FCC TEST REPORT

Client Information:

Applicant:	Shenzhen Shengjiali Electronics Co., Ltd
Applicant add.:	Room 201-601, Building 3, No. 72, Xikeng Road, Fucheng Street, Longhua District, Shenzhen
Manufacturer:	Shenzhen Shengjiali Electronics Co., Ltd
Manufacturer add.:	Room 201-601, Building 3, No. 72, Xikeng Road, Fucheng Street, Longhua District, Shenzhen

Product Information:

Product Name:	TWB Bluetooth headset
Model No.:	GQ001
Serial Model:	N/A
Brand Name:	SJL
FCC ID:	2A2ZX-GQ001

Applicable standards: FCC CFR Title 47 Part 15 Subpart C Section 15.247

Prepared By:

Dongguan Yaxu (AiT) Technology Limited

No.22, Jinqianling Third Street, Jitigang, Huangjiang,Dongguan,
Guangdong, China

Tel.: +86-769-8202 0499 Fax.: +86-769-8202 0495

Date of Receipt: Aug. 10, 2021 Date of Test: Aug. 10, 2021 ~Aug. 19, 2021

Date of Issue: Aug. 20, 2021 Test Result: Pass

This device described above has been tested by Dongguan Yaxu (AiT) Technology Limited 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.

Reviewed by: Simba Huang Simba Huang **Approved by:** Seal.chen

1 Contents

Revision History

Revision	Issue Date	Revisions	Revised By
000	Aug. 20, 2021	Initial Issue	Seal Chen

2 Test Summary

Test Item	Section in CFR 47	Result
Antenna Requirement	15.203	Pass
AC Power Line Conducted Emission	15.207(a)	Pass
Conducted Peak Output Power	15.247 (b)(1)	Pass
20dB Occupied Bandwidth	15.247 (a)(1)	Pass
Carrier Frequencies Separation	15.247 (a)(1)	Pass
Hopping Channel Number	15.247 (a)(1)(iii)	Pass
Dwell Time	15.247 (a)(1)(iii)	Pass
Radiated Emission and Restrict Bands	15.205/15.209	Pass
Conducted Unwanted emissions and Band Edge	15.247(d)	Pass

Note The measurement uncertainty is not included in the test result.

2.1 Statement of the Measurement Uncertainty

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

2.2 Measurement Uncertainty

Test Item	Frequency Range	Measurement Uncertainty	Notes
Radiated Emission	0.009MHz-30MHz	3.10dB	(1)
Radiated Emission	30MHz-1GHz	3.75dB	(1)
Radiated Emission	1GHz-18GHz	3.88dB	(1)
Radiated Emission	18GHz-40GHz	3.88dB	(1)
AC Power Line Conducted Emission	0.15MHz ~ 30MHz	1.20dB	(1)
Note (1): The measurement uncertainty is for coverage factor of k=2 and a level of confidence of 95%.			

3 Test Facility

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

CNAS- Registration No: L6177

FCC Designation Number:CN1313

FCC Test Firm Registration Number:703111

3.1 Deviation from standard

None

3.2 Abnormalities from standard conditions

None

3.3 Environmental conditions

RF Conducted Testing:	
Temperature:	24.6℃
Humidity:	52.4%
Atmospheric pressure:	101kPa
Test by:	Simba Huang

3.4 Test Location

Dongguan Yaxu (AiT) Technology Limited

Address: No.22, Jinqianling 3rd Street, Jitigang, Huangjiang,Dongguan, Guangdong, China

Tel.: +86-769-8202 0499

Fax.: +86-769-8202 0495

4 General Information

EUT Name:	TWB Bluetooth headset
Model No:	GQ001
Serial Model:	N/A
Brand Name:	SJL
Test sample(s) ID:	21081002-1
Sample(s) Status:	Engineer sample
Serial No.:	N/A
Operation frequency:	2402MHz~2480MHz
Channel Number:	79
Modulation Type:	GFSK, π/4-DQPSK, 8-DPSK
Modulation Technology:	FHSS
Antenna Type:	Chip Antenna
Antenna Gain:	1.0dBi
H/W No.:	N/A
S/W No.:	N/A
Power supply:	DC5V (Charging Case) or DC3.7V from battery (Earphones)
Battery:	DC 3.7V Li Battery
Model different:	N/A
Note:	For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.

4.1 Test frequencies

EUT channels and frequencies list:

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
00	2402	27	2429	54	2456
01	2403	28	2430	55	2457
02	2404	29	2431	56	2458
03	2405	30	2432	57	2459
04	2406	31	2433	58	2460
05	2407	32	2434	59	2461
06	2408	33	2435	60	2462
07	2409	34	2436	61	2463
08	2410	35	2437	62	2464
09	2411	36	2438	63	2465
10	2412	37	2439	64	2466
11	2413	38	2440	65	2467
12	2414	39	2441	66	2468
13	2415	40	2442	67	2469
14	2416	41	2443	68	2470
15	2417	42	2444	69	2471
16	2418	43	2445	70	2472
17	2419	44	2446	71	2473
18	2420	45	2447	72	2474
19	2421	46	2448	73	2475
20	2422	47	2449	74	2476
21	2423	48	2450	75	2477
22	2424	49	2451	76	2478
23	2425	50	2452	77	2479
24	2426	51	2453	78	2480
25	2427	52	2454	--	--
26	2428	53	2455	--	--

Note:

In section 15.31(m), regards to the operating frequency range over 10 MHz, the Lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test, and the selected channel see below:

Transmitting mode	Keep the EUT in continuously transmitting mode.		
Test software:	BlueSuite2_4_13		
Frequency	2402 MHz	2440 MHz	2480 MHz
Parameters(1Mbps)	Default	Default	Default
Parameters(2Mbps)	Default	Default	Default
Parameters(2Mbps)	Default	Default	Default

Remark: During the test, the test voltage was tuned from 85% to 115% of the nominal rated supply voltage, and found that the worst case was under the nominal rated supply condition. So the report just shows that condition's data.

4.2 Description of Test setup

EUT was tested in normal configuration (Please See following Block diagrams)

1. Block diagram of EUT configuration (TX Mode)
EUT

4.3 EUT Peripheral List

No.	Equipment	Manufacturer	EMC Compliance	Model No.	Serial No.	Power cord	Signal cord
1	N/A	N/A	N/A	N/A	N/A	N/A	N/A

4.4 Test Peripheral List

No.	Equipment	Manufacturer	EMC Compliance	Model No.	Serial No.	Power cord	Signal cord
1	Adapter	Nokia	FCC	AD-10WU	N/A	N/A	N/A

5 Equipment Used during Test

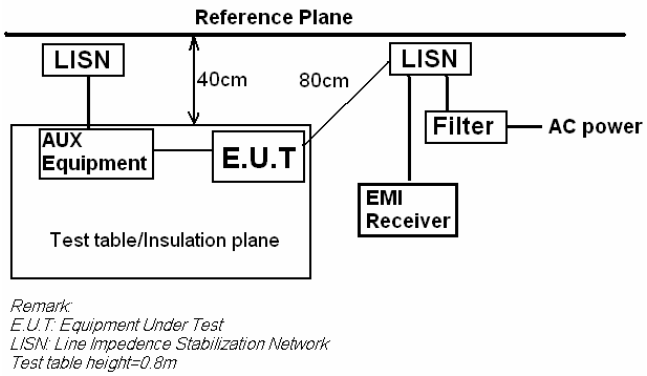
No	Test Equipment	Manufacturer	Model No	Serial No	Cal. Date	Cal. Due Date
1	Spectrum Analyzer	R&S	FSV40	101470	2020.08.28	2021.08.27
2	EMI Measuring Receiver	R&S	ESR	101160	2020.08.28	2021.08.27
3	Low Noise Pre Amplifier	HP	HP8447E	1937A01855	2020.08.28	2021.08.27
4	Low Noise Pre Amplifier	Tsj	MLA-0120-A02-34	2648A04738	2020.08.28	2021.08.27
5	Passive Loop	ETS	6512	00165355	2020.09.05	2022.09.04
6	TRILOG Super Broadband test Antenna	SCHWARZBECK	VULB9160	9160-3206	2020.07.25	2023.07.24
7	Broadband Horn Antenna	SCHWARZBECK	BBHA9120D	452	2020.07.25	2023.07.24
8	SHF-EHF Horn Antenna 15-40GHz	SCHWARZBECK	BBHA9170	BBHA9170367d	2020.11.24	2023.11.23
9	EMI Test Receiver	R&S	ESCI	100124	2020.08.28	2021.08.27
10	LISN	Kyoritsu	KNW-242	8-837-4	2020.08.28	2021.08.27
11	LISN	R&S	ESH3-Z2	0357.8810.54-101161-S2	2020.08.28	2021.08.27
12	Pro.Temp&Humi.chamber	MENTEK	MHP-150-1C	MAA08112501	2020.08.28	2021.08.27
13	RF Automatic Test system	MW	MW100-RFCB	21033016	2020.08.28	2021.08.27
14	Signal Generator	Agilent	N5182A	MY50143009	2020.08.28	2021.08.27
15	Wideband Radio communication tester	R&S	CMW500	1201.0002K50	2020.08.28	2021.08.27
16	RF Automatic Test system	MW	MW100-RFCB	21033016	2020.08.28	2021.08.27
17	DC power supply	ZHAOXIN	RXN-305D-2	28070002559	N/A	N/A
18	RE Software	EZ	EZ-EMC_RE	Ver.AIT-03A	N/A	N/A
19	CE Software	EZ	EZ-EMC_CE	Ver.AIT-03A	N/A	N/A
20	RF Software	MW	MTS 8310	2.0.0.0	N/A	N/A
21	temporary antenna connector(Note)	NTS	R001	N/A	N/A	N/A
Note: The temporary antenna connector is soldered on the PCB board in order to perform conducted tests and this temporary antenna connector is listed in the equipment list.						

6 Test results and Measurement Data

6.1 Antenna requirement

Standard requirement:	FCC Part15 C Section 15.203
15.203 requirement: An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. **15.247(c) (1)(i) requirement:** (i) Systems operating in the 2400-2483.5 MHz band that is used exclusively for fixed. Point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi 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 6dBi.	
E.U.T Antenna:	
The antenna is Chip antenna, the best case gain of the is 1.0dBi, reference to the appendix II for details	

6.2 Conducted Emissions

<table>
<tr><td>Test Requirement:</td><td>FCC Part15 C Section 15.207</td></tr>
<tr><td>Test Method:</td><td>ANSI C63.10:2013</td></tr>
<tr><td>Test Frequency Range:</td><td>150KHz to 30MHz</td></tr>
<tr><td>Receiver setup:</td><td>RBW=9KHz, VBW=30KHz, Sweep time=auto</td></tr>
<tr><td>Limit:</td><td>
<table>
<tr><td rowspan="2">Frequency range (MHz)</td><td colspan="2">Limit (dBuV)</td></tr>
<tr><td>Quasi-peak</td><td>Average</td></tr>
<tr><td>0.15-0.5</td><td>66 to 56*</td><td>56 to 46*</td></tr>
<tr><td>0.5-5</td><td>56</td><td>46</td></tr>
<tr><td>5-30</td><td>60</td><td>50</td></tr>
</table>
* Decreases with the logarithm of the frequency.
</td></tr>
<tr><td>Test setup:</td><td> 

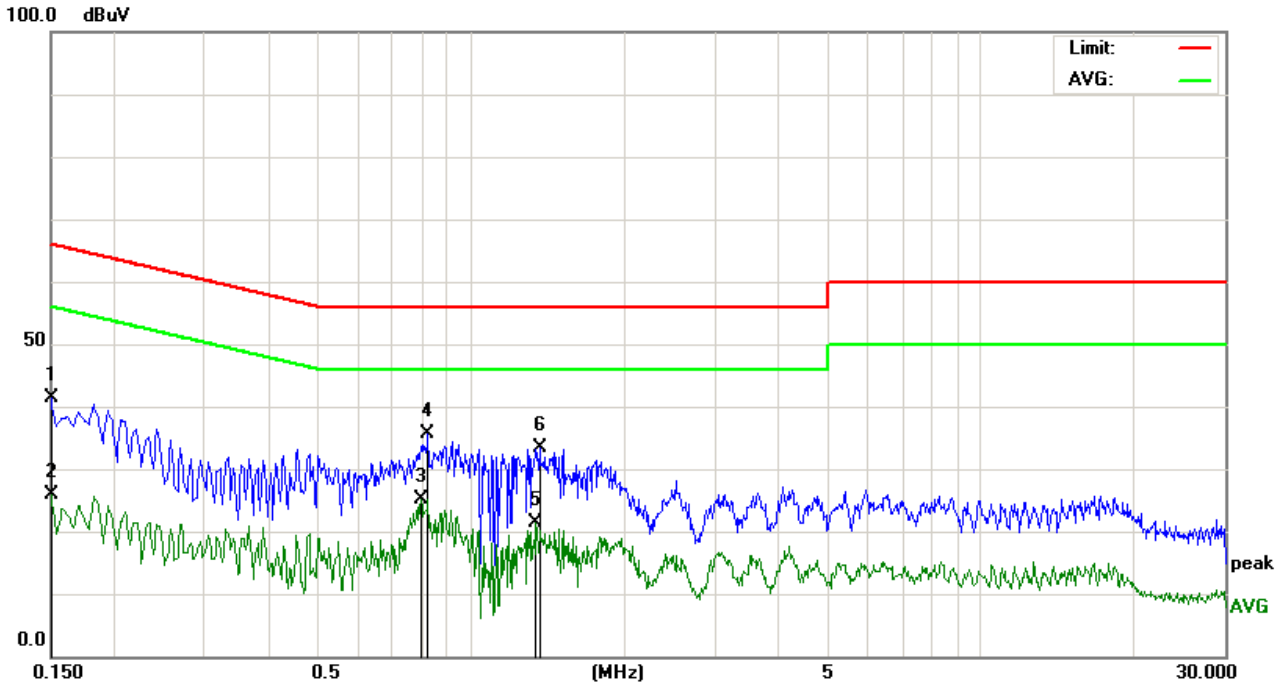
Remark:
E.U.T: Equipment Under Test
LISN: Line Impedence Stabilization Network
Test table height=0.8m</td></tr>
<tr><td>Test procedure:</td><td>1. The E.U.T and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm/50uH coupling impedance for the measuring equipment.
2. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination. (Please refer to the block diagram of the test setup and photographs).
3. Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10:2013 on conducted measurement.</td></tr>
<tr><td>Test Instruments:</td><td>Refer to section 5.0 for details</td></tr>
<tr><td>Test mode:</td><td>Refer to section 4.1 for details</td></tr>
<tr><td>Test environment:</td><td>
<table>
<tr><td>Temp.:</td><td>25 °C</td><td>Humid.:</td><td>52%</td><td>Press.:</td><td>1012mbar</td></tr>
</table>
</td></tr>
<tr><td>Test voltage:</td><td>AC 120V, 60Hz</td></tr>
<tr><td>Test results:</td><td>Pass</td></tr>
</table>

Remark: Both high and low voltages have been tested to show only the worst low voltage test data.

Measurement data:

Pre-scan all test modes, found worst case at GFSK 2480MHz, and so only show the test result of GFSK 2480MHz

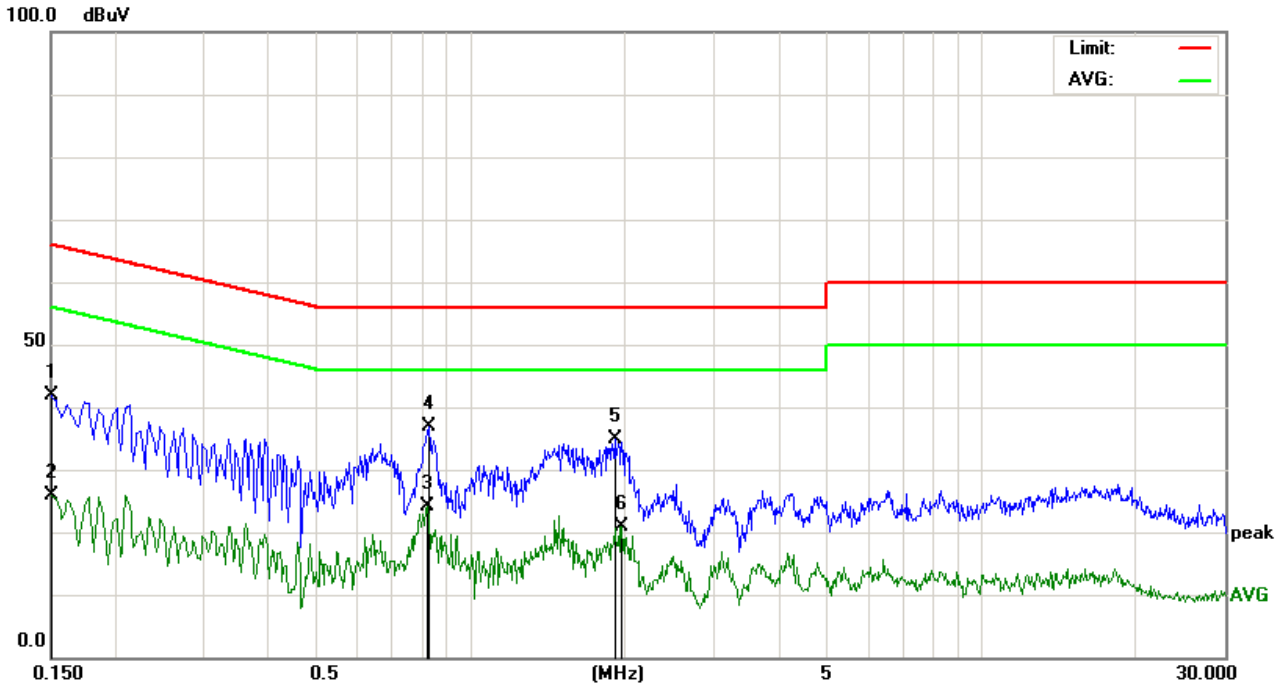
Model name:	GQ001	Test Date :	2021-8-18
Phase :	Line	Test Result:	☒ Pass ☐ Fail



Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.
Measurement Result=Reading Level +Correct Factor;
Over Limit= Measurement Result- Limit;

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector
1		0.1500	29.35	11.94	41.29	65.99	-24.70	QP
2		0.1500	13.96	11.94	25.90	55.99	-30.09	AVG
3		0.7980	15.15	9.96	25.11	46.00	-20.89	AVG
4	*	0.8220	25.73	9.96	35.69	56.00	-20.31	QP
5		1.3380	11.52	9.96	21.48	46.00	-24.52	AVG
6		1.3619	23.36	9.96	33.32	56.00	-22.68	QP

Model name:	GQ001	Test Date :	2021-8-18
Phase :	Neutral	Test Result:	☒ Pass ☐ Fail



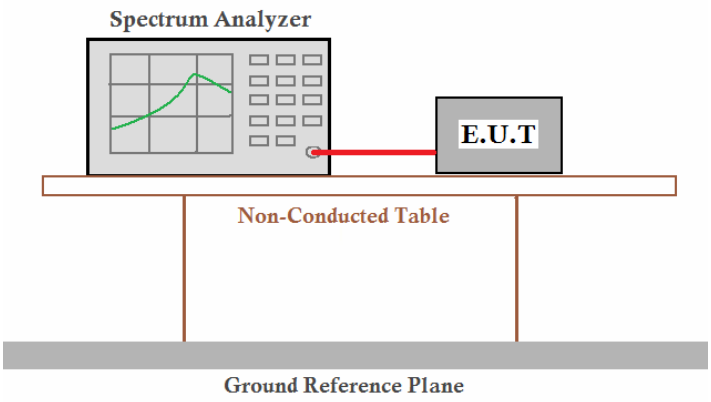
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.
Measurement Result=Reading Level +Correct Factor;
Over Limit= Measurement Result- Limit;

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector
1		0.1500	29.82	11.94	41.76	65.99	-24.23	QP
2		0.1500	13.93	11.94	25.87	55.99	-30.12	AVG
3		0.8180	14.19	9.96	24.15	46.00	-21.85	AVG
4	*	0.8300	26.89	9.96	36.85	56.00	-19.15	QP
5		1.9140	24.79	9.99	34.78	56.00	-21.22	QP
6		1.9740	10.99	9.99	20.98	46.00	-25.02	AVG

Notes:

1. An initial pre-scan was performed on the line and neutral lines with peak detector.
2. Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission.
3. Final Level =Receiver Read level + LISN Factor + Cable Loss

6.3 Conducted Peak Output Power

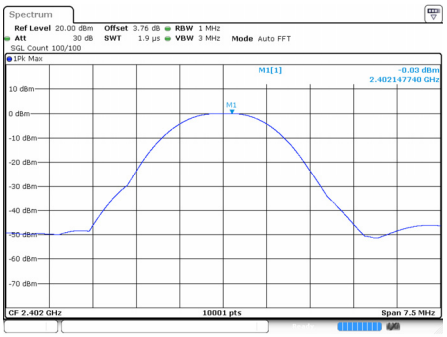
Test Requirement:	FCC Part15 C Section 15.247 (a)(1)
Test Method:	ANSI C63.10:2013
Limit:	30dBm(for GFSK),20.97dBm(for EDR)
Test setup:	
Test Instruments:	Refer to section 5.0 for details
Test mode:	Refer to section 4.1 for details
Test results:	Pass

Measurement Data

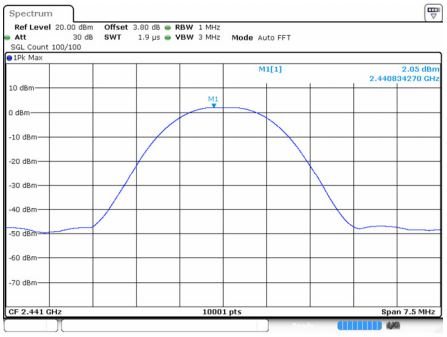
Mode	Test channel	Peak Output Power (dBm)	Limit (dBm)	Result
GFSK	Lowest	-0.03	30.00	Pass
	Middle	2.05		
	Highest	0.53		
π/4-DQPSK	Lowest	1.64	20.97	Pass
	Middle	3.37		
	Highest	2.08		
8-DPSK	Lowest	1.6	20.97	Pass
	Middle	3.65		
	Highest	1.78		

Test plot as follows:

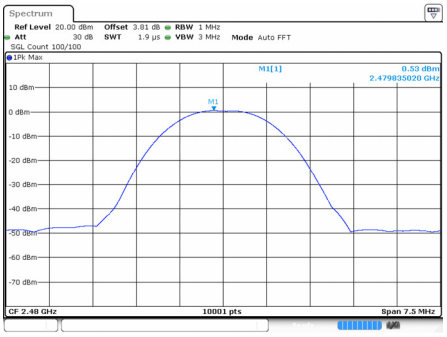
Test mode:	GFSK mode



Lowest channel

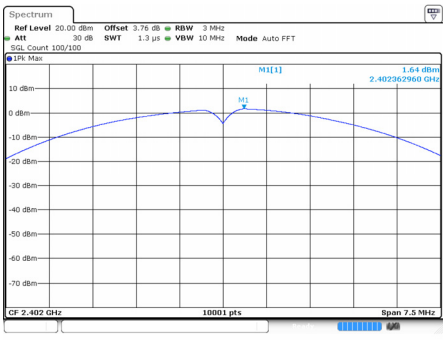


Middle channel

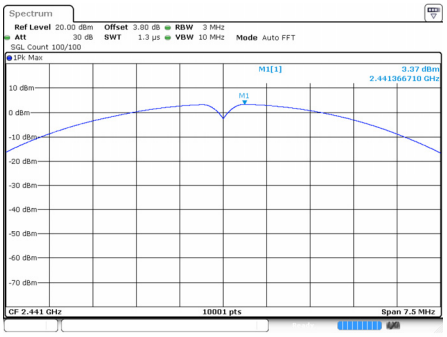


Highest channel

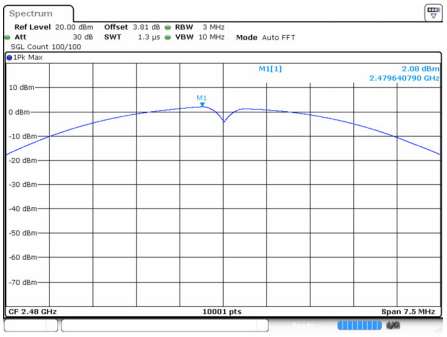
Test mode:	π/4-DQPSK mode



Lowest channel

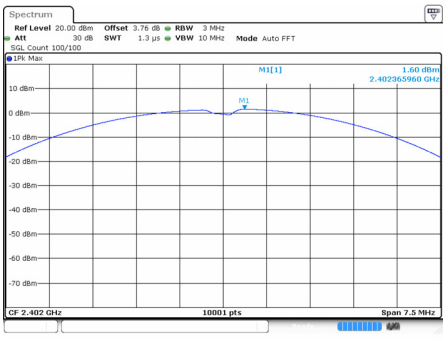


Middle channel

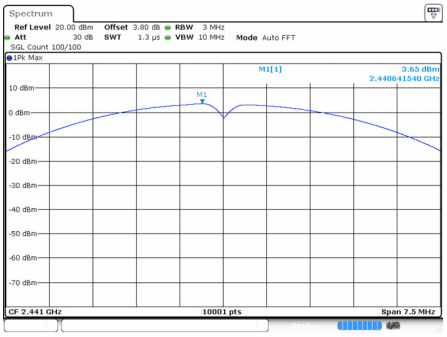


Highest channel

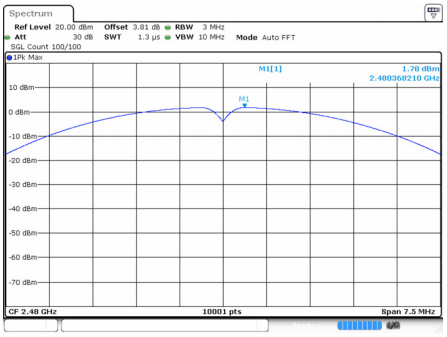
Test mode:	8-DPSK mode



Lowest channel

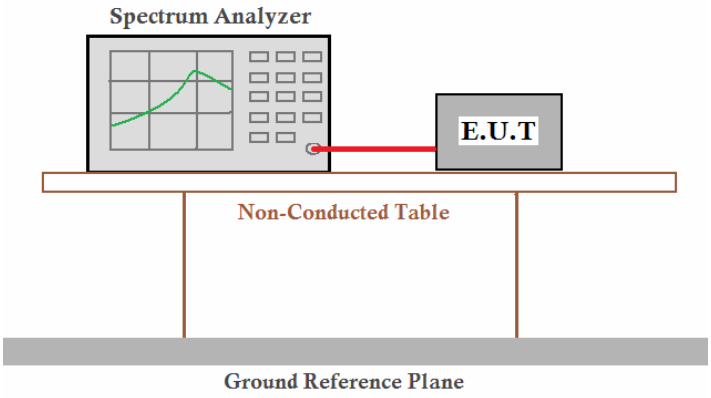


Middle channel



Highest channel

6.4 20dB Emission Bandwidth

Test Requirement:	FCC Part15 C Section 15.247 (a)(1)
Test Method:	ANSI C63.10:2013
Limit:	N/A
Test setup:	
Test Instruments:	Refer to section 5.0 for details
Test mode:	Refer to section 4.1 for details
Test results:	Pass

Measurement Data

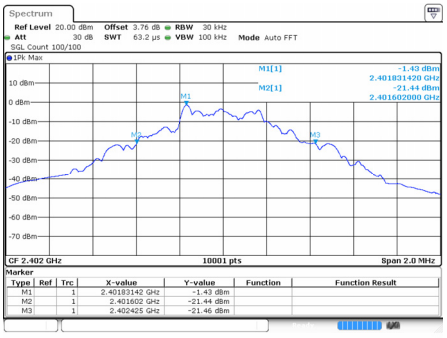
Mode	Test channel	20dB Emission Bandwidth (MHz)	Result
GFSK	Lowest	0.823	Pass
	Middle	0.76	
	Highest	0.992	
8-DPSK	Lowest	1.25	Pass
	Middle	1.21	
	Highest	1.261	

Note:

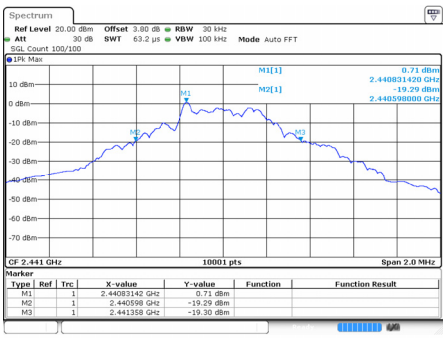
1. *During the test, pre-scan the GFSK, π/4-DQPSK, 8-DPSK modulation, found the GFSK& 8-DPSK modulation which it is worse case, and show in this report.*

Test plot as follows:

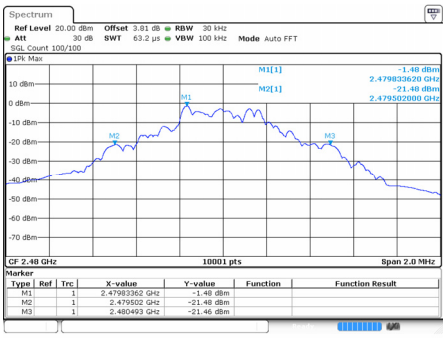
Test mode:	GFSK mode



Lowest channel

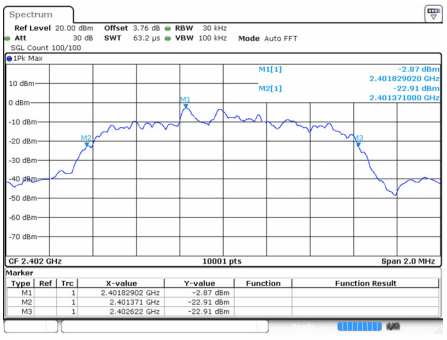


Middle channel

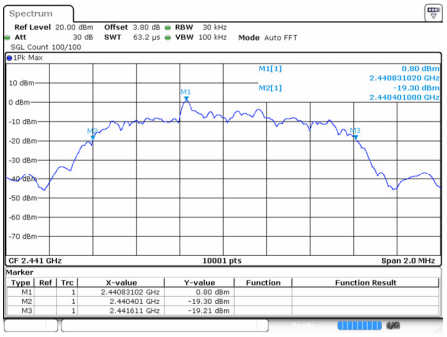


Highest channel

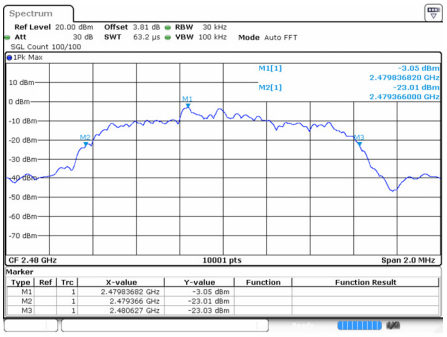
Test mode:	8-DPSK mode



Lowest channel

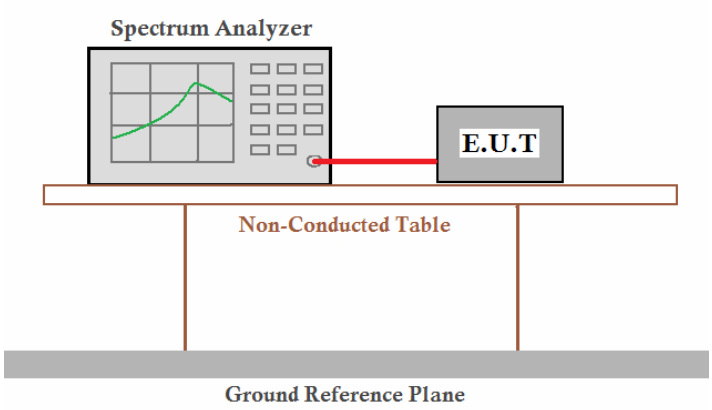


Middle channel



Highest channel

6.5 Carrier Frequencies Separation

Test Requirement:	FCC Part15 C Section 15.247 (a)(1)
Test Method:	ANSI C63.10:2013
Receiver setup:	RBW=100KHz, VBW=300KHz, detector=Peak
Limit:	0.025MHz or 2/3 of the 20dB bandwidth (whichever is greater)
Test setup:	
Test Instruments:	Refer to section 5.0 for details
Test mode:	Refer to section 4.1 for details
Test results:	Pass

Measurement Data

Mode	Test channel	Carrier Frequencies Separation (kHz)	Limit (kHz)	Result
GFSK	Lowest	1.002	548.67	Pass
	Middle	1.002	506.67	Pass
	Highest	1.001	661.33	Pass
8-DPSK	Lowest	1.003	833.33	Pass
	Middle	1	806.67	Pass
	Highest	1.002	840.67	Pass

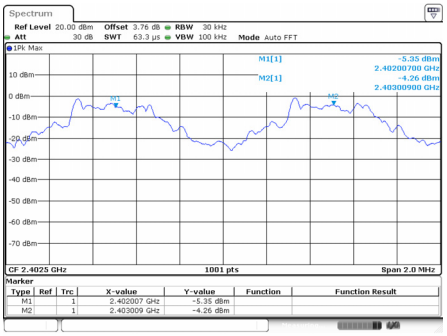
According to section 6.4

Note:

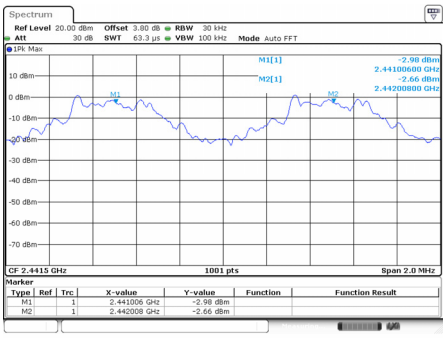
1. *During the test, pre-scan the GFSK, π/4-DQPSK, 8-DPSK modulation, found the GFSK& 8-DPSK modulation which it is worse case, and show in this report.*

Test plot as follows:

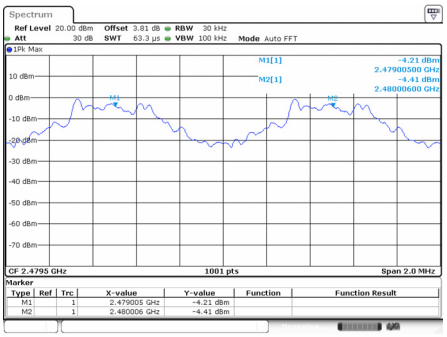
Modulation mode:	GFSK



Lowest channel

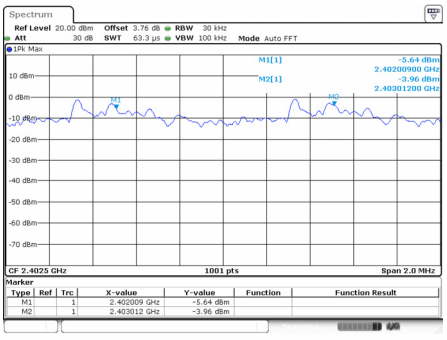


Middle channel

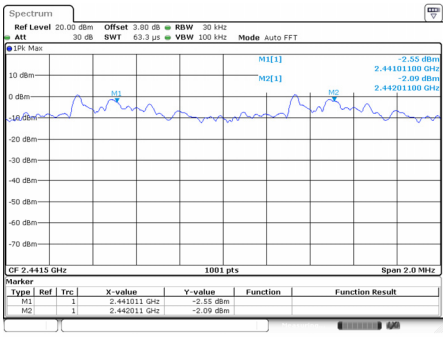


Highest channel

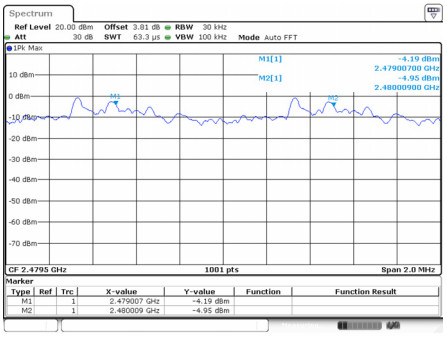
Test mode:	8-DPSK



Lowest channel

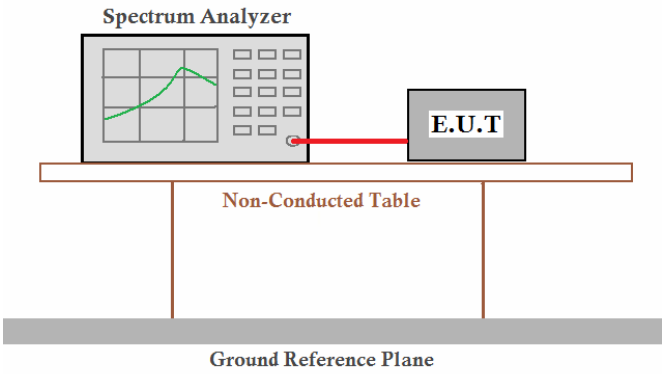


Middle channel



Highest channel

6.6 Hopping Channel Number

Test Requirement:	FCC Part15 C Section 15.247 (a)(1)(iii)
Test Method:	ANSI C63.10:2013
Receiver setup:	RBW=100kHz, VBW=300kHz, Frequency range=2400MHz-2483.5MHz, Detector=Peak
Limit:	15 channels
Test setup:	
Test Instruments:	Refer to section 5.0 for details
Test mode:	Refer to section 4.1 for details
Test results:	Pass

Measurement Data:

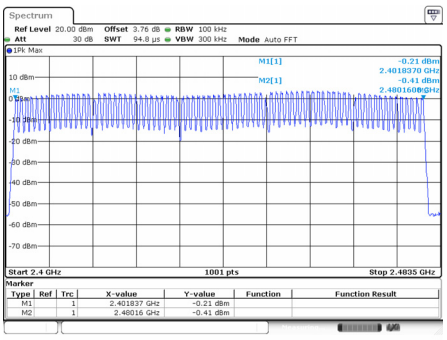
Mode	Hopping channel numbers	Limit	Result
GFSK	79	≥15CH	Pass
8-DPSK	79	≥15CH	Pass

Note:

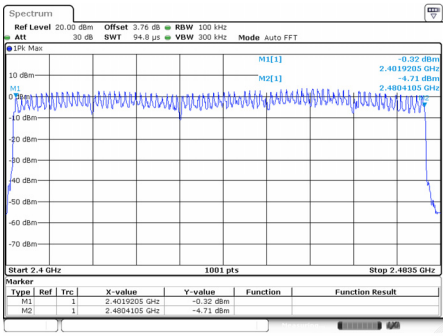
1. *During the test, pre-scan the GFSK, π/4-DQPSK, 8-DPSK modulation, found the GFSK& 8-DPSK modulation which it is worse case, and show in this report.*

Test plot as follows:

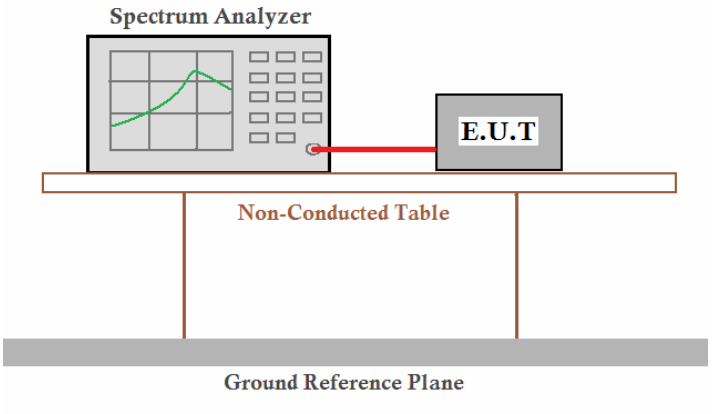
Test mode:	GFSK



Test mode:	8-DPSK



6.7 Dwell Time

Test Requirement:	FCC Part15 C Section 15.247 (a)(1)(iii)
Test Method:	ANSI C63.10:2013
Receiver setup:	RBW=1MHz, VBW=1MHz, Span=0Hz, Detector=Peak
Limit:	0.4 Second
Test setup:	
Test Instruments:	Refer to section 5.0 for details
Test mode:	Refer to section 4.1 for details
Test results:	Pass

Note:

1. *During the test, pre-scan the GFSK, π/4-DQPSK, 8-DPSK modulation, found the GFSK& 8-DPSK modulation which it is worse case, and show in this report.*

Measurement Data

GFSK mode:

Frequency	Packet	Dwell time(ms)	Limit(ms)	Result
2402MHz	DH1	129.195	400	Pass
2402MHz	DH3	274.23	400	Pass
2402MHz	DH5	314.172	400	Pass

Remarks:

The test period: T= 0.4 Second/Channel x 79 Channel = 31.6 s

Test channel: 2402MHz as blow

DH1 time slot=0.3817(ms)*(1600/ (2*79))*31.6=122.14ms

DH3 time slot=1.635(ms)*(1600/ (4*79))*31.6=261.60ms

DH5 time slot=2.883(ms)*(1600/ (6*79))*31.6=307.52ms

8-DPSK mode:

Frequency	Packet	Dwell time(ms)	Limit(ms)	Result
2402MHz	3DH1	126.324	400	Pass
2402MHz	3DH3	263.36	400	Pass
2402MHz	3DH5	298.391	400	Pass

Remarks:

The test period: T= 0.4 Second/Channel x 79 Channel = 31.6 s

Test channel: 2402MHz as blow

DH1 time slot=0.390(ms)*(1600/ (2*79))*31.6=124.80ms

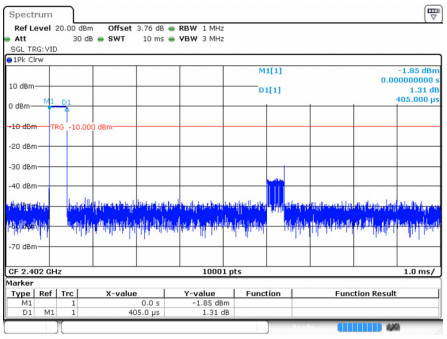
DH3 time slot=1.64(ms)*(1600/ (4*79))*31.6=262.40ms

DH5 time slot=2.892(ms)*(1600/ (6*79))*31.6=308.48ms

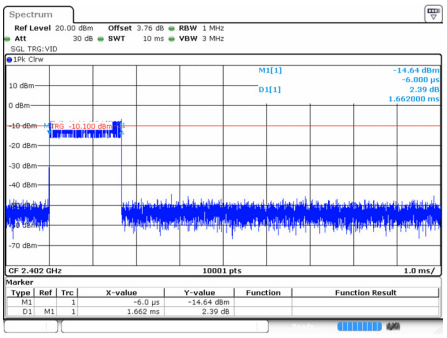
Test plot as follows:

GFSK mode:

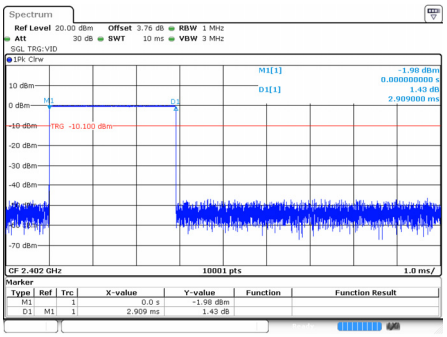
Test channel:	2402MHz



DH1



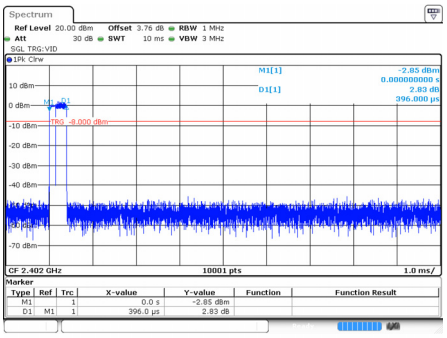
DH3



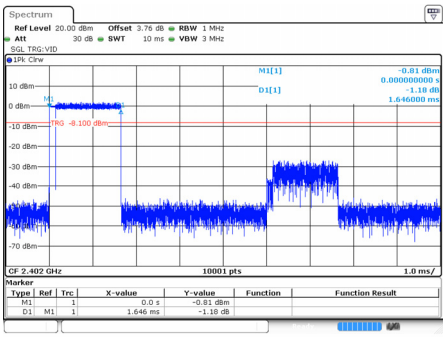
DH5

8-DPSK mode:

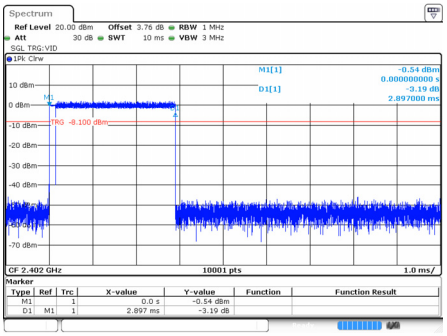
Test channel:	2402MHz



DH1



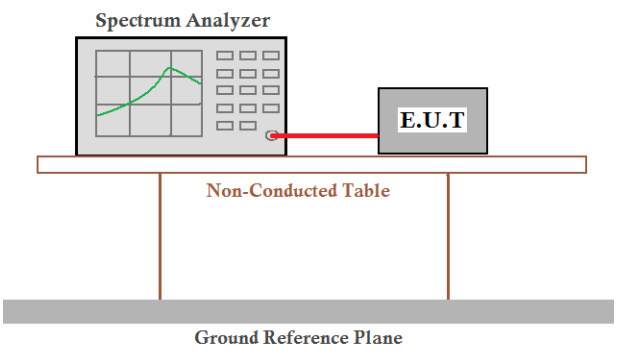
DH3



DH5

6.8 Band Edge

6.8.1 Conducted Emission Method

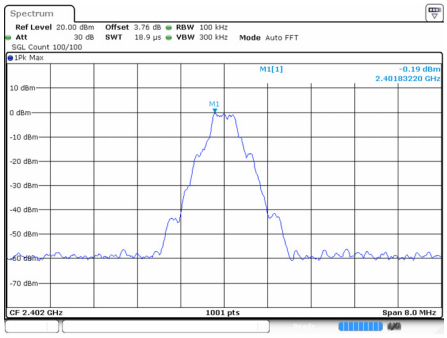
Test Requirement:	FCC Part15 C Section 15.247 (d)
Test Method:	ANSI C63.10:2013
Receiver setup:	RBW=100kHz, VBW=300kHz, Detector=Peak
Limit:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by 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, based on either an RF conducted or a radiated measurement.
Test setup:	
Test Instruments:	Refer to section 5.0 for details
Test mode:	Refer to section 4.1 for details
Test results:	Pass

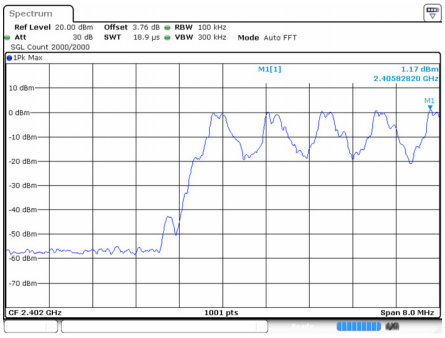
Note:

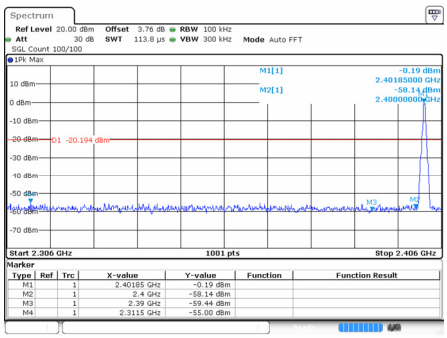
1. *During the test, pre-scan the GFSK, π/4-DQPSK, 8-DPSK modulation, found the GFSK& 8-DPSK modulation which it is worse case, and show in this report.*

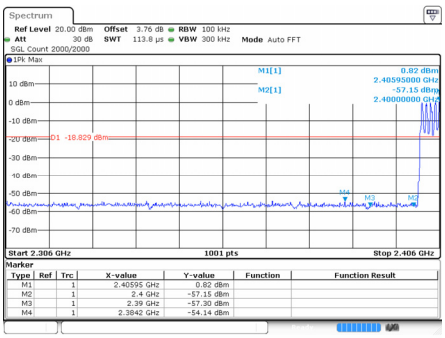
Test plot as follows:

Test channel:	Lowest channel



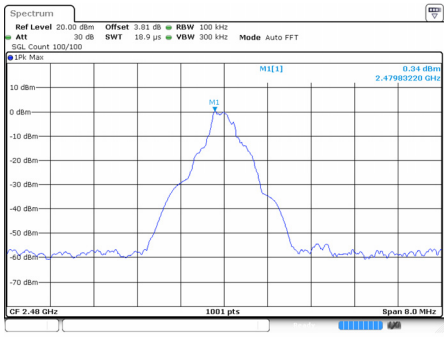


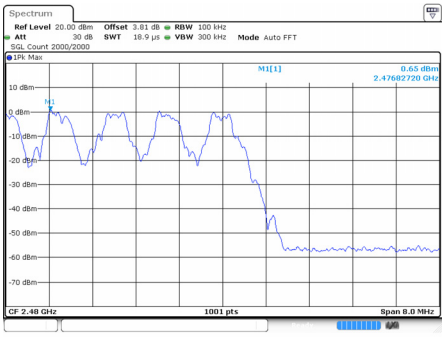


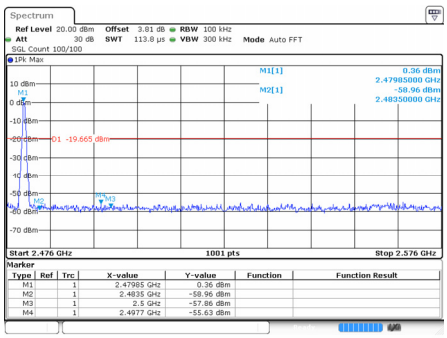


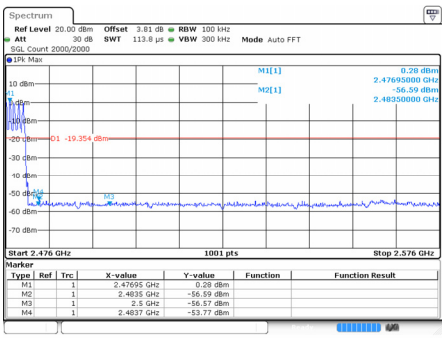
No-hopping mode Hopping mode

Test channel:	Highest channel





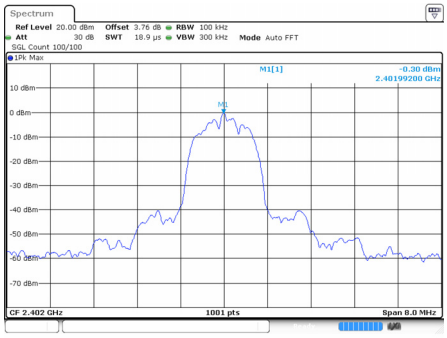


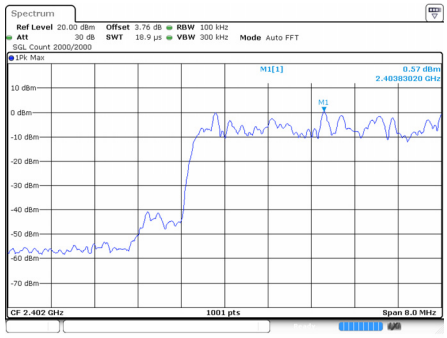


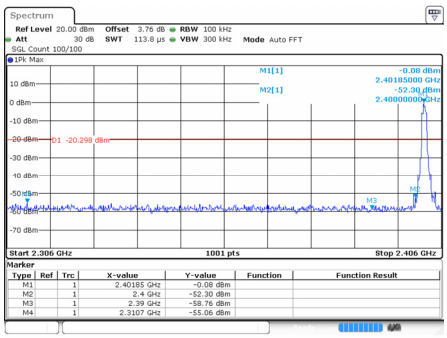
No-hopping mode Hopping mode

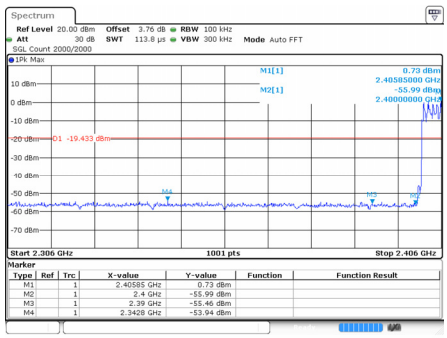
8-DPSK Mode:

Test channel:	Lowest channel



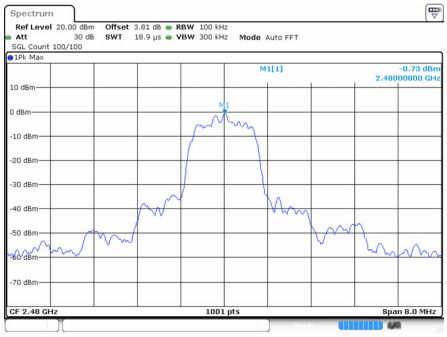


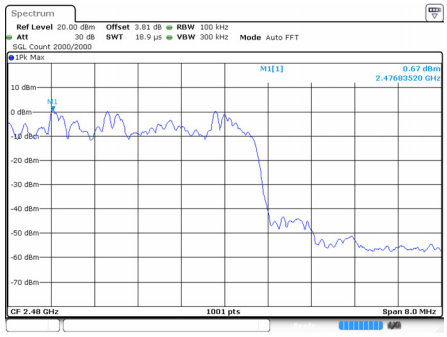


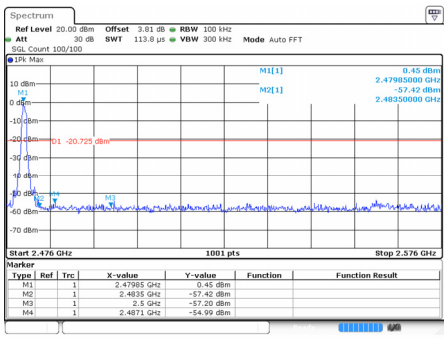


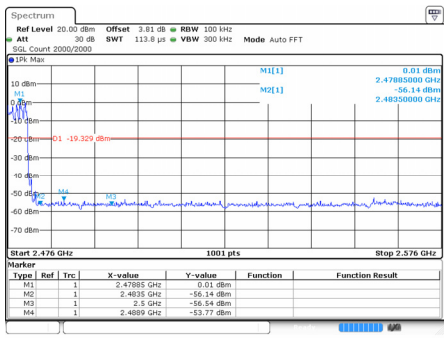
No-hopping mode Hopping mode

Test channel:	Highest channel



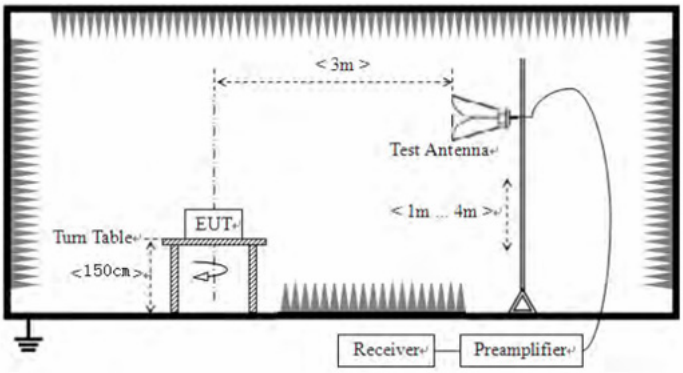






No-hopping mode Hopping mode

6.8.2 Radiated Emission Method

Test Requirement:	FCC Part15 C Section 15.209 and 15.205
Test Method:	ANSI C63.10:2013
Test Frequency Range:	All of the restrict bands were tested, only the worst band's (2310MHz to 2500MHz) data was showed.
Test site:	Measurement Distance: 3m
Receiver setup:	Frequency / Detector / RBW / VBW / Remark Above 1GHz / Peak / 1MHz / 3MHz / Peak Value Above 1GHz / Peak / 1MHz / 10Hz / Average Value
Limit:	Frequency / Limit (dBuV/m @3m) / Remark Above 1GHz / 54.00 / Average Value Above 1GHz / 74.00 / Peak Value
Test setup:	
Test Procedure:	1. The EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation. 2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower. 3. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement. 4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rota table was turned from 0 degrees to 360 degrees to find the maximum reading. 5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. 6. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a

	data sheet.
Test Instruments:	Refer to section 5.0 for details
Test mode:	Refer to section 4.1 for details
Test results:	Pass

Test channel:	Lowest channel

Vertical：

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2390.000	41.57	-5.70	35.87	74.00	-38.13	peak
2390.000	31.86	-5.70	26.16	54.00	-27.84	AVG

Horizontal：

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2390.000	43.21	-5.70	37.51	74.00	-36.49	peak
2390.000	31.40	-5.70	25.70	54.00	-28.30	AVG

Test channel:	Highest channel

Vertical：

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2483.500	42.81	-4.98	37.83	74.00	-36.17	peak
2483.500	32.05	-4.98	27.07	54.00	-26.93	AVG

Horizontal：

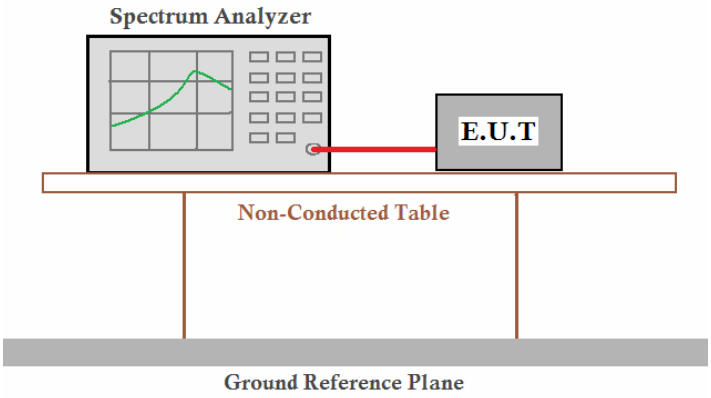
Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2483.500	43.39	-4.98	38.41	74.00	-35.59	peak
2483.500	31.86	-4.98	26.88	54.00	-27.12	AVG

Remarks:

1. *Final Level =Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor*
2. *The emission levels of other frequencies are very lower than the limit and not show in test report.*
3. *The pre-test were performed on lowest, middle and highest frequencies, only the worst case's (lowest and highest frequencies) data was showed.*
4. *During the test, pre-scan the GFSK, π/4-DQPSK, 8-DPSK modulation, and found the GFSK modulation which it is worse case.*

6.9 Spurious Emission

6.9.1 Conducted Emission Method

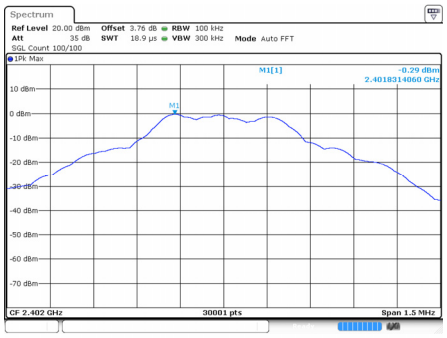
Test Requirement:	FCC Part15 C Section 15.247 (d)
Test Method:	ANSI C63.10:2013
Limit:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.
Test setup:	
Test Instruments:	Refer to section 5.0 for details
Test mode:	Refer to section 4.1 for details
Test results:	Pass

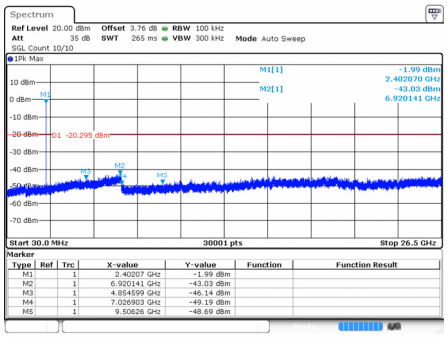
Note:

1. *During the test, pre-scan the GFSK, π/4-DQPSK, 8-DPSK modulation, found the GFSK& 8-DPSK modulation which it is worse case, and show in this report.*

GFSK mode:

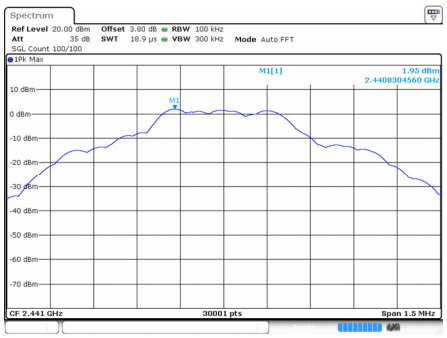
Test channel:	Lowest channel

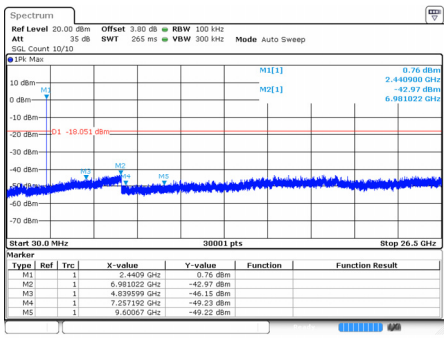




30MHz~25GHz

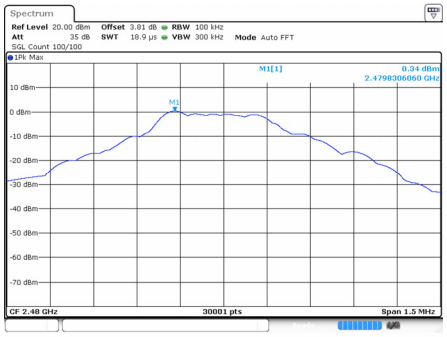
Test channel:	Middle channel

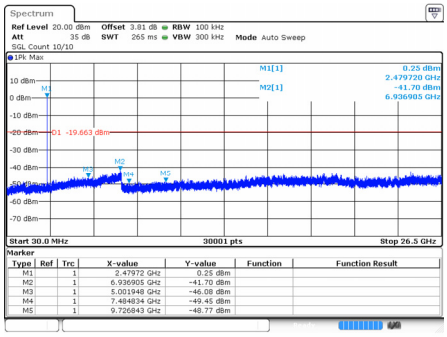




30MHz~25GHz

Test channel:	Highest channel

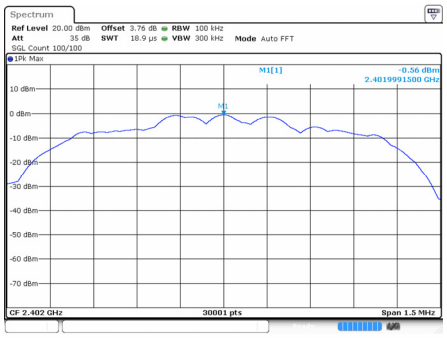


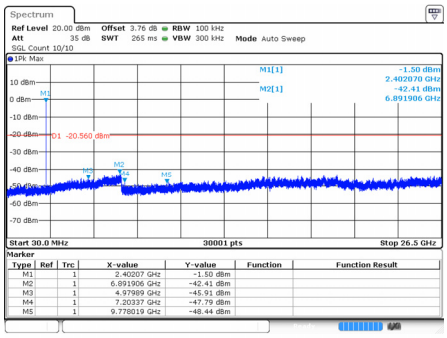


30MHz~25GHz

8-DPSK mode:

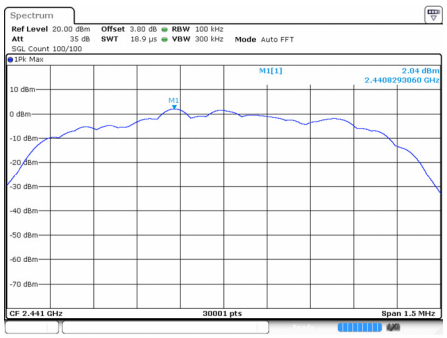
Test channel:	Lowest channel

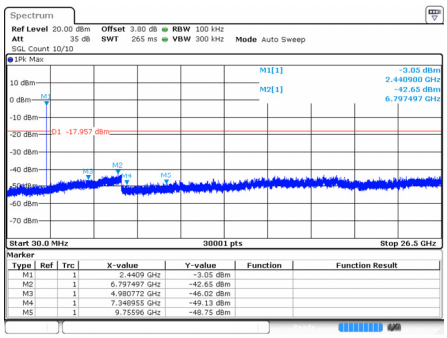




30MHz~25GHz

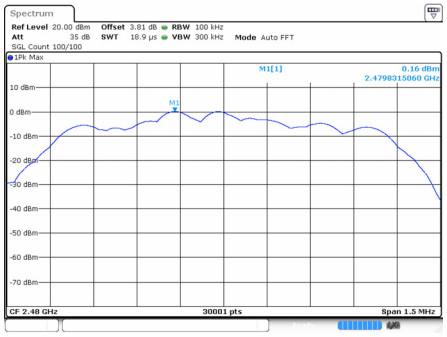
Test channel:	Middle channel

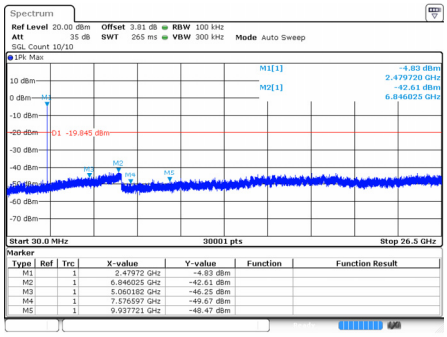




30MHz~25GHz

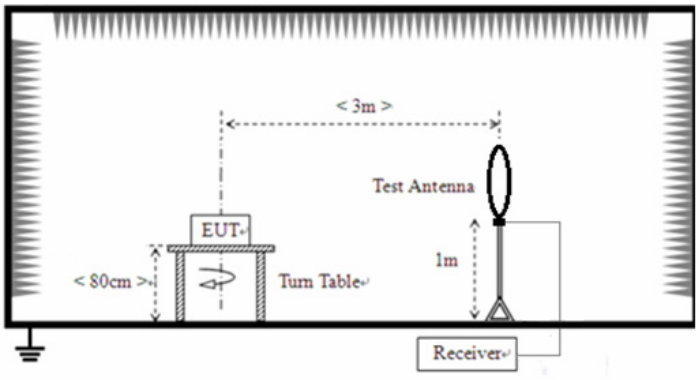
Test channel:	Highest channel



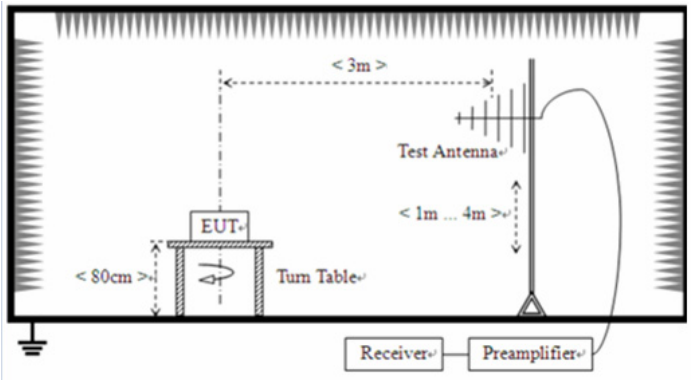


30MHz~25GHz

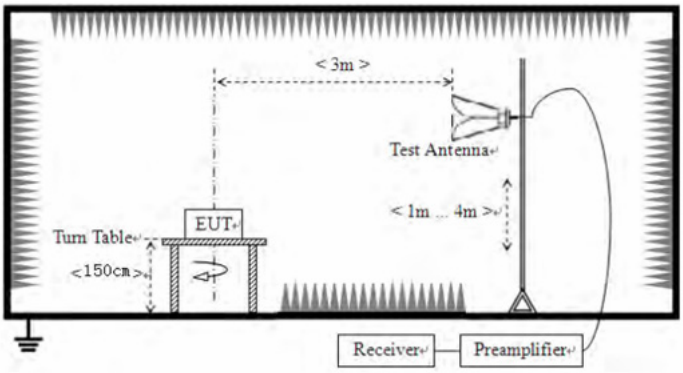
6.9.2 Radiated Emission Method

<table>
<tr><td>Test Requirement:</td><td>FCC Part15 C Section 15.209</td></tr>
<tr><td>Test Method:</td><td>ANSI C63.10:2013</td></tr>
<tr><td>Test Frequency Range:</td><td>9kHz to 25GHz</td></tr>
<tr><td>Test site:</td><td>Measurement Distance: 3m</td></tr>
<tr><td>Receiver setup:</td><td>
<table>
<tr><th>Frequency</th><th>Detector</th><th>RBW</th><th>VBW</th><th>Value</th></tr>
<tr><td>9KHz-150KHz</td><td>Quasi-peak</td><td>200Hz</td><td>600Hz</td><td>Quasi-peak</td></tr>
<tr><td>150KHz-30MHz</td><td>Quasi-peak</td><td>9KHz</td><td>30KHz</td><td>Quasi-peak</td></tr>
<tr><td>30MHz-1GHz</td><td>Quasi-peak</td><td>120KHz</td><td>300KHz</td><td>Quasi-peak</td></tr>
<tr><td rowspan="2">Above 1GHz</td><td>Peak</td><td>1MHz</td><td>3MHz</td><td>Peak</td></tr>
<tr><td>Peak</td><td>1MHz</td><td>10Hz</td><td>Average</td></tr>
</table>
</td></tr>
<tr><td>Limit:</td><td>
<table>
<tr><th>Frequency</th><th>Limit (uV/m)</th><th>Value</th><th>Measurement Distance</th></tr>
<tr><td>0.009MHz-0.490MHz</td><td>2400/F(KHz)</td><td>QP</td><td>300m</td></tr>
<tr><td>0.490MHz-1.705MHz</td><td>24000/F(KHz)</td><td>QP</td><td>30m</td></tr>
<tr><td>1.705MHz-30MHz</td><td>30</td><td>QP</td><td>30m</td></tr>
<tr><td>30MHz-88MHz</td><td>100</td><td>QP</td><td rowspan="6">3m</td></tr>
<tr><td>88MHz-216MHz</td><td>150</td><td>QP</td></tr>
<tr><td>216MHz-960MHz</td><td>200</td><td>QP</td></tr>
<tr><td>960MHz-1GHz</td><td>500</td><td>QP</td></tr>
<tr><td rowspan="2">Above 1GHz</td><td>500</td><td>Average</td></tr>
<tr><td>5000</td><td>Peak</td></tr>
</table>
</td></tr>
<tr><td>Test setup:</td><td>For radiated emissions from 9kHz to 30MHz
 
</td></tr>
</table>

For radiated emissions from 30MHz to1GHz



For radiated emissions above 1GHz



Test Procedure:

1. The EUT was placed on the top of a rotating table (0.8m for below 1G and 1.5m for above 1G) above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation.
2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
3. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rota table was turned from 0 degrees to 360 degrees to find the maximum reading.
5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
6. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

Test Instruments:	Refer to section 5.0 for details					
Test mode:	Refer to section 4.1 for details					
Test environment:	Temp.:	25 °C	Humid.:	52%	Press.:	1012mbar
Test voltage:	AC 120V, 60Hz					
Test results:	Pass					

Measurement data:

Remarks:

1. *During the test, pre-scan the GFSK, π/4-DQPSK, 8-DPSK modulation, and found the GFSK modulation which it is worse case.*
2. *Pre-scan all kind of the place mode (X-axis, Y-axis, Z-axis), and found the Y-axis which it is worse case.*

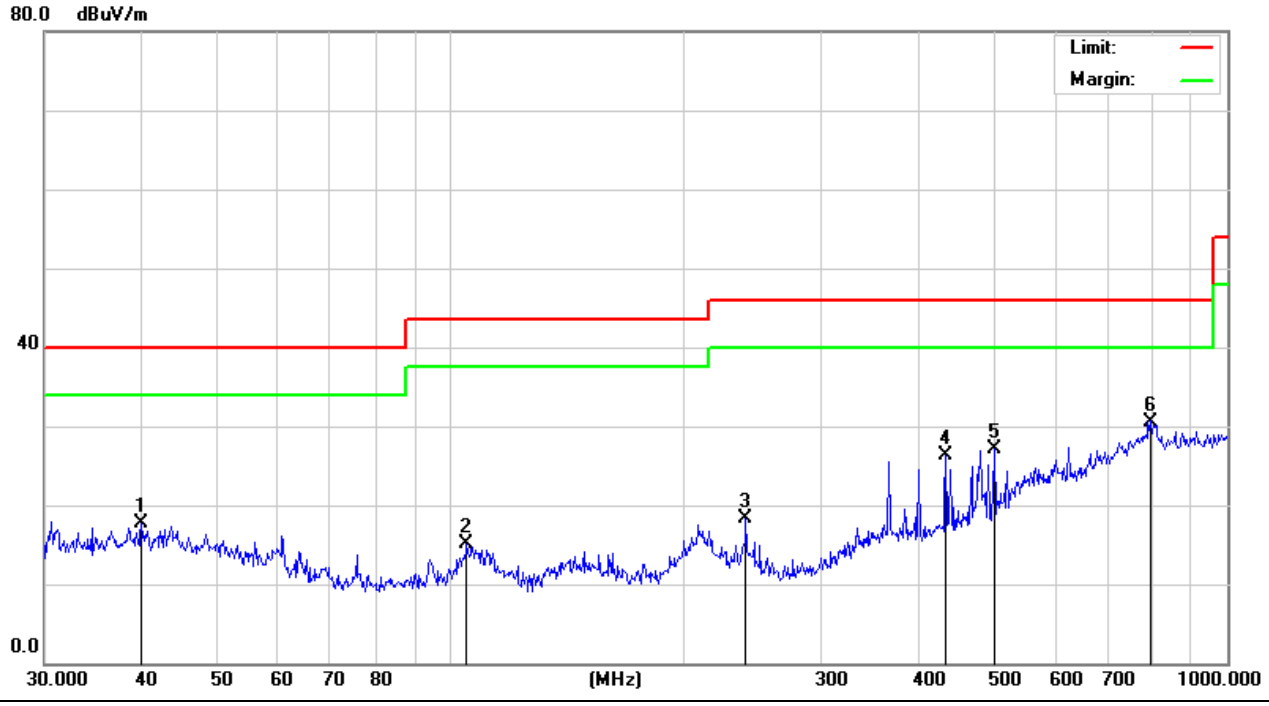
■ **9kHz~30MHz**

The low frequency, which started from 9 kHz to 30 MHz, was pre-scanned and the result which was 20 dB lower than the limit line per 15.31(o) was not reported.

■ **Below 1GHz**

Pre-scan all test modes, found worst case at GFSK 2480MHz, and so only show the test result of GFSK 2480MHz

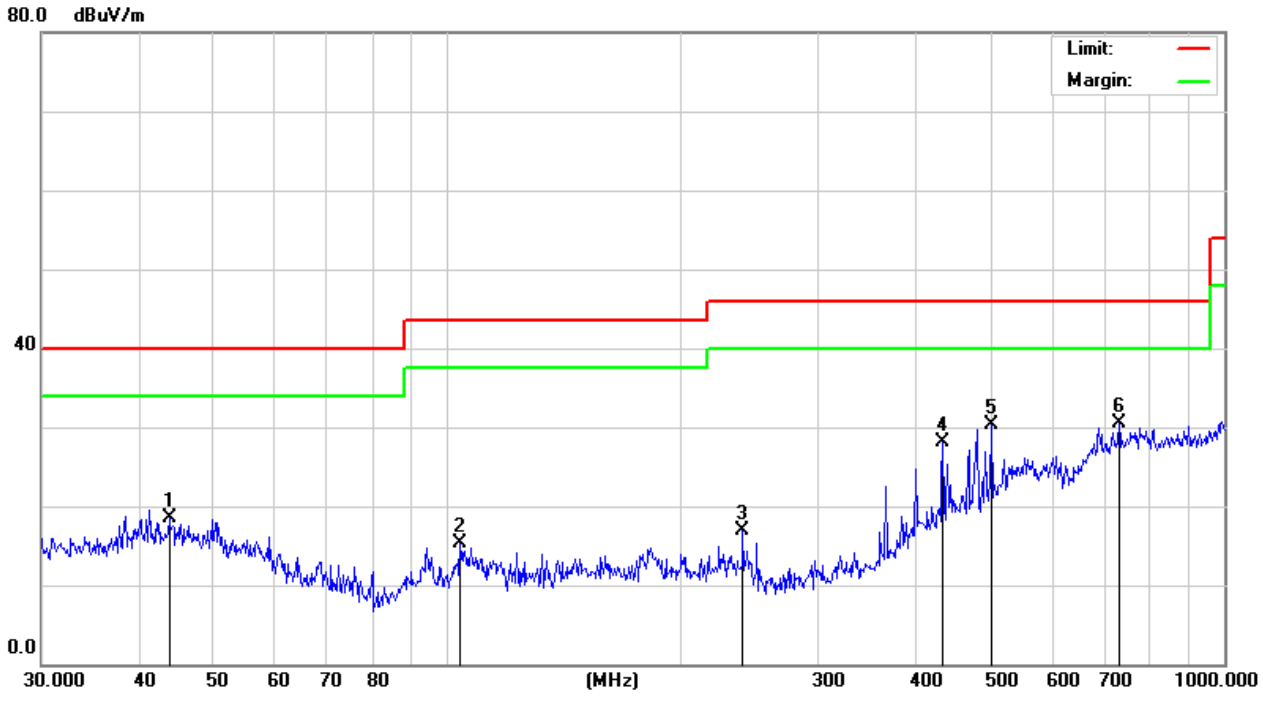
Model name:	GQ001	Test Date :	2021-8-19
Polarization :	Vertical	Test Result:	☒ Pass ☐ Fail



Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.
Measurement Result=Reading Level +Correct Factor;
Over Limit= Measurement Result- Limit;

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector
1		39.9941	21.94	-4.19	17.75	40.00	-22.25	QP
2		104.9033	22.98	-7.84	15.14	43.50	-28.36	QP
3		239.9874	24.79	-6.52	18.27	46.00	-27.73	QP
4		434.0650	29.87	-3.53	26.34	46.00	-19.66	QP
5		501.1789	29.27	-2.12	27.15	46.00	-18.85	QP
6	*	796.1829	22.90	7.70	30.60	46.00	-15.40	QP

Model name:	GQ001	Test Date :	2021-8-19
Polarization :	Vertical	Test Result:	☒ Pass ☐ Fail



Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.
Measurement Result=Reading Level +Correct Factor;
Over Limit= Measurement Result- Limit;

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector
1		43.8119	20.70	-2.12	18.58	40.00	-21.42	QP
2		103.8055	22.74	-7.36	15.38	43.50	-28.12	QP
3		239.9874	23.35	-6.52	16.83	46.00	-29.17	QP
4		434.0651	29.14	-0.95	28.19	46.00	-17.81	QP
5		501.1790	28.80	1.43	30.23	46.00	-15.77	QP
6	*	731.9203	23.37	7.13	30.50	46.00	-15.50	QP

■ **Above 1GHz**

Test channel:	Lowest channel

H

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4804.000	49.45	5.06	54.51	74.00	-19.49	PEAK
4804.000	39.20	5.06	44.26	54.00	-9.74	AVG
7206.000	42.92	7.03	49.95	74.00	-24.05	PEAK
7206.000	32.26	7.03	39.29	54.00	-14.71	AVG

V

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4804.000	47.92	5.14	53.06	74.00	-20.94	PEAK
4804.000	39.10	5.14	44.24	54.00	-9.76	AVG
7206.000	41.64	7.52	49.16	74.00	-24.84	PEAK
7206.000	33.33	7.52	40.85	54.00	-13.15	AVG

Test channel:	Middle channel

H

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
4882.000	49.66	5.14	54.80	74.00	-19.20	PEAK
4882.000	39.92	5.14	45.06	54.00	-8.94	AVG
7323.000	42.36	7.52	49.88	74.00	-24.12	PEAK
7323.000	33.69	7.52	41.21	54.00	-12.79	AVG

V

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
4882.000	48.04	5.14	53.18	74.00	-20.82	PEAK
4882.000	39.39	5.14	44.53	54.00	-9.47	AVG
7323.000	43.27	7.52	50.79	74.00	-23.21	PEAK
7323.000	33.65	7.52	41.17	54.00	-12.83	AVG

Test channel:	Highest channel

H

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
4960.000	49.40	5.22	54.62	74.00	-19.38	PEAK
4960.000	39.51	5.22	44.73	54.00	-9.27	AVG
7440.000	42.83	8.06	50.89	74.00	-23.11	PEAK
7440.000	33.84	8.06	41.90	54.00	-12.10	AVG

V

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
4960.000	48.45	5.22	53.67	74.00	-20.33	PEAK
4960.000	38.86	5.22	44.08	54.00	-9.92	AVG
7440.000	42.38	8.06	50.44	74.00	-23.56	PEAK
7440.000	31.71	8.06	39.77	54.00	-14.23	AVG

Remarks:

1. *Final Level =Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor*
2. *"*", means this data is the too weak instrument of signal is unable to test.*
3. *The emission levels of other frequencies are very lower than the limit and not show in test report.*
4. *The test data shows only the worst case GFSK mode*

7 Test Setup Photo

Reference to the **appendix I** for details.

8 EUT Constructional Details

Reference to the **appendix II** for details.

End of report