FCC TEST REPORT

FCC ID	: QKC2005
Applicant	: LUDA Elektronik AB
Address	: Aschebergsgatan 46, 411 33 Goteborg, Sweden
Manufacturer	: LUDA Elektronik AB
Address	: Aschebergsgatan 46, 411 33 Goteborg, Sweden

Equipment Under Test (EUT) :

Product Name	: liftCam
Model No.	: 2005
Rules	: FCC CFR47 Part 15 Section 15.247:2010
Date of Test	: Nov. 06, 2012 ~ Apr.19, 2013
Date of Issue	: Apr. 27, 2013
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:

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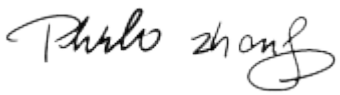
Compiled by:

Zero Zhou / Project Engineer

Approved by:



Philo Zhong / Manager

2 Test Summary

Test Items	Test Requirement	Result
Conduct Emission	15.207	PASS
Radiated Emissions	15.205(a) 15.209 15.247(d)	PASS
20dB Bandwidth	15.247(a)(1)	PASS
Maximum Peak Output Power	15.247(b)(1)	PASS
Frequency Separated	15.247(a)(1)	PASS
Hopping Channel Number	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

4 General Information

4.1 General Description of E.U.T.

Product Name	: liftCam
Model No.	: 2005
Type of Modulation	: GFSK
Operation Frequency	: 2402MHz ~ 2480MHz, 40 channels
Antenna Gain	: 3dBi
Oscillator	: Crystal 16MHz for RF module; 24MHz for MCU

4.2 Details of E.U.T.

Technical Data	: (1)DC 12~48V, 2A powered from Car charge (2)DC 12V, 1000mA powered from Adapter (Input: 100-240V~ 50/60Hz, 0.4A)
Adapter Manufacturer	: TOBY
M/N:	: JY-120-100

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 number 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

4.5 Test Mode

Test Item	Test Mode
Conducted Emissions	Normal linking(adapter)
Radiated Emissions	Normal linking(adapter)
	Normal linking(battery)

4.6 Channel List

Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)
1	2402	2	2404	3	2406	4	2408
5	2410	6	2412	7	2414	8	2416
9	2418	10	2420	11	2422	12	2424
13	2426	14	2428	15	2430	16	2432
17	2434	18	2436	19	2438	20	2440
21	2442	22	2444	23	2446	24	2448
25	2450	26	2452	27	2454	28	2456
29	2458	30	2460	31	2462	32	2464
33	2466	34	2468	35	2470	36	2472
37	2474	38	2476	39	2478	40	2480

5 Equipment Used during Test

5.1 Equipments List

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Calibration Date	Calibration Due Date
1.	EMI Test Receiver	R&S	ESCI	101155	Aug. 13,2012	Aug. 13,2013
2.	LISN	SCHWARZBECK	NSLK 8128	8128-289	Aug. 13,2012	Aug. 13,2013
3.	Cable	LARGE	RF300	EW02014-3	Aug.14,2012	Aug. 14,2013
Spurious Emissions and Radiated 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	COMPLIANCE DIRECTION	PAP-1G18	2004	Feb .23,2013	Feb .23,2014
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
Associated Equipment						
1.	liftCam	LUDA Elektronik AB	3005	-	-	-

5.2 Measurement Uncertainty

Parameter	Uncertainty
Radio Frequency	± 1 x 10^{-6}
RF Power	± 1.0 dB
RF Power Density	± 2.2 dB
Radiated Spurious Emissions test	± 5.03 dB (Bilog antenna 30M~1000MHz)
	± 4.74 dB (Horn antenna 1000M~25000MHz)

5.3 Test Equipment Calibration

All the test equipments used are valid and calibrated by CEPREI Certification Body that address is No.110 Dongguan Zhuang RD. Guangzhou, P.R.China.

6 Conducted Emission

Test Requirement:	FCC CFR 47 Part 15 Section 15.207
Test Method:	ANSI C63.4:2003
Test Result:	PASS
Frequency Range:	150kHz to 30MHz
Class:	Class B
Limit:	66-56 dBμV between 0.15MHz & 0.5MHz 56 dBμV between 0.5MHz & 5MHz 60 dBμV between 5MHz & 30MHz
Detector:	Peak for pre-scan (9kHz Resolution Bandwidth) 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:

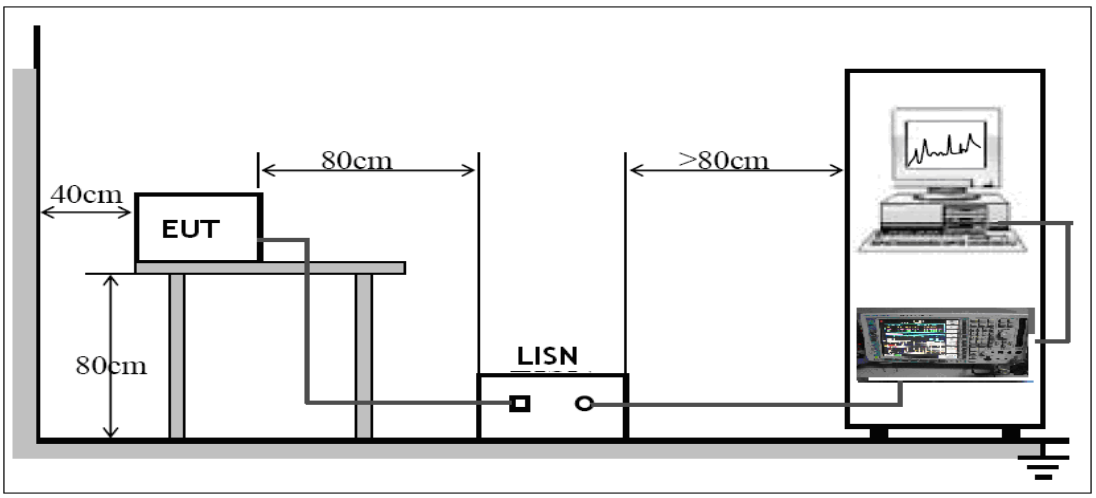
The pre-test was performed in charging and ON mode, the worse mode is charging mode, so the data show is that mode's only.

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

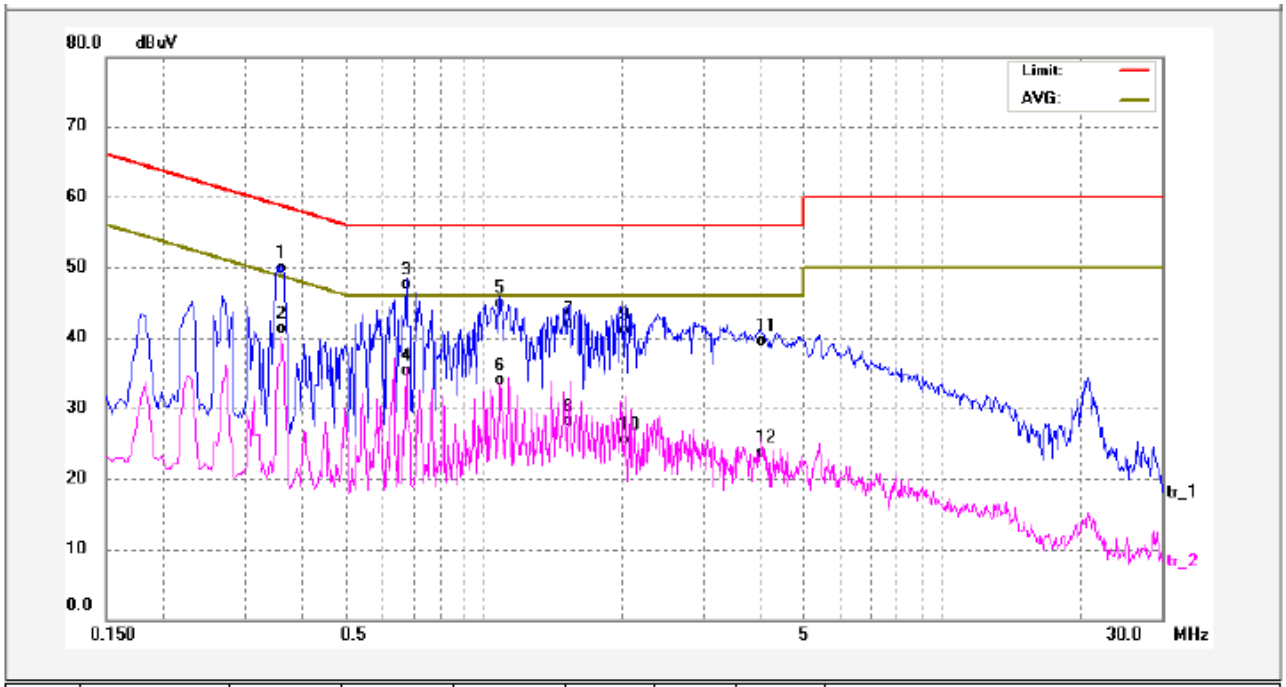
The EUT was placed on the test table in shielding room.



6.3 Conducted Emission Test Result

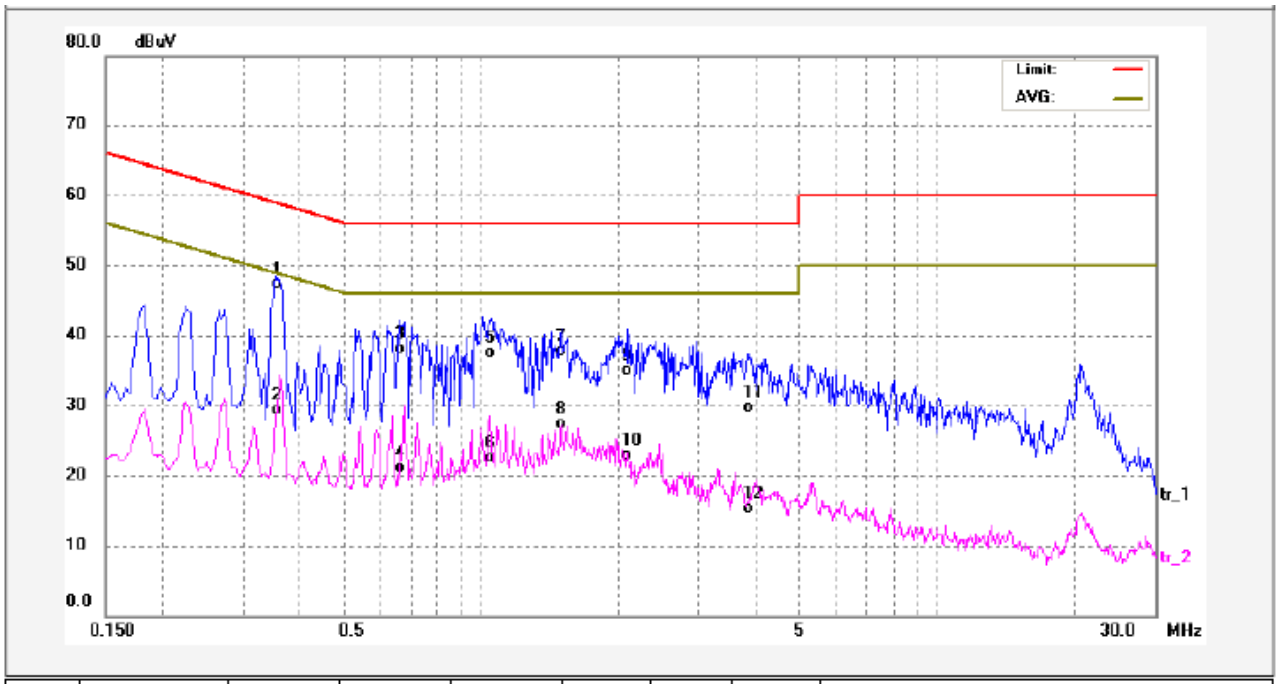
An initial pre-scan was performed on the live and neutral lines.
Test Mode: Charging Mode

Live line:



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Margin (dB)	Detector	Remark
1	0.3620	37.73	11.31	49.04	58.68	-9.64	QP	
2	0.3620	29.21	11.31	40.52	48.68	-8.16	AVG	
3	0.6780	35.38	11.34	46.72	56.00	-9.28	QP	
4	0.6780	23.12	11.34	34.46	46.00	-11.54	AVG	
5	1.0859	32.94	11.18	44.12	56.00	-11.88	QP	
6	1.0859	21.89	11.18	33.07	46.00	-12.93	AVG	
7	1.5300	29.85	11.19	41.04	56.00	-14.96	QP	
8	1.5300	16.07	11.19	27.26	46.00	-18.74	AVG	
9	2.0260	29.15	11.20	40.35	56.00	-15.65	QP	
10	2.0260	13.50	11.20	24.70	46.00	-21.30	AVG	
11	3.9820	27.57	11.23	38.80	56.00	-17.20	QP	
12	3.9820	11.72	11.23	22.95	46.00	-23.05	AVG	

Neutral line:



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Margin (dB)	Detector	Remark
1	0.3540	35.27	11.31	46.58	58.87	-12.29	QP	
2	0.3540	17.14	11.31	28.45	48.87	-20.42	AVG	
3	0.6580	25.96	11.33	37.29	56.00	-18.71	QP	
4	0.6580	8.96	11.33	20.29	46.00	-25.71	AVG	
5	1.0540	25.58	11.18	36.76	56.00	-19.24	QP	
6	1.0540	10.60	11.18	21.78	46.00	-24.22	AVG	
7	1.4980	25.79	11.19	36.98	56.00	-19.02	QP	
8	1.4980	15.35	11.19	26.54	46.00	-19.46	AVG	
9	2.0780	22.93	11.20	34.13	56.00	-21.87	QP	
10	2.0780	10.85	11.20	22.05	46.00	-23.95	AVG	
11	3.8620	17.73	11.22	28.95	56.00	-27.05	QP	
12	3.8620	3.31	11.22	14.53	46.00	-31.47	AVG	

7 Radiated Emissions

Test Requirement: FCC CFR47 Part 15 Section 15.209 & 15.247

Test Method: DA 00-705

Test Result: PASS

Frequency Range: 16MHz 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(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:

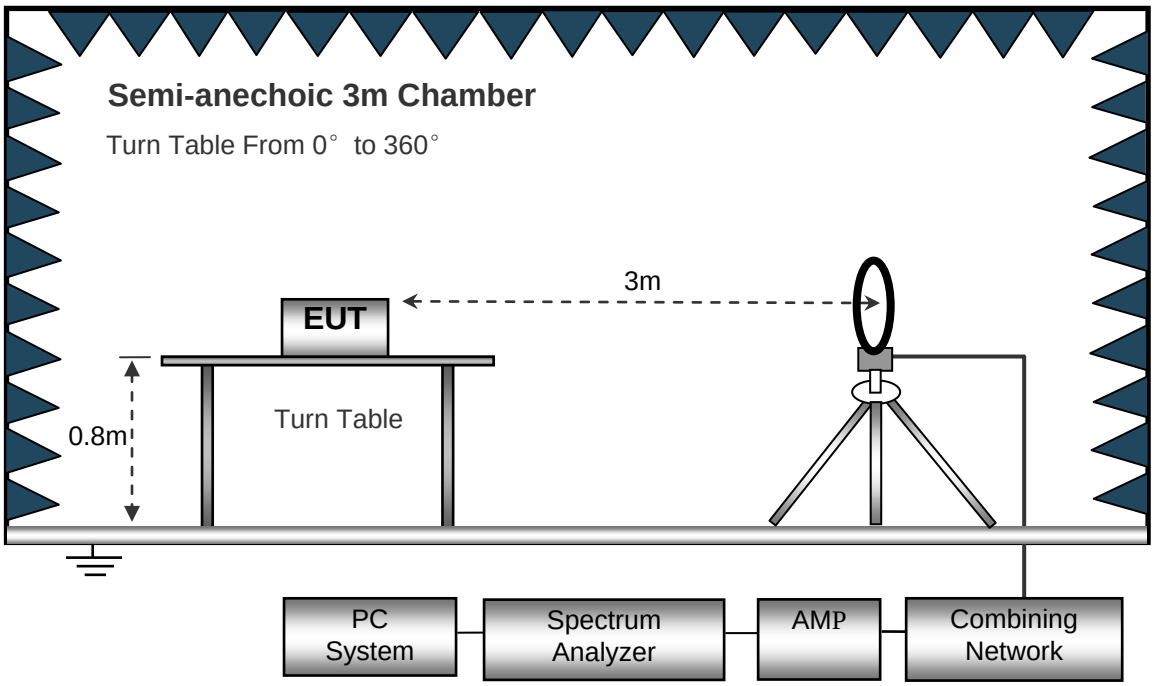
Temperature: 25.5 °C

Humidity: 51 % RH

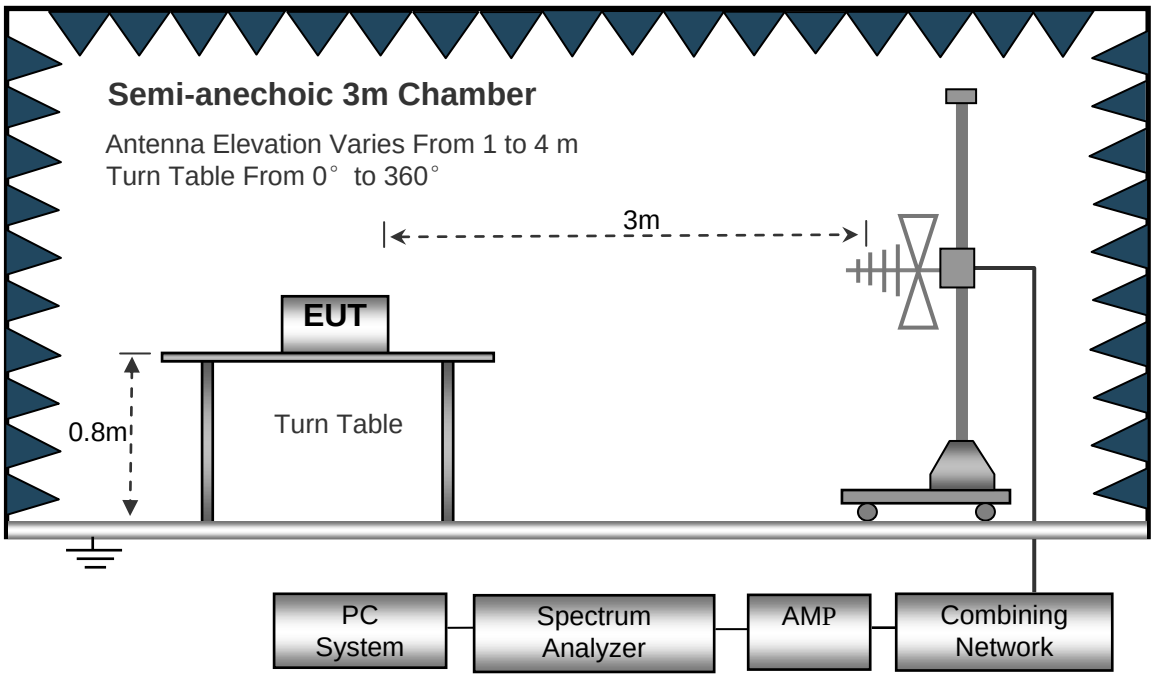
Atmospheric Pressure: 1012 mbar

7.2 Test Setup

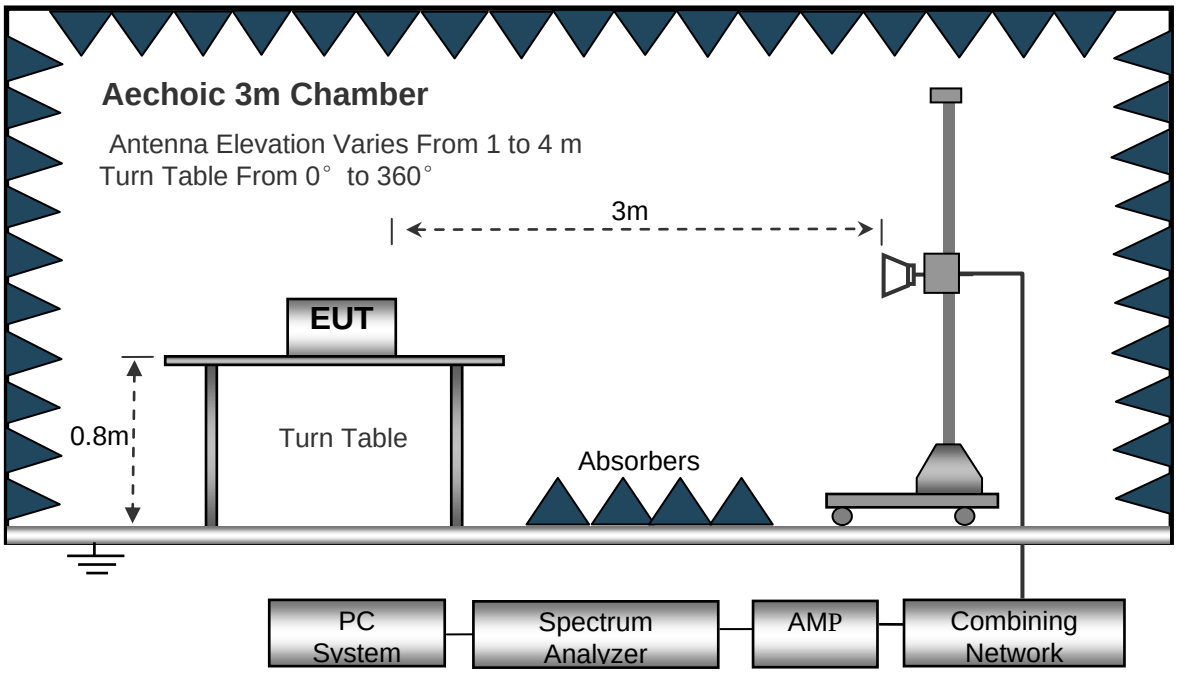
The radiated emission tests were performed in the 3m Semi- Anechoic Chamber test site, using the setup accordance with the ANSI C63.4: 2003.
The test setup for emission measurement below 30MHz.



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 16MHz to 25000MHz.

Below 30MHz

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

Resolution Bandwidth.....10KHz

30MHz ~ 1GHz

Sweep Speed .....Auto
IF Bandwidth.....120KHz
Video Bandwidth.....100KHz
Quasi-Peak Adapter Bandwidth 120KHz
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 X-axes position(X denotes lying on the table).

7.5 Corrected Amplitude & Margin Calculation

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

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

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

Margin = Corr. Ampl. – Limit

7.6 Summary of Test Results

Test mode: normal operation mode

Test Frequency Range : Below 30MHz

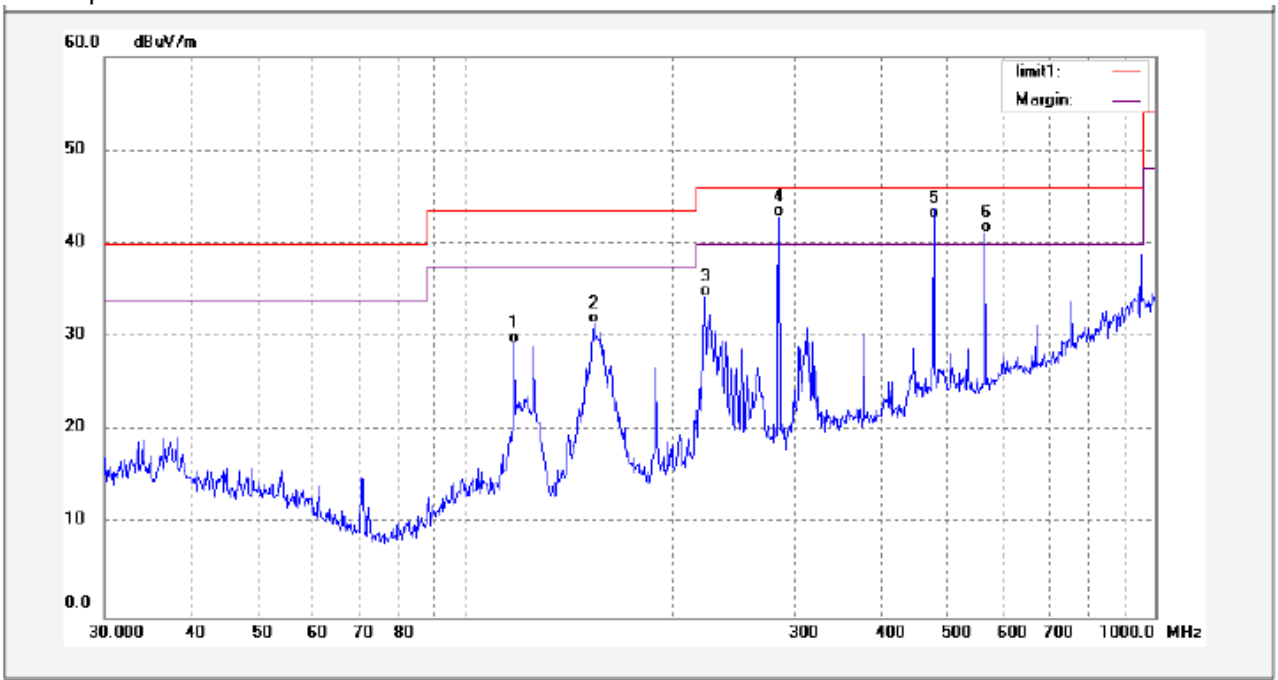
Remark:Because the emissions below 30MHz are more than 20dB below the limit, the data is not show in the report.

Test Voltage: Car Charge Operate (DC 12V)

Test Frequency Range : 30MHz ~ 1000MHz

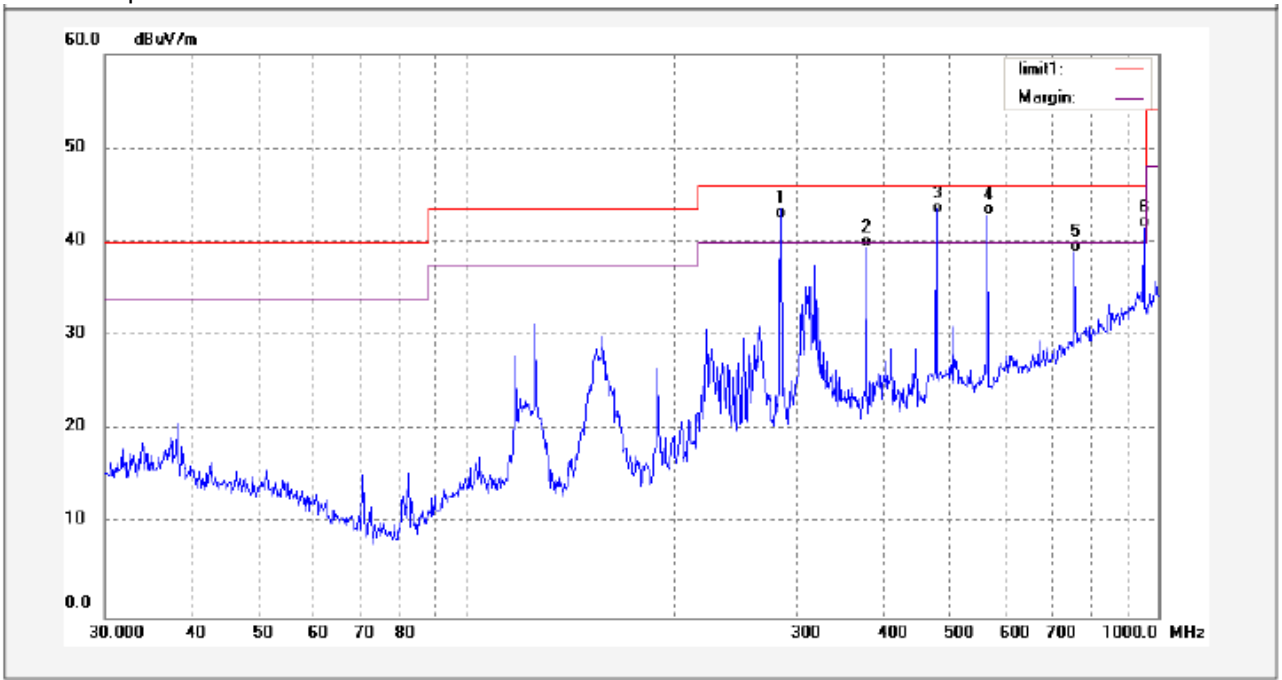
Test Mode:Normal linking

Test Specification: Vertical



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	117.6815	17.13	12.24	29.37	43.50	-14.13	QP	
2	153.7017	20.57	10.89	31.46	43.50	-12.04	QP	
3	222.2807	18.00	16.23	34.23	46.00	-11.77	QP	
4	285.2611	26.28	16.51	42.79	46.00	-3.21	QP	
5	478.1394	20.16	22.52	42.68	46.00	-3.32	QP	
6	565.9776	17.71	23.48	41.19	46.00	-4.81	QP	

Antenna polarization: Horizontal



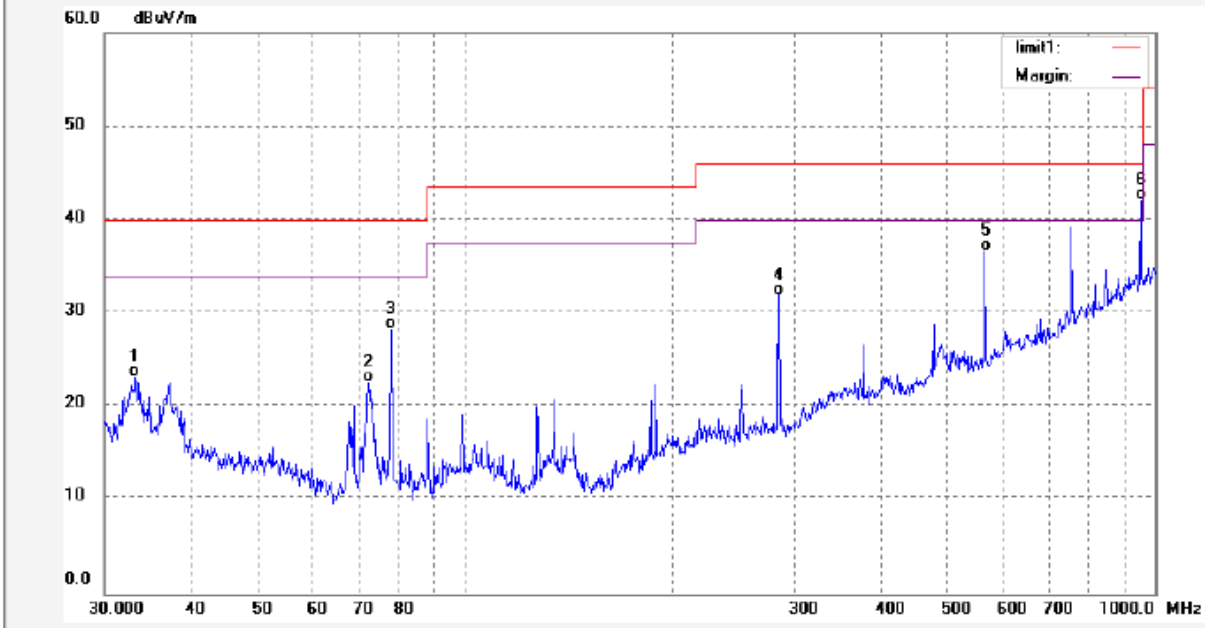
No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	285.2611	26.00	16.51	42.51	46.00	-3.49	QP	
2	377.8481	19.32	20.12	39.44	46.00	-6.56	QP	
3	480.1394	20.20	22.74	42.94	46.00	-3.06	QP	
4	565.9776	19.40	23.48	42.88	46.00	-3.12	QP	
5	757.6201	10.85	28.03	38.88	46.00	-7.12	QP	
6	955.3509	10.06	31.47	41.53	46.00	-4.47	QP	

Test Voltage: Car Charge Operate (DC 24V)

Test Frequency Range : 30MHz ~ 1000MHz

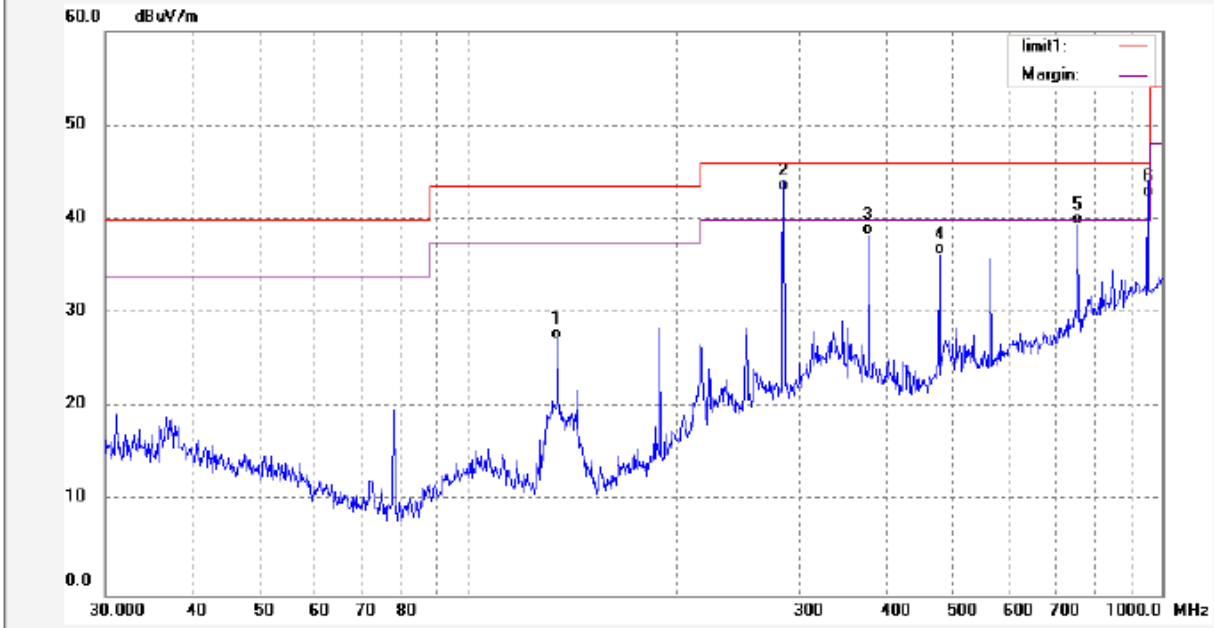
Test Mode:Normal linking

Test Specification: Vertical



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	33.2179	6.62	16.56	23.18	40.00	-16.82	QP	
2	72.4652	13.03	9.55	22.58	40.00	-17.42	QP	
3	78.0143	19.07	9.16	28.23	40.00	-11.77	QP	
4	285.2611	15.44	16.51	31.95	46.00	-14.05	QP	
5	565.9776	13.13	23.48	36.61	46.00	-9.39	QP	
6	955.3509	10.58	31.47	42.05	46.00	-3.95	QP	

Antenna polarization: Horizontal



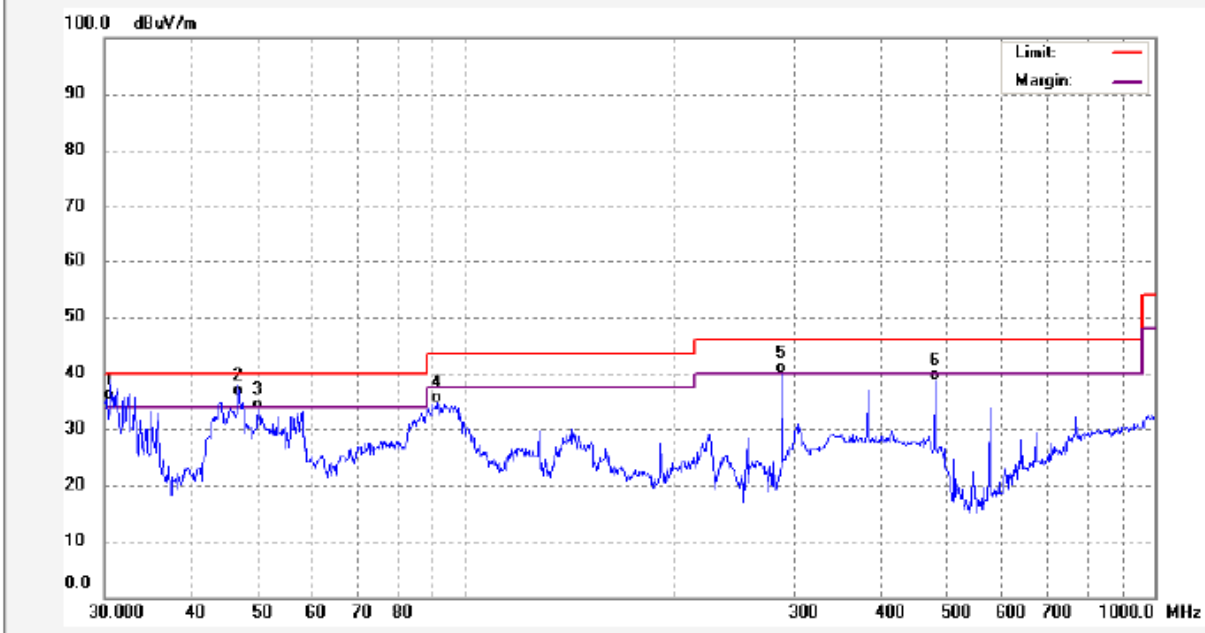
No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	134.4910	15.13	12.11	27.24	43.50	-16.26	QP	
2	285.2611	26.40	16.51	42.91	46.00	-3.09	QP	
3	377.8480	18.27	20.12	38.39	46.00	-7.61	QP	
4	478.1394	13.76	22.52	36.28	46.00	-9.72	QP	
5	757.6200	11.31	28.03	39.34	46.00	-6.66	QP	
6	955.3508	10.96	31.47	42.43	46.00	-3.57	QP	

Test Voltage: Adapter Operate

Test Frequency Range : 30MHz ~ 1000MHz

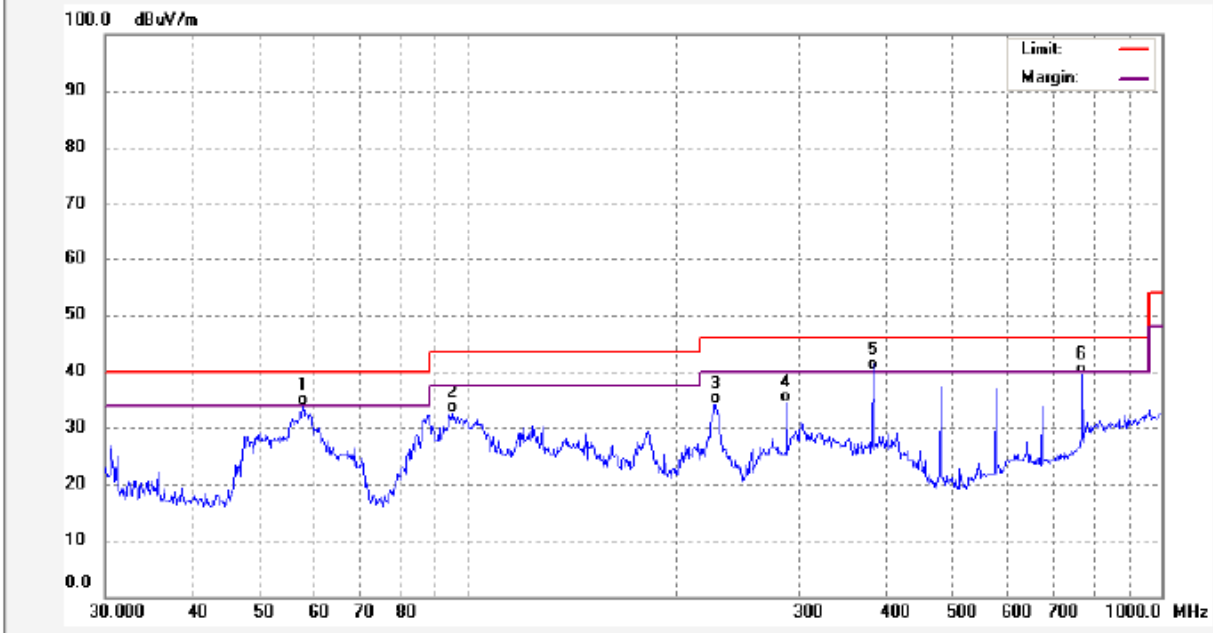
Test Mode:Charging Mode

Test Specification: Vertical



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	30.5304	53.88	-18.74	35.14	40.00	-4.86	QP	
2	46.8301	58.41	-22.43	35.98	40.00	-4.02	QP	
3	50.0566	56.40	-23.10	33.30	40.00	-6.70	QP	
4	90.8554	58.88	-24.24	34.64	43.50	-8.86	QP	
5	287.9904	59.97	-20.13	39.84	46.00	-6.16	QP	
6	480.5276	53.31	-14.80	38.51	46.00	-7.49	QP	

Antenna polarization: Horizontal



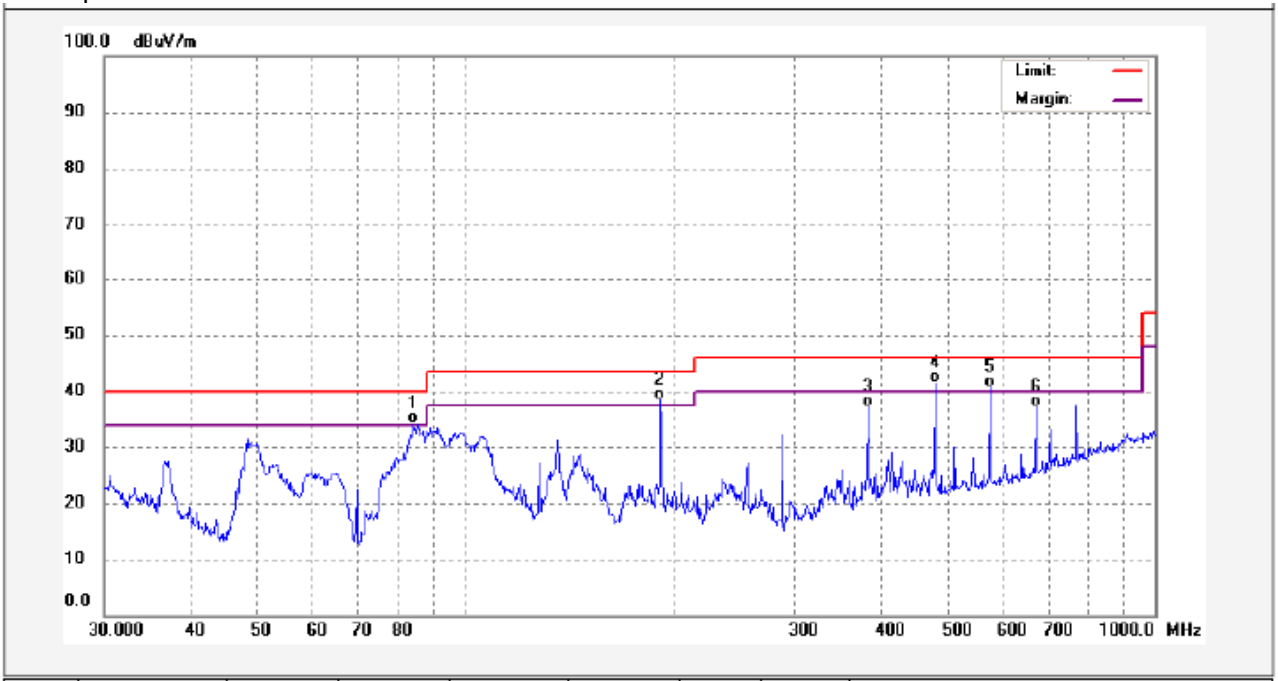
No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	57.7961	55.32	-21.34	33.98	40.00	-6.02	QP	
2	94.7600	57.77	-25.08	32.69	43.50	-10.81	QP	
3	227.6904	56.89	-22.65	34.24	46.00	-11.76	QP	
4	287.9904	54.34	-20.03	34.31	46.00	-11.69	QP	
5	383.9318	57.41	-17.20	40.21	46.00	-5.79	QP	
6	768.7481	47.23	-7.90	39.33	46.00	-6.67	QP	

Test Voltage: Adapter Operate

Test Frequency Range : 30MHz ~ 1000MHz

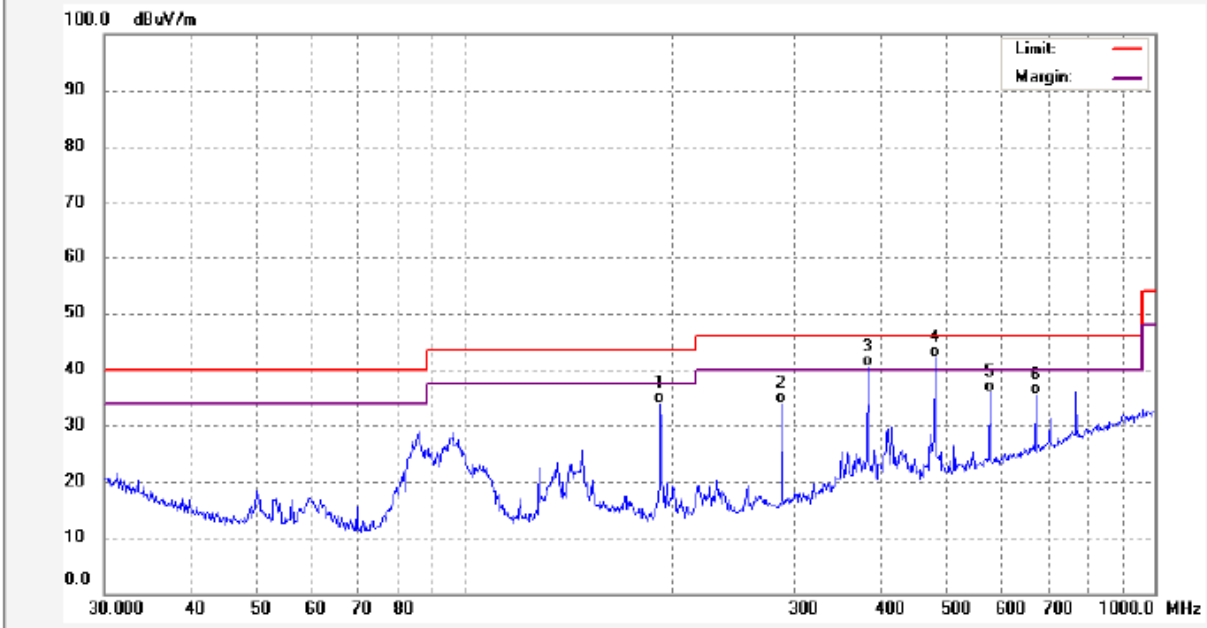
Test Mode:ON Mode

Test Specification: Vertical



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	84.1100	58.03	-23.90	34.13	40.00	-5.87	QP	
2	191.7450	61.65	-23.29	38.36	43.50	-5.14	QP	
3	383.9318	54.31	-17.20	37.11	46.00	-8.89	QP	
4	480.5276	56.14	-14.80	41.34	46.00	-4.66	QP	
5	576.6443	52.74	-12.12	40.62	46.00	-5.38	QP	
6	672.8444	47.29	-10.16	37.13	46.00	-8.87	QP	

Antenna polarization: Horizontal



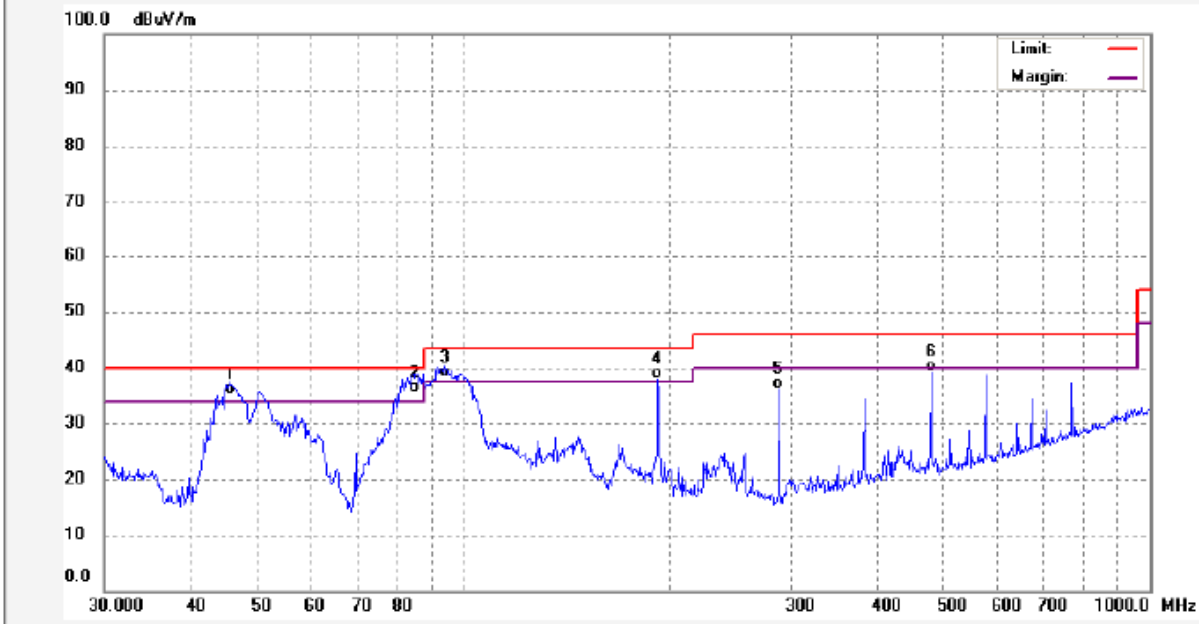
No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	191.7450	57.32	-23.33	33.99	43.50	-9.51	QP	
2	287.9904	53.90	-20.03	33.87	46.00	-12.13	QP	
3	383.9318	57.58	-17.20	40.38	46.00	-5.62	QP	
4	480.5276	56.74	-14.62	42.12	46.00	-3.88	QP	
5	576.6443	48.09	-12.23	35.86	46.00	-10.14	QP	
6	672.8444	45.67	-10.21	35.46	46.00	-10.54	QP	

Test Voltage: battery Operate

Test Frequency Range : 30MHz ~ 1000MHz

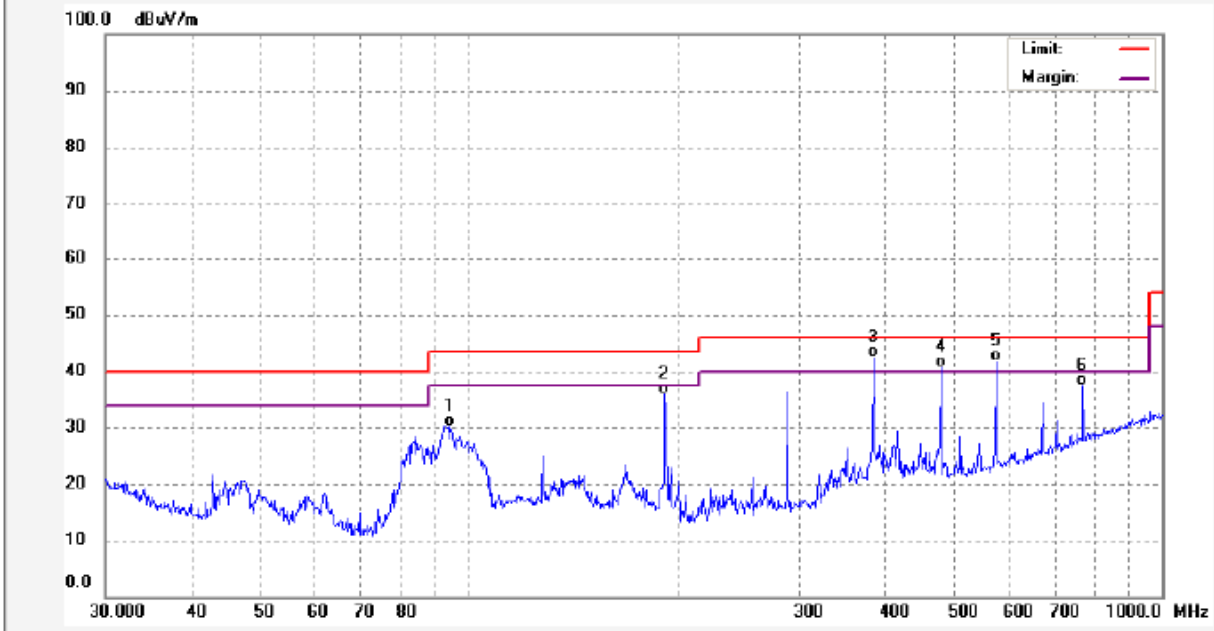
Test Mode:Normal Link Mode

Test Specification: Vertical



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	45.8553	57.33	-22.22	35.11	40.00	-4.89	QP	
2	84.1100	59.32	-23.90	35.42	40.00	-4.58	QP	
3	94.0979	62.53	-24.39	38.14	43.50	-5.36	QP	
4	191.7450	61.26	-23.29	37.97	43.50	-5.53	QP	
5	287.9904	56.23	-20.13	36.10	46.00	-9.90	QP	
6	480.5276	53.93	-14.80	39.13	46.00	-6.87	QP	

Antenna polarization: Horizontal



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	94.0979	55.36	-25.13	30.23	43.50	-13.27	QP	
2	191.7450	59.28	-23.33	35.95	43.50	-7.55	QP	
3	383.9318	59.59	-17.20	42.39	46.00	-3.61	QP	
4	480.5276	55.17	-14.62	40.55	46.00	-5.45	QP	
5	576.6443	53.79	-12.23	41.56	46.00	-4.44	QP	
6	768.7481	45.21	-7.90	37.31	46.00	-8.69	QP	

Test Frequency Range: 1GHz ~ 25GHz

Test Mode:Continuous Transmitting

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	Horizonta	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

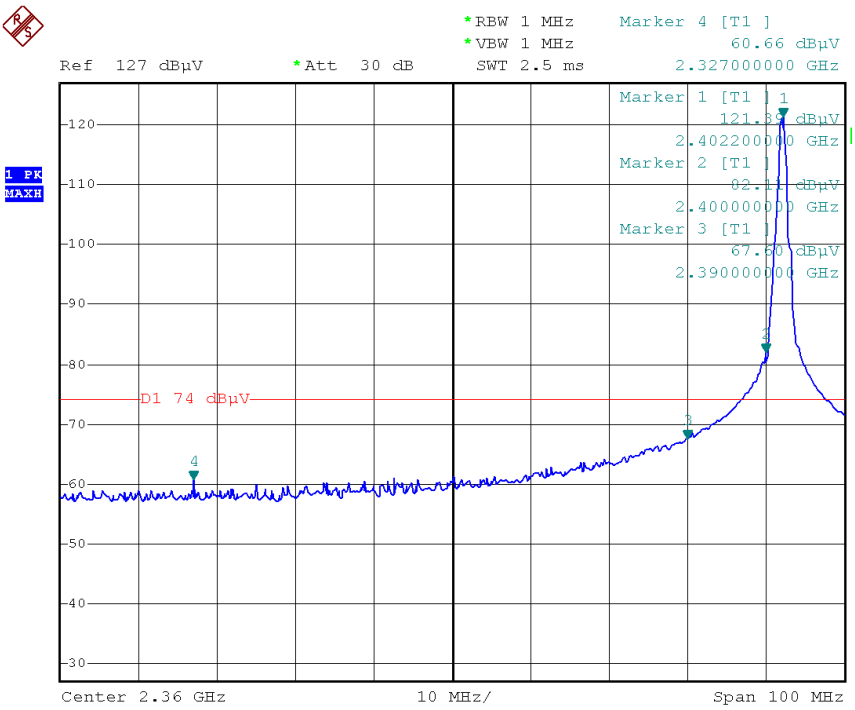
4960.00	AV	Vertical	48.58	54.00	-5.42	1.4	0
7440.00	AV	Vertical	45.01	54.00	-8.99	1.4	170
9920.00	AV	Vertical	47.47	54.00	-6.53	1.7	140
12400.00	AV	Vertical	42.57	54.00	-11.43	1.5	145
14880.00	AV	Vertical	49.12	54.00	-4.88	1.8	110
17360.00	AV	Vertical	43.15	54.00	-10.85	1.2	140
19840.00	AV	Vertical	44.02	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

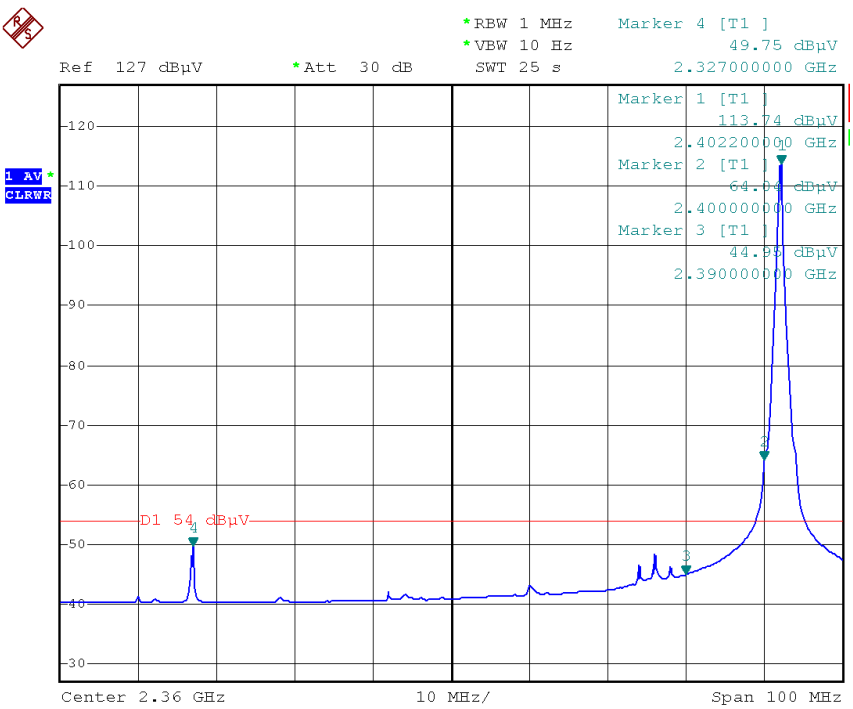
Test Requirement:	Section 15.247(d) In addition, radiated emissions which fall in the restricted bands. as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).
Test Method:	DA 00-705
Measurement Distance:	3m
Limit:	40.0 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 ≥ 1 GHz VBW ≥ RBW; Sweep = auto Detector function = peak Trace = max hold For AVG value: RBW = 1 MHz for f ≥ 1 GHz VBW = 10Hz; Sweep = auto Detector function = AVG Trace = max hold

8.1 Test Result:

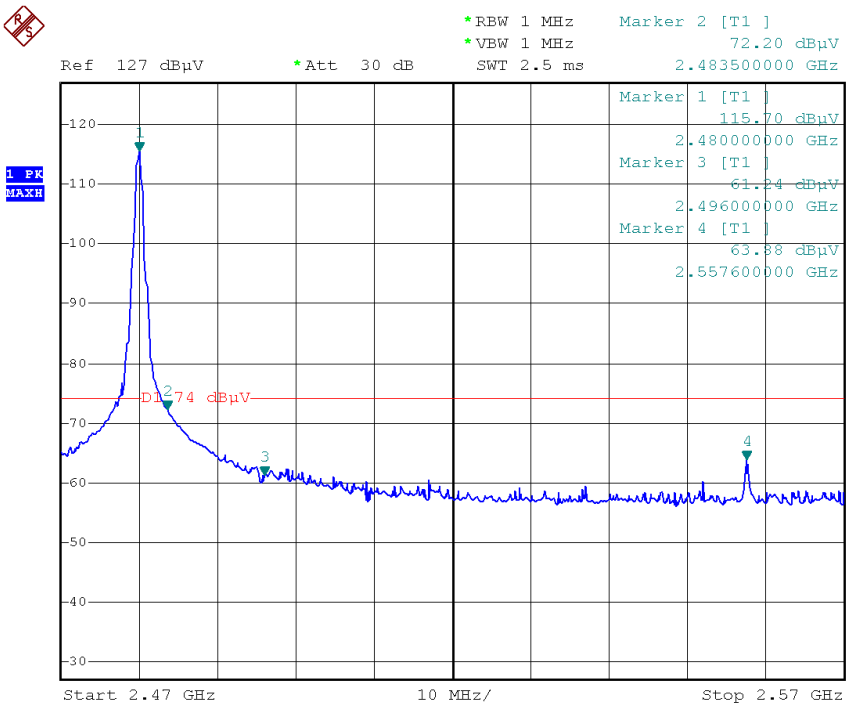
Low Channel – Peak



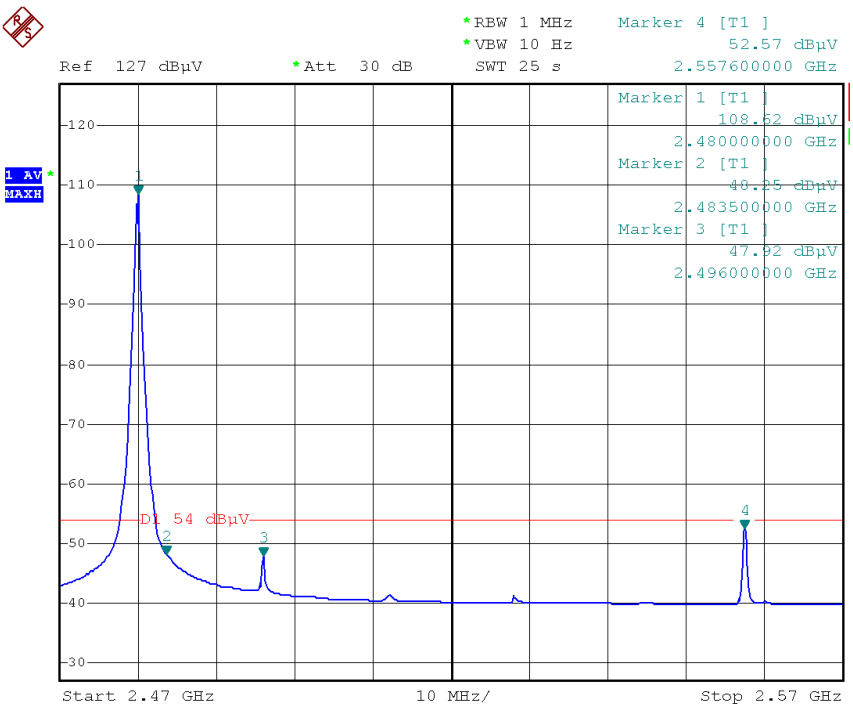
Low Channel – AV



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;

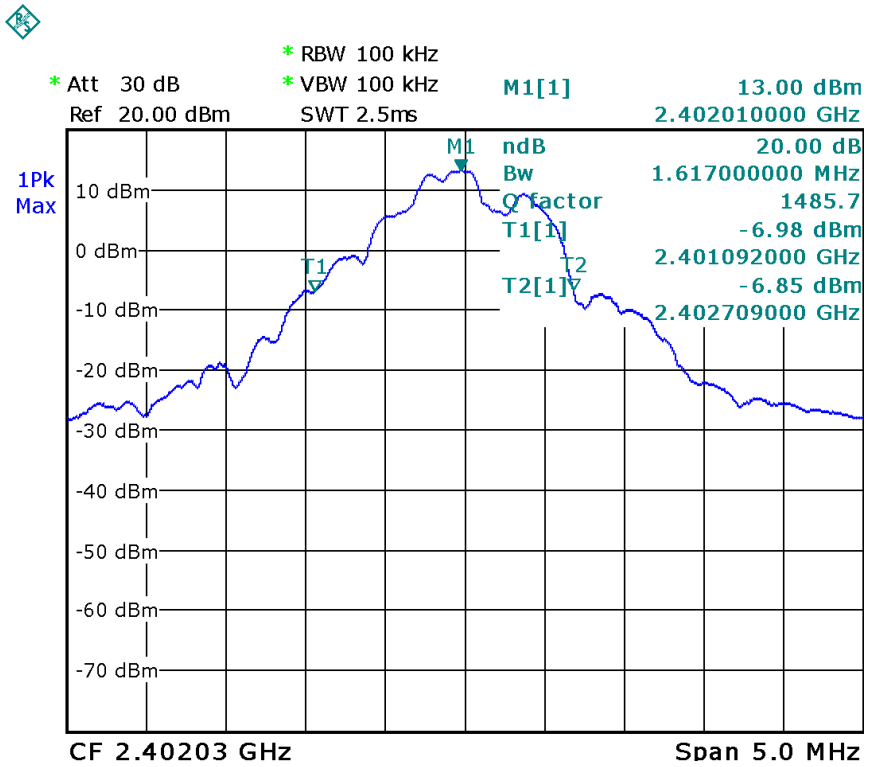
2. Set the spectrum analyzer: RBW = 100kHz, VBW = 100kHz

9.2 Test Result:

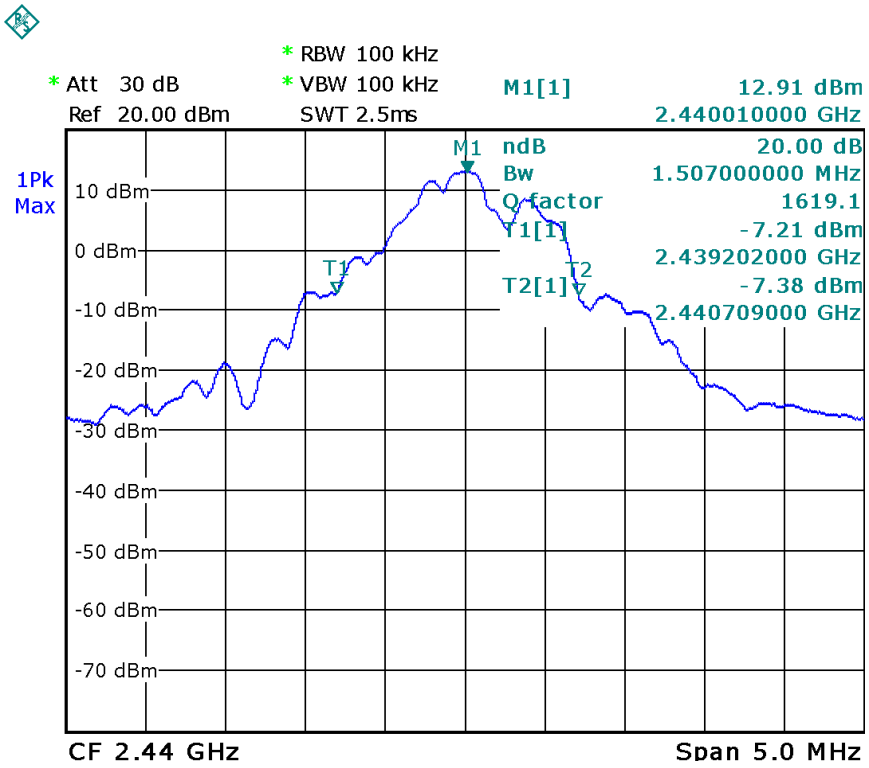
Test Channel	Bandwidth
Low	1.617MHz
Middle	1.507MHz
High	1.527MHz

Test result plot as follows:

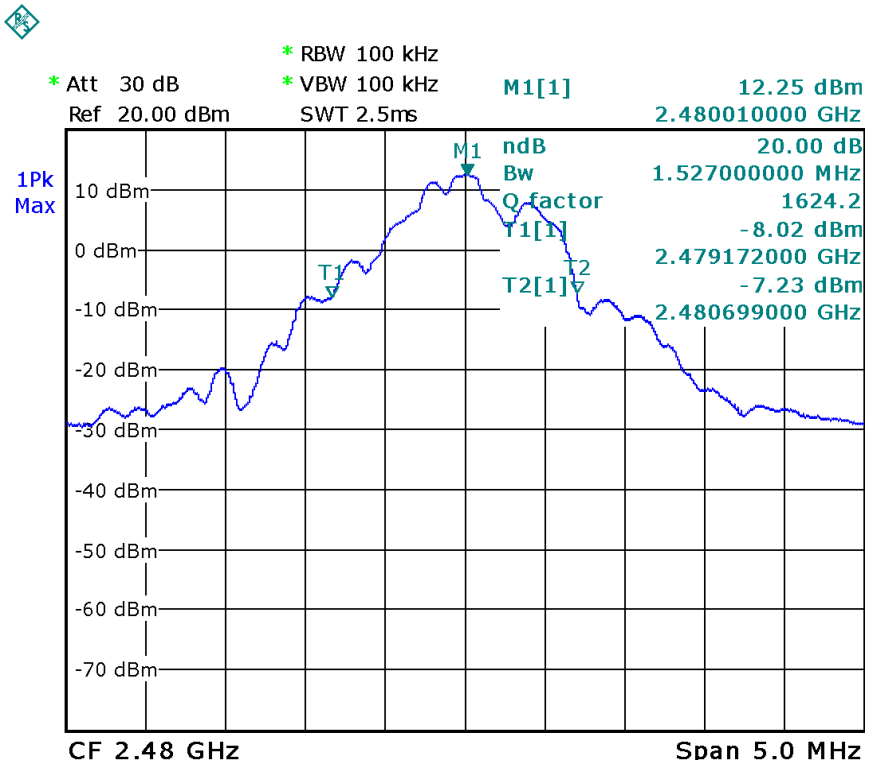
Low Channel



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.

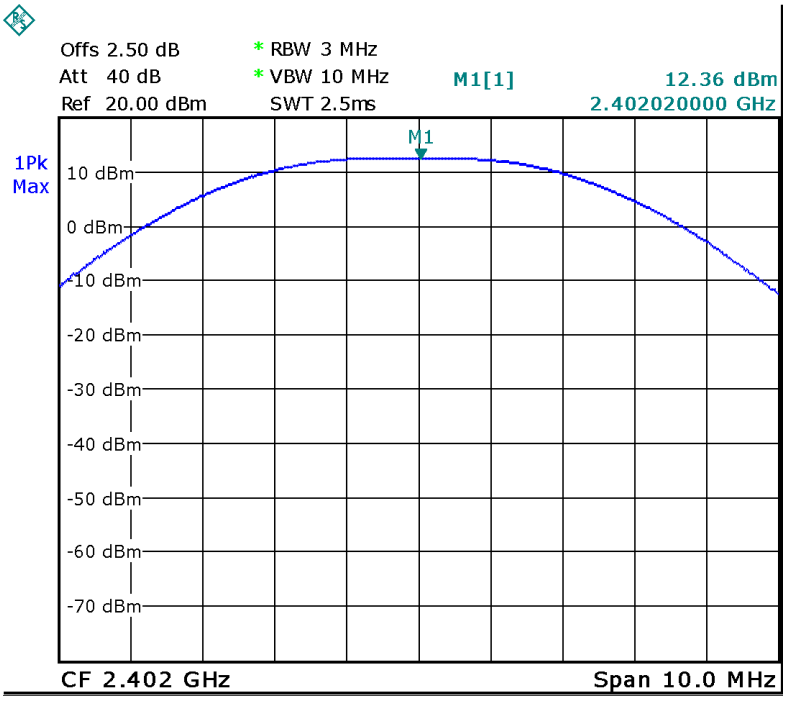
3. Keep the EUT in transmitting at lowest, medium and highest channel individually. Record the max value.

10.2 Test Result:

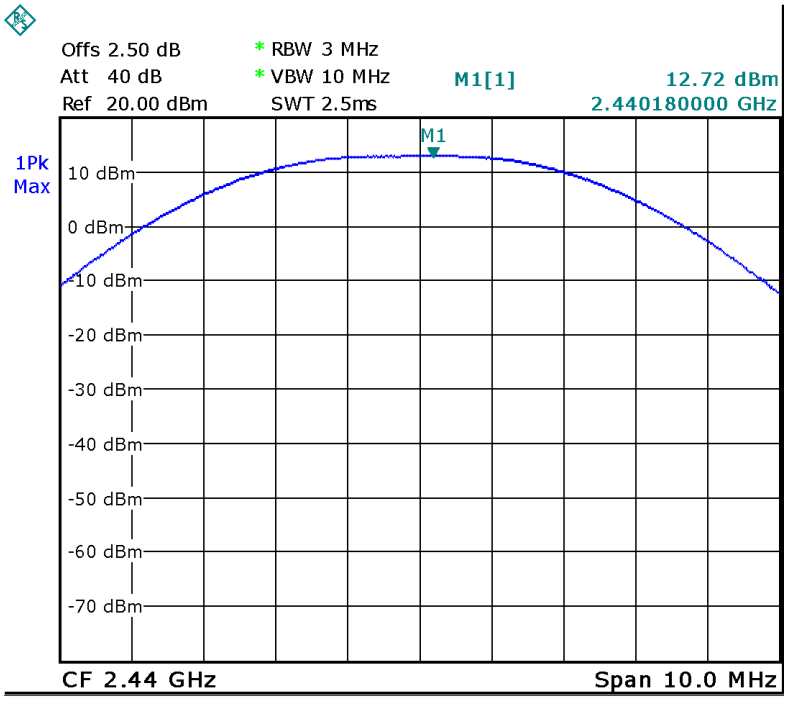
Test Channel	Output Power (dBm)	Limit (dBm)
Low	12.36	20.97
Middle	12.72	20.97
High	12.50	20.97

Test result plot as follows:

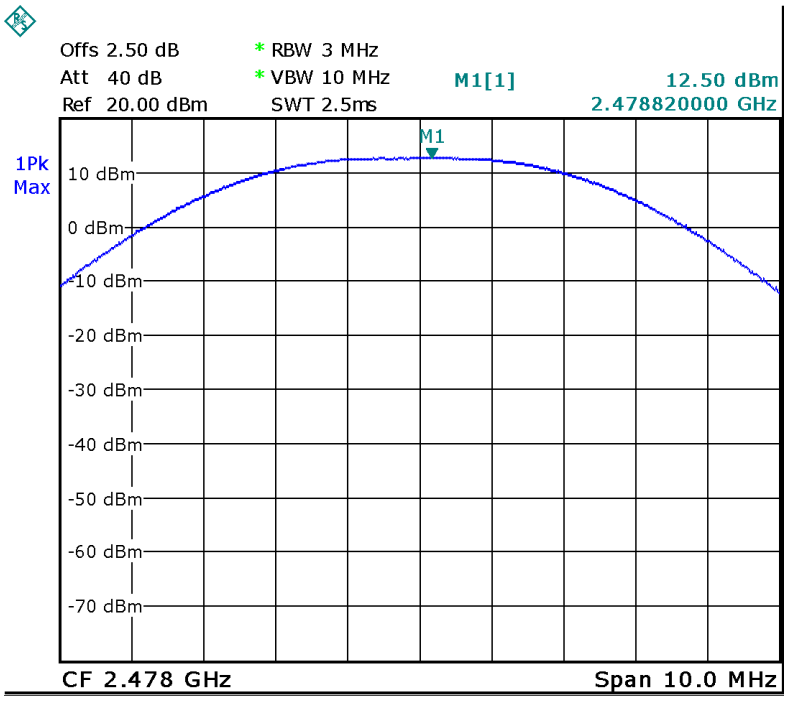
Low Channel



Middle Channel



High Channel



11 Channel Separated

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.

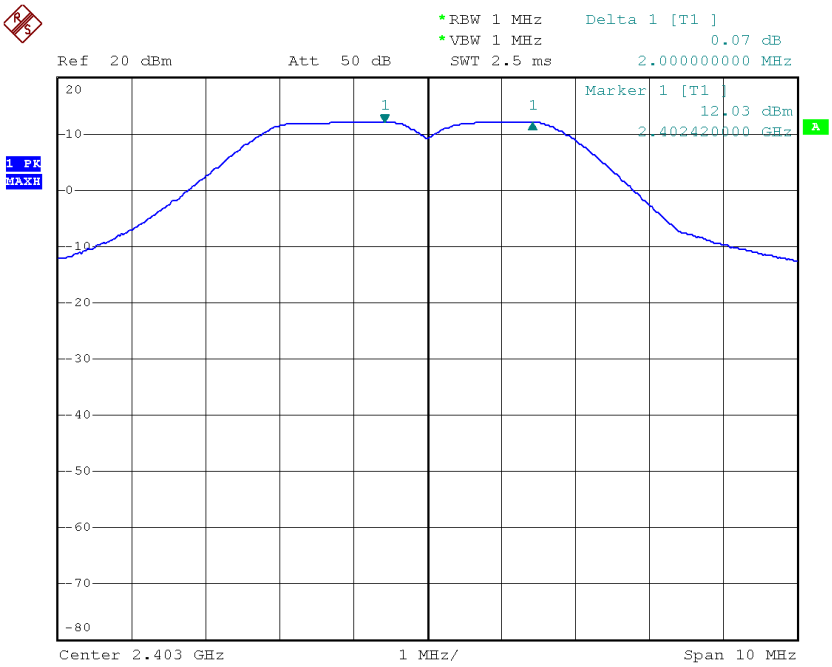
3. Allow the trace to stabilize. Use the marker-delta function to determine the separation between the peaks of the adjacent channels. The limit is specified in one of the subparagraphs of this Section Submit this plot.

11.2 Test Result:

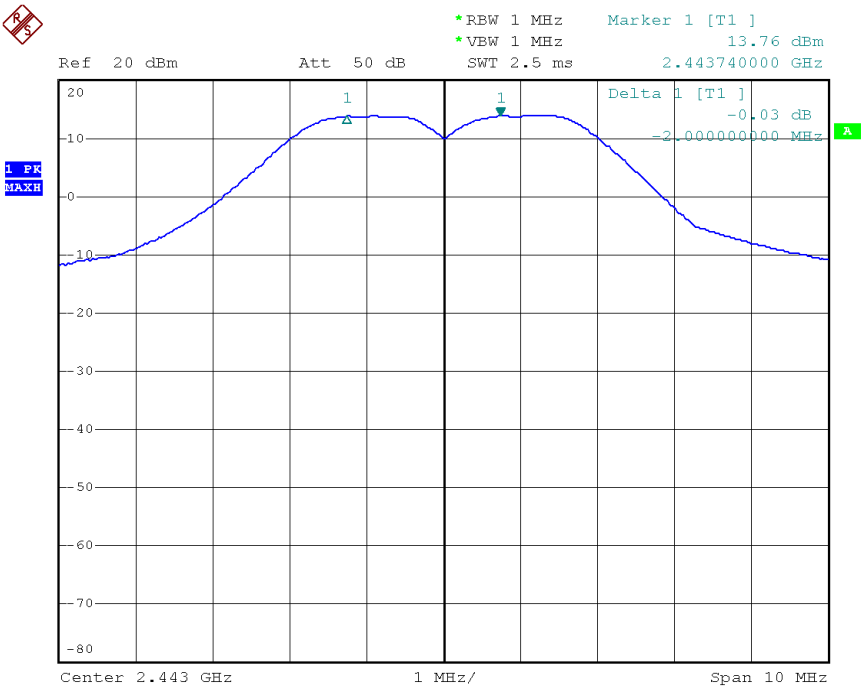
Test Channel	Separation (MHz)	Result
Low	2.000MHz	PASS
Middle	2.000MHz	PASS
High	2.000MHz	PASS

Test result plot as follows:

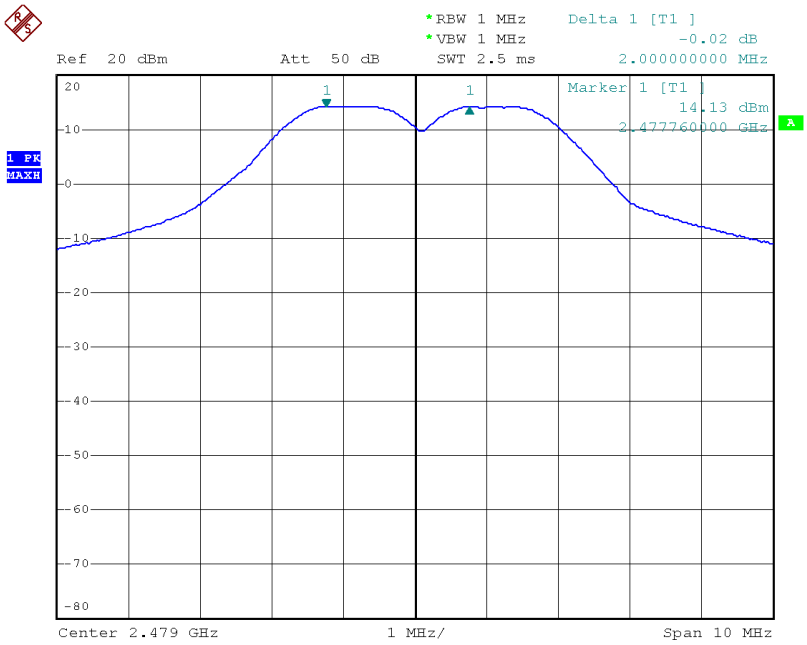
Low Channel



Middle Channel



High Channel



1

12 Hopping Channel number

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.

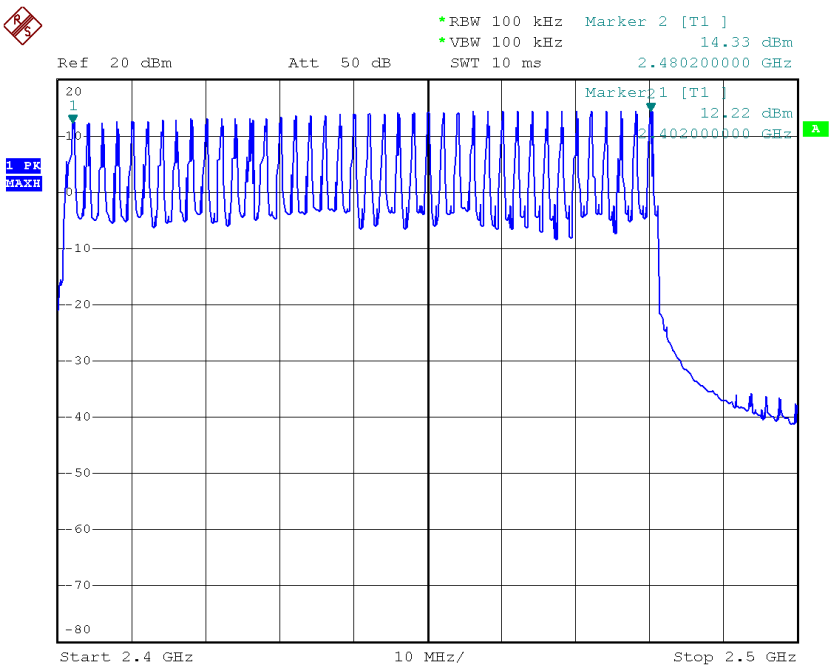
2. Set the spectrum analyzer: RBW = 100 kHz. VBW = 100 kHz. Sweep = auto; Detector Function = Peak. Trace = Max hold.

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

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

So, the Dwell Time can be calculated as follows:

Low channel: slot time=12(times)/1(s)*0.210(ms)*16(s)=0.040(s)

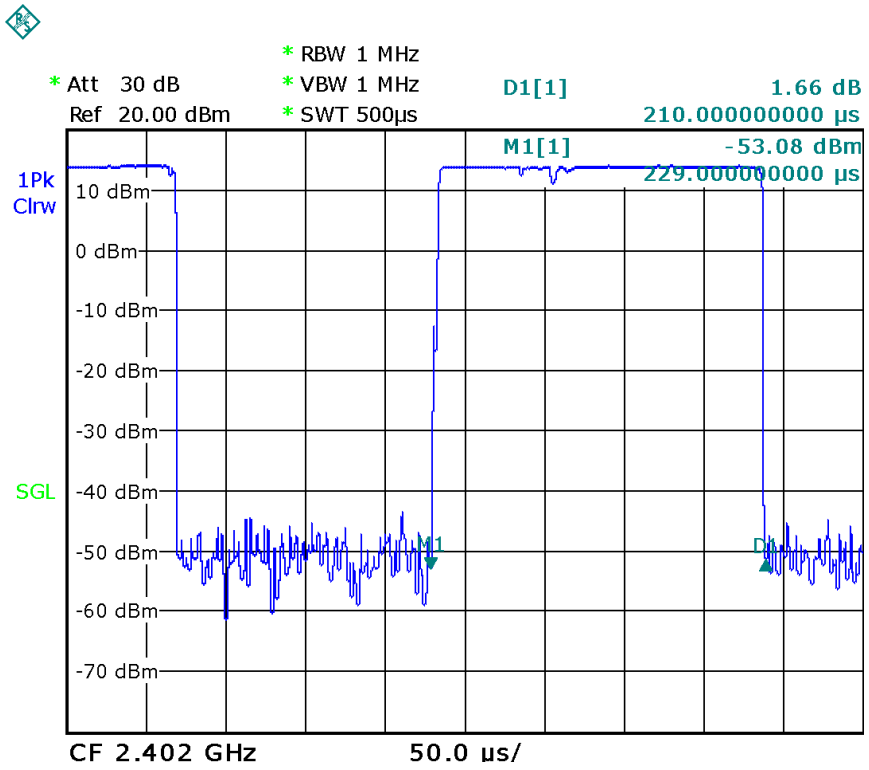
Middle channel: slot time=15(times)/1(s)*0.209(ms)*16(s)=0.050(s)

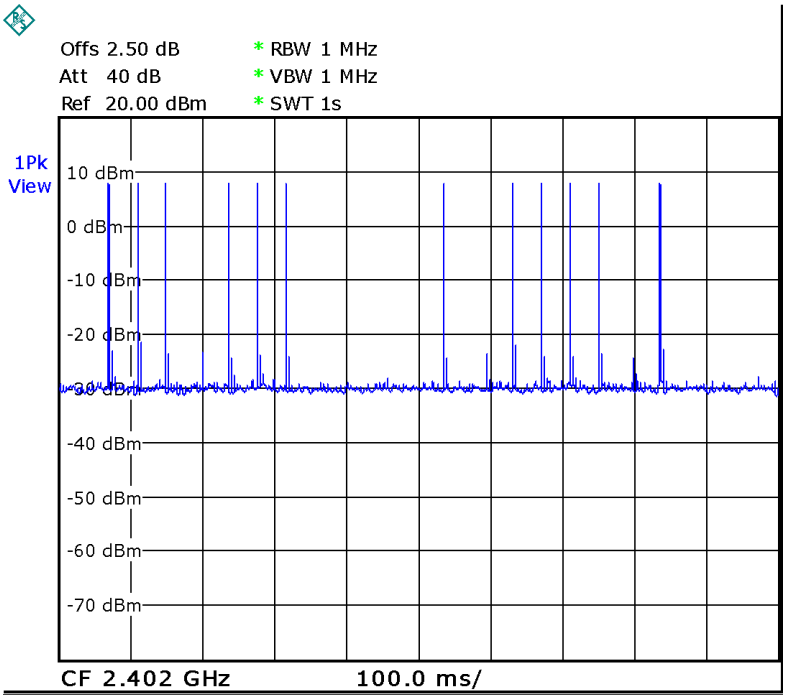
High channel: slot time=15(times)/1(s)*0.212(ms)*16(s)=0.051(s)

Note : Mkr Delta is once pulse time.

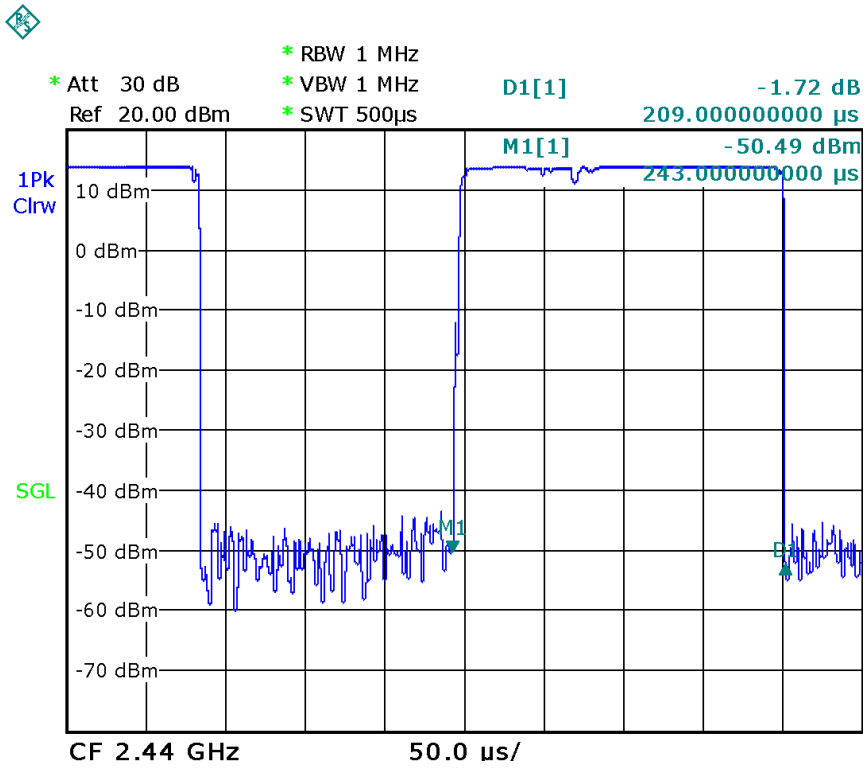
Frequency	Mkr Delta(ms)	Dwell Time(s)	Limits(s)	Result
2402 MHz	0.210	0.040	0.400	Pass
2440 MHz	0.209	0.050	0.400	Pass
2480 MHz	0.212	0.051	0.400	Pass

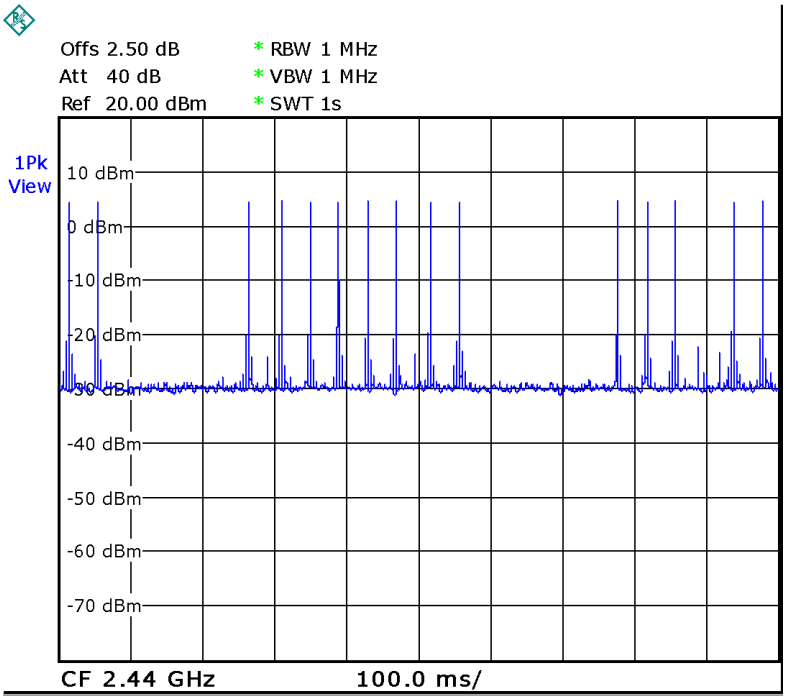
Low Channel


* RBW 1 MHz
* Att 30 dB
* VBW 1 MHz
Ref 20.00 dBm
* SWT 500µs
D1[1] 1.66 dB
210.000000000 µs
M1[1] -53.08 dBm
229.000000000 µs
1Pk
Clrw
SGL
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
M1
D1
CF 2.402 GHz
50.0 µs/

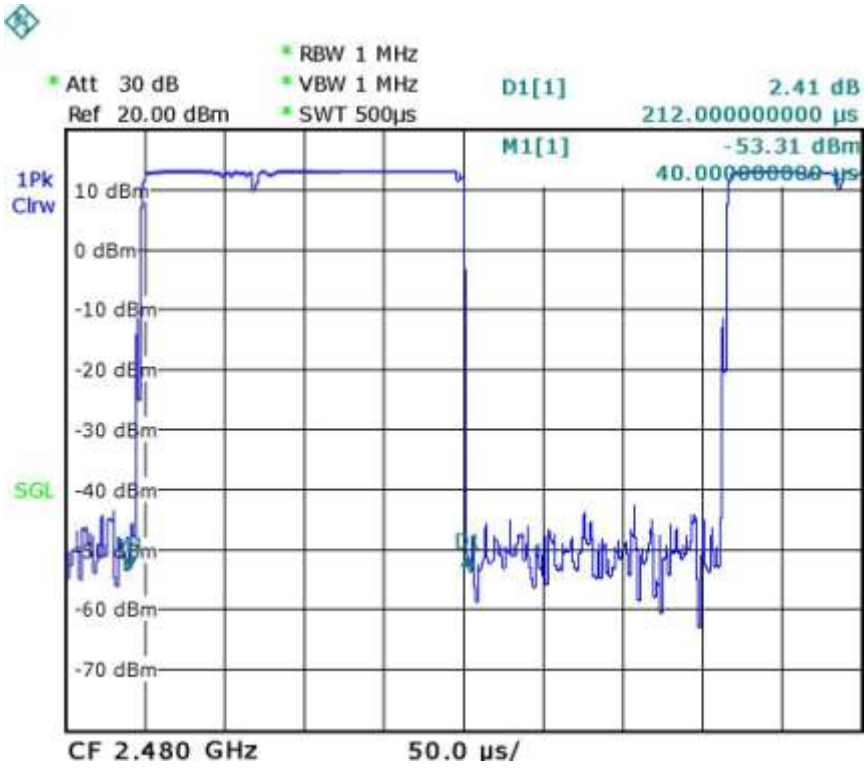

Offs 2.50 dB
* RBW 1 MHz
Att 40 dB
* VBW 1 MHz
Ref 20.00 dBm
* SWT 1s
1Pk
View
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
CF 2.402 GHz
100.0 ms/

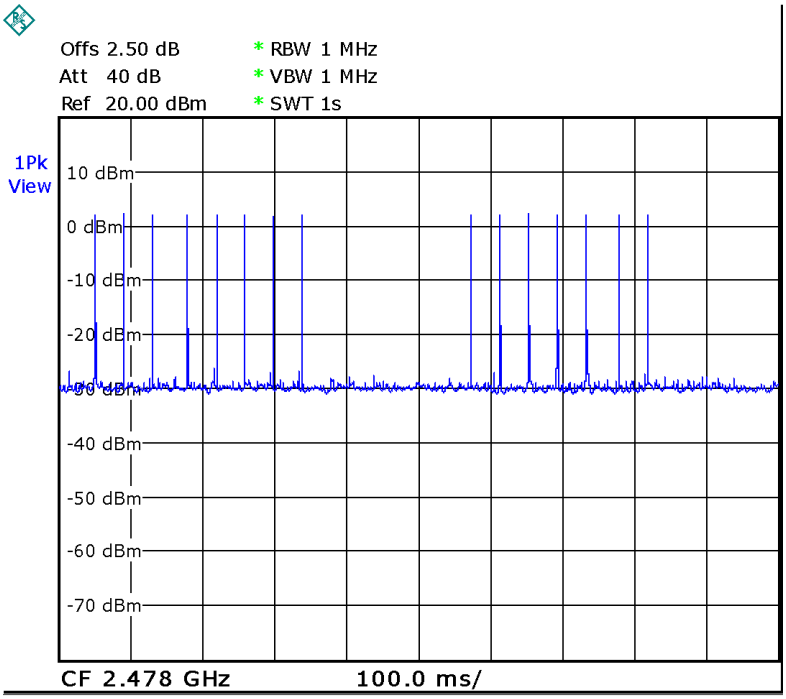
Middle Channel





High Channel





14 Antenna Requirement

According to the FCC Part 15 Paragraph 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. This product has a 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 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.

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

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

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

dBm=10lgmW

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

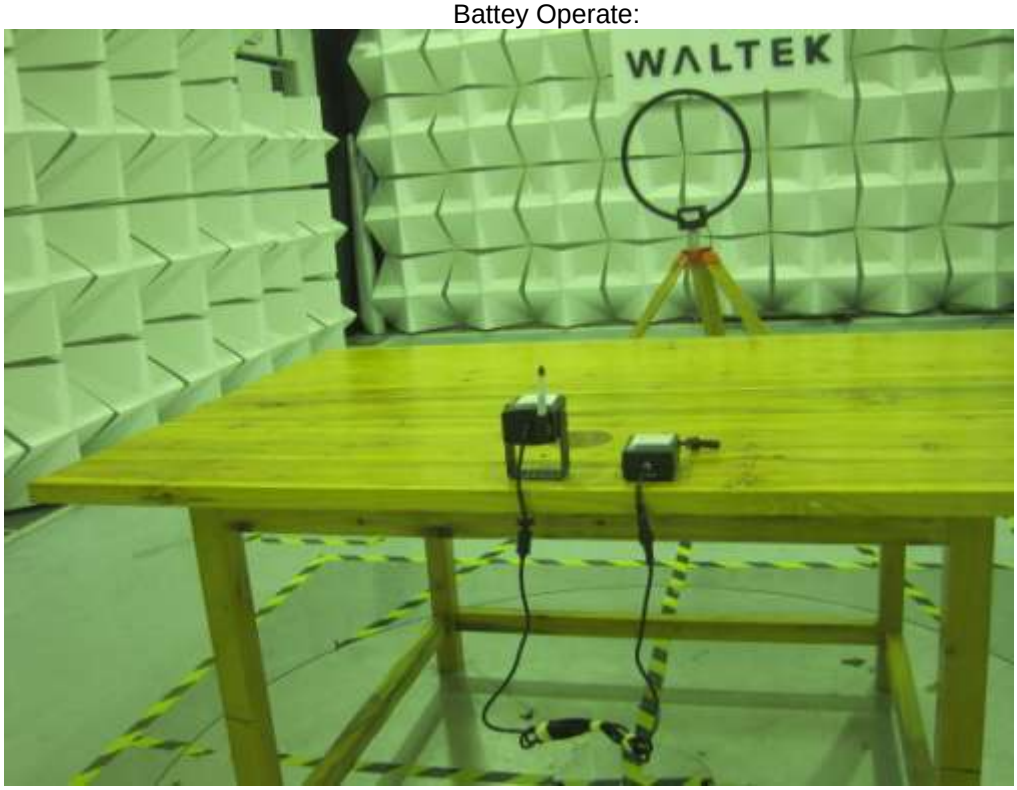
Peak Output Power (mW)	Antenna Gain (numeric)	Power Density (S) (mW/cm2)	Limit of Power Density (S) (mW/cm2)
18.71	1.995	0.007	1

16 Photographs – Test Setup

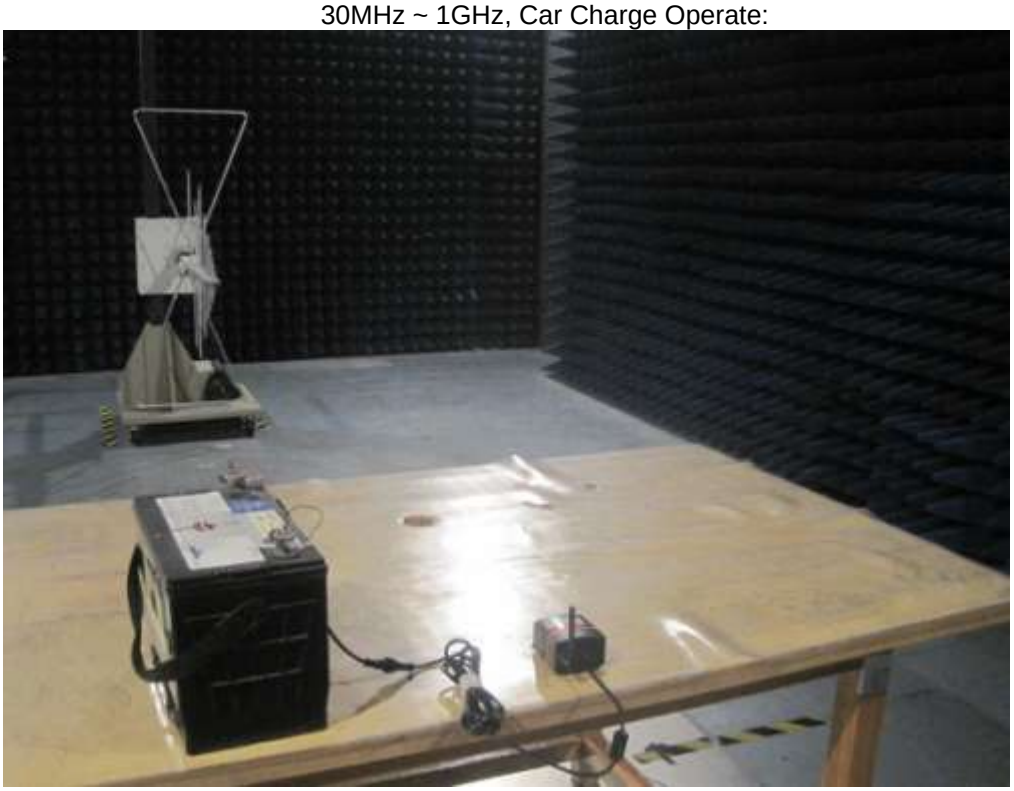
16.1 Photograph –Radiated Emissions Test Setup

Below 30MHz, Car Charge Operate:

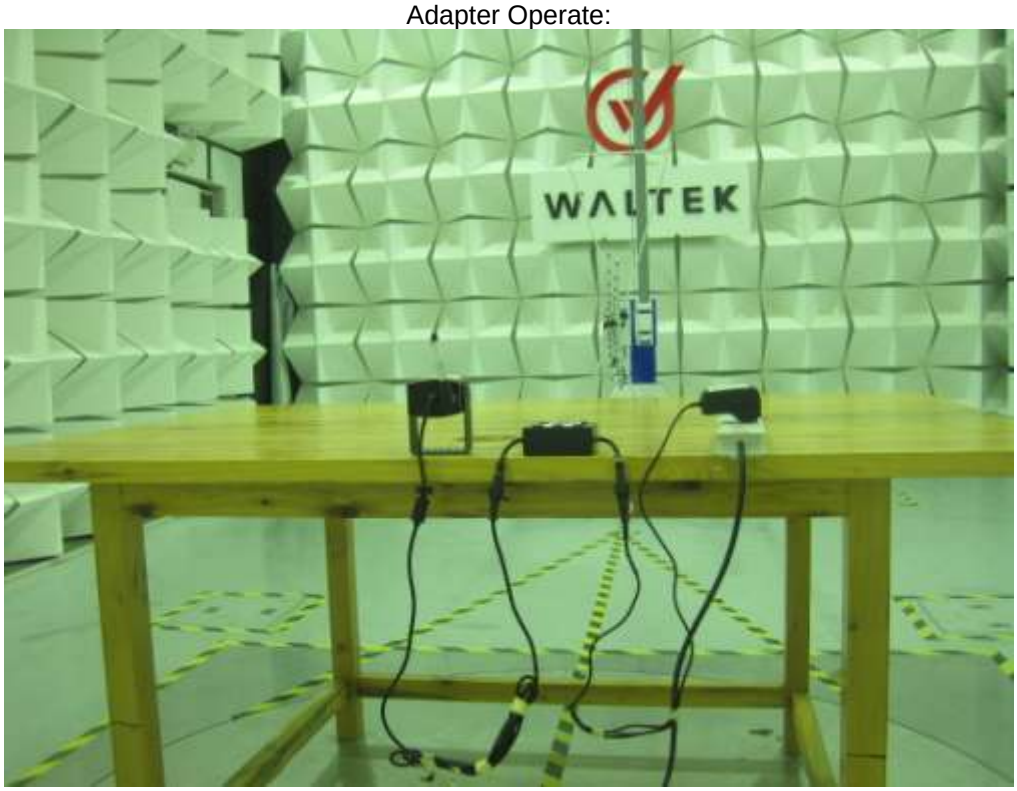
Battey Operate:



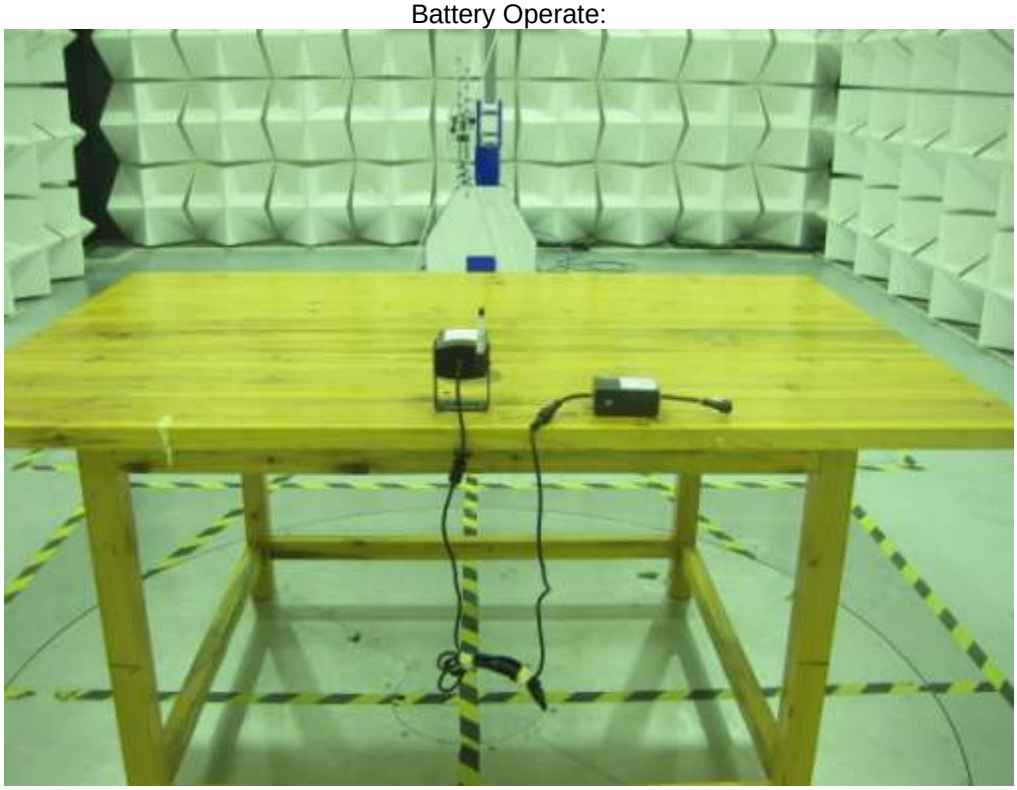
30MHz ~ 1GHz, Car Charge Operate:



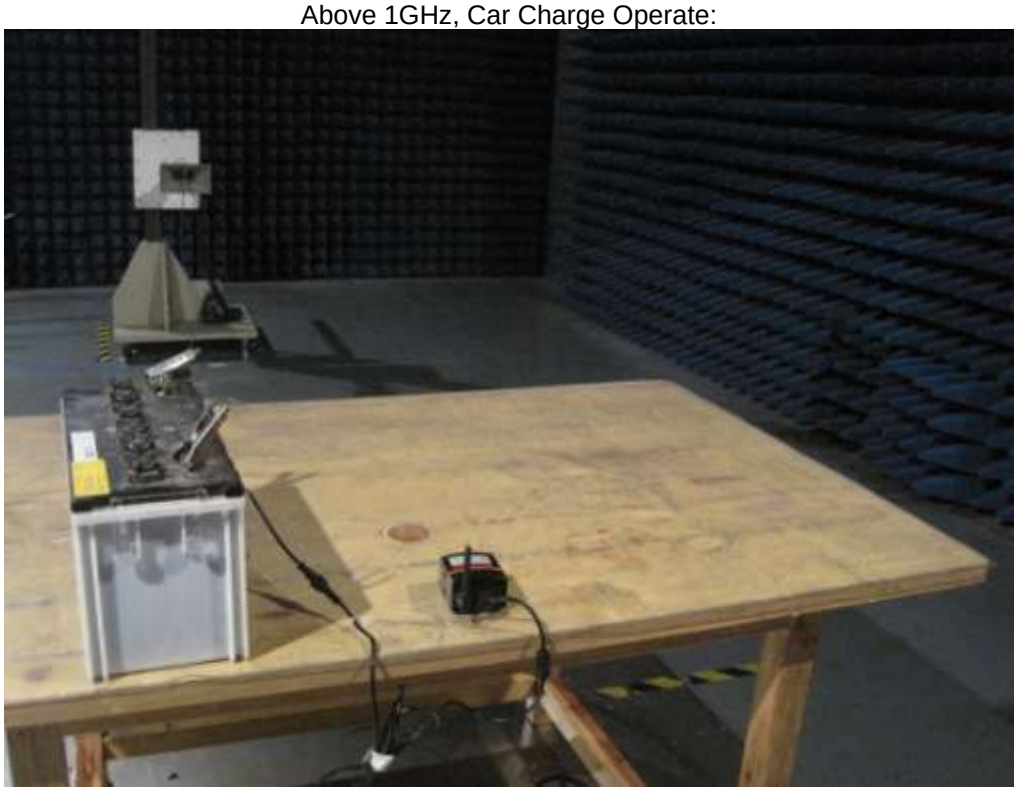
Adapter Operate:



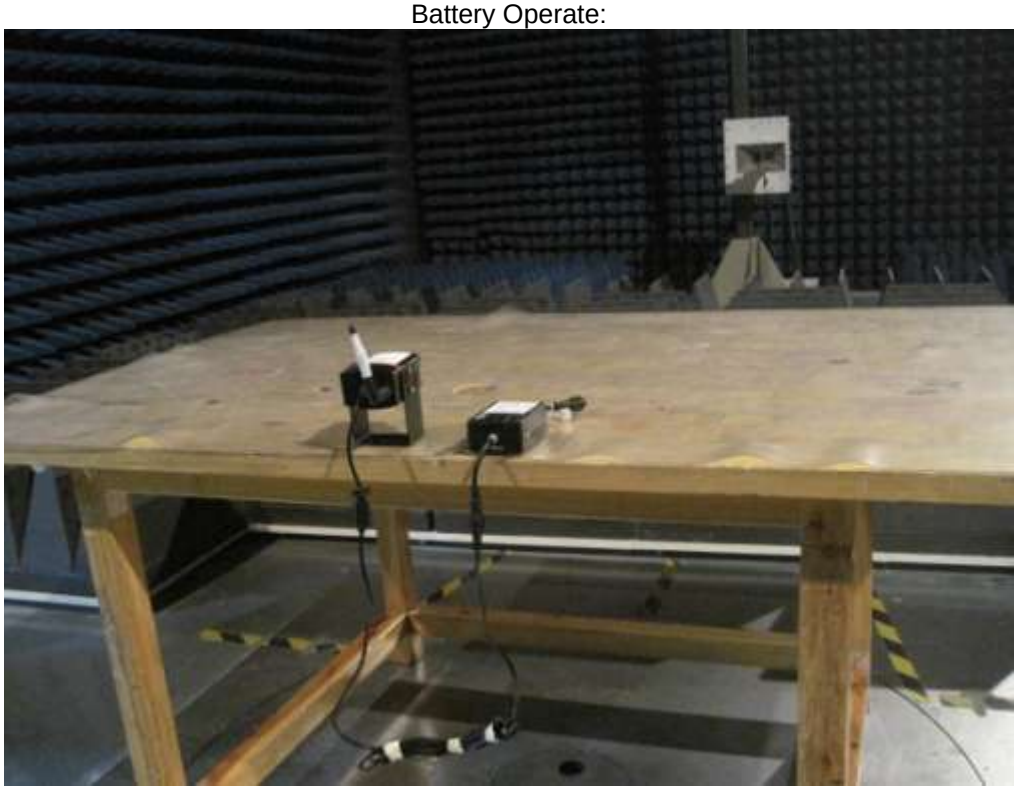
Battery Operate:



Above 1GHz, Car Charge Operate:



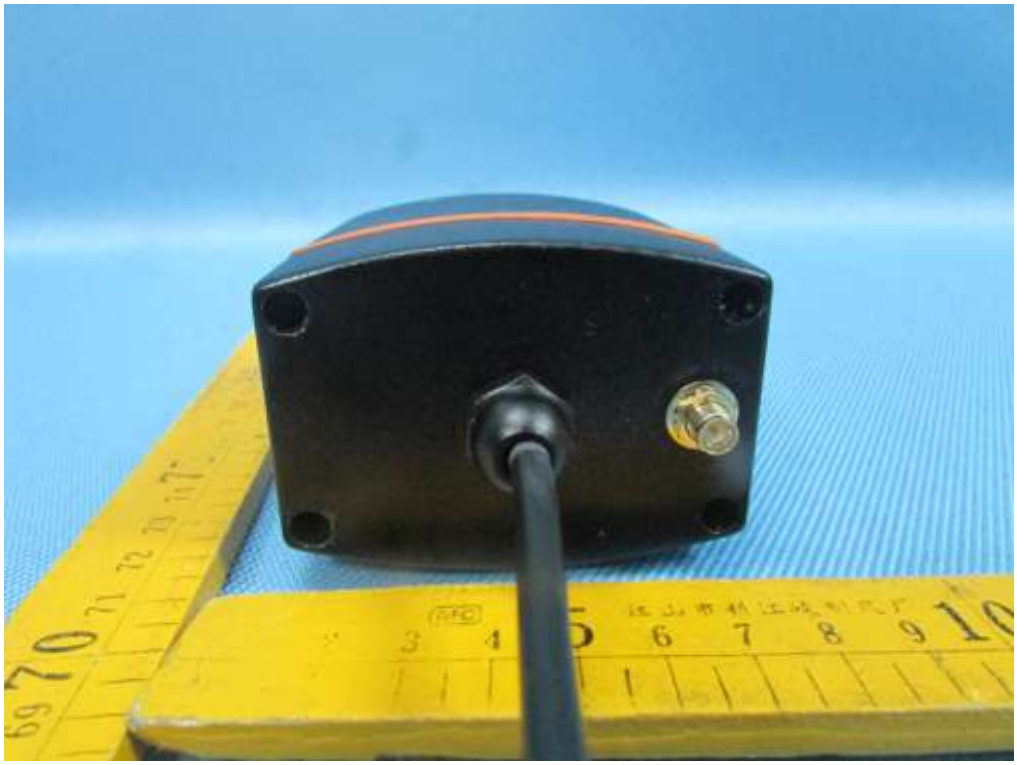
Battery Operate:



16.2 Photographs - Conduction Emission at Mains Terminal Test Setup

17 Photographs - Constructional Details

17.1 EUT –Appearance View

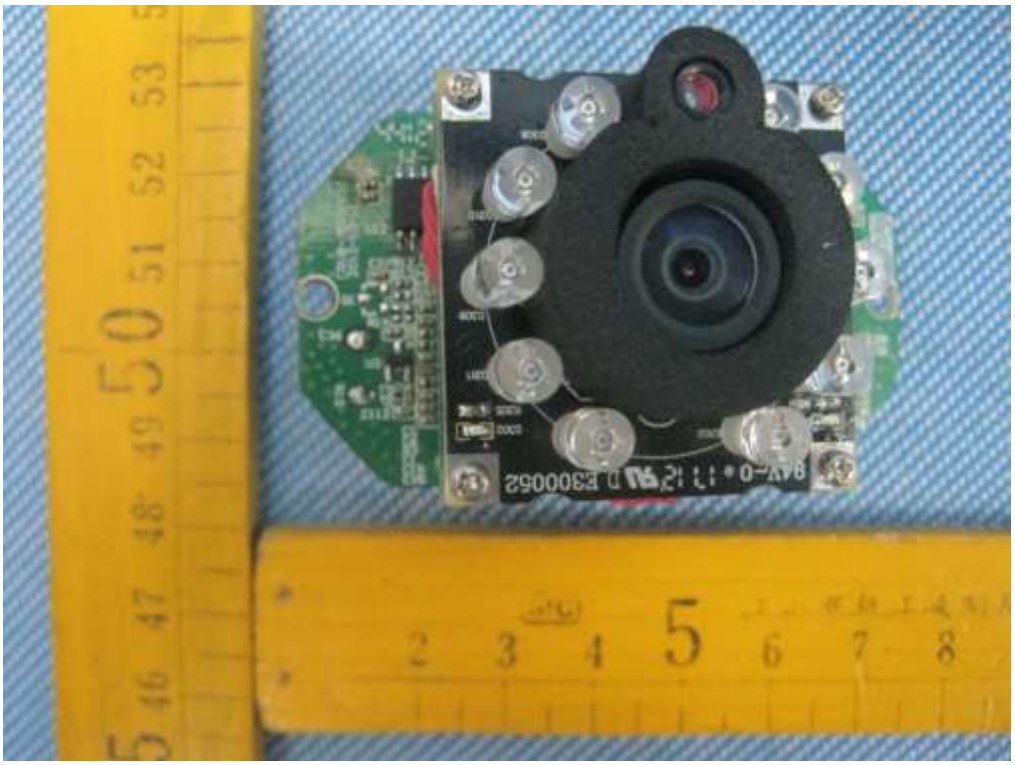


17.2 Antenna –View

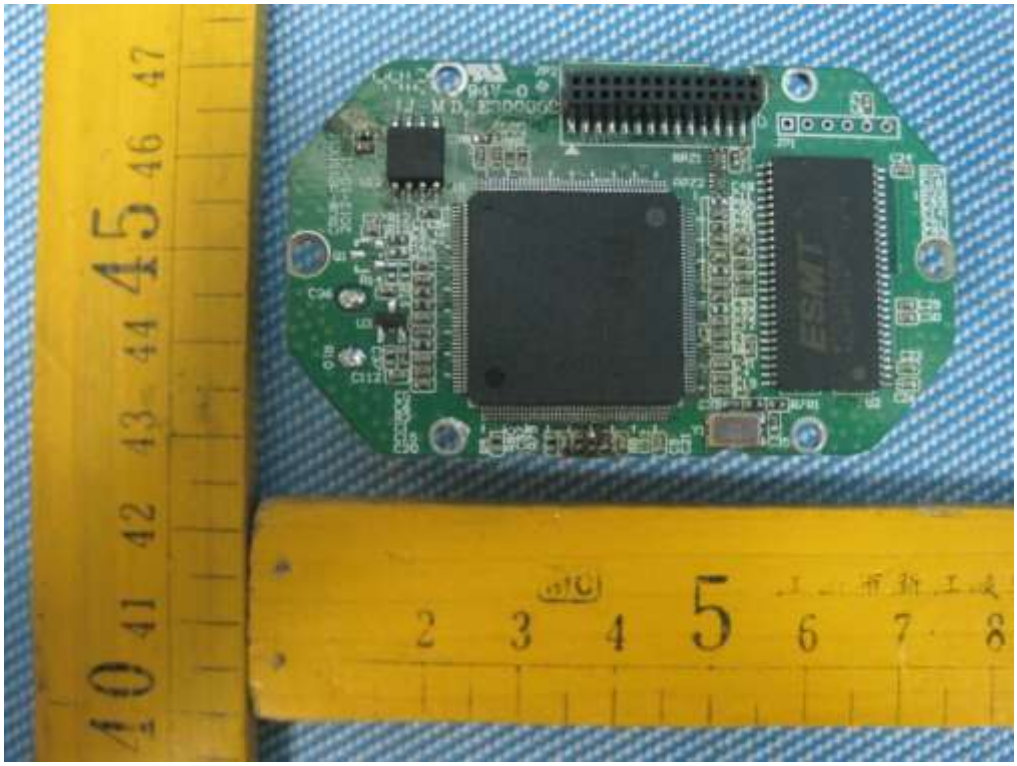
Type 1

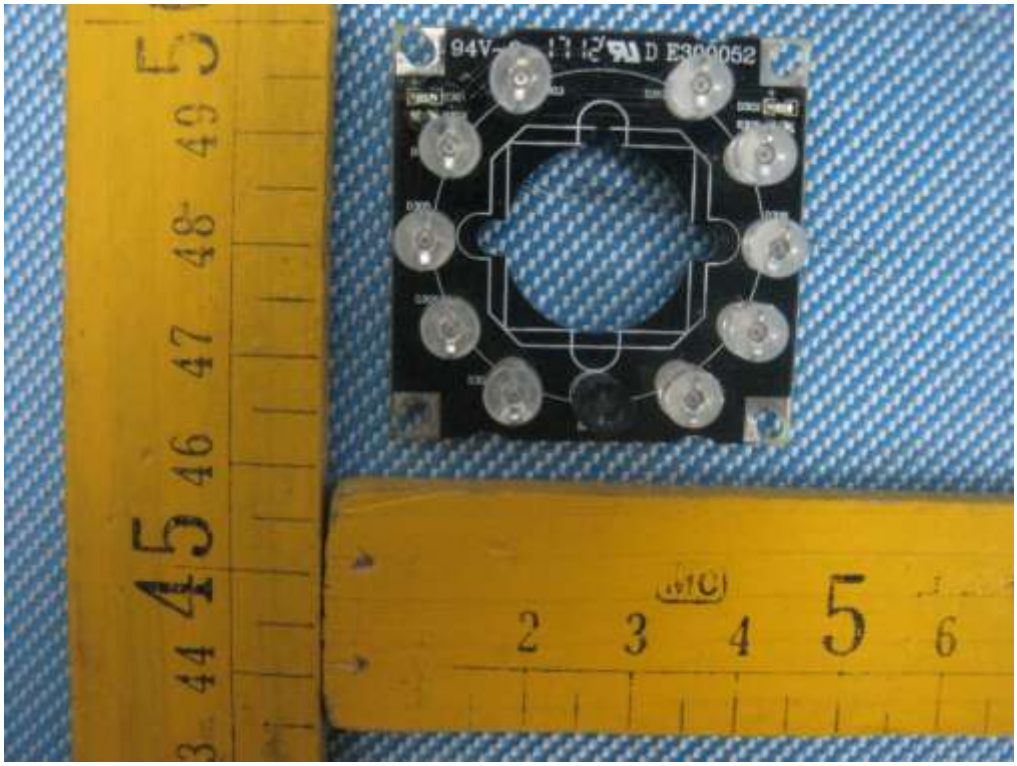
Type 2

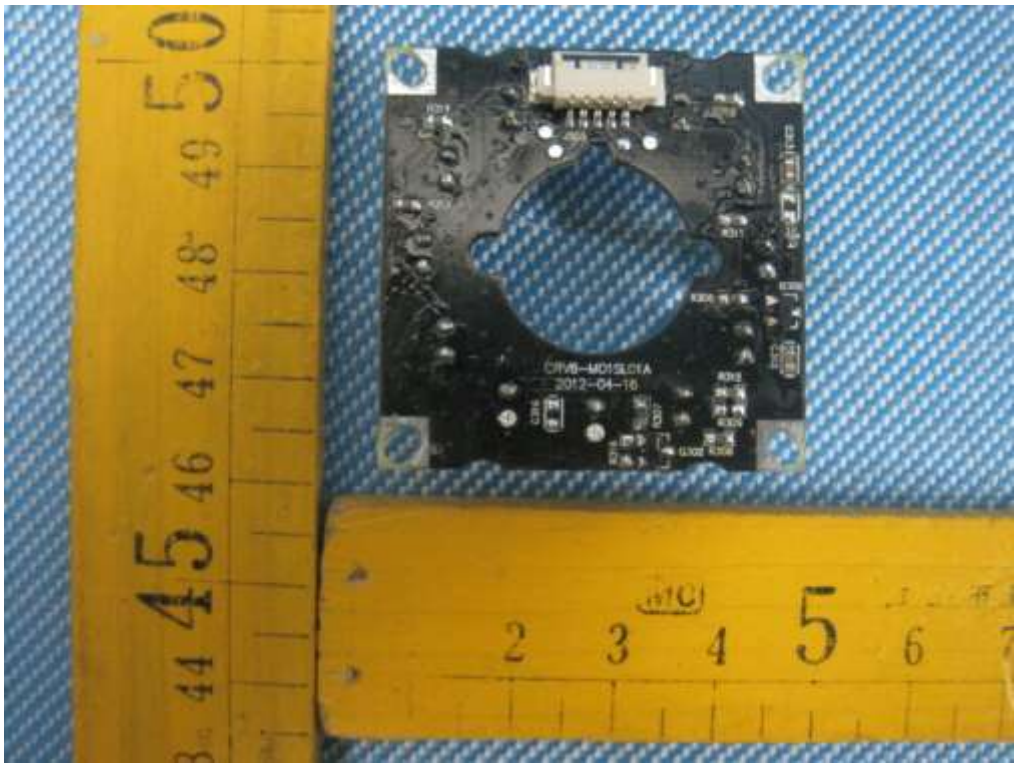
17.3 EUT – Open View

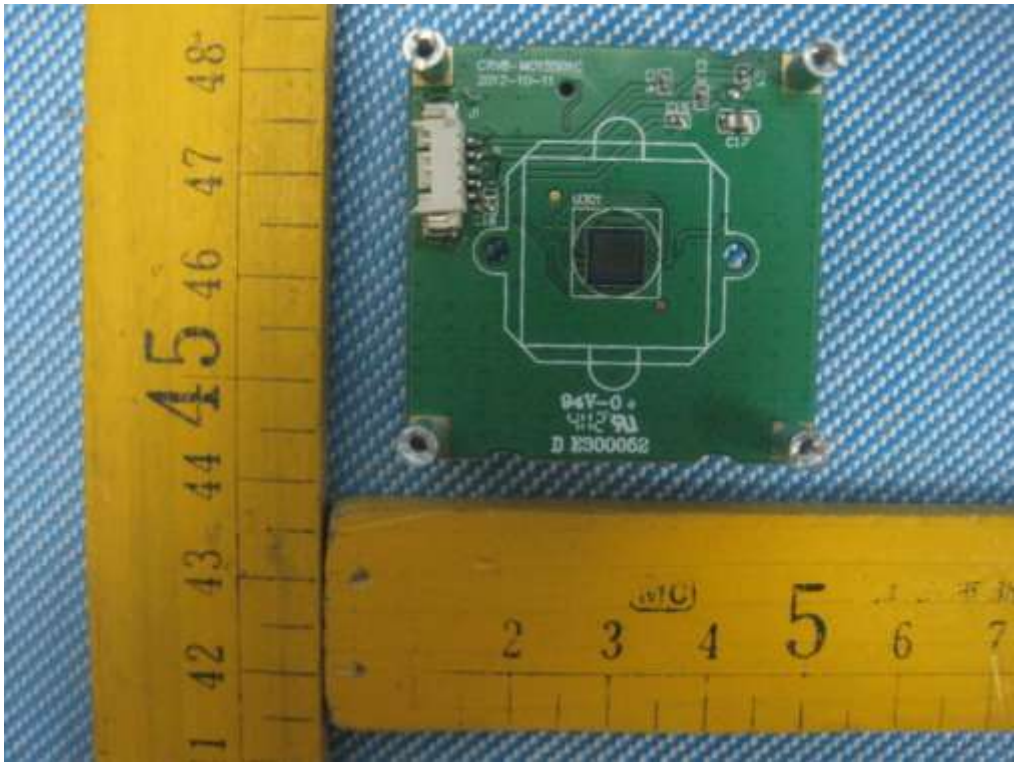


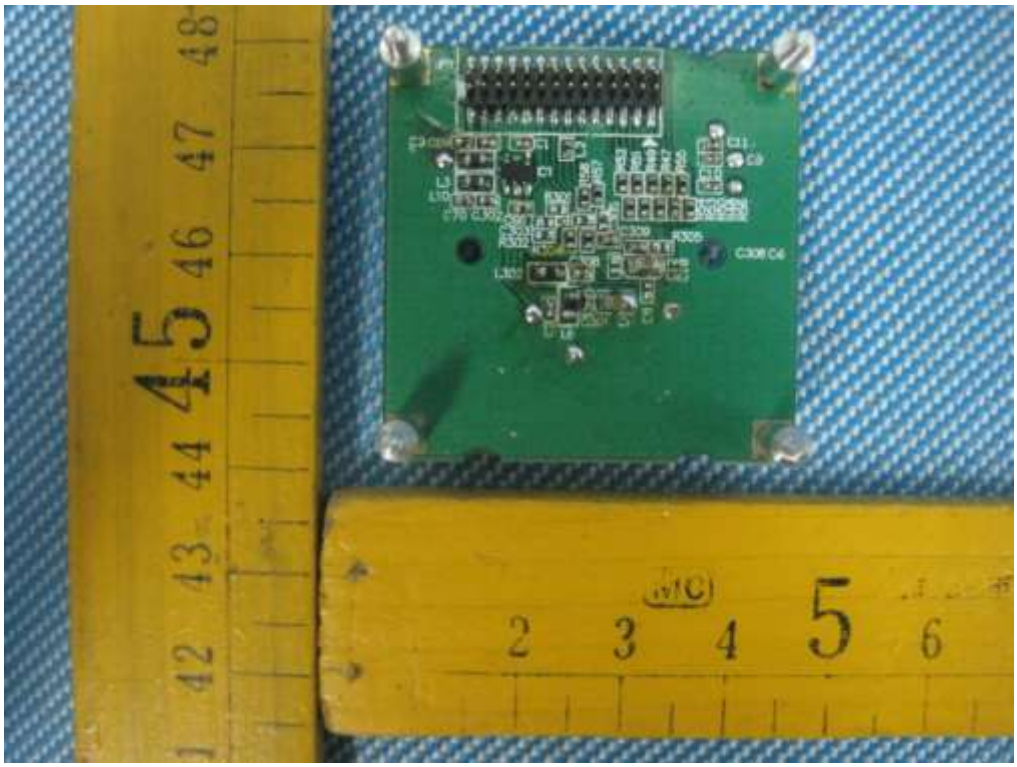
17.4 EUT – PCB View



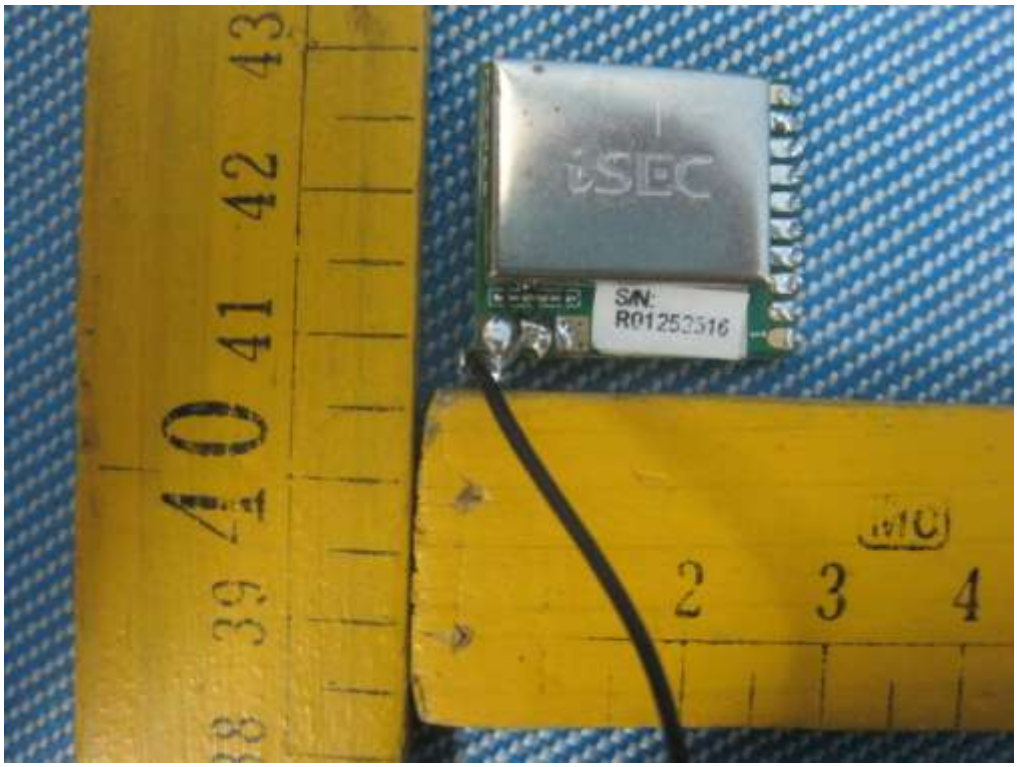


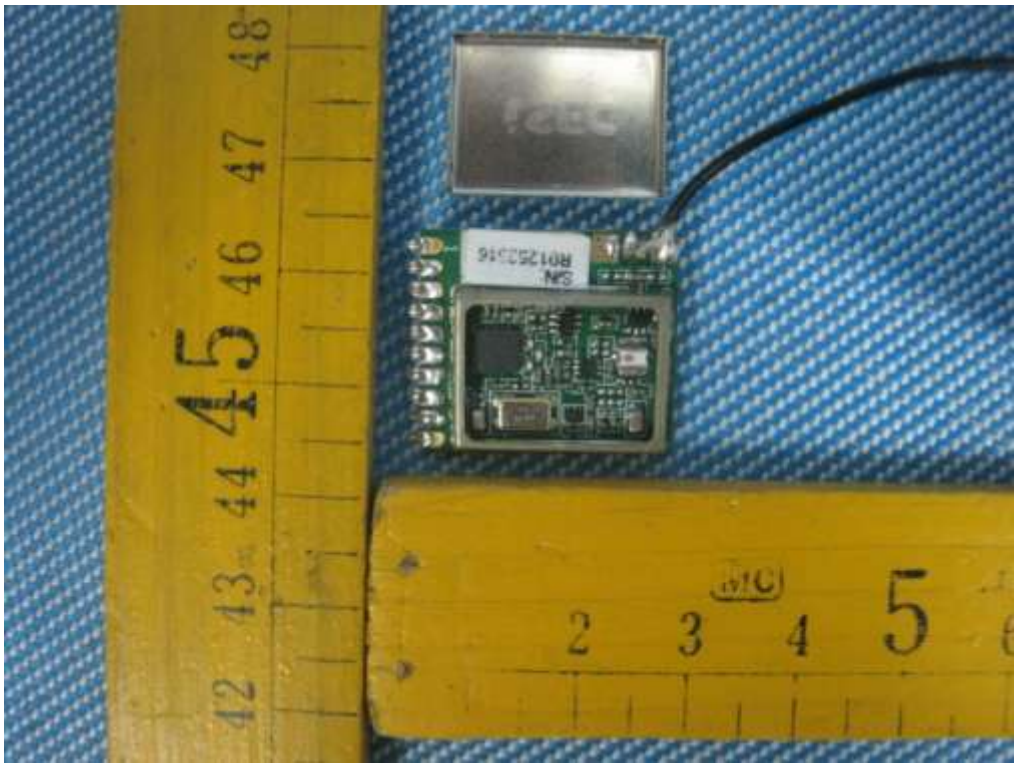


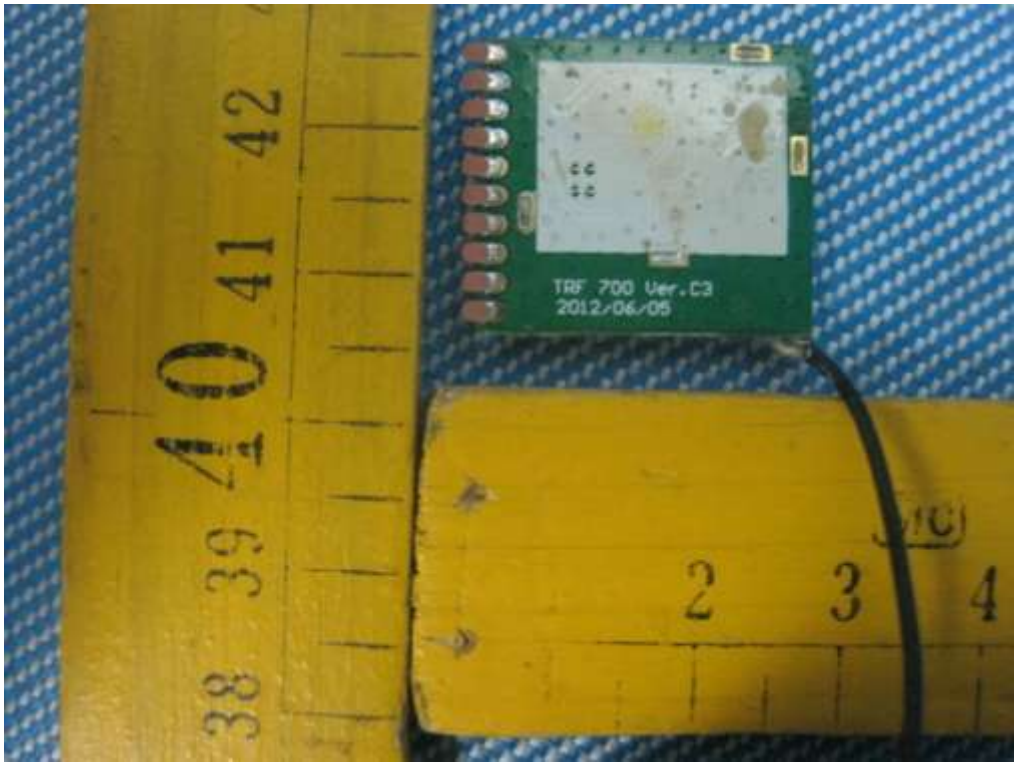




17.5 RF –Module View







17.6 Battery –Appearance View

17.7 Adapter –Appearance View


PUSH
AC/DC ADAPTER
MODEL JY-120-100
INPUT 100-240V~50/60Hz 0.4A
OUTPUT 12V 1000mA
Made in China

18 FCC Label

FCC ID: QKC2005

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.

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=