TEST REPORT

APPLICANT	:	Hangzhou Vision Insight Technology Co., Ltd.
PRODUCT NAME	:	Smart Doorbell
MODEL NAME	:	D10C
BRAND NAME	:	blurams
FCC ID	:	2ASAQ-D10C
STANDARD(S)	:	47 CFR Part 15 Subpart C
RECEIPT DATE	:	2020-09-08
TEST DATE	:	2020-09-19 to 2021-01-22
ISSUE DATE	:	2021-04-13

Edited by: Zeng Xiaoying (Rapporteur)

Approved by: Peng Huarui (Supervisor)

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Change History		
Version	Date	Reason for change
1.0	2021-04-13	First edition

1. Technical Information

Note: Provide by applicant.

1.1. Applicant and Manufacturer Information

Applicant:	Hangzhou Vision Insight Technology Co., Ltd.
Applicant Address:	Room 203, South Floor 2, Building 5, 90 Wensan Road, Xihu District, Hangzhou, China
Manufacturer:	Hangzhou Vision Insight Technology Co., Ltd.
Manufacturer Address:	Room 203, South Floor 2, Building 5, 90 Wensan Road, Xihu District, Hangzhou, China

1.2. Equipment Under Test (EUT) Description

Product Name:	Smart Doorbell	
Serial No.:	(N/A, marked #1 by test site)	
Hardware Version:	D10C-SW-V2.1_D10C-PIR-V2.00_D10C-AC-V1.01	
Software Version:	1.3.38.998	
Modulation Technology:	DSSS, OFDM	
Modulation Mode:	802.11b, 802.11g, 802.11n (HT20)	
Operating Frequency Range:	802.11b/g/ n (HT20): 2412MHz–2462MHz	
Antenna Type:	FPC Antenna	
Antenna Gain:	3.32dBi	
Accessory Information:	Battery	
	Brand Name:	Sinowatt
	Model No.:	SW18650-26HPA
	Serial No.:	(N/A, marked #1 by test site)
	Capacity:	2600mAh
	Rated Voltage:	3.6V
	Charge Limit:	4.2V
	Manufacturer:	Sinowatt Dongguan Limited

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

Modulation Technology	Modulation Type	Data Rate (Mbps) Note1
DSSS (802.11b)	DBPSK	**1**
	DQPSK	2
	CCK	5.5/ 11
OFDM (802.11g)	BPSK	**6** / 9
	QPSK	12 / 18
	16QAM	24 / 36
	64QAM	48 / 54
OFDM (802.11n (HT20))	BPSK	**6.5**
	QPSK	13/19.5
	16QAM	26/39
	64QAM	52/58.5/65

Note1: The worst-case mode (bold face) 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

Test Mode	Channel	Frequency (MHz)	Channel	Frequency (MHz)
802.11b/g/ n (HT20)	**1**	**2412**	8	2447
	2	2417	9	2452
	3	2422	10	2457
	4	2427	**11**	**2462**
	5	2432		
	6	**2437**		
	7	2442		

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 C for the EUT FCC ID Certification:

No.	Identity	Document Title
1	47 CFR Part 15	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	N/A	Duty Cycle Of Test Signal	Jan 22, 2021	Ouyang Feng	PASS	No deviation
3	15.247(b)	Maximum Peak and Average Conducted Output Power	Jan 22, 2021	Ouyang Feng	PASS	No deviation
4	15.247(a)	Bandwidth	Jan 22, 2021	Ouyang Feng	PASS	No deviation
5	15.247(d)	Conducted Spurious Emission and Band Edge	Jan 22, 2021	Ouyang Feng	PASS	No deviation
6	15.247(e)	Power Spectral Density (PSD)	Jan 22, 2021	Ouyang Feng	PASS	No deviation
7	15.207	Conducted Emission	Sep 19, 2020	Huang Zhiye	PASS	No deviation
8	15.247(d)	Restricted Frequency Bands	Jan 15, 2021	Gao Jianrou	PASS	No deviation
9	15.209, 15.247(d)	Radiated Emission	Jan 15, 2021	Gao Jianrou	PASS	No deviation

Note 1: The tests were performed according to the method of measurements prescribed in ANSIC63.10-2013, KDB558074 D01 v05r02.

Note 2: The path loss during the RF test is calibrated to correct the results by the offset setting

in the test equipments. The ref offset 12dB contains two parts that cable loss 2dB and Attenuator 10dB.

Note 3: 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 4: When the test result is a critical value, we will use the measurement uncertainty give the judgment result based on the 95% risk level.

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 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.Test Result: Compliant

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

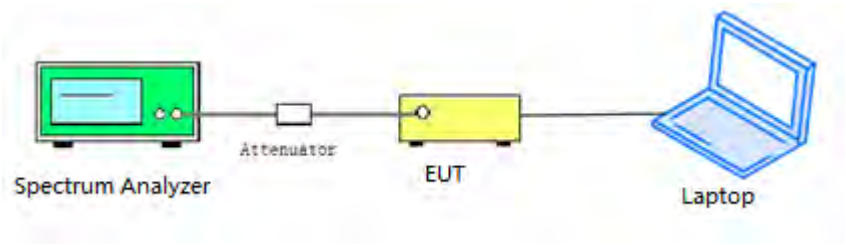
2.2. Duty Cycle of Test Signal

2.2.1.Requirement

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

2.2.2.Test Description

Test Setup:



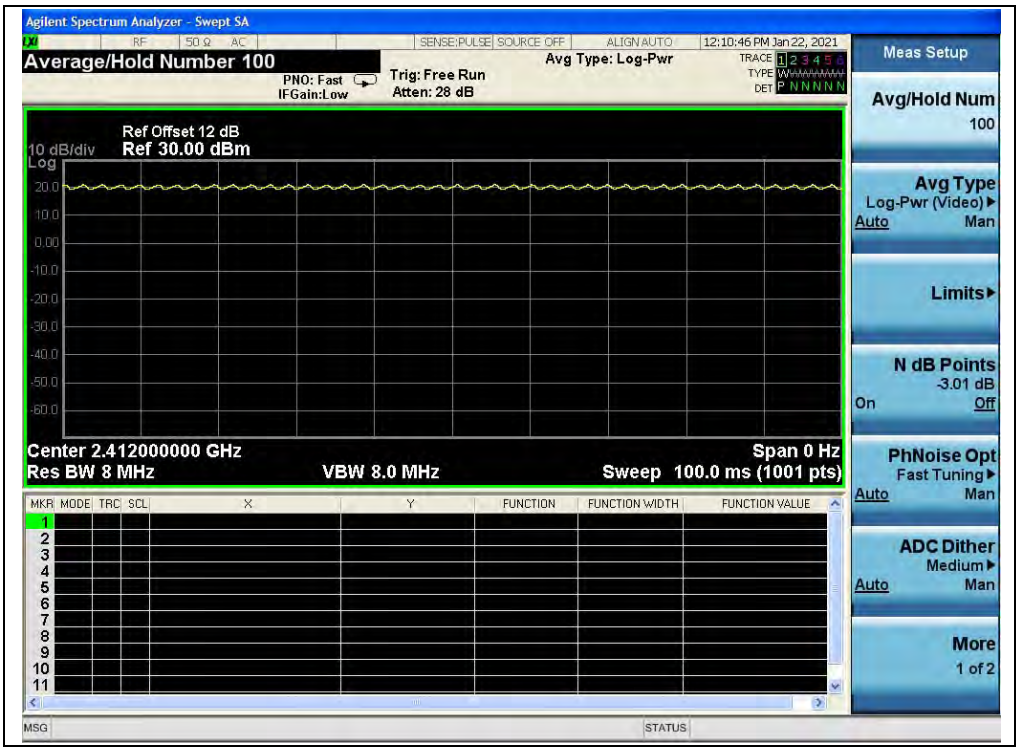
ANSI C63.10 2013 Clause 11.6 was used in order to prove compliance.

2.2.3.Test Result

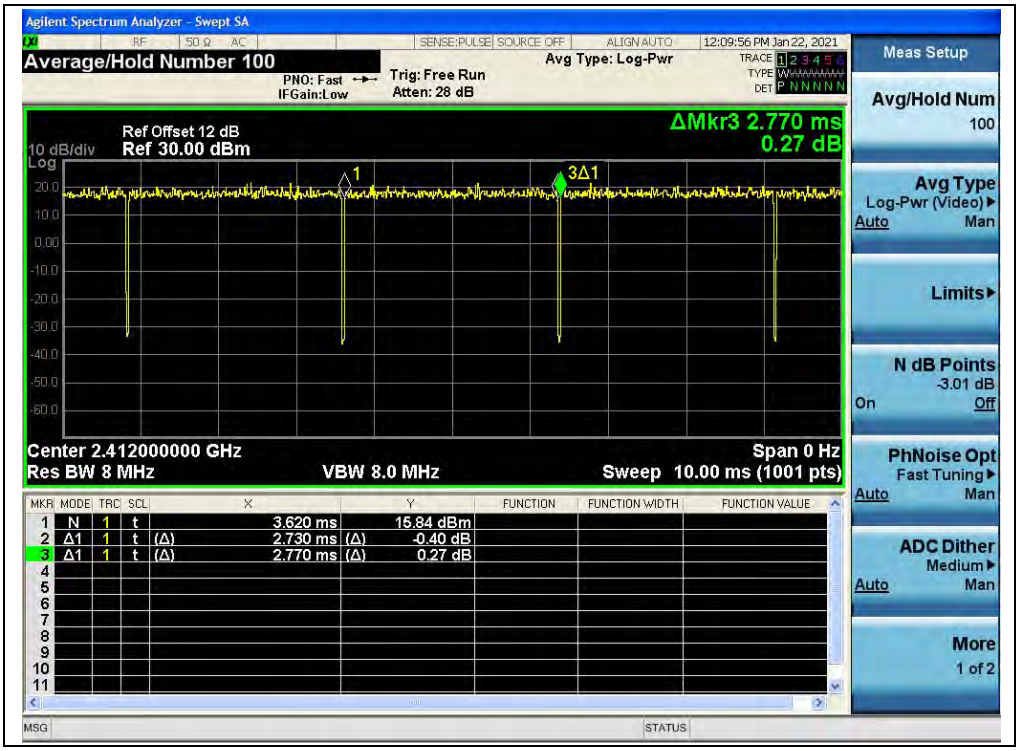
A.Test Verdict:

Test Mode	Duty Cycle (%) (D)	Duty Factor (10*lg[1/D])
802.11b	100.00	0.00
802.11g	98.56	0.06
802.11n (HT20)	98.45	0.07

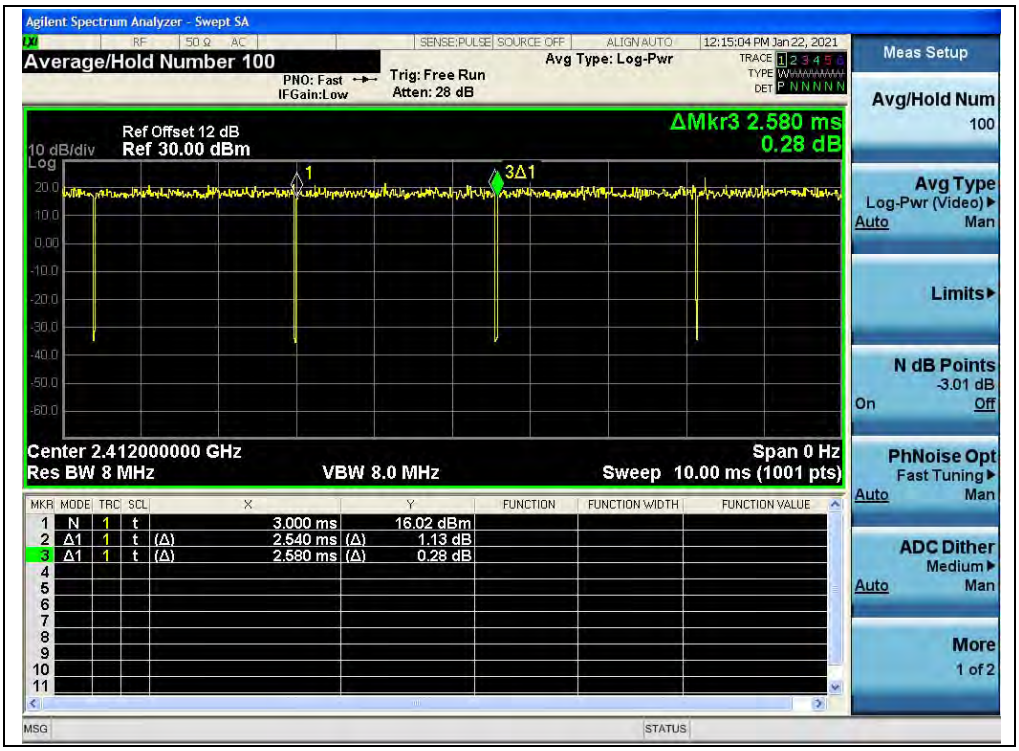
B.Test Plot:



(Channel 1, 802.11b)



(Channel 1, 802.11g)



(Channel 1, 802.11n (HT20))

2.3. Maximum Peak and Average Conducted Output Power

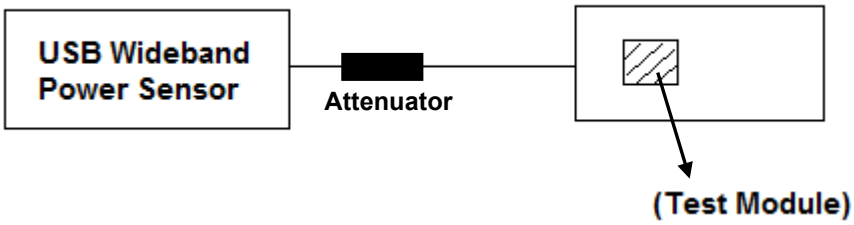
2.3.1. Requirement

According to FCC section 15.247(b)(3), For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: The maximum peak conducted output power of the intentional radiator shall not exceed1 Watt.

2.3.2. Test Description

The measured output power was calculated by the reading of the USB Wideband Power Sensor and calibration.

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.

2.3.3.Test Result

Maximum Peak Conducted Output Power

802.11b Mode

Channel	Frequency (MHz)	Measured Output Peak Power		Limit		Verdict
		dBm	W	dBm	W	
1	2412	19.74	0.094	30	1	PASS
6	2437	19.25	0.084			PASS
11	2462	19.35	0.086			PASS

802.11g Mode

Channel	Frequency (MHz)	Measured Output Peak Power		Limit		Verdict
		dBm	W	dBm	W	
1	2412	21.72	0.149	30	1	PASS
6	2437	22.23	0.167			PASS
11	2462	22.41	0.174			PASS

802.11n (HT20) Mode

Channel	Frequency (MHz)	Measured Output Peak Power		Limit		Verdict
		dBm	W	dBm	W	
1	2412	**22.54**	**0.179**	30	1	PASS
6	2437	22.48	0.177			PASS
11	2462	22.41	0.174			PASS

Maximum Average Conducted Output Power

802.11b Mode

Channel	Frequency (MHz)	Average Power				Limit		Verdict
		Measured	Duty Factor	Duty factor Calculated				
		dBm		dBm	W	dBm	W	
1	2412	15.81	0.00	**15.81**	**0.038**	30	1	PASS
6	2437	15.54		15.54	0.036			PASS
11	2462	15.36		15.36	0.034			PASS

802.11g Mode

Channel	Frequency (MHz)	Average Power				Limit		Verdict
		Measured	Duty Factor	Duty factor Calculated				
		dBm		dBm	W	dBm	W	
1	2412	13.11	0.07	13.17	0.021	30	1	PASS
6	2437	13.14		13.20	0.021			PASS
11	2462	13.24		13.30	0.021			PASS

802.11n (HT20) Mode

Channel	Frequency (MHz)	Average Power				Limit		Verdict
		Measured	Duty Factor	Duty factor Calculated				
		dBm		dBm	W	dBm	W	
1	2412	13.29	0.07	13.36	0.022	30	1	PASS
6	2437	13.41		13.48	0.022			PASS
11	2462	13.28		13.35	0.022			PASS

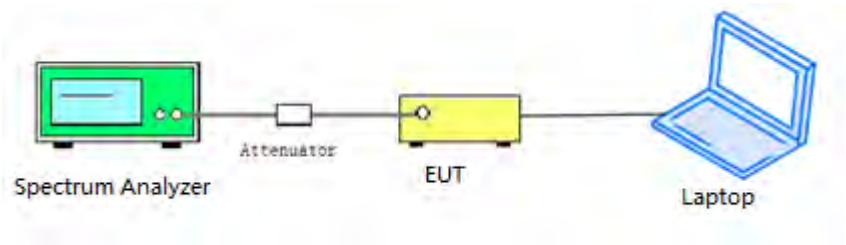
2.4. Bandwidth

2.4.1.Requirement

According to FCC section 15.247(a) (2), Systems using digital modulation techniques may operate in the 902 - 928 MHz, 2400 - 2483.5 MHz, and 5725 - 5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

2.4.2.Test Description

Test Setup:



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

Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 100 kHz. In order to make an accurate measurement, set the span greater than RBW.

2.4.3.Test Procedure

KDB 558074 Section 8.2 was used in order to prove compliance.

2.4.4.Test Result

802.11b Mode

A.Test Verdict:

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Limits(kHz)	Result
1	2412	9.111	≥500	PASS
6	2437	9.089	≥500	PASS
11	2462	9.107	≥500	PASS

B.Test Plot:

(Channel 1, 802.11b)

(Channel 6, 802.11b)

(Channel 11, 802.11b)

802.11g Mode

A.Test Verdict:

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Limits(kHz)	Result
1	2412	16.41	≥500	PASS
6	2437	16.42	≥500	PASS
11	2462	16.40	≥500	PASS

B.Test Plot:

(Channel 1, 802.11g)

(Channel 6, 802.11g)

(Channel 11, 802.11g)

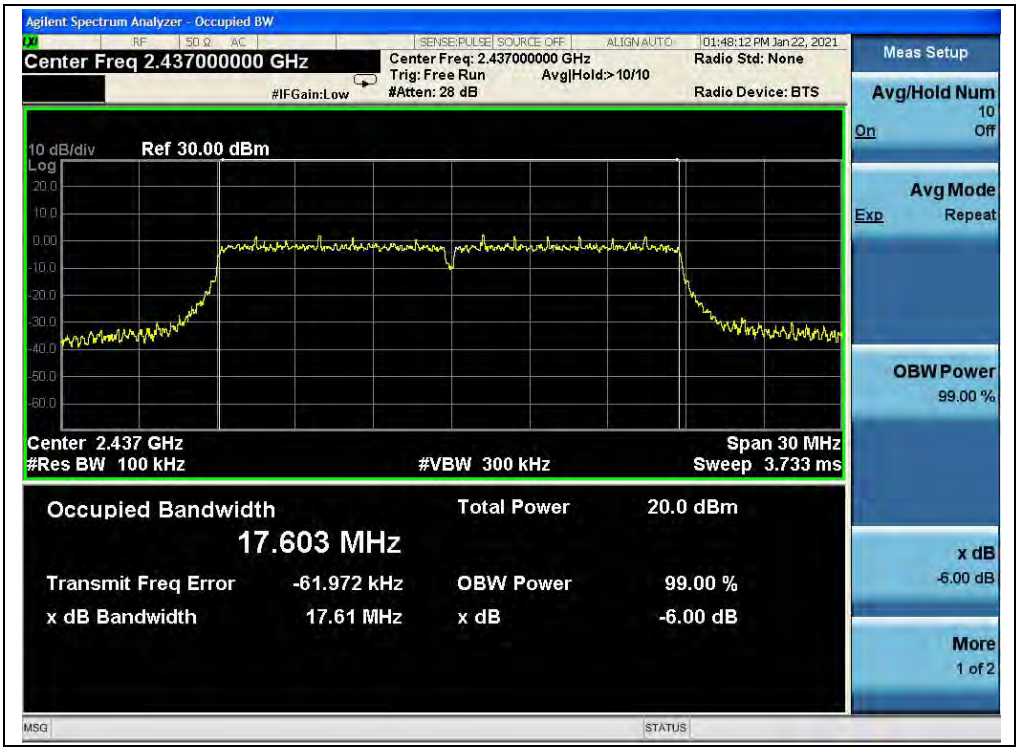
802.11n (HT20) Mode

A.Test Verdict:

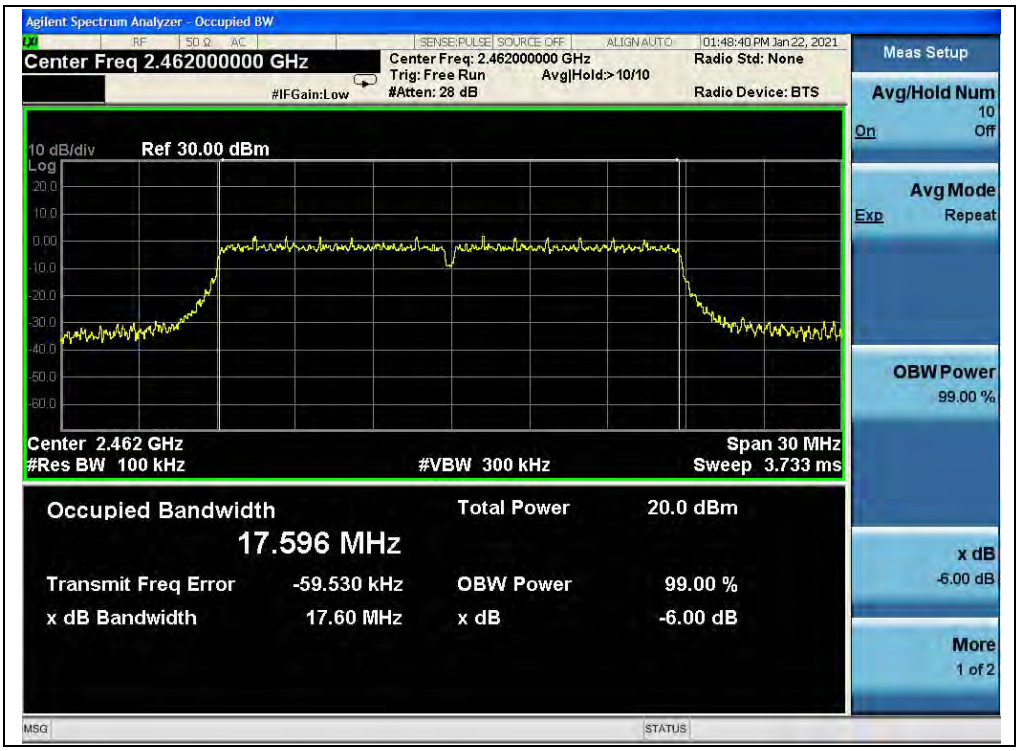
Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Limits(kHz)	Result
1	2412	17.62	≥500	PASS
6	2437	17.61	≥500	PASS
11	2462	17.60	≥500	PASS

B.Test Plot:

(Channel 1, 802.11n (HT20))



(Channel 6, 802.11n (HT20))



(Channel 11, 802.11n (HT20))

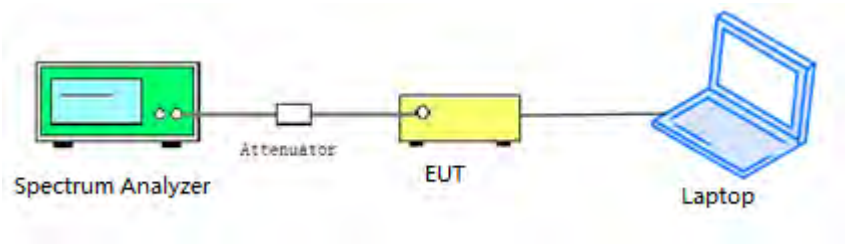
2.5. Conducted Spurious Emissions and Band Edge

2.5.1.Requirement

According to FCC section 15.247(c), 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, based on either an RF conducted or a radiated measurement.

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.

Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 100 kHz. In order to make an accurate measurement, set the span greater than RBW.

2.5.3.Test Procedure

KDB 558074 Section 8.5 and 8.7 was used in order to prove compliance.

2.5.4.Test Result

802.11b Mode

A.Test Verdict:

Channel	Frequency (MHz)	Measured Max. Out of Band Emission (dBm)	Limit (dBm)		Verdict
			Carrier Level	Calculated -20dBc Limit	
1	2412	-43.52	6.05	-13.95	PASS
6	2437	-43.38	7.16	-12.84	PASS
11	2462	-43.18	5.79	-14.21	PASS

B.Test Plot:

(30MHz to 25GHz, Channel 1, 802.11b)

(Band Edge, Channel 1, 802.11b)

(30MHz to 25GHz, Channel 6, 802.11b)

(30MHz to 25GHz, Channel 11, 802.11b)

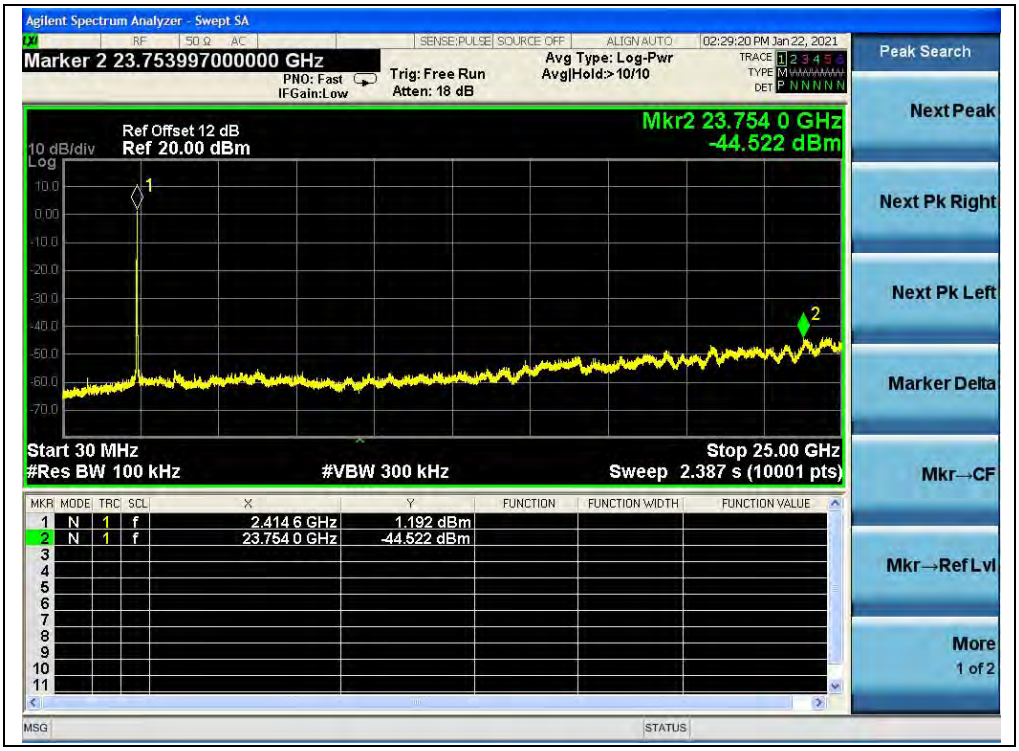
(Band Edge, Channel 11, 802.11b)

802.11g Mode

A.Test Verdict:

Channel	Frequency (MHz)	Measured Max. Out of Band Emission (dBm)	Limit (dBm)		Verdict
			Carrier Level	Calculated -20dBc Limit	
1	2412	-44.52	1.19	-18.81	PASS
6	2437	-44.24	3.06	-16.94	PASS
11	2462	-43.94	3.01	-16.99	PASS

B.Test Plot:



(30MHz to 25GHz, Channel 1, 802.11g)

(Band Edge, Channel 1, 802.11g)

(30MHz to 25GHz, Channel 6, 802.11g)

(30MHz to 25GHz, Channel 11, 802.11g)

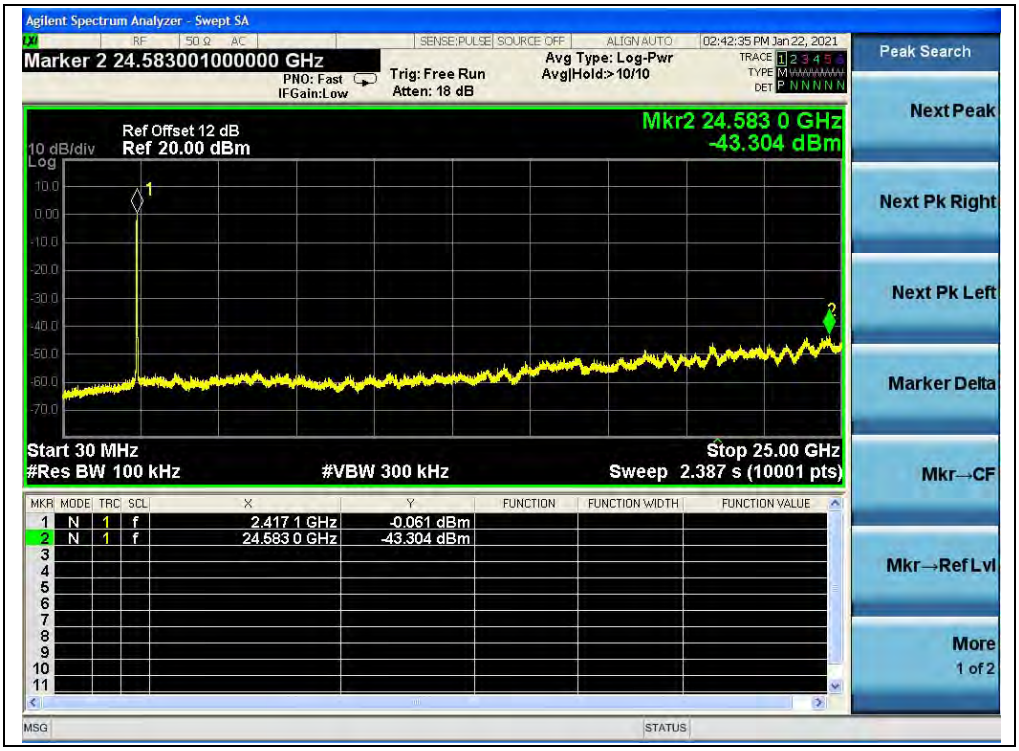
(Band Edge, Channel 11, 802.11g)

802.11n (HT20) Mode

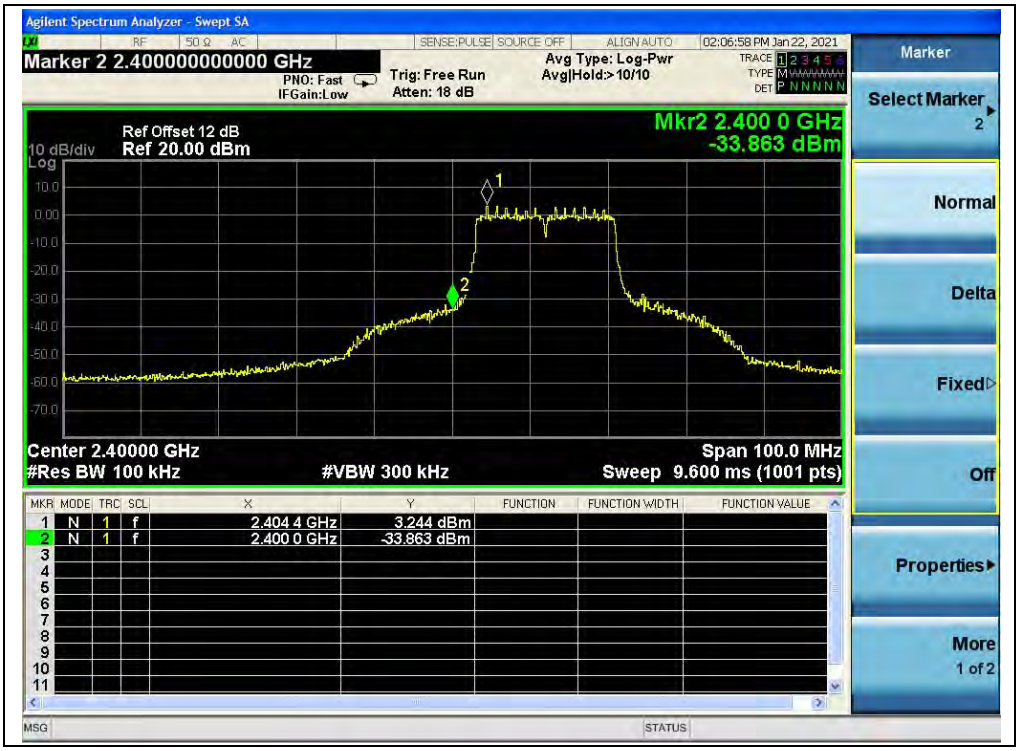
A.Test Verdict:

Channel	Frequency (MHz)	Measured Max. Out of Band Emission (dBm)	Limit (dBm)		Verdict
			Carrier Level	Calculated -20dBc Limit	
1	2412	-43.30	-0.06	-20.06	PASS
6	2437	-43.82	1.10	-18.90	PASS
11	2462	-44.52	0.65	-19.35	PASS

B.Test Plot:



(30MHz to 25GHz, Channel 1, 802.11n (HT20))



(Band Edge, Channel 1, 802.11n (HT20))

(30MHz to 25GHz, Channel 6, 802.11n (HT20))

(30MHz to 25GHz, Channel 11, 802.11n (HT20))

(Band Edge, Channel 11, 802.11n (HT20))

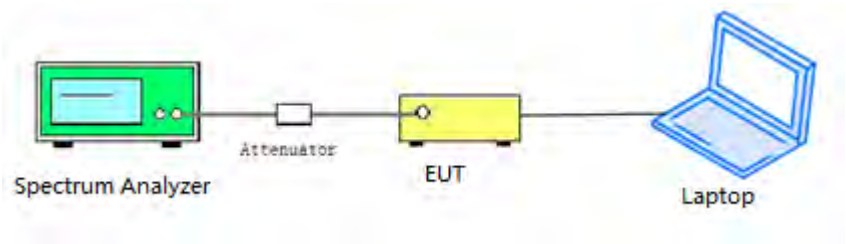
2.6. Power Spectral Density (PSD)

2.6.1.Requirement

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

2.6.2.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.

2.6.3.Test Procedure

KDB 558074 Section 8.4 was used in order to prove compliance.

2.6.4.Test Result

802.11b Mode

A.Test Verdict:

Spectral power density (dBm/3kHz)				
Channel	Frequency (MHz)	Measured PSD (dBm/3kHz)	Limit (dBm/3kHz)	Verdict
1	2412	-7.01	8	PASS
6	2437	-6.79	8	PASS
11	2462	-7.04	8	PASS

B.Test Plot:

(Channel 1, 802.11b)

(Channel 6, 802.11b)

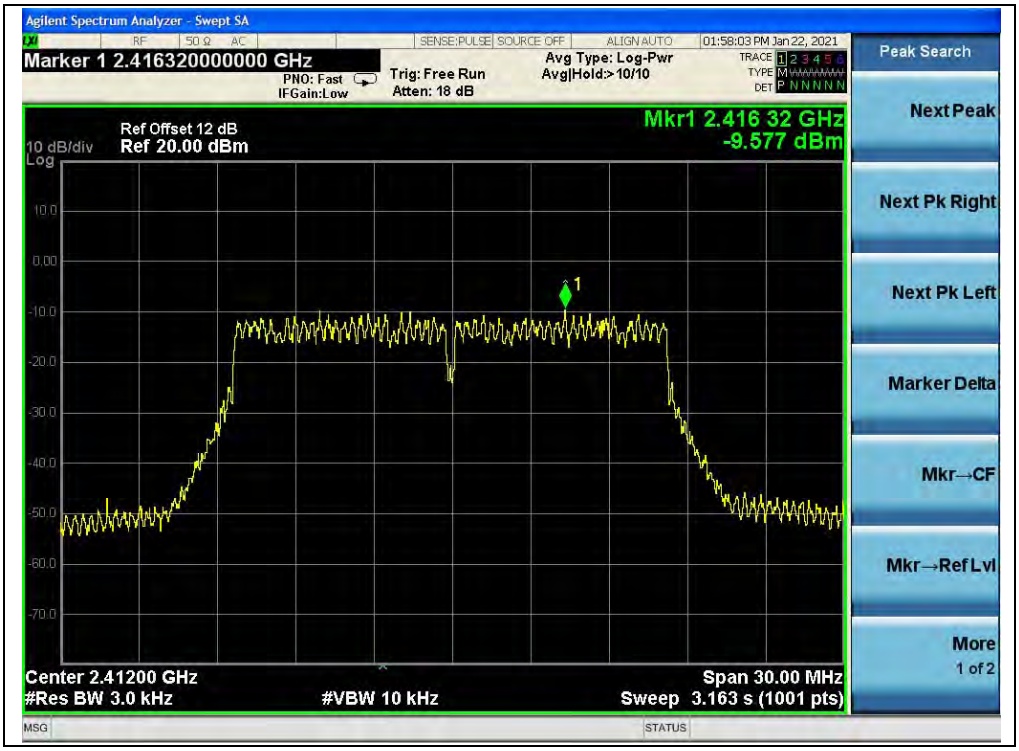
(Channel 11, 802.11b)

802.11g Mode

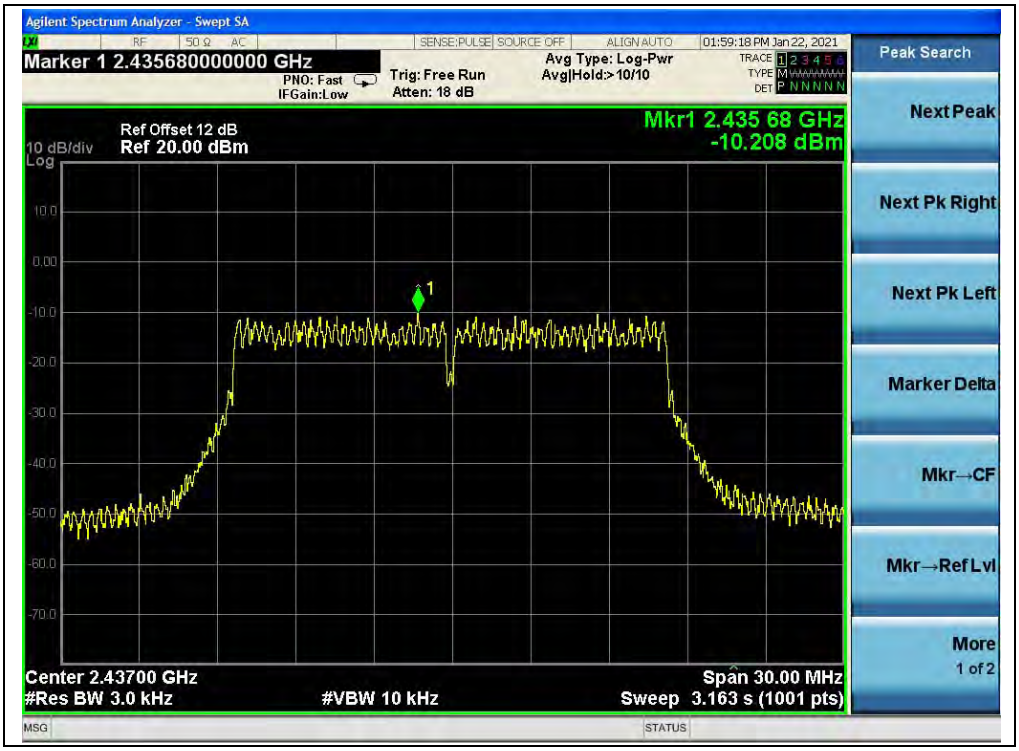
A.Test Verdict:

Spectral power density (dBm/3kHz)				
Channel	Frequency (MHz)	Measured PSD (dBm/3kHz)	Limit (dBm/3kHz)	Verdict
1	2412	-9.58	8	PASS
6	2437	-10.21	8	PASS
11	2462	-10.63	8	PASS

B.Test Plot:



(Channel 1, 802.11g)



(Channel 6, 802.11g)

(Channel 11, 802.11g)

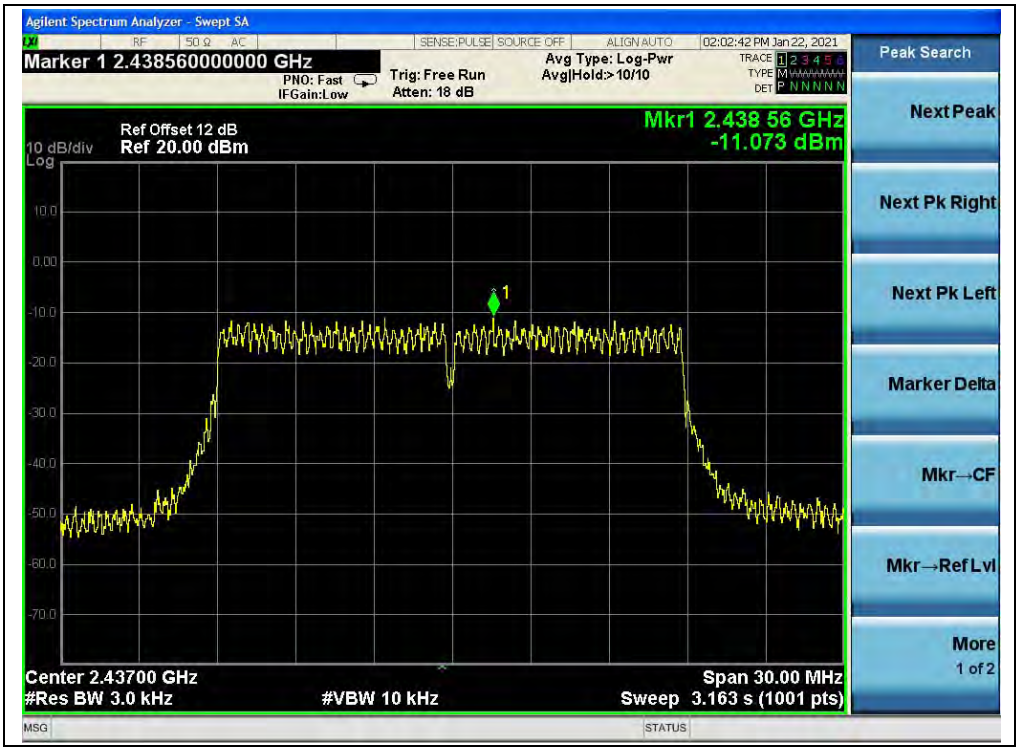
802.11n (HT20) Mode

A.Test Verdict:

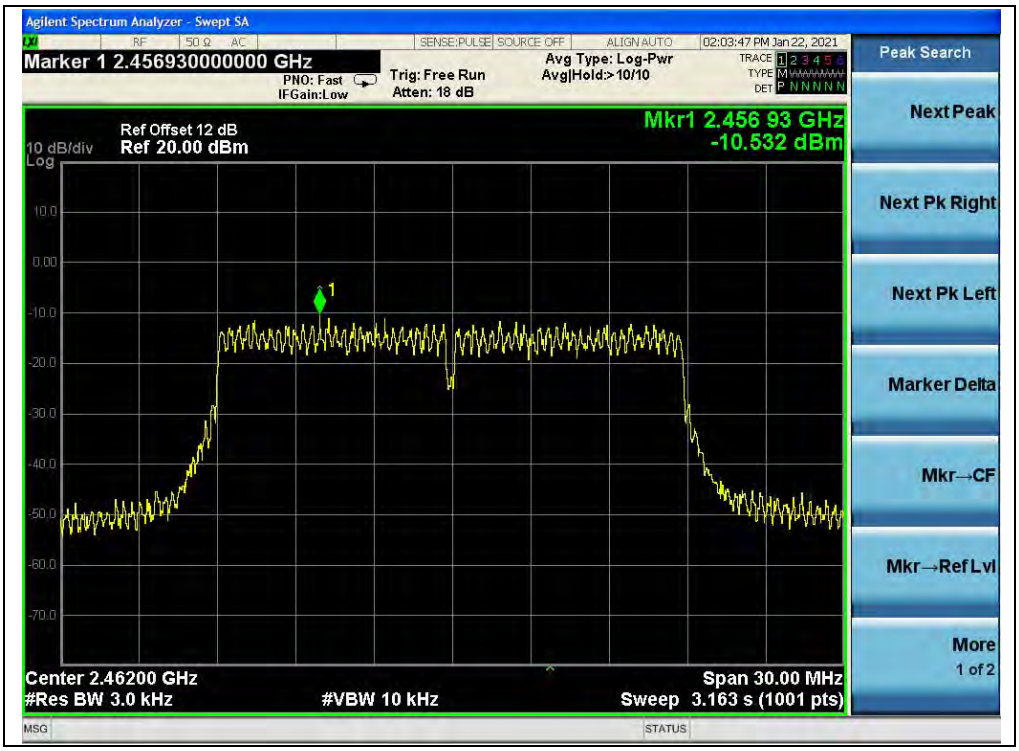
Spectral power density (dBm/3kHz)				
Channel	Frequency (MHz)	Measured PSD (dBm/3kHz)	Limit (dBm/3kHz)	Verdict
1	2412	-10.56	8	PASS
6	2437	-11.07	8	PASS
11	2462	-10.53	8	PASS

B.Test Plot:

(Channel 1, 802.11n (HT20))



(Channel 6, 802.11n (HT20))



(Channel 11, 802.11n (HT20))

2.7. Conducted Emission

2.7.1.Requirement

According to FCC section 15.207, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency within the band 150kHz to 30MHz shall not exceed the limits in the following table, as measured using a 50μH/50Ω line impedance stabilization network (LISN).

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

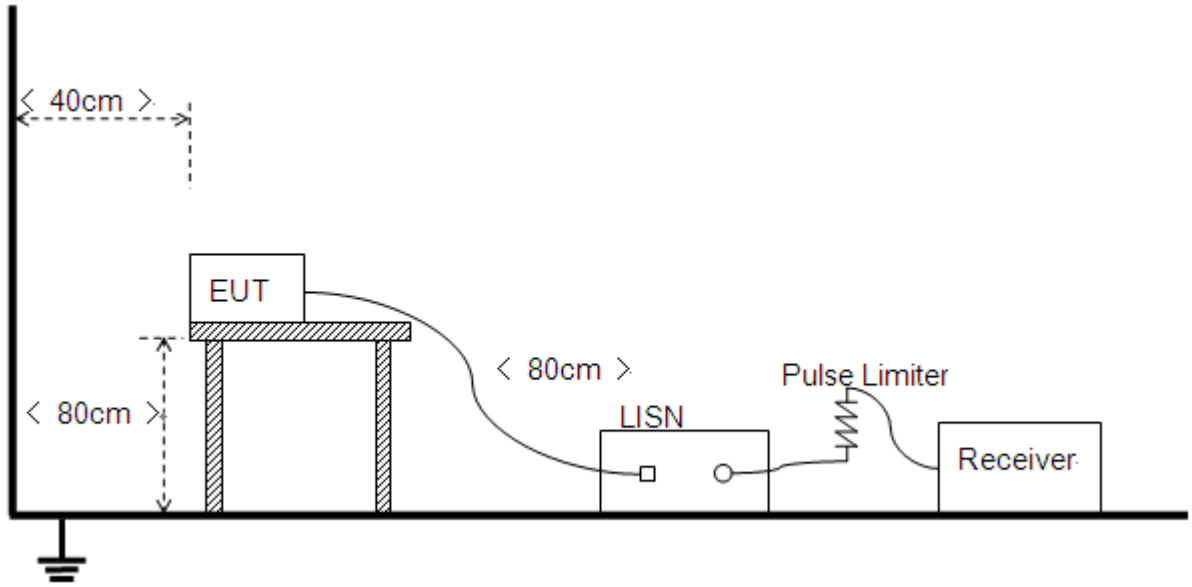
NOTE:

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

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

2.7.2.Test Description

Test Setup:



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

2.7.3.Test Result

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

Test Voltage: AC 120V/60Hz

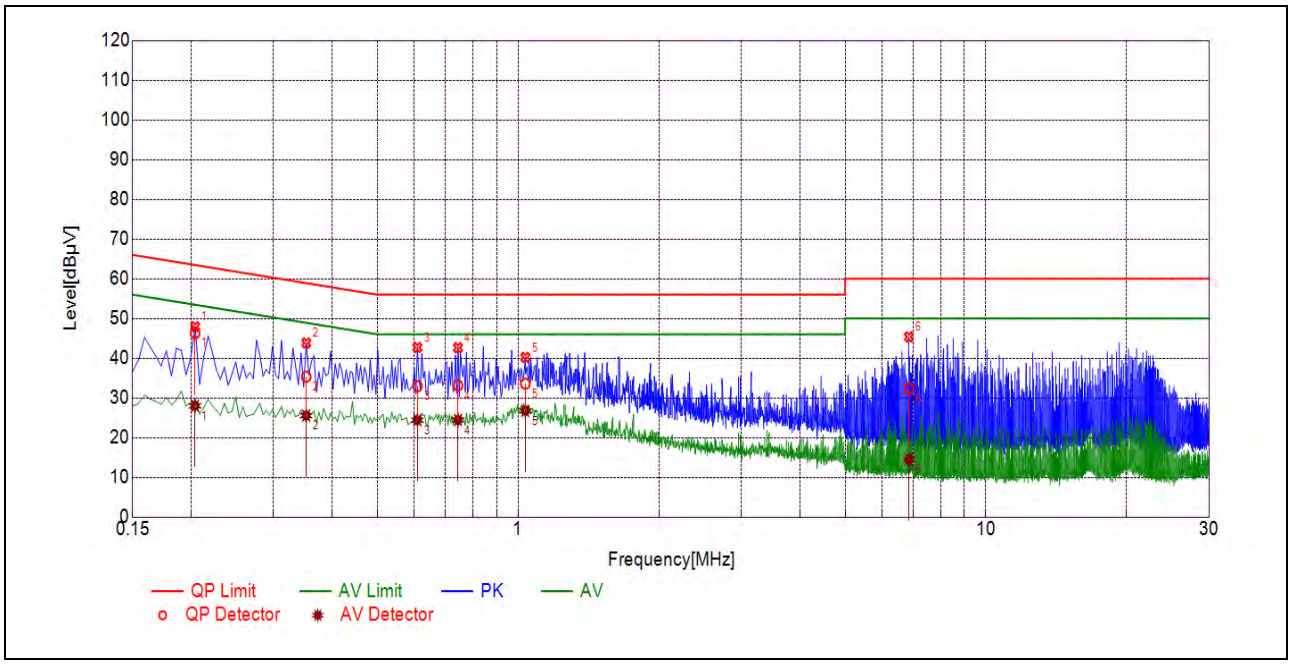
The measurement results are obtained as below:

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

U_R: Receiver Reading

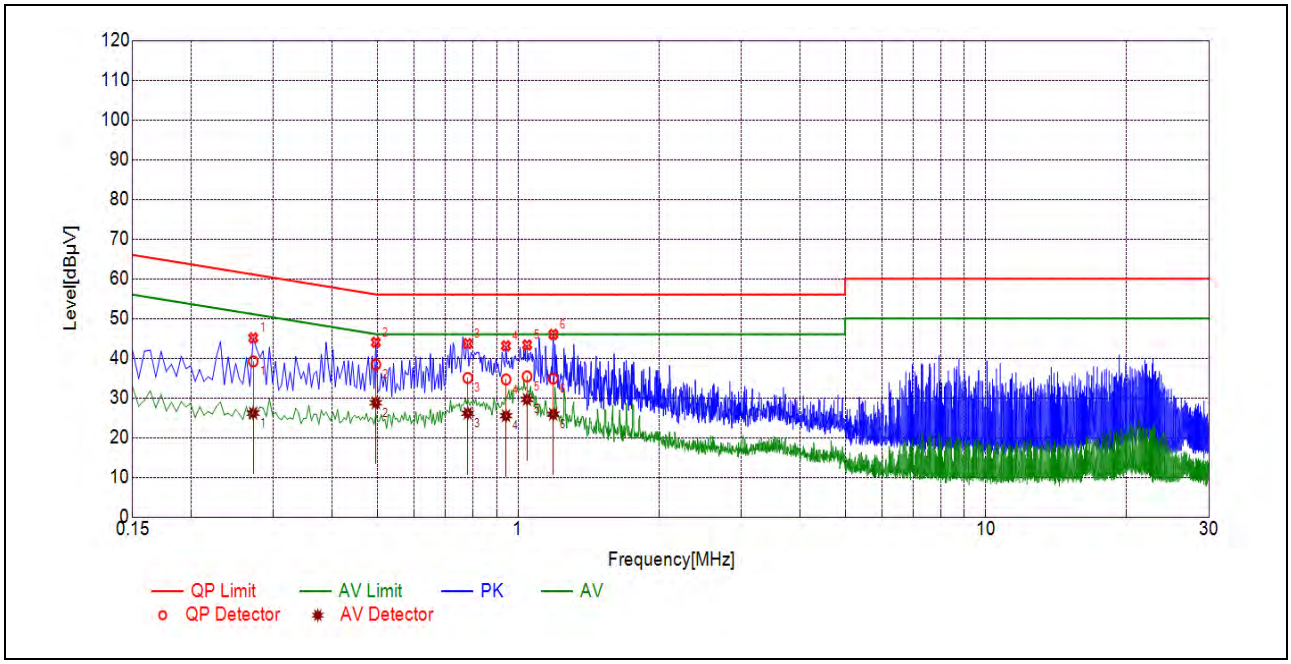
A_{Factor}: Voltage division factor of LISN

B.Test Plot:



(L Phase)

No.	Fre. (MHz)	Emission Level (dBµV)		Limit (dBµV)		Power-line	Verdict
		Quai-peak	Average	Quai-peak	Average		
1	0.2039	46.30	28.03	63.45	53.45	Line	PASS
2	0.3523	35.34	25.54	58.91	48.91		PASS
3	0.6092	32.95	24.40	56.00	46.00		PASS
4	0.7439	33.13	24.45	56.00	46.00		PASS
5	1.0359	33.57	26.74	56.00	46.00		PASS
6	6.8528	32.35	14.46	60.00	50.00		PASS



(N Phase)

No.	Fre. (MHz)	Emission Level (dBµV)		Limit (dBµV)		Power-line	Verdict
		Quai-peak	Average	Quai-peak	Average		
1	0.2714	39.20	26.19	61.07	51.07	Neutral	PASS
2	0.4964	38.40	28.78	56.06	46.06		PASS
3	0.7804	35.01	26.14	56.00	46.00		PASS
4	0.9421	34.65	25.51	56.00	46.00		PASS
5	1.0447	35.42	29.63	56.00	46.00		PASS
6	1.1884	34.87	25.91	56.00	46.00		PASS

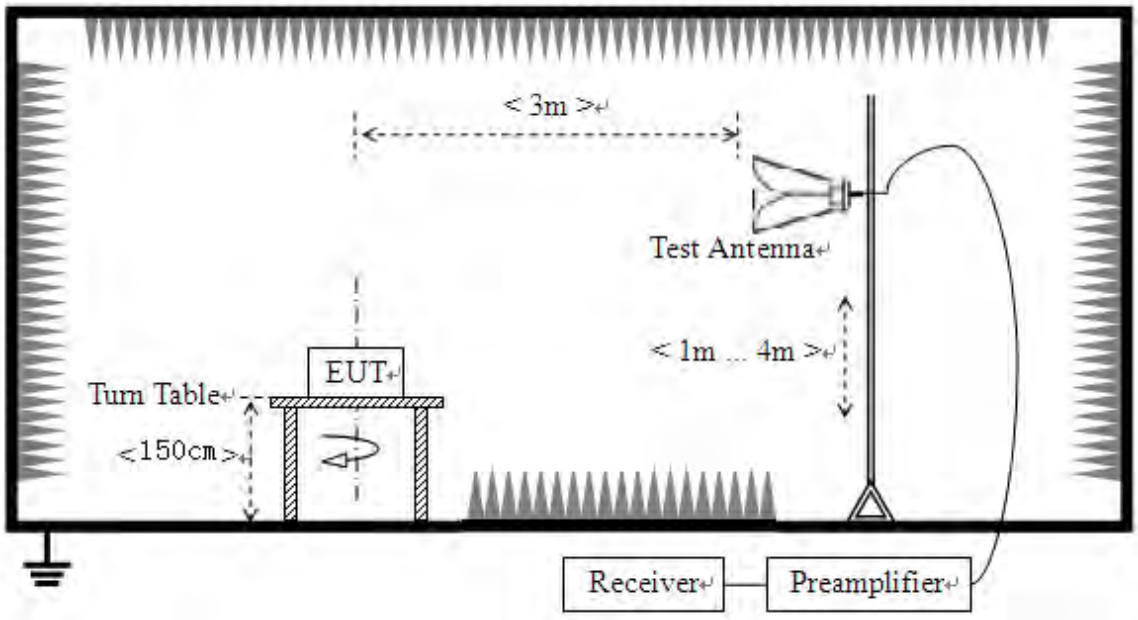
2.8. Restricted Frequency Bands

2.8.1.Requirement

According to FCC section 15.247(d), in any 100kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, In addition, radiated emissions which fall in the restricted bands, as defined in 15.205(a), must also comply with the radiated emission limits specified in 15.209(a).

2.8.2.Test Description

Test Setup



The 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:
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 Procedure

Span = wide enough to fully capture the emission being measured
RBW = 1 MHz for f ≥ 1GHz, 100 kHz for f < 1GHz
VBW = 3 MHz
Sweep = auto
Detector function = peak/average
Trace = max hold

Allow the trace to stabilize

2.8.4.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

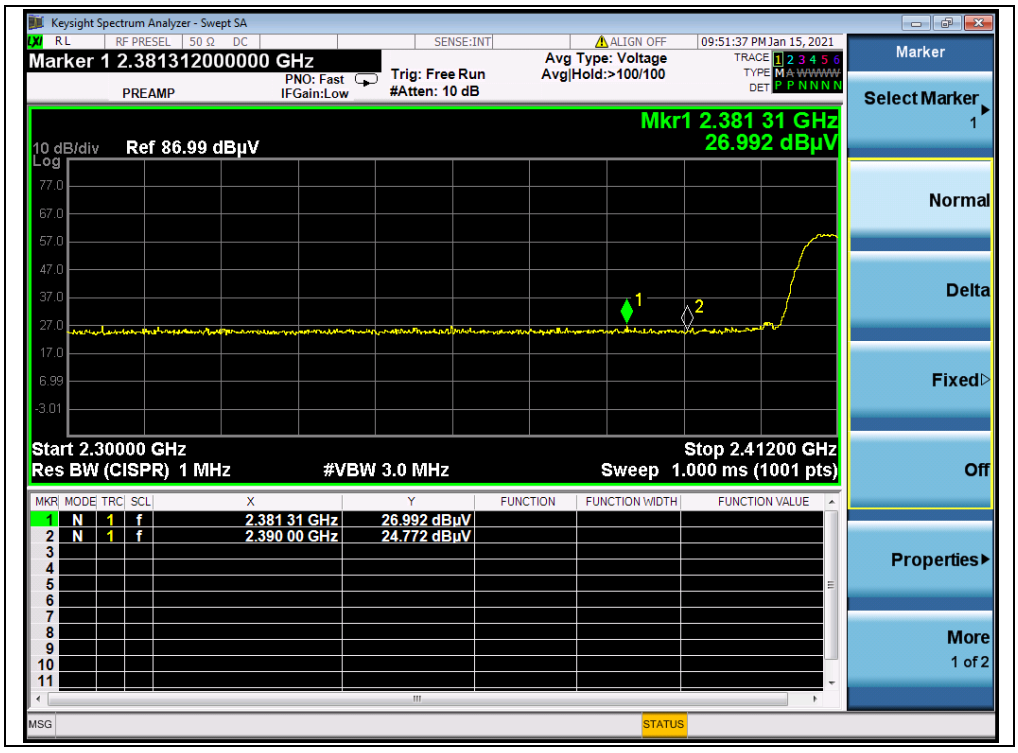
Note: Restricted Frequency Bands were performed when antenna was at vertical and horizontal polarity, and only the worse test condition (vertical) was recorded in this test report.

802.11b Mode

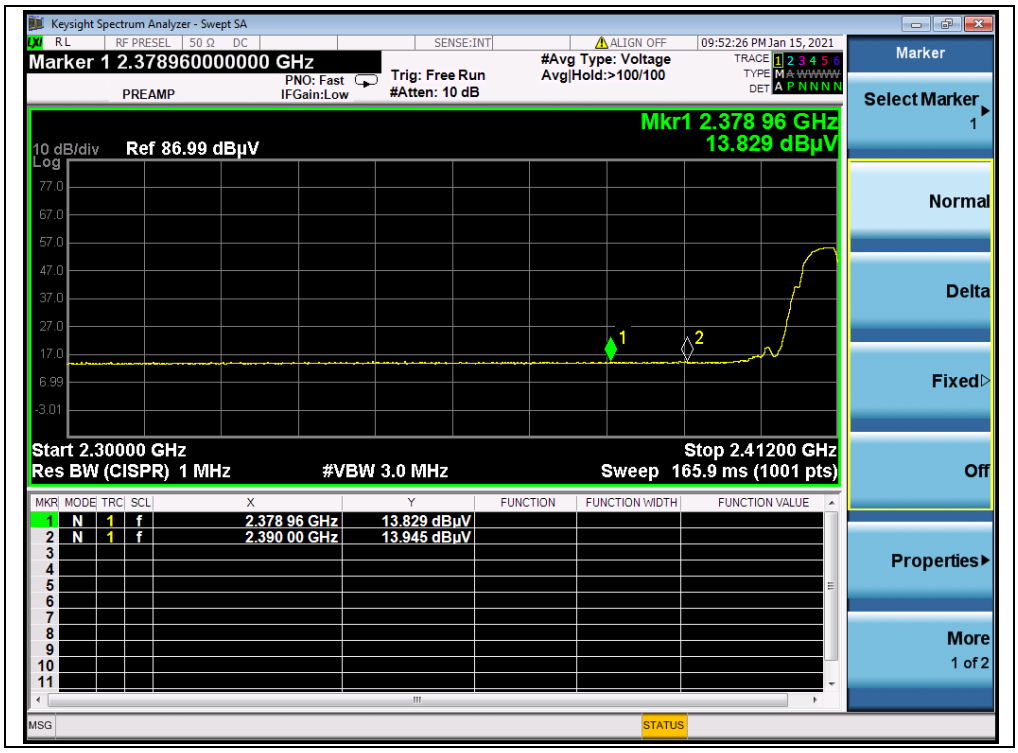
A.Test Verdict:

Channel	Frequency (MHz)	Detector PK/ AV	Receiver Reading U_R (dBμV)	A_T (dB)	A_{Factor} (dB@3m)	Max. Emission E (dBμV/m)	Limit (dBμV/m)	Verdict
1	2381.31	PK	26.99	6.74	27.20	60.93	74	PASS
1	2390.00	AV	13.95	6.74	27.20	47.89	54	PASS
11	2484.38	PK	25.64	6.74	27.20	59.58	74	PASS
11	2484.15	AV	14.67	6.74	27.20	48.61	54	PASS

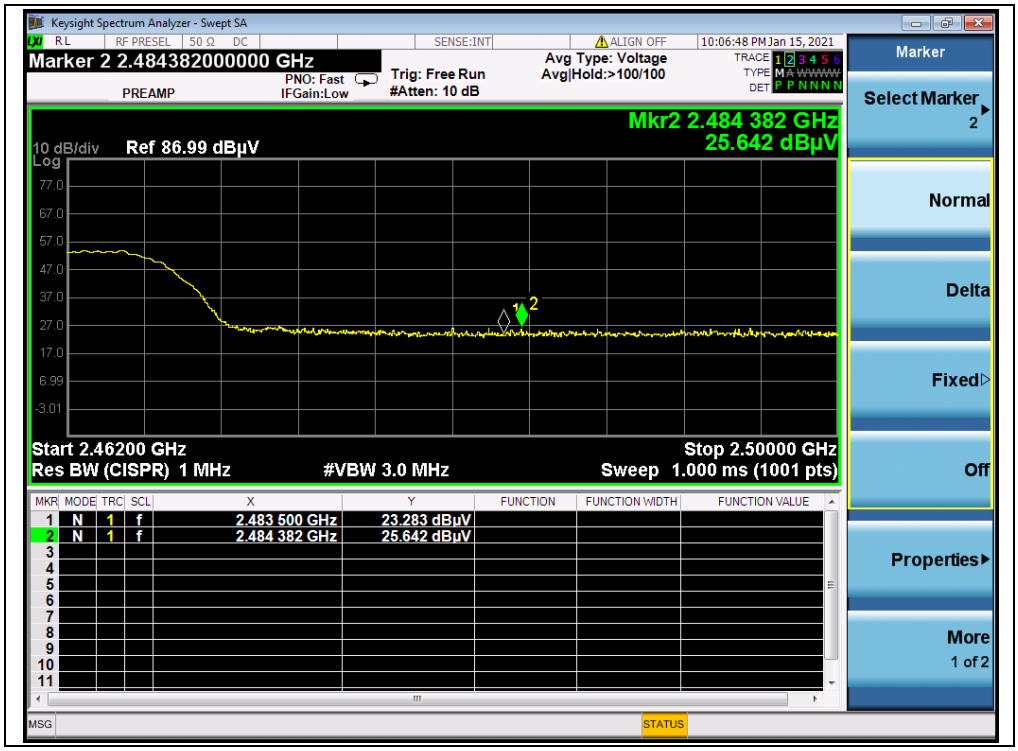
B.Test Plot:



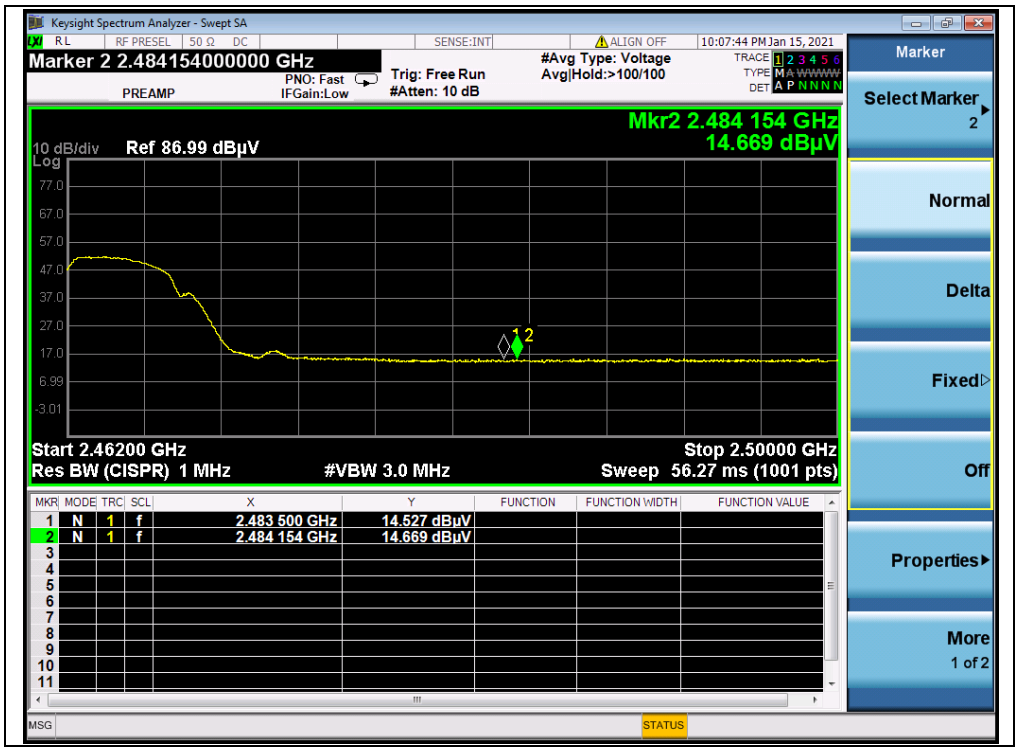
(PEAK, Channel 1, 802.11b)



(AVERAGE, Channel 1, 802.11b)



(PEAK, Channel 11, 802.11b)



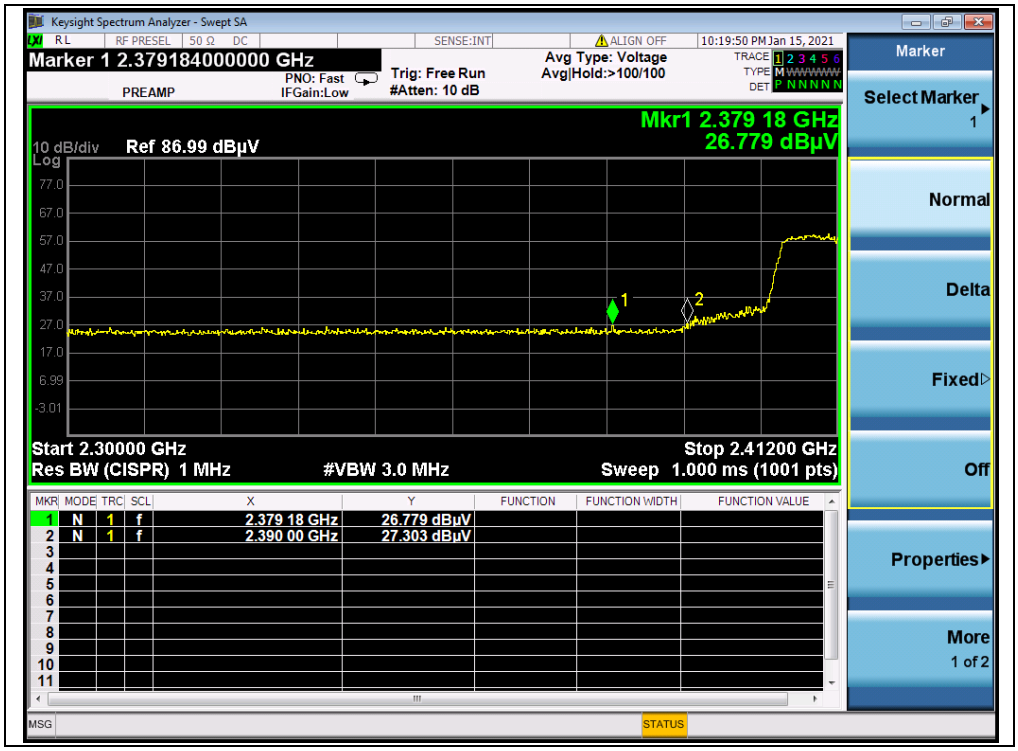
(AVERAGE, Channel 11, 802.11b)

802.11g Mode

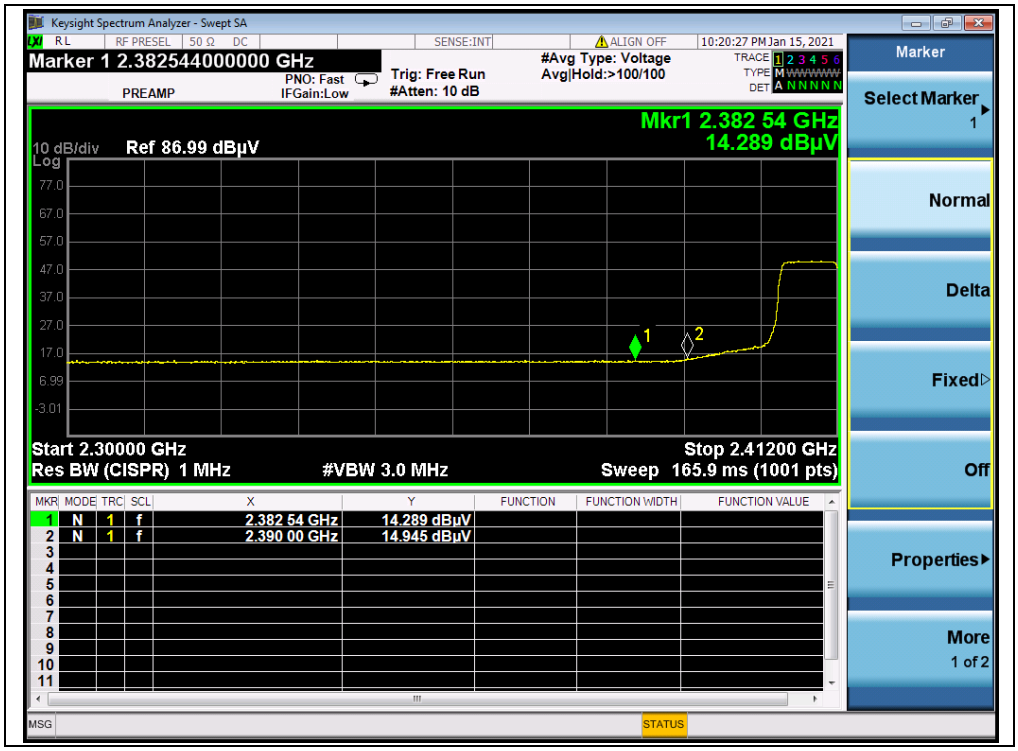
A.Test Verdict:

Channel	Frequency (MHz)	Detector PK/ AV	Receiver Reading U_R (dBμV)	A_T (dB)	A_{Factor} (dB@3m)	Max. Emission E (dBμV/m)	Limit (dBμV/m)	Verdict
1	2390.00	PK	27.30	6.74	27.20	61.24	74	PASS
1	2390.00	AV	14.95	6.74	27.20	48.89	54	PASS
11	2485.52	PK	26.19	6.74	27.20	60.13	74	PASS
11	2483.50	AV	14.84	6.74	27.20	48.78	54	PASS

B.Test Plot:

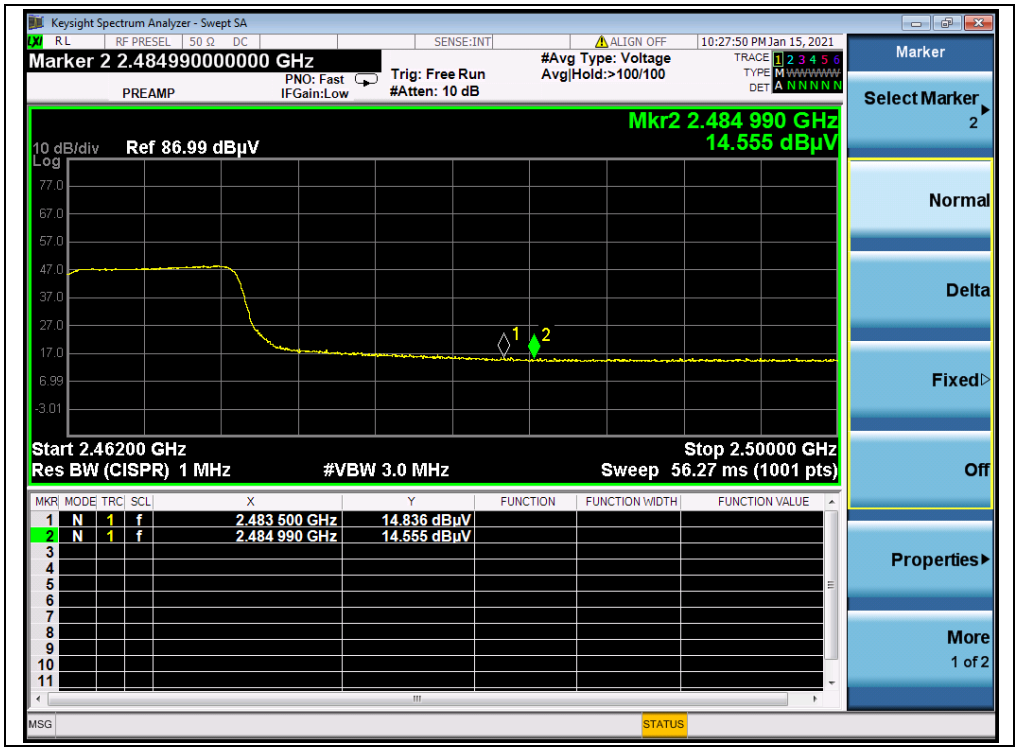


(PEAK, Channel 1, 802.11g)



(AVERAGE, Channel 1, 802.11g)

(PEAK, Channel 11, 802.11g)



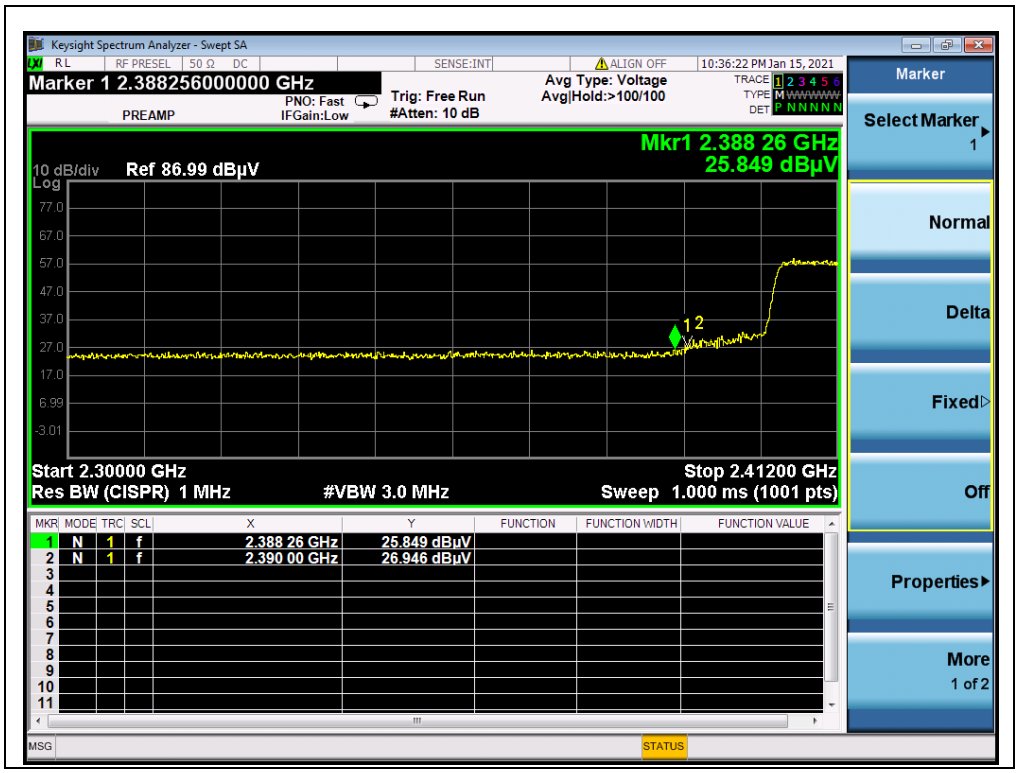
(AVERAGE, Channel 11, 802.11g)

802.11n (HT20) Mode

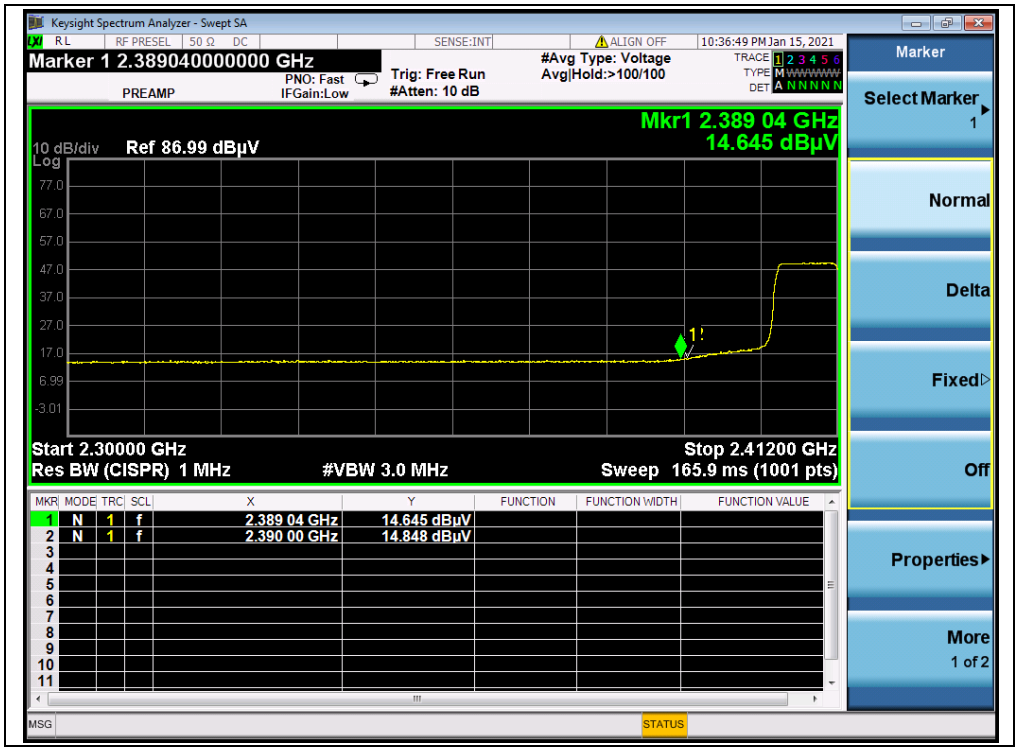
A.Test Verdict:

Channel	Frequency (MHz)	Detector PK/ AV	Receiver Reading U_R (dBμV)	A_T (dB)	A_{Factor} (dB@3m)	Max. Emission E (dBμV/m)	Limit (dBμV/m)	Verdict
1	2390.00	PK	26.95	6.74	27.20	60.89	74	PASS
1	2390.00	AV	14.85	6.74	27.20	48.79	54	PASS
11	2485.14	PK	26.86	6.74	27.20	60.80	74	PASS
11	2483.50	AV	15.25	6.74	27.20	49.19	54	PASS

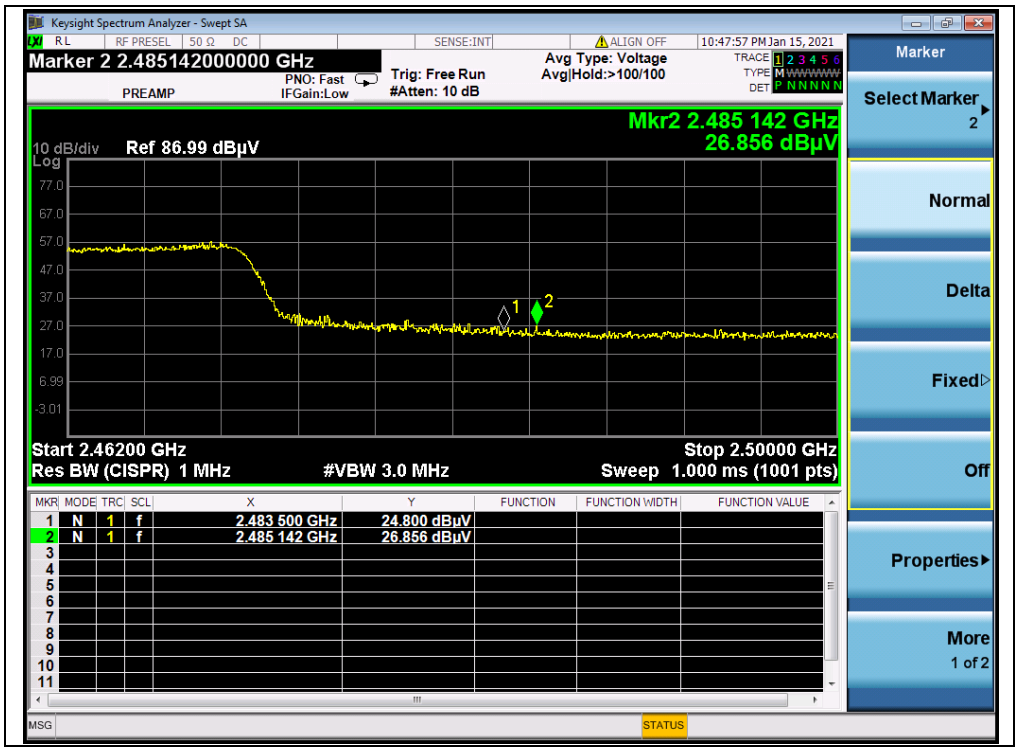
B.Test Plot:



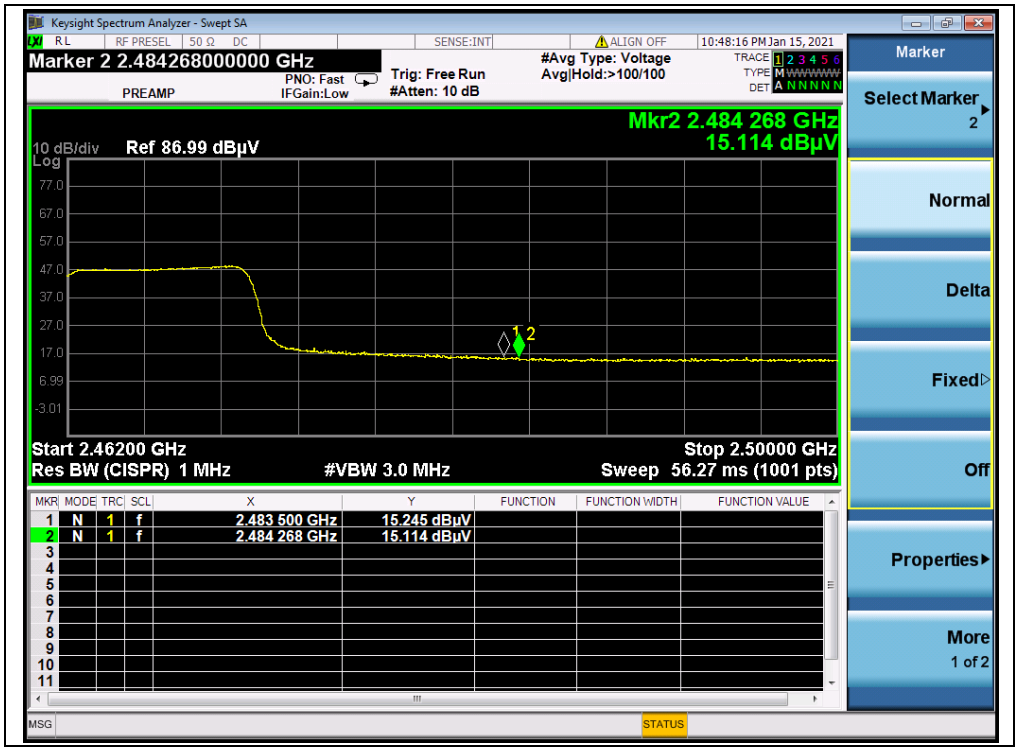
(PEAK, Channel 1, 802.11n (HT20))



(AVERAGE, Channel 1, 802.11n (HT20))



(PEAK, Channel 11, 802.11n (HT20))



(AVERAGE, Channel 11, 802.11n (HT20))

2.9. Radiated Emission

2.9.1.Requirement

According to FCC section 15.247(d), radiated emission outside the frequency band attenuation below the general limits specified in FCC section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in FCC section 15.205(a), must also comply with the radiated emission limits specified in FCC section 15.209(a).

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

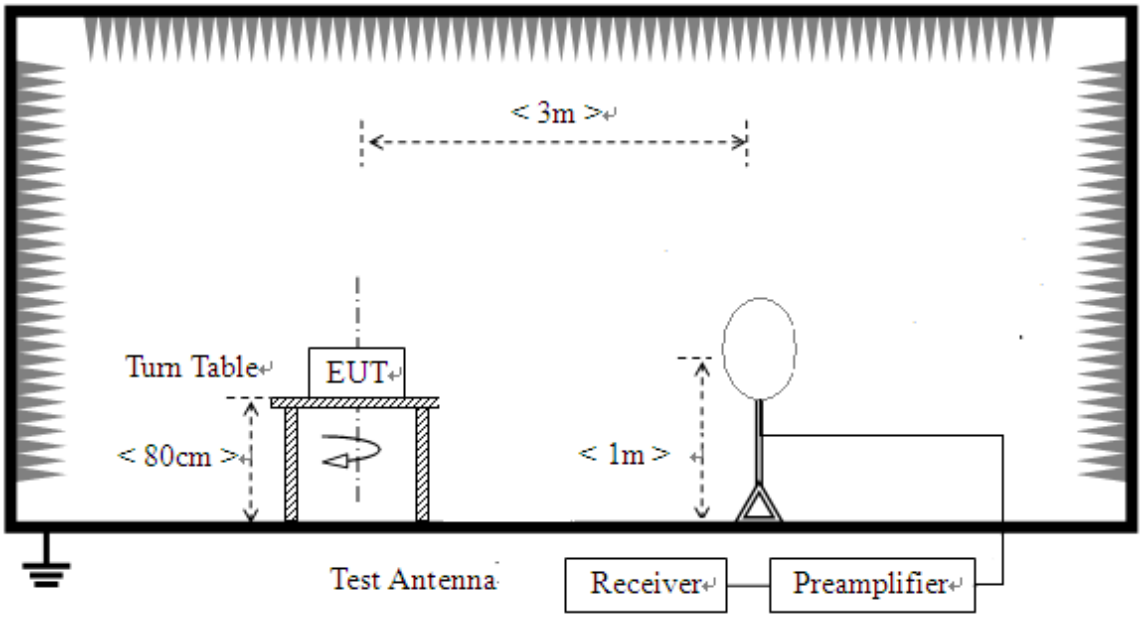
Note1: For above 1000MHz, the emission limit in this paragraph is based on measurement instrumentation employing an average detector, measurement using instrumentation with a peak detector function, corresponding to 20dB above the maximum permitted average limit.

Note2: For above 1000MHz, limit field strength of harmonics: 54dBuV/m@3m (AV) and 74dBuV/m@3m (PK). In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), also should comply with the radiated emission limits specified in Section 15.209(a)(above table).

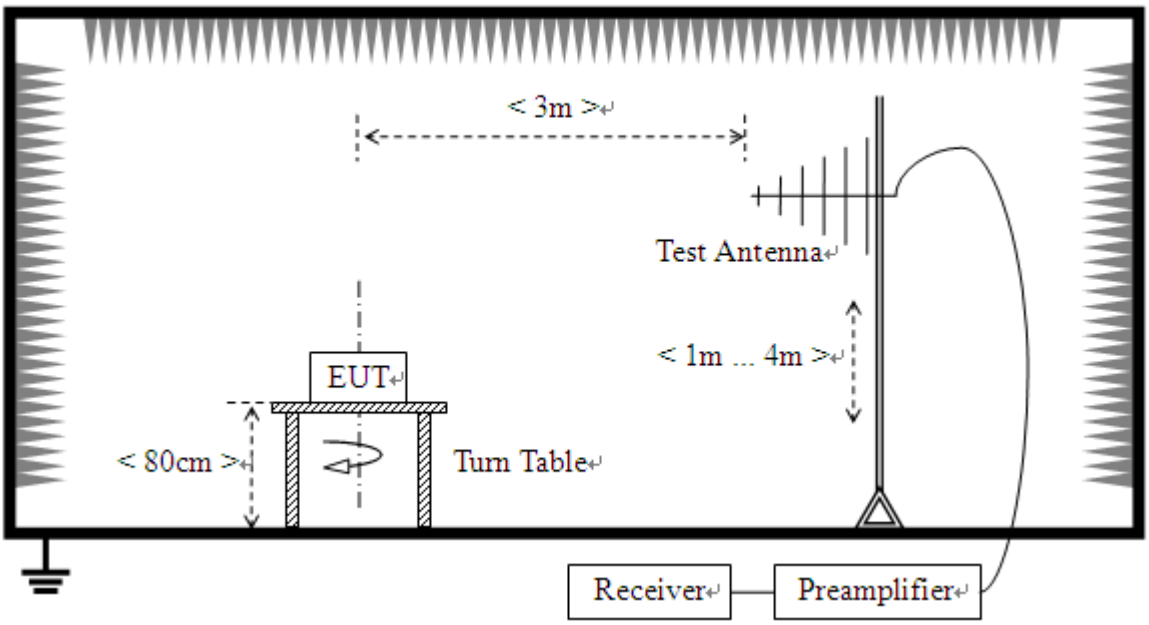
2.9.2.Test Description

Test Setup:

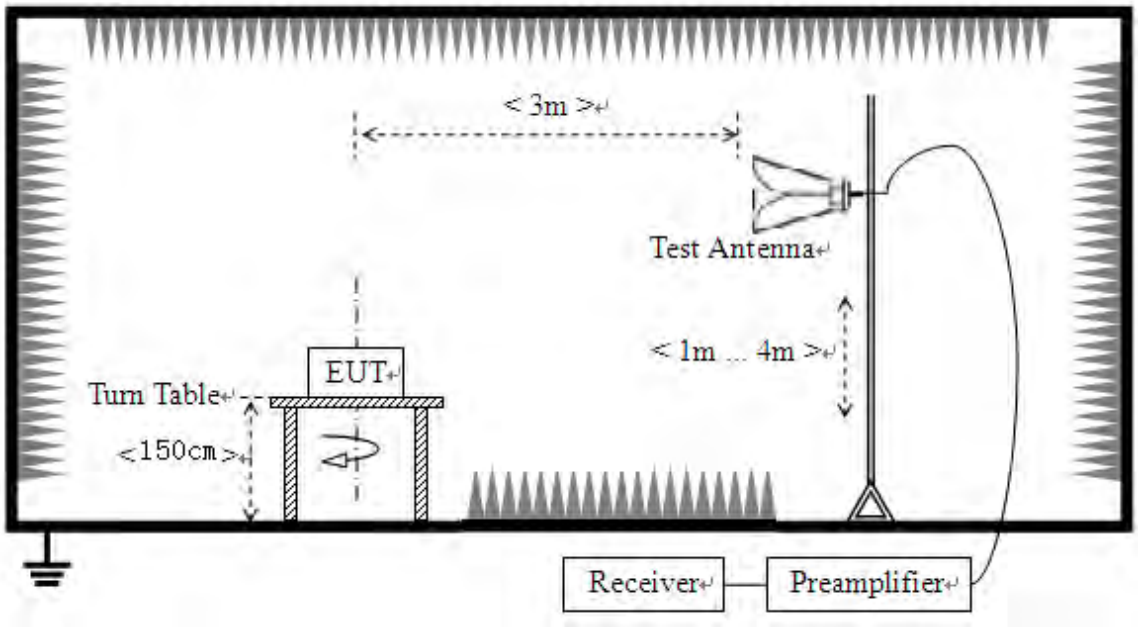
1) For radiated emissions from 9kHz to 30MHz



2) For radiated emissions from 30MHz to1GHz



3) For radiated emissions above 1GHz



The 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 frequency range of interest is monitored at a fixed antenna height and EUT azimuth. 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.

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 [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

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

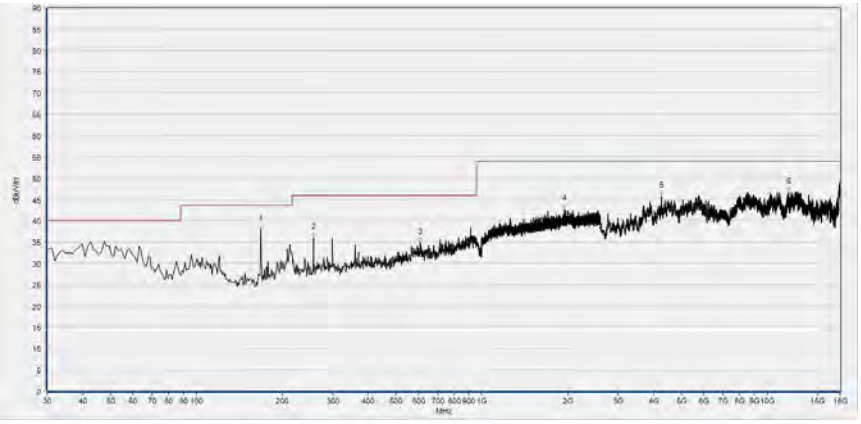
Note1: All radiated emission tests were performed in X, Y, Z axis direction. And only the worst axis test condition was recorded in this test report.

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

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

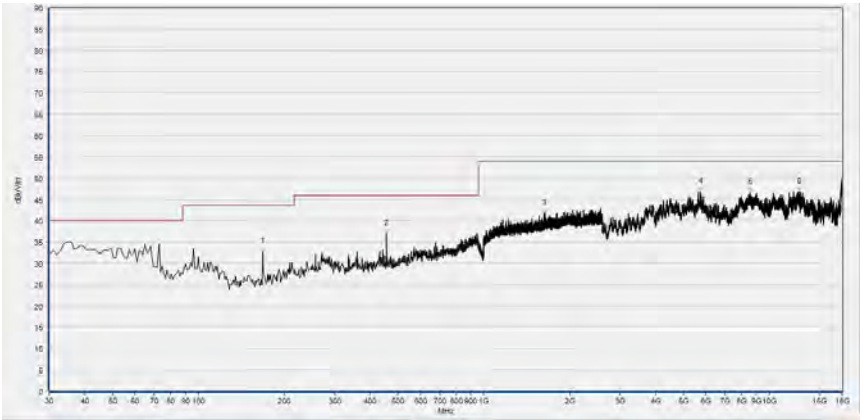
802.11b Mode

Plot for Channel 1



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
167.740	37.98	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
256.980	36.10	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
609.090	34.78	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
1948.800	42.72	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
4263.200	45.74	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
11876.960	46.69	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

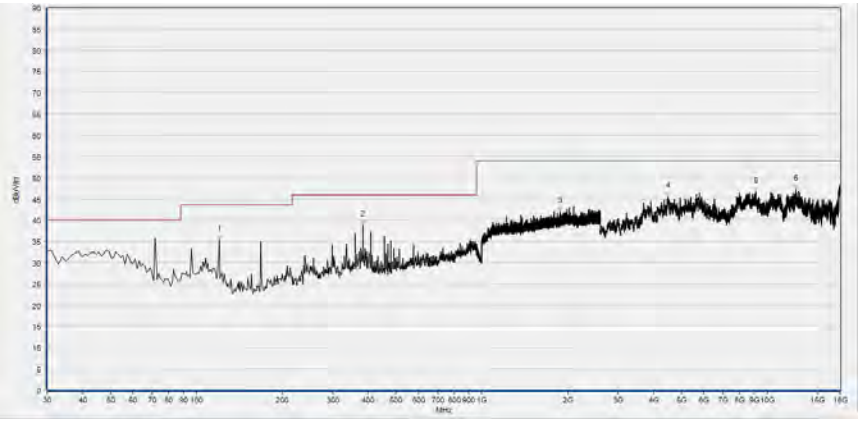
(Antenna Horizontal, 30MHz to 18GHz)



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
167.740	32.61	N/A	N/A	N/A	43.50	N/A	Vertical	PASS
455.830	36.81	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
1624.000	41.66	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
5735.440	46.70	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
8565.960	46.51	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
12733.200	46.77	N/A	N/A	74.00	N/A	54.00	Vertical	PASS

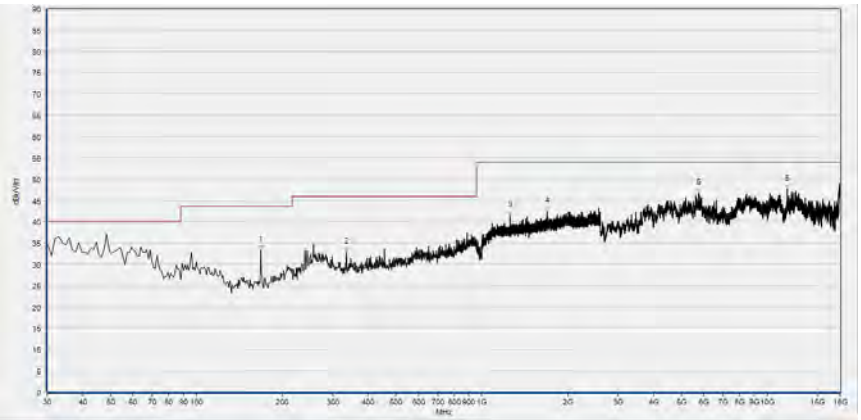
(Antenna Vertical, 30MHz to 18GHz)

Plot for Channel 6



Fre. (MHz)	PK (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
120.210	35.36	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
384.050	38.91	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
1877.867	42.03	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
4494.200	45.57	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
9129.600	46.77	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
12597.680	47.23	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

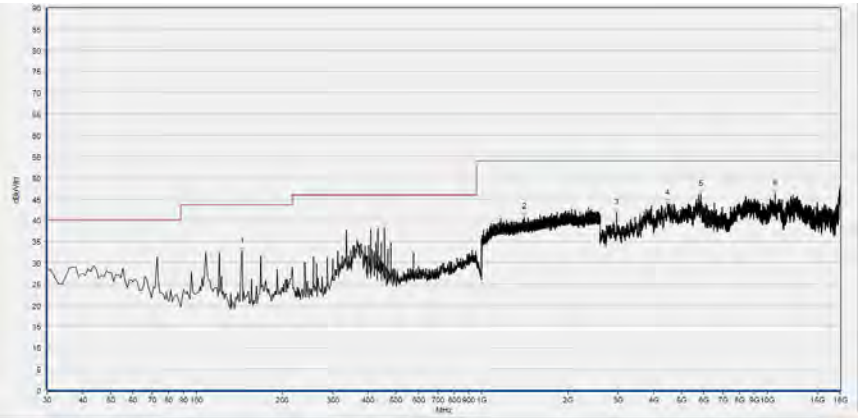
(Antenna Horizontal, 30MHz to 18GHz)



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
167.740	33.40	N/A	N/A	N/A	43.50	N/A	Vertical	PASS
335.550	32.77	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
1258.667	41.43	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
1690.133	42.43	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
5744.680	46.77	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
11738.360	47.58	N/A	N/A	74.00	N/A	54.00	Vertical	PASS

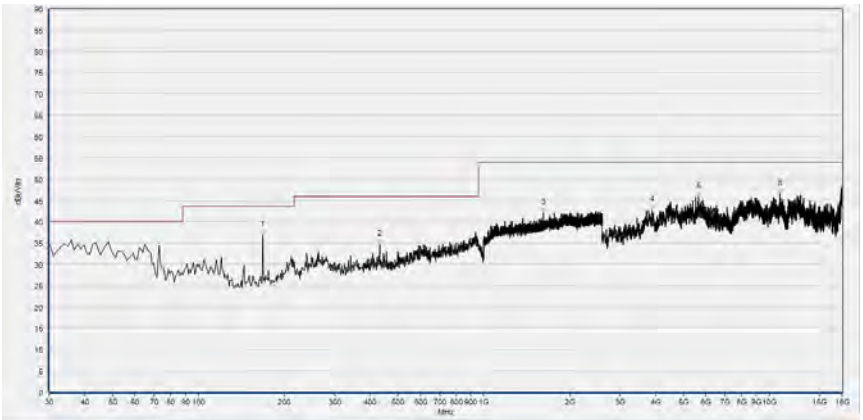
(Antenna Vertical, 30MHz to 18GHz)

Plot for Channel 11



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
144.460	32.44	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
1407.467	40.77	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
2969.600	41.67	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
4472.640	43.95	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
5855.560	46.14	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
10641.880	46.22	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

(Antenna Horizontal, 30MHz to 18GHz)

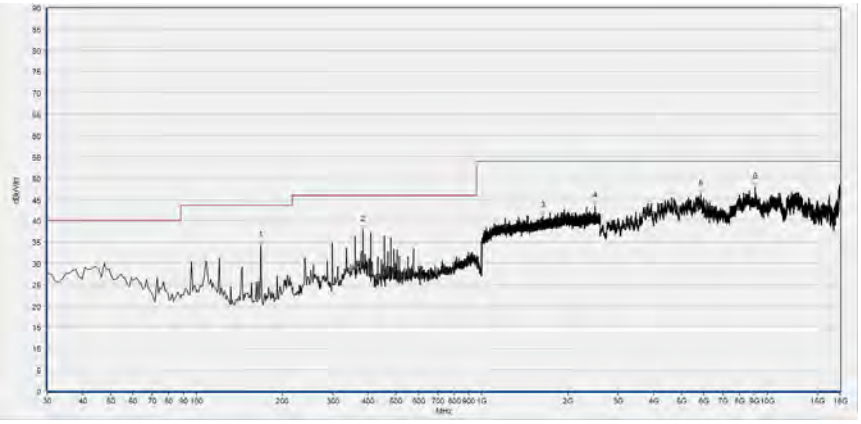


Fre. (MHz)	PK (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
167.740	36.85	N/A	N/A	N/A	43.50	N/A	Vertical	PASS
431.580	34.67	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
1621.333	42.12	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
3896.680	42.80	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
5658.440	45.85	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
10909.840	46.67	N/A	N/A	74.00	N/A	54.00	Vertical	PASS

(Antenna Vertical, 30MHz to 18GHz)

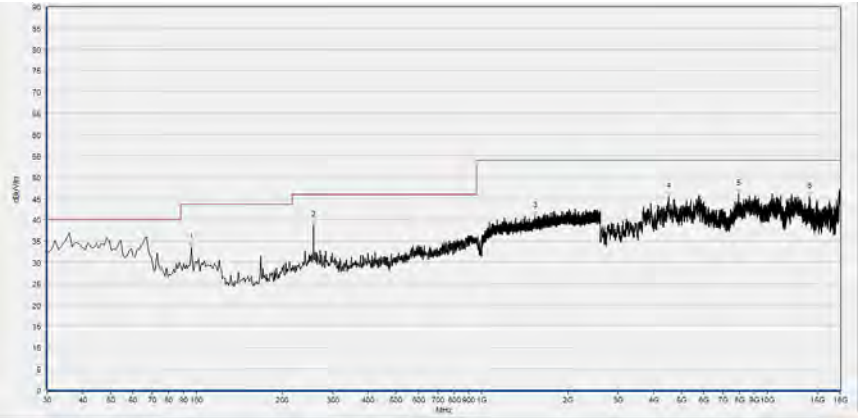
802.11g Mode

Plot for Channel 1



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
167.740	34.16	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
384.050	37.89	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
1636.800	41.06	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
2497.600	43.39	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
5855.560	46.29	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
9077.240	47.92	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

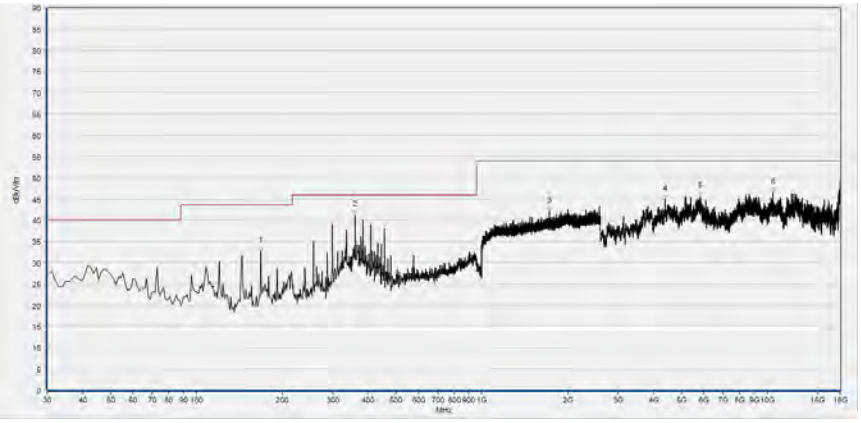
(Antenna Horizontal, 30MHz to 18GHz)



Fre. (MHz)	PK (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
95.960	33.49	N/A	N/A	N/A	43.50	N/A	Vertical	PASS
256.980	38.75	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
1534.400	40.94	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
4509.600	45.40	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
7946.880	46.13	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
14014.480	45.47	N/A	N/A	74.00	N/A	54.00	Vertical	PASS

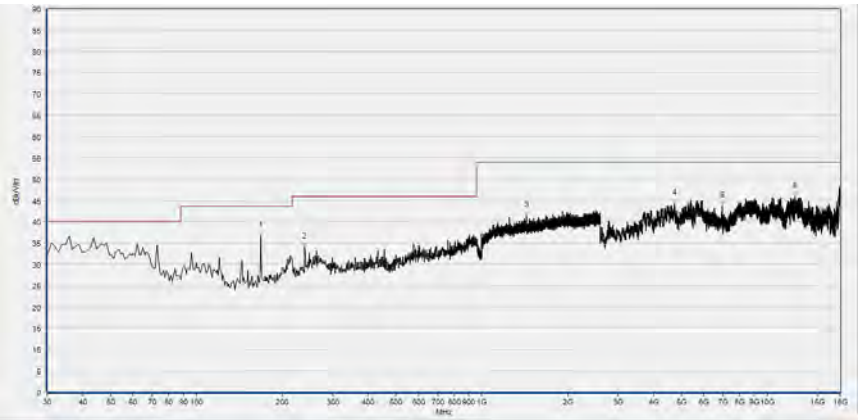
(Antenna Vertical, 30MHz to 18GHz)

Plot for Channel 6



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
167.740	32.63	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
359.800	41.16	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
1721.067	42.04	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
4392.560	44.84	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
5818.600	45.65	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
10444.760	46.63	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

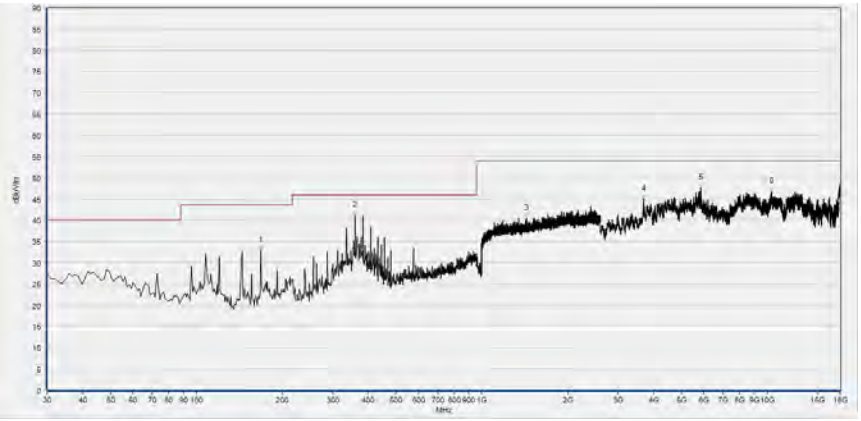
(Antenna Horizontal, 30MHz to 18GHz)



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
167.740	36.72	N/A	N/A	N/A	43.50	N/A	Vertical	PASS
239.520	33.96	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
1435.733	41.36	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
4740.600	44.21	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
6970.520	43.79	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
12520.680	45.97	N/A	N/A	74.00	N/A	54.00	Vertical	PASS

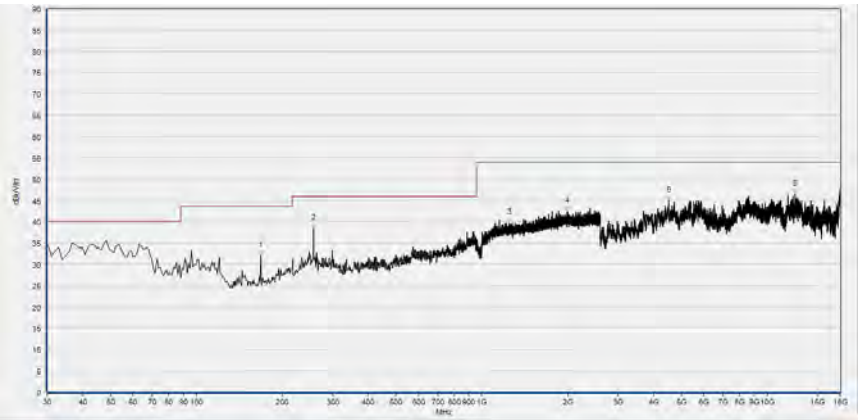
(Antenna Vertical, 30MHz to 18GHz)

Plot for Channel 11



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
167.740	32.82	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
359.800	41.08	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
1434.133	40.45	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
3693.400	44.93	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
5861.720	47.56	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
10327.720	46.83	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

(Antenna Horizontal, 30MHz to 18GHz)

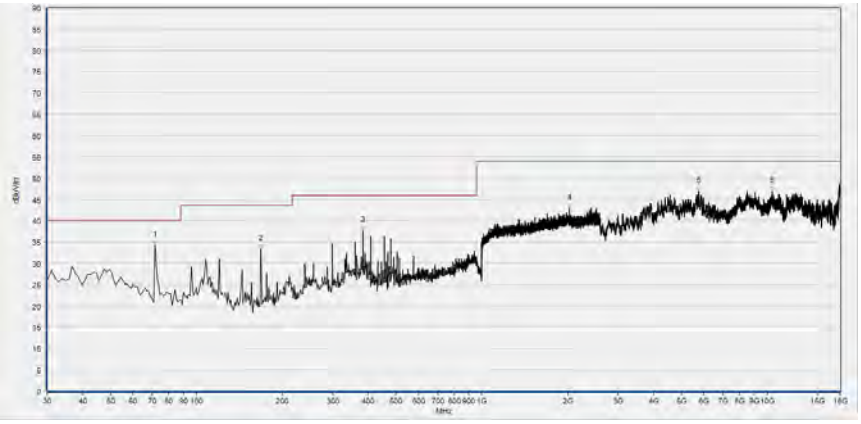


Fre. (MHz)	PK (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
167.740	31.99	N/A	N/A	N/A	43.50	N/A	Vertical	PASS
256.980	38.33	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
1250.667	39.64	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
1994.667	42.33	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
4509.600	44.84	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
12508.360	46.42	N/A	N/A	74.00	N/A	54.00	Vertical	PASS

(Antenna Vertical, 30MHz to 18GHz)

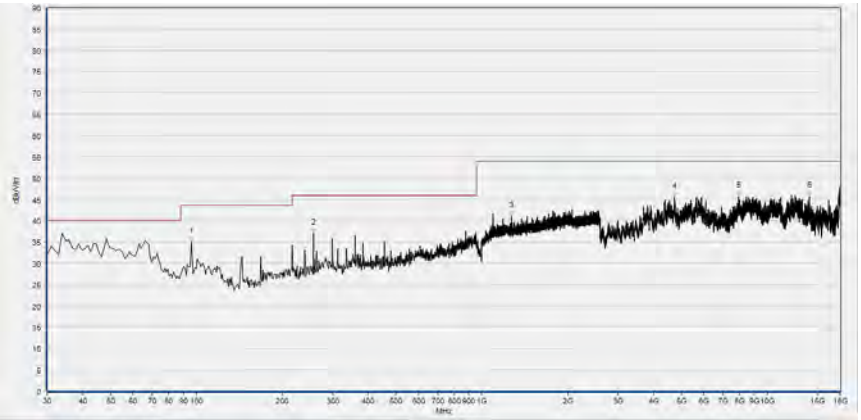
802.11n (HT20) Mode

Plot for Channel 1



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
71.710	34.17	N/A	N/A	N/A	40.00	N/A	Horizontal	PASS
167.740	33.33	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
384.050	37.68	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
2020.800	42.84	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
5738.520	46.96	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
10435.520	46.99	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

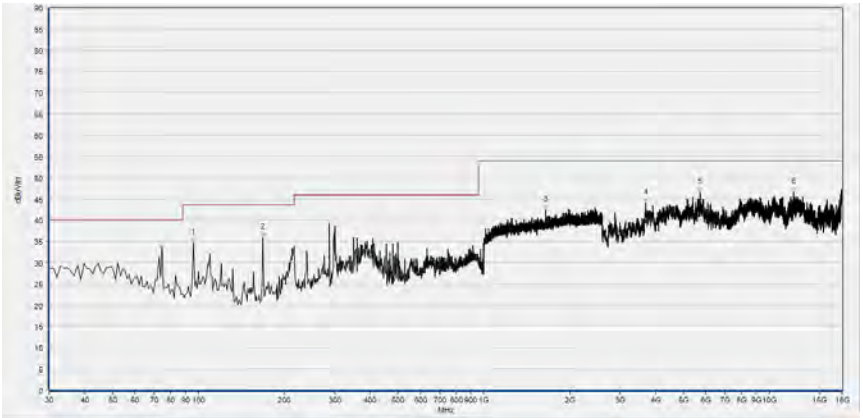
(Antenna Horizontal, 30MHz to 18GHz)



Fre. (MHz)	PK (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
95.960	35.01	N/A	N/A	N/A	43.50	N/A	Vertical	PASS
256.980	37.05	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
1268.800	41.08	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
4734.440	45.63	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
7949.960	45.81	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
14020.640	45.78	N/A	N/A	74.00	N/A	54.00	Vertical	PASS

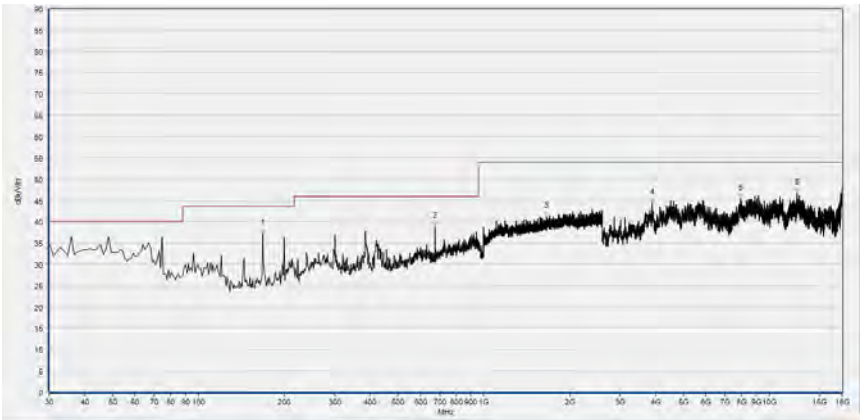
(Antenna Vertical, 30MHz to 18GHz)

Plot for Channel 6



Fre. (MHz)	PK (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
95.960	34.65	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
167.740	35.92	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
1646.933	42.32	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
3690.320	44.15	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
5732.360	46.63	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
12163.400	46.53	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

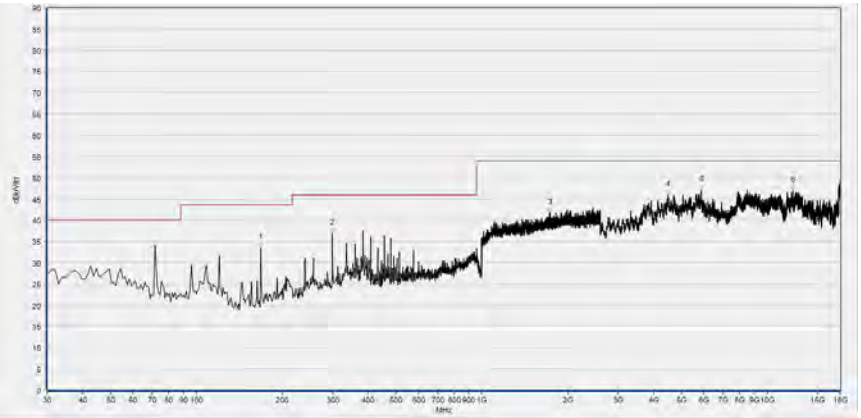
(Antenna Horizontal, 30MHz to 18GHz)



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
167.740	37.20	N/A	N/A	N/A	43.50	N/A	Vertical	PASS
675.050	38.88	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
1655.467	41.16	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
3881.280	44.44	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
7934.560	45.35	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
12520.680	46.76	N/A	N/A	74.00	N/A	54.00	Vertical	PASS

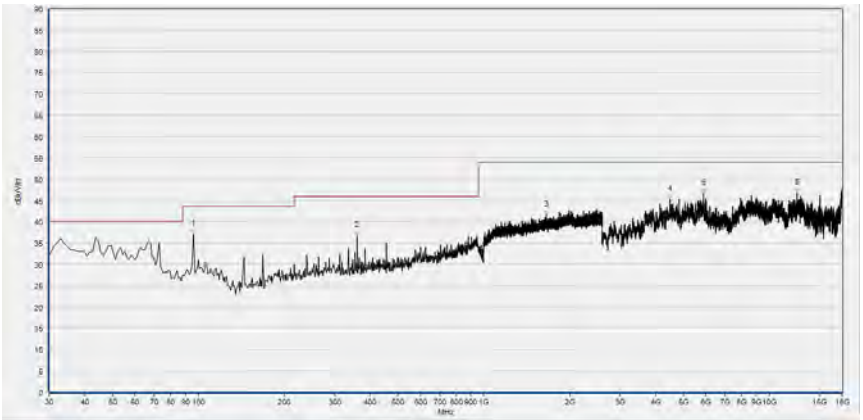
(Antenna Vertical, 30MHz to 18GHz)

Plot for Channel 11



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
167.740	33.55	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
299.660	36.80	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
1732.800	41.75	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
4494.200	45.99	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
5867.880	47.04	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
12295.840	46.99	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

(Antenna Horizontal, 30MHz to 18GHz)



Fre. (MHz)	PK (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
95.960	37.06	N/A	N/A	N/A	43.50	N/A	Vertical	PASS
359.800	36.66	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
1654.933	41.51	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
4484.960	45.31	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
5870.960	46.59	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
12505.280	46.69	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	±2.22dB
Power spectral density (PSD)	±2.22dB
Bandwidth	±5%
Conducted Spurious Emission	±2.77dB
Restricted Frequency Bands	±5%
Radiated Emission	±2.95dB
Conducted Emission	±2.44dB

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

Annex B Testing Laboratory Information

1. Identification of the Responsible Testing Laboratory

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

2. Identification of the Responsible Testing Location

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

3. Facilities and Accreditations

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

4. Test Equipments Utilized

4.1 Conducted Test Equipments

Equipment Name	Serial No.	Type	Manufacturer	Cal. Date	Due Date
Attenuator 1	(N/A.)	10dB	Resent	N/A	N/A
EXA Signal Analyzer	MY53470836	N9010A	Agilent	2020.04.01	2021.03.31
USB Wideband Power Sensor	MY54210011	U2021XA	Agilent	2020.04.01	2021.03.31
RF cable (30MHz-26GHz)	CB01	RF01	Morlab	N/A	N/A
Coaxial cable	CB02	RF02	Morlab	N/A	N/A
SMA connector	CN01	RF03	HUBER-SUHNER	N/A	N/A
Computer	T430i	Think Pad	Lenovo	N/A	N/A

4.2 Conducted Emission Test Equipments

Equipment Name	Serial No.	Type	Manufacturer	Cal. Date	Due Date
Receiver	MY56400093	N9038A	KEYSIGHT	2020.03.26	2021.03.25
LISN	812744	NSLK 8127	Schwarzbeck	2020.03.26	2021.03.25
Pulse Limiter (10dB)	VTSD 9561 F-B #206	VTSD 9561-F	Schwarzbeck	2020.07.24	2021.07.23
Coaxial cable(BNC) (30MHz-26GHz)	CB01	EMC01	Morlab	N/A	N/A
Adapter	K68249G620 9896	HW-05920 0CHQ	HUAWEI	N/A	N/A

4.3 List of Software Used

Description	Manufacturer	Software Version
Test system	Townsend	V2.6
Power Panel	Agilent	V3.8
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	2020.07.21	2021.07.20
Test Antenna - Bi-Log	9163-519	VULB 9163	Schwarzbeck	2019.05.24	2022.05.23
Test Antenna - Loop	1519-022	FMZB1519	Schwarzbeck	2019.02.14	2022.02.13
Test Antenna – Horn	01774	BBHA 9120D	Schwarzbeck	2019.07.26	2022.07.25
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	S020180L3203	Tonscend	2020.07.21	2021.07.20
18-26.5GHz pre-Amplifier	46732	S10M100L3802	Tonscend	2020.07.21	2021.07.20
26-40GHz pre-Amplifier	56774	S40M400L4002	Tonscend	2020.07.21	2021.07.20
Notch Filter	N/A	WRCG-2400-2483.5-60SS	Wainwright	2020.07.21	2021.07.20
Anechoic Chamber	N/A	9m*6m*6m	CRT	2020.01.06	2023.01.05

END OF REPORT