



# FCC Test Report

Report No: FCS202303230W02

Issued for

Applicant:	ADJ PRODUCTS LLC
Address:	6122 S Eastern AveCommerce, CA 90040 United States
Product Name:	ACTIVE SPEAKER
Brand Name:	N/A
Model Name:	A12X
Series Model:	A15X
FCC ID:	2ASML-A12X15X
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 <a href="http://www.FCS-lab.com">http://www.FCS-lab.com</a>	

## TEST RESULT CERTIFICATION

Applicant's Name.....: ADJ PRODUCTS LLC  
 Address.....: 6122 S Eastern AveCommerce, CA 90040 United States  
 Manufacture's Name.....: ADJ PRODUCTS LLC  
 Address.....: 6122 S Eastern AveCommerce, CA 90040 United States

### Product Description

Product Name.....: ACTIVE SPEAKER  
 Brand Name.....: N/A  
 Model Name.....: A12X  
 Series Model.....: A15X  
 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.: Mar 27, 2023 ~ Apr 03, 2023

Date of Issue.....: Apr 03, 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
<b>1. SUMMARY OF TEST RESULTS .....</b>	<b>6</b>
1.1 TEST FACTORY .....	7
1.2 MEASUREMENT UNCERTAINTY .....	7
<b>2. GENERAL INFORMATION .....</b>	<b>8</b>
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
<b>3. CONDUCTED EMISSION MEASUREMENT .....</b>	<b>13</b>
3.1 LIMIT .....	13
3.2 TEST PROCEDURE .....	13
3.3 TEST SETUP .....	14
3.4 TEST RESULTS .....	15
<b>4. 6DB BANDWIDTH .....</b>	<b>17</b>
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
<b>5. CONDUCTED OUTPUT POWER .....</b>	<b>20</b>
5.1 LIMIT .....	20
5.2 TEST PROCEDURE .....	20
5.3 TEST SETUP .....	20
5.4 TEST RESULTS .....	20
<b>6. BAND EDGE AND SPURIOUS(CONDUCTED) .....</b>	<b>23</b>
6.1 LIMIT .....	23
6.2 TEST PROCEDURE .....	23
6.3 TEST SETUP .....	23
6.4 TEST RESULTS .....	24
6.5 Original test data .....	24
<b>7. POWER SPECTRAL DENSITY .....</b>	<b>28</b>
7.1 LIMIT .....	28

Table of Contents	Page
7.2 TEST PROCEDURE .....	28
7.3 TEST SETUP .....	28
7.4 TEST RESULTS .....	28
7.5 original test data .....	29
<b>8. RADIATED EMISSION MEASUREMENT .....</b>	<b>31</b>
8.1 RADIATED EMISSION LIMITS .....	31
8.2 TEST PROCEDURE .....	32
8.3 TESTSETUP .....	33
8.4. TEST RESULTS .....	35
<b>9. RADIATED EMISSION (30MHZ-1000MHZ) .....</b>	<b>36</b>
9.1 RADIATED EMISSION ABOVE 1GHZ .....	38
9.2 RADIATED BAND EDGE DATA .....	41
<b>10. ANTENNA REQUIREMENT .....</b>	<b>42</b>
10.1 STANDARD REQUIREMENT .....	42
10.2 RESULT .....	42

**Revision History**

Rev.	Issue Date	Effect Page	Contents
00	Apr 03, 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			
<div>Organization</div> <div>FLUX COMPLIANCE SERVICE LABORATORY</div> <div>Baohao Technology Building 1 No. 15 Gongye West Road Hi-Tech Industrial Park Songsham Lake Dongguan, Guangdong. 523808 PRC.</div> <div>ISED#: 25801 Contact: Andy Yue andy-vue@fcs-lab.com</div>	<div>CAB identifier</div> <div>CN0097</div>	<div>Scope / Recognition Date (yyyy-mm-dd)</div> <div>RSS-102(RFExp) (2020-01-09)</div> <div>RSS-GEN (2020-01-09)</div> <div>RSS-210 (2020-01-09) RSS-247 (2020-01-09)</div>	<div>Expiration (yyyy-mm-dd)</div> <div>RECOGNIZED UNTIL: 2023-12-31</div> <div>A2LA ISO/IEC 17025: 2017 Expires: 2023-12-31</div>

## 1.2 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 %**.

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

## 2. GENERAL INFORMATION

### 2.1 GENERAL DESCRIPTION OF THE EUT

Product Name	ACTIVE SPEAKER	
Trade Name	N/A	
Model Name	A12X	
Series Model	A15X	
Model Difference	The above product with same circuit, PCB layout, electrical parts, materials and wiring structures, Appearance shape, the materials of decorative accessories is same,the only difference is the model name.	
Product Description	Operation Frequency:	2420-2480 MHz
	Modulation Type:	GFSK
	Radio Technology:	BLE
	Bluetooth Configuration:	LE
	Number Of Channel:	40 CH
	Antenna Gain (dBi)	0.98
	Transmitter rate:	1MHz
Channel List	Please refer to the Note 2.	
Power Supply	AC 100-120V 50/60Hz, 220-240V 50/60Hz	
Battery	N/A	
Report number	FCS202303230W02	
Hardware version number	V1.0	
Software version number	V1.0	
Connecting I/O Port(s)	Please refer to the User's Manual	

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)
1	2402	11	2422	21	2442	31	2462
2	2404	12	2424	22	2444	32	2464
3	2406	13	2426	23	2446	33	2466
4	2408	14	2428	24	2448	34	2468
5	2410	15	2430	25	2450	35	2470
6	2412	16	2432	26	2452	36	2472
7	2414	17	2434	27	2454	37	2474
8	2416	18	2436	28	2456	38	2476
9	2418	19	2438	29	2458	39	2478
10	2420	20	2440	30	2460	40	2480

## 3. Table for Filed Antenna

Ant.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)	NOTE
1	NA	N/A	PCB Antenna	N/A	0.98	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:



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

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

Note:

1. All test modes are directly connected to AC 120 V power supply,, 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

#### 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.

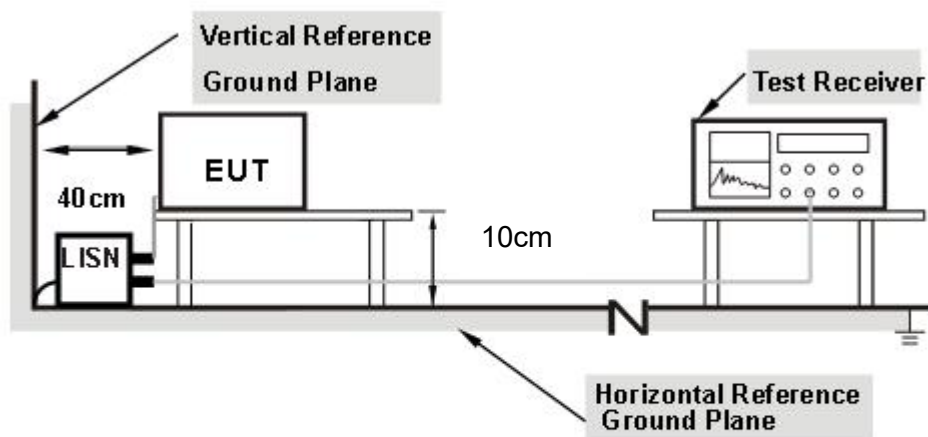
#### 3.2 TEST PROCEDURE

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 0.1 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.

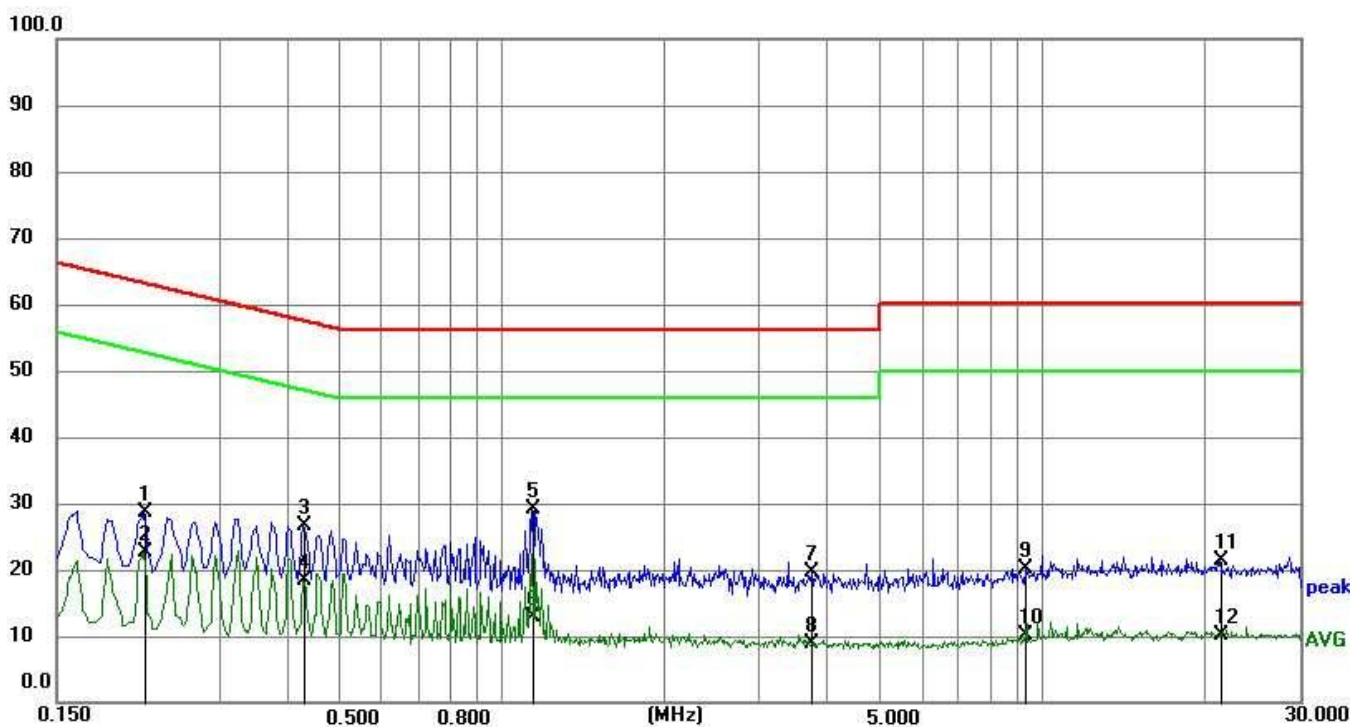
### 3.3 TEST SETUP



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

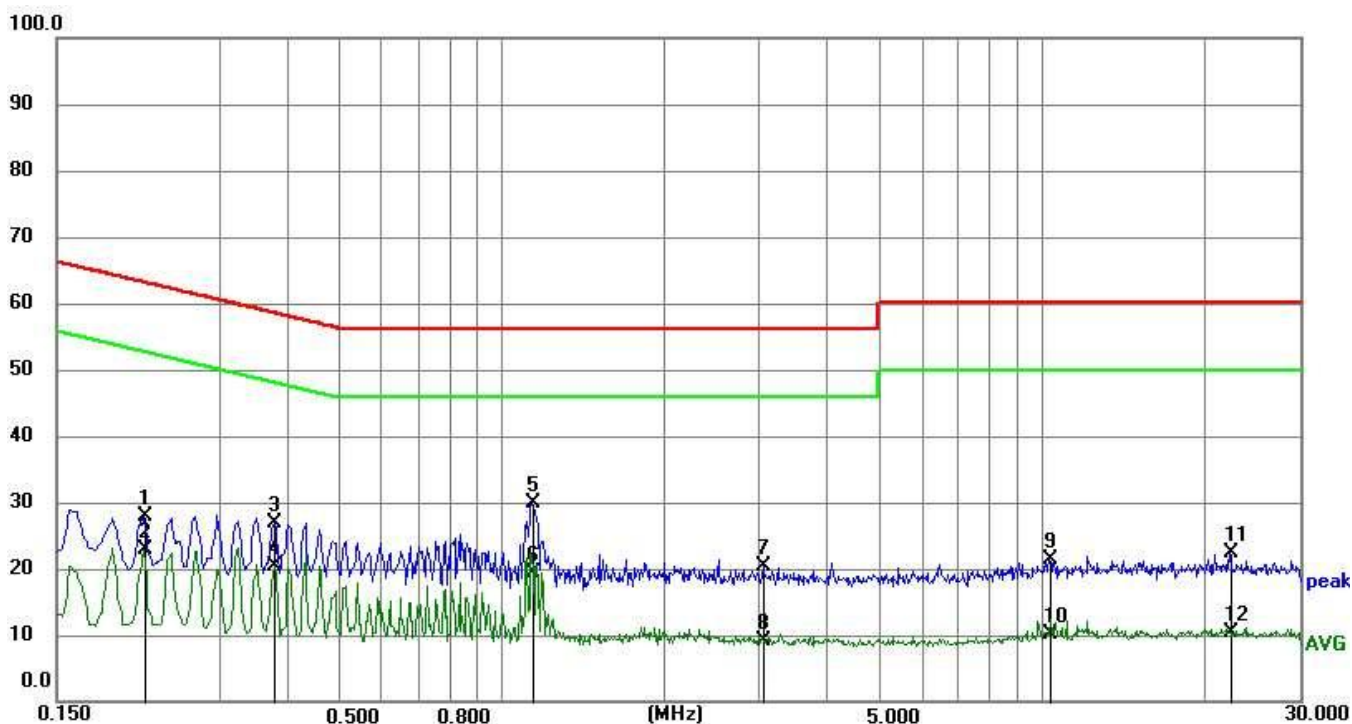
### 3.4 TEST RESULTS

Temperature:	25℃	Relative Humidity:	50%
Test Mode:	GFSK	Test Voltage:	AC 120V
Result:	L	Result:	Pass



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.2175	18.48	10.07	28.55	62.91	34.36	QP
2	0.2175	12.59	10.07	22.66	52.91	30.25	AVG
3	0.4290	16.68	10.02	26.70	57.27	30.57	QP
4	0.4290	8.48	10.02	18.50	47.27	28.77	AVG
5	1.1355	19.01	10.00	29.01	56.00	26.99	QP
6	1.1355	2.76	10.00	12.76	46.00	33.24	AVG
7	3.7410	9.73	9.92	19.65	56.00	36.35	QP
8	3.7410	-1.02	9.92	8.90	46.00	37.10	AVG
9	9.3480	10.42	9.81	20.23	60.00	39.77	QP
10	9.3480	0.26	9.81	10.07	50.00	39.93	AVG
11	21.3495	11.34	9.94	21.28	60.00	38.72	QP
12	21.3495	0.26	9.94	10.20	50.00	39.80	AVG

Temperature:	25°C	Relative Humidity:	50%
Test Mode:	GFSK	Test Voltage:	AC 120V
Result:	N	Result:	Pass



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.2175	17.92	10.05	27.97	62.91	34.94	QP
2	0.2175	12.72	10.05	22.77	52.91	30.14	AVG
3	0.3795	16.94	10.01	26.95	58.29	31.34	QP
4	0.3795	10.38	10.01	20.39	48.29	27.90	AVG
5	1.1355	19.94	9.99	29.93	56.00	26.07	QP
6	1.1355	9.31	9.99	19.30	46.00	26.70	AVG
7	3.0525	10.32	9.94	20.26	56.00	35.74	QP
8	3.0525	-0.85	9.94	9.09	46.00	36.91	AVG
9	10.3380	11.65	9.81	21.46	60.00	38.54	QP
10	10.3380	0.43	9.81	10.24	50.00	39.76	AVG
11	22.2675	12.51	9.99	22.50	60.00	37.50	QP
12	22.2675	0.29	9.99	10.28	50.00	39.72	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	$\geq 500\text{KHz}$	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	0.6770	1.0427	0.5	Pass
Middle	2440MHz	0.6739	1.0475	0.5	Pass
Highest	2480MHz	0.7292	1.0669	0.5	Pass

## 4.5 Original Test Data

Low



Middle



# High



## 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 spectrum analyzer and antenna output port as show in The block diagram above.

(2) Spectrum Setting:

RBW=1MHz, VBW=3MHz Detector=Peak

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

### 5.3 TEST SETUP



### 5.4 TEST RESULTS

TestMode	Channel (MHz)	Result (dBm)	Limit (dBm)	Verdict
Lowest	2402MHz	3.713	30	Pass
Middle	2440MHz	3.975	30	Pass
Highest	2480MHz	3.828	30	Pass

Low



Middle



High



## 6. BAND EDGE AND SPURIOUS(CONDUCTED)

### 6.1 LIMIT

In any 100kHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator is 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:	100kHz
VBW:	300kHz
Span	1.5times the DTS bandwidth
Detector Mode:	Pake
Sweep time:	auto
Trace mode	Max hold

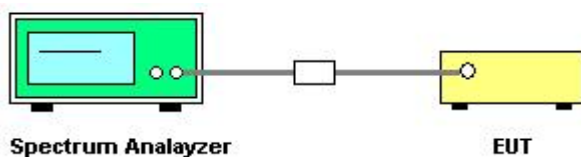
(3) Establish Allow the trace to stabilize, use the peak marker function to determine the maximum peak power level to establish the reference level.

(4) Set the spectrum analyzer as follows:

RBW:	100kHz
VBW:	300kHz
Span	Encompass frequency range to be measured
Number of measurement points	$\geq \text{span}/\text{RBW}$
Detector Mode:	Pake
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

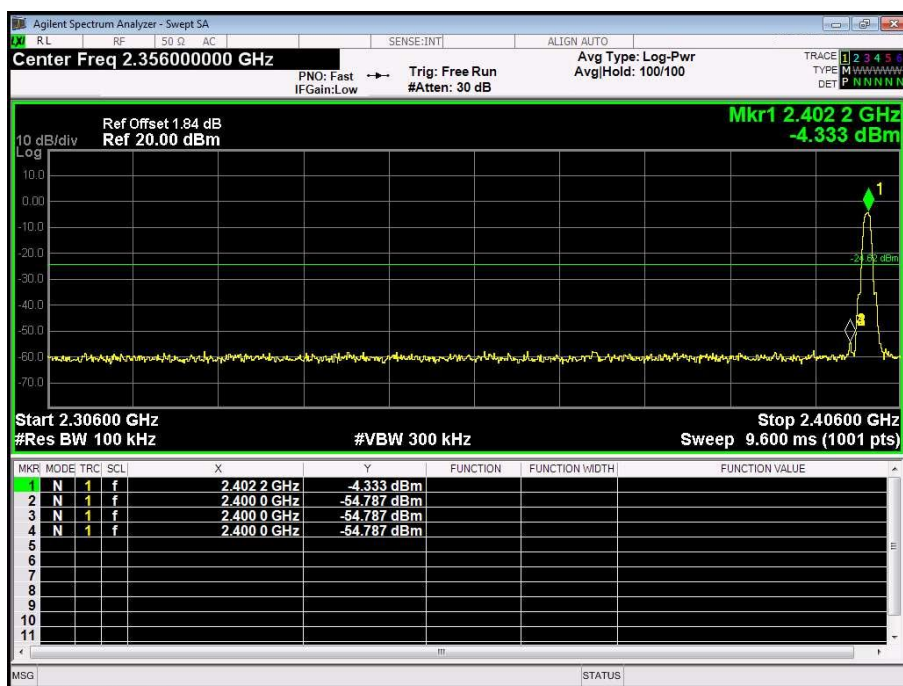


## 6.4 TEST RESULTS

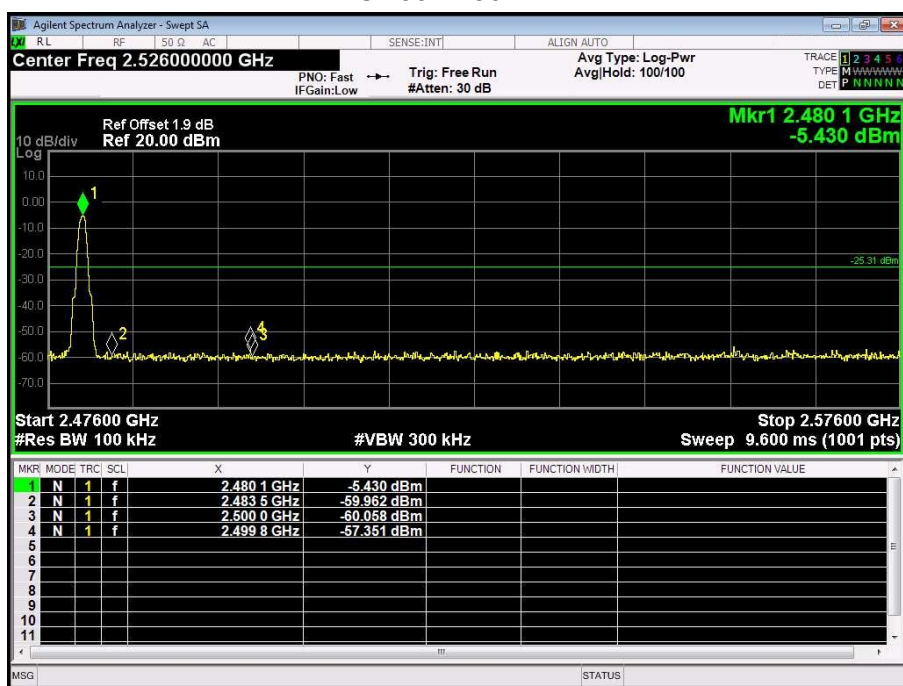
Eut set mode	CH or Frequency	Result
GFSK	CH0	Pass
	CH39	Pass

## 6.5 Original test data

### CH0 2402MHZ



### CH39 2480MHZ



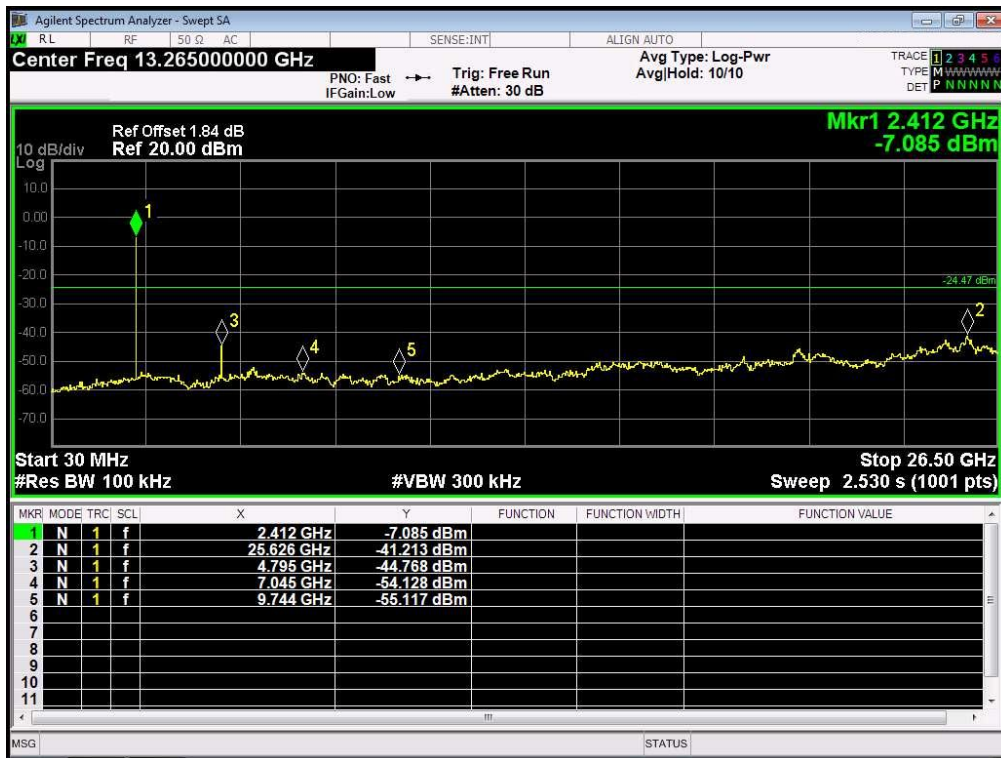


# Spurious emissions

Low 2402MHz



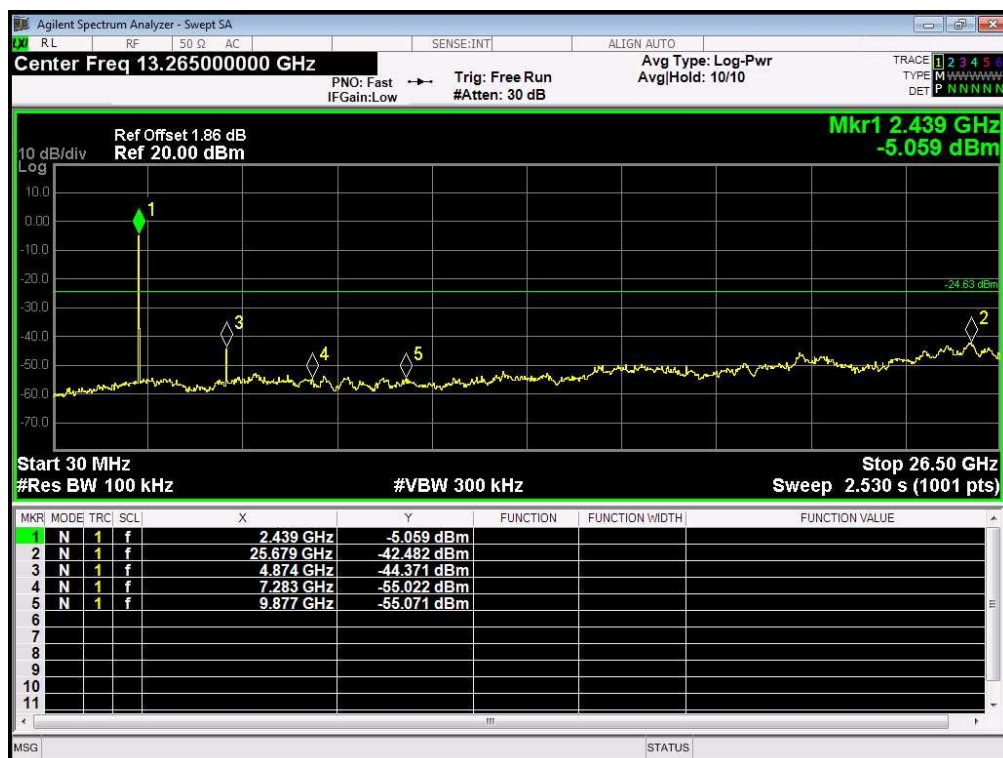
30MHz-26.5GHz



### Middle 2440MHz



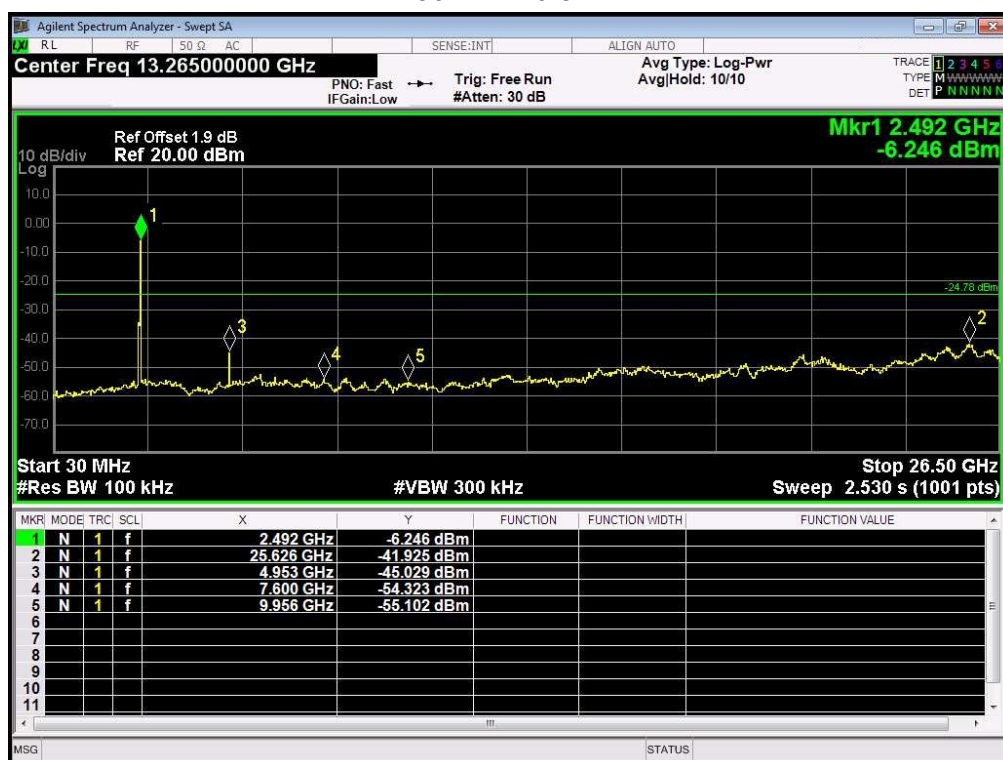
### 30MHz-26.5GHz



### High 2480MHz



### 30MHz-26.5Hz



## 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:	$3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$
VBW:	$\geq 3\text{RBW}$
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	-19.509	8	Pass
GFSK	2440MHz	-19.635	8	Pass
GFSK	2480MHz	-18.355	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

- The measuring distance of at 3 m shall be used for measurements at frequency 0.009MHz up to 1GHz, and above 1GHz.
- The EUT was placed on the top of a rotating table 0.1 meters (above 1GHz is 0.8 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.
- The height of the equipment shall be 0.1 m (above 1GHz is 0.8 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.
- 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.
- 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.
- For the actual test configuration, please refer to the related Item –EUT Test Photos.

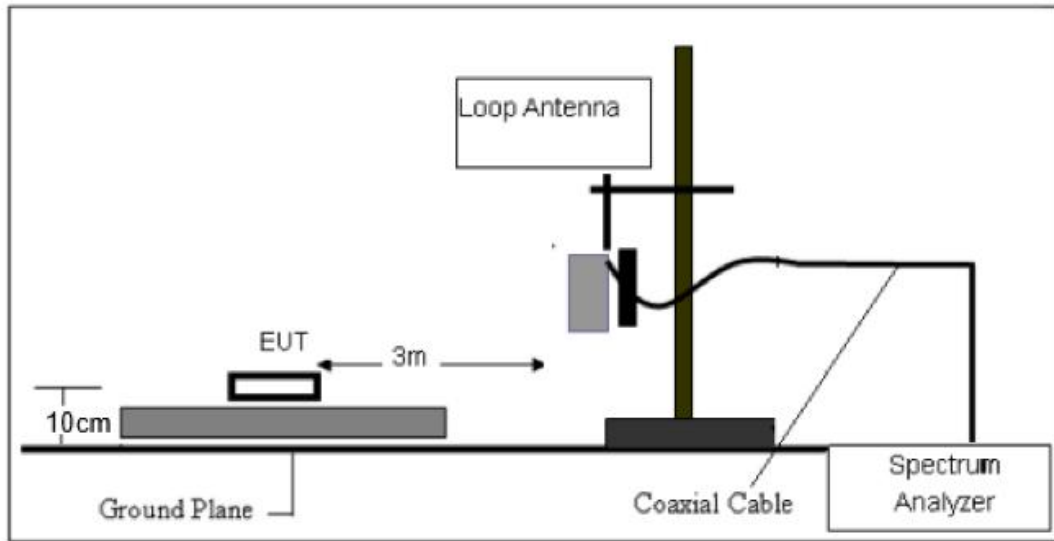
Note:

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

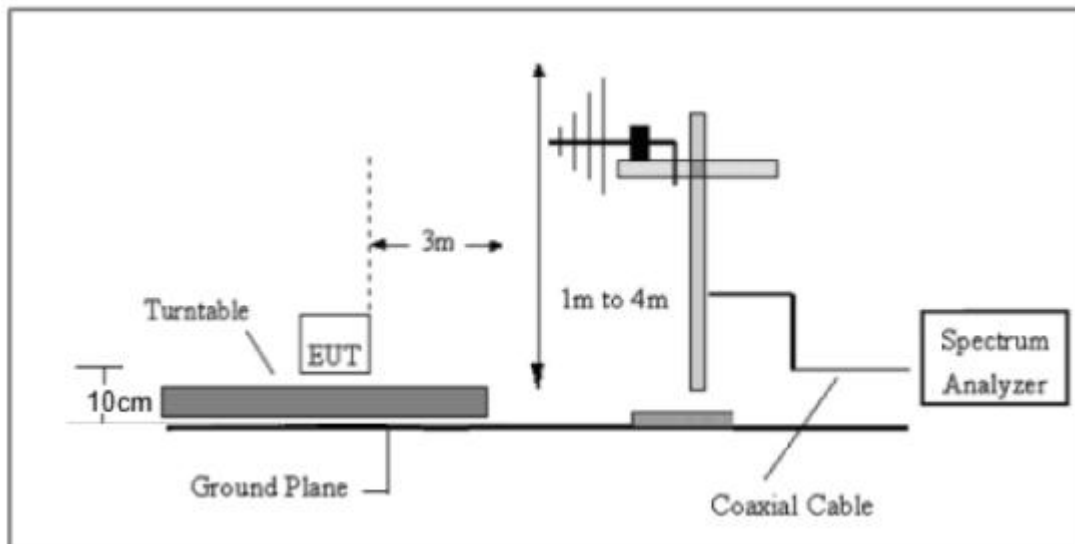


### 8.3 TESTSETUP

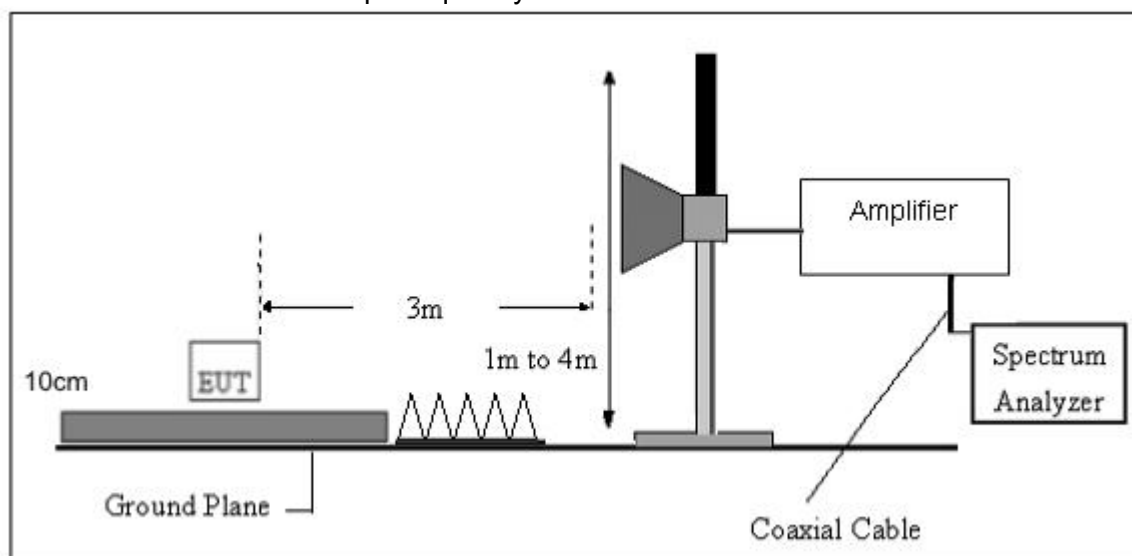
#### (A) Radiated Emission Test-Up Frequency Below 30MHz



#### (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°C	Relative Humidity:	61%
Test Voltage:	AC 120V	Test Mode:	GFSK

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

#### Note:

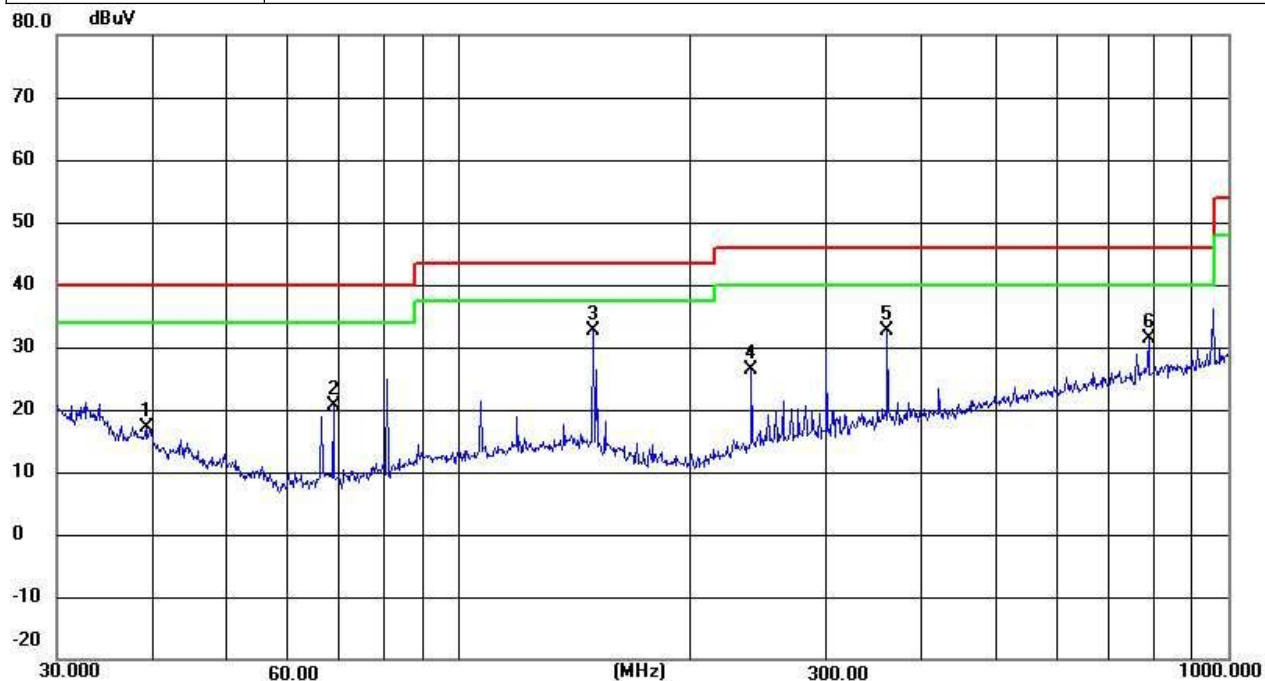
The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

Distance extrapolation factor =  $40 \log (\text{specific distance}/\text{test distance})$ (dB);

Limit line = specific limits (dBuV) + distance extrapolation factor.

(30MHZ-1000MHZ)

Temperature:	24.7°C	Relative Humidity:	61%
Test Voltage:	AC 120V	Phase:	Horizontal
Test Mode:	GFSK		



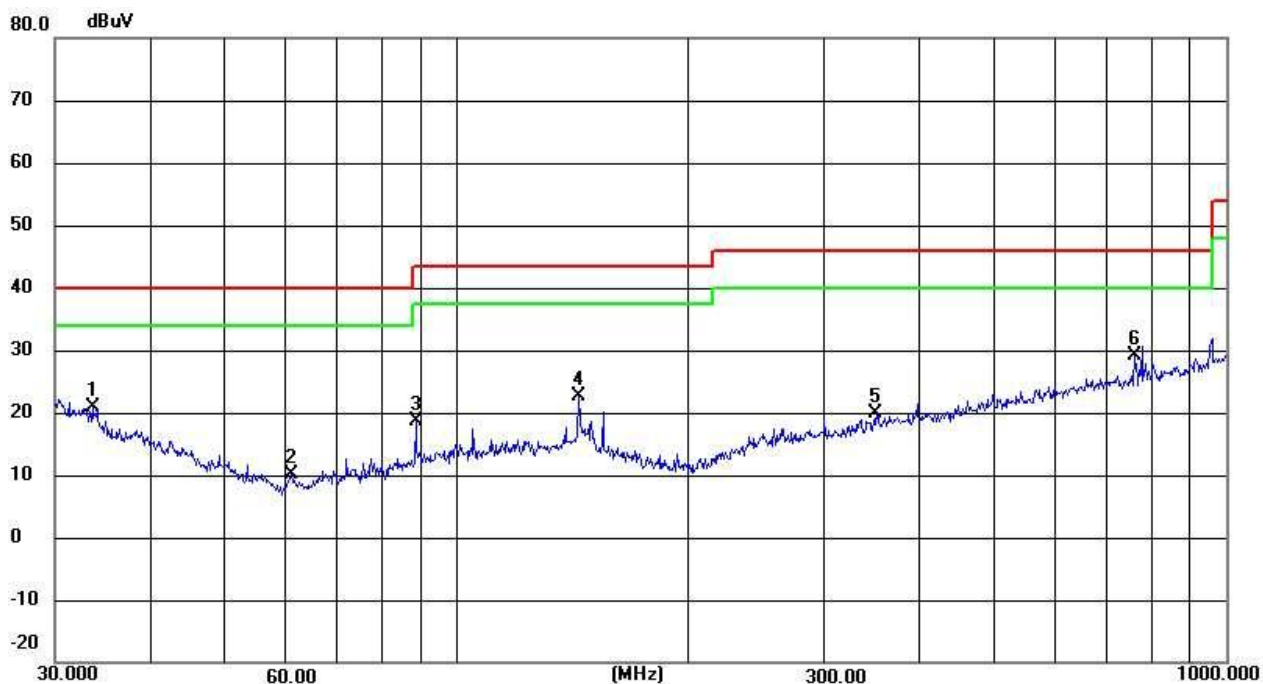
No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	39.1616	30.54	-13.32	17.22	40.00	-22.78	QP
2	68.6310	40.61	-19.92	20.69	40.00	-19.31	QP
3	149.4857	64.93	-32.25	32.68	43.50	-10.82	QP
4	239.9874	58.58	-32.16	26.42	46.00	-19.58	QP
5	360.4476	64.61	-32.04	32.57	46.00	-13.43	QP
6	787.8513	62.96	-31.52	31.44	46.00	-14.56	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°C	Relative Humidity:	61%
Test Voltage:	AC 120V	Phase:	Vertical
Test Mode:	GFSK		



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	33.5624	30.55	-9.66	20.89	40.00	-19.11	QP
2	60.9176	31.13	-20.90	10.23	40.00	-29.77	QP
3	88.3421	50.90	-32.28	18.62	43.50	-24.88	QP
4	143.8295	54.91	-32.26	22.65	43.50	-20.85	QP
5	351.7079	51.88	-32.05	19.83	46.00	-26.17	QP
6	760.7036	60.56	-31.55	29.01	46.00	-16.99	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.

ABOVE 1GHZ  
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
4804.00	36.04	31.78	8.60	32.09	44.33	74.00	-29.67	Vertical
7206.00	30.99	36.15	11.65	32.00	46.79	74.00	-27.21	Vertical
9608.00	30.72	37.95	14.14	31.62	51.19	74.00	-22.81	Vertical
12010.00	*					74.00		Vertical
14412.00	*					74.00		Vertical
4804.00	40.06	31.78	8.60	32.09	48.35	74.00	-25.65	Horizontal
7206.00	32.63	36.15	11.65	32.00	48.43	74.00	-25.57	Horizontal
9608.00	30.02	37.95	14.14	31.62	50.49	74.00	-23.51	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	25.09	31.78	8.60	32.09	33.38	54.00	-20.62	Vertical
7206.00	19.82	36.15	11.65	32.00	35.62	54.00	-18.38	Vertical
9608.00	18.97	37.95	14.14	31.62	39.44	54.00	-14.56	Vertical
12010.00	*					54.00		Vertical
14412.00	*					54.00		Vertical
4804.00	29.18	31.78	8.60	32.09	37.47	54.00	-16.53	Horizontal
7206.00	21.91	36.15	11.65	32.00	37.71	54.00	-16.29	Horizontal
9608.00	18.60	37.95	14.14	31.62	39.07	54.00	-14.93	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)	Preamplifier Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
4880.00	36.04	31.85	8.67	32.12	44.44	74.00	-29.56	Vertical
7320.00	30.99	36.37	11.72	31.89	47.19	74.00	-26.81	Vertical
9760.00	30.72	38.35	14.25	31.62	51.70	74.00	-22.30	Vertical
12200.00	*					74.00		Vertical
14640.00	*					74.00		Vertical
4880.00	40.07	31.85	8.67	32.12	48.47	74.00	-25.53	Horizontal
7320.00	32.63	36.37	11.72	31.89	48.83	74.00	-25.17	Horizontal
9760.00	30.02	38.35	14.25	31.62	51.00	74.00	-23.00	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)	Preamplifier Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
4880.00	25.10	31.85	8.67	32.12	33.50	54.00	-20.50	Vertical
7320.00	19.82	36.37	11.72	31.89	36.02	54.00	-17.98	Vertical
9760.00	18.98	38.35	14.25	31.62	39.96	54.00	-14.04	Vertical
12200.00	*					54.00		Vertical
14640.00	*					54.00		Vertical
4880.00	29.19	31.85	8.67	32.12	37.59	54.00	-16.41	Horizontal
7320.00	21.91	36.37	11.72	31.89	38.11	54.00	-15.89	Horizontal
9760.00	18.61	38.35	14.25	31.62	39.59	54.00	-14.41	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)	Preamplifier Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
4960.00	36.30	31.93	8.73	32.16	44.80	74.00	-29.20	Vertical
7440.00	32.66	36.59	11.79	31.78	49.26	74.00	-24.74	Vertical
9920.00	29.25	38.81	14.38	31.88	50.56	74.00	-23.44	Vertical
12400.00	*					74.00		Vertical
14880.00	*					74.00		Vertical
4960.00	37.89	31.93	8.73	32.16	46.39	74.00	-27.61	Horizontal
7440.00	30.52	36.59	11.79	31.78	47.12	74.00	-26.88	Horizontal
9920.00	30.14	38.81	14.38	31.88	51.45	74.00	-22.55	Horizontal
12400.00	*					74.00		Horizontal
14880.00	*					74.00		Horizontal

### AV value

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
4960.00	30.50	31.93	8.73	32.16	39.00	54.00	-15.00	Vertical
7440.00	24.84	36.59	11.79	31.78	41.44	54.00	-12.56	Vertical
9920.00	22.36	38.81	14.38	31.88	43.67	54.00	-10.33	Vertical
12400.00	*					54.00		Vertical
14880.00	*					54.00		Vertical
4960.00	33.09	31.93	8.73	32.16	41.59	54.00	-12.41	Horizontal
7440.00	24.42	36.59	11.79	31.78	41.02	54.00	-12.98	Horizontal
9920.00	24.57	38.81	14.38	31.88	45.88	54.00	-8.12	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
2390.00	39.87	27.59	5.38	30.18	42.66	74.00	-31.34	Horizontal
2400.00	56.22	27.58	5.39	30.18	59.01	74.00	-14.99	Horizontal
2390.00	40.13	27.59	5.38	30.18	42.92	74.00	-31.08	Vertical
2400.00	57.94	27.58	5.39	30.18	60.73	74.00	-13.27	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
2390.00	31.10	27.59	5.38	30.18	33.89	54.00	-20.11	Horizontal
2400.00	42.16	27.58	5.39	30.18	44.95	54.00	-9.06	Horizontal
2390.00	30.83	27.59	5.38	30.18	33.62	54.00	-20.38	Vertical
2400.00	43.52	27.58	5.39	30.18	46.31	54.00	-7.69	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	41.67	27.53	5.47	29.93	44.74	74.00	-29.26	Horizontal
2500.00	41.40	27.55	5.49	29.93	44.51	74.00	-29.49	Horizontal
2483.50	42.02	27.53	5.47	29.93	45.09	74.00	-28.91	Vertical
2500.00	42.12	27.55	5.49	29.93	45.23	74.00	-28.77	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	33.93	27.53	5.47	29.93	37.00	54.00	-17.00	Horizontal
2500.00	32.35	27.55	5.49	29.93	35.46	54.00	-18.54	Horizontal
2483.50	34.89	27.53	5.47	29.93	37.96	54.00	-16.04	Vertical
2500.00	32.03	27.55	5.49	29.93	35.14	54.00	-18.86	Vertical

## 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 0.98dBi.

\*\*\*\*\*END OF THE REPORT\*\*\*\*\*