

FCC TEST REPORT

FCC ID : Z5MLUVPLAT2CAM
Applicant : Egerium BV
Address : Kleveringweg 25, 2616LZ Delft Netherlands

Equipment Under Test (EUT) :

Product Name : Premium Digital Camera
 Model No. : LUVION PLATINUM 2

Standards : FCC CFR47 Part 15 Section 15.247:2009

Date of Test : November 1~21, 2011
Date of Issue : November 21, 2011

Test Engineer : Zero Zhou/ Engineer

Reviewed By : Philo Zhong/Manager 

Test Result	: PASS
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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 C63.4:2009. The test results have been reviewed against the Directives above and found to meet their essential requirements.

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WALTEK SERVICES

Reference No.: WT11105892-S-E-F

2 Test Summary

Test Items	Test Requirement	Result
Radiated Spurious Emissions (9kHz to 25GHz)	15.205(a) 15.209 15.247(d)	PASS
Conduct Emission	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 : Egerium BV
Address of Applicant : Kleveringweg 25, 2616LZ Delft Netherlands

Manufacturer : RDI Technology (Shenzhen) Co., Ltd.
Address of Manufacturer : Building C1 Xingtang Industrial Park, East Baishixia, Fuyong, Baoan, Shenzhen, PRC

4.2 General Description of E.U.T.

Product Name : Premium Digital Camera
Model No. : LUVION PLATINUM 2

4.3 Details of E.U.T.

Technical Data : Adapter Input: 100 – 240V, 50/60Hz, 0.3A
Adapter Output: 5.0VDC, 1A
DC 6.0V (4 * 1.5V “AA” SIZE Battery)
Operation Frequency : 2402MHz ~ 2480MHz
Antenna Gain : -2.39 dBi

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 Premium Digital Camera. The standards used were FCC CFR47 Part 15 Section 15.247, Section 15.207 and Section 15.209.

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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

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5 Equipment Used during Test

Equipment Name	Manufacturer Model	Equipment No	Internal No	Specification	Cal. Date	Due Date	Uncertainty
EMC Analyzer	Agilent/ E7405A	MY451149 43	W2008001	9k-26.5GHz	Aug. 2, 2011	Aug. 1, 2012	±1dB
Trilog Broadband Antenne	SCHWARZB ECK MESS-ELEKTROM / VULB9163	336	W2008002	30-3000 MHz	Aug. 2, 2011	Aug. 1, 2012	±1dB
Broad-band Horn Antenna	SCHWARZB ECK 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	SCHWARZB ECK 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	SCHWARZB ECK MESS-ELEKTROM / AK 9515 H	-	-	-	Aug. 2, 2011	Aug. 1, 2012	-
10m 50 Ohm Coaxial Cable	SCHWARZB ECK 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&SC HWARZ/ ESPI	101155	W2005001	9k-3GHz	Aug. 2, 2011	Aug. 1, 2012	±1dB
Two-Line V-Network	ROHDE&SC HWARZ/ ENV216	100115	W2005002	50Ω/50μH	Aug. 2, 2011	Aug. 1, 2012	±10%
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 RF electricity distinguish 0.1B
Active Loop Antenna	Beijing Dazhi / ZN30900A	-	-	-	Aug. 2, 2011	Aug. 1, 2012	±1dB

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6 Conducted Emission

Test Requirement:	FCC CFR 47 Part 15 Section 15.207
Test Method:	ANSI C63.4:2009
Test Result:	PASS
Frequency Range:	150kHz to 30MHz
Class:	Class B
Limit:	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
Detector:	Peak for pre-scan (9kHz Resolution Bandwidth) Quasi-Peak & Average if maximised peak within 6dB of Average Limit

E.U.T. Operation

Operating Environment:

Temperature: 25.5 °C

Humidity: 51 % RH

Atmospheric Pressure: 1012 mbar

EUT Operation:

The pre-test was performance on normal working mode, and the worst data were shown as follow.

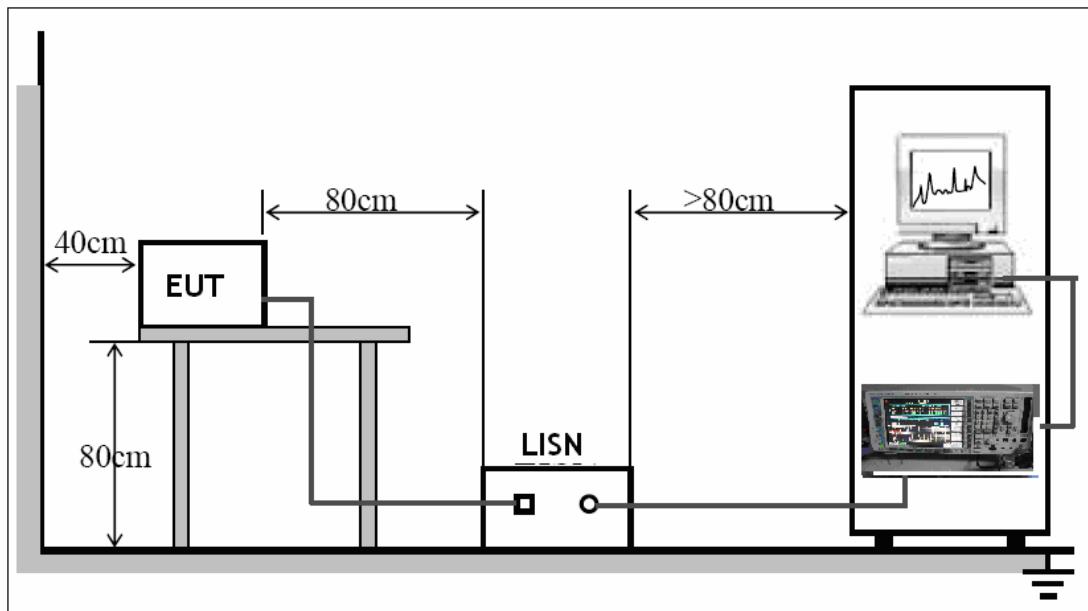
The EUT was tested according to ANSI C63.4:2009. The frequency spectrum from 150kHz to 30MHz was investigated.

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.

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EUT Setup

The conducted emission tests were performed using the setup accordance with the ANSI C63.4:2009, The specification used in this report was the FCC Part15 B 15.207 limits.



The EUT was placed on the test table in shielding room

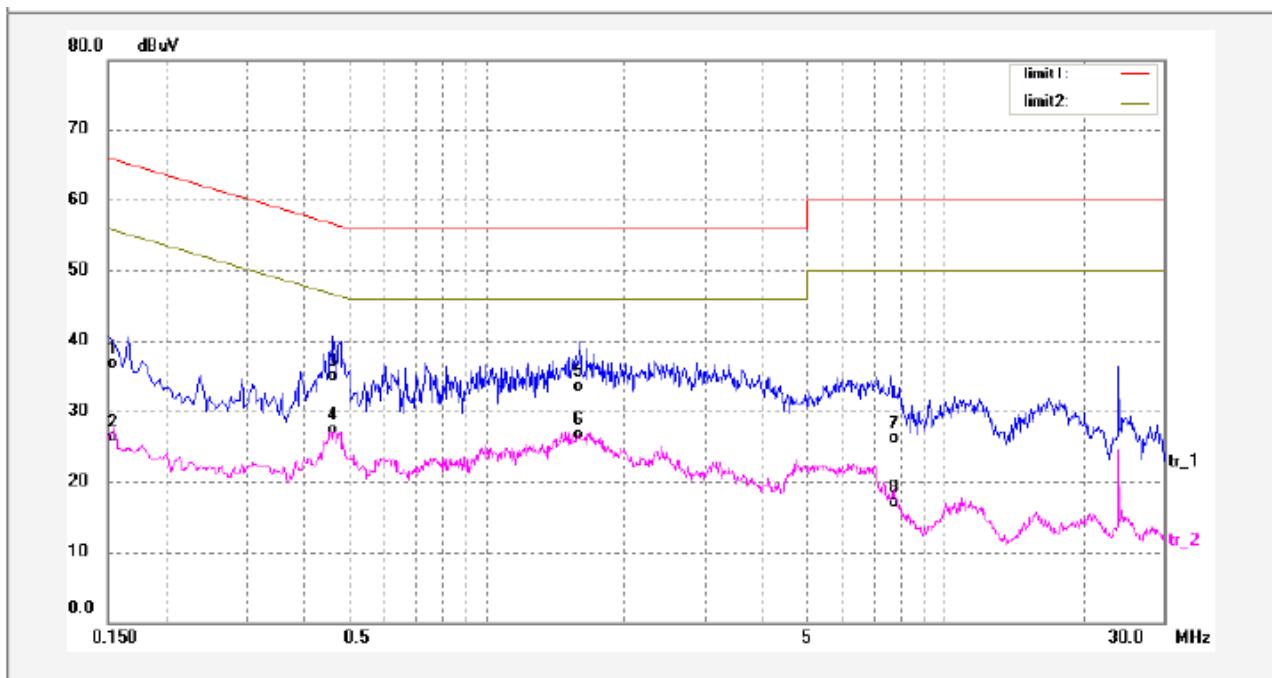
Conducted Emission Test Result

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

The EUT was tested in Normal Linking mode.

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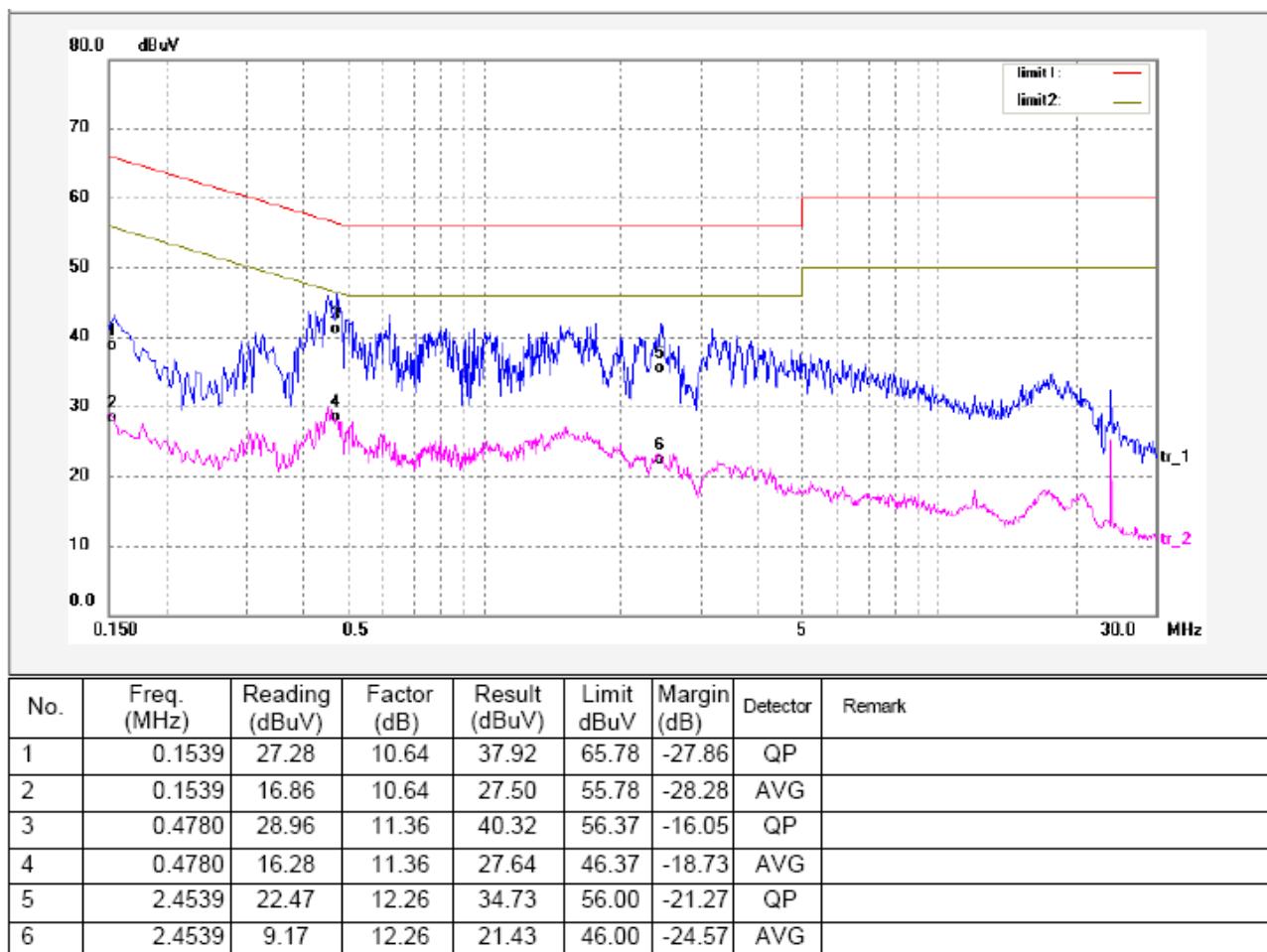
Live line:



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Margin (dB)	Detector	Remark
1	0.1500	25.14	10.67	35.81	65.99	-30.18	QP	
2	0.1500	14.91	10.67	25.58	55.99	-30.41	AVG	
3	0.4660	22.96	11.11	34.07	56.58	-22.51	QP	
4	0.4660	15.47	11.11	26.58	46.58	-20.00	AVG	
5	1.6060	20.43	12.20	32.63	56.00	-23.37	QP	
6	1.6060	13.64	12.20	25.84	46.00	-20.16	AVG	
7	7.6780	13.50	11.85	25.35	60.00	-34.65	QP	
8	7.6780	4.44	11.85	16.29	50.00	-33.71	AVG	

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Neutral line:



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Photograph – Conducted Emission Test Setup



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7 Radiated Spurious Emissions

Test Requirement:	FCC CFR47 Part 15 Section 15.209 & 15.247
Test Method:	Base on ANSI C63.4:2009
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.

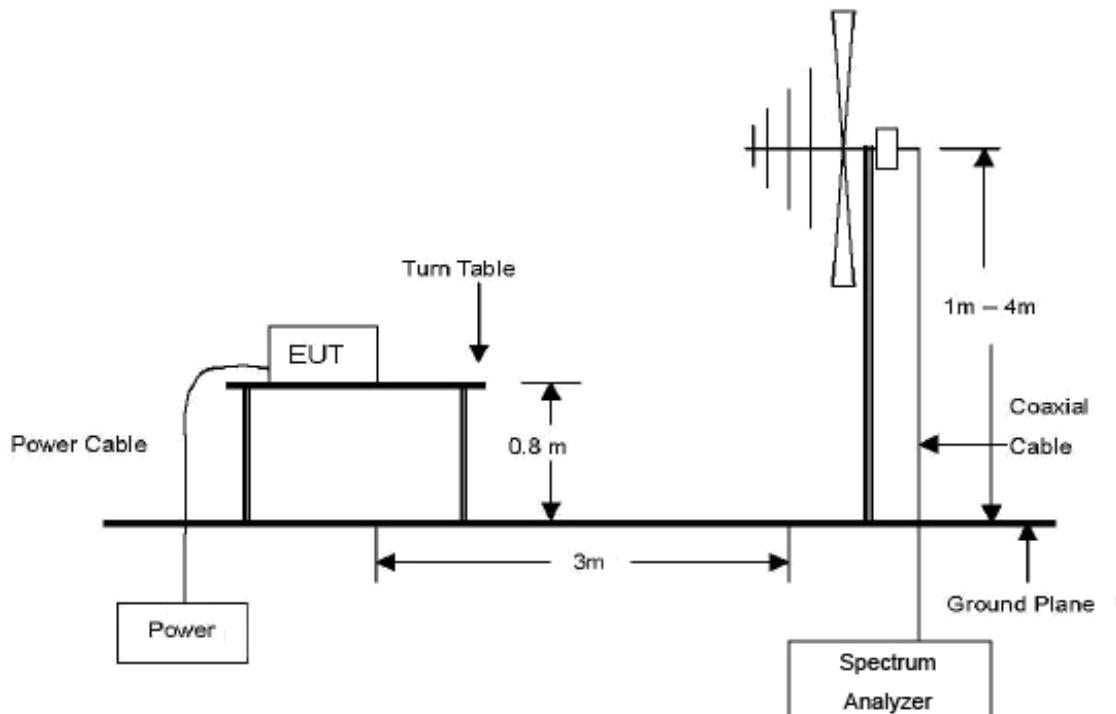
Based on NIS 81, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of a radiation emissions measurement at Waltek EMC Lab is ± 5.03 dB.

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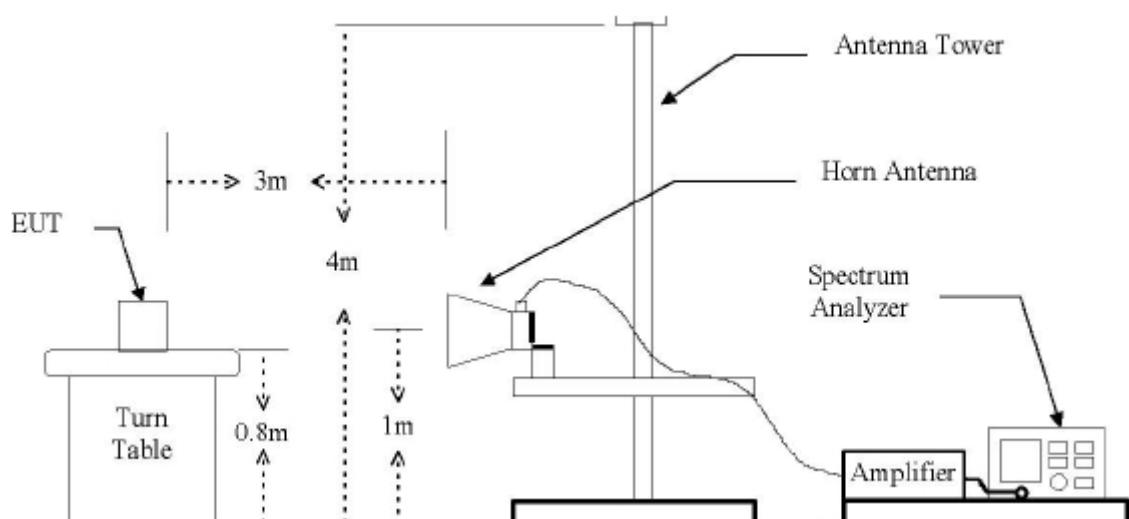
Test Setup

The radiated emission tests were performed in the 3m Semi- Anechoic Chamber test site, using the setup accordance with the ANSI C63.4:2009.

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.



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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

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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:

$$\text{Corr. Ampl.} = \text{Indicated Reading} + \text{Antenna Factor} + \text{Cable Factor} - \text{Amplifier Gain}$$

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:

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

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.

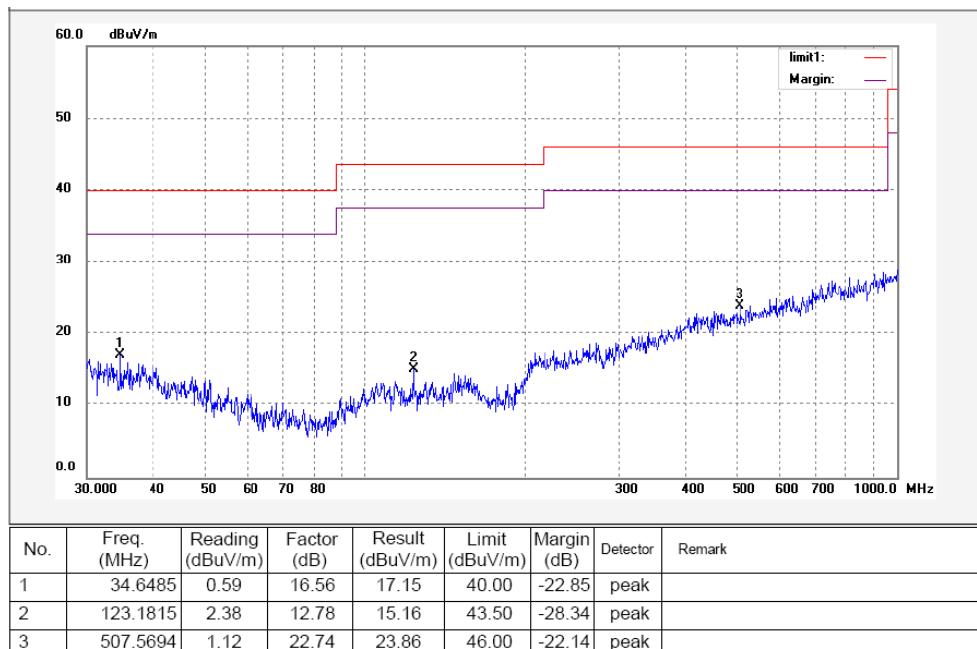
The results shown in this test report refer only to the sample(s) tested , This Test report cannot be reproduced, except in full, without prior written permission of the Company.

Test mode: continuously receive mode

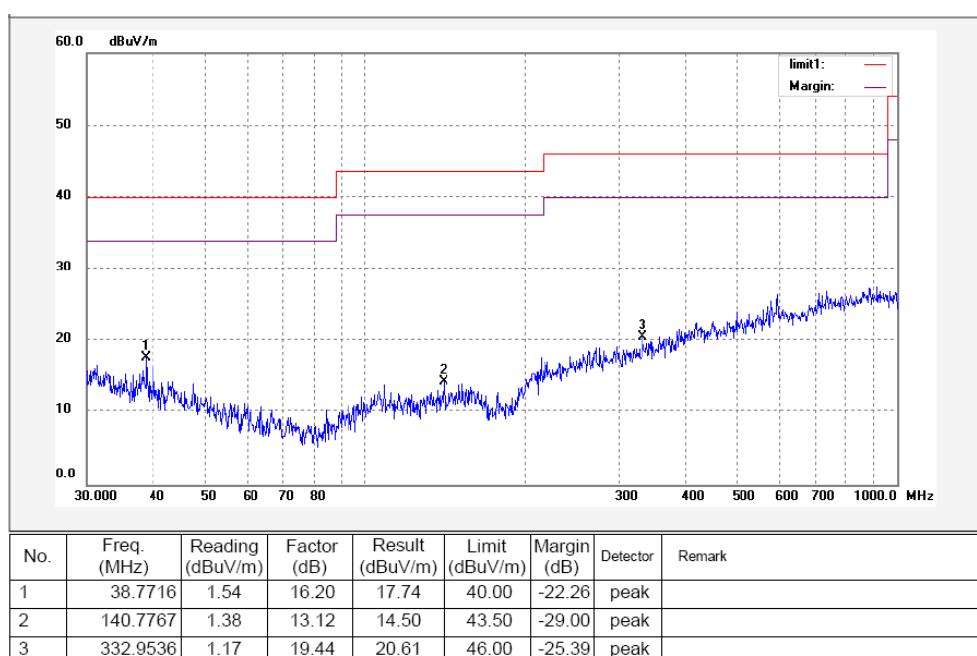
Remark: the EUT was pre-tested at the high, middle and low channel, and the worse case was the low Channel, so the data show was the low channel's only. Because the emissions below 30MHz are more than 20dB below the limit, the data is not show in the report.

Test Frequency : 30MHz ~ 1000MHz

Antenna polarization: Vertical



Antenna polarization: Horizontal

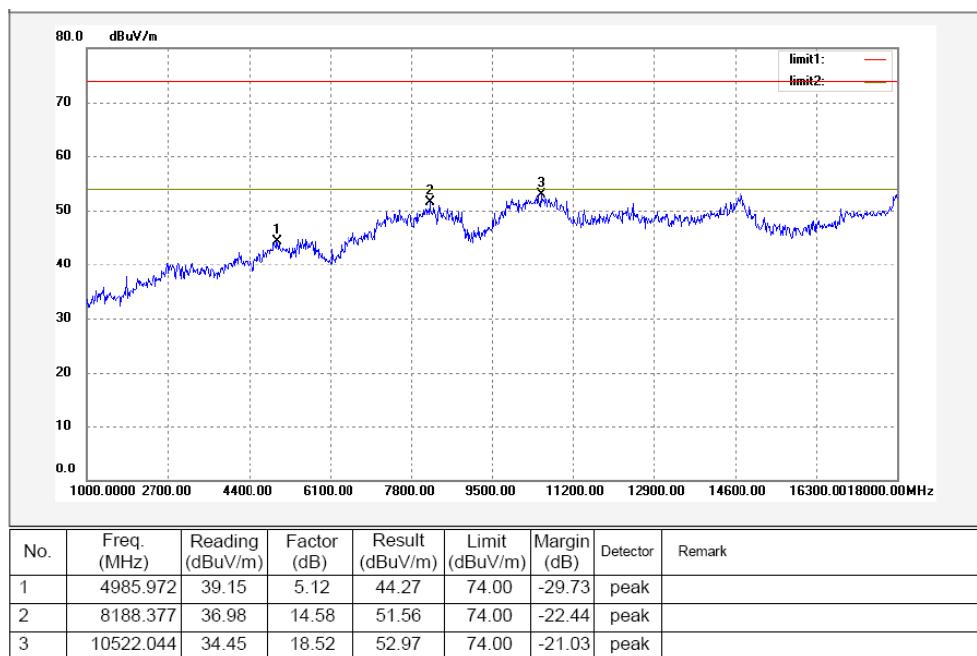


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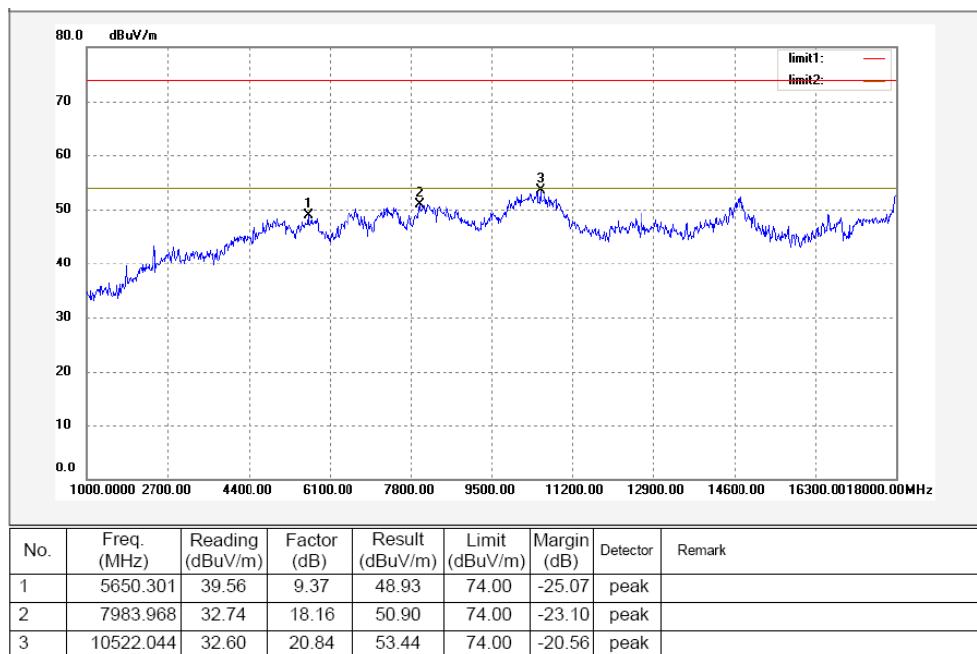
Test Frequency: Above 1GHz radiation test data:

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

Antenna polarization: Vertical



Antenna polarization: Horizontal



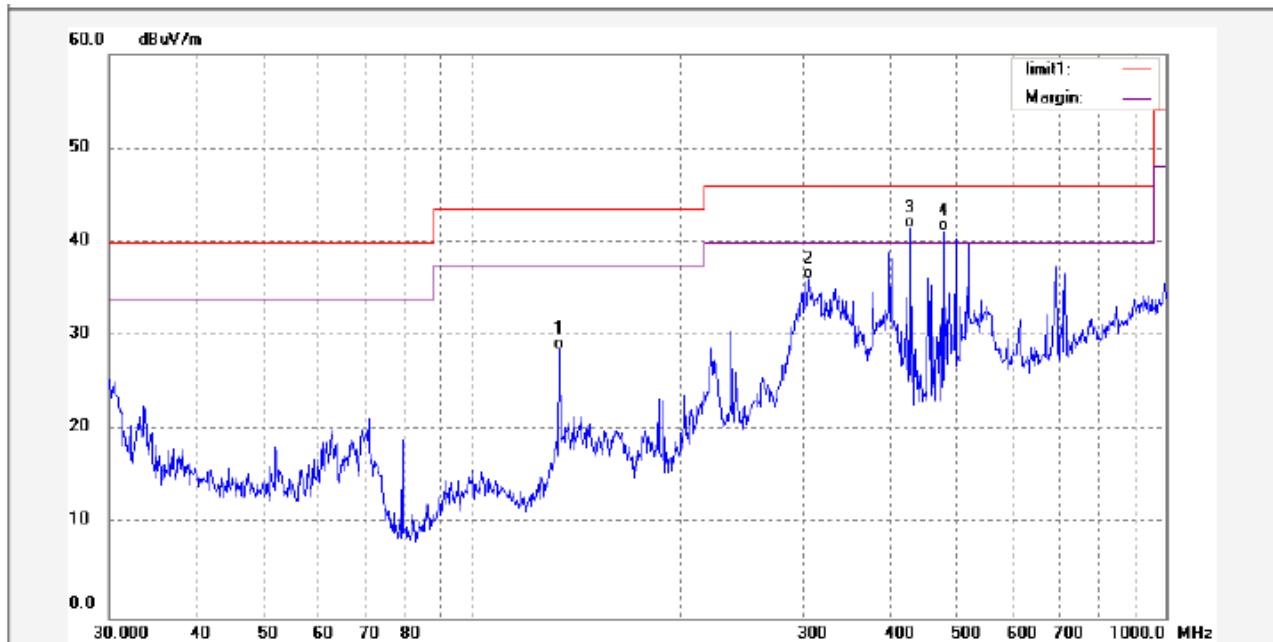
The results shown in this test report refer only to the sample(s) tested, This Test report cannot be reproduced, except in full, without prior written permission of the Company.

Test mode: continuously transmit mode

Test Frequency : 30MHz ~ 1000MHz

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.

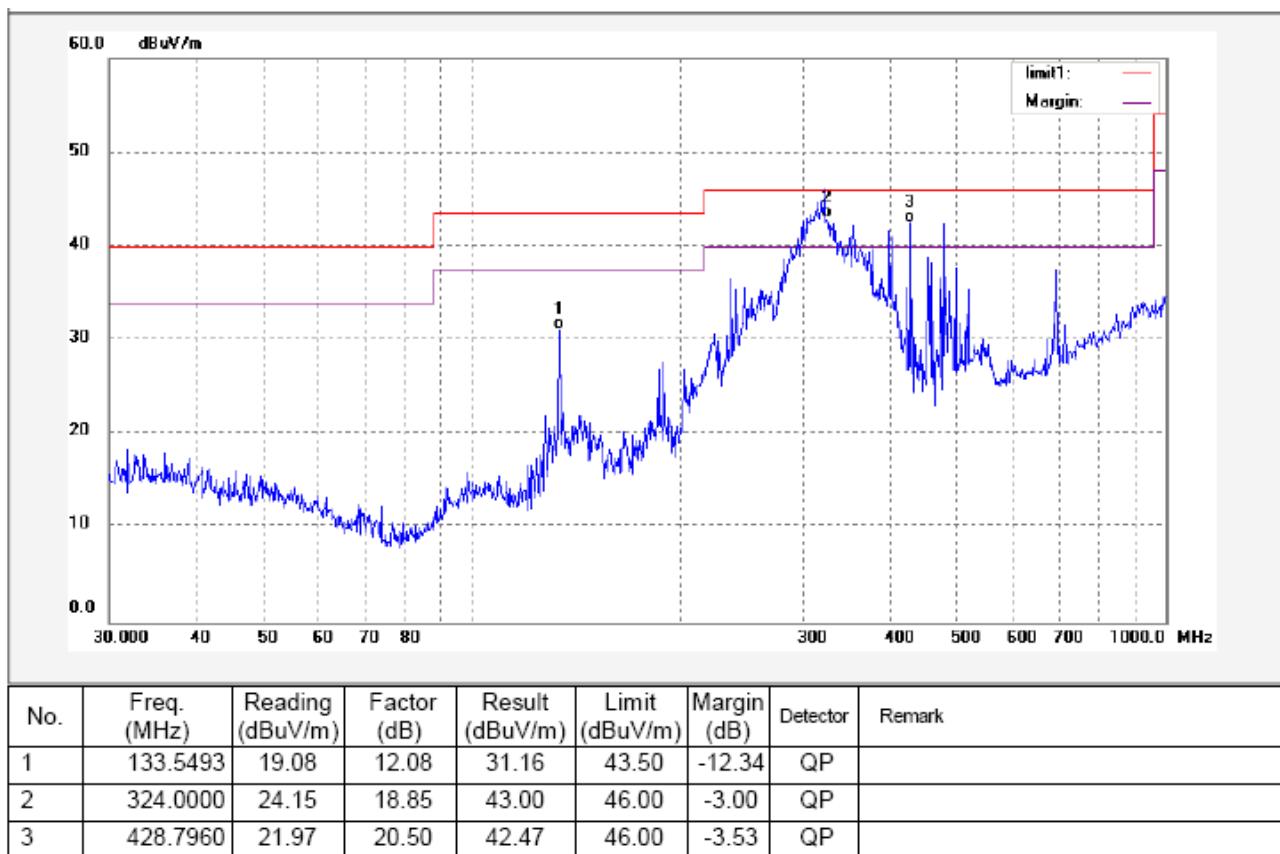
Antenna polarization: Vertical



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	133.5493	16.47	12.08	28.55	43.50	-14.95	QP	
2	306.0282	18.33	17.69	36.02	46.00	-9.98	QP	
3	428.7960	20.95	20.50	41.45	46.00	-4.55	QP	
4	478.1394	18.62	22.52	41.14	46.00	-4.86	QP	

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Antenna polarization: Horizontal



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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	91.33		(Fund.)	1.1	20
4804.00	AV	Vertical	45.62	54.00	-8.38	1.1	65
7206.00	AV	Vertical	43.59	54.00	-10.41	1.4	140
9608.00	AV	Vertical	46.42	54.00	-7.58	1.7	80
12010.00	AV	Vertical	39.77	54.00	-14.23	1.5	155
14412.00	AV	Vertical	39.68	54.00	-14.32	1.3	140
16814.00	AV	Vertical	36.31	54.00	-17.69	1.6	120
19216.00	AV	Vertical	34.52	54.00	-19.48	1.4	80
21618.00	AV	Vertical	32.19	54.00	-21.81	1.5	20
24020.00	AV	Vertical	33.36	54.00	-20.64	1.1	80
2402.00	AV	Horizontal	86.65		(Fund.)	2.2	20
4804.00	AV	Horizontal	43.29	54.00	-10.71	1.9	140
7206.00	AV	Horizontal	41.54	54.00	-12.46	2.0	80
9608.00	AV	Horizontal	45.63	54.00	-8.37	2.4	120
12010.00	AV	Horizontal	41.72	54.00	-12.28	1.7	80
14412.00	AV	Horizontal	38.55	54.00	-15.45	2.1	140
16814.00	AV	Horizontal	36.16	54.00	-17.84	1.8	120
19216.00	AV	Horizontal	33.32	54.00	-20.68	1.5	120
21618.00	AV	Horizontal	34.48	54.00	-19.52	2.5	120
24020.00	AV	Horizontal	36.19	54.00	-17.81	1.9	30
2402.00	PK	Vertical	106.58		(Fund.)	1.4	20
4804.00	PK	Vertical	58.66	74.00	-15.34	1.7	80
7206.00	PK	Vertical	57.93	74.00	-16.07	1.5	110
9608.00	PK	Vertical	55.22	74.00	-18.78	1.3	200
12010.00	PK	Vertical	51.75	74.00	-22.25	1.1	80
14412.00	PK	Vertical	51.41	74.00	-22.59	1.1	80
16814.00	PK	Vertical	48.86	74.00	-25.14	1.3	155
19216.00	PK	Vertical	46.37	74.00	-27.63	1.1	140
21618.00	PK	Vertical	45.93	74.00	-28.07	1.6	80
24020.00	PK	Vertical	42.18	74.00	-31.82	1.3	110
2402.00	PK	Horizontal	100.73		(Fund.)	2.0	80
4804.00	PK	Horizontal	51.22	74.00	-22.78	2.2	110
7206.00	PK	Horizontal	50.13	74.00	-23.87	2.5	80
9608.00	PK	Horizontal	48.67	74.00	-25.33	1.7	20
12010.00	PK	Horizontal	45.89	74.00	-28.11	1.9	155
14412.00	PK	Horizontal	40.13	74.00	-33.87	1.4	20
16814.00	PK	Horizontal	41.23	74.00	-32.77	2.1	200

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19216.00	PK	Horizontal	33.08	74.00	-40.92	2.4	80
21618.00	PK	Horizontal	34.41	74.00	-39.59	1.8	140
24020.00	PK	Horizontal	36.18	74.00	-37.82	2.3	80
Middle frequency							
2440.00	AV	Vertical	90.18		(Fund.)	1.0	20
4880.00	AV	Vertical	45.82	54.00	-8.18	1.0	110
7320.00	AV	Vertical	44.51	54.00	-9.49	1.3	110
9760.00	AV	Vertical	39.49	54.00	-14.51	1.6	20
12200.00	AV	Vertical	43.53	54.00	-10.47	1.4	20
14640.00	AV	Vertical	35.75	54.00	-18.25	1.2	170
17080.00	AV	Vertical	39.61	54.00	-14.39	1.5	20
19520.00	AV	Vertical	33.23	54.00	-20.77	1.3	20
21960.00	AV	Vertical	37.14	54.00	-16.86	1.4	200
24400.00	AV	Vertical	30.57	54.00	-23.43	1.0	110
2440.00	AV	Horizontal	85.65		(Fund.)	2.1	140
4880.00	AV	Horizontal	41.31	54.00	-12.69	1.8	110
7320.00	AV	Horizontal	42.17	54.00	-11.83	1.9	290
9760.00	AV	Horizontal	36.53	54.00	-17.47	2.3	140
12200.00	AV	Horizontal	39.75	54.00	-14.25	1.6	170
14640.00	AV	Horizontal	35.18	54.00	-18.82	2.0	200
17080.00	AV	Horizontal	32.49	54.00	-21.51	1.7	155
19520.00	AV	Horizontal	34.53	54.00	-19.47	1.4	110
21960.00	AV	Horizontal	36.27	54.00	-17.73	2.4	170
24400.00	AV	Horizontal	30.66	54.00	-23.34	1.8	140
2440.00	PK	Vertical	105.82		(Fund.)	1.3	20
4880.00	PK	Vertical	58.75	74.00	-15.25	1.6	110
7320.00	PK	Vertical	57.26	74.00	-16.74	1.4	120
9760.00	PK	Vertical	52.39	74.00	-21.61	1.2	140
12200.00	PK	Vertical	56.48	74.00	-17.52	1.0	200
14640.00	PK	Vertical	48.52	74.00	-25.48	1.0	20
17080.00	PK	Vertical	52.71	74.00	-21.29	1.2	20
19520.00	PK	Vertical	46.66	74.00	-27.34	1.0	140
21960.00	PK	Vertical	50.43	74.00	-23.57	1.5	155
24400.00	PK	Vertical	43.65	74.00	-30.35	1.2	140
2440.00	PK	Horizontal	98.43		(Fund.)	1.9	20
4880.00	PK	Horizontal	54.78	74.00	-19.22	2.1	65
7320.00	PK	Horizontal	55.69	74.00	-18.31	2.4	110
9760.00	PK	Horizontal	49.54	74.00	-24.46	1.6	80
12200.00	PK	Horizontal	52.32	74.00	-21.68	1.8	170
14640.00	PK	Horizontal	48.17	74.00	-25.83	1.3	170
17080.00	PK	Horizontal	45.69	74.00	-28.31	2.0	140
19520.00	PK	Horizontal	47.25	74.00	-26.75	2.3	170
21960.00	PK	Horizontal	49.18	74.00	-24.82	1.7	20

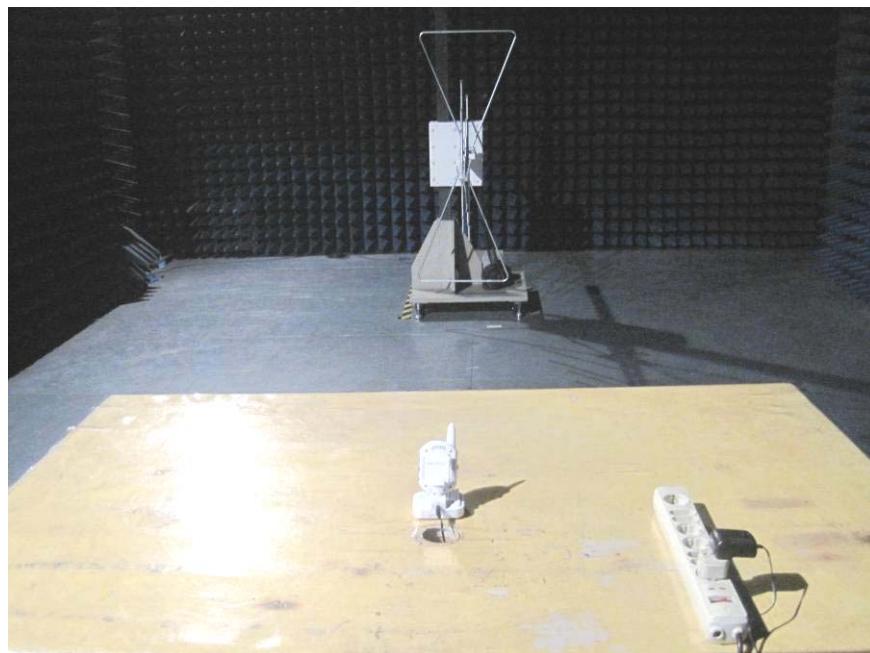
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24400.00	PK	Horizontal	43.69	74.00	-30.31	2.2	155
High frequency							
2480.00	AV	Vertical	90.29		(Fund.)	1.2	170
4960.00	AV	Vertical	45.86	54.00	-8.14	1.2	20
7440.00	AV	Vertical	41.61	54.00	-12.39	1.5	140
9920.00	AV	Vertical	43.32	54.00	-10.68	1.8	80
12400.00	AV	Vertical	38.88	54.00	-15.12	1.6	110
14880.00	AV	Vertical	45.97	54.00	-8.03	1.4	140
17360.00	AV	Vertical	39.15	54.00	-14.85	1.7	120
19840.00	AV	Vertical	40.72	54.00	-13.28	1.5	200
22320.00	AV	Vertical	38.69	54.00	-15.31	1.6	140
24800.00	AV	Vertical	32.43	54.00	-21.57	1.2	155
2480.00	AV	Horizontal	85.52		(Fund.)	2.3	140
4960.00	AV	Horizontal	41.79	54.00	-12.21	2.0	170
7440.00	AV	Horizontal	39.52	54.00	-14.48	2.1	140
9920.00	AV	Horizontal	40.33	54.00	-13.67	2.5	200
12400.00	AV	Horizontal	38.41	54.00	-15.59	1.8	155
14880.00	AV	Horizontal	32.68	54.00	-21.32	2.2	140
17360.00	AV	Horizontal	36.29	54.00	-17.71	1.9	200
19840.00	AV	Horizontal	31.36	54.00	-22.64	1.6	80
22320.00	AV	Horizontal	34.45	54.00	-19.55	2.6	110
24800.00	AV	Horizontal	29.58	54.00	-24.42	2.0	110
2480.00	PK	Vertical	105.73		(Fund.)	1.5	200
4960.00	PK	Vertical	57.81	74.00	-16.19	1.8	50
7440.00	PK	Vertical	54.22	74.00	-19.78	1.6	130
9920.00	PK	Vertical	56.76	74.00	-17.24	1.4	120
12400.00	PK	Vertical	51.39	74.00	-22.61	1.2	110
14880.00	PK	Vertical	58.17	74.00	-15.83	1.2	80
17360.00	PK	Vertical	52.89	74.00	-21.11	1.4	110
19840.00	PK	Vertical	53.91	74.00	-20.09	1.2	140
22320.00	PK	Vertical	51.64	74.00	-22.36	1.7	140
24800.00	PK	Vertical	45.85	74.00	-28.15	1.4	155
2480.00	PK	Horizontal	97.72		(Fund.)	2.1	200
4960.00	PK	Horizontal	54.85	74.00	-19.15	2.3	80
7440.00	PK	Horizontal	52.52	74.00	-21.48	2.6	140
9920.00	PK	Horizontal	53.61	74.00	-20.39	1.8	200
12400.00	PK	Horizontal	51.39	74.00	-22.61	2.0	110
14880.00	PK	Horizontal	45.76	74.00	-28.24	1.5	110
17360.00	PK	Horizontal	49.38	74.00	-24.62	2.2	170
19840.00	PK	Horizontal	44.50	74.00	-29.5	2.5	170
22320.00	PK	Horizontal	47.67	74.00	-26.33	1.9	140
24800.00	PK	Horizontal	42.79	74.00	-31.21	2.4	200

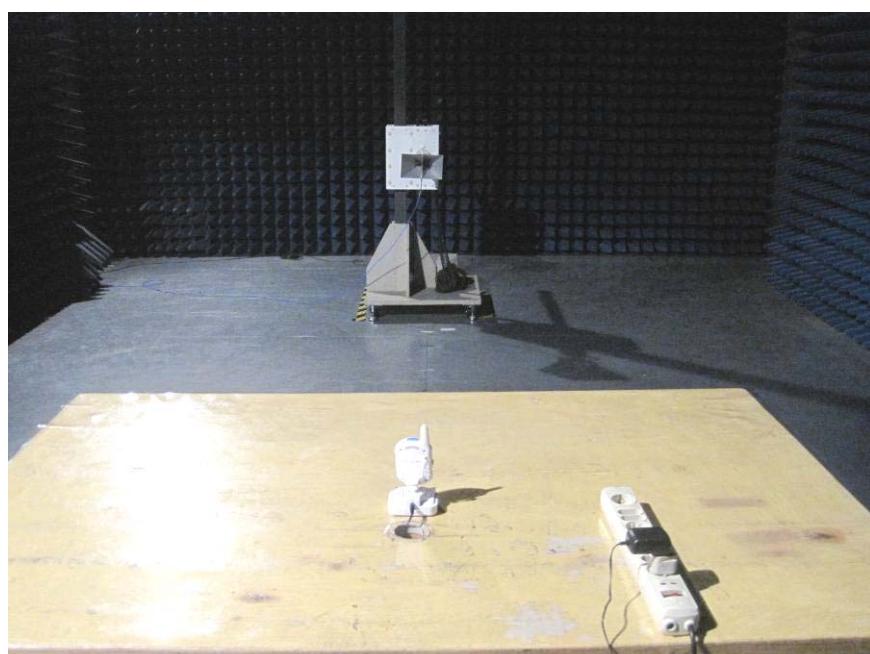
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Photograph – Radiation Spurious Emission Test Setup

Below 1GHz



Above 1GHz



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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 C63.4:2009

Measurement Distance:

3m

Limit:

40.0 dB_{uV/m} between 30MHz & 88MHz;
 43.5 dB_{uV/m} between 88MHz & 216MHz;
 46.0 dB_{uV/m} between 216MHz & 960MHz;
 54.0 dB_{uV/m} above 960MHz.
 74.0 dB_{uV/m} for peak above 1GHz
 54.0 dB_{uV/m} for AVG above 1GHz

Detector:

For Peak value:

RBW = 1 MHz for $f \geq 1$ GHz

VBW \geq RBW; Sweep = auto

Detector function = peak

Trace = max hold

For AVG value:

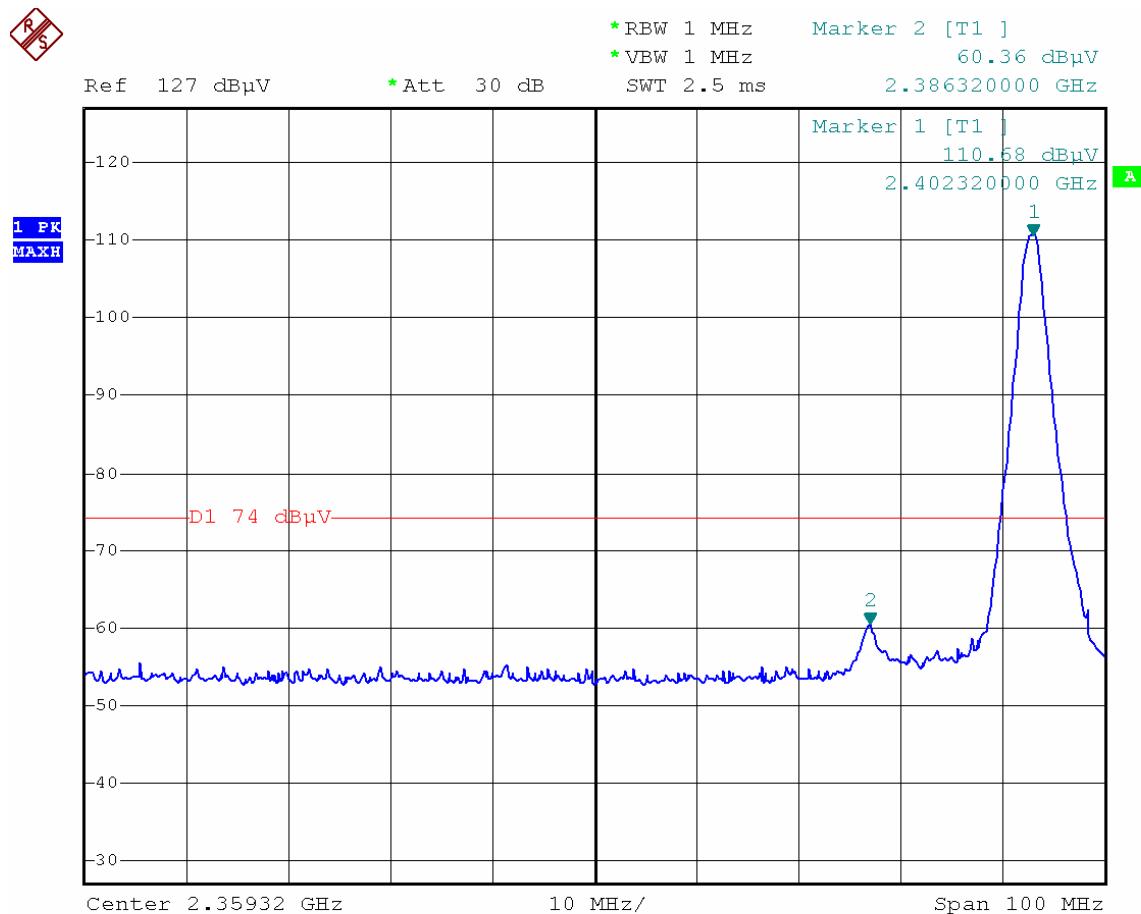
RBW = 1 MHz for $f \geq 1$ GHz

VBW = 10Hz; Sweep = auto

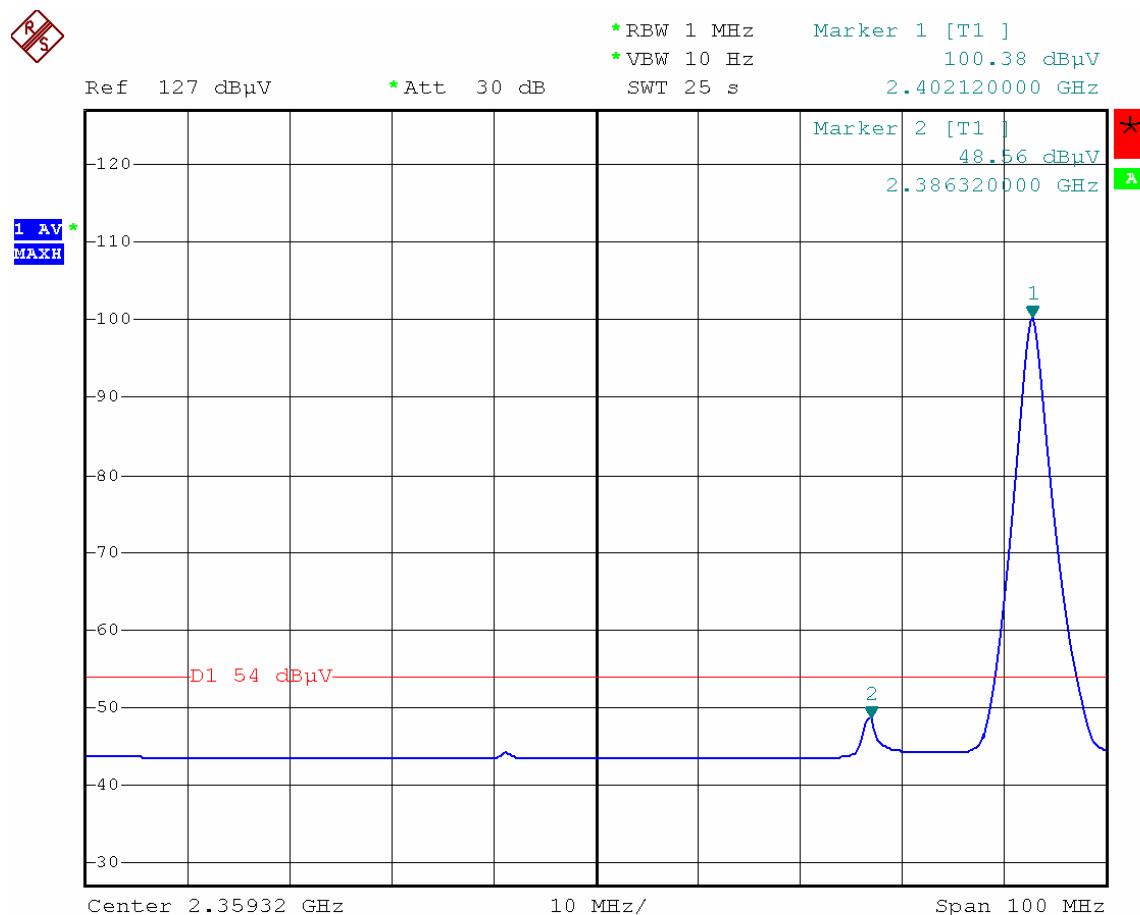
Detector function = AVG

Trace = max hold

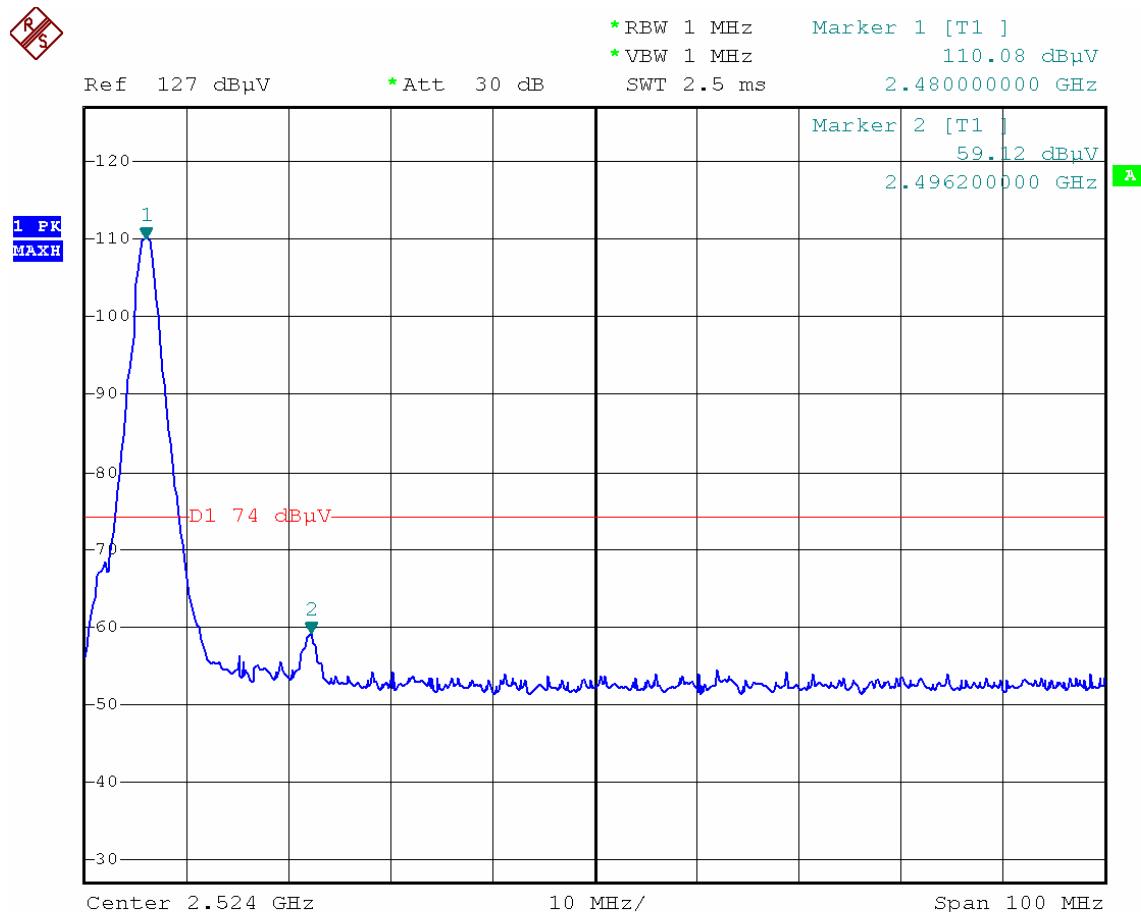
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Test Result:**Low Channel – Peak**

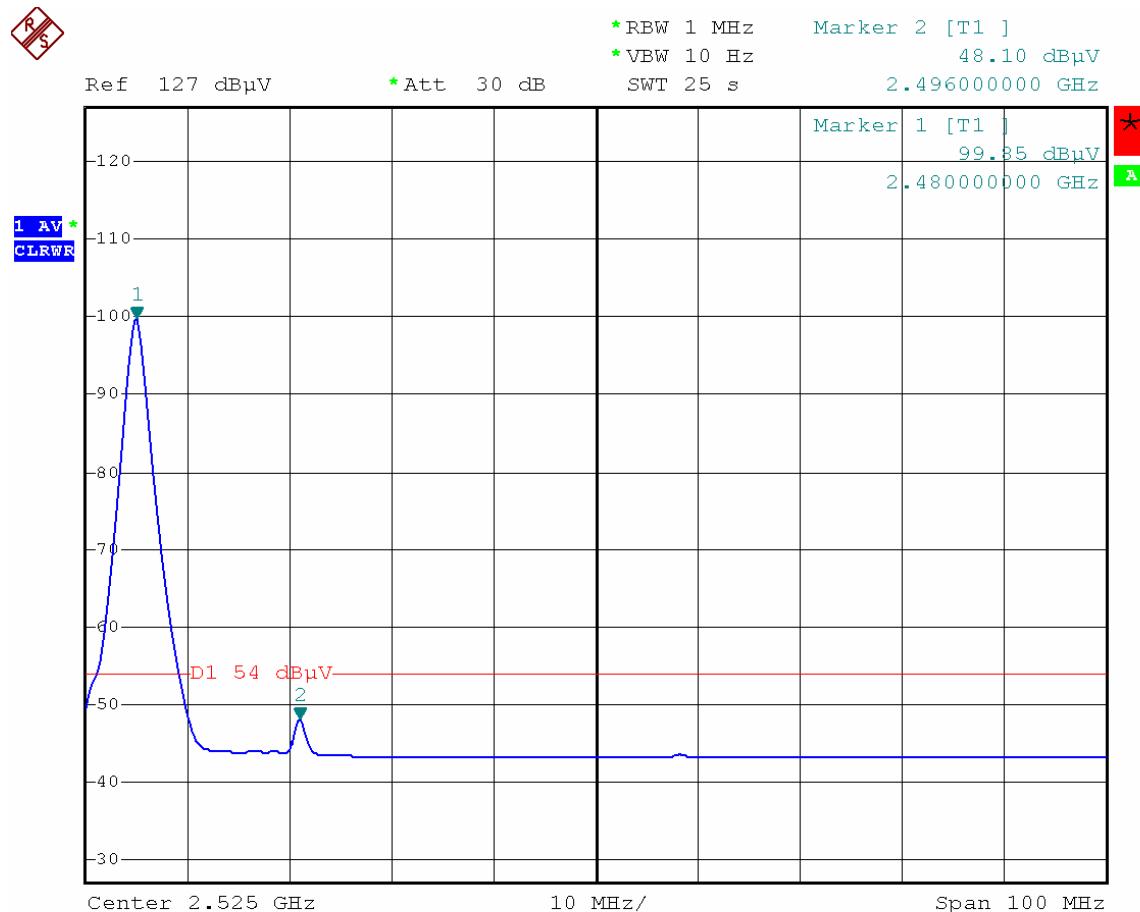
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Low Channel – AV

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High Channel – Peak

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High Channel – AV

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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:

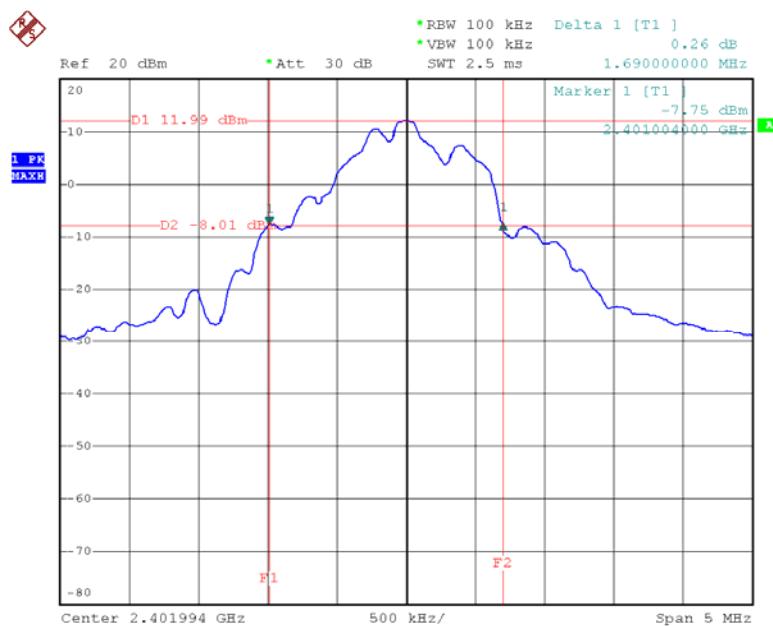
1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum;
2. Set the spectrum analyzer: RBW = 100kHz, VBW = 100kHz

Test Result:

Test Channel	Bandwidth
Low	1.690MHz
Middle	1.690MHz
High	1.690MHz

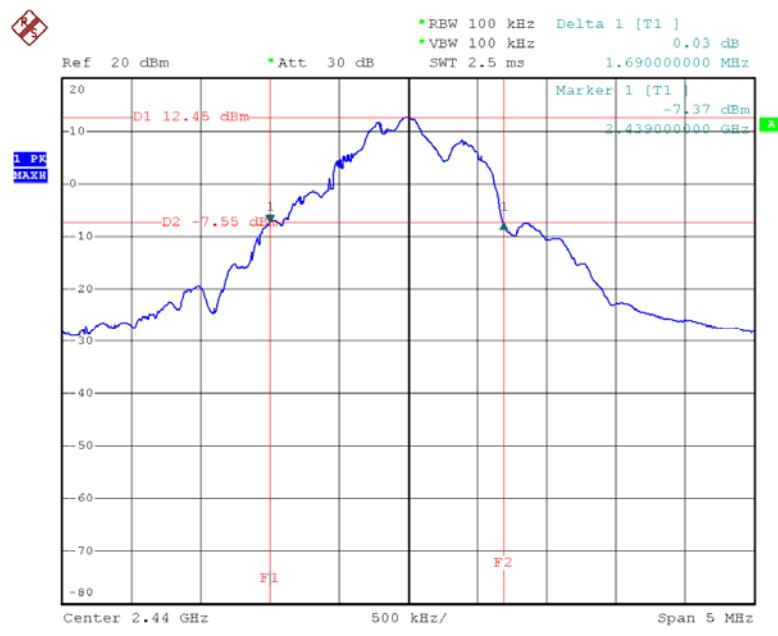
Test result plot as follows:

Low Channel

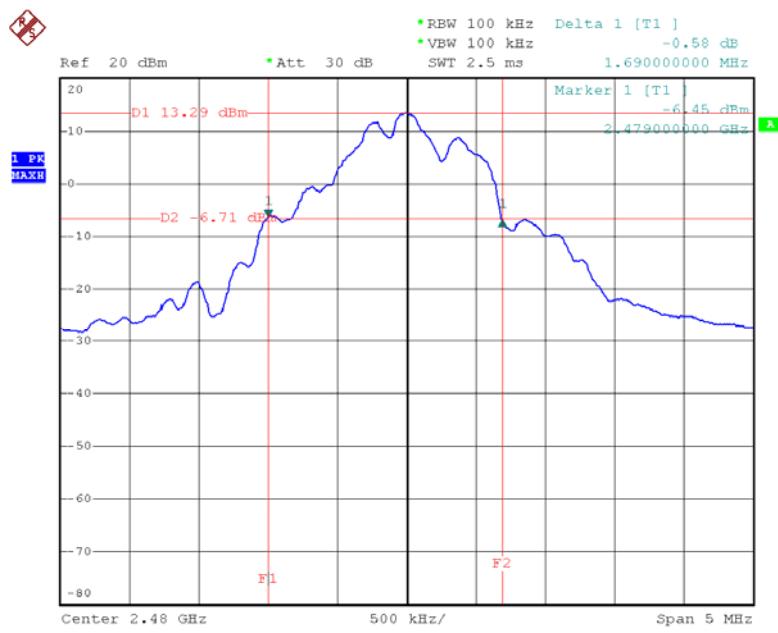


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Middle Channel



High Channel



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10 Maximum Peak Output Power

Test Requirement:	FCC CFR47 Part 15 Section 15.247
Test Method:	Based on ANSI C63.4:2009
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.

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	12.26	20.97
Middle	12.71	20.97
High	13.56	20.97

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11 Hopping Channel Separation

Test Requirement:	FCC CFR47 Part 15 Section 15.247
Test Method:	Based on FCC Part 15.247
Test Limit:	Regulation 15.247(a)(1) Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.
Test Mode:	Test in hopping transmitting operating mode.

Test Procedure:

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.
2. Set the spectrum analyzer: RBW = 30kHz. VBW = 100kHz , Span = 4MHz. Sweep = auto; Detector Function = Peak. Trace = Max hold.
3. Allow the trace to stabilize. Use the marker-delta function to determine the separation between the peaks of the adjacent channels. The limit is specified in one of the subparagraphs of this Section Submit this plot.

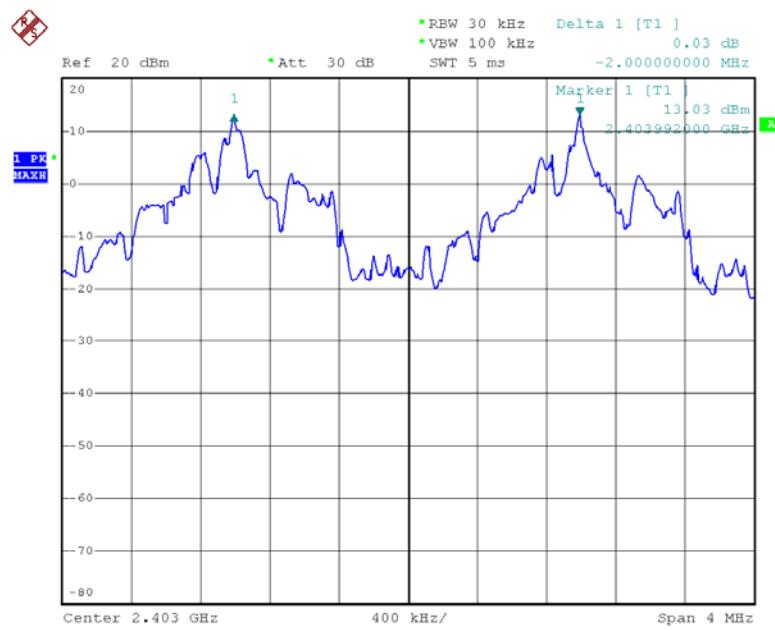
Test Result:

Test Channel	Separation (MHz)	Result
Low	2.0	PASS
Middle	2.0	PASS
High	2.0	PASS

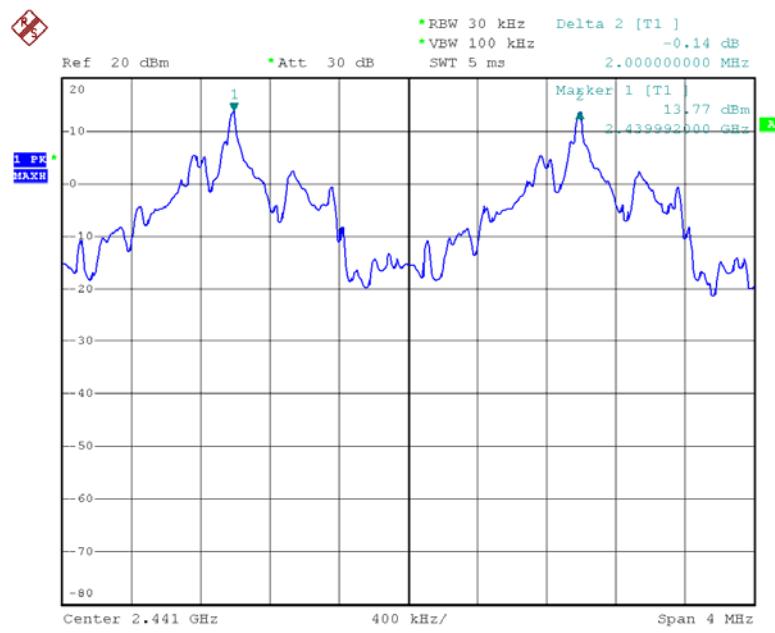
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Test result plot as follows:

Low Channel:

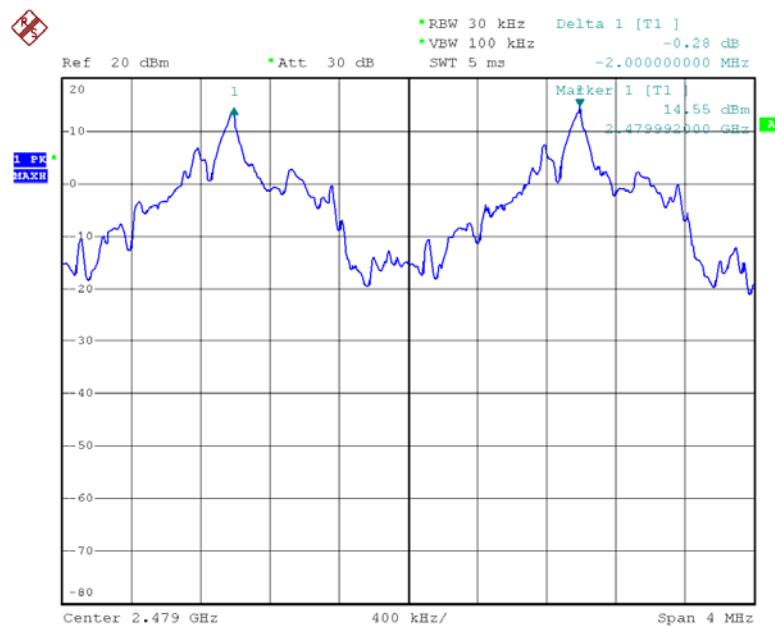


Middle Channel



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High Channel



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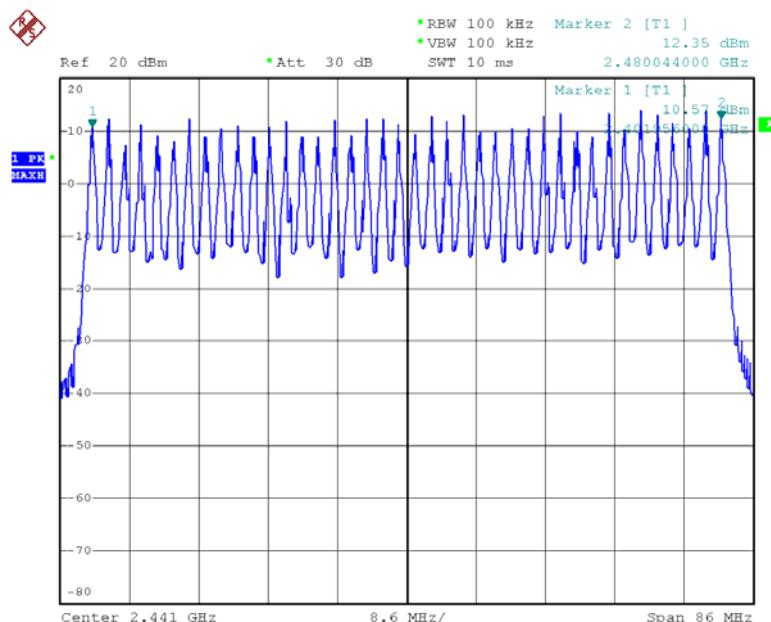
12 Number of Hopping Frequency

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 40 Channels.



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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 time x (Hopping rate / Number of channels) x Period

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

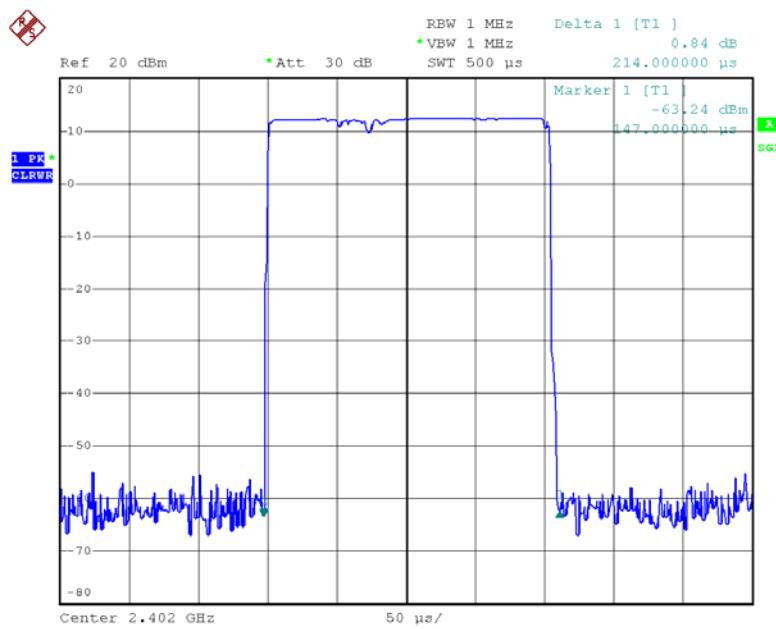
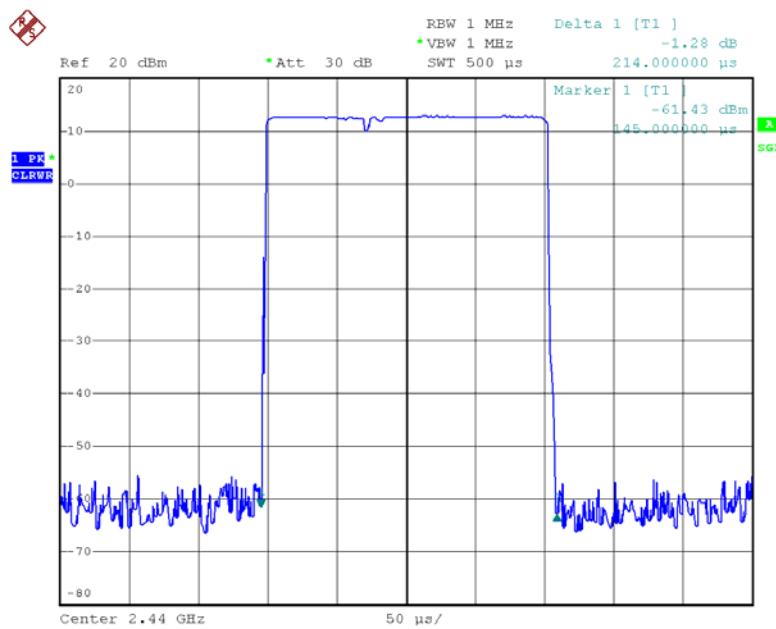
So, the Dwell Time can be calculated as follows:

$Dwell\ time = 60 * 16 * (MkrDelta) / 1$

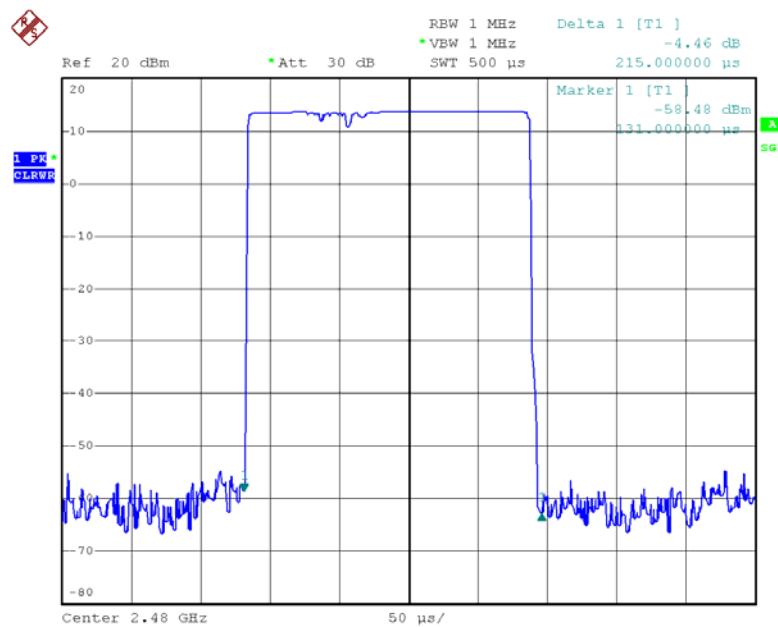
Note : Mkr Delta is once pulse time.

Frequency	Mkr Delta(s)	Dwell Time(s)	Limits(s)	Result
2402 MHz	0.000214	0.2054	0.400	Pass
2440 MHz	0.000214	0.2054	0.400	Pass
2480 MHz	0.000215	0.2064	0.400	Pass

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Low Channel: 2402MHz**Middle Channel: 2440MHz**

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High Channel: 2480MHz

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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).

Requirements:

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

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MPE Calculation Method

$$E \text{ (V/m)} = \frac{\sqrt{30 \times P \times G}}{d}$$

$$\text{Power Density: } Pd \text{ (W/m}^2\text{)} = \frac{E^2}{377}$$

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
-2.39	0.58	12.26(L)	16.826741	0.001942	1	Complies
-2.39	0.58	12.71(M)	18.663797	0.002154	1	Complies
-2.39	0.58	13.56(H)	22.698649	0.002619	1	Complies

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16 Photographs - Constructional Details

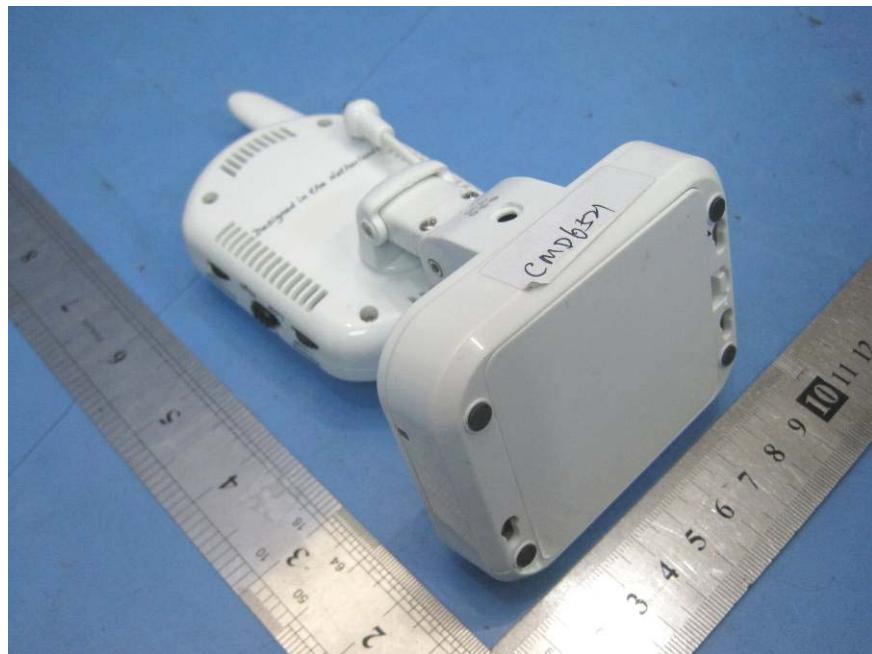
16.1 Product View



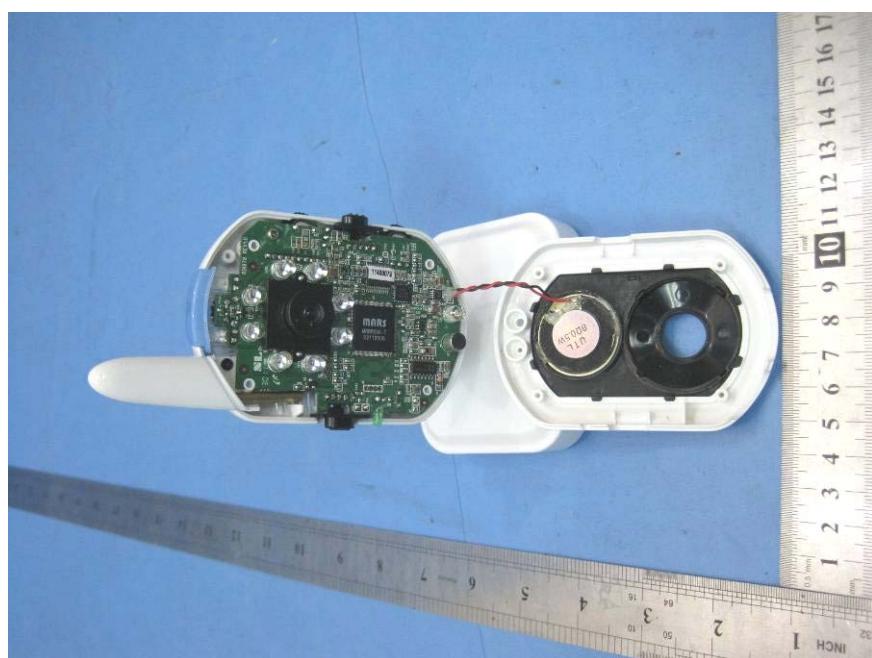
16.2 EUT – Appearance View



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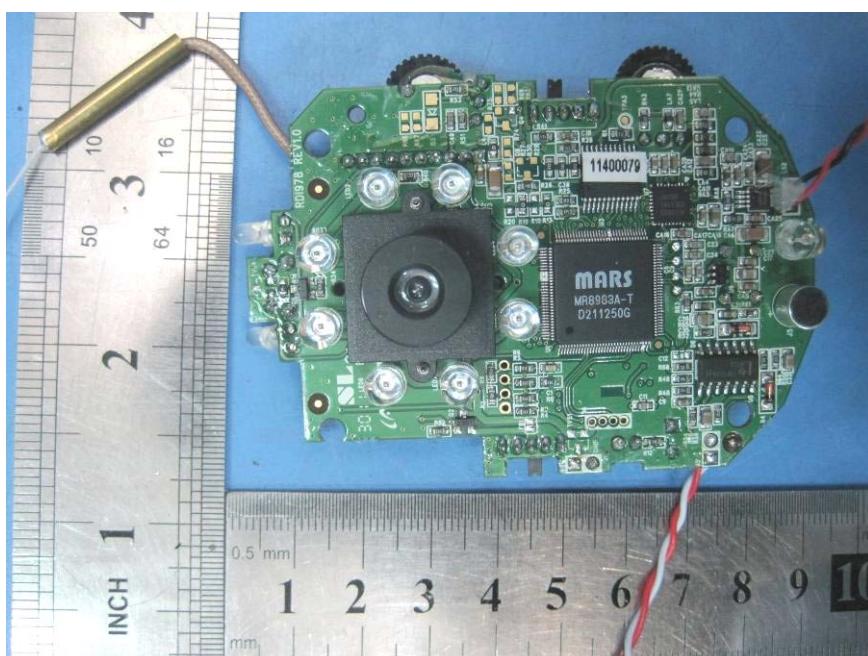
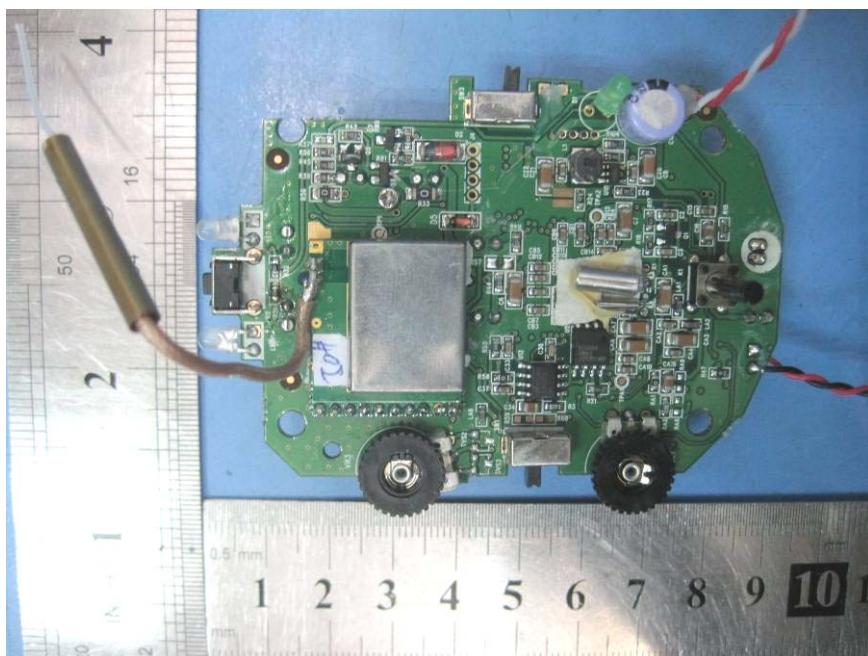


16.3 EUT – Open View

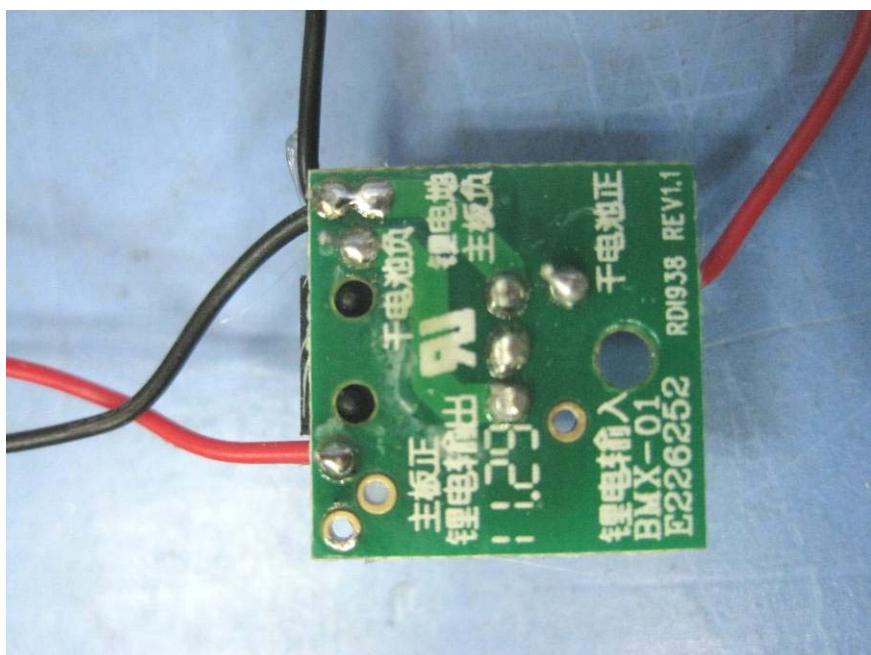
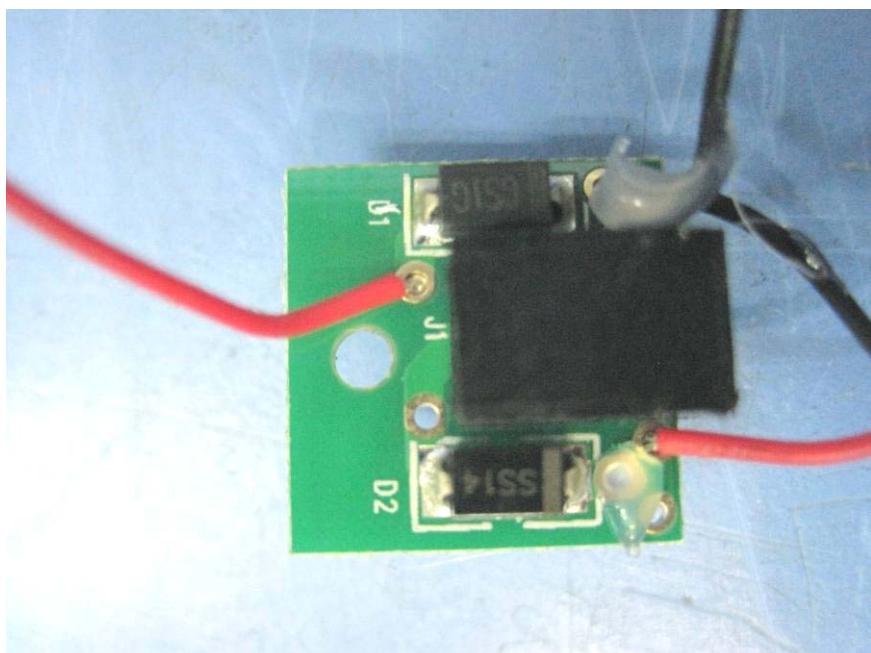


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16.4 EUT - PCB View

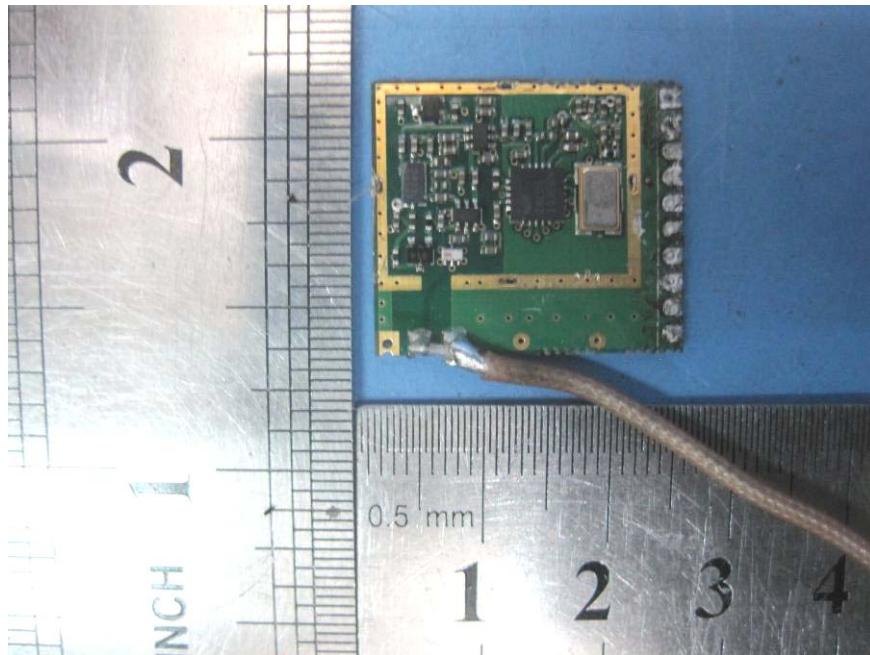
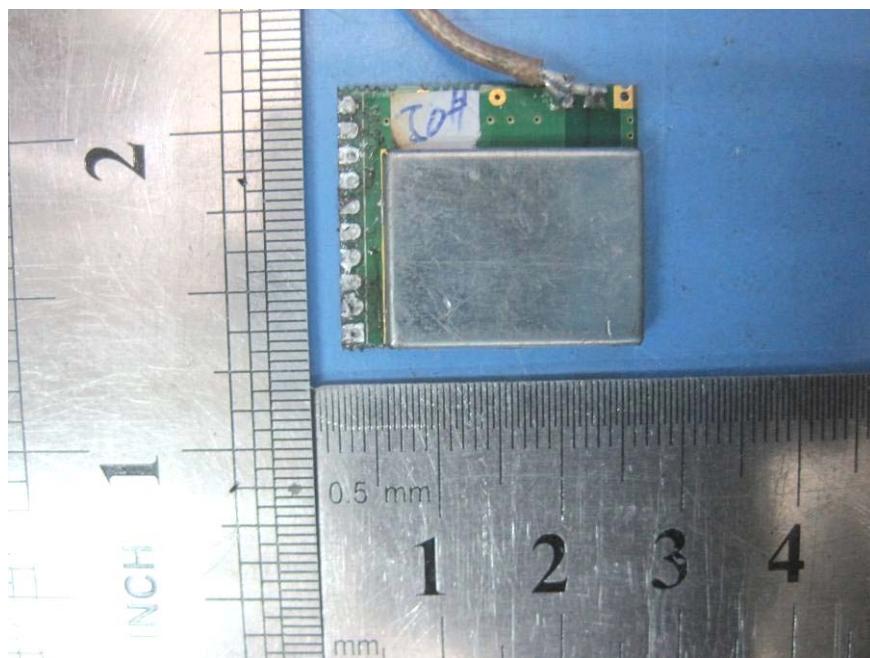


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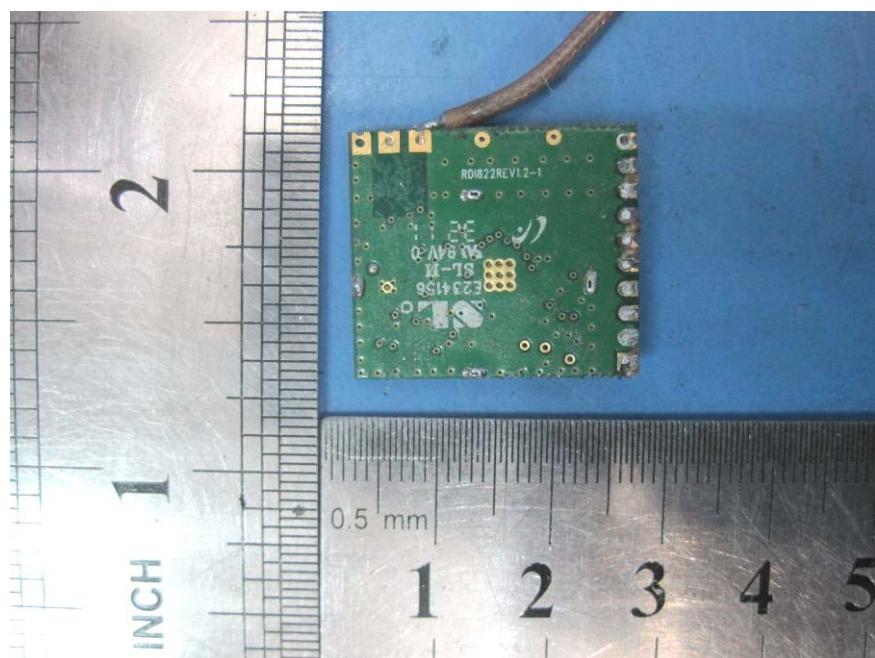


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16.5 RF Module - View

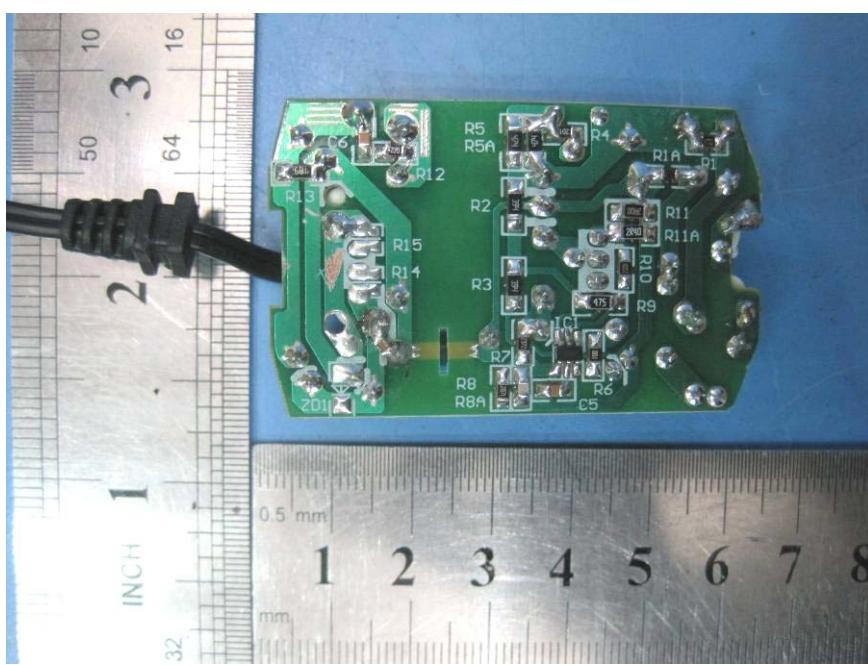
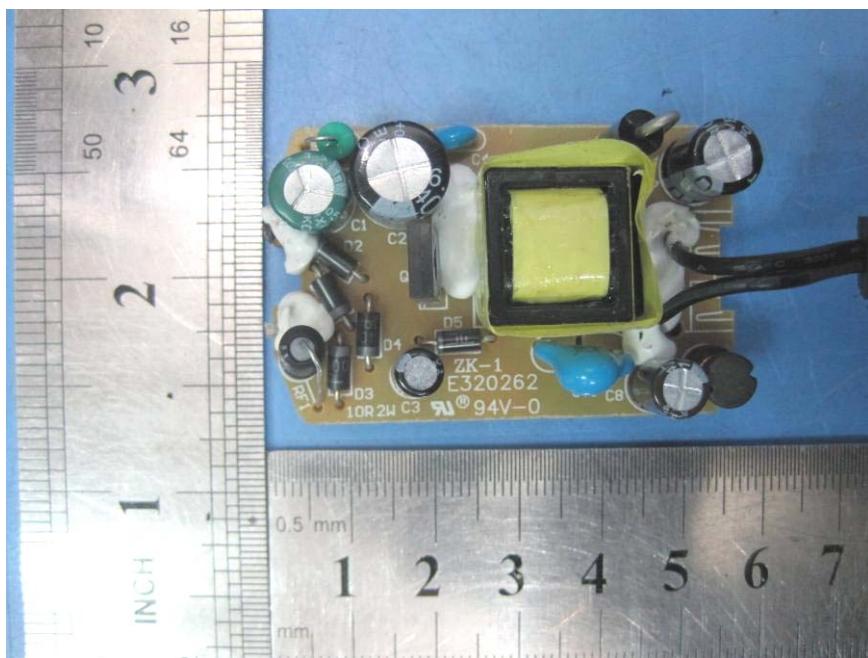


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16.6 Adapter - PCB View



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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



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