TEST REPORT

Reference No.	:	WTF16S0345763-1E
FCC ID	:	2AHTT-RD12
Applicant	:	JYU CO., LTD
Address	:	F7 201, F518 IDEA LAND, Baoyuan Road, Baoan, Shenzhen, China
Manufacturer	:	The same as above.
Address	:	The same as above.
Product Name	:	Remote Controller
Model No	:	RD12
Standards	:	FCC CFR47 Part 15 Section 15.247:2015
Date of Receipt sample	:	Mar. 22, 2016
Date of Test	:	Mar. 23 – Aug. 08, 2016
Date of Issue	:	Sep. 08, 2016
Test Result	:	**Pass**

Remarks:
The results shown in this test report refer only to the sample(s) tested, this test report cannot be reproduced, except in full, without prior written permission of the company. The report would be invalid without specific stamp of test institute and the signatures of compiler and approver.

Prepared By:
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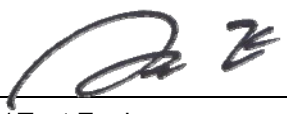
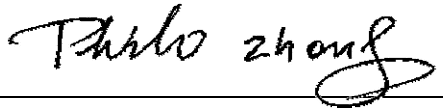
Tested by:



Zero Zhou / Test Engineer

Approved by:



Philo Zhong / Manager

2 Contents

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3 Revision History

Test report No.	Date of Receipt sample	Date of Test	Date of Issue	Purpose	Comment	Approved
WTF16S0345763-1E	Mar. 22, 2016	Mar. 23 – Aug. 08, 2016	Aug. 09, 2016	original	-	Replaced
WTF16S0345763-1E	Mar. 22, 2016	Mar. 23 – Aug. 08, 2016	Sep. 08, 2016	Revision1	Revised section 11.2	Valid

4 General Information

4.1 General Description of E.U.T.

Product Name:	Remote Controller
Model No.:	RD12
Model Description:	N/A
Operation Frequency:	2403MHz ~ 2481MHz, 52 channels in total
Type of Modulation:	GFSK
The lowest oscillator:	8 MHz
Antenna installation:	Dipole Antenna
Antenna Gain:	2.4GHz ANT 2.0dBi
Remark:	This device includes a 2.4GHz transmitting module and a 5.8GHz receiving module.

4.2 Details of E.U.T.

Technical Data:	DC 3.7V, 4000mAh, 14.8Wh by battery DC 5V,1A charging by Charger

4.3 Channel List

Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)
0	2403	1	2404	2	2405	3	2407
4	2409	5	2410	6	2411	7	2413
8	2415	9	2416	10	2417	11	2419
12	2421	13	2422	14	2423	15	2425
16	2427	17	2428	18	2429	19	2431
20	2433	21	2434	22	2435	23	2437
24	2439	25	2440	26	2441	27	2443
28	2445	29	2446	30	2447	31	2449
32	2451	33	2452	34	2453	35	2455
36	2457	37	2458	38	2459	39	2461
40	2463	41	2464	42	2465	43	2467
44	2469	45	2470	46	2471	47	2473
48	2475	49	2477	50	2479	51	2481

4.4 Test Mode

All test mode(s) and condition(s) mentioned were considered and evaluated respectively by performing full tests, the worst data were recorded and reported.

Test mode	Low channel	Middle channel	High channel
Transmitting	2403MHz	2441MHz	2481MHz

4.5 Test Facility

The test facility has a test site registered with the following organizations:

- **IC – Registration No.: 7760A-1**

  Waltek Services(Shenzhen) Co., Ltd. has been registered and fully described in a report filed with the Industry Canada. The acceptance letter from the Industry Canada is maintained in our files. Registration 7760A-1, October 15, 2015

- **FCC Test Site 1#– Registration No.: 880581**

  Waltek Services(Shenzhen) Co., Ltd. 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 880581, April 29, 2014.

- **FCC Test Site 2#– Registration No.: 328995**

  Waltek Services(Shenzhen) Co., Ltd. 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 328995, December 3, 2014.

5 Equipment Used during Test

5.1 Equipments List

Conducted Emissions Test Site 1#						
Item	**Equipment**	**Manufacturer**	**Model No.**	**Serial No.**	**Last Calibration Date**	**Calibration Due Date**
1.	EMI Test Receiver	R&S	ESCI	100947	Sep.15,2015	Sep.14,2016
2.	LISN	R&S	ENV216	101215	Sep.15,2015	Sep.14,2016
3.	Cable	Top	TYPE16(3.5M)	-	Sep.15,2015	Sep.14,2016
Conducted Emissions Test Site 2#						
Item	**Equipment**	**Manufacturer**	**Model No.**	**Serial No.**	**Last Calibration Date**	**Calibration Due Date**
1.	EMI Test Receiver	R&S	ESCI	101155	Sep.15,2015	Sep.14,2016
2.	LISN	SCHWARZBECK	NSLK 8128	8128-289	Sep.15,2015	Sep.14,2016
3.	Limiter	York	MTS-IMP-136	261115-001-0024	Sep.15,2015	Sep.14,2016
4.	Cable	LARGE	RF300	-	Sep.15,2015	Sep.14,2016
3m Semi-anechoic Chamber for Radiation Emissions Test site 1#						
Item	**Equipment**	**Manufacturer**	**Model No.**	**Serial No.**	**Last Calibration Date**	**Calibration Due Date**
1	Spectrum Analyzer	R&S	FSP	100091	Sep.15,2015	Sep.14,2016
2	Amplifier	Agilent	8447D	2944A10178	Sep.15,2015	Sep.14,2016
3	Active Loop Antenna	Beijing Dazhi	ZN30900A	0703	Sep.15,2015	Sep.14,2016
4	Trilog Broadband Antenna	SCHWARZBECK	VULB9163	336	Sep.15,2015	Sep.14,2016
5	Coaxial Cable (below 1GHz)	Top	TYPE16(13M)	-	Sep.15,2015	Sep.14,2016
6	Broad-band Horn Antenna	SCHWARZBECK	BBHA 9120 D	667	Sep.15,2015	Sep.14,2016
7	Broad-band Horn Antenna (FCC/IC ID 才放)	SCHWARZBECK	BBHA 9170	335	N/A	N/A
8	Broadband Preamplifier	COMPLIANCE DIRECTION	PAP-1G18	2004	Sep.15,2015	Sep.14,2016
9	Coaxial Cable (above 1GHz)	Top	1GHz-18GHz	EW02014-7	Sep.15,2015	Sep.14,2016
3m Semi-anechoic Chamber for Radiation Emissions Test site 2#						
Item	**Equipment**	**Manufacturer**	**Model No.**	**Serial No**	**Last Calibration Date**	**Calibration Due Date**
1	Test Receiver	R&S	ESCI	101296	Sep.15,2015	Sep.14,2016
2	Trilog Broadband Antenna	SCHWARZBECK	VULB9160	9160-3325	Sep.15,2015	Sep.14,2016
3	Amplifier	Compliance	PAP-0203	22024	Sep.15,2015	Sep.14,2016

		pirection systems inc				
4	Cable	HUBER+SUHNER	CBL2	525178	Sep.15,2015	Sep.14,2016
RF Conducted Testing						
Item	**Equipment**	**Manufacturer**	**Model No.**	**Serial No.**	**Last Calibration Date**	**Calibration Due Date**
1.	EMC Analyzer (9k~26.5GHz)	Agilent	E7405A	MY45114943	Sep.15,2015	Sep.14,2016
2.	Spectrum Analyzer (9k-6GHz)	R&S	FSL6	100959	Sep.15,2015	Sep.14,2016
3.	Signal Analyzer (9k~26.5GHz)	Agilent	N9010A	MY50520207	Sep.15,2015	Sep.14,2016

5.2 Description of Support Units

Equipment	Manufacturer
Charger	JYU

5.3 Measurement Uncertainty

Parameter	Uncertainty
Radio Frequency	± 1 x 10^{-6}
RF Power	± 1.0 dB
RF Power Density	± 2.2 dB
Radiated Spurious Emissions test	± 5.03 dB (Bilog antenna 30M~1000MHz)
	± 5.47 dB (Horn antenna 1000M~25000MHz)
Conducted Spurious Emissions test	± 3.64 dB (AC mains 150KHz~30MHz)

5.4 Test Equipment Calibration

All the test equipments used are valid and calibrated by CEPREI Certification Body that address is No.110 Dongguan Zhuang RD. Guangzhou, P.R.China.

6 Test Summary

Test Items	Test Requirement	Result
Radiated Spurious Emissions	15.205(a) 15.209 15.247(d)	C
Band edge	15.247(d) 15.205(a)	C
Conduct Emission	15.207	C
Bandwidth	15.247(a)(1)	C
Maximum Peak Output Power	15.247(b)(1)	C
Frequency Separation	15.247(a)(1)	C
Number of Hopping Frequency	15.247(a)(1)(iii)	C
Dwell time	15.247(a)(1)(iii)	C
Maximum Permissible Exposure (Exposure of Humans to RF Fields)	1.1307(b)(1)	C
Note: C=Compliance; NC=Not Compliance; NT=Not Tested; N/A=Not Applicable.		

7 Conducted Emission

Test Requirement:	FCC CFR 47 Part 15 Section 15.207
Test Method:	ANSI C63.10:2013&ANSI C63.4:2014
Test Result:	PASS
Frequency Range:	150kHz to 30MHz
Class/Severity:	Class B
Limit:	66-56 dBμV between 0.15MHz & 0.5MHz
	56 dBμV between 0.5MHz & 5MHz
	60 dBμV between 5MHz & 30MHz
Detector:	Peak for pre-scan (9kHz Resolution Bandwidth)

7.1 E.U.T. Operation

Operating Environment **:**

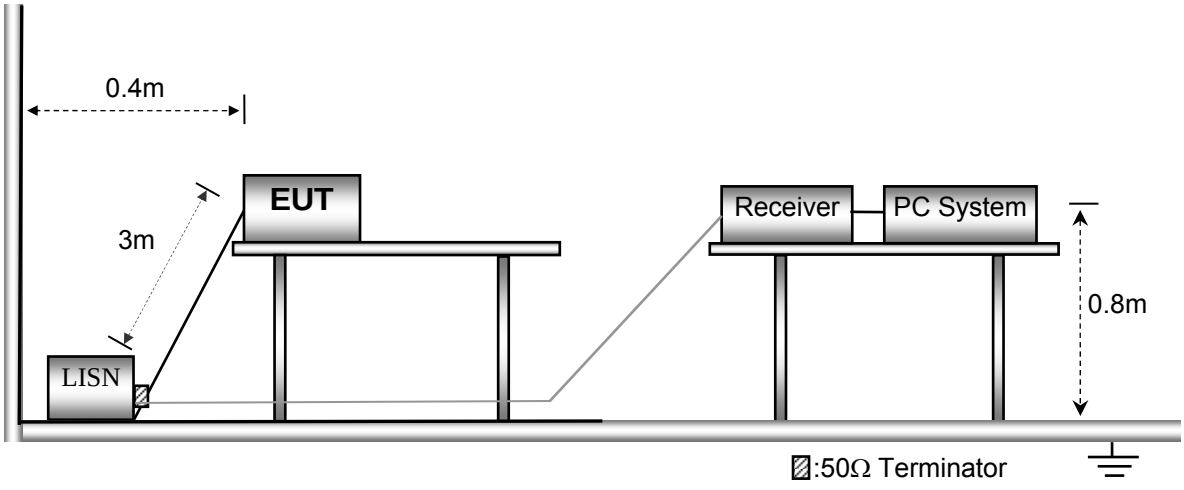
Temperature:	25.5 °C
Humidity:	51 % RH
Atmospheric Pressure:	101.2kPa

EUT Operation **:**

The test was performed in Transmitting mode, the test data were shown in the report.

7.2 EUT Setup

The conducted emission tests were performed using the setup accordance with the ANSI C63.10:2013.

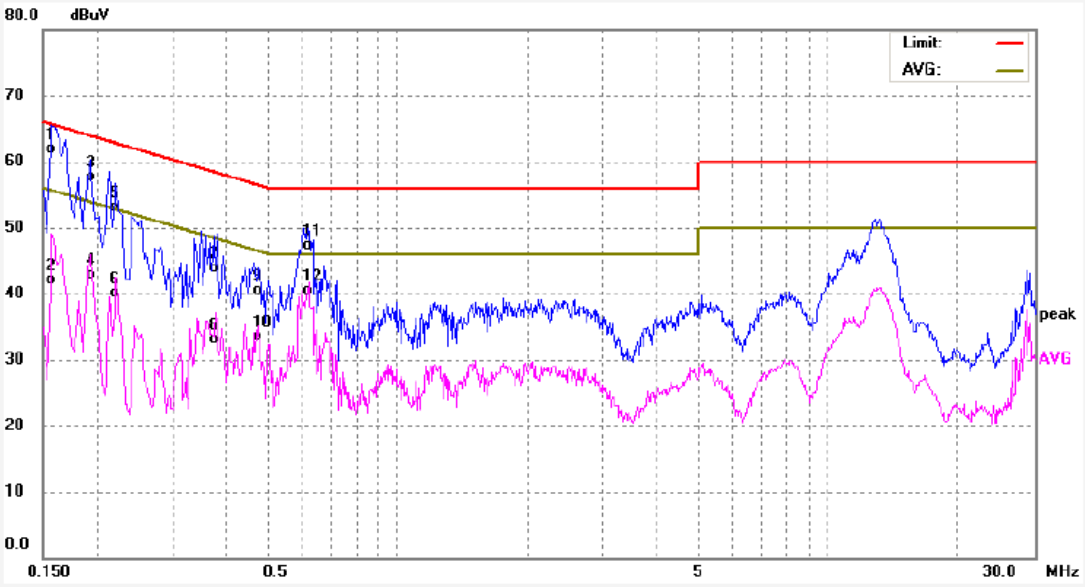


7.3 Measurement Description

The maximised peak emissions from the EUT was scanned and measured for both the Live and Neutral Lines. Quasi-peak & average measurements were performed if peak emissions were within 6dB of the average limit line.

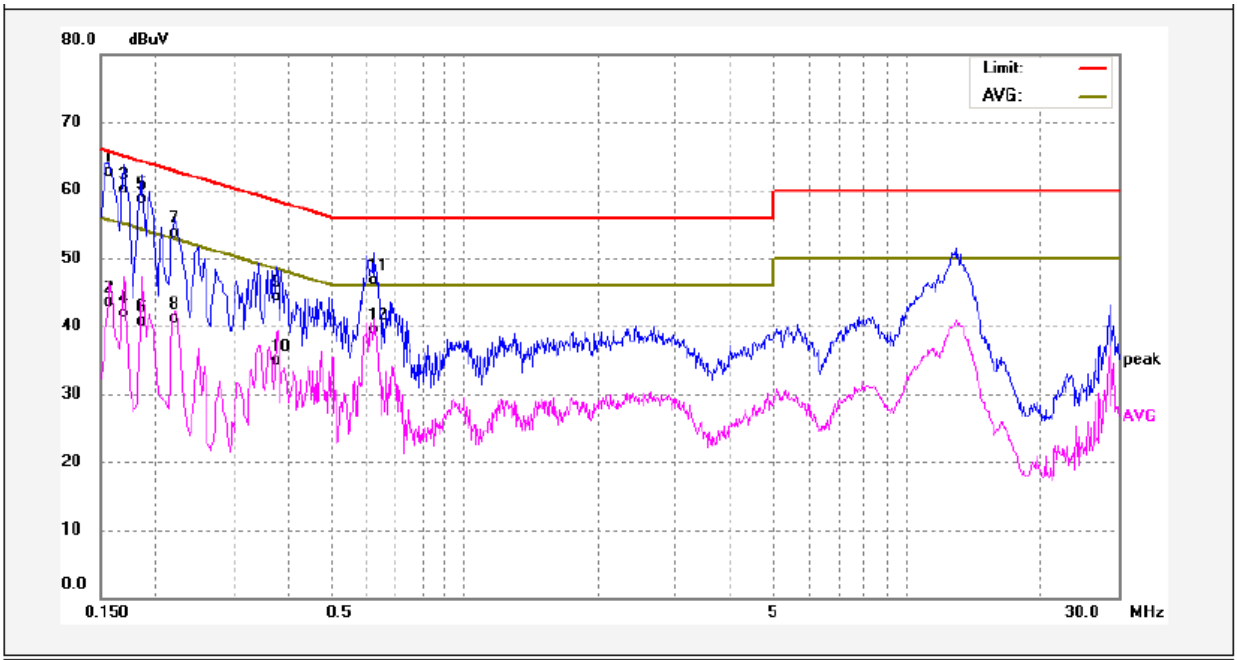
7.4 Conducted Emission Test Result

Live line:



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Margin (dB)	Detector	Remark
1	0.1580	51.65	10.28	61.93	65.56	-3.63	QP	
2	0.1580	31.83	10.28	42.11	55.56	-13.45	AVG	
3	0.1940	47.36	10.26	57.62	63.86	-6.24	QP	
4	0.1940	32.67	10.26	42.93	53.86	-10.93	AVG	
5	0.2220	42.93	10.26	53.19	62.74	-9.55	QP	
6	0.2220	29.90	10.26	40.16	52.74	-12.58	AVG	
7	0.3780	33.71	10.28	43.99	58.32	-14.33	QP	
8	0.3780	22.90	10.28	33.18	48.32	-15.14	AVG	
9	0.4740	30.27	10.26	40.53	56.44	-15.91	QP	
10	0.4740	23.27	10.26	33.53	46.44	-12.91	AVG	
11	0.6220	36.97	10.31	47.28	56.00	-8.72	QP	
12	0.6220	30.15	10.31	40.46	46.00	-5.54	AVG	

Neutral line:



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Margin (dB)	Detector	Remark
1	0.1580	52.41	10.29	62.70	65.56	-2.86	QP	
2	0.1580	33.31	10.29	43.60	55.56	-11.96	AVG	
3	0.1700	49.88	10.28	60.16	64.96	-4.80	QP	
4	0.1700	31.53	10.28	41.81	54.96	-13.15	AVG	
5	0.1860	48.40	10.27	58.67	64.21	-5.54	QP	
6	0.1860	30.49	10.27	40.76	54.21	-13.45	AVG	
7	0.2220	43.45	10.26	53.71	62.74	-9.03	QP	
8	0.2220	30.84	10.26	41.10	52.74	-11.64	AVG	
9	0.3780	34.04	10.28	44.32	58.32	-14.00	QP	
10	0.3780	24.61	10.28	34.89	48.32	-13.43	AVG	
11	0.6260	36.30	10.32	46.62	56.00	-9.38	QP	
12	0.6260	29.27	10.32	39.59	46.00	-6.41	AVG	

8 Radiated Spurious Emissions

Test Requirement: FCC CFR47 Part 15 Section 15.209 & 15.247

Test Method: ANSI C63.10:2013&ANSI C63.4:2014

Test Result: PASS

Measurement Distance: 3m

Limit:

Frequency (MHz)	Field Strength		Field Strength Limit at 3m Measurement Distance	
	uV/m	Distance (m)	uV/m	dBuV/m
0.009 ~ 0.490	2400/F(kHz)	300	10000 * 2400/F(kHz)	$20\log^{(2400/F(kHz))} + 80$
0.490 ~ 1.705	24000/F(kHz)	30	100 * 24000/F(kHz)	$20\log^{(24000/F(kHz))} + 40$
1.705 ~ 30	30	30	100 * 30	$20\log^{(30)} + 40$
30 ~ 88	100	3	100	$20\log^{(100)}$
88 ~ 216	150	3	150	$20\log^{(150)}$
216 ~ 960	200	3	200	$20\log^{(200)}$
Above 960	500	3	500	$20\log^{(500)}$

8.1 EUT Operation

Operating Environment **:**

Temperature: 23.5 °C

Humidity: 51.1 % RH

Atmospheric Pressure: 101.2kPa

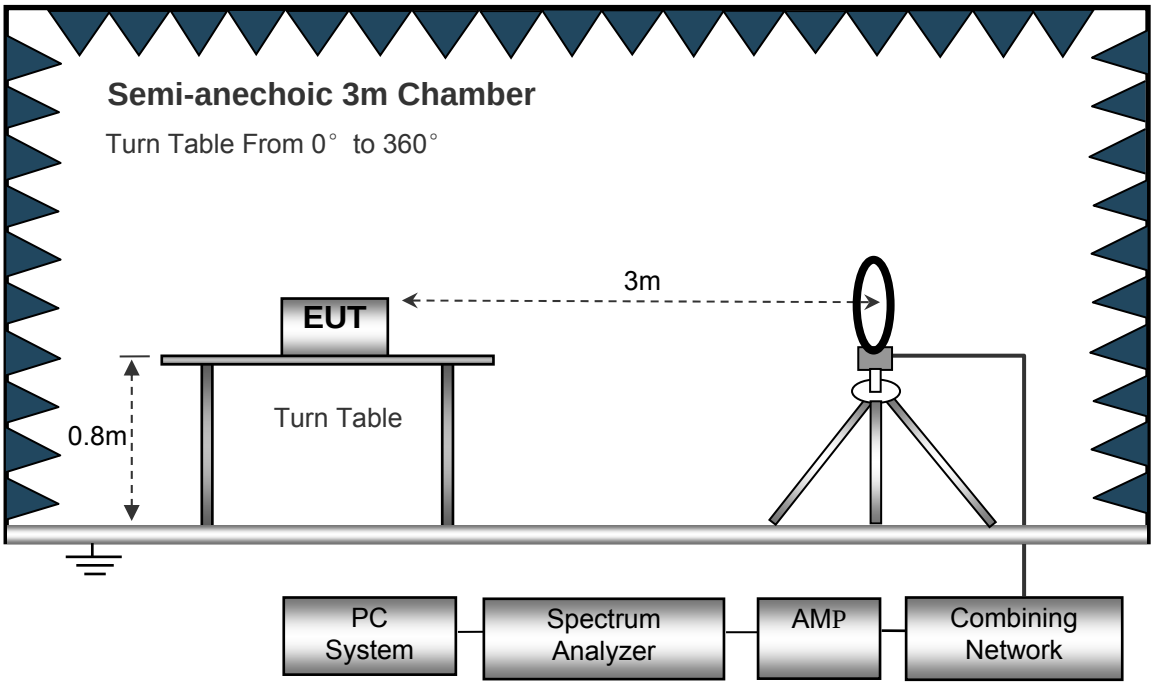
EUT Operation **:**

The test was performed in transmitting mode, the test data were shown in the report.

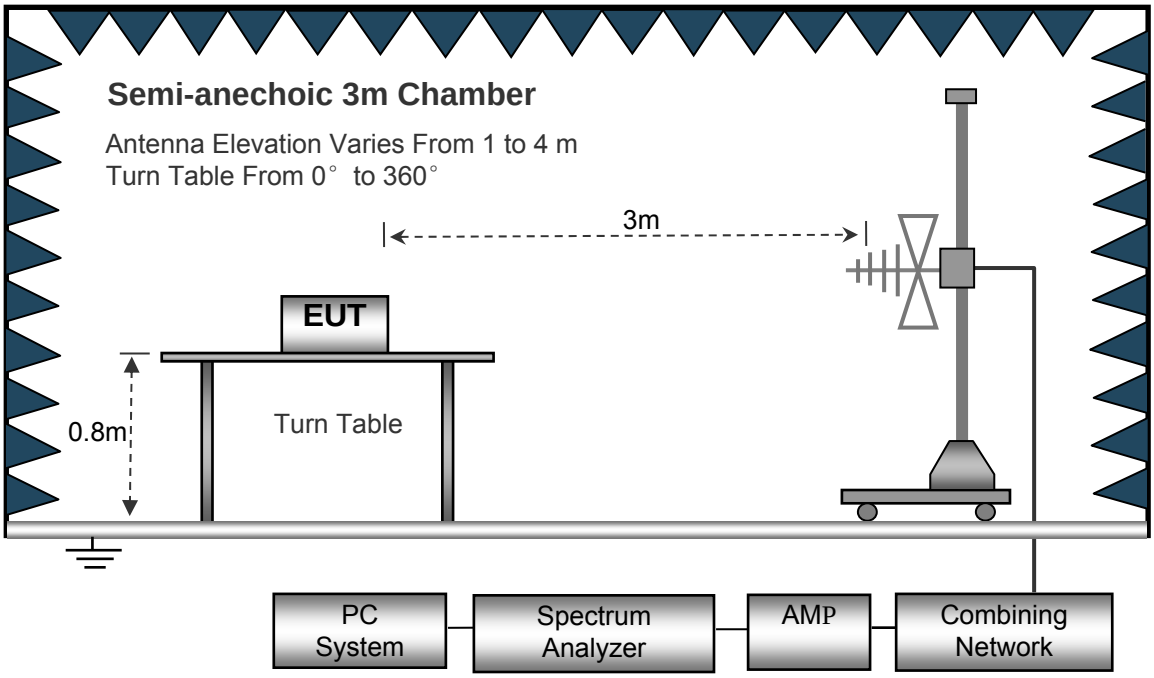
8.2 Test Setup

The radiated emission tests were performed in the 3m Semi- Anechoic Chamber test site, using the setup accordance with the ANSI C63.10:2013.

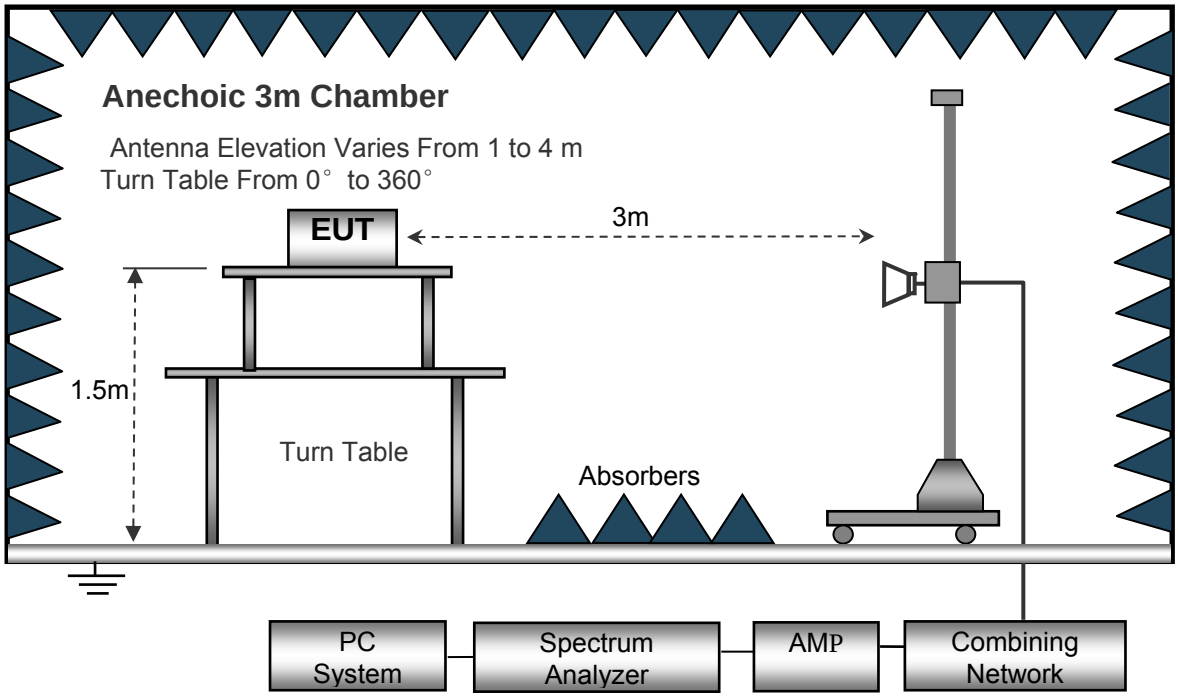
The test setup for emission measurement below 30MHz.



The test setup for emission measurement from 30 MHz to 1 GHz.



The test setup for emission measurement above 1 GHz.



8.3 Spectrum Analyzer Setup

Below 30MHz

Sweep Speed ..... Auto
IF Bandwidth..... 10kHz
Video Bandwidth..... 10kHz

Resolution Bandwidth..... 10kHz

30MHz ~ 1GHz

Sweep Speed ..... Auto
Detector ..... PK
Resolution Bandwidth..... 100kHz
Video Bandwidth..... 300kHz

Above 1GHz

Sweep Speed ..... Auto
Detector ..... PK
Resolution Bandwidth..... 1MHz
Video Bandwidth..... 3MHz
Detector ..... Ave.
Resolution Bandwidth..... 1MHz
Video Bandwidth..... 10Hz

8.4 Test Procedure

1. The EUT is placed on a turntable, which is above ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is moved from 1m to 4m to find out the maximum emissions. The spectrum was investigated from the lowest radio frequency signal generated in the device, without going below 9 kHz, up to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
6. Repeat above procedures until the measurements for all frequencies are complete.
7. The radiation measurements are tested under 3-axes(X,Y,Z) position(X denotes lying on the table, Y denotes side stand and Z denotes vertical stand), After pre-test, It was found that the worse radiation emission was get at the X position. So the data shown was the X position only.

8.5 Summary of Test Results

Test Frequency: 8MHz ~ 30MHz

The measurements were more than 20 dB below the limit and not reported

Test Frequency: 30MHz ~ 18GHz

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	Limit	Margin
				Height	Polar				
(MHz)	(dBμV)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
GFSK Low Channel									
268.32	37.10	QP	98	1.7	H	-13.35	23.75	46.00	-22.25
268.32	40.74	QP	100	1.4	V	-13.35	27.39	46.00	-18.61
4806.00	46.30	PK	268	1.9	V	-1.06	45.24	74.00	-28.76
4806.00	44.81	Ave	268	1.9	V	-1.06	43.75	54.00	-10.25
7209.00	41.96	PK	343	1.4	H	1.33	43.29	74.00	-30.71
7209.00	35.04	Ave	343	1.4	H	1.33	36.37	54.00	-17.63
2337.00	45.16	PK	169	1.9	V	-13.19	31.97	74.00	-42.03
2337.00	38.47	Ave	169	1.9	V	-13.19	25.28	54.00	-28.72
2373.80	42.65	PK	132	2.0	H	-13.14	29.51	74.00	-44.49
2373.80	37.52	Ave	132	2.0	H	-13.14	24.38	54.00	-29.62
2490.11	42.85	PK	265	1.8	V	-13.08	29.77	74.00	-44.23
2490.11	37.89	Ave	265	1.8	V	-13.08	24.81	54.00	-29.19

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	Limit	Margin
				Height	Polar				
(MHz)	(dBμV)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
GFSK Middle Channel									
268.32	36.15	QP	188	1.3	H	-13.35	22.80	46.00	-23.20
268.32	39.96	QP	160	2.0	V	-13.35	26.61	46.00	-19.39
4882.00	45.54	PK	306	1.8	V	-0.62	44.92	74.00	-29.08
4882.00	45.36	Ave	306	1.8	V	-0.62	44.74	54.00	-9.26
7323.00	42.48	PK	216	1.5	H	2.21	44.69	74.00	-29.31
7323.00	36.48	Ave	216	1.5	H	2.21	38.69	54.00	-15.31
2310.26	46.74	PK	337	1.5	V	-13.19	33.55	74.00	-40.45
2310.26	39.16	Ave	337	1.5	V	-13.19	25.97	54.00	-28.03
2352.91	44.65	PK	130	1.3	H	-13.14	31.51	74.00	-42.49
2352.91	36.08	Ave	130	1.3	H	-13.14	22.94	54.00	-31.06
2499.66	42.26	PK	335	1.6	V	-13.08	29.18	74.00	-44.82
2499.66	36.34	Ave	335	1.6	V	-13.08	23.26	54.00	-30.74

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	Limit	Margin
				Height	Polar				
(MHz)	(dBμV)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
GFSK High Channel									
268.32	35.80	QP	128	1.9	H	-13.35	22.45	46.00	-23.55
268.32	40.02	QP	234	1.1	V	-13.35	26.67	46.00	-19.33
4962.00	44.13	PK	271	1.5	V	-0.24	43.89	74.00	-30.11
4962.00	44.24	Ave	271	1.5	V	-0.24	44.00	54.00	-10.00
7443.00	43.79	PK	184	1.1	H	2.84	46.63	74.00	-27.37
7443.00	35.09	Ave	184	1.1	H	2.84	37.93	54.00	-16.07
2325.74	45.80	PK	33	1.5	V	-13.19	32.61	74.00	-41.39
2325.74	37.18	Ave	33	1.5	V	-13.19	23.99	54.00	-30.01
2379.03	43.78	PK	260	1.1	H	-13.14	30.64	74.00	-43.36
2379.03	37.32	Ave	260	1.1	H	-13.14	24.18	54.00	-29.82
2487.10	43.53	PK	89	1.7	V	-13.08	30.45	74.00	-43.55
2487.10	37.93	Ave	89	1.7	V	-13.08	24.85	54.00	-29.15

Test Frequency : 18GHz-25GHz

The measurements were more than 20 dB below the limit and not reported

9 Band Edge Measurement

Test Requirement:	Section 15.247(d) In addition, radiated emissions which fall in the restricted bands. as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).
Test Method:	ANSI C63.10:2013
Test Limit:	Regulation 15.247 (d),In any 100 kHz 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 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, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).
Test Mode:	Transmitting and Hopping

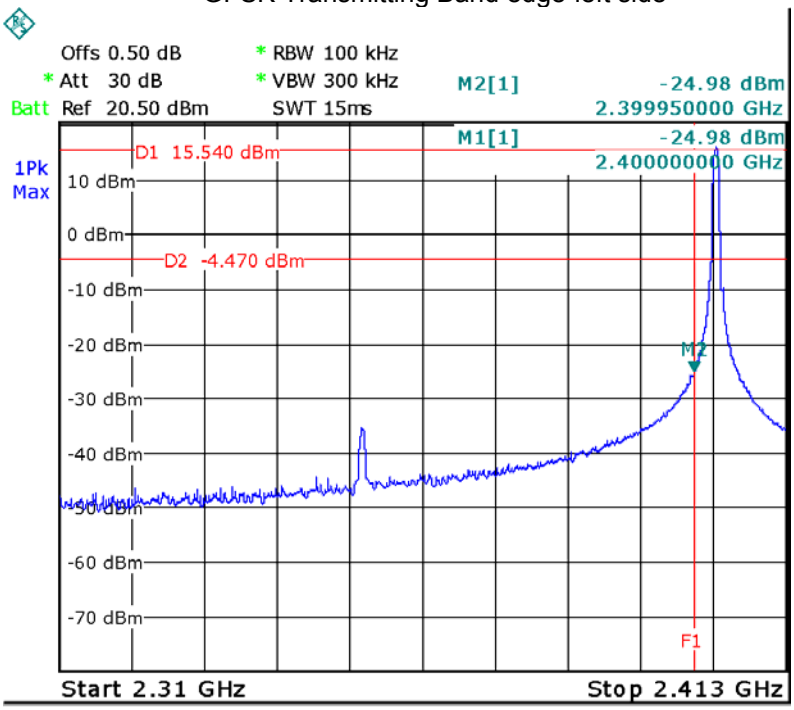
9.1 Test Procedure

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum;
2. Set the spectrum analyzer: RBW = 100kHz, VBW = 300kHz, Sweep = auto
   Detector function = peak, Trace = max hold

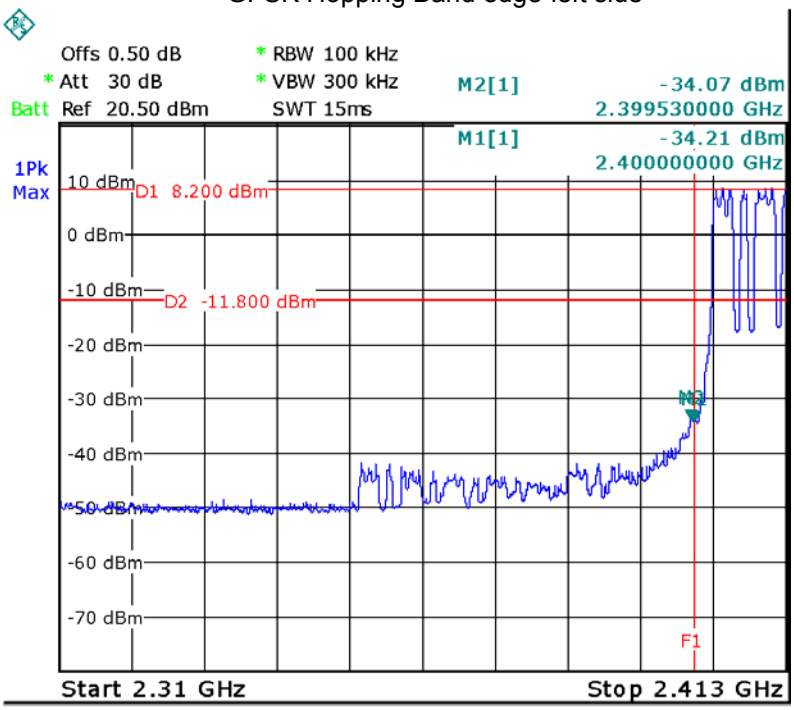
9.2 Test Result

Test plots

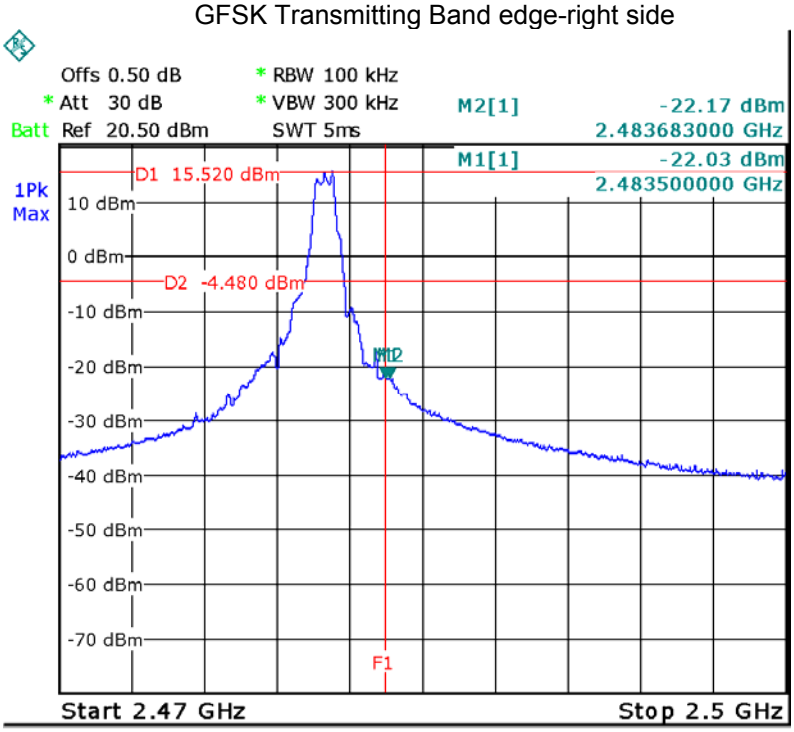
GFSK Transmitting Band edge-left side



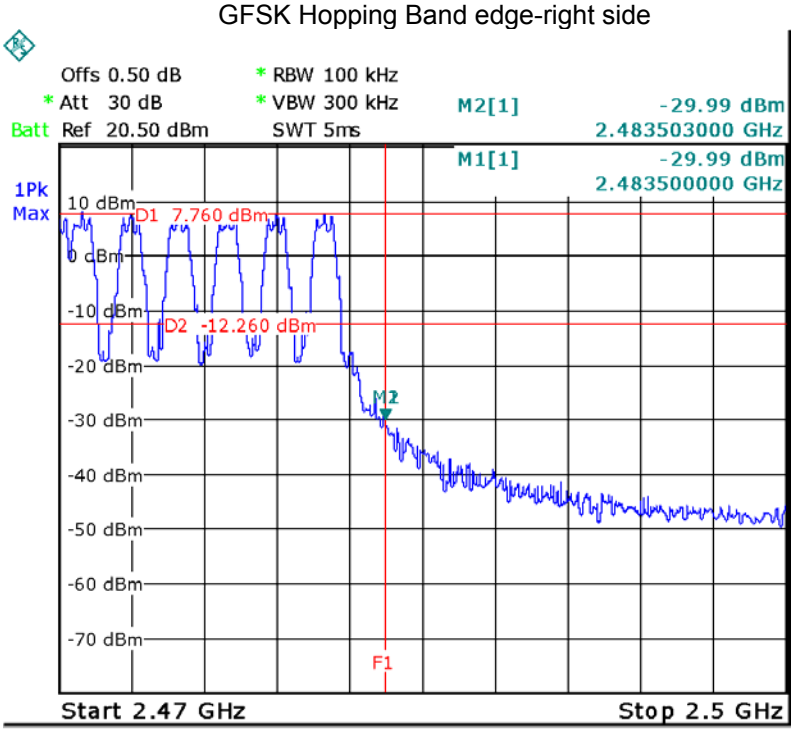
GFSK Hopping Band edge-left side



GFSK Transmitting Band edge-right side



GFSK Hopping Band edge-right side



10 Bandwidth Measurement

Test Requirement: FCC CFR47 Part 15 Section 15.247

Test Method: ANSI C63.10:2013

Test Mode: Test in fixing operating frequency at low, Middle, high channel.

10.1 Test Procedure

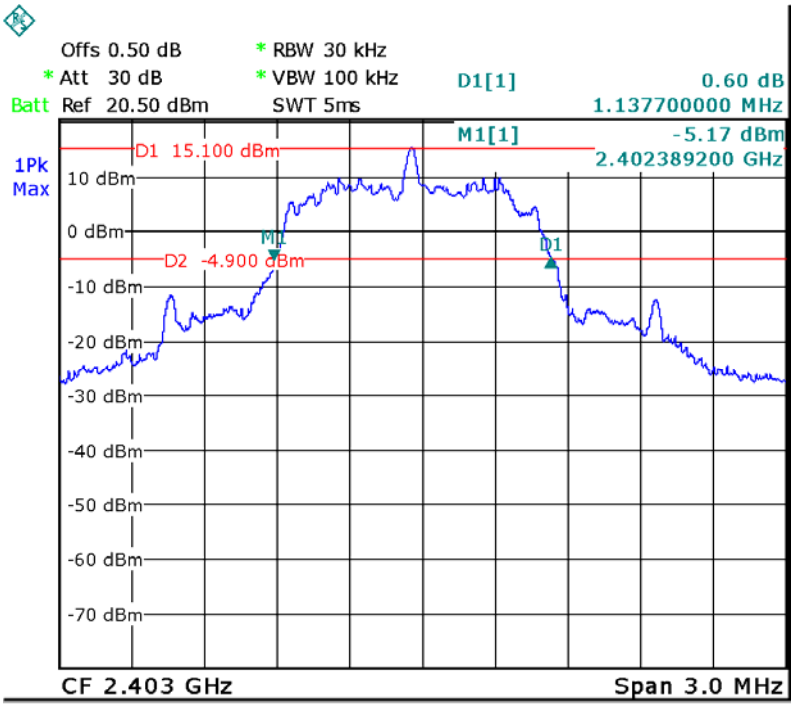
1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum;
2. Set the spectrum analyzer: RBW = 30kHz, VBW = 100kHz

10.2 Test Result

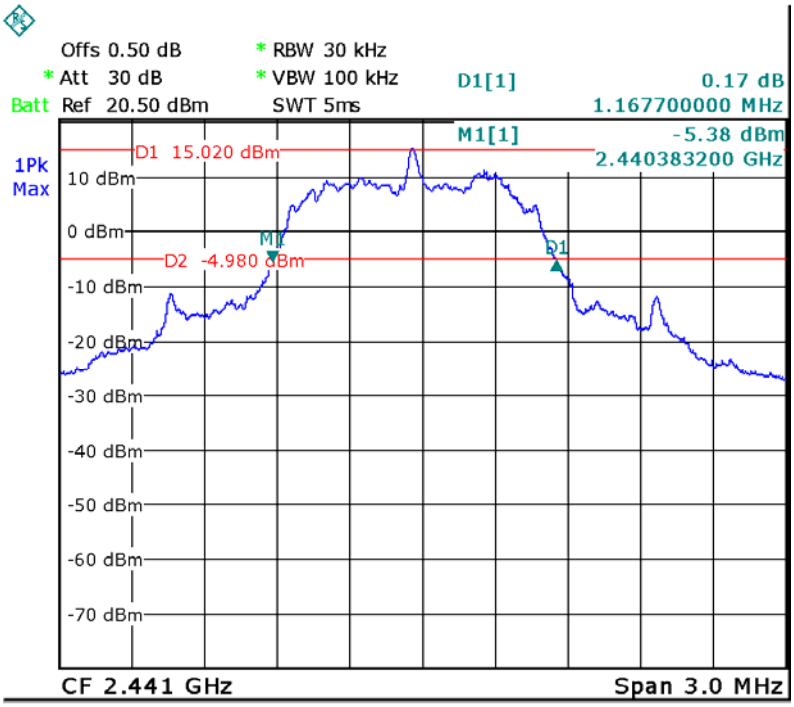
Modulation	Test Channel	20 dB Bandwidth
GFSK	Low	1.138MHz
GFSK	Middle	1.168MHz
GFSK	High	1.192MHz

Test plots

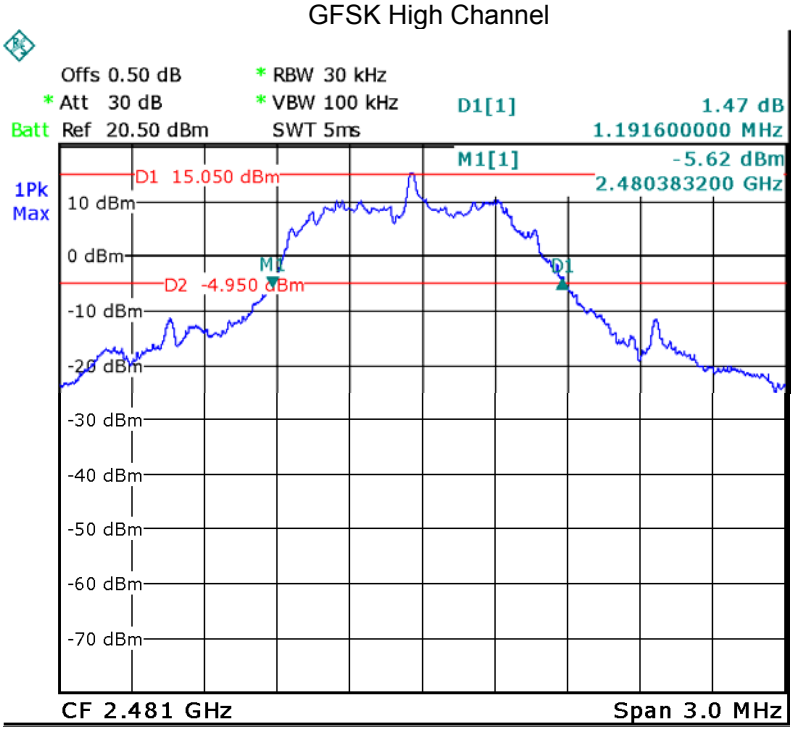
GFSK Low Channel



GFSK Middle Channel



GFSK High Channel



11 Maximum Peak Output Power

Test Requirement:	FCC CFR47 Part 15 Section 15.247
Test Method:	ANSI C63.10:2013
Test Limit:	Regulation 15.247 (b)(1), For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts. Refer to the result “Number of Hopping Frequency” of this document. The 0.125watts (20.97 dBm) limit applies.
Test mode:	Test in fixing frequency transmitting mode.

11.1 Test Procedure

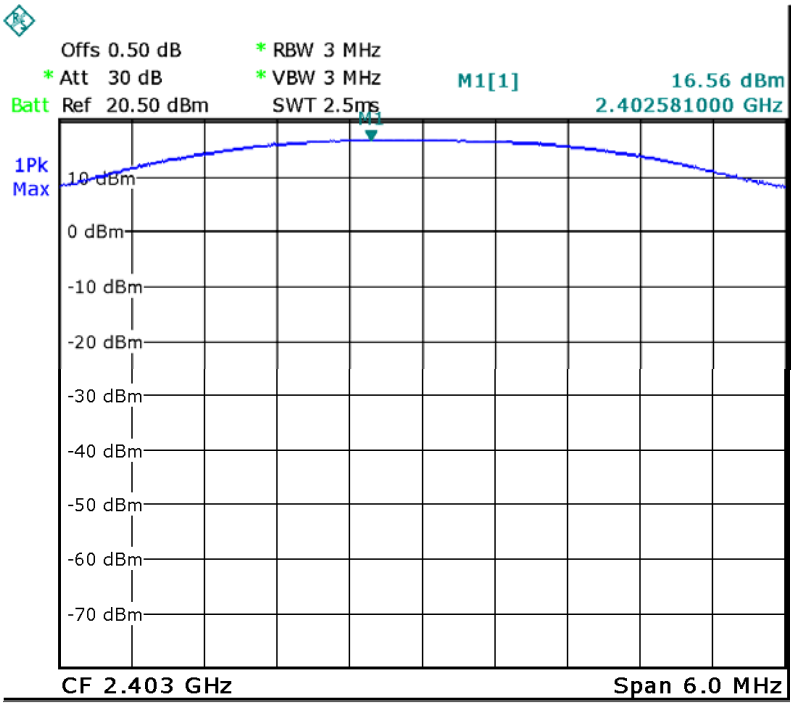
1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.
2. Set the spectrum analyzer: RBW = 3 MHz. VBW =3 MHz. Sweep = auto; Detector Function = Peak.
3. Keep the EUT in transmitting at lowest, medium and highest channel individually. Record the max value.

11.2 Test Result

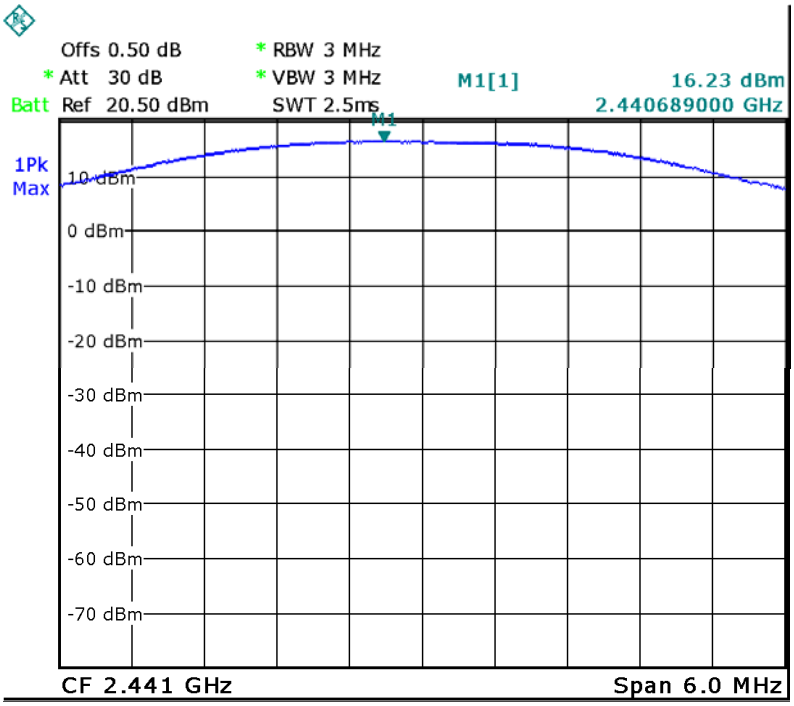
Test Mode	Data Rate	Peak Power(dBm)			Limit (dBm)
		Low Channel	Middle Channel	High Channel	
GFSK	1Mbps	16.56	16.23	16.08	20.97

Test plots

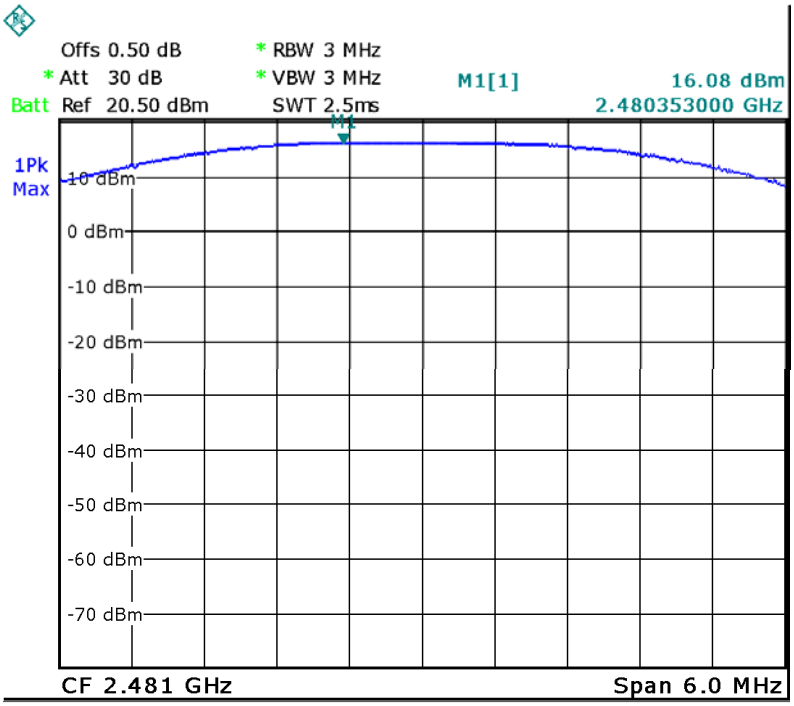
GFSK Low Channel



GFSK Middle Channel



GFSK High Channel



12 Hopping Channel Separation

Test Requirement:	FCC CFR47 Part 15 Section 15.247
Test Method:	ANSI C63.10:2013
Test Limit:	Regulation 15.247(a)(1) Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 1W.
Test Mode:	Test in hopping transmitting operating mode.

12.1 Test Procedure

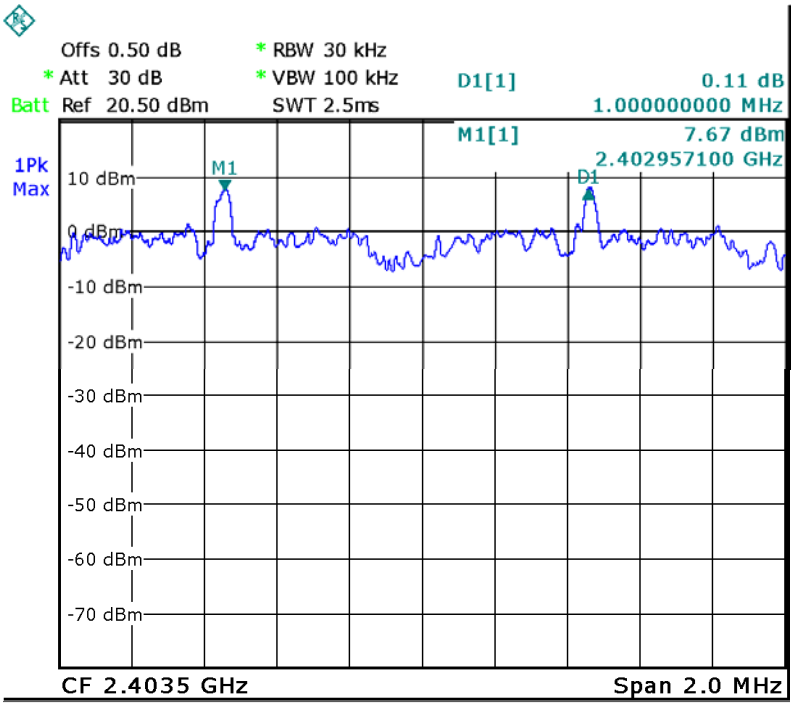
1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.
2. Set the spectrum analyzer: RBW = 30KHz. VBW = 100KHz , Span = 2MHz or 4MHz. Sweep = auto; Detector Function = Peak. Trace = Max hold.
3. Allow the trace to stabilize. Use the marker-delta function to determine the separation between the peaks of the adjacent channels. The limit is specified in one of the subparagraphs of this Section Submit this plot.

12.2 Test Result

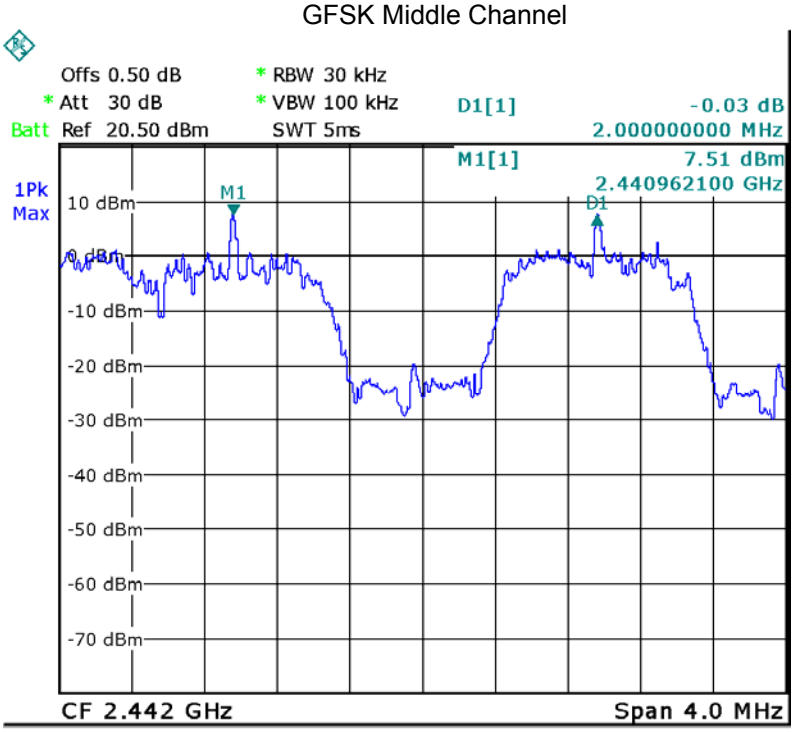
Modulation	Test Channel	Separation (MHz)	Result
GFSK	Low	1 MHz	PASS
GFSK	Middle	2 MHz	PASS
GFSK	High	2 MHz	PASS

Test plots

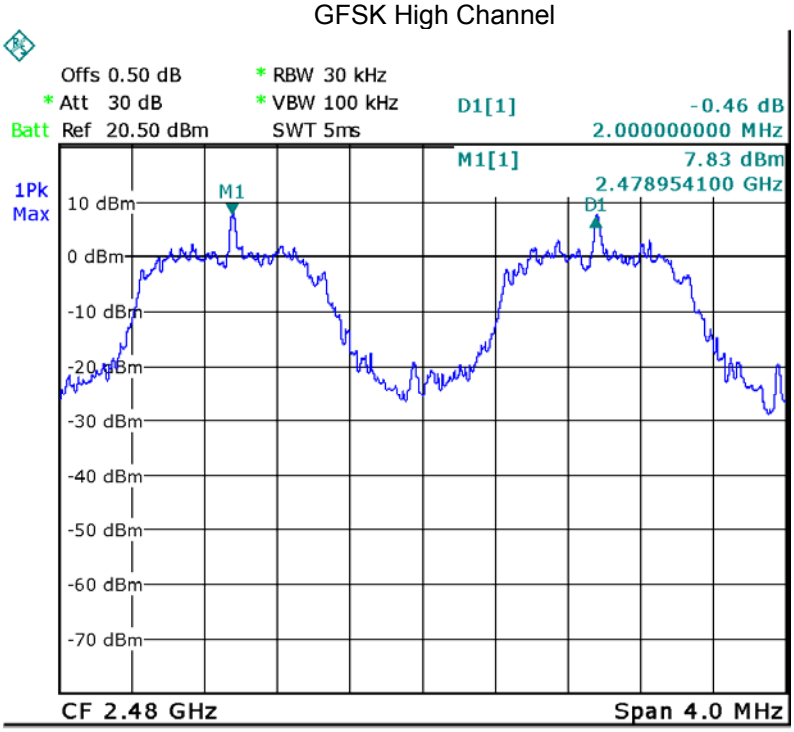
GFSK Low Channel



GFSK Middle Channel



GFSK High Channel



13 Number of Hopping Frequency

Test Requirement:	FCC CFR47 Part 15 Section 15.247
Test Method:	ANSI C63.10:2013
Test Limit:	Regulation 15.247 (a)(1)(iii) Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels.
Test Mode:	Test in hopping transmitting operating mode.

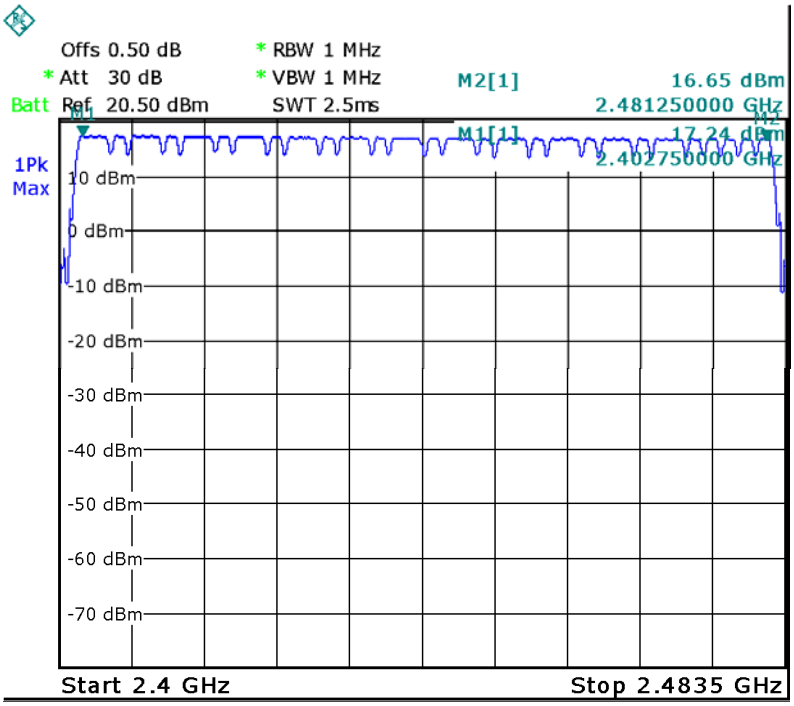
13.1 Test Procedure

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.
2. Set the spectrum analyzer: RBW = 1MHz. VBW = 1MHz. Sweep = auto; Detector Function = Peak. Trace = Max hold.
3. Allow the trace to stabilize. It may prove necessary to break the span up to sections. in order to clearly show all of the hopping frequencies. The limit is specified in one of the subparagraphs of this Section.
4. Set the spectrum analyzer: Start Frequency = 2.4GHz, Stop Frequency = 2.483GHz. Sweep=auto;

13.2 Test Result

Test Plots: 52 Channels in total

GFSK



14 Dwell Time

Test Requirement:	FCC CFR47 Part 15 Section 15.247
Test Method:	ANSI C63.10:2013
Test Limit:	Regulation 15.247(a)(1)(iii) Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.
Test Mode:	Test in hopping transmitting operating mode.

14.1 Test Procedure

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.

2. Set spectrum analyzer span = Zero. Centred on a hopping channel;

3. Set RBW = 1MHz and VBW = 3MHz.Sweep = as necessary to capture the entire dwell time per hopping channel.

4. Use the marker-delta function to determine the dwell time. If this value varies with different modes of operation (e.g.. data rate. modulation format. etc.). repeat this test for each variation. The limit is specified in one of the subparagraphs of this Section. Submit this plot(s).

14.2 Test Result

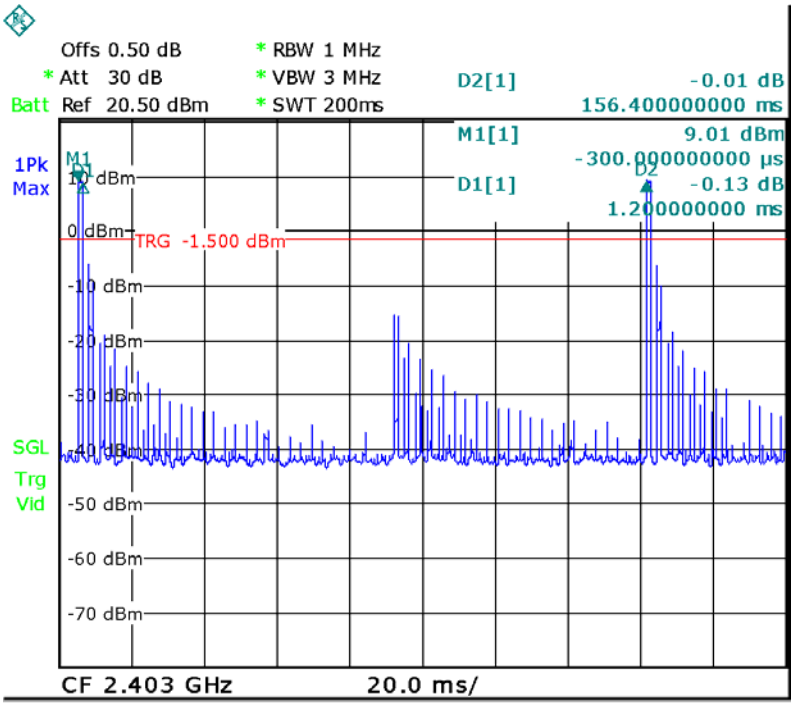
So, the Dwell Time can be calculated as follows:

Total number of channels is 52.

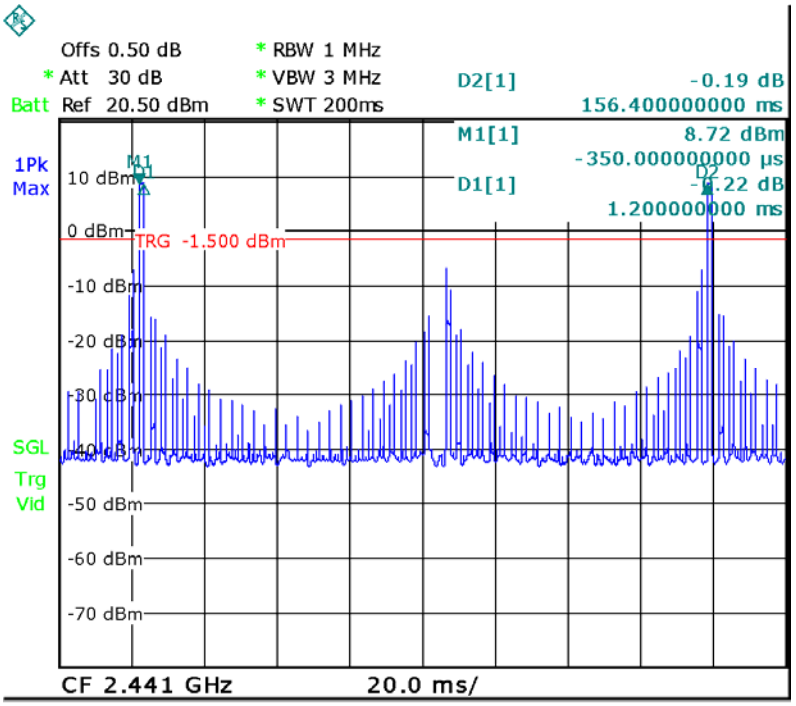
Dwell Time =Ton (ms)*1s/Tperiod(ms)*0.4s*N(channels)

Channel	Ton (ms)	Tperiod(ms)	N(channels)	Dwell Time(s)	Limits(s)
low	1.200	156.4	52	0.160	0.4
middle	1.200	156.4	52	0.160	0.4
high	1.200	156.4	52	0.160	0.4

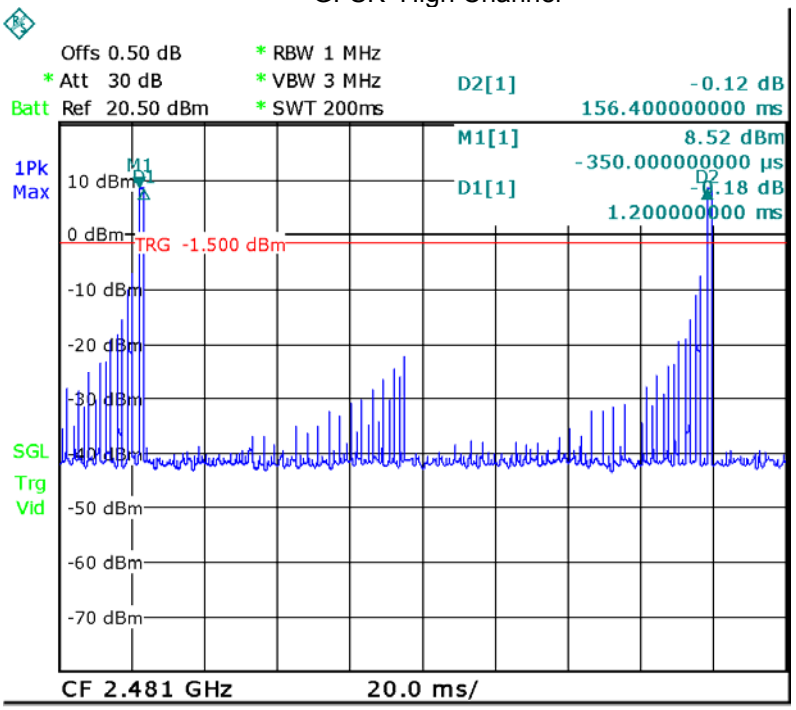
Test Plots
GFSK Low Channel



GFSK Middle Channel



GFSK High Channel



15 Antenna 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 shall be considered sufficient to comply with the provisions of this section. 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. This requirement does not apply to carrier current devices or to devices operated under the provisions of §15.211, §15.213, §15.217, §15.219, or §15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with §15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

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.

Result:

The EUT has one 2.4G TX Dipole Antenna, the gain is 2dBi. meets the requirements of FCC 15.203.

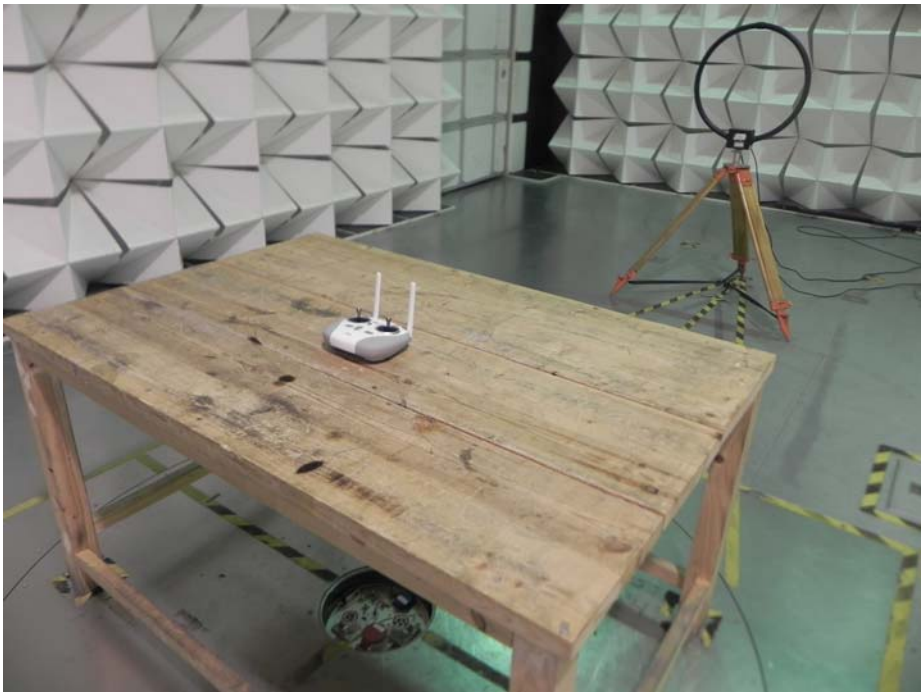
16 RF Exposure

Remark: refer to WTF16S0345763-1E SAR Test Report

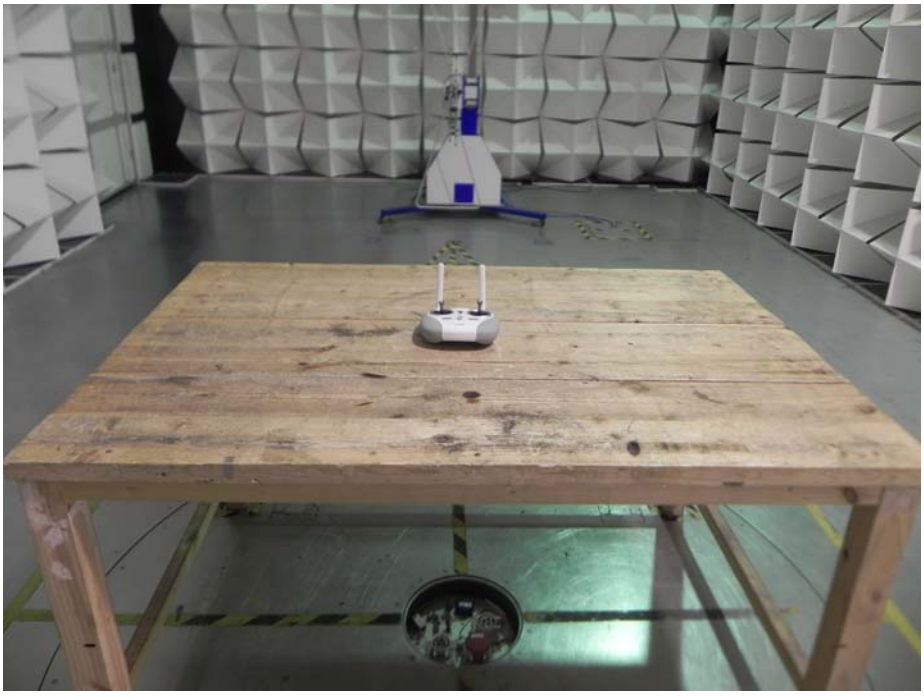
17 Photographs – Model RD12 Test Setup

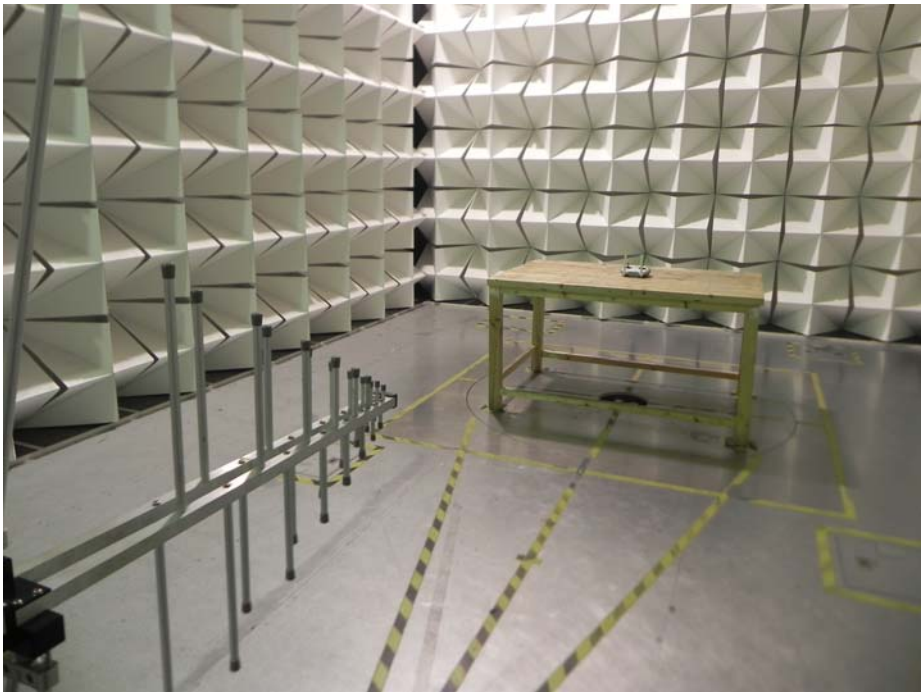
17.1 Photograph – Radiation Spurious Emission Test Setup

8MHz-30MHz at Test Site 2#

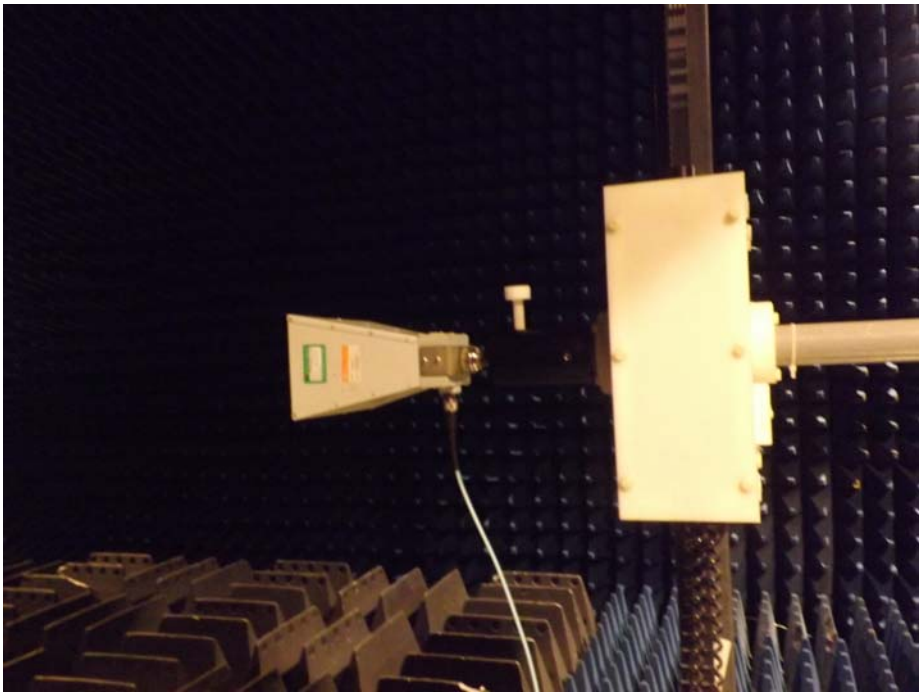


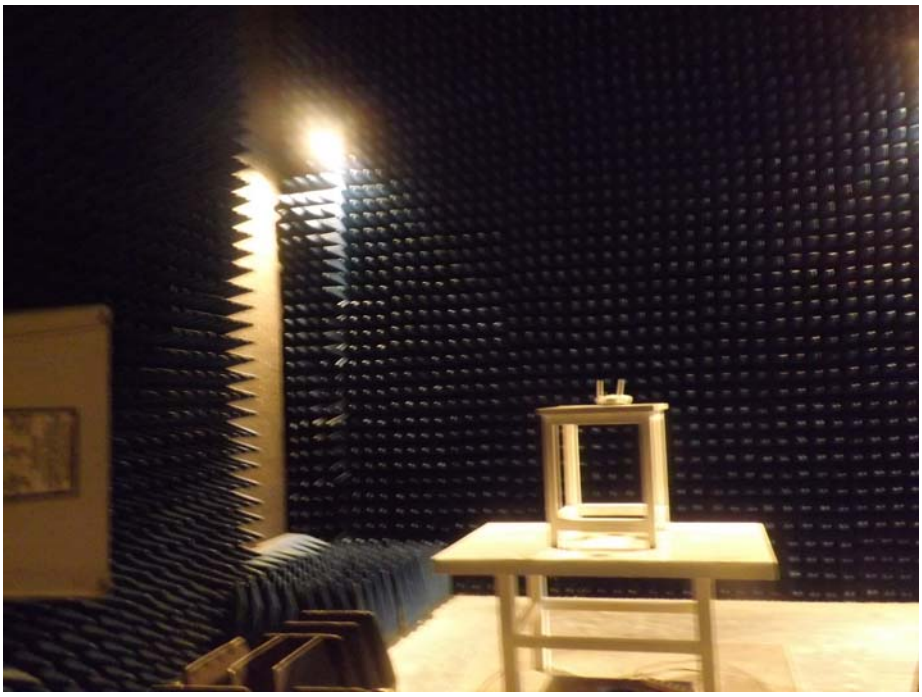
30MHz-1GHz at Test Site 2#





Above 1GHz at Test Site 1#



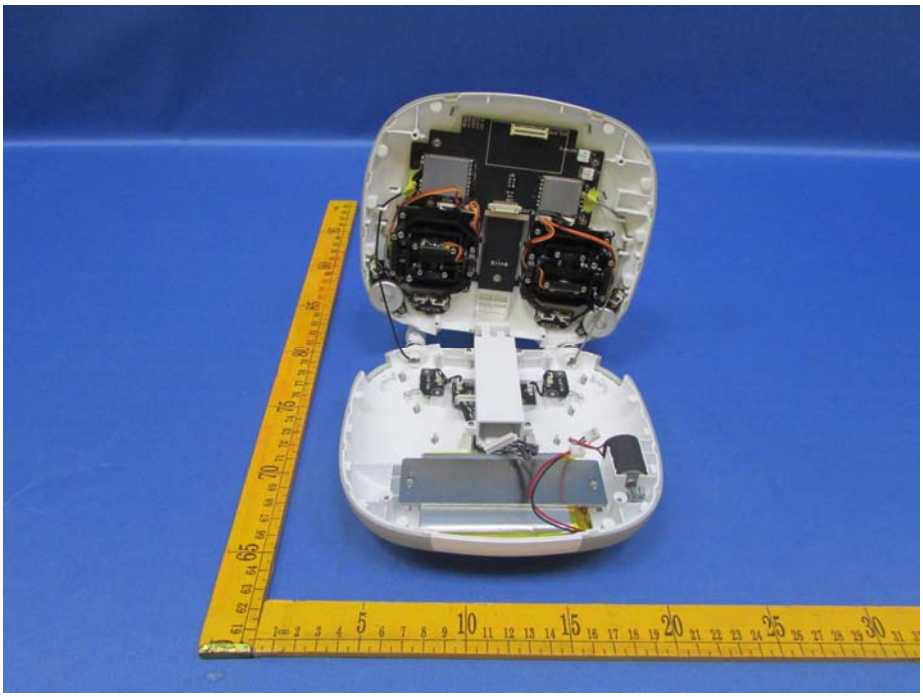


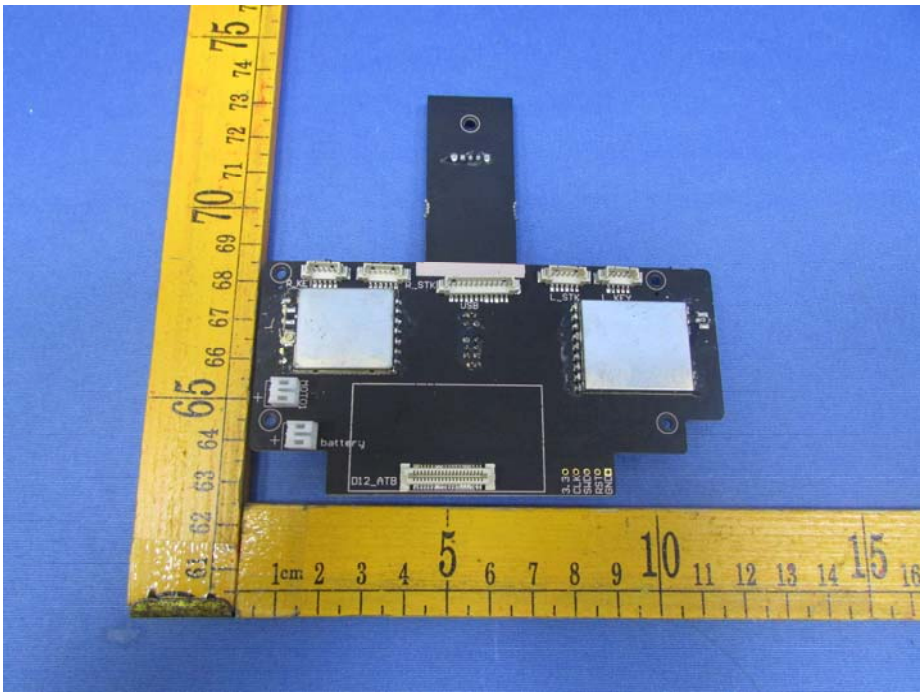
17.2 Photograph – Conducted Emission Test Setup at Test Site 2#

18 Photographs - Constructional Details

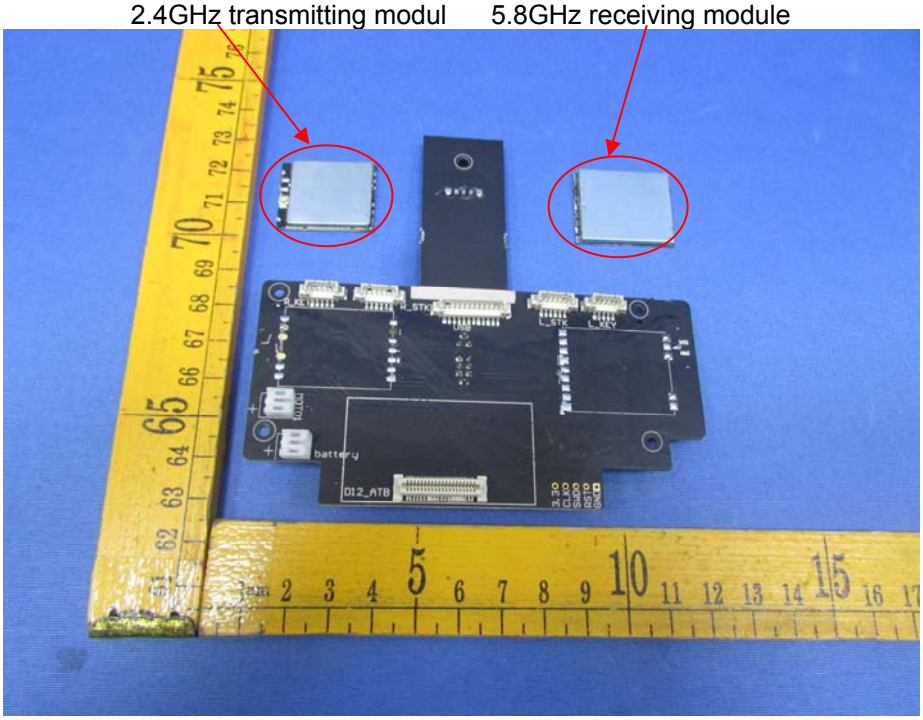
18.1 Model RD12 -External Photos

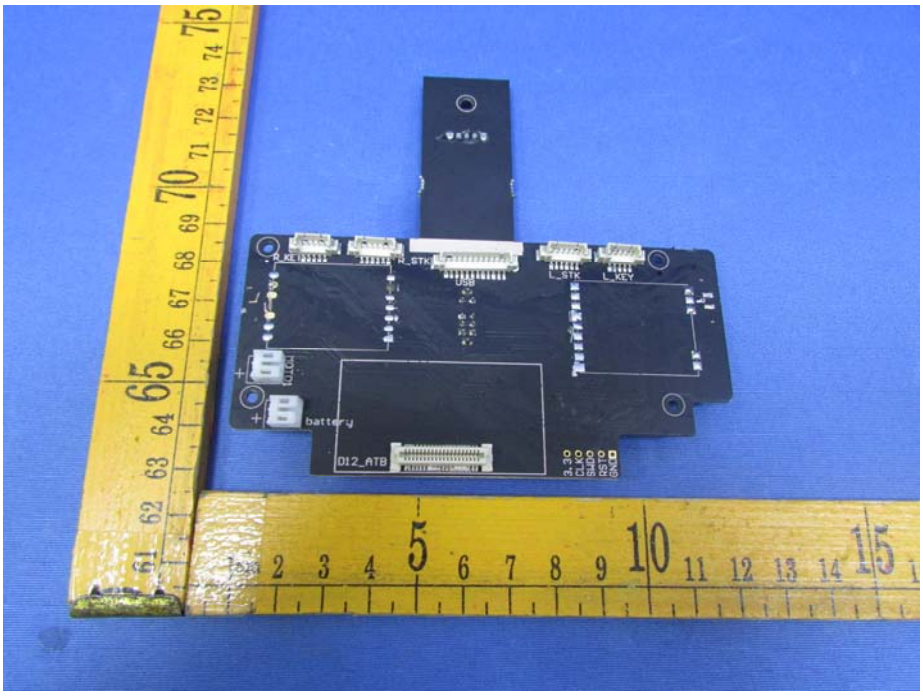
18.2 Model RD12-Internal Photos

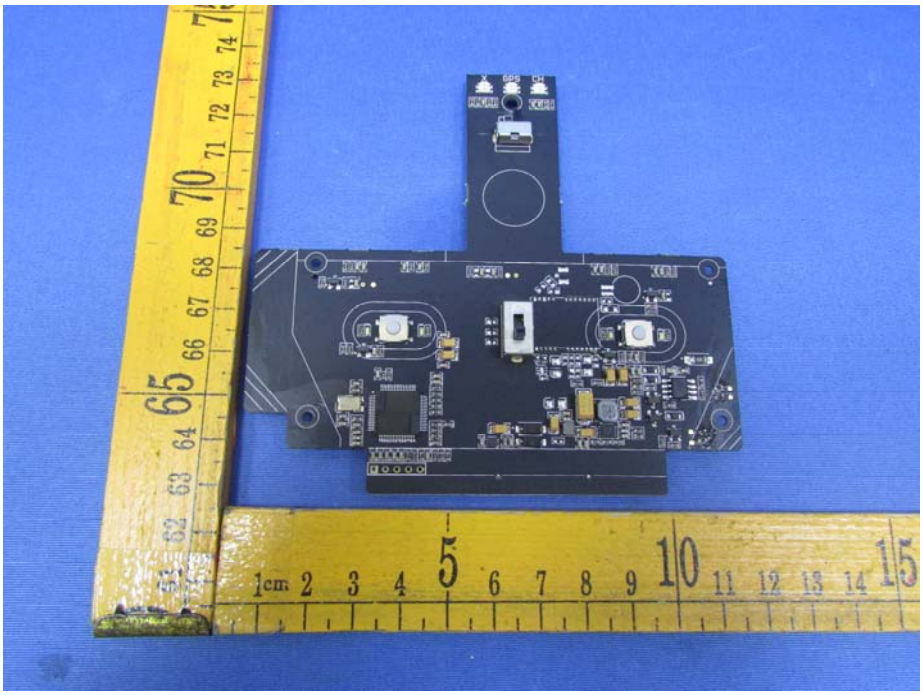




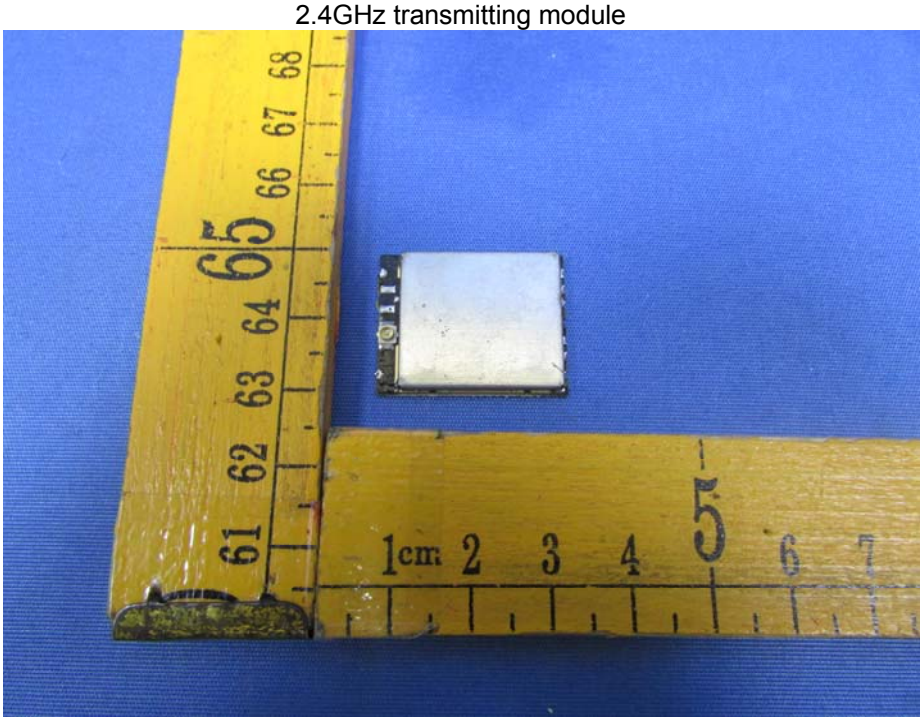
2.4GHz transmitting modul 5.8GHz receiving module

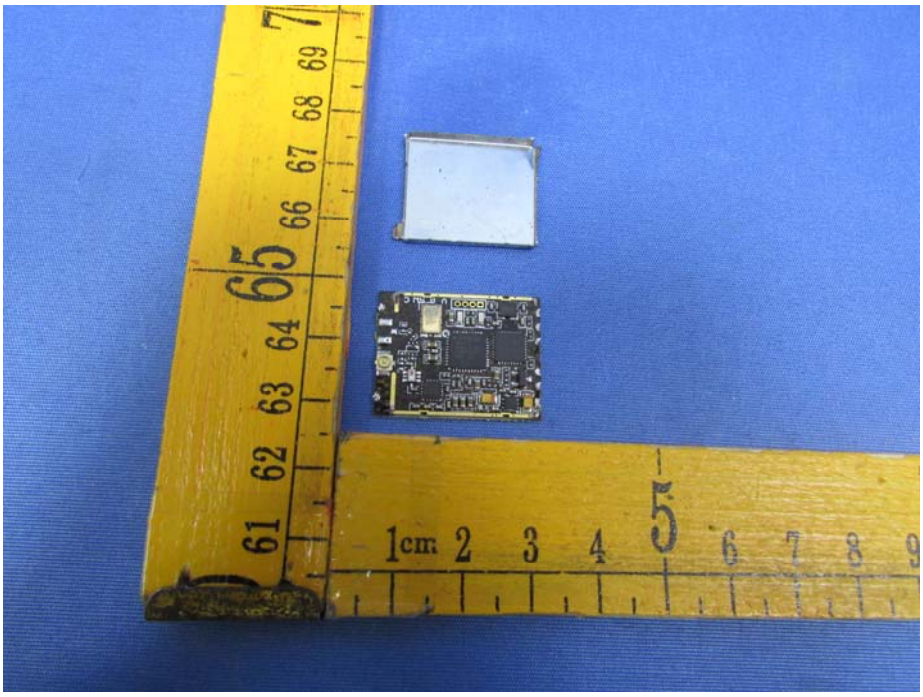


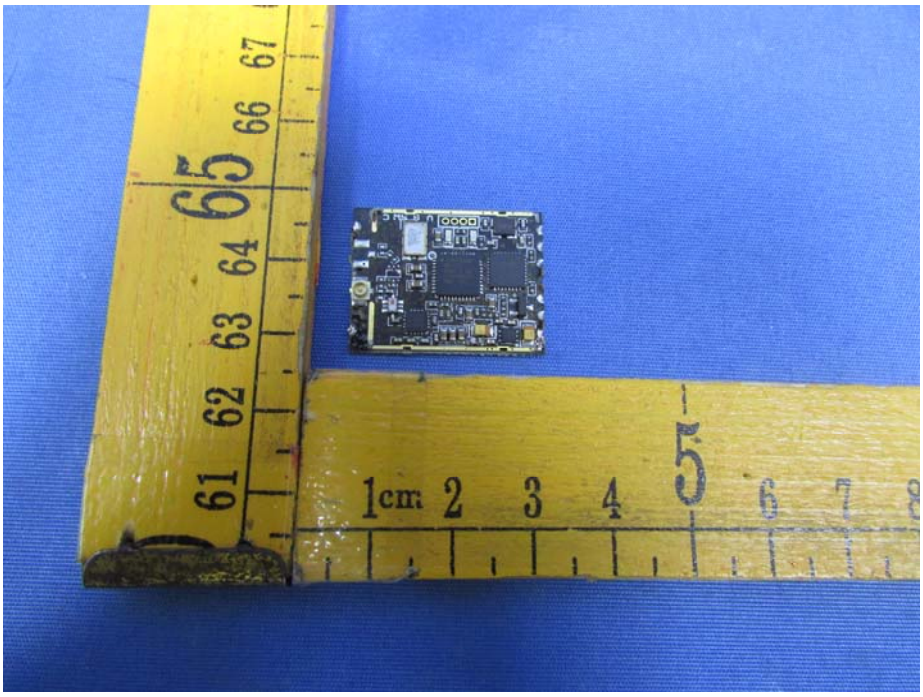


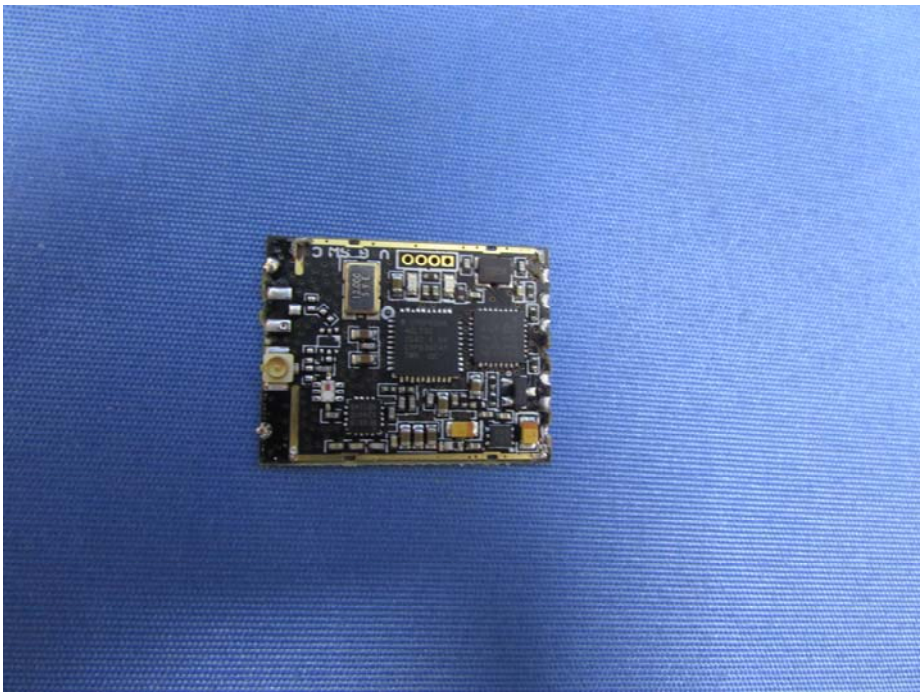


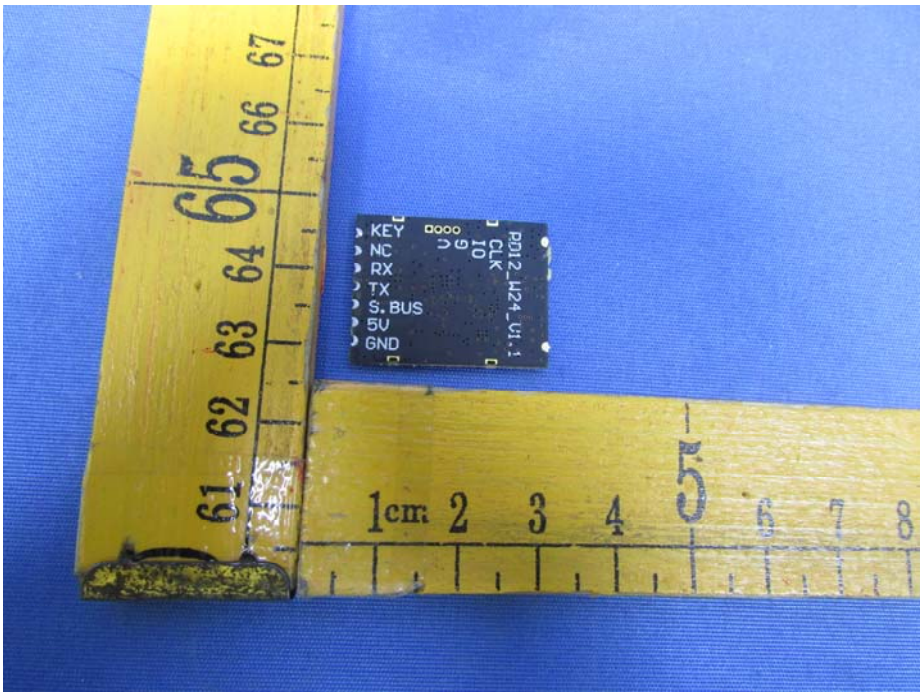
2.4GHz transmitting module



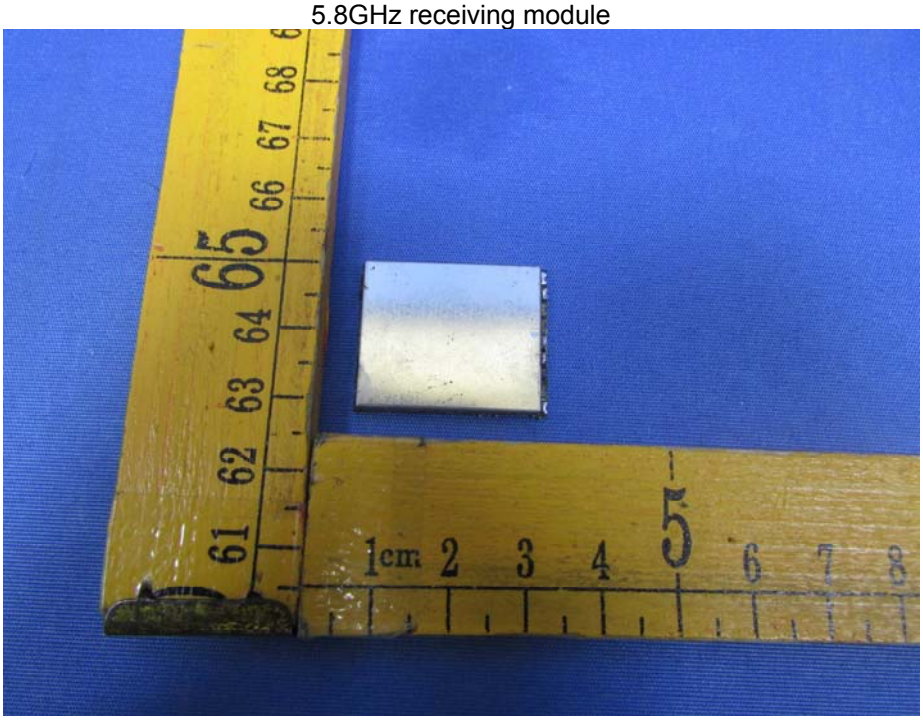

1cm 2 3 4 5 6 7 8 9
61 62 63 64 65 66 67 68 69

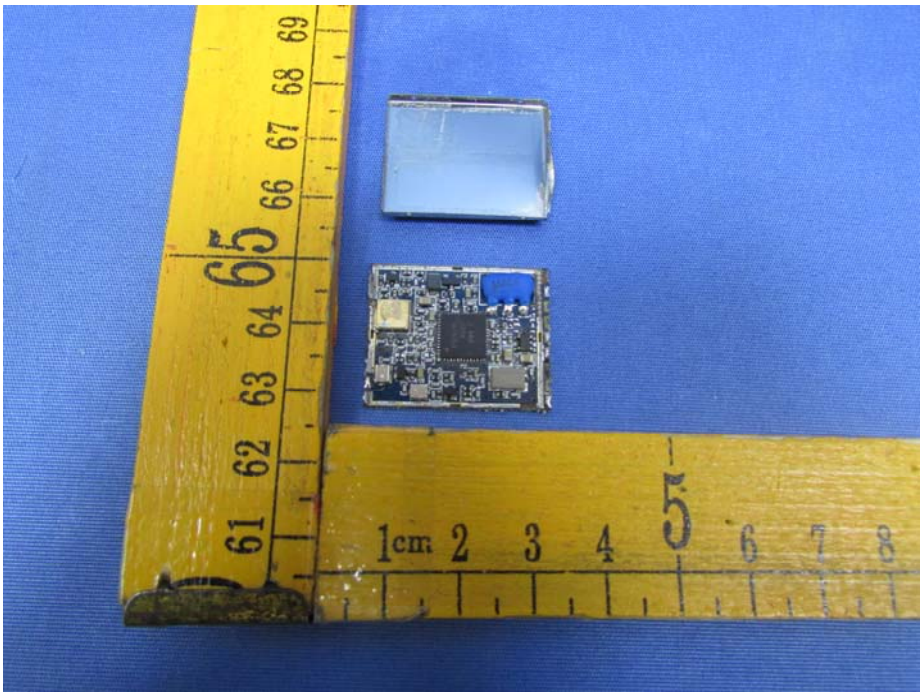

1cm 2 3 4 5 6 7 8
61 62 63 64 65 66 67

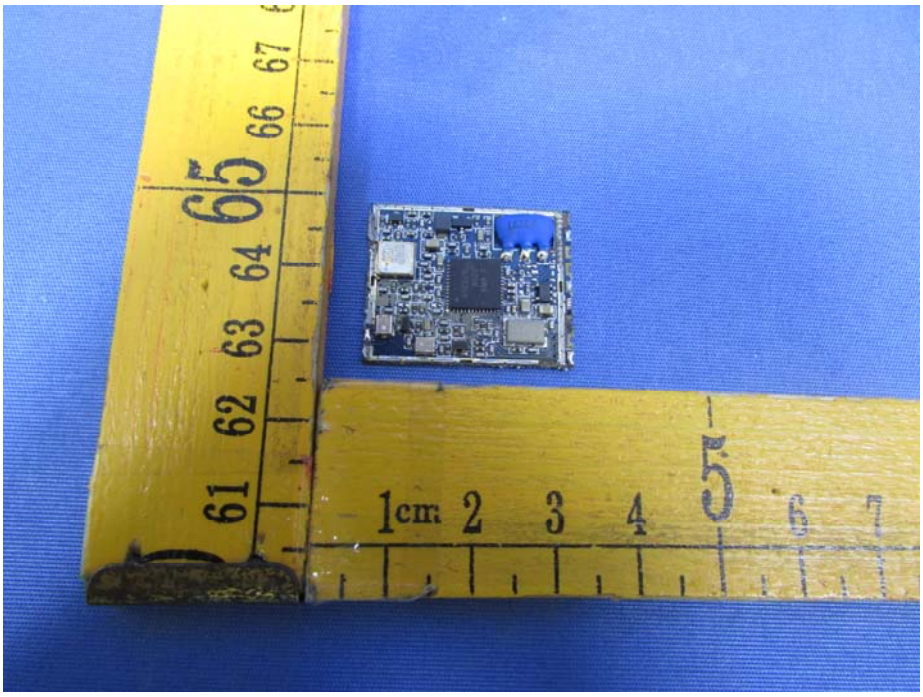


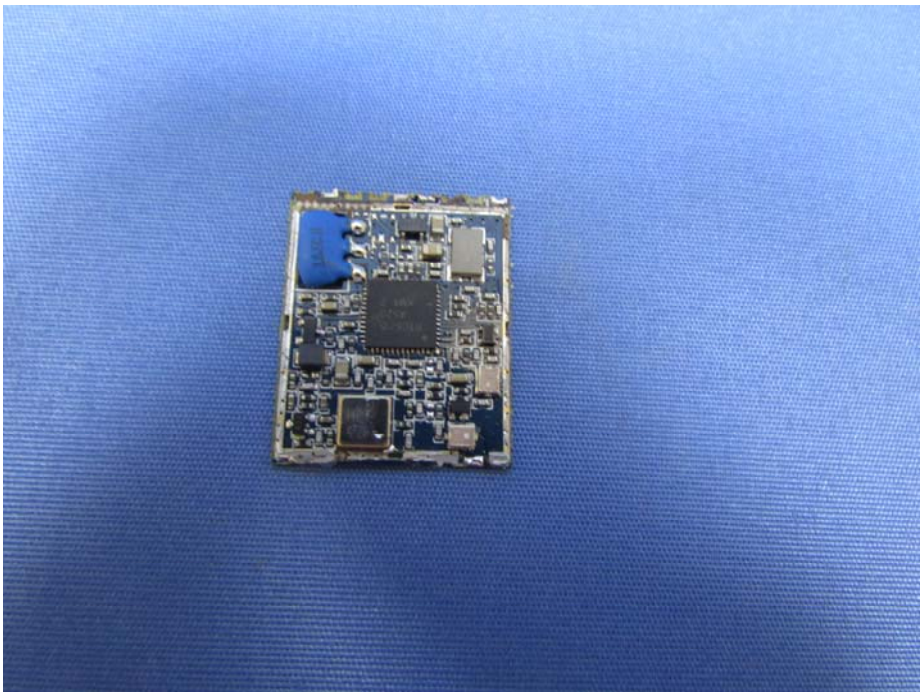

KEY
NC
RX
TX
S.BUS
5V
GND
CLK
IO
PD12_W24_V1.1
1cm 2 3 4 5 6 7 8
61 62 63 64 65 66 67

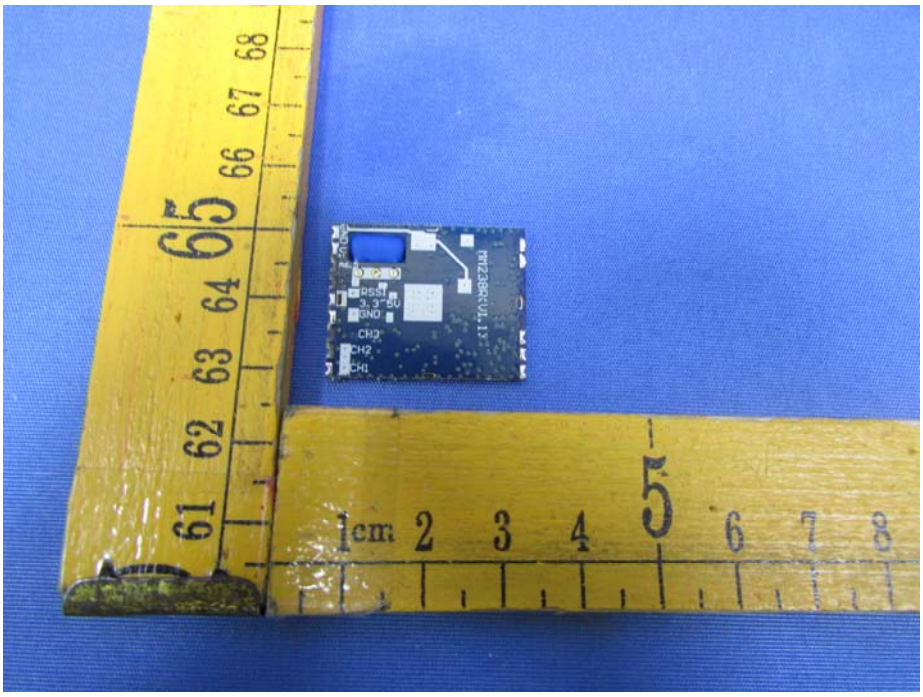
5.8GHz receiving module

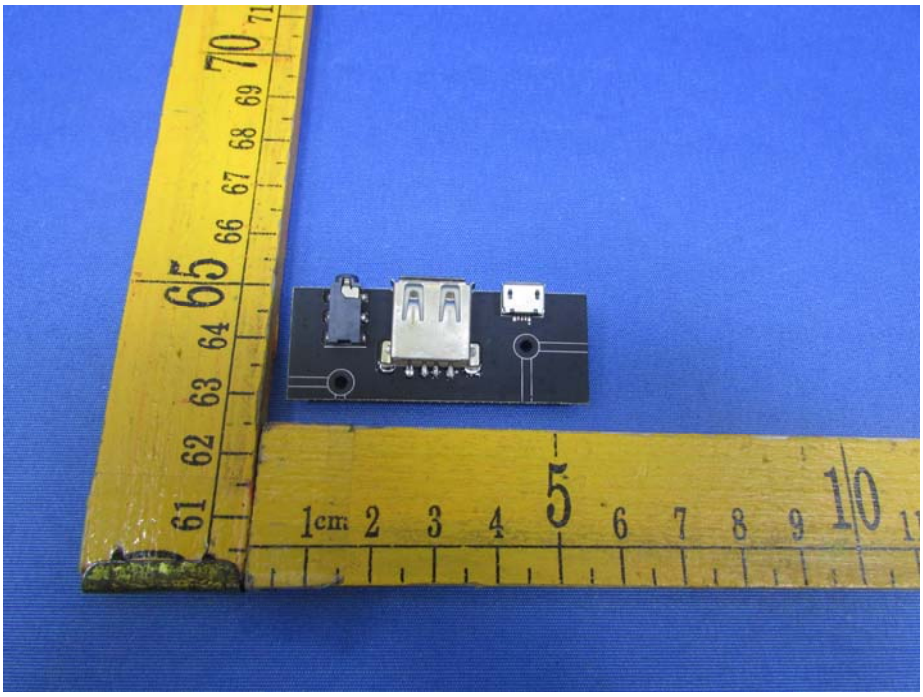


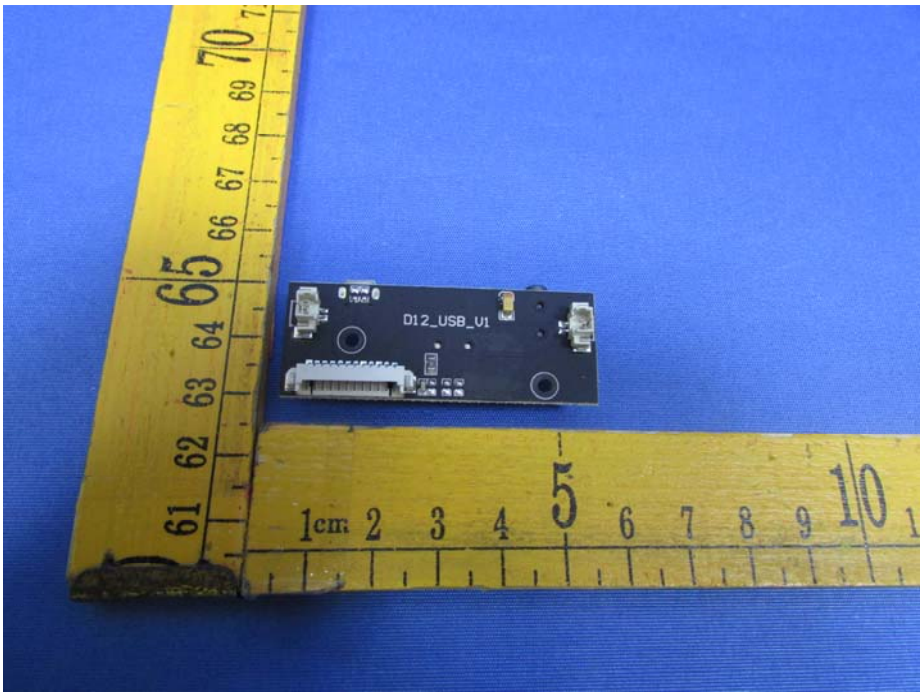


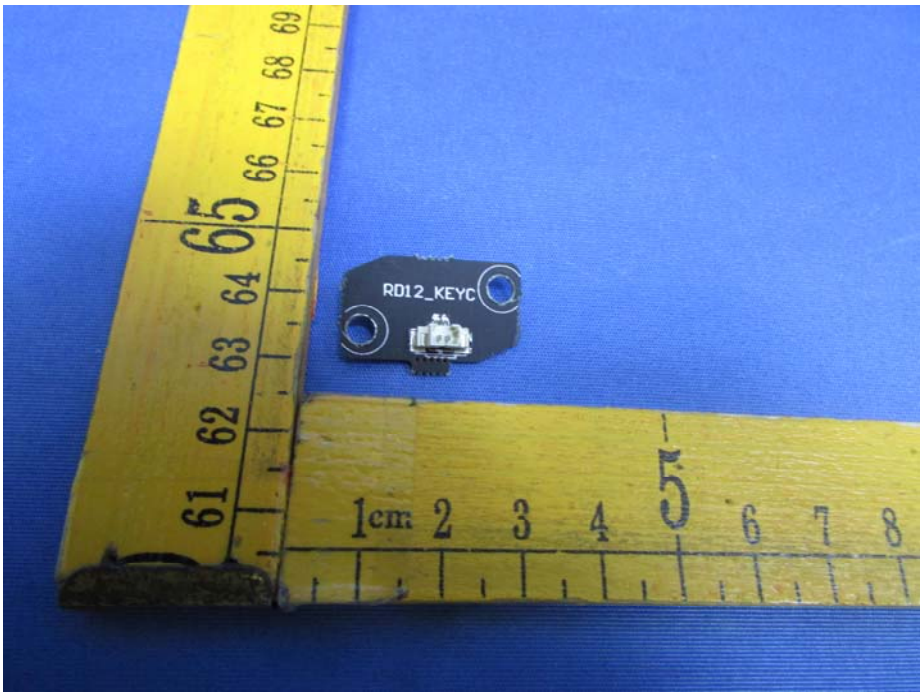

61
62
63
64
65
66
67
1cm
2
3
4
5
6
7

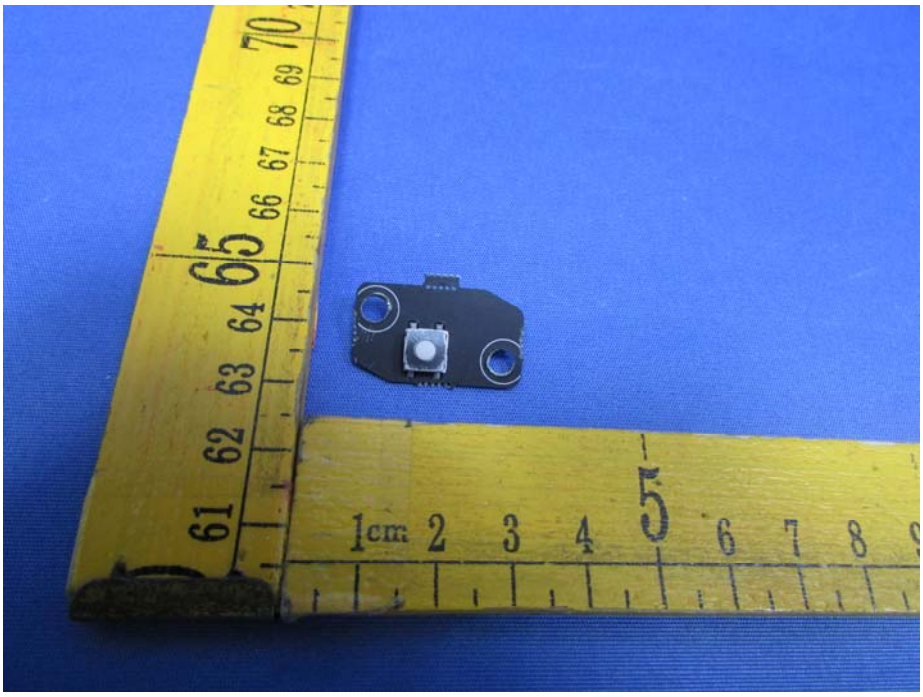



RSSI
3.3~5V
GND
CH3
CH2
CH1
1cm 2 3 4 5 6 7 8

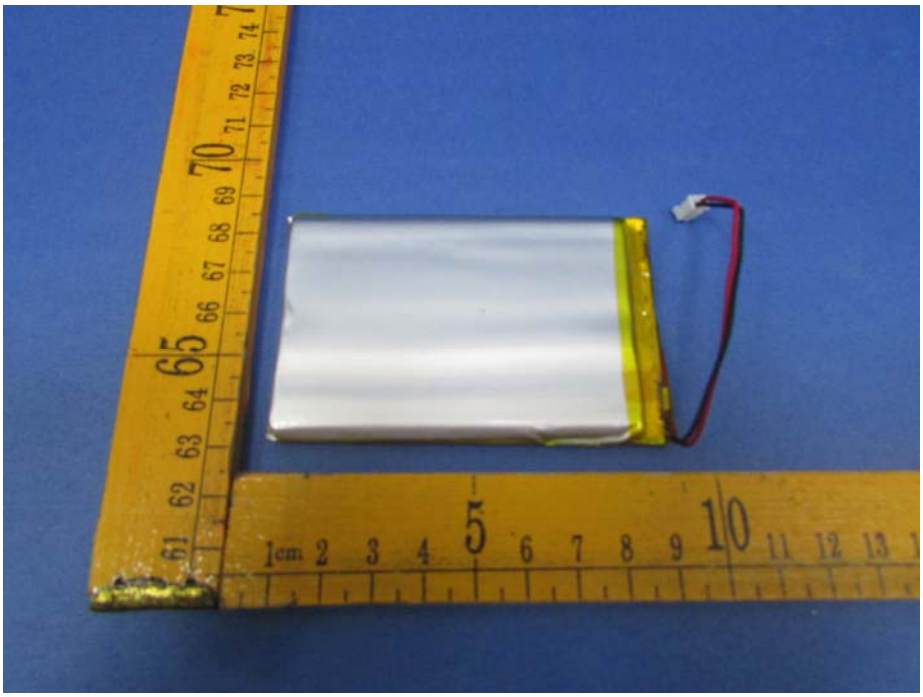

1cm 2 3 4 5 6 7 8 9 10


D12_USB_V1


RD12_KEYC




-IYU-HRCB-4000mAh 755585
3.7V 14.8Wh
+AFYYYYMMDDA



====== End of Report ======