



## Shenzhen Huaxia Testing Technology Co., Ltd

1F., Block A of Tongsheng Technology Building, Huahui Road, Dalang Street, Longhua District, Shenzhen, China

Telephone: +86-755-26648640  
Fax: +86-755-26648637  
Website: [www.cqa-cert.com](http://www.cqa-cert.com)

Report Template Version: V03  
Report Template Revision Date: Mar.1st, 2017

# Test Report

**Report No. :** CQASZ20190500018EX-01  
**Applicant:** Fusion Fnc Co., Ltd  
**Address of Applicant:** F324 Misatesta Tower, Misagangbyeonseo-ro 25, Hanam-si, Gyeonggi-do, South Korea  
**Manufacturer:** Dongguan Lingjie Electronics & Technology Co., Ltd  
**Address of Manufacturer:** 1-5/F B Building, 1-4/F A Building, No.16, Zhenxing Northern Road, Taiyuan Community, Xiegang Town, Dongguan City, Guangdong Province, P.R. China  
**Equipment Under Test (EUT):**  
**Product:** wireless mouse dongle  
**All Model No.:** KAKAO Receiver, FS-111L  
**Test Model No.:** KAKAO Receiver  
**Brand Name:** **KAKAO FRIENDS** / INOTE  
**FCC ID:** 2ATCF-KKREC  
**Standards:** 47 CFR Part 15, Subpart C  
**Date of Test:** 2019-04-28 to 2019-05-19  
**Date of Issue:** 2019-05-19  
**Test Result :** **PASS\***

**Tested By:**

*Daisy Qin*

(Daisy Qin)

**Reviewed By:**

*Aaron Ma*

(Aaron Ma)

**Approved By:**

*Jack Ai*

( Jack Ai)



\* In the configuration tested, the EUT complied with the standards specified above.

The test report is effective only with both signature and specialized stamp, The result(s) shown in this report refer only to the sample(s) tested. Without written approval of CQA, this report can't be reproduced except in full.

## 1 Version

### Revision History Of Report

Report No.	Version	Description	Issue Date
CQASZ20190500018EX-01	Rev.01	Initial report	2019-05-15

## 2 Test Summary

Test Item	Test Requirement	Test method	Result
Antenna Requirement	47 CFR Part 15, Subpart C Section 15.203/15.247 (c)	ANSI C63.10 2013	PASS
AC Power Line Conducted Emission	47 CFR Part 15, Subpart C Section 15.207	ANSI C63.10 2013	PASS
Conducted Peak Output Power	47 CFR Part 15, Subpart C Section 15.247 (b)(3)	ANSI C63.10 2013	PASS
6dB Occupied Bandwidth	47 CFR Part 15, Subpart C Section 15.247 (a)(2)	ANSI C63.10 2013	PASS
Power Spectral Density	47 CFR Part 15, Subpart C Section 15.247 (e)	ANSI C63.10 2013	PASS
Band-edge for RF Conducted Emissions	47 CFR Part 15, Subpart C Section 15.247(d)	ANSI C63.10 2013	PASS
RF Conducted Spurious Emissions	47 CFR Part 15, Subpart C Section 15.247(d)	ANSI C63.10 2013	PASS
Radiated Spurious Emissions	47 CFR Part 15, Subpart C Section 15.205/15.209	ANSI C63.10 2013	PASS
Restricted bands around fundamental frequency (Radiated Emission)	47 CFR Part 15, Subpart C Section 15.205/15.209	ANSI C63.10 2013	PASS

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## 4 General Information

### 4.1 Client Information

Applicant:	Fusion Fnc Co., Ltd
Address of Applicant:	F324 Misatesta Tower, Misagangbyeonse-ro 25, Hanam-si, Gyeonggi-do, South Korea
Manufacturer:	Dongguan Lingjie Electronics & Technology Co., Ltd
Address of Manufacturer:	1-5/F B Building, 1-4/F A Building, No.16, Zhenxing Northern Road, Taiyuan Community, Xiegang Town, Dongguan City, Guangdong Province, P.R. China

### 4.2 General Description of EUT

Product Name:	wireless mouse dongle
All Model No.:	KAKAO Receiver, FS-111L
Test Model No.:	KAKAO Receiver
Trade Mark:	 / INOTE
Hardware Version:	V1.0
Software Version:	V1.0
Operation Frequency:	2403.85 MHz~2479.85MHz
Modulation Type:	GFSK
Transfer Rate:	1Mbps
Number of Channel:	16
Product Type:	<input type="checkbox"/> Mobile <input checked="" type="checkbox"/> Portable <input type="checkbox"/> Fix Location
Antenna Type:	PCB antenna
Antenna Gain:	-0.71dBi
EUT Power Supply:	DC 5.0V from PC

Note:

There are many products, Only the model KAKAO Receiver was tested, since the electrical circuit design, layout, components used and internal wiring were identical for the above models, with difference being color of appearance and model name.

Operation Frequency each of channel			
Channel	Frequency	Channel	Frequency
0	2403.85 MHz	8	2441.85 MHz
1	2407.85 MHz	9	2445.85 MHz
2	2414.85 MHz	10	2453.85 MHz
3	2419.85 MHz	11	2459.85 MHz
4	2422.85 MHz	12	2463.85 MHz
5	2426.85 MHz	13	2466.85 MHz
6	2436.85 MHz	14	2473.85 MHz
7	2439.85 MHz	15	2479.85 MHz

Note:

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

Channel	Frequency
The lowest channel (CH0)	2403.85MHz
The middle channel (CH8)	2441.85MHz
The highest channel (CH15)	2479.85MHz

### 4.3 Test Environment

Operating Environment:	
Temperature:	25.0 °C
Humidity:	53 % RH
Atmospheric Pressure:	1010mbar
Test Mode:	Use test software to set the lowest frequency, the middle frequency and the highest frequency keep transmitting of the EUT. Note: In the process of transmitting of EUT, the duty cycle >98%.

### 4.4 Description of Support Units

The EUT has been tested with associated equipment below.

Description	Manufacturer	Model No.	Remark	FCC certification
PC	Lenovo	Thinkpad E450c	Provide by lab	FCC ID
AC/DC Adapter	Lenovo	ADLX65NLC3A	Provide by lab	FCC DOC

#### 4.5 Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate.

The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities.

The measurement uncertainty was calculated for all measurements listed in this test report acc. to CISPR 16 - 4 „Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements“ and is documented in the **Shenzhen Huaxia Testing Technology Co., Ltd.** quality system acc. to DIN EN ISO/IEC 17025.

Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Hereafter the best measurement capability for CQA laboratory is reported:

No.	Item	Uncertainty	Notes
1	Radiated Emission (Below 1GHz)	±5.12dB	(1)
2	Radiated Emission (Above 1GHz)	±4.60dB	(1)
3	Conducted Disturbance (0.15~30MHz)	±3.34dB	(1)
4	Radio Frequency	$3 \times 10^{-8}$	(1)
5	Duty cycle	0.6 %.	(1)
6	Occupied Bandwidth	1.1%	(1)
7	RF conducted power	0.86dB	(1)
8	RF power density	0.74	(1)
9	Conducted Spurious emissions	0.86dB	(1)
10	Temperature test	0.8°C	(1)
11	Humidity test	2.0%	(1)
12	Supply voltages	0.5 %.	(1)
13	time	0.6 %.	(1)
14	Frequency Error	5.5 Hz	(1)

(1) This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

#### 4.6 Test Location

**Shenzhen Huaxia Testing Technology Co., Ltd,**

1F., Block A of Tongsheng Technology Building, Huahui Road, Dalang Street, Longhua District, Shenzhen, China

#### 4.7 Test Facility

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

- **CNAS (No. CNAS L5785)**

CNAS has accredited Shenzhen Huaxia Testing Technology Co., Ltd. Shenzhen Branch EMC Lab to ISO/IEC 17025:2005 General Requirements for the Competence of Testing and Calibration Laboratories (CNAS-CL01 Accreditation Criteria for the Competence of Testing and Calibration Laboratories) for the competence in the field of testing.

- **A2LA (Certificate No. 4742.01)**

Shenzhen Huaxia Testing Technology Co., Ltd., Shenzhen EMC Laboratory is accredited by the American Association for Laboratory Accreditation(A2LA). Certificate No. 4742.01.

- **FCC Registration No.: 522263**

Shenzhen Huaxia Testing Technology Co., Ltd., Shenzhen EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration No.:522263

#### 4.8 Deviation from Standards

None.

#### 4.9 Other Information Requested by the Customer

None.

#### 4.10 Equipment List

Test Equipment	Manufacturer	Model No.	Instrument No.	Calibration Date	Calibration Due Date
EMI Test Receiver	R&S	ESR7	CQA-005	2018/09/26	2019/09/25
Spectrum analyzer	R&S	FSU26	CQA-038	2018/10/28	2019/10/27
Preamplifier	MITEQ	AFS4-00010300-18-10P-4	CQA-035	2018/09/26	2019/09/25
Preamplifier	MITEQ	AMF-6D-02001800-29-20P	CQA-036	2018/11/02	2019/11/01
Loop antenna	Schwarzbeck	FMZB1516	CQA-087	2018/10/28	2020/10/27
Bilog Antenna	R&S	HL562	CQA-011	2018/09/26	2020/09/25
Horn Antenna	R&S	HF906	CQA-012	2018/09/26	2020/09/25
Horn Antenna	Schwarzbeck	BBHA 9170	CQA-088	2018/09/26	2020/09/25
Coaxial Cable (Above 1GHz)	CQA	N/A	C019	2018/09/26	2019/09/25
Coaxial Cable (Below 1GHz)	CQA	N/A	C020	2018/09/26	2019/09/25
Spectrum analyzer	Agilent	E4440A	CQA-103	2018/10/28	2019/10/27
Antenna Connector	CQA	RFC-01	CQA-080	2018/09/26	2019/09/25
RF cable(9KHz~40GHz)	CQA	RF-01	CQA-079	2018/09/26	2019/9/25
Power divider	MIDWEST	PWD-2533-02-SMA-79	CQA-067	2018/09/26	2019/09/25
EMI Test Receiver	R&S	ESPI3	CQA-013	2018/09/26	2019/09/25
LISN	R&S	ENV216	CQA-003	2018/11/05	2019/11/04
Coaxial cable	CQA	N/A	CQA-C009	2018/09/26	2019/09/25

Note:

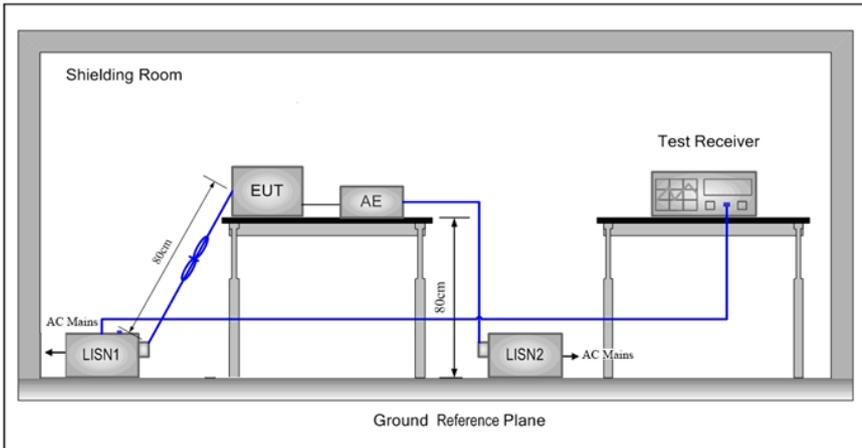
The temporary antenna connector is soldered on the PCB board in order to perform conducted tests and this temporary antenna connector is listed in the equipment list.

## 5 Test results and Measurement Data

### 5.1 Antenna Requirement

<b>Standard requirement:</b>	47 CFR Part 15C Section 15.203 /247(c)
<p>15.203 requirement:  An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.</p> <p>15.247(b) (4) requirement:  The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.</p>	
EUT Antenna:	<p>PCB ANTENNA</p> 
<p>The antenna is a PCB antenna. The best case gain of the antenna is -0.71dBi.</p>	

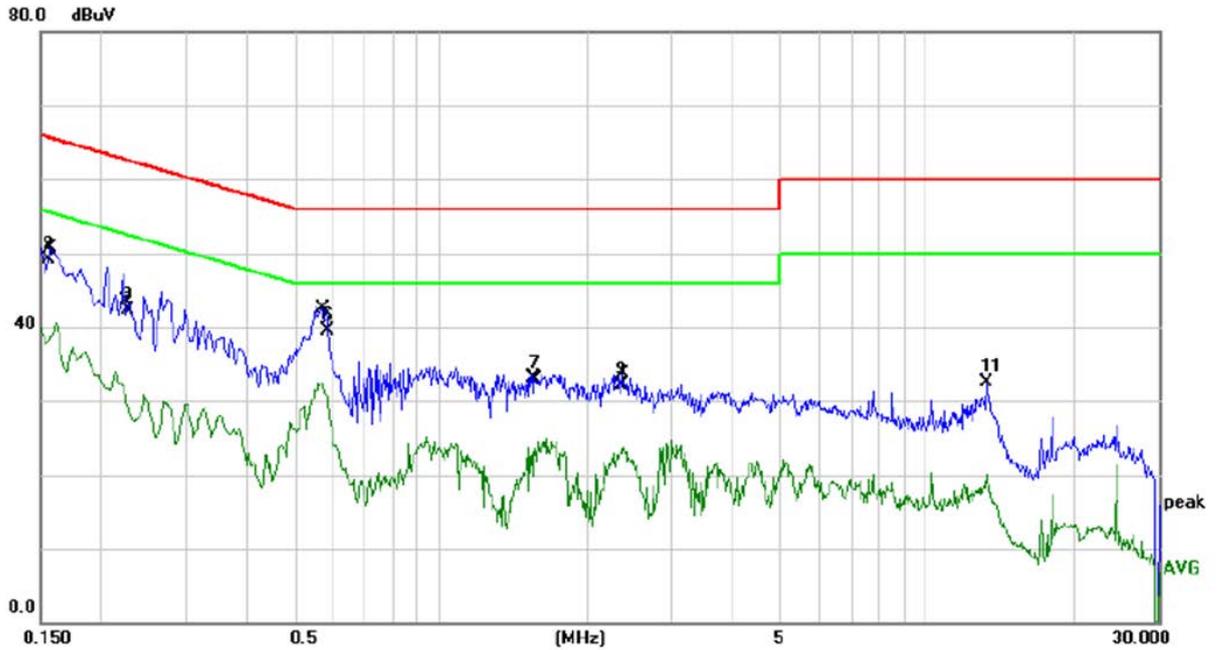
## 5.2 Conducted Emissions

Test Requirement:	47 CFR Part 15C Section 15.207														
Test Method:	ANSI C63.10: 2013														
Test Frequency Range:	150kHz to 30MHz														
Limit:	<table border="1"> <thead> <tr> <th rowspan="2">Frequency range (MHz)</th> <th colspan="2">Limit (dBuV)</th> </tr> <tr> <th>Quasi-peak</th> <th>Average</th> </tr> </thead> <tbody> <tr> <td>0.15-0.5</td> <td>66 to 56*</td> <td>56 to 46*</td> </tr> <tr> <td>0.5-5</td> <td>56</td> <td>46</td> </tr> <tr> <td>5-30</td> <td>60</td> <td>50</td> </tr> </tbody> </table> <p>* Decreases with the logarithm of the frequency.</p>	Frequency range (MHz)	Limit (dBuV)		Quasi-peak	Average	0.15-0.5	66 to 56*	56 to 46*	0.5-5	56	46	5-30	60	50
Frequency range (MHz)	Limit (dBuV)														
	Quasi-peak	Average													
0.15-0.5	66 to 56*	56 to 46*													
0.5-5	56	46													
5-30	60	50													
Test Procedure:	<ol style="list-style-type: none"> <li>1) The mains terminal disturbance voltage test was conducted in a shielded room.</li> <li>2) The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides a <math>50\Omega/50\mu\text{H} + 5\Omega</math> linear impedance. The power cables of all other units of the EUT were connected to a second LISN 2, which was bonded to the ground reference plane in the same way as the LISN 1 for the unit being measured. A multiple socket outlet strip was used to connect multiple power cables to a single LISN provided the rating of the LISN was not exceeded.</li> <li>3) The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane.</li> <li>4) The test was performed with a vertical ground reference plane. The rear of the EUT shall be 0.4 m from the vertical ground reference plane. The vertical ground reference plane was bonded to the horizontal ground reference plane. The LISN 1 was placed 0.8 m from the boundary of the unit under test and bonded to a ground reference plane for LISNs mounted on top of the ground reference plane. This distance was between the closest points of the LISN 1 and the EUT. All other units of the EUT and associated equipment was at least 0.8 m from the LISN 2.</li> <li>5) In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10: 2013 on conducted measurement.</li> </ol>														
Test Setup:															
Final Test Mode:	<p>Through Pre-scan, find the GFSK modulation at the lowest channel is the worst case.</p> <p>Only the worst case is recorded in the report.</p>														

Test Voltage:	AC 120V/60Hz
Test Results:	Pass

Measurement Data:

L line:

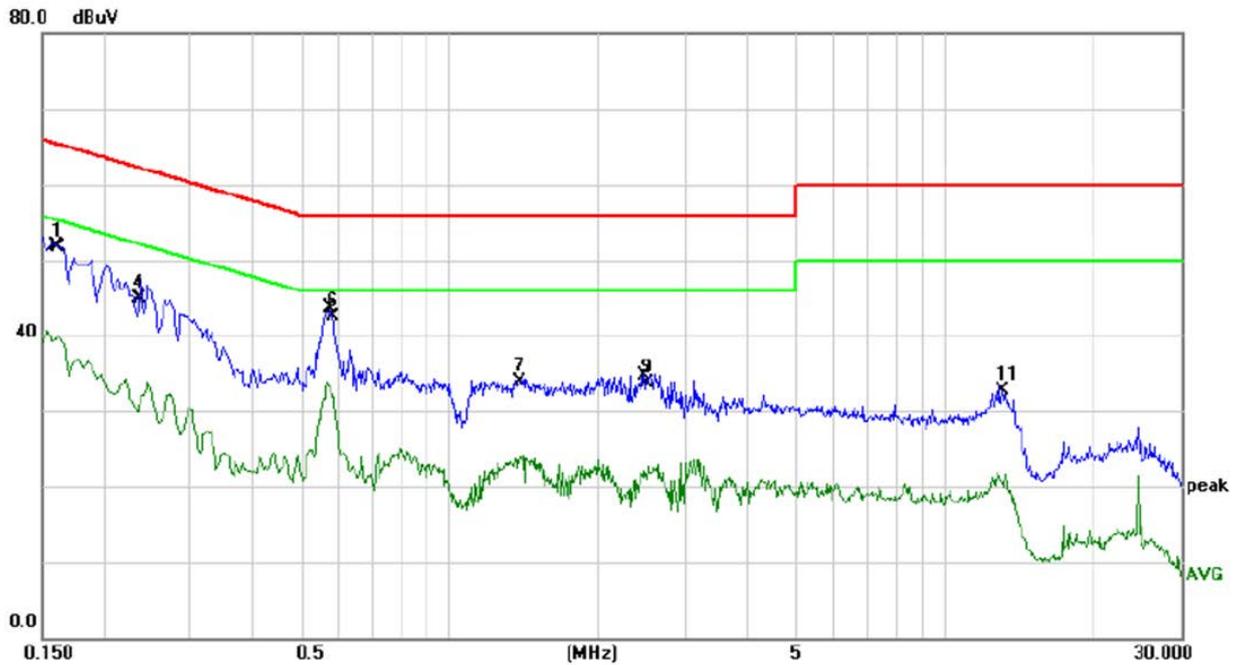


No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector	Comment
1		0.1548	38.01	-0.13	37.88	55.73	-17.85	AVG	
2		0.1556	49.16	-0.13	49.03	65.69	-16.66	peak	
3		0.2268	42.35	-0.12	42.23	62.56	-20.33	peak	
4		0.2268	29.53	-0.12	29.41	52.56	-23.15	AVG	
5	*	0.5780	31.29	-0.04	31.25	46.00	-14.75	AVG	
6		0.5860	39.62	-0.04	39.58	56.00	-16.42	peak	
7		1.5660	33.07	-0.20	32.87	56.00	-23.13	peak	
8		1.5660	23.62	-0.20	23.42	46.00	-22.58	AVG	
9		2.3540	32.36	-0.25	32.11	56.00	-23.89	peak	
10		2.3860	23.87	-0.25	23.62	46.00	-22.38	AVG	
11		13.2900	32.56	-0.15	32.41	60.00	-27.59	peak	
12		13.3500	17.93	-0.16	17.77	50.00	-32.23	AVG	

Remark:

1. The following Quasi-Peak and Average measurements were performed on the EUT:
2. Final Test Level =Receiver Reading + LISN Factor + Cable Loss.
3. If the Peak value under Average limit, the Average value is not recorded in the report.

N line:

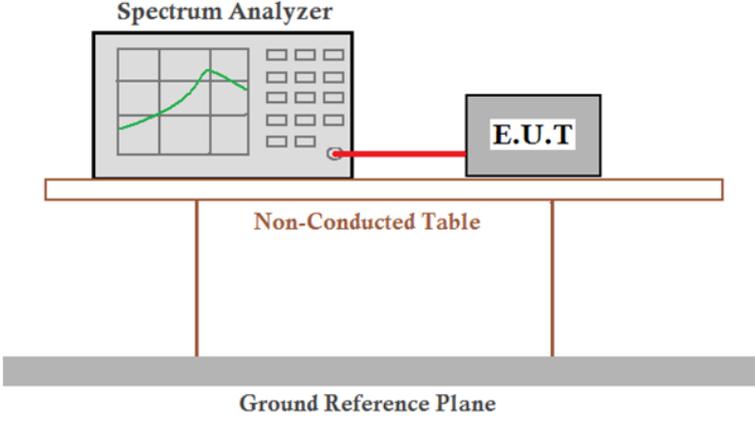


No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector	Comment
1		0.1620	51.89	-0.13	51.76	65.36	-13.60	peak	
2		0.1624	39.87	-0.13	39.74	55.34	-15.60	AVG	
3		0.2340	29.98	-0.12	29.86	52.30	-22.44	AVG	
4		0.2353	45.10	-0.12	44.98	62.26	-17.28	peak	
5	*	0.5780	33.02	-0.04	32.98	46.00	-13.02	AVG	
6		0.5820	42.51	-0.04	42.47	56.00	-13.53	peak	
7		1.3860	34.14	-0.17	33.97	56.00	-22.03	peak	
8		1.3860	24.07	-0.17	23.90	46.00	-22.10	AVG	
9		2.5100	33.89	-0.16	33.73	56.00	-22.27	peak	
10		2.5100	21.05	-0.16	20.89	46.00	-25.11	AVG	
11		13.0659	32.76	-0.14	32.62	60.00	-27.38	peak	
12		13.0659	20.37	-0.14	20.23	50.00	-29.77	AVG	

Remark:

1. The following Quasi-Peak and Average measurements were performed on the EUT:
2. Final Test Level = Receiver Reading + LISN Factor + Cable Loss.
3. If the Peak value under Average limit, the Average value is not recorded in the report.

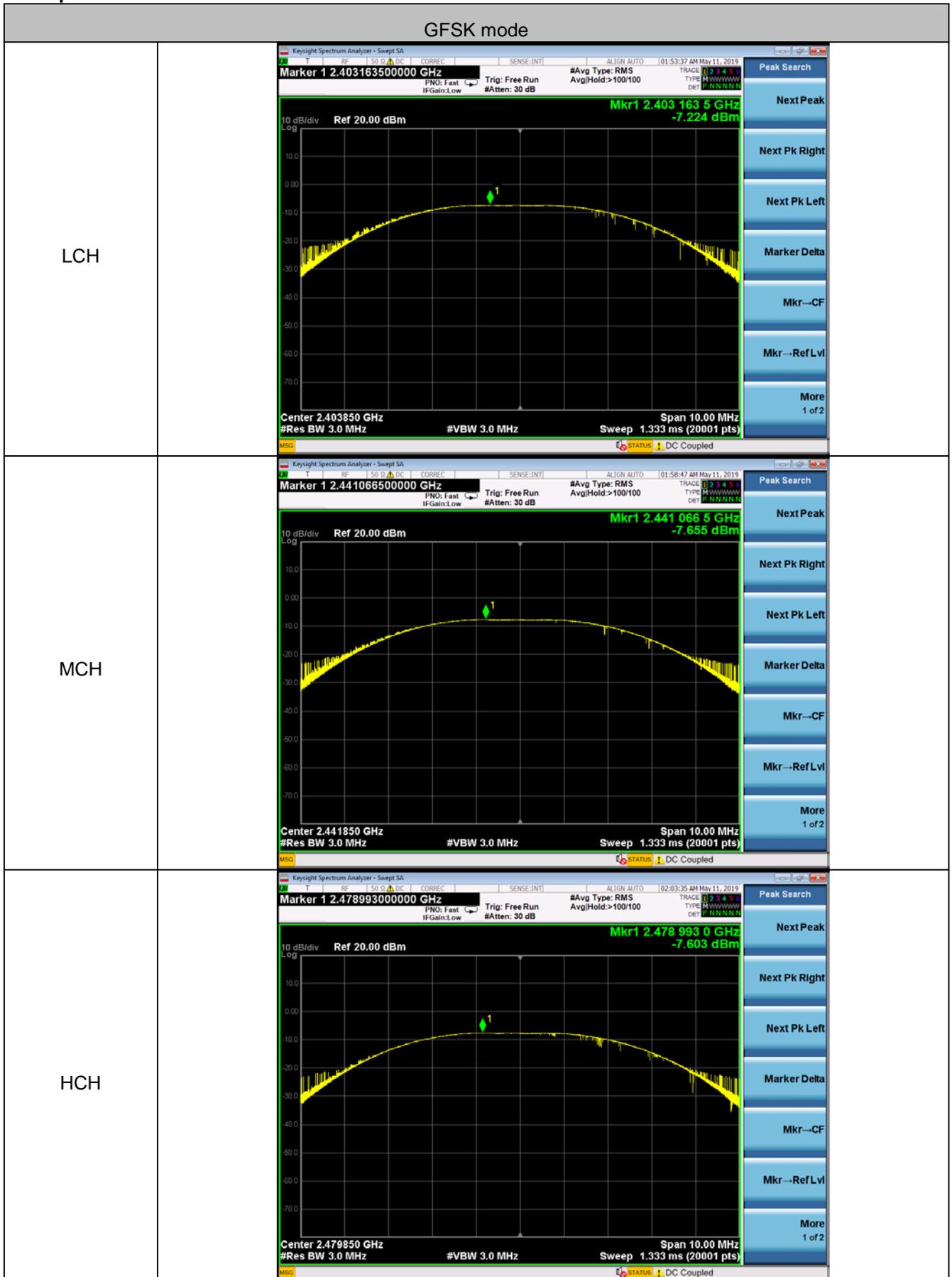
### 5.3 Conducted Peak Output Power

Test Requirement:	47 CFR Part 15C Section 15.247 (b)(1)
Test Method:	ANSI C63.10 2013
Test Setup:	 <p style="text-align: center;">Remark: <math>Offset = \text{Cable loss} + \text{attenuation factor}</math>.</p>
Limit:	30dBm
Test Mode:	Transmitting with GFSK modulation.
Test Results:	Pass

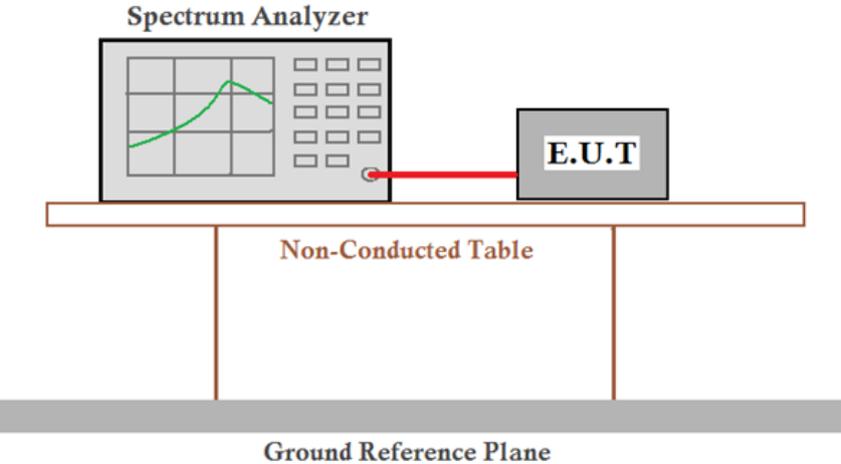
#### Measurement Data

GFSK mode (1Mbps)			
Test channel	Peak Output Power (dBm)	Limit (dBm)	Result
Lowest	-7.224	30.00	Pass
Middle	-7.655	30.00	Pass
Highest	-7.603	30.00	Pass

Test plot as follows:



### 5.46dB Occupy Bandwidth

Test Requirement:	47 CFR Part 15C Section 15.247 (a)(2)
Test Method:	ANSI C63.10 2013
Test Setup:	 <p style="text-align: center;"><i>Remark: Offset=Cable loss+ attenuation factor.</i></p>
Limit:	500KHz
Test Results:	Pass

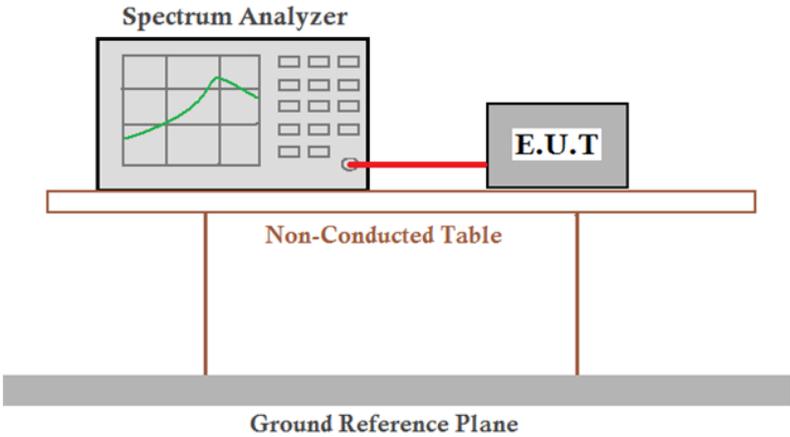
### Measurement Data

GFSK mode			
Test channel	6dB Occupy Bandwidth (MHz)	Limit (MHz)	Result
Lowest	1.399	>0.5	Pass
Middle	1.437	>0.5	Pass
Highest	1.503	>0.5	Pass

Test plot as follows:



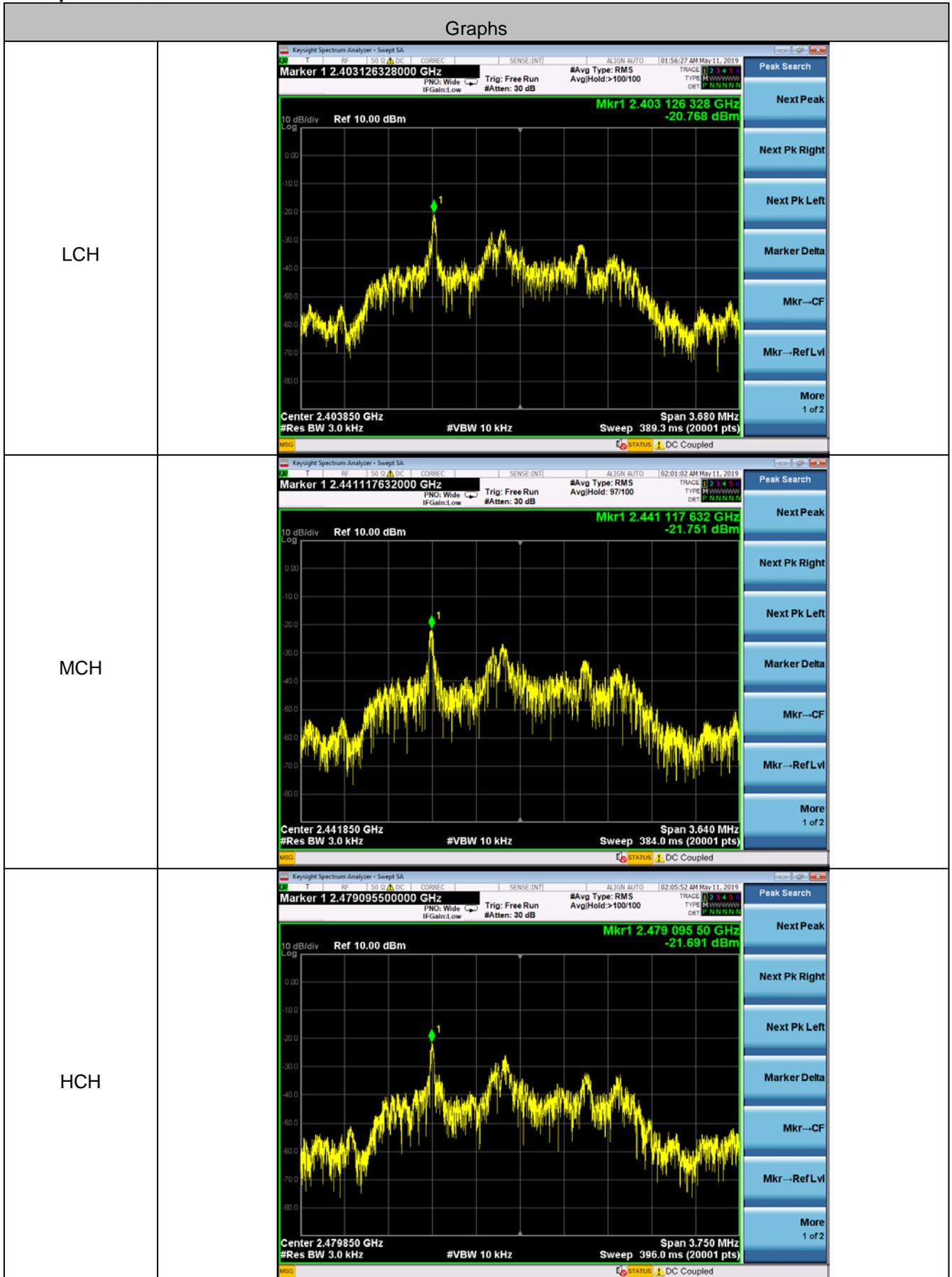
### 5.5 Power Spectral Density

Test Requirement:	47 CFR Part 15C Section 15.247 (e)
Test Method:	ANSI C63.10 2013
Test Setup:	 <p style="text-align: center;"><i>Remark: Offset=Cable loss+ attenuation factor.</i></p>
Limit:	≤8.00dBm/3kHz
Test Mode:	Transmitting with GFSK modulation.
Test Results:	Pass

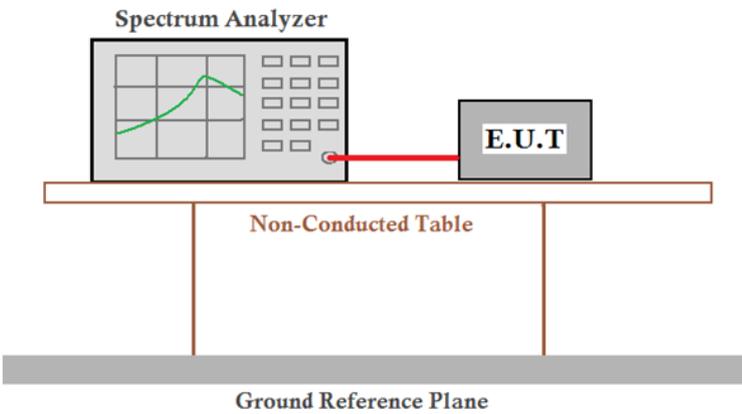
#### Measurement Data

GFSK mode			
Test channel	Power Spectral Density (dBm/3kHz)	Limit (dBm/3kHz)	Result
Lowest	-20.768	≤8.00	Pass
Middle	-21.751	≤8.00	Pass
Highest	-21.691	≤8.00	Pass

Test plot as follows:



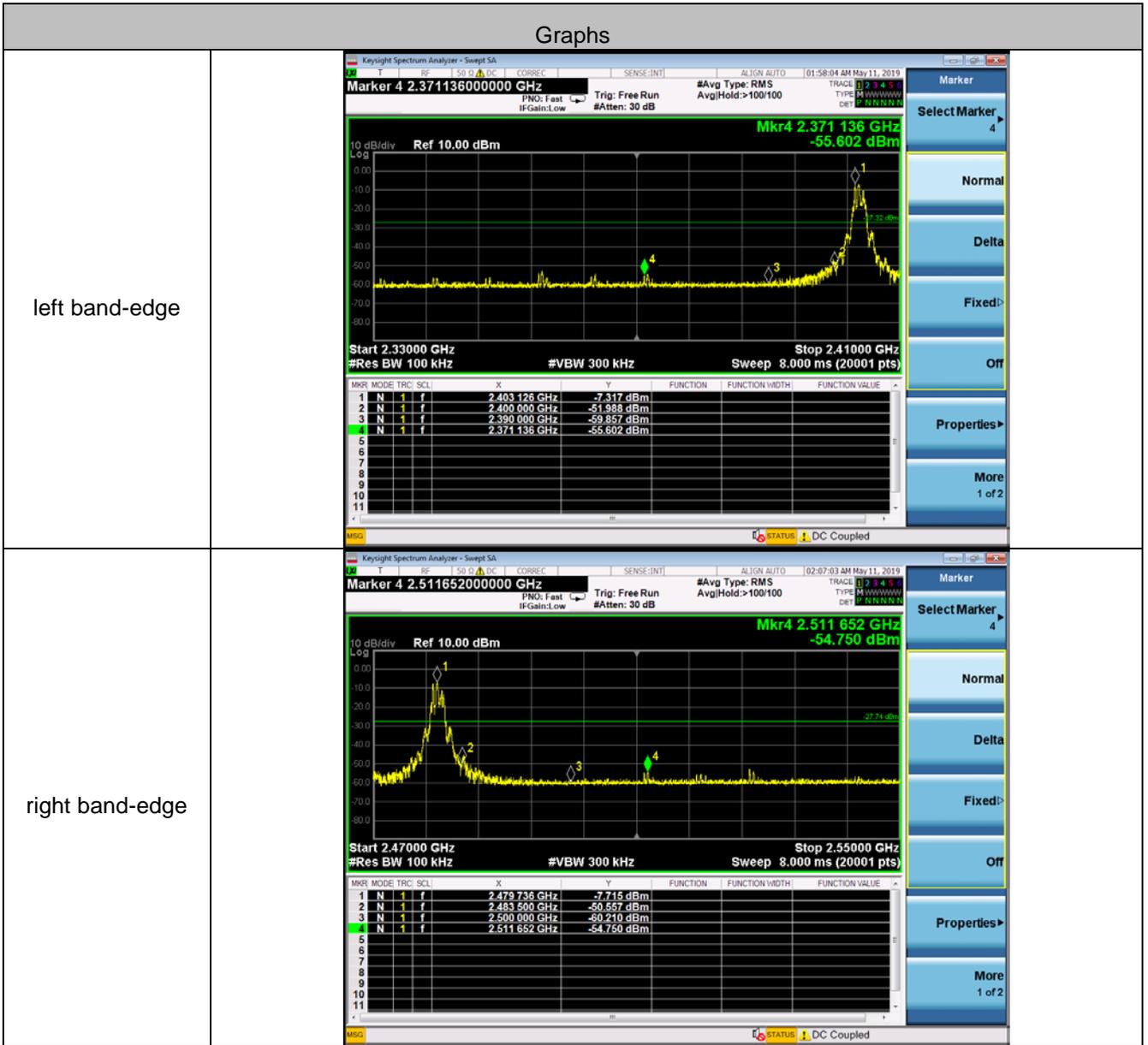
### 5.6 Band-edge for RF Conducted Emissions

Test Requirement:	47 CFR Part 15C Section 15.247 (d)
Test Method:	ANSI C63.10 2013
Test Setup:	 <p style="text-align: center;">Spectrum Analyzer</p> <p style="text-align: center;">E.U.T</p> <p style="text-align: center;">Non-Conducted Table</p> <p style="text-align: center;">Ground Reference Plane</p> <p><i>Remark: Offset=Cable loss+ attenuation factor.</i></p>
Limit:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.
Test Mode:	Transmitting with GFSK modulation.
Test Results:	Pass

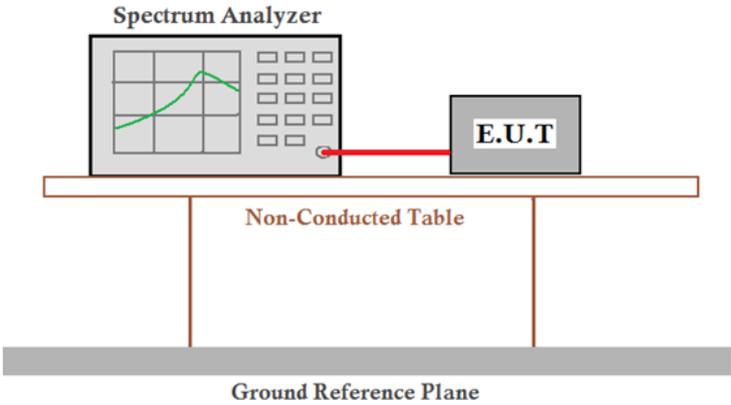
left band-edge			
Frequency(MHz)	Emission Level(dBm)	Limit(dBm)	Result
2390	-59.857	-27.32	Pass
2400	-51.988	-27.32	Pass

right band-edge			
Frequency(MHz)	Emission Level(dBm)	Limit(dBm)	Result
2483.5	-50.557	-24.74	Pass
2500	-60.210	-27.74	Pass

Test plot as follows:



### 5.7 Spurious RF Conducted Emissions

Test Requirement:	47 CFR Part 15C Section 15.247 (d)
Test Method:	ANSI C63.10 2013
Test Setup:	 <p style="text-align: center;"><i>Remark: Offset=Cable loss+ attenuation factor.</i></p>
Limit:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.
Test Mode:	Transmitting with GFSK modulation.
Test Results:	Pass

Test plot as follows:







Remark:

Pretest 9kHz to 25GHz, find the highest point when testing, so only the worst data were shown in the test report. Per FCC Part 15.33 (a) and 15.31 (o) ,The amplitude of spurious emissions from intentional radiators which are attenuated more than 20 dB below the permissible value need not be reported unless specifically required elsewhere in this part.

## 5.8 Radiated Spurious Emission & Restricted bands

5.8.1 Spurious Emissions					
Test Requirement:	47 CFR Part 15C Section 15.209 and 15.205				
Test Method:	ANSI C63.10 2013				
Test Site:	Measurement Distance: 3m (Semi-Anechoic Chamber)				
Receiver Setup:	Frequency	Detector	RBW	VBW	Remark
	0.009MHz-0.090MHz	Peak	10kHz	30kHz	Peak
	0.009MHz-0.090MHz	Average	10kHz	30kHz	Average
	0.090MHz-0.110MHz	Quasi-peak	10kHz	30kHz	Quasi-peak
	0.110MHz-0.490MHz	Peak	10kHz	30kHz	Peak
	0.110MHz-0.490MHz	Average	10kHz	30kHz	Average
	0.490MHz -30MHz	Quasi-peak	10kHz	30kHz	Quasi-peak
	30MHz-1GHz	Quasi-peak	100 kHz	300kHz	Quasi-peak
	Above 1GHz	Peak	1MHz	3MHz	Peak
		Peak	1MHz	10Hz	Average
Limit:	Frequency	Field strength (microvolt/meter)	Limit (dBuV/m)	Remark	Measurement distance (m)
	0.009MHz-0.490MHz	2400/F(kHz)	-	-	300
	0.490MHz-1.705MHz	24000/F(kHz)	-	-	30
	1.705MHz-30MHz	30	-	-	30
	30MHz-88MHz	100	40.0	Quasi-peak	3
	88MHz-216MHz	150	43.5	Quasi-peak	3
	216MHz-960MHz	200	46.0	Quasi-peak	3
	960MHz-1GHz	500	54.0	Quasi-peak	3
	Above 1GHz	500	54.0	Average	3
	<p>Note: 15.35(b), Unless otherwise specified, the limit on peak radio frequency emissions is 20dB above the maximum permitted average emission limit applicable to the equipment under test. This peak limit applies to the total peak emission level radiated by the device.</p>				

Test Setup:

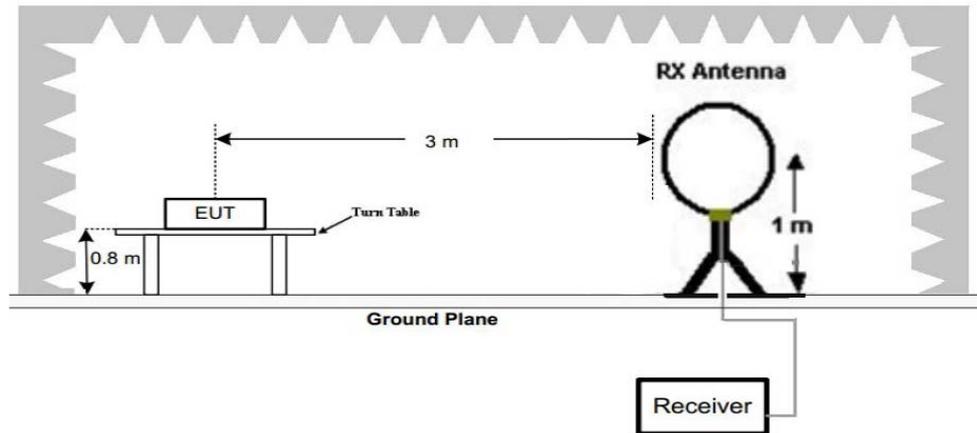


Figure 1. Below 30MHz

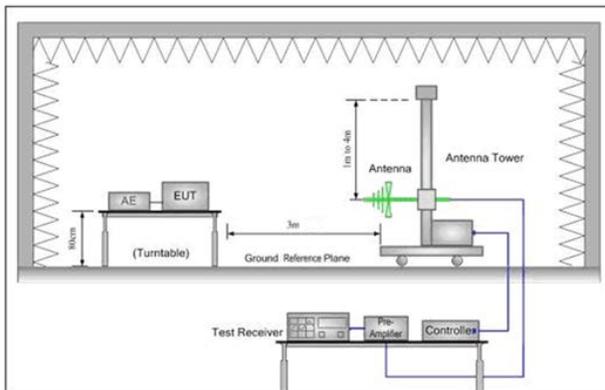


Figure 2. 30MHz to 1GHz

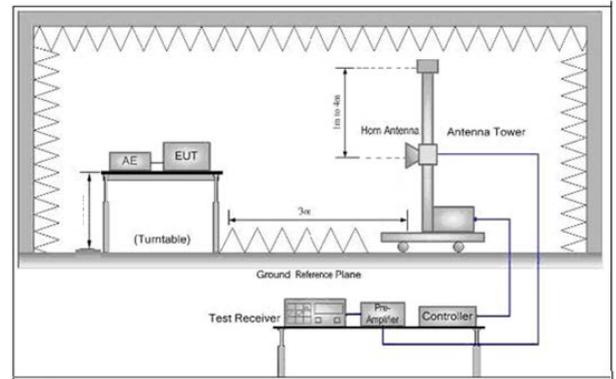


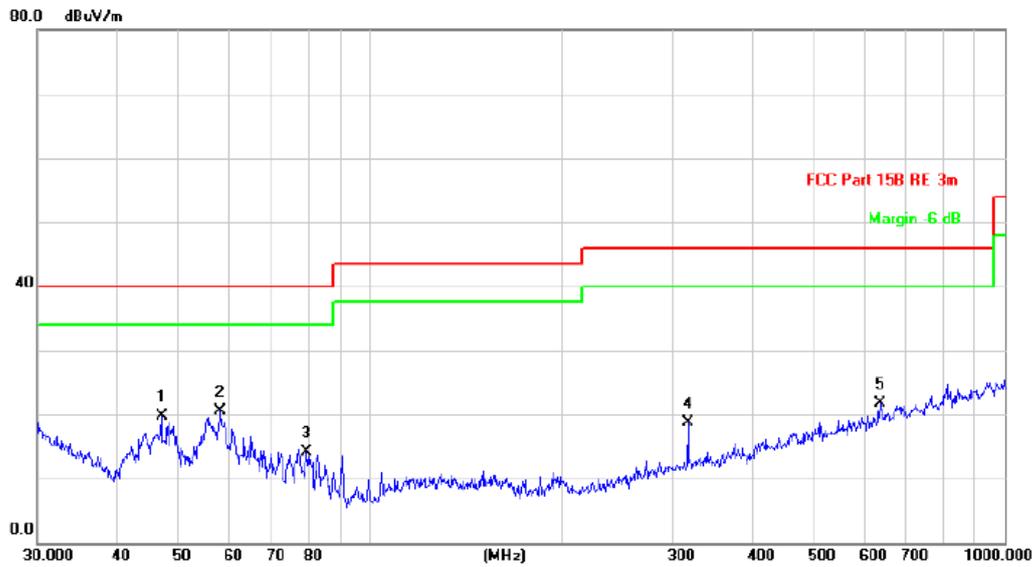
Figure 3. Above 1 GHz

Test Procedure:

- a. 1) Below 1G: The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.  
2) Above 1G: The EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.  
Note: For the radiated emission test above 1GHz:  
Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. The measurement antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal. The final measurement antenna elevation shall be that which maximizes the emissions. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the

	<p>measurement.</p> <p>d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.</p> <p>e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.</p> <p>f. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.</p> <p>g. Test the EUT in the lowest channel (2402MHz),the middle channel (2440MHz),the Highest channel (2480MHz)</p> <p>h. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.</p> <p>i. Repeat above procedures until all frequencies measured was complete.</p>
Exploratory Test Mode:	<p>Transmitting with GFSK modulation. Transmitting mode.</p>
Final Test Mode:	<p>Transmitting with GFSK modulation. For below 1GHz part, through pre-scan, the worst case is the lowest channel. Only the worst case is recorded in the report.</p>
Test Results:	<p>Pass</p>

Radiated Emission below 1GHz		
30MHz~1GHz, the worst case		
Test mode:	Transmitting mode	Vertical



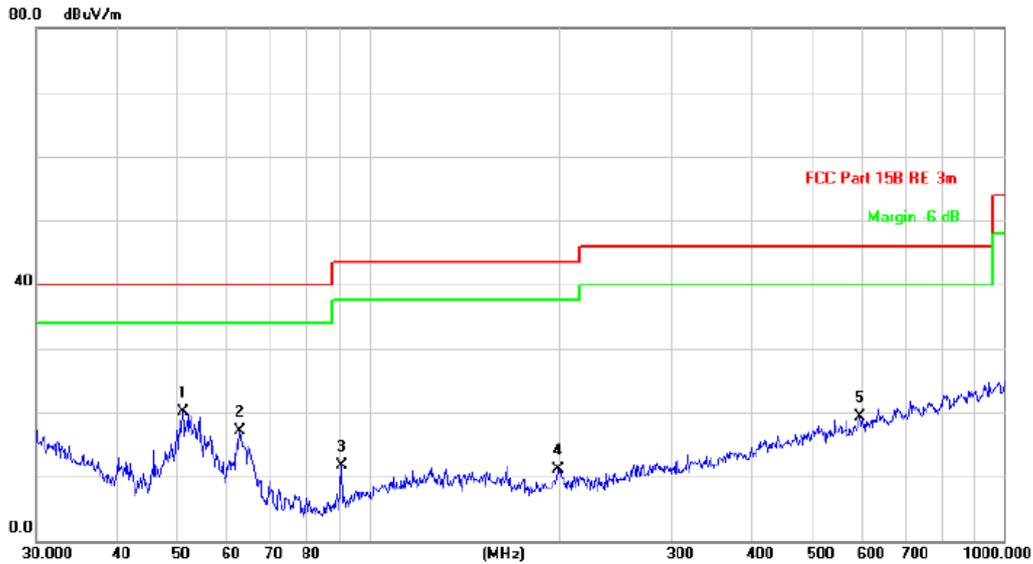
No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB/m	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector
1		46.9947	35.95	-16.32	19.63	40.00	-20.37	peak
2	*	58.2030	39.41	-18.87	20.54	40.00	-19.46	peak
3		79.5208	32.78	-18.65	14.13	40.00	-25.87	peak
4		316.5889	29.43	-10.65	18.78	46.00	-27.22	peak
5		636.1340	25.15	-3.54	21.61	46.00	-24.39	peak

30MHz~1GHz, the worst case

Test mode:

Transmitting mode

Horizontal



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB/m	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector
1	*	50.9420	38.66	-18.64	20.02	40.00	-19.98	peak
2		62.6507	35.97	-18.95	17.02	40.00	-22.98	peak
3		90.5374	28.88	-17.21	11.67	43.50	-31.83	peak
4		198.5880	24.29	-13.17	11.12	43.50	-32.38	peak
5		593.0497	24.27	-5.06	19.21	46.00	-26.79	peak

Transmitter Emission above 1GHz

Worse case mode:		GFSK		Test channel:		Lowest	
Frequency	Meter Reading	Factor	Emission Level	Limits	Over	Detector Type	Ant. Pol.
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)		H/V
<b>2390</b>	<b>55.89</b>	<b>-9.2</b>	<b>46.69</b>	<b>74</b>	<b>-27.31</b>	<b>Peak</b>	<b>H</b>
2400	56.57	-9.39	47.18	74	-26.82	Peak	H
4807.7	53.68	-4.32	49.36	74	-24.64	Peak	H
7211.55	49.78	1.02	50.80	74	-23.20	Peak	H
<b>2390</b>	<b>54.37</b>	<b>-9.2</b>	<b>45.17</b>	<b>74</b>	<b>-28.83</b>	<b>Peak</b>	<b>V</b>
2400	55.30	-9.39	45.91	74	-28.09	Peak	V
4807.7	53.49	-4.32	49.17	74	-24.83	Peak	V
7211.55	50.25	1.02	51.27	74	-22.73	Peak	V

Worse case mode:		GFSK		Test channel:		Middle	
Frequency	Meter Reading	Factor	Emission Level	Limits	Over	Detector Type	Ant. Pol.
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)		H/V
4883.7	52.58	-4.1	48.48	74	-25.52	peak	H
7325.55	49.35	1.52	50.87	74	-23.13	peak	H
4883.7	52.02	-4.1	47.92	74	-26.08	peak	V
7325.55	49.42	1.52	50.94	74	-23.06	peak	V

Worse case mode:		GFSK		Test channel:		Highest	
Frequency	Meter Reading	Factor	Emission Level	Limits	Over	Detector Type	Ant. Pol.
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)		H/V
<b>2483.5</b>	<b>56.67</b>	<b>-9.29</b>	<b>47.38</b>	<b>74</b>	<b>-26.62</b>	<b>Peak</b>	<b>H</b>
4959.7	51.42	-4.03	47.39	74	-26.61	Peak	H
7439.55	48.35	1.58	49.93	74	-24.07	Peak	H
<b>2483.5</b>	<b>55.68</b>	<b>-9.29</b>	<b>46.39</b>	<b>74</b>	<b>-27.61</b>	<b>Peak</b>	<b>V</b>
4959.7	49.71	-4.03	45.68	74	-28.32	Peak	V
7439.55	48.33	1.58	49.91	74	-24.09	Peak	V

Remark:

- The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:  
Final Test Level = Receiver Reading + Antenna Factor + Cable Factor – Preamplifier Factor
- Scan from 9kHz to 25GHz, the disturbance above 10GHz and below 30MHz was very low. As shown in this section, for frequencies above 1GHz, the field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. So, only the peak measurements were shown in the report.

## 6 Photographs - EUT Test Setup

### 6.1 Radiated Spurious Emission

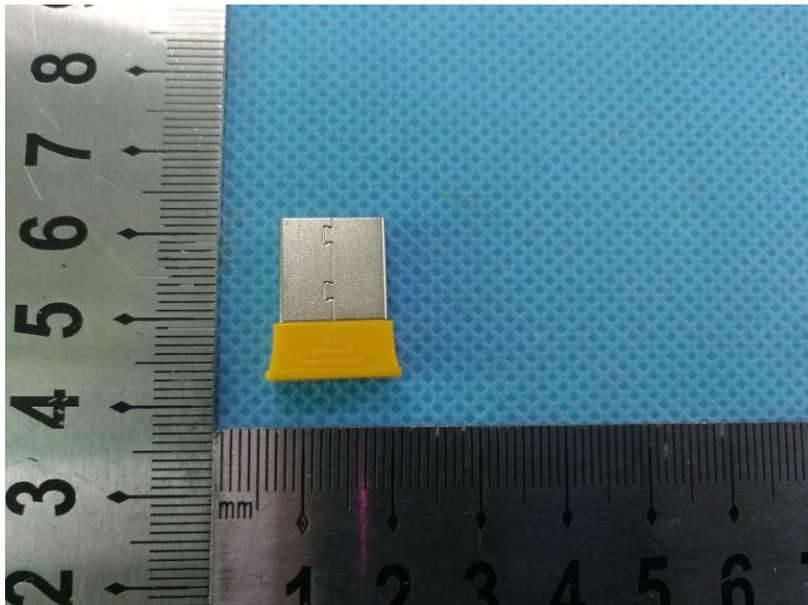
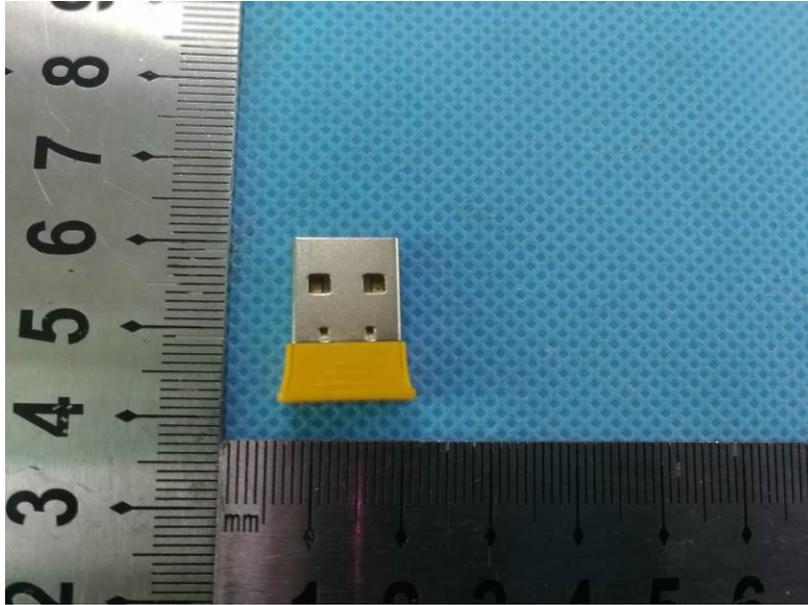


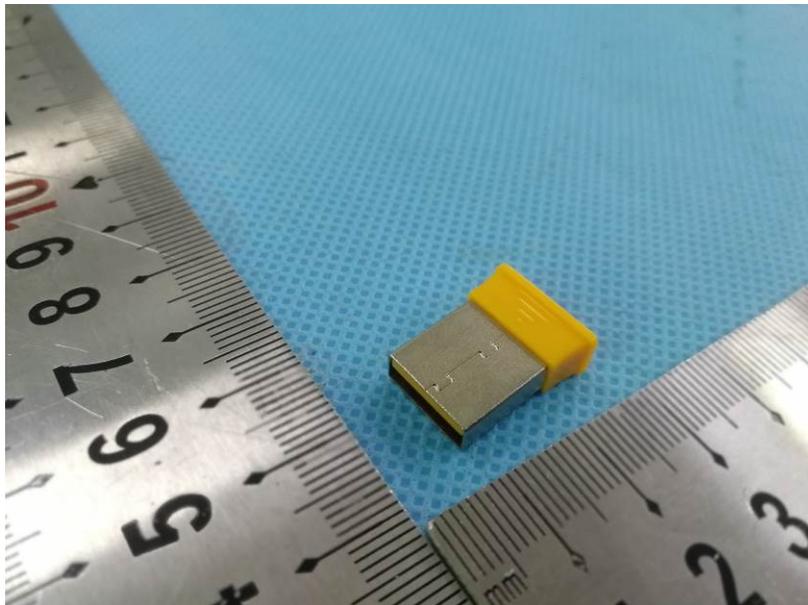
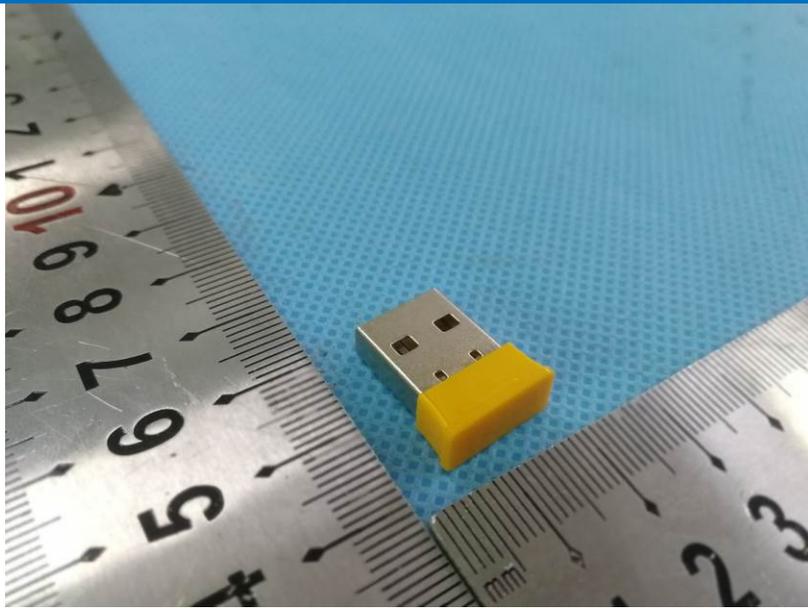
## 6.2 Conducted Emission



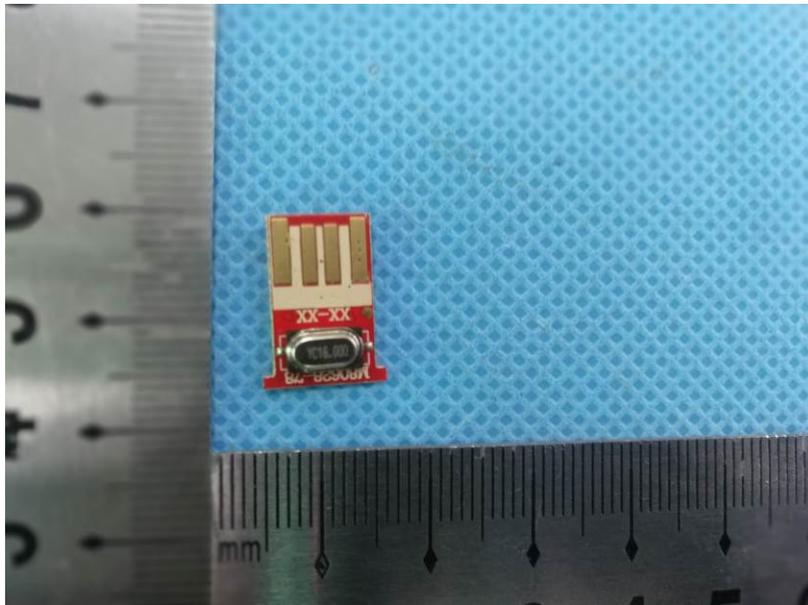
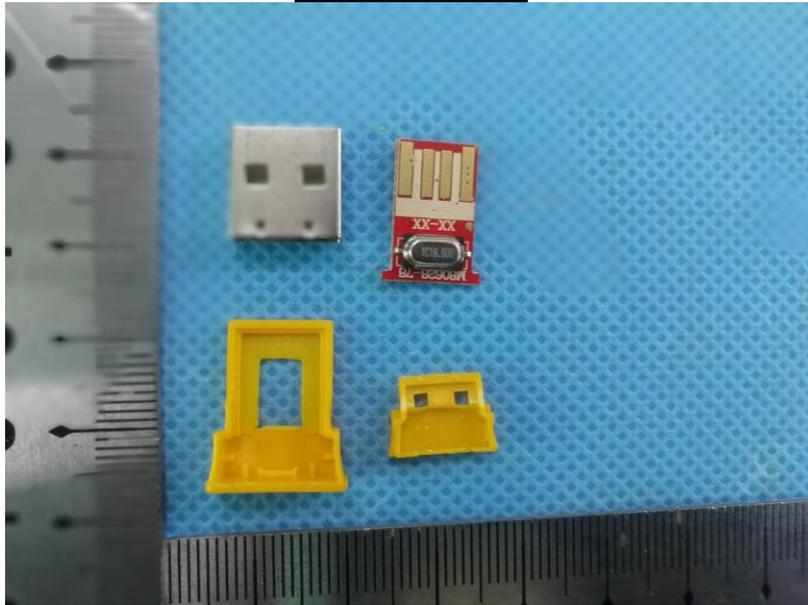
## 7 Photographs - EUT Constructional Details

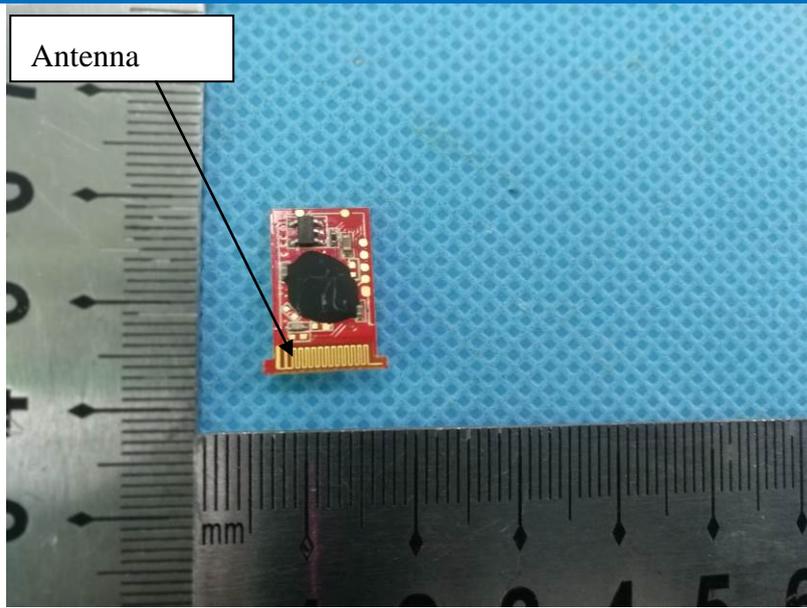
### External photos





Internal photos





The End