

FCC TEST REPORT

FCC ID : SJ8CA200L

Applicant : RDI Technology (Shenzhen) Co., Ltd

Address of Applicant : Building C1 Xingtang Industrial Park, East Baishixia,
Fuyong, Baoan, Shenzhen, PRC.

Equipment Under Test (EUT) :

Product description : Portable Color Digital Wireless Camera And Monitor


Model No. : CMD2027

Frequency Range : 2405~2470MHz

Standards : FCC 15 Paragraph 15.247

Date of Test : Jan.25,2010

Test Engineer : Olic huang

Reviewed By : 

PERPARED BY:

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3 Test Summary

Test Items	Test Requirement	Test Method	Limit / Severity	Result
Maximum peak output power	FCC Part 15:2007	ANSI C63.4: 2009	20dBm	PASS
Restricted Band	FCC Part 15:2007	ANSI C63.4: 2009	Note	PASS
Dwell time	FCC Part 15:2007	ANSI C63.4: 2009	Maximum:0.4 s	PASS
Channel separation	FCC Part 15:2007	ANSI C63.4: 2009	Channel separation at least 1MHz	PASS
Hopping channel No.	FCC Part 15:2007	ANSI C63.4: 2009	Total 66 channels	PASS
20-dB Bandwidth	FCC Part 15:2007	ANSI C63.4: 2009	Note	PASS
RF Exposure Test	FCC Part 15:2007	ANSI C63.4: 2009	Note	PASS
Mains Terminal Disturbance Voltage, 150kHz to 30MHz	FCC Part 15:2007	ANSI C63.4: 2009	N/A	PASS
Radiation Emission, 30MHz to 25GHz	FCC Part 15:2007	ANSI C63.4: 2009	N/A	PASS

Note : denote that for more details of the EUT , please refer to the relating test items as below .

Remark : the methods of measurement in all the test items were according to the FCC Public Notice DA 00-705 .

4 General Information

4.1 Client Information

Applicant: RDI Technology (Shenzhen) Co., Ltd
Address of Applicant: Building C1 Xingtang Industrial Park, East Baishixia,
Fuyong, Baoan, Shenzhen, PRC.

Manufacturer: RDI Technology (Shenzhen) Co., Ltd
Address of Manufacturer: Building C1 Xingtang Industrial Park, East Baishixia,
Fuyong, Baoan, Shenzhen, PRC..

4.2 General Description of E.U.T.

Product description: Portable Color Digital Wireless Camera And Monitor
Model No.: CMD2027

4.3 Details of E.U.T.

Power Supply: Adapter I/P : AC 100-240V~50/60Hz, 0.2A
O/P: 9.0V, 0.56A

4.4 Description of Support Units

The EUT has been tested as an independent unit.

4.5 Standards Applicable for Testing

The customer requested FCC tests for a Portable Color Digital Wireless Camera And Monitor.
The standards used were FCC 15 Paragraph 15.247, Paragraph 15.205, Paragraph
15.207, Paragraph 15.209, Paragraph 15.31, Paragraph 15.33, Paragraph 15.35.

4.6 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

- **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, June 24, 2008.

- **IC – Registration No.:IC 7760A**

Waltek Services(Shenzhen) Co., Ltd. EMC Laboratory 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 IC7760A, July 24, 2008.

4.7 Test Location

All Emissions tests were performed at:-

1/F, Fukangtai Building, West Baima Rd., Songgang Street, Baoan District, Shenzhen 518105, Guangdong, China.

Remark : All the test results of the peripherals were conformed to the Fcc Verification requirements.

4.8 Equipment Used during Test

Equipment Name	Manufacturer Model	Equipment No	Internal No	Specification	Cal. Date	Due Date	Cert. No	Uncertainty
EMC Analyzer	Agilent/ E7405A	MY451149 43	W2008001	9k-26.5GHz	Aug-09	Aug-10	Wws200 81596	±1dB
Trilog Broadband Antenne	SCHWARZB ECK MESS- ELEKTROM / VULB9163	336	W2008002	30-3000 MHz	Aug-09	Aug-10		±1dB
Broad-band Horn Antenna	SCHWARZB ECK MESS- ELEKTROM / VULB9163	667	W2008003	1-18GHz	Aug-09	Aug-10		f<10 GHz: ±1dB 10GHz<f< 18 GHz: ±1.5dB
Broadband Preamplifier	SCHWARZB ECK MESS- ELEKTROM / BBV 9718	9718-148	W2008004	0.5-18GHz	Aug-09	Aug-10		±1.2dB
10m Coaxial Cable with N-male Connectors usable up to 25GHz,	SCHWARZB ECK MESS- ELEKTROM / AK 9515 H	-	-	-	Aug-09	Aug-10		-
10m 50 Ohm Coaxial Cable with N-plug, individual length, usable up to 3(5)GHz, Connector	SCHWARZB ECK MESS- ELEKTROM / AK 9513				Aug-09	Aug-10		
Positioning Controller	C&C LAB/ CC-C-IF				N/A	N/A		
Color Monitor	SUNSP0/ SP-14C				N/A	N/A		
Test Receiver	ROHDE&SC HWARZ/ ESPI	101155	W2005001	9k-3GHz	Aug-09	Aug-10	Wws200 80942	±1dB
EMI Receiver	Beijingkehua n	KH3931		9k-1GHz	Aug-09	Aug-10		
Two-Line V-Network	ROHDE&SC HWARZ/ ENV216	100115	W2005002	50Ω/50μH	Aug-09	Aug-10	Wws200 80941	±10%

Equipment Name	Manufacturer Model	Equipment No	Internal No	Specification	Cal. Date	Due Date	Cert. No	Uncertainty
Absorbing Clamp	ROHDE&SC HWAARZ/ MDS-21	100205	W2005003	impedance 50 Ω loss : 17 dB	Aug-09	Aug-10	Wws200 80943	± 1 dB
10m 50 Ohm Coaxial Cable with N- plug, individual length, usable up to 3(5)GHz, Connectors	SCHWARZB ECK MESS- ELEKTROM / AK 9514				Aug-09	Aug-10		
Digital Power Analyzer	Em Test AG/Switzerland/ DPA 500	V07451 03095	W2008012	Power: 2000VA Vol-range: 0- 300V Freq_range: 10-80Hz	Aug-09	Aug-10	Wwd200 81185	Voltage distinguish:0 .025% Power_freq distinguish:0 .02Hz
Power Source	Em Test AG/Switzerland/ ACS 500	V07451 03096	W2008013	Vol-range: 0- 300V Power_freq: 10-80Hz				
Electrostatic Discharge Simulator	Em Test AG/Switzerland/ DITO	V07451 03094	W2008005	Contact discharge: 500V-10KV Air discharge: 500V-16.5KV	Aug-09	Aug-10	Wwc200 82400	7.5A current will be changed in $V_m=1.5V$
RF Generator	TESEQ GmbH/ NSG4070	25781	W2008008	Freq-range: 9K-1GHz RF voltage: - 60 dBm- +10dBm	Aug-09	Aug-10	Wws200 81890	Power_freq distinguish:0. 1Hz RF electricity distinguish 0.1 B
CDN M- Type	TESEQ GmbH/ CDN M016	25112	W2008009	Voltage correct factor 9.5 dB	Aug-09	Aug-10	Wwc200 82396	150K- 80MHz: ± 1 dB 80- 230MHz:-2- +3dB
EM-Clamp	TESEQ GmbH/ KEMZ 801	25453	W2008010	Freq_range: 0.15-1000 MHz	Aug-09	Aug-10	Wwc200 82397	0.3-400 MHz: ± 4 dB Other freq: ± 5 dB
Attenuator 6dB	TESEQ GmbH/ ATN6050	25365			Aug-09	Aug-10	Wws200 81597	

Equipment Name	Manufacturer Model	Equipment No	Internal No	Specification	Cal. Date	Due Date	Cert. No	Uncertainty
All Modules Generator	SCHAFFNER/6150	34579	W2008006	voltage:200V-4.4KV Pulse current: 100A-2.2KA	Aug-09	Aug-10	Wwc20082401	voltage: ±10% Pulse current: ±10%
Capacitive Coupling Clamp	SCHAFFNER/CDN 8014	25311			Aug-09	Aug-10	Wwc20082398	-
Signal and Data Line Coupling Network	SCHAFFNER/CDN 117	25627	W2008011	1.2/50μS	Aug-09	Aug-10	Wwc20082399	-
AC Power Supply	TONGYUN/DTDGC-4				Aug-09	Aug-10	Wws20080944	-
Exposure Level Tester ELT-400	Narda Safety TEST Solutions/2304/03	M-0155	w2008022	Test freq range: 1—400kHz	Aug-09	Aug-10	Wwd20081191	Test uncertainty : 1—120kHz:±1.83%, 120 kHz-400 kHz: ±4.06%
Magnetic Field Probe 100cm ²	Narda Safety TEST Solutions/2300/90.10	M-1070	w2008021	Test freq range: 1—400kHz				Test uncertainty : 1Hz-10Hz: ±16.2%, 10Hz - 120kHz:±2.2%, 120 kHz-400 kHz: ±4.7%
Active Loop Antenna Charger 10kHz-30MHz	Beijing Dazhi / ZN30900A	-	-	10kHz-30MHz	Aug-09	Aug-10		±1dB

5 Conducted Emission Test

Test Requirement:	FCC Part15 Paragraph 15.207
Test Method:	Based on FCC Part15 Paragraph 15.207
Test Date:	Jan.25,2010
Frequency Range:	150kHz to 30MHz
Class:	Class B
Detector:	Peak for pre-scan (9kHz Resolution Bandwidth) Quasi-Peak & Average if maximised peak within 6dB of Average Limit

5.1 Test Equipment

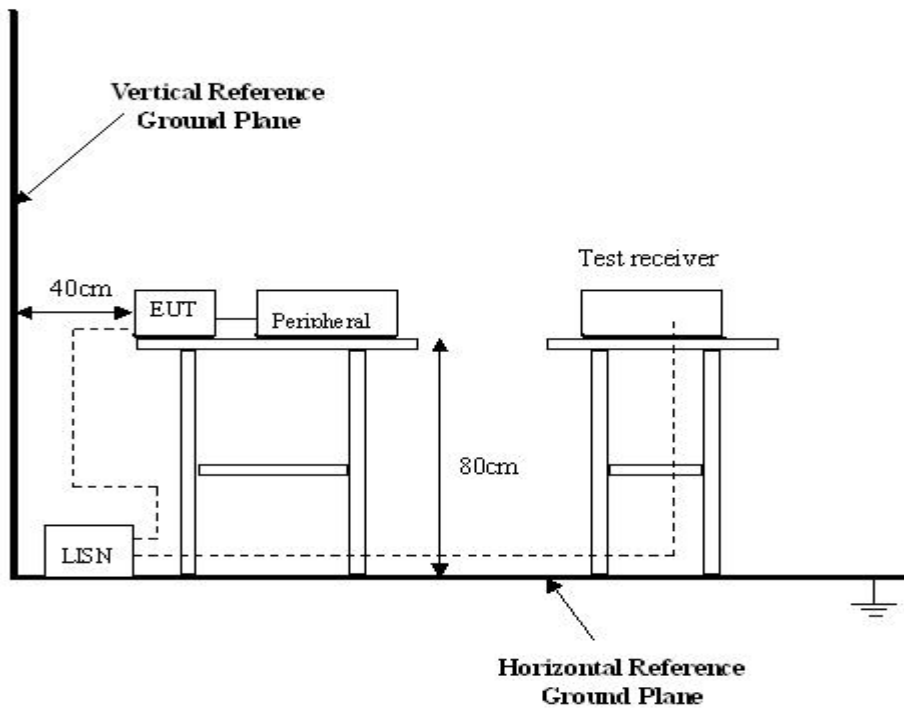
Please refer to Section 5 this report.

5.2 Test Procedure

1. The EUT was connected to LISN and placed on a table.
2. The EUT was tested according to ANSI C63.4:2009. The frequency spectrum from 150kHz to 30MHz was investigated.
3. 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.

5.3 Conducted Test Setup

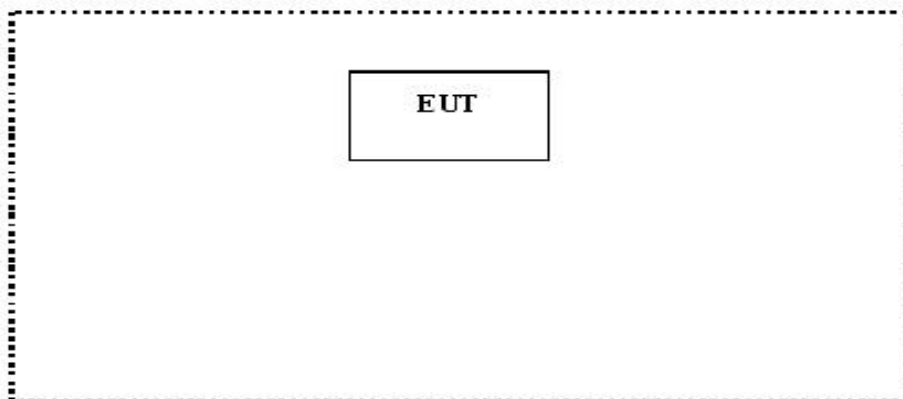
The conducted emission tests were performed using the setup accordance with the ANSI C63.4: 2009, The specification used in this report was the FCC Part15 Paragraph 15.207 limits.



5.4 EUT Operating Condition

Operating condition is according to ANSI C63.4: 2009.

- A. Setup the EUT and simulators as shown on follow.
- B. Enable RF signal and confirm EUT active.
- C. Modulate output capacity of EUT up to specification.



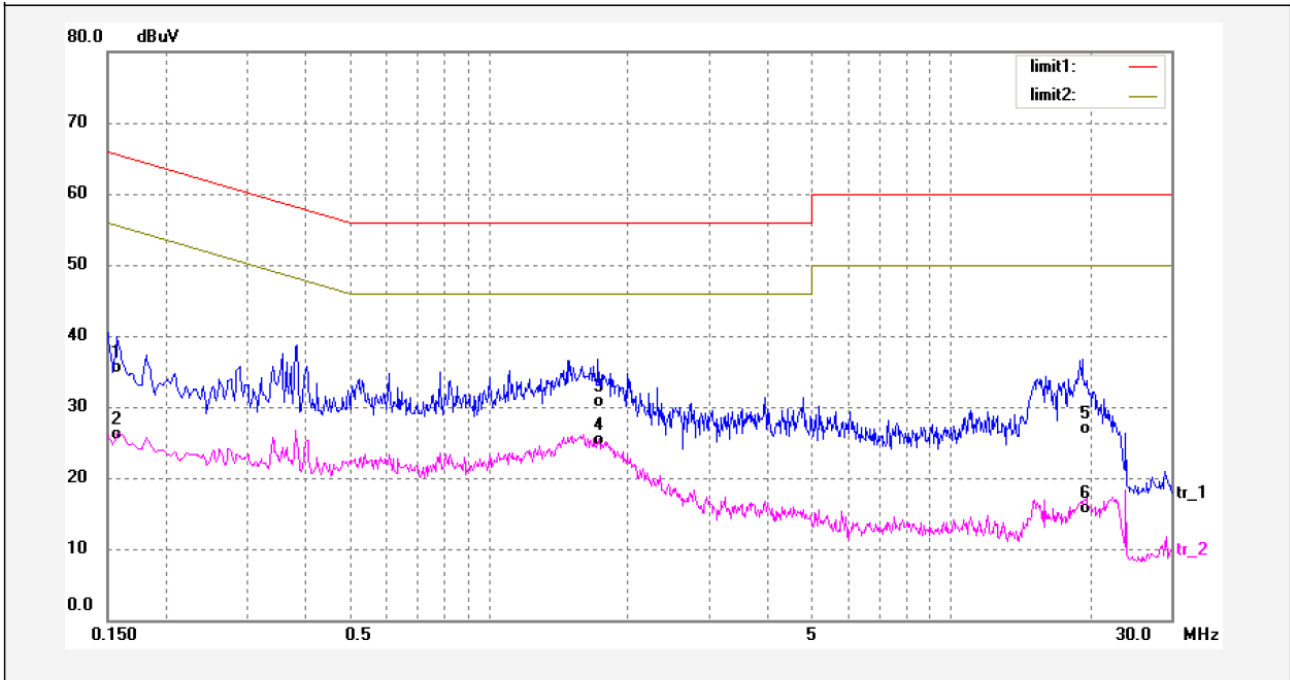
5.5 Conducted Emission Limits

- 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

Note: In the above limits, the tighter limit applies at the band edges.

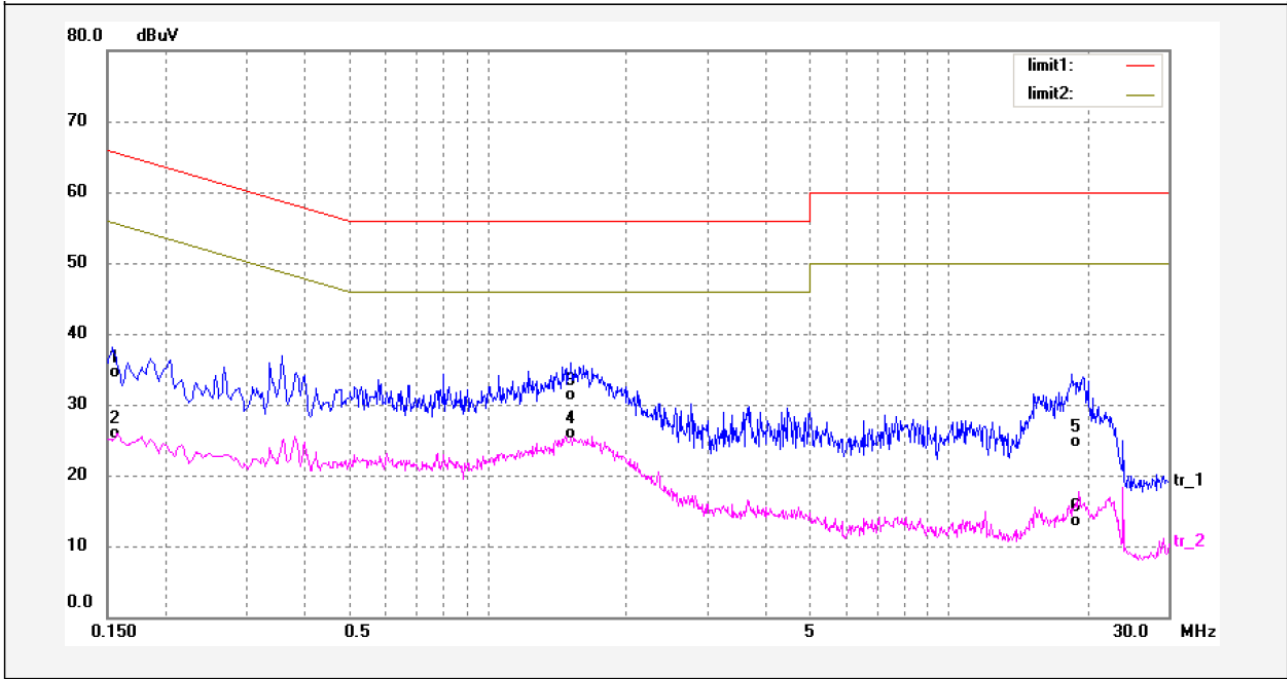
5.6 Conducted Emission Test Data

Live Line



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Margin (dB)	Detector	Remark
1	0.1580	24.19	10.61	34.80	65.56	-30.76	QP	
2	0.1580	14.79	10.61	25.40	55.56	-30.16	AVG	
3	1.7300	18.62	11.22	29.84	56.00	-26.16	QP	
4	1.7300	13.20	11.22	24.42	46.00	-21.58	AVG	
5	19.3060	13.88	12.27	26.15	60.00	-33.85	QP	
6	19.3060	2.54	12.27	14.81	50.00	-35.19	AVG	

Neutral Line



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Margin (dB)	Detector	Remark
1	0.1539	23.16	10.64	33.80	65.78	-31.98	QP	
2	0.1539	14.40	10.64	25.04	55.78	-30.74	AVG	
3	1.5260	19.23	11.19	30.42	56.00	-25.58	QP	
4	1.5260	14.00	11.19	25.19	46.00	-20.81	AVG	
5	18.5660	11.53	12.28	23.81	60.00	-36.19	QP	
6	18.5660	0.40	12.28	12.68	50.00	-37.32	AVG	

5.7 Conducted Emission Test Setup View



6 Radiation Emission Test

Test Requirement:	FCC Part15 Paragraph 15.247
Test Method:	Based on ANSI 63.4:2009
Test Date:	Jan.25,2010
Frequency Range:	30MHz to 25GHz
Measurement Distance:	3m
Detector:	Peak for pre-scan (120kHz resolution bandwidth) Quasi-Peak if maximised peak within 6dB of limit

6.1 Test Equipment

Please refer to Section 5 this report.

6.2 Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in the field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

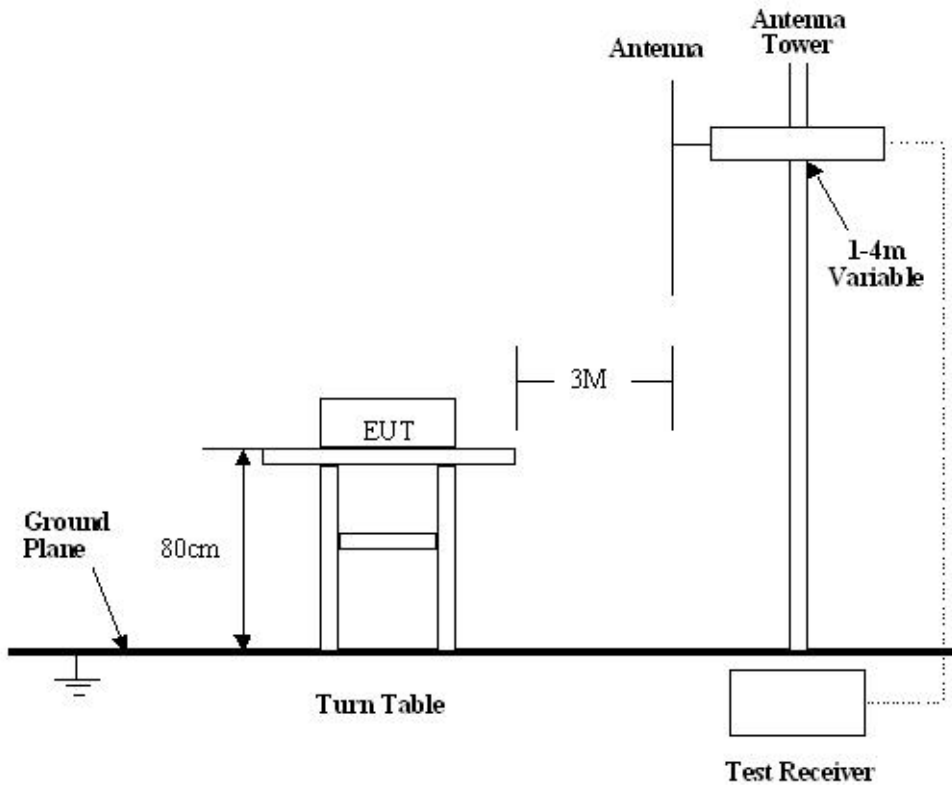
Based on ANSI C63.4: 2009, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of a radiation emissions measurement at WALTEK SERVICES EMC Lab is +/-5.03 dB.

6.3 Test Procedure

1. The adapter uses in the equipment under test for radiated emissions test.
2. The radiation emission should be 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.
3. Maximizing procedure was performed on the six (6) highest emissions to ensure EUT is compliant with all installation combinations.
4. All data was recorded in the peak and average detection mode.
5. The EUT was under working mode during the final qualification test and the configuration was used to represent the worst case results.

6.4 Radiated 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: 2009, The specification used in this report was the FCC Part15 Paragraph 15.209 limits and Paragraph 15.247 limits.



6.5 Spectrum Analyzer Setup

According to FCC Part15 Paragraph 15.247 Rules, the system was tested to 25000 MHz. Below 1GHz

- Start Frequency30 MHz
- Stop Frequency1000 MHz
- Sweep Speed Auto
- IF Bandwidth.....120 kHz
- Video Bandwidth100KHz
- Quasi-Peak Adapter Bandwidth120 kHz
- Quasi-Peak Adapter Mode.....Normal
- Resolution Bandwidth100KHz

Above 1GHz

Start Frequency	1000 MHz
Stop Frequency	25000MHz
Sweep Speed	Auto
IF Bandwidth.....	120 kHz
Video Bandwidth	1MHz
Quasi-Peak Adapter Bandwidth	120 kHz
Quasi-Peak Adapter Mode.....	Normal
Resolution Bandwidth	1MHz

6.6 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 μ V means the emission is 7dB μ V below the maximum limit for Class B. The equation for margin calculation is as follows:

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

6.7 Summary of Test Results

According to the data in section 7.11, the EUT complied with the FCC Part15 Paragraph 15.247 standards.

6.8 EUT Operating Condition

The same as section 6.4 of this report.

Let the EUT work in test mode and test it.

6.9 Radiated Emissions Limit on Paragraph 15.209

Frequency(MHZ)	Distance(m)	Field strength(dBuV/m)
30-88	3	40.0
88-216	3	43.5
216-960	3	46.0
Above 960	3	54.0

- Note:**
- (1) $RF\ Voltage(dBuV) = 20 \log RF\ Voltage(uV)$
 - (2) In the Above Table, the tighter limit applies at the band edges.
 - (3) Distance refers to the distance in meters between the measuring instrument antenna.
 - (4) The emission limit in this paragraph is based on measurement instrumentation employing an average detector. Measurement using instrumentation with a peak detector function, corresponding to 20dB above the maximum permitted average limit.
 - (5) Above 1GHz, mark a Peak and average measurements for all emissions, Limit for peak is 74dBuV/m, According to Part 15.35(b) and average is 54BuV/m.

6.10 Radiated Emissions Test Result

Formula of conversion factors:the field strength at 3m was established by adding
 The meter reading of the spectrum analyzer (which is set to read in units of dBuV/m)
 To the antenna correction factor supplied by the antenna manufacturer. The antenna
 Correction factors are stated in terms of dB.The gain of the pressletor was accounted
 For in the spectrum analyser meter reading.

Example:

Freq(MHz) Meter Reading +ACF=FS

33 20dBuV+10.36dB=30.36dBuV/m @3m

6.11 Radiated Emission Data

- A. Test Item: Radiated Emission Data
- Test Voltage: AC 120V
- Test Mode: TX On
- Temperature: 25.5°C
- Humidity: 51%RH
- Test Result: PASS

Remarks: 30-1000MHz radiation test no significant emissions above the equipment noise floor were detected.

And the below is the Fundamental and Harmonic .

Frequency (MHz)	Detect or	Antenna Polarization	Emission Level (dBuV/m)	FCC Part15 Subpart C Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Turntable Angle (°)
Low frequency							
2405	AV	Vertical	94.36		(Fund.)	1.1	0
4810	AV	Vertical	48.63	54.00	5.37	1.2	10
7215	AV	Vertical	42.36	54.00	11.64	1.1	20
9620	AV	Vertical	41.36	54.00	12.64	1.1	60
12025	AV	Vertical	40.25	54.00	13.75	1.2	90
14430	AV	Vertical	39.26	54.00	14.74	1.4	20
16835	AV	Vertical	37.56	54.00	16.44	1.7	120
19240	AV	Vertical	32.63	54.00	21.37	1.5	100
21645	AV	Vertical	31.03	54.00	22.97	1.6	120
24050	AV	Vertical	31.25	54.00	22.75	1.2	45

2405	AV	Horizontal	92.14		(Fund.)	1.1	10
4810	AV	Horizontal	47.62	54.00	6.38	1.2	120
7215	AV	Horizontal	38.96	54.00	15.04	1.1	10
9620	AV	Horizontal	36.97	54.00	17.03	1.2	1130
12025	AV	Horizontal	38.59	54.00	15.41	1.1	45
14430	AV	Horizontal	38.63	54.00	15.37	1.2	110
16835	AV	Horizontal	36.62	54.00	17.38	1.5	10
19240	AV	Horizontal	35.26	54.00	18.74	1.1	30
21645	AV	Horizontal	33.23	54.00	20.77	1.2	120
24050	AV	Horizontal	32.31	54.00	21.69	1.0	10
2405	PK	Vertical	112.36		(Fund.)	1.0	230
4810	PK	Vertical	65.36	74.00	8.64	1.0	130
7215	PK	Vertical	52.36	74.00	21.64	1.1	10
9620	PK	Vertical	51.26	74.00	22.74	1.1	100
12025	PK	Vertical	46.96	74.00	27.04	1.1	160
14430	PK	Vertical	48.59	74.00	25.41	1.1	120
16835	PK	Vertical	46.96	74.00	27.04	1.2	30
19240	PK	Vertical	46.36	74.00	27.64	1.3	130
21645	PK	Vertical	43.63	74.00	30.37	1.2	45
24050	PK	Vertical	43.01	74.00	30.99	1.2	135
2405	PK	Horizontal	109.36		(Fund.)	1.3	10
4810	PK	Horizontal	62.36	74.00	11.64	1.1	90
7215	PK	Horizontal	48.36	74.00	25.64	1.3	120
9620	PK	Horizontal	46.35	74.00	27.65	1.2	10
12025	PK	Horizontal	45.63	74.00	28.37	1.1	110
14430	PK	Horizontal	42.36	74.00	31.64	1.5	150
16835	PK	Horizontal	43.62	74.00	30.38	1.1	30
19240	PK	Horizontal	43.25	74.00	30.75	1.2	120
21645	PK	Horizontal	43.11	74.00	30.89	1.2	150
24050	PK	Horizontal	42.32	74.00	31.68	1.2	20
Middle frequency							
2438	AV	Vertical	93.98		(Fund.)	1.0	0
4876	AV	Vertical	49.36	54.00	4.64	1.0	20
7314	AV	Vertical	43.65	54.00	10.35	1.1	10

9752	AV	Vertical	42.65	54.00	11.35	1.0	20
12190	AV	Vertical	43.63	54.00	10.37	1.2	10
14628	AV	Vertical	41.36	54.00	12.64	1.1	120
17066	AV	Vertical	36.96	54.00	17.04	1.1	10
19504	AV	Vertical	35.36	54.00	18.64	1.5	30
21942	AV	Vertical	35.03	54.00	18.97	1.1	50
24380	AV	Vertical	36.36	54.00	17.64	1.2	50
2438	AV	Horizontal	91.68		(Fund.)	1.0	120
4876	AV	Horizontal	45.36	54.00	8.64	1.0	90
7314	AV	Horizontal	42.36	54.00	11.64	1.0	20
9752	AV	Horizontal	40.21	54.00	13.79	1.0	110
12190	AV	Horizontal	38.58	54.00	15.42	1.0	120
14628	AV	Horizontal	38.74	54.00	15.26	1.2	0
17066	AV	Horizontal	35.63	54.00	18.37	1.0	45
19504	AV	Horizontal	36.36	54.00	17.64	1.1	90
21942	AV	Horizontal	36.53	54.00	17.47	1.2	20
24380	AV	Horizontal	34.65	54.00	19.35	1.1	120
2438	PK	Vertical	112.93		(Fund.)	1.1	10
4876	PK	Vertical	63.36	74.00	10.64	1.1	20
7314	PK	Vertical	51.36	74.00	22.64	1.6	130
9752	PK	Vertical	51.24	74.00	22.76	1.0	140
12190	PK	Vertical	45.63	74.00	28.37	1.2	180
14628	PK	Vertical	46.36	74.00	27.64	1.2	30
17066	PK	Vertical	45.61	74.00	28.39	1.0	10
19504	PK	Vertical	43.36	74.00	30.64	1.2	120
21942	PK	Vertical	42.35	74.00	31.65	1.1	120
24380	PK	Vertical	41.02	74.00	32.98	1.1	110
2438	PK	Horizontal	108.35		(Fund.)	1.1	10
4876	PK	Horizontal	61.35	74.00	12.65	1.0	135
7314	PK	Horizontal	46.98	74.00	27.02	1.2	190
9752	PK	Horizontal	45.36	74.00	28.64	1.2	20
12190	PK	Horizontal	42.35	74.00	31.65	1.2	110
14628	PK	Horizontal	41.02	74.00	32.98	1.1	120
17066	PK	Horizontal	41.01	74.00	32.99	1.2	210

19504	PK	Horizontal	39.89	74.00	34.11	1.1	200
21942	PK	Horizontal	38.65	74.00	35.35	1.1	30
24380	PK	Horizontal	37.88	74.00	36.12	1.0	120
High frequency							
2470	AV	Vertical	94.95		(Fund.)	1.1	10
4940	AV	Vertical	50.11	54.00	3.89	1.2	110
7410	AV	Vertical	42.69	54.00	11.31	1.1	20
9880	AV	Vertical	41.22	54.00	12.78	1.1	135
12350	AV	Vertical	41.35	54.00	12.65	1.2	50
14820	AV	Vertical	42.31	54.00	11.69	1.4	60
17290	AV	Vertical	38.74	54.00	15.26	1.7	10
19760	AV	Vertical	35.62	54.00	18.38	1.5	150
22230	AV	Vertical	36.87	54.00	17.13	1.6	10
24700	AV	Vertical	38.77	54.00	15.23	1.2	50
2470	AV	Horizontal	91.36		(Fund.)	1.0	10
4940	AV	Horizontal	46.35	54.00	7.65	1.2	110
7410	AV	Horizontal	43.26	54.00	10.74	1.1	10
9880	AV	Horizontal	40.21	54.00	13.79	1.2	120
12350	AV	Horizontal	39.32	54.00	14.68	1.5	70
14820	AV	Horizontal	37.54	54.00	16.46	1.2	140
17290	AV	Horizontal	35.63	54.00	18.37	1.5	120
19760	AV	Horizontal	36.36	54.00	17.64	1.1	10
22230	AV	Horizontal	34.52	54.00	19.48	1.2	15
24700	AV	Horizontal	33.21	54.00	20.79	1.5	10
2470	PK	Vertical	113.14		(Fund.)	1.5	10
4940	PK	Vertical	62.58	74.00	11.42	1.1	10
7410	PK	Vertical	51.36	74.00	22.64	1.1	120
9880	PK	Vertical	52.32	74.00	21.68	1.4	110
12350	PK	Vertical	46.35	74.00	27.65	1.2	45
14820	PK	Vertical	46.36	74.00	27.64	1.1	190
17290	PK	Vertical	44.44	74.00	29.56	1.2	160
19760	PK	Vertical	42.21	74.00	31.79	1.2	110
22230	PK	Vertical	41.02	74.00	32.98	1.1	160
24700	PK	Vertical	41.02	74.00	32.98	1.4	90

2470	PK	Horizontal	108.35		(Fund.)	1.1	120
4940	PK	Horizontal	61.35	74.00	12.65	1.1	110
7410	PK	Horizontal	50.36	74.00	23.64	1.1	15
9880	PK	Horizontal	45.63	74.00	28.37	1.2	110
12350	PK	Horizontal	45.36	74.00	28.64	1.2	60
14820	PK	Horizontal	45.61	74.00	28.39	1.5	70
17290	PK	Horizontal	43.36	74.00	30.64	1.1	10
19760	PK	Horizontal	42.35	74.00	31.65	1.5	110
22230	PK	Horizontal	40.36	74.00	33.64	1.2	135
24700	PK	Horizontal	36.98	74.00	37.02	1.1	45

7 Maximum Peak Output Power

Test Requirement:	FCC Part15 Paragraph 15.247
Test Method:	Based on ANSI 63.4:2009
Test Date:	Nov.25,2010
Test mode:	Compliance test in the worse case: Tx Lower/Tx Middle/Tx Upper
Requirements:	Regulation 15.247(b) The limit of Maximum Peak Output Power Measurement is 0.125W

Test procedure:

The following test procedure as below:

The transmitter output (antenna port) was connected to the spectrum analyzer.EUT and its simulators are placed on a table, let EUT working in test mode,then test it.

The bandwidth of the fundamental frequency was measured with the spectrum analyser using 100kHz RBW and 100kHz VBW.

Test Result: The unit does meet the FCC requirements.

Test Channel	Fundamental Frequency(MHz)	Output Power (mW)	Limit (W)	Power output level
Lower	2405	12.01	0.125	conducted
Middle	2438	12.01	0.125	conducted
Upper	2470	10.32	0.125	conducted

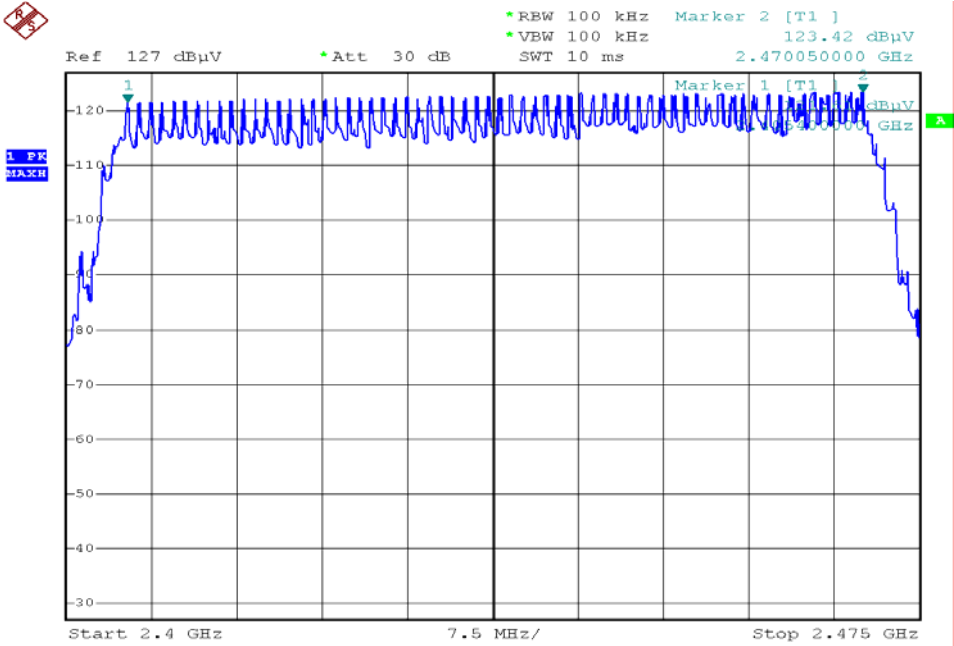
Note: The EUT uses 66 channels ,and according to 47 CFR Part 15 Subpart C Section 15.247 (b),the the maximum allowable power for this device is 0.125W.

8 Hopping Channel Number

Test Requirement: FCC Part15 C
 Test Method: Based on FCC Part15 Paragraph 15.247
 Test Date: Jan.25,2010
 Test mode: The EUT work in test mode(Tx) and test it
 Requirements: Regulation 15.247(b) For frequency hopping systems operating
 In the 2400-2483.5MHz band employing at least 15 hopping
 channels.

Test result: The total number of channels would be 66 channels.
 The unit does meet the FCC requirements.

Please refer the graph as below:



9 Frequency Separated

The requirements in this clause are only applicable to equipment using frequency hopping spread spectrum (FHSS) modulation.

Channel Separated

Definition: A hopping channel is any of the centre frequencies defined within the hopping sequence of a FHSS system.

Limit: Non-adaptive frequency hopping system shall make use of non-overlapping channels separated by the channel bandwidth as measured at 20dB below peak power.

The hopping channels defined within a hopping sequence shall be at least 1MHz apart(channel separation)

Operating Environment:

Temperature: 25.50 °C
 Humidity: 51 % RH
 Barometric Pressure: 1012 mbar

EUT Operation Condition:

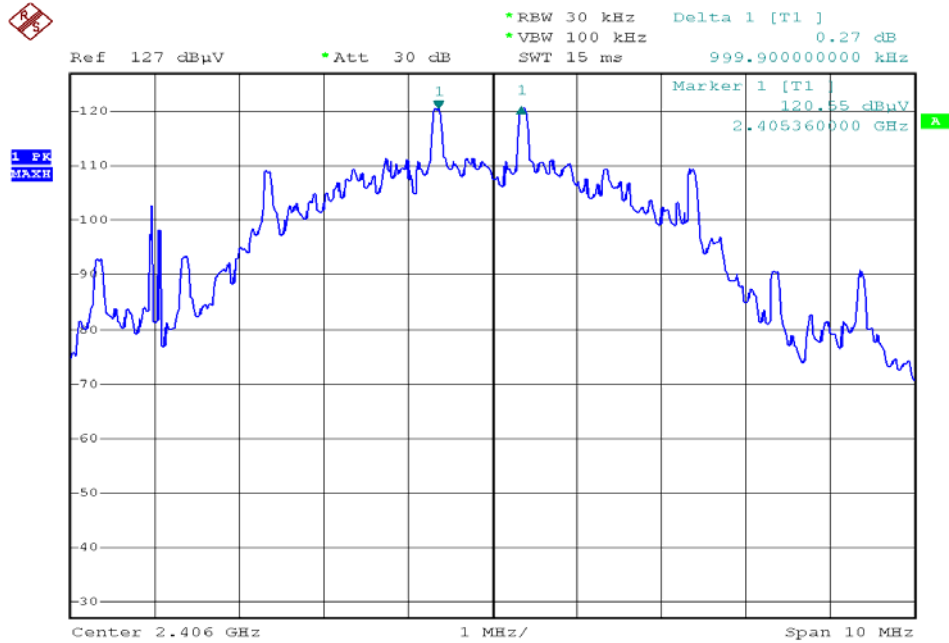
The EUT was programmed to be in continuously transmitting mode.

Test Result: PASS

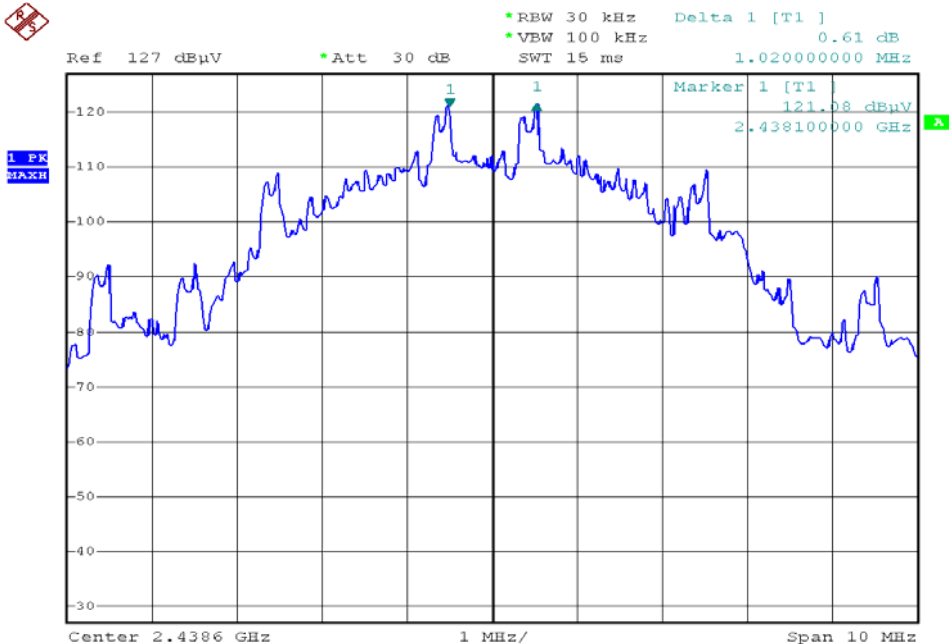
Test Channel	Channel Separation	PASS/FAIL
Lower Channels	1MHz	Pass
Middle Channels	1MHz	Pass
Upper Channels	1MHz	Pass

Please refer to the below photos for more details

Lower Channel



Middle Channel



Upper Channel



10 Dwell time

The dwell time is the time spent at a particular frequency during any single hop.

Limit: the maximum dwell time shall be less than 0.4s.

Operating Environment:

Temperature: 25.5 °C

Humidity: 51 % RH

Barometric Pressure: 1012 mbar

EUT Operation Condition:

The EUT was programmed to be in continuously transmitting mode.

11.2 Test Procedure

The EUT output antenna port was connected to the spectrum analyzer. Set RBW of spectrum analyzer to 1MHz and VBW to 1MHz, and the frequency span to zero span, measure the maximum time duration of one single pulse. So, the Dwell Time can be calculated as follows:

$$T = T_{\text{on-time}} * N_{\text{times}} / 1S * 0.4 * 66 \leq 0.4S.$$

11.3 Test Result: PASS

Please refer to the below photos for more details.

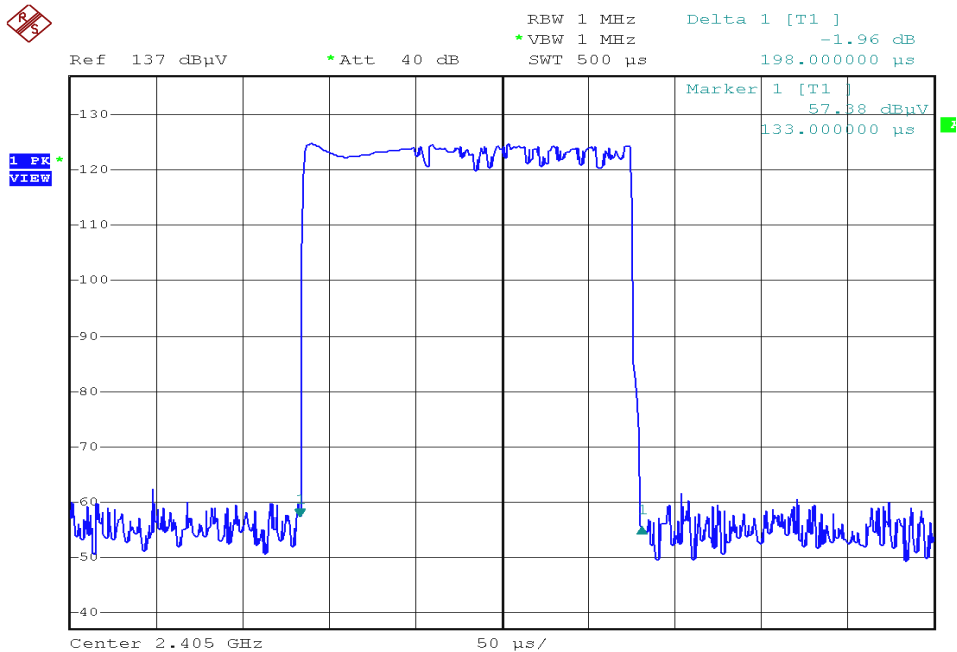
Channel 2405MHz

Dwell time of each occupation in this channel as follows:

$$0.0000198 \times 600 / 1S \times 0.4 \times 66 = 0.3136 < 0.4S$$

Test Result: PASS

The Results are not be greater than 0.4 seconds.

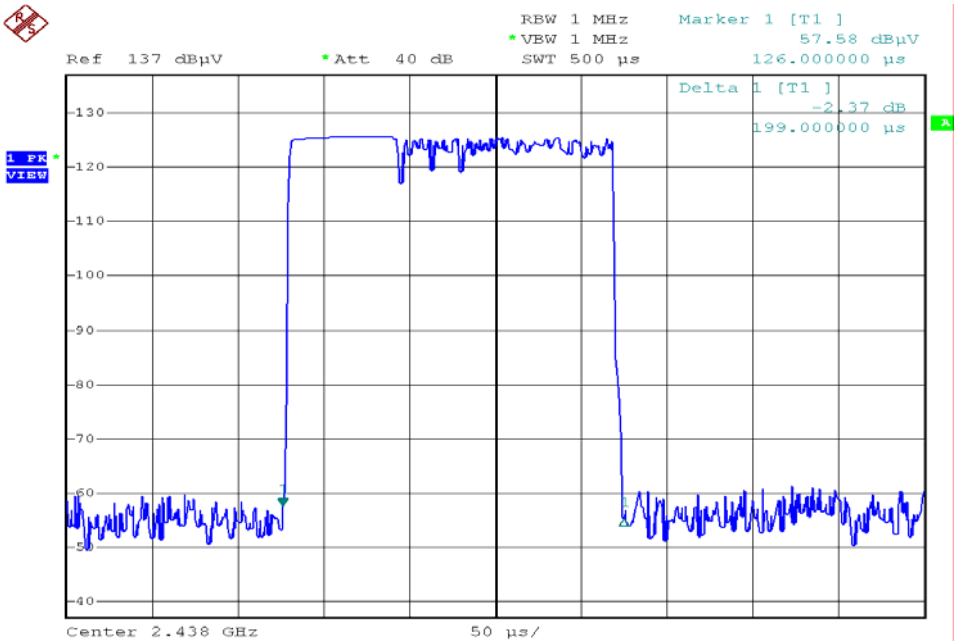


Channel 2438MHz

Dwell time of each occupation in this channel as follows:
 $0.0000199 \times 600 / 1S \times 0.4 \times 66 = 0.3152 < 0.4S$

Test Result: PASS

The Results are not be greater than 0.4 seconds.

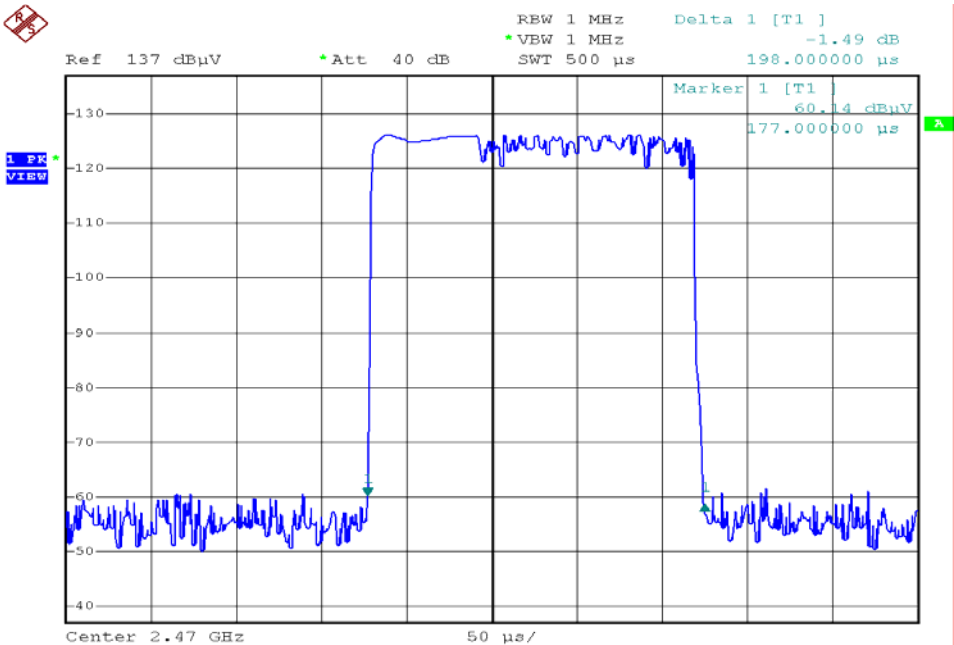


Channel 2470MHz

Dwell time of each occupation in this channel as follows:
 $0.0000198 \times 600 / 1S \times 0.4 \times 66 = 0.3136 < 0.4S$

Test Result: PASS

The Results are not be greater than 0.4 seconds.



11 20-dB Bandwidth

Test Requirement: FCC Part15 C
 Test Method: Based on FCC Part15 Paragraph 15.247
 Test Date: Jan.25,2010
 Test mode: The EUT work in test mode(Tx) and test it

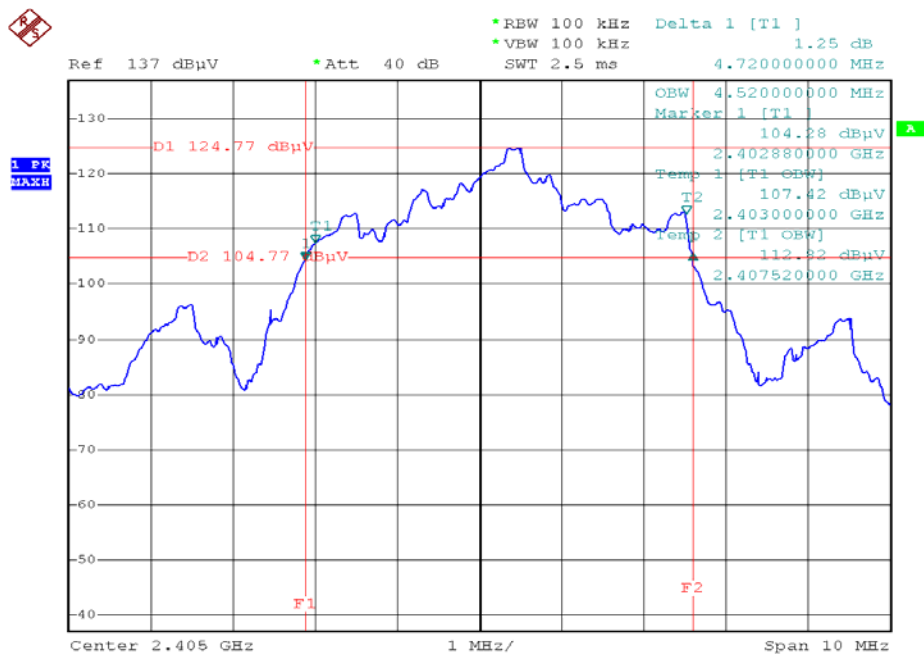
Test Procedure

1. The transmitter output (antenna port) was connected to the spectrum analyzer.
2. The bandwidth of the fundamental frequency was measure by spectrum analyser with 100KHz RBW and 100KHz VBW.The 20dB bandwidth is defined as the total spectrum the power of which is higher than peak power 20dB.

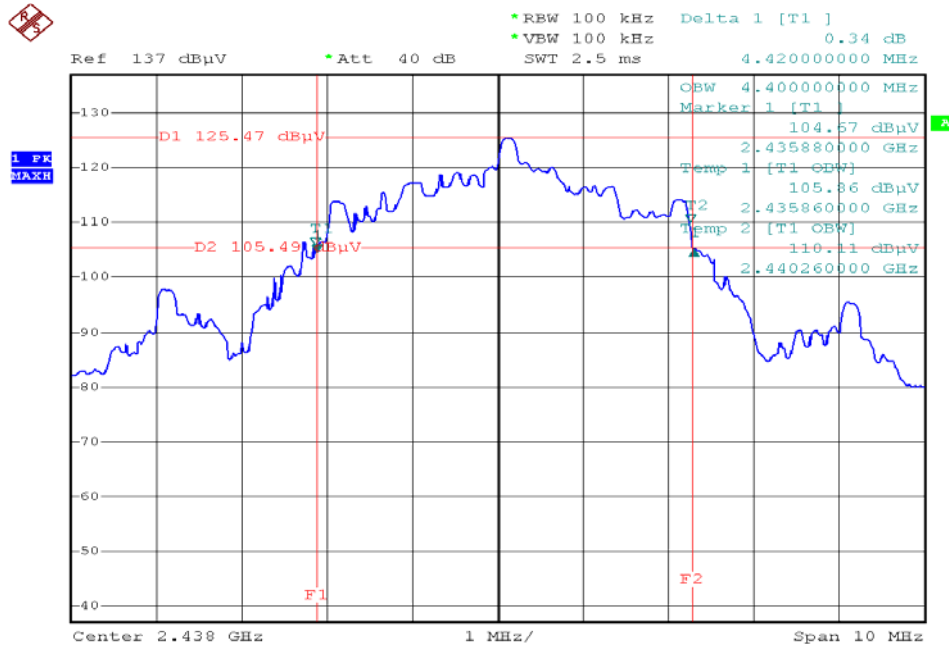
Test Result

Please refer the graph as below:

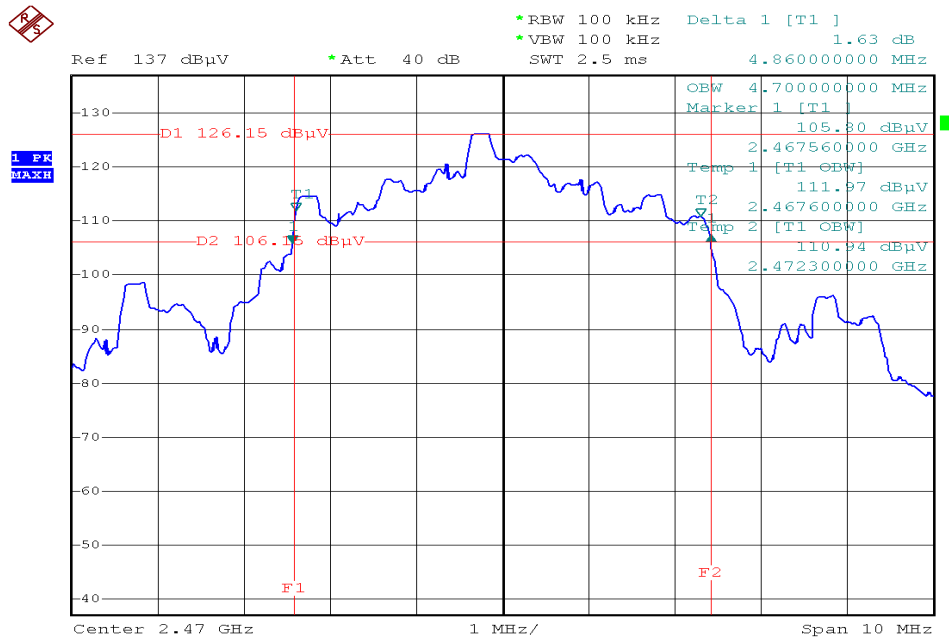
Lower Channel 2405MHz



Middle Channel 2438MHz



Upper Channel 2470MHz



12 Radiated spurious emissions into adjacent restricted band

Test Requirement:	FCC Part15 Paragraph 15.205
Test Method:	Based on FCC Part 15 Paragraph 15.247
Test Date:	Jan.25,2010
Requirements:	The EUT work in test mode(Tx) and test it

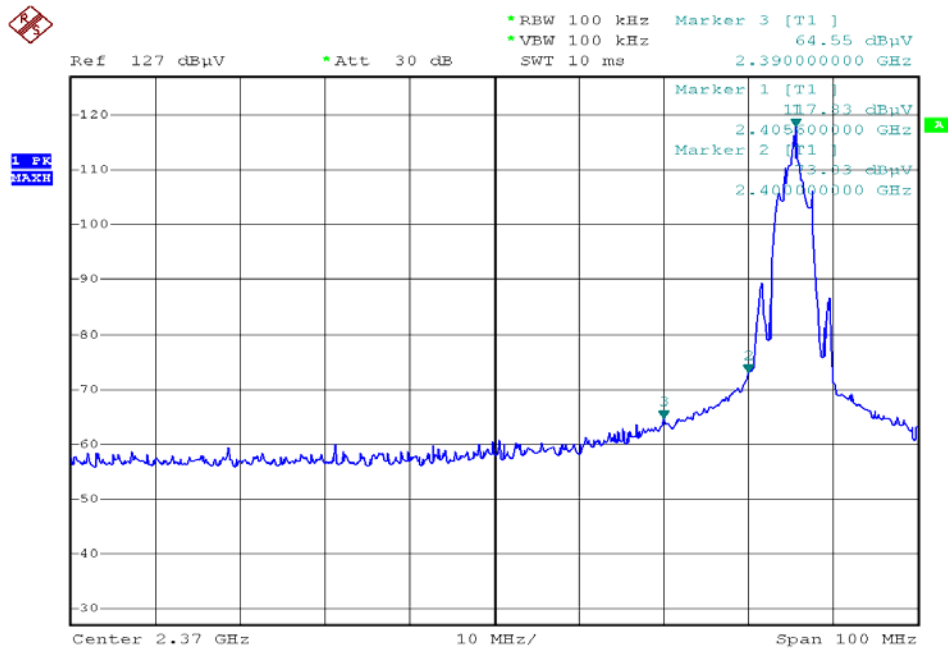
Requiments:

emissions that fall in the restricted bands(15.205).Above 1000MHz, compliance with the emissions limits in section 15.209 shall be demonstrated based on the average value of the measured emissions,The provisions in section 15.35 apply to these measurements.

Test procedure:

An in band field strength measurement of the fundamental emission using the RBW and detector function required by C63.4-2009 and FCC Rules.The procedure was repeated with an average detector and a plot made.The calculated field strength in the adjacent restricted band is presented below.

Lower bandedge/ restricted band (Peak Value)



For 2400MHz bandedge checked with 2405MHz frequency operated,the delta shown at the plot is $117.83-73.03=44.8\text{dB}$ for peak detector mode.

The fundamental emission at the frequency of 2405MHz is 112.36dBuV/m for peak detector mode,so the bandedge emission is $112.36-44.8=67.56\text{dBuV/m}$ for peak detector mode.Here the limit for the emission is 74 dBuV/m for the peak detector,so the result passed.

And the same as the average detector, the bandedge emission is $94.36-44.8=49.56\text{dBuV/m}$.

Here the limit for the emission is 54.0dBuV/m for the average detector. the bandedge emission is lower than the average limit, so the result passed.

Remark: the radation test data,please refer to the section 6.11 .

Upper Bandedge/ Restricted Band (Peak Value)



For 2483.5MHz bandedge checked with 2470MHz frequency operated,the delta shown at the plot is 119.90-64.18=55.72dB for peak detector mode.

The fundamental emission at the frequency of 2470MHz is 113.14dBuV/m for peak detector mode,so the bandedge emission is 113.14-55.72=57.42dBuV/m for peak detector mode.Here the limit for the emission is 74 dBuV/m for the peak detector,so the result passed.

And the same as the average detector, the bandedge emission is 94.95-55.72=39.23dBuV/m. Here the limit for the emission is 54.0dBuV/m for the average detector. the bandedge emission is lower than the average limit, so the result passed.

Remark: the radation test data,please refer to the section 6.11

13 RF Exposure Test

Test Requirement:	FCC Part 2 Subpart J
Test Method:	Based on FCC Part 15 Paragraph 15.247
Test Date:	Jan.25,2010
Requirements:	The EUT work in test mode(Tx) and test it

Requiments:

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.

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

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

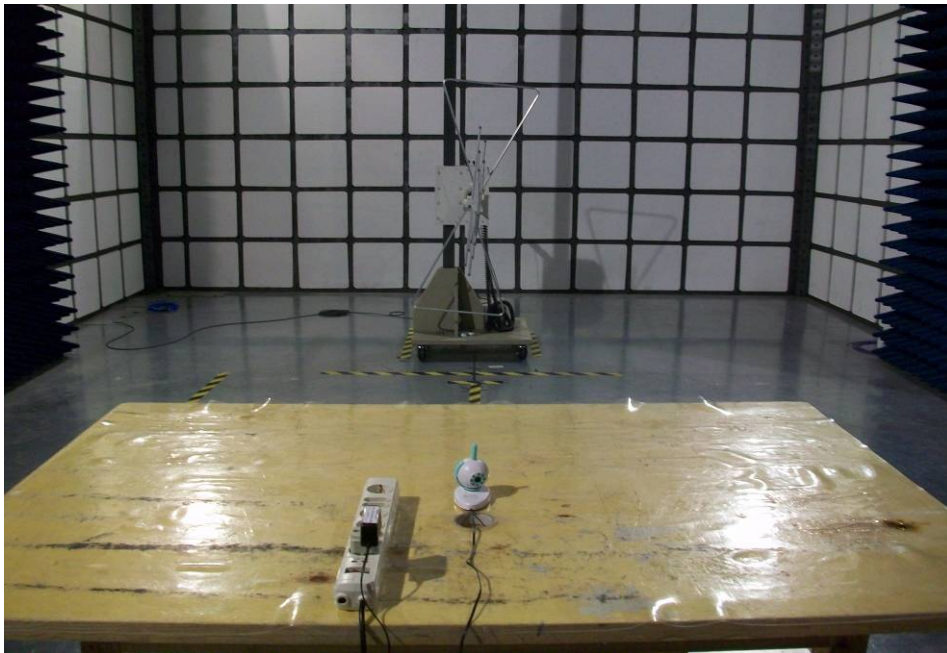
$$Pd = \frac{30 \times P \times G}{377 \times d^2}$$

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

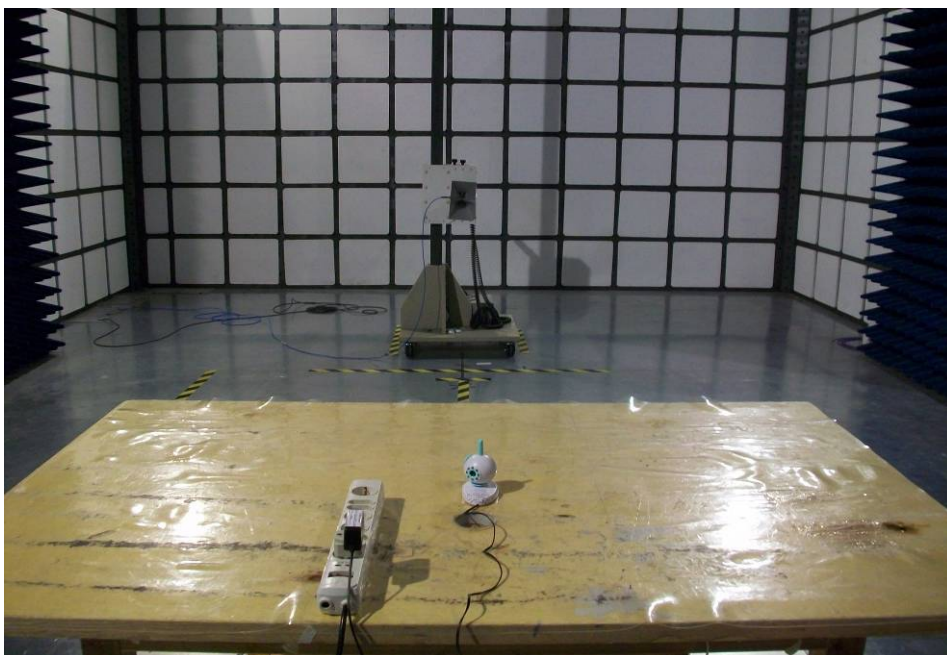
Antenna Gain (dBi)	Antenna Gain (numeric)	Peak Output Power (dBm)	Peak Output Power (mW)	Power Density (S) (mW/cm ²)	Limit of Power Density (S) (mW/cm ²)	Test Result
-4.65	0.343	10.8	12.01	0.00082	1	Complies
-4.65	0.343	10.8	12.01	0.00082	1	Complies
-4.36	0.366	10.14	10.32	0.000751	1	Complies

14 Photographs of Testing

Radiation Emission Test View For 30MHz-1000MHz



Radiation Emission Test View For 1GHz-25GHz



15 Photographs - Constructional Details

15.1 EUT – Appearance View



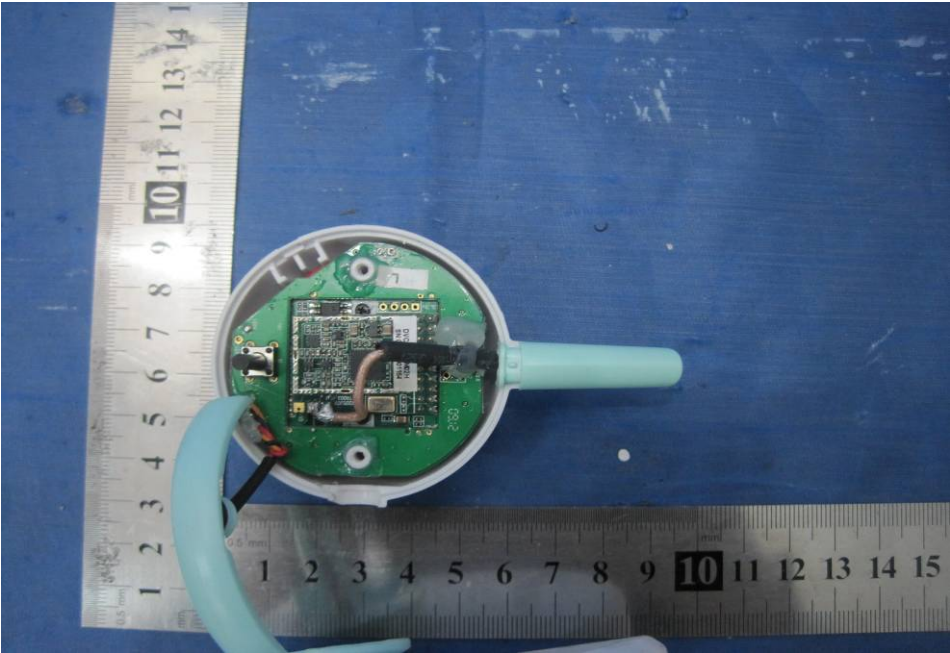
15.2 EUT - Front View



15.3 EUT - Back View



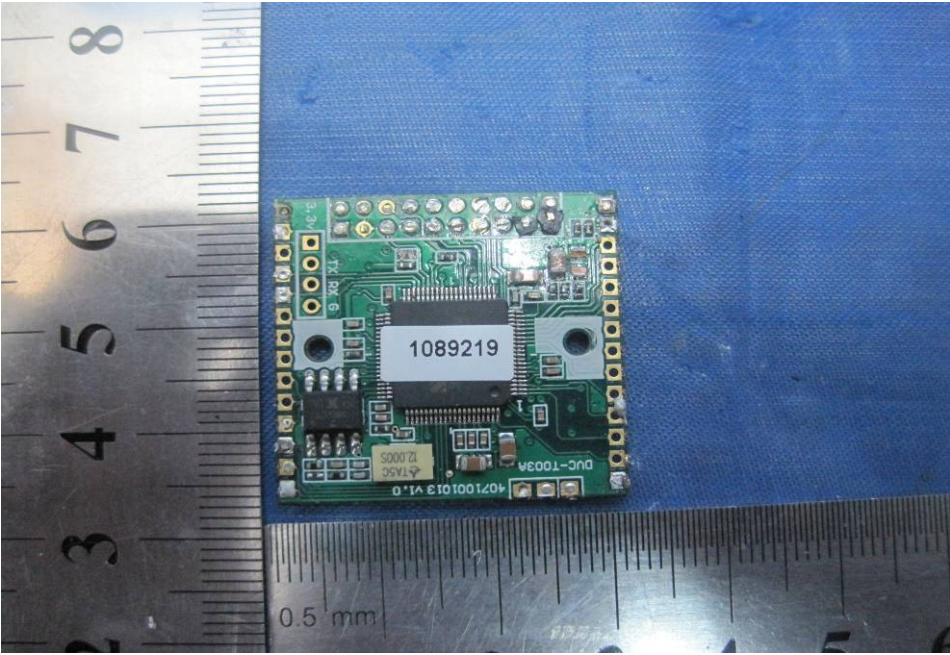
15.4 PCB1 - Front View



15.5 PCB1 - Back View



15.6 PCB2 - Front View



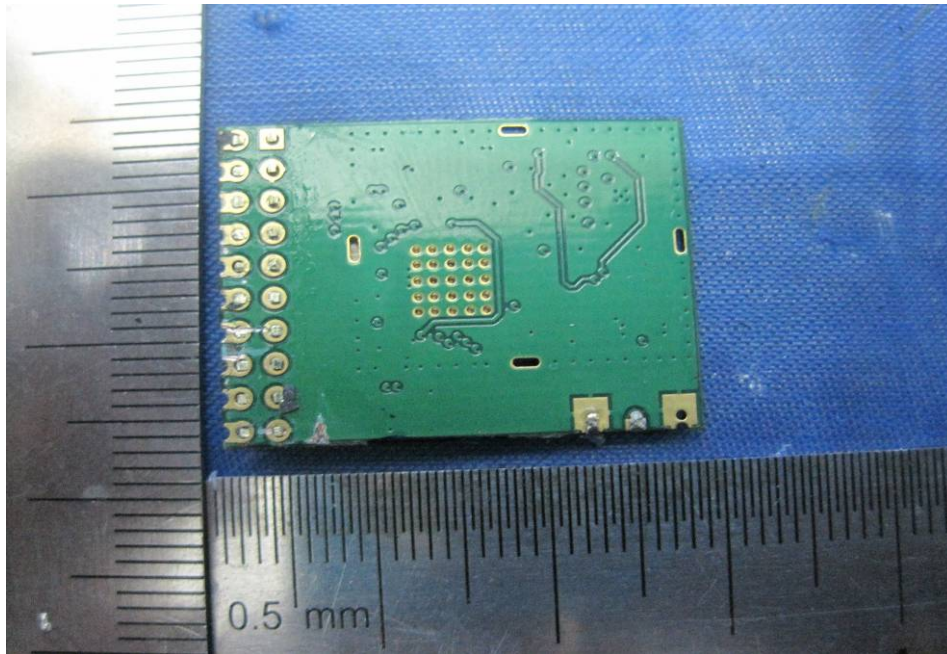
15.7 PCB2 - Back View



15.8 PCB3 - Front View



15.9 PCB3 - Back View



16 FCC ID Label

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:(1)this device may not cause harmful interference,and (2) this device must accept any interference received, including interference that may cause undesired operation.

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.

Proposed Label Location on EUT
EUT Bottom View/proposed FCC Mark Location

