

TEST REPORT

Reference No...... : WTS15S0628922E
FCC ID : SJ8-CA824
Applicant..... : RDI Technology (Shenzhen) Co., Ltd.
Address..... : Building C1, 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...... : CA824
Standards..... : FCC CFR47 Part 15 Section 15.247:2014
Date of Receipt sample : Jun. 26, 2015
Date of Test : Jun. 29 – Jul. 15, 2015
Date of Issue..... : Jul. 21, 2015
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

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
Radiated Spurious Emissions	15.205(a) 15.209 15.247(d)	PASS
Band edge	15.247(d) 15.205(a)	PASS
Conduct Emission	15.207	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

3 Contents

	Page
1 COVER PAGE.....	1
2 TEST SUMMARY	2
3 CONTENTS	3
4 GENERAL INFORMATION.....	5
4.1 GENERAL DESCRIPTION OF E.U.T.	5
4.2 DETAILS OF E.U.T.	5
4.3 CHANNEL LIST	5
4.4 TEST FACILITY	5
5 EQUIPMENT USED DURING TEST	6
5.1 EQUIPMENTS LIST	6
5.2 MEASUREMENT UNCERTAINTY	7
5.3 TEST EQUIPMENT CALIBRATION	7
6 CONDUCTED EMISSION	8
6.1 E.U.T. OPERATION	8
6.2 EUT SETUP	8
6.3 MEASUREMENT DESCRIPTION	8
6.4 CONDUCTED EMISSION TEST RESULT	9
7 RADIATED SPURIOUS EMISSIONS.....	11
7.1 EUT OPERATION.....	11
7.2 TEST SETUP	12
7.3 SPECTRUM ANALYZER SETUP	13
7.4 TEST PROCEDURE	14
7.5 SUMMARY OF TEST RESULTS	15
8 BAND EDGE MEASUREMENT	18
8.1 TEST PROCEDURE	18
8.2 TEST RESULT	19
9 20 DB BANDWIDTH MEASUREMENT	21
9.1 TEST PROCEDURE	21
9.2 TEST RESULT	21
10 MAXIMUM PEAK OUTPUT POWER	23
10.1 TEST PROCEDURE.....	23
10.2 TEST RESULT	23
11 HOPPING CHANNEL SEPARATION	26
11.1 TEST PROCEDURE.....	26
11.2 TEST RESULT	26
12 NUMBER OF HOPPING FREQUENCY.....	29
12.1 TEST PROCEDURE.....	29
12.2 TEST RESULT	29
13 DWELL TIME	30
13.1 TEST PROCEDURE.....	30
13.2 TEST RESULT	30
14 ANTENNA REQUIREMENT	36
15 RF EXPOSURE.....	37

15.1	REQUIREMENTS.....	37
15.2	THE PROCEDURES / LIMIT	37
15.3	MPE CALCULATION METHOD	38
16	PHOTOGRAPHS – MODEL CA824TEST SETUP	39
16.1	PHOTOGRAPH – CONDUCTED EMISSION TEST SETUP AT TEST SITE 1#	39
16.2	PHOTOGRAPH – RADIATION SPURIOUS EMISSION TEST SETUP.....	39
17	PHOTOGRAPHS - CONSTRUCTIONAL DETAILS	41
17.1	MODEL CA824 EXTERNAL VIEW	41
17.2	MODEL CA824 INTERNAL VIEW.....	47

4 General Information

4.1 General Description of E.U.T.

Product Name	:Digital Wireless Camera
Model No.	:CA824
Operation Frequency	:2408MHz ~ 2468MHz, 16 channels in total
Type of Modulation	:GFSK
The lowest oscillator	:32.768kHz
Antenna installation	:Dipole antenna
Antenna Gain	:2.0dBi

4.2 Details of E.U.T.

Technical Data:	DC 9V, 600mA powered by adapter (Adapter Input: 100-240V~50/60Hz, 200mA)
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4.3 Channel List

Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
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 Facility

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

- Industry Canada (IC) Registration No.: 11464A**
 The 3m Semi-anechoic chamber of Shenzhen SEM.Test Technology Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 11464A.
- FCC – Registration No.: 934118**
 Shenzhen SEM.Test Technology 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 and the Registration is 934118.

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.15,2014	Sep.14,2015
2.	LISN	R&S	ENV216	101215	Sep.15,2014	Sep.14,2015
3.	Cable	Top	TYPE16(3.5M)	-	Sep.15,2014	Sep.14,2015
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.15,2014	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 Test site						
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Calibration Date	Calibration Due Date
1	Spectrum Analyzer	R&S	FSP	836079/035	May-07-2015	May-06-2016
2	EMI Test Receiver	R&S	ESVB	825471/005	May-07-2015	May-06-2016
3	Pre-amplifier	Agilent	8447F	3113A06717	May-07-2015	May-06-2016
4	Pre-amplifier	Compliance Direction	PAP-0118	24002	May-07-2015	May-06-2016
5	Trilog Broadband Antenna	SCHWARZBECK	VULB9163	9163-333	Apr-20-2015	Apr-19-2016
6	Horn Antenna	ETS	3117	00086197	Apr-20-2015	Apr-19-2016
7	Horn Antenna	ETS	3116B	00088203	Apr-20-2015	Apr-19-2016
8	Loop Antenna	SCHWARZECK	HFRA 5165	9365	Apr-20-2015	Apr-19-2016
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.15,2014	Sep.14,2015
2	Trilog Broadband Antenna	SCHWARZBECK	VULB9160	9160-3325	Sep.15,2014	Sep.14,2015
3	Amplifier	Compliance pirection systems inc	PAP-0203	22024	Sep.15,2014	Sep.14,2015
4	Cable	HUBER+SUHNER	CBL2	525178	Sep.15,2014	Sep.14,2015

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.15,2014	Sep.14,2015
2.	Spectrum Analyzer (9k-6GHz)	R&S	FSL6	100959	Sep.15,2014	Sep.14,2015
3.	Signal Analyzer (9k~26.5GHz)	Agilent	N9010A	MY50520207	Sep.15,2014	Sep.14,2015

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 C63.4:2014
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 :

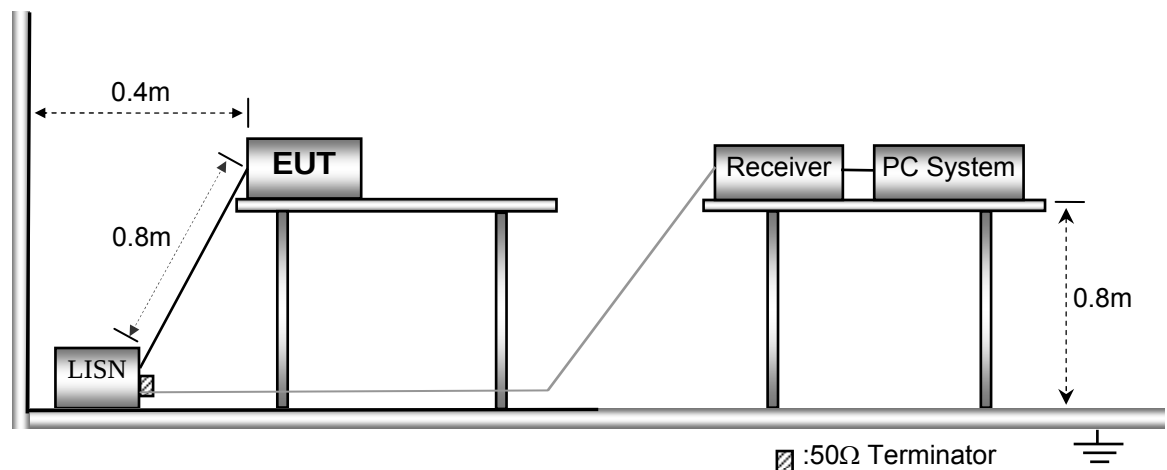
Temperature:	25.5 °C
Humidity:	51 % RH
Atmospheric Pressure:	101.2kPa

EUT Operation :

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

6.2 EUT Setup

The EUT was placed on the test table in shielding room.

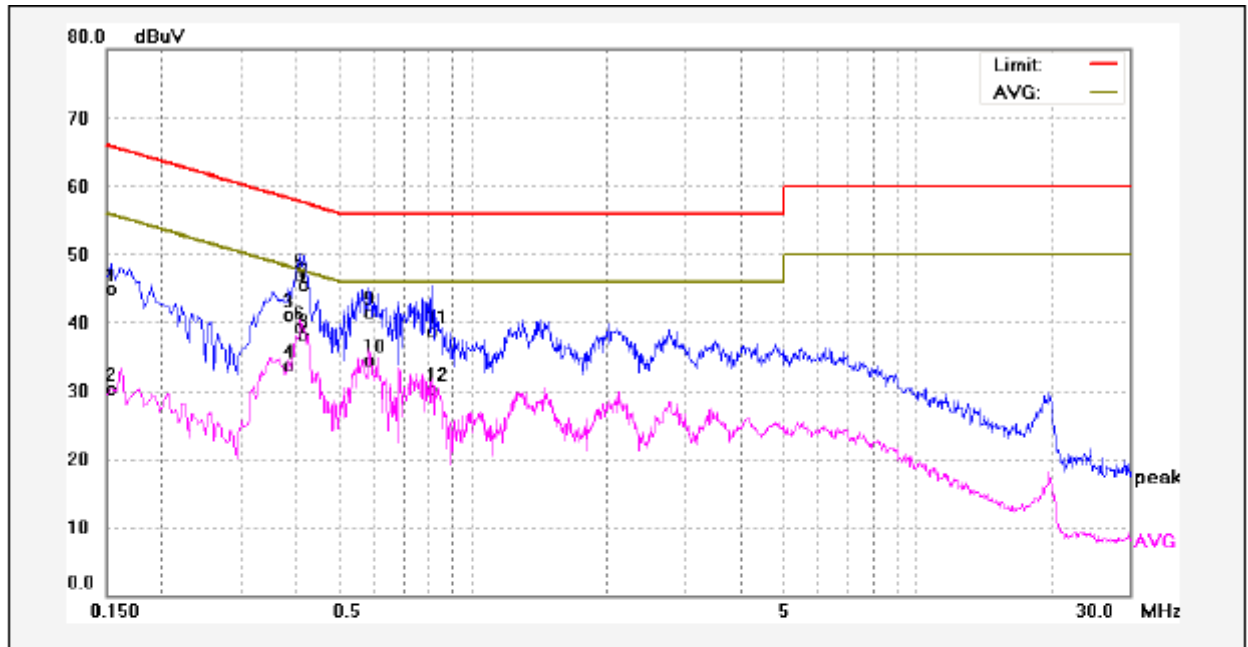


6.3 Measurement Description

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.

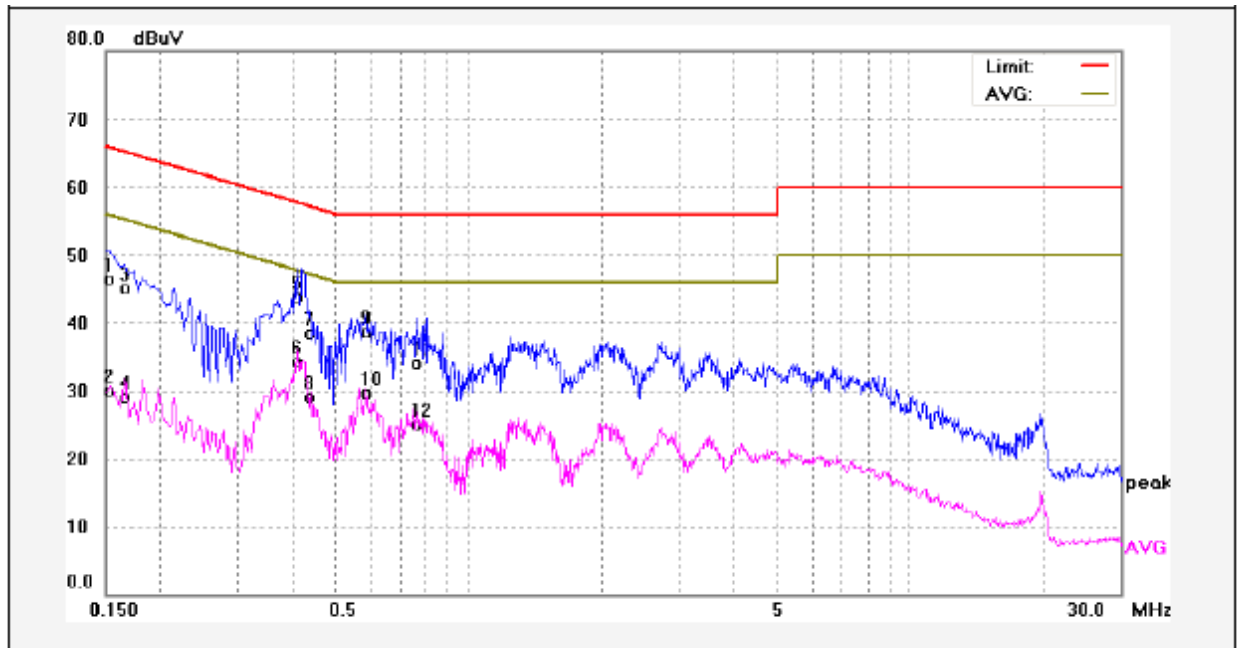
6.4 Conducted Emission Test Result

Live line:



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Margin (dB)	Detector	Remark
1	0.1539	34.69	10.13	44.82	65.78	-20.96	QP	
2	0.1539	20.08	10.13	30.21	55.78	-25.57	AVG	
3	0.3860	30.98	10.17	41.15	58.15	-17.00	QP	
4	0.3860	23.44	10.17	33.61	48.15	-14.54	AVG	
5	0.4100	36.70	10.18	46.88	57.65	-10.77	QP	
6	0.4100	29.09	10.18	39.27	47.65	-8.38	AVG	
7	0.4220	35.23	10.18	45.41	57.41	-12.00	QP	
8	0.4220	27.97	10.18	38.15	47.41	-9.26	AVG	
9	0.5860	31.34	10.20	41.54	56.00	-14.46	QP	
10	0.5860	24.26	10.20	34.46	46.00	-11.54	AVG	
11	0.8100	28.55	10.21	38.76	56.00	-17.24	QP	
12	0.8100	20.05	10.21	30.26	46.00	-15.74	AVG	

Neutral line:



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Margin (dB)	Detector	Remark
1	0.1524	36.39	10.13	46.52	65.86	-19.34	QP	
2	0.1524	19.92	10.13	30.05	55.86	-25.81	AVG	
3	0.1660	35.04	10.14	45.18	65.15	-19.97	QP	
4	0.1660	18.88	10.14	29.02	55.15	-26.13	AVG	
5	0.4100	33.79	10.18	43.97	57.65	-13.68	QP	
6	0.4100	24.21	10.18	34.39	47.65	-13.26	AVG	
7	0.4340	28.25	10.18	38.43	57.18	-18.75	QP	
8	0.4340	18.99	10.18	29.17	47.18	-18.01	AVG	
9	0.5860	28.42	10.20	38.62	56.00	-17.38	QP	
10	0.5860	19.51	10.20	29.71	46.00	-16.29	AVG	
11	0.7620	23.85	10.21	34.06	56.00	-21.94	QP	
12	0.7620	14.87	10.21	25.08	46.00	-20.92	AVG	

7 Radiated Spurious Emissions

Test Requirement: FCC CFR47 Part 15 Section 15.209 & 15.247

Test Method: DA 00-705& ANSI C63.10:2013

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

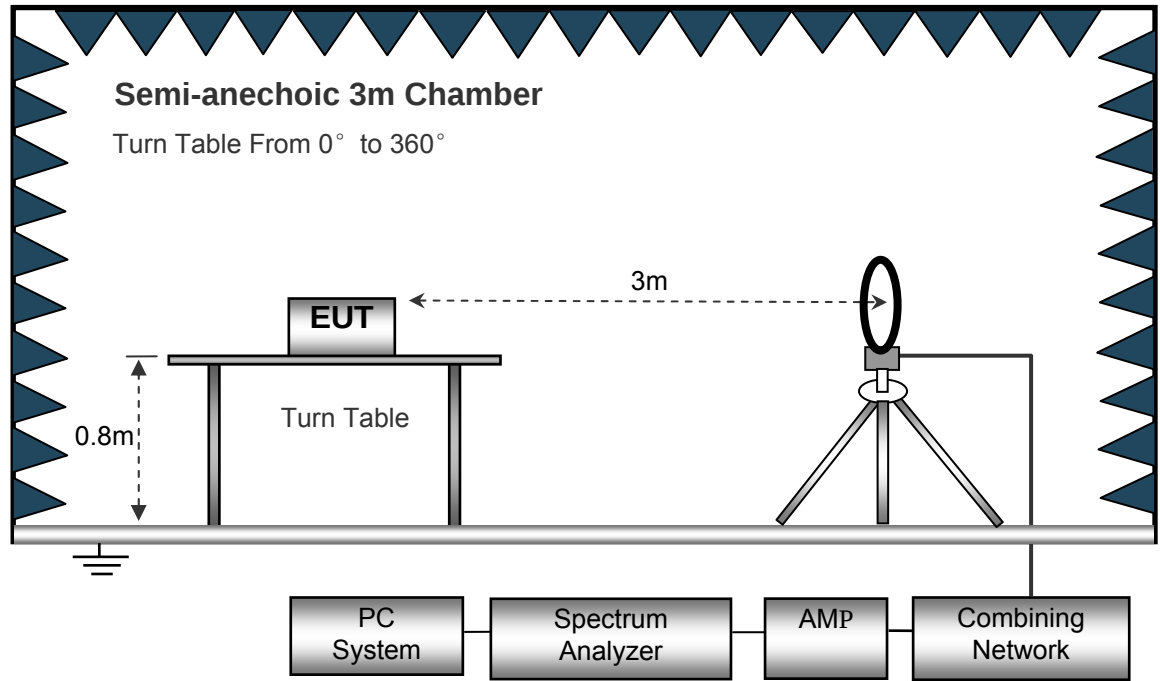
EUT Operation :

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

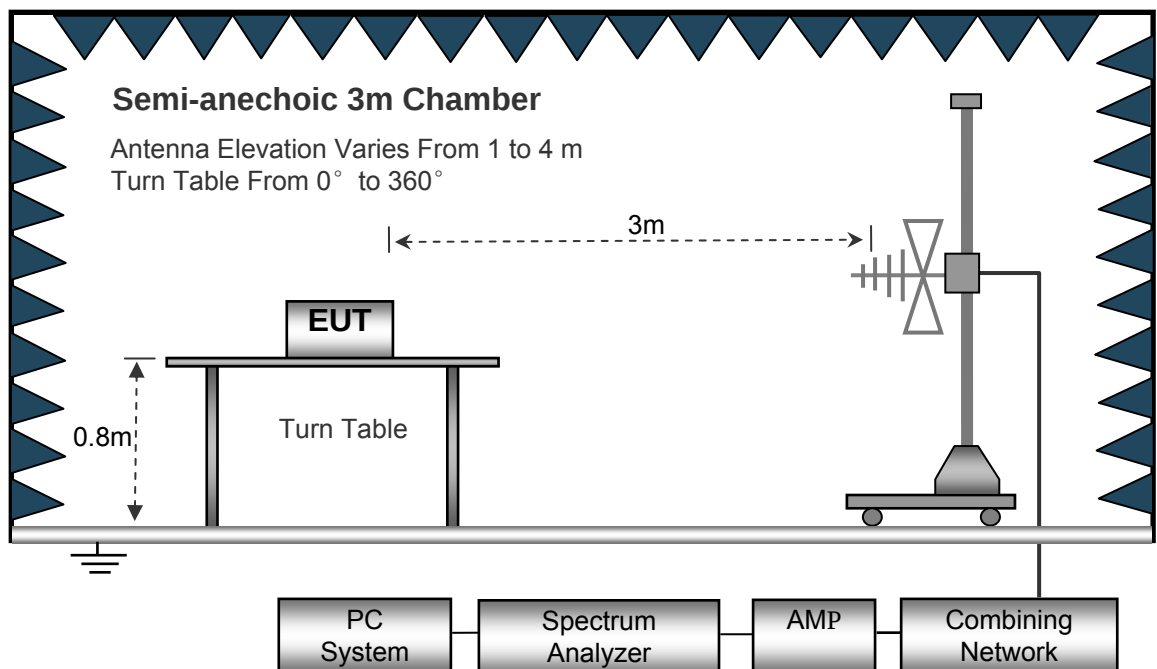
7.2 Test Setup

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

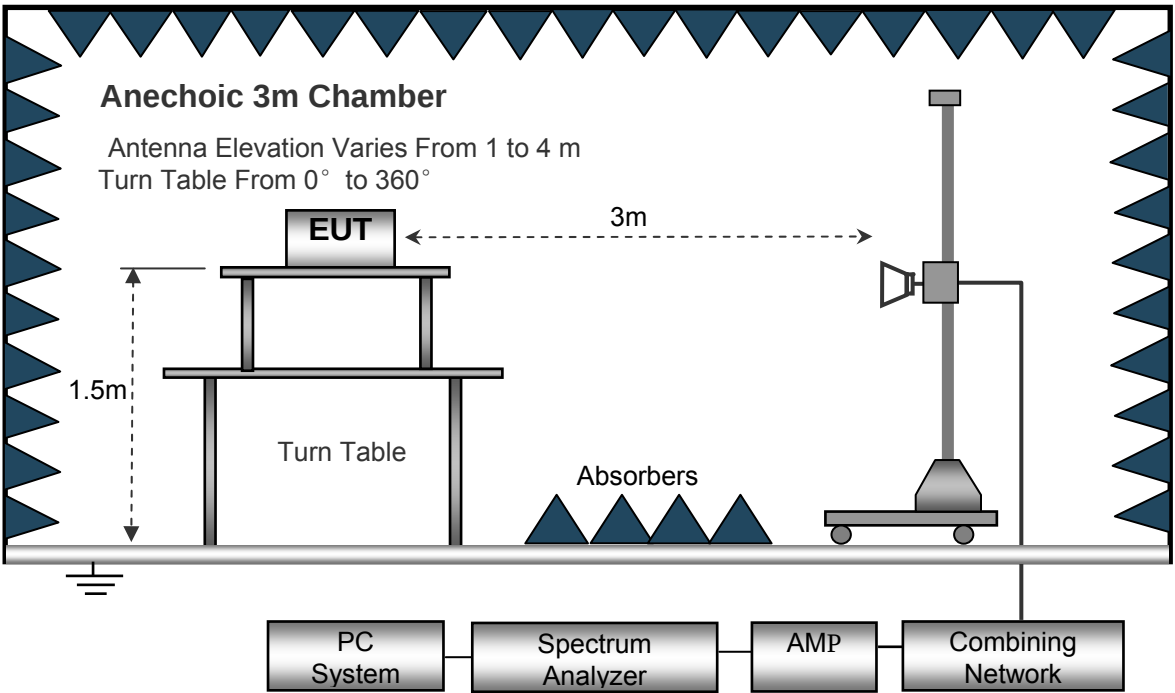
The test setup for emission measurement below 30MHz.



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



The test setup for emission measurement above 1 GHz.



7.3 Spectrum Analyzer Setup

Below 30MHz

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

30MHz ~ 1GHz

Sweep Speed Auto
DetectorPK
Resolution Bandwidth.....100kHz
Video Bandwidth.....300kHz

Above 1GHz

Sweep Speed Auto
DetectorPK
Resolution Bandwidth.....1MHz
Video Bandwidth.....3MHz
DetectorAve.
Resolution Bandwidth.....1MHz
Video Bandwidth.....10Hz

7.4 Test Procedure

1. The EUT is placed on a turntable. For below 1GHz, the EUT is 0.8m above ground plane; For above 1GHz, the EUT is 1.5m 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 Summary of Test Results

Test Frequency: Below 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)	(dBμV/m)	(dBμV/m)	(dB)
GFSK Low Channel 2408MHz									
272.34	36.80	QP	42	1.2	H	-13.35	23.45	46.00	-22.55
272.34	42.17	QP	288	1.8	V	-13.35	28.82	46.00	-17.18
4816.00	45.42	PK	152	1.1	V	-1.06	44.36	74.00	-29.64
4816.00	44.22	Ave	152	1.1	V	-1.06	43.16	54.00	-10.84
7224.00	40.75	PK	26	1.0	H	1.33	42.08	74.00	-31.92
7224.00	35.15	Ave	26	1.0	H	1.33	36.48	54.00	-17.52
2316.58	46.27	PK	134	1.6	V	-13.19	33.08	74.00	-40.92
2316.58	38.09	Ave	134	1.6	V	-13.19	24.90	54.00	-29.10
2369.64	42.68	PK	16	1.8	H	-13.14	29.54	74.00	-44.46
2369.64	37.02	Ave	16	1.8	H	-13.14	23.88	54.00	-30.12
2485.01	42.92	PK	157	1.3	V	-13.08	29.84	74.00	-44.16
2485.01	36.07	Ave	157	1.3	V	-13.08	22.99	54.00	-31.01

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 Center Channel 2440MHz									
272.34	35.88	QP	47	1.7	H	-13.35	22.53	46.00	-23.47
272.34	41.81	QP	266	1.7	V	-13.35	28.46	46.00	-17.54
4880.00	44.26	PK	193	1.5	V	-0.62	43.64	74.00	-30.36
4880.00	43.10	Ave	193	1.5	V	-0.62	42.48	54.00	-11.52
7320.00	40.05	PK	306	1.5	H	2.21	42.26	74.00	-31.74
7320.00	34.57	Ave	306	1.5	H	2.21	36.78	54.00	-17.22
2340.42	45.22	PK	65	1.4	V	-13.19	32.03	74.00	-41.97
2340.42	39.18	Ave	65	1.4	V	-13.19	25.99	54.00	-28.01
2387.18	44.56	PK	331	1.9	H	-13.14	31.42	74.00	-42.58
2387.18	38.07	Ave	331	1.9	H	-13.14	24.93	54.00	-29.07
2499.20	43.42	PK	210	1.2	V	-13.08	30.34	74.00	-43.66
2499.20	36.64	Ave	210	1.2	V	-13.08	23.56	54.00	-30.44

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 2468MHz									
272.34	36.53	QP	25	1.2	H	-13.35	23.18	46.00	-22.82
272.34	42.46	QP	342	1.7	V	-13.35	29.11	46.00	-16.89
4936.00	45.29	PK	13	1.2	V	-0.24	45.05	74.00	-28.95
4936.00	42.24	Ave	13	1.2	V	-0.24	42.00	54.00	-12.00
7404.00	41.15	PK	260	1.4	H	2.84	43.99	74.00	-30.01
7404.00	35.45	Ave	260	1.4	H	2.84	38.29	54.00	-15.71
2313.19	46.92	PK	293	1.5	V	-13.19	33.73	74.00	-40.27
2313.19	37.78	Ave	293	1.5	V	-13.19	24.59	54.00	-29.41
2353.99	44.11	PK	66	1.9	H	-13.14	30.97	74.00	-43.03
2353.99	37.57	Ave	66	1.9	H	-13.14	24.43	54.00	-29.57
2488.29	43.69	PK	99	1.2	V	-13.08	30.61	74.00	-43.39
2488.29	37.25	Ave	99	1.2	V	-13.08	24.17	54.00	-29.83

Test Frequency :Above 18GHz

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& 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

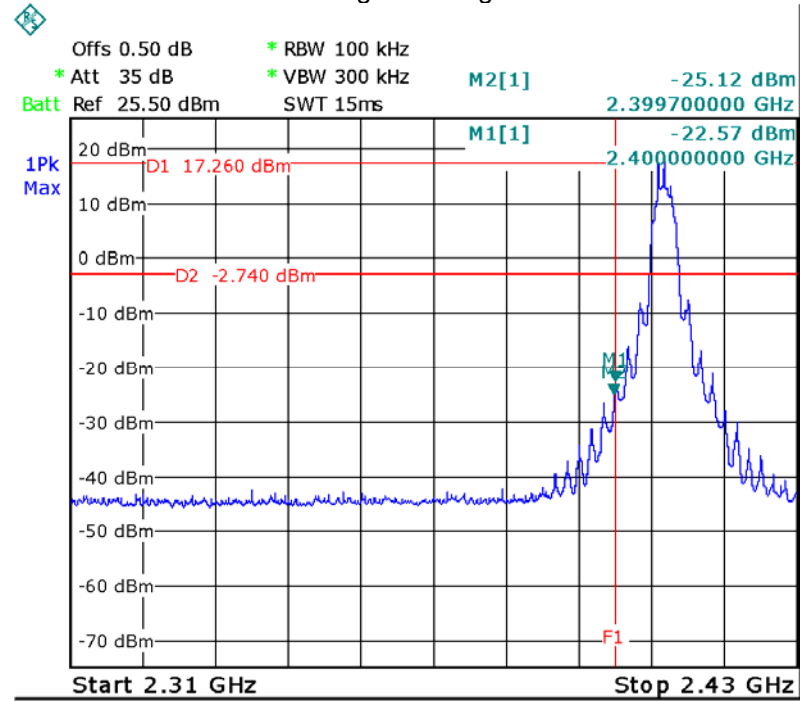
8.1 Test Procedure

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

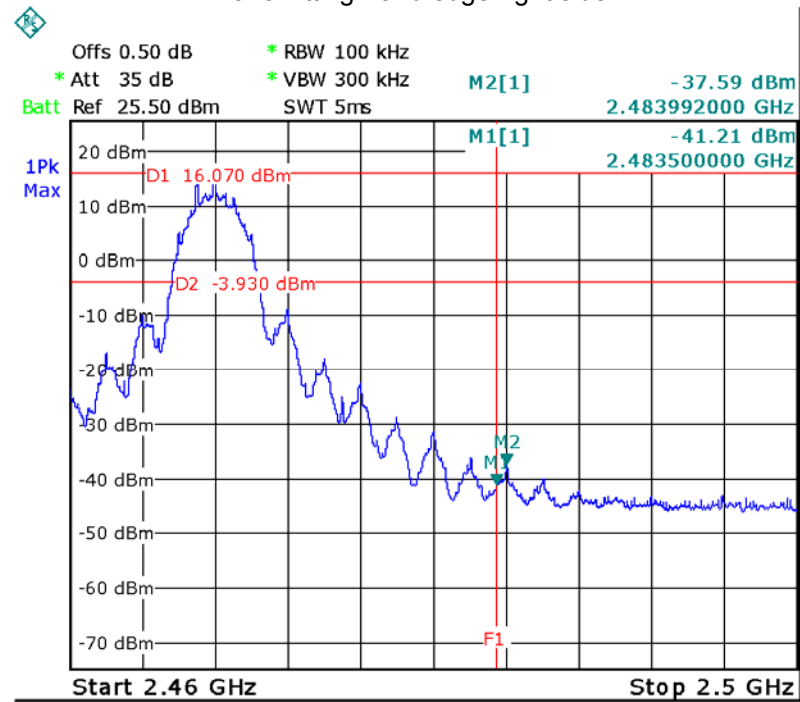
8.2 Test Result

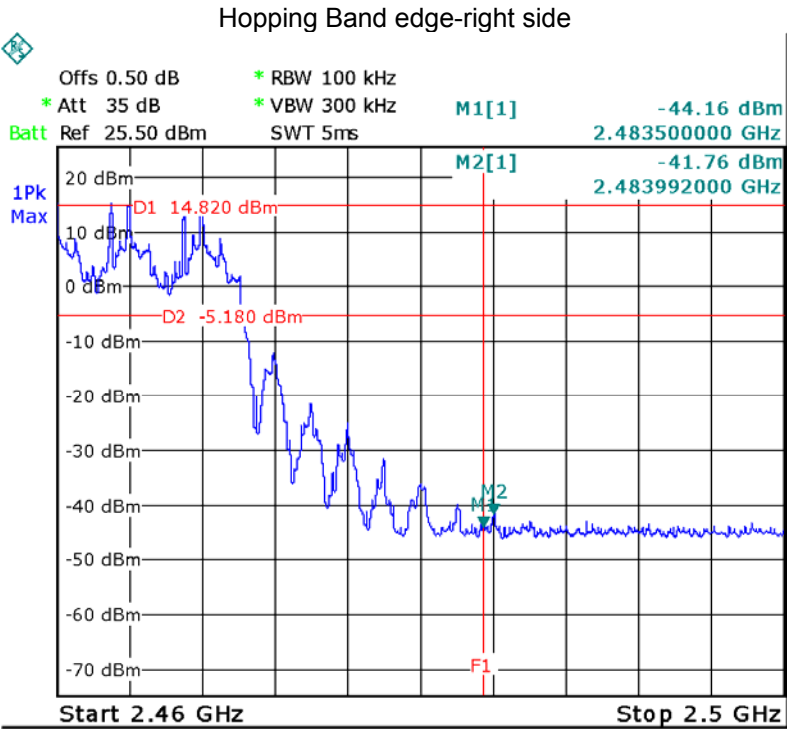
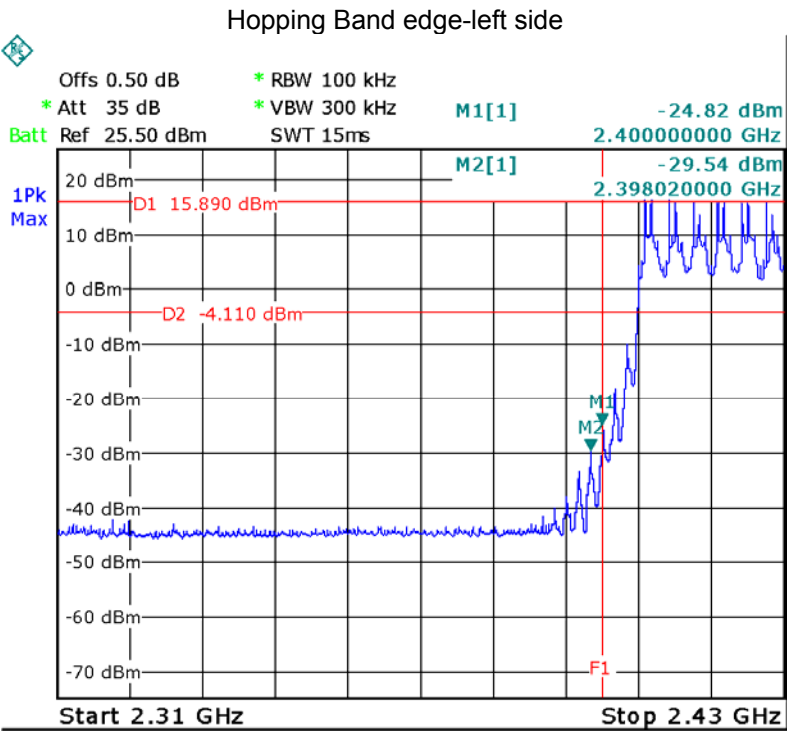
Test plots

Transmitting Band edge-left side



Transmitting Band edge-right side





9 20 dB Bandwidth Measurement

Test Requirement: FCC CFR47 Part 15 Section 15.247
 Test Method: DA 00-705& ANSI C63.10:2013
 Test Mode: Test in fixing operating frequency at low, Middle, high channel.

9.1 Test Procedure

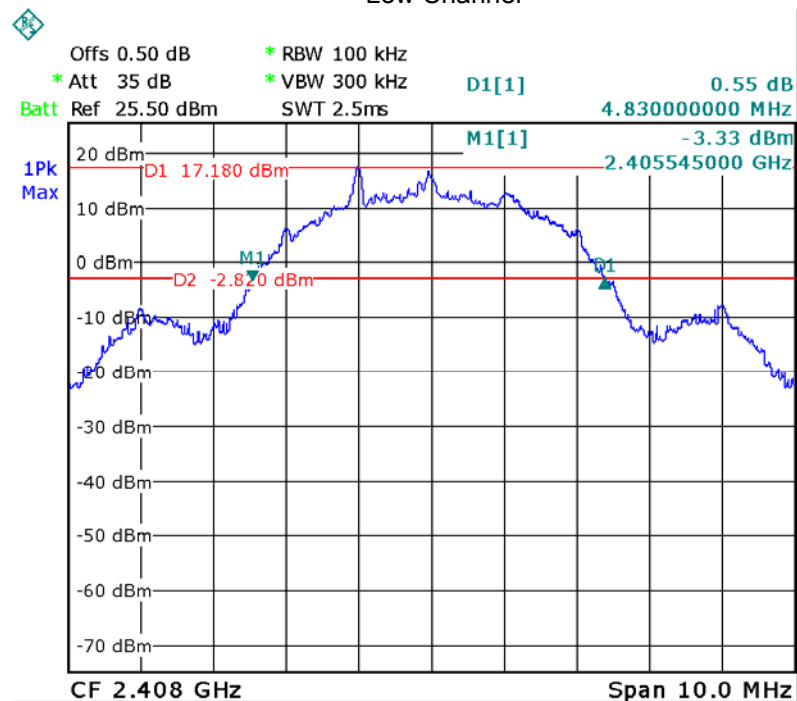
1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum;
2. Set the spectrum analyzer: RBW = 100kHz, VBW = 300kHz

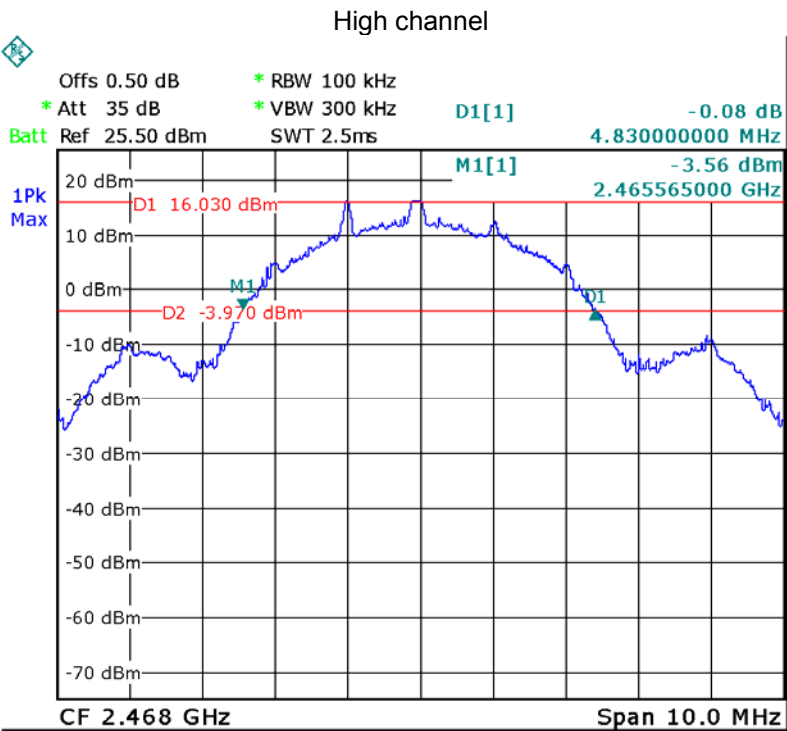
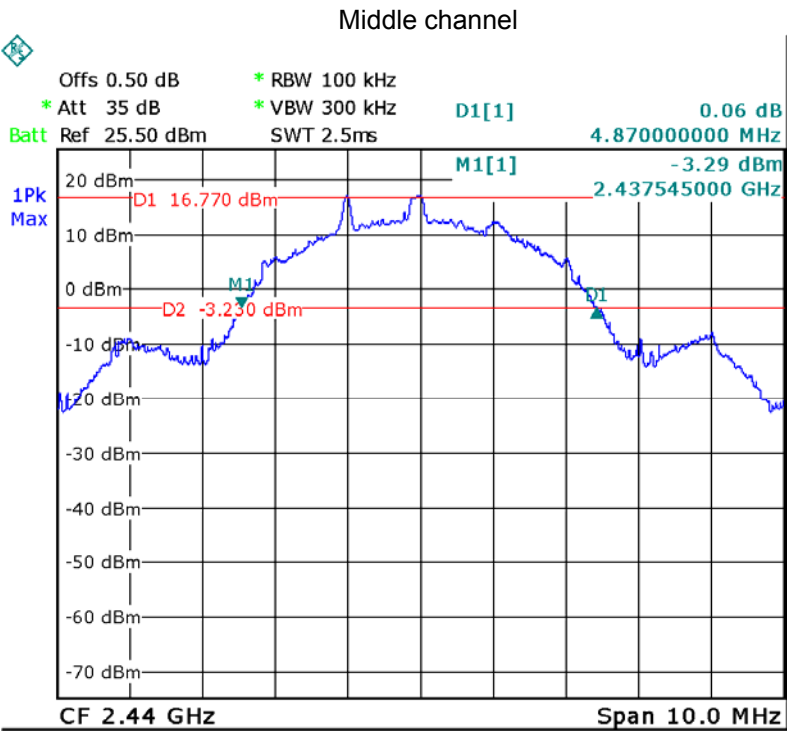
9.2 Test Result

Test Channel	Bandwidth
Low	4.830 MHz
Middle	4.870 MHz
High	4.830 MHz

Test plots

Low Channel





10 Maximum Peak Output Power

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

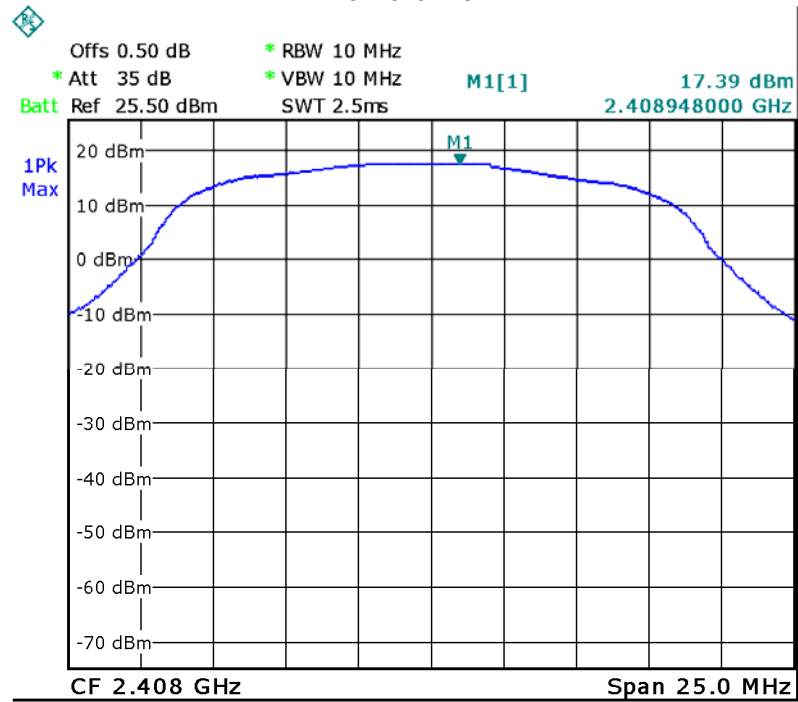
10.1 Test Procedure

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

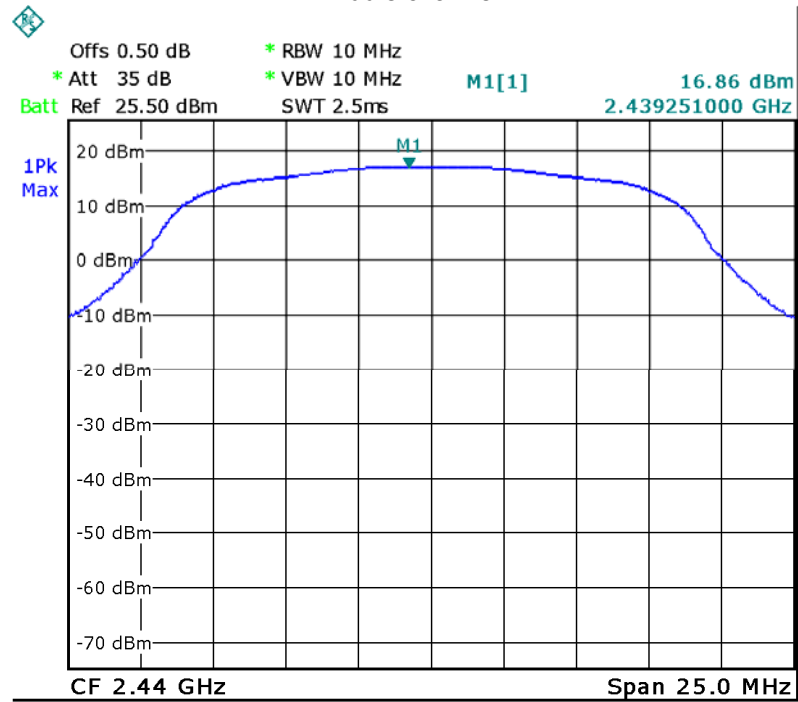
10.2 Test Result

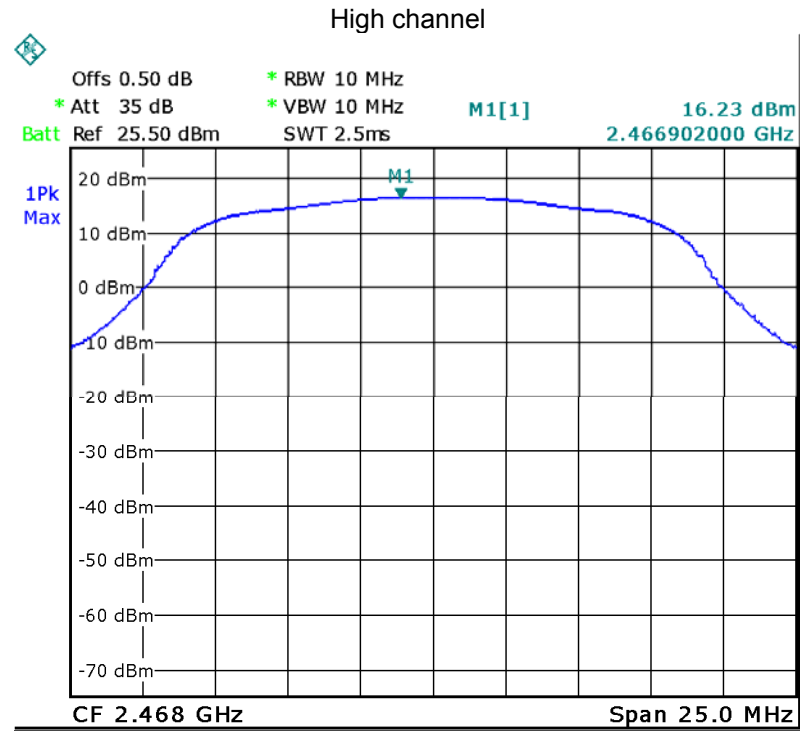
Test Channel	Output Power (dBm)	Limit (dBm)
Low	17.39	20.97
Middle	16.86	20.97
High	16.23	20.97

Test plots
Low channel



Middle channel





11 Hopping Channel Separation

Test Requirement:	FCC CFR47 Part 15 Section 15.247
Test Method:	DA 00-705& 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 2400-2483.5 MHz 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

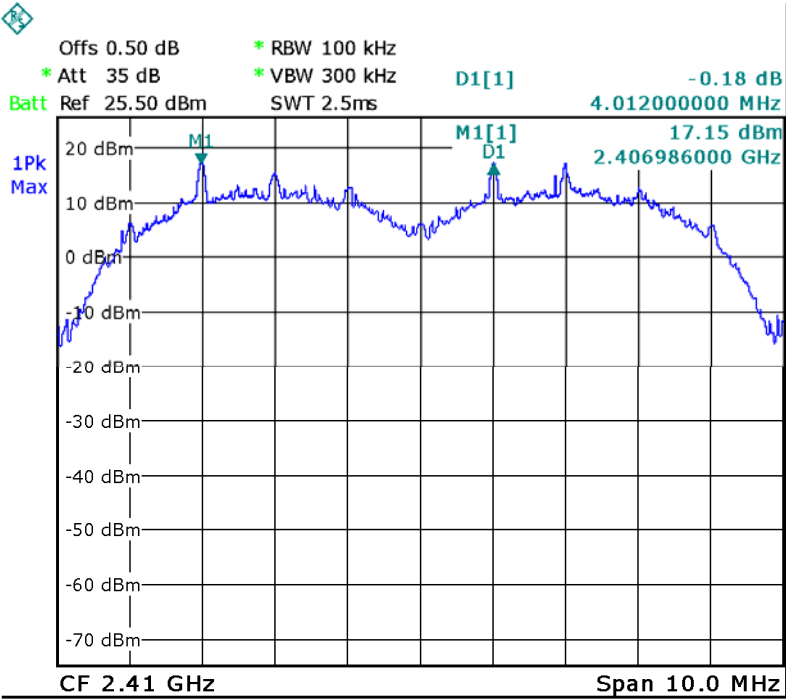
1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.
2. Set the spectrum analyzer: RBW = 100kHz. VBW = 300kHz , Span = 6.0MHz. Sweep = auto; Detector Function = Peak. Trace = Max hold.
3. Allow the trace to stabilize. Use the marker-delta function 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

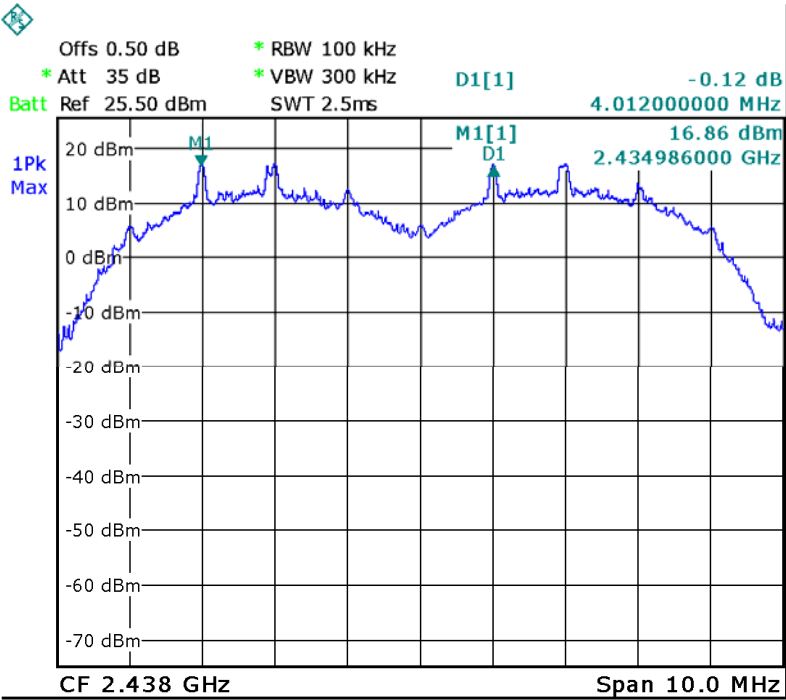
Test Channel	Separation (MHz)	Result
Low	4.012	PASS
Middle	4.012	PASS
High	4.000	PASS

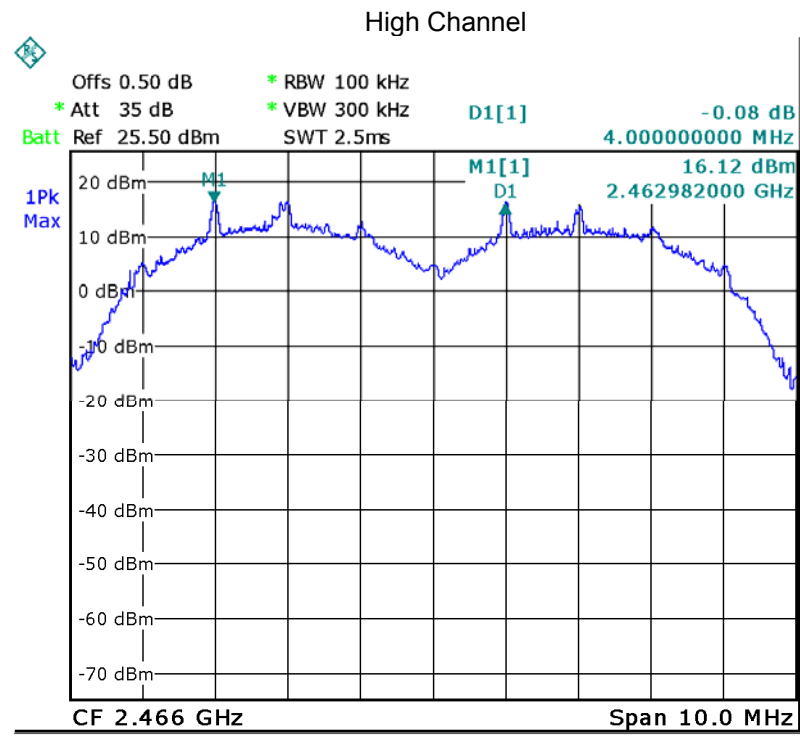
Test plots

Low Channel



Middle Channel





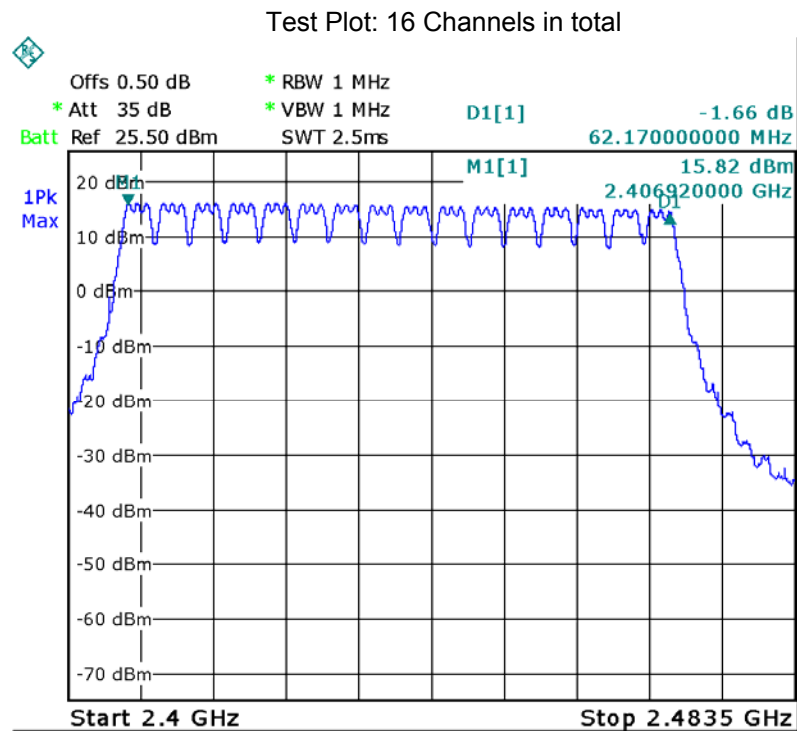
12 Number of Hopping Frequency

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

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 = 2.483GHz. Sweep=auto;

12.2 Test Result



13 Dwell Time

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

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.
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:

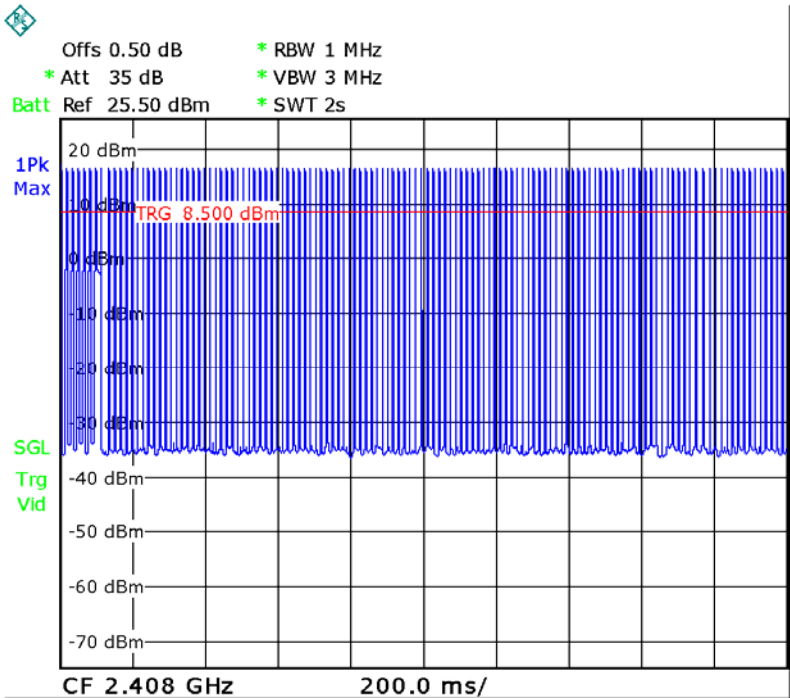
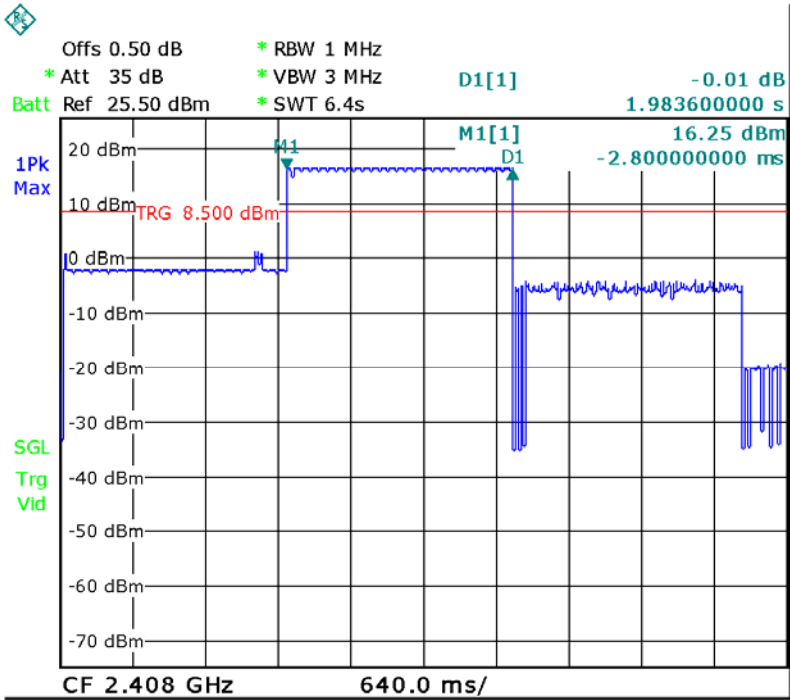
Low channel: Dwell Time = $1.9836 * 2.4 / 17.2 = 0.276s$

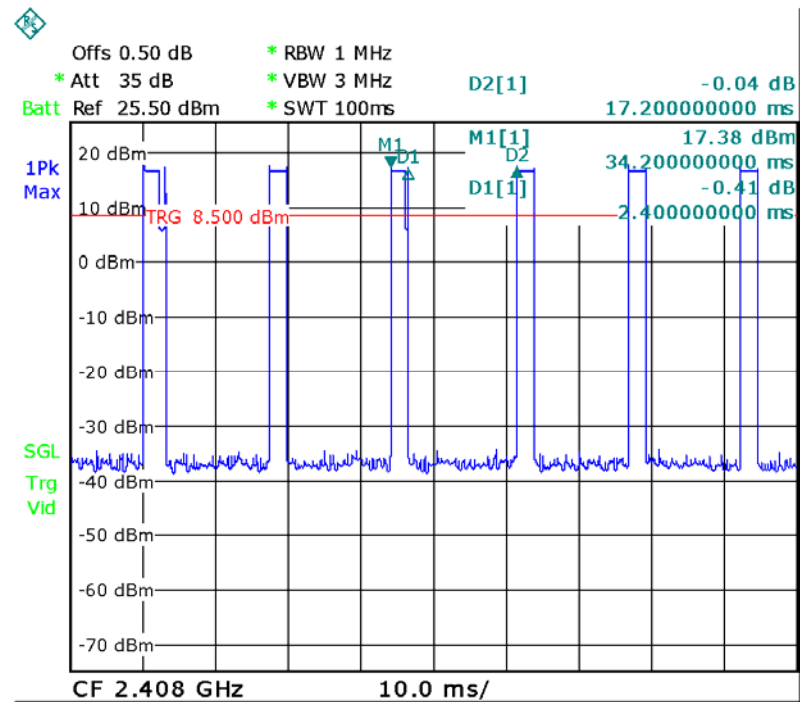
Middle Channel: Dwell Time = $1.9864 * 2.4 / 16.4 = 0.291s$

High Channel: Dwell Time = $1.9863 * 2.4 / 17.4 = 0.274s$

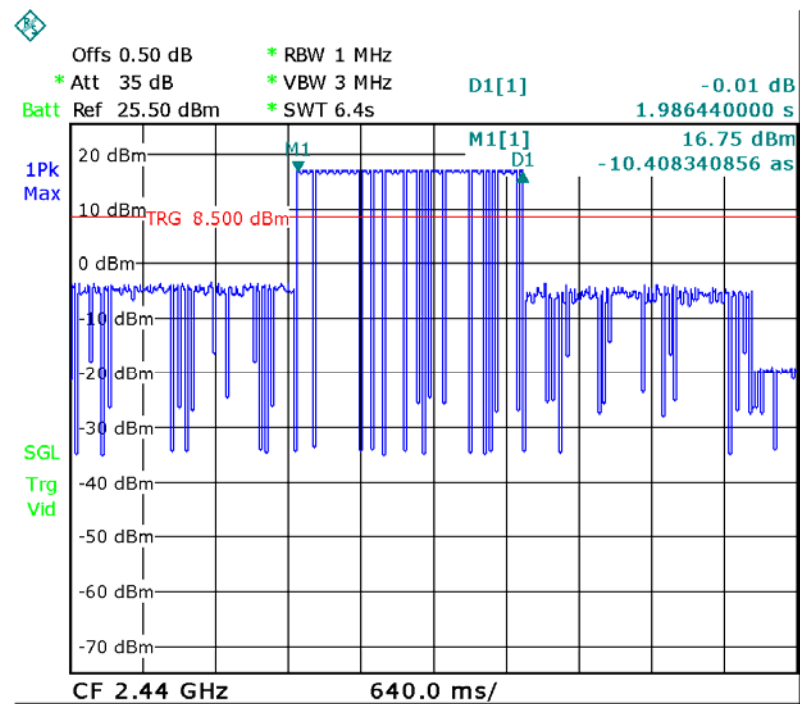
Frequency	Dwell Time(s)	Limits(s)	Result
2408MHz	0.276	0.400	Pass
2440 MHz	0.291	0.400	Pass
2468MHz	0.274	0.400	Pass

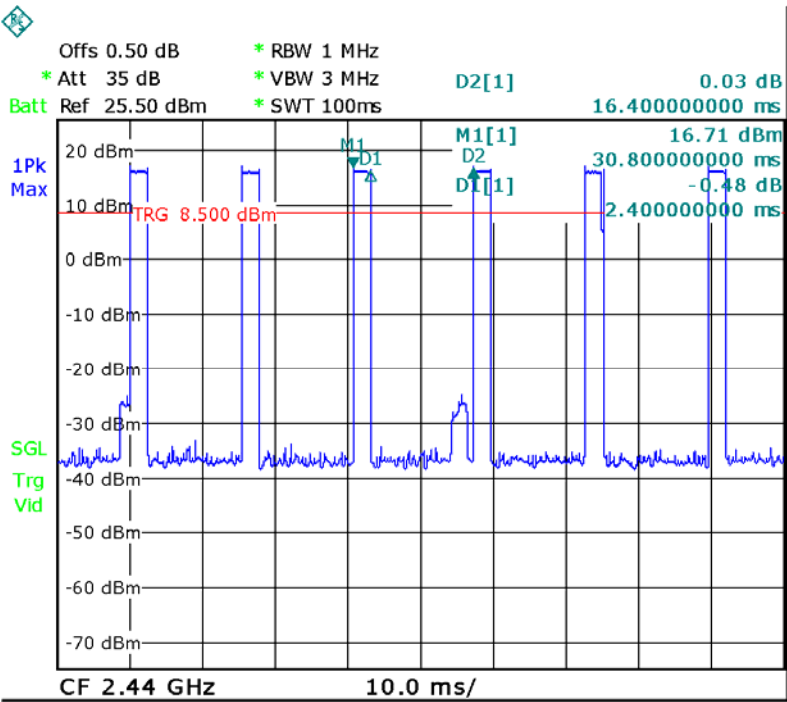
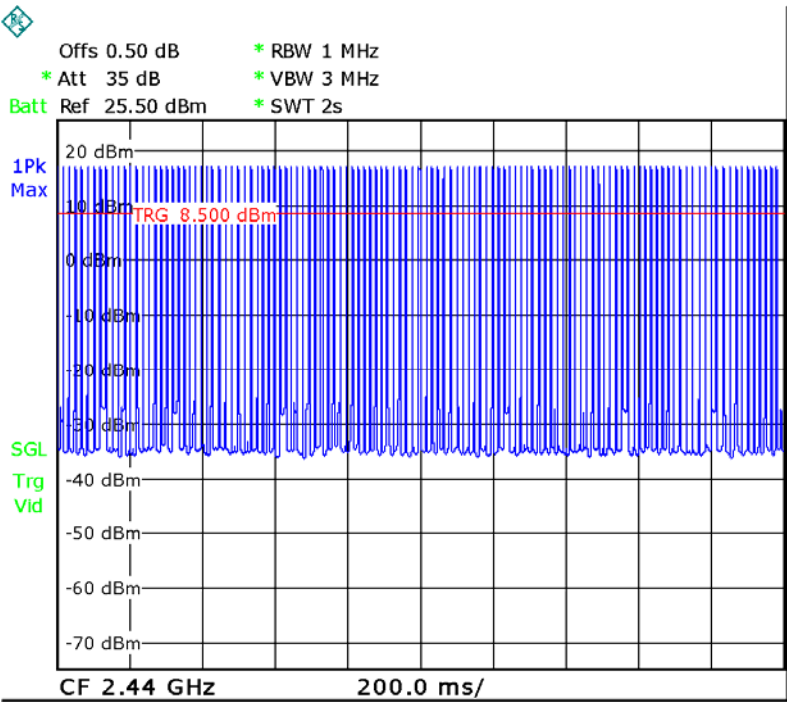
Test Plots
Low Channel

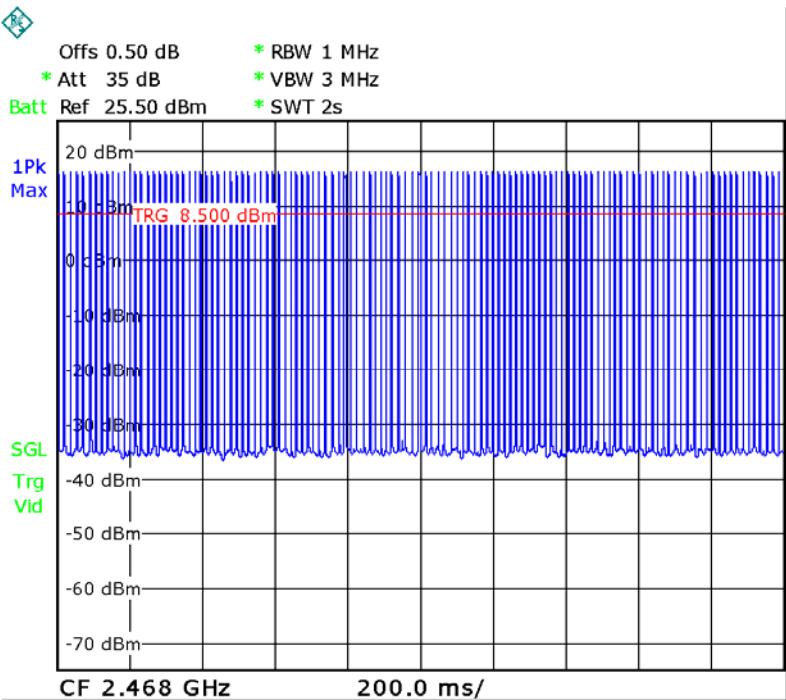
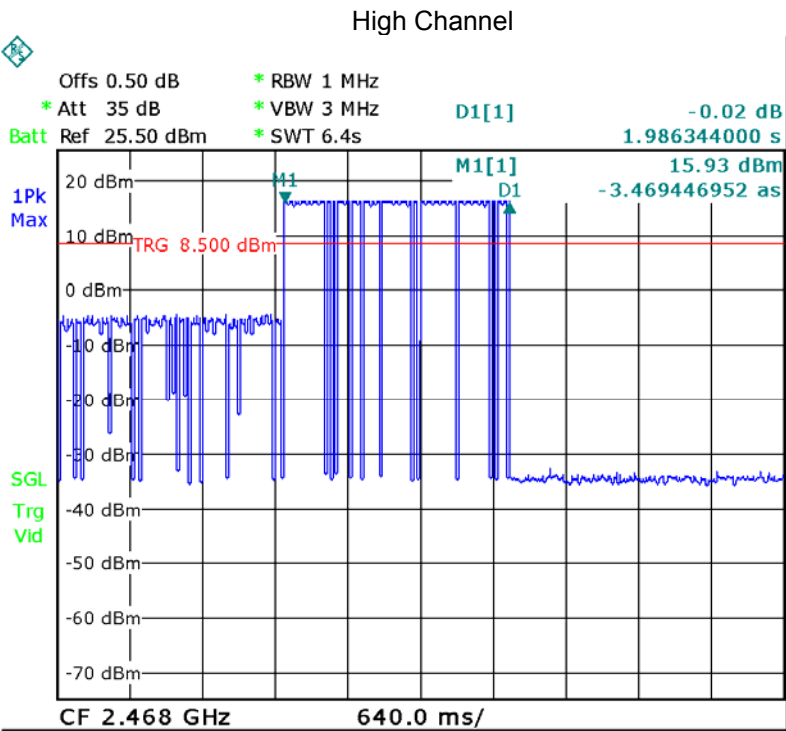


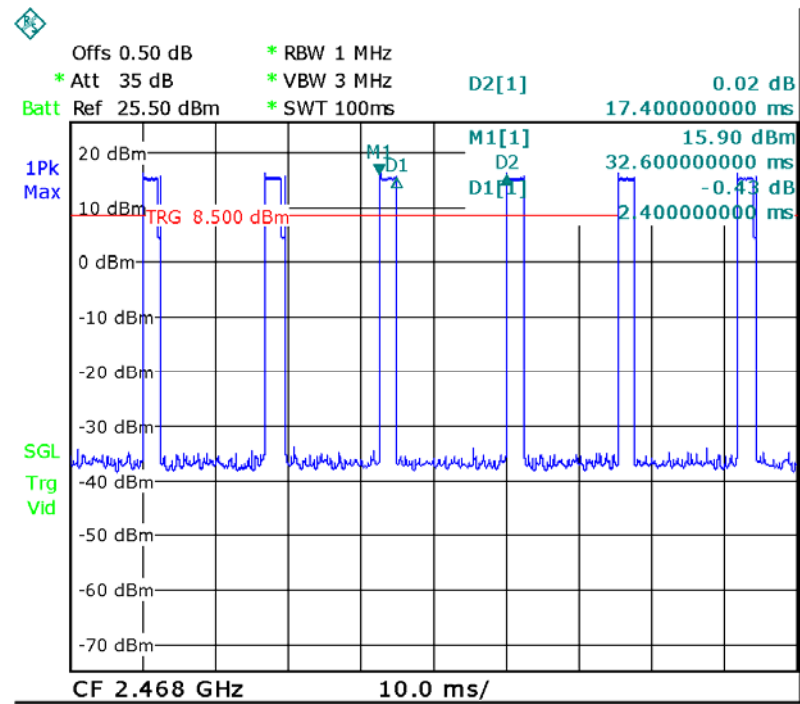


Middle Channel









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 an External antenna with RP-SMA connector (The whorl is non-standard, it only apply to this model), 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

Antenna Gain (numeric)	Peak Output Power (dBm)	Peak Output Power (mW)	Power Density (mW/cm ²)	Limit of Power Density (mW/cm ²)
1.585	17.39	54.828	0.017	1

16 Photographs – Model CA824Test Setup

16.1 Photograph – Conducted Emission Test Setup at Test Site 1#

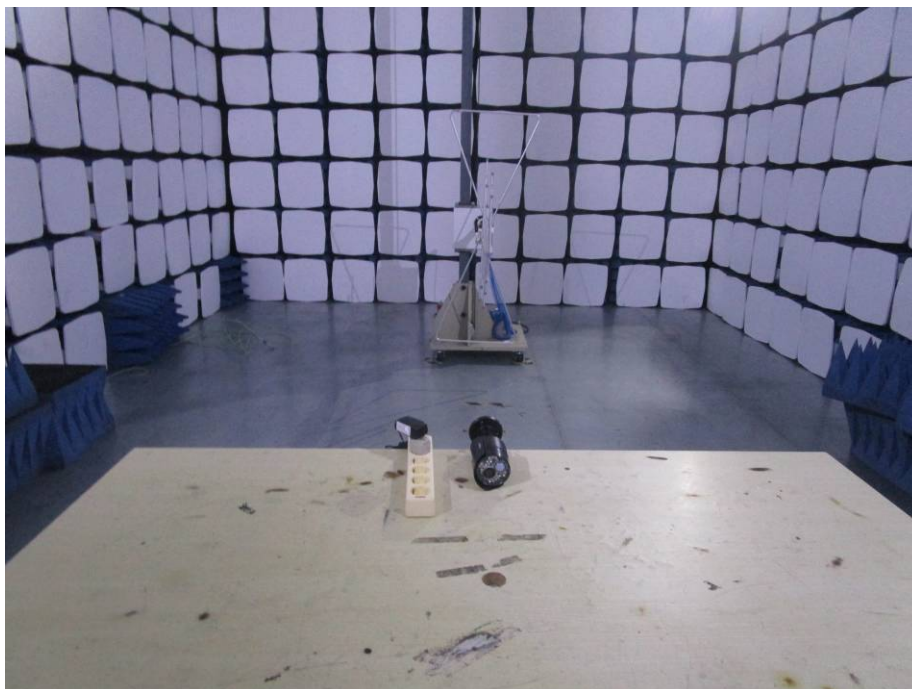


16.2 Photograph – Radiation Spurious Emission Test Setup

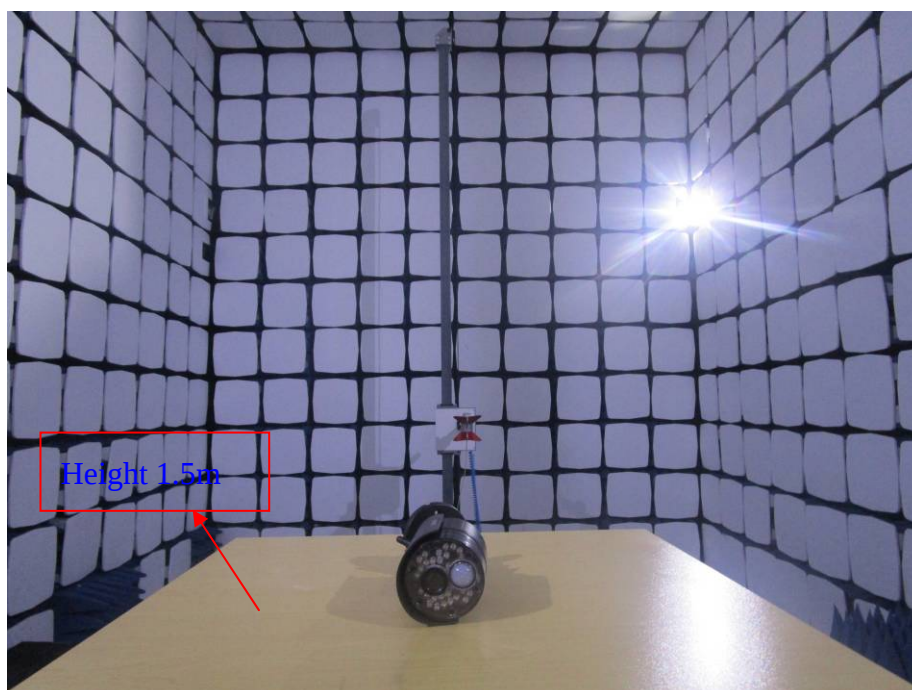
Below 30MHz at Test Site



30MHz-1GHz at Test Site



Above 1GHz at Test Site



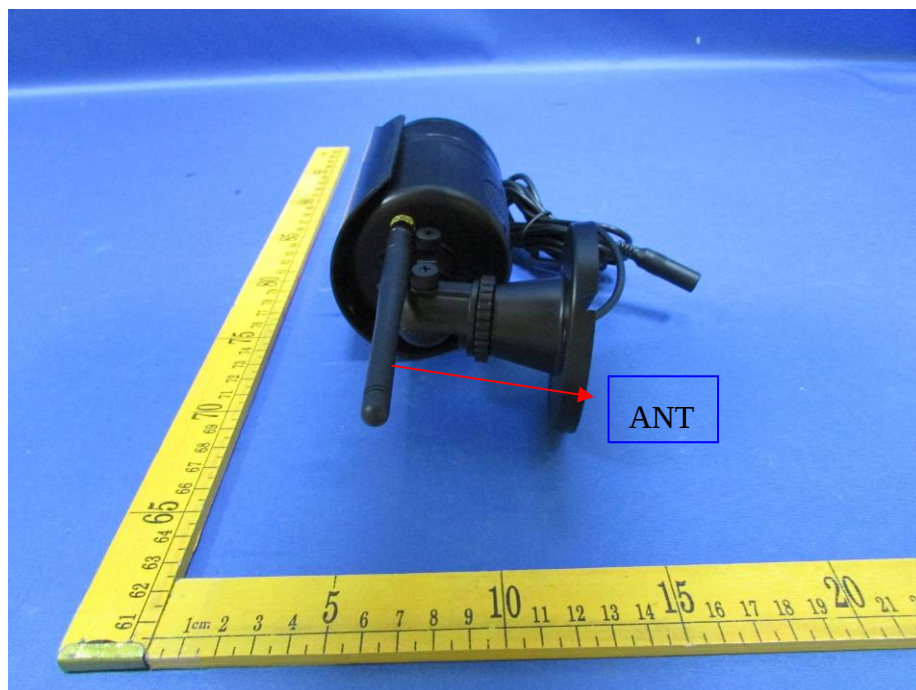
17 Photographs - Constructional Details

17.1 Model CA824 External View



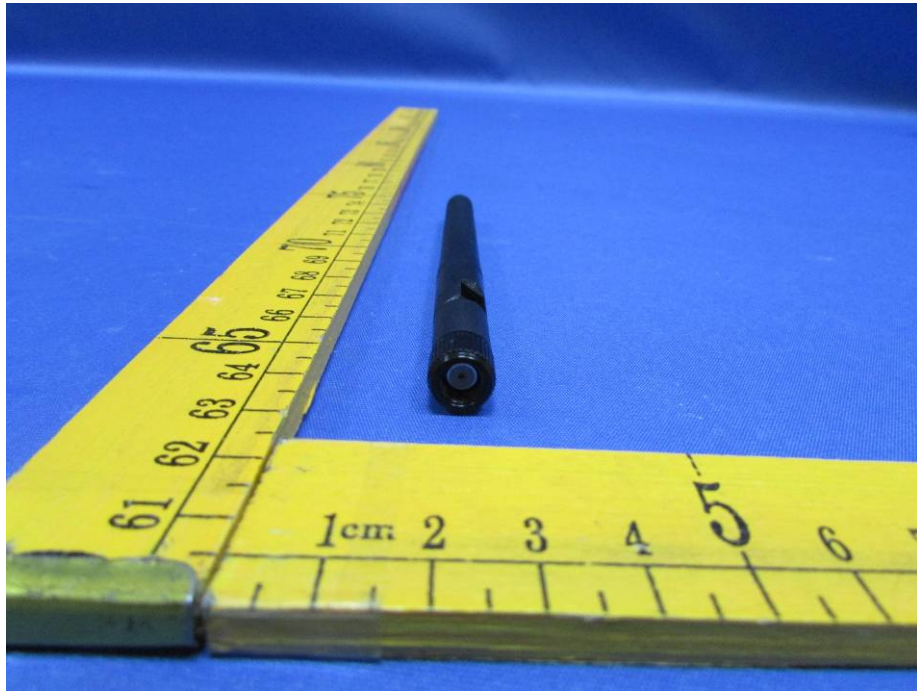






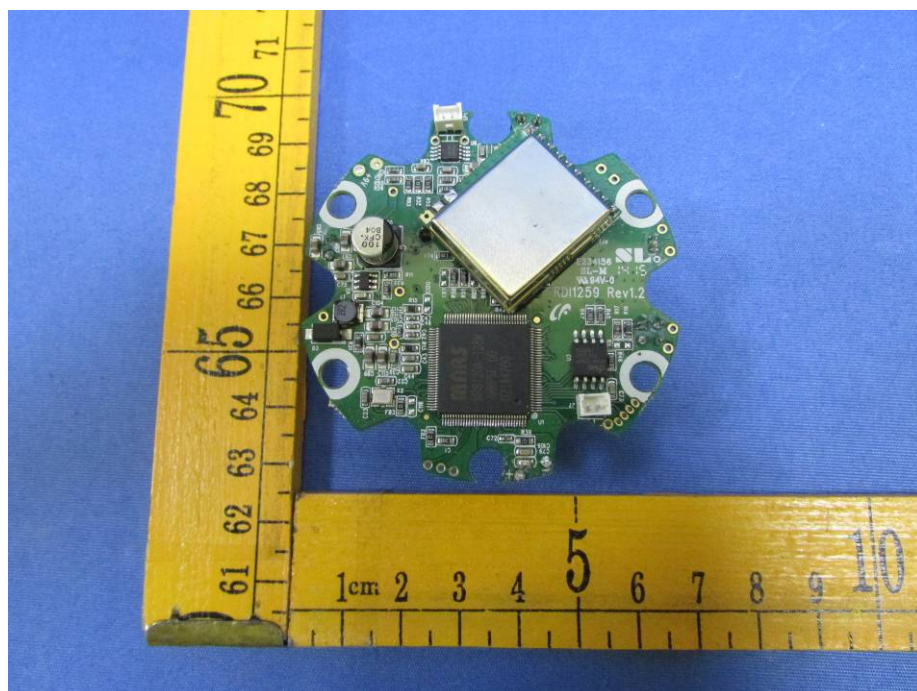


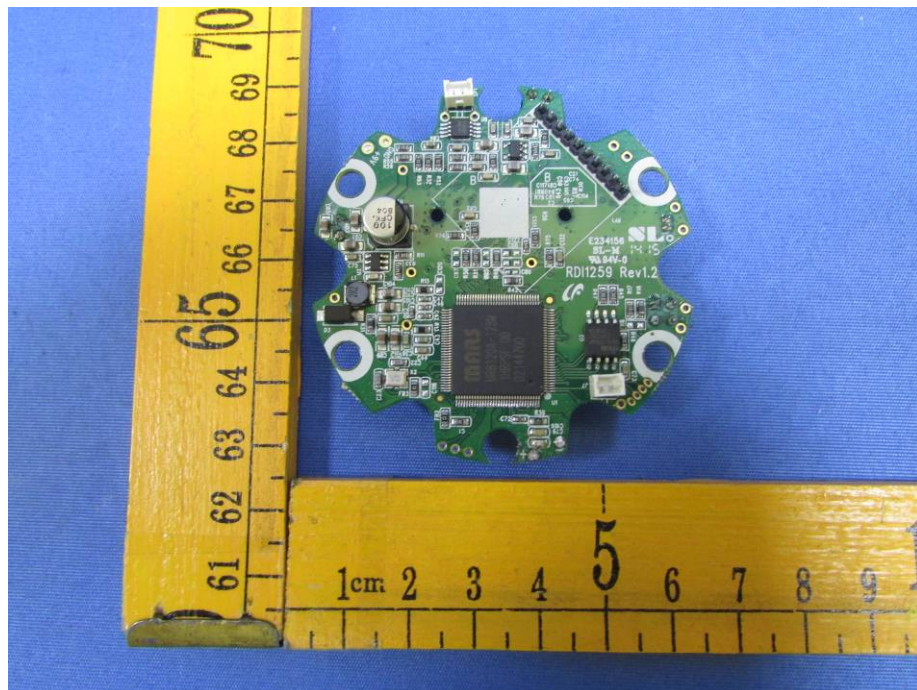
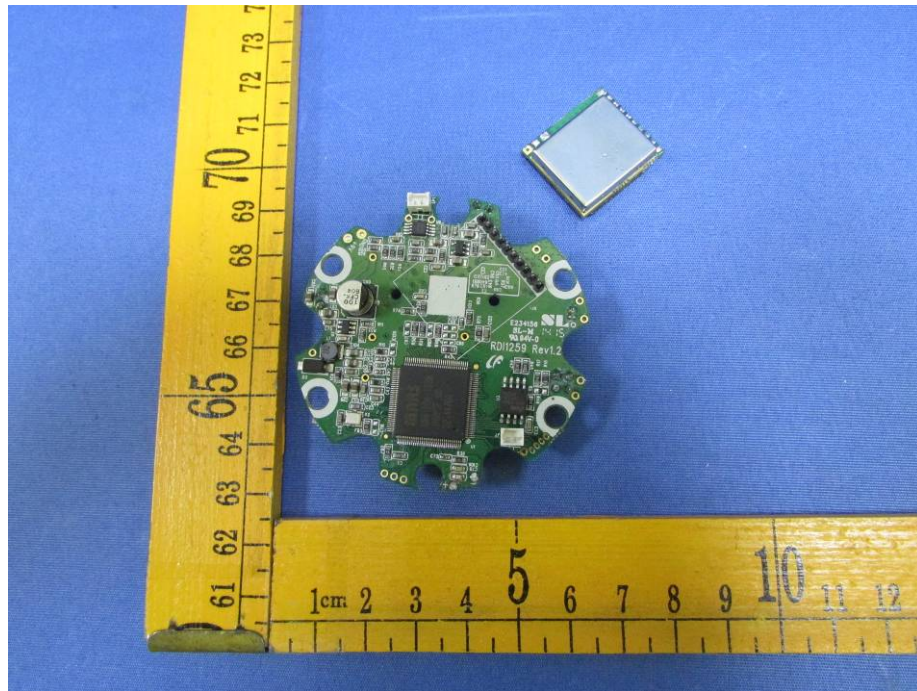


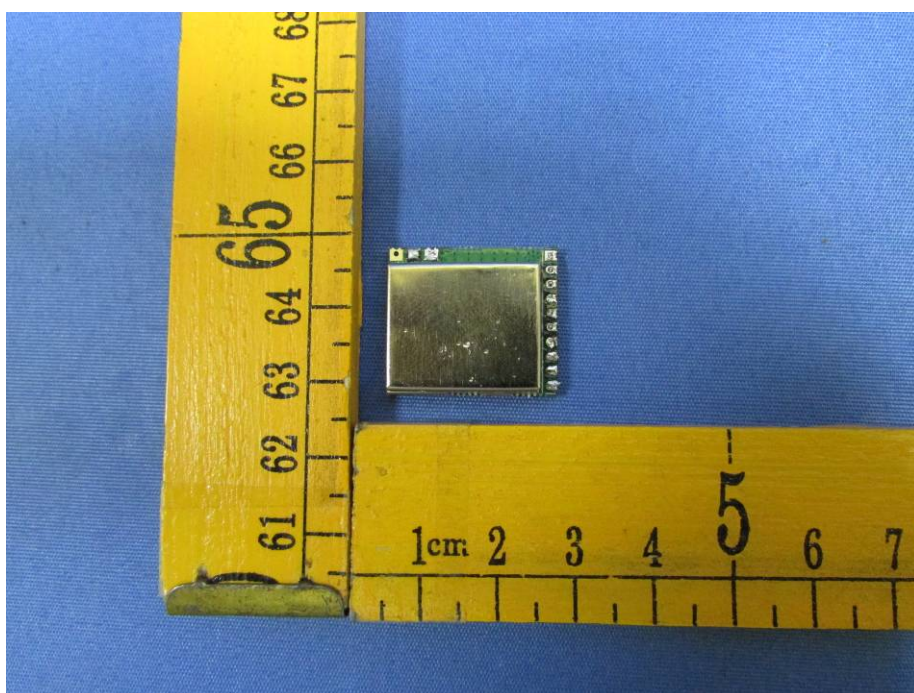
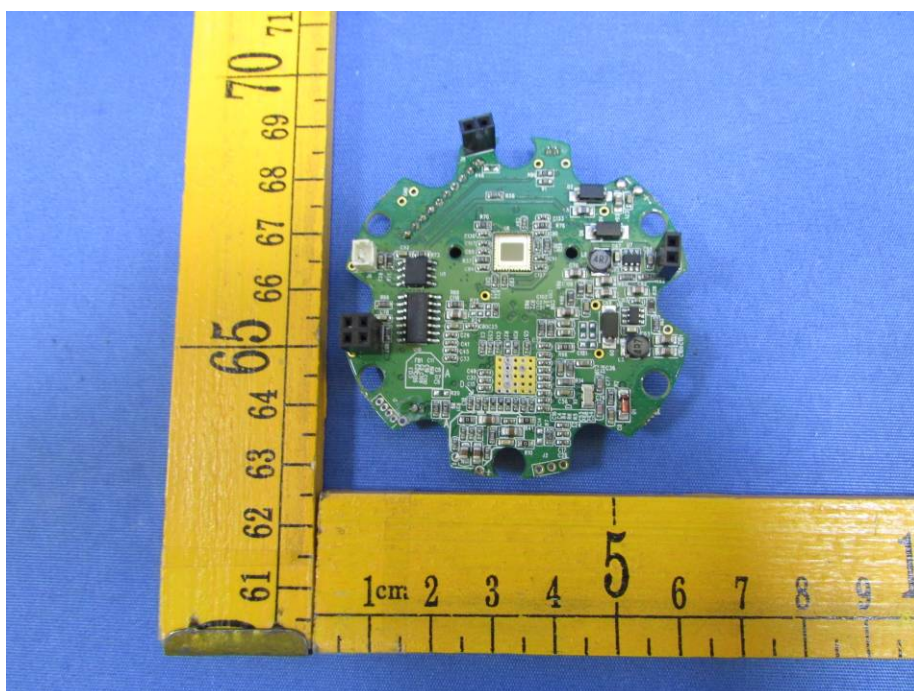


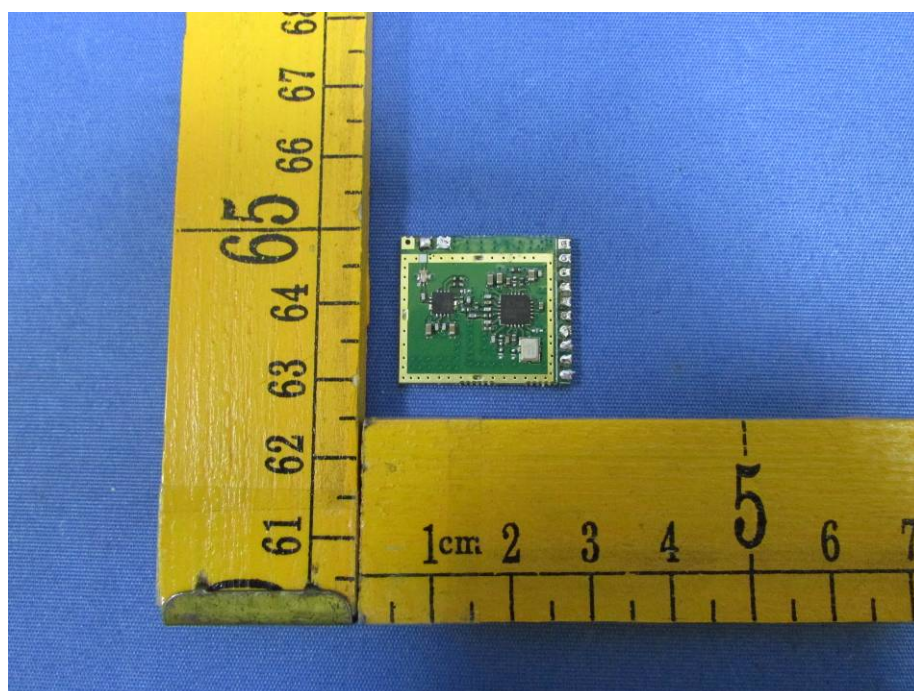
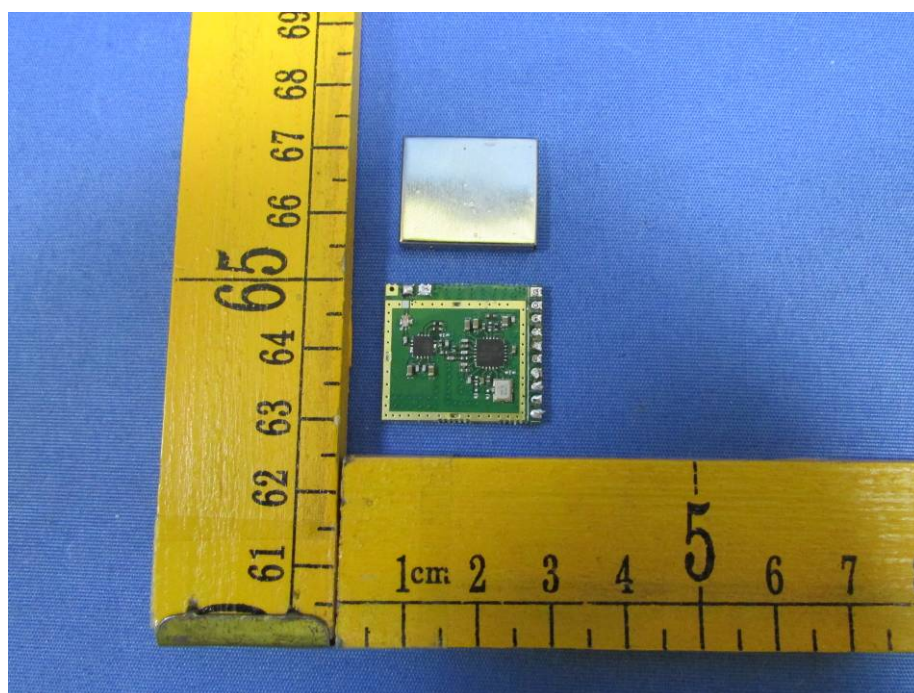
17.2 Model CA824 Internal View

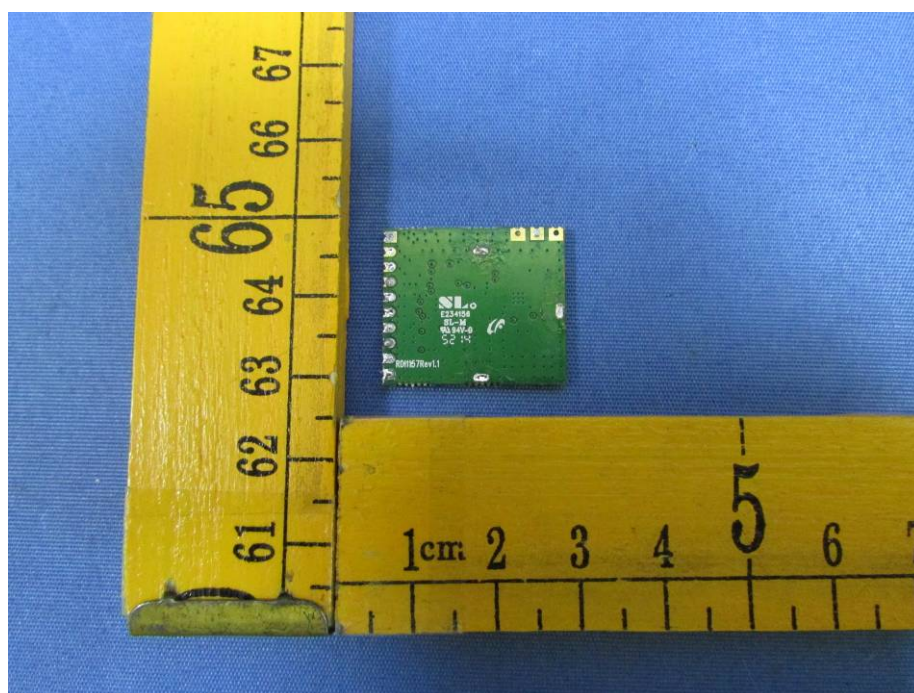


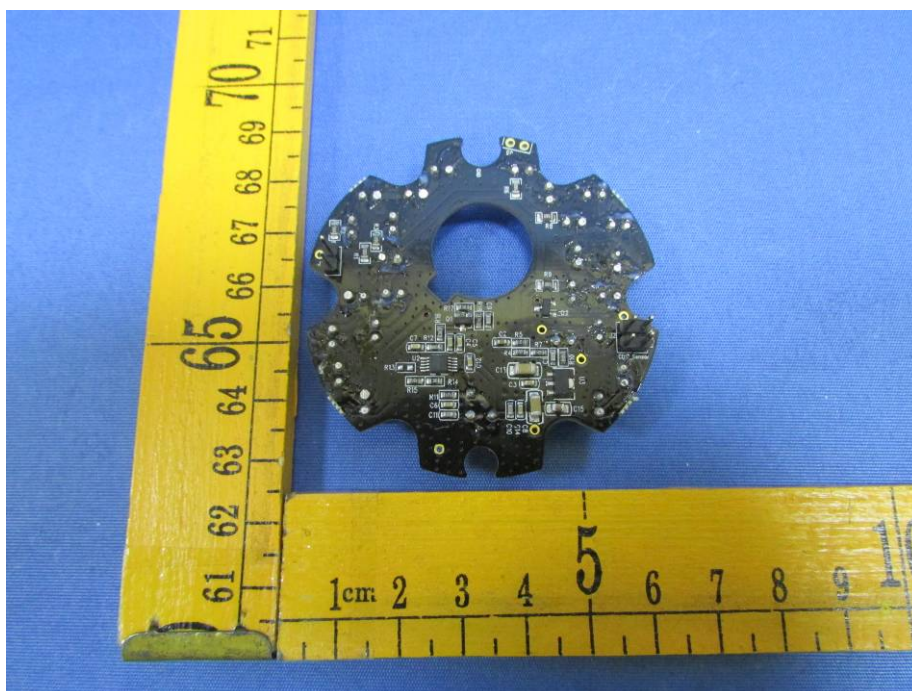












===== End of Report =====