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TEST REPORT

FCC PART 15 SUBPART E 15.407& RSS-247

Report Reference No. : CTL2106235021-WF02

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Product Name : Smart Projector

Model/Type reference : J79-4D1

List Model(s)..... : See next page

Trade Mark..... : JMGO

FCC ID..... : SMC-T72P

Applicant's name : SHENZHEN HOLATEK CO., LTD.

Address of applicant : Rm.1001, Unit 4, Bldg.B, Kexing Science Park, Keyuan Road,
Nanshan District, Shenzhen, China

Test Firm..... : Shenzhen CTL Testing Technology Co., Ltd.

Address of Test Firm : Floor 1-A, Baisha Technology Park, No.3011, Shahexi Road,
Nanshan District, Shenzhen, China 518055

Test specification..... :

Standard : 47 CFR FCC Part 15 Subpart E 15.407
RSS-247 Issue 2, February 2017

TRF Originator : Shenzhen CTL Testing Technology Co., Ltd.

Master TRF : Dated 2011-01

Date of receipt of test item : June 10, 2021

Date of sampling : June 10, 2021

Date of Test Date : June 11, 2021- Aug. 18, 2021

Date of Issue : Aug. 19, 2021

Result..... : Pass

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TEST REPORT

Test Report No. :	CTL2106235021-WF02	Aug. 19, 2021
		Date of issue

Equipment under Test : Smart Projector

Sample No : CTL210623502-S001

Model /Type : J79-4D1

Listed Models : J79-4D0, J79-4D2, J79-4D3, J79-4D4, J79-4D5, J79-4D6, J79-4D7, J79-4D8, J79-4D9, J79-4DA, J79-4DB, J79-4DC, J79-4DD, J79-4DE, J79-4DF, J79-4DG, J79-4DH, J79-4DI, J79-4DJ, J79-4DK, J79-4DM, J79-4DN, J79-4DL, J79-4DO, J79-4DP, J79-4DQ, J79-4DR, J79-4DS, J79-4DT, J79-4DU, J79-4DV, J79-4DW, J79-4DX, J79-4DY, J79-4DZ

Applicant : **SHENZHEN HOLATEK CO., LTD.**

Address : Rm.1001, Unit 4, Bldg.B, Kexing Science Park,
Keyuan Road, Nanshan District, Shenzhen, China

Manufacturer : **SHENZHEN HOLATEK CO., LTD.**

Address : Rm.1001, Unit 4, Bldg.B, Kexing Science Park,
Keyuan Road, Nanshan District, Shenzhen, China

Test result	Pass *
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* In the configuration tested, the EUT complied with the standards specified page 5.

The test results presented in this report relate only to the object tested.

This report shall not be reproduced, except in full, without the written approval of the issuing testing laboratory.

**** Modified History ****

[illegible]

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1. SUMMARY

1.1. TEST STANDARDS

The tests were performed according to following standards:

[FCC Rules Part 15 Subpart E](#)—Unlicensed National Information Infrastructure Devices

[ANSI C63.10:2013](#) : American National Standard for Testing Unlicensed Wireless Devices

[KDB789033 D02](#): General UNII Test Procedures New Rules v02r01

[KDB 662911 D01 v02r01](#): Emissions Testing of Transmitters with Multiple Outputs in the Same Band

[RSS-247-Issue 2](#): Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices.

[RSS-Gen Issue 5](#): General Requirements for Compliance of Radio Apparatus

1.2. Test Description

FCC Requirement		
FCC Part 15.207 RSS-Gen 8.8	AC Power Conducted Emission	PASS
FCC Part 15.407(a) RSS GEN 6.7	Emission Bandwidth(26dBm Bandwidth)	PASS _{Note1}
FCC Part 15.407(e) RSS-247 5.2 (1) RSS GEN 6.7	Minimum Emission Bandwidth(6dBm Bandwidth)	PASS _{Note2}
FCC Part 15.407(a) RSS-Gen 6.8 RSS-247 5.4 (4)	Maximum Conducted Output Power	PASS
FCC Part 15.407(a) RSS-247 5.2 (2)	Peak Power Spectral Density	PASS
FCC Part 15.407(g) RSS-Gen 6.11	Frequency Stability	PASS
FCC Part 15.407(b) RSS-247 5.5	Undesirable emission	PASS
FCC Part 15.407(b)/15.205/15.209 RSS-Gen 8.9	Radiated Emissions	PASS
FCC Part 15.407(h)	Dynamic Frequency Selection	PASS _{Note3}
FCC Part 15.203	Antenna requirement	PASS

Note 1: Apply to U-NII 1, U-NII 2A, and U-NII 2C band.

Note 2: Apply to U-NII 3 band only.

Note 3: N/A means not applicable in this report.

1.3. Test Facility

1.3.1 Address of the test laboratory

Shenzhen CTL Testing Technology Co., Ltd.

Floor 1-A, Baisha Technology Park, No. 3011, Shahexi Road, Nanshan, Shenzhen 518055 China

The 3m-Semi anechoic test site fulfils CISPR 16-1-4 according to ANSI C63.10:2013 and CISPR 16-1-4:2010 SVSWR requirement for radiated emission above 1GHz.

1.3.2 Laboratory accreditation

The test facility is recognized, certified, or accredited by the following organizations:

CNAS-Lab Code: L7497

Shenzhen CTL Testing Technology Co., Ltd. has been assessed and proved to be in compliance with CNAS-CL01 Accreditation Criteria for Testing and Calibration Laboratories (identical to ISO/IEC 17025: 2005 General Requirements) for the Competence of Testing and Calibration Laboratories.

A2LA-Lab Cert. No. 4343.01

Shenzhen CTL Testing Technology Co., Ltd, EMC Laboratory has been accredited by A2LA for technical competence in the field of electrical testing, and proved to be in compliance with ISO/IEC 17025: 2005 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing.

IC Registration No.: 9618B

CAB identifier: CN0041

The 3m alternate test site of Shenzhen CTL Testing Technology Co., Ltd. EMC Laboratory has been registered by Innovation, Science and Economic Development Canada to test to Canadian radio equipment requirements with Registration No.: 9618B on Jan. 22, 2019.

FCC-Registration No.: 399832

Designation No.: CN1216

Shenzhen CTL Testing Technology Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration 399832, December 08, 2017.

1.4. Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. to CISPR 16 - 4 "Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements" and is documented in the Shenzhen CTL Testing Technology Co., Ltd. quality system acc. to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Hereafter the best measurement capability for CTL laboratory is reported:

Test	Measurement Uncertainty	Notes
Transmitter power conducted	±0.57 dB	(1)
Transmitter power Radiated	±2.20 dB	(1)
Conducted spurious emission 9KHz-40 GHz	±2.20 dB	(1)
Occupied Bandwidth	±0.01ppm	(1)
Radiated Emission 30~1000MHz	±4.10dB	(1)
Radiated Emission Above 1GHz	±4.32dB	(1)

Conducted Disturbance0.15~30MHz	$\pm 3.20\text{dB}$	(1)
---------------------------------	---------------------	-----

- (1) This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k=2$.

2. GENERAL INFORMATION

2.1. Environmental conditions

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

Normal Temperature:	25°C
Relative Humidity:	55 %
Air Pressure:	101 kPa

2.2. General Description of EUT

Product Name:	Smart Projector			
Model/Type reference:	J79-4D1			
Power supply:	DC19V from adapter			
Adapter information:	Model:HKA15019079-6C Input: AC 100-240V 50/60Hz 2.0A Output: 19V---7.9A 150.1W			
Hardware version:	Ver C			
Software version:	V1.0.11			
WIFI				
Supported type:	20MHz system	40MHz system	80MHz system	160MHz system
	802.11a 802.11n 802.11ac	802.11n 802.11ac	802.11ac	N/A
Operation frequency:	5180-5240MHz 5745-5825MHz	5190-5230MHz 5755MHz,5795MHz	5210MHz; 5775MHz	N/A
Modulation:	OFDM	OFDM	OFDM	N/A
Channel number:	9	4	2	N/A
Channel separation:	20MHz	40MHz	80MHz	N/A
Antenna Type:	PFC Antenna (MIMO 2*2)			
Antenna gain:	Antenna 1: 3.77dBi, Antenna 2:4.56dBi			
Directional gain:	7.57dBi			

Note1: For more details, please refer to the user's manual of the EUT.

Note2: *Directional gain* = $G_{ANT} + 10 \log(N_{ANT}/N_{SS})$ dBi, where N_{SS} = the number of independent spatial streams of data and G_{ANT} is the antenna gain in dBi. For this devices $N_{SS} = 1$.

2.3. Description of Test Modes and Test Frequency

The Applicant provides communication tools software(CMD Command)to control the EUT for staying in continuous transmitting (Duty Cycle more than 98%) and receiving mode for testing.

All test performed at the low, middle and high of operational frequency range of each mode.

Operation Frequency List WIFI on 5G Band:

Operating band	20MHz		40MHz		80MHz	
	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
U-NII 1 (5150MHz-5250MHz)	36	5180	38	5190	42	5210
	40	5200				
	44	5220	46	5230		
	48	5240				
U-NII 3 (5725MHz-5850MHz)	149	5745	151	5755	155	5775
	153	5765				
	157	5785	159	5795		
	161	5805				
	165	5825	--	--	--	--

Note:

1. "--"Means no channel(s) available any more.
2. The line display in grey is those Channels/Frequencies select to test in this report for each operation mode.

Data Rate Used:

Preliminary tests were performed in different data rate to find the worst radiated emission. The data rate shown in the table below is the worst-case rate with respect to the specific test item. Investigation has been done on all the possible configurations for searching the worst cases. The following table is a list of the test modes shown in this test report.

Test Items	Mode	Data Rate
Maximum Conducted Output Power Power Spectral Density Emission Bandwidth(26dBm Bandwidth) Minimum Emission Bandwidth(6dBm Bandwidth) Undesirable emission Frequency Stability	11a/OFDM	6 Mbps
	11n(20MHz),11ac(20MHz)/OFDM	7.2 Mbps
	11n(40MHz),11ac(40MHz)/OFDM	15.0Mbps
	11ac(80MHz)/OFDM	65.0Mbps

Power setting during the test:

During testing, Channel & Power Controlling Software provided by the customer was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the firmware of the final end product.

Power Parameters:

Test Software Version	CMD Command	
Frequency	Ant1	Ant2
UNII Band 1	72	75
UNII Band 3	42	42

2.4. Equipments Used during the Test

Test Equipment	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Due Date
LISN	R&S	ESH2-Z5	860014/010	2021/05/15	2022/05/14
Bilog Antenna	Sunol Sciences Corp.	JB1	A061713	2021/04/08	2022/04/07
EMI Test Receiver	R&S	ESCI	1166.5950.03	2021/05/18	2022/05/17
Spectrum Analyzer	Agilent	E4407B	MY41440676	2021/05/14	2022/05/13
Spectrum Analyzer	Agilent	N9020A	US46220290	2021/05/14	2022/05/13
Spectrum Analyzer	Keysight	N9020A	MY53420874	2021/05/14	2022/05/13
Controller	EM Electronics	EM 1000	060859	2021/05/19	2022/05/18
Horn Antenna	Ocean Microwave	OBH100400	26999002	2020/11/28	2021/11/27
Horn Antenna	Sunol Sciences Corp.	DRH-118	A062013	2021/05/19	2022/05/18
Active Loop Antenna	Da Ze	ZN30900A	/	2021/05/19	2022/05/18
Amplifier	Agilent	8449B	3008A02306	2021/05/15	2022/05/14
Amplifier	Agilent	8447D	2944A10176	2021/05/15	2022/05/14
Temperature/Humidity Meter	Gangxing	CTH-608	02	2021/05/16	2022/05/15
Power Sensor	Agilent	U2021XA	MY55130004	2021/05/14	2022/05/13
Power Sensor	Agilent	U2021XA	MY55130006	2021/05/14	2022/05/13
Spectrum Analyzer	RS	FSP	1164.4391.38	2021/05/15	2022/05/14

The calibration interval was one year

2.5. Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended to comply with Section 15.407 of the FCC Part 15, Subpart E Rules.

2.6. Modifications

No modifications were implemented to meet testing criteria.

3. TEST CONDITIONS AND RESULTS

3.1. Conducted Emissions Test

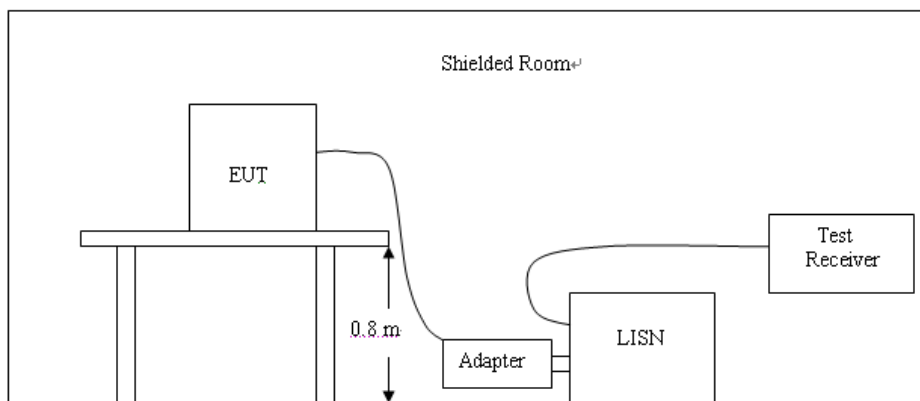
LIMIT

According to FCC CFR Title 47 Part 15 Subpart C Section 15.207 and RSS Gen 8.8, AC Power Line Conducted Emissions Limits for License-Exempt Radio Apparatus as below:

Frequency range (MHz)	Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency.

TEST CONFIGURATION



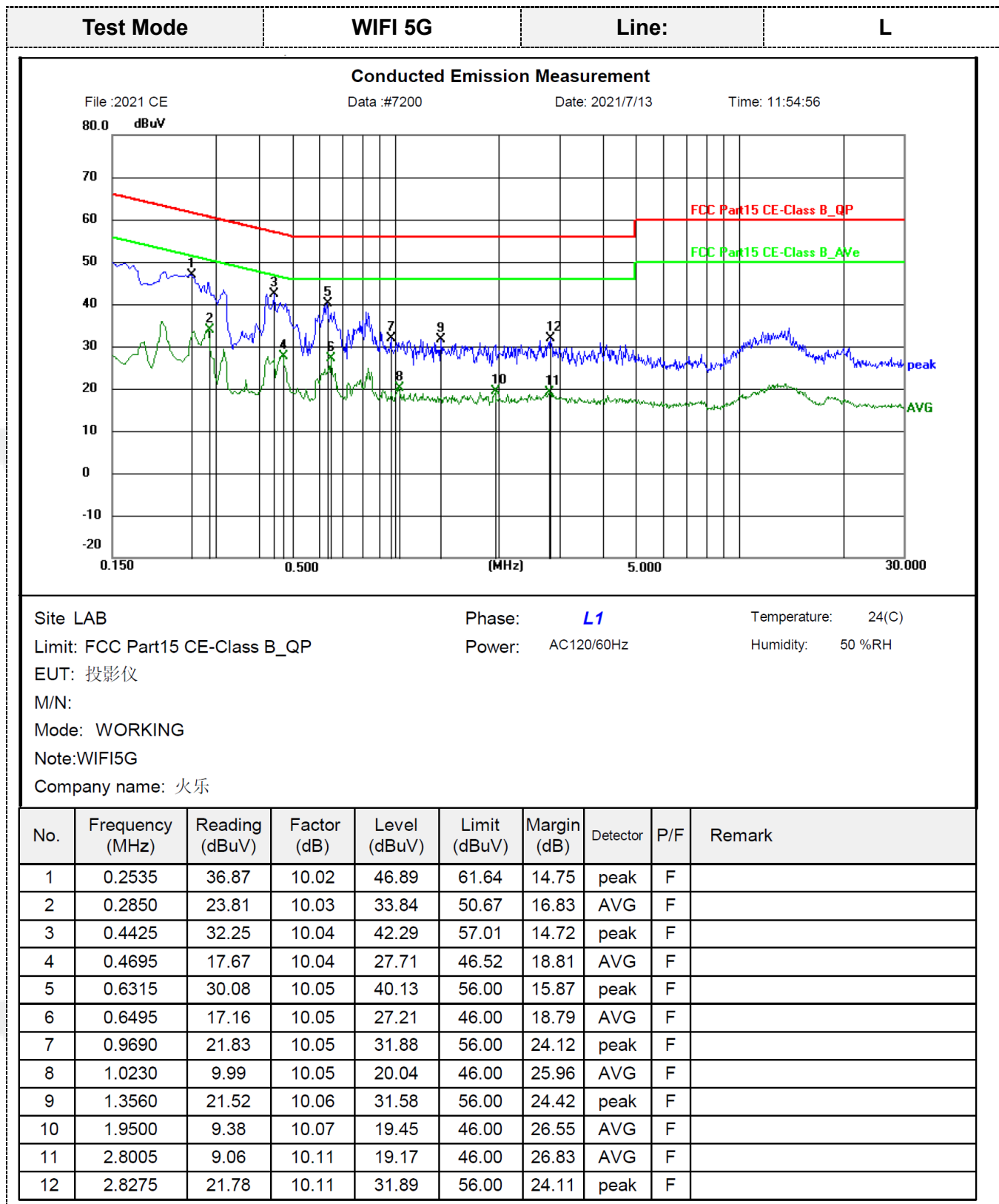
TEST PROCEDURE

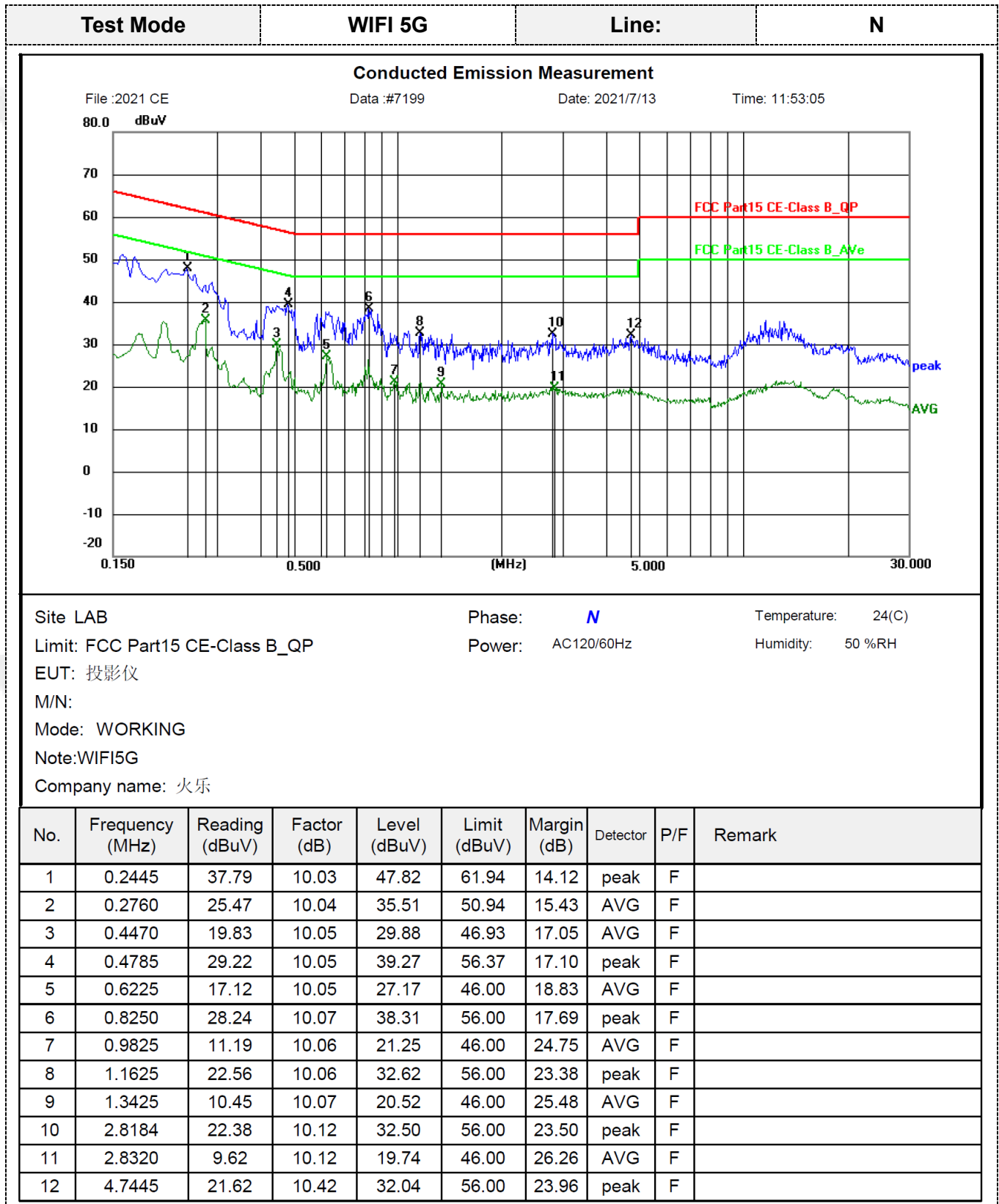
1. The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. The EUT is a tabletop system; a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSI C63.10:2013.
2. Support equipment, if needed, was placed as per ANSI C63.10:2013.
3. All I/O cables were positioned to simulate typical actual usage as per ANSI C63.10:2013.
4. The adapter received AC120V/60Hz power through a Line Impedance Stabilization Network (LISN) which supplied power source and was grounded to the ground plane.
5. All support equipments received AC power from a second LISN, if any.
6. The EUT test program was started. Emissions were measured on each current carrying line of the EUT using a spectrum Analyzer / Receiver connected to the LISN powering the EUT. The LISN has two monitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side). Two scans were taken: one with Line 1 connected to Analyzer / Receiver and Line 2 connected to a 50 ohm load; the second scan had Line 1 connected to a 50 ohm load and Line 2 connected to the Analyzer / Receiver.
7. Analyzer / Receiver scanned from 150 KHz to 30MHz for emissions in each of the test modes.
8. During the above scans, the emissions were maximized by cable manipulation.

TEST RESULTS

Remark:

1. All modes of 802.11a/n/ac were tested at Low, Middle, and High channel; only the worst result of AC20MIMO CH48 was reported as below:
2. Both 120 VAC, 50/60 Hz and 240 VAC, 50/60 Hz power supply have been tested, only the worst result of 120 VAC, 60 Hz was reported as below:





Remark: Level(dBuV)=Reading(dBuV) + Factor(dB)

Margin=Limit(dBuV/m)- Level(dBuV/m)

3.2. Radiated Emissions

Limit

The maximum 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 e.i.r.p. of -27 dBm/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 e.i.r.p. of -27 dBm/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 e.i.r.p. of -27 dBm/MHz.
- (4) For transmitters operating in the 5.725-5.85 GHz band: 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.

Undesirable emission limits

Requirement	Limit(EIRP)	Limit (Field strength at 3m) ^{Note1}
15.407(b)(1)	PK:-27(dBm/MHz)	PK:68.2(dBμV/m)
15.407(b)(2)		
15.407(b)(3)		
15.407(b)(4)		

Note1: The following formula is used to convert the equipment isotropic radiated power (eirp) to field strength:

$$E = \frac{1000000\sqrt{30P}}{3} \mu\text{V/m, where P is the eirp (Watts)}$$

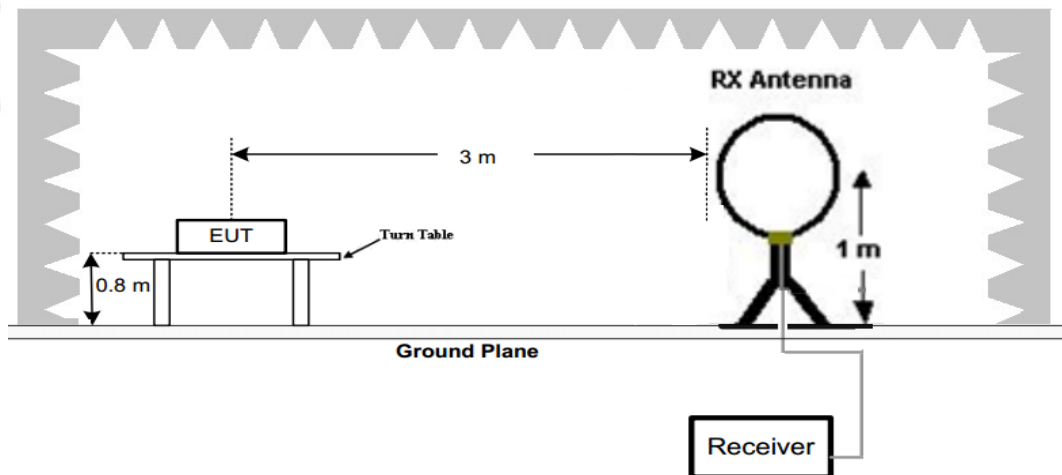
- (5) Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in §15.209
- (6) In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a)

Radiated emission limits

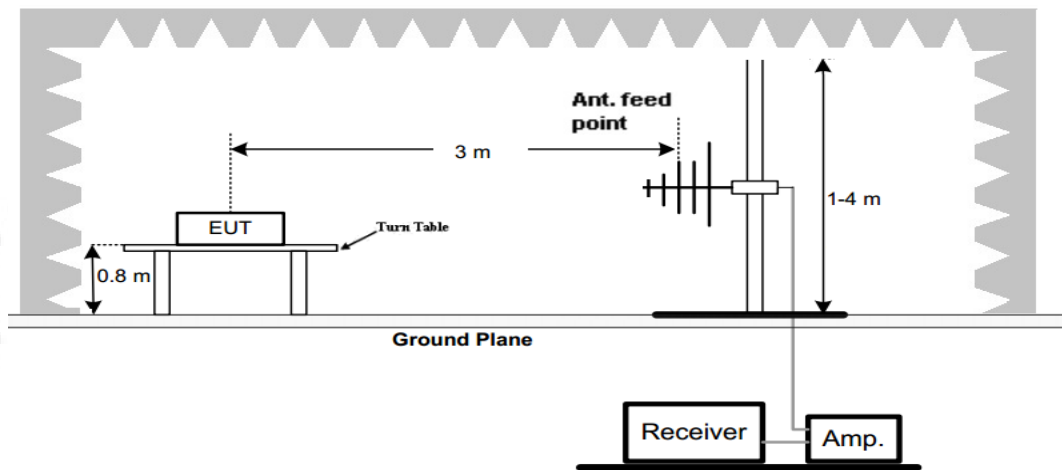
Frequency (MHz)	Distance (Meters)	Radiated (dBμV/m)	Radiated (μV/m)
0.009-0.49	3	$20\log(2400/F(\text{KHz})) + 40\log(300/3)$	$2400/F(\text{KHz})$
0.49-1.705	3	$20\log(24000/F(\text{KHz})) + 40\log(30/3)$	$24000/F(\text{KHz})$
1.705-30	3	$20\log(30) + 40\log(30/3)$	30
30-88	3	40.0	100
88-216	3	43.5	150
216-960	3	46.0	200
Above 960	3	54.0	500

TEST CONFIGURATION

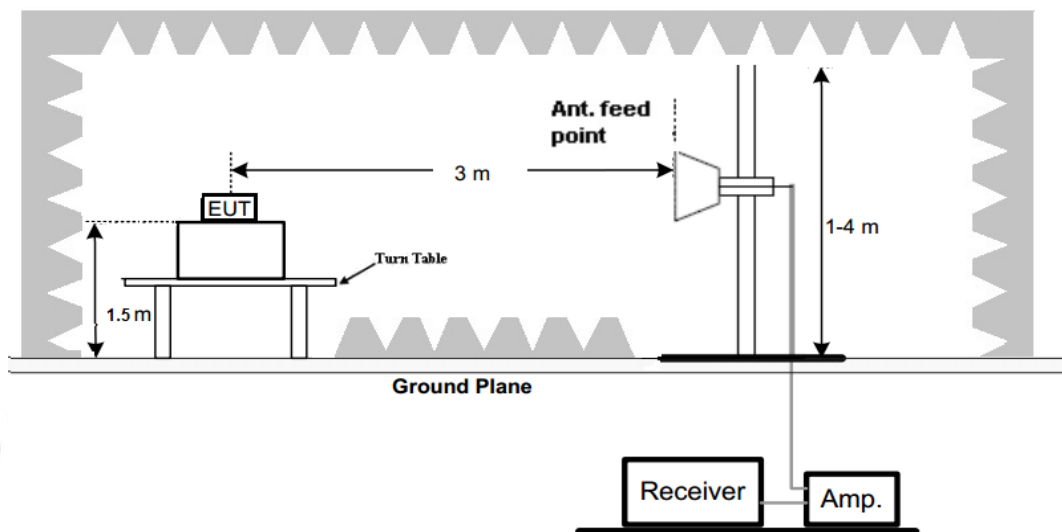
(A) Radiated Emission Test Set-Up, Frequency Below 30MHz



(B) Radiated Emission Test Set-Up, Frequency below 1000MHz



(C) Radiated Emission Test Set-Up, Frequency above 1000MHz



Test Procedure

- Below 1GHz measurement the EUT is placed on a turntable which is 0.8m above ground plane, and above 1GHz measurement EUT was placed on a low permittivity and low loss tangent turn table which is 1.5m above ground plane.
- Maximum procedure was performed by raising the receiving antenna from 1m to 4m and rotating the turn table from 0° to 360° to acquire the highest emissions from EUT
- And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
- Repeat above procedures until all frequency measurements have been completed.
- Radiated emission test frequency band from 9KHz to 40GHz.
- The distance between test antenna and EUT as following table states:

Test Frequency range	Test Antenna Type	Test Distance
9KHz-30MHz	Active Loop Antenna	3
30MHz-1GHz	Bilog Antenna	3
1GHz-18GHz	Horn Antenna	3
18GHz-25GHz	Horn Antennna	1

- Setting test receiver/spectrum as following table states:

Test Frequency range	Test Receiver/Spectrum Setting	Detector
9KHz-150KHz	RBW=200Hz/VBW=3KHz, Sweep time=Auto	QP
150KHz-30MHz	RBW=9KHz/VBW=100KHz, Sweep time=Auto	QP
30MHz-1GHz	RBW=120KHz/VBW=1000KHz, Sweep time=Auto	QP
1GHz-40GHz	Peak Value: RBW=1MHz/VBW=3MHz, Sweep time=Auto Average Value: RBW=1MHz/VBW=10Hz, Sweep time=Auto	Peak

TEST RESULTS

Remark:

- All 802.11a/802.11n (HT20)/802.11ac (VHT20)/802.11n (HT40)/802.11ac (VHT40)/802.11ac (HT80) modes have been tested for below 1GHz test, only the worst case 802.11n (HT40) MIMO low channel of U-NII 3 band was recorded.
- All 802.11a/802.11n (HT20)/802.11ac(VHT20)/802.11n(HT40)/802.11ac (VHT40)/802.11ac (HT80) modes have been tested for above 1GHz test, only the worst case 802.11a mode was recorded for U-NII 1 test and 802.11n (HT40) MIMO for U-NII 3 test.
- All 802.11a/802.11n (HT20)/802.11ac(VHT20)/802.11n(HT40)/802.11ac (VHT40)/802.11ac (HT80) modes have been tested for U-NII 3 bandedge test, only the worst case of 802.11n (HT40) MIMO was recorded.
- Radiated emission test from 9 KHz to 10th harmonic of fundamental was verified, and the emission levels from 9kHz to 30MHz are attenuated 20dB below the limit and not recorded in report.

For 30MHz-1GHz

Horizontal

Radiated Emission Measurement

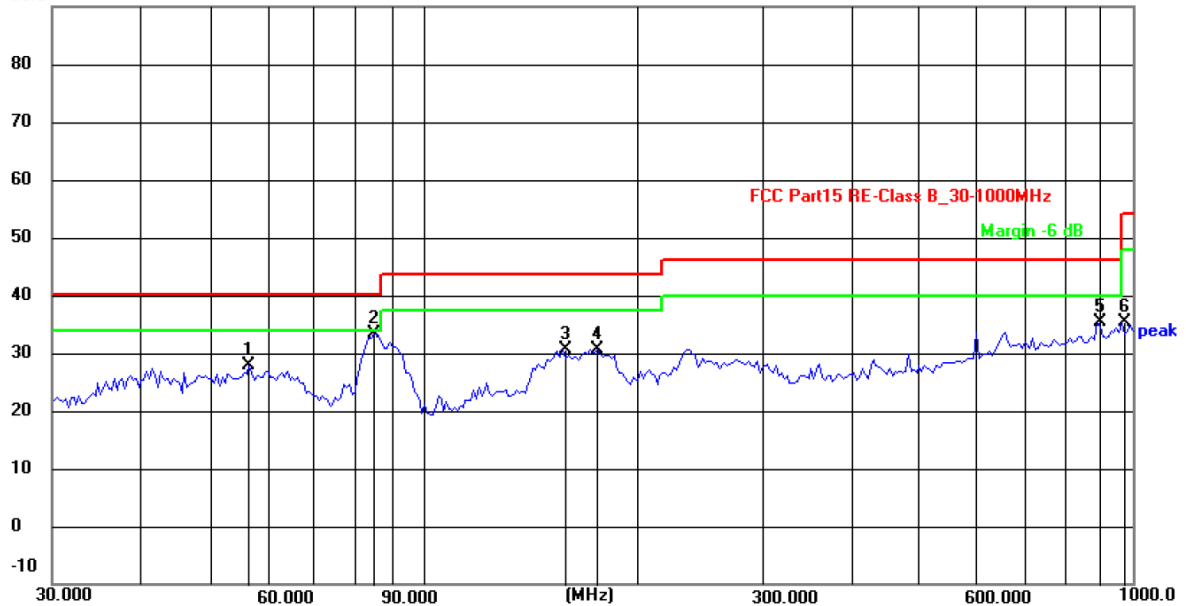
File : RE 1

Data : #5870

Date: 2021/07/13

Time: 10:16:25

90.0 dBuV/m



Site CTL 966 Chamber 1

Polarization: **Vertical**

Temperature: 25(C)

Limit: FCC Part15 RE-Class B_30-1000MHz

Power: AC120/60Hz

Humidity: 50 %

EUT:

Distance: 3m

M/N:

Mode: WORKING

Note: WIFI5G

火乐

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	56.8914	43.64	-15.85	27.79	40.00	-12.21	peak	99	33	P	
2	85.1486	52.37	-18.96	33.41	40.00	-6.59	peak	99	23	P	
3	157.2829	43.58	-12.98	30.60	43.50	-12.90	peak	99	287	P	
4	176.2686	45.37	-14.84	30.53	43.50	-12.97	peak	99	8	P	
5	892.2909	39.14	-3.77	35.37	46.00	-10.63	peak	99	8	P	
6	965.5421	38.08	-2.82	35.26	54.00	-18.74	peak	99	172	P	

Vertical

Radiated Emission Measurement

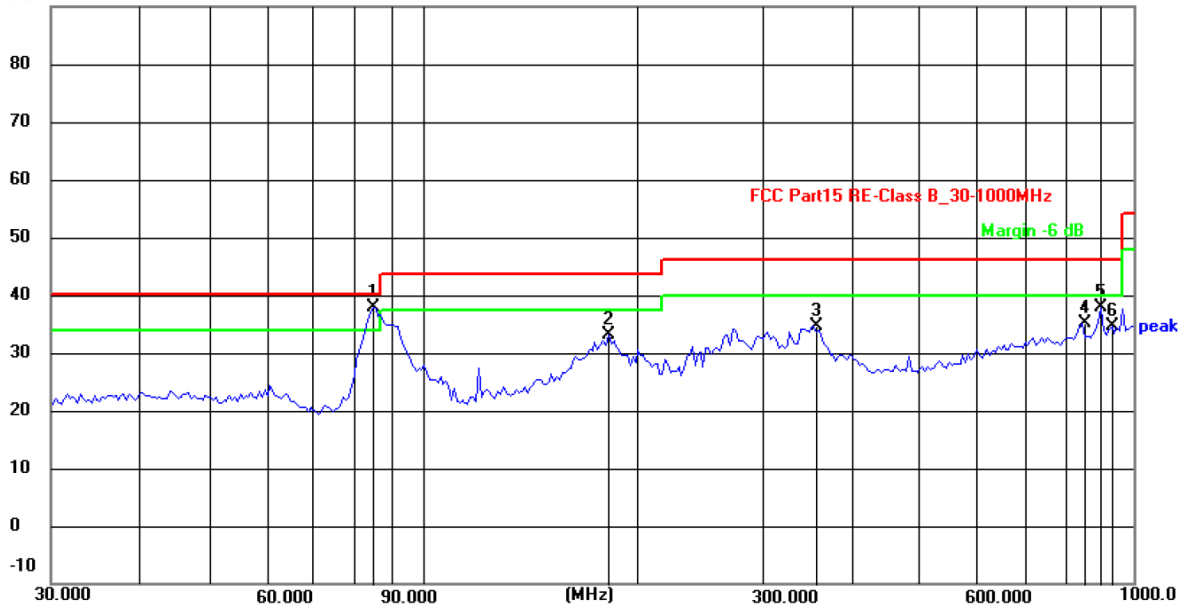
File :RE 1

Data :#5871

Date: 2021/07/13

Time: 10:21:49

90.0 dBuV/m



Site CTL 966 Chamber 1

Polarization: **Horizontal**

Temperature: 25(C)

Limit: FCC Part15 RE-Class B_30-1000MHz

Power: AC120/60Hz

Humidity: 50 %

EUT:

Distance: 3m

M/N:

Mode: WORKING

Note: WIFI5G

火乐

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	85.1486	56.85	-18.96	37.89	40.00	-2.11	peak	300	351	P	
2	182.5592	48.79	-15.76	33.03	43.50	-10.47	peak	99	291	P	
3	355.4273	48.34	-13.76	34.58	46.00	-11.42	peak	99	302	P	
4	846.5708	39.58	-4.51	35.07	46.00	-10.93	peak	99	14	P	
5	900.1474	41.59	-3.64	37.95	46.00	-8.05	peak	99	14	P	
6	932.2715	37.80	-3.12	34.68	46.00	-11.32	peak	300	7	P	

Remark: Level(dBuV)=Reading(dBuV) + Factor(dB)

Margin=Level(dBuV/m)-Limit(dBuV/m)

For 1GHz to 40GHz

Remark: All 802.11a/802.11n (HT20)/802.11ac(VHT20)/802.11n(HT40)/802.11ac (VHT40)/802.11ac (HT80) modes have been tested for above 1GHz test, only the worst case 802.11a mode for U-NII 1 test and 802.11n (HT40) MIMO for U-NII 3 test was recorded as below:

U-NII 1 @ 802.11a mode (above 1GHz)

Tested Channel	Frequency (MHz)	Emission Level (dBuV/m)	Detector Mode	ANT Pol	Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre amplifier (dB)	Correction Factor (dB/m)
36 (5180MHz)	5150.00	46.15	PK	H	68.20	22.05	57.85	34.44	7.12	53.25	-11.70
	10360.00	49.17	PK	H	68.20	19.03	52.29	39.20	11.45	53.77	-3.12
	--	--	--	--	--	--	--	--	--	--	--
40 (5200MHz)	10400.00	48.92	PK	H	68.20	19.28	51.99	39.22	11.48	53.77	-3.07
	--	--	--	--	--	--	--	--	--	--	--
48 (5240MHz)	5350.50	46.75	PK	H	68.20	21.45	58.45	34.44	7.12	53.25	-11.70
	10480.00	49.05	PK	H	68.20	19.15	52.00	39.27	11.55	53.77	-2.95
	--	--	--	--	--	--	--	--	--	--	--

U-NII 3 @ 802.11n (HT40) MIMO mode (above 1GHz)

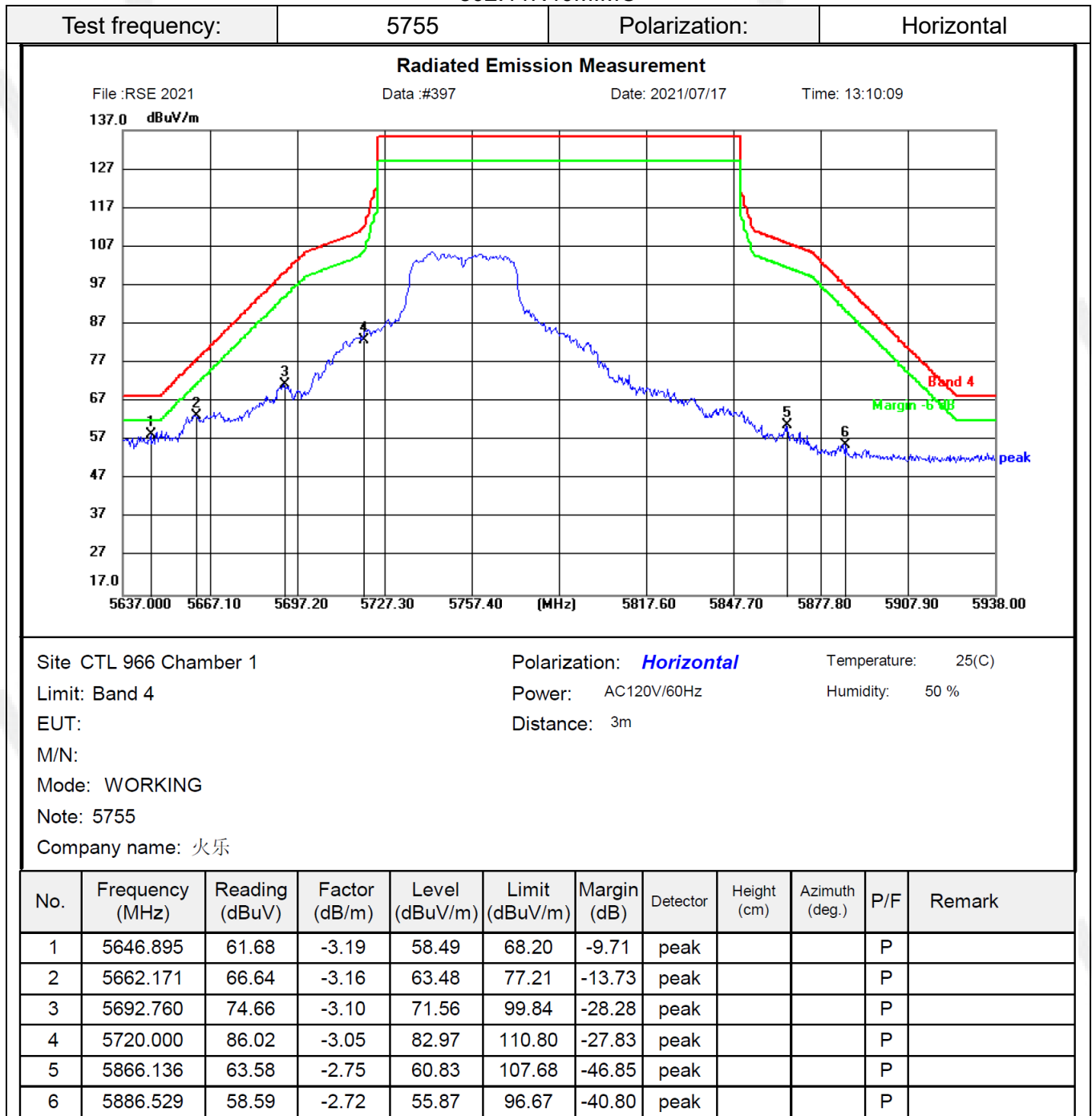
Tested Channel	Frequency (MHz)	Emission Level (dBuV/m)	Detector Mode	ANT Pol	Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre amplifier (dB)	Correction Factor (dB/m)
151 (5755MHz)	5615.25	57.65	PK	H	68.20	10.55	68.80	34.77	7.38	53.30	-11.15
	11510.00	51.33	PK	H	68.20	16.87	51.95	39.69	12.94	53.25	-0.62
	--	--	--	--	--	--	--	--	--	--	--
159 (5795MHz)	5528.75	56.24	PK	H	68.20	11.96	67.45	34.76	7.33	53.29	-11.21
	11590.00	50.69	PK	H	68.20	17.51	51.06	39.71	13.08	53.16	-0.37
	--	--	--	--	--	--	--	--	--	--	--

REMARKS:

1. Emission level (dBuV/m) =Raw Value (dBuV)+Correction Factor (dB/m)
2. Correction Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor
3. Margin value = Limit value- Emission level.
4. --Other emission levels are attenuated 20dB below the limit and not recorded in report.
5. RBW1MHz VBW3MHz Peak detector is for PK value; RBW 1MHz VBW10Hz Peak detector is for AV value.

Band Edge Test Plots of U-NII 3

802.11N40MIMO



Test frequency:

5755

Polarization:

Vertical

Radiated Emission Measurement

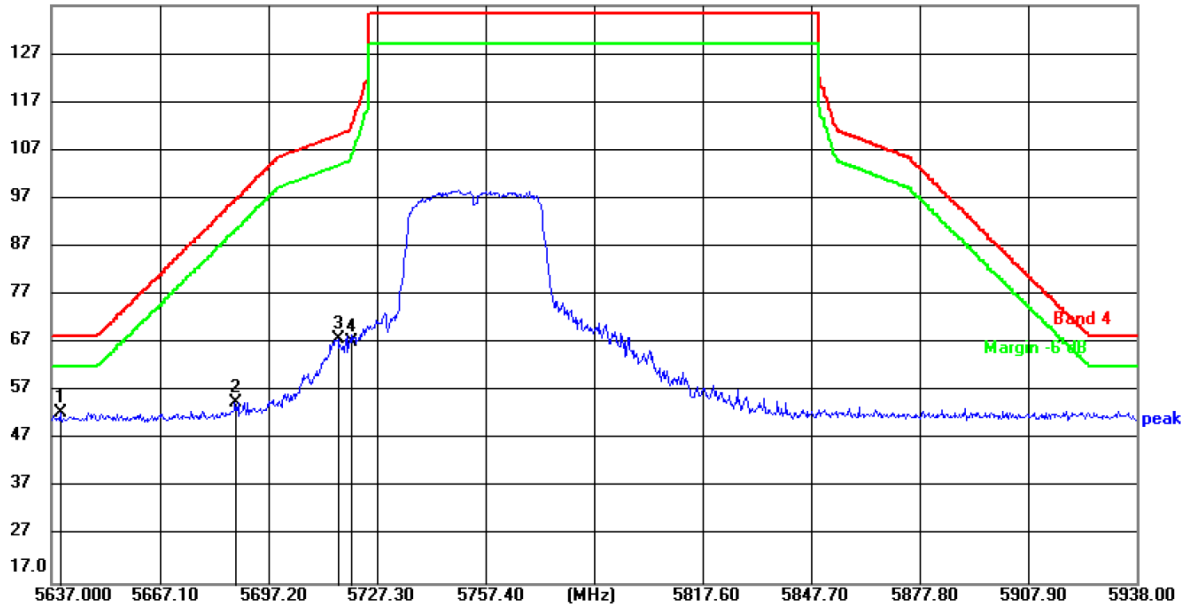
File :RSE 2021

Data :#398

Date: 2021/07/17

Time: 13:12:16

137.0 dBuV/m



Site CTL 966 Chamber 1

Polarization: **Vertical**

Temperature: 25(C)

Limit: Band 4

Power: AC120V/60Hz

Humidity: 50 %

EUT:

Distance: 3m

M/N:

Mode: WORKING

Note: 5755

Company name: 火乐

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	5639.634	55.88	-3.21	52.67	68.20	-15.53	peak			P	
2	5688.020	57.90	-3.11	54.79	96.33	-41.54	peak			P	
3	5716.727	71.00	-3.05	67.95	109.88	-41.93	peak			P	
4	5720.000	70.43	-3.05	67.38	110.80	-43.42	peak			P	

Test frequency:

5795

Polarization:

Horizontal

Radiated Emission Measurement

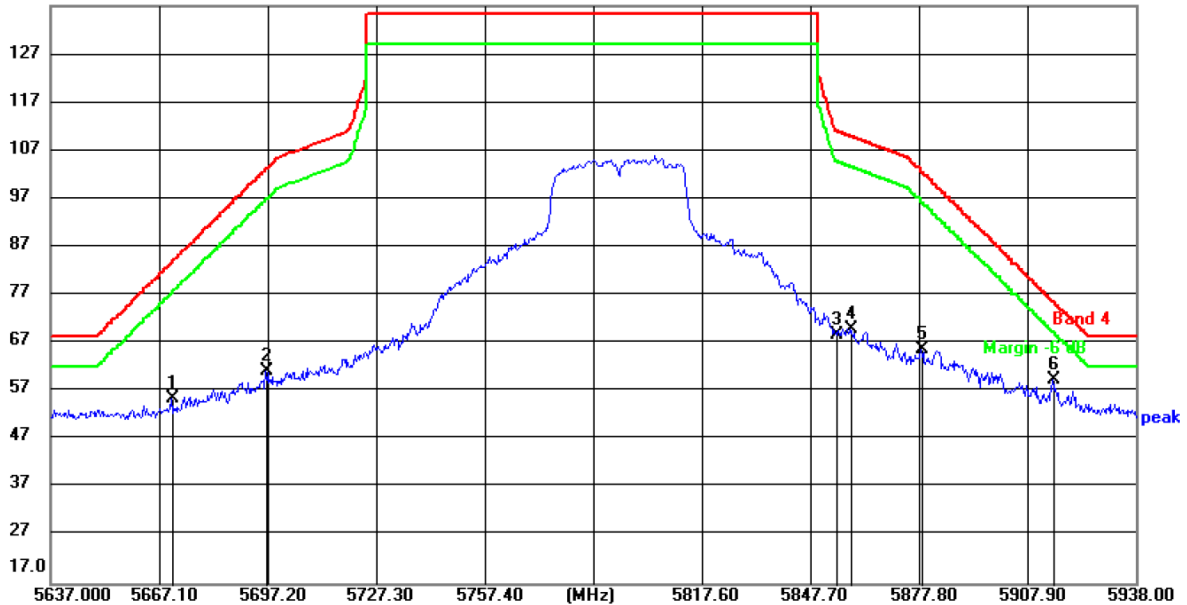
File :RSE 2021

Data :#400

Date: 2021/07/17

Time: 13:16:10

137.0 dBuV/m



Site CTL 966 Chamber 1

Polarization: **Horizontal**

Temperature: 25(C)

Limit: Band 4

Power: AC120V/60Hz

Humidity: 50 %

EUT:

Distance: 3m

M/N:

Mode: WORKING

Note: 5795

Company name: 火乐

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	5670.486	58.55	-3.14	55.41	83.36	-27.95	peak			P	
2	5696.673	64.37	-3.09	61.28	102.74	-41.46	peak			P	
3	5855.000	71.59	-2.78	68.81	110.80	-41.99	peak			P	
4	5858.875	72.83	-2.77	70.06	109.72	-39.66	peak			P	
5	5878.515	68.54	-2.73	65.81	102.60	-36.79	peak			P	
6	5915.011	62.17	-2.65	59.52	75.59	-16.07	peak			P	

Test frequency:

5795

Polarization:

Vertical

Radiated Emission Measurement

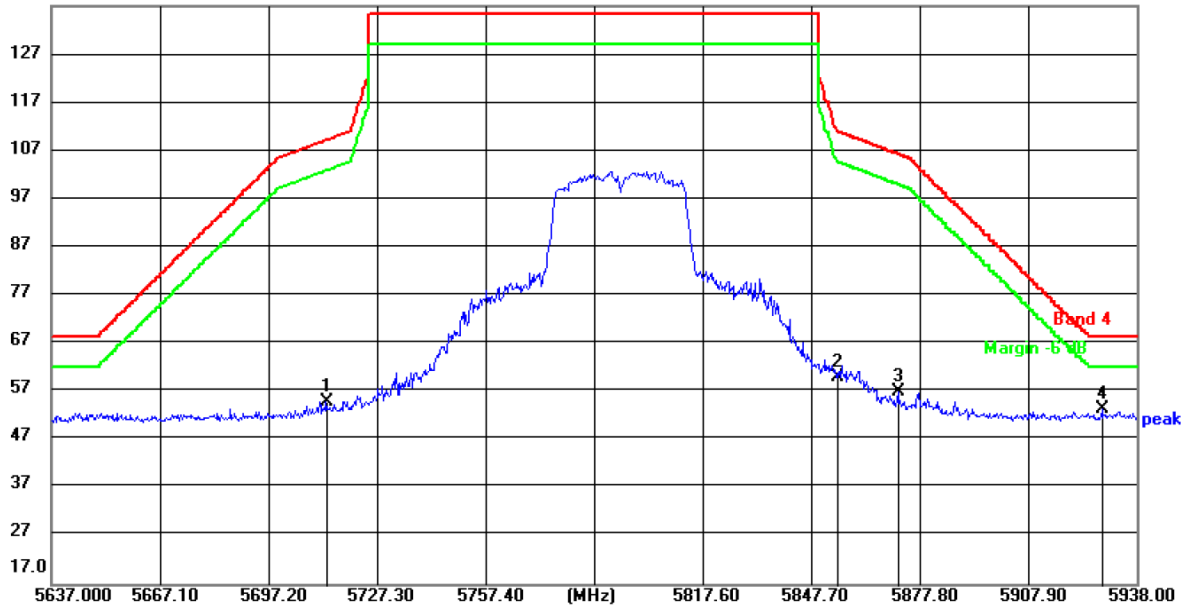
File :RSE 2021

Data :#399

Date: 2021/07/17

Time: 13:14:08

137.0 dBuV/m



Site CTL 966 Chamber 1

Polarization: **Vertical**

Temperature: 25(C)

Limit: Band 4

Power: AC120V/60Hz

Humidity: 50 %

EUT:

Distance: 3m

M/N:

Mode: WORKING

Note: 5795

Company name: 火乐

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	5713.416	58.06	-3.06	55.00	108.96	-53.96	peak			P	
2	5855.000	62.97	-2.78	60.19	110.80	-50.61	peak			P	
3	5872.006	59.75	-2.74	57.01	106.04	-49.03	peak			P	
4	5928.556	56.12	-2.64	53.48	68.20	-14.72	peak			P	

3.3. Maximum Conducted Average Output Power

Limit

FCC requirement:

For the band 5.15-5.25 GHz.

- (i) For an outdoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi.
- (ii) For an indoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi.
- (iii) For fixed point-to-point access points operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W.
- (iv) For client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi.

For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or $11 \text{ dBm} + 10 \log B$, where B is the 26 dB emission bandwidth in megahertz.

For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W

IC requirement:

Frequency band 5150-5250 MHz

For OEM devices installed in vehicles, the maximum e.i.r.p. shall not exceed 30 mW or $1.76 + 10 \log_{10} B$, dBm, whichever is less.

For other devices, the maximum e.i.r.p. shall not exceed 200 mW or $10 + 10 \log_{10} B$, dBm, whichever power is less. B is the 99% emission bandwidth in megahertz.

Frequency band 5250-5350 MHz

For OEM devices installed in vehicles, the maximum e.i.r.p. shall not exceed 30 mW or $1.76 + 10 \log_{10} B$, dBm, whichever is less. Devices shall implement TPC in order to have the capability to operate at least 3 dB below the maximum permitted e.i.r.p. of 30 mW.

Devices, other than devices installed in vehicles, shall comply with the following:

- a) The maximum conducted output power shall not exceed 250 mW or $11 + 10 \log_{10} B$, dBm, whichever is less. The power spectral density shall not exceed 11 dBm in any 1.0 MHz band;
- b) The maximum e.i.r.p. shall not exceed 1.0 W or $17 + 10 \log_{10} B$, dBm, whichever is less. B is the 99% emission bandwidth in megahertz. Note that devices with a maximum e.i.r.p. greater than 500 mW shall implement TPC in order to have the capability to operate at least 6 dB below the maximum permitted e.i.r.p. of 1 W.

Frequency bands 5470-5600 MHz and 5650-5725 MHz

The maximum conducted output power shall not exceed 250 mW or $11 + 10 \log_{10} B$, dBm, whichever is less.

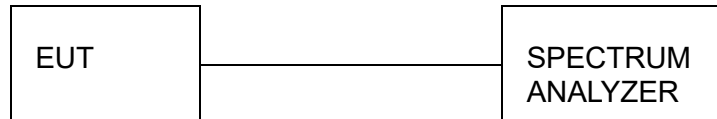
The maximum e.i.r.p. shall not exceed 1.0 W or $17 + 10 \log_{10} B$, dBm, whichever is less. B is the 99% emission bandwidth in megahertz.

Frequency band 5725-5850 MHz

The maximum conducted output power shall not exceed 1 W.

Test Procedure

Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the Spectrum Analyzer.

Test Configuration**Test Results**

Raw data reference to Annex for FCC 5G WIFI Appendix B.

3.4. Power Spectral Density

Limit

FCC requirement:

For the band 5.15-5.25 GHz.

- (i) For an outdoor access point operating in the band 5.15 - 5.25 GHz, the maximum power spectral density shall not exceed 17 dBm in any 1 MHz band. ^{note1}
- (ii) For an indoor access point operating in the band 5.15 - 5.25 GHz, the maximum power spectral density shall not exceed 17 dBm in any 1 MHz band. ^{note1}
- (iii) For fixed point-to-point access points operating in the band 5.15 - 5.25 GHz, transmitters that employ a directional antenna gain greater than 23 dBi, a 1 dB reduction in maximum power spectral density is required for each 1 dB of antenna gain in excess of 23 dBi.
- (iv) For mobile and portable client devices in the 5.15 - 5.25 GHz band, the maximum power spectral density shall not exceed 11 dBm in any 1 MHz band. ^{note1}

For the 5.25-5.35 GHz and 5.47-5.725 GHz bands

The maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band.

For the band 5.725 - 5.85 GHz

The maximum power spectral density shall not exceed 30 dBm in any 500 kHz band. ^{note1, note2}

Note1: If transmitting antennas of directional gain greater than 6 dBi are used, the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Note2: Fixed point - to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information.

IC requirement:

For the band 5.15-5.25 GHz.

The e.i.r.p. spectral density shall not exceed 10 dBm in any 1.0 MHz band.

Frequency band 5250-5350 MHz

The power spectral density shall not exceed 11 dBm in any 1.0 MHz band

Frequency bands 5470-5600 MHz and 5650-5725 MHz

The power spectral density shall not exceed 11 dBm in any 1.0 MHz band.

For the band 5.725 - 5.85 GHz

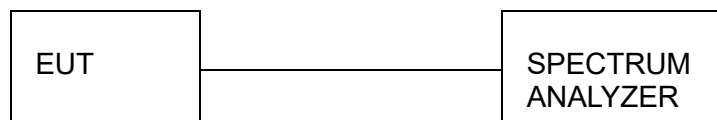
The maximum power spectral density shall not exceed 30 dBm in any 500 kHz band. ^{note1, note2}

Note1: If transmitting antennas of directional gain greater than 6 dBi are used, the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Note2: Fixed point - to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information.

Test Procedure

1. Use this procedure when the maximum peak conducted output power in the fundamental emission is used to demonstrate compliance.
2. Set the RBW = 1MHz for U-NII 1, U-NII 2A, U-NII C band and 510KHz for U-NII 3 band.
3. Set the VBW $\geq 3 \times$ RBW.
4. Set the span to encompass the entire EBW.
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Use the peak marker function to determine the maximum power level.

Test Configuration**Test Results**

Raw data reference to Annex for FCC 5G WIFI Appendix C.

3.5. Emission Bandwidth (26dBm Bandwidth)

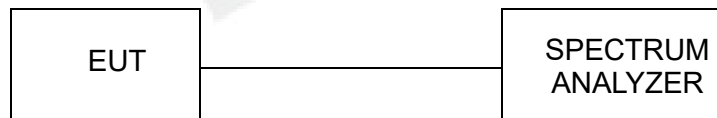
Limit

N/A

Test Procedure

1. Set resolution bandwidth (RBW) = approximately 1 % of the EBW.
2. Set the video bandwidth (VBW) > RBW.
3. Detector = Peak.
4. Trace mode = Max hold.
5. 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 %.

Test Configuration



Test Results

Raw data reference to Annex for FCC 5G WIFI Appendix A1, Appendix A2.

3.6. Minimum Emission Bandwidth (6dBm Bandwidth)

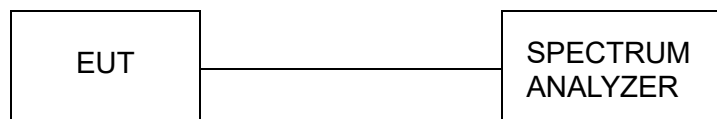
Limit

Within the 5.725-5.85 GHz band, the minimum 6 dB bandwidth of U-NII devices shall be at least 500 kHz.

Test Procedure

1. Set resolution bandwidth (RBW) = 100 kHz
2. Set the video bandwidth 3 x RBW.
3. Detector = Peak.
4. Trace mode = Max hold.
5. 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.

Test Configuration



Test Results

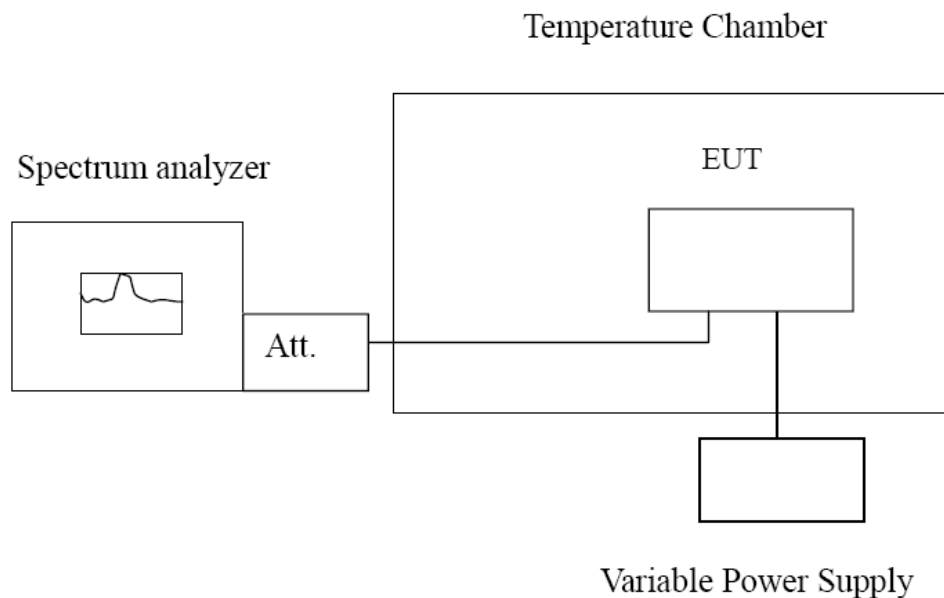
Raw data reference to Annex for FCC 5G WIFI Appendix A3.

3.7. Frequency Stability

LIMIT

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 users manual.

TEST CONFIGURATION



TEST PROCEDURE

Frequency Stability under Temperature Variations:

The equipment under test was connected to an external AC or DC power supply and input rated voltage. RF output was connected to a frequency counter or spectrum analyzer via feed through attenuators. The EUT was placed inside the temperature chamber. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and measure EUT 20°C operating frequency as reference frequency. Turn EUT off and set the chamber temperature to -30°C. After the temperature stabilized for approximately 30 minutes recorded the frequency. Repeat step measure with 10°C increased per stage until the highest temperature of +50°C reached.

Frequency Stability under Voltage Variations:

Set chamber temperature to 20°C. Use a variable AC power supply / DC power source to power the EUT and set the voltage to rated voltage. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and recorded the frequency.

Reduce the input voltage to specify extreme voltage variation ($\pm 15\%$) and endpoint, record the maximum frequency change.

TEST RESULTS

The worst data reference to Annex for FCC 5G WIFI Appendix F.

3.8. Antenna Requirement

Standard Applicable

For intentional device, according to FCC 47 CFR Section 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, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

Test Result:

The device used two FPC antenna, it is soldered on the PCB and the maximum gain is 4.56dBi with Directional gain 7.57dBi.

4. Test Setup Photos of the EUT



5. Photos of the EUT

Reference to the test report No. CTL2106235021-WF01

***** End of Report *****