

FCC TEST REPORT

For

Freemote

Model Number: FMV1



Reference No. : CT09101745-S-F

FCC ID : XUHFMV1

Applicant : Shanghai FlyDigi Electronics Technology Co. Ltd.

Building 3, No. 200 Guodingdong Rd., Yangpu District, Shanghai,

China

Data of Test : Nov.4, 2009 to Nov.12, 2009

Data of Issue : Nov.14, 2009

Prepared By : Shenzhen CCE Test Electronic Co., Ltd.

Test Result : Pass



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3 Test Summary

Test Items	Test Requirement	Test Method	Limit / Severity	Result
Maximum peak output power	FCC Part 15	ANSI C63.4: 2003	20dBm	PASS
Restricted Band	FCC Part 15	ANSI C63.4: 2003	Note	PASS
Dwell time	FCC Part 15	ANSI C63.4: 2003	Maximum:0.4 s	PASS
Channel separation	FCC Part 15	ANSI C63.4: 2003	Channel separation at least 1MHz	PASS
Hopping channel No.	FCC Part 15	ANSI C63.4: 2003	Total 20 channels	PASS
20-dB Bandwidth	FCC Part 15	ANSI C63.4: 2003	Note	PASS
RF Exposure Test	FCC Part 15	ANSI C63.4: 2003	Note	PASS
Mains Terminal Disturbance Voltage, 150kHz to 30MHz	FCC Part 15	ANSI C63.4: 2003	N/A	N/A
Radiation Emission, 30MHz to 25GHz	FCC Part 15	ANSI C63.4: 2003	N/A	PASS

Note: denote that for more details of the EUT, please refer to the relating test items as below.

Remark : the methods of measurement in all the test items were according to the FCC Public Notice $DA\ 00-705$.



Test report declaration 4

Applicant Shanghai FlyDigi Electronics Technology Co. Ltd.

Building 3, No. 200 Guodingdong Rd., Yangpu District, Shanghai, Address

China

Manufacturer Shanghai FlyDigi Electronics Technology Co. Ltd.

Building 3, No. 200 Guodingdong Rd., Yangpu District, Shanghai, Address

China

Product Name Freemote

Model No. FMV1

Power Supply Battery: 3.0V

Frequency Range 2420MHz to 2480MHz

Standards FCC Part 15.247

Temperature 25.5 C

Humidity 51 % RH

Barometric

1012 mbar Pressure

Test Engineer

: Mike Chen : Tom. yas Reviewed By



5 Test Laboratory and facility infromation

The test facility is recognized, certified, or accredited by the following organizations:

• FCC – Registration No.: 759397

Solid Industrial (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 Number: 759397.

5.1 Test Location

All Emissions tests were performed at:-

Solid Industrial (Shenzhen) Co., Ltd. at 333 Bulong Highway, Buji, Longgang, Shenzhen, Guangdong, China.



6 Test Equipment USED

Equipment	Brand Name	Model	Cal. Int Months	Last Cal. Date
3m Anechoic chamber				
EMC Analyzer	Agilent E7405A	MY45114943	12	2009-08
EMI Test Receiver	R&S	ESS	12	2009-08
Pre Amplifier	Anritsu	MH648A	12	2009-08
Bilog Antenna	SCHAFFNER	CBL6111C	12	2009-08
Broad-band Horn Antenna	SCHWARZBECK MESS- ELEKTROM / VULB9163	667	12	2009-08
10m Coaxial Cable with N-male Connectors	SCHWARZBECK MESS-ELEKTROM / AK 9515 H		12	2009-08
10m 50 Ohm Coaxial Cable with N- plug,individual length	SCHWARZBECK MESSELEKTOM / AK 9513		12	2009-08
Test Receiver	ROHDE&SCHW ARZ/ ESPI	101155	12	2009-08
AM/FM Stereo Signal Generator	Panasonic	VP-8122A	12	2009-08
Signal Generator	R&S	SMG	12	2009-08



7 Conducted Disturbance Test

7.1 Test Standard and Limit

7.1.1 Test standard FCC Part 15.207

7.1.2 Limits of disturbance voltage at the mains terminal

E.,	Maximum R	F Line Voltage (dBμV)
Frequency	Quasi-peak Level	Average Level
150kHz~500kHz	66 ~ 56 *	56 ~ 46 *
500kHz~5MHz	56	46
5MHz~30MHz	60	50

^{*} Decreasing linearly with logarithm of the frequency

7.2 Test Procedure

The EUT is put on a table of non-conducting material that is 80cm high. The vertical conducting wall of shielding is located 40cm to the rear of the EUT. The power line of the EUT is connected to the AC mains through a Artificial Mains Network (A.M.N.). A EMI test receiver is used to test the emissions form both sides of AC line. The bandwidth of EMI test receiver is set at 9kHz.

7.3 Test Arrangement

The arrangement of the equipment is installed to meet the standards and operating in a manner, which tends to maximize its emission characteristics in a normal application. The detailed information refers to test picture.

7.4 Test Data

Note: The EUT is powered by battery, so testing was not performed in the report.



8 Radiation Emission Test

Test Requirement: FCC Part 15.247

Test Method: Based on ANSI 63.4:2003

Test Date: Nov. 12, 2009

Frequency Range: 30MHz to 25GHz

Measurement Distance: 3m

Detector: Peak for pre-scan (120kHz resolution bandwidth)

Quasi-Peak if maximised peak within 6dB of limit

8.1 Test Equipment

Please refer to Section 5 this report.

8.2 Measurement Uncertainty

The EUT is placed on a turntable, which is 0.8 meter above ground. The turntable can rotate 360 degrees to determine the position of the maximum emission level. EUT is set 3 meters away from the receiving antenna, which is mounted on an antenna tower. The antenna can move up and down between 1 to 4 meters to find out the maximum emission level. Broadband antenna is used as a receiving antenna. Both horizontal and vertical polarization of the antenna is set on test.Based on ANSI C63.4: 2003, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of a radiation emissions measurement at Solid Industrial (Shenzhen) Co., Ltd. EMC Lab is +/-4.98 dB.

8.3 Test Procedure

- 1. New battery was used in the equipment under test for radiated emissions test.
- 2. The radiation emission should be tested under 3-axes(X,Y,Z) position(X denotes lying on the table,Y denotes side stand and Z denotes vertical stand),After pre-test,It was found that the worse radiation emission was get at the X position.So the data shown was the X position only.
- 3. Maximizing procedure was performed on the six (6) highest emissions to ensure EUT is compliant with all installation combinations.
- 4. All data was recorded in the peak and average detection mode.
- 5. The EUT was under working mode during the final qualification test and the configuration was used to represent the worst case results.



8.4 Spectrum Analyzer Setup

According to FCC Part 15.247, the system was tested to 25000 MHz. Below 1GHz

Start Frequency	30 MHz
Stop Frequency	1000 MHz
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

8.5 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

8.1 Test Arrangement

The arrangement of the equipment is installed to meet the standards and operating in a manner, which tends to maximize its emission characteristics in a normal application. The detailed information refers to test picture.



8.2 Radiated Emissions Limit on FCC Part 15.209

Frequency(MHZ)	Distance(m)	Field strength(dBuV/m)
30-88	3	40.0
88-216	3	43.5
216-960	3	46.0
Above 960	3	54.0

Note: (1) RF Voltage(dBuV)=20 log RF Voltage(uV)

- (2) In the Above Table, the tighter limit applies at the band edges.
- (3) Distance refers to the distance in meters between the measuring instrument antenna.
- (4)The emission limit in this paragraph is based on measurement instrumentation employing an average detector. Measurement using instrumentation with a peak detector function, corresponding to 20dB above the maximum permitted average limit.
- (5)Above 1GHz, mark a Peak and average measurements for all emissions,Limit for peak is 74dBuvV/m,According to Part15.35(b) and average is 54BuvV/m.

8.3 Radiated Emission Data

Test Item: Radiated Emission Data
Test Mode: Continuously transmit

Temperature: 25.6 °C
Humidity: 51.2%RH
Test Result: PASS

Remarks: 30-1000MHz radiation test no significant emissions above the equipment noise floor were detected.

And the below is the Fundamental and Harmonic.



Frequenc y (MHz)	Detect or	Antenna Polarizat ion	Emission Level (dBuV/m)	FCC Part15 Subpart C Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Turntable Angle (°)
			L	ow frequency			
2420	AV	Vertical	98.98		(Fund.)	1.2	0
4840	AV	Vertical	50.00	54.00	4. 00	1.2	10
7260	AV	Vertical	41.41	54.00	12. 59	1.5	20
9680	AV	Vertical	40.04	54.00	13. 96	1.8	60
12100	AV	Vertical	39.75	54.00	14. 25	1.6	90
14520	AV	Vertical	38.74	54.00	15. 26	1.4	20
16940	AV	Vertical	38.68	54.00	15. 32	1.7	120
19360	AV	Vertical	36.42	54.00	17. 58	1.5	100
21780	AV	Vertical	37.4	54.00	16.6	1.6	120
24200	AV	Vertical	37.37	54.00	16.63	1.2	45
2420	AV	Horizontal	96.36		(Fund.)	1.2	10
4840	AV	Horizontal	50.47	54.00	3. 53	1.2	110
7260	AV	Horizontal	35.27	54.00	18. 73	1.1	120
9680	AV	Horizontal	35.38	54.00	18.62	1.2	110
12100	AV	Horizontal	33.42	54.00	20. 58	1.5	135
14520	AV	Horizonta	32.42	54.00	21.58	1.2	120
16940	AV	Horizontal	33.38	54.00	20.62	1.5	110
19360	AV	Horizontal	32.09	54.00	21.91	1.1	60
21780	AV	Horizontal	31.27	54.00	22. 73	1.2	20
24200	AV	Horizontal	30.02	54.00	23. 98	1.5	100
2420	PK	Vertical	104.63		(Fund.)	1.5	110
4840	PK	Vertical	64.25	74.00	9. 75	1.8	30
7260	PK	Vertical	50.35	74.00	23.65	1.6	110
9680	PK	Vertical	48.98	74.00	25. 02	1.4	100
12100	PK	Vertical	48.69	74.00	25. 31	1.2	90
14520	PK	Vertical	47.68	74.00	26. 32	1.2	60
16940	PK	Vertical	47.62	74.00	26. 38	1.4	90
19360	PK	Vertical	45.36	74.00	28.64	1.2	120
21780	PK	Vertical	46.34	74.00	27. 66	1.7	0
24200	PK	Vertical	46.31	74.00	27. 69	1.4	45



2420 PK Horizontal 103.34 (Fund.) 1.8 100 4840 PK Horizontal 59.98 74.00 15.02 1.8 60 7260 PK Horizontal 44.21 74.00 29.79 1.8 110 9680 PK Horizontal 44.32 74.00 29.68 1.2 110 12100 PK Horizontal 44.36 74.00 31.64 1.2 10 14520 PK Horizontal 44.36 74.00 32.64 1.5 90 16940 PK Horizontal 44.32 74.00 31.68 1.8 120 12780 PK Horizontal 44.32 74.00 31.68 1.8 120 12780 PK Horizontal 44.03 74.00 32.97 1.5 110 12780 PK Horizontal 40.21 74.00 33.79 1.2 250 24200 PK Horizontal 49.21 74.00 33.79 1.2 250 24200 PK Horizontal 49.95 (Fund.) 1.5 10 4896 AV Vertical 49.99 54.00 4.01 1.2 10 7344 AV Vertical 40.3 54.00 13.7 1.0 50 9792 AV Vertical 40.18 54.00 13.82 1.2 20 12240 AV Vertical 39.42 54.00 14.58 1.2 20 14688 AV Vertical 39.42 54.00 14.58 1.2 20 14688 AV Vertical 39.44 54.00 15.25 1.2 110 17136 AV Vertical 38.37 54.00 15.26 1.5 10 22032 AV Vertical 38.32 54.00 15.96 1.8 0 2448 AV Vertical 38.32 54.00 15.96 1.8 0 2448 AV Horizontal 47.38 54.00 15.96 1.8 0 2448 AV Horizontal 34.7 54.00 15.96 1.8 0 2448 AV Horizontal 34.7 54.00 19.3 1.5 20 7344 AV Horizontal 35.75 54.00 18.1 1.2 150 14688 AV Horizontal 35.75 54.00 18.1 1.2 150 14688 AV Horizontal 35.75 54.00 18.25 1.4 0 17.36 1.5 10 120 12480 AV Horizontal 35.32 54.00 18.68 1.4 90 12480 AV Horizontal 35.32 54.00 18.68 1.4 90 14.68 AV Horizontal 35.32 54.00 18.68 1.4 90 14.68 AV Horizontal 35.32 54.00 18.68 1.4 90 14.68 1.5 14.68 AV Horizontal 35.32 54.00 18.68								
T260 PK Horizontal 44.21 74.00 29.79 1.8 110	2420	PK	Horizontal	103.34		(Fund.)	1.8	100
9680 PK Horizontal 44.32 74.00 29.68 1.2 110 12100 PK Horizontal 42.36 74.00 31.64 1.2 10 14520 PK Horizontal 41.36 74.00 32.64 1.5 90 16940 PK Horizontal 42.32 74.00 31.68 1.8 120 19360 PK Horizontal 41.03 74.00 32.97 1.5 110 21780 PK Horizontal 40.21 74.00 33.79 1.2 250 24200 PK Horizontal 38.96 74.00 35.04 1.2 230 Middle frequency 2448 AV Vertical 49.99 54.00 4.01 1.2 10 7344 AV Vertical 40.18 54.00 13.82 1.2 20 12240 AV Vertical 39.42 54.00 14.58 1.2 20	4840	PK	Horizontal	59.98	74.00	15. 02	1.8	60
12100 PK	7260	PK	Horizontal	44.21	74.00	29. 79	1.8	110
14520 PK Horizontal 41.36 74.00 32.64 1.5 90	9680	PK	Horizontal	44.32	74.00	29. 68	1.2	110
16940 PK Horizontal 42.32 74.00 31.68 1.8 120 19360 PK Horizontal 41.03 74.00 32.97 1.5 110 21780 PK Horizontal 40.21 74.00 33.79 1.2 250 24200 PK Horizontal 38.96 74.00 35.04 1.2 230	12100	PK	Horizontal	42.36	74.00	31.64	1.2	10
19360	14520	PK	Horizontal	41.36	74.00	32. 64	1.5	90
21780 PK Horizontal 40.21 74.00 33.79 1.2 250	16940	PK	Horizontal	42.32	74.00	31. 68	1.8	120
Niddle frequency 1.5 10 1.5 1.0 1.5 1.0 1.5 1.0 1.5 1.0 1.5 1.0 1	19360	PK	Horizontal	41.03	74.00	32. 97	1.5	110
Middle frequency 2448 AV Vertical 97.95 (Fund.) 1.5 10 4896 AV Vertical 49.99 54.00 4.01 1.2 10 7344 AV Vertical 40.3 54.00 13.7 1.0 50 9792 AV Vertical 40.18 54.00 13.82 1.2 20 12240 AV Vertical 39.42 54.00 14.58 1.2 20 14688 AV Vertical 39.4 54.00 14.58 1.2 20 17136 AV Vertical 39.4 54.00 14.6 1.5 30 19584 AV Vertical 37.44 54.00 16.56 1.5 10 22032 AV Vertical 38.04 54.00 15.96 1.8 0 24480 AV Vertical 38.32 54.00 15.68 1.2 90 2448 AV Horizontal 98.67 (Fund.) 1.0 120 4896 AV Horizontal 34.7 54.00 19.3 1.5 20 9792 AV Horizontal 33.75 54.00 17.3 1.2 10 12240 AV Horizontal 34.7 54.00 19.3 1.5 20 12240 AV Horizontal 35.75 54.00 19.25 1.4 0 17136 AV Horizontal 35.75 54.00 18.25 1.6 135 19584 AV Horizontal 35.32 54.00 18.25 1.6 135 19584 AV Horizontal 35.32 54.00 18.25 1.6 135 19584 AV Horizontal 35.32 54.00 18.68 1.4 90 22032 AV Horizontal 33.43 54.00 20.57 1.2 20 24480 AV Horizontal 33.43 54.00 20.57 1.2 20 24480 AV Horizontal 33.43 54.00 20.57 1.2 20 24480 AV Horizontal 30.62 54.00 23.38 1.7 120 24480 AV Horizontal 30.62 54.00 21.69 1.1 90 30 30 30 30 30 30 30	21780	PK	Horizontal	40.21	74.00	33. 79	1.2	250
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12240 AV Vertical 39.42 54.00 14.58 1.2 20 14688 AV Vertical 38.75 54.00 15.25 1.2 110 17136 AV Vertical 39.4 54.00 14.6 1.5 30 19584 AV Vertical 37.44 54.00 16.56 1.5 10 22032 AV Vertical 38.04 54.00 15.96 1.8 0 24480 AV Vertical 38.32 54.00 15.68 1.2 90 2448 AV Horizontal 98.67 (Fund.) 1.0 120 4896 AV Horizontal 34.73 54.00 19.3 1.5 20 9792 AV Horizontal 36.7 54.00 17.3 1.2 10 12240 AV Horizontal 35.9 54.00 18.1 1.2 150 14688 AV Horizontal	7344	AV	Vertical	40.3	54.00	13.7	1.0	50
14688 AV Vertical 38.75 54.00 15.25 1.2 110 17136 AV Vertical 39.4 54.00 14.6 1.5 30 19584 AV Vertical 37.44 54.00 16.56 1.5 10 22032 AV Vertical 38.04 54.00 15.96 1.8 0 24480 AV Vertical 38.32 54.00 15.68 1.2 90 2448 AV Horizontal 98.67 (Fund.) 1.0 120 4896 AV Horizontal 34.73 54.00 19.3 1.5 20 9792 AV Horizontal 36.7 54.00 17.3 1.2 10 12240 AV Horizontal 35.9 54.00 18.1 1.2 150 14688 AV Horizontal 35.75 54.00 18.25 1.6 135 19584 AV Horizontal	9792	AV	Vertical	40.18	54.00	13.82	1.2	20
17136 AV Vertical 39.4 54.00 14.6 1.5 30 19584 AV Vertical 37.44 54.00 16.56 1.5 10 22032 AV Vertical 38.04 54.00 15.96 1.8 0 24480 AV Vertical 38.32 54.00 15.68 1.2 90 2448 AV Horizontal 98.67 (Fund.) 1.0 120 4896 AV Horizontal 47.38 54.00 6.62 1.0 90 7344 AV Horizontal 34.7 54.00 19.3 1.5 20 9792 AV Horizontal 35.9 54.00 17.3 1.2 10 12240 AV Horizontal 35.9 54.00 18.1 1.2 150 14688 AV Horizontal 35.75 54.00 19.25 1.4 0 17136 AV Horizontal	12240	AV	Vertical	39.42	54.00	14.58	1.2	20
19584 AV Vertical 37.44 54.00 16.56 1.5 10 22032 AV Vertical 38.04 54.00 15.96 1.8 0 24480 AV Vertical 38.32 54.00 15.68 1.2 90 2448 AV Horizontal 98.67 (Fund.) 1.0 120 4896 AV Horizontal 47.38 54.00 6.62 1.0 90 7344 AV Horizontal 34.7 54.00 19.3 1.5 20 9792 AV Horizontal 36.7 54.00 17.3 1.2 10 12240 AV Horizontal 35.9 54.00 18.1 1.2 150 14688 AV Horizontal 35.75 54.00 19.25 1.4 0 17136 AV Horizontal 35.32 54.00 18.68 1.4 90 22032 AV Horizontal	14688	AV	Vertical	38.75	54.00	15.25	1.2	110
22032 AV Vertical 38.04 54.00 15.96 1.8 0 24480 AV Vertical 38.32 54.00 15.68 1.2 90 2448 AV Horizontal 98.67 (Fund.) 1.0 120 4896 AV Horizontal 47.38 54.00 6.62 1.0 90 7344 AV Horizontal 34.7 54.00 19.3 1.5 20 9792 AV Horizontal 36.7 54.00 17.3 1.2 10 12240 AV Horizontal 35.9 54.00 18.1 1.2 150 14688 AV Horizontal 35.75 54.00 19.25 1.4 0 17136 AV Horizontal 35.75 54.00 18.25 1.6 135 19584 AV Horizontal 33.43 54.00 20.57 1.2 20 24480 AV Horizontal	17136	AV	Vertical	39.4	54.00	14.6	1.5	30
24480 AV Vertical 38.32 54.00 15.68 1.2 90 2448 AV Horizontal 98.67 (Fund.) 1.0 120 4896 AV Horizontal 47.38 54.00 6.62 1.0 90 7344 AV Horizontal 34.7 54.00 19.3 1.5 20 9792 AV Horizontal 36.7 54.00 17.3 1.2 10 12240 AV Horizontal 35.9 54.00 18.1 1.2 150 14688 AV Horizontal 34.75 54.00 19.25 1.4 0 17136 AV Horizontal 35.75 54.00 18.25 1.6 135 19584 AV Horizontal 35.32 54.00 18.68 1.4 90 22032 AV Horizontal 30.62 54.00 23.38 1.7 120 24480 AV Horizontal<	19584	AV	Vertical	37.44	54.00	16.56	1.5	10
2448 AV Horizontal 98.67 (Fund.) 1.0 120 4896 AV Horizontal 47.38 54.00 6.62 1.0 90 7344 AV Horizontal 34.7 54.00 19.3 1.5 20 9792 AV Horizontal 36.7 54.00 17.3 1.2 10 12240 AV Horizontal 35.9 54.00 18.1 1.2 150 14688 AV Horizontal 34.75 54.00 19.25 1.4 0 17136 AV Horizontal 35.75 54.00 18.25 1.6 135 19584 AV Horizontal 35.32 54.00 18.68 1.4 90 22032 AV Horizontal 30.62 54.00 20.57 1.2 20 24480 AV Horizontal 30.62 54.00 23.38 1.7 120 2448 PK Vertical </td <td>22032</td> <td>AV</td> <td>Vertical</td> <td>38.04</td> <td>54.00</td> <td>15.96</td> <td>1.8</td> <td>0</td>	22032	AV	Vertical	38.04	54.00	15.96	1.8	0
4896 AV Horizontal 47.38 54.00 6.62 1.0 90 7344 AV Horizontal 34.7 54.00 19.3 1.5 20 9792 AV Horizontal 36.7 54.00 17.3 1.2 10 12240 AV Horizontal 35.9 54.00 18.1 1.2 150 14688 AV Horizontal 34.75 54.00 19.25 1.4 0 17136 AV Horizontal 35.75 54.00 18.25 1.6 135 19584 AV Horizontal 35.32 54.00 18.68 1.4 90 22032 AV Horizontal 33.43 54.00 20.57 1.2 20 24480 AV Horizontal 30.62 54.00 23.38 1.7 120 2448 PK Vertical 104.65 (Fund.) 1.0 10 4896 PK Vertical <td>24480</td> <td>AV</td> <td>Vertical</td> <td>38.32</td> <td>54.00</td> <td>15.68</td> <td>1.2</td> <td>90</td>	24480	AV	Vertical	38.32	54.00	15.68	1.2	90
7344 AV Horizontal 34.7 54.00 19.3 1.5 20 9792 AV Horizontal 36.7 54.00 17.3 1.2 10 12240 AV Horizontal 35.9 54.00 18.1 1.2 150 14688 AV Horizontal 34.75 54.00 19.25 1.4 0 17136 AV Horizontal 35.75 54.00 18.25 1.6 135 19584 AV Horizontal 35.32 54.00 18.68 1.4 90 22032 AV Horizontal 33.43 54.00 20.57 1.2 20 24480 AV Horizontal 30.62 54.00 23.38 1.7 120 2448 PK Vertical 104.65 (Fund.) 1.0 10 4896 PK Vertical 62.31 74.00 11.69 1.1 90	2448	AV	Horizontal	98.67		(Fund.)	1.0	120
9792 AV Horizontal 36.7 54.00 17.3 1.2 10 12240 AV Horizontal 35.9 54.00 18.1 1.2 150 14688 AV Horizontal 34.75 54.00 19.25 1.4 0 17136 AV Horizontal 35.75 54.00 18.25 1.6 135 19584 AV Horizontal 35.32 54.00 18.68 1.4 90 22032 AV Horizontal 33.43 54.00 20.57 1.2 20 24480 AV Horizontal 30.62 54.00 23.38 1.7 120 2448 PK Vertical 104.65 (Fund.) 1.0 10 4896 PK Vertical 62.31 74.00 11.69 1.1 90	4896	AV	Horizontal	47.38	54.00	6.62	1.0	90
12240 AV Horizontal 35.9 54.00 18.1 1.2 150 14688 AV Horizontal 34.75 54.00 19.25 1.4 0 17136 AV Horizontal 35.75 54.00 18.25 1.6 135 19584 AV Horizontal 35.32 54.00 18.68 1.4 90 22032 AV Horizontal 33.43 54.00 20.57 1.2 20 24480 AV Horizontal 30.62 54.00 23.38 1.7 120 2448 PK Vertical 104.65 (Fund.) 1.0 10 4896 PK Vertical 62.31 74.00 11.69 1.1 90	7344	AV	Horizontal	34.7	54.00	19.3	1.5	20
14688 AV Horizontal 34.75 54.00 19.25 1.4 0 17136 AV Horizontal 35.75 54.00 18.25 1.6 135 19584 AV Horizontal 35.32 54.00 18.68 1.4 90 22032 AV Horizontal 33.43 54.00 20.57 1.2 20 24480 AV Horizontal 30.62 54.00 23.38 1.7 120 2448 PK Vertical 104.65 (Fund.) 1.0 10 4896 PK Vertical 62.31 74.00 11.69 1.1 90	9792	AV	Horizontal	36.7	54.00	17.3	1.2	10
17136 AV Horizontal 35.75 54.00 18.25 1.6 135 19584 AV Horizontal 35.32 54.00 18.68 1.4 90 22032 AV Horizontal 33.43 54.00 20.57 1.2 20 24480 AV Horizontal 30.62 54.00 23.38 1.7 120 2448 PK Vertical 104.65 (Fund.) 1.0 10 4896 PK Vertical 62.31 74.00 11.69 1.1 90	12240	AV	Horizontal	35.9	54.00	18.1	1.2	150
19584 AV Horizontal 35.32 54.00 18.68 1.4 90 22032 AV Horizontal 33.43 54.00 20.57 1.2 20 24480 AV Horizontal 30.62 54.00 23.38 1.7 120 2448 PK Vertical 104.65 (Fund.) 1.0 10 4896 PK Vertical 62.31 74.00 11.69 1.1 90	14688	AV	Horizontal	34.75	54.00	19.25	1.4	0
22032 AV Horizontal 33.43 54.00 20.57 1.2 20 24480 AV Horizontal 30.62 54.00 23.38 1.7 120 2448 PK Vertical 104.65 (Fund.) 1.0 10 4896 PK Vertical 62.31 74.00 11.69 1.1 90	17136	AV	Horizontal	35.75	54.00	18.25	1.6	135
24480 AV Horizontal 30.62 54.00 23.38 1.7 120 2448 PK Vertical 104.65 (Fund.) 1.0 10 4896 PK Vertical 62.31 74.00 11.69 1.1 90	19584	AV	Horizontal	35.32	54.00	18.68	1.4	90
2448 PK Vertical 104.65 (Fund.) 1.0 10 4896 PK Vertical 62.31 74.00 11.69 1.1 90	22032	AV	Horizontal	33.43	54.00	20.57	1.2	20
4896 PK Vertical 62.31 74.00 11.69 1.1 90	24480	AV	Horizontal	30.62	54.00	23.38	1.7	120
	2448	PK	Vertical	104.65		(Fund.)	1.0	10
7044 777 77 1 4024 7400 04.70	4896	PK	Vertical	62.31	74.00	11. 69	1.1	90
1344 PK Vertical 49.24 74.00 24.76 1.4 100	7344	PK	Vertical	49.24	74.00	24. 76	1.4	100



9792	PK	Vertical	49.12	74.00	24. 88	1.3	120
12240	PK	Vertical	48.36	74.00	25. 64	1.7	180
14688	PK	Vertical	47.69	74.00	26. 31	1.2	0
17136	PK	Vertical	48.34	74.00	25. 66	1.4	0
19584	PK	Vertical	46.38	74.00	27. 62	1.5	120
22032	PK	Vertical	46.98	74.00	27. 02	1.5	124
24480	PK	Vertical	47.26	74.00	26. 74	1.2	120
2448	PK	Horizontal	103.64		(Fund.)	1.0	10
4896	PK	Horizontal	63.32	74.00	11.68	1.1	45
7344	PK	Horizontal	43.64	74.00	30. 36	1.1	90
9792	PK	Horizontal	45.64	74.00	28. 36	1.5	60
12240	PK	Horizontal	44.84	74.00	29. 16	1.4	10
14688	PK	Horizontal	43.69	74.00	30. 31	1.2	150
17136	PK	Horizontal	44.69	74.00	29. 31	1.1	10
19584	PK	Horizontal	44.26	74.00	29. 74	1.5	260
22032	PK	Horizontal	42.37	74.00	31.63	1.1	00
24480	PK	Horizontal	39.56	74.00	34. 44	1.6	45
			Н	ligh frequency			
2480	AV	Vertical	97.68		(Fund.)	1.0	0
4960	AV	Vertical	50.11	54.00	3. 89	1.2	120
7440	AV	Vertical	41.2	54.00	12.8	1.2	10
9920	AV	Vertical	41.4	54.00	12.6	1.4	45
12400	AV	Vertical	40.95	54.00	13. 05	1.5	90
14880	AV	Vertical	40.69	54.00	13. 31	1.8	60
17360	AV	Vertical	40.74	54.00	13. 26	1.1	10
19840	AV	Vertical	39.04	54.00	14. 96	1.1	120
22320	AV	Vertical	39.65	54.00	14. 35	1.4	10
24800	AV	Vertical	38.42	54.00	15. 58	1.5	60
2480	AV	Horizontal	98.93		(Fund.)	1.0	0
4960	AV	Horizontal	50.47	54.00	3. 53	1.2	120
7440	AV	Horizontal	37.54	54.00	16. 46	1.2	60
9920	AV	Horizontal	37.42	54.00	16. 58	1.5	100
12400	AV	Horizontal	36.7	54.00	17. 3	1.2	60
14880	AV	Horizontal	38.91	54.00	15. 09	1.2	120



17360	AV	Horizontal	36.71	54.00	17. 29	1.4	120
19840	AV	Horizontal	34.75	54.00	19. 25	1.8	10
22320	AV	Horizontal	34.32	54.00	19. 68	1.3	45
24800	AV	Horizontal	32.31	54.00	21. 69	1.7	90
2480	PK	Vertical	102.69		(Fund.)	1.0	60
4960	PK	Vertical	64.11	74.00	9.89	1.2	10
7440	PK	Vertical	50.14	74.00	23. 86	1.8	120
9920	PK	Vertical	50.34	74.00	23. 66	1.5	10
12400	PK	Vertical	49.89	74.00	24. 11	1.4	45
14880	PK	Vertical	49.63	74.00	24. 37	1.2	90
17360	PK	Vertical	49.68	74.00	24. 32	1.2	60
19840	PK	Vertical	47.98	74.00	26. 02	1.2	120
22320	PK	Vertical	48.59	74.00	25. 41	1.6	60
24800	PK	Vertical	47.36	74.00	26. 64	1.4	90
2480	PK	Horizontal	103.67		(Fund.)	1.1	120
4960	PK	Horizontal	63.00	74.00	11.00	1.4	10
7440	PK	Horizontal	46.48	74.00	27. 52	1.5	45
9920	PK	Horizontal	46.36	74.00	27. 64	1.3	90
12400	PK	Horizontal	45.64	74.00	28. 36	1.2	60
14880	PK	Horizontal	47.85	74.00	26. 15	1.7	10
17360	PK	Horizontal	45.65	74.00	28. 35	1.8	120
19840	PK	Horizontal	43.69	74.00	30. 31	1.5	10
22320	PK	Horizontal	43.26	74.00	30. 74	1.8	45
24800	PK	Horizontal	41.25	74.00	32. 75	1.0	90



9 Maximum Peak Output Power

The test procedure as below:

The transmitter output (antenna port) was connected to the spectrum analyzer.EUT and its simulators are placed on a table, let EUT working in test mode-Continuously transmit,the working frequency is high/mid/low channel,and then test it.And the spectrum setup as following 1MHz RBW and 1MHz VBW

Test Result: The unit does meet the FCC requirements.

Test Channel	Fundamental Frequency(MHz)	Output Power (mW)	Limit (W)	Power output level	
Lower	2420	0.488	0.125	conducted	
Middle	2448	0.394	0.125	conducted	
Upper	2480	0.488	0.125	conducted	

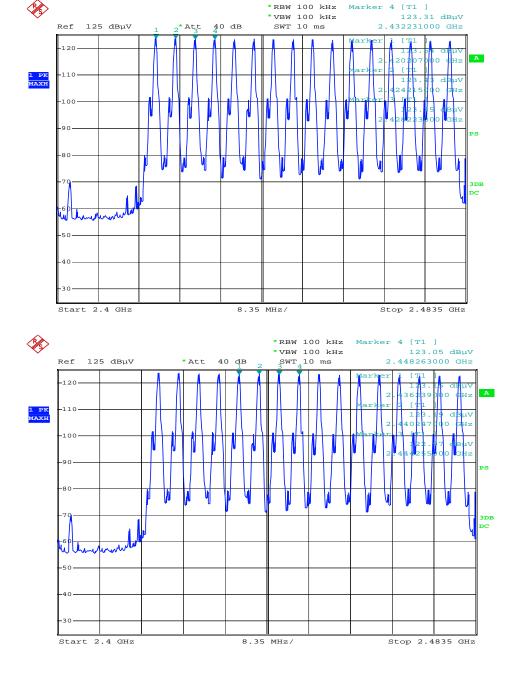
Note: The EUT has 20 channels, and according to CFR Title 47 Part 15.247(b), the maximum allowable power for this device is 0.125W.



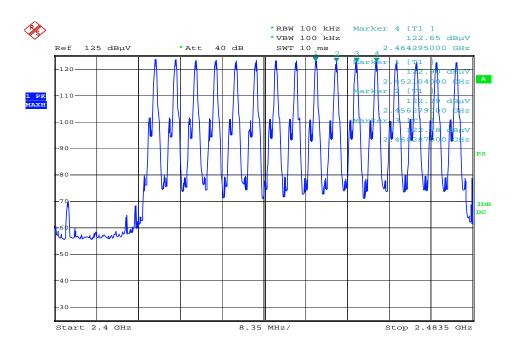
10 Hopping Channel Number

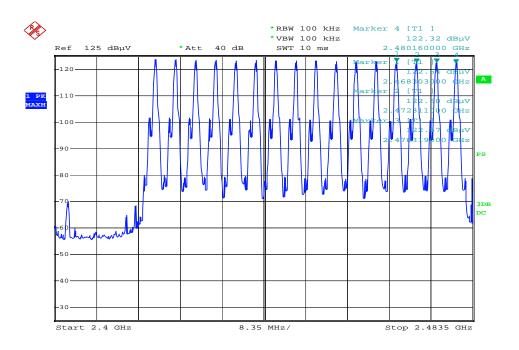
According to the FCC Part 15.247(b) For frequency hopping systems operating in the 2400-2483.5MHz band employing at least 15 hopping channels.the EUT's working total number of channels would be 20 channels. The unit does meet the FCC requirements. Please refer the graph as below:

Note: the test frequency range from 2420 to 2480MHz.











11 Frequency Separated

Definition: A hopping channel is any of the centre frequencies defined within the hopping sequence of a FHSS system. The requirements in this clause are only applicable to equipment using frequency hopping spread spectrum (FHSS) modulation and let the EUT was programmed to be in continuously transmitting mode

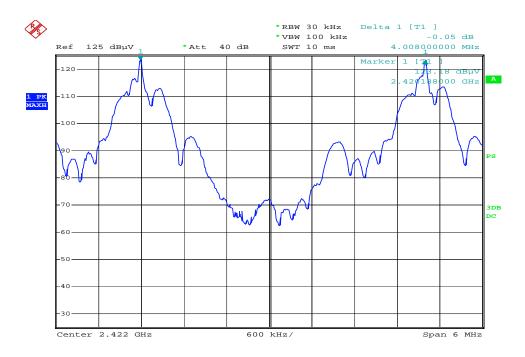
The hopping channels defined within a hopping sequence shall be at least 1MHz apart (channel separation)

Test Result: PASS

Test Channel	Channel Separation	PASS/FAIL	
Lower Channels	4MHz	Pass	
Middle Channels	4MHz	Pass	
Upper Channels	4MHz	Pass	

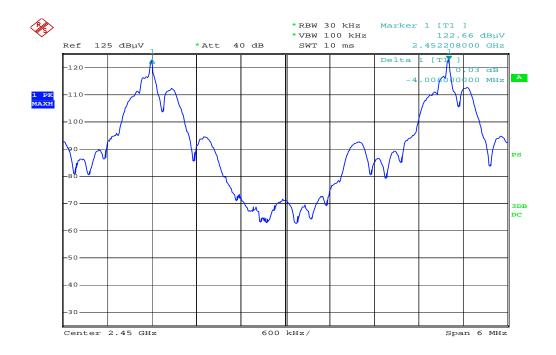
Please refer to the below photos for more details

Lower Channel

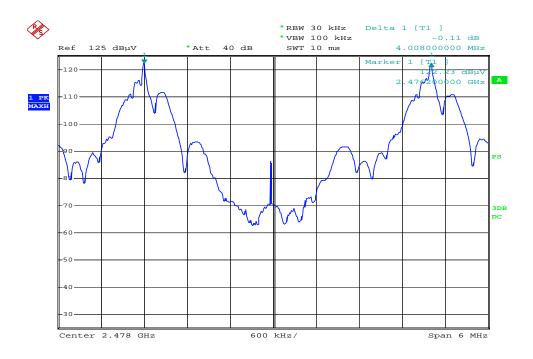




Middle Channel



Upper Channel





12 Dwell time

Definition: The dwell time is the time spent at a particular frequency during any single hop.

Limit: the maximum dwell time shall be less than 0.4s.

The EUT was programmed to be in continuously transmitting mode.

Test Procedure

The EUT output antenna port was connected to the spectrum analyzer. Set RBW of spectrum analyzer to 1MHz and VBW to 1MHz, and the frequency span to zero span, measure the maximum time duration of one single pulse. So, the Dwell Time can be calculated as follows:

T=Ton-time*Ntimes/1S*0.4*20≤0. 4S.

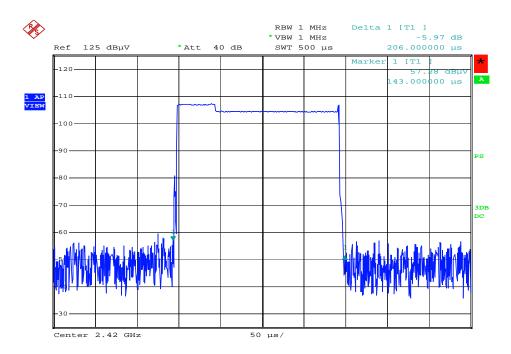
Note: the client declaration the EUT's hopping time is :1200times/s.

Channel 2420MHz

Dwell time of each occupation in this channel as follows: 0.0000206*1200/1S*0.4*76=0.1977<0.4S

Test Result: PASS

The Results are not be greater than 0.4 seconds.



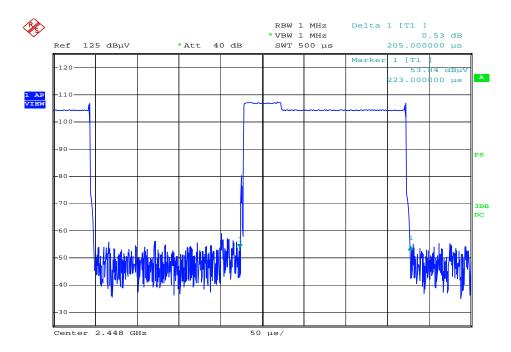


Channel 2448MHz

Dwell time of each occupation in this channel as follows: 0.0000205*1200/1S*0.4*20=0.1968<0.4S

Test Result: PASS

The Results are not be greater than 0.4 seconds.



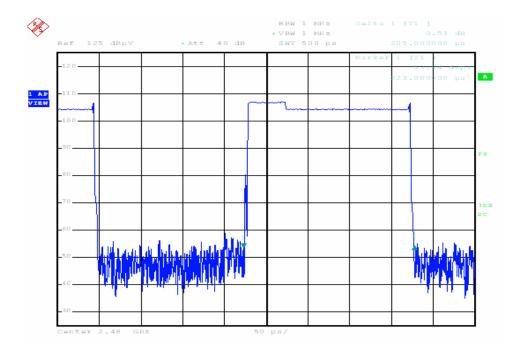


Channel 2480MHz

Dwell time of each occupation in this channel as follows: 0.0000205*1200/1S*0.4*20=0.1968<0.4S

Test Result: PASS

The Results are not be greater than 0.4 seconds.





13 20-dB Bandwidth

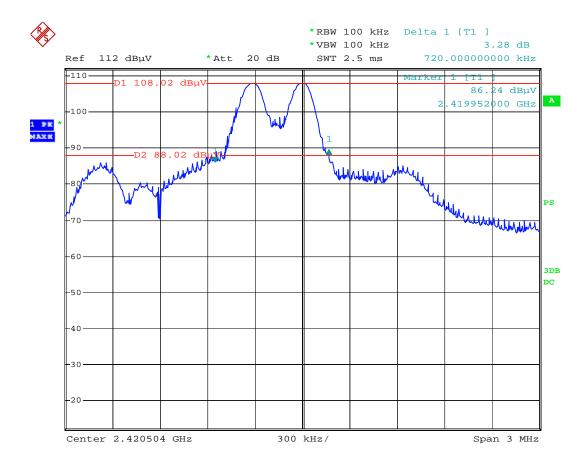
Test Procedure

- 1. The transmitter output (antenna port) was connected to the spectrum analyzer.
- 2. The bandwidth of the fundamental frequency was measure by spectrum analyser with 100KHz RBW and 100KHz VBW.

Test Result

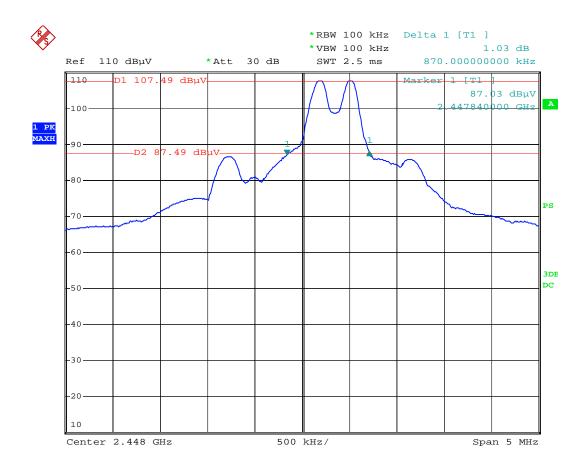
Please refer the graph as below:

Lower Channel 2420MHz

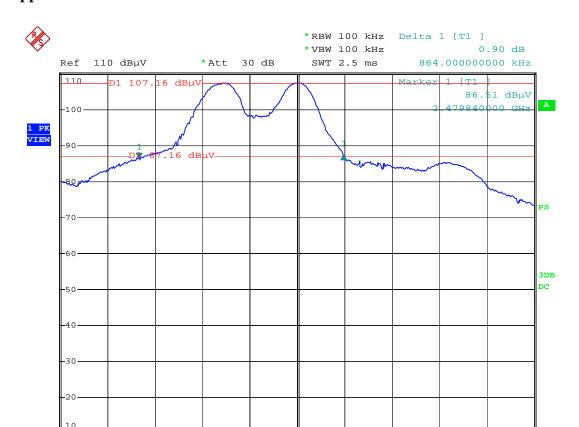




Middle Channel 2448MHz



Upper Channel 2480MHz





14 Radiated spurious emissions into adjacent restricted band

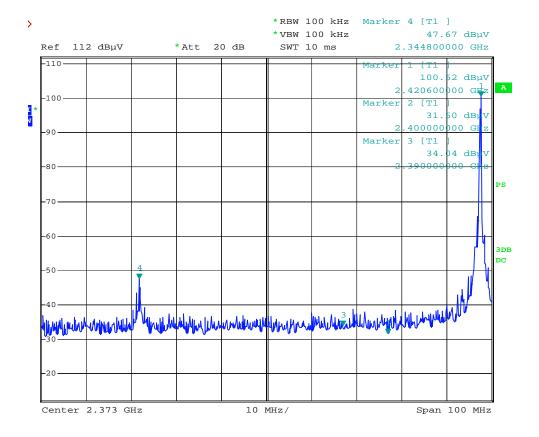
Requiments:

Emissions that fall in the restricted bands (FCC Part 15.205). Above 1000MHz, compliance with the emissions limits in FCC Part 15.209 shall be demonstrated based on the average value of the measured emissions, The provisions in FCC Part 15.35 apply to these measurements.

Test procedure:

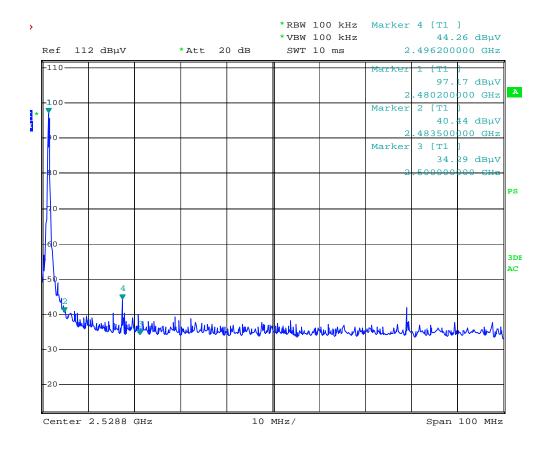
An in band field strength measurement of the fundamental emission using the RBW and detector function required by C63.4-2003 and the FCC Rules. The procedure was repeated with an average detector and a plot made. The calculated field strength in the adjacent restricted band is presented below.

Lower bandedge/ restricted band (Peak Value)





Upper Bandedge/ Restricted Band (Peak Value)





15 RF Exposure Test

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 CFR Title 47 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) =
$$\frac{\sqrt{30 \times P \times G}}{d}$$
 Power Density: Pd (W/m²) = $\frac{E^2}{377}$

 $\mathbf{E} = \text{Electric field (V/m)}$

 $\mathbf{P} = \text{Peak RF output power (W)}$

G = EUT Antenna numeric gain (numeric)

 $\mathbf{d} =$ Separation distance between radiator and human body (m)

The formula can be changed to

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

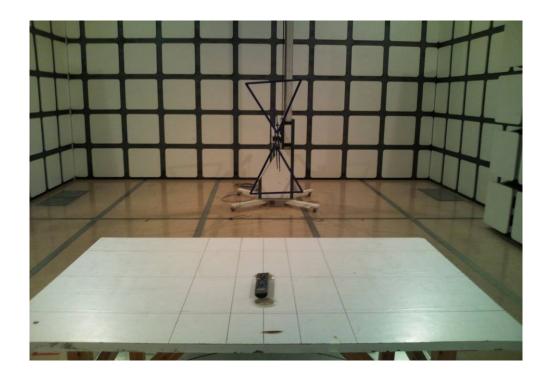
From the peak EUT RF output power, the minimum mobile separation distance, d=0.2m, as well as the gain of the used antenna, the RF power density can be obtained

Antenna Gain (dBi)	Antenna Gain (numeric)		Peak Output Power (mW)	Power Density (S) (mW/cm2)	Limit of Power Density (S) (mW/cm2)	Test Result
-2.39	0.577	-3.12	0.488	0.000056	1	Complies
-2.39	0.577	-4.04	0.394	0.000045	1	Complies
-2.39	0.577	-3.12	0.488	0.000056	1	Complies



16 Test Setup Photo

Radiation Emission Test View For 30MHz-1000MHz



Radiation Emission Test View For 1GHz-25GHz





APPENDIX: EUT Photographs and Test pictureS



Photo 1 Appearance View of EUT



Photo 2 Appearance View of EUT





Photo 3 Front View of PCB

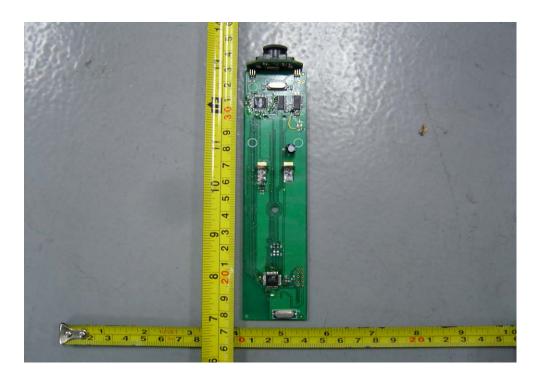
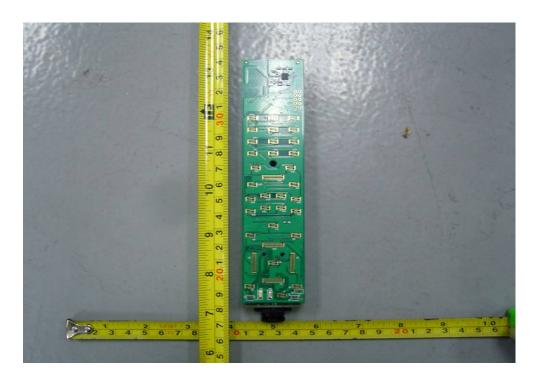


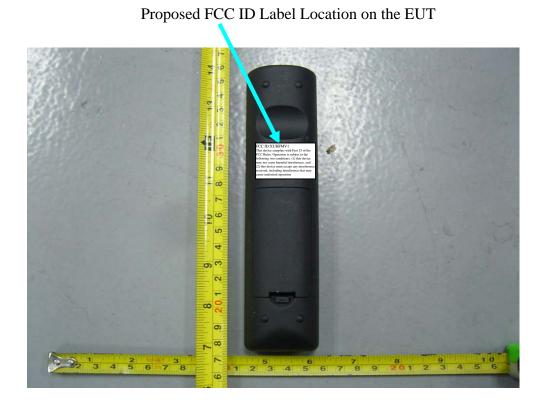
Photo 4 Back View of PCB





17 FCC ID Label

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:(1)this device may not cause harmful interference,and (2) this device must accept any interference received, including interference that may cause undesired operation.



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