FCC TEST REPORT

FCC ID	: VU5P5HM-003
Applicant	: Storm Electronics Co. Ltd
Address	: 22/F., COM WEB PLAZA, 12 CHEUNG YUE STREET., CHEUNG SHA WAN, KOWLOON., HONG KONG

Equipment Under Test (EUT) :

Product Name	: PS3 Bluetooth Handset
Model No.	: P5HM-001, P5HM-002, ASD116, ASD148, SL-4472-SBK

Standards	: FCC CFR47 Part 15 Section 15.247:2009
Date of Test	: August 23 ~ August 29, 2011
Date of Issue	: October 24, 2011
Test Engineer	: Hunk yan
Reviewed By	: Philo zhong

Test Result	**: PASS**

Prepared By:
Waltek Services (Shenzhen) Co., Ltd.
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✧ 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

4 General Information

4.1 Client Information

Applicant	: Storm Electronics Co. Ltd
Address of Applicant	: 22/F., COM WEB PLAZA, 12 CHEUNG YUE STREET., CHEUNG SHA WAN, KOWLOON., HONG KONG
Brand	
Manufacturer	: ShenZhen Asoka Electronic Company Limited
Address of Manufacturer	: BaoZhiWei Technology park, Luo Tian Guang Tian Road, Song Gang Town, BaoAn, ShenZhen, China

4.2 General Description of E.U.T.

Product Name	: PS3 Bluetooth Handset
Model No.	: P5HM-001, P5HM-002, ASD116, ASD148, SL-4472-SBK
Difference Description	: All models are exactly the same excepted different model names

4.3 Details of E.U.T.

Technical Data	: Input: 5.0VDC (Charging mode) Internal Li-ion Battery: 3.7V
Operation Frequency	: 2402MHz ~ 2480MHz
Antenna Gain	: 0dBi

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 PS3 Bluetooth Handset. The standards used were FCC CFR47 Part 15 Section 15.203, Section 15.209, and Section 15.247.

4.6 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.

4.7 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	Uncertainty
EMC Analyzer	Agilent/ E7405A	MY45114943	W2008001	9k-26.5GHz	Aug. 2, 2011	Aug. 1, 2012	±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	±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	±10%
Digital Power Analyzer	Em Test AG/Switzerland/ DPA 500	V0745103095	W2008012	Power：2000VA Vol-range：0-300V Freq_range：10-80Hz	Aug. 2, 2011	Aug. 1, 2012	Voltage distinguish:0.025% Power_freq distinguish:0.02Hz
Power Source	Em Test AG/Switzerland/ ACS 500	V0745103096	W2008013	Vol-range：0-300V Power_freq			

Equipment Name	Manufacturer Model	Equipment No	Internal No	Specification	Cal. Date	Due Date	Uncertainty
				： 10-80Hz			
RF Generator	TESEQ GmbH/ NSG4070	25781	W2008008	Fraq-range：9K-1GHz RF voltage：-60 dBm-+10dBm	Aug. 2, 2011	Aug. 1, 2012	Power_freq distinguish0.1Hz RFeletricity distinguish 0.1 B
CDN M-Type	TESEQ GmbH/ CDN M016	25112	W2008009	Voltage correct factor 9.5 dB	Aug. 2, 2011	Aug. 1, 2012	150K-80MHz：±1dB 80-230MHz:-2-+3dB
EM-Clamp	TESEQ GmbH/ KEMZ 801	25453	W2008010	Freq_range ：0.15-1000 MHz	Aug. 2, 2011	Aug. 1, 2012	0.3-400 MHz：±4dB Other freq：±5dB
Attenuator 6dB	TESEQ GmbH/ ATN6050	25365	-	-	Aug. 2, 2011	Aug. 1, 2012	-
All Modules Generator	SCHAFFNER/6150	34579	W2008006	voltage:200V-4.4KV Pulse current：100A-2.2KA	Aug. 2, 2011	Aug. 1, 2012	voltage: ±10% Pulse current：±10%
Active Loop Antenna 9kHz-30MHz	Beijing Dazhi / ZN30900A	-	-	9kHz-30MHz	Aug. 2, 2011	Aug. 1, 2012	±1dB
Capacitive Coupling Clamp	SCHAFFNER/ CDN 8014	25311	-	-	Aug. 2, 2011	Aug. 1, 2012	-
Signal and Data Line Coupling Network	SCHAFFNER/ CDN 117	25627	W2008011	1.2/50μS	Aug. 2, 2011	Aug. 1, 2012	-
AC Power Supply	TONGYUN/ DTDGC-4	-	-	-	Aug. 2, 2011	Aug. 1, 2012	-

6 Conducted Emission

Test Requirement: FCC CFR47 Part 15 Section 15.207

Test Method: Base on ANSI C63.4:2003

Test Result: N/A

Remark: The EUT is powered by 3.7V Li-ion Battery, so this test is not applicable.

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

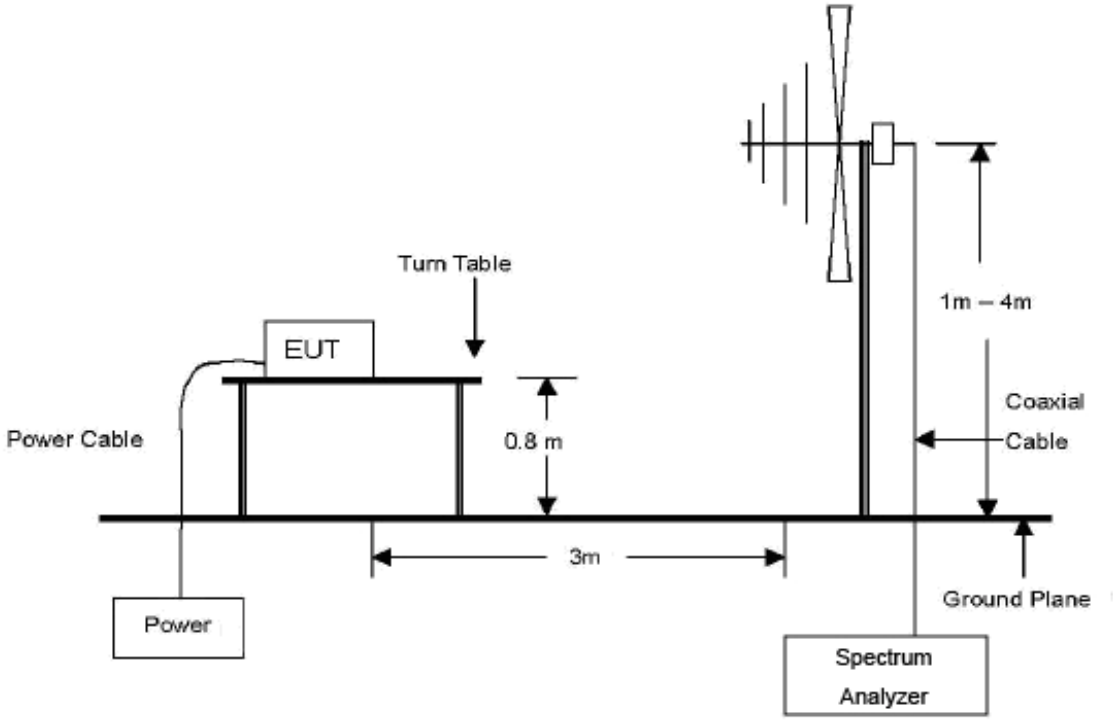
All measurements involve certain levels of uncertainties, especially in the field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor 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 ±5.03dB.

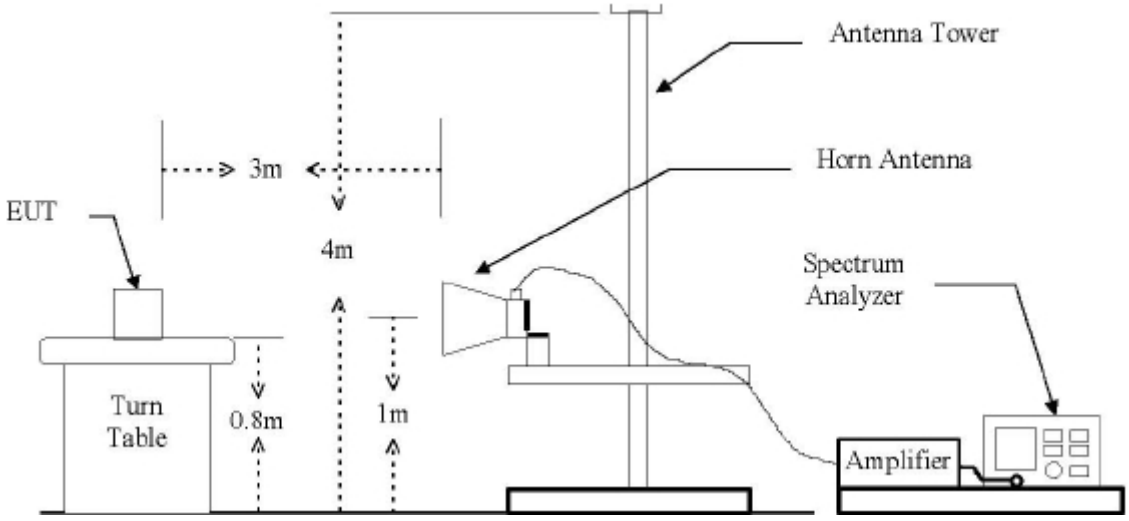
Test Setup

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 ~ 1GHz

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

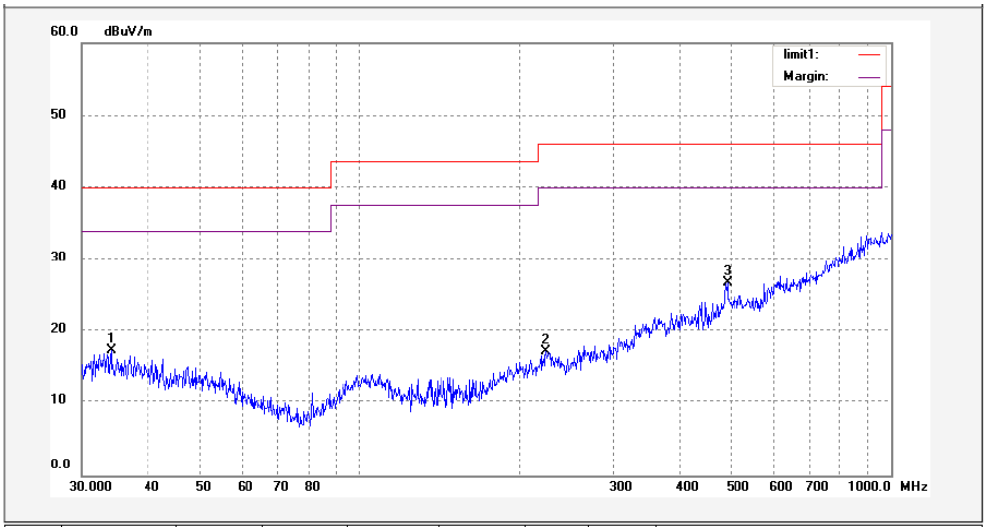
According to the data in this section, the EUT complied with the FCC CFR47 Part 15 Section 15.209 & 15.247 standards.

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.

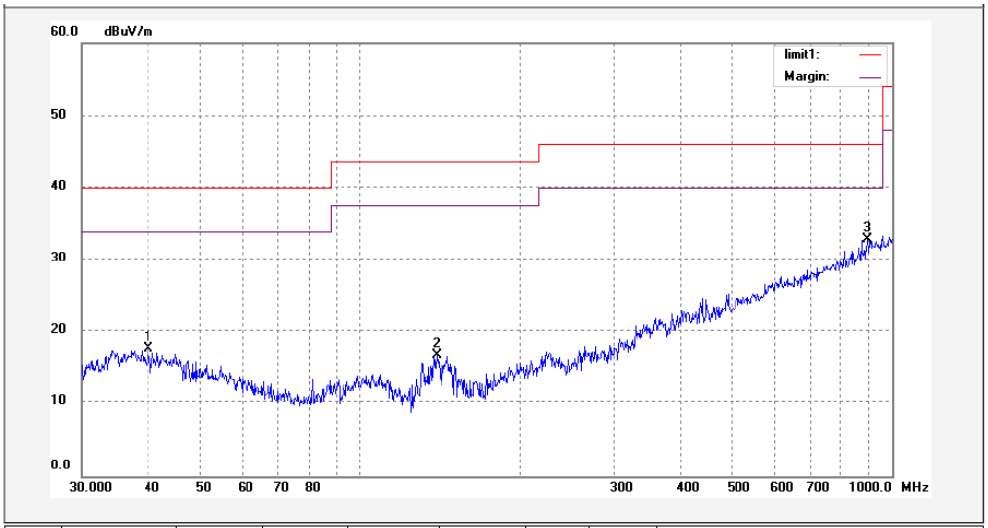
Test Frequency : 30MHz ~ 1000MHz

Antenna polarization: Vertical



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	34.0449	0.92	16.53	17.45	40.00	-22.55	peak	
2	224.6359	0.97	16.34	17.31	46.00	-28.69	peak	
3	491.7699	1.47	25.29	26.76	46.00	-19.24	peak	

Antenna polarization: Horizontal

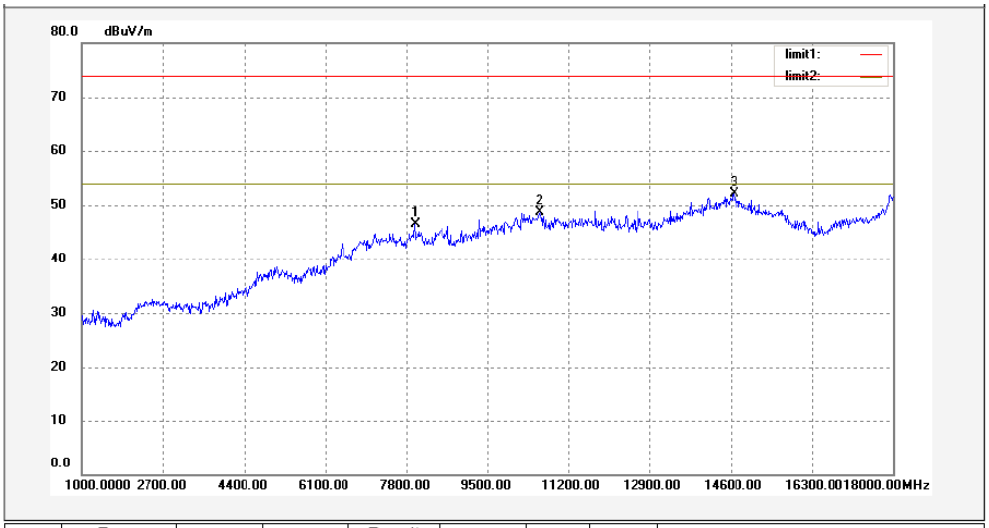


No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	40.0172	1.75	16.04	17.79	40.00	-22.21	peak	
2	139.3006	5.14	11.72	16.86	43.50	-26.64	peak	
3	899.9577	2.03	30.88	32.91	46.00	-13.09	peak	

Test Frequency: Above 1GHz radiation test data:

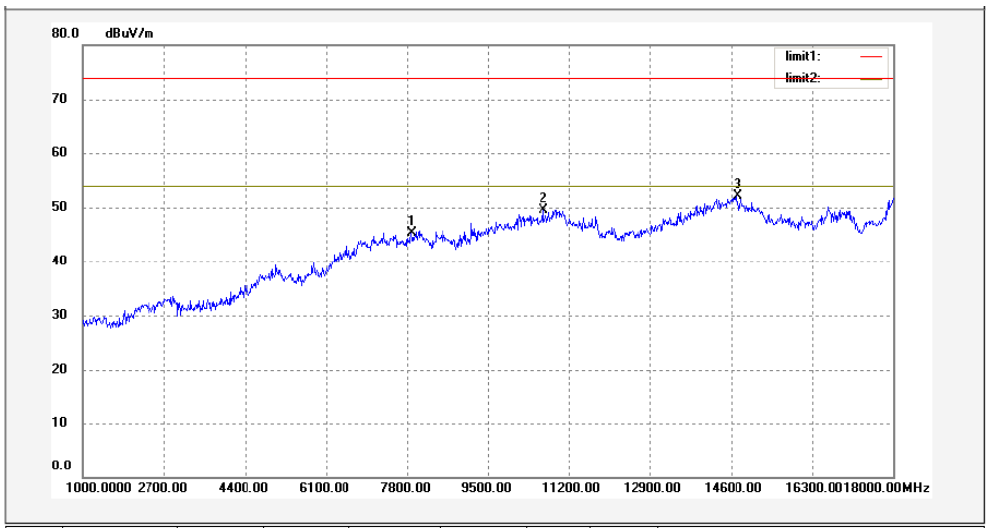
Remark: above 18GHz, the test signal below the noise level, so the data was not perfromed.

Antenna polarization: Vertical



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	7966.934	40.74	5.74	46.48	74.00	-27.52	peak	
2	10607.214	39.12	9.54	48.66	74.00	-25.34	peak	
3	14661.323	-8.39	60.47	52.08	74.00	-21.92	peak	

Antenna polarization: Horizontal



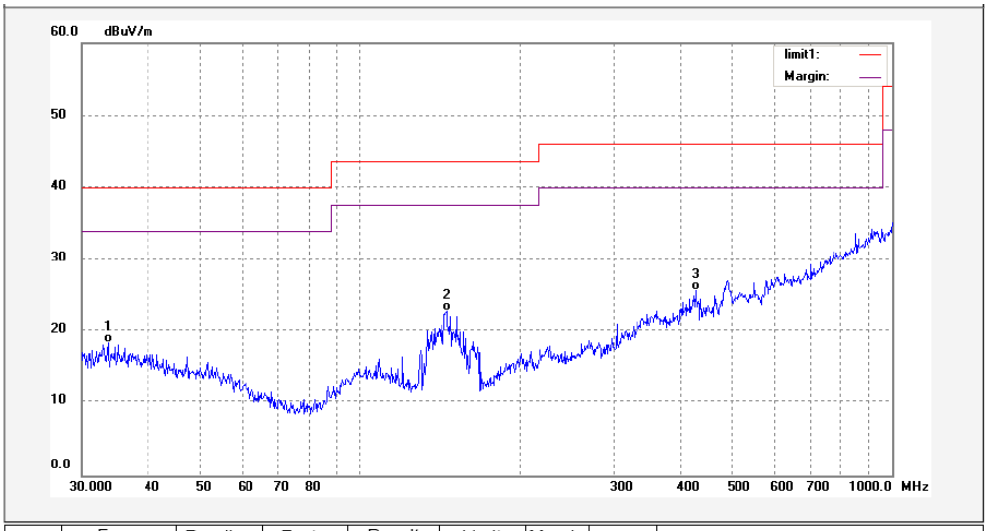
No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	7881.764	40.09	5.26	45.35	74.00	-28.65	peak	
2	10658.317	39.92	9.63	49.55	74.00	-24.45	peak	
3	14729.459	-8.25	60.35	52.10	74.00	-21.90	peak	

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.

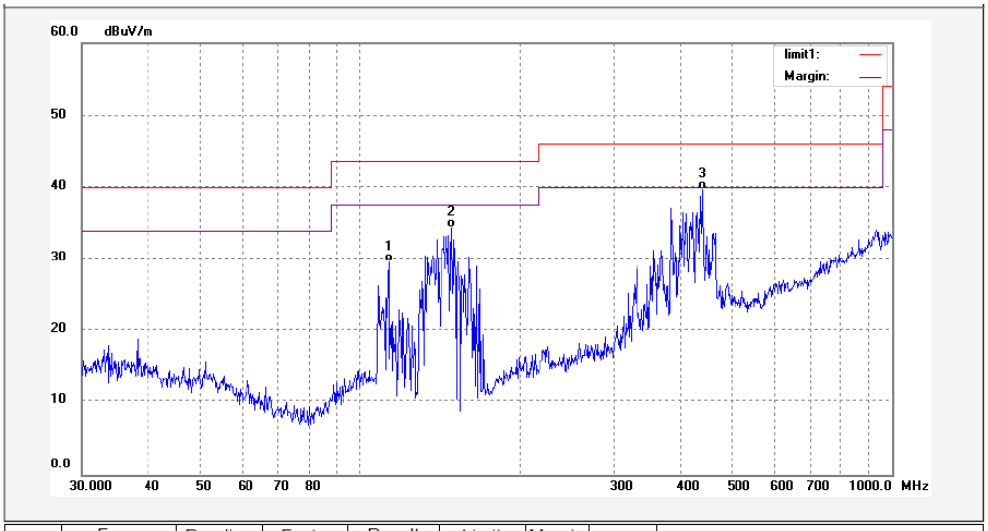
Test Frequency : 30MHz ~ 1000MHz

Antenna polarization: Vertical



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	33.5700	1.99	16.55	18.54	40.00	-21.46	QP	
2	145.8109	11.55	11.26	22.81	43.50	-20.69	QP	
3	427.2920	5.21	20.57	25.78	46.00	-20.22	QP	

Antenna polarization: Horizontal



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	113.2200	16.55	13.02	29.57	43.50	-13.93	QP	
2	148.9175	23.25	11.11	34.36	43.50	-9.14	QP	
3	439.4730	19.70	20.01	39.71	46.00	-6.29	QP	

Test Frequency: 1GHz ~ 25GHz

And the below is the Fundamental and Harmonic

Frequency (MHz)	Detector	Antenna Polarization	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Turntable Angle (°)
Low frequency							
2402.00	AV	Vertical	91.96		(Fund.)	1.2	10
4804.00	AV	Vertical	35.35	54.00	-18.65	1.2	55
7206.00	AV	Vertical	36.14	54.00	-17.86	1.5	130
9608.00	AV	Vertical	32.56	54.00	-21.44	1.8	70
12010.00	AV	Vertical	30.15	54.00	-23.85	1.6	145
14412.00	AV	Vertical	32.16	54.00	-21.84	1.4	130
16814.00	AV	Vertical	31.41	54.00	-22.59	1.7	110
19216.00	AV	Vertical	26.33	54.00	-27.67	1.5	70
21618.00	AV	Vertical	23.57	54.00	-30.43	1.6	10
24020.00	AV	Vertical	26.65	54.00	-27.35	1.2	70
2402.00	AV	Horizontal	85.69		(Fund.)	1.2	10
4804.00	AV	Horizontal	32.24	54.00	-21.76	1.2	130
7206.00	AV	Horizontal	30.57	54.00	-23.43	1.5	70
9608.00	AV	Horizontal	33.12	54.00	-20.88	1.2	110
12010.00	AV	Horizontal	31.36	54.00	-22.64	1.5	70
14412.00	AV	Horizonta	28.21	54.00	-25.79	1.2	130
16814.00	AV	Horizontal	31.02	54.00	-22.98	1.5	110
19216.00	AV	Horizontal	23.53	54.00	-30.47	1.8	110
21618.00	AV	Horizontal	24.47	54.00	-29.53	1.2	110
24020.00	AV	Horizontal	23.09	54.00	-30.91	1.5	20
2402.00	PK	Vertical	99.84		(Fund.)	1.5	10
4804.00	PK	Vertical	54.20	74.00	-19.80	1.8	70
7206.00	PK	Vertical	55.14	74.00	-18.86	1.6	100
9608.00	PK	Vertical	51.87	74.00	-22.13	1.4	190
12010.00	PK	Vertical	48.23	74.00	-25.77	1.2	70
14412.00	PK	Vertical	49.52	74.00	-24.48	1.2	70
16814.00	PK	Vertical	46.33	74.00	-27.67	1.4	145
19216.00	PK	Vertical	44.61	74.00	-29.39	1.2	130
21618.00	PK	Vertical	42.39	74.00	-31.61	1.7	70
24020.00	PK	Vertical	43.54	74.00	-30.46	1.4	100
2402.00	PK	Horizontal	94.19		(Fund.)	1.8	70
4804.00	PK	Horizontal	52.51	74.00	-21.49	1.8	100
7206.00	PK	Horizontal	50.26	74.00	-23.74	1.8	70
9608.00	PK	Horizontal	47.37	74.00	-26.63	1.2	10
12010.00	PK	Horizontal	49.35	74.00	-24.65	1.2	145
14412.00	PK	Horizontal	44.26	74.00	-29.74	1.5	10

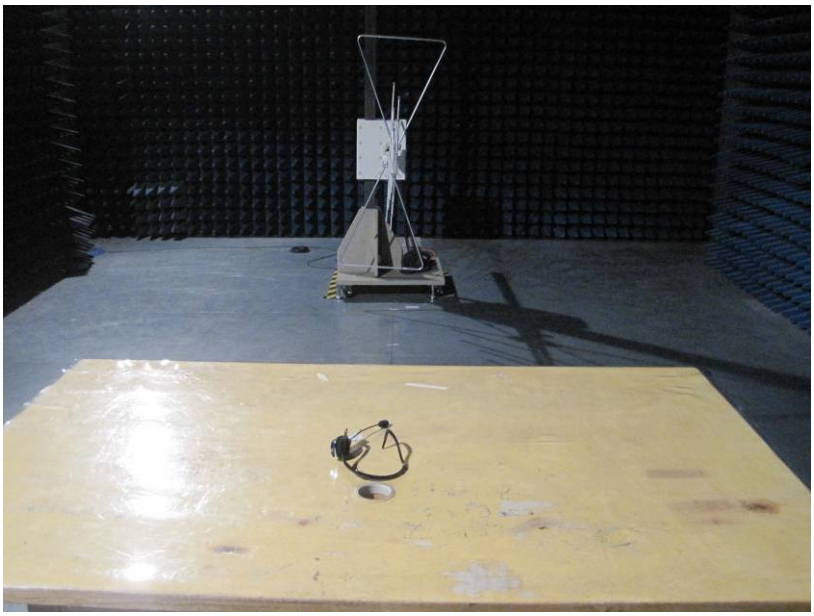
16814.00	PK	Horizontal	50.36	74.00	-23.64	1.8	190
19216.00	PK	Horizontal	42.21	74.00	-31.79	1.5	70
21618.00	PK	Horizontal	43.54	74.00	-30.46	1.2	130
24020.00	PK	Horizontal	45.31	74.00	-28.69	1.2	70
Middle frequency							
2441.00	AV	Vertical	93.47		(Fund.)	1.5	10
4882.00	AV	Vertical	38.03	54.00	-15.97	1.2	100
7323.00	AV	Vertical	36.24	54.00	-17.76	1.0	100
9764.00	AV	Vertical	32.15	54.00	-21.85	1.2	10
12205.00	AV	Vertical	36.74	54.00	-17.26	1.2	10
14646.00	AV	Vertical	30.56	54.00	-23.44	1.2	160
17087.00	AV	Vertical	32.36	54.00	-21.64	1.5	10
19528.00	AV	Vertical	29.15	54.00	-24.85	1.5	10
21969.00	AV	Vertical	27.28	54.00	-26.72	1.8	190
24410.00	AV	Vertical	31.37	54.00	-22.63	1.2	100
2441.00	AV	Horizontal	87.52		(Fund.)	1.0	130
4882.00	AV	Horizontal	34.50	54.00	-19.50	1.0	100
7323.00	AV	Horizontal	35.71	54.00	-18.29	1.5	280
9764.00	AV	Horizontal	30.62	54.00	-23.38	1.2	130
12205.00	AV	Horizontal	28.31	54.00	-25.69	1.2	160
14646.00	AV	Horizontal	32.21	54.00	-21.79	1.4	190
17087.00	AV	Horizontal	31.44	54.00	-22.56	1.6	145
19528.00	AV	Horizontal	26.12	54.00	-27.88	1.4	100
21969.00	AV	Horizontal	27.17	54.00	-26.83	1.2	160
24410.00	AV	Horizontal	25.35	54.00	-28.65	1.7	130
2441.00	PK	Vertical	104.14		(Fund.)	1.0	10
4882.00	PK	Vertical	59.26	74.00	-14.74	1.1	100
7323.00	PK	Vertical	57.37	74.00	-16.63	1.4	110
9764.00	PK	Vertical	53.23	74.00	-20.77	1.3	130
12205.00	PK	Vertical	56.47	74.00	-17.53	1.7	190
14646.00	PK	Vertical	49.14	74.00	-24.86	1.2	10
17087.00	PK	Vertical	52.39	74.00	-21.61	1.4	10
19528.00	PK	Vertical	47.20	74.00	-26.80	1.5	130
21969.00	PK	Vertical	51.19	74.00	-22.81	1.5	145
24410.00	PK	Vertical	44.25	74.00	-29.75	1.2	130
2441.00	PK	Horizontal	96.72		(Fund.)	1.0	10
4882.00	PK	Horizontal	54.33	74.00	-19.67	1.7	55
7323.00	PK	Horizontal	56.06	74.00	-17.94	1.6	100
9764.00	PK	Horizontal	50.17	74.00	-23.83	1.5	70
12205.00	PK	Horizontal	52.92	74.00	-21.08	1.4	160
14646.00	PK	Horizontal	48.32	74.00	-25.68	1.2	160
17087.00	PK	Horizontal	45.51	74.00	-28.49	1.1	130

19528.00	PK	Horizontal	48.20	74.00	-25.80	1.5	160
21969.00	PK	Horizontal	49.43	74.00	-24.57	1.1	10
24410.00	PK	Horizontal	44.11	74.00	-29.89	1.6	145
High frequency							
2480.00	AV	Vertical	94.37		(Fund.)	1.0	160
4960.00	AV	Vertical	38.21	54.00	-15.79	1.2	10
7440.00	AV	Vertical	37.17	54.00	-16.83	1.2	130
9920.00	AV	Vertical	35.65	54.00	-18.35	1.4	70
12400.00	AV	Vertical	34.21	54.00	-19.79	1.5	100
14880.00	AV	Vertical	37.75	54.00	-16.25	1.8	130
17360.00	AV	Vertical	31.14	54.00	-22.86	1.1	110
19840.00	AV	Vertical	28.43	54.00	-25.57	1.1	190
22320.00	AV	Vertical	35.20	54.00	-18.80	1.4	130
24800.00	AV	Vertical	27.16	54.00	-26.84	1.5	145
2480.00	AV	Horizontal	89.52		(Fund.)	1.0	130
4960.00	AV	Horizontal	36.50	54.00	-17.50	1.8	160
7440.00	AV	Horizontal	31.87	54.00	-22.13	1.2	130
9920.00	AV	Horizontal	32.44	54.00	-21.56	1.5	190
12400.00	AV	Horizontal	33.71	54.00	-20.29	1.2	145
14880.00	AV	Horizontal	30.26	54.00	-23.74	1.2	130
17360.00	AV	Horizontal	27.42	54.00	-26.58	1.4	190
19840.00	AV	Horizontal	30.05	54.00	-23.95	1.8	70
22320.00	AV	Horizontal	25.31	54.00	-28.69	1.3	100
24800.00	AV	Horizontal	26.16	54.00	-27.84	1.6	100
2480.00	PK	Vertical	105.34		(Fund.)	1.0	190
4960.00	PK	Vertical	57.74	74.00	-16.26	1.2	40
7440.00	PK	Vertical	54.17	74.00	-19.83	1.8	120
9920.00	PK	Vertical	56.63	74.00	-17.37	1.5	110
12400.00	PK	Vertical	51.73	74.00	-22.27	1.4	100
14880.00	PK	Vertical	58.28	74.00	-15.72	1.2	70
17360.00	PK	Vertical	52.31	74.00	-21.69	1.2	100
19840.00	PK	Vertical	53.18	74.00	-20.82	1.2	130
22320.00	PK	Vertical	51.50	74.00	-22.50	1.6	130
24800.00	PK	Vertical	45.12	74.00	-28.88	1.4	145
2480.00	PK	Horizontal	100.54		(Fund.)	1.1	190
4960.00	PK	Horizontal	54.13	74.00	-19.87	1.4	70
7440.00	PK	Horizontal	52.44	74.00	-21.56	1.5	130
9920.00	PK	Horizontal	53.26	74.00	-20.74	1.3	190
12400.00	PK	Horizontal	51.12	74.00	-22.88	1.2	100
14880.00	PK	Horizontal	45.31	74.00	-28.69	1.7	100
17360.00	PK	Horizontal	49.52	74.00	-24.48	1.8	160
19840.00	PK	Horizontal	44.19	74.00	-29.81	1.5	160

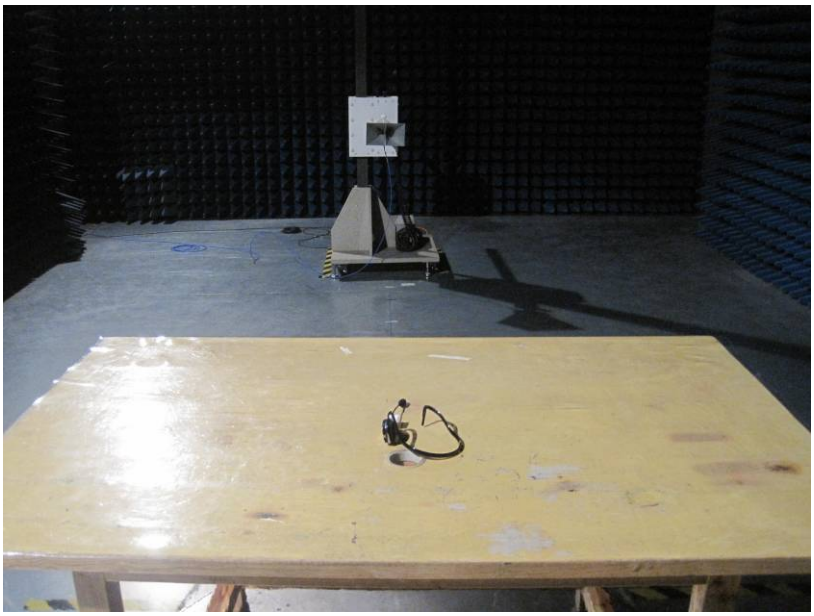
22320.00	PK	Horizontal	47.02	74.00	-26.98	1.8	130
24800.00	PK	Horizontal	42.40	74.00	-31.60	1.0	190

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	47.10	37.01
2483.5	41.24	33.52

2. High Channel

Frequency (MHz)	Peak Emission Level (dBuV/m)	AVG Emission Level (dBuV/m)
2390	41.37	32.86
2483.5	56.78	46.23

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;

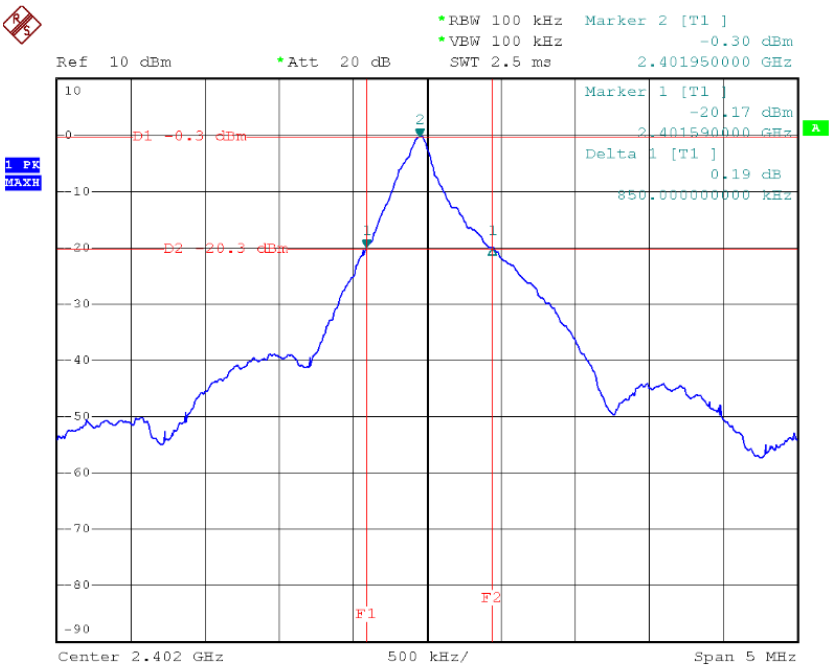
2. Set the spectrum analyzer: Span = 5MHz, RBW = 100kHz, VBW = 100kHz

Test Result:

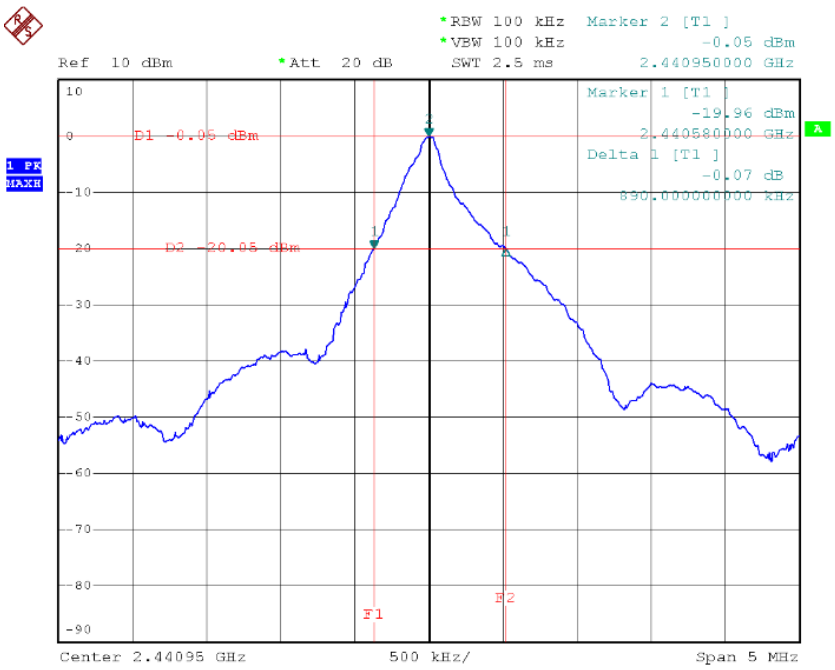
Test Channel	Bandwidth
Low	850kHz
Middle	890kHz
High	930kHz

Test result plot as follows:

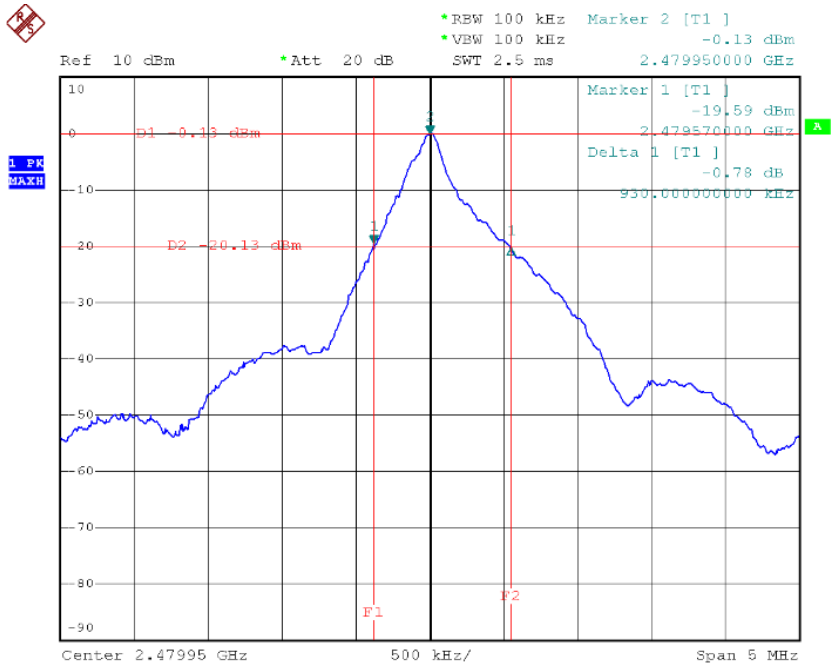
Low Channel



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	0.12	30
Middle	0.52	30
High	0.55	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:

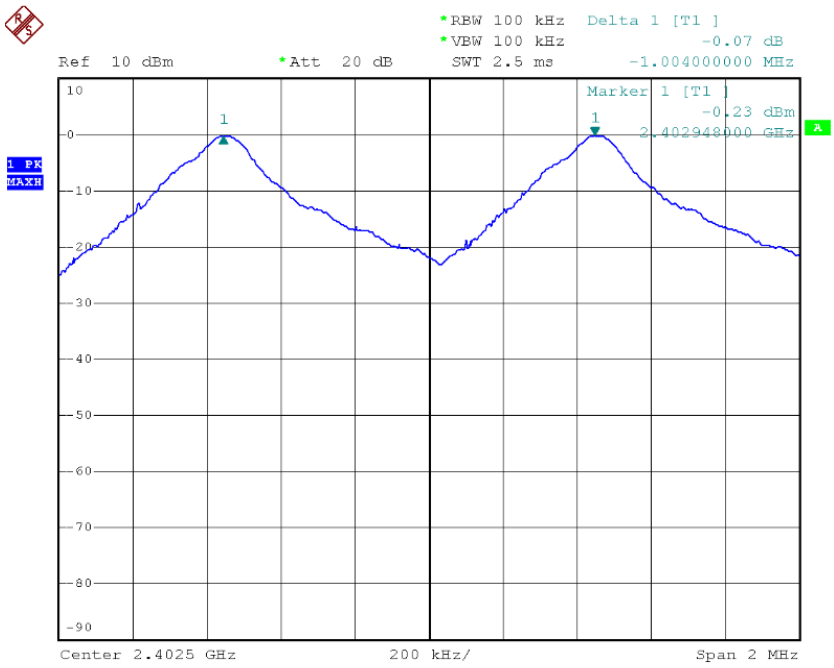
1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.
2. Set the spectrum analyzer: RBW = 100kHz. VBW = 100kHz , Span = 2MHz. Sweep = auto; Detector Function = Peak. Trace = Max hold.
3. Allow the trace to stabilize. Use the marker-delta function to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

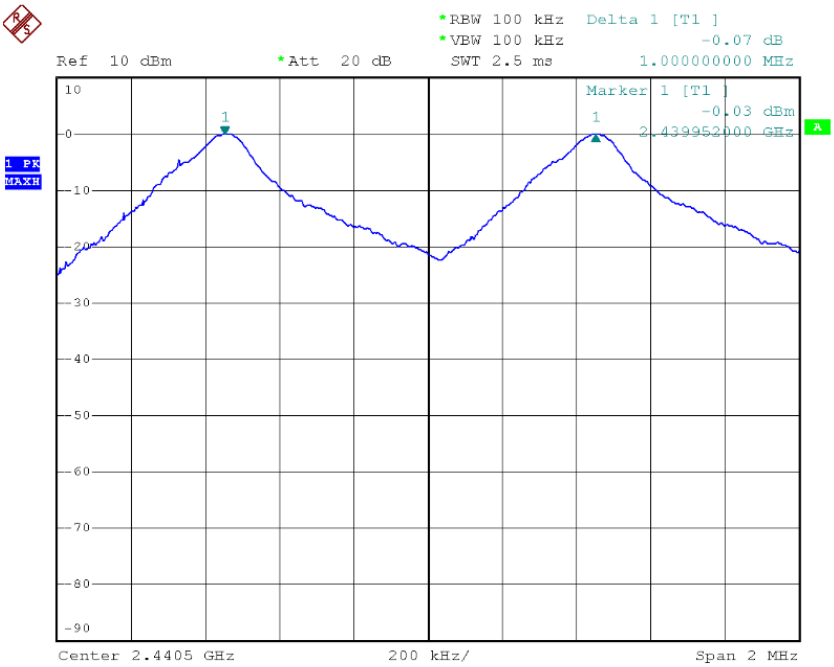
Test Channel	Separation (MHz)	Result
Low	1.004	PASS
Middle	1.000	PASS
High	1.000	PASS

Test result plot as follows:

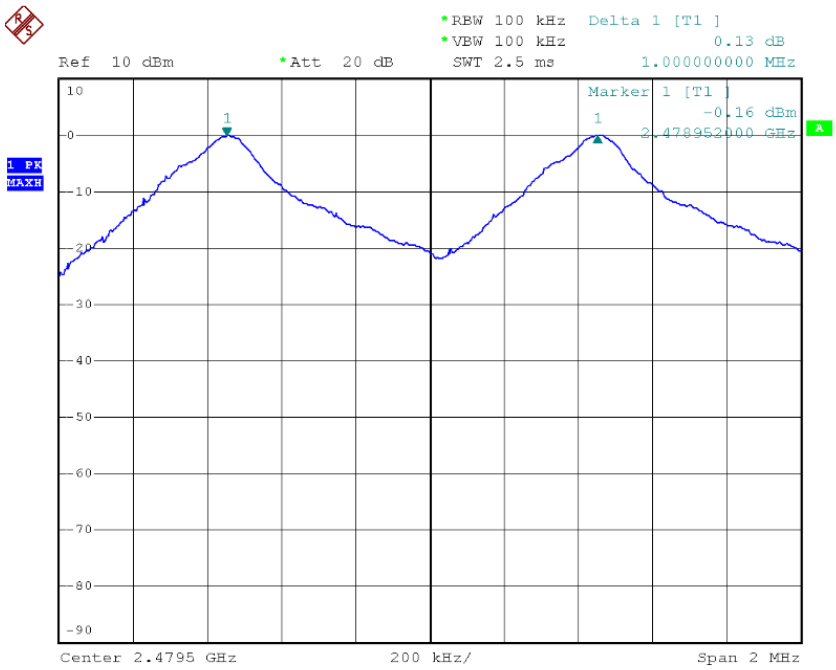
Low Channel:



Middle Channel



High Channel



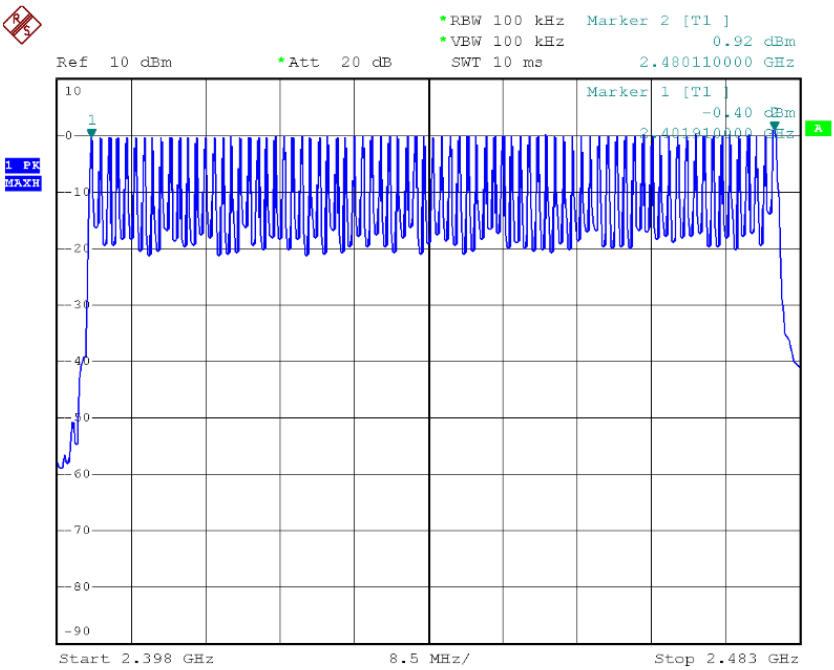
12 Number of Hopping Frequency

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 = 2483MHz. 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:

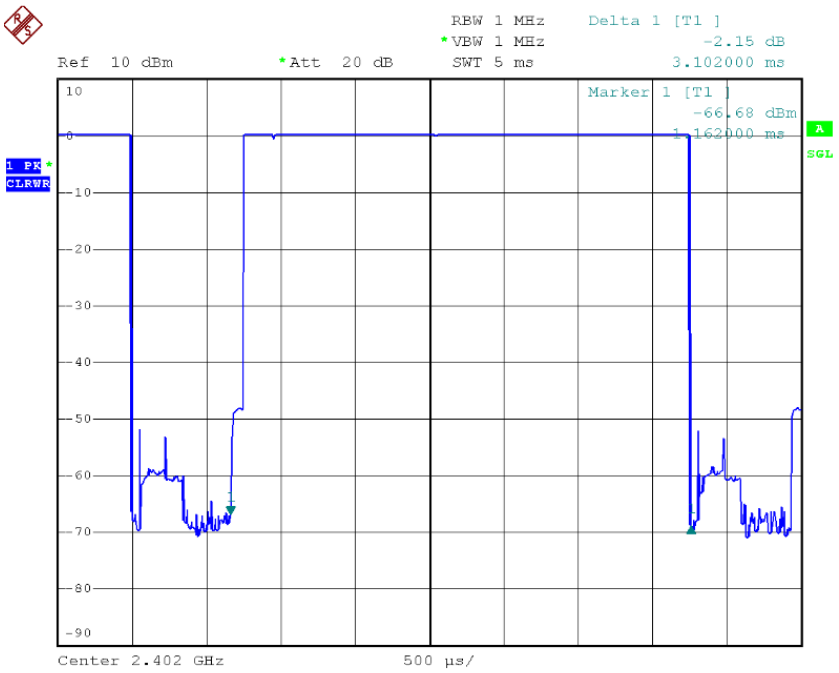
Data Packet	Dwell Time(s)
DH5	1600/79/6*31.6*(MkrDelta)/1000
DH3	1600/79/4*31.6*(MkrDelta)/1000
DH1	1600/79/2*31.6*(MkrDelta)/1000

Note : Mkr Delta is once pulse time .

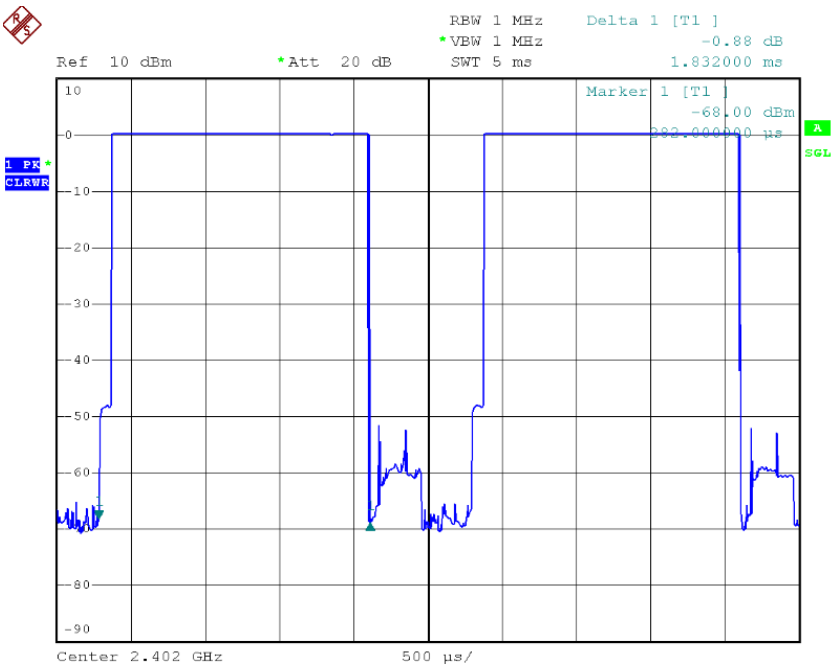
Low Channel: 2402MHz

Dwell time of each occupation in this channel as follows:

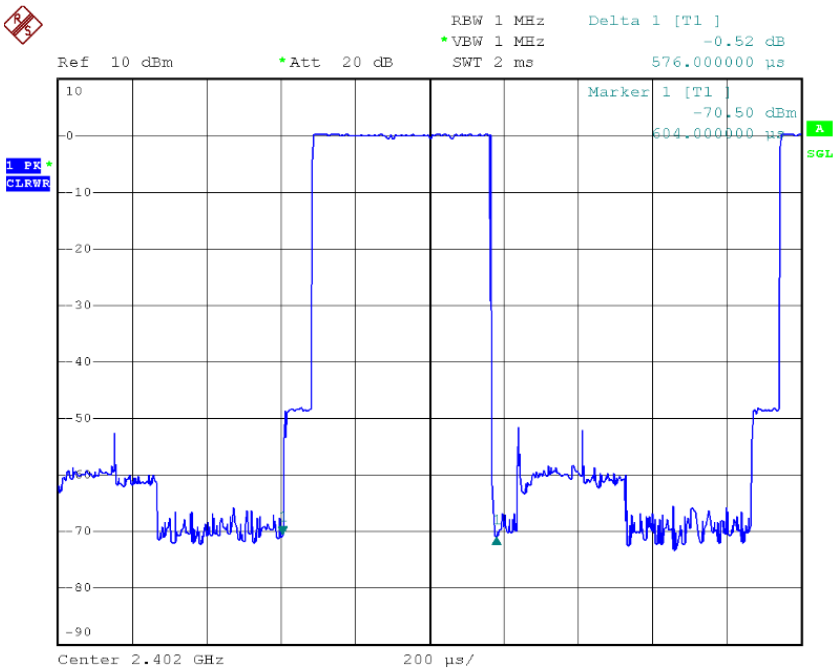
Data Packet	Frequency	Mkr Delta(ms)	Dwell Time(s)	Limits(s)	Result
DH5	2402 MHz	3.102	0.331	0.400	Pass
DH3	2402 MHz	1.832	0.293	0.400	Pass
DH1	2402 MHz	0.576	0.184	0.400	Pass



(DH5)


RBW 1 MHz
*VBW 1 MHz
SWT 5 ms
Delta 1 [T1]
-0.88 dB
1.832000 ms
Ref 10 dBm
*Att 20 dB
Marker 1 [T1]
-68.00 dBm
1 PK*
CLRWR
SGL
Center 2.402 GHz
500 µs/

(DH3)

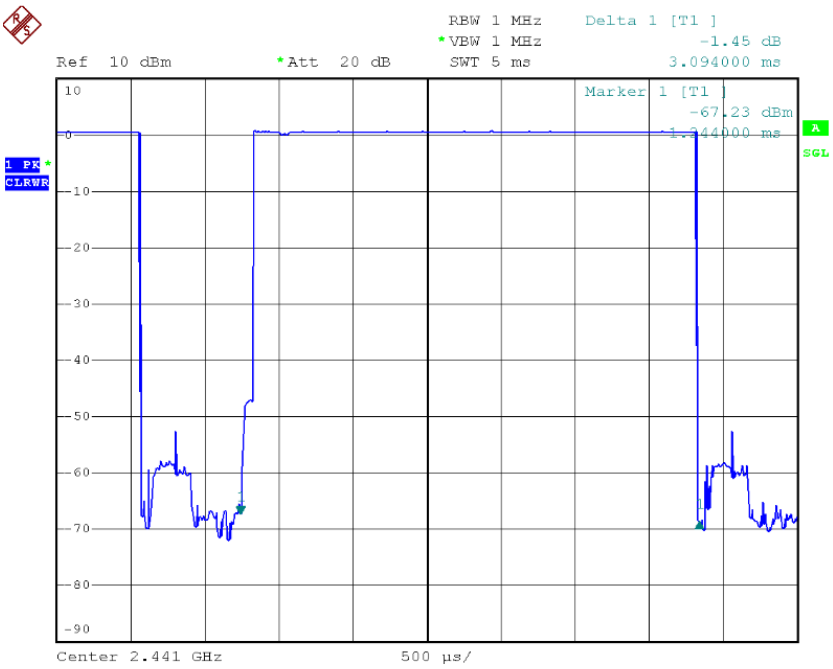

RBW 1 MHz
*VBW 1 MHz
SWT 2 ms
Delta 1 [T1]
-0.52 dB
576.000000 µs
Ref 10 dBm
*Att 20 dB
Marker 1 [T1]
-70.50 dBm
1 PK*
CLRWR
SGL
Center 2.402 GHz
200 µs/

(DH1)

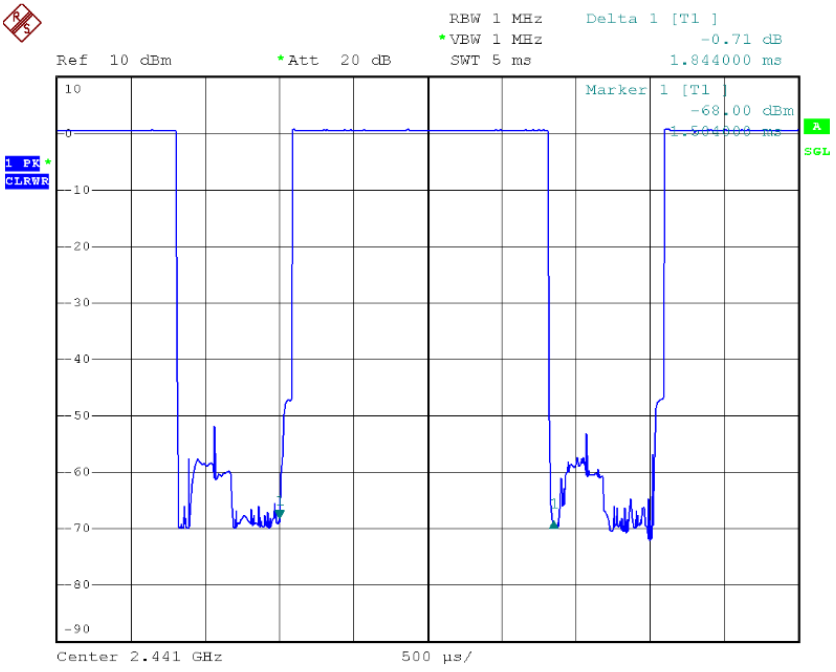
Middle Channel: 2441MHz

Dwell time of each occupation in this channel as follows:

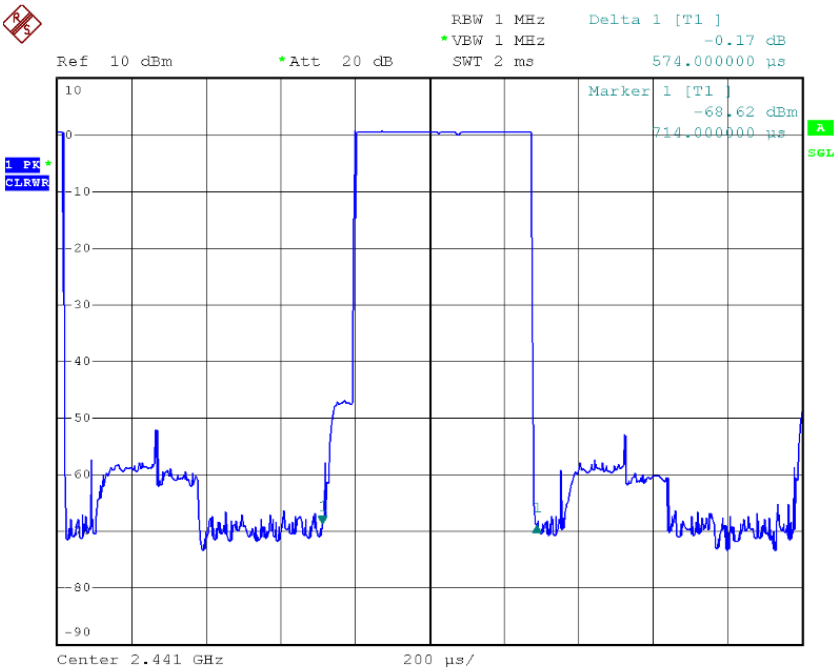
Data Packet	Frequency	Mkr Delta(ms)	Dwell Time(s)	Limits(s)	Result
DH5	2441 MHz	3.094	0.330	0.400	Pass
DH3	2441 MHz	1.844	0.295	0.400	Pass
DH1	2441 MHz	0.574	0.184	0.400	Pass



(DH5)


RBW 1 MHz
*VBW 1 MHz
SWT 5 ms
Delta 1 [T1]
-0.71 dB
1.844000 ms
Ref 10 dBm
*Att 20 dB
Marker 1 [T1]
-68.00 dBm
1 PK*
CLRWR
A
SGL
Center 2.441 GHz
500 µs/

(DH3)

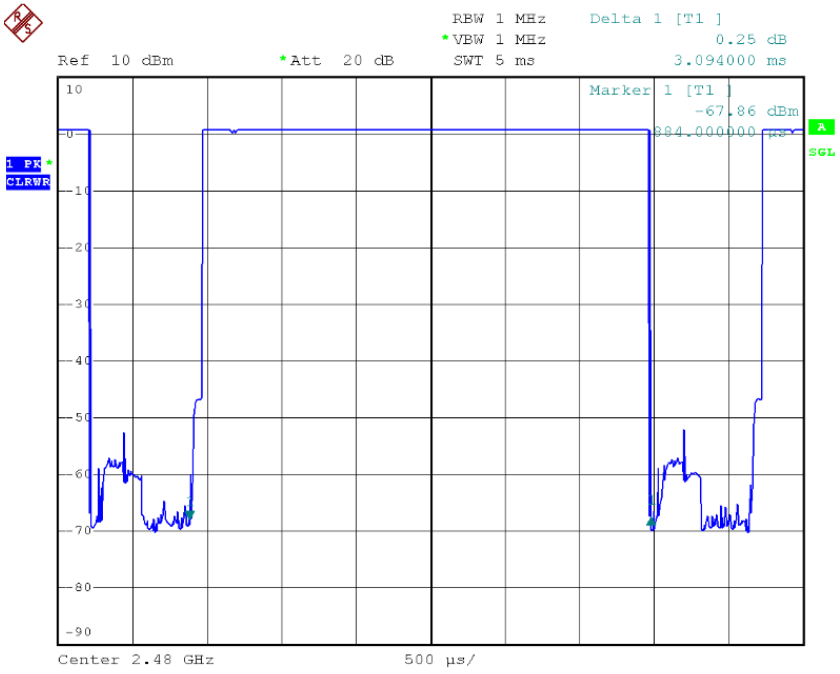

RBW 1 MHz
*VBW 1 MHz
SWT 2 ms
Delta 1 [T1]
-0.17 dB
574.000000 µs
Ref 10 dBm
*Att 20 dB
Marker 1 [T1]
-68.62 dBm
1 PK*
CLRWR
A
SGL
Center 2.441 GHz
200 µs/

(DH1)

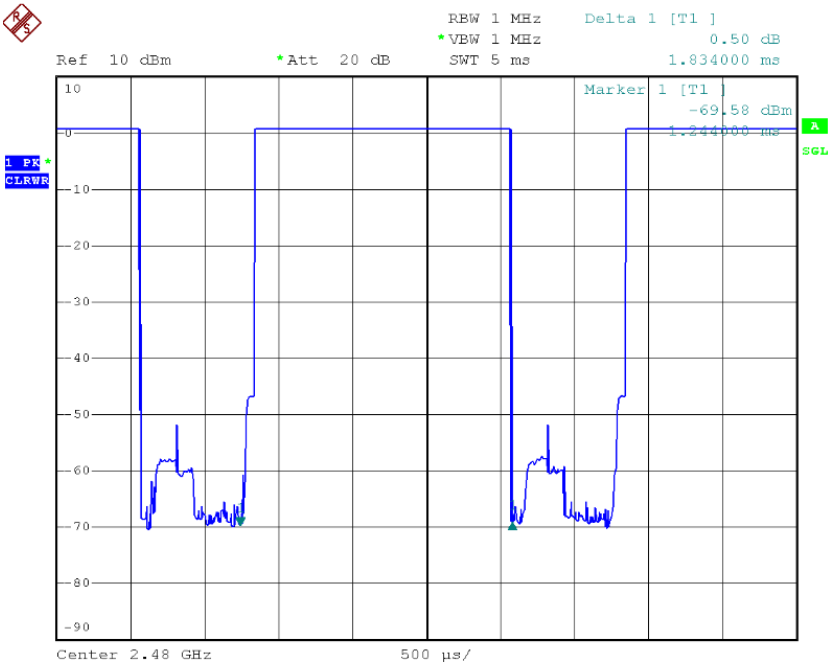
High Channel: 2480MHz

Dwell time of each occupation in this channel as follows:

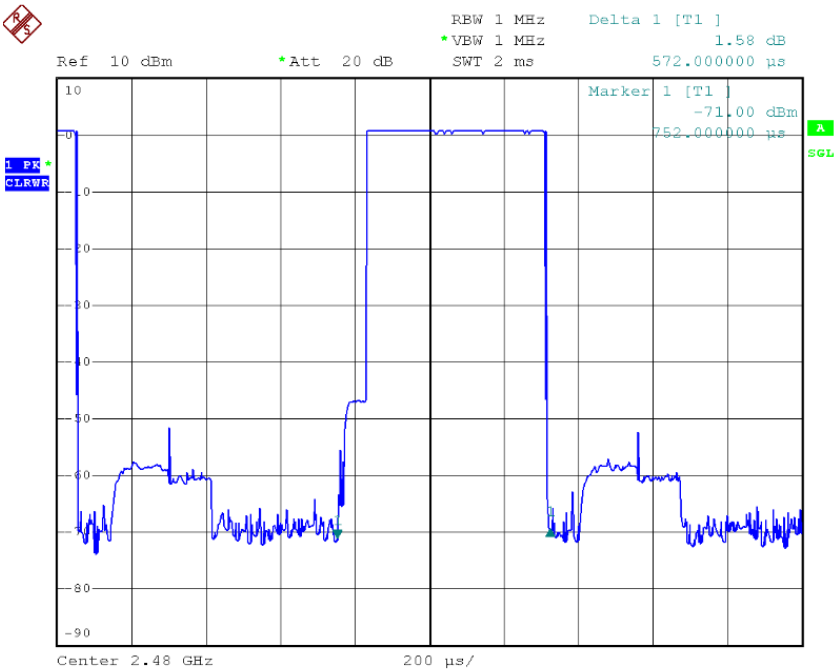
Data Packet	Frequency	Mkr Delta(ms)	Dwell Time(s)	Limits(s)	Result
DH5	2480 MHz	3.094	0.330	DH5	Pass
DH3	2480 MHz	1.834	0.293	DH3	Pass
DH1	2480 MHz	0.572	0.183	DH1	Pass



(DH5)


RBW 1 MHz
*VBW 1 MHz
SWT 5 ms
Delta 1 [T1]
0.50 dB
1.834000 ms
Ref 10 dBm
*Att 20 dB
Marker 1 [T1]
-69.58 dBm
1.244000 ms
1 PK*
CLRWR
A
SGL
10
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
Center 2.48 GHz
500 µs/

(DH3)


RBW 1 MHz
*VBW 1 MHz
SWT 2 ms
Delta 1 [T1]
1.58 dB
572.000000 µs
Ref 10 dBm
*Att 20 dB
Marker 1 [T1]
-71.00 dBm
752.000000 µs
1 PK*
CLRWR
A
SGL
10
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
Center 2.48 GHz
200 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 Part 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	0.12	1.028	0.000205	1	Complies
0	1	0.52	1.127	0.000224	1	Complies
0	1	0.55	1.135	0.000226	1	Complies

16 Photographs - Constructional Details

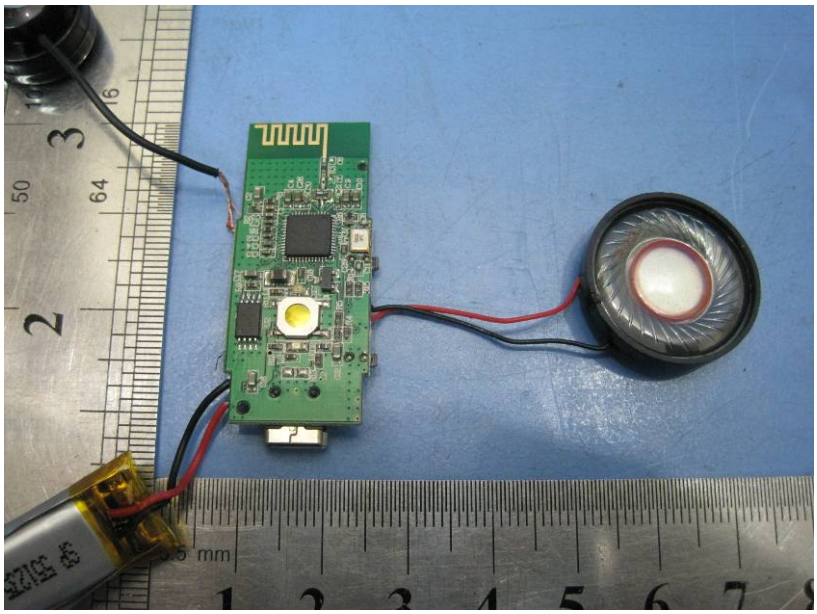
16.1 Product View

16.2 EUT – Front View

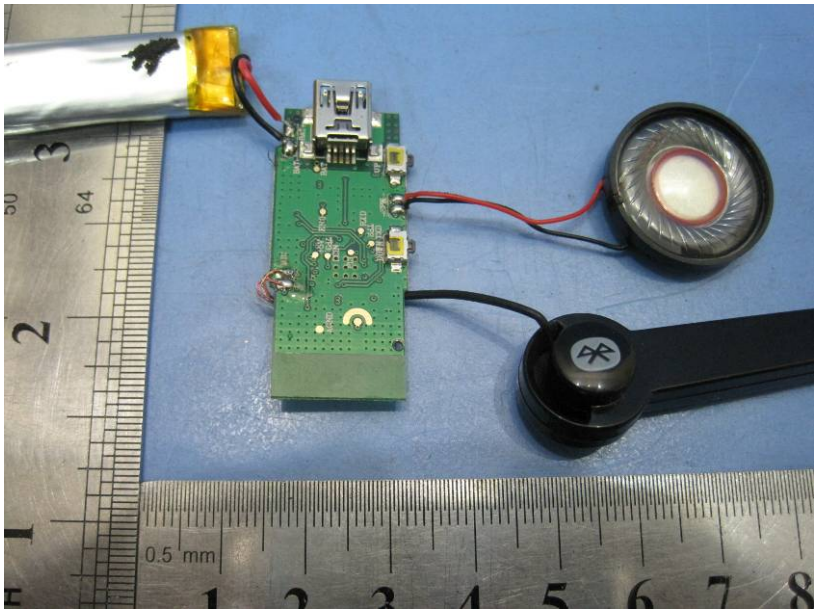
16.3 EUT – Back View

16.4 EUT – Open View

16.5 PCB – Front View



16.6 PCB – Back View



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.

Proposed Label Location on EUT

EUT Top View/ proposed FCC Label Location