FCC 47 CFR PART 15 SUBPART C: 2009 AND ANSI C63.4: 2003

TEST REPORT

For

Wireless 2T2R 300Mbps Giga NAS Router

Model Number: GW-300NAS

Data Applies To: GW-300R

Brand Name: Air Live

Issued for

OvisLink Corp.

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

Issued by

Compliance Certification Services Inc.
Tainan Lab.
No. 8, Jiu Cheng Ling, Jiaokeng Village,Sinhua Township, Tainan Hsien 712, Taiwan R.O.C.
TEL: 886-6-580-2201
FAX: 886-6-580-2202

Total Page: 142

REVISION HISTORY

Rev.		Issue Date		Revisions	Effect Page	Revised By
00		January 7, 2011		Initial Issue	ALL	Leah Peng

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1. TEST REPORT CERTIFICATION

Applicant ：OvisLink Corp.

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

Equipment Under Test ： Wireless 2T2R 300Mbps Giga NAS Router

Model Number ：GW-300NAS

Data Applies To ：GW-300R

Brand Name ：Air Live

Date of Test ：September 25, 2010 ~ October 1, 2010

APPLICABLE STANDARD	
STANDARD	**TEST RESULT**
FCC Part 15 Subpart C : 2009 AND ANSI C63.4 : 2003	No non-compliance noted

Approved by:

Jeter Wu
Assistant Manager

Reviewed by:

Eric Huang
Assistant Section Manager

2. EUT DESCRIPTION

2.1 DESCRIPTION OF EUT & POWER

<table>
<tr><td>Product Name</td><td>Wireless 2T2R 300Mbps Giga NAS Router</td></tr>
<tr><td>Model Number</td><td>GW-300NAS</td></tr>
<tr><td>Data Applies To</td><td>GW-300R</td></tr>
<tr><td>Model Difference</td><td>
<table>
<tr><th>Model</th><th>Product name</th><th>USB</th><th>Tested (Checked)</th></tr>
<tr><td>GW-300NAS (Original)</td><td>Wireless 2T2R 300Mbps Giga NAS Router</td><td>Yes (connect storage)</td><td>☒</td></tr>
<tr><td>GW-300R</td><td>Wireless 2T2R 300Mbps Giga Router</td><td>No</td><td>☐</td></tr>
</table>
</td></tr>
<tr><td>Brand Name</td><td>Air Live</td></tr>
<tr><td>Frequency Range</td><td>IEEE 802.11b/g, 802.11n HT20 (DTS Band):2412MHz～2462MHz
IEEE 802.11n HT40 (DTS Band):2422MHz～2452MHz</td></tr>
<tr><td>Transmit Power (ERP)</td><td>IEEE 802.11b Mode : 20.46dBm (DTS Band) (111.17 mW)
IEEE 802.11g Mode : 24.60dBm (DTS Band) (288.4mW)
IEEE 802.11n HT20 Mode : 25.37dBm (DTS Band) (344.67 mW)
IEEE 802.11n HT40 Mode : 25.07dBm (DTS Band) (321.3 mW)</td></tr>
<tr><td>Channel Spacing</td><td>IEEE 802.11b/g, 802.11n HT20/HT40: 5MHz</td></tr>
<tr><td>Channel Number</td><td>IEEE 802.11b/g, 802.11n HT20:11 Channels
IEEE 802.11n HT40 :7 Channels</td></tr>
<tr><td rowspan="4">Transmit Data Rate</td><td>IEEE 802.11b : 11, 5.5, 2, 1 Mbps</td></tr>
<tr><td>IEEE 802.11g : 54, 48 ,36, 24, 18, 12, 9, 6 Mbps</td></tr>
<tr><td>IEEE 802.11n HT20 : 130 , 117 , 104 , 78 , 52 , 39 , 26 , 13 Mbps</td></tr>
<tr><td>IEEE 802.11n HT40 : 300 , 270 , 243 , 216 , 162 , 108 , 81 , 54 , 27 Mbps</td></tr>
<tr><td rowspan="3">Type of Modulation</td><td>IEEE 802.11b：DSSS (CCK, DQPSK, DBPSK)</td></tr>
<tr><td>IEEE 802.11g：OFDM (64QAM, 16QAM, QPSK, BPSK)</td></tr>
<tr><td>IEEE 802.11n HT20/40：OFDM (64QAM, 16QAM, QPSK, BPSK)</td></tr>
<tr><td>Frequency Selection</td><td>By software / firmware</td></tr>
</table>

Antenna Type	**Two antennas (2T2R)** Dipole Antenna Gain: 3.23 dBi
Power Source	Powered from adapter Adapter 1: Brand: AMIGO Model: AMS9-1201000FU2 Input: 100-240Vac, 50/60Hz, 0.5A Output: 12Vdc, 1.0A Adapter 2: Brand: AMIGO Model: AMS3-1201500FU Input: 100-240Vac, 50/60Hz, 0.5A Output: 12Vdc, 1.5A
Temperature Range	0 ~ +55°C

REMARK:

1. The sample selected for test was engineering sample that approximated to production product and was provided by manufacturer.
2. This submittal(s) (test report) is intended for FCC ID: **ODMGW300R-NAS** filing to comply with Section 15.207,15.209 and 15.247 of the FCC Part 15, Subpart C Rules.
3. For more details, please refer to the User's manual of the EUT.

3. DESCRIPTION OF TEST MODES

The EUT is a 11n router. It has two transmitter chains and two receive chains (2x2 configurations). The 2x2 configuration is implemented with two outside chains (Chain 0 and Chain 1).

The RF chipset is manufactured by Ralink Technology, Corp.

The antenna peak gain 3.23dBi (highest gain) were chosen for full testing.

IEEE 802.11 b ,802.11g ,802.11n HT20 mode (DTS Band)

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: 11Mbps 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 (DTS Band)

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.

The worst-case data rates are determined according to the description above, based on the investigations by measuring the PSD, peak power and average power across all the data rates, bandwidths, modulations and spatial stream modes.

The worst-case channel is determined as the channel with the highest output power. The highest measured output power was at 2462 MHz.

4. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.4 and FCC CFR 47 2.1046, 2046, 2.1047, 2.1049, 2.1051, 2.1053, 2.1055, 2.1057, 15.207, 15.209 and 15.247.

5. FACILITIES AND ACCREDITATIONS

5.1 FACILITIES

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

No. 8, Jiu Cheng Ling, Jiaokeng Village,Sinhua Township, Tainan Hsien 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 EQUIPMENT

Radiated emissions are measured with one or more of the following types of linearly polarized antennas: tuned dipole, biconical, log periodic, bi-log, and/or ridged waveguide, horn. Spectrum analyzers with preselectors and quasi-peak detectors are used to perform radiated measurements.

Conducted emissions are measured with Line Impedance Stabilization Networks and EMI Test Receivers.

Calibrated wideband preamplifiers, coaxial cables, and coaxial attenuators are also used for making measurements.

All receiving equipment conforms to CISPR Publication 16-1, “Radio Interference Measuring Apparatus and Measurement Methods.”

5.3 LABORATORY ACCREDITATIONS LISTINGS

The test facilities used to perform radiated and conducted emissions tests are accredited by Taiwan Accreditation Foundation for the specific scope of accreditation under Lab Code: 1109 to perform Electromagnetic Interference tests according to FCC PART 15 AND CISPR 22 requirements. No part of this report may be used to claim or imply product endorsement by TAF or any agency of the Government. In addition, the test facilities are listed with Federal Communications Commission (registration no: TW-1037).

5.4 TABLE OF ACCREDITATIONS AND LISTINGS

Country	Agency	Scope of Accreditation	Logo
USA	FCC	3/10 meter Open Area Test Sites to perform FCC Part 15/18 measurements	TW-1037
Japan	VCCI	3/10 meter Open Area Test Sites and conducted test sites to perform radiated/conducted measurements	C-2882 R-2635
Taiwan	TAF	CISPR 11, FCC METHOD-47 CFR Part 18, EN 55011, EN 60601-1-2, CISPR 22, CNS 13438, EN 55022, EN 55024, AS/NZS CISPR 22 CISPR 14, EN 55014-1, EN 55014-2, CNS 13783-1, CISPR 22, CNS 13439, EN 55013, FCC Method-47 CFR Part 15 Subpart B, IC ICES-003, VCCI V-3 & V-4 FCC Method-47 CFR Part 15 Subpart C and ANSI C63.4, LP 0002 EN / IEC 61000-4-2 / -3 / -4 / -5 / -6 / -8 / -11 EN 61000-3-2, EN 61000-3-3 EN 61000-6-3, EN 61000-6-1, AS/NZS 4251.1, EN 61000-6-4, EN 61000-6-2, AS/NZS 4251.2, EN 61204-3, EN 50130-4, EN 62040-2, EN 50371, EN 50385, AS/NZS 4268, ETSI EN 300 386 ETSI EN 300 328, ETSI EN 301 489-1/-3/-9/-17 ETSI EN 301 893, ETSI EN 300 220-2/-1 ETSI EN 300 440-2/-1 ETSI EN 301 357-2/-1 RSS-310, RSS-210 Issue 7, RSS-Gen Issue 2	[redacted]
Taiwan	BSMI	CNS 13438, CNS 13783-1, CNS13439	SL2-IN-E-0039 SL2-R1/R2-0039 SL2-A1-E-0039
Canada	Industry Canada	RSS210, Issue 7	IC 2324H-1

* No part of this report may be used to claim or imply product endorsement by TAF or any agency of the US Government.

6. CALIBRATION AND UNCERTAINTY

6.1 MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

6.2 MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

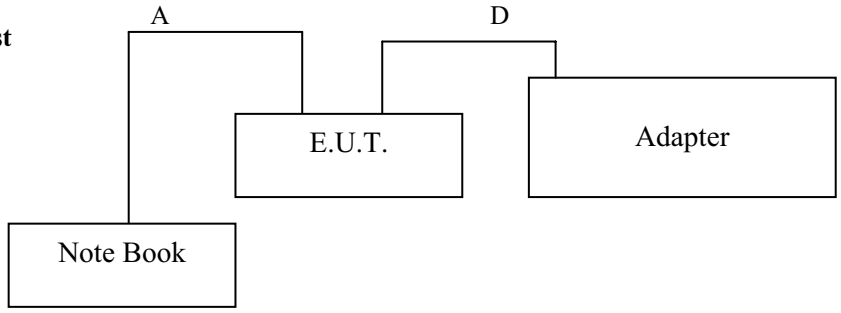
PARAMETER	UNCERTAINTY
Radiated Emission, 30 to 200 MHz Test Site : OATS-6	±3.38dB
Radiated Emission, 200 to 1000 MHz Test Site : OATS-6	±3.04dB
Radiated Emission, 1 to 26.5 GHz	± 3.20dB
Power Line Conducted Emission	± 2.01dB

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

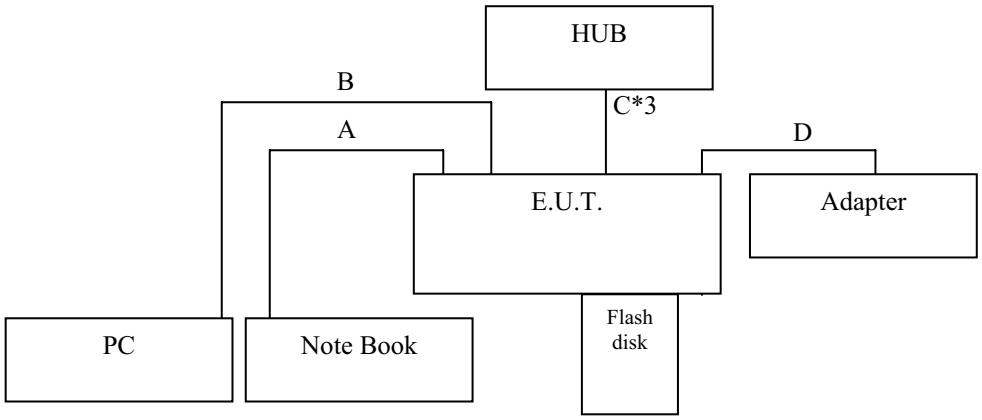
7. SETUP OF EQUIPMENT UNDER TEST

7.1 SETUP CONFIGURATION OF EUT

For RF test



For EMI test



7.2 SUPPORT EQUIPMENT

No.	Product	Manufacturer	Model No.	Certify No.	Signal cable
1	PC	Acer	M1641	DoC	Power cable, unshd, 1.6m
2	Flash Disk	Kingston	DTI/512	DoC	N/A
3	HUB	BARRICAD	SMC7008BR	DoC	Power cable, unshd, 1.6m
4	Note Book	IBM	T43	DoC	Power cable, unshd, 1.6m

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

REMARK:

1. All the above equipment/cables were placed in worse case positions to maximize emission signals during emission test.
2. Grounding was established in accordance with the manufacturer’s requirements and conditions for the intended use.

7.3 EUT OPERATING CONDITION

RF Setup

1. Set up all computers like the setup diagram.
2. The “Ralink QA Test Program for RT3052” software was used for testing
   The EUT driver software installed in the host support equipment during testing was Ralink QA Test Program for RT3052 Drive

TX Mode:

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

⇨ **Tx Data Rate: 11Mbps long** (IEEE 802.11b mode ,chain 0 TX)
6Mbps (IEEE 802.11g mode ,chain 0 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) = **0F (Chain 0)**
IEEE 802.11b Channel Middle (2437MHz) = **11 (Chain 0)**
IEEE 802.11b Channel High (2462MHz) = **16 (Chain 0)**
Target Power: IEEE 802.11g Channel Low (2412MHz) = **12 (Chain 0)**
IEEE 802.11g Channel Middle (2437MHz) = **14 (Chain 0)**
IEEE 802.11g Channel High (2462MHz) = **15 (Chain 0)**
Target Power: IEEE 802.11n HT20 Channel Low (2412MHz) = **11 (Chain 0)**
IEEE 802.11 n HT20 Channel Middle (2437MHz) = **13 (Chain 0)**
IEEE 802.11 n HT20 Channel High (2462MHz) = **17 (Chain 0)**
IEEE 802.11n HT20 Channel Low (2412MHz) = **13 (Chain 1)**
IEEE 802.11 n HT20 Channel Middle (2437MHz) = **15 (Chain 1)**
IEEE 802.11 n HT20 Channel High (2462MHz) = **17 (Chain 1)**
Target Power: IEEE 802.11n HT40 Channel Low (2422MHz) = **13 (Chain 0)**
IEEE 802.11 n HT40 Channel Middle (2437MHz) = **14 (Chain 0)**
IEEE 802.11 n HT40 Channel High (2452MHz) = **15 (Chain 0)**
IEEE 802.11n HT40 Channel Low (2422MHz) = **15 (Chain 1)**
IEEE 802.11 n HT40 Channel Middle (2437MHz) = **16 (Chain 1)**
IEEE 802.11 n HT40 Channel High (2452MHz) = **16 (Chain 1)**

(2) **RX Mode：**

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.

8. APPLICABLE LIMITS AND TEST RESULTS

8.1 6DB BANDWIDTH

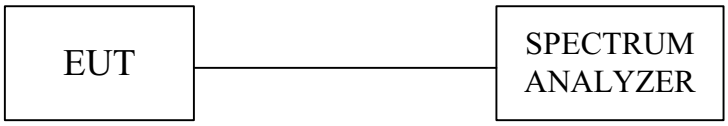
LIMIT

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

TEST EQUIPMENTS

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	R&S	FSEK 30	835253/002	JUL. 14, 2011

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

No non-compliance noted.

IEEE 802.11b mode

Channel	Channel Frequency (MHz)	6dB Bandwidth (kHz)	Minimum Limit (kHz)	Pass / Fail
Low	2412	12324	500	PASS
Middle	2437	11923	500	PASS
High	2462	12185	500	PASS

NOTE : 1. At finial test to get the worst-case emission at11Mbps.
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)	6dB Bandwidth (kHz)	Minimum Limit (kHz)	Pass / Fail
Low	2412	16633	500	PASS
Middle	2437	16684	500	PASS
High	2462	16677	500	PASS

NOTE : 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)	6dB Bandwidth (kHz)		Minimum Limit (kHz)	Pass / Fail
		Chain 0	Chain1		
Low	2412	17735	17741	500	PASS
Middle	2437	17715	17702	500	PASS
High	2462	17769	17742	500	PASS

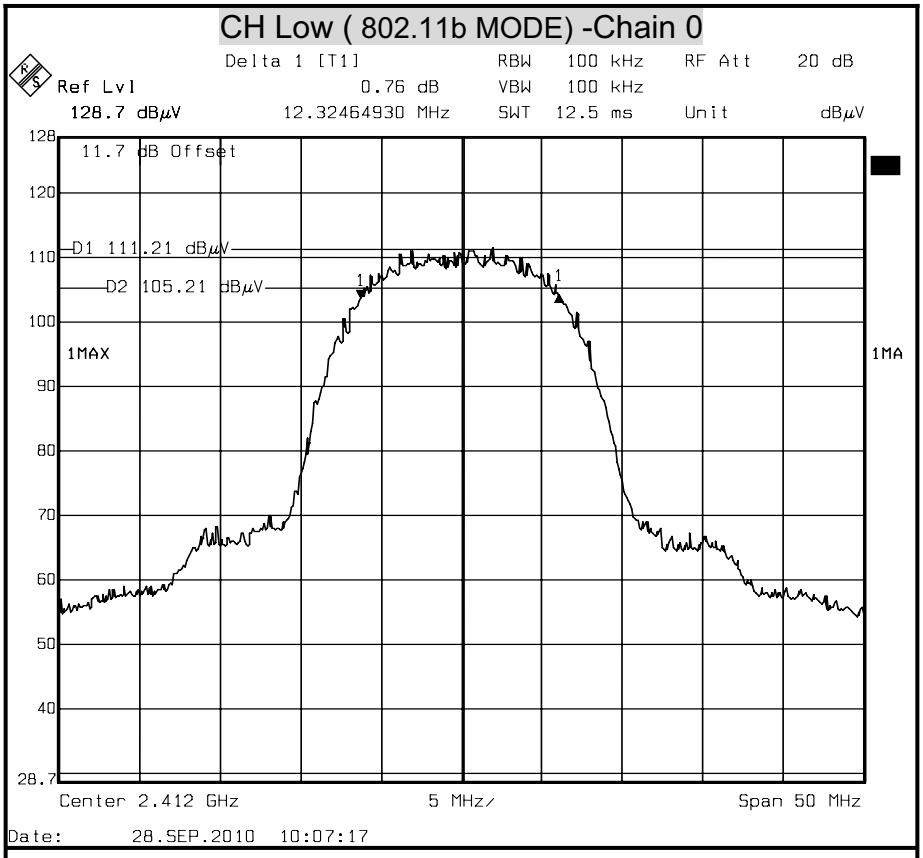
NOTE : 1. At finial test to get the worst-case emission at 13Mbps.
2. The cable assembly insertion loss of 11.7dB (including 10 dB pad and 1.7 dB cable) was entered as an offset in the spectrum analyzer to allow for direct reading of power.

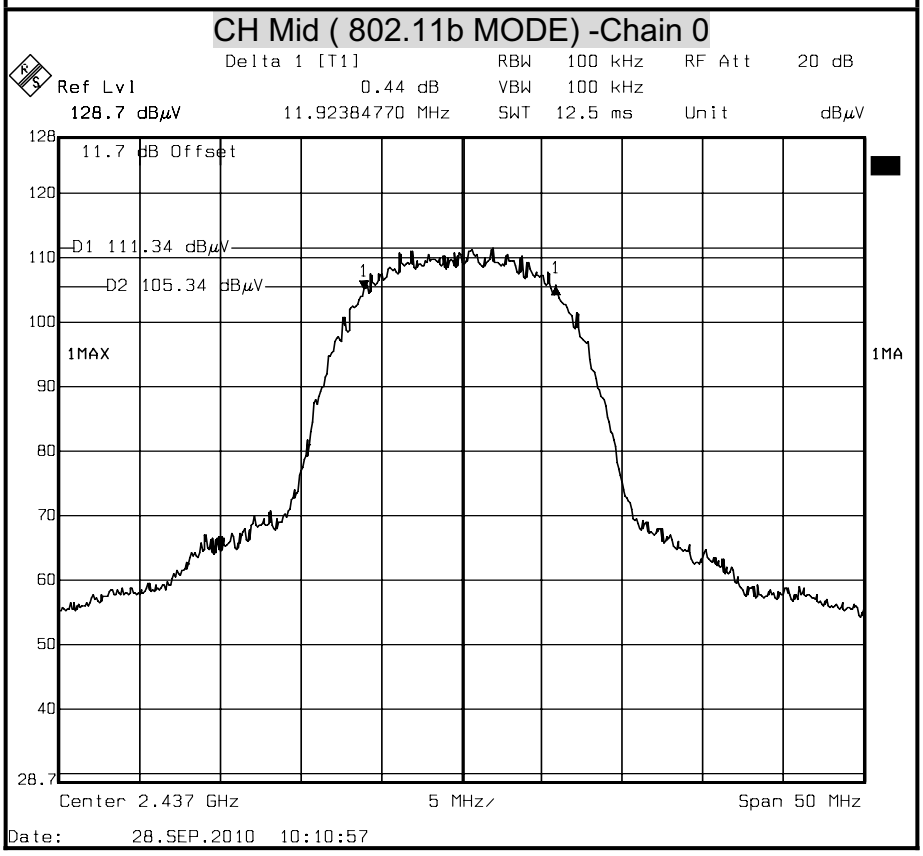
IEEE 802.11n HT40 mode

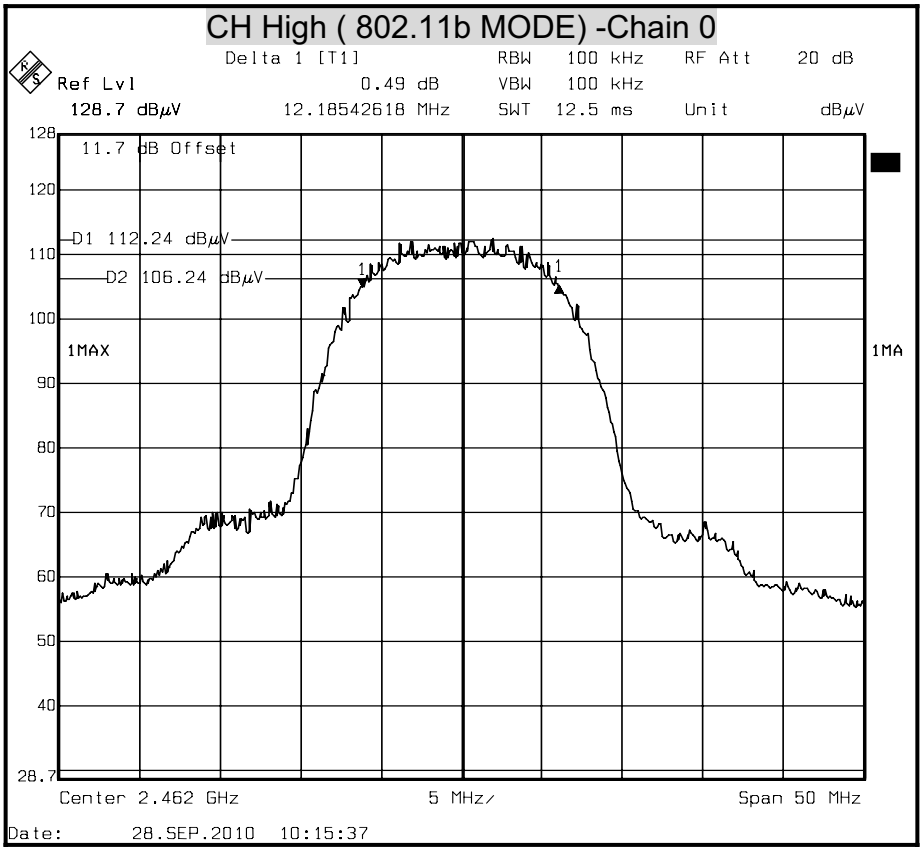
Channel	Channel Frequency (MHz)	6dB Bandwidth (kHz)		Minimum Limit (kHz)	Pass / Fail
		Chain 0	Chain1		
Low	2422	36472	36472	500	PASS
Middle	2437	36685	36548	500	PASS
High	2452	36608	36272	500	PASS

NOTE : 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.

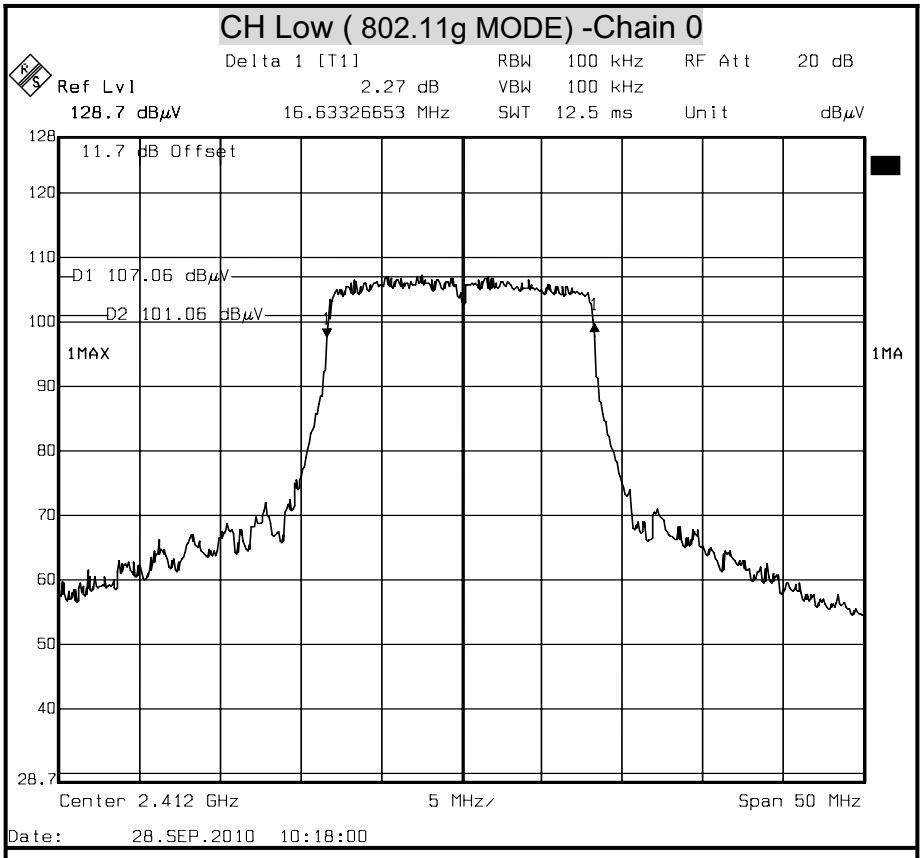
6dB BANDWIDTH (802.11b MODE)

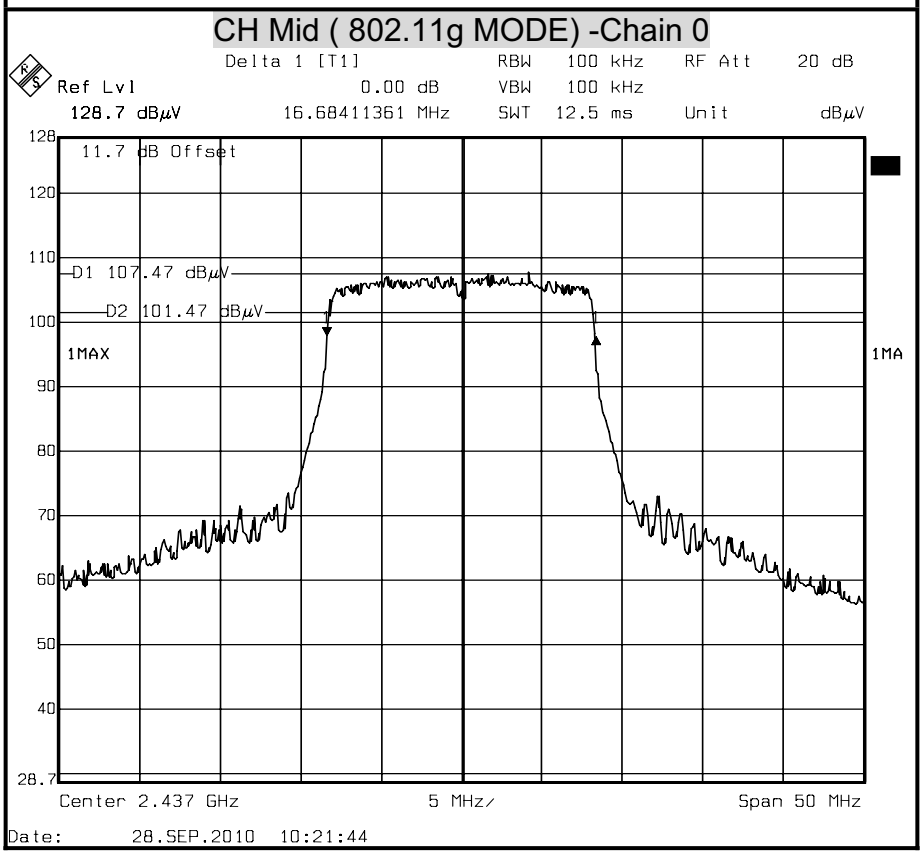


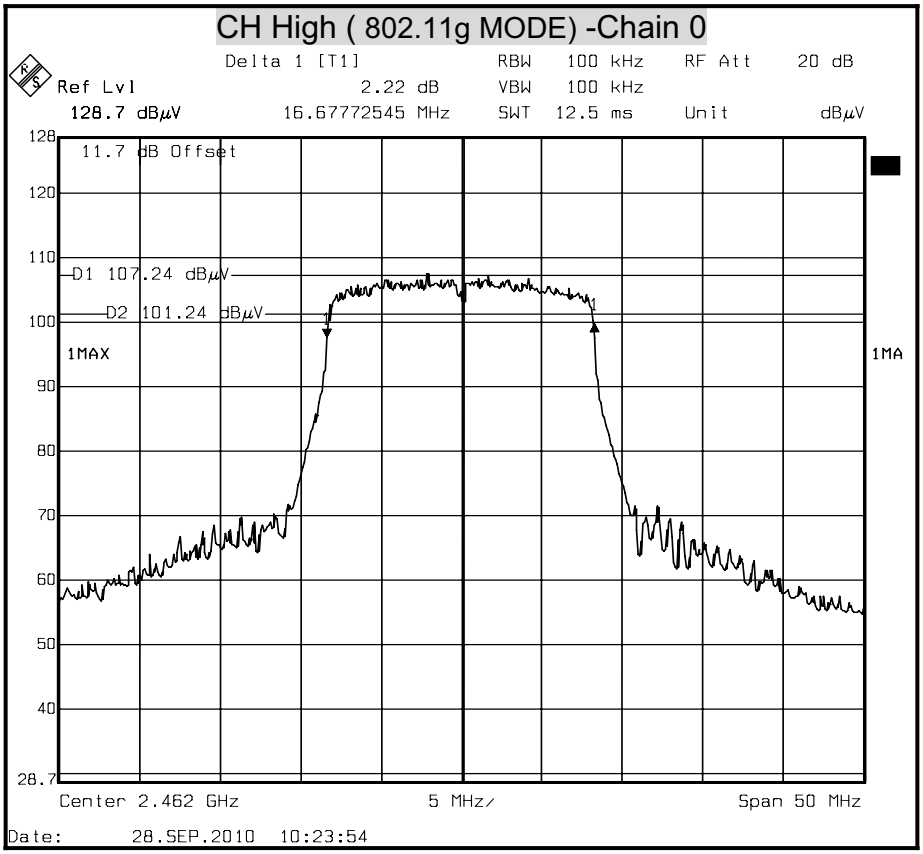



CH High (802.11b MODE) -Chain 0
Delta 1 [T1]
RBW 100 kHz
RF Att 20 dB
Ref Lvl
0.49 dB
VBW 100 kHz
128.7 dBµV
12.18542618 MHz
SWT 12.5 ms
Unit dBµV
11.7 dB Offset
D1 112.24 dBµV
D2 106.24 dBµV
1MAX
1MA
128
120
110
100
90
80
70
60
50
40
28.7
Center 2.462 GHz
5 MHz/
Span 50 MHz
Date: 28.SEP.2010 10:15:37

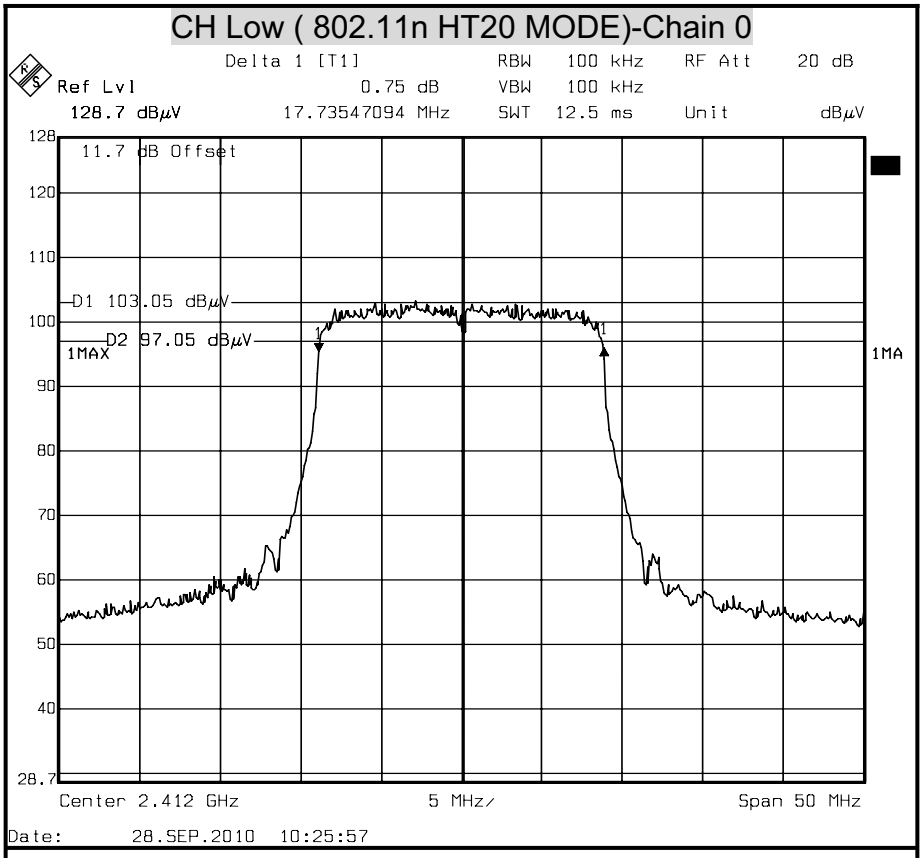
6dB BANDWIDTH (802.11g MODE)

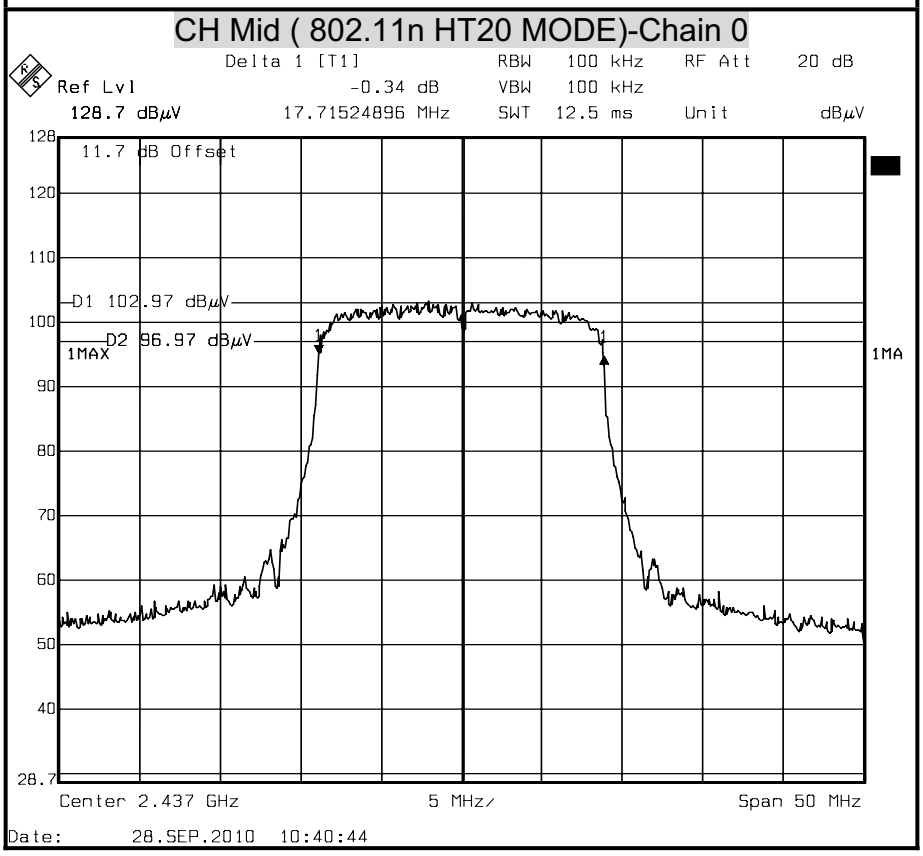


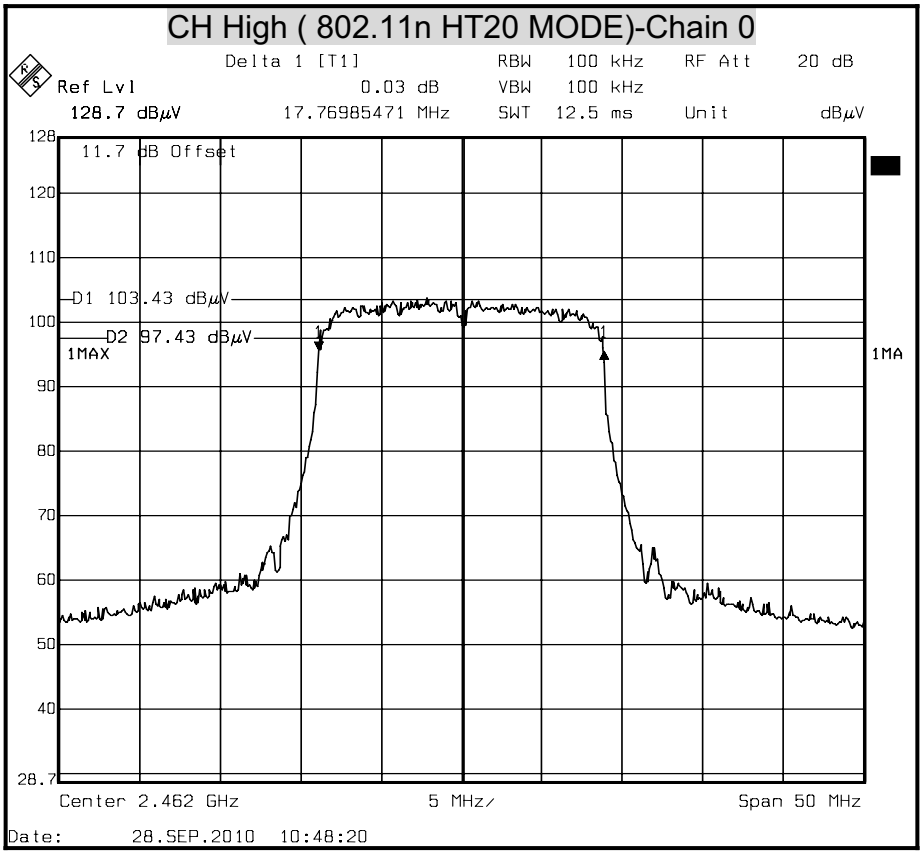



CH High (802.11g MODE) -Chain 0
Delta 1 [T1]
RBW 100 kHz
RF Att 20 dB
Ref Lvl
2.22 dB
VBW 100 kHz
128.7 dBµV
16.67772545 MHz
SWT 12.5 ms
Unit dBµV
11.7 dB Offset
D1 107.24 dBµV
D2 101.24 dBµV
1MAX
1MA
128
120
110
100
90
80
70
60
50
40
28.7
Center 2.462 GHz
5 MHz/
Span 50 MHz
Date: 28.SEP.2010 10:23:54

6dB BANDWIDTH (802.11n HT20 MODE) Chain 0






CH High (802.11n HT20 MODE)-Chain 0
Delta 1 [T1]
RBW 100 kHz
RF Att 20 dB
Ref Lvl
0.03 dB
VBW 100 kHz
128.7 dBµV
17.76985471 MHz
SWT 12.5 ms
Unit dBµV
11.7 dB Offset
D1 103.43 dBµV
D2 97.43 dBµV
1MAX
1MA
128
120
110
100
90
80
70
60
50
40
28.7
Center 2.462 GHz
5 MHz/
Span 50 MHz
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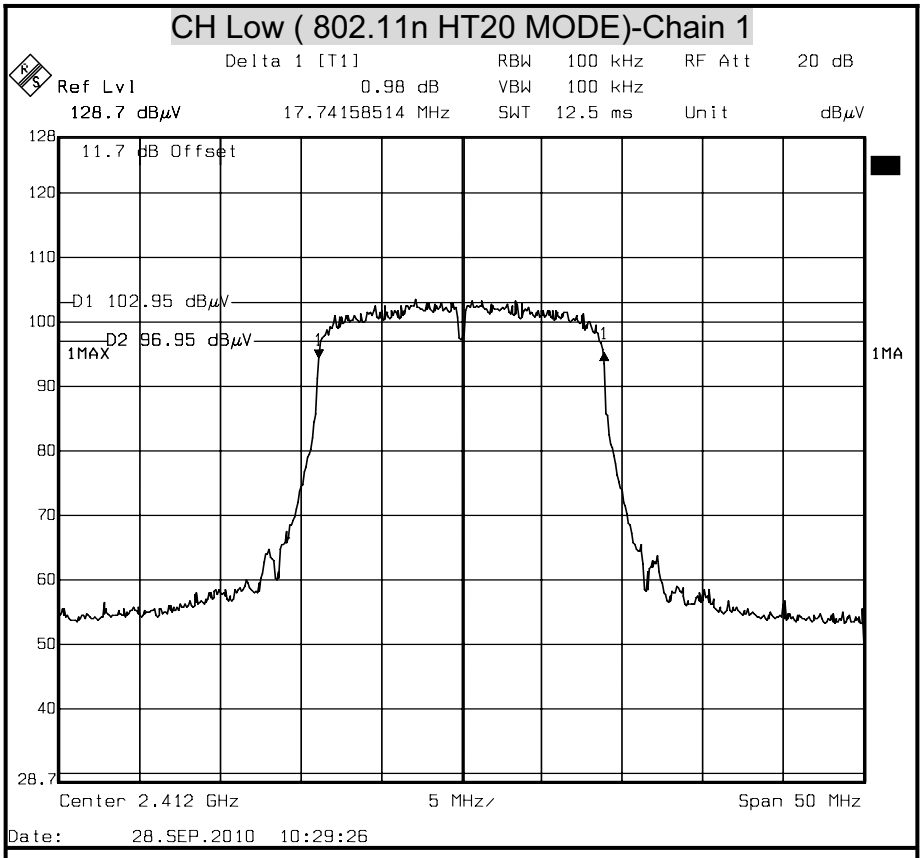
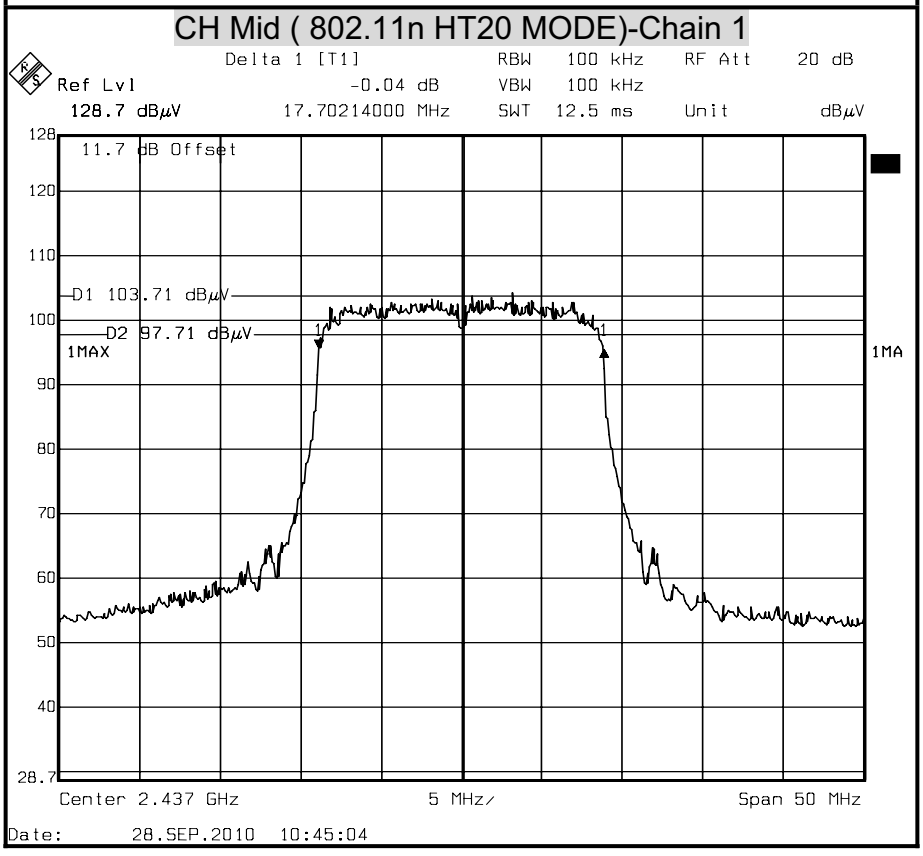
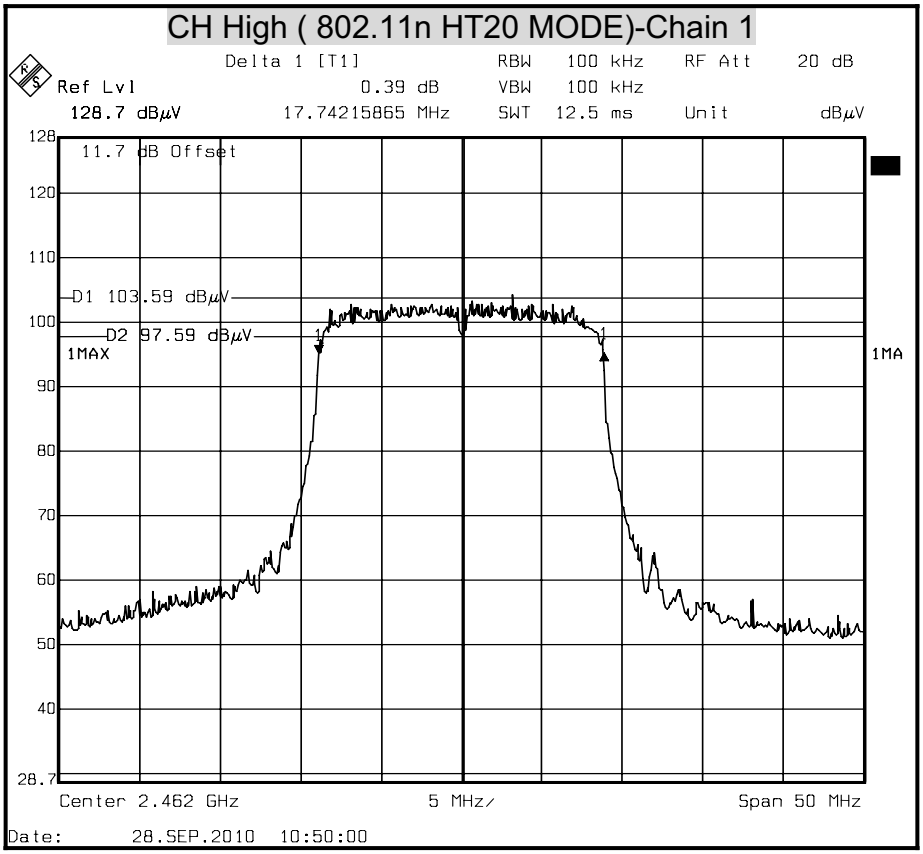
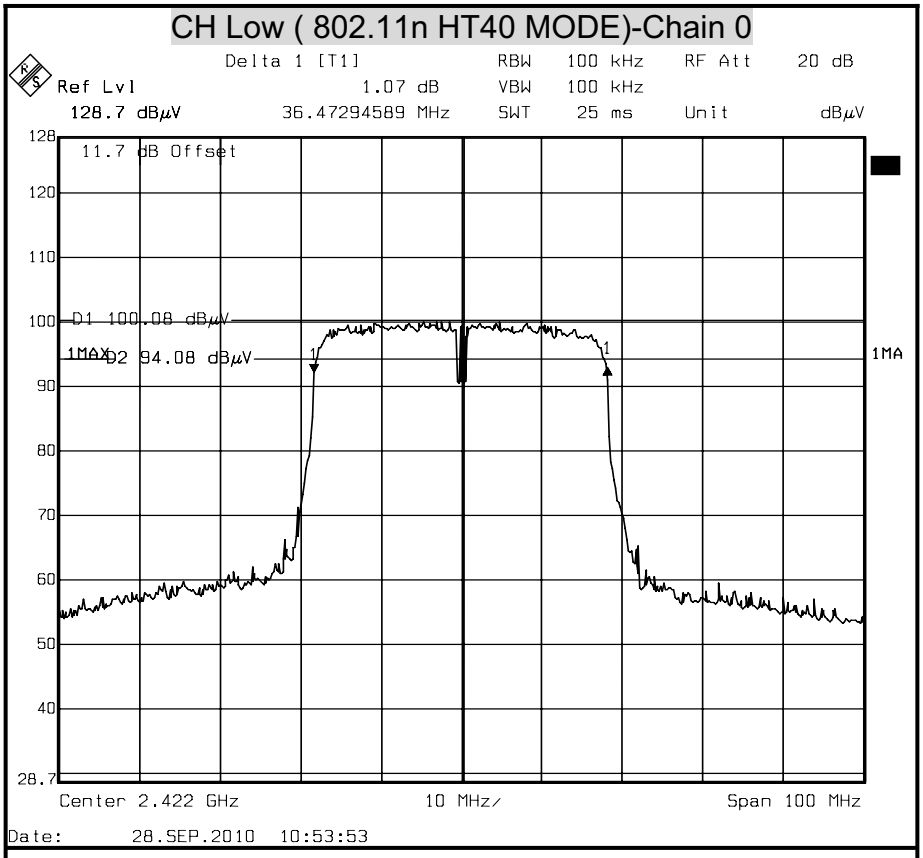
6dB BANDWIDTH (802.11n HT20 MODE) Chain 1

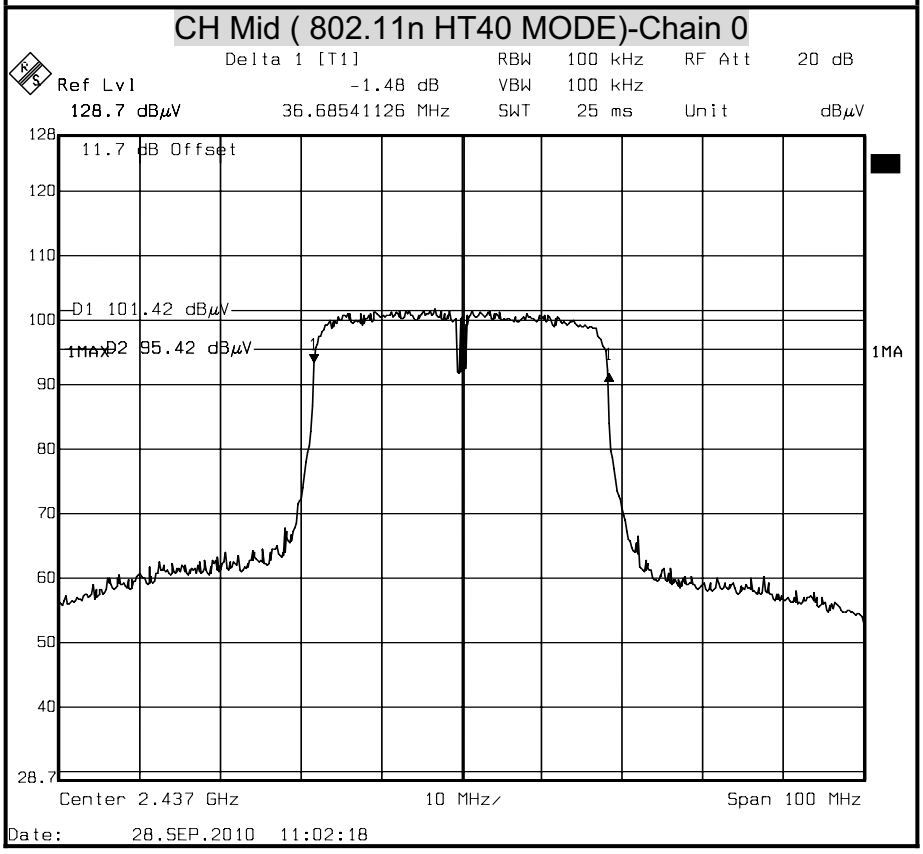


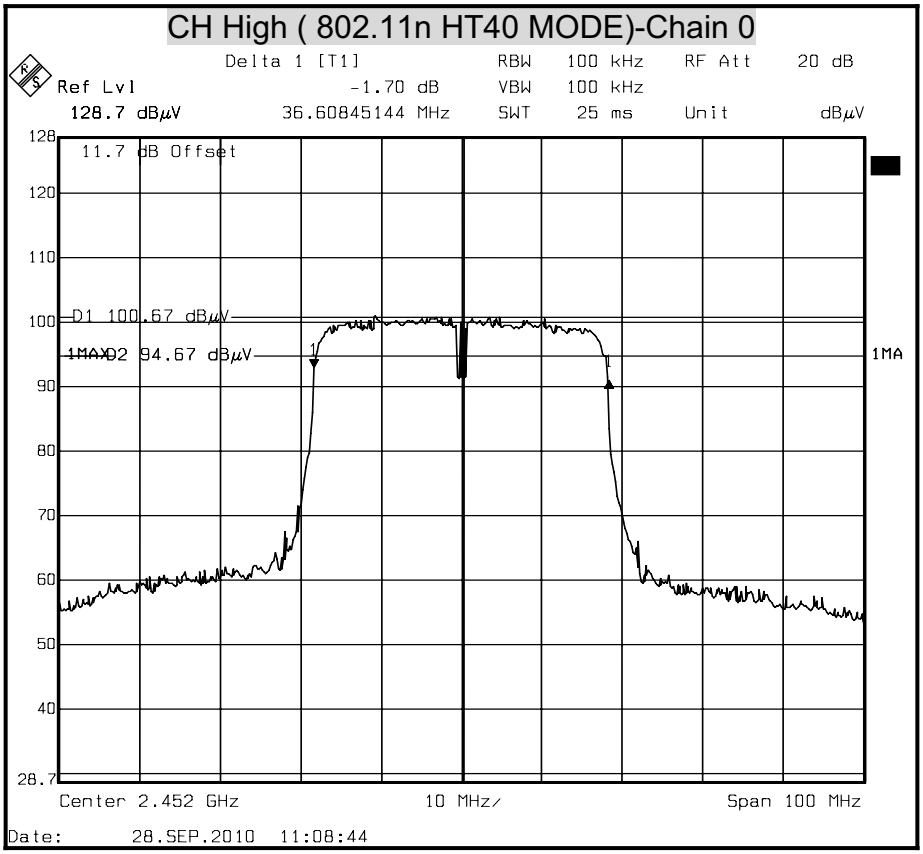



CH High (802.11n HT20 MODE)-Chain 1
Delta 1 [T1]
RBW 100 kHz
RF Att 20 dB
Ref Lvl
0.39 dB
VBW 100 kHz
128.7 dBµV
17.74215865 MHz
SWT 12.5 ms
Unit dBµV
11.7 dB Offset
D1 103.59 dBµV
D2 97.59 dBµV
1MAX
1MA
128
120
110
100
90
80
70
60
50
40
28.7
Center 2.462 GHz
5 MHz/
Span 50 MHz
Date: 28.SEP.2010 10:50:00

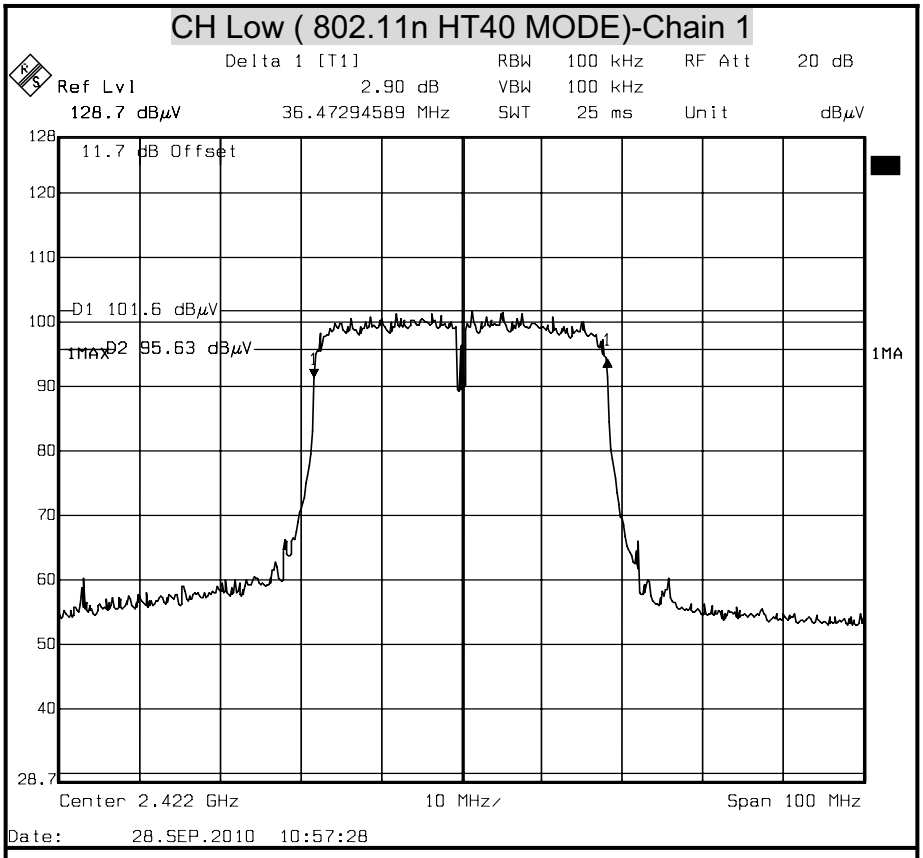
6dB BANDWIDTH (802.11n HT40 MODE) Chain 0

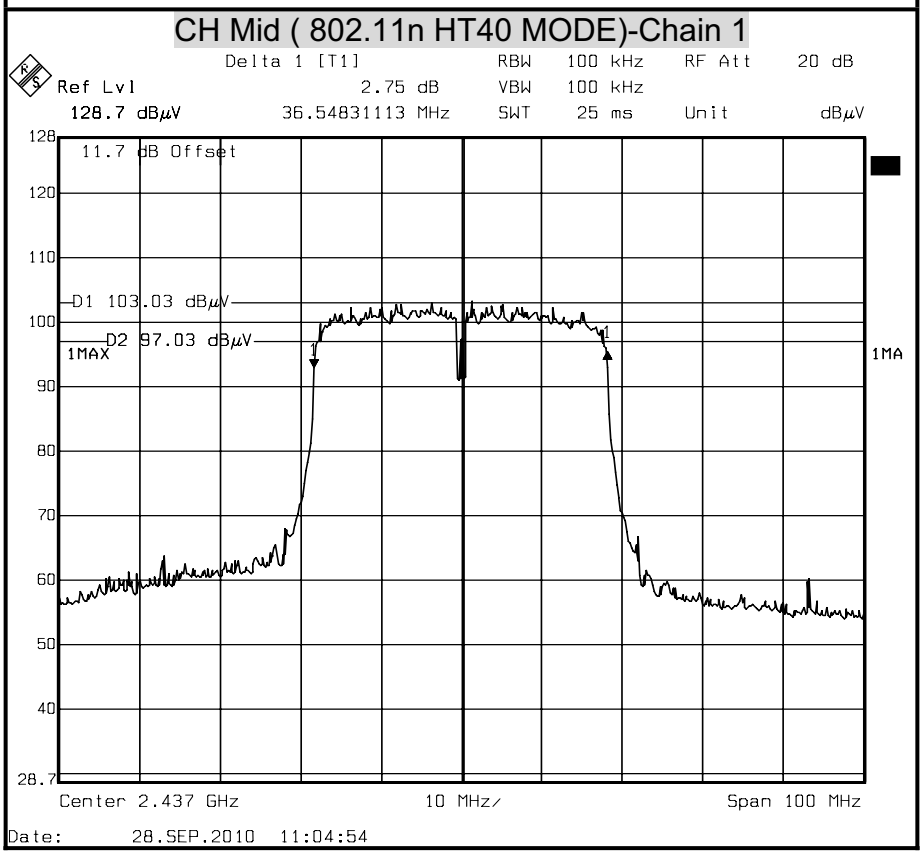


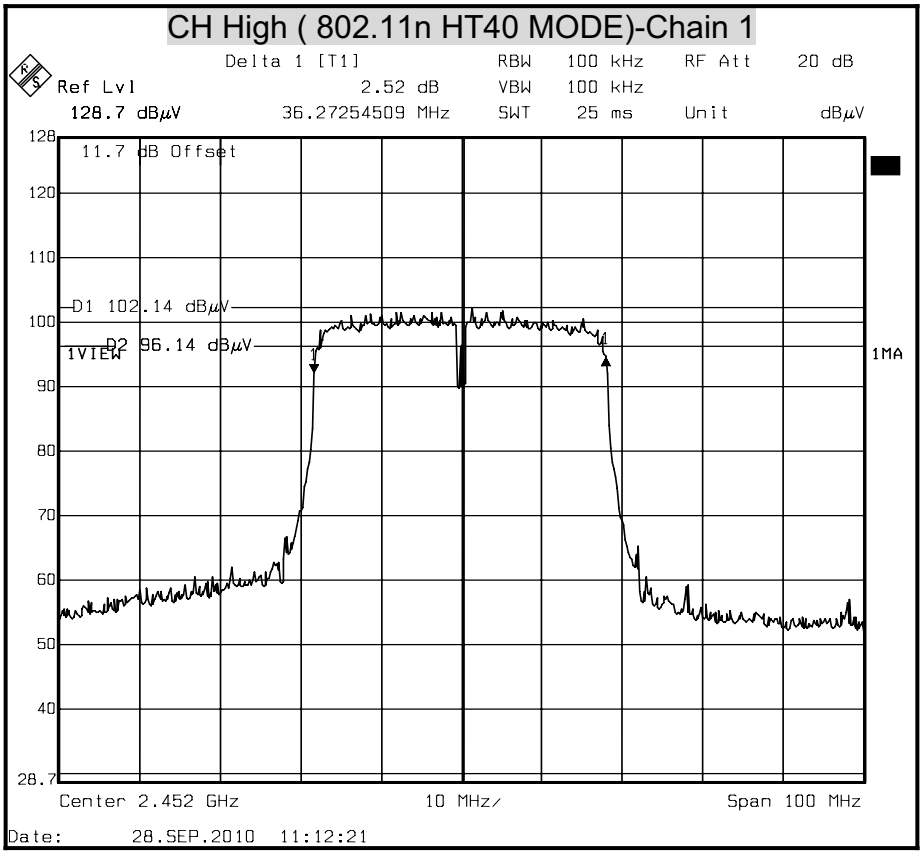



CH High (802.11n HT40 MODE)-Chain 0
Delta 1 [T1]
RBW 100 kHz
RF Att 20 dB
Ref Lvl
-1.70 dB
VBW 100 kHz
128.7 dBµV
36.60845144 MHz
SWT 25 ms
Unit dBµV
11.7 dB Offset
D1 100.67 dBµV
1MAXD2 94.67 dBµV
1MA
128
120
110
100
90
80
70
60
50
40
28.7
Center 2.452 GHz
10 MHz/
Span 100 MHz
Date: 28.SEP.2010 11:08:44

6dB BANDWIDTH (802.11n HT40 MODE) Chain 1






CH High (802.11n HT40 MODE)-Chain 1
Delta 1 [T1]
RBW 100 kHz
RF Att 20 dB
Ref Lvl
2.52 dB
VBW 100 kHz
128.7 dBµV
36.27254509 MHz
SWT 25 ms
Unit dBµV
11.7 dB Offset
D1 102.14 dBµV
D2 96.14 dBµV
1VIEW
1MA
128
120
110
100
90
80
70
60
50
40
28.7
Center 2.452 GHz
10 MHz/
Span 100 MHz
Date: 28.SEP.2010 11:12:21

8.2 MAXIMUM PEAK OUTPUT POWER

LIMIT

§ 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 EQUIPMENTS

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Power Meter	Anritsu	ML2487A	6K00003888	MAY. 11, 2011

TEST SETUP

TEST PROCEDURE

Connect the EUT to power meter, set the center frequency of the power meter to the channel center frequency. Set the RBW to 1MHz and VBW to 3MHz.

Set sweep time=auto

Use detector max peak mode

Measurement of Digital Transmission Systems Operating under Section 15.247

TEST RESULTS

No non-compliance noted

IEEE 802.11b mode

Channel	Channel Frequency (MHz)	Peak Power (dBm)	Peak Power Total (dBm)	Peak Power Limit (dBm)	Pass / Fail
Low	2412	20.09	20.09	30	PASS
Middle	2437	19.69	19.69	30	PASS
High	2462	20.46	20.46	30	PASS

NOTE : 1. At finial test to get the worst-case emission at 11Mbps.
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)	Peak Power (dBm)	Peak Power Total (dBm)	Peak Power Limit (dBm)	Pass / Fail
Low	2412	24.24	24.24	30	PASS
Middle	2437	24.60	24.60	30	PASS
High	2462	24.37	24.37	30	PASS

NOTE : 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)	Peak Power (dBm)		Peak Power Total (dBm)	Peak Power Limit (dBm)	Pass / Fail
		Chain 0	Chain 1			
Low	2412	22.01	21.76	24.90	30	PASS
Middle	2437	22.06	21.73	24.91	30	PASS
High	2462	22.54	22.18	25.37	30	PASS

NOTE : 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)	Peak Power (dBm)		Peak Power Total (dBm)	Peak Power Limit (dBm)	Pass / Fail
		Chain 0	Chain 1			
Low	2422	21.94	21.42	24.70	30	PASS
Middle	2437	22.49	21.58	25.07	30	PASS
High	2452	22.04	21.68	24.87	30	PASS

NOTE : 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.

MAXIMUM PEAK OUTPUT POWER (802.11b MODE)

CH Low (802.11b MODE)

CH Mid (802.11b MODE)

CH High (802.11b MODE)

MAXIMUM PEAK OUTPUT POWER (802.11g MODE)

CH Low (802.11g MODE)

CH Mid (802.11g MODE)

CH High (802.11g MODE)

MAXIMUM PEAK OUTPUT POWER (802.11n HT20 MODE)

CH Low (802.11n HT20 MODE-Chain 0)

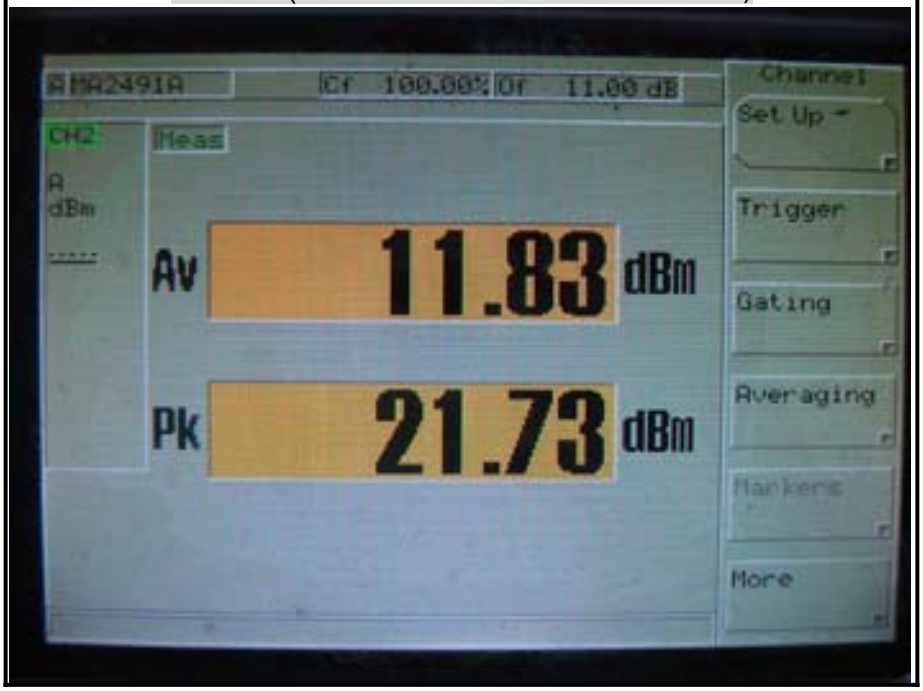
CH Mid (802.11n HT20 MODE-Chain 0)

CH High (802.11n HT20 MODE-Chain 0)

MAXIMUM PEAK OUTPUT POWER (802.11n HT20 MODE)

CH Low (802.11n HT20 MODE-Chain)

CH Mid (802.11n HT20 MODE-Chain 1)



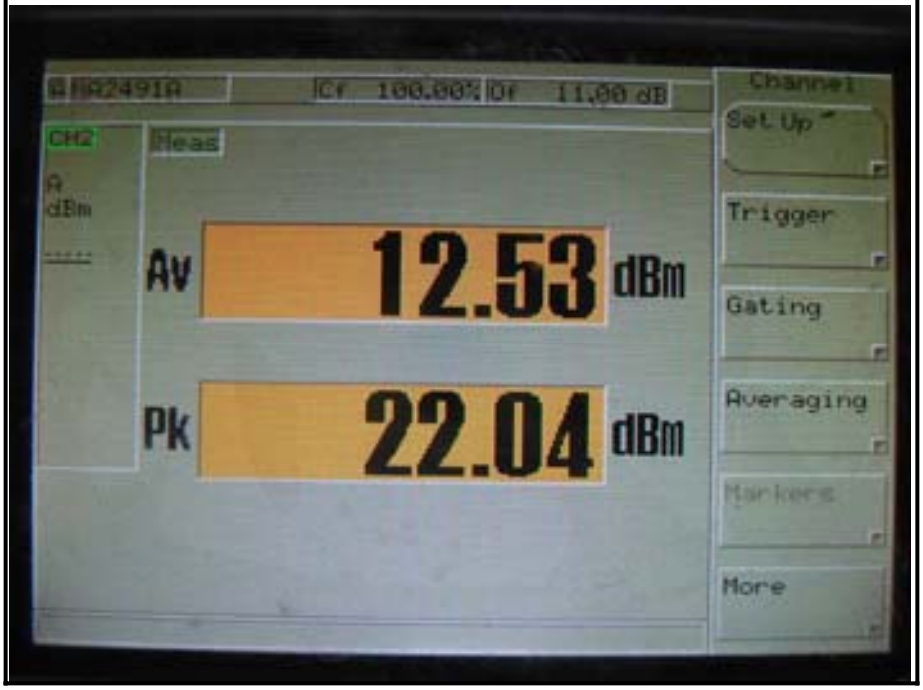
CH High (802.11n HT20 MODE-Chain 1)

MAXIMUM PEAK OUTPUT POWER (802.11n HT40 MODE)

CH Low (802.11n HT40 MODE-Chain 0)

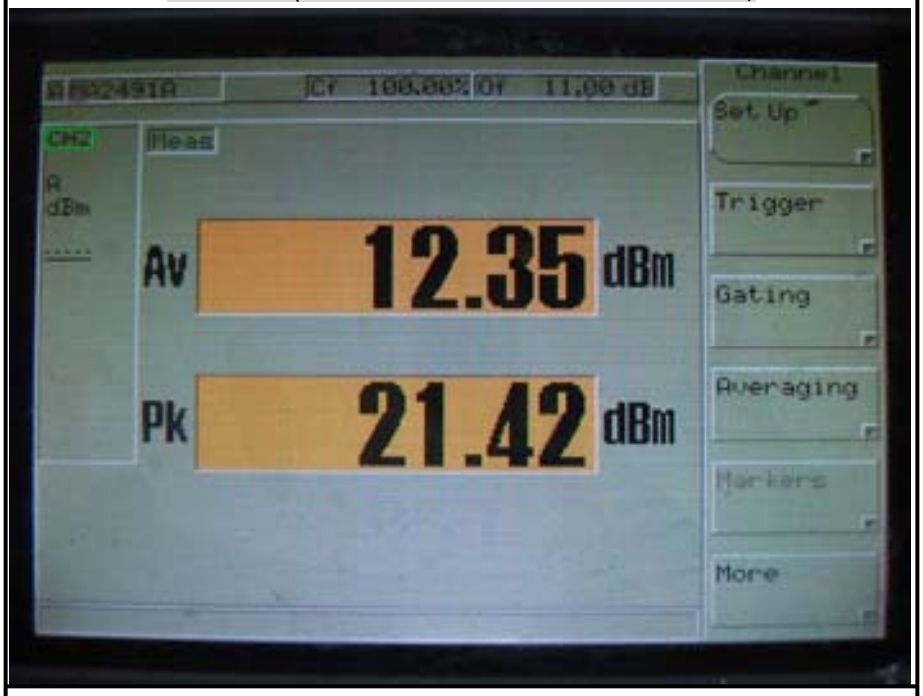
CH Mid (802.11n HT40 MODE-Chain 0)

CH High (802.11n HT40 MODE-Chain 0)



MAXIMUM PEAK OUTPUT POWER (802.11n HT40 MODE)

CH Low (802.11n HT40 MODE-Chain 1)



CH Mid (802.11n HT40 MODE-Chain 1)

CH High (802.11n HT40 MODE-Chain 1)

8.3 MAXIMUM PERMISSIBLE EXPOSURE

According to FCC 1.1310 : The criteria listed in the following table shall be used to evaluate the environment impact of human exposure to radio frequency (RF) radiation as specified in 1.1307(b)LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm^2)	Average Time
(A) Limits for Occupational / Control Exposures				
300-1,500	--	--	F/300	6
1,500-100,000	--	--	5	6
(B) Limits for General Population / Uncontrol Exposures				
300-1,500	--	--	F/1500	6
1,500-100,000	--	--	1	30

CALCULATIONS

Given $E = \frac{\sqrt{30 \times P \times G}}{d}$ & $S = \frac{E^2}{3770}$

Where *E = Field strength in Volts / meter*

P = Power in Watts

G = Numeric antenna gain

d = Distance in meters

S = Power density in milliwatts / square centimeter

Combining equations and re-arranging the terms to express the distance as a function of the remaining variables yields:

$$S = \frac{30 \times P \times G}{3770 d^2}$$

Changing to units of mW and cm, using:

P (mW) = P (W) / 1000 and

d (cm) = d(m) / 100

Yields

$$S = \frac{30 \times (P/1000) \times G}{3770 \times (d/100)^2} = 0.0796 \times \frac{P \times G}{d^2}$$

Where *d = Distance in cm*

P = Power in mW

G = Numeric antenna gain

S = Power density in mW / cm^2

LIMIT

Power Density Limit, S=1.0mW/cm^2

TEST RESULTS

No non-compliance noted.

$$S = \frac{30 \times (P/1000) \times G}{3770 \times (d/100)^2} = 0.0796 \times \frac{P \times G}{d^2}$$

G=3.23dBi=2.1037784mW

IEEE 802.11b =0.0796*111.1732*2.10377844/400=0.046543

IEEE 802.11g =0.0796*288.4032*2.10377844/400=0.120741

IEEE 802.11n HT20 =0.0796*344.695*2.10377844/400=0.144297

IEEE 802.11n HT40 =0.0796*321.2988*2.10377844/400=0.134512

Mode	Minimum separation distance (cm)	Output Power (dBm)	Output Power (mw)	Antenna Gain (dBi)	Power Density Limit (mW/cm^2)	Power Density at 20cm (mW/cm^2)
IEEE 802.11b	20.0	20.46	111.17	3.23	1	0.046543
IEEE 802.11g	20.0	24.60	288.40	3.23	1	0.120741
IEEE 802.11n HT20	20.0	25.37	344.67	3.23	1	0.144297
IEEE 802.11n HT40	20.0	25.07	321.30	3.23	1	0.134512

REMARK: For mobile or fixed location transmitters, the maximum power density is 1.0 mW/cm^2 even if the calculation indicates that the power density would be larger.

8.4 POWER SPECTRAL DENSITY

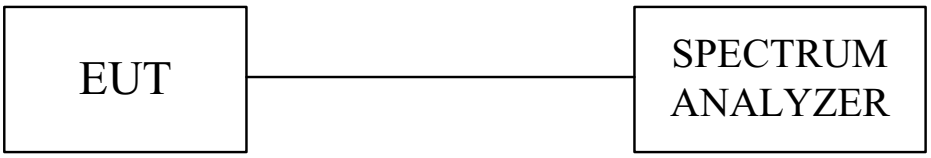
LIMIT

§ 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 EQUIPMENTS

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	R&S	FSEK 30	835253/002	JUL. 14, 2010

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

Total peak power calculation formula:
10 log (10^ (Chain 0 PPSD / 10)).

No non-compliance noted.

IEEE 802.11b mode

Channel	Channel Frequency (MHz)	PPSD (dBm)	Maximum Limit (dBm)	Pass / Fail
Low	2412	-6.51	8	PASS
Middle	2437	-6.48	8	PASS
High	2462	-5.51	8	PASS

NOTE : 1. At finial test to get the worst-case emission at 11Mbps.
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)	PPSD (dBm)	Maximum Limit (dBm)	Pass / Fail
Low	2412	-5.96	8	PASS
Middle	2437	-4.90	8	PASS
High	2462	-5.87	8	PASS

NOTE : 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)	PPSD(dBm)			Maximum Limit	Pass / Fail
		Chain 0	Chain 1	Total	(dBm)	
Low	2412	-9.20	-14.33	-8.04	8	PASS
Middle	2437	-9.52	-13.99	-8.19	8	PASS
High	2462	-9.07	-15.25	-8.13	8	PASS

NOTE : 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)	PPSD(dBm)			Maximum Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Total		
Low	2422	-9.35	-14.07	-8.09	8	PASS
Middle	2437	-8.45	-13.40	-7.24	8	PASS
High	2452	-9.05	-13.76	-7.79	8	PASS

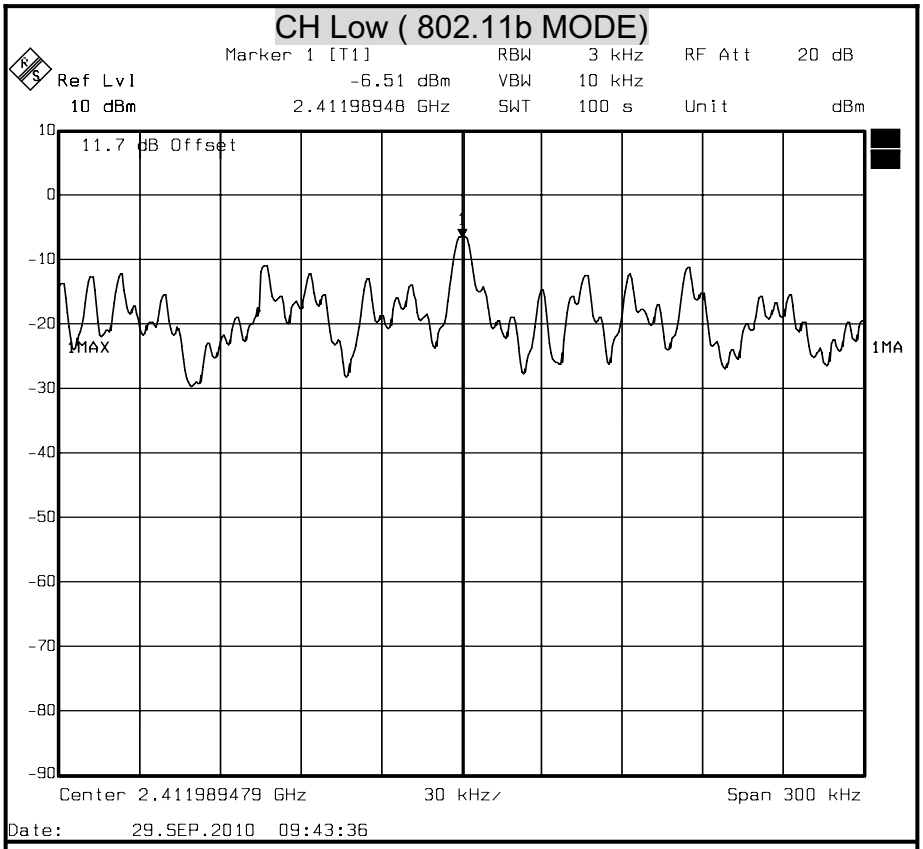
NOTE : 1. At finial test to get the worst-case emission at 27Mbps.
2. The cable assembly insertion loss of 11.7dB (including 10 dB pad and 1.7 dB cable) was Entered as an offset in the spectrum analyzer to allow for direct reading of power.

Combined mode

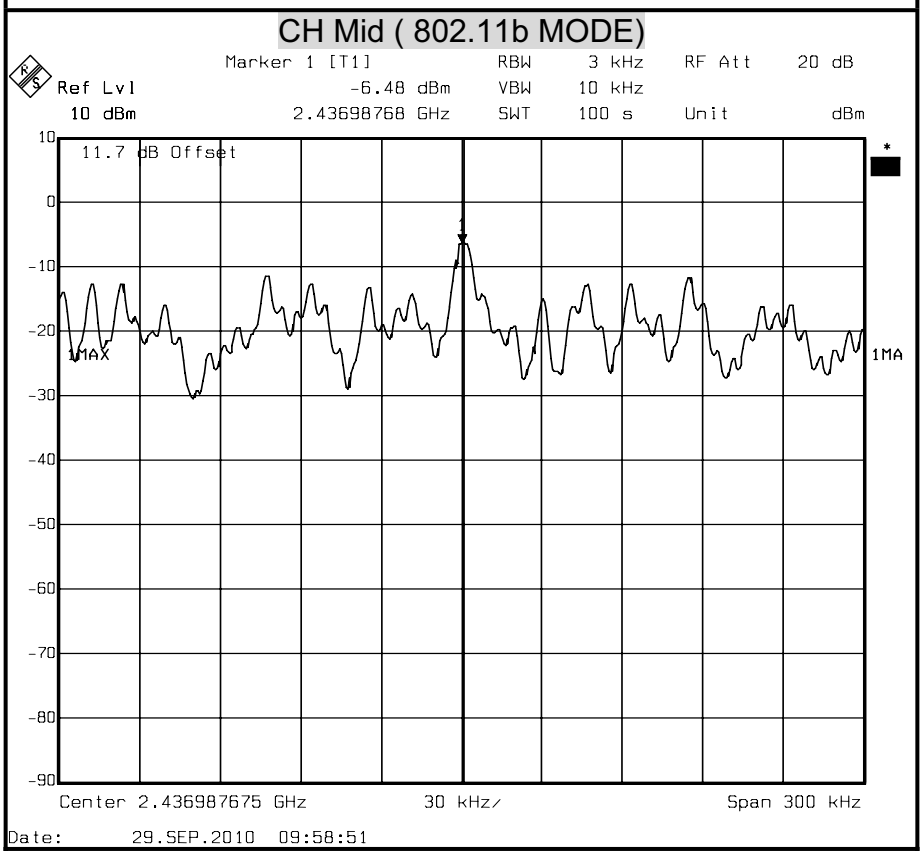
Channel		Channel Frequency (MHz)	PPSD(dBm)	Maximum Limit (dBm)	Pass / Fail
802.11n HT20 Combined mode	CH Low	2412	-5.50	8	PASS
	CH Middle	2437	-5.19		
	CH High	2462	-4.19		
802.11n HT40 Combined mode	CH Low	2422	-4.58	8	PASS
	CH Middle	2437	-2.89		
	CH High	2452	-3.64		

POWER SPECTRAL DENSITY (IEEE 802.11b MODE)

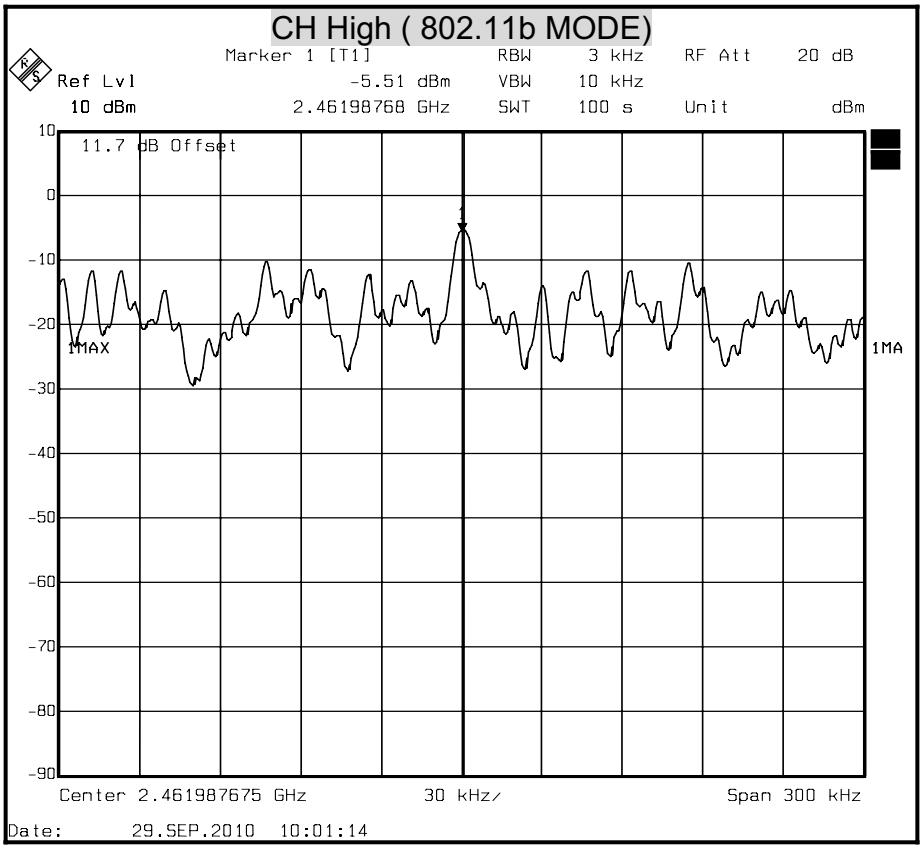
CH Low (802.11b MODE)



CH Mid (802.11b MODE)

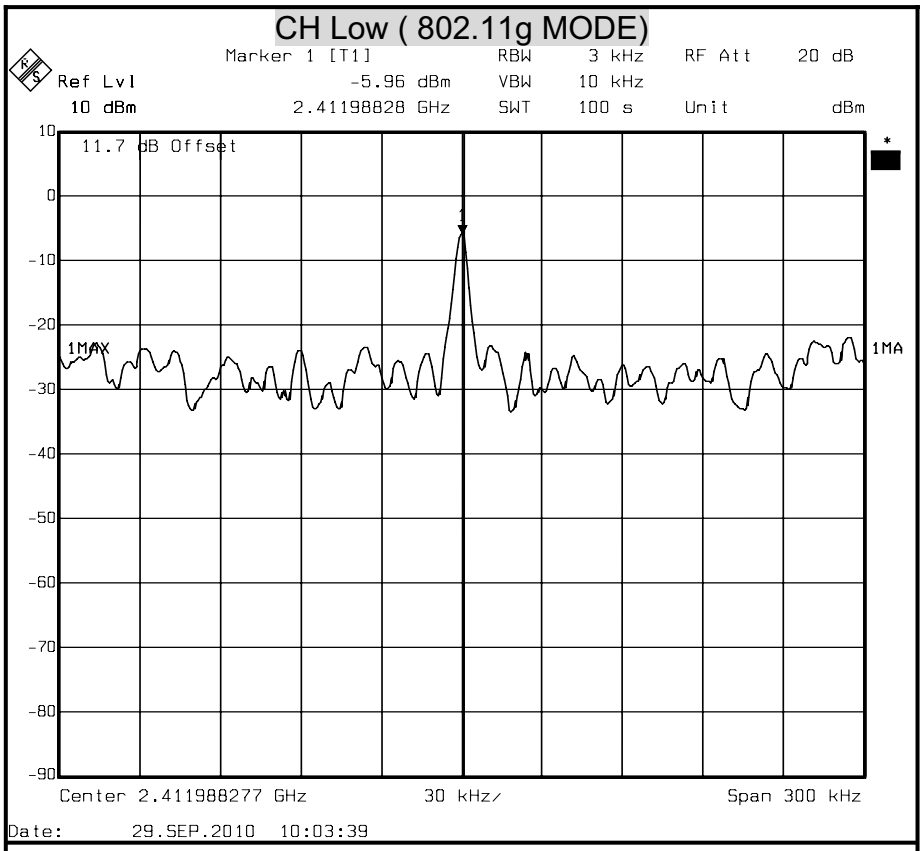


CH High (802.11b MODE)

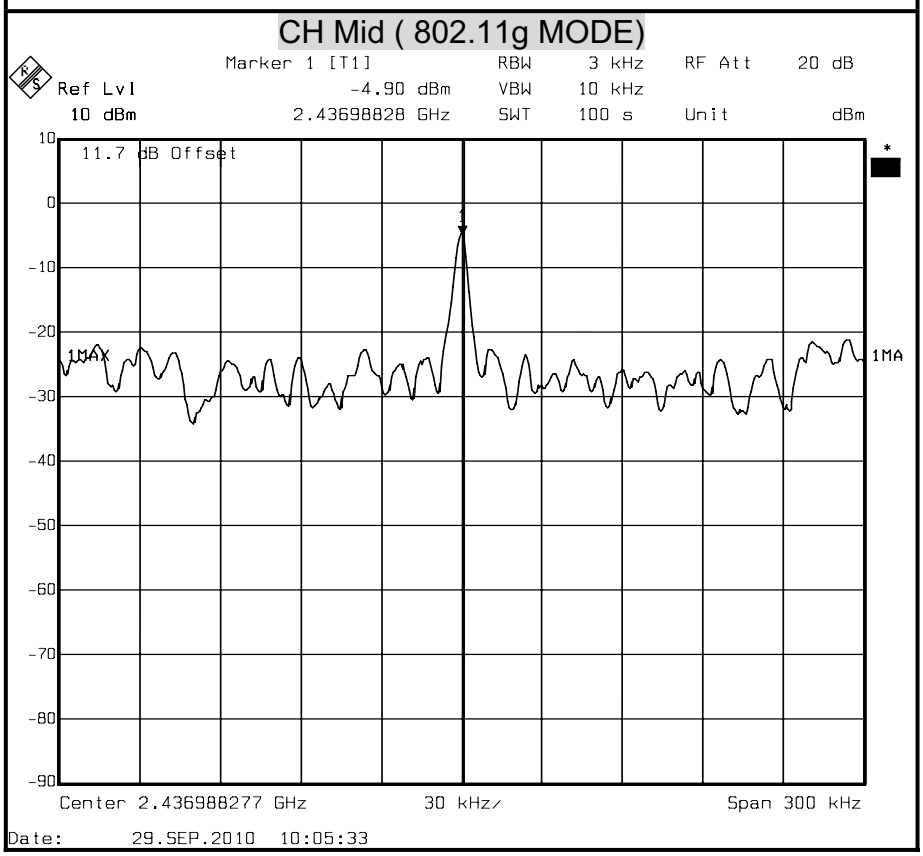


POWER SPECTRAL DENSITY (IEEE 802.11g MODE)

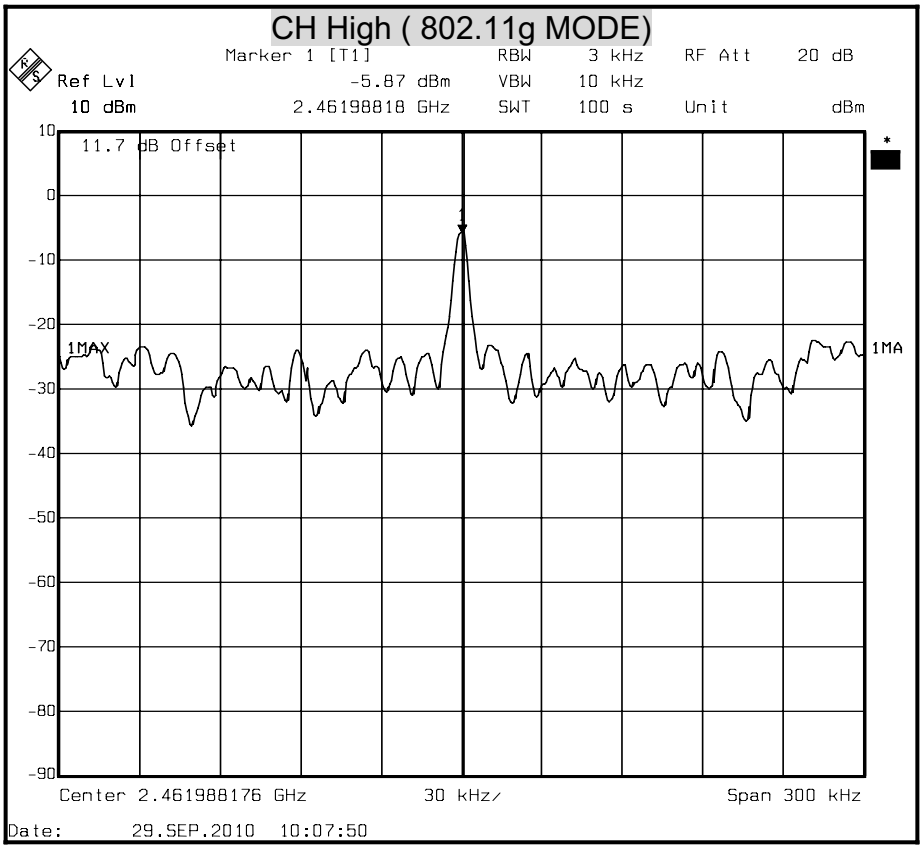
CH Low (802.11g MODE)



CH Mid (802.11g MODE)

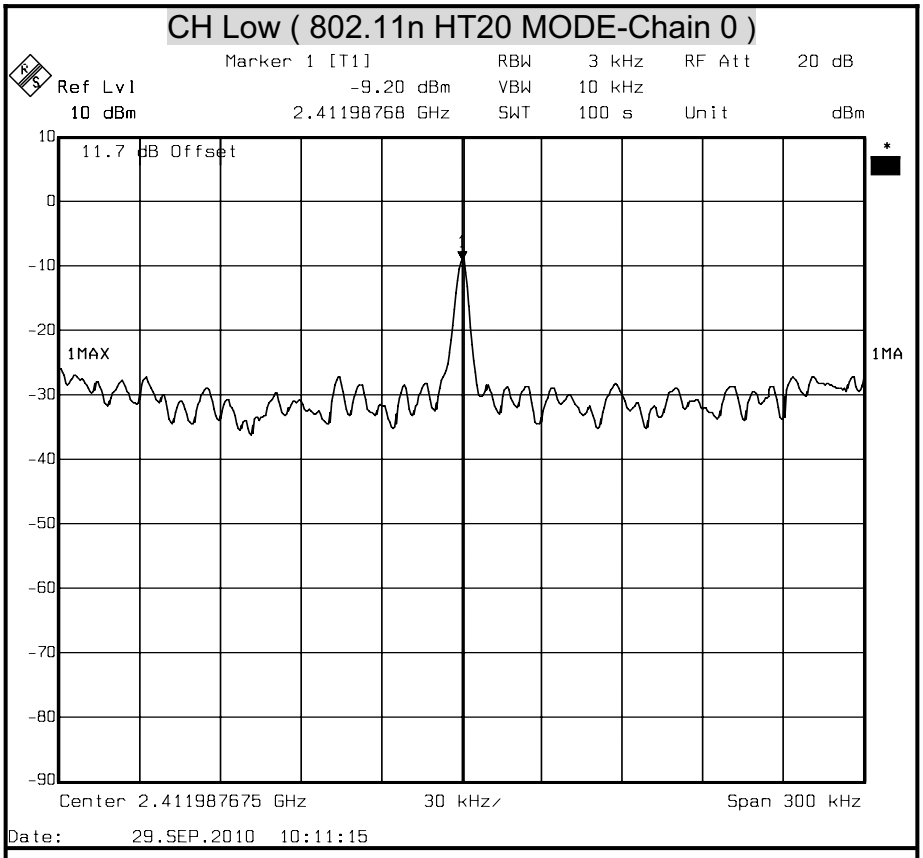


CH High (802.11g MODE)

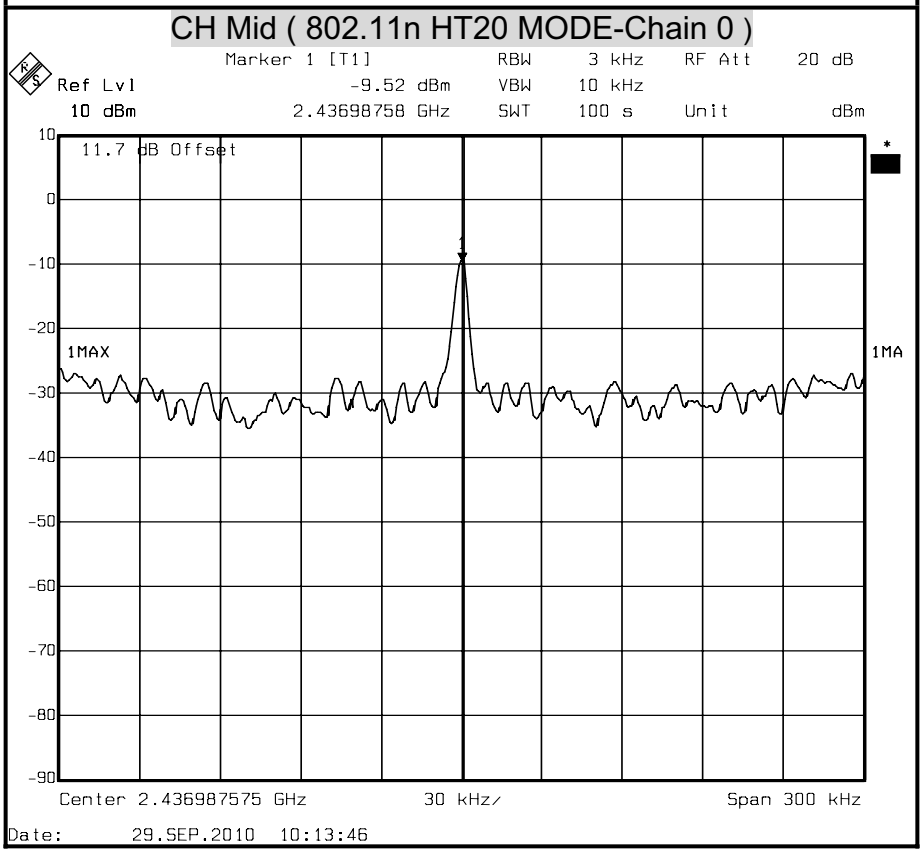


POWER SPECTRAL DENSITY (802.11n HT20 MODE)

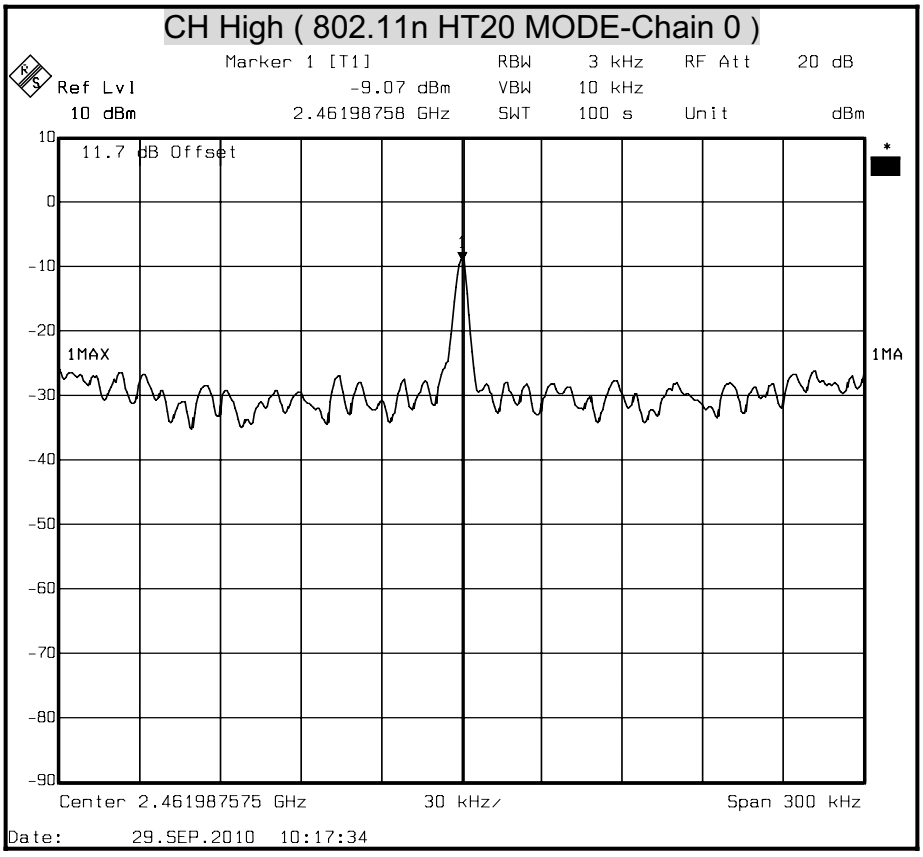
CH Low (802.11n HT20 MODE-Chain 0)



CH Mid (802.11n HT20 MODE-Chain 0)

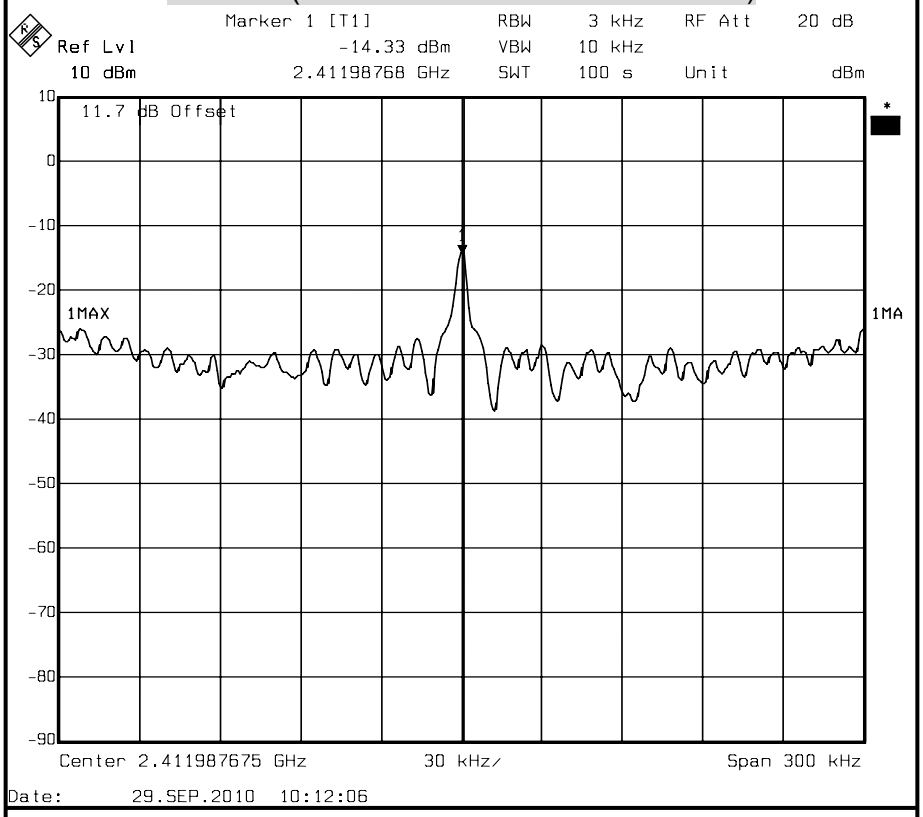


CH High (802.11n HT20 MODE-Chain 0)

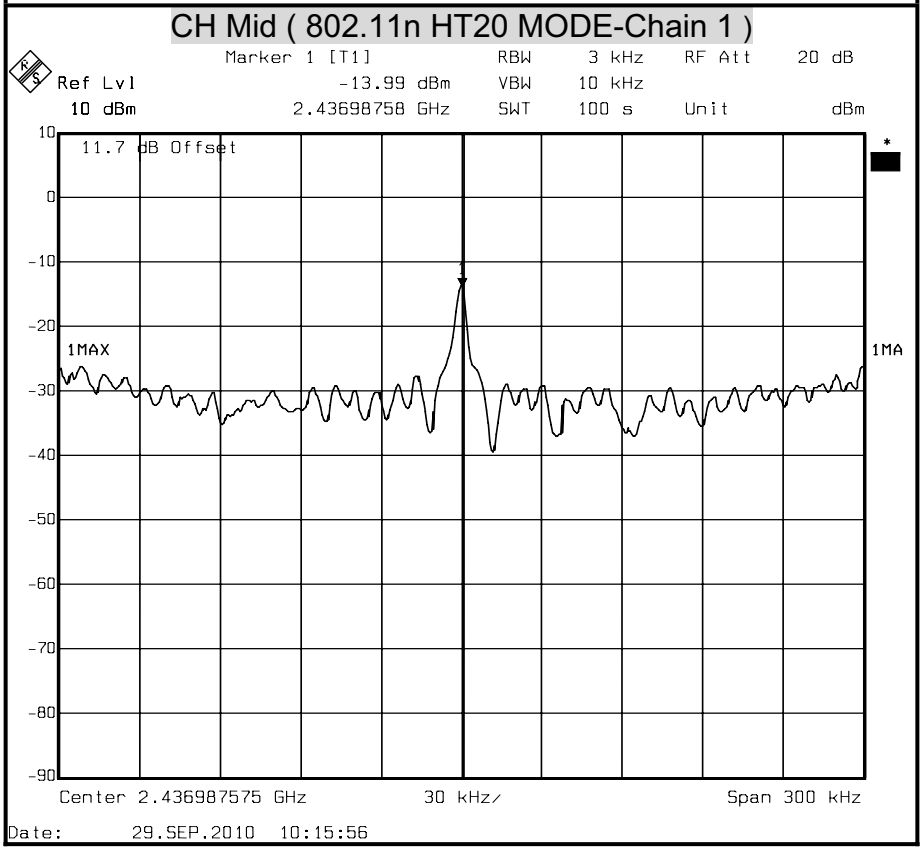


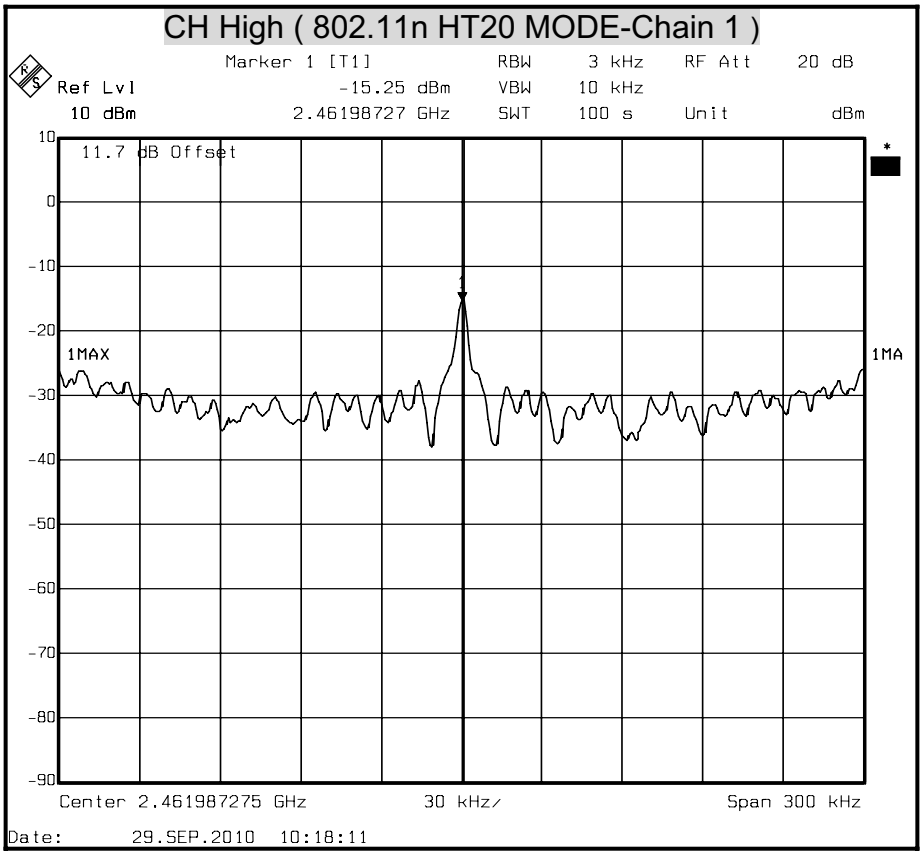
POWER SPECTRAL DENSITY (802.11n HT20 MODE)

CH Low (802.11n HT20 MODE-Chain 1)



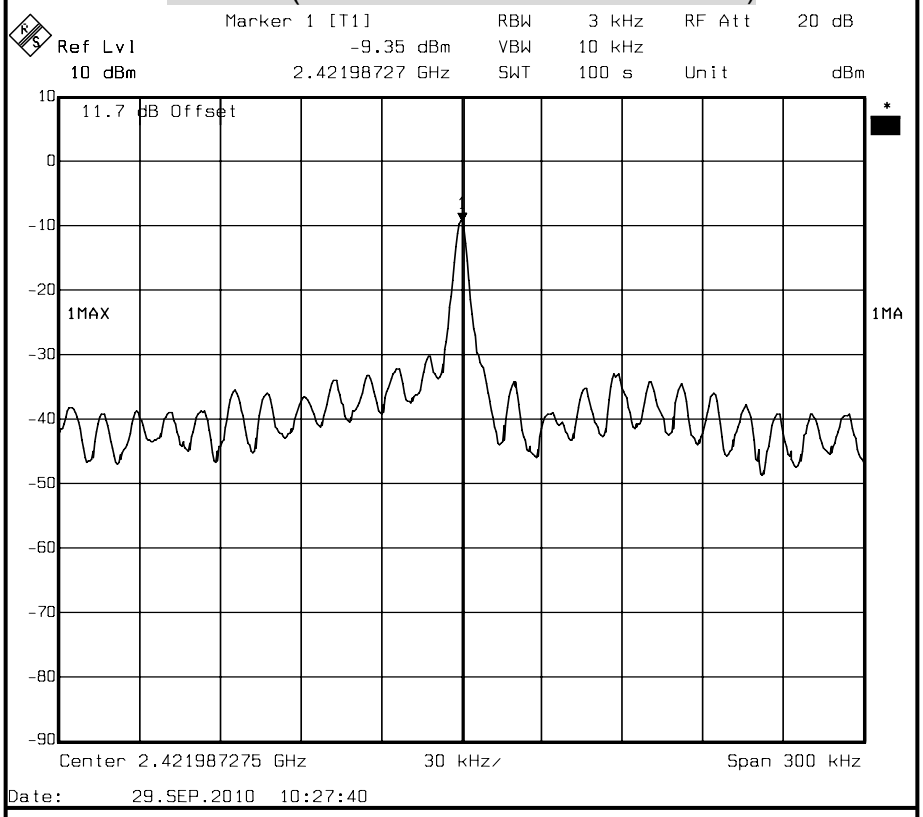
CH Mid (802.11n HT20 MODE-Chain 1)



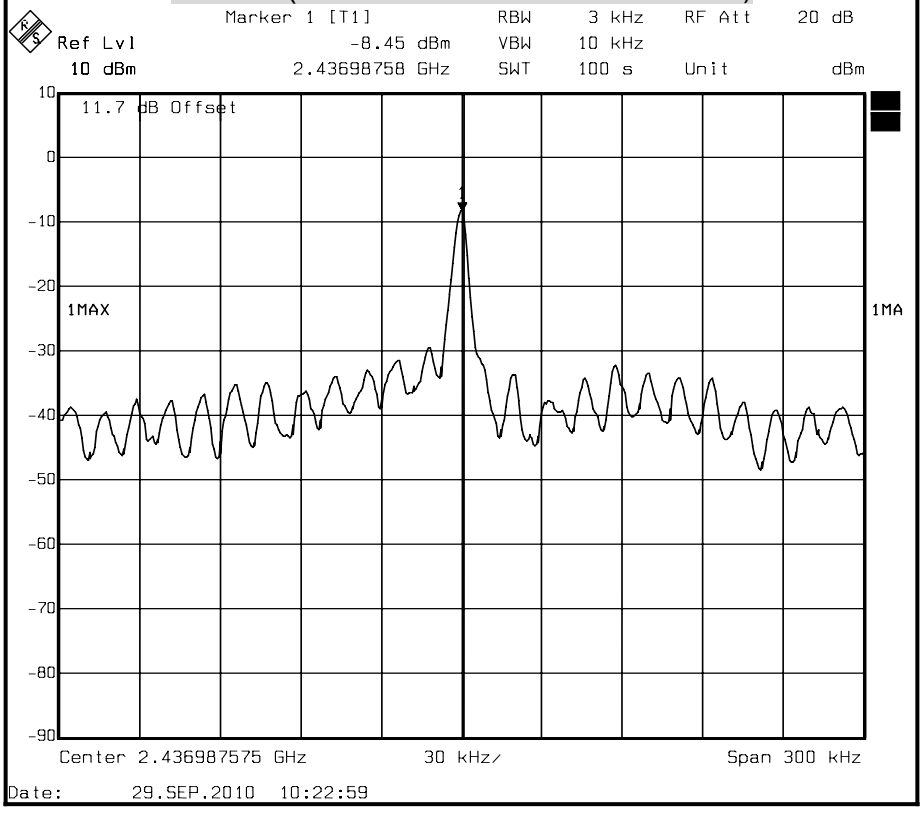

CH High (802.11n HT20 MODE-Chain 1)
Marker 1 [T1]
RBW 3 kHz
RF Att 20 dB
Ref Lvl
-15.25 dBm
VBW 10 kHz
10 dBm
2.46198727 GHz
SWT 100 s
Unit dBm
11.7 dB Offset
1MAX
1MA
Center 2.461987275 GHz
30 kHz/
Span 300 kHz
Date: 29.SEP.2010 10:18:11

POWER SPECTRAL DENSITY (802.11n HT40 MODE)

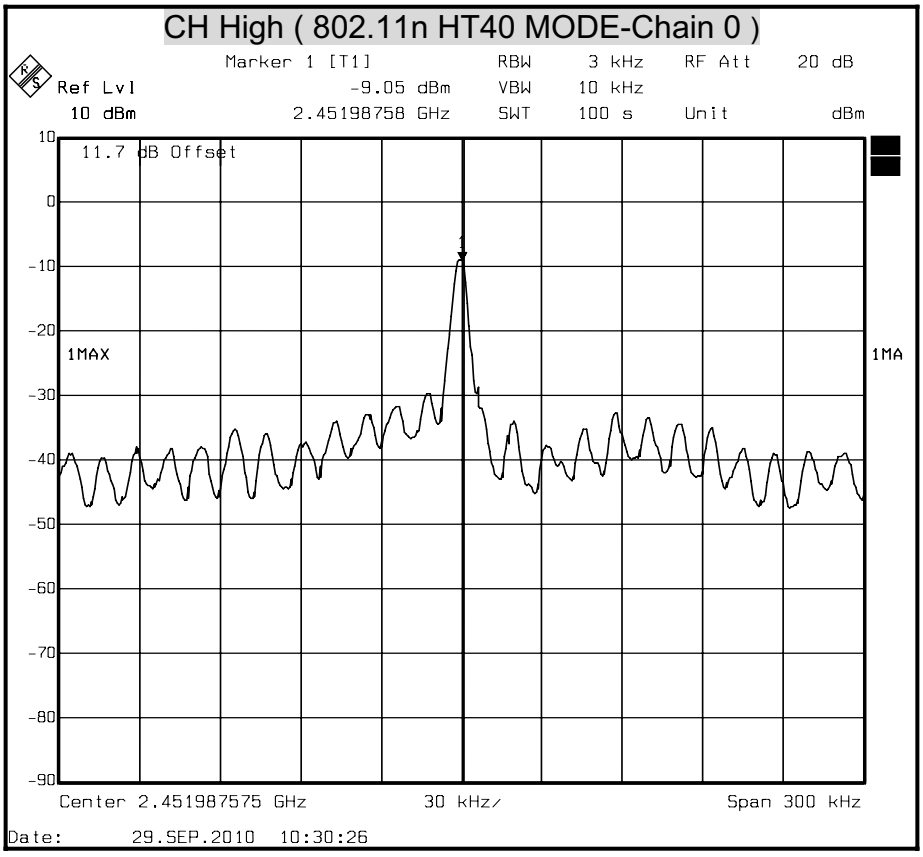
CH Low (802.11n HT40 MODE-Chain 0)



CH Mid (802.11n HT40 MODE-Chain 0)

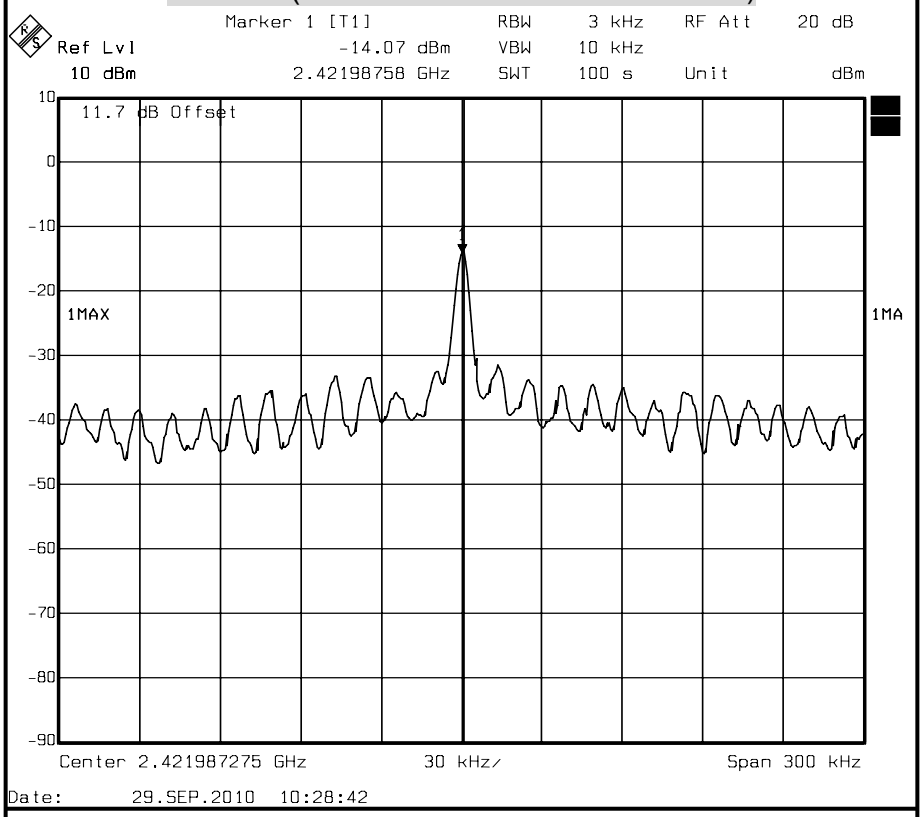


CH High (802.11n HT40 MODE-Chain 0)

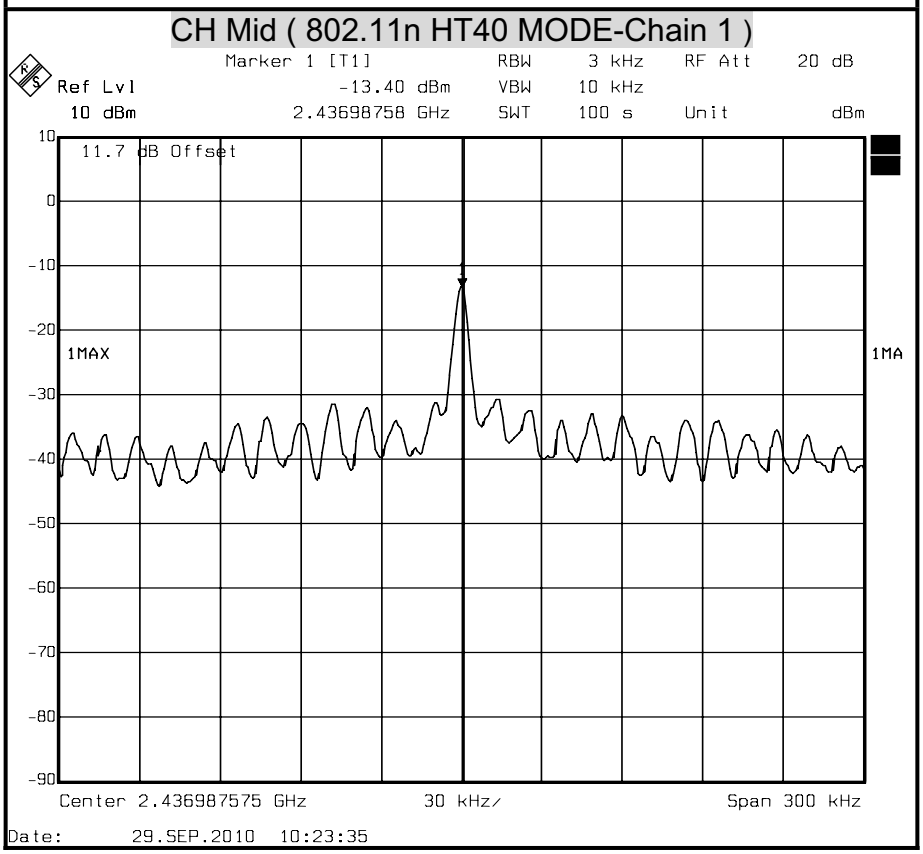


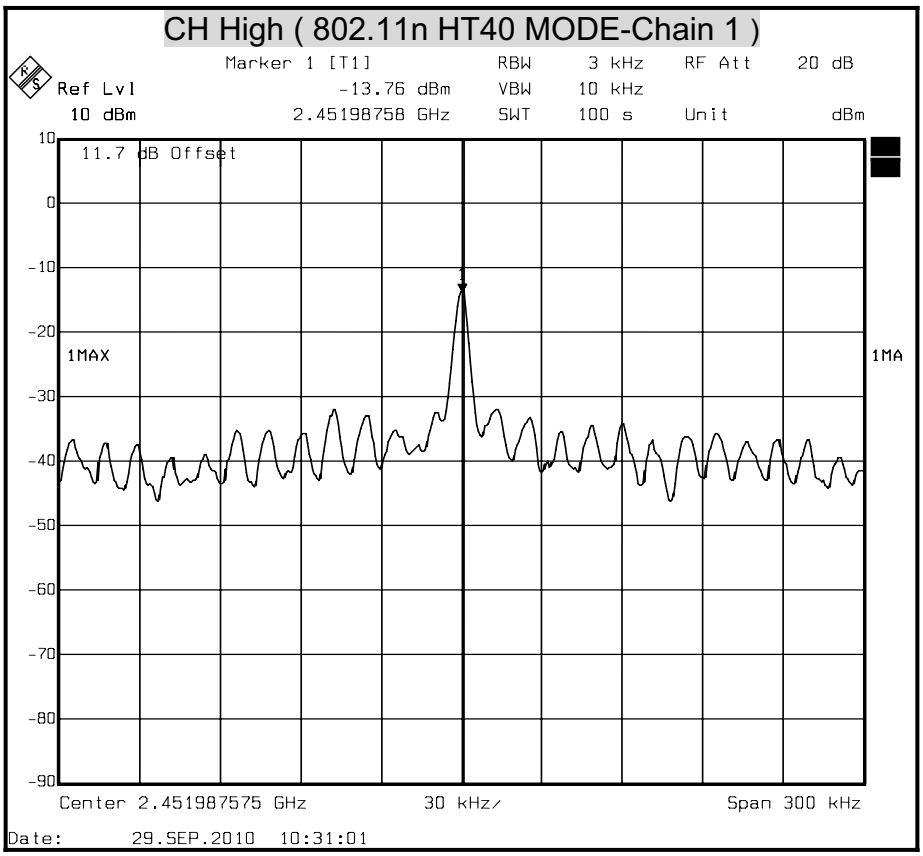
POWER SPECTRAL DENSITY (802.11n HT40 MODE)

CH Low (802.11n HT40 MODE-Chain 1)



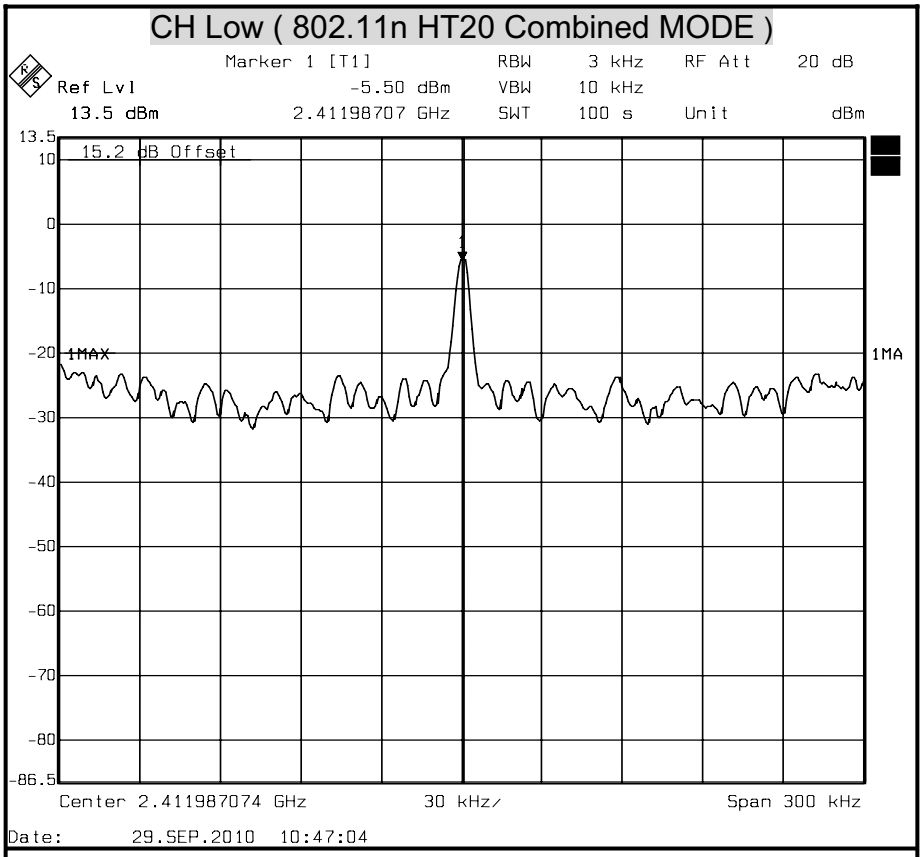
CH Mid (802.11n HT40 MODE-Chain 1)



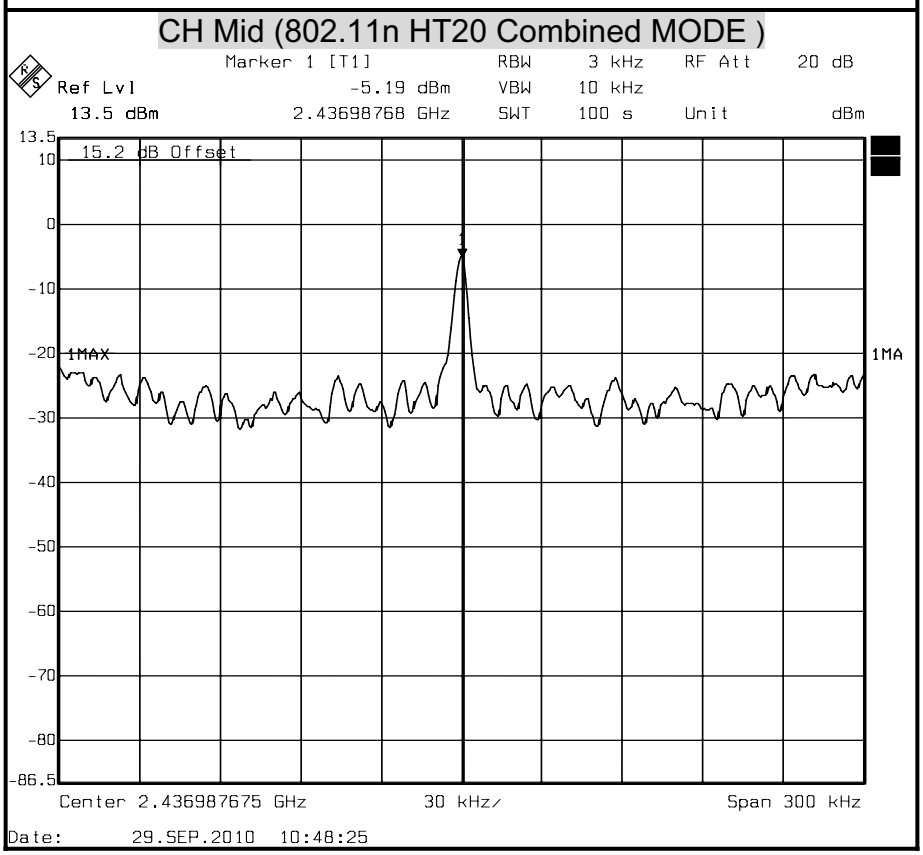

CH High (802.11n HT40 MODE-Chain 1)
Marker 1 [T1]
-13.76 dBm
2.45198758 GHz
RBW 3 kHz
VBW 10 kHz
SWT 100 s
RF Att 20 dB
Unit dBm
Ref Lvl
10 dBm
11.7 dB Offset
1MAX
1MA
10
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
Center 2.451987575 GHz
30 kHz/
Span 300 kHz
Date: 29.SEP.2010 10:31:01

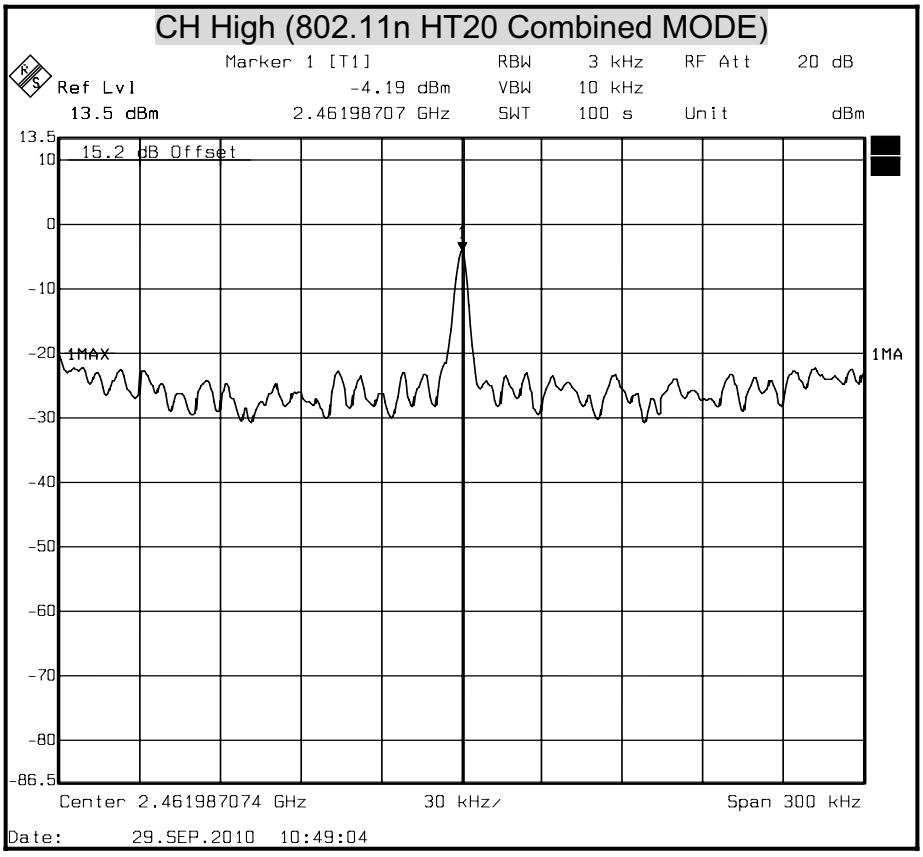
POWER SPECTRAL DENSITY (802.11n HT20 Combined MODE)

CH Low (802.11n HT20 Combined MODE)



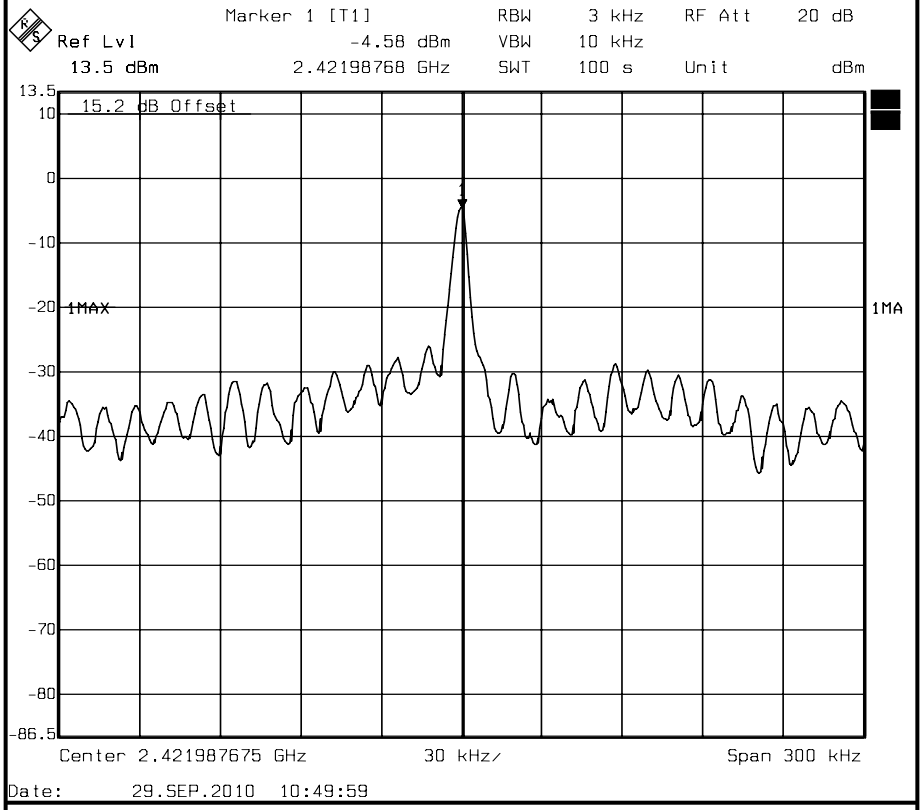
CH Mid (802.11n HT20 Combined MODE)



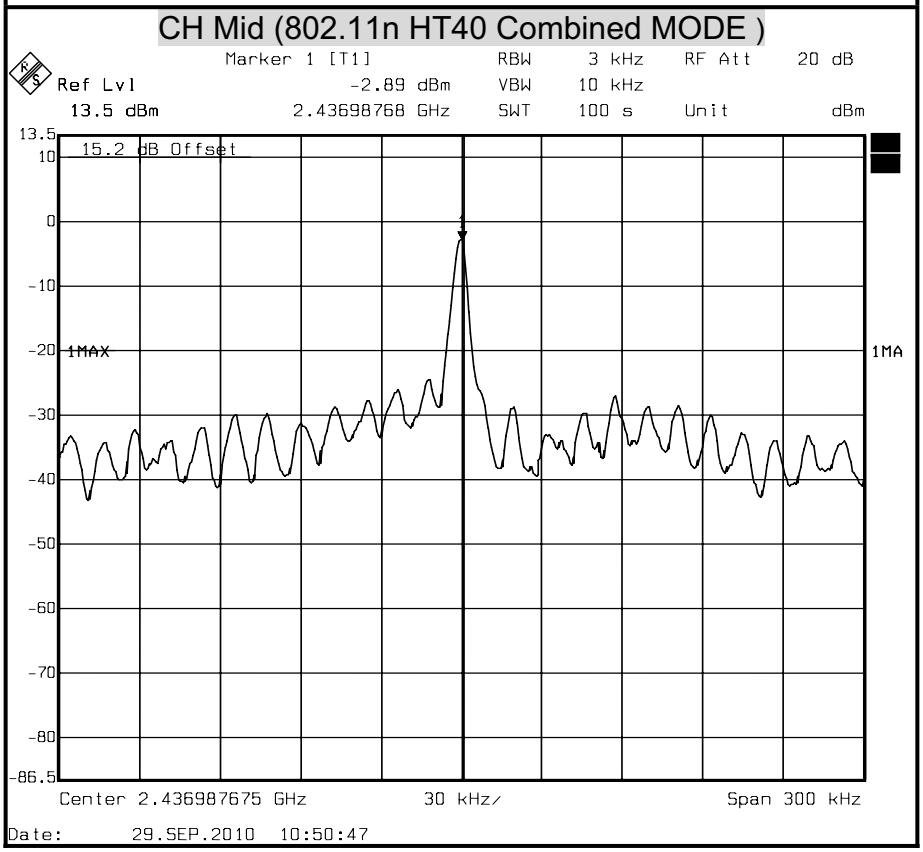

CH High (802.11n HT20 Combined MODE)
Marker 1 [T1]
RBW 3 kHz
RF Att 20 dB
Ref Lvl
-4.19 dBm
VBW 10 kHz
13.5 dBm
2.46198707 GHz
SWT 100 s
Unit dBm
15.2 dB Offset
1MAX
1MA
Center 2.461987074 GHz
30 kHz/
Span 300 kHz
Date: 29.SEP.2010 10:49:04

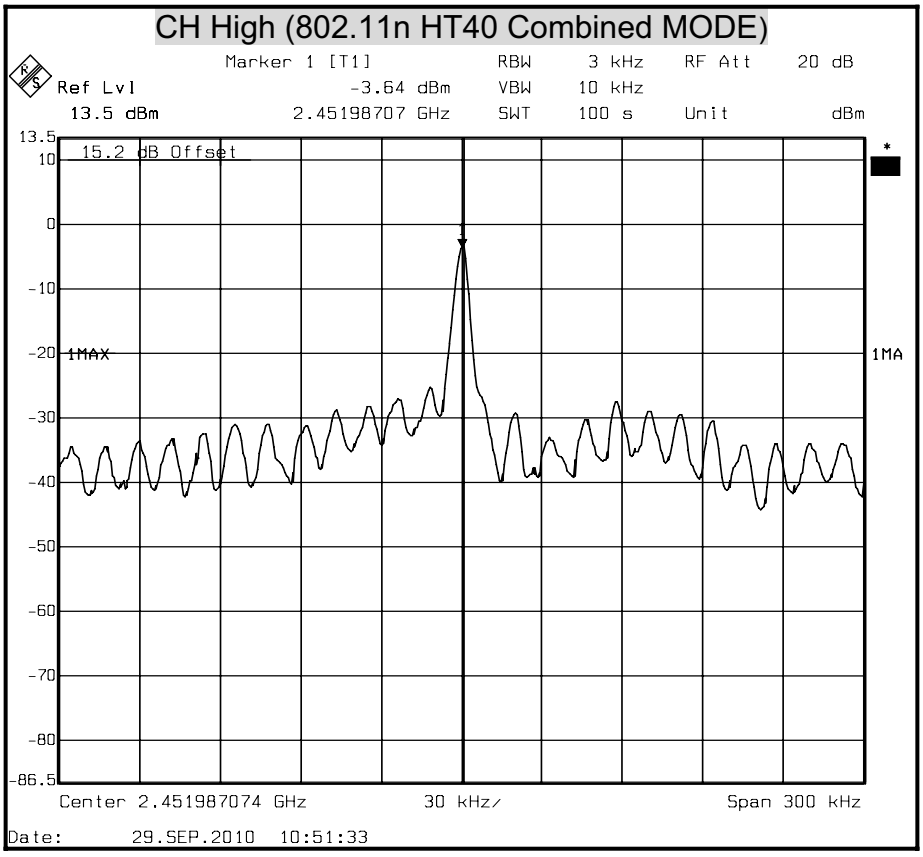
POWER SPECTRAL DENSITY (802.11n HT40 Combined MODE)

CH Low (802.11n HT40 Combined MODE)



CH Mid (802.11n HT40 Combined MODE)




CH High (802.11n HT40 Combined MODE)
Marker 1 [T1]
RBW 3 kHz
RF Att 20 dB
Ref Lvl
-3.64 dBm
VBW 10 kHz
13.5 dBm
2.45198707 GHz
SWT 100 s
Unit dBm
15.2 dB Offset
1MAX
1MA
Center 2.451987074 GHz
30 kHz/
Span 300 kHz
Date: 29.SEP.2010 10:51:33

8.5 CONDUCTED SPURIOUS EMISSION

LIMITS

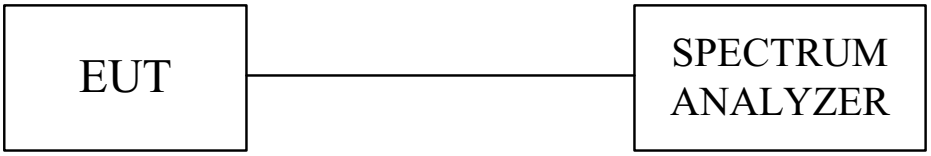
§ 15.247(d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the and that contains the highest level 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 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 26.5 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in the 2.4 GHz band.

TEST SETUP



TEST RESULTS

No non-compliance noted.

802.11b Mode

CH Low

Frequency (MHz)	Offset (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)
2411.85414	11.7	99.52	111.22	N/A	N/A
6660.7615	11.7	45.70	57.4	91.22	-33.82
13821.9839	11.7	44.97	56.67	91.22	-34.55

CH Mid

Frequency (MHz)	Offset (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)
2437.5414	11.7	100.06	111.76	N/A	N/A
6925.9919	11.7	45.31	57.01	91.76	-34.75
12283.6472	11.7	44.14	55.84	91.76	-35.92

CH High

Frequency (MHz)	Offset (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)
2461.5115	11.7	99.74	111.44	N/A	N/A
6925.9919	11.7	45.23	56.93	91.44	-34.51
9790.4809	11.7	41.86	53.56	91.44	-37.88

802.11g Mode

CH Low

Frequency (MHz)	Offset (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)
2412.2474	11.7	95.27	106.97	N/A	N/A
6925.9919	11.7	45.49	57.19	86.97	-29.78
12442.7855	11.7	43.82	55.52	86.97	-31.45

CH Mid

Frequency (MHz)	Offset (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)
2436.0841	11.7	93.02	104.72	N/A	N/A
6554.6693	11.7	45.75	57.45	84.72	-27.27
11806.2324	11.7	43.80	55.5	84.72	-29.22

CH High

Frequency (MHz)	Offset (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)
2461.8517	11.7	94.60	106.3	N/A	N/A
6925.9919	11.7	45.04	56.74	86.30	-29.56
12761.0621	11.7	44.00	55.7	86.30	-30.60

802.11n HT20 Mode Chain 0

CH Low

Frequency (MHz)	Offset (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)
2412.8541	11.7	90.76	102.46	N/A	N/A
6979.038	11.7	44.72	56.42	82.46	-26.04
12495.8316	11.7	43.27	54.97	82.46	-27.49

CH Mid

Frequency (MHz)	Offset (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)
2436.8511	11.7	90.28	101.98	N/A	N/A
6289.4388	11.7	44.77	56.47	81.98	-25.51
12442.7855	11.7	44.32	56.02	81.98	-25.96

CH High

Frequency (MHz)	Offset (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)
2461.8546	11.7	90.84	102.54	N/A	N/A
6925.9919	11.7	45.67	57.37	82.54	-25.17
7827.7755	11.7	43.03	54.73	82.54	-27.81

802.11n HT20 Mode Chain 1

CH Low

Frequency (MHz)	Offset (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)
2412.8541	11.7	100.21	111.91	N/A	N/A
6979.038	11.7	44.62	56.32	91.91	-35.59
11594.0481	11.7	43.16	54.86	91.91	-37.05

CH Mid

Frequency (MHz)	Offset (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)
2437.2411	11.7	89.91	101.61	N/A	N/A
6925.9919	11.7	45.12	56.82	81.61	-24.79
10427.034	11.7	42.25	53.95	81.61	-27.66

CH High

Frequency (MHz)	Offset (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)
2462.5058	11.7	89.74	101.44	N/A	N/A
6660.7615	11.7	45.26	56.96	81.44	-24.48
9047.8356	11.7	42.54	54.24	81.44	-27.20

802.11n HT40 Mode Chain 0

CH Low

Frequency (MHz)	Offset (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)
2423.3653	11.7	88.36	100.06	N/A	N/A
6713.8076	11.7	44.16	55.86	80.06	-24.20
12761.0621	11.7	44.46	56.16	80.06	-23.90

CH Mid

Frequency (MHz)	Offset (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)
2436.8577	11.7	88.98	100.68	N/A	N/A
6979.038	11.7	44.76	56.46	80.68	-24.22
9578.2965	11.7	41.85	53.55	80.68	-27.13

CH High

Frequency (MHz)	Offset (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)
2452.6988	11.7	87.76	99.46	N/A	N/A
6925.9919	11.7	45.33	57.03	79.46	-22.43
8623.4669	11.7	43.58	55.28	79.46	-24.18

802.11n HT40 Mode Chain 1

CH Low

Frequency (MHz)	Offset (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)
2423.3653	11.7	88.50	100.2	N/A	N/A
6979.038	11.7	45.98	57.68	80.20	-22.52
12761.0621	11.7	43.96	55.66	80.20	-24.54

CH Mid

Frequency (MHz)	Offset (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)
2436.8577	11.7	91.90	103.6	N/A	N/A
6713.8076	11.7	45.03	56.73	83.60	-26.87
8252.1442	11.7	44.16	55.86	83.60	-27.74

CH High

Frequency (MHz)	Offset (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)
2452.6988	11.7	87.56	99.26	N/A	N/A
6979.038	11.7	45.89	57.59	79.26	-21.67
9896.5731	11.7	43.18	54.88	79.26	-24.38

802.11n HT20 Combined Mode

CH Low

Frequency (MHz)	Offset (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)
2411.9888	15.2	90.57	105.77	N/A	N/A
6607.7154	15.2	45.51	60.71	85.77	-25.06
12124.509	15.2	43.85	59.05	85.77	-26.72

CH Mid

Frequency (MHz)	Offset (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)
2436.7148	15.2	91.04	106.24	N/A	N/A
6979.038	15.2	45.45	60.65	86.24	-25.59
11222.7254	15.2	42.86	58.06	86.24	-28.18

CH High

Frequency (MHz)	Offset (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)
2463.7811	15.2	90.66	105.86	N/A	N/A
6979.038	15.2	44.33	59.53	85.86	-26.33
9843.527	15.2	41.69	56.89	85.86	-28.97

802.11n HT40 Combined Mode

CH Low

Frequency (MHz)	Offset (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)
2422.0471	15.2	89.34	104.54	N/A	N/A
6979.038	15.2	44.87	60.07	84.54	-24.47
8305.1903	15.2	43.23	58.43	84.54	-26.11

CH Mid

Frequency (MHz)	Offset (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)
2436.4857	15.2	88.70	103.9	N/A	N/A
6660.7615	15.2	45.22	60.42	83.90	-23.48
10427.034	15.2	42.61	57.81	83.90	-26.09

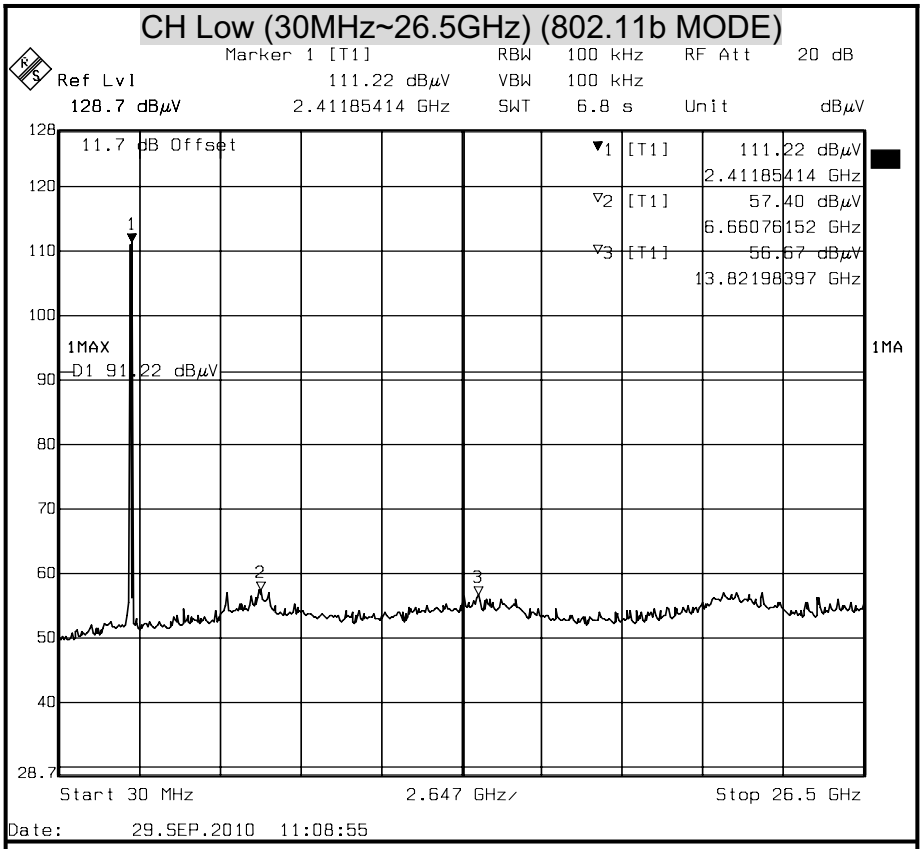
CH High

Frequency (MHz)	Offset (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)
2453.1544	15.2	88.81	104.01	N/A	N/A
6660.7615	15.2	44.61	59.81	84.01	-24.20
7827.7755	15.2	42.90	58.1	84.01	-25.91

OUT-OF-BAND SPURIOUS EMISSIONS-CONDUCTED MEASUREMENT

(IEEE 802.11b MODE)

CH Low (30MHz~26.5GHz) (802.11b MODE)



CH Mid (30MHz~26.5GHz) (802.11b MODE)