

FCC TEST REPORT

FCC ID : ZRRBS635

Applicant : Shenzhen Addition Audio Science & Technology CO.,LTD.

Address of Applicant : Mingzhuo Industry Park,Guangming Main Street,Guangming New District,Shenzhen,China

Equipment Under Test (EUT) :

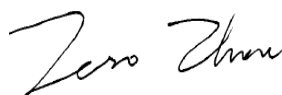
Product description : Portable wireless speaker
Model No. : BS635,AURA BLUNOTE

Standards : FCC 15 Paragraph 15.247

Date of Test : July 1~9,2011

Date of Issue : July 11,2011

Test Engineer : **Zero Zhou /Engineer**



Reviewed By : **Philo Zhong /Manager**



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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: 2003	30dBm	PASS
Restricted Band	FCC Part 15:2007	ANSI C63.4: 2003	Note	PASS
Dwell time	FCC Part 15:2007	ANSI C63.4: 2003	Maximum:0.4 s	PASS
Channel separation	FCC Part 15:2007	ANSI C63.4: 2003	Channel separation at least 1MHz	PASS
Hopping channel No.	FCC Part 15:2007	ANSI C63.4: 2003	Total 79 channels	PASS
20-dB Bandwidth	FCC Part 15:2007	ANSI C63.4: 2003	Note	PASS
RF Exposure Test	FCC Part 15:2007	ANSI C63.4: 2003	Note	PASS
Mains Terminal Disturbance Voltage, 150kHz to 30MHz	FCC Part 15:2007	ANSI C63.4: 2003	N/A	PASS
Radiation Emission, 30MHz to 25GHz	FCC Part 15:2007	ANSI C63.4: 2003	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 test items were according to the FCC Public Notice DA 00-705 .

4 General Information

4.1 Client Information

Applicant: Shenzhen Adition Audio Science & Technology CO.,LTD.
Address of Applicant: Mingzhuo Industry Park,Guangming Main Street,Guangming
New District,Shenzhen,China

Manufacturer: Shenzhen Adition Audio Science & Technology CO.,LTD.
Address of Manufacturer: Mingzhuo Industry Park,Guangming Main Street,Guangming
New District,Shenzhen,China

4.2 General Description of E.U.T.

Product description: Portable wireless speaker
Model No.: BS635,AURA BLUNOTE
Model Different: All models are identical in interior structure,electrical circuits,
components and appearance with different model names for the
marketing requirement.BS635 is the test sample.
Modulation Technique : GFSK
Working Frequency: 2402MHz-2483MHz
Channel Separation: 1MHz
Antenna Gain: 1.37dBi

4.3 Details of E.U.T.

Power Supply: DC 5.0V 1.0A powered from adapter(INPUT : AC 100-
240V,50-60Hz ,0.15A)

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 wireless speaker. 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,May 26,2011.

- **IC – Registration No.: 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 IC:7760A, August.03,2010.

4.7 Test Location

All Emission tests were performed at:-

1/F, Fukangtai Building, West Baima Rd., Songgang Street, Baoan District, Shenzhen 518105, Guangdong, 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	MY451149 43	W2008001	9k-26.5GHz	Aug-03 2010	Aug-02 2011	Wws200 81596	±1dB
Trilog Broadband Antenne	SCHWARZB ECK MESS- ELEKTROM / VULB9163	336	W2008002	30-3000 MHz	Aug-03 2010	Aug-02 2011		±1dB
Broad-band Horn Antenna	SCHWARZB ECK MESS- ELEKTROM / BBHA 9120D(1201)	667	W2008003	1-18GHz	Aug-03 2010	Aug-02 2011		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-03 2010	Aug-02 2011		±1.2dB
10m Coaxial Cable with N-male Connectors	SCHWARZB ECK MESS- ELEKTROM / AK 9515 H	-	-	-	Aug-03 2010	Aug-02 2011		-
10m 50 Ohm Coaxial Cable with N-plug, individual length	SCHWARZB ECK MESS- ELEKTROM / AK 9513				Aug-03 2010	Aug-02 2011		
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-03 2010	Aug-02 2011	Wws200 80942	±1dB
EMI Receiver	Beijingkehua n	KH3931		9k-1GHz	Aug-03 2010	Aug-02 2011		
Two-Line V-Network	ROHDE&SC HWARZ/ ENV216	100115	W2005002	50Ω/50μH	Aug-03 2010	Aug-02 2011	Wws200 80941	±10%
Absorbing Clamp	ROHDE&SC HWARZ/ MDS-21	100205	W2005003	impandance50 Ω loss : 17 dB	Aug-03 2010	Aug-02 2011	Wws200 80943	±1dB
10m 50	SCHWARZB				Aug-03	Aug-02		

Equipment Name	Manufacturer Model	Equipment No	Internal No	Specification	Cal. Date	Due Date	Cert. No	Uncertainty
Ohm Coaxial Cable with N-plug, individual length	ECK MESS-ELEKTROM / AK 9514				2010	2011		
Digital Power Analyzer	Em Test AG/Switzerland/ DPA 500	V07451 03095	W2008012	Power: 2000VA Vol-range: 0-300V Freq_range: 10-80Hz	Aug-03 2010	Aug-02 2011	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-03 2010	Aug-02 2011	Wwc200 82400	7.5A current will be changed in $V_m=1.5V$
RF Generator	TESEQ GmbH/ NSG4070	25781	W2008008	Fraq-range: 9K-1GHz RF voltage: -60 dBm-+10dBm	Aug-03 2010	Aug-02 2011	Wws200 81890	Power_freq distinguish0.1Hz RFelectricity distinguish 0.1 B
CDN M-Type	TESEQ GmbH/ CDN M016	25112	W2008009	Voltage correct factor 9.5 dB	Aug-03 2010	Aug-02 2011	Wwc200 82396	150K-80MHz: $\pm 1dB$ 80-230MHz:-2-+3dB
EM-Clamp	TESEQ GmbH/ KEMZ 801	25453	W2008010	Freq_range: 0.15-1000 MHz	Aug-03 2010	Aug-02 2011	Wwc200 82397	0.3-400 MHz: $\pm 4dB$ Other freq: $\pm 5dB$
Attenuator 6dB	TESEQ GmbH/ ATN6050	25365			Aug-03 2010	Aug-02 2011	Wws200 81597	
All Modules Generator	SCHAFFNER/6150	34579	W2008006	voltage:200V-4.4KV Pulse current: 100A-2.2KA	Aug-03 2010	Aug-02 2011	Wwc200 82401	voltage: $\pm 10\%$ Pulse current: $\pm 10\%$
Capacitive Coupling Clamp	SCHAFFNER/ CDN 8014	25311			Aug-03 2010	Aug-02 2011	Wwc200 82398	-

Equipment Name	Manufacturer Model	Equipment No	Internal No	Specification	Cal. Date	Due Date	Cert. No	Uncertainty
Signal and Data Line Coupling Network	SCHAFFNER/ CDN 117	25627	W2008011	1.2/50 μ S	Aug-03 2010	Aug-02 2011	Wwc200 82399	-
AC Power Supply	TONGYUN/ DTDGC-4				Aug-03-10	Aug-02-11	Wws200 80944	-
Exposure Level Tester ELT-400	Narda Safety TEST Solutions/230 4/03	M-0155	w2008022	Test freq range: 1—400kHz	Aug-03 2010	Aug-02 2011	Wwd200 81191	Test uncertainty : 1—120kHz:±1.83%, 120 kHz-400 kHz: ±4.06%
Magnetic Field Probe 100cm ²	Narda Safety TEST Solutions/230 0/90.10	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 10kHz-30MHz	Beijing Dazhi / ZN30900A	-	-	10kHz-30MHz	Aug-03 2010	Aug-02 2011		±1dB

6 Conducted Emission Test

Test Requirement:	FCC Part15 Paragraph 15.207
Test Method:	Based on FCC Part15 Paragraph 15.207
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

6.1 Test Equipment

Please refer to Section 5 this report.

6.2 Measurement Uncertainty

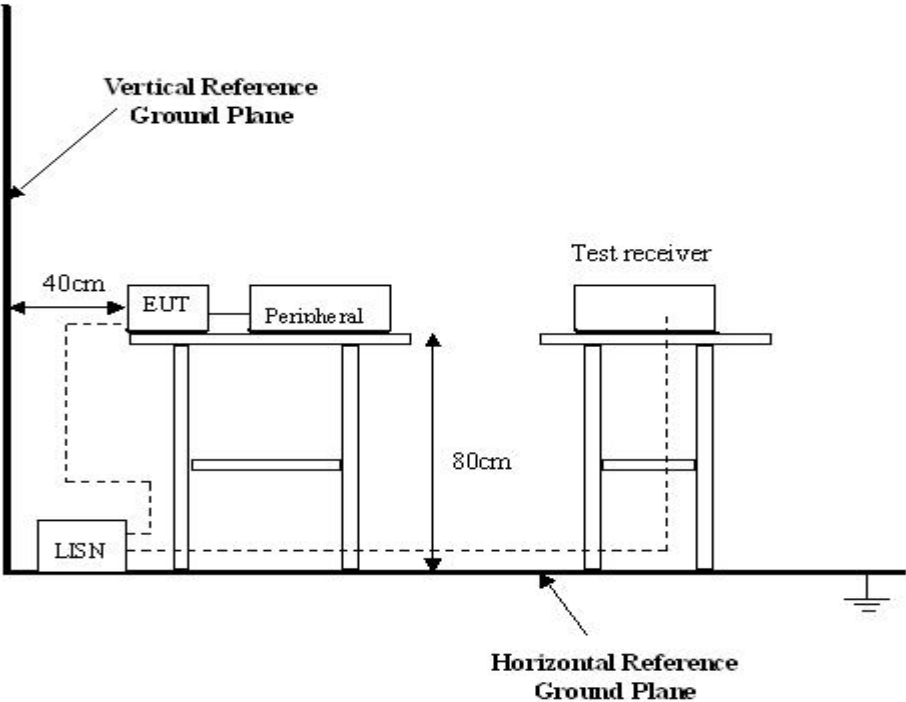
Based on ANSI C63.4:2003, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of a conduction emissions measurement at WALTEK SERVICES EMC Lab is +/-2.66 dB.

6.3 Test Procedure

1. The EUT was connected with signal generator and placed on a table.
2. The EUT was tested according to ANSI C63.4:2003. 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.

6.4 Conducted Test Setup

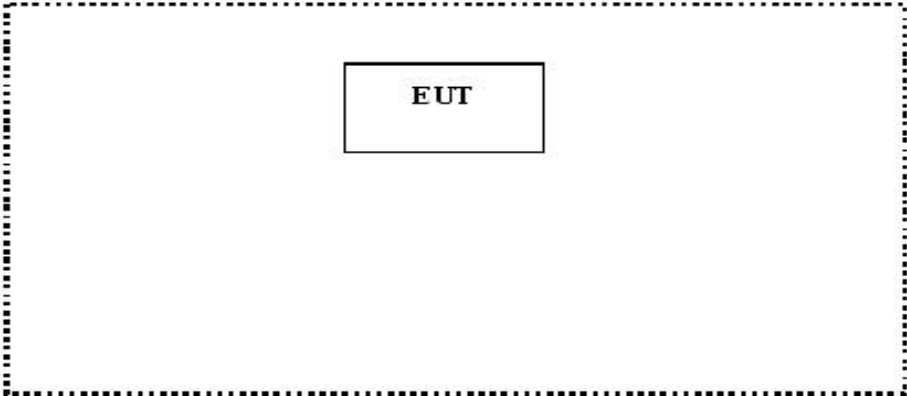
The conducted emission tests were performed using the setup accordance with the ANSI C63.4:2003, The specification used in this report was the FCC Part15 Paragraph 15.207 limits.



6.5 EUT Operating Condition

Operating condition is according to ANSI C63.4:2003.

- 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.



6.6 Conducted Emission Limits

66-56 dB μ V between 0.15MHz & 0.5MHz

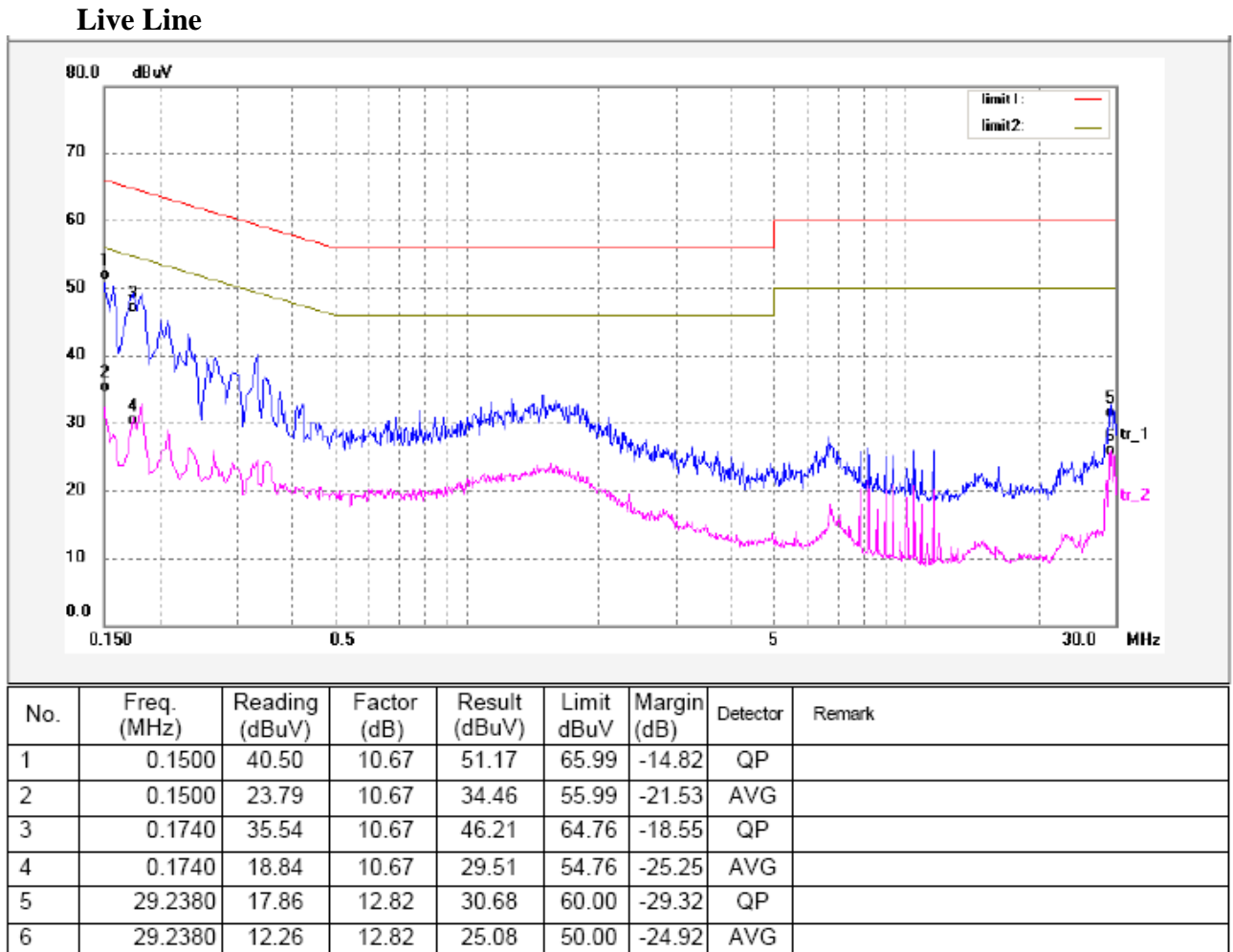
56 dB μ V between 0.5MHz & 5MHz

60 dB μ V between 5MHz & 30MHz

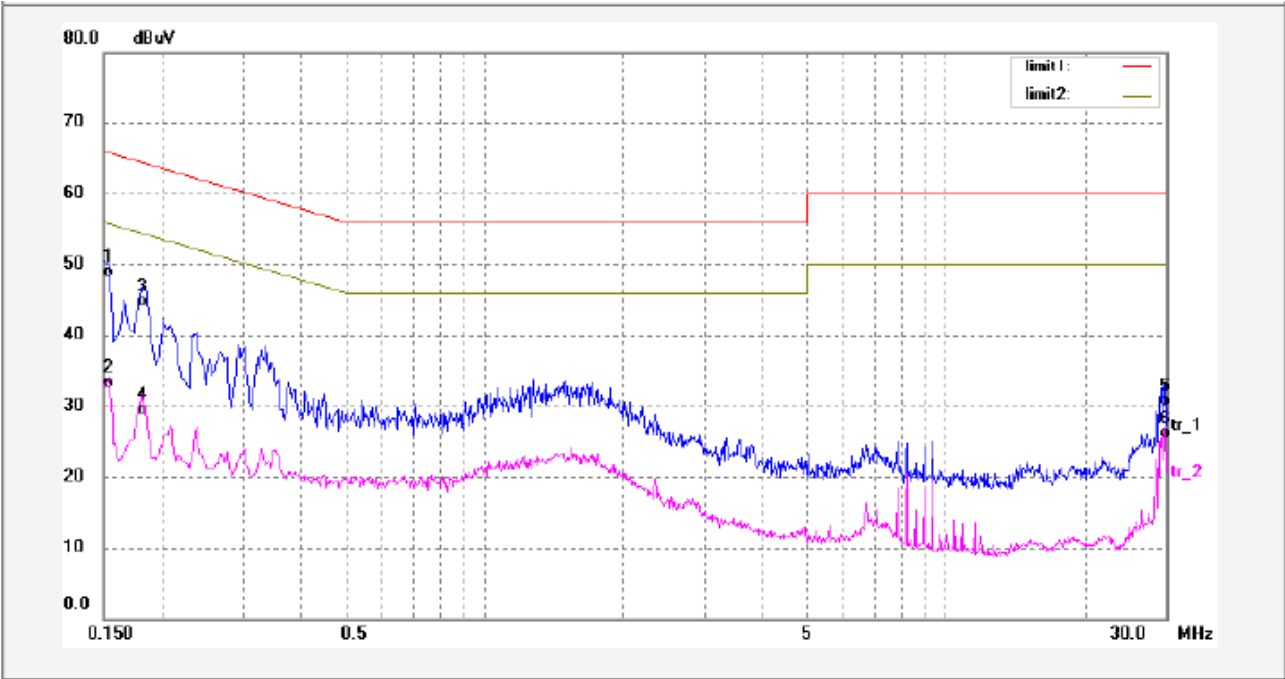
Note: In the above limits, the tighter limit applies at the band edges.

6.7 Conducted Emission Test Data

Remark: the EUT was tested in Bluetooth link mode.



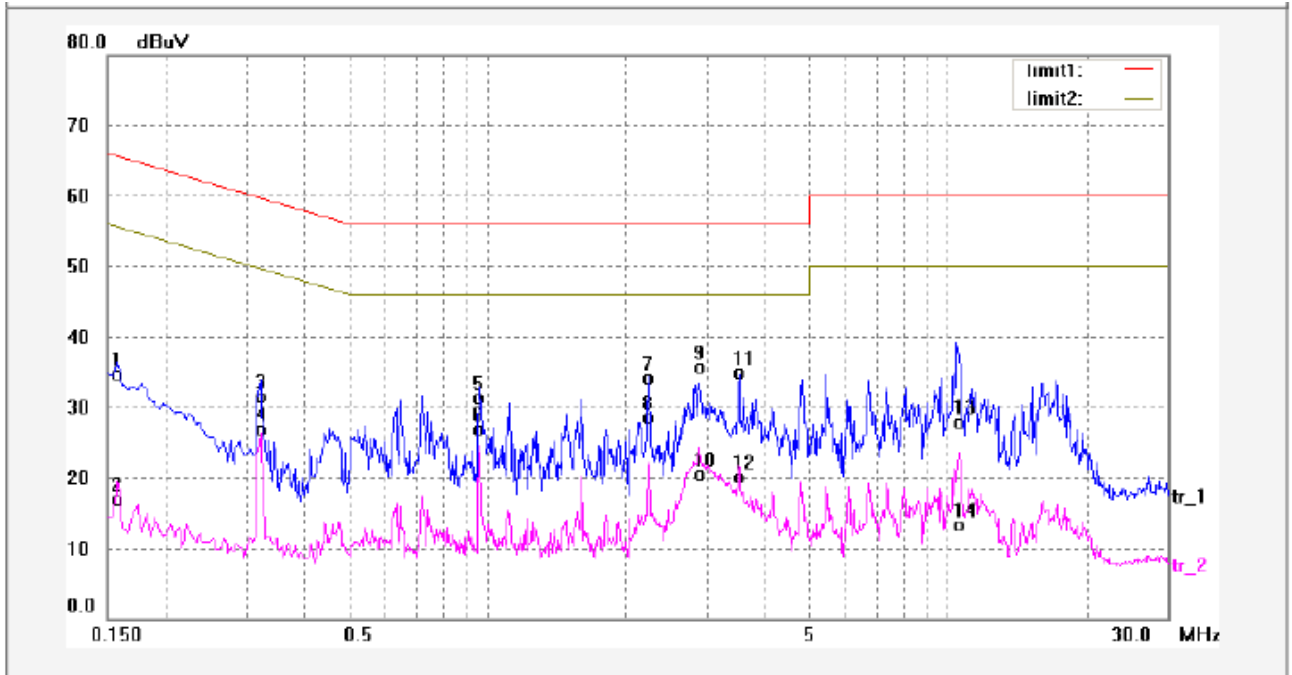
Neutral Line



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Margin (dB)	Detector	Remark
1	0.1500	37.47	10.67	48.14	65.99	-17.85	QP	
2	0.1500	21.80	10.67	32.47	55.99	-23.52	AVG	
3	0.1835	33.24	10.66	43.90	64.32	-20.42	QP	
4	0.1835	18.14	10.66	28.80	54.32	-25.52	AVG	
5	29.9100	17.11	12.77	29.88	60.00	-30.12	QP	
6	29.9100	12.48	12.77	25.25	50.00	-24.75	AVG	

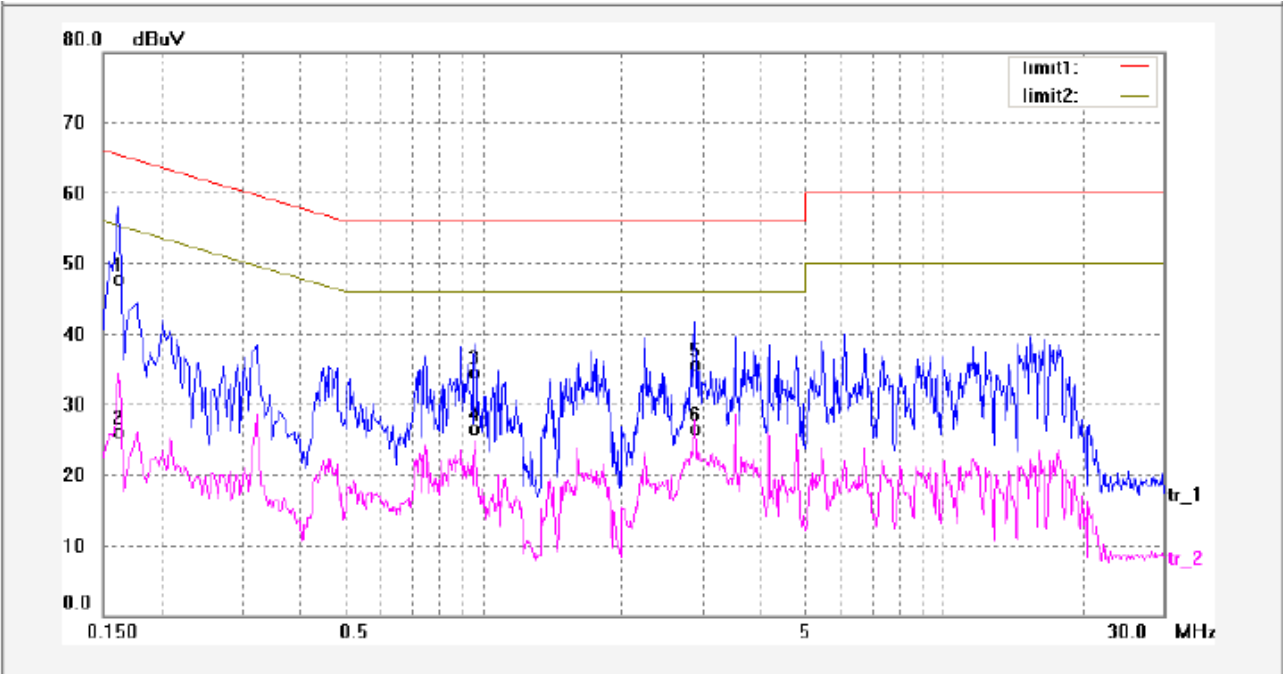
Remark: the EUT was tested in Line in mode.

Live Line



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Margin (dB)	Detector	Remark
1	0.1580	23.59	10.35	33.94	65.56	-31.62	QP	
2	0.1580	5.78	10.35	16.13	55.56	-39.43	AVG	
3	0.3220	20.30	10.35	30.65	59.65	-29.00	QP	
4	0.3220	15.76	10.35	26.11	49.65	-23.54	AVG	
5	0.9660	20.09	10.36	30.45	56.00	-25.55	QP	
6	0.9660	15.68	10.36	26.04	46.00	-19.96	AVG	
7	2.2460	22.87	10.37	33.24	56.00	-22.76	QP	
8	2.2460	17.25	10.37	27.62	46.00	-18.38	AVG	
9	2.8900	24.51	10.38	34.89	56.00	-21.11	QP	
10	2.8900	9.32	10.38	19.70	46.00	-26.30	AVG	
11	3.5340	23.65	10.39	34.04	56.00	-21.96	QP	
12	3.5340	8.97	10.39	19.36	46.00	-26.64	AVG	
13	10.4940	16.73	10.46	27.19	60.00	-32.81	QP	
14	10.4940	2.05	10.46	12.51	50.00	-37.49	AVG	

Neutral Line



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Margin (dB)	Detector	Remark
1	0.1620	36.55	10.35	46.90	65.36	-18.46	QP	
2	0.1620	14.96	10.35	25.31	55.36	-30.05	AVG	
3	0.9620	23.27	10.36	33.63	56.00	-22.37	QP	
4	0.9620	15.26	10.36	25.62	46.00	-20.38	AVG	
5	2.8900	24.61	10.38	34.99	56.00	-21.01	QP	
6	2.8900	15.38	10.38	25.76	46.00	-20.24	AVG	

6.8 Conducted Emission Test Setup View



7 Radiation Emission Test

Test Requirement:	FCC Part15 Paragraph 15.247
Test Method:	Based on ANSI 63.4:2003
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

7.1 Test Equipment

Please refer to Section 5 this report.

7.2 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.

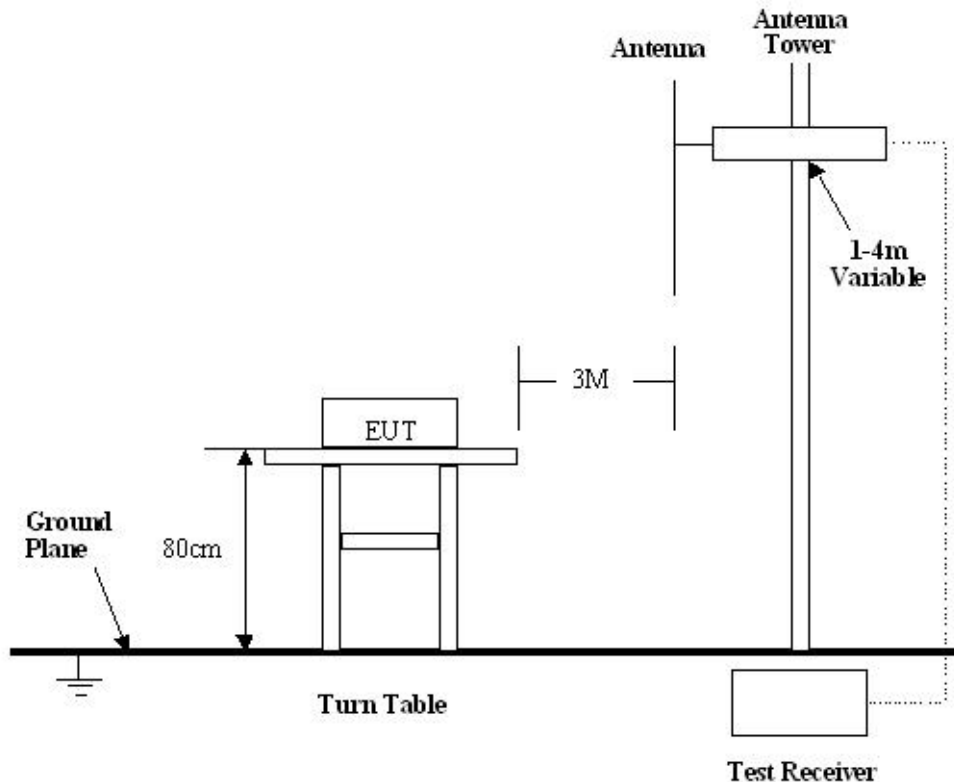
Based on ANSI C63.4:2003, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of a radiation emissions measurement at WALTEK SERVICES EMC Lab is +/-5.03 dB.

7.3 Test Procedure

1. The EUT was used the ac 120V in the equipment under test for radiated emissions test.
2. The radiation emission should be tested under lying on the table as normal use.
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.

7.4 Radiated Test Setup

The radiated emission tests were performed in the 3m Semi-Anechoic Chamber test site, using the setup accordance with the ANSI C63.4:2003, The specification used in this report was the FCC Part15 Paragraph 15.209 limits and Paragraph 15.247 limits.



7.5 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

7.6 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:

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

7.7 Summary of Test Results

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

7.8 EUT Operating Condition

The same as section 6.4 of this report.

Let the EUT work in test mode and test it.

7.9 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.

7.10 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 presselector was accounted
For in the spectrum analyser meter reading.

Example:

Freq(MHz) Meter Reading +ACF=FS

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

7.11 Radiated Emission Data

A. Test Item:	Radiated Emission Data
Test Voltage:	Adapter input 120.0V
Test Mode:	TX On
Temperature:	25.0 °C
Humidity:	51%RH
Test Result:	PASS

Remark:

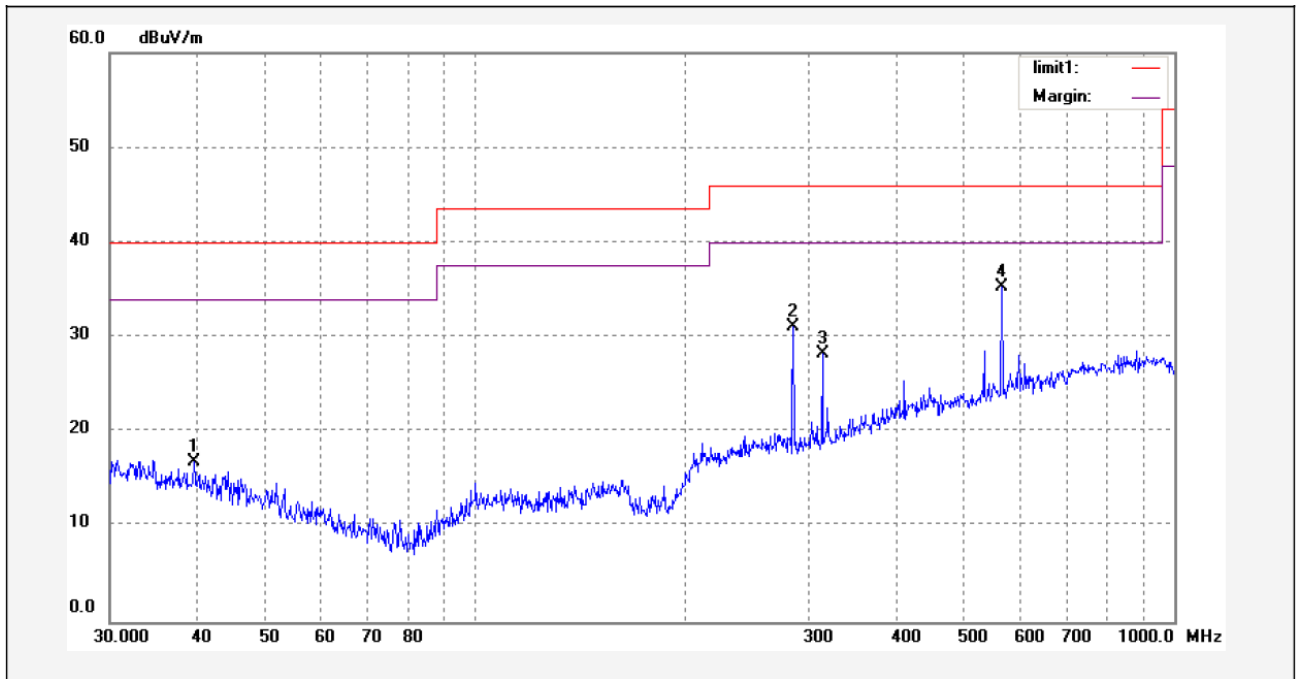
The EUT was pre-tested in Bluetooth link mode, the worst case was continuously transmit mode.so the data show was the continuously transmit mode only.The continuously transmit mode and continuously receive mode were controlled by the software.

7.11.1 Test mode: continuously receive mode.

Remark: the EUT was pre-tested at the high,middle and low channel, and the worst case was the low Channel,so the data show was the low channel only.

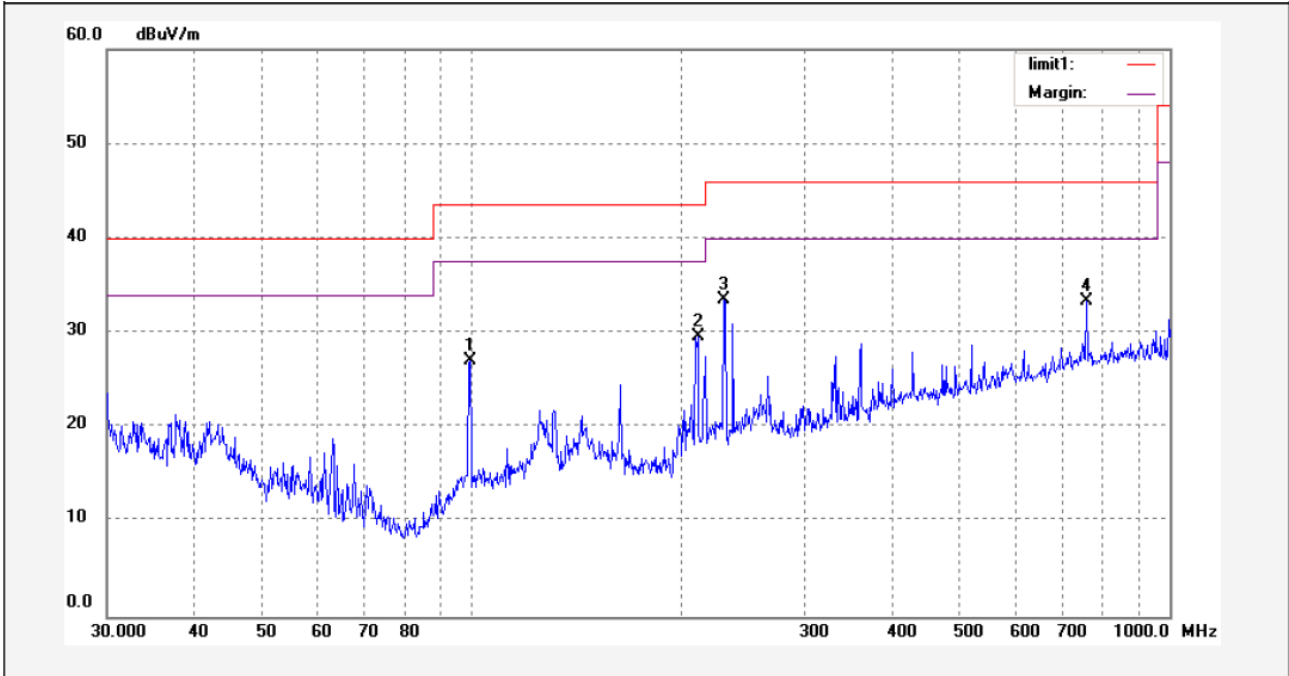
Test frequency Range: 30-1000MHz

Vertical:



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	39.5977	0.68	16.13	16.81	40.00	-23.19	peak	
2	285.2611	13.03	18.04	31.07	46.00	-14.93	peak	
3	313.6482	9.25	19.00	28.25	46.00	-17.75	peak	
4	565.9776	11.55	23.74	35.29	46.00	-10.71	peak	

Horizontal

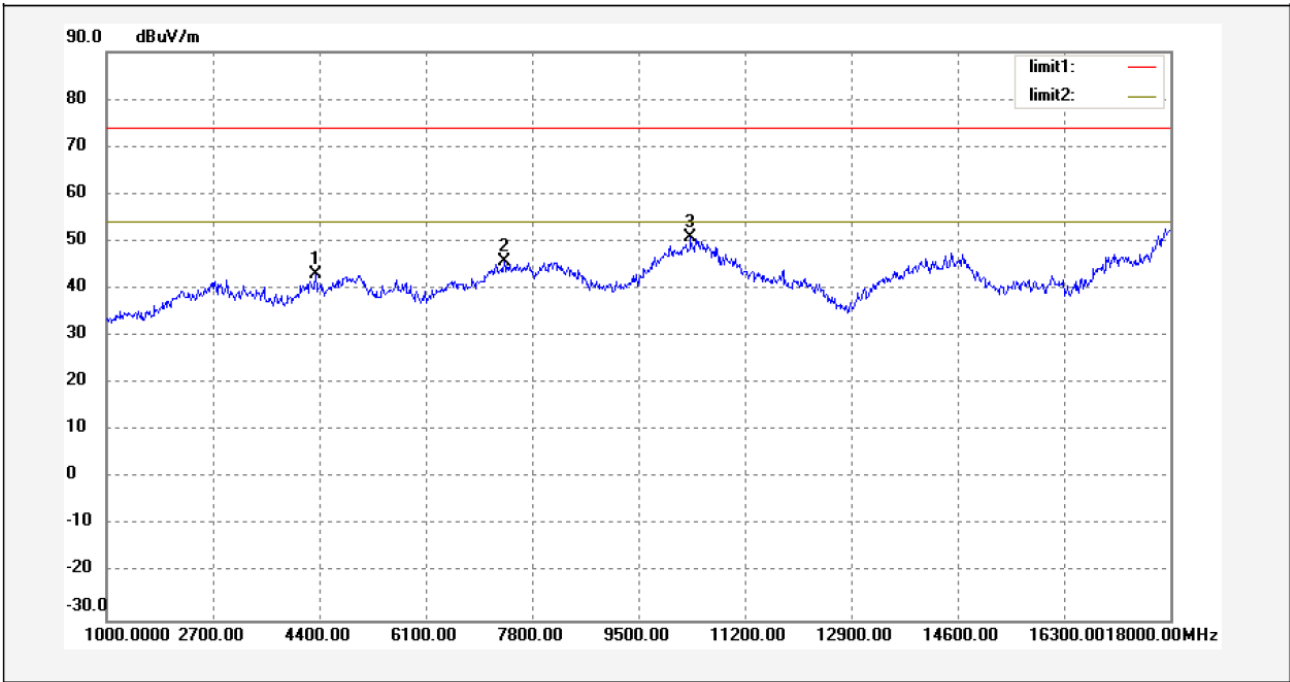


No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	99.4177	14.12	12.93	27.05	43.50	-16.45	peak	
2	210.8690	12.91	16.73	29.64	43.50	-13.86	peak	
3	229.4220	16.70	16.85	33.55	46.00	-12.45	peak	
4	760.2867	7.95	25.44	33.39	46.00	-12.61	peak	

Test frequency Range: Above 1GHz

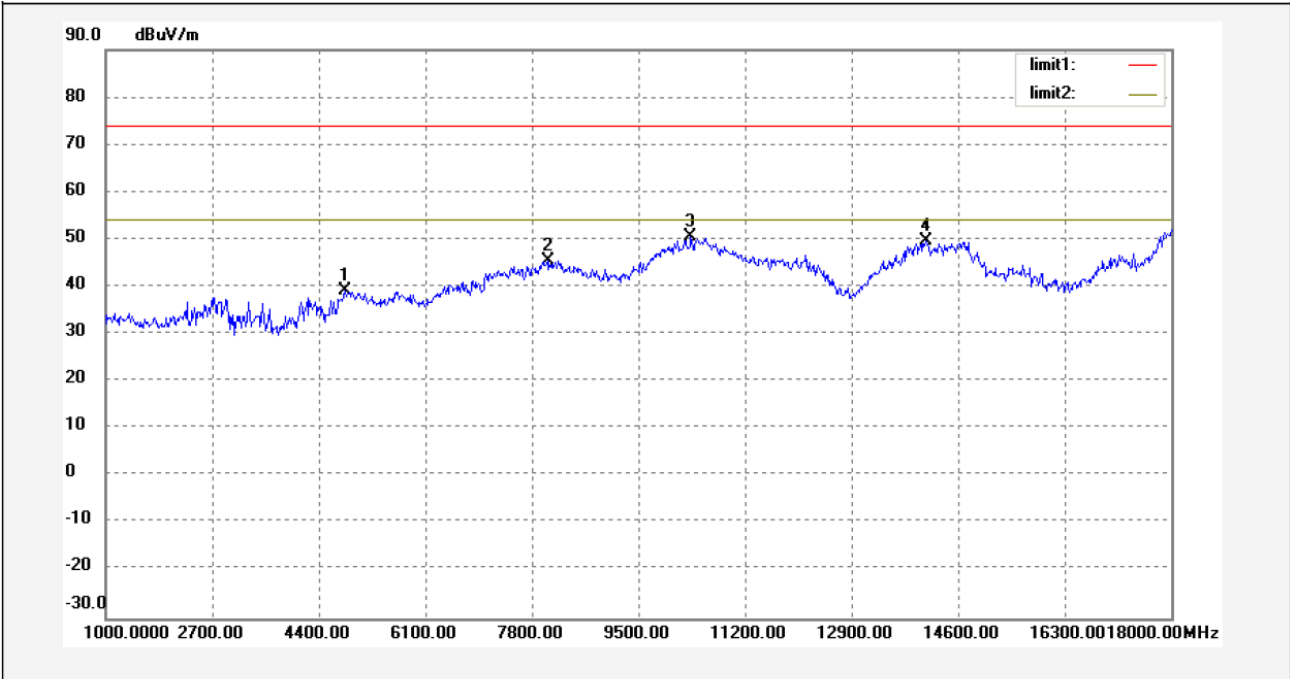
Remark: above 18GHz,the emissions below the noise level,so the data was not perfomed.

Vertical



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	4338.677	35.84	7.16	43.00	74.00	-31.00	peak	
2	7353.707	29.64	16.06	45.70	74.00	-28.30	peak	
3	10334.669	30.10	20.72	50.82	74.00	-23.18	peak	

Horizontal



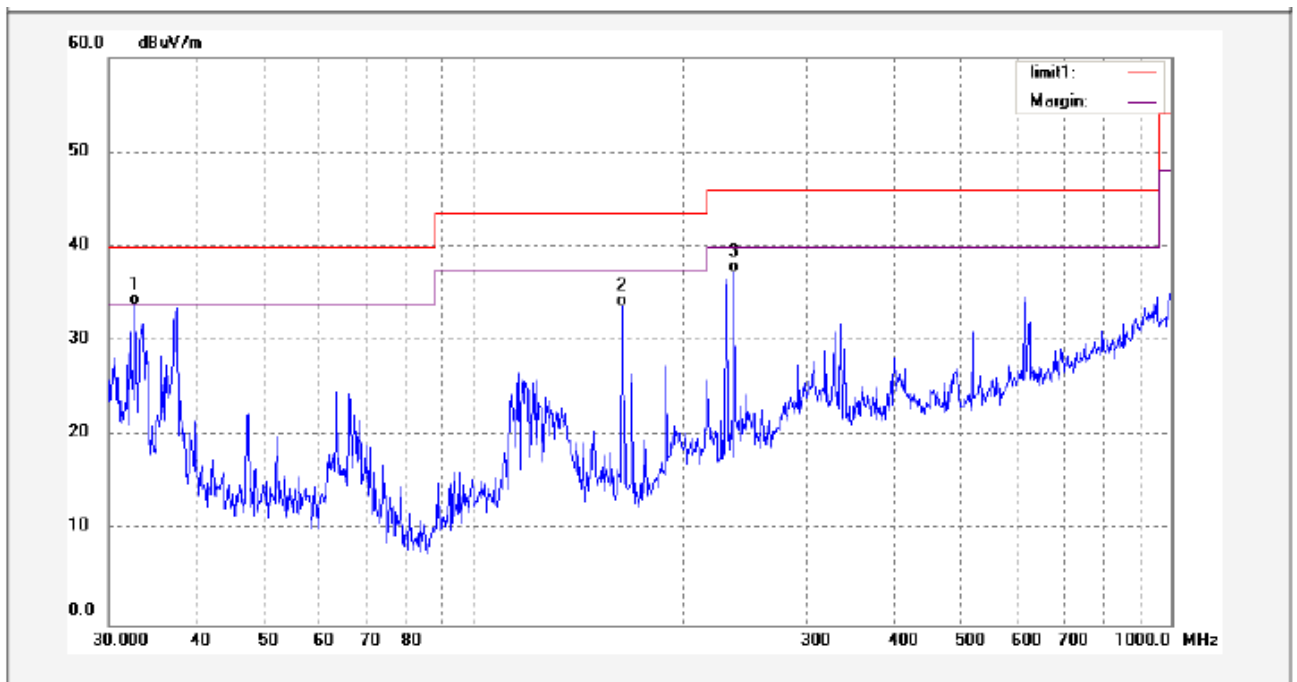
No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	4815.631	34.38	4.77	39.15	74.00	-34.85	peak	
2	8052.104	30.68	14.91	45.59	74.00	-28.41	peak	
3	10334.669	32.56	18.05	50.61	74.00	-23.39	peak	
4	14082.164	26.66	23.01	49.67	74.00	-24.33	peak	

7.11.2 Test mode: continuously transmit mode.

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

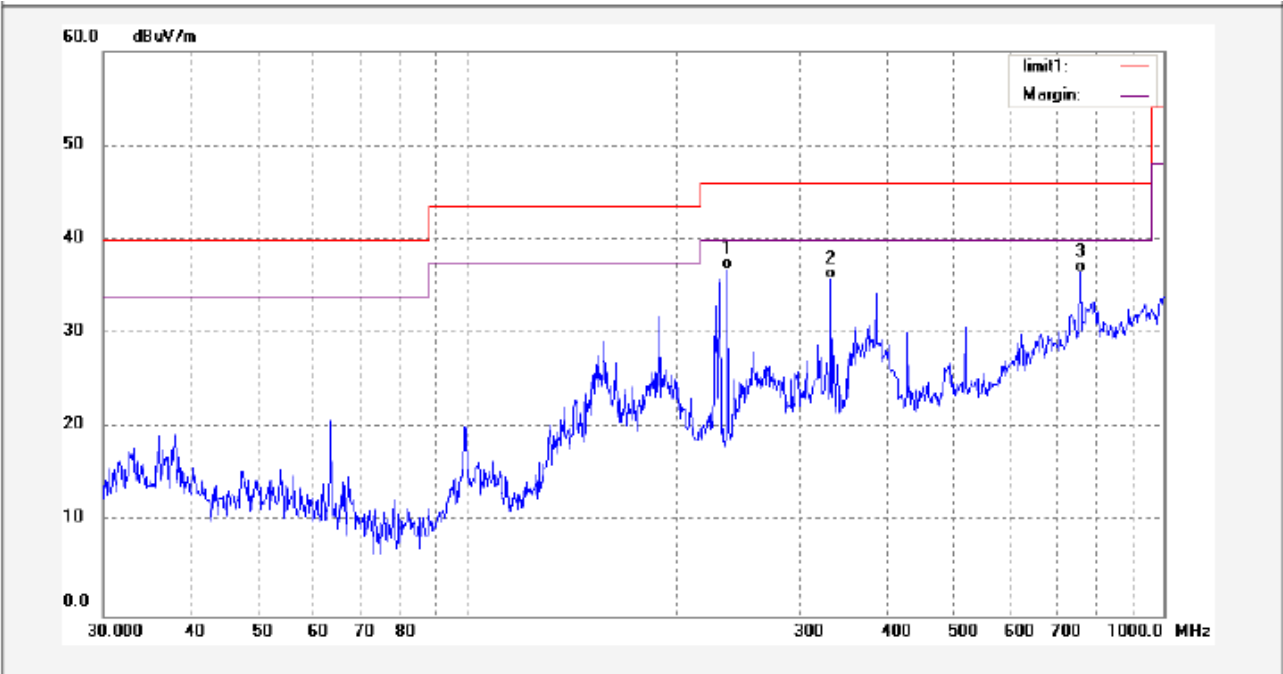
Test frequency Range:30-1000MHz

Vertical:



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	32.7544	17.31	16.57	33.88	40.00	-6.12	QP	
2	163.7366	21.95	11.78	33.73	43.50	-9.77	QP	
3	236.7928	21.65	15.66	37.31	46.00	-8.69	QP	

Horizontal :



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	236.7928	21.23	15.66	36.89	46.00	-9.11	QP	
2	332.9536	16.25	19.47	35.72	46.00	-10.28	QP	
3	760.2867	8.52	28.07	36.59	46.00	-9.41	QP	

Test frequency Range: above 1GHz

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							
2402.00	AV	Vertical	96.52		(Fund.)	1.2	150
4804.00	AV	Vertical	41.02	54.00	13.98	1.2	0
7206.00	AV	Vertical	35.23	54.00	19.73	1.5	120
9608.00	AV	Vertical	32.52	54.00	21.48	1.8	60
12010.00	AV	Vertical	31.25	54.00	22.75	1.6	90
14412.00	AV	Vertical	31.01	54.00	22.99	1.4	120
16814.00	AV	Vertical	30.02	54.00	23.98	1.7	100
19216.00	AV	Vertical	30.67	54.00	23.33	1.5	180
21618.00	AV	Vertical	29.63	54.00	24.34	1.6	120
24020.00	AV	Vertical	29.01	54.00	24.99	1.2	135
2402.00	AV	Horizontal	92.23		(Fund.)	1.2	120
4804.00	AV	Horizontal	41.12	54.00	12.88	1.2	150
7206.00	AV	Horizontal	36.21	54.00	17.79	1.5	120
9608.00	AV	Horizontal	34.25	54.00	19.75	1.2	180
12010.00	AV	Horizontal	33.21	54.00	20.79	1.5	135
14412.00	AV	Horizontal	31.25	54.00	22.75	1.2	120
16814.00	AV	Horizontal	30.74	54.00	23.26	1.5	180
19216.00	AV	Horizontal	32.01	54.00	21.99	1.8	60
21618.00	AV	Horizontal	31.53	54.00	22.47	1.2	90
24020.00	AV	Horizontal	30.01	54.00	23.99	1.5	90
2402.00	PK	Vertical	106.41		(Fund.)	1.5	180
4804.00	PK	Vertical	45.21	74.00	29.64	1.8	30
7206.00	PK	Vertical	40.01	74.00	33.99	1.6	110
9608.00	PK	Vertical	37.42	74.00	36.58	1.4	100
12010.00	PK	Vertical	36.21	74.00	37.79	1.2	90
14412.00	PK	Vertical	32.01	74.00	41.99	1.2	60
16814.00	PK	Vertical	33.21	74.00	40.79	1.4	90
19216.00	PK	Vertical	30.10	74.00	43.90	1.2	120
21618.00	PK	Vertical	29.01	74.00	44.99	1.7	120
24020.00	PK	Vertical	29.01	74.00	44.99	1.4	135
2402.00	PK	Horizontal	102.32		(Fund.)	1.8	180
4804.00	PK	Horizontal	41.24	74.00	32.76	1.8	60
7206.00	PK	Horizontal	38.25	74.00	35.75	1.8	120
9608.00	PK	Horizontal	36.98	74.00	37.02	1.2	180
12010.00	PK	Horizontal	35.69	74.00	38.31	1.2	90
14412.00	PK	Horizontal	35.62	74.00	38.38	1.5	90
16814.00	PK	Horizontal	33.35	74.00	40.65	1.8	150
19216.00	PK	Horizontal	33.01	74.00	40.99	1.5	150
21618.00	PK	Horizontal	30.21	74.00	43.79	1.2	120

24020.00	PK	Horizontal	30.01	74.00	43.99	1.2	180
Middle frequency							
2441.00	AV	Vertical	92.21		(Fund.)	1.5	0
4882.00	AV	Vertical	39.02	54.00	14.98	1.2	90
7323.00	AV	Vertical	35.21	54.00	18.71	1.0	90
9764.00	AV	Vertical	33.33	54.00	20.67	1.2	0
12205.00	AV	Vertical	32.02	54.00	21.98	1.2	0
14646.00	AV	Vertical	32.01	54.00	21.99	1.2	150
17087.00	AV	Vertical	30.26	54.00	23.74	1.5	0
19528.00	AV	Vertical	30.01	54.00	23.99	1.5	0
21969.00	AV	Vertical	29.02	54.00	24.98	1.8	180
24410.00	AV	Vertical	28.23	54.00	25.77	1.2	90
2441.00	AV	Horizontal	92.96		(Fund.)	1.0	120
4882.00	AV	Horizontal	35.69	54.00	18.31	1.0	90
7323.00	AV	Horizontal	34.25	54.00	19.75	1.5	270
9764.00	AV	Horizontal	33.52	54.00	20.48	1.2	120
12205.00	AV	Horizontal	31.21	54.00	22.79	1.2	150
14646.00	AV	Horizontal	30.25	54.00	23.75	1.4	180
17087.00	AV	Horizontal	29.25	54.00	24.75	1.6	135
19528.00	AV	Horizontal	28.36	54.00	25.64	1.4	90
21969.00	AV	Horizontal	28.02	54.00	25.98	1.2	150
24410.00	AV	Horizontal	28.02	54.00	25.98	1.7	120
2441.00	PK	Vertical	107.52		(Fund.)	1.0	0
4882.00	PK	Vertical	44.21	74.00	29.79	1.1	90
7323.00	PK	Vertical	38.25	74.00	35.75	1.4	100
9764.00	PK	Vertical	37.94	74.00	36.06	1.3	120
12205.00	PK	Vertical	37.87	74.00	36.13	1.7	180
14646.00	PK	Vertical	36.10	74.00	38.90	1.2	0
17087.00	PK	Vertical	32.03	74.00	41.97	1.4	0
19528.00	PK	Vertical	30.21	74.00	43.79	1.5	120
21969.00	PK	Vertical	28.30	74.00	45.70	1.5	135
24410.00	PK	Vertical	28.30	74.00	45.70	1.2	120
2441.00	PK	Horizontal	103.45		(Fund.)	1.0	0
4882.00	PK	Horizontal	43.56	74.00	30.44	1.7	45
7323.00	PK	Horizontal	41.51	74.00	32.49	1.6	90
9764.00	PK	Horizontal	40.14	74.00	33.86	1.5	60
12205.00	PK	Horizontal	39.36	74.00	34.64	1.4	150
14646.00	PK	Horizontal	37.44	74.00	36.56	1.2	150
17087.00	PK	Horizontal	34.21	74.00	39.79	1.1	120
19528.00	PK	Horizontal	38.86	74.00	35.14	1.5	150
21969.00	PK	Horizontal	34.21	74.00	39.79	1.1	0
24410.00	PK	Horizontal	33.33	74.00	40.67	1.6	135
High frequency							
2480.00	AV	Vertical	93.42		(Fund.)	1.0	0

4960.00	AV	Vertical	36.25	54.00	17.75	1.2	45
7440.00	AV	Vertical	32.25	54.00	21.75	1.2	120
9920.00	AV	Vertical	30.26	54.00	23.74	1.4	60
12400.00	AV	Vertical	30.55	54.00	23.45	1.5	135
14880.00	AV	Vertical	30.34	54.00	23.66	1.8	120
17360.00	AV	Vertical	30.62	54.00	23.38	1.1	100
19840.00	AV	Vertical	30.13	54.00	23.87	1.1	60
22320.00	AV	Vertical	30.27	54.00	23.73	1.4	0
24800.00	AV	Vertical	28.25	54.00	25.75	1.5	60
2480.00	AV	Horizontal	92.51		(Fund.)	1.0	0
4960.00	AV	Horizontal	34.56	54.00	19.44	1.8	120
7440.00	AV	Horizontal	30.35	54.00	23.65	1.2	60
9920.00	AV	Horizontal	31.47	54.00	22.53	1.5	100
12400.00	AV	Horizontal	31.89	54.00	22.11	1.2	60
14880.00	AV	Horizontal	32.42	54.00	21.58	1.2	120
17360.00	AV	Horizontal	31.17	54.00	22.83	1.4	100
19840.00	AV	Horizontal	32.55	54.00	21.45	1.8	100
22320.00	AV	Horizontal	32.86	54.00	21.14	1.3	100
24800.00	AV	Horizontal	30.25	54.00	22.75	1.6	10
2480.00	PK	Vertical	107.53		(Fund.)	1.0	0
4960.00	PK	Vertical	44.21	74.00	29.79	1.2	60
7440.00	PK	Vertical	35.62	74.00	38.38	1.8	90
9920.00	PK	Vertical	35.35	74.00	38.65	1.5	180
12400.00	PK	Vertical	35.56	74.00	38.44	1.4	60
14880.00	PK	Vertical	34.21	74.00	39.79	1.2	60
17360.00	PK	Vertical	33.54	74.00	40.46	1.2	135
19840.00	PK	Vertical	36.26	74.00	37.74	1.2	120
22320.00	PK	Vertical	36.73	74.00	37.27	1.6	60
24800.00	PK	Vertical	30.21	74.00	43.99	1.4	90
2480.00	PK	Horizontal	93.64		(Fund.)	1.1	60
4960.00	PK	Horizontal	42.58	74.00	31.42	1.4	90
7440.00	PK	Horizontal	38.64	74.00	35.36	1.5	60
9920.00	PK	Horizontal	35.37	74.00	38.63	1.3	0
12400.00	PK	Horizontal	35.52	74.00	38.48	1.2	135
14880.00	PK	Horizontal	35.26	74.00	38.74	1.7	0
17360.00	PK	Horizontal	36.41	74.00	37.59	1.8	180
19840.00	PK	Horizontal	32.41	74.00	41.59	1.5	60
22320.00	PK	Horizontal	31.11	74.00	42.89	1.8	120
24800.00	PK	Horizontal	28.21	74.00	45.79	1.0	60

8 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 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.

9 Maximum Peak Output Power

Test Requirement:	FCC Part15 Paragraph 15.247
Test Method:	Based on ANSI 63.4:2003
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 1W(30dBm)

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.

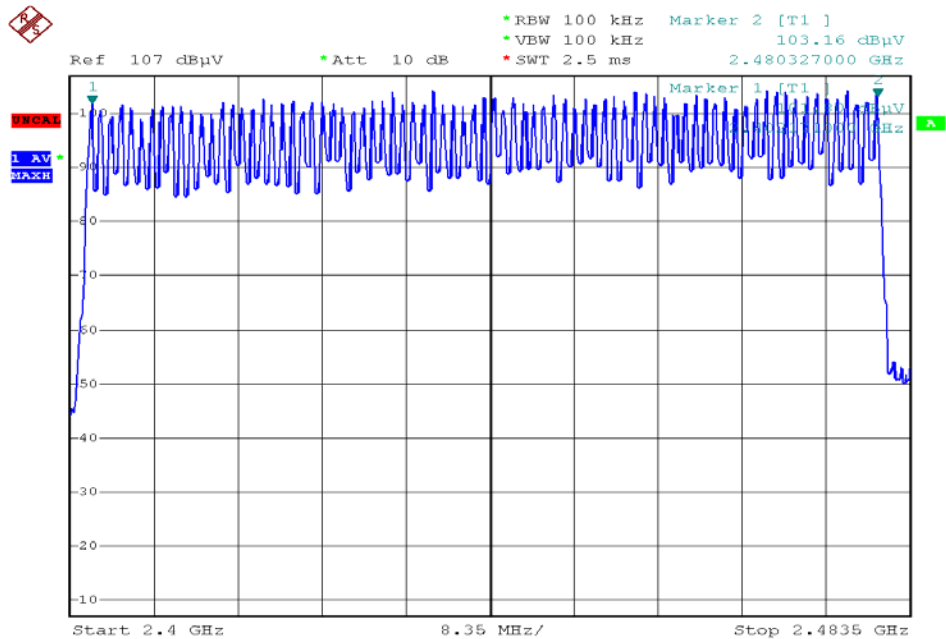
Test Result: The unit does meet the FCC requirements.

Test Channel	Fundamental Frequency(MHz)	Output Power (mW)	Limit (W)	Power output level
Lower	2402	1.32	1	conducted
Middle	2441	1.32	1	conducted
Upper	2480	1.30	1	conducted

10 Hopping Channel Number

Test Requirement:	FCC Part15 C
Test Method:	Based on FCC Part15 Paragraph 15.247
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 79 channels. The unit does meet the FCC requirements.

Please refer the graph as below:



11 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: 25.5 °C
 Humidity: 51 % RH
 Barometric Pressure: 1012 mbar

EUT Operation Condition:

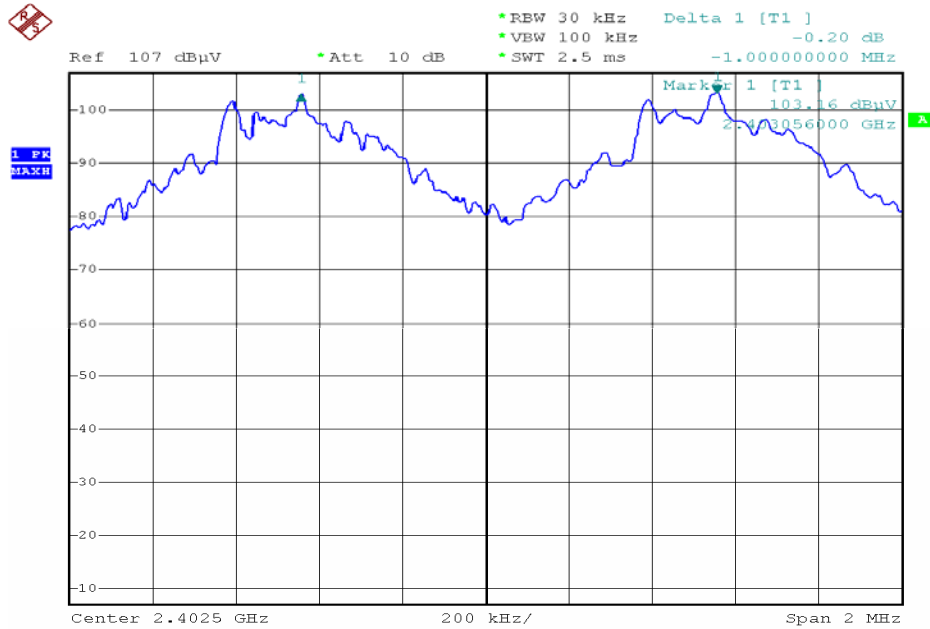
The EUT was programmed to be in continuously transmitting mode.

Test Result: PASS

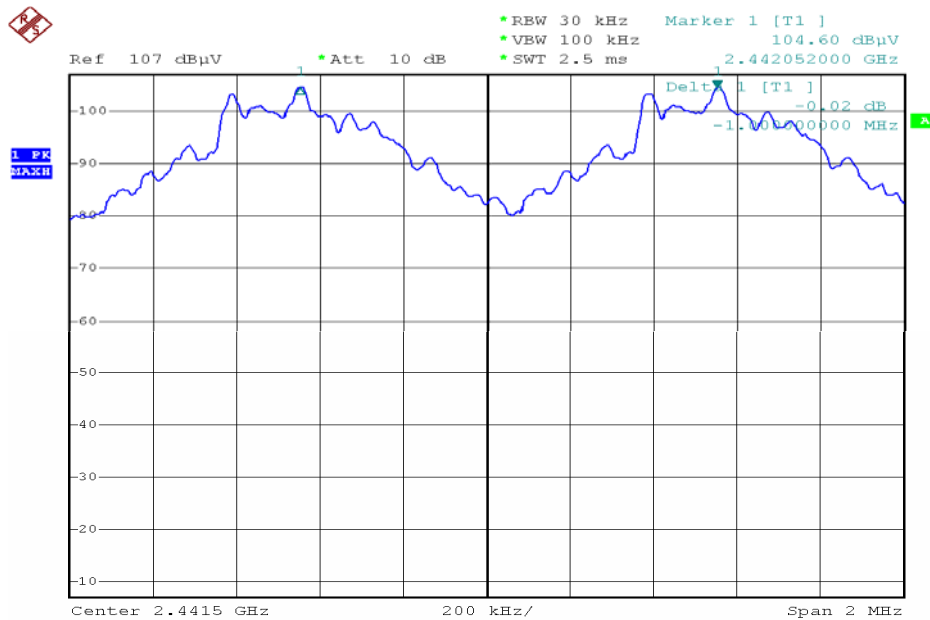
Test Channel	Channel Separation	PASS/FAIL
Lower Channels	1MHz	Pass
Middle Channels	1MHz	Pass
Upper Channels	1MHz	Pass

Please refer to the below photos for more details

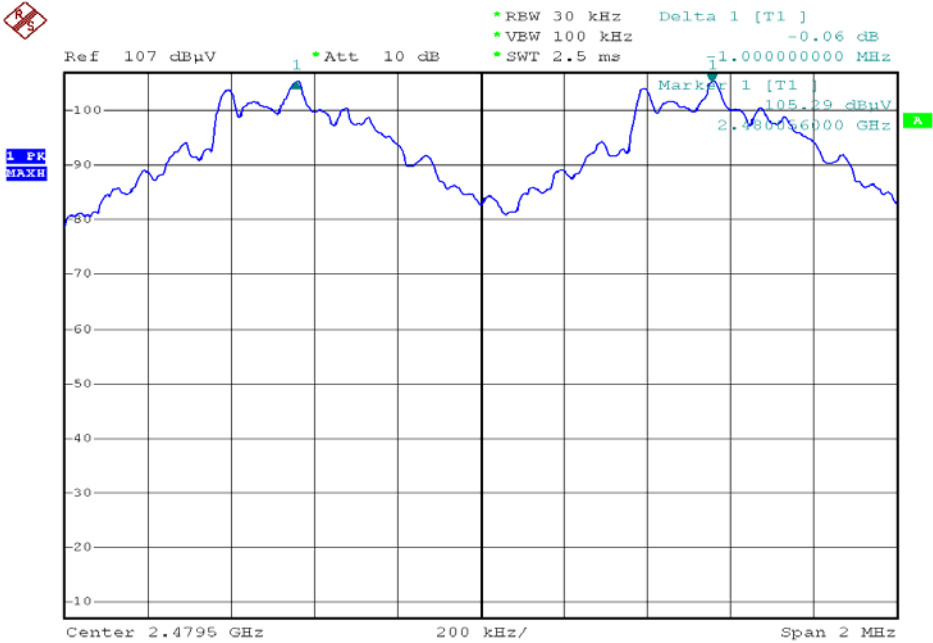
Lower Channel 2402MHz



Middle Channel 2441MHz



Upper Channel 2480MHz



12 Dwell time

11.1 Definition:

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 0 Hz, measure the maximum time duration of one single pulse. Set the EUT for DH5, DH3 and DH1 packet transmitting.

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 .

11.3 Test Result: PASS

Please refer to the below photos for more details.

Channel 00 2402MHz

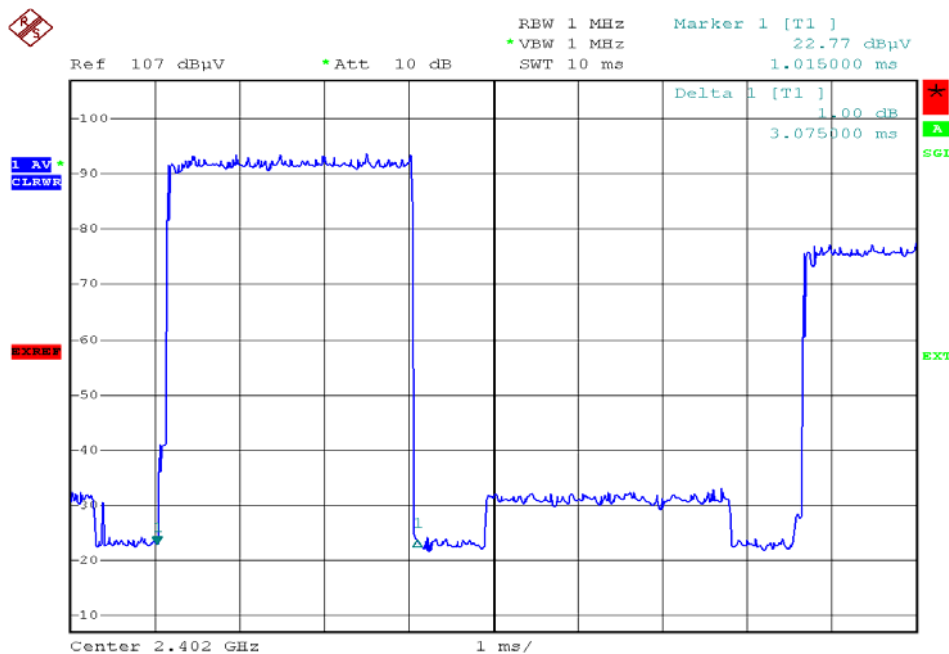
Dwell time of each occupation in this channel as follows:

Data Packet	Frequency	Mkr Delta(ms)	Dwell Time(s)	Limits(s)
DH5	2402 MHz	3.075	0.326	0.400
DH3	2402 MHz	1.845	0.295	0.400
DH1	2402 MHz	0.535	0.195	0.400

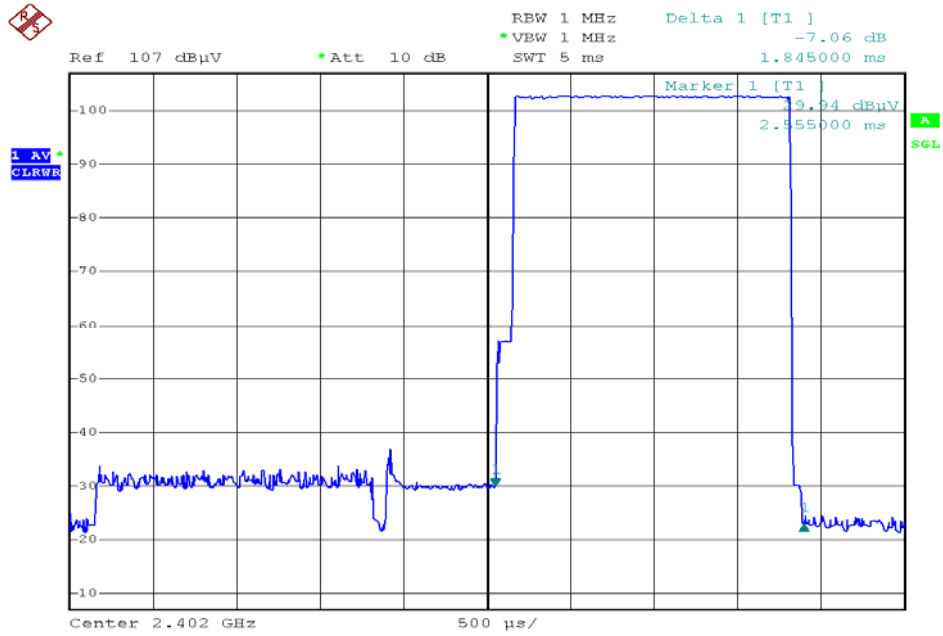
Test Result: PASS

The Results are not be greater than 0.4 seconds.

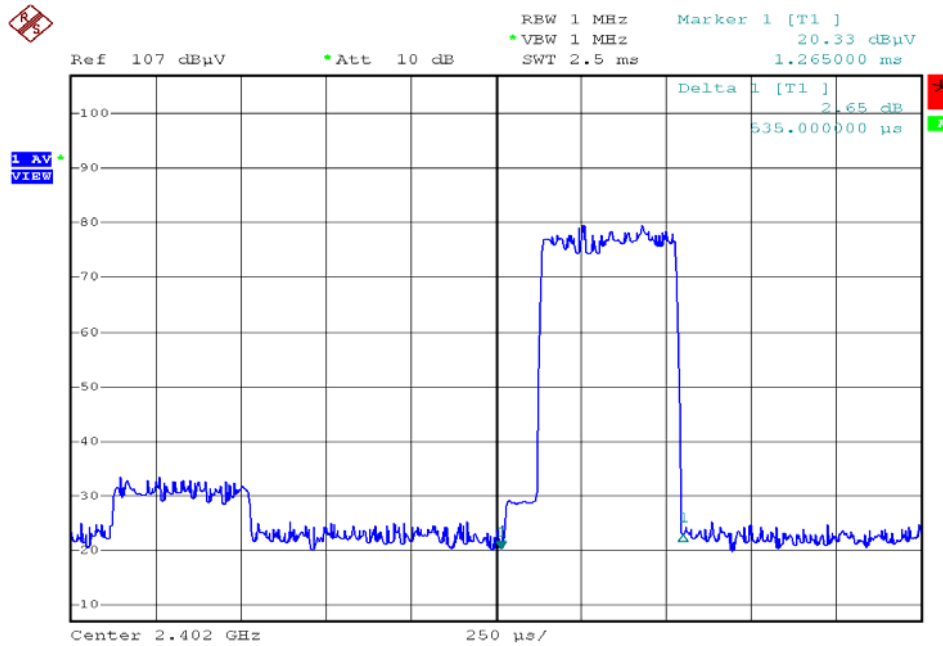
Channel 00 2402 MHz DH5



Channel 00 2402 MHz DH3



Channel 00 2402 MHz DH1



Channel 39 2441MHz

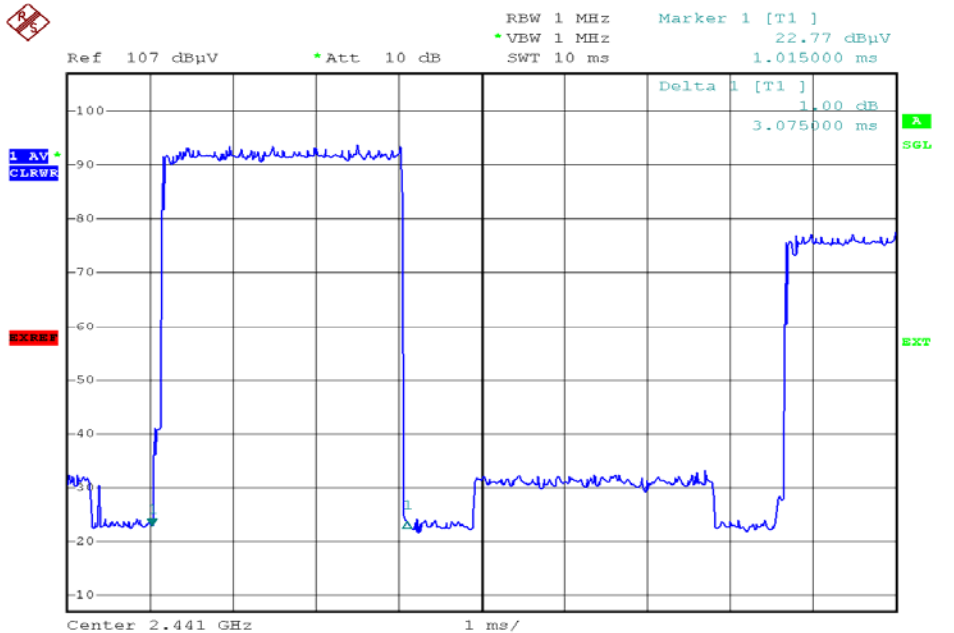
Dwell time of each occupation in this channel as follows:

Data Packet	Frequency	Mkr Delta(ms)	Dwell Time(s)	Limits(s)
DH5	2441 MHz	3.075	0.326	0.400
DH3	2441 MHz	1.855	0.298	0.400
DH1	2441 MHz	0.530	0.192	0.400

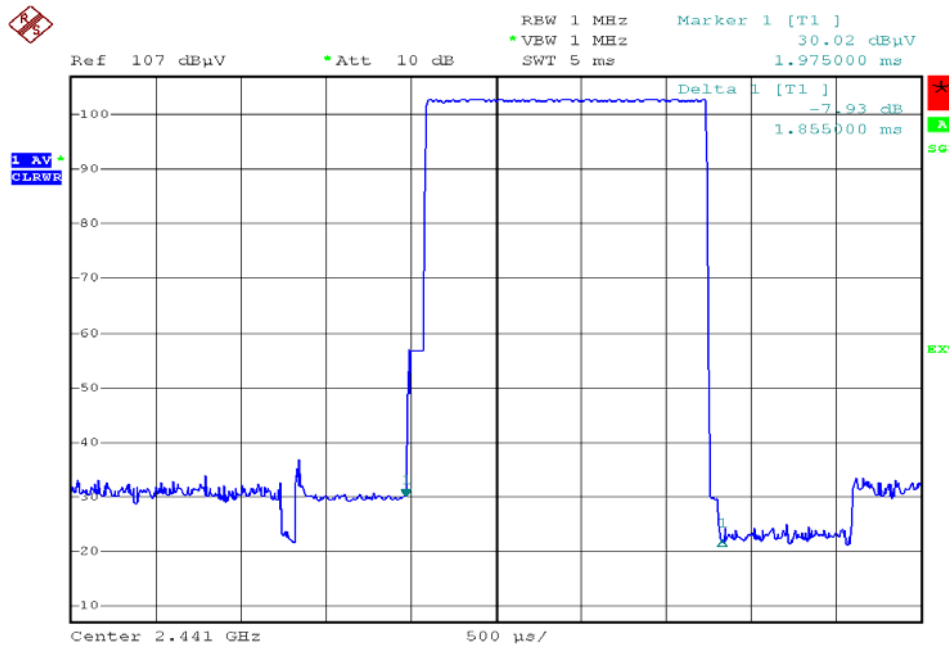
Test Result: PASS

The Results are not be greater than 0.4 seconds.

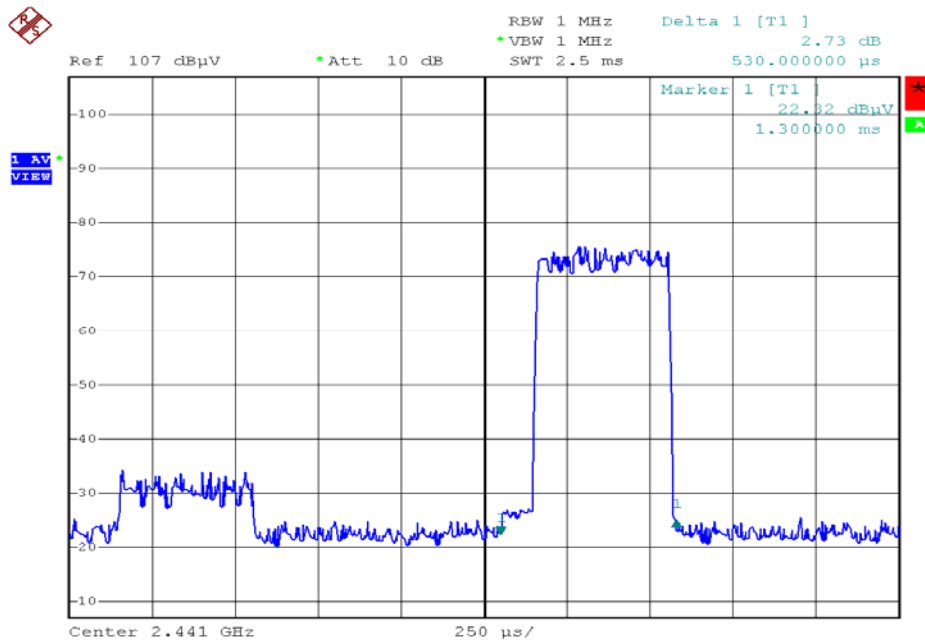
Channel 39 2441 MHz DH5



Channel 39 2441 MHz DH3



Channel 39 2441 MHz DH1



Channel 78 2480MHz

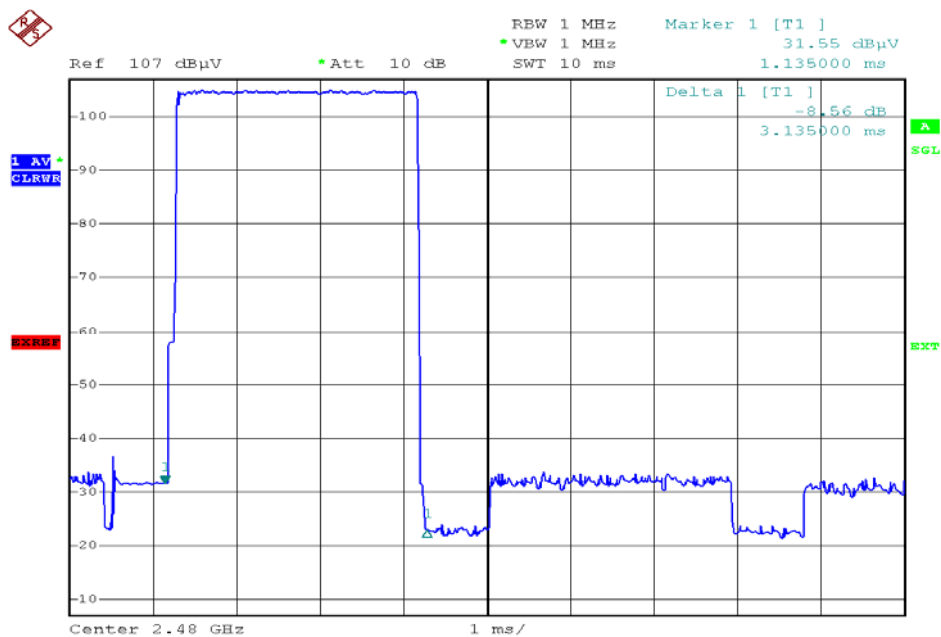
Dwell time of each occupation in this channel as follows:

Data Packet	Frequency	Mkr Delta(ms)	Dwell Time(s)	Limits(s)
DH5	2480 MHz	3.135	0.334	0.400
DH3	2480 MHz	1.855	0.298	0.400
DH1	2480 MHz	0.535	0.195	0.400

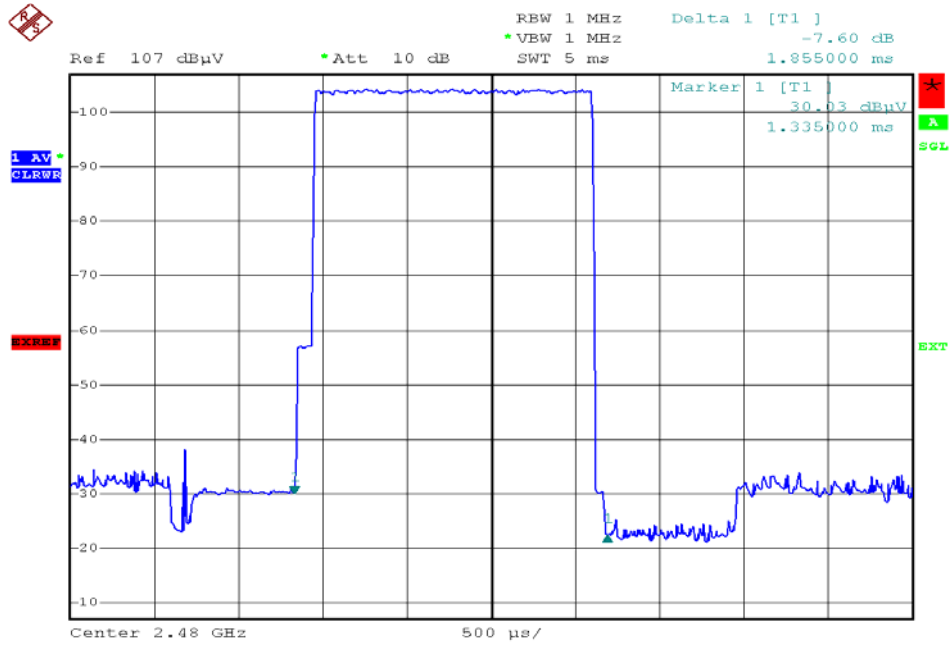
Test Result: PASS

The Results are not be greater than 0.4 seconds.

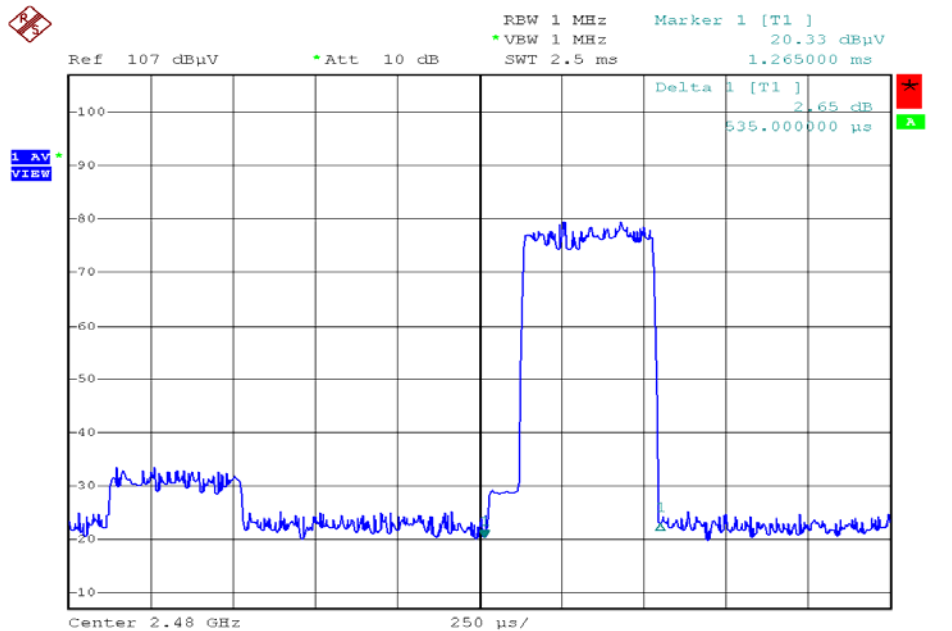
Channel 78 2480 MHz DH5



Channel 78 2480 MHz DH3



Channel 78 2480 MHz DH1



13 20-dB Bandwidth

Test Requirement: FCC Part15 C
 Test Method: Based on FCC Part15 Paragraph 15.247
 Test mode: The EUT work in test mode(Tx) and test it

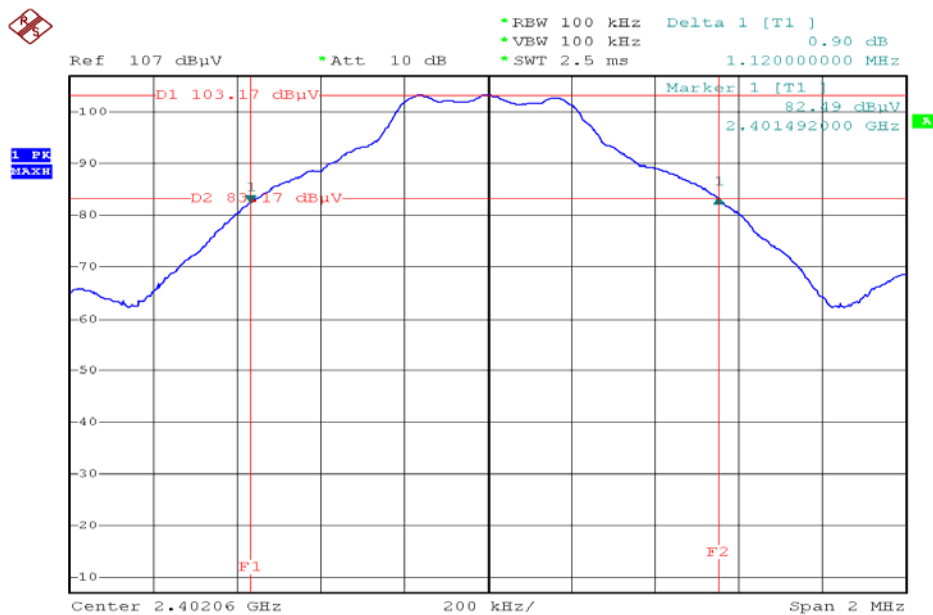
Test Procedure

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.

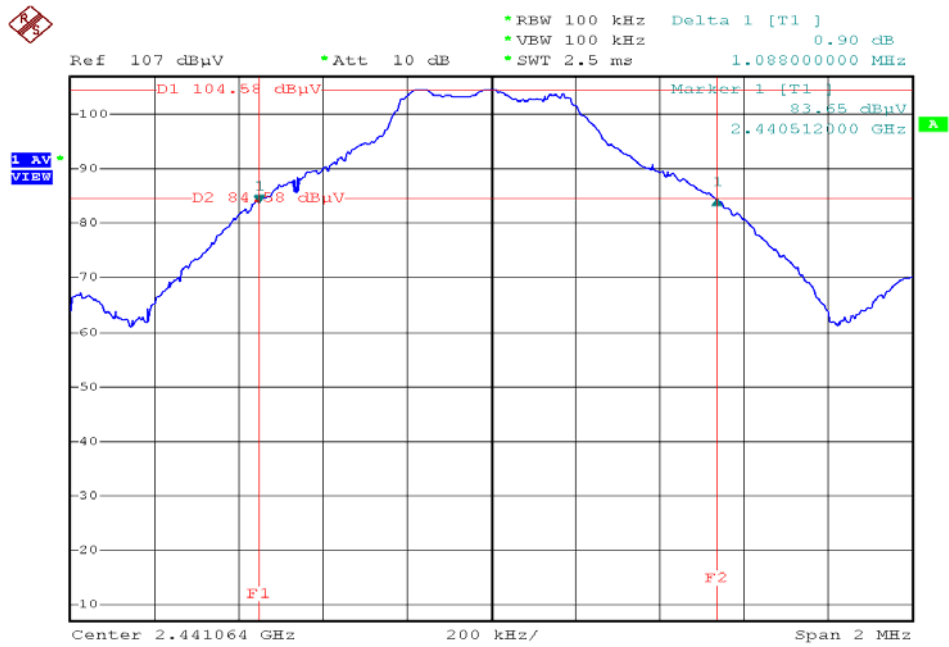
Test Result

Please refer the graph as below:

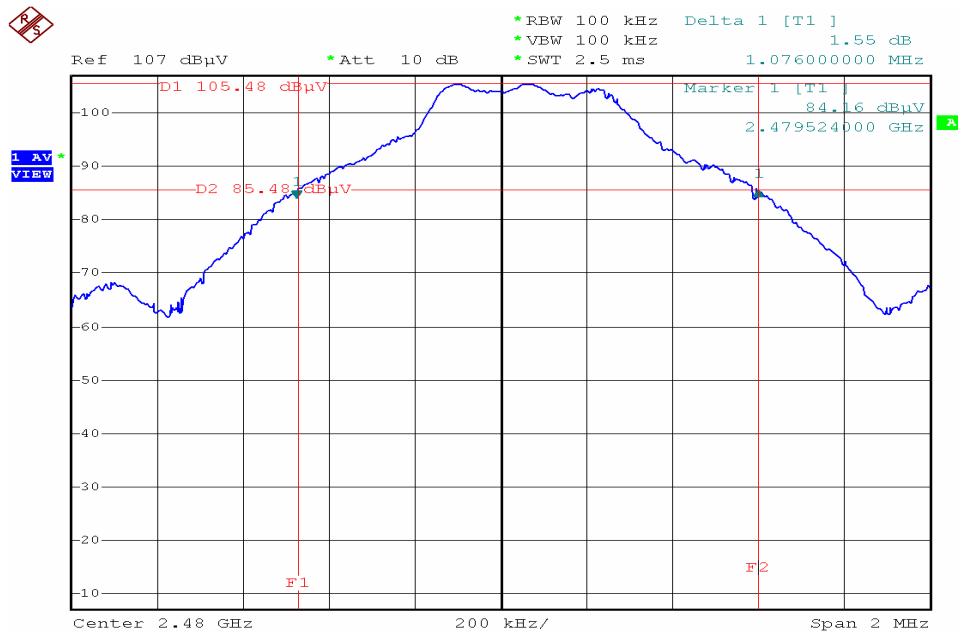
Lower Channel 2402MHz



Middle Channel 2441MHz



Upper Channel 2480MHz



14 Radiated Spurious Emissions Into Adjacent Restricted Band

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

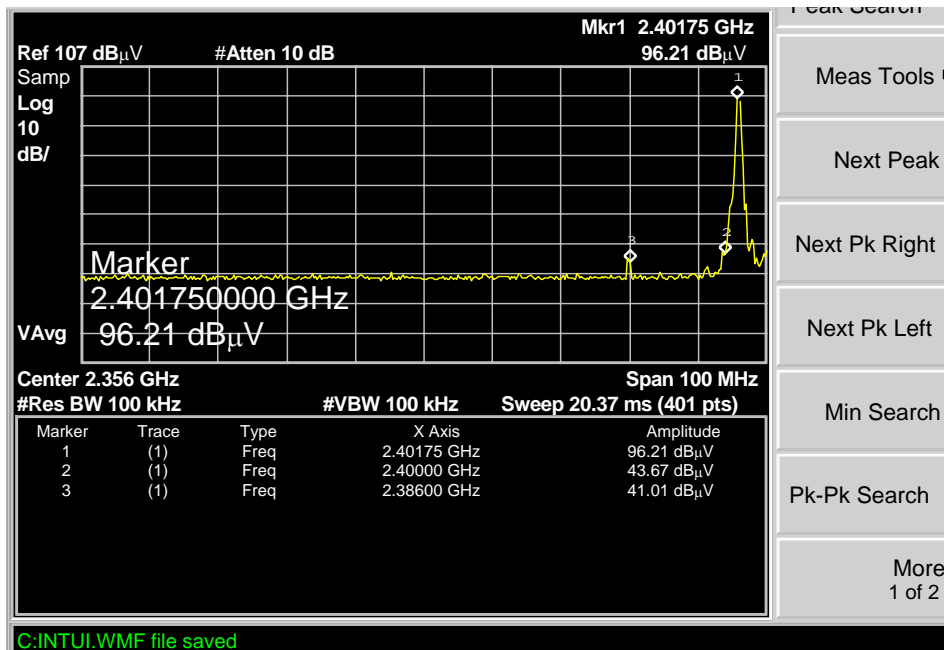
Requiments:

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.

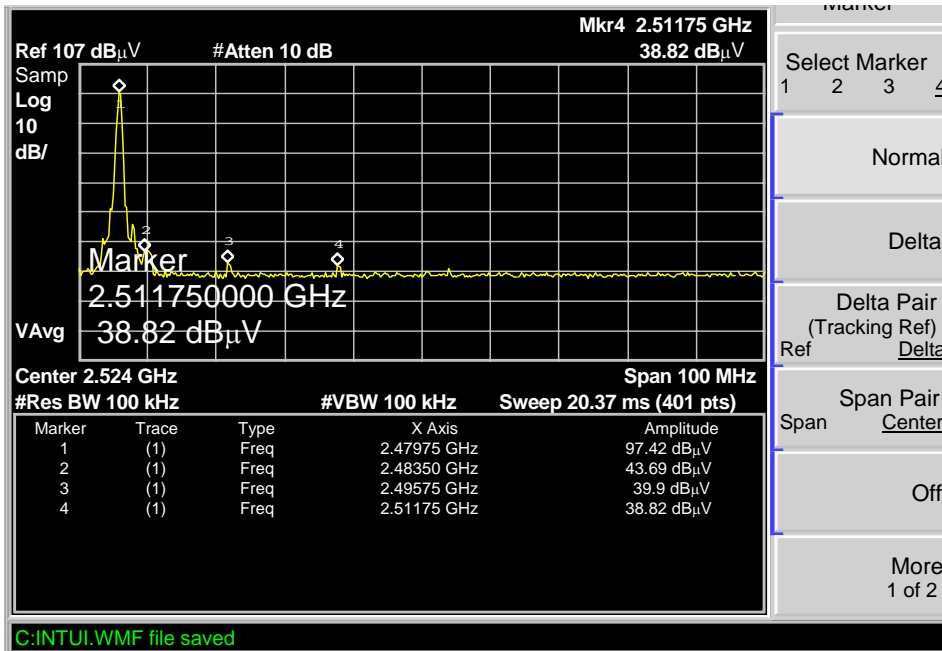
Test procedure:

An in band field strength measurement of the fundamental emission using the RBW and detector function required by C63.4-2003 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)



Upper Bandedge/ Restricted Band (Peak Value)



15 RF Exposure Test

Test Requirement:	FCC Part 2 Subpart J
Test Method:	Based on FCC Part 15 Paragraph 15.247
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

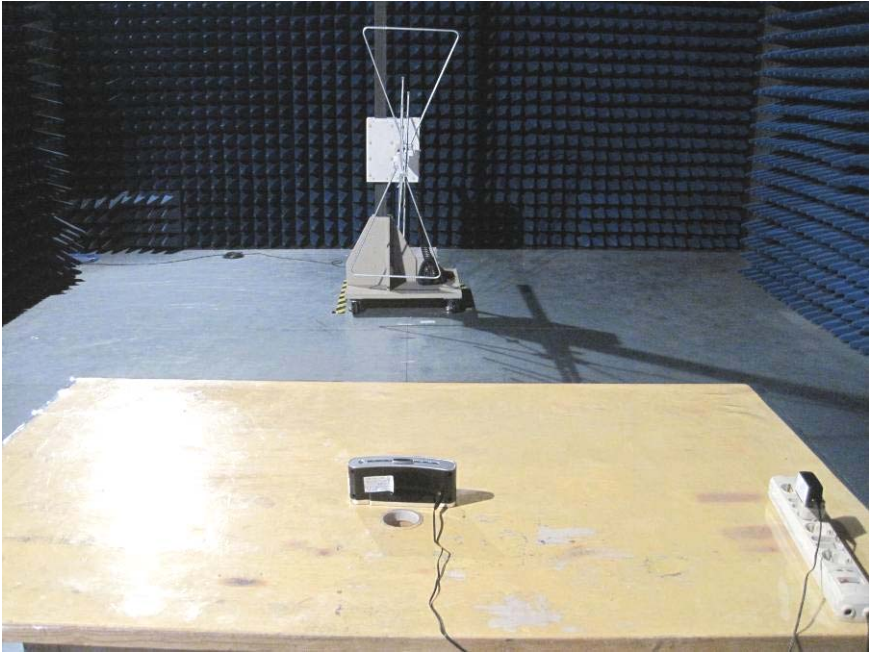
$$Pd = \frac{30 \times P \times G}{377 \times d^2}$$

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

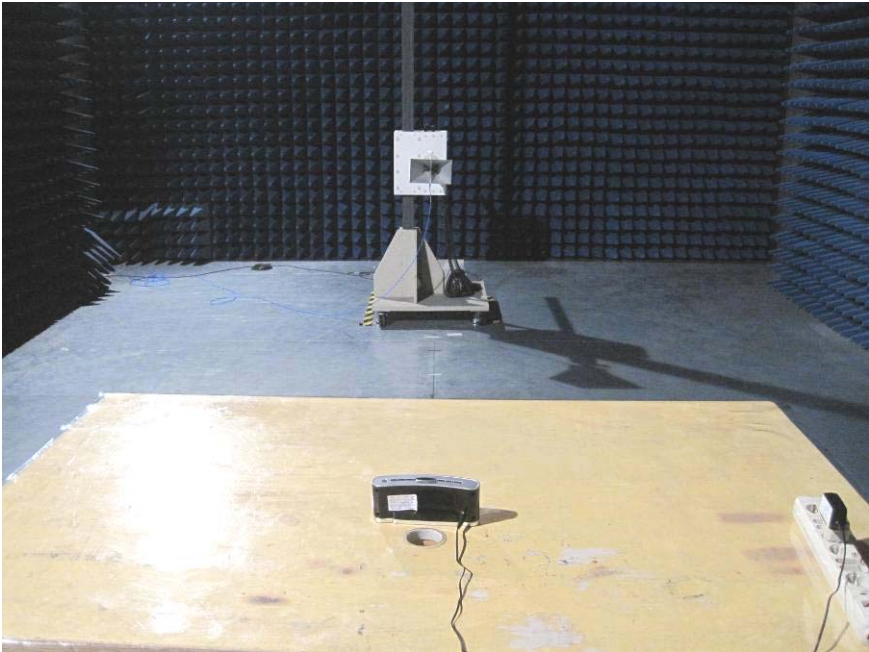
Antenna Gain (dBi)	Antenna Gain (numeric)	Peak Output Power (dBm)	Peak Output Power (mW)	Power Density (S) (mW/cm ²)	Limit of Power Density (S) (mW/cm ²)	Test Result
1.37	1.37	-1.21	1.32	0.000360	1	Complies
1.37	1.37	-1.21	1.32	0.000360	1	Complies
1.37	1.37	-1.15	1.30	0.000354	1	Complies

16 Photographs of Testing

Radiation Emission Test View For 30MHz-1000MHz



Radiation Emission Test View For 1GHz-25GHz



17 Photographs - Constructional Details

17.1EUT - Front View



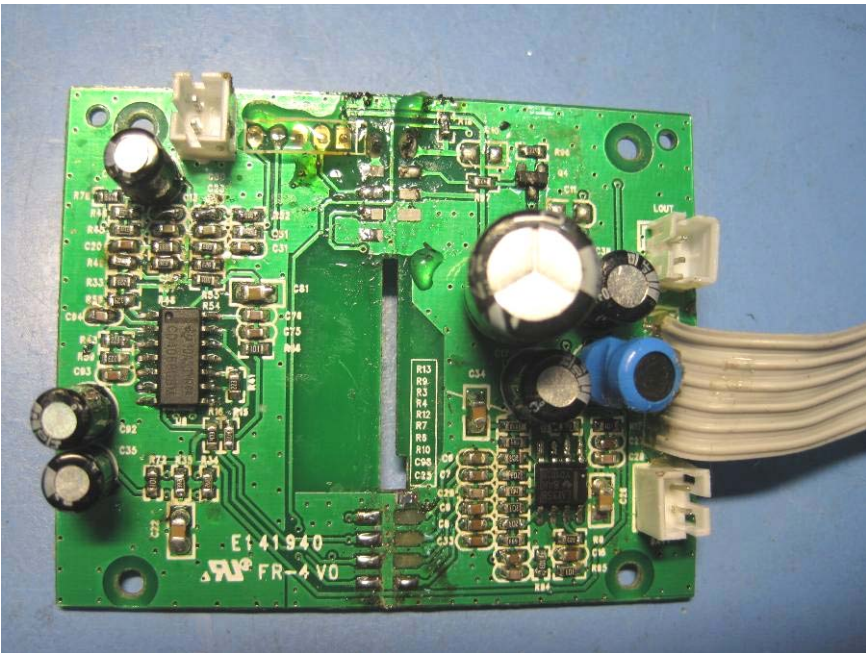
17.2EUT - Back View



17.3EUT - Open View



17.4PCB1 - Front View



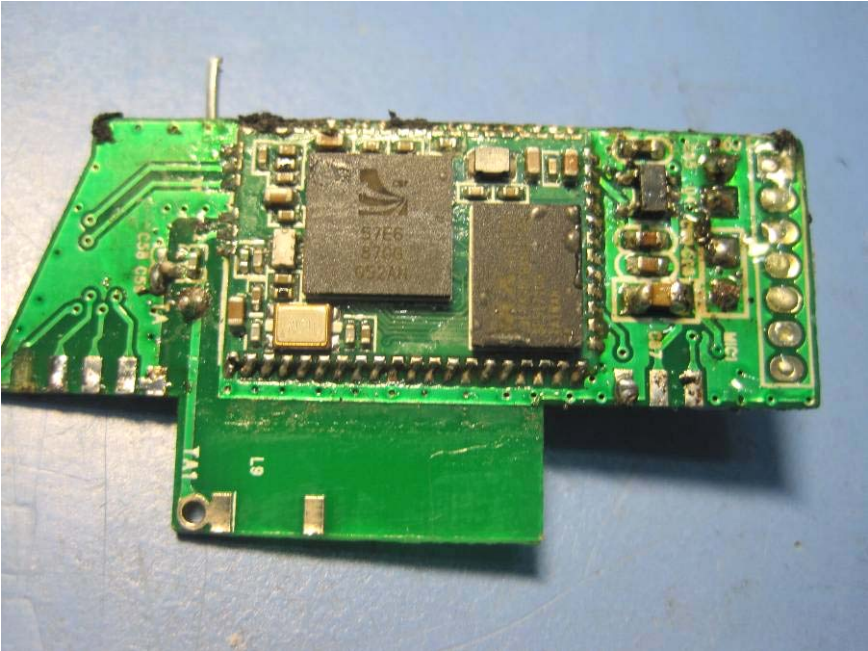
17.5PCB1 - Back View



17.6PCB2 - Front View



17.7PCB2 - Back View



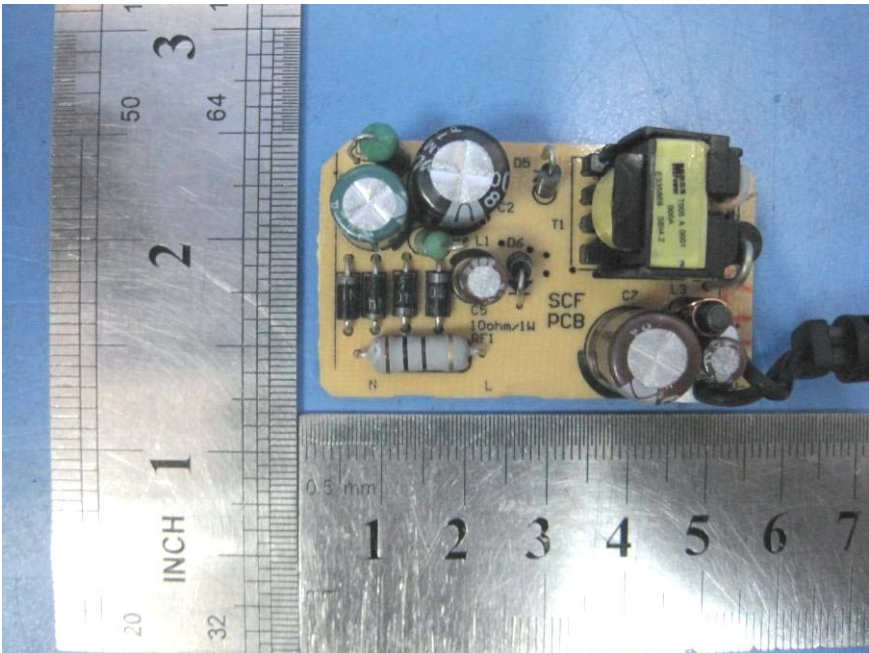
17.8Adapter - Front View



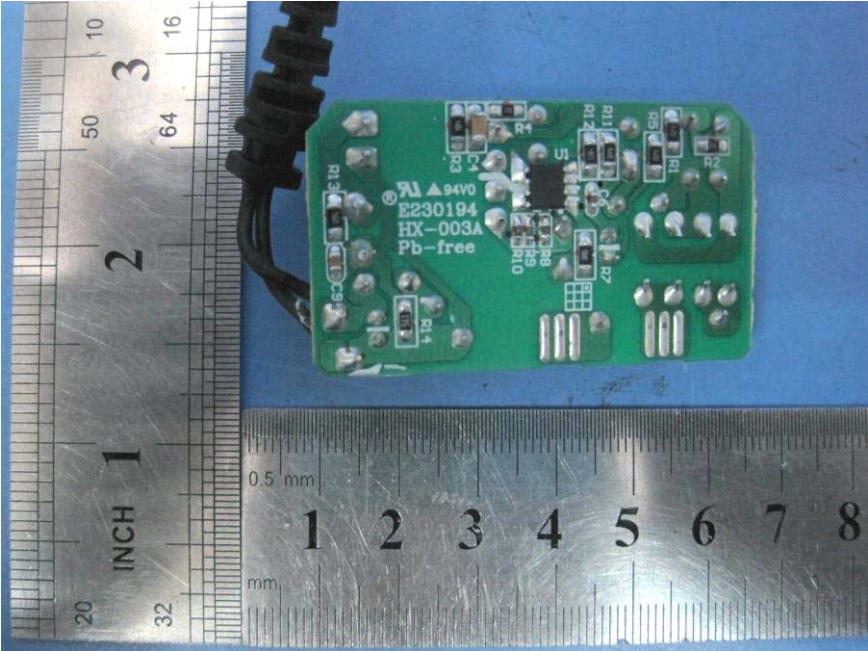
17.9 Adapter - Back View



17.10 Adapter PCB - Front View



17.11 Adapter PCB - Back View



18 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

