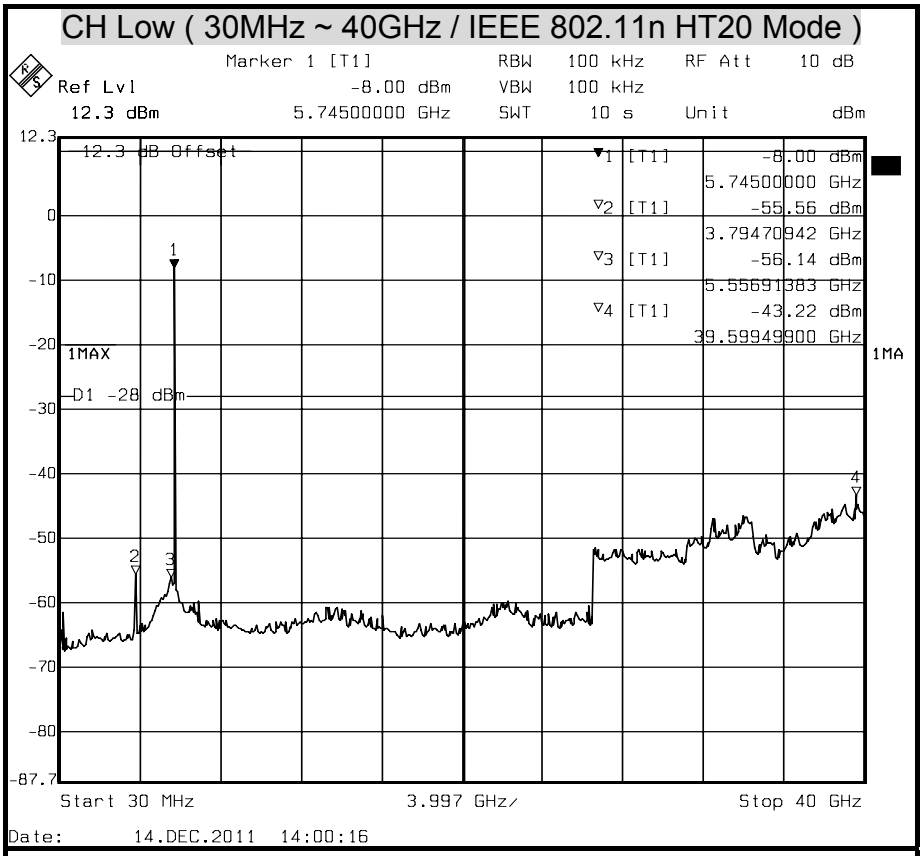


CH High (30MHz ~ 40GHz / IEEE 802.11n HT20 Mode)

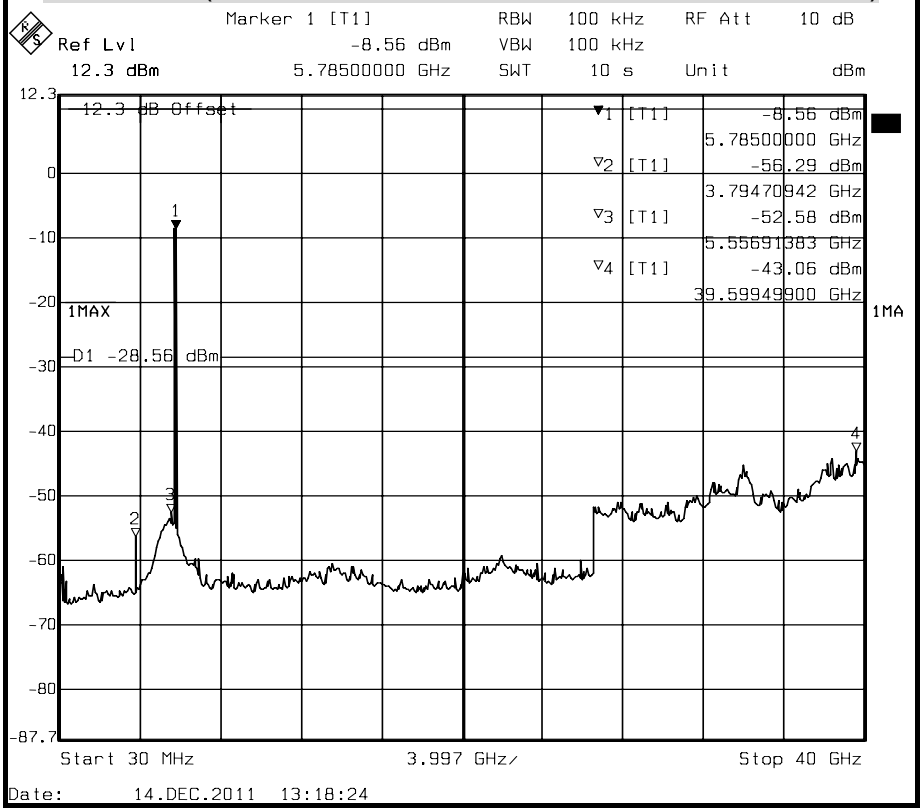


OUT-OF-BAND SPURIOUS EMISSIONS-CONDUCTED MEASUREMENT
(IEEE 802.11n HT20 Mode / Chain 1)

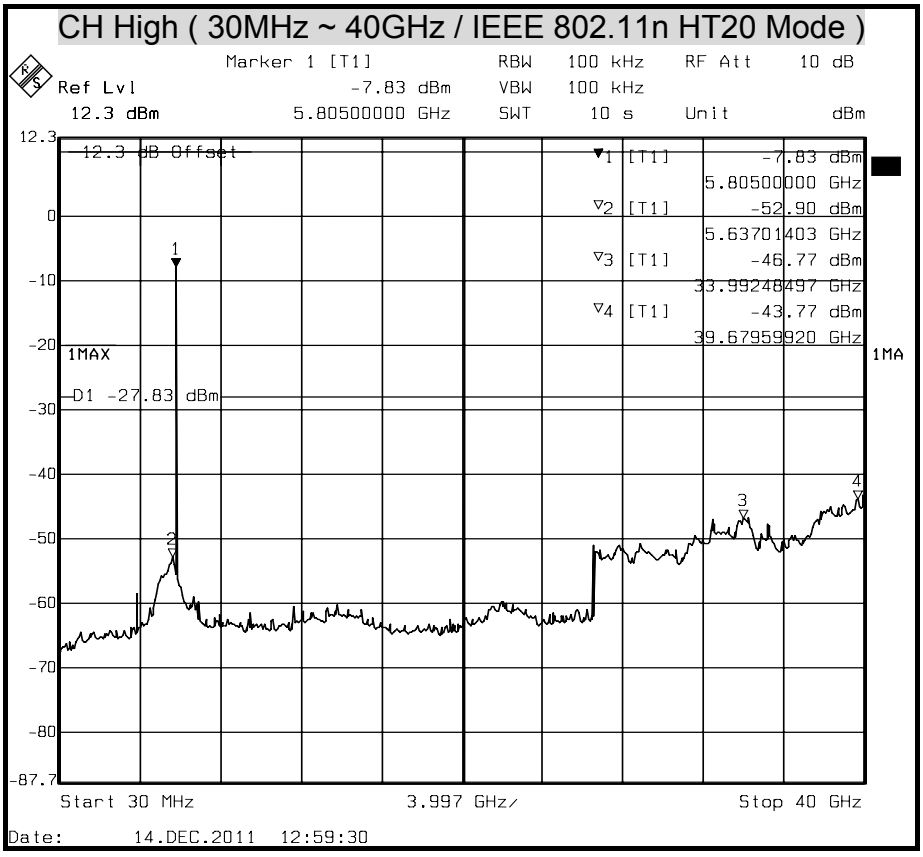
CH Low (30MHz ~ 40GHz / IEEE 802.11n HT20 Mode)



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

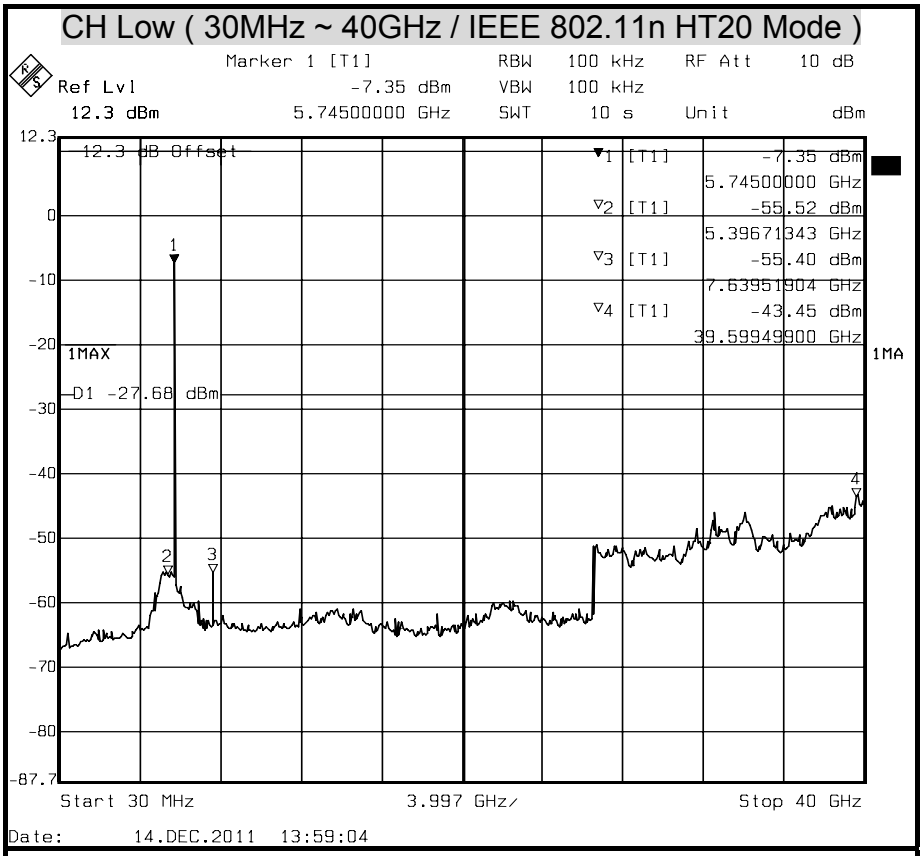


CH High (30MHz ~ 40GHz / IEEE 802.11n HT20 Mode)

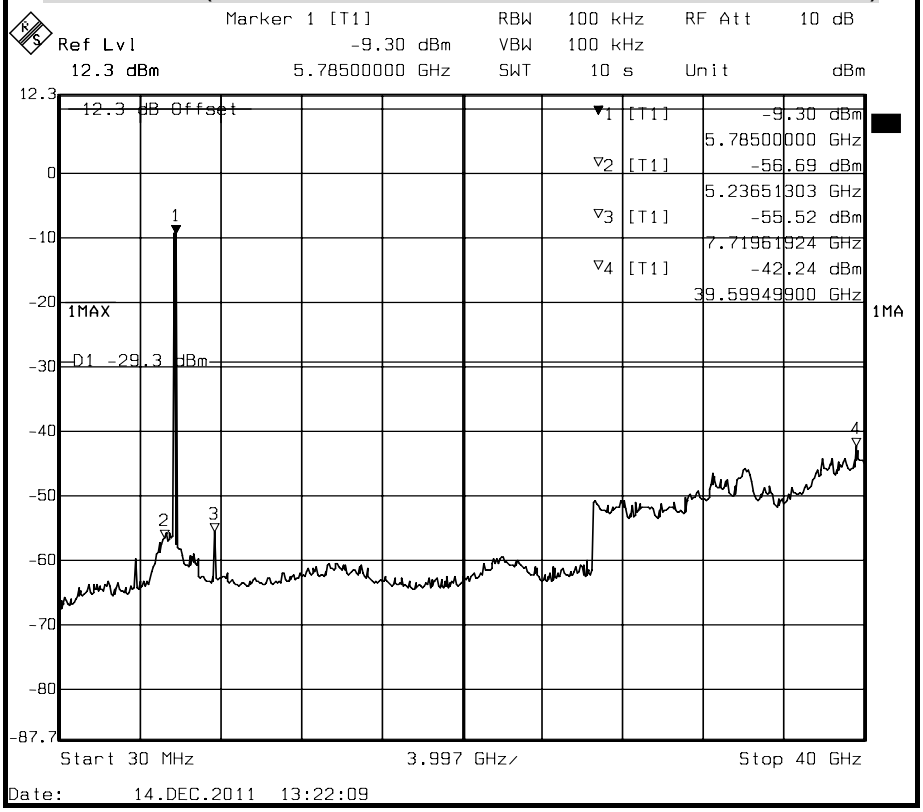


OUT-OF-BAND SPURIOUS EMISSIONS-CONDUCTED MEASUREMENT
(IEEE 802.11n HT20 Mode / Chain 2)

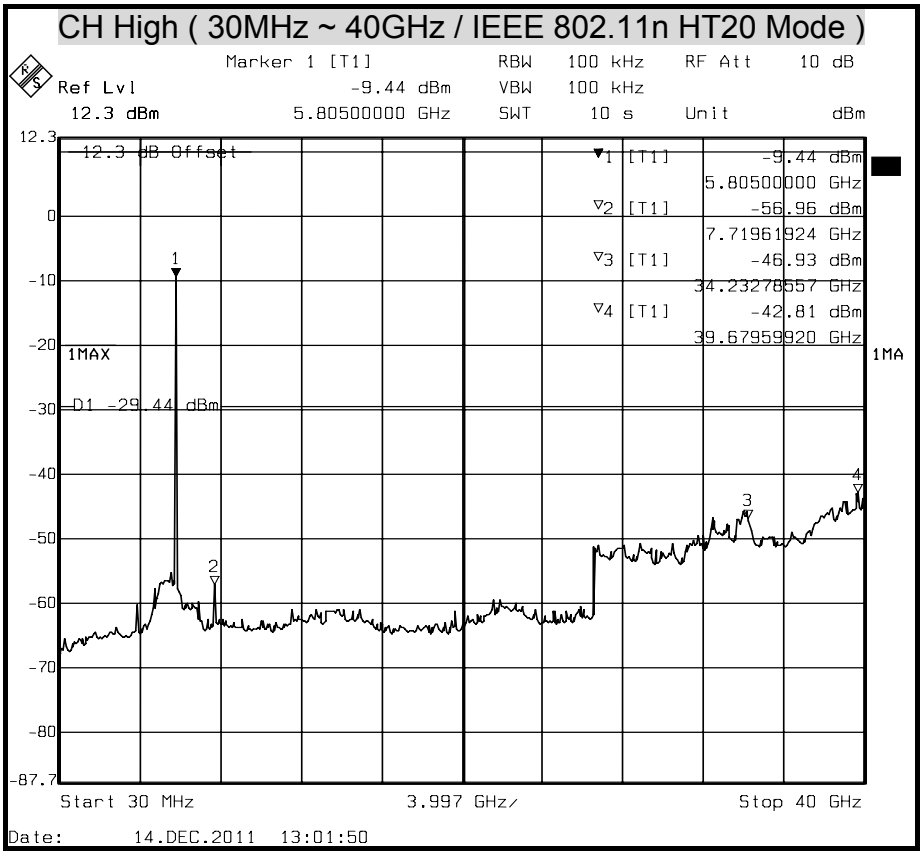
CH Low (30MHz ~ 40GHz / IEEE 802.11n HT20 Mode)



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

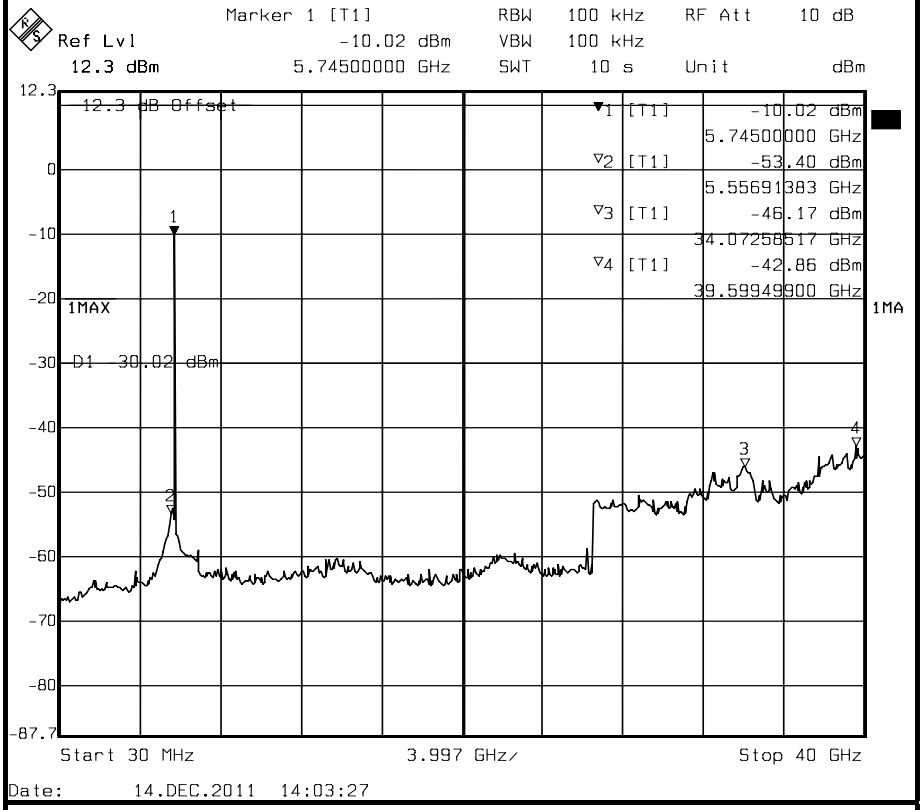


CH High (30MHz ~ 40GHz / IEEE 802.11n HT20 Mode)

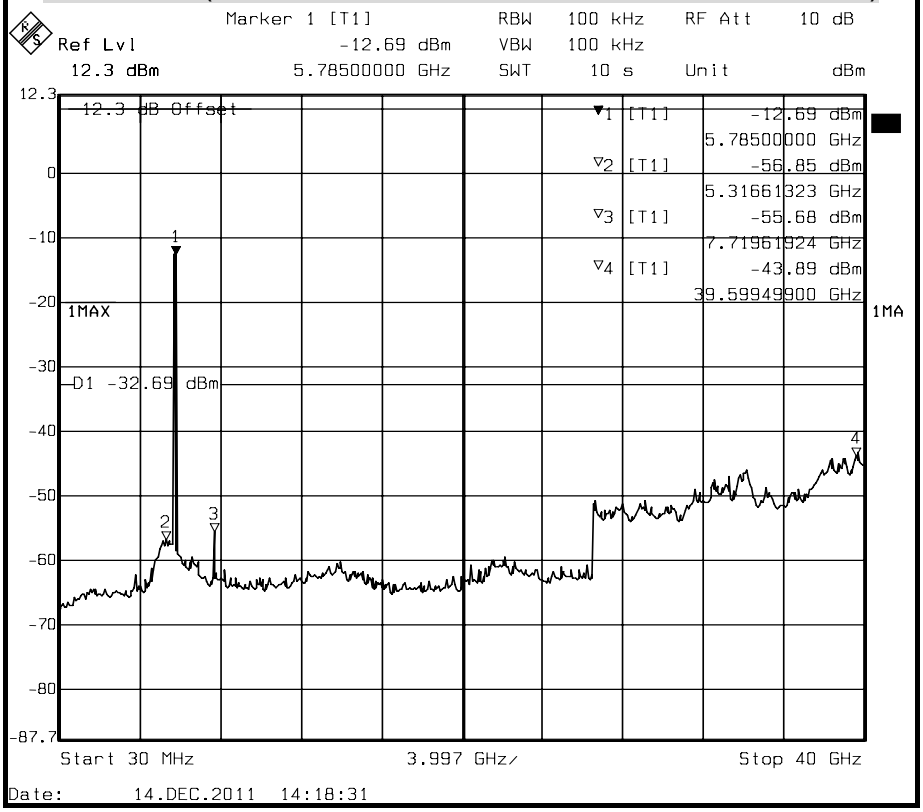


OUT-OF-BAND SPURIOUS EMISSIONS-CONDUCTED MEASUREMENT
(IEEE 802.11n HT40 Mode / Chain 0)

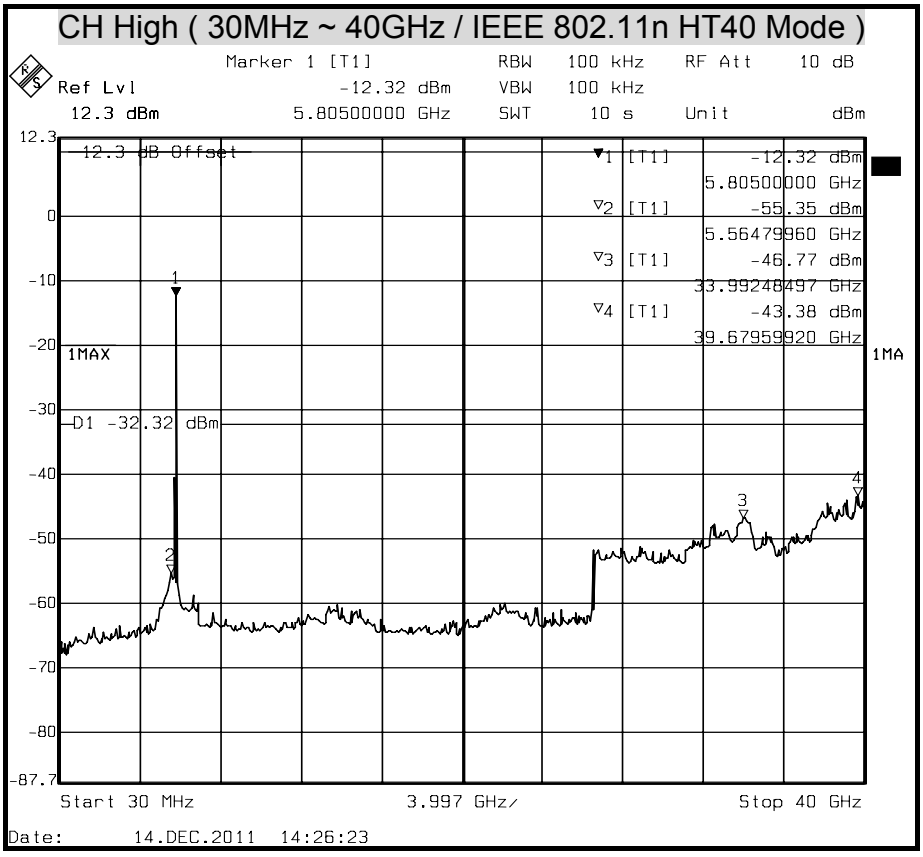
CH Low (30MHz ~ 40GHz / IEEE 802.11n HT40 Mode)



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

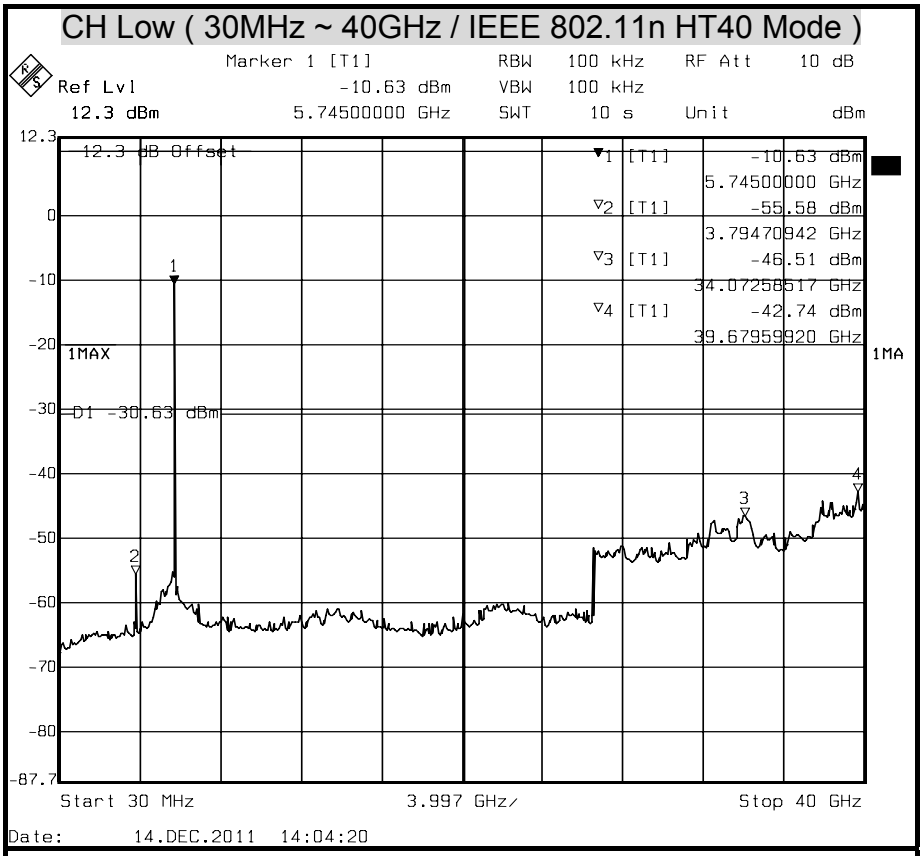


CH High (30MHz ~ 40GHz / IEEE 802.11n HT40 Mode)

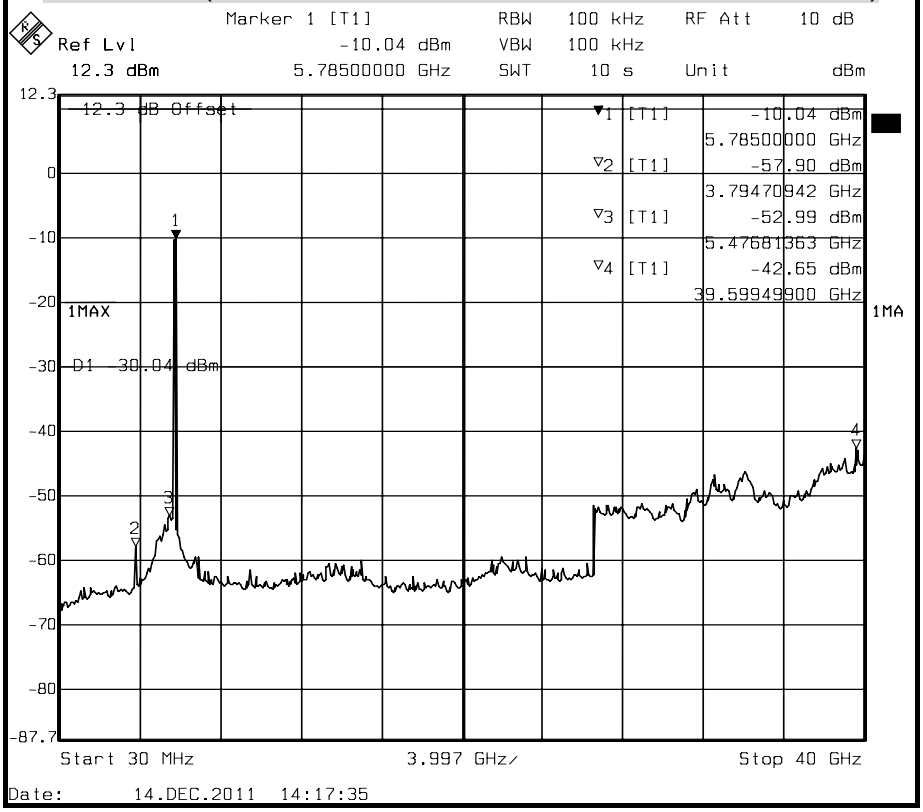


OUT-OF-BAND SPURIOUS EMISSIONS-CONDUCTED MEASUREMENT
(IEEE 802.11n HT40 Mode / Chain 1)

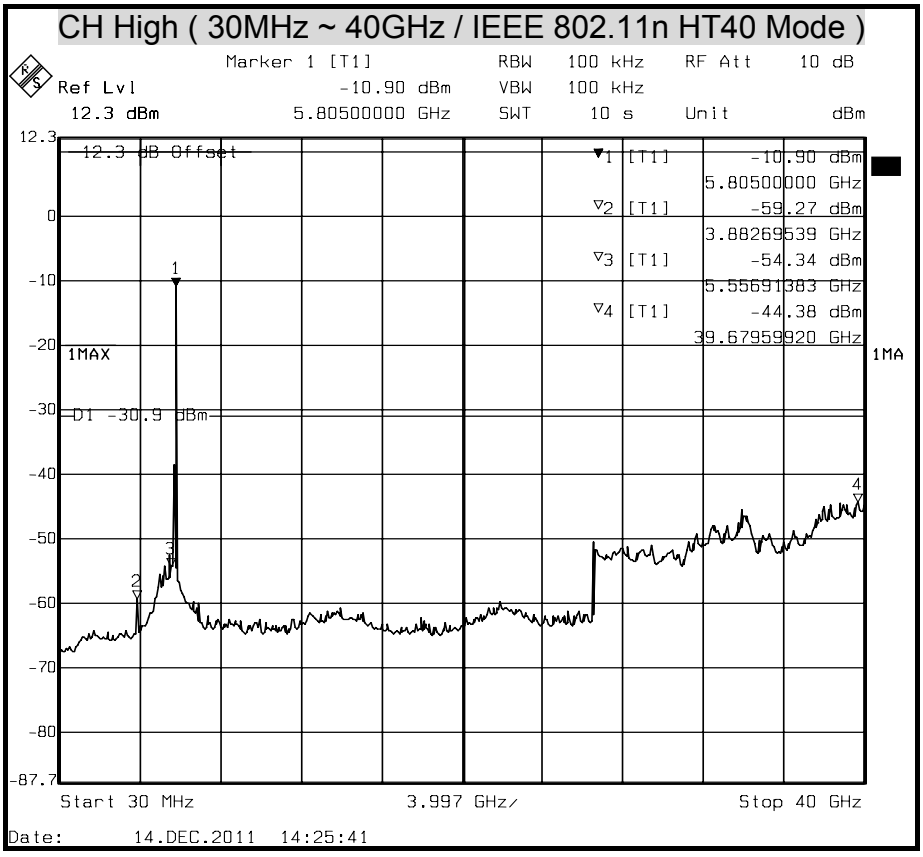
CH Low (30MHz ~ 40GHz / IEEE 802.11n HT40 Mode)



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

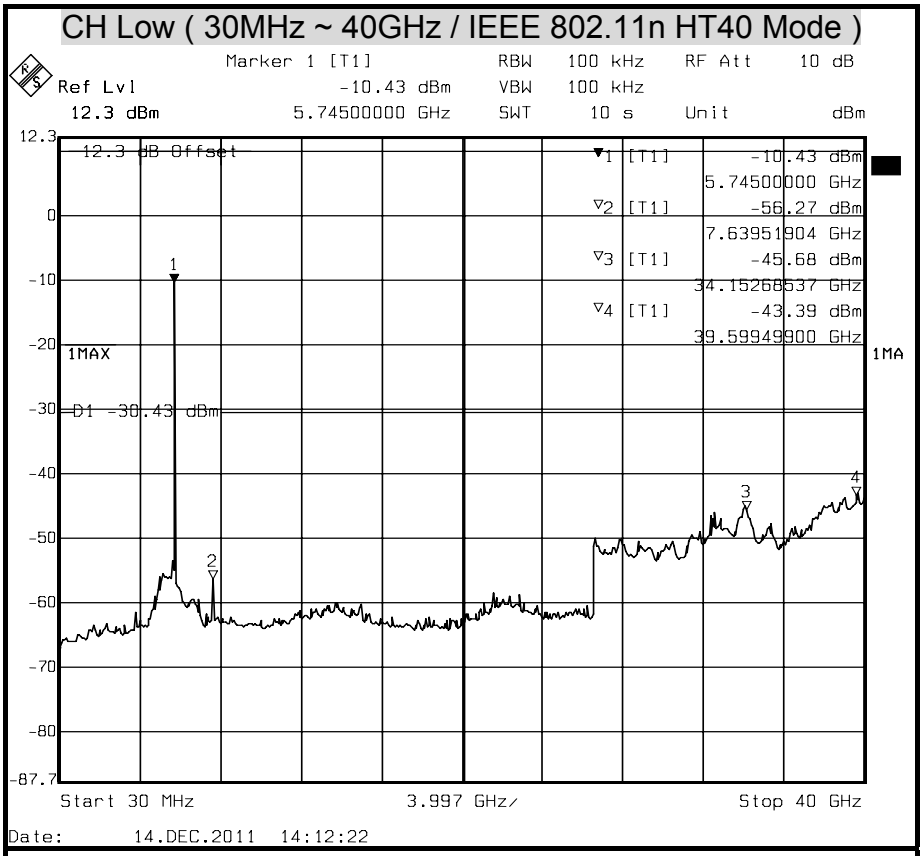


CH High (30MHz ~ 40GHz / IEEE 802.11n HT40 Mode)

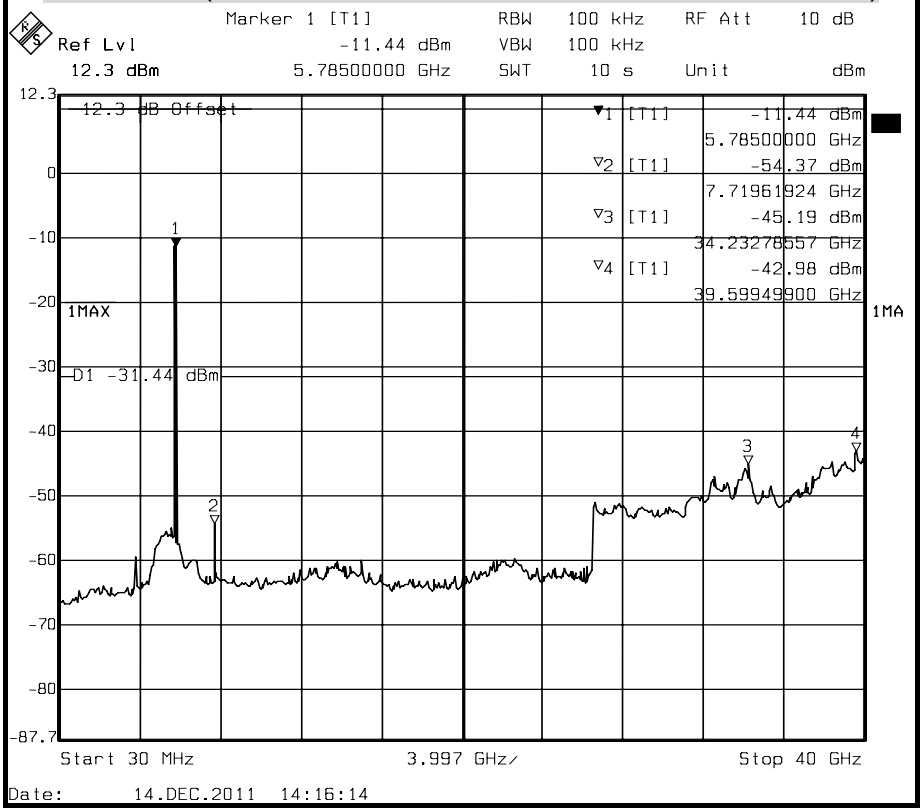


OUT-OF-BAND SPURIOUS EMISSIONS-CONDUCTED MEASUREMENT
(IEEE 802.11n HT40 Mode / Chain 2)

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)