FCC Test Report

Report No: FCS202306231W01

Issued for

Applicant:	Dongguang Zoyo Electronics Technology Co., Ltd.
Address:	No.11, Nange west road, Nanya Village,Daojiao Town,Dongguan city, Guangdong province, China.
Product Name:	Smart LED String
Brand Name:	N/A
Model Name:	Wi-Fi_BLE-RGBIC-200
Series Model:	Wi-Fi_BLE-RGBIC-100, Wi-Fi_BLE-RGBIC-250,Wi-Fi_BLE-RGBIC-400 Wi-Fi_BLE-RGBIC-500
FCC ID:	2AZK7-RGBIC-200

Issued By: Flux Compliance Service Laboratory
Add: Room 105 Floor Bao hao Technology Building 1 NO.15 Gong ye West Road Hi-Tech Industrial, Song shan lake Dongguan
Tel: 769-27280901 Fax:769-27280901 http://www.FCS-lab.com

TEST RESULT CERTIFICATION

Applicant's Name..... :	Dongguang Zoyo Electronics Technology Co., Ltd.
Address..... :	No.11, Nange west road, Nanya Village,Daojiao Town,Dongguan city, Guangdong province, China.
Manufacture's Name..... :	Dongguang Zoyo Electronics Technology Co., Ltd.
Address..... :	No.11, Nange west road, Nanya Village,Daojiao Town,Dongguan city, Guangdong province, China.

Product Description

Product Name..... :	Smart LED String
Brand Name.....:	N/A
Model Name..... :	Wi-Fi_BLE-RGBIC-200
Series Model.....:	Wi-Fi_BLE-RGBIC-100, Wi-Fi_BLE-RGBIC-250,Wi-Fi_BLE-RGBIC-400 Wi-Fi_BLE-RGBIC-500
Test Standards.....:	FCC Rules and Regulations Part 15 Subpart C, Section 247
Test Procedure.....:	ANSI C63.10:2013

This device described above has been tested by Flux Compliance Service Laboratory, 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.
This report shall not be reproduced except in full, without the written approval of Flux Compliance Service Laboratory, this document may be altered or revised by Flux Compliance Service Laboratory, personal only, and shall be noted in the revision of the document..

Date of Test.....:

Date (s) of performance of tests. :	Jun 29, 2023 ~ July 4, 2023
Date of Issue.....:	July 4, 2023
Test Result..... :	Pass

Tested by : Scott Shen

(Scott Shen)

Reviewed by : Duke Qian

(Duke Qian)

Approved by : Jack Wang

(Jack Wang)

Table of Contents **Page**

1. SUMMARY OF TEST RESULTS 6
1.1 TEST FACTORY 7
1.2 MEASUREMENT UNCERTAINTY 7
2. GENERAL INFORMATION 8
2.1 GENERAL DESCRIPTION OF THE EUT 8
2.2 BLOCK DIGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED 10
2.3 DESCRIPTION OF NECESSARY ACCESSORIES AND SUPPORT UNITS 11
2.4 EQUIPMENTS LIST 12
3. CONDUCTED EMISSION MEASUREMENT 13
4. 6DB BANDWIDTH 17
4.1 Limit 17
4.2 Test Procedure 17
4.3 Test setup 17
4.4 Test results 17
4.5 Original Test Data 18
5. CONDUCTED OUTPUT POWER 21
5.1 LIMIT 21
5.2 TEST PROCEDURE 21
5.3 TEST SETUP 21
5.5 TEST RESULTS 21
6. BAND EDGE AND SPURIOUS(CONDUCTED) 22
6.1 LIMIT 22
6.2 TEST PROCEDURE 22
6.3 TEST SETUP 22
6.4 TEST RESULTS 23
6.5 Original test data 23
7. POWER SPECTRAL DENSITY 26
7.1 LIMIT 26
7.2 TEST PROCEDURE 26
7.3 TEST SETUP 26
7.4 TEST RESULTS 26

Table of Contents **Page**

7.5 original test data 27

8. RADIATED EMISSION MEASUREMENT 29

8.1 RADIATED EMISSION LIMITS 29

8.2 TEST PROCEDURE 30

8.3 TESTSETUP 31

8.4. TEST RESULTS 33

9. RADIATED EMISSION (30MHZ-1000MHZ) 34

■ 9.1 RADIATED EMISSION ABOVE 1GHZ 36

9.2 RADIATED BAND EDGE DATA 39

10. ANTENNA REQUIREMENT 40

10.1 STANDARD REQUIREMENT 40

10.2 RESULT 40

Revision History

Rev.	Issue Date	Effect Page	Contents
00	July 4, 2023	N/A	N/A

1. SUMMARY OF TEST RESULTS

Test procedures according to the technical standards:
KDB 558074 D01 15.247 Meas Guidance v05r02

FCC Part 15.247,Subpart C			
Standard Section	Test Item	Judgment	Remark
15.207	Conducted Emission	PASS	--
15.247 (b)(3)	Output Power	PASS	--
15.209	Radiated Spurious Emission	PASS	--
15.247(d)	Conducted Spurious & Band Edge Emission	PASS	--
15.247 (e)	Power Spectral Density	PASS	--
15.247(a)(2)	6dB Bandwidth 99% Bandwidth	PASS	--
15.205	Restricted bands of operation	PASS	--
Part 15.247(d)/part 15.209(a)	Band Edge Emission	PASS	--
15.203	Antenna Requirement	PASS	--

NOTE:

(1)" N/A" denotes test is not applicable in this Test Report

(2) All tests are according to ANSI C63.10-2013

1.1 TEST FACTORY

Company Name:	Flux Compliance Service Laboratory
Address:	Room 105 Floor Bao hao Technology Building 1 NO.15 Gong ye West Road Hi-Tech Industrial, Song shan lake Dongguan
Telephone:	+86-769-27280901
Fax:	+86-769-27280901

FCC Test Firm Registration Number: 514908
Designation number: CN0127
A2LA accreditation number：5545.01
ISED Number：25801
CAB ID ： CN0097

Organization	CAB identifier	Scope / Recognition Date (yyyy-mm-dd)	Expiration (yyyy-mm-dd)
FLUX COMPLIANCE SERVICE LABORATORY Baohao Technology Building 1 No. 15 Gongye West Road Hi-Tech Industrial Park Songsham Lake Dongguan, Guangdong. 523808 PRC. **ISED#: 25801** Contact: Andy Yue andy-vue@fcs-lab.com	CN0097	RSS-102(RFExp) (2020-01-09) RSS-GEN (2020-01-09) RSS-210 (2020-01-09) RSS-247 (2020-01-09)	**RECOGNIZED UNTIL: 2023-12-31** A2LA ISO/IEC 17025: 2017 Expires: 2023-12-31

1.2 MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement **y** ±**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** %.

No.	Item	Uncertainty
1	RF output power, conducted	±0.71dB
2	Unwanted Emissions, conducted	±2.988 dB
3	Conducted Emission (9KHz-150KHz)	±4.13 dB
4	All emissions radiated (9KHz -30MHz)	±3.1 dB
5	Conducted Emission (150KHz-30MHz)	±4.74 dB
6	All emissions,radiated(<1G) 30MHz-1000MHz	±5.2 dB
7	All emissions,radiated 1GHz -18GHz	±4.66 dB
8	All emissions,radiated 18GHz -40GHz	±4.31 dB
9	Occupied bandwidth and PSD	±0.3 dB

2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF THE EUT

<table>
<tr><td>Product Name</td><td>Smart LED String</td></tr>
<tr><td>Trade Name</td><td>N/A</td></tr>
<tr><td>Model Name</td><td>Wi-Fi_BLE-RGBIC-200</td></tr>
<tr><td>Series Model</td><td>Wi-Fi_BLE-RGBIC-100,
Wi-Fi_BLE-RGBIC-250,Wi-Fi_BLE-RGBIC-400
Wi-Fi_BLE-RGBIC-500</td></tr>
<tr><td>Model Difference</td><td>The above product with same circuit, PCB layout, electrical parts, materials and wiring structures, the materials of decorative accessories is same, For the product appearance difference, the size is the same, but the color of the product is different</td></tr>
<tr><td>Product Description</td><td><table>
<tr><td>Operation Frequency:</td><td>2402-2480 MHz</td></tr>
<tr><td>Modulation Type:</td><td>GFSK</td></tr>
<tr><td>Radio Technology:</td><td>BLE</td></tr>
<tr><td>Bluetooth Configuration:</td><td>LE</td></tr>
<tr><td>Number Of Channel:</td><td>40 CH</td></tr>
<tr><td>Antenna Gain (dBi)</td><td>2.21</td></tr>
<tr><td>Transmitter rate:</td><td>1MHz</td></tr>
</table></td></tr>
<tr><td>Channel List</td><td>Please refer to the Note 2.</td></tr>
<tr><td>Power Supply</td><td>Input:100-240V 50/60Hz 0.5A Max Output: DC 24V 1A</td></tr>
<tr><td>Battery</td><td>N/A</td></tr>
<tr><td>Hardware version number</td><td>V1.0</td></tr>
<tr><td>Software version number</td><td>V1.0</td></tr>
<tr><td>Connecting I/O Port(s)</td><td>Please refer to the User's Manual</td></tr>
</table>

Note:

1. For a more detailed features description, please refer to the manufacturer’s specifications or the User's Manual.

2. Channel List

Channel	Freq.(MHz)	Channel	Freq.(MHz)	Channel	Freq.(MHz)	Channel	Freq.(MHz)
0	2402	10	2422	20	2442	30	2462
1	2404	11	2424	21	2444	31	2464
2	2406	12	2426	22	2446	32	2466
3	2408	13	2428	23	2448	33	2468
4	2410	14	2430	24	2450	34	2470
5	2412	15	2432	25	2452	35	2472
6	2414	16	2434	26	2454	36	2474
7	2416	17	2436	27	2456	37	2476
8	2418	18	2438	28	2458	38	2478
9	2420	19	2440	29	2460	39	2480

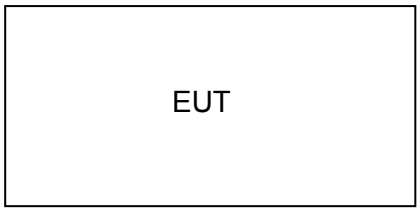
3. Table for Filed Antenna

Ant.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)	NOTE
1	NA	N/A	PCB Antenna	N/A	2.21	Antenna

2.2 BLOCK DIGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED

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

Block diagram of EUT configuration for test



Test software: AmebaZ2_mptool_1v3.exe

The test softeware was used to control EUT work in continuous TX mode, and select test channel, Wireless mode as below table

No.	Test model descrption
1	Low channel GFSK
2	Middle channel GFSK
3	High channel GFSK

Note:

1. All the test modes can be supply by battery, only the result of the worst case recorded in the report. GFSK mode is worst mode.
2. For radiated emission, 3 axis were chosen for testing for each applicable mode.
3. The EUT used fully charge battery when tested.
4. During the test, the dutycycle>98%, the test voltage was tuned from 85% to 115% of the Nominal rate supply votage, and found that the worst case was the nominal rated supply condition, So the report just shows that condition's data

2.3 DESCRIPTION OF NECESSARY ACCESSORIES AND SUPPORT UNITS

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

Necessary accessories

Item	Equipment	Mfr/Brand	Model/Type No.	Serial No.	Note
1	Adapter	N/A	XY24SE-240100VQ-UT	N/A	Test use

Support units

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

Note:

(1) The support equipment was authorized by Declaration of Confirmation.
(2) For detachable type I/O cable should be specified the length in cm in 『Length』 column.
(3) “YES” is means “shielded” “with core”; “NO” is means “unshielded” “without core”.

2.4 EQUIPMENTS LIST

Radiation Test equipment

Kind of Equipment	Manufacturer	Type No.	Company No.	Last calibration	Calibrated until
EMI Test Receiver	R&S	ESRP 3	FCS-E001	2022.08.30	2023.08.29
Signal Analyzer	R&S	FSV40-N	FCS-E012	2022.08.30	2023.08.29
Active loop Antenna	ZHINAN	ZN30900C	FCS-E013	2022.08.30	2023.08.29
Bilog Antenna	SCHWARZBECK	VULB 9168	FCS-E002	2022.08.30	2023.08.29
Horn Antenna	SCHWARZBECK	BBHA 9120D	FCS-E003	2022.08.30	2023.08.29
SHF-EHF Horn Antenna (18G-40GHz)	A-INFO	LB-180400-KF	FCS-E018	2022.08.30	2023.08.29
Pre-Amplifier(0.1M-3G Hz)	EMCI	EM330N	FCS-E004	2022.08.30	2023.08.29
Pre-Amplifier (1G-18GHz)	N/A	TSAMP-0518SE	FCS-E014	2022.08.30	2023.08.29
Pre-Amplifier (18G-40GHz)	TERA-MW	TRLA-0400	FCS-E019	2022.08.30	2023.08.29
Temperature & Humidity	HTC-1	victor	FCS-E005	2022.08.30	2023.08.29
Testing Software	EZ-EMC(Ver.STSLAB 03A1 RE)				

Conduction Test equipment

Kind of Equipment	Manufacturer	Type No.	Company No.	Last calibration	Calibrated until
EMI Test Receiver	R&S	ESPI	FCS-E020	2022.08.30	2023.08.29
LISN	R&S	ENV216	FCS-E007	2022.08.30	2023.08.29
LISN	ETS	3810/2NM	FCS-E009	2022.08.30	2023.08.29
Temperature & Humidity	HTC-1	victor	FCS-E008	2022.08.30	2023.08.29
Testing Software	EZ-EMC(Ver.EMC-CON 3A1.1)				

RF Connected Test

Kind of Equipment	Manufacturer	Type No.	Company No.	Last calibration	Calibrated until
MXA SIGNAL Analyzer	Keysight	N9020A	FCS-E015	2022.08.30	2023.08.29
Spectrum Analyzer	Agilent	E4447A	MY50180039	2022.08.30	2023.08.29
Spectrum Analyzer	R&S	FSV-40	101499	2022.08.30	2023.08.29
Power Sensor	Agilent	UX2021XA	FCS-E021	2022.08.30	2023.08.29
Testing Software	EZ-EMC(Ver.STSLAB 03A1 RE)				

3. CONDUCTED EMISSION MEASUREMENT

3.1 LIMIT

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

FREQUENCY (MHz)	Conducted Emissionlimit (dBuV)	
	Quasi-peak	Average
0.15 -0.5	66 - 56 *	56 - 46 *
0.50 -5.0	56.00	46.00
5.0 -30.0	60.00	50.00

Note:

(1) The tighter limit applies at the band edges.

(2) The limit of " * " marked band means the limitation decreases linearly with the logarithm of the frequency in the range.

3.2 TEST PROCEDURE

The following table is the setting of the receiver

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

a. The EUT was 0.8 meters from the horizontal ground plane and 0.4 meters from the vertical ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipments powered from additional LISN(s). The LISN provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.

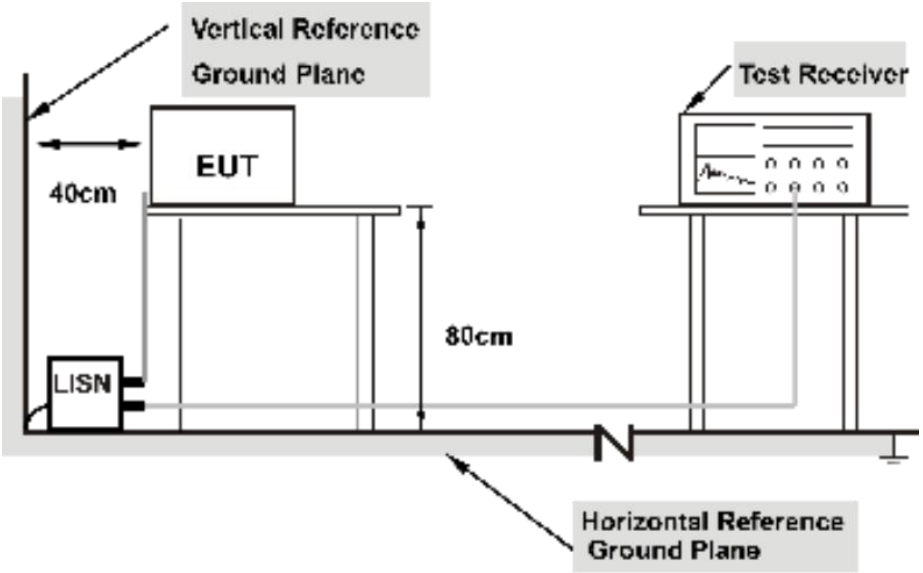
b. Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.

c. I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.

d. LISN at least 80 cm from nearest part of EUT chassis.

e. For the actual test configuration, please refer to the related Item –EUT Test Photos.

3.3 TEST SETUP

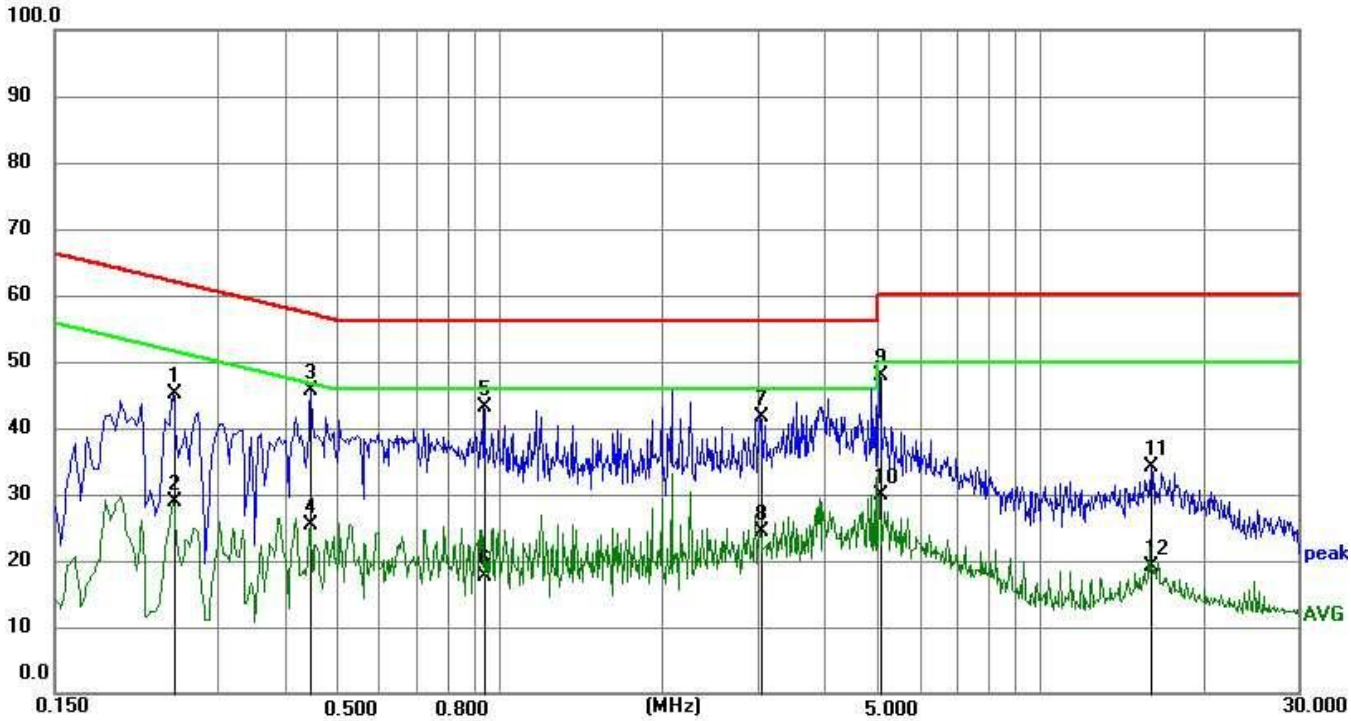


Note: 1.Support units were connected to second LISN.

2.Both of LISNs (AMN) are 80 cm from EUT and at least 80 from other units and other metal planes

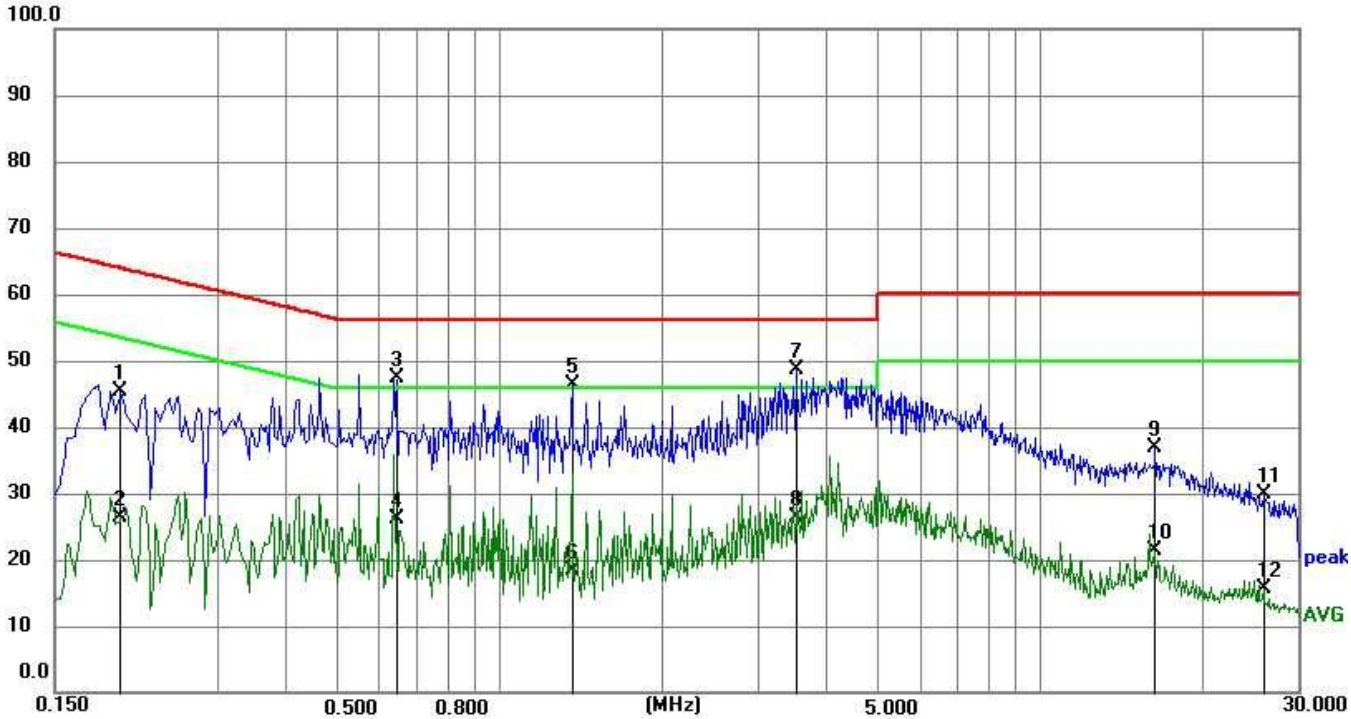
3.4 TEST RESULTS

Temperature:	25℃	Relative Humidity:	50%
Test Mode:	GFSK	Test Voltage:	AC 110V
Result:	L	Result:	Pass



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.2490	35. 19	10.05	45.24	61.79	16.55	QP
2	0.2490	18.88	10.05	28.93	51.79	22.86	AVG
3	0.4470	35.72	10.02	45.74	56.93	11. 19	QP
4	0.4470	15.27	10.02	25.29	46.93	21.64	AVG
5	0.9375	33.23	10.00	43.23	56.00	12.77	QP
6	0.9375	7.65	10.00	17.65	46.00	28.35	AVG
7	3.0345	31.64	9.94	41.58	56.00	14.42	QP
8	3.0345	14.52	9.94	24.46	46.00	21.54	AVG
9	5.0550	37.99	9.88	47.87	60.00	12. 13	QP
10	5.0550	20. 12	9.88	30.00	50.00	20.00	AVG
11	16.0710	24.41	9.84	34.25	60.00	25.75	QP
12	16.0710	9. 17	9.84	19.01	50.00	30.99	AVG

Temperature:	25℃	Relative Humidity:	50%
Test Mode:	GFSK	Test Voltage:	AC 110V
Result:	N	Result:	Pass



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0. 1995	35.40	10.05	45.45	63.63	18. 18	QP
2	0. 1995	16.21	10.05	26.26	53.63	27.37	AVG
3	0.6405	37.42	9.99	47.41	56.00	8.59	QP
4	0.6405	16. 12	9.99	26. 11	46.00	19.89	AVG
5	1.3605	36.47	9.98	46.45	56.00	9.55	QP
6	1.3605	8.50	9.98	18.48	46.00	27.52	AVG
7	3.5295	38.71	9.92	48.63	56.00	7.37	QP
8	3.5295	16.52	9.92	26.44	46.00	19.56	AVG
9	16.3590	26.90	9.87	36.77	60.00	23.23	QP
10	16.3590	11.43	9.87	21.30	50.00	28.70	AVG
11	25.9035	19.91	9.98	29.89	60.00	30. 11	QP
12	25.9035	5.76	9.98	15.74	50.00	34.26	AVG

Remark:

1. All readings are Quasi-Peak and Average values

4. 6DB BANDWIDTH

4.1 Limit

FCC Part 15.247,Subpart C RSS-Gen Clause 6.7				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247(a)(2)	6dB Bandwidth	>= 500KHz	2400-2483.5	PASS
RSS-Gen Clause 6.7	99% Bandwidth	For reporting purposes only.	2400-2483.5	PASS

4.2 Test Procedure

(1) Connect EUT's antenna output to spectrum analyzer by RF cable.

(2) Set the spectrum analyzer as follows

RBW: 100kHz

VBW: 300kHz

Detector Mode: AVG

Sweep time: auto

Trace mode Max hold

(3) Allow the trace to stabilize, measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission

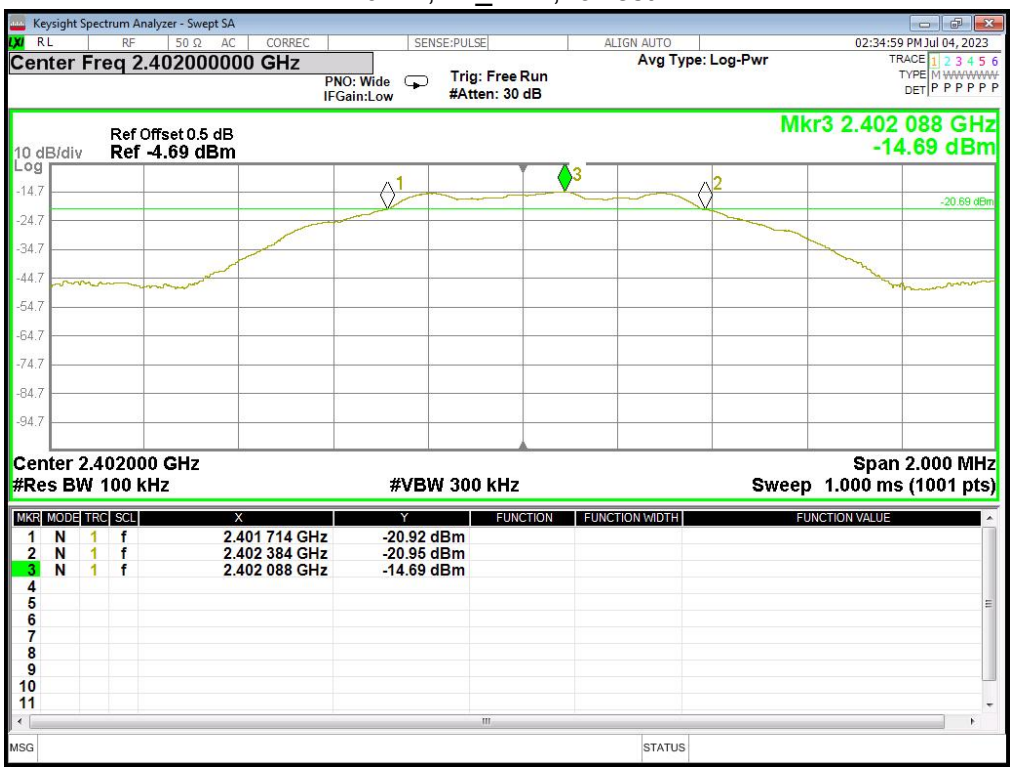
4.3 Test setup

4.4 Test results

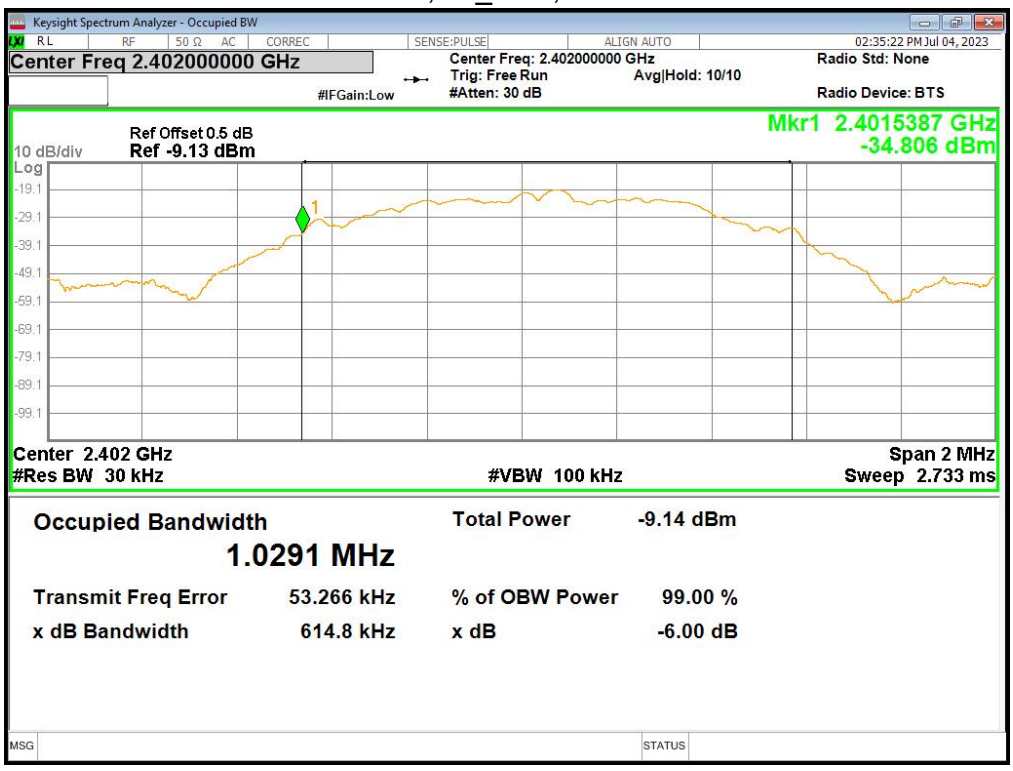
TestMode	Channel (MHz)	6dB Bandwidth (MHz)	99% Bandwidth(MHz)	Limit [MHz]	Verdict
Lowest	2402MHz	0.670	1.029	0.5	Pass
Middle	2440MHz	0.678	1.037	0.5	Pass
Highest	2480MHz	0.686	1.025	0.5	Pass

4.5 Original Test Data

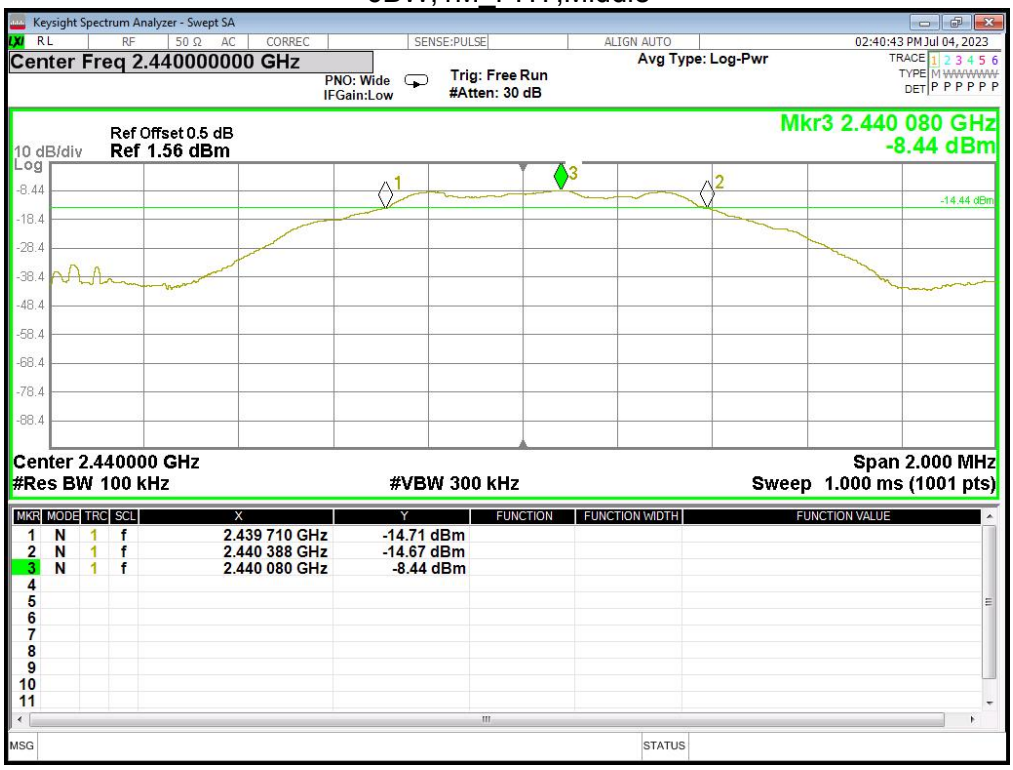
6BW,1M_PHY,Lowest



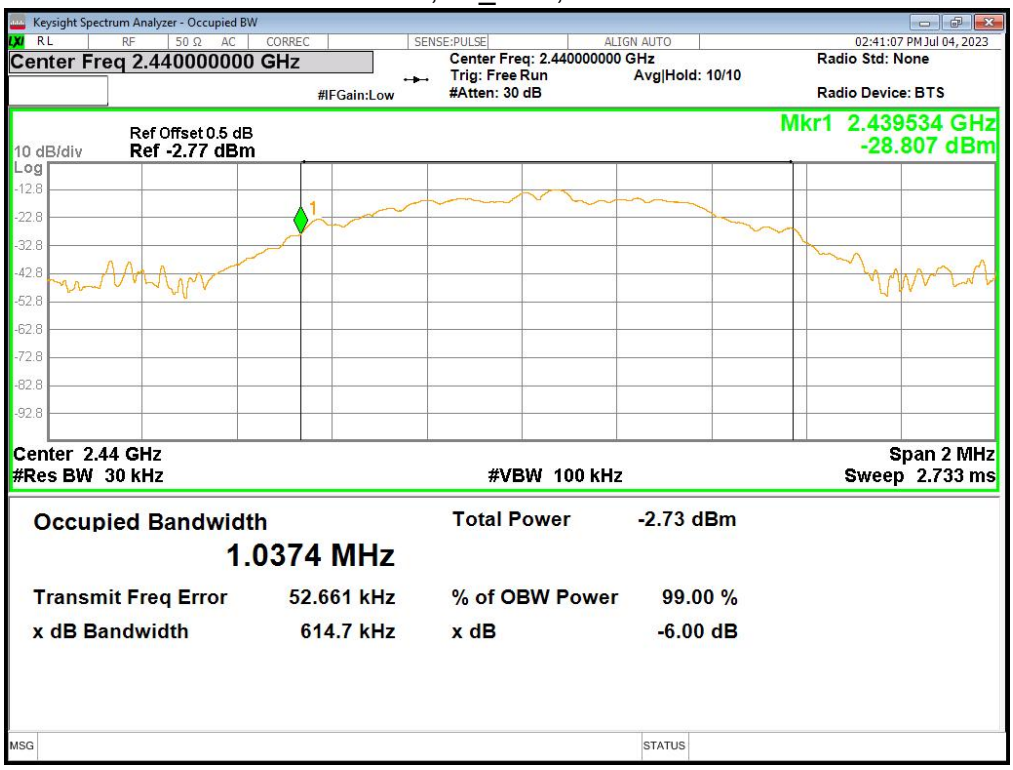
OCB,1M_PHY,Lowest



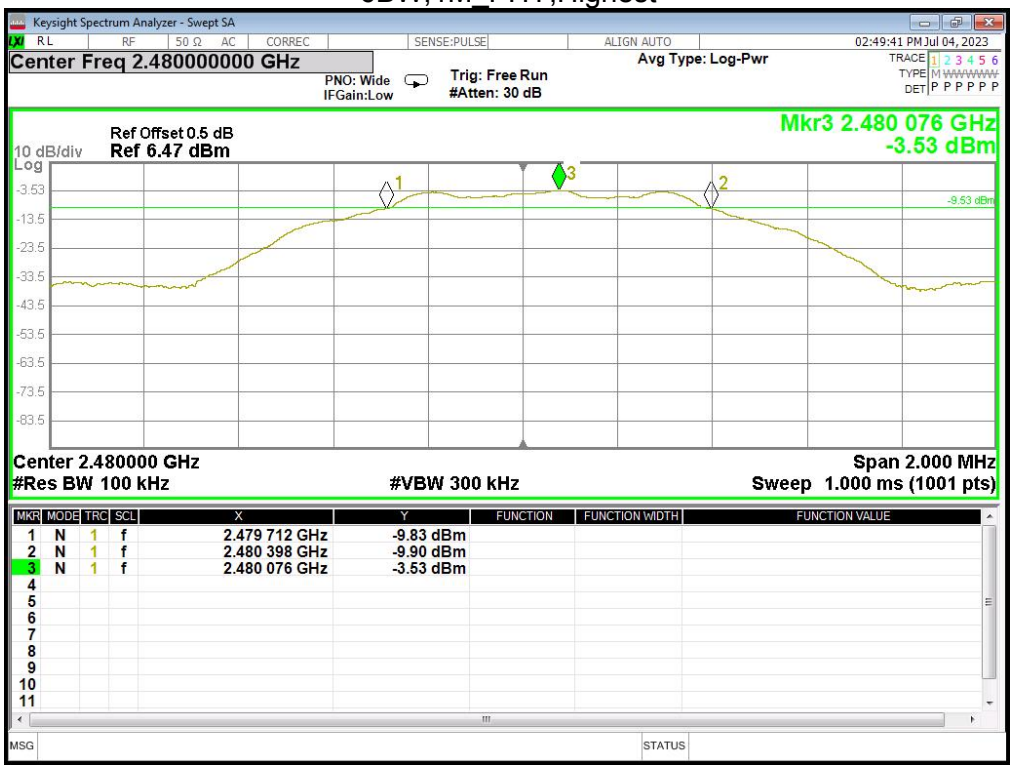
6BW,1M_PHY,Middle



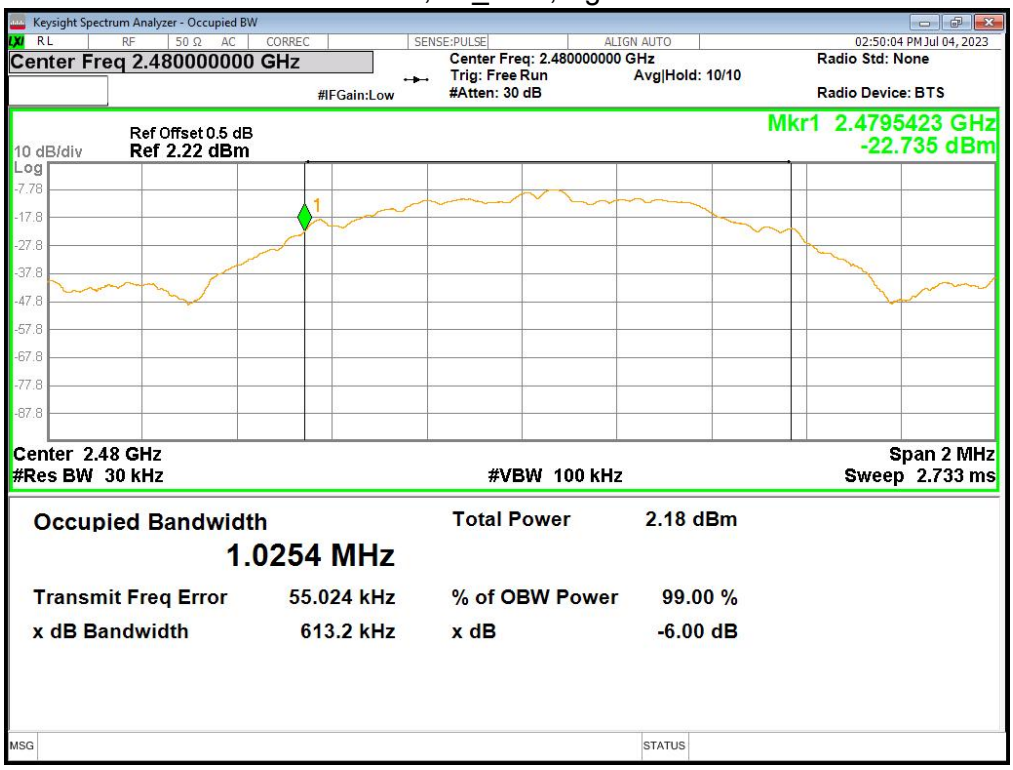
OCB,1M_PHY,Middle



6BW,1M_PHY,Highest



OCB,1M_PHY,Highest



5. CONDUCTED OUTPUT POWER

5.1 LIMIT

FCC Part 15 Subpart C			
Section	Test Item	Limit	Frequency Range
15.247(b)(3)	Peak output power	Power <1W(30dBm)	2400-2483.5

5.2 TEST PROCEDURE

(1) The EUT was directly connected to the Power sensor and antenna output port as show in The block diagram adove.

(2) The EUT was set to continuously transmitting in the max power during the test.

5.3 TEST SETUP

5.5 TEST RESULTS

TestMode	Channel (MHz)	Result (dBm)	Limit (dBm)	Verdict
Lowest	2402MHz	2.32	30	Pass
Middle	2440MHz	2.29	30	Pass
Highest	2480MHz	2.30	30	Pass

6. BAND EDGE AND SPURIOUS(CONDUCTED)

6.1 LIMIT

In any 100kHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator in operating, the radio frequency power that is produced by the intentional radiator shall be at least 30dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power.

6.2 TEST PROCEDURE

(1) Connect EUT's antenna output to spectrum analyzer by RF cable.

(2) Establish a reference level by using the following procedure:

Center frequency	DTS Channel center frequency
RBW:	30kHz
VBW:	100kHz
Span	1.5times the DTS bandwidth
Detector Mode:	Peak
Sweep time:	auto
Trace mode	Max hold

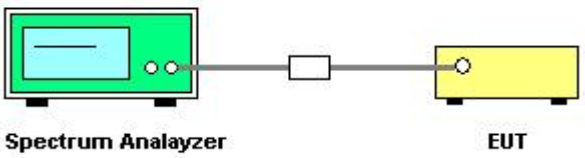
(3) Establish Allow the trace to stabilize, use the peak marker function to determine the maximum peak power level to establish the reference level.

(4) Set the spectrum analyzer as follows:

RBW:	100kHz
VBW:	300kHz
Span	Encompass frequency range to be measured
Number of measurement points	≥span/RBW
Detector Mode:	Peak
Sweep time:	auto
Trace mode	Max hold

(5) Allow the trace to stabilize, use the peak marker function to determine the maximum amplitude of all unwanted emissions outside of the authorized frequency band

6.3 TEST SETUP



6.4 TEST RESULTS

Eut set mode	CH or Frequency	Result
GFSK	CH0	Pass
	CH39	Pass

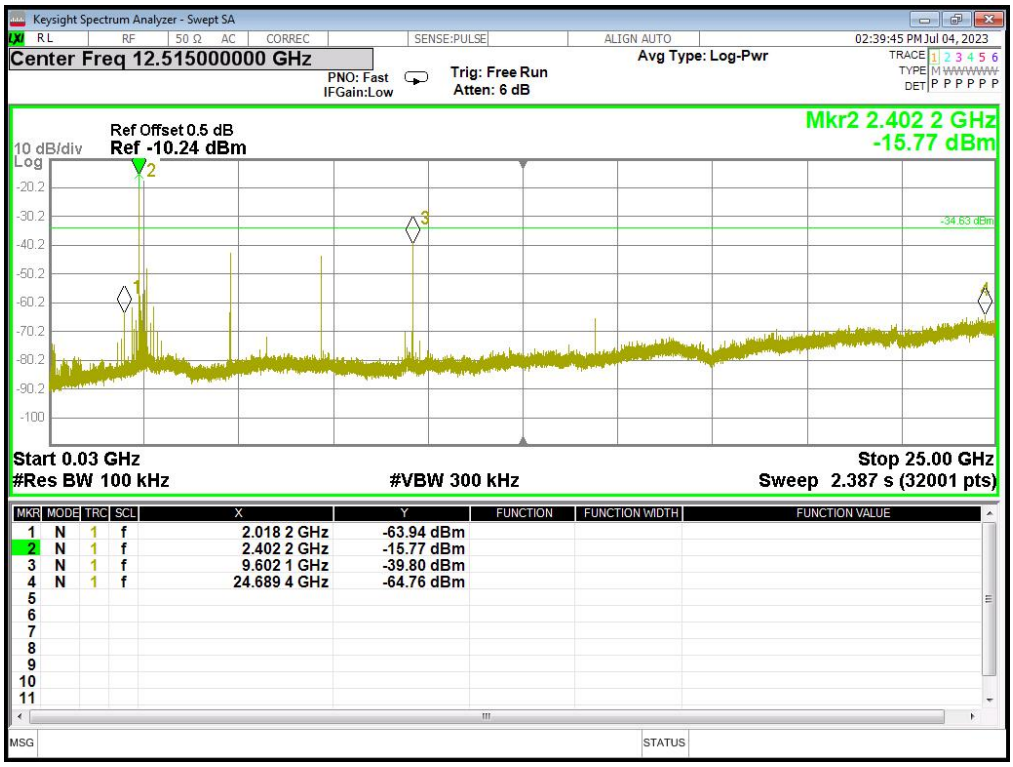
6.5 Original test data

CH0 2402MHZ

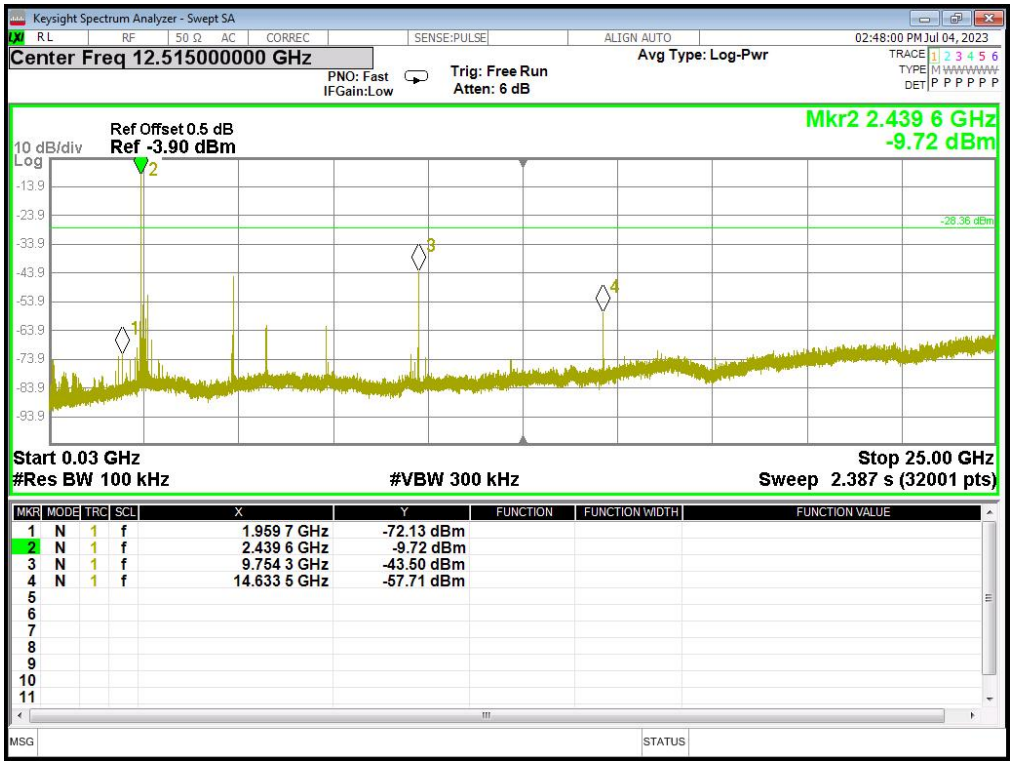
CH39 2480MHZ

Spurious emissions

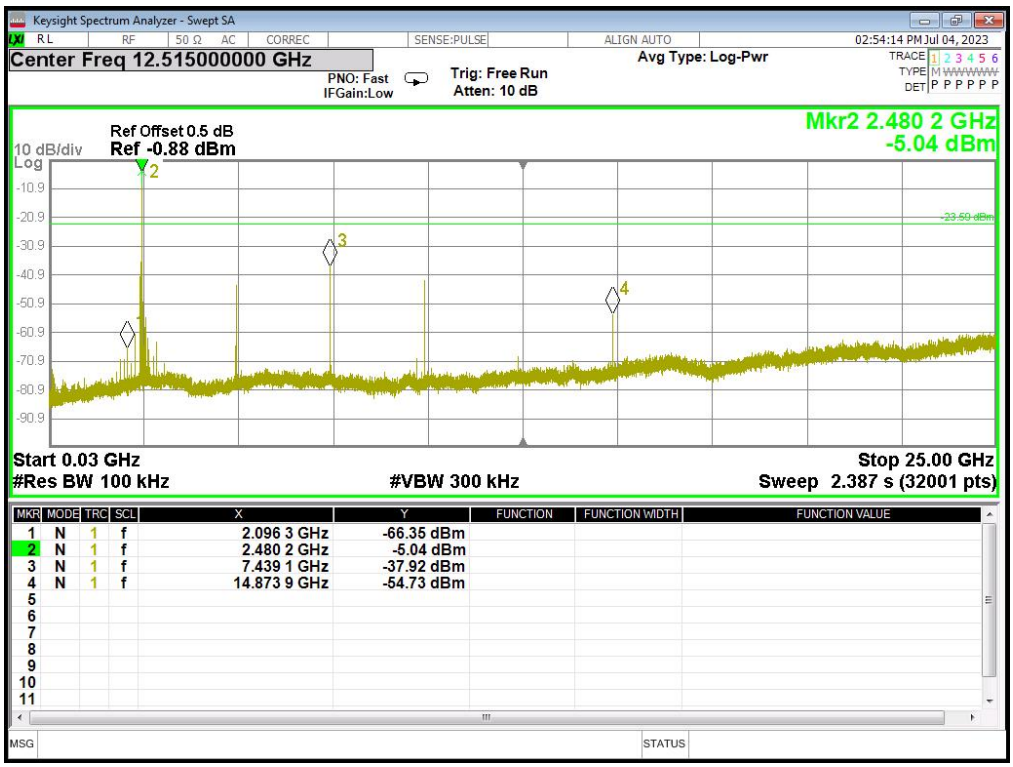
Low 2402MHz 0.3GHz-26.5GHz



MIDDLE 2440MHZ 0.3GHZ-26.5GHZ



High 2480MHz 0.3GHz-26.5GHz



7. POWER SPECTRAL DENSITY

7.1 LIMIT

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3 kHz band during any time interval of continuous transmission.

7.2 TEST PROCEDURE

(1) Connect EUT's antenna output to spectrum analyzer by RF cable.

(2) Set the spectrum analyzer as follows:

Center frequency	DTS Channel center frequency
RBW:	3 kHz ≤ RBW ≤ 100 kHz
VBW:	≥ 3RBW
Span	1.5 times the DTS bandwidth
Detector Mode:	Peak
Sweep time:	auto
Trace mode	Max hold

(3) Allow the trace to stabilize, use the peak marker function to determine the maximum amplitude level within the RBW

(4) If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

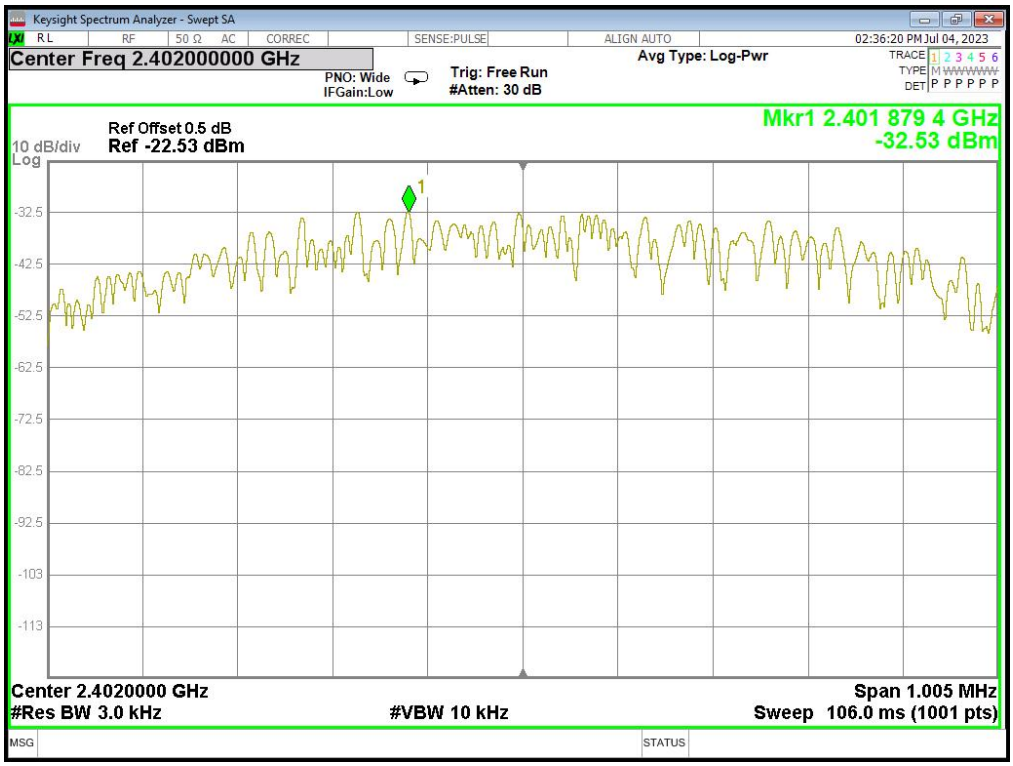
7.3 TEST SETUP

7.4 TEST RESULTS

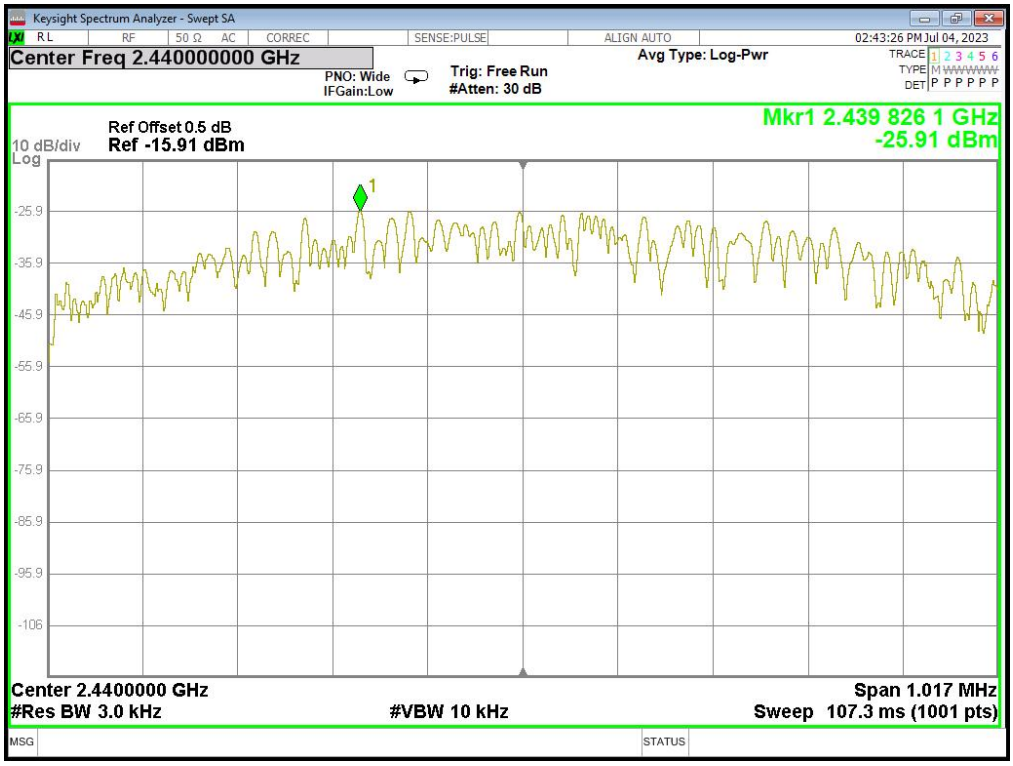
TestMode	Channel (MHz)	Result (dBm/3KHz)	Limit (dBm/3KHz)	Verdict
GFSK	2402MHz	-28.46	8	Pass
GFSK	2440MHz	-30.66	8	Pass
GFSK	2480MHz	-31.97	8	Pass

7.5 original test data

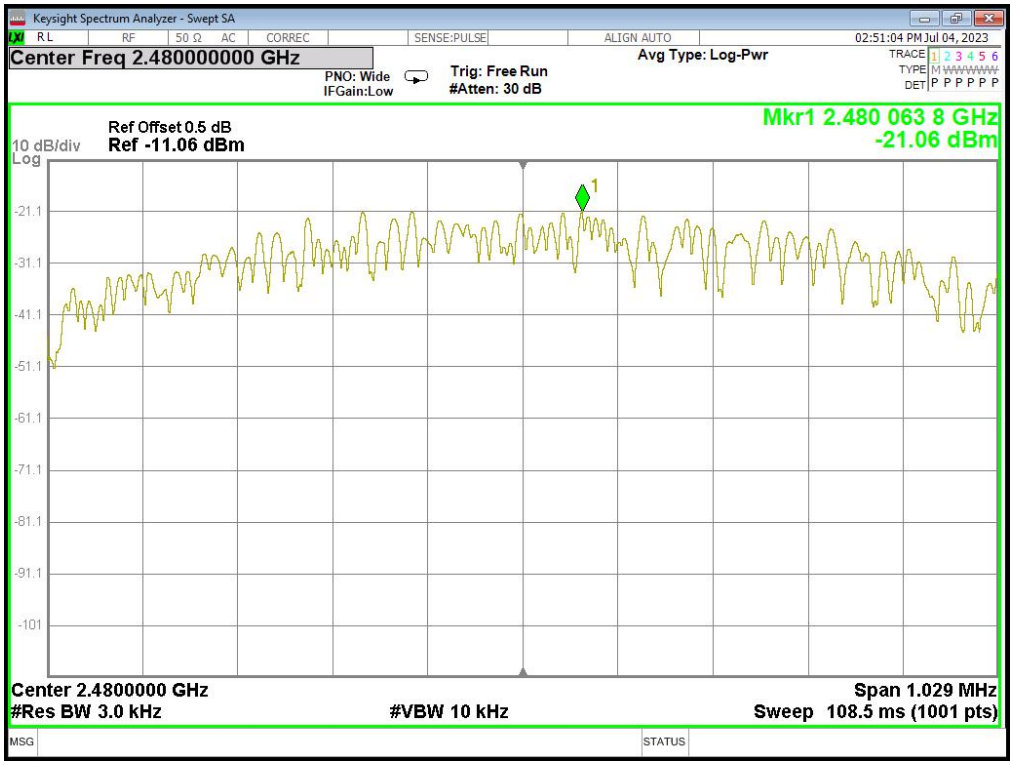
GFSK-2402MHz



GFSK-2440MHz



GFSK-2480MHz



8. RADIATED EMISSION MEASUREMENT

8.1 RADIATED EMISSION LIMITS

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

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

Frequencies (MHz)	Field Strength (micorvolts/meter)	Measurement Distance (meters)
0.009~0.490	2400/F(KHz)	300
0.490~1.705	24000/F(KHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
Above 960	500	3

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

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

Notes:

(1) The limit for radiated test was performed according to FCC PART 15C.

(2) The tighter limit applies at the band edges.

(3) Emission level (dBuV/m)=20log Emission level (uV/m).

For Radiated Emission

Spectrum Parameter	Setting
Attenuation	Auto
Detector	Peak/AV
Start Frequency	1000 MHz(Peak/AV)
Stop Frequency	10th carrier hamonic(Peak/AV)
RB / VB (emission in restricted band)	PK=1MHz / 1MHz, AV=1 MHz /10 Hz

For Band edge

Spectrum Parameter	Setting
Detector	Peak/AV
Start/Stop Frequency	Lower Band Edge: 2300 to 2403 MHz Upper Band Edge: 2479 to 2500 MHz
RB / VB (emission in restricted band)	PK=1MHz / 1MHz, AV=1 MHz / 10 Hz

Receiver Parameter	**Setting**
Attenuation	Auto
Start ~ Stop Frequency	9kHz~90kHz / RB 200Hz for PK & AV
Start ~ Stop Frequency	90kHz~110kHz / RB 200Hz for QP
Start ~ Stop Frequency	110kHz~490kHz / RB 200Hz for PK & AV
Start ~ Stop Frequency	490kHz~30MHz / RB 9kHz for QP
Start ~ Stop Frequency	30MHz~1000MHz / RB 120kHz for QP

8.2 TEST PROCEDURE

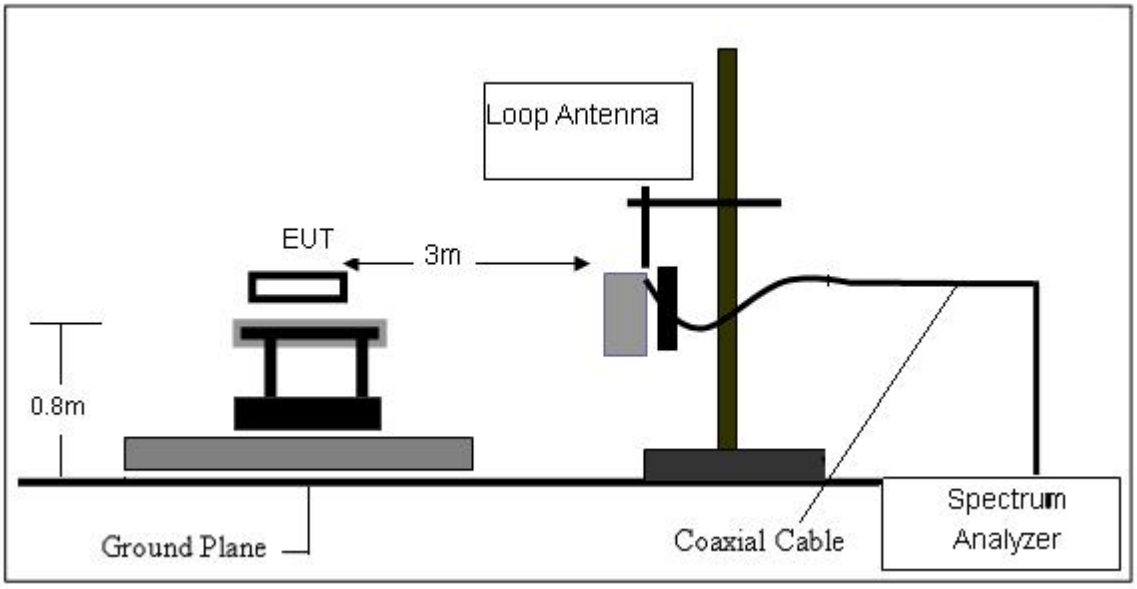
a. The measuring distance of at 3 m shall be used for measurements at frequency 0.009MHz up to 1GHz,and above 1GHz.
b. The EUT was placed on the top of a rotating table 0.8 meters (above 1GHz is 1.5 m) above the ground at a 3 meter anechoic chamber test site. The table was rotated 360 degrees to determine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

Note:

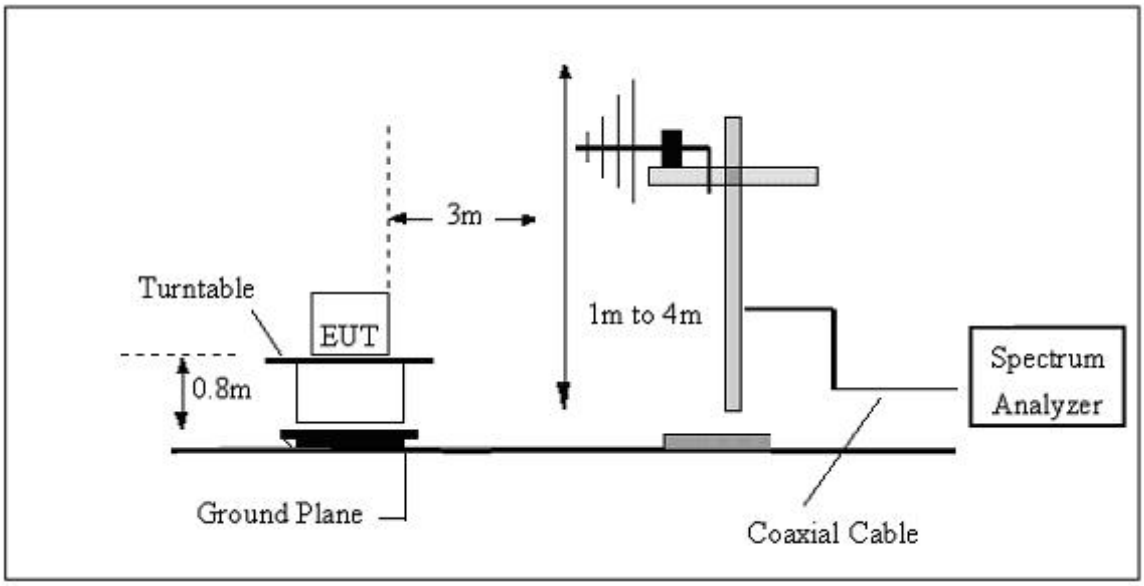
Both horizontal and vertical antenna polarities were tested
and performed pretest to three orthogonal axis. The worst case emissions were reported

8.3 TESTSETUP

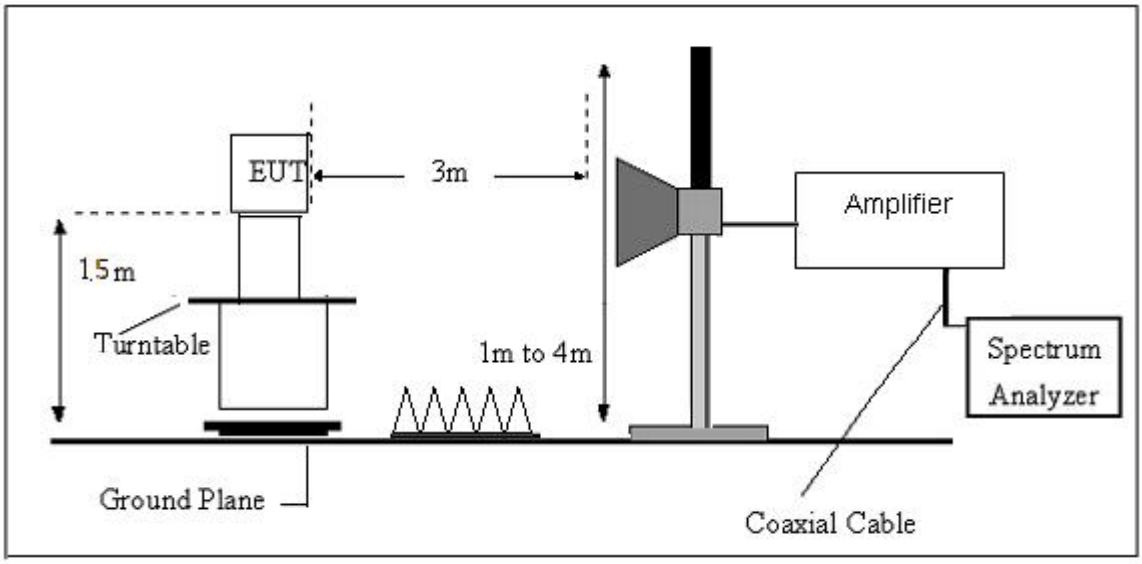
(A) Radiated Emission Test-Up Frequency Below 30MHz



(B) Radiated Emission Test-Up Frequency 30MHz~1GHz



(C) Radiated Emission Test-Up Frequency Above 1GHz



8.4. TEST RESULTS

(9KHz-30MHz)

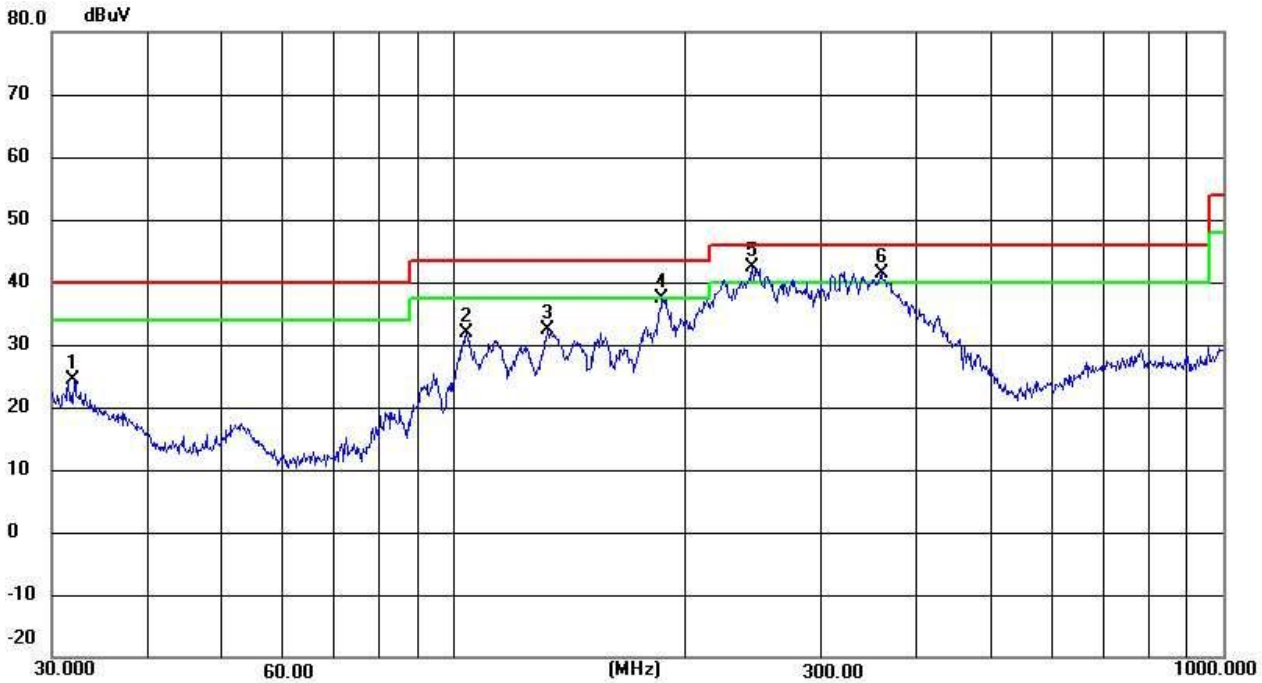
Temperature:	22.7℃	Relative Humidity:	61%
Test Voltage:	AC 110V	Test Mode:	GFSK

Freq.	Reading	Limit	Margin	State	Test Result
(MHz)	(dBuV/m)	(dBuV/m)	(dB)	P/F	
--	--	--	--	--	PASS
--	--	--	--	--	PASS

Note:
The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.
Distance extrapolation factor =40 log (specific distance/test distance)(dB);
Limit line = specific limits (dBuv) + distance extrapolation factor.

9. RADIATED EMISSION (30MHZ-1000MHZ)

Temperature:	24.7℃	Relative Humidity:	61%
Test Voltage:	AC 110V	Phase:	Horizontal
Test Mode:	GFSK		



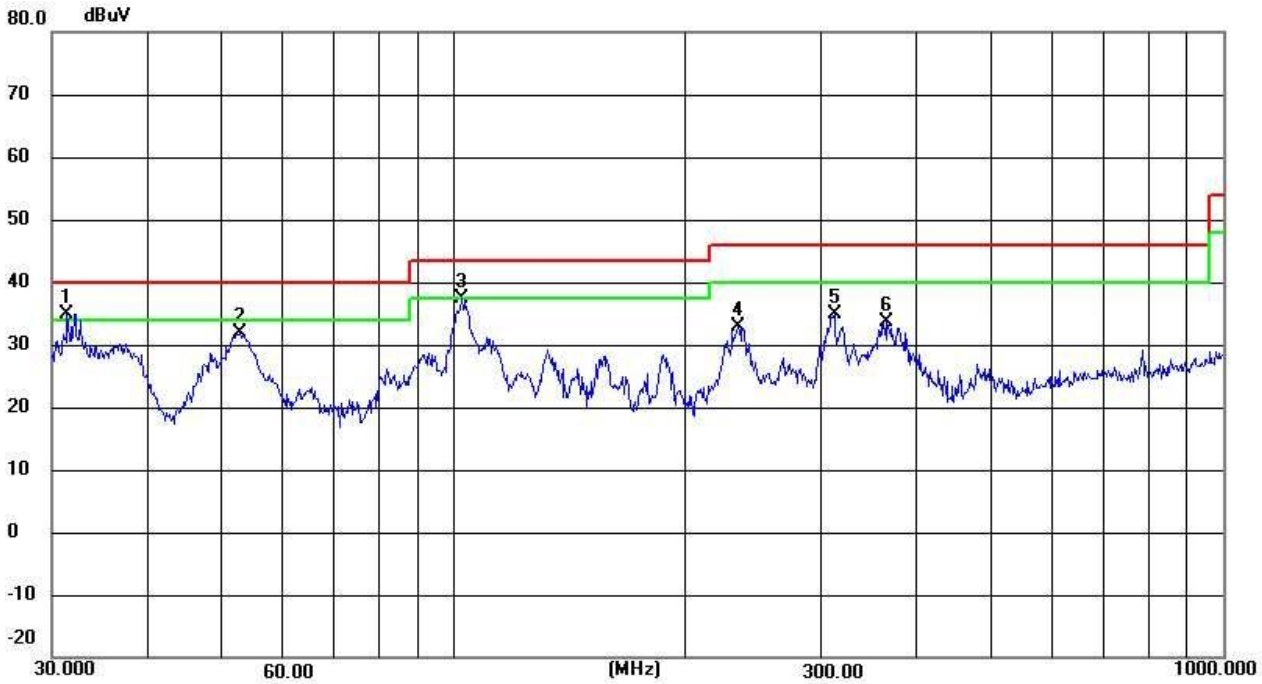
No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	32.0667	33.09	-8.68	24.41	40.00	-15.59	QP
2	103.8055	64.21	-32.30	31.91	43.50	-11.59	QP
3	132.2206	64.62	-32.27	32.35	43.50	-11.15	QP
4	186.4409	69.64	-32.21	37.43	43.50	-6.07	QP
5	244.2321	74.43	-32. 16	42.27	46.00	-3.73	QP
6	359.1860	73.35	-32.04	41.31	46.00	-4.69	QP

Note: 1. Margin = Result (Result =Reading + Factor)–Limit

2. If Peak Result complies with QP limit, QP Result is deemed to comply with QP limit.

3. Test setup: RBW: 120 kHz, VBW: 300 kHz, Sweep time: auto.

Temperature:	22.7℃	Relative Humidity:	61%
Test Voltage:	AC 110V	Phase:	Vertical
Test Mode:	GFSK		



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	31.3992	43.24	-8.25	34.99	40.00	-5.01	QP
2	52.7600	50.68	-18.77	31.91	40.00	-8.09	QP
3	102.3597	69.66	-32.30	37.36	43.50	-6.14	QP
4	234.1684	65.06	-32.17	32.89	46.00	-13.11	QP
5	312.1794	66.96	-32.09	34.87	46.00	-11.13	QP
6	365.5391	65.71	-32.03	33.68	46.00	-12.32	QP

Note: 1. Margin = Result (Result =Reading + Factor)–Limit

2. If Peak Result complies with QP limit, QP Result is deemed to comply with QP limit.

3. Test setup: RBW: 120 kHz, VBW: 300 kHz, Sweep time: auto.

■ 9.1 RADIATED EMISSION ABOVE 1GHZ

Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
4804.00	35.74	31.78	8.60	32.09	44.03	74.00	-29.97	Vertical
7206.00	30.80	36.15	11.65	32.00	46.60	74.00	-27.40	Vertical
9608.00	30.55	37.95	14.14	31.62	51.02	74.00	-22.98	Vertical
12010.00	*					74.00		Vertical
14412.00	*					74.00		Vertical
4804.00	39.71	31.78	8.60	32.09	48.00	74.00	-26.00	Horizontal
7206.00	32.41	36.15	11.65	32.00	48.21	74.00	-25.79	Horizontal
9608.00	29.82	37.95	14.14	31.62	50.29	74.00	-23.71	Horizontal
12010.00	*					74.00		Horizontal
14412.00	*					74.00		Horizontal

Average value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
4804.00	24.85	31.78	8.60	32.09	33.14	54.00	-20.86	Vertical
7206.00	19.66	36.15	11.65	32.00	35.46	54.00	-18.54	Vertical
9608.00	18.83	37.95	14.14	31.62	39.30	54.00	-14.70	Vertical
12010.00	*					54.00		Vertical
14412.00	*					54.00		Vertical
4804.00	28.91	31.78	8.60	32.09	37.20	54.00	-16.80	Horizontal
7206.00	21.73	36.15	11.65	32.00	37.53	54.00	-16.47	Horizontal
9608.00	18.43	37.95	14.14	31.62	38.90	54.00	-15.10	Horizontal
12010.00	*					54.00		Horizontal
14412.00	*					54.00		Horizontal

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. *"*", means this data is the too weak instrument of signal is unable to test.*

Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
4880.00	35.91	31.85	8.67	32.12	44.31	74.00	-29.69	Vertical
7320.00	30.90	36.37	11.72	31.89	47.10	74.00	-26.90	Vertical
9760.00	30.64	38.35	14.25	31.62	51.62	74.00	-22.38	Vertical
12200.00	*					74.00		Vertical
14640.00	*					74.00		Vertical
4880.00	39.91	31.85	8.67	32.12	48.31	74.00	-25.69	Horizontal
7320.00	32.54	36.37	11.72	31.89	48.74	74.00	-25.26	Horizontal
9760.00	29.93	38.35	14.25	31.62	50.91	74.00	-23.09	Horizontal
12200.00	*					74.00		Horizontal
14640.00	*					74.00		Horizontal

Average value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
4880.00	24.99	31.85	8.67	32.12	33.39	54.00	-20.61	Vertical
7320.00	19.75	36.37	11.72	31.89	35.95	54.00	-18.05	Vertical
9760.00	18.92	38.35	14.25	31.62	39.90	54.00	-14.10	Vertical
12200.00	*					54.00		Vertical
14640.00	*					54.00		Vertical
4880.00	29.07	31.85	8.67	32.12	37.47	54.00	-16.53	Horizontal
7320.00	21.83	36.37	11.72	31.89	38.03	54.00	-15.97	Horizontal
9760.00	18.53	38.35	14.25	31.62	39.51	54.00	-14.49	Horizontal
12200.00	*					54.00		Horizontal
14640.00	*					54.00		Horizontal

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. *"*", means this data is the too weak instrument of signal is unable to test.*

Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
4960.00	35.67	31.93	8.73	32.16	44.17	74.00	-29.83	Vertical
7440.00	30.74	36.59	11.79	31.78	47.34	74.00	-26.66	Vertical
9920.00	30.50	38.81	14.38	31.88	51.81	74.00	-22.19	Vertical
12400.00	*					74.00		Vertical
14880.00	*					74.00		Vertical
4960.00	39.62	31.93	8.73	32.16	48.12	74.00	-25.88	Horizontal
7440.00	32.35	36.59	11.79	31.78	48.95	74.00	-25.05	Horizontal
9920.00	29.77	38.81	14.38	31.88	51.08	74.00	-22.92	Horizontal
12400.00	*					74.00		Horizontal
14880.00	*					74.00		Horizontal

Average value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
4960.00	24.83	31.93	8.73	32.16	33.33	54.00	-20.67	Vertical
7440.00	19.64	36.59	11.79	31.78	36.24	54.00	-17.76	Vertical
9920.00	18.82	38.81	14.38	31.88	40.13	54.00	-13.87	Vertical
12400.00	*					54.00		Vertical
14880.00	*					54.00		Vertical
4960.00	28.88	31.93	8.73	32.16	37.38	54.00	-16.62	Horizontal
7440.00	21.71	36.59	11.79	31.78	38.31	54.00	-15.69	Horizontal
9920.00	18.41	38.81	14.38	31.88	39.72	54.00	-14.28	Horizontal
12400.00	*					54.00		Horizontal
14880.00	*					54.00		Horizontal

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. *"*", means this data is the too weak instrument of signal is unable to test.*

9.2 RADIATED BAND EDGE DATA

Remark: All restriction band have been tested, and only the worst case is shown in report

Low CH (GFSK)

Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
2310.00	35.49	27.59	5.38	30.18	38.28	74.00	-35.72	Horizontal
2390.00	51.22	27.58	5.39	30.18	54.01	74.00	-19.99	Horizontal
2400.00	51.64	27.56	5.40	30.18	54.42	74.00	-19.58	Horizontal
2310.00	35.33	27.59	5.38	30.18	38.12	74.00	-35.88	Vertical
2390.00	52.47	27.58	5.39	30.18	55.26	74.00	-18.74	Vertical
2400.00	51.77	27.56	5.40	30.18	54.55	74.00	-19.45	Vertical

Average value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
2310.00	27.71	27.59	5.38	30.18	30.50	54.00	-23.50	Horizontal
2390.00	38.51	27.58	5.39	30.18	41.30	54.00	-12.70	Horizontal
2400.00	37.53	27.56	5.40	30.18	40.31	54.00	-13.69	Horizontal
2310.00	27.13	27.59	5.38	30.18	29.92	54.00	-24.08	Vertical
2390.00	39.45	27.59	5.38	30.18	42.24	54.00	-11.76	Vertical
2400.00	39.06	27.56	5.40	30.18	41.84	54.00	-12.16	Vertical

High CH(GFSK)

Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
2483.50	36.71	27.53	5.47	29.93	39.78	74.00	-34.22	Horizontal
2500.00	37.29	27.55	5.49	29.93	40.40	74.00	-33.60	Horizontal
2483.50	36.33	27.53	5.47	29.93	39.40	74.00	-34.60	Vertical
2500.00	37.59	27.55	5.49	29.93	40.70	74.00	-33.30	Vertical

Average value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
2483.50	30.45	27.53	5.47	29.93	33.52	54.00	-20.48	Horizontal
2500.00	29.51	27.55	5.49	29.93	32.62	54.00	-21.38	Horizontal
2483.50	31.05	27.53	5.47	29.93	34.12	54.00	-19.88	Vertical
2500.00	28.81	27.55	5.49	29.93	31.92	54.00	-22.08	Vertical

Remark:

1. *Final Level =Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor*

10. ANTENNA REQUIREMENT

10.1 STANDARD REQUIREMENT

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. And according to FCC 47 CFR Section 15.247 (b), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

10.2 RESULT

The antennas used for this product are PCB antenna and no antenna other than that furnished by the responsible party shall be used with the device, the maximum peak gain of the transmit antenna is 2.21 dBi.

※※※※※END OF THE REPORT※※※※※