



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

For

Smart Energy Wireless Bridge

Model : Billion SG600NX-Std

**Data Applies To : Please refer to section 2
(altogether 9 series models)**

Trade Name : Billion ; BEC

Issued for

Billion Electric Co., Ltd.

**8F., No.192, Sec. 2, Zhongxing Rd., Xindian Dist.,
New Taipei City 231, Taiwan (R.O.C.)**

Issued by

**Compliance Certification Services Inc.
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Issued Date: April 02, 2013



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Revision History

Rev.	Issue Date	Revisions	Effect Page	Revised By
00	04/02/2013	Initial Issue	All Page 94	Victoria Liu



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1. TEST REPORT CERTIFICATION

Applicant : Billion Electric Co., Ltd.
Address : 8F., No.192, Sec. 2, Zhongxing Rd., Xindian Dist.,
 New Taipei City 231, Taiwan (R.O.C.)
Equipment Under Test : Smart Energy Wireless Bridge
Model : Billion SG600NX-Std
Data Applies To : Please refer to section 2 (altogether 9 series models)
Trade Name : BILLION ; BEC
Tested Date : December 21, 2012 ~ April 02, 2013

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:

Sb. Lu
Sr. Engineer

Reviewed by:

Gundam Lin
Sr. Engineer

**2. EUT DESCRIPTION**

Product Name	Smart Energy Wireless Bridge
Model Number	Billion SG600NX-Std
Data Applies To	Please refer to section 2 (altogether 9 series models)
Identify Number	T130205S01
Received Date	December 21, 2012
Frequency Range	IEEE 802.11b/g, 802.11n HT20 : 2412MHz ~ 2462MHz IEEE 802.11n HT40 : 2422MHz ~ 2452MHz
Transmit Power	IEEE 802.11b : 16.00dBm (0.0398W) IEEE 802.11g : 20.96dBm (0.1247W) IEEE 802.11n HT20 : 20.50dBm (0.1122W) IEEE 802.11n HT40 : 20.28dBm (0.1067W)
Channel Spacing	IEEE 802.11b/g, 802.11n HT20/HT40 : 5MHz
Channel Number	IEEE 802.11b/g, IEEE 802.11n HT20: 11 Channels IEEE 802.11n HT40 : 7 Channels
Transmit Data Rate	IEEE 802.11b : 11, 5.5, 2, 1 Mbps IEEE 802.11a/g : 54, 48, 36, 24, 18, 12, 9, 6 Mbps IEEE 802.11n HT20 : 65, 58.5, 52, 39, 26, 19.5, 13, 6.5 Mbps IEEE 802.11n HT40 : 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)
Antenna Type	PIFA Antenna, Antenna Gain 2 dBi
Power Rating	12Vdc
Test Voltage	120Vac, 60Hz
DC Power Cable Type	Non-shielded cable 1.5m (Non-detachable)
I/O Port	RJ-45 Port × 1, Power Port × 1

Power Adapter :

No.	Manufacturer	Model No.	Power Input	Power Output
1	EGB	PAW012A12UL	100-240Vac, 0.5A, 50/60Hz	12Vdc, 1.0A



The difference of the model :

Model Difference Item	Billion SG600NX-Std	Billion SG600	Billion SG600NXL-Std	Billion SG600NXL-SDK	Billion SG600NX-SDK
External Feature					
External Color	Gray	White	White	White	Gray
Housing Drawing	D2	D2	D2	D2	D2
Support 802.11n					
VPN		X	X	X	
Circuits Design					
Major Component location, module					
Major Component location					
Power Adaptor	DC12V/1A	DC12V /1A	DC12V/1A	DC12V/1A	DC12V/1A
Trade Name	Billion				

Remark : "O" means within those functions ; "X" means without those functions.



Model Difference Item	BEC SG600	BEC SG600NXL-Std	BEC SG600NX-Std	BEC SG600NXL-SDK	BEC SG600NX-SDK
External Feature					
External Color	White	White	Gray	White	Gray
Housing Drawing	D2 / B2	D2 / B2	D2 / B2	D2 / B2	D2 / B2
Support 802.11n					
VPN	X	X		X	
Circuits Design					
Major Component location, module					
Major Component location					
Power Adaptor	DC12V /1A	DC12V/1A	DC12V/1A	DC12V/1A	DC12V/1A
Trade Name	BEC				

Remark : "O" means within those functions ; "X" means without those functions.

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. The models Billion SG600NX-Std was considered the main model for testing.
4. This submittal(s) (test report) is intended for FCC ID: QI3BIL-SG600 filing to comply with Section 15.207, 15.209 and 15.247 of the FCC Part 15, Subpart C Rules.



3. DESCRIPTION OF TEST MODES

The EUT is an 802.11n transceiver in Smart Energy Wireless Bridge form factor.

Conducted Emission / Radiated Emission Test (Below 1 GHz)

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

No.	Pre-Test Mode
1	Normal Operating

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

Final Test Mode		
Emission	Radiated Emission	Normal Operating
	Conducted Emission	Normal Operating

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

Conducted / Radiated Emission Test (Above 1 GHz)

IEEE 802.11b, 802.11g, 802.11n HT20 mode

The EUT had been tested under operating condition.

There are three channels have been tested as following :

Channel	Frequency (MHz)
Low	2412
Middle	2437
High	2462

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

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

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

IEEE 802.11n HT40 mode

The EUT had been tested under operating condition.

There are three channels have been tested as following :

Channel	Frequency (MHz)
Low	2422
Middle	2437
High	2452

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



4. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.4: 2003 and FCC CFR 47, 15.207, 15.209, 15.247, KDB558074 and KDB662911.

5. FACILITIES AND ACCREDITATION

5.1 FACILITIES

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

NO. 989-1 Wen Shan Rd., Shang Shan Village,
Qionglin Shiang Hsinchu County 30741, Taiwan, R.O.C

The sites are constructed in conformance with the requirements of ANSI C63.4:2003 and CISPR 22. All receiving equipment conforms to CISPR 16-1-1, CISPR 16-1-2, CISPR 16-1-3, CISPR 16-1-4, CISPR 16-1-5.

5.2 ACCREDITATIONS

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

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

Canada	INDUSTRY CANADA
Japan	VCCI
Taiwan	BSMI
USA	FCC MRA

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
Semi Anechoic Chamber (966 Chamber_B) / Radiated Emission, 30 to 1000 MHz	+/- 3.97
Semi Anechoic Chamber (966 Chamber_B) / Radiated Emission, 1 to 18GHz	+/- 3.58
Semi Anechoic Chamber (966 Chamber_B) / Radiated Emission, 18 to 26 GHz	+/- 3.59
Semi Anechoic Chamber (966 Chamber_B) / Radiated Emission, 26 to 40 GHz	+/- 3.81
Conducted Emission (Mains Terminals), 9kHz to 30MHz	+/- 2.48

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k=2$.

Consistent with industry standard (e.g. CISPR 22, clause 11, Measurement Uncertainty) determining compliance with the limits shall be base on the results of the compliance measurement. Consequently the measure emissions being less than the maximum allowed emission result in this be a compliant test or passing test.

The acceptable measurement uncertainty value without requiring revision of the compliance statement is base on conducted and radiated emissions being less than U_{CISPR} which is 3.6dB and 5.2dB respectively. CCS values (called U_{Lab} in CISPR 16-4-2) is less than U_{CISPR} as shown in the table above. Therefore, MU need not be considered for compliance.



6. SETUP OF EQUIPMENT UNDER TEST

SUPPORT EQUIPMENT

No.	Product	Manufacturer	Model No.	Serial No.	FCC ID
1	Notebook PC	HP	ProBook 4421s	CNF03242PJ	DoC
2	Notebook PC	HP	ProBook 4421s	CNF03242PM	DoC

No.	Power & Signal Cable Description
1	Non-shielded RJ-45 cable, 12m × 1

SETUP DIAGRAM FOR TESTS

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

EUT OPERATING CONDITION

RF Mode :

1. EUT & peripherals setup diagram is shown in appendix setup photos.
2. NB set fixed ip, 10.10.10.x
3. In MS-DOS : telnet 10.10.10.252
4. username : admin
5. password: admin
6. key in ated
7. Run“Ralink QA Test Program for RT5350 AP V1.0.0.8” software was used for testing.
 - ⇒ Tx Data Rate: MCS=0; 1Mbps Bandwidth 20 (IEEE 802.11b mode)
 - MCS=0; 6Mbps Bandwidth 20 (IEEE 802.11g mode)
 - MCS=0; 6.5Mbps Bandwidth 20 (IEEE 802.11n HT20 mode)
 - MCS=0; 13.5Mbps Bandwidth 40 (IEEE 802.11n HT40 mode)
 - ⇒ Power control
 - IEEE 802.11b Channel Low (2412MHz) TX Power 11
 - IEEE 802.11b Channel Mid (2437MHz) TX Power 13
 - IEEE 802.11b Channel High (2462MHz) TX Power 14
 - IEEE 802.11g Channel Low (2412MHz) TX Power 11
 - IEEE 802.11g Channel Mid (2437MHz) TX Power 13
 - IEEE 802.11g Channel High (2462MHz) TX Power 14
 - IEEE 802.11n HT20 Channel Low (2412MHz) TX Power 11
 - IEEE 802.11n HT20 Channel Mid (2437MHz) TX Power 13
 - IEEE 802.11n HT20 Channel High (2462MHz) TX Power 14



IEEE 802.11n HT40 Channel Low (2422MHz) TX Power 11
IEEE 802.11n HT40 Channel Mid (2437MHz) TX Power 13
IEEE 802.11n HT40 Channel High (2452MHz) TX Power 14

1. All of the functions are under run.
2. Start test.

Normal Mode :

1. EUT & peripherals setup diagram is shown in appendix setup photos.
2. Power on all equipment, NB set fixed ip, 10.10.10.x
3. Notebook PC(2)_ping EUT IP 10.10.10.252 through LAN connected by RJ-45 cable.
4. Notebook PC(1)_ping EUT IP 10.10.10.252 through wireless LAN.
5. 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	Agilent	E4446A	MY43360132	06/14/2013

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

TEST SETUP



TEST PROCEDURE

1. The transmitter output was connected to a spectrum analyzer.
2. Set resolution bandwidth (RBW) = 1-5% or DTS BW, not to exceed 100 kHz.
3. Set the video bandwidth (VBW) $\geq 3 \times$ RBW.
4. Detector = Peak.
5. Trace mode = max hold.
6. Sweep = auto couple.
7. Allow the trace to stabilize.
8. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.



TEST RESULTS

IEEE 802.11b Mode

Channel	Channel Frequency (MHz)	6dB Bandwidth (MHz)	Minimum Limit (kHz)	Pass / Fail
Low	2412	12.20	500	PASS
Middle	2437	12.20	500	PASS
High	2462	12.20	500	PASS

IEEE 802.11g Mode

Channel	Channel Frequency (MHz)	6dB Bandwidth (MHz)	Minimum Limit (kHz)	Pass / Fail
Low	2412	16.55	500	PASS
Middle	2437	16.55	500	PASS
High	2462	16.55	500	PASS

IEEE 802.11n HT20 Mode

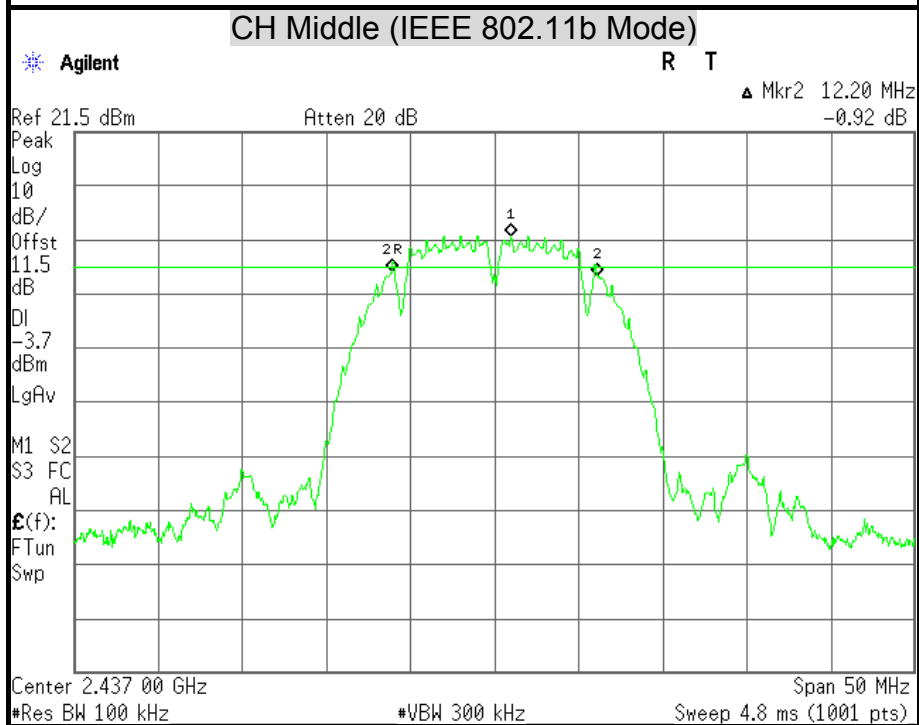
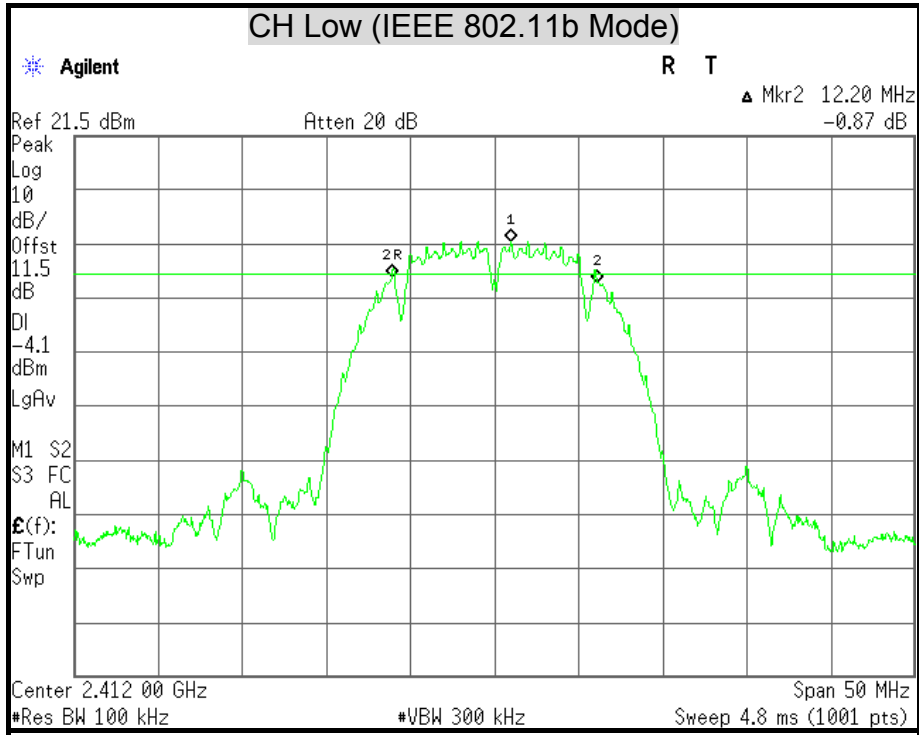
Channel	Channel Frequency (MHz)	6dB Bandwidth (MHz)	Minimum Limit (kHz)	Pass / Fail
Low	2412	17.70	500	PASS
Middle	2437	17.70	500	PASS
High	2462	17.65	500	PASS

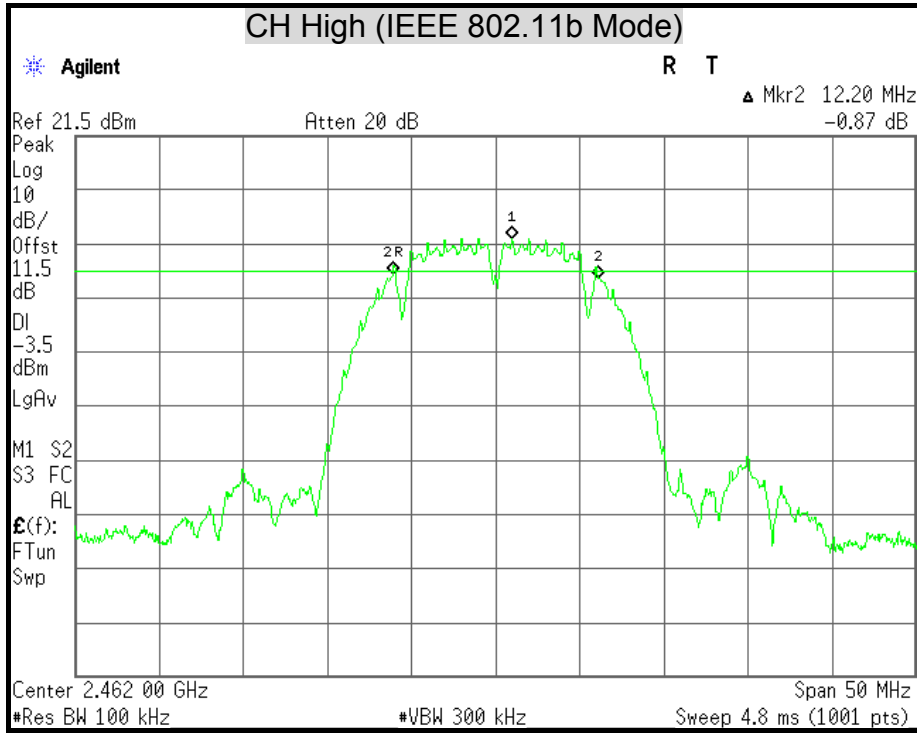
IEEE 802.11n HT40 Mode

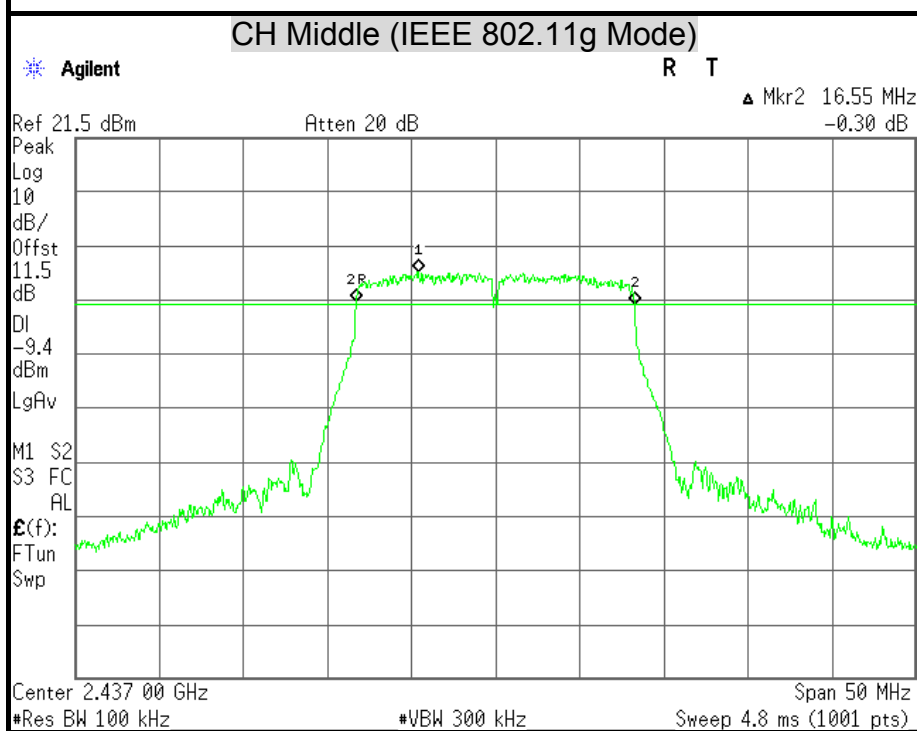
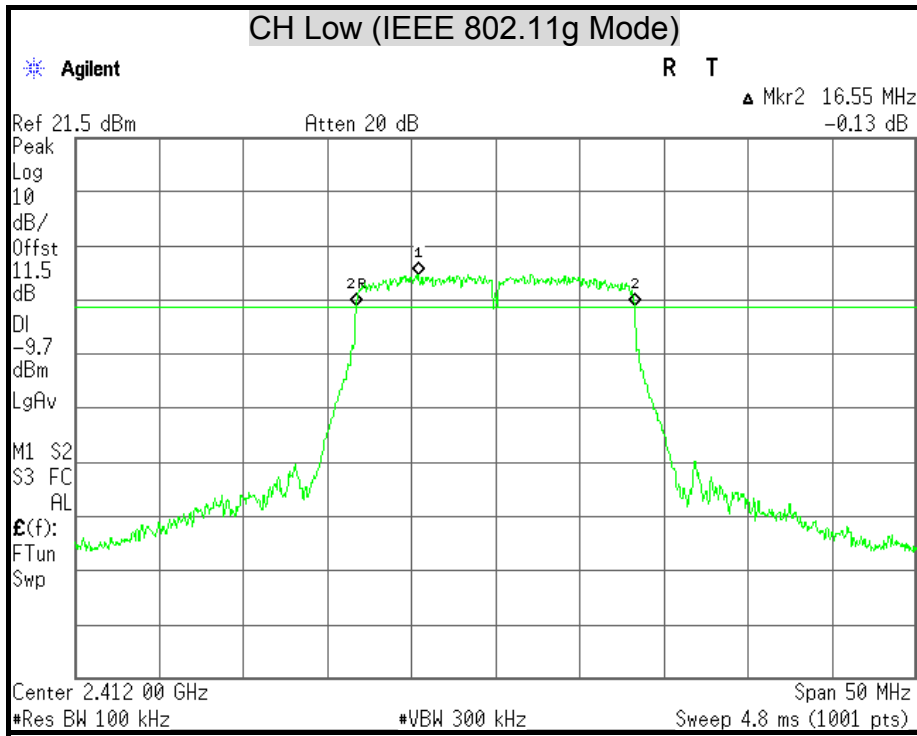
Channel	Channel Frequency (MHz)	6dB Bandwidth (MHz)	Minimum Limit (kHz)	Pass / Fail
Low	2422	36.35	500	PASS
Middle	2437	36.35	500	PASS
High	2452	36.35	500	PASS

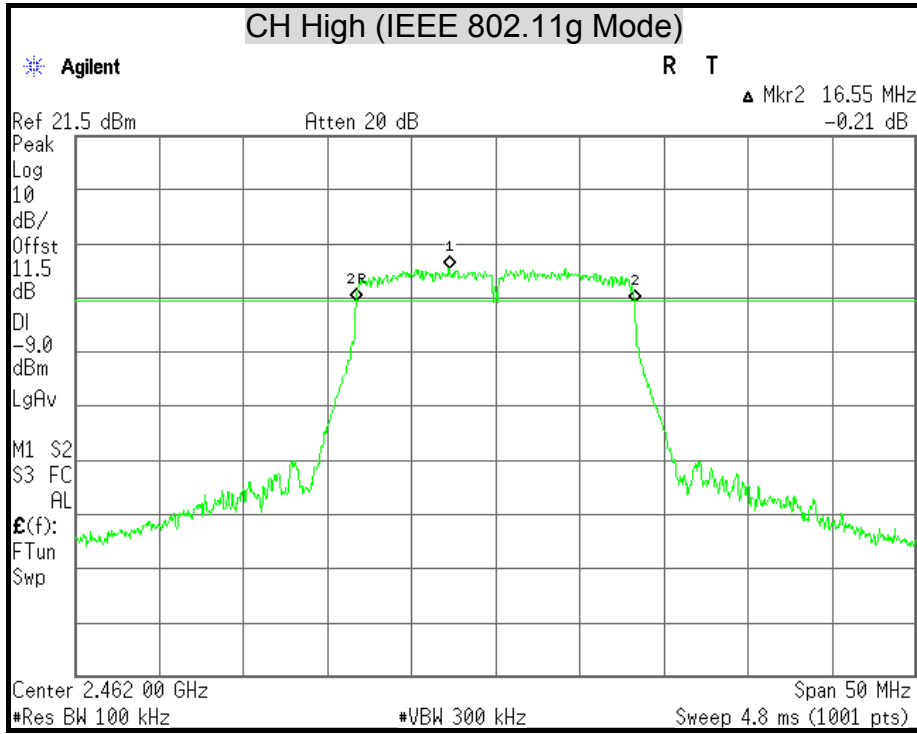


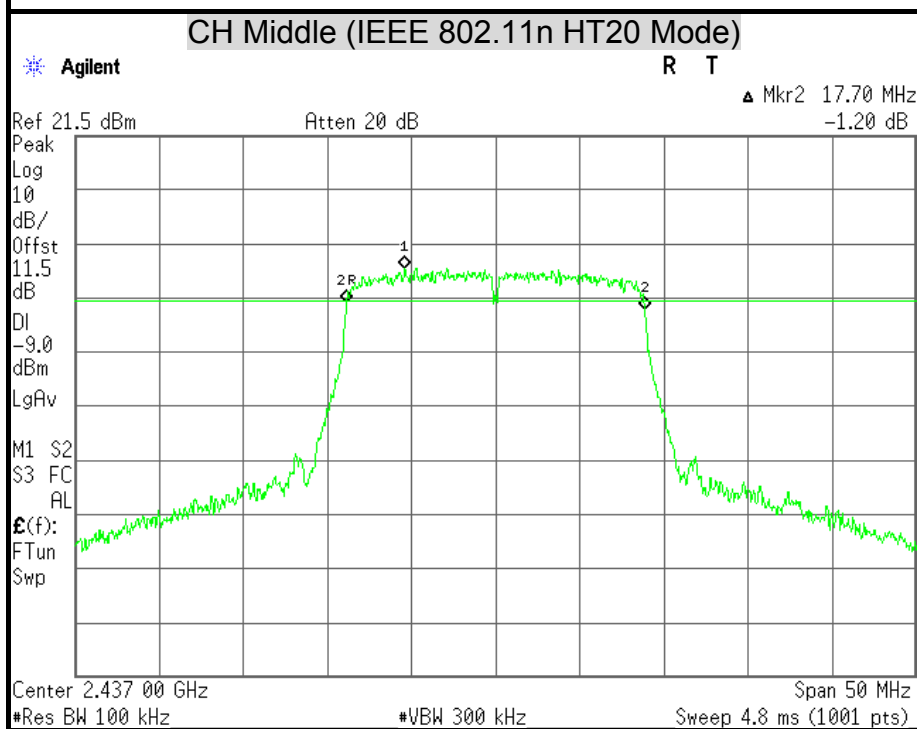
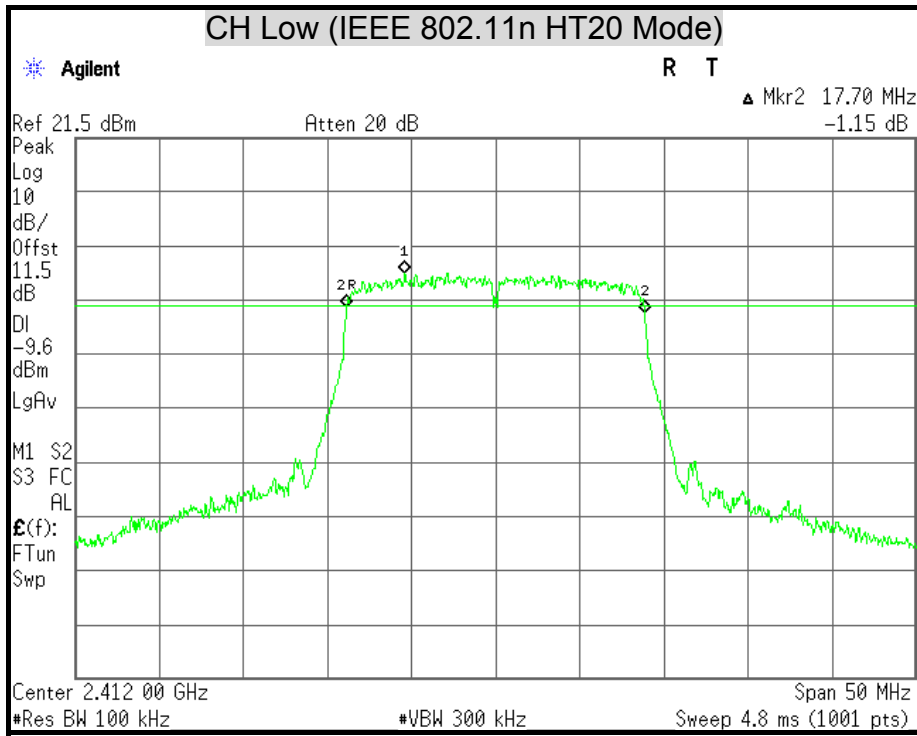
6dB BANDWIDTH

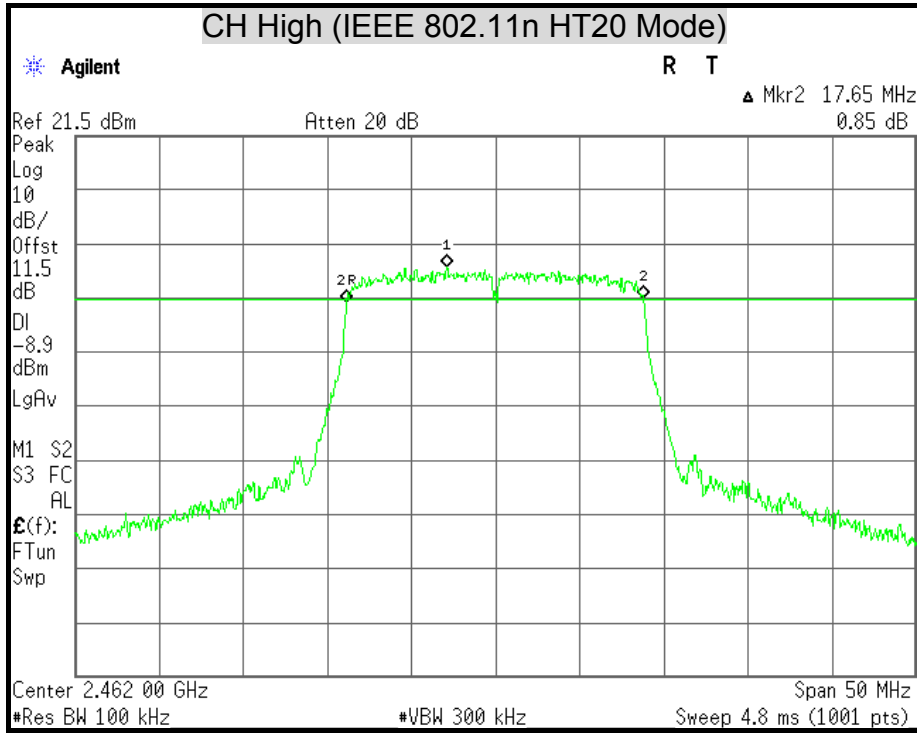


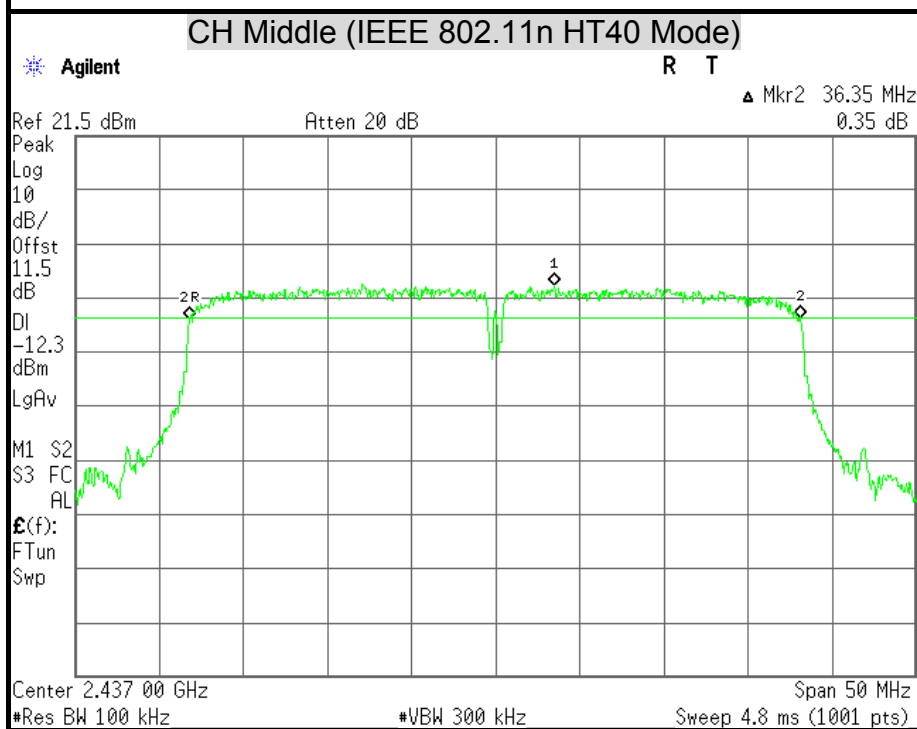
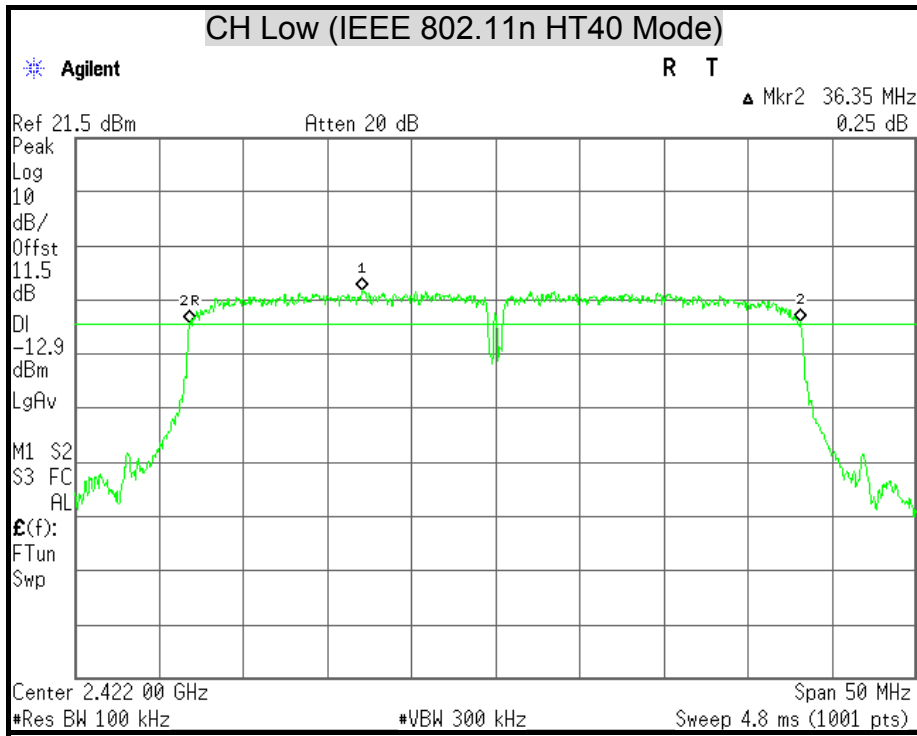


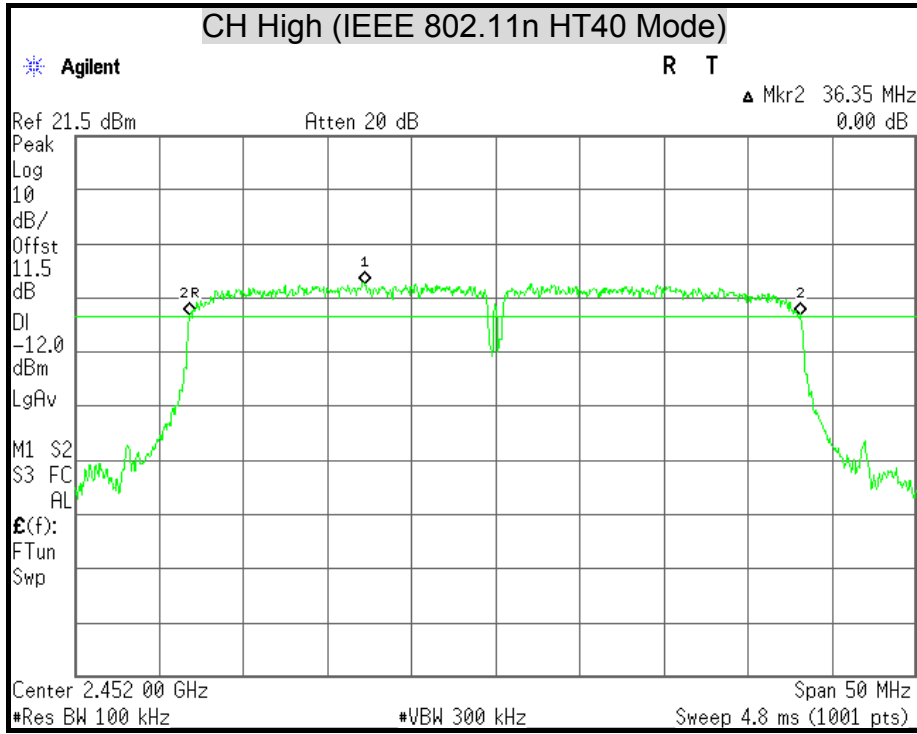














7.2 MAXIMUM PEAK OUTPUT POWER

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.

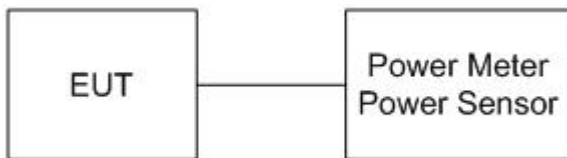
§ 15.247(b) (4) Except as shown in paragraphs (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used the peak output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1) or (b)(2), and (b)(3) of this section, as appropriate, 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	ML2495A	1149001	12/06/2013
Power Sensor	ANRITSU	MA2411B	1126148	12/07/2013

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		Peak Power Limit		Pass / Fail
		(dBm)	(W)	(dBm)	(W)	
Low	2412	15.57	0.0361	30	1	PASS
Middle	2437	15.72	0.0373	30	1	PASS
High	2462	16.00	0.0398	30	1	PASS

Remark:

1. At final test to get the worst-case emission at 1Mbps.
2. The cable assembly insertion loss of 11.5dB (including 10 dB pad and 1.5 dB cable) was Entered as an offset in the power meter to allow for direct reading of power.

IEEE 802.11g Mode

Channel	Channel Frequency (MHz)	Peak Power		Peak Power Limit		Pass / Fail
		(dBm)	(W)	(dBm)	(W)	
Low	2412	19.75	0.0944	30	1	PASS
Middle	2437	20.40	0.1096	30	1	PASS
High	2462	20.96	0.1247	30	1	PASS

Remark:

1. At final test to get the worst-case emission at 6Mbps.
2. The cable assembly insertion loss of 11.5dB (including 10 dB pad and 1.5 dB cable) was Entered as an offset in the power meter to allow for direct reading of power.



IEEE 802.11n HT20 Mode

Channel	Channel Frequency (MHz)	Peak Power		Peak Power Limit		Pass / Fail
		(dBm)	(W)	(dBm)	(W)	
Low	2412	19.85	0.0966	30	1	PASS
Middle	2437	20.33	0.1079	30	1	PASS
High	2462	20.50	0.1122	30	1	PASS

Remark:

1. At final test to get the worst-case emission at 6.5Mbps.
2. The cable assembly insertion loss of 11.5dB (including 10 dB pad and 1.5 dB cable) was Entered as an offset in the power meter to allow for direct reading of power.

IEEE 802.11n HT40 Mode

Channel	Channel Frequency (MHz)	Peak Power		Peak Power Limit		Pass / Fail
		(dBm)	(W)	(dBm)	(W)	
Low	2422	19.20	0.0832	30	1	PASS
Middle	2437	19.81	0.0957	30	1	PASS
High	2452	20.28	0.1067	30	1	PASS

Remark:

1. At final test to get the worst-case emission at 13.5Mbps.
2. The cable assembly insertion loss of 11.5dB (including 10 dB pad and 1.5 dB cable) was Entered as an offset in the power meter to allow for direct reading of power.



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	Agilent	E4446A	MY43360132	06/14/2013

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

TEST SETUP



TEST PROCEDURE

1. The transmitter output was connected to the spectrum analyzer.
2. Set analyzer center frequency to DTS channel center frequency.
3. Set the span to 1.5 times the DTS channel bandwidth.
4. Set the RBW \geq 3 kHz.
5. Set the VBW \geq 3 x RBW.
6. Detector = peak.
7. Sweep time = auto couple.
8. Trace mode = max hold.
9. Allow trace to fully stabilize.
10. Use the peak marker function to determine the maximum amplitude level.
11. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.



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	-13.45	8	PASS
Middle	2437	-14.23	8	PASS
High	2462	-12.84	8	PASS

Remark:

1. At final test to get the worst-case emission at 1Mbps.
2. The cable assembly insertion loss of 11.5dB (including 10 dB pad and 1.5 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	-12.73	8	PASS
Middle	2437	-13.19	8	PASS
High	2462	-11.73	8	PASS

Remark:

1. At final test to get the worst-case emission at 6Mbps.
2. The cable assembly insertion loss of 11.5dB (including 10 dB pad and 1.5 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
Low	2412	-13.01	8	PASS
Middle	2437	-13.26	8	PASS
High	2462	-11.51	8	PASS

Remark:

1. At final test to get the worst-case emission at 6.5Mbps.
2. The cable assembly insertion loss of 11.5dB (including 10 dB pad and 1.5 dB cable) was Entered as an offset in the spectrum analyzer to allow for direct reading of power.

IEEE 802.11n HT40 Mode

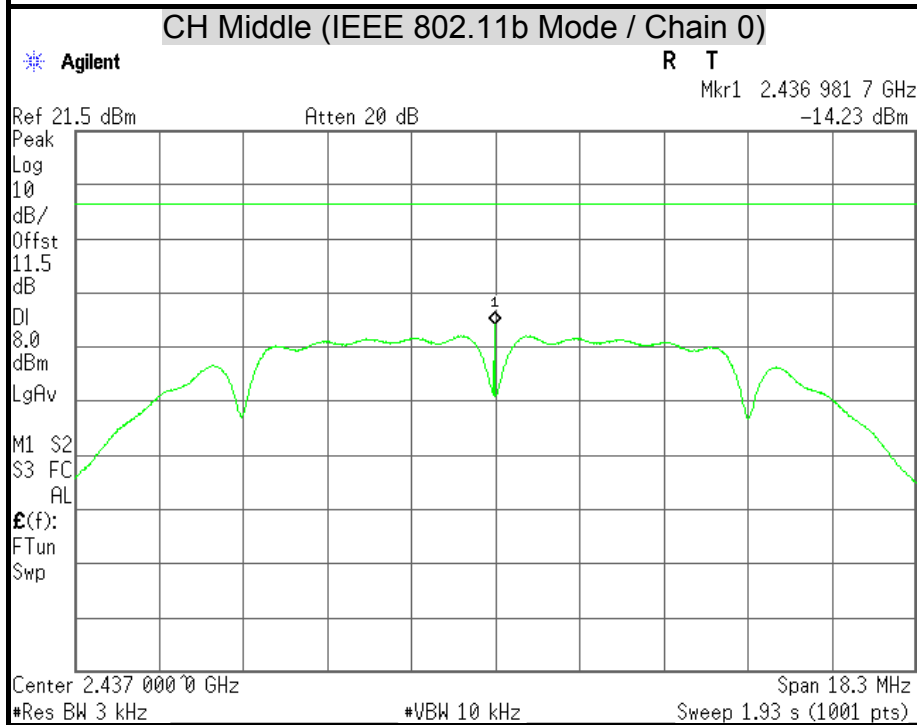
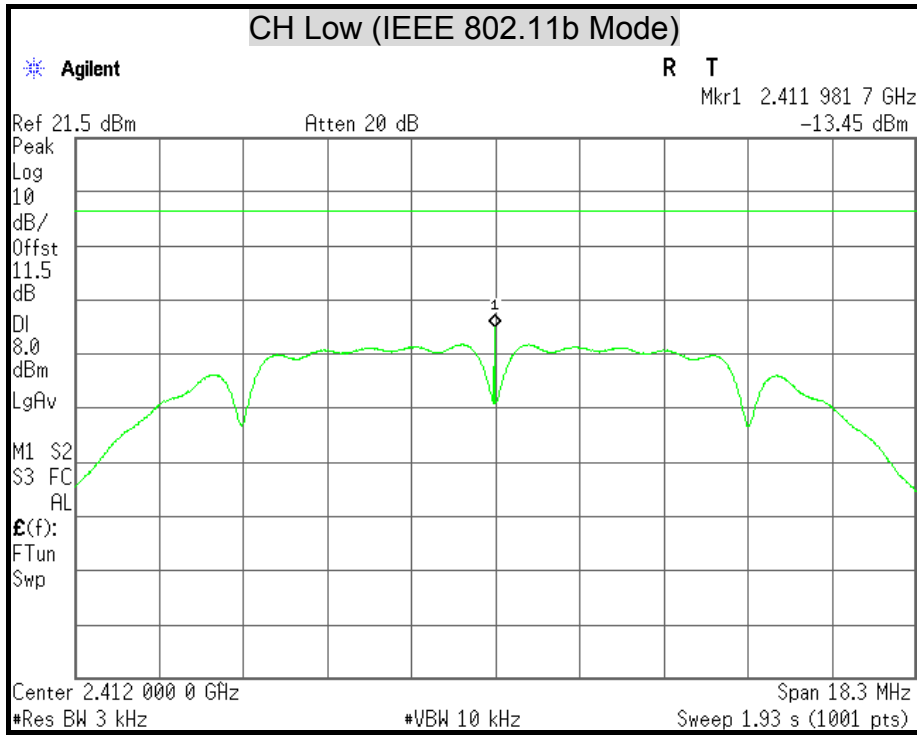
Channel	Channel Frequency (MHz)	Final RF Power Level in 3KHz BW (dBm)	Minimum Limit (dBm)	Pass / Fail
Low	2422	-13.38	8	PASS
Middle	2437	-13.73	8	PASS
High	2452	-11.75	8	PASS

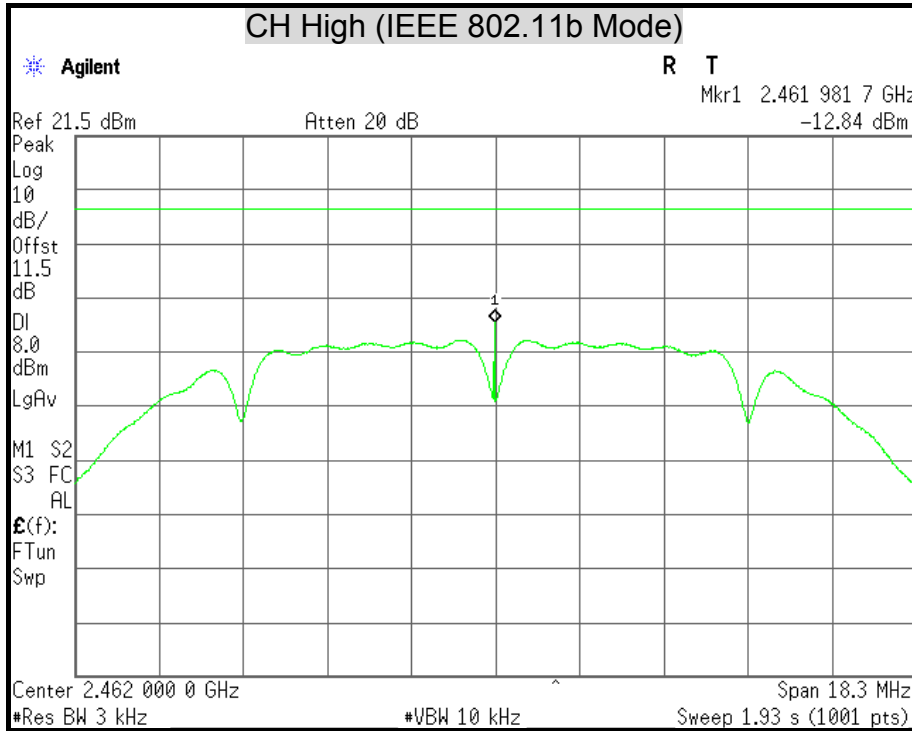
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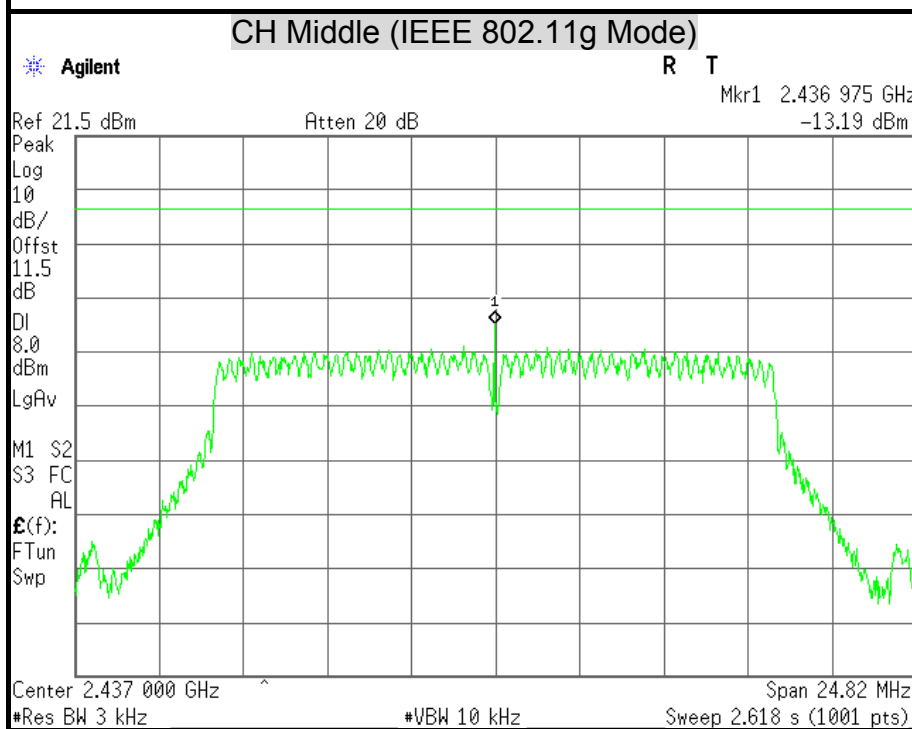
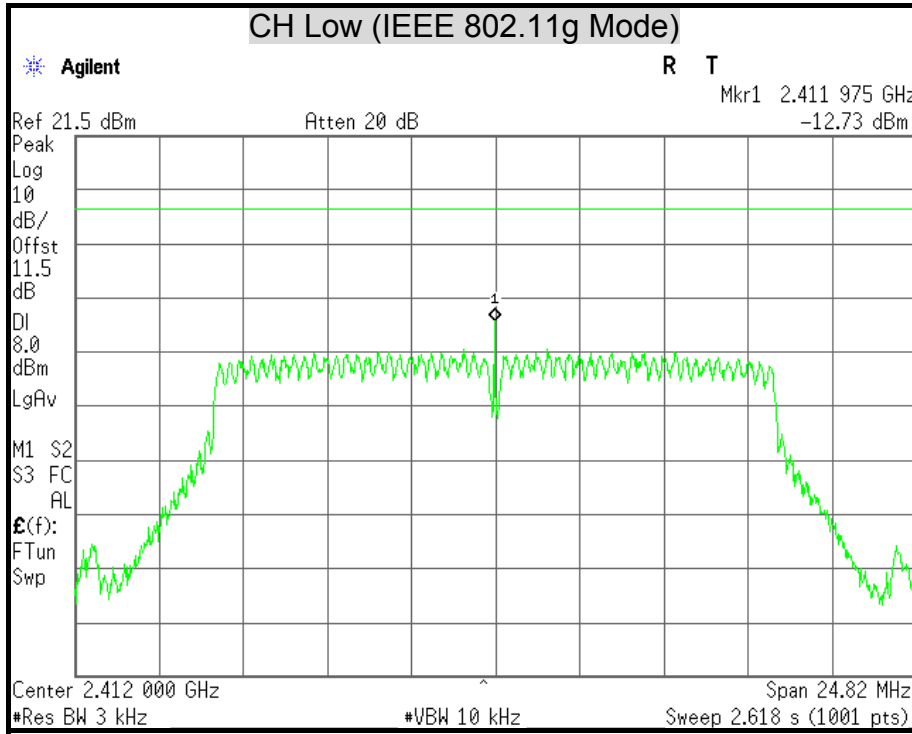
1. At final test to get the worst-case emission at 13.5Mbps.
2. The cable assembly insertion loss of 11.5dB (including 10 dB pad and 1.5 dB cable) was Entered as an offset in the spectrum analyzer to allow for direct reading of power.

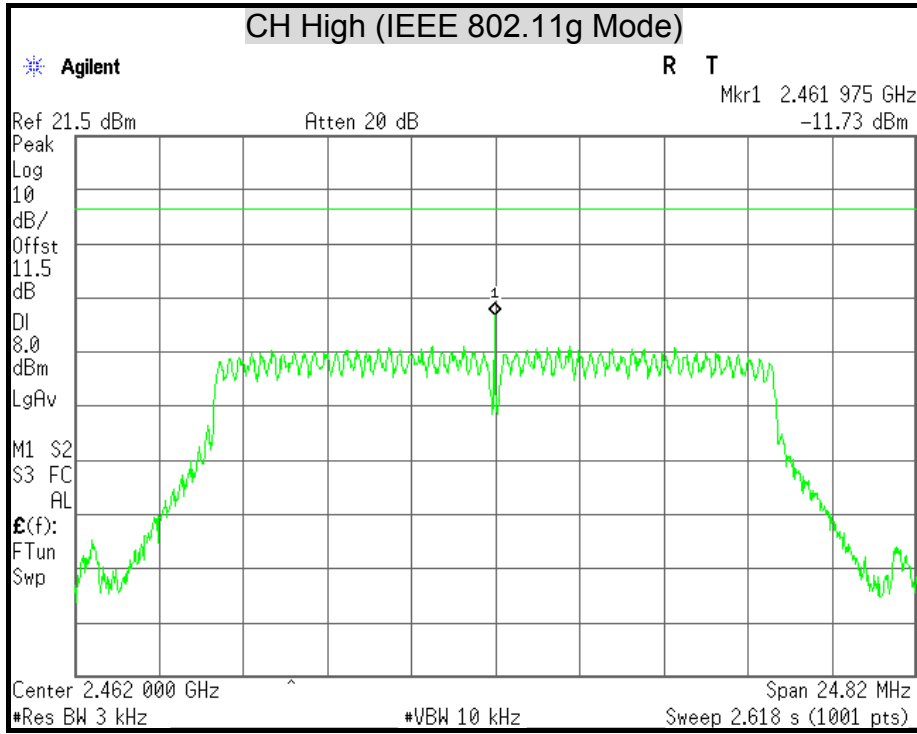


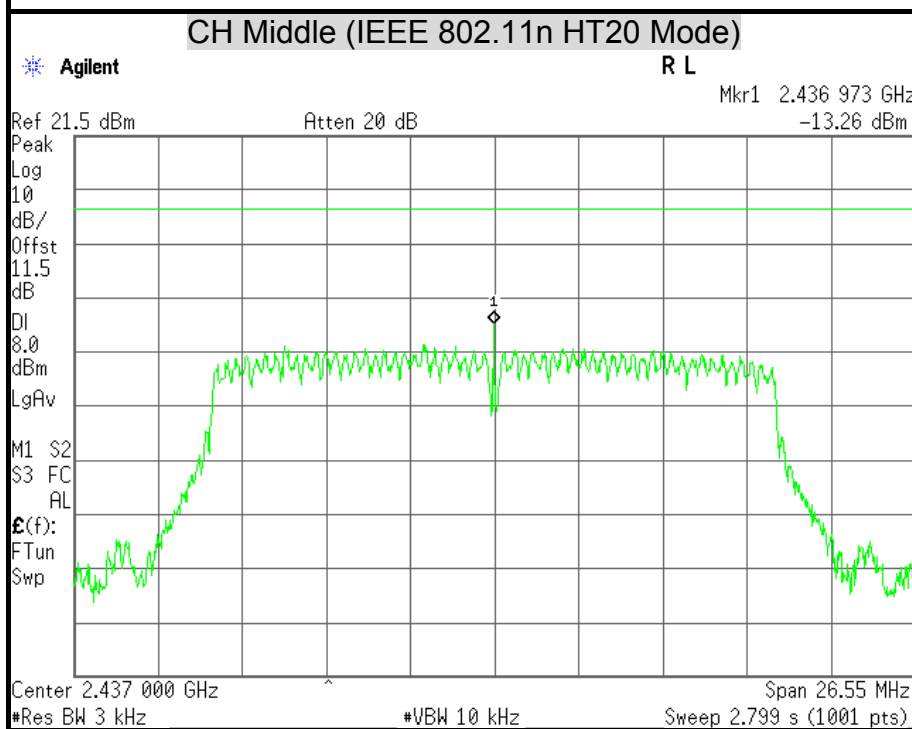
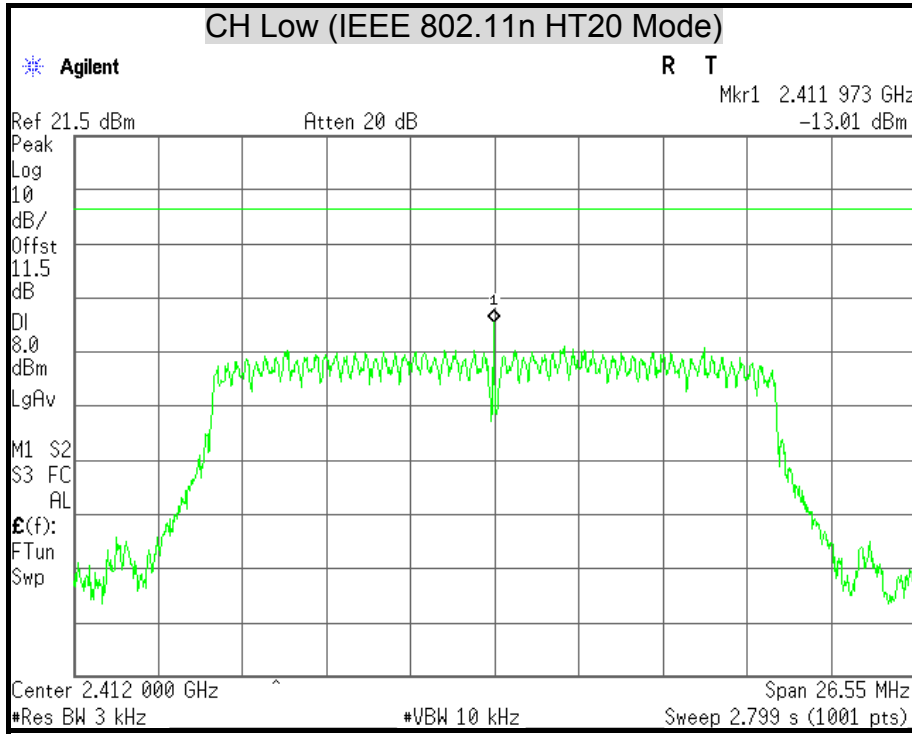
POWER SPECTRAL DENSITY

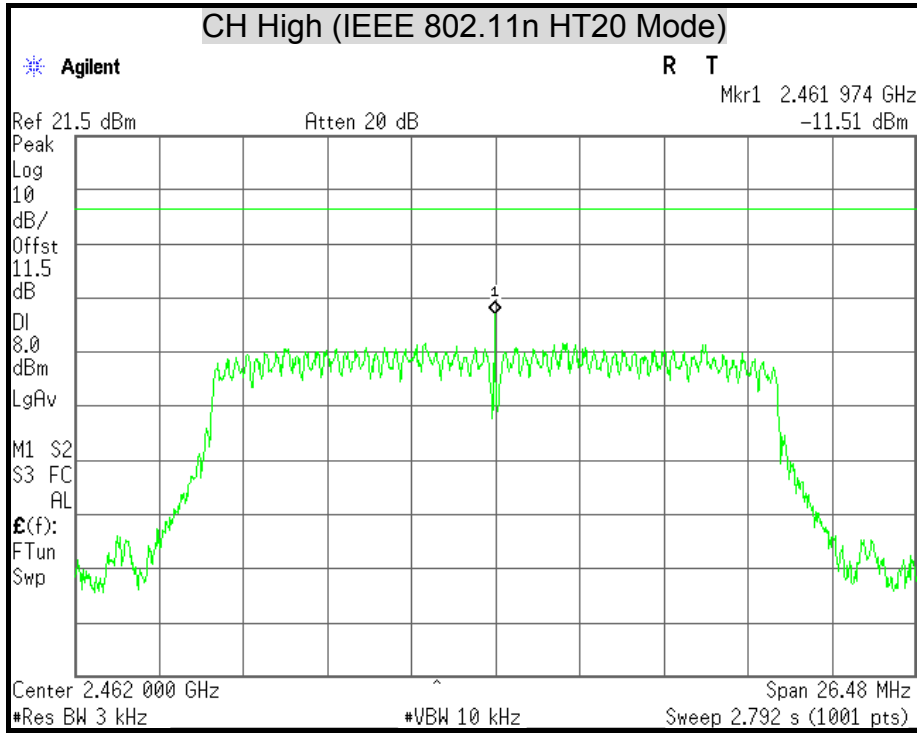


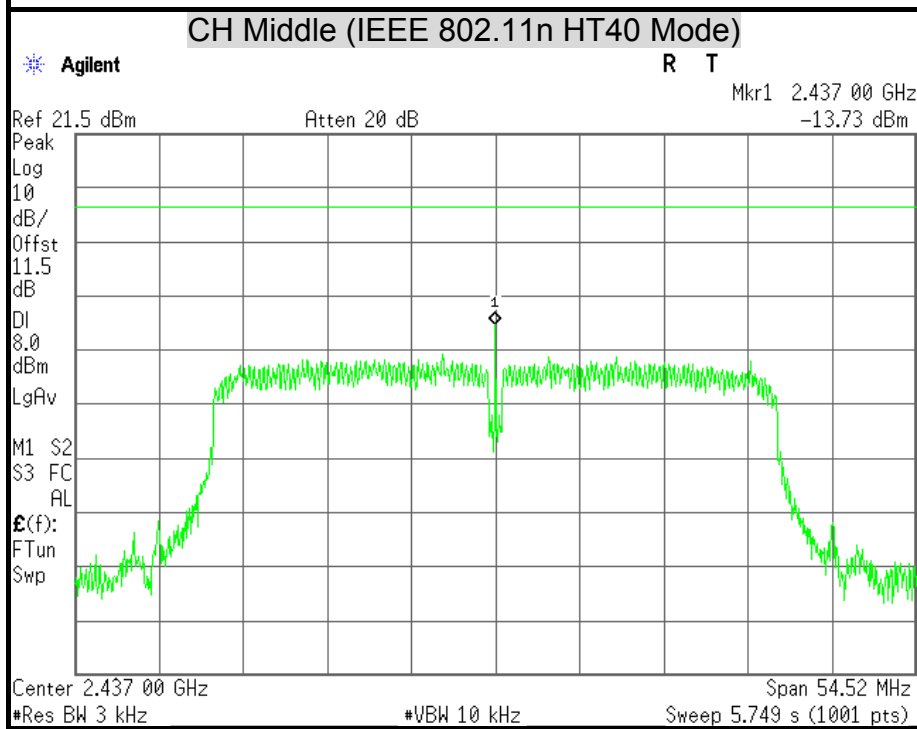
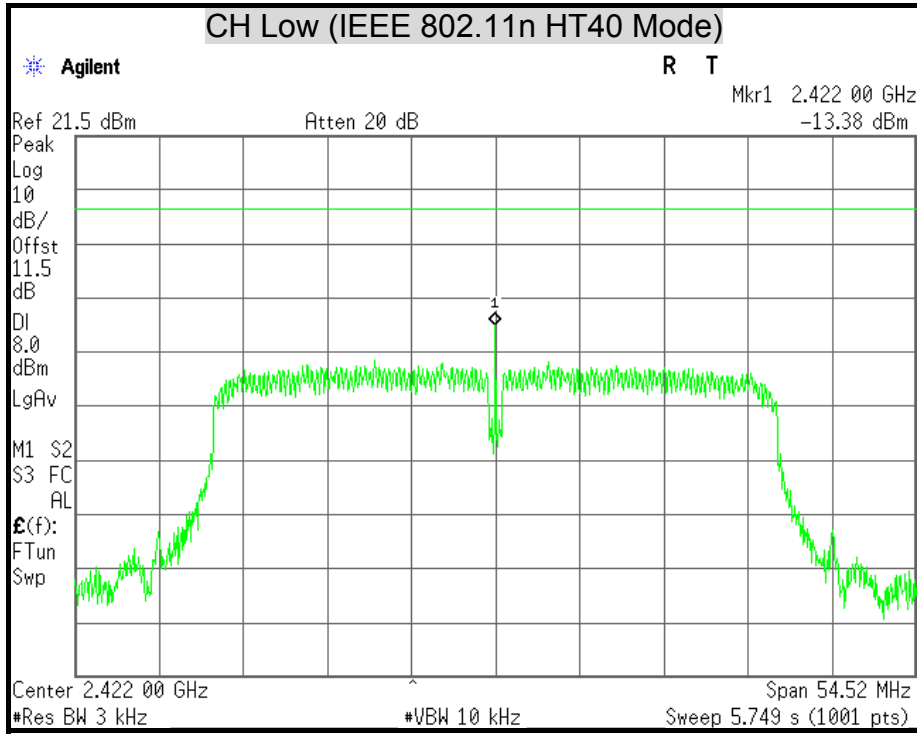


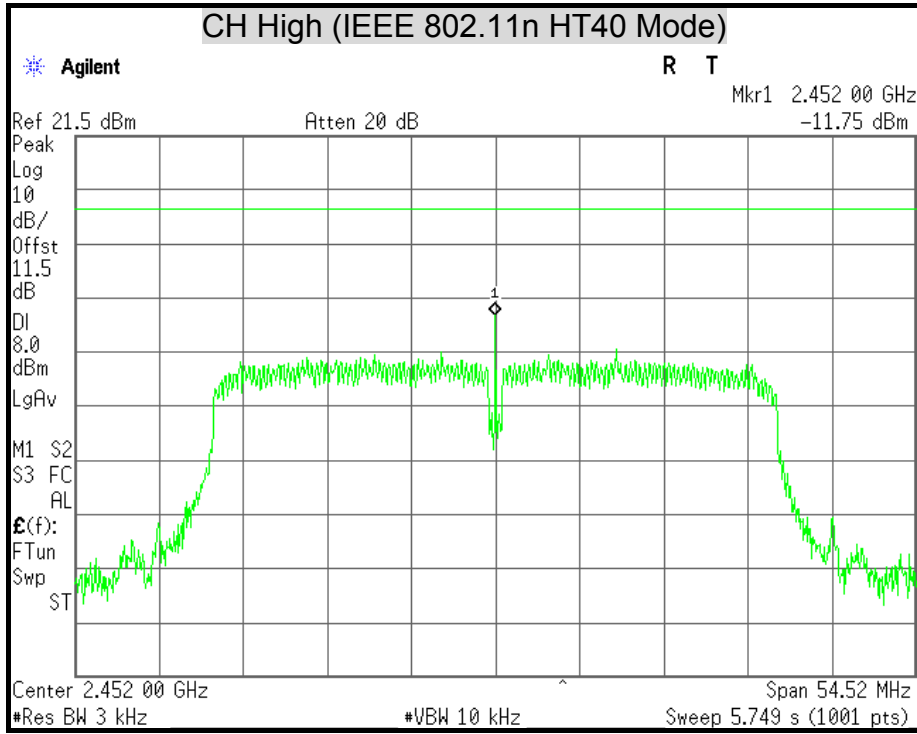














7.4 CONDUCTED SPURIOUS EMISSION

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 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	Agilent	E4446A	MY43360132	06/14/2013

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

TEST SETUP



TEST PROCEDURE

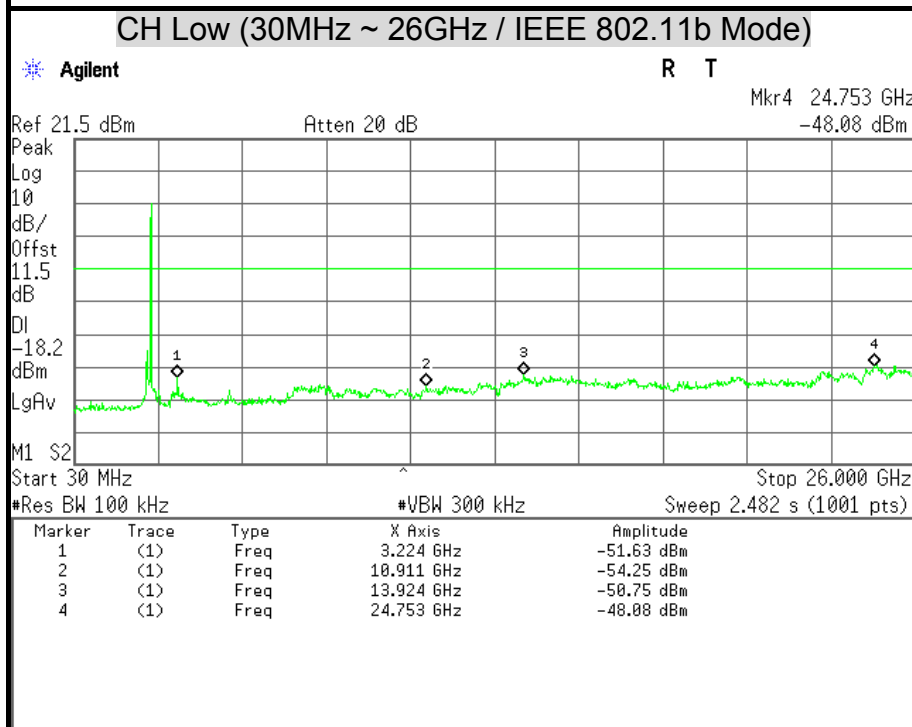
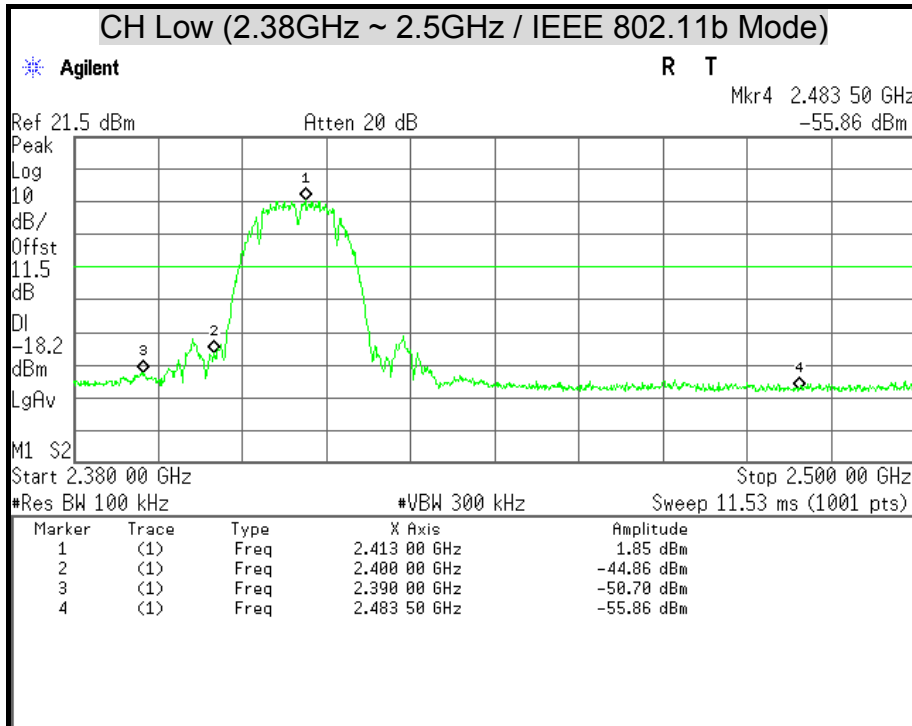
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

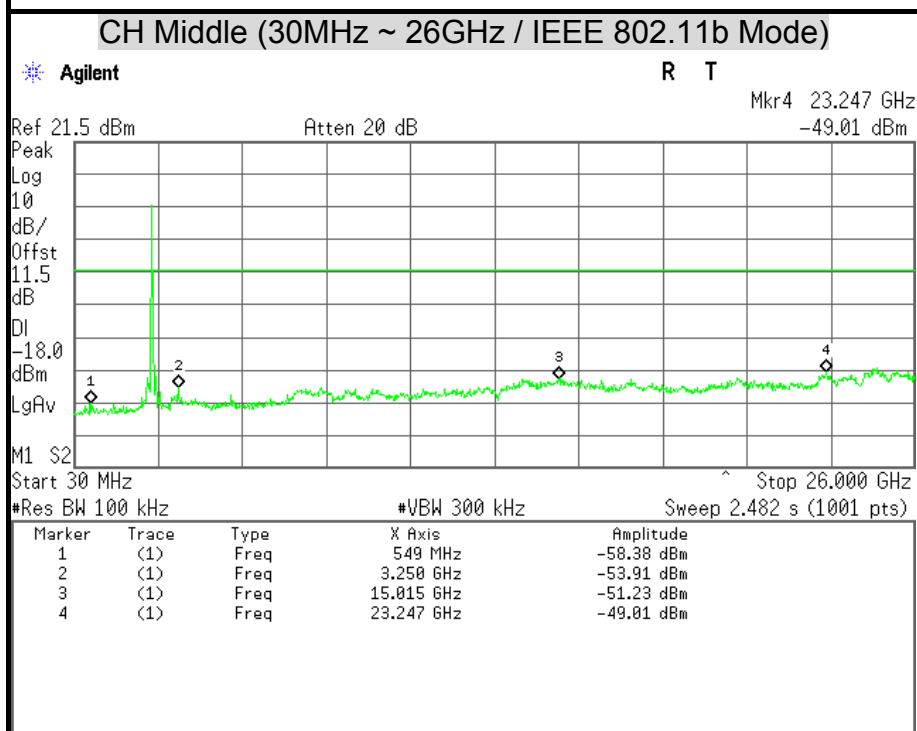
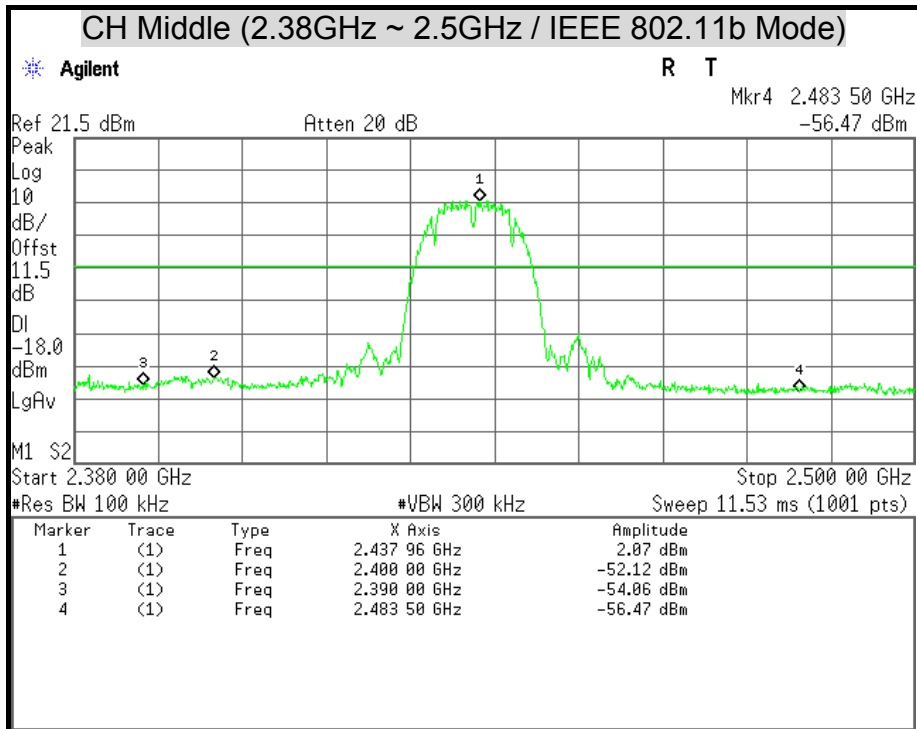
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in the 2.4 GHz band.

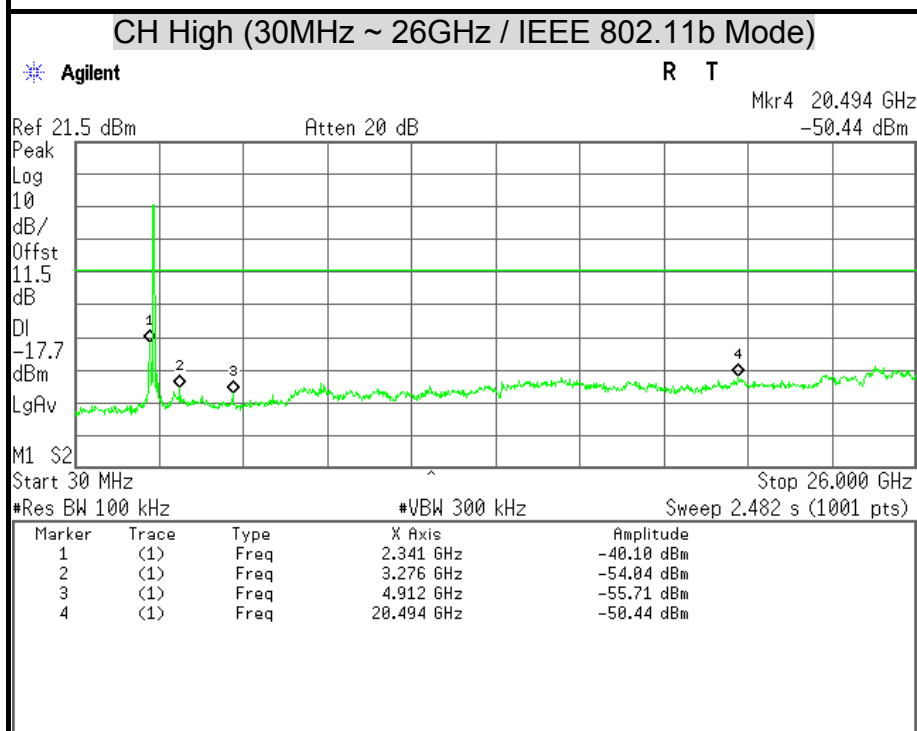
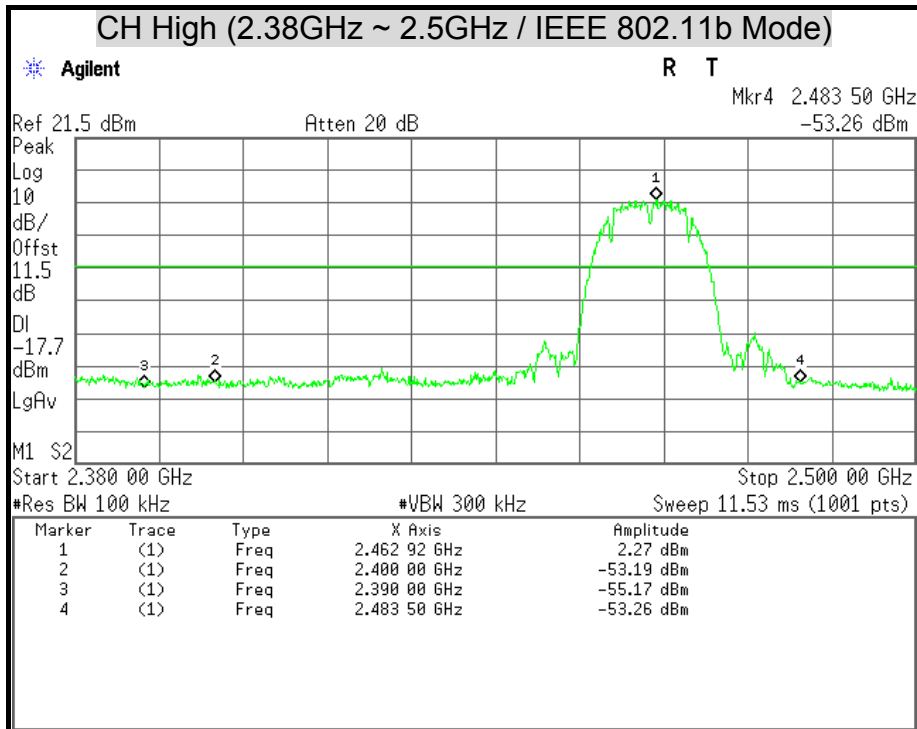


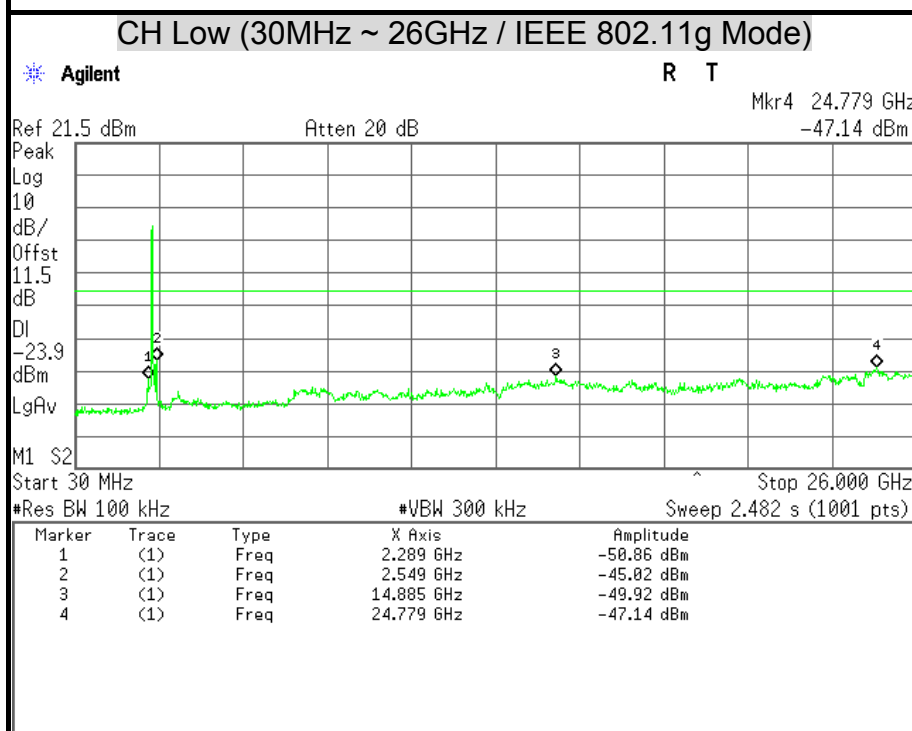
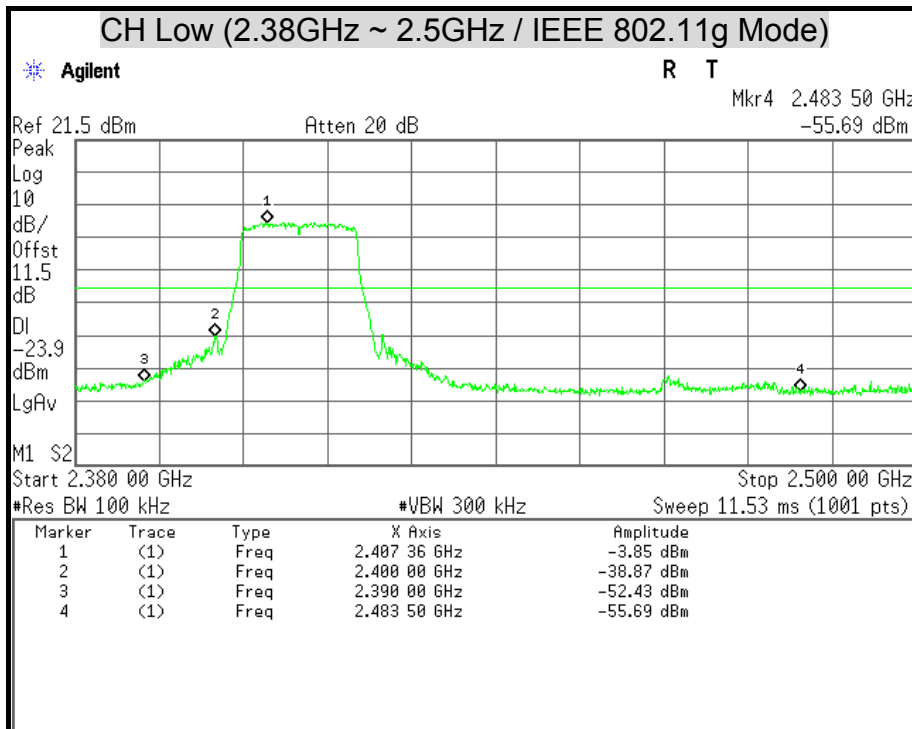
TEST RESULTS

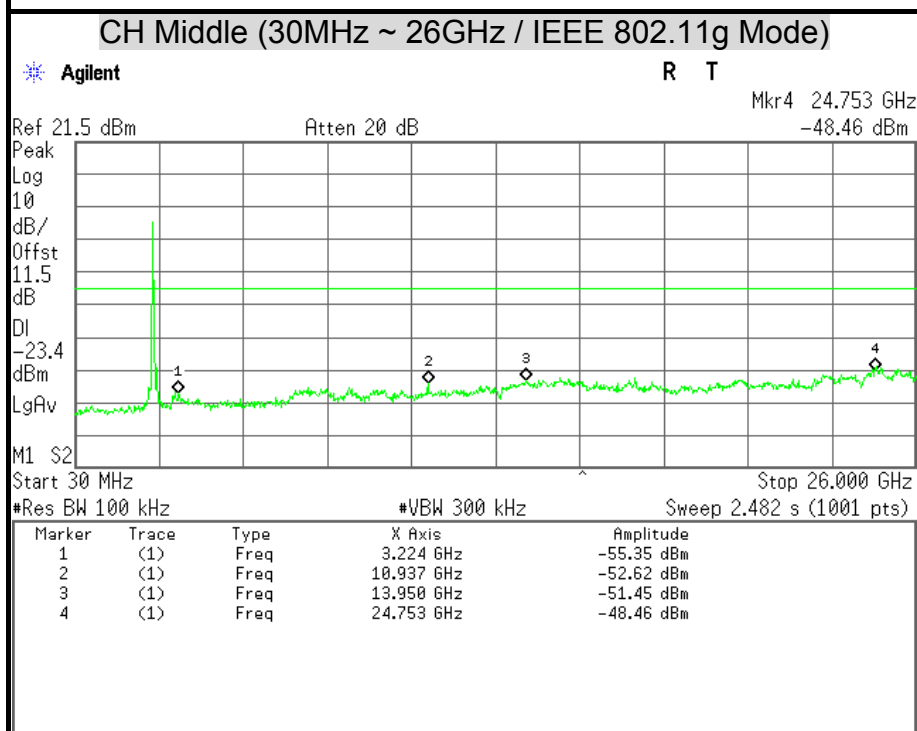
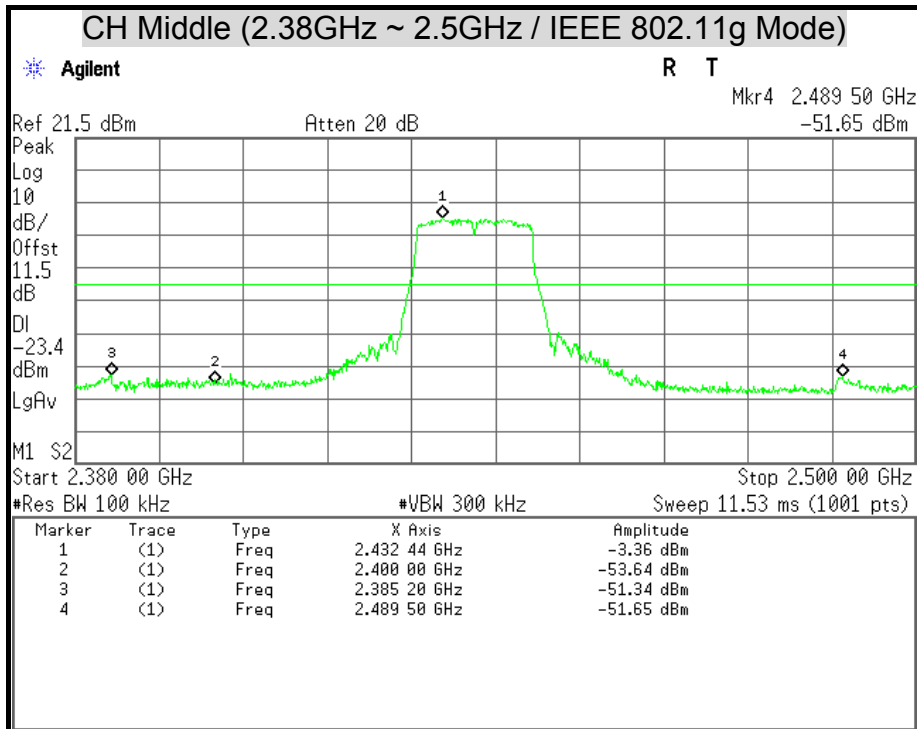
OUT-OF-BAND SPURIOUS EMISSIONS-CONDUCTED MEASUREMENT

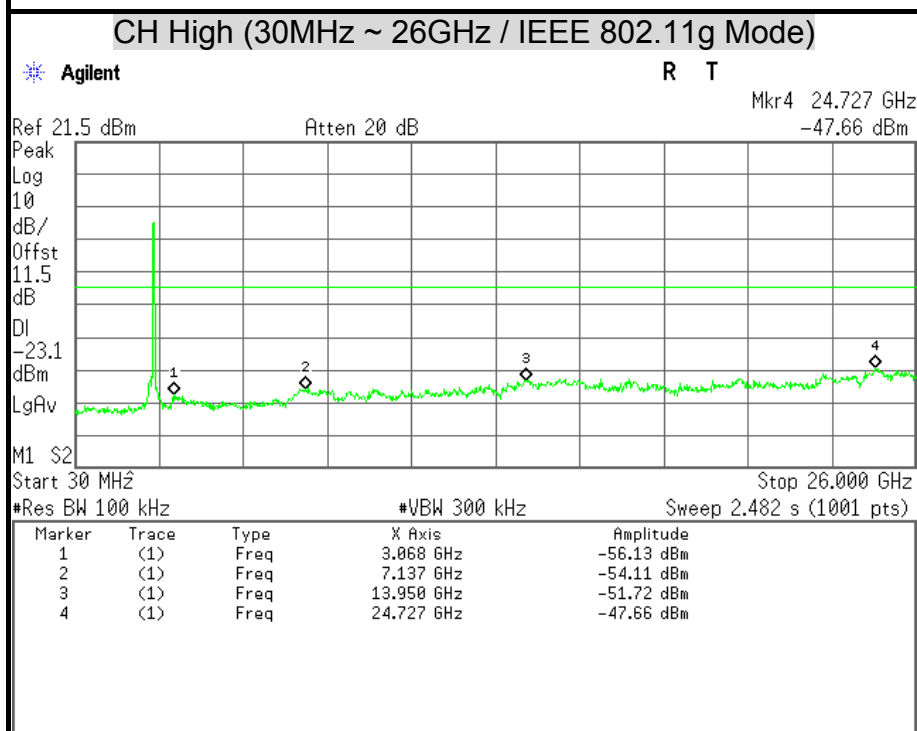
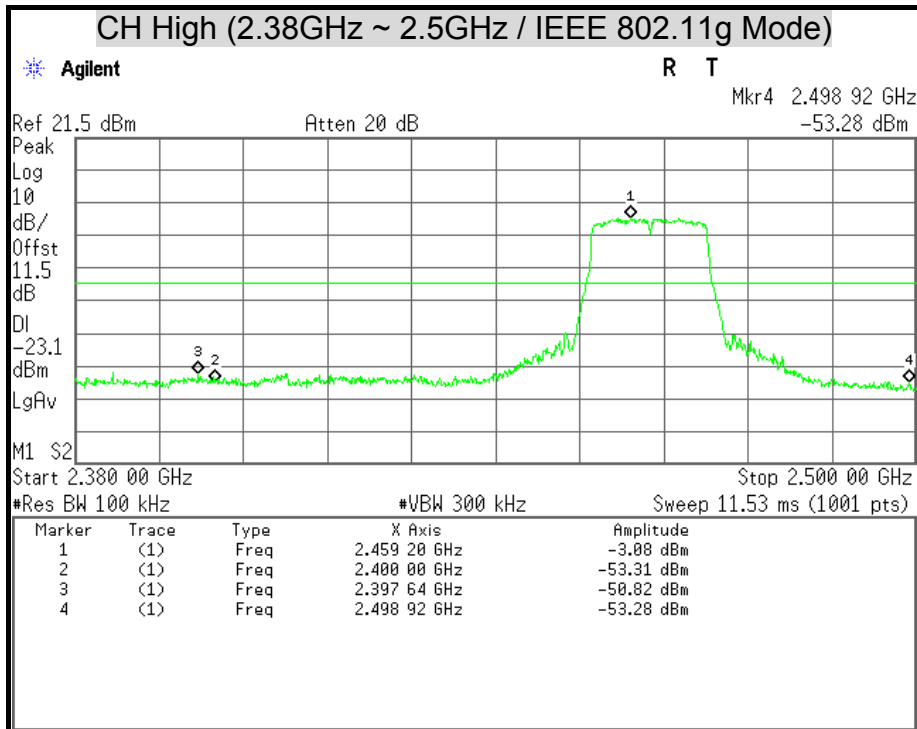


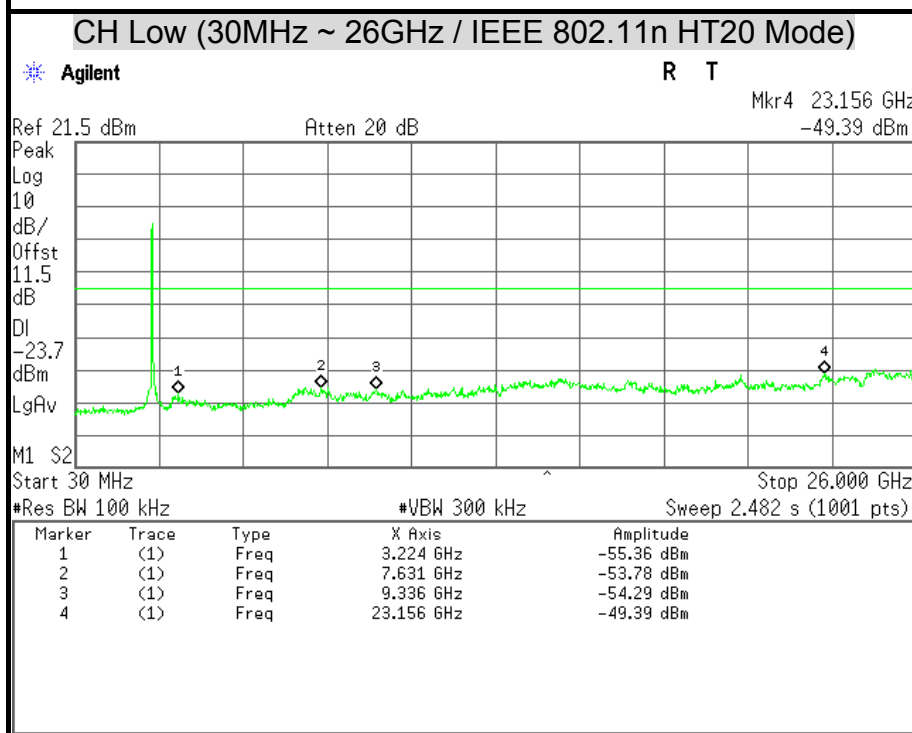
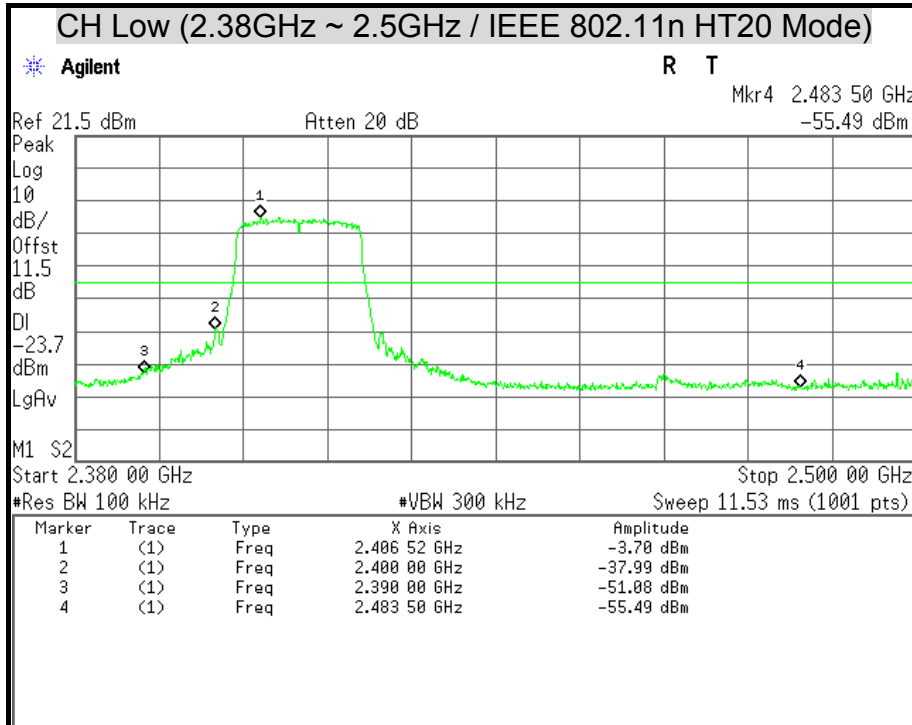


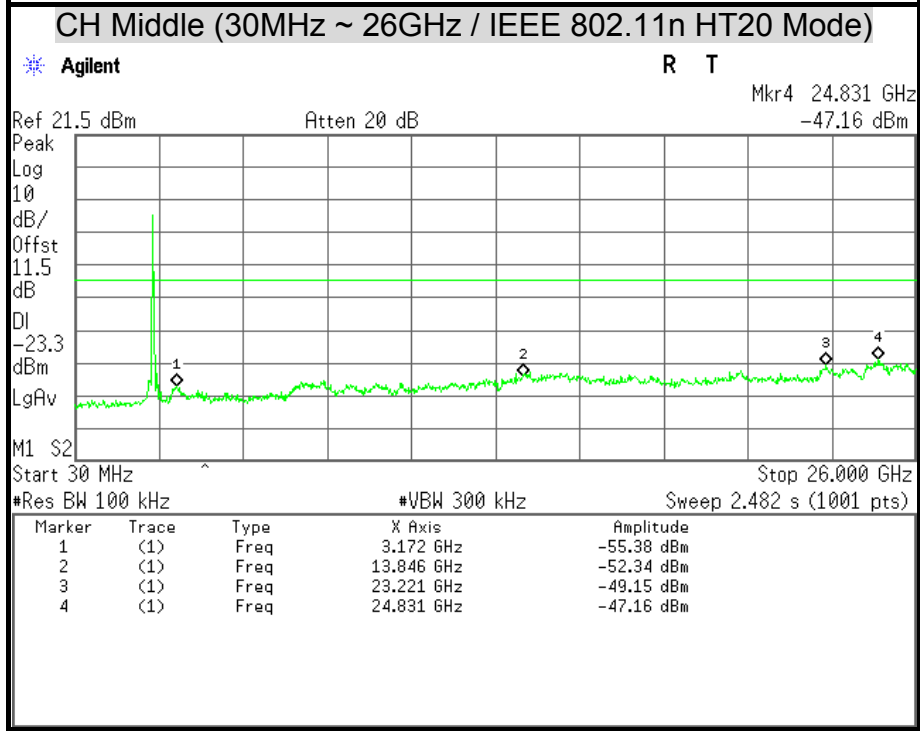
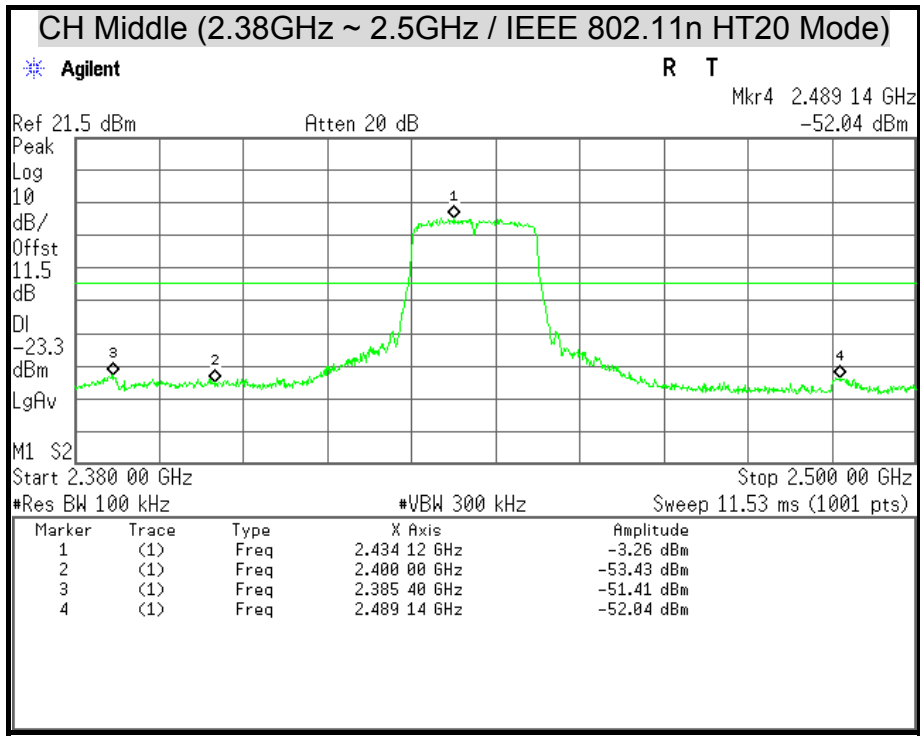


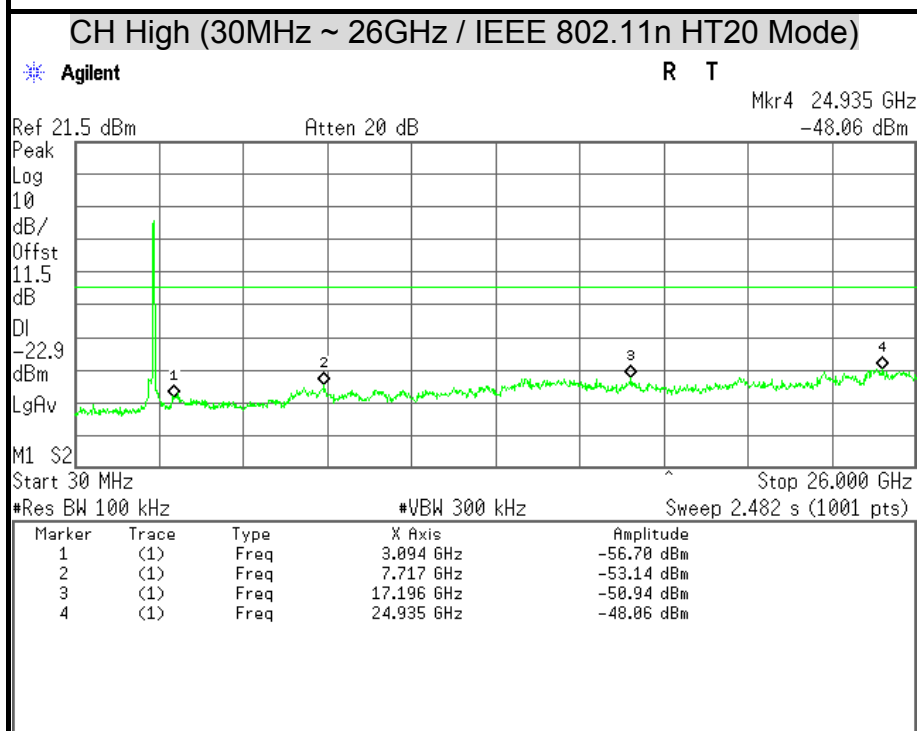
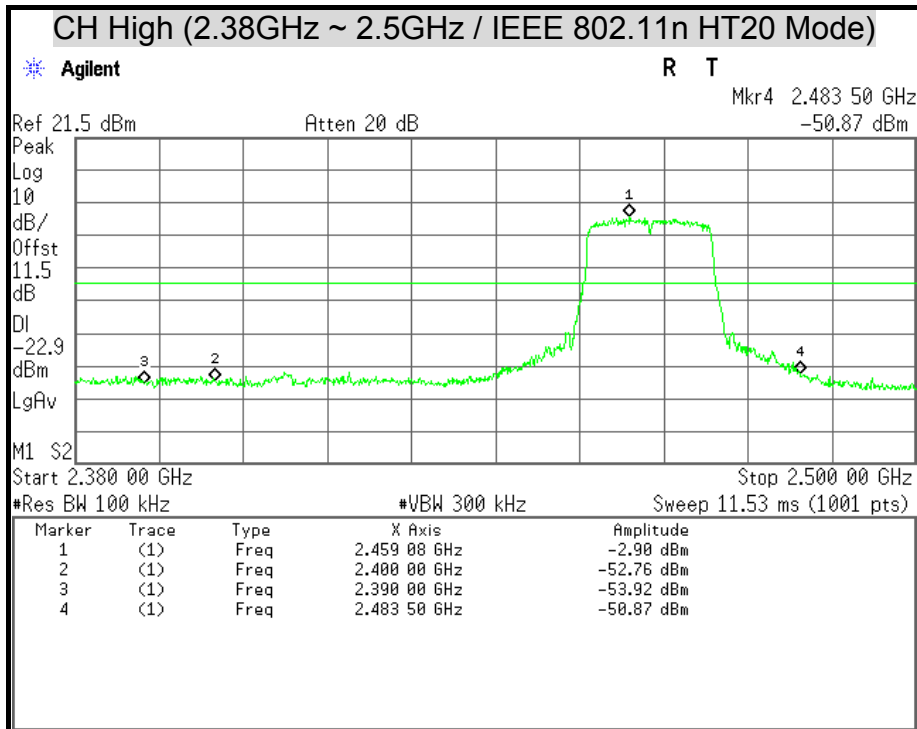


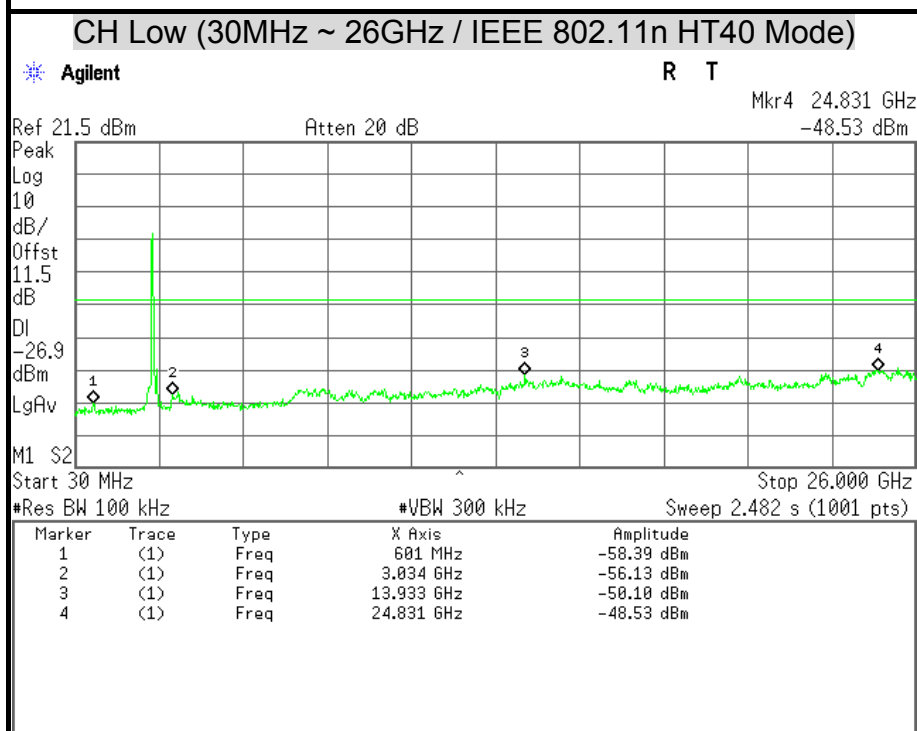
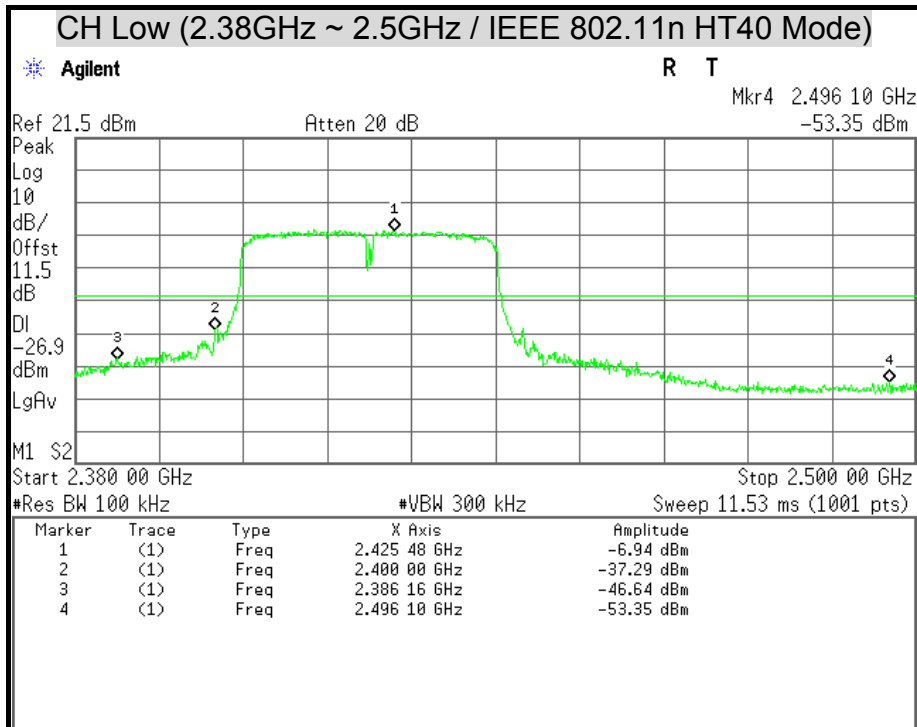


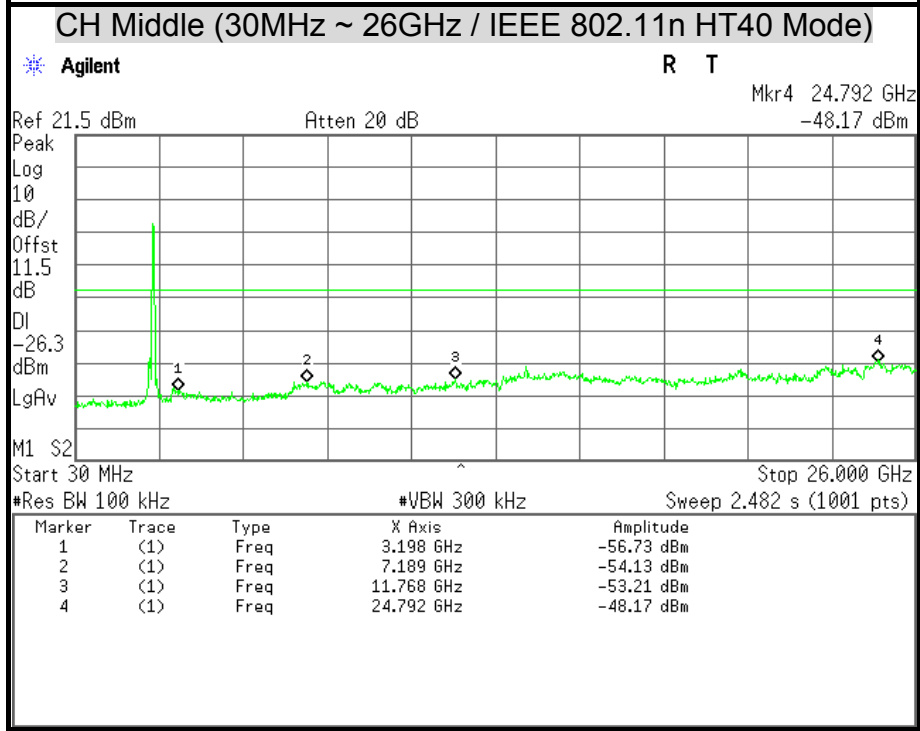
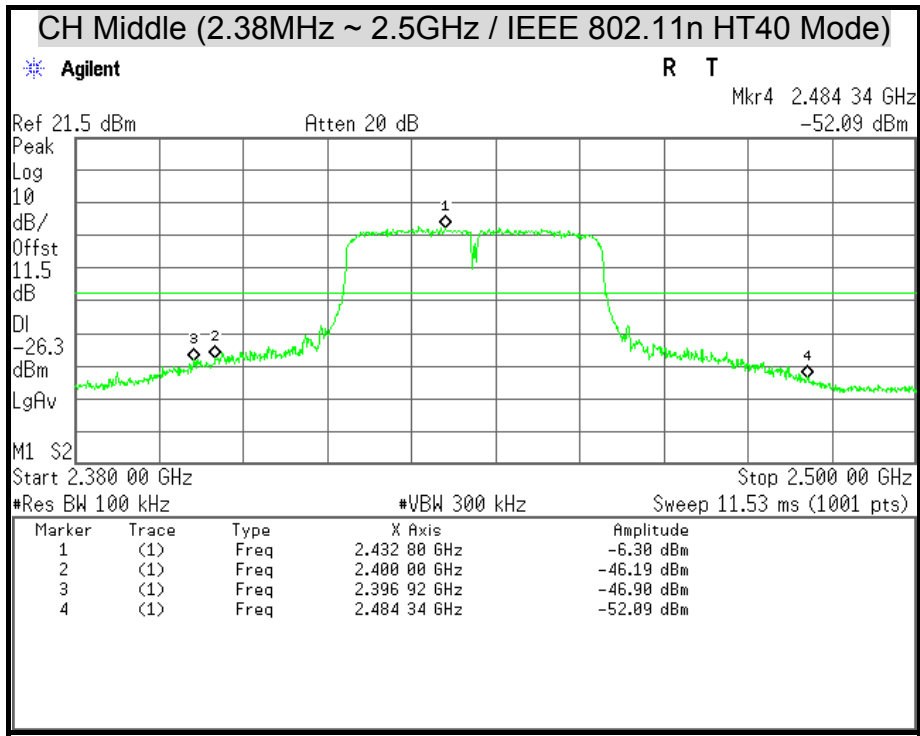


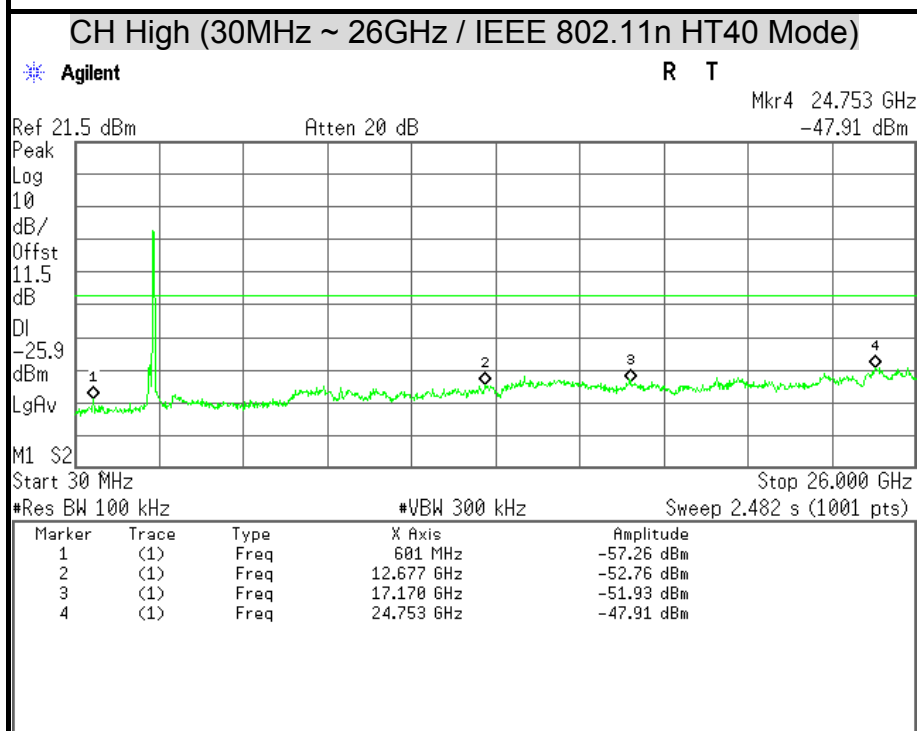
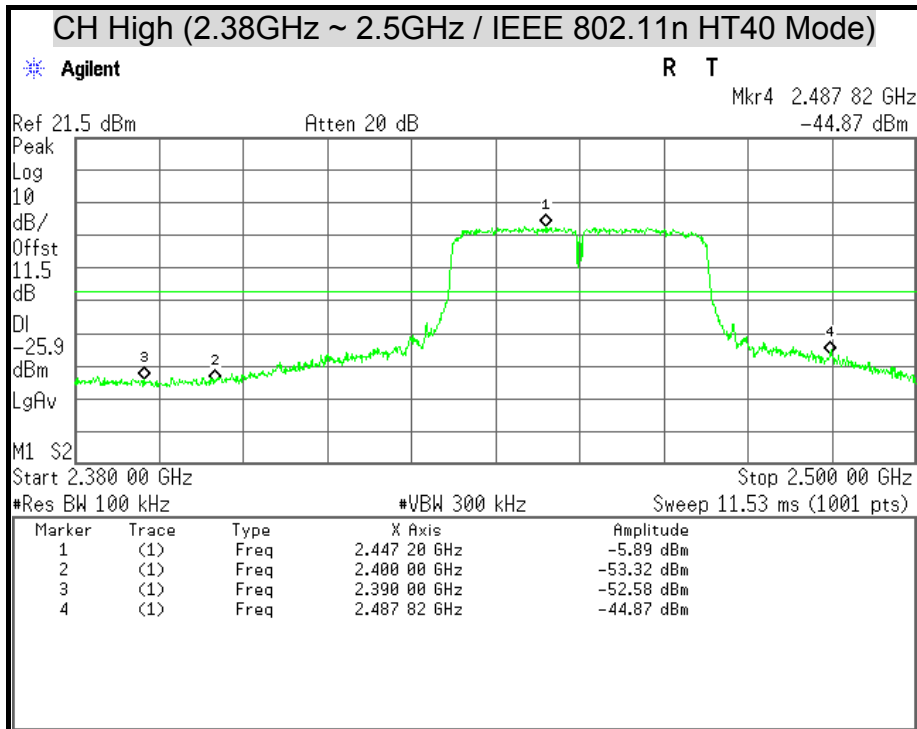














7.5 RADIATED EMISSION

LIMITS

(1) According to § 15.205 (a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
¹ 0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 -1710	10.6 -12.7
6.26775 - 6.26825	108 -121.94	1718.8 - 1722.2	13.25 -13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 – 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 -16.2
8.362 - 8.366	156.52475 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2655 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3338	36.43 - 36.5
12.57675 - 12.57725	322 -335.4	3600 - 4400	(²)
13.36 - 13.41			

Remark:

1. ¹ Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.
2. ² Above 38.6

(2) According to § 15.205 (b) Except as provided in paragraphs (d) and (e), the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.



(3) According to § 15.209 (a) Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table :

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 – 0.490	2400/F(KHz)	300
0.490 – 1.705	24000/F(KHz)	30
1.705 – 30.0	30	30
30 - 88	100 **	3
88 - 216	150 **	3
216 - 960	200 **	3
Above 960	500	3

Remark: **Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.

(4) According to § 15.209 (b) In the emission table above, the tighter limit applies at the band edges.

TEST EQUIPMENT

966Chamber_B

Name of Equipment	Manufacture	Model	Serial Number	Calibration Due
Spectrum Analyzer	Agilent	E4446A	MY46180323	04/22/2013
EMI Test Receiver	ROHDE & SCHWARZ	ESCI	101131	01/14/2014
Bi-log Antenna	SCHWARZBECK	VULB 9168	9168-250	09/26/2013
Double-Ridged Waveguide Horn	ETS-LINDGREN	3117	00078733	12/11/2013
Horn Antenna	COM-POWER	AH-840	03077	12/20/2013
Pre-Amplifier	Agilent	8447D	2944A10052	07/17/2013
Pre-Amplifier	Agilent	8449B	3008A01916	07/17/2013
LOOP Antenna	EMCO	6502	8905-2356	06/10/2013
Notch Filters Band Reject	Micro-Tronics	BRM05702-01	026	N.C.R.

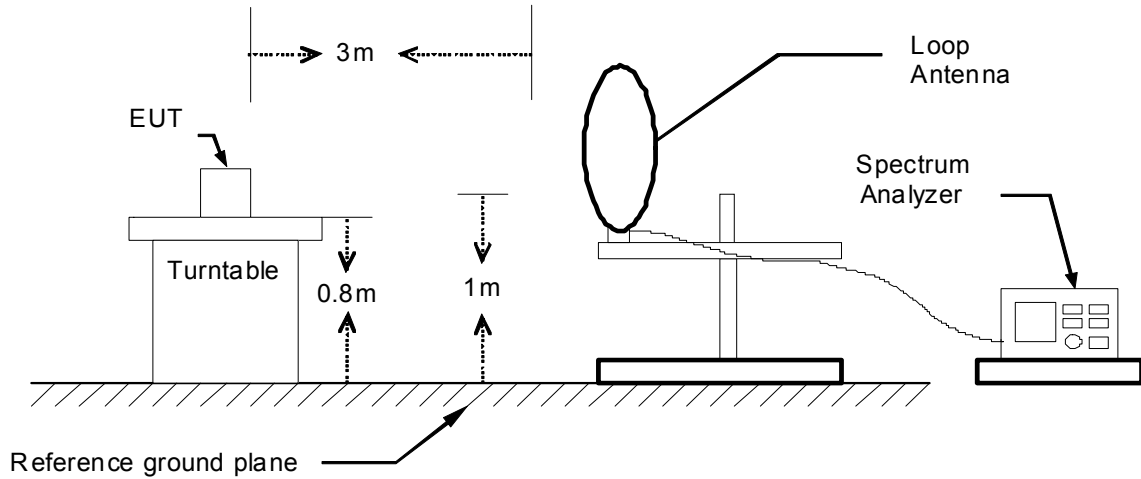
Remark: 1. Each piece of equipment is scheduled for calibration once a year.
2. N.C.R = No Calibration Request.



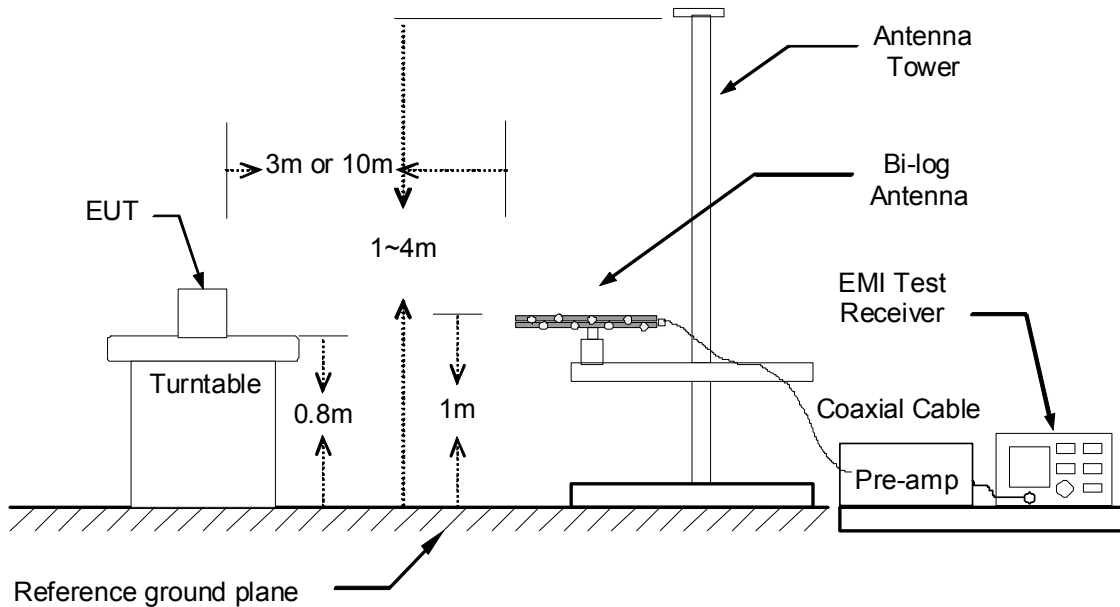
TEST SETUP

The diagram below shows the test setup that is utilized to make the measurements for emission from below 1GHz.

9kHz ~ 30MHz

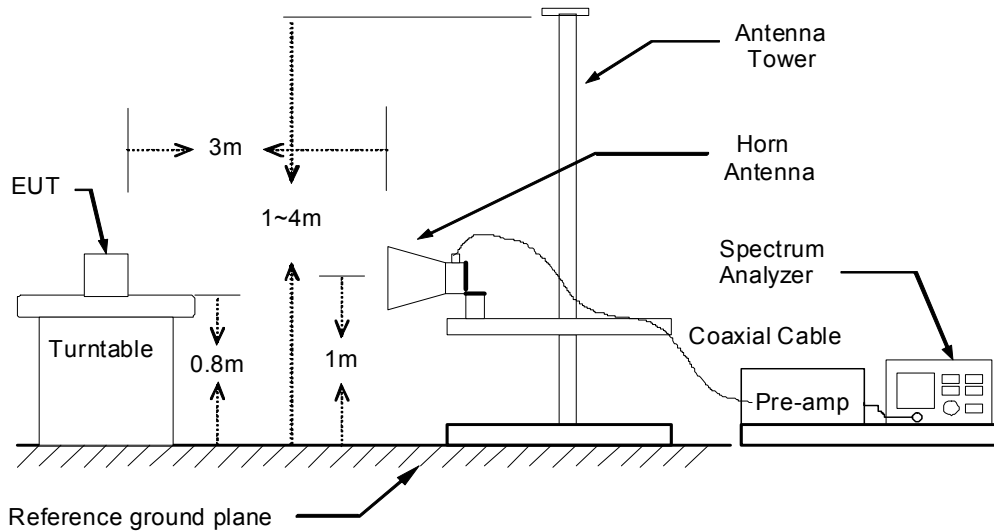


30MHz ~ 1GHz





The diagram below shows the test setup that is utilized to make the measurements for emission above 1GHz.



TEST PROCEDURE

1. The EUT was placed on the top of a rotating table 0.8 meters above the ground. The table was rotated 360 degrees to determine the position of the highest radiation.
2. While measuring the radiated emission below 1GHz, the EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower. While measuring the radiated emission above 1GHz, the EUT was set 3 meters away from the interference-receiving antenna.
3. The antenna is a broadband antenna, and its height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarization of the antenna are set to make the measurement.
4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the table was turned from 0 degrees to 360 degrees to find the maximum reading.
5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
6. If the emission level of the EUT in peak mode was 10 dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10 dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

Remark :

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 KHz for Peak detection (PK) and Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1 MHz for Peak detection and frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 10 Hz for Average detection (AV) at frequency above 1GHz.



TEST RESULTS

Below 1 GHz (9kHz ~ 30MHz)

No emission found between lowest internal used/generated frequency to 30MHz.

Below 1 GHz (30MHz ~ 1GHz)

Product Name	Smart Energy Wireless Bridge	Test By	Waternil Guan
Test Model	Billion SG600NX-Std	Test Date	2013/02/21
Test Mode	Normal Operating	Temp. & Humidity	19°C, 61%

966 Chamber_B at 3Meter / Horizontal						
Frequency (MHz)	Reading (dBµV)	Correction Factor (dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Remark
179.38	45.62	-14.29	31.33	43.50	-12.17	Peak
296.75	49.92	-11.43	38.49	46.00	-7.51	Peak
359.80	53.70	-10.24	43.46	46.00	-2.54	QP
421.88	36.50	-8.90	27.60	46.00	-18.40	QP
600.36	47.70	-5.30	42.40	46.00	-3.60	QP
658.56	38.80	-4.90	33.90	46.00	-12.10	QP
719.67	42.83	-3.70	39.13	46.00	-6.87	Peak
839.95	40.70	-1.71	38.99	46.00	-7.01	QP

966 Chamber_B at 3Meter / Vertical						
Frequency (MHz)	Reading (dBµV)	Correction Factor (dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Remark
30.97	48.20	-14.64	33.56	40.00	-6.44	QP
50.37	49.90	-13.16	36.74	40.00	-3.26	QP
125.06	50.29	-15.29	35.01	43.50	-8.49	Peak
359.80	48.50	-10.24	38.26	46.00	-7.74	Peak
419.94	45.50	-8.95	36.55	46.00	-9.45	Peak
661.47	43.66	-4.85	38.82	46.00	-7.18	Peak
839.95	43.85	-1.71	42.14	46.00	-3.86	Peak
943.74	37.93	-0.16	37.78	46.00	-8.22	Peak

Remark:

1. Quasi-peak test would be performed if the peak result were greater than the quasi-peak limit.
2. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
3. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Loss (dB) – PreAmp.Gain (dB)
4. Result (dBµV/m) = Reading (dBµV) + Correction Factor (dB/m)
5. Margin (dB) = Remark result (dBµV/m) - Quasi-peak limit (dBµV/m).



Above 1 GHz

Product Name	Smart Energy Wireless Bridge	Test By	Allen Liu
Test Model	Billion SG600NX-Std	Test Date	2012/12/24
Test Mode	IEEE 802.11b TX / CH Low	Temp. & Humidity	23°C, 52%

966 Chamber_B at 3Meter / Horizontal									
Frequency (MHz)	Reading-PK (dBuV)	Reading-AV (dBuV)	Correction Factor (dB/m)	Result-PK (dBuV/m)	Result-AV (dBuV/m)	Limit-PK (dBuV/m)	Limit-AV (dBuV/m)	Margin (dB)	Remark
1080.00	50.15	---	-3.72	46.43	---	74.00	54.00	-7.57	Peak
1140.00	49.03	---	-3.51	45.52	---	74.00	54.00	-8.48	Peak
2290.00	60.30	39.35	3.24	63.54	42.59	74.00	54.00	-11.41	AVG
2534.00	58.12	41.33	4.02	62.14	45.35	74.00	54.00	-8.65	AVG
3750.00	41.33	---	6.60	47.93	---	74.00	54.00	-6.07	Peak
4830.00	41.75	---	9.24	50.99	---	74.00	54.00	-3.01	Peak
5115.00	40.51	---	9.85	50.36	---	74.00	54.00	-3.64	Peak

966 Chamber_B at 3Meter / Vertical									
Frequency (MHz)	Reading-PK (dBuV)	Reading-AV (dBuV)	Correction Factor (dB/m)	Result-PK (dBuV/m)	Result-AV (dBuV/m)	Limit-PK (dBuV/m)	Limit-AV (dBuV/m)	Margin (dB)	Remark
1080.00	47.35	---	-3.72	43.63	---	74.00	54.00	-10.37	Peak
1646.00	46.21	---	-0.94	45.27	---	74.00	54.00	-8.73	Peak
2290.00	59.31	42.53	3.24	62.55	45.77	74.00	54.00	-8.23	AVG
2534.00	60.23	43.43	4.02	64.25	47.45	74.00	54.00	-6.55	AVG
3750.00	41.95	---	6.60	48.55	---	74.00	54.00	-5.45	Peak
4830.00	41.32	---	9.24	50.56	---	74.00	54.00	-3.44	Peak
5835.00	39.07	---	11.18	50.25	---	74.00	54.00	-3.75	Peak

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Average test would be performed if the peak result were greater than the average limit.
3. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
4. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
5. Result = Reading + Correction Factor
Margin = Result - Limit
Remark Peak = Result(PK) - Limit(AV)
Remark AVG = Result(AV) - Limit(AV)



Product Name	Smart Energy Wireless Bridge	Test By	Allen Liu
Test Model	Billion SG600NX-Std	Test Date	2012/12/24
Test Mode	IEEE 802.11b TX / CH Middle	Temp. & Humidity	23°C, 52%

966 Chamber_B at 3Meter / Horizontal									
Frequency (MHz)	Reading-PK (dBuV)	Reading-AV (dBuV)	Correction Factor (dB/m)	Result-PK (dBuV/m)	Result-AV (dBuV/m)	Limit-PK (dBuV/m)	Limit-AV (dBuV/m)	Margin (dB)	Remark
1018.00	51.92	---	-3.94	47.98	---	74.00	54.00	-6.02	Peak
1080.00	49.28	---	-3.72	45.56	---	74.00	54.00	-8.44	Peak
2314.00	66.40	46.84	3.32	69.72	50.16	74.00	54.00	-3.84	AVG
2556.00	60.60	40.54	4.07	64.67	44.61	74.00	54.00	-9.39	AVG
4050.00	42.03	---	7.30	49.33	---	74.00	54.00	-4.67	Peak
4875.00	41.79	---	9.36	51.15	---	74.00	54.00	-2.85	Peak
5715.00	39.51	---	10.89	50.40	---	74.00	54.00	-3.60	Peak

966 Chamber_B at 3Meter / Vertical									
Frequency (MHz)	Reading-PK (dBuV)	Reading-AV (dBuV)	Correction Factor (dB/m)	Result-PK (dBuV/m)	Result-AV (dBuV/m)	Limit-PK (dBuV/m)	Limit-AV (dBuV/m)	Margin (dB)	Remark
1684.00	45.45	---	-0.59	44.85	---	74.00	54.00	-9.15	Peak
2312.00	59.20	41.28	3.31	62.51	44.59	74.00	54.00	-9.41	AVG
2560.00	59.85	45.07	4.08	63.93	49.15	74.00	54.00	-4.85	AVG
2890.00	45.08	---	4.77	49.85	---	74.00	54.00	-4.15	Peak
3690.00	42.05	---	6.46	48.51	---	74.00	54.00	-5.49	Peak
4230.00	40.40	---	7.73	48.13	---	74.00	54.00	-5.87	Peak
5460.00	39.63	---	10.32	49.94	---	74.00	54.00	-4.06	Peak

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Average test would be performed if the peak result were greater than the average limit.
3. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
4. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
5. Result = Reading + Correction Factor
Margin = Result - Limit
Remark Peak = Result(PK) - Limit(AV)
Remark AVG = Result(AV) - Limit(AV)



Product Name	Smart Energy Wireless Bridge	Test By	Allen Liu
Test Model	Billion SG600NX-Std	Test Date	2012/12/24
Test Mode	IEEE 802.11b TX / CH High	Temp. & Humidity	23°C, 52%

966 Chamber_B at 3Meter / Horizontal									
Frequency (MHz)	Reading-PK (dBuV)	Reading-AV (dBuV)	Correction Factor (dB/m)	Result-PK (dBuV/m)	Result-AV (dBuV/m)	Limit-PK (dBuV/m)	Limit-AV (dBuV/m)	Margin (dB)	Remark
1080.00	48.64	---	-3.72	44.92	---	74.00	54.00	-9.08	Peak
1238.00	47.31	---	-3.17	44.14	---	74.00	54.00	-9.86	Peak
2344.00	69.13	48.54	3.42	72.55	51.96	74.00	54.00	-2.04	AVG
2584.00	59.87	37.68	4.13	64.00	41.81	74.00	54.00	-12.19	AVG
3675.00	41.58	---	6.43	48.00	---	74.00	54.00	-6.00	Peak
4890.00	39.22	---	9.40	48.62	---	74.00	54.00	-5.38	Peak
5790.00	38.84	---	11.07	49.91	---	74.00	54.00	-4.09	Peak

966 Chamber_B at 3Meter / Vertical									
Frequency (MHz)	Reading-PK (dBuV)	Reading-AV (dBuV)	Correction Factor (dB/m)	Result-PK (dBuV/m)	Result-AV (dBuV/m)	Limit-PK (dBuV/m)	Limit-AV (dBuV/m)	Margin (dB)	Remark
1080.00	48.74	---	-3.72	45.02	---	74.00	54.00	-8.98	Peak
2342.00	64.77	47.87	3.41	68.18	51.28	74.00	54.00	-2.72	AVG
2584.00	59.18	37.92	4.13	63.31	42.05	74.00	54.00	-11.95	AVG
2700.00	53.90	33.46	4.37	58.27	37.83	74.00	54.00	-16.17	AVG
3720.00	41.70	---	6.53	48.23	---	74.00	54.00	-5.77	Peak
4800.00	40.29	---	9.16	49.45	---	74.00	54.00	-4.55	Peak
5685.00	39.14	---	10.82	49.96	---	74.00	54.00	-4.04	Peak

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Average test would be performed if the peak result were greater than the average limit.
3. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
4. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
5. Result = Reading + Correction Factor
Margin = Result - Limit
Remark Peak = Result(PK) - Limit(AV)
Remark AVG = Result(AV) - Limit(AV)



Product Name	Smart Energy Wireless Bridge	Test By	Allen Liu
Test Model	Billion SG600NX-Std	Test Date	2012/12/24
Test Mode	IEEE 802.11g TX / CH Low	Temp. & Humidity	23°C, 52%

966 Chamber_B at 3Meter / Horizontal									
Frequency (MHz)	Reading-PK (dBuV)	Reading-AV (dBuV)	Correction Factor (dB/m)	Result-PK (dBuV/m)	Result-AV (dBuV/m)	Limit-PK (dBuV/m)	Limit-AV (dBuV/m)	Margin (dB)	Remark
1080.00	48.51	---	-3.72	44.79	---	74.00	54.00	-9.21	Peak
1680.00	46.43	---	-0.63	45.80	---	74.00	54.00	-8.20	Peak
2298.00	60.52	38.89	3.26	63.78	42.15	74.00	54.00	-11.85	AVG
2526.00	61.98	40.69	4.00	65.98	44.69	74.00	54.00	-9.31	AVG
3180.00	42.95	---	5.37	48.32	---	74.00	54.00	-5.68	Peak
5025.00	39.91	---	9.72	49.64	---	74.00	54.00	-4.36	Peak
6285.00	38.72	---	12.17	50.89	---	74.00	54.00	-3.11	Peak

966 Chamber_B at 3Meter / Vertical									
Frequency (MHz)	Reading-PK (dBuV)	Reading-AV (dBuV)	Correction Factor (dB/m)	Result-PK (dBuV/m)	Result-AV (dBuV/m)	Limit-PK (dBuV/m)	Limit-AV (dBuV/m)	Margin (dB)	Remark
1080.00	47.08	---	-3.72	43.36	---	74.00	54.00	-10.64	Peak
1270.00	46.50	---	-3.06	43.44	---	74.00	54.00	-10.56	Peak
2294.00	58.62	38.17	3.25	61.87	41.42	74.00	54.00	-12.58	AVG
2524.00	62.10	39.75	4.00	66.10	43.75	74.00	54.00	-10.25	AVG
3150.00	42.54	---	5.31	47.85	---	74.00	54.00	-6.15	Peak
3915.00	41.29	---	6.98	48.27	---	74.00	54.00	-5.73	Peak
4620.00	40.19	---	8.69	48.87	---	74.00	54.00	-5.13	Peak

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Average test would be performed if the peak result were greater than the average limit.
3. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
4. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
5. Result = Reading + Correction Factor
Margin = Result - Limit
Remark Peak = Result(PK) - Limit(AV)
Remark AVG = Result(AV) - Limit(AV)



Product Name	Smart Energy Wireless Bridge	Test By	Allen Liu
Test Model	Billion SG600NX-Std	Test Date	2012/12/24
Test Mode	IEEE 802.11g TX / CH Middle	Temp. & Humidity	23°C, 52%

966 Chamber_B at 3Meter / Horizontal									
Frequency (MHz)	Reading-PK (dBuV)	Reading-AV (dBuV)	Correction Factor (dB/m)	Result-PK (dBuV/m)	Result-AV (dBuV/m)	Limit-PK (dBuV/m)	Limit-AV (dBuV/m)	Margin (dB)	Remark
1080.00	48.86	---	-3.72	45.14	---	74.00	54.00	-8.86	Peak
1522.00	46.49	---	-2.05	44.44	---	74.00	54.00	-9.56	Peak
2320.00	65.88	41.88	3.34	69.22	45.22	74.00	54.00	-8.78	AVG
2550.00	57.36	39.72	4.05	61.41	43.77	74.00	54.00	-10.23	AVG
3705.00	41.25	---	6.50	47.75	---	74.00	54.00	-6.25	Peak
4590.00	40.84	---	8.61	49.45	---	74.00	54.00	-4.55	Peak
4830.00	40.19	---	9.24	49.44	---	74.00	54.00	-4.56	Peak

966 Chamber_B at 3Meter / Vertical									
Frequency (MHz)	Reading-PK (dBuV)	Reading-AV (dBuV)	Correction Factor (dB/m)	Result-PK (dBuV/m)	Result-AV (dBuV/m)	Limit-PK (dBuV/m)	Limit-AV (dBuV/m)	Margin (dB)	Remark
1506.00	46.26	---	-2.20	44.06	---	74.00	54.00	-9.94	Peak
2314.00	57.14	36.80	3.32	60.46	40.12	74.00	54.00	-13.88	AVG
2560.00	58.66	38.32	4.08	62.74	42.40	74.00	54.00	-11.60	AVG
2918.00	45.73	---	4.83	50.56	---	74.00	54.00	-3.44	Peak
3210.00	43.08	---	5.43	48.51	---	74.00	54.00	-5.49	Peak
4035.00	41.73	---	7.26	48.99	---	74.00	54.00	-5.01	Peak
5610.00	39.30	---	10.64	49.94	---	74.00	54.00	-4.06	Peak

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Average test would be performed if the peak result were greater than the average limit.
3. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
4. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
5. Result = Reading + Correction Factor
Margin = Result - Limit
Remark Peak = Result(PK) - Limit(AV)
Remark AVG = Result(AV) - Limit(AV)



Product Name	Smart Energy Wireless Bridge	Test By	Allen Liu
Test Model	Billion SG600NX-Std	Test Date	2012/12/24
Test Mode	IEEE 802.11g TX / CH High	Temp. & Humidity	23°C, 52%

966 Chamber_B at 3Meter / Horizontal									
Frequency (MHz)	Reading-PK (dBuV)	Reading-AV (dBuV)	Correction Factor (dB/m)	Result-PK (dBuV/m)	Result-AV (dBuV/m)	Limit-PK (dBuV/m)	Limit-AV (dBuV/m)	Margin (dB)	Remark
1020.00	49.27	---	-3.93	45.34	---	74.00	54.00	-8.66	Peak
1080.00	49.31	---	-3.72	45.59	---	74.00	54.00	-8.41	Peak
2340.00	63.23	45.92	3.41	66.64	49.33	74.00	54.00	-4.67	AVG
2580.00	57.51	39.98	4.12	61.63	44.10	74.00	54.00	-9.90	AVG
3450.00	42.49	---	5.92	48.41	---	74.00	54.00	-5.59	Peak
4620.00	40.79	---	8.69	49.47	---	74.00	54.00	-4.53	Peak
5535.00	39.45	---	10.45	49.91	---	74.00	54.00	-4.09	Peak

966 Chamber_B at 3Meter / Vertical									
Frequency (MHz)	Reading-PK (dBuV)	Reading-AV (dBuV)	Correction Factor (dB/m)	Result-PK (dBuV/m)	Result-AV (dBuV/m)	Limit-PK (dBuV/m)	Limit-AV (dBuV/m)	Margin (dB)	Remark
1080.00	47.25	---	-3.72	43.53	---	74.00	54.00	-10.47	Peak
1986.00	44.99	---	2.12	47.11	---	74.00	54.00	-6.89	Peak
2346.00	59.36	41.77	3.43	62.79	45.20	74.00	54.00	-8.80	AVG
2588.00	58.76	42.57	4.13	62.89	46.70	74.00	54.00	-7.30	AVG
3975.00	41.36	---	7.12	48.48	---	74.00	54.00	-5.52	Peak
4860.00	40.62	---	9.32	49.94	---	74.00	54.00	-4.06	Peak
5910.00	38.43	---	11.36	49.79	---	74.00	54.00	-4.21	Peak

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Average test would be performed if the peak result were greater than the average limit.
3. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
4. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
5. Result = Reading + Correction Factor
Margin = Result - Limit
Remark Peak = Result(PK) - Limit(AV)
Remark AVG = Result(AV) - Limit(AV)



Product Name	Smart Energy Wireless Bridge	Test By	Allen Liu
Test Model	Billion SG600NX-Std	Test Date	2012/12/24
Test Mode	IEEE 802.11n HT20 TX / CH Low	Temp. & Humidity	23°C, 52%

966 Chamber_B at 3Meter / Horizontal									
Frequency (MHz)	Reading-PK (dBuV)	Reading-AV (dBuV)	Correction Factor (dB/m)	Result-PK (dBuV/m)	Result-AV (dBuV/m)	Limit-PK (dBuV/m)	Limit-AV (dBuV/m)	Margin (dB)	Remark
1018.00	49.83	---	-3.94	45.89	---	74.00	54.00	-8.11	Peak
1080.00	48.13	---	-3.72	44.41	---	74.00	54.00	-9.59	Peak
2288.00	63.22	40.42	3.23	66.45	43.65	74.00	54.00	-10.35	AVG
2528.00	57.55	39.04	4.01	61.56	43.05	74.00	54.00	-10.95	AVG
3180.00	42.69	---	5.37	48.05	---	74.00	54.00	-5.95	Peak
4035.00	41.30	---	7.26	48.56	---	74.00	54.00	-5.44	Peak
4905.00	39.69	---	9.44	49.13	---	74.00	54.00	-4.87	Peak

966 Chamber_B at 3Meter / Vertical									
Frequency (MHz)	Reading-PK (dBuV)	Reading-AV (dBuV)	Correction Factor (dB/m)	Result-PK (dBuV/m)	Result-AV (dBuV/m)	Limit-PK (dBuV/m)	Limit-AV (dBuV/m)	Margin (dB)	Remark
1112.00	46.60	---	-3.61	42.99	---	74.00	54.00	-11.01	Peak
1538.00	45.83	---	-1.91	43.92	---	74.00	54.00	-10.08	Peak
2286.00	57.36	37.18	3.22	60.58	40.40	74.00	54.00	-13.60	AVG
2536.00	60.03	40.86	4.03	64.06	44.89	74.00	54.00	-9.11	AVG
4350.00	40.85	---	8.01	48.87	---	74.00	54.00	-5.13	Peak
4785.00	40.38	---	9.12	49.50	---	74.00	54.00	-4.50	Peak
5835.00	38.76	---	11.18	49.94	---	74.00	54.00	-4.06	Peak

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Average test would be performed if the peak result were greater than the average limit.
3. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
4. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
5. Result = Reading + Correction Factor
Margin = Result - Limit
Remark Peak = Result(PK) - Limit(AV)
Remark AVG = Result(AV) - Limit(AV)



Product Name	Smart Energy Wireless Bridge	Test By	Allen Liu
Test Model	Billion SG600NX-Std	Test Date	2012/12/24
Test Mode	IEEE 802.11n HT20 TX / CH Middle	Temp. & Humidity	23°C, 52%

966 Chamber_B at 3Meter / Horizontal									
Frequency (MHz)	Reading-PK (dBuV)	Reading-AV (dBuV)	Correction Factor (dB/m)	Result-PK (dBuV/m)	Result-AV (dBuV/m)	Limit-PK (dBuV/m)	Limit-AV (dBuV/m)	Margin (dB)	Remark
1018.00	49.81	---	-3.94	45.87	---	74.00	54.00	-8.13	Peak
1080.00	49.31	---	-3.72	45.59	---	74.00	54.00	-8.41	Peak
2322.00	63.20	45.08	3.34	66.54	48.42	74.00	54.00	-5.58	AVG
2562.00	58.63	37.49	4.08	62.71	41.57	74.00	54.00	-12.43	AVG
3705.00	41.92	---	6.50	48.42	---	74.00	54.00	-5.58	Peak
4785.00	40.34	---	9.12	49.46	---	74.00	54.00	-4.54	Peak
6030.00	38.86	---	11.64	50.50	---	74.00	54.00	-3.50	Peak

966 Chamber_B at 3Meter / Vertical									
Frequency (MHz)	Reading-PK (dBuV)	Reading-AV (dBuV)	Correction Factor (dB/m)	Result-PK (dBuV/m)	Result-AV (dBuV/m)	Limit-PK (dBuV/m)	Limit-AV (dBuV/m)	Margin (dB)	Remark
1080.00	48.83	---	-3.72	45.11	---	74.00	54.00	-8.89	Peak
1272.00	47.15	---	-3.05	44.10	---	74.00	54.00	-9.90	Peak
2314.00	58.54	39.80	3.32	61.86	43.12	74.00	54.00	-10.88	AVG
2558.00	59.55	41.89	4.07	63.62	45.96	74.00	54.00	-8.04	AVG
3105.00	42.84	---	5.21	48.05	---	74.00	54.00	-5.95	Peak
4005.00	41.73	---	7.19	48.92	---	74.00	54.00	-5.08	Peak
4785.00	40.78	---	9.12	49.90	---	74.00	54.00	-4.10	Peak

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Average test would be performed if the peak result were greater than the average limit.
3. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
4. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
5. Result = Reading + Correction Factor
Margin = Result - Limit
Remark Peak = Result(PK) - Limit(AV)
Remark AVG = Result(AV) - Limit(AV)



Product Name	Smart Energy Wireless Bridge	Test By	Allen Liu
Test Model	Billion SG600NX-Std	Test Date	2012/12/24
Test Mode	IEEE 802.11n HT20 TX / CH High	Temp. & Humidity	23°C, 52%

966 Chamber_B at 3Meter / Horizontal									
Frequency (MHz)	Reading-PK (dBuV)	Reading-AV (dBuV)	Correction Factor (dB/m)	Result-PK (dBuV/m)	Result-AV (dBuV/m)	Limit-PK (dBuV/m)	Limit-AV (dBuV/m)	Margin (dB)	Remark
1020.00	49.41	---	-3.93	45.48	---	74.00	54.00	-8.52	Peak
1080.00	49.49	---	-3.72	45.77	---	74.00	54.00	-8.23	Peak
2342.00	61.50	41.93	3.41	64.91	45.34	74.00	54.00	-8.66	AVG
2578.00	56.22	38.76	4.11	60.33	42.87	74.00	54.00	-11.13	AVG
3240.00	42.20	---	5.49	47.69	---	74.00	54.00	-6.31	Peak
4620.00	40.91	---	8.69	49.60	---	74.00	54.00	-4.40	Peak
5505.00	39.31	---	10.38	49.69	---	74.00	54.00	-4.31	Peak

966 Chamber_B at 3Meter / Vertical									
Frequency (MHz)	Reading-PK (dBuV)	Reading-AV (dBuV)	Correction Factor (dB/m)	Result-PK (dBuV/m)	Result-AV (dBuV/m)	Limit-PK (dBuV/m)	Limit-AV (dBuV/m)	Margin (dB)	Remark
1080.00	47.26	---	-3.72	43.54	---	74.00	54.00	-10.46	Peak
1300.00	47.36	---	-2.95	44.41	---	74.00	54.00	-9.59	Peak
2346.00	58.99	38.11	3.43	62.42	41.54	74.00	54.00	-12.46	AVG
2580.00	61.53	41.07	4.12	65.65	45.19	74.00	54.00	-8.81	AVG
3255.00	43.67	---	5.52	49.19	---	74.00	54.00	-4.81	Peak
3870.00	42.00	---	6.88	48.88	---	74.00	54.00	-5.12	Peak
5670.00	38.99	---	10.78	49.78	---	74.00	54.00	-4.22	Peak

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Average test would be performed if the peak result were greater than the average limit.
3. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
4. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
5. Result = Reading + Correction Factor
Margin = Result - Limit
Remark Peak = Result(PK) - Limit(AV)
Remark AVG = Result(AV) - Limit(AV)



Product Name	Smart Energy Wireless Bridge	Test By	Allen Liu
Test Model	Billion SG600NX-Std	Test Date	2012/12/24
Test Mode	IEEE 802.11n HT40 TX / CH Low	Temp. & Humidity	23°C, 52%

966 Chamber_B at 3Meter / Horizontal

Frequency (MHz)	Reading-PK (dBuV)	Reading-AV (dBuV)	Correction Factor (dB/m)	Result-PK (dBuV/m)	Result-AV (dBuV/m)	Limit-PK (dBuV/m)	Limit-AV (dBuV/m)	Margin (dB)	Remark
1022.00	50.37	---	-3.92	46.45	---	74.00	54.00	-7.55	Peak
1080.00	50.03	---	-3.72	46.31	---	74.00	54.00	-7.69	Peak
2284.00	57.69	42.62	3.22	60.91	45.84	74.00	54.00	-8.16	AVG
2462.00	60.88	39.15	3.82	64.70	42.97	74.00	54.00	-11.03	AVG
2530.00	56.39	37.11	4.01	60.40	41.12	74.00	54.00	-12.88	AVG
3630.00	41.00	---	6.32	47.32	---	74.00	54.00	-6.68	Peak
4260.00	40.75	---	7.80	48.55	---	74.00	54.00	-5.45	Peak
4665.00	40.10	---	8.81	48.91	---	74.00	54.00	-5.09	Peak

966 Chamber_B at 3Meter / Vertical

Frequency (MHz)	Reading-PK (dBuV)	Reading-AV (dBuV)	Correction Factor (dB/m)	Result-PK (dBuV/m)	Result-AV (dBuV/m)	Limit-PK (dBuV/m)	Limit-AV (dBuV/m)	Margin (dB)	Remark
1350.00	46.20	---	-2.78	43.42	---	74.00	54.00	-10.58	Peak
2288.00	57.36	37.31	3.23	60.59	40.54	74.00	54.00	-13.46	AVG
2460.00	62.36	40.51	3.81	66.17	44.32	74.00	54.00	-9.68	AVG
2536.00	60.25	39.40	4.03	64.28	43.43	74.00	54.00	-10.57	AVG
3225.00	42.05	---	5.46	47.51	---	74.00	54.00	-6.49	Peak
3990.00	41.27	---	7.16	48.42	---	74.00	54.00	-5.58	Peak
4965.00	40.37	---	9.60	49.96	---	74.00	54.00	-4.04	Peak

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Average test would be performed if the peak result were greater than the average limit.
3. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
4. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
5. Result = Reading + Correction Factor
Margin = Result - Limit
Remark Peak = Result(PK) - Limit(AV)
Remark AVG = Result(AV) - Limit(AV)



Product Name	Smart Energy Wireless Bridge	Test By	Allen Liu
Test Model	Billion SG600NX-Std	Test Date	2012/12/24
Test Mode	IEEE 802.11n HT40 TX / CH Middle	Temp. & Humidity	23°C, 52%

966 Chamber_B at 3Meter / Horizontal									
Frequency (MHz)	Reading-PK (dBuV)	Reading-AV (dBuV)	Correction Factor (dB/m)	Result-PK (dBuV/m)	Result-AV (dBuV/m)	Limit-PK (dBuV/m)	Limit-AV (dBuV/m)	Margin (dB)	Remark
1080.00	49.48	---	-3.72	45.76	---	74.00	54.00	-8.24	Peak
1158.00	46.89	---	-3.45	43.45	---	74.00	54.00	-10.55	Peak
2304.00	62.36	42.72	3.28	65.64	46.00	74.00	54.00	-8.00	AVG
2556.00	57.12	38.51	4.07	61.19	42.58	74.00	54.00	-11.42	AVG
3405.00	42.18	---	5.83	48.00	---	74.00	54.00	-6.00	Peak
4755.00	39.86	---	9.04	48.91	---	74.00	54.00	-5.09	Peak
5745.00	38.90	---	10.96	49.87	---	74.00	54.00	-4.13	Peak

966 Chamber_B at 3Meter / Vertical									
Frequency (MHz)	Reading-PK (dBuV)	Reading-AV (dBuV)	Correction Factor (dB/m)	Result-PK (dBuV/m)	Result-AV (dBuV/m)	Limit-PK (dBuV/m)	Limit-AV (dBuV/m)	Margin (dB)	Remark
1080.00	47.58	---	-3.72	43.86	---	74.00	54.00	-10.14	Peak
1920.00	46.16	---	1.53	47.69	---	74.00	54.00	-6.31	Peak
2310.00	58.66	38.96	3.30	61.96	42.26	74.00	54.00	-11.74	AVG
2542.00	61.34	42.52	4.04	65.38	46.56	74.00	54.00	-7.44	AVG
3675.00	41.40	---	6.43	47.83	---	74.00	54.00	-6.17	Peak
5520.00	38.95	---	10.42	49.37	---	74.00	54.00	-4.63	Peak
6285.00	38.64	---	12.17	50.81	---	74.00	54.00	-3.19	Peak

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Average test would be performed if the peak result were greater than the average limit.
3. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
4. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
5. Result = Reading + Correction Factor
Margin = Result - Limit
Remark Peak = Result(PK) - Limit(AV)
Remark AVG = Result(AV) - Limit(AV)



Product Name	Smart Energy Wireless Bridge	Test By	Allen Liu
Test Model	Billion SG600NX-Std	Test Date	2012/12/24
Test Mode	IEEE 802.11n HT40 TX / CH High	Temp. & Humidity	23°C, 52%

966 Chamber_B at 3Meter / Horizontal									
Frequency (MHz)	Reading-PK (dBuV)	Reading-AV (dBuV)	Correction Factor (dB/m)	Result-PK (dBuV/m)	Result-AV (dBuV/m)	Limit-PK (dBuV/m)	Limit-AV (dBuV/m)	Margin (dB)	Remark
1020.00	51.08	---	-3.93	47.15	---	74.00	54.00	-6.85	Peak
1080.00	48.79	---	-3.72	45.07	---	74.00	54.00	-8.93	Peak
2324.00	63.27	46.21	3.35	66.62	49.56	74.00	54.00	-4.44	AVG
2568.00	56.21	37.22	4.09	60.30	41.31	74.00	54.00	-12.69	AVG
3990.00	40.84	---	7.16	48.00	---	74.00	54.00	-6.00	Peak
4830.00	39.81	---	9.24	49.05	---	74.00	54.00	-4.95	Peak
5745.00	38.51	---	10.96	49.48	---	74.00	54.00	-4.52	Peak

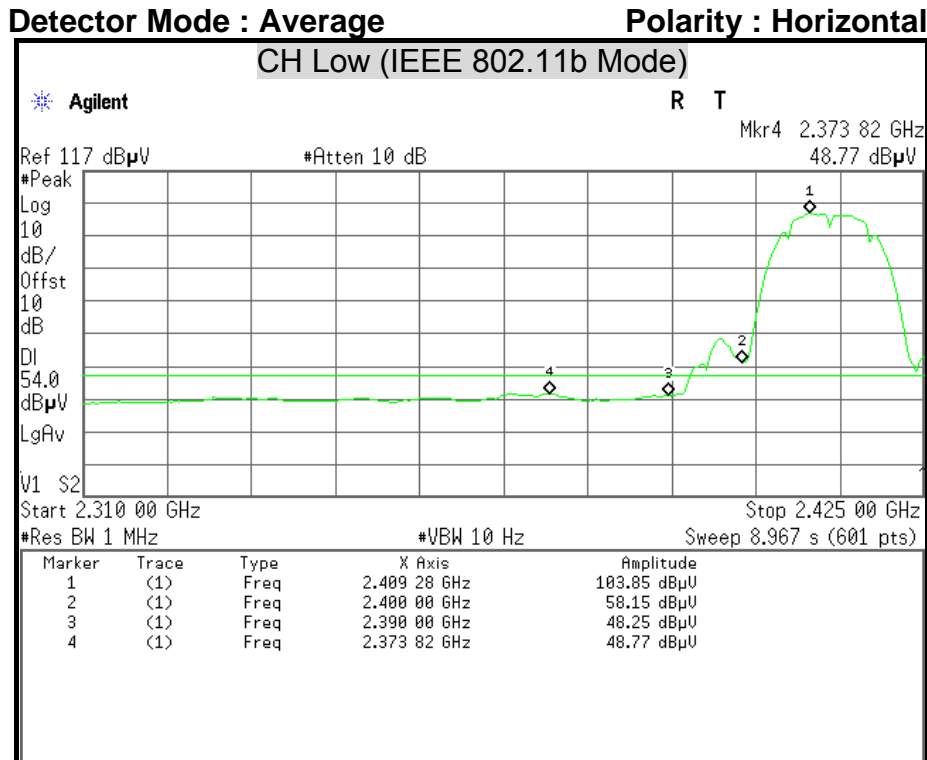
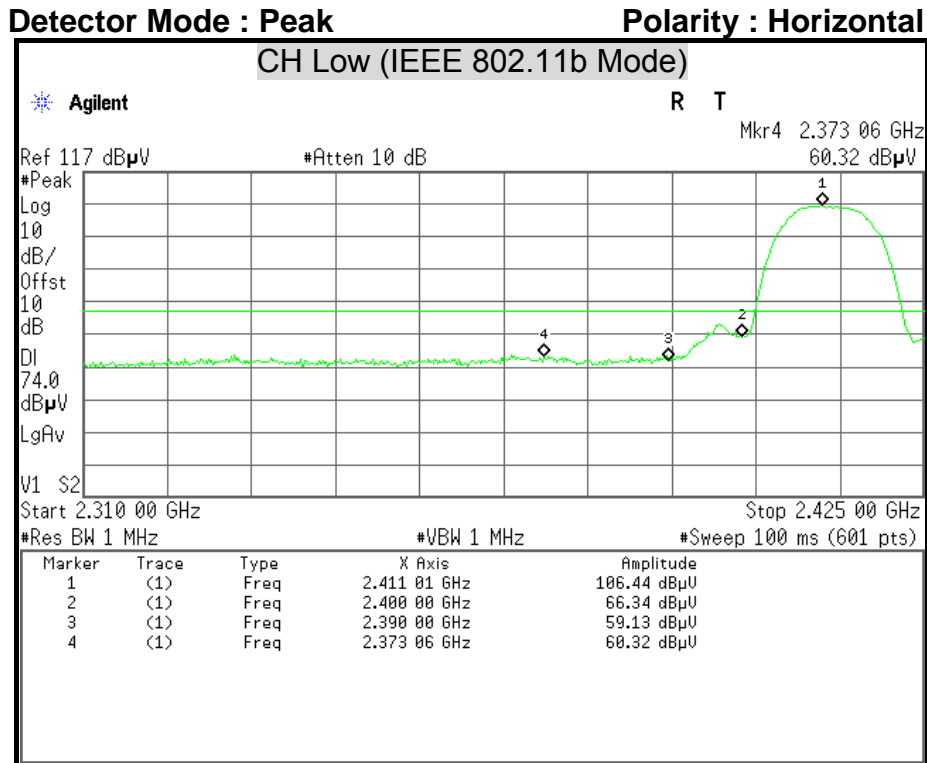
966 Chamber_B at 3Meter / Vertical									
Frequency (MHz)	Reading-PK (dBuV)	Reading-AV (dBuV)	Correction Factor (dB/m)	Result-PK (dBuV/m)	Result-AV (dBuV/m)	Limit-PK (dBuV/m)	Limit-AV (dBuV/m)	Margin (dB)	Remark
1080.00	47.01	---	-3.72	43.29	---	74.00	54.00	-10.71	Peak
1890.00	45.54	---	1.26	46.80	---	74.00	54.00	-7.20	Peak
2318.00	63.55	39.87	3.33	66.88	43.20	74.00	54.00	-10.80	AVG
2554.00	60.33	45.36	4.06	64.39	49.42	74.00	54.00	-4.58	AVG
3675.00	42.44	---	6.43	48.86	---	74.00	54.00	-5.14	Peak
4755.00	40.97	---	9.04	50.01	---	74.00	54.00	-3.99	Peak
5625.00	39.66	---	10.67	50.34	---	74.00	54.00	-3.66	Peak

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Average test would be performed if the peak result were greater than the average limit.
3. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
4. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
5. Result = Reading + Correction Factor
Margin = Result - Limit
Remark Peak = Result(PK) - Limit(AV)
Remark AVG = Result(AV) - Limit(AV)



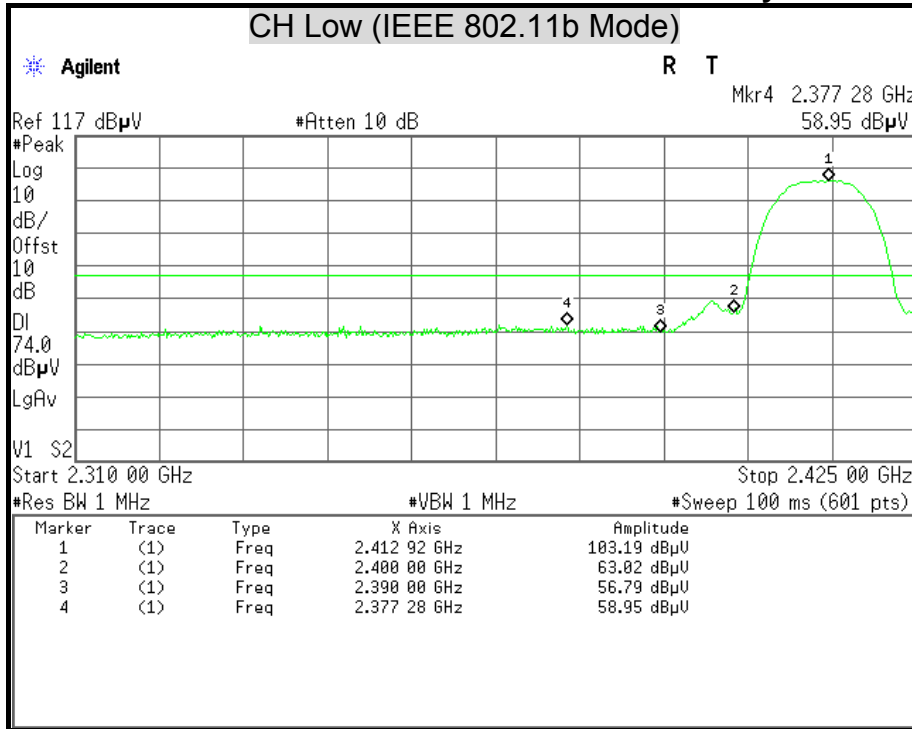
Restricted Band Edges





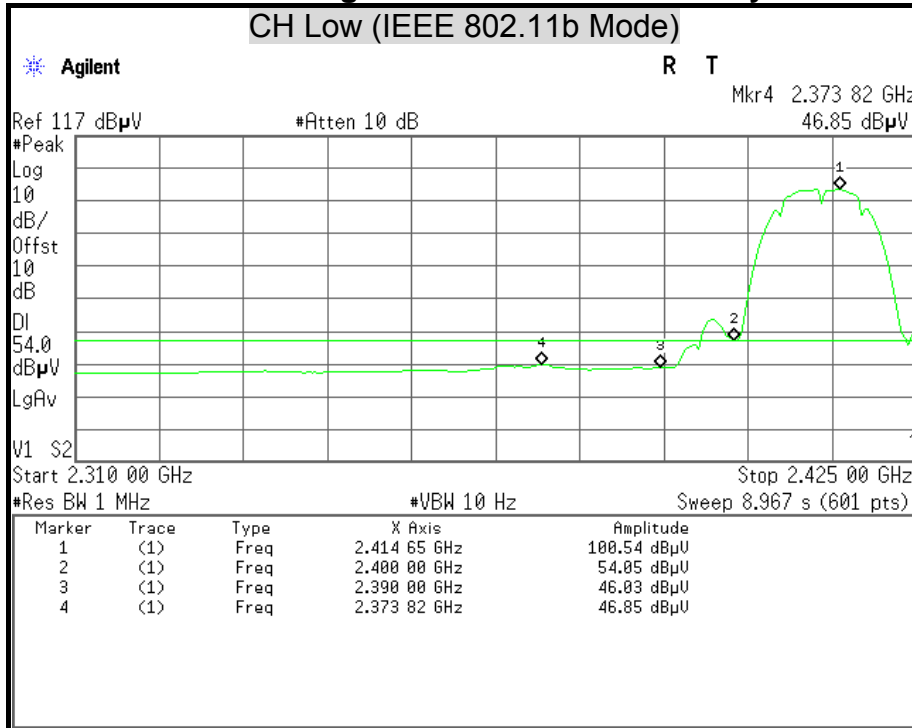
Detector Mode : Peak

Polarity : Vertical



Detector Mode : Average

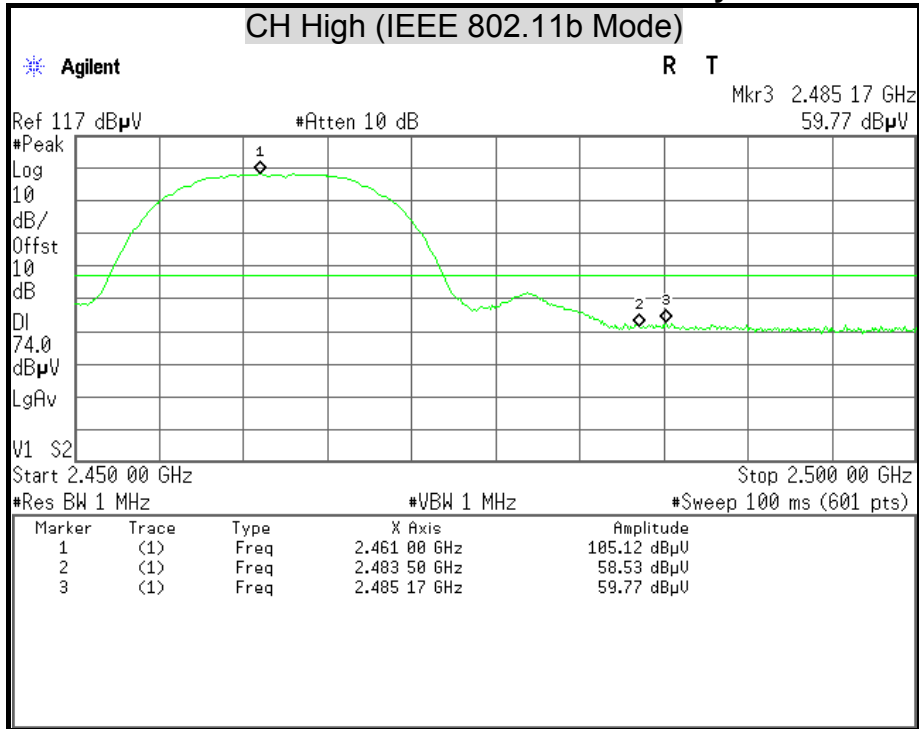
Polarity : Vertical





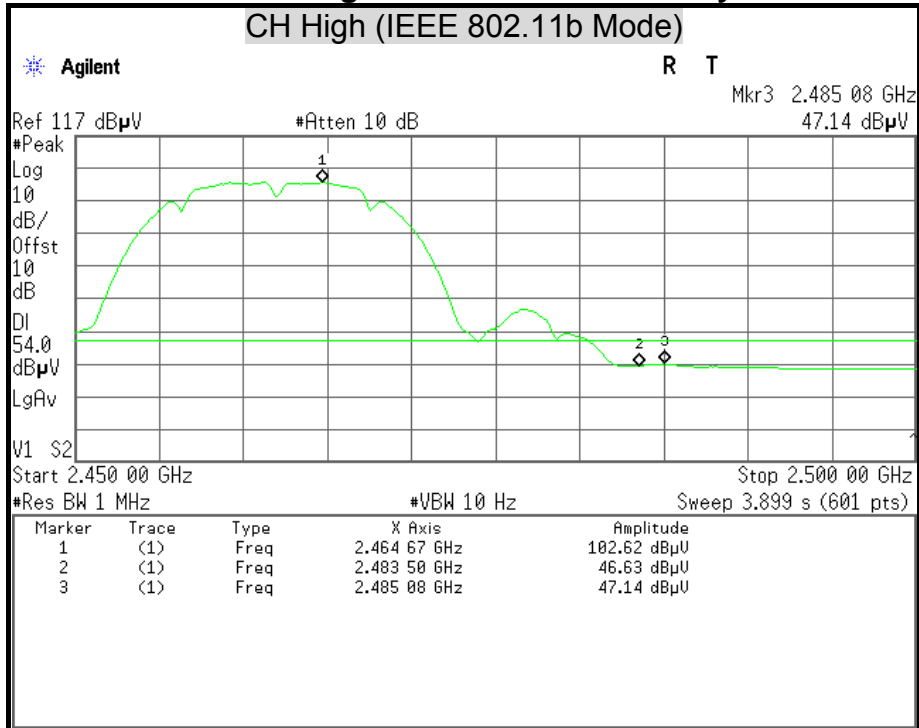
Detector Mode : Peak

Polarity : Horizontal



Detector Mode : Average

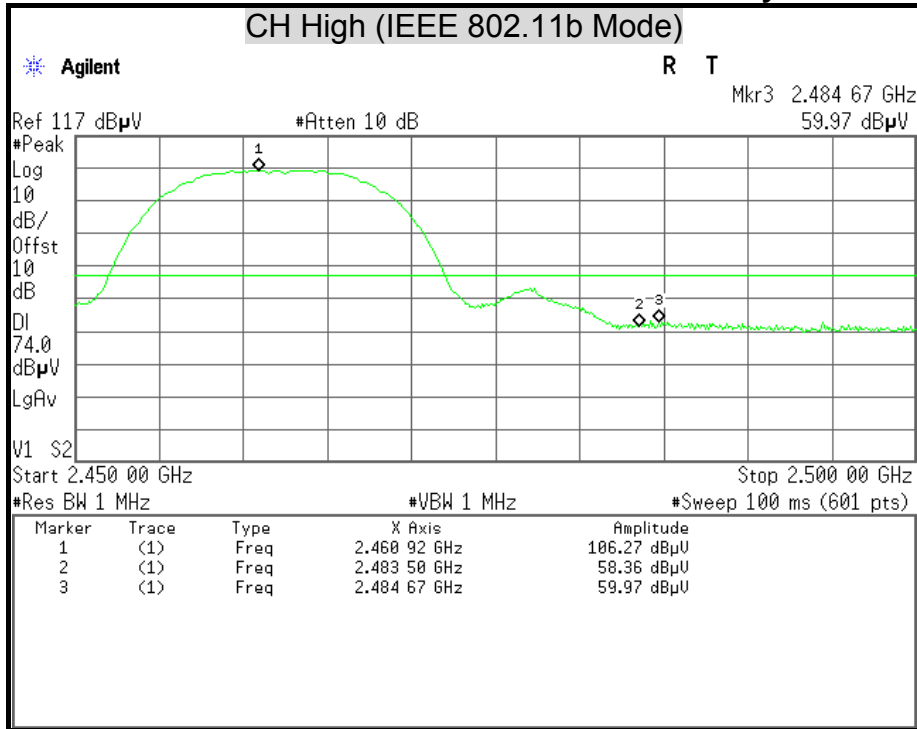
Polarity : Horizontal





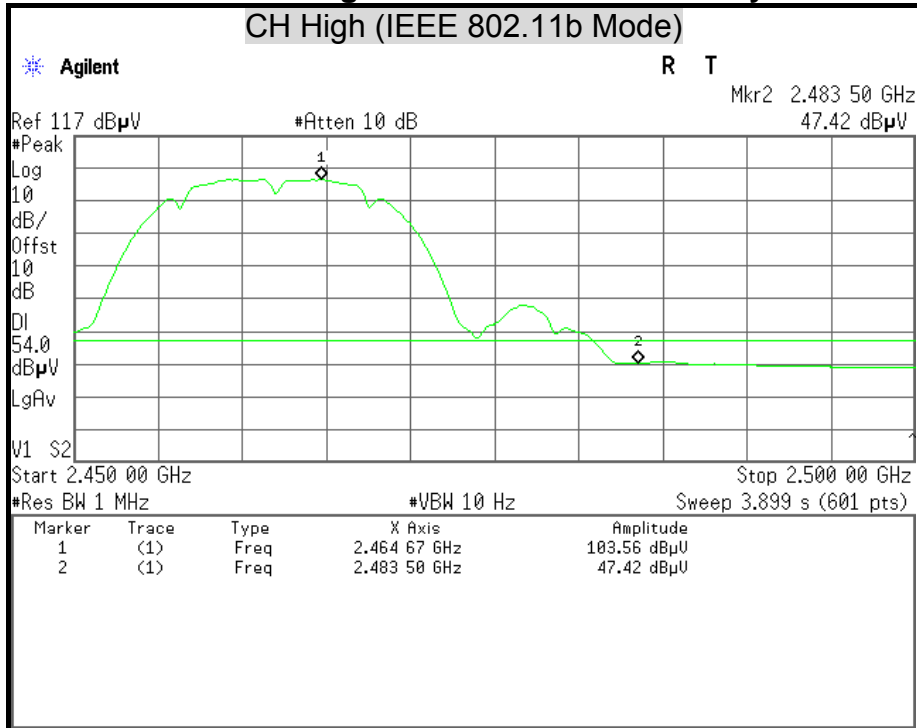
Detector Mode : Peak

Polarity : Vertical



Detector Mode : Average

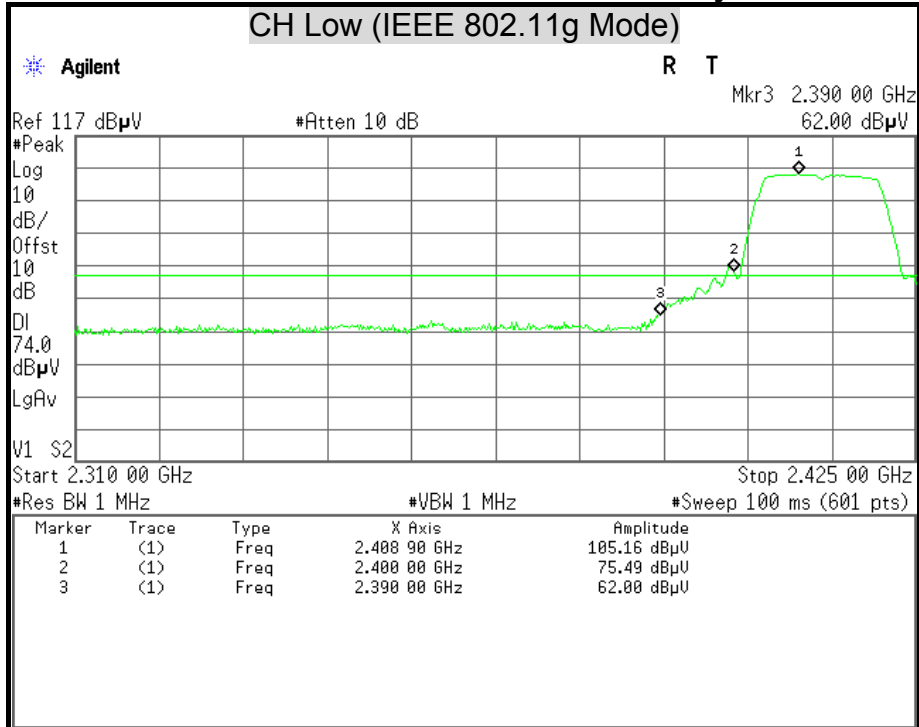
Polarity : Vertical





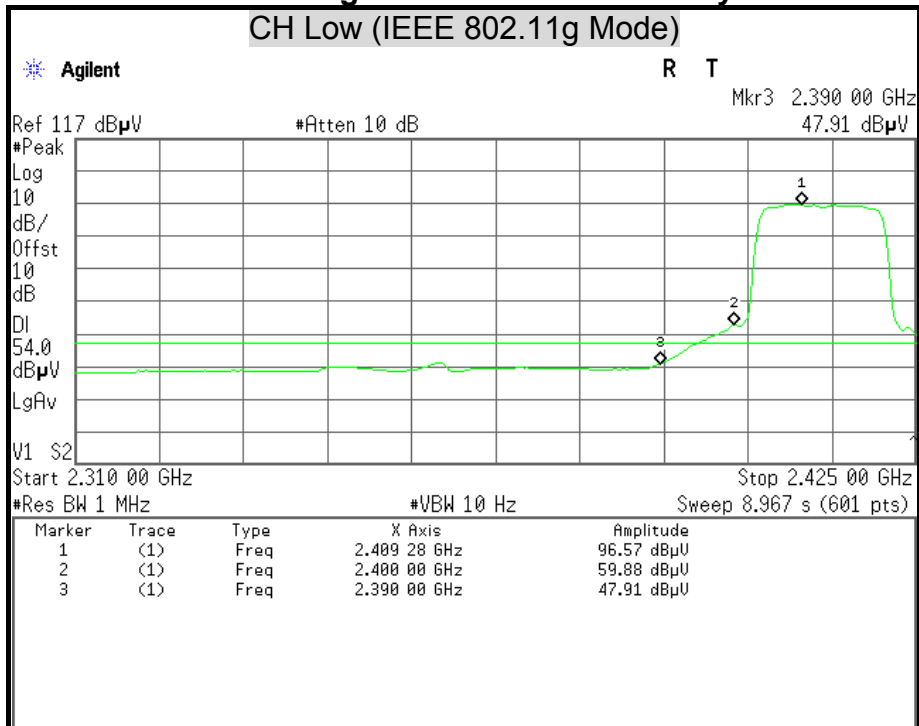
Detector Mode : Peak

Polarity : Horizontal



Detector Mode : Average

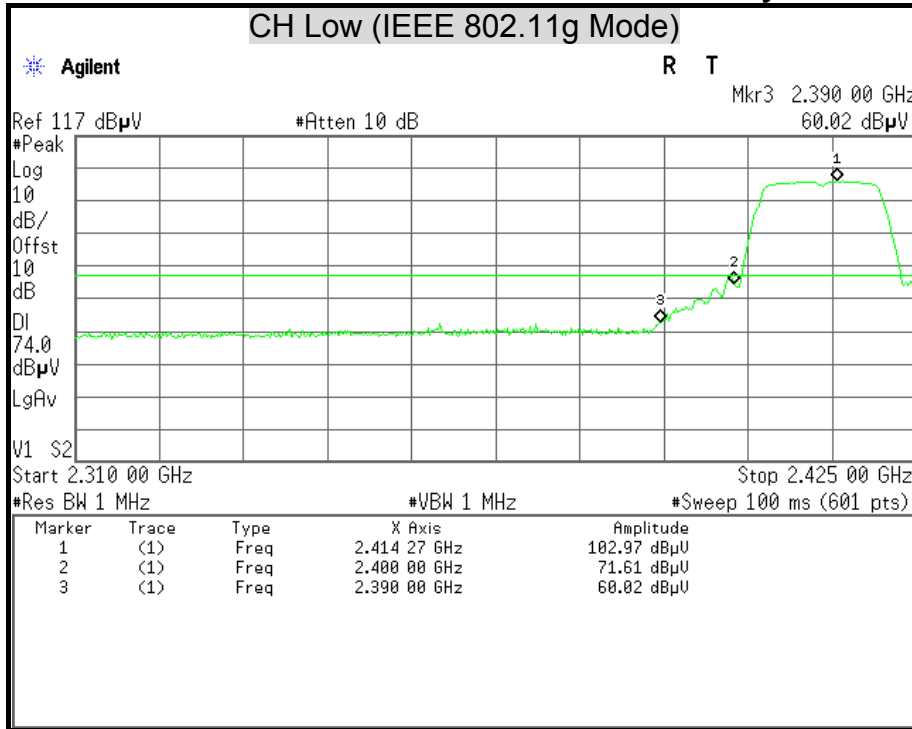
Polarity : Horizontal





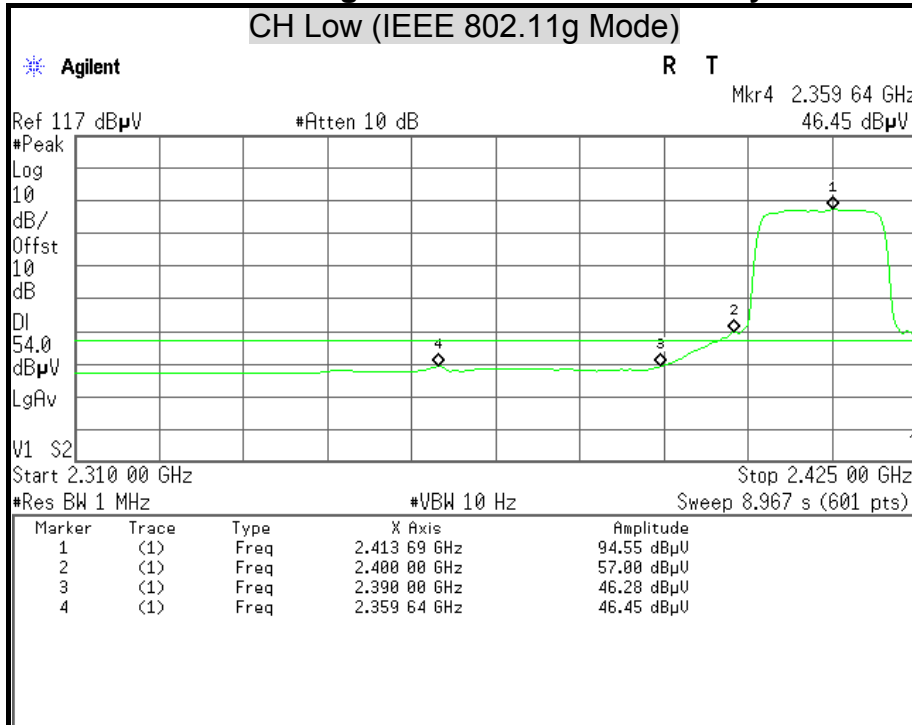
Detector Mode : Peak

Polarity : Vertical



Detector Mode : Average

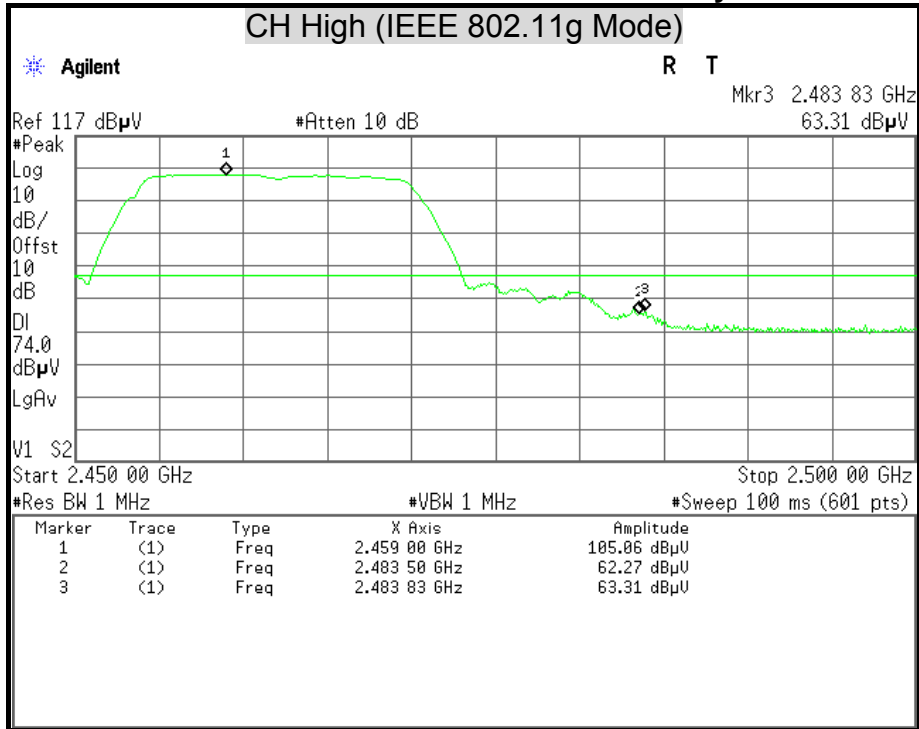
Polarity : Vertical





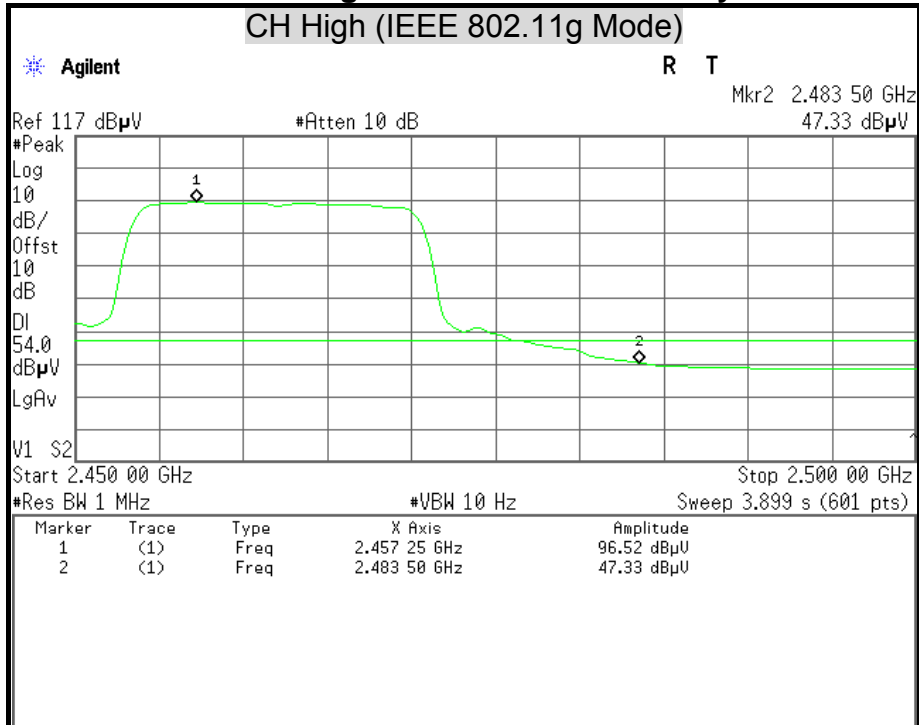
Detector Mode : Peak

Polarity : Horizontal



Detector Mode : Average

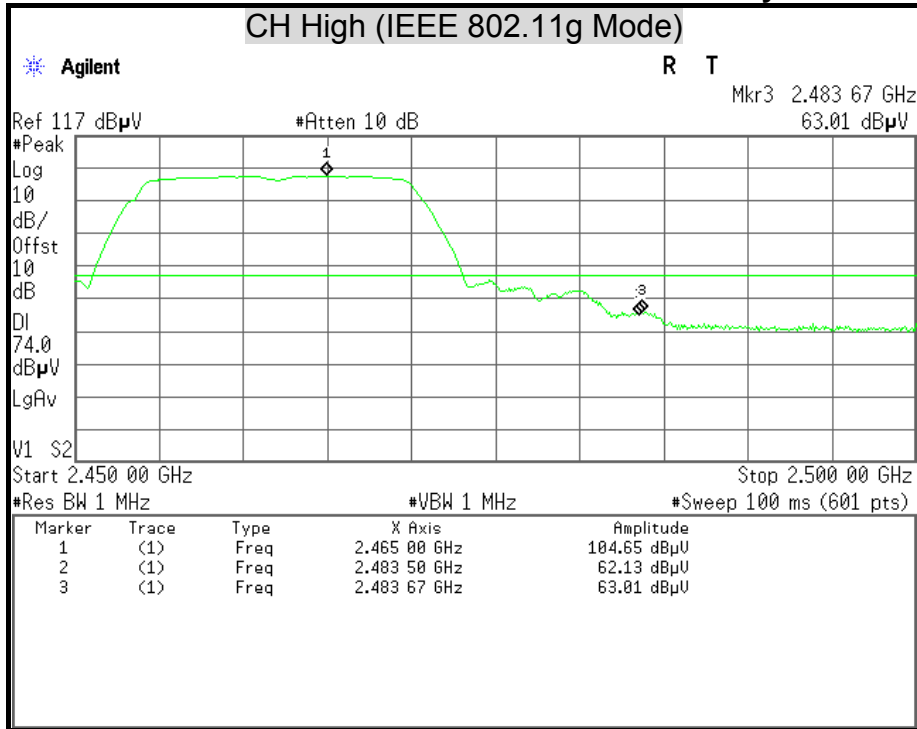
Polarity : Horizontal





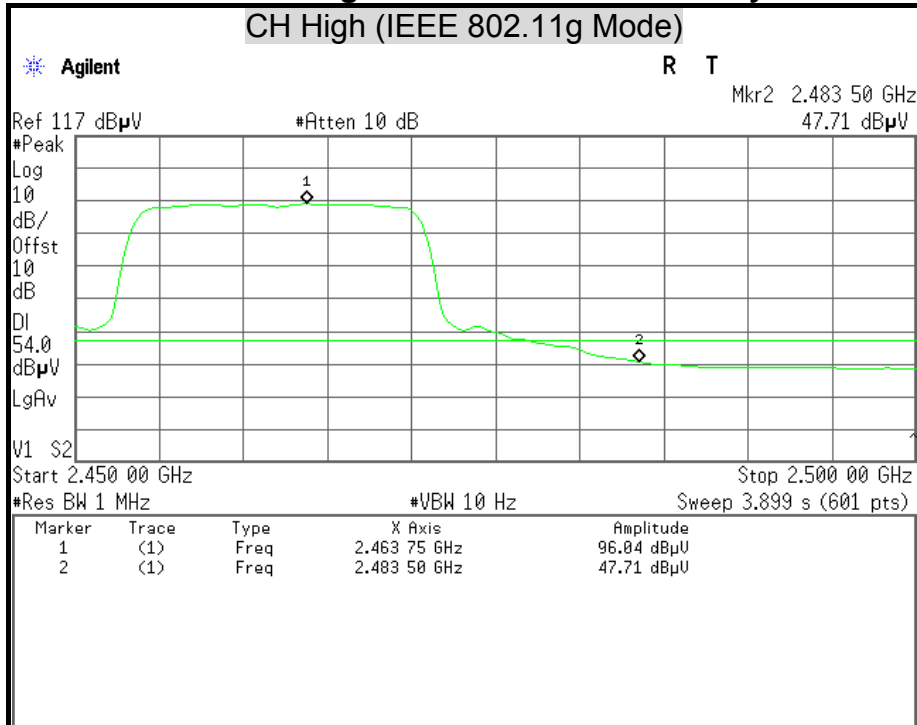
Detector Mode : Peak

Polarity : Vertical



Detector Mode : Average

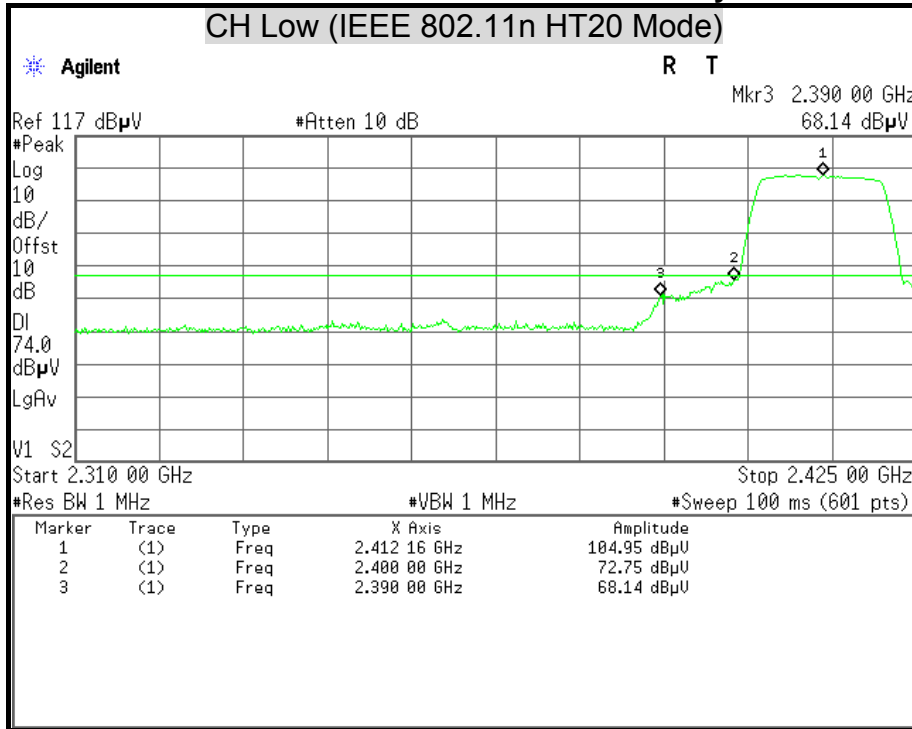
Polarity : Vertical





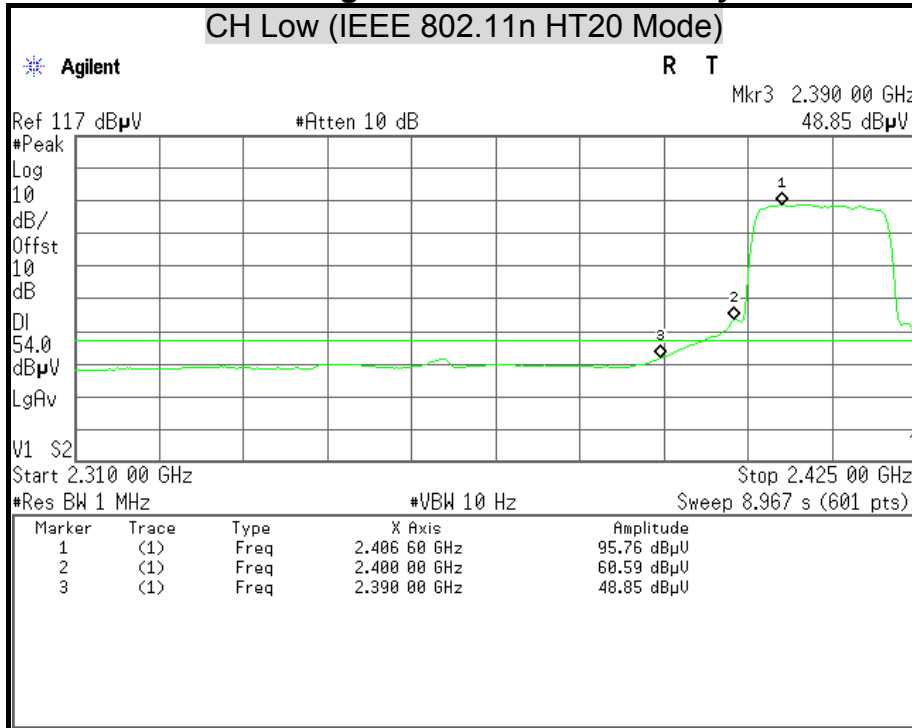
Detector Mode : Peak

Polarity : Horizontal



Detector Mode : Average

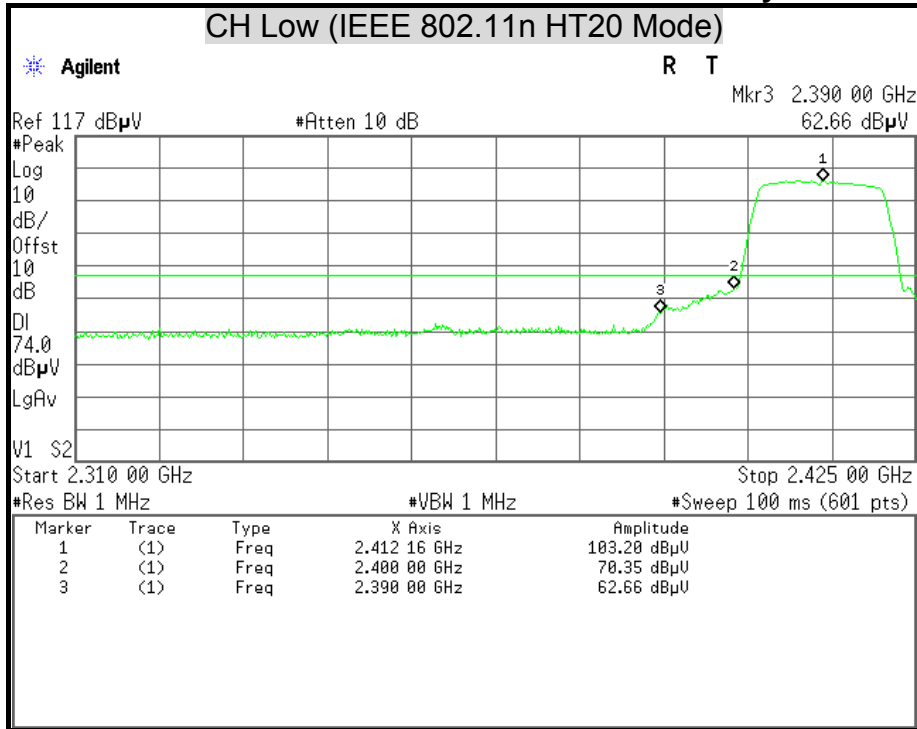
Polarity : Horizontal





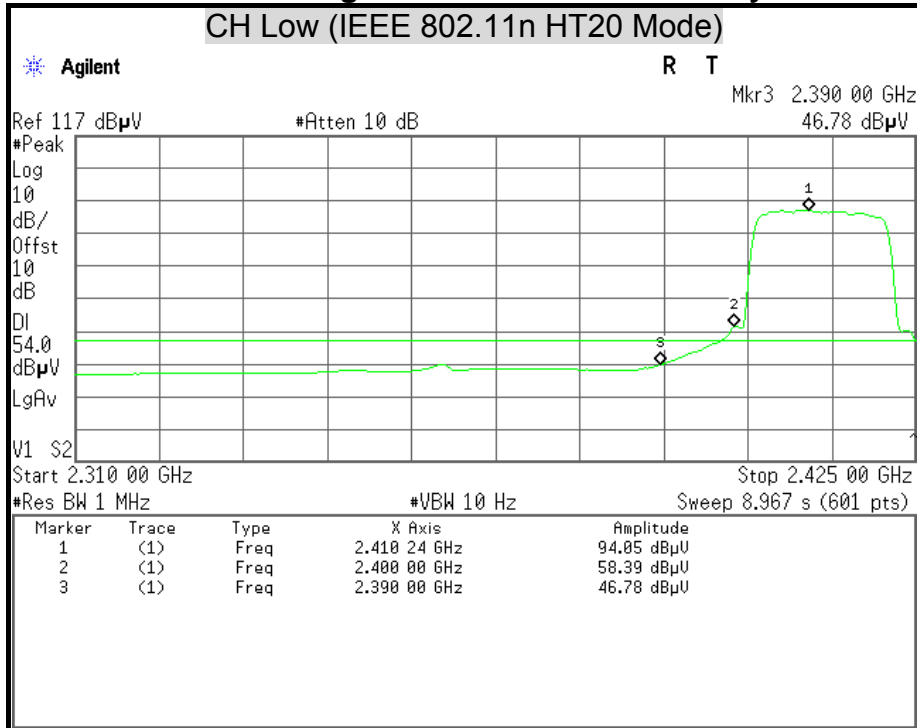
Detector Mode : Peak

Polarity : Vertical



Detector Mode : Average

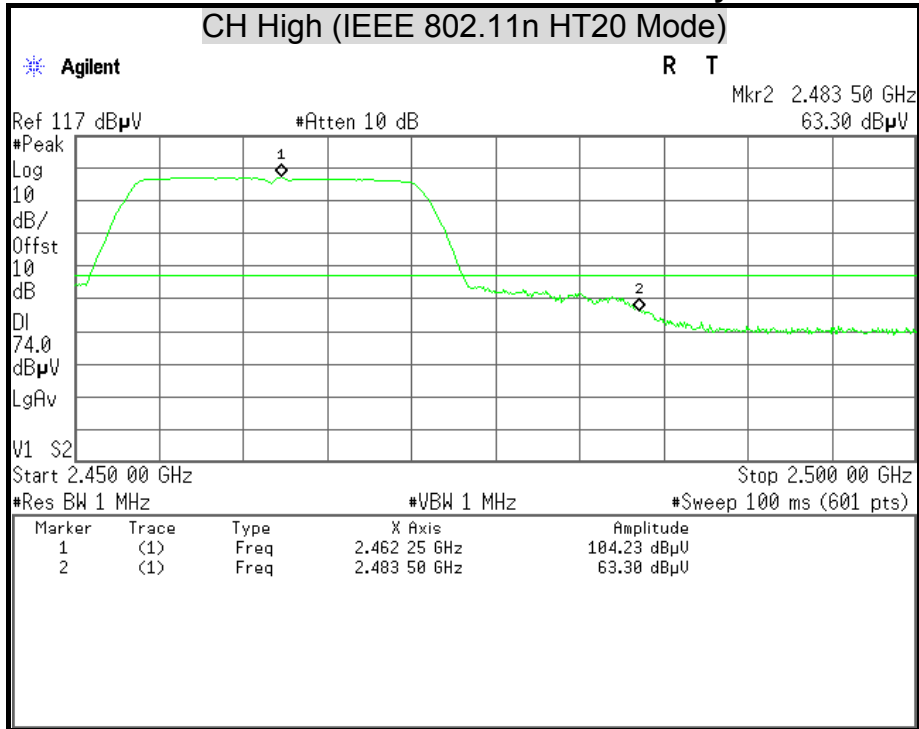
Polarity : Vertical





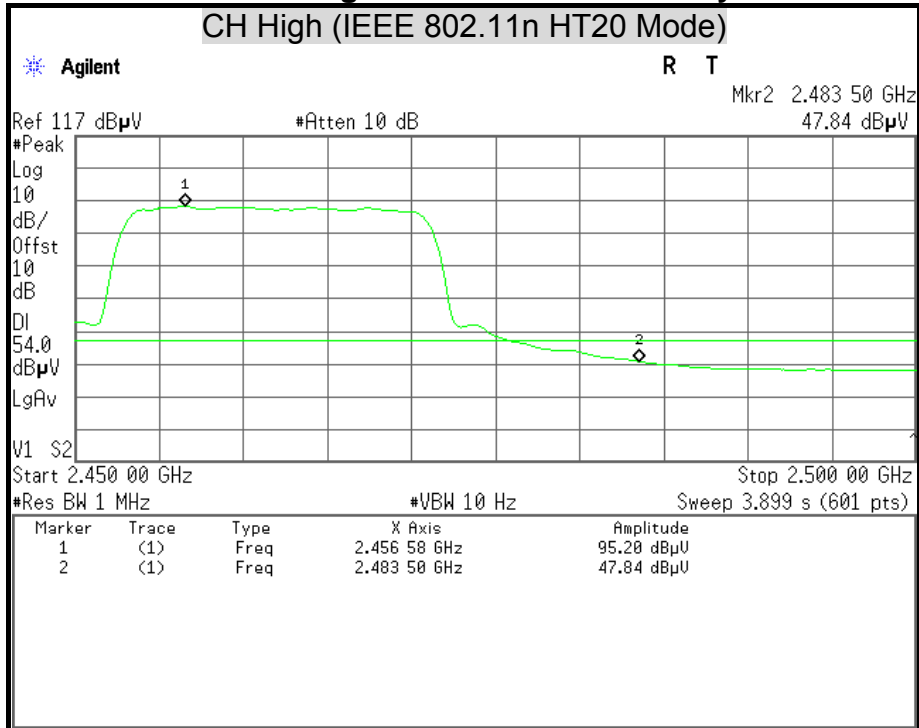
Detector Mode : Peak

Polarity : Horizontal



Detector Mode : Average

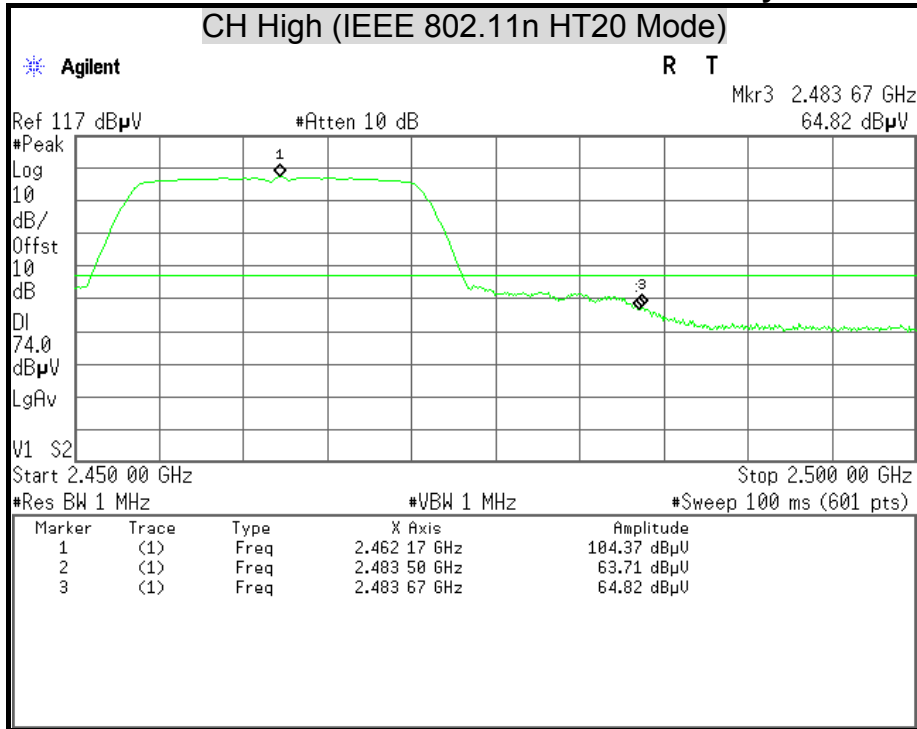
Polarity : Horizontal





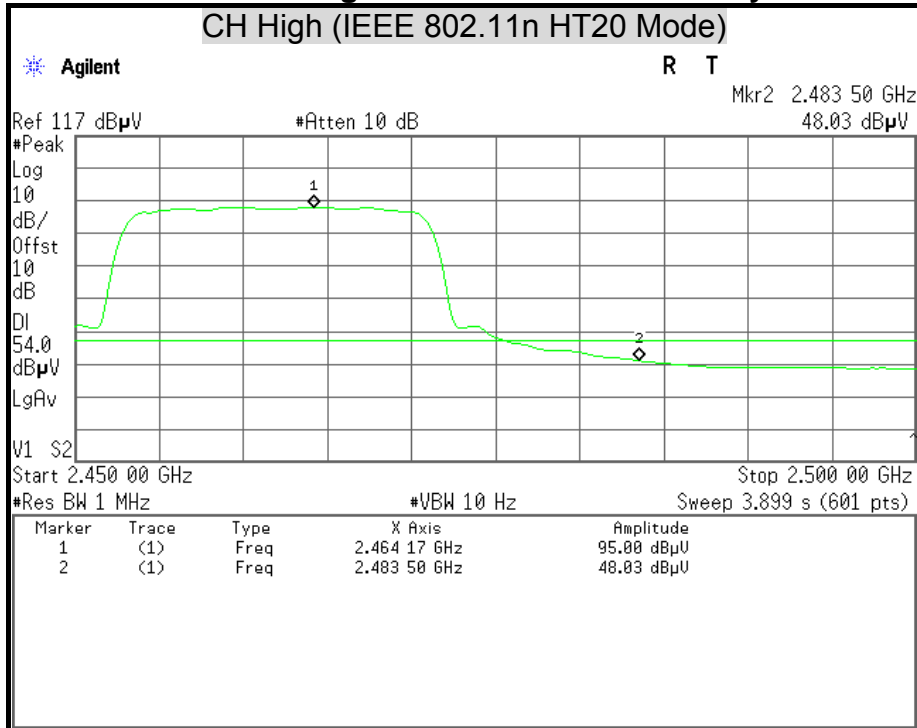
Detector Mode : Peak

Polarity : Vertical



Detector Mode : Average

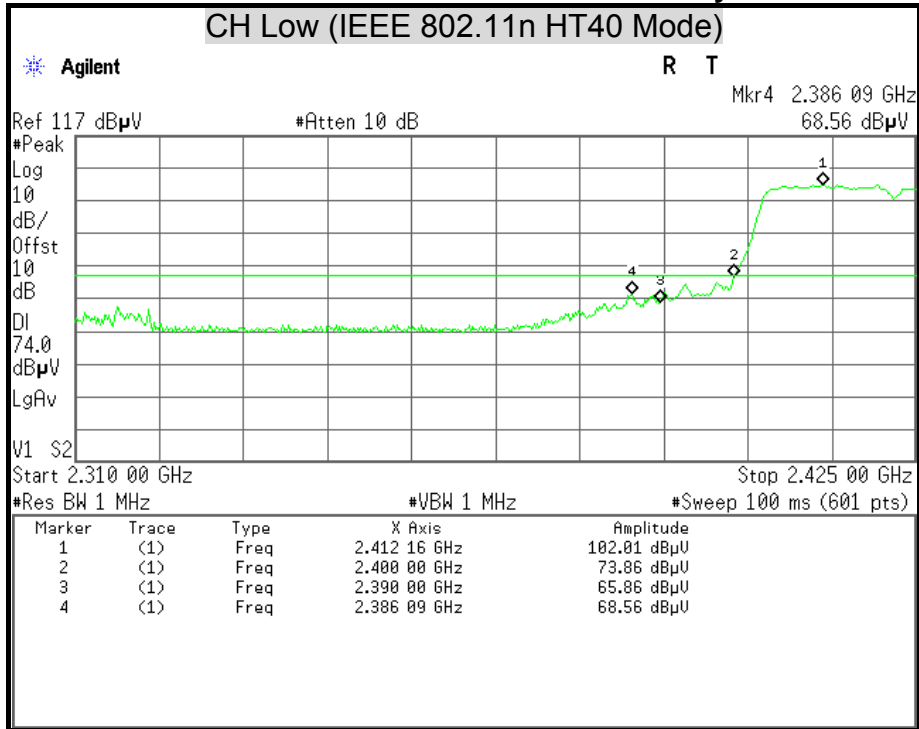
Polarity : Vertical





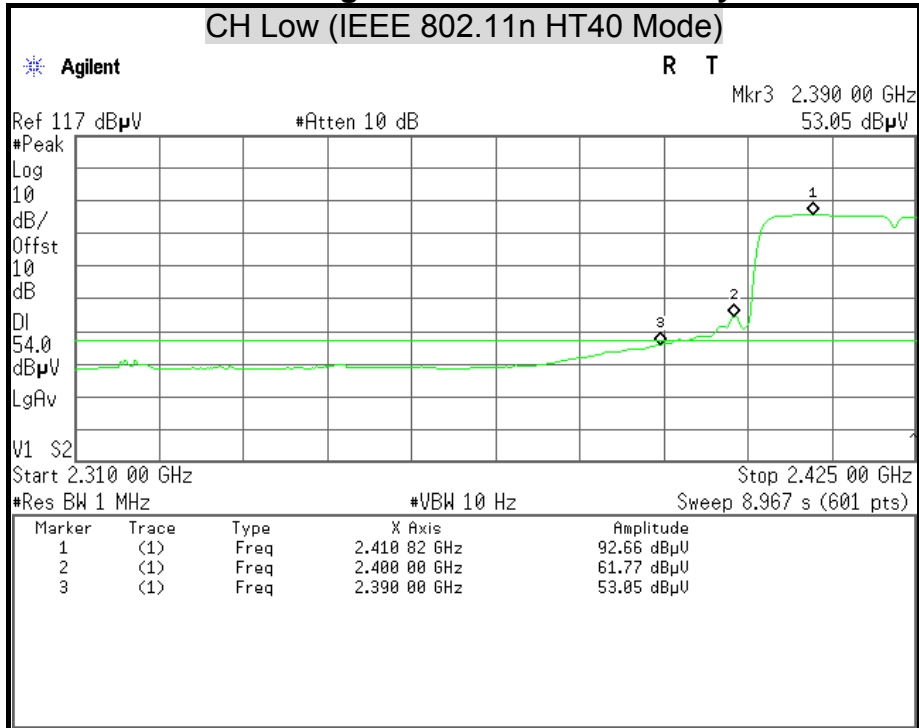
Detector Mode : Peak

Polarity : Horizontal



Detector Mode : Average

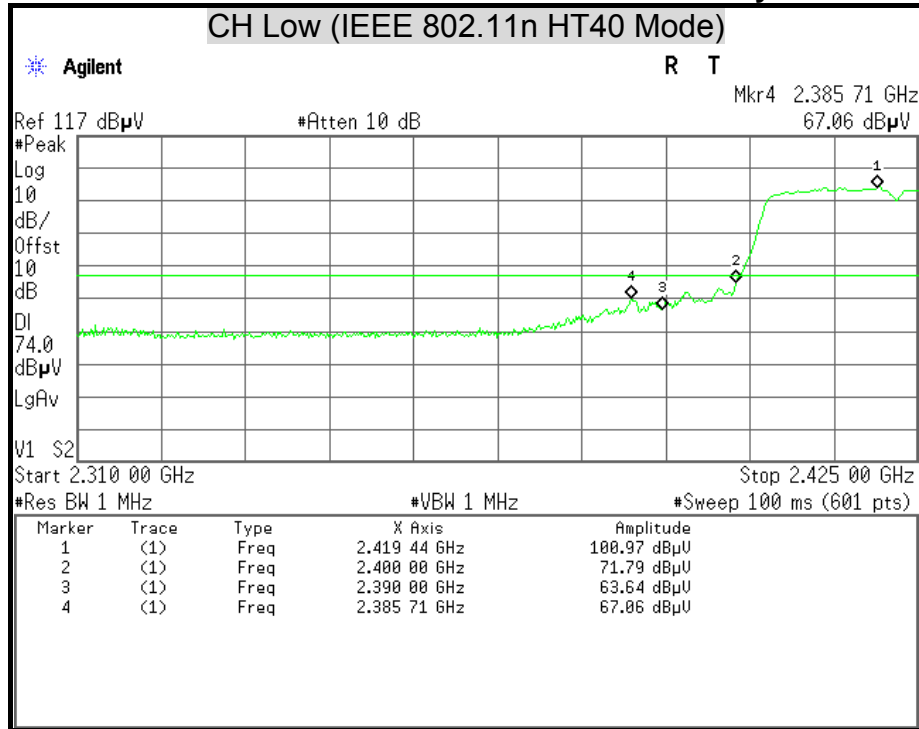
Polarity : Horizontal





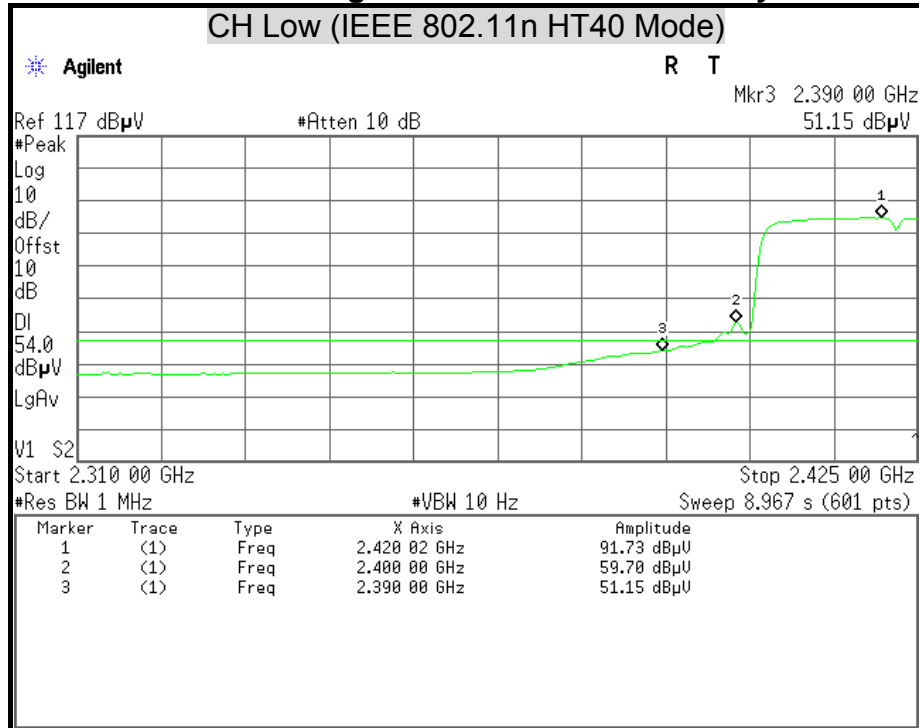
Detector Mode : Peak

Polarity : Vertical



Detector Mode : Average

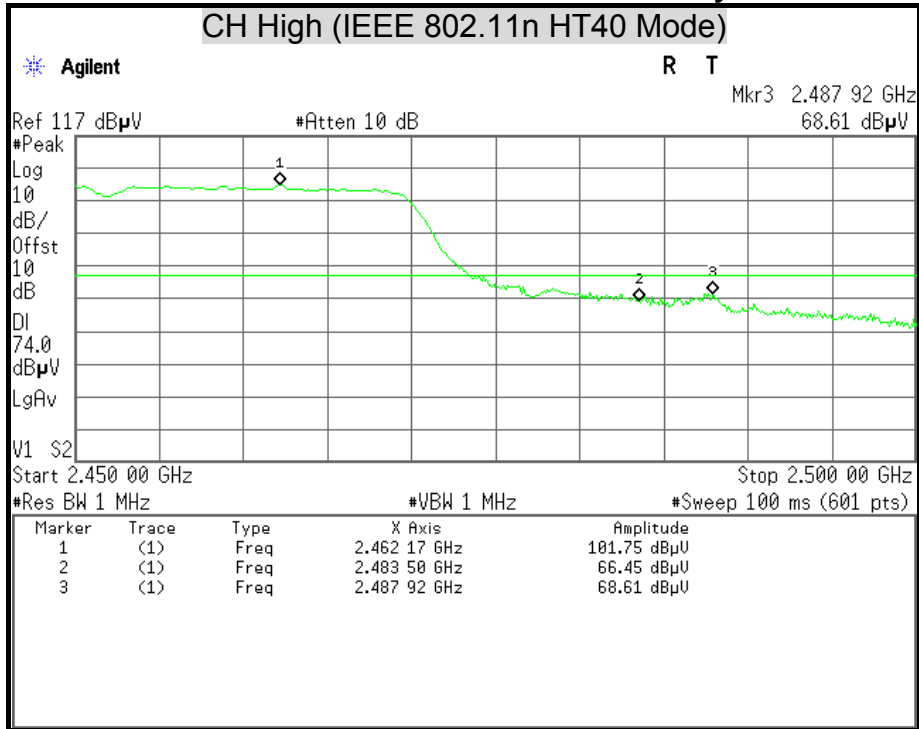
Polarity : Vertical





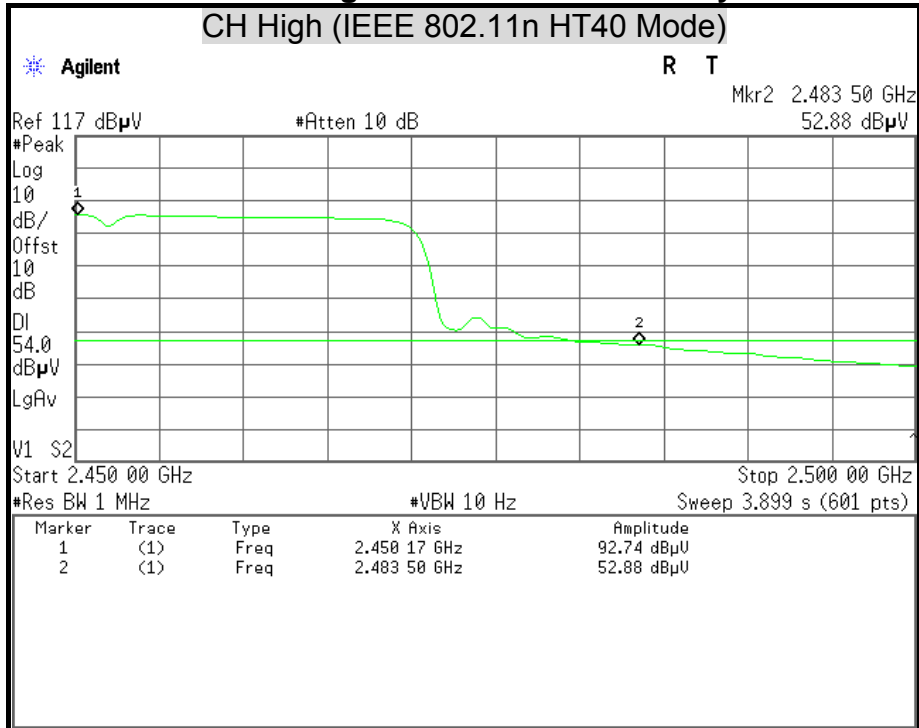
Detector Mode : Peak

Polarity : Horizontal



Detector Mode : Average

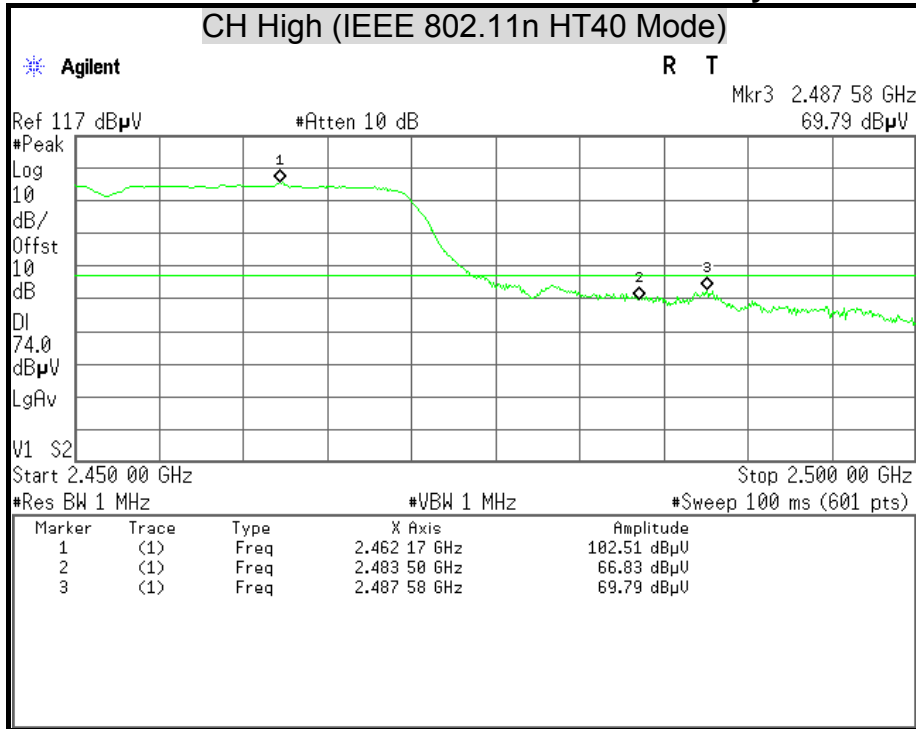
Polarity : Horizontal





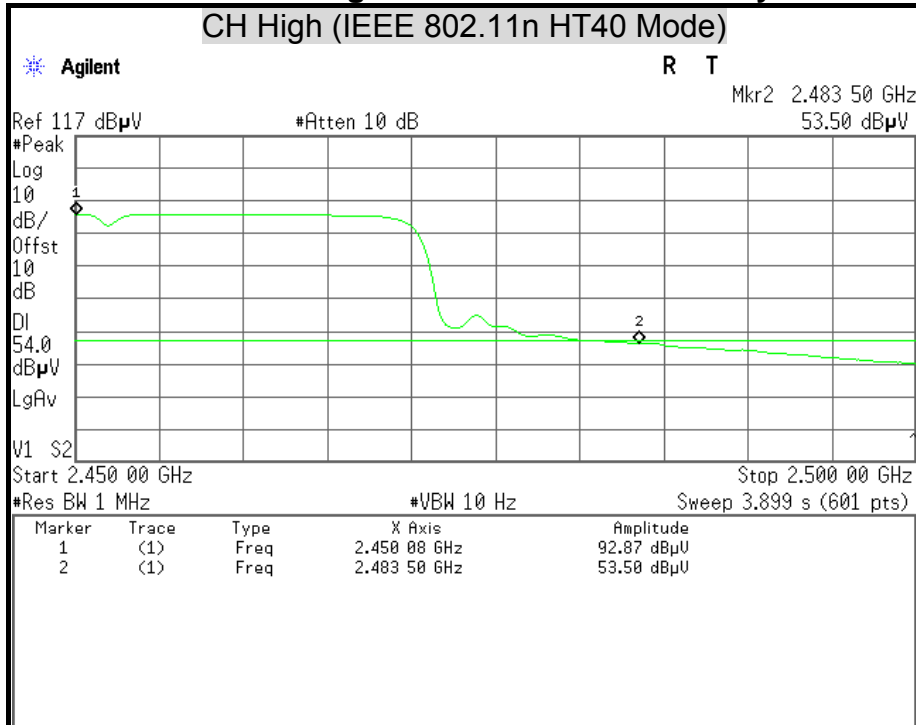
Detector Mode : Peak

Polarity : Vertical



Detector Mode : Average

Polarity : Vertical





7.6 CONDUCTED EMISSION

LIMITS

§ 15.207 (a) Except as shown in paragraph (b) and (c) this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 μ H/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

Frequency Range (MHz)	Conducted Limit (dB μ v)	
	Quasi-peak	Average
0.15 - 0.50	66 to 56	56 to 46
0.50 - 5.00	56	46
5.00 - 30.0	60	50

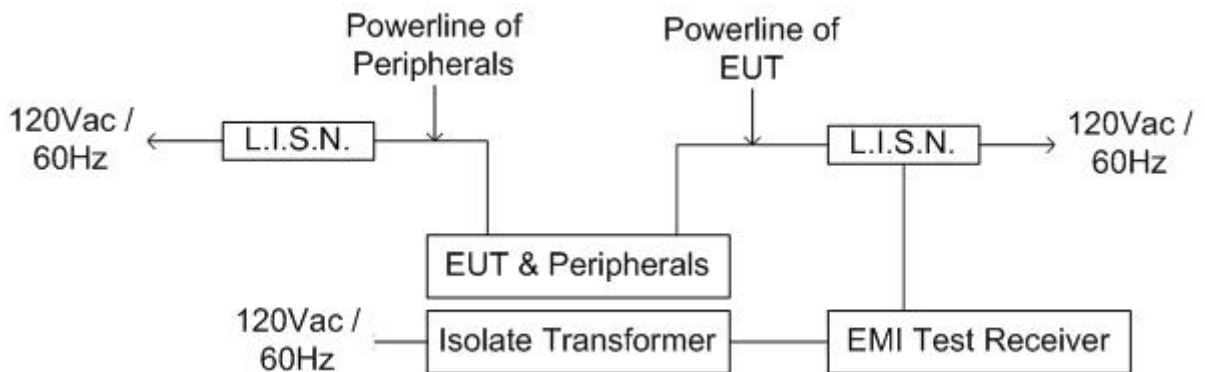
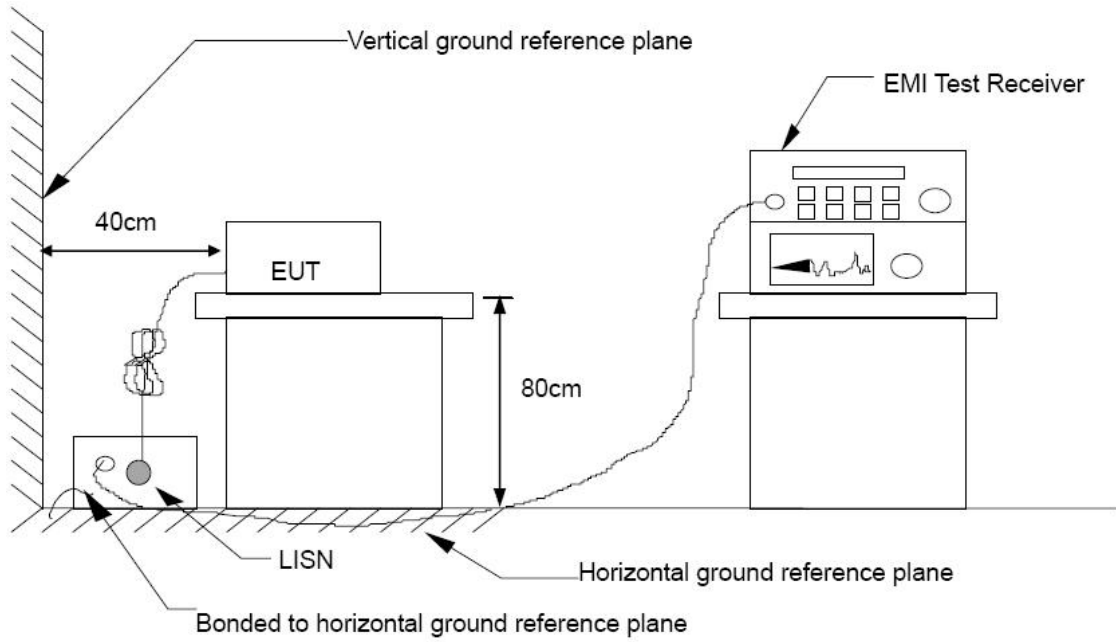
TEST EQUIPMENT

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
L.I.S.N	SCHWARZBECK	NSLK 8127	8127-465	08/07/2013
L.I.S.N	SCHWARZBECK	NSLK 8127	8127-473	03/07/2014
EMI Receiver	ROHDE & SCHWARZ	ESCS 30	835418/008	10/16/2013
Pulse Limiter	ROHDE & SCHWARZ	ESH3-Z2	100117	07/03/2013

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



TEST SETUP





TEST PROCEDURE

The basic test procedure was in accordance with ANSI C63.4:2003.

The test procedure is performed in a 4m × 3m × 2.4m (L×W×H) shielded room.

The EUT along with its peripherals were placed on a 1.0m (W) × 1.5m (L) and 0.8m in height wooden table and the EUT was adjusted to maintain a 0.4 meter space from a vertical reference plane.

The EUT was connected to power mains through a line impedance stabilization network (LISN) which provides 50 ohm coupling impedance for measuring instrument and the chassis ground was bounded to the horizontal ground plane of shielded room. All peripherals were connected to the second LISN and the chassis ground also bounded to the horizontal ground plane of shielded room.

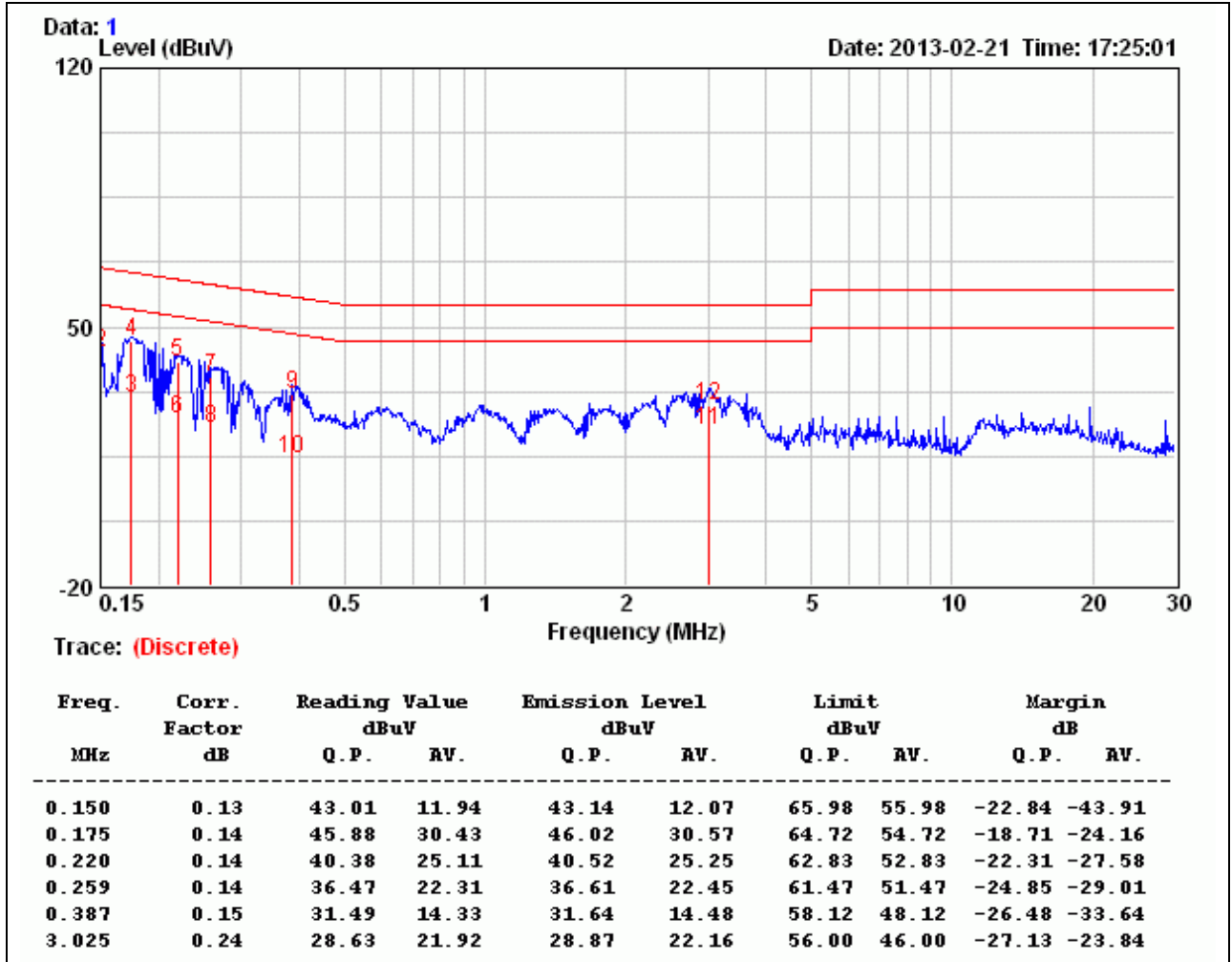
The EUT was located so that the distance between the boundary of the EUT and the closest surface of the LISN is 0.8 m. Where a mains flexible cord was provided by the manufacturer shall be 1 m long, or if in excess of 1 m, the excess cable was folded back and forth as far as possible so as to form a bundle not exceeding 0.4 m in length.



TEST RESULTS

Product Name	Smart Energy Wireless Bridge	Test By	Waternil Guan
Test Model	Billion SG600NX-Std	Test Date	2013/02/21
Test Mode	Normal Operating	Temp. & Humidity	20°C, 60%

LINE



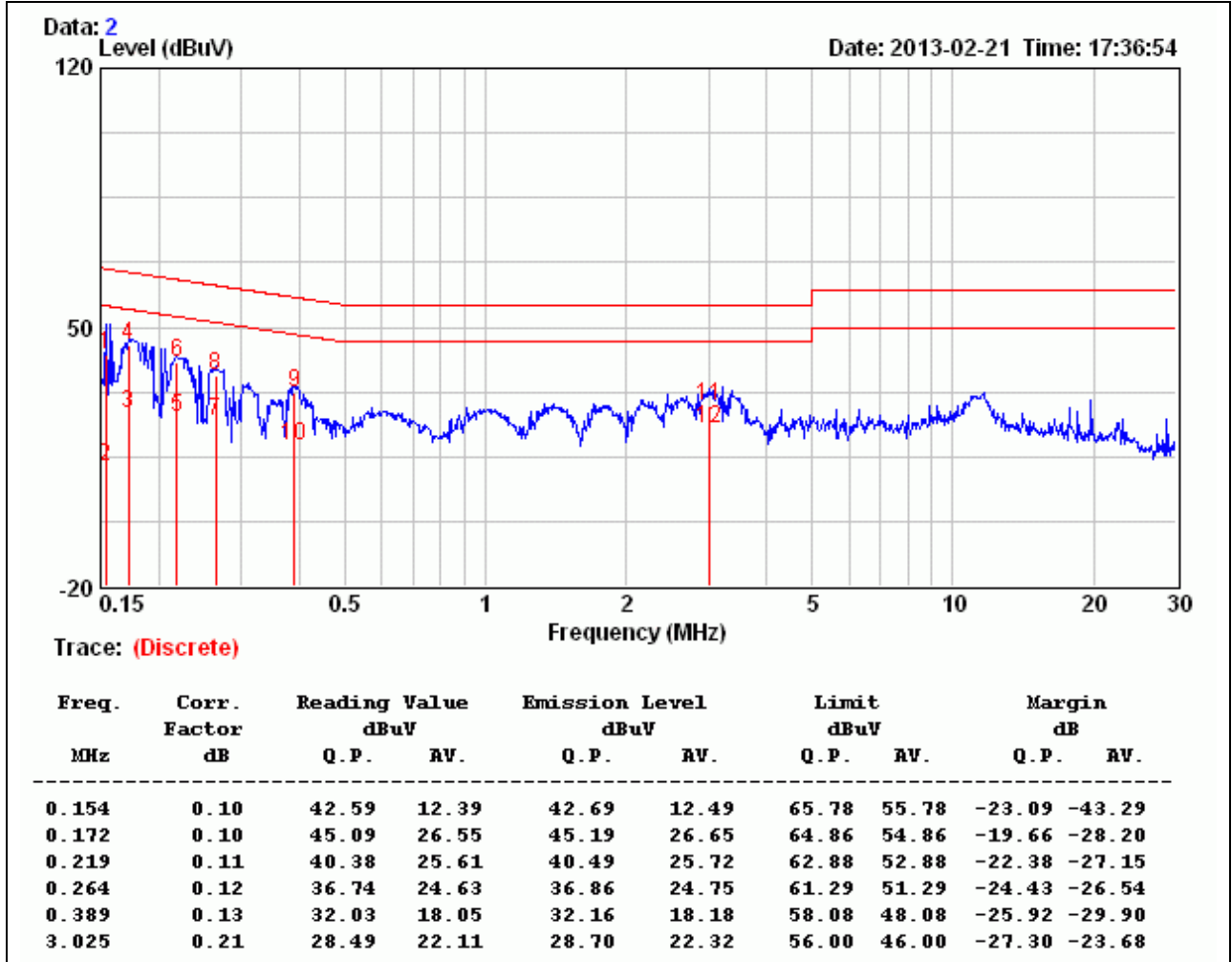
Remark:

1. Correction Factor = Insertion loss + Cable loss
2. Emission level = Reading Value + Correction factor
3. Margin value = Emission level - Limit value



Product Name	Smart Energy Wireless Bridge	Test By	Waternil Guan
Test Model	Billion SG600NX-Std	Test Date	2013/02/21
Test Mode	Normal Operating	Temp. & Humidity	20°C, 60%

NEUTRAL



Remark:

1. Correction Factor = Insertion loss + Cable loss
2. Emission level = Reading value + Correction factor
3. Margin value = Emission level - Limit value



APPENDIX I 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:

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

Changing to units of mW and cm, using:

$$P (mW) = P (W) / 1000 \text{ and}$$

$$d (cm) = d(m) / 100$$

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 / cm²



LIMIT

Power Density Limit, S=1.0mW/cm²

TEST RESULTS

Mode	Antenna Gain (dBi)	Minimum separation distance (cm)	Output Power (dBm)	Numeric antenna gain (mW)	Power Density Limit (mW/cm ²)	Power Density at 20cm (mW/cm ²)
IEEE 802.11b	2	20	16.00	1.58	1.00	0.012552
IEEE 802.11g	2	20	20.96	1.58	1.00	0.039330
IEEE 802.11n HT20	2	20	20.50	1.58	1.00	0.035377
IEEE 802.11n HT40	2	20	20.28	1.58	1.00	0.033629

Remark: For mobile or fixed location transmitters, the maximum power density is 1.0 mW/cm² even if the calculation indicates that the power density would be larger.

Mode	Antenna Gain (dBi)	Minimum separation distance (cm)	Output Power (dBm)	Numeric antenna gain (mW)	Power Density Limit (mW/cm ²)	Power Density at 20cm (mW/cm ²)
Zigbee	3.74	20	6.76	2.37	1.00	0.002232

Remark: For mobile or fixed location transmitters, the maximum power density is 1.0 mW/cm² even if the calculation indicates that the power density would be larger.

Collocated MPE Calculations

WLAN		Zigbee		Limit	Power Density (Worst-Case)
PD ₁	PD ₁ / PDL ₂	PD ₂	PD ₂ / PDL ₂		
0.039330	0.039330	0.002232	0.002232	1.00	0.041562

Remark: 1. $PD_1 / PDL_1 + PD_2 / PDL_2 + \dots \text{etc.} < 1$
 2. PD = Power density
 LPD = Power density limit



APPENDIX II CO-LOCATION

Above 1 GHz

Product Name	Smart Energy Wireless Bridge	Test By	Allen Liu
Test Model	Billion SG600NX-Std	Test Date	2013/04/02
Test Mode	IEEE 802.11g CH High + Zigbee Low (Worst)	Temp. & Humidity	23°C, 51%

966 Chamber_B at 3Meter / Horizontal									
Frequency (MHz)	Reading-PK (dBuV)	Reading-AV (dBuV)	Correction Factor (dB/m)	Result-PK (dBuV/m)	Result-AV (dBuV/m)	Limit-PK (dBuV/m)	Limit-AV (dBuV/m)	Margin (dB)	Remark
1080.00	52.19	---	-3.72	48.47	---	74.00	54.00	-5.53	Peak
1304.00	51.72	---	-2.94	48.78	---	74.00	54.00	-5.22	Peak
2340.00	63.07	44.28	3.41	66.48	47.69	74.00	54.00	-6.31	AVG
2580.00	59.42	37.99	4.12	63.54	42.11	74.00	54.00	-11.89	AVG
3660.00	41.48	---	6.39	47.87	---	74.00	54.00	-6.13	Peak
3915.00	42.04	---	6.98	49.02	---	74.00	54.00	-4.98	Peak
4470.00	39.86	---	8.30	48.16	---	74.00	54.00	-5.84	Peak
4815.00	46.91	38.81	9.20	56.11	48.01	74.00	54.00	-5.99	AVG

966 Chamber_B at 3Meter / Vertical									
Frequency (MHz)	Reading-PK (dBuV)	Reading-AV (dBuV)	Correction Factor (dB/m)	Result-PK (dBuV/m)	Result-AV (dBuV/m)	Limit-PK (dBuV/m)	Limit-AV (dBuV/m)	Margin (dB)	Remark
1036.00	52.00	---	-3.87	48.12	---	74.00	54.00	-5.88	Peak
1484.00	51.42	---	-2.31	49.11	---	74.00	54.00	-4.89	Peak
2338.00	59.85	39.83	3.40	63.25	43.23	74.00	54.00	-10.77	AVG
2582.00	63.43	42.35	4.12	67.55	46.47	74.00	54.00	-7.53	AVG
3225.00	42.06	---	5.46	47.52	---	74.00	54.00	-6.48	Peak
3615.00	41.57	---	6.29	47.85	---	74.00	54.00	-6.15	Peak
4440.00	39.95	---	8.23	48.18	---	74.00	54.00	-5.82	Peak
4815.00	46.31	40.05	9.20	55.51	49.25	74.00	54.00	-4.75	AVG

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Average test would be performed if the peak result were greater than the average limit.
3. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
4. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
5. Result = Reading + Correction Factor
Margin = Result - Limit
Remark Peak = Result(PK) - Limit(AV)
Remark AVG = Result(AV) - Limit(AV)



APPENDIX III SETUP PHOTOS

RADIATED EMISSION SETUP

Below 1 GHz





Above 1 GHz





ANTENNA PORT CONDUCTED RF MEASUREMENT SETUP





CONDUCTED EMISSION SETUP

