

TEST REPORT

Reference No..... : WTS14S0816950E
FCC ID : 2ACU9-UDRC24
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..... : Digital Wireless Camera
Model No..... : UDRC24
Standards..... : FCC CFR47 Part 15 Section 15.247:2012
Date of Receipt sample : Aug.02, 2014
Date of Test : Aug.03~11, 2014
Date of Issue..... : Aug.11, 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:

Waltek Services (Shenzhen) Co., Ltd.

Address: 1/F., Fukangtai Building, West Baima Road, Songgang Street, Baoan District, Shenzhen,
Guangdong, China

Testing location: The same as above

Tel :+86-755-83551033

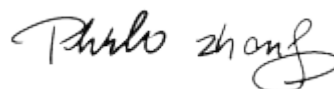
Fax:+86-755-83552400

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	:Digital Wireless Camera
Model No.	:UDRC24
Operation Frequency	: 2408MHz ~ 2468MHz, 16 channels in total
Type of Modulation	: GFSK
The lowest oscillator	: 32.768kHz
Antenna installation	: Monopole antenna
Antenna Gain	: 2dBi

4.2 Details of E.U.T.

Technical Data	:DC 9V, 600mA powered by adapter (Adapter Input: 100-240V~50/60Hz, 200mA)
Adapter	: Csec, M/N:CS6D090060FUF

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.18,2013	Sep.17,2014
2.	LISN	SCHWARZBECK	NSLK 8128	8128-289	Sep.18,2013	Sep.17,2014
3.	Limiter	York	MTS-IMP-136	261115-001-0024	Sep.18,2013	Sep.17,2014
4.	Cable	LARGE	RF300	-	Sep.18,2013	Sep.17,2014
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.18,2013	Sep.17,2014
2	Active Loop Antenna	Beijing Dazhi	ZN30900A	-	Sep.18,2013	Sep.17,2014
3	Trilog Broadband Antenna	SCHWARZBECK	VULB9163	336	Apr.20,2014	Apr.19,2015
4	Coaxial Cable (below 1GHz)	Top	TYPE16(13M)	-	Sep.18,2013	Sep.17,2014
5	Broad-band Horn Antenna	SCHWARZBECK	BBHA 9120 D	667	Apr.20,2014	Apr.19,2015
6	Broadband Preamplifier	COMPLIANCE DIRECTION	PAP-1G18	2004	Mar.17,2014	Mar.16,2015
7	Coaxial Cable (above 1GHz)	Top	1000MHZ-25GHz	EW02014-7	Apr.20,2014	Apr.19,2015
8	Broad-band Horn Antenna	SCHWARZBECK	BBHA 9170	335	Apr.20,2014	Apr.19,2015

5.2 Measurement Uncertainty

Parameter	Uncertainty
Radio Frequency	$\pm 1 \times 10^{-6}$
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 dB μ V between 0.15MHz & 0.5MHz 56 dB μ V between 0.5MHz & 5MHz 60 dB μ V between 5MHz & 30MHz
Detector:	Peak for pre-scan (9kHz Resolution Bandwidth)

6.1 E.U.T. Operation

Operating Environment :

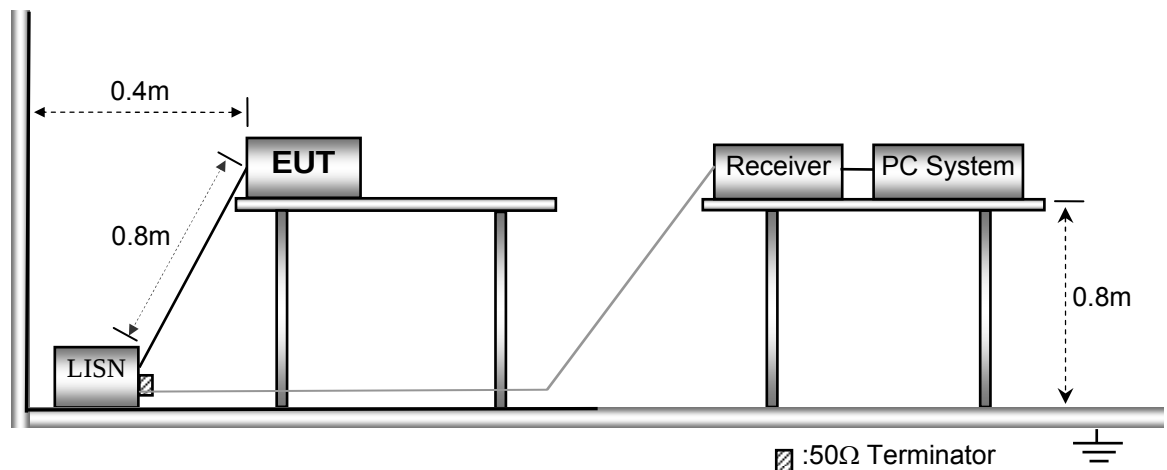
Temperature:	22.6 °C
Humidity:	52.5 % RH
Atmospheric Pressure:	101.2kPa

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.

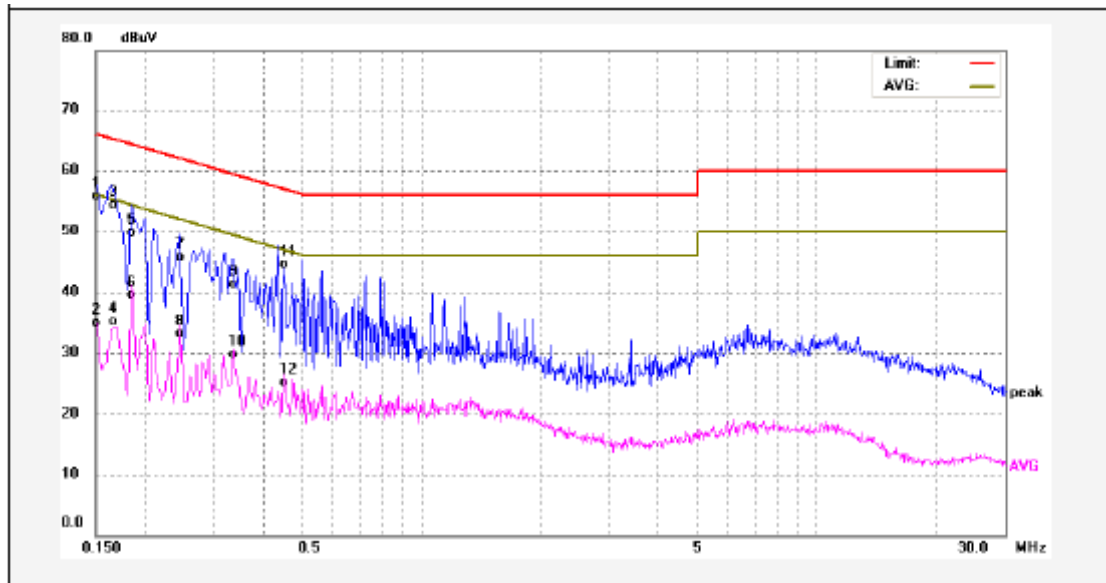


6.3 Measurement Description

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.

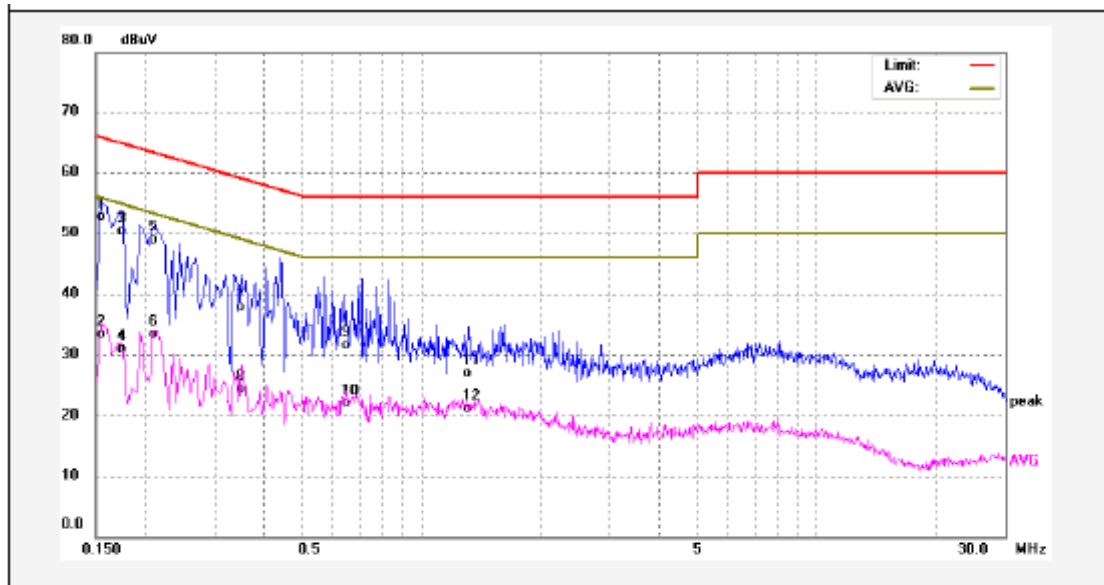
6.4 Conducted Emission Test Result

Live line:



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Margin (dB)	Detector	Remark
1	0.1500	45.23	10.57	55.80	65.99	-10.19	QP	
2	0.1500	24.40	10.57	34.97	55.99	-21.02	AVG	
3	0.1650	43.72	10.57	54.29	65.20	-10.91	QP	
4	0.1650	24.60	10.57	35.17	55.20	-20.03	AVG	
5	0.1850	39.20	10.57	49.77	64.25	-14.48	QP	
6	0.1850	28.88	10.57	39.45	54.25	-14.80	AVG	
7	0.2450	35.18	10.57	45.75	61.92	-16.17	QP	
8	0.2450	22.62	10.57	33.19	51.92	-18.73	AVG	
9	0.3350	30.74	10.57	41.31	59.32	-18.01	QP	
10	0.3350	19.17	10.57	29.74	49.32	-19.58	AVG	
11	0.4500	33.95	10.56	44.51	56.87	-12.36	QP	
12	0.4500	14.51	10.56	25.07	46.87	-21.80	AVG	

Neutral line:



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Margin (dB)	Detector	Remark
1	0.1550	42.20	10.57	52.77	65.72	-12.95	QP	
2	0.1550	22.66	10.57	33.23	55.72	-22.49	AVG	
3	0.1750	39.71	10.57	50.28	64.71	-14.43	QP	
4	0.1750	20.27	10.57	30.84	54.71	-23.87	AVG	
5	0.2100	38.29	10.57	48.86	63.20	-14.34	QP	
6	0.2100	22.77	10.57	33.34	53.20	-19.86	AVG	
7	0.3500	27.22	10.57	37.79	58.96	-21.17	QP	
8	0.3500	13.77	10.57	24.34	48.96	-24.62	AVG	
9	0.6450	20.44	11.02	31.46	56.00	-24.54	QP	
10	0.6450	10.88	11.02	21.90	46.00	-24.10	AVG	
11	1.3099	15.97	10.90	26.87	56.00	-29.13	QP	
12	1.3099	10.21	10.90	21.11	46.00	-24.89	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

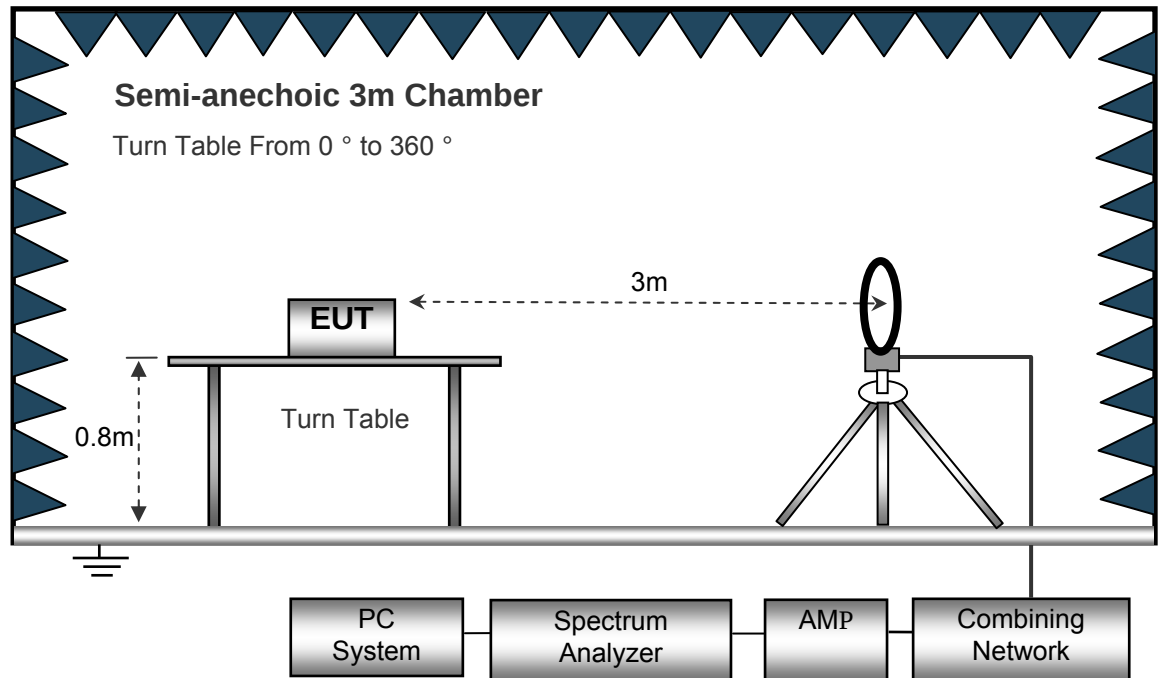
EUT Operation :

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

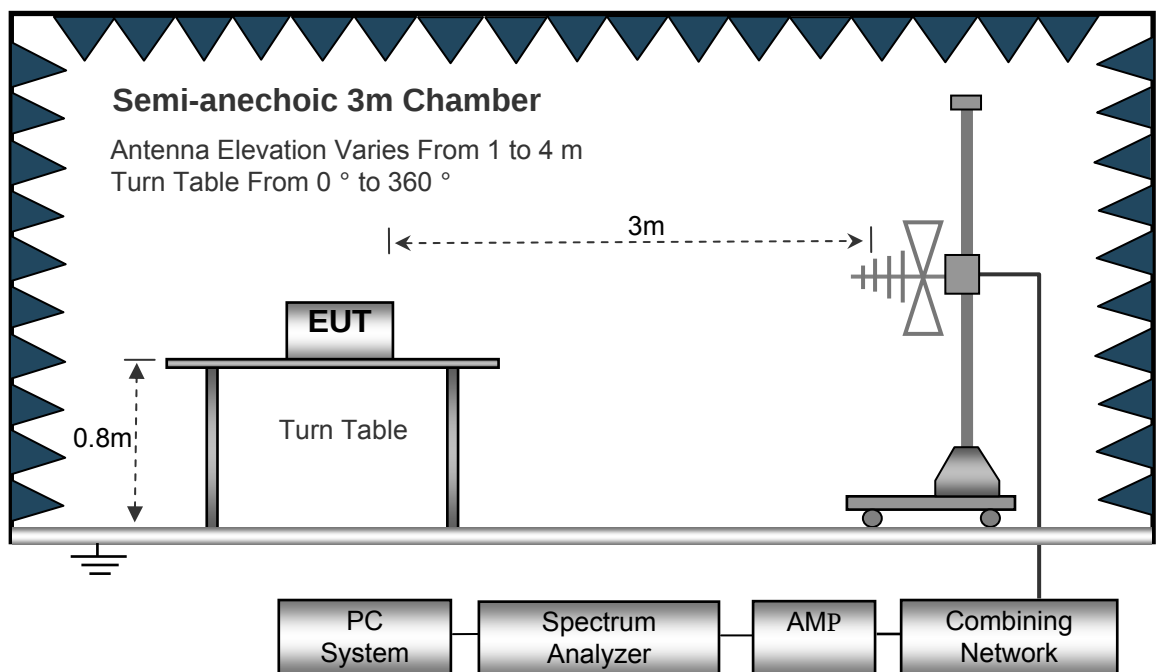
7.2 Test Setup

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

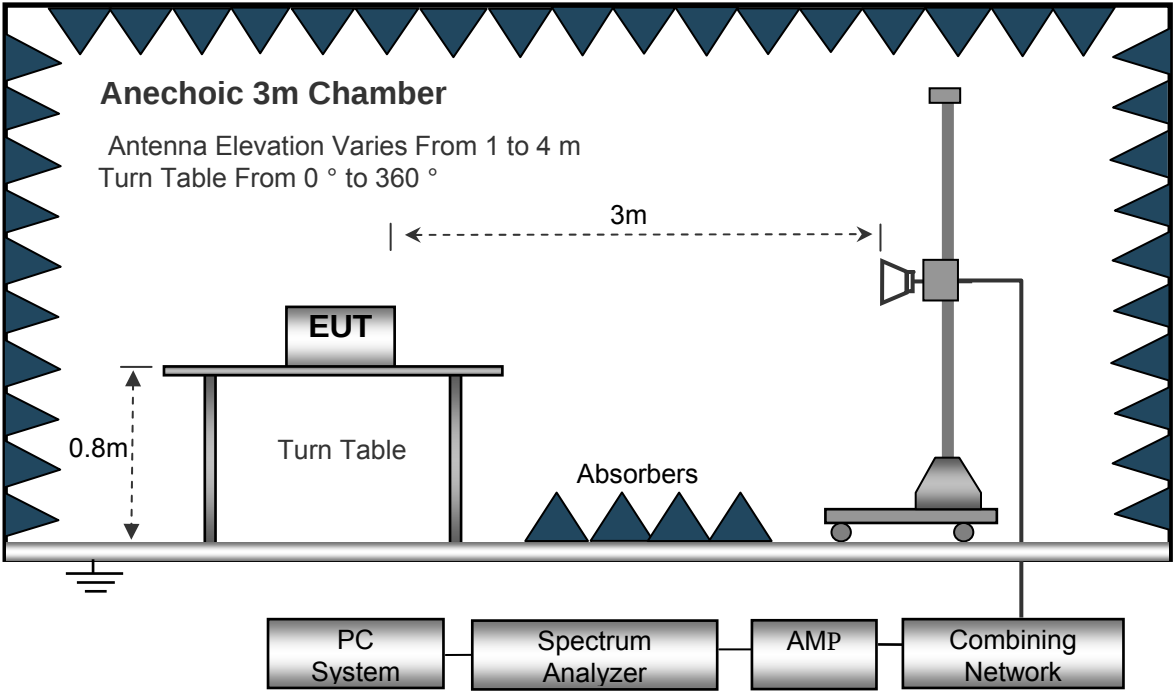
The test setup for emission measurement below 30MHz.



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:

$$\text{Corr. Ampl.} = \text{Indicated Reading} + \text{Antenna Factor} + \text{Cable Factor} - \text{Amplifier Gain}$$

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:

$$\text{Margin} = \text{Corr. Ampl.} - \text{Limit}$$

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

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									
126.32	19.62	QP	34	1.5	H	17.01	36.63	43.50	-6.87
126.32	14.88	QP	233	1.5	V	17.01	31.89	43.50	-11.61
4816.00	62.34	PK	85	1.3	V	-1.06	61.28	74.00	-12.72
4816.00	51.21	Ave	85	1.3	V	-1.06	50.15	54.00	-3.85
7224.00	54.67	PK	126	1.4	V	1.33	56.00	74.00	-18.00
7224.00	45.93	Ave	126	1.4	V	1.33	47.26	54.00	-6.74
2331.14	46.11	PK	50	1.7	V	-13.19	32.92	74.00	-41.08
2331.14	37.85	Ave	50	1.7	V	-13.19	24.66	54.00	-29.34
2357.36	42.07	PK	307	1.9	H	-13.14	28.93	74.00	-45.07
2357.36	37.38	Ave	307	1.9	H	-13.14	24.24	54.00	-29.76
2484.12	44.61	PK	127	1.8	V	-13.08	31.53	74.00	-42.47
2484.12	38.52	Ave	127	1.8	V	-13.08	25.44	54.00	-28.56

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									
126.32	19.36	QP	8	1.8	H	17.01	36.37	43.50	-7.13
126.32	15.41	QP	7	1.7	V	17.01	32.42	43.50	-11.08
4880.00	61.07	PK	53	1.1	V	-0.62	60.45	74.00	-13.55
4880.00	48.33	Ave	53	1.1	V	-0.62	47.71	54.00	-6.29
7320.00	51.90	PK	123	1.8	V	2.21	54.11	74.00	-19.89
7320.00	43.08	Ave	123	1.8	V	2.21	45.29	54.00	-8.71
2321.36	45.24	PK	28	1.2	V	-13.19	32.05	74.00	-41.95
2321.36	38.42	Ave	28	1.2	V	-13.19	25.23	54.00	-28.77
2379.94	42.63	PK	12	1.5	H	-13.14	29.49	74.00	-44.51
2379.94	38.94	Ave	12	1.5	H	-13.14	25.80	54.00	-28.20
2498.78	43.77	PK	112	1.6	V	-13.08	30.69	74.00	-43.31
2498.78	37.11	Ave	112	1.6	V	-13.08	24.03	54.00	-29.97

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									
126.32	20.83	QP	297	1.7	H	17.01	37.84	43.50	-5.66
126.32	15.69	QP	273	1.6	V	17.01	32.70	43.50	-10.80
4936.00	59.77	PK	103	1.6	V	-0.24	59.53	74.00	-14.47
4936.00	50.46	Ave	103	1.6	V	-0.24	50.22	54.00	-3.78
7404.00	52.94	PK	268	1.9	V	2.84	55.78	74.00	-18.22
7404.00	42.65	Ave	268	1.9	V	2.84	45.49	54.00	-8.51
2325.30	45.42	PK	121	1.6	V	-13.19	32.23	74.00	-41.77
2325.30	38.29	Ave	121	1.6	V	-13.19	25.10	54.00	-28.90
2372.00	44.92	PK	107	2.0	H	-13.14	31.78	74.00	-42.22
2372.00	37.68	Ave	107	2.0	H	-13.14	24.54	54.00	-29.46
2485.99	42.18	PK	19	1.7	V	-13.08	29.10	74.00	-44.90
2485.99	38.07	Ave	19	1.7	V	-13.08	24.99	54.00	-29.01

Test Frequency: 18~25GHz

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

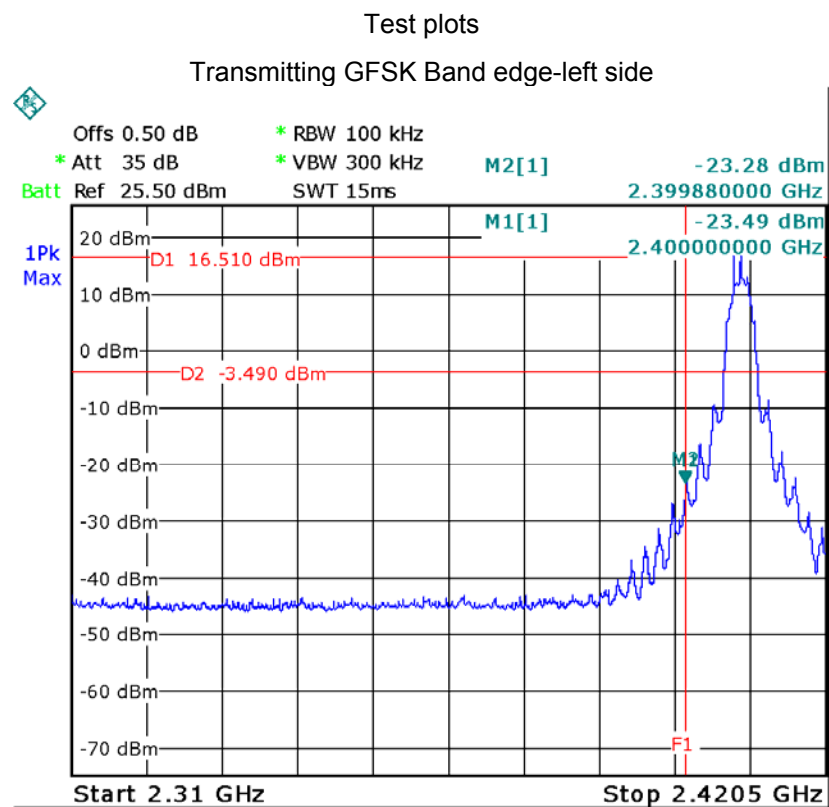
8 Band Edge Measurement

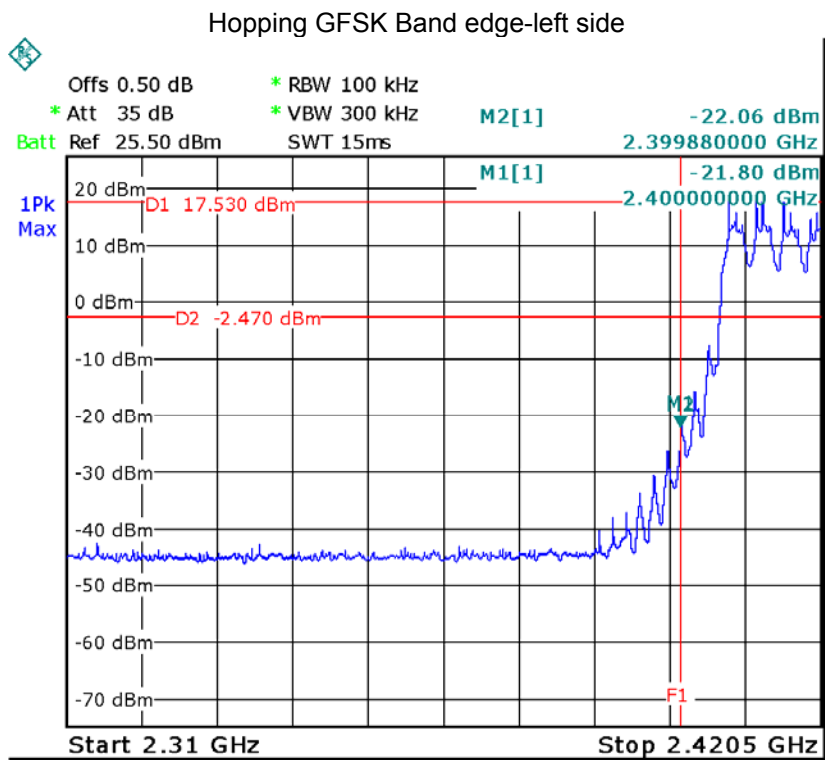
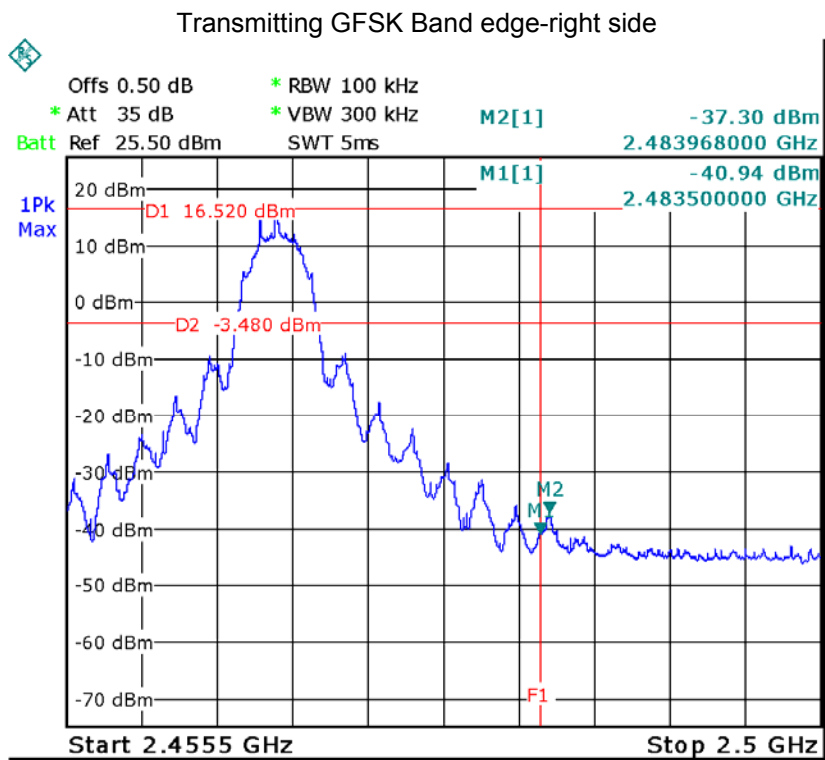
Test Requirement:	Section 15.247(d) In addition, radiated emissions which fall in the restricted bands. as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).
Test Method:	DA 00-705
Test Mode:	Transmitting, Hopping

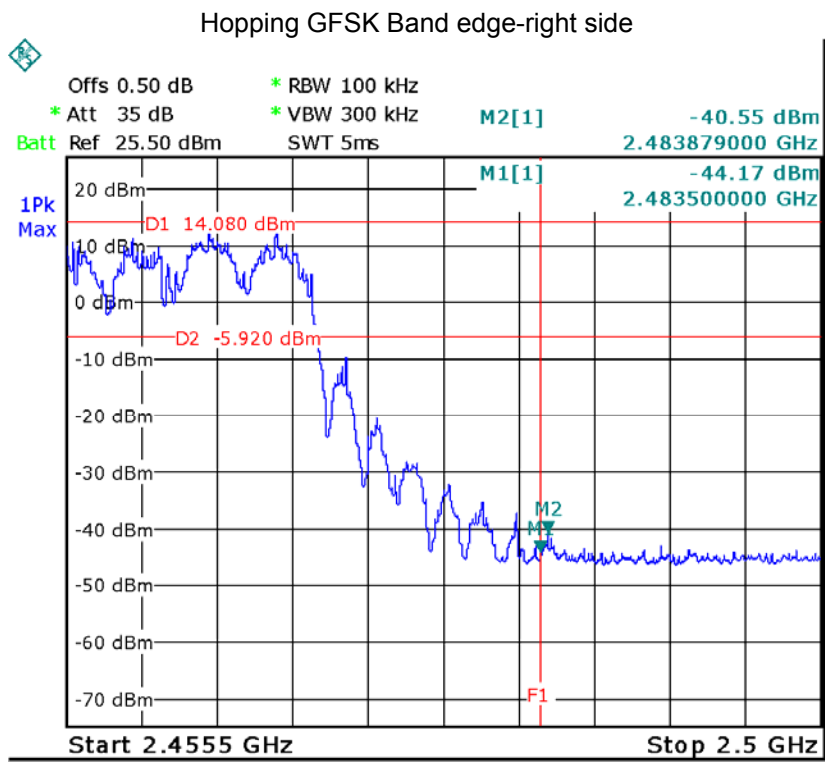
8.1 Test Procedure

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







9 20 dB Bandwidth Measurement

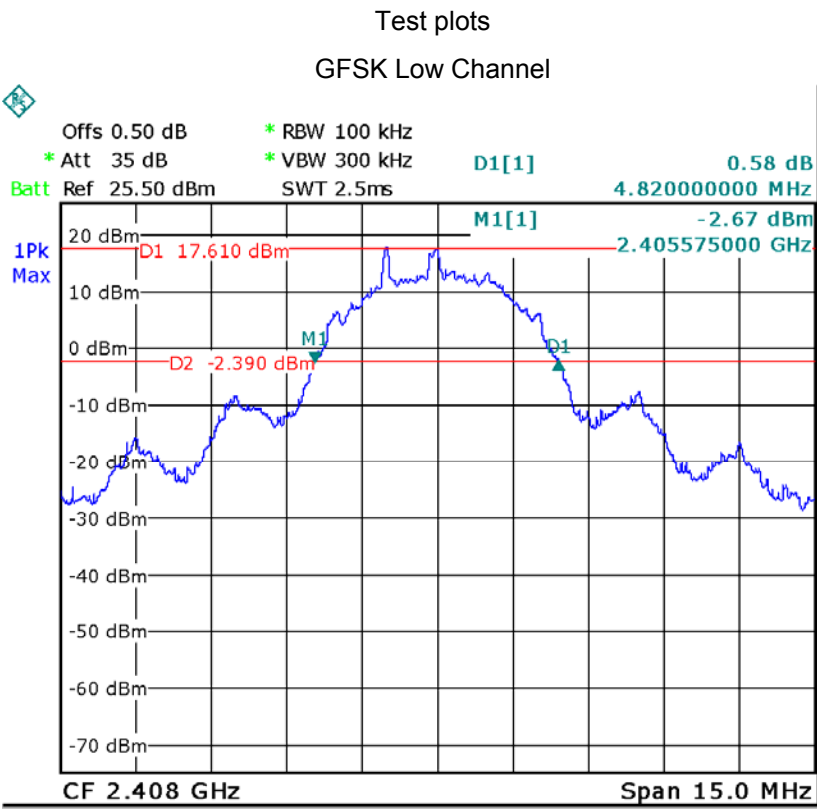
Test Requirement: FCC CFR47 Part 15 Section 15.247
Test Method: DA 00-705
Test Mode: Test in fixing operating frequency at low, Middle, high channel.

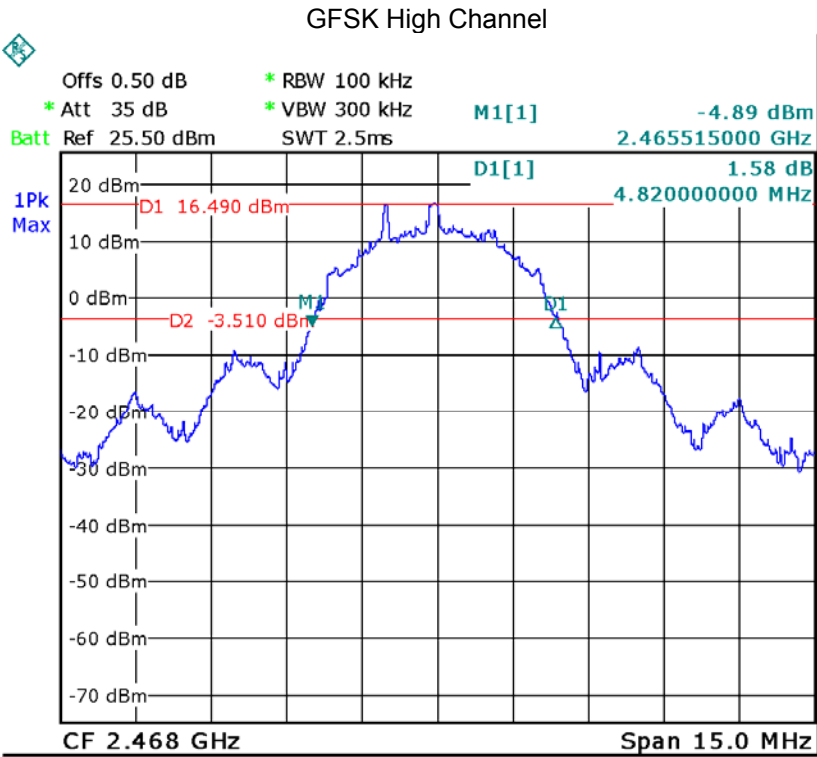
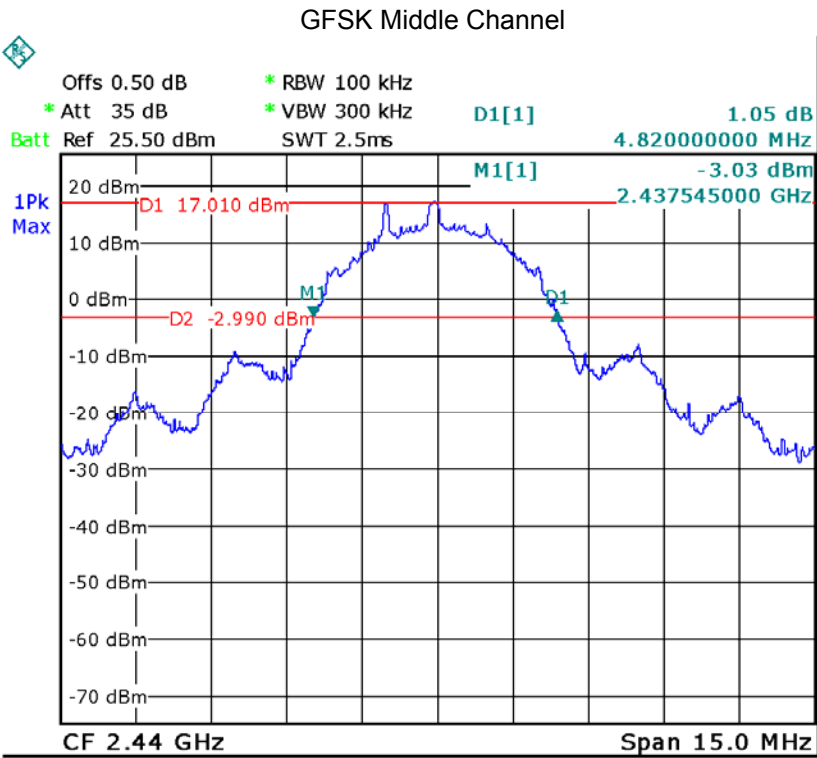
9.1 Test Procedure

- 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

Modulation	20dB Bandwidth(MHz)		
	low channel	middle channel	high channel
GFSK	4.820	4.820	4.820





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

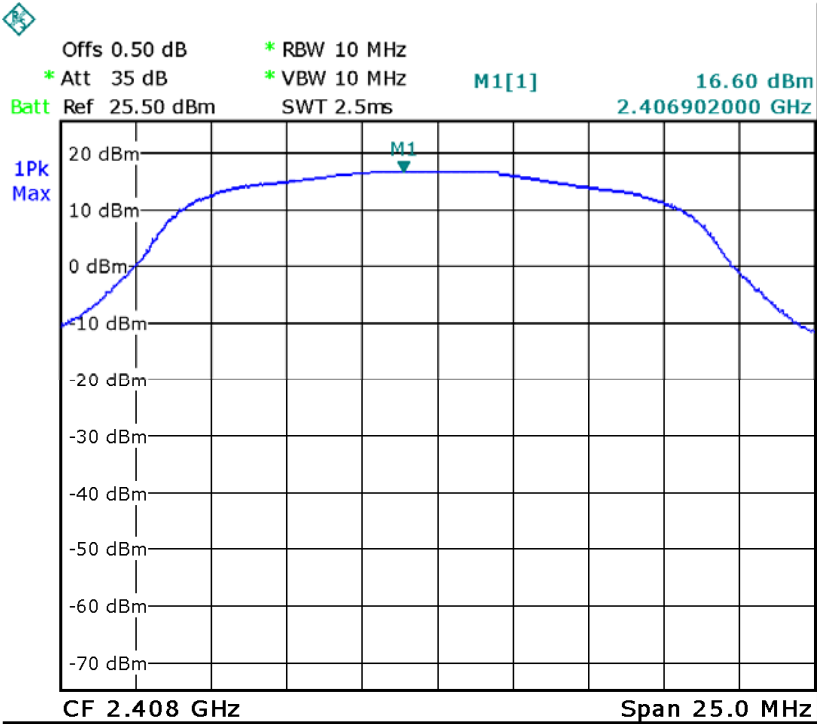
1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.
2. Set the spectrum analyzer: RBW = 10 MHz. VBW =10 MHz. Sweep = auto; Detector Function = Peak.
3. Keep the EUT in transmitting at lowest, medium and highest channel individually. Record the max value.

10.2 Test Result

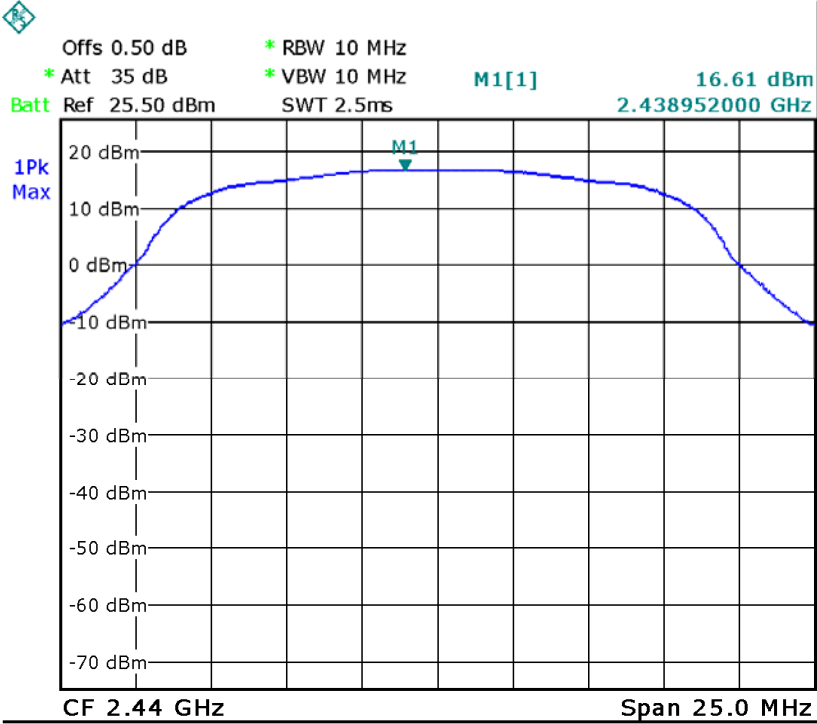
Modulation	Peak Output Power (dBm)		
	low channel	middle channel	high channel
GFSK	16.600	16.610	16.290
Limit		≤20.97dBm	
Result		PASS	

Test plots

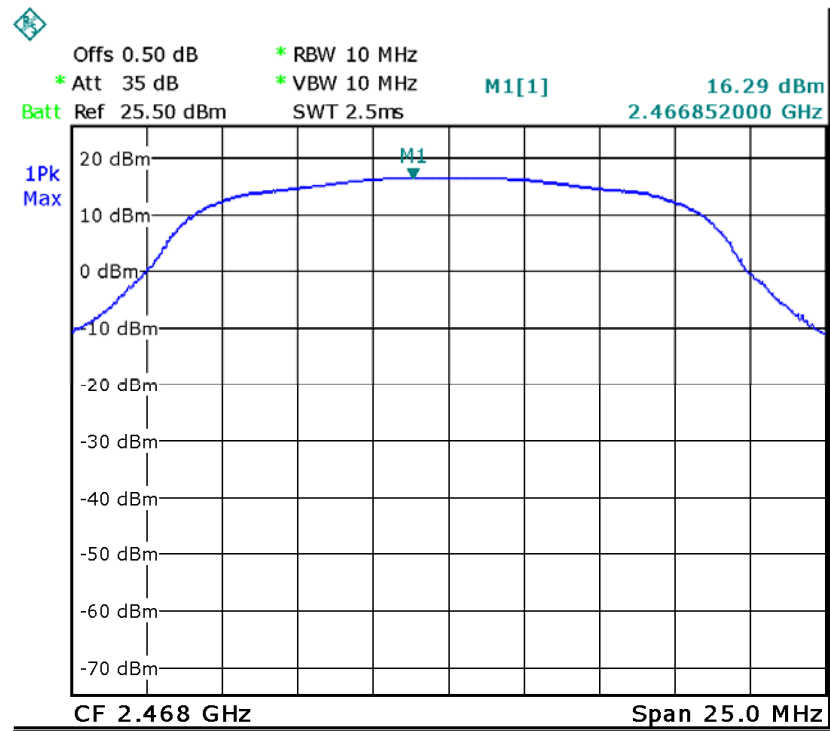
GFSK Low Channel



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

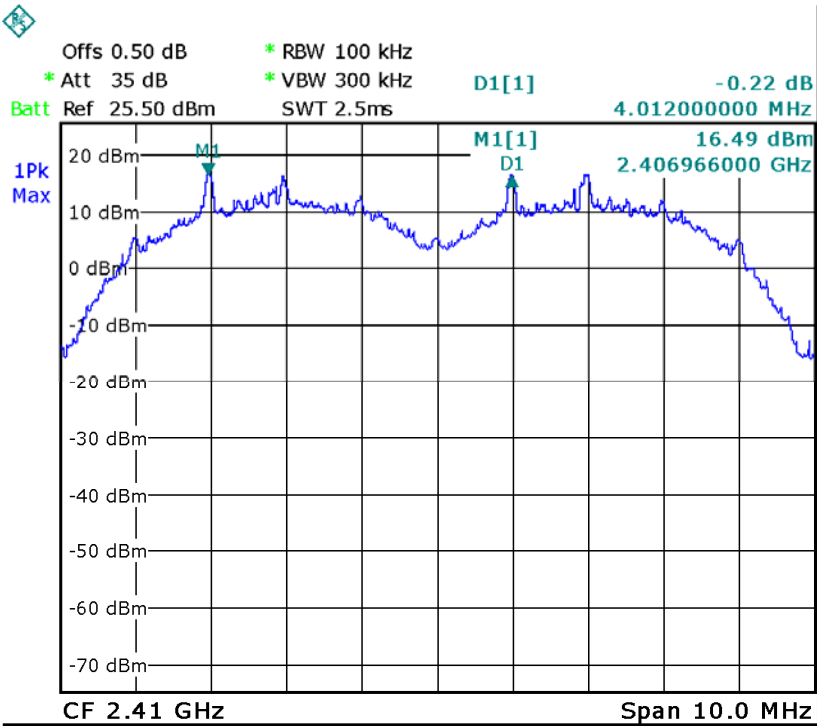
1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.
2. Set the spectrum analyzer: RBW = 100KHz. VBW = 300KHz , Span = 10.0MHz. Sweep = auto; Detector Function = Peak. Trace = Max hold.
3. Allow the trace to stabilize. Use the marker-delta function 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

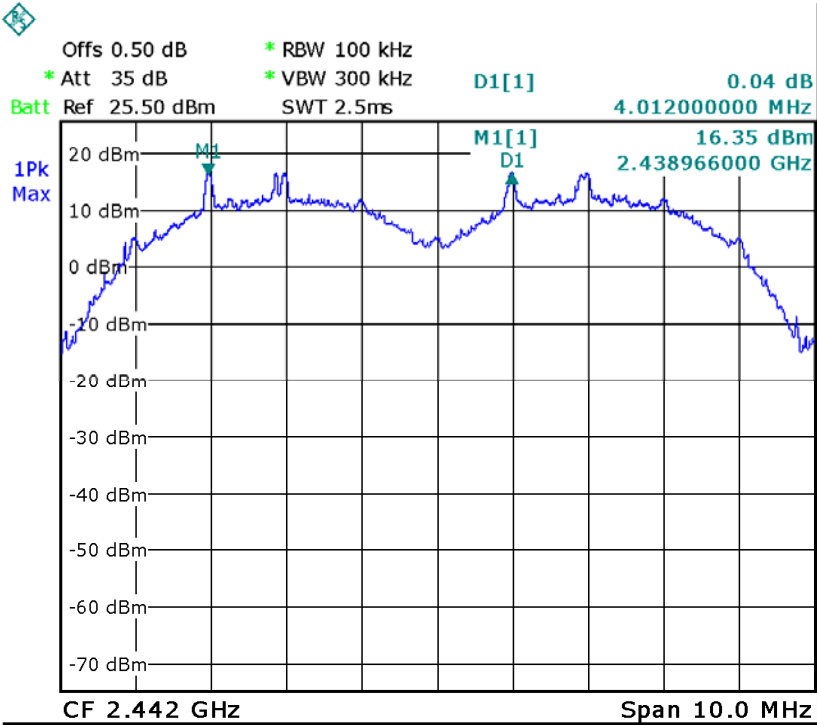
Modulation	Test Channel	Separation (MHz)	Result
GFSK	Low	4.012	PASS
GFSK	Middle	4.012	PASS
GFSK	High	4.012	PASS

Test plots

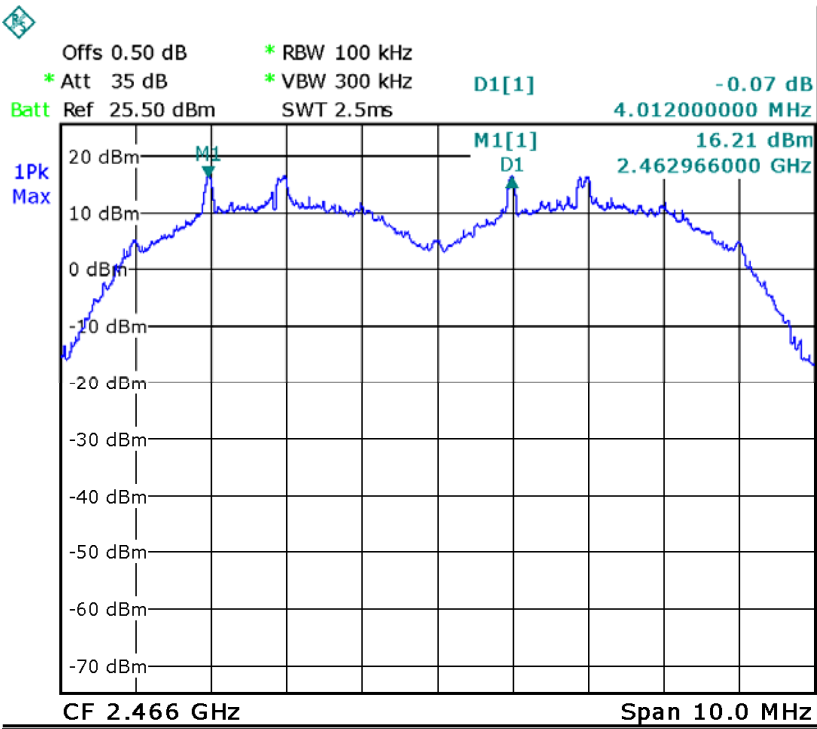
GFSK Low Channel



GFSK Middle Channel



GFSK High Channel



12 Number of Hopping Frequency

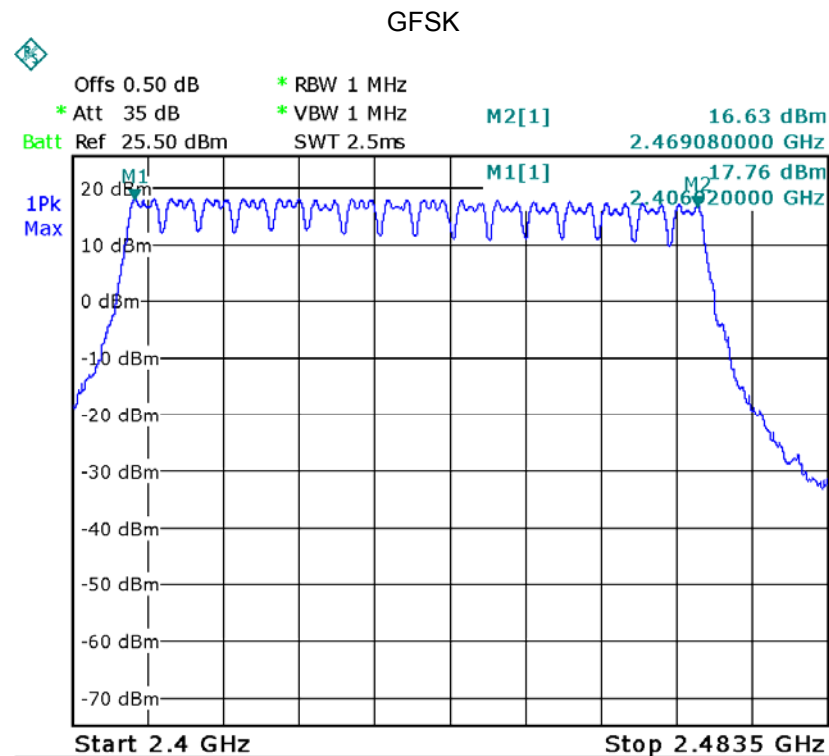
Test Requirement:	FCC CFR47 Part 15 Section 15.247
Test Method:	DA 00-705
Test Limit:	Regulation 15.247 (a)(1)(iii) Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels.
Test Mode:	Test in hopping transmitting operating mode.

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: 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} : occupied time of transmission in a period

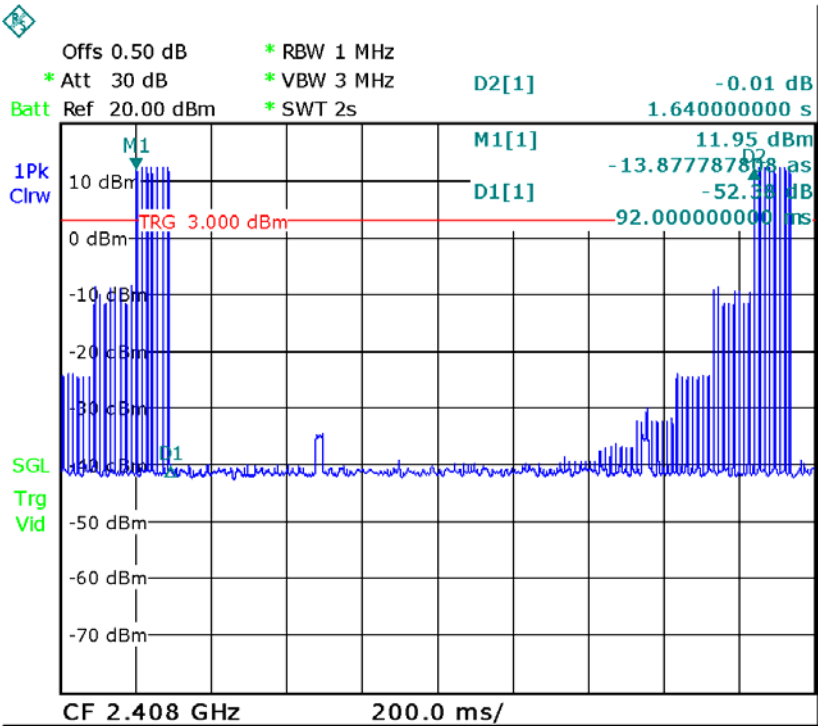
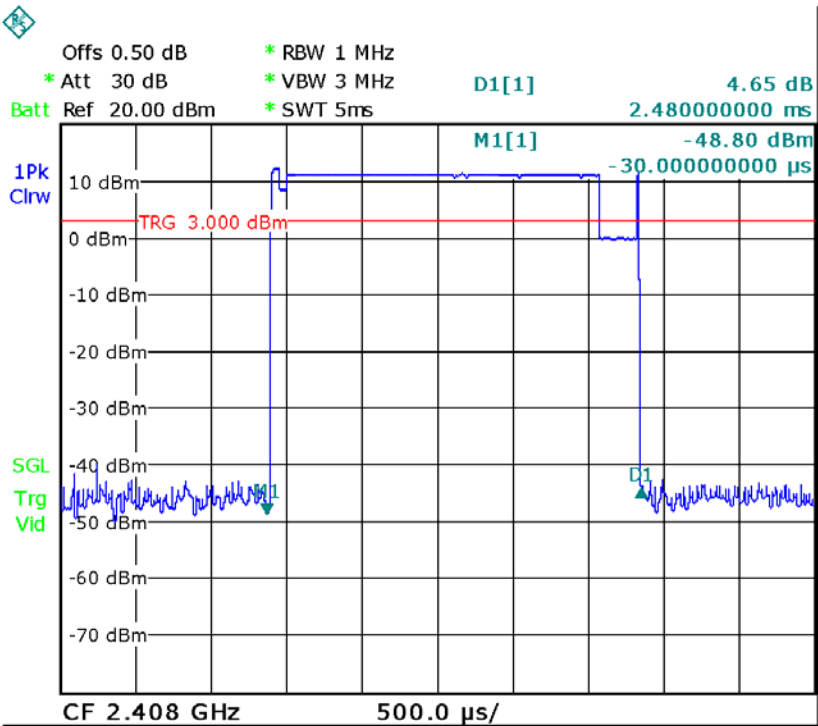
T_{period} : single hopping channel period

$N_{channels}$: number of hopping channel

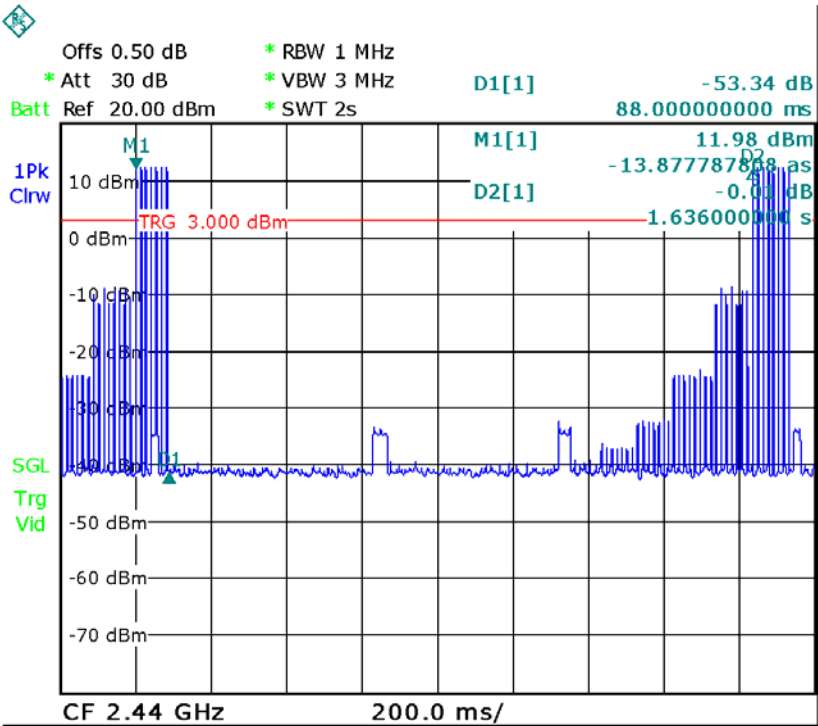
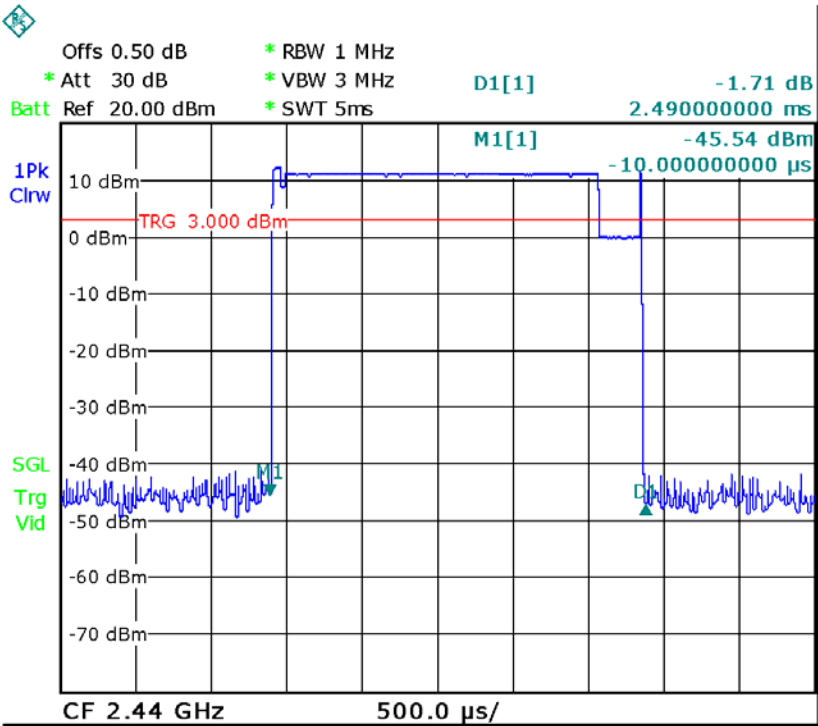
Modulation	Channel	T_{on} (ms)	T_{period} (ms)	$N_{channels}$	T(s)
GFSK	Low	19.84	1640	16	0.077
	middle	19.92	1636	16	0.078
	High	19.76	1632	16	0.077
Limit	$T \leq 0.4s$				

Test Plots

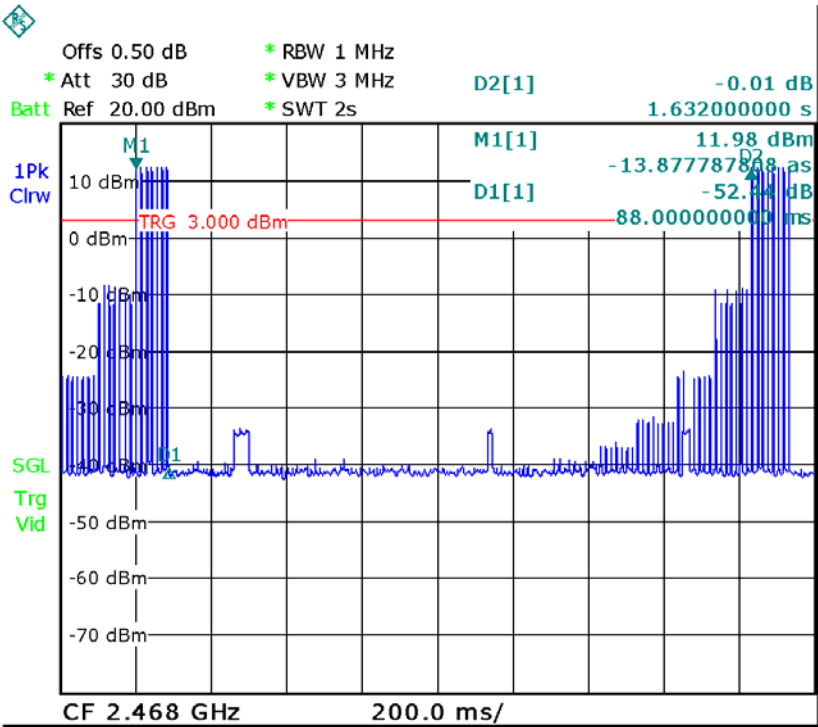
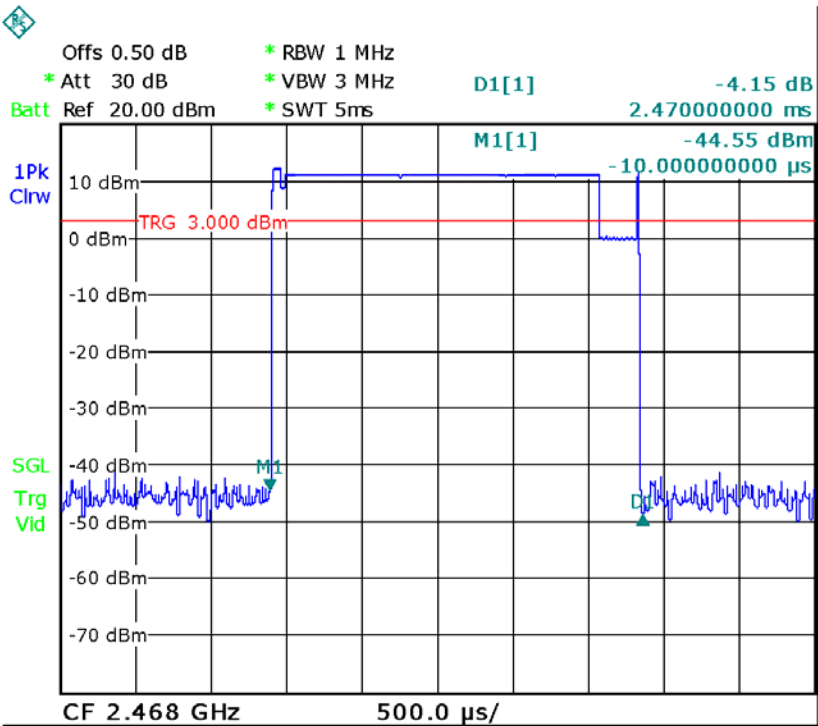
Low Channel



Middle Channel



High Channel



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 External antenna with RP-SMA connector , 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

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

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

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

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

Frequency (MHz)	Antenna Gain		Conducted Power		Evaluation Distance(cm)	Power Density (mW/cm ²)	MPE Limit (mW/cm ²)
	(dBi)	(numeric)	(dBm)	(mW)			
2440	2	1.58	16.61	45.81	20	0.0145	1.0

16 Photographs –Model UDRC24 Test Setup

16.1 Photograph – Conducted Emission Test Setup



16.2 Photograph – Radiation Spurious Emission Test Setup

Below 30MHz

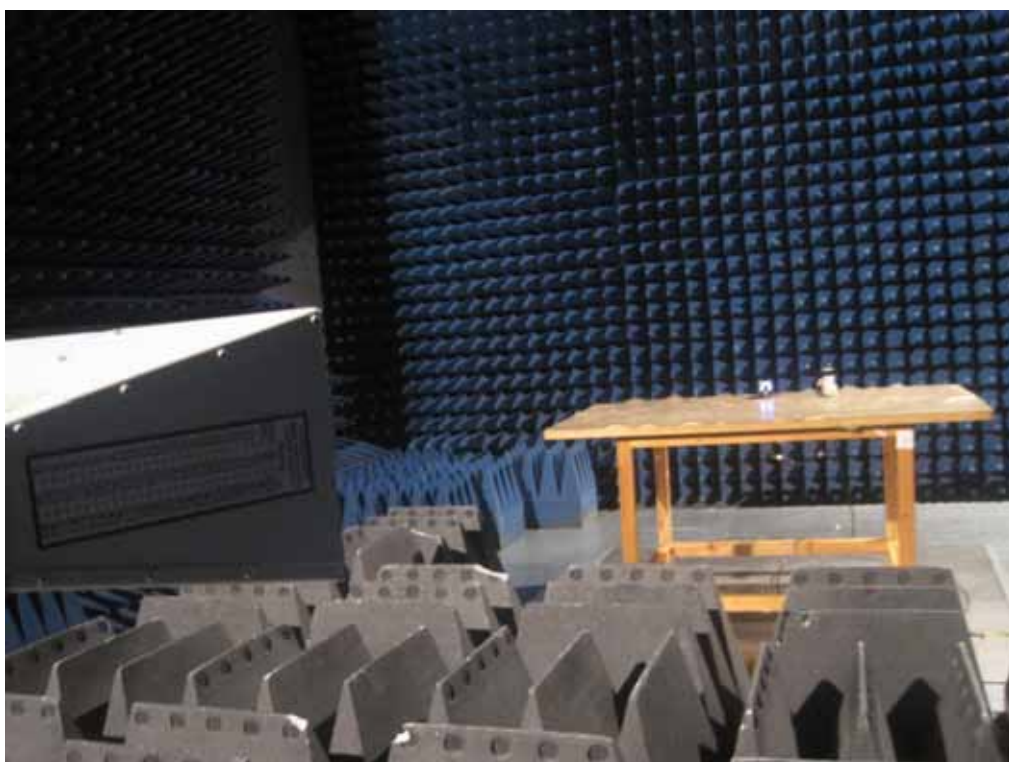


30MHz-1GHz



Above 1GHz





17 Photographs - Constructional Details

17.1 Model UDRC24 External View







ANT. RP-SMA connector



Adapter Label



17.2 Model UDRC24 Internal View





RF Module







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