



Test Report No.:
FCC2024-0023-RF1

TEST REPORT

FCC ID	:	2BG7U-7912120X9D01
Applicant	:	Xiamen Yaxon Zhilian Technology Co.,Ltd.
Product Name	:	Intelligent Cockpit Domain Controller
Model No.	:	IMP-202M-FD

CVC Testing Technology Co., Ltd.




Applicant		Name: Xiamen Yaxon Zhilian Technology Co.,Ltd. Address: 303-E, District C, Innovation Building, Software Park, Torch High-tech Zone, Xiamen, Fujian, China	
Manufacturer		Name: Xiamen Yaxon Zhilian Technology Co.,Ltd. Address: 303-E, District C, Innovation Building, Software Park, Torch High-tech Zone, Xiamen, Fujian, China	
Equipment Under Test		Product Name : Intelligent Cockpit Domain Controller Model No. : IMP-202M-FD Trade mark : N/A Serial no. : N/A Sampling : 1-1	
Date of Receipt.	2024.5.22	Date of Testing	2024.7.20
Test Specification		Test Result	
FCC CFR47 Part 15C Radio Frequency Devices ANSI C63.10-2020/Cor1-2023 KDB 558074 D01 15.247 Meas Guidance v05r02 KDB 662911 D01 Multiple Transmitter Output v02r01		PASS	
Evaluation of Test Result		The equipment under test was found to comply with the requirements of the standards applied. Seal of CVC Issue Date: 2024-8-26	
Approved by: Chen Huawen 		Reviewed by: Xu Zhenfei 	Tested by: Lu Weiji 
Other Aspects: NONE.			
Abbreviations:OK, Pass= passed Fail = failed N/A= not applicable EUT= equipment, sample(s) under tested			
Note: This test report relates only to the EUT, and shall not be reproduced except in full, without written approval of CVC .			

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1. General Product Information

1.1 General information

Product Name	Intelligent Cockpit Domain Controller
Model No.	IMP-202M-FD
Additional model	/
Power Supply	DC 27.5V
Serial Number(SN)	/
Hardware	IMP-202M-FD-WD
Software	MPU: c0055-mt-701-wh11 MCU: WD_E3
specific power settings	Bluetooth(LE_1M, LE_2M): Default IEEE 802.11b: 17 IEEE 802.11g: 16 IEEE 802.11n(20MHz): 14.5 IEEE 802.11n(40MHz): 14.5
Antenna Type	Internal antenna
Antenna Gain	WIFI: Ant1:3.21 dBi, Ant2:3.21 dBi (provided by client) Bluetooth: 3.21 dBi (provided by client)
Beamforming gain	Unsupported (provided by client)
Frequency Range	Bluetooth(LE_1M, LE_2M): 2402~2480MHz IEEE 802.11b/g/n(20MHz): 2412~2462MHz IEEE 802.11n(40MHz): 2422~2452MHz
Channel Number	Bluetooth(LE_1M, LE_2M):40 Channels IEEE 802.11b/g/n (20MHz): 11 Channels IEEE 802.11n(40MHz): 7 Channels
Type of Modulation	Bluetooth(LE_1M, LE_2M):GFSK IEEE 802.11b: DSSS (CCK,DQPSK,DBPSK); IEEE 802.11g: OFDM (64QAM, 16QAM, QPSK, BPSK); IEEE 802.11n(HT20 and HT40) : OFDM (64QAM, 16QAM,QPSK,BPSK)
Max. Conducted Power	Bluetooth(LE): 1.88 dBm WIFI2.4G: 22.42dBm
Operate Temp.Range	-35~80°C

Note:

1. The information of the EUT is declared by the manufacturer.
2. The laboratory is not responsible for the product technical specification provided by the client.

2. Test Sites

2.1 Test Facilities

The tests and measurements refer to this report were performed by RF testing Lab. of CVC Testing Technology Co., Ltd.

Add.: No.3, Tiantaiyi Road, Kaitai Avenue, Science City, Guangzhou,Guangdong,510663, People's Republic of China

Telephone : +86-20-32293888

Fax : +86-20-32293889

FCC(Test firm designation number: CN1282)

2.2 Description of Non-standard Method and Deviations

The testing and measurement methods used in this report are applied by all standard methods. Not any non-standard method or deviation from the used standards was used.

2.3 List of Test and Measurement Instruments

Refer to **Appendix X**.

3. Test Configuration

3.1 Test Mode

The EUT has been associated with peripherals and configuration operated in a manner tended to maximize its emission characteristics in a typical application.

Test Mode	Antenna Delivery	Test Channel
Bluetooth(LE_1M)	1TX / 1RX	0,19,39
Bluetooth(LE_2M)	1TX / 1RX	0,19,39
IEEE 802.11b	1TX / 1RX	1,6,11
IEEE 802.11g	1TX / 1RX	1,6,11
IEEE 802.11n 20 MIMO	2TX / 2RX	1,6,11
IEEE 802.11n 40 MIMO	2TX / 2RX	3,6,9

The radiated emission was measured in the following position: EUT stand-up position (Z axis), lie-down position (X, Y axis). The worst emission was found in lie-down position (X axis) and the worst case was recorded.

In order to find the worst case condition, Pre-tests are needed at the presence of different data rate and different channels. Preliminary tests have been done on all the configurations for confirming worst case. Data rate below means worst-case rate of each test item.

Worst-case data rates and channels are shown as following table.

Test Mode	Data Rate		
	Antenna 1	Antenna 2	MIMO
Bluetooth(LE_1M)	1	/	/
Bluetooth(LE_2M)	2	/	/
IEEE 802.11b	1	1	/
IEEE 802.11g	6	6	/
IEEE 802.11n 2.4GHz 20MHz	MCS 0	MCS 0	MCS 8
IEEE 802.11n 2.4GHz 40MHz	MCS 0	MCS 0	MCS 8

Test Items	Test Antennas	Test Modes	Test Channels
Radiated Emissions	Antenna 1, Antenna 2	IEEE 802.11n 20 Bluetooth(LE_2M)	1/ 0
Radiated Emissions (Band Edge)	Antenna 1, Antenna 2	IEEE 802.11n 20 Bluetooth(LE_2M)	1,11/ 0,39
Maximum conducted output power	Antenna 1, Antenna 2	Bluetooth(LE_1M)/ Bluetooth(LE_2M)/ IEEE 802.11b/ IEEE 802.11g/ IEEE 802.11n 20/ IEEE 802.11n 40	0,19,39/ 0,19,39/ 1,6,11/ 1,6,11/ 1,6,11/ 3,6,9
Minimum 6 dB bandwidth	Antenna 1, Antenna 2	Bluetooth(LE_1M)/ Bluetooth(LE_2M)/ IEEE 802.11b/ IEEE 802.11g/ IEEE 802.11n 20/ IEEE 802.11n 40	0,19,39/ 0,19,39/ 1,6,11/ 1,6,11/ 1,6,11/ 3,6,9
Occupied Channel Bandwidth	Antenna 1, Antenna 2	Bluetooth(LE_1M)/ Bluetooth(LE_2M)/ IEEE 802.11b/ IEEE 802.11g/ IEEE 802.11n 20/ IEEE 802.11n 40	0,19,39/ 0,19,39/ 1,6,11/ 1,6,11/ 1,6,11/ 3,6,9
Band Edge Measurement	Antenna 1, Antenna 2	Bluetooth(LE_1M)/ Bluetooth(LE_2M)/ IEEE 802.11b/ IEEE 802.11g/ IEEE 802.11n 20/ IEEE 802.11n 40	0,39/ 0,39/ 1,11/ 1,11/ 1,11/ 3,9
Maximum Power spectral density	Antenna 1, Antenna 2	Bluetooth(LE_1M)/ Bluetooth(LE_2M)/ IEEE 802.11b/ IEEE 802.11g/ IEEE 802.11n 20/ IEEE 802.11n 40	0,19,39/ 0,19,39/ 1,6,11/ 1,6,11/ 1,6,11/ 3,6,9
Spurious RF Conducted Emissions	Antenna 1, Antenna 2	Bluetooth(LE_1M)/ Bluetooth(LE_2M)/ IEEE 802.11b/ IEEE 802.11g/ IEEE 802.11n 20/ IEEE 802.11n 40	0,19,39/ 0,19,39/ 1,6,11/ 1,6,11/ 1,6,11/ 3,6,9

3.2 Duty cycle

TestMode	Antenna	Channel	Transmission Duration [ms]	Transmission Period [ms]	Duty Cycle [%]	Limit	Verdict
11B	Ant1	2412	8.38	8.41	99.64	---	---
	Ant2	2412	8.38	8.41	99.64	---	---
	Ant1	2437	8.39	8.42	99.64	---	---
	Ant2	2437	8.38	8.41	99.64	---	---
	Ant1	2462	8.38	8.41	99.64	---	---
	Ant2	2462	8.37	8.40	99.64	---	---
11G	Ant1	2412	1.39	1.43	97.20	---	---
	Ant2	2412	1.39	1.43	97.20	---	---
	Ant1	2437	1.39	1.43	97.20	---	---
	Ant2	2437	1.39	1.43	97.20	---	---
	Ant1	2462	1.39	1.43	97.20	---	---
	Ant2	2462	1.39	1.43	97.20	---	---
11N20MIMO	Ant1	2412	1.29	1.33	96.99	---	---
	Ant2	2412	1.30	1.33	97.74	---	---
	Ant1	2437	1.30	1.34	97.01	---	---
	Ant2	2437	1.30	1.34	97.01	---	---
	Ant1	2462	1.30	1.34	97.01	---	---
	Ant2	2462	1.30	1.34	97.01	---	---
11N40MIMO	Ant1	2422	0.65	0.69	94.20	---	---
	Ant2	2422	0.65	0.68	95.59	---	---
	Ant1	2437	0.65	0.68	95.59	---	---
	Ant2	2437	0.65	0.68	95.59	---	---
	Ant1	2452	0.65	0.69	94.20	---	---
	Ant2	2452	0.65	0.69	94.20	---	---
BLE_1M	Ant1	2402	2.13	2.50	85.20	---	---
		2440	2.13	2.50	85.20	---	---
		2480	2.13	2.50	85.20	---	---
BLE_2M	Ant1	2402	1.08	1.88	57.45	---	---
		2440	1.08	1.88	57.45	---	---
		2480	1.08	1.88	57.45	---	---

4. Summary of measurement results

Summary of measurements of results	Clause in FCC rules	Verdict	Note
Conducted Emissions	15.207	N/A	See note 2
Radiated Emissions	15.247(d),15.205,15.209	PASS	/
Maximum conducted output power	15.247(b)(3)	PASS	Appendix C of WIFI2.4G_ diagram and Appendix C of BLE_ diagram
Minimum 6 dB bandwidth	15.247(a)(2)	PASS	Appendix A of WIFI2.4G_ diagram and Appendix A of BLE_ diagram
Occupied Channel Bandwidth	15.247(a)(2)	PASS	Appendix B of WIFI2.4G_ diagram and Appendix B of BLE_ diagram
Band Edge Measurement	15.247(d)	PASS	Appendix E of WIFI2.4G_ diagram and Appendix E of BLE_ diagram
Maximum Power spectral density	15.247(e)	PASS	Appendix D of WIFI2.4G_ diagram and Appendix D of BLE_ diagram
Spurious RF Conducted Emissions	15.247(d)	PASS	Appendix F of WIFI2.4G_ diagram and Appendix F of BLE_ diagram
Antenna Requirement	15.203	PASS	See note 1

Note 1: According to 15.203, it is considered sufficient to comply with the provisions of this section.

Note 2: Not applicable to DC powered devices.

5. Measurement procedure

5.1 Conducted Emission

Ambient condition:

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.2kPa

Method of Measurement:

The EUT was setup according to ANSI C63.10-2020/Cor1-2023 for compliance to FCC 47CFR 15.247 requirements. The EUT was placed on a platform of nominal size, 1 m by 1.5 m, raised 80 cm above the conducting ground plane. The vertical conducting plane was located 40 cm to the rear of the EUT. All other surfaces of EUT were at least 80 cm from any other grounded conducting surface. The EUT and simulators are connected to the main power through a line impedance stabilization network (LISN). The LISN provides a 50 ohm /50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN. (Please refer to the block diagram of the test setup and photographs) Each current-carrying conductor of the EUT power cord, except the ground (safety) conductor, was individually connected through a LISN to the input power source.

The excess length of the power cord between the EUT and the LISN receptacle were folded back and forth at the center of the lead to form a bundle not exceeding 40 cm in length.

Conducted emissions were investigated over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9 kHz.

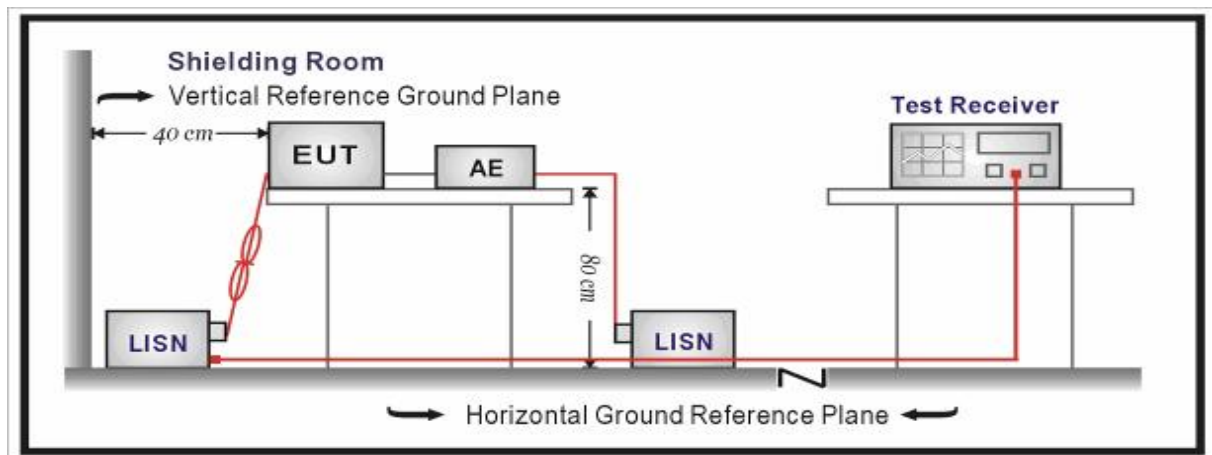
Limits:

Frequency (MHz)	Conducted Limits(dBμV)	
	Quasi-peak	Average
0.15 - 0.5	66 to 56 *	56 to 46*
0.5 - 5	56	46
5 - 30	60	50

Note 1: The lower limit shall apply at the transition frequencies.

Note 2: The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.5 MHz.

Test Setup:



Measurement Data

An initial pre-scan was performed on the live and neutral lines with peak detector.

Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission were detected.

Notes:

1. The following Quasi-Peak and Average measurements were performed on the EUT:
2. Final Level = Reading + Factor.

Measurement Uncertainty:

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor $k = 1.96$. $U = 3.12$ dB.

Test Results:

Conducted Emission applies to an intentional radiator that is designed to be connected to the public utility (AC) power line. Measurements to demonstrate compliance with the conducted limits are not required for devices which only employ battery power for operation and which do not operate from the AC power lines or contain provisions for operation while connected to the AC power lines.

5.2 Radiated Emission

Ambient condition:

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.2kPa

Method of Measurement:

The EUT was setup and tested according to ANSI C63.10-2020/Cor1-2023.

The EUT is placed on a turn table which is 1.5 meter above ground. The turn table is rotated 360 degrees to determine the position of the maximum emission level. The EUT was positioned such that the distance from Antenna to the EUT was 3 meters.

The Antenna is scanned from 1 meter to 4 meters to find out the maximum emission level. This is repeated for both horizontal and vertical polarization of the Antenna. In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.10-2020/Cor1-2023 on radiated measurement.

The resolution bandwidth below 1GHz setting on the field strength meter is 120 kHz and above 1GHz is 1MHz.

The frequency range from 30MHz to 10th harmonic is checked.

Note: When doing emission measurement above 1GHz, the horn Antenna will be bended down a little (as horn Antenna has the narrow beamwidth) in order to keeping the Antenna in the “cone of radiation” of EUT. The 3dB beamwidth is 10~60 degrees for H-plane and 10~90 degrees for E-plane.

Limits:

Radiated emissions which fall in the restricted bands, as defined in Section 15.205(a) of FCC part 15, must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

Frequency	Limit ($\mu\text{V/m}$)	Limit ($\text{dB}\mu\text{V/m @3m}$)	Remark
0.009MHz-0.490MHz	2400/F(kHz)@300m	20lg(24000000/F(kHz))	Quasi-peak Level
0.490MHz~1.705MHz	24000/F(kHz)@30m	20lg(2400000/F(kHz))	Quasi-peak Level
1.705MHz~30.0MHz	30@30m	69.54	Quasi-peak Level
30MHz-88MHz	100@3m	40.0	Quasi-peak Level
88MHz-216MHz	150@3m	43.5	Quasi-peak Level
216MHz-960MHz	200@3m	46.0	Quasi-peak Level
960MHz-1GHz	500@3m	54.0	Quasi-peak Level
Above 1GHz	500@3m	54.0	Average Level

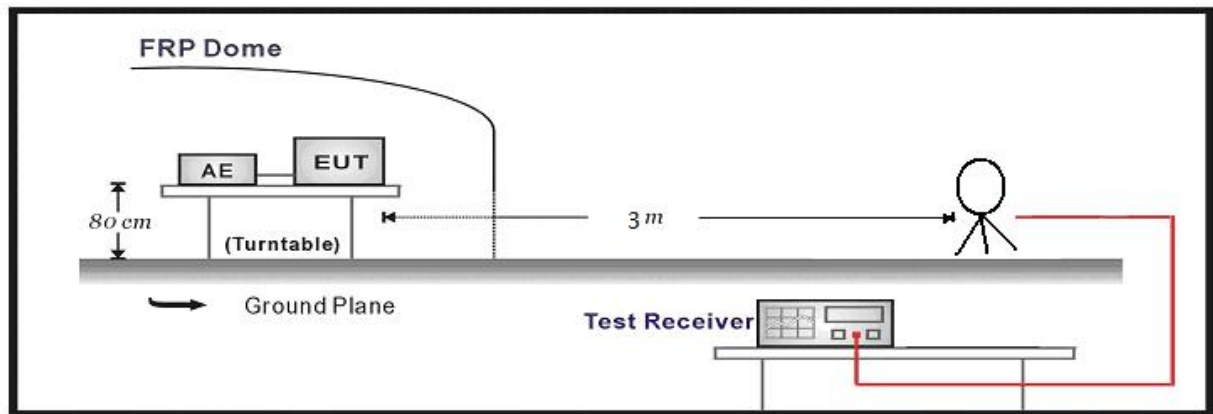
	5000@3m	74.0	Peak Level
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Spurious Radiated Emissions are permitted in any of the frequency bands listed below:

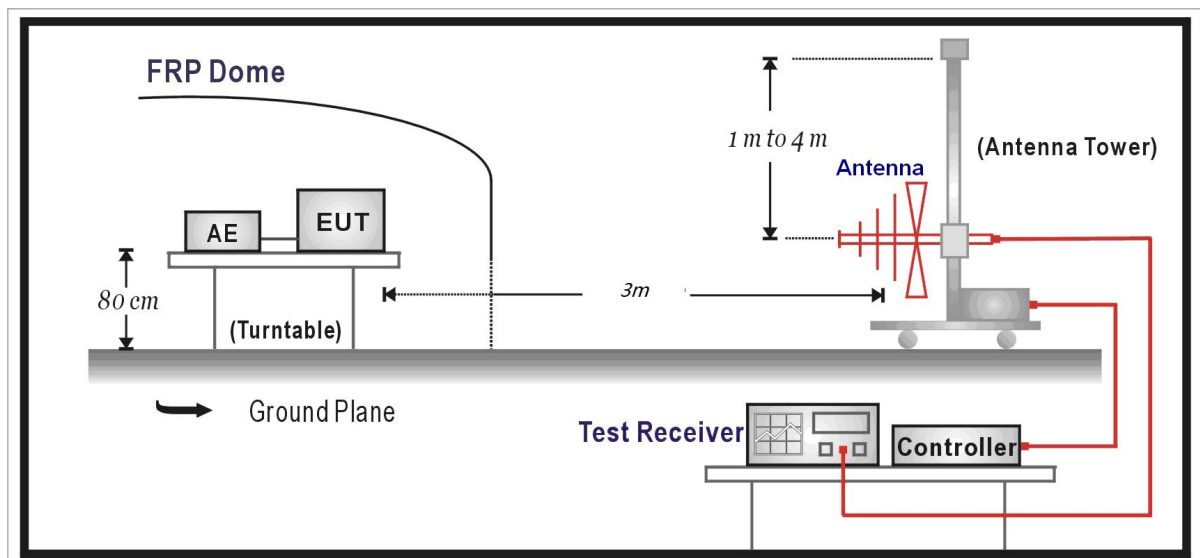
MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	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.
12.57675-12.57725	322-335.4	3600-4400	/
13.36-13.41	/	/	/

Test Setup:

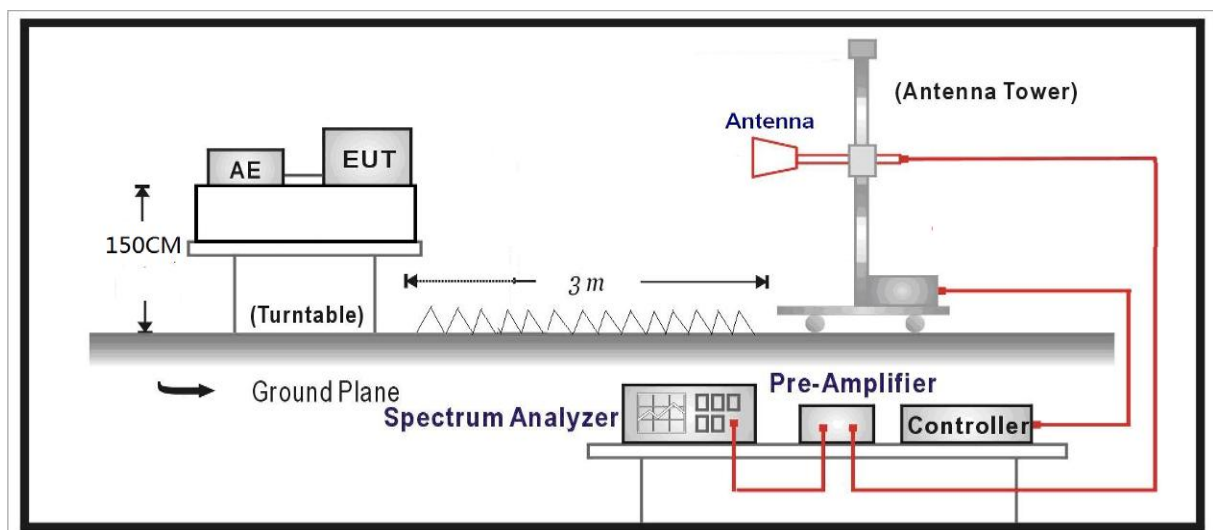
Below 30MHz Test Setup:



Below 1GHz Test Setup:



Above 1GHz Test Setup:



Measurement Data:

The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

Final Level = Reading - Factor

Factor = Preamplifier Factor – Antenna Factor–Cable Loss

Measurement Uncertainty:

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor $k = 1.96$.

Frequency	Uncertainty
9KHz-30MHz	3.55 dB
30MHz-200MHz	4.19 dB
200MHz-1GHz	3.63 dB
Above 1GHz	3.68 dB

Test Results:

SPURIOUS EMISSIONS:

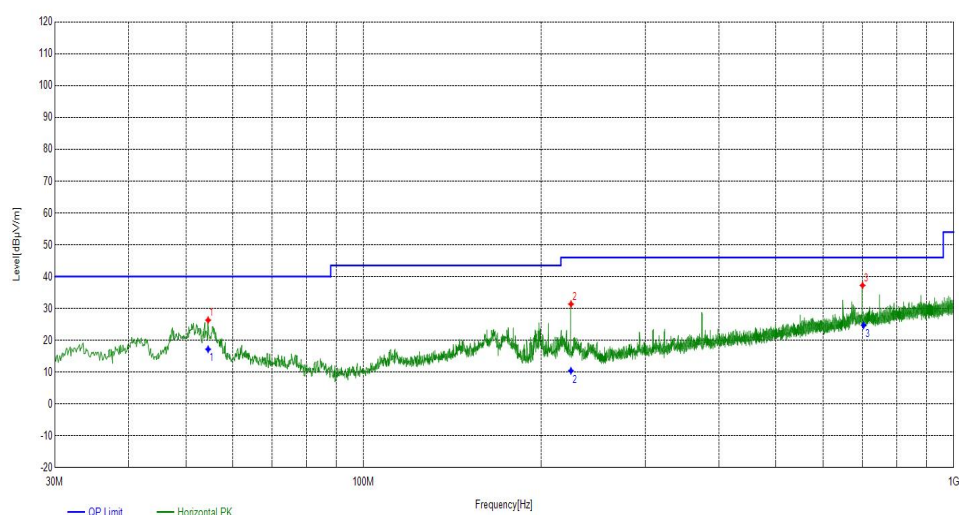
WIFI:

During the test, the Radiates Emission from 9kHz to 1GHz was performed in WIFI all modes with all channels and all antennas. 802.11n20, Channel 1, MIMO are selected as the worst condition. The test data of the worst-case condition was recorded in this report.

Radiates Emission			9k~1G							
Test channel			Worst-Case							
Suspected List										
Frequency [MHz]	Polarity	Factor [dB]	Reading [dBμV/m]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Detect or	Height [cm]	Angle deg	Pass/Fail
54.5435	Horizontal	20.19	6.14	26.33	---	---	PK	100	230	---
224.6985	Horizontal	18.35	13.02	31.37	---	---	PK	100	170	---
700.5311	Horizontal	30.36	6.89	37.25	---	---	PK	100	230	---

Note: 9kHz~30MHz have been test and test data more than 20dB margin.

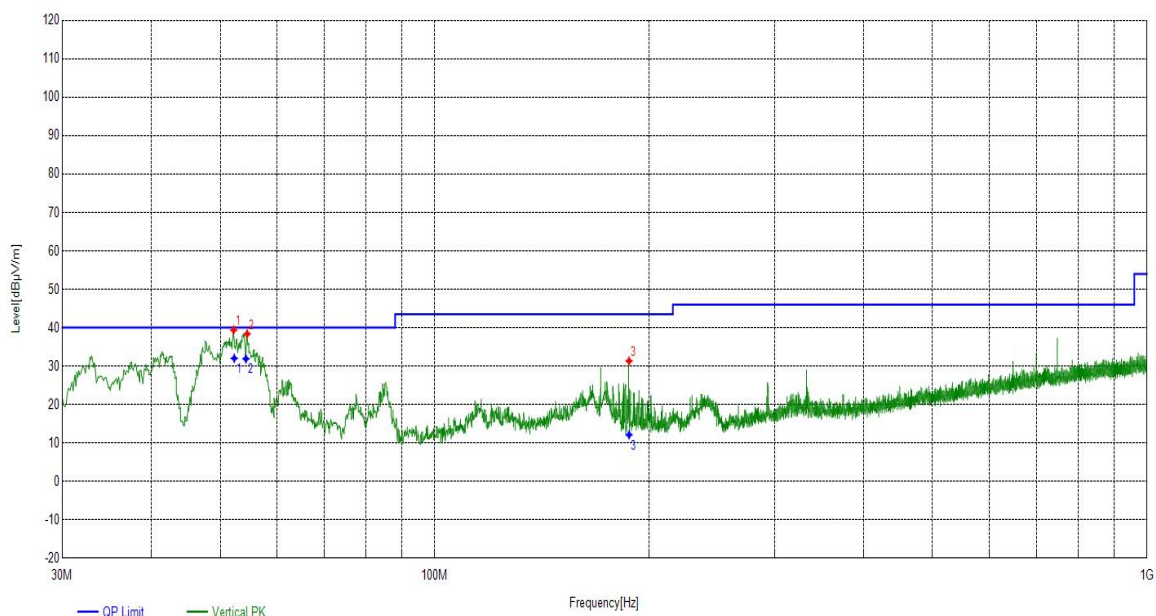
Final Data List									
Frequency [MHz]	Polarity	Factor [dB]	QP Value [dBμV/m]	QP Limit [dBμV/m]	QP Margin [dB]	Height [cm]	Angle [°]	Pass/Fail	
54.5403	Horizontal	20.19	17.19	40.00	22.81	170	230	PASS	
224.5782	Horizontal	18.35	10.44	46.00	35.56	320	170	PASS	
703.5424	Horizontal	30.36	24.73	46.00	21.27	160	230	PASS	



Radiates Emission			9k~1G							
Test channel			Worst-Case							
Suspected List										
Frequency [MHz]	Polarity	Factor [dB]	Reading [dBμV/m]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Detect or	Height [cm]	Angle deg	Pass/Fail
52.2152	Vertical	20.32	19.06	39.38	---	---	PK	100	260	---
54.5435	Vertical	20.19	18.19	38.38	---	---	PK	100	140	---
187.4467	Vertical	18.24	13.09	31.33	---	---	PK	100	40	---

Note: 9kHz~30MHz have been test and test data more than 20dB margin.

Final Data List									
Frequency [MHz]	Polarity	Factor [dB]	QP Value [dBμV/m]	QP Limit [dBμV/m]	QP Margin [dB]	Height [cm]	Angle [°]	Pass/Fail	
52.3074	Vertical	20.32	32.03	40.00	7.97	340	265	PASS	
54.3296	Vertical	20.19	31.90	40.00	8.10	370	145	PASS	
187.4359	Vertical	18.24	12.12	43.50	31.38	230	45	PASS	



During the test, the Radiates Emission from 1GHz to 40GHz was performed in WIFI all modes with all channels and all antennas. 802.11n20, Highest, medium, lowest channels, MIMO are selected as the worst condition. The test data of the worst-case condition was recorded in this report.

Radiates Emission		Above 1G							
Test channel		Lowest							
polarization		Horizontal							
Suspected List									
Frequency [MHz]	Factor [dB]	Reading [dBμV/ m]	Level [dBμV/ m]	Limit [dBμV/ m]	Margin [dB]	Detect or	Height [cm]	Angle deg	Pass/ Fail
4827.182718	1.36	41.79	43.15	74.00	30.85	PK	150	140	PASS
7744.974497	9.19	35.45	44.64	74.00	29.36	PK	150	360	PASS
10872.787279	12.69	34.43	47.12	74.00	26.88	PK	150	280	PASS
4827.182718	1.36	28.96	30.32	54.00	23.68	AV	150	50	PASS
7768.976898	9.21	26.03	35.24	54.00	18.76	AV	150	80	PASS
10796.279628	12.77	23.73	36.50	54.00	17.50	AV	150	110	PASS
Radiates Emission		Above 1G							
Test channel		Lowest							
polarization		Vertical							
Suspected List									
Frequency [MHz]	Factor [dB]	Reading [dBμV/ m]	Level [dBμV/ m]	Limit [dBμV/ m]	Margin [dB]	Detect or	Height [cm]	Angle deg	Pass/ Fail
3628.562856	-0.15	42.02	41.87	74.00	32.13	PK	150	100	PASS
4825.682568	1.35	47.58	48.93	74.00	25.07	PK	150	310	PASS
8508.550855	10.01	36.53	46.54	74.00	27.46	PK	150	360	PASS
3631.563156	-0.15	32.78	32.63	54.00	21.37	AV	150	140	PASS
4825.682568	1.35	37.06	38.41	54.00	15.59	AV	150	50	PASS
8582.058206	10.08	24.60	34.68	54.00	19.32	AV	150	210	PASS

Note: The emission levels of other frequencies were greater than 20dB margin.

Radiates Emission		Above 1G							
Test channel		Medium							
polarization		Horizontal							
Suspected List									
Frequency [MHz]	Factor [dB]	Reading [dBμV/ m]	Level [dBμV/ m]	Limit [dBμV/ m]	Margin [dB]	Detect or	Height [cm]	Angle deg	Pass/ Fail
4828.682868	1.36	40.06	41.42	74.00	32.58	PK	150	260	PASS
7012.90129	8.95	35.58	44.53	74.00	29.47	PK	150	190	PASS
8790.579058	10.14	34.44	44.58	74.00	29.42	PK	150	220	PASS
4828.682868	1.36	30.04	31.40	54.00	22.60	AV	150	10	PASS
7099.909991	8.97	24.86	33.83	54.00	20.17	AV	150	240	PASS
8604.560456	10.11	25.34	35.45	54.00	18.55	AV	150	70	PASS
Radiates Emission		Above 1G							
Test channel		Medium							
polarization		Vertical							
Suspected List									
Frequency [MHz]	Factor [dB]	Reading [dBμV/ m]	Level [dBμV/ m]	Limit [dBμV/ m]	Margin [dB]	Detect or	Height [cm]	Angle deg	Pass/ Fail
3630.063006	-0.15	42.16	42.01	74.00	31.99	PK	150	150	PASS
4821.182118	1.32	46.34	47.66	74.00	26.34	PK	150	70	PASS
9396.639664	11.88	33.86	45.74	74.00	28.26	PK	150	20	PASS
3631.563156	-0.15	32.25	32.10	54.00	21.90	AV	150	90	PASS
4825.682568	1.35	35.43	36.78	54.00	17.22	AV	150	20	PASS
9323.132313	11.58	23.61	35.19	54.00	18.81	AV	150	10	PASS

Note: The emission levels of other frequencies were greater than 20dB margin.

Radiates Emission		Above 1G							
Test channel		Highest							
polarization		Horizontal							
Suspected List									
Frequency [MHz]	Factor [dB]	Reading [dBμV/ m]	Level [dBμV/ m]	Limit [dBμV/ m]	Margin [dB]	Detect or	Height [cm]	Angle deg	Pass/ Fail
5544.254425	3.65	35.57	39.22	74.00	34.78	PK	150	160	PASS
8511.551155	10.01	35.09	45.10	74.00	28.90	PK	150	230	PASS
12879.987999	13.75	33.68	47.43	74.00	26.57	PK	150	350	PASS
5442.244224	3.31	26.02	29.33	54.00	24.67	AV	150	210	PASS
8604.560456	10.11	25.06	35.17	54.00	18.83	AV	150	10	PASS
13001.50015	14.08	23.74	37.82	54.00	16.18	AV	150	40	PASS
Radiates Emission		Above 1G							
Test channel		Highest							
polarization		Vertical							
Suspected List									
Frequency [MHz]	Factor [dB]	Reading [dBμV/ m]	Level [dBμV/ m]	Limit [dBμV/ m]	Margin [dB]	Detect or	Height [cm]	Angle deg	Pass/ Fail
3630.063006	-0.15	41.68	41.53	74.00	32.47	PK	150	340	PASS
4825.682568	1.35	46.55	47.90	74.00	26.10	PK	150	270	PASS
10229.222922	12.64	33.42	46.06	74.00	27.94	PK	150	140	PASS
3631.563156	-0.15	32.10	31.95	54.00	22.05	AV	150	340	PASS
4822.682268	1.33	35.90	37.23	54.00	16.77	AV	150	10	PASS
10272.727273	12.70	23.55	36.25	54.00	17.75	AV	150	20	PASS

Note: The emission levels of other frequencies were greater than 20dB margin.

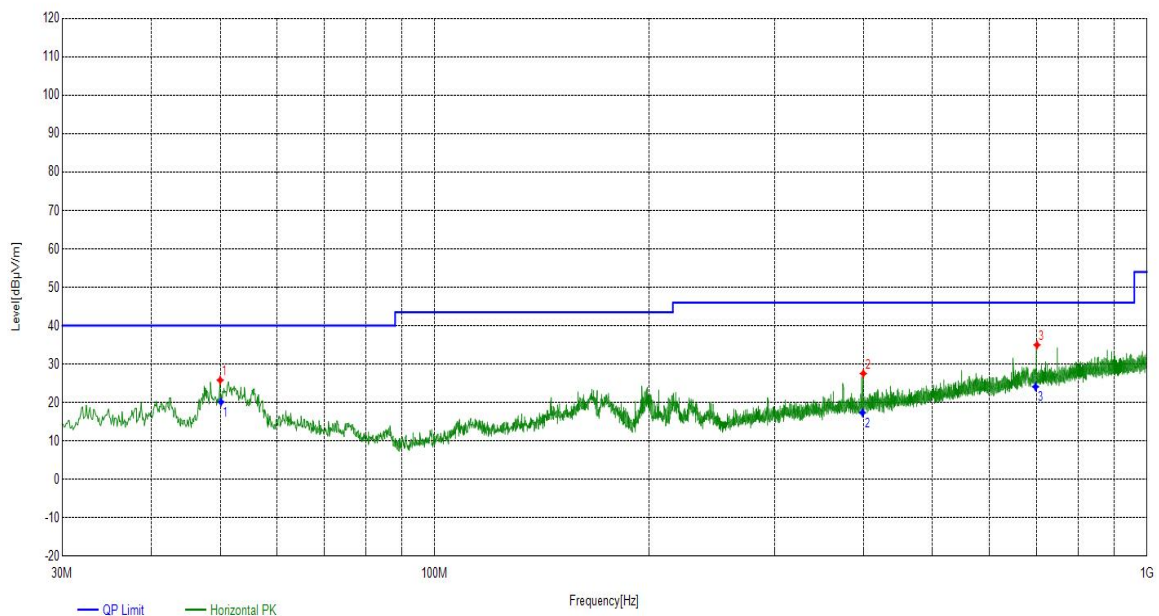
Bluetooth(Low Energy):

During the test, the Radiates Emission from 9kHz to 40GHz was performed in Bluetooth(Low Energy) all modes with all channels and all antennas. BLE(2Mbps), channel 0, antenna 1 are selected as the worst condition. The test data of the worst-case condition was recorded in this report.

Radiates Emission			9k~1G							
Test channel			Worst-Case							
Suspected List										
Frequency [MHz]	Polarity	Factor [dB]	Reading [dBμV/m]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Detect or	Height [cm]	Angle deg	Pass/Fail
49.984	Horizontal	20.45	5.38	25.83	---	---	PK	100	180	---
399.704	Horizontal	23.94	3.60	27.54	---	---	PK	100	230	---
700.7251	Horizontal	30.36	4.63	34.99	---	---	PK	100	140	---

Note: 9kHz~30MHz have been test and test data more than 20dB margin.

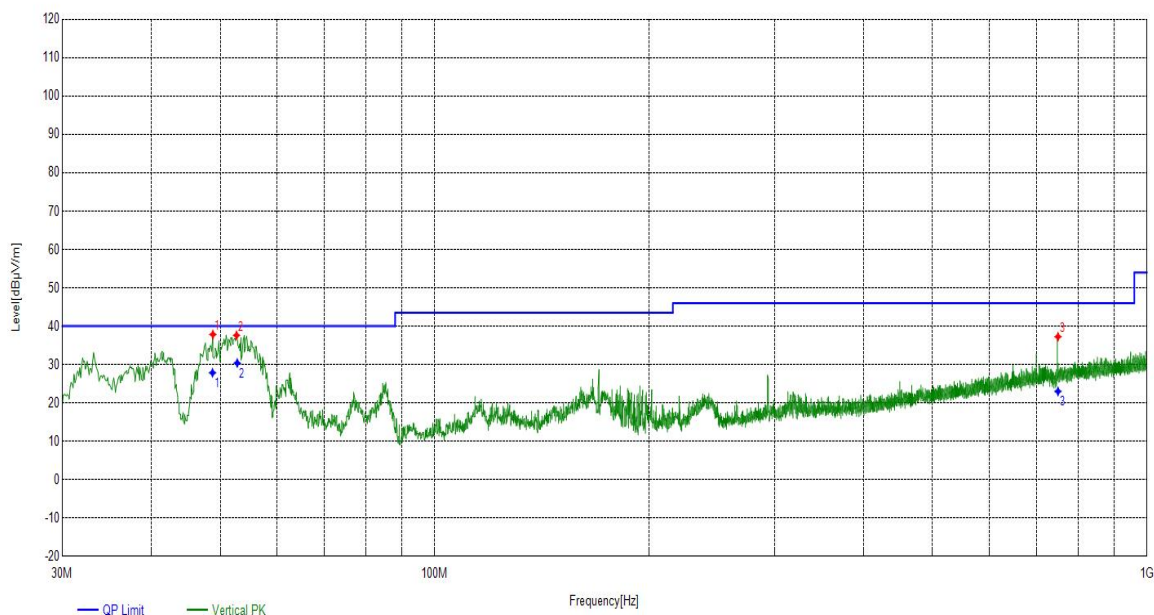
Final Data List									
Frequency [MHz]	Polarity	Factor [dB]	QP Value [dB μ V/m]	QP Limit [dB μ V/m]	QP Margin [dB]	Height [cm]	Angle [°]	Pass/Fail	
50.1222	Horizontal	20.45	20.15	40.00	19.85	220	180	PASS	
398.6108	Horizontal	23.94	17.36	46.00	28.64	220	230	PASS	
697.4395	Horizontal	30.36	24.12	46.00	21.88	190	140	PASS	



Radiates Emission			9k~1G							
Test channel			Worst-Case							
Suspected List										
Frequency [MHz]	Polarity	Factor [dB]	Readin g [dBμV/ m]	Level [dBμV/ m]	Limit [dBμV/ m]	Margin [dB]	Detect or	Height [cm]	Angle deg	Pass/ Fail
48.8199	Vertical	20.39	17.44	37.83	---	---	PK	100	300	---
52.7003	Vertical	20.29	17.32	37.61	---	---	PK	100	290	---
750.006	Vertical	31.27	5.97	37.24	---	---	PK	100	90	---

Note: 9kHz~30MHz have been test and test data more than 20dB margin.

Final Data List								
Frequency [MHz]	Polarity	Factor [dB]	QP Value [dB μ V/m]	QP Limit [dB μ V/m]	QP Margin [dB]	Height [cm]	Angle [°]	Pass/Fail
48.7599	Vertical	20.39	27.85	40.00	12.15	220	305	PASS
52.8132	Vertical	20.29	30.39	40.00	9.61	270	295	PASS
749.973	Vertical	31.27	23.01	46.00	22.99	400	95	PASS



During the test, the Radiates Emission from 1GHz to 40GHz was performed in WIFI all modes with all channels and all antennas. BLE(2Mbps), Highest, medium, lowest channels, antenna 1 are selected as the worst condition. The test data of the worst-case condition was recorded in this report.

Radiates Emission		Above 1G							
Test channel		Lowest							
polarization		Horizontal							
Suspected List									
Frequency [MHz]	Factor [dB]	Reading [dBμV/ m]	Level [dBμV/ m]	Limit [dBμV/ m]	Margin [dB]	Detect or	Height [cm]	Angle deg	Pass/ Fail
4017.10171	0.53	39.07	39.60	74.00	34.40	PK	150	50	PASS
4920.192019	1.75	41.79	43.54	74.00	30.46	PK	150	220	PASS
7872.487249	9.24	35.59	44.83	74.00	29.17	PK	150	160	PASS
4098.109811	0.49	28.56	29.05	54.00	24.95	AV	150	31	PASS
4921.692169	1.75	30.39	32.14	54.00	21.86	AV	150	360	PASS
7777.977798	9.21	24.98	34.19	54.00	19.81	AV	150	280	PASS
Radiates Emission		Above 1G							
Test channel		Lowest							
polarization		Vertical							
Suspected List									
Frequency [MHz]	Factor [dB]	Reading [dBμV/ m]	Level [dBμV/ m]	Limit [dBμV/ m]	Margin [dB]	Detect or	Height [cm]	Angle deg	Pass/ Fail
3513.051305	-0.33	41.82	41.49	74.00	32.51	PK	100	40	PASS
4920.192019	1.75	44.07	45.82	74.00	28.18	PK	100	200	PASS
8604.560456	10.11	35.60	45.71	74.00	28.29	PK	100	270	PASS
3514.551455	-0.33	33.45	33.12	54.00	20.88	AV	100	110	PASS
4926.192619	1.78	32.73	34.51	54.00	19.49	AV	100	50	PASS
8601.560156	10.11	24.97	35.08	54.00	18.92	AV	100	210	PASS

Note: The emission levels of other frequencies were greater than 20dB margin.

Radiates Emission		Above 1G							
Test channel		Medium							
polarization		Horizontal							
Suspected List									
Frequency [MHz]	Factor [dB]	Reading [dBμV/ m]	Level [dBμV/ m]	Limit [dBμV/ m]	Margin [dB]	Detect or	Height [cm]	Angle deg	Pass/ Fail
3675.067507	-0.07	39.73	39.66	74.00	34.34	PK	150	31	PASS
4926.192619	1.78	41.14	42.92	74.00	31.08	PK	150	360	PASS
7713.471347	9.17	35.73	44.90	74.00	29.10	PK	150	280	PASS
3714.071407	0.00	29.18	29.18	54.00	24.82	AV	150	136	PASS
4921.692169	1.75	31.40	33.15	54.00	20.85	AV	150	359	PASS
8280.528053	9.65	24.26	33.91	54.00	20.09	AV	150	80	PASS
Radiates Emission		Above 1G							
Test channel		Medium							
polarization		Vertical							
Suspected List									
Frequency [MHz]	Factor [dB]	Reading [dBμV/ m]	Level [dBμV/ m]	Limit [dBμV/ m]	Margin [dB]	Detect or	Height [cm]	Angle deg	Pass/ Fail
3513.051305	-0.33	41.37	41.04	74.00	32.96	PK	150	17	PASS
4932.193219	1.80	44.45	46.25	74.00	27.75	PK	150	254	PASS
9848.184819	12.40	33.34	45.74	74.00	28.26	PK	150	32	PASS
3514.551455	-0.33	33.04	32.71	54.00	21.29	AV	150	110	PASS
4926.192619	1.78	33.19	34.97	54.00	19.03	AV	150	50	PASS
9449.144915	12.11	22.95	35.06	54.00	18.94	AV	150	210	PASS

Note: The emission levels of other frequencies were greater than 20dB margin.

Radiates Emission		Above 1G							
Test channel		Highest							
polarization		Horizontal							
Suspected List									
Frequency [MHz]	Factor [dB]	Reading [dBμV/ m]	Level [dBμV/ m]	Limit [dBμV/ m]	Margin [dB]	Detect or	Height [cm]	Angle deg	Pass/ Fail
3835.583558	0.23	38.40	38.63	74.00	35.37	PK	150	290	PASS
4930.693069	1.80	40.27	42.07	74.00	31.93	PK	150	50	PASS
7855.985599	9.24	35.75	44.99	74.00	29.01	PK	150	240	PASS
3721.572157	0.01	29.42	29.43	54.00	24.57	AV	150	110	PASS
4921.692169	1.75	31.33	33.08	54.00	20.92	AV	150	50	PASS
7902.490249	9.24	25.22	34.46	54.00	19.54	AV	150	210	PASS
Radiates Emission		Above 1G							
Test channel		Highest							
polarization		Vertical							
Suspected List									
Frequency [MHz]	Factor [dB]	Reading [dBμV/ m]	Level [dBμV/ m]	Limit [dBμV/ m]	Margin [dB]	Detect or	Height [cm]	Angle deg	Pass/ Fail
3630.063006	-0.15	42.44	42.29	74.00	31.71	PK	150	17	PASS
4924.692469	1.77	43.89	45.66	74.00	28.34	PK	150	254	PASS
9786.678668	12.41	32.68	45.09	74.00	28.91	PK	150	32	PASS
3631.563156	-0.15	32.07	31.92	54.00	22.08	AV	150	110	PASS
4926.192619	1.78	33.19	34.97	54.00	19.03	AV	150	50	PASS
9251.125113	11.28	23.98	35.26	54.00	18.74	AV	150	210	PASS

Note: The emission levels of other frequencies were greater than 20dB margin.

Band Edge:

During the test, the Band Edge was performed in WIFI all modes with all channels and all antennas. 802.11n20,MIMO are selected as the worst condition. The test data of the worst-case condition was recorded in this report.

Test mode			802.11n20						
Test channel			Lowest channel						
polarization			Horizontal						
Suspected List									
Frequency [MHz]	Factor [dB]	Reading [dBμV/m]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Detect or	Height [cm]	Angle deg	Pass/ Fail
2295.9296	36.40	14.49	50.89	74.00	23.11	PK	150	300	PASS
2371.3371	37.08	14.02	51.10	74.00	22.90	PK	150	0	PASS
2390.1390	37.25	19.50	56.75	74.00	17.25	PK	150	270	PASS
2295.9296	36.40	2.18	38.58	54.00	15.42	AV	150	31	PASS
2371.3371	37.08	2.22	39.30	54.00	14.70	AV	150	0	PASS
2390.1390	37.25	8.73	45.98	54.00	8.02	AV	150	285	PASS
Test mode			802.11n20						
Test channel			Lowest channel						
polarization			Vertical						
Suspected List									
Frequency [MHz]	Factor [dB]	Reading [dBμV/m]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Detect or	Height [cm]	Angle deg	Pass/ Fail
2328.7329	36.71	11.30	48.01	74.00	25.99	PK	150	269	PASS
2389.5390	37.24	28.83	66.07	74.00	7.93	PK	150	353	PASS
2390.1390	37.25	25.02	62.27	74.00	11.73	PK	150	1	PASS
2328.7329	36.71	2.25	38.96	54.00	15.04	AV	150	328	PASS
2389.5390	37.24	14.68	51.92	54.00	2.08	AV	150	1	PASS
2390.1390	37.25	15.27	52.52	54.00	1.48	AV	150	7	PASS

Test mode			802.11n20						
Test channel			Highest channel						
polarization			Horizontal						
Suspected List									
Frequency [MHz]	Factor [dB]	Reading [dBμV/m]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Detector	Height [cm]	Angle deg	Pass/ Fail
2483.5484	37.71	21.64	59.35	74.00	14.65	PK	150	135	PASS
2489.3489	37.74	15.50	53.24	74.00	20.76	PK	150	76	PASS
2576.3576	38.10	14.59	52.69	74.00	21.31	PK	150	1	PASS
2483.5484	37.71	8.49	46.20	54.00	7.80	AV	150	105	PASS
2489.3489	37.74	4.00	41.74	54.00	12.26	AV	150	120	PASS
2576.3576	38.10	2.98	41.08	54.00	12.92	AV	150	254	PASS
Test mode			802.11n20						
Test channel			Highest channel						
polarization			Vertical						
Suspected List									
Frequency [MHz]	Factor [dB]	Reading [dBμV/m]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Detector	Height [cm]	Angle deg	Pass/ Fail
2483.5484	37.71	24.75	62.46	74.00	11.54	PK	150	329	PASS
2485.5486	37.72	24.71	62.43	74.00	11.57	PK	150	354	PASS
2574.9575	38.09	14.34	52.43	74.00	21.57	PK	150	211	PASS
2483.5484	37.71	12.56	50.27	54.00	3.73	AV	150	359	PASS
2485.5486	37.72	13.12	50.84	54.00	3.16	AV	150	359	PASS
2574.9575	38.09	2.69	40.78	54.00	13.22	AV	150	152	PASS

During the test, the Band Edge was performed in BLE all modes with all channels and all antennas. BLE(2Mbps), Antenna 1 are selected as the worst condition. The test data of the worst-case condition was recorded in this report.

Test mode			BLE(2Mbps)						
Test channel			Lowest channel						
polarization			Horizontal						
Suspected List									
Frequency [MHz]	Factor [dB]	Reading [dBμV/m]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Detect or	Height [cm]	Angle deg	Pass/ Fail
2266.1266	36.14	14.13	50.27	74.00	23.73	PK	150	286	PASS
2372.1372	37.08	14.61	51.69	74.00	22.31	PK	150	33	PASS
2390.1390	37.25	11.74	48.99	74.00	25.01	PK	150	33	PASS
2266.1266	36.14	2.06	38.20	54.00	15.80	AV	150	108	PASS
2372.1372	37.08	2.09	39.17	54.00	14.83	AV	150	108	PASS
2390.1390	37.25	2.62	39.87	54.00	14.13	AV	150	93	PASS
Test mode			BLE(2Mbps)						
Test channel			Lowest channel						
polarization			Vertical						
Suspected List									
Frequency [MHz]	Factor [dB]	Reading [dBμV/m]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Detect or	Height [cm]	Angle deg	Pass/ Fail
2308.3308	36.51	13.92	50.43	74.00	23.57	PK	150	360	PASS
2381.1381	37.16	12.37	49.53	74.00	24.47	PK	150	45	PASS
2390.1390	37.25	12.56	49.81	74.00	24.19	PK	150	210	PASS
2308.3308	36.51	2.50	39.01	54.00	14.99	AV	150	360	PASS
2381.1381	37.16	2.85	40.01	54.00	13.99	AV	150	1	PASS
2390.1390	37.25	2.53	39.78	54.00	14.22	AV	150	360	PASS

Test mode		BLE(2Mbps)							
Test channel		Highest channel							
polarization		Horizontal							
Suspected List									
Frequency [MHz]	Factor [dB]	Reading [dBμV/m]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Detect or	Height [cm]	Angle deg	Pass/ Fail
2483.5484	37.71	11.97	49.68	74.00	24.32	PK	150	209	PASS
2507.1507	37.83	14.21	52.04	74.00	21.96	PK	150	253	PASS
2544.7545	37.98	12.00	49.98	74.00	24.02	PK	150	104	PASS
2483.5484	37.71	2.40	40.11	54.00	13.89	AV	150	1	PASS
2507.1507	37.83	2.24	40.07	54.00	13.93	AV	150	134	PASS
2544.7545	37.98	2.71	40.69	54.00	13.31	AV	150	253	PASS
Test mode		BLE(2Mbps)							
Test channel		Highest channel							
polarization		Vertical							
Suspected List									
Frequency [MHz]	Factor [dB]	Reading [dBμV/m]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Detect or	Height [cm]	Angle deg	Pass/ Fail
2483.5484	37.71	12.91	50.62	74.00	23.38	PK	150	152	PASS
2501.3501	37.80	14.50	52.30	74.00	21.70	PK	150	152	PASS
2543.3543	37.97	15.60	53.57	74.00	20.43	PK	150	152	PASS
2483.5484	37.71	3.21	40.92	54.00	13.08	AV	150	359	PASS
2501.3501	37.80	2.66	40.46	54.00	13.54	AV	150	240	PASS
2543.3543	37.97	2.44	40.41	54.00	13.59	AV	150	330	PASS

5.3 Maximum conducted output power

Ambient condition:

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.2kPa

Method of Measurement:

a.A peak power sensor was used on the output port of the EUT. A power meter was used to read the response of the peak power sensor and set the detector to PEAK. Record the power level.

Limits:

Average Output Power	≤ 1W (30dBm)
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Note: the conducted output power limit specified above is based on the use the antennas with directional gains that do not exceed 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated Levels above, as appropriate, by the amount in dB that the directional gain of antenna exceeds 6 dBi.

Systems operating in the 2400-2483.5 MHz band that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6 dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

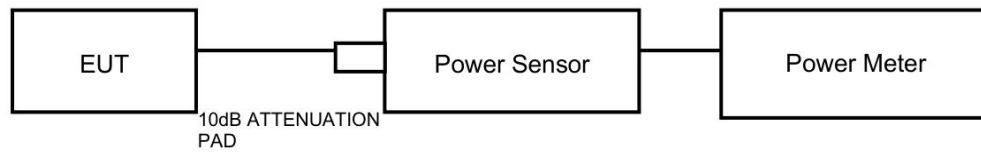
Frequency(MHz)	Antenna Gain(dBi)		Directional gain	Limit(dBm)
	Antenna 1	Antenna 2		
2412-2462	3.21	3.21	6.22	29.78

Directional gain is to be computed as follows:

transmit signals are correlated, then

Directional gain = $10 \log[(10^{G_1/20} + 10^{G_2/20} + \dots + 10^{G_N/20})^2 / N_{ANT}]$ dBi [Note the “20”s in the denominator of each exponent and the square of the sum of terms; the object is to combine the signal levels coherently.

Test Setup:



Measurement Uncertainty:

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor $k = 2$, $U = 0.44$ dB.

Test Results:

TestMode	Antenna	Channel	Result[dBm]	Limit[dBm]	Verdict
11B	Ant1	2412	16.99	≤29.78	PASS
	Ant2	2412	15.45	≤29.78	PASS
	Ant1	2437	16.39	≤29.78	PASS
	Ant2	2437	15.88	≤29.78	PASS
	Ant1	2462	16.15	≤29.78	PASS
	Ant2	2462	15.74	≤29.78	PASS
11G	Ant1	2412	20.99	≤29.78	PASS
	Ant2	2412	19.81	≤29.78	PASS
	Ant1	2437	20.32	≤29.78	PASS
	Ant2	2437	19.17	≤29.78	PASS
	Ant1	2462	20.78	≤29.78	PASS
	Ant2	2462	19.65	≤29.78	PASS
11N20SISO	Ant1	2412	19.14	≤29.78	PASS
	Ant2	2412	18.43	≤29.78	PASS
	total	2412	21.81	≤29.78	PASS
	Ant1	2437	18.56	≤29.78	PASS
	Ant2	2437	18.45	≤29.78	PASS
	total	2437	21.52	≤29.78	PASS
	Ant1	2462	18.66	≤29.78	PASS
	Ant2	2462	18.66	≤29.78	PASS
	total	2462	21.67	≤29.78	PASS
11N40SISO	Ant1	2422	19.59	≤29.78	PASS
	Ant2	2422	19.22	≤29.78	PASS
	total	2422	22.42	≤29.78	PASS
	Ant1	2437	19.31	≤29.78	PASS
	Ant2	2437	19.30	≤29.78	PASS
	total	2437	22.32	≤29.78	PASS
	Ant1	2452	19.23	≤29.78	PASS
	Ant2	2452	18.70	≤29.78	PASS
	total	2452	21.98	≤29.78	PASS
BLE_1M	Ant1	2402	1.50	≤30.00	PASS
	Ant1	2440	1.88	≤30.00	PASS
	Ant1	2480	1.06	≤30.00	PASS
BLE_2M	Ant1	2402	1.40	≤30.00	PASS
	Ant1	2440	1.85	≤30.00	PASS
	Ant1	2480	1.12	≤30.00	PASS

Note: WIFI has MIMO function, Directional gain needs to be considered.

5.4 Minimum 6 dB Bandwidth

Ambient condition:

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.2kPa

Method of Measurement:

The EUT was connected to the spectrum analyzer through an external attenuator (20dB) and a known loss cable. Set RBW = shall be in the range of 1% to 5% of the OBW but not less than 100 kHz; VBW is set to greater than 3 times RBW on spectrum analyzer.

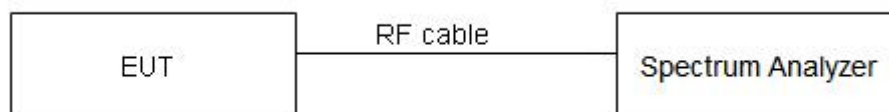
Detector=Peak, Trace mode=Max hold.

Limits:

Rule Part 15.247 (a) (2) specifies that “Systems using digital modulation techniques may operate in the 902–928 MHz, 2400–2483.5 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.”

Minimum 6dB Bandwidth	≥ 500 kHz
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Test Setup:



Measurement Uncertainty:

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor $k = 2$, $U = 936$ Hz.

Test Results:

TestMode	Antenna	Channel	DTS BW [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
11B	Ant1	2412	9.76	2407.00	2416.76	≥ 0.5	PASS
	Ant2	2412	8.08	2407.00	2415.08	≥ 0.5	PASS
	Ant1	2437	9.04	2432.48	2441.52	≥ 0.5	PASS
	Ant2	2437	8.08	2433.44	2441.52	≥ 0.5	PASS
	Ant1	2462	7.12	2458.44	2465.56	≥ 0.5	PASS
	Ant2	2462	9.56	2457.48	2467.04	≥ 0.5	PASS
11G	Ant1	2412	15.44	2404.44	2419.88	≥ 0.5	PASS
	Ant2	2412	15.12	2403.80	2418.92	≥ 0.5	PASS
	Ant1	2437	15.04	2429.48	2444.52	≥ 0.5	PASS
	Ant2	2437	12.56	2430.08	2442.64	≥ 0.5	PASS
	Ant1	2462	16.32	2453.84	2470.16	≥ 0.5	PASS
	Ant2	2462	15.64	2454.12	2469.76	≥ 0.5	PASS
11N20MIMO	Ant1	2412	15.08	2404.48	2419.56	≥ 0.5	PASS
	Ant2	2412	14.44	2403.20	2417.64	≥ 0.5	PASS
	Ant1	2437	15.12	2429.44	2444.56	≥ 0.5	PASS
	Ant2	2437	14.04	2429.84	2443.88	≥ 0.5	PASS
	Ant1	2462	14.08	2455.48	2469.56	≥ 0.5	PASS
	Ant2	2462	17.52	2453.24	2470.76	≥ 0.5	PASS
11N40MIMO	Ant1	2422	33.84	2405.76	2439.60	≥ 0.5	PASS
	Ant2	2422	36.32	2403.84	2440.16	≥ 0.5	PASS
	Ant1	2437	33.84	2419.48	2453.32	≥ 0.5	PASS
	Ant2	2437	33.84	2419.48	2453.32	≥ 0.5	PASS
	Ant1	2452	32.64	2436.96	2469.60	≥ 0.5	PASS
	Ant2	2452	35.68	2434.48	2470.16	≥ 0.5	PASS
BLE_1M	Ant1	2402	0.66	2401.67	2402.33	≥ 0.5	PASS
		2440	0.72	2439.64	2440.36	≥ 0.5	PASS
		2480	0.73	2479.63	2480.36	≥ 0.5	PASS
BLE_2M	Ant1	2402	1.26	2401.36	2402.62	≥ 0.5	PASS
		2440	1.20	2439.39	2440.59	≥ 0.5	PASS
		2480	1.31	2479.33	2480.64	≥ 0.5	PASS

5.5 Occupied Channel Bandwidth

Ambient condition:

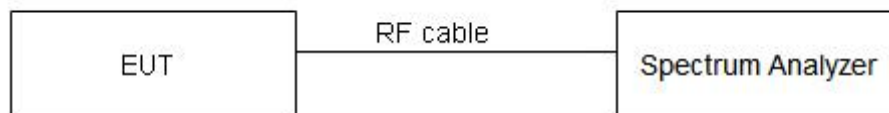
Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.2kPa

Method of Measurement:

The EUT was connected to the spectrum analyzer through an external attenuator (20dB) and a known loss cable. RBW is set to 1% to 5% of the OBW; video bandwidth (VBW) shall be at least three times RBW on spectrum analyzer.

Detector=Peak, Trace mode=Max hold.

Test Setup:



Measurement Uncertainty:

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor $k = 2$, $U = 936$ Hz.

Test Results:

TestMode	Antenna	Channel	OCB [MHz]	Limit[MHz]	Verdict
11B	Ant1	2412	13.227	---	---
	Ant2	2412	13.546	---	---
	Ant1	2437	13.307	---	---
	Ant2	2437	13.107	---	---
	Ant1	2462	13.147	---	---
	Ant2	2462	13.626	---	---
11G	Ant1	2412	16.783	---	---
	Ant2	2412	16.823	---	---
	Ant1	2437	16.783	---	---
	Ant2	2437	16.903	---	---
	Ant1	2462	16.663	---	---
	Ant2	2462	16.863	---	---
11N20MIMO	Ant1	2412	17.742	---	---
	Ant2	2412	17.742	---	---
	Ant1	2437	17.822	---	---
	Ant2	2437	17.822	---	---
	Ant1	2462	17.662	---	---
	Ant2	2462	17.742	---	---
11N40MIMO	Ant1	2422	35.964	---	---
	Ant2	2422	36.444	---	---
	Ant1	2437	36.284	---	---
	Ant2	2437	36.044	---	---
	Ant1	2452	36.044	---	---
	Ant2	2452	36.124	---	---
BLE_1M	Ant1	2402	1.043	---	---
		2440	1.015	---	---
		2480	1.031	---	---
BLE_2M	Ant1	2402	2.034	---	---
		2440	2.01	---	---
		2480	2.042	---	---

5.6 Band Edge Measurement

Ambient condition:

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.2kPa

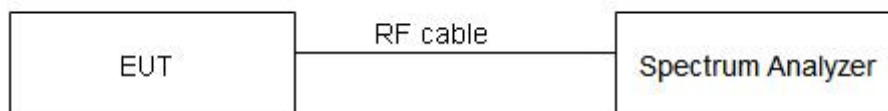
Method of Measurement:

The EUT was connected to the spectrum analyzer through an external attenuator (20dB) and a known loss cable the band edge of the lowest and highest channels were measured. The peak detector is used and RBW is set to 100 kHz and VBW is set to 300 kHz on spectrum analyzer.

Limits:

Rule Part 15.247(d) specifies that “In any 100 kHz 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 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits.

Test Setup:



Measurement Uncertainty:

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor $k = 1.96$, $U = 936 \text{ Hz}$, $2 \text{ GHz}-3 \text{ GHz} = 1.407 \text{ dB}$.

Test Results:

TestMode	Antenna	ChName	Channel	RefLevel[dBm]	Result[dBm]	Limit[dBm]	Verdict
11B	Ant1	Low	2412	5.26	-39.22	≤ -14.74	PASS
	Ant2	Low	2412	3.71	-41.23	≤ -16.29	PASS
	Ant1	High	2462	5.45	-49.15	≤ -14.55	PASS
	Ant2	High	2462	3.21	-49.36	≤ -16.79	PASS
11G	Ant1	Low	2412	2.95	-38.46	≤ -17.05	PASS
	Ant2	Low	2412	1.72	-37.59	≤ -18.28	PASS
	Ant1	High	2462	2.48	-46.67	≤ -17.52	PASS
	Ant2	High	2462	1.37	-47.54	≤ -18.63	PASS
11N20MIMO	Ant1	Low	2412	1.21	-41.72	≤ -18.79	PASS
	Ant2	Low	2412	-0.42	-37.25	≤ -20.42	PASS
	Ant1	High	2462	0.16	-46.63	≤ -19.84	PASS
	Ant2	High	2462	-0.20	-48.91	≤ -20.2	PASS
11N40MIMO	Ant1	Low	2422	-1.49	-40.96	≤ -21.49	PASS
	Ant2	Low	2422	-2.44	-39.21	≤ -22.44	PASS
	Ant1	High	2452	-1.63	-43.07	≤ -21.63	PASS
	Ant2	High	2452	-2.67	-43.26	≤ -22.67	PASS
BLE_1M	Ant1	Low	2402	1.26	-49.66	≤ -18.74	PASS
		High	2480	0.38	-48.63	≤ -19.62	PASS
BLE_2M	Ant1	Low	2402	1.07	-31.75	≤ -18.93	PASS
		High	2480	-0.60	-48.32	≤ -20.6	PASS

5.7 Maximum Power Spectral Density

Ambient condition:

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.2kPa

Method of Measurement:

During the process of the testing, The EUT was connected to Spectrum Analyzer with a known loss. The EUT is max power transmission with proper modulation. The Peak detector is used.

The conducted Power is measured at each antenna port. The measured results at the various antenna ports are then summed mathematically.

Limits:

Rule Part 15.247(e) specifies that" For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

Maximum Power Spectral Density	$\leq 8 \text{ dBm} / 3\text{kHz}$
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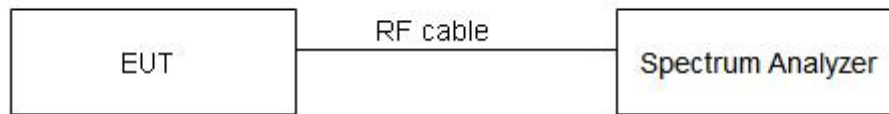
Frequency(MHz)	Antenna Gain(dBi)		Directional gain	Limit(dBm)
	Antenna 1	Antenna 2		
2412-2462	3.21	3.21	6.22	7.78

Directional gain is to be computed as follows:

transmit signals are correlated, then

Directional gain = $10 \log[(10^{G_1/20} + 10^{G_2/20} + \dots + 10^{G_N/20})^2 / N_{\text{ANT}}]$ dBi [Note the "20"s in the denominator of each exponent and the square of the sum of terms; the object is to combine the signal levels coherently.

Test Setup:



Measurement Uncertainty:

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor $k = 2$, $U = 0.75\text{dB}$.

Test Results:

TestMode	Antenna	Channel	Result [dBm/3-100kHz]	Limit[dBm/3kHz]	Verdict
11B	Ant1	2412	-8.23	≤7.78	PASS
	Ant2	2412	-8.33	≤7.78	PASS
	Ant1	2437	-7.87	≤7.78	PASS
	Ant2	2437	-7.98	≤7.78	PASS
	Ant1	2462	-7.74	≤7.78	PASS
	Ant2	2462	-8.76	≤7.78	PASS
11G	Ant1	2412	-9.98	≤7.78	PASS
	Ant2	2412	-11.07	≤7.78	PASS
	Ant1	2437	-10.86	≤7.78	PASS
	Ant2	2437	-10.46	≤7.78	PASS
	Ant1	2462	-10.79	≤7.78	PASS
	Ant2	2462	-10.67	≤7.78	PASS
11N20MIMO	Ant1	2412	-12.24	≤7.78	PASS
	Ant2	2412	-11.67	≤7.78	PASS
	total	2412	-8.94	≤7.78	PASS
	Ant1	2437	-11.38	≤7.78	PASS
	Ant2	2437	-11.25	≤7.78	PASS
	total	2437	-8.30	≤7.78	PASS
	Ant1	2462	-10.83	≤7.78	PASS
	Ant2	2462	-12.92	≤7.78	PASS
	total	2462	-8.74	≤7.78	PASS
11N40MIMO	Ant1	2422	-13.39	≤7.78	PASS
	Ant2	2422	-15.42	≤7.78	PASS
	total	2422	-11.28	≤7.78	PASS
	Ant1	2437	-15.53	≤7.78	PASS
	Ant2	2437	-14.40	≤7.78	PASS
	total	2437	-11.92	≤7.78	PASS
	Ant1	2452	-14.88	≤7.78	PASS
	Ant2	2452	-16.43	≤7.78	PASS
	total	2452	-12.58	≤7.78	PASS
BLE_1M	Ant1	2402	-15.36	≤8	PASS
		2440	-14.95	≤8	PASS
		2480	-14.56	≤8	PASS
BLE_2M	Ant1	2402	-11.10	≤8	PASS
		2440	-10.52	≤8	PASS
		2480	-11.17	≤8	PASS

Note: WIFI has MIMO function, Directional gain needs to be considered.

5.8 Spurious RF Conducted Emissions

Ambient condition:

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.2kPa

Method of Measurement:

The EUT was connected to the spectrum analyzer with a known loss. The spectrum analyzer scans from 30MHz to the 10th harmonic of the carrier. The peak detector is used. Set RBW to 100kHz and VBW to 300 kHz, Sweep is set to AUTO. The test is in transmitting mode.

Limits:

Rule Part 15.247(d) specifies that "In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power."

Test Setup:



Measurement Uncertainty:

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor $k = 1.96$.

Frequency	Uncertainty
100kHz-2GHz	0.684 dB
2GHz-26GHz	1.407 dB

Test Results:

TestMode	Antenna	Channel	FreqRange [Mhz]	RefLevel [dBm]	Result [dBm]	Limit [dBm]	Verdict
11B	Ant1	2412	Reference	3.49	3.49	---	PASS
			30~1000	3.49	-60.36	≤-16.51	PASS
			1000~26500	3.49	-48.69	≤-16.51	PASS
	Ant2	2412	Reference	0.49	0.49	---	PASS
			30~1000	0.49	-60.51	≤-19.51	PASS
			1000~26500	0.49	-49.8	≤-19.51	PASS
	Ant1	2437	Reference	2.03	2.03	---	PASS
			30~1000	2.03	-60.72	≤-17.97	PASS
			1000~26500	2.03	-48.84	≤-17.97	PASS
	Ant2	2437	Reference	1.73	1.73	---	PASS
			30~1000	1.73	-60.19	≤-18.27	PASS
			1000~26500	1.73	-49.04	≤-18.27	PASS
	Ant1	2462	Reference	2.55	2.55	---	PASS
			30~1000	2.55	-60.34	≤-17.45	PASS
			1000~26500	2.55	-48.59	≤-17.45	PASS
	Ant2	2462	Reference	1.31	1.31	---	PASS
			30~1000	1.31	-60.71	≤-18.69	PASS
			1000~26500	1.31	-49.3	≤-18.69	PASS
11G	Ant1	2412	Reference	-0.54	-0.54	---	PASS
			30~1000	-0.54	-60.33	≤-20.54	PASS
			1000~26500	-0.54	-48.57	≤-20.54	PASS
	Ant2	2412	Reference	-1.46	-1.46	---	PASS
			30~1000	-1.46	-60.37	≤-21.46	PASS
			1000~26500	-1.46	-48.91	≤-21.46	PASS
	Ant1	2437	Reference	-1.58	-1.58	---	PASS
			30~1000	-1.58	-60.59	≤-21.58	PASS
			1000~26500	-1.58	-48.91	≤-21.58	PASS
	Ant2	2437	Reference	1.41	1.41	---	PASS
			30~1000	1.41	-60.4	≤-18.59	PASS
			1000~26500	1.41	-49.18	≤-18.59	PASS
	Ant1	2462	Reference	0.43	0.43	---	PASS
			30~1000	0.43	-60.6	≤-19.57	PASS
			1000~26500	0.43	-47.89	≤-19.57	PASS
	Ant2	2462	Reference	-2.28	-2.28	---	PASS
			30~1000	-2.28	-60.34	≤-22.28	PASS
			1000~26500	-2.28	-48.28	≤-22.28	PASS
11N20MIMO	Ant1	2412	Reference	-2.13	-2.13	---	PASS
			30~1000	-2.13	-60.11	≤-22.13	PASS
			1000~26500	-2.13	-49.09	≤-22.13	PASS
	Ant2	2412	Reference	-2.13	-2.13	---	PASS
			30~1000	-2.13	-59.57	≤-22.13	PASS
			1000~26500	-2.13	-47.88	≤-22.13	PASS
	Ant1	2437	Reference	-2.87	-2.87	---	PASS
			30~1000	-2.87	-60.27	≤-22.87	PASS
			1000~26500	-2.87	-48.59	≤-22.87	PASS
	Ant2	2437	Reference	-2.73	-2.73	---	PASS
			30~1000	-2.73	-60.46	≤-22.73	PASS
			1000~26500	-2.73	-48.93	≤-22.73	PASS
	Ant1	2462	Reference	-2.16	-2.16	---	PASS
			30~1000	-2.16	-59.82	≤-22.16	PASS
			1000~26500	-2.16	-49.37	≤-22.16	PASS
	Ant2	2462	Reference	-2.99	-2.99	---	PASS
			30~1000	-2.99	-60.71	≤-22.99	PASS
			1000~26500	-2.99	-48.85	≤-22.99	PASS
11N40MIMO	Ant1	2422	Reference	-3.31	-3.31	---	PASS
			30~1000	-3.31	-60.03	≤-23.31	PASS
			1000~26500	-3.31	-48.52	≤-23.31	PASS
	Ant2	2422	Reference	-5.68	-5.68	---	PASS
			30~1000	-5.68	-60.66	≤-25.68	PASS

	Ant1	2437	1000~26500	-5.68	-48.67	≤-25.68	PASS
			Reference	-5.32	-5.32	---	PASS
			30~1000	-5.32	-60.04	≤-25.32	PASS
			1000~26500	-5.32	-48.06	≤-25.32	PASS
	Ant2	2437	Reference	-5.07	-5.07	---	PASS
			30~1000	-5.07	-60.36	≤-25.07	PASS
			1000~26500	-5.07	-48.54	≤-25.07	PASS
	Ant1	2452	Reference	-3.42	-3.42	---	PASS
			30~1000	-3.42	-60.38	≤-23.42	PASS
			1000~26500	-3.42	-48.89	≤-23.42	PASS
	Ant2	2452	Reference	-4.70	-4.70	---	PASS
			30~1000	-4.70	-60.69	≤-24.7	PASS
			1000~26500	-4.70	-49.27	≤-24.7	PASS

TestMode	Antenna	Channel	FreqRange [MHz]	RefLevel [dBm]	Result[dBm]	Limit[dBm]	Verdict
BLE_1M	Ant1	2402	Reference	-1.05	-1.05	---	PASS
			30~1000	-1.05	-59.71	≤-21.05	PASS
			1000~26500	-1.05	-48.66	≤-21.05	PASS
		2440	Reference	0.40	0.40	---	PASS
			30~1000	0.40	-60.04	≤-19.6	PASS
			1000~26500	0.40	-48.62	≤-19.6	PASS
		2480	Reference	-1.45	-1.45	---	PASS
			30~1000	-1.45	-60	≤-21.45	PASS
			1000~26500	-1.45	-48.88	≤-21.45	PASS
BLE_2M	Ant1	2402	Reference	-2.04	-2.04	---	PASS
			30~1000	-2.04	-60.27	≤-22.04	PASS
			1000~26500	-2.04	-48.53	≤-22.04	PASS
		2440	Reference	-1.36	-1.36	---	PASS
			30~1000	-1.36	-60.45	≤-21.36	PASS
			1000~26500	-1.36	-48.34	≤-21.36	PASS
		2480	Reference	-1.51	-1.51	---	PASS
			30~1000	-1.51	-60.1	≤-21.51	PASS
			1000~26500	-1.51	-48.92	≤-21.51	PASS

6. Appendix X

Test Equipment	Type/Mode	SERIAL NO.	Equipment No.	Manufacturer	Cal. Due
Communication Shielded Room 2	4m*3m*3m	CRTDSWKS R 44301	/	CRT	2027/04/22
Spectrum Analyzer	FSV40	101580	DZ-000238-3	R&S	2025/04/22
Power Meter	JS0806-2	19H9080187	DZ-000241	Tonscend	2025/04/27
Programmable DC Power Supply	E3644A	MY58036222	DZ-000178	KEYSIGHT	2025/04/11
5m Semi-Anechoic Chamber	SAC-5	SAC-5-2.0	EM-000557	COMTEST	2024/11/02
Spectrum Analyzer	N9010B	MY57470323	DZ-000174	KEYSIGHT	2025/01/02
EMI Test Receiver	N9038A-508	MY532290079	EM-000397	Agilent	2025/01/13
EMI Test Receiver	ESR7	102235	EM-000574	R&S	2025/01/13
loop antenna	HLA 6121	540046	EM-000546	TESEQ	2025/06/04
Broadband Antenna	VULB 9163	9163-530	EM-000342	SCHWARZBECK	2025/06/09
Waveguide Horn Antenna	HF906	360306/008	EM-000093	R&S	2025/01/13
Waveguide Horn Antenna	BBHA9170	00949	DZ-000209-2	SCHWARZBECK	2025/08/03
Preamplifier	BBV 9721	9721-050	DZ-000209-1	SCHWARZBECK	2025/06/02
Bandstop Filters	SW-BSF-2400-100-7-A1	/	EM-000495	/	2025/08/29
5G Bandstop Filters	WRCJV12-4900-5100-5900-6100-50EE	1	DZ-000186	WI	2024/12/03
Preamplifier	BBV 9721	9721-050	DZ-000209-1	SCHWARZBECK	2025/06/03
Temperature and humidity meter	MHO-C201	/	DZ-000249-2	Seconds test	2025/07/28
Temperature and humidity meter	MHO-C201	/	DZ-000249-5	Seconds test	2025/07/28

Dynacomm	Software Release	Software Developer
TS1120-3 Test System(Conduction test)	3.3.38	Tonscend
TS+ (5m,Radiation test)	JS32-RE 5.0.0	Tonscend

The End

Important

1. The test report is invalid without the official stamp of CVC;
2. Any part photocopies of the test report are forbidden without the written permission from CVC;
3. The test report is invalid without the signatures of Author and Reviewer;
4. The test report is invalid if altered;
5. Objections to the test report must be submitted to CVC within 15 days;
6. Generally, commission test is responsible for the tested samples only;
7. As for the test result, “—” or “ N/A” means “not applicable”, “ / ”means “not testing”, “P” means “pass” and “F” means “fail”.

Address: No.3,Tiantaiyi Road, Kaitai Avenue, Science City, Guangzhou, China (Test location)

Post Code: 510663 Tel: 020-32293888

FAX: 020 32293889 E-mail: office@cvc.org.cn