FCC TEST REPORT

For

Fusion Sport Proprietary Limited

Smartspeed PT

Model No.: Smartspeed PT 1.00

Prepared For	:	Fusion Sport Proprietary Limited
Address	:	76 Neon Street, Sumner Park, QLD4074, Australia

Prepared By	:	Shenzhen Anbotek Compliance Laboratory Limited
Address	:	1/F, Building D, Sogood Science and Technology Park, Sanwei community, Hangcheng Street, Bao'an District, Shenzhen, Guangdong, China.518102 Tel: (86) 755-26066440 Fax: (86) 755-26014772

Report Number	:	SZAWW180703002-02
Date of Receipt	:	Jul. 03, 2018
Date of Test	:	Jul. 03~Dec. 03, 2018
Date of Report	:	Dec. 03, 2018

Contents

1. General Information....5
1.1. Client Information....5
1.2. Description of Device (EUT)....5
1.3. Auxiliary Equipment Used During Test....5
1.4. Description of Test Modes....6
1.5. List of channels....6
1.6. Description Of Test Setup....7
1.7. Test Equipment List....8
1.8. Description of Test Facility....9
2. Summary of Test Results....10
3. Conducted Emission Test....11
3.1. Test Standard and Limit....11
3.2. Test Setup....11
3.3. Test Procedure....11
3.4. Test Data....11
4. Radiation Spurious Emission and Band Edge....16
4.1. Test Standard and Limit....16
4.2. Test Setup....16
4.3. Test Procedure....17
4.4. Test Data....18
5. Output Power Test....26
5.1. Test Standard and Limit....26
5.2. Test Setup....26
5.3. Test Procedure....26
5.4. Test Data....26
6. Dutycycle....29
7. 6DB Occupy Bandwidth Test....31
7.1. Test Standard and Limit....31
7.2. Test Setup....31
7.3. Test Procedure....31
7.4. Test Data....31
8. Power Spectral Density Test....34
8.1. Test Standard and Limit....34
8.2. Test Setup....34
8.3. Test Procedure....34
8.4. Test Data....34
9. 100kHz Bandwidth of Frequency Band Edge Requirement....37
9.1. Test Standard and Limit....37
9.2. Test Setup....37
9.3. Test Procedure....37
9.4. Test Data....37
10. Antenna Requirement....41

10.1. Test Standard and Requirement.....41
10.2. Antenna Connected Construction.....41
APPENDIX I -- TEST SETUP PHOTOGRAPH.....42
APPENDIX II -- EXTERNAL PHOTOGRAPH.....44
APPENDIX III -- INTERNAL PHOTOGRAPH.....48

TEST REPORT

Applicant	:	Fusion Sport Proprietary Limited
Manufacturer	:	Fusion Sport Proprietary Limited
Product Name	:	Smartspeed PT
Model No.	:	Smartspeed PT 1.00
Trade Mark	:	Fusion Sport Pty. Ltd.
Rating(s)	:	Input: DC 5V, 2A(via adapter input: AC 100~240V, 50/60Hz; with DC 3.7V, 1800 mAh Battery inside)

Test Standard(s)	**:**	**FCC Part15 Subpart C 2018, Section 15.247**
Test Method(s)	**:**	**ANSI C63.10: 2013, KDB558074 D01 DTS Meas Guidance v05**

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 : : Jul. 03~Dec. 03, 2018

Prepared by : :

(Engineer / Dolly Mo)

Reviewer : :

(Supervisor / Snowy Meng)

Approved & Authorized Signer : :

(Manager / Sally Zhang)

1. General Information

1.1. Client Information

Applicant	:	Fusion Sport Proprietary Limited
Address	:	76 Neon Street, Sumner Park, QLD4074, Australia
Manufacturer	:	Fusion Sport Proprietary Limited
Address	:	76 Neon Street, Sumner Park, QLD4074, Australia
Factory	:	Fusion Sport Proprietary Limited
Address	:	76 Neon Street, Sumner Park, QLD4074, Australia

1.2. Description of Device (EUT)

Product Name	:	Smartspeed PT	
Model No.	:	Smartspeed PT 1.00	
Trade Mark	:	Fusion Sport Pty. Ltd.	
Test Power Supply	:	AC 120V, 60Hz for adapter/AC 240V, 60Hz for adapter/ DC 3.7V battery inside	
Test Sample No.	:	S1(Normal Sample), S2(Engineering Sample)	
Product Description	:	Operation Frequency:	2405-2450MHz
		Number of Channel:	10 Channels
		Modulation Type:	O-QPSK
		Antenna Type:	PCB Antenna
		Antenna Gain(Peak):	1.5 dBi
Remark: 1)For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual. 2)This report is for Zigbee module.			

1.3. Auxiliary Equipment Used During Test

Adapter	:	Model: BX-0502000 Input: 100-240V~ 50/60Hz Output: DC 5V, 2.0A

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	CH06
Mode 3	CH10
Mode 4	Keeping TX+ Charging Mode

For Conducted Emission	
Final Test Mode	Description
Mode 4	Keeping TX+ Charging Mode

For Radiated Emission	
Final Test Mode	Description
Mode 1	CH01
Mode 2	CH06
Mode 3	CH10

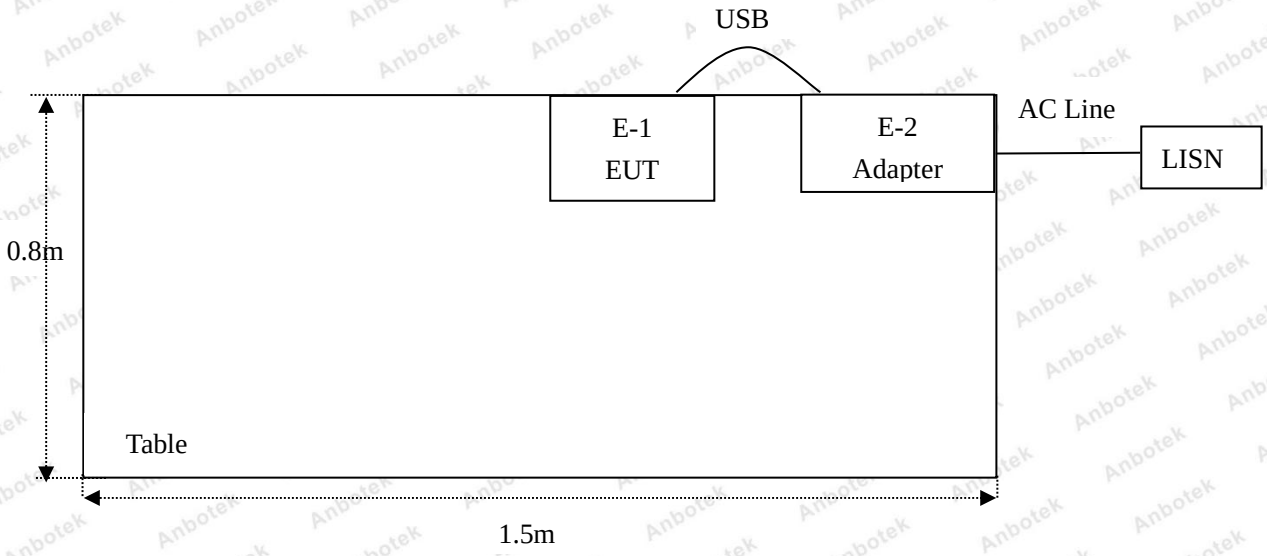
Note:
(1) The measurements are performed at the highest, middle, lowest available channels.
(2)The data rate was set in 1Mbps for radiated emission due to the highest RF output power.

1.5. List of channels

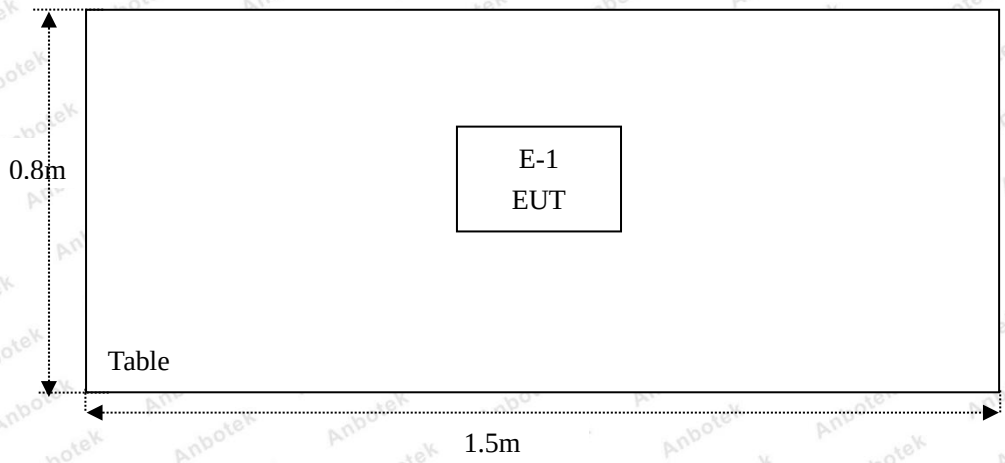
Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)
01	2405	05	2425	09	2445
02	2410	06	2430	10	2450
03	2415	07	2435		
04	2420	08	2440		

1.6. Description Of Test Setup

CE



RE



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. 05, 2018	1 Year
2.	EMI Test Receiver	Rohde & Schwarz	ESPI3	101604	Nov. 05, 2018	1 Year
3.	RF Switching Unit	Compliance Direction	RSU-M2	38303	Nov. 05, 2018	1 Year
4.	Spectrum Analysis	Agilent	E4407B	US39390582	Nov. 05, 2018	1 Year
5.	MAX Spectrum Analysis	Agilent	N9020A	MY51170037	Nov. 05, 2018	1 Year
6.	Preamplifier	SKET Electronic	BK1G18G30D	KD17503	Nov. 05, 2018	1 Year
7.	Double Ridged Horn Antenna	Instruments corporation	GTH-0118	351600	Nov. 19, 2018	1 Year
8.	Bilog Broadband Antenna	Schwarzbeck	VULB9163	VULB 9163-289	Nov. 19, 2018	1 Year
9.	Loop Antenna	Schwarzbeck	FMZB1519B	00053	Nov. 19, 2018	1 Year
10.	Horn Antenna	A-INFO	LB-180400-KF	J211060628	Nov. 20, 2018	1 Year
11.	Pre-amplifier	SONOMA	310N	186860	Nov. 05, 2018	1 Year
12.	EMI Test Software EZ-EMC	SHURPLE	N/A	N/A	N/A	N/A
13.	RF Test Control System	YIHENG	YH3000	2017430	Nov. 05, 2018	1 Year
14.	Power Sensor	DAER	RPR3006W	15I00041SN045	Nov. 05, 2018	1 Year
15.	Power Sensor	DAER	RPR3006W	15I00041SN046	Nov. 05, 2018	1 Year
16.	MXA Spectrum Analysis	Agilent	N9020A	MY51170037	Nov. 05, 2018	1 Year
17.	MXG RF Vector Signal Generator	Agilent	N5182A	MY48180656	Nov. 05, 2018	1 Year
18.	Signal Generator	Agilent	E4421B	MY41000743	Nov. 05, 2018	1 Year
19.	DC Power Supply	IVYTECH	IV3605	1804D360510	Apr. 02, 2018	1 Year
20.	Constant Temperature Humidity Chamber	ZHONGJIAN	ZJ-KHWS80B	N/A	Nov. 01, 2018	1 Year

1.8. 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 registed 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

Shenzhen Anbotek Compliance Laboratory Limited.

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.		

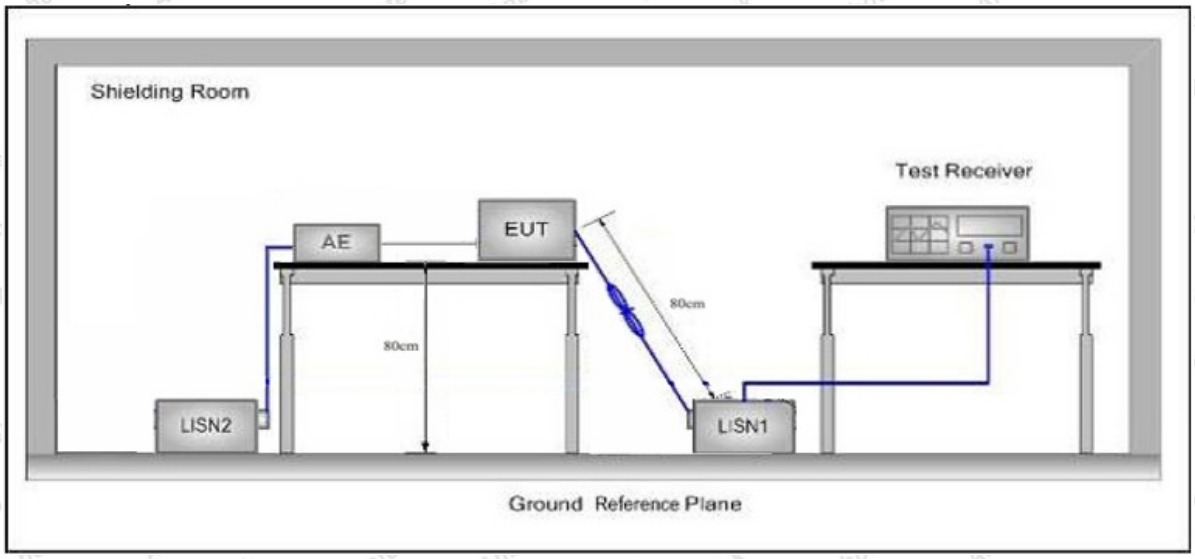
3. Conducted Emission Test

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.

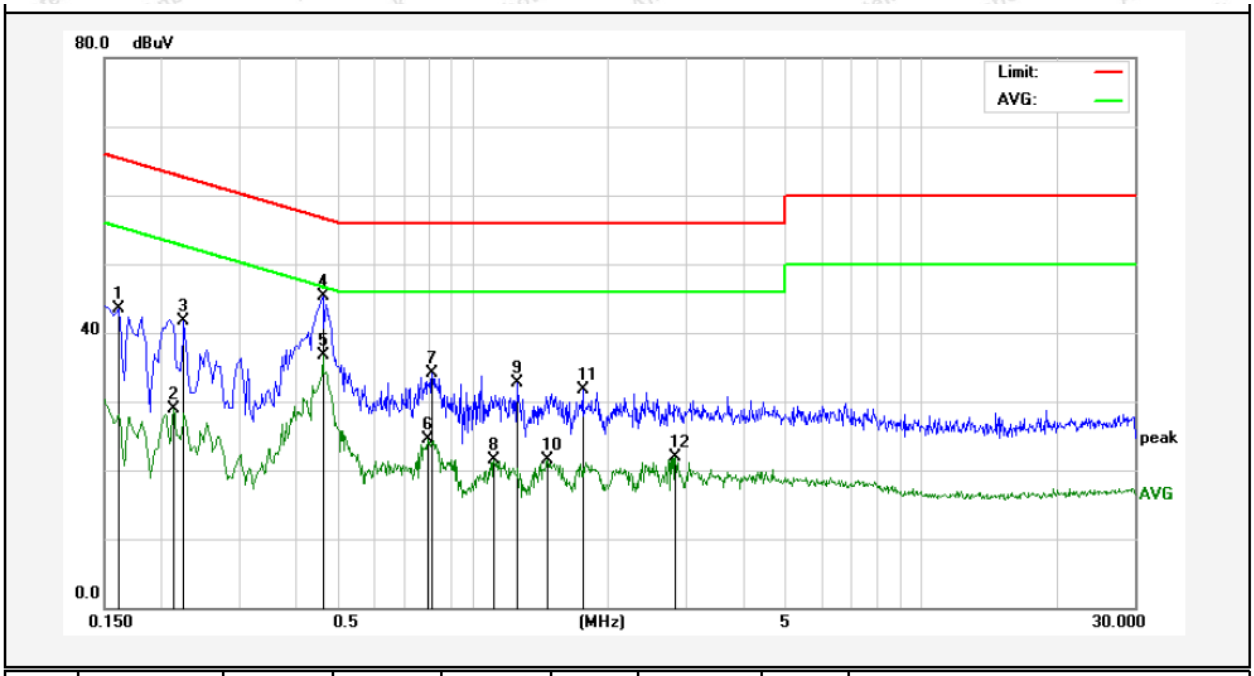
The frequency range from 150kHz to 30MHz is checked.

3.4. Test Data

Please to see the following pages

Conducted Emission Test Data

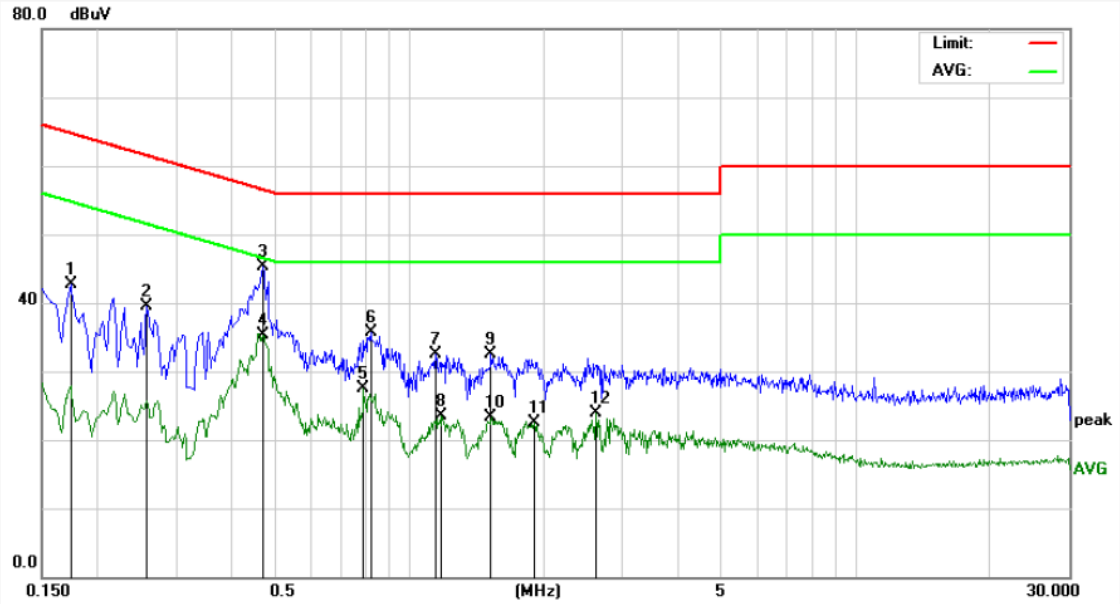
Test Site: 1# Shielded Room
Operating Condition: Keeping TX+ Charging Mode
Test Specification: AC 120V, 60Hz for adapter
Comment: Live Line
Tem.:25℃ Hum.:50%



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Over Limit (dB)	Detector	Remark
1	0.1620	23.51	19.90	43.41	65.36	-21.95	QP	
2	0.2140	8.97	19.90	28.87	53.04	-24.17	AVG	
3	0.2260	21.86	19.89	41.75	62.59	-20.84	QP	
4	0.4620	25.34	19.96	45.30	56.66	-11.36	QP	
5	0.4620	16.80	19.96	36.76	46.66	-9.90	AVG	
6	0.7940	4.49	20.06	24.55	46.00	-21.45	AVG	
7	0.8100	13.94	20.07	34.01	56.00	-21.99	QP	
8	1.1140	1.29	20.12	21.41	46.00	-24.59	AVG	
9	1.2540	12.67	20.13	32.80	56.00	-23.20	QP	
10	1.4700	1.40	20.13	21.53	46.00	-24.47	AVG	
11	1.7540	11.61	20.14	31.75	56.00	-24.25	QP	
12	2.8380	1.70	20.16	21.86	46.00	-24.14	AVG	

Conducted Emission Test Data

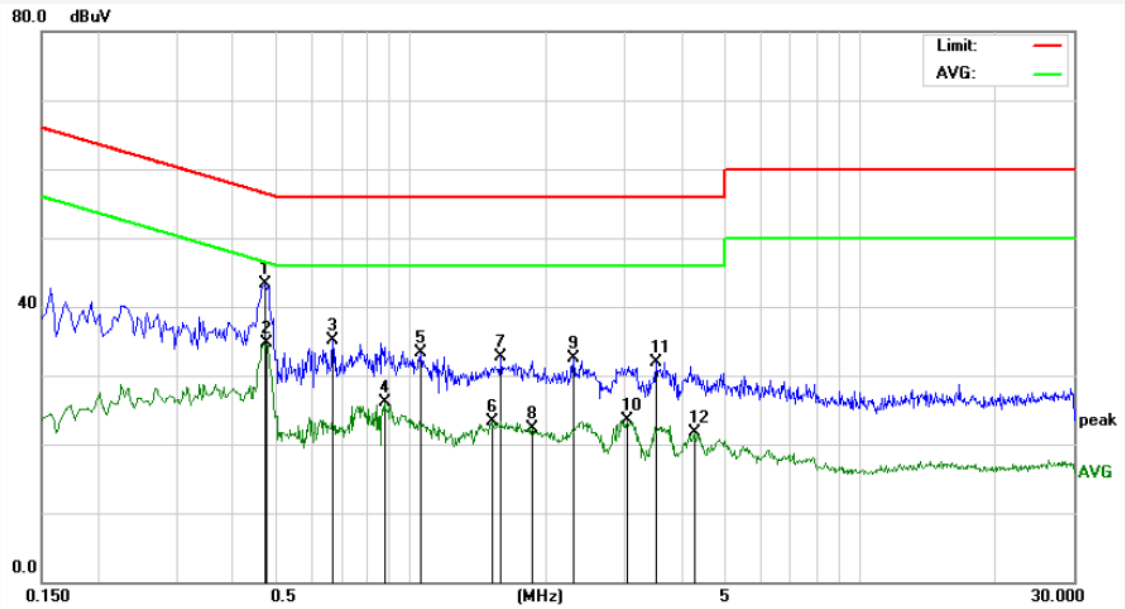
Test Site:	1# Shielded Room
Operating Condition:	Keeping TX+ Charging Mode
Test Specification:	AC 120V, 60Hz for adapter
Comment:	Neutral Line
	Tem.:25℃ Hum.:50%



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Over Limit (dB)	Detector	Remark
1	0.1740	22.81	19.90	42.71	64.76	-22.05	QP	
2	0.2580	19.54	19.89	39.43	61.49	-22.06	QP	
3	0.4700	25.34	19.97	45.31	56.51	-11.20	QP	
4	0.4700	15.31	19.97	35.28	46.51	-11.23	AVG	
5	0.7900	7.35	20.06	27.41	46.00	-18.59	AVG	
6	0.8180	15.67	20.07	35.74	56.00	-20.26	QP	
7	1.1460	12.35	20.12	32.47	56.00	-23.53	QP	
8	1.1780	3.38	20.12	23.50	46.00	-22.50	AVG	
9	1.5220	12.40	20.13	32.53	56.00	-23.47	QP	
10	1.5339	3.09	20.13	23.22	46.00	-22.78	AVG	
11	1.8980	2.36	20.14	22.50	46.00	-23.50	AVG	
12	2.6099	3.74	20.15	23.89	46.00	-22.11	AVG	

Conducted Emission Test Data

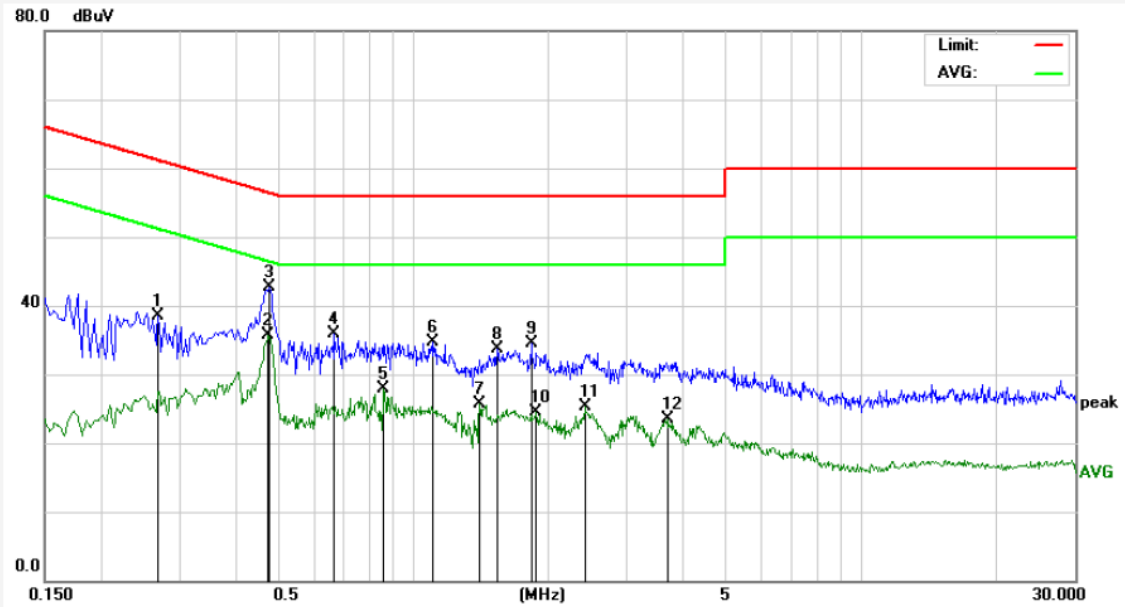
Test Site: 1# Shielded Room
Operating Condition: Keeping TX+ Charging Mode
Test Specification: AC 240V, 60Hz for adapter
Comment: Live Line
Tem.:25℃ Hum.:50%



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Over Limit (dB)	Detector	Remark
1	0.4740	23.27	19.97	43.24	56.44	-13.20	QP	
2	0.4780	14.71	19.97	34.68	46.37	-11.69	AVG	
3	0.6700	14.98	20.03	35.01	56.00	-20.99	QP	
4	0.8740	5.95	20.09	26.04	46.00	-19.96	AVG	
5	1.0500	13.23	20.12	33.35	56.00	-22.65	QP	
6	1.5180	3.26	20.13	23.39	46.00	-22.61	AVG	
7	1.5900	12.61	20.13	32.74	56.00	-23.26	QP	
8	1.8620	2.14	20.14	22.28	46.00	-23.72	AVG	
9	2.2980	12.33	20.15	32.48	56.00	-23.52	QP	
10	3.0380	3.31	20.16	23.47	46.00	-22.53	AVG	
11	3.5100	11.69	20.17	31.86	56.00	-24.14	QP	
12	4.2900	1.43	20.19	21.62	46.00	-24.38	AVG	

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℃ Hum.:50%



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Over Limit (dB)	Detector	Remark
1	0.2700	18.59	19.89	38.48	61.12	-22.64	peak	
2	0.4740	15.65	19.97	35.62	46.44	-10.82	AVG	
3	0.4780	22.71	19.97	42.68	56.37	-13.69	peak	
4	0.6660	15.95	20.03	35.98	56.00	-20.02	peak	
5	0.8580	7.81	20.08	27.89	46.00	-18.11	AVG	
6	1.1100	14.51	20.12	34.63	56.00	-21.37	peak	
7	1.4100	5.59	20.13	25.72	46.00	-20.28	AVG	
8	1.5380	13.53	20.13	33.66	56.00	-22.34	peak	
9	1.8380	14.45	20.14	34.59	56.00	-21.41	peak	
10	1.8820	4.38	20.14	24.52	46.00	-21.48	AVG	
11	2.4140	5.06	20.15	25.21	46.00	-20.79	AVG	
12	3.6900	3.30	20.17	23.47	46.00	-22.53	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

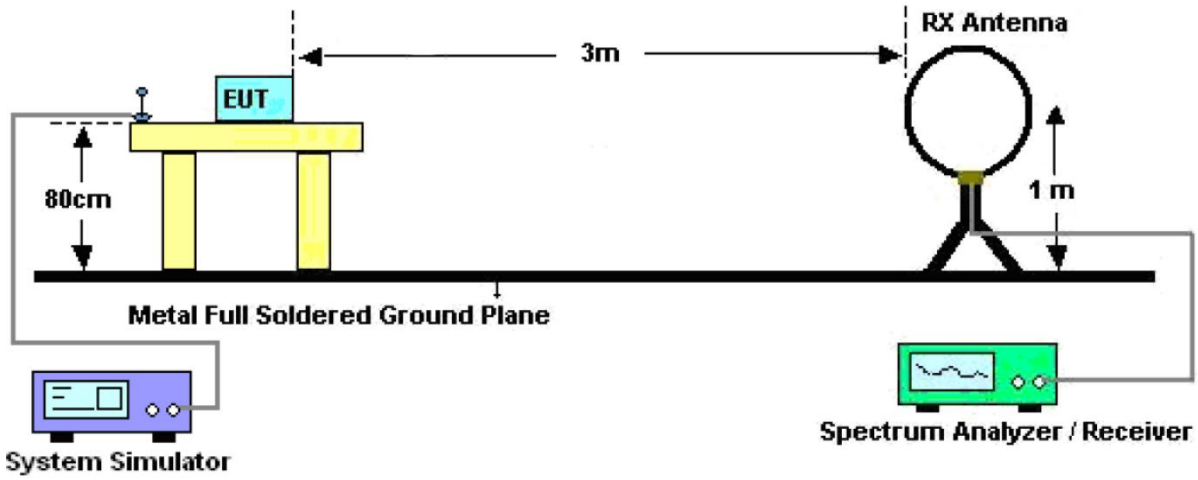


Figure 1. Below 30MHz

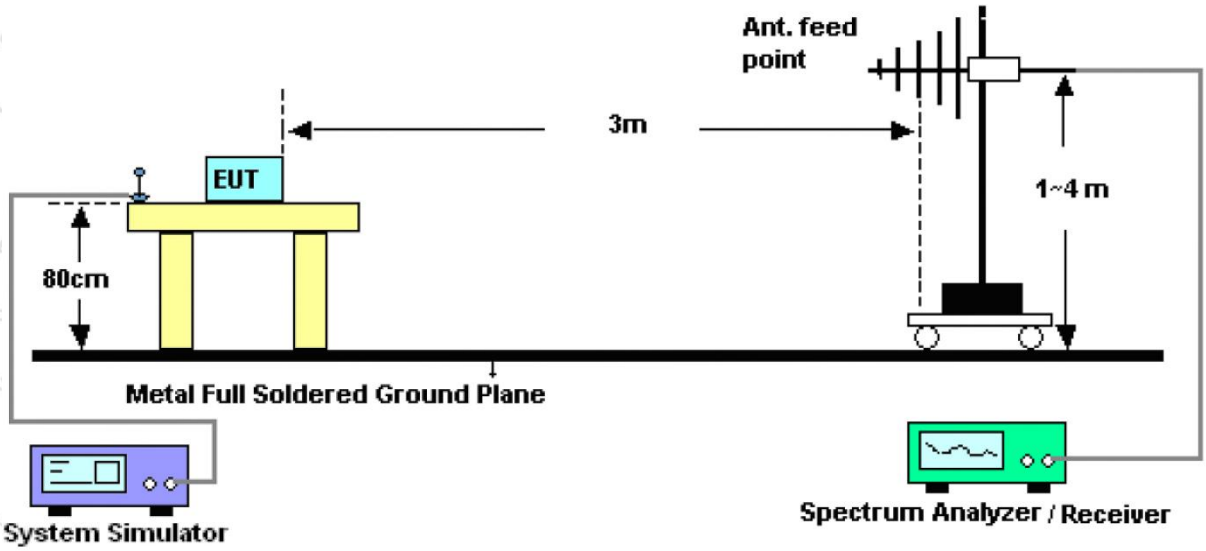


Figure 2. 30MHz to 1GHz

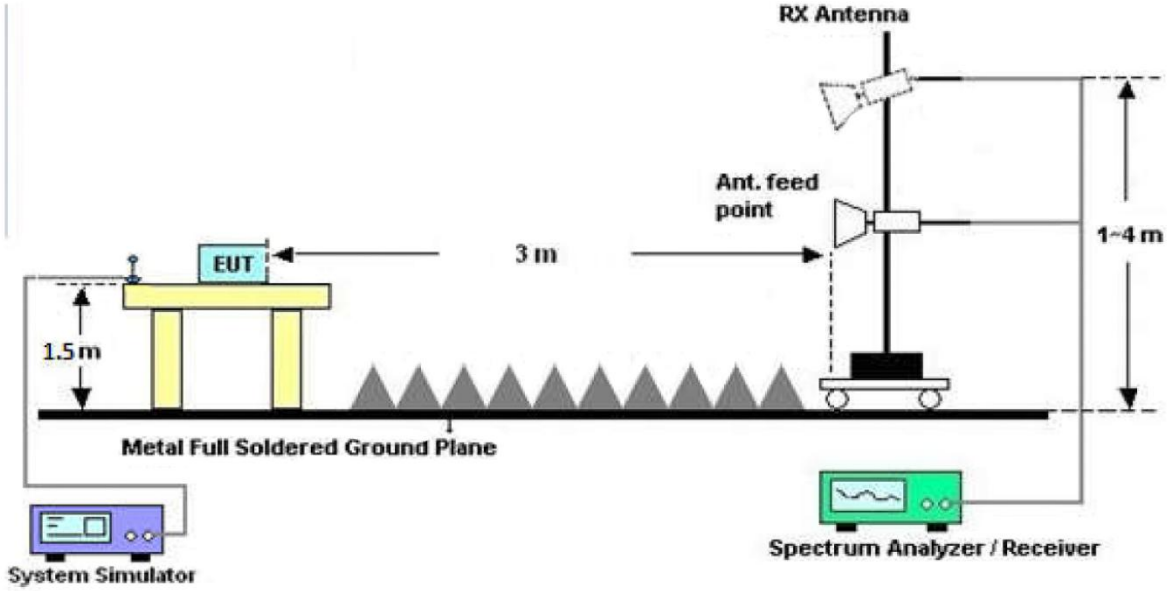


Figure 3. Above 1 GHz

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 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

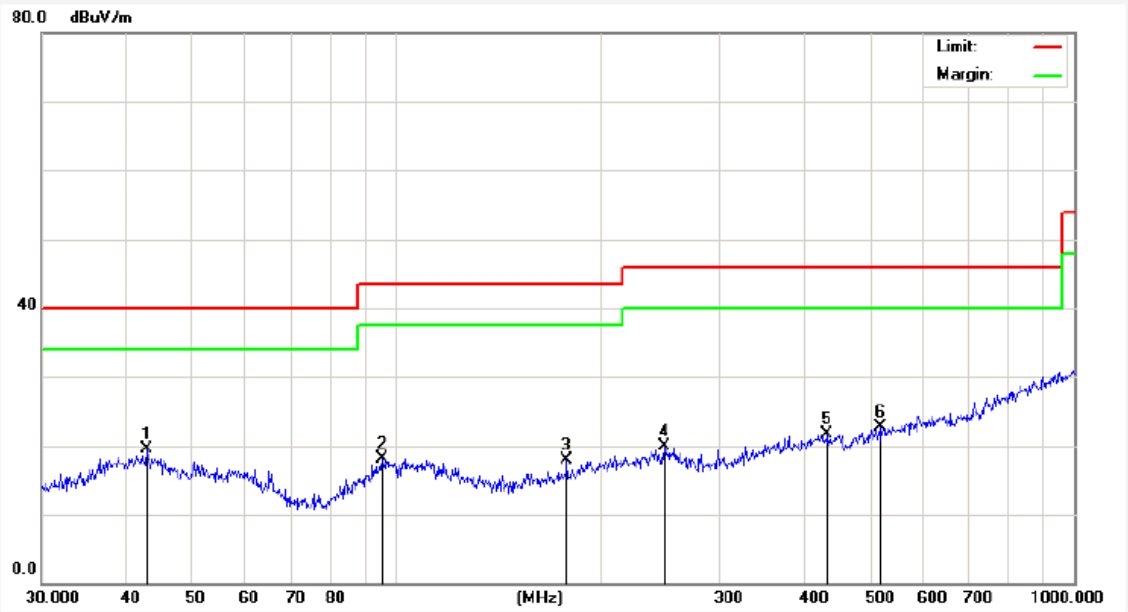
PASS

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 and above 18000MHz are attenuated more than 20dB below the permissible limits, so the results don't record in the report.

Test Results (30~1000MHz)

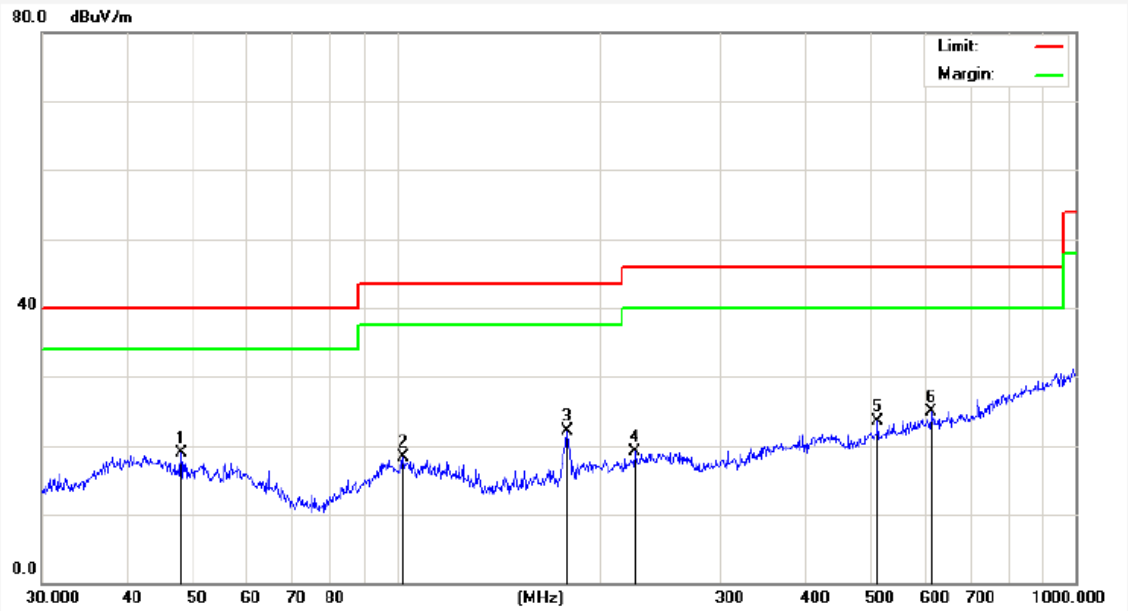
Job No.:	SZAWW180703002	Temp.(℃)/Hum.(%RH):	24.3℃/55%RH
Standard:	FCC PART 15C	Power Source:	DC 3.7V battery inside
Test Mode:	Keeping TX+ Charging Mode	Polarization:	Horizontal



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/	Over Limit (dB)	Detector	Height (cm)	degree (deg)	Remark
1	42.8998	34.46	-14.93	19.53	40.00	-20.47	QP	300	99	
2	95.4270	39.27	-21.18	18.09	43.50	-25.41	QP	300	142	
3	178.7584	37.79	-19.81	17.98	43.50	-25.52	QP	300	176	
4	248.5519	37.83	-17.96	19.87	46.00	-26.13	QP	300	256	
5	432.5457	33.91	-12.27	21.64	46.00	-24.36	QP	300	306	
6	517.2480	33.63	-11.00	22.63	46.00	-23.37	QP	300	360	

Test Results (30~1000MHz)

Job No.:	SZAWW180703002	Temp.(℃)/Hum.(%RH):	24.3℃/55%RH
Standard:	FCC PART 15C	Power Source:	DC 3.7V battery inside
Test Mode:	Keeping TX+ Charging Mode	Polarization:	Vertical



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/	Over Limit (dB)	Detector	Height (cm)	degree (deg)	Remark
1	48.1626	34.11	-15.11	19.00	40.00	-21.00	QP	300	46	
2	102.3597	32.99	-14.73	18.26	43.50	-25.24	QP	300	76	
3	178.1327	38.13	-15.98	22.15	43.50	-21.35	QP	300	120	
4	224.5193	33.17	-14.13	19.04	46.00	-26.96	QP	300	166	
5	511.8352	34.23	-10.75	23.48	46.00	-22.52	QP	300	284	
6	614.2142	33.95	-9.13	24.82	46.00	-21.18	QP	300	352	

Test Results (Above 1000MHz)

Test Mode: TX Mode					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	38.46	34.04	6.58	34.09	44.99	74.00	-29.01	V
7215.00	32.59	37.11	7.73	34.50	42.93	74.00	-31.07	V
9620.00	32.15	39.31	9.23	34.79	45.90	74.00	-28.10	V
12025.00	*					74.00		V
14430.00	*					74.00		V
4810.00	42.98	34.04	6.58	34.09	49.51	74.00	-24.49	H
7215.00	34.45	37.11	7.73	34.50	44.79	74.00	-29.21	H
9620.00	31.68	39.31	9.23	34.79	45.43	74.00	-28.57	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	27.05	34.04	6.58	34.09	33.58	54.00	-20.42	V
7215.00	21.15	37.11	7.73	34.50	31.49	54.00	-22.51	V
9620.00	20.16	39.31	9.23	34.79	33.91	54.00	-20.09	V
12025.00	*					54.00		V
14430.00	*					54.00		V
4810.00	31.41	34.04	6.58	34.09	37.94	54.00	-16.06	H
7215.00	23.40	37.11	7.73	34.50	33.74	54.00	-20.26	H
9620.00	19.98	39.31	9.23	34.79	33.73	54.00	-20.27	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.
4860.00	35.83	34.38	6.69	34.09	42.81	74.00	-31.19	V
7290.00	30.85	37.22	7.78	34.53	41.32	74.00	-32.68	V
9270.00	30.59	39.46	9.35	34.80	44.60	74.00	-29.40	V
12150.00	*					74.00		V
14580.00	*					74.00		V
4860.00	39.81	34.38	6.69	34.09	46.79	74.00	-27.21	H
7290.00	32.47	37.22	7.78	34.53	42.94	74.00	-31.06	H
9270.00	29.88	39.46	9.35	34.80	43.89	74.00	-30.11	H
12150.00	*					74.00		H
14580.00	*					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.
4860.00	24.93	34.38	6.69	34.09	31.91	54.00	-22.09	V
7290.00	19.71	37.22	7.78	34.53	30.18	54.00	-23.82	V
9270.00	18.88	39.46	9.35	34.80	32.89	54.00	-21.11	V
12150.00	*					54.00		V
14580.00	*					54.00		V
4860.00	28.99	34.38	6.69	34.09	35.97	54.00	-18.03	H
7290.00	21.78	37.22	7.78	34.53	32.25	54.00	-21.75	H
9270.00	18.48	39.46	9.35	34.80	32.49	54.00	-21.51	H
12150.00	*					54.00		H
14580.00	*					54.00		H

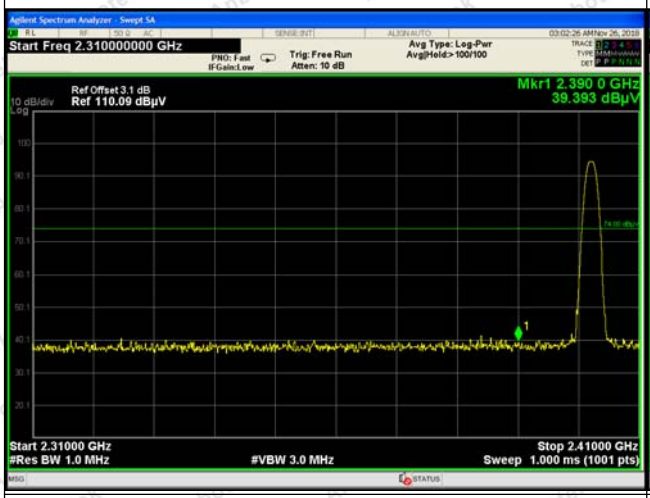
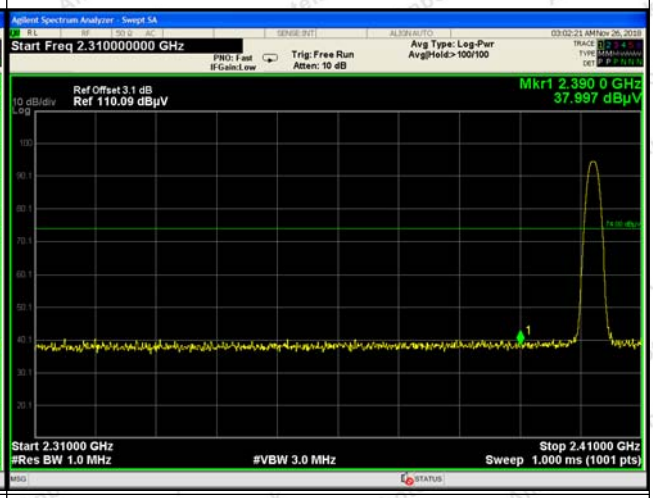
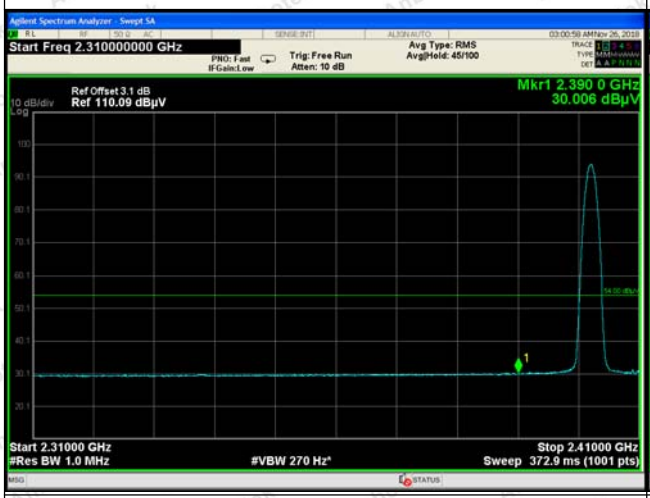
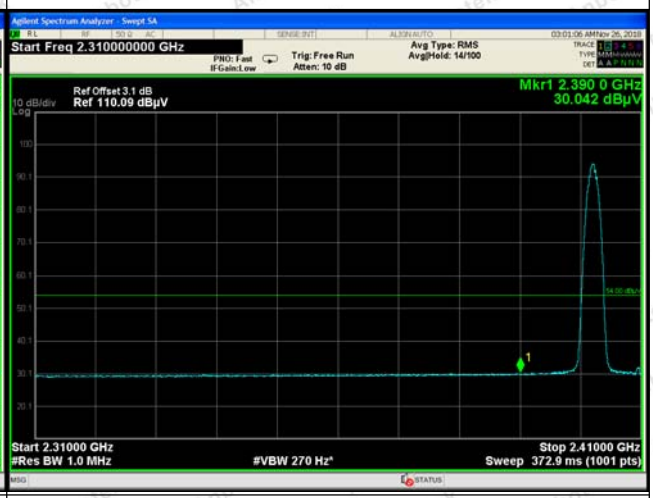
Test Results (Above 1000MHz)

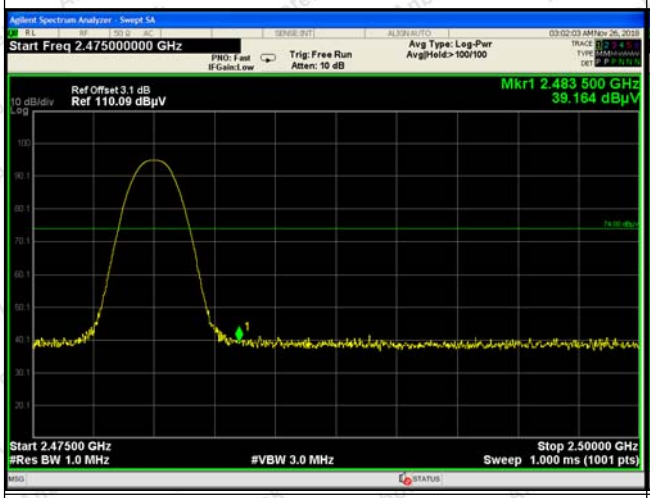
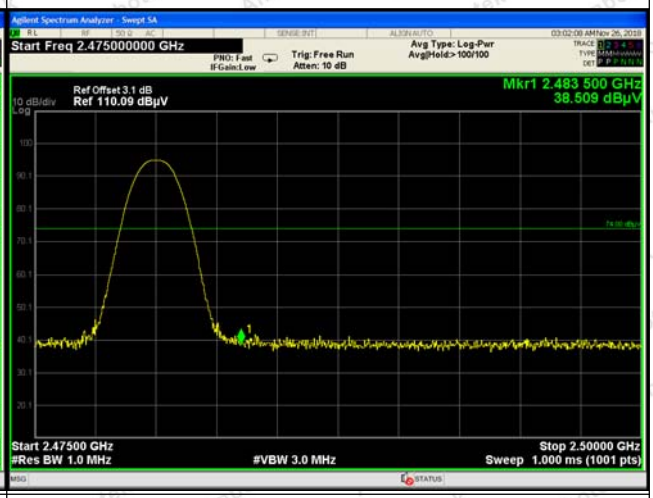
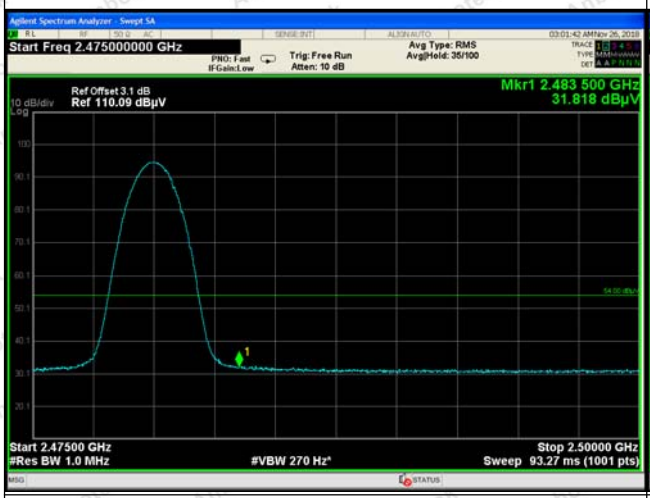
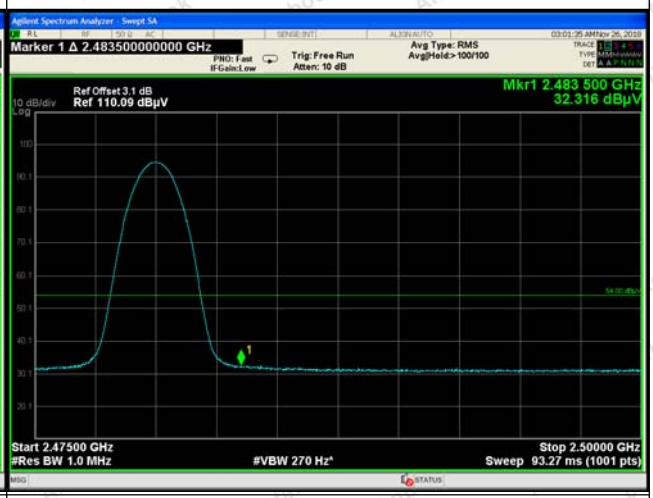
Test Mode: TX Mode					Test channel: Highest			
Peak Value								
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Pol.
4900.00	36.38	34.72	6.79	34.09	43.80	74.00	-30.20	V
7350.00	31.21	37.34	7.82	34.57	41.80	74.00	-32.20	V
9800.00	30.92	39.62	9.46	34.81	45.19	74.00	-28.81	V
12250.00	*					74.00		V
14700.00	*					74.00		V
4900.00	40.47	34.72	6.79	34.09	47.89	74.00	-26.11	H
7350.00	32.89	37.34	7.82	34.57	43.48	74.00	-30.52	H
9800.00	30.25	39.62	9.46	34.81	44.52	74.00	-29.48	H
12250.00	*					74.00		H
14700.00	*					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.
4900.00	25.42	34.72	6.79	34.09	32.84	54.00	-21.16	V
7350.00	20.04	37.34	7.82	34.57	30.63	54.00	-23.37	V
9800.00	19.18	39.62	9.46	34.81	33.45	54.00	-20.55	V
12250.00	*					54.00		V
14700.00	*					54.00		V
4900.00	29.56	34.72	6.79	34.09	36.98	54.00	-17.02	H
7350.00	22.16	37.34	7.82	34.57	32.75	54.00	-21.25	H
9800.00	18.83	39.62	9.46	34.81	33.10	54.00	-20.90	H
12250.00	*					54.00		H
14700.00	*					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: CH01	Test channel: Lowest
	
Average Value(Vertical)	Average Value(Horizontal)
	
Peak Value(Vertical)	Peak Value(Horizontal)

Test Mode: CH10	Test channel: Highest
	
Average Value(Vertical)	Average Value(Horizontal)
	
Peak Value(Vertical)	Peak Value(Horizontal)

Remark:

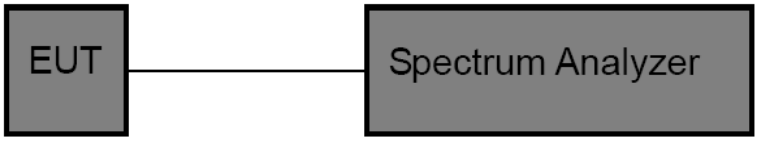
1. Level =Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor

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

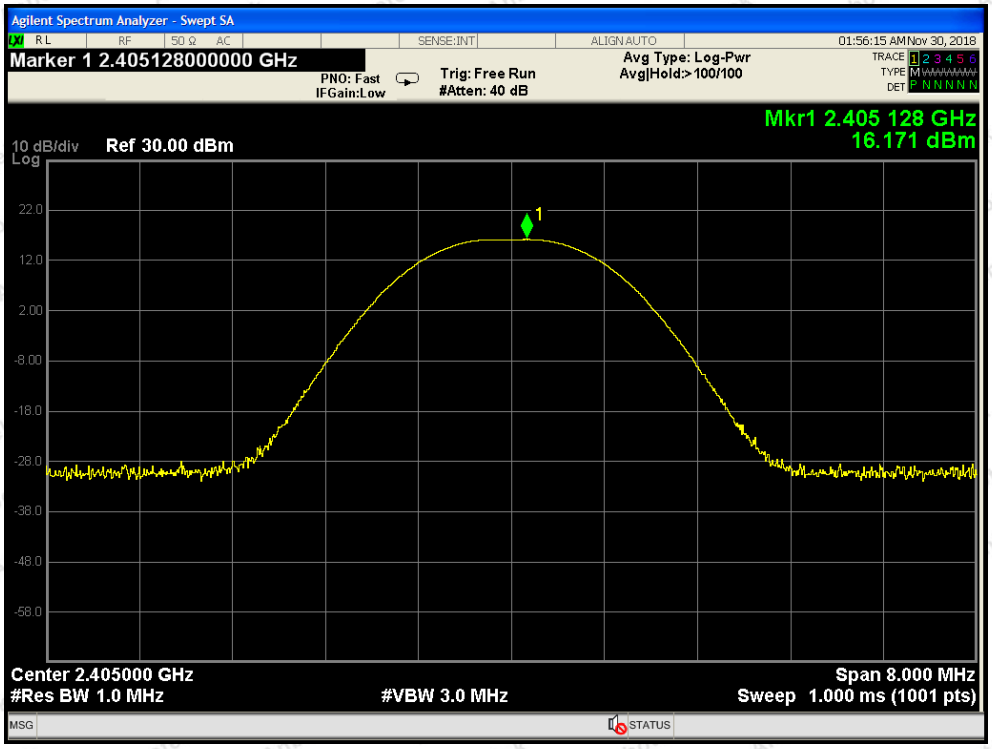
1. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram above,
2. Spectrum Setting:
   RBW > the 20 dB bandwidth of the emission being measured
   Span = approximately 5 times the 20 dB bandwidth, centered on a hopping channel
   VBW ≥ RBW
   Sweep = auto
   Detector function = peak
   Trace = max hold

5.4. Test Data

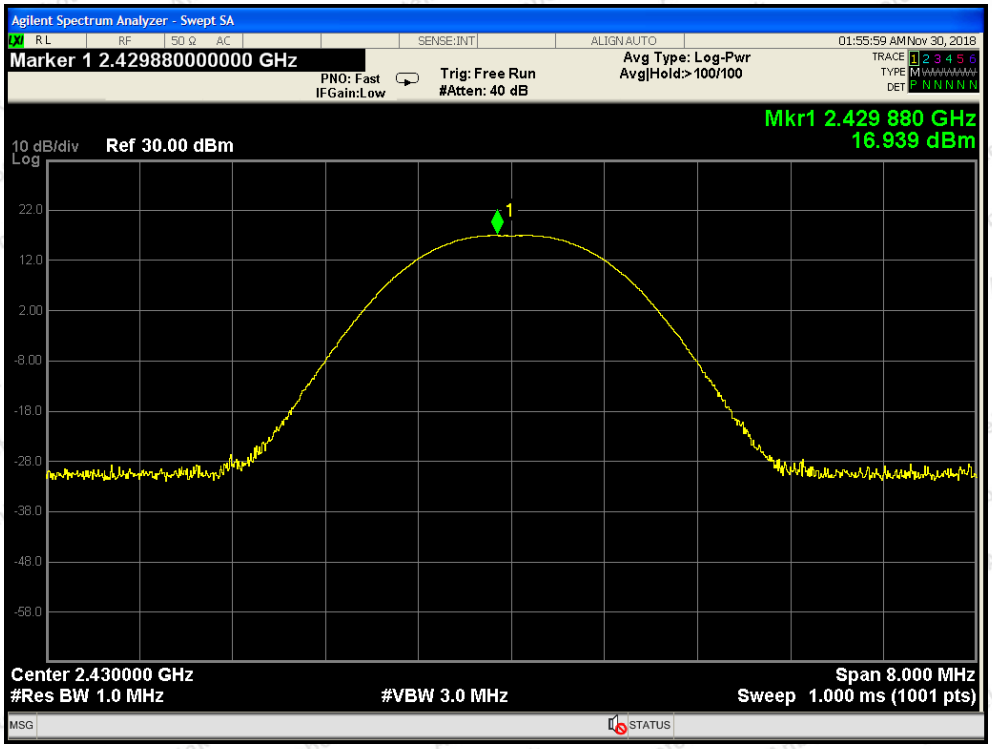
Test Item	:	Output power	Test Mode	:	CH Low ~ CH High
Test Voltage	:	DC 3.7V battery inside	Temperature	:	24℃
Test Result	:	PASS	Humidity	:	55%RH

Channel Frequency (MHz)	Maximum Power output(AV) (dBm)	Limit (dBm)	Results
2405	16.171	30	PASS
2430	**16.939**	30	PASS
2450	16.374	30	PASS

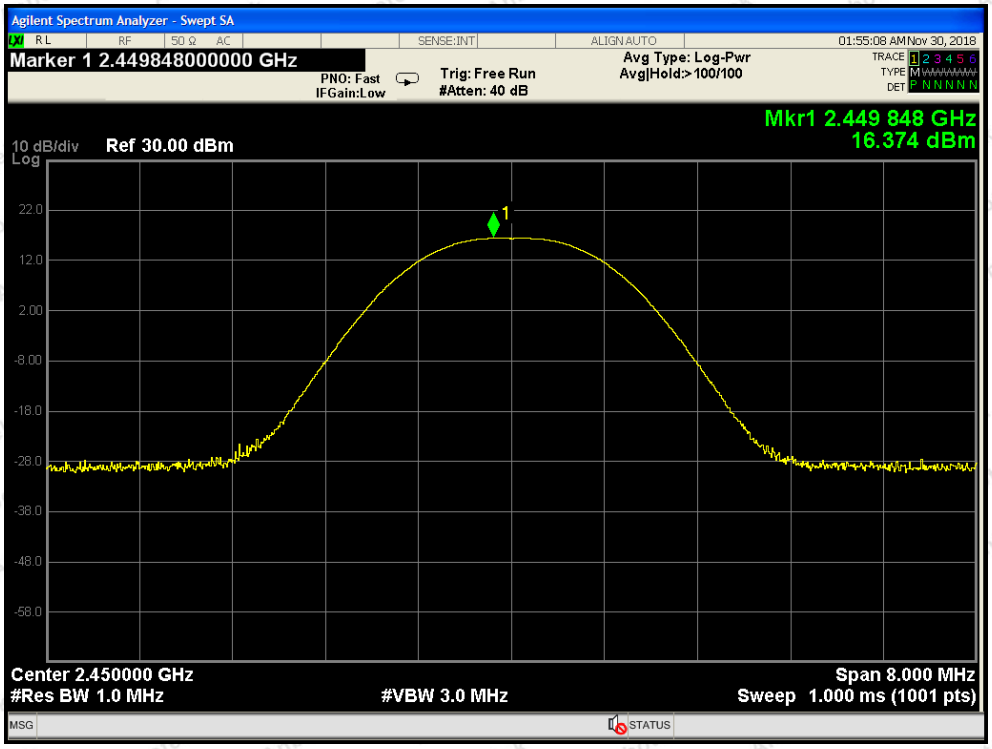
For power test the duty cycle is 100% in continous transmitting mode



Test Mode: Low



Test Mode: Middle



Test Mode: High

6. Dutycycle

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 ≥OBW if possible; otherwise, set RBW to the largest available value.

Set VBW ≥ 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 ≤ 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

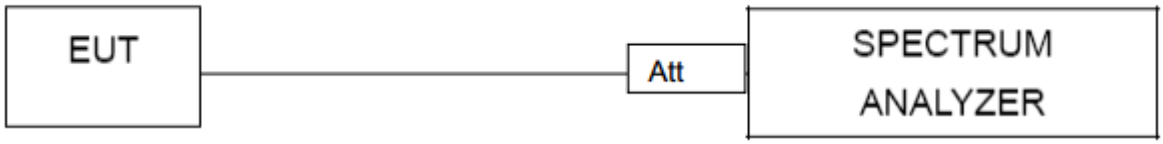
Number of points in Sweep >100

Detector function = peak

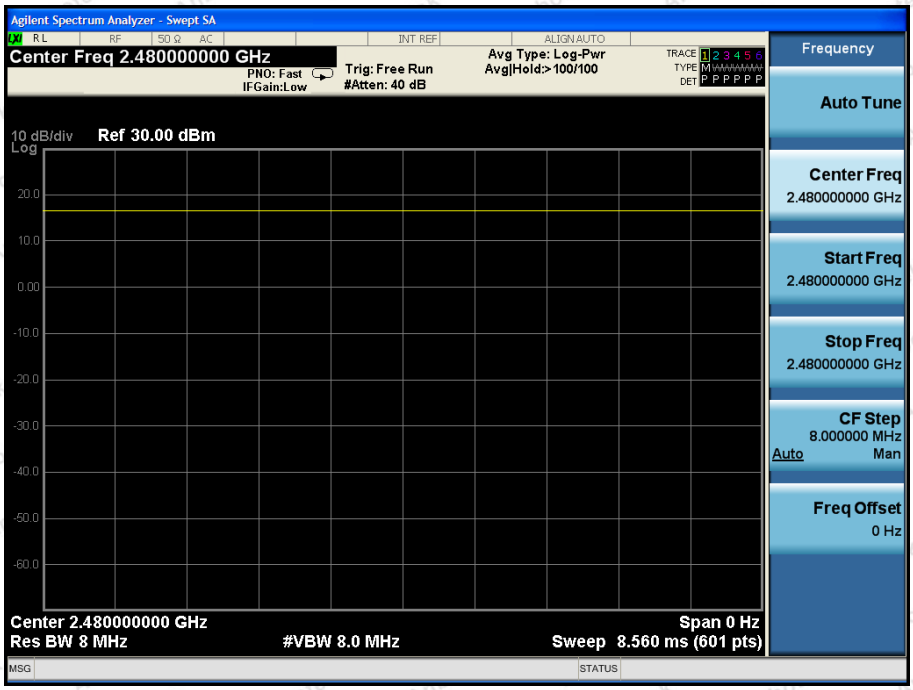
Trace = Clear write Measure Ttotal and Ton

Calculate Duty Cycle = Ton / Ttotal and Duty Cycle Factor=10*log(1/Duty Cycle)

b.TEST SETUP



Test plot of Duty Cycle for Middle Channel

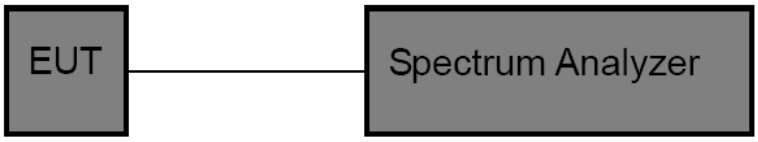


7. 6DB Occupy Bandwidth Test

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≥3*RBW =300kHz,

Detector= Peak

Trace mode= Max hold.

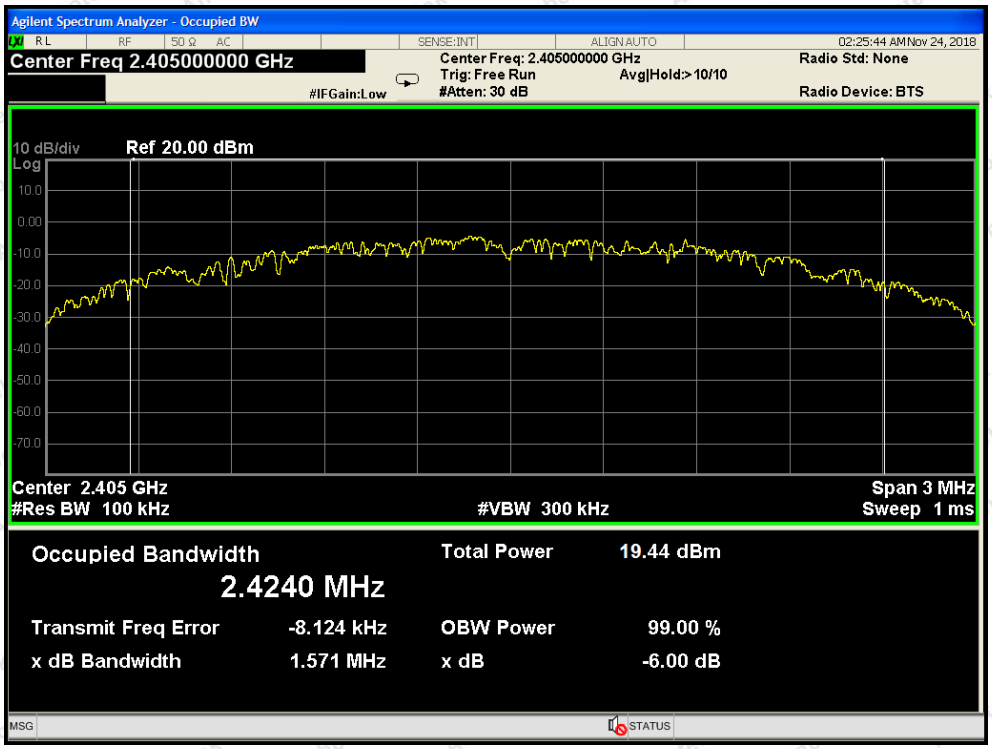
Sweep- auto couple.

4. Mark the peak frequency and –6dB (upper and lower) frequency.
5. Repeat until all the rest channels are investigated.

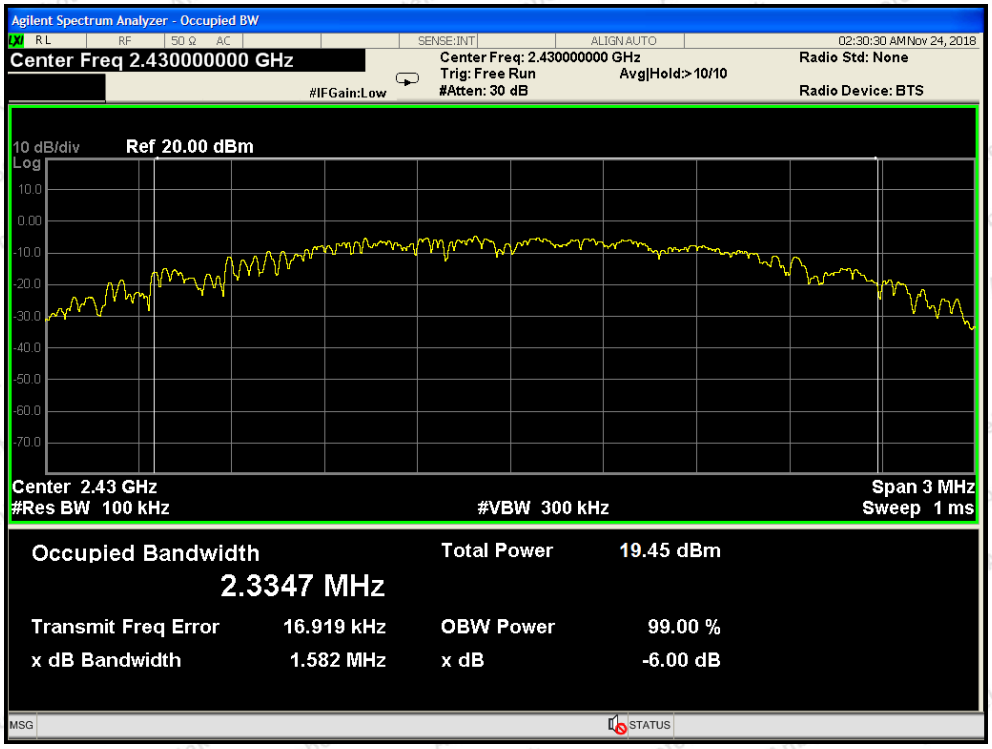
7.4. Test Data

Test Item	:	6dB Bandwidth	Test Mode	:	CH Low ~ CH High
Test Voltage	:	DC 3.7V battery inside	Temperature	:	24℃
Test Result	:	PASS	Humidity	:	55%RH

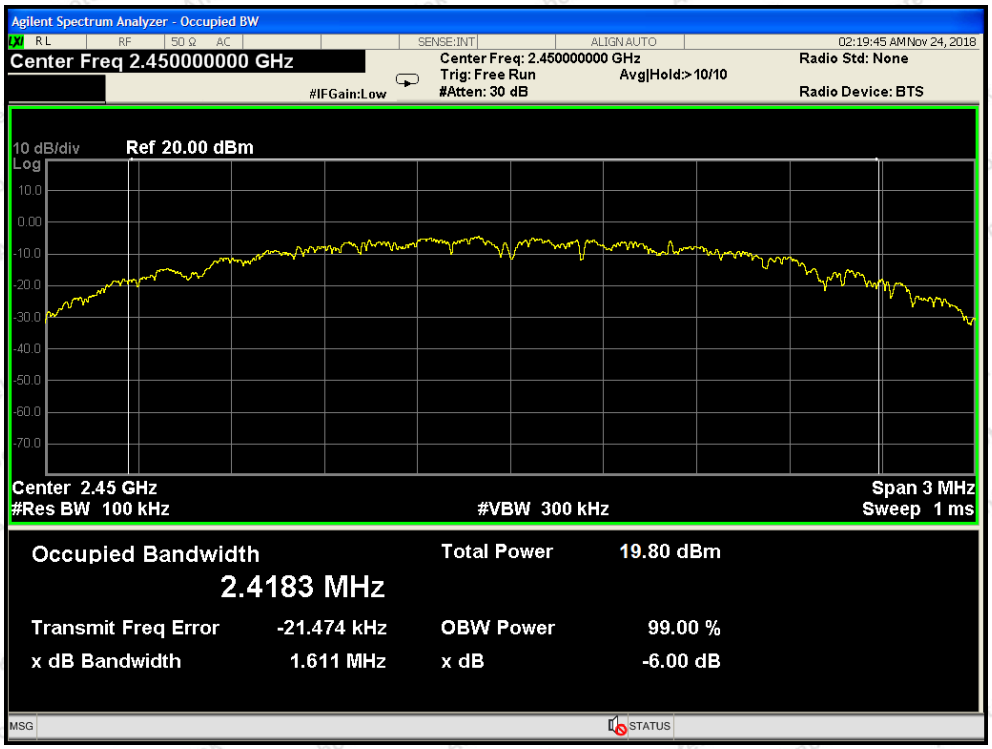
Channel	Frequency(MHz)	Bandwidth (kHz)	Limit (kHz)	Results
Low	2405	1571	>500	PASS
Middle	2430	1582		PASS
High	2450	1611		PASS



CH: Low



CH: Middle


Agilent Spectrum Analyzer - Occupied BW
Center Freq 2.450000000 GHz
Center Freq: 2.450000000 GHz
Trig: Free Run
#Atten: 30 dB
Avg|Hold:>10/10
Radio Std: None
Radio Device: BTS
02:19:45 AM Nov 24, 2018
10 dB/div
Ref 20.00 dBm
Center 2.45 GHz
#Res BW 100 kHz
#VBW 300 kHz
Span 3 MHz
Sweep 1 ms
Occupied Bandwidth
2.4183 MHz
Total Power 19.80 dBm
Transmit Freq Error -21.474 kHz
OBW Power 99.00 %
x dB Bandwidth 1.611 MHz
x dB -6.00 dB

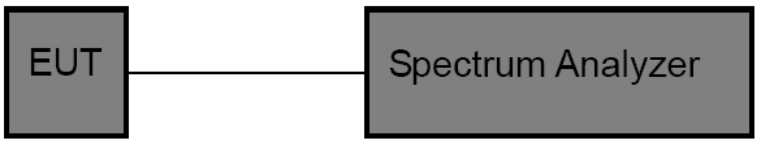
CH: High

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



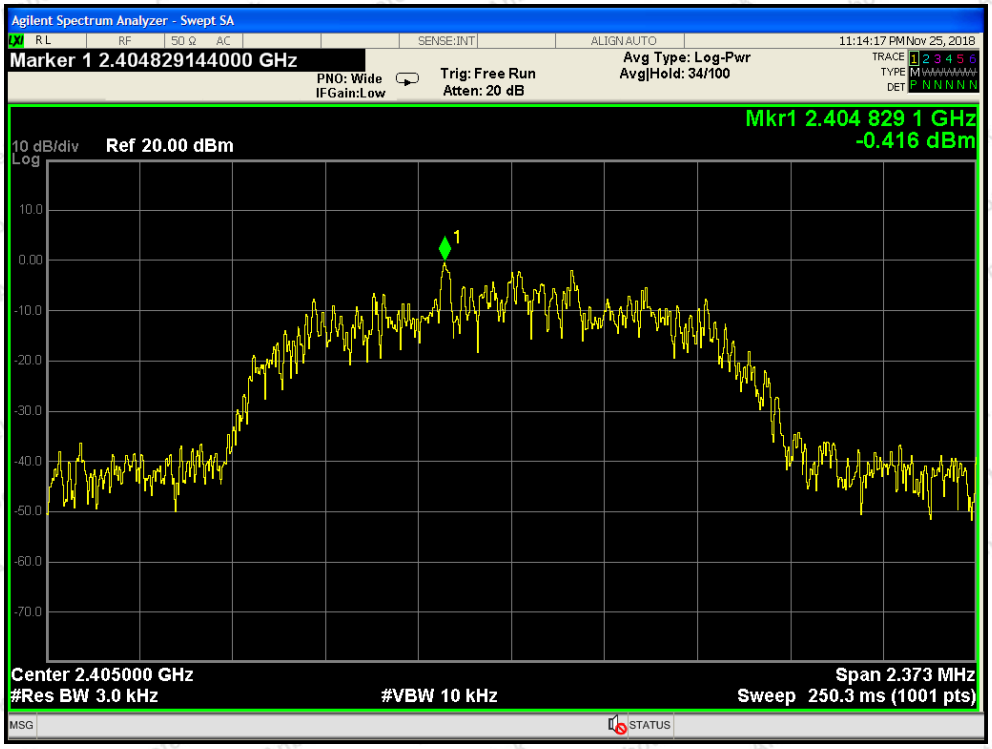
8.3. Test Procedure

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.

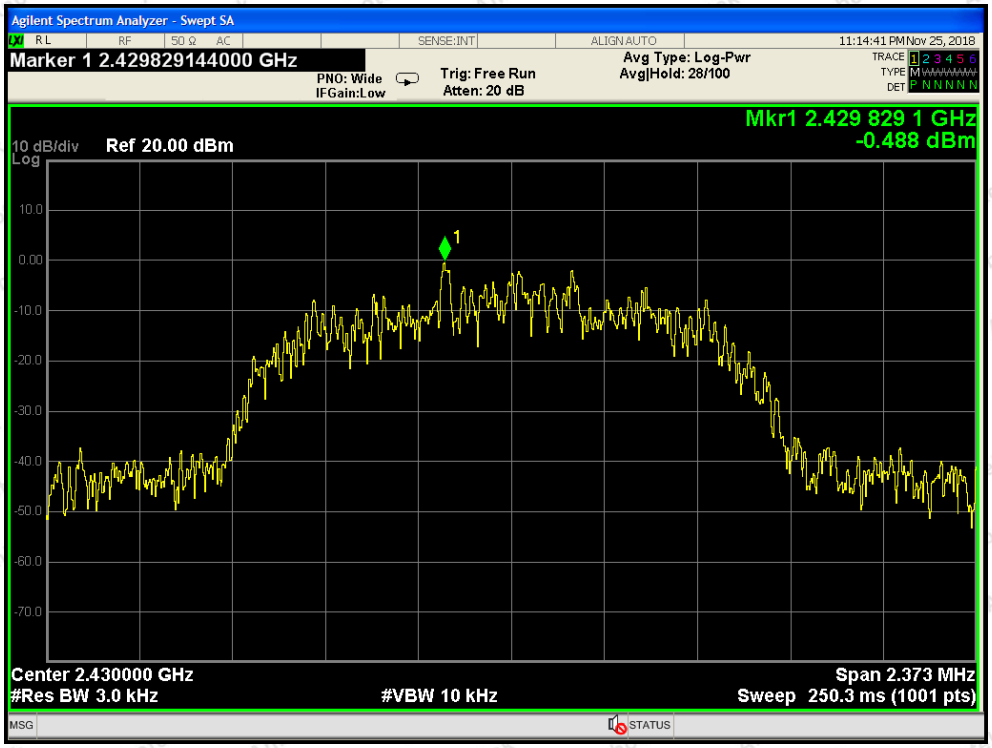
8.4. Test Data

Test Item	:	Power Spectral Density	Test Mode	:	CH Low ~ CH High
Test Voltage	:	DC 3.7V battery inside	Temperature	:	24℃
Test Result	:	PASS	Humidity	:	55%RH

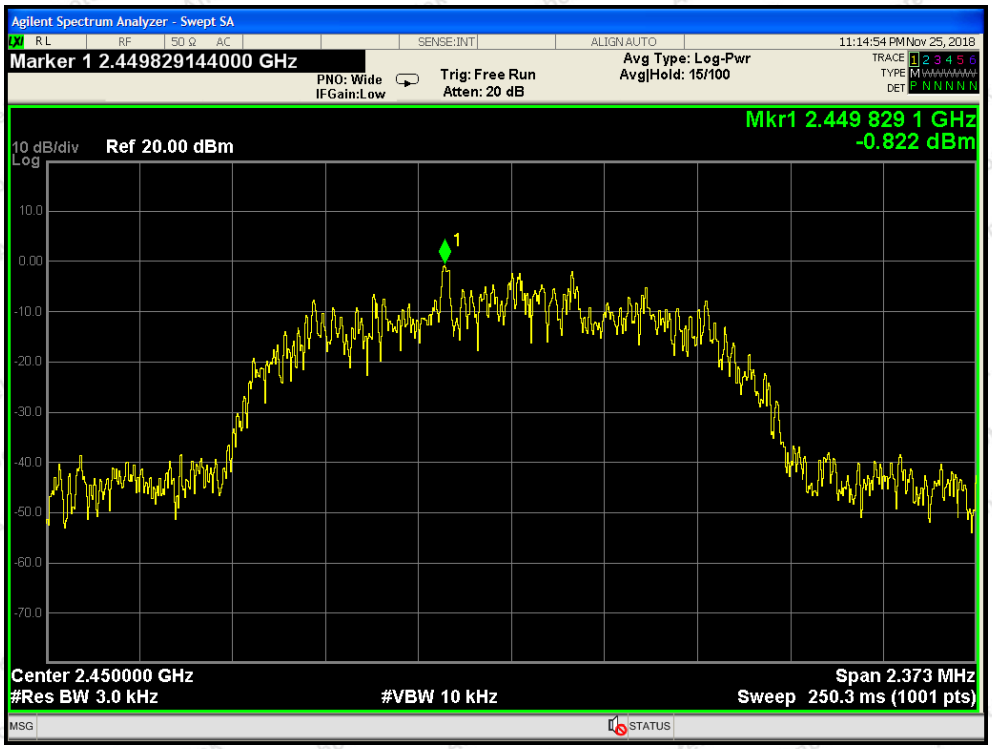
Channel	Frequency (MHz)	PSD (dBm/3KHz)	Limit (dBm/3KHz)	Results
Low	2405	-0.416	8.00	PASS
Middle	2430	-0.488	8.00	PASS
High	2450	-0.822	8.00	PASS



CH: Low



CH: Middle


Agilent Spectrum Analyzer - Swept SA
Marker 1 2.449829144000 GHz
PNO: Wide
IFGain:Low
Trig: Free Run
Atten: 20 dB
Avg Type: Log-Pwr
Avg|Hold: 15/100
11:14:54 PM Nov 25, 2018
Mkr1 2.449 829 1 GHz
-0.822 dBm
10 dB/div
Ref 20.00 dBm
Log
Center 2.450000 GHz
#Res BW 3.0 kHz
#VBW 10 kHz
Span 2.373 MHz
Sweep 250.3 ms (1001 pts)

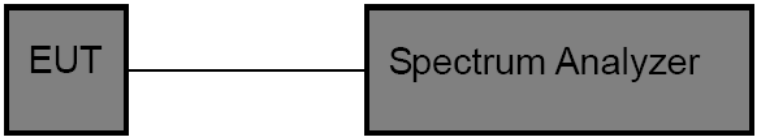
CH: High

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

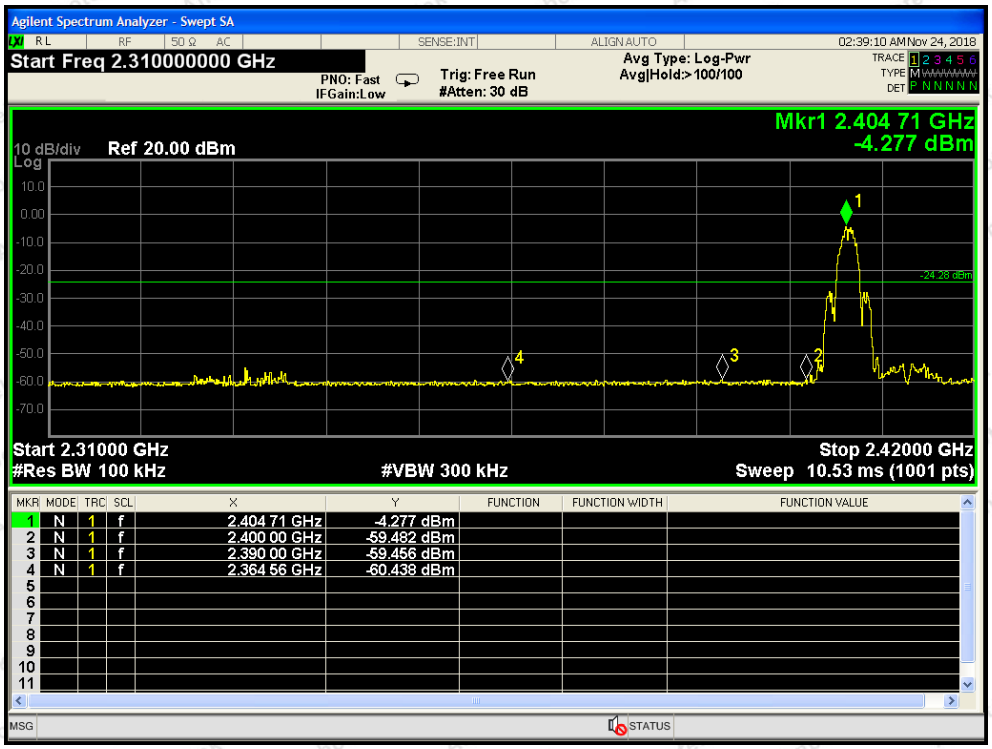
Using the following spectrum analyzer setting:

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.

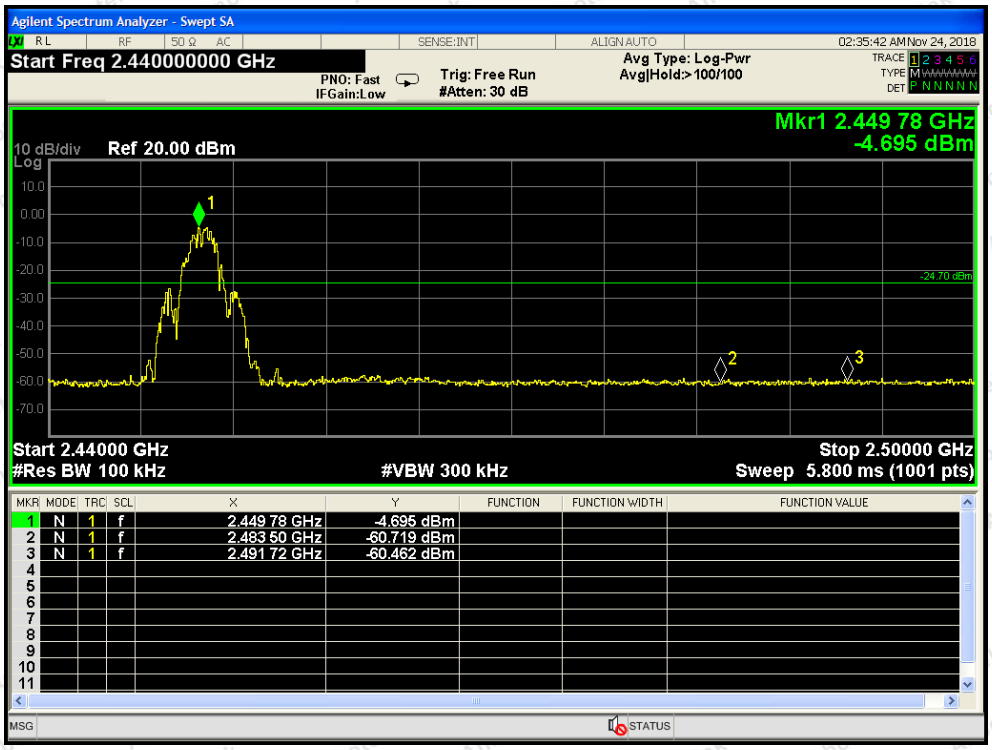
9.4. Test Data

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

Frequency Band (MHz)	Delta Peak toBand Emission (dBc)	Limit (dBc)	Results
2400	63.759	>30	PASS
2483.5	65.414	>30	PASS

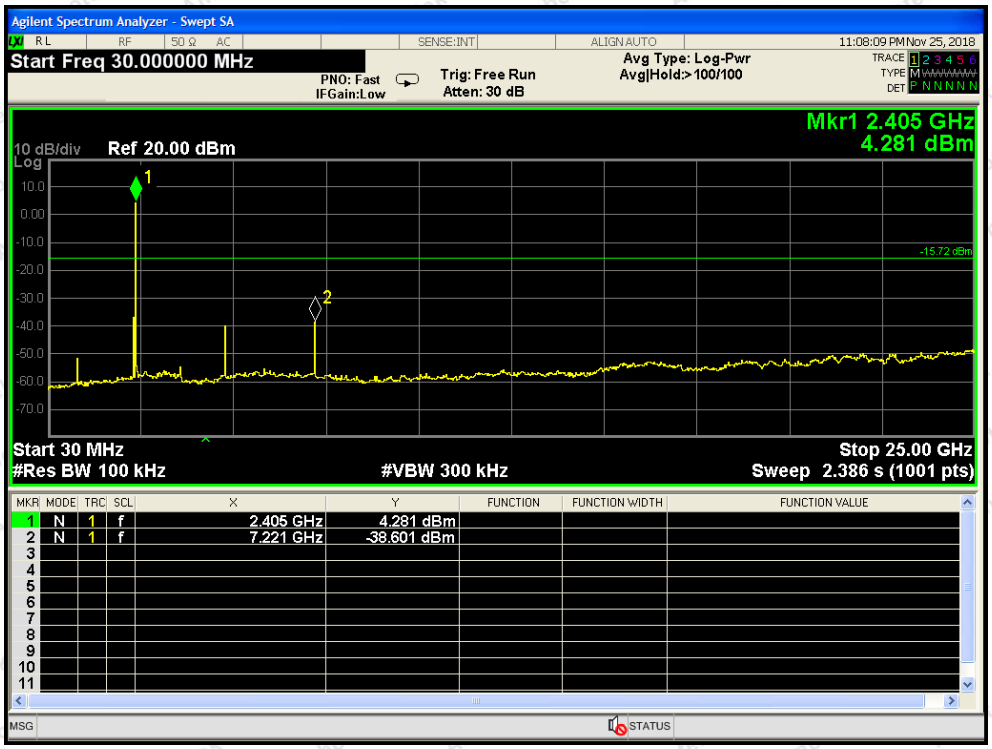


CH: Low

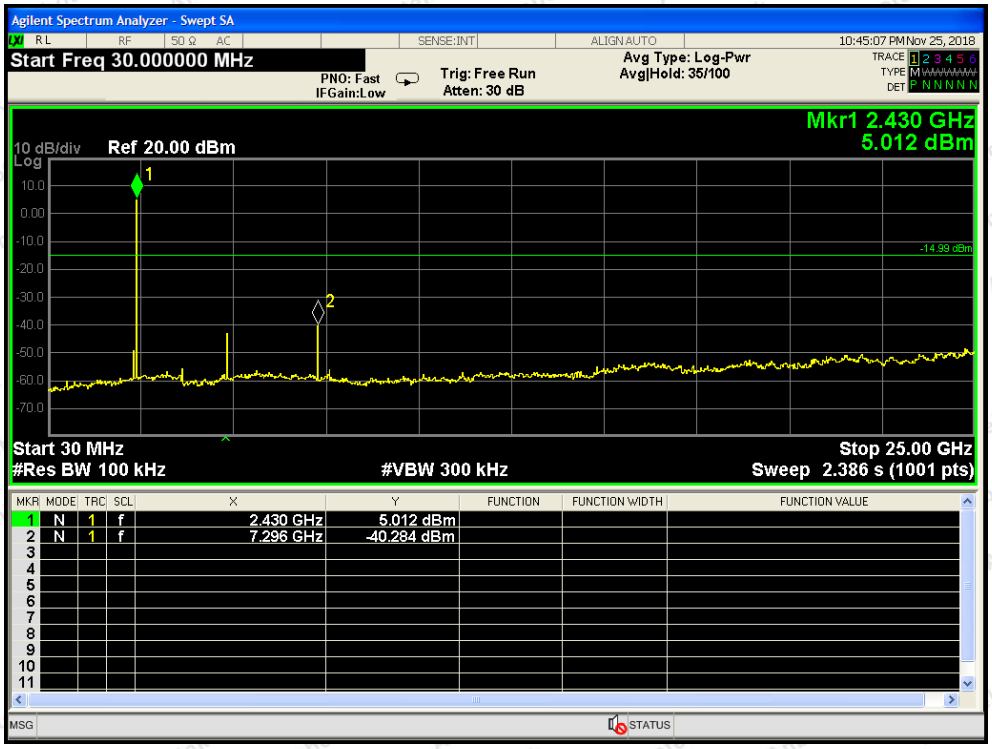


CH: High

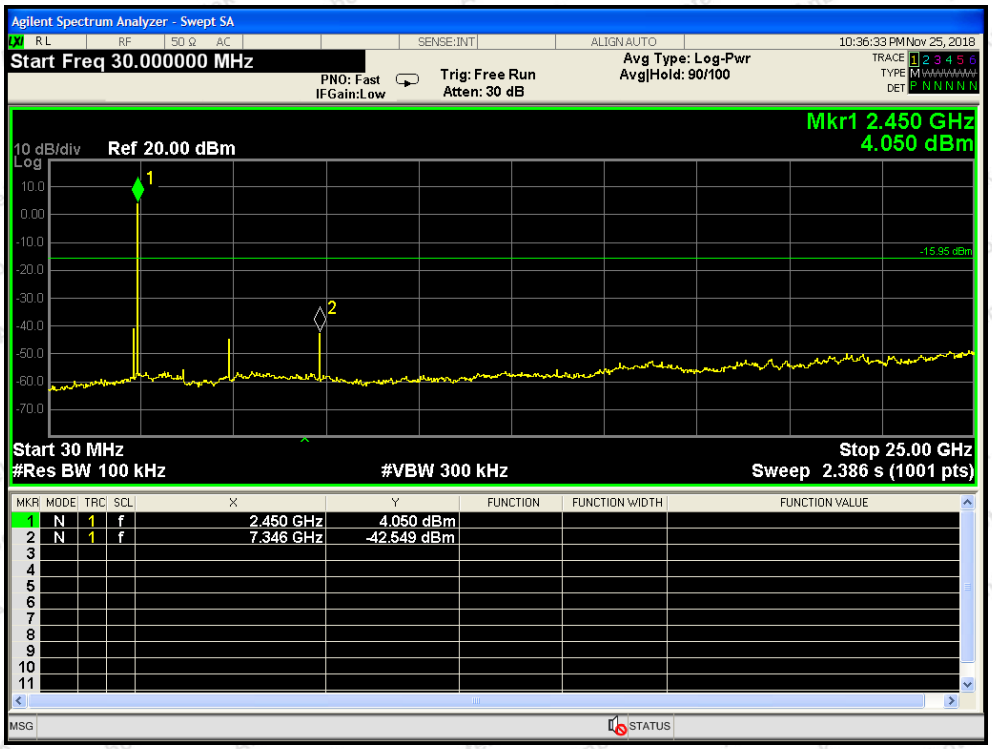
Conducted Emission Method



CH: Low



CH: Middle


Agilent Spectrum Analyzer - Swept SA
Start Freq 30.000000 MHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold: 90/100
10:36:33 PM Nov 25, 2018
Mkr1 2.450 GHz
4.050 dBm
10 dB/div
Ref 20.00 dBm
Log
-15.95 dBm
Start 30 MHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 25.00 GHz
Sweep 2.386 s (1001 pts)
1 N 1 f 2.450 GHz 4.050 dBm
2 N 1 f 7.346 GHz -42.549 dBm

CH: High

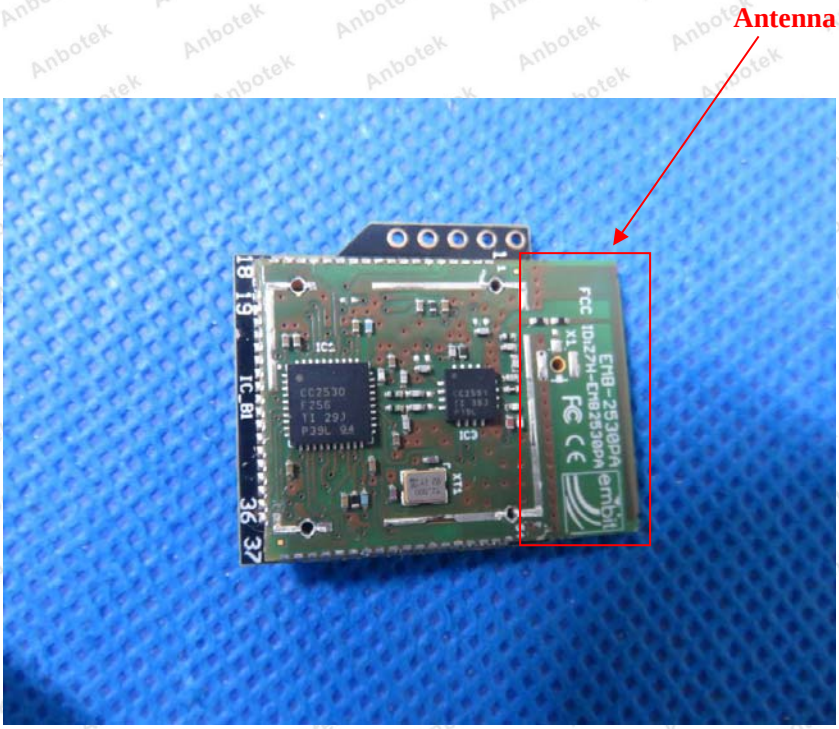
10. Antenna Requirement

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

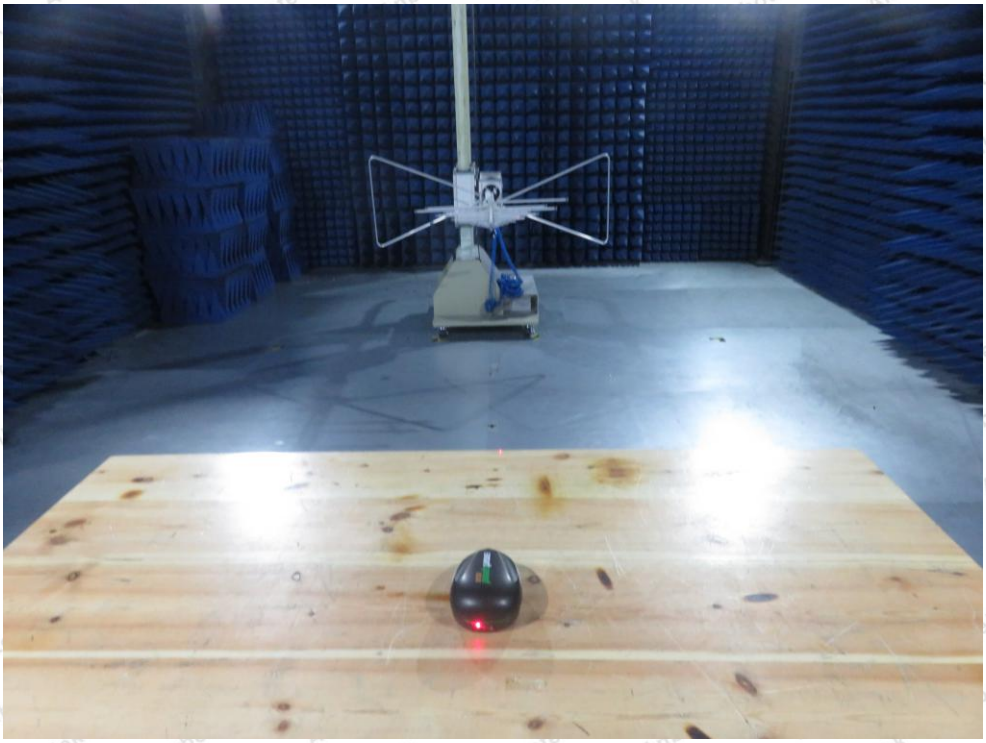
The bluetooth antenna is a PCB antenna which permanently attached, and the best case gain of the antenna is 1.5dBi. It complies with the standard requirement.

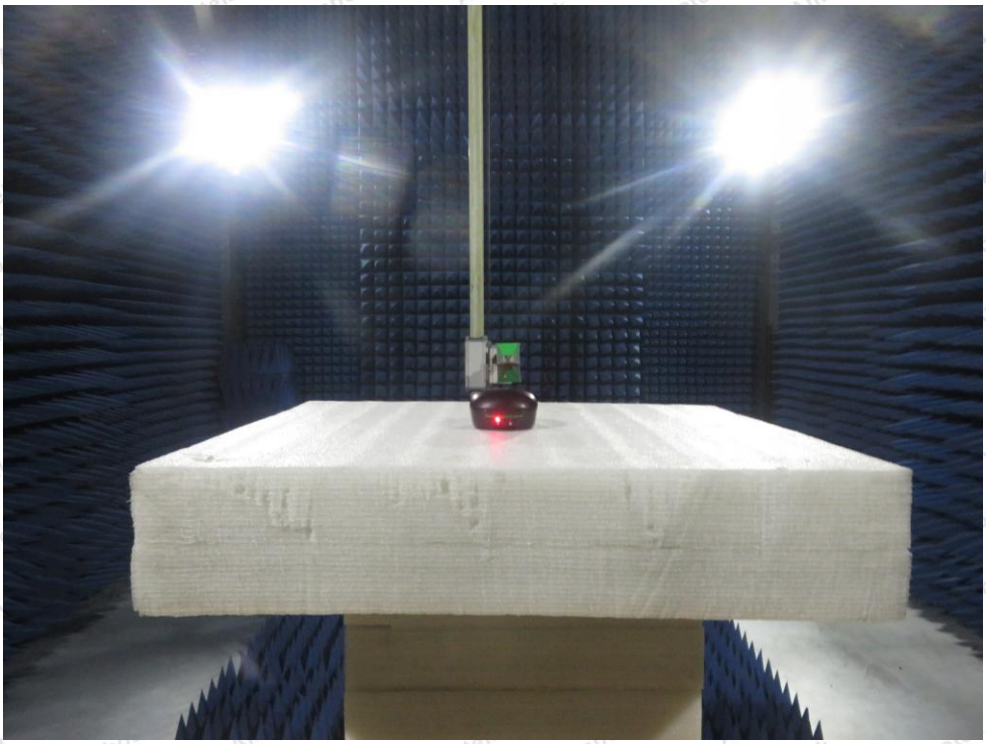


APPENDIX I -- TEST SETUP PHOTOGRAPH

Photo of Conducted Emission Measurement

Photo of Radiation Emission Test





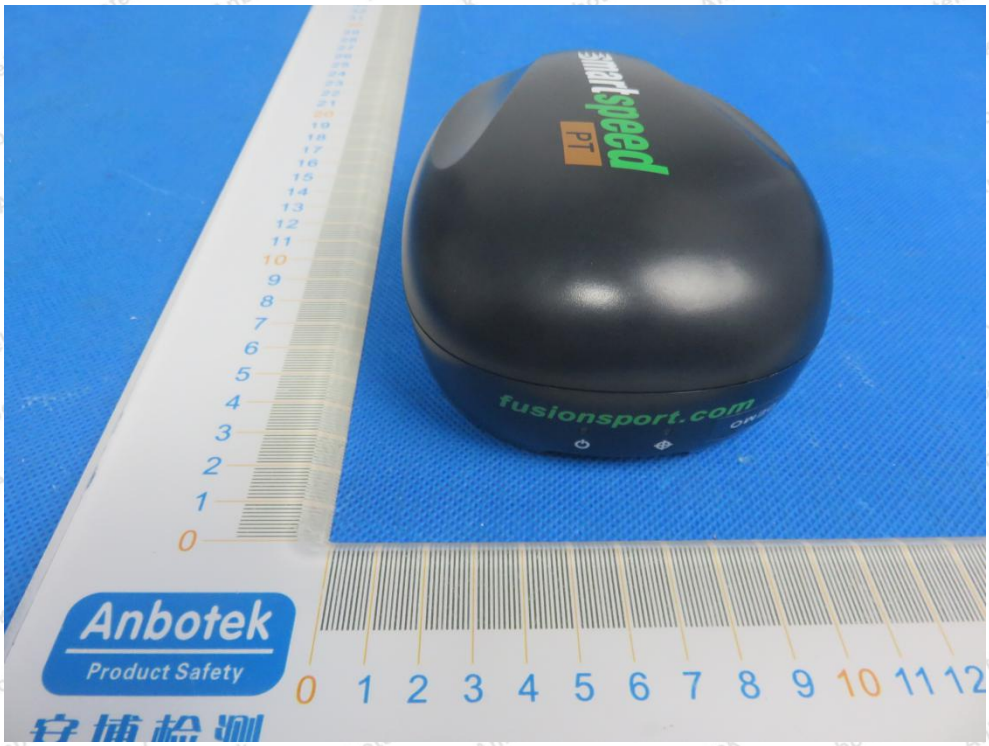
APPENDIX II -- EXTERNAL PHOTOGRAPH

Anbotek
Product Safety
安博检测

smartspeed
PT

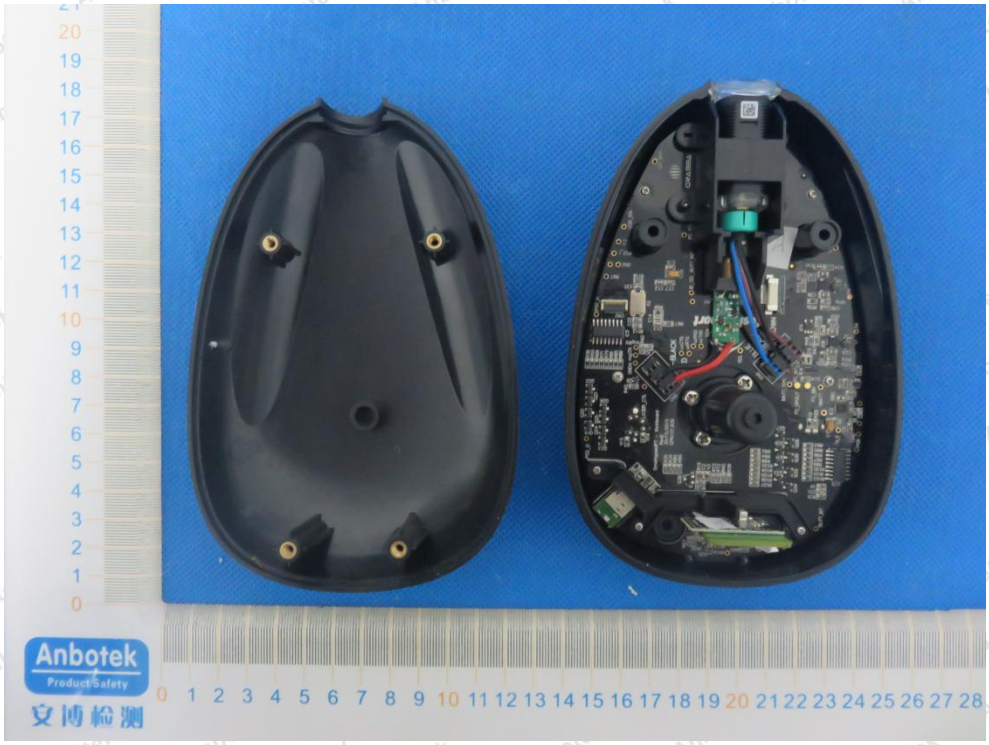
smartspeed
PT
fusion sport

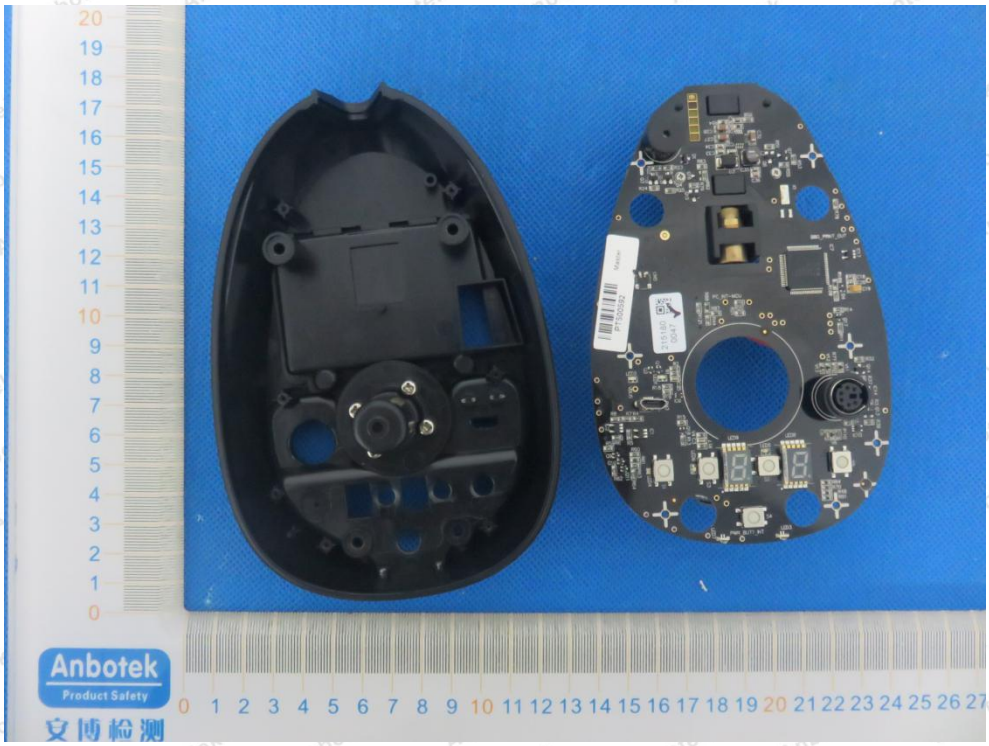
smartspeed
PT
Anbotek
Product Safety

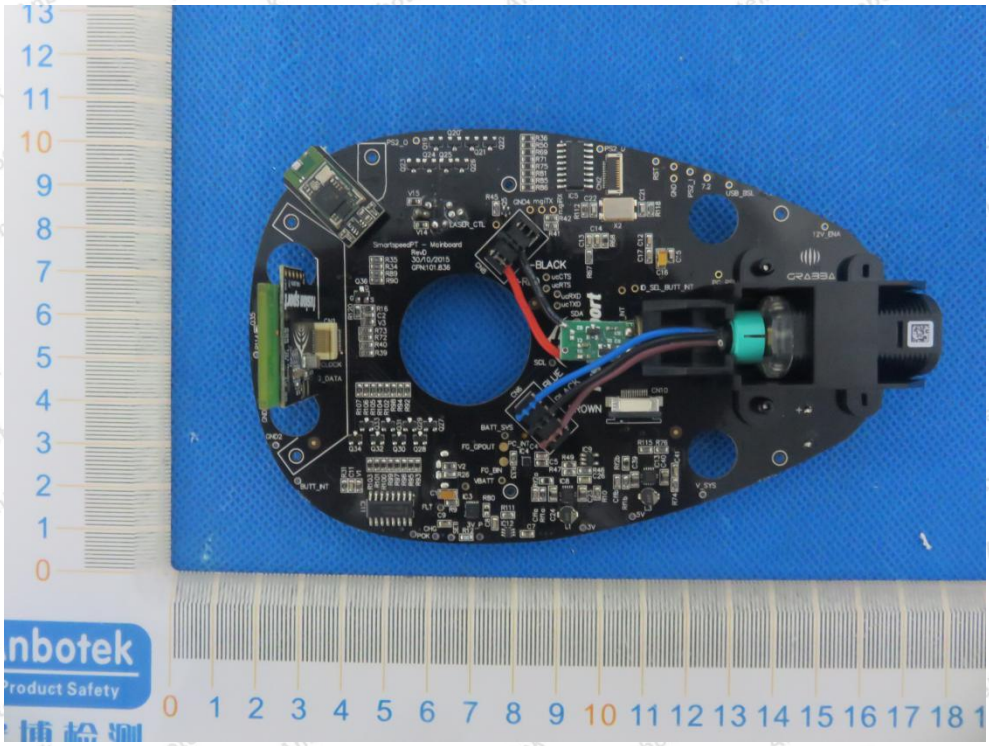

smartspeed
PT
fusionsport.com
Anbotek
Product Safety

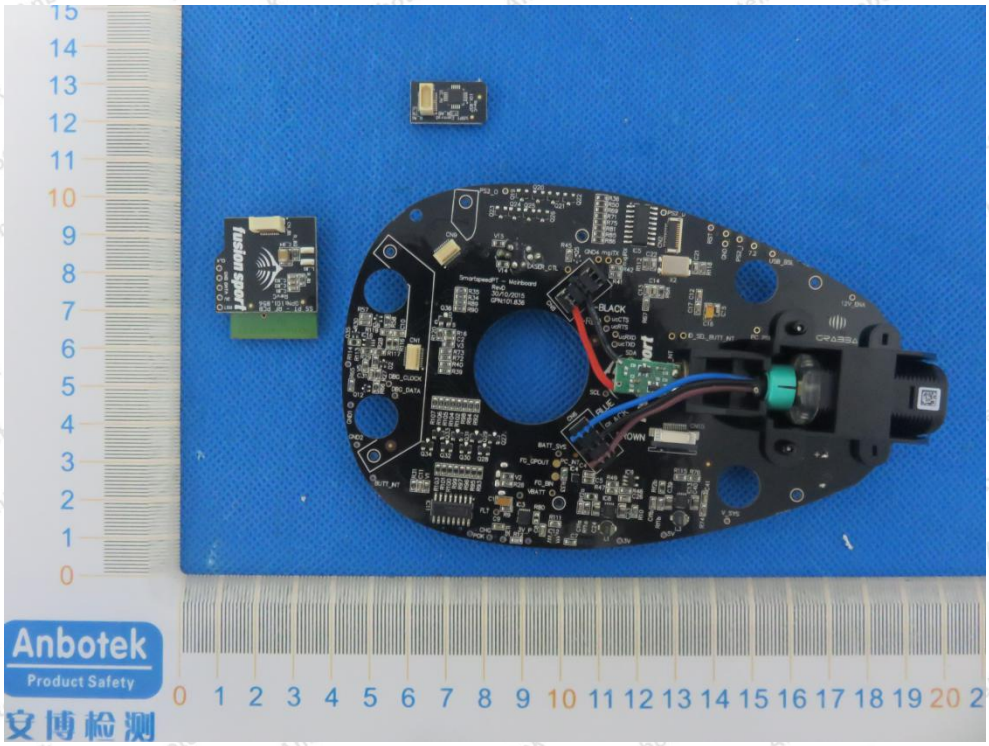
AC/DC ADAPTER
MODEL: BX-0502000
INPUT: 100-240V~
50/60Hz
OUTPUT: 5V ⎓ 2.0A
LISTED
E482953
CE BS
MADE IN CHINA

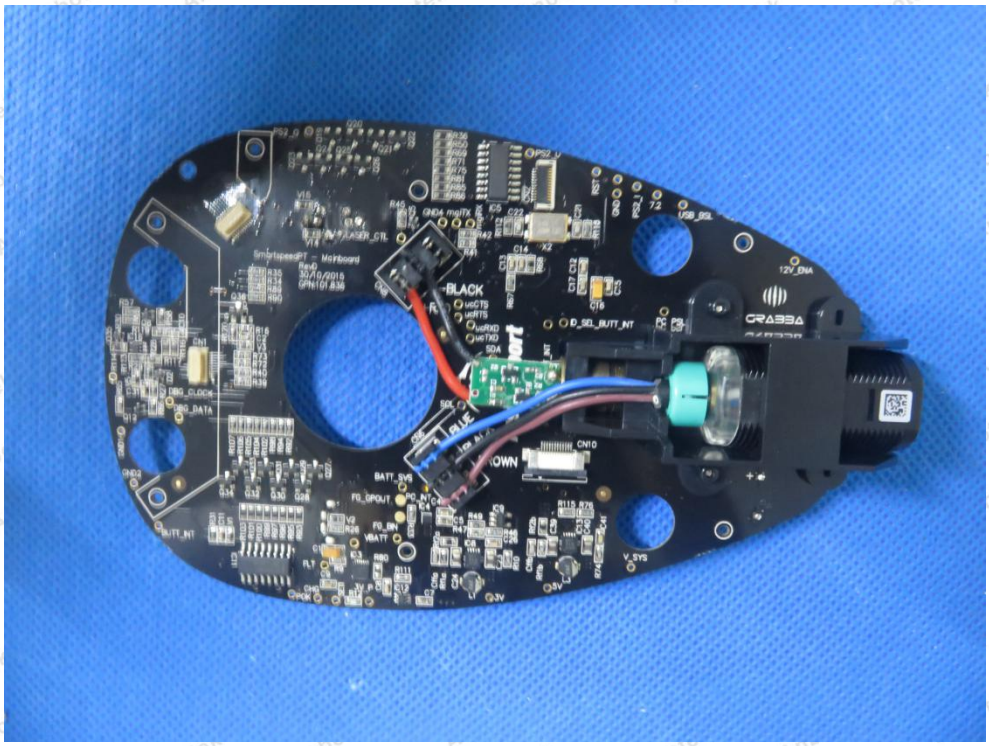
APPENDIX III -- INTERNAL PHOTOGRAPH





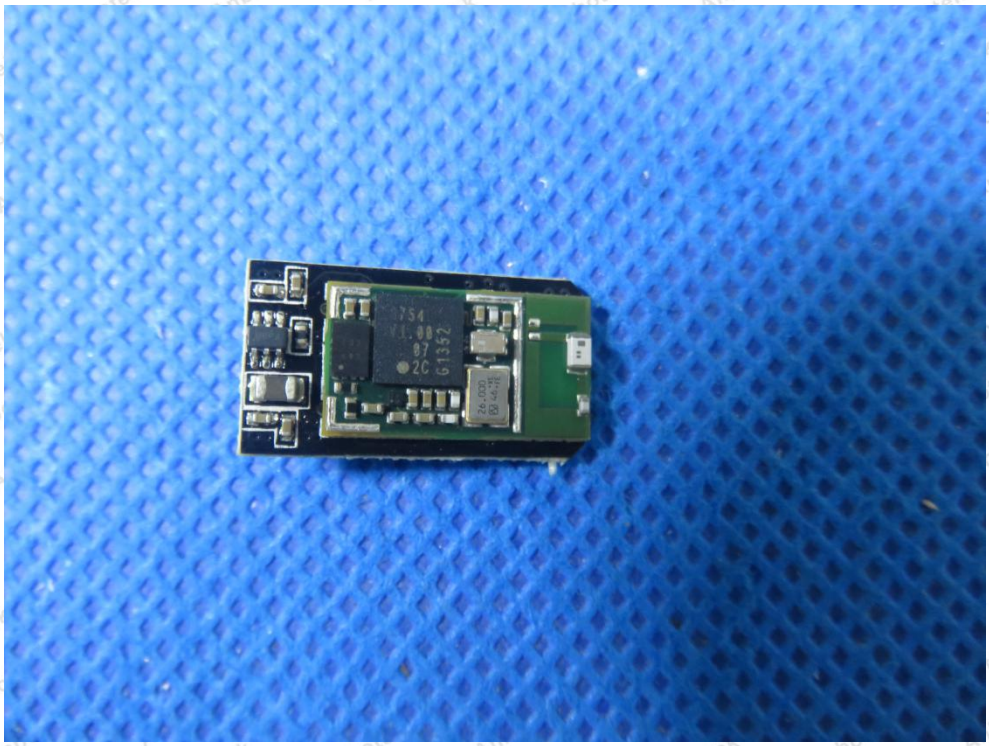

BLACK
BLUE
BROWN

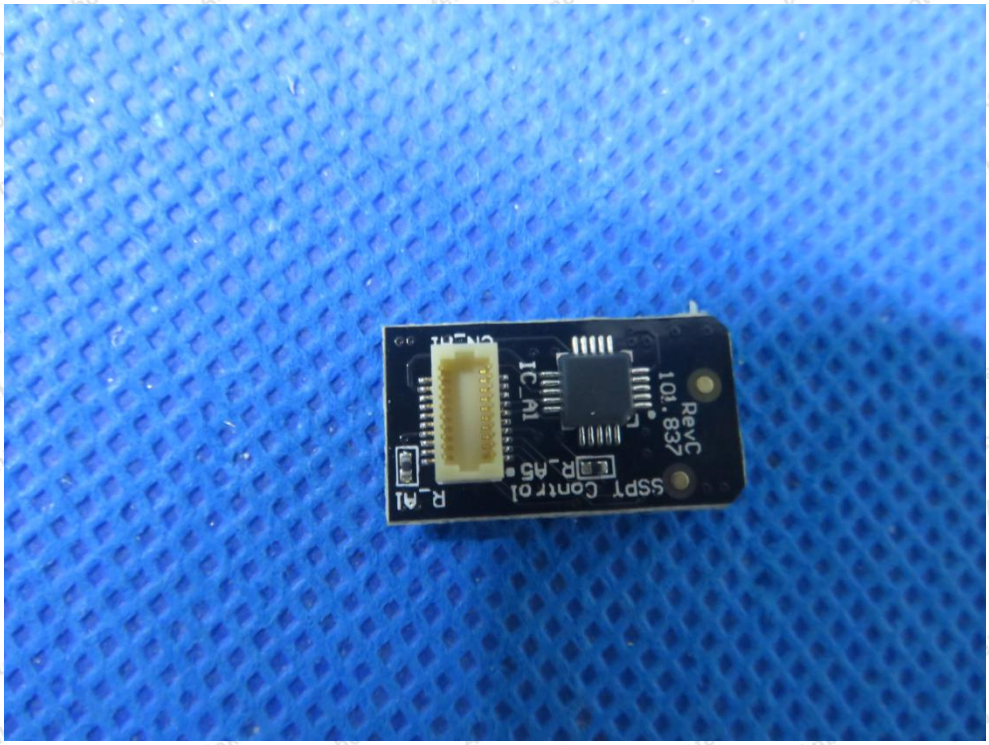


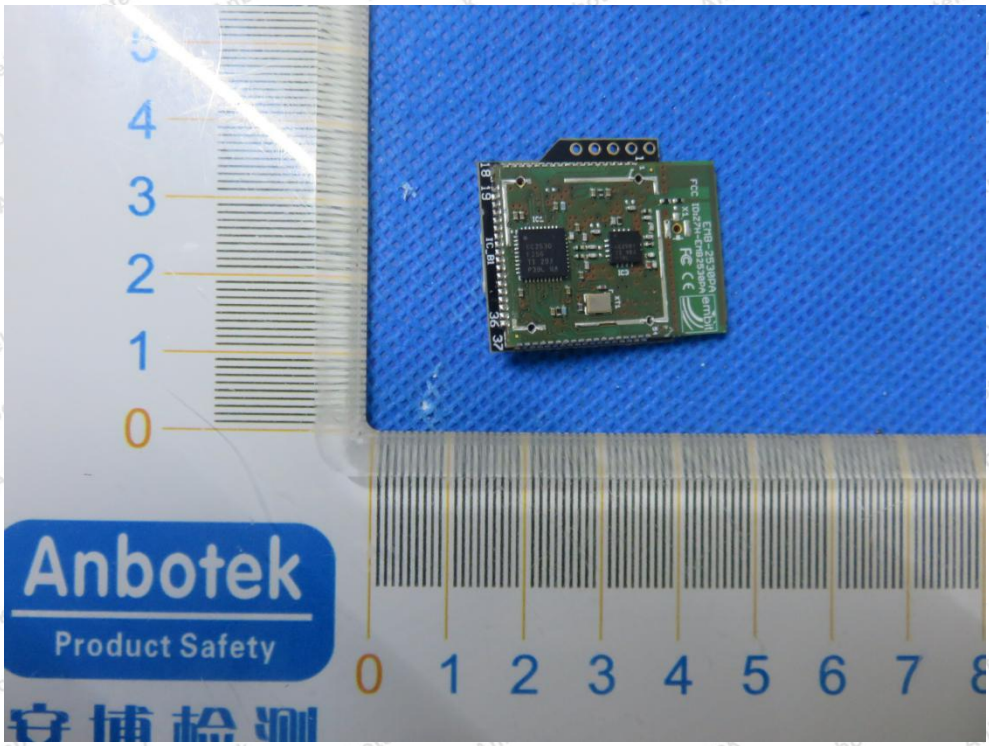


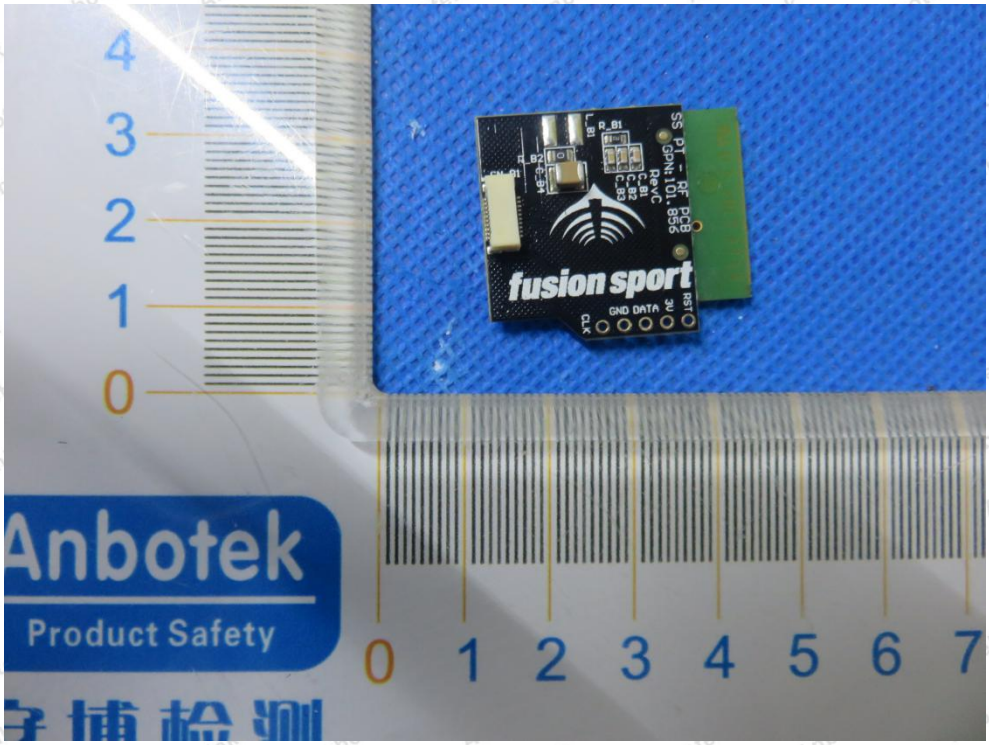
nbotek
roduct Safety

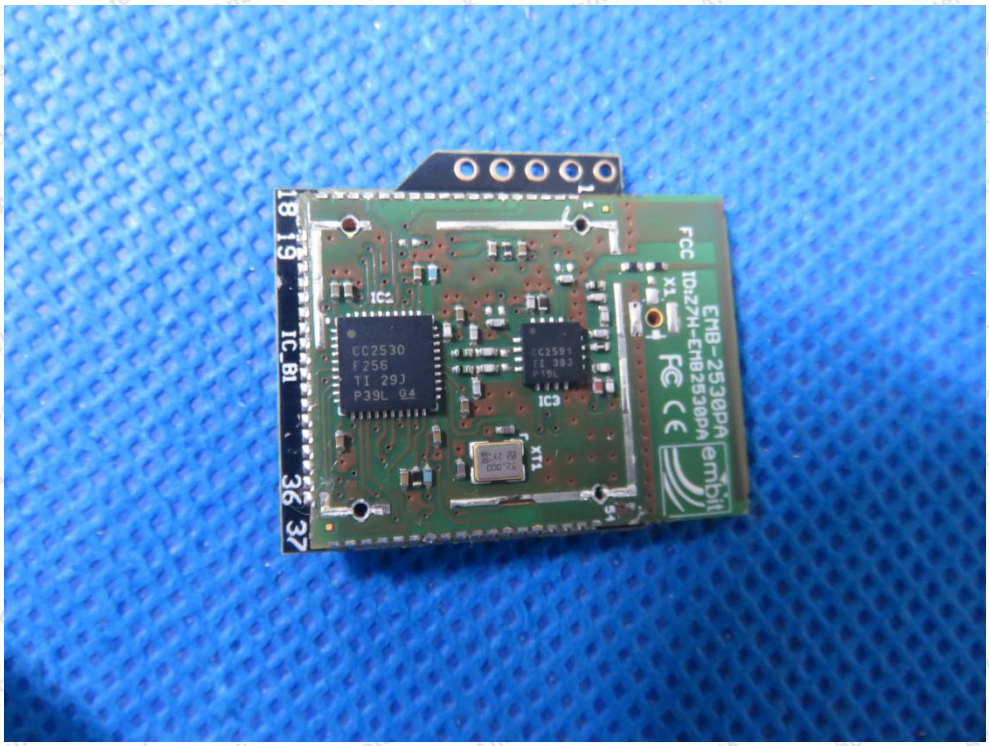
Anbotek
Product Safety




IC_A1
RevC
101.837
SSPT Control
R_A5
R_A1




fusion sport



---------- End of Report ----------