FCC TEST REPORT

FCC ID	: ZWUM501-7
Applicant	: Everbest Co., Ltd.
Address	: Unit 704, 7/FL., Vanta Industrial Centre, 21-33 Tai Lin Pai Road, Kwai Chung, New Territories, Hong Kong

Equipment Under Test (EUT) :

Product Name	: Mobile Internet Device
Model No.	: M501-7, MXXX, SX-SP700A, SX-M728

Standards	: FCC CFR47 Part 15 Section 15.247:2009
Date of Test	: August 16, 2011 ~ August 20, 2011
Date of Issue	: August 23, 2011
Test Engineer	: Hunk yan
Reviewed By	: Philo zhong

Test Result	**: PASS**

Prepared By:
Waltek Services (Shenzhen) Co., Ltd.
1/F, Fukangtai Building, West Baima Rd., Songgang Street, Baoan District,
Shenzhen 518105, China

Tel :+86-755-27553488
Fax:+86-755-27553868

✧ The sample detailed above has been tested to the requirements of Council Directives ANSI C63.4:2003. The test results have been reviewed against the Directives above and found to meet their essential requirements.

2 Test Summary

FCC Part 15 Requirements		
Test Items	**Test Requirement**	**Result**
Radiated Spurious Emissions (9kHz to 25GHz)	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 Separation	15.247(a)(1)	PASS
Number of Hopping Frequency	15.247(a)(1)(iii)	PASS
Dwell time	15.247(a)(1)(iii)	PASS
Maximum Permissible Exposure (Exposure of Humans to RF Fields)	1.1307(b)(1)	PASS

3 Contents

1 COVER PAGE 1

2 TEST SUMMARY 2

3 CONTENTS 3

4 GENERAL INFORMATION 4

4.1 GENERAL DESCRIPTION OF E.U.T. 4
4.2 DETAILS OF E.U.T. 4
4.3 DESCRIPTION OF SUPPORT UNITS 4
4.4 STANDARDS APPLICABLE FOR TESTING 4
4.5 TEST FACILITY 5
4.6 TEST LOCATION 5

5 EQUIPMENT USED DURING TEST 6

6 CONDUCTED EMISSION 8

7 RADIATED SPURIOUS EMISSIONS 13

8 RADIATED EMISSIONS WHICH FALL IN THE RESTRICTED BANDS 25

9 20 DB BANDWIDTH MEASUREMENT 26

10 MAXIMUM PEAK OUTPUT POWER 28

11 HOPPING CHANNEL SEPARATION 29

12 NUMBER OF HOPPING FREQUENCY 32

13 DWELL TIME 33

14 ANTENNA REQUIREMENT 40

15 RF EXPOSURE 40

16 PHOTOGRAPHS - CONSTRUCTIONAL DETAILS 42

16.1 PRODUCT VIEW 42
16.2 EUT - FRONT VIEW 42
16.3 EUT - BACK VIEW 43
16.4 EUT - OPEN VIEW 43
16.5 PCB - FRONT VIEW 44
16.6 PCB - BACK VIEW 44
16.7 ADAPTER - FRONT VIEW 45
16.8 ADAPTER - BACK VIEW 45
16.9 PCB OF ADAPTER - FRONT VIEW 46
16.10 PCB OF ADAPTER - BACK VIEW 46

17 FCC LABEL 47

4 General Information

Applicant : Everbest Co., Ltd.

Address of Applicant : Unit 704, 7/FL., Vanta Industrial Centre, 21-33 Tai Lin Pai Road, Kwai Chung, New Territories, Hong Kong

Manufacturer : YONGGUAN ELECTRONIC TECHNOLOGY(D.G) LTD.

Address of Manufacturer : No.1, 2nd Industrial Zone, Xinfeng Rd., Mowu Village, Wanjiang District, Dong Guan City, Guang Dong, China

4.1 General Description of E.U.T.

Product Name : Mobile Internet Device

Model No. : M501-7, MXXX, SX-SP700A, SX-M728

Difference Description : All the models are exactly the same excepte different model names

4.2 Details of E.U.T.

Technical Data : Adapter Input: 100 ~ 240VAC, 50/60Hz, 0.4A Max
Adapter Output: 5VDC, 2A
Internal Battery: 3.7V

Operation Frequency : 2402MHz ~ 2480MHz

Antenna Gain : 0dBi

4.3 Description of Support Units

The EUT has been tested as an independent unit.

4.4 Standards Applicable for Testing

The customer requested FCC tests for a Mobile Internet Device. The standards used were FCC CFR47 Part 15 Section 15.247, Section 15.209, and Section 15.207.

4.5 Test Facility

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

- **IC – Registration No.: IC7760A**
  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, August 3, 2010.

- **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.

4.6 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

Equipment Name	Manufacturer Model	Equipment No	Internal No	Specification	Cal. Date	Due Date	Cert. No	Uncertainty
EMC Analyzer	Agilent/ E7405A	MY45114943	W2008001	9k-26.5GHz	Aug. 2, 2011	Aug. 1, 2012	Wws20081596	±1dB
Trilog Broadband Antenne	SCHWARZBECK MESS-ELEKTROM / VULB9163	336	W2008002	30-3000 MHz	Aug. 2, 2011	Aug. 1, 2012	-	±1dB
Broad-band Horn Antenna	SCHWARZBECK MESS-ELEKTROM / BBHA 9120D(1201)	667	W2008003	1-18GHz	Aug. 2, 2011	Aug. 1, 2012	-	f＜10 GHz：±1dB 10GHz＜f＜18 GHz：±1.5dB
Broadband Preamplifier	SCHWARZBECK MESS-ELEKTROM / BBV 9718	9718-148	W2008004	0.5-18GHz	Aug. 2, 2011	Aug. 1, 2012	-	±1.2dB
10m Coaxial Cable with N-male Connectors	SCHWARZBECK MESS-ELEKTROM / AK 9515 H	-	-	-	Aug. 2, 2011	Aug. 1, 2012	-	-
10m 50 Ohm Coaxial Cable	SCHWARZBECK MESS-ELEKTROM / AK 9513	-	-	-	Aug. 2, 2011	Aug. 1, 2012	-	-
Positioning Controller	C&C LAB/ CC-C-IF	-	-	-	Aug. 2, 2011	Aug. 1, 2012	-	-
Color Monitor	SUNSPO/ SP-14C	-	-	-	Aug. 2, 2011	Aug. 1, 2012	-	-
Test Receiver	ROHDE&SCHWARZ/ ESPI	101155	W2005001	9k-3GHz	Aug. 2, 2011	Aug. 1, 2012	Wws20080942	±1dB
EMI Receiver	Beijingkehuan	KH3931	-	9k-1GHz	Aug. 2, 2011	Aug. 1, 2012	-	-
Two-Line V-Network	ROHDE&SCHWARZ/ ENV216	100115	W2005002	50Ω/50μH	Aug. 2, 2011	Aug. 1, 2012	Wws20080941	±10%
RF Generator	TESEQ GmbH/ NSG4070	25781	W2008008	Fraq-range：9K-1GHz RF voltage：-60 dBm-+10dBm	Aug. 2, 2011	Aug. 1, 2012	Wws20081890	Power_freq distinguish0.1Hz RFeletricity distinguish 0.1 B
Attenuator 6dB	TESEQ GmbH/ ATN6050	25365	-	-	Aug. 2, 2011	Aug. 1, 2012	Wws20081597	-

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. 2, 2011	Aug. 1, 2012	Wwc20082401	voltage: ±10% Pulse current：±10%
Capacitive Coupling Clamp	SCHAFFNER/ CDN 8014	25311	-	-	Aug. 2, 2011	Aug. 1, 2012	Wwc20082398	-
Signal and Data Line Coupling Network	SCHAFFNER/ CDN 117	25627	W2008011	1.2/50μS	Aug. 2, 2011	Aug. 1, 2012	Wwc20082399	-
AC Power Supply	TONGYUN/ DTDGC-4	-	-	-	Aug. 2, 2011	Aug. 1, 2012	Wws20080944	-
PC	Lenovo	T2900D	-	-	Aug. 2, 2011	Aug. 1, 2012	-	±1dB
Display	ViewSonic	S27996-1W	-	-	Aug. 2, 2011	Aug. 1, 2012	-	±0.5dB
K/B	Dell	L100	-	-	Aug. 2, 2011	Aug. 1, 2012	-	±0.5dB
Mouse	Acer	M-UVACR1	-	-	Aug. 2, 2011	Aug. 1, 2012	-	±0.5dB

6 Conducted Emission

Test Requirement:	FCC CFR47 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 The tighter limit applies at the band edges.
Detector:	Peak for pre-scan (9kHz Resolution Bandwidth) Quasi-Peak & Average if maximised peak within 6dB of Average Limit

Operating Environment:

Temperature: 25.5 °C
Humidity: 51 % RH
Atmospheric Pressure: 1012 mbar

EUT Operation:

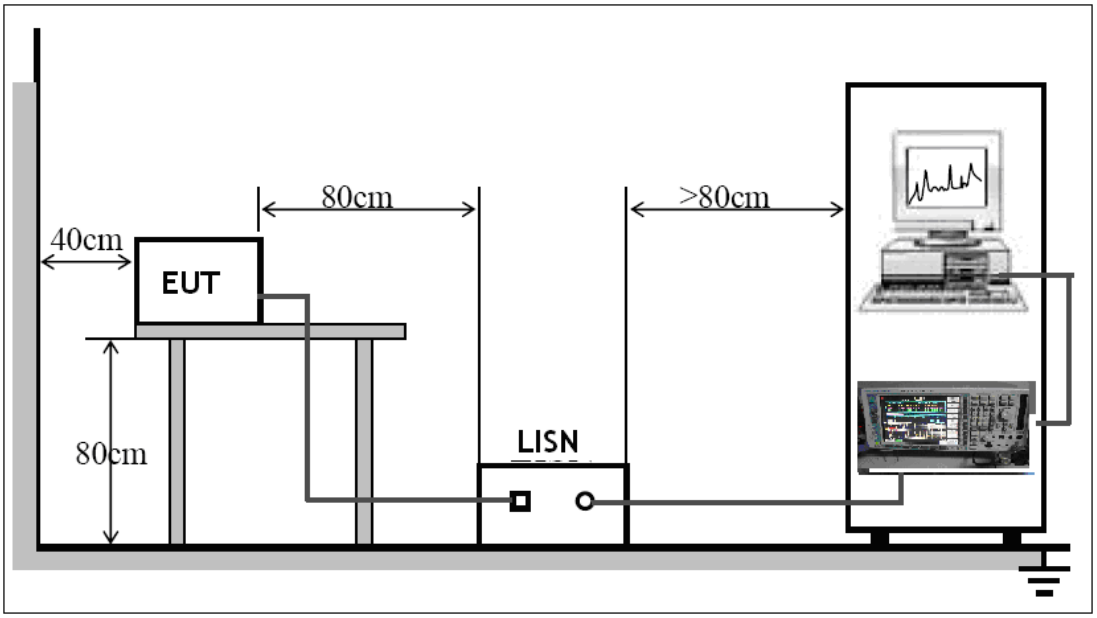
The EUT is tested in normal link with Bluetooth mode.

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.

EUT Setup

The conducted emission tests were performed using the setup accordance with the ANSI C63.4:2003, The specification used in this report was the FCC CFR47 Part 15 Section 15.207 limits.

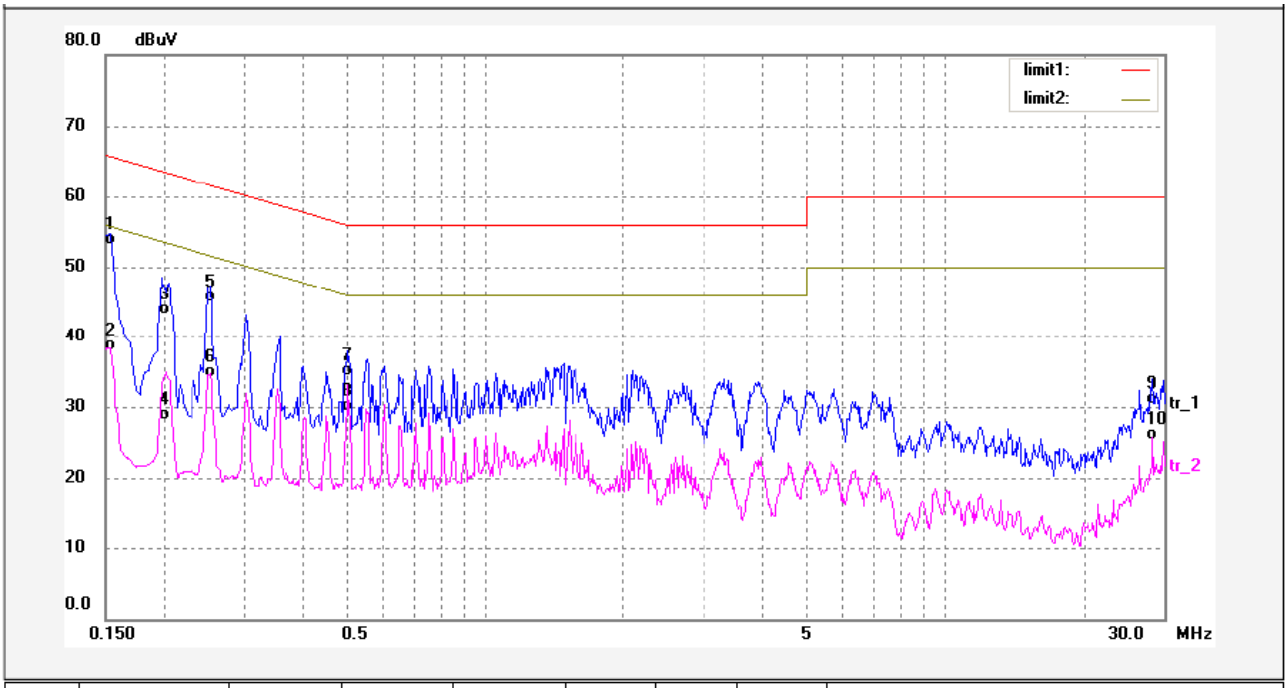


The EUT was placed on the test table in shielding room

Conducted Emission Test Result

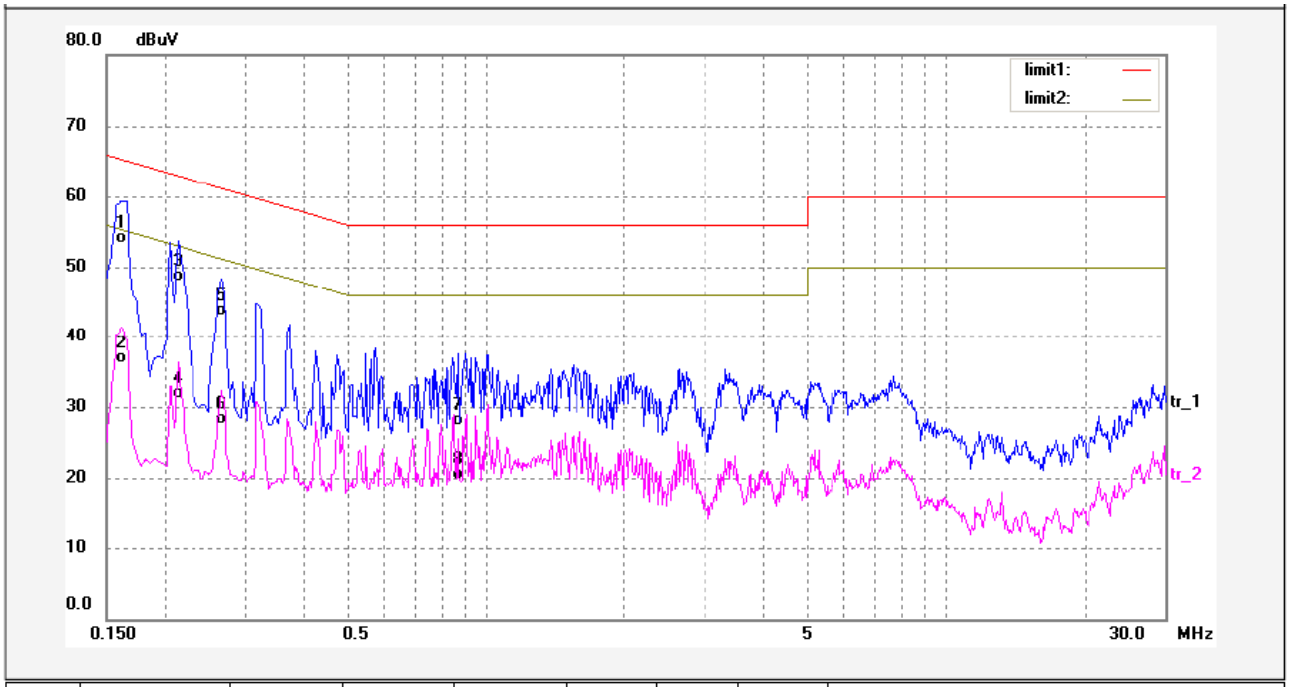
An initial pre-scan was performed on the live and neutral lines.

Live line:



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Margin (dB)	Detector	Remark
1	0.1539	42.38	10.64	53.02	65.78	-12.76	QP	
2	0.1539	27.34	10.64	37.98	55.78	-17.80	AVG	
3	0.1980	32.48	10.67	43.15	63.69	-20.54	QP	
4	0.1980	17.44	10.67	28.11	53.69	-25.58	AVG	
5	0.2540	34.33	10.64	44.97	61.62	-16.65	QP	
6	0.2540	23.54	10.64	34.18	51.62	-17.44	AVG	
7	0.5060	22.58	11.79	34.37	56.00	-21.63	QP	
8	0.5060	17.55	11.79	29.34	46.00	-16.66	AVG	
9	28.3020	17.50	12.78	30.28	60.00	-29.72	QP	
10	28.3020	12.45	12.78	25.23	50.00	-24.77	AVG	

Neutral line:



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Margin (dB)	Detector	Remark
1	0.1620	42.76	10.62	53.38	65.36	-11.98	QP	
2	0.1620	25.49	10.62	36.11	55.36	-19.25	AVG	
3	0.2140	37.28	10.66	47.94	63.04	-15.10	QP	
4	0.2140	20.53	10.66	31.19	53.04	-21.85	AVG	
5	0.2660	32.35	10.63	42.98	61.24	-18.26	QP	
6	0.2660	16.96	10.63	27.59	51.24	-23.65	AVG	
7	0.8740	15.91	11.42	27.33	56.00	-28.67	QP	
8	0.8740	8.29	11.42	19.71	46.00	-26.29	AVG	

Photograph – Conducted Emission Test Setup

7 Radiated Spurious Emissions

Test Requirement:	FCC CFR47 Part 15 Section 15.209 & 15.247
Test Method:	Base on ANSI C63.4:2003
Test Result:	PASS
Frequency Range:	9kHz to 25GHz
Measurement Distance:	3m
15.209 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
15.247 (d) Limit:	(d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating. The radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that Contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits.
Test mode:	The EUT was tested in continuously Transmit mode.

EUT Operation :

Operating Environment:

Temperature: 25.5 °C
Humidity: 51 % RH
Atmospheric Pressure: 1012 mbar

Measurement Uncertainty

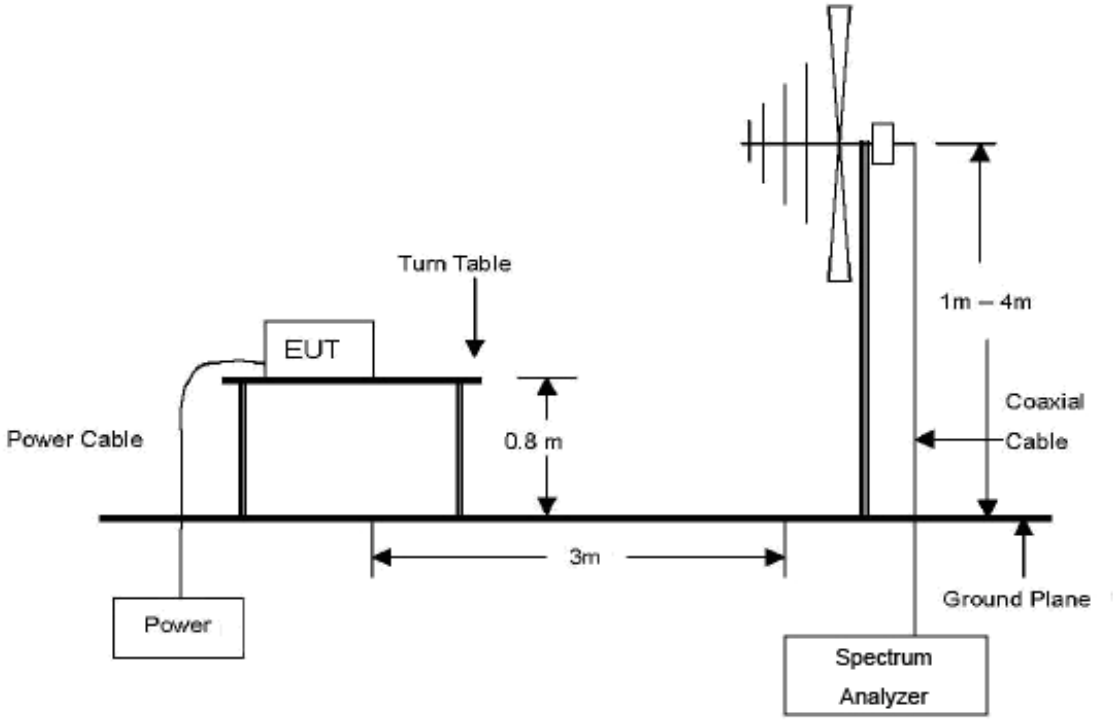
All measurements involve certain levels of uncertainties, especially in the field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor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

Based on NIS 81, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of a radiation emissions measurement at Waltek EMC Lab is $\pm$5.03dB.

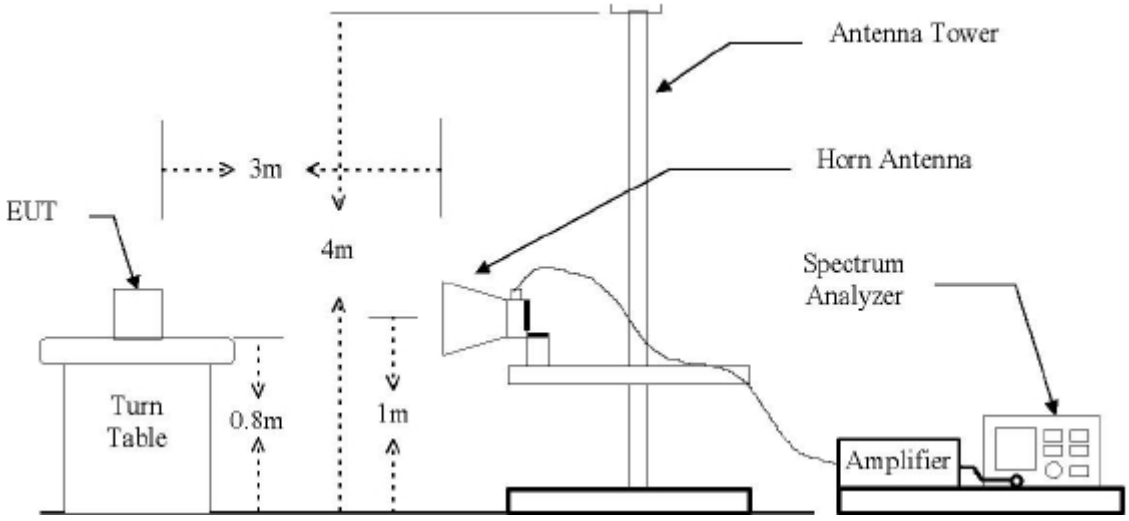
Test Setup

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 diagram below shows the test setup that is utilized to make the measurements for emission from 30 MHz to 1 GHz Emissions.



The diagram below shows the test setup that is utilized to make the measurements for emission from 1 GHz to 25 GHz Emissions.



Spectrum Analyzer Setup

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

9kHz ~ 30MHz

Start Frequency	9kHz
Stop Frequency	30MHz
Sweep Speed	Auto
IF Bandwidth	10KHz
Video Bandwidth	10KHz
Resolution Bandwidth	10KHz

30MHz ~ 1000MHz

Start Frequency	30 MHz
Stop Frequency	1000MHz
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

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

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 performed in X(normal uses) axis positioning. And all the modes was tested in the report.Only the worst case is shown in the report.

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 -7dBμV means the emission is 7dBμV below the maximum limit for Class B. The equation for margin calculation is as follows:

Margin = Corr. Ampl. – Limit

Summary of Test Results

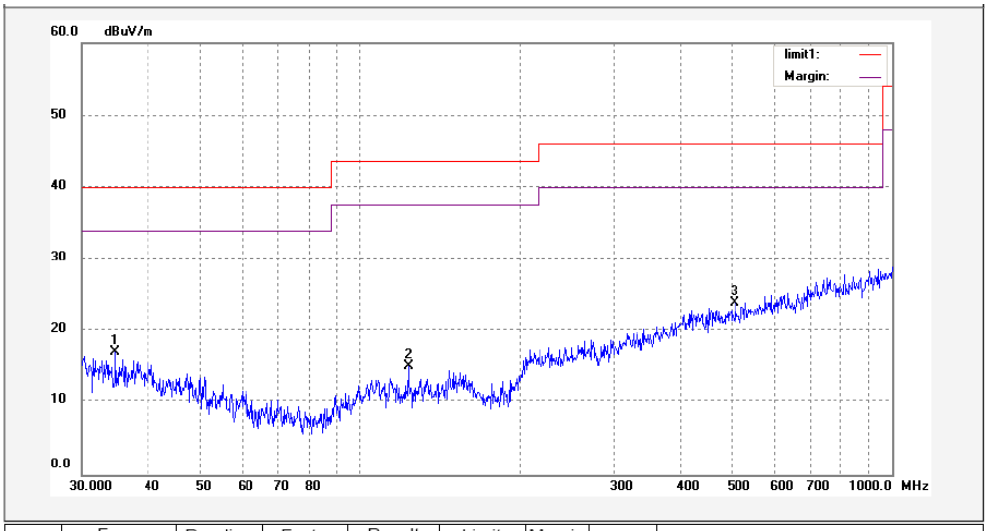
According to the data in this section, the EUT complied with the FCC CFR47 Part 15 Section 15.209 & 15.247 standards.

Test mode: continuously recevie 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.

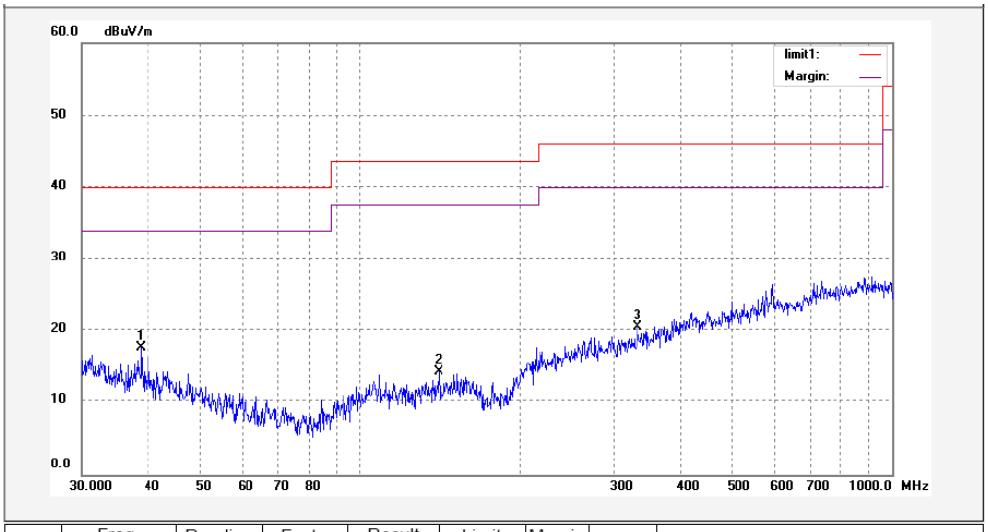
Test Frequency : 30MHz ~ 1000MHz

Antenna polarization: Vertical



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	34.6485	0.59	16.56	17.15	40.00	-22.85	peak	
2	123.1815	2.38	12.78	15.16	43.50	-28.34	peak	
3	507.5694	1.12	22.74	23.86	46.00	-22.14	peak	

Antenna polarization: Horizontal

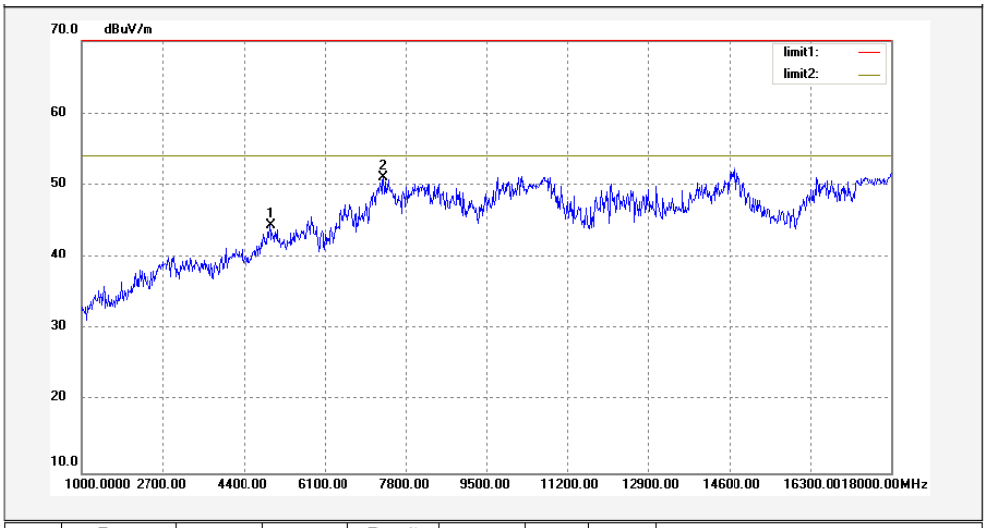


No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	38.7716	1.54	16.20	17.74	40.00	-22.26	peak	
2	140.7767	1.38	13.12	14.50	43.50	-29.00	peak	
3	332.9536	1.17	19.44	20.61	46.00	-25.39	peak	

Test Frequency: Above 1GHz radiation test data:

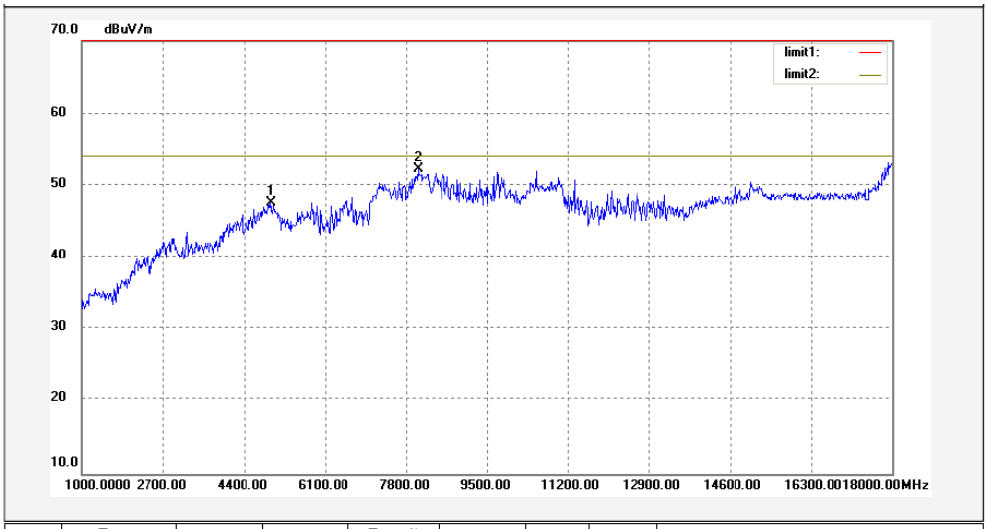
Remark: above 18GHz,the test signal below the noise level, so the data was not perfromed.

Antenna polarization: Vertical



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	4951.904	39.33	5.04	44.37	74.00	-29.63	peak	
2	7336.673	38.50	12.59	51.09	74.00	-22.91	peak	

Antenna polarization: Horizontal



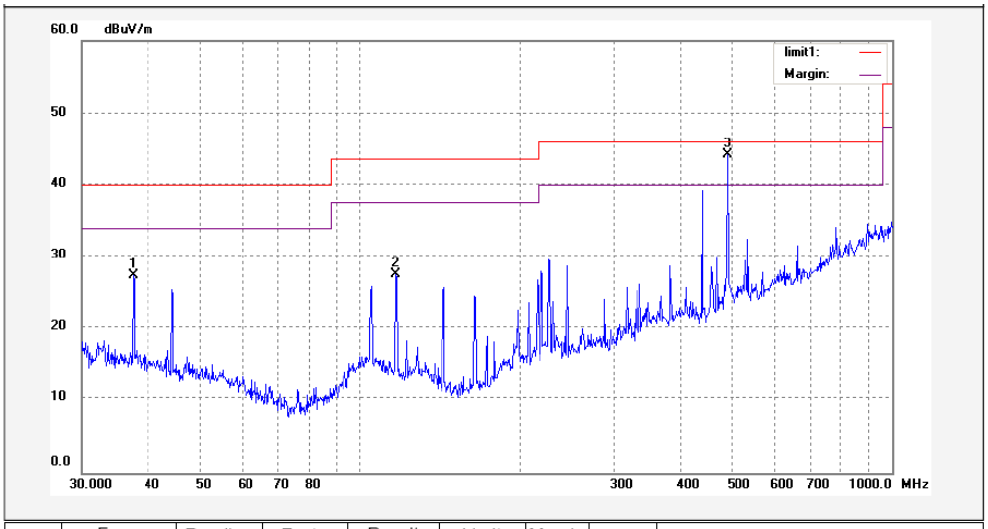
No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	4951.904	38.93	8.72	47.65	74.00	-26.35	peak	
2	8052.104	33.92	18.27	52.19	74.00	-21.81	peak	

Test mode: continuously transmit 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.

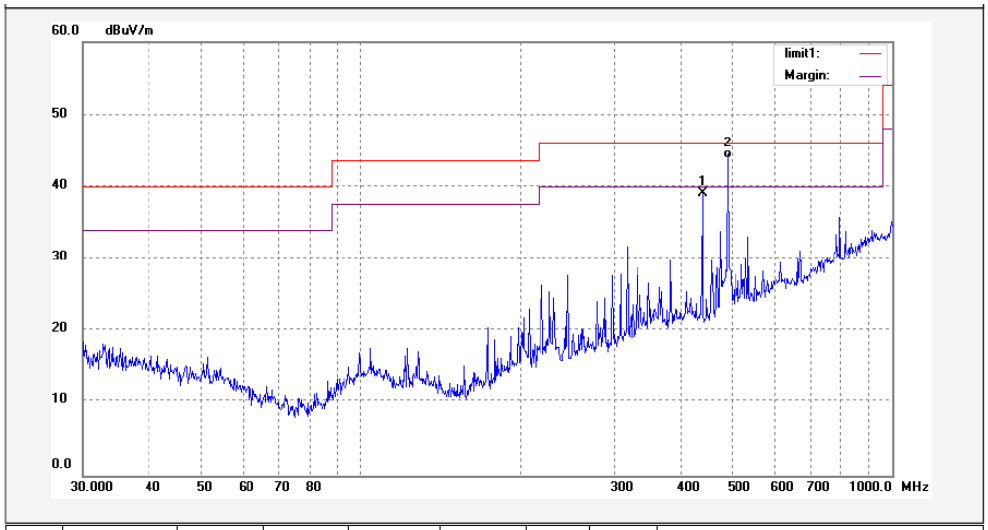
Test Frequency : 30MHz ~ 1000MHz

Antenna polarization: Vertical



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	37.4328	10.81	16.59	27.40	40.00	-12.60	peak	
2	116.4475	15.10	12.41	27.51	43.50	-15.99	peak	
3	490.0450	18.46	25.75	44.21	46.00	-1.79	peak	

Antenna polarization: Horizontal



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	439.4730	19.07	20.01	39.08	46.00	-6.92	peak	
2	490.0450	18.09	25.75	43.84	46.00	-2.16	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	AV	Vertical	96.52		(Fund.)	1.2	150
4804	AV	Vertical	41.02	54.00	-12.98	1.2	0
7206	AV	Vertical	35.23	54.00	-18.77	1.5	120
9608	AV	Vertical	32.52	54.00	-21.48	1.8	60
12010	AV	Vertical	31.25	54.00	-22.75	1.6	90
14412	AV	Vertical	31.01	54.00	-22.99	1.4	120
16814	AV	Vertical	30.02	54.00	-23.98	1.7	100
19216	AV	Vertical	30.67	54.00	-23.33	1.5	180
21618	AV	Vertical	29.63	54.00	-24.37	1.6	120
24020	AV	Vertical	29.01	54.00	-24.99	1.2	135
2402	AV	Horizontal	92.23		(Fund.)	1.2	120
4804	AV	Horizontal	41.12	54.00	-12.88	1.2	150
7206	AV	Horizontal	36.21	54.00	-17.79	1.5	120
9608	AV	Horizontal	34.25	54.00	-19.75	1.2	180
12010	AV	Horizontal	33.21	54.00	-20.79	1.5	135
14412	AV	Horizonta	31.25	54.00	-22.75	1.2	120
16814	AV	Horizontal	30.74	54.00	-23.26	1.5	180
19216	AV	Horizontal	32.01	54.00	-21.99	1.8	60
21618	AV	Horizontal	31.53	54.00	-22.47	1.2	90
24020	AV	Horizontal	30.01	54.00	-23.99	1.5	90
2402	PK	Vertical	106.41		(Fund.)	1.5	180
4804	PK	Vertical	45.21	74.00	-28.79	1.8	30
7206	PK	Vertical	40.01	74.00	-33.99	1.6	110
9608	PK	Vertical	37.42	74.00	-36.58	1.4	100
12010	PK	Vertical	36.21	74.00	-37.79	1.2	90
14412	PK	Vertical	32.01	74.00	-41.99	1.2	60
16814	PK	Vertical	33.21	74.00	-40.79	1.4	90
19216	PK	Vertical	30.10	74.00	-43.90	1.2	120

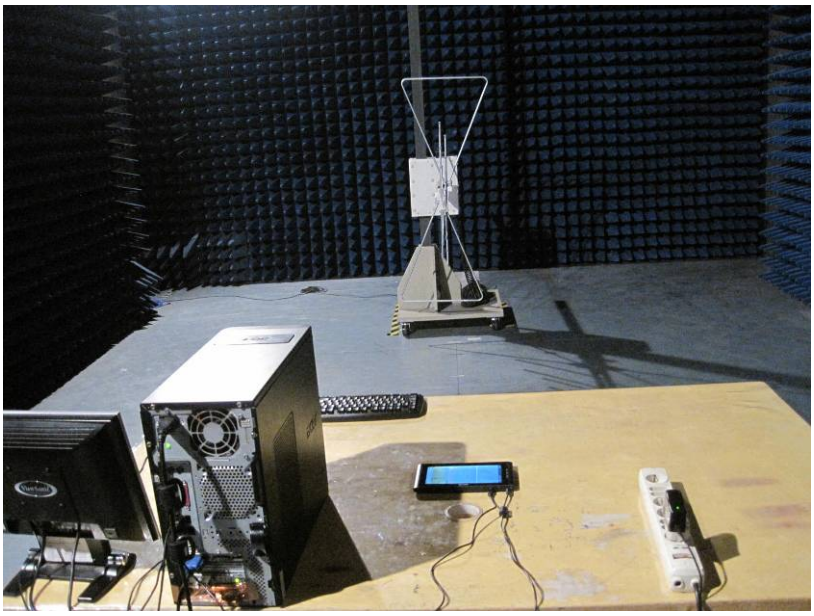
21618	PK	Vertical	29.01	74.00	-44.99	1.7	120
24020	PK	Vertical	29.01	74.00	-44.99	1.4	135
2402	PK	Horizontal	102.32		(Fund.)	1.8	180
4804	PK	Horizontal	41.24	74.00	-32.76	1.8	60
7206	PK	Horizontal	38.25	74.00	-35.75	1.8	120
9608	PK	Horizontal	36.98	74.00	-37.02	1.2	180
12010	PK	Horizontal	35.69	74.00	-38.31	1.2	90
14412	PK	Horizontal	35.62	74.00	-38.38	1.5	90
16814	PK	Horizontal	33.35	74.00	-40.65	1.8	150
19216	PK	Horizontal	33.01	74.00	-40.99	1.5	150
21618	PK	Horizontal	30.21	74.00	-43.79	1.2	120
24020	PK	Horizontal	30.01	74.00	-43.99	1.2	180
Middle frequency							
2440	AV	Vertical	92.21		(Fund.)	1.5	0
4880	AV	Vertical	39.02	54.00	-14.98	1.2	90
7320	AV	Vertical	35.21	54.00	-18.79	1.0	90
9760	AV	Vertical	33.33	54.00	-20.67	1.2	0
12200	AV	Vertical	32.02	54.00	-21.98	1.2	0
14640	AV	Vertical	32.01	54.00	-21.99	1.2	150
17080	AV	Vertical	30.26	54.00	-23.74	1.5	0
19520	AV	Vertical	30.01	54.00	-23.99	1.5	0
21960	AV	Vertical	29.02	54.00	-24.98	1.8	180
24400	AV	Vertical	28.23	54.00	-25.77	1.2	90
2440	AV	Horizontal	92.96		(Fund.)	1.0	120
4880	AV	Horizontal	35.69	54.00	-18.31	1.0	90
7320	AV	Horizontal	34.25	54.00	-19.75	1.5	270
9760	AV	Horizontal	33.52	54.00	-20.48	1.2	120
12200	AV	Horizontal	31.21	54.00	-22.79	1.2	150
14640	AV	Horizontal	30.25	54.00	-23.75	1.4	180
17080	AV	Horizontal	29.25	54.00	-24.75	1.6	135
19520	AV	Horizontal	28.36	54.00	-25.64	1.4	90
21960	AV	Horizontal	28.02	54.00	-25.98	1.2	150
24400	AV	Horizontal	28.02	54.00	-25.98	1.7	120

2440	PK	Vertical	107.52		(Fund.)	1.0	0
4880	PK	Vertical	44.21	74.00	-29.79	1.1	90
7320	PK	Vertical	38.25	74.00	-35.75	1.4	100
9760	PK	Vertical	37.94	74.00	-36.06	1.3	120
12200	PK	Vertical	37.87	74.00	-36.13	1.7	180
14640	PK	Vertical	36.10	74.00	-37.90	1.2	0
17080	PK	Vertical	32.03	74.00	-41.97	1.4	0
19520	PK	Vertical	30.21	74.00	-43.79	1.5	120
21960	PK	Vertical	28.30	74.00	-45.70	1.5	135
24400	PK	Vertical	28.30	74.00	-45.70	1.2	120
2440	PK	Horizontal	103.45		(Fund.)	1.0	0
4880	PK	Horizontal	43.56	74.00	-30.44	1.7	45
7320	PK	Horizontal	41.51	74.00	-32.49	1.6	90
9760	PK	Horizontal	40.14	74.00	-33.86	1.5	60
12200	PK	Horizontal	39.36	74.00	-34.64	1.4	150
14640	PK	Horizontal	37.44	74.00	-36.56	1.2	150
17080	PK	Horizontal	34.21	74.00	-39.79	1.1	120
19520	PK	Horizontal	38.86	74.00	-35.14	1.5	150
21960	PK	Horizontal	34.21	74.00	-39.79	1.1	0
24400	PK	Horizontal	33.33	74.00	-40.67	1.6	135
High frequency							
2480	AV	Vertical	93.42		(Fund.)	1.0	0
4960	AV	Vertical	36.25	54.00	-17.75	1.2	45
7440	AV	Vertical	32.25	54.00	-21.75	1.2	120
9920	AV	Vertical	30.26	54.00	-23.74	1.4	60
12400	AV	Vertical	30.55	54.00	-23.45	1.5	135
14880	AV	Vertical	30.34	54.00	-23.66	1.8	120
17360	AV	Vertical	30.62	54.00	-23.38	1.1	100
19840	AV	Vertical	30.13	54.00	-23.87	1.1	60
22320	AV	Vertical	30.27	54.00	-23.73	1.4	0
24800	AV	Vertical	28.25	54.00	-25.75	1.5	60
2480	AV	Horizontal	92.51		(Fund.)	1.0	0
4960	AV	Horizontal	34.56	54.00	-19.44	1.8	120

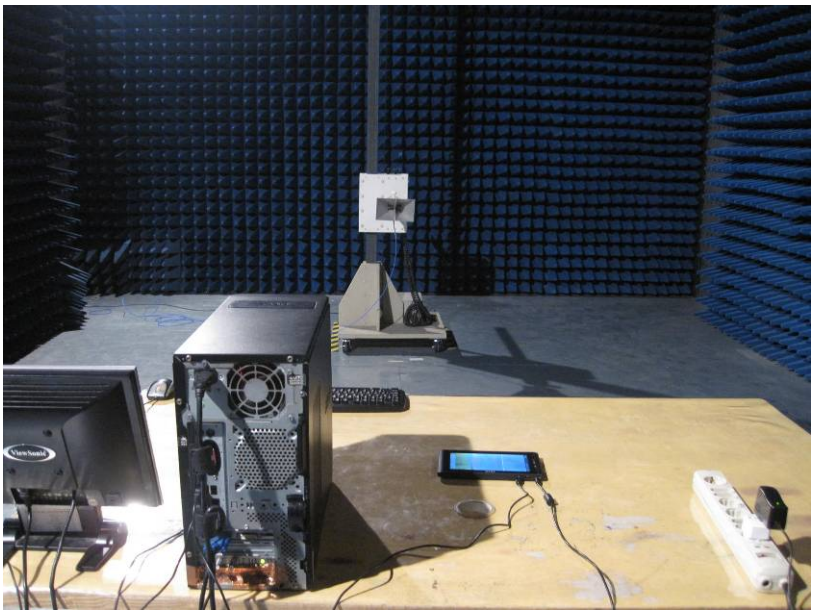
7440	AV	Horizontal	30.35	54.00	-23.65	1.2	60
9920	AV	Horizontal	31.47	54.00	-22.53	1.5	100
12400	AV	Horizontal	31.89	54.00	-22.11	1.2	60
14880	AV	Horizontal	32.42	54.00	-21.58	1.2	120
17360	AV	Horizontal	31.17	54.00	-22.83	1.4	100
19840	AV	Horizontal	32.55	54.00	-21.45	1.8	100
22320	AV	Horizontal	32.86	54.00	-21.14	1.3	100
24800	AV	Horizontal	30.25	54.00	-23.75	1.6	10
2480	PK	Vertical	107.53		(Fund.)	1.0	0
4960	PK	Vertical	44.21	74.00	-29.79	1.2	60
7440	PK	Vertical	35.62	74.00	-38.38	1.8	90
9920	PK	Vertical	35.35	74.00	-38.65	1.5	180
12400	PK	Vertical	35.56	74.00	-38.44	1.4	60
14880	PK	Vertical	34.21	74.00	-39.79	1.2	60
17360	PK	Vertical	33.54	74.00	-40.46	1.2	135
19840	PK	Vertical	36.26	74.00	-37.74	1.2	120
22320	PK	Vertical	36.73	74.00	-37.27	1.6	60
24800	PK	Vertical	30.21	74.00	-43.79	1.4	90
2480	PK	Horizontal	93.64		(Fund.)	1.1	60
4960	PK	Horizontal	42.58	74.00	-31.42	1.4	90
7440	PK	Horizontal	38.64	74.00	-35.36	1.5	60
9920	PK	Horizontal	35.37	74.00	-38.63	1.3	0
12400	PK	Horizontal	35.52	74.00	-38.48	1.2	135
14880	PK	Horizontal	35.26	74.00	-38.74	1.7	0
17360	PK	Horizontal	36.41	74.00	-37.59	1.8	180
19840	PK	Horizontal	32.41	74.00	-41.59	1.5	60
22320	PK	Horizontal	31.11	74.00	-42.89	1.8	120
24800	PK	Horizontal	28.21	74.00	-45.79	1.0	60

Photograph – Radiation Spurious Emission Test Setup

Below 1GHz



Above 1GHz



8 Radiated Emissions which fall in the restricted bands

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:	Base on ANSI C63.4:2003
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

Test Result:

1. Low Channel

Frequency (MHz)	Peak Emission Level (dBuV/m)	AVG Emission Level (dBuV/m)
2390	57.24	42.21
2483.5	41.57	32.35

2. High Channel

Frequency (MHz)	Peak Emission Level (dBuV/m)	AVG Emission Level (dBuV/m)
2390	42.16	31.87
2483.5	58.26	43.68

9 20 dB Bandwidth Measurement

Test Requirement: FCC CFR47 Part 15 Section 15.247

Test Method: Based on FCC Part 15.247

Test Mode: Test in fixing operating frequency at low, Middle, high channel.

Test Procedure:

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum;

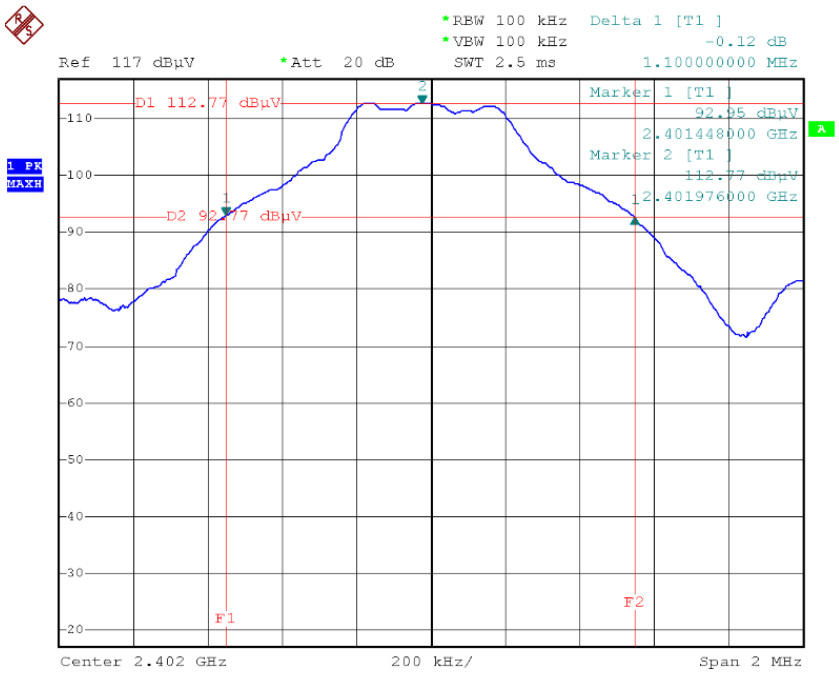
2. Set the spectrum analyzer: Span = 2MHz, RBW = 100kHz, VBW = 100kHz

Test Result:

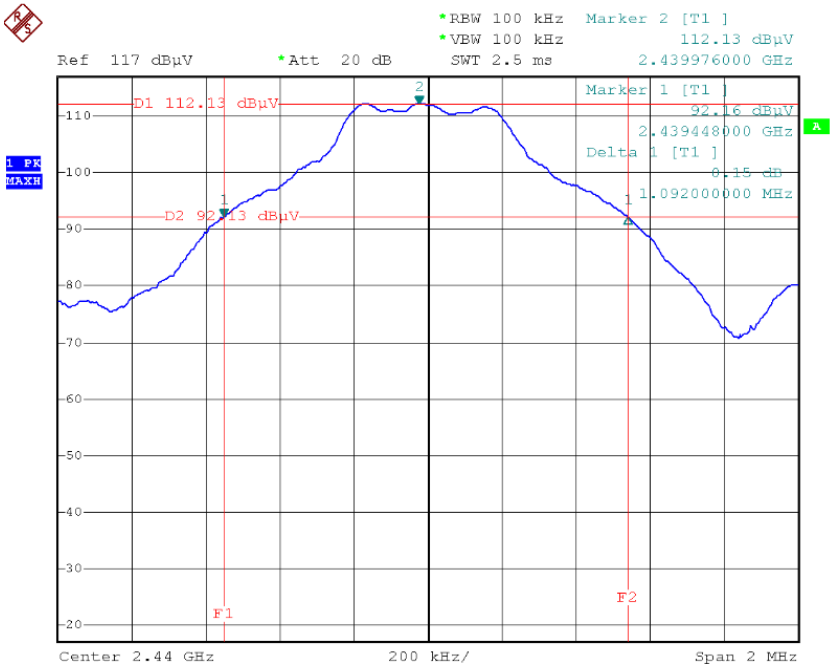
Test Channel	Bandwidth
Low	1.100MHz
Middle	1.092MHz
High	1.088MHz

Test result plot as follows:

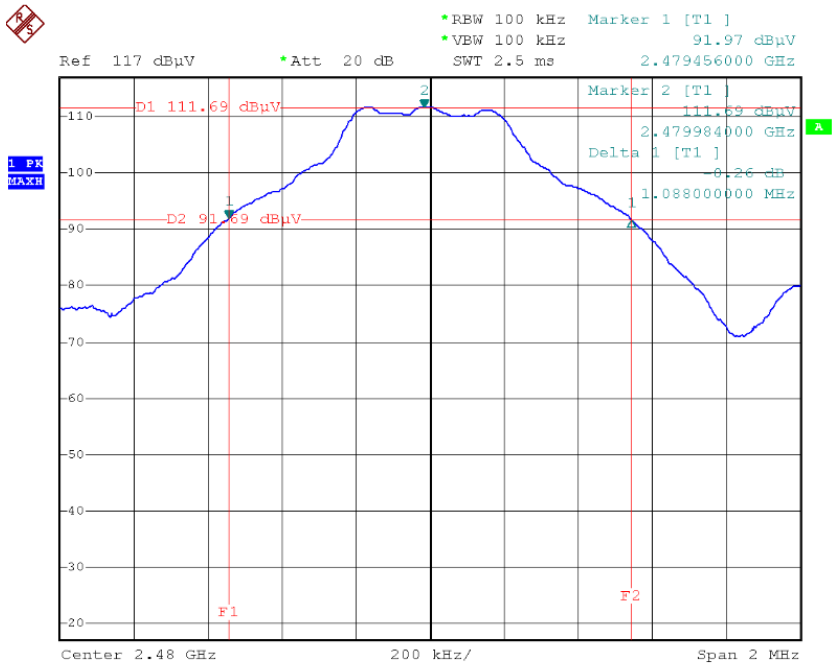
Low Channel



Middle Channel



High Channel



10 Maximum Peak Output Power

Test Requirement:	FCC CFR47 Part 15 Section 15.247
Test Method:	Based on 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 1watts (30 dBm) limit applies.
Test mode:	Test in fixing frequency transmitting mode.

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 = 1 MHz. VBW = 1 MHz. Sweep = auto; Detector Function = Peak.

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

Test Result:

Test Channel	Output Power (dBm)	Limit (dBm)
Low	6.53	30
Middle	5.53	30
High	5.06	30

11 Hopping Channel Separation

Test Requirement: FCC CFR47 Part 15 Section 15.247

Test Method: Based on FCC Part 15.247

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 125 mW.

Test Mode: Test in hopping transmitting operating mode.

Test Procedure:

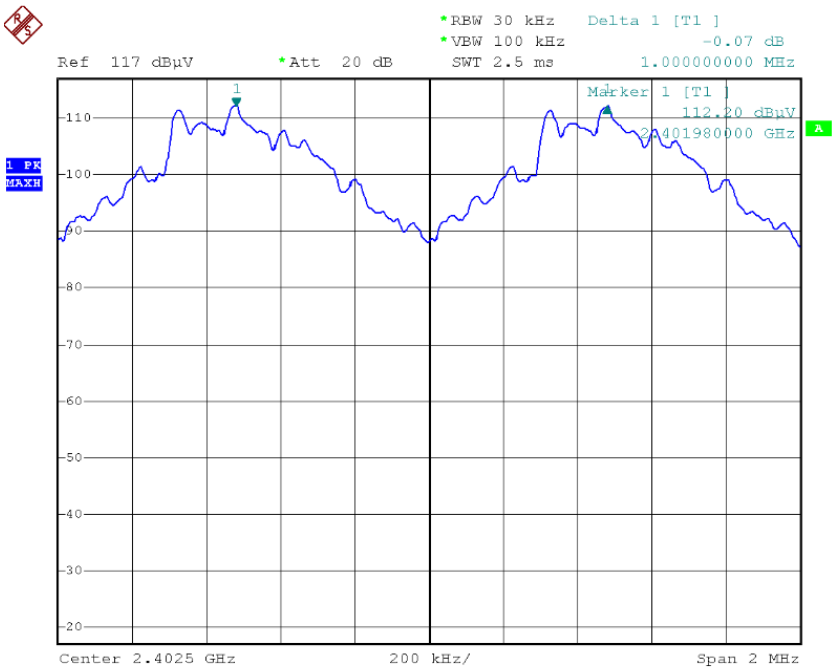
1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.
2. Set the spectrum analyzer: RBW = 30kHz. VBW = 100kHz , Span = 2MHz. Sweep = auto; Detector Function = Peak. Trace = Max hold.
3. Allow the trace to stabilize. Use the marker-delta function to 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.

Test Result:

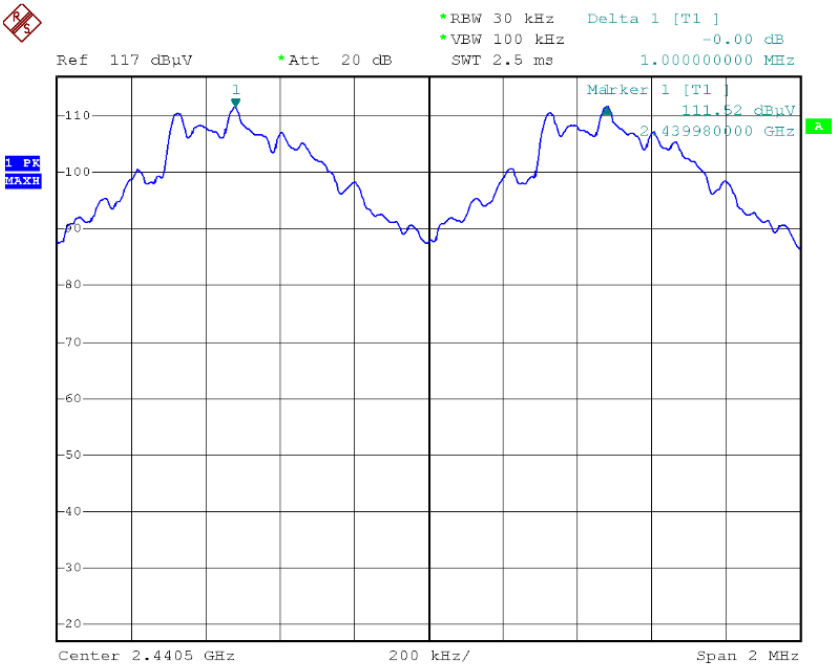
Test Channel	Separation (MHz)	Result
Low	1.000	PASS
Middle	1.000	PASS
High	1.004	PASS

Test result plot as follows:

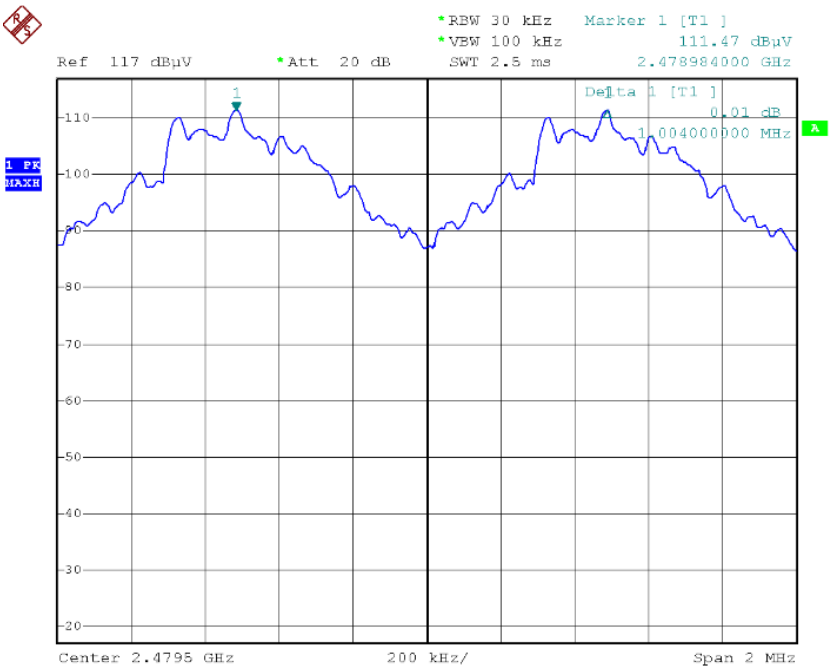
Low Channel:



Middle Channel



High Channel



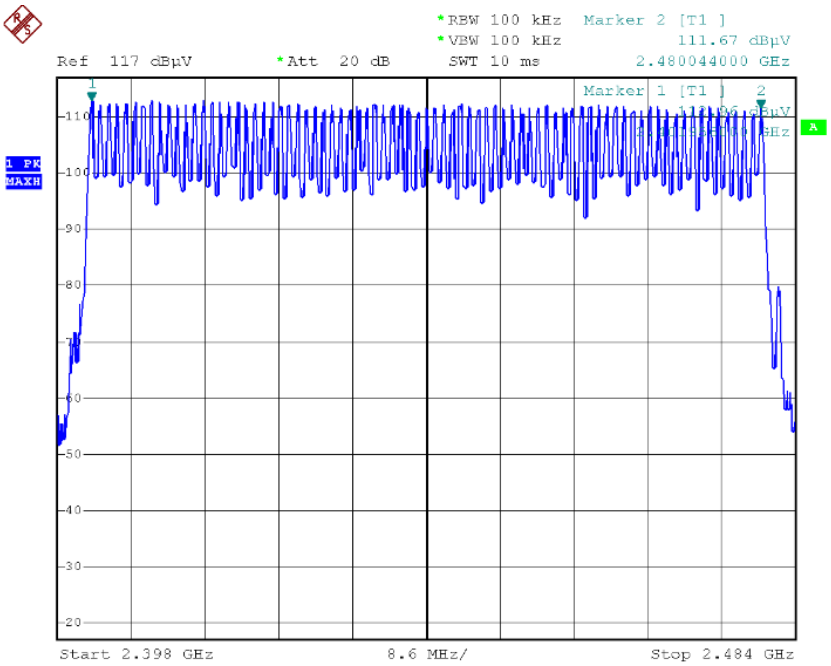
12 Number of Hopping Frequency

Test Requirement:	FCC CFR47 Part 15 Section 15.247
Test Method:	Based on FCC Part 15.247
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.

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: Start Frequency = 2398MHz, Stop Frequency = 2484MHz. Submit the test result graph.

Test Result: Total Channels are 79 Channels.



13 Dwell Time

Test Requirement:	FCC CFR47 Part 15 Section 15.247
Test Method:	Based on FCC Part 15.247
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.

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).

Test Result:

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

The test period: T= 0.4(s) * 79 = 31.6 (s)

DH5 Packet permit maximum 1600 / 79 / 6 hops per second in each channel (5 time slots RX, 1 time slot TX).

DH3 Packet permit maximum 1600 / 79 / 4 hops per second in each channel (3 time slots RX, 1 time slot TX).

DH1 Packet permit maximum 1600 / 79 /2 hops per second in each channel (1 time slot RX, 1 time slot TX). So,the Dwell Time can be calculated as follows:

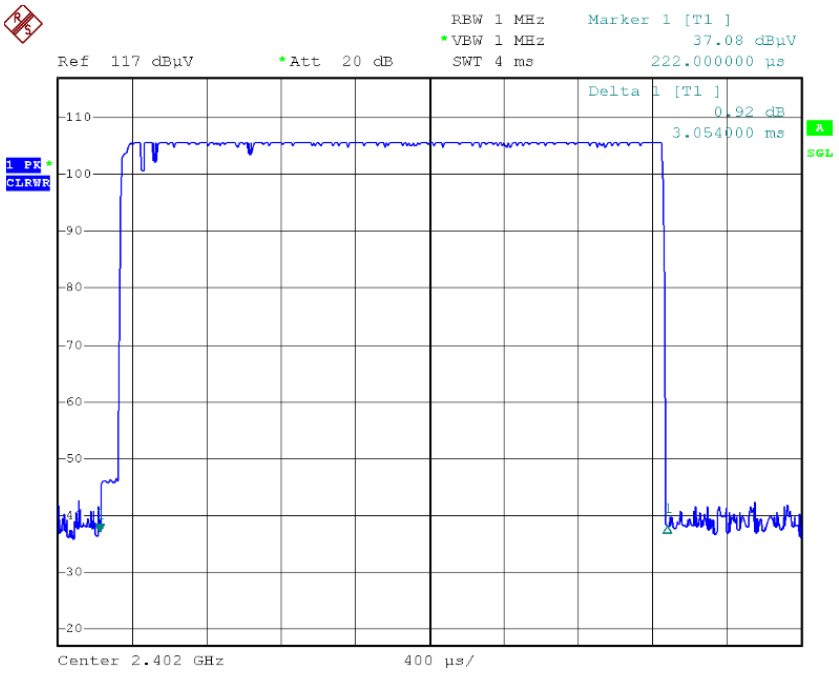
Data Packet	Dwell Time(s)
DH5	1600/79/6*31.6*(MkrDelta)/1000
DH3	1600/79/4*31.6*(MkrDelta)/1000
DH1	1600/79/2*31.6*(MkrDelta)/1000

Note : Mkr Delta is once pulse time .

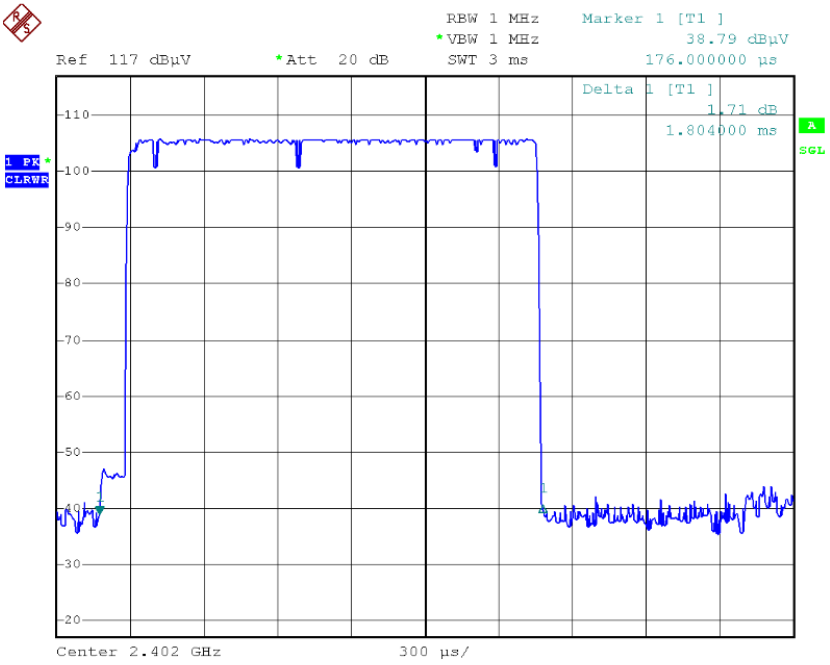
Low Channel: 2402MHz

Dwell time of each occupation in this channel as follows:

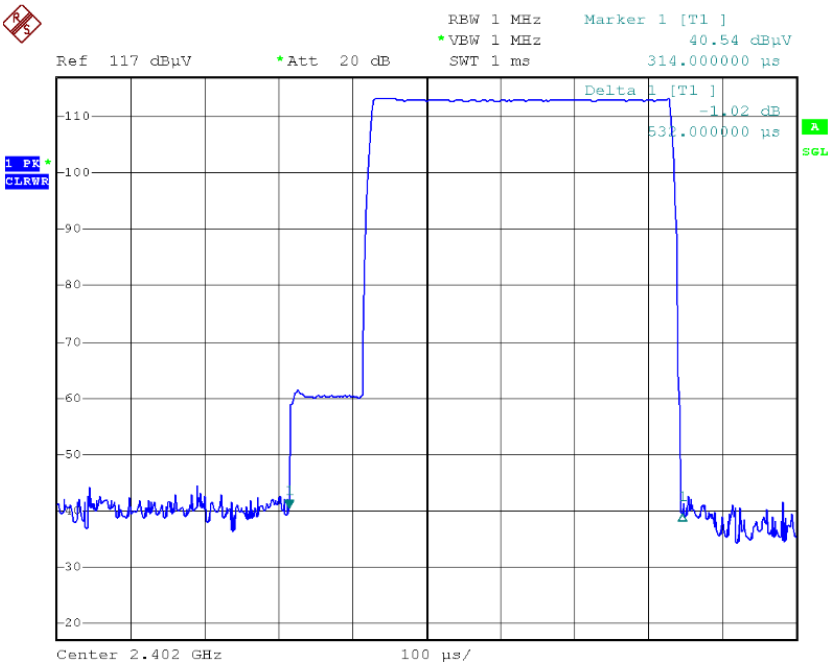
Data Packet	Frequency	Mkr Delta(ms)	Dwell Time(s)	Limits(s)	Result
DH5	2402 MHz	3.054	0.326	0.400	Pass
DH3	2402 MHz	1.804	0.289	0.400	Pass
DH1	2402 MHz	0.532	0.170	0.400	Pass



(DH5)


RBW 1 MHz
*VBW 1 MHz
SWT 3 ms
Marker 1 [T1]
38.79 dBµV
176.000000 µs
Delta 1 [T1]
1.71 dB
1.804000 ms
Ref 117 dBµV
*Att 20 dB
1 PK
CLRWR
A
SGL
Center 2.402 GHz
300 µs/

(DH3)

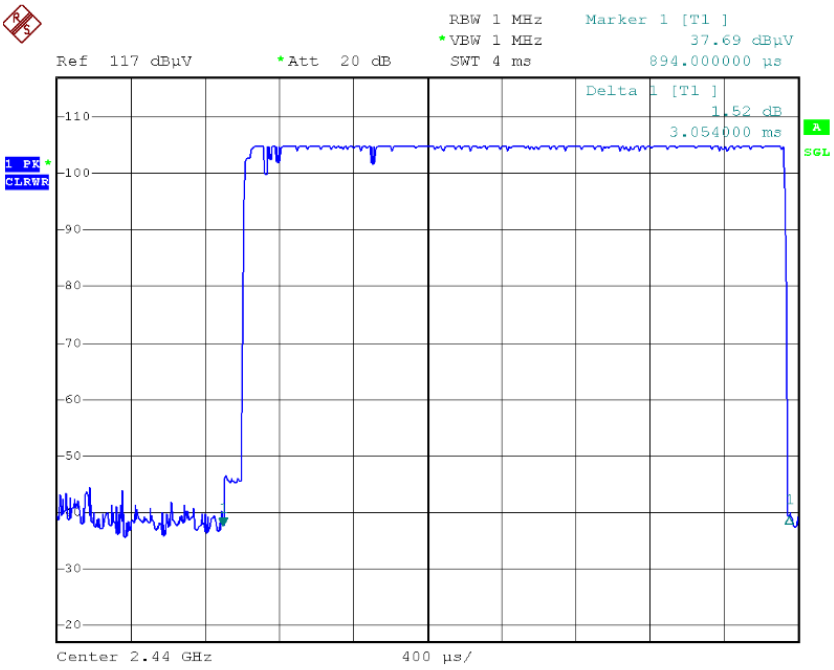

RBW 1 MHz
*VBW 1 MHz
SWT 1 ms
Marker 1 [T1]
40.54 dBµV
314.000000 µs
Delta 1 [T1]
-1.02 dB
532.000000 µs
Ref 117 dBµV
*Att 20 dB
1 PK
CLRWR
A
SGL
Center 2.402 GHz
100 µs/

(DH1)

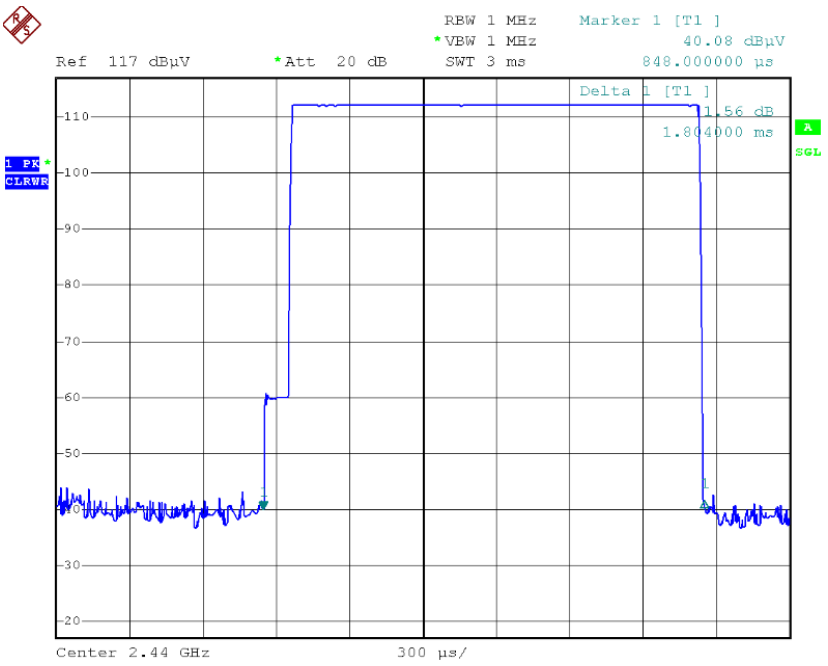
Middle Channel: 2440MHz

Dwell time of each occupation in this channel as follows:

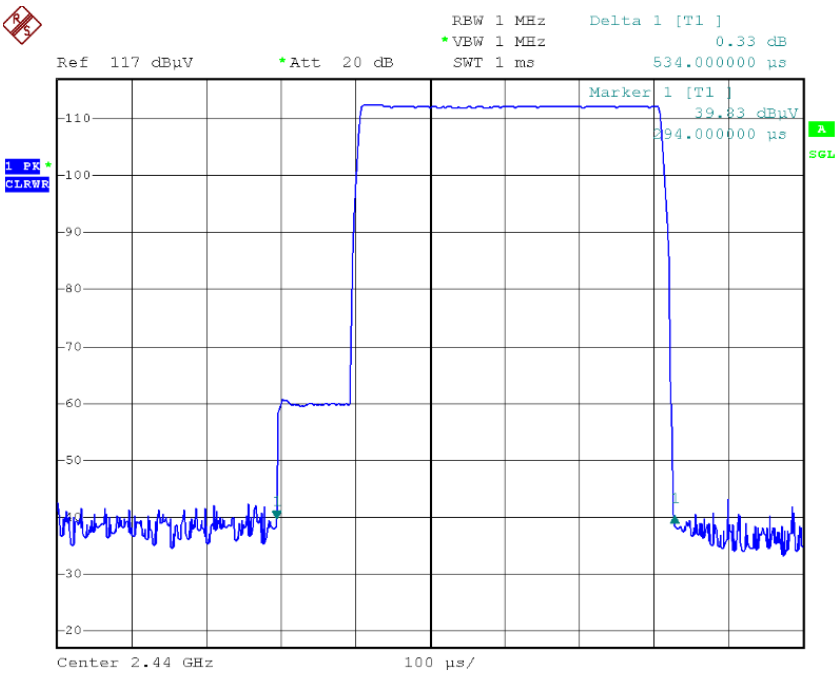
Data Packet	Frequency	Mkr Delta(ms)	Dwell Time(s)	Limits(s)	Result
DH5	2440 MHz	3.054	0.326	0.400	Pass
DH3	2440 MHz	1.804	0.289	0.400	Pass
DH1	2440 MHz	0.534	0.171	0.400	Pass



(DH5)


RBW 1 MHz
*VBW 1 MHz
SWT 3 ms
Marker 1 [T1]
40.08 dBµV
848.000000 µs
Delta 1 [T1]
1.56 dB
1.804000 ms
Ref 117 dBµV
*Att 20 dB
1 PK
CLRWR
A
SGL
Center 2.44 GHz
300 µs/

(DH3)

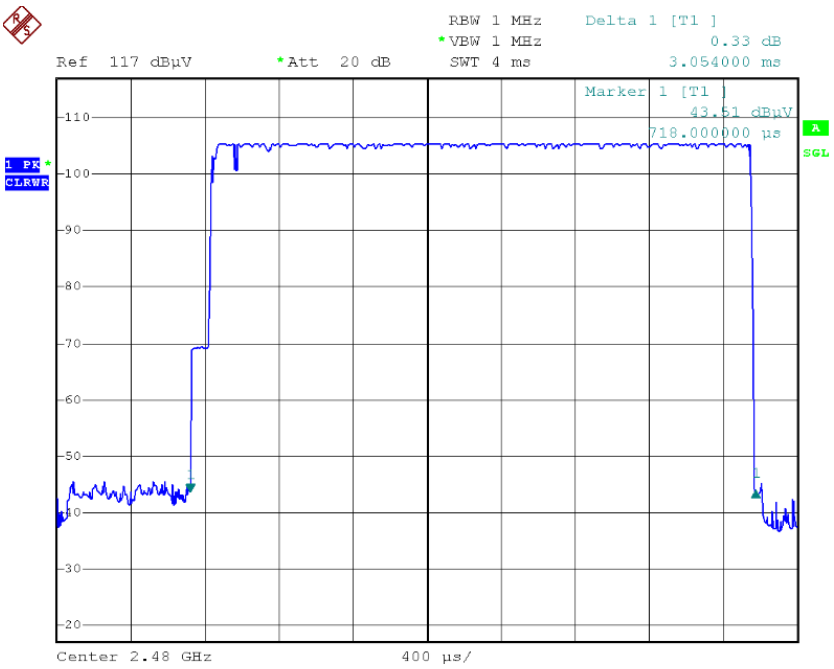

RBW 1 MHz
*VBW 1 MHz
SWT 1 ms
Delta 1 [T1]
0.33 dB
534.000000 µs
Marker 1 [T1]
39.83 dBµV
294.000000 µs
Ref 117 dBµV
*Att 20 dB
1 PK
CLRWR
A
SGL
Center 2.44 GHz
100 µs/

(DH1)

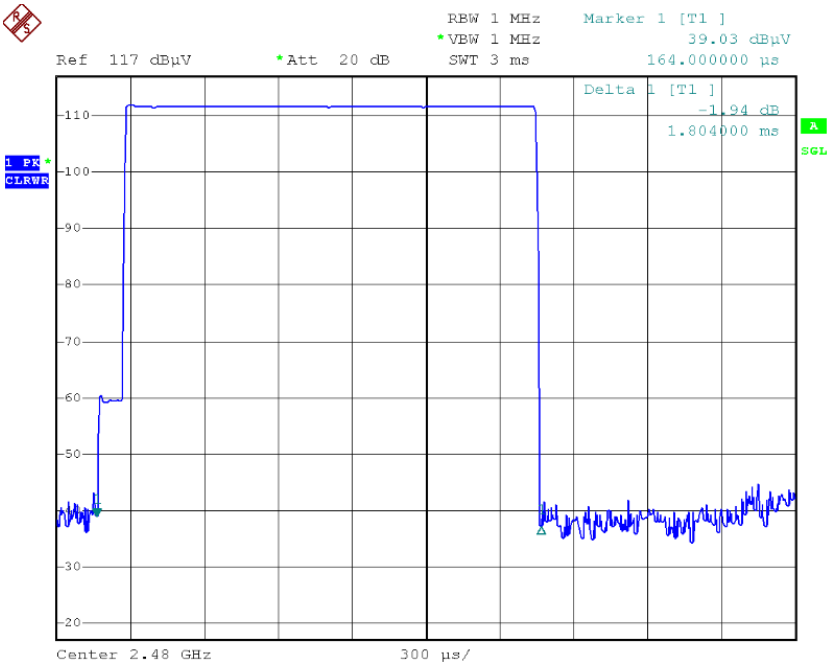
High Channel: 2480MHz

Dwell time of each occupation in this channel as follows:

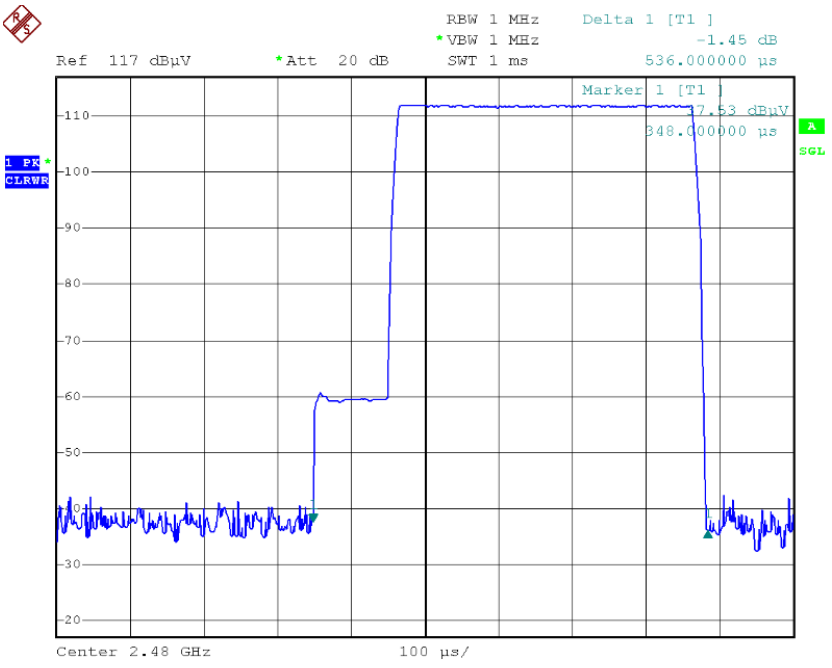
Data Packet	Frequency	Mkr Delta(ms)	Dwell Time(s)	Limits(s)	Result
DH5	2480 MHz	3.054	0.326	DH5	Pass
DH3	2480 MHz	1.804	0.289	DH3	Pass
DH1	2480 MHz	0.536	0.172	DH1	Pass



(DH5)


RBW 1 MHz
*VBW 1 MHz
SWT 3 ms
Marker 1 [T1]
39.03 dBµV
164.000000 µs
Delta 1 [T1]
-1.94 dB
1.804000 ms
Ref 117 dBµV
*Att 20 dB
1 PK
CLRWR
A
SGL
110
100
90
80
70
60
50
30
20
Center 2.48 GHz
300 µs/

(DH3)


RBW 1 MHz
*VBW 1 MHz
SWT 1 ms
Delta 1 [T1]
-1.45 dB
536.000000 µs
Marker 1 [T1]
97.53 dBµV
348.000000 µs
Ref 117 dBµV
*Att 20 dB
1 PK
CLRWR
A
SGL
110
100
90
80
70
60
50
30
20
Center 2.48 GHz
100 µs/

(DH1)

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 antenna, fulfill the requirement of this section.

15 RF Exposure

Test Requirement:	FCC CFR47 Part 1 Section 1.1307
Test Method:	Based on FCC Part 15.247
Test Mode:	The EUT work in test mode(Tx).

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

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

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

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

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

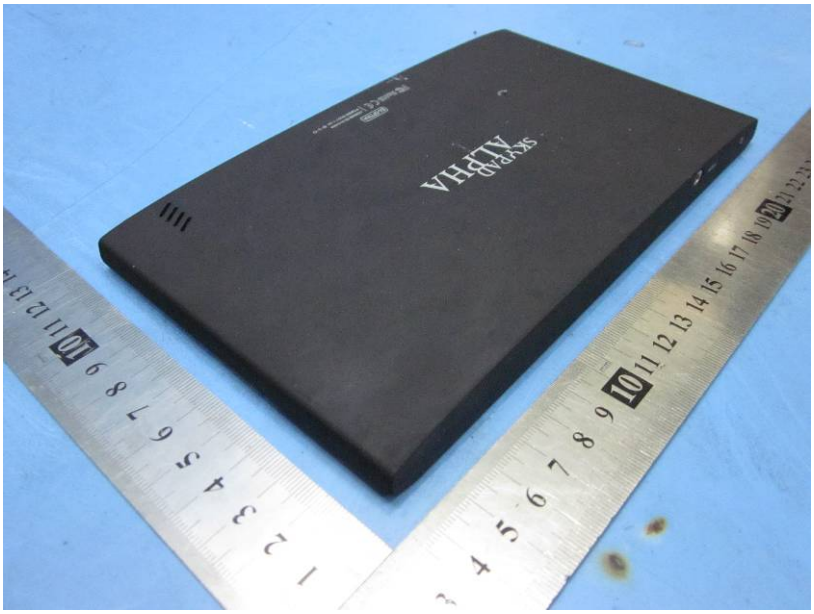
Antenna Gain (dBi)	Antenna Gain (numeric)	Peak Output Power (dBm)	Peak Output Power (mW)	Power Density (S) (mW/cm2)	Limit of Power Density (S) (mW/cm2)	Test Result
0	1	6.53	4.498	0.000895	1	Complies
0	1	5.53	3.573	0.000711	1	Complies
0	1	5.06	3.206	0.000638	1	Complies

16 Photographs - Constructional Details

16.1 Product View

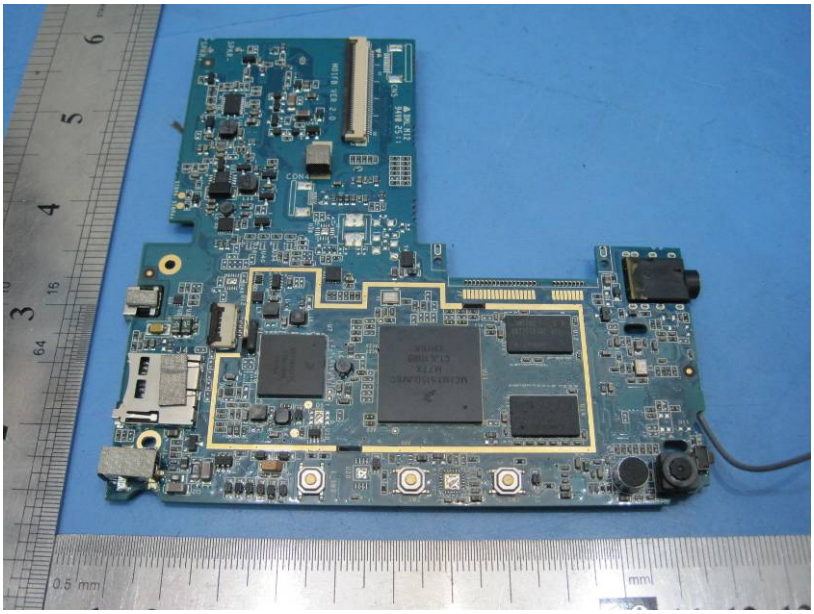
16.2 EUT - Front View

16.3 EUT - Back View

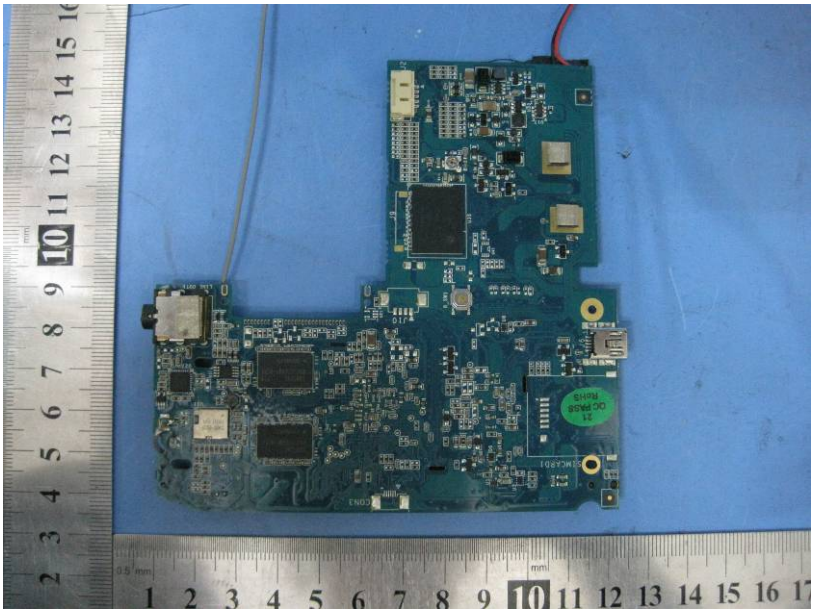


16.4 EUT - Open View

16.5 PCB - Front View



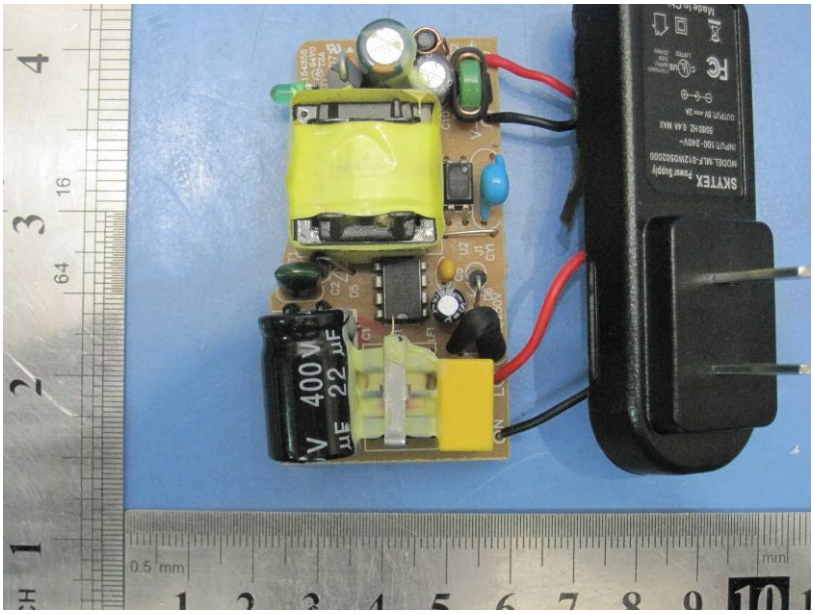
16.6 PCB - Back View



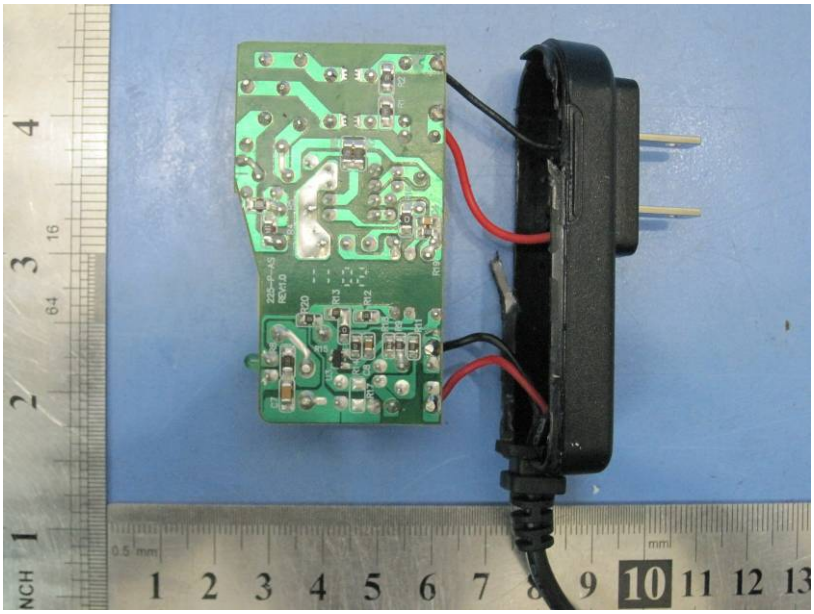
16.7 Adapter - Front View

16.8 Adapter - Back View

16.9 PCB of Adapter - Front View



16.10 PCB of Adapter - Back View



17 FCC 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.