

FCC RADIO TEST REPORT

FCC ID: 2BBNO-CA701

Sample : CARPLAY

Trade Mark : N/A

Main Model : CA701

Additional Model : Additional model please refer to the page 8

Report No.: 23060629ER-62

Prepared for

Shenzhen jinnaibo Electronic Co., Ltd.
Floor 3, building L, Shasi hi tech park, Shasi Community, Shajing street,
Baoan, Shenzhen, China

Prepared by

Global United Technology Services Co. Ltd.
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Industrial Zone, Xixiang Road, Baoan District, Shenzhen, Guangdong,
China 518102

TEST RESULT CERTIFICATION

Applicant.....: Shenzhen jinnaibo Electronic Co., Ltd.
Address.....: Floor 3, building L, Shasi hi tech park, Shasi Community, Shajing street, Baoan, Shenzhen, China

Manufacturer.....: Shenzhen jinnaibo Electronic Co., Ltd.
Address.....: Floor 3, building L, Shasi hi tech park, Shasi Community, Shajing street, Baoan, Shenzhen, China

Product description

Product.....: CARPLAY
Trade Mark.....: N/A
Model Name.....: CA701, Additional model please refer to the page 8
Test Methods.....: FCC Rules and Regulations Part 15 Subpart C Section 15.247
ANSI C63.10: 2013

This device described above has been tested by Global United Technology Services Co. Ltd., and the test results show that the equipment under test (EUT) is in compliance with the FCC requirements. And it is applicable only to the tested sample identified in the report.

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Date of Test

Date (s) of performance of tests: Jun. 06, 2023 ~ Jul. 13, 2023

Date of Issue.....: Jul. 13, 2023

Test Result: Pass

Prepared By:



Date:

2023-7-13

Project Engineer

Check By:



Date:

2023-7-13

Reviewer

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1 TEST SUMMARY

1.1 TEST PROCEDURES AND RESULTS

Item	FCC Rules	Description Of Test	Result
1	FCC Part 15.207	Conducted Emission	N/A
2	FCC Part 15.209(a)	Radiated Emission	Pass
3	FCC Part 15.247(a)(2)	Occupied Bandwidth	Pass
4	FCC Part 15.247(e)	Power Spectral Density	Pass
5	FCC Part 15.247(b)	Peak Output Power	Pass
6	FCC Part 15.247(d)	Out Of Band Emissions	Pass
7	FCC Part 15.247(d)	Conducted Spurious Emission	Pass
8	FCC Part 15.203	Antenna Requirement	Pass

Note:

“N/A” denotes test is not applicable in this Test Report.

1.2 TEST FACILITY

Test Firm : Global United Technology Services Co. Ltd.
Address : No. 123-128, Tower A, Jinyuan Business Building, No.2, Laodong Industrial Zone, Xixiang Road, Baoan District, Shenzhen, Guangdong, China 518102

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

- **FCC—Registration No.: 381383**

Designation Number: CN5029

Global United Technology Services Co., Ltd., Shenzhen EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in files.

- **IC —Registration No.: 9079A**

CAB identifier: CN0091

The 3m Semi-anechoic chamber of Global United Technology Services Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing.

- **NVLAP (LAB CODE: 600179-0)**

Global United Technology Services Co., Ltd., is accredited by the National Voluntary Laboratory Accreditation Program (NVLAP).

1.3 MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement $y \pm U$, where expended uncertainty U is based on a standard uncertainty multiplied by a coverage factor of $k=2$, providing a level of confidence of approximately 95 %.

A. Conducted Measurement:

Test Site	Method	Measurement Frequency Range	U , (dB)
UNI	ANSI	9kHz ~ 150kHz	2.96
		150kHz ~ 30MHz	2.44

B. Radiated Measurement:

Test Site	Method	Measurement Frequency Range	U , (dB)
UNI	ANSI	9kHz ~ 30MHz	2.50
		30MHz ~ 1000MHz	4.80
		1000MHz ~ 18000MHz	4.13

C. RF Conducted Method:

Item	Measurement Uncertainty
Uncertainty of total RF power, conducted	$U_c = \pm 0.8$ dB
Uncertainty of RF power density, conducted	$U_c = \pm 2.6$ dB
Uncertainty of spurious emissions, conducted	$U_c = \pm 2$ %
Uncertainty of Occupied Channel Bandwidth	$U_c = \pm 2$ %

1.4 ENVIRONMENTAL CONDITIONS

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

	NORMAL CONDITIONS	EXTREME CONDITIONS
Temperature range (°C)	15 - 35	-20 - 50
Relative humidity range	20 % - 75 %	20 % - 75 %
Pressure range (kPa)	86 - 106	86 - 106

Note: The Extreme Temperature and Extreme Voltages declared by the manufacturer.

2 GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

Product:	CARPLAY
Trade Name:	N/A
Main Model:	CA701
Additional Model:	CA702, CA703, CA704, CA705, CA706, CA707, CA708, CA709, CA710, CA711, CA712, CA713, CA714, CA715, CA716, CA717, CA718, CA719, CA720, CA721, CA722, CA723, CA724, CA725, CA726, CA727, CA728, CA729, CA730, CA901, CA902, CA903, CA904, CA905, CA906, CA907, CA908, CA909, CA910, CA911, CA912, CA913, CA914, CA915, CA916, CA917, CA918, CA919, CA920, CA921, CA922, CA923, CA924, CA925, CA926, CA927, CA928, CA929, CA930, CA101, CA102, CA103, CA104, CA105, CA106, CA107, CA108, CA109, CLP1, CLP2, CLP3, CLP4, CLP5, CLP6, CLP7, CLP8, CLP9, CLP10, CLP11, CLP12, CLP13, CLP15, LY7C-B, QZ7C-S, LY9C-S, LY9C-B, CL2, AA2, LY7C-ZYZ, QZ7C-01, QZ7C-02, QZ7C-03, QZ7C-05, QZ7C-06, QZ7C-07, QZ7C-08, QZ7C-09, T76, T96, A7, A9, S7, S9, J704, J706, J708, J710, J901, J904, D100, D200, D300, D400, D500, D600, D700, D800, D900
Model Difference:	All model's the function, software and electric circuit are the same, only with a product color and model named different. Test sample model: CA701.
Operation Frequency:	2402MHz~2480MHz
Number of Channels:	40CH
RF Output Power:	-1.079 dBm
Field Strength of Fundamental:	94.81dBuV/m
Modulation Type:	GFSK
Antenna Type:	PCB Antenna
Antenna Gain:	-4.96dBi
Battery:	N/A
Adapter:	N/A
Power Source:	DC 9-26V from car charger

2.2 CARRIER FREQUENCY OF CHANNELS

Channel List							
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
00	2402	10	2422	20	2442	30	2462
01	2404	11	2424	21	2444	31	2464
02	2406	12	2426	22	2446	32	2466
03	2408	13	2428	23	2448	33	2468
04	2410	14	2430	24	2450	34	2470
05	2412	15	2432	25	2452	35	2472
06	2414	16	2434	26	2454	36	2474
07	2416	17	2436	27	2456	37	2476
08	2418	18	2438	28	2458	38	2478
09	2420	19	2440	29	2460	39	2480

2.3 TEST MODE

The EUT was programmed to be in continuously transmitting mode.

No.	Test Mode Description
1	Low channel TX
2	Middle channel TX
3	High channel TX

Note: 1. For Radiated Emission, 3axis were chosen for testing for each applicable mode.
 2. For Conducted Test method, at temporary antenna connector is provided by the manufacturer.

2.4 DESCRIPTION OF THE TEST MODES

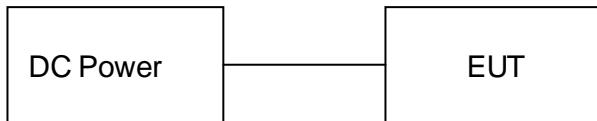
During the measurement the environmental conditions were within the listed ranges:

Voltage	Normal Voltage	DC 24V
	High Voltage	DC 26.4V
	Low Voltage	DC 21.6V
Other	Normal Temperature	24°C
	Relative Humidity	55 %
	Air Pressure	989 hPa

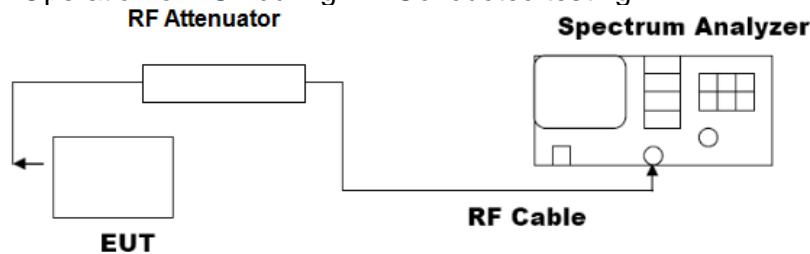
Note: All modes were test at Normal Voltage, High Voltage, and Low Voltage, only the worst results of Normal Voltage was reported in the test report.

2.5 TEST SETUP

Operation of EUT during Radiation testing:



Operation of EUT during RF Conducted testing:



2.6 DESCRIPTION TEST PERIPHERAL AND EUT PERIPHERAL

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.

Item	Equipment	Model No.	Cable Length(cm)	Remark
1	CARPLAY	CA701	--	EUT
2	Battery	--	--	AE

Note:

1. The support equipment was authorized by Declaration of Confirmation.
2. All the above equipment/cables were placed in worse case positions to maximize emission signals during emission test.

2.7 MEASUREMENT INSTRUMENTS LIST

Conducted Emission						
Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal.Date (mm-dd-yy)	Cal.Due date (mm-dd-yy)
1	Shielding Room	ZhongYu Electron	7.3(L)x3.1(W)x2.9(H)	GTS252	July 12, 2022	July 11, 2027
2	EMI Test Receiver	R&S	ESCI 7	GTS552	April 14, 2023	April 13, 2024
3	LISN	ROHDE & SCHWARZ	ENV216	GTS226	April 14, 2023	April 13, 2024
4	Coaxial Cable	GTS	N/A	GTS227	N/A	N/A
5	EMI Test Software	AUDIX	E3	N/A	N/A	N/A
6	Thermo meter	JINCHUANG	GSP-8A	GTS642	April 19, 2023	April 18, 2024
7	Absorbing clamp	Elektronik-Feinmechanik	MDS21	GTS229	April 14, 2023	April 13, 2024
8	ISN	SCHWARZBECK	NTFM 8158	GTS565	April 14, 2023	April 13, 2024
9	High voltage probe	SCHWARZBECK	TK9420	GTS537	April 14, 2023	April 13, 2024
10	Antenna end assembly	Weinschel	1870A	GTS560	April 14, 2023	April 13, 2024

Radiated Emission:						
Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal.Date (mm-dd-yy)	Cal.Due date (mm-dd-yy)
1	3m Semi-Anechoic Chamber	ZhongYu Electron	9.2(L)*6.2(W)* 6.4(H)	GTS250	June 23, 2021	June 22, 2024
2	Control Room	ZhongYu Electron	6.2(L)*2.5(W)* 2.4(H)	GTS251	N/A	N/A
3	EMI Test Receiver	Rohde & Schwarz	ESU26	GTS203	April 14, 2023	April 13, 2024
4	BiConiLog Antenna	SCHWARZBECK MESS-ELEKTRONIK	VULB9168	GTS640	March 19, 2023	March 18, 2025
5	Double -ridged waveguide horn	SCHWARZBECK MESS-ELEKTRONIK	BBHA 9120 D	GTS208	April 17, 2023	April 16, 2025
6	EMI Test Software	AUDIX	E3	N/A	N/A	N/A
7	Coaxial Cable	GTS	N/A	GTS213	April 21, 2023	April 20, 2024
8	Coaxial Cable	GTS	N/A	GTS211	April 21, 2023	April 20, 2024
9	Coaxial cable	GTS	N/A	GTS210	April 21, 2023	April 20, 2024
10	Coaxial Cable	GTS	N/A	GTS212	April 21, 2023	April 20, 2024
11	Wideband Radio Communication Tester	Rohde & Schwarz	CMW500	GTS575	April 14, 2023	April 13, 2024
12	Loop Antenna	ZHINAN	ZN30900A	GTS534	Nov. 29, 2022	Nov. 28, 2023
13	Broadband Preamplifier	SCHWARZBECK	BBV9718	GTS535	April 14, 2023	April 13, 2024
14	Amplifier(1GHz-26.5GHz)	HP	8449B	GTS601	April 14, 2023	April 13, 2024
15	Horn Antenna (18-26.5GHz)	/	UG-598A/U	GTS664	Oct. 30, 2022	Oct. 29, 2023
16	Horn Antenna (26.5-40GHz)	AH Systems	SAS-573	GTS665	Oct. 30, 2022	Oct. 29, 2023
17	FSV-Signal Analyzer (10Hz-40GHz)	Keysight	FSV-40-N	GTS666	March 13, 2023	March 12, 2024
18	Amplifier	/	LNA-1000-30S	GTS650	April 14, 2023	April 13, 2024
19	CDNE M2+M3-16A	HCT	30MHz-300MHz	GTS668	Dec. 20, 2022	Dec.19, 2023
20	Thermo meter	JINCHUANG	GSP-8A	GTS643	April 19, 2023	April 18, 2024

RF Conducted Test:						
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Cal.Date (mm-dd-yy)	Cal.Due date (mm-dd-yy)
1	MXA Signal Analyzer	Agilent	N9020A	GTS566	April 14, 2023	April 13, 2024
2	EMI Test Receiver	R&S	ESCI 7	GTS552	April 14, 2023	April 13, 2024
3	PSA Series Spectrum Analyzer	Agilent	E4440A	GTS536	April 14, 2023	April 13, 2024
4	MXG vector Signal Generator	Agilent	N5182A	GTS567	April 14, 2023	April 13, 2024
5	ESG Analog Signal Generator	Agilent	E4428C	GTS568	April 14, 2023	April 13, 2024
6	USB RF Power Sensor	DARE	RPR3006W	GTS569	April 14, 2023	April 13, 2024
7	RF Switch Box	Shongyi	RFSW3003328	GTS571	April 14, 2023	April 13, 2024
8	Programmable Constant Temp & Humi Test Chamber	WEWON	WHTH-150L-40-880	GTS572	April 14, 2023	April 13, 2024
9	Thermo meter	JINCHUANG	GSP-8A	GTS641	April 19, 2023	April 18, 2024

3 CONDUCTED EMISSION

3.1 TEST LIMIT

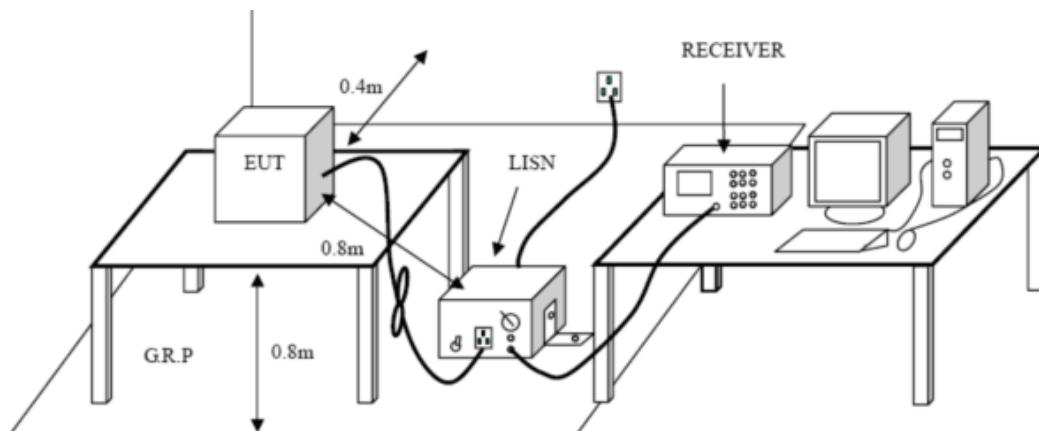
For unintentional device, according to § 15.207(a) Line Conducted Emission Limits is as following

Frequency (MHz)	Maximum RF Line Voltage (dB V)			
	CLASS A		CLASS B	
	Q.P.	Ave.	Q.P.	Ave.
0.15~0.50	79	66	66~56*	56~46*
0.50~5.00	73	60	56	46
5.00~30.0	73	60	60	50

* Decreasing linearly with the logarithm of the frequency.

For intentional device, according to §15.207(a) Line Conducted Emission Limit is same as above table.

3.2 TEST SETUP



3.3 TEST PROCEDURE

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

3.4 TEST RESULT

N/A

Remark:

The EUT is powered by DC power.

4 RADIATED EMISSION

4.1 TEST LIMIT

For unintentional device, according to §15.209(a), except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values:

Frequency	Field strength (microvolt/meter)	Limit (dBuV/m)	Remark	Measurement distance (m)
0.009MHz-0.490MHz	2400/F (kHz)	-	Quasi-peak	300
0.490MHz-1.705MHz	24000/F (kHz)	-	Quasi-peak	30
1.705MHz-30MHz	30	-	Quasi-peak	30
30MHz-88MHz	100	40.0	Quasi-peak	3
88MHz-216MHz	150	43.5	Quasi-peak	3
216MHz-960MHz	200	46.0	Quasi-peak	3
960MHz-1GHz	500	54.0	Quasi-peak	3
Above 1GHz	500	54.0	Average	3
		74.0	Peak	3

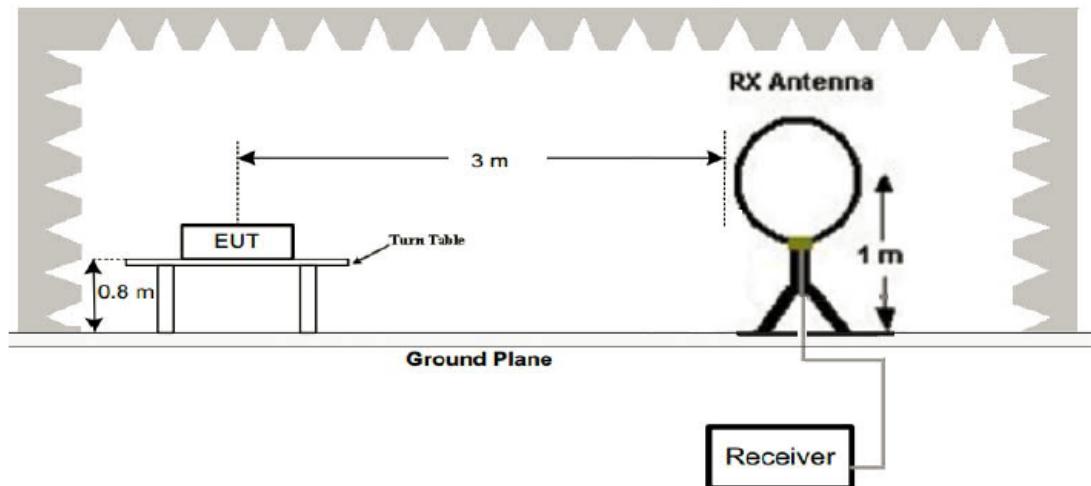
Limit calculation and transfer to 3m distance as showed in the following table:

Frequency (MHz)	Limit (dBuV/m)	Distance (m)
0.009-0.490	$20\log(2400/F(\text{kHz}))+40\log(300/3)$	3
0.490-1.705	$20\log(24000/F(\text{kHz}))+40\log(30/3)$	3
1.705-30.0	69.5	3
30-88	40.0	3
88-216	43.5	3
216-960	46.0	3
Above 960	54.0	3

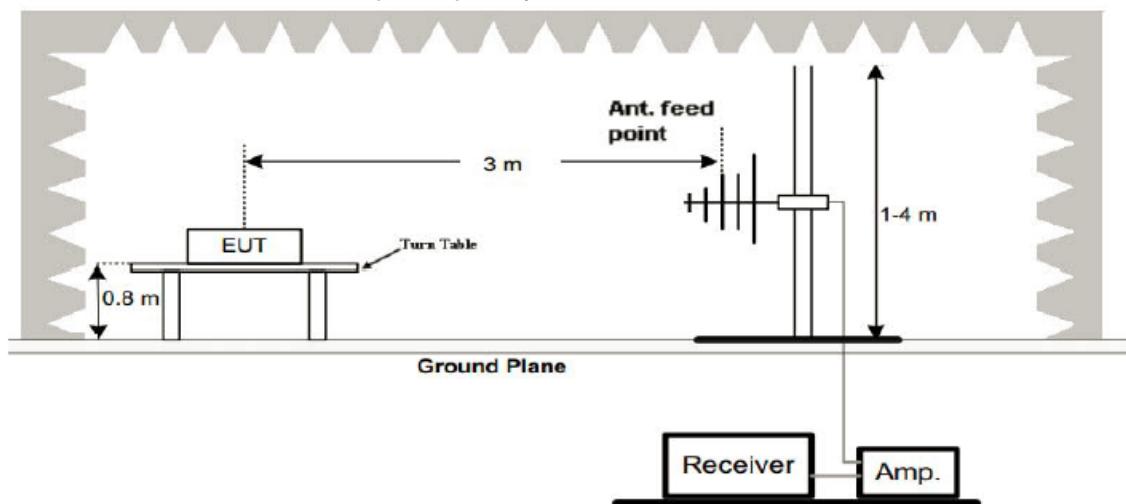
For intentional device, according to §15.209(a), the general requirement of field strength of radiated emissions from intentional radiators at a distance of 3 meters shall not exceed the above table.

4.2 TEST SETUP

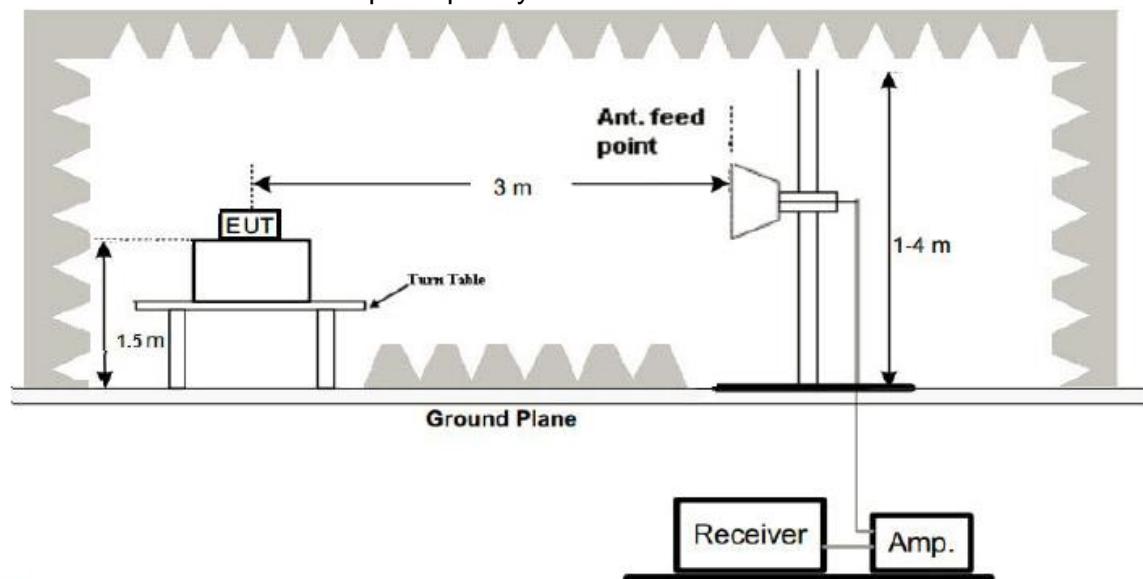
1. Radiated Emission Test-Up Frequency Below 30MHz



2. Radiated Emission Test-Up Frequency 30MHz~1GHz



3. Radiated Emission Test-Up Frequency Above 1GHz



4.3 TEST PROCEDURE

1. Below 1GHz measurement the EUT is placed on turntable which is 0.8m above ground plane. And above 1GHz measurement EUT was placed on low permittivity and low tangent turn table which is 1.5m above ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
6. Repeat above procedures until the measurements for all frequencies are complete.
7. The test frequency range from 9kHz to 25GHz per FCC PART 15.33(a).

Note: For battery operated equipment, the equipment tests shall be performed using a new battery.

4.4 TEST RESULT

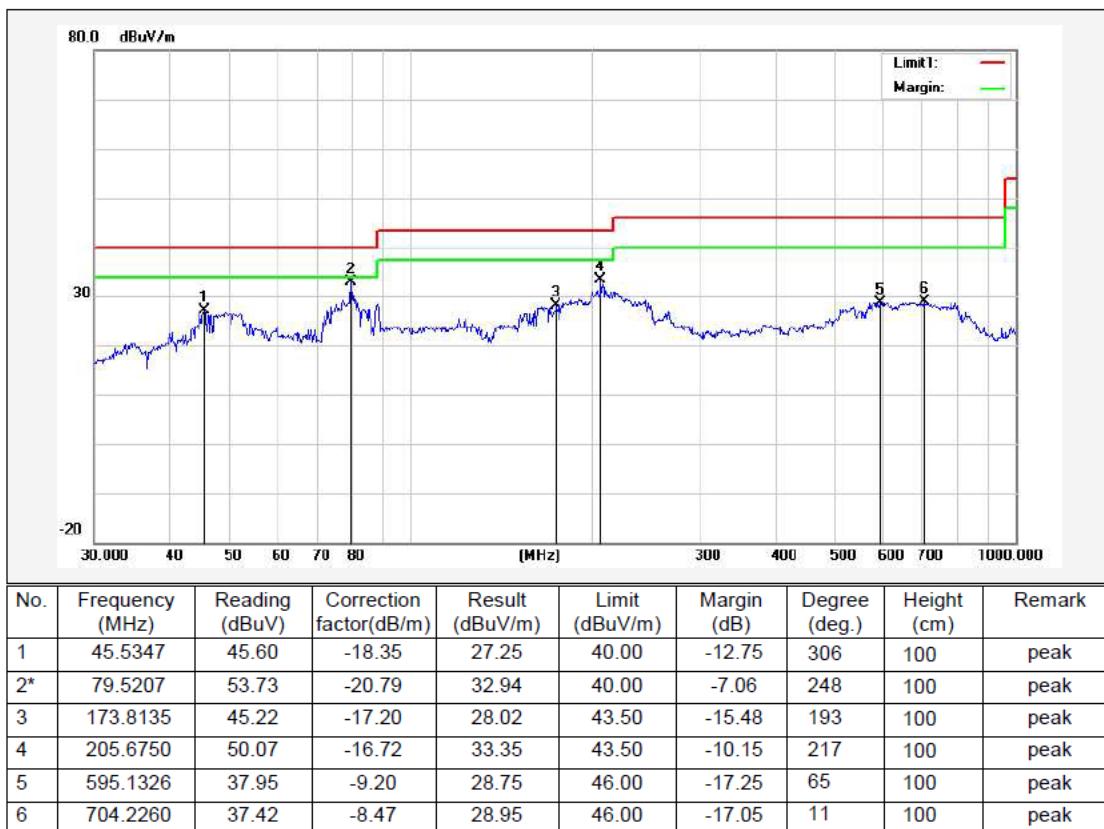
PASS

Remark:

1. All modes were test at Low, Middle, and High channel, only the worst result of GFSK Low Channel was reported for below 1GHz test.
2. By preliminary testing and verifying three axis (X, Y and Z) position of EUT transmitted status, it was found that "X axis" position was the worst, and test data recorded in this report.
3. Radiated emission test from 9kHz to 10th harmonic of fundamental was verified, and no emission found except system noise floor in 9kHz to 30MHz and not recorded in this report.

Below 1GHz Test Results:

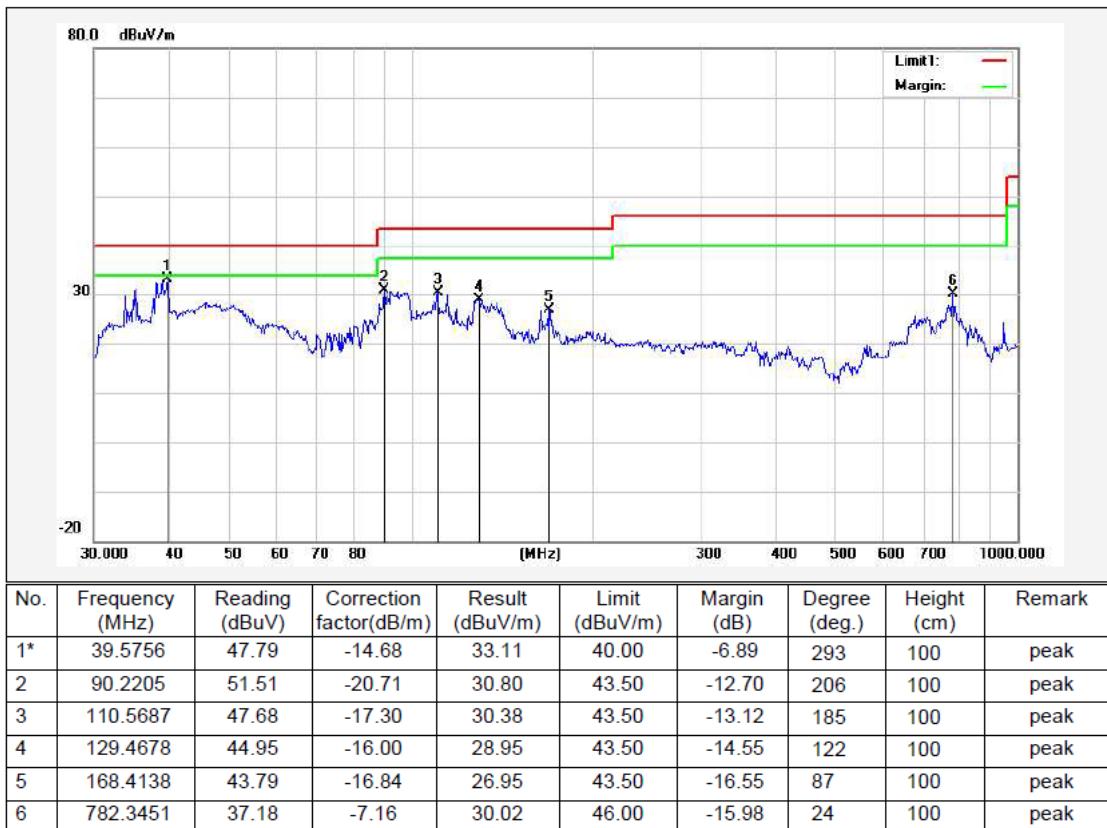
Temperature:	24°C	Relative Humidity:	48%
Test Date:	Jun. 13, 2023	Pressure:	1010hPa
Test Voltage:	DC 26V	Phase:	Horizontal
Test Mode:	Transmitting mode of GFSK 2402MHz		



Remark: Result = Reading Level + Factor, Margin = Result – Limit

Factor = Ant. Factor + Cable Loss – Pre-amplifier

Temperature:	24°C	Relative Humidity:	48%
Test Date:	Jun. 13, 2023	Pressure:	1010hPa
Test Voltage:	DC 26V	Phase:	Vertical
Test Mode:	Transmitting mode of GFSK 2402MHz		



Remark: Result = Reading Level + Factor, Margin = Result – Limit
 Factor = Ant. Factor + Cable Loss – Pre-amplifier

Remark:

1. Measuring frequencies from 9 kHz to the 1 GHz, Radiated emission test from 9kHz to 30MHz was verified, and no any emission was found except system noise floor.
2. * denotes emission frequency which appearing within the Restricted Bands specified in provision of 15.205, then the general radiated emission limits in 15.209 apply.
3. The IF bandwidth of EMI Test Receiver between 30MHz to 1GHz was 120kHz, 1 MHz for measuring above 1 GHz, below 30MHz was 10kHz.

Above 1 GHz Test Results:
CH00 (2402MHz)

Horizontal:

Frequency (MHz)	Reading Result (dB μ V)	Factor (dB)	Emission Level (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)	Detector Type
4804	49.17	-3.64	45.53	74	-28.47	PK
4804	38.38	-3.64	34.74	54	-19.26	AV
7206	44.07	-0.95	43.12	74	-30.88	PK
7206	34.63	-0.95	33.68	54	-20.32	AV

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Margin = Emission Level – Limit

Vertical:

Frequency (MHz)	Reading Result (dB μ V)	Factor (dB)	Emission Level (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)	Detector Type
4804	49.93	-3.64	46.29	74	-27.71	PK
4804	36.84	-3.64	33.2	54	-20.8	AV
7206	45.41	-0.95	44.46	74	-29.54	PK
7206	34.32	-0.95	33.37	54	-20.63	AV

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Margin = Emission Level – Limit

CH19 (2440MHz)

Horizontal:

Frequency (MHz)	Reading Result (dB μ V)	Factor (dB)	Emission Level (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)	Detector Type
4880	46.91	-3.51	43.4	74	-30.6	PK
4880	37.52	-3.51	34.01	54	-19.99	AV
7320	45.68	-0.82	44.86	74	-29.14	PK
7320	33.04	-0.82	32.22	54	-21.78	AV

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Margin = Emission Level – Limit

Vertical:

Frequency (MHz)	Reading Result (dB μ V)	Factor (dB)	Emission Level (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)	Detector Type
4880	48.84	-3.51	45.33	74	-28.67	PK
4880	37.93	-3.51	34.42	54	-19.58	AV
7320	45.37	-0.82	44.55	74	-29.45	PK
7320	33.61	-0.82	32.79	54	-21.21	AV

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Margin = Emission Level – Limit

CH39 (2480MHz)

Horizontal:

Frequency (MHz)	Reading Result (dB μ V)	Factor (dB)	Emission Level (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)	Detector Type
4960	48.08	-3.43	44.65	74	-29.35	PK
4960	37.36	-3.43	33.93	54	-20.07	AV
7440	45.18	-0.75	44.43	74	-29.57	PK
7440	33.02	-0.75	32.27	54	-21.73	AV

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Margin = Emission Level – Limit

Vertical:

Frequency (MHz)	Reading Result (dB μ V)	Factor (dB)	Emission Level (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)	Detector Type
4960	48.04	-3.43	44.61	74	-29.39	PK
4960	37.37	-3.43	33.94	54	-20.06	AV
7440	45.05	-0.75	44.3	74	-29.7	PK
7440	33.03	-0.75	32.28	54	-21.72	AV

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Margin = Emission Level – Limit

Remark:

1. Measuring frequencies from 1 GHz to the 25 GHz.
2. "F" denotes fundamental frequency; "H" denotes spurious frequency. "E" denotes band edge frequency.
3. * denotes emission frequency which appearing within the Restricted Bands specified in provision of 15.205, then the general radiated emission limits in 15.209 apply.
4. Data of measurement within this frequency range shown "---" in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
5. The IF bandwidth of EMI Test Receiver between 30MHz to 1GHz was 120kHz, 1 MHz for measuring above 1 GHz, below 30MHz was 10kHz. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 3MHz for peak measurement with peak detector at frequency above 1GHz. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 10Hz for Average measurement with peak detection at frequency above 1GHz.
6. When the test results of Peak Detected below the limits of Average Detected, the Average Detected is not need completed. For example: Top Channel at Fundamental 73.16dB_{uV/m}(PK Value) <93.98(AV Limit), at harmonic 53.20 dB_{uV/m}(PK Value) <54 dB_{uV/m}(AV Limit), the Average Detected not need to completed.
7. For fundamental frequency, $RBW > 20\text{dB BW}$, $VBW = 3 \times RBW$, PK detector for PK value, AV detector for AV value.

Band Edge:

Operation Mode: TX CH00 (2402MHz)

Horizontal:

Frequency (MHz)	Reading Result (dB μ V)	Factor (dB)	Emission Level (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)	Detector Type
2310	46.24	-5.81	40.43	74	-33.57	
2310	/	-5.81	/	54	/	AV
2390	46.39	-5.84	40.55	74	-33.45	PK
2390	/	-5.84	/	54	/	AV
2400	46.02	-5.84	40.18	74	-33.82	PK
2400	/	-5.84	/	54	/	AV

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.

Vertical:

Frequency (MHz)	Reading Result (dB μ V)	Factor (dB)	Emission Level (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)	Detector Type
2310	45.95	-5.81	40.14	74	-33.86	
2310	/	-5.81	/	54	/	AV
2390	46.01	-5.84	40.17	74	-33.83	PK
2390	/	-5.84	/	54	/	AV
2400	46.26	-5.84	40.42	74	-33.58	PK
2400	/	-5.84	/	54	/	AV

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.

Operation Mode: TX CH39 (2480MHz)

Horizontal:

Frequency (MHz)	Reading Result (dB μ V)	Factor (dB)	Emission Level (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)	Detector Type
2483.5	44.85	-5.65	39.2	74	-34.8	PK
2483.5	/	-5.65	/	54	/	AV
2500	45.93	-5.72	40.21	74	-33.79	PK
2500	/	-5.72	/	54	/	AV

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.

Vertical:

Frequency (MHz)	Reading Result (dB μ V)	Factor (dB)	Emission Level (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)	Detector Type
2483.5	46.38	-5.65	40.73	74	-33.27	PK
2483.5	/	-5.65	/	54	/	AV
2500	45.84	-5.72	40.12	74	-33.88	PK
2500	/	-5.72	/	54	/	AV

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.

5 6dB BANDWIDTH

5.1 TEST LIMIT

FCC Part15(15.247), Subpart C				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247(a)(2)	Bandwidth	$\geq 500\text{KHz}$ (6dB bandwidth)	2400-2483.5	PASS

5.2 TEST PROCEDURE

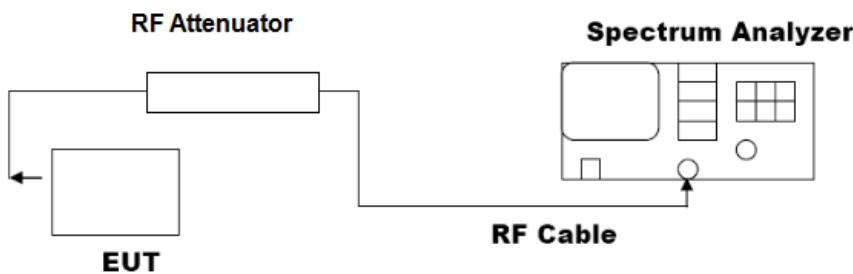
5.2.1 6dB BANDWIDTH MEASUREMENT PROCEDURE

1. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
2. Set the EUT Work on the top, the middle and the bottom operation frequency individually.
3. Set SPA Centre Frequency = Operation Frequency, RBW= 100 KHz, VBW $\geq 3\times$ RBW.
4. Set SPA Trace 1 Max hold, then View.

5.2.2 99% OCCUPIED BANDWIDTH

1. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
2. Set the EUT Work on the top, the middle and the bottom operation frequency individually.
3. Set Span = approximately 1.5 to 5 times the OBW, centered on a nominal channel
The nominal IF filter bandwidth (3 dB RBW) shall be in the range of 1% to 5% of the OBW and video bandwidth (VBW) shall be approximately three times RBW; Sweep = auto; Detector function = peak
4. Set SPA Trace 1 Max hold, then View.

5.3 TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)



5.4 MEASUREMENT EQUIPMENT USED

The same as described in section 2.7.

5.5 TEST RESULT

PASS

GFSK Modulation:

Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Result
CH00	2402	0.652	PASS
CH19	2440	0.654	PASS
CH39	2480	0.650	PASS

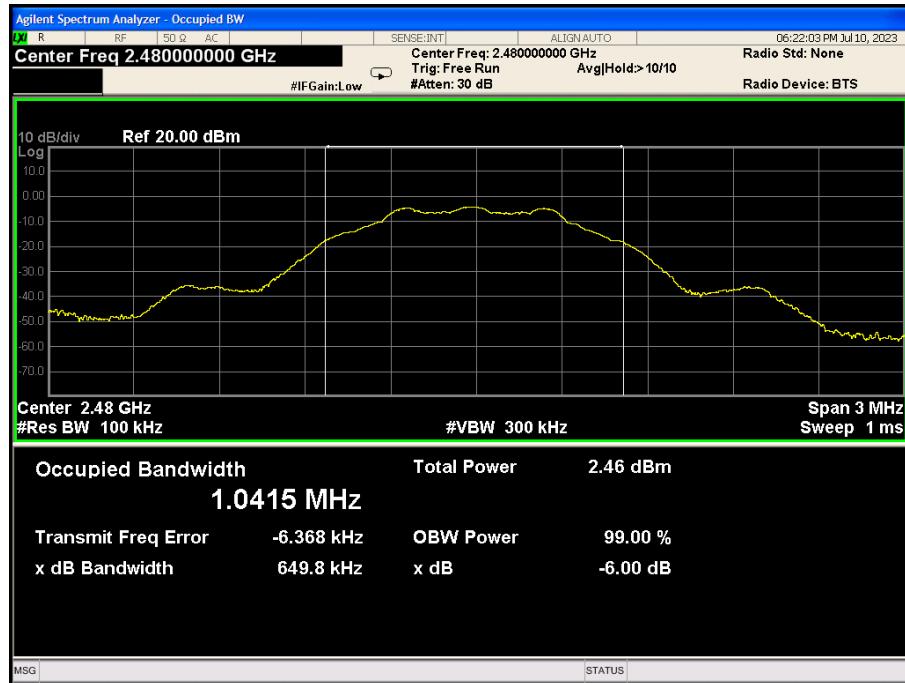
CH00: 2402MHz



CH19: 2440MHz



CH39: 2480MHz



6 POWER SPECTRAL DENSITY

6.1 TEST LIMIT

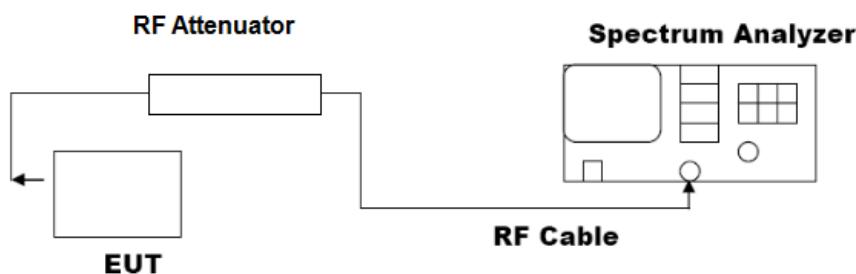
FCC Part15(15.247), Subpart C				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247	Power Spectral Density	8 dBm (in any 3kHz)	2400-2483.5	PASS

6.2 TEST PROCEDURE

- (1) Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
- (2) Set the EUT Work on the top, the middle and the bottom operation frequency individually.
- (3) Set SPA Trace 1 Max hold, then View.

Note: The method of AVGPSD-1 in the ANSI C63.10 (2013) item 11.10 was used in this testing.

6.3 TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)



6.4 EQUIPMENT USED

The same as described in section 2.7.

6.5 TEST RESULT

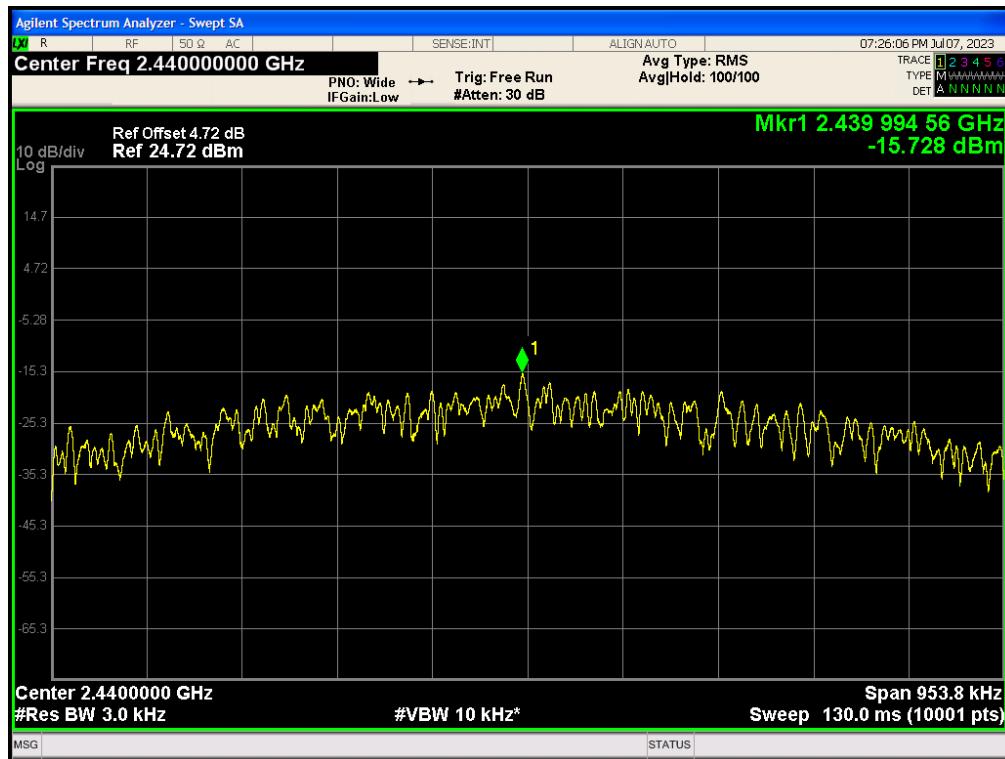
PASS

Channel No.	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Result
Low Channel	-15.589	8	Pass
Middle Channel	-15.728	8	Pass
High Channel	-17.062	8	Pass

TEST PLOT OF SPECTRAL DENSITY FOR LOW CHANNEL



TEST PLOT OF SPECTRAL DENSITY FOR MIDDLE CHANNEL



TEST PLOT OF SPECTRAL DENSITY FOR HIGH CHANNEL



7 PEAK OUTPUT POWER

7.1 TEST LIMIT

FCC Part15(15.247), Subpart C				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247(b)(3)	Peak Output Power	1 watt or 30dBm	2400-2483.5	PASS

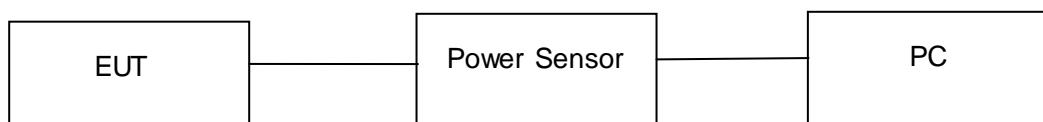
7.2 TEST PROCEDURE

For average power test:

1. Connect EUT RF output port to power sensor through an RF attenuator.
2. Connect the power sensor to the PC.
3. Set the EUT Work on the top, the middle and the bottom operation frequency individually.
4. Record the maximum power from the software.

Note: The EUT was tested according to ANSI C63.10 (2013) for compliance to FCC 47CFR 15.247 requirements.

7.3 TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)



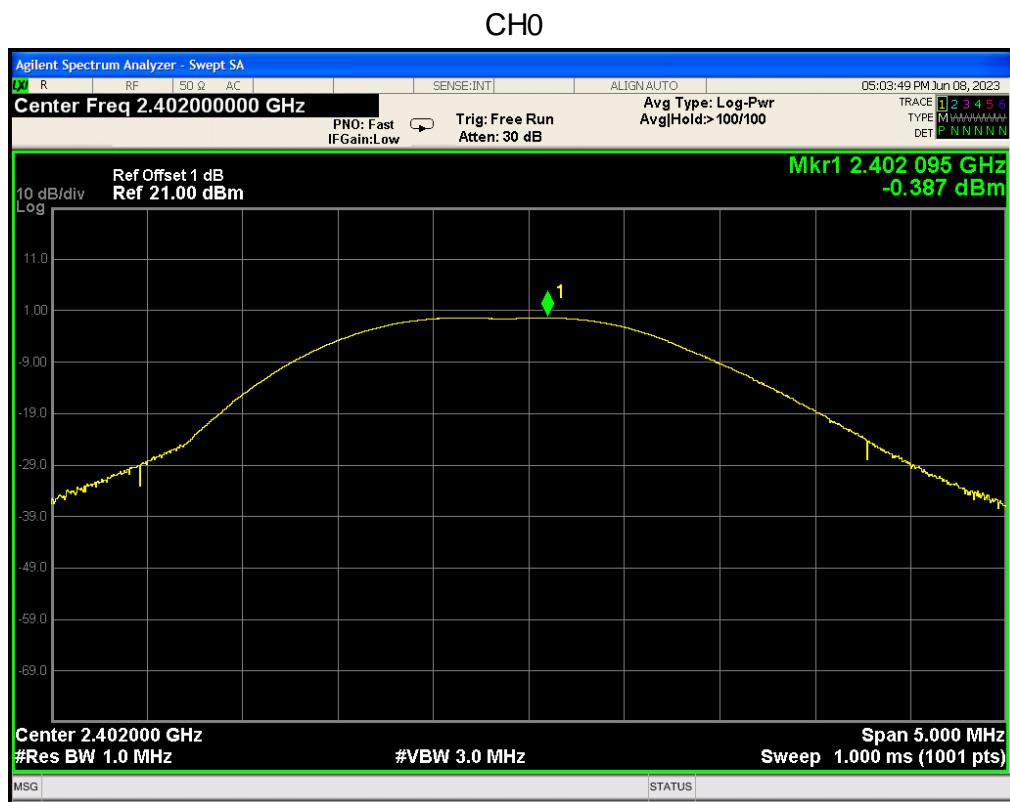
7.4 EQUIPMENT USED

The same as described in section 2.7.

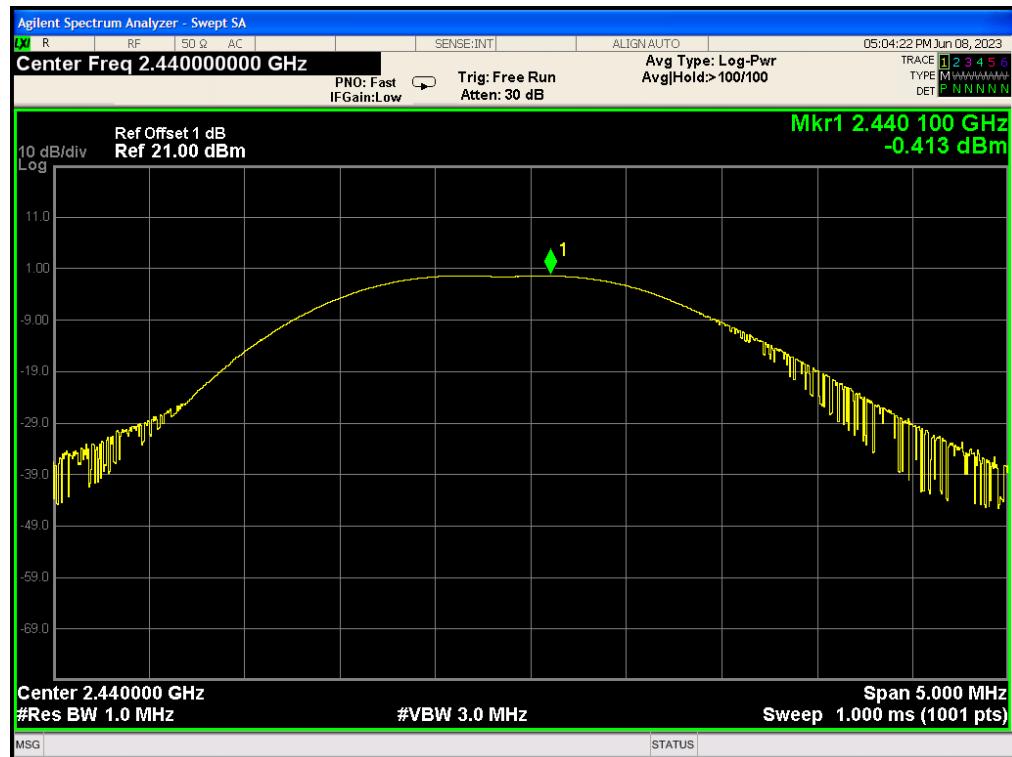
7.5 TEST RESULT

PASS

PEAK OUTPUT POWER MEASUREMENT RESULT FOR GFSK MODULATION			
Frequency (GHz)	Peak Power (dBm)	Applicable Limits (dBm)	Result
2.402	-0.387	30	Pass
2.440	-0.413	30	Pass
2.480	-1.923	30	Pass



CH19



CH39



8 CONDUCTED SPURIOUS EMISSION

8.1 MEASUREMENT PROCEDURE

1. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
2. Set the EUT Work on the top, the middle and the bottom operation frequency individually.
3. Set SPA Trace 1 Max hold, then View.

Note: The EUT was tested according to ANSI C63.10 for compliance to RSS-247 requirements.

8.2 TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)

The same as described in section 3.1.

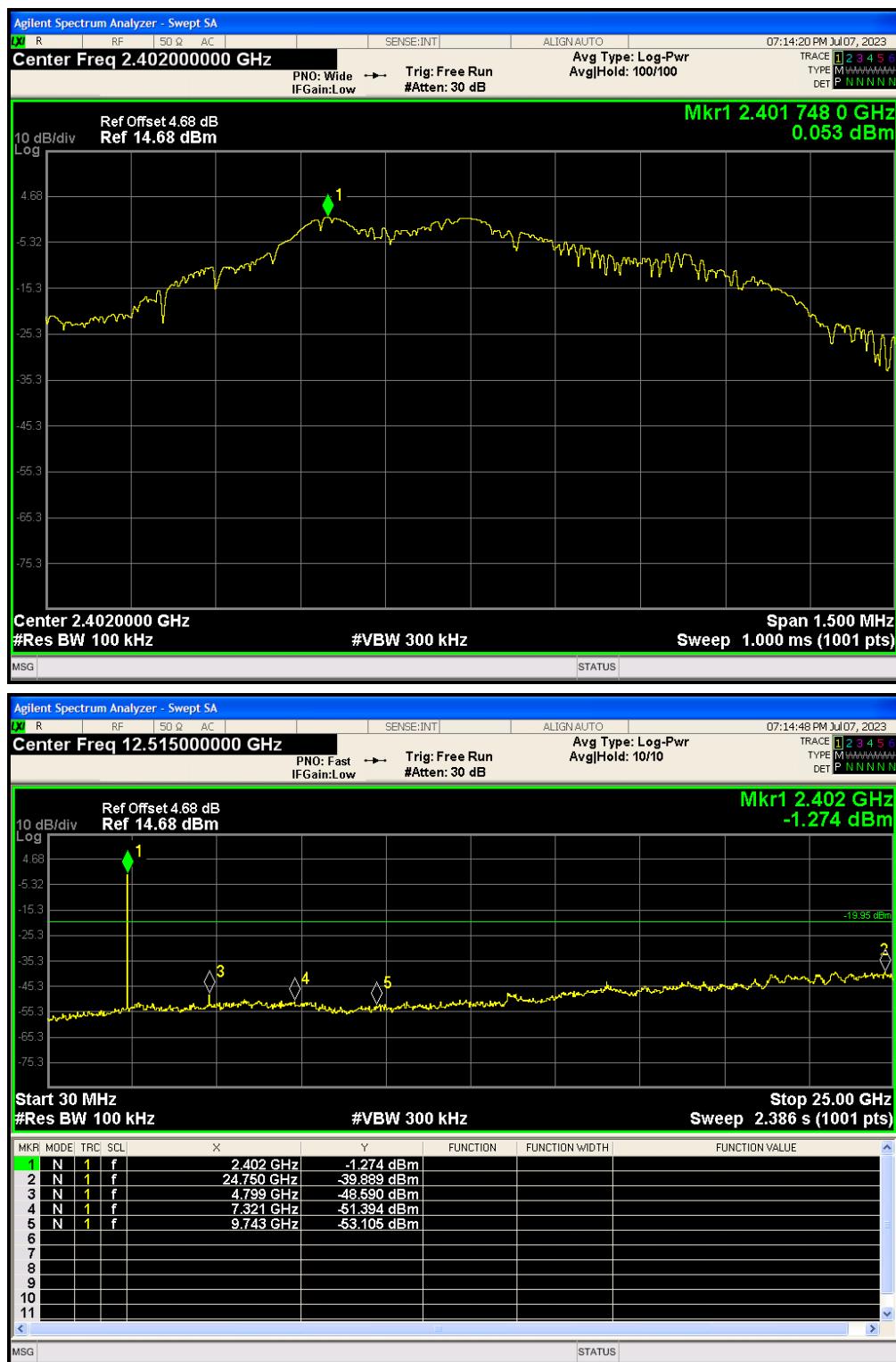
8.3 MEASUREMENT EQUIPMENT USED

The same as described in section 3.4.

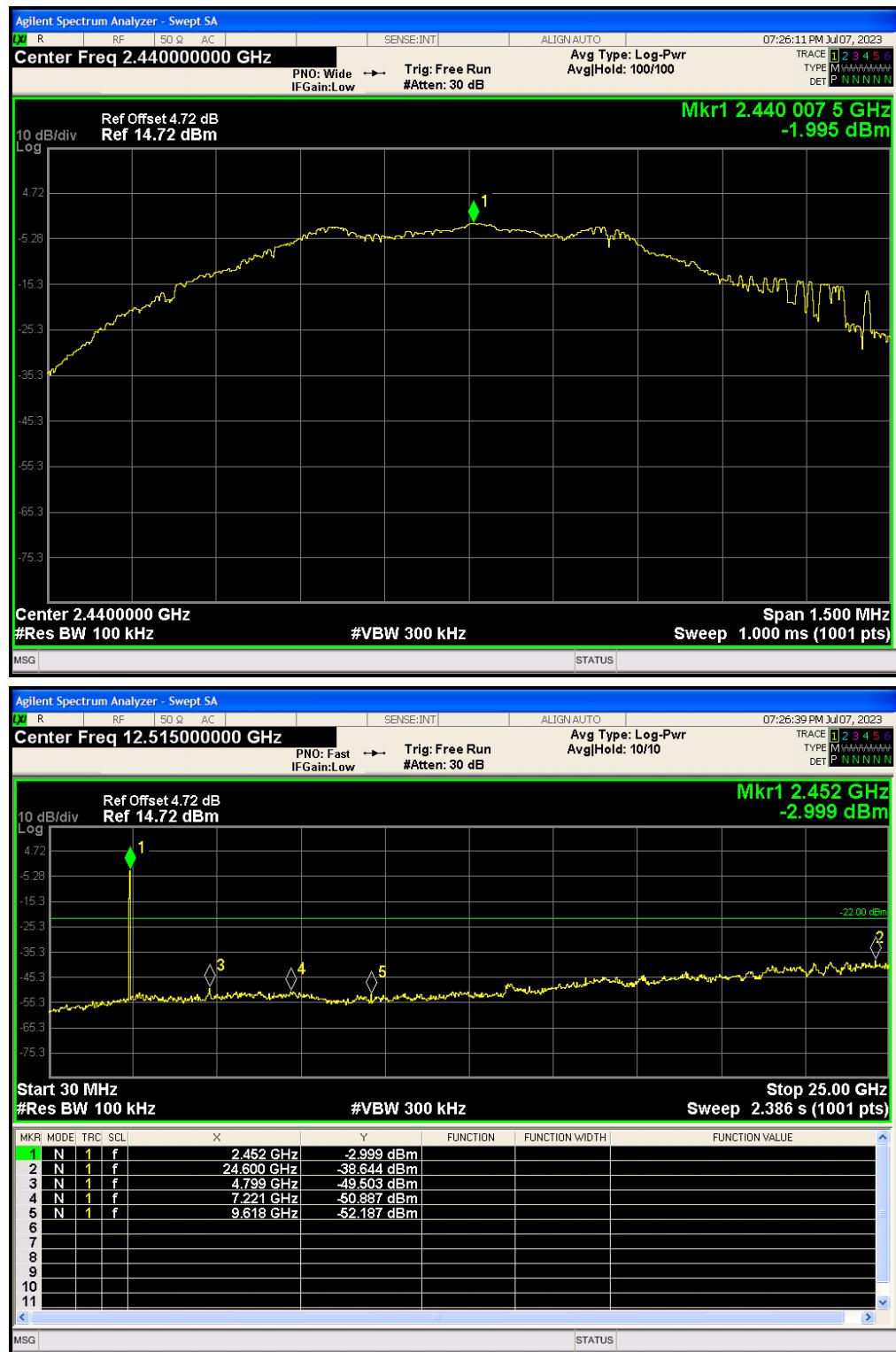
8.4 LIMITS AND MEASUREMENT RESULT

LIMITS AND MEASUREMENT RESULT		
Applicable Limits	Measurement Result	
	Test Data	Result
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 100KHz bandwidth within the band that contains the highest level of the desired power.	At least -20dBc than the reference level	PASS

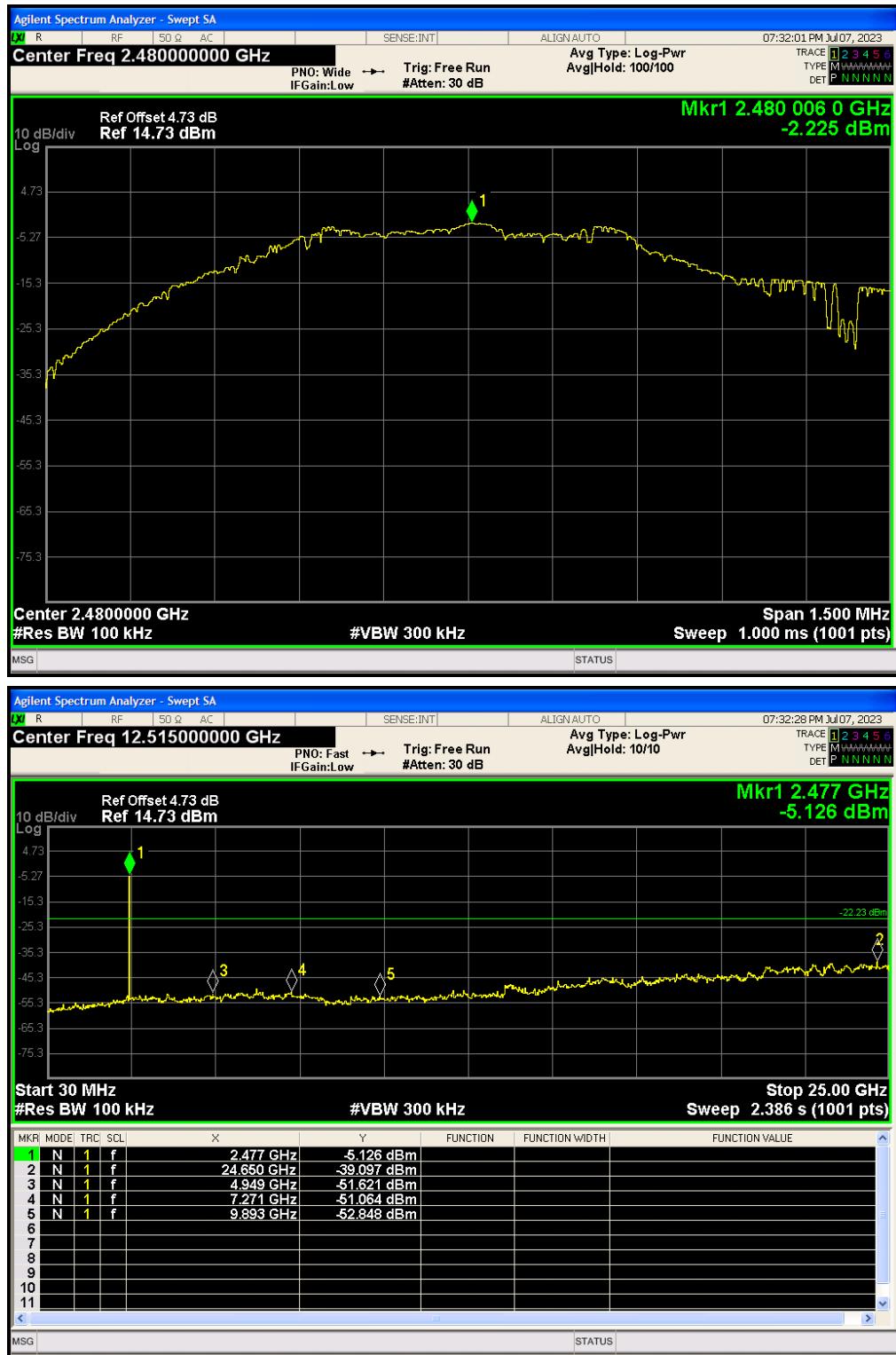
TEST RESULT FOR ENTIRE FREQUENCY RANGE
LOW CHANNEL



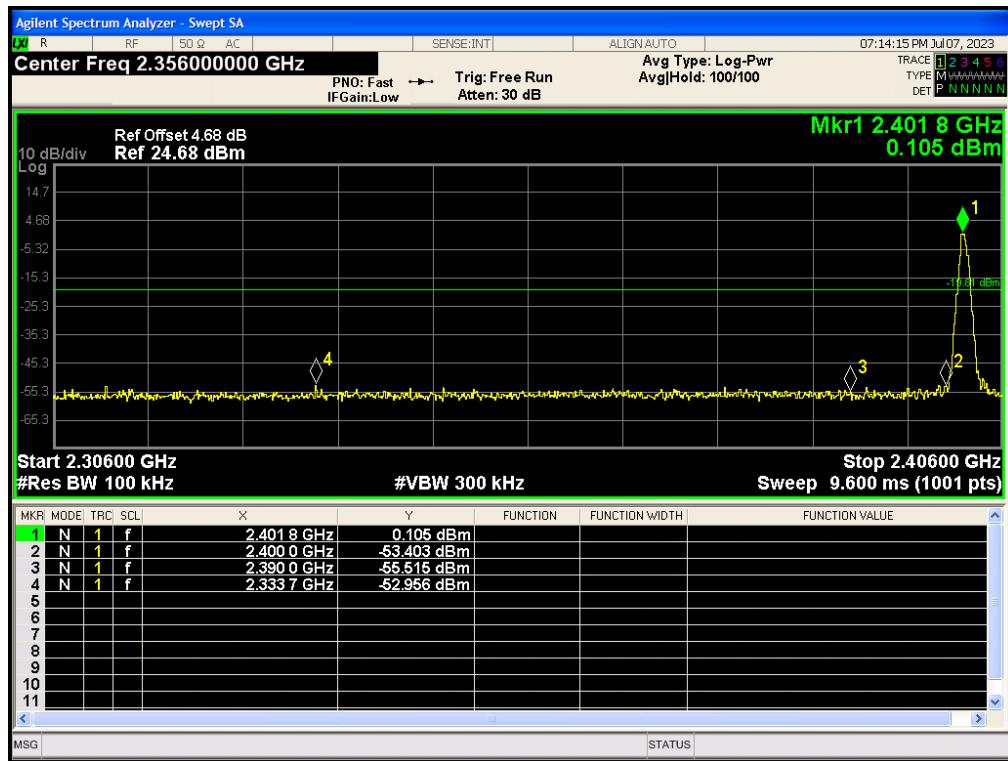
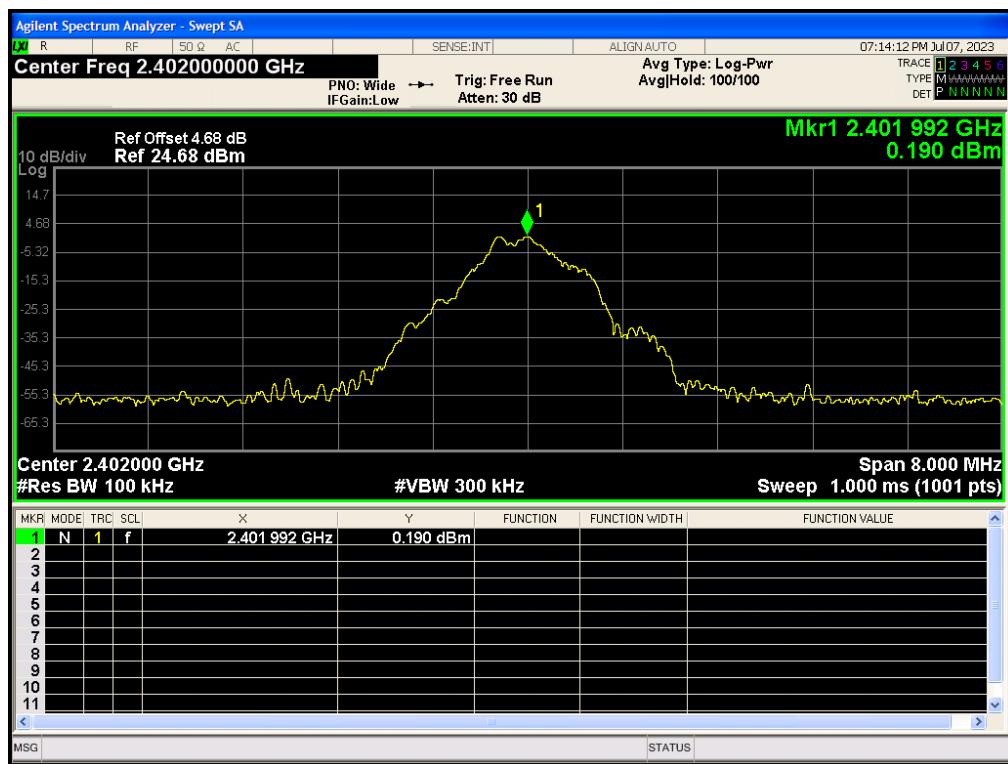
MIDDLE CHANNEL



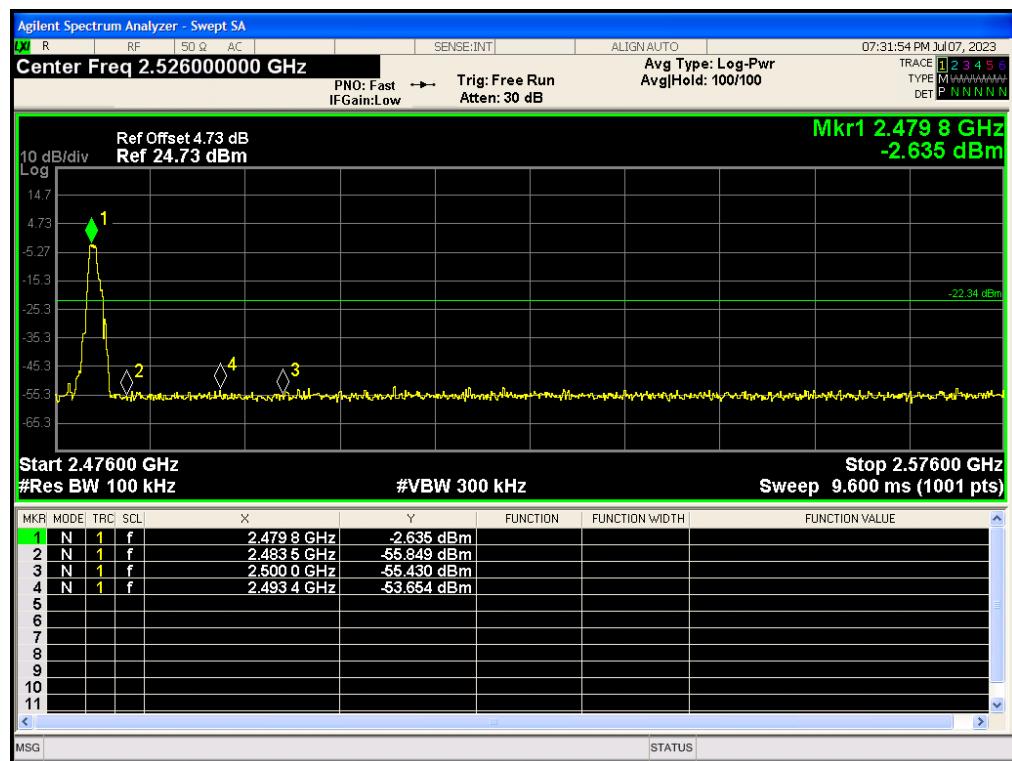
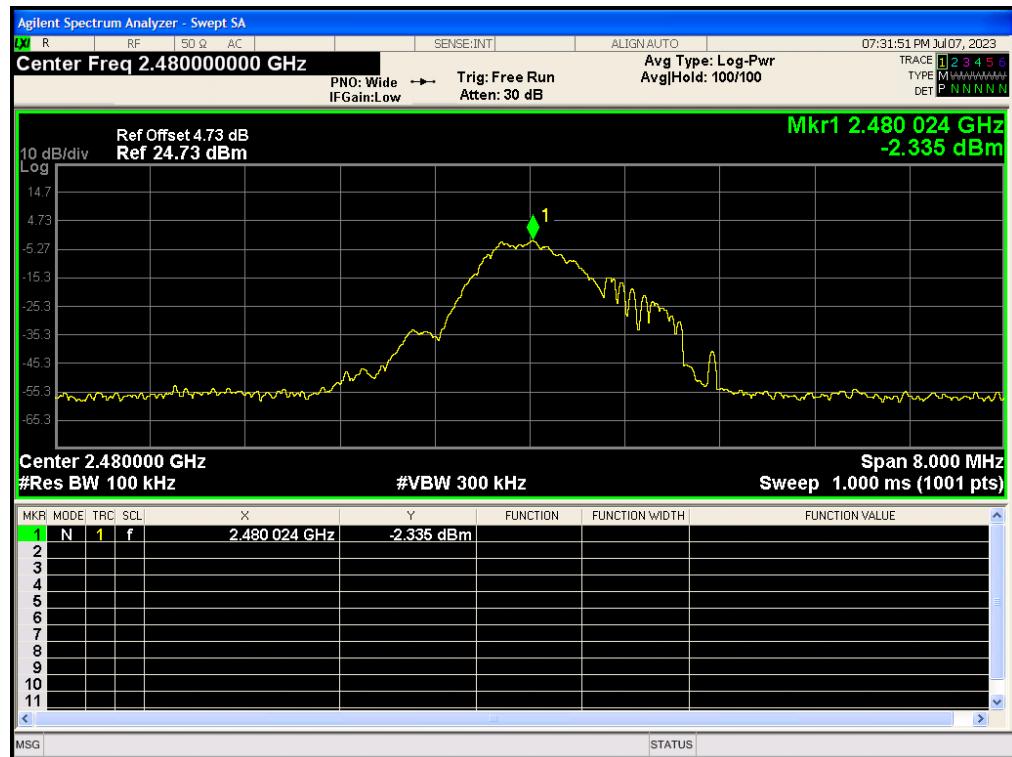
HIGH CHANNEL



TEST RESULT FOR BAND EDGE LOW CHANNEL



HIGH CHANNEL



9 ANTENNA REQUIREMENT

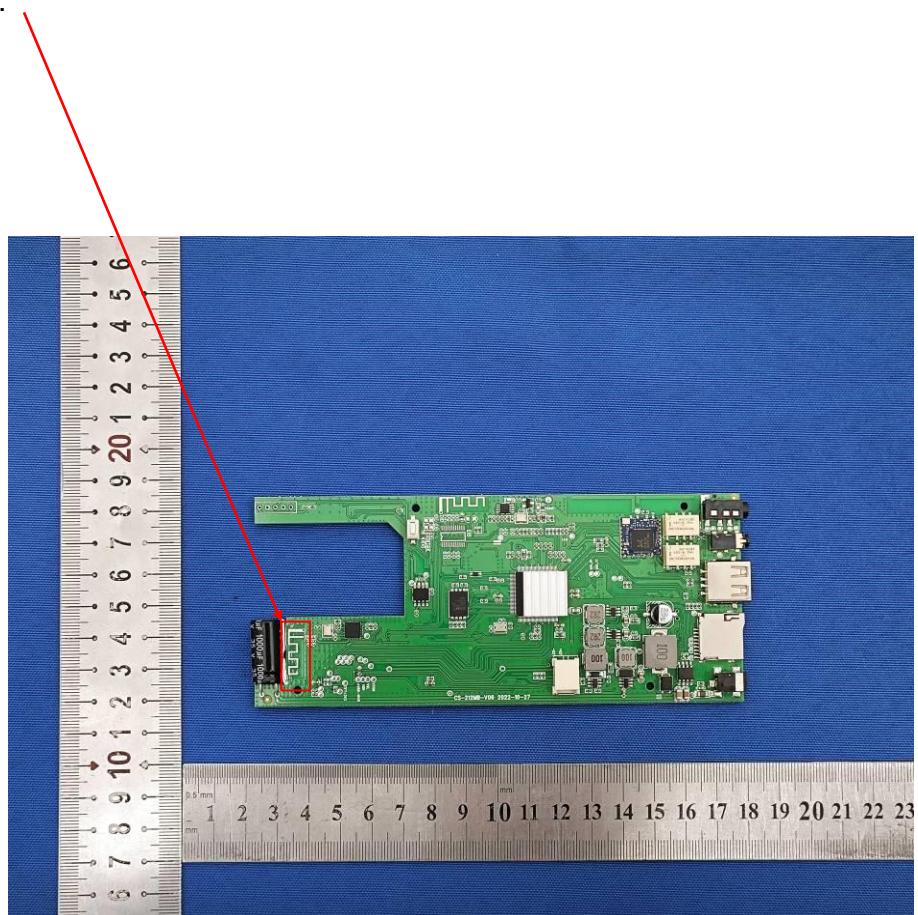
Standard Applicable:

For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

Antenna Connected Construction

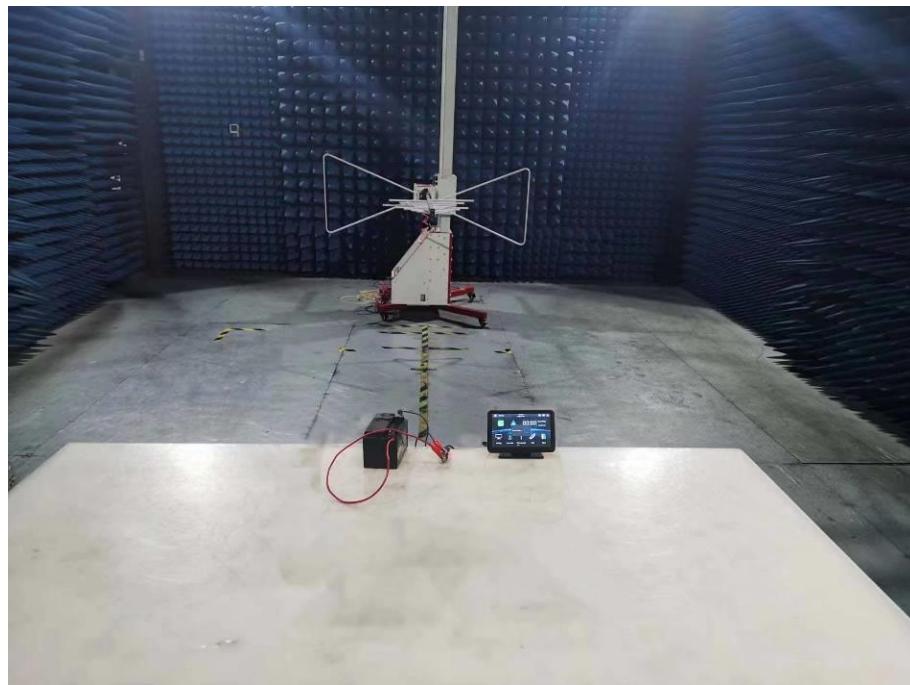
The antenna used in this product is a PCB Antenna.

ANTENNA:



10 PHOTO OF TEST

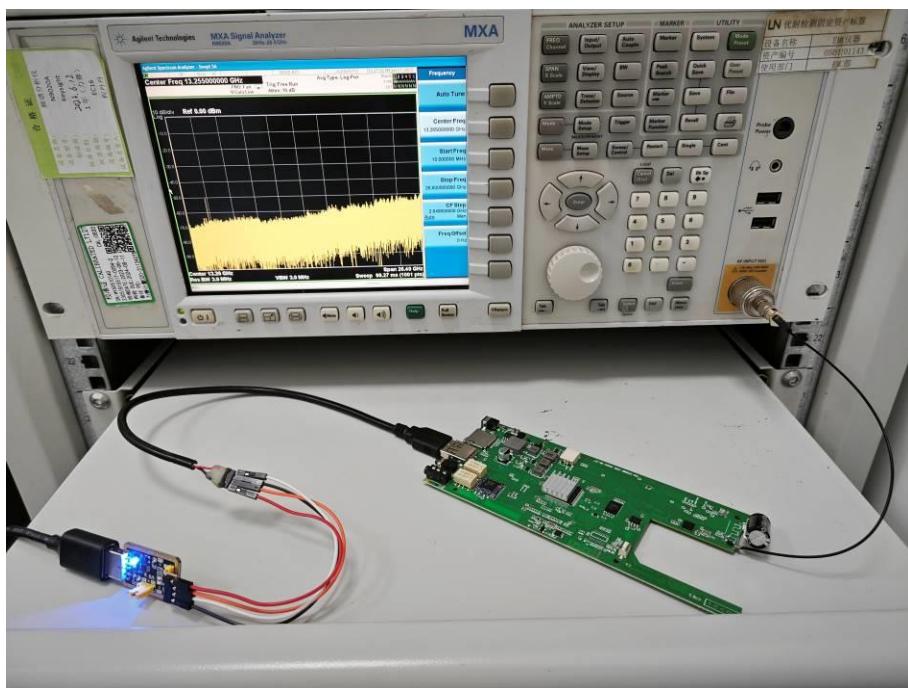
RADIATED EMISSION



30MHz-1000MHz



Above 1GHz

RF Conducted

End of Report