



REPORT No. : SZ22050073W03

TEST REPORT

APPLICANT : Dongguan SmartAction Technology Co.,Ltd

PRODUCT NAME : High Resolution Music Player

MODEL NAME : HiBy R3Pro

BRAND NAME : HiBy

FCC ID : 2AOBQ-HIBYR3PRO

STANDARD(S) : 47 CFR Part 15 Subpart E

RECEIPT DATE : 2022-05-09

TEST DATE : 2022-05-16 to 2022-05-23

ISSUE DATE : 2022-06-14

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Change History		
Version	Date	Reason for change
1.0	2022-06-14	First edition



1. Technical Information

Note: Provide by applicant.

1.1. Applicant and Manufacturer Information

Applicant:	Dongguan SmartAction Technology Co.,Ltd
Applicant Address:	Room 1201, Lianjing Commercial Building, No.39, Hongwei 3rd Road, Nancheng District, Dongguan, Guangdong, China
Manufacturer:	SHENZHEN GR-VOICE TECHNOLOGY.,LTD.
Manufacturer Address:	201, Building1, Anhao'rui industrial Park, NO.2, Jian'an Road, Tangwei Community, Fuhai Subdistrict, Bao'an District, Shenzhen

1.2. Equipment Under Test (EUT) Description

Product Name:	High Resolution Music Player	
Sample No.:	4#	
Hardware Version:	V3.0	
Software Version:	V1.0	
Modulation Type:	OFDM	
Modulation Mode:	802.11a, 802.11n (HT20), 802.11n (HT40) 802.11ac (VHT20), 802.11ac (VHT40)	
Operating Frequency Range:	5180MHz-5240MHz; 5745MHz-5825MHz	
Channel Number:	Refer to 1.3	
Antenna Type:	FPC Antenna	
Antenna Gain:	5.74dBi	
Accessory Information:	Battery	
	Brand Name:	N/A
	Model No.:	455057
	Serial No.:	N/A
	Capacity:	1600mAh
	Rated Voltage:	3.7V
	Charge Limit:	4.2V
	Manufacturer:	Dongguan Yiming Electronic Technology Co., Ltd.



Note 1: We use the dedicated software to control the EUT continuous transmission.

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

Mode	Bandwidth (MHz)	Modulation Technology	Modulation Type	Data Rate	RU Size
802.11a	20	OFDM	DBPSK	1/2/5.5/11Mbps	N/A
			DQPSK		
			CCK		
802.11n	20/40 (HT20/40)	OFDM	BPSK	MCS0~MCS7	N/A
			QPSK		
			16QAM		
			64QAM		
802.11ac	20/40/80 (VHT20/40)	OFDM	BPSK	MCS0~MCS9	N/A
			QPSK		
			16QAM		
			64QAM		
			256QAM		

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

(U-NII-1) 5180MHz-5240MHz				
Bandwidth	Channel	Frequency (MHz)	Channel	Frequency (MHz)
20MHz	36	5180	40	5200
	44	5220	48	5240
40MHz	38	5190	46	5230
(U-NII-3) 5745MHz-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	May 18, 2022	Meng Shurui	PASS	No deviation
3	15.407(a)	Maximum Conducted Output Power	May 20, 2022	Meng Shurui	PASS	No deviation
4	15.407(a) (e)	Emission Bandwidth	May 20, 2022	Meng Shurui	PASS	No deviation
5	15.407(a)	Peak Power Spectral Density	May 18, 2022	Meng Shurui	PASS	No deviation
6	15.407(g)	Frequency Stability	May 18, 2022	Meng Shurui	PASS	No deviation
7	15.207	Conducted Emission	May 18, 2022	Wu Zhaoling	PASS	No deviation
8	15.407(b)	Restricted Frequency Bands	May 21, 2022	Su Zhan	PASS	No deviation
9	15.407(b)	Radiated Emission	May 25, 2022	Su Zhan	PASS	No deviation

Note 1: The tests of Conducted Emission and Radiated Emission were performed according to the method of measurements prescribed in ANSI C63.102013.

Note 2: These RF tests were performed according to the method of measurements prescribed in KDB789033 D02 v02r01.

Note 3: The path loss during the RF test is calibrated to correct the results by the offset setting in the test equipments. The ref offset 12.0dB contains two parts that cable loss 2.0dB 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.

Note 5: When the test result is a critical value, we will use the measurement uncertainty give the judgment result based on the 95% confidence intervals.

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. Test Result: Compliant

Inside of the EUT has a FPC antenna coupled with the metal shrapnel. Please refer to the EUT internal photos.

2.2. Duty Cycle of the Test Signal

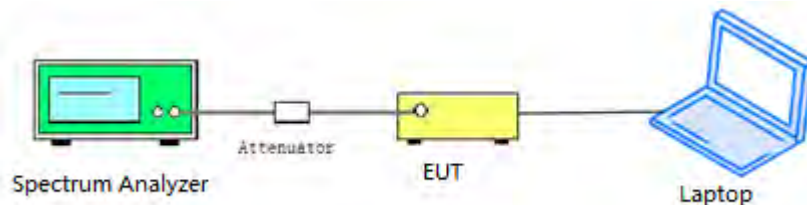
2.2.1. Requirement

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 sub clause, 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 $\pm 2\%$; 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.

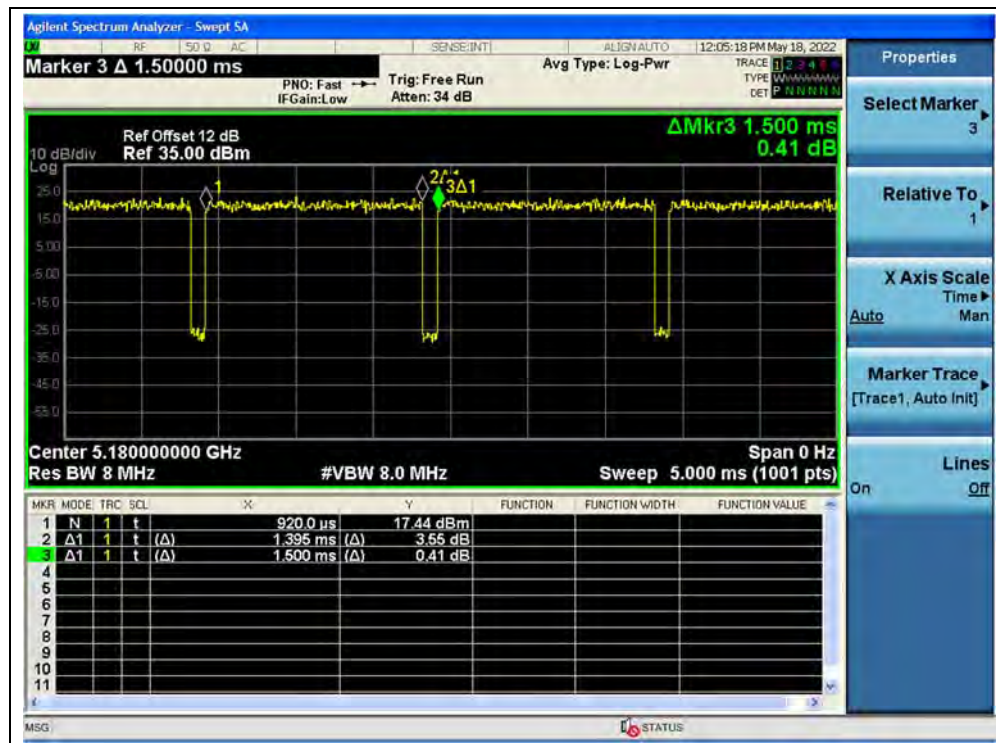


2.2.4. Test Result

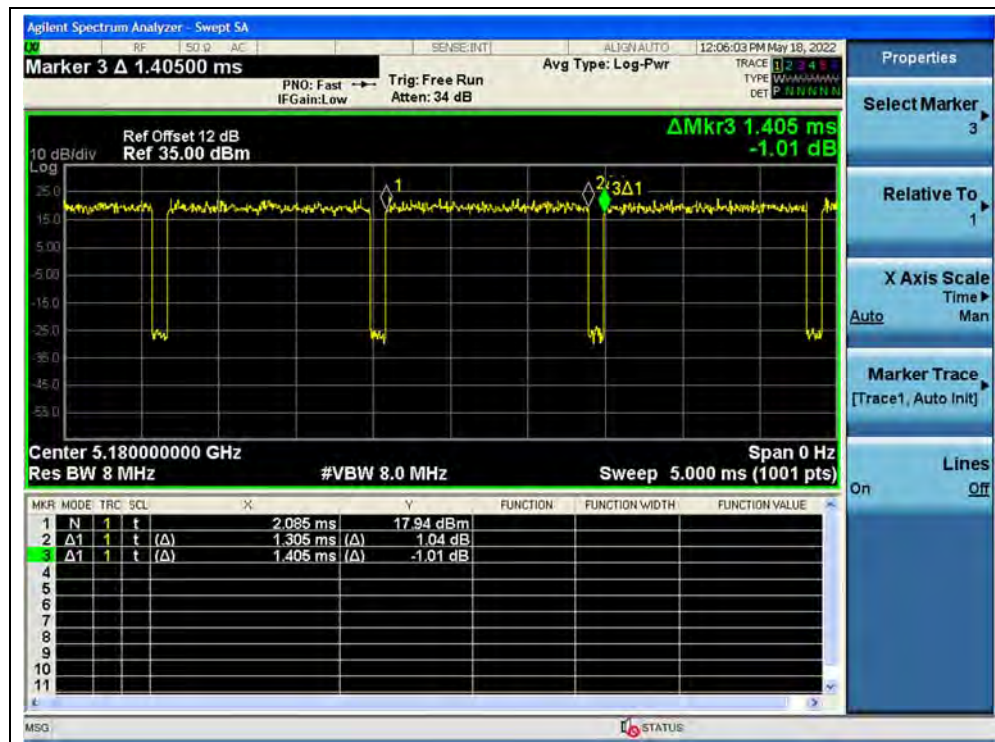
A.Test Verdict:

Test Mode	Duty Cycle (%) (D)	Duty Factor (10*log[1/D])
802.11a	93.00	0.32
802.11n (HT20)	92.88	0.32
802.11n (HT40)	86.67	0.62
802.11ac(VHT20)	92.25	0.35
802.11ac(VHT40)	86.77	0.62

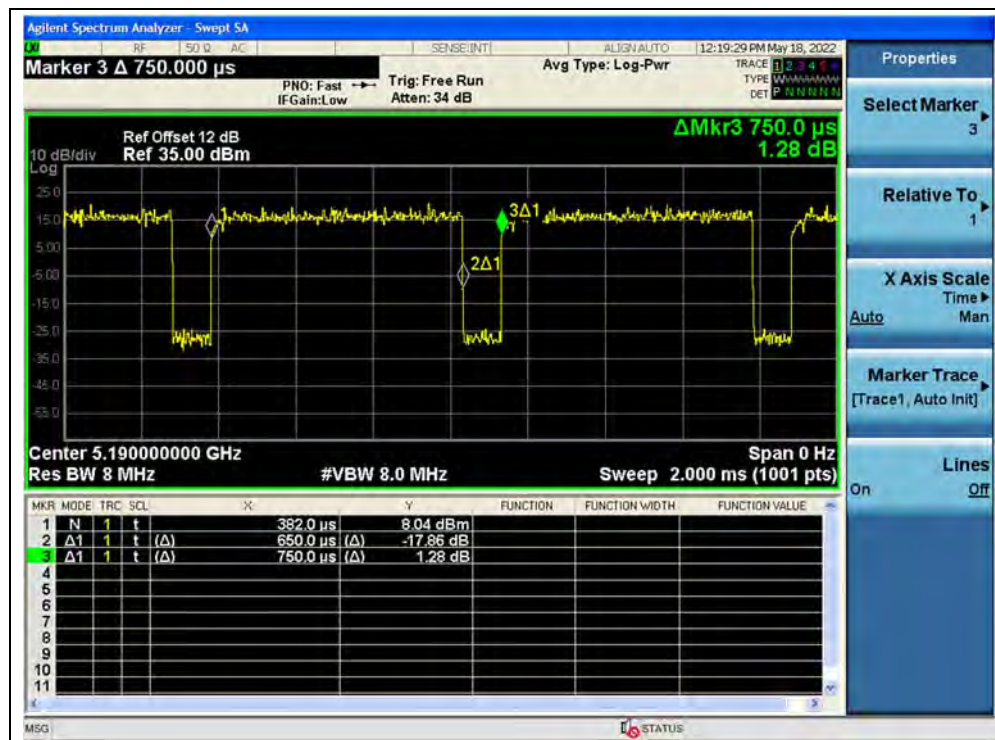
B.Test Plot:



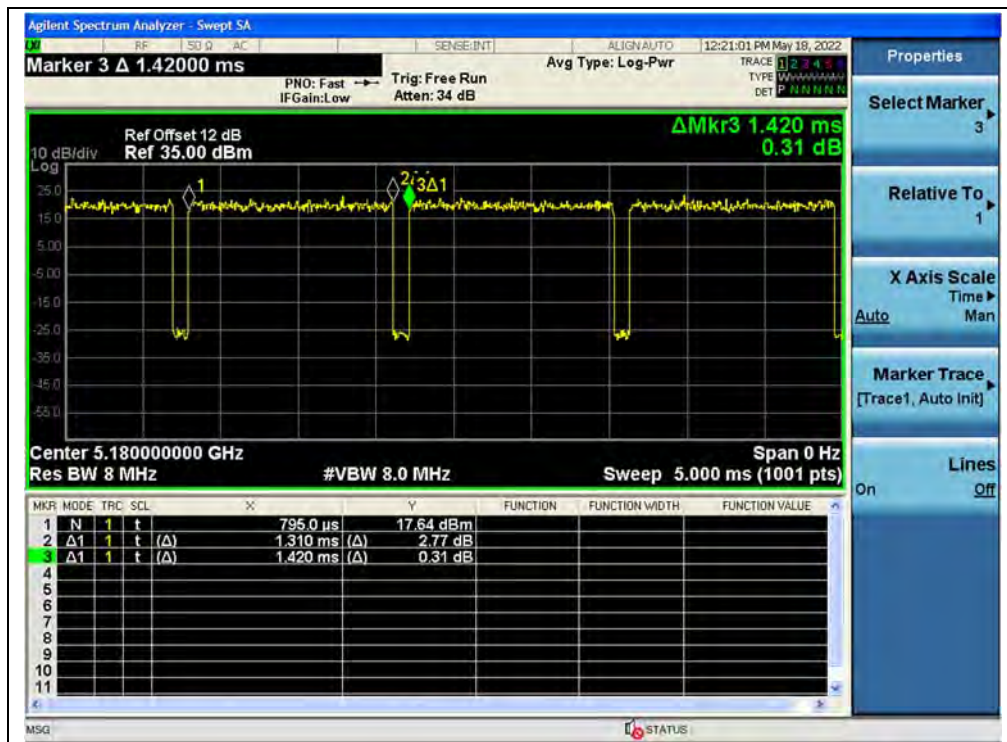
(Channel 36, 5180MHz, 802.11a)



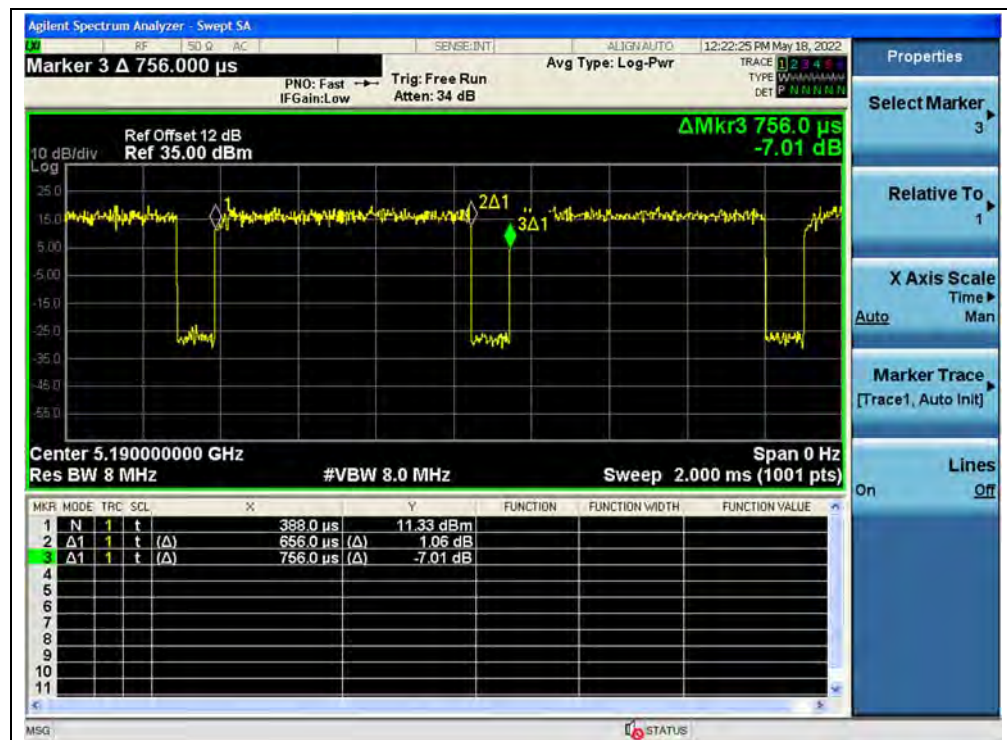
(Channel 36, 5180MHz, 802.11n (HT20))



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



(CH36_5180MHz_802.11ac (VHT20))



(CH38_5190MHz_802.11ac (VHT40))

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 250mW provided the maximum antenna gain does not exceed 6dBi.

(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 250mW or $11\text{dBm} + 10 \log B$, 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 6dBi are used, the maximum conducted output power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

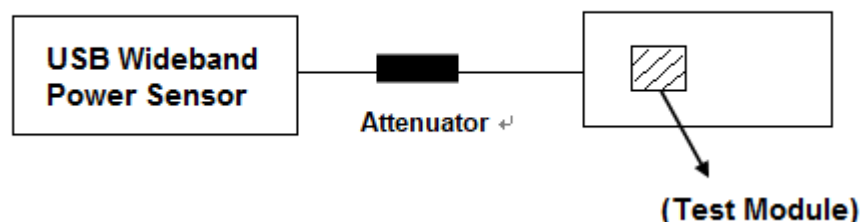
(4) According to KDB662911D01 Measure-and-sum technique, the conducted emission level (e.g., transmit power or power in specified bandwidth) is measured at each antenna port. The measured results at the various antenna ports are then summed mathematically to determine the total emission level from the device. Summing is performed in units that are directly proportional to power.

(5) According to KDB 662911 D01, the directional gain = $G_{\text{ANT}} + 10\log(N_{\text{ANT}})\text{dBi}$, where G_{ANT} is the antenna gain in dBi, N_{ANT} is the number of outputs.

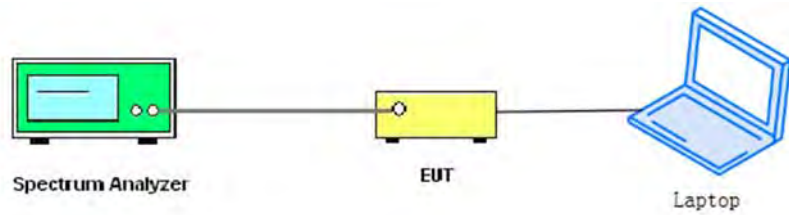
2.3.2. Test Description

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.

For ac (VHT80) mode power

The EUT (Equipment under the test) 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, all test result in Spectrum analyzer.



2.3.3. Test Result

Maximum Average Conducted Output Power

802.11a Mode

Channel	Frequency (MHz)	Average Power (dBm)				Limit (dBm)		Verdict
		Measured	Duty Factor	Duty Factor Calculated				
				dBm		dBm	W	
36	5180	13.65	0.32	13.97	0.025	24	0.25	PASS
44	5220	13.13		13.45	0.022			
48	5240	13.03		13.35	0.022			
149	5745	12.23		12.55	0.018	30	1	
157	5785	11.70		12.02	0.016			
165	5825	11.23		11.55	0.014			

802.11n (HT20) Mode

Channel	Frequency (MHz)	Average Power (dBm)				Limit (dBm)		Verdict
		Measured	Duty Factor	Duty Factor Calculated				
		dBm		dBm	W	dBm	W	
36	5180	13.05	0.32	13.37	0.022	24	0.25	PASS
44	5220	12.75		13.07	0.020			
48	5240	12.50		12.82	0.019			
149	5745	12.02		12.34	0.017	30	1	
157	5785	11.58		11.90	0.015			
165	5825	11.02		11.34	0.014			

802.11n (HT40) Mode

Channel	Frequency (MHz)	Average Power				Limit (dBm)		Verdict
		Measured	Duty Factor	Duty Factor Calculated				
		dBm		dBm	W	dBm	W	
38	5190	12.48	0.62	13.10	0.020	24	0.25	PASS
46	5230	12.08		12.70	0.019			
151	5755	11.59		12.21	0.017	30	1	
159	5795	10.97		11.59	0.014			

**802.11ac (VHT20) Mode**

Channel	Frequency (MHz)	Average Power (dBm)				Limit (dBm)		Verdict
		Measured	Duty Factor	Duty Factor Calculated		dBm	W	
		dBm		dBm	W			
36	5180	13.24	0.35	13.59	0.023	24	0.25	PASS
44	5220	12.84		13.19	0.021			
48	5240	12.56		12.91	0.020			
149	5745	11.99		12.34	0.017	30	1	
157	5785	11.31		11.66	0.015			
165	5825	11.03		11.38	0.014			

802.11ac (VHT40) Mode

Channel	Frequency (MHz)	Average Power				Limit (dBm)		Verdict
		Measured	Duty Factor	Duty Factor Calculated		dBm	W	
		dBm		dBm	W			
38	5190	12.52	0.62	13.14	0.021	24	0.25	PASS
46	5230	12.44		13.06	0.020			
151	5755	11.63		12.25	0.017	30	1	
159	5795	11.12		11.74	0.015			

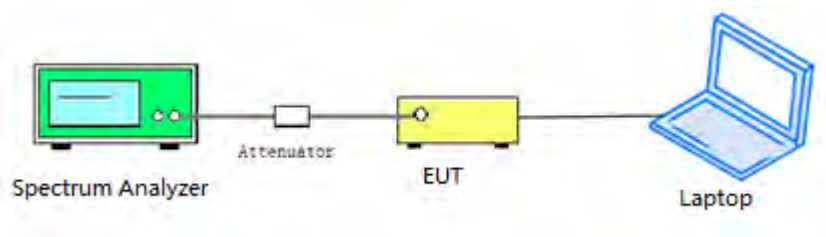
2.4. Emission Bandwidth

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

2.4.4. Test Result

802.11a Mode

A.Test Verdict:

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)
36	5180	21.10
44	5220	21.11
48	5240	21.27
Channel	Frequency (MHz)	6 dB Bandwidth (MHz)
149	5745	16.34
157	5785	16.34
165	5825	16.36



B.Test Plot:



(Channel 36, 5180MHz, 802.11a)



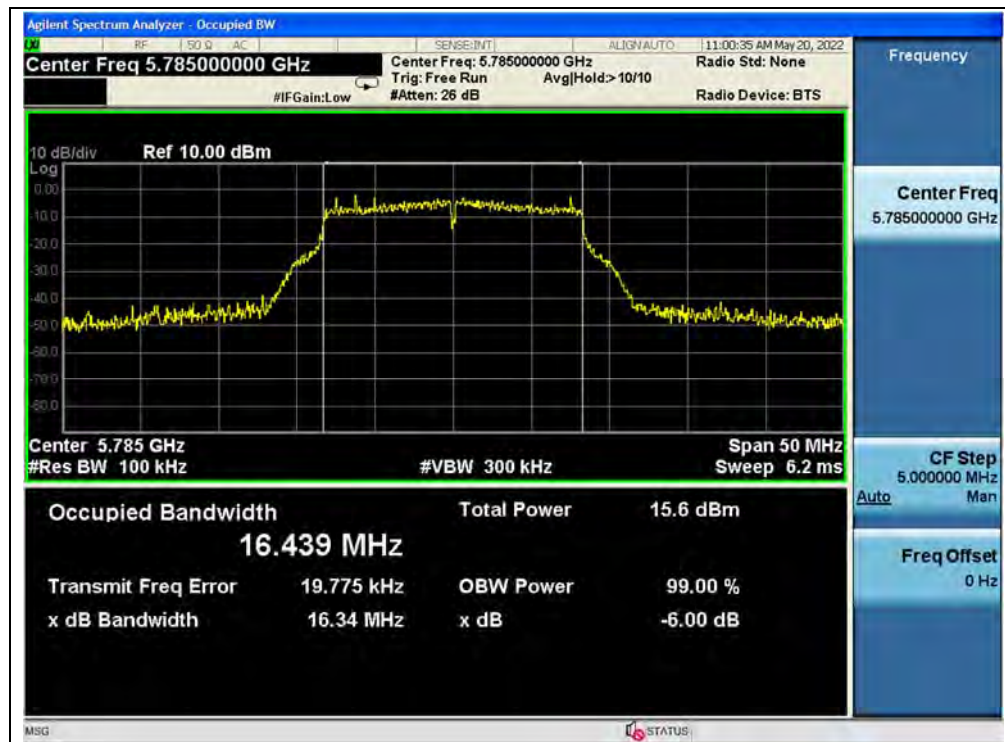
(Channel 44, 5220 MHz, 802.11a)



(Channel 48, 5240MHz, 802.11a)



(Channel 149, 5745MHz, 802.11a)



(Channel 157, 5785MHz, 802.11a)



(Channel 165, 5825MHz, 802.11a)

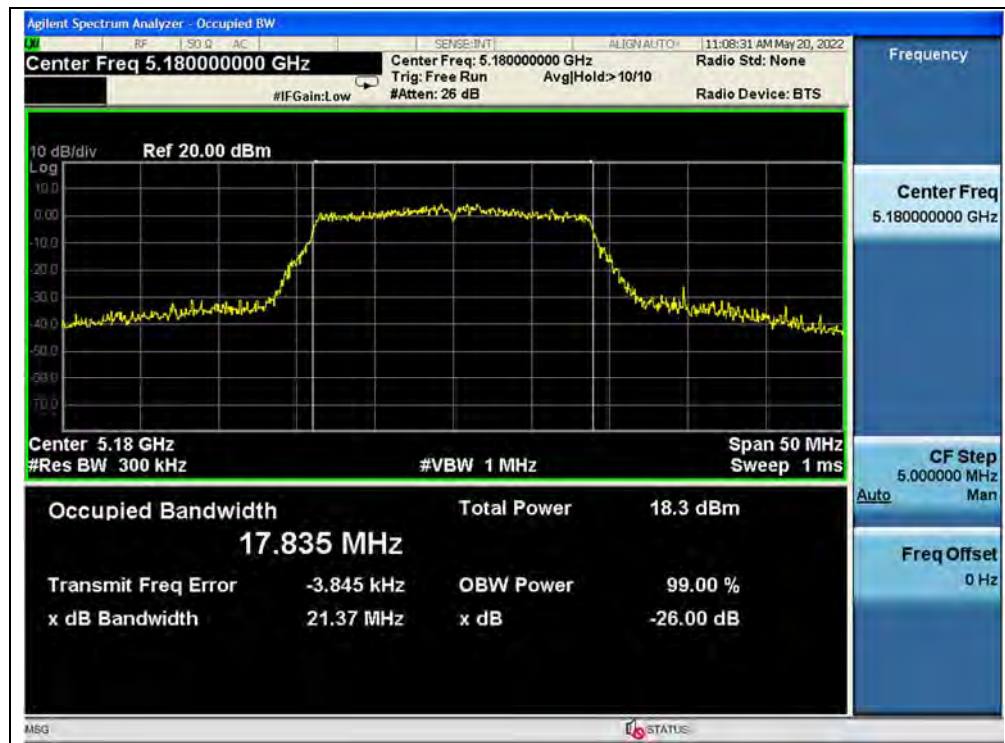


802.11n (HT20) Mode

A.Test Verdict:

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)
36	5180	21.37
44	5220	21.46
48	5240	21.63
Channel	Frequency (MHz)	6 dB Bandwidth (MHz)
149	5745	17.59
157	5785	16.95
165	5825	17.58

B.Test Plot:



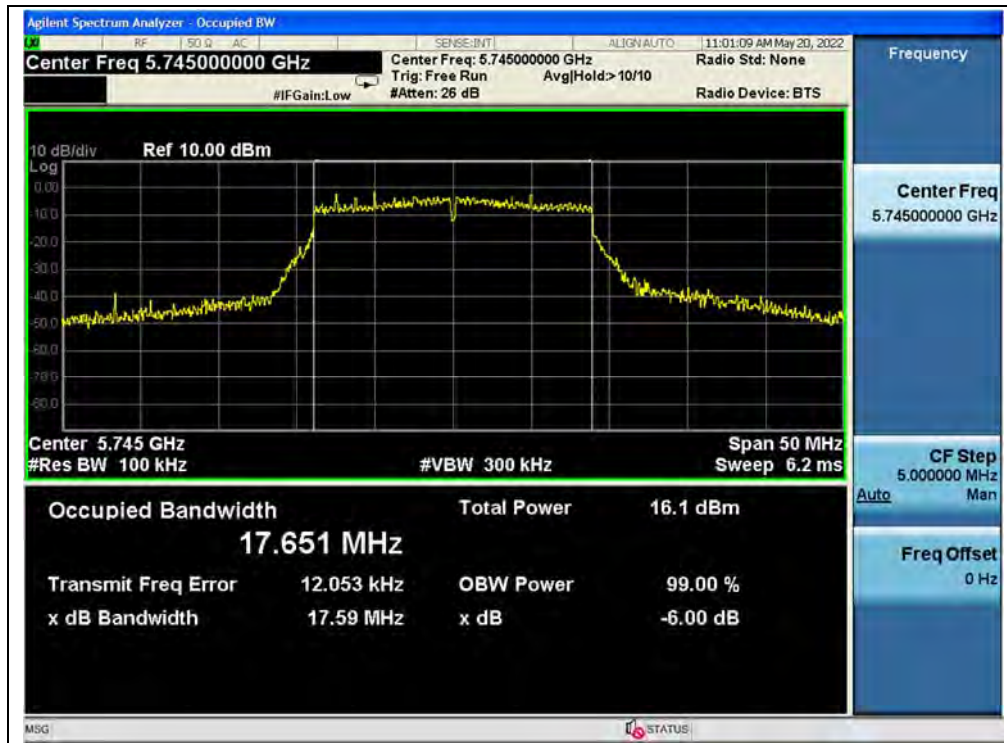
(Channel 36, 5180MHz, 802.11n (HT20))



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



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

A.Test Verdict:

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)
38	5190	39.63
46	5230	40.01
Channel	Frequency (MHz)	6 dB Bandwidth (MHz)
151	5755	36.06
159	5795	36.01

B.Test Plot:



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



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



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



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

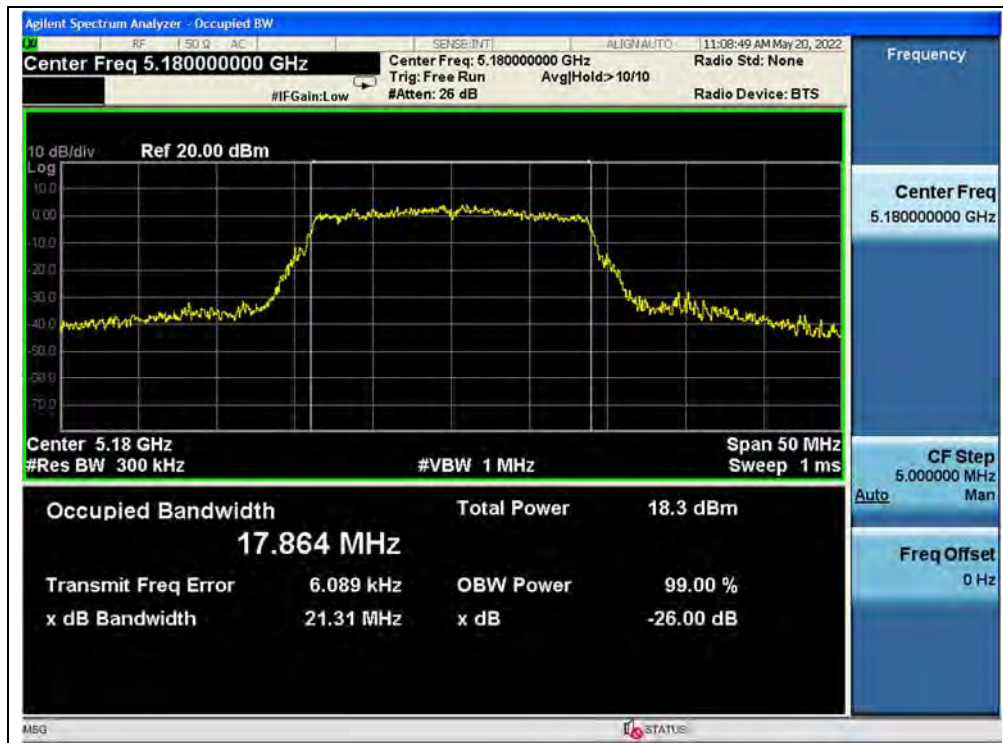


802.11ac (VHT20) Mode

A. Test Verdict:

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)
36	5180	21.31
44	5220	21.33
48	5240	21.29
Channel	Frequency (MHz)	6dB Bandwidth (MHz)
149	5745	17.58
157	5785	17.58
165	5825	16.92

B. Test Plot:



(Channel 36, 5180MHz, 802.11ac (VHT20))



(Channel 44, 5220 MHz, 802.11ac (VHT20))



(Channel 48, 5240MHz, 802.11ac (VHT20))



(Channel 149, 5745MHz, 802.11ac (VHT20))



(Channel 157, 5785MHz, 802.11ac (VHT20))



(Channel 165, 5825MHz, 802.11ac (VHT20))

**802.11ac (VHT40) Mode****A.Test Verdict:**

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)
38	5190	40.19
46	5230	39.47
Channel	Frequency (MHz)	6dB Bandwidth (MHz)
151	5755	36.35
159	5795	36.36

B.Test Plot:

(Channel 38, 5190MHz, 802.11ac (VHT40))



(Channel 46, 5230 MHz, 802.11ac (VHT40))



(Channel 151, 5755 MHz, 802.11ac (VHT40))



(Channel 159, 5795MHz, 802.11ac (VHT40))

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 11dBm 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 11dBm in any 1 megahertz band.

(3) For the band 5.725-5.85 GHz, the maximum power spectral density shall not exceed 30dBm in any 500kHz band.

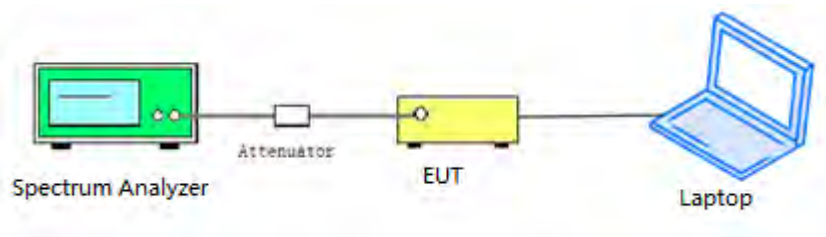
If transmitting antennas of directional gain greater than 6dBi are used, the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

(4) According to KDB662911D01 Measure-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 = $G_{ANT} + 10\log(N_{ANT})$ 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 = 1MHz. Set VBW $\geq$ 3MHz
- 3) Number of points in sweep $\geq$ 2 Span / RBW. Sweep time = auto
- 4) Detector = Average
- 5) Trace mode=Max hold
- 6) Record the max value

2.5.4. Test Result

802.11a Mode

A.Test Verdict:

Channel	Frequency (MHz)	Measured PPSD (dBm/MHz)	Duty Factor	Corrected PPSD (dBm/MHz)	Limit (dBm/MHz)	Verdict
36	5180	3.78	0.32	4.10	11	PASS
44	5220	3.85		4.17		
48	5240	3.76		4.08		
Channel	Frequency (MHz)	Measured PPSD (dBm/500KHz)	Duty Factor	Corrected PPSD (dBm/500KHz)	Limit (dBm/500KHz)	Verdict
149	5745	0.49	0.32	0.81	30	PASS
157	5785	-0.31		0.01		
165	5825	-0.48		-0.16		



B.Test Plot:



(Channel 36, 5180MHz, 802.11)



(Channel 44, 5220MHz, 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) Mode

A.Test Verdict:

Channel	Frequency (MHz)	Measured PSD (dBm/MHz)	Duty Factor	Corrected PSD (dBm/MHz)	Limit (dBm/MHz)	Verdict
36	5180	3.04	0.32	3.36	11	PASS
44	5220	3.32		3.64		
48	5240	3.10		3.42		
Channel	Frequency (MHz)	Measured PSD (dBm/500KHz)	Duty Factor	Corrected PSD (dBm/500KHz)	Limit (dBm/500KHz)	Verdict
149	5745	-0.19	0.32	0.13	30	PASS
157	5785	-0.74		-0.42		
165	5825	-1.11		-0.79		

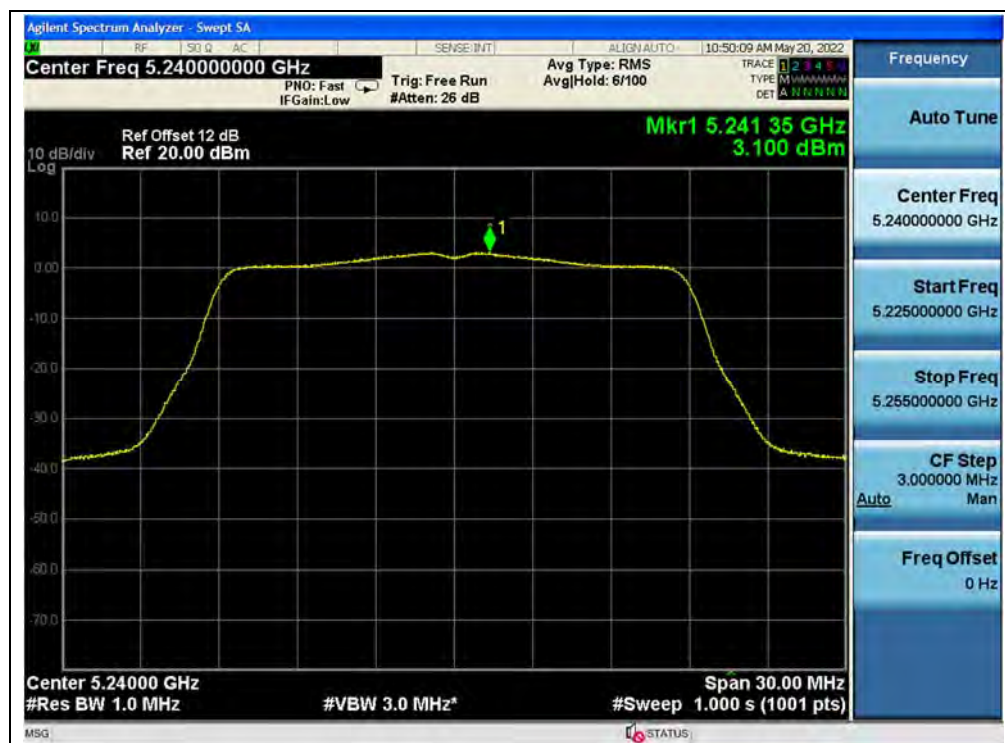
B.Test Plot:



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



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



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



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



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



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



802.11n (HT40) Mode

A.Test Verdict:

Channel	Frequency (MHz)	Measured PSD (dBm/MHz)	Duty Factor	Corrected PSD (dBm/MHz)	Limit (dBm/MHz)	Verdict
38	5190	-0.28	0.62	0.34	11	PASS
46	5230	-0.72		-0.10		
Channel	Frequency (MHz)	Measured PSD (dBm/500KHz)	Duty Factor	Corrected (dBm/500KHz)	Limit (dBm/500KHz)	Verdict
151	5755	-4.68	0.62	-4.06	30	PASS
159	5795	-5.35		-4.73		

B.Test Plot:



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



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



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



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



802.11ac (VHT20) Mode

A.Test Verdict:

Channel	Frequency (MHz)	Measured PSD (dBm/MHz)	Duty Factor	Corrected PSD (dBm/MHz)	Limit (dBm/MHz)	Verdict
36	5180	3.02	0.35	3.37	11	PASS
44	5220	3.43		3.78		
48	5240	1.74		2.09		
Channel	Frequency (MHz)	Measured PSD (dBm/500KHz)	Duty Factor	Corrected PSD (dBm/500KHz)	Limit (dBm/500KHz)	Verdict
149	5745	-0.16	0.35	0.19	30	PASS
157	5785	-0.68		-0.33		
165	5825	-1.16		-0.81		

B.Test Plot:



(Channel 36, 5180MHz, 802.11ac (VHT20))



(Channel 44, 5220 MHz, 802.11ac (VHT20))



(Channel 48, 5240MHz, 802.11ac (VHT20))



(Channel 149, 5745MHz, 802.11ac (VHT20))



(Channel 157, 5785MHz, 802.11ac (VHT20))



(Channel 165, 5825MHz, 802.11ac (VHT20))



802.11ac (VHT40) Mode

A.Test Verdict:

Channel	Frequency (MHz)	Measured PPSD (dBm/MHz)	Duty Factor	Corrected PPSD (dBm/MHz)	Limit (dBm/MHz)	Verdict
38	5190	-1.23	0.62	-0.61	11	PASS
46	5230	-1.31		-0.69		
Channel	Frequency (MHz)	Measured PPSD (dBm/500KHz)	Duty Factor	Corrected PPSD (dBm/500KHz)	Limit (dBm/500KHz)	Verdict
151	5755	-4.15	0.62	-3.53	30	PASS
159	5795	-4.32		-3.70		

B.Test Plot:



(Channel 38, 5190MHz, 802.11ac (VHT40))



(Channel 46, 5230 MHz, 802.11ac (VHT40))



(Channel 151, 5755MHz, 802.11ac (VHT40))



(Channel 159, 5795MHz, 802.11ac (VHT40))



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° 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)	Fre. Dev. (kHz)	Deviation (ppm)
100%	5.00	+20(Ref)	24	4.633
100%		-30	30	5.792
100%		-20	28	5.405
100%		-10	26	5.019
100%		0	23	4.440
100%		+10	22	4.247
100%		+20	20	3.861
100%		+30	22	4.247
100%		+40	26	5.019
100%		+50	23	4.440
115%	5.75	+20	29	5.598
85%	4.25	+20	30	5.792



U-NII-3 (Ch. 149) 5745MHz				
VOLTAGE (%)	POWER (VDC)	TEMP (°C)	Fre. Dev. (kHz)	Deviation (ppm)
100%	5.00	+20(Ref)	21	3.655
100%		-30	25	4.352
100%		-20	26	4.526
100%		-10	22	3.829
100%		0	31	5.396
100%		+10	25	4.352
100%		+20	26	4.526
100%		+30	27	4.700
100%		+40	28	4.874
100%		+50	29	5.048
115%	5.75	+20	30	5.222
85%	4.25	+20	29	5.048

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 50 μ H/50 Ω line impedance stabilization network (LISN).

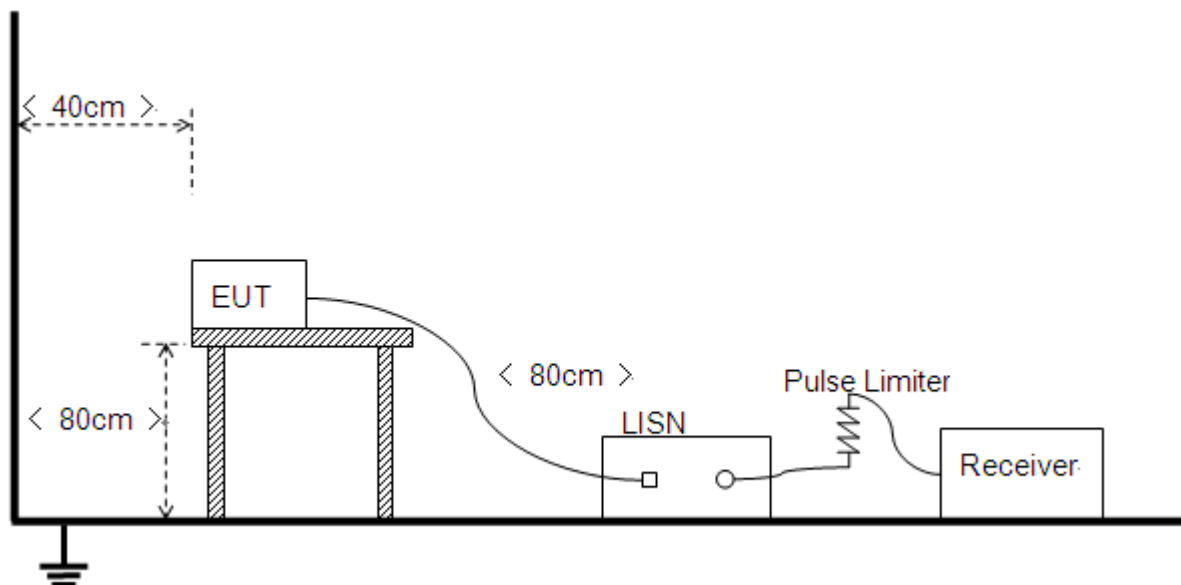
Frequency Range (MHz)	Conducted Limit (dB μ V)	
	Quai-peak	Average
0.15 - 0.50	66 to 56	56 to 46
0.50 - 5	56	46
5 - 30	60	50

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. Set RBW=9kHz, VBW=30kHz. 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+Adaptor+Earphone + WIFI TX

Test Voltage: AC 120V/60Hz

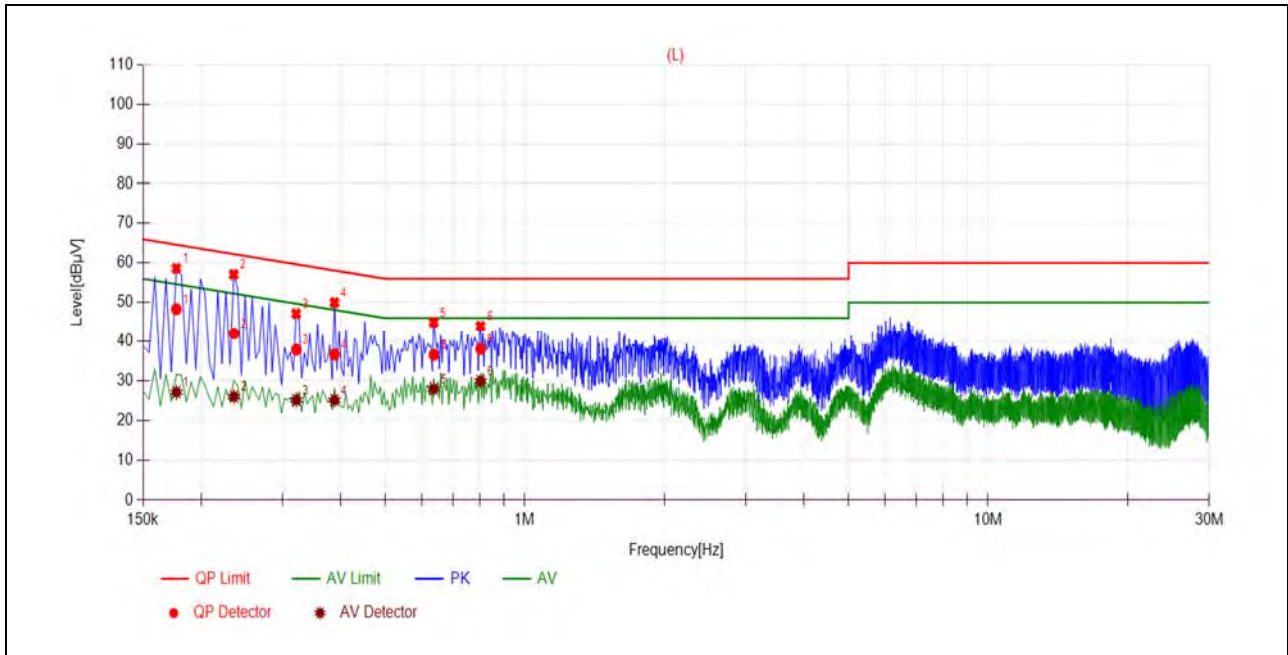
The measurement results are obtained as below:

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

U_R : Receiver Reading

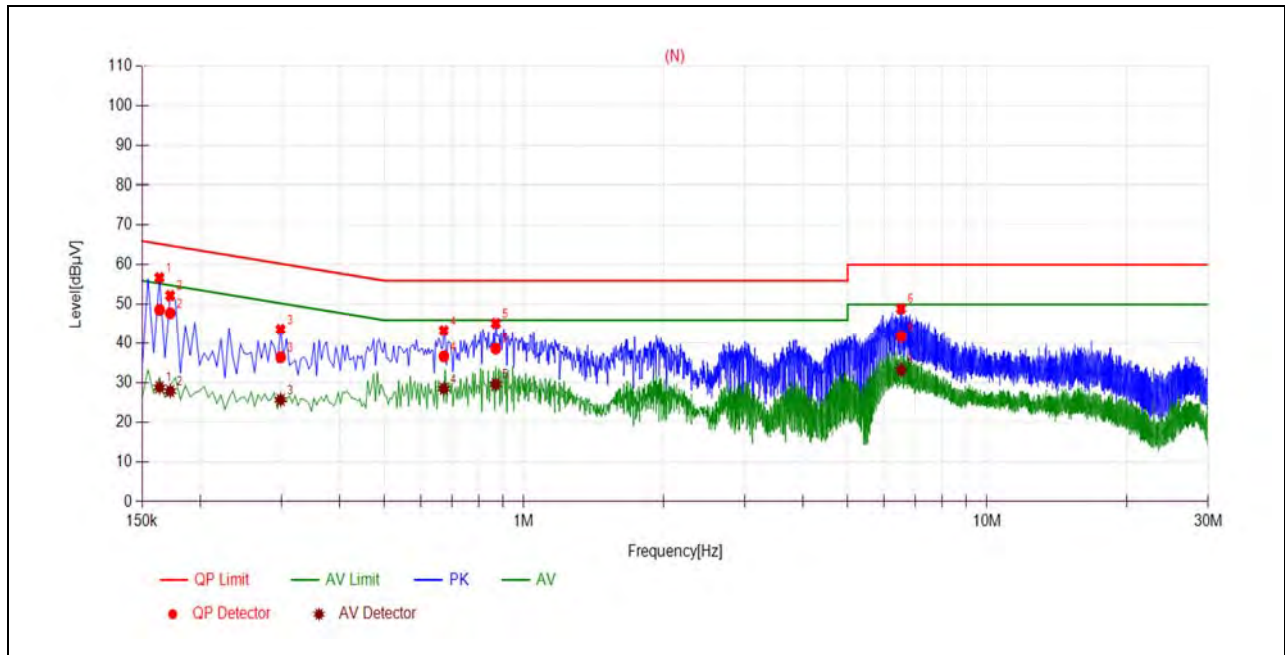
A_{Factor} : Voltage division factor of LISN

B.Test Plot:



(L Phase)

No.	Fre. (MHz)	Emission Level (dBμV)		Limit (dBμV)		Power-line	Verdict
		Quai-peak	Average	Quai-peak	Average		
1	0.1770	48.30	27.09	64.63	54.63	Line	PASS
2	0.2357	42.04	25.98	62.25	52.25		PASS
3	0.3213	37.88	25.14	59.67	49.67		PASS
4	0.3884	36.66	25.12	58.10	48.10		PASS
5	0.6363	36.55	27.91	56.00	46.00		PASS
6	0.8027	38.05	29.90	56.00	46.00		PASS



(N Phase)

No.	Fre. (MHz)	Emission Level (dBμV)		Limit (dBμV)		Power-line	Verdict
		Quai-peak	Average	Quai-peak	Average		
1	0.1636	48.64	28.80	65.28	55.28	Neutral	PASS
2	0.1725	47.77	27.85	64.84	54.84		PASS
3	0.2987	36.43	25.63	60.28	50.28		PASS
4	0.6721	36.66	28.45	56.00	46.00		PASS
5	0.8696	38.62	29.57	56.00	46.00		PASS
6	6.5240	41.79	33.15	60.00	50.00		PASS

2.8. Restricted Frequency Bands

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:
 - (i) All emissions shall be limited to a level of -27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.

The following formula is used to convert the equipment isotropic radiated power(e.i.r.p.) to field strength (dBμV/m);

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

where P is the EIRP in Watts

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

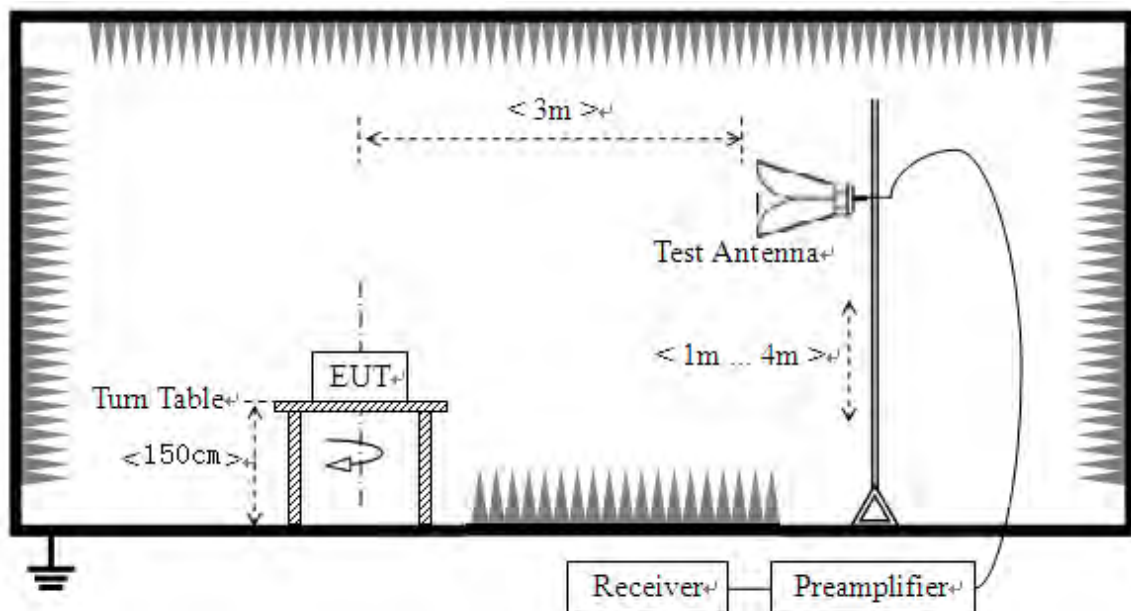
Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in § 15.209. According to FCC section 15.209 (a), except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength ($\mu\text{V/m}$)	Measurement Distance (m)
0.009 - 0.490	$2400/F(\text{kHz})$	300
0.490 - 1.705	$24000/F(\text{kHz})$	30
1.705 - 30.0	30	30
30 - 88	100	3
88 - 216	150	3
216 - 960	200	3
Above 960	500	3

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

Test Setup





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.

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:

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

A_T : Total correction Factor except Antenna; U_R : Receiver Reading

G_{preamp} : Preamplifier Gain; A_{Factor} : Antenna Factor at 3m

Note 1: 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.

Note 2 All test modes and bandwidth were considered and evaluated respectively by performing full test, only the worst data were recorded for each bandwidth.

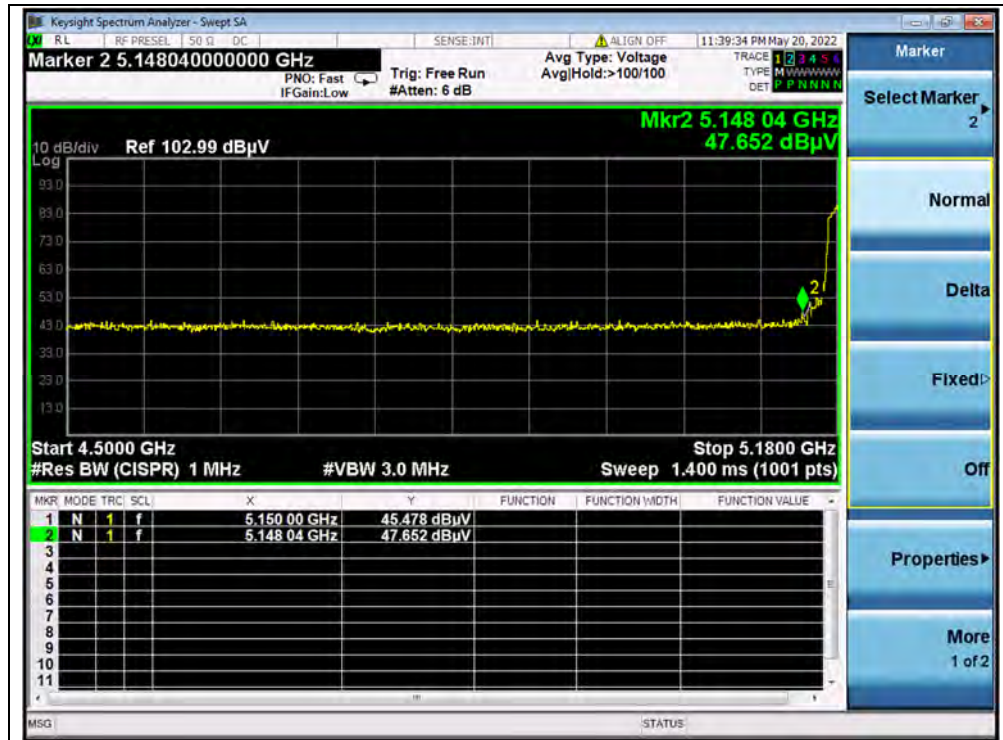
802.11a Mode

A.Test Verdict:

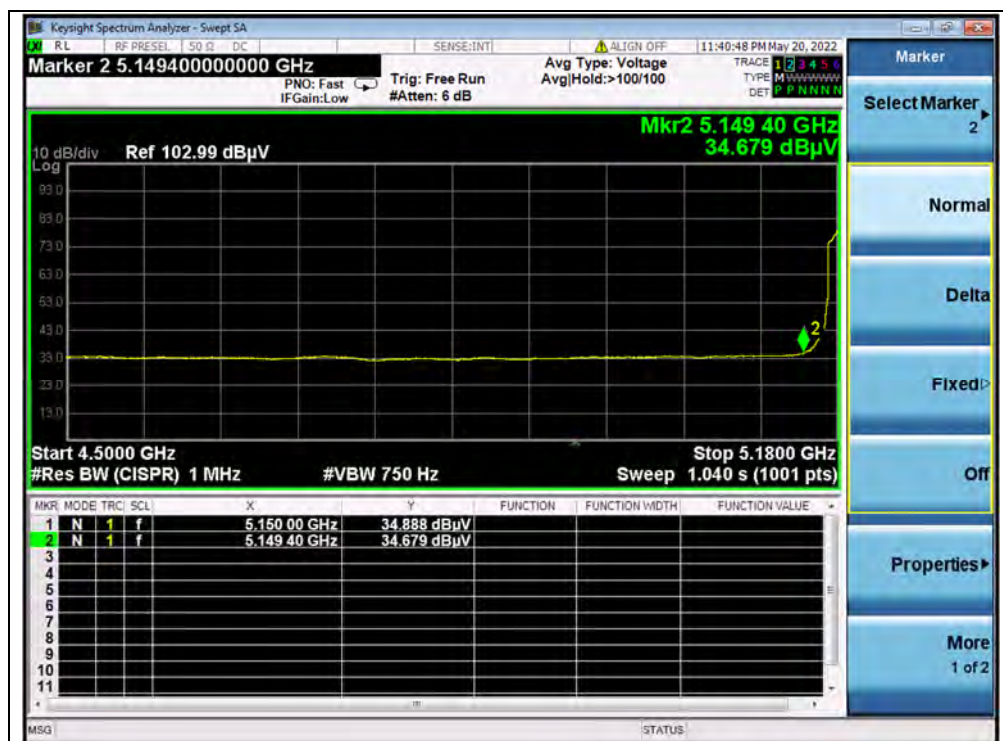
Channel	Frequency (MHz)	Detector	Receiver Reading U_R (dB μ V)	A_T (dB)	A_{Factor} (dB@3m)	Max. Emission E (dB μ V/m)	Limit (dB μ V/m)	Verdict
		PK/ AV						
36	5148.04	PK	47.65	-19.54	32.20	60.31	74	PASS
36	5150.00	AV	34.89	-19.54	32.20	47.55	54	PASS
48	5446.14	PK	42.45	-19.54	32.20	55.11	74	PASS
48	5356.38	AV	32.12	-19.54	32.20	44.78	54	PASS
149	5725.00	PK	47.28	-19.01	32.20	60.47	122.23	PASS
165	5850.00	PK	46.93	-19.01	32.20	60.12	122.23	PASS



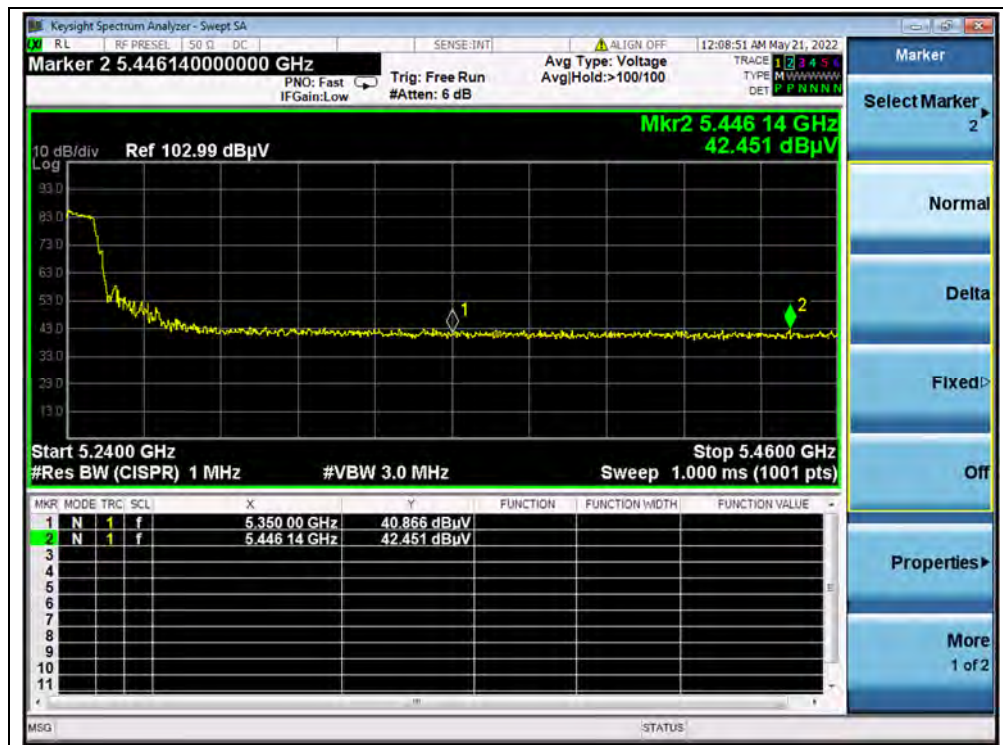
B.Test Plot:



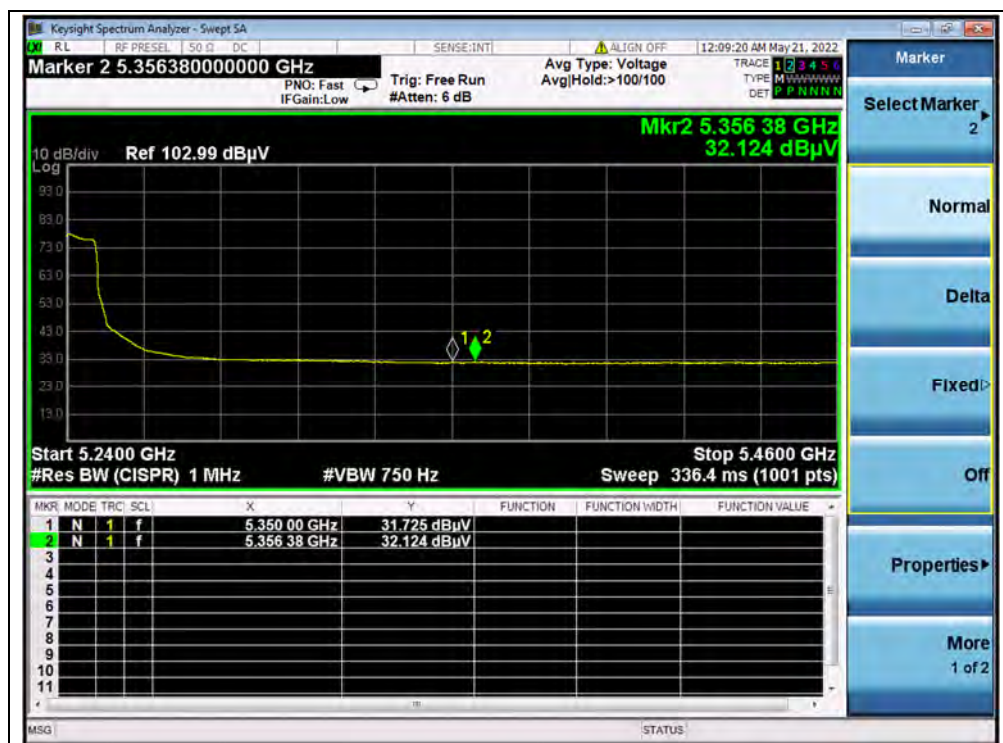
(PEAK, Channel 36, 802.11a)



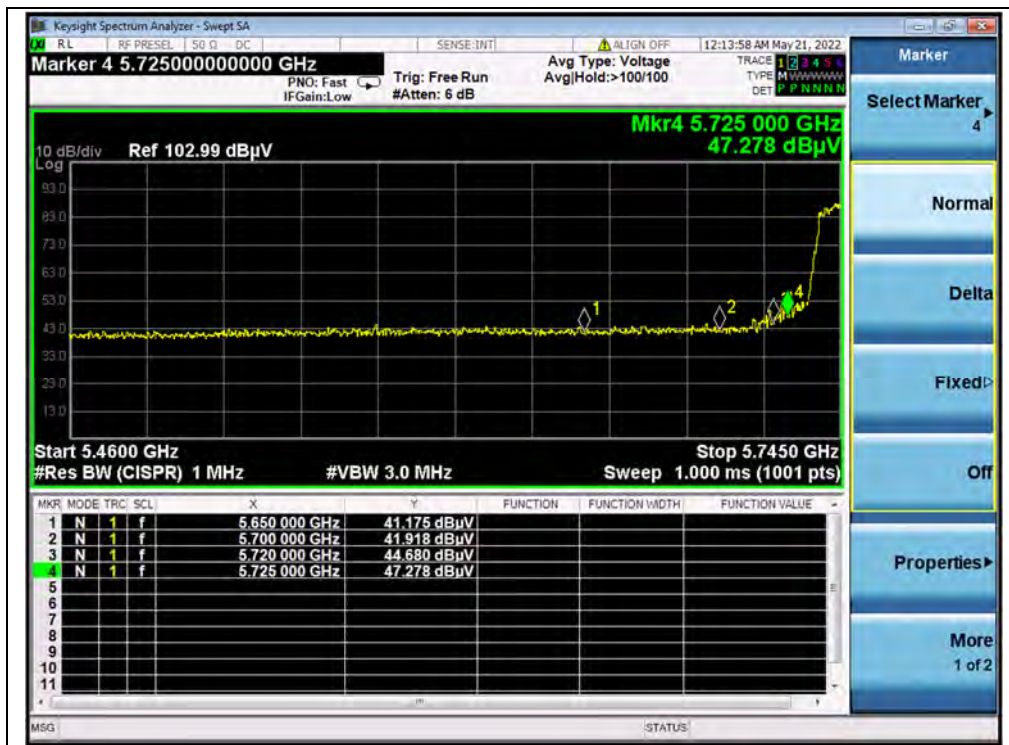
(AVERAGE, Channel 36, 802.11a)



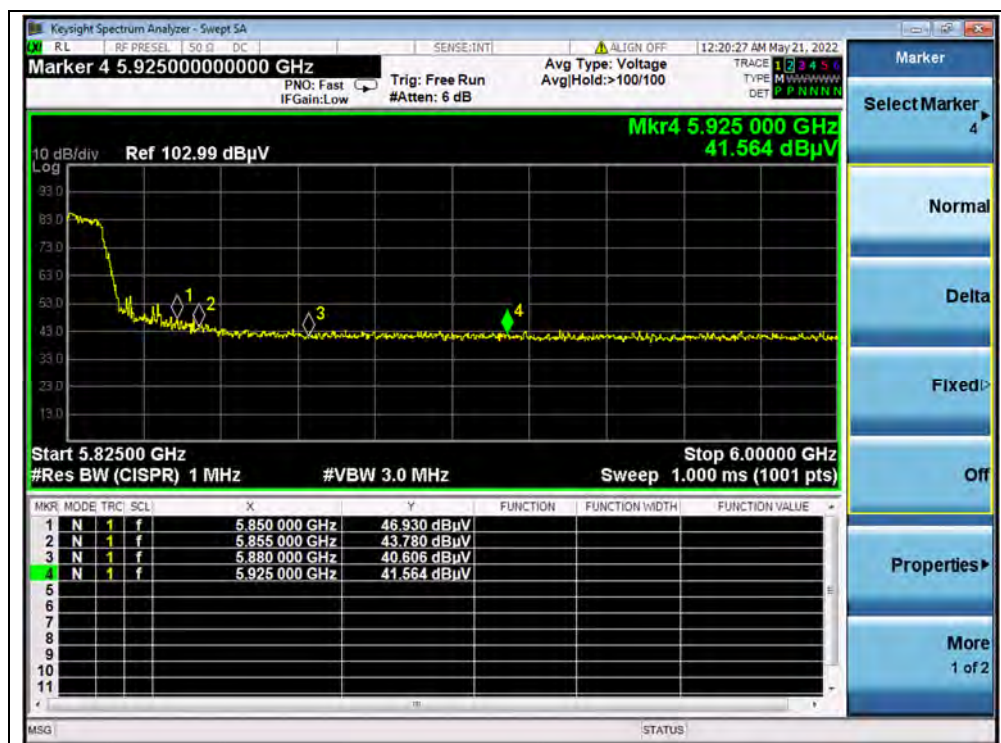
(PEAK, Channel 48, 802.11a)



(AVERAGE, Channel 48, 802.11a)



(PEAK, Channel 149, 802.11a)



(PEAK, Channel 165, 802.11a)

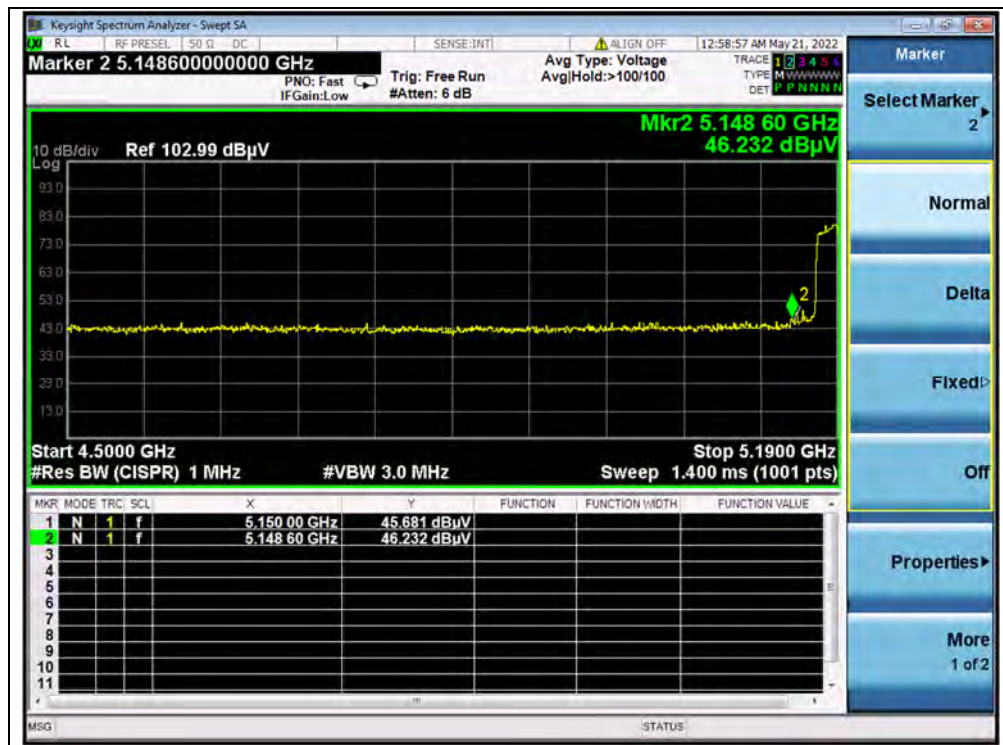


802.11n (HT40) Mode

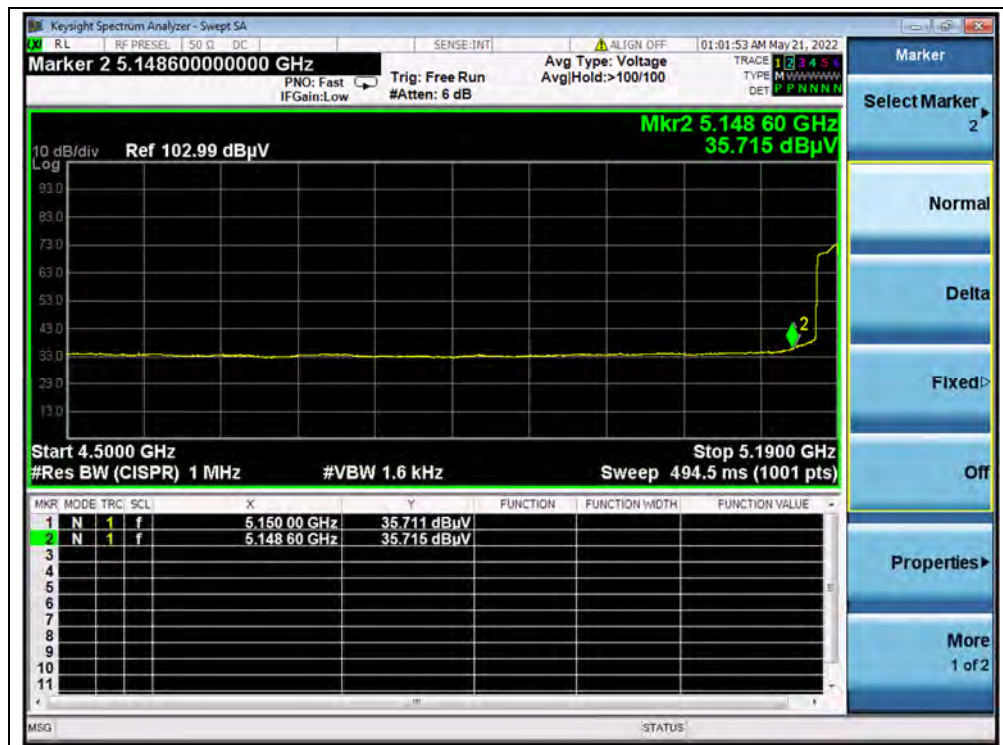
A.Test Verdict:

Channel	Frequency (MHz)	Detector	Receiver Reading U_R (dB μ V)	A_T (dB)	A_{Factor} (dB@3m)	Max. Emission E (dB μ V/m)	Limit (dB μ V/m)	Verdict
		PK/ AV						
38	5148.60	PK	46.23	-19.54	32.20	58.89	74	PASS
38	5148.60	AV	35.72	-19.54	32.20	48.38	54	PASS
48	5406.18	PK	43.01	-19.54	32.20	55.67	74	PASS
48	5357.19	AV	32.49	-19.54	32.20	45.15	54	PASS
151	5725.00	PK	46.58	-19.01	32.20	59.77	122.23	PASS
159	5855.00	PK	42.31	-19.01	32.20	55.50	110.83	PASS

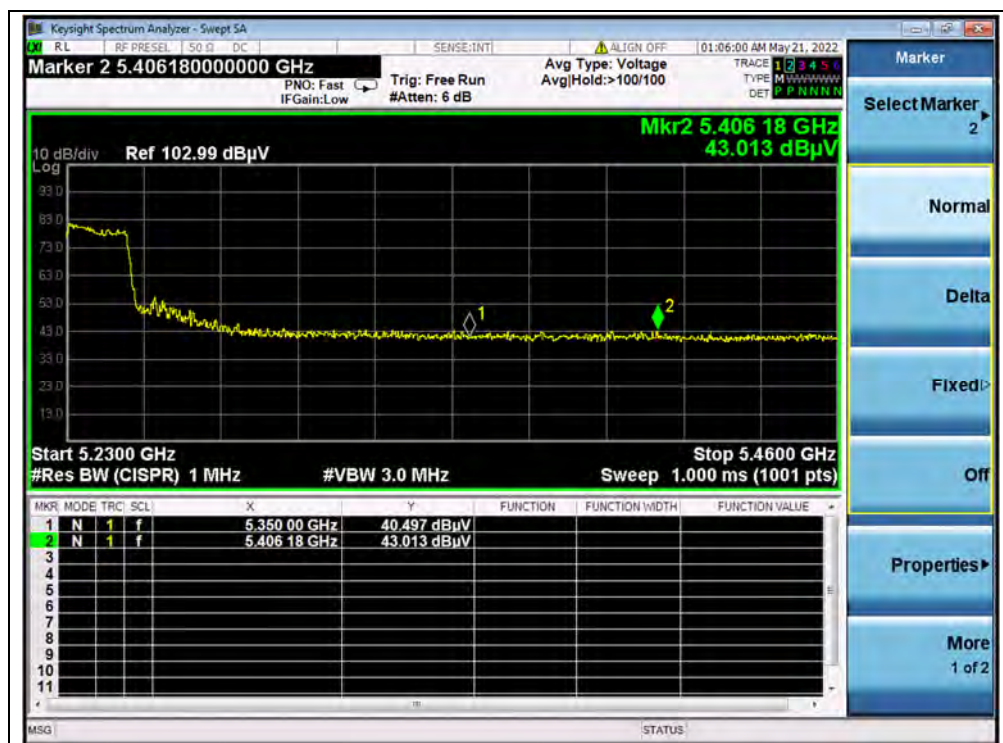
B.Test Plot:



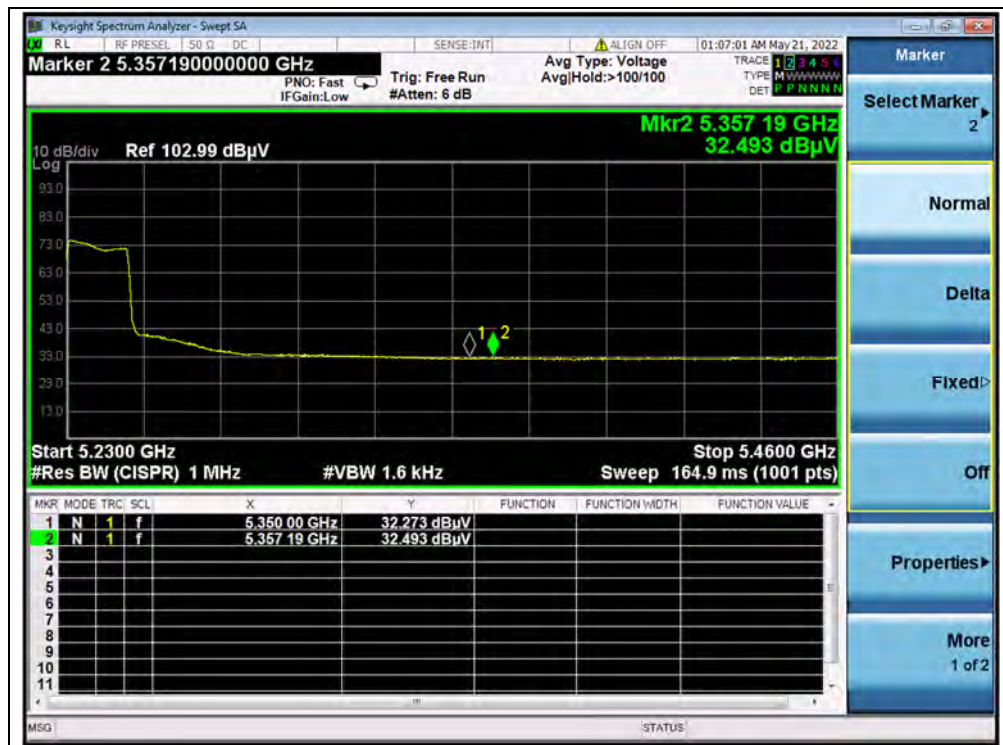
(PEAK, Channel 38, 802.11n (HT40))



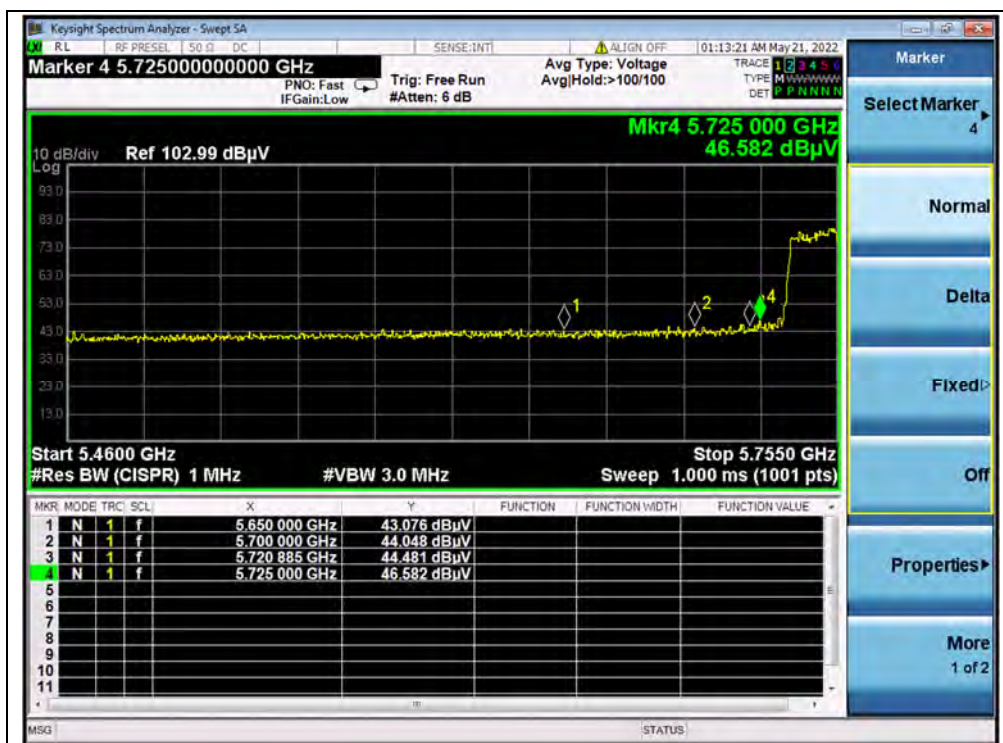
(AVERAGE, Channel 38, 802.11n (HT40))



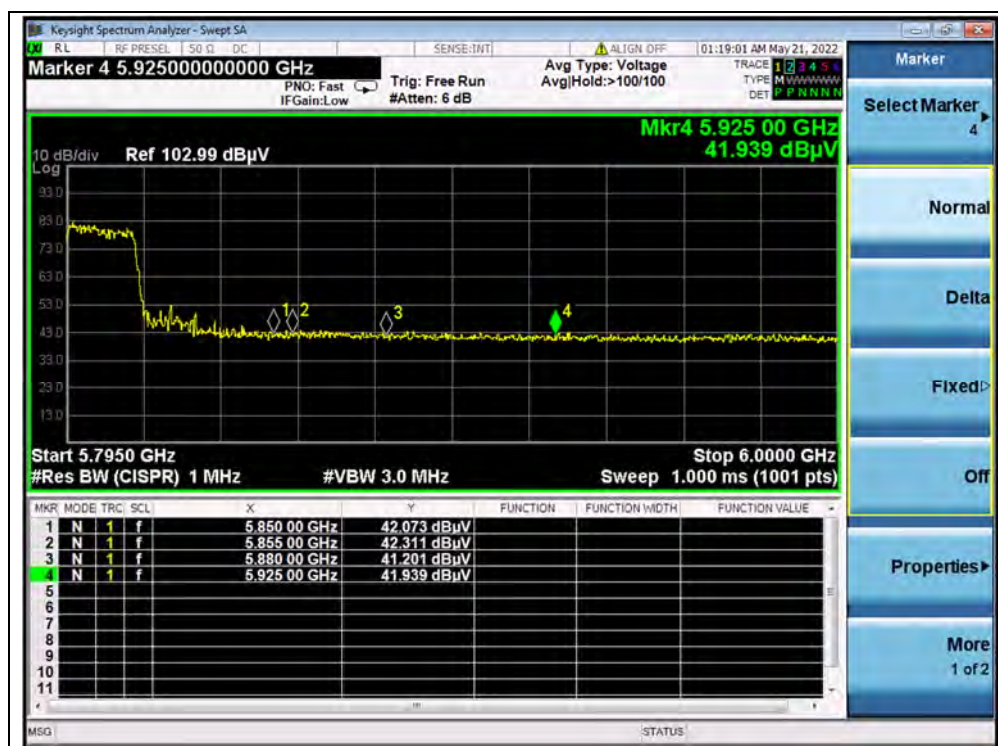
(PEAK, Channel 48, 802.11n (HT40))



(AVERAGE, Channel 48, 802.11n (HT40))



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



(PEAK, Channel 159, 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(e.i.r.p.) to field strength (dBμV/m);

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

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:

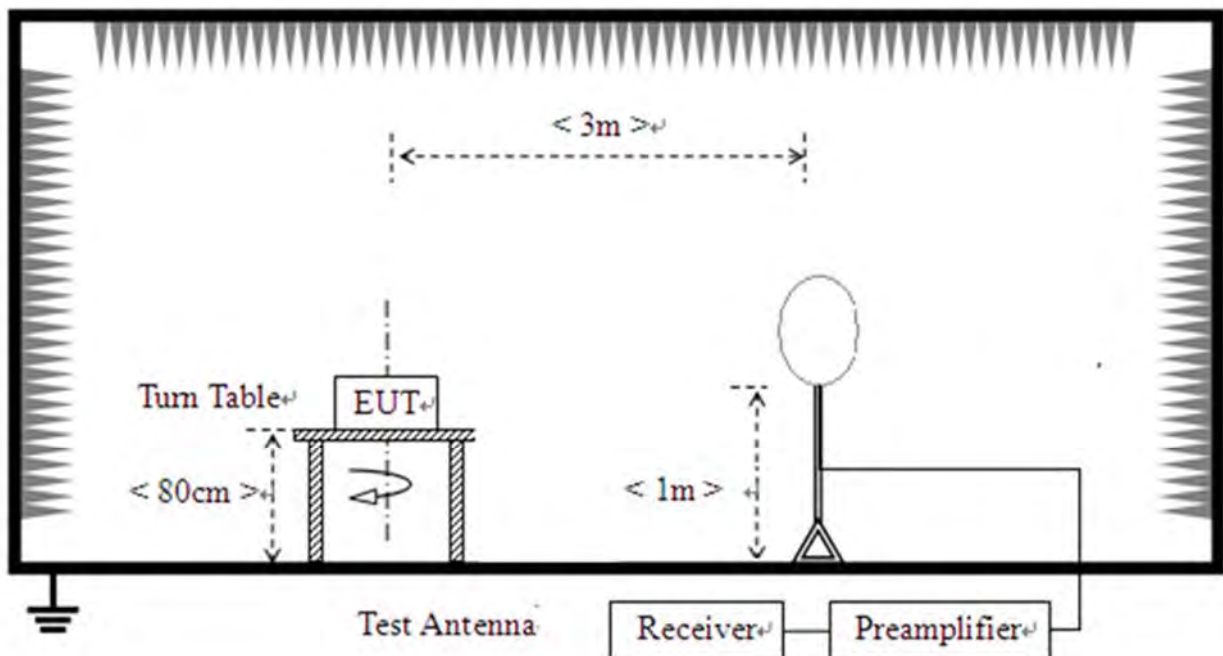
Frequency (MHz)	Field Strength (μV/m)	Measurement Distance (m)
0.009 - 0.490	2400/F(kHz)	300
0.490 - 1.705	24000/F(kHz)	30
1.705 - 30.0	30	30
30 - 88	100	3
88 - 216	150	3
216 - 960	200	3
Above 960	500	3

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).

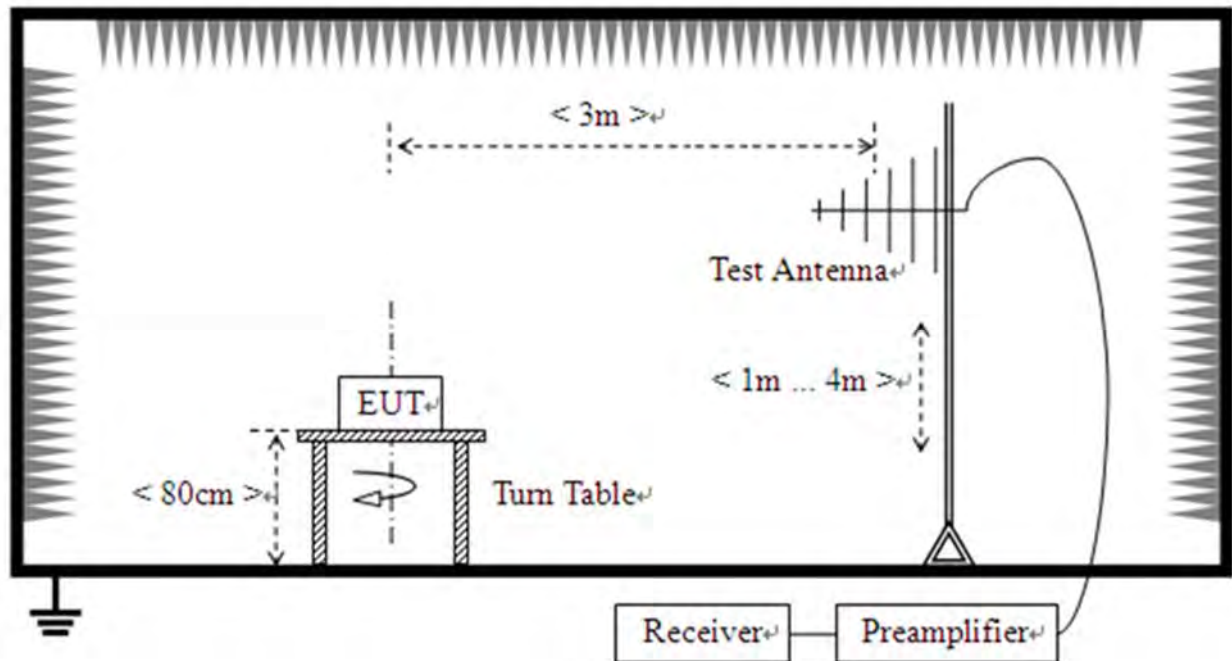
2.9.2. Test Description

Test Setup:

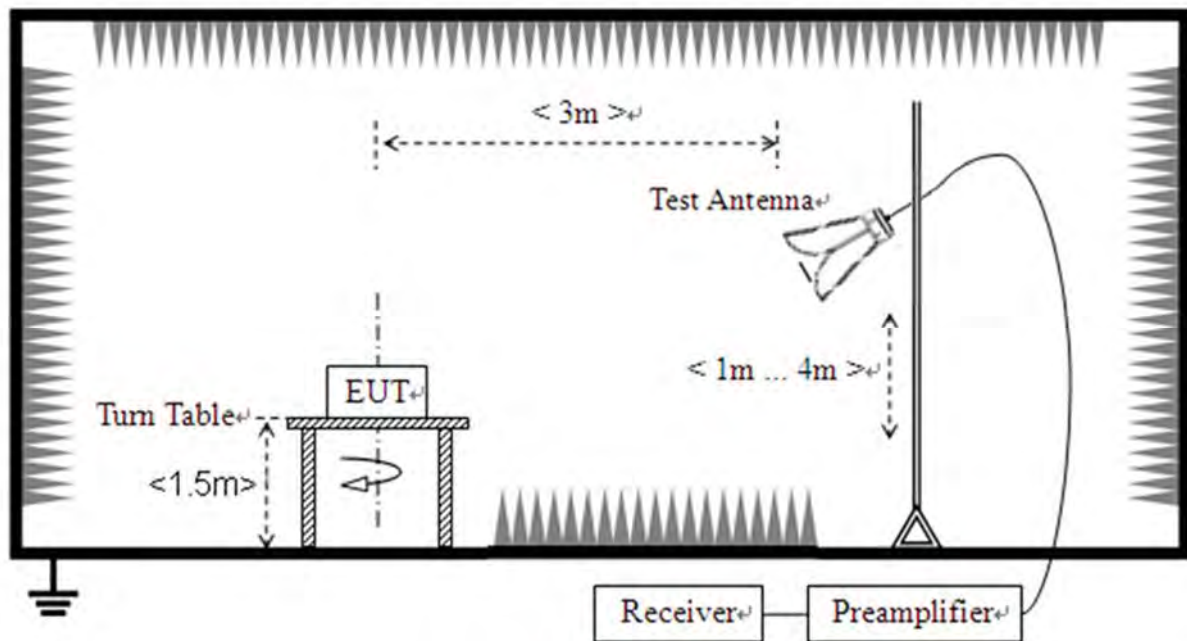
- 1) For radiated emissions from 9kHz to 30MHz



- 2) For radiated emissions from 30MHz to 1GHz



3) For radiated emissions above 1GHz



The EUT is placed on a non-conducting table 80 cm above the ground plane for measurement below 1GHz; 1.5 m above the ground plane for measurement above 1GHz. The antenna to EUT distance is 3meters. The EUT is configured in accordance with ANSI C63.10. The EUT is set to transmit in a continuous mode.



For measurements below 30MHz, the emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9kHz-90 kHz, 110kHz-490 kHz. Radiated emission limits in these two bands are based on measurements employing an average detector.

For measurements below 1GHz the resolution bandwidth is set to 100kHz for peak detection measurements or 120kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

For measurements above 1GHz the resolution bandwidth is set to 1MHz, the video band width is set to 3MHz for peak measurements and as applicable for average measurements.

The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized in both the vertical and the horizontal positions. For measurements above 1 GHz, keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response.

2.9.3. Test Result

According to ANSI C63.10, 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 (or average) limit, it is unnecessary to perform an quasi-peak measurement (or average).

The measurement results are obtained as below:

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

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.

Note 1: 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.

Note 2: 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.

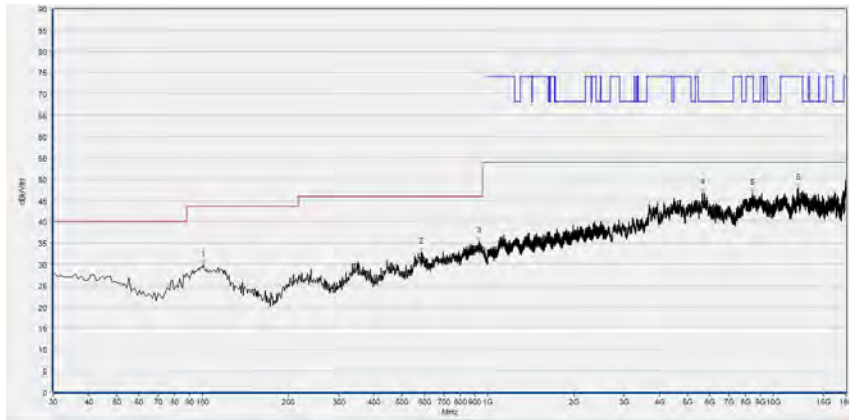
Note 3: For the frequency, which started from 18GHz to 10th harmonic of the highest frequency, was pre-scanned and the result which was 20dB lower than the limit was not recorded.

Note 4: All test modes and bandwidth were considered and evaluated respectively by performing full test, only the worst data were recorded for each bandwidth.



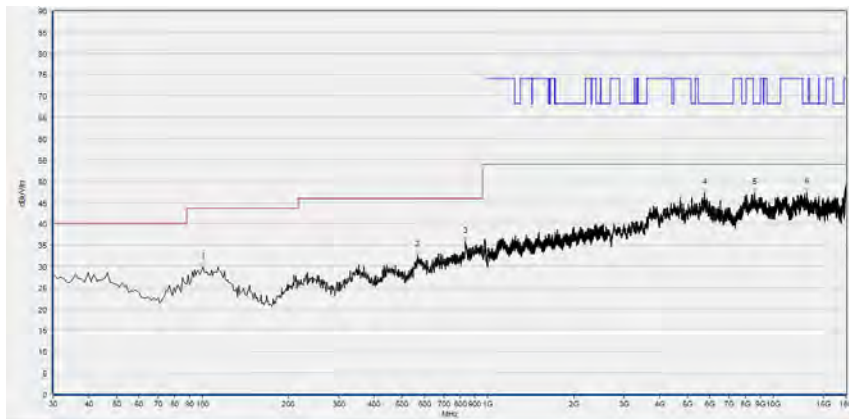
802.11a Mode

Plot 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
100.881	29.88	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
584.424	32.87	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
928.148	35.35	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
5649.810	46.68	N/A	N/A	68.23	N/A	N/A	Horizontal	PASS
8456.251	46.78	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
12205.361	47.89	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

(Antenna Horizontal, 30MHz to 18GHz)

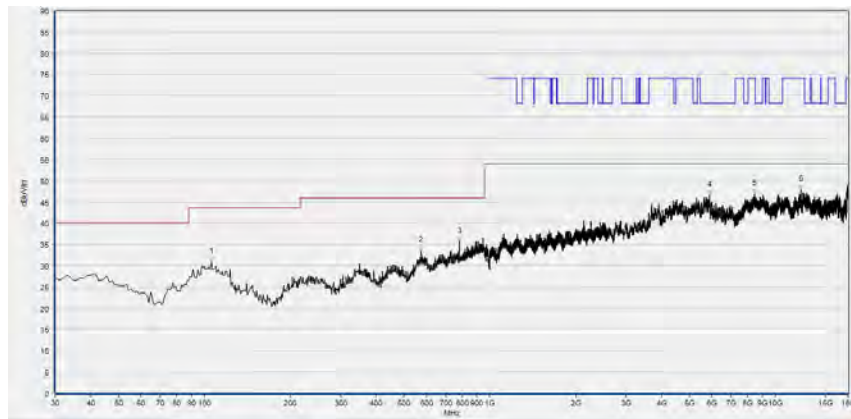


Fre. (MHz)	PK (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
100.881	29.87	N/A	N/A	N/A	43.50	N/A	Vertical	PASS
566.947	32.61	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
833.964	35.79	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
5736.067	47.33	N/A	N/A	68.23	N/A	N/A	Vertical	PASS
8604.121	47.31	N/A	N/A	68.23	N/A	N/A	Vertical	PASS
13080.256	47.41	N/A	N/A	68.23	N/A	N/A	Vertical	PASS

(Antenna Vertical, 30MHz to 18GHz)

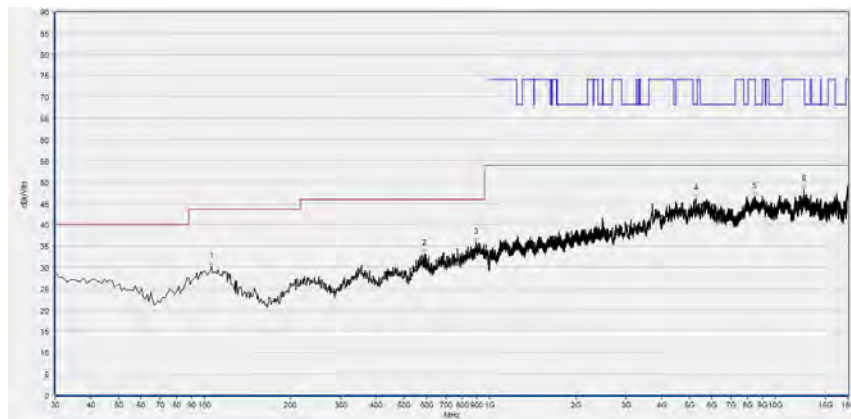


Plot for Channel 44



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
105.736	30.91	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
574.715	33.60	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
781.532	35.68	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
5871.614	46.51	N/A	N/A	68.23	N/A	N/A	Horizontal	PASS
8450.090	46.87	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
12316.263	47.88	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

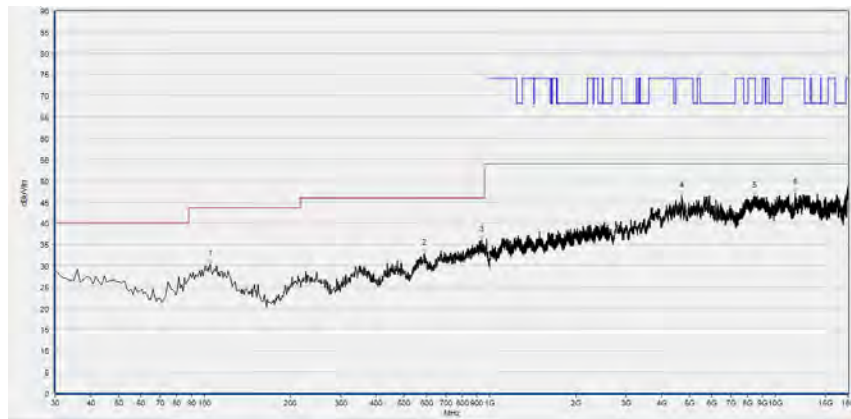
(Antenna Horizontal, 30MHz to 18GHz)



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
105.736	30.20	N/A	N/A	N/A	43.50	N/A	Vertical	PASS
591.221	33.12	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
896.106	35.78	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
5289.378	46.11	N/A	N/A	68.23	N/A	N/A	Vertical	PASS
8450.090	46.54	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
12615.083	48.23	N/A	N/A	74.00	N/A	54.00	Vertical	PASS

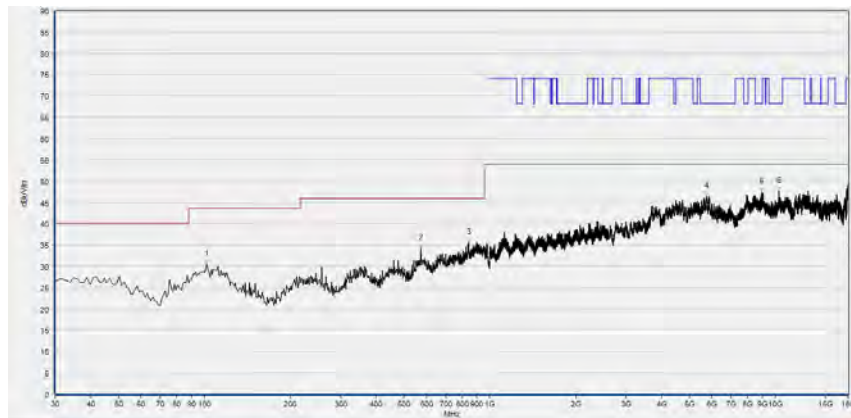
(Antenna Vertical, 30MHz to 18GHz)

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
104.765	30.27	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
590.250	32.77	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
937.858	36.03	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
4707.141	46.36	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
8440.848	46.39	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
11770.994	47.14	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

(Antenna Horizontal, 30MHz to 18GHz)

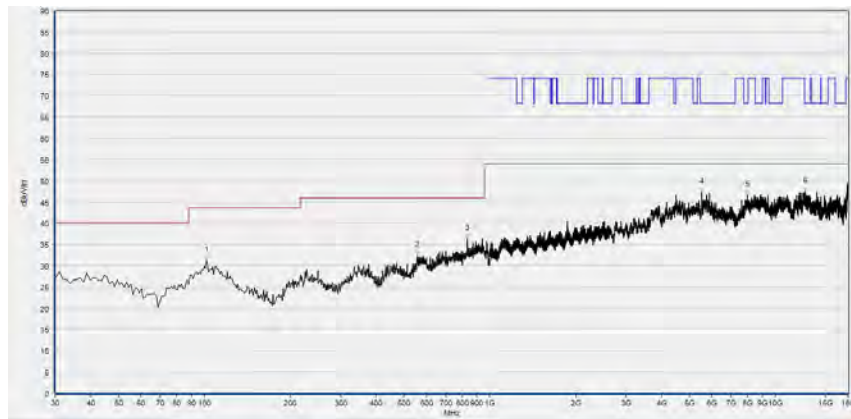


Fre. (MHz)	PK (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
101.852	30.56	N/A	N/A	N/A	43.50	N/A	Vertical	PASS
572.773	34.21	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
842.703	35.46	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
5742.228	46.37	N/A	N/A	68.23	N/A	N/A	Vertical	PASS
8976.875	47.49	N/A	N/A	68.23	N/A	N/A	Vertical	PASS
10286.137	47.53	N/A	N/A	68.23	N/A	N/A	Vertical	PASS

(Antenna Vertical, 30MHz to 18GHz)

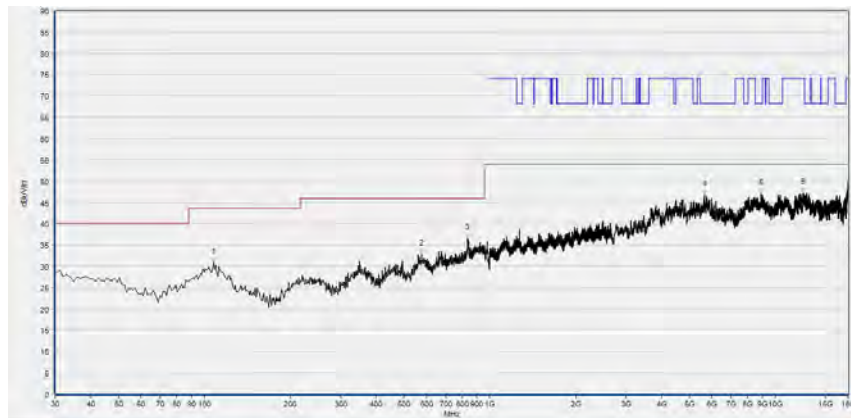


Plot for Channel 149



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
101.852	31.23	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
556.266	32.27	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
833.964	36.42	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
5514.263	47.18	N/A	N/A	68.23	N/A	N/A	Horizontal	PASS
7981.836	46.61	N/A	N/A	68.23	N/A	N/A	Horizontal	PASS
12735.227	47.45	N/A	N/A	68.23	N/A	N/A	Horizontal	PASS

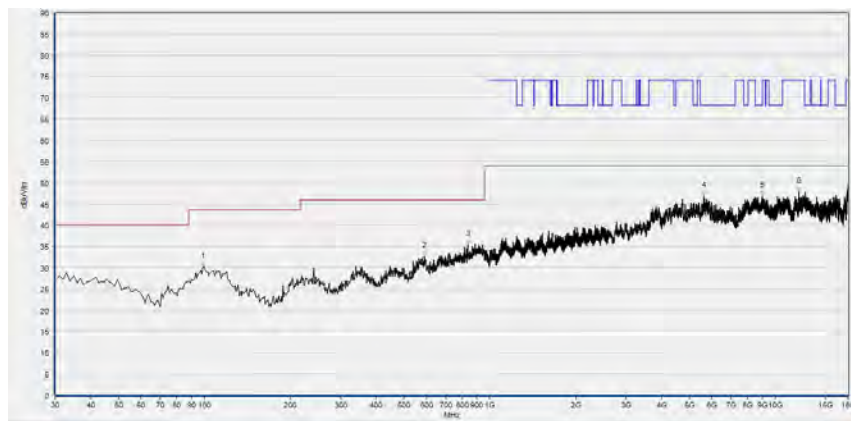
(Antenna Horizontal, 30MHz to 18GHz)



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
107.678	30.91	N/A	N/A	N/A	43.50	N/A	Vertical	PASS
576.657	32.81	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
835.906	36.60	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
5655.971	46.83	N/A	N/A	68.23	N/A	N/A	Vertical	PASS
8927.586	47.14	N/A	N/A	68.23	N/A	N/A	Vertical	PASS
12485.697	47.27	N/A	N/A	74.00	N/A	54.00	Vertical	PASS

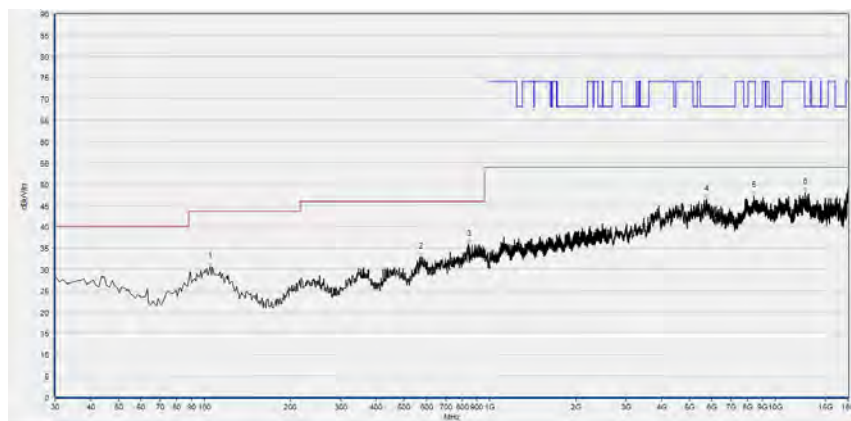
(Antenna Vertical, 30MHz to 18GHz)

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
98.939	30.20	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
589.279	32.60	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
836.877	35.32	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
5622.084	47.00	N/A	N/A	68.23	N/A	N/A	Horizontal	PASS
8989.198	46.85	N/A	N/A	68.23	N/A	N/A	Horizontal	PASS
12128.346	47.87	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

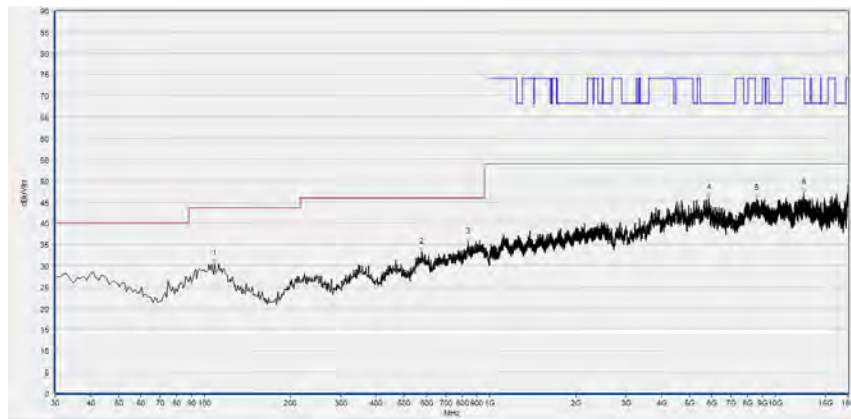
(Antenna Horizontal, 30MHz to 18GHz)



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
104.765	30.61	N/A	N/A	N/A	43.50	N/A	Vertical	PASS
572.773	32.90	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
842.703	35.86	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
5766.873	46.38	N/A	N/A	68.23	N/A	N/A	Vertical	PASS
8413.123	47.29	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
12738.308	48.06	N/A	N/A	68.23	N/A	N/A	Vertical	PASS

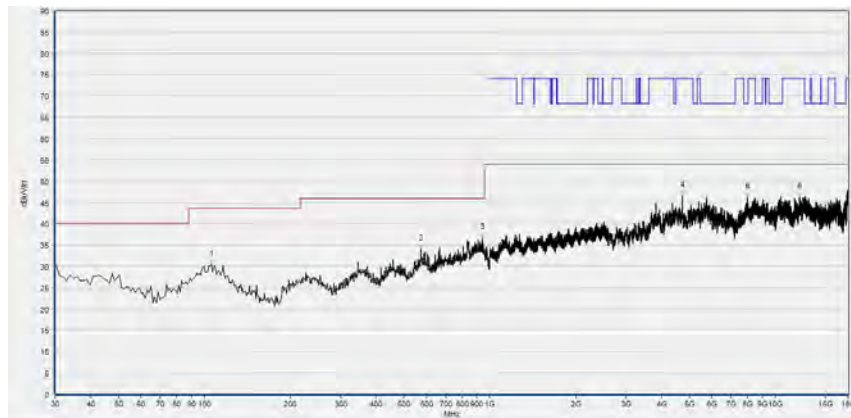
(Antenna Vertical, 30MHz to 18GHz)

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
108.649	30.44	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
576.657	33.18	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
837.848	35.53	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
5859.292	45.89	N/A	N/A	68.23	N/A	N/A	Horizontal	PASS
8631.846	45.69	N/A	N/A	68.23	N/A	N/A	Horizontal	PASS
12608.922	47.08	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

(Antenna Horizontal, 30MHz to 18GHz)



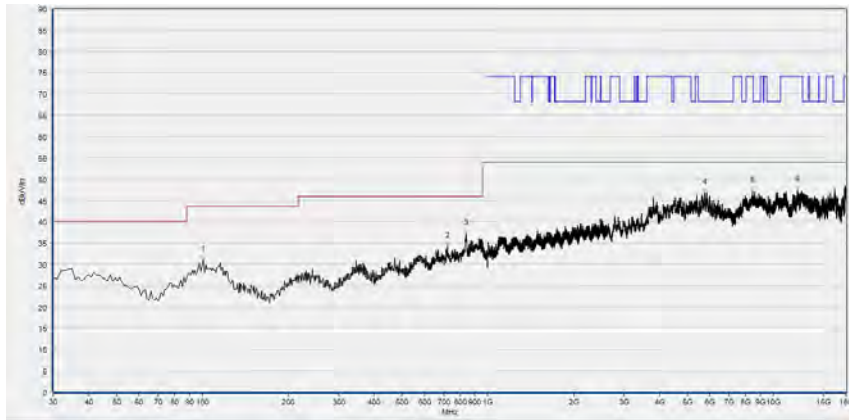
Fre. (MHz)	PK (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
105.736	30.50	N/A	N/A	N/A	43.50	N/A	Vertical	PASS
574.715	34.03	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
938.829	36.72	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
4722.545	46.62	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
8000.320	46.22	N/A	N/A	68.23	N/A	N/A	Vertical	PASS
12146.829	46.23	N/A	N/A	74.00	N/A	54.00	Vertical	PASS

(Antenna Vertical, 30MHz to 18GHz)



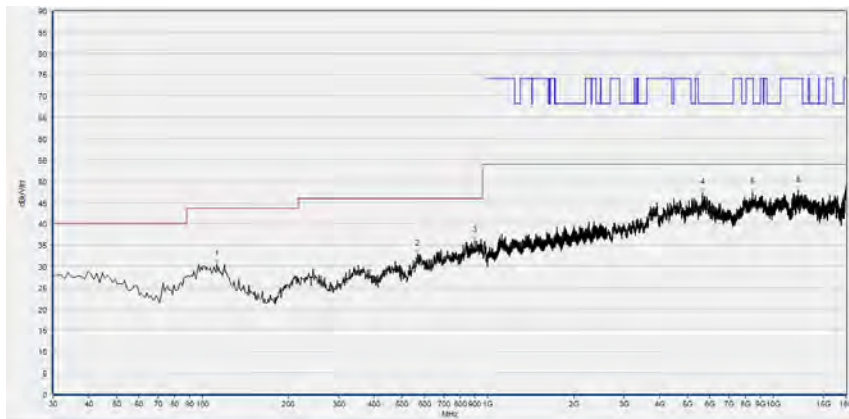
802.11n (HT40) Mode

Plot 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
100.881	30.99	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
721.331	34.27	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
838.819	37.27	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
5763.793	46.68	N/A	N/A	68.23	N/A	N/A	Horizontal	PASS
8462.412	47.12	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
12143.749	47.42	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

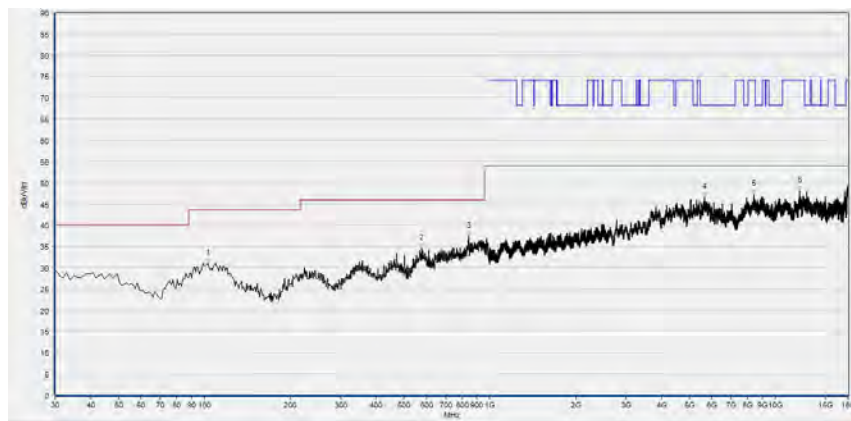
(Antenna Horizontal, 30MHz to 18GHz)



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
112.533	30.54	N/A	N/A	N/A	43.50	N/A	Vertical	PASS
567.918	32.82	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
900.961	36.03	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
5646.729	47.20	N/A	N/A	68.23	N/A	N/A	Vertical	PASS
8437.768	47.40	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
12211.522	47.82	N/A	N/A	74.00	N/A	54.00	Vertical	PASS

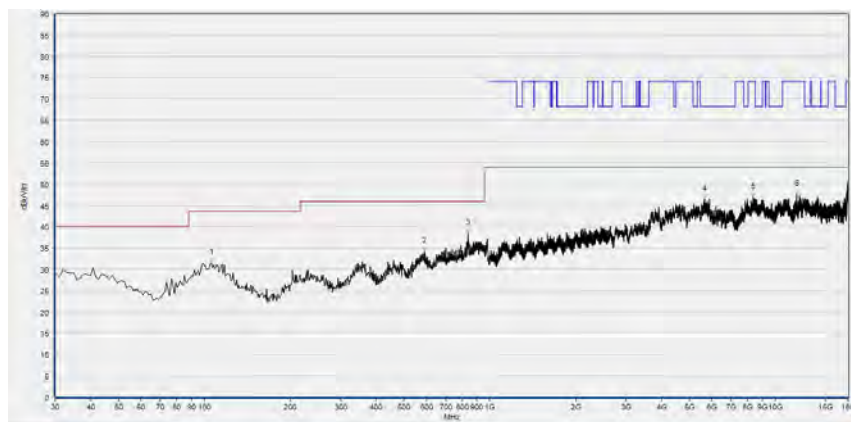
(Antenna Vertical, 30MHz to 18GHz)

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
102.823	31.05	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
577.628	34.51	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
843.674	37.35	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
5662.132	46.61	N/A	N/A	68.23	N/A	N/A	Horizontal	PASS
8406.961	47.25	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
12196.119	48.07	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

(Antenna Horizontal, 30MHz to 18GHz)

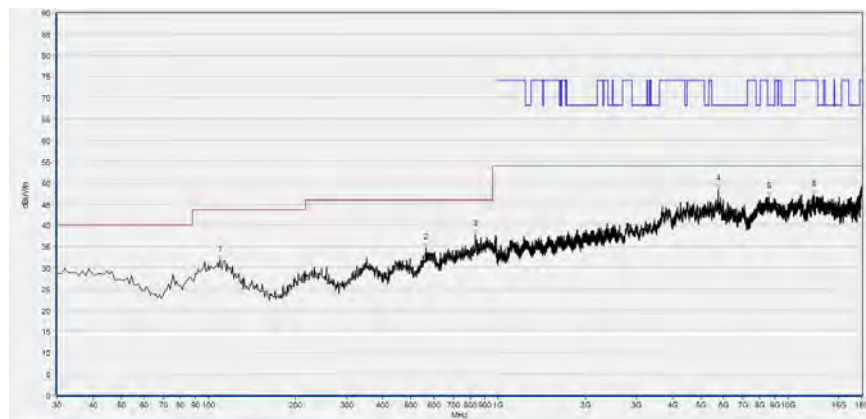


Fre. (MHz)	PK (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
105.736	31.53	N/A	N/A	N/A	43.50	N/A	Vertical	PASS
591.221	34.15	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
839.790	38.35	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
5646.729	46.36	N/A	N/A	68.23	N/A	N/A	Vertical	PASS
8373.075	46.95	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
11860.332	47.52	N/A	N/A	74.00	N/A	54.00	Vertical	PASS

(Antenna Vertical, 30MHz to 18GHz)

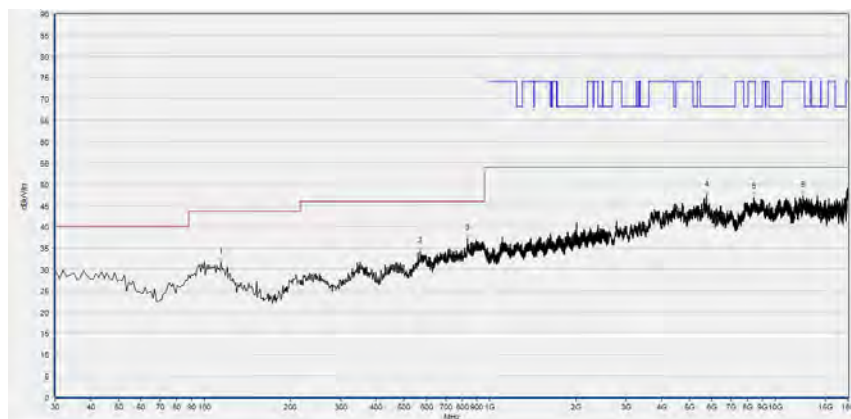


Plot for Channel 151



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
109.620	31.83	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
564.034	34.74	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
834.935	37.83	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
5751.470	48.51	N/A	N/A	68.23	N/A	N/A	Horizontal	PASS
8613.363	46.82	N/A	N/A	68.23	N/A	N/A	Horizontal	PASS
12282.376	47.11	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

(Antenna Horizontal, 30MHz to 18GHz)

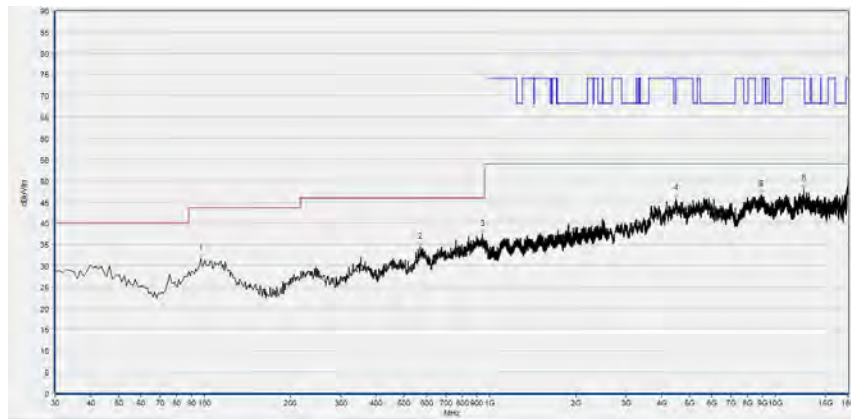


Fre. (MHz)	PK (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
114.474	31.65	N/A	N/A	N/A	43.50	N/A	Vertical	PASS
570.831	34.26	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
834.935	37.18	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
5757.632	47.48	N/A	N/A	68.23	N/A	N/A	Vertical	PASS
8413.123	46.99	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
12541.148	47.20	N/A	N/A	74.00	N/A	54.00	54.00	PASS

(Antenna Vertical, 30MHz to 18GHz)

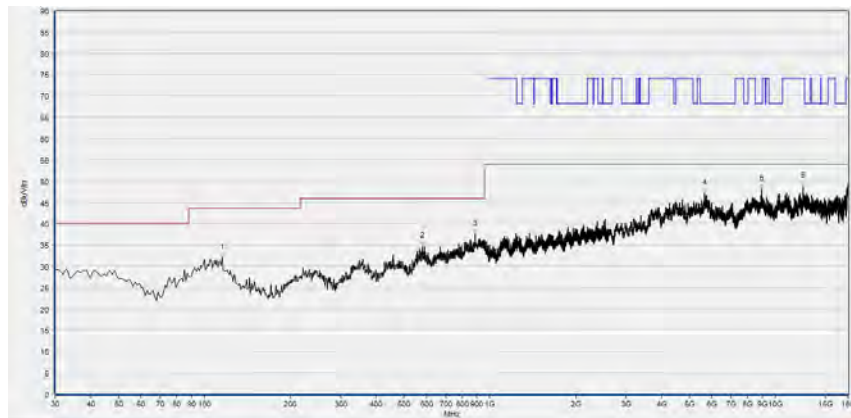


Plot for Channel 159



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
96.997	31.70	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
570.831	34.30	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
939.800	37.43	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
4479.176	45.72	N/A	N/A	68.23	N/A	N/A	Horizontal	PASS
8918.344	46.75	N/A	N/A	68.23	N/A	N/A	Horizontal	PASS
12590.438	48.12	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
115.445	31.97	N/A	N/A	N/A	43.50	N/A	Vertical	PASS
579.570	34.65	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
890.280	37.62	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
5646.729	47.14	N/A	N/A	68.23	N/A	N/A	Vertical	PASS
8958.392	48.08	N/A	N/A	68.23	N/A	N/A	Vertical	PASS
12510.342	48.73	N/A	N/A	74.00	N/A	54.00	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	$\pm 2.22\text{dB}$
Power Spectral Density	$\pm 2.22\text{dB}$
Bandwidth	$\pm 5\%$
Restricted Frequency Bands	$\pm 5\%$
Radiated Emission	$\pm 2.95\text{dB}$
Conducted Emission	$\pm 2.44\text{dB}$

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.
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.
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	Due Date
Attenuator 1	N/A	10dB	Resnet	N/A	N/A
EXA Signal Analyzer	MY53470836	N9010A	Agilent	2022.03.01	2023.02.28
USB Wideband Power Sensor	MY54180008	U2021XA	Agilent	2021.10.21	2022.10.20
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	2021.10.20	2022.10.19

4.2 Conducted Emission Test Equipments

Equipment Name	Serial No.	Type	Manufacturer	Cal. Date	Due Date
Receiver	MY56400093	N9038A	KEYSIGHT	2022.03.03	2023.03.02
LISN	812744	NSLK 8127	Schwarzbeck	2022.03.03	2023.03.02
Pulse Limiter (10dB)	VTSD 9561 F-B #206	VTSD 9561-F	Schwarzbeck	2021.07.21	2022.07.20
Coaxial Cable(BNC) (30MHz-26GHz)	CB01	EMC01	Morlab	N/A	N/A

4.3 List of Software Used

Description	Manufacturer	Software Version
Test System	Tonscend	V2.5.77.0418
Morlab EMCR V1.2	Morlab	V1.0
TS+ -[JS32-CE]	Tonscend	V2.5.0.0

**4.4 Radiated Test Equipments**

Equipment Name	Serial No.	Type	Manufacturer	Cal. Date	Due Date
Receiver	MY54130016	N9038A	Agilent	2021.07.16	2022.07.15
Test Antenna - Bi-Log	9163-519	VULB 9163	Schwarzbeck	2022.05.25	2025.05.24
Test Antenna - Loop	1519-022	FMZB1519	Schwarzbeck	2022.02.11	2025.02.10
Test Antenna – Horn	01774	BBHA 9120D	Schwarzbeck	2019.07.26	2022.07.25
Test Antenna – Horn	BBHA9170 #774	BBHA9170	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	S020180L32 03	Tonscend	2021.07.16	2022.07.15
26-40GHz pre-Amplifier	56774	S40M400L4 002	Tonscend	2021.07.16	2022.07.15
18-26.5GHz pre-Amplifier	46732	S10M100L38 02	Tonscend	2021.07.16	2022.07.15
Notch Filter	N/A	WRCG-5150-5350	Wainwright	2021.07.16	2022.07.15
Notch Filter	N/A	WRCG-5725-5850	Wainwright	2021.07.16	2022.07.15
Anechoic Chamber	N/A	9m*6m*6m	CRT	2020.01.06	2023.01.05

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