

FCC TEST REPORT

FCC ID : SJ8-CA670HR
Applicant : RDI Technology (Shenzhen) Co., Ltd.
Address : Building C1 Xingtang Industrial Park, East Baishixia, Fuyong, Baoan, Shenzhen, China
Manufacturer : RDI Technology (Shenzhen) Co., Ltd.
Address : Building C1 Xingtang Industrial Park, East Baishixia, Fuyong, Baoan, Shenzhen, China
Equipment Under Test (EUT) :
Product Name : Digital Wireless Camera
Model No. : CA670HR
Rules : FCC CFR47 Part 15 Section 15.247:2010
Date of Test : July 13 ~ July 19, 2012
Date of Issue : July 21, 2012

Test Result : **PASS**

Remark:

* The sample described above has been tested to be in compliance with the requirements of ANSI C63.4:2003. The test results have been reviewed and comply with the rules listed above and found to meet their essential requirements.

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:

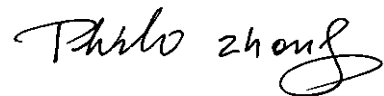
Waltek Services (Shenzhen) Co., Ltd.
1/F, Fukangtai Building, West Baima Rd., Songgang Street, Baoan District,
Shenzhen 518105, China
Tel: +86-755-83551033 Fax: +86-755-83552400

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
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
Antenna Requirement	15.203	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 TEST FACILITY	6
4.4 TEST LOCATION.....	6
5 EQUIPMENT USED DURING TEST	7
5.1 EQUIPMENTS LIST.....	7
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.....	9
6.3 CONDUCTED EMISSION TEST RESULT.....	9
7 RADIATED SPURIOUS EMISSIONS	12
7.1 EUT OPERATION :	12
7.2 TEST SETUP.....	13
7.3 SPECTRUM ANALYZER SETUP.....	14
7.4 TEST PROCEDURE.....	15
7.5 CORRECTED AMPLITUDE & MARGIN CALCULATION	15
7.6 SUMMARY OF TEST RESULTS.....	16
8 BAND EDGE MEASUREMENT	21
8.1 TEST RESULT:.....	22
9 20 DB BANDWIDTH MEASUREMENT.....	26
9.1 TEST PROCEDURE:	26
9.2 TEST RESULT:.....	26
10 MAXIMUM PEAK OUTPUT POWER.....	28
10.1 TEST PROCEDURE:.....	28
10.2 TEST RESULT:	28
11 HOPPING CHANNEL SEPARATION.....	29
11.1 TEST PROCEDURE:.....	29
11.2 TEST RESULT:	29
12 NUMBER OF HOPPING FREQUENCY	32
12.1 TEST PROCEDURE:.....	32
12.2 TEST RESULT.....	32
13 DWELL TIME.....	33
13.1 TEST PROCEDURE:.....	33
13.2 TEST RESULT:	33
14 ANTENNA REQUIREMENT	36
15 RF EXPOSURE.....	37
15.1 REQUIRMENTS:.....	37

15.2	THE PROCEDURES / LIMIT	37
15.3	MPE CALCULATION METHOD.....	38
16	PHOTOGRAPHS – TEST SETUP	39
16.1	PHOTOGRAPH – RADIATION SPURIOUS EMISSION TEST SETUP.....	39
16.2	PHOTOGRAPH – CONDUCTED EMISSION TEST SETUP.....	40
17	PHOTOGRAPHS - CONSTRUCTIONAL DETAILS	41
17.1	PRODUCT VIEW.....	41
17.2	EUT – APPEARANCE VIEW	41
17.3	EUT – OPEN VIEW.....	42
17.4	EUT - PCB VIEW	43
18	FCC LABEL.....	47

4 General Information

4.1 General Description of E.U.T.

Product Name	: Digital Wireless Camera
Model No.	: CA670HR
Operation Frequency	: 2402MHz ~ 2480MHz,40 channels in total
Type of Modulation	: GFSK
Antenna installation	: Integrated Antenna
Antenna Gain	: 2 dBi

4.2 Details of E.U.T.

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

4.3 Test Facility

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

- **IC – Registration No.: 7760A**

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, 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, May 26, 2011.

4.4 Test Location

All the tests were performed at:

Waltek Services(Shenzhen) Co., Ltd. at 1/F, Fukangtai Building, West Baima Rd., Songgang Street, Baoan District, Shenzhen, China

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	101178	Aug. 13,2012	Aug. 13,2013
2.	LISN	R&S	ENV216	101215	Aug. 13,2012	Aug. 13,2013
3.	Cable	HUBER+SUHNER	CBL2-NN-3M	2230300	Aug. 13,2012	Aug. 13,2013
4.	Switch	---	RSU/M2	---	Aug. 13,2012	Aug. 13,2013
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	Aug. 13,2012	Aug. 13,2013
2.	Active Loop Antenna	Beijing Dazhi	ZN30900A	-	Aug. 13,2012	Aug. 13,2013
3.	Trilog Broadband Antenna	SCHWARZBECK	VULB9163	336	Aug. 13,2012	Aug. 13,2013
4.	Broad-band Horn Antenna	SCHWARZBECK	VULB9163	667	Aug. 13,2012	Aug. 13,2013
5.	Broad-band Horn Antenna	SCHWARZBECK	BBHA 9170	399	Aug. 13,2012	Aug. 13,2013
6.	Broadband Preamplifier	SCHWARZBECK	BBV 9719	9719-254	Aug. 13,2012	Aug. 13,2013
7.	Broadband Preamplifier	SCHWARZBECK	BBV 9718	9718-148	Aug. 13,2012	Aug. 13,2013
8.	10m Coaxial Cable with N- plug	SCHWARZBECK	AK 9515 H	-	Aug. 13,2012	Aug. 13,2013
9.	10m 50 Ohm Coaxial Cable with N-plug	SCHWARZBECK	AK 9513	-	Aug. 13,2012	Aug. 13,2013
10.	Positioning Controller	C&C LAB	CC-C-IF	-	Aug. 13,2012	Aug. 13,2013
11.	Color Monitor	SUNSPO	SP-14C	-	Aug. 13,2012	Aug. 13,2013

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)
	± 4.74 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.

Waltek Services (Shenzhen) Co.,Ltd.

<http://www.waltek.com.cn>

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:	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) Quasi-Peak &Average if maximised peak within 6dB of Average Limit

6.1 E.U.T. Operation

Operating Environment:

Temperature: 25.5 °C

Humidity: 51 % RH

Atmospheric Pressure: 1012 mbar

EUT Operation:

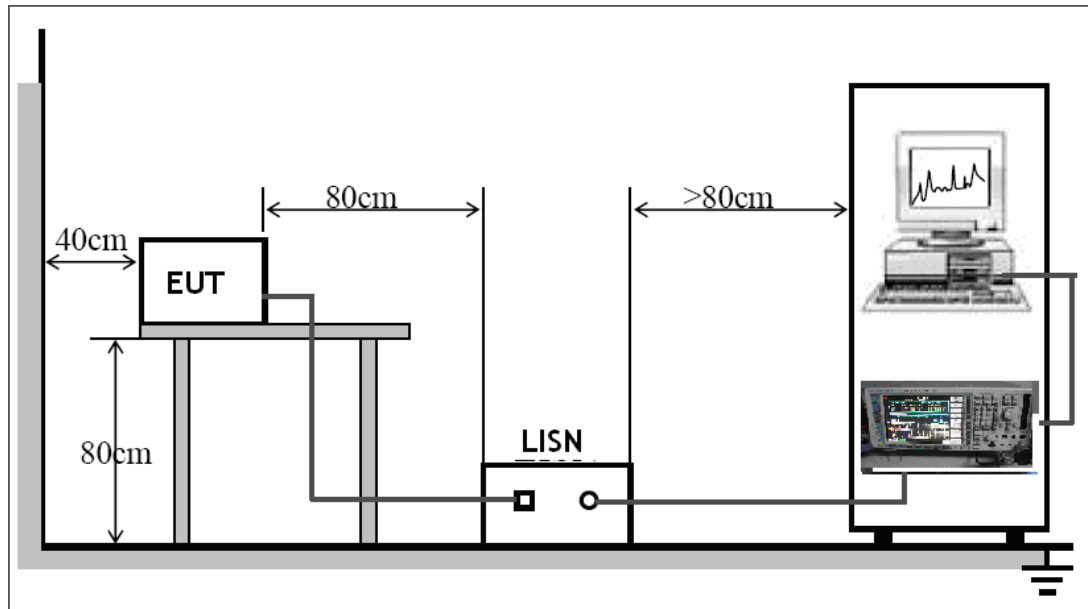
The pre-test was performed in normal link mode, the worst data shown as follow.

The EUT was tested according to ANSI C63.4:2003. The frequency spectrum from 150kHz to 30MHz was investigated.

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.

6.2 EUT Setup

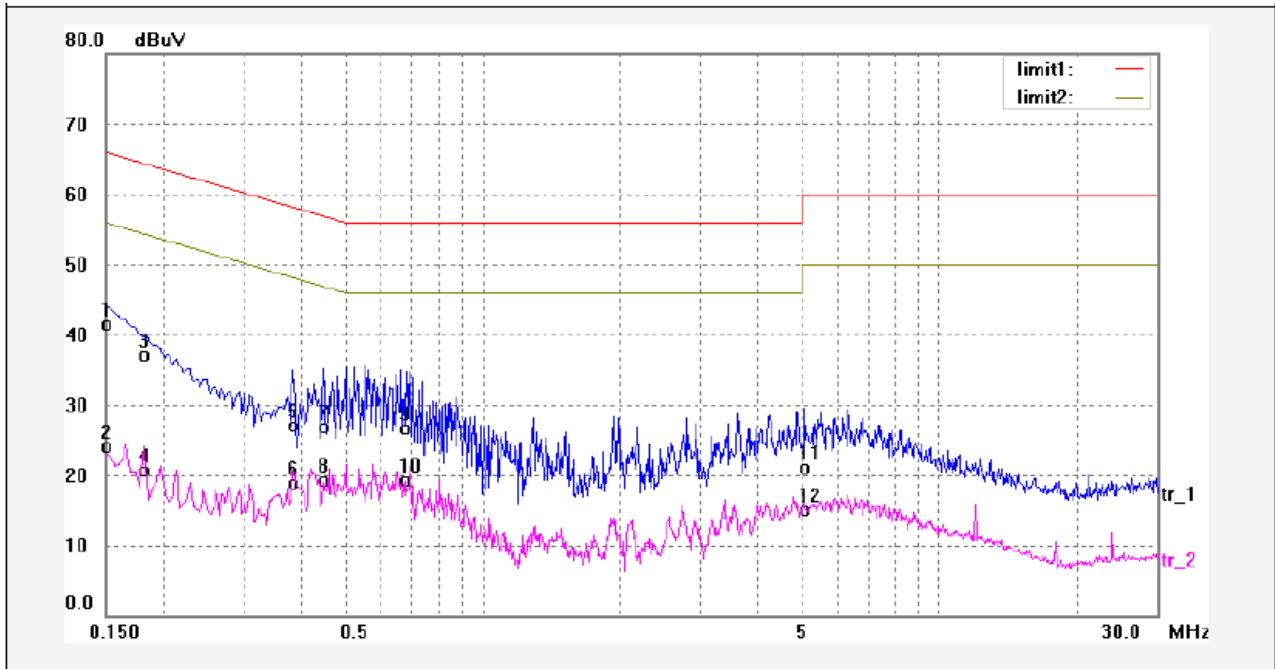
The EUT was placed on the test table in shielding room.



6.3 Conducted Emission Test Result

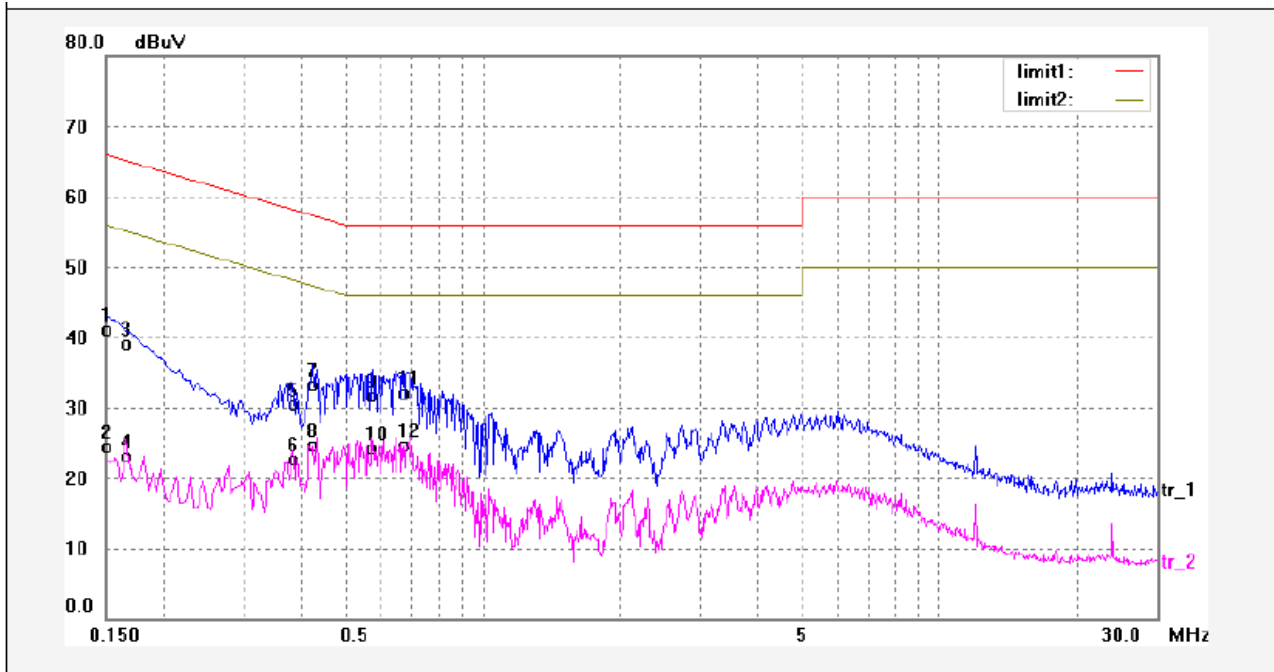
An initial pre-scan was performed on the live and neutral lines.

Live line:



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Margin (dB)	Detector	Remark
1	0.1500	30.96	9.80	40.76	65.99	-25.23	QP	
2	0.1500	13.59	9.80	23.39	55.99	-32.60	AVG	
3	0.1825	26.39	9.83	36.22	64.37	-28.15	QP	
4	0.1825	9.99	9.83	19.82	54.37	-34.55	AVG	
5	0.3860	16.47	9.90	26.37	58.15	-31.78	QP	
6	0.3860	8.25	9.90	18.15	48.15	-30.00	AVG	
7	0.4500	16.12	9.91	26.03	56.87	-30.84	QP	
8	0.4500	8.53	9.91	18.44	46.87	-28.43	AVG	
9	0.6660	16.05	9.95	26.00	56.00	-30.00	QP	
10	0.6660	8.54	9.95	18.49	46.00	-27.51	AVG	
11	5.1020	10.22	10.11	20.33	60.00	-39.67	QP	
12	5.1020	4.16	10.11	14.27	50.00	-35.73	AVG	

Neutral line:



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Margin (dB)	Detector	Remark
1	0.1500	30.50	9.80	40.30	65.99	-25.69	QP	
2	0.1500	13.99	9.80	23.79	55.99	-32.20	AVG	
3	0.1641	28.44	9.81	38.25	65.25	-27.00	QP	
4	0.1641	12.41	9.81	22.22	55.25	-33.03	AVG	
5	0.3820	19.73	9.89	29.62	58.23	-28.61	QP	
6	0.3820	11.93	9.89	21.82	48.23	-26.41	AVG	
7	0.4260	22.51	9.91	32.42	57.33	-24.91	QP	
8	0.4260	13.98	9.91	23.89	47.33	-23.44	AVG	
9	0.5780	20.91	9.94	30.85	56.00	-25.15	QP	
10	0.5780	13.50	9.94	23.44	46.00	-22.56	AVG	
11	0.6700	21.28	9.95	31.23	56.00	-24.77	QP	
12	0.6700	13.92	9.95	23.87	46.00	-22.13	AVG	

7 Radiated Spurious Emissions

Test Requirement: FCC CFR47 Part 15 Section 15.209 & 15.247

Test Method: DA 00-705

Test Result: PASS

Frequency Range: 9KHz to 25GHz

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	$2400/F(\text{kHz})$	300	$10000 * 2400/F(\text{kHz})$	$20\log^{(2400/F(\text{kHz}))} + 80$
0.490 ~ 1.705	$24000/F(\text{kHz})$	30	$100 * 24000/F(\text{kHz})$	$20\log^{(24000/F(\text{kHz}))} + 40$
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: 25.5 °C

Humidity: 51 % RH

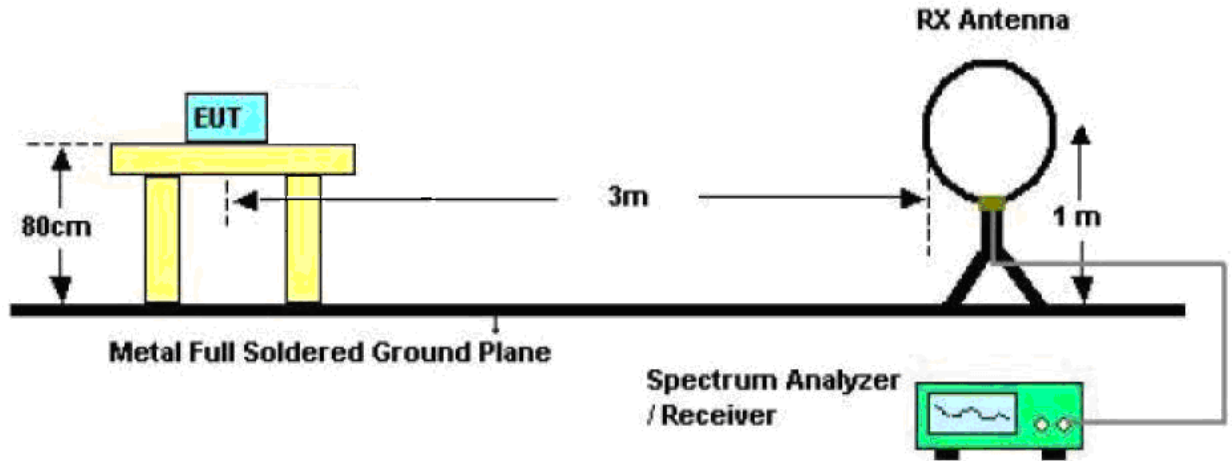
Atmospheric Pressure: 1012 mbar

Test mode: The EUT was tested in continuously Transmit mode.

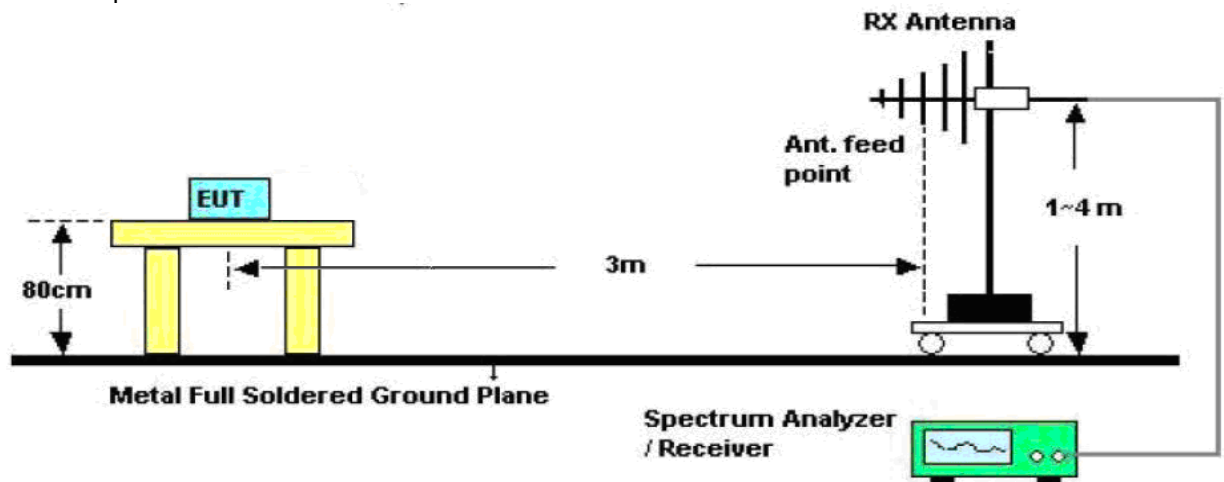
7.2 Test Setup

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

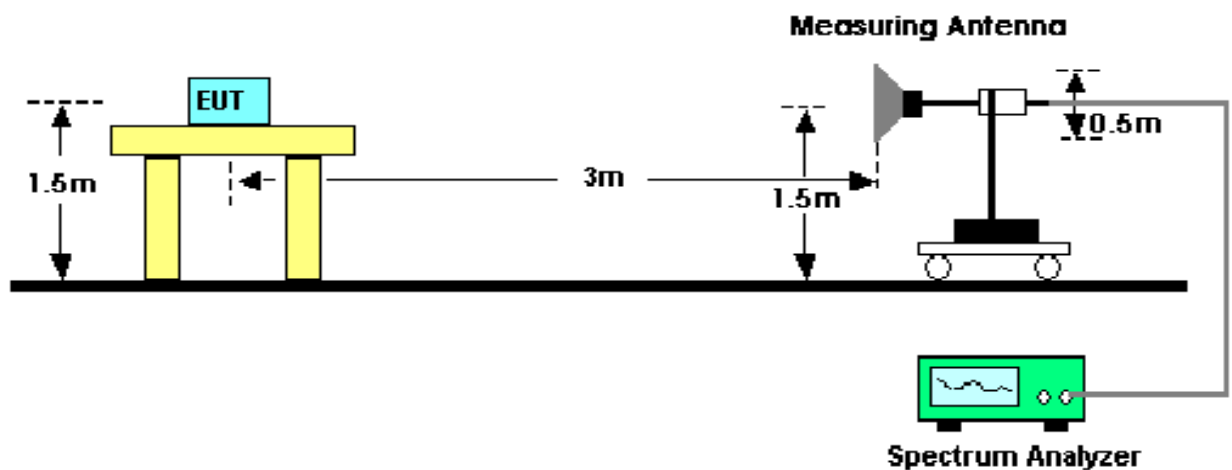
The test setup for emission measurement below 30MHz.



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



The test setup for emission measurement above 1 GHz.



7.3 Spectrum Analyzer Setup

According to FCC Part15 Rules, the system was tested 9KHz to 25000MHz.

Below 30MHz

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

30MHz ~ 1GHz

Sweep Speed Auto
IF Bandwidth 120 KHz
Video Bandwidth..... 100KHz
Quasi-Peak Adapter Bandwidth..... 120 KHz
Quasi-Peak Adapter Mode Normal
Resolution Bandwidth..... 100KHz

Above 1GHz

Sweep Speed Auto
IF Bandwidth 120 KHz
Video Bandwidth..... 3MHz
Quasi-Peak Adapter Bandwidth..... 120 KHz
Quasi-Peak Adapter Mode Normal
Resolution Bandwidth..... 1MHz

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.
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 worst 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

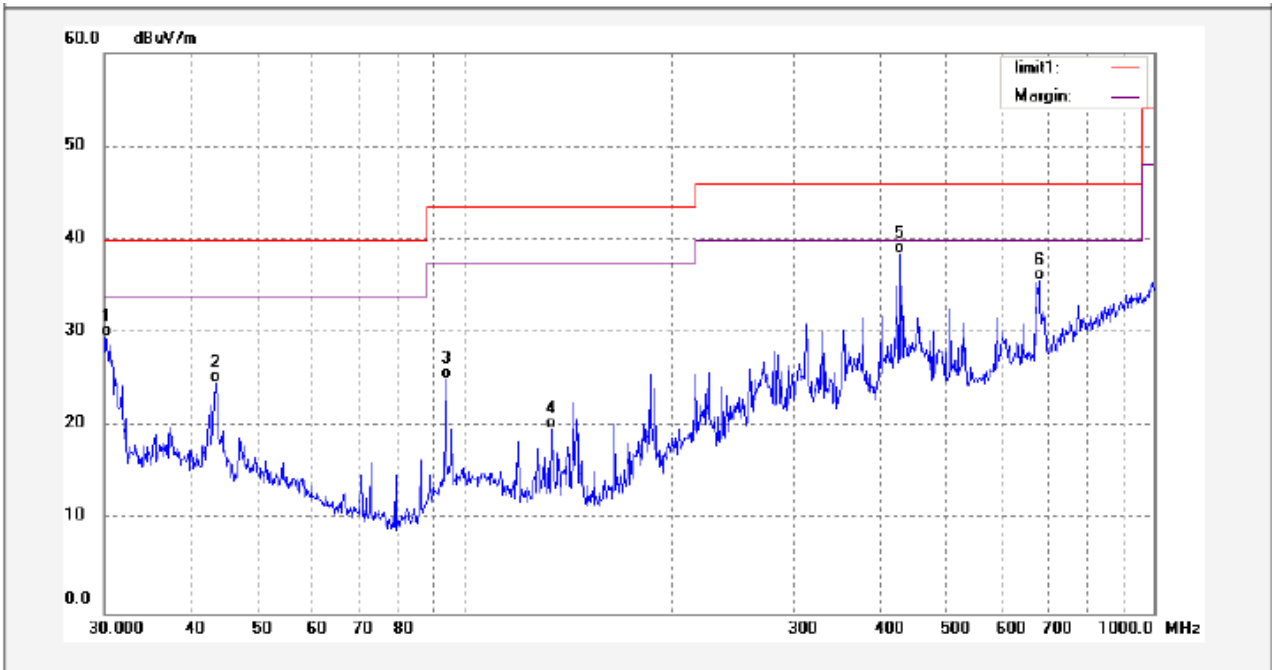
Test mode: normal operation mode

Remark: the EUT was pretested at the high, middle and low channel, and the worse case was the low Channel, so the data show was the low channel only.

Because the emissions below 30MHz are more than 20dB below the limit, the data is not show in the report.

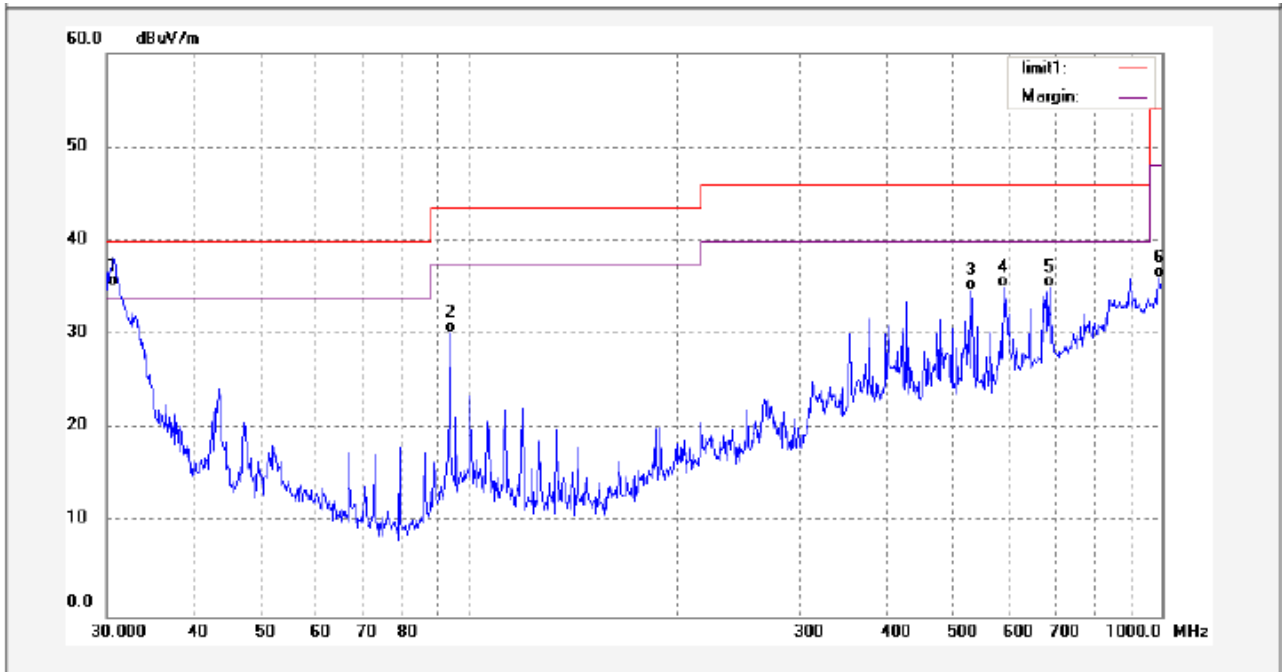
Test Frequency : 30MHz ~ 1000MHz

Antenna polarization: Vertical



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	30.0000	13.45	16.15	29.60	40.00	-10.40	QP	
2	43.5380	9.54	15.12	24.66	40.00	-15.34	QP	
3	93.9829	12.22	12.86	25.08	43.50	-18.42	QP	
4	133.5491	7.69	12.08	19.77	43.50	-23.73	QP	
5	428.7959	17.97	20.50	38.47	46.00	-7.53	QP	
6	681.8260	9.38	26.30	35.68	46.00	-10.32	QP	

Antenna polarization: Horizontal



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	30.6392	18.83	16.29	35.12	40.00	-4.88	QP	
2	93.9829	17.34	12.86	30.20	43.50	-13.30	QP	
3	531.2910	10.97	23.82	34.79	46.00	-11.21	QP	
4	590.3511	10.06	24.96	35.02	46.00	-10.98	QP	
5	689.0510	8.72	26.26	34.98	46.00	-11.02	QP	
6	992.9975	3.75	32.38	36.13	54.00	-17.87	QP	

Test Frequency: 1GHz ~ 25GHz

And the below is the Fundamental and Harmonic

Frequency (MHz)	Detector	Antenna Polarization	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Turntable Angle (°)
Low frequency							
2402.00	AV	Vertical	104.95		(Fund.)	1.3	40
4804.00	AV	Vertical	47.01	54.00	-6.99	1.4	45
7206.00	AV	Vertical	46.01	54.00	-7.99	1.3	160
9608.00	AV	Vertical	43.02	54.00	-10.98	2.1	120
12010.00	AV	Vertical	39.75	54.00	-14.25	1.6	190
14412.00	AV	Vertical	40.06	54.00	-13.94	1.4	110
16814.00	AV	Vertical	38.05	54.00	-15.95	1.8	140
19216.00	AV	Vertical	36.33	54.00	-17.67	1.7	130
21618.00	AV	Vertical	34.11	54.00	-19.89	1.4	40
24020.00	AV	Vertical	35.26	54.00	-18.74	1.5	65
2402.00	AV	Horizontal	101.41		(Fund.)	1.2	30
4804.00	AV	Horizontal	46.66	54.00	-7.34	1.2	190
7206.00	AV	Horizontal	41.39	54.00	-12.61	1.6	110
9608.00	AV	Horizontal	37.35	54.00	-16.65	1.4	90
12010.00	AV	Horizontal	42.99	54.00	-11.01	1.3	105
14412.00	AV	Horizontal	38.08	54.00	-15.92	1.5	180
16814.00	AV	Horizontal	41.92	54.00	-12.08	1.5	150
19216.00	AV	Horizontal	32.35	54.00	-21.65	1.8	100
21618.00	AV	Horizontal	37.22	54.00	-16.78	1.3	130
24020.00	AV	Horizontal	35.75	54.00	-18.25	1.7	85
2402.00	PK	Vertical	115.05		(Fund.)	1.3	40
4804.00	PK	Vertical	60.05	74.00	-13.95	2.1	60
7206.00	PK	Vertical	59.02	74.00	-14.98	1.6	130
9608.00	PK	Vertical	56.06	74.00	-17.94	1.4	240
12010.00	PK	Vertical	53.02	74.00	-20.98	1.3	115
14412.00	PK	Vertical	54.98	74.00	-19.02	1.4	50
16814.00	PK	Vertical	52.35	74.00	-21.65	1.2	175
19216.00	PK	Vertical	48.79	74.00	-25.21	1.5	190
21618.00	PK	Vertical	47.62	74.00	-26.38	1.7	100
24020.00	PK	Vertical	48.82	74.00	-25.18	1.4	95
2402.00	PK	Horizontal	110.03		(Fund.)	1.9	90
4804.00	PK	Horizontal	45.23	74.00	-28.77	2.0	160
7206.00	PK	Horizontal	42.98	74.00	-31.02	1.6	110
9608.00	PK	Horizontal	39.65	74.00	-34.35	1.5	-10
12010.00	PK	Horizontal	41.38	74.00	-32.62	1.2	180
14412.00	PK	Horizontal	37.85	74.00	-36.15	1.5	60
16814.00	PK	Horizontal	41.95	74.00	-32.05	1.9	230

19216.00	PK	Horizontal	33.91	74.00	-40.09	1.7	60
21618.00	PK	Horizontal	36.26	74.00	-37.74	1.0	150
24020.00	PK	Horizontal	38.03	74.00	-35.97	1.3	135
Middle frequency							
2440.00	AV	Vertical	106.02		(Fund.)	1.6	70
4880.00	AV	Vertical	46.65	54.00	-7.35	1.4	90
7320.00	AV	Vertical	43.63	54.00	-10.37	1.2	140
9760.00	AV	Vertical	42.49	54.00	-11.51	1.5	80
12200.00	AV	Vertical	45.73	54.00	-8.27	1.2	55
14640.00	AV	Vertical	38.4	54.00	-15.60	1.2	140
17080.00	AV	Vertical	41.65	54.00	-12.35	1.6	40
19520.00	AV	Vertical	36.46	54.00	-17.54	1.7	100
21960.00	AV	Vertical	40.45	54.00	-13.55	1.6	250
24400.00	AV	Vertical	33.51	54.00	-20.49	1.5	90
2440.00	AV	Horizontal	102.65		(Fund.)	1.3	170
4880.00	AV	Horizontal	43.59	54.00	-10.41	1.0	170
7320.00	AV	Horizontal	45.32	54.00	-8.68	1.6	325
9760.00	AV	Horizontal	39.43	54.00	-14.57	1.4	110
12200.00	AV	Horizontal	42.18	54.00	-11.82	1.0	190
14640.00	AV	Horizontal	37.58	54.00	-16.42	1.7	280
17080.00	AV	Horizontal	35.26	54.00	-18.74	1.6	205
19520.00	AV	Horizontal	37.31	54.00	-16.69	1.4	90
21960.00	AV	Horizontal	39.23	54.00	-14.77	1.3	200
24400.00	AV	Horizontal	33.37	54.00	-20.63	1.9	200
2440.00	PK	Vertical	115.28		(Fund.)	1.2	55
4880.00	PK	Vertical	60.04	74.00	-13.96	1.4	80
7320.00	PK	Vertical	59.63	74.00	-14.37	1.4	140
9760.00	PK	Vertical	53.92	74.00	-20.08	1.3	220
12200.00	PK	Vertical	58.73	74.00	-15.27	1.8	250
14640.00	PK	Vertical	51.26	74.00	-22.74	1.4	0
17080.00	PK	Vertical	54.65	74.00	-19.35	1.2	50
19520.00	PK	Vertical	49.46	74.00	-24.54	1.8	200
21960.00	PK	Vertical	53.45	74.00	-20.55	1.5	190
24400.00	PK	Vertical	46.51	74.00	-27.49	1.2	110
2440.00	PK	Horizontal	109.56		(Fund.)	1.6	40
4880.00	PK	Horizontal	56.92	74.00	-17.08	1.9	145
7320.00	PK	Horizontal	58.32	74.00	-15.68	1.4	160
9760.00	PK	Horizontal	50.06	74.00	-23.94	1.8	60
12200.00	PK	Horizontal	55.18	74.00	-18.82	1.4	200
14640.00	PK	Horizontal	49.08	74.00	-24.92	1.2	230
17080.00	PK	Horizontal	47.77	74.00	-26.23	1.2	175
19520.00	PK	Horizontal	46.75	74.00	-27.25	1.7	140
21960.00	PK	Horizontal	50.01	74.00	-23.99	1.4	40

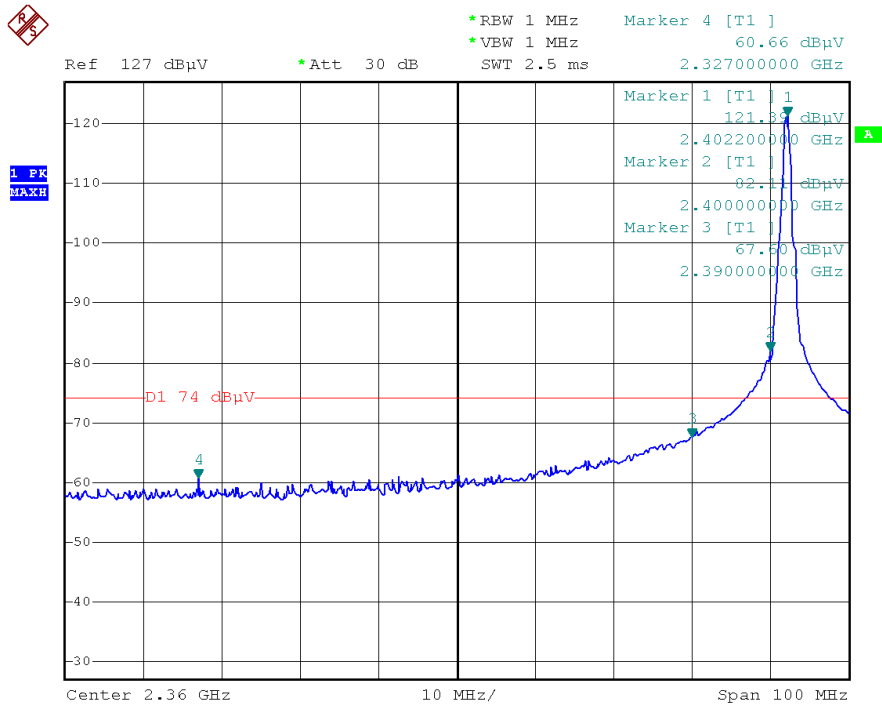
24400.00	PK	Horizontal	46.31	74.00	-27.69	1.7	235
High frequency							
2480.00	AV	Vertical	106.83		(Fund.)	1.6	220
4960.00	AV	Vertical	48.58	54.00	-5.42	1.4	0
7440.00	AV	Vertical	45.01	54.00	-8.99	1.4	170
9920.00	AV	Vertical	47.47	54.00	-6.53	1.7	140
12400.00	AV	Vertical	42.57	54.00	-11.43	1.5	145
14880.00	AV	Vertical	49.12	54.00	-4.88	1.8	110
17360.00	AV	Vertical	43.15	54.00	-10.85	1.2	140
19840.00	AV	Vertical	44.02	54.00	-9.98	1.3	280
22320.00	AV	Vertical	42.34	54.00	-11.66	1.2	190
24800.00	AV	Vertical	35.96	54.00	-18.04	1.8	135
2480.00	AV	Horizontal	101.98		(Fund.)	1.3	170
4960.00	AV	Horizontal	44.97	54.00	-9.03	1.8	230
7440.00	AV	Horizontal	43.28	54.00	-10.72	1.3	175
9920.00	AV	Horizontal	44.1	54.00	-9.90	1.7	170
12400.00	AV	Horizontal	41.96	54.00	-12.04	1.0	175
14880.00	AV	Horizontal	36.15	54.00	-17.85	1.5	220
17360.00	AV	Horizontal	40.36	54.00	-13.64	1.4	250
19840.00	AV	Horizontal	35.03	54.00	-18.97	1.8	60
22320.00	AV	Horizontal	37.86	54.00	-16.14	1.4	140
24800.00	AV	Horizontal	33.24	54.00	-20.76	1.8	170
2480.00	PK	Vertical	115.51		(Fund.)	1.2	235
4960.00	PK	Vertical	61.58	74.00	-12.42	1.5	20
7440.00	PK	Vertical	58.01	74.00	-15.99	1.8	150
9920.00	PK	Vertical	60.47	74.00	-13.53	1.5	200
12400.00	PK	Vertical	55.57	74.00	-18.43	1.5	160
14880.00	PK	Vertical	62.12	74.00	-11.88	1.4	60
17360.00	PK	Vertical	56.15	74.00	-17.85	1.0	140
19840.00	PK	Vertical	57.02	74.00	-16.98	1.5	200
22320.00	PK	Vertical	55.34	74.00	-18.66	1.6	175
24800.00	PK	Vertical	48.96	74.00	-25.04	1.4	125
2480.00	PK	Horizontal	111.09		(Fund.)	1.7	220
4960.00	PK	Horizontal	57.97	74.00	-16.03	1.6	160
7440.00	PK	Horizontal	56.28	74.00	-17.72	1.3	190
9920.00	PK	Horizontal	57.1	74.00	-16.90	1.6	180
12400.00	PK	Horizontal	54.96	74.00	-19.04	1.2	140
14880.00	PK	Horizontal	49.15	74.00	-24.85	1.7	170
17360.00	PK	Horizontal	53.36	74.00	-20.64	1.9	205
19840.00	PK	Horizontal	48.03	74.00	-25.97	1.7	140
22320.00	PK	Horizontal	50.86	74.00	-23.14	2.1	160
24800.00	PK	Horizontal	46.24	74.00	-27.76	1.1	280

8 Band Edge Measurement

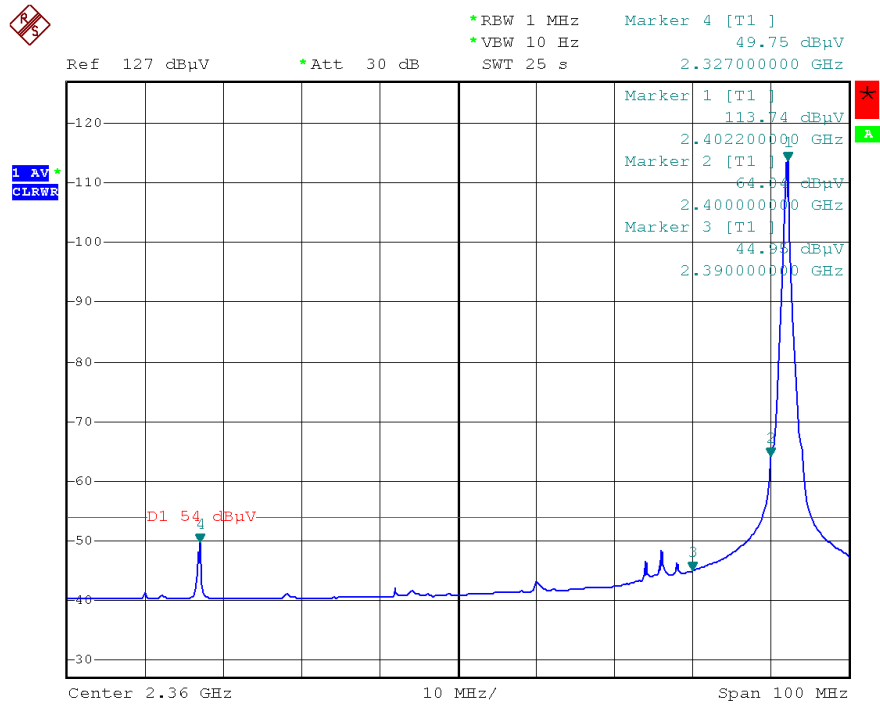
Test Requirement:	Section 15.247(d) In addition, radiated emissions which fall in the restricted bands. as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).
Test Method:	DA 00-705
Measurement Distance:	3m
Limit:	40.0 dBuV/m between 30MHz & 88MHz; 43.5 dBuV/m between 88MHz & 216MHz; 46.0 dBuV/m between 216MHz & 960MHz; 54.0 dBuV/m above 960MHz. 74.0 dBuV/m for peak above 1GHz 54.0 dBuV/m for AVG above 1GHz
Detector:	For Peak value: RBW = 1 MHz for $f \geq 1$ GHz VBW \geq RBW; Sweep = auto Detector function = peak Trace = max hold For AVG value: RBW = 1 MHz for $f \geq 1$ GHz VBW = 10Hz; Sweep = auto Detector function = AVG Trace = max hold

8.1 Test Result:

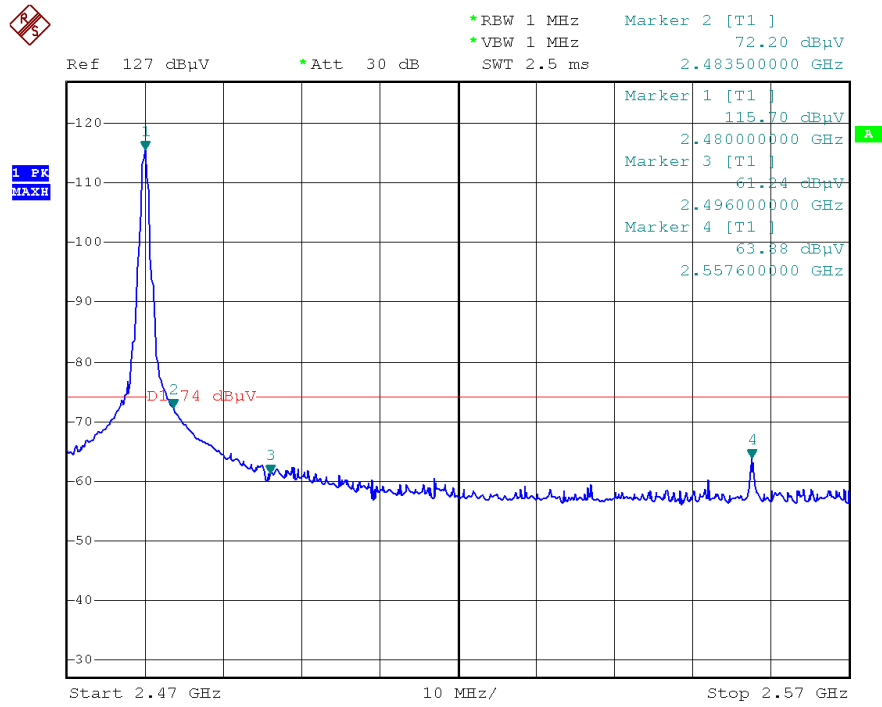
Low Channel – Peak



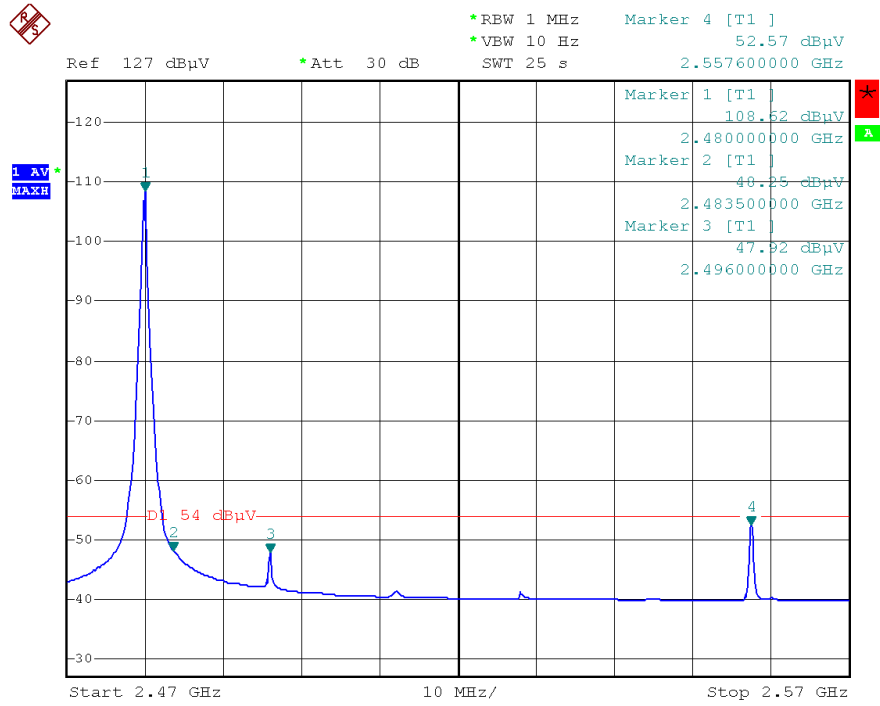
Low Channel – AV



High Channel – Peak



High Channel – AV



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.

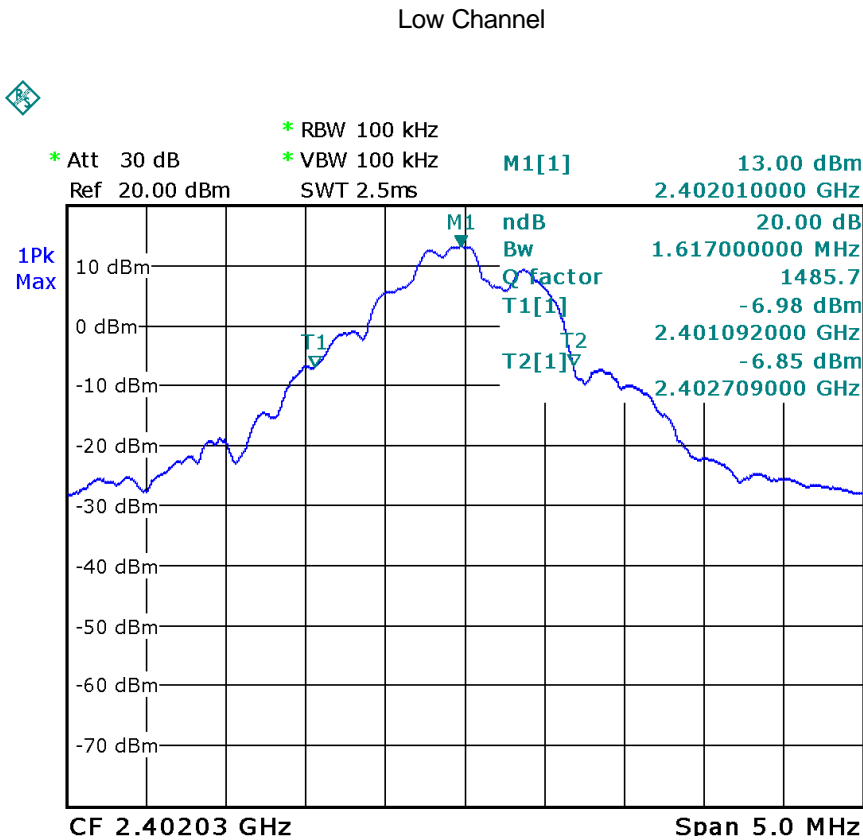
9.1 Test Procedure:

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 = 100kHz

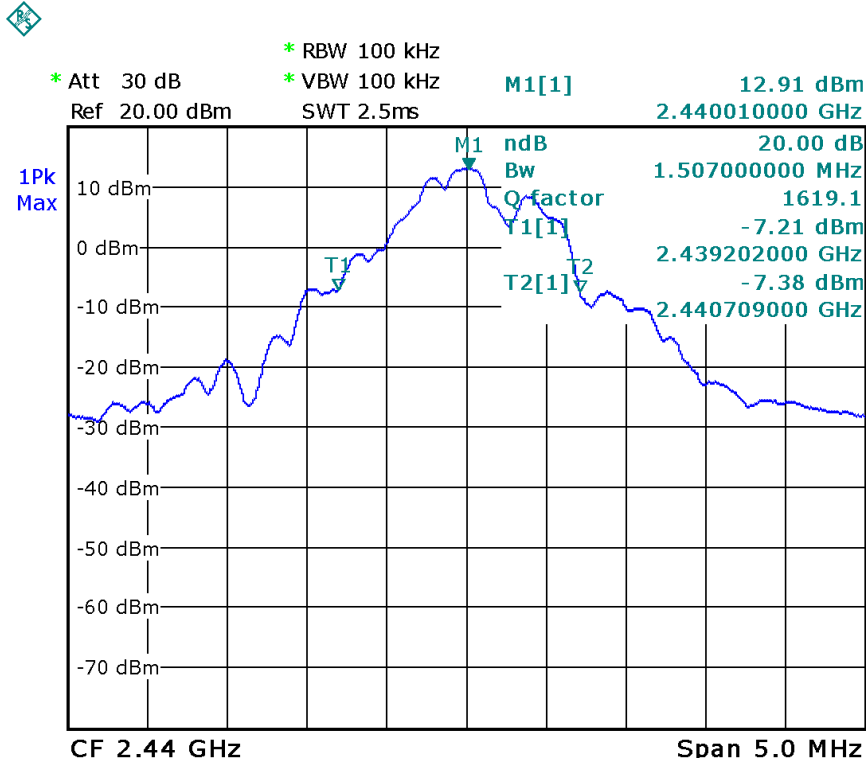
9.2 Test Result:

Test Channel	Bandwidth
Low	1.617MHz
Middle	1.507MHz
High	1.527MHz

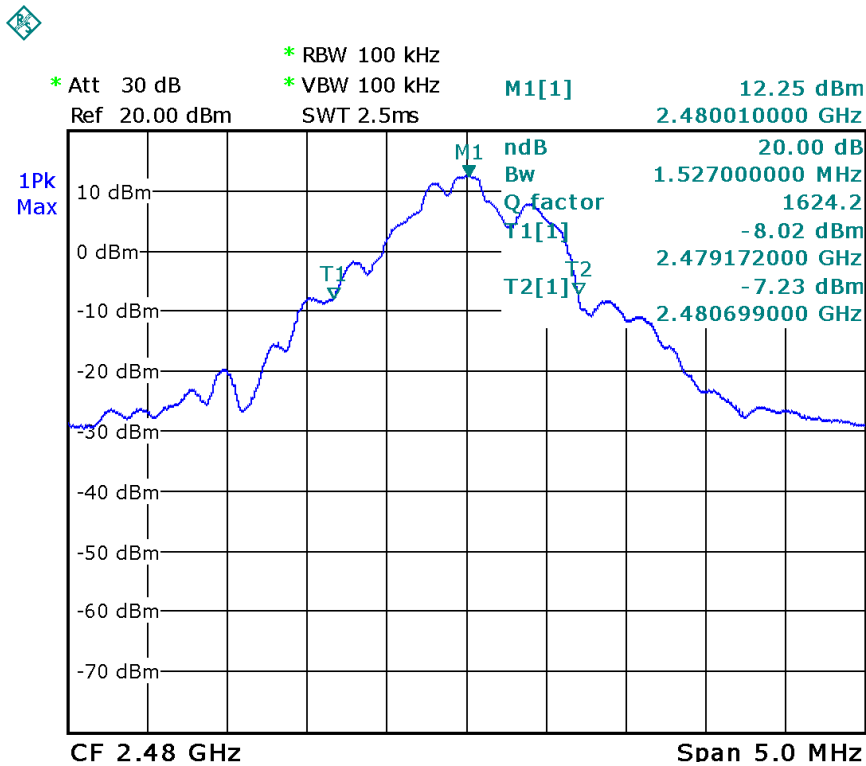
Test result plot as follows:



Middle Channel



High Channel



10 Maximum Peak Output Power

Test Requirement:	FCC CFR47 Part 15 Section 15.247
Test Method:	ANSI C63.4:2003
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 = 3 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:

Test Channel	Output Power (dBm)	Limit (dBm)
Low	12.93	20.97
Middle	12.94	20.97
High	12.57	20.97

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 2400-2483.5 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:

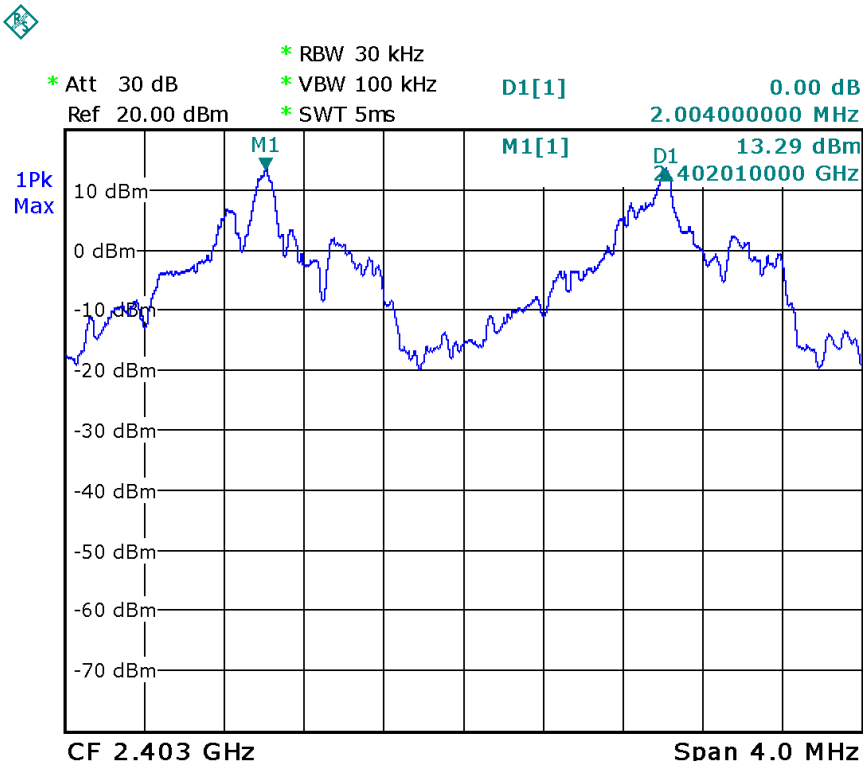
1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.
2. Set the spectrum analyzer: RBW = 30kHz. VBW = 100kHz , Span = 4MHz. Sweep = auto; Detector Function = Peak. Trace = Max hold.
3. Allow the trace to stabilize. Use the marker-delta function to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

11.2 Test Result:

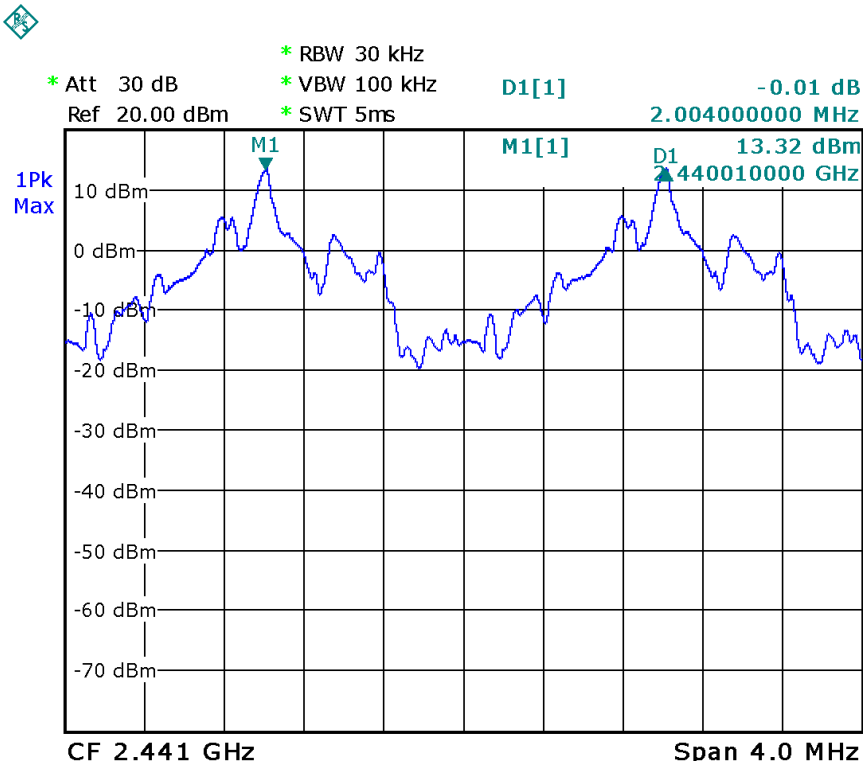
Test Channel	Separation (MHz)	Result
Low	2.004	PASS
Middle	2.004	PASS
High	2.004	PASS

Test result plot as follows:

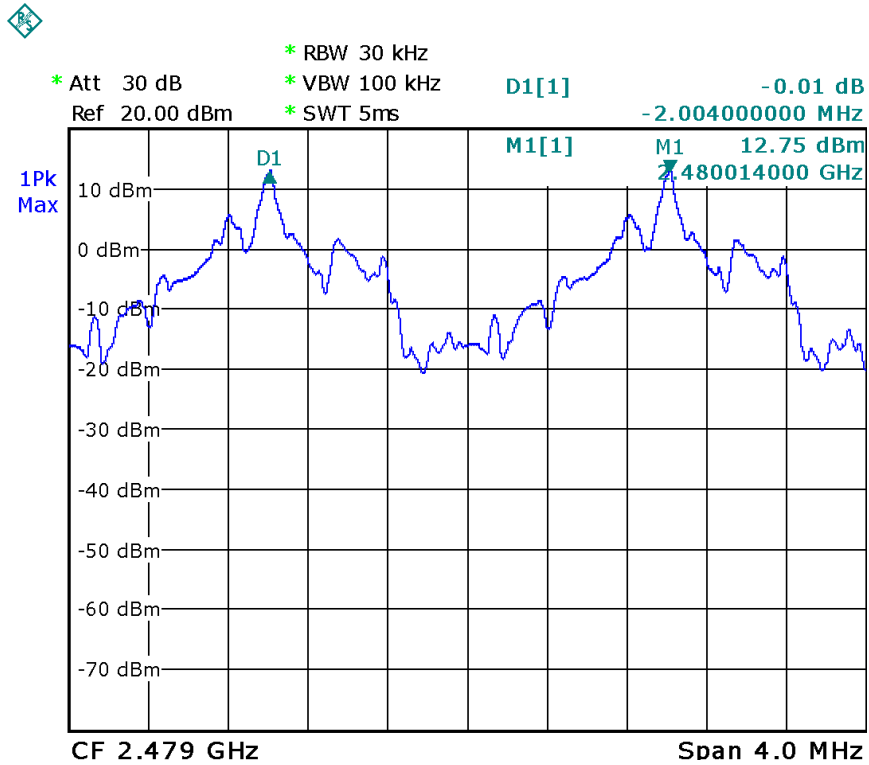
Low Channel



Middle Channel



High Channel



12 Number of Hopping Frequency

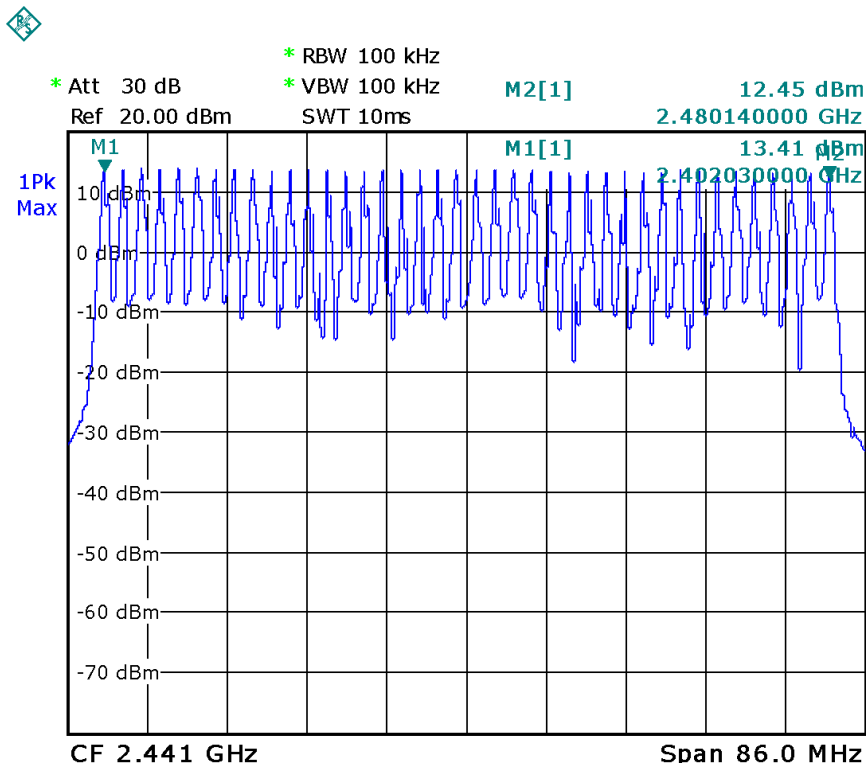
Test Requirement: FCC CFR47 Part 15 Section 15.247
 Test Method: DA 00-705
 Test Limit: Regulation 15.247 (a)(1)(iii) Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels.
 Test Mode: Test in hopping transmitting operating mode.

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 = 100 kHz. VBW = 100 kHz. 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: Center Frequency = 2441MHz, Span = 86MHz. Submit the test result graph.

12.2 Test Result

Total Channels are 40 Channels.



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. centered on a hopping channel;
- 3.Set RBW = 1MHz and VBW = 1MHz.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:

Dwell time = Pulse wide x (Hopping rate / Number of channels) x Period

The test period: $T = 0.4(s) * 40 = 16 (s)$

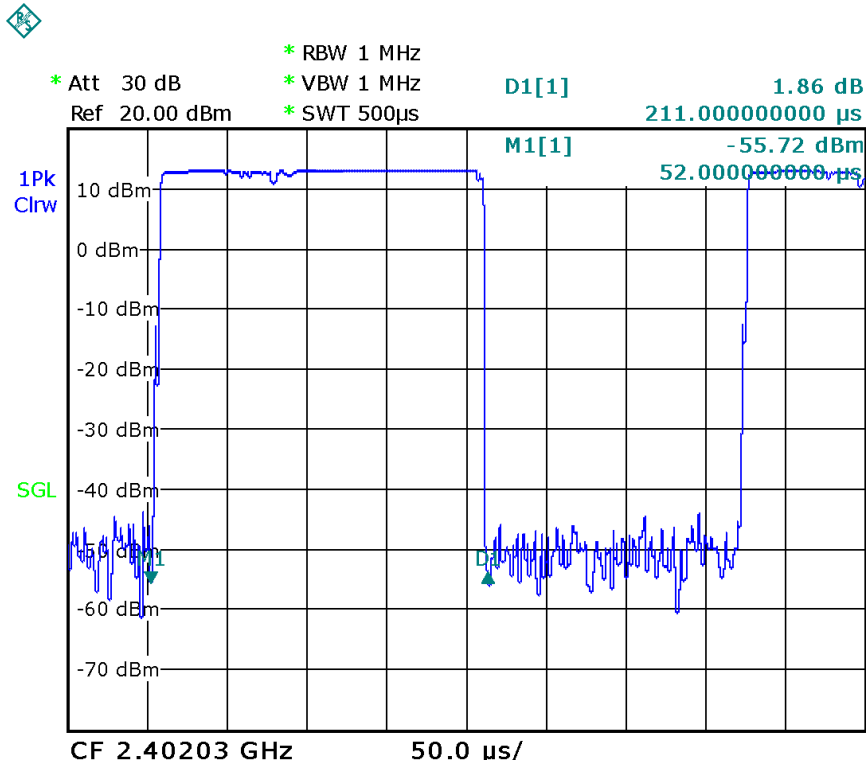
So, the Dwell Time can be calculated as follows:

Dwell time = $31 * 16 * (MkrDelta) / 1000$

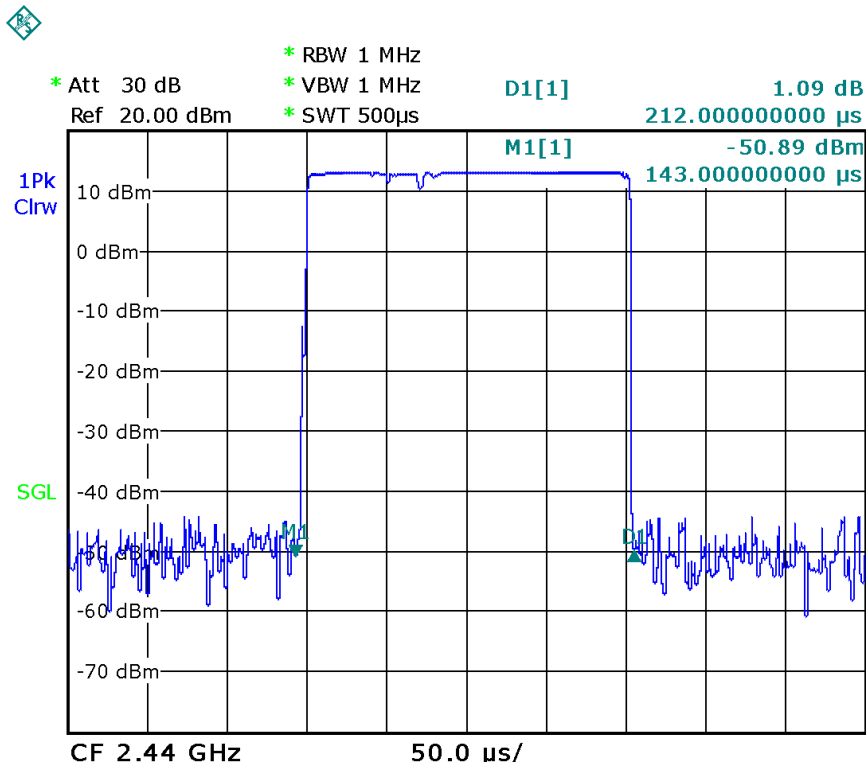
Note : Mkr Delta is once pulse time.

Frequency	Mkr Delta(ms)	Dwell Time(s)	Limits(s)	Result
2402 MHz	0.211	0.105	0.400	Pass
2440 MHz	0.212	0.105	0.400	Pass
2480 MHz	0.212	0.105	0.400	Pass

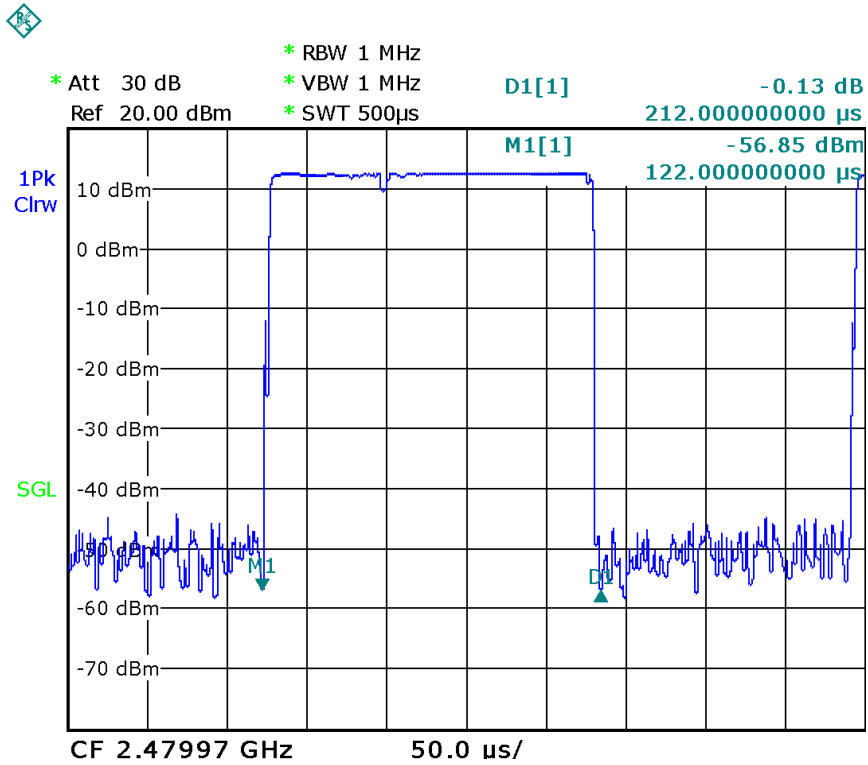
Low Channel



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. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. This product has a permanent integrated antenna, fulfill the requirement of this section.

15 RF Exposure

Test Requirement: FCC Part 1.1307

Test Mode: The EUT work in test mode(Tx).

15.1 Requirments:

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 (dBi)	Antenna Gain (numeric)	Peak Output Power (dBm)	Peak Output Power (mW)	Power Density (S) (mW/cm ²)	Limit of Power Density (S) (mW/cm ²)	Test Result
2	1.58	12.93	19.63	0.0062	1	Complies
2	1.58	12.94	19.68	0.0062	1	Complies
2	1.58	12.57	18.07	0.0057	1	Complies

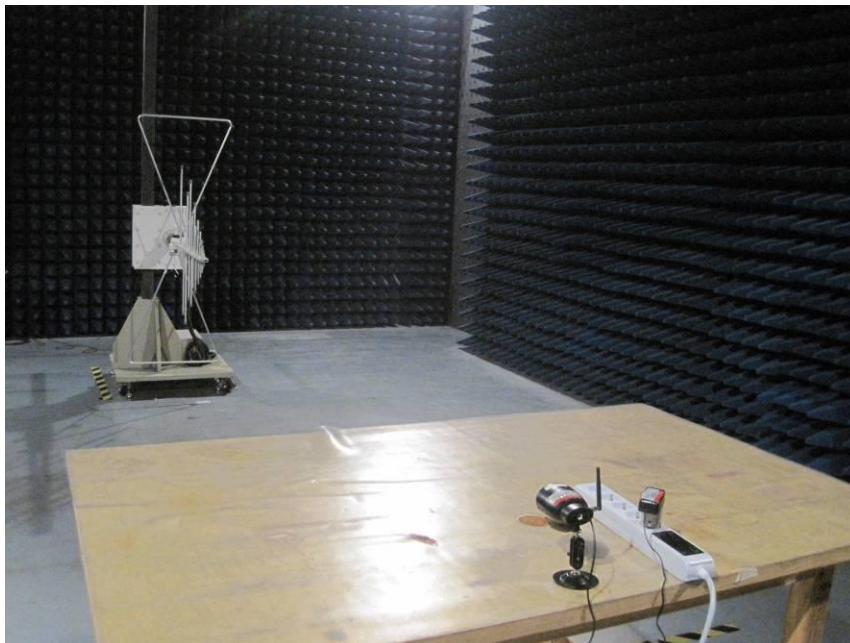
16 Photographs – Test Setup

16.1 Photograph – Radiation Spurious Emission Test Setup

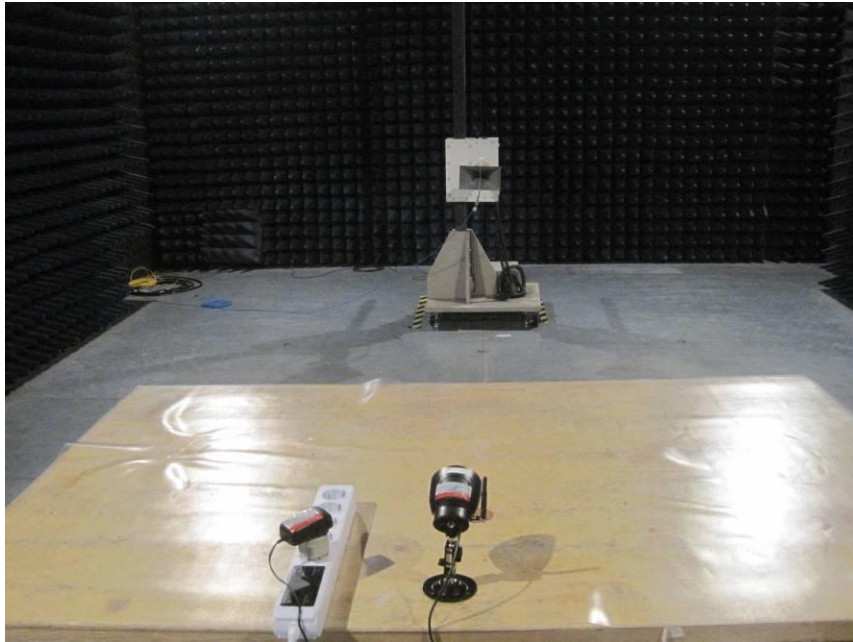
Below 30MHz



30MHz-1GHz



Above 1GHz



16.2 Photograph – Conducted Emission Test Setup



17 Photographs - Constructional Details

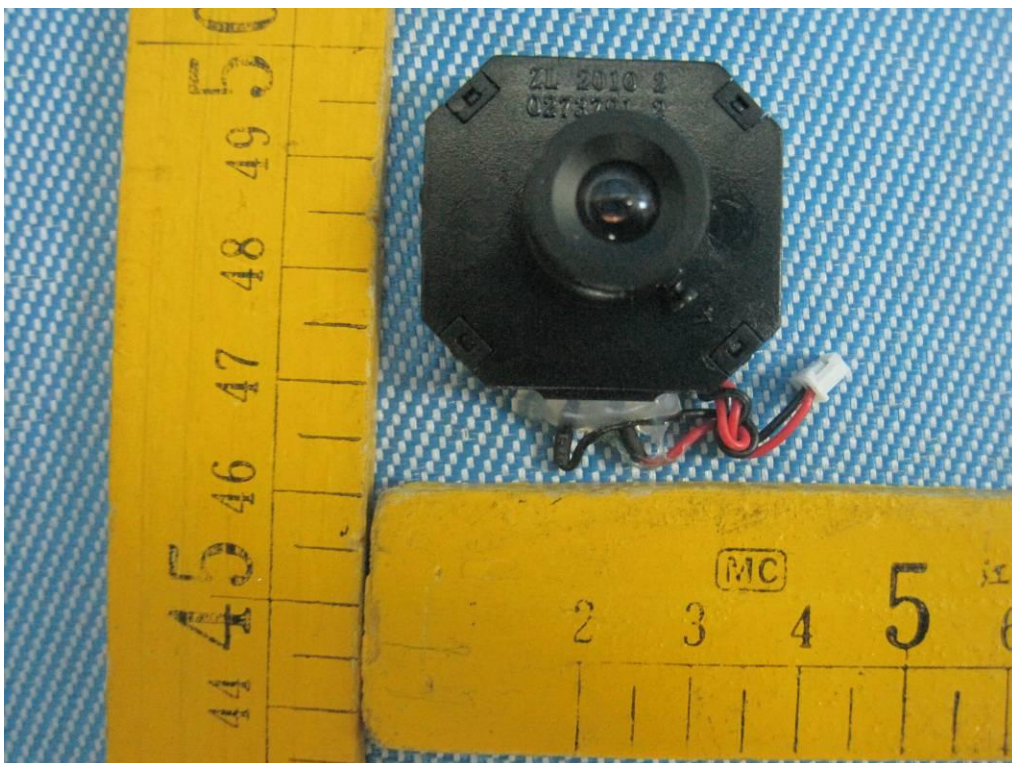
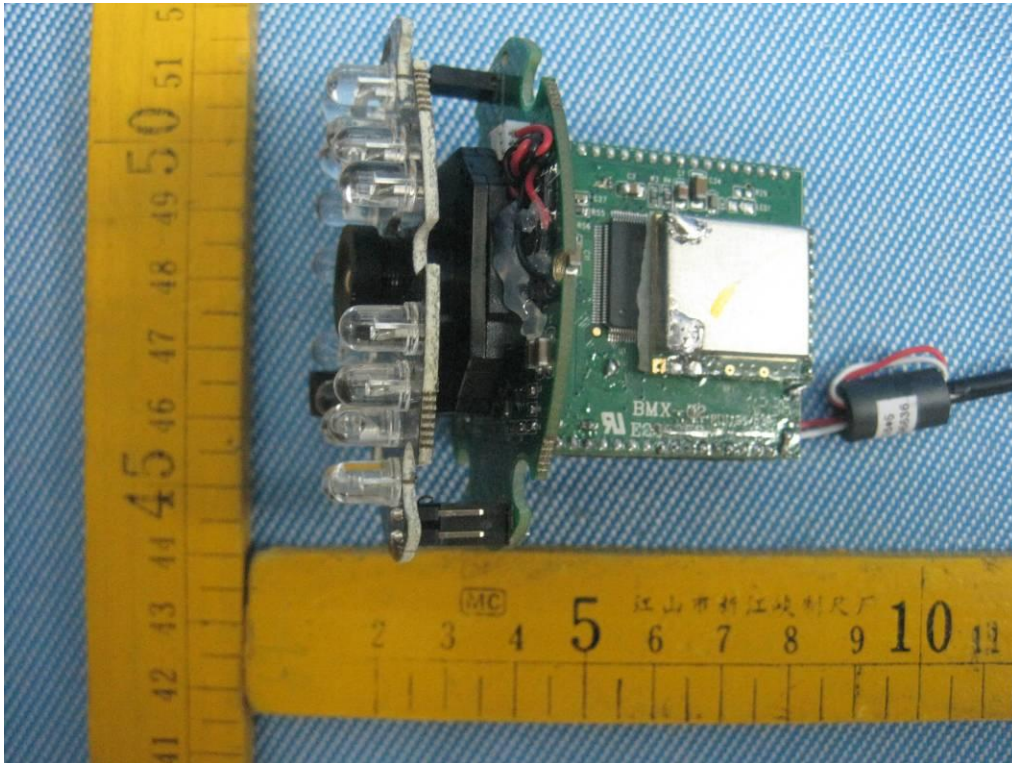
17.1 Product View



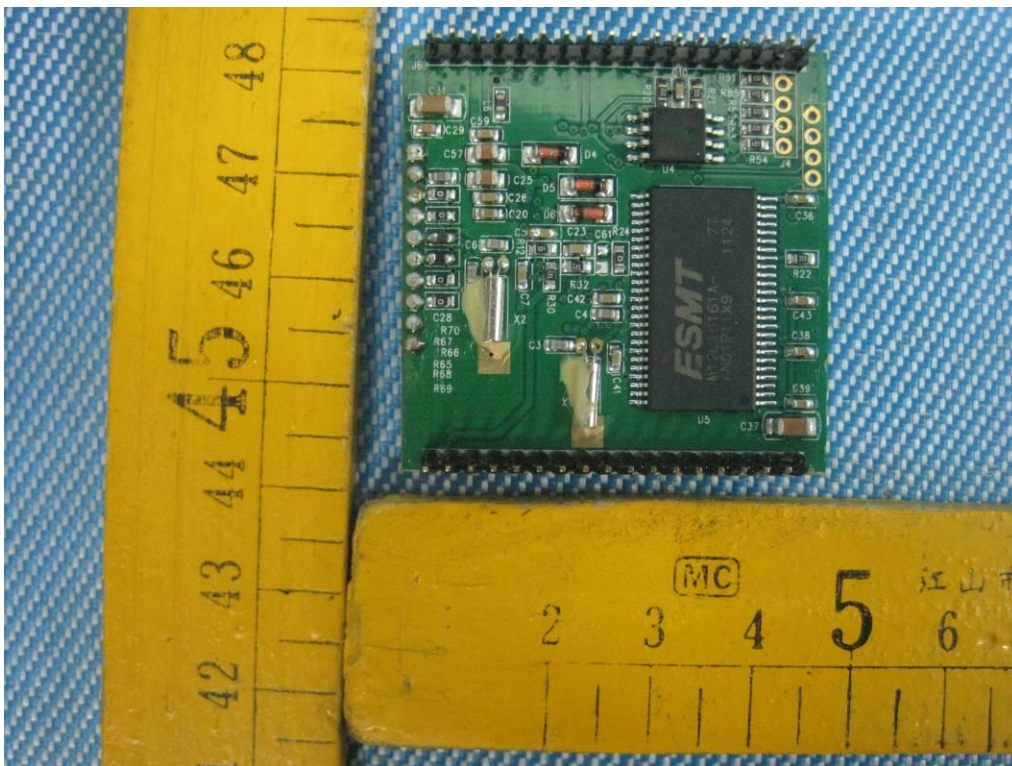
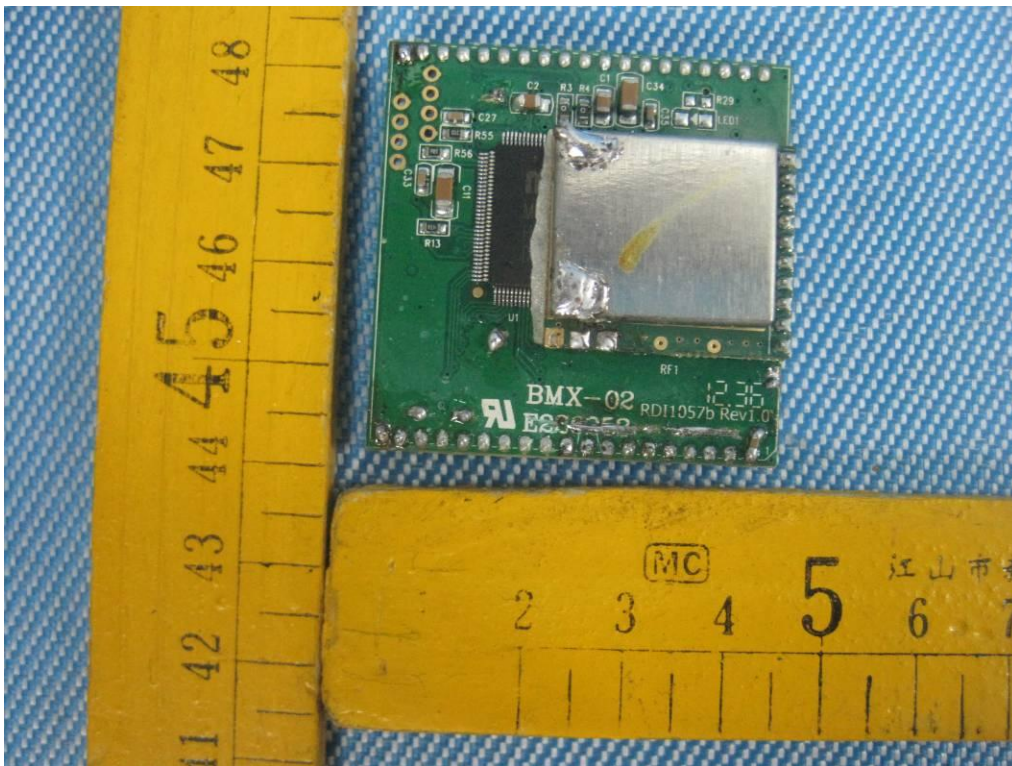
17.2 EUT – Appearance View

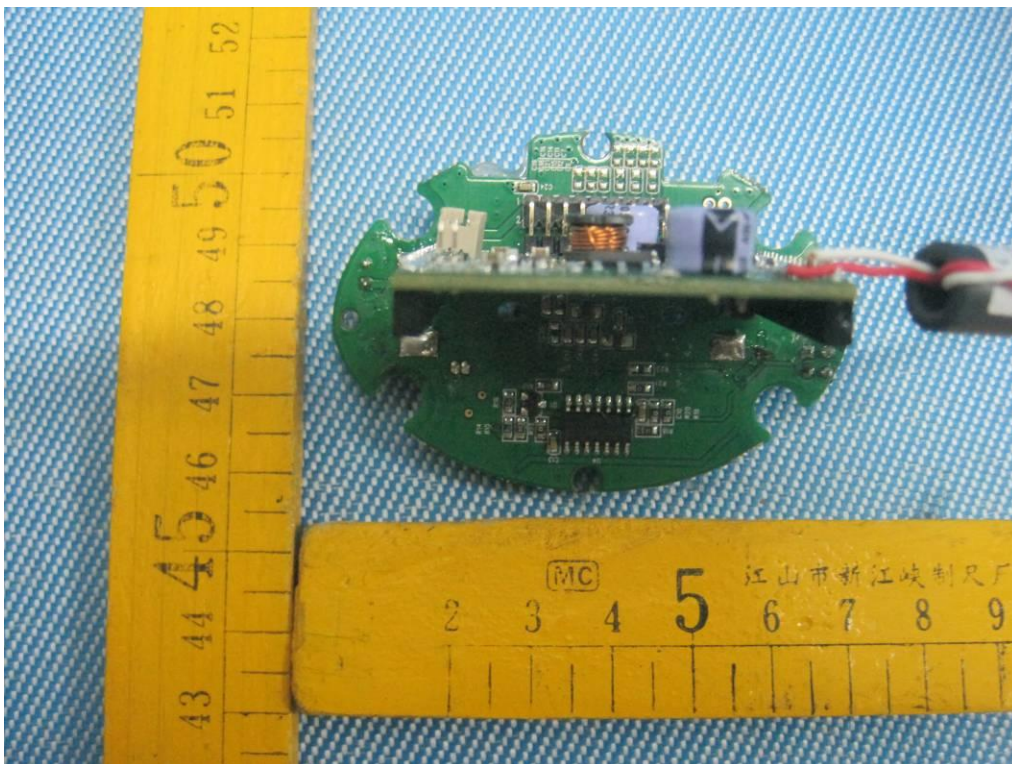
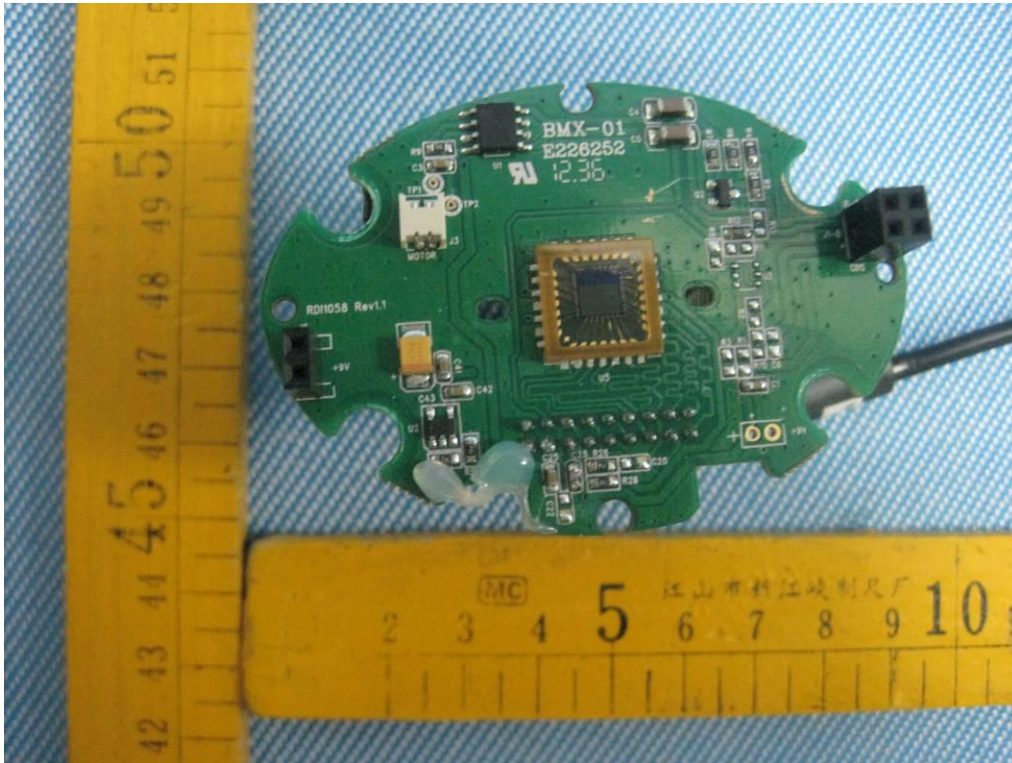


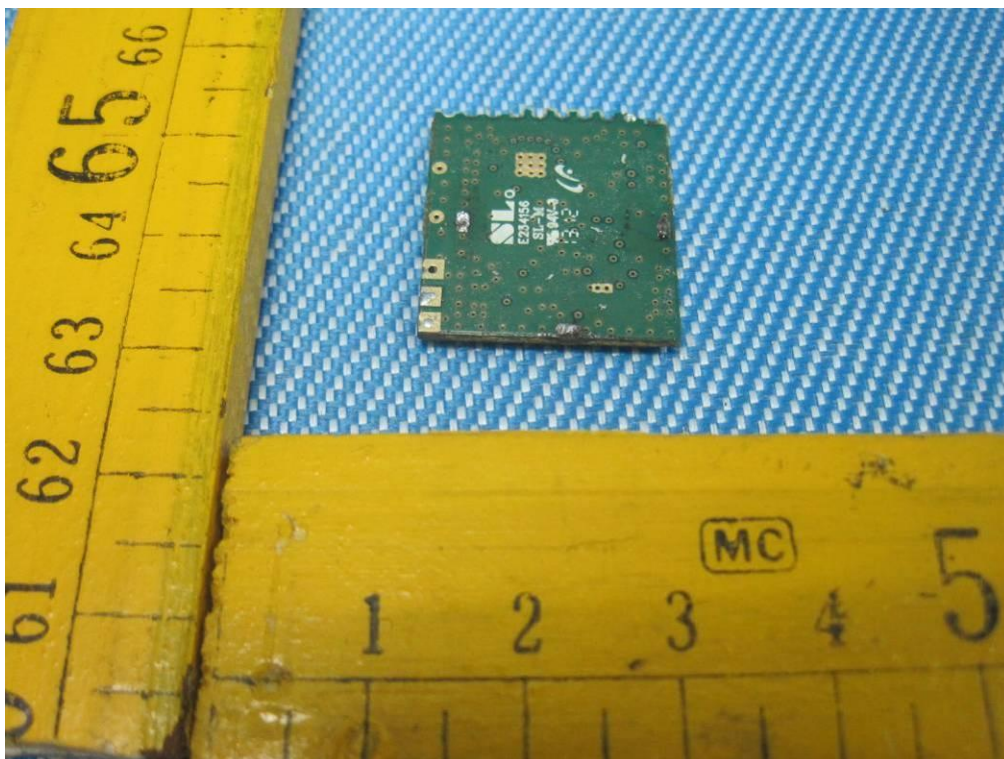
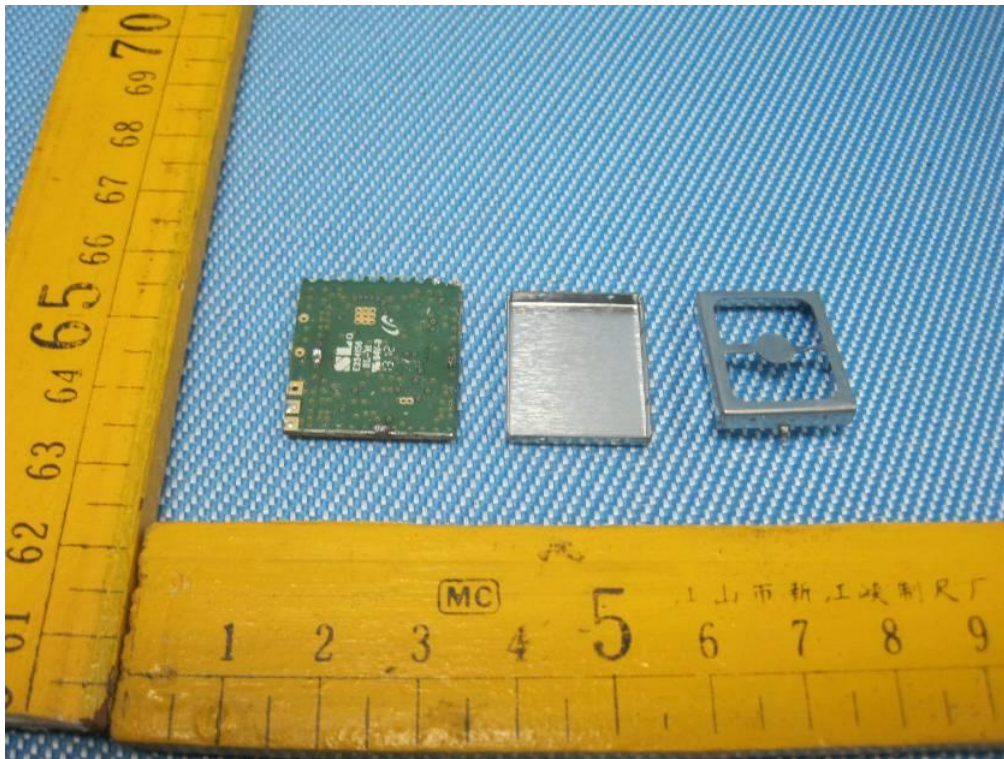
17.3 EUT – Open View



17.4 EUT - PCB View









18 FCC Label

FCC Label Sample for model: CA670HR

FCC ID: SJ8-CA670HR

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

(1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

FCC Label Location for model: CA670HR

The Label must not be a stick-on paper. The Label on these products must be permanently affixed to the product and readily visible at the time of purchase and must last the expected lifetime of the equipment not be readily detachable.



=End of report=