



FCC 47 CFR PART 15 SUBPART C

for

802.11n VDSL2 Bonding Gateway

Model: SR552n

Brand: SmartRG

Test Report Number:

C141010Z06-RP1

Issued Date: November 14, 2014

Issued for

SmartRG Inc.

**501 SE Columbia Shores Boulevard, Suite 500 Vancouver,
Washington 98661**

Issued by:

Compliance Certification Services (Shenzhen) Inc.

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Revision History

Rev.	Issue Date	Revisions	Effect Page	Revised By
00	August 18, 2014	Initial Issue	ALL	Nancy Fu
01	November 14, 2014	Update	ALL	Sinphy Xie

Rev.01: C141010Z06-RP1

Note:

1. The applicant company and the manufacturer, product name, product model name has changed, in addition, SR522n contrast with old product model 6729-W1-NA, product's shell of silk-screen also has change, the SmartRG inner PiFa antenna instead of ZHOne dipole antenna, other information remains the same; after reassessment, the item of radiated emission and band edges measurement necessary to re-test ,the setup photos and product photos also update.
2. The other information, please refer to the report No.:C140703Z02-RP1 and this report.



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1 TEST CERTIFICATION

Product	802.11n VDSL2 Bonding Gateway
Model	SR552n
Brand	SmartRG
Tested	July 3~ August 18, 2014 & October 10~November 13, 2014
Applicant	SmartRG Inc. 501 SE Columbia Shores Boulevard, Suite 500 Vancouver, Washington 98661
Manufacturer	SmartRG Inc. 501 SE Columbia Shores Boulevard, Suite 500 Vancouver, Washington 98661

APPLICABLE STANDARDS			
Standard	Test Type	Standard	Test Type
15.207(a)	Power Line Conducted Emissions	15.247(d) 15.209(a)	● Spurious Emissions ● Conducted Measurement ● Radiated Emissions
15.247(a)(2)	6dB Bandwidth Measurement	15.247(b)(3) 15.247(b)(4)	Peak Power Measurement
15.247(d)	Band Edges Measurement	15.247(e)	Peak Power Spectral Density

We hereby certify that:

The above equipment was tested by Compliance Certification Services Inc. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in **ANSI C63.4: 2009** and the energy emitted by the sample EUT tested as described in this report is in compliance with the requirements of FCC Rules Part 15.207, 15.209, 15.247.

The test results of this report relate only to the tested sample EUT identified in this report.

Approved by:

Sunday Hu
Supervisor of EMC Dept.
Compliance Certification Service Inc.

Reviewed by:

Ruby Zhang
Supervisor of Report Dept.
Compliance Certification Service Inc.



2 TEST RESULT SUMMARY

APPLICABLE STANDARDS			
Standard	Test Type	Result	Remark
15.247(a)(2)	6dB Bandwidth Measurement	Pass	Meet the requirement of limit.
15.247(b)(3) 15.247(b)(4)	Peak Power Measurement	Pass	Meet the requirement of limit.
15.247(d)	Band Edges Measurement	Pass	Meet the requirement of limit.
15.247(e)	Peak Power Spectral Density	Pass	Meet the requirement of limit.
15.247(d) 15.209(a)	● Spurious Emissions ● Conducted Measurement ● Radiated Emissions	Pass	Meet the requirement of limit.
15.207(a)	Power line Conducted Emissions	Pass	Meet the requirement of limit.

Note: 1. The statements of test result on the above are decided by the request of test standard only; the measurement uncertainties are not factored into this compliance determination.
2. The information of measurement uncertainty is available upon the customer's request.



3 EUT DESCRIPTION

Product	802.11n VDSL2 Bonding Gateway
Model Number	SR552n
Brand	SmartRG
Model Discrepancy	N/A
Serial Number	C141010Z06-RP1
Received Date	July 3, 2014&October 10, 2014
Power Supply	DC12V powered by the adapter
Adapter Manufacturer / Model No.	DVE/DSA-30PFB-12 FUS 120250 I/P:100-240,50/60Hz,0.8A O/P:12V,2.5A DC Output Cable: Unshielded,1.45m
Transmit Power	IEEE 802.11b mode: 17.45dBm (Antenna 0) IEEE 802.11b mode: 16.77dBm (Antenna 1) IEEE 802.11g mode: 23.81dBm (Antenna 0) IEEE 802.11g mode: 22.97dBm (Antenna 1) IEEE 802.11n HT20 MHz mode: 24.12dBm (Combine with Antenna 0 and Antenna 1) IEEE 802.11n HT40 MHz mode: 23.39dBm (Combine with Antenna 0 and Antenna 1)
Modulation Technique	IEEE 802.11b mode: DSSS(CCK,QPSK, BPSK) IEEE 802.11g mode: OFDM (BPSK/QPSK/16QAM/64QAM) IEEE 802.11n HT20 MHz mode: OFDM (BPSK/QPSK/16QAM/64QAM) IEEE 802.11n HT40 MHz mode: OFDM (BPSK/QPSK/16QAM/64QAM)
Transmit Data Rate	IEEE 802.11b: 11Mbps(CCK) with fall back rates of 5.5/2/1Mbps IEEE 802.11g: 54Mbps with fall back rates of 48/36/24/18/12/9 /6Mbps IEEE 802.11n HT20: 130Mbps with fall back rates of 130/117/104/78/52/39/26/13Mbps IEEE 802.11n HT40: 270Mbps with fall back rates of 270/243/216/162/108/81/54/27Mbps
Number of Channels	IEEE 802.11b mode: 11 Channels IEEE 802.11g mode: 11 Channels IEEE 802.11n HT20 MHz mode: 11 Channels IEEE 802.11n HT40 MHz mode: 7 Channels
Antenna Specification	Inner PiFa antenna with 5.0dBi gain (Max)
Channels Spacing	IEEE 802.11b/g ,802.11n HT20/HT40 : 5MHz
Temperature Range	0°C ~ +40°C
Hardware Version	V0.1
Software Version	V0.1

Note: 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: VW7SR552N filing to comply with Section 15.207, 15.209 and 15.247 of the FCC Part 15, Subpart C Rules.



4 TEST METHODOLOGY

4.1. DESCRIPTION OF TEST MODES

The EUT has been tested under operating condition.

Software used to control the EUT for staying in continuous transmitting and receiving mode is programmed.

Test Item	Test mode	Worse mode
Conducted Emission	Mode 1: Normal Link 1Gbps Mode 2: Normal Link 100Mbps Mode 3: Normal Link 10Mbps	Mode 1
Radiated Emission	Mode 1: TX	Mode 1

After verification, all tests were carried out with the worst case test modes as shown below except radiated spurious emission below 1GHz, which worst case was in normal link mode only, and power line conducted emission below 30MHz, which worst case was in normal link mode.

IEEE802.11b mode: Channel Low (2412MHz), Channel Mid (2437MHz) and Channel High(2462MHz) with 1Mbps data rate were chosen for full testing.

IEEE802.11g mode: Channel Low (2412MHz), Channel Mid (2437MHz) and Channel High (2462MHz) with 6Mbps data rate were chosen for full testing.

IEEE 802.11n HT20 MHz mode: Channel Low (2412MHz), Channel Mid (2437MHz) and Channel High (2462MHz) with 13Mbps data rate were chosen for full testing.

IEEE 802.11n HT40 MHz mode: Channel Low (2422MHz), Channel Mid (2437MHz) and Channel High (2452MHz) with 27Mbps data rate were chosen for full testing.



5 SETUP OF EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF SUPPORT UNITS

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

No.	Equipment	Model No.	Serial No.	FCC ID	Brand	Data Cable	Power Cord
1	Notebook #1	E336	R9-WN1EF	N/A	Thinkpad	Unshielded 0.50m	Unshielded 1.50m
2	Notebook #2	E335	R9-WN0EF	N/A	Thinkpad	Unshielded 0.50m	Unshielded 1.50m
3	WD#1	WXB1AAO V4476	WDBACY320 1ABK-PESN	N/A	N/A	Unshielded 0.50m	N/A
4	WD#2	WXF1A902 7339	WDBACY320 2ABK-PESN	N/A	N/A	Unshielded 0.50m	N/A
5	Broadband integrated access device	ZXDSL 9806H	N/A	N/A	N/A	Unshielded 2.00m	Unshielded 1.50m

Note:

Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.

5.2. CONFIGURATION OF SYSTEM UNDER TEST

See test photographs attached in Appendix II for the actual connections between EUT and support equipment.



6 FACILITIES AND ACCREDITATIONS

6.1. FACILITIES

All measurement facilities used to collect the measurement data are located at
**No.10-1 Mingkeda Logistics park, No.18, Huanguan South Rd., Guan Lan Town,
Baoan District, Shenzhen, China**

The sites are constructed in conformance with the requirements of ANSI C63.4, ANSI C63.7 and CISPR Publication 22. All receiving equipment conforms to CISPR Publication 16-1, "Radio Interference Measuring Apparatus and Measurement Methods."

6.2. ACCREDITATIONS

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

USA	A2LA
China	CNAS

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

USA	FCC
Japan	VCCI(C-3478, R-3135, T-652, G-624)
Canada	INDUSTRY CANADA
Taiwan	BSMI

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

6.3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

Parameter	Uncertainty
Radiated Emission, 30 to 200 MHz Test Site : 966(2)	+/-3.6880dB
Radiated Emission, 200 to 1000 MHz Test Site : 966(2)	+/-3.6695dB
Radiated Emission, 1 to 8 GHz	+/-5.1782dB
Radiated Emission, 8 to 18 GHz	+/-5.2173dB
Conducted Emissions	+/-3.6836dB
Band Width	178kHz
Peak Output Power MU	+/-1.906dB
Band Edge MU	+/-0.182dB
Channel Separation MU	416.178Hz
Duty Cycle MU	0.054ms
Frequency Stability MU	226Hz

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

The measured result is above (below) the specification limit by a margin less than the measurement uncertainty; it is therefore not possible to state compliance based on the 95% level of confidence. However, the result indicates that compliance (non-compliance) is more probable than non-compliance) with the specification limit.



7 FCC PART 15.247 REQUIREMENTS

7.1. POWER LINE CONDUCTED EMISSIONS MEASUREMENT

7.1.1. LIMITS OF CONDUCTED EMISSIONS MEASUREMENT

According to §15.207(a), except as shown in paragraphs (b) and (c) of 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 µH/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)	Limits (dB μ V)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56*	56 to 46*
0.50 to 5	56	46
5 to 30	60	50

NOTE:

- (1) The lower limit shall apply at the transition frequencies.
- (2) The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50 MHz.
- (3) All emanations from a class A/B digital device or system, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strengths specified above.

7.1.2. TEST INSTRUMENTS

Conducted Emission Test Site					
Name of Equipment	Manufacturer	Model Number	Serial Number	Last Calibration	Due Calibration
EMI TEST RECEIVER	ROHDE&SCHWARZ	ESCI	100783	03/09/2014	03/08/2015
LISN(EUT)	ROHDE&SCHWARZ	ENV216	101543-WX	04/20/2014	04/19/2015
LISN	EMCO	3825/2	8901-1459	03/09/2014	03/08/2015
Temp. / Humidity Meter	VICTOR	HTC-1	N/A	03/04/2014	03/03/2015
Test S/W	FARAD	EZ-EMC/ CCS-3A1-CE			

NOTE: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

2. N.C.R = No Calibration Request.

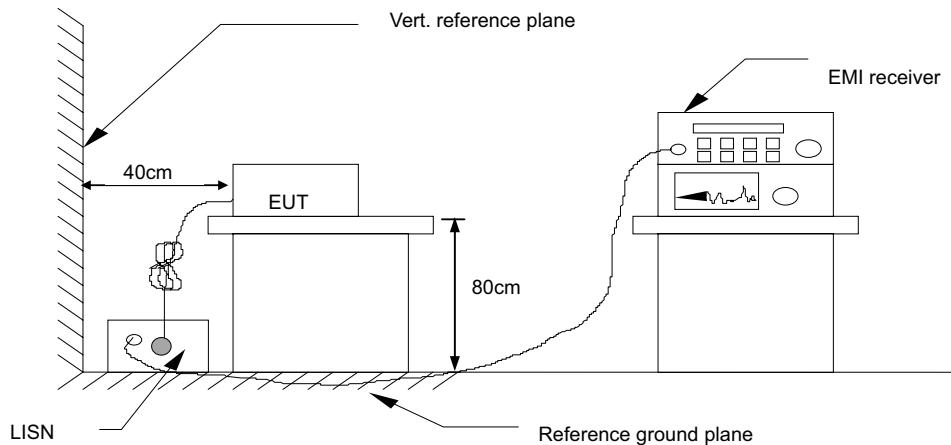


7.1.3. TEST PROCEDURES (please refer to measurement standard)

- The EUT and Support equipment, if needed, was placed on a non-conducted table, which is 0.8m above the ground plane and 0.4m away from the conducted wall.
- The test equipment EUT installed received AC main power, through a Line Impedance Stabilization Network (LISN), which supplied power source and was grounded to the ground plane. All support equipment power received from a second LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance for the measuring instrument.
- The EUT test program was started. Emissions were measured on each current carrying line of the EUT using an EMI Test Receiver connected to the LISN powering the EUT.
- The frequency range from 150 kHz to 30 MHz was searched. The test data of the worst-case condition(s) was recorded. Emission levels under limit 20dB were not recorded.



7.1.4. TEST SETUP



For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

7.1.5. DATA SAMPLE

Frequency (MHz)	QuasiPeak Reading (dBuV)	Average Reading (dBuV)	Correction Factor (dB)	QuasiPeak Result (dBuV)	Average Result (dBuV)	QuasiPeak Limit (dBuV)	Average Limit (dBuV)	QuasiPeak Margin (dB)	Average Margin (dB)	Remark (Pass/Fail)
X.XXXX	32.69	25.65	11.52	44.21	37.17	65.78	55.79	-21.57	-18.62	Pass

Factor = Insertion loss of LISN + Cable Loss
Result = Quasi-peak Reading/ Average Reading + Factor
Limit = Limit stated in standard
Margin = Result (dBuV) – Limit (dBuV)



7.1.6. TEST RESULTS

Model No.	SR552n	RBW,VBW	9 kHz
Environmental Conditions	22°C, 45% RH	Test Mode	Mode 1
Tested by	Mack Li	Line	L1
Test Date	July 11, 2014		

Frequency (MHz)	QuasiPeak Reading (dBuV)	Average Reading (dBuV)	Correction Factor (dB)	QuasiPeak Result (dBuV)	Average Result (dBuV)	QuasiPeak Limit (dBuV)	Average Limit (dBuV)	QuasiPeak Margin (dB)	Average Margin (dB)	Remark (Pass/Fail)
0.1500	40.78	29.09	9.58	50.36	38.67	65.99	56.00	-15.63	-17.33	Pass
0.1900	34.53	22.84	9.67	44.20	32.51	64.03	54.04	-19.83	-21.53	Pass
0.2260	31.71	20.58	9.69	41.40	30.27	62.59	52.60	-21.19	-22.33	Pass
0.2980	26.76	15.03	9.69	36.45	24.72	60.30	50.30	-23.85	-25.58	Pass
11.4220	25.22	16.61	9.88	35.10	26.49	60.00	50.00	-24.90	-23.51	Pass
12.8340	31.48	23.12	9.89	41.37	33.01	60.00	50.00	-18.63	-16.99	Pass

Model No.	SR552n	RBW,VBW	9 kHz
Environmental Conditions	22°C, 45% RH	Test Mode	Mode 1
Tested by	Mack Li	Line	L2
Test Date	July 11, 2014		

Frequency (MHz)	QuasiPeak Reading (dBuV)	Average Reading (dBuV)	Correction Factor (dB)	QuasiPeak Result (dBuV)	Average Result (dBuV)	QuasiPeak Limit (dBuV)	Average Limit (dBuV)	QuasiPeak Margin (dB)	Average Margin (dB)	Remark (Pass/Fail)
0.1500	40.74	27.61	9.78	50.52	37.39	65.99	56.00	-15.47	-18.61	Pass
0.1940	34.58	19.88	9.79	44.37	29.67	63.86	53.86	-19.49	-24.19	Pass
0.2380	34.12	13.73	9.78	43.90	23.51	62.16	52.17	-18.26	-28.66	Pass
0.3060	29.44	19.37	9.75	39.19	29.12	60.08	50.08	-20.89	-20.96	Pass
1.8820	17.93	2.94	9.74	27.67	12.68	56.00	46.00	-28.33	-33.32	Pass
12.7140	28.66	20.10	9.78	38.44	29.88	60.00	50.00	-21.56	-20.12	Pass

REMARKS: L1 = Line One (Live Line)

L2 = Line Two (Neutral Line)



7.2. SPURIOUS EMISSIONS MEASUREMENT

7.2.1. CONDUCTED EMISSIONS MEASUREMENT

7.2.1.1. LIMITS OF CONDUCTED EMISSIONS MEASUREMENT

§15.247(d) specifies that in any 100 kHz bandwidth outside of the authorized frequency band, the power shall be attenuated according to the following conditions:

If the peak output power procedure is used to measure the fundamental emission power to demonstrate compliance to 15.247(b)(3) requirements, then the peak conducted output power measured within any 100 kHz outside the authorized frequency band shall be attenuated by at least 20 dB relative to the maximum measured in-band peak PSD level.

If the average output power procedure is used to measure the fundamental emission power to demonstrate compliance to 15.247(b)(3) requirements, then the power in any 100 kHz outside of the authorized frequency band shall be attenuated by at least 30 dB relative to the maximum measured in-band average PSD level.

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 Section 15.205(c)).

7.2.1.2. TEST INSTRUMENTS

Name of Equipment	Manufacturer	Model	Serial Number	Last Calibration	Due Calibration
Spectrum Analyzer	Agilent	E4446A	US44300399	03/01/2014	03/01/2015

7.2.1.3. TEST PROCEDURE (please refer to measurement standard)

Conducted RF measurements of the transmitter output were made to confirm that the EUT antenna port conducted emissions meet the specified limit and to identify any spurious signals that require further investigation or measurements on the radiated emissions site.

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

Measurements are made over the 30MHz to 26GHz range with the transmitter set to the lowest, middle, and highest channels.

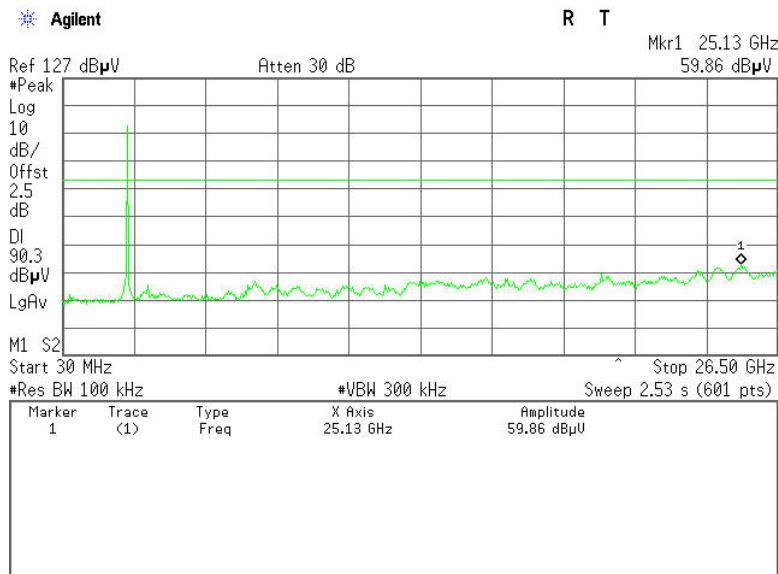


7.2.1.4. TEST RESULTS

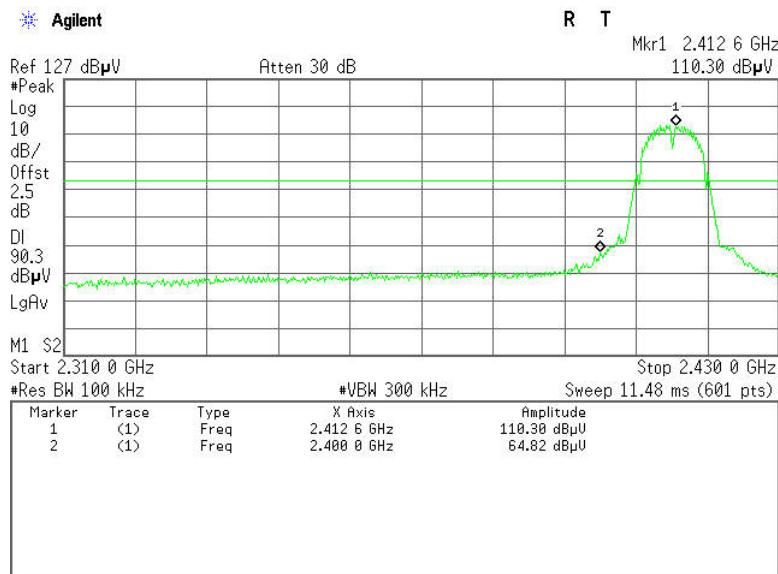
Test Plot

IEEE 802.11b mode(Antenna 0)

CH Low (30MHz ~26.5GHz)

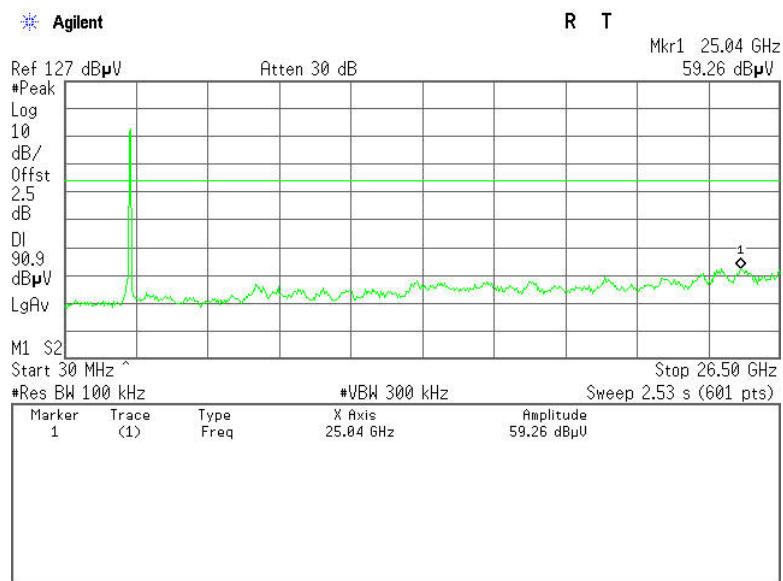


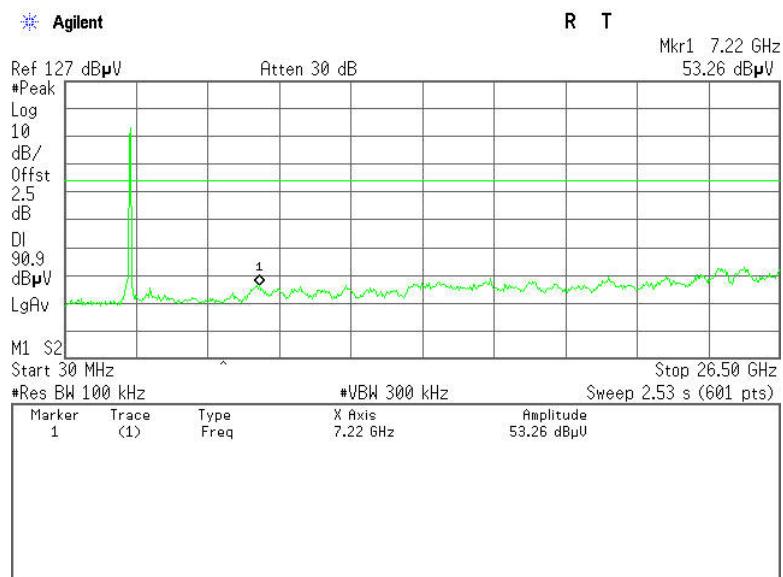
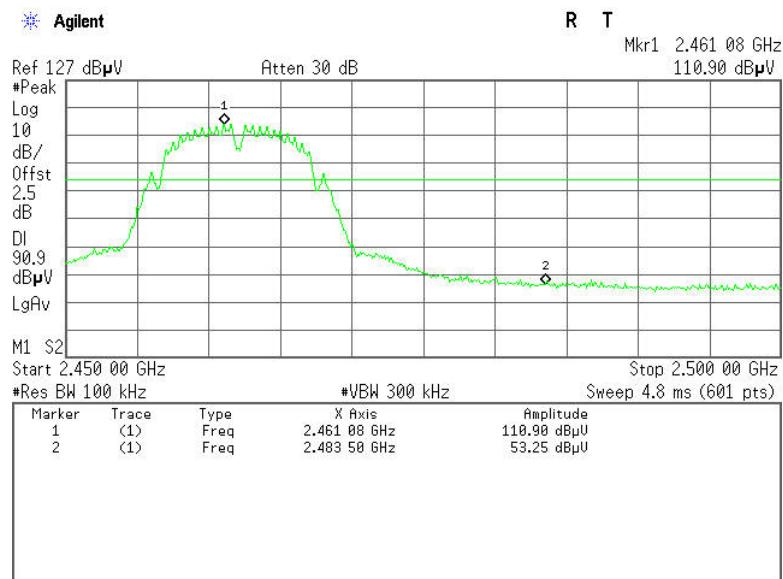
CH Low (2.31GHz ~2.43GHz)

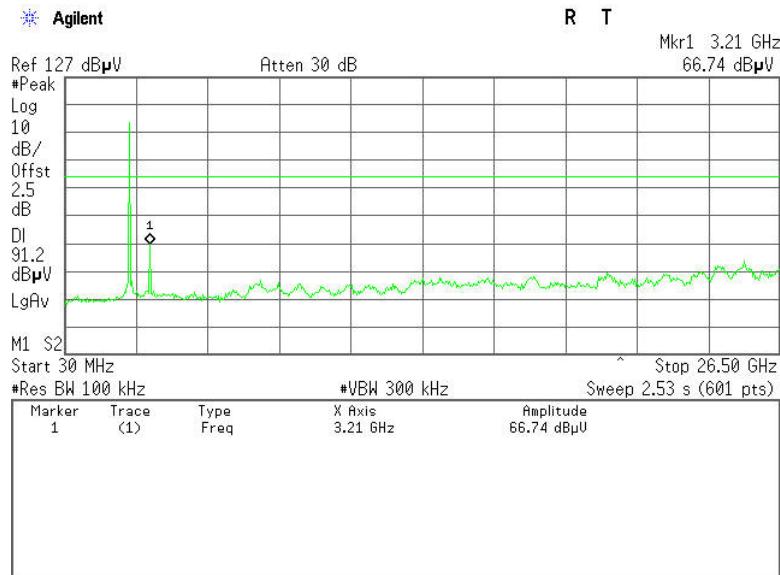
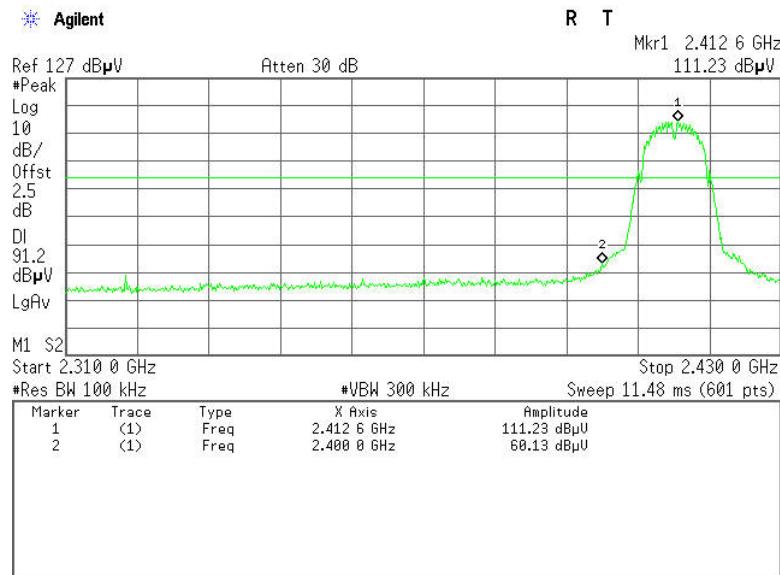


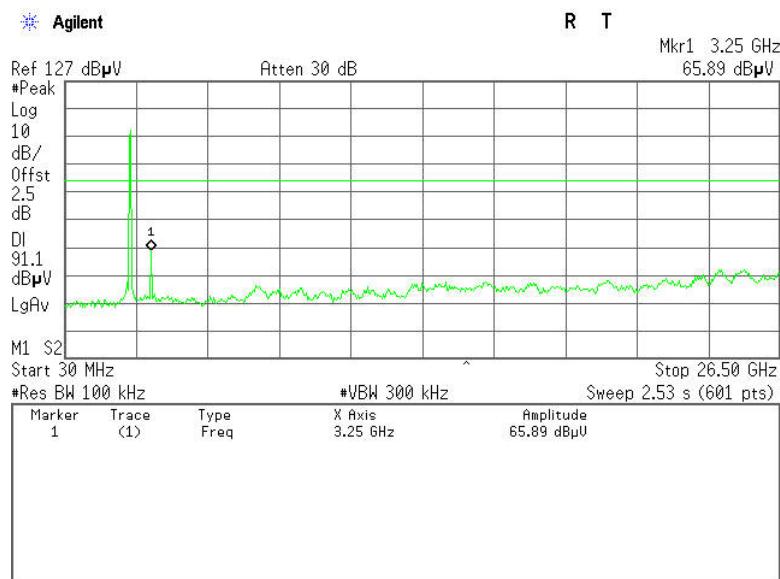


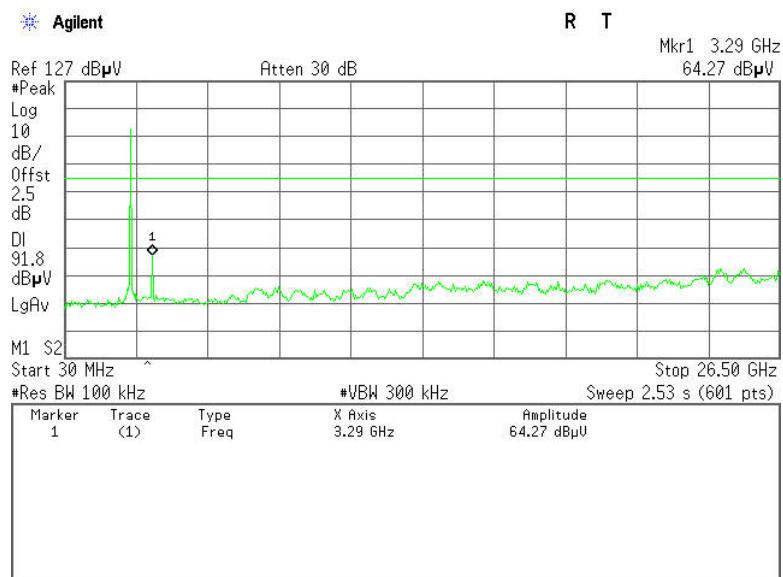
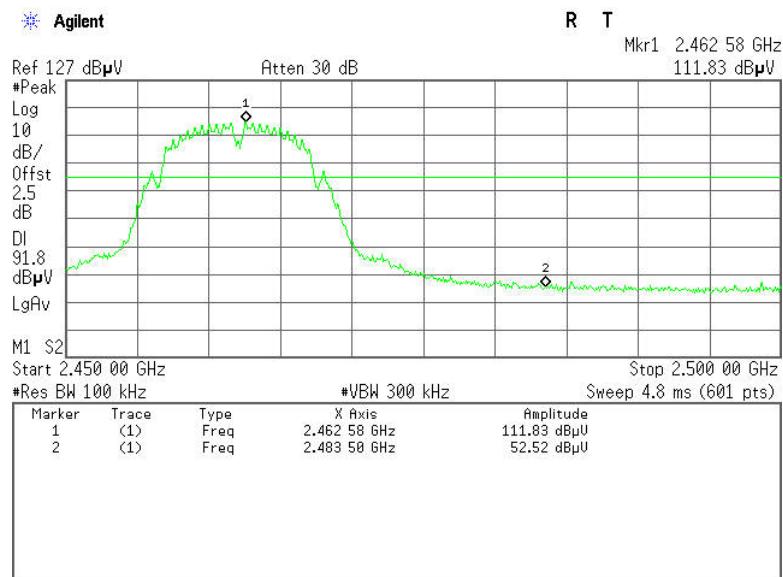
CH Mid (30MHz ~26.5GHz)

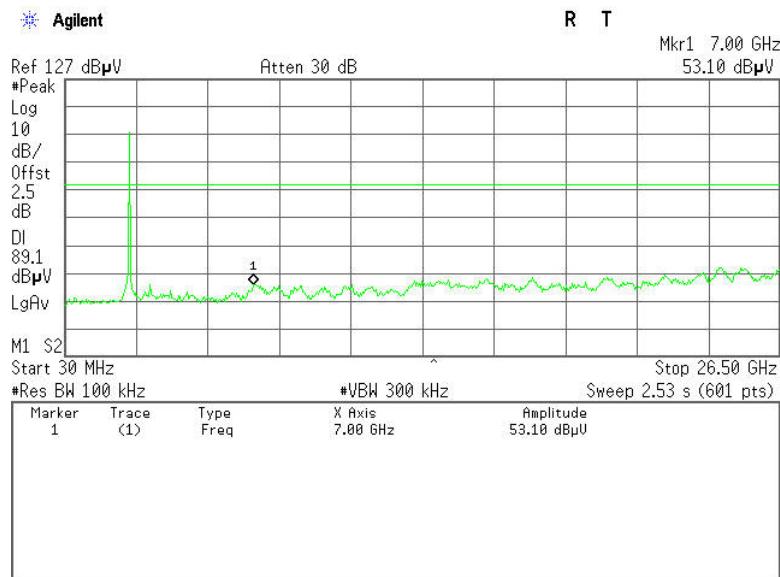
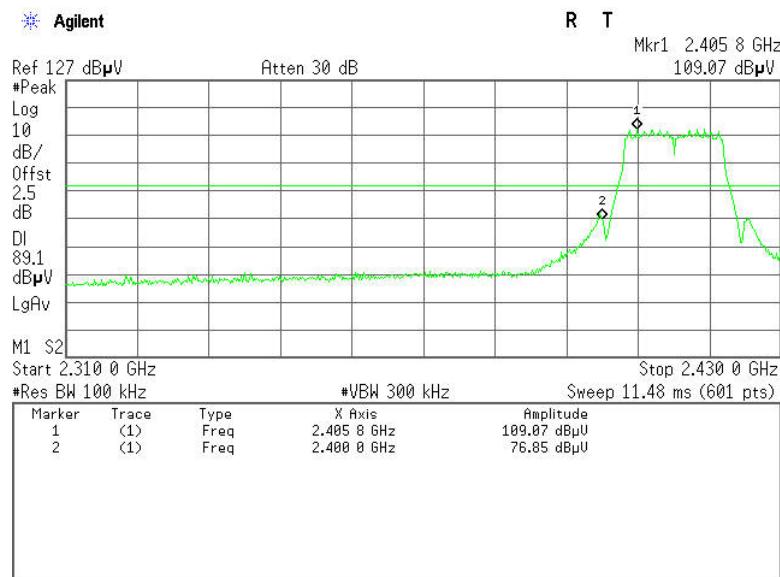


**CH High (30MHz ~26.5GHz)****CH High (2.45GHz ~2.5GHz)**

**IEEE 802.11b mode(Antenna 1)****CH Low (30MHz ~26.5GHz)****CH Low (2.31GHz ~2.43GHz)**

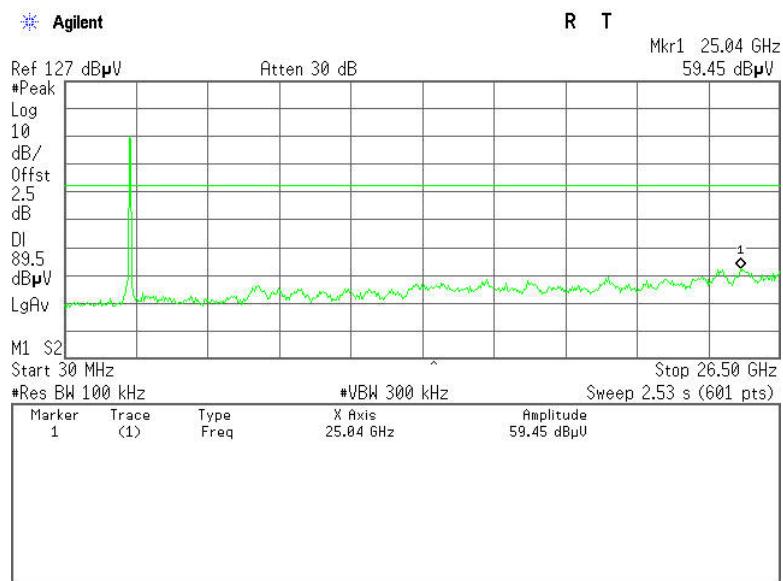
**CH Mid (30MHz ~26.5GHz)**

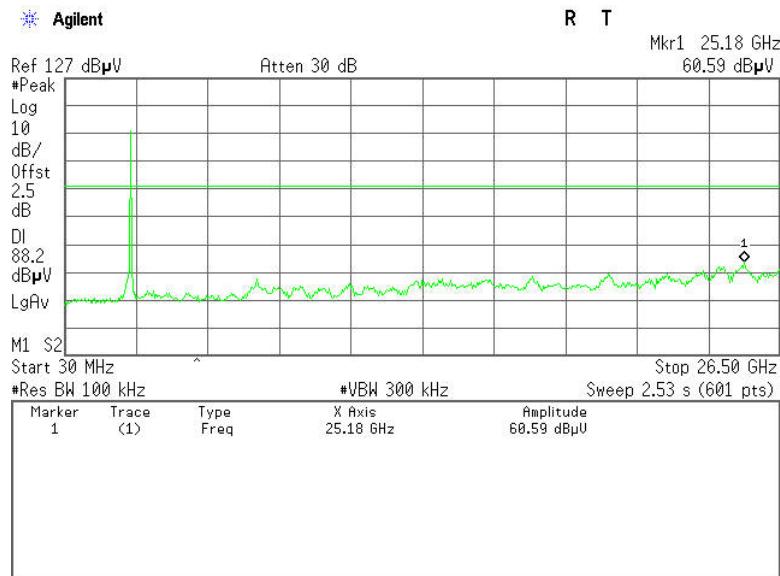
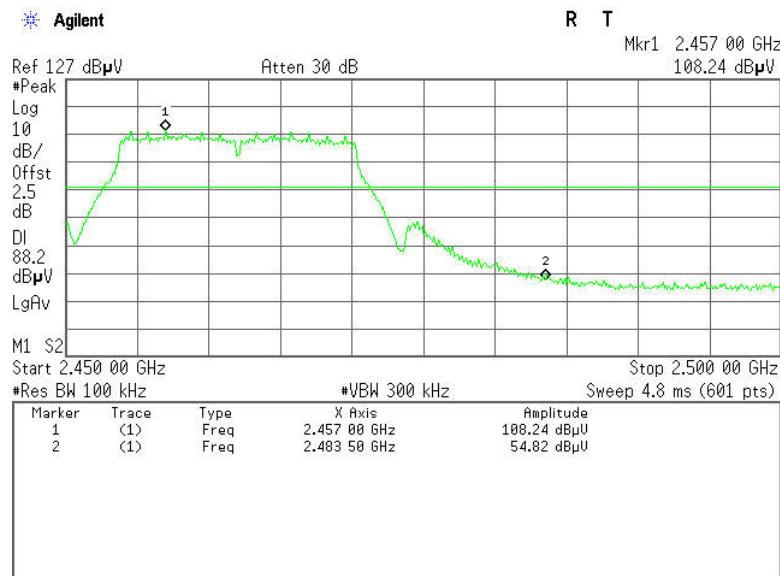
**CH High (30MHz ~26.5GHz)****CH High (2.45GHz ~2.5GHz)**

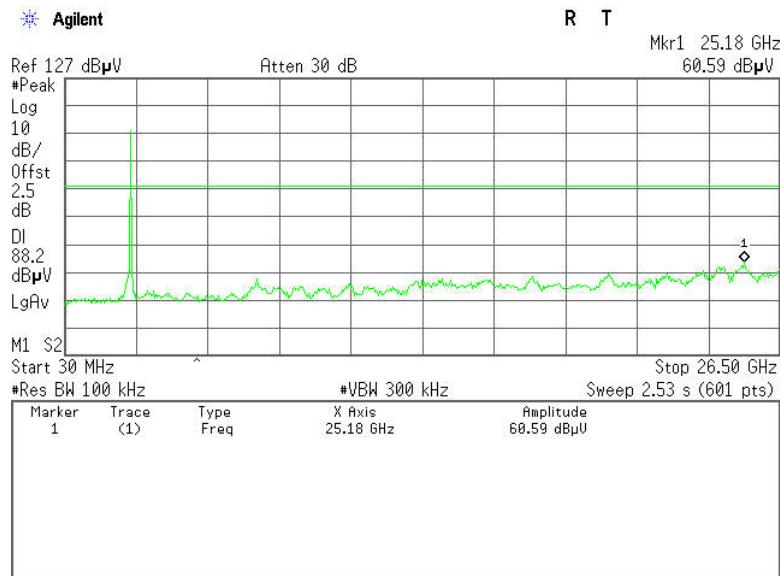
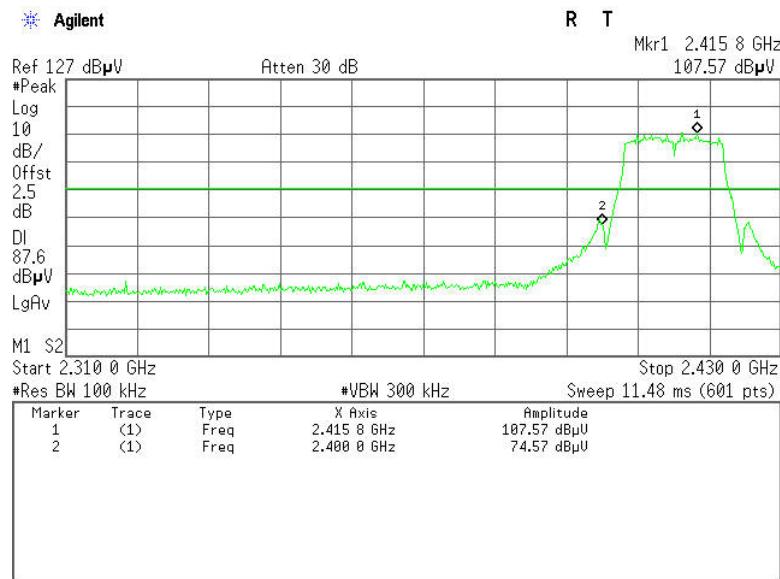
**IEEE 802.11g mode(Antenna 0)****CH Low (30MHz ~26.5GHz)****CH Low (2.31GHz ~2.43GHz)**



CH Mid (30MHz ~26.5GHz)

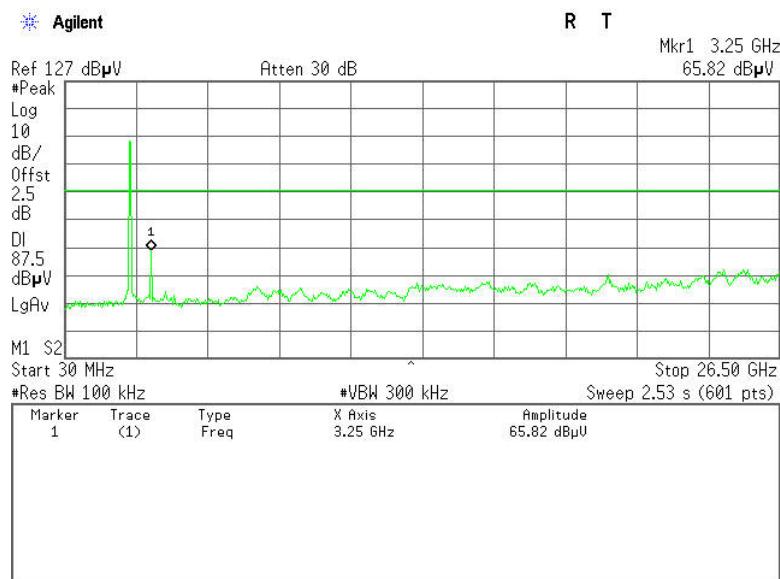


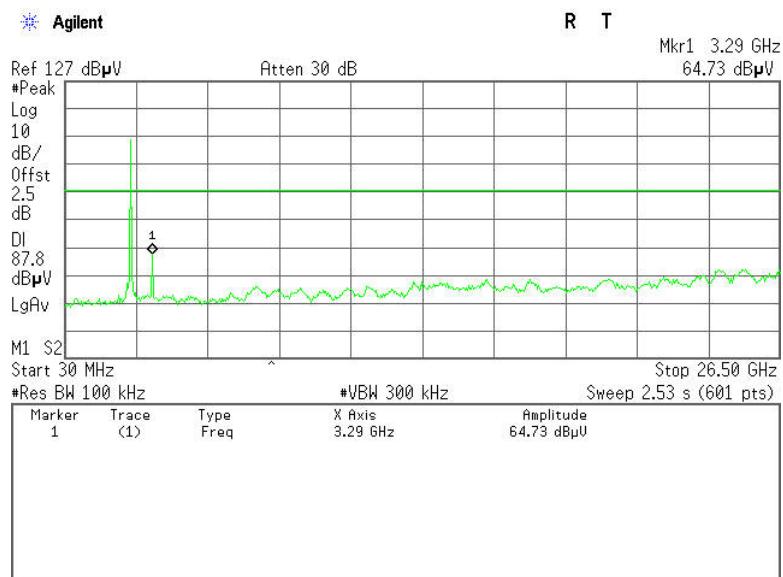
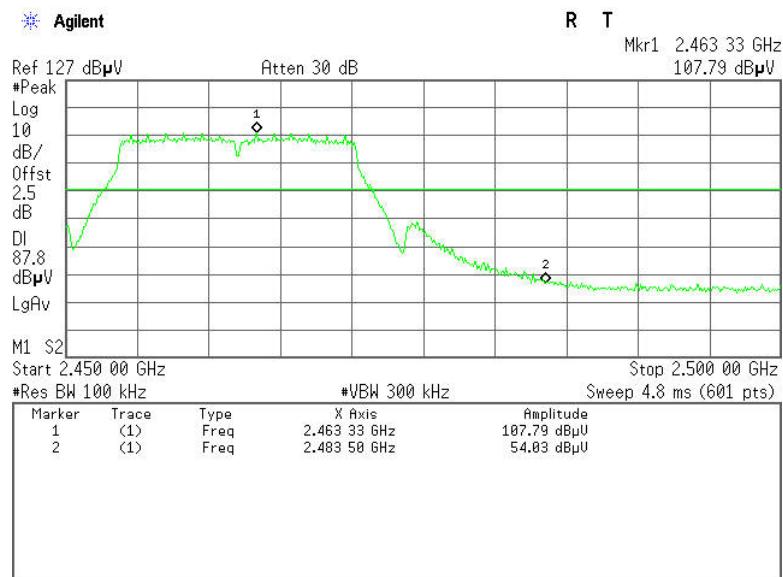
**CH High (30MHz ~26.5GHz)****CH High (2.45GHz ~2.5GHz)**

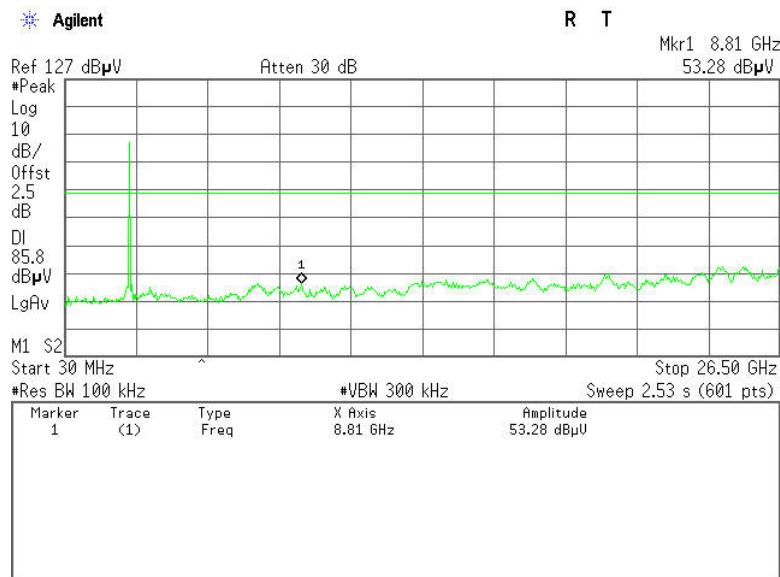
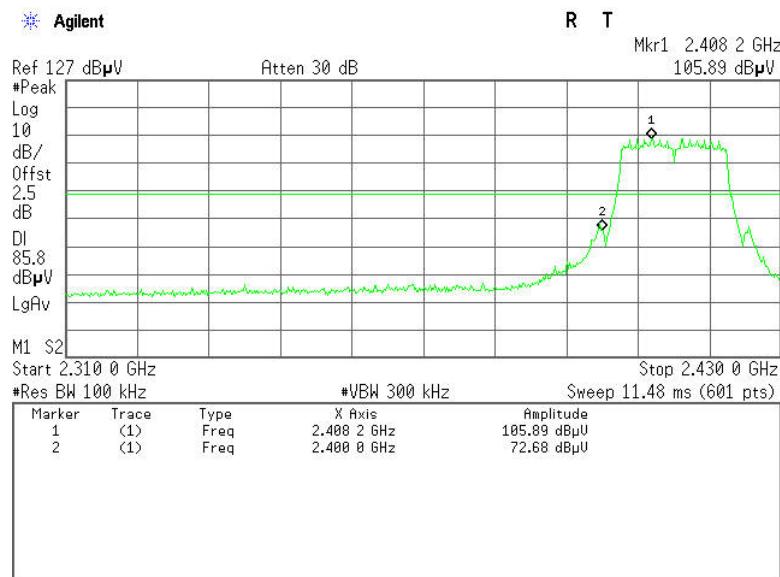
**IEEE 802.11g mode(Antenna 1)****CH Low (30MHz ~26.5GHz)****CH Low (2.31GHz ~2.43GHz)**

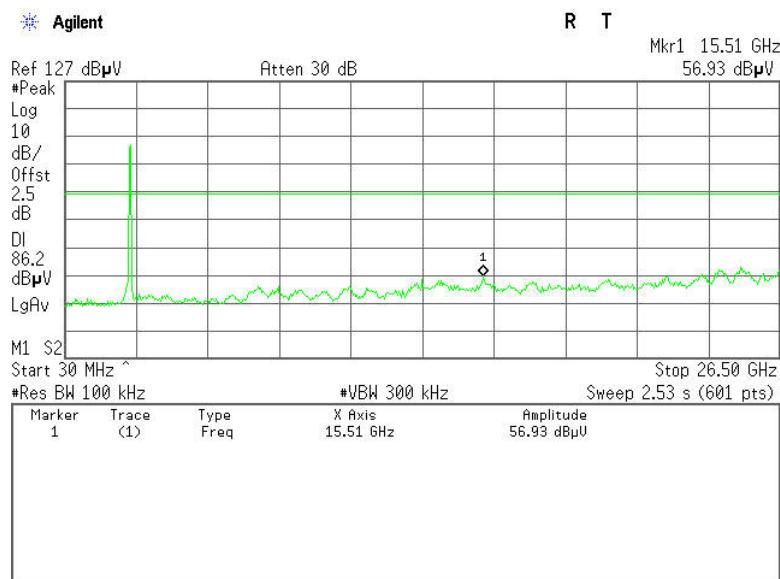


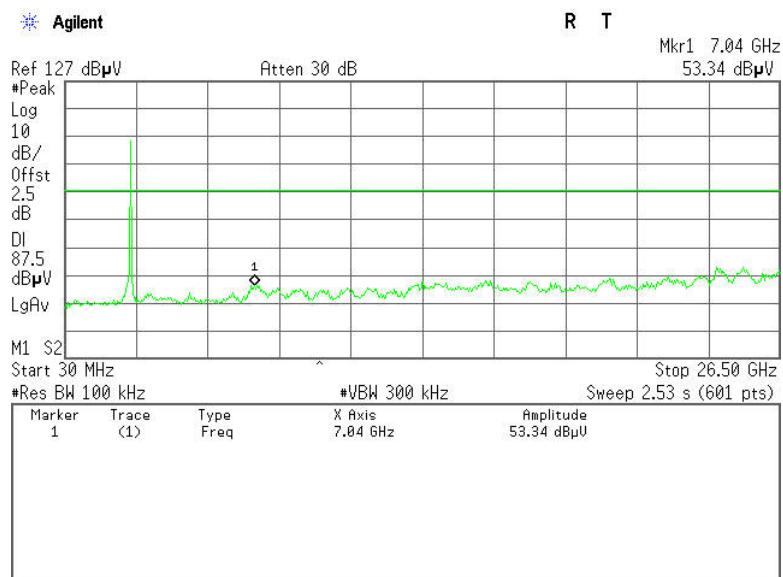
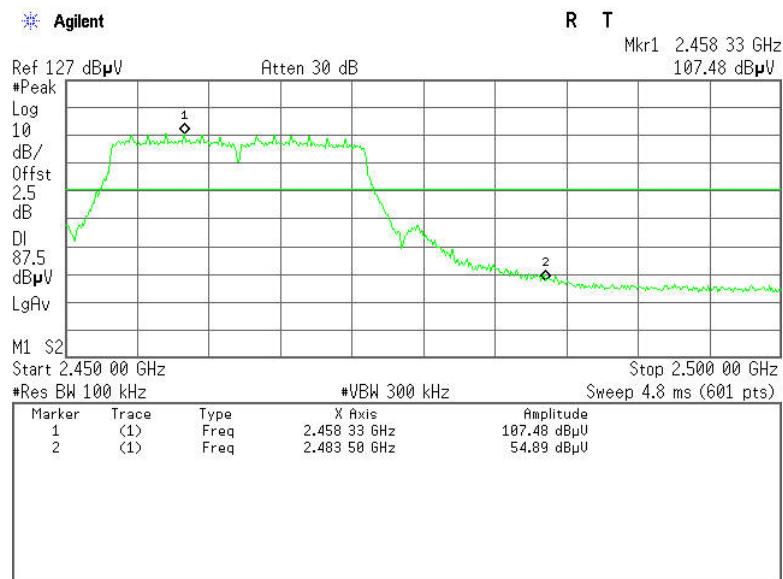
CH Mid (30MHz ~26.5GHz)

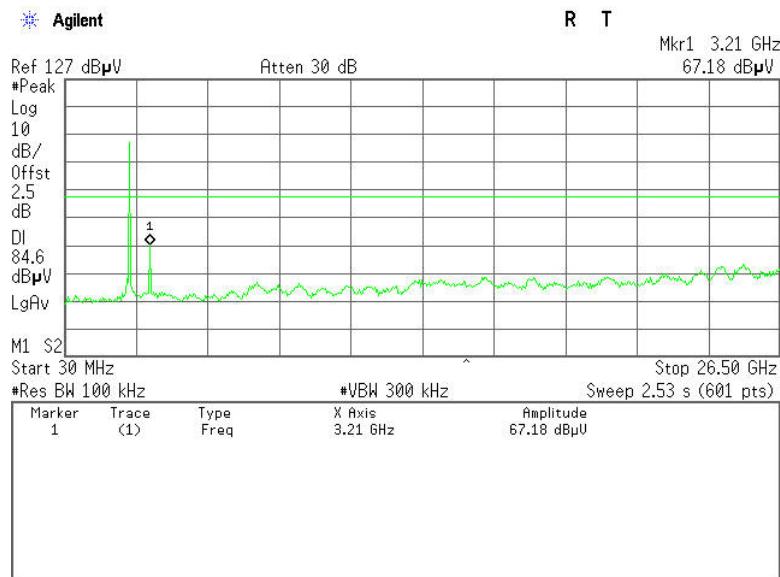
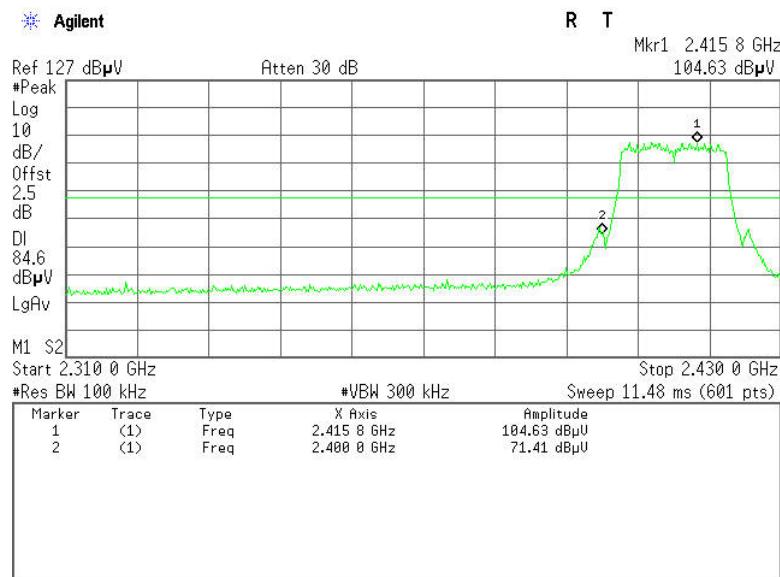


**CH High (30MHz ~26.5GHz)****CH High (2.45GHz ~2.5GHz)**

**IEEE 802.11n HT20 MHz mode(Antenna 0)****CH Low (30MHz ~26.5GHz)****CH Low (2.31GHz ~2.43GHz)**

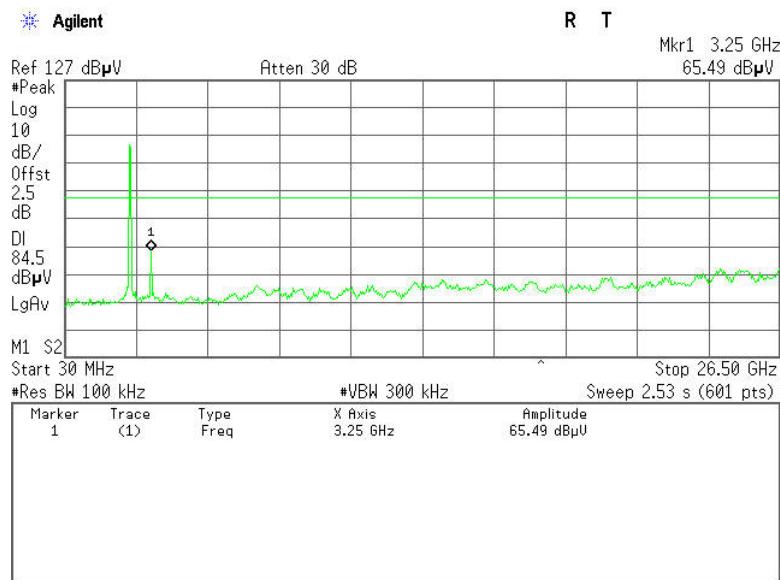
**CH Mid (30MHz ~26.5GHz)**

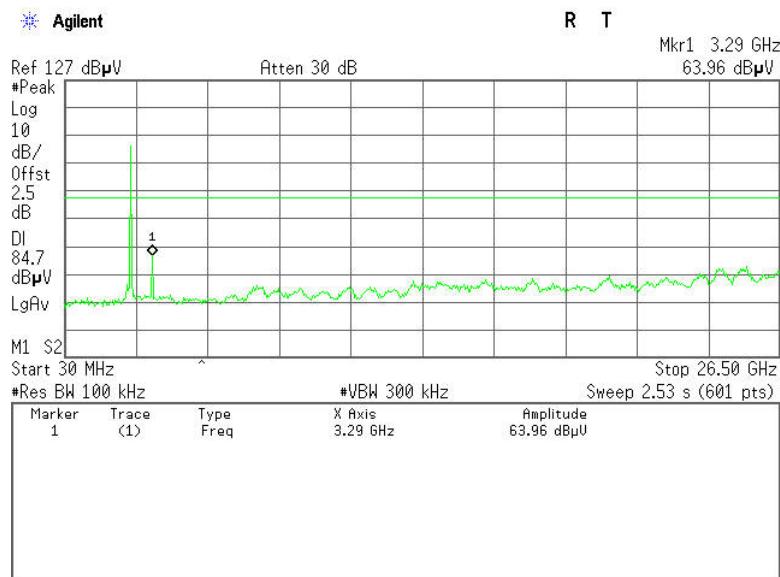
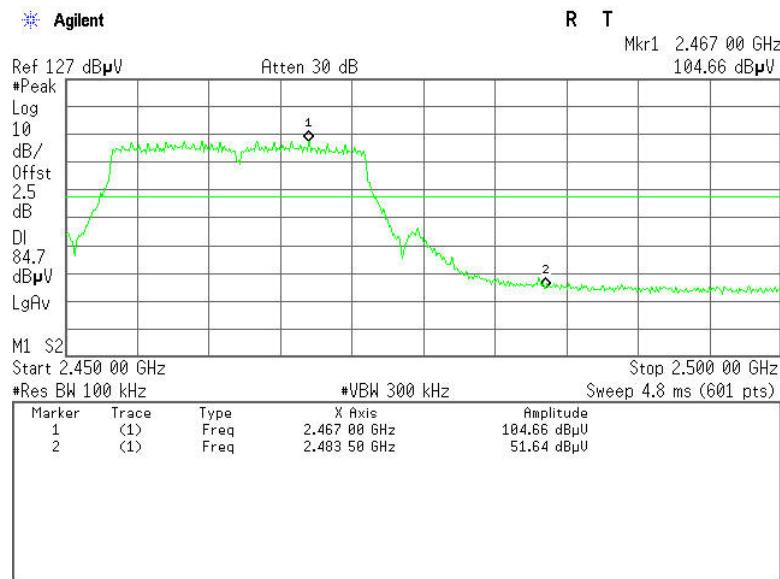
**CH High (30MHz ~26.5GHz)****CH High (2.45GHz ~2.5GHz)**

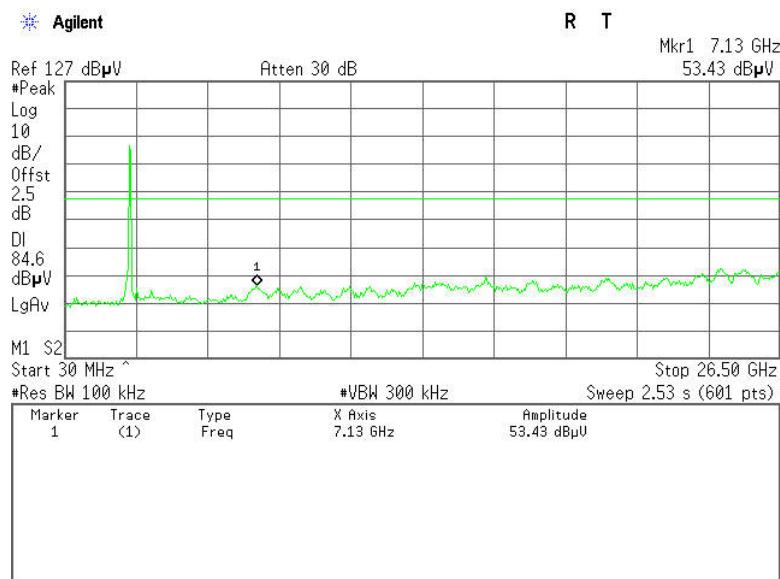
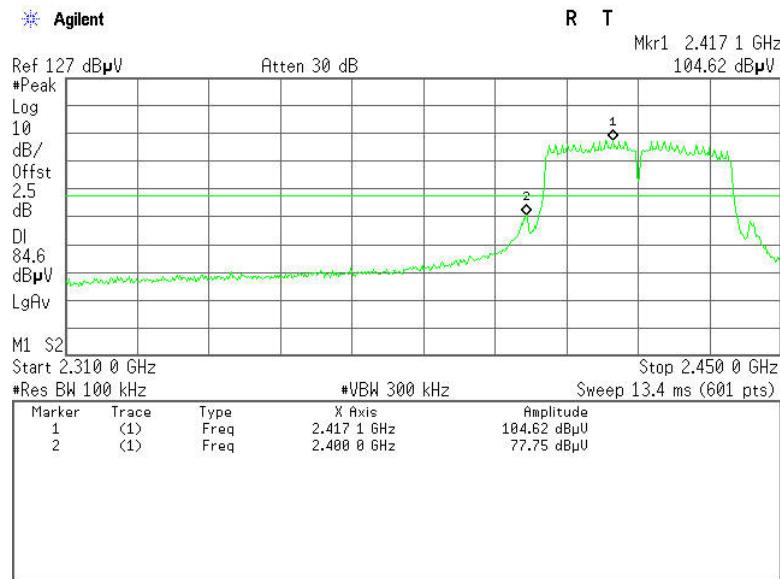
**IEEE 802.11n HT20 MHz mode(Antenna 1)****CH Low (30MHz ~26.5GHz)****CH Low (2.31GHz ~2.43GHz)**

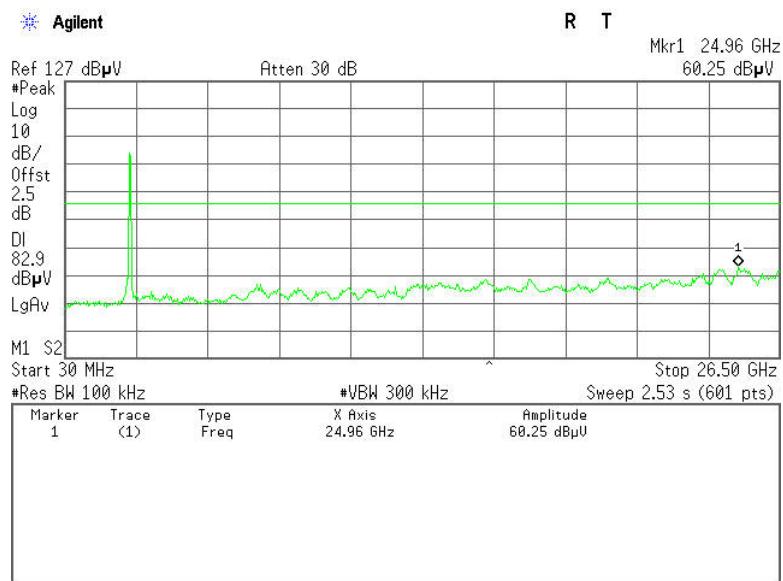


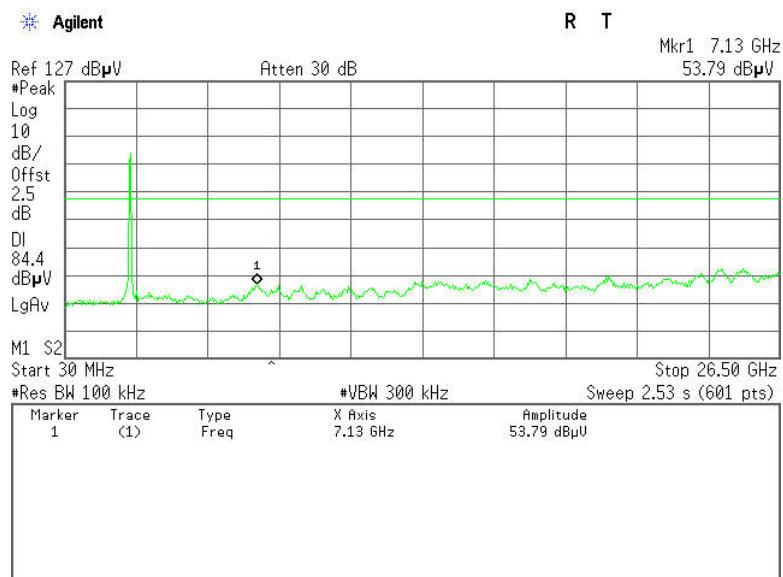
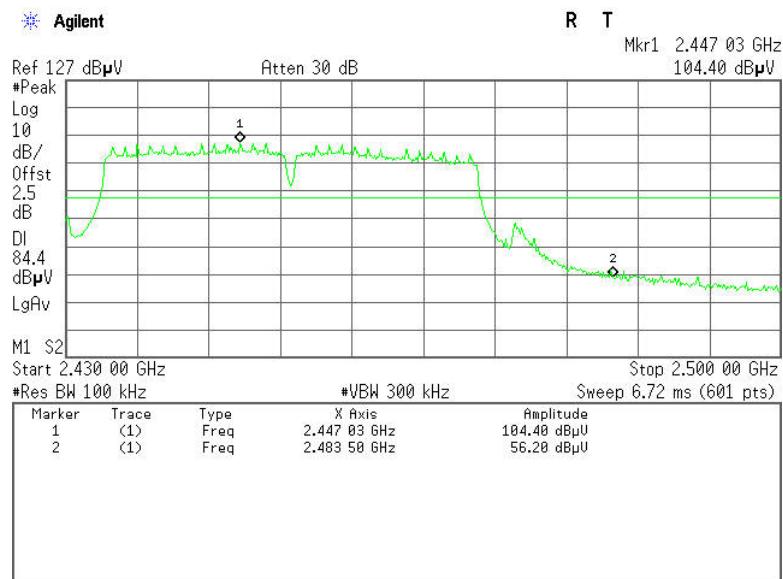
CH Mid (30MHz ~26.5GHz)

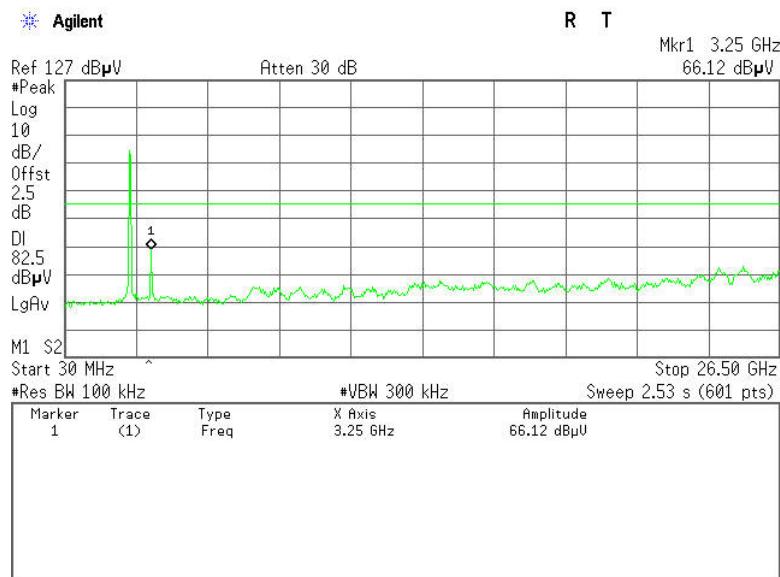
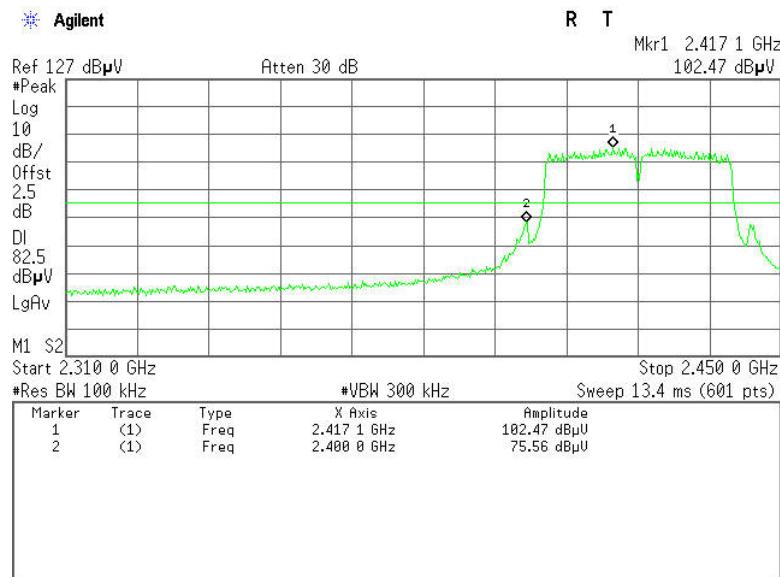


**CH High (30MHz ~26.5GHz)****CH High (2.45GHz ~2.5GHz)**

IEEE 802.11n HT40 MHz mode(Antenna 0)**CH Low (30MHz ~26.5GHz)****CH Low (2.31GHz ~2.45GHz)**

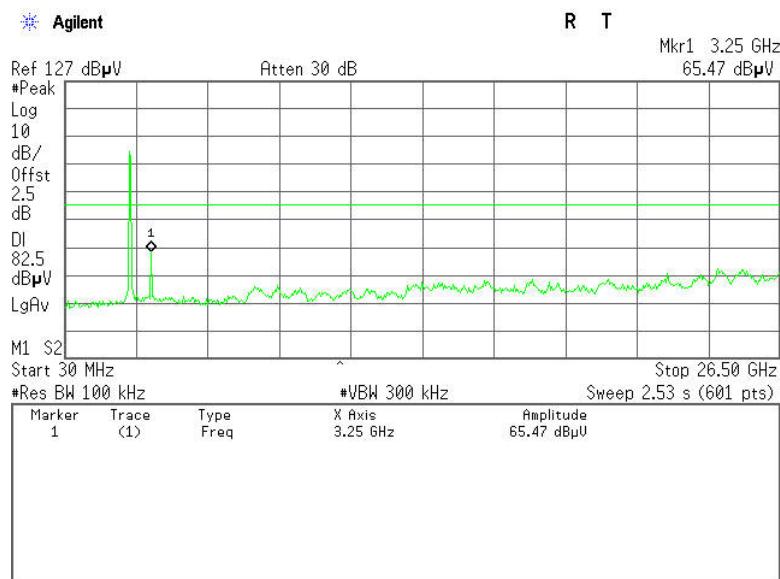
**CH Mid (30MHz ~26.5GHz)**

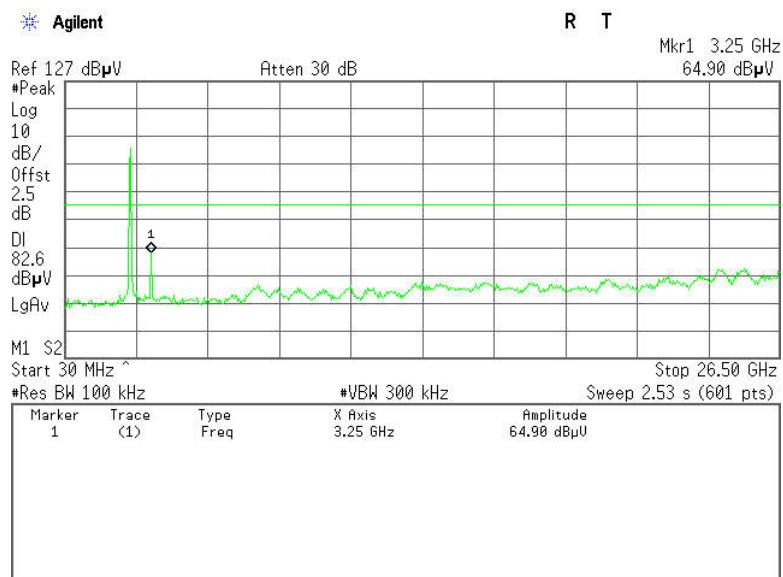
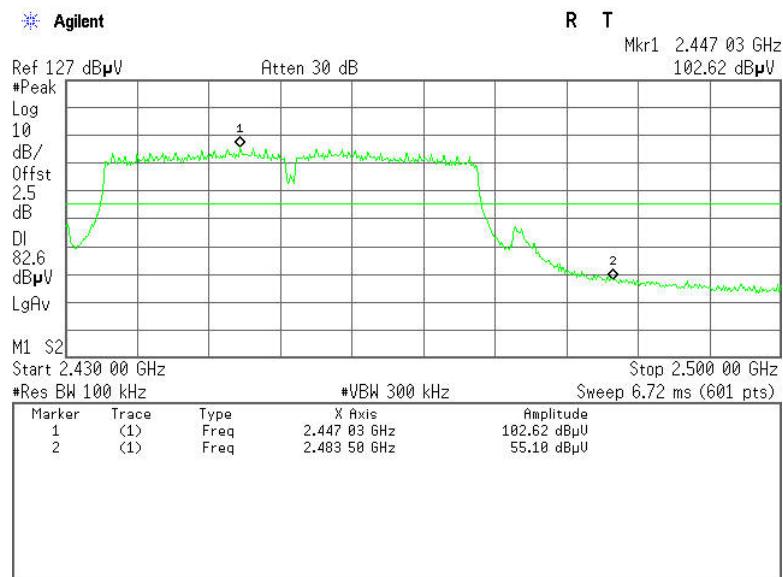
**CH High (30MHz ~26.5GHz)****CH High (2.43GHz ~2.5GHz)**

IEEE 802.11n HT40 MHz mode(Antenna 1)**CH Low (30MHz ~26.5GHz)****CH Low (2.31GHz ~2.45GHz)**



CH Mid (30MHz ~26.5GHz)



**CH High (30MHz ~26.5GHz)****CH High (2.43GHz ~2.5GHz)**



7.2.2. RADIATED EMISSIONS MEASUREMENT

7.2.2.1. LIMITS OF RADIATED EMISSIONS MEASUREMENT

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 (mV/m)	Measurement Distance (m)
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.

1. In the emission table above, the tighter limit applies at the band edges.

Frequency (MHz)	Field Strength (μ V/m at 3-meter)	Field Strength (dB μ V/m at 3-meter)
30-88	100	40
88-216	150	43.5
216-960	200	46
Above 960	500	54

NOTE:(1) The lower limit shall apply at the transition frequencies.

(2) Emission level (dB μ V/m) = 20 log Emission level (μ V/m).



7.2.2.2. TEST INSTRUMENTS

Radiated Emission Test Site 966(2)					
Name of Equipment	Manufacturer	Model Number	Serial Number	Last Calibration	Due Calibration
PSA Series Spectrum Analyzer	Agilent	E4446A	US44300399	03/01/2014	03/01/2015
EMI TEST RECEIVER	ROHDE&SCHWARZ	ESCI	100783	03/09/2014	03/08/2015
Amplifier	MITEQ	AM-1604-3000	1123808	03/18/2014	03/18/2015
High Noise Amplifier	Agilent	8449B	3008A01838	03/18/2014	03/18/2015
Board-Band Horn Antenna	Schwarzbeck	BBHA 9170	9170-497	07/10/2014	07/09/2015
Bilog Antenna	SCHAFFNER	CBL6143	5082	03/01/2014	03/01/2015
Horn Antenna	SCHWARZBECK	BBHA9120	D286	03/01/2014	03/01/2015
Loop Antenna	A, R, A	PLA-1030/B	1029	09/27/2014	09/26/2015
Turn Table	N/A	N/A	N/A	N.C.R	N.C.R
Controller	Sunol Sciences	SC104V	022310-1	N.C.R	N.C.R
Controller	CT	N/A	N/A	N.C.R	N.C.R
Temp. / Humidity Meter	Anymetre	JR913	N/A	02/28/2014	02/28/2015
Antenna Tower	SUNOL	TLT2	N/A	N.C.R	N.C.R
Test S/W	FARAD	LZ-RF / CCS-SZ-3A2			

NOTE: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

2. The FCC Site Registration number is 101879.
3. N.C.R = No Calibration Required.



7.2.2.3. TEST PROCEDURE (please refer to measurement standard)

1. The EUT is placed on a turntable, which is 0.8m above ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
6. Set the spectrum analyzer in the following setting as:

Below 1GHz:

RBW=100kHz / VBW=300kHz / Sweep=AUTO

Above 1GHz:

(a) PEAK: RBW=1MHz,VBW=3MHz / Sweep=AUTO

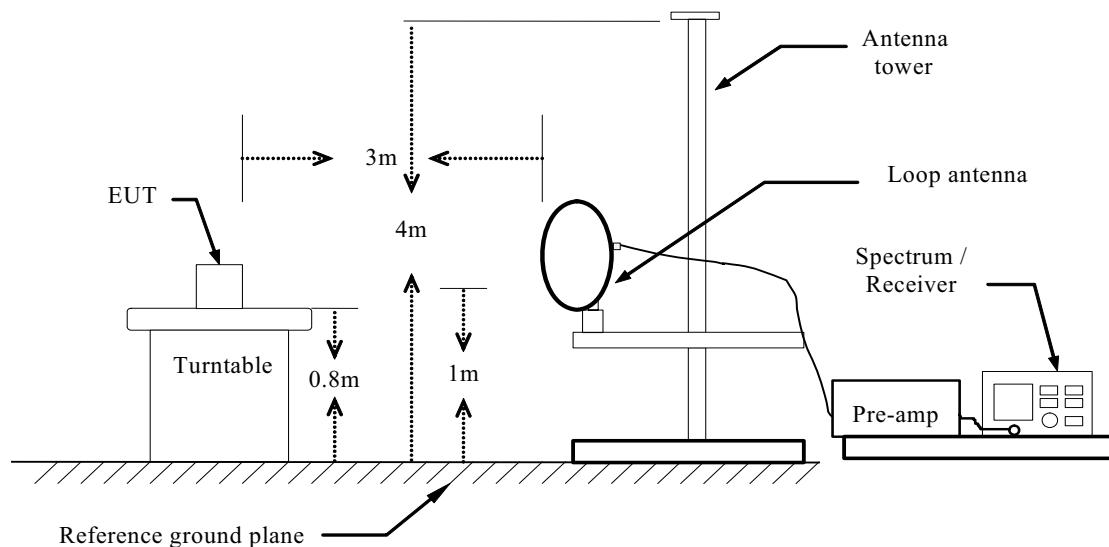
(b) AVERAGE: RBW=1MHz / VBW=10Hz / Sweep=AUTO

7. Repeat above procedures until the measurements for all frequencies are complete.

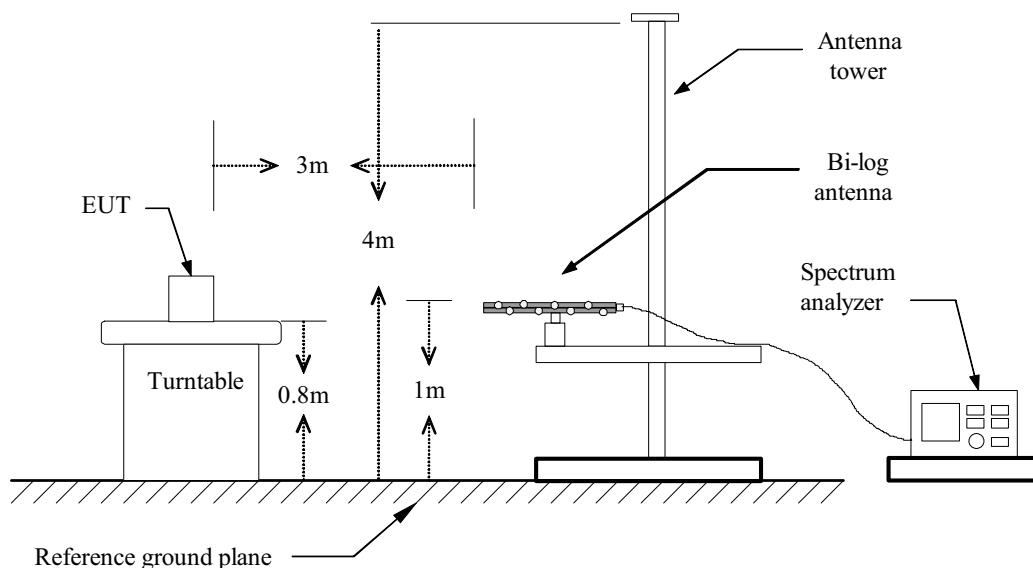


7.2.2.4. TEST SETUP

Below 30MHz

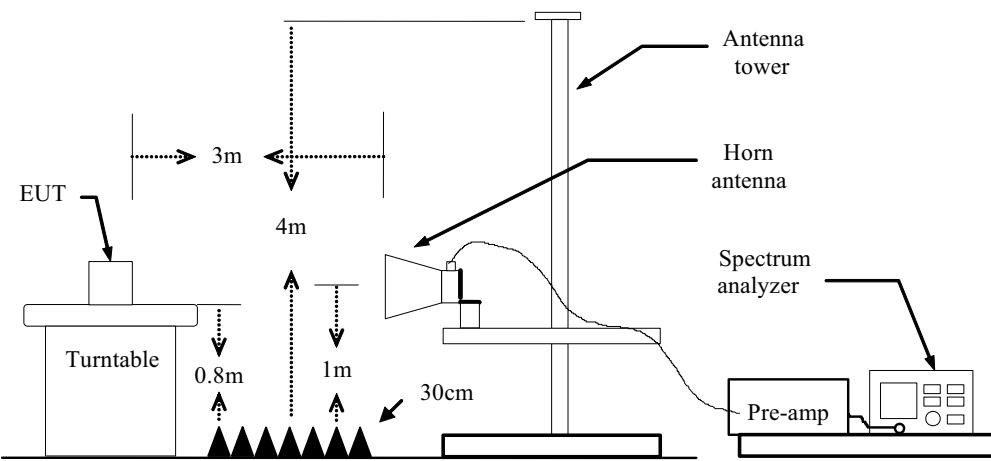


Below 1 GHz





Above 1 GHz



For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.



7.2.2.5. DATA SAMPLE

Below 1GHz

Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Pole (V/H)	Remark
XXX.XXXX	36.37	-12.20	24.17	40.00	-15.83	V	QP

Frequency (MHz)

= Emission frequency in MHz

Reading (dBuV)

= Uncorrected Analyzer / Receiver reading

Correct Factor (dB/m)

= Antenna factor + Cable loss – Amplifier gain

Result (dBuV/m)

= Reading (dBuV) + Corr. Factor (dB/m)

Limit (dBuV/m)

= Limit stated in standard

Margin (dB)

= Result (dBuV/m) – Limit (dBuV/m)

Q.P.

= Quasi-peak Reading

Above 1GHz

Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Pole (V/H)	Remark
XXXX.XXXX	62.09	-11.42	50.67	74.00	-23.33	V	Peak
XXXX.XXXX	49.78	-11.42	38.36	54.00	-15.64	V	AVG

Frequency (MHz)

= Emission frequency in MHz

Reading (dBuV)

= Uncorrected Analyzer / Receiver reading

Correction Factor (dB/m)

= Antenna factor + Cable loss – Amplifier gain

Result (dBuV/m)

= Reading (dBuV) + Corr. Factor (dB/m)

Limit (dBuV/m)

= Limit stated in standard

Margin (dB)

= Result (dBuV/m) – Limit (dBuV/m)

Peak

= Peak Reading

AVG

= Average Reading

Calculation Formula

Margin (dB) = Result (dBuV/m) – Limits (dBuV/m)

Result (dBuV/m) = Reading (dBuV) + Correction Factor



7.2.2.6. TEST RESULTS

Below 1 GHz

Operation Mode: TX

Test Date: October 25, 2014

Temperature: 24°C

Tested by: Mack Li

Humidity: 52% RH

Polarity: Ver. / Hor.

Frequency (MHz)	Reading (dB μ V)	Correction Factor (dB/m)	Result (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Antenna Pole (V/H)	Remark
249.9475	56.12	-21.08	35.04	46.00	-10.96	V	QP
320.0300	54.12	-18.93	35.19	46.00	-10.81	V	QP
479.9588	47.56	-14.36	33.20	46.00	-12.80	V	QP
640.0087	51.03	-12.47	38.56	46.00	-7.44	V	QP
709.9700	53.19	-11.90	41.29	46.00	-4.71	V	QP
874.9912	47.26	-10.14	37.12	46.00	-8.88	V	QP
249.9474	56.24	-21.08	35.16	46.00	-10.84	H	QP
369.9850	55.15	-17.22	37.93	46.00	-8.07	H	QP
479.9588	52.03	-14.36	37.67	46.00	-8.33	H	QP
709.9700	53.10	-11.90	41.20	46.00	-4.80	H	QP
800.0588	49.42	-11.12	38.30	46.00	-7.70	H	QP
959.9875	46.49	-8.68	37.81	46.00	-8.19	H	QP

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

Notes:

1. Radiated emissions measured in frequency range from 9kHz to 1GHz were made with an instrument using Quasi-peak detector mode.
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. The IF bandwidth of Receiver between 30MHz to 1GHz was 120kHz.
4. Frequency (MHz). = Emission frequency in MHz
Reading (dB μ V/m) = Receiver reading
Correction Factor (dB) = Antenna factor + Cable loss – Amplifier gain
Limit (dB μ V/m) = Limit stated in standard
Margin (dB) = Measured (dB μ V/m) – Limits (dB μ V/m)
Antenna Pol e(H/V) = Current carrying line of reading

**Above 1 GHz****Antenna 0****Test Mode:** TX / IEEE 802.11b (CH Low)**Tested by:** Mack Li**Ambient temperature:** 24°C **Relative humidity:** 52 % RH **Date:** November 5, 2014

Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Pole (V/H)	Remark
3216.250	44.24	1.52	45.76	74.00	-28.24	V	Peak
3599.875	40.74	3.32	44.06	74.00	-29.94	V	Peak
4823.875	40.02	10.27	50.29	74.00	-23.71	V	Peak
5088.250	34.60	11.72	46.32	74.00	-27.68	V	Peak
6199.750	34.77	12.61	47.38	74.00	-26.62	V	Peak
7026.625	34.87	12.81	47.68	74.00	-26.32	V	Peak
1725.625	43.99	-4.11	39.88	74.00	-34.12	H	Peak
3216.250	42.54	1.52	44.06	74.00	-29.94	H	Peak
4399.750	40.05	6.49	46.54	74.00	-27.46	H	Peak
4823.875	41.83	10.27	52.10	74.00	-21.90	H	Peak
5199.625	37.40	11.18	48.58	74.00	-25.42	H	Peak
5999.500	37.49	12.57	50.06	74.00	-23.94	H	Peak

REMARKS:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. 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.
5. 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.
6. Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).

**Test Mode:** TX / IEEE 802.11b (CH Mid)**Tested by:** Mack Li**Ambient temperature:** 24°C **Relative humidity:** 52 % RH **Date:** November 5, 2014

Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Pole (V/H)	Remark
3248.875	49.63	1.67	51.30	74.00	-22.70	V	peak
3599.875	43.23	3.32	46.55	74.00	-27.45	V	peak
4873.375	39.75	10.80	50.55	74.00	-23.45	V	peak
6100.750	34.85	12.59	47.44	74.00	-26.56	V	peak
6783.625	35.21	12.74	47.95	74.00	-26.05	V	peak
7750.000	34.96	13.45	48.41	74.00	-25.59	V	peak
3248.875	45.47	1.67	47.14	74.00	-26.86	H	Peak
3999.250	40.07	5.23	45.30	74.00	-28.70	H	Peak
4873.375	40.95	10.80	51.75	74.00	-22.25	H	Peak
6497.875	36.66	12.68	49.34	74.00	-24.66	H	Peak
7697.125	34.94	13.40	48.34	74.00	-25.66	H	Peak
8729.875	34.67	13.39	48.06	74.00	-25.94	H	Peak

REMARKS:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. 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.
5. 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.
6. Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).

**Test Mode:** TX / IEEE 802.11b (CH High)**Tested by:** Mack Li**Ambient temperature:** 24°C **Relative humidity:** 52 % RH **Date:** November 5, 2014

Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Pole (V/H)	Remark
3282.625	43.29	1.83	45.12	74.00	-28.88	V	peak
3599.875	40.26	3.32	43.58	74.00	-30.42	V	peak
4399.750	37.45	6.49	43.94	74.00	-30.06	V	peak
4924.000	40.53	11.34	51.87	74.00	-22.13	V	peak
6881.500	34.91	12.76	47.67	74.00	-26.33	V	peak
7680.250	35.67	13.39	49.06	74.00	-24.94	V	peak
3282.625	44.67	1.83	46.50	74.00	-27.50	H	Peak
4399.750	39.35	6.49	45.84	74.00	-28.16	H	Peak
4924.000	40.54	11.34	51.88	74.00	-22.12	H	Peak
5199.625	37.81	11.18	48.99	74.00	-25.01	H	Peak
5999.500	37.28	12.57	49.85	74.00	-24.15	H	Peak
6565.375	36.42	12.69	49.11	74.00	-24.89	H	Peak

REMARKS:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. 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.
5. 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.
6. Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).

**Antenna 1****Test Mode:** TX / IEEE 802.11b (CH Low)**Tested by:** Mack Li**Ambient temperature:** 24°C **Relative humidity:** 52 % RH **Date:** November 5, 2014

Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Pole (V/H)	Remark
3199.375	44.03	1.45	45.48	74.00	-28.52	V	Peak
3839.500	39.16	4.46	43.62	74.00	-30.38	V	Peak
4399.750	37.75	6.49	44.24	74.00	-29.76	V	Peak
5039.875	34.50	11.96	46.46	74.00	-27.54	V	Peak
6109.750	35.34	12.59	47.93	74.00	-26.07	V	Peak
6890.500	34.67	12.77	47.44	74.00	-26.56	V	Peak
3216.250	48.33	1.52	49.85	74.00	-24.15	H	Peak
4399.750	41.23	6.49	47.72	74.00	-26.28	H	Peak
4800.250	39.20	10.01	49.21	74.00	-24.79	H	Peak
5199.625	38.24	11.18	49.42	74.00	-24.58	H	Peak
5999.500	38.94	12.57	51.51	74.00	-22.49	H	Peak
6431.500	37.35	12.66	50.01	74.00	-23.99	H	Peak

REMARKS:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. 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.
5. 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.
6. Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).

**Test Mode:** TX / IEEE 802.11b (CH Mid)**Tested by:** Mack Li**Ambient temperature:** 24°C **Relative humidity:** 52 % RH **Date:** November 5, 2014

Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Pole (V/H)	Remark
3248.875	49.60	1.67	51.27	74.00	-22.73	V	peak
3599.875	43.09	3.32	46.41	74.00	-27.59	V	peak
4873.375	36.65	10.80	47.45	74.00	-26.55	V	peak
6205.375	35.35	12.62	47.97	74.00	-26.03	V	peak
7787.125	35.51	13.48	48.99	74.00	-25.01	V	peak
8377.750	34.65	13.53	48.18	74.00	-25.82	V	peak
3248.875	46.78	1.67	48.45	74.00	-25.55	H	Peak
4873.375	39.75	10.80	50.55	74.00	-23.45	H	Peak
6400.000	36.51	12.66	49.17	74.00	-24.83	H	Peak
7436.125	34.49	13.17	47.66	74.00	-26.34	H	Peak
8371.000	34.65	13.53	48.18	74.00	-25.82	H	Peak
9403.750	34.61	13.78	48.39	74.00	-25.61	H	Peak

REMARKS:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. 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.
5. 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.
6. Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).

**Test Mode:** TX / IEEE 802.11b (CH High)**Tested by:** Mack Li**Ambient temperature:** 24°C **Relative humidity:** 52 % RH **Date:** November 5, 2014

Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Pole (V/H)	Remark
3282.625	49.82	1.83	51.65	74.00	-22.35	V	peak
3599.875	40.08	3.32	43.40	74.00	-30.60	V	peak
4924.000	36.22	11.34	47.56	74.00	-26.44	V	peak
6229.000	34.37	12.62	46.99	74.00	-27.01	V	peak
6890.500	34.67	12.77	47.44	74.00	-26.56	V	peak
7732.000	34.86	13.43	48.29	74.00	-25.71	V	peak
3282.625	48.41	1.83	50.24	74.00	-23.76	H	Peak
3999.250	39.79	5.23	45.02	74.00	-28.98	H	Peak
4800.250	41.00	10.01	51.01	74.00	-22.99	H	Peak
4924.000	39.20	11.34	50.54	74.00	-23.46	H	Peak
5999.500	36.71	12.57	49.28	74.00	-24.72	H	Peak
6565.375	36.85	12.69	49.54	74.00	-24.46	H	Peak

REMARKS:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. 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.
5. 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.
6. Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).

**Antenna 0****Test Mode:** TX / IEEE 802.11g (CH Low)**Tested by:** Mack Li**Ambient temperature:** 24°C **Relative humidity:** 52 % RH **Date:** November 5, 2014

Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Pole (V/H)	Remark
3216.250	48.00	1.52	49.52	74.00	-24.48	V	Peak
3599.875	43.61	3.32	46.93	74.00	-27.07	V	Peak
4800.250	37.52	10.01	47.53	74.00	-26.47	V	Peak
6400.000	35.33	12.66	47.99	74.00	-26.01	V	Peak
7720.750	34.76	13.42	48.18	74.00	-25.82	V	Peak
8421.625	34.55	13.51	48.06	74.00	-25.94	V	Peak
3216.250	42.29	1.52	43.81	74.00	-30.19	H	Peak
3839.500	39.61	4.46	44.07	74.00	-29.93	H	Peak
4823.875	40.50	10.27	50.77	74.00	-23.23	H	Peak
5999.500	36.92	12.57	49.49	74.00	-24.51	H	Peak
6431.500	37.19	12.66	49.85	74.00	-24.15	H	Peak
7199.875	36.12	12.97	49.09	74.00	-24.91	H	Peak

REMARKS:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. 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.
5. 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.
6. Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).

**Test Mode:** TX / IEEE 802.11g (CH Mid)**Tested by:** Mack Li**Ambient temperature:** 24°C **Relative humidity:** 52 % RH **Date:** November 5, 2014

Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Pole (V/H)	Remark
3248.875	49.47	1.67	51.14	74.00	-22.86	V	Peak
3599.875	43.48	3.32	46.80	74.00	-27.20	V	Peak
4874.500	39.45	10.81	50.26	74.00	-23.74	V	Peak
6400.000	35.51	12.66	48.17	74.00	-25.83	V	Peak
6916.375	35.57	12.77	48.34	74.00	-25.66	V	Peak
8277.625	34.44	13.56	48.00	74.00	-26.00	V	Peak
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3248.875	44.30	1.67	45.97	74.00	-28.03	H	Peak
3999.250	39.87	5.23	45.10	74.00	-28.90	H	Peak
4800.250	40.48	10.01	50.49	74.00	-23.51	H	Peak
5199.625	38.39	11.18	49.57	74.00	-24.43	H	Peak
6400.000	37.08	12.66	49.74	74.00	-24.26	H	Peak
7764.625	34.74	13.46	48.20	74.00	-25.80	H	Peak

REMARKS:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. 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.
5. 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.
6. Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).

**Test Mode:** TX / IEEE 802.11g (CH High)**Tested by:** Mack Li**Ambient temperature:** 24°C **Relative humidity:** 52 % RH **Date:** November 5, 2014

Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Pole (V/H)	Remark
1730.125	47.38	-4.08	43.30	74.00	-30.70	V	Peak
3199.375	44.95	1.45	46.40	74.00	-27.60	V	Peak
3599.875	40.12	3.32	43.44	74.00	-30.56	V	Peak
4399.750	36.66	6.49	43.15	74.00	-30.85	V	Peak
4921.750	35.84	11.31	47.15	74.00	-26.85	V	Peak
6076.000	35.00	12.59	47.59	74.00	-26.41	V	Peak
3282.625	44.98	1.83	46.81	74.00	-27.19	H	Peak
4399.750	39.72	6.49	46.21	74.00	-27.79	H	Peak
4917.250	39.20	11.26	50.46	74.00	-23.54	H	Peak
5199.625	38.24	11.18	49.42	74.00	-24.58	H	Peak
5999.500	37.00	12.57	49.57	74.00	-24.43	H	Peak
7789.375	35.04	13.48	48.52	74.00	-25.48	H	Peak

REMARKS:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. 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.
5. 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.
6. Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).

**Antenna 1****Test Mode:** TX / IEEE 802.11g (CH Low)**Tested by:** Mack Li**Ambient temperature:** 24°C **Relative humidity:** 52 % RH **Date:** November 5, 2014

Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Pole (V/H)	Remark
3216.250	50.06	1.52	51.58	74.00	-22.42	V	Peak
5064.625	35.78	11.84	47.62	74.00	-26.38	V	Peak
5999.500	36.34	12.57	48.91	74.00	-25.09	V	Peak
7784.875	34.91	13.48	48.39	74.00	-25.61	V	Peak
8341.750	34.76	13.54	48.30	74.00	-25.70	V	Peak
9642.250	35.59	14.07	49.66	74.00	-24.34	V	Peak
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3282.625	45.18	1.83	47.01	74.00	-26.99	H	Peak
3999.250	41.80	5.23	47.03	74.00	-26.97	H	Peak
4800.250	38.66	10.01	48.67	74.00	-25.33	H	Peak
6565.375	35.66	12.69	48.35	74.00	-25.65	H	Peak
7737.625	34.63	13.44	48.07	74.00	-25.93	H	Peak
8714.125	34.93	13.40	48.33	74.00	-25.67	H	Peak

REMARKS:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. 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.
5. 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.
6. Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).

**Test Mode:** TX / IEEE 802.11g (CH Mid)**Tested by:** Mack Li**Ambient temperature:** 24°C **Relative humidity:** 52 % RH **Date:** November 5, 2014

Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Pole (V/H)	Remark
3248.875	49.24	1.67	50.91	74.00	-23.09	V	Peak
3599.875	43.62	3.32	46.94	74.00	-27.06	V	Peak
4800.250	39.11	10.01	49.12	74.00	-24.88	V	Peak
6157.000	34.62	12.60	47.22	74.00	-26.78	V	Peak
6992.875	34.84	12.79	47.63	74.00	-26.37	V	Peak
7708.375	34.74	13.41	48.15	74.00	-25.85	V	Peak
3248.875	47.96	1.67	49.63	74.00	-24.37	H	Peak
4800.250	41.71	10.01	51.72	74.00	-22.28	H	Peak
5199.625	39.21	11.18	50.39	74.00	-23.61	H	Peak
5999.500	37.89	12.57	50.46	74.00	-23.54	H	Peak
6400.000	38.56	12.66	51.22	74.00	-22.78	H	Peak
7697.125	34.44	13.40	47.84	74.00	-26.16	H	Peak

REMARKS:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. 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.
5. 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.
6. Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).

**Test Mode:** TX / IEEE 802.11g (CH High)**Tested by:** Mack Li**Ambient temperature:** 24°C **Relative humidity:** 52 % RH **Date:** November 5, 2014

Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Pole (V/H)	Remark
3282.625	45.81	1.83	47.64	74.00	-26.36	V	Peak
3599.875	39.65	3.32	42.97	74.00	-31.03	V	Peak
4399.750	37.56	6.49	44.05	74.00	-29.95	V	Peak
5023.000	33.95	12.04	45.99	74.00	-28.01	V	Peak
6226.750	34.66	12.62	47.28	74.00	-26.72	V	Peak
7139.125	34.24	12.91	47.15	74.00	-26.85	V	Peak
3216.250	44.67	1.52	46.19	74.00	-27.81	H	Peak
4399.750	39.07	6.49	45.56	74.00	-28.44	H	Peak
5199.625	38.32	11.18	49.50	74.00	-24.50	H	Peak
5999.500	36.54	12.57	49.11	74.00	-24.89	H	Peak
6431.500	35.97	12.66	48.63	74.00	-25.37	H	Peak
7693.750	35.34	13.40	48.74	74.00	-25.26	H	Peak

REMARKS:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. 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.
5. 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.
6. Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).

**Combine with Antenna 0 and Antenna 1****Test Mode:** TX / IEEE 802.11n HT20 MHz(CH Low)**Tested by:** Mack Li**Ambient temperature:** 24°C **Relative humidity:** 52 % RH**Date:** November 5, 2014

Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Pole (V/H)	Remark
3216.250	50.10	1.52	51.62	74.00	-22.38	V	Peak
3599.875	44.38	3.32	47.70	74.00	-26.30	V	Peak
4800.250	37.14	10.01	47.15	74.00	-26.85	V	Peak
6311.125	35.31	12.64	47.95	74.00	-26.05	V	Peak
7930.000	35.63	13.61	49.24	74.00	-24.76	V	Peak
9146.125	34.73	13.47	48.20	74.00	-25.80	V	Peak
3215.125	45.87	1.52	47.39	74.00	-26.61	H	Peak
3999.250	39.18	5.23	44.41	74.00	-29.59	H	Peak
4799.125	40.24	10.00	50.24	74.00	-23.76	H	Peak
5199.625	37.77	11.18	48.95	74.00	-25.05	H	Peak
6400.000	38.25	12.66	50.91	74.00	-23.09	H	Peak
7751.125	34.76	13.45	48.21	74.00	-25.79	H	Peak

REMARKS:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. 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.
5. 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.
6. Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).

**Test Mode:** TX / IEEE 802.11n HT20 MHz(CH Mid)**Tested by:** Mack Li**Ambient temperature:** 24°C **Relative humidity:** 52 % RH **Date:** November 5, 2014

Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Pole (V/H)	Remark
3248.875	49.90	1.67	51.57	74.00	-22.43	V	Peak
3599.875	44.01	3.32	47.33	74.00	-26.67	V	Peak
4983.625	35.29	11.97	47.26	74.00	-26.74	V	Peak
6063.625	35.30	12.58	47.88	74.00	-26.12	V	Peak
7556.500	35.40	13.28	48.68	74.00	-25.32	V	Peak
8330.500	34.95	13.54	48.49	74.00	-25.51	V	Peak
3248.875	47.37	1.67	49.04	74.00	-24.96	H	Peak
4800.250	39.86	10.01	49.87	74.00	-24.13	H	Peak
5199.625	39.28	11.18	50.46	74.00	-23.54	H	Peak
6431.500	37.19	12.66	49.85	74.00	-24.15	H	Peak
7199.875	35.90	12.97	48.87	74.00	-25.13	H	Peak
8357.500	34.95	13.53	48.48	74.00	-25.52	H	Peak

REMARKS:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. 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.
5. 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.
6. Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).

**Test Mode:** TX / IEEE 802.11n HT20 MHz(CH High)**Tested by:** Mack Li**Ambient temperature:** 24°C **Relative humidity:** 52 % RH **Date:** November 5, 2014

Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Pole (V/H)	Remark
3282.625	48.94	1.83	50.77	74.00	-23.23	V	Peak
3599.875	44.61	3.32	47.93	74.00	-26.07	V	Peak
4800.250	37.38	10.01	47.39	74.00	-26.61	V	Peak
6013.000	34.82	12.57	47.39	74.00	-26.61	V	Peak
6986.125	35.09	12.79	47.88	74.00	-26.12	V	Peak
8300.125	34.63	13.56	48.19	74.00	-25.81	V	Peak
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3282.625	48.10	1.83	49.93	74.00	-24.07	H	Peak
4800.250	40.17	10.01	50.18	74.00	-23.82	H	Peak
5999.500	35.91	12.57	48.48	74.00	-25.52	H	Peak
6565.375	36.47	12.69	49.16	74.00	-24.84	H	Peak
7652.125	34.88	13.36	48.24	74.00	-25.76	H	Peak
8339.500	34.72	13.54	48.26	74.00	-25.74	H	Peak

REMARKS:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. 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.
5. 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.
6. Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).

**Combine with Antenna 0 and Antenna 1****Test Mode:** TX / IEEE 802.11n HT40 MHz(CH Low)**Tested by:** Mack Li**Ambient temperature:** 24°C **Relative humidity:** 52 % RH **Date:** November 5, 2014

Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Pole (V/H)	Remark
3228.625	49.24	1.58	50.82	74.00	-23.18	V	Peak
3599.875	43.72	3.32	47.04	74.00	-26.96	V	Peak
4800.250	37.48	10.01	47.49	74.00	-26.51	V	Peak
6002.875	35.30	12.57	47.87	74.00	-26.13	V	Peak
7854.625	34.61	13.54	48.15	74.00	-25.85	V	Peak
8402.500	35.28	13.52	48.80	74.00	-25.20	V	Peak
3228.625	46.54	1.58	48.12	74.00	-25.88	H	Peak
4800.250	39.60	10.01	49.61	74.00	-24.39	H	Peak
5999.500	36.37	12.57	48.94	74.00	-25.06	H	Peak
6458.500	37.82	12.67	50.49	74.00	-23.51	H	Peak
7850.125	34.50	13.54	48.04	74.00	-25.96	H	Peak
8751.250	34.98	13.38	48.36	74.00	-25.64	H	Peak

REMARKS:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. 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.
5. 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.
6. Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).

**Test Mode:** TX / IEEE 802.11n HT40 MHz(CH Mid)**Tested by:** Mack Li**Ambient temperature:** 24°C **Relative humidity:** 52 % RH **Date:** November 5, 2014

Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Pole (V/H)	Remark
3248.875	49.47	1.67	51.14	74.00	-22.86	V	Peak
3599.875	44.59	3.32	47.91	74.00	-26.09	V	Peak
5002.750	35.11	12.14	47.25	74.00	-26.75	V	Peak
6400.000	35.32	12.66	47.98	74.00	-26.02	V	Peak
7648.750	35.18	13.36	48.54	74.00	-25.46	V	Peak
8384.500	34.96	13.52	48.48	74.00	-25.52	V	Peak
3248.875	47.48	1.67	49.15	74.00	-24.85	H	Peak
3999.250	40.53	5.23	45.76	74.00	-28.24	H	Peak
4799.125	39.46	10.00	49.46	74.00	-24.54	H	Peak
5999.500	36.29	12.57	48.86	74.00	-25.14	H	Peak
6400.000	37.32	12.66	49.98	74.00	-24.02	H	Peak
7753.375	34.75	13.45	48.20	74.00	-25.80	H	Peak

REMARKS:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. 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.
5. 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.
6. Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).

**Test Mode:** TX / IEEE 802.11n HT40 MHz(CH High)**Tested by:** Mack Li**Ambient temperature:** 24°C **Relative humidity:** 52 % RH **Date:** November 5, 2014

Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Pole (V/H)	Remark
3269.125	49.56	1.77	51.33	74.00	-22.67	V	Peak
3599.875	44.42	3.32	47.74	74.00	-26.26	V	Peak
4800.250	37.47	10.01	47.48	74.00	-26.52	V	Peak
6025.375	35.09	12.58	47.67	74.00	-26.33	V	Peak
6925.375	35.03	12.77	47.80	74.00	-26.20	V	Peak
7679.125	34.55	13.39	47.94	74.00	-26.06	V	Peak
3269.125	48.37	1.77	50.14	74.00	-23.86	H	Peak
4800.250	39.58	10.01	49.59	74.00	-24.41	H	Peak
5999.500	36.46	12.57	49.03	74.00	-24.97	H	Peak
6400.000	37.06	12.66	49.72	74.00	-24.28	H	Peak
7584.625	34.56	13.30	47.86	74.00	-26.14	H	Peak
9517.375	35.28	13.92	49.20	74.00	-24.80	H	Peak

REMARKS:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. 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.
5. 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.
6. Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).



7.3. 6dB BANDWIDTH MEASUREMENT

7.3.1. LIMITS

According to §15.247(a)(2), systems using digital modulation techniques may operate in the 902 - 928 MHz, 2400 - 2483.5 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

7.3.2. TEST INSTRUMENTS

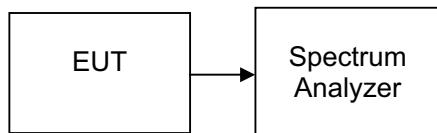
Name of Equipment	Manufacturer	Model	Serial Number	Last Calibration	Calibration Due
Spectrum Analyzer	Agilent	E4446A	US44300399	03/01/2014	03/01/2015

7.3.3. TEST PROCEDURES (please refer to measurement standard)

8.1 Option 1:

- a) Set RBW = 100 kHz.
- b) Set the video bandwidth (VBW) $\geq 3 \times$ RBW.
- c) Detector = Peak.
- d) Trace mode = max hold.
- e) Sweep = auto couple.
- f) Allow the trace to stabilize.
- g) Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

7.3.4. TEST SETUP





7.3.5. TEST RESULTS

No non-compliance noted

Test Data

Test mode: IEEE 802.11b (Antenna 0)

Channel	Frequency (MHz)	Bandwidth (kHz)	Limit (kHz)	Test Result
Low	2412	8112	>500	PASS
Mid	2437	8113		PASS
High	2462	8138		PASS

Test mode: IEEE 802.11b (Antenna 1)

Channel	Frequency (MHz)	Bandwidth (kHz)	Limit (kHz)	Test Result
Low	2412	8135	>500	PASS
Mid	2437	8135		PASS
High	2462	8098		PASS

Test mode: IEEE 802.11g (Antenna 0)

Channel	Frequency (MHz)	Bandwidth (kHz)	Limit (kHz)	Test Result
Low	2412	16465	>500	PASS
Mid	2437	16533		PASS
High	2462	16463		PASS

Test mode: IEEE 802.11g (Antenna 1)

Channel	Frequency (MHz)	Bandwidth (kHz)	Limit (kHz)	Test Result
Low	2412	16465	>500	PASS
Mid	2437	16468		PASS
High	2462	16470		PASS

**Test mode: IEEE 802.11n HT20 MHz (Antenna 0)**

Channel	Frequency (MHz)	Bandwidth (kHz)	Limit (kHz)	Test Result
Low	2412	17662	>500	PASS
Mid	2437	17657		PASS
High	2462	17643		PASS

Test mode: IEEE 802.11n HT20 MHz (Antenna 1)

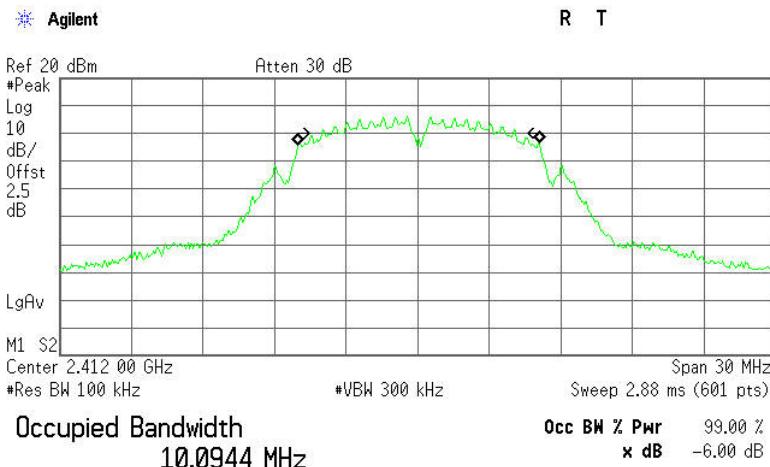
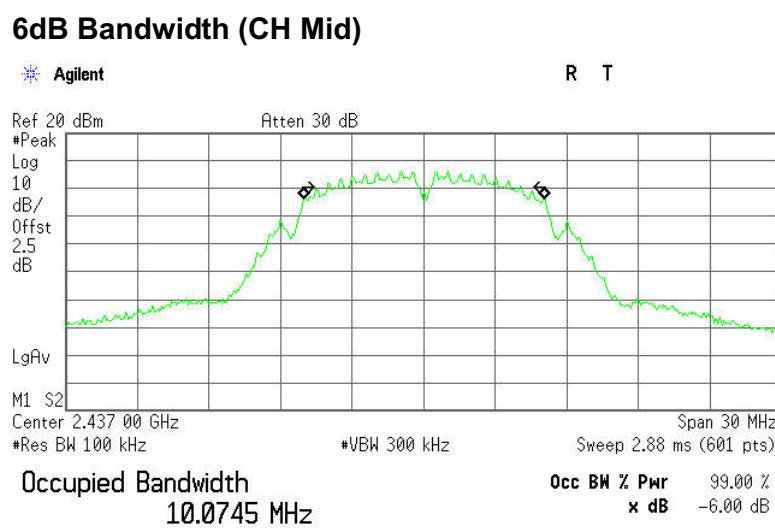
Channel	Frequency (MHz)	Bandwidth (kHz)	Limit (kHz)	Test Result
Low	2412	17711	>500	PASS
Mid	2437	17682		PASS
High	2462	17701		PASS

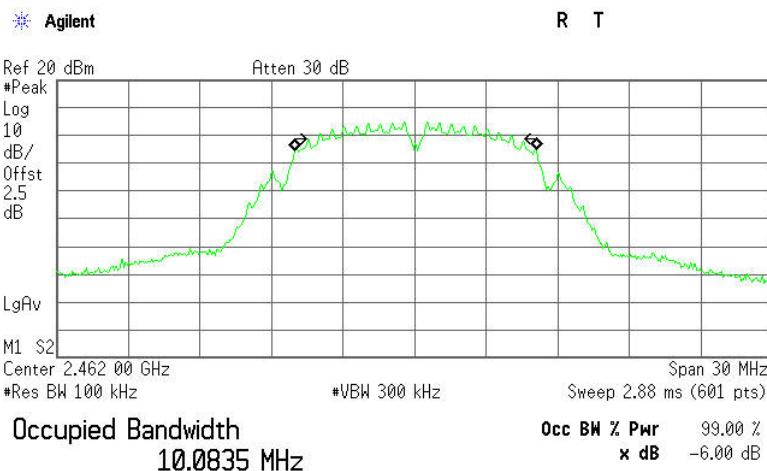
Test mode: IEEE 802.11n HT40 MHz (Antenna 0)

Channel	Frequency (MHz)	Bandwidth (kHz)	Limit (kHz)	Test Result
Low	2422	35770	>500	PASS
Mid	2437	35591		PASS
High	2452	35783		PASS

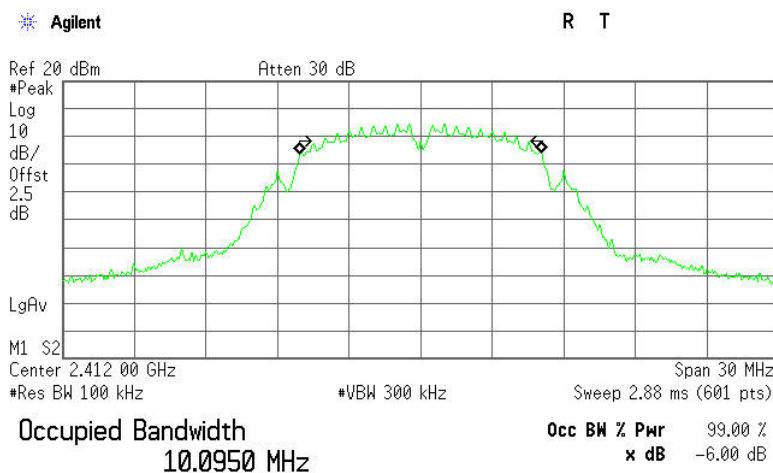
Test mode: IEEE 802.11n HT40 MHz (Antenna1)

Channel	Frequency (MHz)	Bandwidth (kHz)	Limit (kHz)	Test Result
Low	2422	35669	>500	PASS
Mid	2437	35954		PASS
High	2452	35861		PASS

**Test Plot****IEEE 802.11b mode (Antenna 0)****6dB Bandwidth (CH Low)****6dB Bandwidth (CH Mid)**

**6dB Bandwidth (CH High)**

Transmit Freq Error 36.735 kHz
x dB Bandwidth 8.138 MHz

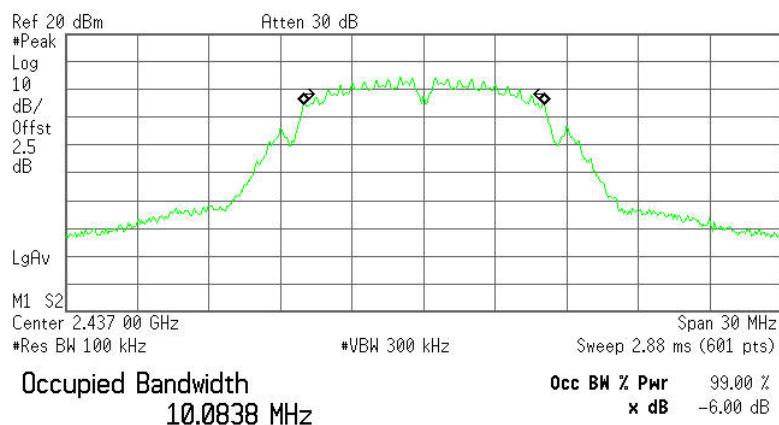
IEEE 802.11b mode (Antenna 1)**6dB Bandwidth (CH Low)**

Transmit Freq Error 15.386 kHz
x dB Bandwidth 8.135 MHz

**6dB Bandwidth (CH Mid)**

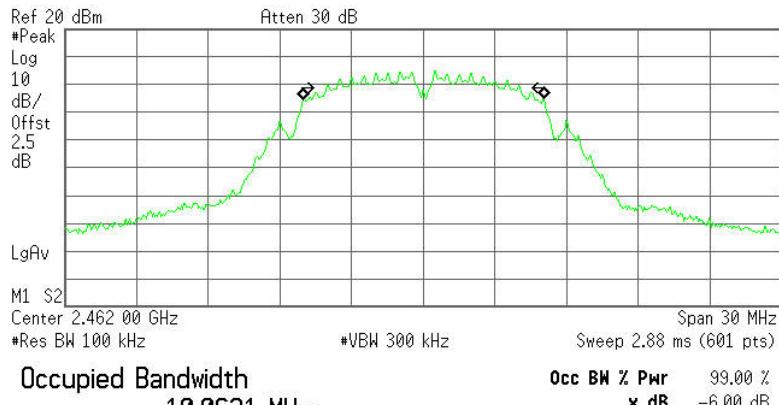
Agilent

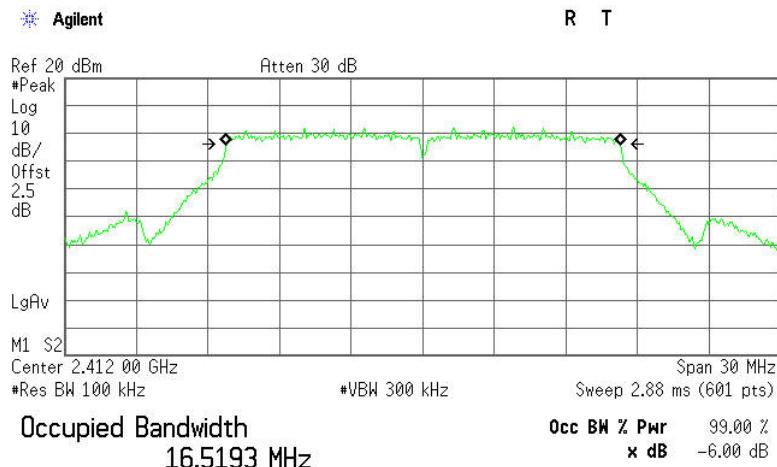
R T

Transmit Freq Error 21.370 kHz
x dB Bandwidth 8.135 MHz**6dB Bandwidth (CH High)**

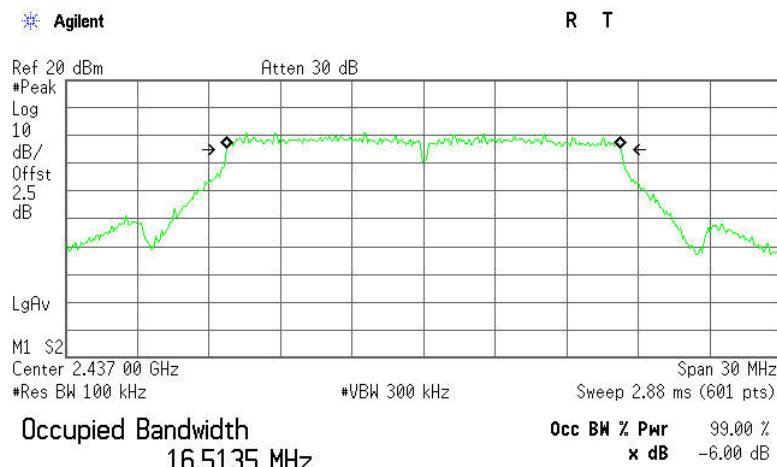
Agilent

R T

Transmit Freq Error 16.100 kHz
x dB Bandwidth 8.098 MHz

**IEEE 802.11g mode (Antenna 0)****6dB Bandwidth (CH Low)**

Transmit Freq Error 29.825 kHz
x dB Bandwidth 16.465 MHz

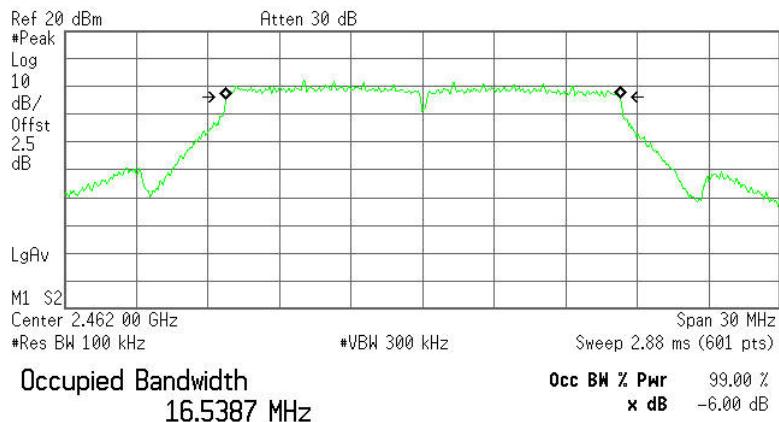
6dB Bandwidth (CH Mid)

Transmit Freq Error 9.668 kHz
x dB Bandwidth 16.533 MHz

**6dB Bandwidth (CH High)**

Agilent

R T

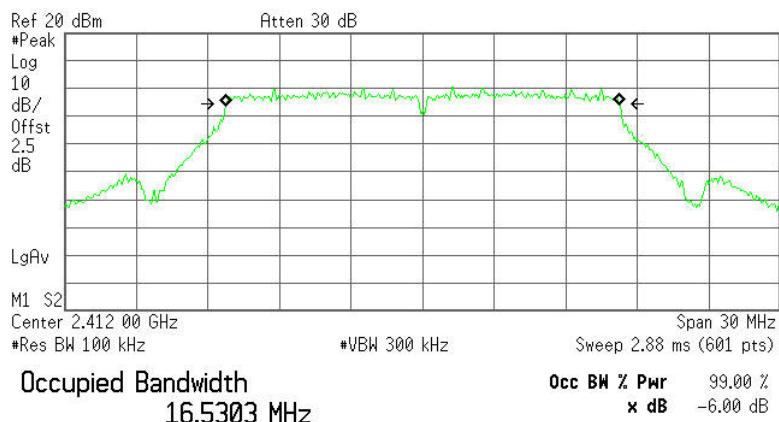


Transmit Freq Error 19.004 kHz
x dB Bandwidth 16.463 MHz

IEEE 802.11g mode (Antenna 1)**6dB Bandwidth (CH Low)**

Agilent

R T

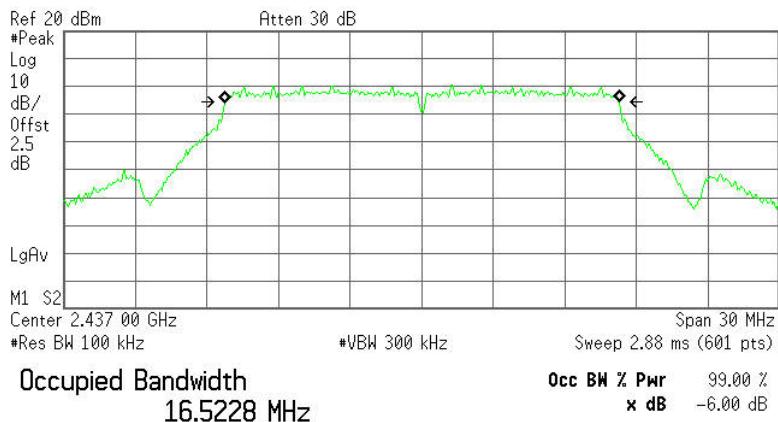


Transmit Freq Error 6.869 kHz
x dB Bandwidth 16.465 MHz

**6dB Bandwidth (CH Mid)**

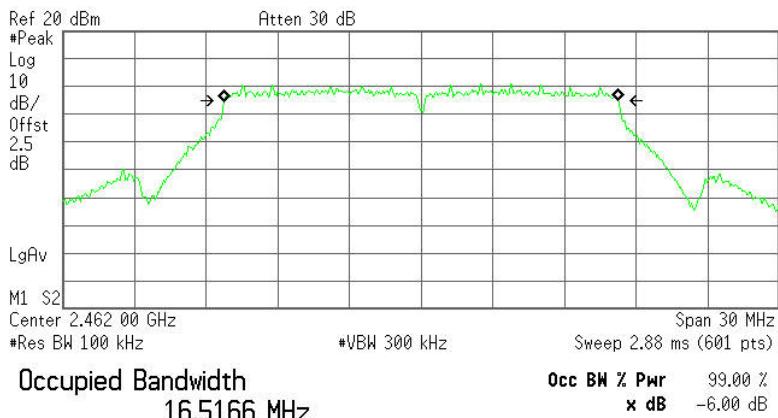
Agilent

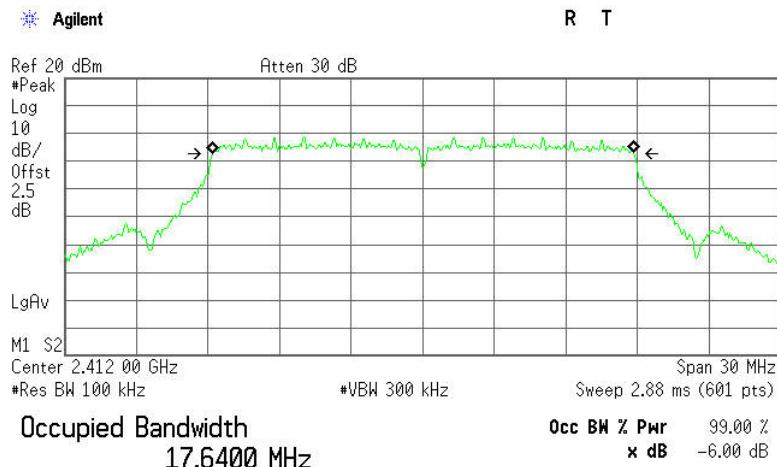
R T

Transmit Freq Error 18.360 kHz
x dB Bandwidth 16.468 MHz**6dB Bandwidth (CH High)**

Agilent

R T

Transmit Freq Error 7.632 kHz
x dB Bandwidth 16.470 MHz

**IEEE 802.11n HT20 MHz mode (Antenna 0)****6dB Bandwidth (CH Low)****6dB Bandwidth (CH Mid)**