FCC TEST REPORT

FCC ID	: LE2GC43
Applicant	: JSW Pacific Corporation
Address	: 3F-3, No 700, Chung-Zweng Road Chung Ho City, Taipei, Hsien, Taiwan

Equipment Under Test (EUT) :

Product Name	: Digital Wireless Camera
Model No.	: GC43

Standards	: FCC CFR47 Part 15 Section 15.247:2010
Date of Test	: May 7, 2012 ~ May 13, 2012
Date of Issue	: May 14, 2012
Test Engineer	: Hunk yan / Engineer
Reviewed By	: Philo zhong / Manager

Test Result	**: PASS**

Prepared By:

Waltek Services (Shenzhen) Co., Ltd.

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2 Test Summary

Test Items	Test Requirement	Result
Radiated Spurious Emissions (18MHz to 25GHz)	15.205(a) 15.109&15.209 15.247(d)	PASS
Conduct Emission	15.107&15.207	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

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4 General Information

4.1 Client Information

Applicant : JSW Pacific Corporation

Address of Applicant : 3F-3, No 700, Chung-Zweng Road Chung Ho City, Taipei, Hsien, Taiwan

Manufacturer : JSW Pacific Corporation

Address of Manufacturer : 3F-3, No 700, Chung-Zweng Road Chung Ho City, Taipei, Hsien, Taiwan

4.2 General Description of E.U.T.

Product Name : Digital Wireless Camera

Model No. : GC43

4.3 Details of E.U.T.

Technical Data : 5.0V DC or 3.7V 1250mAh Li-ion Rechargeable Battery.
Three kind of adapters can be used for diffent market.The full test were performed with these three adapters separately and battery, the worst case is the sample going with adapter 1, so the worst data were shown as follow.We confirm that all conditions had been considered during the test and full tests are passed.

Adapter 1 : KSAS0060500100VUD (Ktec)
Input: 100 – 240VAC, 50/60Hz, 0.18A
Output: 5.0VDC, 1.0A

Adapter 2 : SYS1421-0505-W2 (Sunny)
Input: 100 – 240VAC, 50/60Hz, 0.5A MAX
Output: 5.0VDC, 1.0A, 5W MAX

Adapter 3 : SSA051F050100USD (KUANTEN)
Input: 100 – 240VAC, 50/60Hz, 0.2A
Output: 5.0VDC, 1.0A

Operation Frequency : 2414.25MHz ~ 2461.50MHz

Antenna Gain : 2 dBi

There are 15 channels in total.

Channel 1	2414.25MHz	Channel 6	2431.15MHz	Channel 11	2448.02MHz
Channel 2	2417.63MHz	Channel 7	2434.53MHz	Channel 12	2451.40MHz
Channel 3	2421.01MHz	Channel 8	2437.88MHz	Channel 13	2454.78MHz
Channel 4	2424.39MHz	Channel 9	2441.26MHz	Channel 14	2458.16MHz
Channel 5	2427.77MHz	Channel 10	2444.64MHz	Channel 15	2461.50MHz

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 Digital Wireless Camera. The standards used were FCC CFR47 Part 15 Section 15.203, Section 15.207, 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
Broad-band Horn Antenna	SCHWARZBECK MESS-ELEKTROM / BBHA 9170	399	W2008005	15-26.5GHz	Aug. 2, 2011	Aug. 1, 2012	±1.5dB
Broadband Preamplifier	SCHWARZBECK MESS-ELEKTROM / BBV 9719	9719-254	W2008006	18-26.5GHz	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	-

Equipment Name	Manufacturer Model	Equipment No	Internal No	Specification	Cal. Date	Due Date	Uncertainty
Test Receiver	ROHDE&SCHWARZ/ ESPI	101155	W2005001	9k-3GHz	Aug. 2, 2011	Aug. 1, 2012	±1dB
Two-Line V-Network	ROHDE&SCHWARZ/ ENV216	100115	W2005002	50Ω/50μH	Aug. 2, 2011	Aug. 1, 2012	±10%
RF Generator	TESEQ GmbH/ NSGC43070	25781	W2008008	Fraq-range : 9K-1GHz RF voltage : -60 dBm-+10dBm	Aug. 2, 2011	Aug. 1, 2012	Power_freq distinguish0.1Hz RFeletricity distinguish 0.1B
Active Loop Antenna	Beijing Dazhi / ZN30900A	-	-	-	Aug. 2, 2011	Aug. 1, 2012	±1dB
AC Power Supply	TONGYUN/ DTDGC-4	-	-	-	Aug. 2, 2011	Aug. 1, 2012	-

6 Conducted Emission

Test Requirement:	FCC CFR 47 Part 15 Section 15.107&15.207
Test Method:	ANSI C63.4:2003
Test Result:	PASS
Frequency Range:	150kHz to 30MHz
Class:	Class B
Limit:	66-56 dBμV between 0.15MHz & 0.5MHz 56 dBμV between 0.5MHz & 5MHz 60 dBμV between 5MHz & 30MHz
Detector:	Peak for pre-scan (9kHz Resolution Bandwidth) Quasi-Peak & Average if maximised peak within 6dB of Average Limit

6.1 E.U.T. Operation

Operating Environment:

Temperature: 25.5 °C

Humidity: 51 % RH

Atmospheric Pressure: 1012 mbar

EUT Operation:

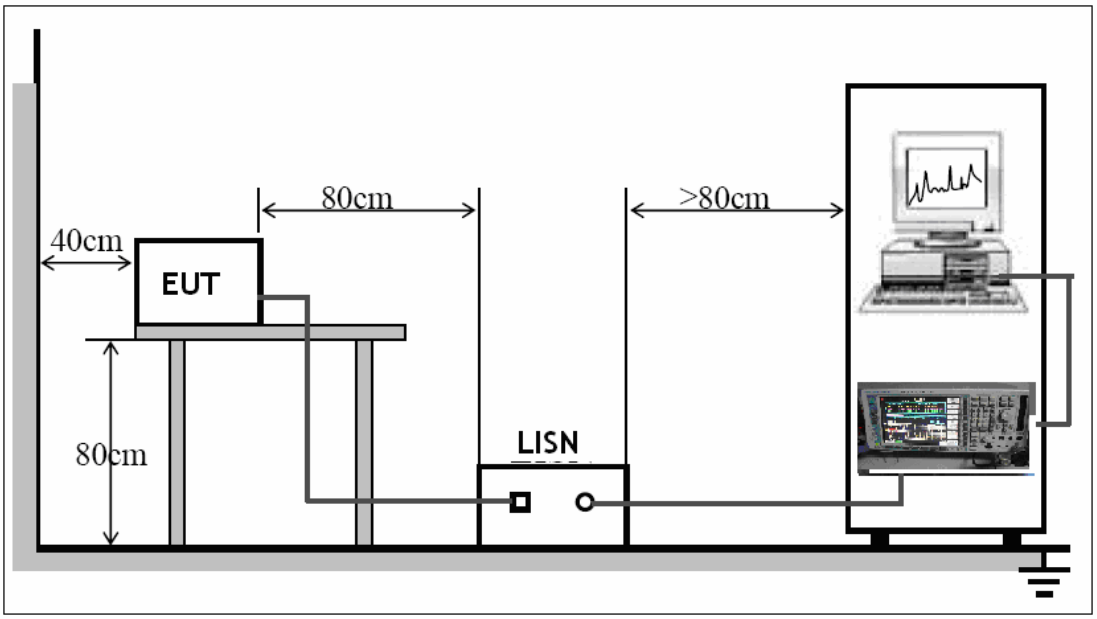
The pre-test was performed in normal link mode and continuously transmit mode, the worse mode is normal link mode, so the worst data were shown as follow.

The EUT was tested according to ANSI C63.4:2003. The frequency spectrum from 150kHz to 30MHz was investigated.

The maximised peak emissions from the EUT was scanned and measured for both the Live and Neutral Lines. Quasi-peak & average measurements were performed if peak emissions were within 6dB of the average limit line.

6.2 EUT Setup

The conducted emission tests were performed using the setup accordance with the ANSI C63.4:2003, The specification used in this report was the FCC Part15.207 limits.



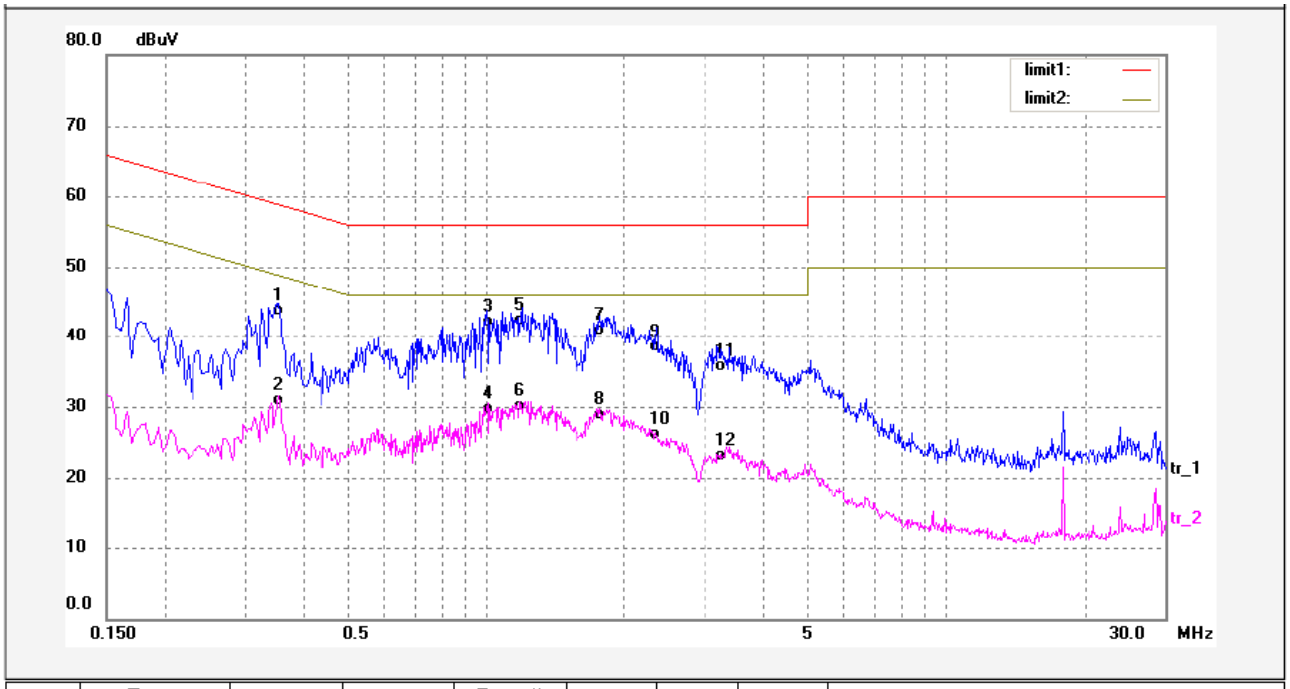
The EUT was placed on the test table in shielding room

6.3 Conducted Emission Test Result

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

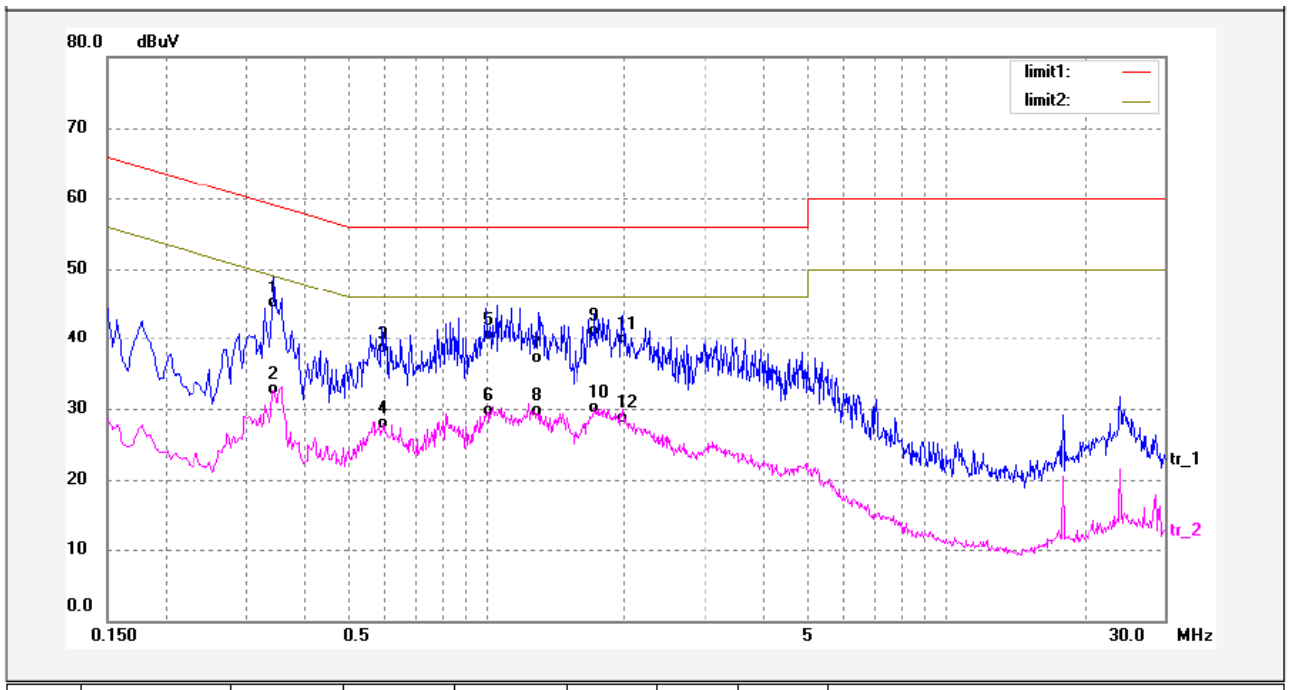
Mode: normal link

Live line:



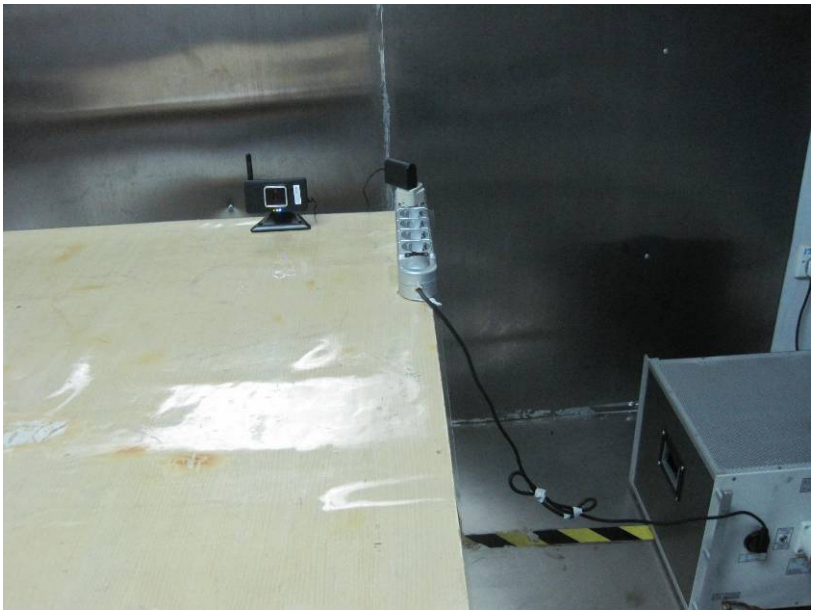
No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Margin (dB)	Detector	Remark
1	0.3540	32.53	10.35	42.88	58.87	-15.99	QP	
2	0.3540	19.68	10.35	30.03	48.87	-18.84	AVG	
3	1.0100	30.81	10.45	41.26	56.00	-14.74	QP	
4	1.0100	18.47	10.45	28.92	46.00	-17.08	AVG	
5	1.1940	31.10	10.50	41.60	56.00	-14.40	QP	
6	1.1940	18.81	10.50	29.31	46.00	-16.69	AVG	
7	1.7700	29.53	10.64	40.17	56.00	-15.83	QP	
8	1.7700	17.48	10.64	28.12	46.00	-17.88	AVG	
9	2.3340	27.08	10.72	37.80	56.00	-18.20	QP	
10	2.3340	14.59	10.72	25.31	46.00	-20.69	AVG	
11	3.2300	24.12	10.76	34.88	56.00	-21.12	QP	
12	3.2300	11.55	10.76	22.31	46.00	-23.69	AVG	

Neutral line:



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Margin (dB)	Detector	Remark
1	0.3460	33.96	10.34	44.30	59.06	-14.76	QP	
2	0.3460	21.52	10.34	31.86	49.06	-17.20	AVG	
3	0.5940	27.23	10.42	37.65	56.00	-18.35	QP	
4	0.5940	16.64	10.42	27.06	46.00	-18.94	AVG	
5	1.0020	29.25	10.45	39.70	56.00	-16.30	QP	
6	1.0020	18.43	10.45	28.88	46.00	-17.12	AVG	
7	1.2980	25.88	10.52	36.40	56.00	-19.60	QP	
8	1.2980	18.40	10.52	28.92	46.00	-17.08	AVG	
9	1.7340	29.64	10.63	40.27	56.00	-15.73	QP	
10	1.7340	18.67	10.63	29.30	46.00	-16.70	AVG	
11	1.9860	28.48	10.70	39.18	56.00	-16.82	QP	
12	1.9860	17.12	10.70	27.82	46.00	-18.18	AVG	

6.4 Photograph – Conducted Emission Test Setup



7 Radiated Spurious Emissions

Test Requirement: FCC CFR47 Part 15 Section 15.109&15.209 & 15.247

Test Method: Based on DA 00-705

Test Result: PASS

Frequency Range: 18MHz to 25GHz

Measurement Distance: 3m

Limit:

Frequency (MHz)	Field Strength		Field Strength Limit at 3m Measurement Dist	
	uV/m	Distance (m)	uV/m	dBuV/m
0.009 ~ 0.490	2400/F(kHz)	300	10000 * 2400/F(kHz)	$20\log^{(2400/F(kHz))} + 80$
0.490 ~ 1.705	24000/F(kHz)	30	100 * 24000/F(kHz)	$20\log^{(24000/F(kHz))} + 40$
1.705 ~ 30	30	30	100 * 30	$20\log^{(30)} + 40$
30 ~ 88	100	3	100	$20\log^{(100)}$
88 ~ 216	150	3	150	$20\log^{(150)}$
216 ~ 960	200	3	200	$20\log^{(200)}$
Above 960	500	3	500	$20\log^{(500)}$

Test mode: The EUT was tested in continuously Transmit mode.

7.1 EUT Operation :

Operating Environment:

Temperature: 25.5 °C

Humidity: 51 % RH

Atmospheric Pressure: 1012 mbar

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.

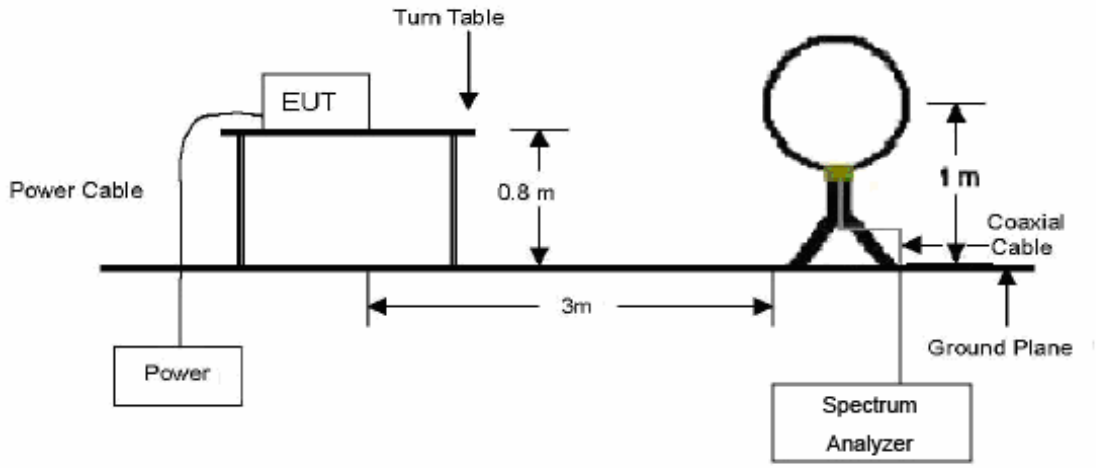
Based on NIS 81, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of a radiation emissions measurement at Waltek EMC Lab is ±5.03dB.

7.3 Test Setup

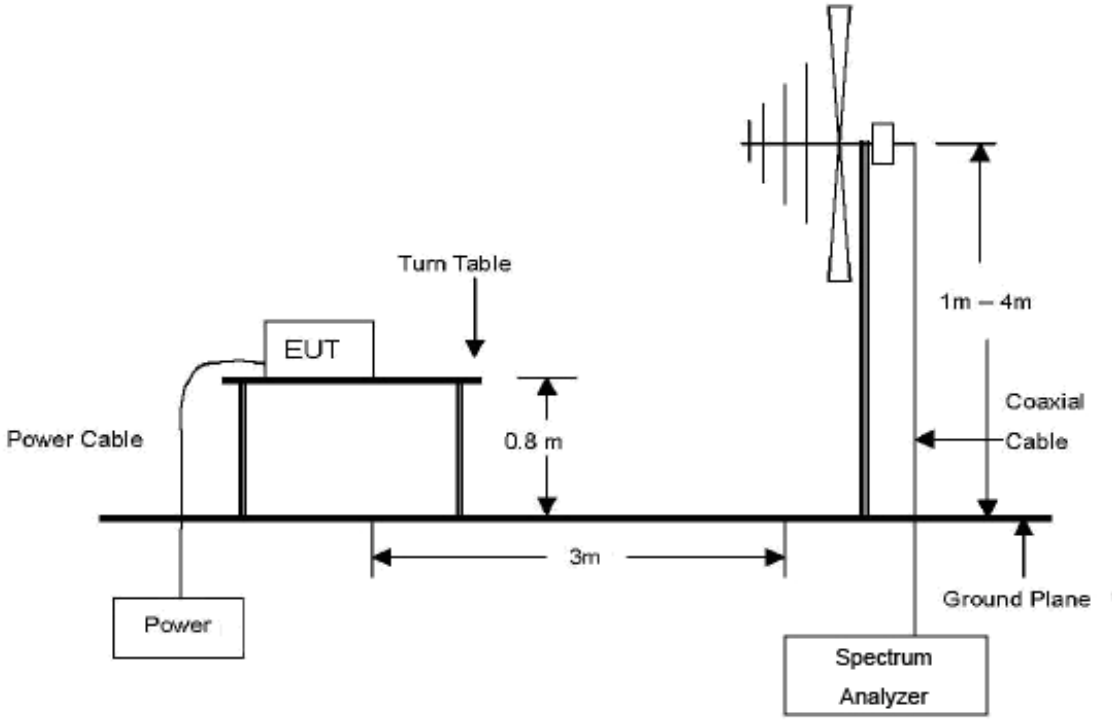
The radiated emission tests were performed in the 3m Semi- Anechoic Chamber test site, using the setup accordance with the ANSI C63.4:2003.

According to blockdiagram,the lowest oscillator generated in the device is 18MHz, so the emission was tested from the lowest frequency.

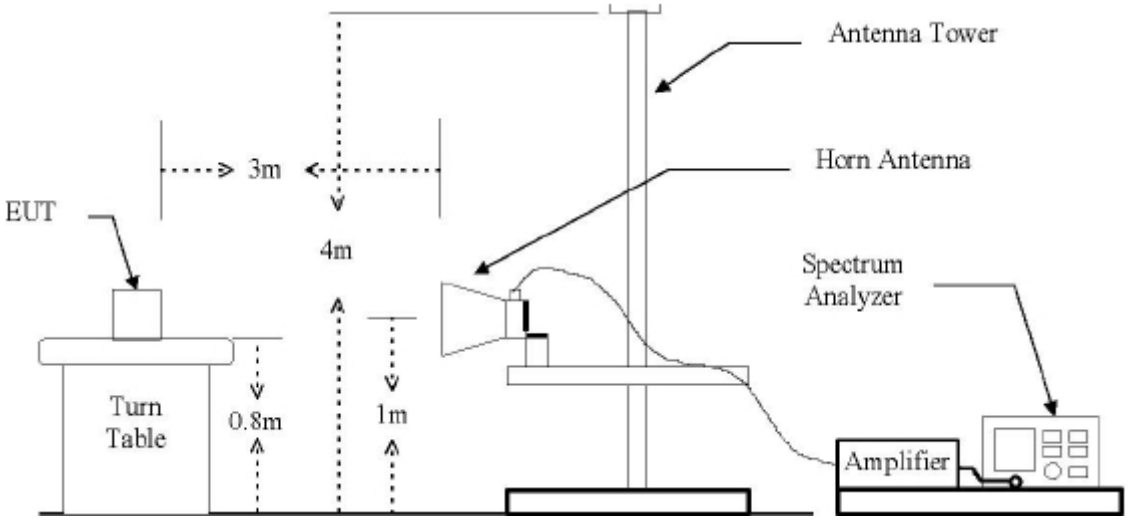
The diagram below shows the test setup that is utilized to make the measurements for emission from 18MHz to 30 MHz Emissions.



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.



7.4 Spectrum Analyzer Setup

According to FCC Part15 Rules, the system was tested from 18MHz to 25000MHz.

18MHz ~ 30MHz

Start Frequency	18MHz
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	3MHz
Quasi-Peak Adapter Bandwidth	120 KHz
Quasi-Peak Adapter Mode	Normal
Resolution Bandwidth	1MHz

7.5 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.

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:

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

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

Margin = Corr. Ampl. – Limit

7.7 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

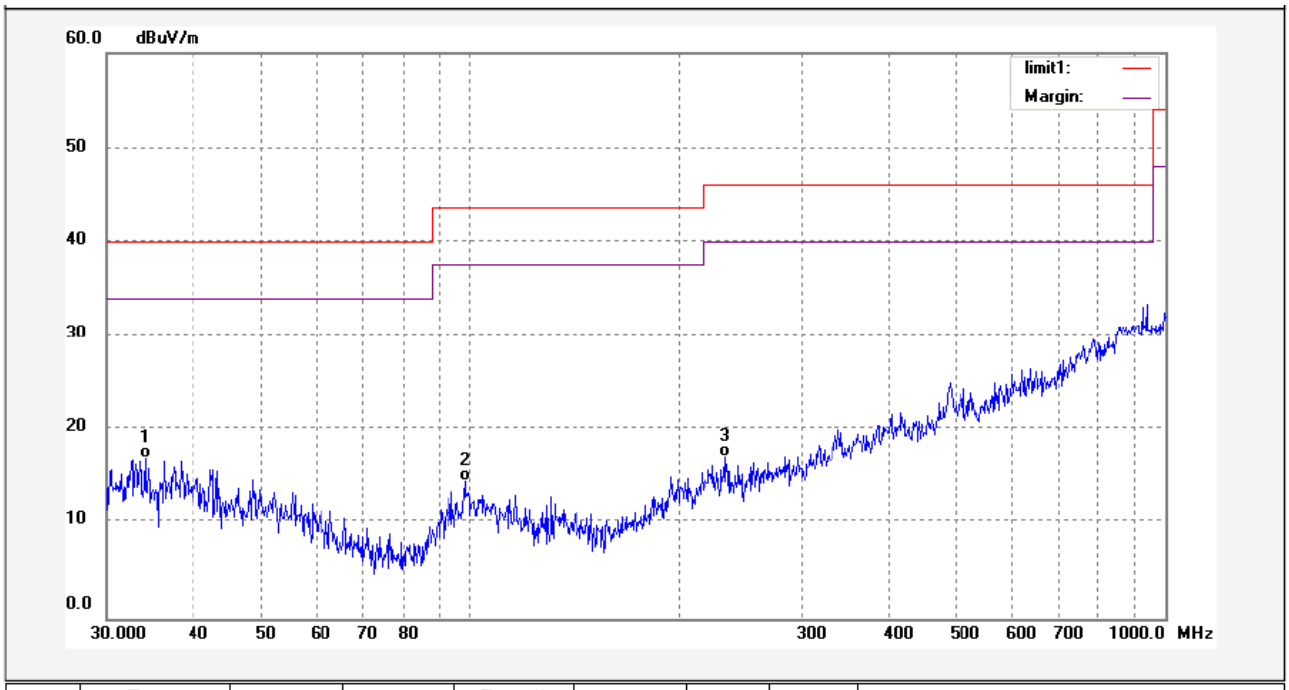
Remark: the EUT was pretested at the high, middle and low channel, and the worse case was the low Channel, so the data show was the low channel only.

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

Mode:Normal link

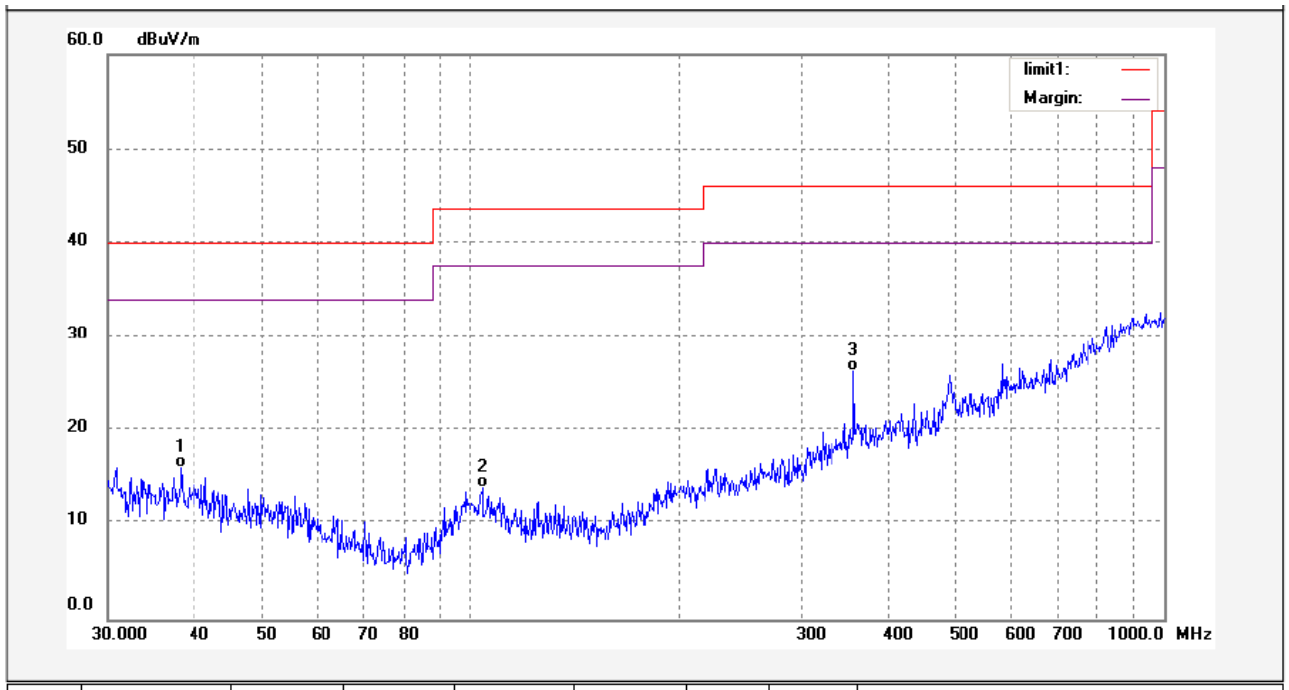
Test Frequency : 30MHz ~ 1000MHz

Antenna polarization: Vertical



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	34.0449	0.43	16.53	16.96	40.00	-23.04	QP	
2	98.3752	0.87	13.71	14.58	43.50	-28.92	QP	
3	232.6690	1.19	15.96	17.15	46.00	-28.85	QP	

Antenna polarization: Horizontal

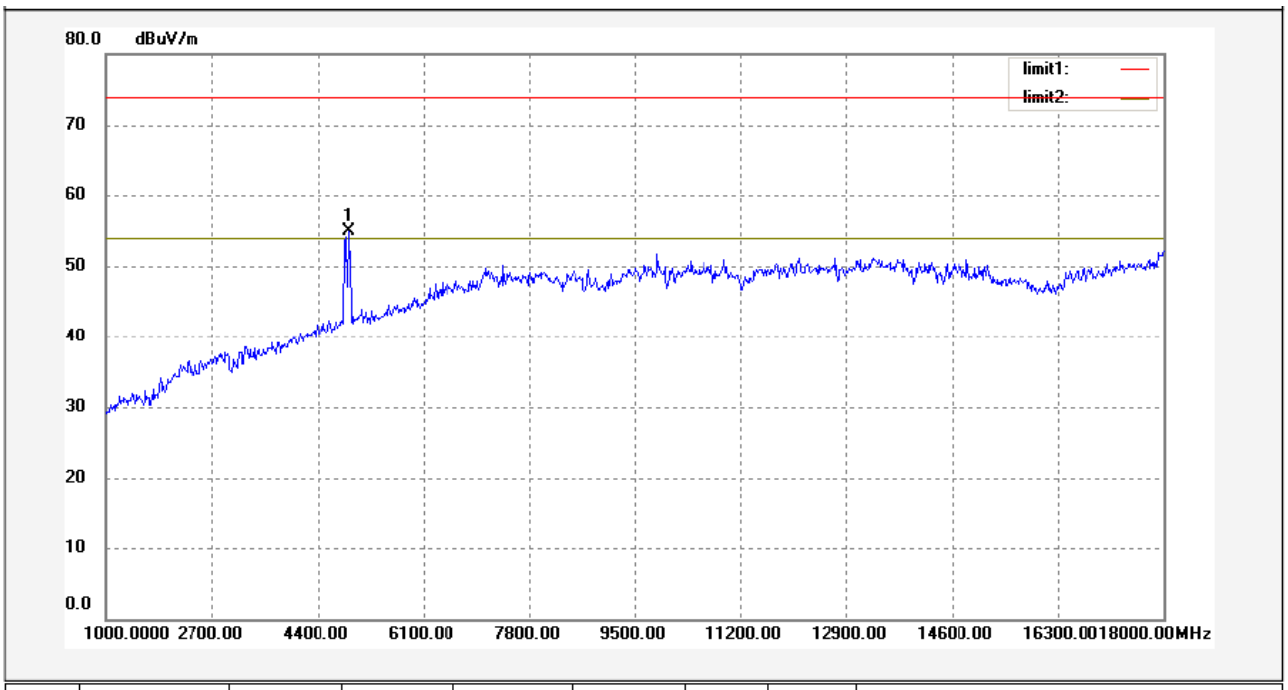


No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	38.2304	-0.53	16.63	16.10	40.00	-23.90	QP	
2	104.0639	-0.19	14.20	14.01	43.50	-29.49	QP	
3	357.1923	5.80	20.59	26.39	46.00	-19.61	QP	

Test Frequency: Above 1GHz radiation test data:

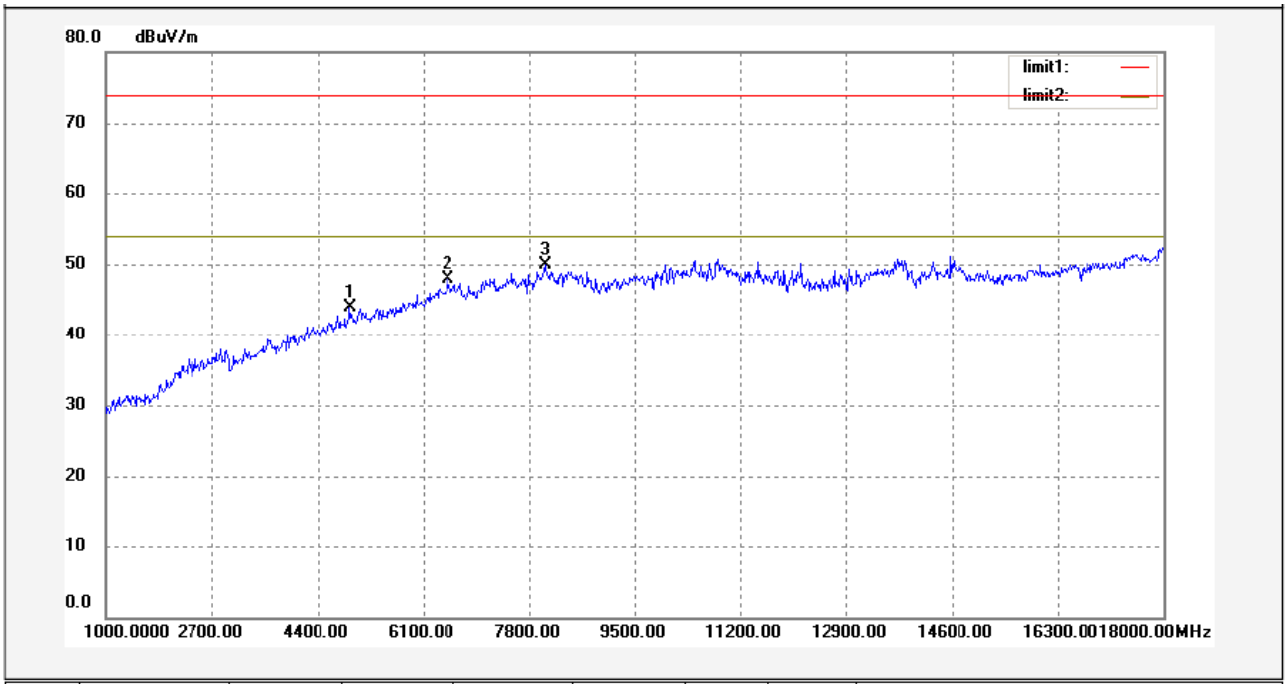
Remark: No any emissions were found from 18GHz to 25 GHz, So the radiated emissions from 18GHz to 25GHz were not record.

Antenna polarization: Vertical



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	4900.801	58.98	-4.08	54.90	74.00	-19.10	peak	

Antenna polarization: Horizontal



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	4917.836	47.93	-4.00	43.93	74.00	-30.07	peak	
2	6484.970	47.83	0.04	47.87	74.00	-26.13	peak	
3	8052.104	45.49	4.42	49.91	74.00	-24.09	peak	

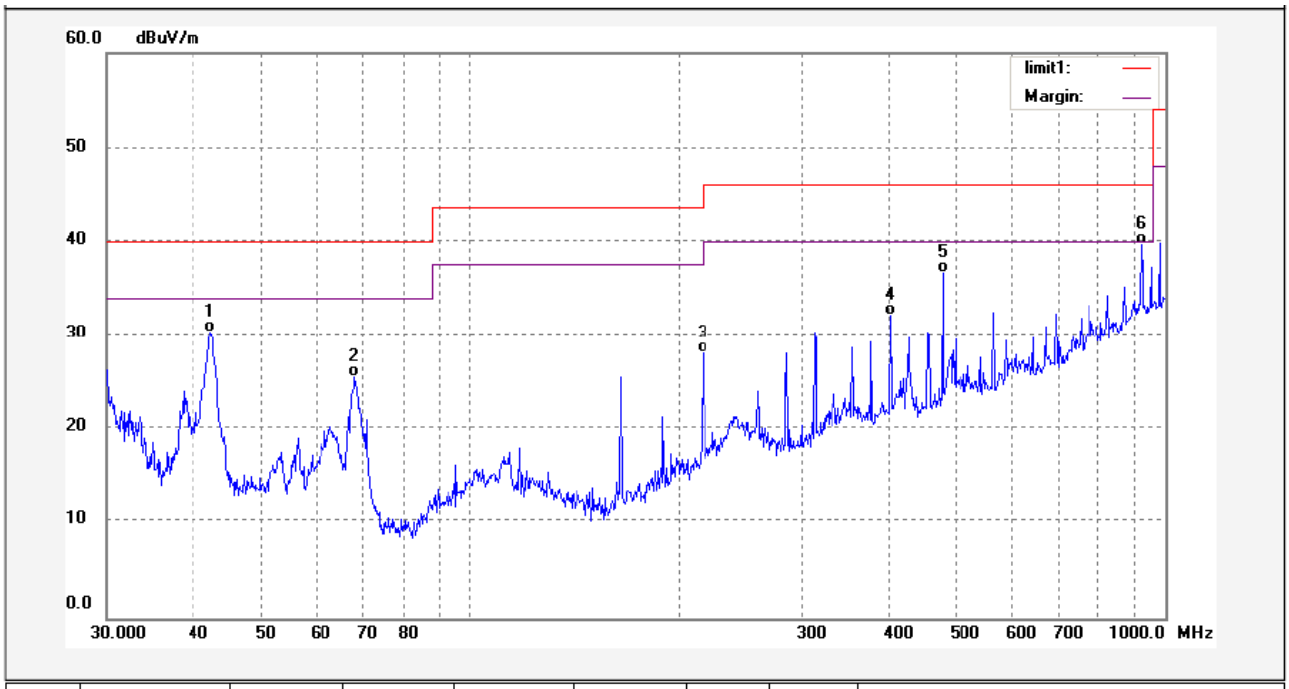
Test mode: continuously transmit mode

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 do not show in the report.

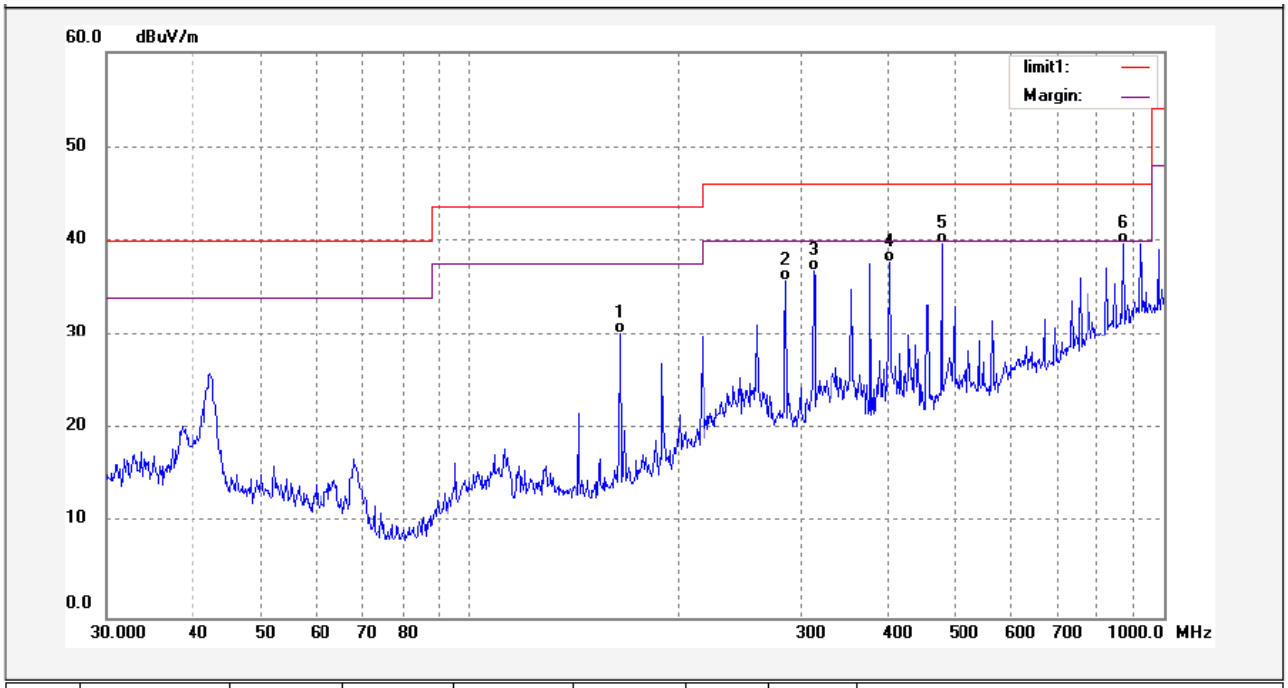
Test Frequency : 30MHz ~ 1000MHz

Antenna polarization: Vertical



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	42.3314	14.96	15.47	30.43	40.00	-9.57	QP	
2	68.2634	15.31	10.31	25.62	40.00	-14.38	QP	
3	216.1195	12.76	15.33	28.09	46.00	-17.91	QP	
4	402.5167	11.10	21.06	32.16	46.00	-13.84	QP	
5	478.1394	14.18	22.52	36.70	46.00	-9.30	QP	
6	925.6132	7.87	31.77	39.64	46.00	-6.36	QP	

Antenna polarization: Horizontal



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	164.8909	18.33	11.94	30.27	43.50	-13.23	QP	
2	285.2610	19.20	16.51	35.71	46.00	-10.29	QP	
3	312.5482	18.51	18.29	36.80	46.00	-9.20	QP	
4	402.5168	16.71	21.06	37.77	46.00	-8.23	QP	
5	478.1394	17.20	22.52	39.72	46.00	-6.28	QP	
6	875.0131	9.25	30.39	39.64	46.00	-6.36	QP	

Test Frequency: 1GHz ~ 25GHz

And the below is the Fundamental and Harmonic

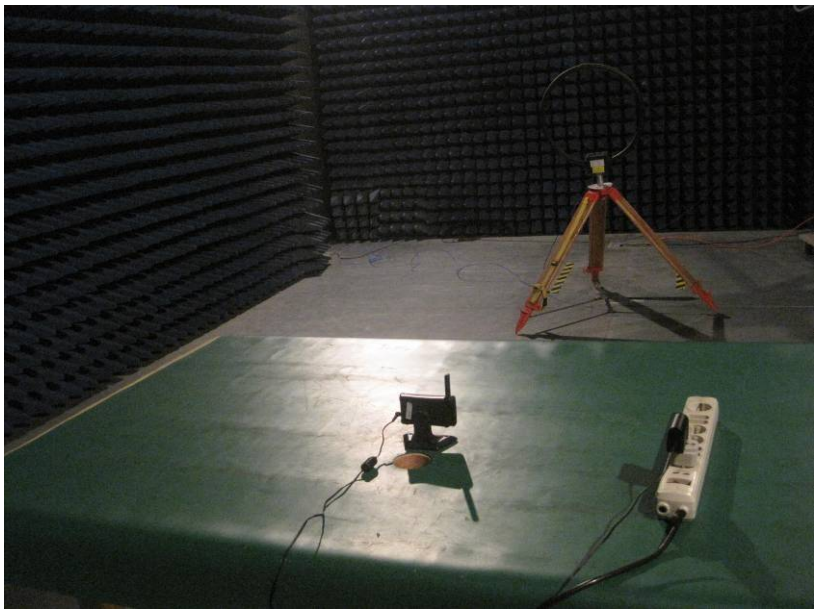
Frequency (MHz)	Detector	Antenna Polarization	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Turntable Angle (°)
Low frequency							
2414.25	AV	Vertical	102.35		(Fund.)	1.6	10
4828.50	AV	Vertical	45.32	54.00	-8.68	1.8	70
7242.75	AV	Vertical	47.24	54.00	-6.76	1.9	145
9657.00	AV	Vertical	45.21	54.00	-8.79	2.4	110
12071.25	AV	Vertical	37.95	54.00	-16.05	2.0	165
14485.50	AV	Vertical	40.68	54.00	-13.32	2.0	135
16899.75	AV	Vertical	39.24	54.00	-14.76	2.3	125
19314.00	AV	Vertical	38.15	54.00	-15.85	2.1	85
21728.25	AV	Vertical	33.12	54.00	-20.88	2.2	15
24142.50	AV	Vertical	32.24	54.00	-21.76	2.0	115
2414.25	AV	Horizontal	96.98		(Fund.)	1.8	45
4828.50	AV	Horizontal	44.21	54.00	-9.79	2.0	170
7242.75	AV	Horizontal	40.35	54.00	-13.65	2.0	110
9657.00	AV	Horizontal	39.54	54.00	-14.46	1.9	140
12071.25	AV	Horizontal	43.15	54.00	-10.85	2.0	115
14485.50	AV	Horizonta	38.15	54.00	-15.85	1.9	160
16899.75	AV	Horizontal	45.31	54.00	-8.69	2.0	150
19314.00	AV	Horizontal	34.25	54.00	-19.75	2.5	150
21728.25	AV	Horizontal	35.98	54.00	-18.02	1.7	135
24142.50	AV	Horizontal	36.15	54.00	-17.85	2.2	60
2414.25	PK	Vertical	114.66		(Fund.)	1.7	35
4828.50	PK	Vertical	57.23	74.00	-16.77	2.5	105
7242.75	PK	Vertical	59.64	74.00	-14.36	2.1	135
9657.00	PK	Vertical	56.21	74.00	-17.79	2.1	215
12071.25	PK	Vertical	52.36	74.00	-21.64	1.6	115
14485.50	PK	Vertical	54.48	74.00	-19.52	1.8	95
16899.75	PK	Vertical	49.53	74.00	-24.47	1.8	180
19314.00	PK	Vertical	48.65	74.00	-25.35	1.8	165
21728.25	PK	Vertical	46.52	74.00	-27.48	2.1	105
24142.50	PK	Vertical	47.62	74.00	-26.38	2.0	165
2414.25	PK	Horizontal	105.68		(Fund.)	2.4	105
4828.50	PK	Horizontal	43.21	74.00	-30.79	3.0	145
7242.75	PK	Horizontal	10.25	74.00	-63.75	2.4	115
9657.00	PK	Horizontal	43.25	74.00	-30.75	2.0	45
12071.25	PK	Horizontal	41.21	74.00	-32.79	1.8	195
14485.50	PK	Horizontal	38.21	74.00	-35.79	2.3	45
16899.75	PK	Horizontal	42.15	74.00	-31.85	2.4	225

19314.00	PK	Horizontal	33.12	74.00	-40.88	2.3	105
21728.25	PK	Horizontal	35.45	74.00	-38.55	1.8	155
24142.50	PK	Horizontal	37.25	74.00	-36.75	2.0	105
Middle frequency							
2437.88	AV	Vertical	102.68		(Fund.)	1.8	40
4875.76	AV	Vertical	47.52	54.00	-6.48	1.7	115
7313.64	AV	Vertical	45.21	54.00	-8.79	1.7	125
9751.52	AV	Vertical	42.02	54.00	-11.98	1.7	70
12189.40	AV	Vertical	45.24	54.00	-8.76	1.5	30
14627.28	AV	Vertical	38.15	54.00	-15.85	1.7	165
17065.16	AV	Vertical	40.25	54.00	-13.75	2.0	25
19503.04	AV	Vertical	38.24	54.00	-15.76	2.2	55
21940.92	AV	Vertical	40.25	54.00	-13.75	2.1	225
24378.80	AV	Vertical	35.45	54.00	-18.55	1.9	140
2437.88	AV	Horizontal	97.81		(Fund.)	2.0	185
4875.76	AV	Horizontal	43.24	54.00	-10.76	1.7	150
7313.64	AV	Horizontal	44.15	54.00	-9.85	1.9	325
9751.52	AV	Horizontal	37.15	54.00	-16.85	1.8	160
12189.40	AV	Horizontal	40.15	54.00	-13.85	1.6	200
14627.28	AV	Horizontal	39.15	54.00	-14.85	2.0	260
17065.16	AV	Horizontal	34.51	54.00	-19.49	2.1	205
19503.04	AV	Horizontal	37.15	54.00	-16.85	2.0	140
21940.92	AV	Horizontal	38.45	54.00	-15.55	1.6	205
24378.80	AV	Horizontal	34.15	54.00	-19.85	2.3	175
2437.88	PK	Vertical	113.95		(Fund.)	1.8	50
4875.76	PK	Vertical	60.25	74.00	-13.75	1.7	125
7313.64	PK	Vertical	57.15	74.00	-16.85	1.8	145
9751.52	PK	Vertical	57.21	74.00	-16.79	1.8	195
12189.40	PK	Vertical	55.21	74.00	-18.79	2.0	250
14627.28	PK	Vertical	52.15	74.00	-21.85	1.7	45
17065.16	PK	Vertical	50.23	74.00	-23.77	1.7	55
19503.04	PK	Vertical	47.24	74.00	-26.76	2.0	175
21940.92	PK	Vertical	53.15	74.00	-20.85	1.8	195
24378.80	PK	Vertical	46.31	74.00	-27.69	1.7	180
2437.88	PK	Horizontal	107.52		(Fund.)	2.0	55
4875.76	PK	Horizontal	57.21	74.00	-16.79	2.5	130
7313.64	PK	Horizontal	56.54	74.00	-17.46	2.1	165
9751.52	PK	Horizontal	52.11	74.00	-21.89	2.2	115
12189.40	PK	Horizontal	50.31	74.00	-23.69	1.9	215
14627.28	PK	Horizontal	50.21	74.00	-23.79	1.9	215
17065.16	PK	Horizontal	47.21	74.00	-26.79	1.6	170
19503.04	PK	Horizontal	47.12	74.00	-26.88	2.2	185
21940.92	PK	Horizontal	50.15	74.00	-23.85	1.6	45
24378.80	PK	Horizontal	46.21	74.00	-27.79	2.5	205

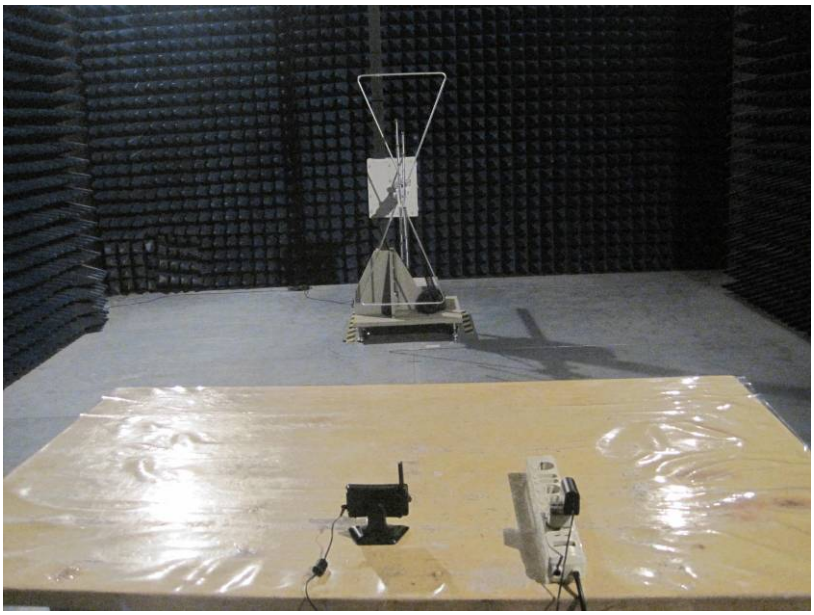
High frequency							
2461.50	AV	Vertical	104.02		(Fund.)	1.9	190
4923.00	AV	Vertical	46.32	54.00	-7.68	1.8	25
7384.50	AV	Vertical	43.15	54.00	-10.85	1.8	155
9846.00	AV	Vertical	45.58	54.00	-8.42	1.8	130
12307.50	AV	Vertical	40.21	54.00	-13.79	1.6	120
14769.00	AV	Vertical	47.28	54.00	-6.72	1.8	135
17230.50	AV	Vertical	40.25	54.00	-13.75	2.3	125
19692.00	AV	Vertical	43.98	54.00	-10.02	2.5	235
22153.50	AV	Vertical	40.28	54.00	-13.72	2.4	165
24615.00	AV	Vertical	36.27	54.00	-17.73	2.2	185
2461.50	AV	Horizontal	97.85		(Fund.)	2.3	185
4923.00	AV	Horizontal	40.98	54.00	-13.02	2.0	210
7384.50	AV	Horizontal	41.56	54.00	-12.44	2.1	175
9846.00	AV	Horizontal	42.81	54.00	-11.19	2.0	220
12307.50	AV	Horizontal	40.85	54.00	-13.15	1.8	185
14769.00	AV	Horizontal	34.73	54.00	-19.27	2.2	200
17230.50	AV	Horizontal	38.81	54.00	-15.19	2.3	250
19692.00	AV	Horizontal	34.15	54.00	-19.85	2.2	110
22153.50	AV	Horizontal	37.15	54.00	-16.85	1.8	145
24615.00	AV	Horizontal	29.64	54.00	-24.36	2.5	145
2461.50	PK	Vertical	112.95		(Fund.)	2.0	230
4923.00	PK	Vertical	61.23	74.00	-12.77	1.9	65
7384.50	PK	Vertical	56.48	74.00	-17.52	2.0	155
9846.00	PK	Vertical	57.25	74.00	-16.75	2.0	175
12307.50	PK	Vertical	53.16	74.00	-20.84	2.1	160
14769.00	PK	Vertical	59.68	74.00	-14.32	1.8	105
17230.50	PK	Vertical	54.15	74.00	-19.85	1.8	145
19692.00	PK	Vertical	55.15	74.00	-18.85	2.1	175
22153.50	PK	Vertical	52.15	74.00	-21.85	1.9	180
24615.00	PK	Vertical	47.85	74.00	-26.15	1.8	195
2461.50	PK	Horizontal	109.65		(Fund.)	2.3	235
4923.00	PK	Horizontal	55.66	74.00	-18.34	2.8	145
7384.50	PK	Horizontal	54.25	74.00	-19.75	2.4	195
9846.00	PK	Horizontal	54.16	74.00	-19.84	2.5	235
12307.50	PK	Horizontal	52.68	74.00	-21.32	2.2	155
14769.00	PK	Horizontal	46.85	74.00	-27.15	2.2	155
17230.50	PK	Horizontal	44.21	74.00	-29.79	1.9	200
19692.00	PK	Horizontal	43.29	74.00	-30.71	2.5	185
22153.50	PK	Horizontal	47.56	74.00	-26.44	1.9	165
24615.00	PK	Horizontal	44.52	74.00	-29.48	2.8	250

7.8 Photograph – Radiation Spurious Emission Test Setup

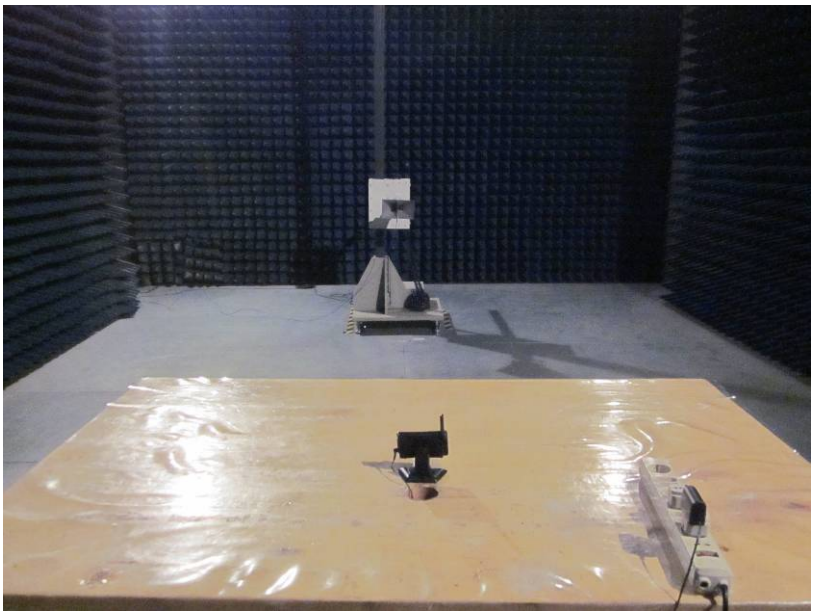
Below 30 MHz



30 MHz-1GHz



Above 1GHz

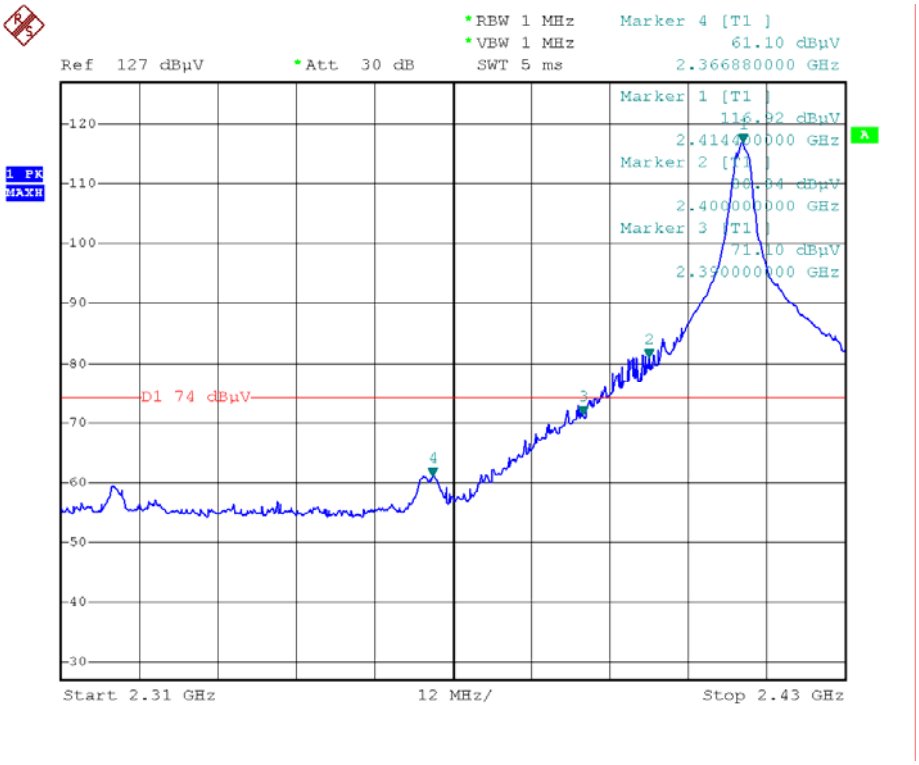


8 Band Edge Measurement

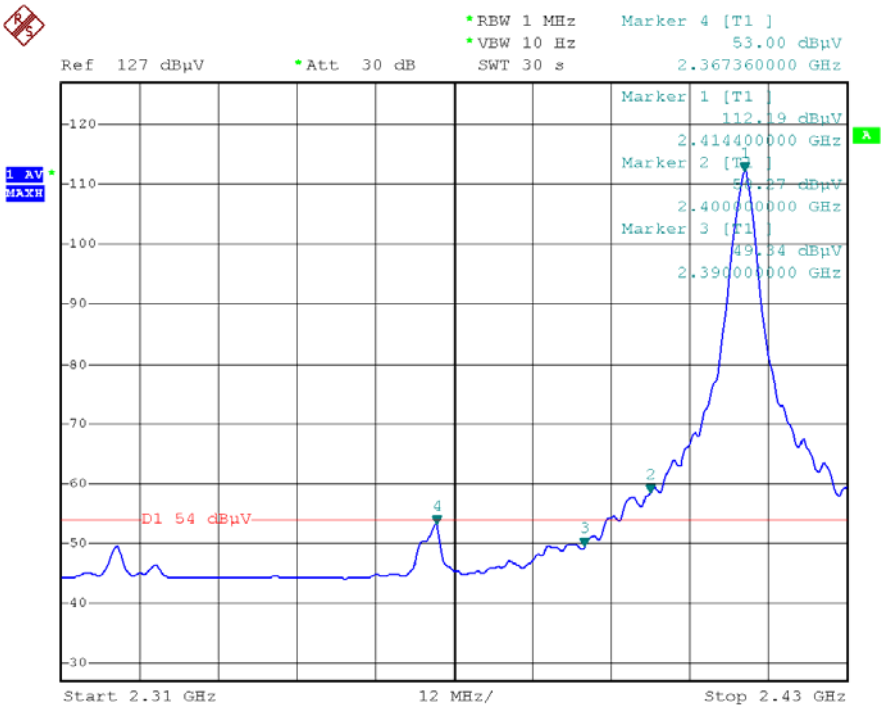
Test Requirement:	Section 15.247(d) In addition, radiated emissions which fall in the restricted bands. as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).
Test Method:	Based on DA 00-705
Measurement Distance:	3m
Limit:	40.0 dBuV/m between 30MHz & 88MHz; 43.5 dBuV/m between 88MHz & 216MHz; 46.0 dBuV/m between 216MHz & 960MHz; 54.0 dBuV/m above 960MHz. 74.0 dBuV/m for peak above 1GHz 54.0 dBuV/m for AVG above 1GHz
Detector:	For Peak value: RBW = 1 MHz for f ≥ 1 GHz VBW ≥ RBW; Sweep = auto Detector function = peak Trace = max hold For AVG value: RBW = 1 MHz for f ≥ 1 GHz VBW = 10Hz; Sweep = auto Detector function = AVG Trace = max hold

8.1 Test Result:

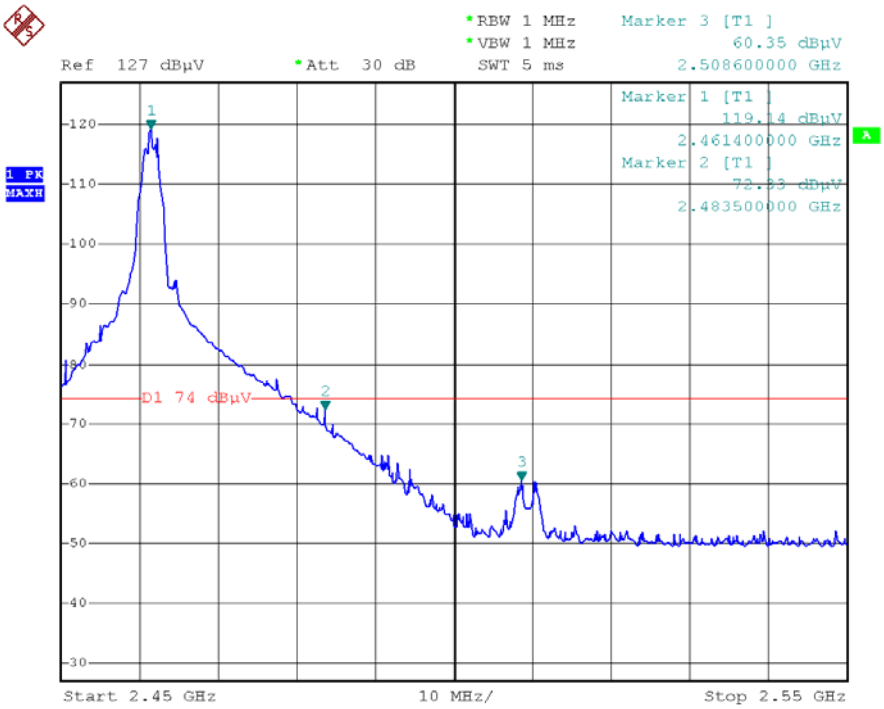
Low Channel – Peak



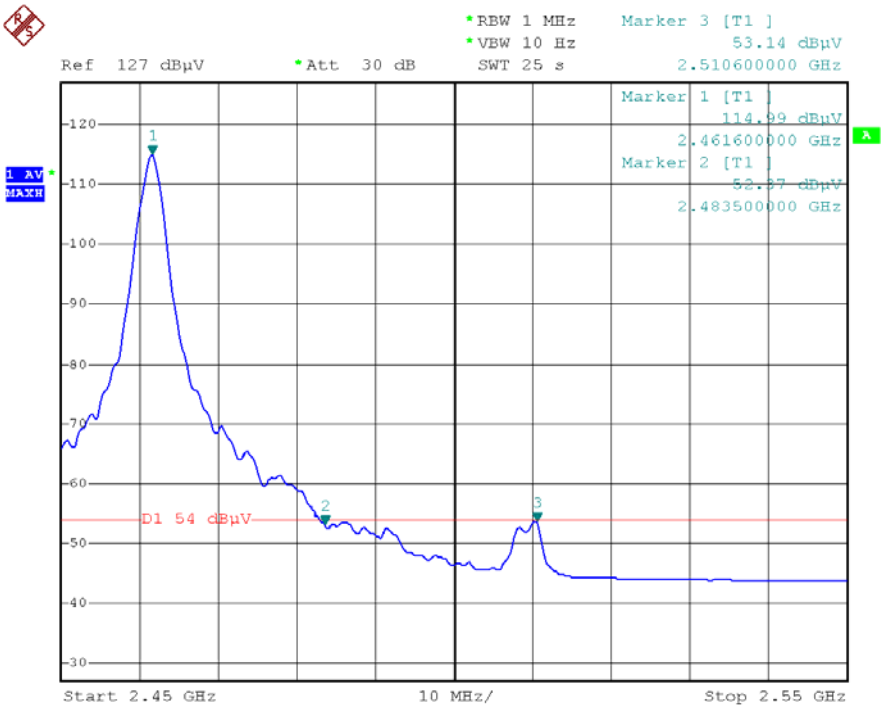
Low Channel – AV



High Channel – Peak



High Channel – AV



9 20 dB Bandwidth Measurement

Test Requirement: FCC CFR47 Part 15 Section 15.247

Test Method: Based on DA 00-705

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

9.1 Test Procedure:

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

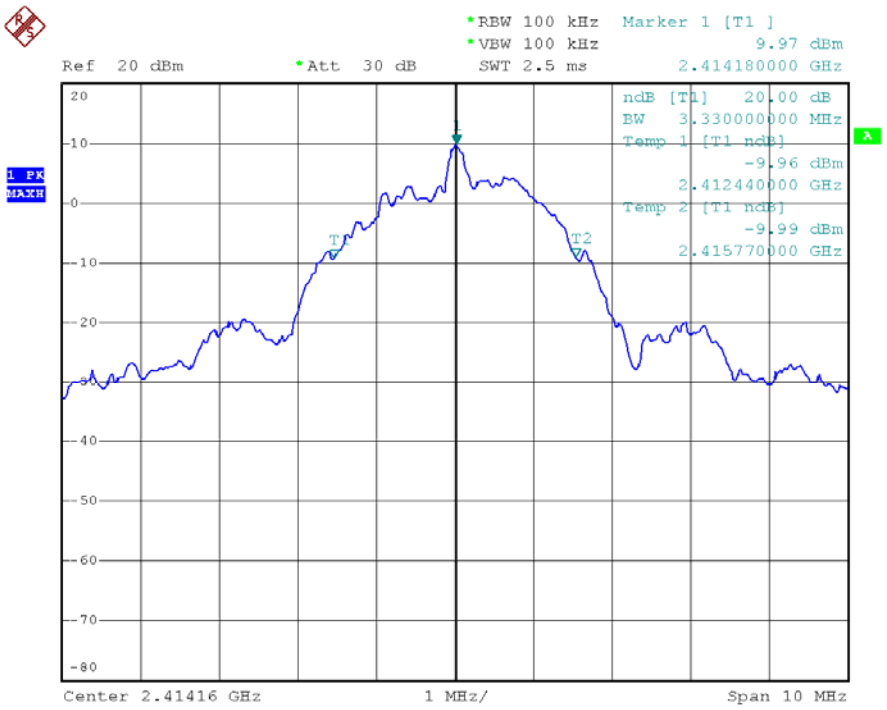
2. Set the spectrum analyzer: RBW = 100kHz, VBW = 100kHz

9.2 Test Result:

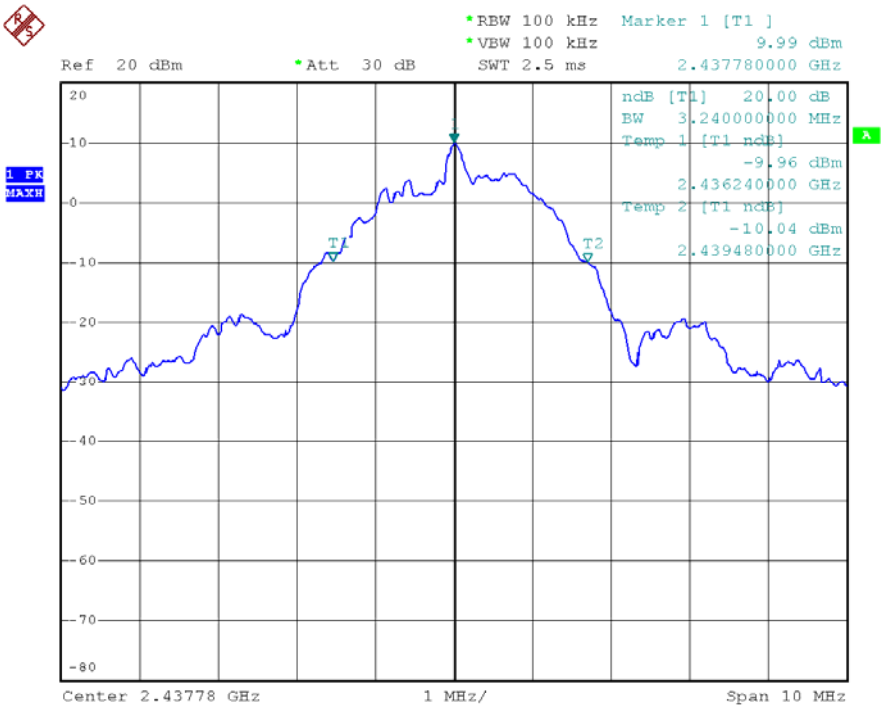
Test Channel	Bandwidth
Low	3.33MHz
Middle	3.24MHz
High	3.38MHz

Test result plot as follows:

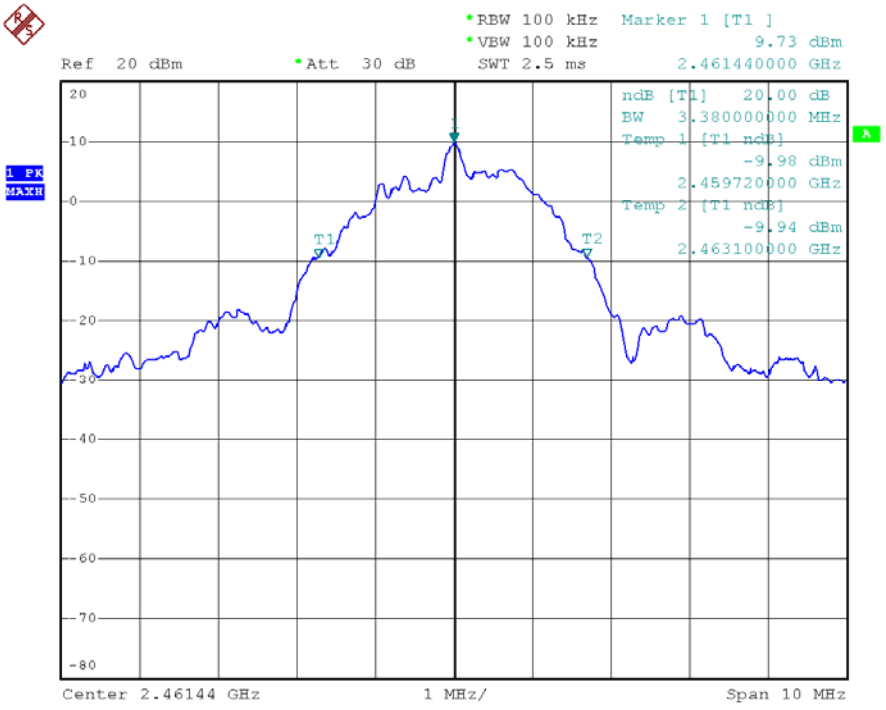
Low Channel



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 0.125watts (20.97 dBm) limit applies.
Test mode:	Test in fixing frequency transmitting mode.

10.1 Test Procedure:

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.
2. Set the spectrum analyzer: RBW = 3 MHz. VBW = 10 MHz. Sweep = auto; Detector Function = Peak.
3. Keep the EUT in transmitting at lowest, medium and highest channel individually. Record the max value.

10.2 Test Result:

Test Channel	Output Power (dBm)	Limit (dBm)
Low	9.98	20.97
Middle	9.99	20.97
High	9.80	20.97

11 Hopping Channel Separation

Test Requirement:	FCC CFR47 Part 15 Section 15.247
Test Method:	Based on DA 00-705
Test Limit:	Regulation 15.247(a)(1) Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 1W.
Test Mode:	Test in hopping transmitting operating mode.

11.1 Test Procedure:

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

2. Set the spectrum analyzer: RBW = 30kHz. VBW = 100kHz , Span = 7MHz. Sweep = auto; Detector Function = Peak. Trace = Max hold.

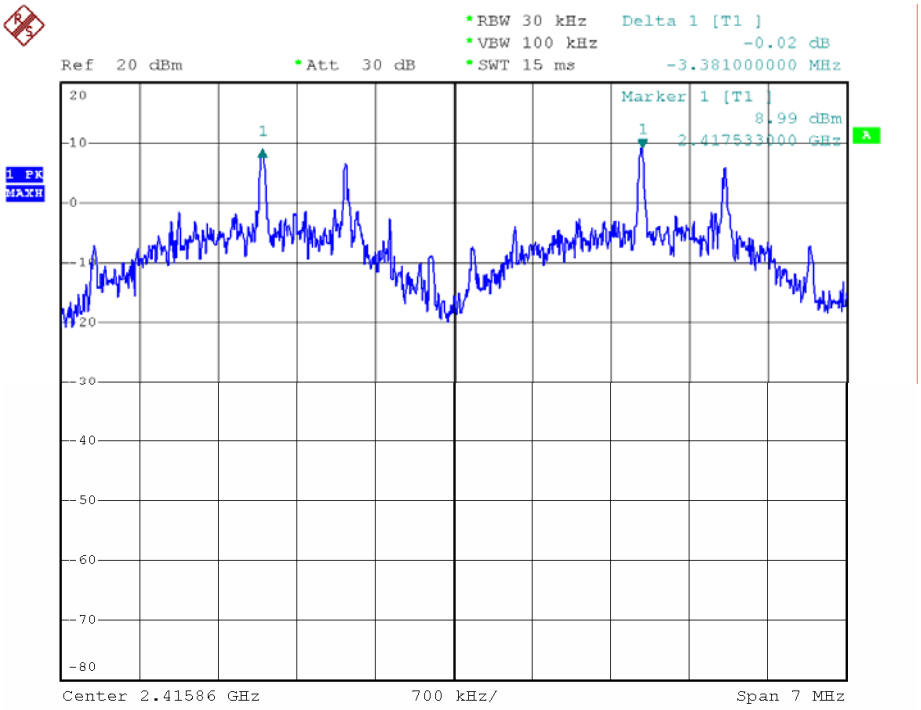
3. Allow the trace to stabilize. Use the marker-delta function to determine the separation between the peaks of the adjacent channels. The limit is specified in one of the subparagraphs of this Section Submit this plot.

11.2 Test Result:

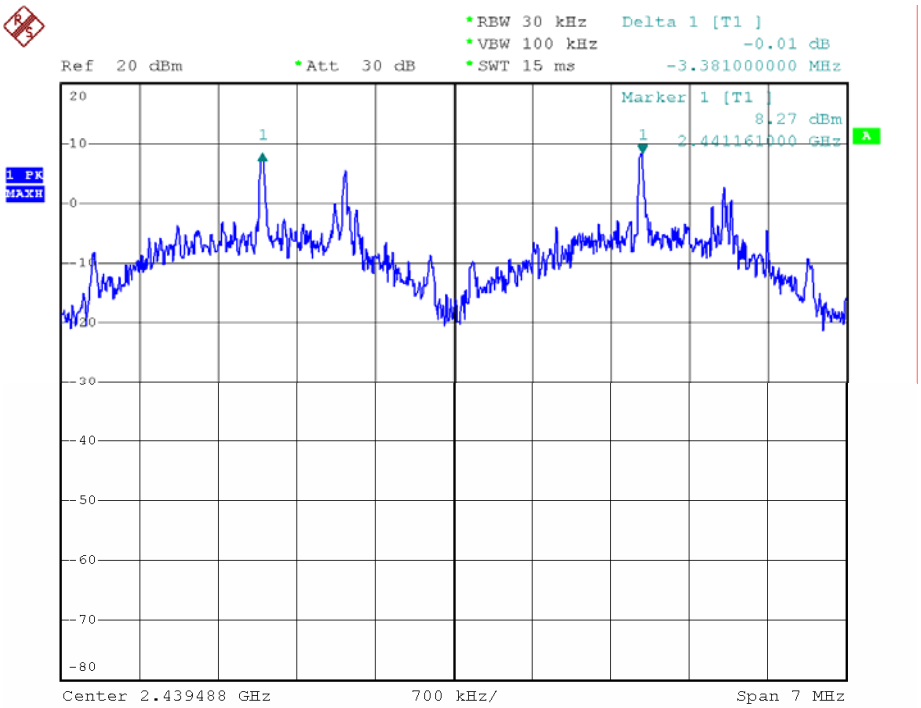
Test Channel	Separation (MHz)	Result
Low	3.381	PASS
Middle	3.381	PASS
High	3.374	PASS

Test result plot as follows:

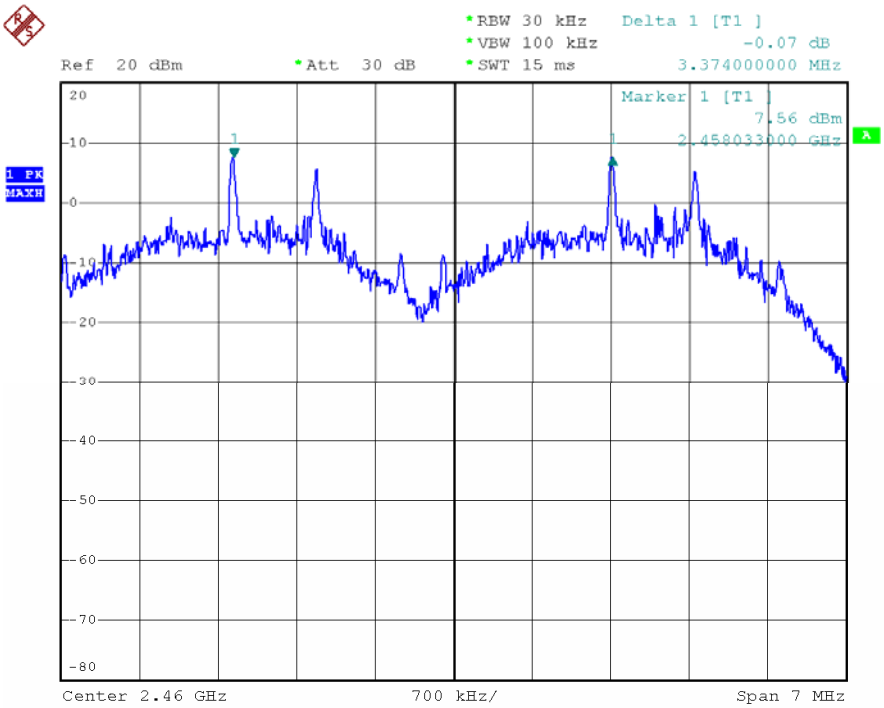
Low Channel:



Middle Channel



High Channel



12 Number of Hopping Frequency

Test Requirement:	FCC CFR47 Part 15 Section 15.247
Test Method:	Based on DA 00-705
Test Limit:	Regulation 15.247 (a)(1)(iii) Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels.
Test Mode:	Test in hopping transmitting operating mode.

12.1 Test Procedure:

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

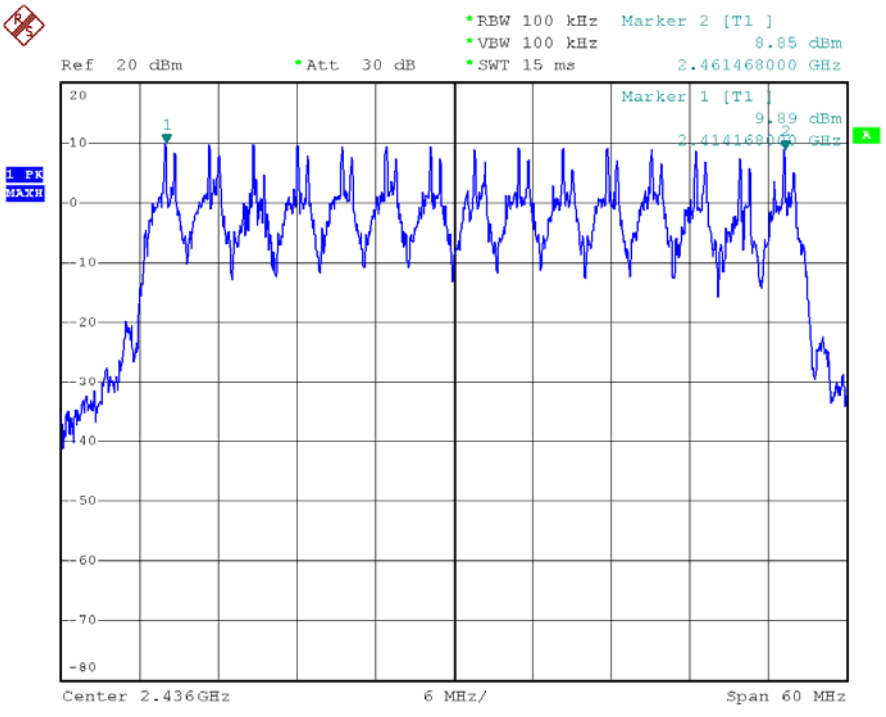
2. Set the spectrum analyzer: RBW = 100 kHz. VBW = 100 kHz. Sweep = auto; Detector Function = Peak. Trace = Max hold.

3. Allow the trace to stabilize. It may prove necessary to break the span up to sections. in order to clearly show all of the hopping frequencies. The limit is specified in one of the subparagraphs of this Section.

4. Set the spectrum analyzer: Center Frequency = 2436MHz, Span = 60MHz. Submit the test result graph.

12.2 Test Result:

Total Channels are 15 Channels.



13 Dwell Time

Test Requirement:	FCC CFR47 Part 15 Section 15.247
Test Method:	Based on DA 00-705
Test Limit:	Regulation 15.247(a)(1)(iii) Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.
Test Mode:	Test in hopping transmitting operating mode.

13.1 Test Procedure:

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

2.Set spectrum analyzer span = 0. centered on a hopping channel;

3.Set RBW = 1MHz and VBW = 1MHz.Sweep = as necessary to capture the entire dwell time per hopping channel.

4.Use the marker-delta function to determine the dwell time. If this value varies with different modes of operation (e.g.. data rate. modulation format. etc.). repeat this test for each variation. The limit is specified in one of the subparagraphs of this Section. Submit this plot(s).

13.2 Test Result:

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

The test period: T= 0.4(s) * 15 = 6 (s)

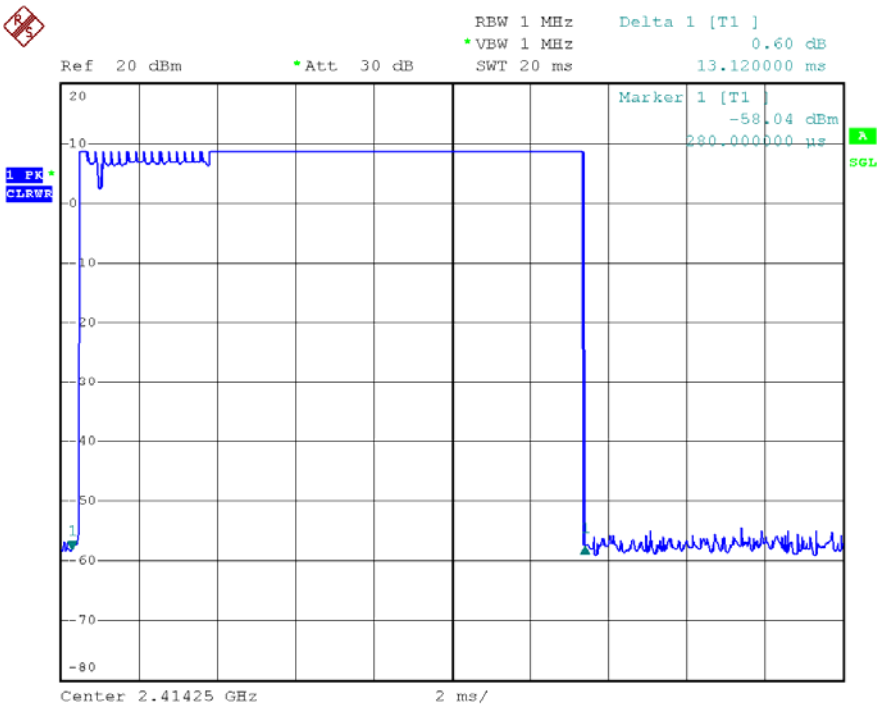
So, the Dwell Time can be calculated as follows:

Dwell time = 4 * 6 * (MkrDelta) / 1000

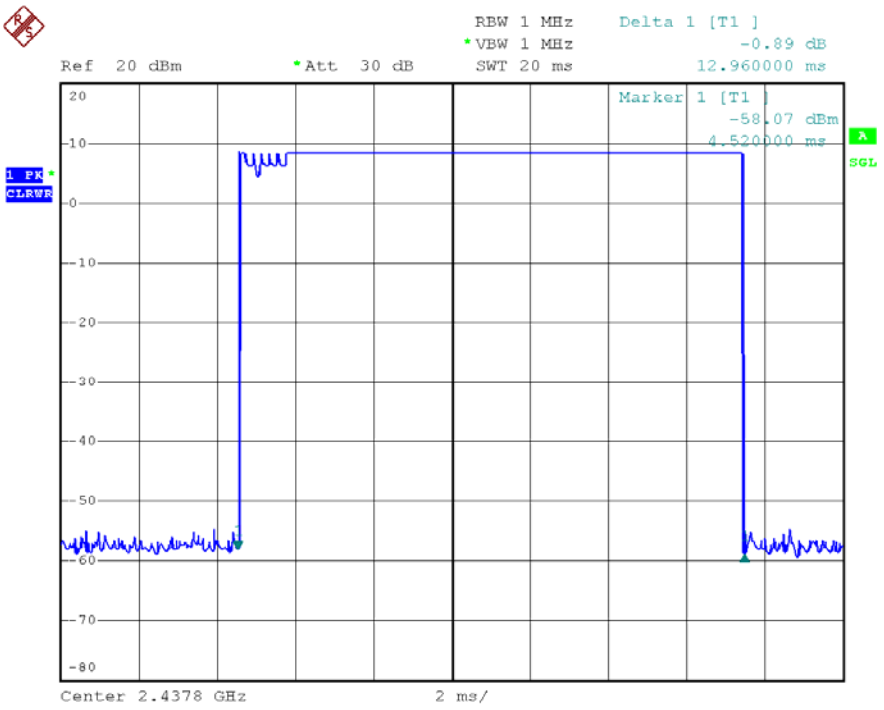
Note : Mkr Delta is once pulse time.

Frequency	Mkr Delta(ms)	Dwell Time(s)	Limits(s)	Result
2414 MHz	13.12	0.3149	0.400	Pass
2437 MHz	12.96	0.3110	0.400	Pass
2461 MHz	12.92	0.3100	0.400	Pass

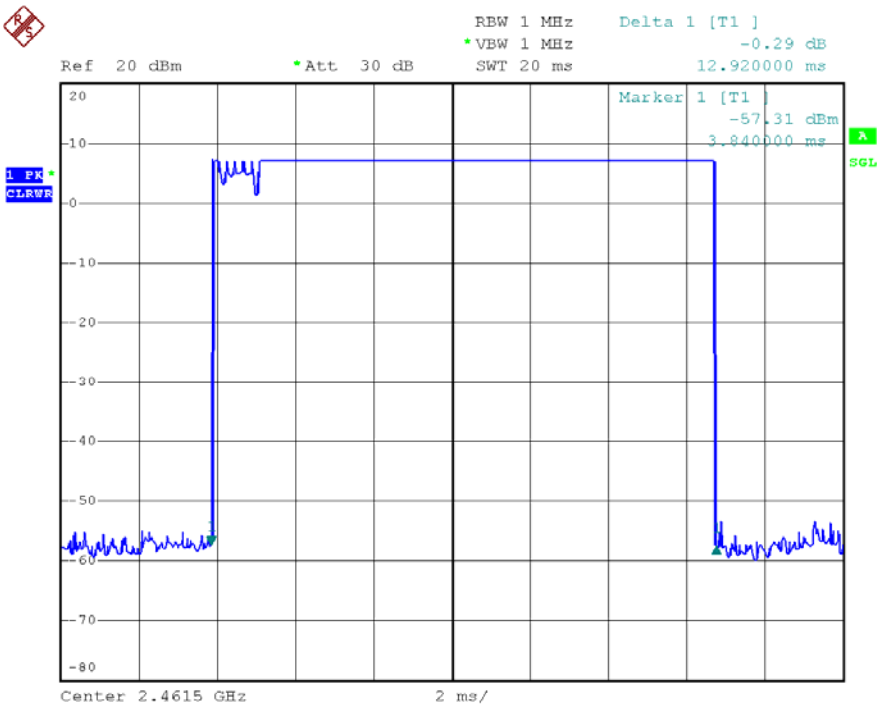
Low Channel



Middle Channel



High Channel



14 Antenna Requirement

According to the FCC Part 15 Paragraph 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. 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 Mode: The EUT work in test mode(Tx).

15.1 Requiments:

Systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess limit for maximum permissible exposure. In accordance with 47 CFR FCC Part 2 Subpart J, section 2.1091 this device has been defined as a mobile device whereby a distance of 0.2 m normally can be maintained between the user and the device.

15.2 The procedures / limit

(A) Limits for Occupational / Controlled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/cm^2)	Averaging Time $\|E\|^2$,$\|H\|^2$ or S (minutes)
0.3-3.0	614	1.63	(100)*	6
3.0-30	1842 / f	4.89 / f	(900 / f)*	6
30-300	61.4	0.163	1.0	6
300-1500			F/300	6
1500-100,000			5	6

(B) Limits for General Population / Uncontrolled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/cm^2)	Averaging Time $\|E\|^2$,$\|H\|^2$ or S (minutes)
0.3-1.34	614	1.63	(100)*	30
1.34-30	824/f	2.19/f	(180/f)*	30
30-300	27.5	0.073	0.2	30
300-1500			F/1500	30
1500-100,000			1.0	30

Note: f = frequency in MHz ; *Plane-wave equivalent power density

15.3 MPE Calculation Method

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

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

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

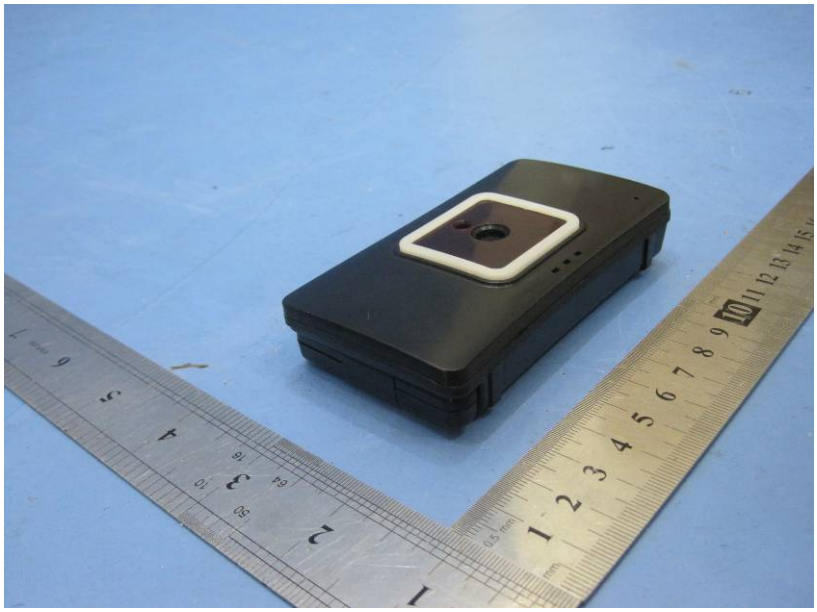
From the peak EUT RF output power, the minimum mobile separation distance, d=0.2m, as well as the gain of the used antenna, the RF power density can be obtained

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
2	1.585	9.98	9.954	0.003147	1	Complies
2	1.585	9.99	9.977	0.003150	1	Complies
2	1.585	9.80	9.550	0.003090	1	Complies

16 Photographs - Constructional Details

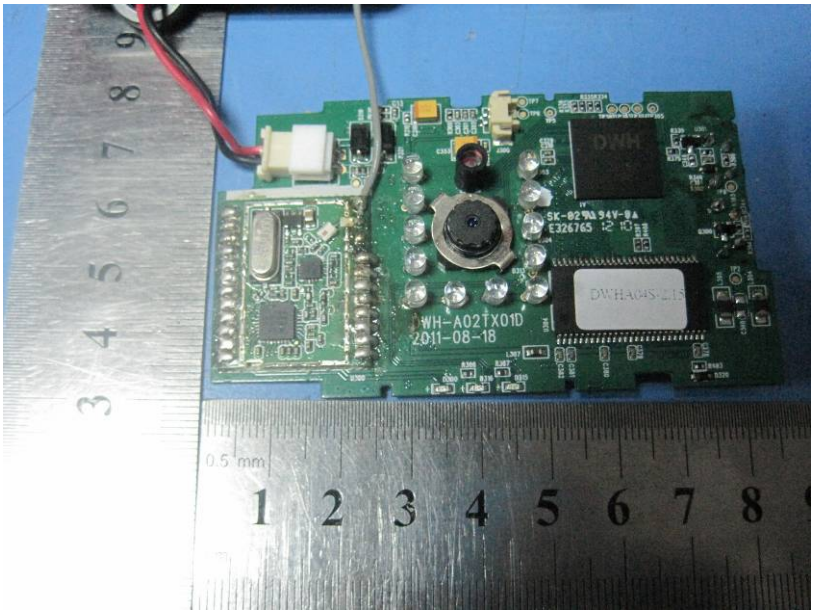
16.1 Product View

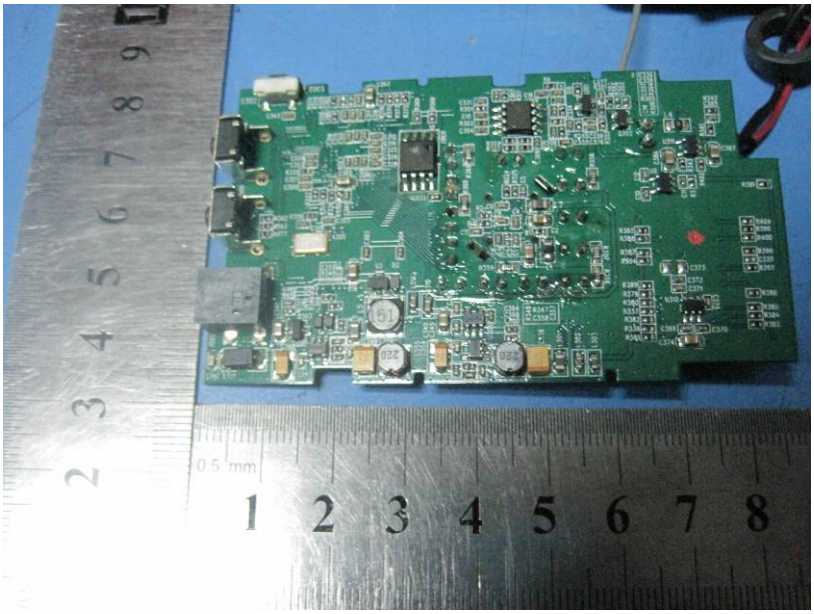
16.2 EUT – Appearance View



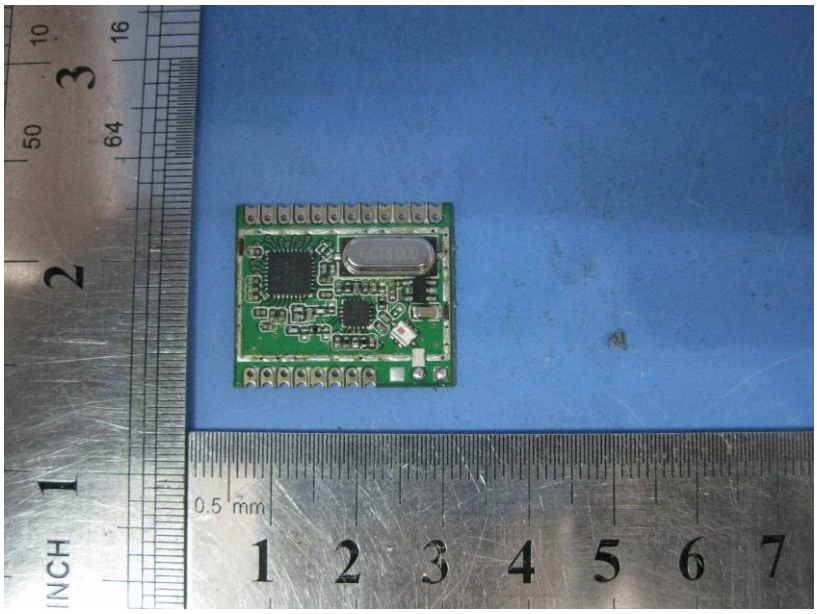
16.3 EUT – Open View

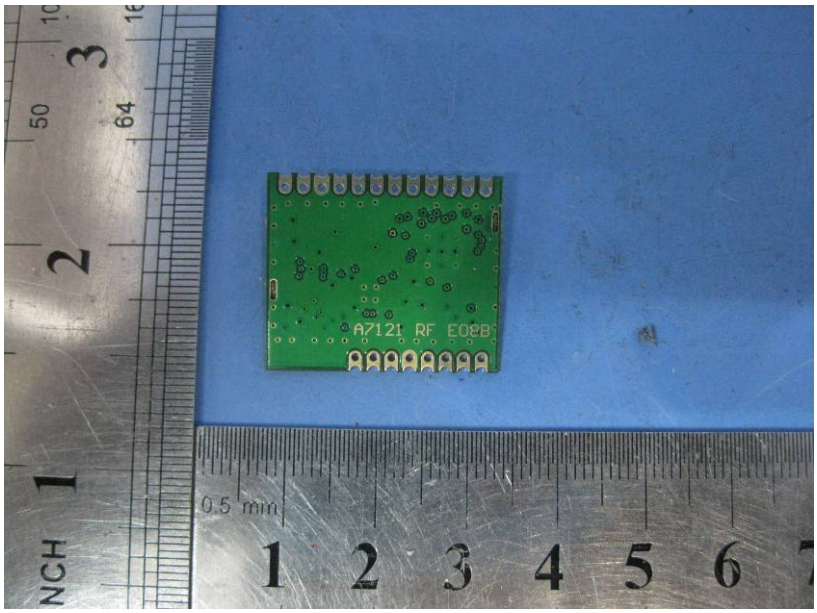
16.4 EUT – PCB View





16.5 RF Module - 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 interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

The Label must not be a stick-on paper. The Label on these products must be permanently affixed to the product and readily visible at the time of purchase and must last the expected lifetime of the equipment not be readily detachable.

Proposed Label Location on EUT

EUT Back View/ proposed FCC Label Location