MEASUREMENT REPORT

(FCC : Part 15 Subpart C (15.247) / ANSI C63.4-2014)

Testing Laboratory
1288

Product	:	Mobile Nose
Trade Name	:	ADDWII
Model No.	:	AQ0101
Series No.	:	N/A
Applicant	:	Microjet Technology CO., LTD
Applicant Address	:	1F., No. 28, R&D 2 nd Road, Science-Based Industrial Park, Hsinchu City, Taiwan(R.O.C.)

Report Number	MLT1806P15001
Applicant	Microjet Technology CO., LTD
Product	Mobile Nose
Sample Received Date	2018/06/04
Sample Tested Date	2018/06/04~2018/06/28

Report Prepared By	Jesse Tien
Signature	Jesse Tien
Date Prepared	2018/06/29

Report Authorized By	Roger Chen
Signature	Roger Chen
Date Authorized	2018/06/29

Test By

Max Light Technology Co., Ltd.
No. 74-4, Shibachong Xi, Shiding Dist, New Taipei City, Taiwan, R.O.C.
Office : Tel: 886-2-2363-2447 Fax: 886-2-2363-2597
Lab. : Tel: 886-2-2663-3486 Fax: 886-2-2663-3582
Lab Location : Xi Shiding Dist. New Taipei City 223 Taiwan R.O.C.
Designation Number: TW0015

It may be duplicated completely for legal use with the allowance of the applicant.
It shall not be reproduced except in full, without the written approval of our laboratory.

Contents

History of Test Report **5**

1. General Information **7**

2. Report of Measurements and Examinations **8**

2.1 List of Measurements and Examinations 8

3. Test Configuration of Equipment under Test **9**

3.1 Carrier Frequency of Channels 9
3.2 Test Mode and Test Software 10
3.3 TEST Methodology & General Test Procedures 11
3.4 Measurement Uncertainty 12
3.5 Description of the Support Equipments 12

4. Test and measurement equipment **13**

4.1 Calibration 13
4.2 Equipment 13

5. Antenna Requirements **15**

5.1 Standard Applicable 15
5.2 Antenna Construction and Directional Gain 15

6. Test of Conducted Emission **16**

6.1 Test Limit 16
6.2 Test Procedures 16
6.3 Typical Test Setup 17
6.4 Test Result and Data 18

7. Test of Radiated Emission **19**

7.1 Test Limit 19
7.2 Test Procedures 19
7.3 Typical Test Setup 20
7.4 Test Result and Data (9kHz ~ 30MHz) 21
7.5 Test Result and Data (30MHz ~ 1GHz, worst emissions found) 21
7.6 Test Result and Data (Above 1GHz) 22

8. 6dB Bandwidth **26**

8.1 Test Limit 26
8.2 Test Procedures 26

8.3 Test Setup Layout 26
8.4 Test Result and Data 27

9. Maximum Peak and Average Output Power 29

9.1 Test Limit 29
9.2 Test Procedures 29
9.3 Test Setup Layout 29
9.4 Test Result and Data 30

10. Power Spectral Density 35

10.1 Test Limit 35
10.2 Test Procedures 35
10.3 Test Setup Layout 35
10.4 Test Result and Data 36

11. Band Edges 38

11.1 Test Limit 38
11.2 Test Procedure 38
11.3 Test Setup Layout 38
11.4 Test Result and Data 39
11.5 Restrict Band Emission Measurement Data 42

12. Restricted Bands of Operation 45

12.1 Labeling Requirement 45

APPENDIX 1 PHOTOS OF TEST CONFIGURATION

APPENDIX 2 PHOTOS OF EUT

History of Test Report

Original Report Issue Date: 2018/6/29

■ No additional attachment

☐ Additional attachments were issued as in the following record:

Attachment No.	Issue Date	Description
MLT1806P15001	2018/6/29	Original report

CERTIFICATION

We here by verify that :

The test data, data evaluation, test procedures and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.4-2014. All test were conducted by

MLT(Max Light Technology Co., Ltd) Room 5, 8F, No.125, Section 3 Roosevelt Road, Taipei, Taiwan, R.O.C Also, we attest to the accuracy of each.

We further submit that the energy emitted by the sample EUT tested as described in the report is in compliance with Class B radiated and conducted emission limit of FCC Rules Part 15 Subpart C (15.247).

Applicant Name	Microjet Technology CO., LTD
Applicant Address	1F., No. 28, R&D 2 nd Road, Science-Based Industrial Park, Hsinchu City, Taiwan(R.O.C.)
Manufacturer Name	CHEW CHIENG PLASTICS CO., LTD
Manufacturer Address	NO. 1, Ln. 67, Xinshu Rd., Xinzhuang Dist., New Taipei City, 24262, Taiwan(R.O.C.)

Equipment	Mobile Nose
Model No	AQ0101
Series No	N/A
Model Differences	N/A
FCC ID	2AP6V-AQ0101

Report Prepared By	Jesse Tien
Signature	Jesse Tien

Report Authorized By	Roger Chen
Signature	Roger Chen

1. General Information

1.1 Introduction

The following measurement report is submitted on behalf of Microjet Technology CO., LTD In support of a Class B Digital Device certification in accordance with Part2 Subpart J and Part 15 Subpart C of the Commission's and Regulations.

1.2 Customer Details

Applicant Name	Microjet Technology CO., LTD
Applicant Address	1F., No. 28, R&D 2 nd Road, Science-Based Industrial Park, Hsinchu City, Taiwan(R.O.C.)
Manufacturer Name	CHEW CHIENG PLASTICS CO., LTD
Manufacturer Address	NO. 1Ln. 67, Xinshu Rd., Xinzhuang Dist., New Taipei City, 24262, Taiwan(R.O.C.)

1.3 Technical data of EUT

Equipment	Mobile Nose
Model No	AQ0101
FCC ID	2AP6V-AQ0101
Power Type	1) 3.7Vdc From Battery 2) 5Vdc From PC or NB
Type of Modulation	GFSK
Transfer rate	1 Mbps
Type of Antenna	Chip Antenna
Frequency of Channel	2402~2480 MHz

During testing the EUT was operated at Tx or Rx mode for each emission measured. This was done in order to ensure that maximum emission levels were attained.

2. Report of Measurements and Examinations

2.1 List of Measurements and Examinations

FCC Rule	Description of Test	Result
15.203	. Antenna Requirement	Pass
15.207	. Conducted Emission	Pass
15.209 15.247(d)	. Radiated Emission	Pass
15.247(a)(2)	. 6dB Bandwidth	Pass
15.247(b)	. Maximum Peak Output Power	Pass
15.247(d)	. 100kHz Bandwidth of Frequency Band Edges	Pass
15.247(e)	. Power Spectral Density	Pass

3. Test Configuration of Equipment under Test

3.1 Carrier Frequency of Channels

BLE

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

3.2 Test Mode and Test Software

a. During testing, the interface cables and equipment positions were varied according to ANSI C63.4 and C63.10.
b. The complete test system included PC and EUT for RF test.
c. Test Software: nRFgo Studio
d. New Battery was used for all testing and the worst radiated emission case from X,Y and Z axis evaluation was selected for testing.
e. The following test modes were performed for test:
   - BLE: CH00: 2402MHz, CH19: 2440MHz, CH39: 2480MHz

3.3 TEST Methodology & General Test Procedures

All testing as described bellowed were performed in accordance ANSI C63.4:2014, C63.10:2013 and FCC CFR 47 Part 15 Subpart C.

Conducted Emissions

The EUT is placed on a wood table, which is at 0.8 m above ground plane acceding to clause 15.207 and requirements of ANSI C63.4 and C63.10. Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz are using CISPR Quasi-Peak / Average detectors. The resolution bandwidth of test receiver/spectrum analyzer is 9 KHz and video bandwidth is 120 KHz.

Radiated Emissions

The EUT is a placed on a turn table, which is 0.8 m (1.5 m for above 1 GHz) above ground plane. The turntable was rotated through 360 degrees to determine the position of maximum emission level. The EUT is placed at 3m away from the receiving antenna, which varied from 1m to 4m to find out the highest emission. Each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.

1) Putting the EUT on the platform and turning on the EUT (on/off button on the bottom of the EUT).
2) Setting test channel described as “Channel setting and operating condition”, and testing channel by channel.
3) For the spurious emission test based on ANSI C63.4 and C63.10, the resolution bandwidth of test receiver/spectrum analyzer is 120 KHz and video bandwidth is 300 KHz for Quasi-peak detection at frequency 30 MHz~1GHz. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and video bandwidth is 3 MHz for Peak detection at frequency above 1GHz. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 3MHz RMS detector for Average Value at frequency above 1GHz

3.4 Measurement Uncertainty

Measurement Item	Uncertainty
Conducted emissions	±2.24 dB
Radiated emissions (30MHz ~ 1GHz)	±3.96 dB
Radiated emissions (above 1GHz)	±3.74 dB

3.5 Description of the Support Equipments

Setup Diagram

See test photographs attached in appendix 1 for the actual connections between EUT and support equipment.

4. Test and measurement equipment

4.1 Calibration

The measuring equipment utilized to perform the tests documented in the report has been calibrated once a year or in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

4.2 Equipment

The following list contains measurement equipment used for testing. The equipment conforms to the requirement of CISPR 16-1, ANSI C63.2 and. Other required standards.

Calibration of all test and measurement, including any accessories that may effect such calibration, is checked frequently to ensure the accuracy. Adjustments are made and correction factors are applied in accordance with the instructions contained in the respective.

TABLELIST OF TEST AND MEASUREMENT EQUIPMENT

Item	Instrument	Manufacturer	Model No.	S/N	Next Cal. Date
1.	EMI Receiver	R&S	ESPI	100085	2018/12/14
2.	Pre Amplifier	MLT	PREAMP6G-01	20110209	2019/04/10
3.	Pre Amplifier	MLT	PREAMP6G-02	20110301	2019/04/10
4.	Biconilog Antenna	EMCO	3142C	00044568	2018/11/02
5.	LISN	EMCO	3825/2	2654	2019/01/04
6.	LISN	EMCO	3825/2	2658	2018/12/11
7.	Spectrum Analyzer	Agilent	E4446A	US44300422	2019/03/08
8.	Home Antenna	SCHWARZBECK	BBHA 9120D	304	2018/12/13
9.	Pre Amplifier	TA	0.10~19.1GHz 60dBm	RF01	2019/03/23
10.	Pre Amplifier	Herotek	A402-417	306090	2018/12/15
11.	Spectrum Analyzer	Agilent	N9010A	MY50060164	2018/09/04

★ **CALIBRATION INTERVAL OF INSTRUMENTS LISTED ABOVE IS ONE YEAR**

5. Antenna Requirements

5.1 Standard Applicable

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

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.

5.2 Antenna Construction and Directional Gain

Antenna Type: CHIP Antenna
Antenna Gain: -0.3 dBi

6. Test of Conducted Emission

6.1 Test Limit

Conducted Emissions were measured from 150 kHz to 30 MHz with a bandwidth of 9 KHz on the 120 VAC power and return leads of the EUT according to the methods defined in ANSI C63.4-2014. The EUT was placed on a nonmetallic stand in a shielded room 0.8 meters above the ground plane. The interface cables and equipment positioning were varied within limits of reasonable applications to determine the position produced maximum conducted emissions.

Frequency (MHz)	Quasi Peak (dB μ V)	Average (dB μ V)
0.15 – 0.5	66-56*	56-46*
0.5 – 5.0	56	46
5.0 – 30.0	60	50

*Decreases with the logarithm of the frequency.

6.2 Test Procedures

a. The EUT was placed 0.4 meter from the conducting wall of the shielding room was kept at least 80 centimeters from any other grounded conducting surface.

b. Connect EUT to the power mains through a line impedance stabilization network (LISN).

c. All the support units are connecting to the other LISN.

d. The LISN provides 50 ohm coupling impedance for the measuring instrument.

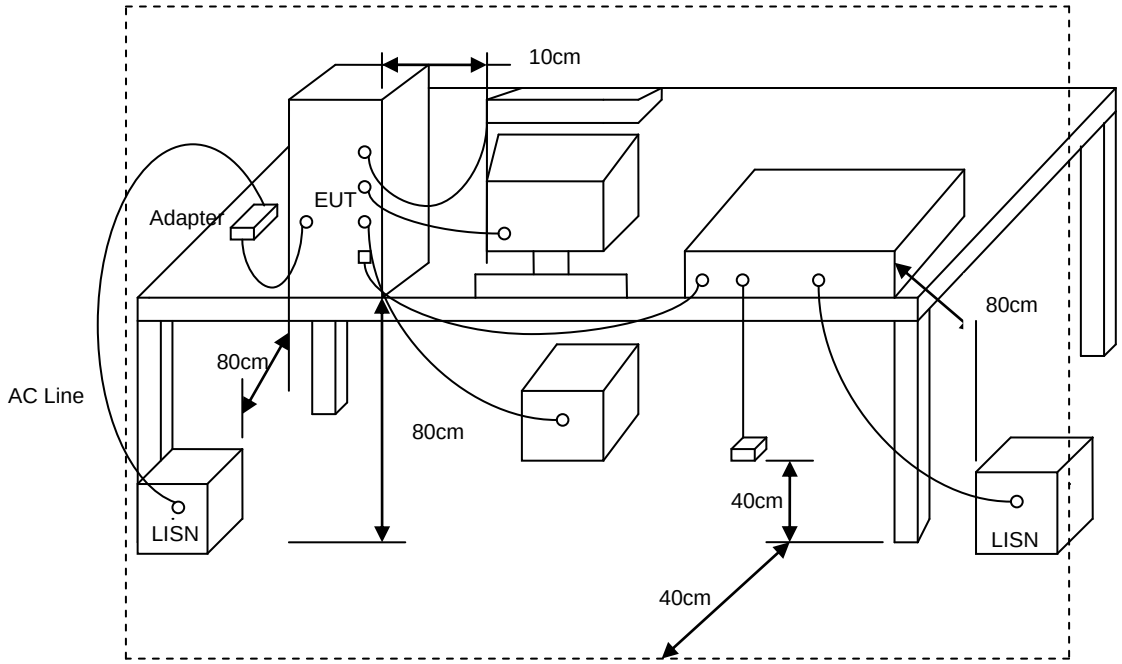
e. The FCC states that a 50 ohm, 50 micro-Henry LISN should be used.

f. Both sides of AC line were checked for maximum conducted interference.

g. The frequency range from 150 kHz to 30 MHz was searched.

h. Set the test-receiver system to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

6.3 Typical Test Setup



6.4 Test Result and Data

Power :	DC 5V		
Test Mode :	GFSK CH0	Temperature :	28 °C
Test Date :	June 13, 2018	Humidity :	60 %

Conducted Emissions										
Conductor	Frequency (MHz)	Read(dBuV)		Factor	Limits (dBuV)		Amplitude (dBuV)		Margin (dB)	
		QP	AV		QP	AV	QP	AV	QP	AV
L1	0.165	55.12	39.19	0.28	65.21	55.21	55.40	39.47	-9.81	-15.74
	0.195	55.22	42.68	0.28	63.83	53.83	55.50	42.96	-8.33	-10.87
	0.269	50.09	--	0.28	61.14	51.14	50.37	--	-10.77	--
	0.419	39.72	--	0.28	57.47	47.47	40.00	--	-17.47	--
	0.702	34.23	--	0.29	56	46.00	34.52	--	-21.48	--
	1.956	38.14	--	0.34	56	46.00	38.48	--	-17.52	--
	2.941	32.46	--	0.36	56	46.00	32.82	--	-23.18	--
L2	0.165	53.92	--	0.34	65.21	55.21	54.26	--	-10.95	--
	0.269	50.00	--	0.34	61.14	51.14	50.34	--	-10.80	--
	0.478	38.38	--	0.34	56.37	46.37	38.72	--	-17.65	--
	1.135	36.56	--	0.36	56	46.00	36.92	--	-19.08	--
	2.090	38.40	--	0.39	56	46.00	38.79	--	-17.21	--
	2.941	37.20	--	0.41	56	46.00	37.61	--	-18.39	--
	13.612	32.38	--	0.50	60	50.00	32.88	--	-27.12	--

Notes:

1. L1: One end & Ground L2: The other end & Ground
2. Height of table on which the EUT was placed 0.8 m.
3. The Quasi-Peak Value have already met the Average Value Limit showed on above limits.
4. The above test results are obtained under the normal condition.
5. Amplitude = Read + Factor

7. Test of Radiated Emission

7.1 Test Limit

Radiated Emissions were measured from 9 KHz to 25 GHz and return leads of the EUT according to the methods defined in ANSI C63.4-2014 and C63.10-2013. In any 100kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. If the transmitter measurement is based on the maximum conducted output power, the attenuation required under this paragraph shall be 30dB instead of 20dB. In addition, radiated emissions which fall in section 15.205(a) the restricted bands must also comply with the radiated emission limit specified in section 15.209(a).

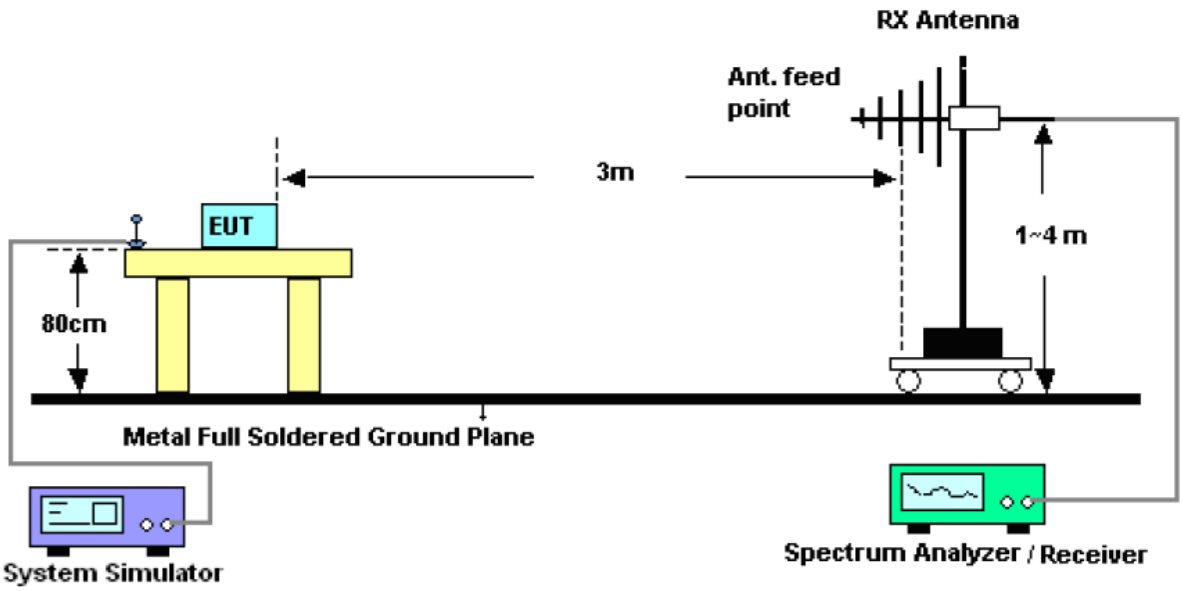
Frequency (MHz)	Field Strength (microvolt/meter)	Measurement Distance (meters)
0.009 ~ 0.490	2400/F(kHz)	300
0.490 ~ 1.705	24000/F(kHz)	30
1.705 ~ 30.0	30	30
30 ~ 88	100	3
88 ~ 216	150	3
216 ~ 960	200	3
Above 960	500	3

7.2 Test Procedures

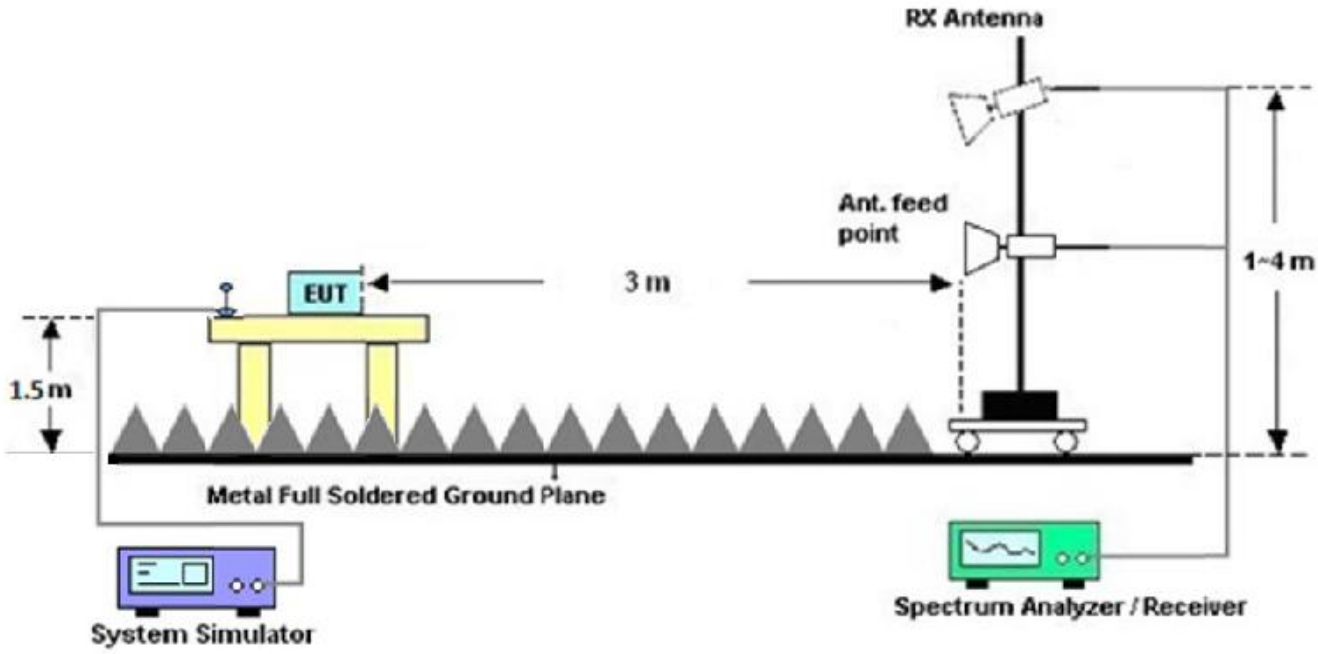
a. The EUT was placed on a rotatable table top 0.8 meter above ground (1.5 meter for above 1 GHz).
b. The EUT was set 3 meters from the interference receiving antenna which was mounted on the top of a variable height antenna tower.
c. The table was rotated 360 degrees to determine the position of the highest radiation.
d. The antenna is a broadband antenna and its height is varied between one meter and four meters above ground to find the maximum value of the field strength both horizontal polarization and vertical polarization of the antenna are set to make the measurement.
e. For each suspected emission the EUT was arranged to its worst case and then tune the antenna tower (from 1 M to 4 M) and turn table (from 0 degree to 360 degrees) to find the maximum reading.
f. Set the test-receiver system to Peak or CISPR quasi-peak Detect Function and specified bandwidth with Maximum Hold Mode.
g. If the emission level of the EUT in peak mode was 3 dB lower than the limit specified, then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions which do not have 3 dB margin will be repeated one by one using the quasi-peak method and reported.
h. For testing above 1GHz, the emission level of the EUT in peak mode was 20dB lower than average limit (that means the emission level in peak mode also complies with the limit in average mode), then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.

7.3 Typical Test Setup

For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz



7.4 Test Result and Data (9kHz ~ 30MHz)

The 9kHz - 30MHz spurious emission is under limit 20dB more.

7.5 Test Result and Data (30MHz ~ 1GHz, worst emissions found)

Power :	DC 5V		
Test Mode :	GFSK CH0	Temperature :	30 °C
Test Date :	June 7, 2018	Humidity :	71 %
Memo :	X axis		

Radiated Emissions (VERTICAL)					
Frequency (MHz)	Read (dBuV/m)	Factor	Amplitude (dBuV/m)	Limits (dBuV/m)	Margin (dB)
68.80	42.97	-29.91	13.06	40	-26.94
148.14	51.85	-30.24	21.61	43.5	-21.89
221.14	44.55	-27.02	17.53	46	-28.47
240.00	56.59	-25.84	30.75	46	-15.25
340.01	45.00	-22.51	22.49	46	-23.51
450.01	45.93	-19.23	26.70	46	-19.30

Radiated Emissions (HORIZONTAL)					
Frequency (MHz)	Read (dBuV/m)	Factor	Amplitude (dBuV/m)	Limits (dBuV/m)	Margin (dB)
36.00	44.39	-20.41	23.98	40	-16.02
127.97	49.43	-30.34	19.09	43.5	-24.41
233.51	50.14	-26.27	23.87	46	-22.13
317.33	41.55	-22.57	18.98	46	-27.02
439.13	46.12	-19.83	26.29	46	-19.71
757.50	35.80	-11.85	23.95	46	-22.05

7.6 Test Result and Data (Above 1GHz)

Power :	DC 5V		
Test Mode :	GFSK CH0	Temperature :	28 °C
Test Date :	June 11, 2018	Humidity :	70 %
Memo :	X axis		

Radiated Emissions (VERTICAL)									
Frequency (MHz)	Read (dBuV/m)		Factor	Amplitude (dBuV/m)		Limits (dBuV/m)		Margin (dB)	
	PK	AV		PK	AV	PK	AV	PK	AV
3223.00	69.18	--	-31.40	37.78	--	74	54	-36.22	--
3821.00	70.49	--	-30.12	40.37	--	74	54	-33.63	--
4804.50	67.03	--	-28.10	38.93	--	74	54	-35.07	--
5290.00	66.16	--	-27.73	38.43	--	74	54	-35.57	--
5979.00	64.65	--	-23.36	41.29	--	74	54	-32.71	--
7206.50	66.39	--	-21.26	45.13	--	74	54	-28.87	--

Radiated Emissions (HORIZONTAL)									
Frequency (MHz)	Read (dBuV/m)		Factor	Amplitude (dBuV/m)		Limits (dBuV/m)		Margin (dB)	
	PK	AV		PK	AV	PK	AV	PK	AV
3236.00	69.89	--	-31.57	38.32	--	74	54	-35.68	--
3886.00	67.08	--	-29.76	37.32	--	74	54	-36.68	--
4804.50	67.71	--	-28.10	39.61	--	74	54	-34.39	--
5361.50	65.21	--	-27.30	37.91	--	74	54	-36.09	--
6148.00	65.18	--	-23.65	41.53	--	74	54	-32.47	--
7206.50	69.44	--	-21.26	48.18	--	74	54	-25.82	--

Power :	DC 5V		
Test Mode :	GFSK CH19	Temperature :	28 °C
Test Date :	June 11, 2018	Humidity :	70 %
Memo :	X axis		

Radiated Emissions (VERTICAL)									
Frequency (MHz)	Read (dBuV/m)		Factor	Amplitude (dBuV/m)		Limits (dBuV/m)		Margin (dB)	
	PK	AV		PK	AV	PK	AV	PK	AV
3229.50	69.07	--	-31.49	37.58	--	74	54	-36.42	--
4003.00	69.48	--	-29.72	39.76	--	74	54	-34.24	--
4880.50	66.51	--	-28.12	38.39	--	74	54	-35.61	--
5264.00	65.69	--	-27.68	38.01	--	74	54	-35.99	--
6239.00	63.77	--	-23.65	40.12	--	74	54	-33.88	--
7320.50	68.19	--	-21.44	46.75	--	74	54	-27.25	--

Radiated Emissions (HORIZONTAL)									
Frequency (MHz)	Read (dBuV/m)		Factor	Amplitude (dBuV/m)		Limits (dBuV/m)		Margin (dB)	
	PK	AV		PK	AV	PK	AV	PK	AV
3203.50	68.70	--	-31.24	37.46	--	74	54	-36.54	--
3782.00	68.11	--	-30.11	38.00	--	74	54	-36.00	--
4880.50	69.10	--	-28.12	40.98	--	74	54	-33.02	--
5446.00	66.56	--	-27.20	39.36	--	74	54	-34.64	--
6284.50	64.18	--	-23.39	40.79	--	74	54	-33.21	--
7320.50	68.77	--	-21.44	47.33	--	74	54	-26.67	--

Power :	DC 5V		
Test Mode :	GFSK CH39	Temperature :	28 °C
Test Date :	June 11, 2018	Humidity :	70 %
Memo :	X axis		

Radiated Emissions (VERTICAL)									
Frequency (MHz)	Read (dBuV/m)		Factor	Amplitude (dBuV/m)		Limits (dBuV/m)		Margin (dB)	
	PK	AV		PK	AV	PK	AV	PK	AV
3223.00	68.96	--	-31.40	37.56	--	74	54	-36.44	--
3801.50	71.47	--	-30.16	41.31	--	74	54	-32.69	--
4960.50	67.04	--	-28.09	38.95	--	74	54	-35.05	--
5680.00	65.24	--	-25.60	39.64	--	74	54	-34.36	--
6278.00	64.13	--	-23.42	40.71	--	74	54	-33.29	--
7440.50	63.56	--	-20.90	42.66	--	74	54	-31.34	--

Radiated Emissions (HORIZONTAL)									
Frequency (MHz)	Read (dBuV/m)		Factor	Amplitude (dBuV/m)		Limits (dBuV/m)		Margin (dB)	
	PK	AV		PK	AV	PK	AV	PK	AV
3210.00	69.53	--	-31.23	38.30	--	74	54	-35.70	--
4042.00	66.67	--	-29.54	37.13	--	74	54	-36.87	--
4960.50	69.23	--	-28.09	41.14	--	74	54	-32.86	--
5686.50	66.73	--	-25.59	41.14	--	74	54	-32.86	--
6369.00	64.38	--	-23.15	41.23	--	74	54	-32.77	--
7440.50	67.28	--	-20.90	46.38	--	74	54	-27.62	--

Notes:

1. Amplitude = Reading Amplitude + Factor
2. Factor = Antenna Factor + Cable Loss – Amplifier Gain
3. The resolution bandwidth of test receiver/spectrum analyzer is 120 KHz and video bandwidth is 300 KHz for Quasi-peak detection at frequency 30 MHz~1GHz.
4. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and video bandwidth is 3 MHz for Peak detection at frequency above 1GHz.
5. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 3 MHz RMS detector for Average Value at frequency above 1GHz
6. All emissions as described above were determining by rotating the EUT through three orthogonal axes to maximizing the emissions if the EUT belongs to hand-held or body-worn devices.
7. Where limits are specified for both average and peak detector functions, if the peak measured value complies with the average limit, it is unnecessary to perform an average measurement at frequency above 1GHz.

8. 6dB Bandwidth

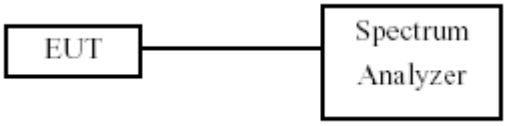
8.1 Test Limit

The minimum of 6dB Bandwidth Measurement is 0.5 MHz.

8.2 Test Procedures

a. The transmitter output was connected to the spectrum analyzer.
b. Set RBW of spectrum analyzer to 1~5% of the emission bandwidth and VBW ≥ 3x RBW.
c. The 6 dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 6 dB.
d. The 6dB Bandwidth was measured and recorded.

8.3 Test Setup Layout



8.4 Test Result and Data

Test Date: Jun. 14, 2018 Temperature: 29℃

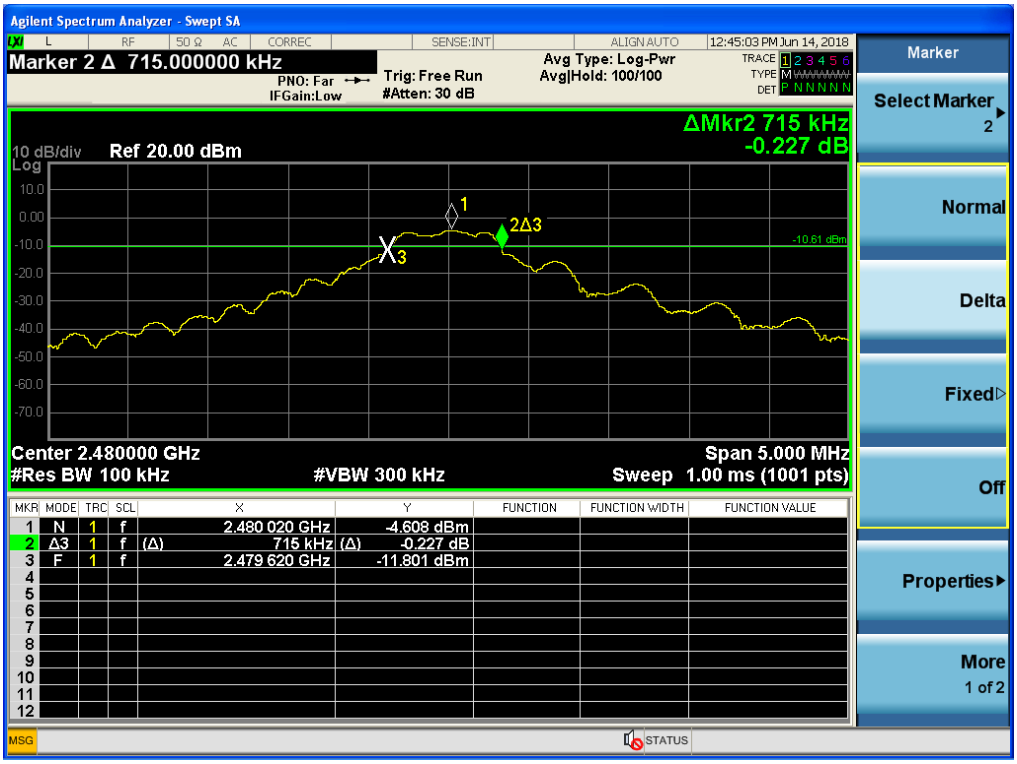
Atmospheric pressure: 993 hPa Humidity: 65%

Modulation Standard	Channel	Frequency (MHz)	6dB Bandwidth (MHz)
GFSK	00	2402	0.69
	19	2440	0.73
	39	2480	0.72

Modulation Standard: GFSK
Channel: 00

Modulation Standard: GFSK
Channel: 19

Modulation Standard: GFSK
Channel: 39



9. Maximum Peak and Average Output Power

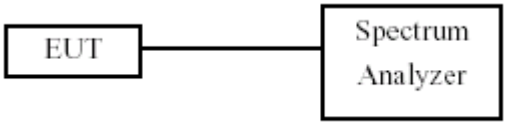
9.1 Test Limit

The Maximum Peak and Average Output Power Measurement is 30dBm.

9.2 Test Procedures

a. The transmitter output was connected to spectrum analyzer.
b. The spectrum analyzer's resolution bandwidth were set at 1MHz RBW and 3MHz VBW as that of the fundamental frequency. Set the sweep time=auto couple.
c. Use the spectrum analyzer's band/channel power measurement function with the band limits set equal to the DTS bandwidth edges (for some analyzers, this may require a manual override to ensure use of peak detector).
d. Employ trace averaging in power averaging (RMS) mode over a minimum of 100 traces.
e. Use the spectrum analyzer's band power measurement function with band limits set equal to the EBW band edges.
f. The peak and average output power was measured and recorded.

9.3 Test Setup Layout



9.4 Test Result and Data

Test Date: Jun. 14, 2018 Temperature: 29℃

Atmospheric pressure: 993 hPa Humidity: 65%

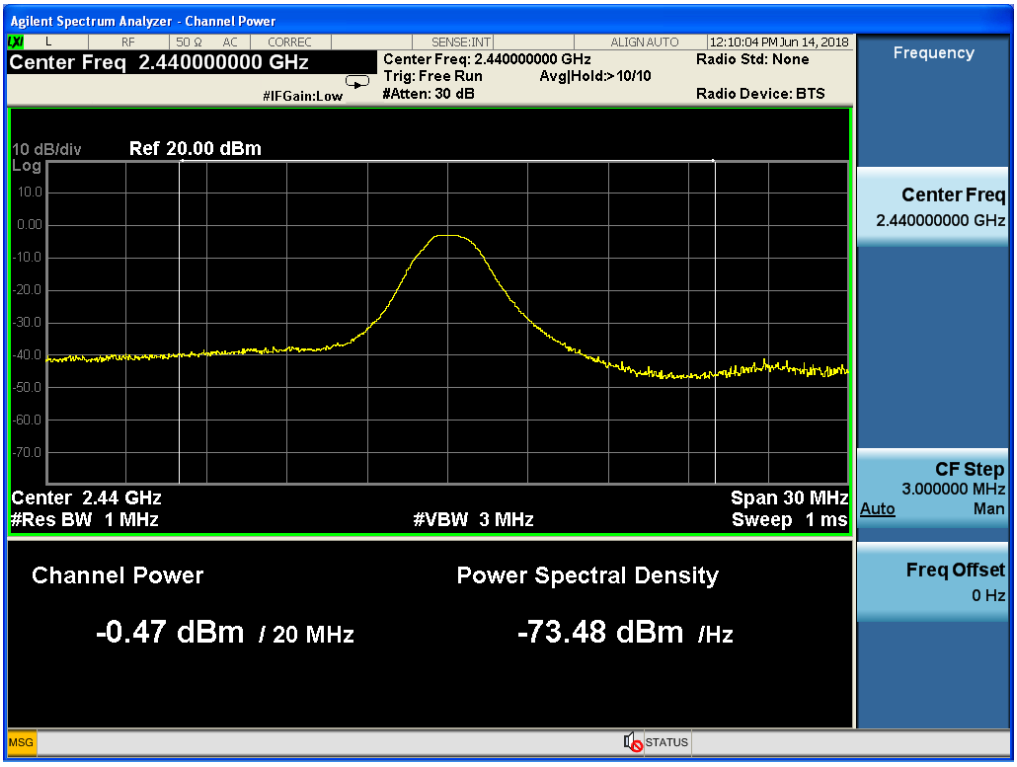
Modulation Standard	Channel	Frequency (MHz)	Peak Power Output (dBm)	Peak Power Output (mW)
GFSK	00	2402	0.36	1.09
	19	2440	-0.47	0.90
	39	2480	-2.12	0.62

Modulation Standard	Channel	Frequency (MHz)	Average Power Output (dBm)	Average Power Output (mW)
GFSK	00	2402	0.00	1
	19	2440	-1.09	0.78
	39	2480	-2.68	0.54

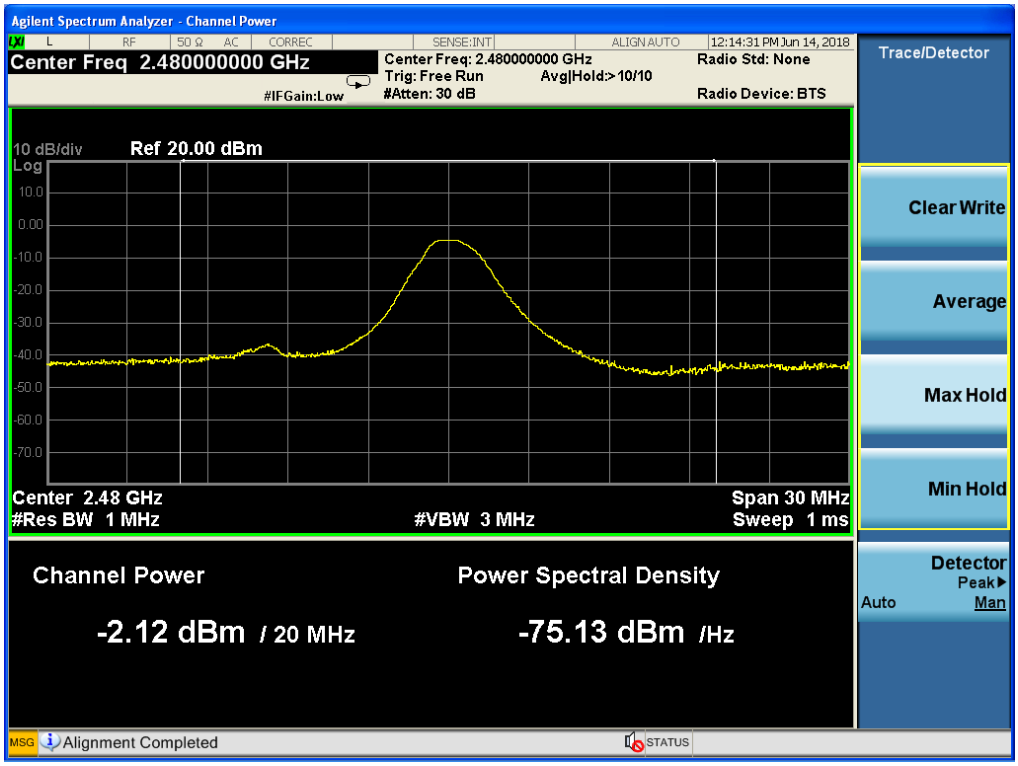
Peak Output Power

Modulation Standard: GFSK
Channel: 00

Modulation Standard: GFSK
Channel: 19



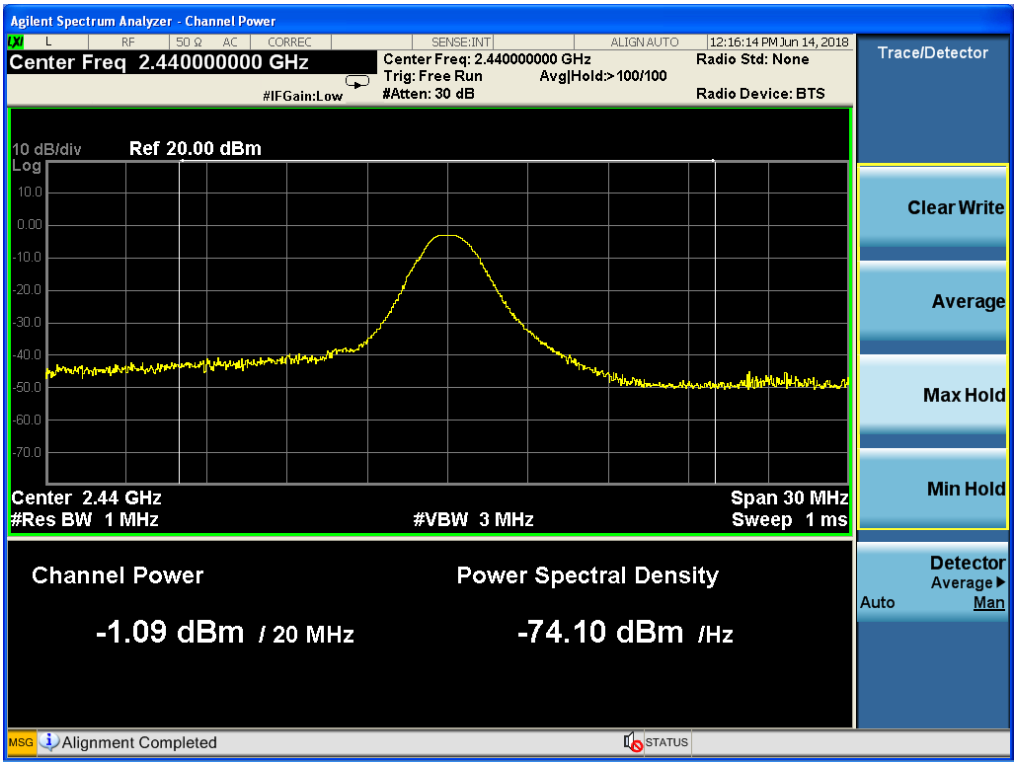
Modulation Standard: GFSK
Channel: 39



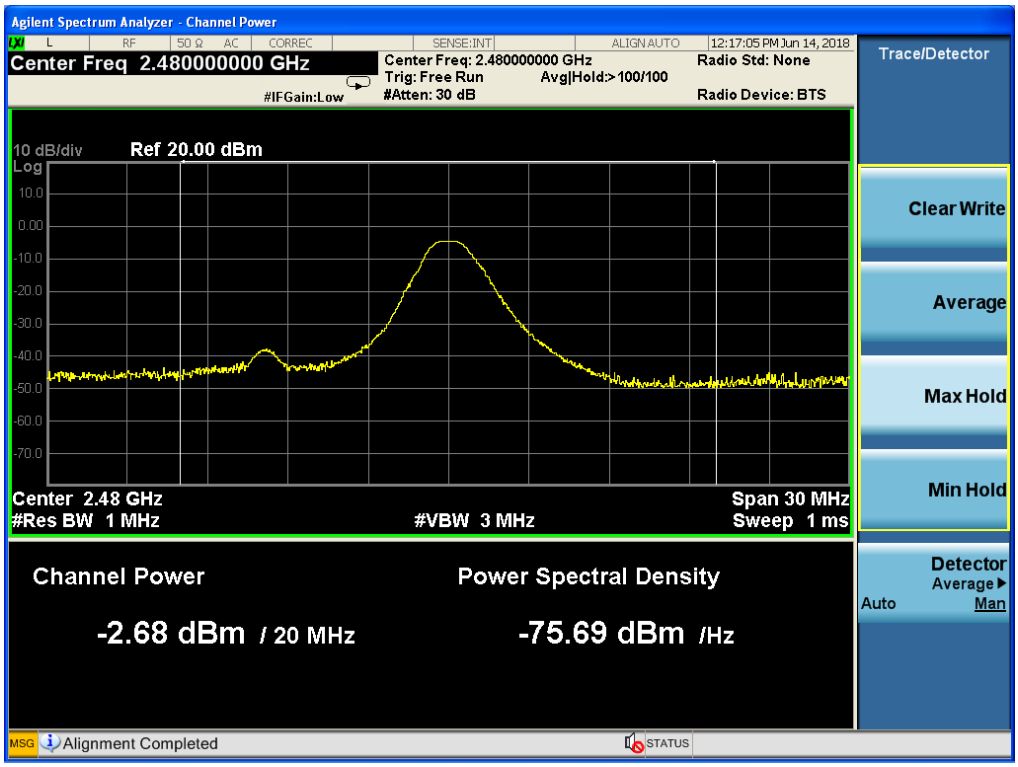
Average Output Power

Modulation Standard: GFSK
Channel: 00

Modulation Standard: GFSK
Channel: 19



Modulation Standard: GFSK
Channel: 39



10. Power Spectral Density

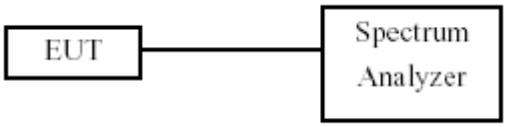
10.1 Test Limit

The Maximum of Power Spectral Density Measurement is 8dBm

10.2 Test Procedures

g. The transmitter output was connected to spectrum analyzer.
h. The spectrum analyzer's resolution bandwidth were set at 3KHz RBW and 30KHz VBW as that of the fundamental frequency. Set the sweep time=auto couple.
i. The power spectral density was measured and recorded.

10.3 Test Setup Layout



10.4 Test Result and Data

Test Date: Jun. 14, 2018 Temperature: 29℃

Atmospheric pressure: 993 hPa Humidity: 65%

Modulation Standard	Channel	Frequency (MHz)	Measured Power Density (dBm)
GFSK	00	2402	-15.50
	19	2440	-17.38
	39	2480	-18.65

Modulation Standard: GFSK
Channel: 00

Modulation Standard: GFSK
Channel: 19

Modulation Standard: GFSK
Channel: 39

11. Band Edges

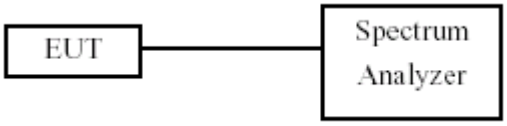
11.1 Test Limit

Below –20dB of the highest emission level of operating band (In 100 kHz Resolution Bandwidth)

11.2 Test Procedure

a. The transmitter output was connected to the spectrum analyzer via a low lose cable.
b. Set RBW of spectrum analyzer to 100 KHz and VBW of spectrum analyzer to 300 KHz with convenient frequency span including 100 KHz bandwidth from band edge.
c. Peak conducted output power measured within any 100 kHz outside the authorized frequency band shall be attenuated by at least 20dB relative to the maximum measured in-band peak PSD level.
d. The band edges was measured and recorded.

11.3 Test Setup Layout



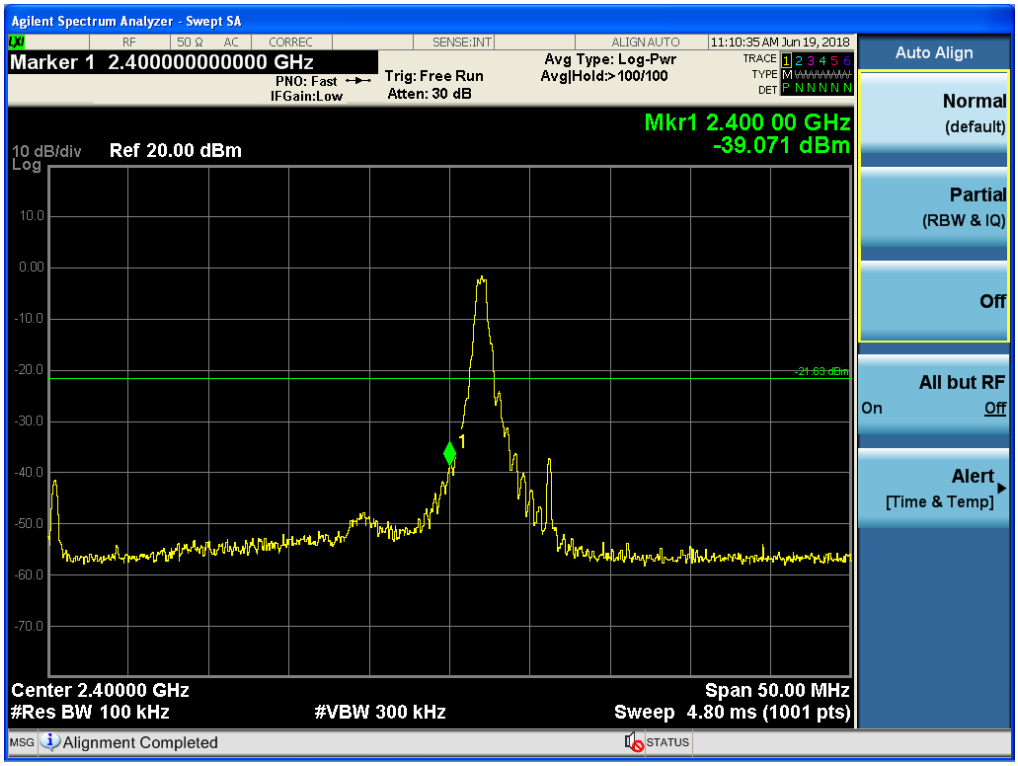
11.4 Test Result and Data

Test Date: Jun. 14, 2018 Temperature: 29℃

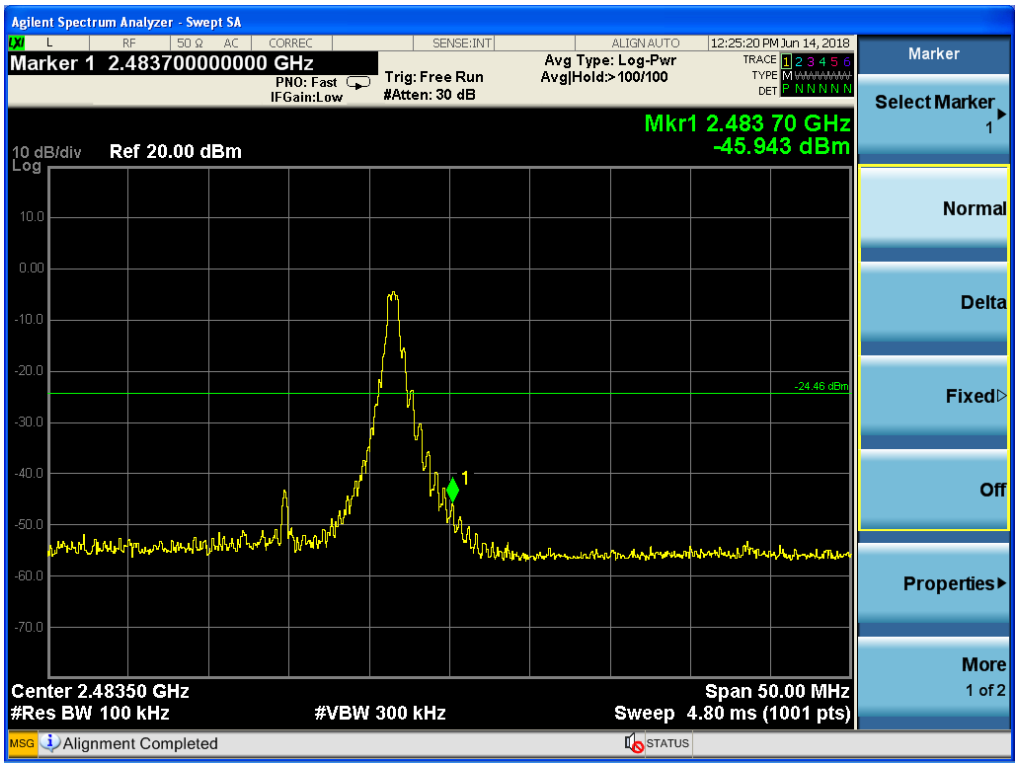
Atmospheric pressure: 993 hPa Humidity: 65%

Modulation Standard	Channel	Frequency (MHz)	maximum value in frequency (MHz)	maximum value (dBm)
GFSK	00	2402	24723	-37.24
	39	2480	24757	-37.95

Modulation Standard: GFSK
Channel: 00



Modulation Standard: GFSK
Channel: 39



11.5 Restrict Band Emission Measurement Data

Power	:	DC 5V			
Test Mode	:	GFSK CH0	Temperature	:	28 °C
Test Date	:	June 11 2018	Humidity	:	70 %
Memo	:	X axis			

Radiated Emissions (VERTICAL)									
Frequency (MHz)	Read (dBuV/m)		Factor	Amplitude (dBuV/m)		Limits (dBuV/m)		Margin (dB)	
	PK	AV		PK	AV	PK	AV	PK	AV
2333.25	77.57	--	-32.74	44.83	--	74	54	-29.17	--

Radiated Emissions (HORIZONTAL)									
Frequency (MHz)	Read (dBuV/m)		Factor	Amplitude (dBuV/m)		Limits (dBuV/m)		Margin (dB)	
	PK	AV		PK	AV	PK	AV	PK	AV
2333.25	73.70	--	-32.74	40.96	--	74	54	-33.04	--

Power :	DC 5V		
Test Mode :	GFSK CH39	Temperature :	28 °C
Test Date :	June 11 2018	Humidity :	70 %
Memo :	X axis		

Radiated Emissions (VERTICAL)									
Frequency (MHz)	Read (dBuV/m)		Factor	Amplitude (dBuV/m)		Limits (dBuV/m)		Margin (dB)	
	PK	AV		PK	AV	PK	AV	PK	AV
2499.48	74.96	--	-32.79	42.17	--	74	54	-31.83	--

Radiated Emissions (HORIZONTAL)									
Frequency (MHz)	Read (dBuV/m)		Factor	Amplitude (dBuV/m)		Limits (dBuV/m)		Margin (dB)	
	PK	AV		PK	AV	PK	AV	PK	AV
2485.93	70.90	--	-32.73	38.17	--	74	54	-35.83	--

Notes:

1. Amplitude = Reading Amplitude + Factor
2. Factor = Antenna Factor + Cable Loss – Amplifier Gain
3. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and video bandwidth is 3 MHz for Peak detection at frequency above 1GHz.
4. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 3MHz RMS detector for Average Value at frequency above 1GHz
5. All emissions as described above were determining by rotating the EUT through three orthogonal axes to maximizing the emissions if the EUT belongs to hand-held or body-worn devices.
6. Where limits are specified for both average and peak detector functions, if the peak measured value complies with the average limit, it is unnecessary to perform an average measurement.

12. Restricted Bands of Operation

Only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.09000 – 0.11000	16.42000 – 16.42300	399.9 – 410.0	4.500 – 5.150
0.49500 – 0.505**	16.69475 – 16.69525	608.0 – 614.0	5.350 – 5.460
2.17350 – 2.19050	16.80425 – 16.80475	960.0 – 1240.0	7.250 – 7.750
4.12500 – 4.12800	25.50000 – 25.67000	1300.0 – 1427.0	8.025 – 8.500
4.17725 – 4.17775	37.50000 – 38.25000	1435.0 – 1626.5	9.000 – 9.200
4.20725 – 4.20775	73.00000 – 74.60000	1645.5 – 1646.5	9.300 – 9.500
6.21500 – 6.21800	74.80000 – 75.20000	1660.0 – 1710.0	10.600 – 12.700
6.26775 – 6.26825	108.00000 – 121.94000	1718.8 – 1722.2	13.250 – 13.400
6.31175 – 6.31225	123.00000 – 138.00000	2200.0 – 2300.0	14.470 – 14.500
8.29100 – 8.29400	149.90000 – 150.05000	2310.0 – 2390.0	15.350 – 16.200
8.36200 – 8.36600	156.52475 – 156.52525	2483.5 – 2500.0	17.700 – 21.400
8.37625 – 8.38675	156.70000 – 156.90000	2655.0 – 2900.0	22.010 – 23.120
8.41425 – 8.41475	162.01250 – 167.17000	3260.0 – 3267.0	23.600 – 24.000
12.29000 – 12.29300	167.72000 – 173.20000	3332.0 – 3339.0	31.200 – 31.800
12.51975 – 12.52025	240.00000 – 285.00000	3345.8 – 3358.0	36.430 – 36.500
12.57675 – 12.57725	322.00000 – 335.40000	3600.0 – 4400.0	Above 38.6
13.36000 – 13.41000			

**: Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz

12.1 Labeling Requirement

The device shall bear the following statement in a conspicuous location on the device:

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.