REPORT No.: SZ20050353W02

TEST REPORT

APPLICANT	:	Nortek Security & Control LLC
PRODUCT NAME	:	Edge Remote Keypad
MODEL NAME	:	2GIG-EDG-RK
BRAND NAME	:	2GIG
FCC ID	:	EF400189
STANDARD(S)	:	47 CFR Part 15 Subpart E
RECEIPT DATE	:	2020-06-16
TEST DATE	:	2020-06-18 to 2020-06-29
ISSUE DATE	:	2020-07-14

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DIRECTORY

Change History		
Version	Date	Reason for change
1.0	2020-07-14	First edition

1. Technical Information

Note: Provide by applicant.

1.1. Applicant and Manufacturer Information

Applicant:	Nortek Security & Control LLC
Applicant Address:	5919 Sea Otter Place, Carlsbad, CA 92010, United States
Manufacturer:	Flextronics Electronics Technology (Shenzhen) Co., Ltd
Manufacturer Address:	89 Yong Fu Road, Tong Fu Yu Industrial Park, Fu Yong Town, Bao An District, Shenzhen, Guangdong, 518103, China

1.2. Equipment Under Test (EUT) Description

Product Name:	Edge Remote Keypad	
Serial No.:	(N/A, marked #1 by test site)	
Hardware Version:	2GIG-EDG-RK	
Software Version:	20200426. 002457	
Modulation Technology:	OFDM	
Modulation Mode:	802.11a, 802.11n(HT20), 802.11n(HT40)	
Operating Frequency Range:	5.180 GHz- 5.240 GHz; 5.745GHz- 5.825GHz	
Channel Number:	Refer to 1.4	
Antenna Type:	FPC Antenna	
Antenna Gain:	3.4dBi	
Accessory Information:	Battery	
	Brand Name:	Highpower
	Model No.:	763740
	Serial No.:	(N/A, marked #1 by test site)
	Capacity:	1600mAh
	Rated Voltage:	3.85V
	Charge Limit:	4.4V

Accessory Information:	AC Adapter	
	Brand Name:	ZBPOWER
	Model No.:	ZB-H140017
	Serial No.:	(N/A, marked #1 by test site)
	Rated Output:	14V⎓1.7A
	Rated Input:	100-240V ～ 0.6A

Note 1: WIFI hotspot does not support U-NII band.

Note 2: For a more detailed description, please refer to Specification or User's Manual supplied by the applicant and/or manufacturer.

1.3. Modulation Type and Data Rate of EUT

Modulation Technology	Modulation Type	Data Rate (Mbps) Note1
OFDM (802.11a)	BPSK	**6**/9
	QPSK	12/18
	16QAM	24/36
	64QAM	48/54
OFDM (802.11n)	BPSK	**6.5**
	QPSK	13/19.5
	16QAM	26/39
	64QAM	52/58.5/65

Note1: The worst-case mode (black bold) in all data rates has been determined during the pre-scan, only the test data of the worst-case were recorded in this report.

1.4. The Channel Number and Frequency

Frequency Range: 5180MHz-5240MHz				
Bandwidth	Channel	Frequency (MHz)	Channel	Frequency (MHz)
20MHz	**36**	**5180**	40	5200
	44	**5220**	**48**	**5240**
40MHz	**38**	**5190**	**46**	**5230**
Frequency Range: 5745-5825MHz				
Bandwidth	Channel	Frequency (MHz)	Channel	Frequency (MHz)
20MHz	**149**	**5745**	153	5765
	157	**5785**	161	5805
	165	**5825**		
40MHz	**151**	**5775**	**159**	**5795**

Note 1: The black bold channels were selected for test.

1.5. Test Standards and Results

The objective of the report is to perform testing according to 47 CFR Part 15 Subpart E (U-NII band) for the EUT FCC ID Certification:

No.	Identity	Document Title
1	47 CFR Part 15 (5-1-14 Edition)	Radio Frequency Devices

Test detailed items/section required by FCC rules and results are as below:

No.	Section	Description	Test Date	Test Engineer	Result	Method determination /Remark
1	15.203	Antenna Requirement	N/A	N/A	PASS	No deviation
2	ANSI C63.10	Duty Cycle of the test signal	Jun 23, 2020	Lu Qiang	PASS	No deviation
3	15.407(a)	Maximum conducted output Power	Jun 23, 2020	Lu Qiang	PASS	No deviation
4	15.407(a)(e)	Emission Bandwidth	Jun 29, 2020	Lu Qiang	PASS	No deviation
5	15.407(a)	Maximum Power spectral density	Jun 29, 2020	Lu Qiang	PASS	No deviation
6	15.407(g)	Frequency Stability	Jun 23, 2020	Lu Qiang	PASS	No deviation
7	15.207	Conducted Emission	Jun 18, 2020	Huang Zhiye	PASS	No deviation
8	15.407(b)	Restricted Frequency Bands	Jun 28, 2020	Gao Jianrou	PASS	No deviation
9	15.407(b)	Radiated Emission	Jun 28, 2020	Gao Jianrou	PASS	No deviation

Note1: The tests of Conducted Emission and Radiated Emission were performed according to the method of measurements prescribed in ANSI C63.10 2013.

Note2: These RF tests were performed according to the method of measurements prescribed in KDB789033 D02 v02r01.

Note3: The path loss during the RF test is calibrated to correct the results by the offset setting in the test equipments. The ref offset 11dB contains two parts that cable loss 1dB and Attenuator 10dB.

Note 4: Additions to, deviation, or exclusions from the method shall be judged in the "method determination" column of add, deviate or exclude from the specific method shall be explained in the "Remark" of the above table.

1.6. Environmental Conditions

During the measurement, the environmental conditions were within the listed ranges:

Temperature (°C):	15-35
Relative Humidity (%):	30-60
Atmospheric Pressure (kPa):	86-106

2. 47 CFR Part 15E Requirements

2.1. Antenna Requirement

2.1.1. Applicable Standard

According to FCC 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

2.1.2. Result: Compliant

Inside of the EUT has a FPC antenna coupled with the I-PEX connector. Please refer to the EUT internal photos.

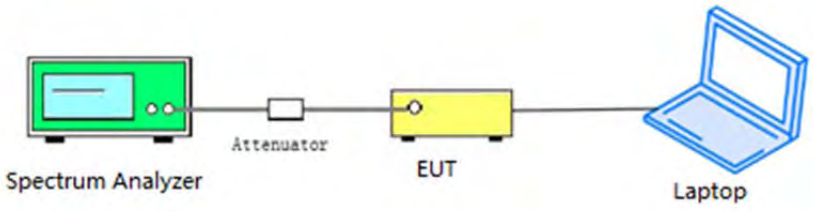
2.2. Duty Cycle of the Test Signal

2.2.1. Requirement

Preferably, all measurements of maximum conducted (average) output power will be performed with the EUT transmitting continuously (i.e., with a duty cycle of greater than or equal to 98%). When continuous operation cannot be realized, then the use of sweep triggering/signal gating techniques can be used to ensure that measurements are made only during transmissions at the maximum power control level. Such sweep triggering/signal gating techniques will require knowledge of the minimum transmission duration (T) over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation. Sweep triggering/signal gating techniques can then be used if the measurement/sweep time of the analyzer can be set such that it does not exceed T at any time that data are being acquired (i.e., no transmitter OFF-time is to be considered).
When continuous transmission cannot be achieved and sweep triggering/signal gating cannot be implemented, alternative procedures are provided that can be used to measure the average power; however, they will require an additional measurement of the transmitter duty cycle (D). Within this subclause, the duty cycle refers to the fraction of time over which the transmitter is ON and is transmitting at its maximum power control level. The duty cycle is considered to be constant if variations are less than ±2%; otherwise, the duty cycle is considered to be nonconstant.

2.2.2. Test Description

Test Setup:



The EUT is coupled to the Spectrum Analyzer; the RF load attached to the EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading.

2.2.3. Test Procedure

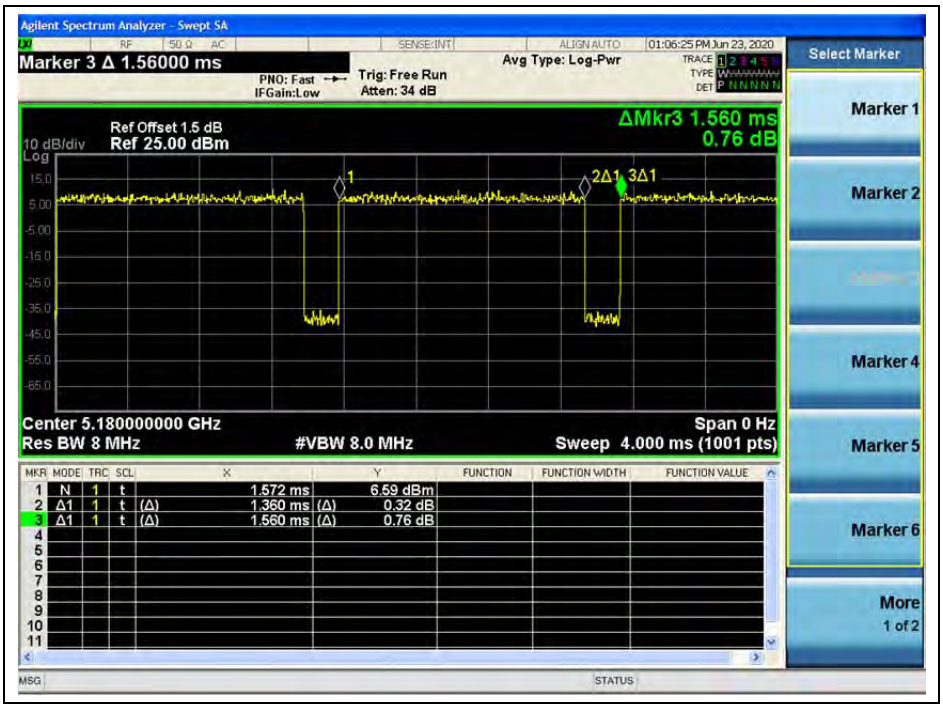
KDB 789033 Section B was used in order to prove compliance.

2.2.4. Test Result

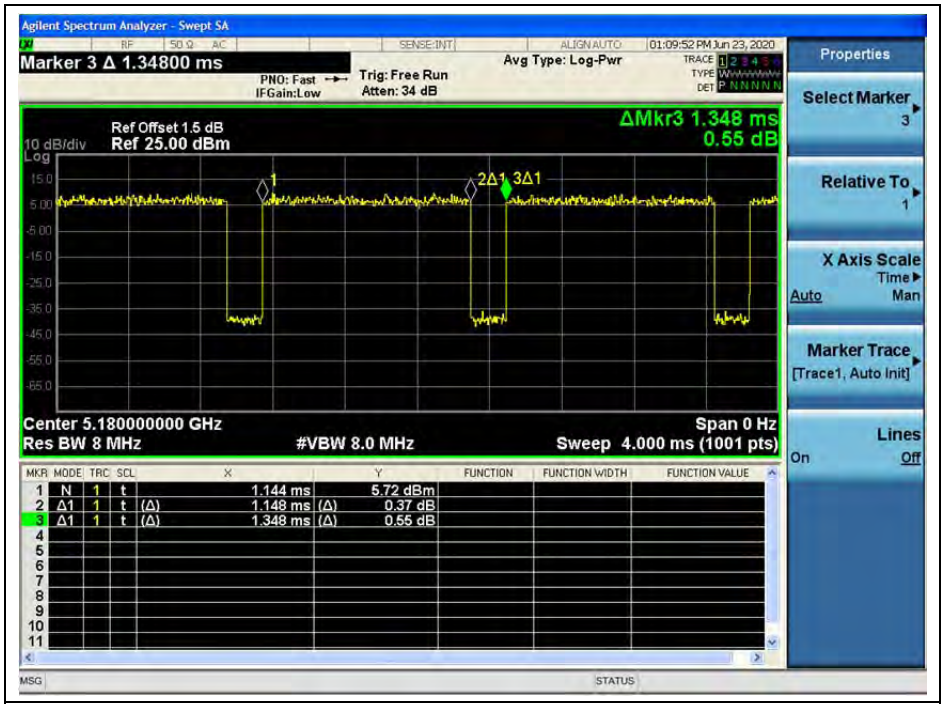
A. Test Verdict:

Test Mode	Duty Cycle (%) (D)	Duty Factor (10*log[1/D])
802.11a	87.18	0.60
802.11n(HT20)	85.16	0.70
802.11n(HT40)	74.93	1.25

B. Test Plots



(CH36_5180MHz_802.11a)



(CH36_5180MHz _802.11n(HT20))

(CH38_5190MHz _802.11n(HT40))

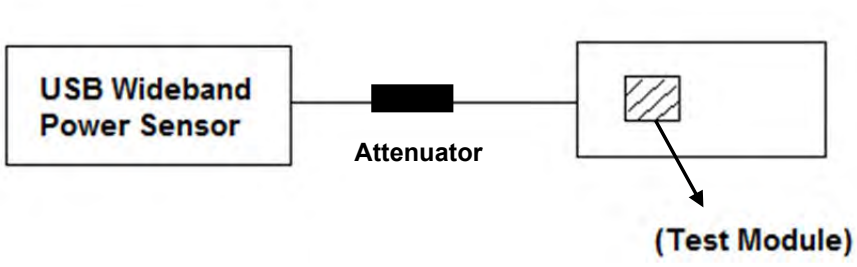
2.3. Maximum Conducted Output Power

2.3.1. Requirement

(1) For client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi.
(2) For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26 dB emission bandwidth in megahertz.
(3) For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W.
If transmitting antennas of directional gain greater than 6 dBi are used, the maximum conducted output power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.
(4) According to KDB662911D01Measure-and-sum technique, the conducted emission level (e.g., transmit power or power in specified bandwidth) is measured at each antenna port. The measured results at the various antenna ports are then summed mathematically to determine the total emission level from the device. Summing is performed in units that are directly proportional to power.
(5) According to KDB 662911 D01, the directional gain = G_{ANT} +10log(N_{ANT}) dBi, where G_{ANT} is the antenna gain in dBi, N_{ANT} is the number of outputs.

2.3.2. Test Description

Section E) 3) of KDB 789033 defines a methodology using a USB Wideband Power Sensor.
Test Setup:



The EUT (Equipment under the test) which is coupled to the USB Wideband Power Sensor; the RF load attached to the EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading, all test result in USB Wideband Power Sensor.

2.3.3. Test Result

Maximum Average Conducted Output Power

802.11a Test mode

Channel	Frequency (MHz)	Average Power (dBm)				Limit (dBm)		Verdict
		Measured	Duty Factor	Duty factor Calculated				
		dBm		dBm	W	dBm	W	
36	5180	14.82	0.60	15.42	0.035	24	0.25	PASS
44	5220	15.23		15.83	0.038			
48	5240	**15.26**		**15.86**	**0.039**			
149	5745	11.37		11.97	0.016	30	1	
157	5785	14.45		15.05	0.032			
165	5825	14.48		15.08	0.032			

802.11 n (HT20) Test mode

Channel	Frequency (MHz)	Average Power (dBm)				Limit (dBm)		Verdict
		Measured	Duty Factor	Duty factor Calculated				
		dBm		dBm	W	dBm	W	
36	5180	14.18	0.70	14.88	0.031	24	0.25	PASS
44	5220	14.32		15.02	0.032			
48	5240	**14.56**		**15.26**	**0.034**			
149	5745	13.77		14.47	0.028	30	1	
157	5785	13.54		14.24	0.027			
165	5825	13.51		14.21	0.026			

802.11 n (HT40) Test mode

Channel	Frequency (MHz)	Average Power				Limit (dBm)		Verdict
		Measured	Duty Factor	Duty factor Calculated				
		dBm		dBm	W	dBm	W	
38	5190	13.54	1.25	14.79	0.030	24	0.25	PASS
46	5230	**13.73**		**14.98**	**0.031**			
151	5755	13.22		14.47	0.028	30	1	
159	5795	12.91		14.16	0.026			

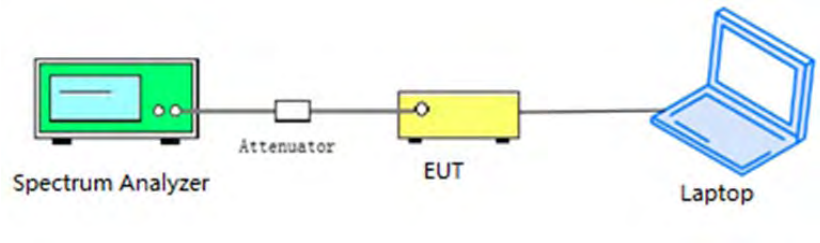
2.4. Emission Bandwidth

2.4.1. Requirement

For purposes of this subpart the emission bandwidth shall be determined by measuring the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, that are 26 dB down relative to the maximum level of the modulated carrier. Determination of the emissions bandwidth is based on the use of measurement instrumentation employing a peak detector function with an instrument resolution bandwidth approximately equal to 1.0 percent of the emission bandwidth of the device under measurement. Within the 5.725-5.85 GHz band, the minimum 6 dB bandwidth of U-NII devices shall be at least 500 kHz.

2.4.2. Test Description

Test Setup:



The EUT is coupled to the Spectrum Analyzer; the RF load attached to the EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading.

2.4.3. Test Procedure

1. KDB 789033 Section C) 1) Emission Bandwidth was used in order to prove compliance
a) Set RBW = approximately 1% of the emission bandwidth.
b) Set the VBW > RBW.
c) Detector = Peak.
d) Trace mode = max hold.
e) Measure the maximum width of the emission that is 26 dB down from the peak of the emission. Compare this with the RBW setting of the analyzer. Readjust RBW and repeat measurement as needed until the RBW/EBW ratio is approximately 1%.
2. KDB 789033 Section C) 2) minimum emission bandwidth for the band 5.725-5.85GHz was used in order to prove compliance.
Section 15.407(e) specifies the minimum 6 dB emission bandwidth of at least 500 KHz for the band 5.715-5.85 GHz. The following procedure shall be used for measuring this bandwidth:

a) Set RBW = 100 kHz.
b) Set the video bandwidth (VBW) ≥ 3 × 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.

2.4.4. Test Result

802.11a Test mode

A. Test Verdict:

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)
36	5180	25.96
44	5220	30.00
48	5240	42.72
Channel	**Frequency (MHz)**	**6 dB Bandwidth (MHz)**
149	5745	16.54
157	5785	16.56
165	5825	16.55

B. Test Plots

(Channel 36, 5180MHz, 802.11a,)

(Channel 44, 5220 MHz, 802.11a,)

(Channel 48, 5240MHz, 802.11a,)

(Channel 149, 5745MHz, 802.11a)

(Channel 157, 5785MHz, 802.11a)

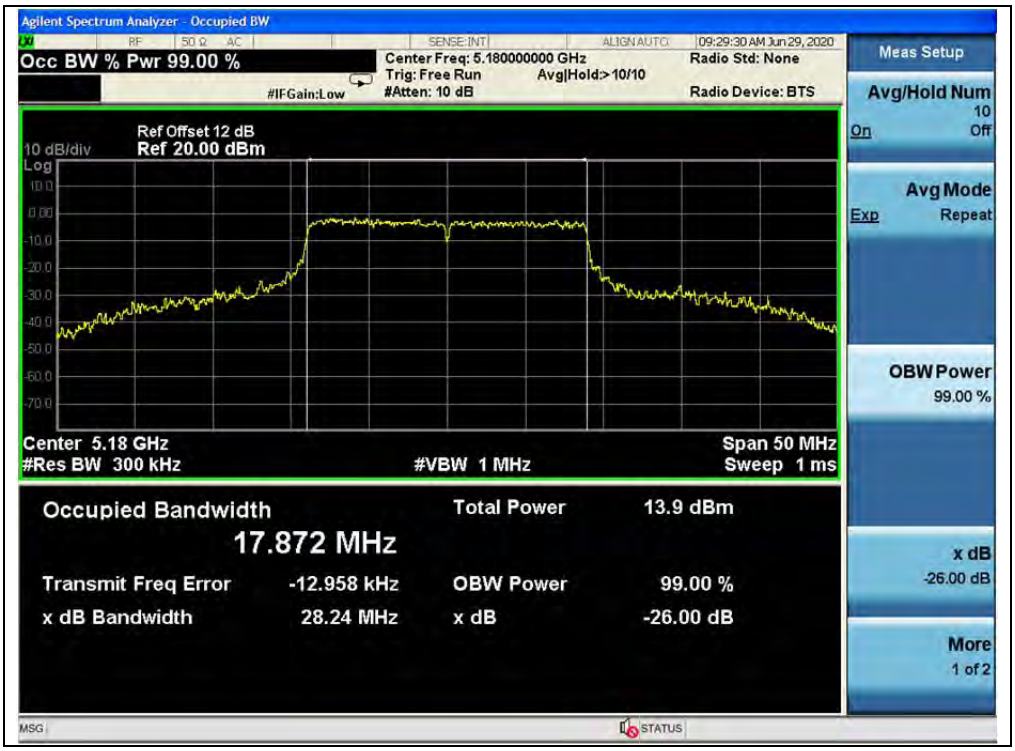
(Channel 165, 5825MHz, 802.11a)

802.11n (HT20) Test mode

A. Test Verdict:

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)
36	5180	28.24
44	5220	26.56
48	5240	42.71
Channel	**Frequency (MHz)**	**6 dB Bandwidth (MHz)**
149	5745	17.79
157	5785	17.80
165	5825	17.74

B. Test Plots

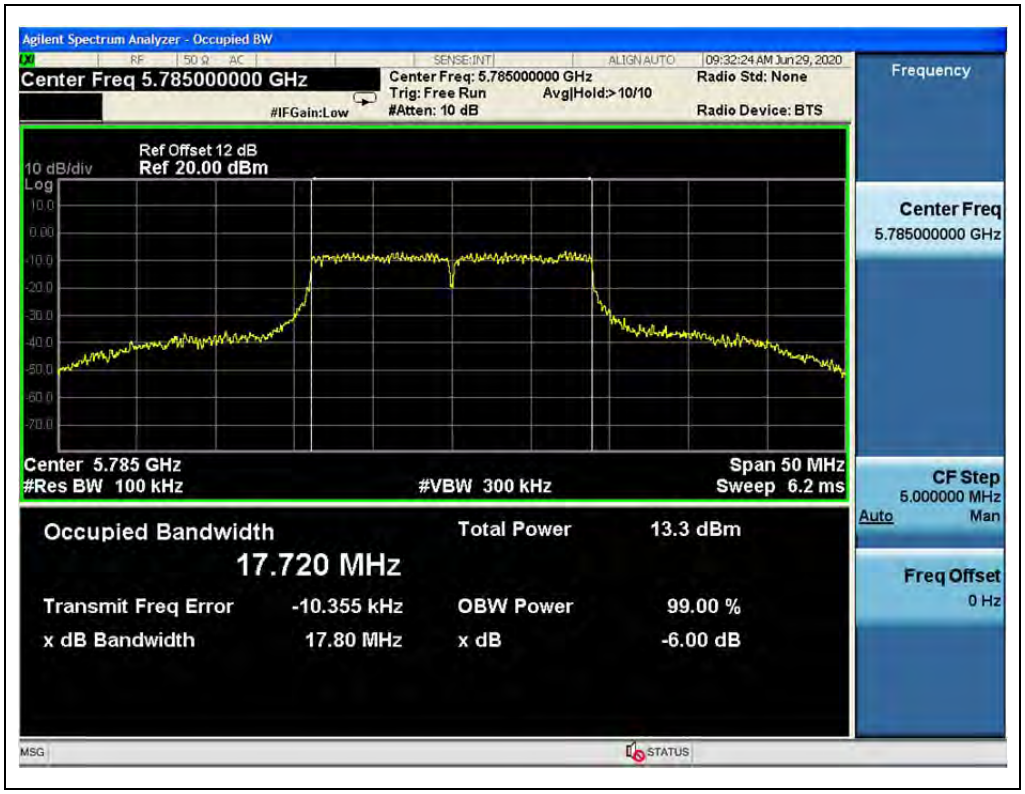


(Channel 36, 5180MHz, 802.11 n (HT20))

(Channel 44, 5220 MHz, 802.11 n (HT20))

(Channel 48, 5240MHz, 802.11 n (HT20))

(Channel 149, 5745MHz, 802.11 n (HT20))



(Channel 157, 5785MHz, 802.11 n (HT20))

(Channel 165, 5825MHz, 802.11 n (HT20))

802.11n (HT40) Test mode

A. Test Verdict:

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)
38	5190	50.50
46	5230	77.03
Channel	**Frequency (MHz)**	**6 dB Bandwidth (MHz)**
151	5755	36.38
159	5795	36.37

B. Test Plots

(Channel 38, 5190MHz, 802.11n (HT40))

(Channel 46, 5230 MHz, 802.11n (HT40))

(Channel 151, 5755 MHz, 802.11n (HT40))

(Channel 159, 5795MHz, 802.11n (HT40))

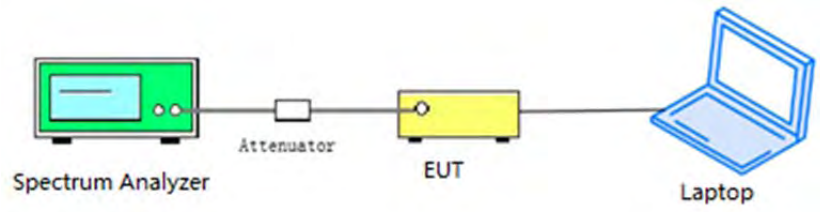
2.5. Peak Power spectral density

2.5.1. Requirement

(1) For client devices in the 5.15-5.25 GHz band, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band.
(2) For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band.
(3) For the band 5.725-5.85 GHz, the maximum power spectral density shall not exceed 30 dBm in any 500KHz band.
If transmitting antennas of directional gain greater than 6 dBi are used, the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.
(4) According to KDB662911D01Measure-and-sum technique, the conducted emission level (e.g., transmit power or power in specified bandwidth) is measured at each antenna port. The measured results at the various antenna ports are then summed mathematically to determine the total emission level from the device. Summing is performed in units that are directly proportional to power.
(5) According to KDB 662911 D01, the directional gain = G_{ANT} +10log(N_{ANT}) dBi, where G_{ANT} is the antenna gain in dBi, N_{ANT} is the number of outputs.

2.5.2. Test Description

Test Setup:



The EUT is coupled to the Spectrum Analyzer; the RF load attached to the EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading.

2.5.3. Test Procedure

KDB 789033 Section F) Maximum Power Spectral Density (PSD) Method SA-1 was used in order to prove compliance

1) Set span to encompass the entire 26-dB emission bandwidth
2) Set RBW = 1 MHz. Set VBW ≥ 3 MHz.
3) Number of points in sweep ≥ 2 Span / RBW. Sweep time = auto.
4) Detector = Peak
5) Trace mode=Max hold
6) Record the max value

2.5.4. Test Result

802.11a Test mode

A. Test Verdict:

Channel	Frequency (MHz)	Measured PPSD (dBm/MHz)	Duty Factor	Total PPSD (dBm/MHz)	Limit (dBm/MHz)	Verdict
36	5180	3.939	0.60	4.539	11	PASS
44	5220	4.072		4.672		
48	5240	3.792		4.392		
Channel	Frequency (MHz)	Measured PPSD (dBm/500KHz)	Duty Factor	Total PPSD (dBm/500KHz)	Limit (dBm/500KHz)	Verdict
149	5745	0.772	0.60	1.372	30	PASS
157	5785	0.487		1.087		
165	5825	0.032		0.632		

B. Test Plots

(Channel 36, 5180MHz, 802.11a,)

(Channel 44, 5220 MHz, 802.11a,)

(Channel 48, 5240MHz, 802.11a,)

(Channel 149, 5745MHz, 802.11a)

(Channel 157, 5785MHz, 802.11a)

(Channel 165, 5825MHz, 802.11a)

802.11n (HT20) Test mode

A. Test Verdict:

Channel	Frequency (MHz)	Measured PPSD (dBm/MHz)	Duty Factor	Total PPSD (dBm/MHz)	Limit (dBm/MHz)	Verdict
36	5180	2.792	0.70	3.492	11	PASS
44	5220	2.985		3.685		
48	5240	2.546		3.246		
Channel	Frequency (MHz)	Measured PPSD (dBm/500KHz)	Duty Factor	Total PPSD (dBm/500KHz)	Limit (dBm/500KHz)	Verdict
149	5745	-0.231	0.70	0.469	30	PASS
157	5785	-0.821		-0.121		
165	5825	-1.051		-0.351		

B. Test Plots

(Channel 36, 5180MHz, 802.11 n (HT20))

(Channel 44, 5220 MHz, 802.11 n (HT20))

(Channel 48, 5240MHz, 802.11 n (HT20))

(Channel 149, 5745MHz, 802.11 n (HT20))

(Channel 157, 5785MHz, 802.11 n (HT20))

(Channel 165, 5825MHz, 802.11 n (HT20))

802.11n (HT40) Test mode

A. Test Verdict:

Channel	Frequency (MHz)	Measured PPSD (dBm/MHz)	Duty Factor	Total PPSD (dBm/MHz)	Limit (dBm/MHz)	Verdict
38	5190	-0.826	1.25	0.424	11	PASS
46	5230	-0.540		0.71		
Channel	Frequency (MHz)	Measured PPSD (dBm/500KHz)	Duty Factor	Total PPSD (dBm/500KHz)	Limit (dBm/500KHz)	Verdict
151	5755	-3.843	1.25	-2.593	30	PASS
159	5795	-4.468		-3.218		

B. Test Plots

(Channel 38, 5190MHz, 802.11n (HT40))

(Channel 46, 5230 MHz, 802.11n (HT40))

(Channel 151, 5755 MHz, 802.11n (HT40))

(Channel 159, 5795MHz, 802.11n (HT40))

2.6. Frequency Stability

2.6.1. Requirement

Manufacturers of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the user's manual.

2.6.2. Test Description

The EUT was placed inside of an environmental chamber as the temperature in the chamber was varied between 5°C to 40°C. The temperature was incremented by 10° intervals and the unit was allowed to stabilize at each temperature before each measurement. The center frequency of the transmitting channel was evaluated at each temperature and the frequency deviation from the channel's center frequency was recorded. Data for the worst case channel is shown below.

2.6.3. Test Result

U-NII-1 (Ch. 36) 5180MHz				
VOLTAGE (%)	POWER (VDC)	TEMP (°C)	Freq Dev. (kHz)	Deviation (ppm)
100%	14	+20(Ref)	8	1.544
100%		-30	8	1.544
100%		-20	8	1.544
100%		-10	7	1.351
100%		0	8	1.544
100%		+10	8	1.544
100%		+20	7	1.351
100%		+30	7	1.351
100%		+40	6	1.158
100%		+50	7	1.351
85%	11.9	+20	7	1.351
115%	16.1	+20	7	1.351

U-NII-3 (Ch. 149) 5745MHz				
VOLTAGE (%)	POWER (VDC)	TEMP (°C)	Freq Dev. (kHz)	Deviation (ppm)
100%	14	+20(Ref)	9	1.567
100%		-30	8	1.393
100%		-20	9	1.567
100%		-10	10	1.741
100%		0	11	1.915
100%		+10	9	1.567
100%		+20	11	1.915
100%		+30	12	2.089
100%		+40	13	2.263
100%		+50	12	2.089
85%	11.9	+20	9	1.567
115%	16.1	+20	10	1.741

2.7. Conducted Emission

2.7.1. Requirement

According to FCC section 15.207, 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 within the band 150kHz to 30MHz shall not exceed the limits in the following table, as measured using a 50μH/50Ω line impedance stabilization network (LISN).

Frequency range (MHz)	Conducted Limit (dBμV)	
	Quai-peak	Average
0.15 - 0.50	66 to 56	56 to 46
0.50 - 5	56	46
5 - 30	60	50

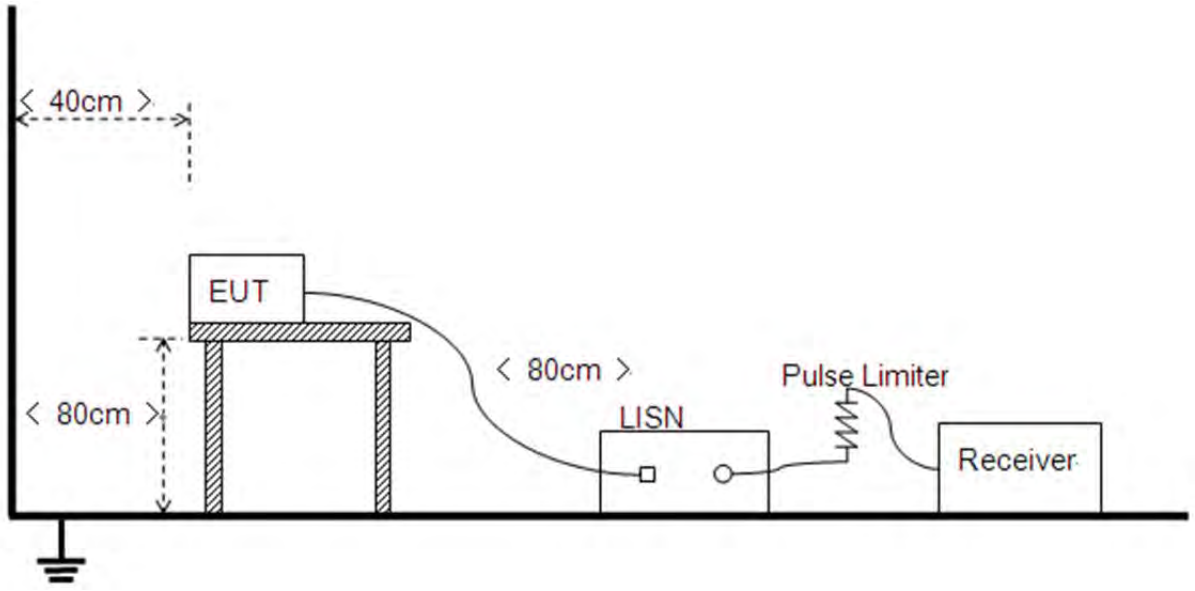
NOTE:

(a) The lower limit shall apply at the band edges.

(b) The limit decreases linearly with the logarithm of the frequency in the range 0.15 - 0.50MHz.

2.7.2. Test Description

Test Setup:



The Table-top EUT was placed upon a non-metallic table 0.8m above the horizontal metal reference ground plane. EUT was connected to LISN and LISN was connected to reference Ground Plane. EUT was 80cm from LISN. The set-up and test methods were according to ANSI C63.10: 2013.

2.7.3. Test Result

The maximum conducted interference is searched using Peak (PK), if the emission levels more than the AV and QP limits, and that have narrow margins from the AV and QP limits will be re-measured with AV and QP detectors. Tests for both L phase and N phase lines of the power mains connected to the EUT are performed. Refer to recorded points and plots below.

Note: Both of the test voltage AC 120V/60Hz and AC 230V/50Hz were considered and tested respectively, only the results of the worst case AC 120V/60Hz were recorded in this report.

A. Test Setup:

Test Mode: EUT + Adapter +wifi TX

Test Voltage: AC 120V/60Hz

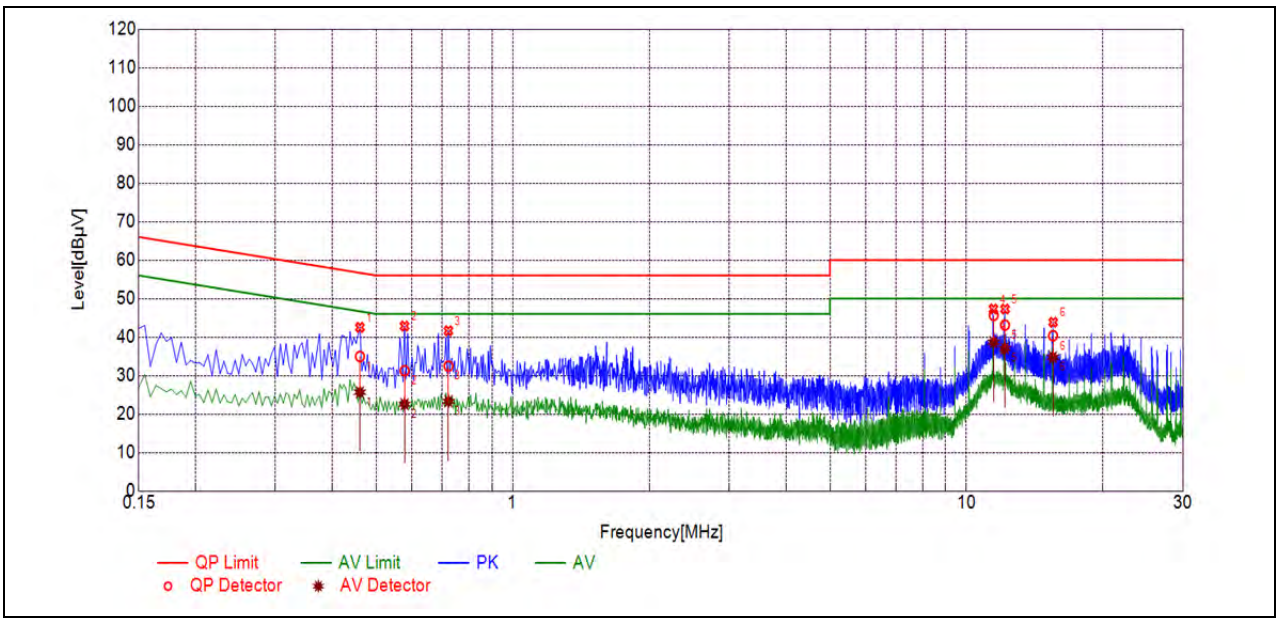
The measurement results are obtained as below:

$E\ [dB\mu V] = U_R + L_{Cable\ loss}\ [dB] + A_{Factor}$

U_R: Receiver Reading

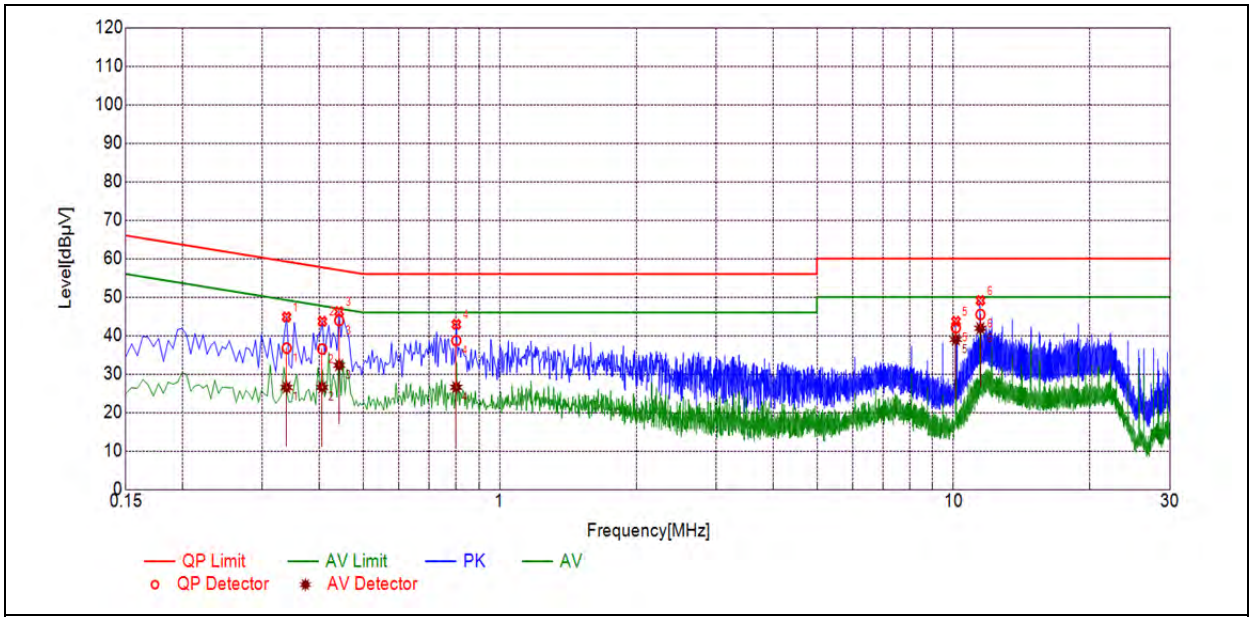
A_{Factor}: Voltage division factor of LISN

B. Test Plots:



(L Phase)

NO.	Fre. (MHz)	Emission Level (dBµV)		Limit (dBµV)		Power-line	Verdict
		Quai-peak	Average	Quai-peak	Average		
1	0.4605	34.96	25.68	56.68	46.68	Line	PASS
2	0.5777	31.26	22.57	56.00	46.00		PASS
3	0.7217	32.46	23.32	56.00	46.00		PASS
4	11.4788	45.64	38.68	60.00	50.00		PASS
5	12.1533	43.12	37.06	60.00	50.00		PASS
6	15.5133	40.35	34.76	60.00	50.00		PASS



(N Phase)

NO.	Fre. (MHz)	Emission Level (dBµV)		Limit (dBµV)		Power-line	Verdict
		Quai-peak	Average	Quai-peak	Average		
1	0.3391	36.75	26.52	59.23	49.23	Neutral	PASS
2	0.4061	36.50	26.54	57.73	47.73		PASS
3	0.4427	43.92	32.31	57.01	47.01		PASS
4	0.8020	38.69	26.58	56.00	46.00		PASS
5	10.1171	42.04	39.02	60.00	50.00		PASS
6	11.4638	45.50	41.88	60.00	50.00		PASS

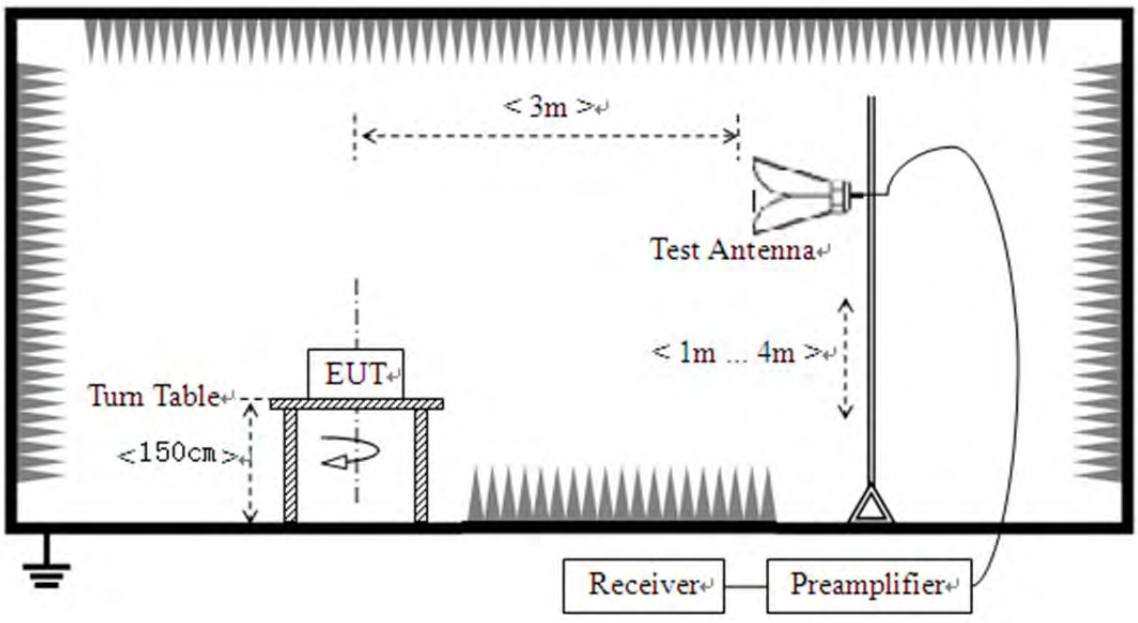
2.8. Restricted Frequency Bands

2.8.1. Requirement

According to FCC section 15.407(b)(7), in any 100kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, 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).

2.8.2. Test Description

Test Setup



The Module is located in a 3m Semi-Anechoic Chamber; the antenna factors, cable loss and so on of the site as factors are calculated to correct the reading.
KDB 789033 Section H) 3)5)6(d)) was used in order to prove compliance
For the Test Antenna:
Test Antenna is 3m away from the EUT. Test Antenna height is varied from 1m to 4m above the ground to determine the maximum value of the field strength.

2.8.3. Test Result

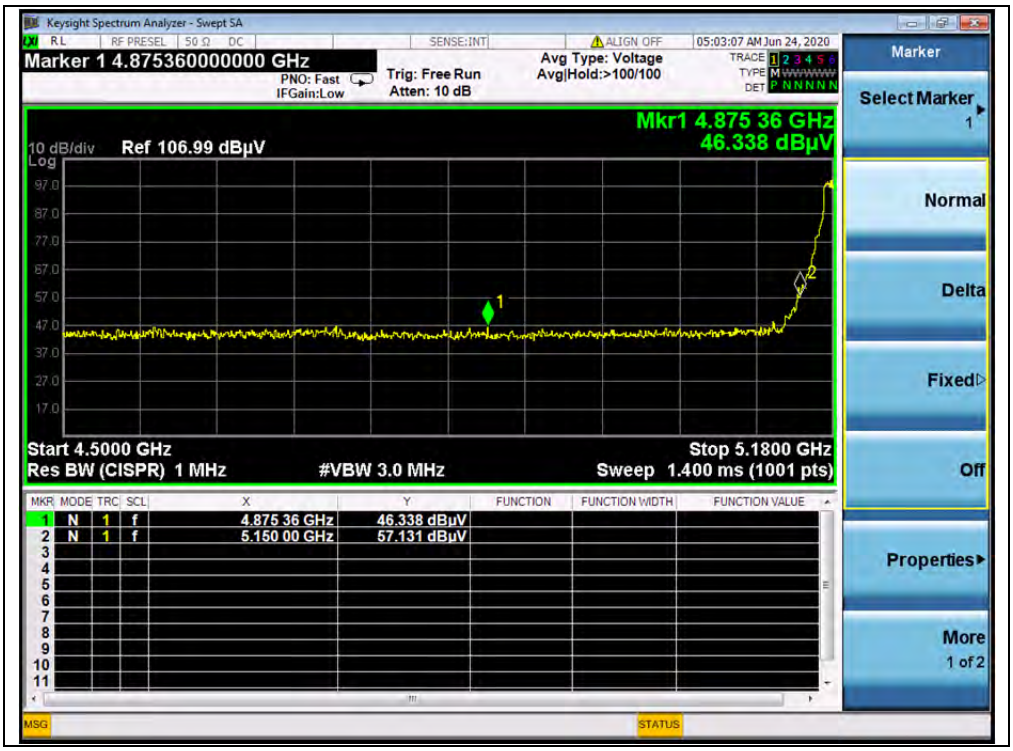
The lowest and highest channels are tested to verify Restricted Frequency Bands.
The measurement results are obtained as below:
E [dBμV/m] =U_R + A_T + A_{Factor} [dB]; A_T =$L_{Cable\ loss}$ [dB]-G_{preamp} [dB]
A_T: Total correction Factor except Antenna; U_R: Receiver Reading
G_{preamp}: Preamplifier Gain; A_{Factor}: Antenna Factor at 3m
Note: Restricted Frequency Bands were performed when antenna was at vertical and horizontal polarity, and only the worse test condition (vertical) was recorded in this test report.

802.11a Test mode

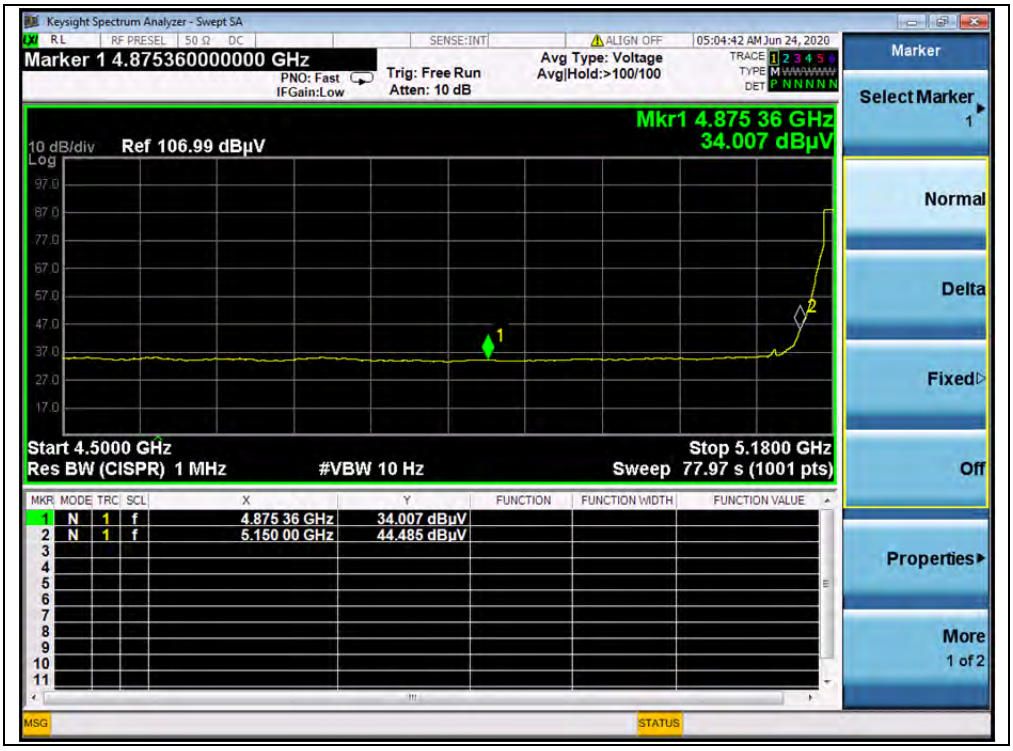
A. Test Verdict:

Channel	Frequency (MHz)	Detector	Receiver Reading U_R (dBuV)	A_T (dB)	A_{Factor} (dB@3m)	Max. Emission E (dBμV/m)	Limit (dBμV/m)	Verdict
		PK/ AV						
36	4875.36	PK	46.34	-26.92	32.2	51.62	74	PASS
36	5150.00	PK	57.13	-26.92	32.2	62.41	74	PASS
36	4875.36	AV	34.01	-26.92	32.2	39.29	54	PASS
36	5150.00	AV	44.49	-26.92	32.2	49.77	54	PASS
48	5350.00	PK	42.17	-26.92	32.2	47.45	74	PASS
48	5375.08	PK	42.91	-26.92	32.2	48.19	74	PASS
48	5350.00	AV	33.39	-26.92	32.2	38.67	54	PASS
48	5377.94	AV	33.03	-26.92	32.2	38.31	54	PASS
149	5696.01	PK	45.35	-26.23	32.2	51.32	102.28	PASS
149	5700.00	PK	45.49	-26.23	32.2	51.46	105.23	PASS
149	5723.00	PK	59.50	-26.23	32.2	65.47	117.67	PASS
149	5725.00	PK	64.98	-26.23	32.2	70.95	122.23	PASS
165	5850.00	PK	52.99	-26.23	32.2	58.96	122.23	PASS
165	5855.00	PK	48.93	-26.23	32.2	54.9	110.83	PASS
165	5880.00	PK	42.64	-26.23	32.2	48.61	101.53	PASS
165	5925.00	PK	43.26	-26.23	32.2	49.23	68.23	PASS

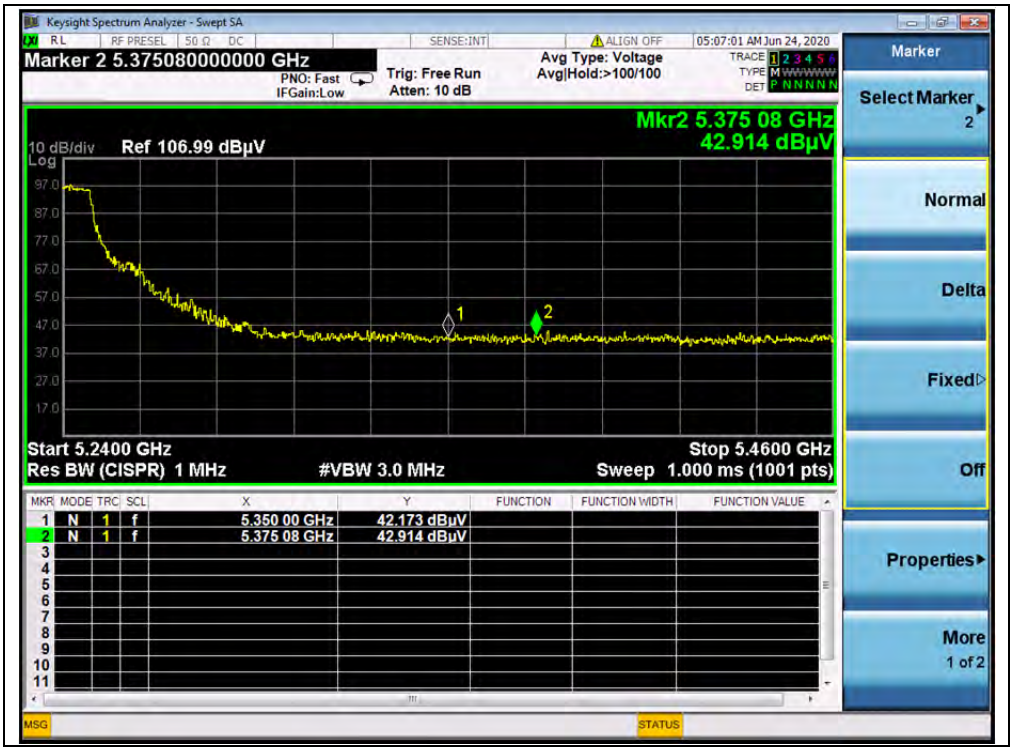
B. Test Plots:



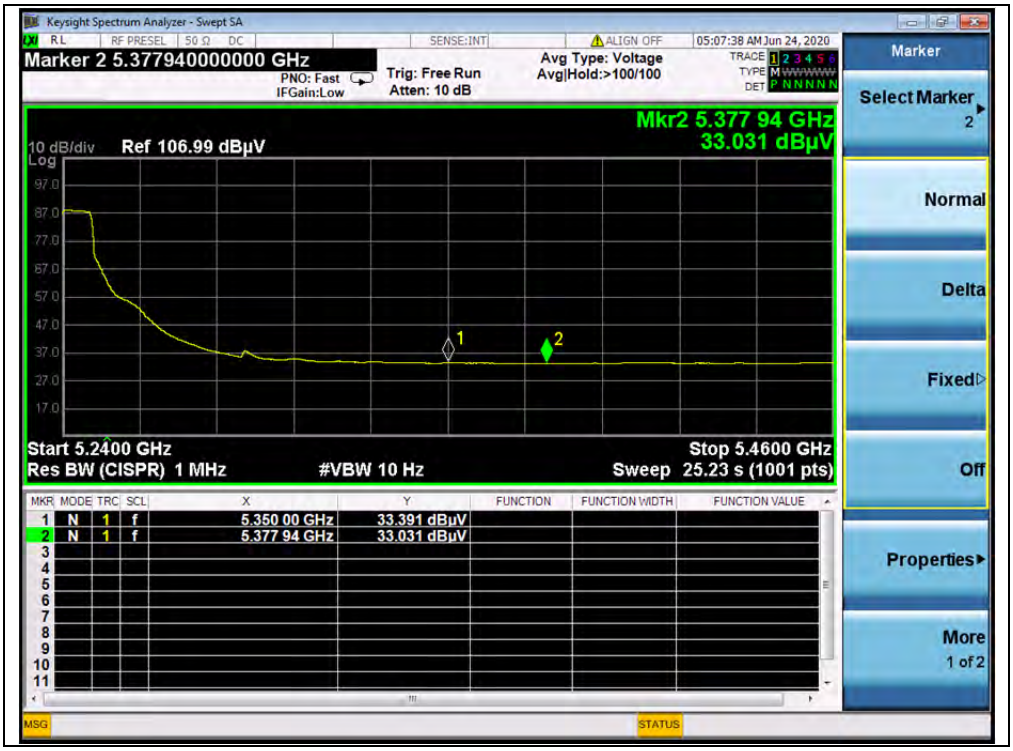
(Channel 36, PEAK, 802.11a)



(Channel 36, AVG, 802.11a)



(Channel 48, PEAK, 802.11a)



(Channel 48, AVG, 802.11a)

(Channel 149, PEAK, 802.11a)

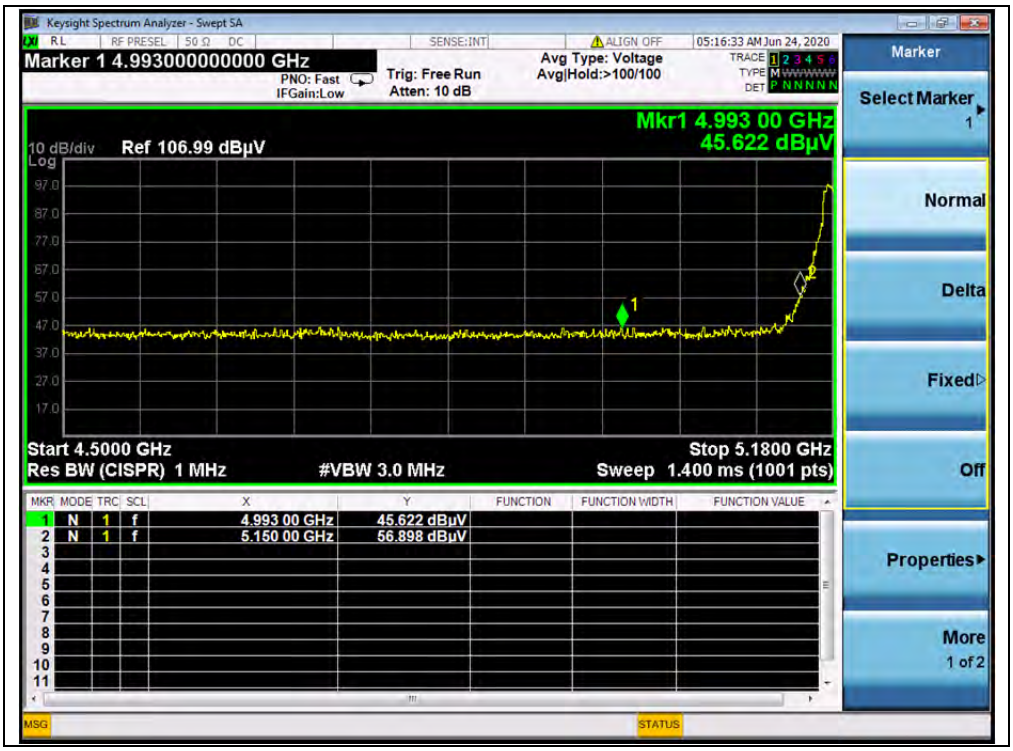
(Channel 165, PEAK, 802.11a)

802.11n (HT20) Test mode

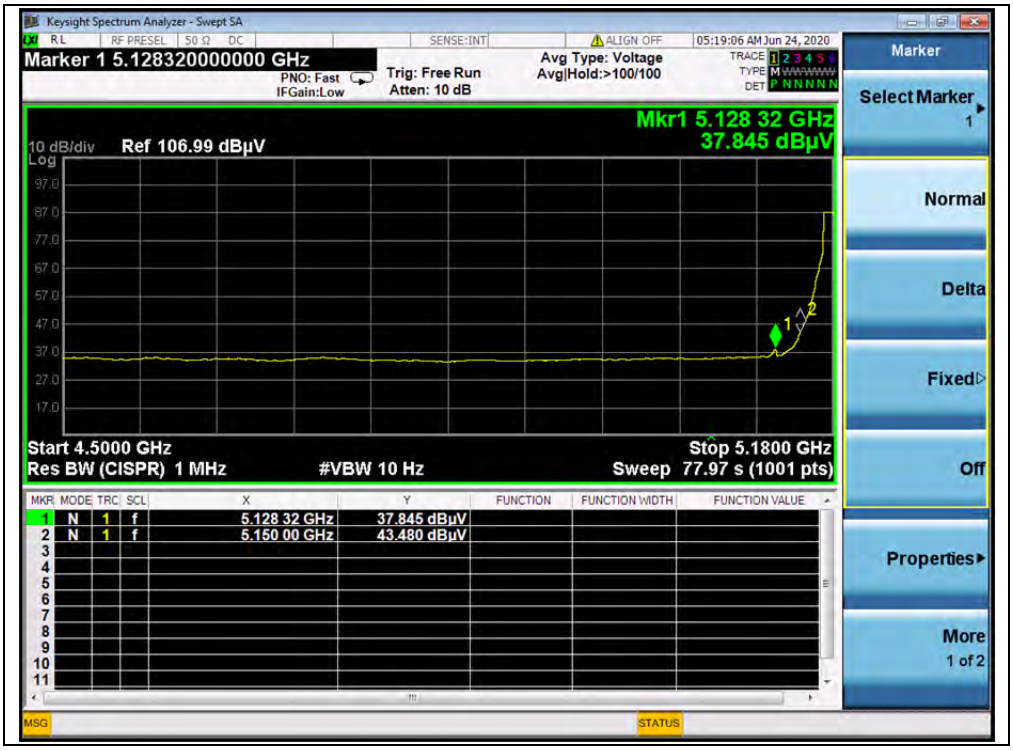
A. Test Verdict:

Channel	Frequency (MHz)	Detector	Receiver Reading U_R (dBuV)	A_T (dB)	A_{Factor} (dB@3m)	Max. Emission E (dBμV/m)	Limit (dBμV/m)	Verdict
		PK/ AV						
36	4993.00	PK	45.62	-26.92	32.2	50.9	74	PASS
36	5150.00	PK	56.90	-26.92	32.2	62.18	74	PASS
36	5128.32	AV	37.85	-26.92	32.2	43.13	54	PASS
36	5150.00	AV	43.48	-26.92	32.2	48.76	54	PASS
48	5350.00	PK	41.76	-26.92	32.2	47.04	74	PASS
48	5364.52	PK	45.25	-26.92	32.2	50.53	74	PASS
48	5350.00	AV	33.32	-26.92	32.2	38.6	54	PASS
48	5362.54	AV	33.20	-26.92	32.2	38.48	54	PASS
149	5693.44	PK	46.91	-26.23	32.2	52.88	100.37	PASS
149	5700.00	PK	44.94	-26.23	32.2	50.91	105.23	PASS
149	5723.00	PK	66.77	-26.23	32.2	72.74	117.67	PASS
149	5725.00	PK	66.01	-26.23	32.2	71.98	122.23	PASS
165	5850.00	PK	51.49	-26.23	32.2	57.46	122.23	PASS
165	5855.00	PK	50.70	-26.23	32.2	56.67	110.83	PASS
165	5880.00	PK	42.92	-26.23	32.2	48.89	101.53	PASS
165	5925.00	PK	42.11	-26.23	32.2	48.08	68.23	PASS

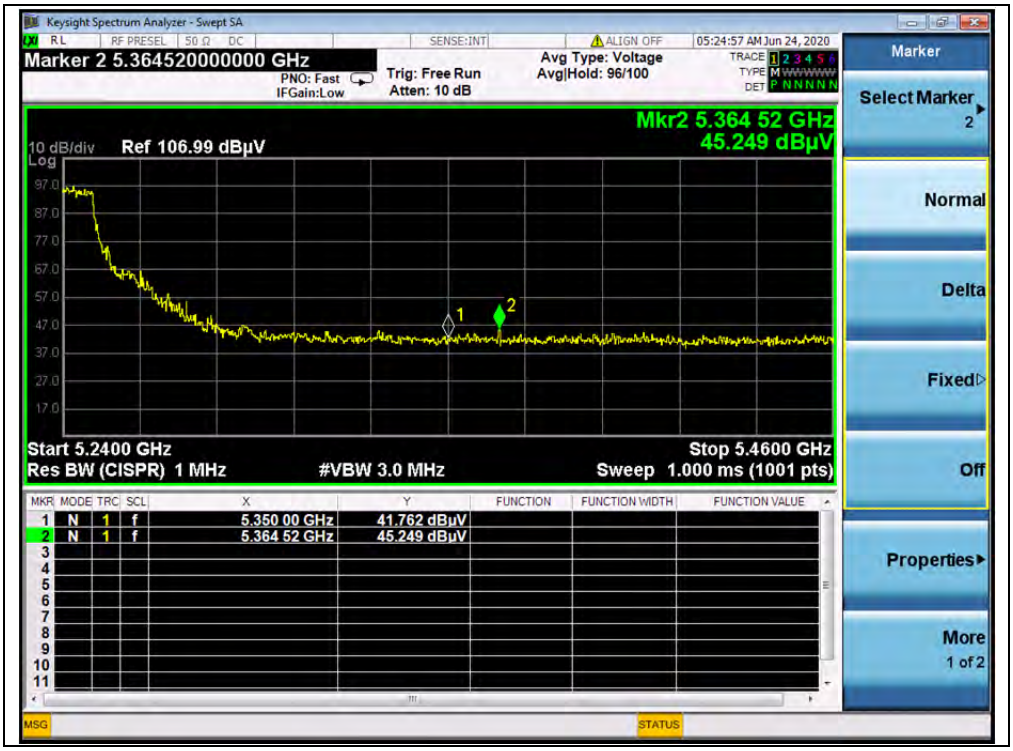
B. Test Plots:



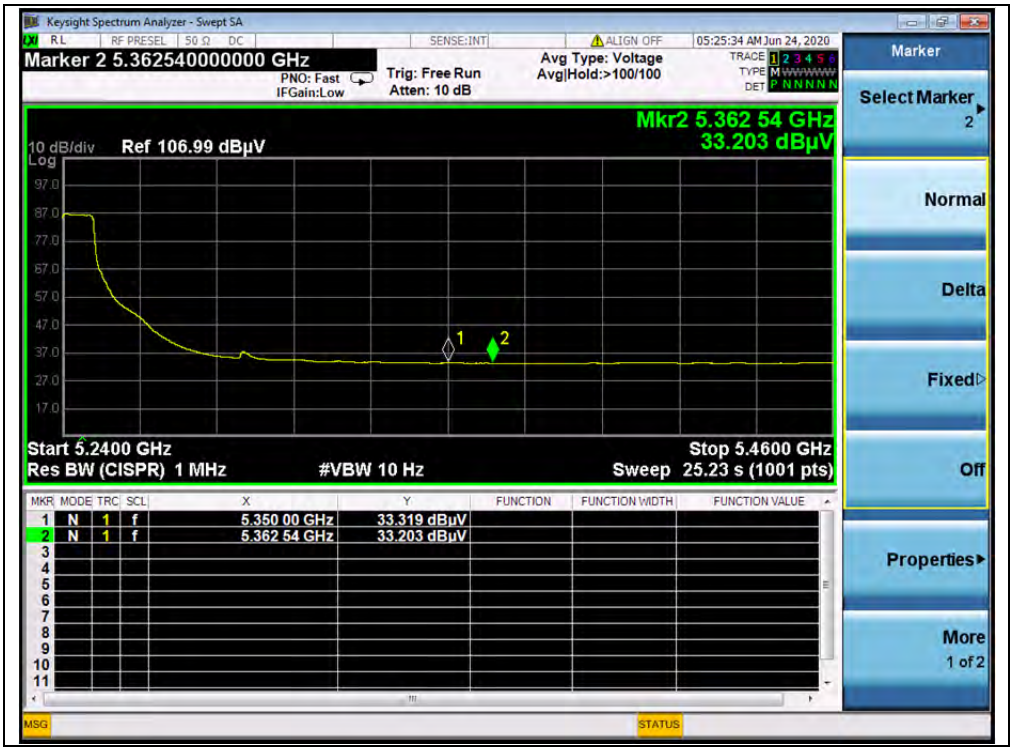
(Channel 36, PEAK, 802.11n (HT20))



(Channel 36, AVG, 802.11 n (HT20))

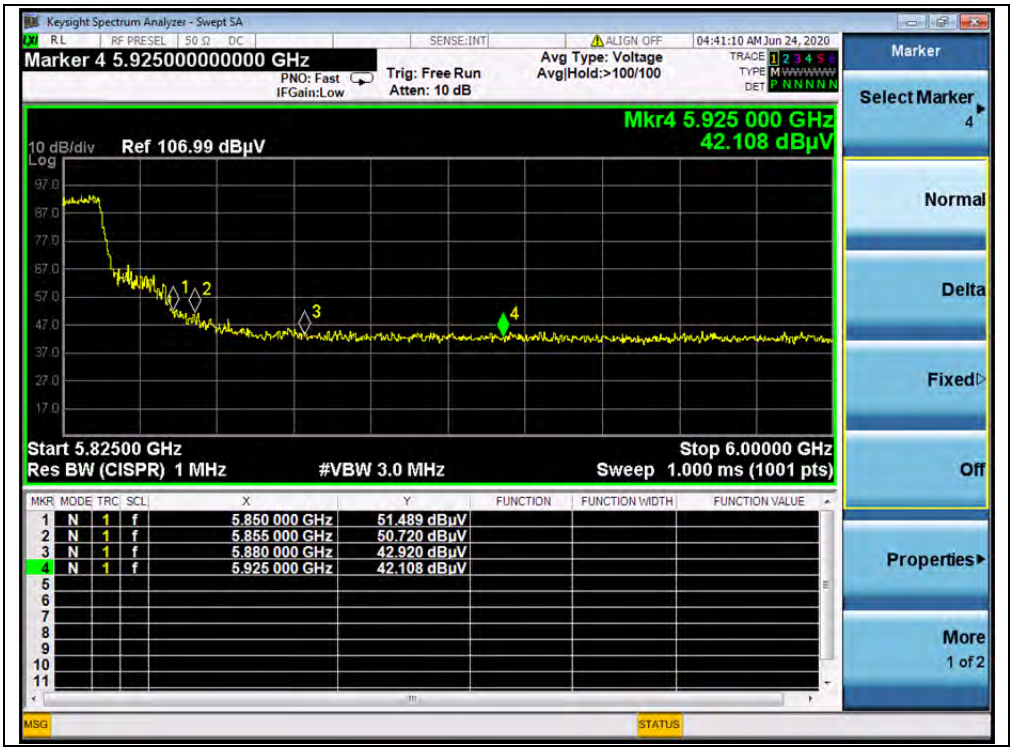


(Channel 48, PEAK, 802.11 n (HT20))



(Channel 48, AVG, 802.11n (HT20))

(Channel 149, PEAK, 802.11 n (HT20))



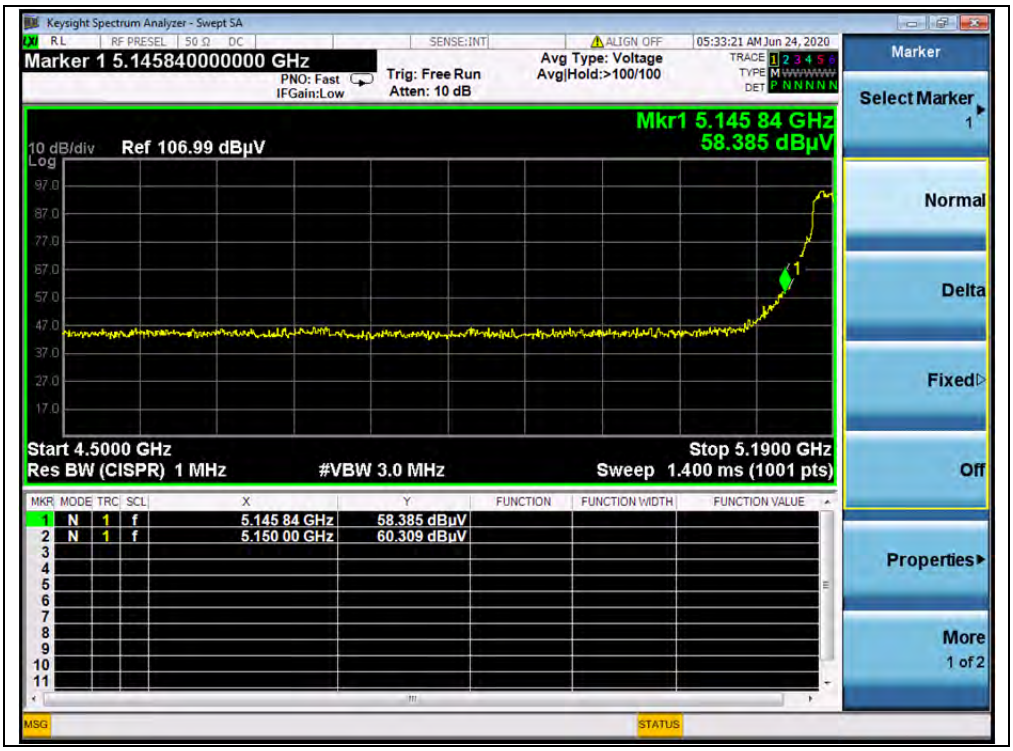
(Channel 165, PEAK, 802.11 n (HT20))

802.11n (HT40) Test mode

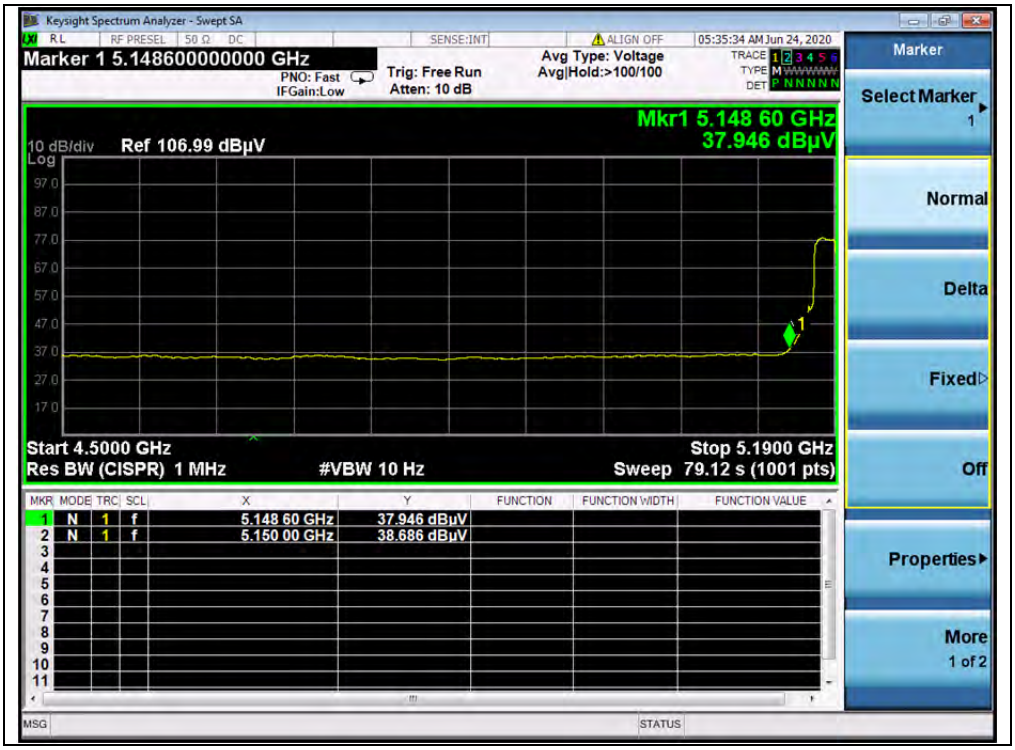
A. Test Verdict:

Channel	Frequency (MHz)	Detector	Receiver Reading U_R (dBuV)	A_T (dB)	A_{Factor} (dB@3m)	Max. Emission E (dBμV/m)	Limit (dBμV/m)	Verdict
		PK/ AV						
38	5145.84	PK	58.39	-26.92	32.2	63.67	74	PASS
38	5150.00	PK	60.31	-26.92	32.2	65.59	74	PASS
38	5148.60	AV	37.95	-26.92	32.2	43.23	54	PASS
38	5150.00	AV	38.69	-26.92	32.2	43.97	54	PASS
46	5350.00	PK	42.81	-26.92	32.2	48.09	74	PASS
46	5364.61	PK	43.26	-26.92	32.2	48.54	74	PASS
46	5350.00	AV	33.39	-26.92	32.2	38.67	54	PASS
46	5362.08	AV	33.32	-26.92	32.2	38.6	54	PASS
151	5698.00	PK	48.51	-26.23	32.2	54.48	103.75	PASS
151	5700.00	PK	47.84	-26.23	32.2	53.81	105.23	PASS
151	5725.32	PK	60.99	-26.23	32.2	66.96	122.23	PASS
151	5725.00	PK	62.40	-26.23	32.2	68.37	122.23	PASS
159	5850.00	PK	51.16	-26.23	32.2	57.13	122.23	PASS
159	5855.00	PK	48.63	-26.23	32.2	54.6	110.83	PASS
159	5880.00	PK	44.68	-26.23	32.2	50.65	101.53	PASS
159	5925.00	PK	42.03	-26.23	32.2	48	68.23	PASS

B. Test Plots:

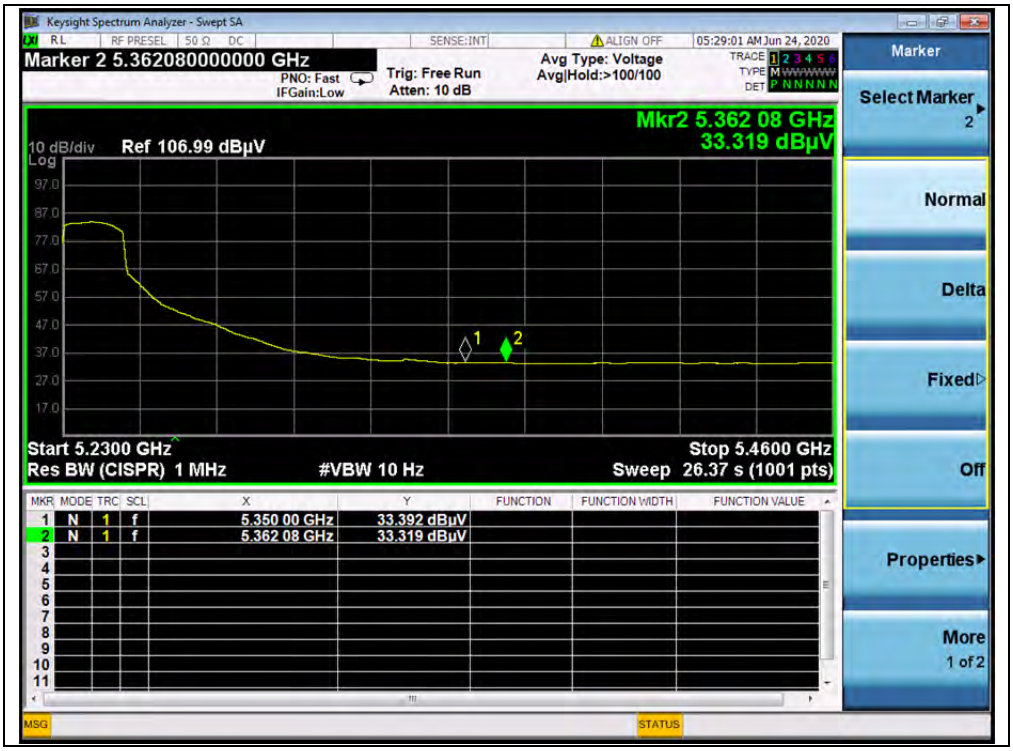


(Channel 38, PEAK, 802.11n (HT40))

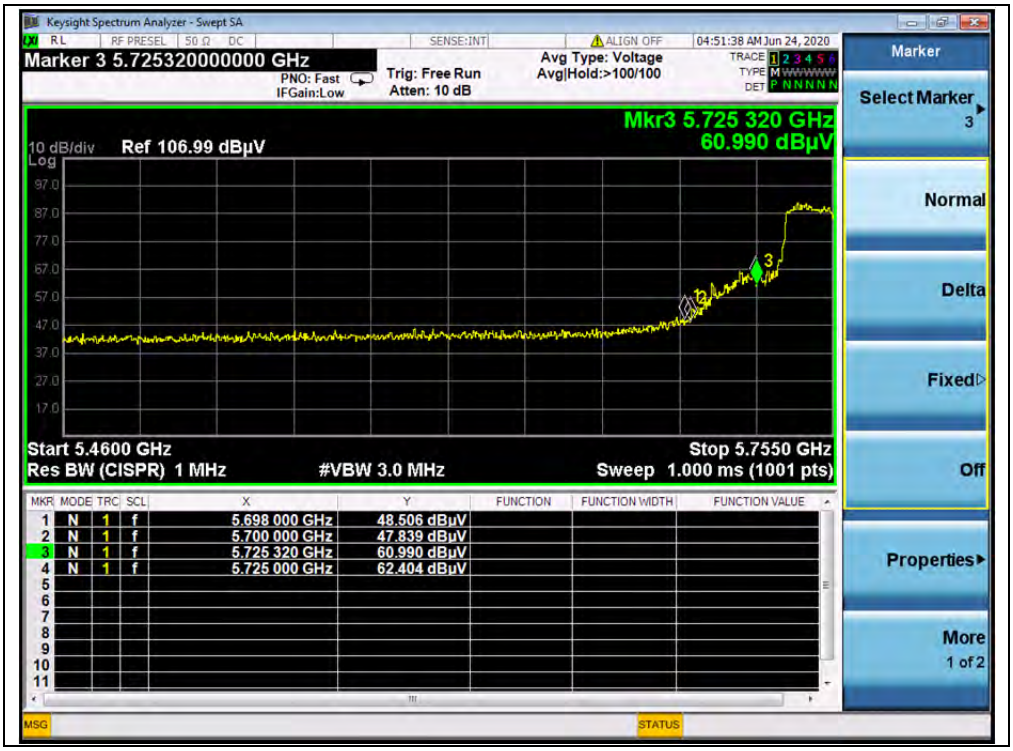


(Channel 38, AVG, 802.11n (HT40))

(Channel 46, PEAK, 802.11n (HT40))



(Channel 46, AVG, 802.11n (HT40))



(Channel 151, PEAK, 802.11n (HT40))

(Channel 159, PEAK, 802.11n (HT40))

2.9. Radiated Emission

2.9.1. Requirement

The peak emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:
(1) For transmitters operating in the 5.15–5.25 GHz band: all emissions outside of the 5.15–5.35 GHz band shall not exceed an EIRP of -27dBm/MHz.
(2) For transmitters operating in the 5.25–5.35 GHz band: all emissions outside of the 5.15–5.35 GHz band shall not exceed an EIRP of -27dBm/MHz.
(3) For transmitters operating in the 5.47–5.725 GHz band: all emissions outside of the 5.47–5.725 GHz band shall not exceed an EIRP of -27dBm/MHz.
(4) For transmitters operating in the 5.725-5.85 GHz band: All emissions within the frequency range from the band edge to 10 MHz above or below the band edge shall not exceed an e.i.r.p. of −17 dBm/MHz; for frequencies 10 MHz or greater above or below the band edge, emissions shall not exceed an e.i.r.p. of −27 dBm/MHz.
The following formula is used to convert the equipment isotropic radiated power(eirp) to field strength (dBμV/m);

$$E = 1000000 \times \sqrt{30P} / 3 \ \mu V/m$$

where P is the EIRP in Watts

Therefore: -27 dBm/MHz = 68.23 dBuV/m

Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in § 15.209. According to FCC section 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 (μV/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

Note:

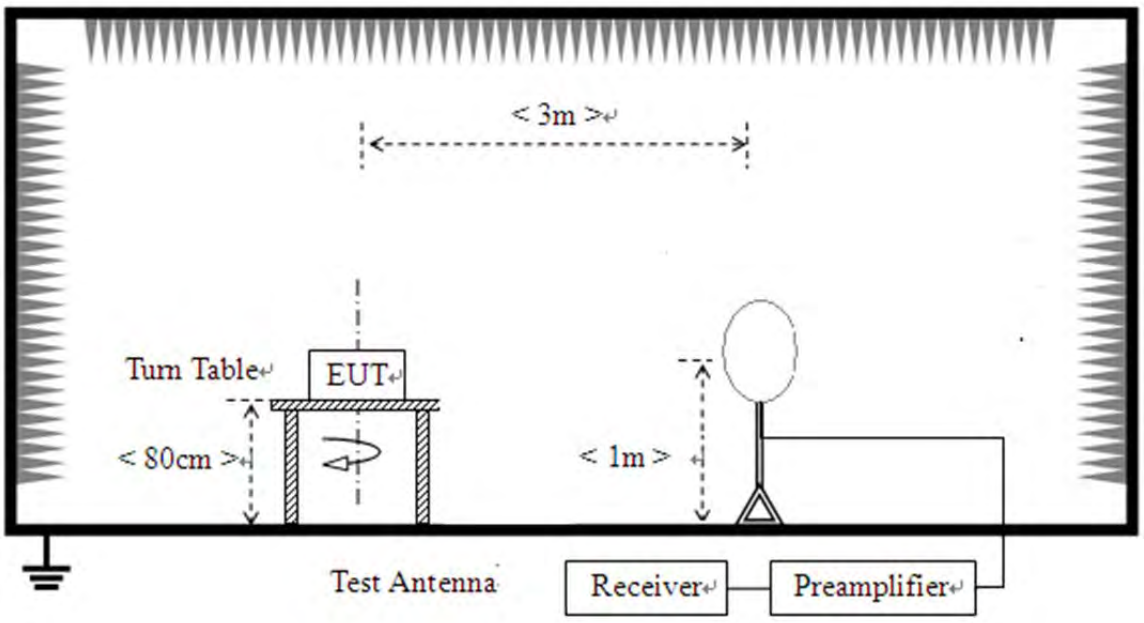
For Above 1000MHz, the emission limit in this paragraph is based on measurement instrumentation employing an average detector, measurement using instrumentation with a peak detector function, corresponding to 20dB above the maximum permitted average limit.

In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), also should comply with the radiated emission limits specified in Section 15.209(a)(above table)

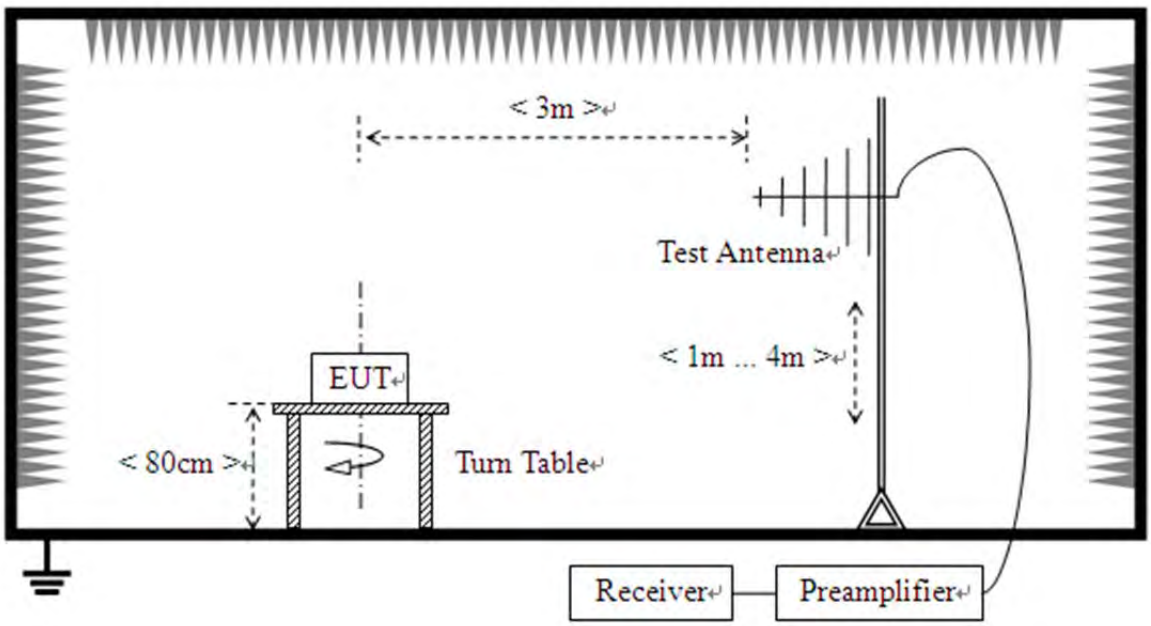
2.9.2. Test Description

Test Setup:

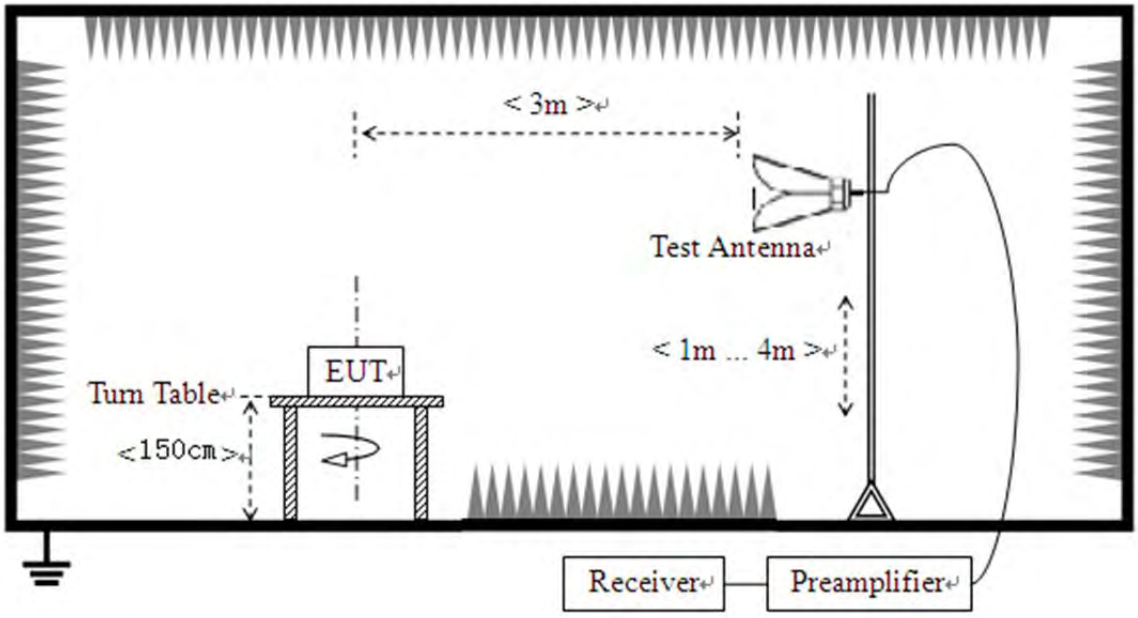
1) For radiated emissions from 9kHz to 30MHz



2) For radiated emissions from 30MHz to1GHz



3) For radiated emissions above 1GHz



The RF absorbing material used on the reference ground plane and on the turntable have a maximum height (thickness) of 30 cm (12 in) and have a minimum-rated attenuation of 20 dB at all frequencies from 1 GHz to 18 GHz.

The test site semi-anechoic chamber has met the requirement of NSA tolerance 4dB according to the standards: ANSI C63.10 (2013). For radiated emissions below or equal to 1GHz, The EUT was set-up on insulator 80cm above the Ground Plane, For radiated emissions above 1GHz, The EUT

was set-up on insulator 150cm above the Ground Plane. The set-up and test methods were according to ANSI C63.10

For the radiated emission test above 1GHz:

Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. The measurement antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal. The final measurement antenna elevation shall be that which maximizes the emissions. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane.

The EUT is located in a 3m Semi-Anechoic Chamber; the antenna factors, cable loss and so on of the site as factors are calculated to correct the reading

For the Test Antenna:

(a) In the frequency range of 9kHz to 30MHz, magnetic field is measured with Loop Test Antenna. The Test Antenna is positioned with its plane vertical at 1m distance from the EUT. The center of the Loop Test Antenna is 1m above the ground. During the measurement the Loop Test Antenna rotates about its vertical axis for maximum response at each azimuth about the EUT.
(b) In the frequency range above 30MHz, Bi-Log Test Antenna (30MHz to 1GHz) and Horn Test Antenna (above 1GHz) are used. Place the test antenna at 3m away from area of the EUT, while keeping the test antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. The test antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal. The final test antenna elevation shall be that which maximizes the emissions. The test antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane. The emission levels at both horizontal and vertical polarizations should be tested.

2.9.3. Test Result

According to ANSI C63.4 selection 4.2.2, because of peak detection will yield amplitudes equal to or greater than amplitudes measured with the quasi-peak (or average) detector, the measurement data from a spectrum analyzer peak detector will represent the worst-case results, if the peak measured value complies with the quasi-peak limit, it is unnecessary to perform an quasi-peak measurement.

The measurement results are obtained as below:

$E\ [dB\mu V/m] = U_R + A_T + A_{Factor}\ [dB]$; $A_T = L_{Cable\ loss}\ [dB] - G_{preamp}\ [dB]$

A_T: Total correction Factor except Antenna

U_R: Receiver Reading

G_{preamp}: Preamplifier Gain

A_{Factor}: Antenna Factor at 3m

During the test, the total correction Factor A_T and A_{Factor} were built in test software.

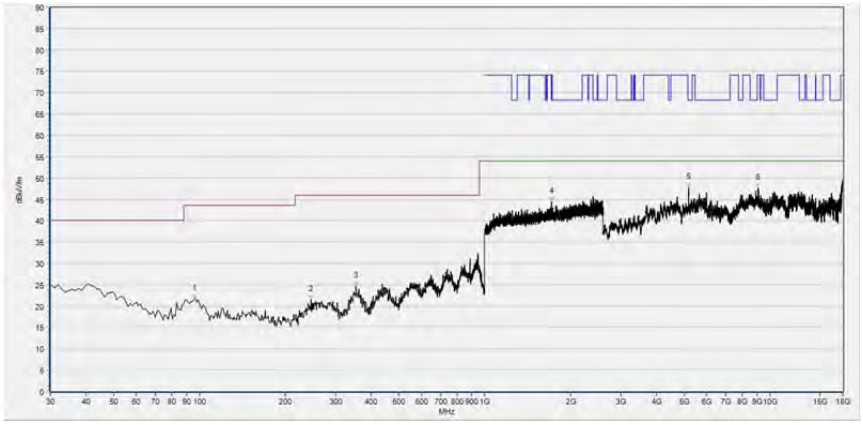
Note1: All radiated emission tests were performed in X, Y, Z axis direction. And only the worst axis test condition was recorded in this test report.

Note2: For the frequency, which started from 9kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit was not recorded.

Note3: For the frequency, which started from 18GHz to 40GHz, was pre-scanned and the result which was 20dB lower than the limit was not recorded.

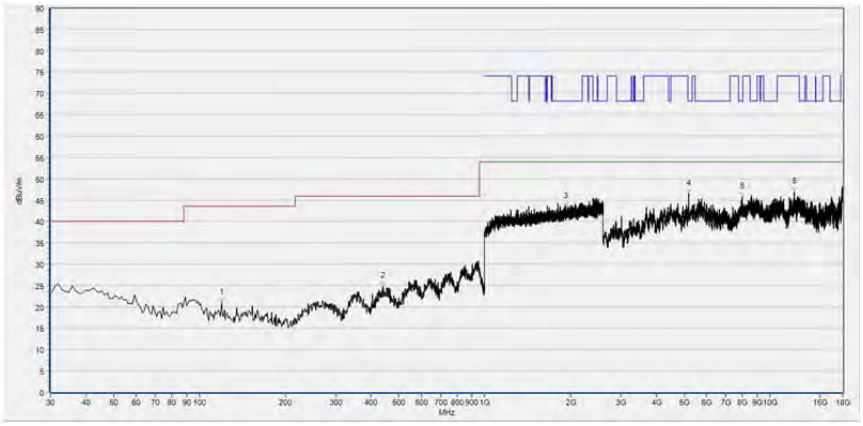
802.11a Test mode

Plots for Channel = 36



Fre. (MHz)	Pk (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
96.026	21.66	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
246.527	21.51	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
354.304	24.56	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
1713.838	44.38	N/A	N/A	68.23	N/A	N/A	Horizontal	PASS
5181.556	47.72	N/A	N/A	68.23	N/A	N/A	Horizontal	PASS
9090.858	47.62	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

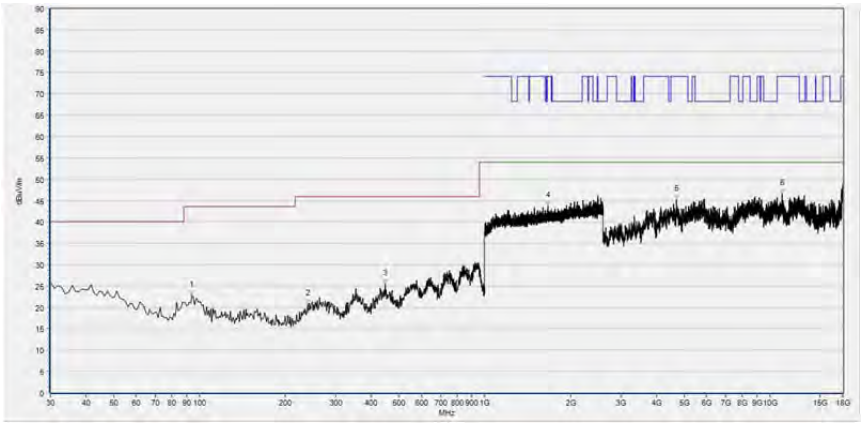
(Antenna Horizontal, 30MHz to 18GHz)



Fre. (MHz)	Pk (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
119.329	20.89	N/A	N/A	N/A	43.50	N/A	Vertical	PASS
439.750	24.82	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
1921.374	43.43	N/A	N/A	68.23	N/A	N/A	Vertical	PASS
5178.476	46.47	N/A	N/A	68.23	N/A	N/A	Vertical	PASS
7972.595	45.68	N/A	N/A	68.23	N/A	N/A	Vertical	PASS
12186.877	46.93	N/A	N/A	74.00	N/A	54.00	Vertical	PASS

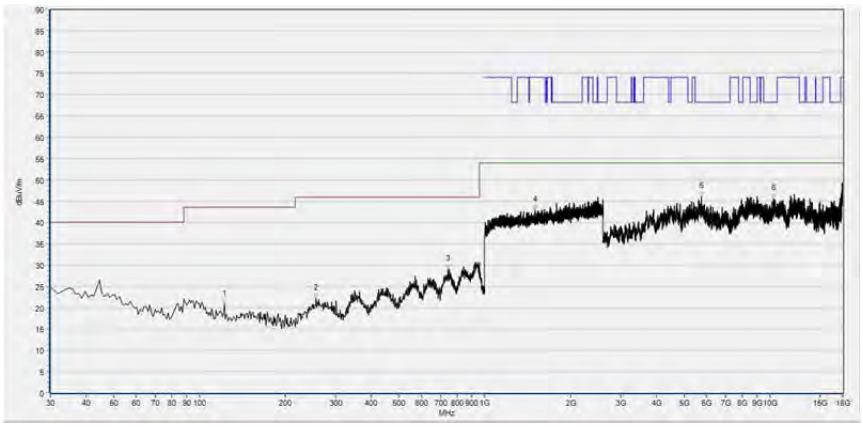
(Antenna Vertical, 30MHz to 18GHz)

Plots for Channel = 44



Fre. (MHz)	Pk (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
94.084	22.82	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
239.730	20.72	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
448.488	25.50	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
1662.621	43.68	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
4707.141	45.19	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
10997.760	46.61	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

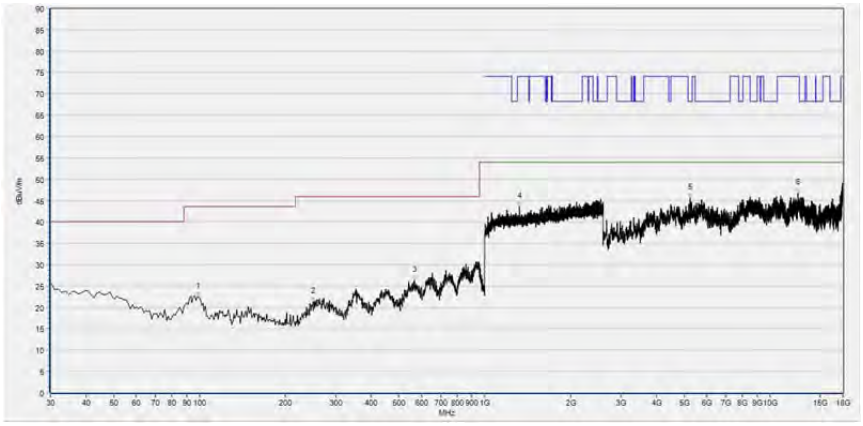
(Antenna Horizontal, 30MHz to 18GHz)



Fre. (MHz)	Pk (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
122.242	20.74	N/A	N/A	N/A	43.50	N/A	Vertical	PASS
256.236	22.20	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
742.693	29.00	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
1500.433	42.82	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
5736.067	46.01	N/A	N/A	68.23	N/A	N/A	Vertical	PASS
10276.895	45.59	N/A	N/A	68.23	N/A	N/A	Vertical	PASS

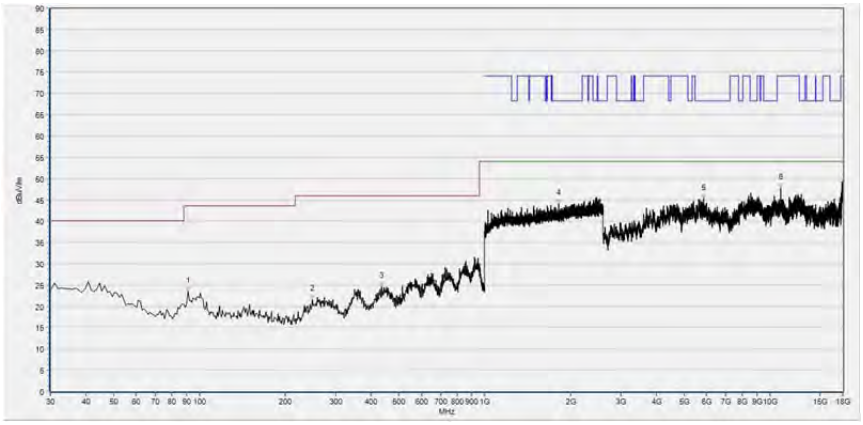
(Antenna Vertical, 30MHz to 18GHz)

Plot for Channel = 48



Fre. (MHz)	Pk (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
98.939	22.40	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
249.439	21.33	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
565.976	26.30	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
1325.975	43.55	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
5233.927	45.58	N/A	N/A	68.23	N/A	N/A	Horizontal	PASS
12519.584	46.84	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

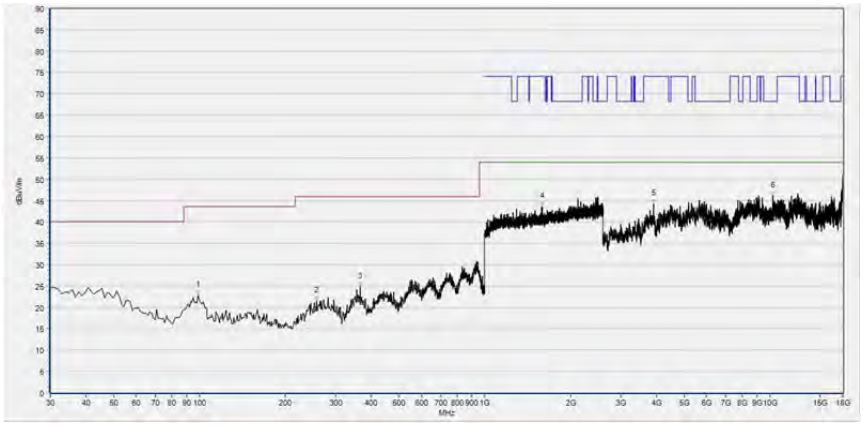
(Antenna Horizontal, 30MHz to 18GHz)



Fre. (MHz)	Pk (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
91.171	23.44	N/A	N/A	N/A	43.50	N/A	Vertical	PASS
248.468	21.65	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
433.924	24.67	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
1818.940	44.01	N/A	N/A	68.23	N/A	N/A	Vertical	PASS
5856.211	45.19	N/A	N/A	68.23	N/A	N/A	Vertical	PASS
10926.905	47.69	N/A	N/A	74.00	N/A	54.00	Vertical	PASS

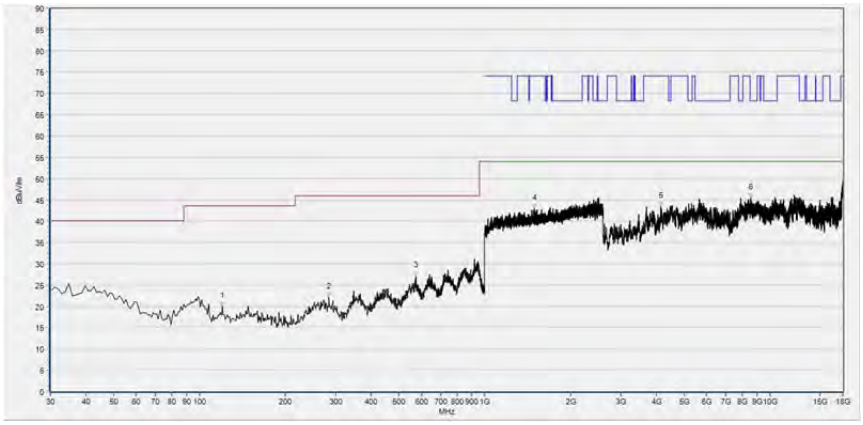
(Antenna Vertical, 30MHz to 18GHz)

Plots for Channel = 149



Fre. (MHz)	Pk (dBµV/m)	QP (dBµV/m)	AV (dBµV/m)	Limit-PK (dBµV/m)	Limit-QP (dBµV/m)	Limit-AV (dBµV/m)	Antenna	Verdict
98.939	22.76	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
258.178	21.43	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
365.956	24.75	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
1587.929	43.62	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
3900.020	44.20	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
10230.686	46.04	N/A	N/A	68.23	N/A	N/A	Horizontal	PASS

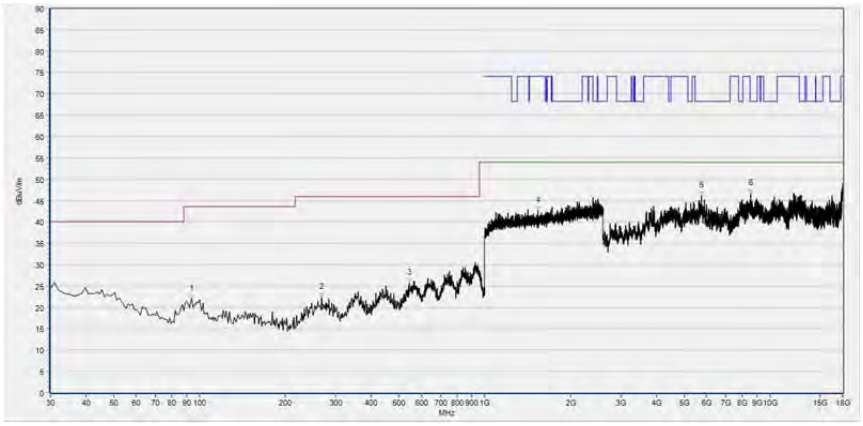
(Antenna Horizontal, 30MHz to 18GHz)



Fre. (MHz)	Pk (dBµV/m)	QP (dBµV/m)	AV (dBµV/m)	Limit-PK (dBµV/m)	Limit-QP (dBµV/m)	Limit-AV (dBµV/m)	Antenna	Verdict
120.300	19.91	N/A	N/A	N/A	43.50	N/A	Vertical	PASS
284.394	22.18	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
574.715	27.13	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
1495.098	42.92	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
4143.389	43.47	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
8557.912	45.48	N/A	N/A	68.23	N/A	N/A	Vertical	PASS

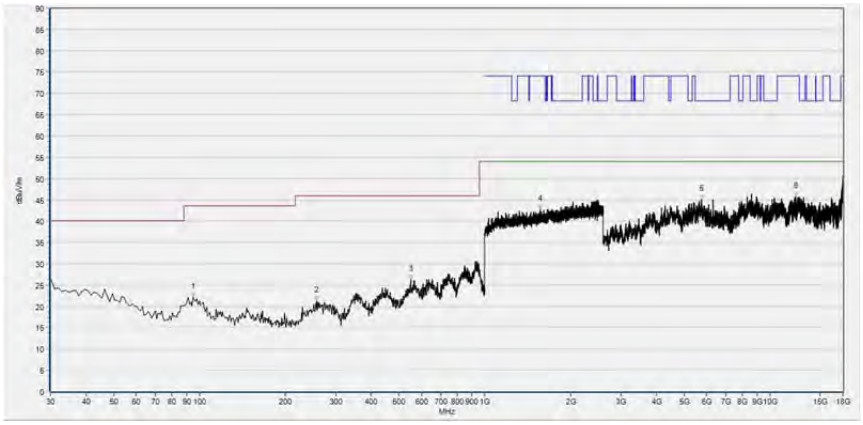
(Antenna Vertical, 30MHz to 18GHz)

Plot for Channel = 157



Fre. (MHz)	Pk (dBμV/m)	QP (dBμV/m	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
94.084	21.93	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
267.888	22.26	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
543.644	25.66	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
1532.444	42.56	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
5748.390	46.02	N/A	N/A	68.23	N/A	N/A	Horizontal	PASS
8570.234	46.67	N/A	N/A	68.23	N/A	N/A	Horizontal	PASS

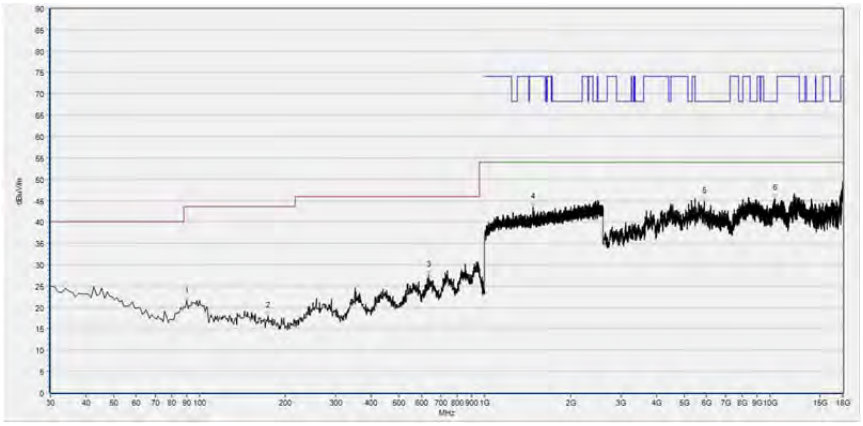
(Antenna Horizontal, 30MHz to 18GHz)



Fre. (MHz)	Pk (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
95.055	22.10	N/A	N/A	N/A	43.50	N/A	Vertical	PASS
258.178	21.23	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
550.440	26.28	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
1563.388	42.71	N/A	N/A	68.23	N/A	N/A	Vertical	PASS
5760.712	45.06	N/A	N/A	68.23	N/A	N/A	Vertical	PASS
12291.618	45.74	N/A	N/A	74.00	N/A	54.00	Vertical	PASS

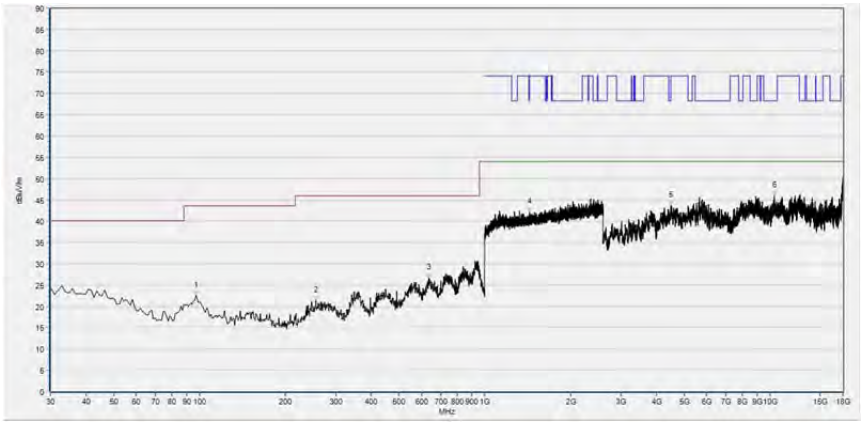
(Antenna Vertical, 30MHz to 18GHz)

Plot for Channel = 165



Fre. (MHz)	Pk (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
90.200	21.48	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
173.704	17.86	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
634.915	27.42	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
1475.892	43.46	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
5880.856	44.69	N/A	N/A	68.23	N/A	N/A	Horizontal	PASS
10437.087	45.38	N/A	N/A	68.23	N/A	N/A	Horizontal	PASS

(Antenna Horizontal, 30MHz to 18GHz)

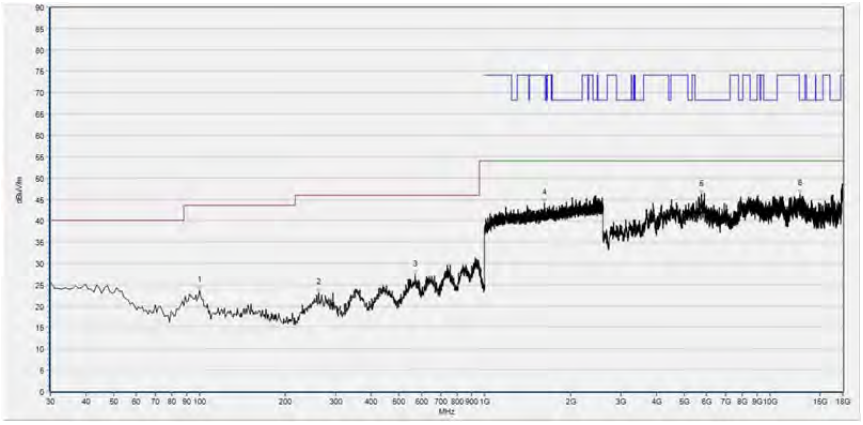


Fre. (MHz)	Pk (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
96.997	22.45	N/A	N/A	N/A	43.50	N/A	Vertical	PASS
255.265	21.27	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
634.915	26.72	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
1435.345	42.11	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
4497.660	43.54	N/A	N/A	68.23	N/A	N/A	Vertical	PASS
10350.830	45.84	N/A	N/A	68.23	N/A	N/A	Vertical	PASS

(Antenna Vertical, 30MHz to 18GHz)

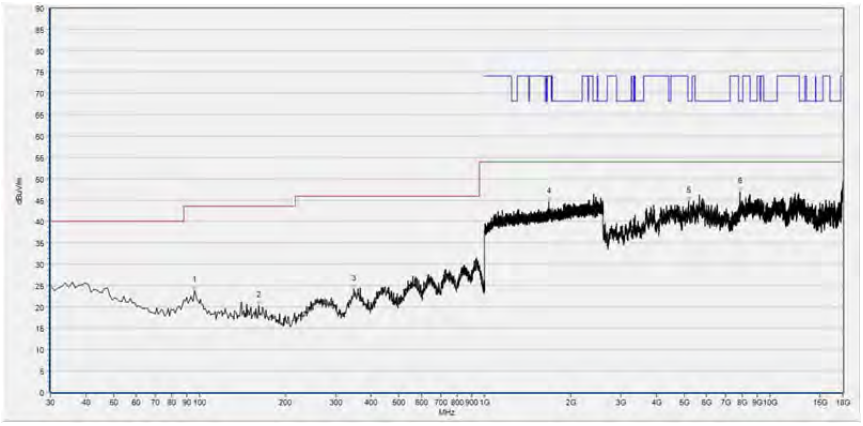
802.11n (HT20) Test mode

Plots for Channel = 36



Fre. (MHz)	Pk (dBµV/m)	QP (dBµV/m)	AV (dBµV/m)	Limit-PK (dBµV/m)	Limit-QP (dBµV/m)	Limit-AV (dBµV/m)	Antenna	Verdict
99.910	23.70	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
262.062	23.05	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
569.860	27.34	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
1615.138	44.02	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
5754.551	46.08	N/A	N/A	68.23	N/A	N/A	Horizontal	PASS
12747.550	46.33	N/A	N/A	68.23	N/A	N/A	Horizontal	PASS

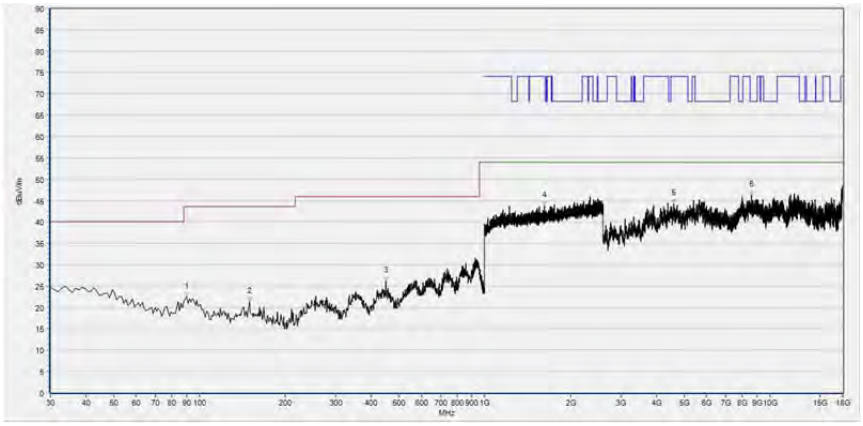
(Antenna Horizontal, 30MHz to 18GHz)



Fre. (MHz)	Pk (dBµV/m)	QP (dBµV/m)	AV (dBµV/m)	Limit-PK (dBµV/m)	Limit-QP (dBµV/m)	Limit-AV (dBµV/m)	Antenna	Verdict
96.026	23.77	N/A	N/A	N/A	43.50	N/A	Vertical	PASS
161.081	20.21	N/A	N/A	N/A	43.50	N/A	Vertical	PASS
347.508	24.15	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
1677.559	44.65	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
5178.476	44.75	N/A	N/A	68.23	N/A	N/A	Vertical	PASS
7846.289	47.01	N/A	N/A	68.23	N/A	N/A	Vertical	PASS

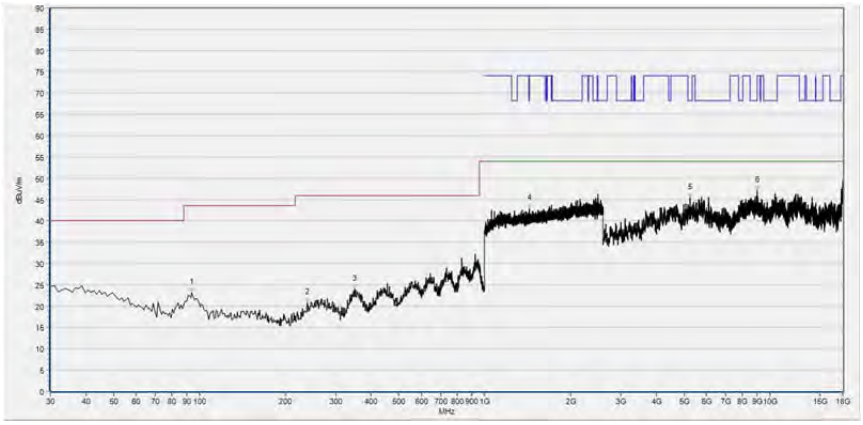
(Antenna Vertical, 30MHz to 18GHz)

Plots for Channel = 44



Fre. (MHz)	Pk (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
90.200	22.48	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
149.429	21.33	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
450.430	26.14	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
1622.074	43.81	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
4602.400	44.19	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
8616.443	46.26	N/A	N/A	68.23	N/A	N/A	Horizontal	PASS

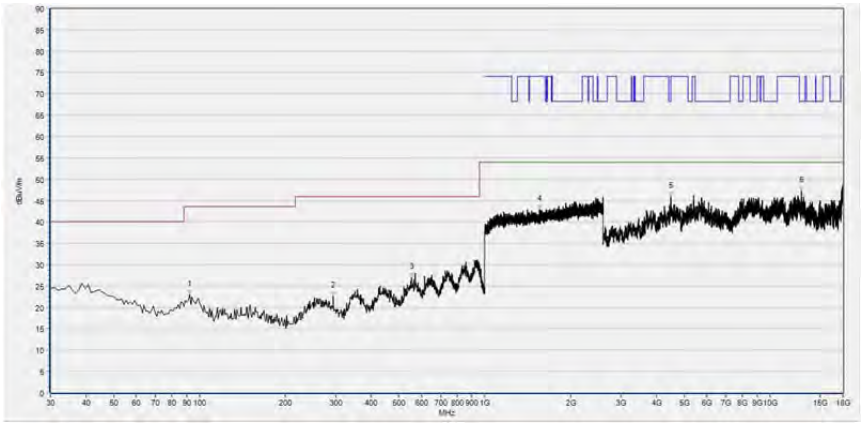
(Antenna Horizontal, 30MHz to 18GHz)



Fre. (MHz)	Pk (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
94.084	23.16	N/A	N/A	N/A	43.50	N/A	Vertical	PASS
238.759	20.81	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
348.478	23.91	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
1435.879	42.87	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
5237.007	45.46	N/A	N/A	68.23	N/A	N/A	Vertical	PASS
8992.278	47.04	N/A	N/A	68.23	N/A	N/A	Vertical	PASS

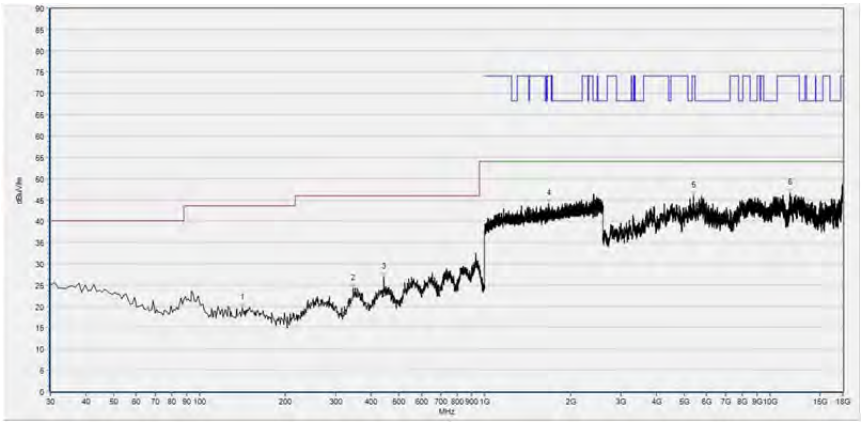
(Antenna Vertical, 30MHz to 18GHz)

Plot for Channel = 48



Fre. (MHz)	Pk (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
92.142	22.88	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
294.104	22.70	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
553.353	26.91	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
1555.385	42.98	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
4488.418	45.88	N/A	N/A	68.23	N/A	N/A	Horizontal	PASS
12892.338	47.32	N/A	N/A	68.23	N/A	N/A	Horizontal	PASS

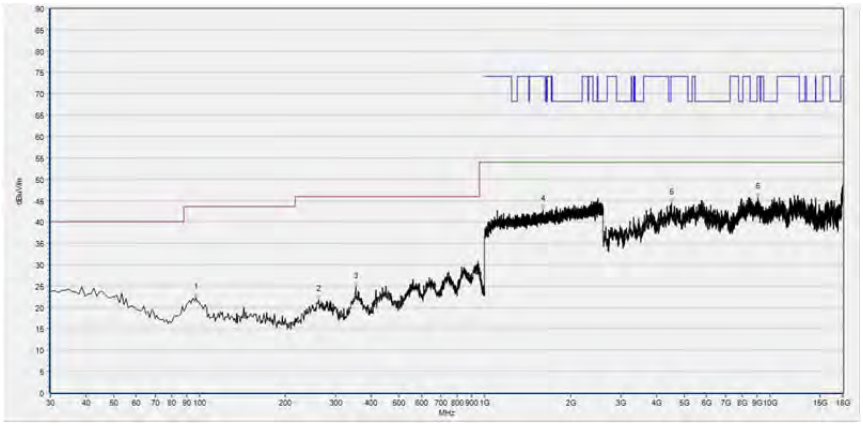
(Antenna Horizontal, 30MHz to 18GHz)



Fre. (MHz)	Pk (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
141.662	19.59	N/A	N/A	N/A	43.50	N/A	Vertical	PASS
345.566	24.11	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
443.634	26.81	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
1673.825	44.12	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
5400.280	45.93	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
11770.994	46.52	N/A	N/A	74.00	N/A	54.00	Vertical	PASS

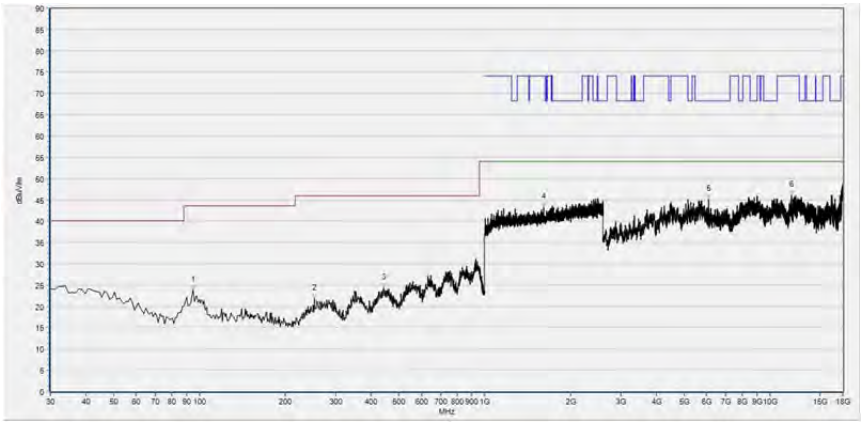
(Antenna Vertical, 30MHz to 18GHz)

Plots for Channel = 149



Fre. (MHz)	Pk (dBμV/m)	QP (dBμV/m	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
96.997	22.30	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
262.062	21.71	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
353.333	24.85	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
1601.267	42.86	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
4522.304	44.46	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
9075.455	45.68	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

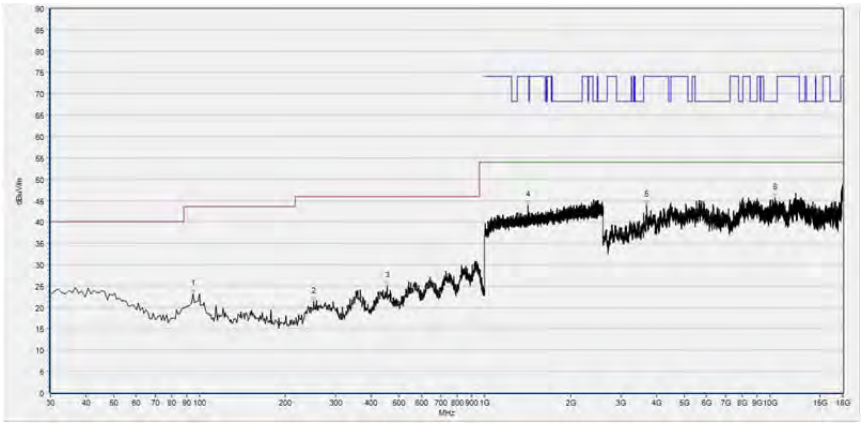
(Antenna Horizontal, 30MHz to 18GHz)



Fre. (MHz)	Pk (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
95.055	23.75	N/A	N/A	N/A	43.50	N/A	Vertical	PASS
252.352	21.83	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
442.663	24.26	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
1608.736	43.24	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
6087.257	45.12	N/A	N/A	68.23	N/A	N/A	Vertical	PASS
11866.493	46.07	N/A	N/A	74.00	N/A	54.00	Vertical	PASS

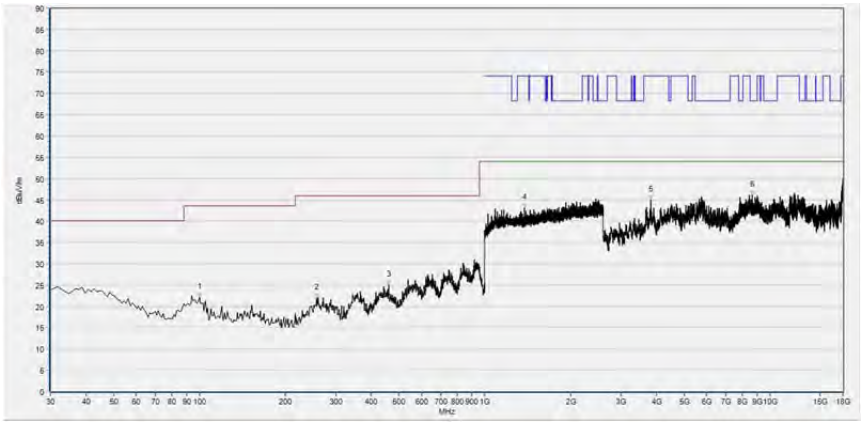
(Antenna Vertical, 30MHz to 18GHz)

Plot for Channel = 157



Fre. (MHz)	Pk (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
95.055	23.05	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
251.381	21.31	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
454.314	24.99	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
1417.206	43.88	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
3699.780	43.88	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
10437.087	45.62	N/A	N/A	68.23	N/A	N/A	Horizontal	PASS

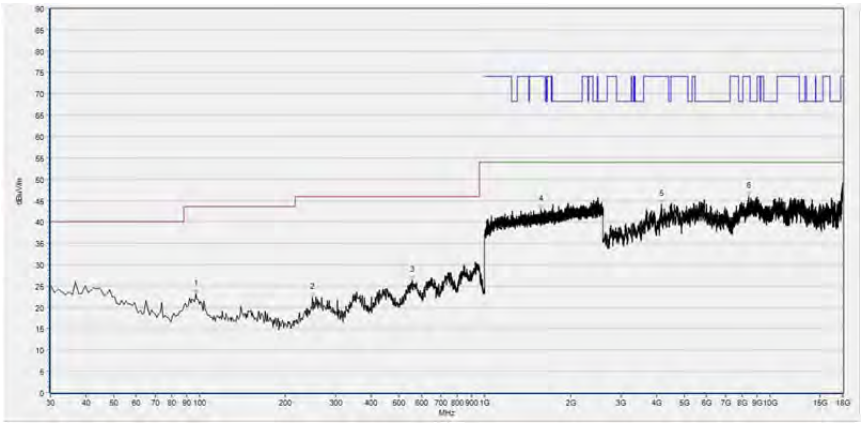
(Antenna Horizontal, 30MHz to 18GHz)



Fre. (MHz)	Pk (dBμV/m)	QP (dBμV/m)	AV (dBμV/m	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
99.910	22.06	N/A	N/A	N/A	43.50	N/A	Vertical	PASS
257.207	22.04	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
460.140	24.93	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
1377.192	43.03	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
3816.843	44.87	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
8638.008	46.11	N/A	N/A	68.23	N/A	N/A	Vertical	PASS

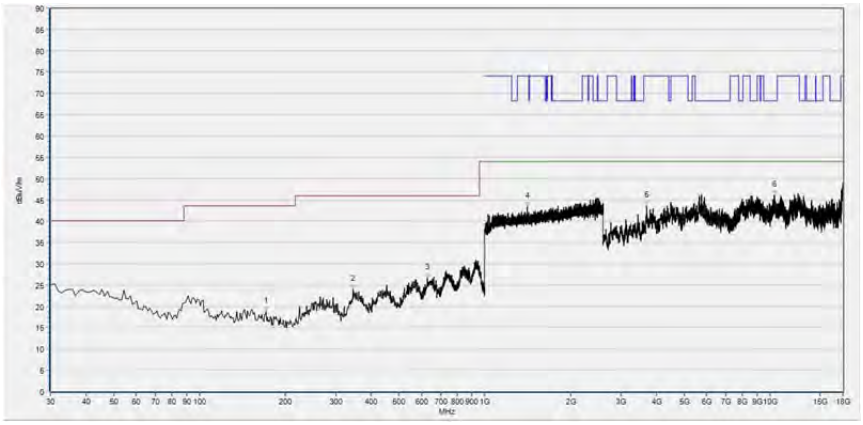
(Antenna Vertical, 30MHz to 18GHz)

Plot for Channel = 165



Fre. (MHz)	Pk (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
96.997	23.10	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
248.468	22.37	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
557.237	26.36	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
1574.592	42.93	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
4158.792	44.00	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
8400.800	45.84	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

(Antenna Horizontal, 30MHz to 18GHz)

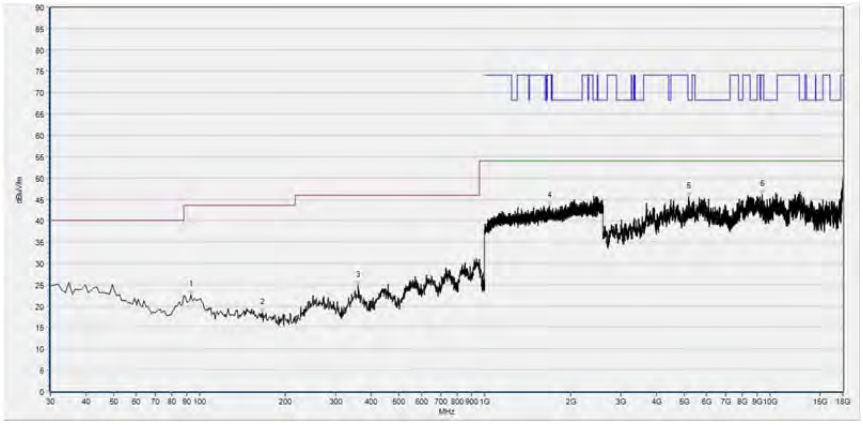


Fre. (MHz)	Pk (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
170.791	18.82	N/A	N/A	N/A	43.50	N/A	Vertical	PASS
344.595	23.91	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
629.089	26.57	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
1405.468	43.36	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
3699.780	43.55	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
10369.314	46.14	N/A	N/A	68.23	N/A	N/A	Vertical	PASS

(Antenna Vertical, 30MHz to 18GHz)

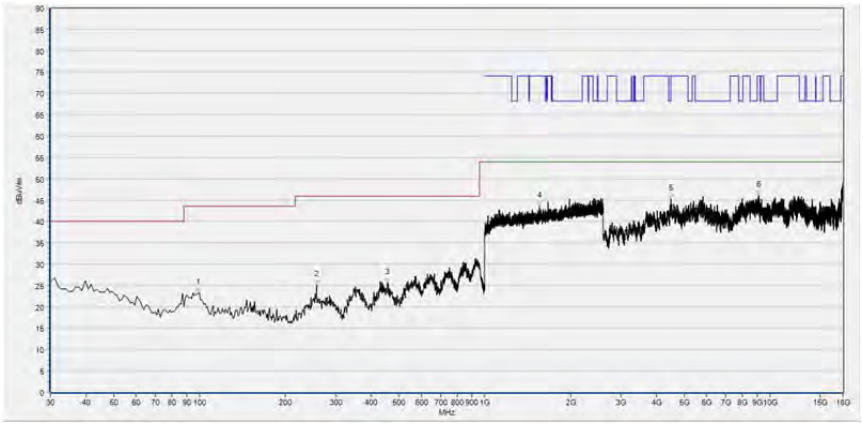
802.11n (HT40) Test mode

Plots for Channel = 38



Fre. (MHz)	Pk (dBµV/m)	QP (dBµV/m)	AV (dBµV/m)	Limit-PK (dBµV/m)	Limit-QP (dBµV/m)	Limit-AV (dBµV/m)	Antenna	Verdict
93.113	22.67	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
165.936	18.50	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
360.130	24.81	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
1687.162	43.48	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
5175.395	45.62	N/A	N/A	68.23	N/A	N/A	Horizontal	PASS
9358.872	46.03	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

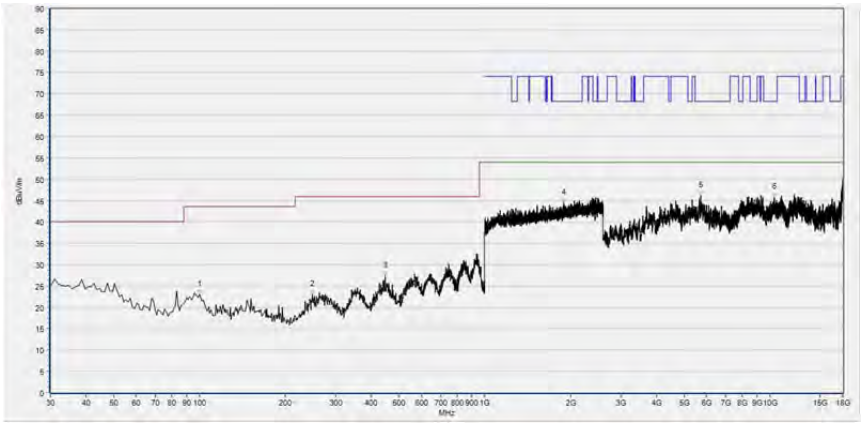
(Antenna Horizontal, 30MHz to 18GHz)



Fre. (MHz)	Pk (dBµV/m)	QP (dBµV/m)	AV (dBµV/m)	Limit-PK (dBµV/m)	Limit-QP (dBµV/m)	Limit-AV (dBµV/m)	Antenna	Verdict
98.939	23.25	N/A	N/A	N/A	43.50	N/A	Vertical	PASS
257.207	25.18	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
455.285	25.68	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
1554.852	43.65	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
4497.660	45.21	N/A	N/A	68.23	N/A	N/A	Vertical	PASS
9121.664	46.03	N/A	N/A	74.00	N/A	54.00	Vertical	PASS

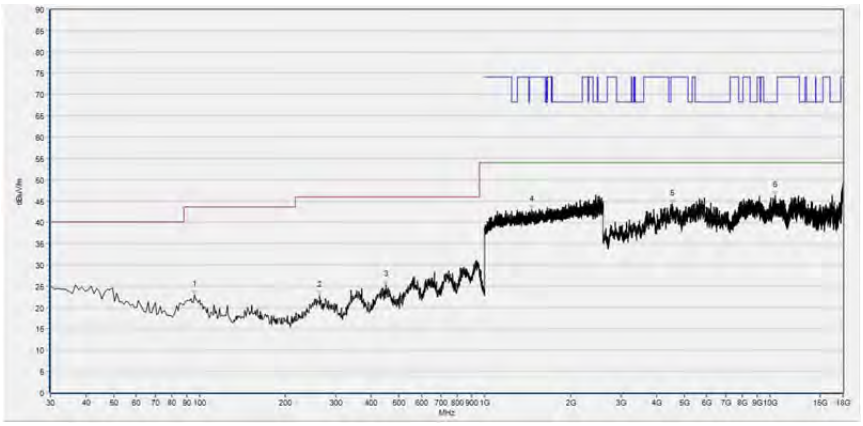
(Antenna Vertical, 30MHz to 18GHz)

Plot for Channel = 46



Fre. (MHz)	Pk (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
99.910	23.02	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
248.468	23.01	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
447.518	27.24	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
1887.229	44.49	N/A	N/A	68.23	N/A	N/A	Horizontal	PASS
5720.664	46.05	N/A	N/A	68.23	N/A	N/A	Horizontal	PASS
10326.185	45.71	N/A	N/A	68.23	N/A	N/A	Horizontal	PASS

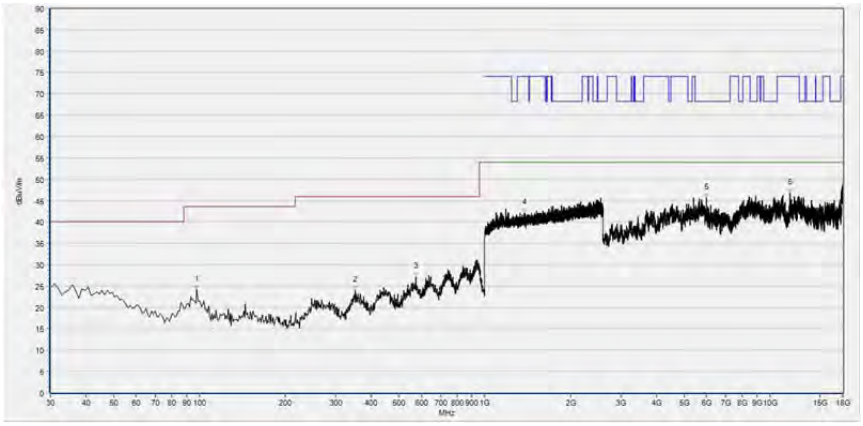
(Antenna Horizontal, 30MHz to 18GHz)



Fre. (MHz)	Pk (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
96.026	22.98	N/A	N/A	N/A	43.50	N/A	Vertical	PASS
264.004	22.71	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
449.459	25.28	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
1455.085	42.91	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
4553.111	44.24	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
10440.168	46.31	N/A	N/A	68.23	N/A	N/A	Vertical	PASS

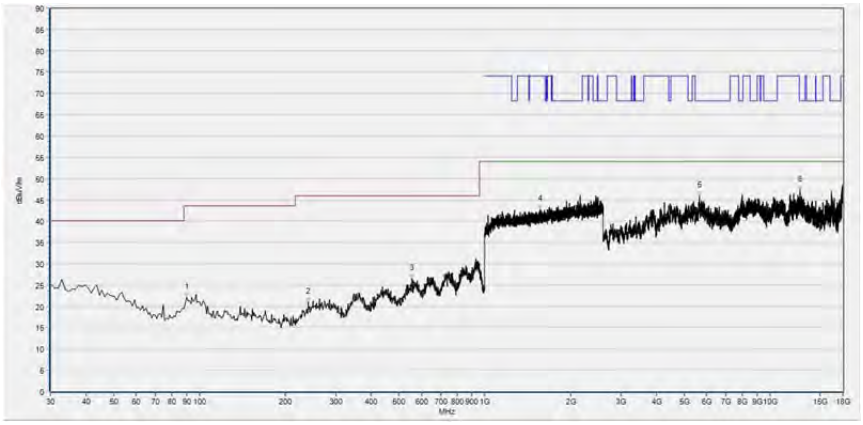
(Antenna Vertical, 30MHz to 18GHz)

Plot for Channel = 151



Fre. (MHz)	Pk (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
97.968	24.09	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
352.362	23.97	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
573.744	27.08	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
1379.326	42.06	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
5985.597	45.67	N/A	N/A	68.23	N/A	N/A	Horizontal	PASS
11746.349	46.82	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

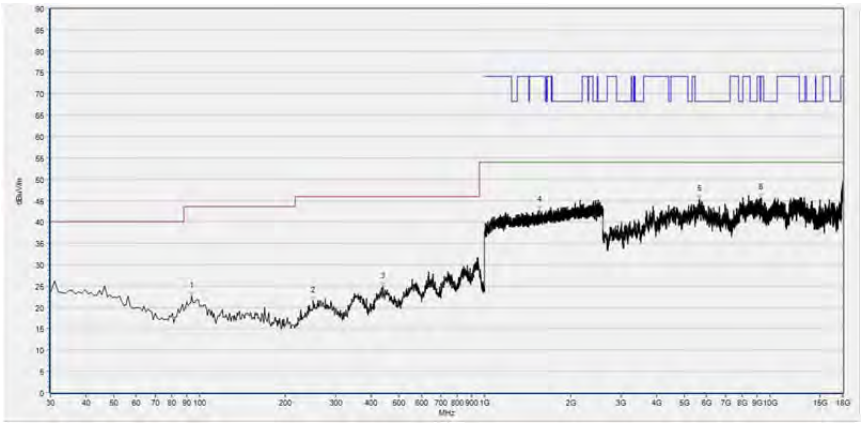
(Antenna Horizontal, 30MHz to 18GHz)



Fre. (MHz)	Pk (dBμV/m)	QP (dBμV/m)	AV (dBμV/m	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
90.200	22.11	N/A	N/A	N/A	43.50	N/A	Vertical	PASS
240.701	20.96	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
555.295	26.44	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
1560.720	42.70	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
5646.729	45.87	N/A	N/A	68.23	N/A	N/A	Vertical	PASS
12729.066	47.20	N/A	N/A	68.23	N/A	N/A	Vertical	PASS

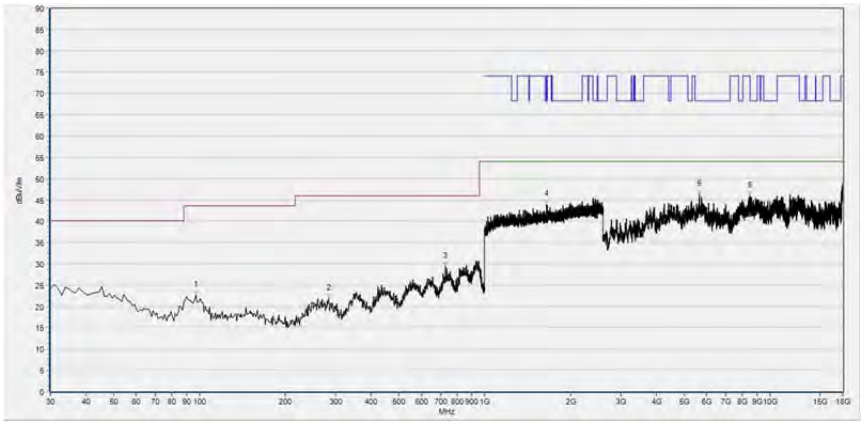
(Antenna Vertical, 30MHz to 18GHz)

Plots for Channel = 159



Fre. (MHz)	Pk (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
94.084	22.62	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
250.410	21.46	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
440.721	24.73	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
1556.452	42.69	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
5637.487	45.22	N/A	N/A	68.23	N/A	N/A	Horizontal	PASS
9275.695	45.55	N/A	N/A	68.23	N/A	N/A	Horizontal	PASS

(Antenna Horizontal, 30MHz to 18GHz)



Fre. (MHz)	Pk (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
96.997	22.62	N/A	N/A	N/A	43.50	N/A	Vertical	PASS
283.423	21.72	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
728.128	29.28	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
1647.683	43.99	N/A	N/A	68.23	N/A	N/A	Vertical	PASS
5643.649	46.19	N/A	N/A	68.23	N/A	N/A	Vertical	PASS
8511.702	45.85	N/A	N/A	68.23	N/A	N/A	Vertical	PASS

(Antenna Vertical, 30MHz to 18GHz)

Annex A Test Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for test performed on the EUT as specified in CISPR 16-1-2:

Test items	Uncertainty
Peak Output Power	±2.22dB
Power spectral density (PSD)	±2.22dB
Bandwidth	±5%
Restricted Frequency Bands	±5%
Radiated Emission	±2.95dB
Conducted Emission	±2.44dB

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

Annex B Testing Laboratory Information

1. Identification of the Responsible Testing Laboratory

Laboratory Name:	Shenzhen Morlab Communications Technology Co., Ltd. Morlab Laboratory
Laboratory Address:	FL.3, Building A, FeiYang Science Park, No.8 LongChang Road, Block 67, BaoAn District, ShenZhen, GuangDong Province, P. R. China
Telephone:	+86 755 36698555
Facsimile:	+86 755 36698525

2. Identification of the Responsible Testing Location

Name:	Shenzhen Morlab Communications Technology Co., Ltd. Morlab Laboratory
Address:	FL.3, Building A, FeiYang Science Park, No.8 LongChang Road, Block 67, BaoAn District, ShenZhen, GuangDong Province, P. R. China

3. Facilities and Accreditations

All measurement facilities used to collect the measurement data are located at FL.3, Building A, FeiYang Science Park, Block 67, BaoAn District, Shenzhen, 518101 P. R. China. The test site is constructed in conformance with the requirements of ANSI C63.10-2013 and CISPR Publication 22; the FCC designation number is CN1192, the test firm registration number is 226174.

4. Test Equipments Utilized

4.1 Conducted Test Equipments

Equipment	Serial No.	Type	Manufacturer	Cal. Date	Cal. Due
Attenuator 1	(N/A)	10dB	Resnet	N/A	N/A
EXA Signal Analzyer	MY53470836	N9010A	Agilent	2020.04.01	2021.03.31
USB Wideband Power Sensor	MY54210011	U2021XA	Agilent	2020.04.01	2021.03.31
RF cable (30MHz-26GHz)	CB01	RF01	Morlab	N/A	N/A
Coaxial cable	CB02	RF02	Morlab	N/A	N/A
SMA connector	CN01	RF03	HUBER-SUHNER	N/A	N/A
Temperature Chamber	12108015	DTL-003S101	YOMA	2020.01.08	2021.01.07
Computer	T430i	Think Pad	Lenovo	N/A	N/A

4.2 Conducted Emission Test Equipments

Equipment Name	Serial No.	Type	Manufacturer	Cal. Date	Cal. Due
Receiver	MY56400093	N9038A	KEYSIGHT	2020.03.26	2021.03.25
LISN	8127449	NSLK 8127	Schwarzbeck	2020.03.26	2021.03.25
Pulse Limiter (10dB)	9391	VTSD 9561-D	Schwarzbeck	2019.08.13	2020.08.12
Coaxial cable(BNC)	CB01	EMC01	Morlab	N/A	N/A

4.3 List of Software Used

Description	Manufacturer	Software Version
Test system	Tonscend	V2.6
Power Panel	Agilent	V3.8
MORLAB EMCR V1.2	MORLAB	V1.0

4.4 Radiated Test Equipments

Equipment Name	Serial No.	Type	Manufacturer	Cal. Date	Cal.Due
Receiver	MY54130016	N9038A	Agilent	2019.07.29	2020.07.28
Test Antenna - Bi-Log	9163-519	VULB 9163	Schwarzbeck	2019.05.24	2022.05.23
Test Antenna - Horn	BBHA9170 #774	BBHA9170	Schwarzbeck	2019.07.26	2022.07.25
Test Antenna - Loop	1519-022	FMZB1519	Schwarzbeck	2019.02.14	2022.02.13
Test Antenna - Horn	01774	BBHA 9120D	Schwarzbeck	2019.07.26	2022.07.25
Coaxial cable (N male) (9KHz-30MHz)	CB04	EMC04	Morlab	N/A	N/A
Coaxial cable (N male) (30MHz-26GHz)	CB02	EMC02	Morlab	N/A	N/A
Coaxial cable(N male) (30MHz-26GHz)	CB03	EMC03	Morlab	N/A	N/A
Coaxial cable(N male) (30MHz-40GHz)	CB05	EMC05	Morlab	N/A	N/A
1-18GHz pre-Amplifier	61171/61172	S020180L3203	Tonscend	2019.07.29	2020.07.28
18-26.5GHz pre-Amplifier	46732	S10M100L3802	Tonscend	2019.07.29	2020.07.28
Notch Filter	N/A	WRCG-5150-5350	Wainwright	2019.12.01	2020.11.30
Notch Filter	N/A	WRCG-5470-5725	Wainwright	2019.12.01	2020.11.30
Notch Filter	N/A	WRCG-5725-5850	Wainwright	2019.12.01	2020.11.30
Anechoic Chamber	N/A	9m*6m*6m	CRT	2020.01.06	2023.01.05

END OF REPORT