REPORT No.: SZ18050012W04

TEST REPORT

APPLICANT	:	Anker Innovations Limited
PRODUCT NAME	:	Nebula Mars II
MODEL NAME	:	D2322
BRAND NAME	:	Nebula
FCC ID	:	2AOKB-D2322
STANDARD(S)	:	47 CFR Part 15 Subpart E
TEST DATE	:	2018-05-17 to 2018-05-23
ISSUE DATE	:	2018-05-24

Tested by: Wang Meng

Wang Meng (Test Engineer)

Approved by: Andy Yeh

Andy Yeh (Technical Director)

MORLAB

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DIRECTORY

Change History		
Issue	**Date**	**Reason for change**
1.0	2018-05-24	First edition

1. Technical Information

Note: Provide by applicant.

1.1. Applicant and Manufacturer Information

Applicant:	Anker Innovations Limited
Applicant Address:	Room 1318-19,Hollywood Plaza,610 Nathan Road, Mongkok, Kowloon, Hong Kong
Manufacturer:	Anker Innovations Limited
Manufacturer Address:	Room 1318-19,Hollywood Plaza,610 Nathan Road, Mongkok, Kowloon, Hong Kong

1.2. Equipment Under Test (EUT) Description

Product Name:	Nebula Mars II
Serial No:	(N/A, marked #1 by test site)
Hardware Version:	V0.3
Software Version:	NBUI_P2_V1.0.6
Modulation Type:	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 1.3
Antenna Type:	Monopole Antenna
Antenna Gain:	0 dBi

Note 1: The U-NII band is applicable to this report, another bands of operation (2.4GHz) is documented in a separate report.

Note 2: WIFI hotspot does not support U-NII band.

Note 3: During test, the duty cycle of the EUT was setting to 100%.

Note 4: For a more detailed description, please refer to Specification or User's Manual supplied by the applicant and/or manufacturer.

1.3. The channel number and frequency of EUT

Frequency Range: 5180-5240MHz				
Bandwidth	Channel	Frequency (MHz)	Channel	Frequency (MHz)
20MHz	**36**	**5180**	40	5200
	44	**5220**	**48**	**5240**
40MHz	**38**	**5190**	**46**	**5230**
Frequency Range: 5745-5805MHz				
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.

1.4. 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
1	15.203	Antenna Requirement	N/A	N/A	PASS
2	15.407(a) (e)	Emission Bandwidth	May 17&23, 2018	Su Hang	PASS
3	15.407(a)	Maximum conducted output Power	May 23, 2018	Su Hang	PASS
4	15.407(a)	Peak Power spectral density	May 18, 2018	Su Hang	PASS
5	15.407(b)	Restricted Frequency Bands	May 22, 2018	Wu Zhongwen	PASS
6	15.407(g)	Frequency Stability	May 23, 2018	Su Hang	PASS
7	15.207	Conducted Emission	May 23, 2018	Wu Zhongwen	PASS
8	15.407(b)	Radiated Emission	May 18, 2018	Wu Zhongwen	PASS
9	15.407(c)	Automatically discontinue transmission requirement	N/A	N/A	PASS

Note1: EUT is a Client Device Without Radar Detection, WIFI hotspot does not support U-NII band; A TPC mechanism is not required for systems with an e.i.r.p. of less than 500 mW.

Note2: The tests of Conducted Emission and Radiated Emission were performed according to the method of measurements prescribed in ANSI C63.10 2013.

Note3: These RF tests were performed according to the method of measurements prescribed in KDB789033 D02 General UNII Test Procedures New Rules v01r03

1.5. 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 15C 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. 2.1.2 Result: Compliant

The EUT has a permanently and irreplaceable attached antenna. Please refer to the EUT internal photos.

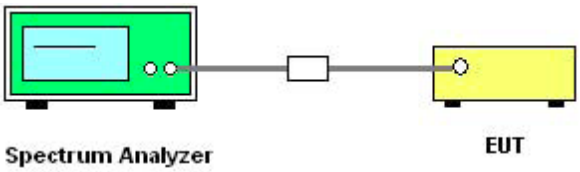
2.2. Emission Bandwidth

2.2.1. 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.

2.2.2. Test Description

A. Test Set:



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.

B. 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.

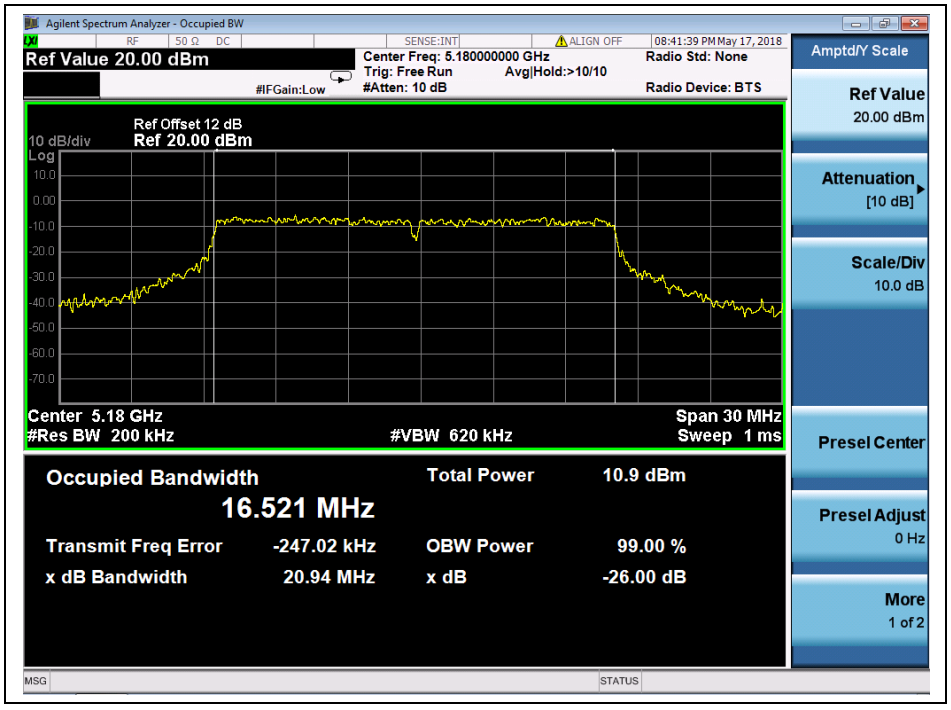
2.2.3. Test Result

802.11a Test mode

A. Test Verdict:

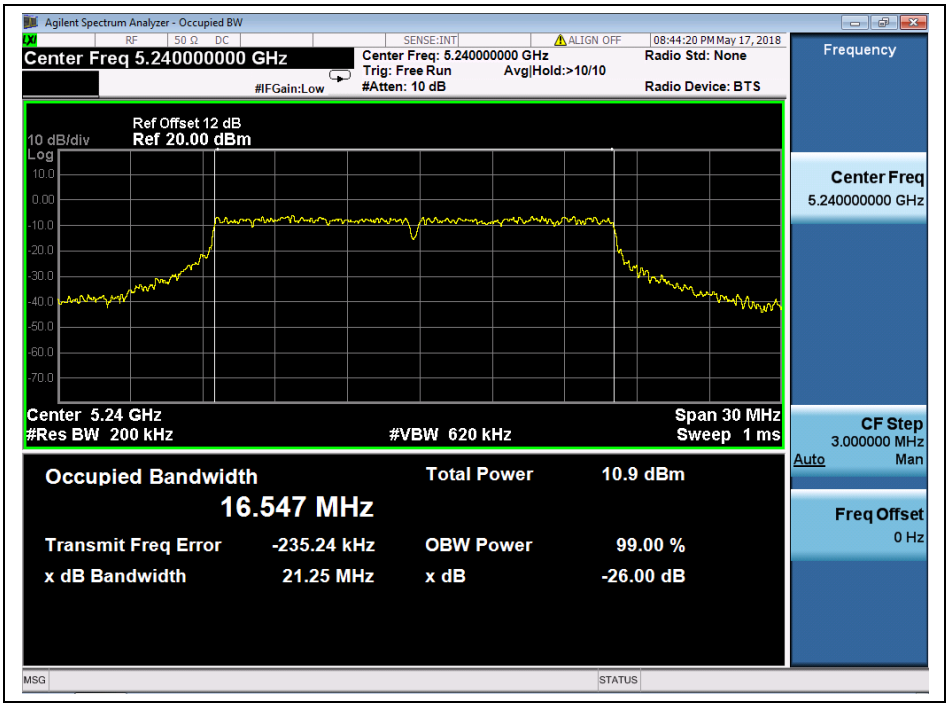
Channel	Frequency (MHz)	26 dB Bandwidth (MHz)
36	5180	20.94
44	5220	21.04
48	5240	21.25
Channel	**Frequency (MHz)**	**6dB Bandwidth (MHz)**
149	5745	16.53
157	5785	16.47
165	5825	16.57

B. Test Plots



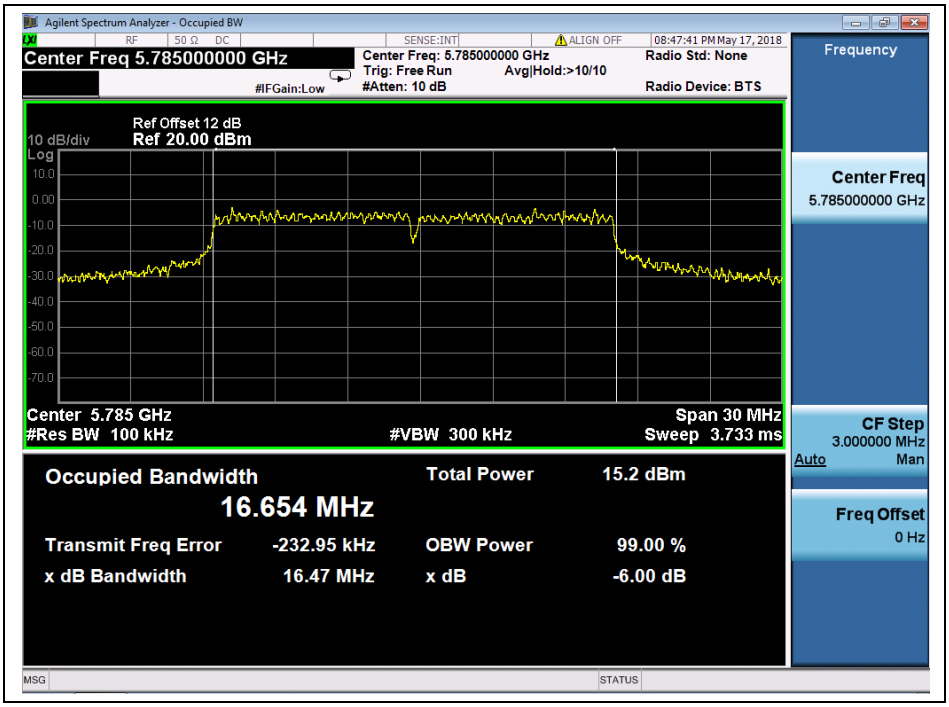
(Channel 36, 5180MHz, 802.11a,)

(Channel 44, 5220 MHz, 802.11a,)

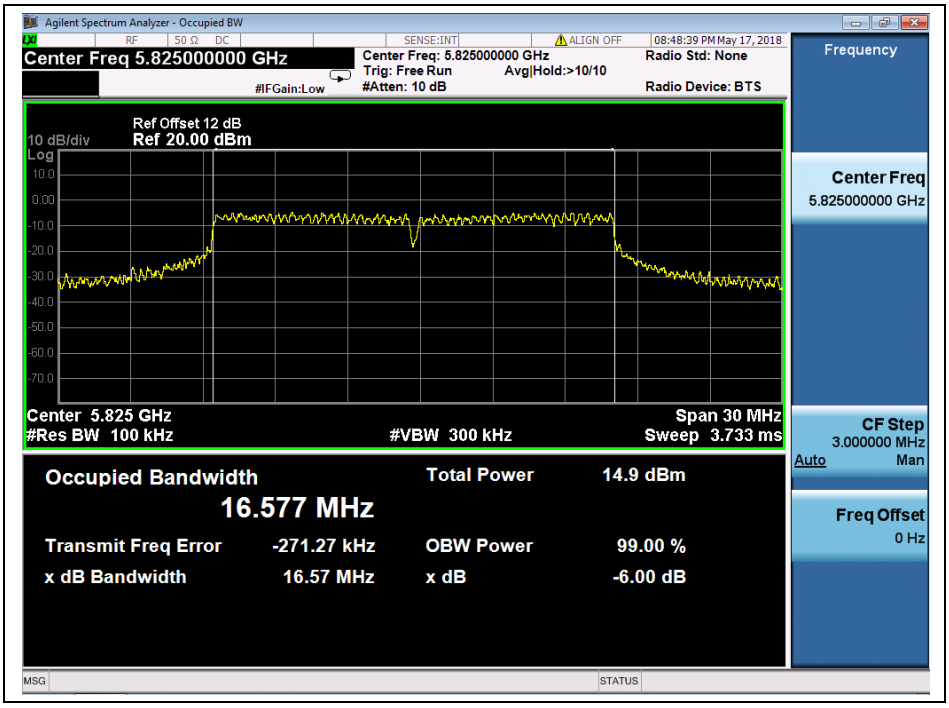


(Channel 48, 5240MHz, 802.11a,)

(Channel 149, 5745MHz, 802.11a)



(Channel 157, 5785MHz, 802.11a)



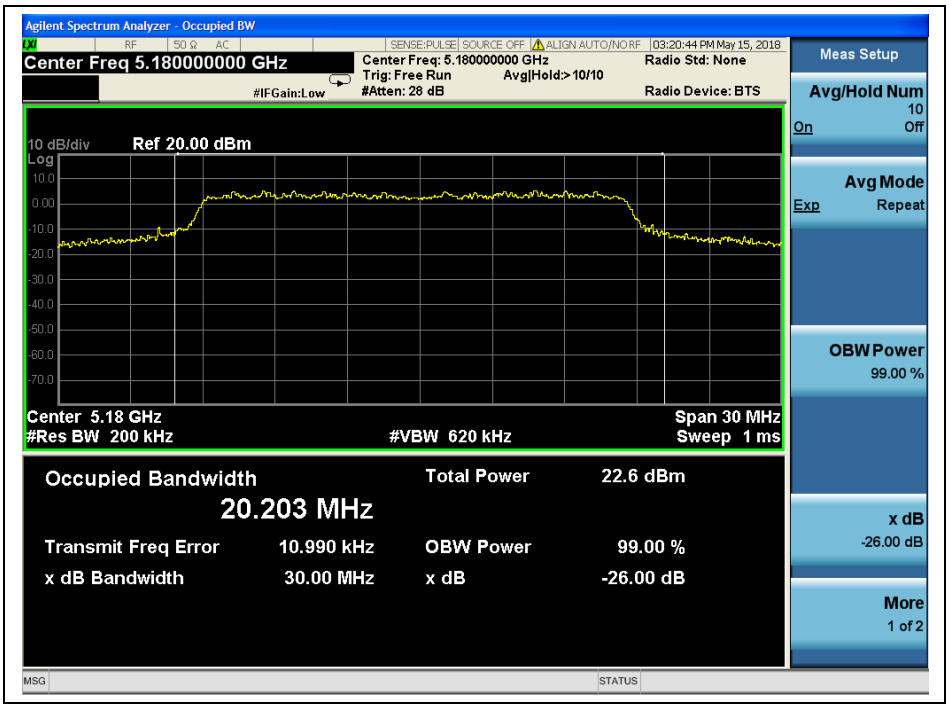
(Channel 165, 5825MHz, 802.11a)

802.11n (HT20) Test mode

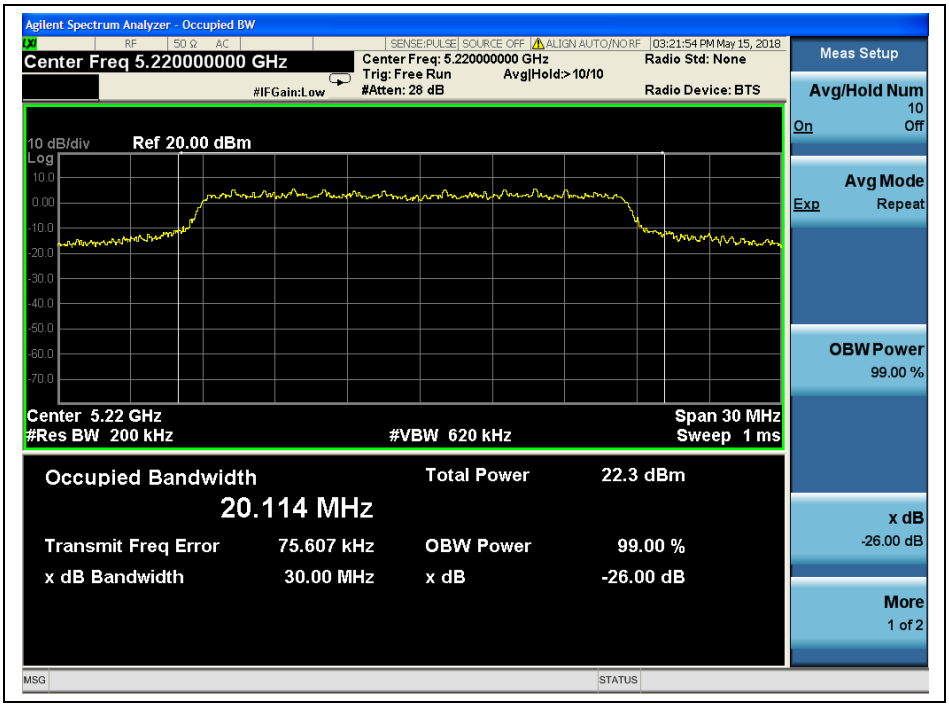
A. Test Verdict:

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)
36	5180	30.00
44	5220	30.00
48	5240	30.00
Channel	**Frequency (MHz)**	**6dB Bandwidth (MHz)**
149	5745	17.75
157	5785	17.76
165	5825	17.74

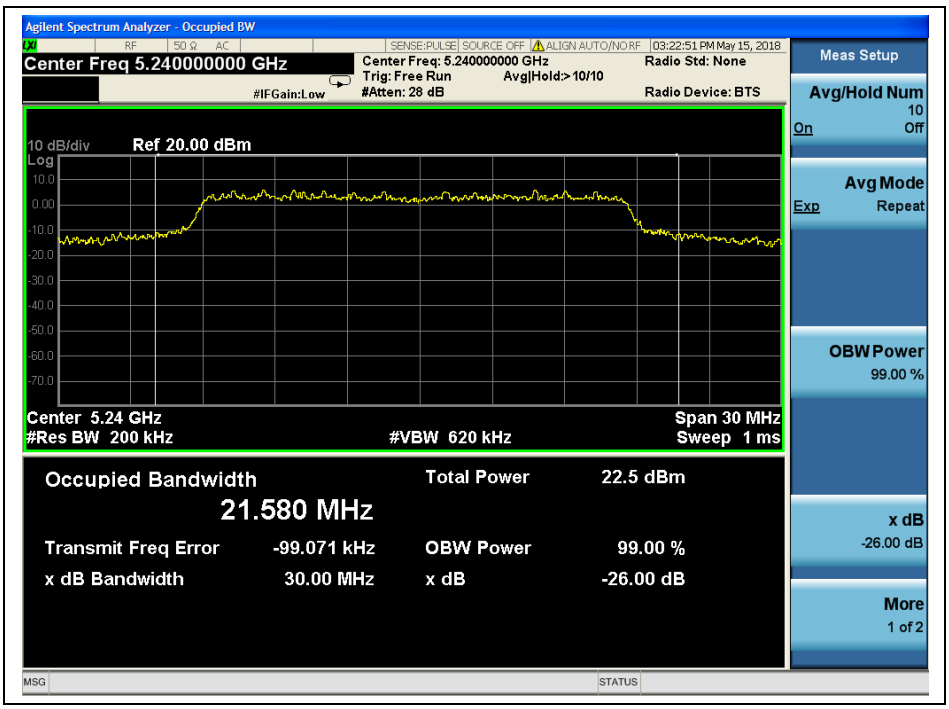
B. Test Plots



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

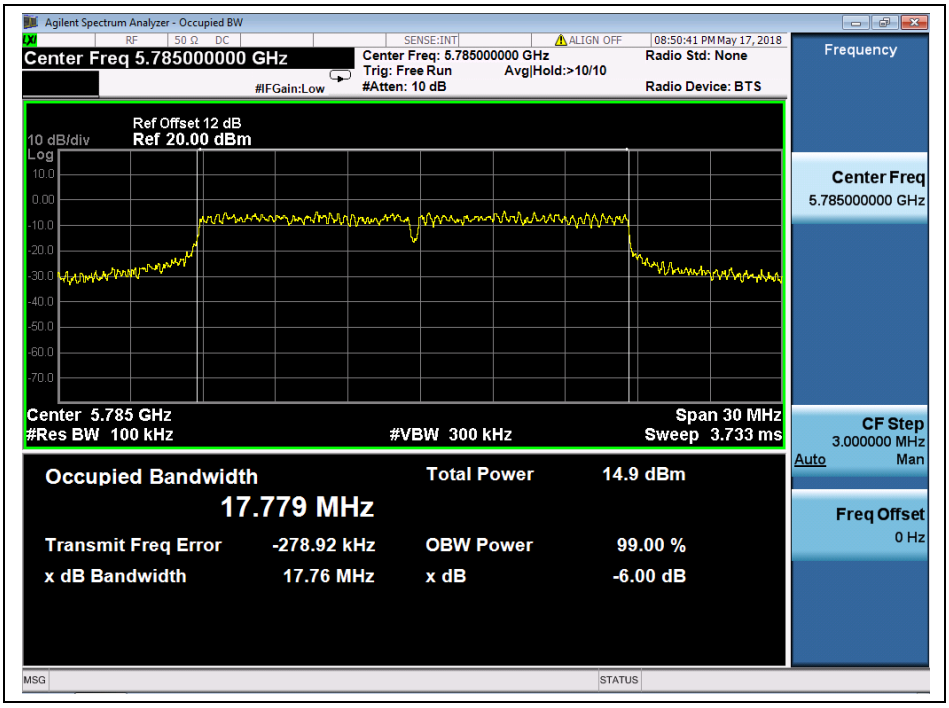


(Channel 44, 5220 MHz, 802.11 n (HT20))

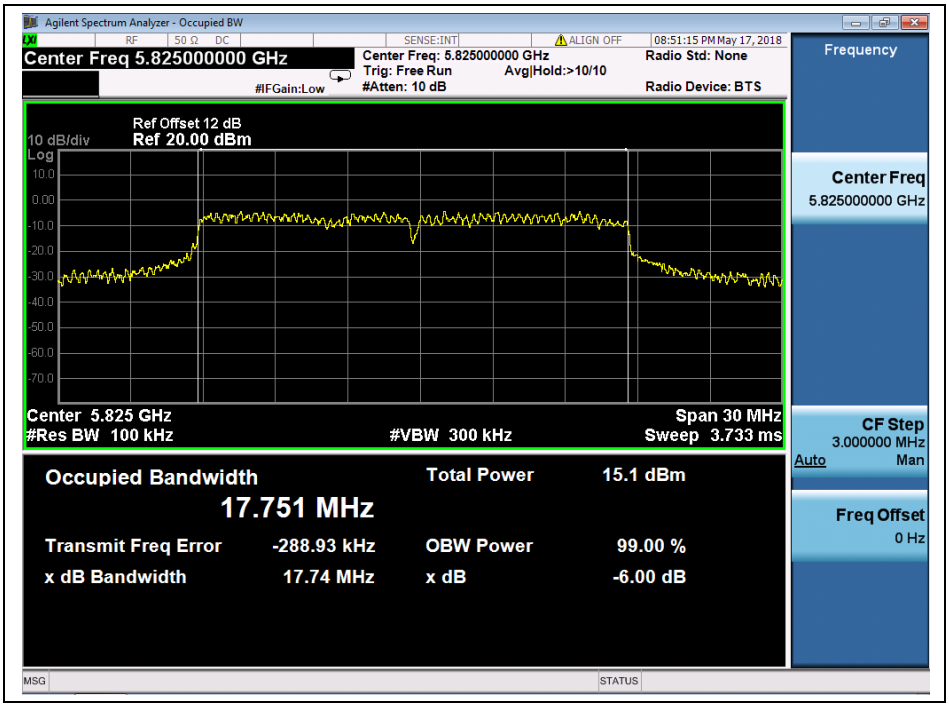


(Channel 48, 5240MHz, 802.11 n (HT20))

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



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



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

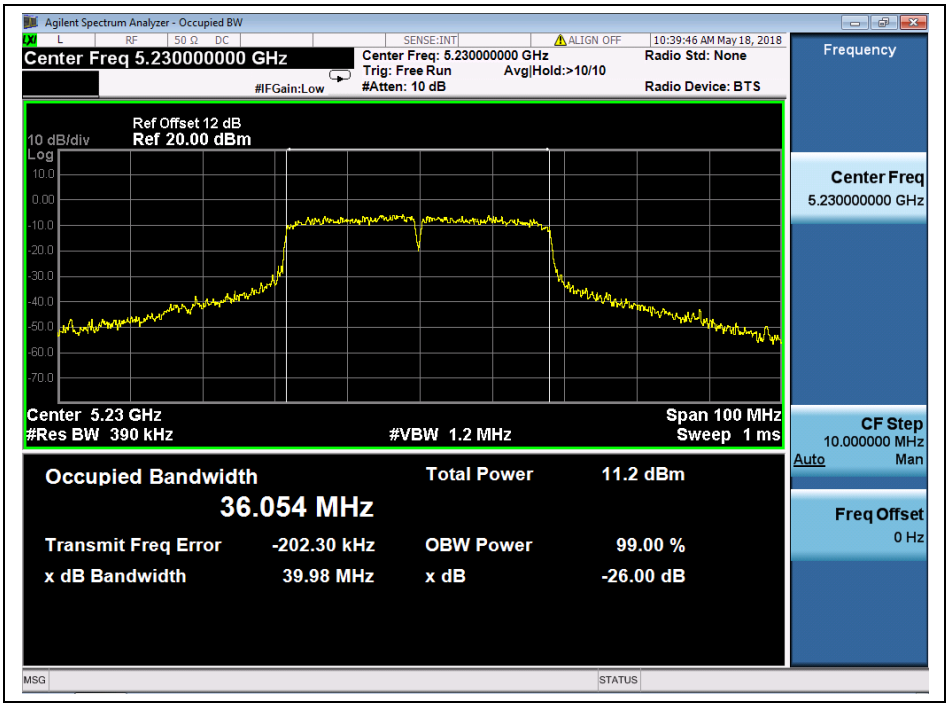
802.11n (HT40) Test mode

A. Test Verdict:

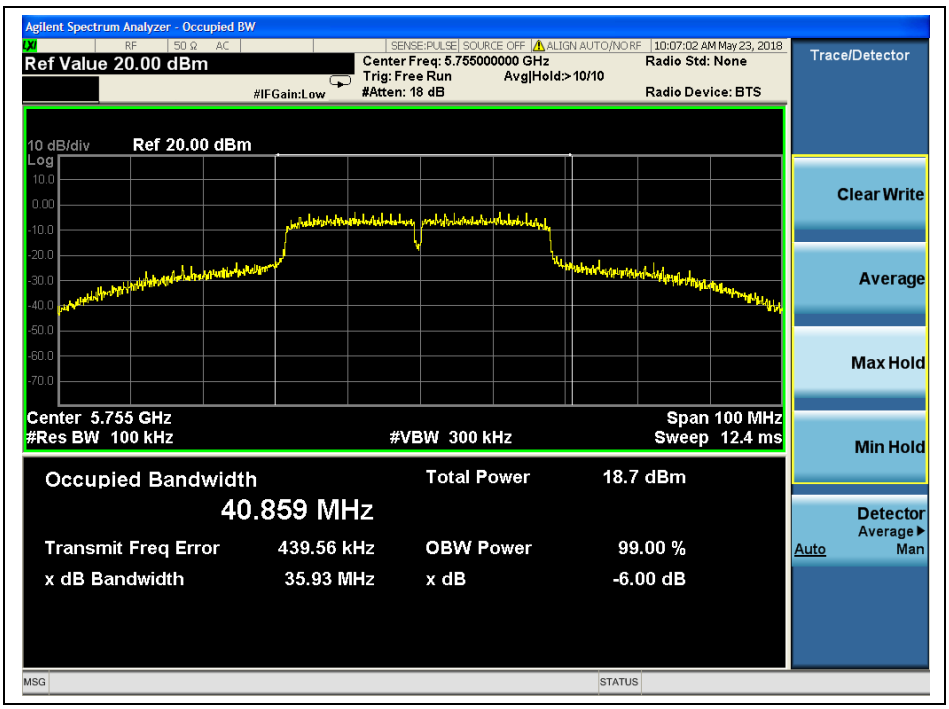
Channel	Frequency (MHz)	26 dB Bandwidth (MHz)
38	5190	40.30
46	5230	39.98
Channel	**Frequency (MHz)**	**6dB Bandwidth (MHz)**
151	5755	35.93
159	5795	35.17

B. Test Plots

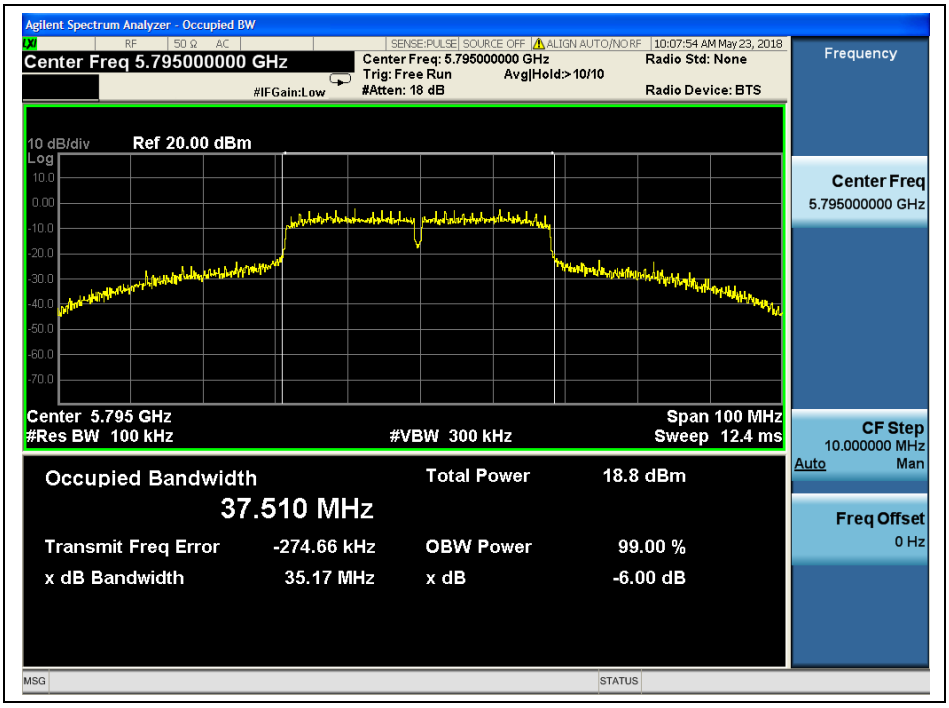
(Channel 38, 5190MHz, 802.11n (HT40))



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



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



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

2.3. 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.

A. Test Setup:

(Test Module)

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

802.11a Test mode

Channel	Frequency (MHz)	Measured Peak Power (dBm)	Limit (dBm)	Verdict
36	5180	15.71	24	PASS
44	5220	15.57		
48	5240	14.89		
149	5745	16.80	30	
157	5785	18.36		
165	5825	16.87		

Channel	Frequency (MHz)	Measured Average Power (dBm)	Limit (dBm)	Verdict
36	5180	8.77	24	PASS
44	5220	8.40		
48	5240	8.69		
149	5745	12.05	30	
157	5785	13.52		
165	5825	11.71		

802.11n (HT20) Test mode

Channel	Frequency (MHz)	Measured Peak Power (dBm)	Limit (dBm)	Verdict
36	5180	20.17	24	PASS
44	5220	19.74		
48	5240	19.80		
149	5745	21.27	30	
157	5785	21.45		
165	5825	21.44		

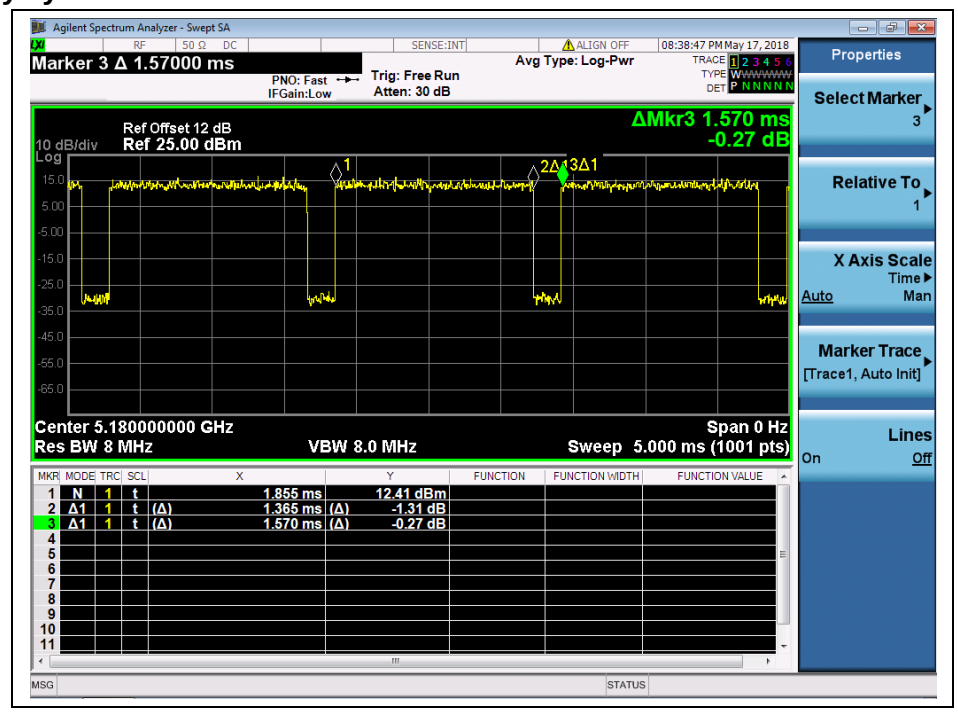
Channel	Frequency (MHz)	Measured Average Power (dBm)	Limit (dBm)	Verdict
36	5180	12.49	24	PASS
44	5220	12.18		
48	5240	12.51		
149	5745	16.34	30	
157	5785	16.29		
165	5825	15.98		

802.11n (HT40) Test mode

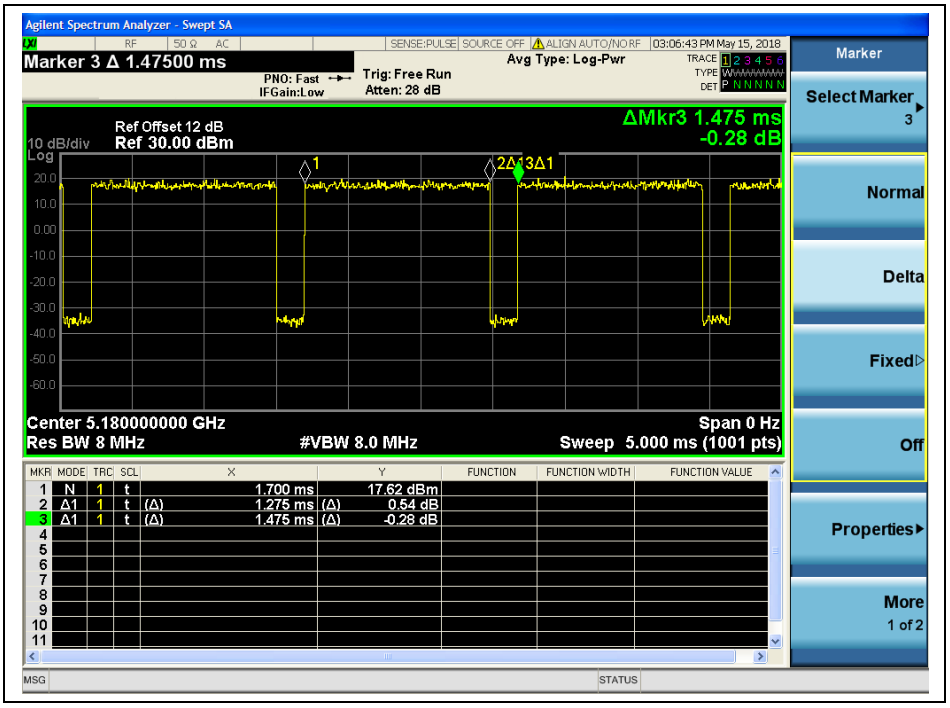
Channel	Frequency (MHz)	Measured Peak Power (dBm)	Limit (dBm)	Verdict
38	5190	19.72	24	PASS
46	5230	19.30		
151	5755	21.23	30	
159	5795	21.32		

Channel	Frequency (MHz)	Measured Average Power (dBm)	Limit (dBm)	Verdict
38	5190	11.89	24	PASS
46	5230	11.28		
151	5755	15.69	30	
159	5795	16.15		

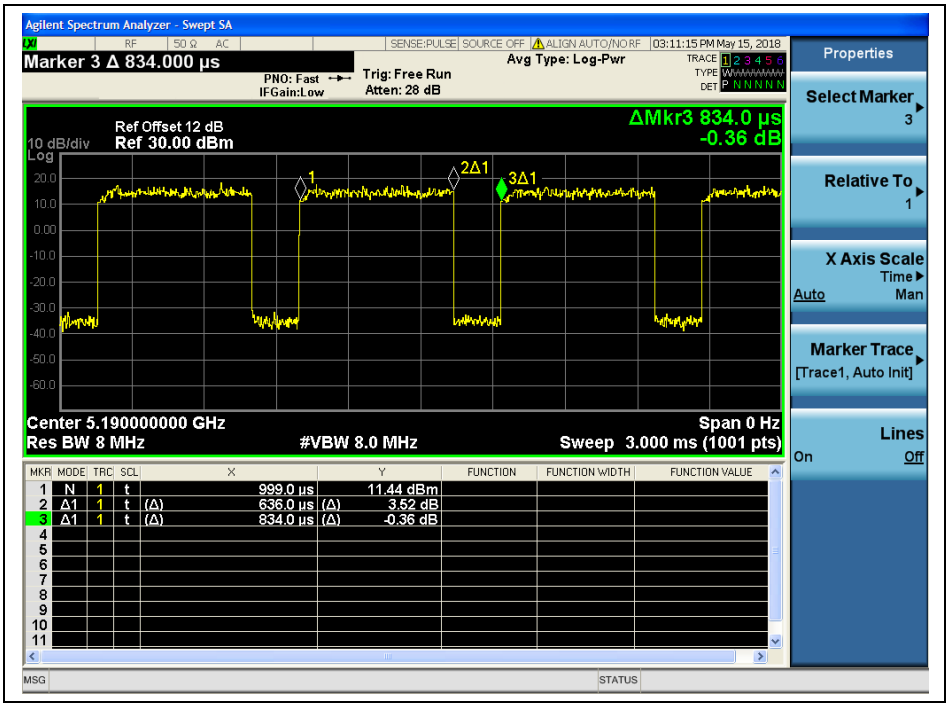
Plot for duty cycle



(Duty cycle for 802.11 a)



(Duty cycle for 802.11 n(HT20))



(Duty cycle for 802.11 n(HT40))

2.4. Peak Power spectral density

2.4.1. 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.

2.4.2. Test Description

A. Test Set:

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.

B. 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 = RMS (i.e., power averaging)
5) Trace average at least 100 traces in power averaging (i.e., RMS) mode
6) Record the max value

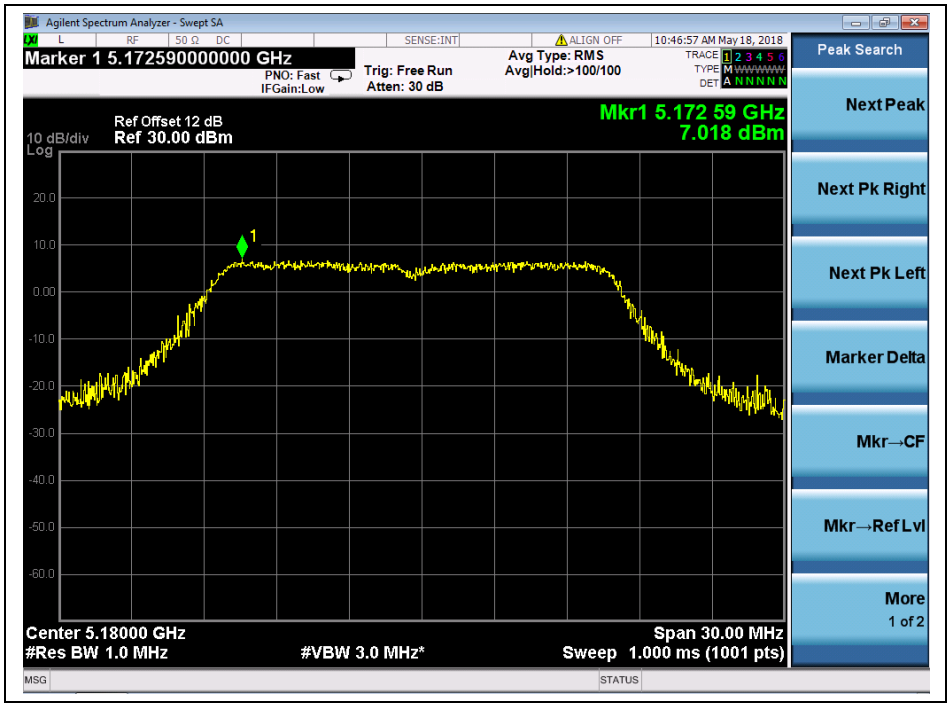
2.4.3. Test Result

802.11a Test mode

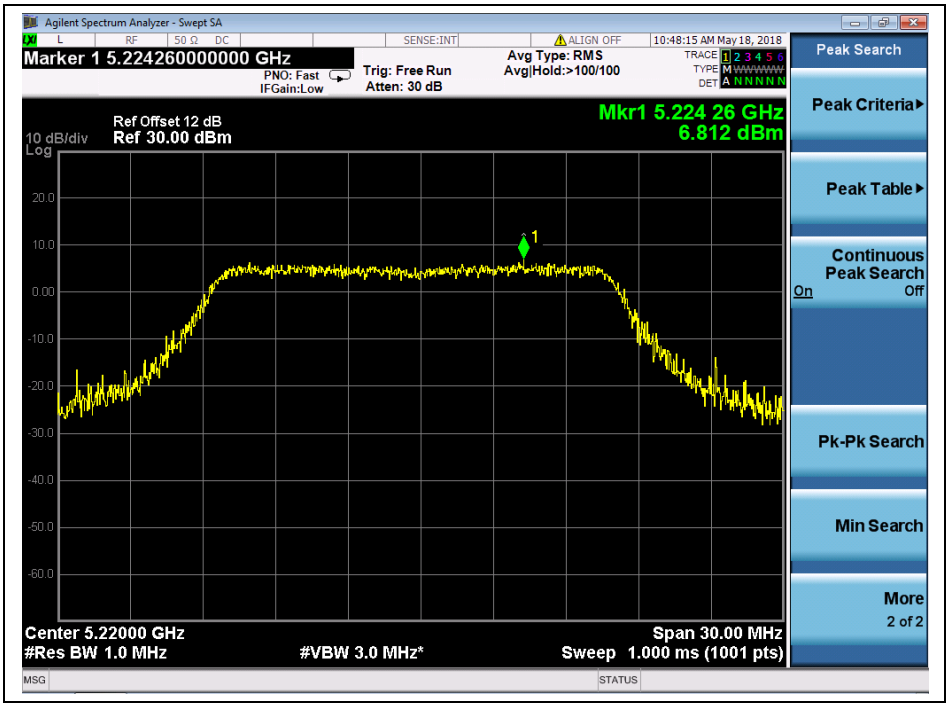
A. Test Verdict:

Channel	Frequency (MHz)	Measured PPSD (dBm/MHz)	Limit (dBm/MHz)	Verdict
36	5180	7.02	11	PASS
44	5220	6.81		
48	5240	6.78		
Channel	Frequency (MHz)	Measured PPSD (dBm/500KHz)	Limit (dBm/500KHz)	Verdict
149	5745	8.64	30	PASS
157	5785	9.68		
165	5825	8.65		

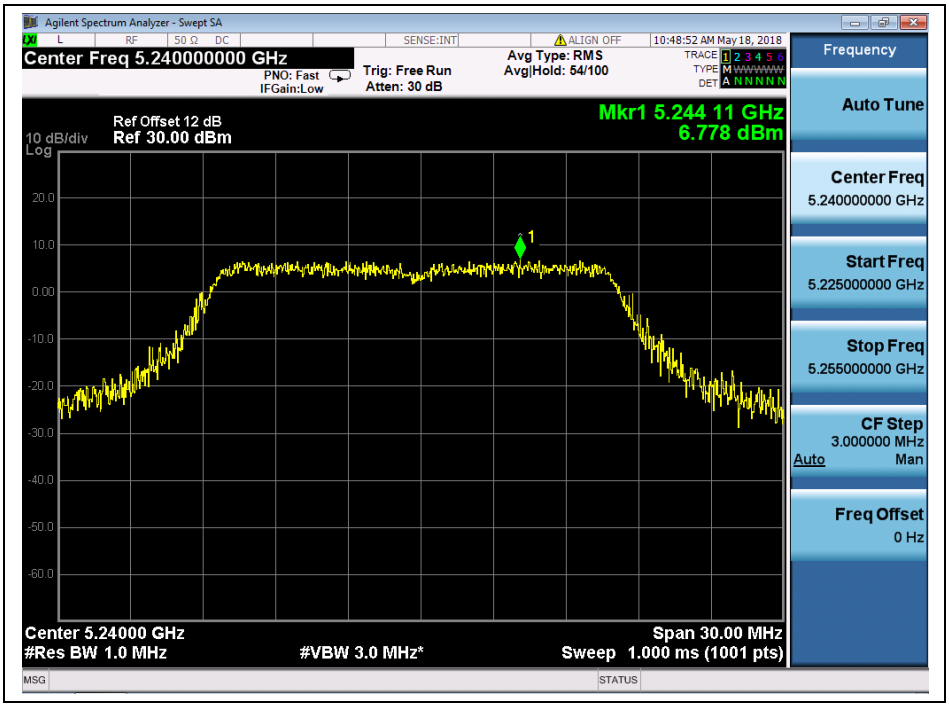
B. Test Plots



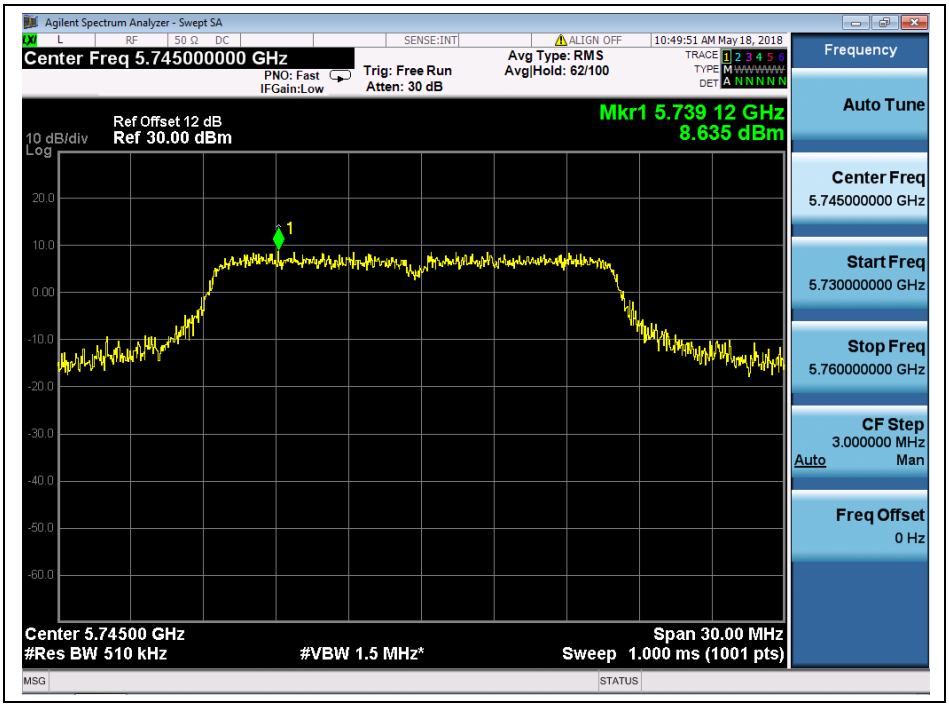
(Channel 36, 5180MHz, 802.11a,)



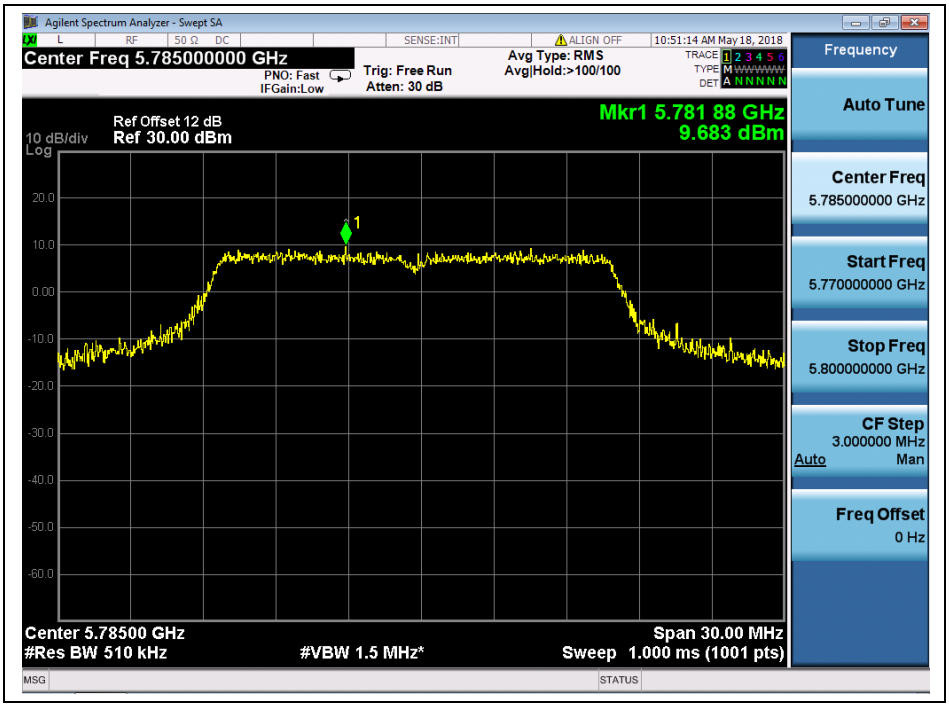
(Channel 44, 5220 MHz, 802.11a,)



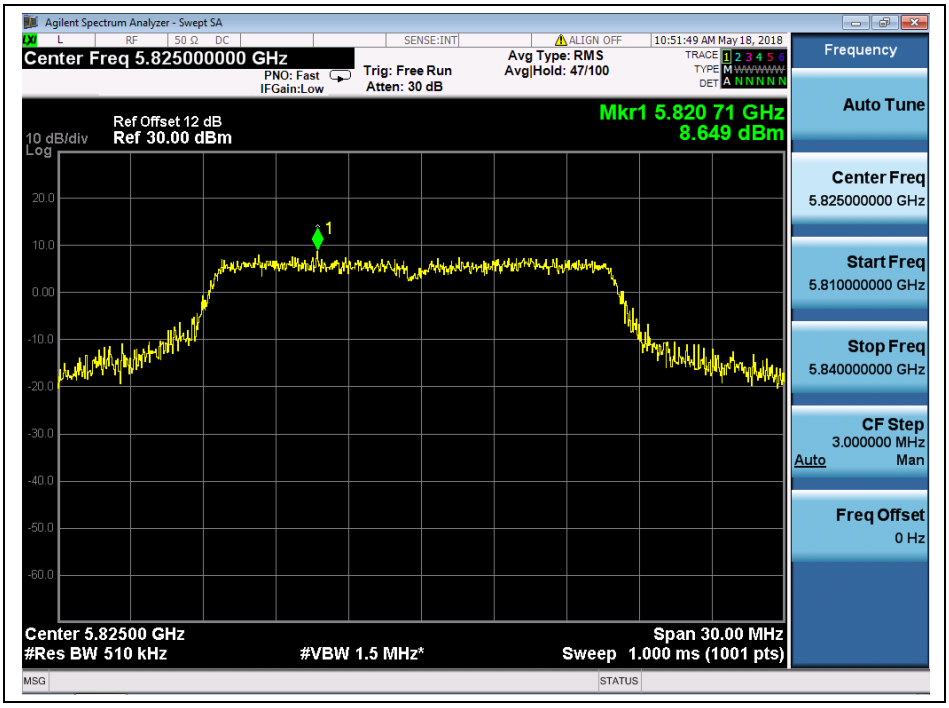
(Channel 48, 5240MHz, 802.11a,)



(Channel 149, 5745MHz, 802.11a)



(Channel 157, 5785MHz, 802.11a)



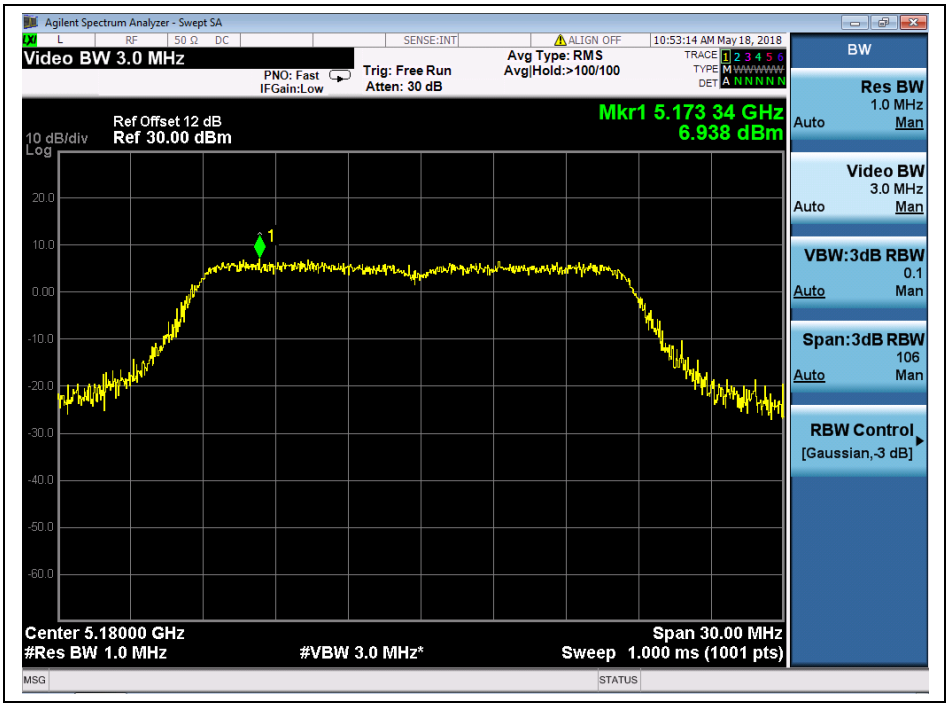
(Channel 165, 5825MHz, 802.11a)

802.11n (HT20) Test mode

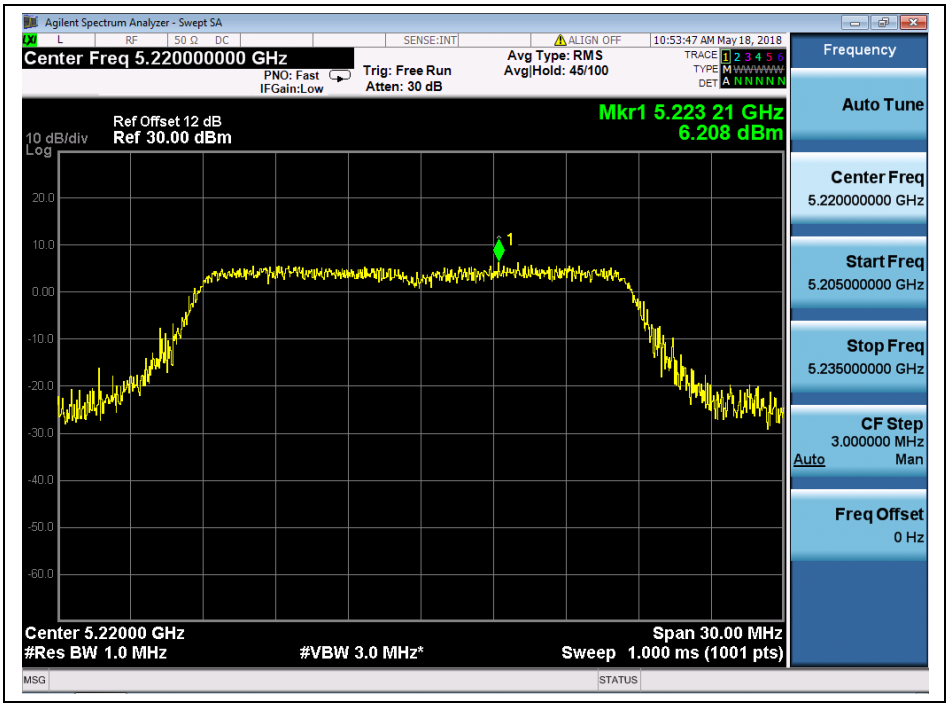
A. Test Verdict:

Channel	Frequency (MHz)	Measured PPSD (dBm/MHz)	Limit (dBm/MHz)	Verdict
36	5180	6.94	11	PASS
44	5220	6.21		
48	5240	6.70		
Channel	Frequency (MHz)	Measured PPSD (dBm/500KHz)	Limit (dBm/500KHz)	Verdict
149	5745	8.84	30	PASS
157	5785	9.15		
165	5825	8.90		

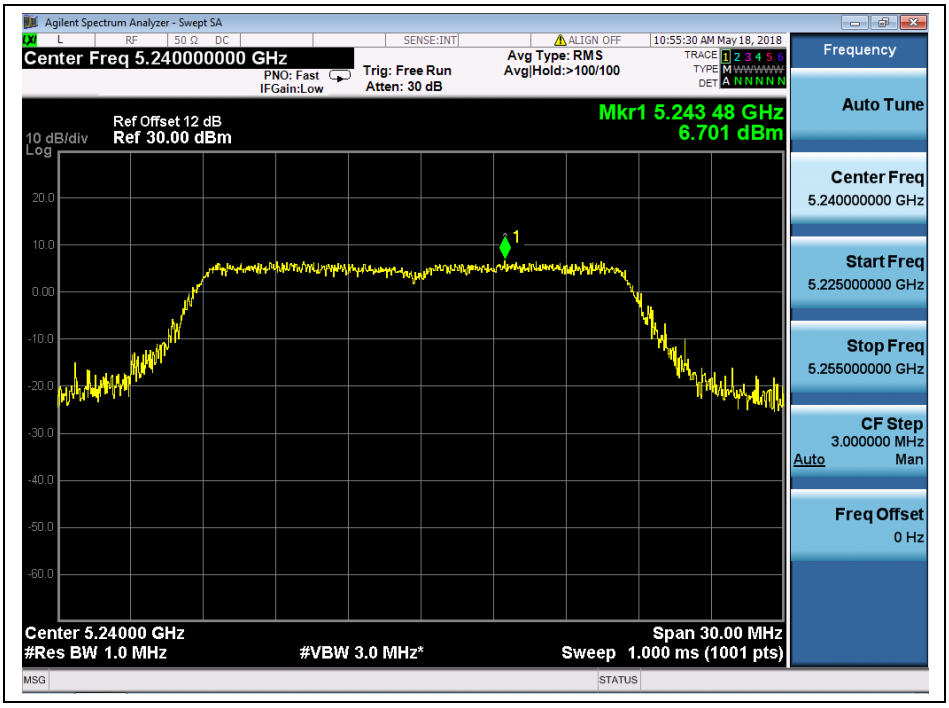
B. Test Plots



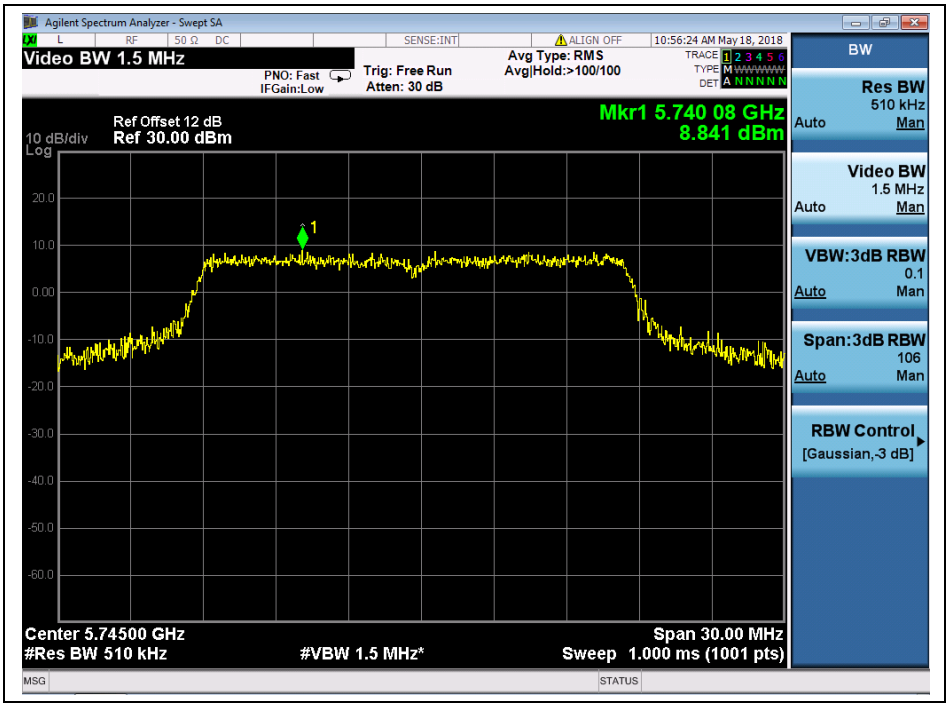
(Channel 36, 5180MHz, 802.11 n (HT20))



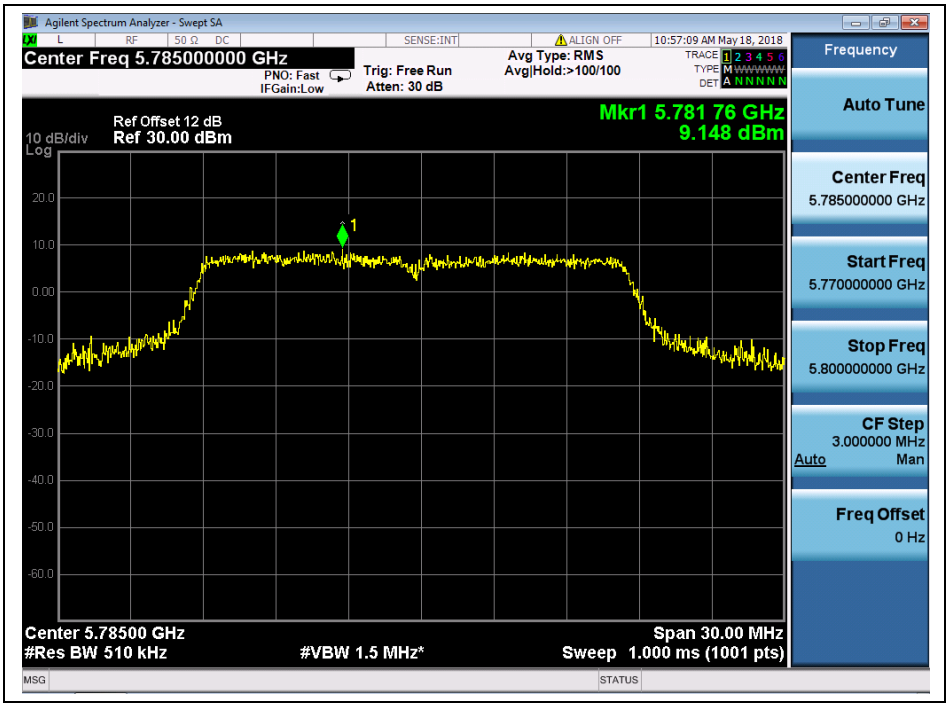
(Channel 44, 5220 MHz, 802.11 n (HT20))



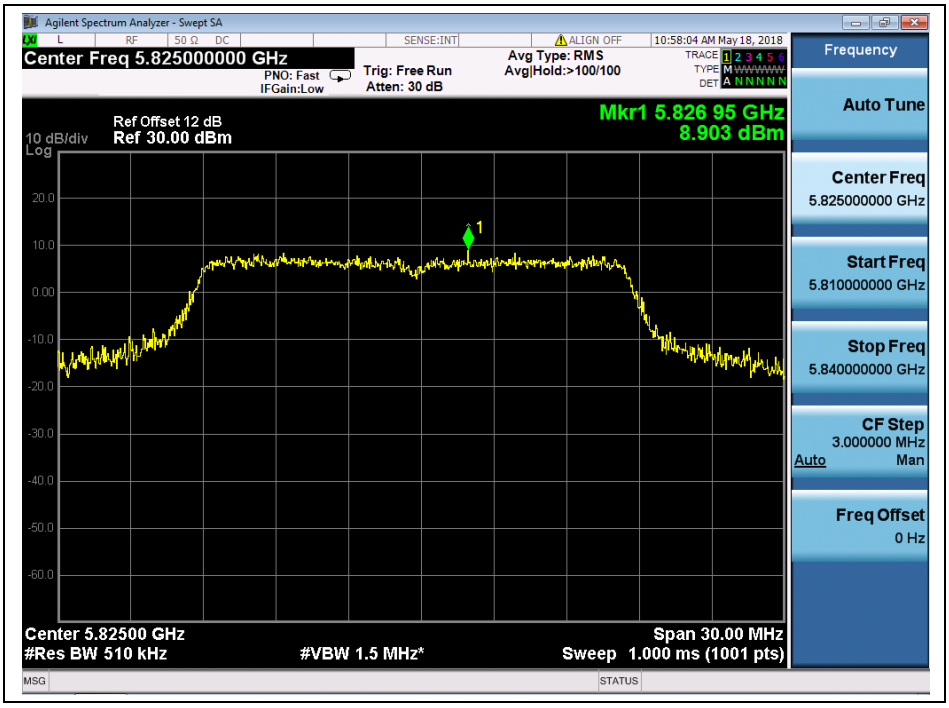
(Channel 48, 5240MHz, 802.11 n (HT20))



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



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



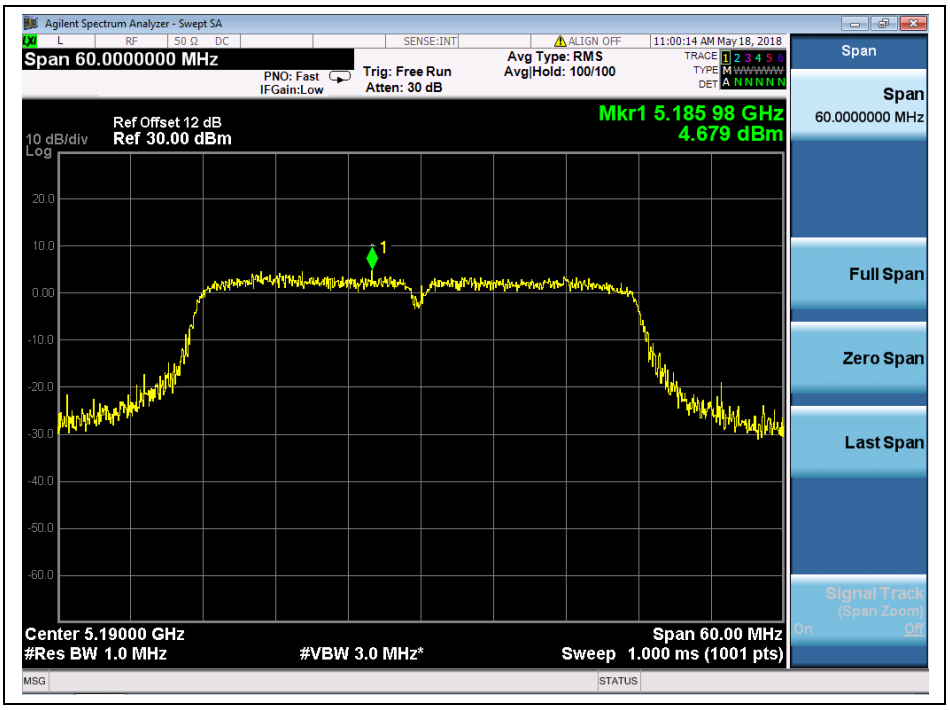
(Channel 165, 5825MHz, 802.11 n (HT20))

802.11n (HT40) Test mode

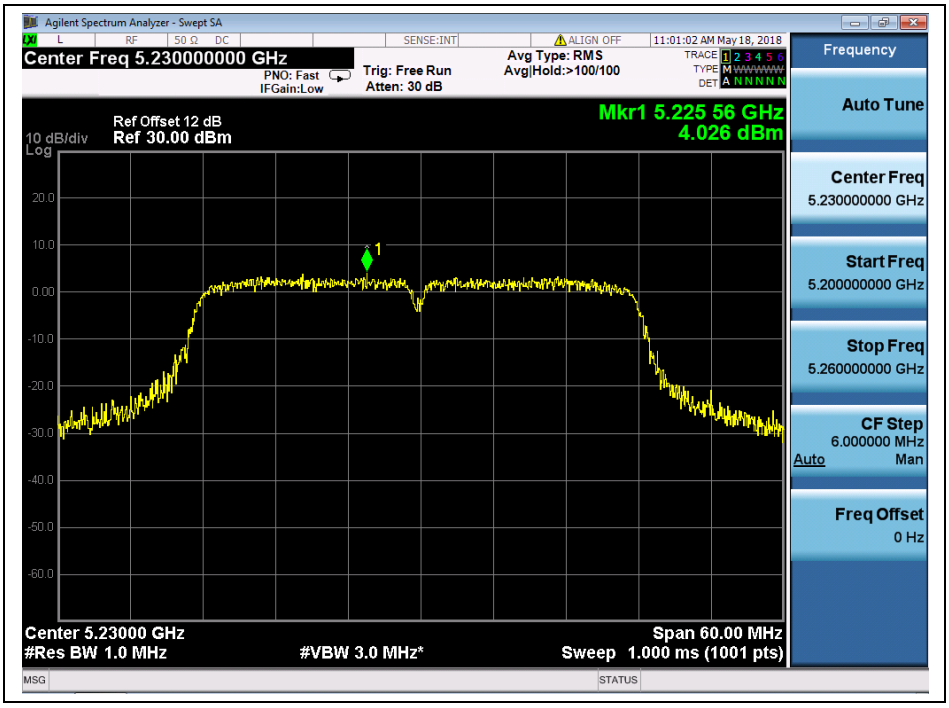
A. Test Verdict:

Channel	Frequency (MHz)	Measured PPSD (dBm/MHz)	Limit (dBm/MHz)	Verdict
38	5190	4.68	11	PASS
46	5230	4.03		
Channel	Frequency (MHz)	Measured PPSD (dBm/500KHz)	Limit (dBm/500KHz)	Verdict
151	5755	7.45	30	PASS
159	5795	5.98		

B. Test Plots

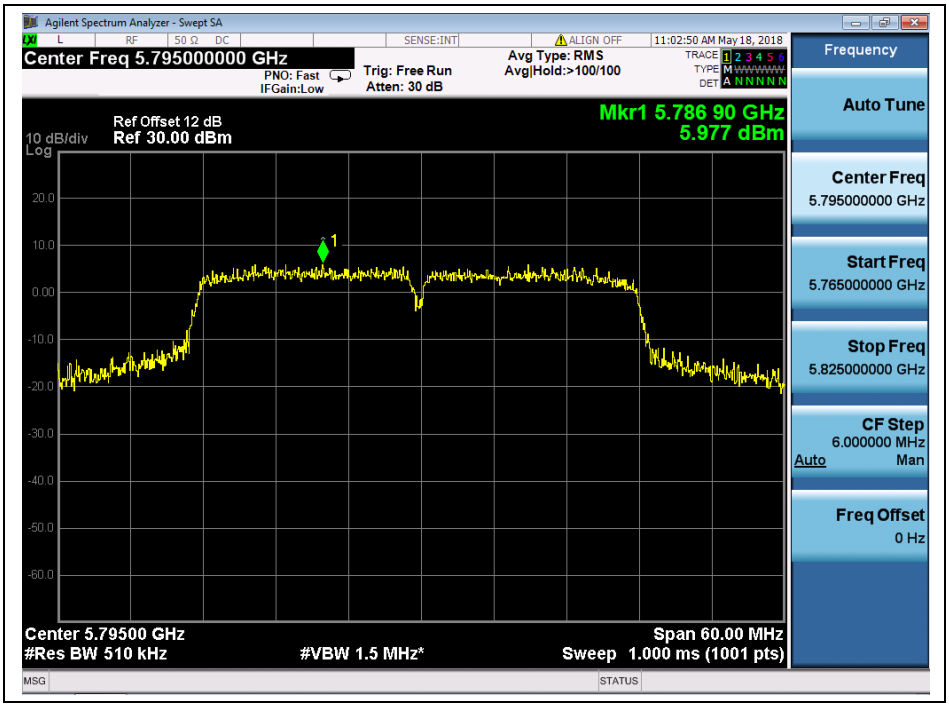


(Channel 38, 5190MHz, 802.11n (HT40))



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

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



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

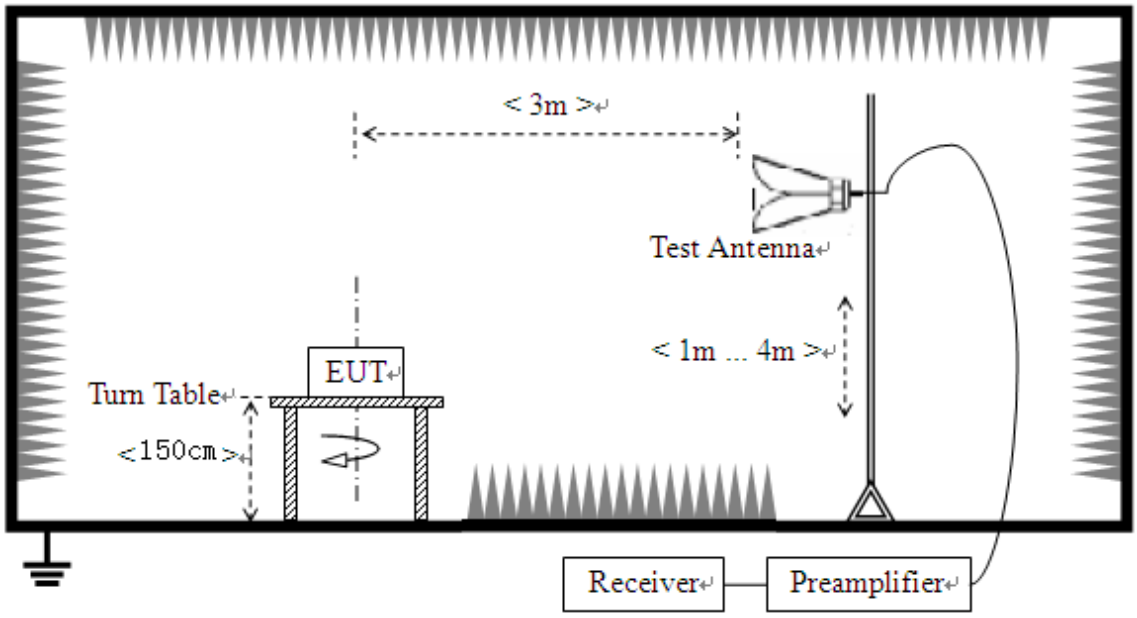
2.5. Restricted Frequency Bands

2.5.1. 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).

2.5.2. Test Description

A. 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.

2.5.3. Test Result

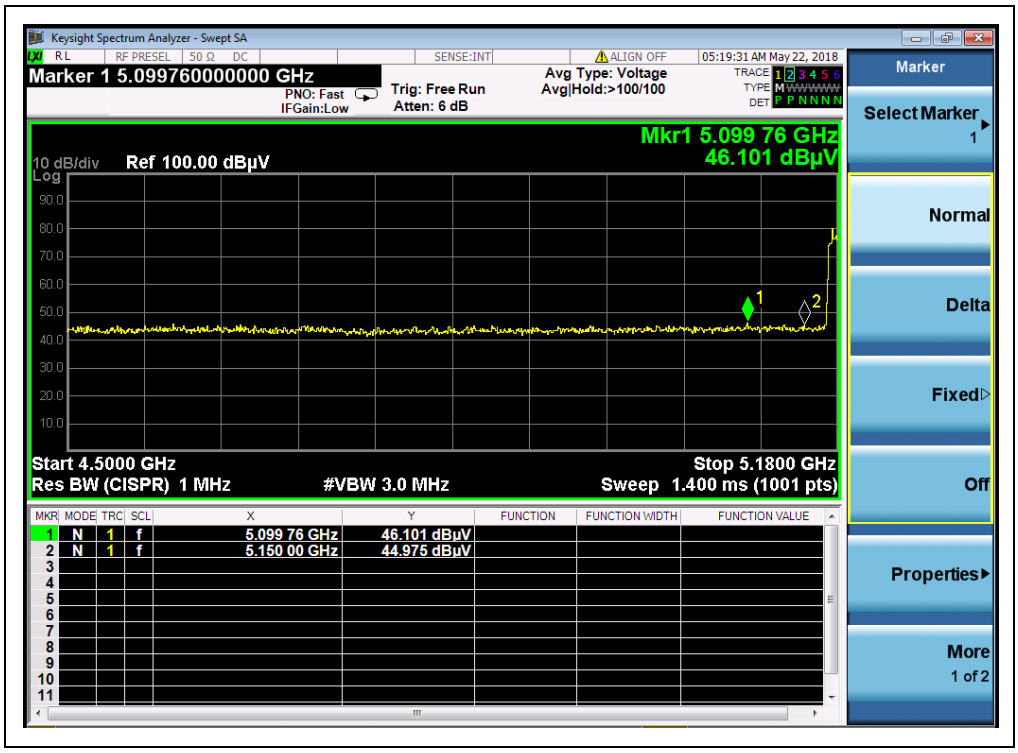
The lowest and highest channels are tested to verify Restricted Frequency Bands.
The measurement results are obtained as below:
E [dBμV/m] =U_R + A_T + A_{Factor} [dB]; A_T =$L_{Cable\ loss}$ [dB]-G_{preamp} [dB]
A_T: Total correction Factor except Antenna; U_R: Receiver Reading
G_{preamp}: Preamplifier 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

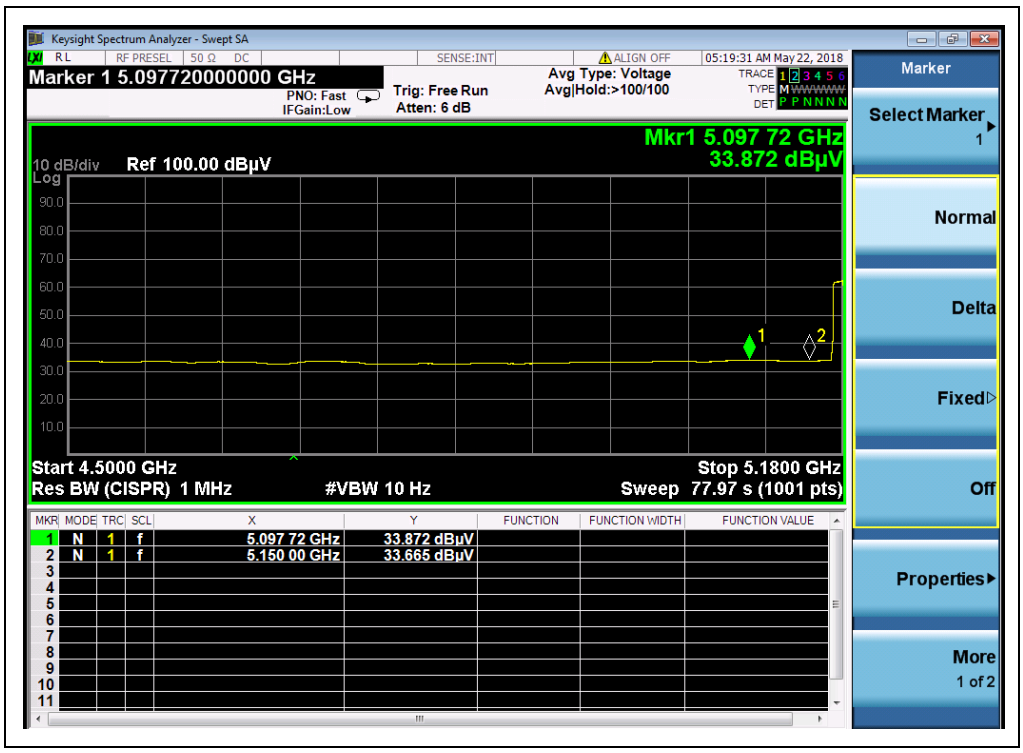
A. Test Verdict:

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	5099.76	PK	46.10	-50.65	32.11	27.56	74	PASS
36	5097.72	AV	33.87	-50.65	32.11	15.33	54	PASS
48	5357.50	PK	44.76	-50.65	32.11	26.22	74	PASS
48	5352.79	AV	34.40	-50.65	32.11	15.86	54	PASS
149	5720.00	PK	49.84	-50.65	32.11	31.30	110.83	PASS
149	5720.00	AV	40.02	-50.65	32.11	21.48	54	PASS
165	5855.00	PK	46.58	-50.65	32.11	28.04	110.83	PASS
165	5855.00	AV	38.02	-50.65	32.11	19.48	54	PASS

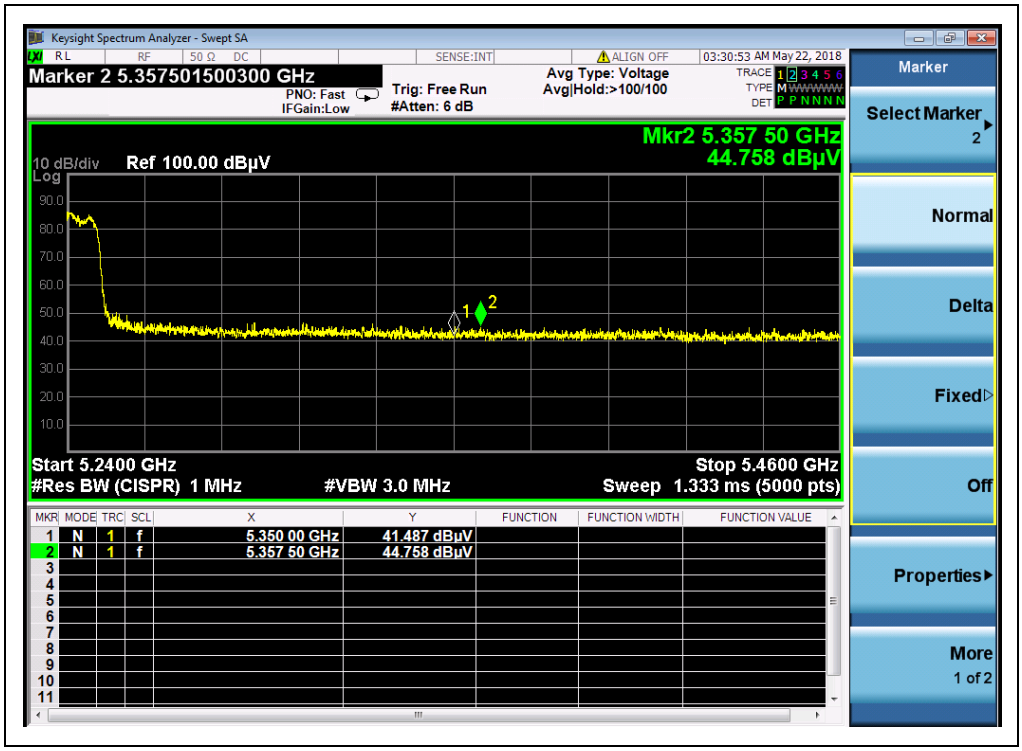
B. Test Plots:



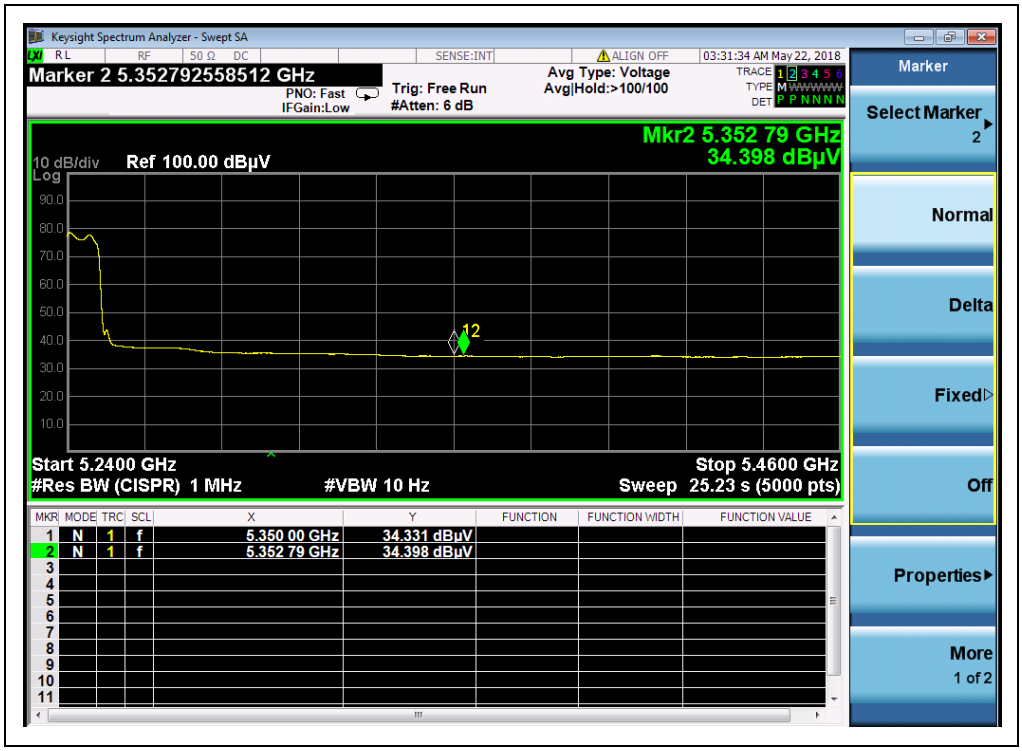
(Channel 36, PEAK, 802.11a)



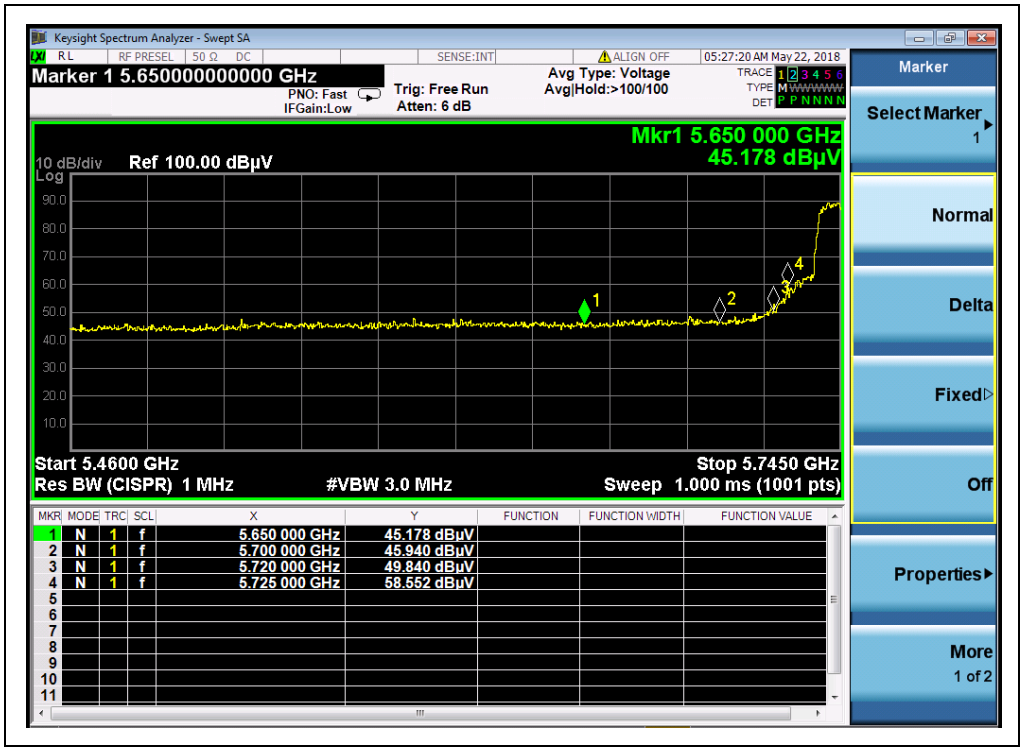
(Channel 36, AVG, 802.11a)



(Channel 48, PEAK, 802.11a)

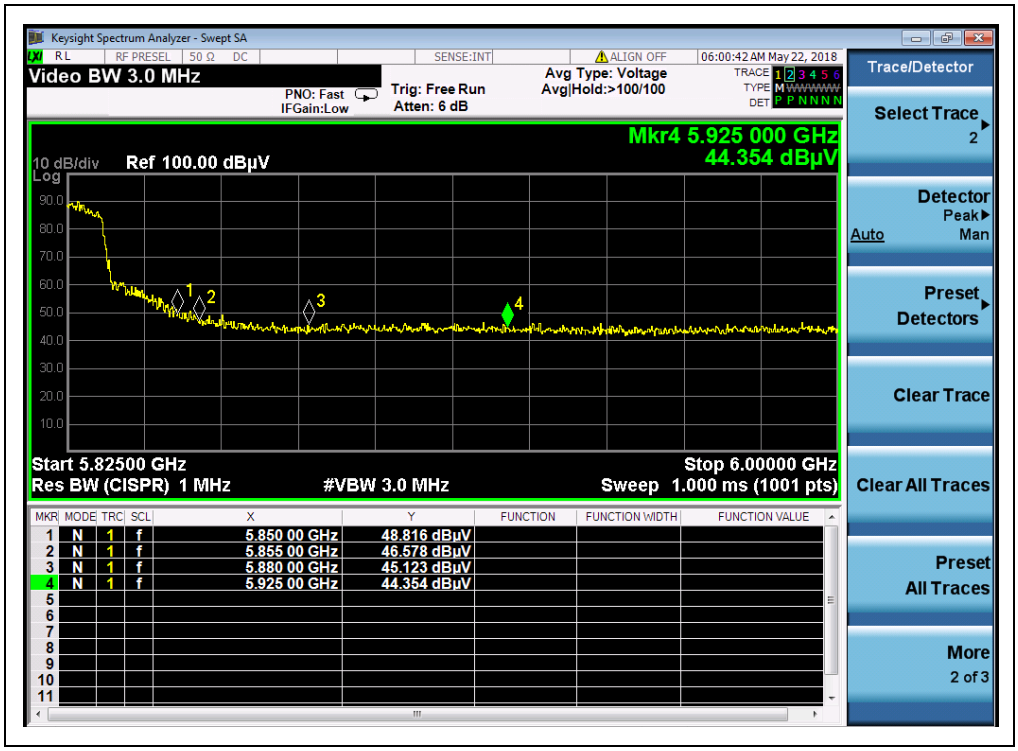


(Channel 48, AVG, 802.11a)

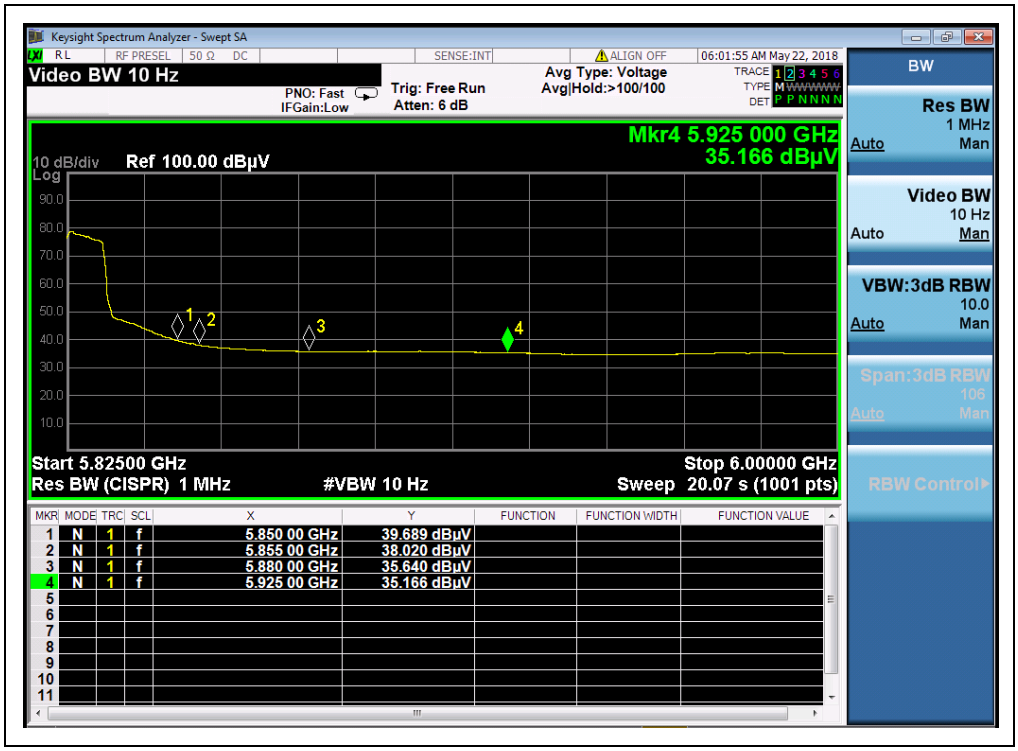


(Channel 149, PEAK, 802.11a)

(Channel 149, AVG, 802.11a)



(Channel 165, PEAK, 802.11a)



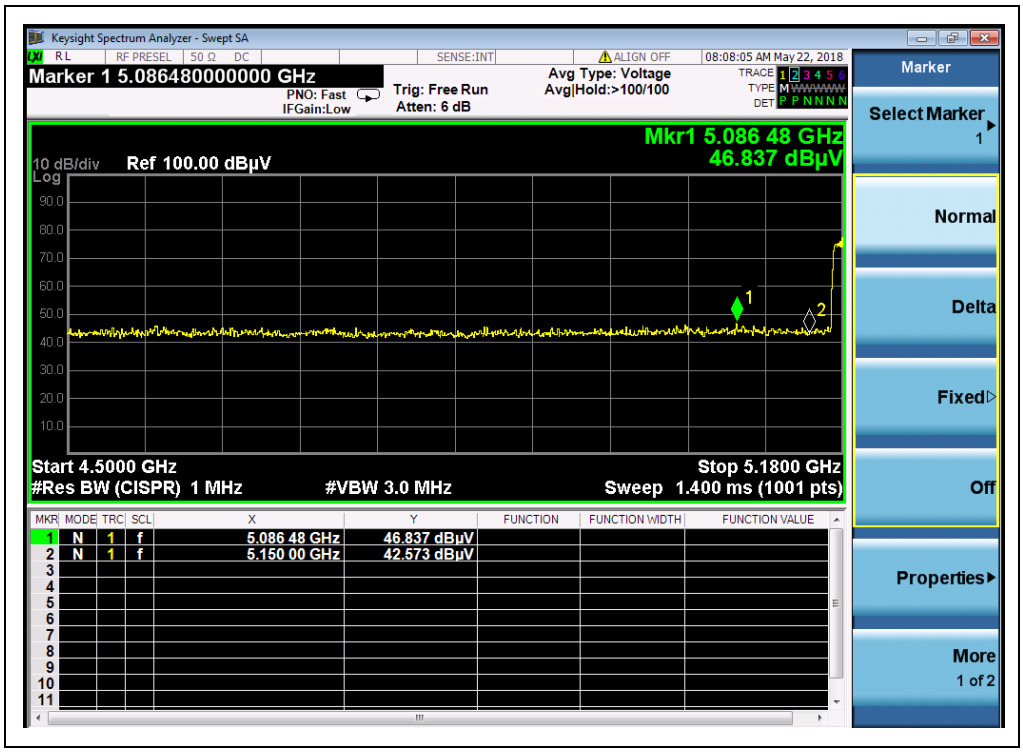
(Channel 165, AVG, 802.11a)

802.11n (HT20) Test mode

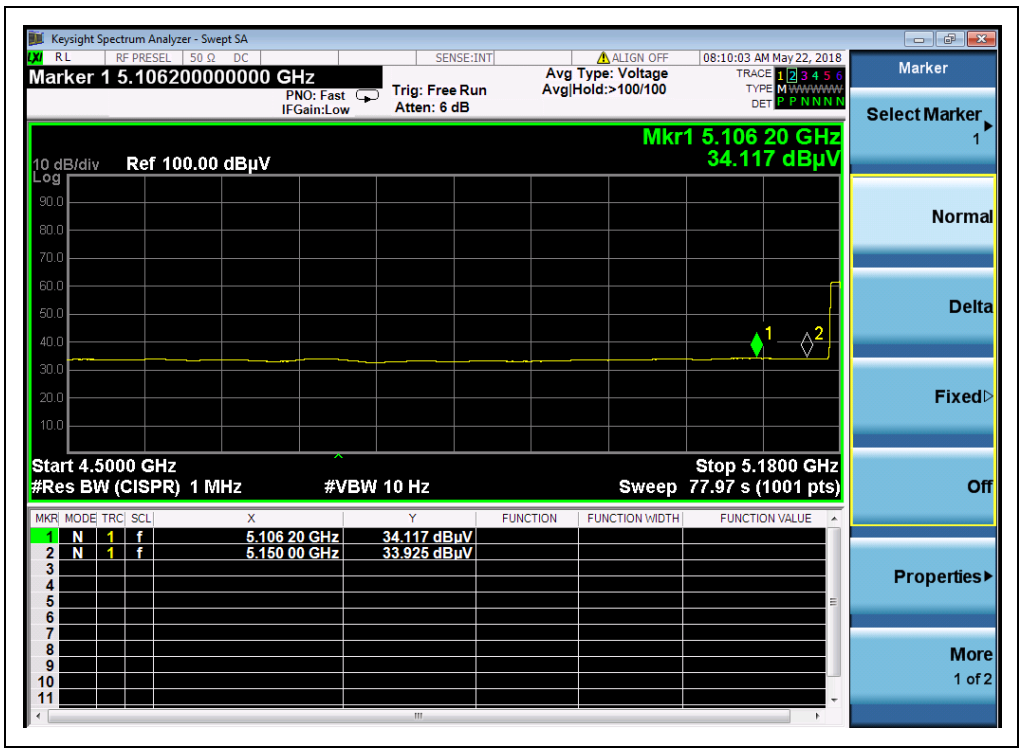
A. Test Verdict:

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	5086.48	PK	46.84	-50.65	32.11	28.3	74	PASS
36	5106.20	AV	34.12	-50.65	32.11	15.58	54	PASS
48	5352.84	PK	45.68	-50.65	32.11	27.14	74	PASS
48	5353.41	AV	34.50	-50.65	32.11	15.96	54	PASS
149	5720.00	PK	51.92	-50.65	32.11	33.38	110.83	PASS
149	5270.00	AV	38.62	-50.65	32.11	20.08	54	PASS
165	5880.00	PK	45.83	-50.65	32.11	27.29	101.53	PASS
165	5855.00	AV	37.20	-50.65	32.11	18.66	54	PASS

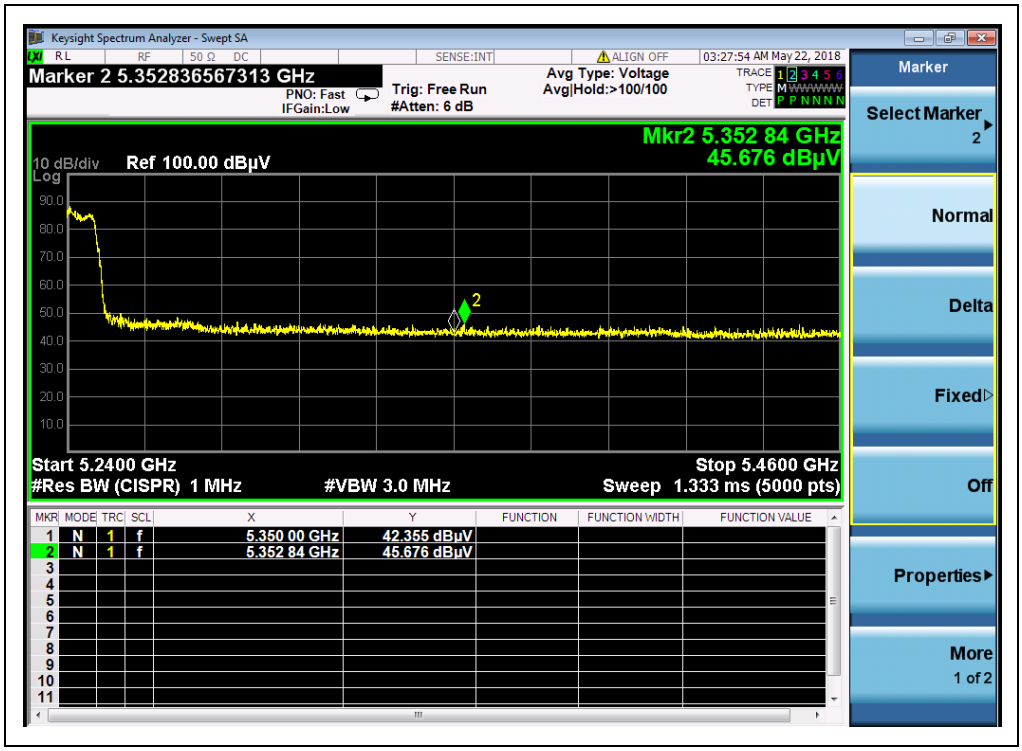
B. Test Plots:



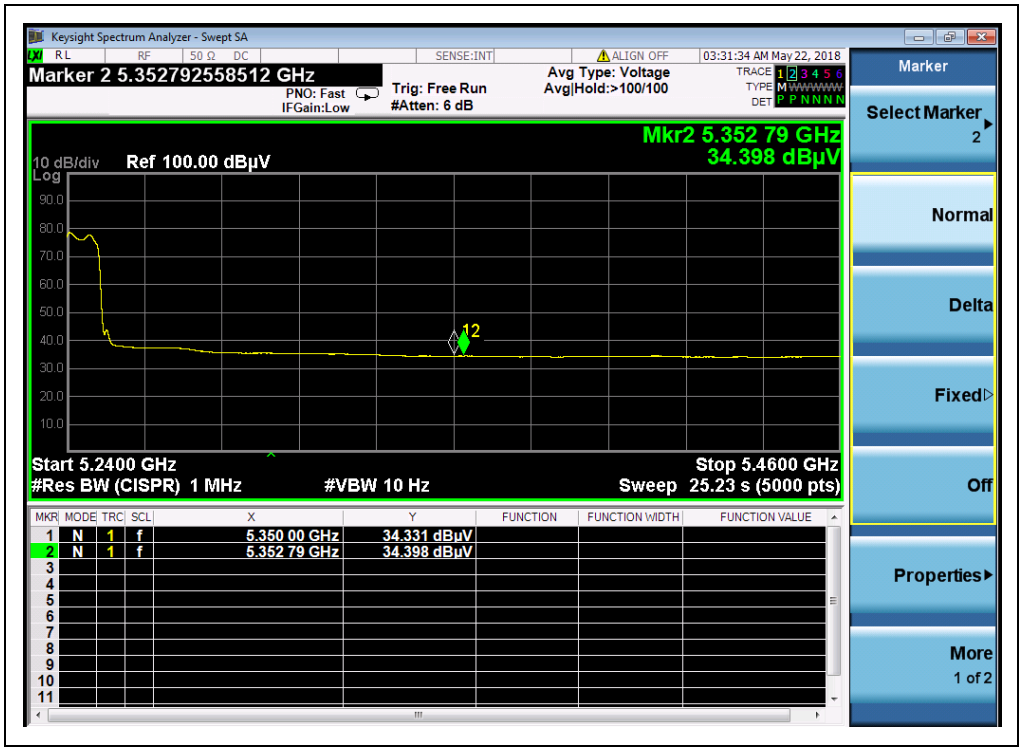
(Channel 36, PEAK, 802.11n (HT20))



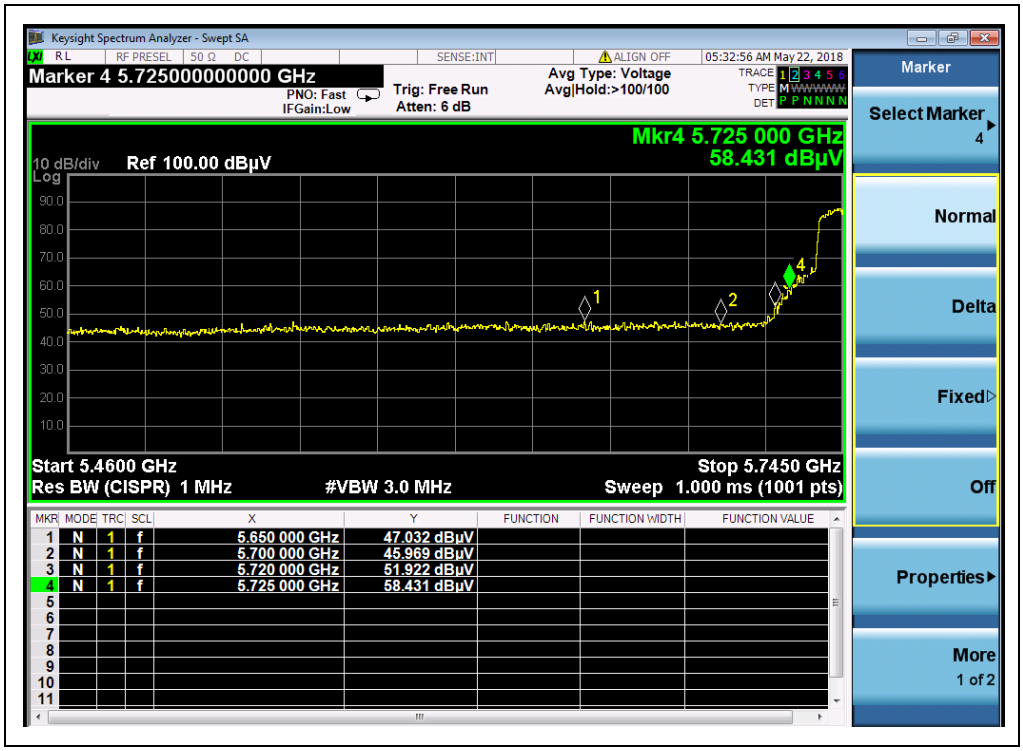
(Channel 36, AVG, 802.11 n (HT20))



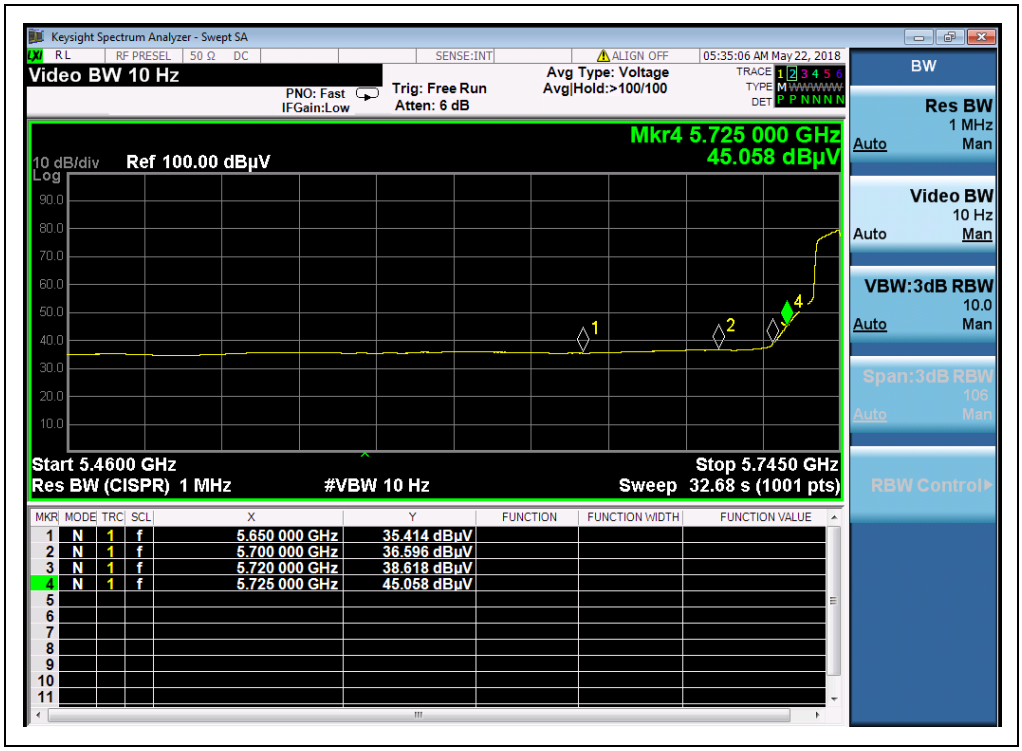
(Channel 48, PEAK, 802.11 n (HT20))



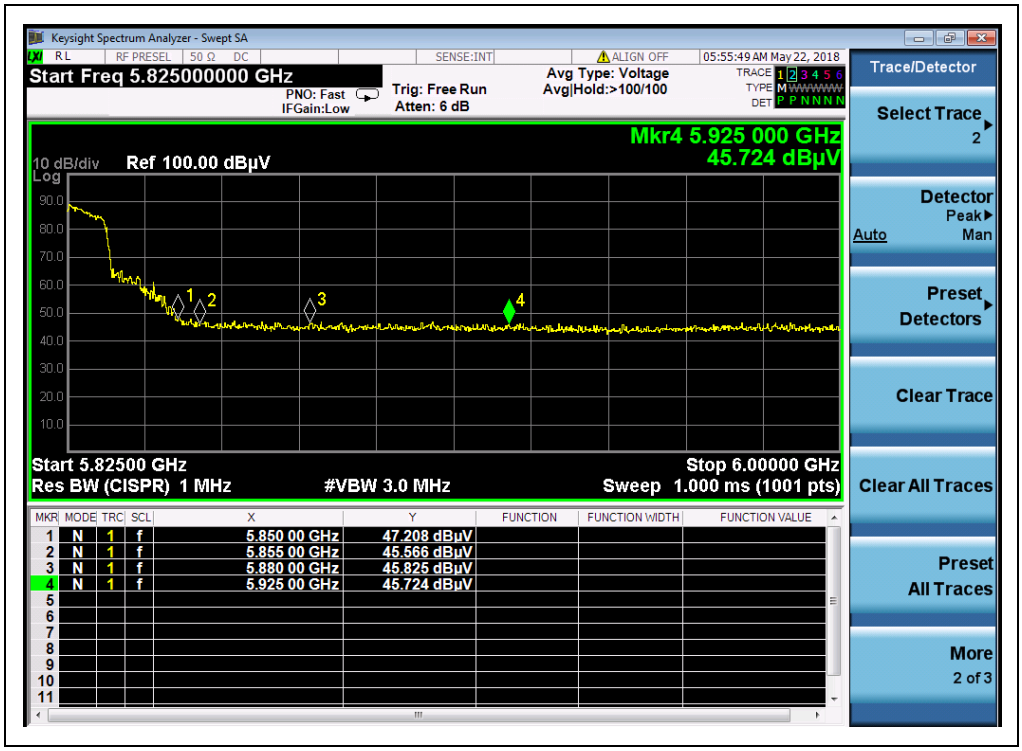
(Channel 64, AVG, 802.11n (HT20))



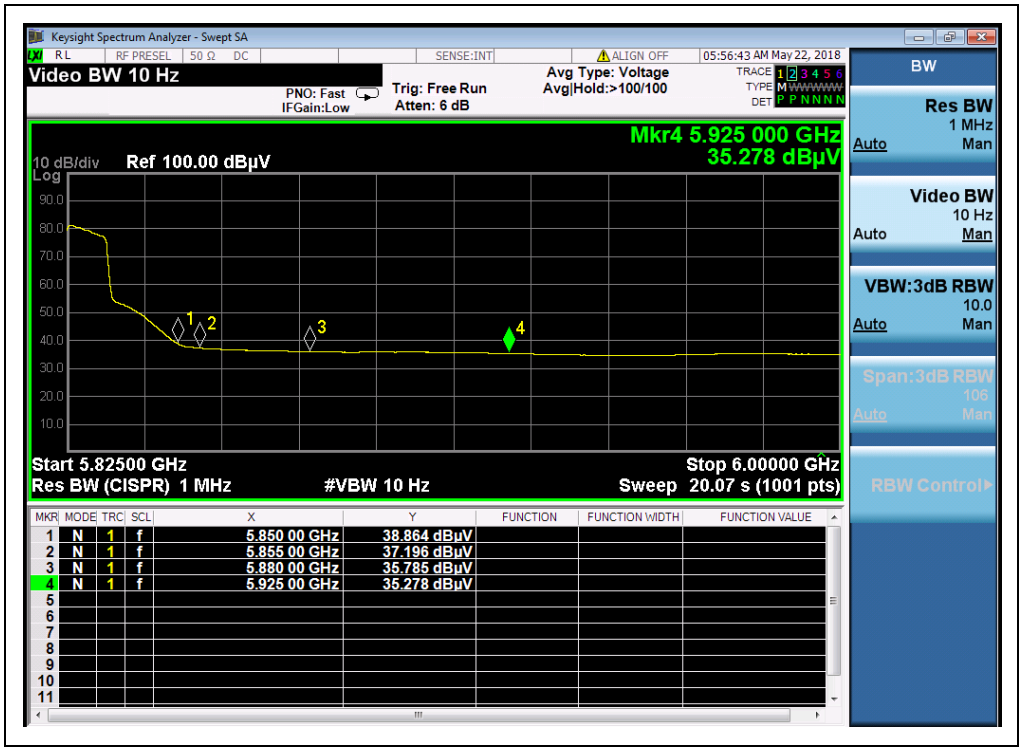
(Channel 149, PEAK, 802.11 n (HT20))



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



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



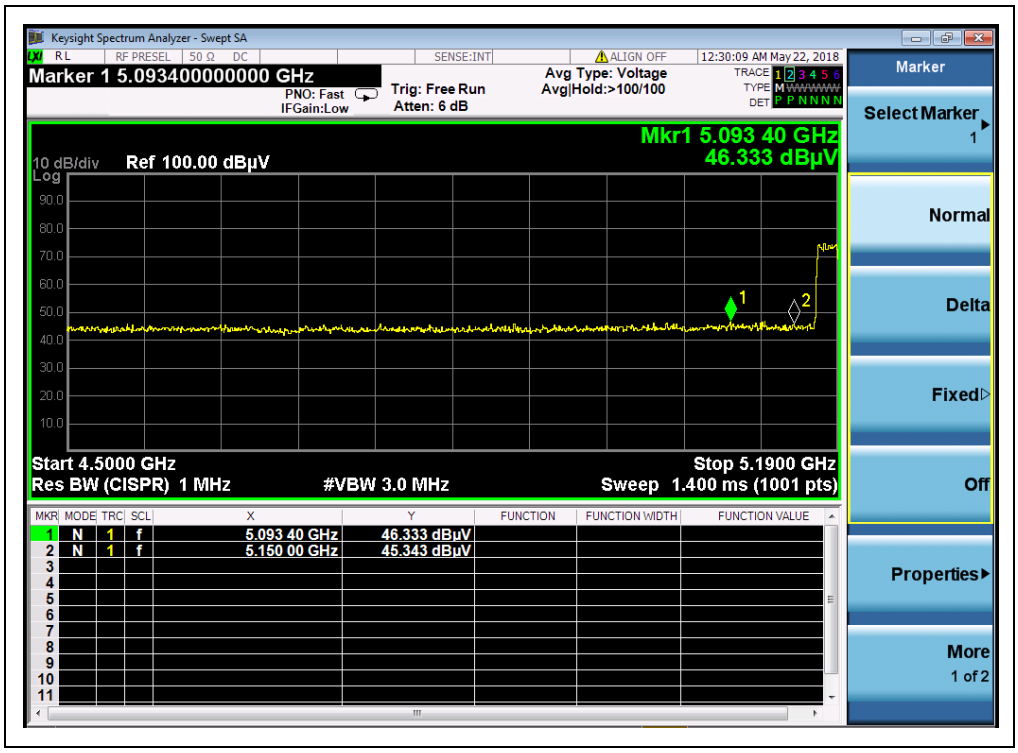
(Channel 165, AVG, 802.11n (HT20))

802.11n (HT40) Test mode

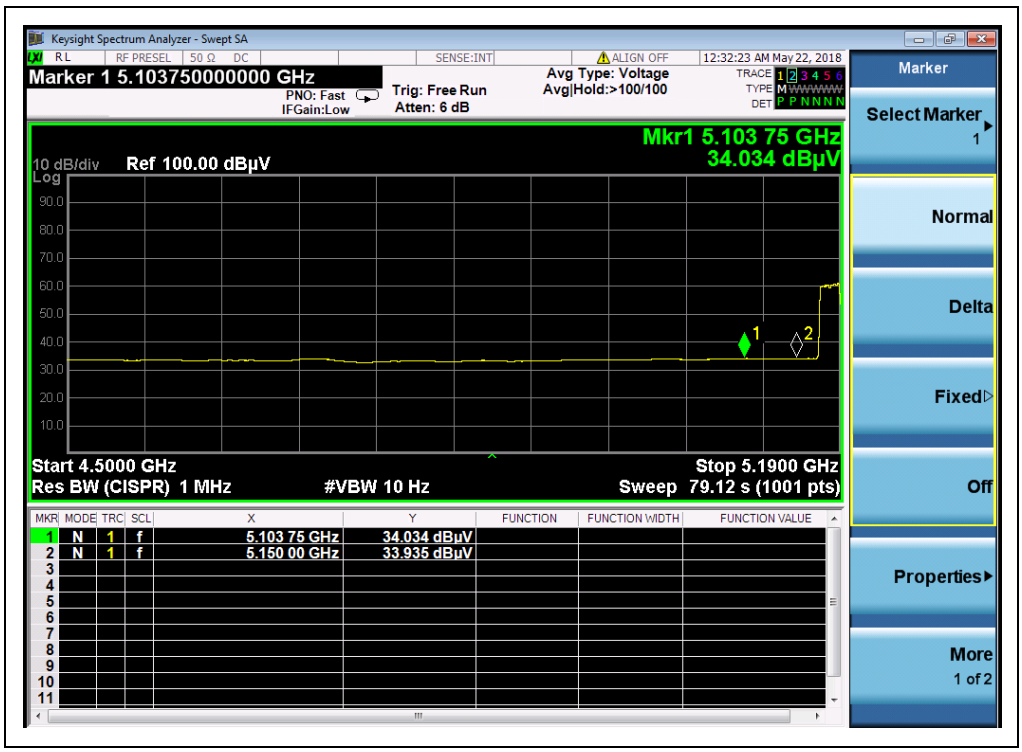
A. Test Verdict:

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	5093.40	PK	46.33	-50.65	32.11	27.79	74	PASS
38	5103.75	AV	34.03	-50.65	32.11	15.49	54	PASS
46	5396.76	PK	45.66	-50.65	32.11	27.12	74	PASS
46	5406.19	AV	34.45	-50.65	32.11	15.91	54	PASS
151	5720.00	PK	61.11	-50.65	32.11	42.57	110.83	PASS
151	5720.00	AV	48.10	-50.65	32.11	29.56	54	PASS
159	5880.00	PK	44.97	-50.65	32.11	26.43	101.53	PASS
159	5855.00	AV	36.64	-50.65	32.11	18.10	54	PASS

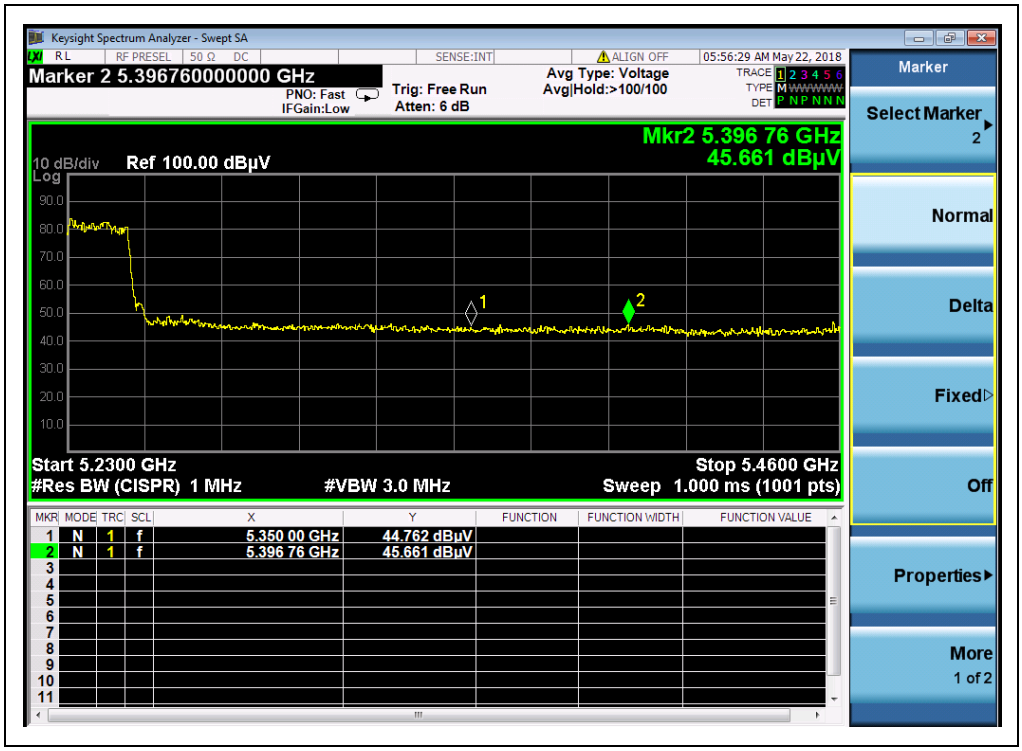
B. Test Plots:



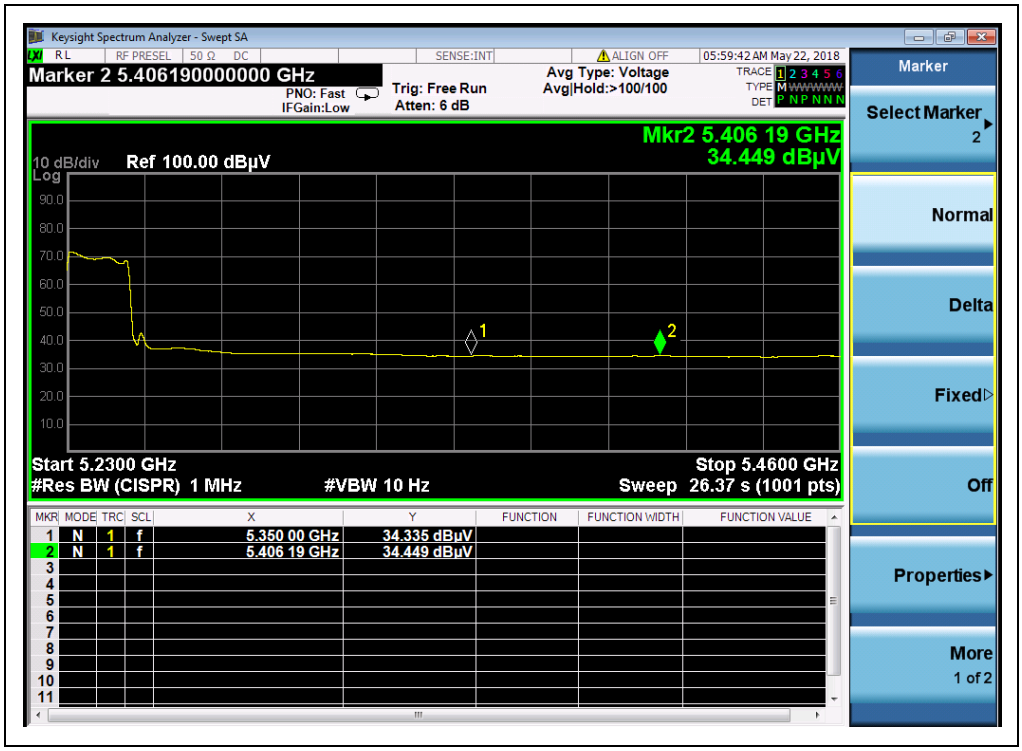
(Channel 38, PEAK, 802.11n (HT40))



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



(Channel 62, PEAK, 802.11n (HT40))



(Channel 62, AVG, 802.11n (HT40))

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

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

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

(Channel 159, AVG, 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 Procedure

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^{o} 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

Frequency Stability Measurements for UNII Band 1 (Ch. 36)

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq Dev. (Hz)	Deviation (%)
100%	14.52	+20(Ref)	5,179,999,978	-22	-0.0000004
100%		-30	5,180,000,033	33	0.0000006
100%		-20	5,180,000,041	41	0.0000008
100%		-10	5,179,999,972	-28	-0.0000005
100%		0	5,180,000,035	35	0.0000007
100%		+10	5,180,000,041	41	0.0000008
100%		+20	5,179,999,976	-24	-0.0000005
100%		+30	5,179,999,981	-19	-0.0000004
100%		+40	5,180,000,039	39	0.0000008
100%		+50	5,180,000,040	40	0.0000008
85%	12	+20	5,179,999,977	-23	-0.0000004
115%	19	+20	5,179,999,982	-18	-0.0000003

Frequency Stability Measurements for UNII Band 3 (Ch. 149)

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq Dev. (Hz)	Deviation (%)
100%	14.52	+20(Ref)	5,745,000,044	44	0.0000008
100%		-30	5,744,999,974	-26	-0.0000005
100%		-20	5,745,000,039	39	0.0000007
100%		-10	5,744,999,934	-66	-0.0000011
100%		0	5,745,000,045	45	0.0000008
100%		+10	5,744,999,971	-29	-0.0000005
100%		+20	5,745,000,043	43	0.0000007
100%		+30	5,745,000,050	50	0.0000009
100%		+40	5,744,999,969	-31	-0.0000005
100%		+50	5,745,000,035	35	0.0000006
85%	12	+20	5,745,000,045	45	0.0000008
115%	19	+20	5,744,999,976	-24	-0.0000004

Note: Based on the results of the frequency stability test shown above the frequency deviation results measured are very small. As such it is determined that the channels at the band edge would remain in-band when the maximum measured frequency deviation noted during the frequency stability tests is applied. Therefore the device is determined to remain operating in band over the temperature and voltage range as tested.

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

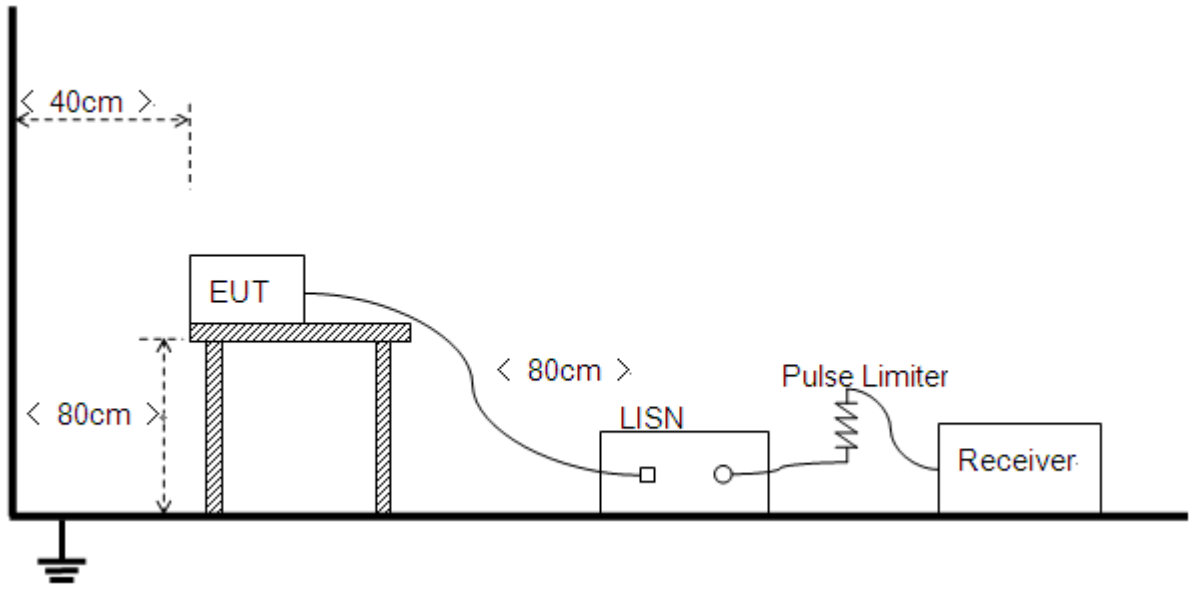
NOTE:

(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

A. 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.

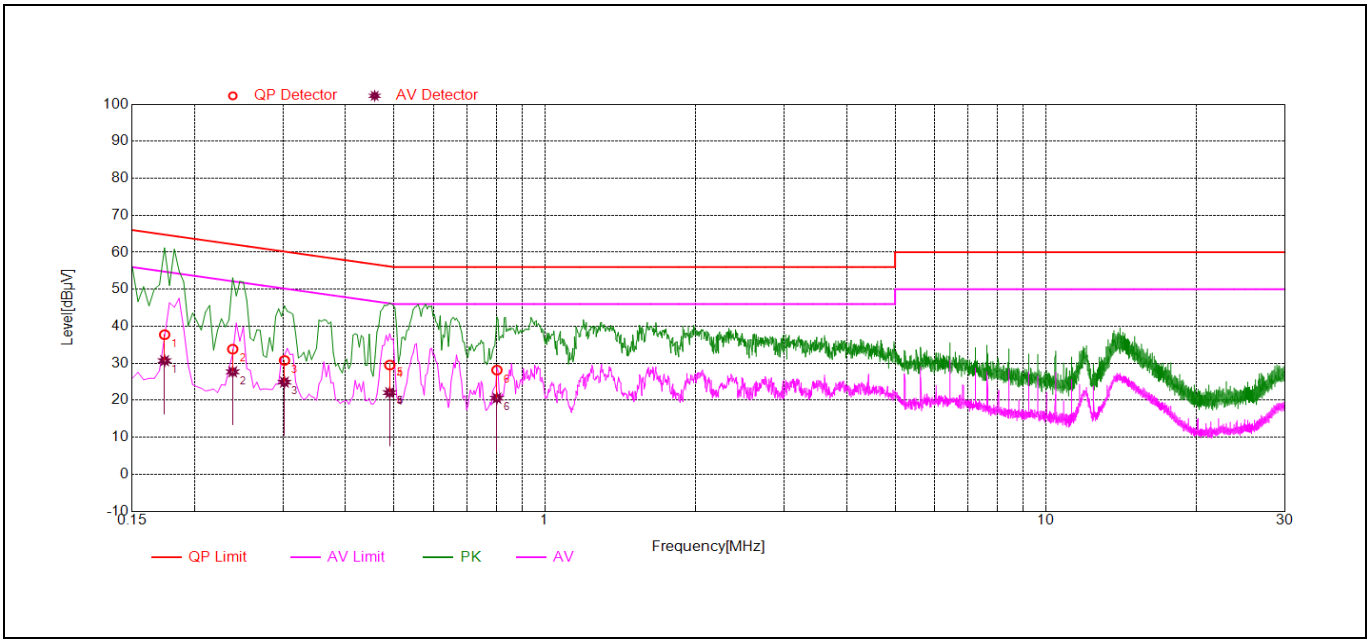
Note: Both of the test voltage AC 120V/60Hz and AC 230V/50Hz were considered and tested respectively, only the results of the worst case AC 120V/60Hz were recorded in this report.

A. Test setup:

The EUT configuration of the emission tests is EUT + Link.

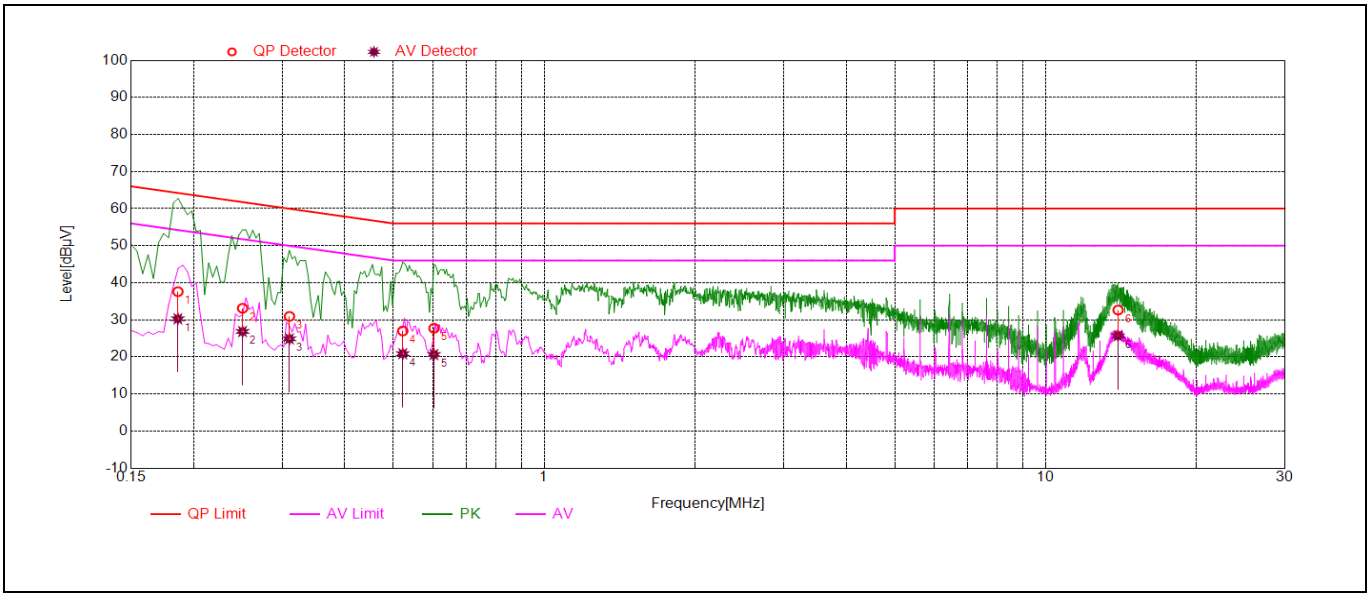
Note: The test voltage is AC 120V/60Hz.

B. Test Plots:



(Plot A: L Phase)

NO.	Fre. (MHz)	Emission Level (dBµV)		Limit (dBµV)		Power-line	Verdict
		Quai-peak	Average	Quai-peak	Average		
1	0.17	37.72	30.69	64.77	54.77	Line	PASS
2	0.24	33.81	27.69	62.17	52.17		PASS
3	0.30	30.77	24.91	60.19	50.19		PASS
4	0.49	29.52	22.06	56.17	46.17		PASS
5	0.49	30.03	22.22	56.17	46.17		PASS
6	0.80	28.15	20.56	56.00	46.00		PASS



(Plot B: N Phase)

NO.	Fre. (MHz)	Emission Level (dBµV)		Limit (dBµV)		Power-line	Verdict
		Quai-peak	Average	Quai-peak	Average		
1	0.19	37.61	30.28	64.23	54.23	Neutral	PASS
2	0.25	33.12	26.85	61.76	51.76		PASS
3	0.31	30.94	24.87	59.97	49.97		PASS
4	0.52	27.00	20.87	56.00	46.00		PASS
5	0.60	27.72	20.63	56.00	46.00		PASS
6	13.95	32.65	25.69	60.00	50.00		PASS

2.8. Radiated Emission

2.8.1. 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:

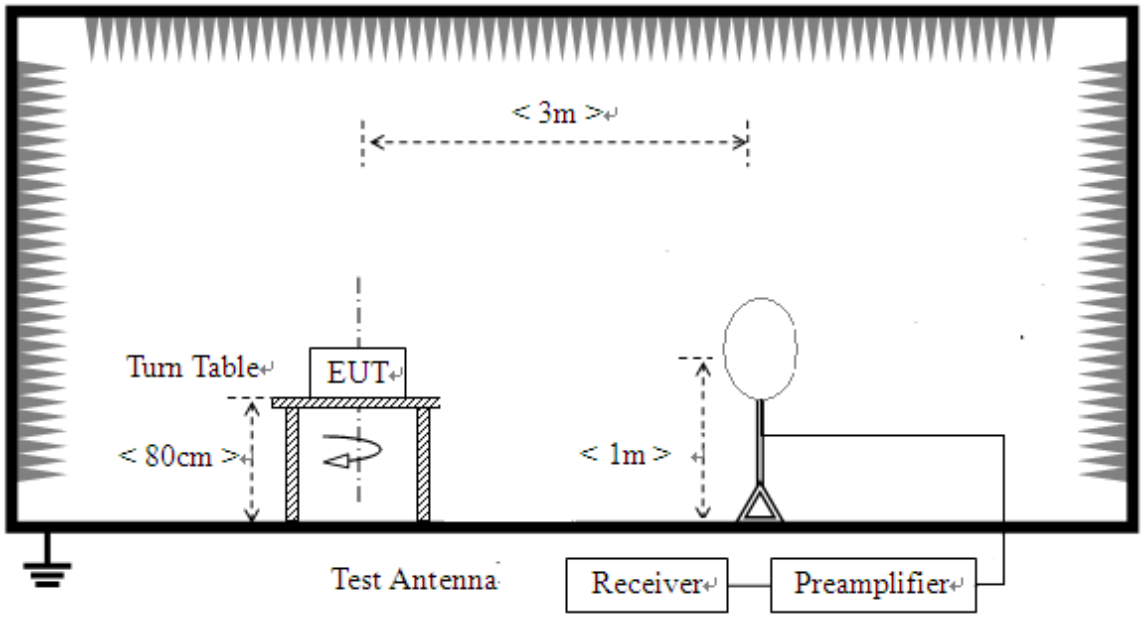
For Above 1000MHz, the emission limit in this paragraph is based on measurement instrumentation employing an average detector, measurement using instrumentation with a peak detector function, corresponding to 20dB above the maximum permitted average limit.

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)

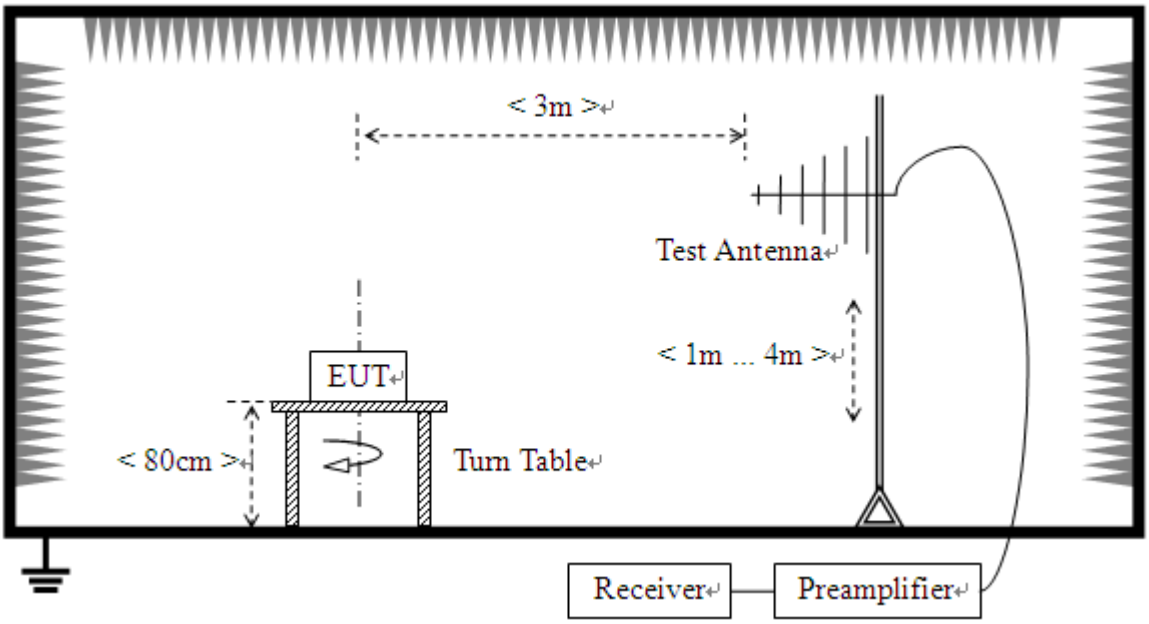
2.8.2. Test Description

A. Test Setup:

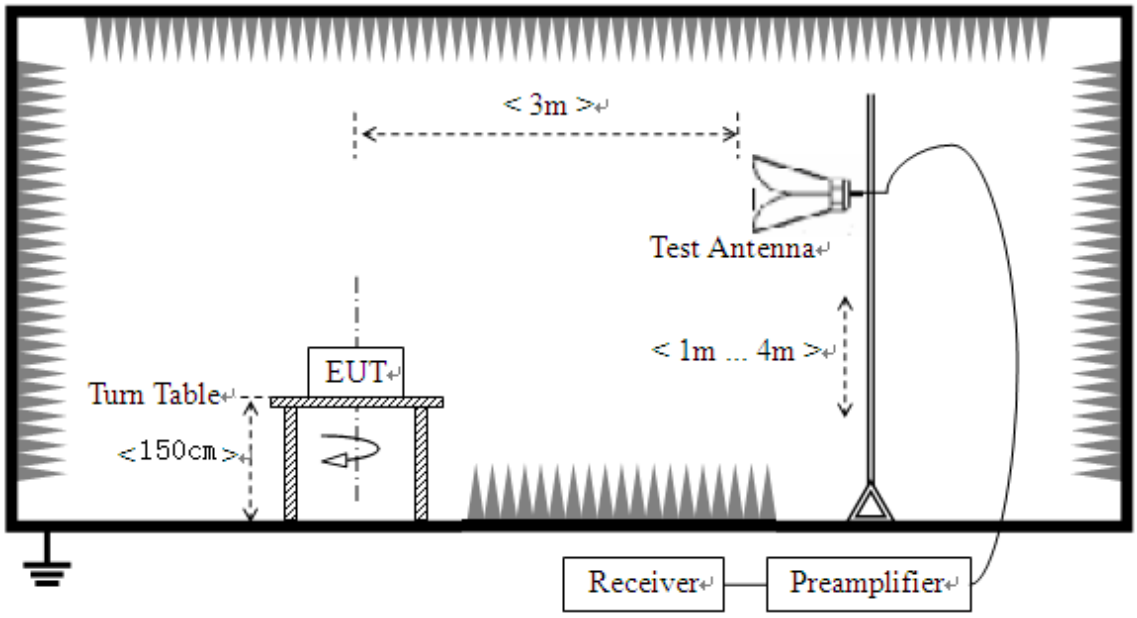
1) For radiated emissions from 9kHz to 30MHz



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.

2.8.3. 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.

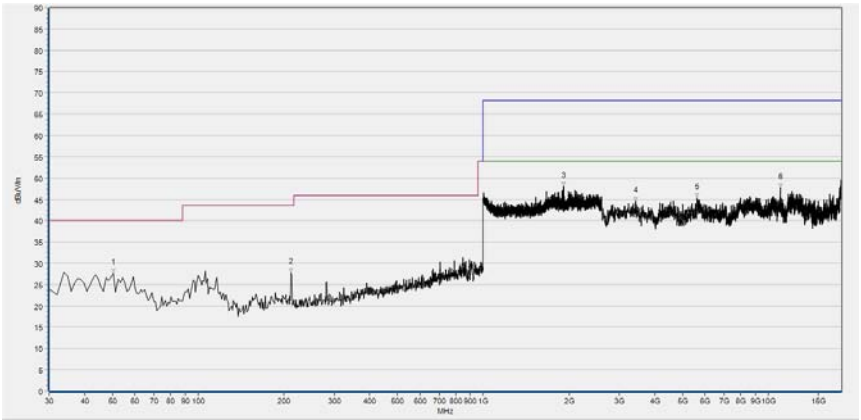
Note1: All radiated emission tests were performed in X, Y, Z axis direction. And only the worst axis test condition was recorded in this test report.

Note2: For the frequency, which started from 9 kHz 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 25GHz to 40GHz, was pre-scanned and the result which was 20dB lower than the limit was not recorded.

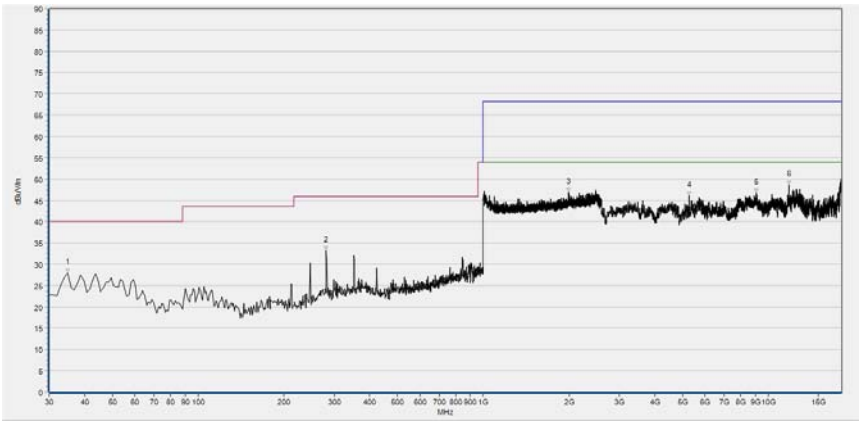
802.11a Test mode

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
50.390	27.60	N/A	N/A	N/A	40.00	N/A	Horizontal	PASS
211.572	27.89	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
1911.771	48.15	N/A	N/A	68.23	N/A	54.00	Horizontal	PASS
3428.966	44.50	N/A	N/A	68.23	N/A	54.00	Horizontal	PASS
5629.086	45.43	N/A	N/A	68.23	N/A	54.00	Horizontal	PASS
10997.199	47.69	N/A	N/A	68.23	N/A	54.00	Horizontal	PASS

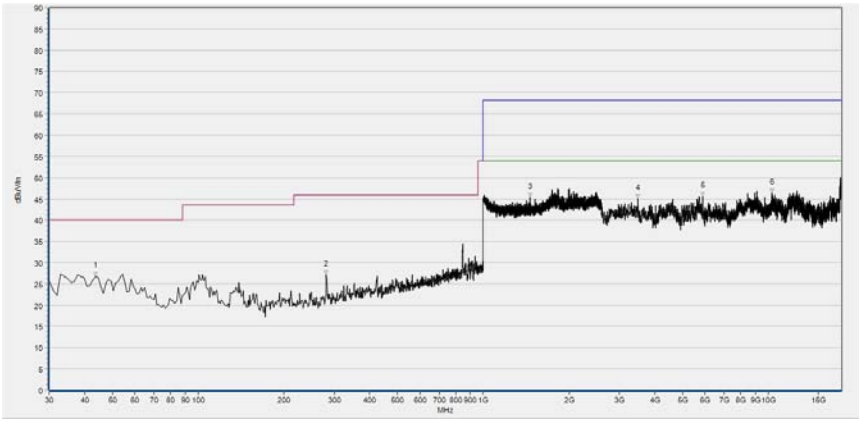
(Antenna Horizontal, 30MHz to 25GHz)



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
34.855	27.96	N/A	N/A	N/A	40.00	N/A	Vertical	PASS
281.481	33.24	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
1995.532	46.88	N/A	N/A	68.23	N/A	54.00	Vertical	PASS
5279.576	46.08	N/A	N/A	68.23	N/A	54.00	Vertical	PASS
9052.490	46.80	N/A	N/A	68.23	N/A	54.00	Vertical	PASS
11785.837	48.65	N/A	N/A	68.23	N/A	54.00	Vertical	PASS

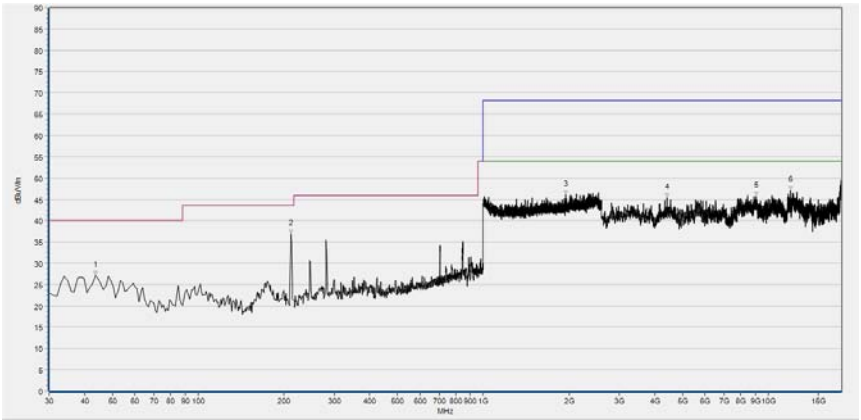
(Antenna Vertical, 30MHz to 25GHz)

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
43.594	26.75	N/A	N/A	N/A	40.00	N/A	Horizontal	PASS
281.481	27.16	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
1461.487	45.41	N/A	N/A	68.23	N/A	54.00	Horizontal	PASS
3491.698	45.16	N/A	N/A	68.23	N/A	54.00	Horizontal	PASS
5888.978	45.66	N/A	N/A	68.23	N/A	54.00	Horizontal	PASS
10289.218	46.42	N/A	N/A	68.23	N/A	54.00	Horizontal	PASS

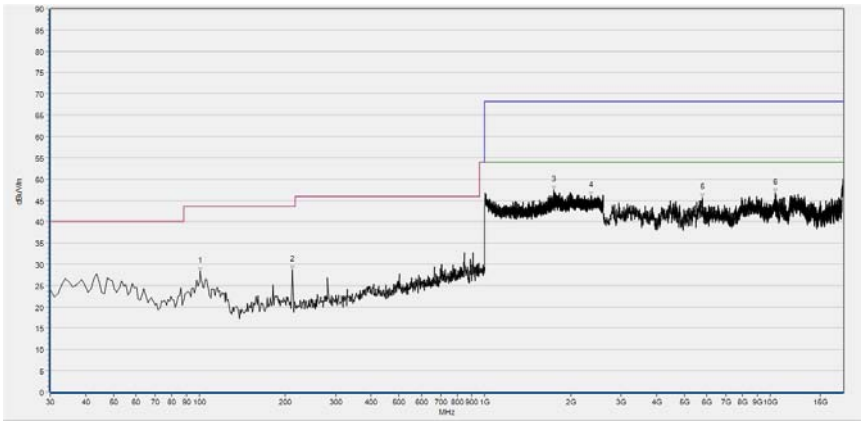
(Antenna Horizontal, 30MHz to 25GHz)



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
43.594	27.22	N/A	N/A	N/A	40.00	N/A	Vertical	PASS
211.572	36.84	N/A	N/A	N/A	43.50	N/A	Vertical	PASS
1943.248	46.12	N/A	N/A	68.23	N/A	54.00	Vertical	PASS
4410.282	45.36	N/A	N/A	68.23	N/A	54.00	Vertical	PASS
9043.529	45.83	N/A	N/A	68.23	N/A	54.00	Vertical	PASS
11982.997	47.13	N/A	N/A	68.23	N/A	54.00	Vertical	PASS

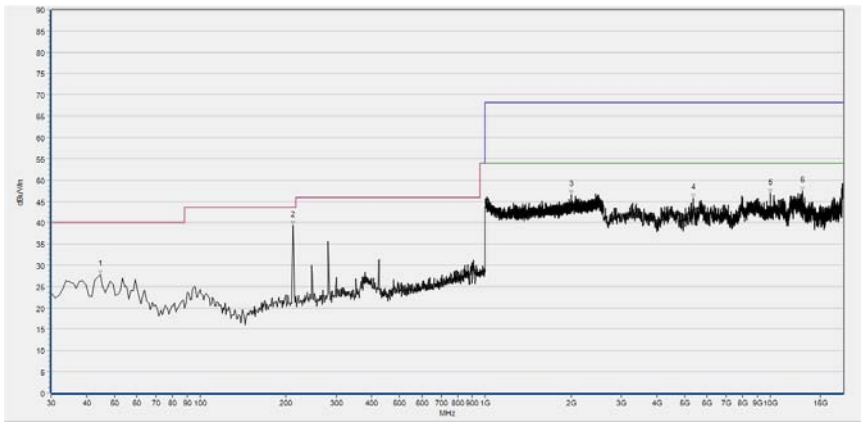
(Antenna Vertical, 30MHz to 25GHz)

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
100.881	28.25	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
211.572	28.62	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
1747.983	47.37	N/A	N/A	68.23	N/A	54.00	Horizontal	PASS
2353.518	46.01	N/A	N/A	68.23	N/A	54.00	Horizontal	PASS
5776.955	45.61	N/A	N/A	68.23	N/A	54.00	Horizontal	PASS
10401.240	46.74	N/A	N/A	68.23	N/A	54.00	Horizontal	PASS

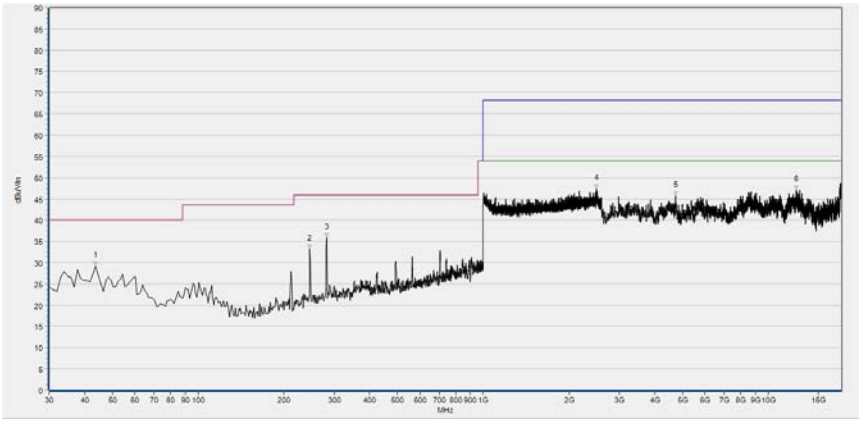
(Antenna Horizontal, 30MHz to 25GHz)



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
44.565	27.80	N/A	N/A	N/A	40.00	N/A	Vertical	PASS
211.572	39.38	N/A	N/A	N/A	43.50	N/A	Vertical	PASS
2008.336	46.61	N/A	N/A	68.23	N/A	54.00	Vertical	PASS
5351.270	45.74	N/A	N/A	68.23	N/A	54.00	Vertical	PASS
10006.921	46.96	N/A	N/A	68.23	N/A	54.00	Vertical	PASS
12923.985	47.48	N/A	N/A	68.23	N/A	54.00	Vertical	PASS

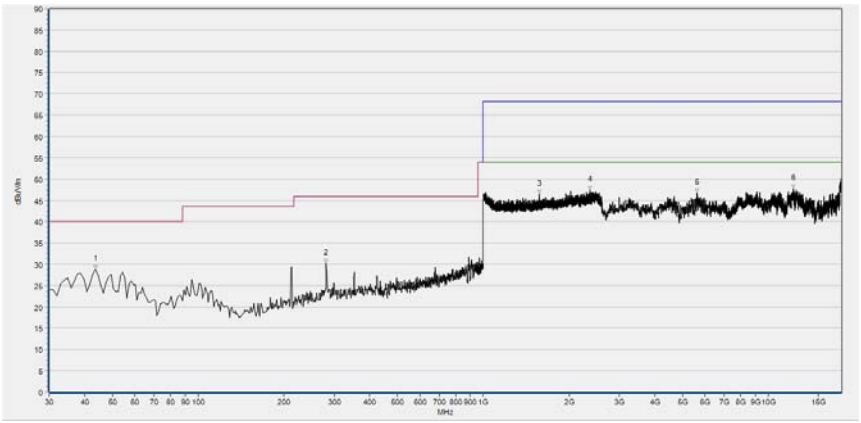
(Antenna Vertical, 30MHz to 25GHz)

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
43.594	29.15	N/A	N/A	N/A	40.00	N/A	Horizontal	PASS
246.527	33.21	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
282.452	35.81	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
2490.097	47.43	N/A	N/A	68.23	N/A	54.00	Horizontal	PASS
4732.907	45.80	N/A	N/A	68.23	N/A	54.00	Horizontal	PASS
12493.819	47.03	N/A	N/A	68.23	N/A	54.00	Horizontal	PASS

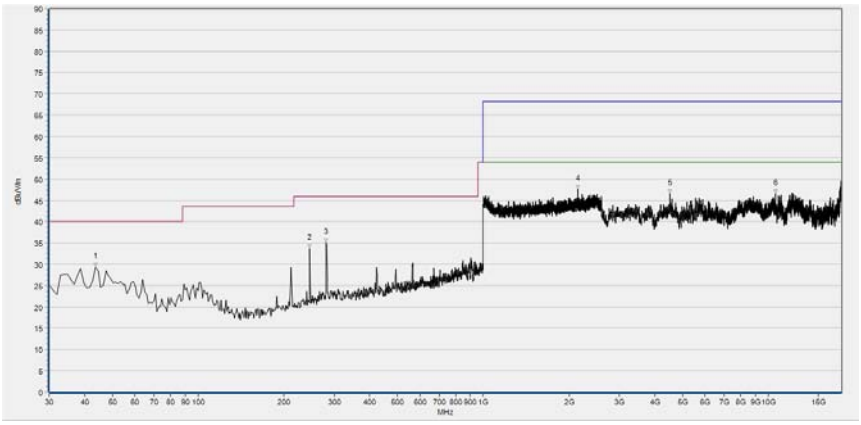
(Antenna Horizontal, 30MHz to 25GHz)



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
43.594	28.86	N/A	N/A	N/A	40.00	N/A	Vertical	PASS
281.481	30.14	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
1574.592	46.44	N/A	N/A	68.23	N/A	54.00	Vertical	PASS
2372.191	47.36	N/A	N/A	68.23	N/A	54.00	Vertical	PASS
5633.567	46.82	N/A	N/A	68.23	N/A	54.00	Vertical	PASS
12238.408	47.70	N/A	N/A	68.23	N/A	54.00	Vertical	PASS

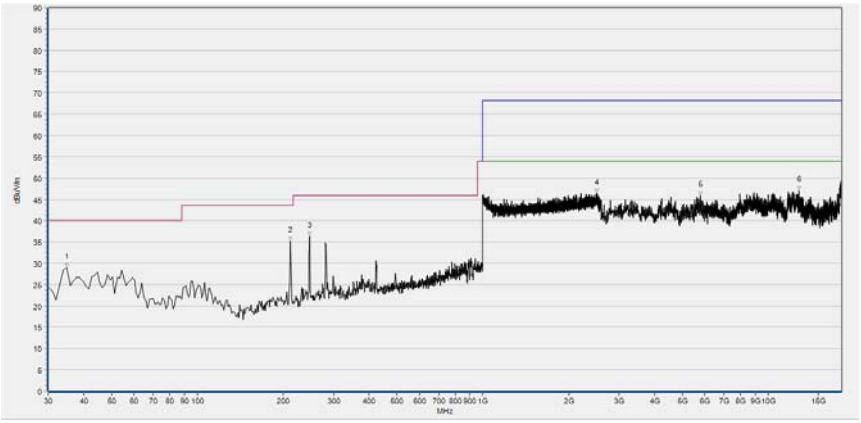
(Antenna Vertical, 30MHz to 25GHz)

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
43.594	29.33	N/A	N/A	N/A	40.00	N/A	Horizontal	PASS
246.527	33.70	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
281.481	35.05	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
2147.583	47.64	N/A	N/A	68.23	N/A	54.00	Horizontal	PASS
4513.343	46.54	N/A	N/A	68.23	N/A	54.00	Horizontal	PASS
10571.514	46.53	N/A	N/A	68.23	N/A	54.00	Horizontal	PASS

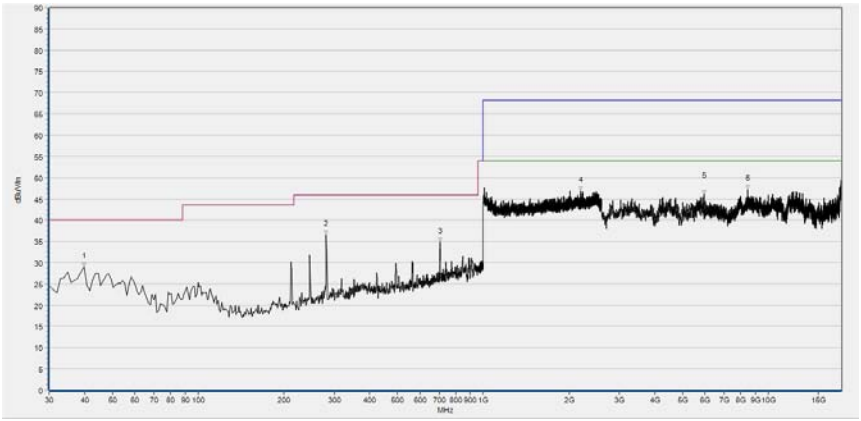
(Antenna Horizontal, 30MHz to 25GHz)



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
34.855	29.07	N/A	N/A	N/A	40.00	N/A	Vertical	PASS
211.572	35.25	N/A	N/A	N/A	43.50	N/A	Vertical	PASS
247.497	36.28	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
2507.703	46.39	N/A	N/A	68.23	N/A	54.00	Vertical	PASS
5794.879	46.00	N/A	N/A	68.23	N/A	54.00	Vertical	PASS
12785.077	47.16	N/A	N/A	68.23	N/A	54.00	Vertical	PASS

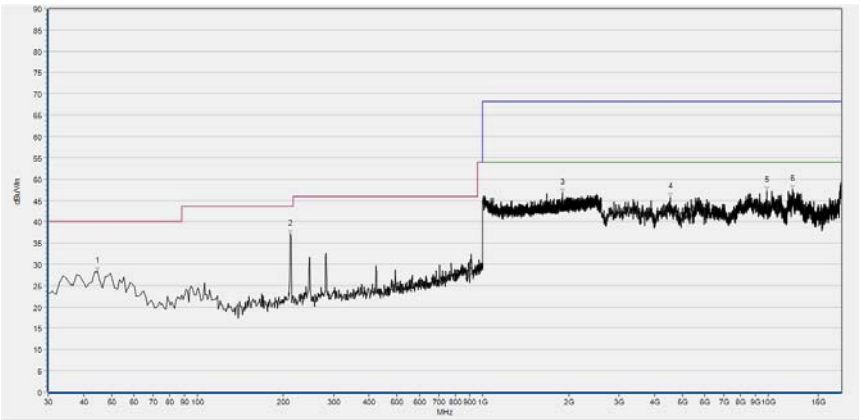
(Antenna Vertical, 30MHz to 25GHz)

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
39.710	29.07	N/A	N/A	N/A	40.00	N/A	Horizontal	PASS
281.481	36.53	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
703.854	34.83	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
2199.333	46.92	N/A	N/A	68.23	N/A	54.00	Horizontal	PASS
5938.268	46.07	N/A	N/A	68.23	N/A	54.00	Horizontal	PASS
8447.570	47.22	N/A	N/A	68.23	N/A	54.00	Horizontal	PASS

(Antenna Horizontal, 30MHz to 25GHz)

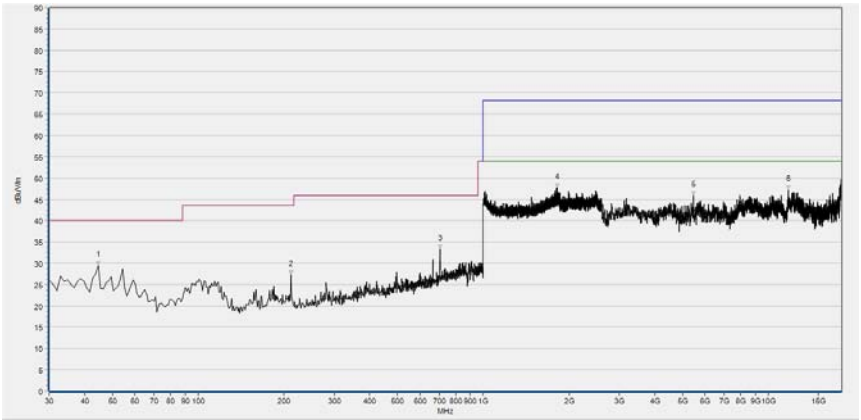


Fre. (MHz)	Pk (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
44.565	28.33	N/A	N/A	N/A	40.00	N/A	Vertical	PASS
211.572	37.01	N/A	N/A	N/A	43.50	N/A	Vertical	PASS
1903.768	46.74	N/A	N/A	68.23	N/A	54.00	Vertical	PASS
4531.266	45.74	N/A	N/A	68.23	N/A	54.00	Vertical	PASS
9903.861	47.21	N/A	N/A	68.23	N/A	54.00	Vertical	PASS
12157.752	47.64	N/A	N/A	68.23	N/A	54.00	Vertical	PASS

(Antenna Vertical, 30MHz to 25GHz)

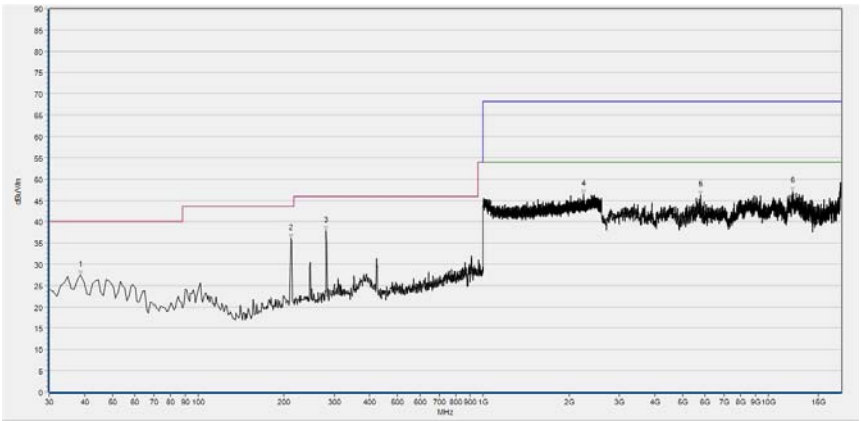
802.11n (HT20) Test mode

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
44.565	29.57	N/A	N/A	N/A	40.00	N/A	Horizontal	PASS
211.572	27.33	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
703.854	33.43	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
1813.605	47.84	N/A	N/A	68.23	N/A	54.00	Horizontal	PASS
5463.293	45.96	N/A	N/A	68.23	N/A	54.00	Horizontal	PASS
11772.394	47.24	N/A	N/A	68.23	N/A	54.00	Horizontal	PASS

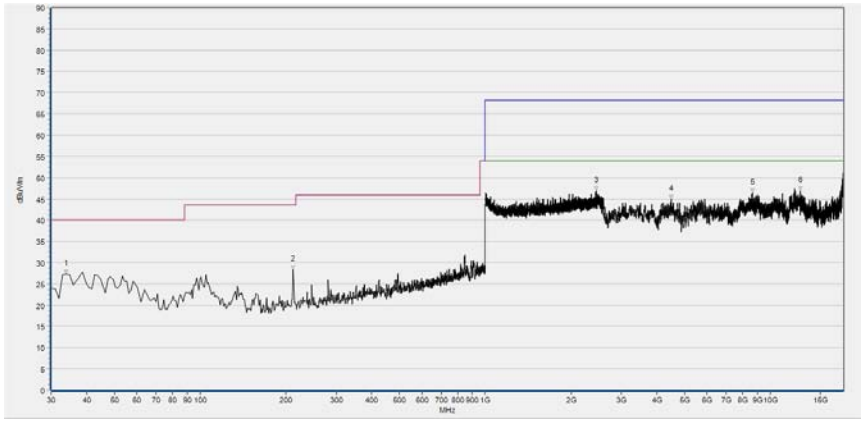
(Antenna Horizontal, 30MHz to 25GHz)



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
38.739	27.55	N/A	N/A	N/A	40.00	N/A	Vertical	PASS
211.572	36.00	N/A	N/A	N/A	43.50	N/A	Vertical	PASS
281.481	37.94	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
2249.483	46.47	N/A	N/A	68.23	N/A	54.00	Vertical	PASS
5799.360	46.33	N/A	N/A	68.23	N/A	54.00	Vertical	PASS
12162.232	47.04	N/A	N/A	68.23	N/A	54.00	Vertical	PASS

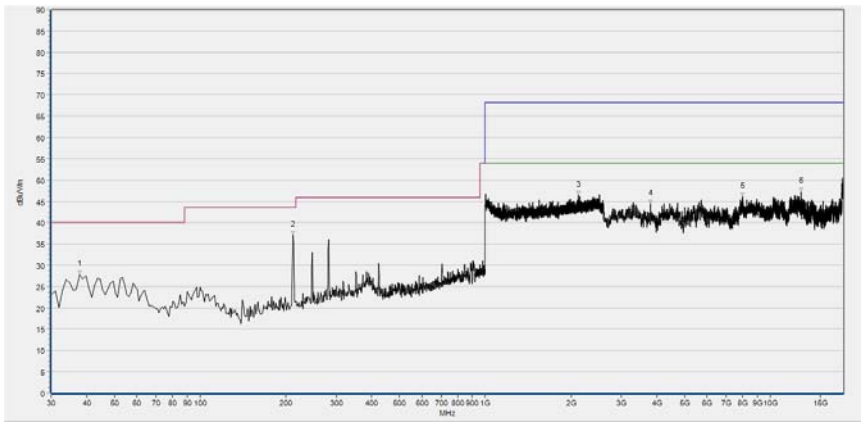
(Antenna Vertical, 30MHz to 25GHz)

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
33.884	27.30	N/A	N/A	N/A	40.00	N/A	Horizontal	PASS
211.572	28.36	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
2444.748	47.00	N/A	N/A	68.23	N/A	54.00	Horizontal	PASS
4499.900	44.83	N/A	N/A	68.23	N/A	54.00	Horizontal	PASS
8635.767	46.38	N/A	N/A	68.23	N/A	54.00	Horizontal	PASS
12717.864	46.86	N/A	N/A	68.23	N/A	54.00	Horizontal	PASS

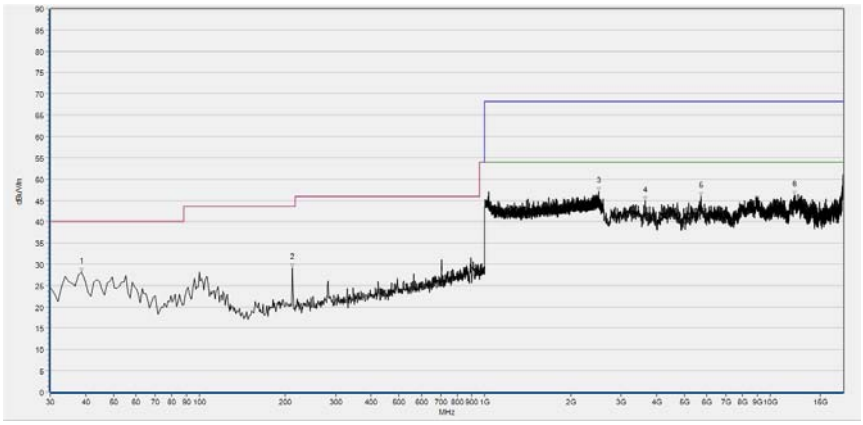
(Antenna Horizontal, 30MHz to 25GHz)



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
37.768	27.87	N/A	N/A	N/A	40.00	N/A	Vertical	PASS
211.572	37.04	N/A	N/A	N/A	43.50	N/A	Vertical	PASS
2117.706	46.39	N/A	N/A	68.23	N/A	54.00	Vertical	PASS
3800.880	44.46	N/A	N/A	68.23	N/A	54.00	Vertical	PASS
8008.442	46.06	N/A	N/A	68.23	N/A	54.00	Vertical	PASS
12780.596	47.34	N/A	N/A	68.23	N/A	54.00	Vertical	PASS

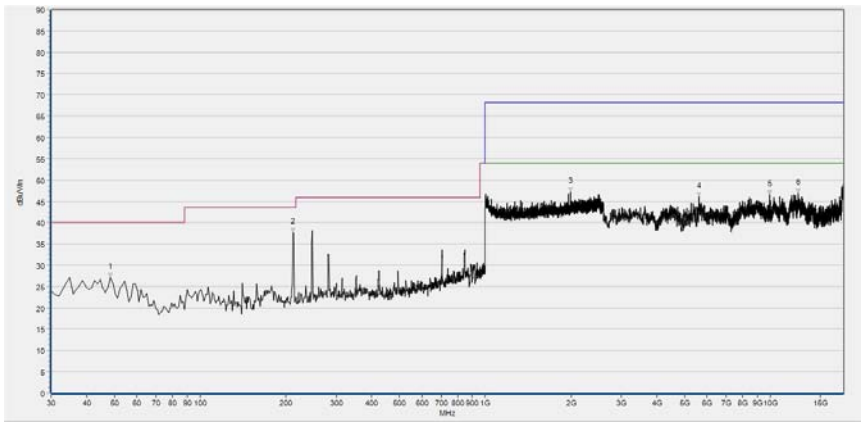
(Antenna Vertical, 30MHz to 25GHz)

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
38.739	28.11	N/A	N/A	N/A	40.00	N/A	Horizontal	PASS
211.572	29.18	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
2502.367	47.03	N/A	N/A	68.23	N/A	54.00	Horizontal	PASS
3653.011	44.86	N/A	N/A	68.23	N/A	54.00	Horizontal	PASS
5723.185	45.96	N/A	N/A	68.23	N/A	54.00	Horizontal	PASS
12162.232	46.24	N/A	N/A	68.23	N/A	54.00	Horizontal	PASS

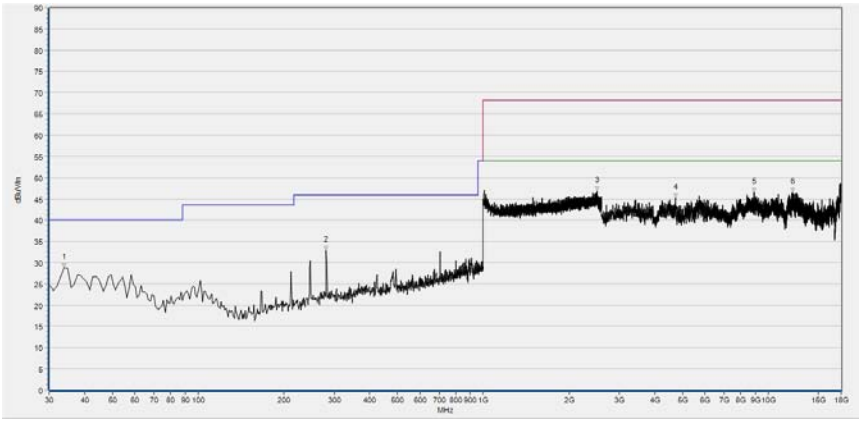
(Antenna Horizontal, 30MHz to 25GHz)



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
48.448	27.08	N/A	N/A	N/A	40.00	N/A	Vertical	PASS
211.572	37.67	N/A	N/A	N/A	43.50	N/A	Vertical	PASS
1991.797	48.14	N/A	N/A	68.23	N/A	54.00	Vertical	PASS
5629.086	46.11	N/A	N/A	68.23	N/A	54.00	Vertical	PASS
9921.784	46.53	N/A	N/A	68.23	N/A	54.00	Vertical	PASS
12516.223	46.89	N/A	N/A	68.23	N/A	54.00	Vertical	PASS

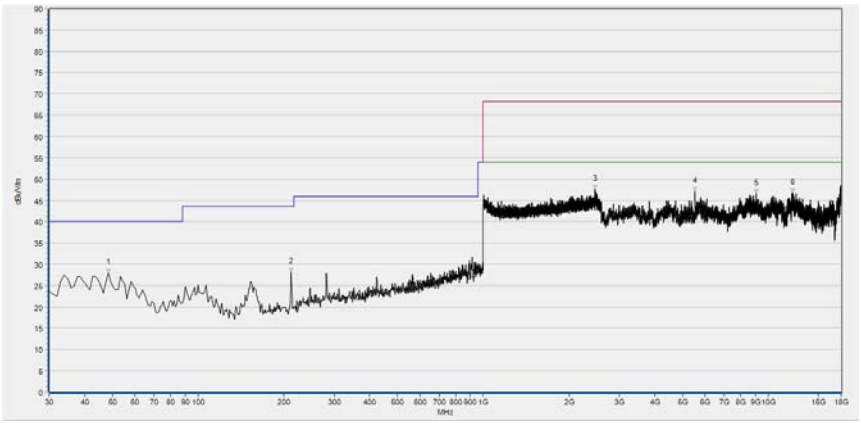
(Antenna Vertical, 30MHz to 25GHz)

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
33.884	28.80	N/A	N/A	N/A	40.00	N/A	Horizontal	PASS
281.481	32.86	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
2503.434	46.90	N/A	N/A	68.23	N/A	54.00	Horizontal	PASS
4716.383	45.27	N/A	N/A	68.23	N/A	54.00	Horizontal	PASS
8887.538	46.59	N/A	N/A	68.23	N/A	54.00	Horizontal	PASS
12162.232	46.62	N/A	N/A	68.23	N/A	54.00	Horizontal	PASS

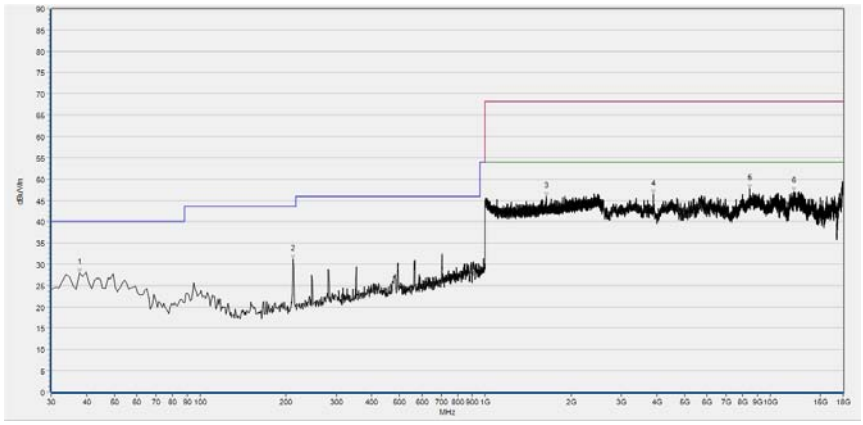
(Antenna Horizontal, 30MHz to 25GHz)



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
48.448	27.94	N/A	N/A	N/A	40.00	N/A	Vertical	PASS
211.572	28.23	N/A	N/A	N/A	43.50	N/A	Vertical	PASS
2467.156	47.59	N/A	N/A	68.23	N/A	54.00	Vertical	PASS
5535.827	47.02	N/A	N/A	68.23	N/A	54.00	Vertical	PASS
9053.891	46.58	N/A	N/A	68.23	N/A	54.00	Vertical	PASS
12143.749	46.84	N/A	N/A	68.23	N/A	54.00	Vertical	PASS

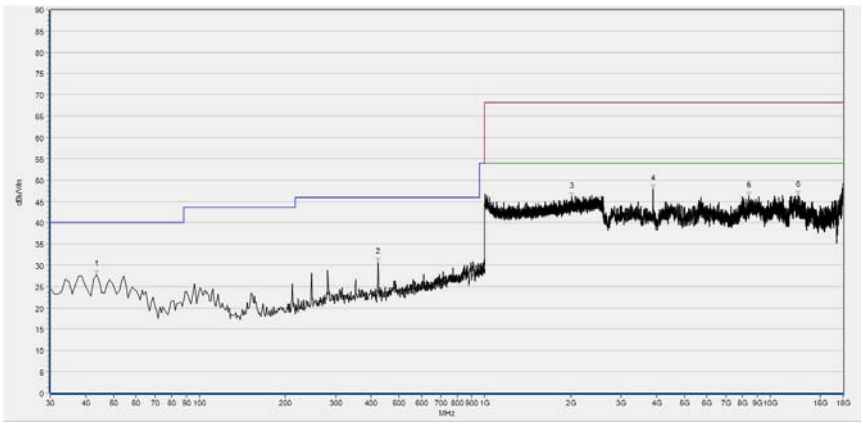
(Antenna Vertical, 30MHz to 25GHz)

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
37.768	28.02	N/A	N/A	N/A	40.00	N/A	Horizontal	PASS
211.572	31.09	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
1641.280	45.85	N/A	N/A	68.23	N/A	54.00	Horizontal	PASS
3884.617	46.38	N/A	N/A	68.23	N/A	54.00	Horizontal	PASS
8447.009	47.70	N/A	N/A	68.23	N/A	54.00	Horizontal	PASS
12088.298	47.13	N/A	N/A	68.23	N/A	54.00	Horizontal	PASS

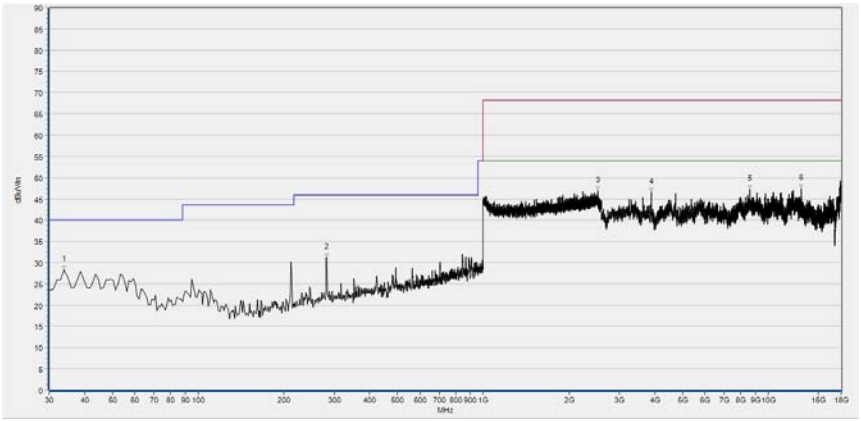
(Antenna Horizontal, 30MHz to 25GHz)



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
43.594	27.80	N/A	N/A	N/A	40.00	N/A	Vertical	PASS
423.243	30.69	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
2018.473	46.08	N/A	N/A	68.23	N/A	54.00	Vertical	PASS
3884.617	47.98	N/A	N/A	68.23	N/A	54.00	Vertical	PASS
8394.639	46.27	N/A	N/A	68.23	N/A	54.00	Vertical	PASS
12522.665	46.37	N/A	N/A	68.23	N/A	54.00	Vertical	PASS

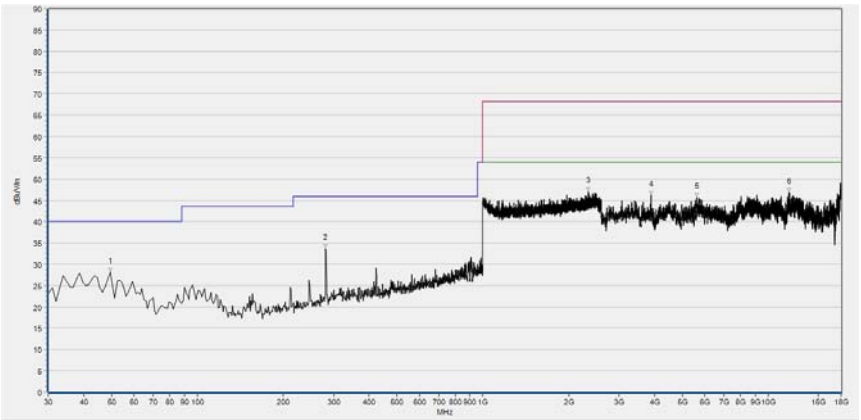
(Antenna Vertical, 30MHz to 25GHz)

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
33.884	28.30	N/A	N/A	N/A	40.00	N/A	Horizontal	PASS
282.452	31.16	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
2522.641	46.95	N/A	N/A	68.23	N/A	54.00	Horizontal	PASS
3881.536	46.68	N/A	N/A	68.23	N/A	54.00	Horizontal	PASS
8616.443	47.24	N/A	N/A	68.23	N/A	54.00	Horizontal	PASS
13071.014	47.36	N/A	N/A	68.23	N/A	54.00	Horizontal	PASS

(Antenna Horizontal, 30MHz to 25GHz)

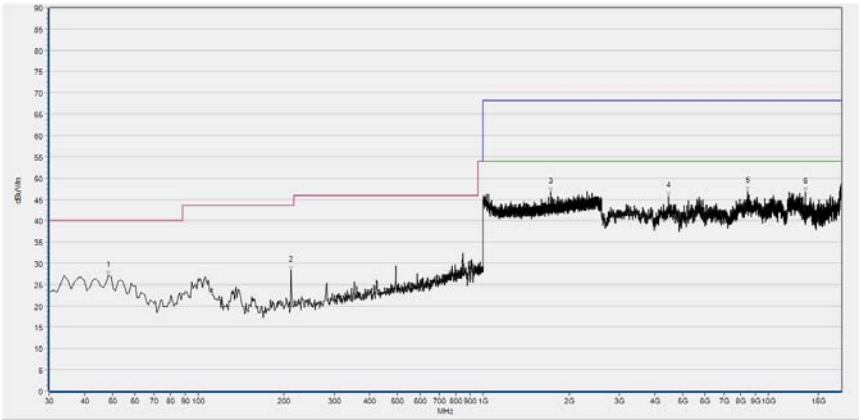


Fre. (MHz)	Pk (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
49.419	28.10	N/A	N/A	N/A	40.00	N/A	Vertical	PASS
281.481	33.77	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
2336.445	47.10	N/A	N/A	68.23	N/A	54.00	Vertical	PASS
3884.617	46.27	N/A	N/A	68.23	N/A	54.00	Vertical	PASS
5625.165	45.70	N/A	N/A	68.23	N/A	54.00	Vertical	PASS
11848.010	46.89	N/A	N/A	68.23	N/A	54.00	Vertical	PASS

(Antenna Vertical, 30MHz to 25GHz)

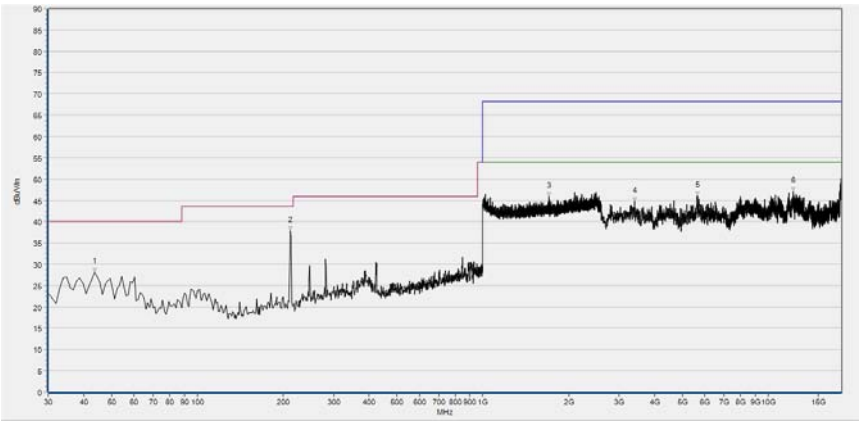
802.11n (HT40) Test mode

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
48.448	27.17	N/A	N/A	N/A	40.00	N/A	Horizontal	PASS
211.572	28.40	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
1724.508	46.70	N/A	N/A	68.23	N/A	54.00	Horizontal	PASS
4455.091	45.77	N/A	N/A	68.23	N/A	54.00	Horizontal	PASS
8452.050	46.98	N/A	N/A	68.23	N/A	54.00	Horizontal	PASS
13457.211	46.78	N/A	N/A	68.23	N/A	54.00	Horizontal	PASS

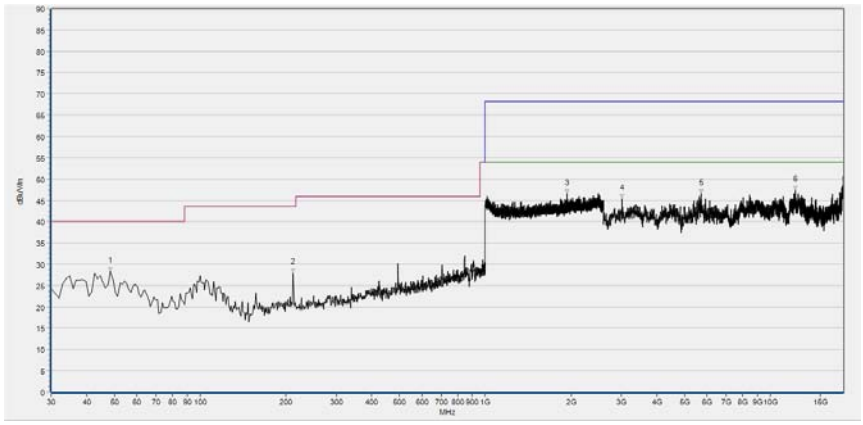
(Antenna Horizontal, 30MHz to 25GHz)



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
43.594	28.23	N/A	N/A	N/A	40.00	N/A	Vertical	PASS
211.572	37.82	N/A	N/A	N/A	43.50	N/A	Vertical	PASS
1704.768	45.85	N/A	N/A	68.23	N/A	54.00	Vertical	PASS
3397.600	44.83	N/A	N/A	68.23	N/A	54.00	Vertical	PASS
5647.009	46.01	N/A	N/A	68.23	N/A	54.00	Vertical	PASS
12233.927	47.05	N/A	N/A	68.23	N/A	54.00	Vertical	PASS

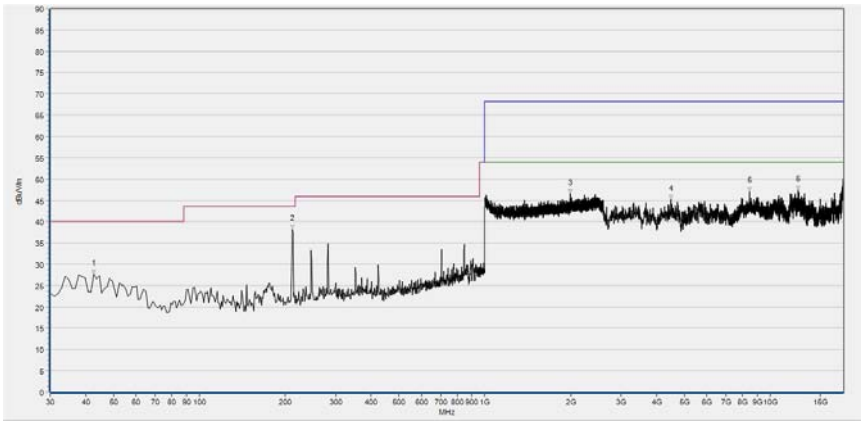
(Antenna Vertical, 30MHz to 25GHz)

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
48.448	28.31	N/A	N/A	N/A	40.00	N/A	Horizontal	PASS
211.572	27.93	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
1934.712	46.53	N/A	N/A	68.23	N/A	54.00	Horizontal	PASS
3021.204	45.44	N/A	N/A	68.23	N/A	54.00	Horizontal	PASS
5705.261	46.59	N/A	N/A	68.23	N/A	54.00	Horizontal	PASS
12229.446	47.37	N/A	N/A	68.23	N/A	54.00	Horizontal	PASS

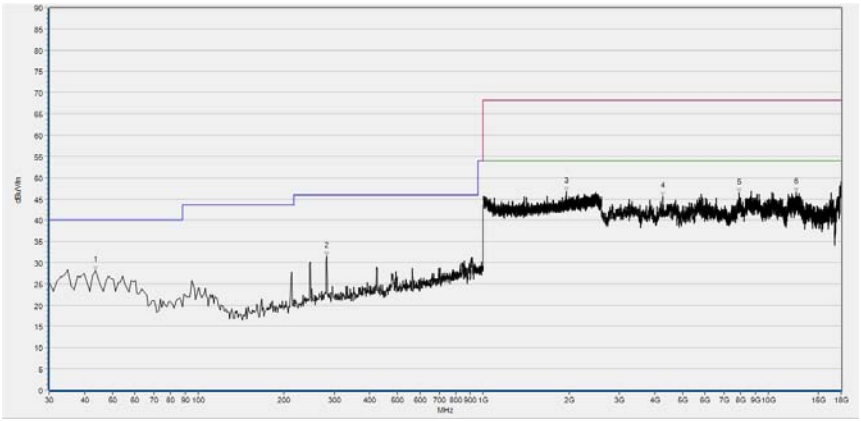
(Antenna Horizontal, 30MHz to 25GHz)



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
42.623	27.68	N/A	N/A	N/A	40.00	N/A	Vertical	PASS
211.572	38.18	N/A	N/A	N/A	43.50	N/A	Vertical	PASS
1990.730	46.61	N/A	N/A	68.23	N/A	54.00	Vertical	PASS
4477.495	45.28	N/A	N/A	68.23	N/A	54.00	Vertical	PASS
8443.089	47.11	N/A	N/A	68.23	N/A	54.00	Vertical	PASS
12529.666	47.39	N/A	N/A	68.23	N/A	54.00	Vertical	PASS

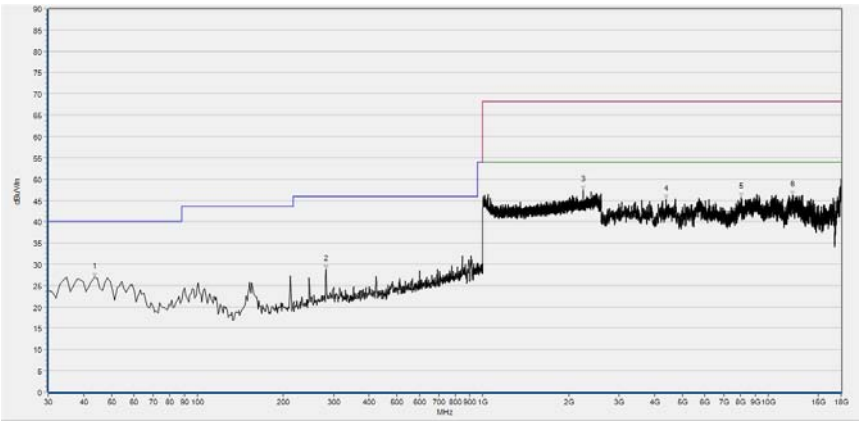
(Antenna Vertical, 30MHz to 25GHz)

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
43.594	28.22	N/A	N/A	N/A	40.00	N/A	Horizontal	PASS
282.452	31.57	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
1953.918	46.78	N/A	N/A	68.23	N/A	54.00	Horizontal	PASS
4260.452	45.64	N/A	N/A	68.23	N/A	54.00	Horizontal	PASS
7883.257	46.44	N/A	N/A	68.23	N/A	54.00	Horizontal	PASS
12525.745	46.58	N/A	N/A	68.23	N/A	54.00	Horizontal	PASS

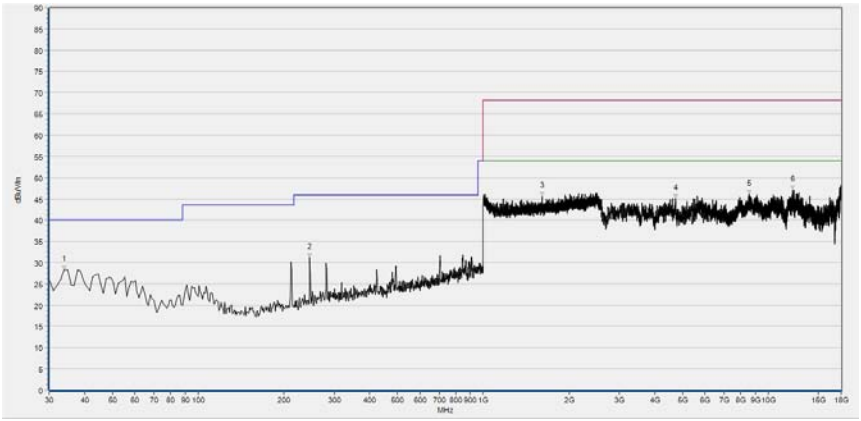
(Antenna Horizontal, 30MHz to 25GHz)



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
43.594	27.04	N/A	N/A	N/A	40.00	N/A	Vertical	PASS
282.452	28.89	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
2250.017	47.36	N/A	N/A	68.23	N/A	54.00	Vertical	PASS
4374.435	45.17	N/A	N/A	68.23	N/A	54.00	Vertical	PASS
8024.965	45.68	N/A	N/A	68.23	N/A	54.00	Vertical	PASS
12156.071	46.26	N/A	N/A	68.23	N/A	54.00	Vertical	PASS

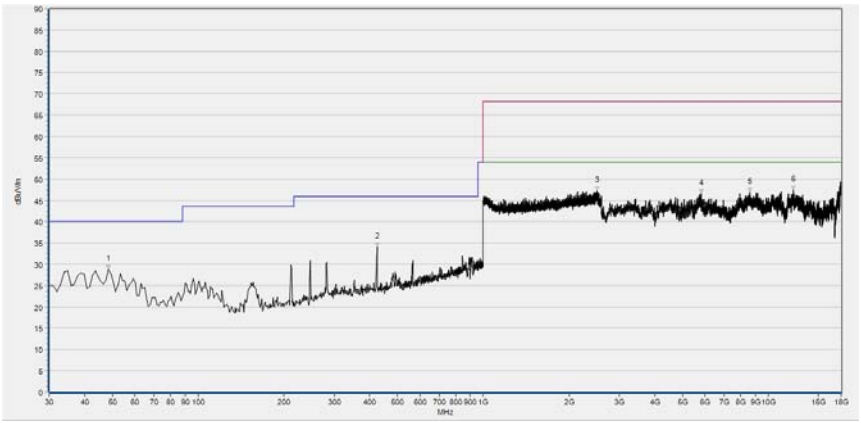
(Antenna Vertical, 30MHz to 25GHz)

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
33.884	28.30	N/A	N/A	N/A	40.00	N/A	Horizontal	PASS
246.527	31.10	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
1608.203	45.52	N/A	N/A	68.23	N/A	54.00	Horizontal	PASS
4728.706	45.15	N/A	N/A	68.23	N/A	54.00	Horizontal	PASS
8576.395	46.01	N/A	N/A	68.23	N/A	54.00	Horizontal	PASS
12152.991	47.16	N/A	N/A	68.23	N/A	54.00	Horizontal	PASS

(Antenna Horizontal, 30MHz to 25GHz)



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
48.448	28.88	N/A	N/A	N/A	40.00	N/A	Vertical	PASS
424.214	33.95	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
2502.367	47.23	N/A	N/A	68.23	N/A	54.00	Vertical	PASS
5803.841	46.55	N/A	N/A	68.23	N/A	54.00	Vertical	PASS
8610.282	46.89	N/A	N/A	68.23	N/A	54.00	Vertical	PASS
12220.764	47.42	N/A	N/A	68.23	N/A	54.00	Vertical	PASS

(Antenna Vertical, 30MHz to 25GHz)

2.9. Automatically discontinue transmission requirement

2.9.1. Requirement

According to 15.407(c), the device shall automatically discontinue transmission in case of either absence of information to transmit or operational failure. These provisions are not intended to preclude the transmission of control or signalling information or the use of repetitive codes used by certain digital technologies to complete frame or burst intervals. Applicants shall include in their application for equipment authorization a description of how this requirement is met

2.9.2. Result

The EUT will automatically discontinue transmission in case of either absence of information to transmit or operational failure.

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

Company Name:	Shenzhen Morlab Communications Technology Co., Ltd.
Department:	Morlab Laboratory
Address:	FL.3, Building A, FeiYang Science Park, No.8 LongChang Road, Block 67, BaoAn District, ShenZhen, GuangDong Province, P. R. China
Responsible Test Lab Manager:	Mr. Su Feng
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.

4. Test Equipments Utilized

4.1 Conducted Test Equipments

Equipment	Serial No.	Type	Manufacturer	Cal. Date	Cal. Due
Power Splitter	NW521	1506A	Weinschel	2018.04.17	2019.04.16
Attenuator 1	(N/A)	10dB	Resnet	2018.04.17	2019.04.16
Attenuator 2	(N/A)	3dB	Resnet	2018.04.17	2019.04.16
EXA Signal Analzyer	MY53470836	N9010A	Agilent	2017.12.03	2018.12.02
USB Wideband Power Sensor	MY54210011	U2021XA	Agilent	2018.04.17	2019.04.16
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	(N/A)	HUT705P	CHONGQING HANBA EXPERIMENTAL EQUIPMENT CO.,LTD	2018.04.17	2019.04.16

4.2 Conducted Emission Test Equipments

Equipment Name	Serial No.	Type	Manufacturer	Cal. Date	Cal. Due
Receiver	MY56400093	N9038A	KEYSIGHT	2017.07.13	2018.07.12
LISN	812744	NSLK 8127	Schwarzbeck	2018.05.08	2019.05.07
Pulse Limiter (20dB)	9391	VTSD 9561-D	Schwarzbeck	2018.05.08	2019.05.07
Coaxial cable(BNC) (30MHz-26GHz)	CB01	EMC01	Morlab	N/A	N/A

4.3Auxiliary Test Equipment

Equipment Name	Model No.	Brand Name	Manufacturer	Cal.Date	Cal. Due
Computer	T430i	Think Pad	Lenovo	N/A	N/A

4.4 Radiated Test Equipments

Equipment Name	Serial No.	Type	Manufacturer	Cal. Date	Cal. Due
Receiver	MY54130016	N9038A	Agilent	2018.05.08	2019.05.07
Test Antenna - Bi-Log	9163-519	VULB 9163	Schwarzbeck	2018.05.08	2019.05.07
Test Antenna - Horn	9170C-531	BBHA9170	Schwarzbeck	2017.09.13	2018.09.12
Test Antenna - Loop	1519-022	FMZB1519	Schwarzbeck	2018.03.03	2019.03.02
Test Antenna - Horn	01774	BBHA 9120D	Schwarzbeck	2017.09.13	2018.09.12
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	MA02	TS-PR18	Rohde& Schwarz	2018.05.08	2019.05.07
18-26.5GHz pre-Amplifier	MA03	TS-PR18	Rohde& Schwarz	2018.05.08	2019.05.07
26GHz -40GHz pre-Amplifier	MA05	BBV9721	Rohde& Schwarz	2018.05.08	2019.05.07
Anechoic Chamber	N/A	9m*6m*6m	CRT	2017.11.19	2020.11.18

END OF REPORT