

FCC TEST REPORT

For

OVAL DIGITAL INC.

OVAL SMART SENSOR SYSTEM

Model No.: OVAL GATEWAY, OVAL_v01

Prepared For : OVAL DIGITAL INC.

Address : 6 Peter Cooper Road #4F, New York, NY 10010, United States

Prepared By : Shenzhen Anbotek Compliance Laboratory Limited

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Report Number : R0217080054W

Date of Test : Aug. 18, 2017~Feb. 06, 2018

Date of Report : Feb. 06, 2018

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Anbotech

TEST REPORT

Applicant : OVAL DIGITAL INC.
Manufacturer : DAH SUN MANUFACTURING CO. LTD.
Product Name : OVAL SMART SENSOR SYSTEM
Model No. : OVAL GATEWAY, OVAL_v01
Trade Mark : OVAL
Rating(s) : DC 5V, 1000mAh (via adapter input: AC 100~240V, 50/60Hz, 0.2A; Output: 5V, 1A)

Test Standard(s) : FCC Part15 Subpart C 2017, Section 15.247

Test Method(s) : ANSI C63.10: 2013, KDB558074 D01 DTS Meas Guidance v04

The device described above is tested by Shenzhen Anbotek Compliance Laboratory Limited to determine the maximum emission levels emanating from the device and the severe levels of the device can endure and its performance criterion. The measurement results are contained in this test report and Shenzhen Anbotek Compliance Laboratory Limited is assumed full of responsibility for the accuracy and completeness of these measurements. Also, this report shows that the EUT (Equipment Under Test) is technically compliant with the FCC Part 15 Subpart C requirements.

This report applies to above tested sample only and shall not be reproduced in part without written approval of Shenzhen Anbotek Compliance Laboratory Limited.

Date of Test : Aug. 18, 2017~Feb. 06, 2018

Prepared by :



Winkey Wang

(Tested Engineer / Winkey Wang)

Reviewer :

Tangcy. T.

(Project Manager / Tangcy. T)

Approved & Authorized Signer :

Tom Chen

(Manager / Tom Chen)

1. General Information

1.1. Client Information

Applicant	:	OVAL DIGITAL INC.
Address	:	6 Peter Cooper Road #4F, New York, NY 10010, United States
Manufacturer	:	DAH SUN MANUFACTURING CO. LTD.
Address	:	Unit 2611, 26/F, 1 Hung To Road, No.1 Hung To Road, Kwun Tong, Kowloon, Hong Kong

1.2. Description of Device (EUT)

Product Name	:	OVAL SMART SENSOR SYSTEM	
Model No.	:	OVAL GATEWAY, OVAL_v01 (Note: All samples are the same except the model number and colour, so we prepare "OVAL GATEWAY" for test only.)	
Trade Mark	:	OVAL	
Test Power Supply	:	AC 120V, 60Hz for adapter / AC 240V, 60Hz for adapter	
Product Description	:	Operation Frequency:	2405MHz~2480MHz
		Number of Channel:	16 Channels
		Modulation Type:	GFSK
		Antenna Type:	PCB Antenna
		Antenna Gain(Peak):	3.3 dbi
Remark: 1)For a more detailed features description, please refer to the manufacturer’s specifications or the User’s Manual.			

1.3. Auxiliary Equipment Used During Test

Adapter	:	Model No.: FD06SU-050-1000 Input: AC 100-240V, 50/60Hz, 0.2A Output: DC 5V, 1.0A
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1.4. Description of Test Modes

To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.

Pretest Mode	Description
Mode 1	CH01
Mode 2	CH08
Mode 3	CH16
Mode 4	Keeping TX + Charging Mode

For Radiated Emission	
Final Test Mode	Description
Mode 1	CH01
Mode 2	CH08
Mode 3	CH16
Mode 4	Keeping TX + Charging Mode

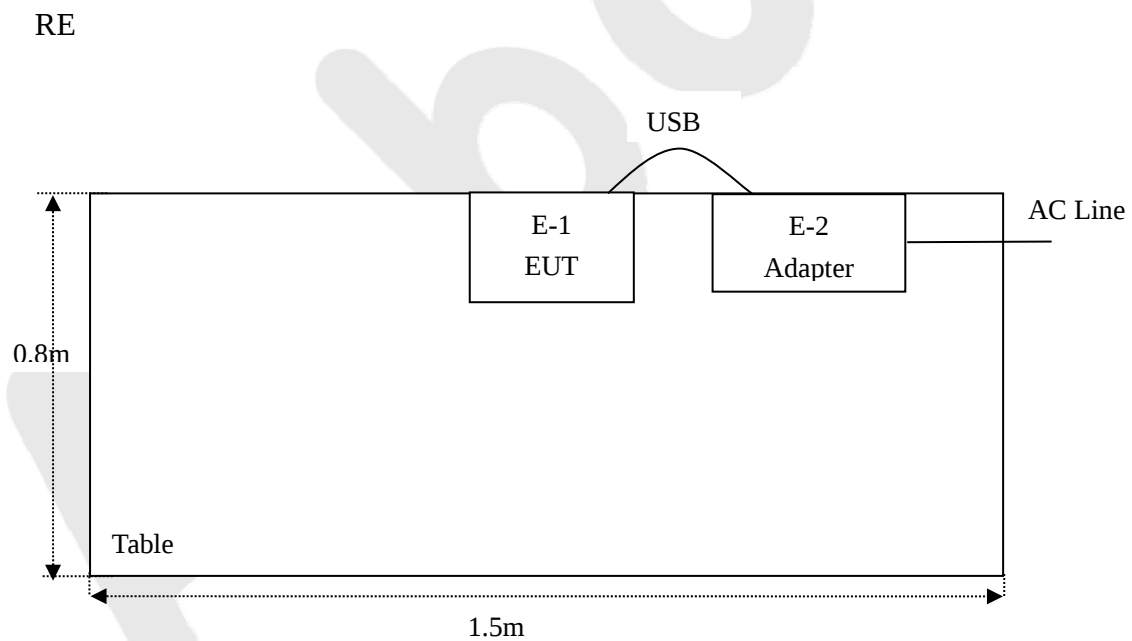
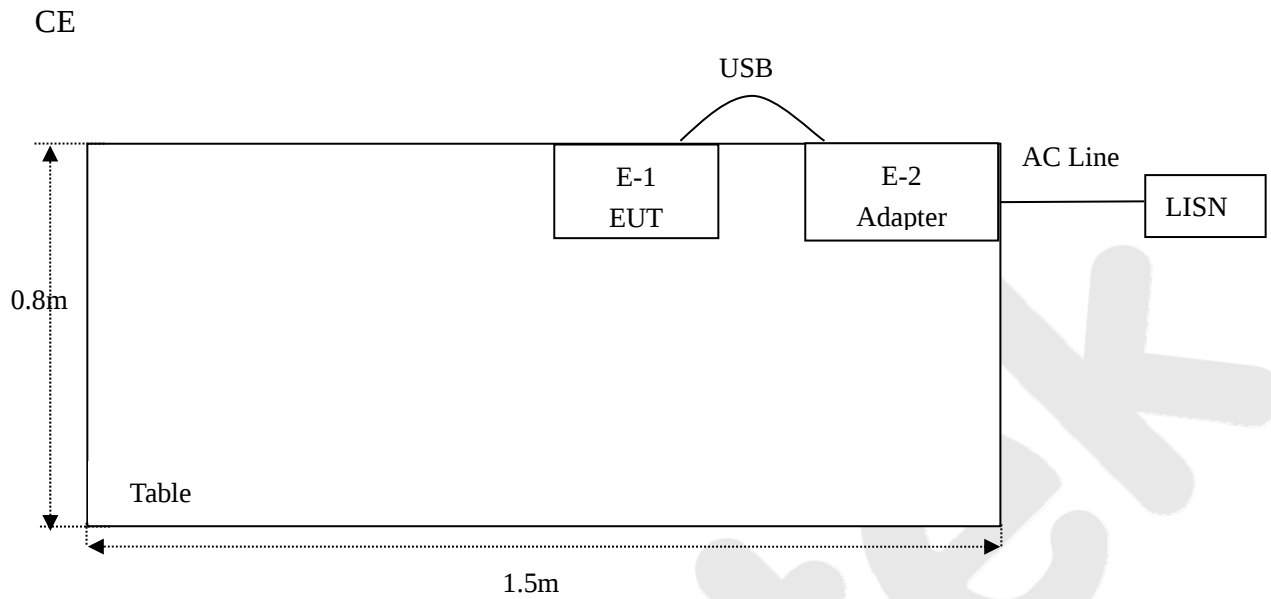
Note:

- (1) The measurements are performed at the highest, middle, lowest available channels.
- (2)The data rate was set in 1Mbps for radiated emission due to the highest RF output power.

1.5. List of channels

Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)
01	2405	05	2425	09	2445	13	2465
02	2410	06	2430	10	2450	14	2470
03	2415	07	2435	11	2455	15	2475
04	2420	08	2440	12	2460	16	2480

1.6. Description Of Test Setup



1.7. Test Equipment List

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	L.I.S.N. Artificial Mains Network	Rohde & Schwarz	ENV216	100055	Nov. 17, 2017	1 Year
2.	EMI Test Receiver	Rohde & Schwarz	ESCI	100627	Nov. 17, 2017	1 Year
3.	RF Switching Unit	Compliance Direction	RSU-M2	38303	Nov. 17, 2017	1 Year
4.	Spectrum Analysis	Agilent	E4407B	US39390582	Nov. 17, 2017	1 Year
5.	Spectrum Analysis	Agilent	N9038A	MY53227295	Nov. 17, 2017	1 Year
6.	Preamplifier	SKET Electronic	BK1G18G30 D	KD17503	Nov. 17, 2017	1 Year
7.	EMI Test Receiver	Rohde & Schwarz	ESPI	101604	Nov. 17, 2017	1 Year
8.	Double Ridged Horn Antenna	Instruments corporation	GTH-0118	351600	Nov. 20, 2017	1 Year
9.	Bilog Broadband Antenna	Schwarzbeck	VULB9163	VULB 9163-289	Nov. 20, 2017	1 Year
10.	Loop Antenna	Schwarzbeck	HFH2-Z2	100047	Nov. 17, 2017	1 Year
11.	Horn Antenna	Schwarzbeck	BBHA9170	9170-375	Nov. 17, 2017	1 Year
12.	Pre-amplifier	SONOMA	310N	186860	Nov. 17, 2017	1 Year
13.	EMI Test Software EZ-EMC	SHURPLE	N/A	N/A	N/A	N/A
14.	RF Test Control System	YIHENG	YH3000	2017430	Nov. 18, 2017	1 Year
15.	Power Sensor	DAER	RPR3006W	15I00041SN045	Nov. 17, 2017	1 Year
16.	Power Sensor	DAER	RPR3006W	15I00041SN046	Nov. 17, 2017	1 Year
17.	MXA Spectrum Analysis	Agilent	N9020A	MY51170037	Nov. 18, 2017	1 Year
18.	MXG RF Vector Signal Generator	Agilent	N5182A	MY48180656	Nov. 18, 2017	1 Year
19.	Signal Generator	Agilent	E4421B	MY41000743	Nov. 18, 2017	1 Year
20.	DC Power Supply	LW	TPR-6410D	349315	Nov. 01, 2017	1 Year
21.	Constant Temperature Humidity Chamber	Sertep	ZJ-HWHS80 B	ZJ-17042804	Nov. 01, 2017	1 Year

1.8. Measurement Uncertainty

Radiation Uncertainty	:	Ur = 4.1 dB (Horizontal)
		Ur = 4.3 dB (Vertical)
Conduction Uncertainty	:	Uc = 3.4dB

1.9. Description of Test Facility

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

FCC-Registration No.: 184111

Shenzhen Anbotek Compliance Laboratory Limited, 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 No. 184111, July 31, 2017.

ISED-Registration No.: 8058A-1

Shenzhen Anbotek Compliance Laboratory Limited, EMC Laboratory has been registered and fully described in a report filed with the (ISED) Innovation, Science and Economic Development Canada. The acceptance letter from the ISED is maintained in our files. Registration 8058A-1, June 13, 2016.

Test Location

All Emissions tests were performed at
Shenzhen Anbotek Compliance Laboratory Limited. at 1/F, Building D, Sogood Science and Technology Park,
Sanwei community, Hangcheng Street, Bao'an District, Shenzhen, Guangdong, China.518102

2. Summary of Test Results

Standard Section	Test Item	Result
15.203/15.247(c)	Antenna Requirement	PASS
15.207	Conducted Emission	PASS
15.205/15.209	Spurious Emission	PASS
15.247(b)(3)	Maximum Peak Output Power	PASS
15.247(a)(2)	6dB Occupied Bandwidth	PASS
15.247(e)	Power Spectral Density	PASS
15.247(d)	Band Edge	PASS
Remark: “N/A” is an abbreviation for Not Applicable.		

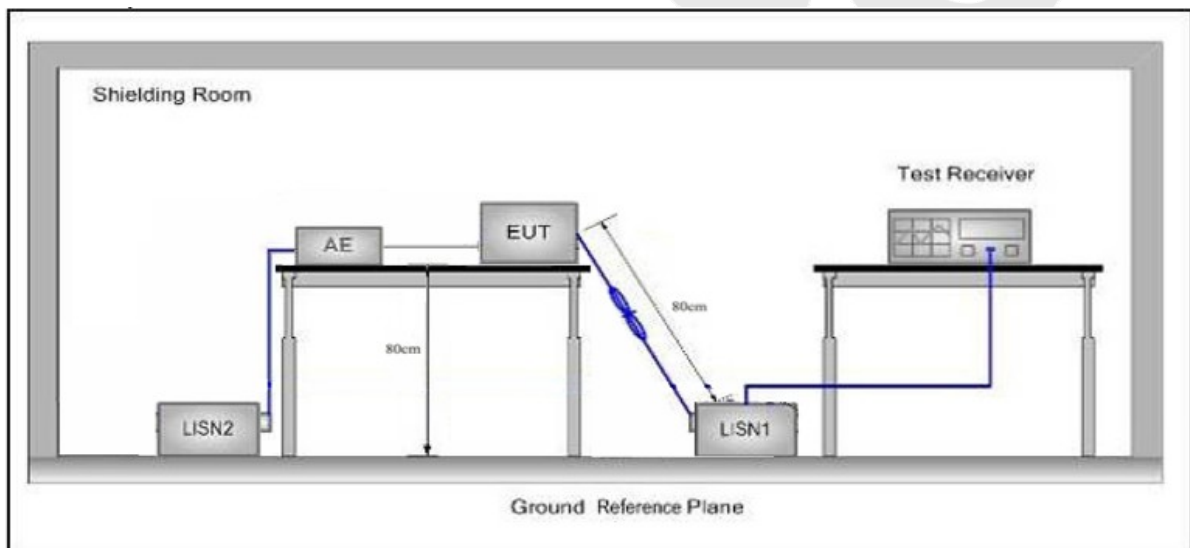
3. Conducted Emission Test

3.1. Test Standard and Limit

Test Standard	FCC Part15 Section 15.207		
Test Limit	Frequency	Maximum RF Line Voltage (dBuV)	
		Quasi-peak Level	Average Level
	150kHz~500kHz	66 ~ 56 *	56 ~ 46 *
	500kHz~5MHz	56	46
	5MHz~30MHz	60	50

Remark: (1) *Decreasing linearly with logarithm of the frequency.
(2) The lower limit shall apply at the transition frequency.

3.2. Test Setup



3.3. Test Procedure

The EUT system is connected to the power mains through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm coupling impedance for the EUT system. Please refer the block diagram of the test setup and photographs. Both sides of AC line are checked to find out the maximum conducted emission. In order to find the maximum emission levels, the relative positions of equipment and all of the interface cables shall be changed according to FCC ANSI C63.10-2013 on Conducted Emission Measurement.

The bandwidth of test receiver (ESCI) set at 9kHz.

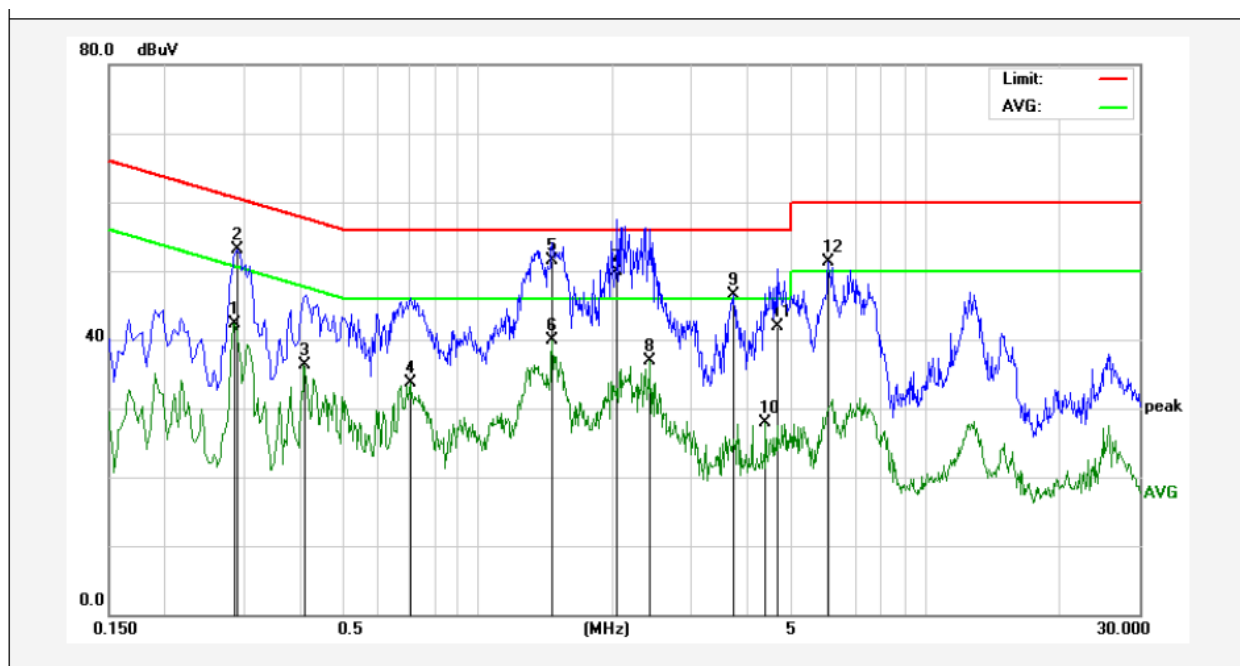
The frequency range from 150kHz to 30MHz is checked.

3.4. Test Data

Please to see the following pages.

Conducted Emission Test Data

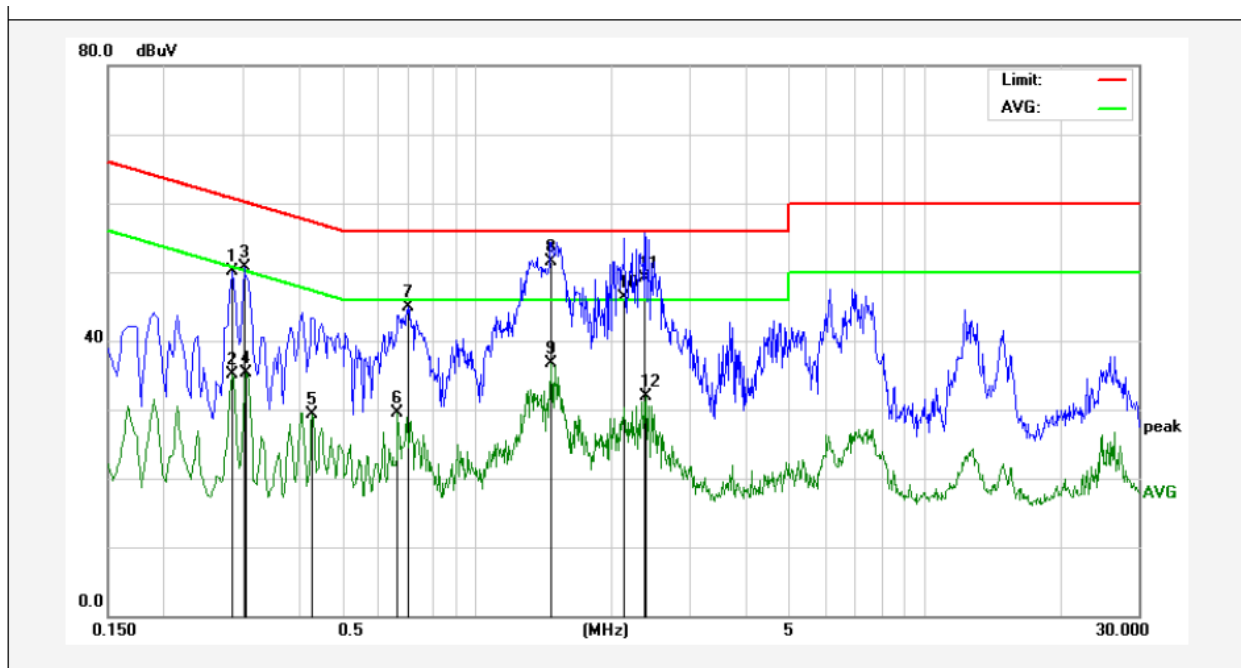
Test Site: 1# Shielded Room
Operating Condition: Keeping TX+ Charging Mode
Test Specification: AC 120V, 60Hz for adapter
Comment: Live Line
Tem.:25.4℃ Hum.:54%



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Over Limit (dB)	Detector	Remark
1	0.2860	22.45	19.89	42.34	50.64	-8.30	AVG	
2	0.2900	33.12	19.89	53.01	60.52	-7.51	QP	
3	0.4100	16.36	19.94	36.30	47.65	-11.35	AVG	
4	0.7060	13.70	20.04	33.74	46.00	-12.26	AVG	
5	1.4660	31.42	20.13	51.55	56.00	-4.45	QP	
6	1.4660	19.71	20.13	39.84	46.00	-6.16	AVG	
7	2.0540	29.74	20.14	49.88	56.00	-6.12	QP	
8	2.4340	16.84	20.15	36.99	46.00	-9.01	AVG	
9	3.7260	26.35	20.17	46.52	56.00	-9.48	QP	
10	4.4020	7.74	20.19	27.93	46.00	-18.07	AVG	
11	4.6500	21.78	20.20	41.98	56.00	-14.02	QP	
12	6.0700	30.99	20.24	51.23	60.00	-8.77	QP	

Conducted Emission Test Data

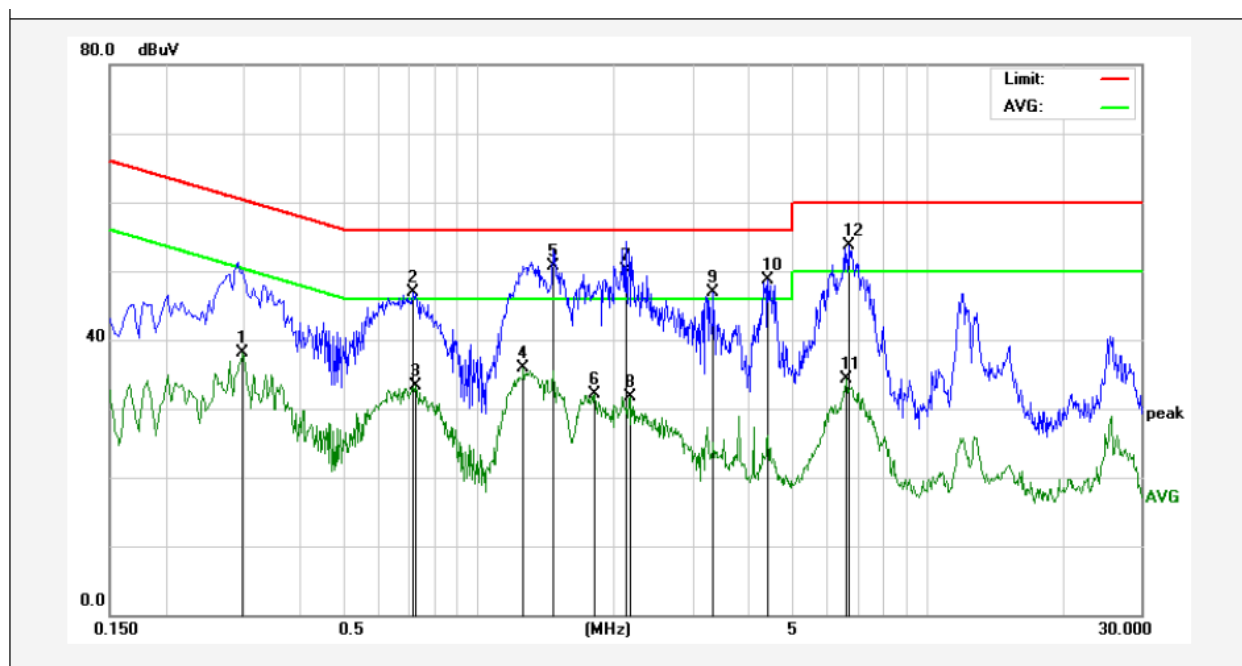
Test Site: 1# Shielded Room
Operating Condition: Keeping TX+ Charging Mode
Test Specification: AC 120V, 60Hz for adapter
Comment: Neutral Line
Tem.:25.4℃ Hum.:54%



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Over Limit (dB)	Detector	Remark
1	0.2860	30.17	19.89	50.06	60.64	-10.58	QP	
2	0.2860	15.30	19.89	35.19	50.64	-15.45	AVG	
3	0.3020	30.75	19.89	50.64	60.19	-9.55	QP	
4	0.3060	15.48	19.89	35.37	50.08	-14.71	AVG	
5	0.4300	9.39	19.95	29.34	47.25	-17.91	AVG	
6	0.6660	9.54	20.03	29.57	46.00	-16.43	AVG	
7	0.7019	24.91	20.04	44.95	56.00	-11.05	QP	
8	1.4660	31.40	20.13	51.53	56.00	-4.47	QP	
9	1.4660	16.53	20.13	36.66	46.00	-9.34	AVG	
10	2.1380	26.08	20.14	46.22	56.00	-9.78	QP	
11	2.3780	28.99	20.15	49.14	56.00	-6.86	QP	
12	2.3940	11.72	20.15	31.87	46.00	-14.13	AVG	

Conducted Emission Test Data

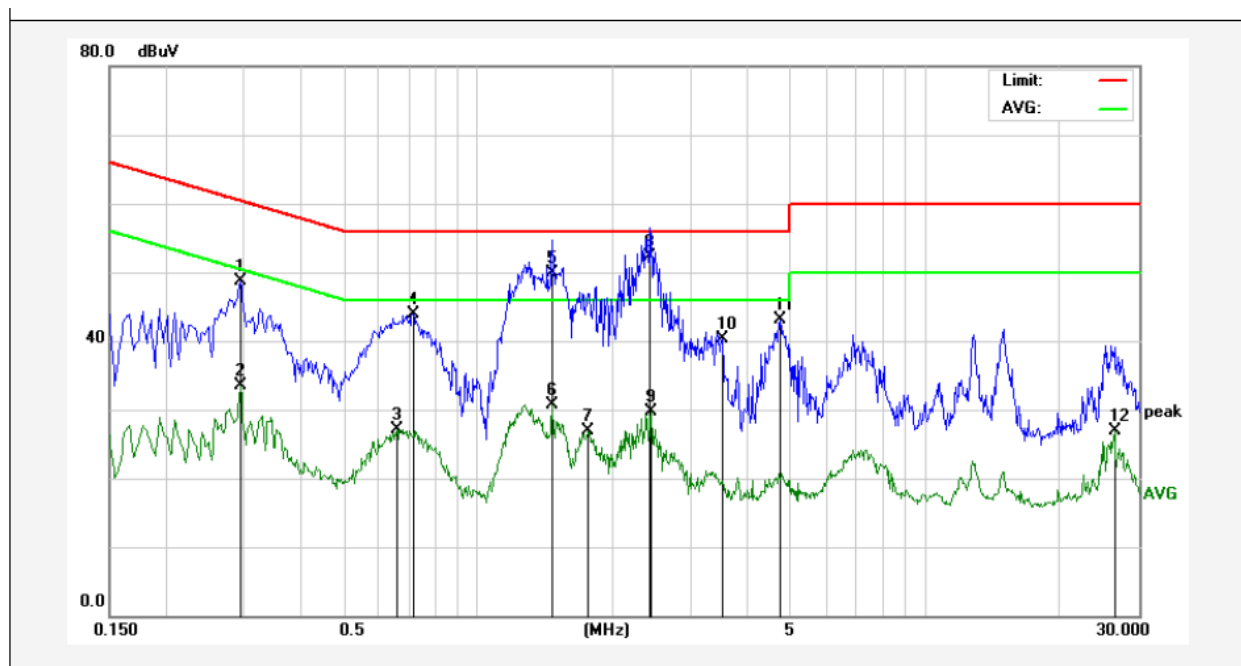
Test Site: 1# Shielded Room
Operating Condition: Keeping TX+ Charging Mode
Test Specification: AC 240V, 60Hz for adapter
Comment: Live Line
Tem.:25.4℃ Hum.:54%



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Over Limit (dB)	Detector	Remark
1	0.2980	18.24	19.89	38.13	50.30	-12.17	AVG	
2	0.7140	26.87	20.04	46.91	56.00	-9.09	QP	
3	0.7220	13.17	20.05	33.22	46.00	-12.78	AVG	
4	1.2620	15.84	20.13	35.97	46.00	-10.03	AVG	
5	1.4660	30.54	20.13	50.67	56.00	-5.33	QP	
6	1.8100	11.98	20.14	32.12	46.00	-13.88	AVG	
7	2.1300	29.87	20.14	50.01	56.00	-5.99	QP	
8	2.1700	11.56	20.14	31.70	46.00	-14.30	AVG	
9	3.3340	26.80	20.17	46.97	56.00	-9.03	QP	
10	4.4140	28.61	20.19	48.80	56.00	-7.20	QP	
11	6.6100	13.96	20.25	34.21	50.00	-15.79	AVG	
12	6.6740	33.51	20.25	53.76	60.00	-6.24	QP	

Conducted Emission Test Data

Test Site: 1# Shielded Room
Operating Condition: Keeping TX+ Charging Mode
Test Specification: AC 240V, 60Hz for adapter
Comment: Neutral Line
Tem.:25.4℃ Hum.:54%



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit (dBuV)	Over Limit (dB)	Detector	Remark
1	0.2940	28.83	19.89	48.72	60.41	-11.69	QP	
2	0.2940	13.68	19.89	33.57	50.41	-16.84	AVG	
3	0.6580	7.13	20.03	27.16	46.00	-18.84	AVG	
4	0.7180	23.88	20.04	43.92	56.00	-12.08	QP	
5	1.4700	29.72	20.13	49.85	56.00	-6.15	QP	
6	1.4700	10.64	20.13	30.77	46.00	-15.23	AVG	
7	1.7700	6.75	20.14	26.89	46.00	-19.11	AVG	
8	2.4340	32.08	20.15	52.23	56.00	-3.77	QP	
9	2.4380	9.54	20.15	29.69	46.00	-16.31	AVG	
10	3.5180	20.12	20.17	40.29	56.00	-15.71	QP	
11	4.7340	22.84	20.20	43.04	56.00	-12.96	QP	
12	26.5540	6.61	20.28	26.89	50.00	-23.11	AVG	

4. Radiation Spurious Emission and Band Edge

4.1. Test Standard and Limit

Test Standard	FCC Part15 C Section 15.209 and 15.205				
Test Limit	Frequency (MHz)	Field strength (microvolt/meter)	Limit (dBuV/m)	Remark	Measurement distance (m)
	0.009MHz~0.490MHz	2400/F(kHz)	-	-	300
	0.490MHz-1.705MHz	24000/F(kHz)	-	-	30
	1.705MHz-30MHz	30	-	-	30
	30MHz~88MHz	100	40.0	Quasi-peak	3
	88MHz~216MHz	150	43.5	Quasi-peak	3
	216MHz~960MHz	200	46.0	Quasi-peak	3
	960MHz~1000MHz	500	54.0	Quasi-peak	3
	Above 1000MHz	500	54.0	Average	3
		-	74.0	Peak	3

Remark:

(1)The lower limit shall apply at the transition frequency.

(2) 15.35(b), Unless otherwise specified, the limit on peak radio frequency emissions is 20dB above the maximum permitted average emission limit applicable to the equipment under test. This peak limit applies to the total peak emission level radiated by the device.

4.2. Test Setup

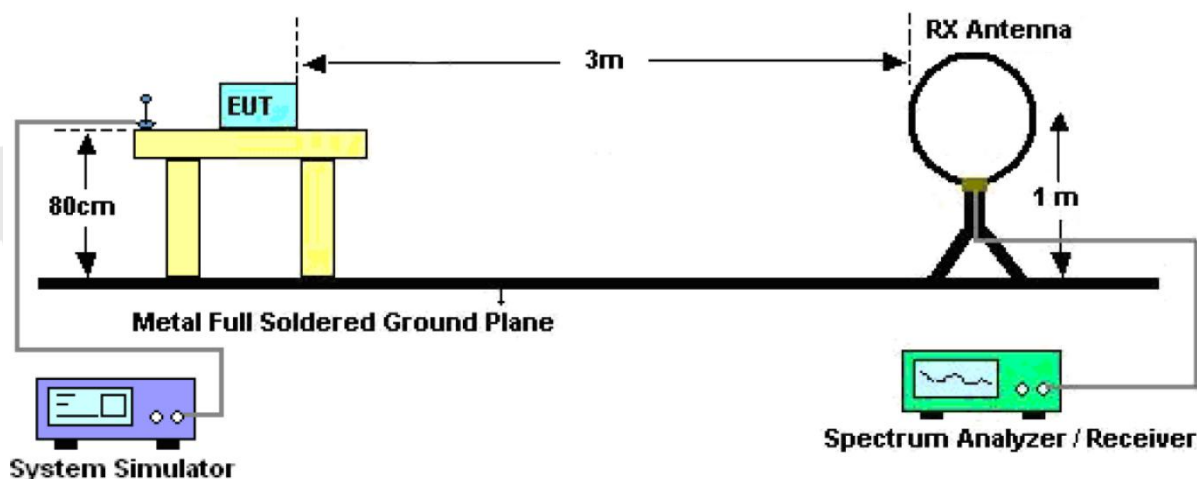


Figure 1. Below 30MHz

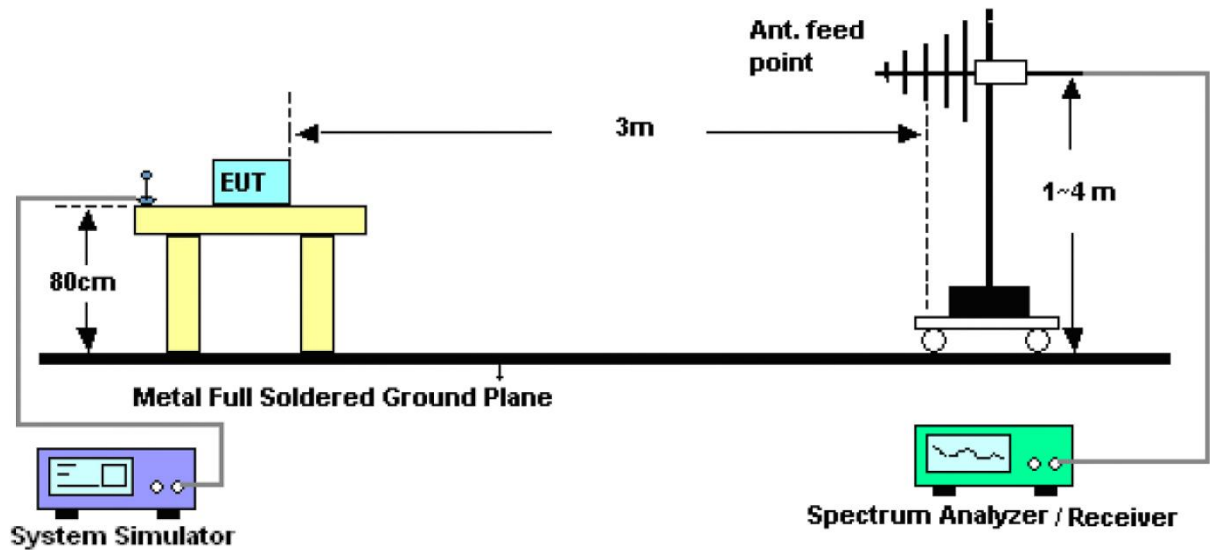


Figure 2. 30MHz to 1GHz

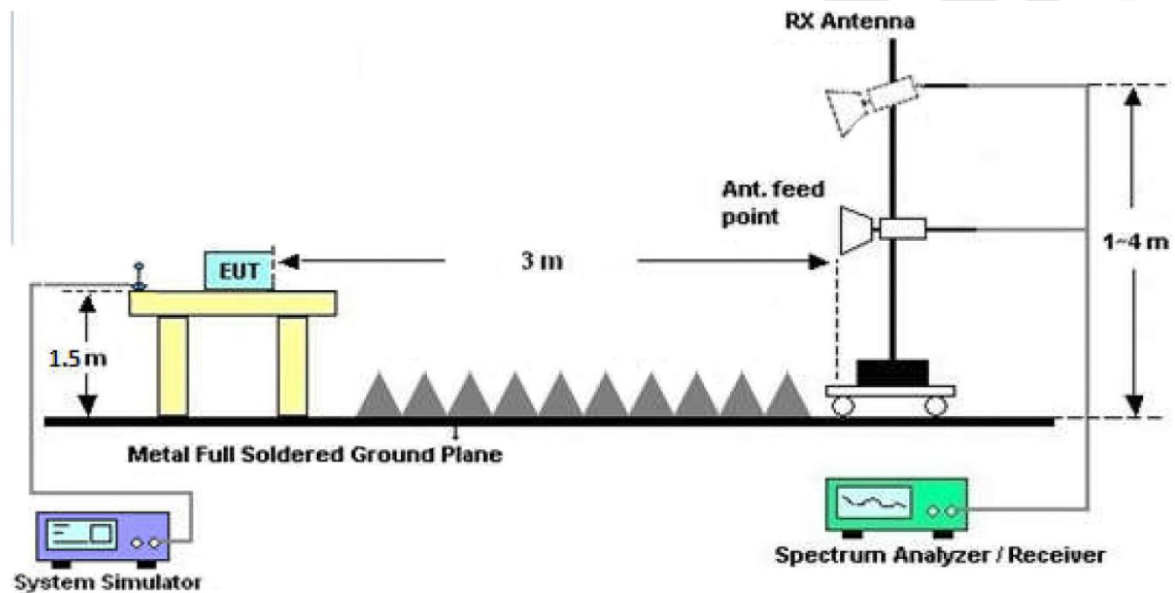


Figure 3. Above 1 GHz

4.3. Test Procedure

For below 1GHz: The EUT is placed on a turntable, which is 0.8m above the ground plane.

For above 1GHz: The EUT is placed on a turntable, which is 1.5m above the ground plane.

The turn table can rotate 360 degrees to determine the position of the maximum emission level. The EUT is set 3 meters away from the receiving antenna which is mounted on a antenna tower. The antenna can be moved up and down from 1 to 4 meters to find out the maximum emission level. Rotated the EUT through three orthogonal axes to determine the maximum emissions, both horizontal and vertical polarization of the antenna are set on test. The EUT is tested in 9*6*6 Chamber. The device is evaluated in xyz orientation.

For 9kHz to 150kHz, Set the spectrum analyzer as:

RBW = 200Hz, VBW = 1kHz, Detector= Quasi-Peak, Trace mode= Max hold, Sweep- auto couple.

For 9kHz to 150kHz, Set the spectrum analyzer as:

RBW = 200Hz, VBW = 1kHz, Detector = Quasi-Peak, Trace mode = Max hold, Sweep - auto couple.

For 150kHz to 30MHz, Set the spectrum analyzer as:

RBW = 9KHz, VBW = 30kHz, Detector = Quasi-Peak, Trace mode = Max hold, Sweep - auto couple.

For 30MHz to 1000MHz, Set the spectrum analyzer as:

RBW = 100kHz, VBW = 300kHz, Detector = Quasi-Peak, Trace mode = Max hold, Sweep - auto couple.

For above 1GHz, Set the spectrum analyzer as:

RBW = 1MHz, VBW = 1MHz, Detector = Peak, Trace mode = Max hold, Sweep - auto couple.

RBW = 1MHz, VBW = 10Hz, Detector = Average, Trace mode = Max hold, Sweep - auto couple.

4.4. Test Data

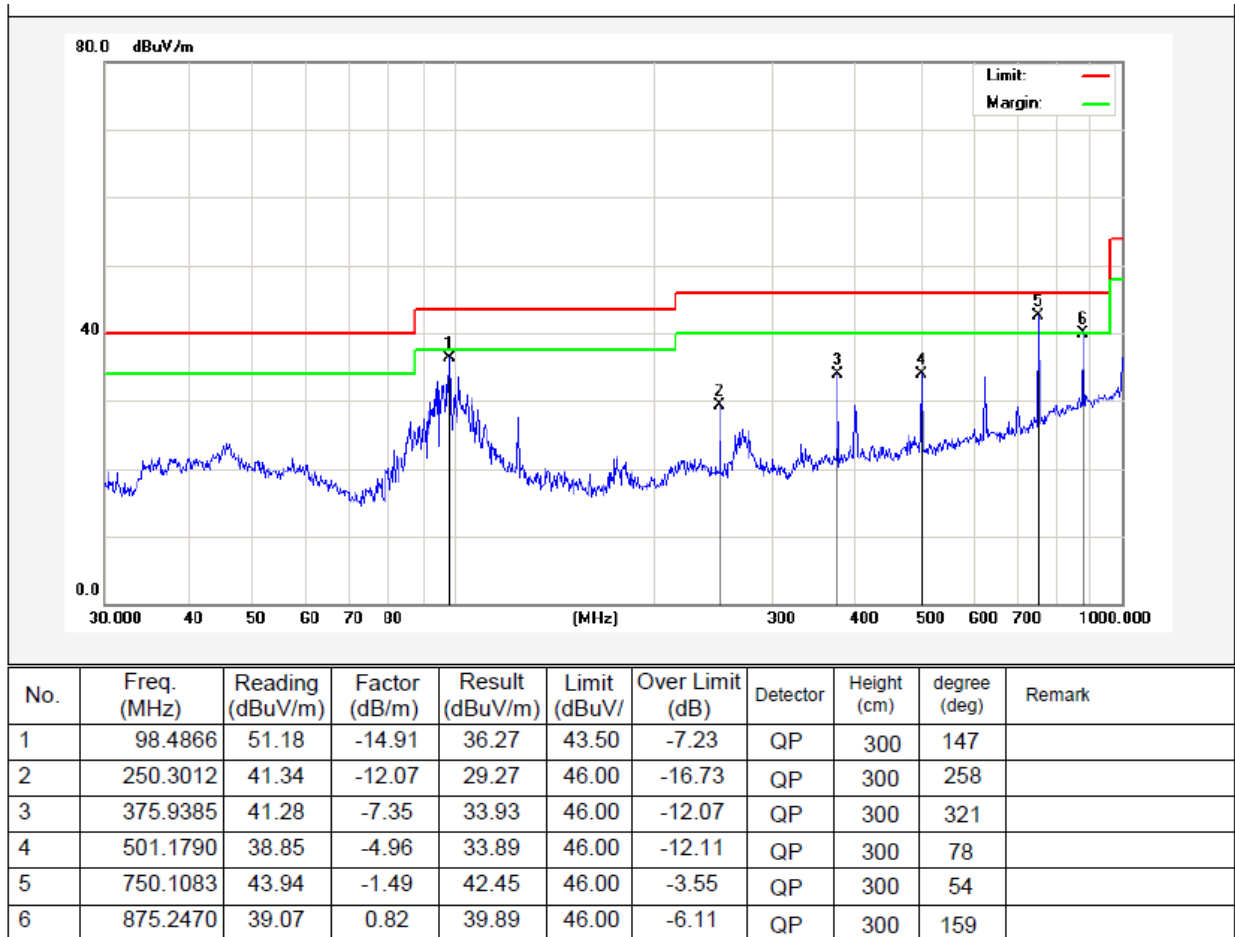
PASS

During the test, Pre-scan all kind of the place mode (X-axis, Y-axis, Z-axis), and found the X-axis is the worst case.

The test results of 9kHz-30MHz was attenuated more than 20dB below the permissible limits, so the results don't record in the report.

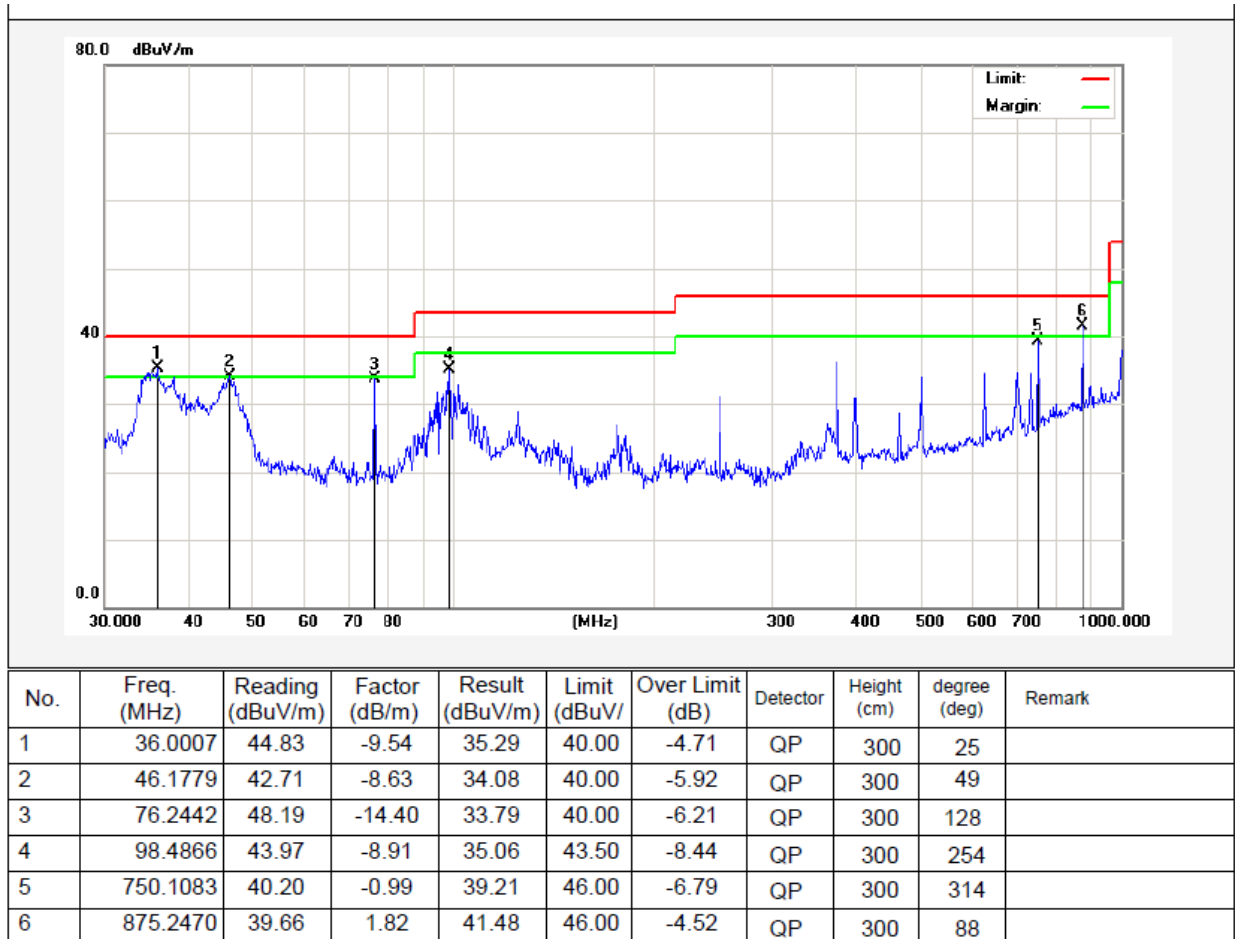
Test Results (30~1000MHz)

Job No.: 0217080054W Temp.(°C)/Hum.(%RH): 24.3°C/55%RH
Standard: FCC PART 15C Power Source: AC 120V, 60Hz for adapter
Test Mode: Keeping TX+ Charging Mode Polarization: Horizontal



Test Results (30~1000MHz)

Job No.: 0217080054W Temp.(°C)/Hum.(%RH): 24.3°C/55%RH
Standard: FCC PART 15C Power Source: AC 120V, 60Hz for adapter
Test Mode: Keeping TX+ Charging Mode Polarization: Vertical



Test Results (Above 1000MHz)

Test Mode: CH01					Test channel: Lowest			
Peak Value								
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Pol.
4810.00	38.73	34.04	6.58	34.09	45.26	74.00	-28.74	V
7215.00	32.77	37.11	7.73	34.50	43.11	74.00	-30.89	V
9620.00	32.31	39.31	9.23	34.79	46.06	74.00	-27.94	V
12025.00	*					74.00		V
14430.00	*					74.00		V
4810.00	43.30	34.04	6.58	34.09	49.83	74.00	-24.17	H
7215.00	34.66	37.11	7.73	34.50	45.00	74.00	-29.00	H
9620.00	31.87	39.31	9.23	34.79	45.62	74.00	-28.38	H
12025.00	*					74.00		H
14430.00	*					74.00		H
Average Value								
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Pol.
4810.00	27.27	34.04	6.58	34.09	33.80	54.00	-20.20	V
7215.00	21.30	37.11	7.73	34.50	31.64	54.00	-22.36	V
9620.00	20.29	39.31	9.23	34.79	34.04	54.00	-19.96	V
12025.00	*					54.00		V
14430.00	*					54.00		V
4810.00	31.66	34.04	6.58	34.09	38.19	54.00	-15.81	H
7215.00	23.57	37.11	7.73	34.50	33.91	54.00	-20.09	H
9620.00	20.13	39.31	9.23	34.79	33.88	54.00	-20.12	H
12025.00	*					54.00		H
14430.00	*					54.00		H

Test Results (Above 1000MHz)

Test Mode: TX Mode					Test channel: Middle			
Peak Value								
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Pol.
4880.00	37.20	34.38	6.69	34.09	44.18	74.00	-29.82	V
7320.00	31.76	37.22	7.78	34.53	42.23	74.00	-31.77	V
9760.00	31.40	39.46	9.35	34.80	45.41	74.00	-28.59	V
12200.00	*					74.00		V
14640.00	*					74.00		V
4880.00	41.46	34.38	6.69	34.09	48.44	74.00	-25.56	H
7320.00	33.50	37.22	7.78	34.53	43.97	74.00	-30.03	H
9760.00	30.82	39.46	9.35	34.80	44.83	74.00	-29.17	H
12200.00	*					74.00		H
14640.00	*					74.00		H
Average Value								
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Pol.
4880.00	26.04	34.38	6.69	34.09	33.02	54.00	-20.98	V
7320.00	20.46	37.22	7.78	34.53	30.93	54.00	-23.07	V
9760.00	19.55	39.46	9.35	34.80	33.56	54.00	-20.44	V
12200.00	*					54.00		V
14640.00	*					54.00		V
4880.00	30.26	34.38	6.69	34.09	37.24	54.00	-16.76	H
7320.00	22.63	37.22	7.78	34.53	33.10	54.00	-20.90	H
9760.00	19.27	39.46	9.35	34.80	33.28	54.00	-20.72	H
12200.00	*					54.00		H
14640.00	*					54.00		H

Test Results (Above 1000MHz)

Test Mode: TX Mode					Test channel: Highest			
Peak Value								
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Pol.
4960.00	36.55	34.72	6.79	34.09	43.97	74.00	-30.03	V
7440.00	31.33	37.34	7.82	34.57	41.92	74.00	-32.08	V
9920.00	31.02	39.62	9.46	34.81	45.29	74.00	-28.71	V
12400.00	*					74.00		V
14880.00	*					74.00		V
4960.00	40.68	34.72	6.79	34.09	48.10	74.00	-25.90	H
7440.00	33.02	37.34	7.82	34.57	43.61	74.00	-30.39	H
9920.00	30.37	39.62	9.46	34.81	44.64	74.00	-29.36	H
12400.00	*					74.00		H
14880.00	*					74.00		H
Average Value								
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Pol.
4960.00	25.57	34.72	6.79	34.09	32.99	54.00	-21.01	V
7440.00	20.15	37.34	7.82	34.57	30.74	54.00	-23.26	V
9920.00	19.26	39.62	9.46	34.81	33.53	54.00	-20.47	V
12400.00	*					54.00		V
14880.00	*					54.00		V
4960.00	29.72	34.72	6.79	34.09	37.14	54.00	-16.86	H
7440.00	22.27	37.34	7.82	34.57	32.86	54.00	-21.14	H
9920.00	18.94	39.62	9.46	34.81	33.21	54.00	-20.79	H
12400.00	*					54.00		H
14880.00	*					54.00		H

Remark:

1. Level =Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor
2. “*”, means this data is the too weak instrument of signal is unable to test.

Radiated Band Edge:

Test Mode: GFSK					Test channel: Lowest			
Peak Value								
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Pol.
2390.00	56.32	29.15	3.41	34.01	54.87	74.00	-19.13	H
2400.00	60.10	29.16	3.43	34.01	58.68	74.00	-15.32	H
2390.00	53.20	29.15	3.41	34.01	51.75	74.00	-22.25	V
2400.00	63.12	29.16	3.43	34.01	61.70	74.00	-12.30	V
Average Value								
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Pol.
2390.00	42.33	29.15	3.41	34.01	40.88	54.00	-13.12	H
2400.00	46.01	29.16	3.43	34.01	44.59	54.00	-9.41	H
2390.00	42.01	29.15	3.41	34.01	40.56	54.00	-13.44	V
2400.00	47.32	29.16	3.43	34.01	45.90	54.00	-8.10	V

Test Mode: GFSK					Test channel: Highest			
Peak Value								
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Pol.
2483.50	53.21	29.28	3.53	34.03	51.99	74.00	-22.01	H
2500.00	46.20	29.30	3.56	34.03	45.03	74.00	-28.97	H
2483.50	51.32	29.28	3.53	34.03	50.10	74.00	-23.90	V
2500.00	47.21	29.30	3.56	34.03	46.04	74.00	-27.96	V
Average Value								
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Pol.
2483.50	41.20	29.28	3.53	34.03	39.98	54.00	-14.02	H
2500.00	35.26	29.30	3.56	34.03	34.09	54.00	-19.91	H
2483.50	43.21	29.28	3.53	34.03	41.99	54.00	-12.01	V
2500.00	35.21	29.30	3.56	34.03	34.04	54.00	-19.96	V

Remark:

1. Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor

5. Output Power Test

5.1. Test Standard and Limit

Test Standard	FCC Part15 C Section 15.247 (b)(3)
Test Limit	30dBm

5.2. Test Setup



5.3. Test Procedure

1. The Transmitter output (antenna port) was connected to the power meter.
2. Turn on the EUT and power meter and then record the power value.
3. Repeat above procedures on all channels needed to be tested.

Note: The cable loss and attenuator loss were offset into measure device as an amplitude offset.

5.4. Test Data

Test Item	: output power	Test Mode	: CH Low ~ CH High
Test Voltage	: AC 120V, 60Hz for adapter	Temperature	: 24°C
Test Result	: PASS	Humidity	: 55%RH

Channel Frequency (MHz)	Maximum Power output(AV) (dBm)	Limit (dBm)	Results
2405	0.813	30	PASS
2440	0.563	30	PASS
2480	0.382	30	PASS

For power test the duty cycle is 100% in continuous transmitting mode

6. Duty cycle

a. Test Procedure

The zero-span mode on a spectrum analyzer or EMI receiver if the response time and spacing between bins on the sweep are sufficient to permit accurate measurements of the on and off times of the transmitted signal.

Set the center frequency of the instrument to the center frequency of the transmission.

Set $RBW \geq OBW$ if possible; otherwise, set RBW to the largest available value.

Set $VBW \geq RBW$. Set detector = peak or average. The zero-span measurement method shall not be used unless both RBW and VBW are $> 50/T$ and the number of sweep points across duration T exceeds 100. (For example, if VBW and/or RBW are limited to 3 MHz, then the zero-span method of measuring duty cycle shall not be used if $T \leq 16.7$ microseconds.)

The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator.

The path loss was compensated to the results for each measurement.

Set to the maximum power setting and enable the EUT transmit continuously.

The EUT was operating in controlled its channel.

Use the following spectrum analyzer settings:

Span = Zero Span

RBW = 8MHz

VBW = 8MHz

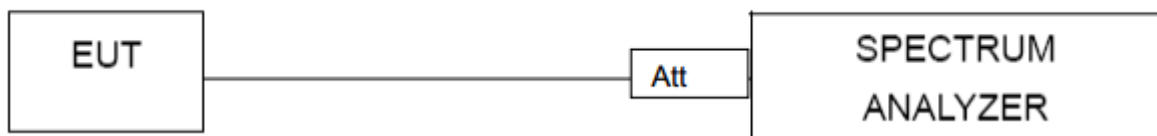
Number of points in Sweep > 100

Detector function = peak

Trace = Clear write Measure Ttotal and Ton

Calculate Duty Cycle = $Ton / Ttotal$ and Duty Cycle Factor = $10 \cdot \log(1/Duty\ Cycle)$

b. TEST SETUP



Test plot of Duty Cycle for Middle Channel

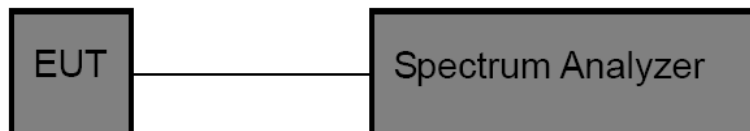


7. 6DB Occupy Bandwidth Test

7.1. Test Standard and Limit

Test Standard	FCC Part15 C Section 15.247 (a)(2)
Test Limit	>500kHz

7.2. Test Setup



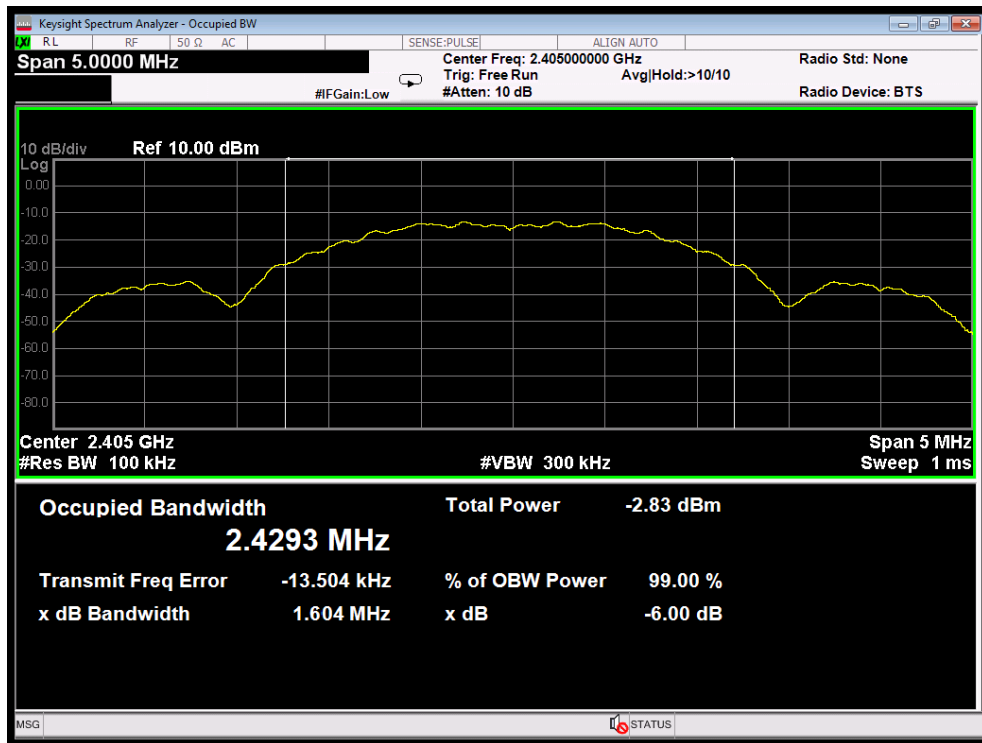
7.3. Test Procedure

1. Place the EUT on the table and set it in the transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set the spectrum analyzer as:
RBW = 100kHz, VBW $\geq$ 3*RBW = 300kHz,
Detector= Peak
Trace mode= Max hold.
Sweep- auto couple.
4. Mark the peak frequency and -6dB (upper and lower) frequency.
5. Repeat until all the rest channels are investigated.

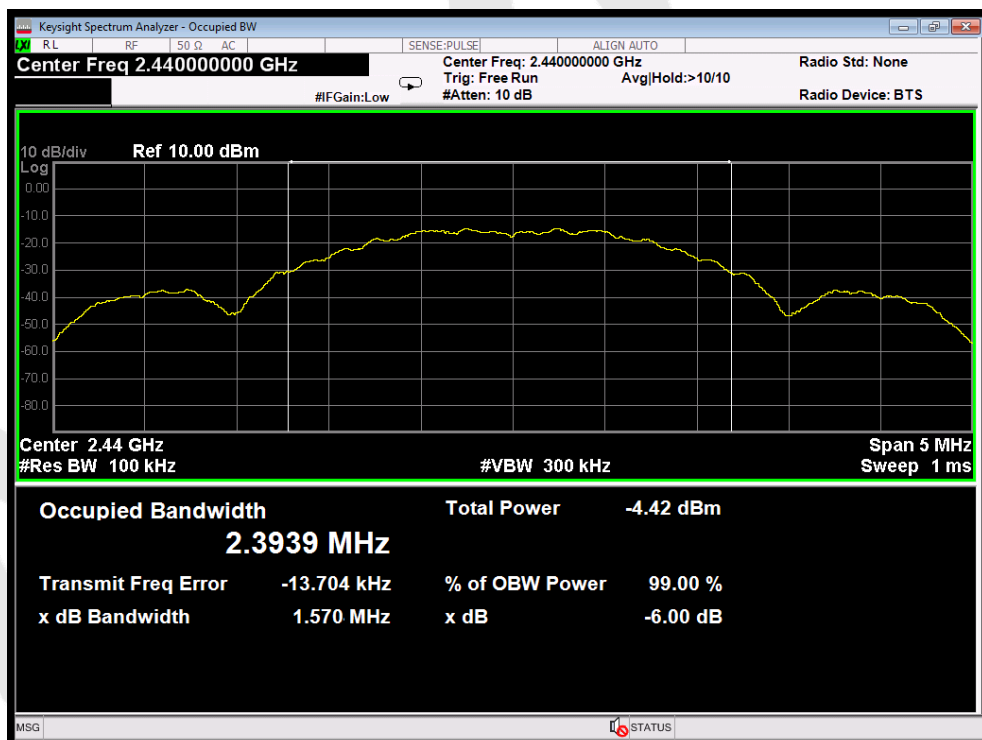
7.4. Test Data

Test Item	: 6dB Bandwidth	Test Mode	: CH Low ~ CH High
Test Voltage	: AC 120V, 60Hz for adapter	Temperature	: 24°C
Test Result	: PASS	Humidity	: 55%RH

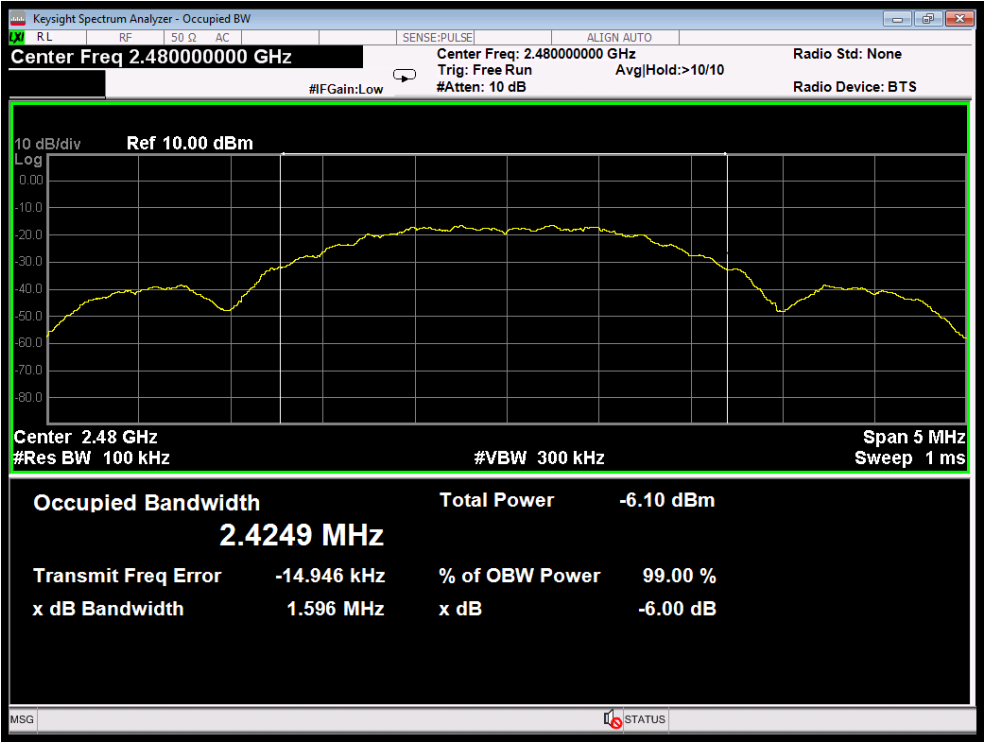
Channel	Frequency(MHz)	Bandwidth (kHz)	Limit (kHz)	Results
Low	2405	1604	>500	PASS
Middle	2440	1570		PASS
High	2480	1596		PASS



CH: Low



CH: Middle



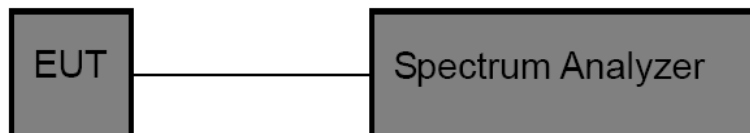
CH: High

8. Power Spectral Density Test

8.1. Test Standard and Limit

Test Standard	FCC Part15 C Section 15.247 (e)
Test Limit	8dBm

8.2. Test Setup



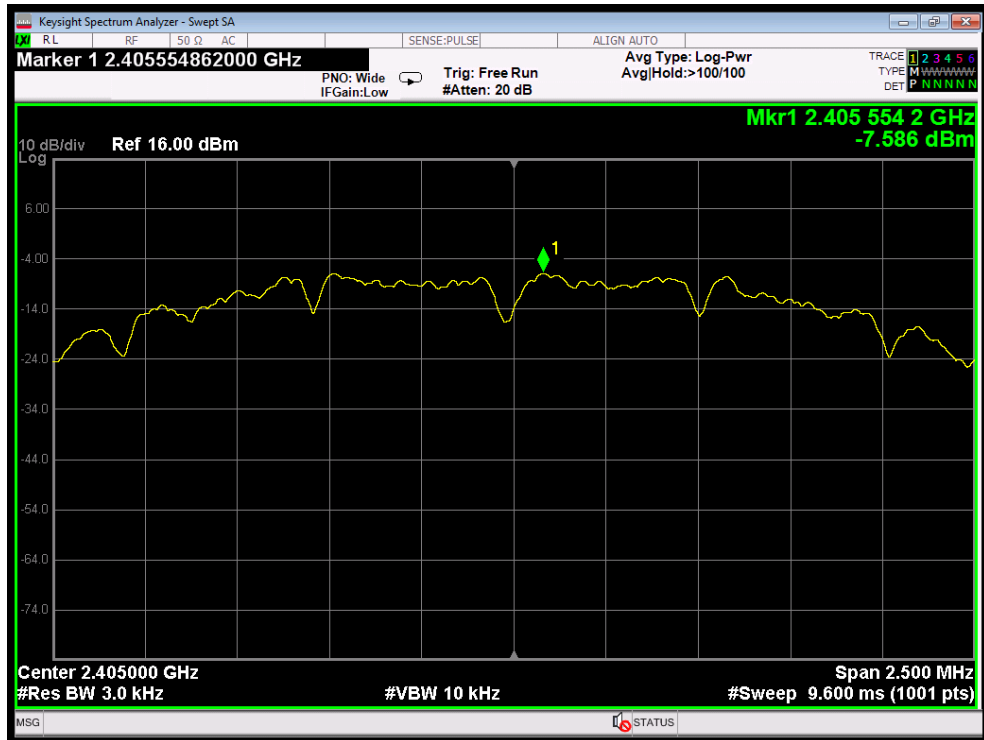
8.3. Test Procedure

1. Place the EUT on the table and set it in transmitting mode. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
2. Set the spectrum analyzer as RBW = 3kHz, VBW = 10kHz, Span = 1.5xDTS BW
3. Record the max. reading.
4. Repeat the above procedure until the measurements for all frequencies are completed.

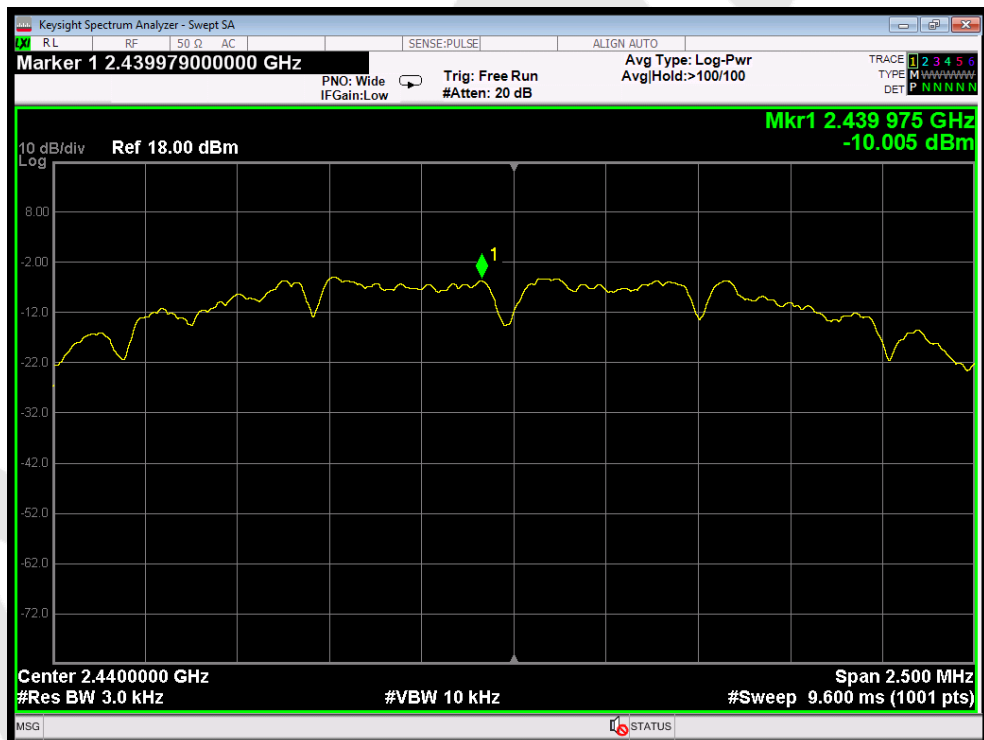
8.4. Test Data

Test Item	: Power Spectral Density	Test Mode	: CH Low ~ CH High
Test Voltage	: AC 120V, 60Hz for adapter	Temperature	: 24°C
Test Result	: PASS	Humidity	: 55%RH

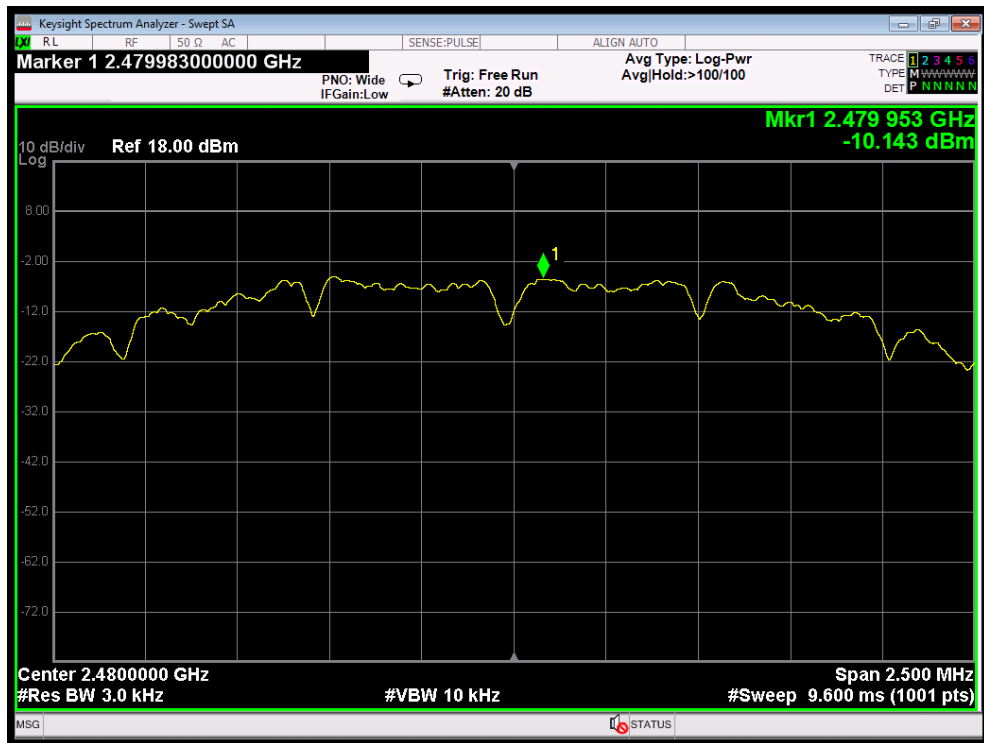
Channel	Frequency (MHz)	PSD (dBm/3KHz)	Limit (dBm/3KHz)	Results
Low	2405	-7.586	8.00	PASS
Middle	2440	-10.005	8.00	PASS
High	2480	-10.143	8.00	PASS



CH: Low



CH: Middle



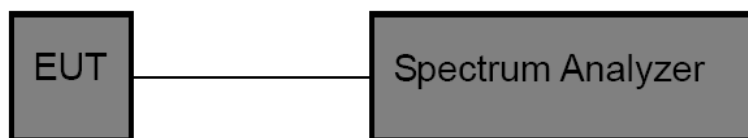
CH: High

9. 100kHz Bandwidth of Frequency Band Edge Requirement

9.1. Test Standard and Limit

Test Standard	FCC Part15 C Section 15.247 (d)
Test Limit	in any 100 kHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator in operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in15.209(a).

9.2. Test Setup



9.3. Test Procedure

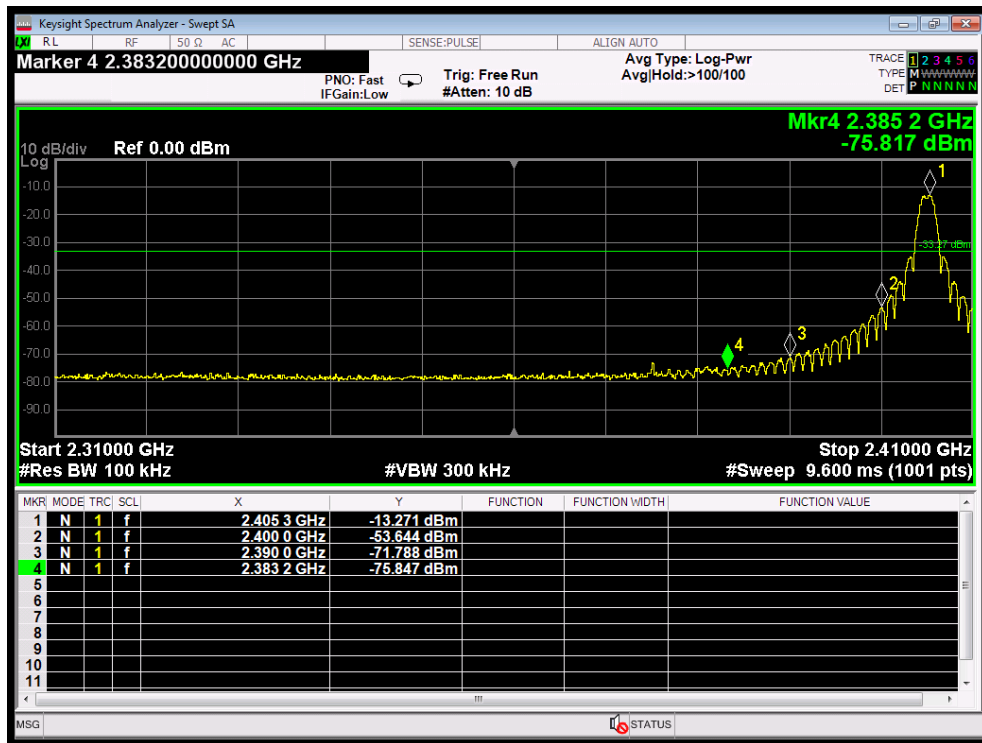
Using the following spectrum analyzer setting:

1. Set the RBW = 100KHz.
2. Set the VBW = 300KHz.
3. Sweep time = auto couple.
4. Detector function = peak.
5. Trace mode = max hold.
6. Allow trace to fully stabilize.

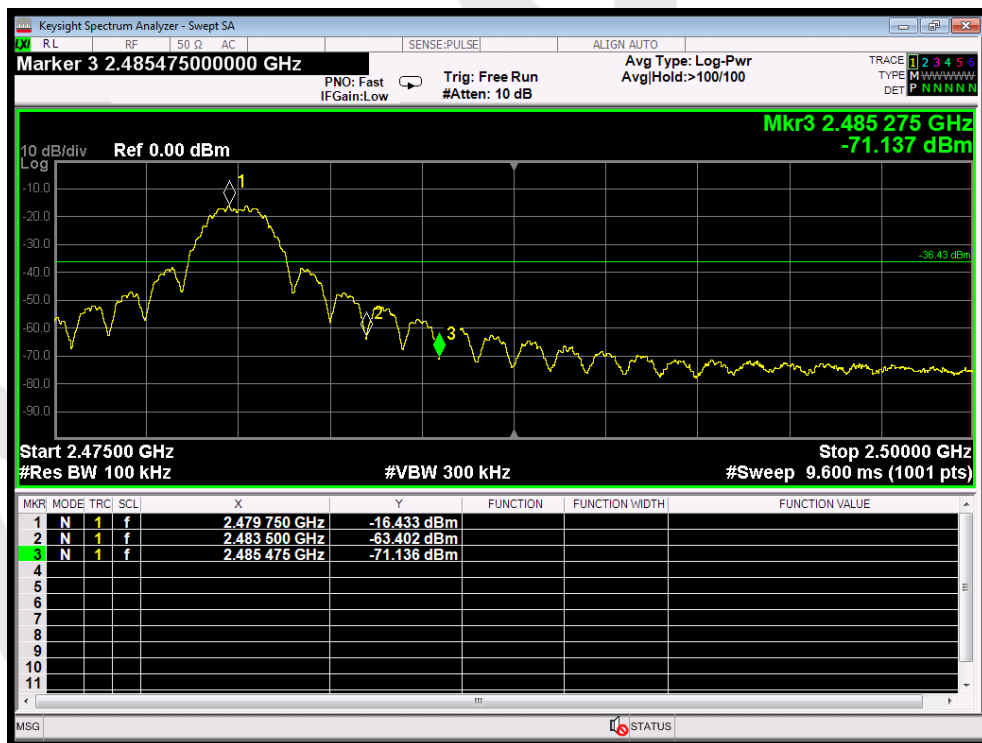
9.4. Test Data

Test Item	: Band edge	Test Mode	: CH Low ~ CH High
Test Voltage	: AC 120V, 60Hz for adapter	Temperature	: 24°C
Test Result	: PASS	Humidity	: 55%RH

Frequency Band (MHz)	Delta Peak to Band Emission (dBc)	Limit (dBc)	Results
2405	40.373	>30	PASS
2480	46.969	>30	PASS

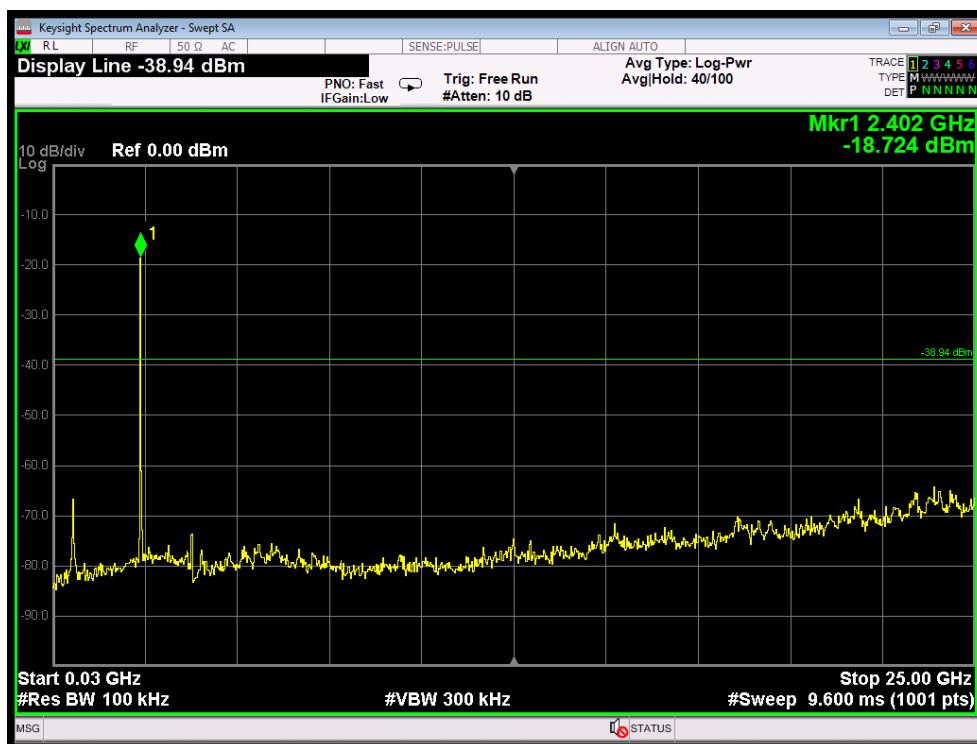


CH: Low

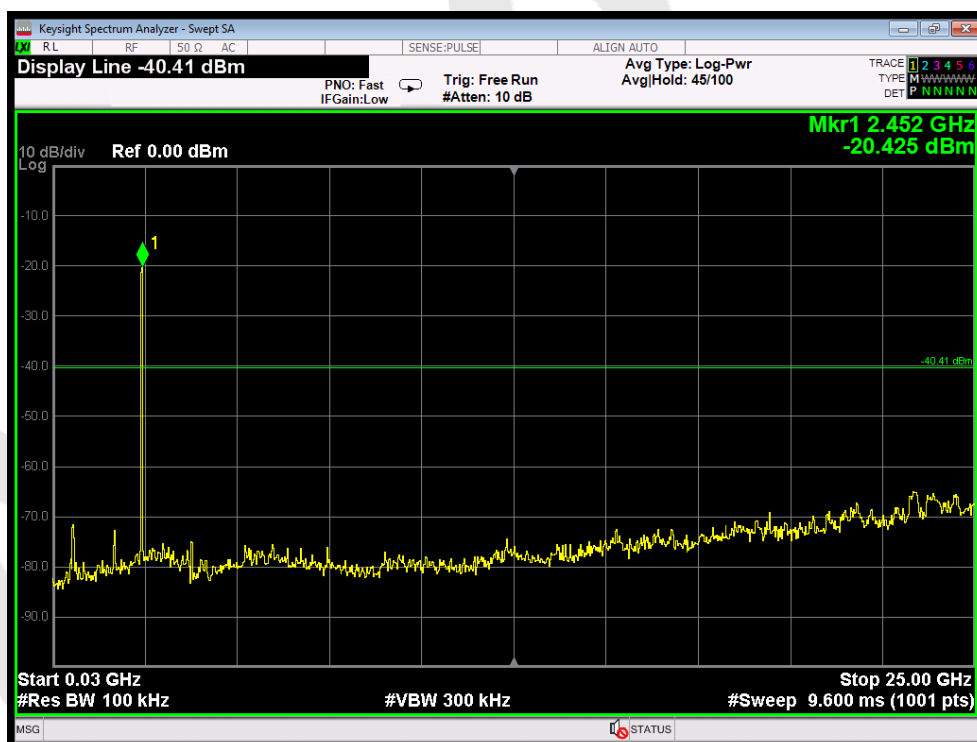


CH: High

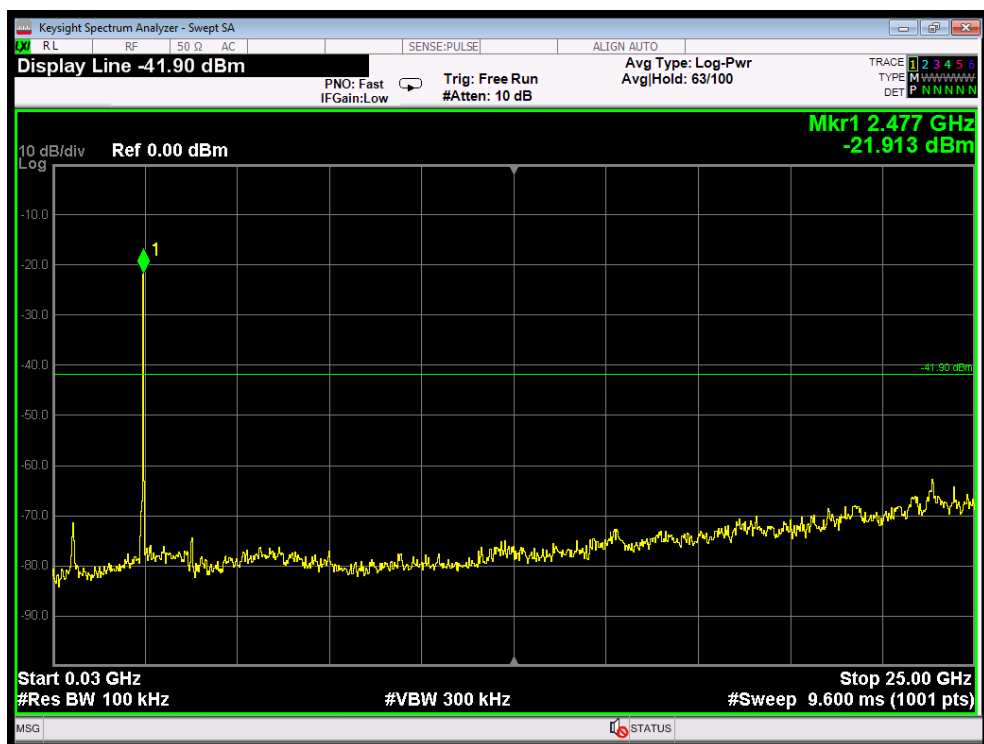
Conducted Emission Method



CH: Low



CH: Middle



CH: High

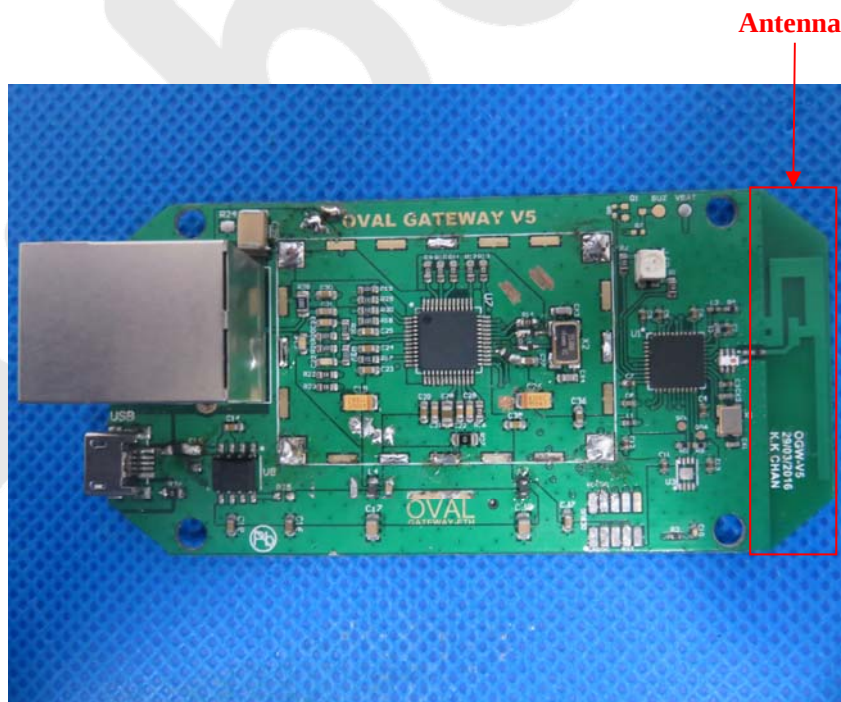
10. Antenna Requirement

10.1. Test Standard and Requirement

Test Standard	FCC Part15 Section 15.203 /247(c)
Requirement	1) 15.203 requirement: 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, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. 2) 15.247(c) (1)(i) requirement: Systems operating in the 2400-2483.5 MHz band that is used exclusively for fixed. Point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

10.2. Antenna Connected Construction

The bluetooth antenna is a PCB Antenna which permanently attached, and the best case gain of the antenna is 3.3dbi. It complies with the standard requirement.

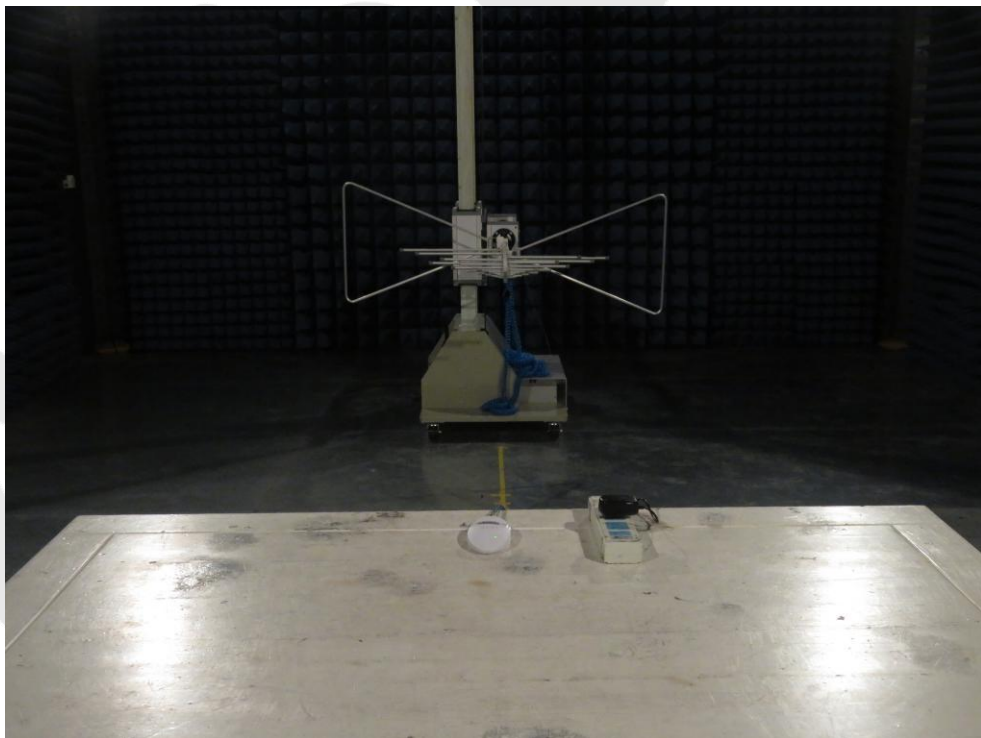


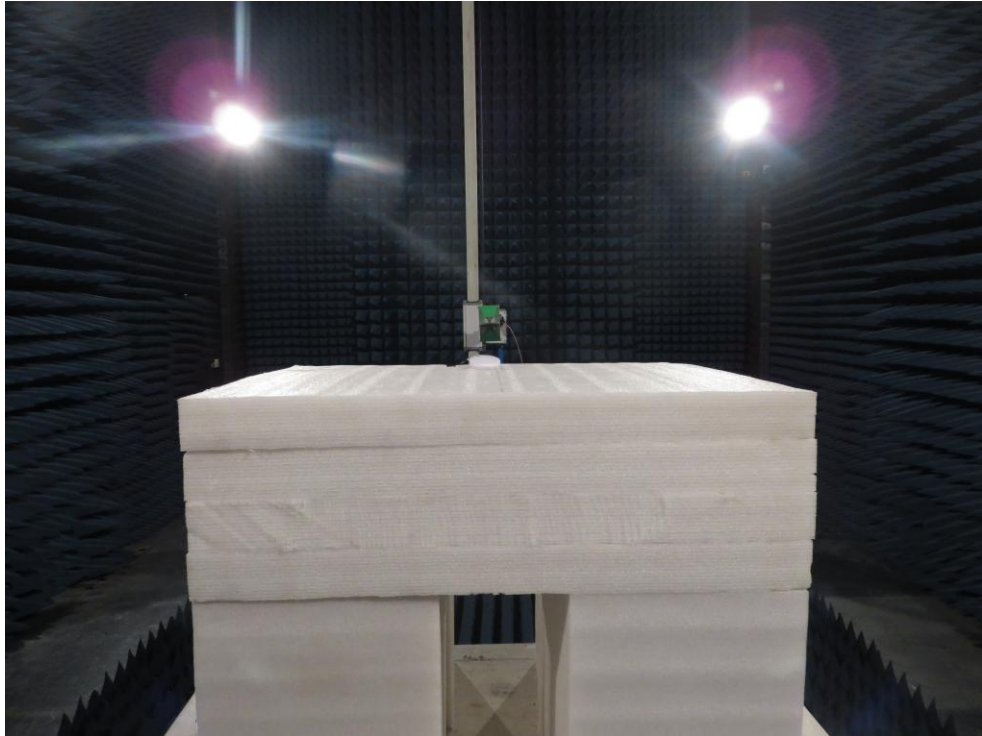
APPENDIX I -- TEST SETUP PHOTOGRAPH

Photo of Conducted Emission Measurement



Photo of Radiation Emission Test





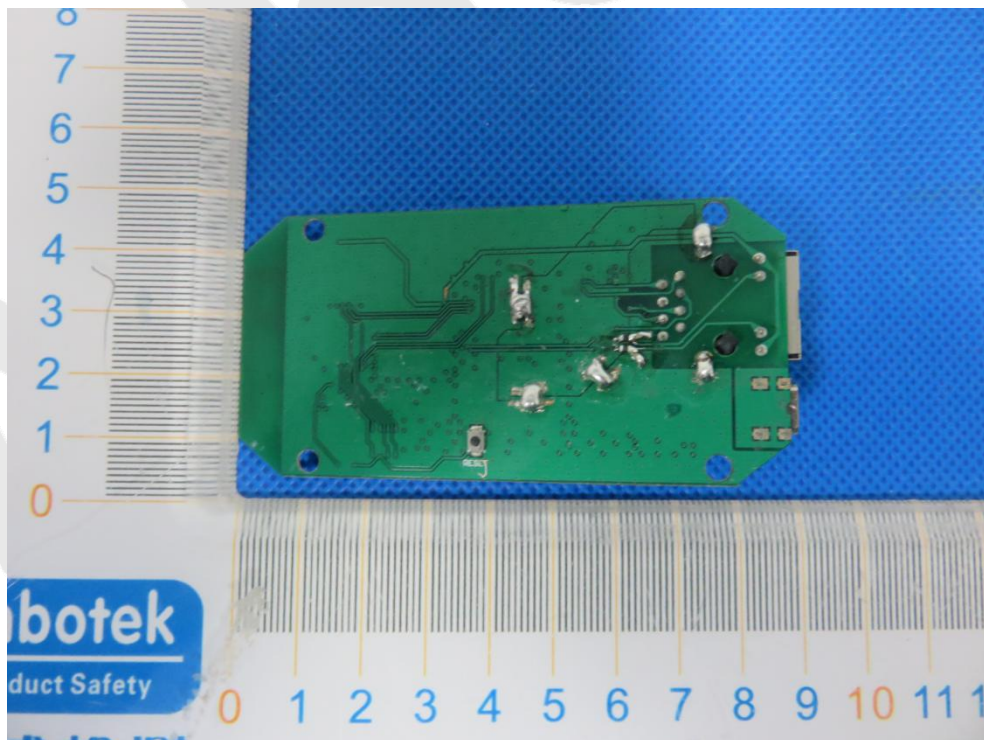
APPENDIX II -- EXTERNAL PHOTOGRAPH

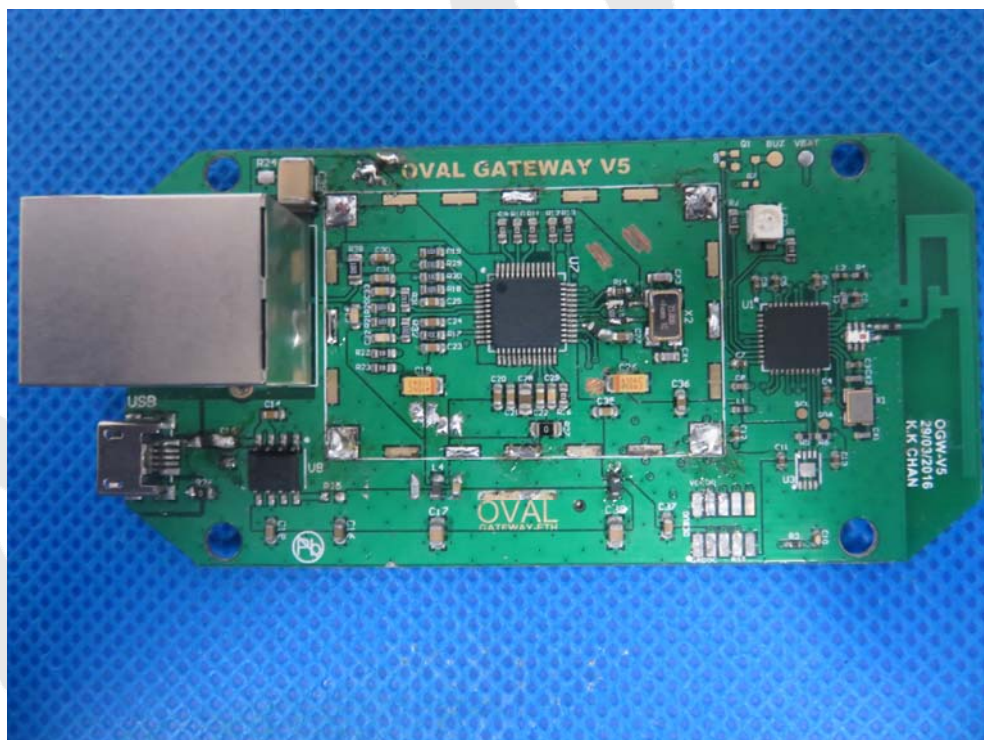
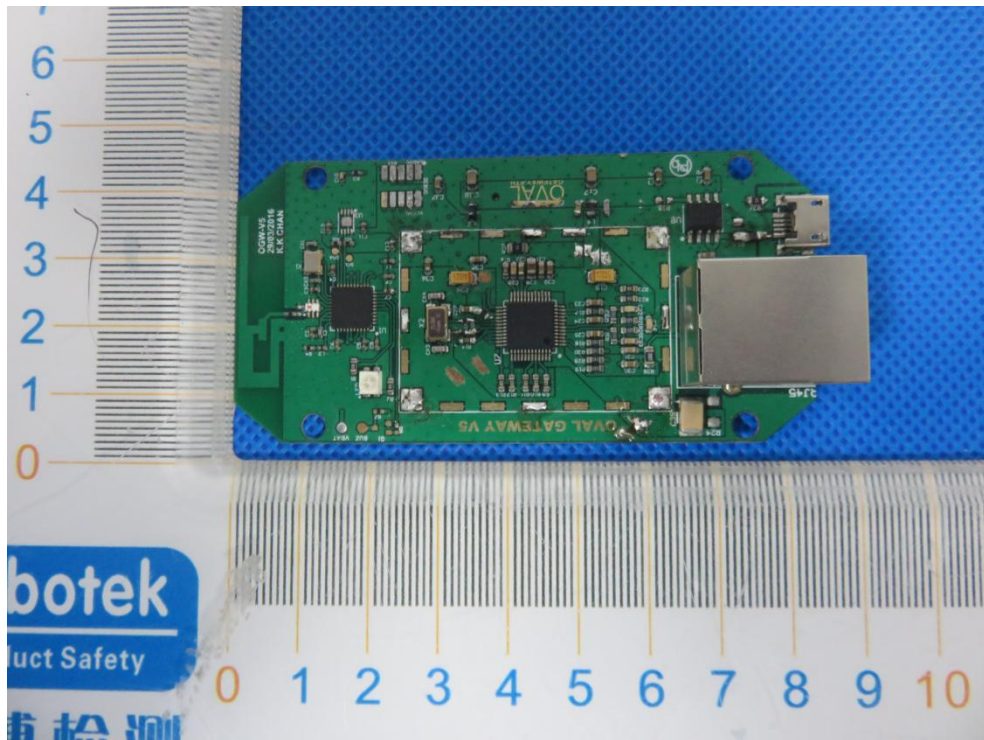


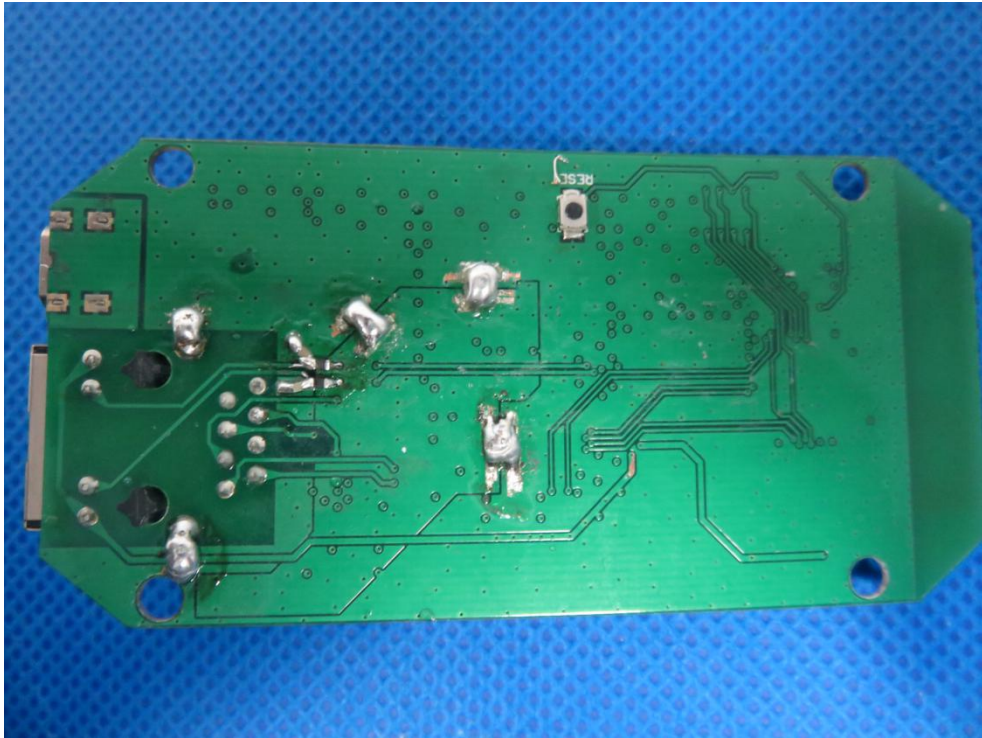




APPENDIX III -- INTERNAL PHOTOGRAPH







End of report