



**FCC 47 CFR PART 15 SUBPART E**

**TEST REPORT**

**For**

**Notebook Computer**

**Model:**

**Satellite S5\*\*\*\*\*.C\*\*\*\*\***

**Satellite E5\*\*\*\*\*.C\*\*\*\*\***

**Satellite L5\*\*\*\*\*.C\*\*\*\*\***

**Satellite P5\*\*\*\*\*.C\*\*\*\*\***

**Satellite Radius L5\*\*\*\*\*.C\*\*\*\*\***

**Satellite Radius P5\*\*\*\*\*.C\*\*\*\*\***

**Satellite Fusion L5\*\*\*\*\*.C\*\*\*\*\***

(\* means 0-9; a-z; A-Z; / ; - ; no symbol, or blank for marketing purpose)

**Trade Name: TOSHIBA**

*Issued to*

**Pegatron Corporation**

**5F, NO. 76, LIGONG ST., BEITOU DISTRICT, TAIPEI CITY 112, TAIWAN (R.O.C.)**

*Issued by*

**Compliance Certification Services Inc.**

**No.11, Wugong 6th Rd., Wugu Dist.,**

**New Taipei City 24891, Taiwan. (R.O.C.)**

**<http://www.ccsrf.com>**

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**Issued Date: February 25, 2015**



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**Revision History**

Rev.		Issue Date		Revisions	Effect Page	Revised By
00		February 25, 2015		Initial Issue	ALL	Doris Chu



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### APPENDIX 1 - PHOTOGRAPHS OF EUT



## 1. TEST RESULT CERTIFICATION

**Applicant:** Pegatron Corporation  
5F, NO. 76, LIGONG ST., BEITOU DISTRICT, TAIPEI CITY 112,  
TAIWAN (R.O.C.)

**Equipment Under Test:** Notebook Computer

**Trade Name:** TOSHIBA

**Model:** Satellite S5\*\*\*\*\*-C\*\*\*\*\*  
Satellite E5\*\*\*\*\*-C\*\*\*\*\*  
Satellite L5\*\*\*\*\*-C\*\*\*\*\*  
Satellite P5\*\*\*\*\*-C\*\*\*\*\*  
Satellite Radius L5\*\*\*\*\*-C\*\*\*\*\*  
Satellite Radius P5\*\*\*\*\*-C\*\*\*\*\*  
Satellite Fusion L5\*\*\*\*\*-C\*\*\*\*\*  
(\* means 0-9; a-z; A-Z; / ; - ; no symbol, or blank for marketing purpose)

**Date of Test:** February 6 ~ 11, 2015

APPLICABLE STANDARDS	
STANDARD	TEST RESULT
FCC 47 CFR Part 15 Subpart E	No non-compliance noted

### We hereby certify that:

Compliance Certification Services Inc. tested the above equipment. 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: 2003 and the energy emitted by the sample EUT tested as described in this report is in compliance with conducted and radiated emission limits of FCC Rules Part 15.407.

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

Approved by:

Miller Lee  
Section Manager  
Compliance Certification Services Inc.

Reviewed by:

Angel Cheng  
Section Manager  
Compliance Certification Services Inc.



## 2. EUT DESCRIPTION

Product	Notebook Computer				
Trade Name	TOSHIBA				
Model Number	Satellite S5*****-C***** Satellite E5*****-C***** Satellite L5*****-C***** Satellite P5*****-C***** Satellite Radius L5*****-C***** Satellite Radius P5*****-C***** Satellite Fusion L5*****-C***** (* means 0-9; a-z; A-Z; / ; - ; no symbol, or blank for marketing purpose)				
Model Discrepancy	All the above models are identical except for the designation of model numbers. The suffix of “*” (* means 0-9; a-z; A-Z; / ; - ; no symbol, or blank for marketing purpose) on model number is just for marketing purpose only.				
Received Date	January 23, 2015				
WLAN Manufacturer	Intel	Model	3160NGW		
Power Supply	1. VDC from Power Adapter TOSHIBA / Model: PA5178U-1ACA I/P: 100-240V, 50-60Hz, 1.7A O/P: 19V, 3.42A 2. Power from Battery TOSHIBA / PA5208U-1BRS Rating 10.8Vdc, 45Wh, 3860mAh				
Frequency Range	IEEE 802.11a, IEEE 802.11n HT20 mode: 5745 ~ 5825MHz IEEE 802.11n HT40 mode: 5755 ~ 5795MHz IEEE 802.11ac VHT 80 mode: 5775MHz				
Channel Number	IEEE 802.11a, IEEE 802.11n HT20 mode: 5 Channels IEEE 802.11n HT40 mode: 2 Channels IEEE 802.11ac VHT 80 mode: 1 Channels				
Transmit Power		Mode	Frequency Range (MHz)	Transmit Power (dBm)	Transmit Power (W)
	UNII Band VI	IEEE 802.11a	5745 ~ 5825	13.44	0.02208
		IEEE 802.11n HT 20 MHz	5745 ~ 5825	13.42	0.02198
		IEEE 802.11n HT 40 MHz	5755 ~ 5795	13.43	0.02203
		IEEE 802.11ac VHT 80 MHz	5775	13.39	0.02183
Modulation Technique	OFDM (QPSK, BPSK, 16-QAM, 64-QAM, 256QAM)				



<b>Transmit Data Rate</b>	IEEE 802.11a: 54, 48, 36, 24, 18, 12, 9, 6 Mbps IEEE 802.11n HT 20 mode OFDM (6.5, 7.2, 13, 14.4, 14.44, 19.5, 21.7, 26, 28.89, 28.9, 39, 43.3, 43.33 52, 57.78, 57.8, 58.5, 65.0, 72.2, 78, 86.67, 104, 115.56, 117, 130, 144.44 Mbps) IEEE 802.11n HT 40 mode: OFDM (13.5, 15, 27, 30, 40.5, 45, 54, 60, 81, 90, 108, 120, 121.5, 135, 150, 162, 180, 216, 240, 243, 270, 300 Mbps) IEEE 802.11ac VHT 80 mode: OFDM (29.3, 58.5, 87.8, 117, 175.5, 234, 263.3, 292.5, 351, 390, 468, 526.5, 585, 702, 780 Mbps)
<b>Antenna Specification</b>	1. Yageo(Metal) ANTA0TP09551WLAN4 (TX1) / 0.32dBi (Worse) 2. Yageo(IMR) ANTA0TP09551WLAN2 (TX1) / -2.81dBi 3. ACON(Metal) APP6Y-700301 (TX1) / -5.75dBi 4. ACON(IMR) APP6Y-700249 (TX1) /-3.42dBi
<b>Antenna Designation</b>	PIFA Antenna

**Remark:**

1. The sample selected for test was engineering sample that approximated to production product and was provided by manufacturer.
2. This submittal(s) (test report) is intended for FCC ID: **VUI-THOR3160** filing to comply with Section 15.407 of the FCC Part 15, Subpart E Rules.



### **3. TEST METHODOLOGY**

Both conducted and radiated testing was performed according to the procedures in ANSI C63.4. Radiated testing was performed at an antenna to EUT distance 3 meters.

#### **3.1 EUT CONFIGURATION**

The EUT configuration for testing is installed for RF field strength measurement to meet the Commissions requirement, and is operated in a manner intended to generate the maximum emission in a continuous normal application.

#### **3.2 EUT EXERCISE**

The EUT is operated in the engineering mode to fix the Tx frequency for the purposes of measurement.

According to its specifications, the EUT must comply with the requirements of Section 15.407 under the FCC Rules Part 15 Subpart E.

#### **3.3 GENERAL TEST PROCEDURES**

##### **Conducted Emissions**

The EUT is placed on the turntable, which is positioned at 0.8 m above the ground plane. According to the requirements in Section 13.1.4.1 of ANSI C63.4, the conducted emission from the EUT is measured in the frequency range between 0.15 MHz and 30MHz, using the CISPR Quasi-Peak detector mode.

##### **Radiated Emissions**

The EUT is placed on the turntable, which is 0.8 m above the ground plane. The turntable is then rotated for 360 degrees to determine the proper orientation for the maximum emission level. The EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emission level. And, each emission is to be maximized by changing the horizontal and vertical polarization of the receiving antenna. In order to find out the maximum emissions, exploratory radiated emission measurements were made according to the requirements in Section 13.1.4.1 of ANSI C63.4.



### 3.4 FCC PART 15.205 RESTRICTED BANDS OF OPERATIONS

- (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
<sup>1</sup> 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 -	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.52525	2655 - 2900	22.01 - 23.12
8.41425 - 8.41475	156.7 - 156.9	3260 - 3267	23.6 - 24.0
12.29 - 12.293	162.0125 - 167.17	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	167.72 - 173.2	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	240 - 285	3600 - 4400	( <sup>2</sup> )
13.36 - 13.41	322 - 335.4		

<sup>1</sup> Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

<sup>2</sup> Above 38.6

- (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.





### 3.5 DESCRIPTION OF TEST MODES

The EUT (model: Satellite S50-C) comes with four types of antenna (model: ANTA0TP09551WLAN4 (TX1) / ANTA0TP09551WLAN2 (TX1) / APP6Y-700301 (TX1) / APP6Y-700249 (TX1)) for sale. After the preliminary test, the antenna ANTA0TP09551WLAN4 (TX1) was found to emit the worst emissions and therefore had been tested under operating condition.

Software used to control the EUT for staying in continuous transmitting mode was programmed.

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.

#### **Band IV**

##### **IEEE 802.11a mode / 5745 ~ 5825MHz**

Channel Low (5745MHz), Channel Mid (5785MHz) and Channel High (5825MHz) with 6Mbps data rate were chosen for full testing.

##### **IEEE 802.11n HT 20 MHz mode / 5745 ~ 5825MHz**

Channel Low(5745MHz), Channel Mid(5785MHz) and Channel High(5825MHz) with 6.5Mbps data rate were chosen for full testing.

##### **IEEE 802.11n HT 40 MHz mode / 5755 ~ 5795MHz**

Channel Low(5755MHz) and Channel High(5795MHz) with 13.5Mbps data rate were chosen for full testing.

##### **IEEE 802.11ac VHT 80 MHz mode for 5775MHz:**

Channel (5775MHz) with 6.5Mbps data rate were chosen for full testing.

The field strength of spurious emission was measured in the following position: The EUT has Notebook mode, Flat mode, Tent mode, Stand mode, Tablet X, Y and Z axis modes. The worst emission was found in Notebook mode and the worst case was recorded.



## 4. INSTRUMENT CALIBRATION

### 4.1 MEASURING INSTRUMENT CALIBRATION

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipment, which is traceable to recognized national standards.

### 4.2 MEASUREMENT EQUIPMENT USED

#### Equipment Used for Emissions Measurement

*Remark: Each piece of equipment is scheduled for calibration once a year and Loop Antenna is scheduled for calibration once three years.*

Conducted Emissions Test Site				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	Agilent	E4446A	US42510252	11/23/2015
Thermostatic/Hrgrosatic Chamber	TAICHY	MHG-150LF	930619	10/07/2015
AC Power Source	EXTECH	6205	1140845	N.C.R
DC Power Supply	ABM	8301HD	D011531	N.C.R
Power Meter	Anritsu	ML2495A	1012009	06/03/2015
Power Sensor	Anritsu	MA2411A	0917072	06/03/2015
Spectrum Analyzer	ROHDE&SCHWARZ	FSV40	101073	07/09/2015

Wugu 966 Chamber A				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	Agilent	E4446A	US42510268	09/18/2015
EMI Test Receiver	R&S	ESCI	100064	05/30/2015
Bilog Antenna	Sunol Sciences	JB3	A030105	08/19/2015
Horn Antenna	EMCO	3117	00055165	01/26/2016
Horn Antenna	EMCO	3116	26370	12/25/2015
Turn Table	CCS	CC-T-1F	N/A	N.C.R
Antenna Tower	CCS	CC-A-1F	N/A	N.C.R
Controller	CCS	CC-C-1F	N/A	N.C.R
Pre-Amplifier	MITEQ	1652-3000	1490939	08/09/2016
Pre-Amplifier	EMC	EMC 01265	4035	08/09/2016
Pre-Amplifier	MITEQ	AMF-6F-260400-40-8P	985646	12/25/2015
Coaxial Cable	Huber+Suhner	102	29212/2	12/25/2015
Coaxial Cable	Huber+Suhner	102	29406/2	12/25/2015
Test S/W	EZ-EMC (CCS-3A1RE)			

Conducted Emission room # B				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
EMI Test Receiver	R&S	ESCI	101073	09/18/2015
LISN	R&S	ENV216	101054	05/18/2015
LISN	SCHWARZBECK	NSLK 8127	8127-541	11/25/2015
Capacitive Voltage Probe	FCC	F-CVP-1	100185	03/09/2015
Test S/W	CCS-3A1-CE			



#### 4.3 MEASUREMENT UNCERTAINTY

PARAMETER	UNCERTAINTY
Powerline Conducted Emission	+/- 1.2575
3M Semi Anechoic Chamber / <200M	+/- 4.0138
3M Semi Anechoic Chamber / 200M~1000M	+/- 3.9483
3M Semi Anechoic Chamber / 1G~8G	+/- 2.5975
3M Semi Anechoic Chamber / 8G~18G	+/- 2.6112
3M Semi Anechoic Chamber / 18G~26G	+/- 2.7389
3M Semi Anechoic Chamber / 26G~40G	+/- 2.9683

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



## 5. FACILITIES AND ACCREDITATIONS

### 5.1 FACILITIES

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

☒ No.139, Wugong Rd., Wugu Dist., New Taipei City 24891, Taiwan (R.O.C.)

Tel: 886-2-2298-4086 / Fax: 886-2-2298-1470

☒ No.11, Wugong 6th Rd., Wugu Dist., New Taipei City 24891, Taiwan. (R.O.C.)

Tel: 886-2-2299-9720 / Fax: 886-2-2298-4045

☐ No.81-1, Lane 210, Bade 2nd Rd., Lujhu Township, Taoyuan County 33841, TAIWAN, R.O.C.

Tel: 886-3-324-0332 / Fax: 886-3-324-5235

The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 and CISPR Publication 22.

### 5.2 EQUIPMENT




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

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

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

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

**5.3 TABLE OF ACCREDITATIONS AND LISTINGS**

Country	Agency	Scope of Accreditation	Logo
USA	FCC	3M Semi Anechoic Chamber (FCC MRA: TW1039) to perform FCC Part 15 measurements	 FCC MRA: TW1039
Taiwan	TAF	LP0002, RTTE01, FCC Method-47 CFR Part 15 Subpart C, D, E, RSS-210, RSS-310 IDA TS SRD, AS/NZS 4268, AS/NZS 4771, TS 12.1 & 12.2, ETSI EN 300 440-1, ETSI EN 300 440-2, ETSI EN 300 328, ETSI EN 300 220-1, ETSI EN 300 220-2, ETSI EN 301 893, ETSI EN 301 489-1/3/7/17 FCC OET Bulletin 65 + Supplement C, EN 50360, EN 50361, EN 50371, RSS 102, EN 50383, EN 50385, EN 50392, IEC 62209, CNS 14958-1, CNS 14959 FCC Method -47 CFR Part 15 Subpart B IEC / EN 61000-3-2, IEC / EN 61000-3-3, IEC / EN 61000-4-2/3/4/5/6/8/11	 Testing Laboratory 1309
Canada	Industry Canada	3M Semi Anechoic Chamber (IC 2324G-1 / IC 2324G-2) to perform	 IC 2324G-1 IC 2324G-2

*\* No part of this report may be used to claim or imply product endorsement by A2LA or any agency of the US Government.*



## 6. SETUP OF EQUIPMENT UNDER TEST

### 6.1 SETUP CONFIGURATION OF EUT

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

### 6.2 SUPPORT EQUIPMENT

No.	Device Type	Brand	Model	Series No.	FCC ID	Data Cable	Power Cord
	N/A						

**Remark:**

- 1. All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.*
- 2. Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.*



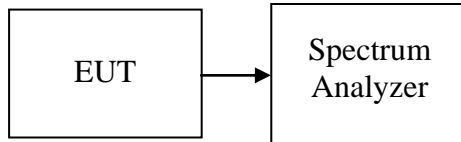
## 7. FCC PART 15 REQUIREMENTS

### 7.16DB BANDWIDTH

#### **LIMIT**

According to §15.407, systems using digital modulation techniques may operate in the 5725 - 5850 MHz bands. The minimum 6dB bandwidth shall be at least 500 kHz.

#### **Test Configuration**



#### **TEST PROCEDURE**

1. Place the EUT on the table and set it in the transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set the spectrum analyzer as RBW = VBW = 100kHz, Span = 50MHz, Sweep = auto.
4. Mark the peak frequency and -6dB (upper and lower) frequency.
5. Repeat until all the rest channels are investigated.

#### **TEST RESULTS**

*No non-compliance noted*

**Test Data****Test mode: IEEE 802.11a mode / 5745 ~ 5825MHz**

Channel	Frequency (MHz)	6db Bandwidth (MHz)	99% Bandwidth (MHz)
Low	5745	16.621	17.7239
Mid	5785	16.549	17.7974
High	5825	16.498	18.2464

**Test mode: IEEE 802.11n HT 20 MHz mode / 5745 ~ 5825MHz**

Channel	Frequency (MHz)	6db Bandwidth (MHz)	99% Bandwidth (MHz)
Low	5745	17.761	18.4730
Mid	5785	17.590	18.7138
High	5825	17.645	18.6437

**Test mode: IEEE 802.11n HT 40 MHz mode / 5755 ~ 5815MHz**

Channel	Frequency (MHz)	6db Bandwidth (MHz)	99% Bandwidth (MHz)
Low	5755	35.650	36.3759
High	5795	35.786	36.4918

**Test mode: IEEE 802.11ac VHT 80 MHz mode / 5775MHz**

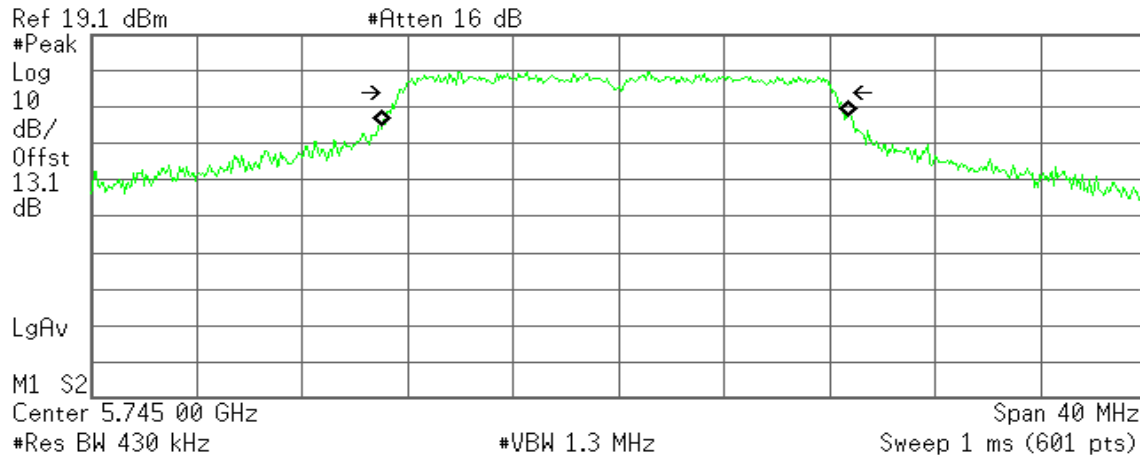
Channel	Frequency (MHz)	6db Bandwidth (MHz)	99% Bandwidth (MHz)
Mid	5775	72.966	74.7682



**Test Plot****IEEE 802.11a mode / 5745 ~ 5825MHz****CH Low**

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R T



**Occupied Bandwidth**  
**17.7239 MHz**

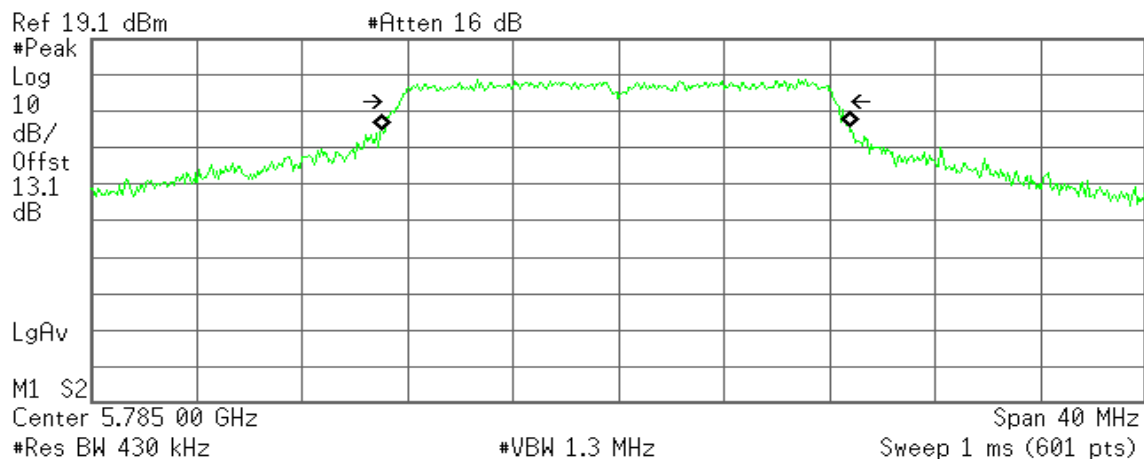
**Occ BW % Pwr** 99.00 %  
**x dB** -6.00 dB

**Transmit Freq Error** -110.348 kHz  
**x dB Bandwidth** 16.621 MHz

**CH Mid**

\* Agilent

R T



**Occupied Bandwidth**  
**17.7974 MHz**

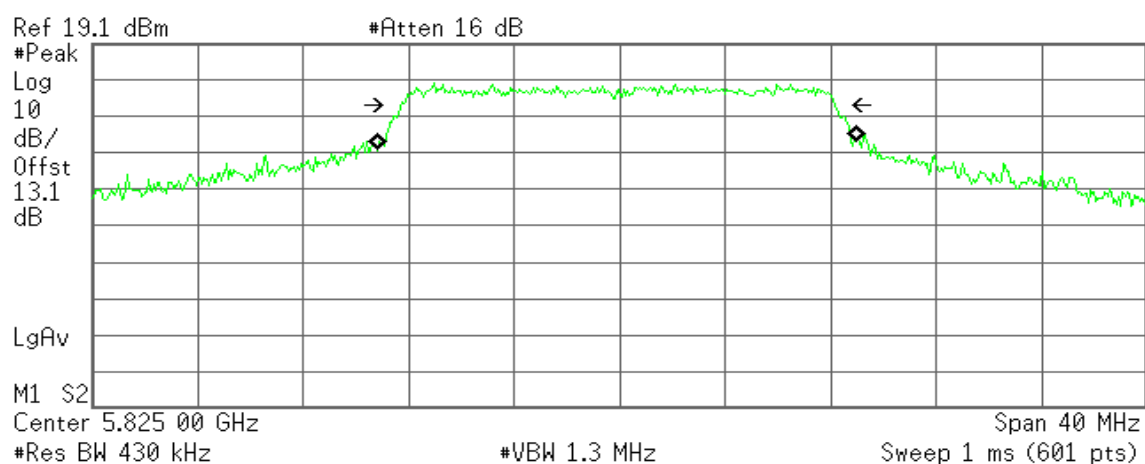
**Occ BW % Pwr** 99.00 %  
**x dB** -6.00 dB

**Transmit Freq Error** -125.531 kHz  
**x dB Bandwidth** 16.549 MHz

CH High

 **Agilent**

R T



## Occupied Bandwidth

18.2464 MHz

Occ BW % Pwr 99.00 %

**x dB** -6.00 dB

**Transmit Freq Error**     -103.782 kHz

x dB Bandwidth	16.498 MHz
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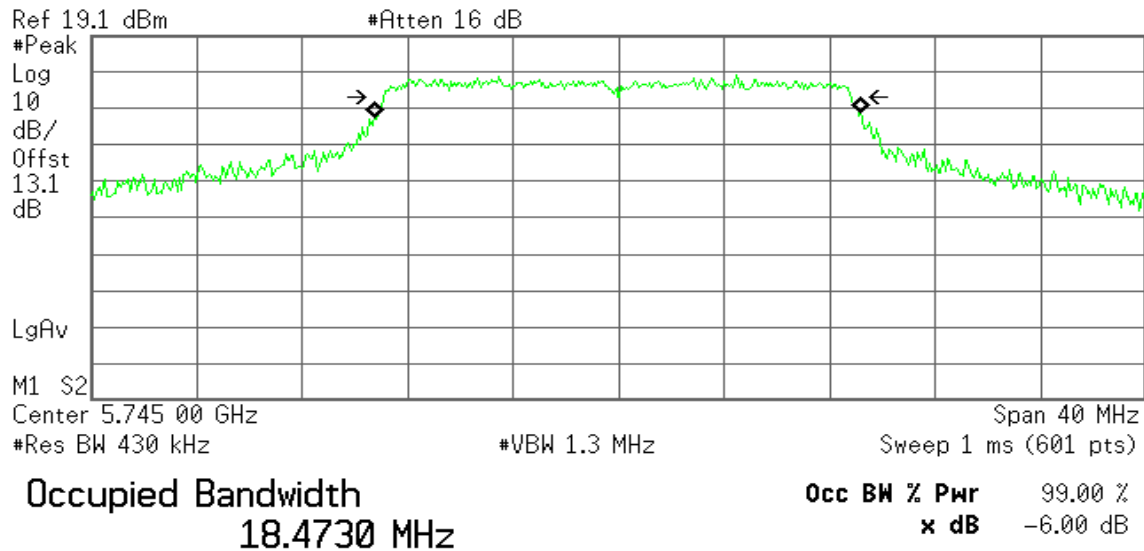


**IEEE 802.11n HT 20 MHz mode / 5745 ~ 5825MHz**

**CH Low**

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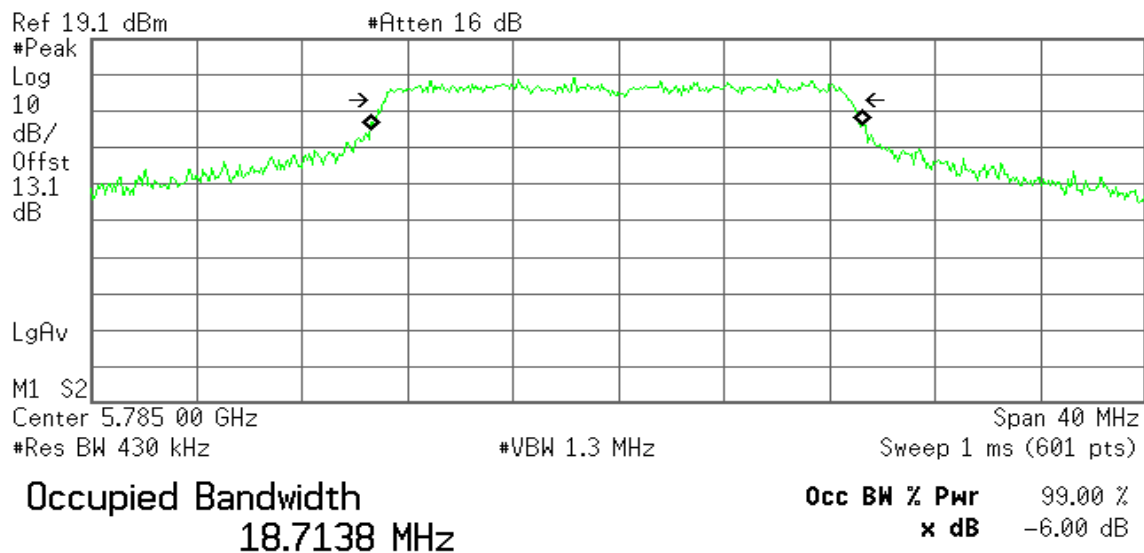


**Transmit Freq Error** -51.007 kHz  
**x dB Bandwidth** 17.761 MHz

**CH Mid**

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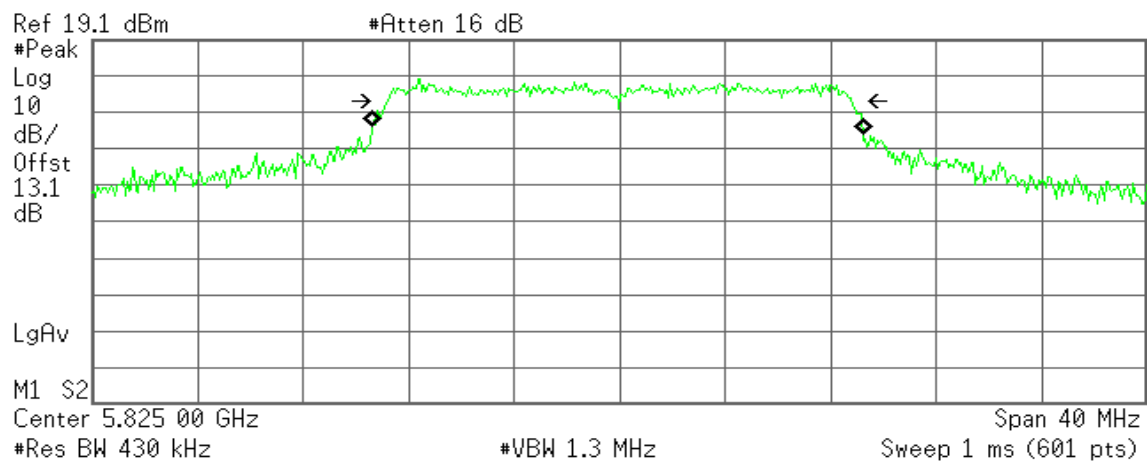
**Transmit Freq Error** -74.500 kHz  
**x dB Bandwidth** 17.590 MHz



# CH High

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R T



Occupied Bandwidth

18.6437 MHz

Occ BW % Pwr 99.00 %  
x dB -6.00 dB

Transmit Freq Error -70.634 kHz  
x dB Bandwidth 17.645 MHz

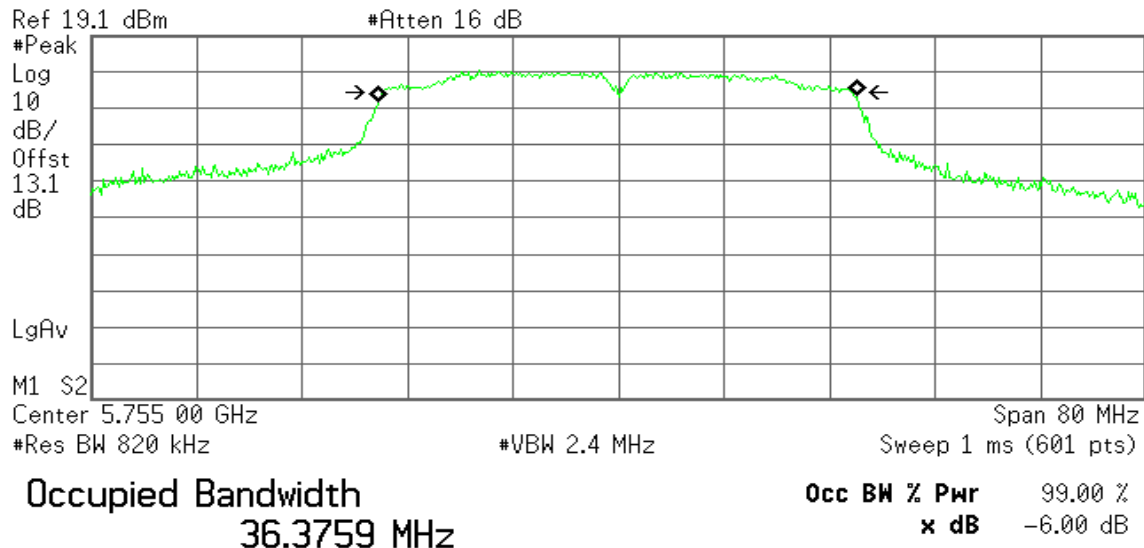


**IEEE 802.11n HT 40 MHz mode / 5755 ~ 5795MHz**

**CH Low**

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R T

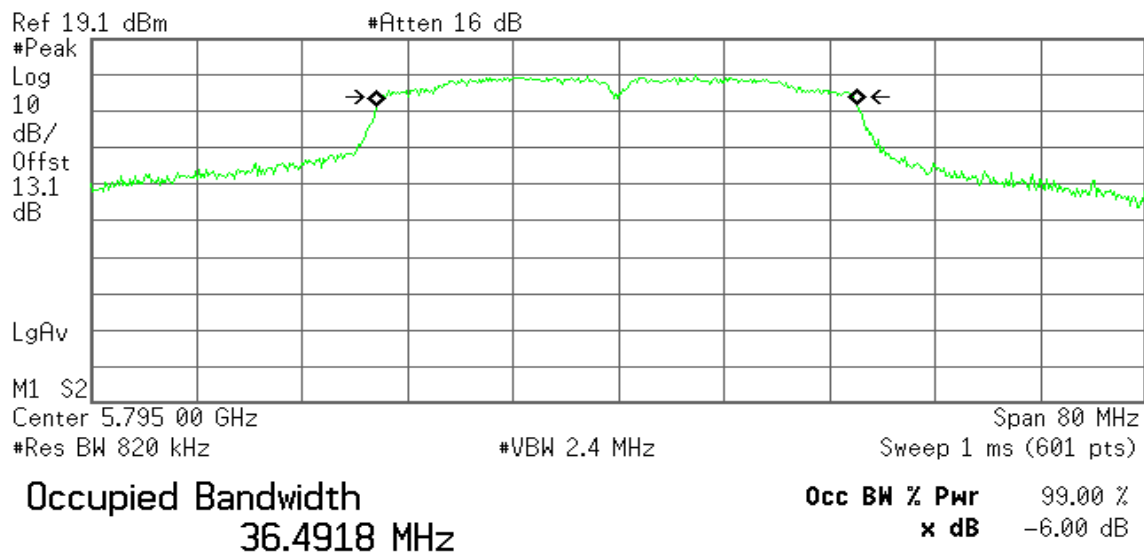


**Transmit Freq Error** -92.606 kHz  
**x dB Bandwidth** 35.650 MHz

**CH High**

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**Transmit Freq Error** -118.620 kHz  
**x dB Bandwidth** 35.786 MHz

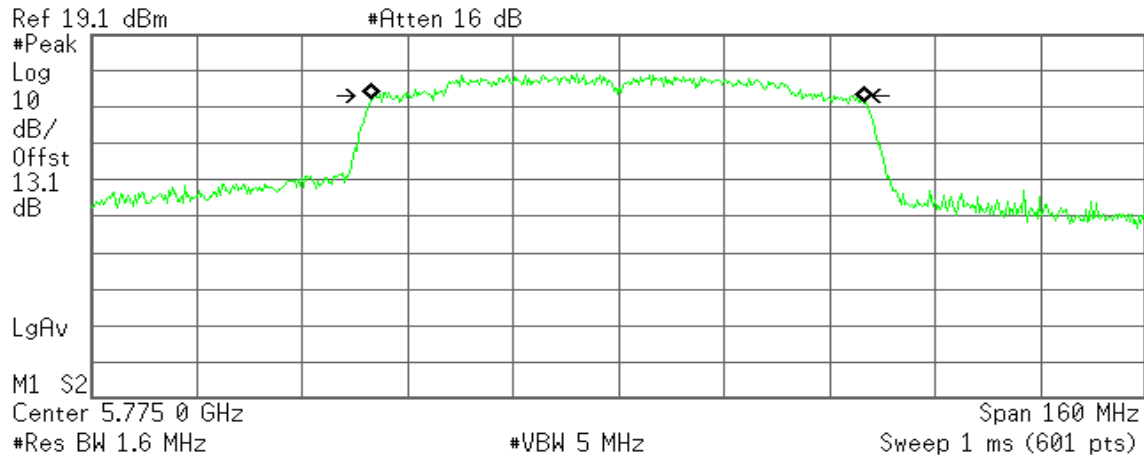


**IEEE 802.11ac VHT 80 MHz mode / 5775MHz**

**CH Mid**

Agilent

R T



**Occupied Bandwidth**  
**74.7682 MHz**

**Occ BW % Pwr** 99.00 %  
**x dB** -6.00 dB

**Transmit Freq Error** -161.783 kHz  
**x dB Bandwidth** 72.966 MHz



## 7.2 MAXIMUM OUTPUT POWER

### LIMIT

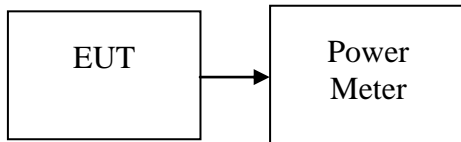
According to §15.407(a)

- (1) For the band 5.725-5.850 GHz bands, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 30 dBm, where B is the 6 dB emission bandwidth in MHz.

*If transmitting antennas of directional gain greater than 6dBi are used, both the peak transmit power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.*

### Test Configuration

*The EUT was connected to a Power Meter through a 50Ω RF cable.*



### TEST PROCEDURE

The transmitter output is connected to the Power Meter. The Power Meter is set to the avg power detection. The EUT is configured to transmit continuously.

### TEST RESULTS

*No non-compliance noted*

**Test Data****Test mode: IEEE 802.11a mode / 5745 ~ 5825MHz**

Channel	Frequency (MHz)	Maximum Conducted Output Power (dBm)	Limit (dBm)
Low	5745	*13.44	30.00
Mid	5785	13.43	30.00
High	5825	13.37	30.00

**Test mode: IEEE 802.11n HT 20 MHz mode / 5245 ~ 5825MHz**

Channel	Frequency (MHz)	Total Maximum Conducted Output Power (dBm)	Limit (dBm)
Low	5745	13.39	30.00
Mid	5785	13.39	30.00
High	5825	*13.42	30.00

**Test mode: IEEE 802.11n HT 40 MHz mode / 5755 ~ 5795MHz**

Channel	Frequency (MHz)	Total Maximum Conducted Output Power (dBm)	Limit (dBm)
Low	5755	13.35	30.00
High	5795	*13.43	30.00

**Test mode: IEEE 802.11ac VHT 80 MHz mode / 5775MHz**

Channel	Frequency (MHz)	Total Maximum Conducted Output Power (dBm)	Limit (dBm)
Mid	5775	*13.39	30.00





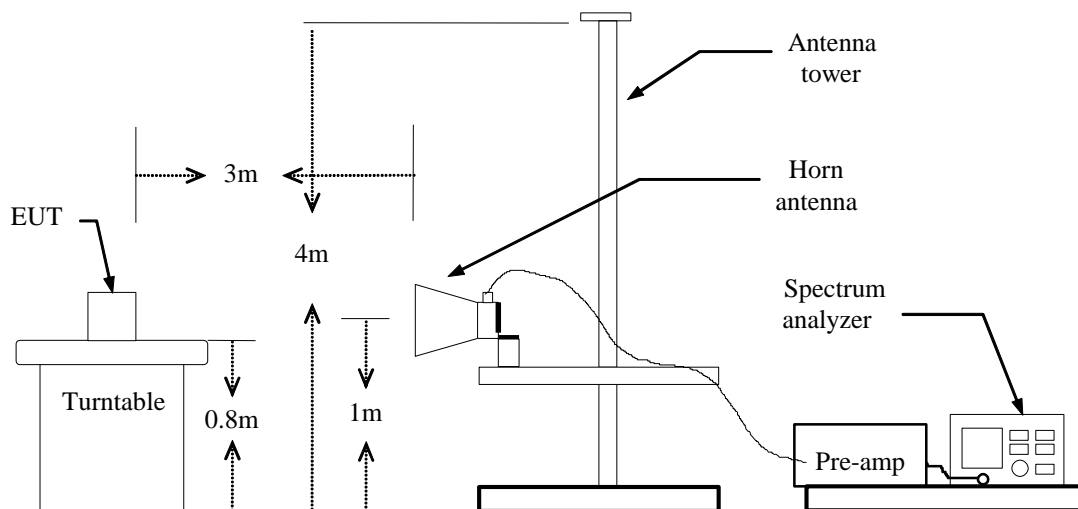
## 7.3 BAND EDGES MEASUREMENT

### LIMIT

According to §15.407(b),

- (1) The provisions of Section 15.205 of this part apply to intentional radiators operating under this section.
- (2) When measuring the emission limits, the nominal carrier frequency shall be adjusted as close to the upper and lower frequency block edges as the design of the equipment permits.

### Test Configuration



### TEST PROCEDURE

1. The EUT is placed on a turntable, which is 0.8m above the 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 emission.
4. Set the spectrum analyzer in the following setting in order to capture the lower and upper band-edges of the emission:
  - (a) PEAK: RBW=VBW=1MHz / Sweep=AUTO
  - (b) AVERAGE: RBW=1MHz,  
if duty cycle  $\geq 98\%$ , VBW=10Hz.  
if duty cycle  $< 98\%$  VBW=1/T.  
**IEEE 802.11b mode:**  $\geq 98\%$ , VBW=10Hz  
**IEEE 802.11g mode:**  $\geq 98\%$ , VBW=10Hz  
**IEEE 802.11n HT 20 MHz mode:**  $\geq 98\%$ , VBW=10Hz  
**IEEE 802.11n HT 40 MHz mode:**  $96\% = \text{VBW } 2\text{kHz}$
5. Repeat the procedures until all the PEAK and AVERAGE versus POLARIZATION are measured.

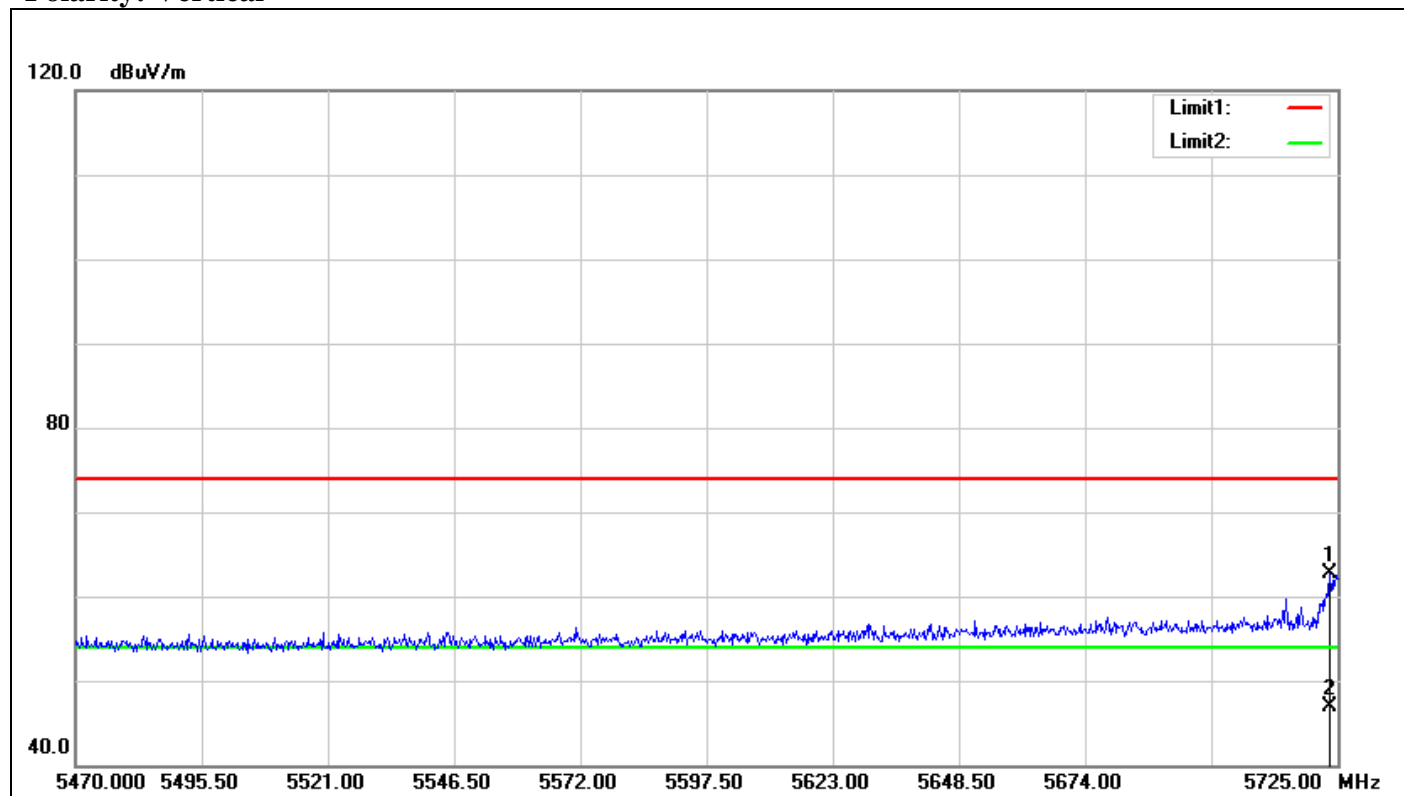
### TEST RESULTS

Refer to attach spectrum analyzer data chart.



**Band Edges (IEEE 802.11a mode / CH 5745 MHz)**

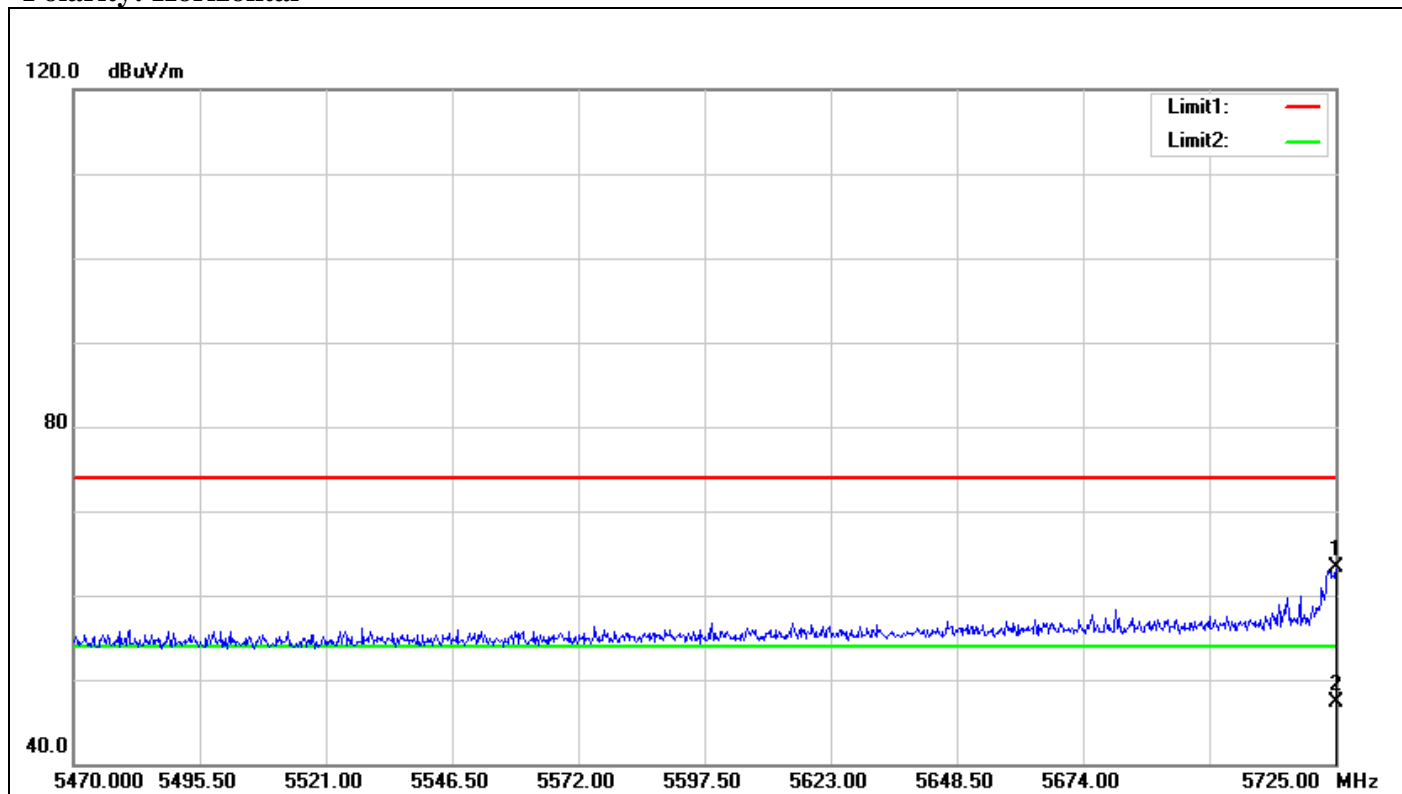
**Polarity: Vertical**



No.	Frequency	Reading	Correct	Result	Limit	Margin	Height	Degree	Remark
	(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	(cm)	( ° )	
1	5723.470	56.58	6.20	62.78	74.00	-11.22	100	211	peak
2	5723.470	40.72	6.20	46.92	54.00	-7.08	100	211	AVG



Polarity: Horizontal

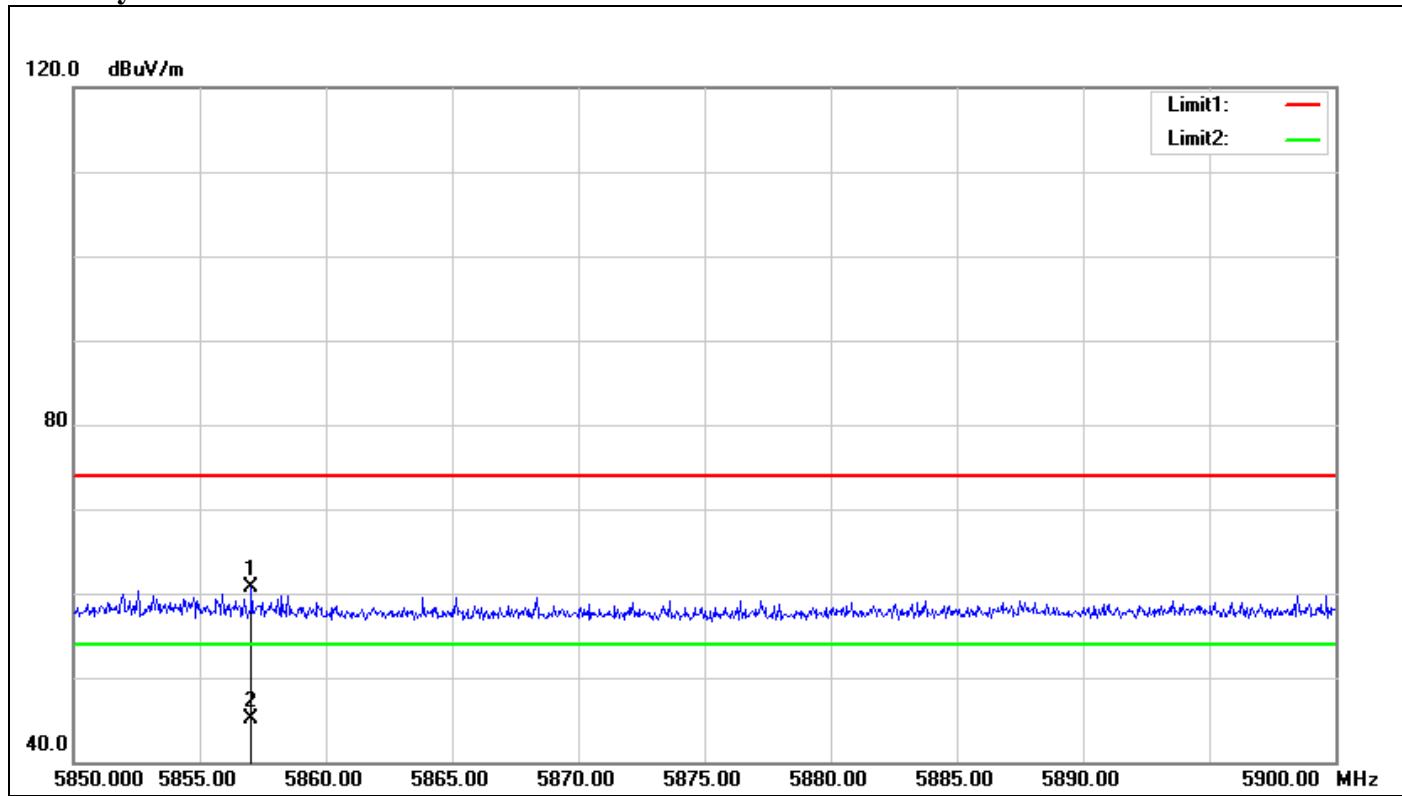


No.	Frequency	Reading	Correct	Result	Limit	Margin	Height	Degree	Remark
	(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	(cm)	( ° )	
1	5725.000	57.19	6.21	63.40	74.00	-10.60	100	130	peak
2	5725.000	41.15	6.21	47.36	54.00	-6.64	100	130	AVG



**Band Edges (IEEE 802.11a mode / CH 5825 MHz)**

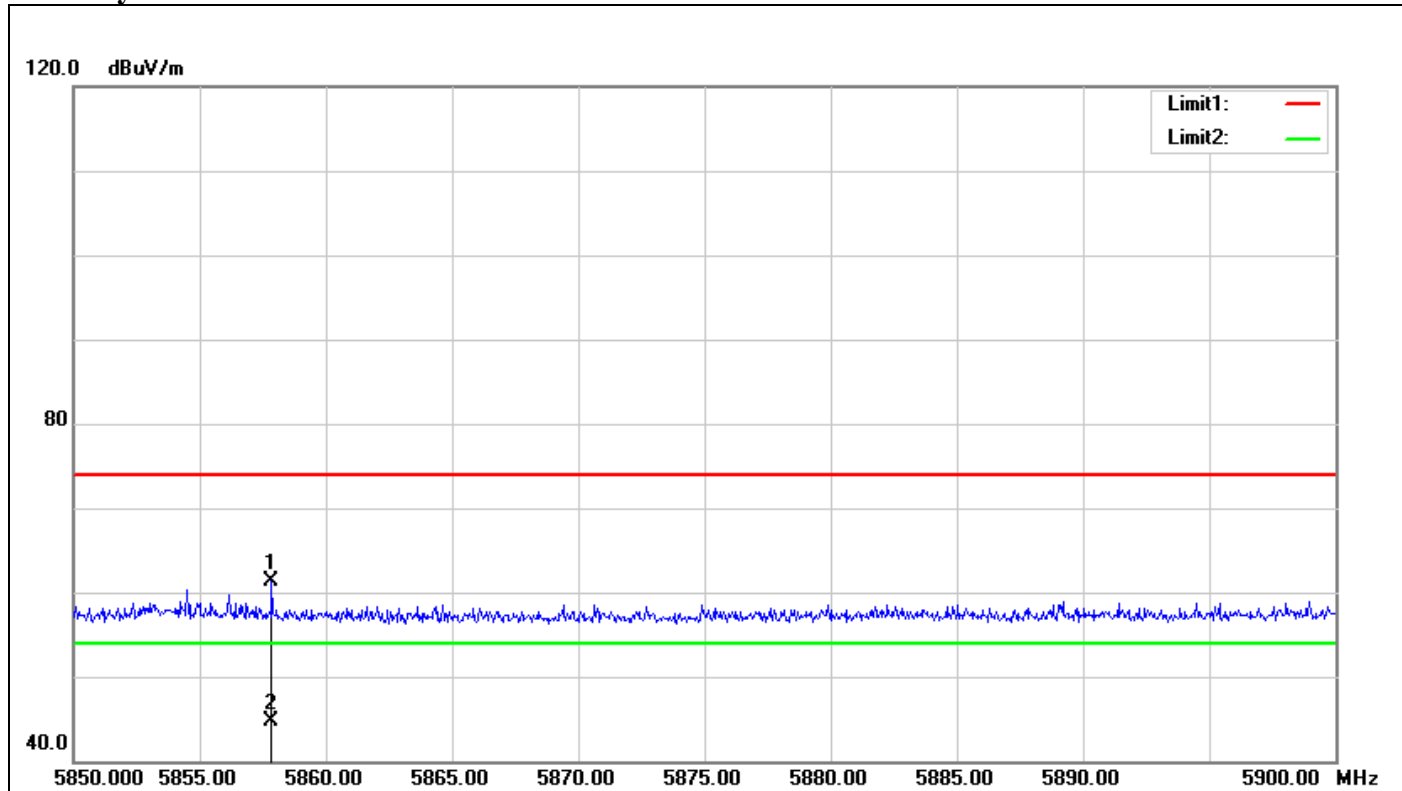
**Polarity: Vertical**



No.	Frequency	Reading	Correct	Result	Limit	Margin	Height	Degree	Remark
	(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	(cm)	( ° )	
1	5857.050	53.87	6.77	60.64	74.00	-13.36	100	145	peak
2	5857.050	38.36	6.77	45.13	54.00	-8.87	100	145	AVG



Polarity: Horizontal

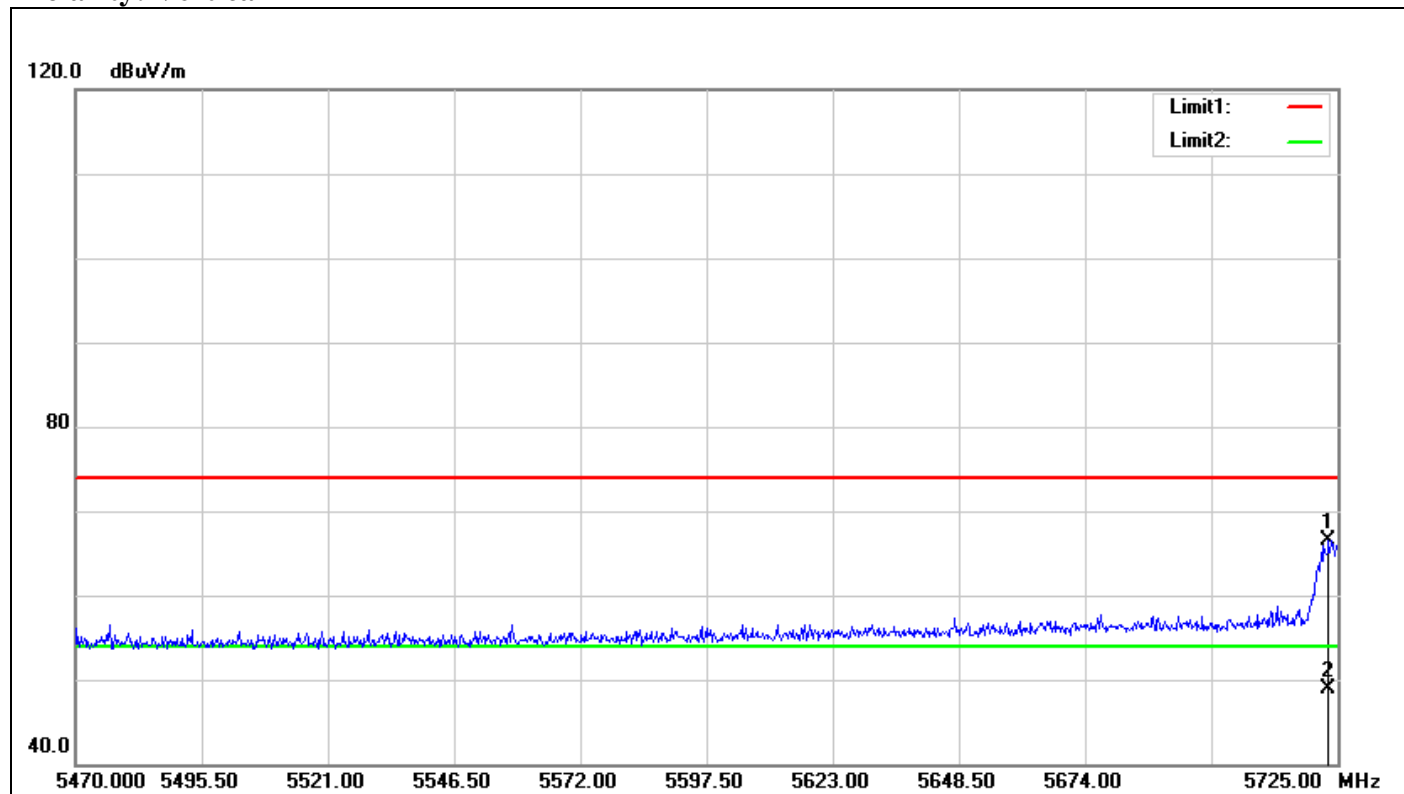


No.	Frequency	Reading	Correct	Result	Limit	Margin	Height	Degree	Remark
	(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	(cm)	( ° )	
1	5857.850	54.48	6.77	61.25	74.00	-12.75	100	127	peak
2	5857.850	37.95	6.77	44.72	54.00	-9.28	100	127	AVG



**Band Edges (IEEE 802.11n HT 20 MHz Channel mode / CH 5745 MHz)**

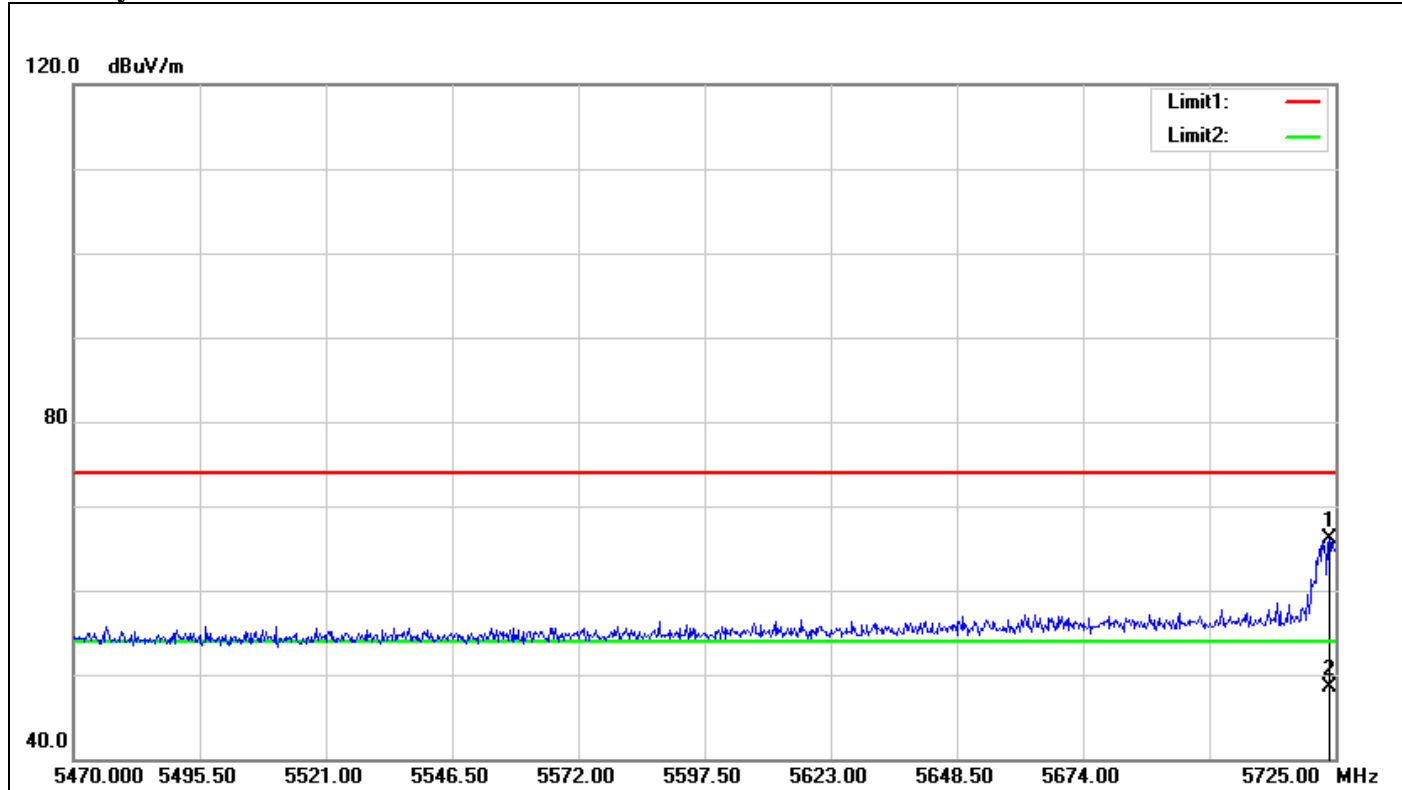
**Polarity: Vertical**



No.	Frequency	Reading	Correct	Result	Limit	Margin	Height	Degree	Remark
	(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	(cm)	( ° )	
1	5723.215	60.26	6.20	66.46	74.00	-7.54	100	288	peak
2	5723.215	42.72	6.20	48.92	54.00	-5.08	100	288	AVG



Polarity: Horizontal

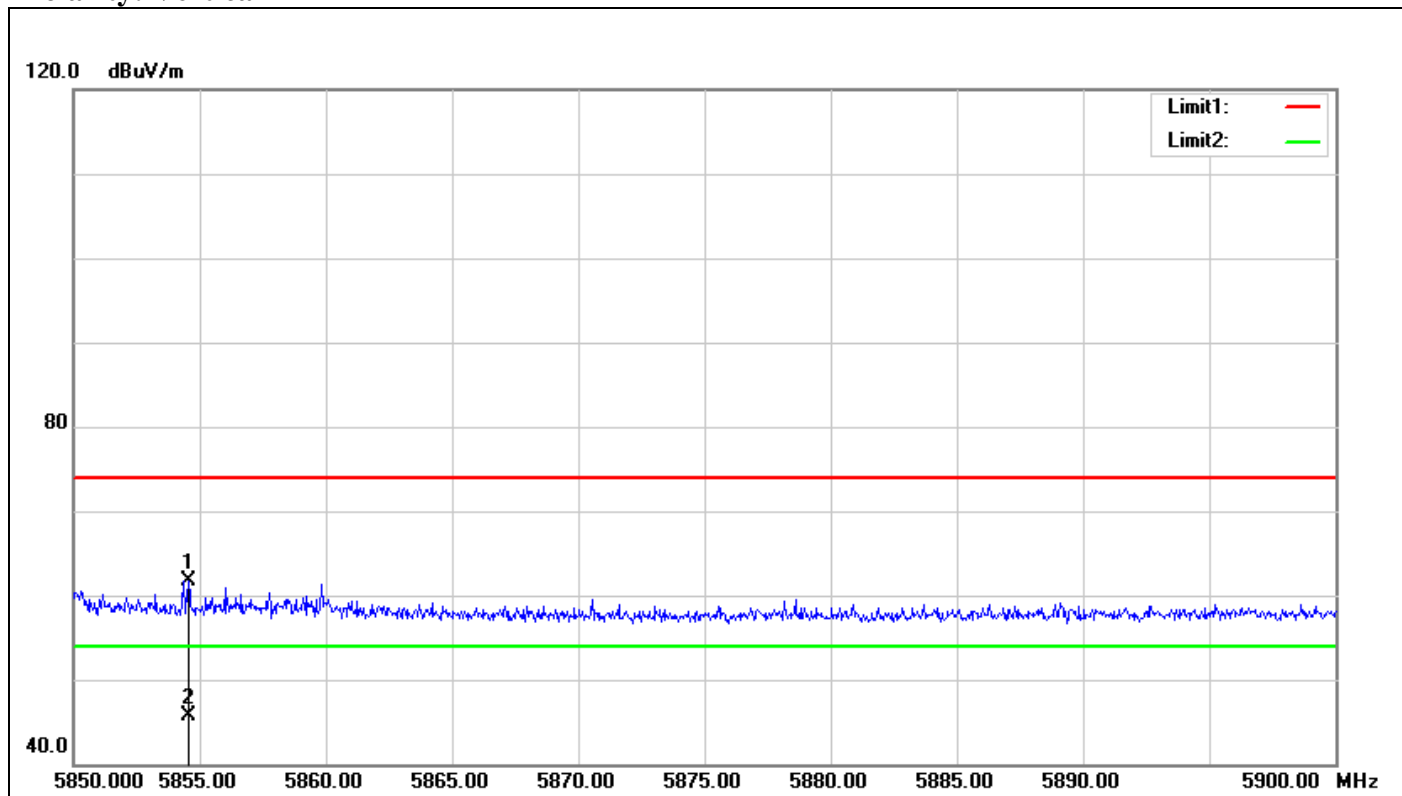


No.	Frequency	Reading	Correct	Result	Limit	Margin	Height	Degree	Remark
	(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	(cm)	( ° )	
1	5723.725	59.89	6.20	66.09	74.00	-7.91	100	188	peak
2	5723.725	42.37	6.20	48.57	54.00	-5.43	100	188	AVG



**Band Edges (IEEE 802.11n HT 20 MHz Channel mode / CH 5825 MHz)**

**Polarity: Vertical**

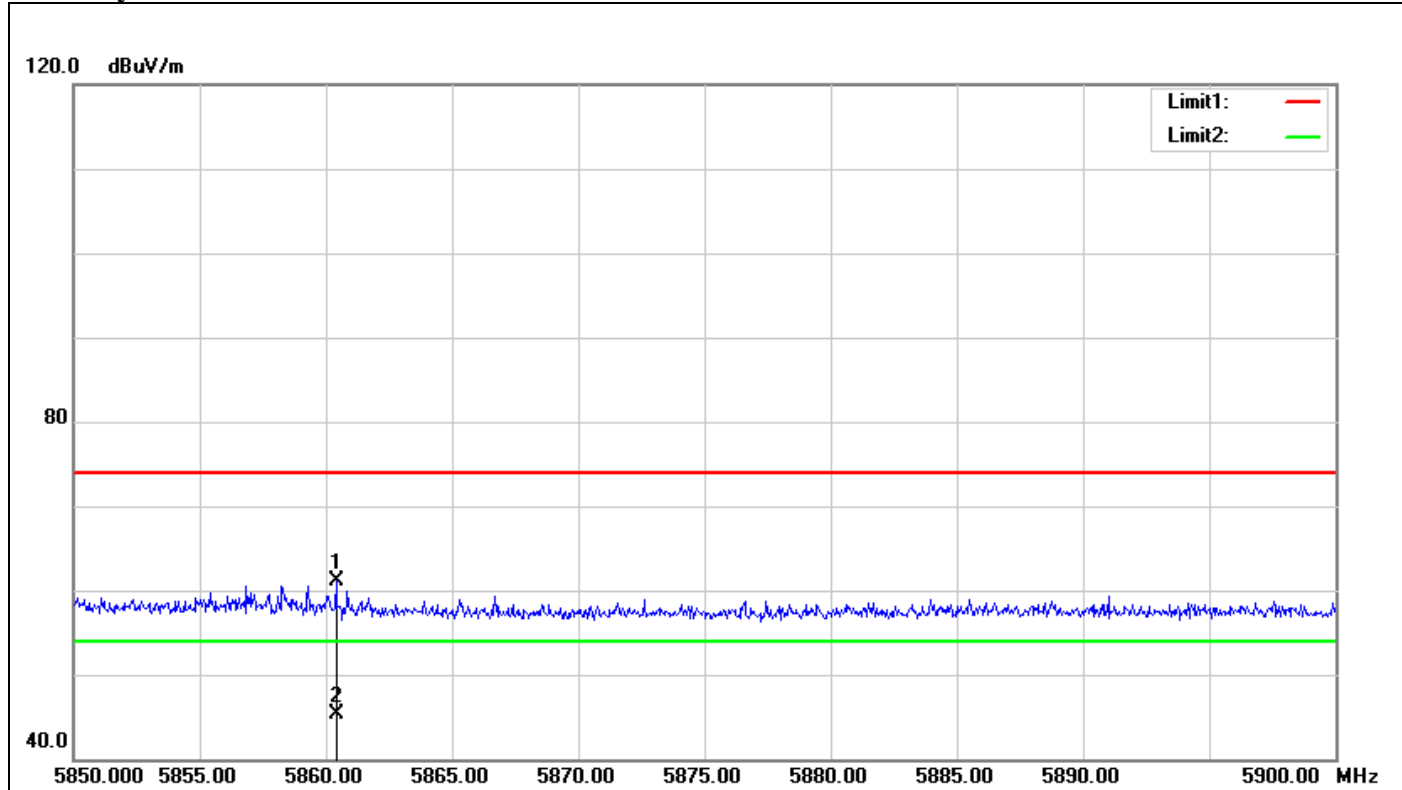


No.	Frequency	Reading	Correct	Result	Limit	Margin	Height	Degree	Remark
	(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	(cm)	( ° )	
1	5854.550	55.02	6.76	61.78	74.00	-12.22	100	333	peak
2	5854.550	39.02	6.76	45.78	54.00	-8.22	100	333	AVG





Polarity: Horizontal

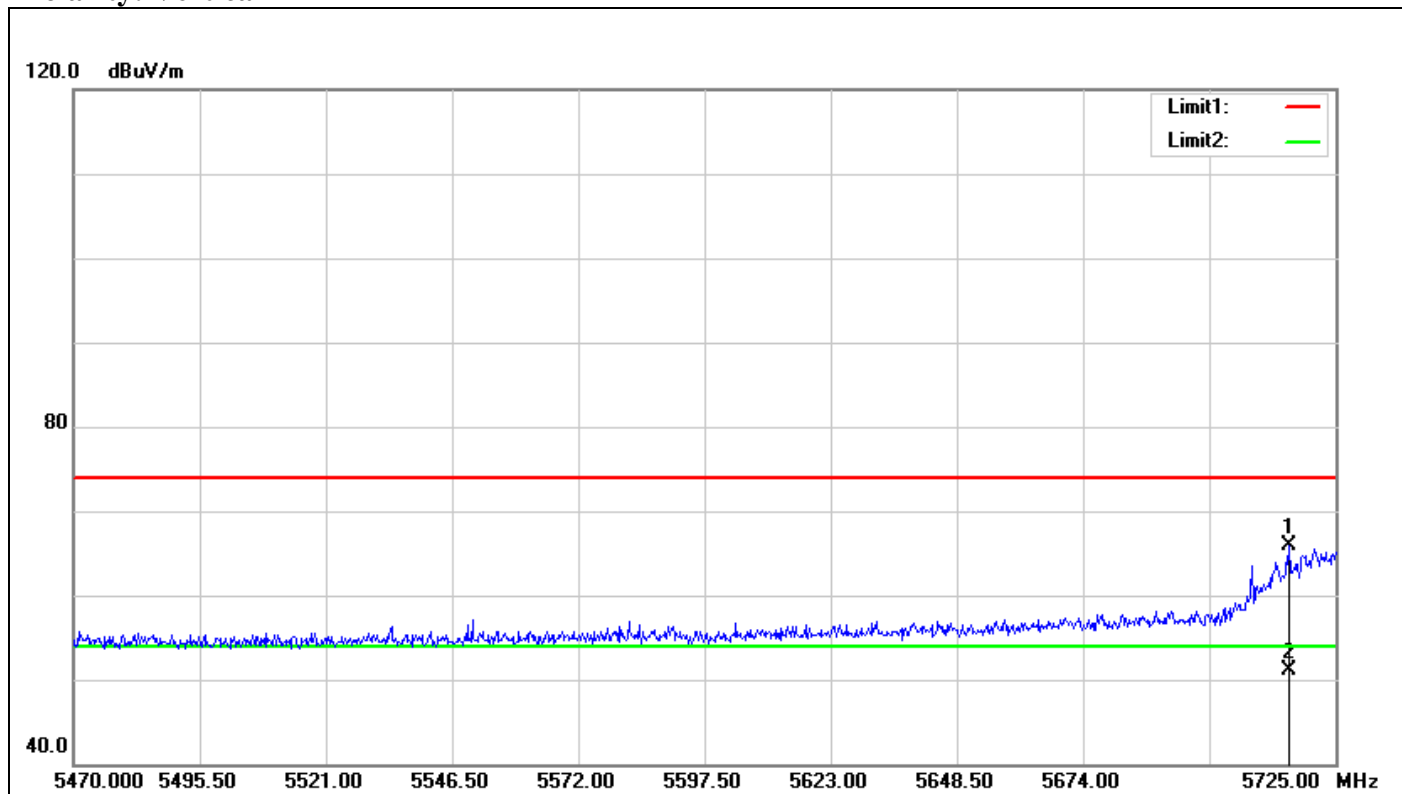


No.	Frequency	Reading	Correct	Result	Limit	Margin	Height	Degree	Remark
	(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	(cm)	( ° )	
1	5860.400	54.36	6.79	61.15	74.00	-12.85	100	149	peak
2	5860.400	38.56	6.79	45.35	54.00	-8.65	100	149	AVG



**Band Edges (IEEE 802.11n HT 40 MHz mode / CH 5755 MHz)**

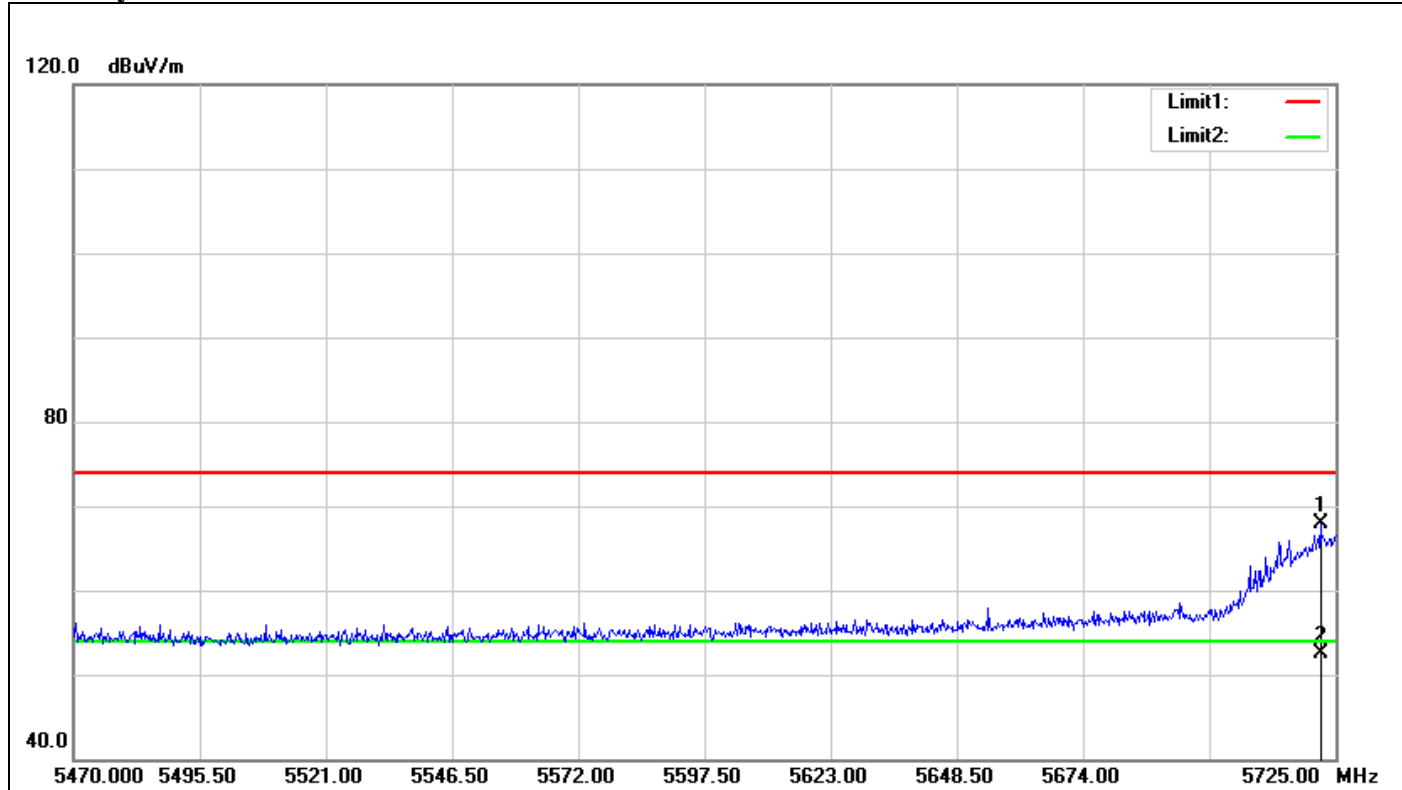
**Polarity: Vertical**



No.	Frequency	Reading	Correct	Result	Limit	Margin	Height	Degree	Remark
	(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	(cm)	( ° )	
1	5715.565	59.68	6.17	65.85	74.00	-8.15	100	328	peak
2	5715.565	44.97	6.17	51.14	54.00	-2.86	100	328	AVG



Polarity: Horizontal

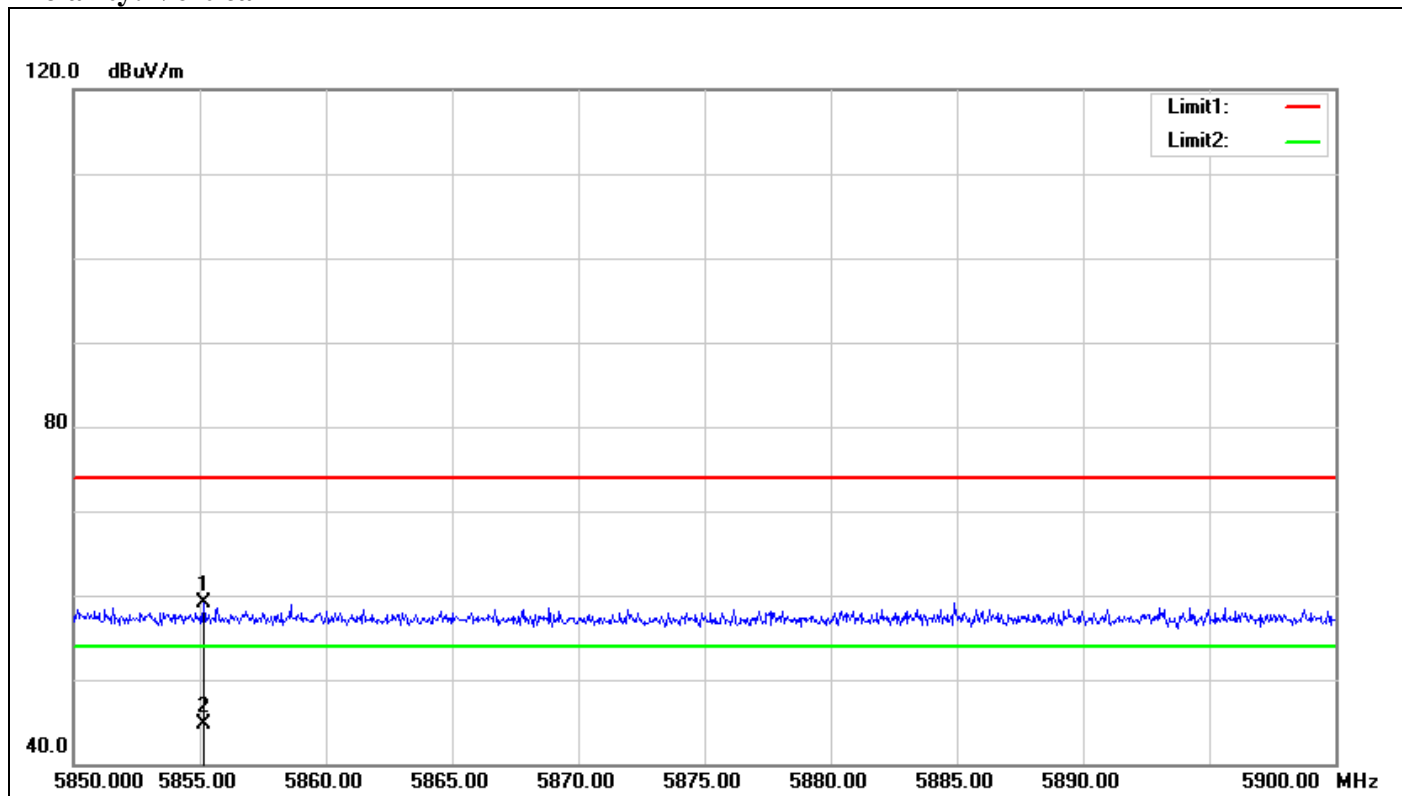


No.	Frequency	Reading	Correct	Result	Limit	Margin	Height	Degree	Remark
	(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	(cm)	( ° )	
1	5721.940	61.69	6.20	67.89	74.00	-6.11	100	162	peak
2	5721.940	46.38	6.20	52.58	54.00	-1.42	100	162	AVG



Band Edges (IEEE 802.11n HT 40 MHz mode / CH 5795 MHz)

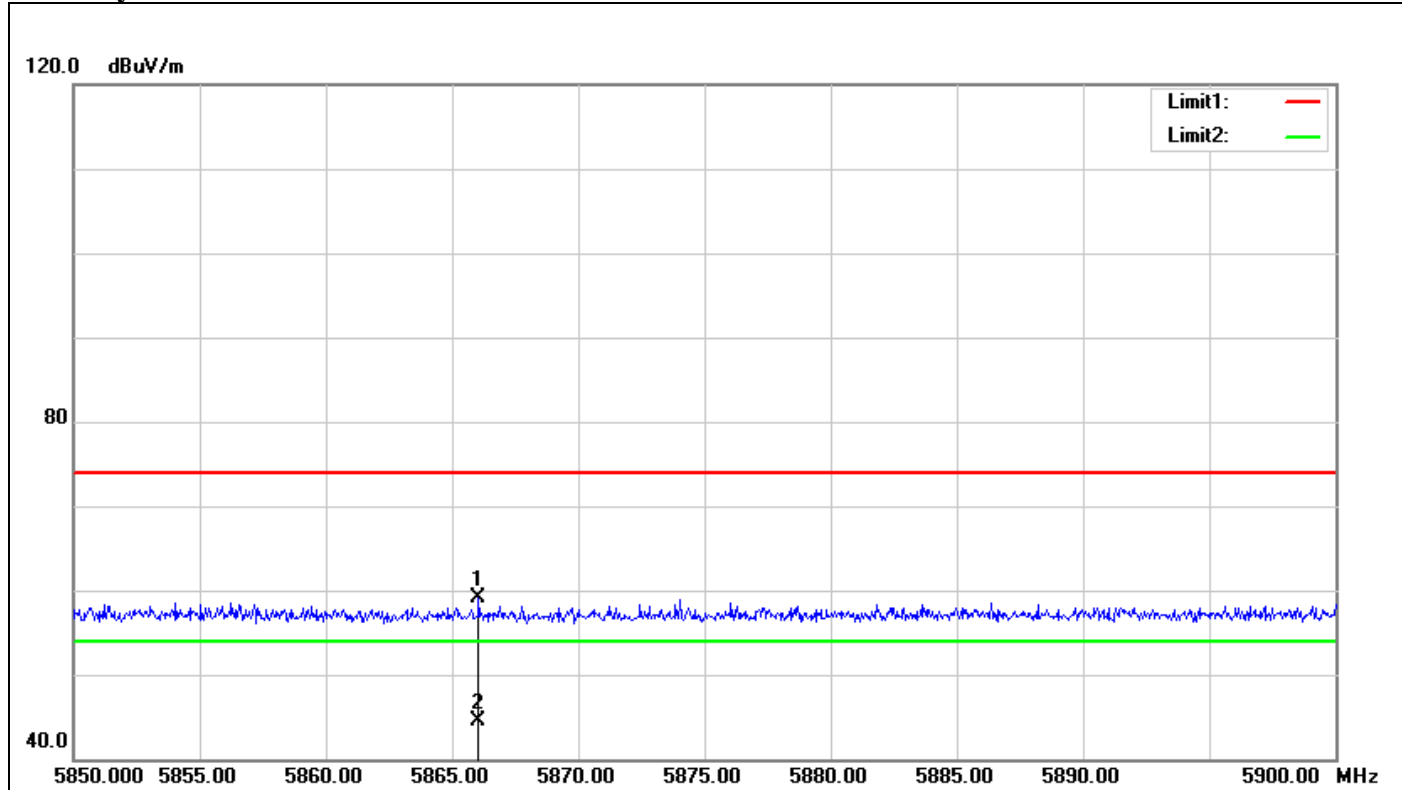
Polarity: Vertical



No.	Frequency	Reading	Correct	Result	Limit	Margin	Height	Degree	Remark
	(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	(cm)	( ° )	
1	5855.150	52.30	6.76	59.06	74.00	-14.94	100	9	peak
2	5855.150	37.86	6.76	44.62	54.00	-9.38	100	9	AVG



Polarity: Horizontal

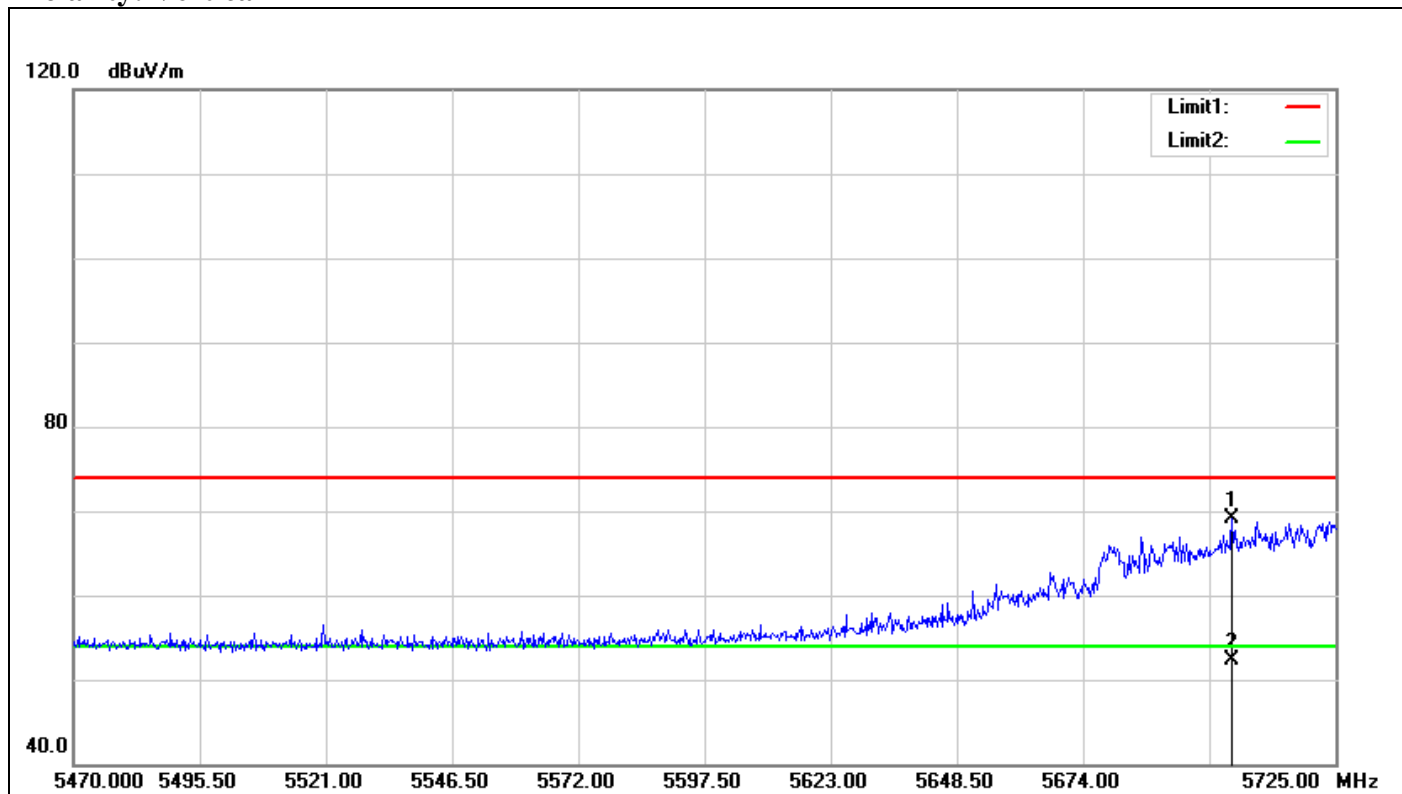


No.	Frequency	Reading	Correct	Result	Limit	Margin	Height	Degree	Remark
	(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	(cm)	( ° )	
1	5866.050	52.31	6.81	59.12	74.00	-14.88	100	288	peak
2	5866.050	37.77	6.81	44.58	54.00	-9.42	100	288	AVG



Band Edges (IEEE 802.11ac VHT 80 MHz mode / CH 5775 MHz)

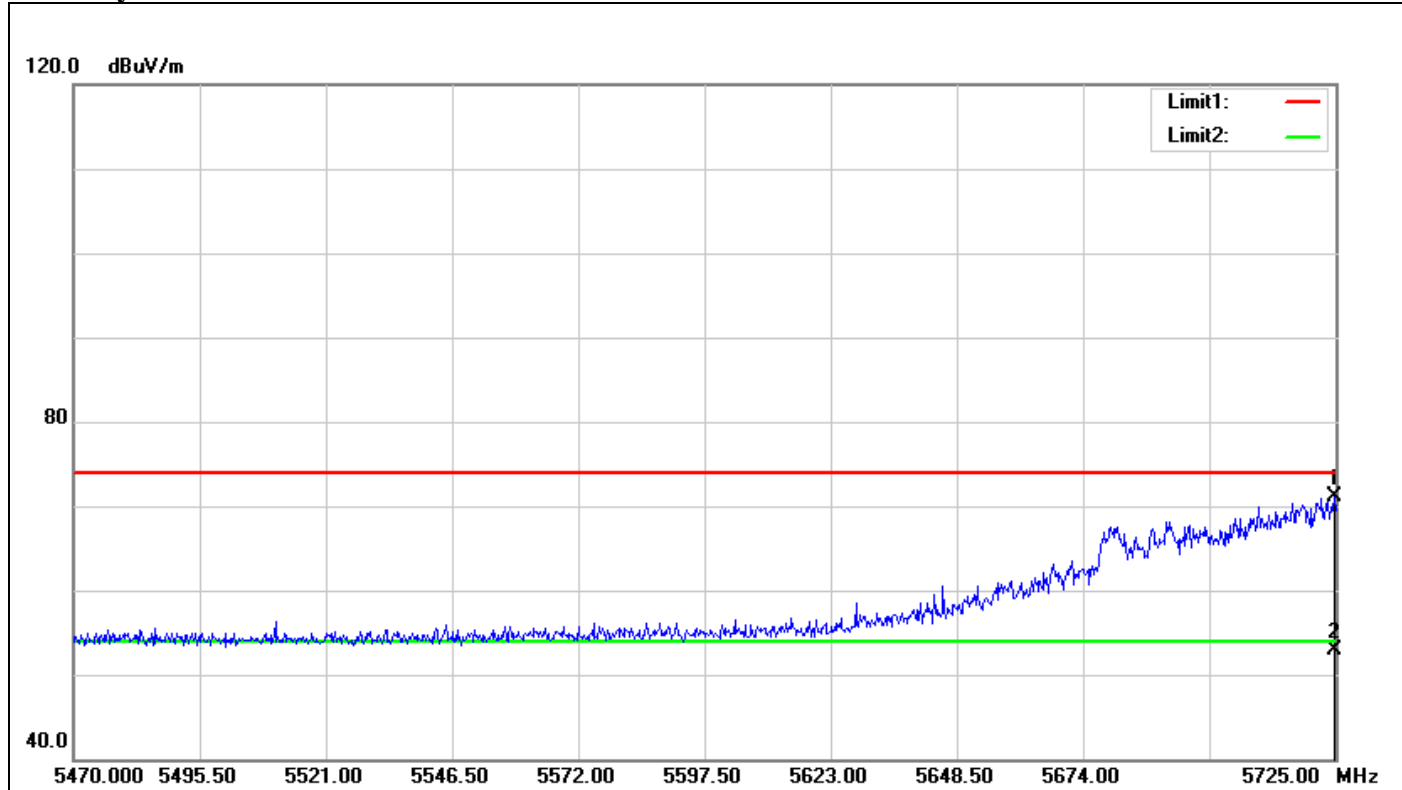
Polarity: Vertical



No.	Frequency	Reading	Correct	Result	Limit	Margin	Height	Degree	Remark
	(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	(cm)	( ° )	
1	5704.090	62.98	6.12	69.10	74.00	-4.90	100	294	peak
2	5704.090	46.13	6.12	52.25	54.00	-1.75	100	294	AVG



Polarity: Horizontal

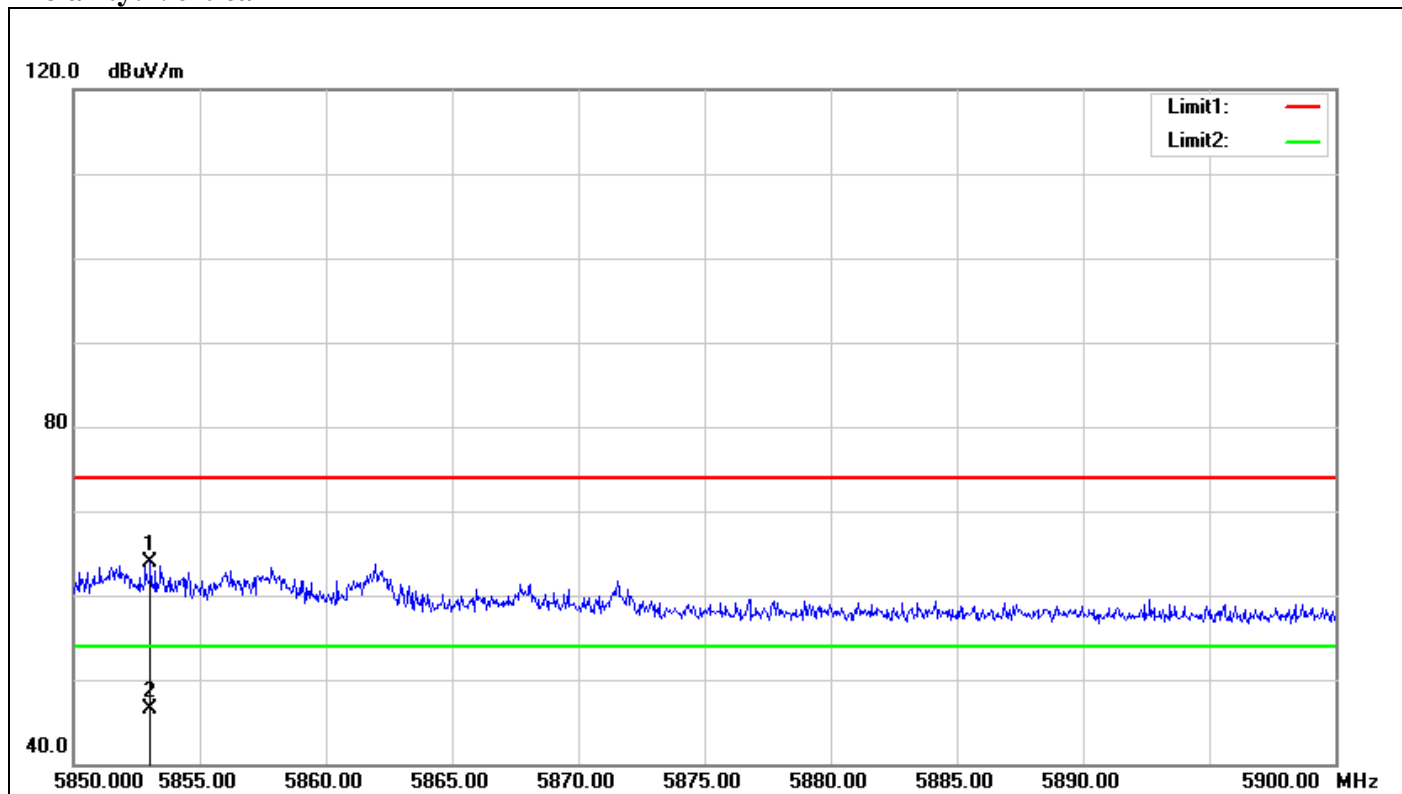


No.	Frequency	Reading	Correct	Result	Limit	Margin	Height	Degree	Remark
	(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	(cm)	( ° )	
1	5724.745	64.83	6.21	71.04	74.00	-2.96	100	172	peak
2	5724.745	46.77	6.21	52.98	54.00	-1.02	100	172	AVG



Band Edges (IEEE 802.11ac VHT 80 MHz mode / CH 5775 MHz)

Polarity: Vertical

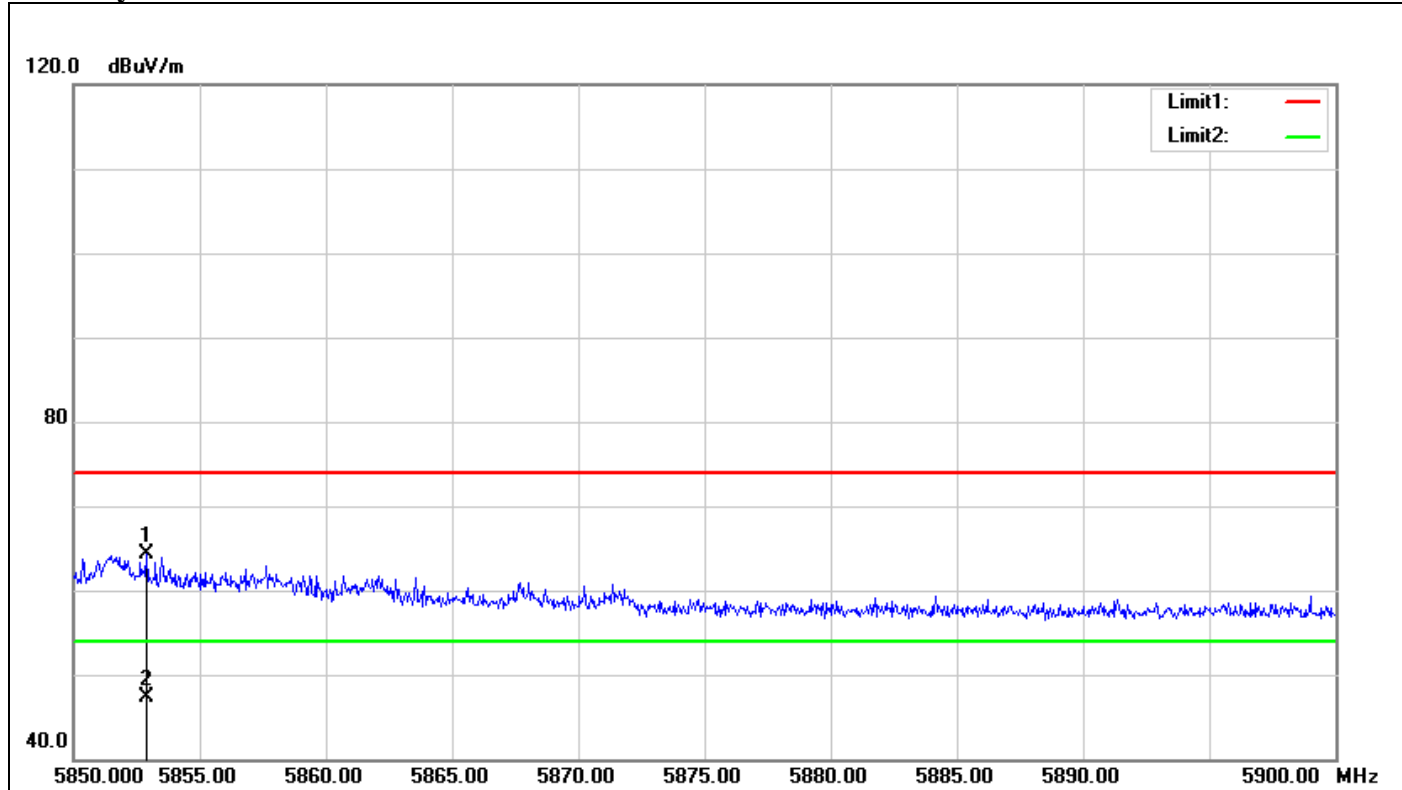


No.	Frequency	Reading	Correct	Result	Limit	Margin	Height	Degree	Remark
	(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	(cm)	( ° )	
1	5853.050	57.09	6.75	63.84	74.00	-10.16	100	57	peak
2	5853.050	39.79	6.75	46.54	54.00	-7.46	100	57	AVG





Polarity: Horizontal



No.	Frequency	Reading	Correct	Result	Limit	Margin	Height	Degree	Remark
	(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	(cm)	( ° )	
1	5852.900	57.50	6.75	64.25	74.00	-9.75	100	113	peak
2	5852.900	40.48	6.75	47.23	54.00	-6.77	100	113	AVG



## 7.4 PEAK POWER SPECTRAL DENSITY

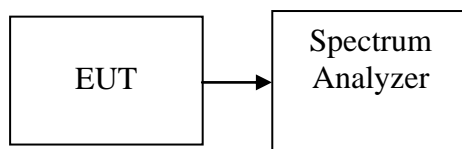
### LIMIT

According to §15.407(a),

- (1) For the band 5.725-5.850 GHz, the peak power spectral density shall not exceed 30dBm in any 1MHz band.

*If transmitting antennas of directional gain greater than 6dBi are used, both the peak transmit power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.*

### Test Configuration



### TEST PROCEDURE

1. Place the EUT on the table and set it in transmitting mode.  
Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
2. Set the spectrum analyzer as RBW = 500kHz, VBW = 3\*RBW, Span = Sweep= AUTO
3. Record the max. reading.
4. Repeat the above procedure until the measurements for all frequencies are completed

### TEST RESULTS

*No non-compliance noted*

**Test Data****Test mode: IEEE 802.11a mode/ 5745 ~ 5825MHz**

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin	Result
Low	5745	-0.55	30.00	-30.55	PASS
Mid	5785	-0.40	30.00	-30.4	PASS
High	5825	-0.23	30.00	-30.23	PASS

**Test mode: IEEE 802.11n HT 20 MHz mode / 5745 ~ 5825MHz**

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin	Result
Low	5745	-0.38	30.00	-30.38	PASS
Mid	5785	-0.56	30.00	-30.56	PASS
High	5825	-0.14	30.00	-30.14	PASS

**Test mode: IEEE 802.11n HT 40 MHz mode / 5755 ~ 5795MHz**

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin	Result
Low	5755	-2.95	30.00	-32.95	PASS
High	5795	-2.80	30.00	-32.8	PASS

**Test mode: IEEE 802.11ac VHT 80 MHz mode / 5775MHz**

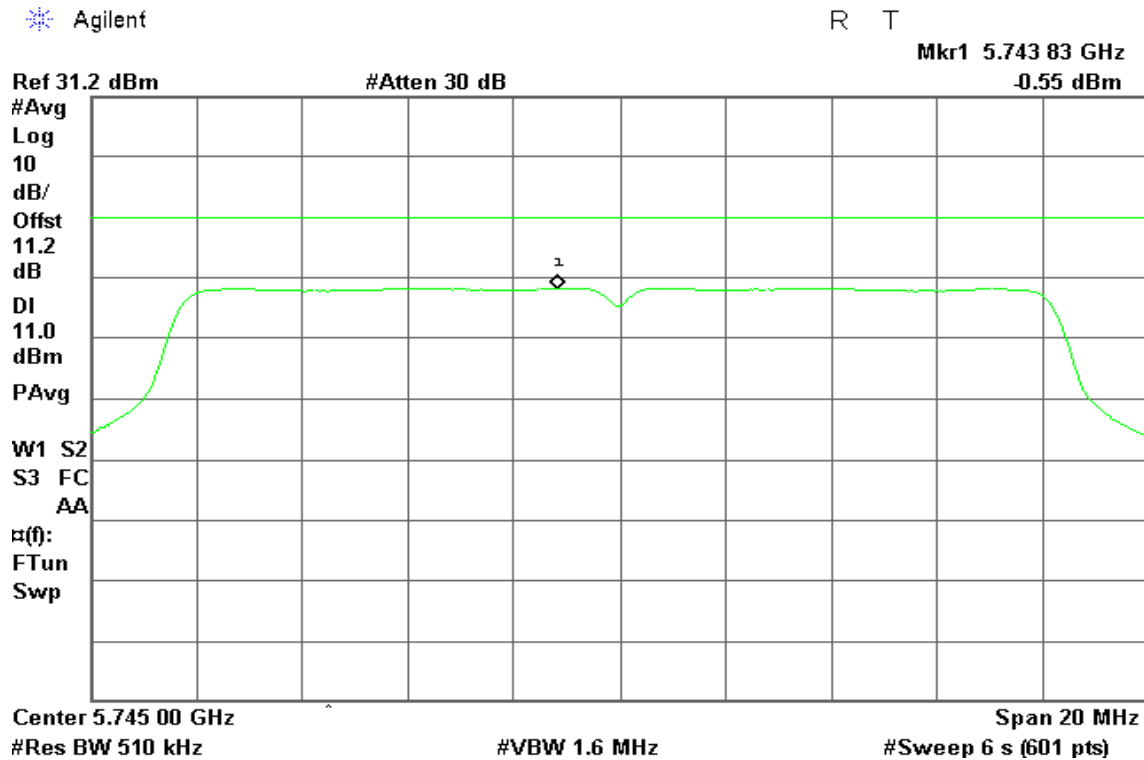
Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin	Result
Mid	5775	-4.45	30.00	-34.45	PASS



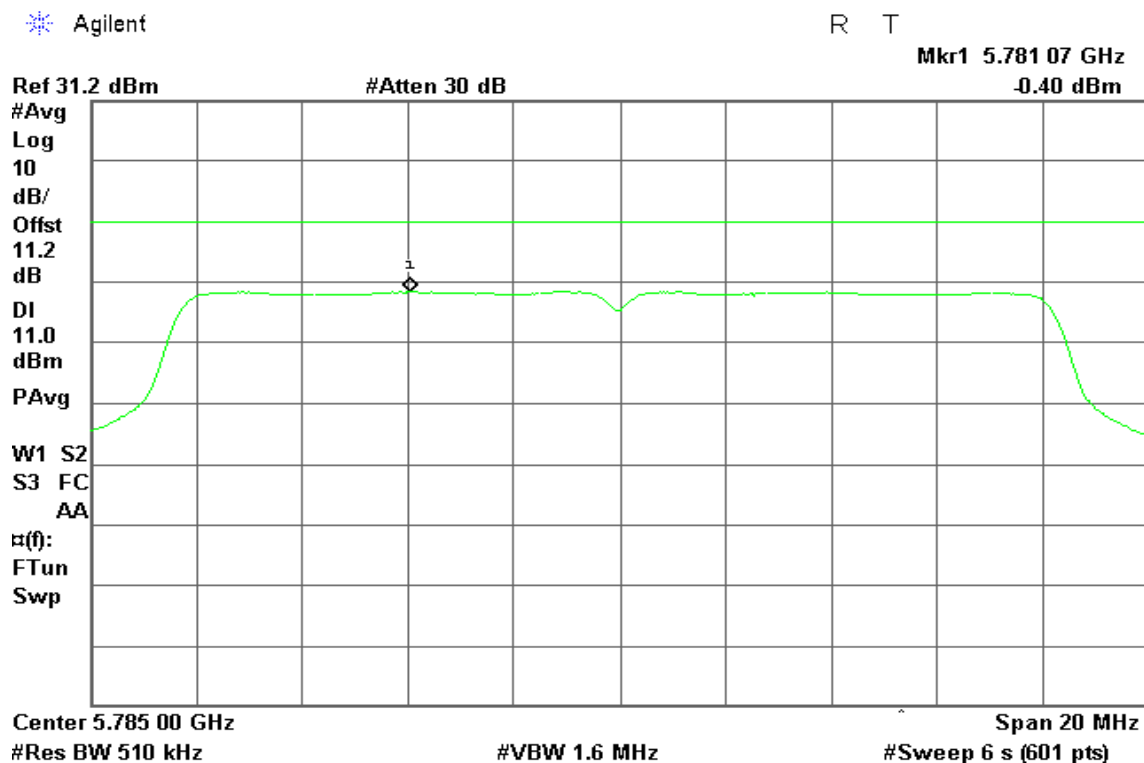
## Test Plot

### IEEE 802.11a MHz mode / 5745 ~ 5825MHz

#### CH Low



#### CH Mid





CH High

Agilent

R T

Mkr1 5.823 87 GHz

-0.23 dBm

Ref 31.2 dBm

#Atten 30 dB

#Avg

Log

10

dB/

Offst

11.2

dB

DI

11.0

dBm

PAvg

W1 S2

S3 FC

AA

⌘(f):

FTun

Swp

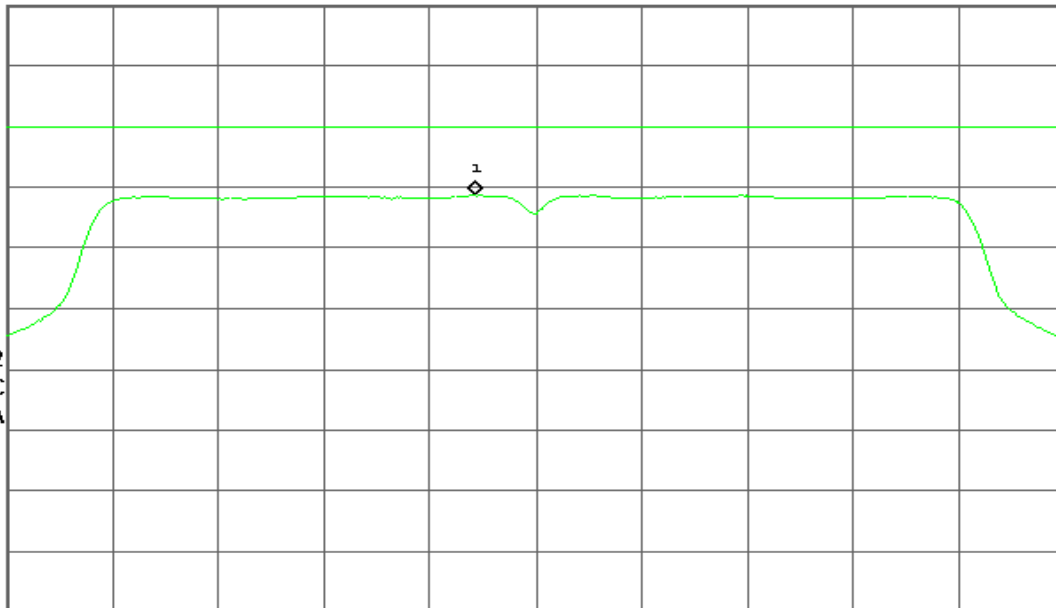
Center 5.825 00 GHz

#Res BW 510 kHz

#VBW 1.6 MHz

Span 20 MHz

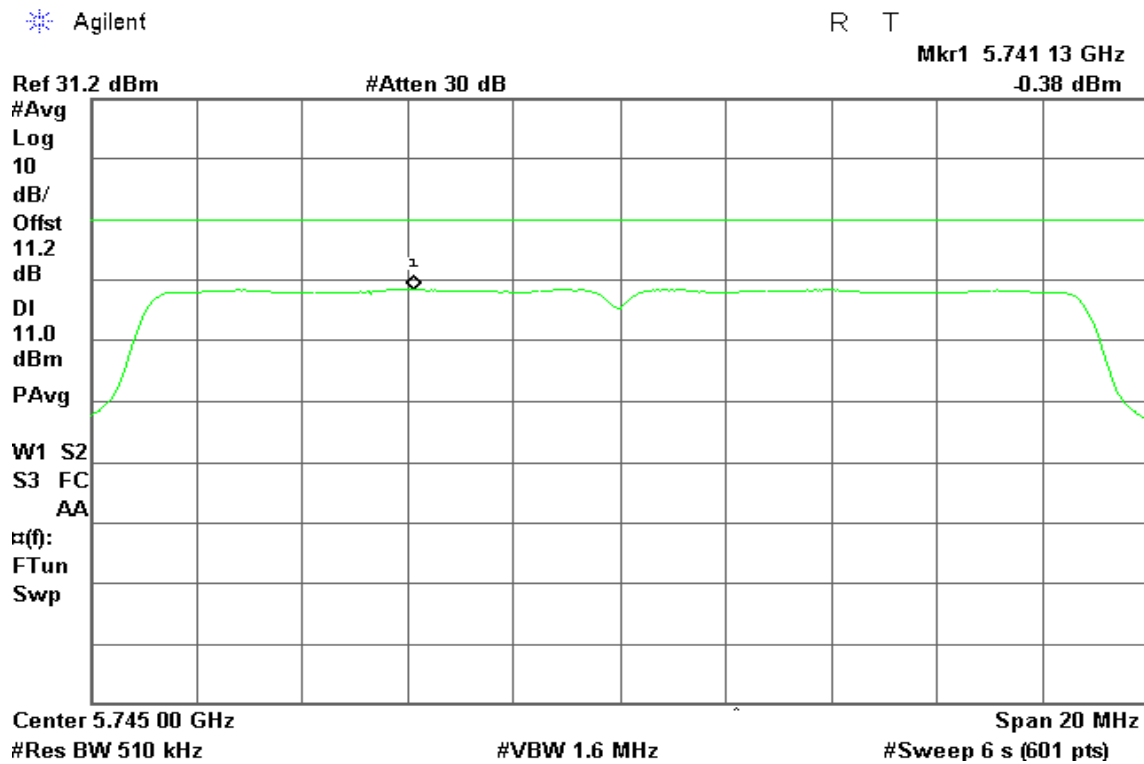
#Sweep 6 s (601 pts)



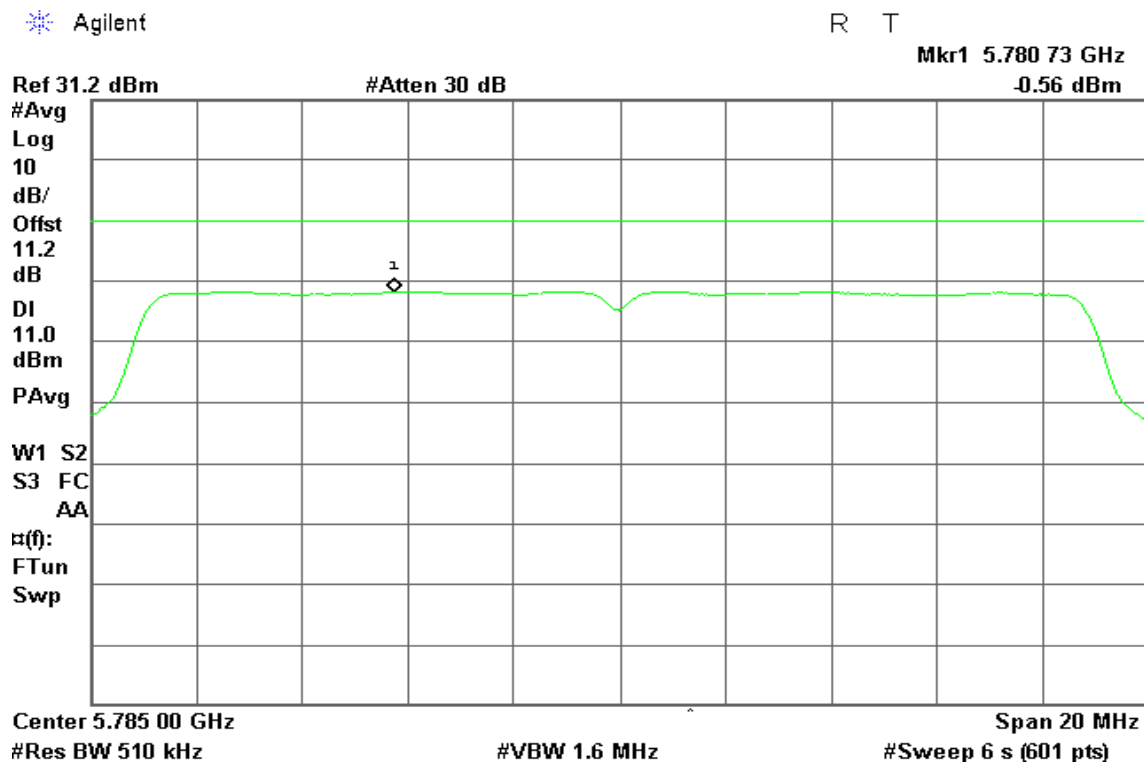


**IEEE 802.11n HT 20 MHz mode / 5745 ~ 5825MHz**

**CH Low**



**CH Mid**





## CH High

Agilent

R T

Mkr1 5.823 80 GHz

-0.14 dBm

Ref 31.2 dBm

#Atten 30 dB

#Avg

Log

10

dB/

Offst

11.2

dB

DI

11.0

dBm

PAvg

W1 S2

S3 FC

AA

$\alpha(f)$ :

FTun

Swp

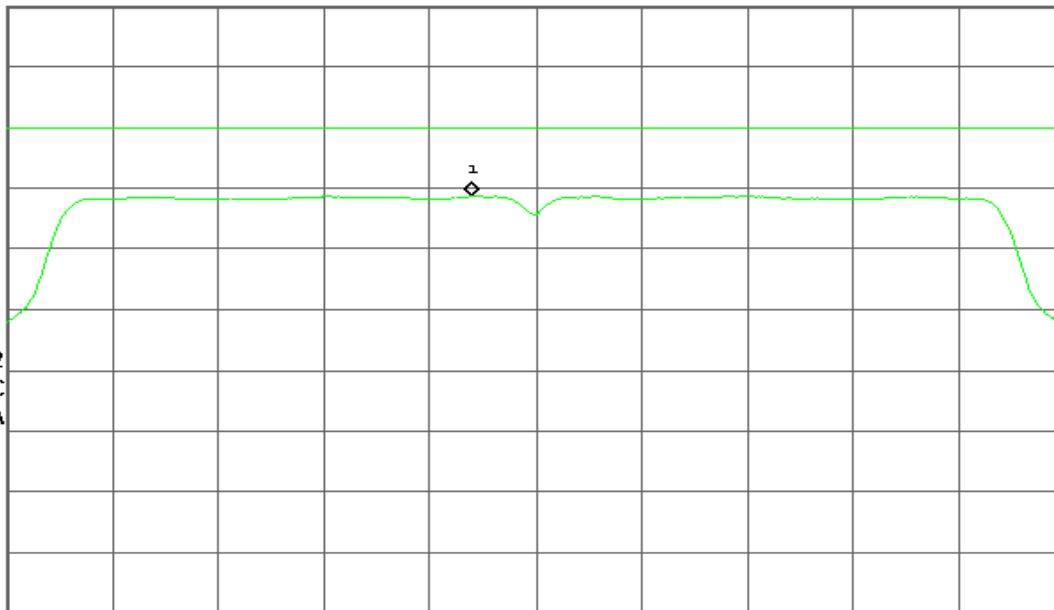
Center 5.825 00 GHz

#Res BW 510 kHz

#VBW 1.6 MHz

Span 20 MHz

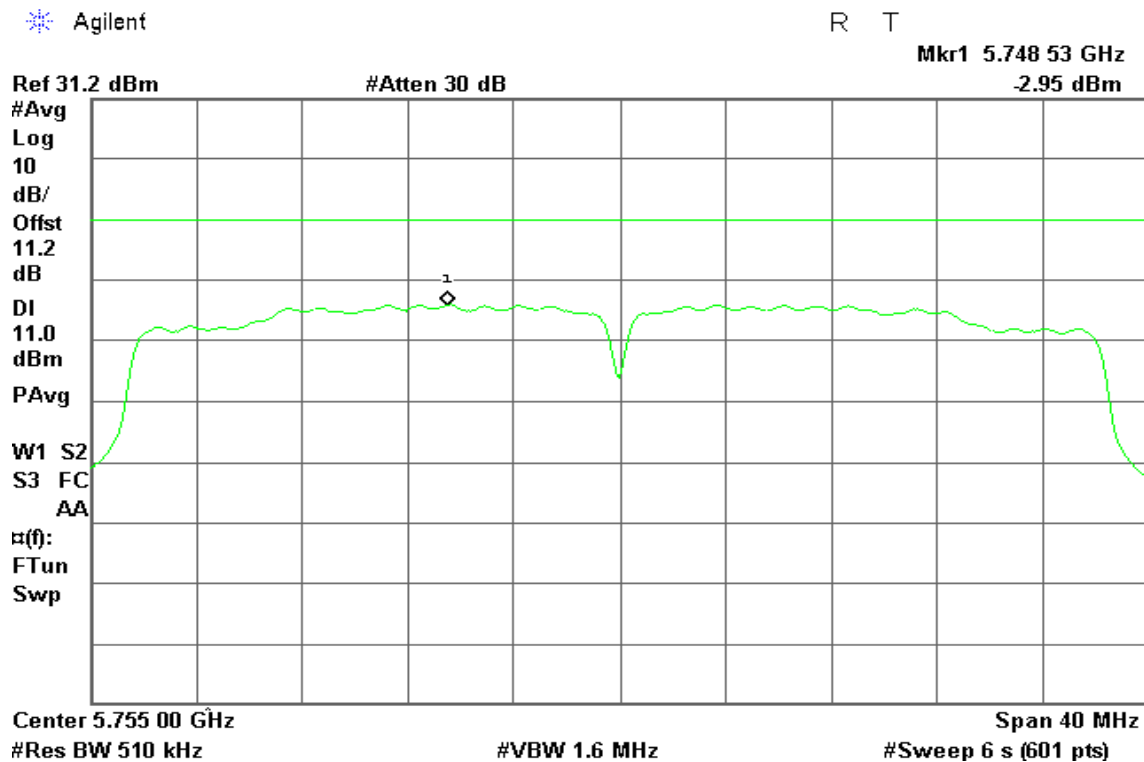
#Sweep 6 s (601 pts)



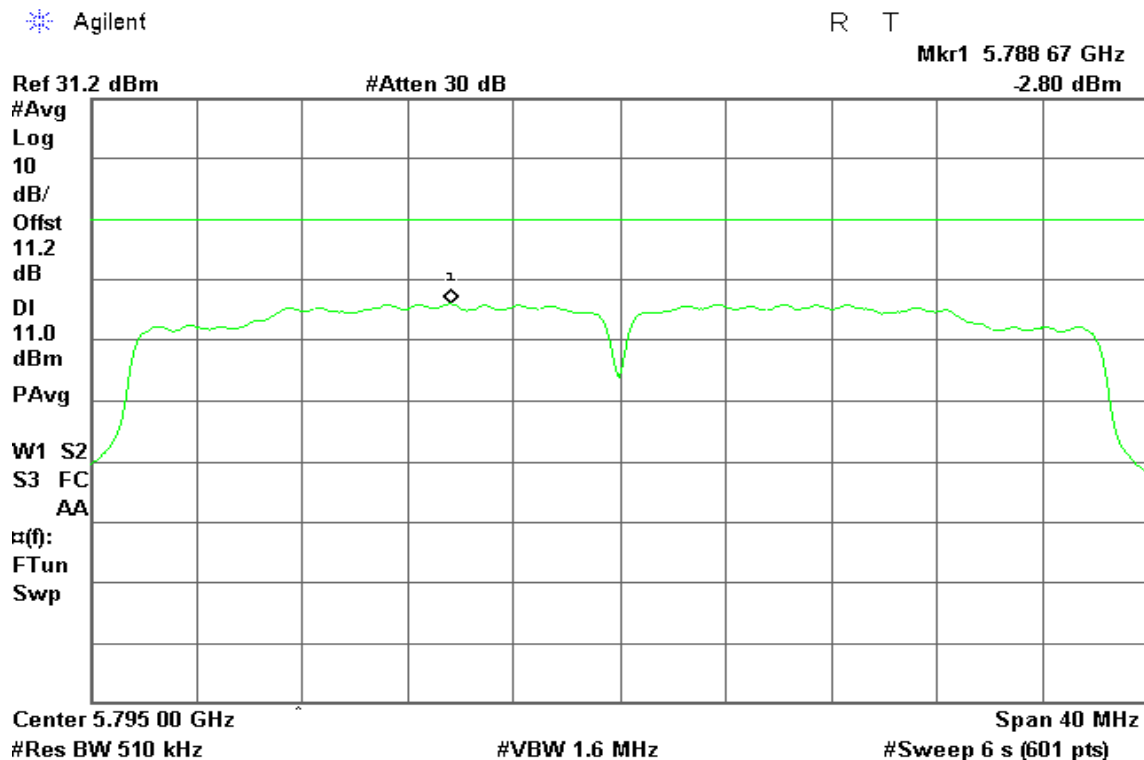


**IEEE 802.11n HT 40 MHz mode / 5755 ~ 5815MHz**

**CH Low**



**CH High**

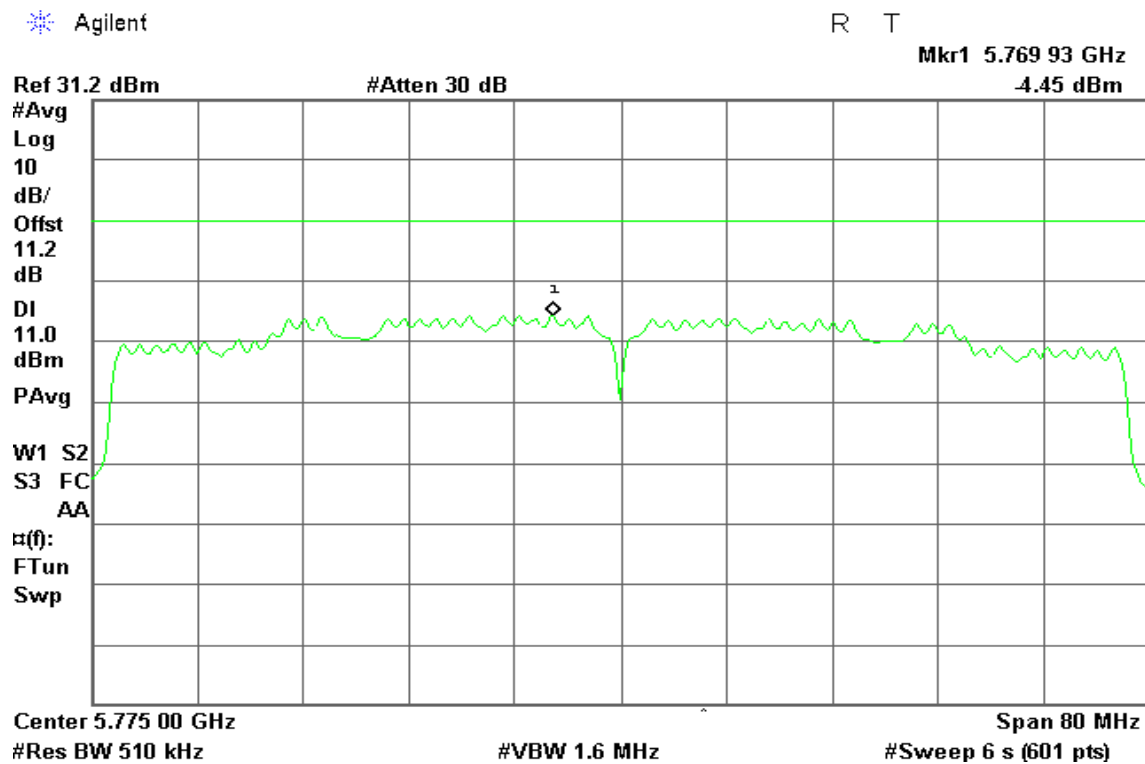






**IEEE 802.11ac VHT 80 MHz mode / 5775MHz**

**CH Mid**





## 7.5 RADIATED UNDESIRABLE EMISSION

1. 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 ( $\mu\text{V/m}$ )	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.

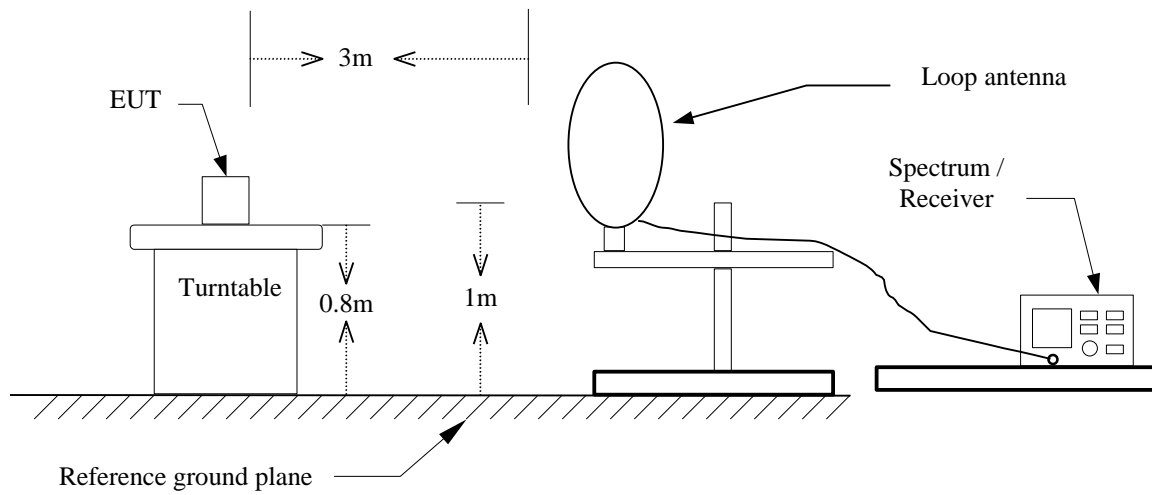
2. In the emission table above, the tighter limit applies at the band edges.

Frequency (MHz)	Field Strength ( $\mu\text{V/m}$ at 3-meter)	Field Strength (dB $\mu\text{V/m}$ at 3-meter)
0.009 - 0.490	2400/F(kHz) +80	20LOG((2400/F(kHz))+80)
0.490 - 1.705	24000/F(kHz) +40	20LOG((24000/F(kHz))+40)
1.705 – 30.0	30	69.54
30-88	100	40
88-216	150	43.5
216-960	200	46
Above 960	500	54

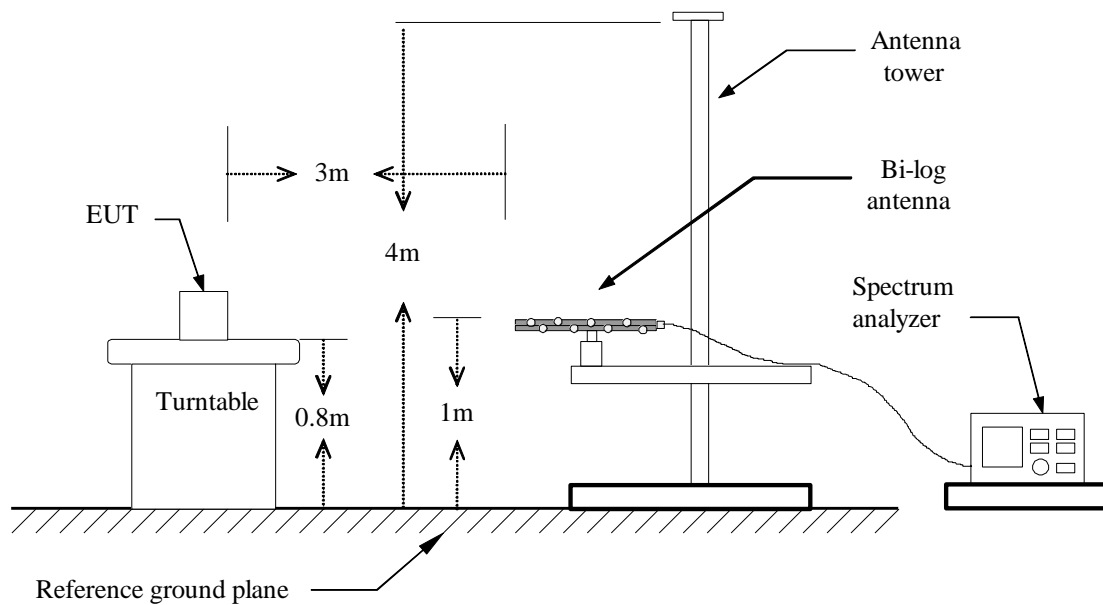


## Test Configuration

### 9kHz ~ 30MHz

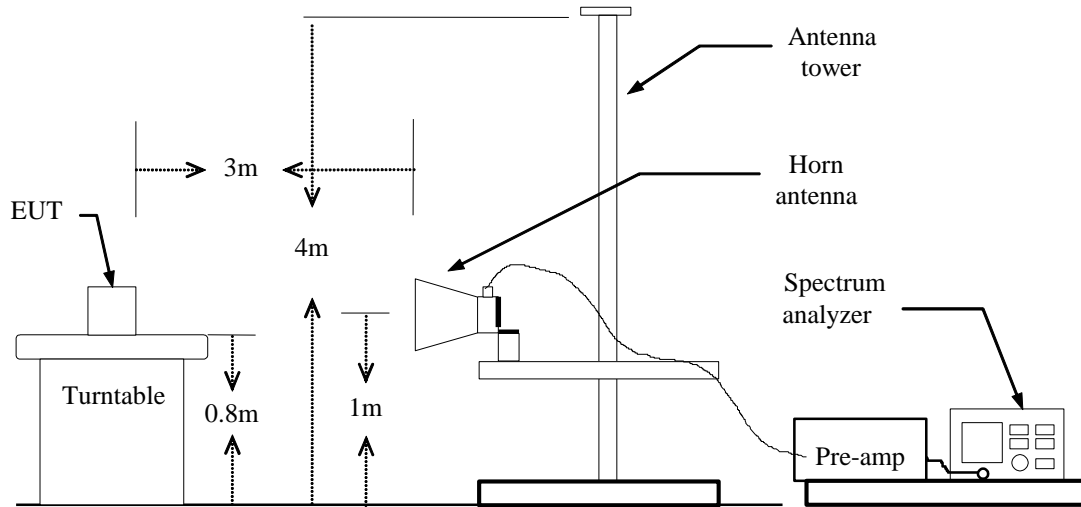


### 30MHz ~ 1GHz





Above 1 GHz





## **TEST PROCEDURE**

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=VBW=1MHz / Sweep=AUTO

(b) AVERAGE: RBW=1MHz,  
if duty cycle  $\geq 98\%$ , VBW=10Hz.  
if duty cycle  $< 98\%$  VBW=1/T.

**IEEE 802.11b mode:**  $\geq 98\%$ , VBW=10Hz

**IEEE 802.11g mode:**  $\geq 98\%$ , VBW=10Hz

**IEEE 802.11n HT 20 MHz mode:**  $\geq 98\%$ , VBW=10Hz

**IEEE 802.11n HT 40 MHz mode:**  $96\% = \text{VBW } 2\text{kHz}$

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

**TEST RESULTS****Below 1 GHz****Operation Mode:** Normal Link**Test Date:** February 14, 2015**Temperature:** 27°C**Tested by:** Dennis Li**Humidity:** 53% RH**Polarity:** Ver. / Hor.

Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit 3m (dBuV/m)	Margin (dB)	Detector Mode (PK/QP)	Ant.Pol. (H/V)
36.7900	44.92	-14.85	30.07	40.00	-9.93	Peak	V
157.0700	46.07	-18.19	27.88	43.50	-15.62	Peak	V
233.7000	53.49	-18.73	34.76	46.00	-11.24	Peak	V
268.6200	54.05	-17.04	37.01	46.00	-8.99	Peak	V
450.0100	43.07	-12.66	30.41	46.00	-15.59	Peak	V
594.5400	40.42	-10.56	29.86	46.00	-16.14	Peak	V
36.7900	47.70	-14.85	32.85	40.00	-7.15	Peak	H
157.0700	53.57	-18.19	35.38	43.50	-8.12	Peak	H
234.6700	57.83	-18.71	39.12	46.00	-6.88	Peak	H
255.0400	57.12	-18.04	39.08	46.00	-6.92	Peak	H
366.5900	49.03	-14.80	34.23	46.00	-11.77	Peak	H
450.0100	48.47	-12.66	35.81	46.00	-10.19	Peak	H

**Remark:**

1. Measuring frequencies from 30 MHz to the 1GHz.
2. Radiated emissions measured in frequency range from 30 MHz to 1000MHz were made with an instrument using peak/quasi-peak detector mode.
3. Quasi-peak test would be performed if the peak result were greater than the quasi-peak limit or as required by the applicant.
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. Margin (dB) = Remark result (dBuV/m) – Quasi-peak limit (dBuV/m).

**Above 1 GHz**

**Operation Mode:** Tx / IEEE 802.11a mode / 5745 ~ 5825MHz / CH Low **Test Date:** February 6, 2015

**Temperature:** 27°C

**Tested by:** Dennis Li

**Humidity:** 53% RH

**Polarity:** Ver. / Hor.

Frequency (MHz)	Reading (dBuV)	Correction (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Pol. (H/V)
1952.000	51.90	-5.13	46.77	74.00	-27.23	peak	V
10960.000	33.01	16.76	49.77	74.00	-24.23	peak	V
13490.000	32.65	19.59	52.24	74.00	-21.76	peak	V
N/A							
3296.000	51.77	-1.40	50.37	74.00	-23.63	peak	H
10790.000	30.63	16.91	47.54	74.00	-26.46	peak	H
14160.000	31.34	20.30	51.64	74.00	-22.36	peak	H
N/A							

**Remark:**

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.
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.  $\text{Margin (dB)} = \text{Remark result (dBuV/m)} - \text{Average limit (dBuV/m)}$ .



**Operation Mode:** Tx / IEEE 802.11a mode / 5745 ~ 5825MHz / CH Mid **Test Date:** February 6, 2015  
**Temperature:** 27°C **Tested by:** Dennis Li  
**Humidity:** 53% RH **Polarity:** Ver. / Hor.

Frequency (MHz)	Reading (dBuV)	Correction (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Pol. (H/V)
1602.000	53.39	-6.99	46.40	74.00	-27.60	peak	V
10950.000	32.83	16.77	49.60	74.00	-24.40	peak	V
13410.000	32.24	19.56	51.80	74.00	-22.20	peak	V
N/A							
1602.000	53.21	-6.99	46.22	74.00	-27.78	peak	H
11080.000	31.80	16.74	48.54	74.00	-25.46	peak	H
14360.000	31.49	20.46	51.95	74.00	-22.05	peak	H
N/A							

**Remark:**

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.
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).





**Operation Mode:** Tx / IEEE 802.11a mode / 5745 ~ 5825MHz /  
CH High

**Test Date:** February 6, 2015

**Temperature:** 27°C

**Tested by:** Dennis Li

**Humidity:** 53% RH

**Polarity:** Ver. / Hor.

Frequency (MHz)	Reading (dBuV)	Correction (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Pol. (H/V)
3240.000	51.38	-1.53	49.85	74.00	-24.15	peak	V
11040.000	33.15	16.73	49.88	74.00	-24.12	peak	V
15690.000	32.49	19.17	51.66	74.00	-22.34	peak	V
N/A							
2442.000	49.00	-3.48	45.52	74.00	-28.48	peak	H
10970.000	32.42	16.76	49.18	74.00	-24.82	peak	H
13490.000	32.24	19.59	51.83	74.00	-22.17	peak	H
N/A							

**Remark:**

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.
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).



**Operation Mode:** Tx / IEEE 802.11n HT 20 MHz mode / 5745 ~ 5825MHz / CH Low **Test Date:** February 6, 2015  
**Temperature:** 27°C **Tested by:** Dennis Li  
**Humidity:** 53% RH **Polarity:** Ver. / Hor.

Frequency (MHz)	Reading (dBuV)	Correction (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Pol. (H/V)
1595.000	54.65	-7.03	47.62	74.00	-26.38	peak	V
10940.000	31.78	16.78	48.56	74.00	-25.44	peak	V
12970.000	30.73	19.33	50.06	74.00	-23.94	peak	V
N/A							
3170.000	50.34	-1.70	48.64	74.00	-25.36	peak	H
10780.000	31.11	16.92	48.03	74.00	-25.97	peak	H
13370.000	31.82	19.55	51.37	74.00	-22.63	peak	H
N/A							

**Remark:**

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.
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).



**Operation Mode:** Tx / IEEE 802.11n HT 20 MHz mode / 5745 ~ 5825MHz / CH Mid **Test Date:** February 6, 2015  
**Temperature:** 27°C **Tested by:** Dennis Li  
**Humidity:** 53% RH **Polarity:** Ver. / Hor.

Frequency (MHz)	Reading (dBuV)	Correction (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Pol. (H/V)
1728.000	52.65	-6.32	46.33	74.00	-27.67	peak	V
10880.000	32.07	16.83	48.90	74.00	-25.10	peak	V
13290.000	32.77	19.52	52.29	74.00	-21.71	peak	V
N/A							
1595.000	53.16	-7.03	46.13	74.00	-27.87	peak	H
9230.000	34.34	13.90	48.24	74.00	-25.76	peak	H
13300.000	32.26	19.53	51.79	74.00	-22.21	peak	H
N/A							

**Remark:**

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.
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).



**Operation Mode:** Tx / IEEE 802.11n HT 20 MHz mode / 5745 ~ 5825MHz / CH High **Test Date:** February 6, 2015  
**Temperature:** 27°C **Tested by:** Dennis Li  
**Humidity:** 53% RH **Polarity:** Ver. / Hor.

Frequency (MHz)	Reading (dBuV)	Correction (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Pol. (H/V)
3142.000	51.10	-1.77	49.33	74.00	-24.67	peak	V
11800.000	33.95	17.04	50.99	74.00	-23.01	peak	V
13390.000	31.78	19.55	51.33	74.00	-22.67	peak	V
N/A							
1994.000	52.81	-4.91	47.90	74.00	-26.10	peak	H
10840.000	32.39	16.87	49.26	74.00	-24.74	peak	H
13280.000	32.10	19.52	51.62	74.00	-22.38	peak	H
N/A							

**Remark:**

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.
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).



**Operation Mode:** Tx / IEEE 802.11n HT 40 MHz mode / 5755 ~ 5795MHz / CH Low **Test Date:** February 7, 2015  
**Temperature:** 27°C **Tested by:** Dennis Li  
**Humidity:** 53% RH **Polarity:** Ver. / Hor.

Frequency (MHz)	Reading (dBuV)	Correction (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Pol. (H/V)
2631.000	49.37	-2.86	46.51	74.00	-27.49	peak	V
11340.000	31.97	16.76	48.73	74.00	-25.27	peak	V
12790.000	31.36	18.72	50.08	74.00	-23.92	peak	V
N/A							
3177.000	50.58	-1.69	48.89	74.00	-25.11	peak	H
10950.000	33.13	16.77	49.90	74.00	-24.10	peak	H
14010.000	32.12	20.18	52.30	74.00	-21.70	peak	H
N/A							

**Remark:**

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.
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).



**Operation Mode:** Tx / IEEE 802.11n HT 40 MHz mode / 5755 ~ 5795MHz / CH High **Test Date:** February 7, 2015  
**Temperature:** 27°C **Tested by:** Dennis Li  
**Humidity:** 53% RH **Polarity:** Ver. / Hor.

Frequency (MHz)	Reading (dBuV)	Correction (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Pol. (H/V)
3891.000	50.15	0.76	50.91	74.00	-23.09	peak	V
10960.000	32.43	16.76	49.19	74.00	-24.81	peak	V
13360.000	32.47	19.55	52.02	74.00	-21.98	peak	V
N/A							
2645.000	48.80	-2.83	45.97	74.00	-28.03	peak	H
10830.000	32.03	16.88	48.91	74.00	-25.09	peak	H
13310.000	32.00	19.53	51.53	74.00	-22.47	peak	H
N/A							

**Remark:**

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.
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).



**Operation Mode:** Tx / IEEE 802.11ac VHT 80 MHz mode /  
5775MHz / CH Mid

**Test Date:** February 6, 2015

**Temperature:** 27°C

**Tested by:** Dennis Li

**Humidity:** 53% RH

**Polarity:** Ver. / Hor.

Frequency (MHz)	Reading (dBuV)	Correction (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Pol. (H/V)
3065.000	50.07	-1.95	48.12	74.00	-25.88	peak	V
10900.000	33.86	16.82	50.68	74.00	-23.32	peak	V
13200.000	34.13	19.49	53.62	74.00	-20.38	peak	V
N/A							
							V
2743.000	50.13	-2.63	47.50	74.00	-26.50	peak	H
10770.000	35.22	16.93	52.15	74.00	-21.85	peak	H
14010.000	34.56	20.18	54.74	74.00	-19.26	peak	H
N/A							

**Remark:**

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.  $\text{Margin (dB)} = \text{Remark result (dBuV/m)} - \text{Average limit (dBuV/m)}$ .



## 7.6 POWERLINE CONDUCTED EMISSIONS

### LIMIT

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  $\mu$ 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)	Limits (dB $\mu$ 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

\* Decreases with the logarithm of the frequency.

### TEST CONFIGURATION

See test photographs attached in Appendix 1 for the actual connections between EUT and support equipment.

### TEST PROCEDURE

1. The EUT was placed on a table, which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. Repeat above procedures until all frequency measured were complete.



**TEST RESULTS**

The initial step in collecting conducted data is a spectrum analyzer peak scan of the measurement range. Significant peaks are then marked as shown on the following data page, and these signals are then quasi-peaked.

**Test Data**

**Operation Mode:** Normal Link      **Test Date:** February 14, 2015  
**Temperature:** 24°C      **Tested by:** Ken Tsai  
**Humidity:** 50% RH

Freq. (MHz)	QP Reading (dBuV)	AV Reading (dBuV)	Corr. factor (dB/m)	QP Result (dBuV/m)	AV Result (dBuV/m)	QP Limit (dBuV)	AV Limit (dBuV)	QP Margin (dB)	AV Margin (dB)	Note
0.2678	33.00	31.98	9.58	42.58	41.56	61.18	51.19	-18.60	-9.63	L1
0.4876	22.71	16.02	9.58	32.29	25.60	56.21	46.21	-23.92	-20.61	L1
0.5197	36.26	27.46	9.58	45.84	37.04	56.00	46.00	-10.16	-8.96	L1
0.7229	28.38	17.64	9.59	37.97	27.23	56.00	46.00	-18.03	-18.77	L1
0.8562	28.61	17.66	9.59	38.20	27.25	56.00	46.00	-17.80	-18.75	L1
2.5752	26.91	16.17	9.60	36.51	25.77	56.00	46.00	-19.49	-20.23	L1
0.2679	32.58	31.73	9.63	42.21	41.36	61.18	51.18	-18.97	-9.82	L2
0.5039	28.72	19.06	9.63	38.35	28.69	56.00	46.00	-17.65	-17.31	L2
0.5917	26.90	17.19	9.63	36.53	26.82	56.00	46.00	-19.47	-19.18	L2
0.7316	22.93	13.73	9.64	32.57	23.37	56.00	46.00	-23.43	-22.63	L2
1.4299	18.52	11.75	9.64	28.16	21.39	56.00	46.00	-27.84	-24.61	L2
2.5111	20.16	12.60	9.65	29.81	22.25	56.00	46.00	-26.19	-23.75	L2

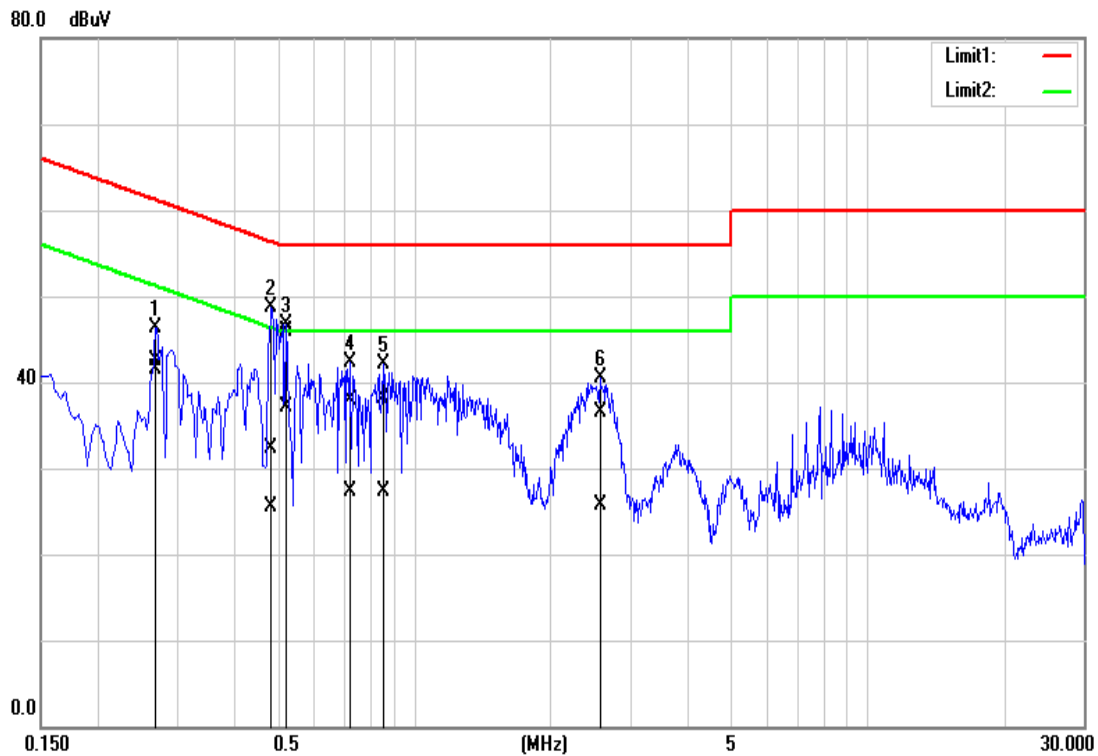
**Remark:**

1. Measuring frequencies from 0.15 MHz to 30MHz.
2. The emissions measured in frequency range from 0.15 MHz to 30MHz were made with an instrument using Quasi-peak detector and average detector.
3. The IF bandwidth of SPA between 0.15MHz to 30MHz was 10kHz; the IF bandwidth of Test Receiver between 0.15MHz to 30MHz was 9kHz;
4. L1 = Line One (Live Line) / L2 = Line Two (Neutral Line)



## Test Plots

### Conducted emissions (Line 1)



### Conducted emissions (Line 2)

