Test Report

Product name	:	WIFI + Bluetooth Module
Trademark	:	SKYWORTH
Model no.	:	M2V6810X1
Series Model(s).	:	See section 2.1 for details.
FCC ID	:	2ANM3M2V6810X1
IC	:	23165-M2V6810X1
HVIN	:	M2V6810X1
Report No	:	C250109026-RF04
Test Standards	:	CFR47 FCC Part 15: Subpart E Section 15.407 CFR47 FCC Part 15: Subpart C Section 15.207 CFR47 FCC Part 15: Subpart C Section 15.209 RSS-247 Issue 3 RSS-Gen Issue 5
Applicant	:	Shenzhen Chuangwei-RGB Electronics Co., Ltd.
Address of applicant	:	13F-16F, Unit A, Skyworth Building, Shennan Road, Nanshan District, Shenzhen, Guangdong, China.
Manufacturer	:	Shenzhen Chuangwei-RGB Electronics Co., Ltd.
Manufacturer Address	:	13F-16F, Unit A, Skyworth Building, Shennan Road, Nanshan District, Shenzhen, Guangdong, China.
Date of Test Date	:	Jan 9, 2025 to Feb 21, 2025
Date of issue.	:	Apr 02, 2025
Test result	:	Compliance

Prepared By : Adil Yang/Engineer

Reviewed By : Greg Zhang/Engineer

Approved By : Tom Gan/Manager

The test results in the report only apply to the tested sample. The test report shall be invalid without all the signatures of preparer, reviewer and approver. Any objections must be raised to CSIC within 15 days since the date when the report is received. It will not be taken into consideration beyond this limit.

Revision History

Rev.	Issue Date	Revisions	Effect Page	Revised By
00	Apr.02, 2025	Initial Issue	ALL	Adil Yang

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1. TEST SUMMARY

1.1. TEST DESCRIPTION

Test procedures according to the technical standards:

Item	Clause	Result	Note
Conducted Emission on AC Mains	Part 15.207(a) RSS-GEN clause 8.8	PASS	
Radiated Spurious Emission	Part 15.407(b) Part 15.205 Part 15.209 RSS-247 clause 6.2 RSS-GEN clause 8.9 RSS-GEN clause 8.10	PASS	
Maximum Conducted Output Power	Part 15.407(a) RSS-247 clause 6.2	PASS	
Conducted Power Spectral Density	Part 15.407(a) RSS-247 clause 6.2	PASS	
6dB Bandwidth	Part 15.407(e) RSS-247 clause 6.2	PASS	
26dB Bandwidth	Part 15.407(e) RSS-Gen Clause 6.6	PASS	
99% Bandwidth	Part 15.407(a) RSS-Gen Clause 6.6	PASS	
Frequency Stability	Part 15.407(g) RSS-Gen Clause 6.11	PASS	
Dynamic Frequency Selection (DFS)	Part 15.407(h) RSS-247 clause 6.3	PASS	
Antenna Requirement	Part 15.407(b)(4) Part 15.203	PASS	

Note:
1) “N/A” denotes test is not applicable in this Test Report.
2) All tests are according to ANSI C63.10-2013.
3) The statements of test result on the above are decided by the request of test standard only; the measurement uncertainties are not factored into this compliance determination.
4) The information of measurement uncertainty is available upon the customer’s request.

1.2. TEST FACILITY

Shenzhen Central Standard International Center Co., Ltd. (CSIC)

Room 201, Building 1, Mogen Fashion Industrial Park, No. 10, Shilongzai Road, Xinshi Community, Dalang Street, Longhua District, Shenzhen.

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

CNAS	Registration No.: L11671	
FCC	Registration No.: 0031378433	Designation Number: CN1317
IC	CAB identifier: CN0051	
A2LA	Lab Cert. No.: 6426.01	

1.3. MEASUREMENT UNCERTAINTY

The estimated combined standard uncertainty for radiated emissions and conducted emissions measurements as below table.

Below is the best measurement capability for Shenzhen Central Standard International Center Co., Ltd.

Test Items	Measurement Uncertainty	Notes
RF output power, conducted	±1.04dB	(1)
Unwanted Emissions, conducted	±1.38dB	(1)
All emissions, radiated 9KHz-30MHz	±4.44dB	(1)
All emissions, radiated 30-1GHz	±4.56dB	(1)
All emissions, radiated 1G-6GHz	±4.84dB	(1)
All emissions, radiated>6G	±4.84dB	(1)
Conducted Emission (9KHz-150KHz)	±3.22dB	(1)
Conducted Emission (150KHz-30MHz)	±3.24dB	(1)

Note(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. GENERAL DESCRIPTION OF EUT

EUT(Product Specifications)	
Product Name:	WIFI + Bluetooth Module
Model No.:	M2V6810X1
Series Models:	M2V6810X1A, M2V6810X1B, M2V6810X1C
Power supply:	DC 3.3V
Hardware version:	VER00.03
Software version:	VER00.01
WIFI-5G (RF Specifications)	
Operating Frequency	5150-5350MHz, 5470-5725MHz, 5725-5850MHz
Channel number:	5180-5320MHz, 14CHs, 802.11 a/n20/n40/ac20/ac40/ac80 5500-5700MHz, 21CHs, 802.11 a/n20/n40/ac20/ac40/ac80 5745-5825MHz, 8CHs, 802.11 a/n20/n40/ac20/ac40/ac80
Channel Spacing	20MHz, 40MHz, 80MHz
Modulation	OFDM (BPSK, QPSK, 16QAM, 64QAM,256QAM)
Type of Product	Adaptive equipment and does not support non-adaptive mode: LBT based Detect and Avoid (load-based equipment)
Type of Product	Client Device without Radar Detection
TX Power Control (TPC)	Not Supported
Antenna Type	ANT1/2: PCB Antenna
Antenna Gain	ANT1/2: 5150MHz to 5350MHz: 3.79 dBi, 5470MHz to 5725MHz: 4.19 dBi, 5725MHz to 5850MHz: 3.94 dBi
Product factory information	
Name of factory 1:	n.a.
Address of factory 1:	n.a.
Remark: There are differences(MIC and LED) in the EMC performance used between different models of the product, and RF parameters are the same, these differences are component reductions and/or functionality reductions, and testing is performed on the most fully functional model.	

Note:

1. For a more detailed features description, please refer to the manufacture's specifications or the user's manual.
2. Full tests were applied to sample C250109026-Y01/01 only in this document.

2.2. DESCRIPTION OF TEST MODES AND TEST FREQUENCY

The EUT has been tested under typical operating conditions. The Applicant provides communication tools software to control the EUT for staying in continuous transmitting mode for testing.

Operation Frequency List for WIFI：

Channel List for 802.11a/n20/ac20							
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
36	**5180**	**40**	**5200**	44	5220	**48**	**5240**
52	**5260**	56	5280	**60**	**5300**	**64**	**5320**
100	**5500**	104	5520	108	5540	112	5560
116	**5580**	120	5600	124	5620	128	5640
132	5660	136	5680	**140**	**5700**	**149**	**5745**
153	5765	**157**	**5785**	159	5795	**165**	**5825**

Channel List for 802.11n40/ac40							
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
38	**5190**	**46**	**5230**	**54**	**5270**	**62**	**5310**
102	**5510**	**110**	**5550**	118	5590	126	5630
134	**5670**	**151**	**5755**	**159**	**5795**		

Channel List for 802.11ac80							
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
42	**5210**	**58**	**5290**	**106**	**5530**	**155**	**5775**
122	**5610**						

Note: The channels in bold in the table are used for testing. Per RSS-247 section 6.2.3, transmission on channels which overlap 5600-5650MHz is prohibited.

2.3. MEASUREMENT INSTRUMENTS LIST

RF Connected Test					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Calibrated until
1	Spectrum Analyzer	Agilent	N9020A	MY50200391	May. 26, 2025
2	Spectrum Analyzer	R&S	FSV40	1632339B	May. 26, 2025
3	Power sensor	KEYSIGHT	U2021XA	MY55080015	May. 26, 2025
4	Power sensor	KEYSIGHT	U2021XA	MY54250016	May. 26, 2025
5	Power sensor	KEYSIGHT	U2021XA	MY54250020	May. 26, 2025
6	Power sensor	KEYSIGHT	U2021XA	MY54210030	May. 26, 2025
7	Vector Signal Generator	Agilent	N5182A	MY50140130	May. 26, 2025
8	Signal generator	Agilent	SML03	100925	May. 26, 2025
9	Temperature Humidity Chamber	GZ-ESPEC	ER-10AGT	0005091-2	May. 26, 2025
10	EXTENDED RANGE DC POWER SUPPLY	TAKASAGO	ZX-400LA	N/A	May. 26, 2025
11	Inverter power supply	AKE	AKE-2003-P2	N/A	May. 26, 2025
12	Power sensor Box	MWRFtest	N/A	N/A	N/A
13	RF Switch Box	MWRFtest	MW100-RFCB	N/A	N/A
14	MTS 8310	MWRFtest	V：2.0.0.0		

Radiation Test equipment					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Calibrated until
1	EMI TEST RECEIVER	R&S	ESIB26	100342	May. 26, 2025
2	Spectrum Analyzer	R&S	FSV40	1632339B	May. 26, 2025
3	Amplifier	EMCO	EM330	980204	May. 26, 2025
4	Amplifier	MW	DPA8-1000-18000-1012	8220837	Mar. 06, 2025
5	Amplifier	SKET	LNPA_1840-50	SK201801801	Mar. 05, 2025
6	Loop Antenna	SCHNARZBECK	FMZB1519B	00023	Nov. 12, 2025
7	Bilog Antenna	Sunol Sciences	JB1	n.a.	Jul. 01, 2025
8	Horn Antenna	COMMW	ZAB-1-18G-50	20171109	Jul. 01, 2025
9	Horn Antenna	A-INFOMW	LB-180400-KF	J211020657	Sep. 25, 2025
10	3M Chamber	Maor	9*6*6	--	Mar. 01, 2026
11	EZ-EMC	Farad	V3.1		

Mains Terminal Disturbance Voltage Test equipment					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Calibrated until
1	EMI Test Receiver	R&S	ESRP3	101936	May. 26, 2025
2	LISN	R&S	ENV216	100002	May. 26, 2025
3	LISN	MEB	NNB 42	--	May. 26, 2025
4	Shelding Room	Maor	8*4*3	--	Mar. 01, 2025
8	EZ-EMC	Fara	V3.1		

Note:

1) The cable loss has calculated in test result which connection between each test instruments.

2.4. DESCRIPTION OF THE TEST MODES

To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.

Worst Mode	Description	Data Rate
Mode 1	TX IEEE 802.11a CH36&CH40&CH48	6 Mbps
Mode 2	TX IEEE 802.11n HT20 CH36&CH40&CH48	6.5 Mbps
Mode 3	TX IEEE 802.11ac VHT20 CH36&CH40&CH48	6.5 Mbps
Mode 4	TX IEEE 802.11a CH52&CH60&CH64	6 Mbps
Mode 5	TX IEEE 802.11n HT20 CH52&CH60&CH64	6.5 Mbps
Mode 6	TX IEEE 802.11ac VHT20 CH52&CH60&CH64	6.5 Mbps
Mode 7	TX IEEE 802.11a CH100&CH116&CH140	6 Mbps
Mode 8	TX IEEE 802.11n HT20 CH100&CH116&CH140	6.5 Mbps
Mode 9	TX IEEE 802.11ac VHT20 CH100&CH116&CH140	6.5 Mbps
Mode 10	TX IEEE 802.11a CH149&CH157&CH165	6 Mbps
Mode 11	TX IEEE 802.11n HT20 CH149&CH157&CH165	6.5 Mbps
Mode 12	TX IEEE 802.11ac VHT20 CH149&CH157&CH165	6.5 Mbps
Mode 13	TX IEEE 802.11n HT40 CH38&CH46	13.5 Mbps
Mode 14	TX IEEE 802.11ac VHT40 CH38&CH46	13.5 Mbps
Mode 15	TX IEEE 802.11n HT40 CH54&CH62	13.5 Mbps
Mode 16	TX IEEE 802.11ac VHT40 CH54&CH62	13.5 Mbps
Mode 17	TX IEEE 802.11n HT40 CH102&CH110&CH134	13.5 Mbps
Mode 18	TX IEEE 802.11ac VHT40 CH102&CH110&CH134	13.5 Mbps
Mode 19	TX IEEE 802.11n HT40 CH151&CH159	13.5 Mbps
Mode 20	TX IEEE 802.11ac VHT40 CH151&CH159	13.5 Mbps
Mode 21	TX IEEE 802.11ac VHT80 CH42	29 Mbps
Mode 22	TX IEEE 802.11ac VHT80 CH58	29 Mbps
Mode 23	TX IEEE 802.11ac VHT80 CH106&122	29 Mbps
Mode 24	TX IEEE 802.11ac VHT80 CH155	29 Mbps

Note:

1) The measurements are performed at the high, middle, low available channels.
2) All the bit rate of transmitter have been tested and found the lowest rate is found to be the worst case and recorded.
3) This test was performed with EUT in X, Y, Z position and worst case was found when EUT in X position.
4) For radiated emission above 1 GHz test, 1GHz-40GHz have been pre-tested and in this report only recorded the worst case. The remaining spurious points are all below the limit value of 20dB.

For AC Conducted Emission

Test Case	
AC Conducted Emission	Mode25: Working

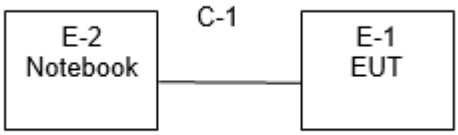
2.5. TEST SOFTWARE AND POWER LEVEL

During testing channel & power controlling software provided by the customer was used to control the operating channel as well as the output power level.

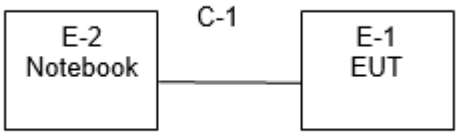
RF Function	Type	Mode Or Modulation type	Ant Gain(dBi)	Power Setting	Software For Testing
WIFI(5G)	5G WIFI	802.11a	5150MHz to 5350MHz: 3.79 dBi, 5470MHz to 5725MHz: 4.19 dBi, 5725MHz to 5850MHz: 3.94 dBi	0A	QA UI(MT7663) V 0.0.2.6
		802.11n20		14	
		802.11n40		16	
		802.11ac20		14	
		802.11ac40		16	
		802.11ac80		16	

2.6. BLOCK DIGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED

a. Radiated Spurious Emission Test



b. Conducted Emission Test



2.7. DESCRIPTION OF NECESSARY ACCESSORIES AND SUPPORT UNITS

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

Necessary accessories					
Item	Equipment	Mfr/Brand	Model/Type No.	Serial No.	Note
N/A	N/A	N/A	N/A	N/A	N/A

Support units					
Item	Equipment	Mfr/Brand	Model/Type No.	Serial No.	Note
E-2	Notebook	DELL	Vostro 3400	N/A	N/A
E-3	Router	GL iNet	GL-MT3000	N/A	N/A
E-4	LED TV	Skyworth	65Q6700H	N/A	N/A

Note:
1) The support equipment was authorized by Declaration of Confirmation.
2) For detachable type I/O cable should be specified the length in cm in『Length』column.
3) The Router FCC ID: 2AFIW-MT3000; IC ID: 23019-MT3000.

2.8. ENVIRONMENTAL CONDITIONS FOR TESTING

Test Item	Temperature (°C)	Relative Humidity (%)	Test Voltage	Tested by
Conducted Emission on AC Mains	24.2	60.0	AC 110V/60Hz	Adil Yang
Radiated Spurious Emission	24.5	53.0	DC 3.3V	Adil Yang
Conducted Spurious Emissions Measured in 100 kHz Bandwidth	22.1	58.0	DC 3.3V	Adil Yang
Conducted Power Spectral Density	22.1	58.0	DC 3.3V	Adil Yang
99% Bandwidth	22.1	58.0	DC 3.3V	Adil Yang
6dB Bandwidth	22.1	58.0	DC 3.3V	Adil Yang
Maximum Conducted Output Power	22.1	58.0	DC 3.3V	Adil Yang

3. EMC TEST

3.1. Conducted Emission on AC Mains Measurement

Limit

Operating frequency band. In case the emission fall within the restricted band specified on Part 207(a) and RSS-Gen 8.8 limit in the table below has to be followed.

FREQUENCY (MHz)	Conducted Emission limit (dBuV)	
	Quasi-peak	Average
0.15 - 0.5	66 - 56 *	56 - 46 *
0.5 - 5	56	46
5 - 30	60	50

Note:

1) The tighter limit applies at the band edges.
2) The limit of " * " marked band means the limitation decreases linearly with the logarithm of the frequency in the range.

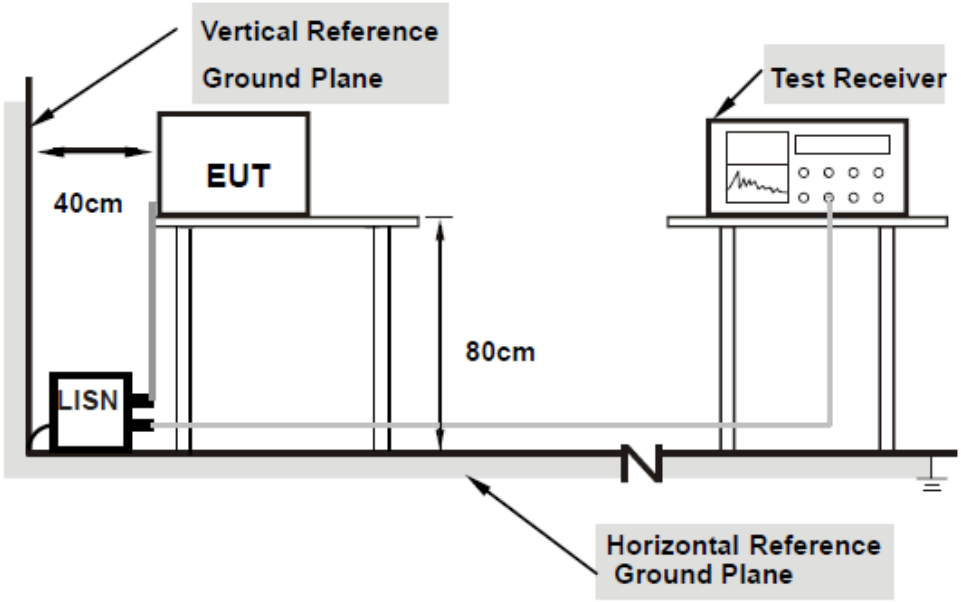
The following table is the setting of the receiver

Receiver Parameters	Setting
Attenuation	10 dB
Start Frequency	0.15 MHz
Stop Frequency	30 MHz
RBW	9 kHz

Test Procedure

a) The EUT was 0.8 meters from the horizontal ground plane and 0.4 meters from the vertical ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipment's powered from additional LISN(s). The LISN provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.
b) Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.
c) I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.
d) LISN at least 80 cm from nearest part of EUT chassis.
e) For the actual test configuration, please refer to the related Item –EUT Test Photos.

Test Setup



Note:

1) Support units were connected to second LISN.
2) Both of LISNs (AMN) are 80 cm from EUT and at least 80 from other units and other metal planes

EUT OPERATING CONDITIONS

The EUT was configured for testing in a typical fashion (as a customer would normally use it).

The EUT has been programmed to continuously transmit during test. This operating condition was tested and used to collect the included data.

Test Results

Pass

Please refer to Appendix A.

3.2. Radiated Spurious Emission Measurement

Limit

In any 100 kHz bandwidth outside the operating frequency band. In case the emission fall within the Restricted band specified on Part15.205 (a)&209(a) and RSS-247 3.3 limit in the table and according to ANSI C63.10-2013 and RSS-Gen below has to be followed.

LIMITS OF RADIATED EMISSION MEASUREMENT (0.009MHz - 1000MHz)

For FCC:

Frequencies (MHz)	Field Strength (micorvolts/meter)	Measurement Distance (meters)
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 IC:

Frequencies (MHz)	Field Strength (micorvolts/meter)	Measurement Distance (meters)
0.009~0.490	6.37/F(KHz)	300
0.490~1.705	63.7/F(KHz)	30
1.705~30.0	0.08	30
30~88	100	3
88~216	150	3
216~960	200	3
Above 960	500	3

LIMITS OF RADIATED EMISSION MEASUREMENT (1GHz-25 GHz)

FREQUENCY (MHz)	(dBuV/m) (at 3M)	
	PEAK	AVERAGE
Above 1000	74	54

Notes:

1) The limit for radiated test was performed according to FCC PART 15C.
2) The tighter limit applies at the band edges.
3) Emission level (dBuV/m)=20log Emission level (uV/m).

LIMITS OF RESTRICTED FREQUENCY BANDS

For FCC:

FREQUENCY (MHz)	FREQUENCY (MHz)	FREQUENCY (MHz)	FREQUENCY (GHz)
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	Above 38.6
13.36-13.41			

For IC:

FREQUENCY (MHz)	FREQUENCY (MHz)	FREQUENCY (MHz)	FREQUENCY (GHz)
0.090-0.110	13.36-13.41	960-1427	9.0-9.2
0.495-0.505	16.42-16.423	1435-1626.5	9.3-9.5
2.1735-2.1905	16.69475-16.69525	1645.5-1646.5	10.6-12.7
3.020-3.026	16.80425-16.80475	1660-1710	13.25-13.4
4.125-4.128	25.5-25.67	1718.8-1722.2	14.47-14.5
4.17725-4.17775	37.5-38.25	2200-2300	15.35-16.2
4.20725-4.20775	73-74.6	2310-2390	17.7-21.4
5.677-5.683	74.8-75.2	2483.5-2500	22.01-23.12
6.215-6.218	108-138	2655-2900	23.6-24.0
6.26775-6.26825	149.9-150.05	3260-3267	31.2-31.8
6.31175-6.31225	156.52475-156.52525	3332-3339	36.43-36.5
8.291-8.294	156.7-156.9	3345.8-3358	Above 38.6
8.362-8.366	162.0125-167.17	3500-4400	--
8.37625-8.38675	167.72-173.2	4500-5150	--
8.41425-8.41475	240-285	5350-5460	--
12.29-12.293	322-335.4	7250-7750	--
12.51975-12.52025	399.9-410	8025-8500	--
12.57675-12.57725	608-614	--	--

For Radiated Emission	
Spectrum Parameter	Setting
Attenuation	Auto
Detector	Peak/QP/AVG
Start Frequency	9 KHz/150KHz(Peak/QP/AVG)
Stop Frequency	150KHz/30MHz(Peak/QP/AVG)
RB / VB (emission in restricted band)	200Hz (From 9kHz to 0.15MHz)/
	9KHz (From 0.15MHz to 30MHz);
	200Hz (From 9kHz to 0.15MHz)/
	9KHz (From 0.15MHz to 30MHz)
Attenuation	Auto
Detector	Peak/QP
Start Frequency	30 MHz(Peak/QP)
Stop Frequency	1000 MHz (Peak/QP)
RB / VB (emission in restricted band)	120 KHz / 300 KHz
Attenuation	Auto
Detector	Peak/AVG
Start Frequency	1000 MHz(Peak/AVG)
Stop Frequency	10th carrier hamonic(Peak/AVG)
RB / VB (emission in restricted band)	1 MHz / 3 MHz(Peak)
	1 MHz/1/T MHz(AVG)
For Restricted band	
Spectrum Parameter	Setting
Detector	Peak/AVG
Start/Stop Frequency	Lower Band Edge: 2310 to 2410 MHz
	Upper Band Edge: 2476 to 2500 MHz
RB / VB	1 MHz / 3 MHz(Peak)
	1 MHz/1/T MHz(AVG)
Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~90kHz / RB 200Hz for Peak & AVG
Start ~ Stop Frequency	90kHz~110kHz / RB 200Hz for QP
Start ~ Stop Frequency	110kHz~490kHz / RB 200Hz for Peak & AVG
Start ~ Stop Frequency	490kHz~30MHz / RB 9kHz for QP
Start ~ Stop Frequency	30MHz~1000MHz / RB 120kHz for QP

Test Procedure

a) The measuring distance of at 3 m shall be used for measurements at frequency 0.009MHz up to 1GHz,and above 1GHz.
b) The EUT was placed on the top of a rotating table 0.8 meters (above 1GHz is 1.5 m) above the ground at a 3 meter anechoic chamber test site. The table was rotated 360 degrees to determine the position of the highest radiation.
c) The height of the equipment shall be 0.8 m(above 1GHz is 1.5 m); the height of the test antenna shall vary between 1 m to 4 m. horizontal and vertical polarizations of the antenna are set to make the measurement.
d) The initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then QuasiPeak detector mode re-measured.
e) If the Peak Mode measured value compliance with and lower than Quasi Peak Mode Limit, the EUT shall be deemed to meet QP Limits and then no additional QP Mode measurement performed.
f) For the actual test configuration, please refer to the related Item –EUT Test Photos.

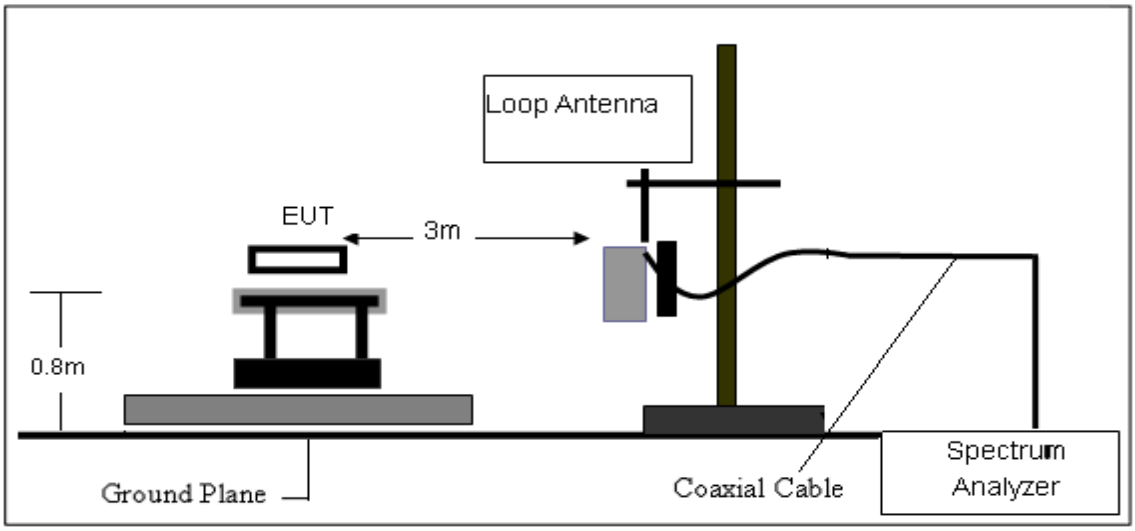
Note:
Both horizontal and vertical antenna polarities were tested and performed pretest to three orthogonal axis. The worst case emissions were reported.

DEVIATION FROM TEST STANDARD

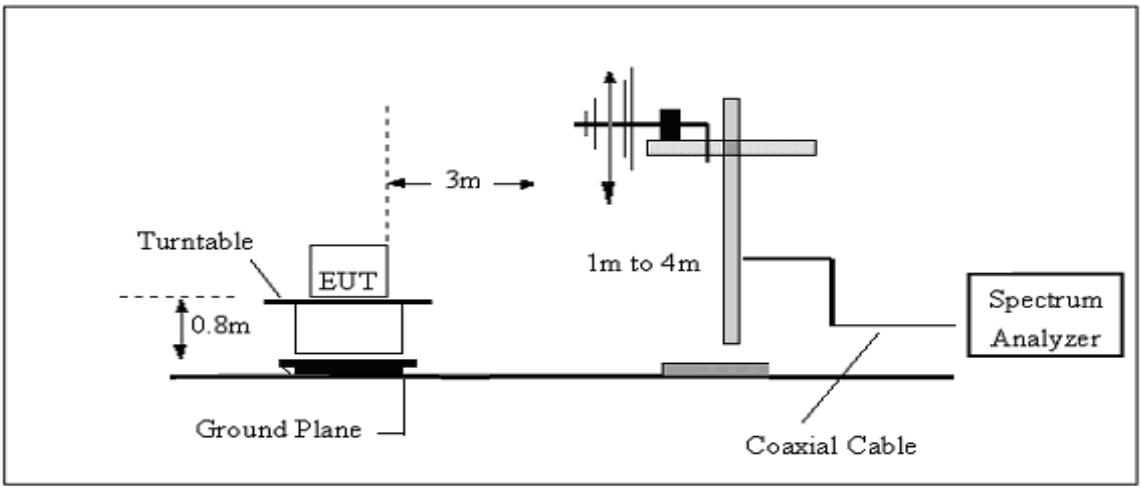
No deviation.

Test Setup

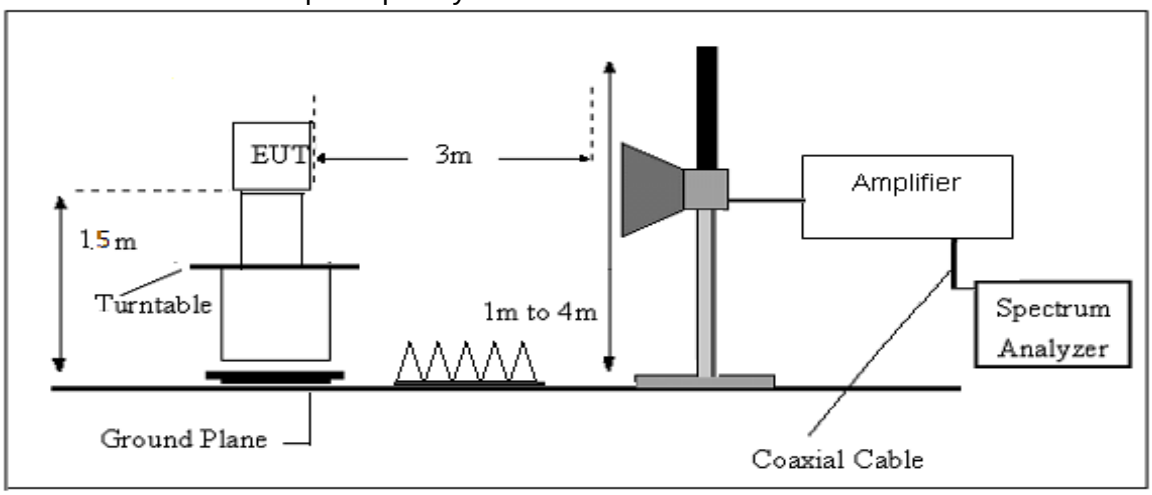
1. Radiated Emission Test-Up Frequency Below 30MHz



2. Radiated Emission Test-Up Frequency Below1GHz



3. Radiated Emission Test-Up Frequency Above 1GHz



EUT OPERATING CONDITIONS

The EUT tested system was configured as the statements of 2.5 Unless otherwise a special operating condition is specified in the follows during the testing.

Test Result

Pass

Please refer to Appendix A.

3.3. Maximum Conducted Output Power Measurement

Limit

Type	Test Item	Frequency [MHz]	Limit
FCC	Conducted Output Power	5150-5250	⩽ 250mW (24dBm)
		5250-5350 5470-5725	⩽ 250mW(24dBm) or 11dBm+10logB, where B is the 26 dB emission bandwidth in MHz, where is lesser.
		5725-5850	⩽1W (30dBm)
IC	E.I.R.P	5150-5250	⩽200mW (23dBm) or 10 dBm + 10 logB, where B is the 99% emission bandwidth in MHz, where is lesser.
		5250-5350	⩽1W (30dBm) or 17 + 10 log10B, dBm, whichever is less. B is the 99% emission bandwidth in megahertz.
		5470-5600	
		5650-5725	
	Conducted Output Power	5725-5850	⩽1W (30dBm)

Test Procedure

The EUT was directly connected to the Power Sensor & PC.
Some regulatory agencies permit the maximum conducted (average) output power to be measured as an alternative to the maximum peak conducted output power for determining compliance to the limit. When this option is exercised, the measured power is to be referenced to the OBW rather than to the DTS bandwidth (see 11.2 for definitions and 6.9.2 for measurement guidance).
When using a spectrum analyzer or EMI receiver to perform these measurements, it shall be capable of utilizing a number of measurement points in each sweep that is greater than or equal to twice the span / RBW, to set a bin-to-bin spacing of ≤ RBW / 2 so that narrowband signals are not lost between frequency bins. If possible, configure or modify the operation of the EUT so that it transmits continuously at its maximum power control level (see 11.6).
The intent is to test at 100% duty cycle; however, a small reduction in duty cycle (to no lower than 98%) is permitted, if required by the EUT for amplitude control purposes. Manufacturers are expected to provide software to the test laboratory to permit such continuous operation.
If continuous transmission (or at least 98% duty cycle) cannot be achieved because of hardware limitations (e.g., overheating), the EUT shall be operated at its maximum power control level, with the transmit duration as long as possible, and the duty cycle as high as possible during which sweep triggering/signal gating techniques may be used to perform the measurement over the transmission duration.

Measurement using a power meter (PM)：

1. Method AVGPM：

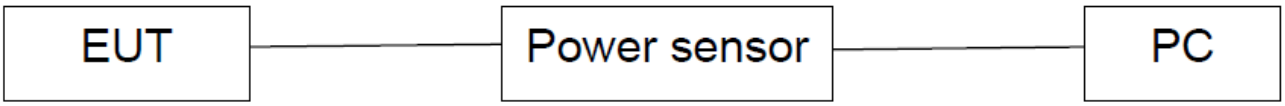
Method AVGPM is a measurement using an RF average power meter, as follows:
a) As an alternative to spectrum analyzer or EMI receiver measurements, measurements may be performed using a wideband RF power meter with a thermocouple detector or equivalent if all of the conditions listed below are satisfied:
1) The EUT is configured to transmit continuously, or to transmit with a constant duty cycle.
2) At all times when the EUT is transmitting, it shall be transmitting at its maximum power control level.
3) The integration period of the power meter exceeds the repetition period of the transmitted signal by at least a factor of five.
b) If the transmitter does not transmit continuously, measure the duty cycle, D, of the transmitter

output signal as described in 11.6.
c) Measure the average power of the transmitter. This measurement is an average over both the ON
and OFF periods of the transmitter.
d) Adjust the measurement in dBm by adding [10 log (1 / D)], where D is the duty cycle.

2. Method AVGPM-G：

Method AVGPM-G is a measurement using a gated RF average power meter.
Alternatively, measurements may be performed using a wideband gated RF power meter provided that the gate parameters are adjusted such that the power is measured only when the EUT is transmitting at its maximum power control level. Because the measurement is made only during the ON time of the transmitter, no duty cycle correction factor is required.

Test Configuration



EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.

Test Results

Pass
Please refer to Appendix A.

3.4. Conducted Power Spectral Density Measurement

Limits

Type	Frequency [MHz]	Limit
FCC	5150-5250 5250-5350 5470-5725	≤11dBm/MHz
	5725-5850	≤30dBm/500KHz
IC	5150-5250	≤10dBm/MHz
	5250-5350	≤11dBm/MHz
	5470-5600	
	5650-5725	
	5725-5850	≤30dBm/500KHz

Test Procedure

1. The setting follows Method SA-1 of FCC KDB 789033 D02 General U-NII Test Procedures New Rules v02r01.
For devices operating in the band, the rules specify a measurement bandwidth of 500 kHz. Many spectrum analyzers do not have 500 kHz RBW, thus a narrower RBW may need to be used. The rules permit the use of a RBWs less than 1 MHz, or 500 kHz, “provided that the measured power is integrated over the full reference bandwidth” to show the total power over the specified measurement bandwidth (i.e., 1 MHz, or 500 kHz). If measurements are performed using a reduced resolution bandwidth (< 1 MHz, or < 500 kHz) and integrated over 1 MHz, or 500 KHz bandwidth, the following adjustments to the procedures apply:
a) Set RBW ⩾ 1/T, where T is defined in section II.B.I.a).
b) Set VBW ⩾ 3 RBW.
c) If measurement bandwidth of Maximum PSD is specified in 500 kHz, add 10 log (500kHz/RBW) to the measured result, whereas RBW (< 500 kHz) is the reduced resolution bandwidth of the spectrum analyzer set during measurement.
d) If measurement bandwidth of Maximum PSD is specified in 1 MHz, add 10 log (1MHz/RBW) to the measured result, whereas RBW (< 1 MHz) is the reduced resolution bandwidth of spectrum analyzer set during measurement.
e) Care must be taken to ensure that the measurements are performed during a period of continuous transmission or are corrected upward for duty cycle.
Note: As a practical matter, it is recommended to use reduced RBW of 100 kHz for the sections5.c) and 5.d) above, since RBW=100 KHZ is available on nearly all spectrum analyzers.

TEST SETUP

EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 2.5 Unless otherwise a special operating condition is specified in the follows during the testing.

Test Results

Pass
Please refer to Appendix A.

3.5. 6dB BANDWIDTH Measurement

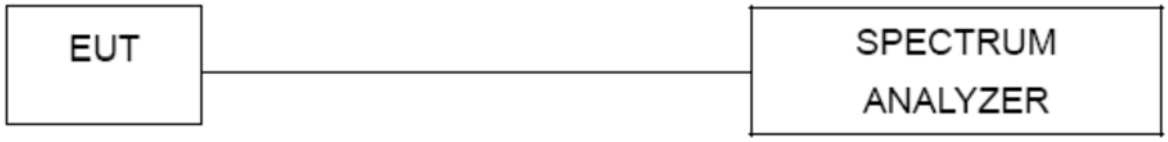
Limits

Frequency Range (MHz)		Limit
FCC	5725-5850	>500KHz
IC	5725-5850	>500KHz

Test Procedure

1. The testing follows FCC KDB 789033 D02 General UNII Test Procedures v02r01.
a) Set RBW = 100 kHz.
b) Set the video bandwidth (VBW) ⩾ 3 × RBW.
c) Detector = Peak.
d) Trace mode = max hold.
e) Sweep = auto couple.
f) Allow the trace to stabilize.
g) Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

TEST SETUP



EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.

Test Results

Pass
Please refer to Appendix A.

3.6. 26dB BANDWIDTH Measurement

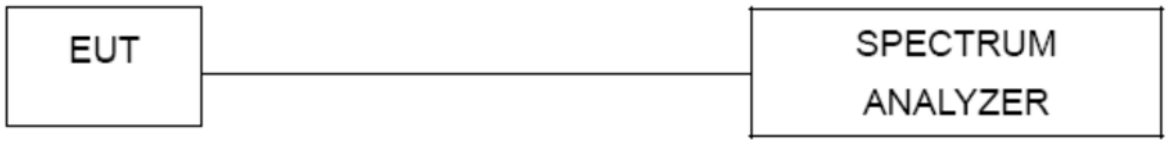
Limits

Frequency Range (MHz)		Limit
FCC	5150-5250	/
	5250-5350	/
	5470-5725	/

Test Procedure

1. The testing follows FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01.
2. Set RBW = approximately 1% of the emission bandwidth.
3. Set the VBW > =RBW.
4. Detector = Peak.
5. Trace mode = max hold.
6. 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 SETUP



EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.

Test Results

Pass
Please refer to Appendix A.

3.7. 99% BANDWIDTH Measurement

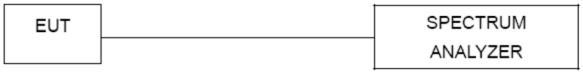
Limits

Frequency Range (MHz)		Limit
IC	5150-5250	/
	5250-5350	/
	5470-5600	/
	5650-5725	/

Test Procedure

The testing follows FCC KDB 789033 D02 General UNII Test Procedures v02r01.
The following procedure shall be used for measuring (99 %) power bandwidth:
1. Set center frequency to the nominal EUT channel center frequency.
2. Set span = 1.5 times to 5.0 times the OBW.
3. Set RBW = 1 % to 5 % of the OBW
4. Set VBW ⩾ 3 · RBW
5. Video averaging is not permitted. Where practical, a sample detection and single sweep mode shall be used. Otherwise, peak detection and max hold mode (until the trace stabilizes) shall be used.
6. Use the 99 % power bandwidth function of the instrument (if available).
7. If the instrument does not have a 99 % power bandwidth function, the trace data points are recovered and directly summed in power units. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5 % of the total is reached; that frequency is recorded as the lower frequency. The process is repeated until 99.5 % of the total is reached; that frequency is recorded as the upper frequency. The 99% occupied bandwidth is the difference between these two frequencies.

TEST SETUP



EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.

Test Results

Pass
Please refer to Appendix A.

3.8. Frequency Stability Measurement

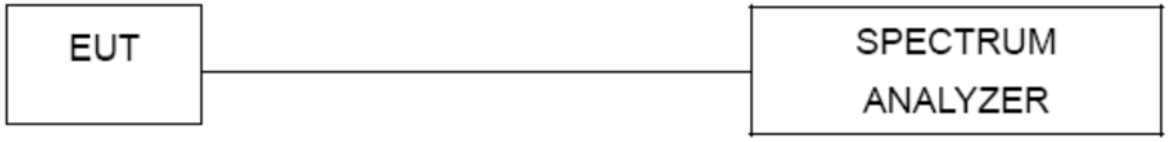
Limits

Frequency Range (MHz)		Limit
FCC	5150-5250	25ppm
	5250-5350	25ppm
	5470-5725	25ppm
	5725-5850	25ppm

Test Procedure

(1) To ensure emission at the band edge is maintained within the authorized band, those values shall be measured by radiation emissions at upper and lower frequency points, and finally compensated by frequency deviation as procedures below.
(2) The EUT was operated at the maximum output power, and connected to the spectrum analyzer, which is set to maximum hold function and peak detector. The peak value of the power envelope was measured and noted. The upper and lower frequency points were respectively measured relatively 10 dB lower than the measured peak value.
(3) The frequency deviation was calculated by adding the upper frequency point and the lower frequency point divided by two. Those detailed values of frequency deviation are provided in table below.

TEST SETUP



EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.

Test Results

Pass
Please refer to Appendix A.

3.9. Dynamic Frequency Selection (DFS) Measurement

Applicability of DFS requirements

Applicability of DFS Requirements Prior to Use of a Channel

Requirement	Operational Mode		
	☐Master	☒Client Without Radar Detection	☐Client with Radar Detection
Non-Occupancy Period	Yes	Not required	Yes
DFS Detection Threshold	Yes	Not required	Yes
Channel Availability Check Time	Yes	Not required	Not required
U-NII Detection Bandwidth	Yes	Not required	Yes

Applicability of DFS requirements during normal operation

Requirement	Operational Mode	
	☐Master Device or Client with Radar Detection	☒Client Without Radar Detection
DFS Detection Threshold	Yes	Not required
Channel Closing Transmission Time	Yes	Yes
Channel Move Time	Yes	Yes
U-NII Detection Bandwidth	Yes	Not required

Additional requirements for devices with multiple bandwidth modes	☐Master Device or Client with Radar Detection	☒Client Without Radar Detection
U-NII Detection Bandwidth and Statistical Performance Check	All BW modes must be tested	Not required
Channel Move Time and Channel Closing Transmission Time	Test using widest BW mode available	Test using the widest BW Mode available for the link
All other tests	Any single BW mode	Not required
Note: Frequencies selected for statistical performance check should include several frequencies within the radar detection bandwidth and frequencies near the edge of the radar detection bandwidth. For 802.11 devices it is suggested to select frequencies in each of the bonded 20MHz channels and the channel center frequency.		

Limit

DFS Detection Thresholds for Master Devices and Client Devices with Radar Detection

Maximum Transmit Power	Value (See Notes 1, 2, and 3)
EIRP ⩾ 200 milliwatt	-64 dBm
EIRP < 200 milliwatt and power spectral density < 10 dBm/MHz	-62 dBm
EIRP < 200 milliwatt that do not meet the power spectral density requirement	-64 dBm
Note 1: This is the level at the input of the receiver assuming a 0 dBi receive antenna. Note 2: Throughout these test procedures an additional 1 dB has been added to the amplitude of the test transmission waveforms to account for variations in measurement equipment. This will ensure that the test signal is at or above the detection threshold level to trigger a DFS response. Note3: EIRP is based on the highest antenna gain. For MIMO devices refer to KDB Publication 662911 D01.	

DFS Response Requirement Values

Parameter	Value
Non-occupancy period	Minimum 30 minutes
Channel Availability Check Time	60 seconds
Channel Move Time	10 seconds See Note 1.
Channel Closing Transmission Time	200 milliseconds + an aggregate of 60 milliseconds over remaining 10 second period. See Notes 1 and 2.
U-NII Detection Bandwidth	Minimum 100% of the U-NII 99% transmission power bandwidth. See Note 3.

Note 1: Channel Move Time and the Channel Closing Transmission Time should be performed with Radar Type 0. The measurement timing begins at the end of the Radar Type 0 burst.
Note 2: The Channel Closing Transmission Time is comprised of 200 milliseconds starting at the beginning of the Channel Move Time plus any additional intermittent control signals required facilitating a Channel move (an aggregate of 60 milliseconds) during the remainder of the 10 second period. The aggregate duration of control signals will not count quiet periods in between transmissions.
Note 3: During the U-NII Detection Bandwidth detection test, radar type 0 should be used. For each frequency step the minimum percentage of detection is 90 percent. Measurements are performed with no data traffic.

Parameters of radar test waveforms

This section provides the parameters for required test waveforms, minimum percentage of successful detections, and the minimum number of trials that must be used for determining DFS conformance. Step intervals of 0.1 microsecond for Pulse Width, 1 microsecond for PRI, 1 MHz for chirp width and 1 for the number of pulses will be utilized for the random determination of specific test waveforms.

Short Pulse Radar Test Waveforms

Radar Type	Pulse Width (μsec)	PRI (μsec)	Number of Pulses	Minimum Percentage of Successful Detection	Minimum Number of Trials
0	1	1428	18	See Note 1	See Note 1
1	1	Test A: 15 unique PRI values randomly selected from the list of 23 PRI values in Table 5a	$\text{Roundup}\left\{\left(\frac{1}{360}\right)\cdot\left(\frac{19\cdot 10^6}{\text{PRI}_{\mu\text{sec}}}\right)\right\}$	60%	30
		Test B: 15 unique PRI values randomly selected within the range of 518-3066 μsec, with a minimum increment of 1 μsec, excluding PRI values selected in Test A			
2	1-5	150-230	23-29	60%	30
3	6-10	200-500	16-18	60%	30
4	11-20	200-500	12-16	60%	30
Aggregate (Radar Types 1-4)				80%	120

Note 1: Short Pulse Radar Type 0 should be used for the detection bandwidth test, channel move time, and channel closing time tests.

A minimum of 30 unique waveforms are required for each of the Short Pulse Radar Types 2 through 4. If more than 30 waveforms are used for Short Pulse Radar Types 2 through 4, then each

additional
waveform must also be unique and not repeated from the previous waveforms. If more than 30 waveforms are used for Short Pulse Radar Type 1, then each additional waveform is generated with Test
B and must also be unique and not repeated from the previous waveforms in Tests A or B.

Calibration of radar waveform

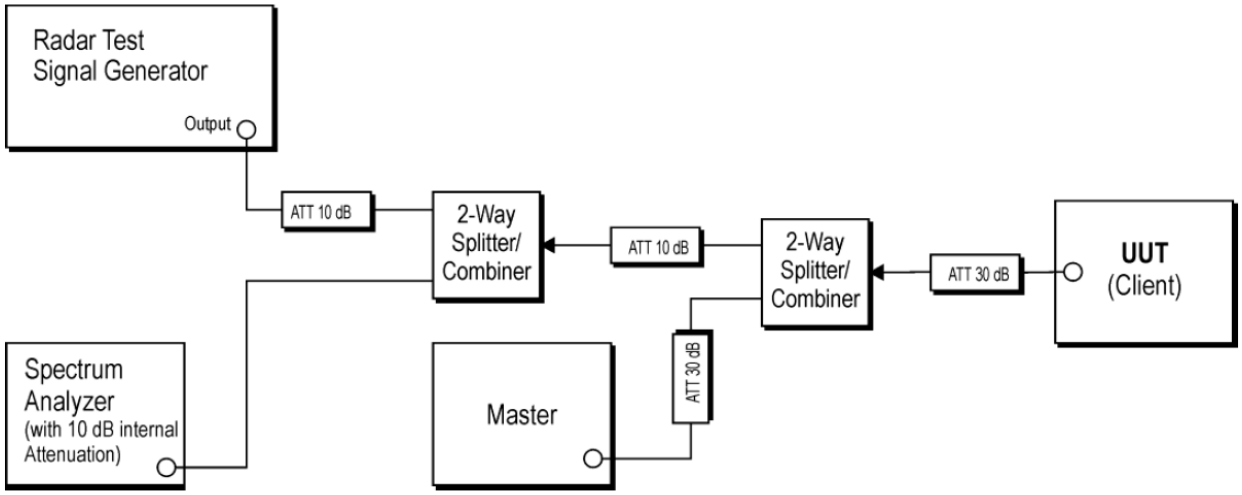
Radar Waveform Calibration Procedure:
(1) A 50 ohm load is connected in place of the spectrum analyzer, and the spectrum analyzer is connected to place of the master
(2) The interference Radar Detection Threshold Level is -62dBm + 0dBi +1dB = -61dBm that had been taken into account the output power range and antenna gain.
(3) The following equipment setup was used to calibrate the conducted radar waveform. A vector signal generator was utilized to establish the test signal level for radar type 0. During this process there were no transmissions by either the master or client device. The spectrum analyzer was switched to the zero spans (time domain) at the frequency of the radar waveform generator. Peak detection was used. The spectrum analyzer resolution bandwidth (RBW) and video bandwidth (VBW) were set to 3 MHz. The spectrum analyzer had offset -1.0dB to compensate RF cable loss 1.0dB.
(4) The vector signal generator amplitude was set so that the power level measured at the spectrum analyzer was - -62dBm + 0dBi +1dB = -61dBm. Capture the spectrum analyzer plots on short pulse radar waveform.
Conducted Calibration Setup:

Channel closing transmission time, channel move time and non-occupancy period

Block diagram of test setup Test Procedure:
(1) The radar pulse generator is setup to provide a pulse at frequency that the master and client are operating. A type 0 radar pulse with a 1us pulse width and a 1428us PRI is used for the testing.
(2) The vector signal generator is adjusted to provide the radar burst (18 pulses) at the level of approximately -61dBm at the antenna port of the master device.
(3) A trigger is provided from the pulse generator to the DFS monitoring system in order to capture the traffic and the occurrence of the radar pulse.
(4) EUT will associate with the master at channel. The file “iperf.exe” specified by the FCC is streamed from the PC 2 through the master and the client device to the PC 1 and played in full motion video using Test Software in order to properly load the network for the entire period of the test.
(5) When radar burst with a level equal to the DFS Detection Threshold +1dB is generated on the operating channel of the U-NII device. At time T0 the radar waveform generator sends a burst of pulse of the radar waveform at Detection Threshold +1dB.
(6) Observe the transmissions of the EUT at the end of the radar Burst on the Operating Channel. Measure and record the transmissions from the UUT during the observation time (Channel Move Time). One 15 seconds plot is reported for the Short Pulse Radar Type 0. The plot for the Short Pulse Radar Types start at the end of the radar burst. The Channel Move Time will be calculated based on the zoom in 600ms plot of the Short Pulse Radar Type.
(7) Measurement of the aggregate duration of the Channel Closed Transmission Time method. With the
(8) spectrum analyzer set to zero span tuned to the center frequency of the EUT operating channel at the radar simulated frequency, peak detection, and max hold, the dwell time per bin is given by: Dwell (0.3ms) =S (12000ms) / B (4000); where Dwell is the dwell time per spectrum analyzer sampling bin, S is sweep time and B is the number of spectrum analyzer sampling bins. An upper bound of the aggregate duration of the intermittent control signals of Channel Closing Transmission Time is calculated by: C (ms)= N X Dwell (0.3ms); where C is the Closing Time, N is the number of spectrum analyzer sampling bins (intermittent control

signals) showing a U-NII transmission and Dwell is the dwell time per bin.
(9) Measurement the EUT for more than 30 minutes following the channel move time to verify that no transmission or beacons occur on this channel.

Test setup



Test result

Pass
Please refer to Appendix A.

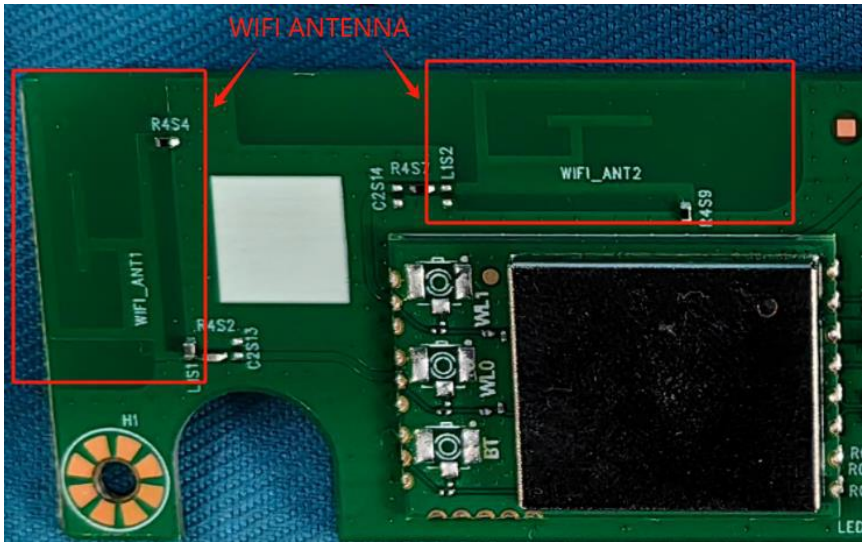
3.10. ANTENNA REQUIREMENT

STANDARD REQUIREMENT

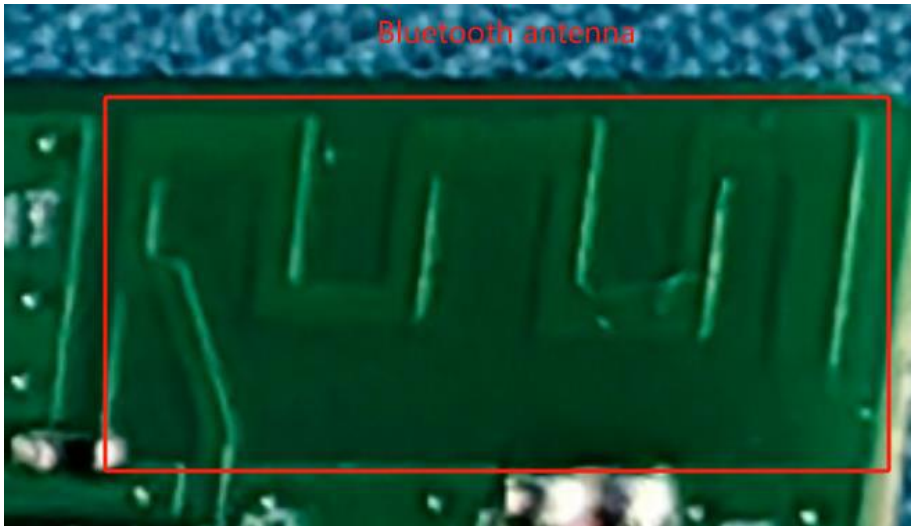
According to the manufacturer declared, the EUT has PCB antenna, the directional gain of antenna is 5150MHz to 5350MHz: 3.79 dBi, 5470MHz to 5725MHz: 4.19 dBi, 5725MHz to 5850MHz: 3.94 dBi (ANT1&2)., and the antenna and other components are all on the same PCB and cannot be replaced. Therefore, the EUT is considered sufficient to comply with the provision.

EUT ANTENNA

The wi-fi antenna is PCB antenna. It complies with the standard requirement.



The Bluetooth antenna is PCB antenna. It complies with the standard requirement.



4. TEST PHOTOS

Please refer to Appendix D Test Setup.

5. EUT PHOTOS

External Photos Please refer to Appendix B and Internal Photos Please refer to Appendix C.

**************************THE END**************************