TEST REPORT

Reference No.	:	WTS14S0918371E
FCC ID	:	2ACU9-UDR744HD
Applicant	:	Shenzhen Jietuo Industries Co., Ltd.
Address	:	3rd Floor, Building C2, Xintang Industrial Park, East Baishixia, Fuyong, Baoan, Shenzhen, PRC.
Manufacturer	:	The same as above
Address	:	The same as above
Product Name	:	HD Digital Wireless Monitor
Model No	:	UDR744HD
Standards	:	FCC CFR47 Part 15 Section 15.247:2012
Date of Receipt sample	:	Sep.18, 2014
Date of Test	:	Sep.18~20, 2014
Date of Issue	:	Sep.22, 2014
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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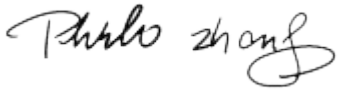
Compiled by:

Zero Zhou / Project Engineer

Approved by:



Philo Zhong / Manager

2 Test Summary

Test Items	Test Requirement	Result
Conduct Emission	15.207	PASS
Radiated Spurious Emissions	15.205(a) 15.209 15.247(d)	PASS
Band edge	15.247(d) 15.205(a)	PASS
20dB Bandwidth	15.247(a)(1)	PASS
Maximum Peak Output Power	15.247(b)(1)	PASS
Frequency Separation	15.247(a)(1)	PASS
Number of Hopping Frequency	15.247(a)(1)(iii)	PASS
Dwell time	15.247(a)(1)(iii)	PASS
Maximum Permissible Exposure (Exposure of Humans to RF Fields)	1.1307(b)(1)	PASS

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4 General Information

4.1 General Description of E.U.T.

Product Name	: HD Digital Wireless Monitor
Model No.	: UDR744HD
Operation Frequency	: 2408MHz ~ 2468MHz, 16 channels in total
Type of Modulation	: GFSK
The lowest oscillator	: 32.768kHz
Antenna installation	: Monopole antenna
Antenna Gain	: 2dBi
Remark	: This device includes two RF modules and antennas which are the same. It works with two camera. Both RF modules adopt different frequencies simultaneously, but never operate at the same frequency. If one module detects an occupied channel, it recognizes and adopts its hopsets to avoid this channel. They do not interfere with each other. All RF tests are conducted on both RF ports.

4.2 Details of E.U.T.

Technical Data	:DC 5V, 2A powered by adapter (Adapter Input: 100-240V~50/60Hz, 500mA)
Adapter	: Csec, M/N:CS12B050200FUF

4.3 Channel List

Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)
1	2408	2	2412	3	2416	4	2420
5	2424	6	2428	7	2432	8	2436
9	2440	10	2444	11	2448	12	2452
13	2456	14	2460	15	2464	16	2468

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	2408MHz	2440MHz	2468MHz

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, July 12, 2012.

- **FCC – 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.

5 Equipment Used during Test

5.1 Equipments List

Conducted Emissions						
Item	**Equipment**	**Manufacturer**	**Model No.**	**Serial No.**	**Last Calibration Date**	**Calibration Due Date**
1.	EMI Test Receiver	R&S	ESCI	101155	Sep.15,2014	Sep.14,2015
2.	LISN	SCHWARZBECK	NSLK 8128	8128-289	Sep.15,2014	Sep.14,2015
3.	Limiter	York	MTS-IMP-136	261115-001-0024	Sep.15,2014	Sep.14,2015
4.	Cable	LARGE	RF300	-	Sep.15,2014	Sep.14,2015
3m Semi-anechoic Chamber for Radiation Emissions						
Item	**Equipment**	**Manufacturer**	**Model No.**	**Serial No.**	**Last Calibration Date**	**Calibration Due Date**
1	EMC Analyzer	Agilent	E7405A	MY45114943	Sep.15,2014	Sep.14,2015
2	Active Loop Antenna	Beijing Dazhi	ZN30900A	-	Sep.15,2014	Sep.14,2015
3	Trilog Broadband Antenna	SCHWARZBECK	VULB9163	336	Sep.15,2014	Sep.14,2015
4	Coaxial Cable (below 1GHz)	Top	TYPE16(13M)	-	Sep.15,2014	Sep.14,2015
5	Broad-band Horn Antenna	SCHWARZBECK	BBHA 9120 D	667	Sep.15,2014	Sep.14,2015
6	Broadband Preamplifier	COMPLIANCE DIRECTION	PAP-1G18	2004	Sep.15,2014	Sep.14,2015
7	Coaxial Cable (above 1GHz)	Top	1000MHz-25GHz	EW02014-7	Sep.15,2014	Sep.14,2015
8	Broad-band Horn Antenna	SCHWARZBECK	BBHA 9170	335	Sep.15,2014	Sep.14,2015

5.2 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)

5.3 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 Conducted Emission

Test Requirement:	FCC CFR 47 Part 15 Section 15.207
Test Method:	ANSI C63.4:2003
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)

6.1 E.U.T. Operation

Operating Environment **:**

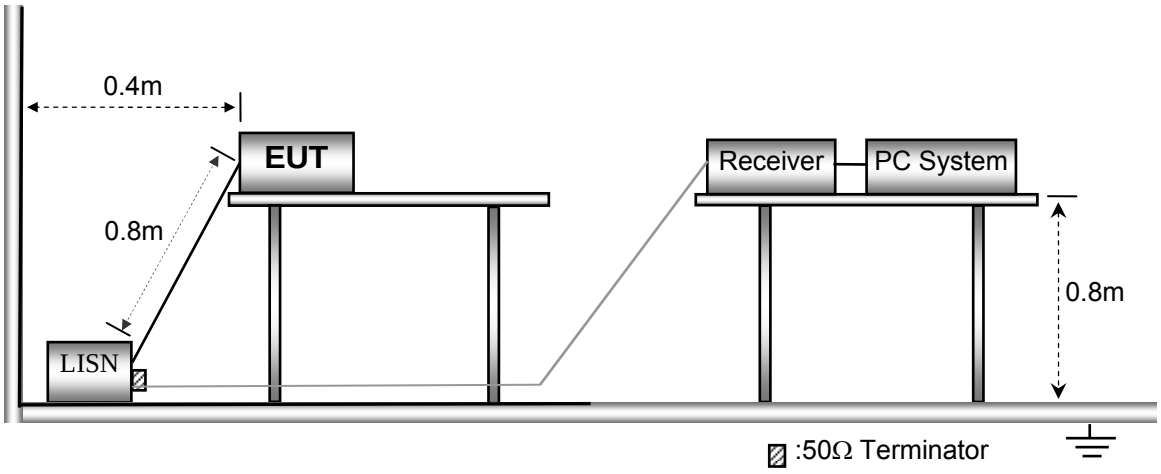
Temperature:	22.6 °C
Humidity:	52.5 % RH
Atmospheric Pressure:	101.2kPa

EUT Operation **:**

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

6.2 EUT Setup

The conducted emission tests were performed using the setup accordance with the ANSI C63.4:2003.

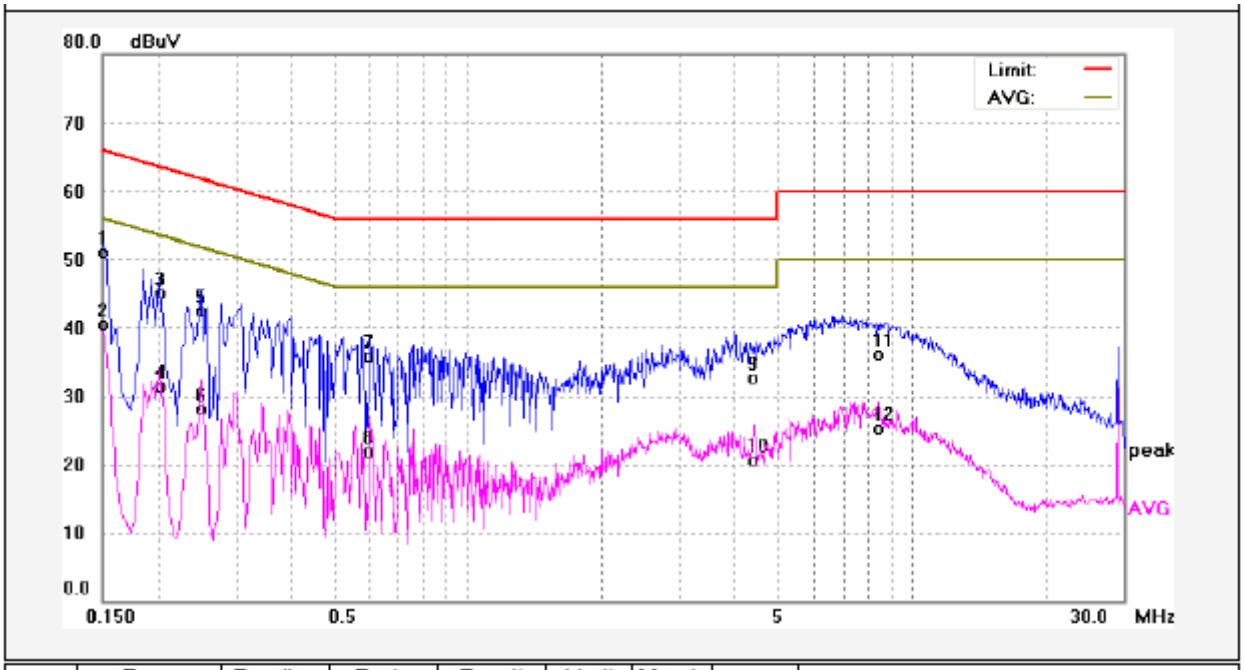


6.3 Measurement Description

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.

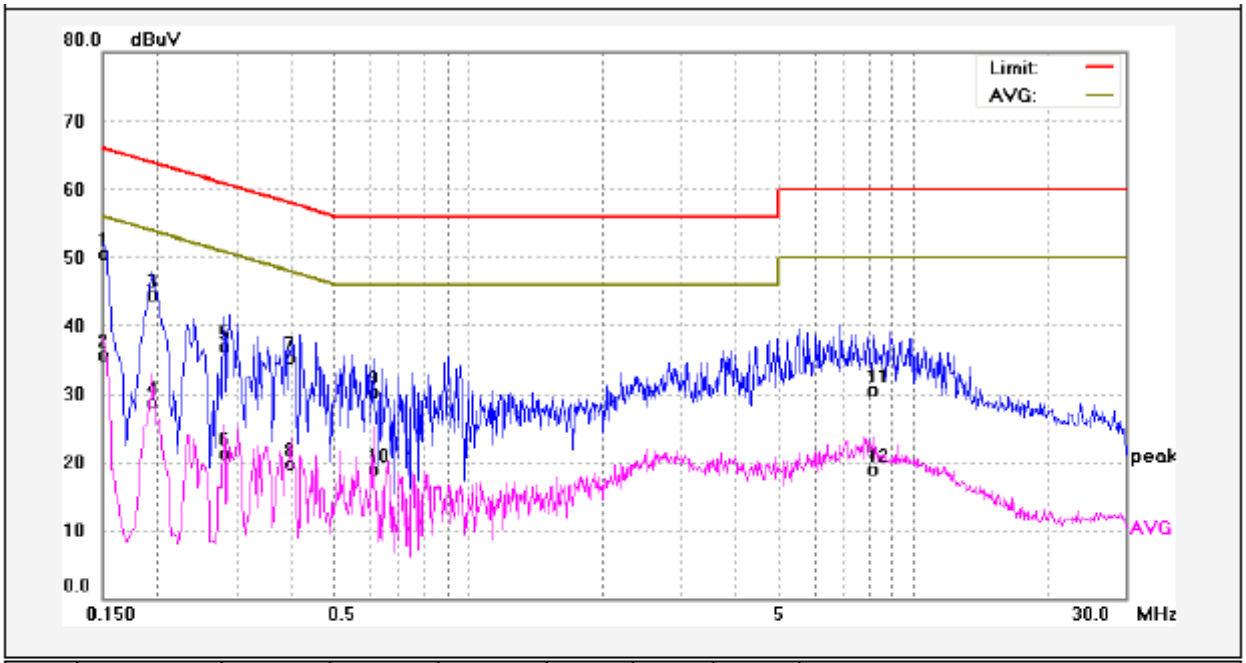
6.4 Conducted Emission Test Result

Live line:



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Margin (dB)	Detector	Remark
1	0.1500	40.65	10.48	51.13	65.99	-14.86	QP	
2	0.1500	29.94	10.48	40.42	55.99	-15.57	AVG	
3	0.2020	34.63	10.48	45.11	63.52	-18.41	QP	
4	0.2020	21.05	10.48	31.53	53.52	-21.99	AVG	
5	0.2500	32.06	10.48	42.54	61.75	-19.21	QP	
6	0.2500	17.53	10.48	28.01	51.75	-23.74	AVG	
7	0.6020	25.43	10.54	35.97	56.00	-20.03	QP	
8	0.6020	11.33	10.54	21.87	46.00	-24.13	AVG	
9	4.4180	22.07	10.65	32.72	56.00	-23.28	QP	
10	4.4180	10.05	10.65	20.70	46.00	-25.30	AVG	
11	8.3900	25.28	10.79	36.07	60.00	-23.93	QP	
12	8.3900	14.54	10.79	25.33	50.00	-24.67	AVG	

Neutral line:



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Margin (dB)	Detector	Remark
1	0.1500	39.95	10.48	50.43	65.99	-15.56	QP	
2	0.1500	25.22	10.48	35.70	55.99	-20.29	AVG	
3	0.1940	34.04	10.48	44.52	63.86	-19.34	QP	
4	0.1940	18.19	10.48	28.67	53.86	-25.19	AVG	
5	0.2819	26.47	10.48	36.95	60.76	-23.81	QP	
6	0.2819	10.75	10.48	21.23	50.76	-29.53	AVG	
7	0.3980	24.81	10.49	35.30	57.89	-22.59	QP	
8	0.3980	9.18	10.49	19.67	47.89	-28.22	AVG	
9	0.6100	19.78	10.55	30.33	56.00	-25.67	QP	
10	0.6100	8.39	10.55	18.94	46.00	-27.06	AVG	
11	8.1300	19.65	10.78	30.43	60.00	-29.57	QP	
12	8.1300	8.15	10.78	18.93	50.00	-31.07	AVG	

7 Radiated Spurious Emissions

Test Requirement: FCC CFR47 Part 15 Section 15.209 & 15.247

Test Method: DA 00-705

Test Result: PASS

Measurement Distance: 3m

Limit:

Frequency (MHz)	Field Strength		Field Strength Limit at 3m Measurement Dist	
	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	$20\log^{(500)}$

7.1 EUT Operation

Operating Environment **:**

Temperature: 23.5 °C

Humidity: 51.1 % RH

Atmospheric Pressure: 101.2kPa

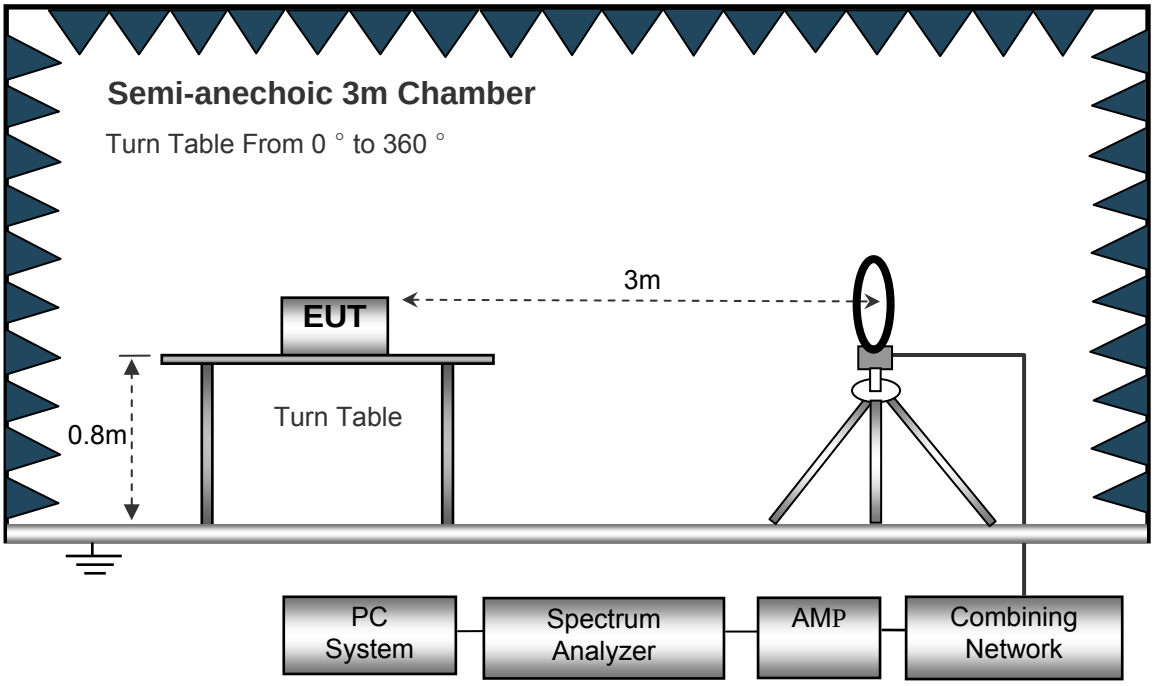
EUT Operation **:**

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

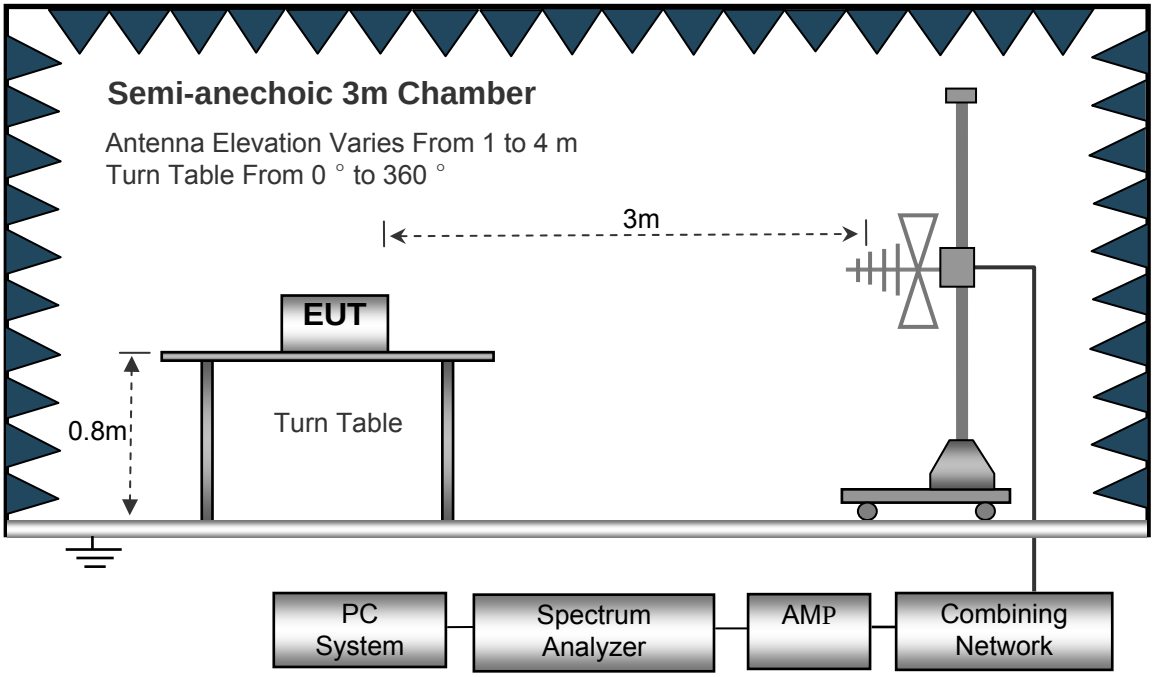
7.2 Test Setup

The radiated emission tests were performed in the 3m Semi- Anechoic Chamber test site, using the setup accordance with the ANSI C63.4: 2003.

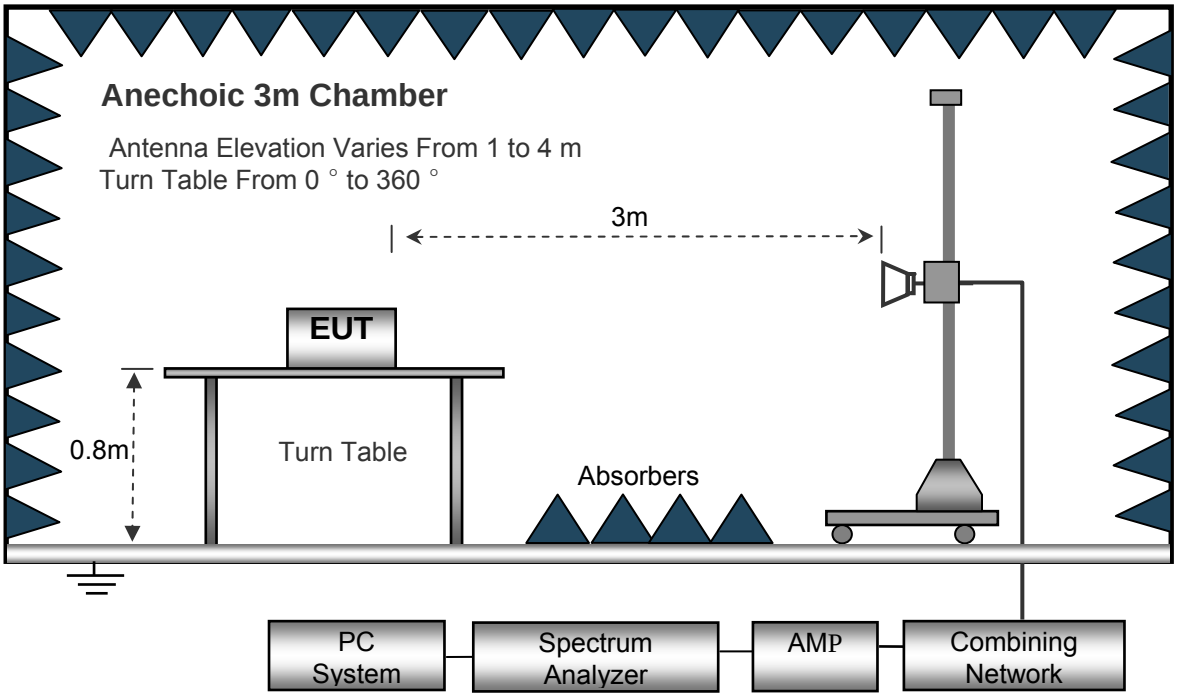
The test setup for emission measurement below 30MHz.



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



The test setup for emission measurement above 1 GHz.



7.3 Spectrum Analyser 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

7.4 Test Procedure

1. The EUT is placed on a turntable, which is 0.8m 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.

7.5 Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

Corr. Ampl. = Indicated Reading + Antenna Factor + Cable Factor - Amplifier Gain

The “Margin” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -7dB means the emission is 7dB below the maximum limit for Class B. The equation for margin calculation is as follows:

Margin = Corr. Ampl. – Limit

7.6 Summary of Test Results

Test Frequency: 32.768KHz ~ 30MHz

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

Test Frequency: 30MHz ~ 18GHz

Test mode: transmitting mode

RF module 1

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/m)	(dBμV/m)	(dBμV/m)	(dB)
GFSK Low Channel									
464.70	19.62	QP	201	1.7	H	17.01	36.63	46.00	-9.37
464.70	19.67	QP	341	1.1	V	17.01	36.68	46.00	-9.32
4816.00	62.34	PK	87	1.7	V	-1.06	61.28	74.00	-12.72
4816.00	47.26	Ave	87	1.7	V	-1.06	46.20	54.00	-7.80
7224.00	61.62	PK	329	1.2	V	1.33	62.95	74.00	-11.05
7224.00	48.00	Ave	329	1.2	V	1.33	49.33	54.00	-4.67
2316.69	45.12	PK	78	1.3	V	-13.19	31.93	74.00	-42.07
2316.69	38.28	Ave	78	1.3	V	-13.19	25.09	54.00	-28.91
2369.54	42.61	PK	262	1.2	H	-13.14	29.47	74.00	-44.53
2369.54	38.45	Ave	262	1.2	H	-13.14	25.31	54.00	-28.69
2496.95	43.09	PK	330	1.2	V	-13.08	30.01	74.00	-43.99
2496.95	36.83	Ave	330	1.2	V	-13.08	23.75	54.00	-30.25

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/m)	(dBμV/m)	(dBμV/m)	(dB)
GFSK Middle Channel									
464.70	18.96	QP	186	2.0	H	17.01	35.97	46.00	-10.03
464.70	19.04	QP	282	1.1	V	17.01	36.05	46.00	-9.95
4880.00	60.77	PK	194	1.3	V	-0.62	60.15	74.00	-13.85
4880.00	45.85	Ave	194	1.3	V	-0.62	45.23	54.00	-8.77
7320.00	62.78	PK	306	1.8	V	2.21	64.99	74.00	-9.01
7320.00	46.98	Ave	306	1.8	V	2.21	49.19	54.00	-4.81
2342.84	46.62	PK	1	1.8	V	-13.19	33.43	74.00	-40.57
2342.84	39.36	Ave	1	1.8	V	-13.19	26.17	54.00	-27.83
2364.70	42.73	PK	326	1.4	H	-13.14	29.59	74.00	-44.41
2364.70	36.93	Ave	326	1.4	H	-13.14	23.79	54.00	-30.21
2491.67	43.89	PK	228	1.8	V	-13.08	30.81	74.00	-43.19
2491.67	38.20	Ave	228	1.8	V	-13.08	25.12	54.00	-28.88

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/m)	(dBμV/m)	(dBμV/m)	(dB)
GFSK High Channel									
464.70	17.84	QP	160	1.4	H	17.01	34.85	46.00	-11.15
464.70	17.91	QP	203	1.5	V	17.01	34.92	46.00	-11.08
4936.00	62.87	PK	42	1.0	V	-0.24	62.63	74.00	-11.37
4936.00	45.77	Ave	42	1.0	V	-0.24	45.53	54.00	-8.47
7404.00	61.73	PK	194	1.8	V	2.84	64.57	74.00	-9.43
7404.00	46.44	Ave	194	1.8	V	2.84	49.28	54.00	-4.72
2349.89	45.28	PK	9	1.2	V	-13.19	32.09	74.00	-41.91
2349.89	37.13	Ave	9	1.2	V	-13.19	23.94	54.00	-30.06
2378.27	43.26	PK	163	1.2	H	-13.14	30.12	74.00	-43.88
2378.27	37.08	Ave	163	1.2	H	-13.14	23.94	54.00	-30.06
2490.73	42.06	PK	158	1.5	V	-13.08	28.98	74.00	-45.02
2490.73	38.68	Ave	158	1.5	V	-13.08	25.60	54.00	-28.40

RF module 2

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/m)	(dBμV/m)	(dBμV/m)	(dB)
GFSK Low Channel									
464.73	19.52	QP	40	1.5	H	17.01	36.53	46.00	-9.47
464.73	18.73	QP	138	1.4	V	17.01	35.74	46.00	-10.26
4816.00	62.28	PK	134	1.7	V	-1.06	61.22	74.00	-12.78
4816.00	47.92	Ave	134	1.7	V	-1.06	46.86	54.00	-7.14
7224.00	61.38	PK	348	2.0	V	1.33	62.71	74.00	-11.29
7224.00	46.46	Ave	348	2.0	V	1.33	47.79	54.00	-6.21
2330.95	45.33	PK	33	1.1	V	-13.19	32.14	74.00	-41.86
2330.95	37.39	Ave	33	1.1	V	-13.19	24.20	54.00	-29.80
2380.46	44.14	PK	72	1.1	H	-13.14	31.00	74.00	-43.00
2380.46	36.25	Ave	72	1.1	H	-13.14	23.11	54.00	-30.89
2483.72	43.93	PK	293	1.4	V	-13.08	30.85	74.00	-43.15
2483.72	38.16	Ave	293	1.4	V	-13.08	25.08	54.00	-28.92

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/m)	(dBμV/m)	(dBμV/m)	(dB)
GFSK Middle Channel									
464.73	19.15	QP	136	1.8	H	17.01	36.16	46.00	-9.84
464.73	18.62	QP	261	1.6	V	17.01	35.63	46.00	-10.37
4880.00	60.35	PK	359	1.6	V	-0.62	59.73	74.00	-14.27
4880.00	48.77	Ave	359	1.6	V	-0.62	48.15	54.00	-5.85
7320.00	60.62	PK	170	1.2	V	2.21	62.83	74.00	-11.17
7320.00	48.09	Ave	170	1.2	V	2.21	50.30	54.00	-3.70
2330.14	45.06	PK	165	1.2	V	-13.19	31.87	74.00	-42.13
2330.14	39.68	Ave	165	1.2	V	-13.19	26.49	54.00	-27.51
2378.18	42.75	PK	11	1.7	H	-13.14	29.61	74.00	-44.39
2378.18	37.25	Ave	11	1.7	H	-13.14	24.11	54.00	-29.89
2494.62	42.89	PK	250	1.7	V	-13.08	29.81	74.00	-44.19
2494.62	36.80	Ave	250	1.7	V	-13.08	23.72	54.00	-30.28

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/m)	(dBμV/m)	(dBμV/m)	(dB)
GFSK High Channel									
464.73	18.92	QP	219	1.4	H	17.01	35.93	46.00	-10.07
464.73	18.35	QP	88	1.2	V	17.01	35.36	46.00	-10.64
4936.00	60.66	PK	101	1.1	V	-0.24	60.42	74.00	-13.58
4936.00	46.54	Ave	101	1.1	V	-0.24	46.30	54.00	-7.70
7404.00	60.92	PK	330	1.4	V	2.84	63.76	74.00	-10.24
7404.00	47.67	Ave	330	1.4	V	2.84	50.51	54.00	-3.49
2323.38	45.94	PK	67	1.9	V	-13.19	32.75	74.00	-41.25
2323.38	39.70	Ave	67	1.9	V	-13.19	26.51	54.00	-27.49
2382.53	42.80	PK	282	1.4	H	-13.14	29.66	74.00	-44.34
2382.53	36.23	Ave	282	1.4	H	-13.14	23.09	54.00	-30.91
2484.43	44.00	PK	275	1.5	V	-13.08	30.92	74.00	-43.08
2484.43	38.33	Ave	275	1.5	V	-13.08	25.25	54.00	-28.75

Test Frequency: 18~25GHz

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

8 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:	DA 00-705
Test Mode:	Transmitting, Hopping

8.1 Test Procedure

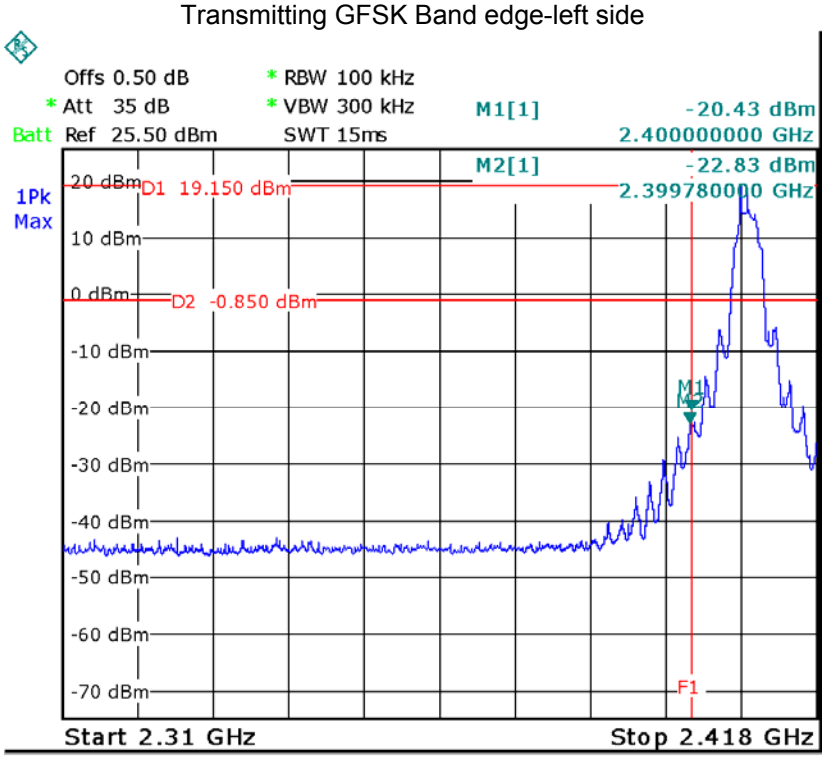
1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum;
2. Set the spectrum analyzer: RBW = 100kHz, VBW = 300kHz, Sweep = auto
   Detector function = peak, Trace = max hold

8.2 Test Result

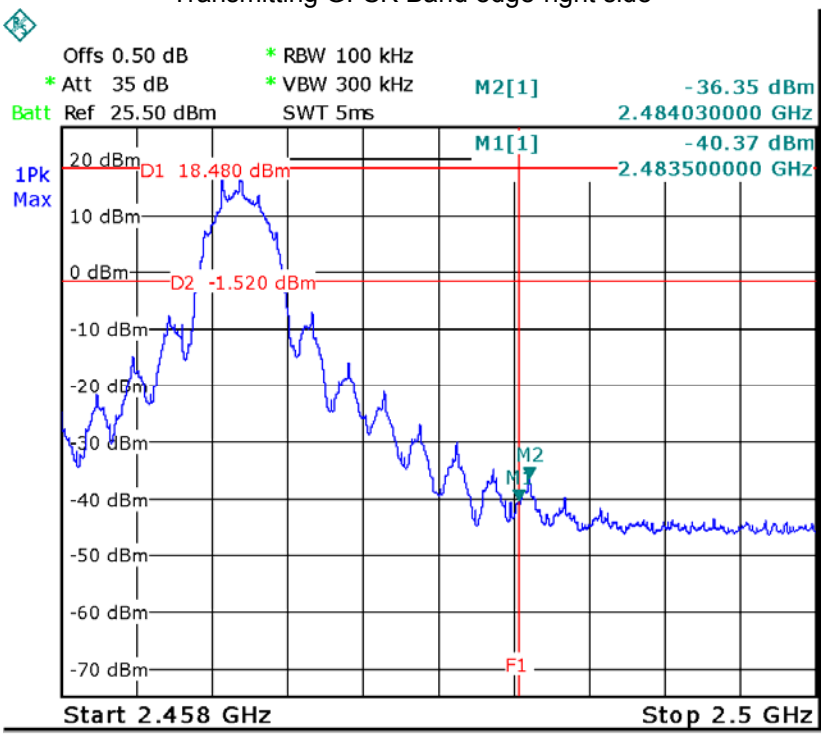
Test plots

RF module 1

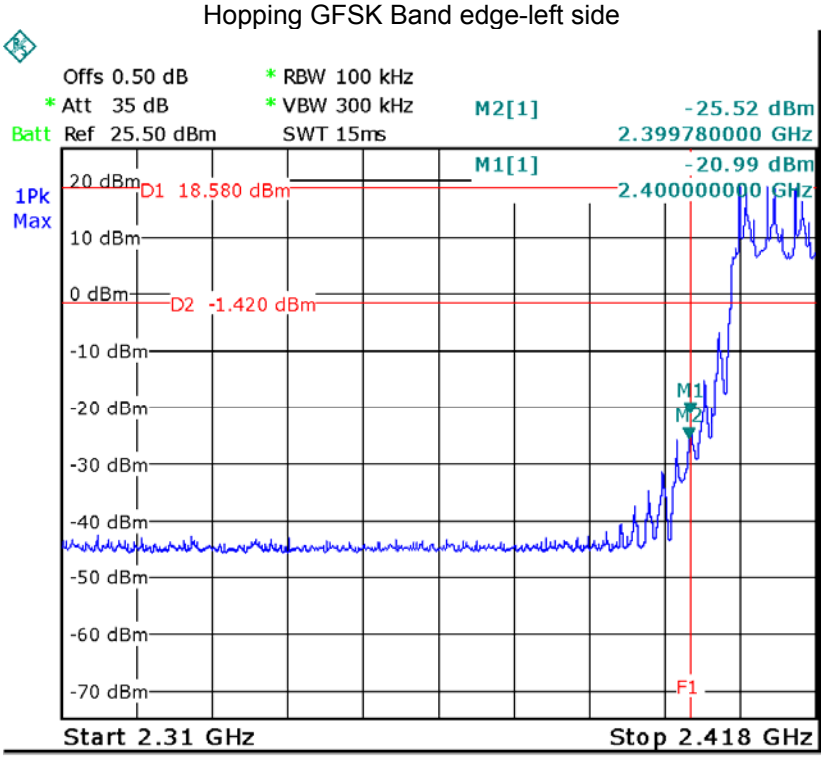
Transmitting GFSK Band edge-left side



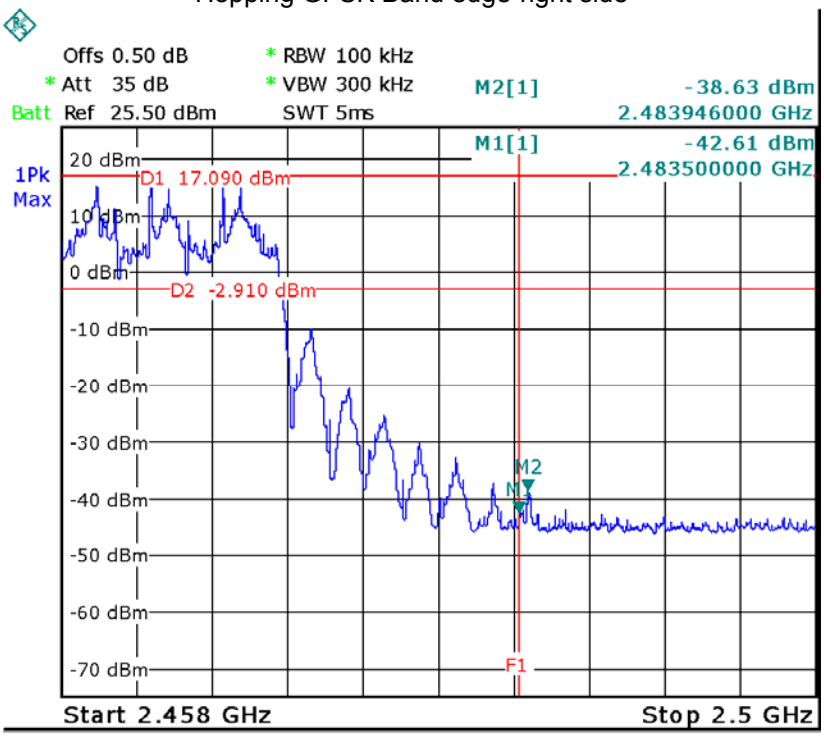
Transmitting GFSK Band edge-right side



Hopping GFSK Band edge-left side

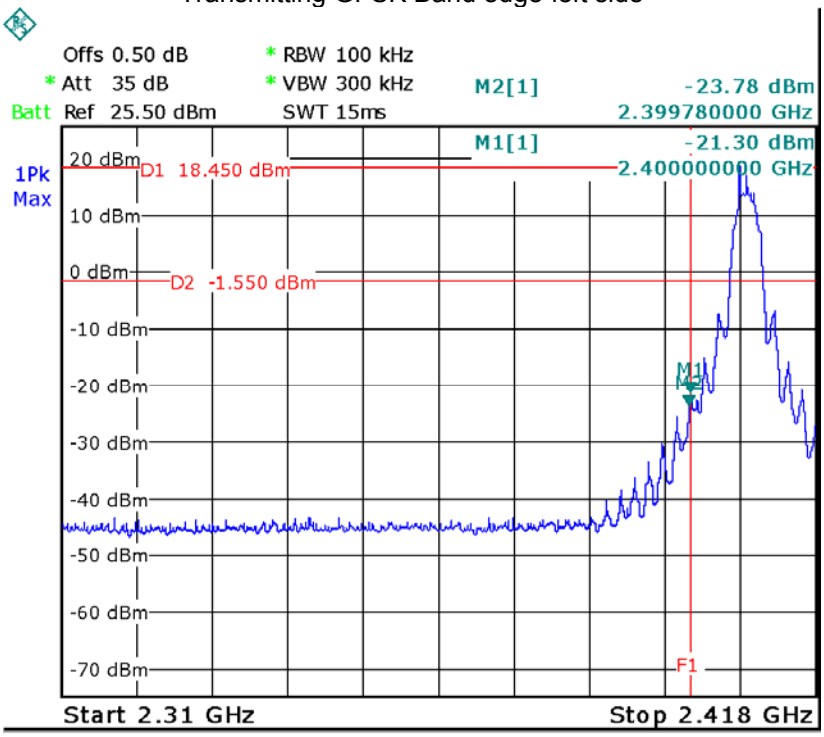


Hopping GFSK Band edge-right side

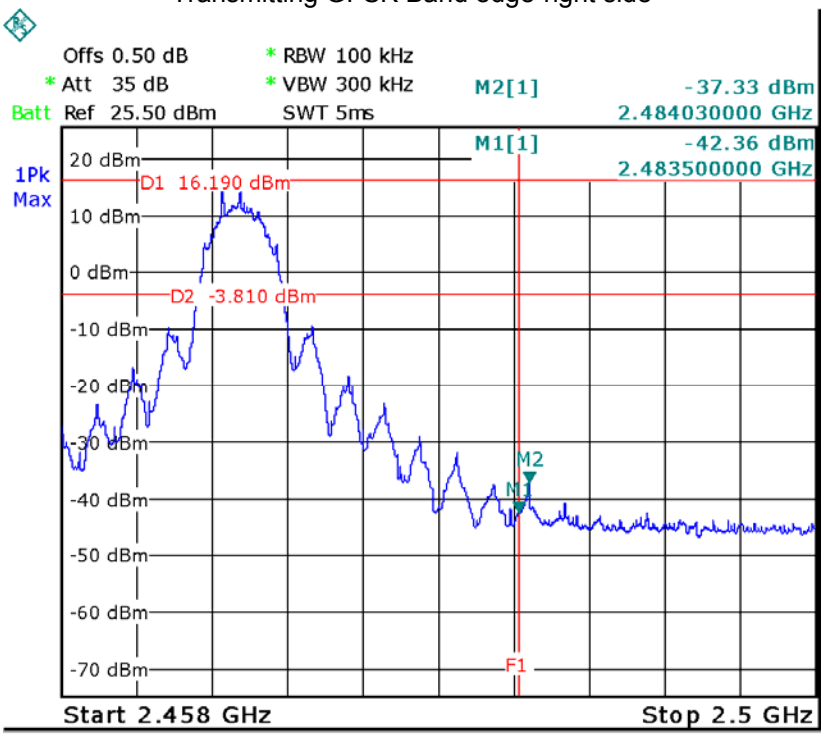


RF module 2

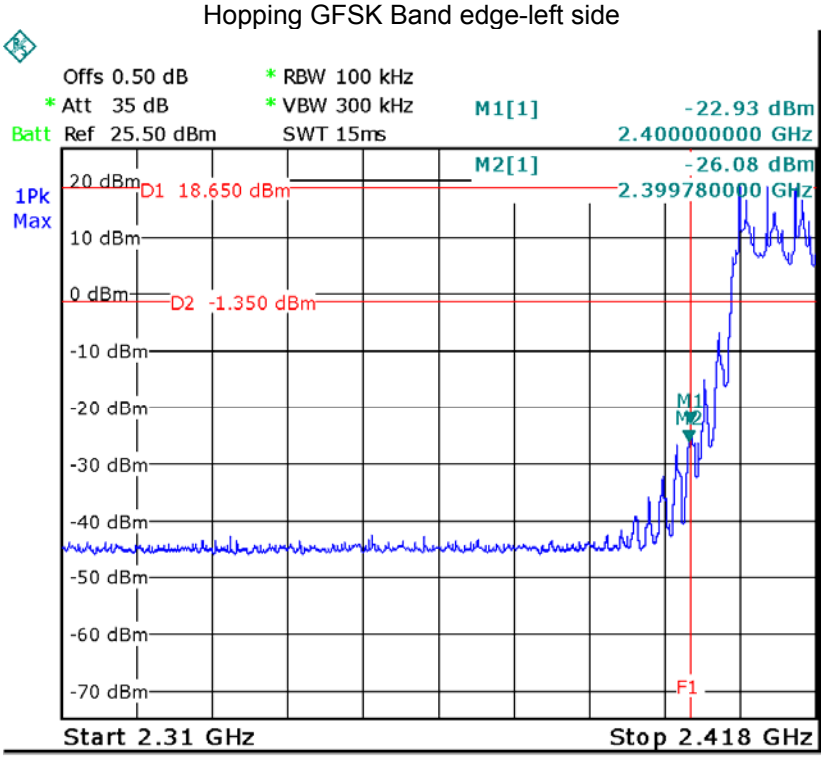
Transmitting GFSK Band edge-left side



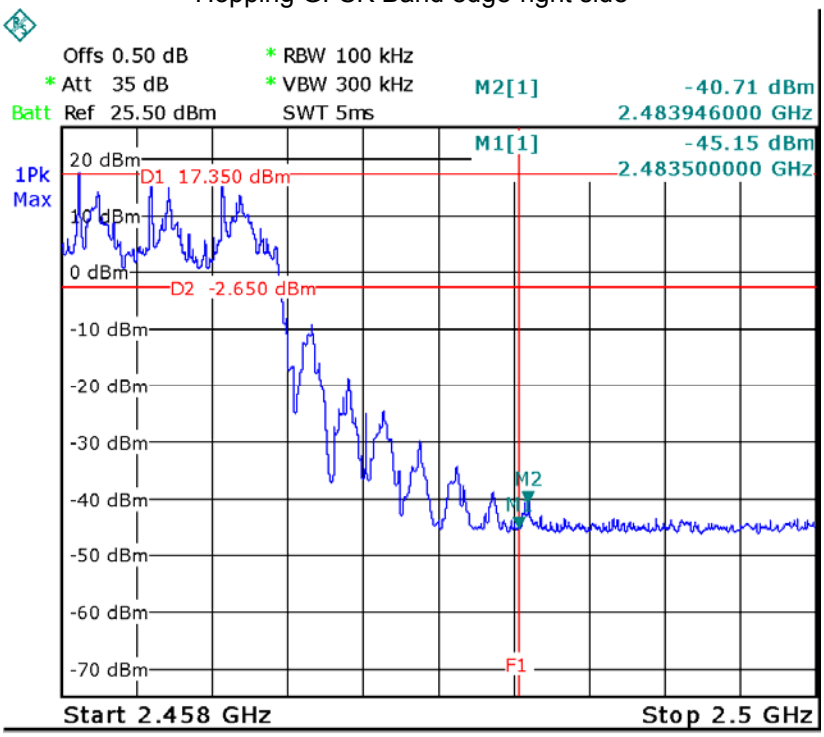
Transmitting GFSK Band edge-right side



Hopping GFSK Band edge-left side



Hopping GFSK Band edge-right side



9 20 dB Bandwidth Measurement

Test Requirement: FCC CFR47 Part 15 Section 15.247

Test Method: DA 00-705

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

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

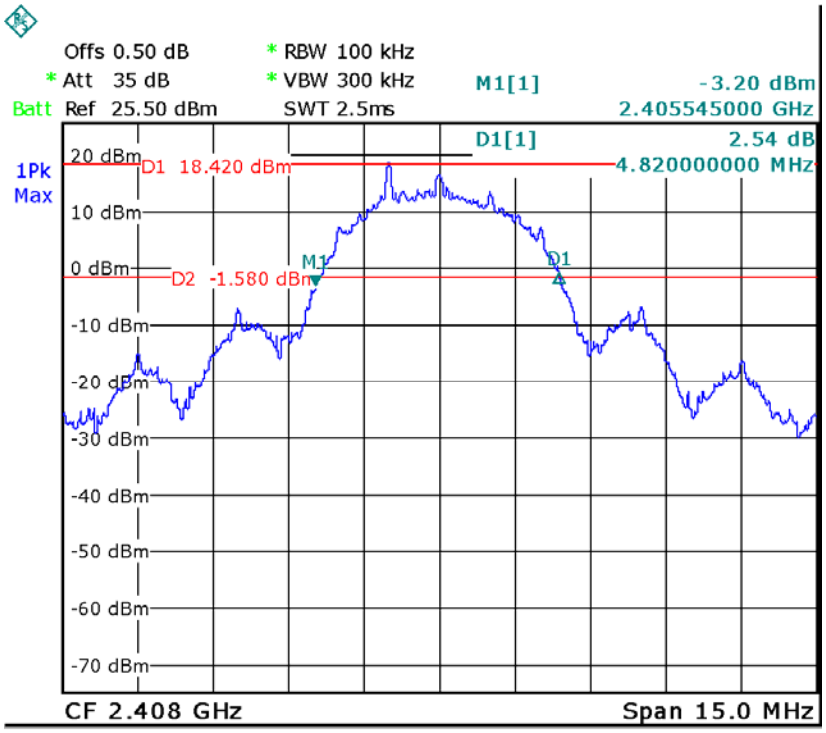
9.2 Test Result

20dB Bandwidth(MHz)					
Low channel		Middle channel		High channel	
RF module 1	RF module 2	RF module 1	RF module 2	RF module 1	RF module 2
4.820	4.820	4.820	4.820	4.820	4.820

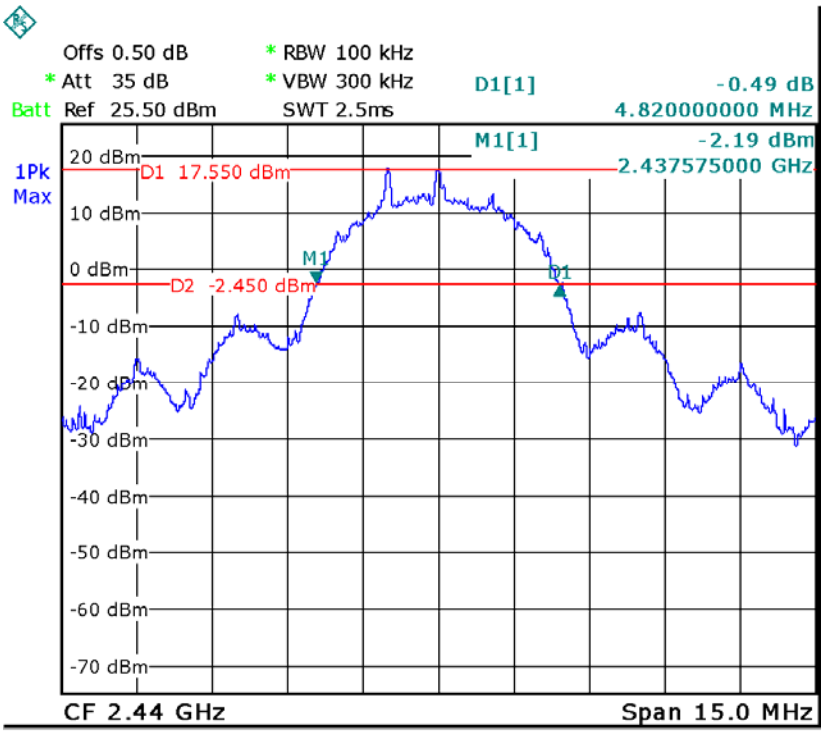
Test plots

RF module 1

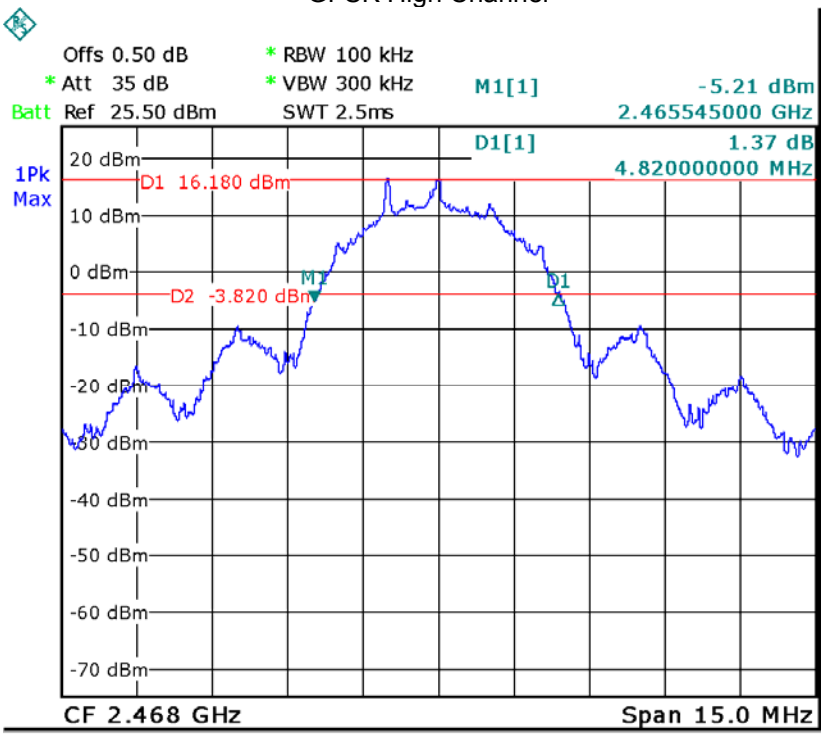
GFSK Low Channel



GFSK Middle Channel

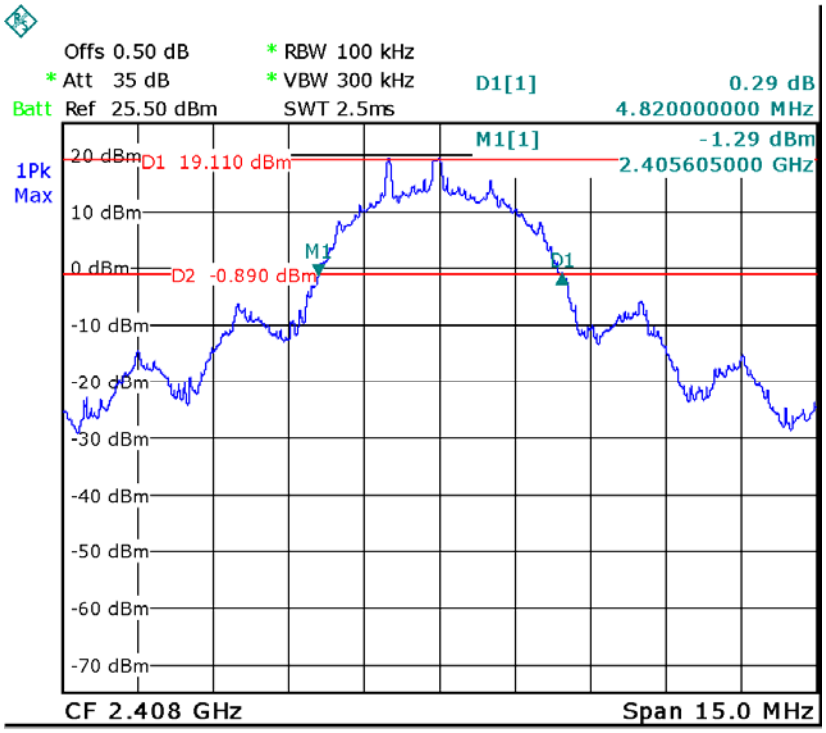


GFSK High Channel

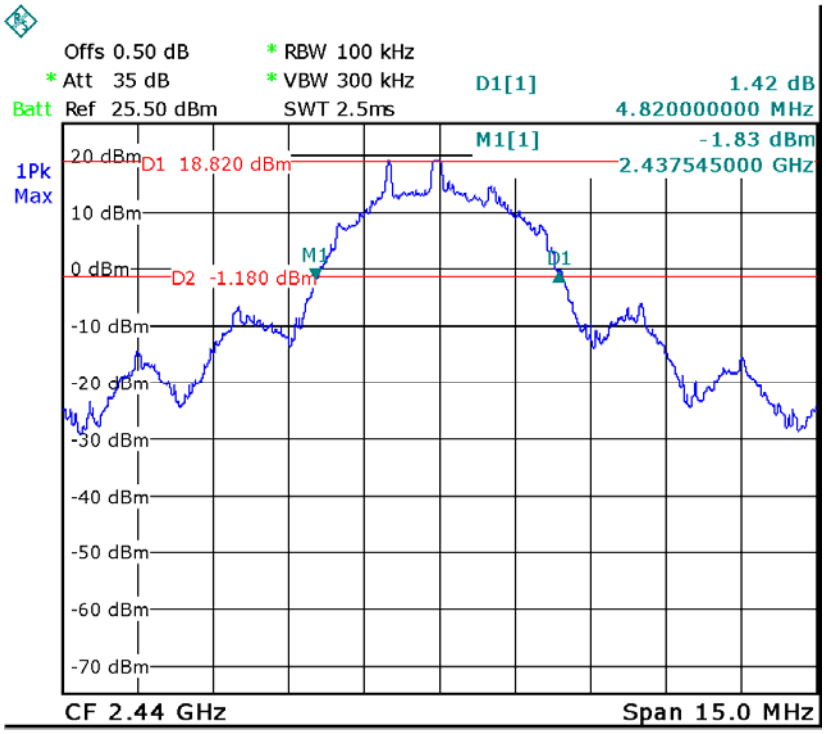


RF module 2

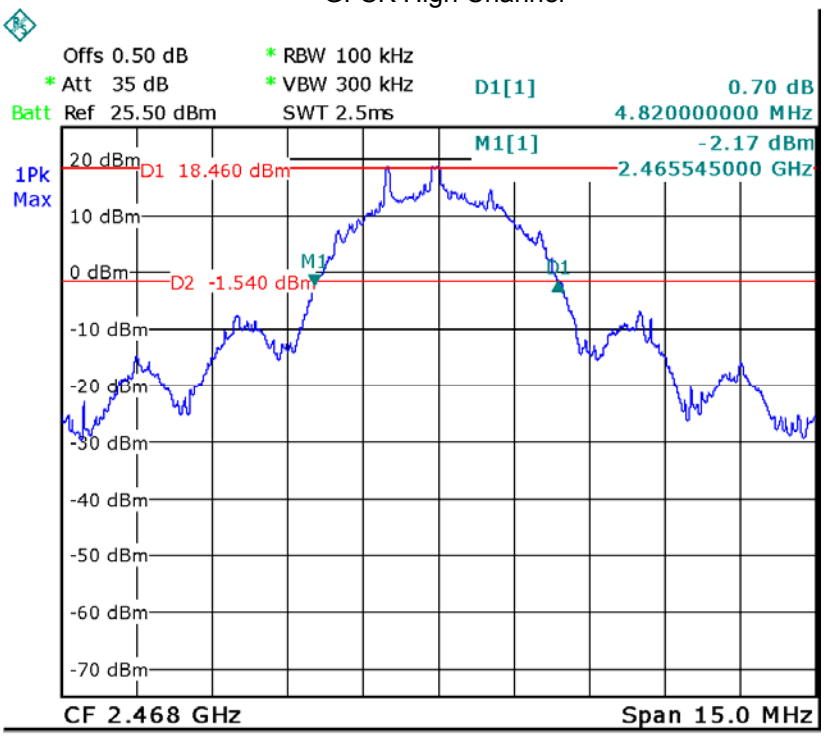
GFSK Low Channel



GFSK Middle Channel



GFSK High Channel



10 Maximum Peak Output Power

Test Requirement: FCC CFR47 Part 15 Section 15.247

Test Method: DA 00-705

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.

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 = 10 MHz. VBW =10 MHz. Sweep = auto; Detector Function = Peak.
3. Keep the EUT in transmitting at lowest, medium and highest channel individually. Record the max value.

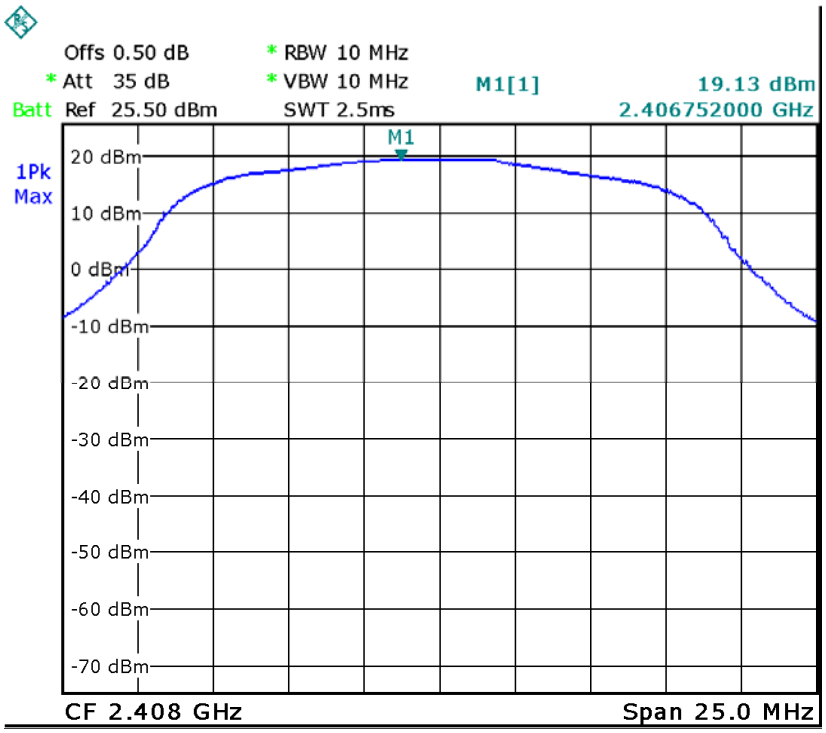
10.2 Test Result

Peak Output Power(dBm)					
Low channel		Middle channel		High channel	
RF module 1	RF module 2	RF module 1	RF module 2	RF module 1	RF module 2
19.13	18.39	18.88	17.57	18.44	16.21
≤20.97dBm					

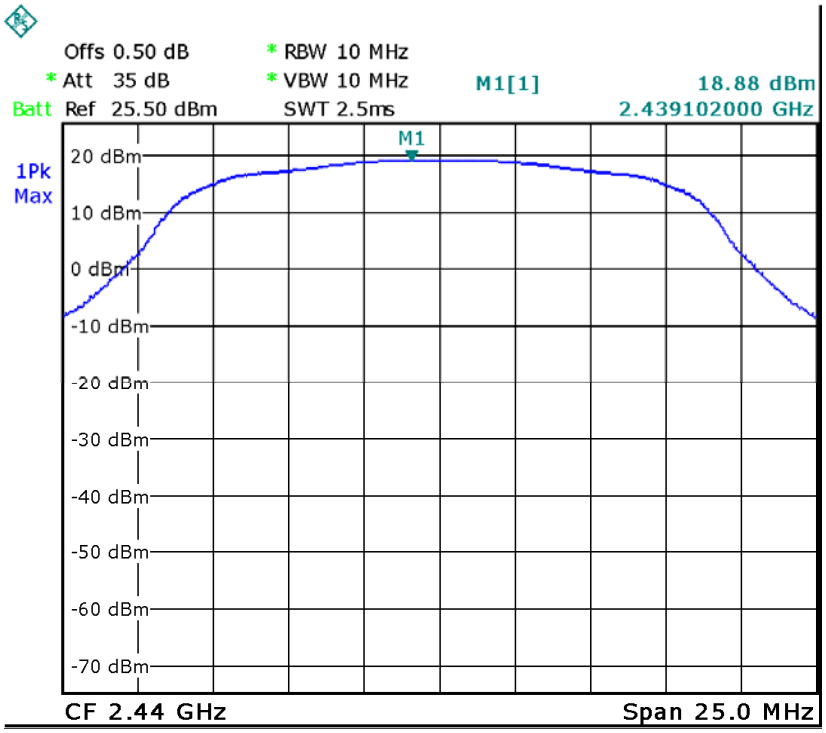
Test plots

RF module 1

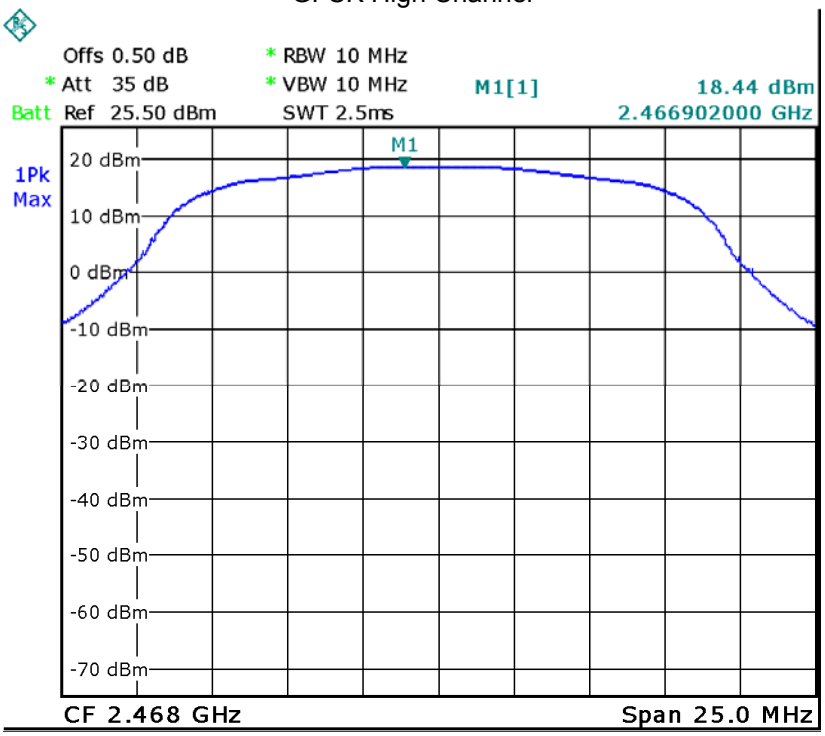
GFSK Low Channel



GFSK Middle Channel

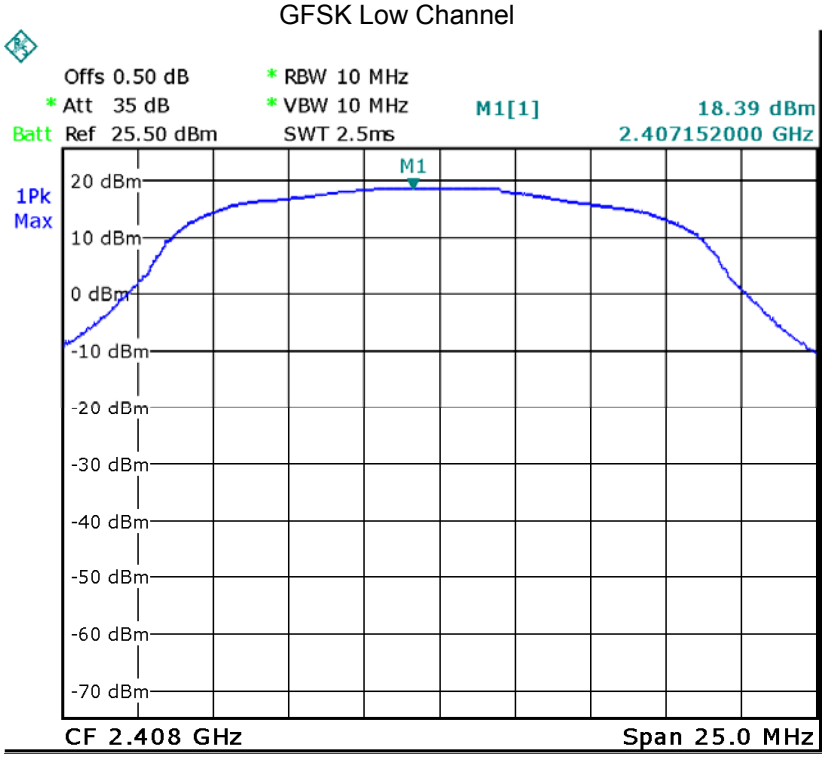


GFSK High Channel

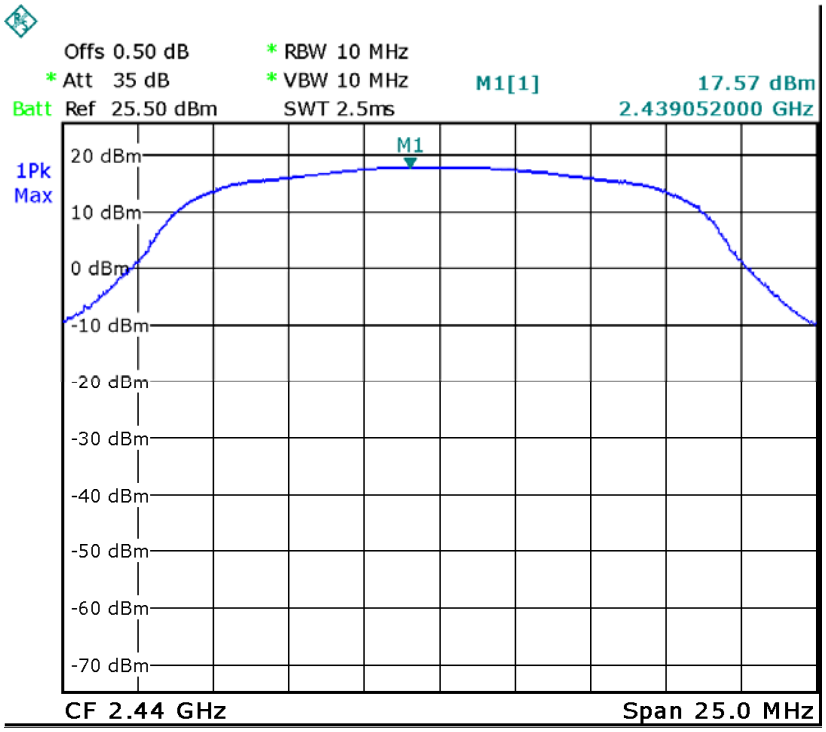


RF module 2

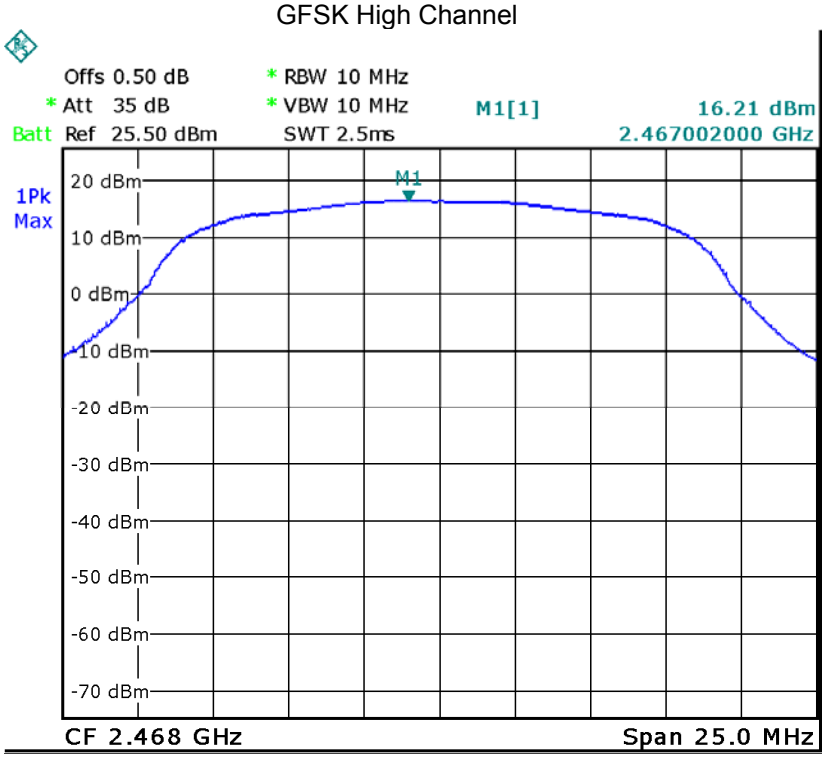
GFSK Low Channel



GFSK Middle Channel



GFSK High Channel



11 Hopping Channel Separation

Test Requirement: FCC CFR47 Part 15 Section 15.247

Test Method: DA 00-705

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.

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 = 100KHz. VBW = 300KHz , Span = 10.0MHz. 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.

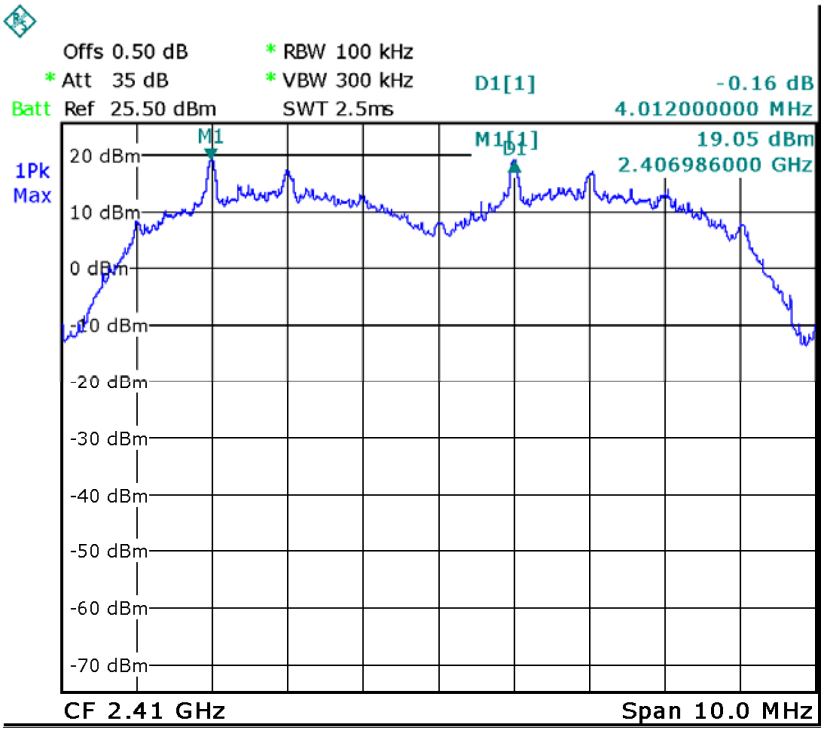
11.2 Test Result

Test Channel		Separation (MHz)	Limit(MHz)
Low Channel	RF module 1	4.012	≥3.213
	RF module 2	4.012	≥3.213
Middle Channel	RF module 1	4.012	≥3.213
	RF module 2	4.012	≥3.213
High Channel	RF module 1	4.012	≥3.213
	RF module 2	4.012	≥3.213

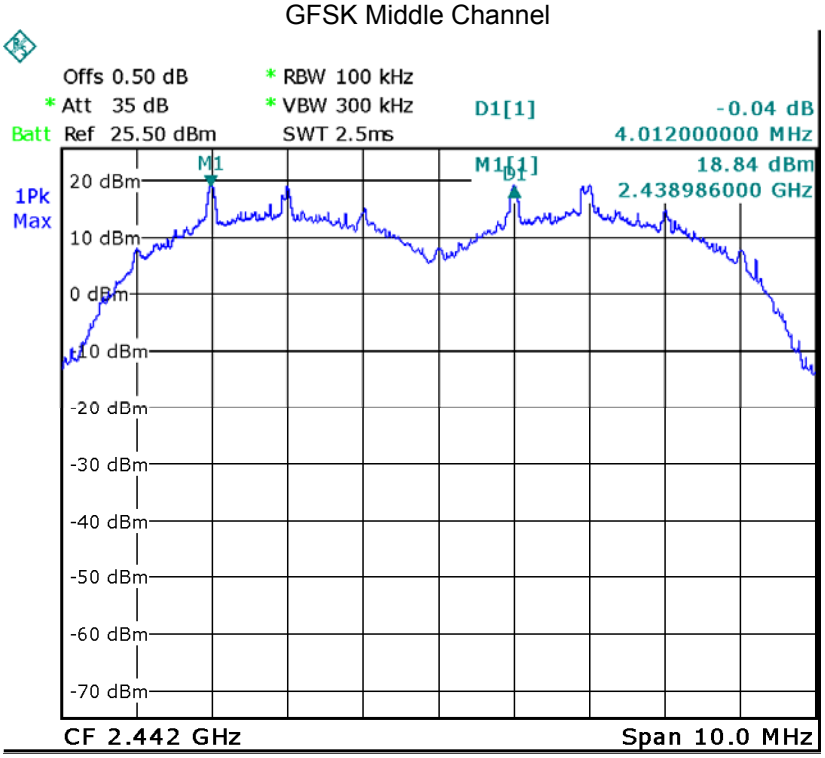
Test plots

RF module 1

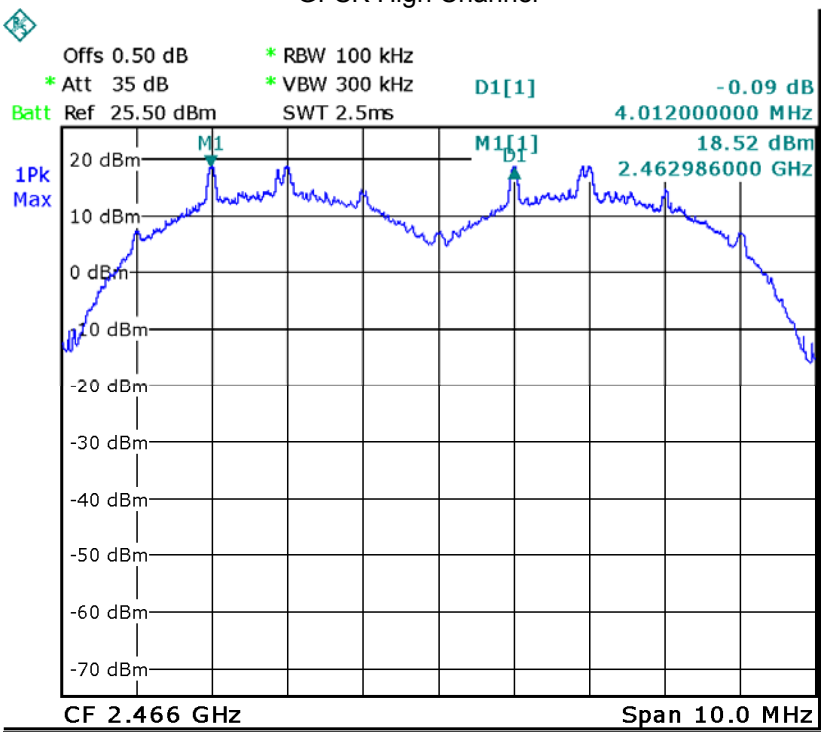
GFSK Low Channel



GFSK Middle Channel

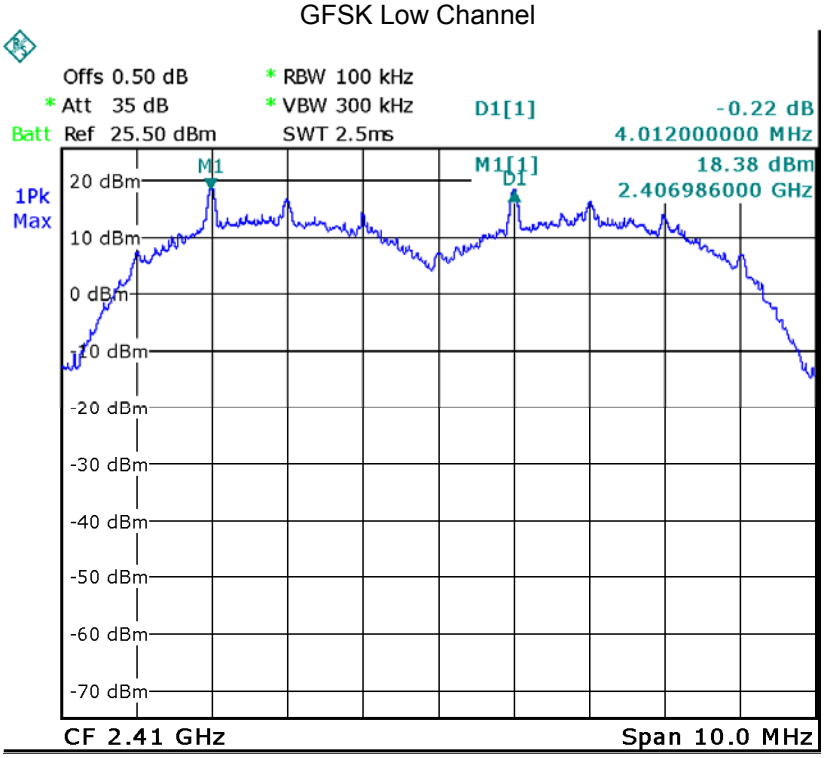


GFSK High Channel

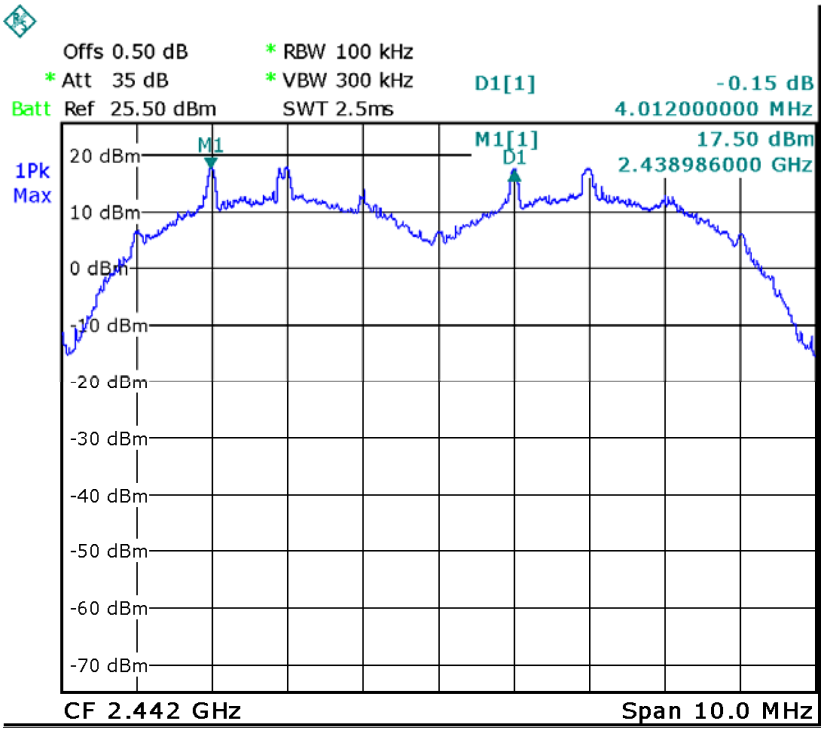


RF module 2

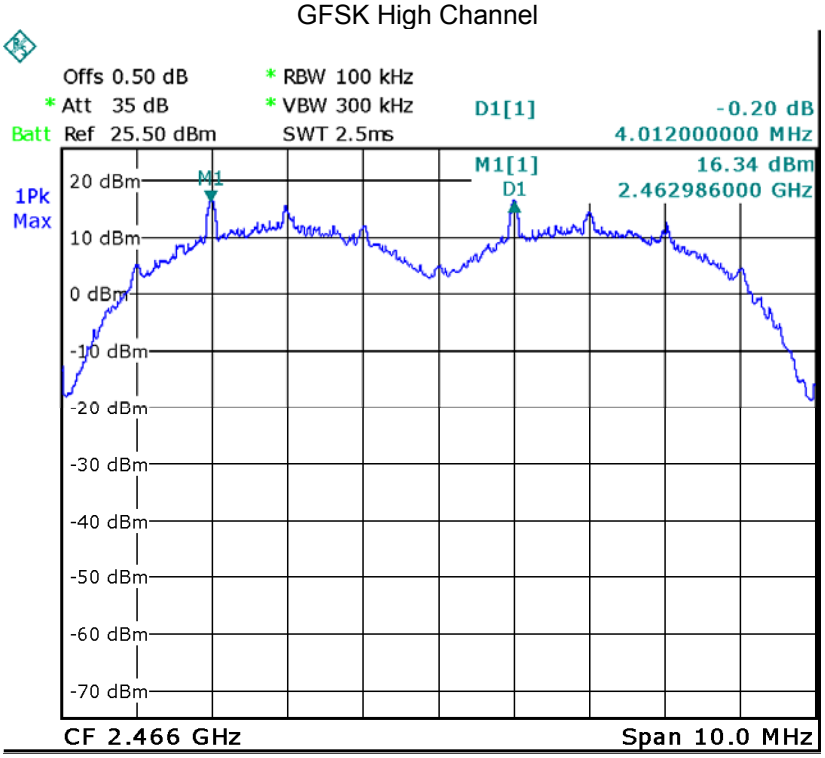
GFSK Low Channel



GFSK Middle Channel



GFSK High Channel



12 Number of Hopping Frequency

Test Requirement:	FCC CFR47 Part 15 Section 15.247
Test Method:	DA 00-705
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.

12.1 Test Procedure

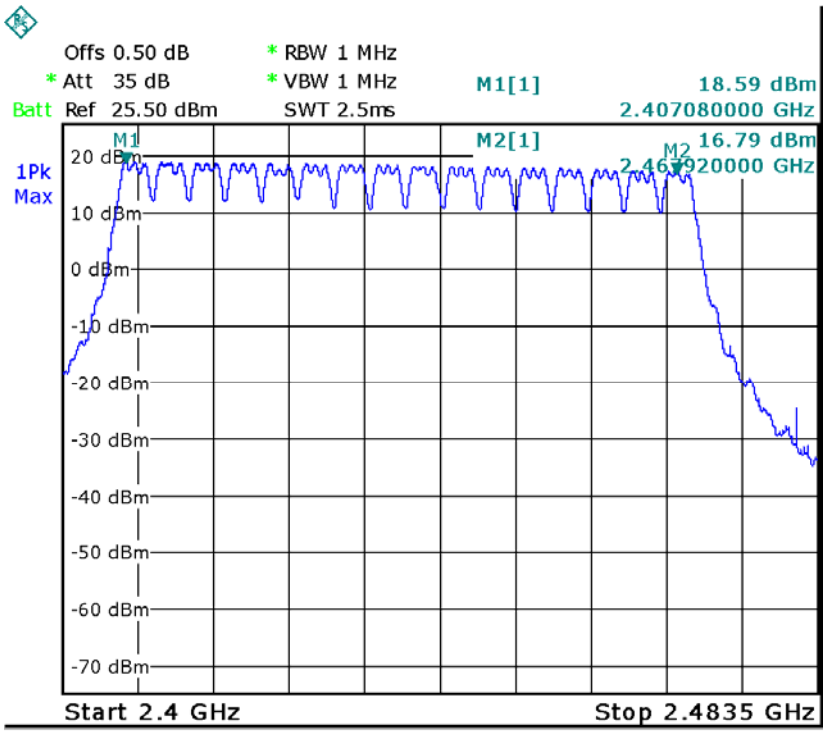
1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.
2. Set the spectrum analyzer: RBW = 1MHz. VBW = 1MHz. Sweep = auto; Detector Function = Peak. Trace = Max hold.
3. Allow the trace to stabilize. It may prove necessary to break the span up to sections. 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 =2.4835GHz. Sweep=auto;

12.2 Test Result

Test Plots

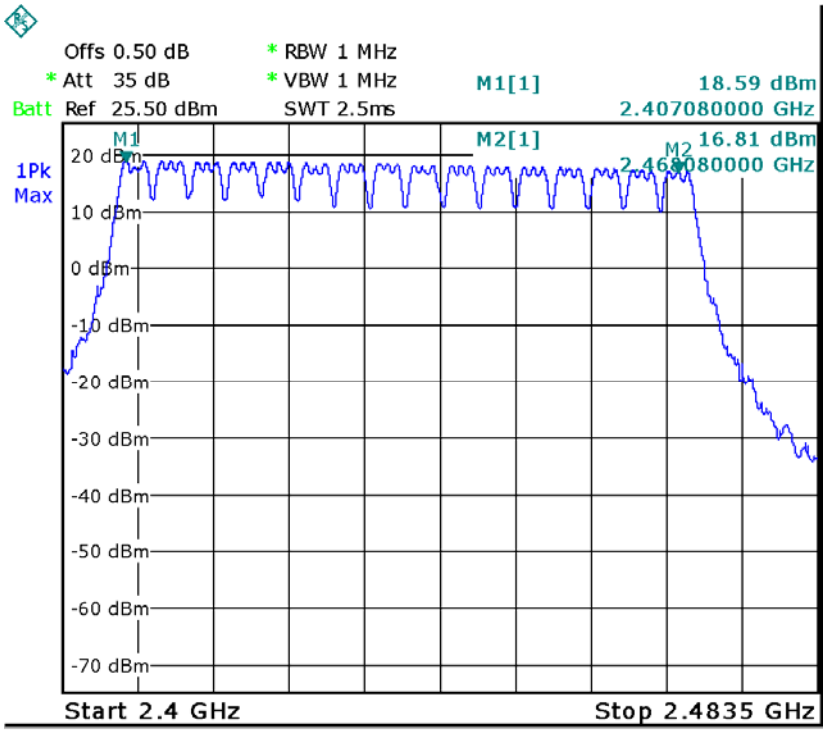
RF module 1

16 Channels in total



RF module 2

16 Channels in total



13 Dwell Time

Test Requirement: FCC CFR47 Part 15 Section 15.247

Test Method: DA 00-705

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.

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 spectrum analyzer span = 0. Centred on a hopping channel;

3. Set RBW = 1MHz and VBW = 3MHz.Sweep = as necessary to capture the entire dwell time per hopping channel. Set the EUT for DH5, DH3 and DH1 packet transmitting.

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).

13.2 Test Result

The test period: T= 0.4(s) * 16 =6.4(s)

So, the Dwell Time can be calculated as follows:

$$T = T_{on} * 1s / T_{period} * 0.4s * N_{channels} \leq 0.4s$$

T: dwell time

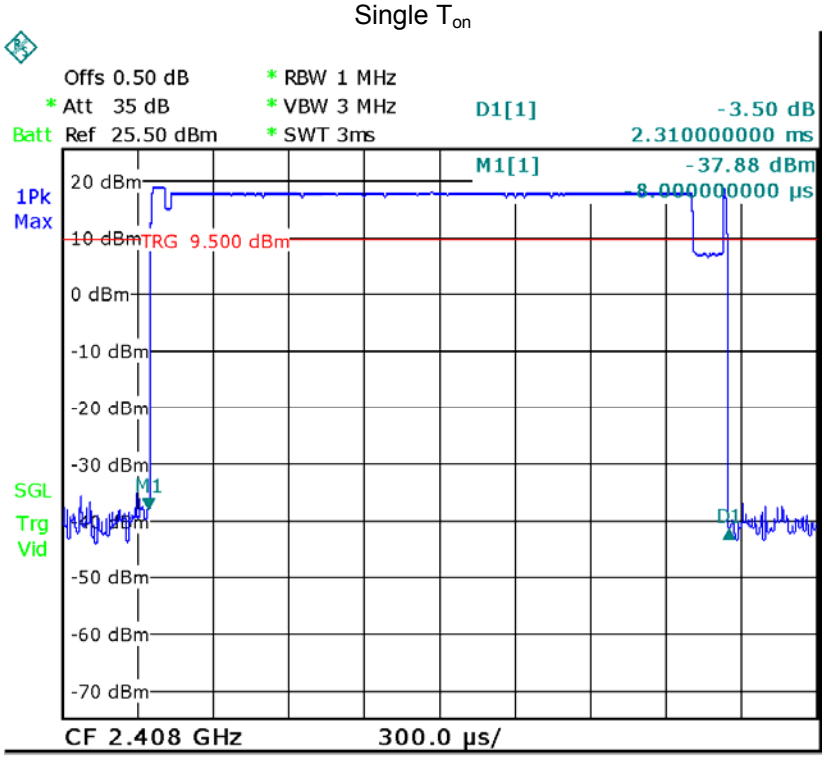
T_{on}: total occupied time of transmission in a period

T_{period}: single hopping channel period

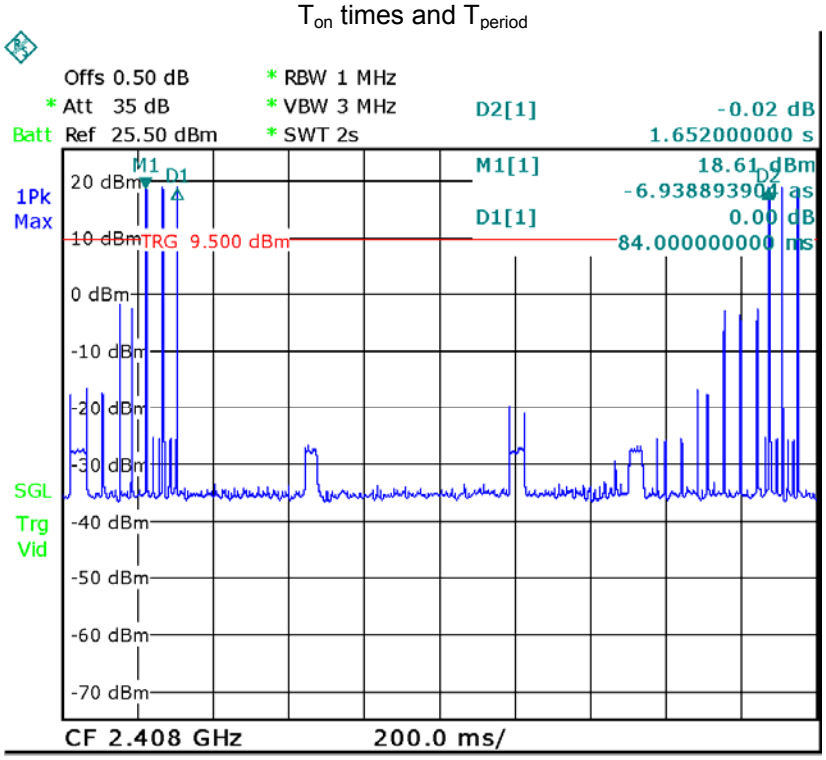
$N_{channels}$: number of hopping channel

ANT. port	Channel	T_{on} (ms)	T_{period} (ms)	$N_{channels}$	T(s)	Limit(s)
RF module 1	Low	6.93	1652	16	0.027	≤0.4
	middle	7.02	1624	16	0.028	≤0.4
	High	6.93	1648	16	0.027	≤0.4
RF module 2	Low	6.96	1644	16	0.027	≤0.4
	middle	6.96	1636	16	0.027	≤0.4
	High	6.96	1630	16	0.027	≤0.4

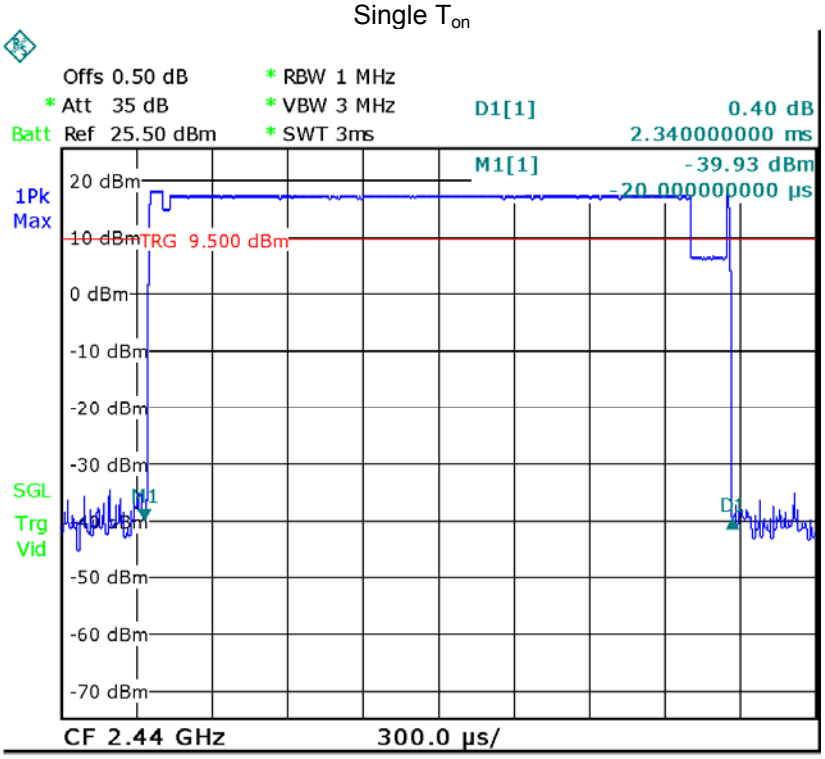
Test Plots
RF module 1
Low Channel
Single T_{on}



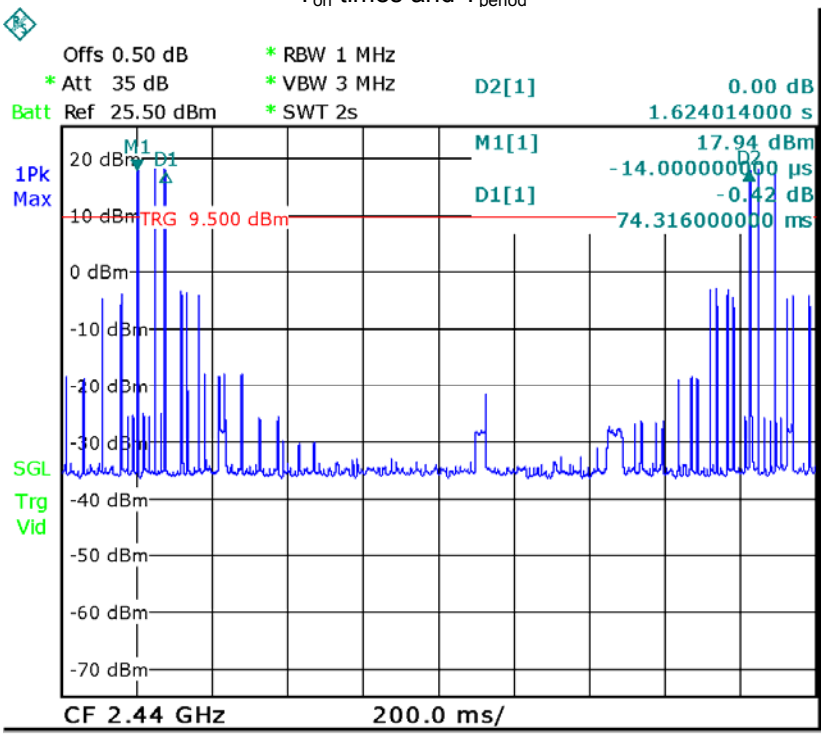
T_{on} times and T_{period}



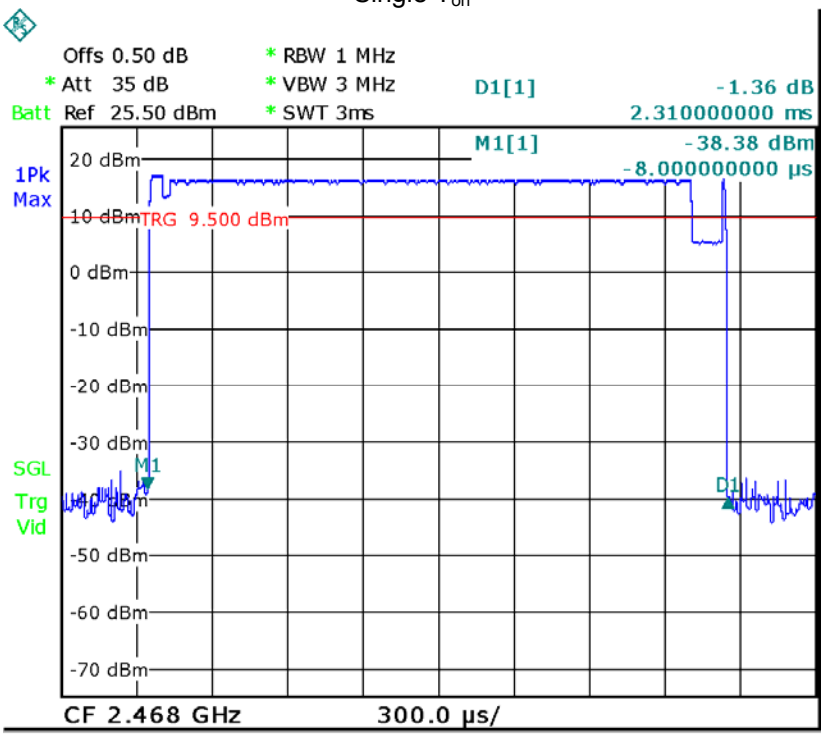
Middle Channel
Single T_{on}



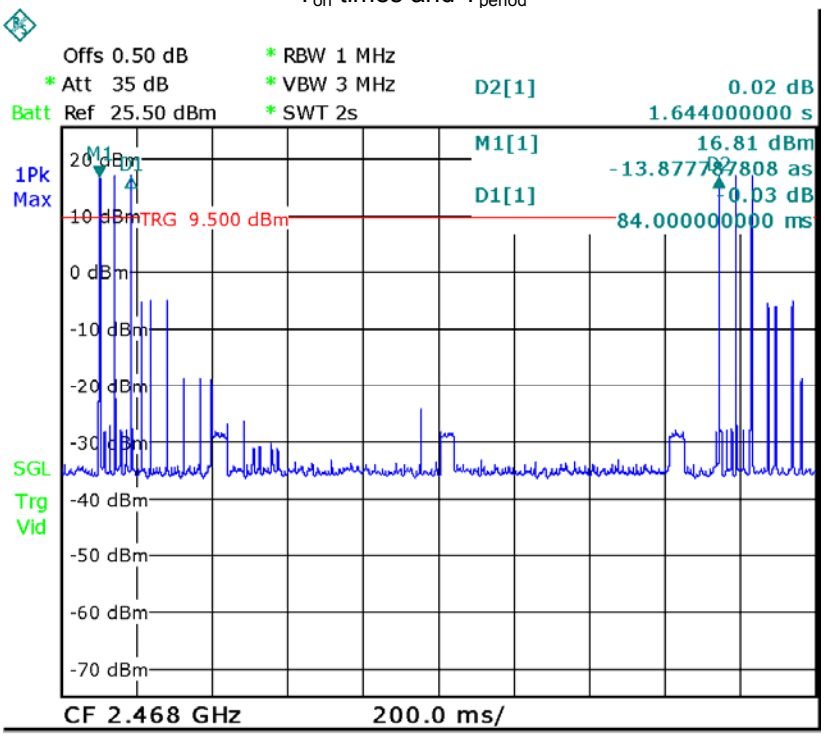
T_{on} times and T_{period}



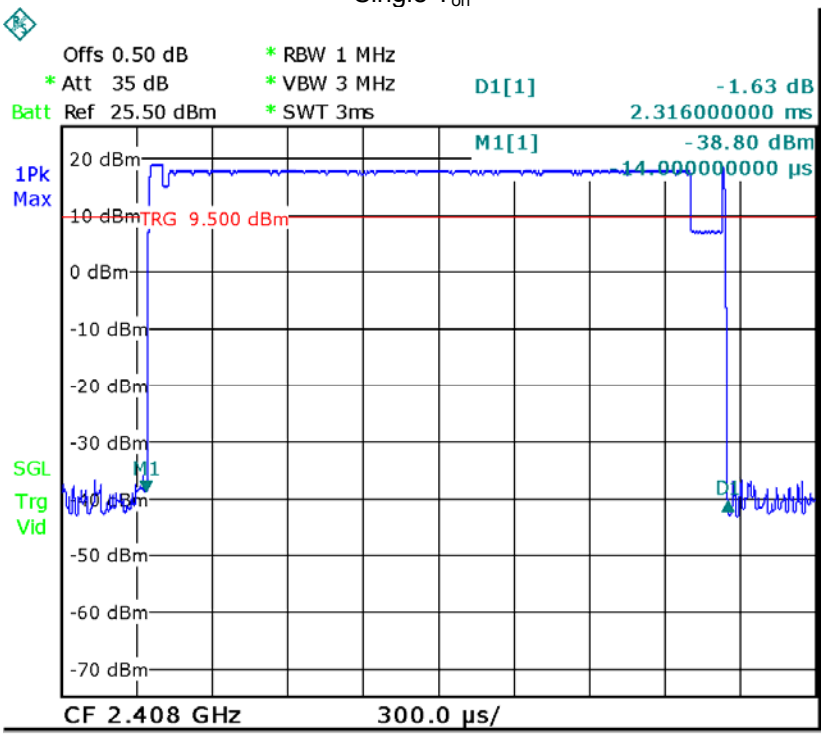
High Channel
Single T_{on}



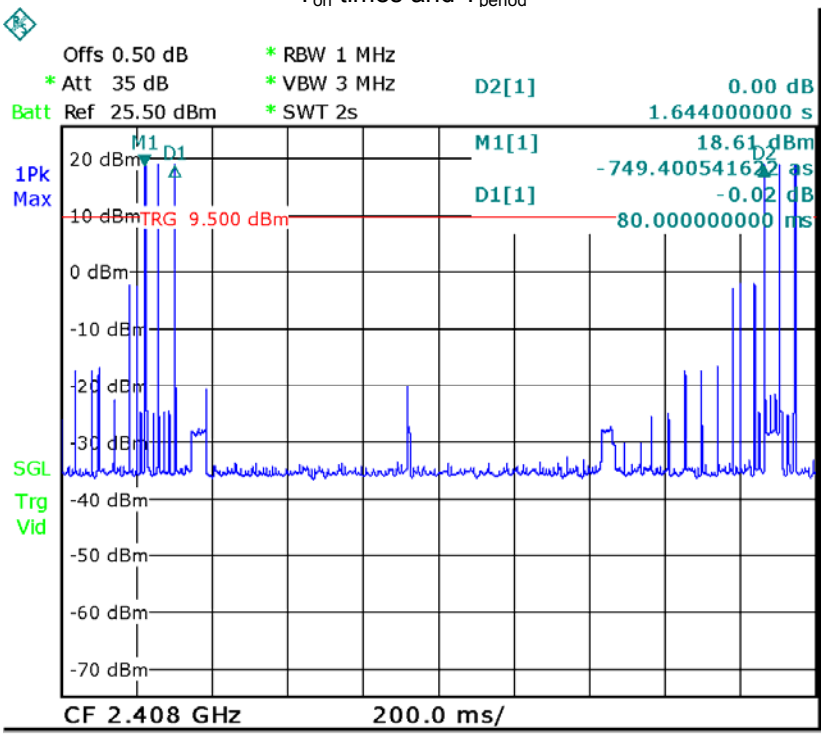
T_{on} times and T_{period}



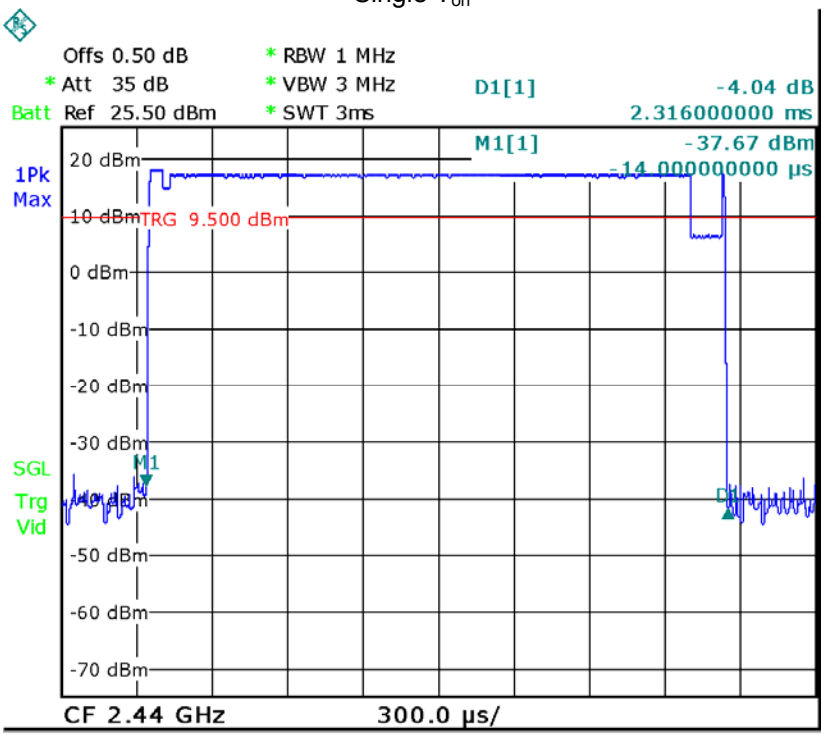
RF module 2
Low Channel
Single T_{on}



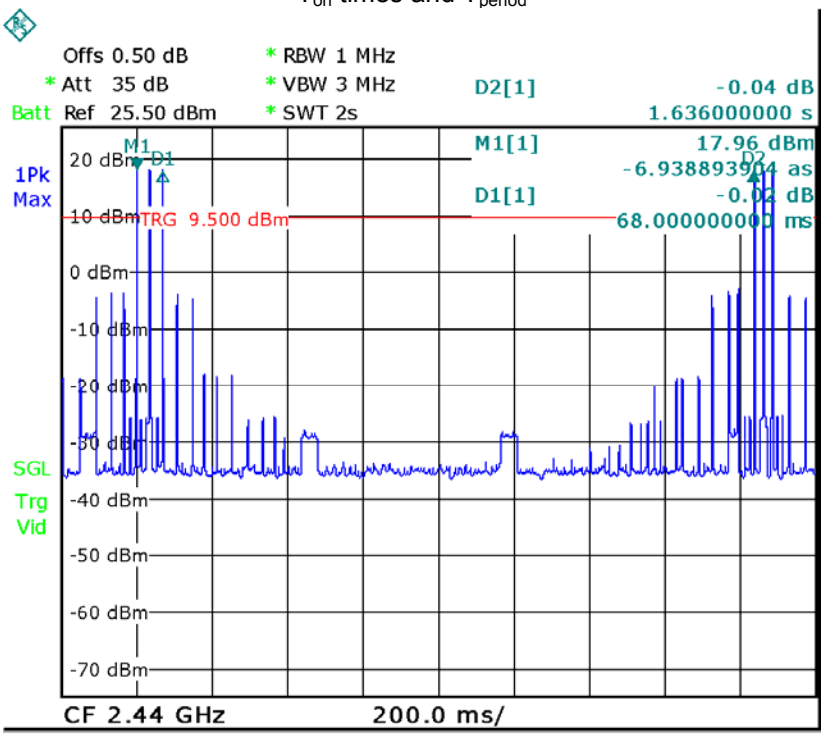
T_{on} times and T_{period}



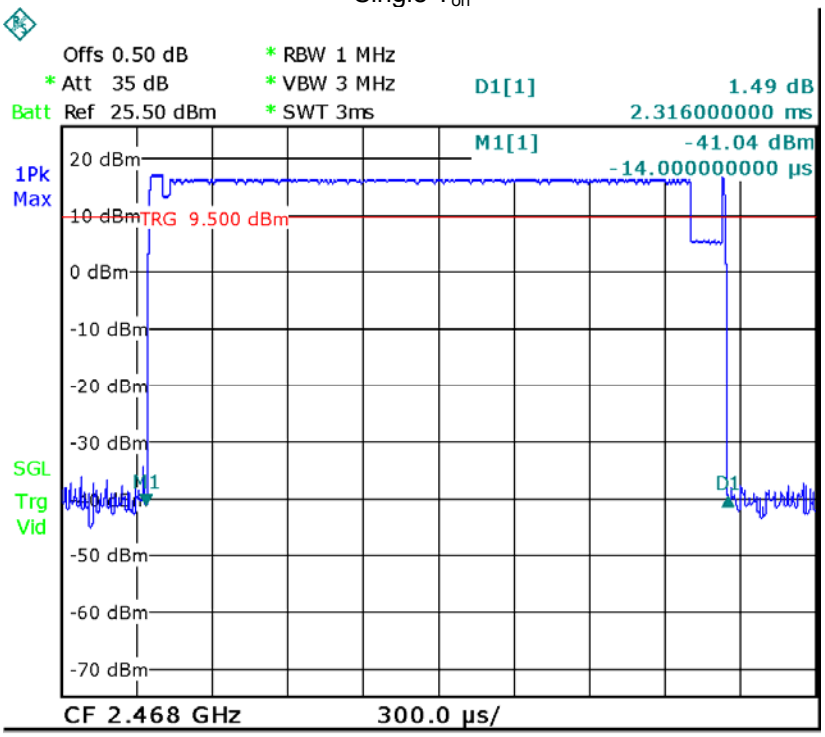
Middle Channel
Single T_{on}



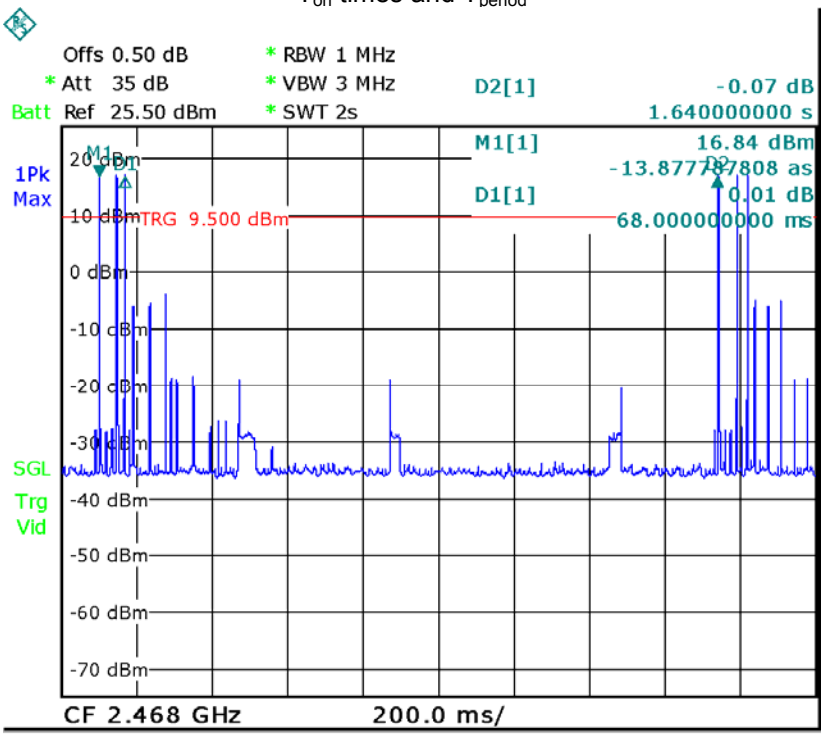
T_{on} times and T_{period}



High Channel
Single T_{on}



T_{on} times and T_{period}



14 Antenna Requirement

According to the FCC Part 15 Paragraph 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. This product has a Monopole antenna , fulfil the requirement of this section.

15 RF Exposure

Test Requirement: FCC Part 1.1307

Evaluation Method: FCC Part 2.1091

15.1 Requirements

Systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess limit for maximum permissible exposure. In accordance with 47 CFR FCC Part 2 Subpart J, section 2.1091 this device has been defined as a mobile device whereby a distance of 0.2 m normally can be maintained between the user and the device.

15.2 The procedures / limit

(A) Limits for Occupational / Controlled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/ cm^2)	Averaging Time $\|E\|^2$,$\|H\|^2$or S (minutes)
0.3-3.0	614	1.63	(100)*	6
3.0-30	1842 / f	4.89 / f	(900 / f)*	6
30-300	61.4	0.163	1.0	6
300-1500			F/300	6
1500-100,000			5	6

(B) Limits for General Population / Uncontrolled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/ cm^2)	Averaging Time $\|E\|^2$,$\|H\|^2$ or S (minutes)
0.3-1.34	614	1.63	(100)*	30
1.34-30	824/f	2.19/f	(180/f)*	30
30-300	27.5	0.073	0.2	30
300-1500			F/1500	30
1500-100,000			1.0	30

Note: f = frequency in MHz ; *Plane-wave equivalent power density

15.3 MPE Calculation Method

$$\text{E (V/m)} = \frac{\sqrt{30 \times P \times G}}{d} \qquad \text{Power Density: } Pd \text{ (W/m²)} = \frac{E^2}{377}$$

E = Electric field (V/m)
P = Peak RF output power (W)
G = EUT Antenna numeric gain (numeric)
d = Separation distance between radiator and human body (m)
The formula can be changed to

$$\boldsymbol{Pd} = \frac{30 \times P \times G}{377 \times d^2}$$

From the peak EUT RF output power, the minimum mobile separation distance, d=0.2m, as well as the gain of the used antenna, the RF power density can be obtained

RF Module	Antenna Gain		Conducted Power		Evaluation Distance(cm)	Power Density (mW/cm2)	MPE Limit (mW/cm2)
	(dBi)	(numeric)	(dBm)	(mW)			
1	2	1.58	19.13	81.85	20	0.0258	1.0
2	2	1.58	18.39	69.02	20	0.0218	1.0

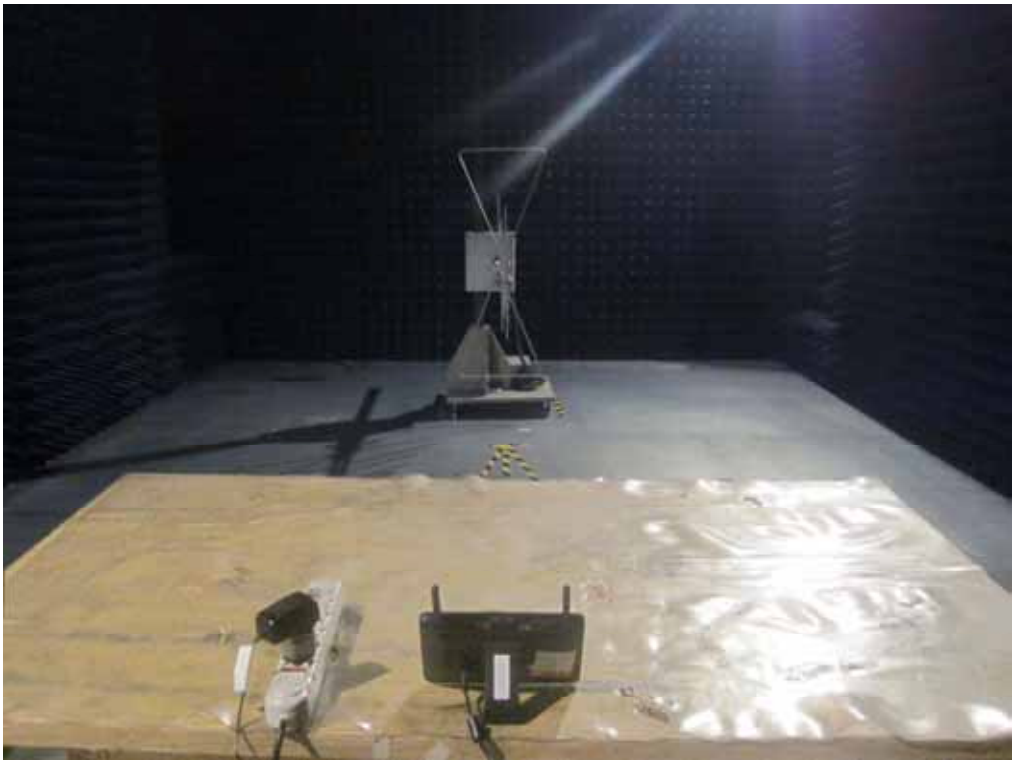
16 Photographs –Model UDR744HD Test Setup

16.1 Photograph – Conducted Emission Test Setup

16.2 Photograph – Radiation Spurious Emission Test Setup

Below 30MHz

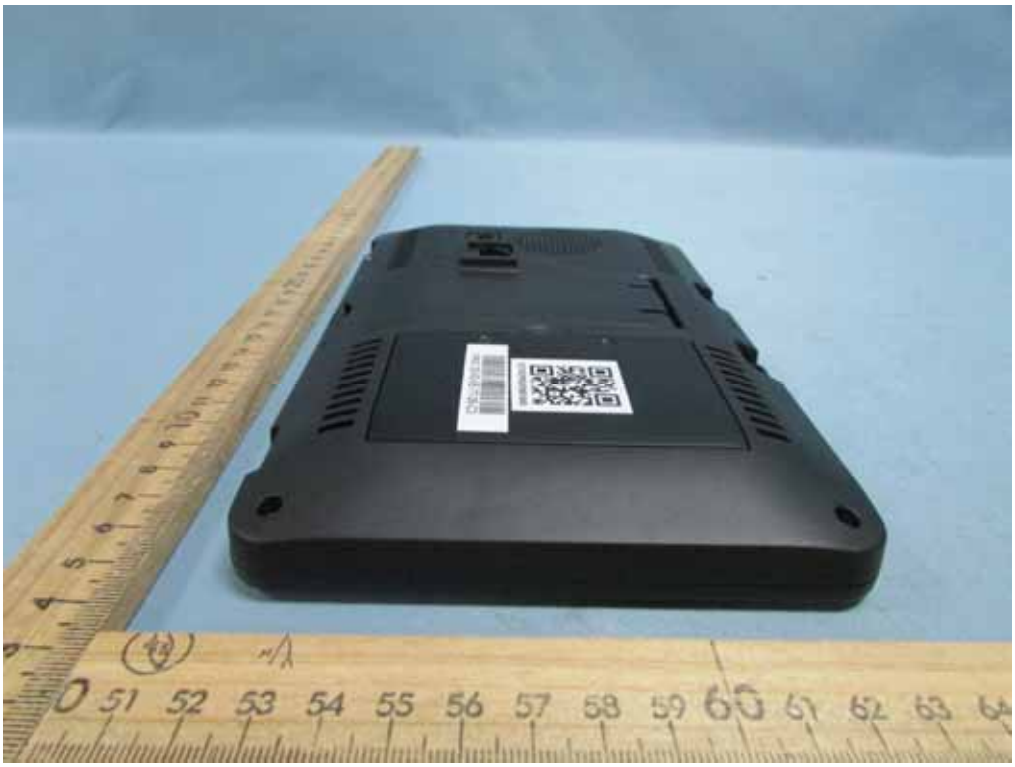
30MHz-1GHz



Above 1GHz

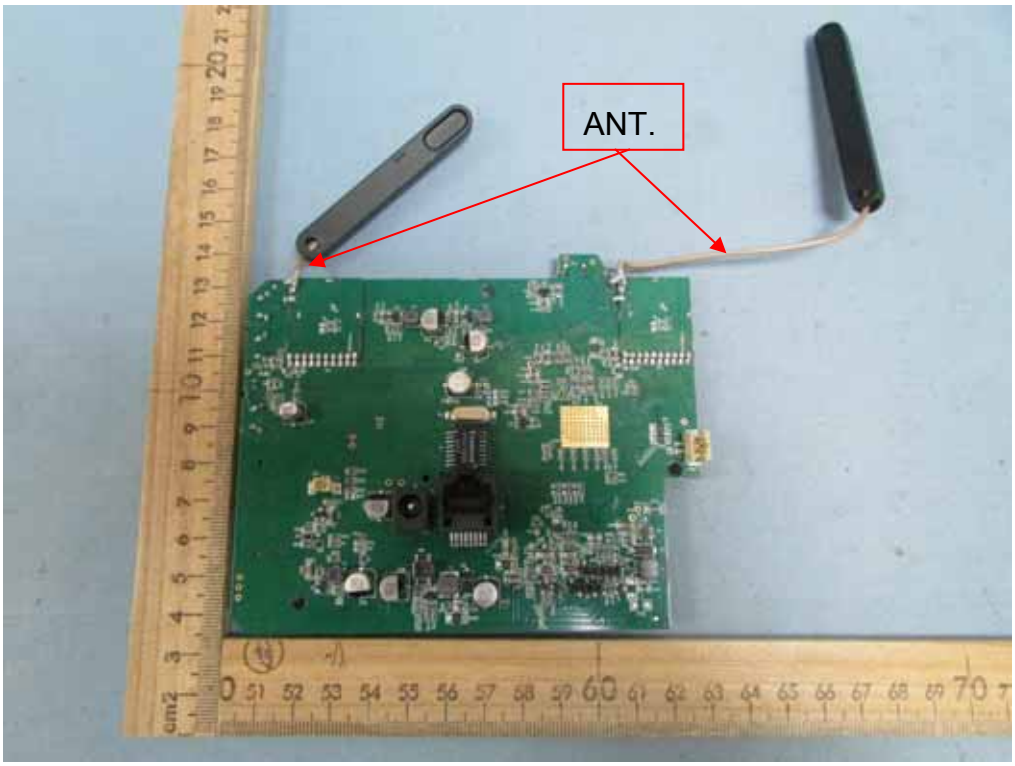
17 Photographs - Constructional Details

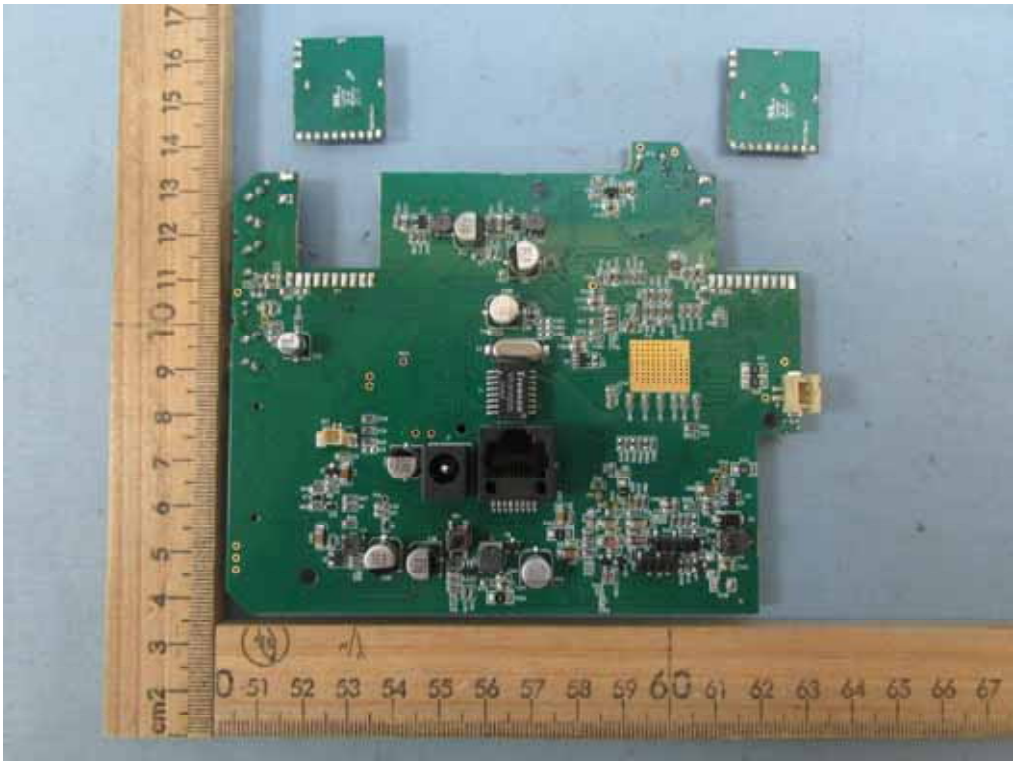
17.1 Model UDR744HD External View

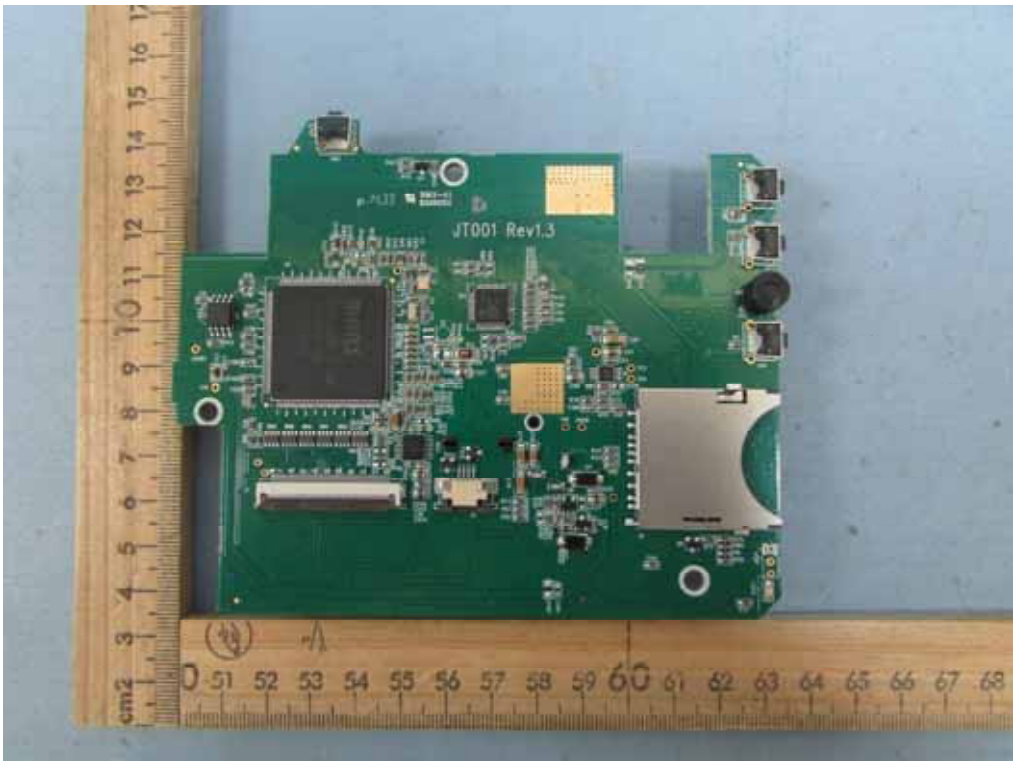


17.2 Model UDR744HD Internal View

Battery position

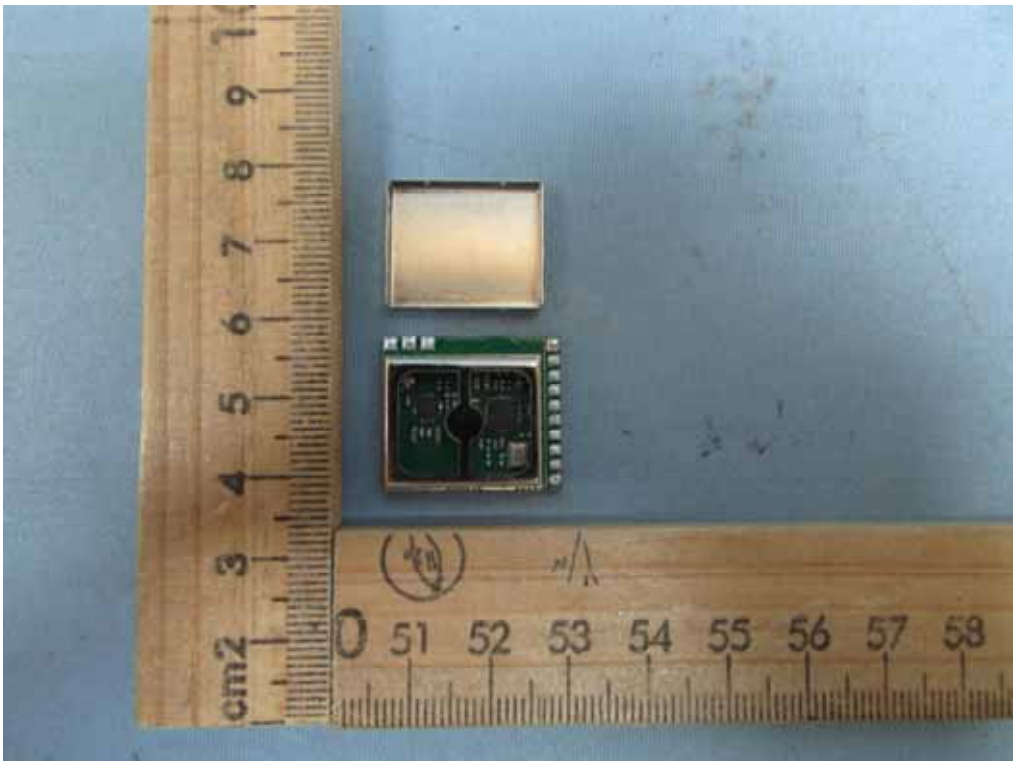

ANT.

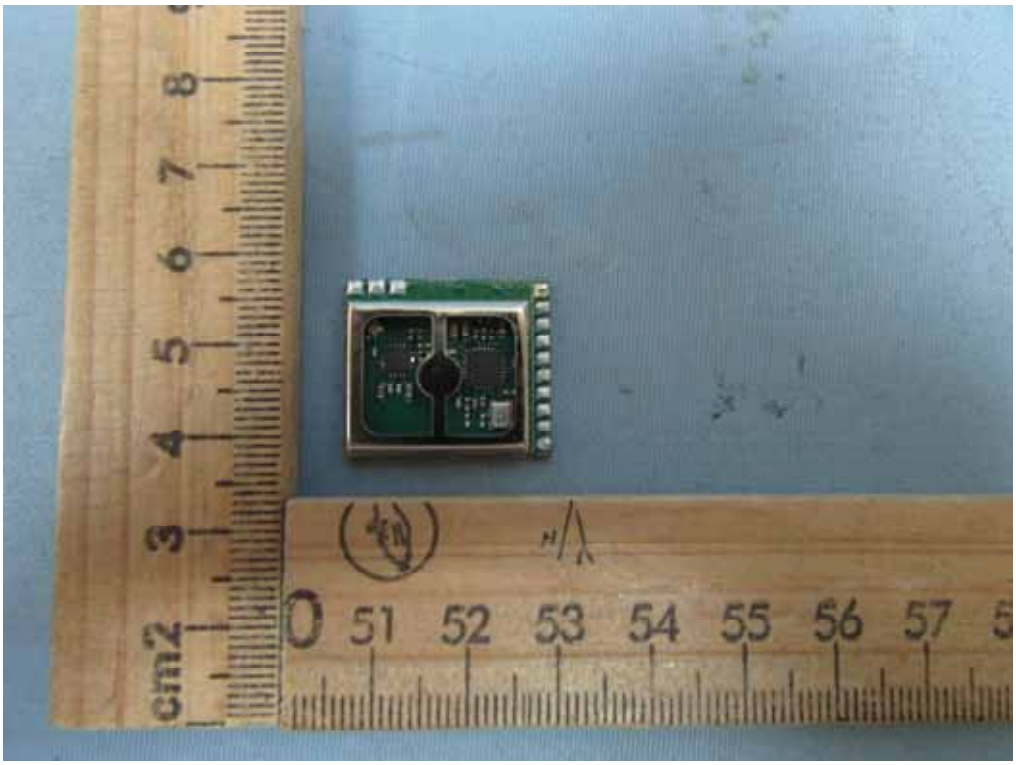


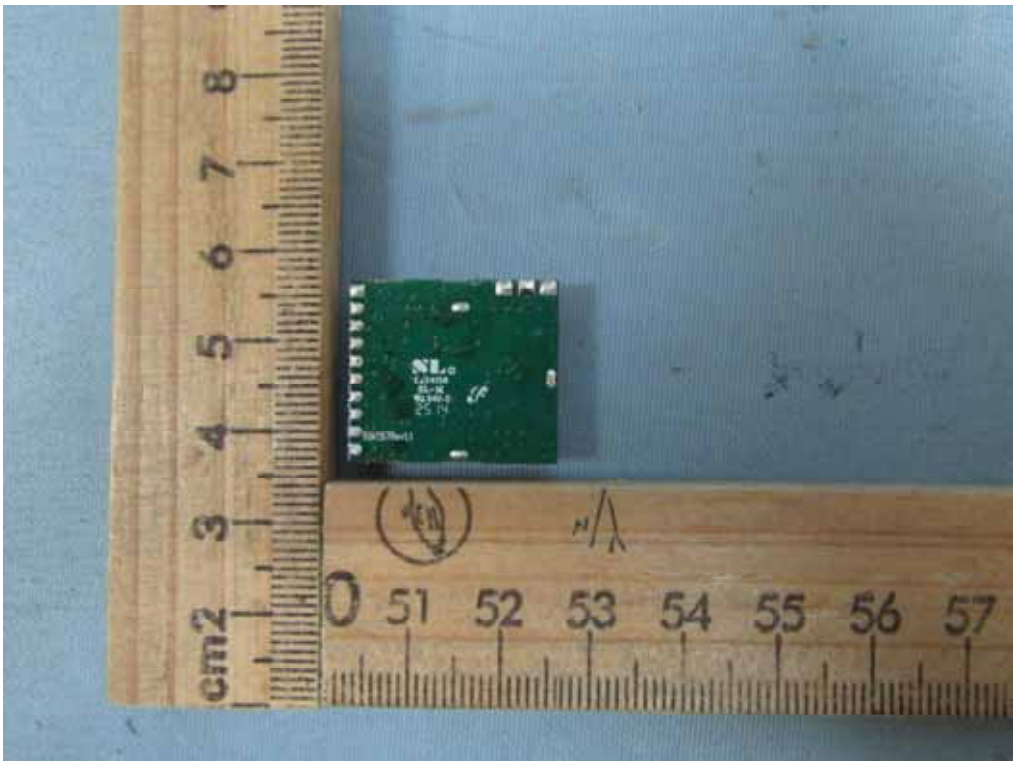


RF Module

Remark: Two modules are the same.







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