

FCC TEST REPORT

For

Handheld Rugged Terminal

Model Number: HRT500i

FCC ID: SX3-HRT500I

Report Number : WT158002878

Test Laboratory	:	Shenzhen Academy of Metrology and Quality Inspection National Digital Electronic Product Testing Center
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Test report declaration

Applicant : PRADOTEC CORPORATION SDN.BHD. (807780-P)

Address : IRIS Smart Technology Complex, Technology Park Malaysia,
Bukit Jalil, Kuala Lumpur, Malaysia

Manufacturer : OPTIMA KLASIK SDN.BHD. (807783-T)

Address : IRIS Smart Technology Complex, Technology Park Malaysia,
Bukit Jalil, Kuala Lumpur, Malaysia

EUT Description : Handheld Rugged Terminal

Model No : HRT500i

Trade mark : 

Serial Number : /

FCC ID : SX3-HRT500I

Test Standards:

FCC Part 15 15.207, 15.209, 15.247(2014)

The EUT described above is tested by Shenzhen Academy of Metrology and Quality Inspection EMC Laboratory to determine the maximum emissions from the EUT. Shenzhen Academy of Metrology and Quality Inspection EMC Laboratory is assumed full responsibility for the accuracy of the test results. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.4 (2003) and the energy emitted by the sample EUT tested as described in this report is in compliance with FCC Rules Part 15.207, 15.209 and 15.247.

The test report is valid for above tested sample only and shall not be reproduced in part without written approval of the laboratory.

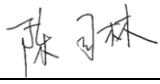
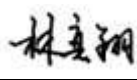
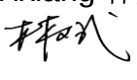
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Approved by:	 (Lin Bin 林斌)	Date:	<u>Jun.16.2015</u>

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1. TEST RESULTS SUMMARY

Table 1 Test Results Summary

Test Items	FCC Rules	Test Results
20dB bandwidth measurement	15.247 (a) (1)	Pass
Carrier frequency separation measurement	15.247 (a) (1)	Pass
Number of hopping channel	15.247 (a) (1) III	Pass
Time of occupancy	15.247 (a) (1) III	Pass
Peak output power	15.247 (b) (1)	Pass
Band edge compliance measurement	15.247 (d)	Pass
Radiated spurious emission & Radiated restricted band measurement	15.247 (d) / 15.205 & 15.209	Pass
Conducted emission test for power port	15.207	Pass

Remark: "N/A" means "Not applicable."

2. GENERAL INFORMATION

2.1. Report information

- 2.1.1. This report is not a certificate of quality; it only applies to the sample of the specific product/equipment given at the time of its testing. The results are not used to indicate or imply that they are application to the similar items. In addition, such results must not be used to indicate or imply that SMQ approves recommends or endorses the manufacture, supplier or use of such product/equipment, or that SMQ in any way guarantees the later performance of the product/equipment.
- 2.1.2. The sample/s mentioned in this report is/are supplied by Applicant, SMQ therefore assumes no responsibility for the accuracy of information on the brand name, model number, origin of manufacture or any information supplied.
- 2.1.3. Additional copies of the report are available to the Applicant at an additional fee. No third part can obtain a copy of this report through SMQ, unless the applicant has authorized SMQ in writing to do so.

2.2. Laboratory Accreditation and Relationship to Customer

The testing report were performed by the Shenzhen Academy of Metrology and quality Inspection EMC Laboratory (Guangdong EMC compliance testing center), in their facilities located at Bldg. of Metrology & Quality Inspection, Longzhu Road, Nanshan District, Shenzhen, Guangdong, China. At the time of testing, Laboratory is accredited by the following organizations:

China National Accreditation Service for Conformity Assessment (CNAS) accredits the Laboratory for conformance to FCC standards, EMC international standards and EN standards. The Registration Number is CNAS L0579.

The Laboratory is listed in the United States of American Federal Communications Commission (FCC), and the registration number are 446246 806614 994606(semi anechoic chamber).

The Laboratory is listed in Voluntary Control Council for Interference by Information Technology Equipment (VCCI), and the registration number are R-1974(open area test site) , R-1966(semi anechoic chamber),C-2117(mains ports conducted interference measurement) and T-180(telecommunication ports conducted interference measurement).

The Laboratory is registered to perform emission tests with Industry Canada (IC), and the registration number is 11177A-1 11177A-2.

TUV Rhineland accredits the Laboratory for conformance to IEC and EN standards, the registration number is E2024086Z02.

2.3.Measurement Uncertainty

Conducted Emission

9kHz~30MHz 3.5dB

Radiated Emission

30MHz~1000MHz 4.5dB

1GHz~26.5GHz 4.6dB

3. PRODUCT DESCRIPTION

3.1.EUT Description

Description	: Handheld Rugged Terminal
Manufacturer	: OPTIMA KLASIK SDN.BHD. (807783-T)
Model Number	: HRT500i
Operate Frequency	: 2.402GHz~2.480GHz
Antenna Designation	: PCB Antenna 0.0dBi

Remark: This is a derivative report based on original report WT158002172(FCC ID: SX3-HRT700).

HRT500i and HRT500, HRT700 differences are:

1. HRT700 has added on a printer board with different casing outlook
2. HRT500 and HRT500i don't have a printer
3. HRT500 and HRT500i have common casing outlook but HRT500i has added on HID module.
the rest are the same,

All the test data of HRT500i comes from the original test data of HRT500, HRT700.

3.2.Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for FCC ID: **SX3-HRT500I**, filing to comply with Section 15.207, 15.209, 15.247 of the FCC Part 15, Subpart C Rules.

3.3.Block Diagram of EUT Configuration

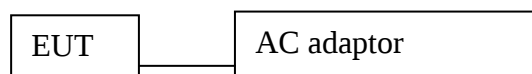


Figure 1 EUT setup

3.4.Operating Condition of EUT

The transmitter has a maximum peak conducted output power of Basic rate GFSK modulation and EDR mode 8DPSK modulation. Tests were performed with Basic rate GFSK modulation and EDR mode 8DPSK modulation.

3.5.Support Equipment List

Table 2 Support Equipment List

Name	Model No	number	Manufacturer
Adaptor for EUT	KSAS0250900300M2	--	Kuantech(Shenzhen)Co.,Ltd

3.6.Test Conditions

Date of test: May 21,2015-Jun 11, 2015

Date of EUT Receive: May 21,2015

Temperature: 21-24 °C

Relative Humidity: 48-54%

3.7.Special Accessories

Not available for this EUT intended for grant.

3.8.Equipment Modifications

Not available for this EUT intended for grant.

4. TEST EQUIPMENT USED

Test 3 Test Equipment

No.	Equipment	Manufacturer	Model No.	Last Cal.	Cal. Interval
SB2603	EMI Test Receiver	Rohde & Schwarz	ESCS30	Dec.19, 2014	1 Year
SB3321	AMN	Rohde & Schwarz	ESH2-Z5	Jan.18, 2015	1 Year
SB2604	AMN	Rohde & Schwarz	ESH3-Z5	Nov.18, 2015	1 Year
----	Radiated Emissions Cable set	HUBER+SUHN ER	---	Jan.19, 2015	1 Year
SB8501/09	EMI Test Receiver	Rohde & Schwarz	ESU40	Mar.19, 2015	1 Year
SB8501/04	Bilog Antenna	Schwarzbeck	VULB9163	Mar.19, 2015	1 Year
SB3435	Horn Antenna	Rohde & Schwarz	HF906	Jan.19, 2015	1 Year
SB5392/02	Horn Antenna	Amplifier Research	AT4560	May.15, 2015	1 Year
SB3450/01	3m Semi-anechoic chamber	Albatross Projects	9X6X6	Oct.09, 2014	2 Years
SB3345	Loop Antenna	Schwarzbeck	FMZB1516	Jan.19, 2015	2 Years
SB3437	Power meter	Rohde & Schwarz	NRVD	Jul.02,2014	1 Year
SB3437/01	Power sensor	Rohde & Schwarz	URV5-Z2	Jul.02,2014	1 Year
SB9721/02	Signal Analyzer	Agilent	N9020A	Jan.05, 2015	1 Year
----	Radiated Emissions Cable set	HUBER+SUHN ER	---	Jan.19, 2015	1 Year
---	Radiated Emissions Cable set	HUBER+SUHN ER	---	Jan.19, 2015	1 Year
SB8501/17	Preamplifier	Rohde & Schwarz	SCU-18	Mar.27, 2015	1 Year
SB8501/16	Preamplifier	Rohde & Schwarz	SCU-26	Mar.27, 2015	1 Year
SB9059	Preamplifier	Rohde & Schwarz	SCU-40	May.12, 2015	1 Year

5. CONDUCTED DISTURBANCE TEST

5.1. Test Standard and Limit

5.1.1. Test Standard

FCC Part 15 15.207

5.1.2. Test Limit

Table 4 Conducted Disturbance Test Limit

Frequency	Maximum RF Line Voltage (dB μ V)	
	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

* The lower limit shall apply at the transition frequency.

5.2. 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 (R&S Test Receiver ESCS30) is used to test the emissions from both sides of AC line. According to the requirements in Section 7 and 13 of ANSI C63.4-2003. Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR Quasi-Peak and average detector mode.

The bandwidth of EMI test receiver is set at 9kHz.

5.3. 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.

5.4. Test Data

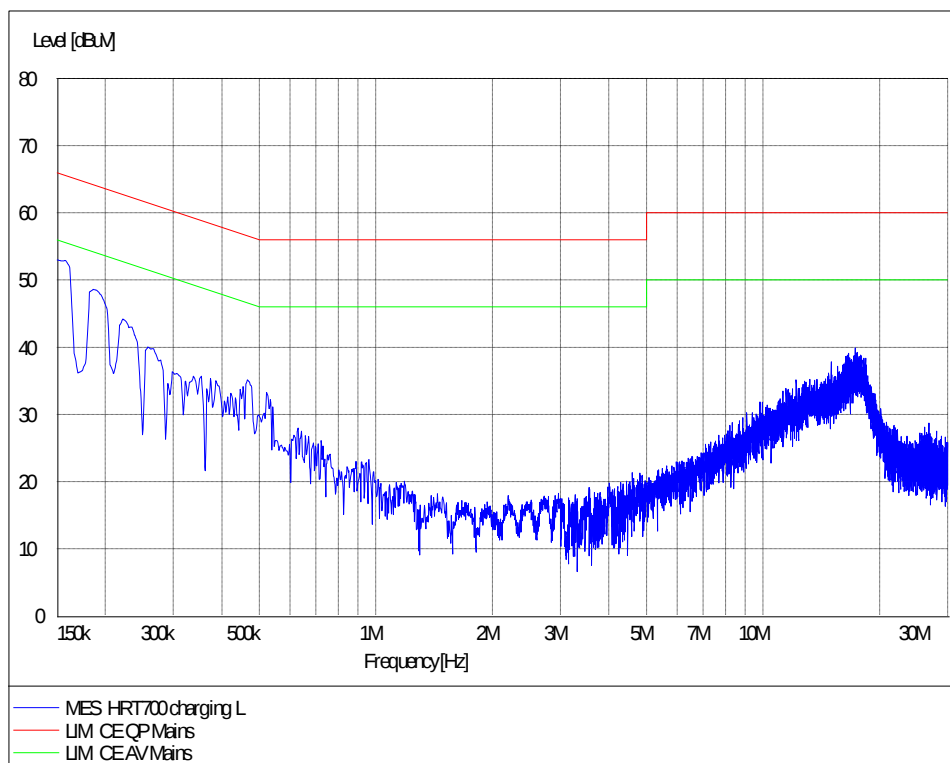
The emissions don't show in below are too low against the limits. Refer to the test curves.

Table 5 Conducted Disturbance Test Data

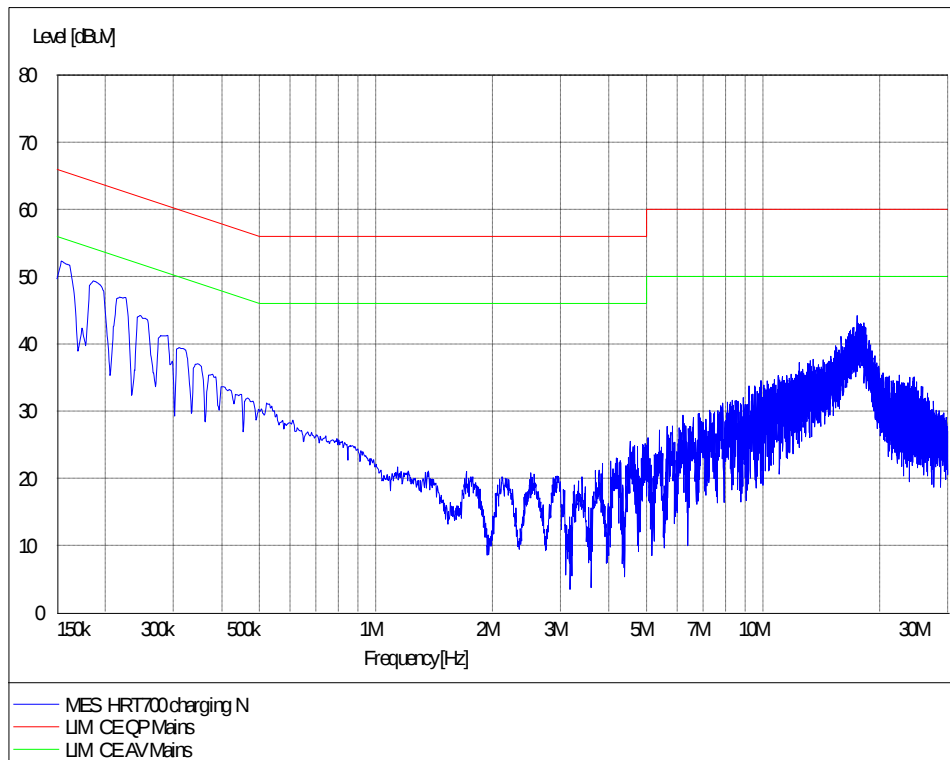
Model No.: HRT500i								
Test mode: Charging and transmitter								
	Frequency (MHz)	Correction Factor (dB)	Quasi-Peak			Average		
			Reading (dB μ V)	Emission Level (dB μ V)	Limits (dB μ V)	Reading (dB μ V)	Emission Level (dB μ V)	Limits (dB μ V)
Line	0.150	9.7	40.9	50.6	66	26.4	36.1	56
	0.182	9.7	29.0	38.7	64.4	13.1	22.8	54.4
	0.230	9.7	28.7	38.4	62.4	13.9	23.6	52.4
	0.514	9.8	28.1	37.9	56	23.2	33	46
	0.598	9.8	29.6	39.4	56	22.8	32.6	46
	0.890	9.8	14.5	24.3	56	5.8	15.6	46
Neutral	0.154	9.7	39.1	48.8	65.8	17.0	26.7	55.8
	0.222	9.7	37.4	47.1	62.7	22.3	32	52.7
	0.270	9.7	25.5	35.2	61.1	11.2	20.9	51.1
	0.518	9.8	25.9	35.7	56	9.4	19.2	46
	0.582	9.8	25.7	35.5	56	6.0	15.8	46
	20.796	10.2	27.3	37.5	60	16.6	26.8	50

REMARKS: 1. Emission level(dBuV)=Read Value(dBuV) + Correction Factor(dB)
2. Correction Factor(dB) =LISN Factor (dB) + Cable Factor (dB)+Limiter Factor(dB)
3. The other emission levels were very low against the limit.

EUT: HRT500i
Manufacturer:
Operating Condition: Charging and transmitter
Test Site:
Operator:
Test Specification: L
Comment: AC 120V/60H



EUT: HRT500i
Manufacturer:
Operating Condition: Charging and transmitter
Test Site:
Operator:
Test Specification: N
Comment: AC 120V/60Hz



6. RADIATED DISTURBANCE TEST

6.1. Test Standard and Limit

6.1.1. Test Standard

FCC Part 15 15.209

6.1.2. Test Limit

Table 6 Radiation Disturbance Test Limit for FCC (Class B)(9KHz-1GHz)

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009~0.490	2400/F(KHz)	300
0.490~1.705	24000/F(KHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
960~1000	500	3

Table 7 Radiation Disturbance Test Limit for FCC (Class B)(Above 1G)

Frequency (MHz)	(dBuV/m) (at 3 meters)	
	PEAK	AVERAGE
Above 1000	74	54

* The lower limit shall apply at the transition frequency.

* The test distance is 3m.

6.2. Test Procedure

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. In order to find out the max emission, the relative positions of this hand-held transmitter(EUT) was rotated through three orthogonal axes according to the requirements in Section 8 and 13 of ANSI C63.4-2003.

Radiated measurements were performed on the frequency range from 30MHz to 25GHz. All readings from 30 MHz to 1 GHz are quasi-peak values with a resolution bandwidth of 120 kHz , $VBW \geq RBW$. All readings above 1 GHz are AV and PK values. $RBW=1MHz$ and $VBW=10Hz$ for AV value , $RBW=1MHz$ and $VBW \geq RBW$ for peak value.
Measurements were made at 3 meters

6.3.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.

6.4.Test Data

The emissions don't show in following result tables are more than 20dB below the limits.
Bluetooth basic rate and Bluetooth EDR mode were tested, below only shows worst case result of Bluetooth basic rate.
The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line per 15.31(o) was not reported.

Table 8 General Radiated Emission Data

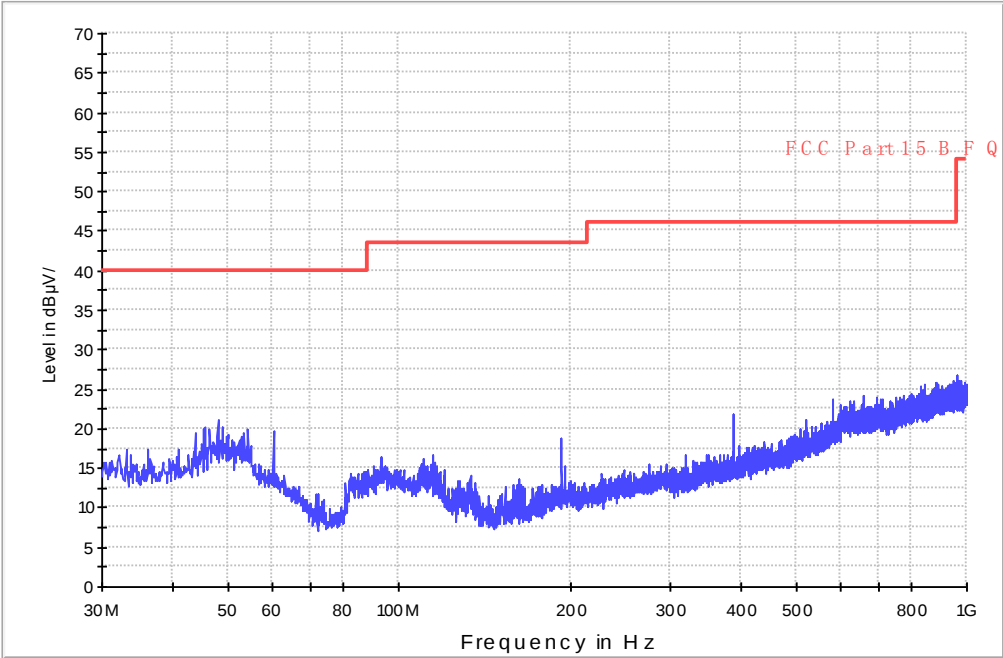
Model No.: HRT500i						
Test mode: Channel B						
Below 1GHz						
Frequency MHz	Emission (dBuV/m)	Read Value (dBuV)	Correction Factor (dB/m)	Polarization	Limits (dBuV/m)	Note
--	--	--	--	--	--	--
--	--	--	--	--	--	--
--	--	--	--	--	--	--
Above 1GHz						

Frequency MHz	Emission (dBuV/m)	Read Value (dBuV)	Correction Factor (dB/m)	Polarization	Limits (dBuV/m)	Note
--	--	--	--	--	--	--
--	--	--	--	--	--	--
--	--	--	--	--	--	--

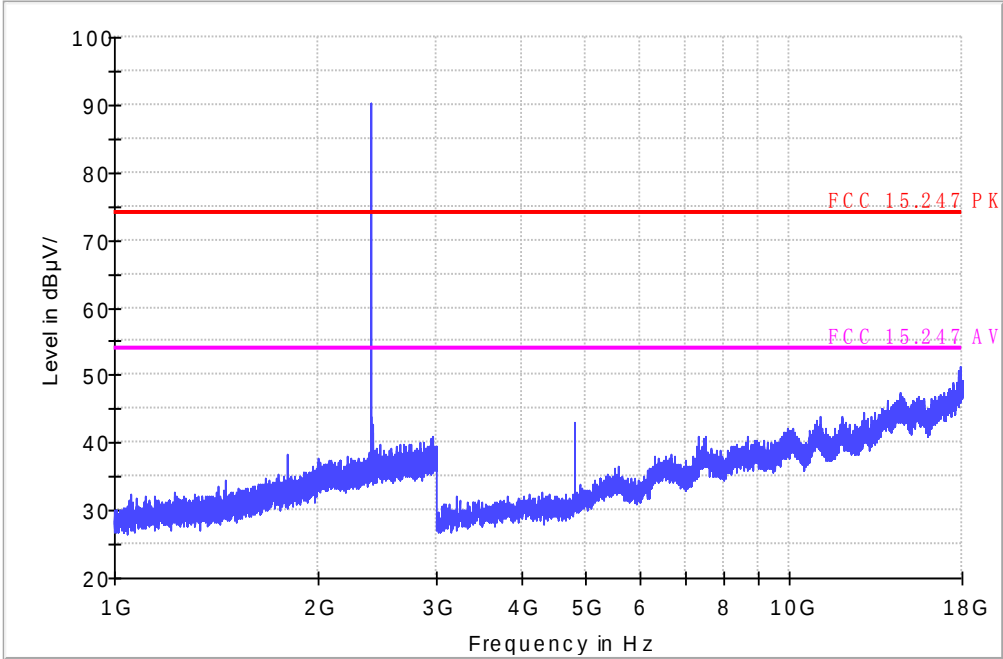
REMARKS: 1. Emission level(dBuV/m)=Read Value(dBuV) + Correction Factor(dB/m)
 2. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB)
 3. The other emission levels were very low against the limit.

Horizontal

Field strength 30M-1GHz 1F 3m chamber

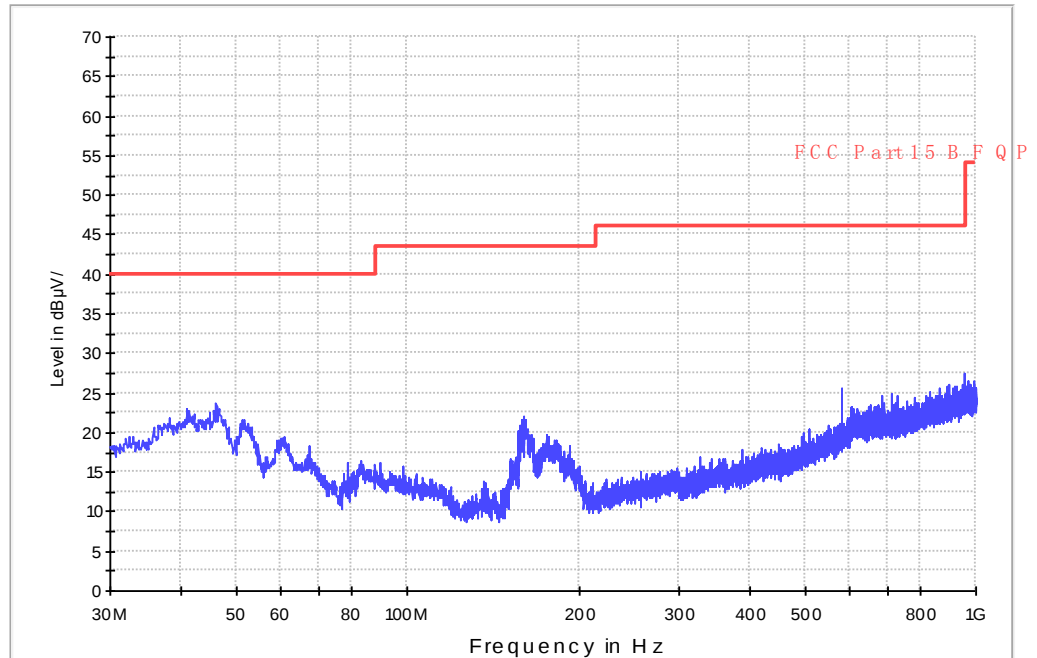


FCC Electric Field Strength 1-18GHz operate on 2.4GHz

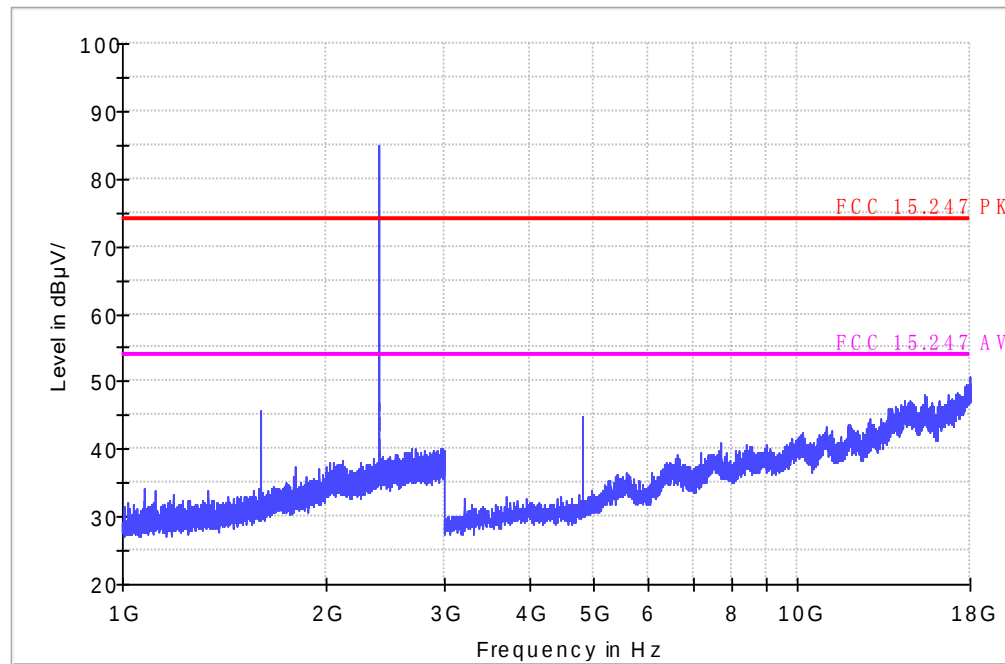


Vertical

Field strength 30M-1GHz 1F 3m chamber



FCC Electric Field Strength 1-18GHz operate on 2.4GHz



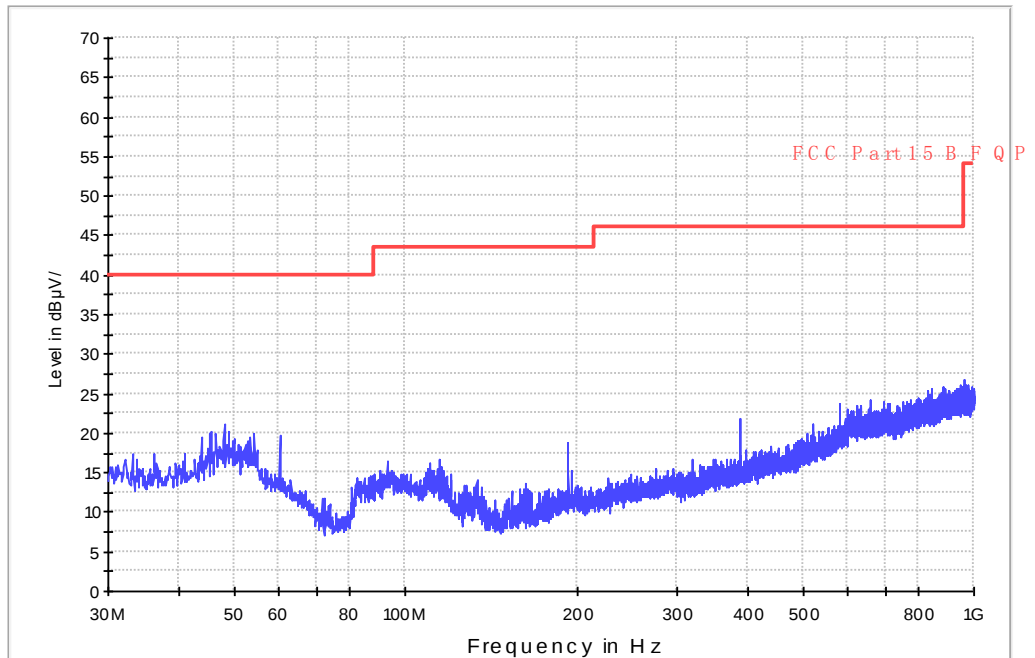
Model No.: HRT500i						
Test mode: Channel M						
Below 1GHz						
Frequency MHz	Emission (dBuV/m)	Read Value (dBuV)	Correction Factor (dB/m)	Polarization	Limits (dBuV/m)	Note
--	--	--	--	--	--	--
--	--	--	--	--	--	--
--	--	--	--	--	--	--
Above 1GHz						

Frequency MHz	Emission (dBuV/m)	Read Value (dBuV)	Correction Factor (dB/m)	Polarization	Limits (dBuV/m)	Note
--	--	--	--	--	--	--
--	--	--	--	--	--	--
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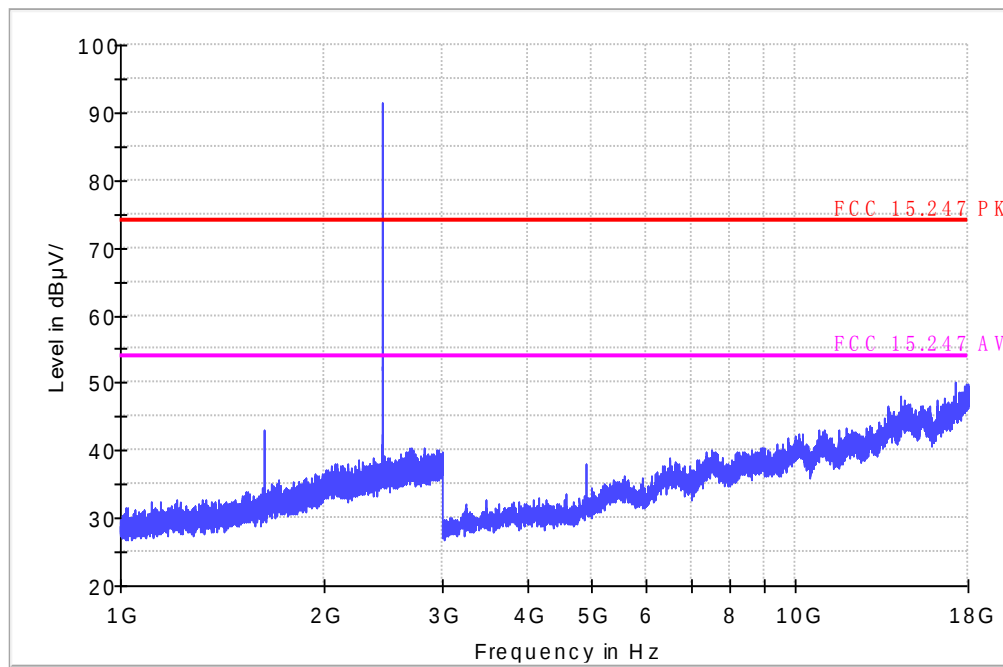
REMARKS: 1. Emission level(dBuV/m)=Read Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB)
3. The other emission levels were very low against the limit.

Horizontal

Field strength 30M-1GHz 1F 3m chamber

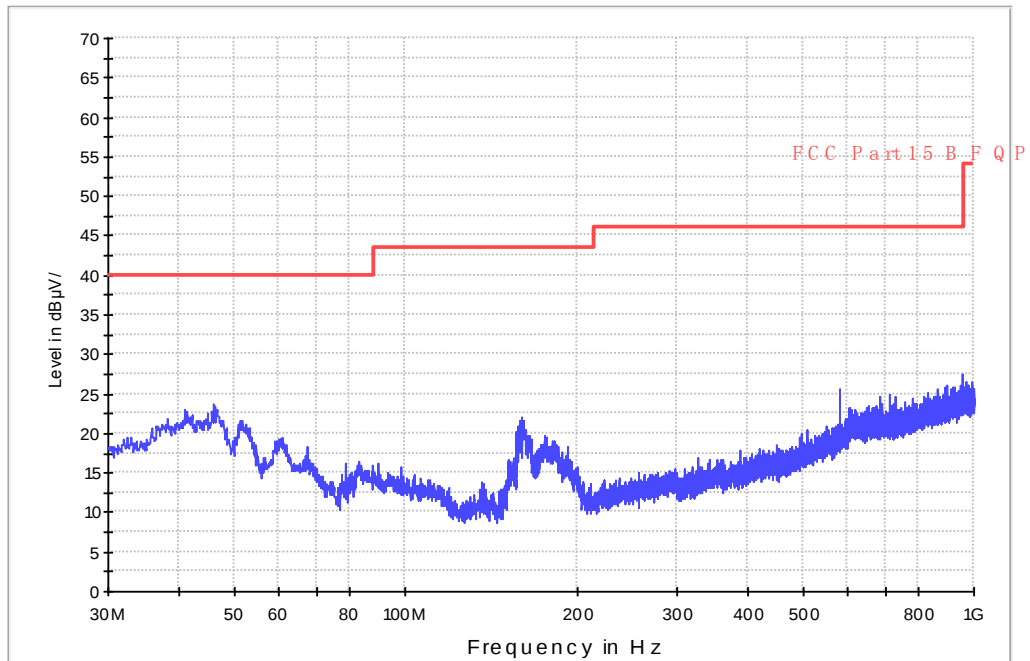


FCC Electric Field Strength 1-18GHz operate on 2.4GHz

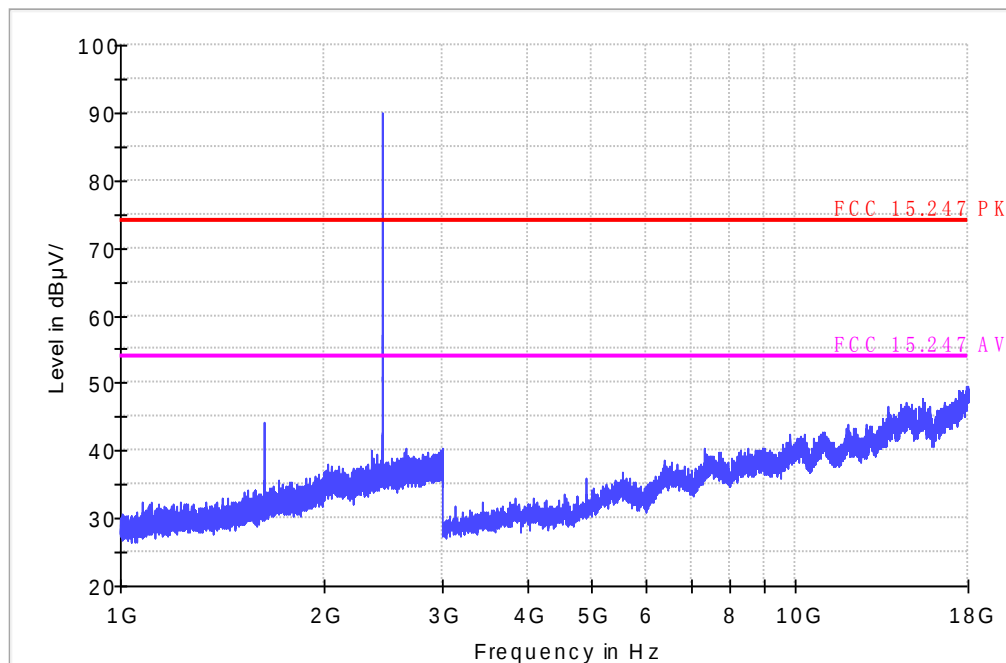


Vertical

Field strength 30M-1GHz 1F 3m chamber



FCC Electric Field Strength 1-18GHz operate on 2.4GHz



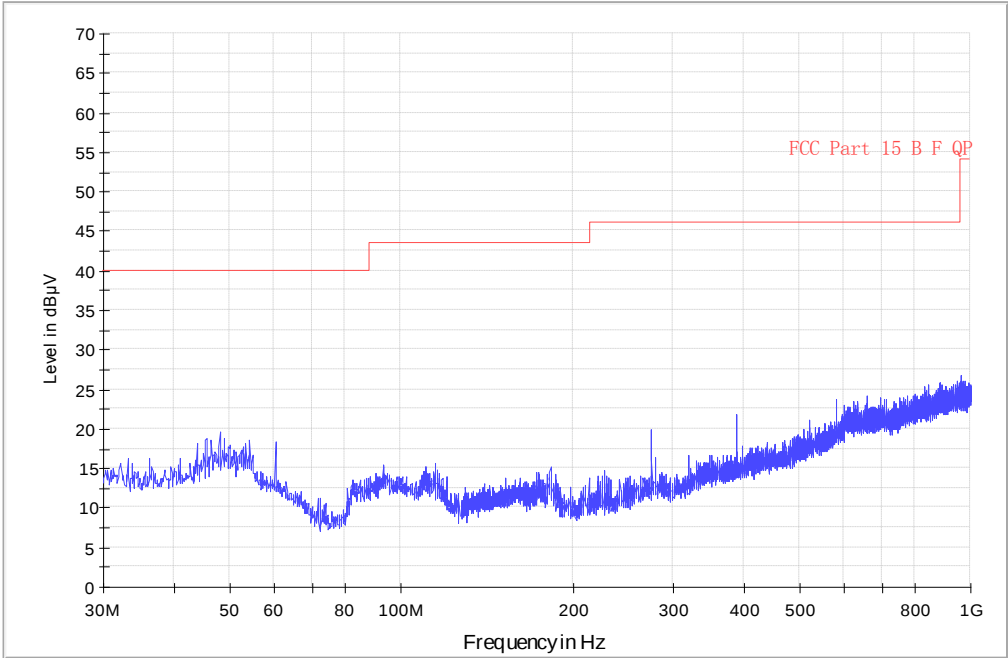
Model No.: HRT500i						
Test mode: Channel T						
Below 1GHz						
Frequency MHz	Emission (dBuV/m)	Read Value (dBuV)	Correction Factor (dB/m)	Polarization	Limits (dBuV/m)	Note
--	--	--	--	--	--	--
--	--	--	--	--	--	--
--	--	--	--	--	--	--
Above 1GHz						

Frequency MHz	Emission (dBuV/m)	Read Value (dBuV)	Correction Factor (dB/m)	Polarization	Limits (dBuV/m)	Note
--	--	--	--	--	--	--
--	--	--	--	--	--	--
--	--	--	--	--	--	--

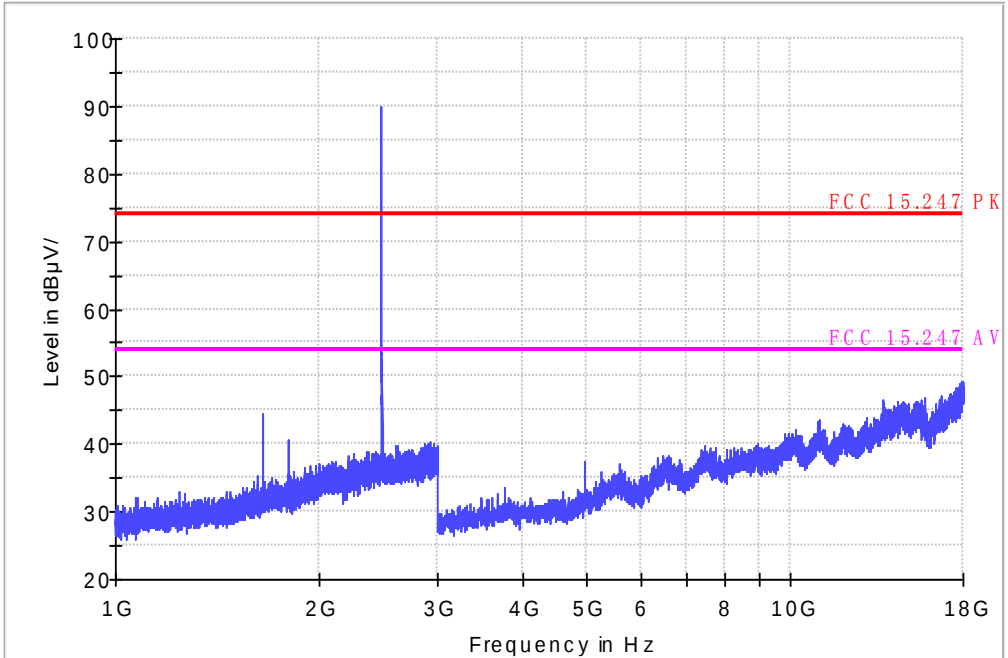
REMARKS: 1. Emission level(dBuV/m)=Read Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB)
3. The other emission levels were very low against the limit.

Horizontal

Field strength 30M-1GHz 1F 3m chamber

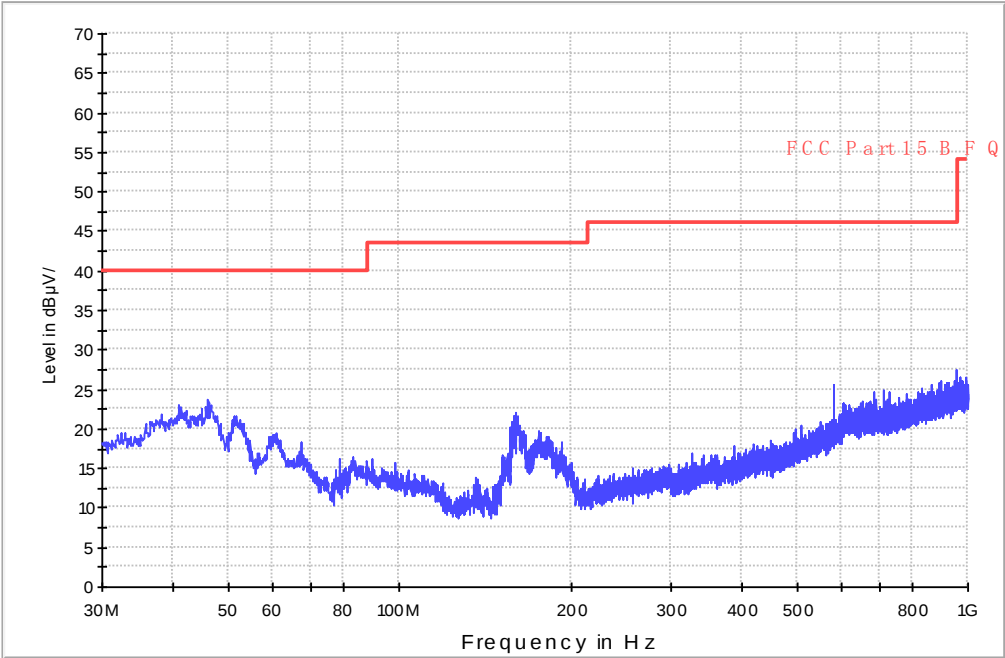


FCC Electric Field Strength 1-18GHz operate on 2.4GHz

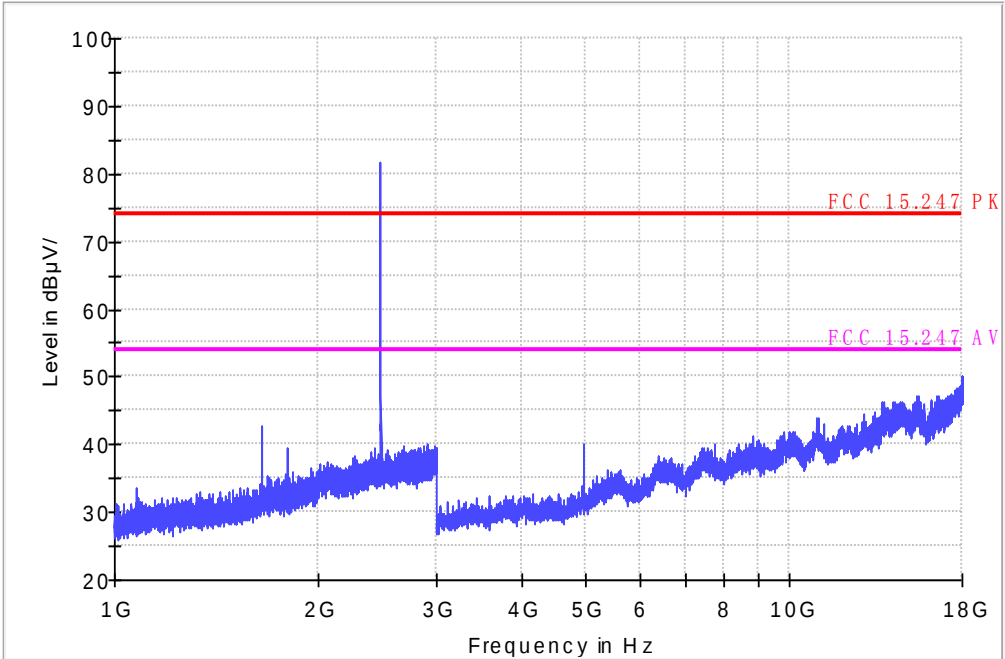


Vertical

Field strength 30M-1GHz 1F 3m chamber



FCC Electric Field Strength 1-18GHz operate on 2.4GHz



18-26.5GHz

No Peak found in pre-scan, only worst case result is listed in this report.

FCC Electric Field Strength 18-26.5GHz

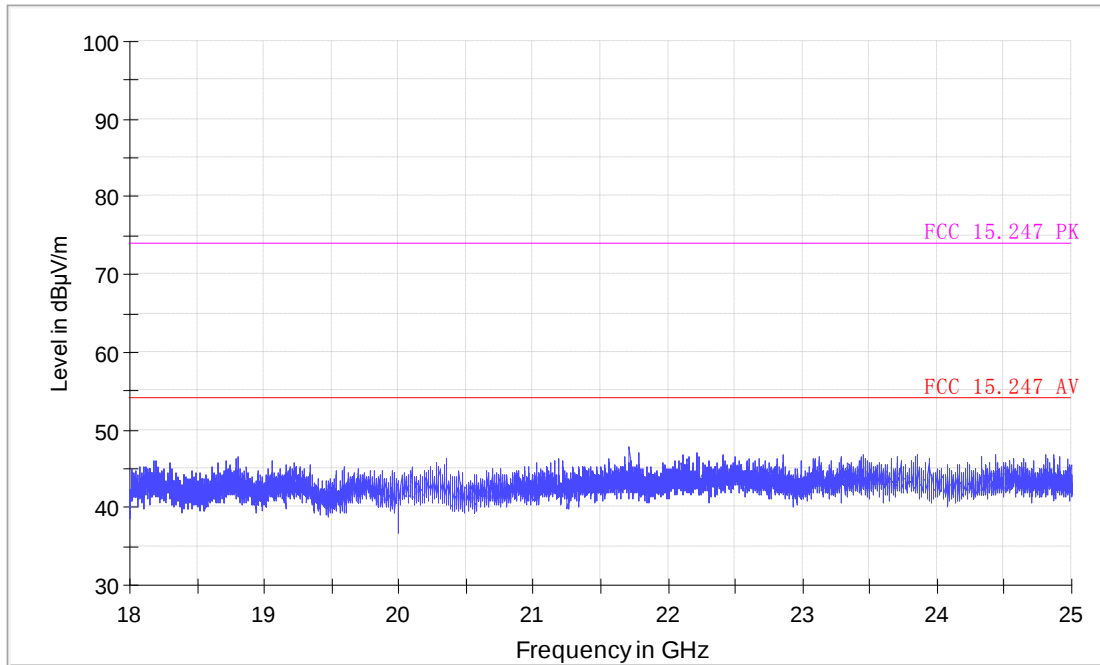


Table 9 Restricted Band Radiated Emission Data

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	
6.31175 - 6.31225	123 - 138	2200 - 2300	
8.291 - 8.294	149.9 - 150.05	2310 - 2390	
8.362 - 8.366	156.52475 - 156.52525	2483.5 - 2500	
8.37625 - 8.38675	156.7 - 156.9	2655 - 2900	
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	
12.29 - 12.293	167.72 - 173.2	3332 - 3339	
12.51975 -	240 - 285	3345.8 - 3358	
12.52025	322 - 335.4	3600 - 4400	
12.57675 -			
12.57725			
13.36 - 13.41			

Except as shown in table 9 to table 15, all other emission of the above band were less than the limit 20dB.

7. 20DB BANDWIDTH MEASUREMENT

7.1.LIMITS OF 20dB BANDWIDTH MEASUREMENT

CFR 47 (FCC) part 15.247 (a) (1) and DA 00-705

7.2.TEST PROCEDURE

The transmitter output was connected to the spectrum analyzer through an attenuator. The bandwidth of the fundamental frequency was measured by spectrum analyzer with 30kHz RBW and $VBW \geq RBW$. The 20dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 20dB.

7.3.TEST SETUP



7.4.Test Data

Table 10 20dB Bandwidth Test Data Modulation: Basic rate

CHANNEL FREQUENCY (MHz)	20dB BANDWIDTH (MHz)	results
2402	0.8523	Pass
2441	0.8543	Pass
2480	0.8512	Pass

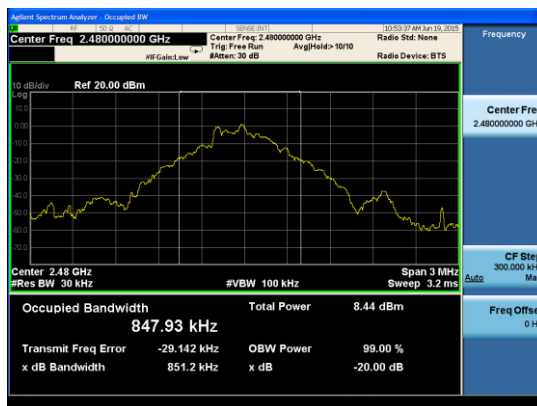
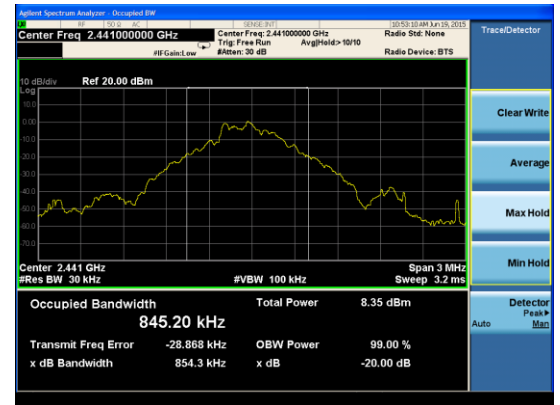
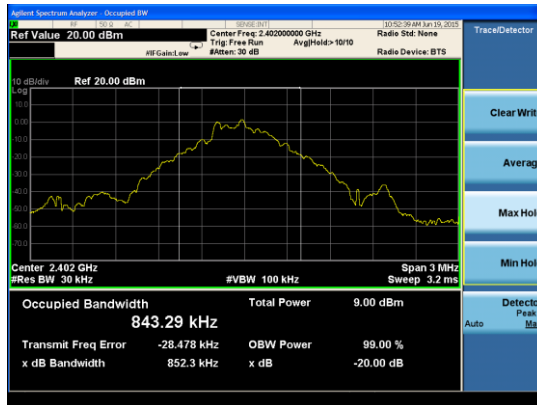
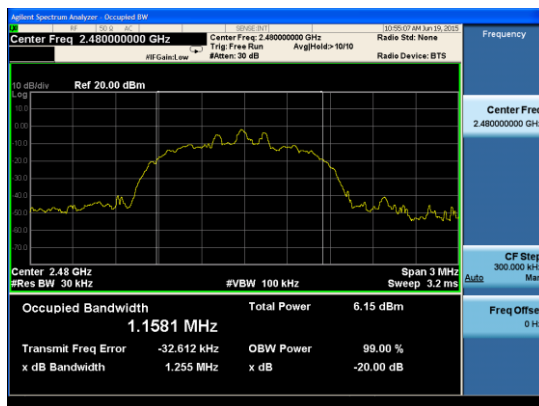
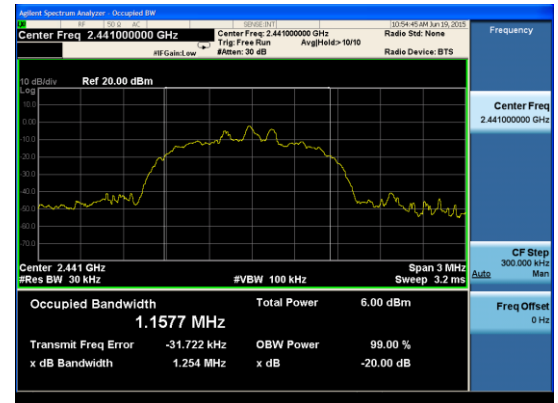
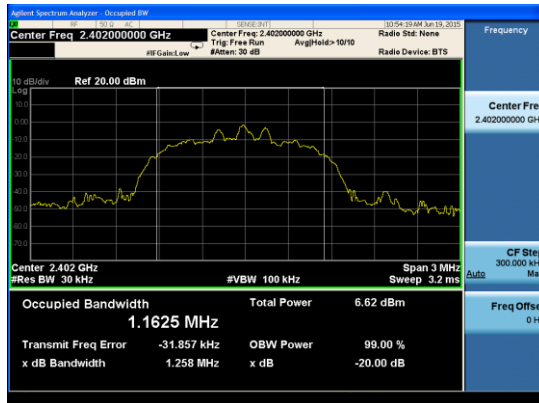


Table 11 20dB Bandwidth Test Data Modulation: Modulation: EDR

CHANNEL FREQUENCY (MHz)	20dB BANDWIDTH (MHz)	results
2402	1.258	Pass
2441	1.254	Pass
2480	1.255	Pass



8. CARRIER FREQUENCY SEPARATION MEASUREMENT

8.1.LIMITS OF Carrier frequency separation measurement

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater.

8.2.TEST PROCEDURES

- (a) Connect test port of Handheld Rugged Terminal to spectrum analyzer and universal communication tester.
- (b) Set the Handheld Rugged Terminal to transmit maximum output power at 2.4GHz and switch off frequency hopping function, then set the measured frequency number to two adjacent channels separately and test the carrier frequency separation with spectrum analyzer.

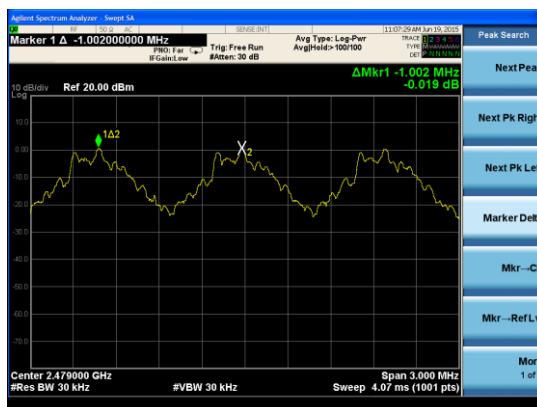
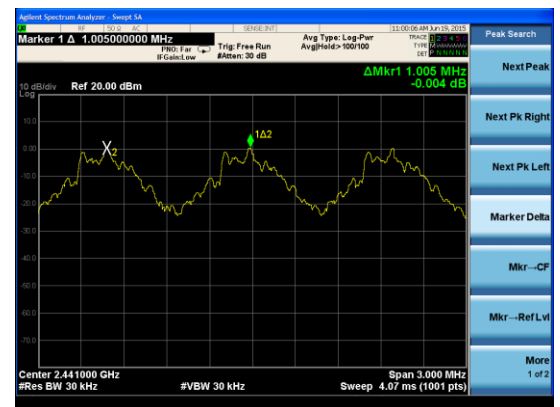
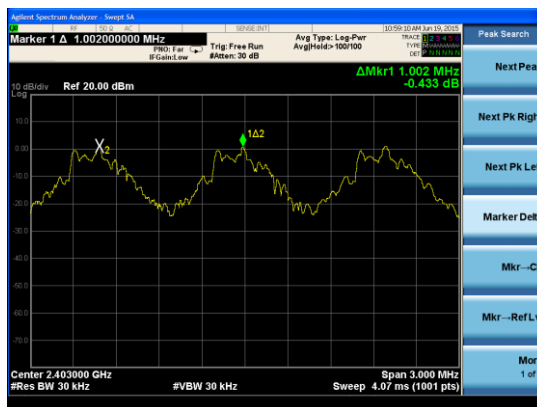
8.3.TEST SETUP



8.4.Test Data

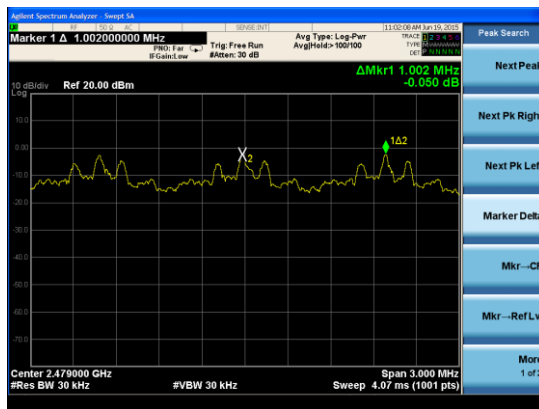
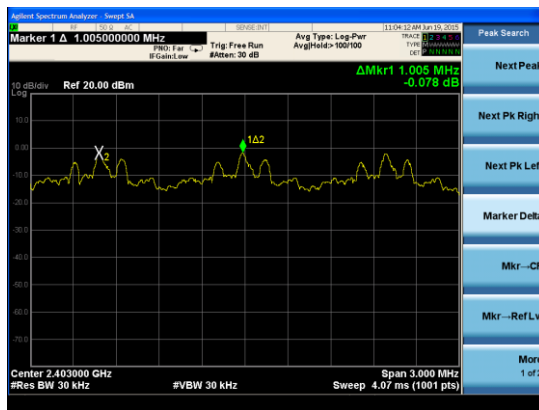
Basic Rate

Frequency	Frequency	frequency	Limit	Result
[GHz]	[GHz]	separation		
		[MHz]	[MHz]	
2. 401	2. 402	1. 002	0. 569	Pass
2. 440	2. 441	1. 005	0. 569	Pass
2. 478	2. 479	1. 002	0. 569	Pass



EDR

Frequency	Frequency	frequency	Limit	Result
[GHz]	[GHz]	separation		
		[MHz]	[MHz]	
2.402	2.403	1.005	0.844	Pass
2.440	2.441	1.002	0.844	Pass
2.479	2.480	1.002	0.844	Pass



9. NUMBER OF HOPPING CHANNEL

9.1.LIMITS OF 9. NUMBER OF HOPPING CHANNEL

Number of hopping channel should be compliance with the requirements in part15.247 (a) (1) iii.

9.2.TEST PROCEDURE

- (a) Connect test port of Handheld Rugged Terminal to spectrum analyzer and universal communication tester.
- (b) Set the Handheld Rugged Terminal to transmit maximum output power at 2.4GHz and switch on frequency hopping function, then set enough count time (larger than 5000 times) to get all the hopping frequency channel displayed on the screen of spectrum analyzer.
- (c) Count the quantity of peaks to get the number of hopping channels.

9.3.TEST SETUP

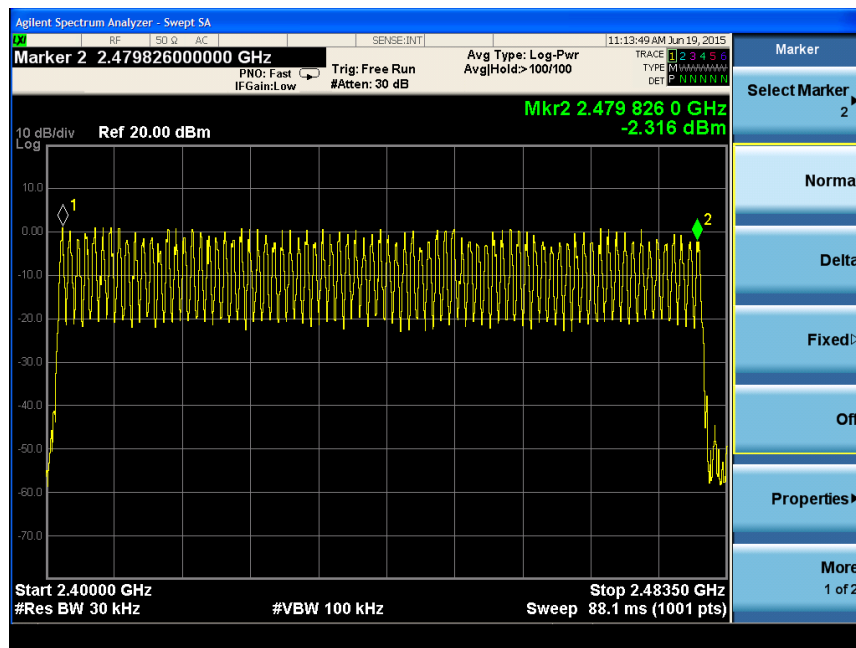


9.4.Test Data

Table 12 Hopping channel number Test Data

Hopping numbers	LIMIT	results
79	>15	Pass

Basic



Agilent Spectrum Analyzer - Swept SA

Marker 2 2.480160000000 GHz

PNO: Fast IF Gain: Low Trig: Free Run #Atten: 30 dB

Avg Type: Log-Pwr Avg|Hold: 100/100

11:16:51 AM Jun 19, 2015

TRACE 1 2 3 4 5 6

TYPE M M M M M M M M

DET P P P P P P P P

10 dB/div Ref 20.00 dBm

Log

Mkr2 2.480160 0 GHz -2.226 dBm

Start 2.40000 GHz #Res BW 300 kHz

#VBW 3.0 MHz

Stop 2.48350 GHz

Sweep 1.00 ms (1001 pts)

Marker

Select Marker

Normal

Delta

Fixed

On

Properties

More

1 of 2

10.TIME OF OCCUPANCY

10.1.LIMITS OF TIME OF OCCUPANCY

The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

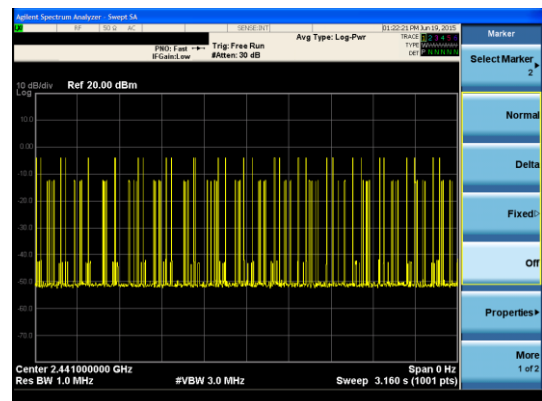
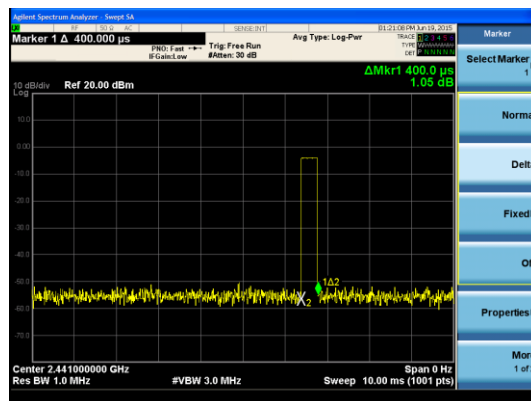
10.2.TEST PROCEDURE

- (a) Connect test port of Handheld Rugged Terminal to spectrum analyzer and universal communication tester.
- (b) Set the Handheld Rugged Terminal to transmit maximum output power at 2.4GHz and switch on frequency hopping function.
- (c) Set the span of spectrum analyzer to 0 Hz, and set the resolution bandwidth to 1 MHz and the video bandwidth to 1 MHz, then get the time domain measured diagram. and set sweep time to 2 times of one burst occupancy time, and measure the time of occupancy of one burst.
- (d) Set the resolution bandwidth to 1 MHz and the video bandwidth to 3 MHz, and set the sweep time to a period (0.4 seconds multiplied by the number of hopping channels employed), and count the number of the bursts.
- (e) Calculate the time of occupancy in a period with time occupancy of a burst and quantity of bursts.

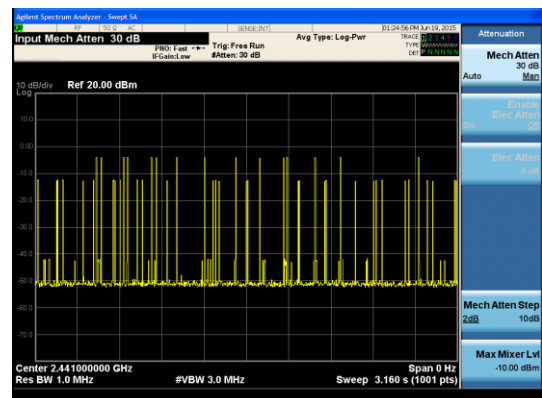
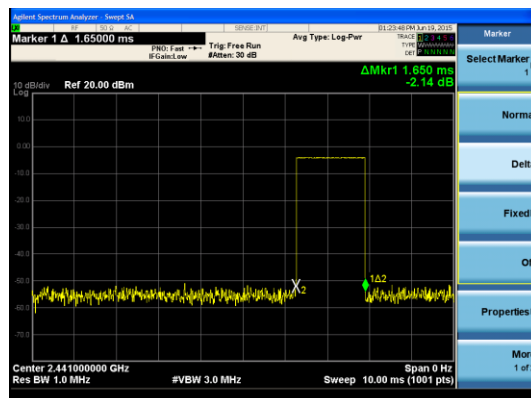
10.3.TEST RESULTS

	Time of Single Slot [ms]	Numbers of slots in a period	Time of occupied in a period [s]	Limit [s]	Result
DH1	0.400	30	0.1200	≤ 0.4	Pass
DH3	1.650	15	0.2475	≤ 0.4	Pass
DH5	2.910	9	0.2619	≤ 0.4	Pass

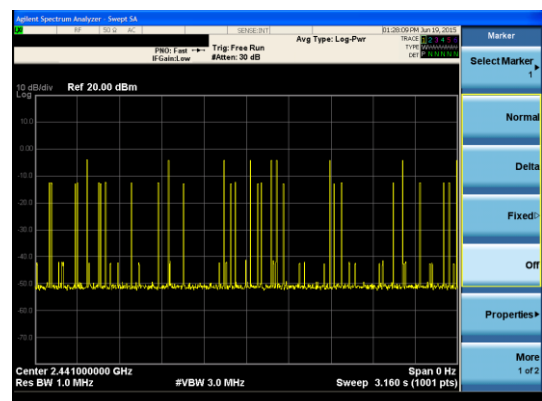
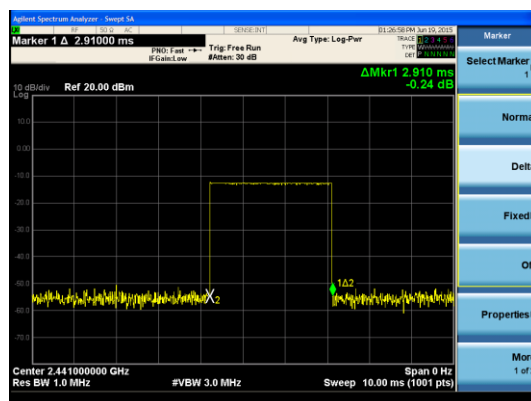
DH1



DH3



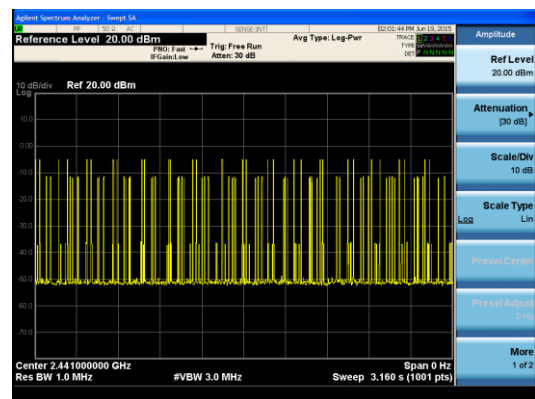
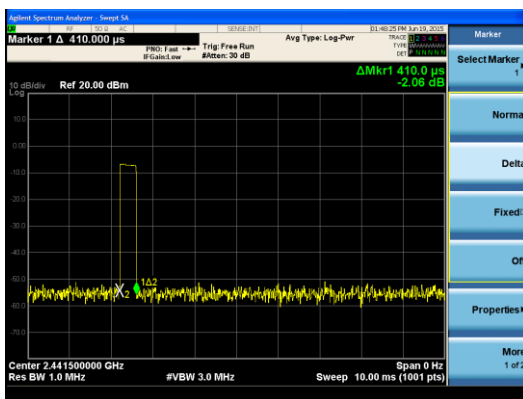
DH5



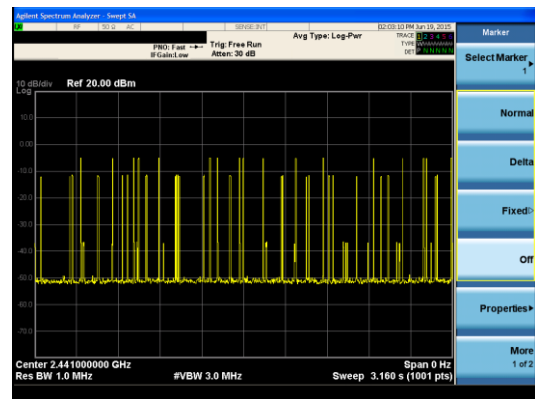
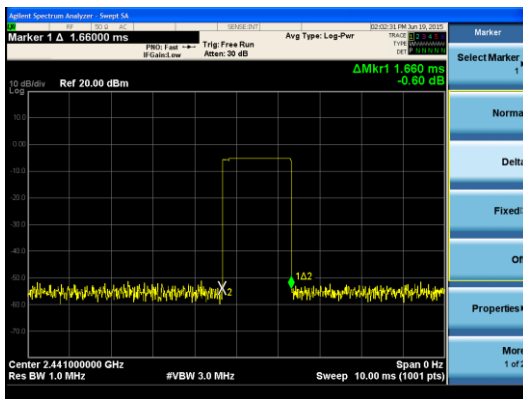
8DPSK

	Time of Single Slot [ms]	Numbers of slots in a period	Time of occupied in a period [s]	Limit [s]	Result
3-DH1	0.410	31	0.1271	≤ 0.4	Pass
3-DH3	1.660	17	0.2822	≤ 0.4	Pass
3-DH5	2.900	10	0.2900	≤ 0.4	Pass

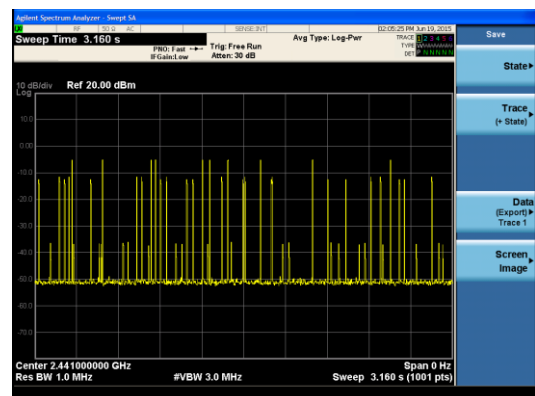
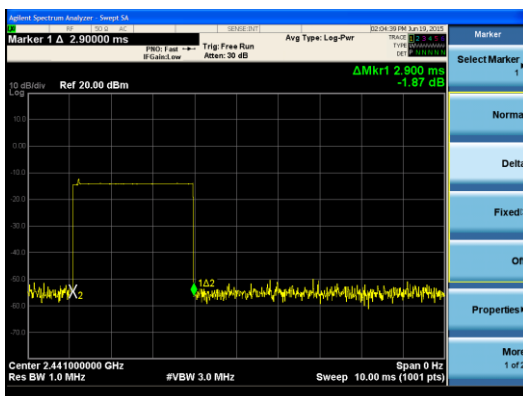
3-DH1



3-DH3



3-DH5



11. PEAK POWER

11.1. LIMITS OF Peak Power

Compliance with part 15.247 (b) (1), for frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt.

For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watt.

11.2. TEST PROCEDURE

(a) Connect test port of Handheld Rugged Terminal to universal communication tester.

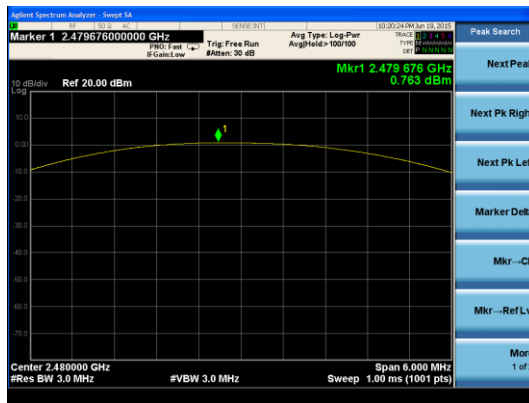
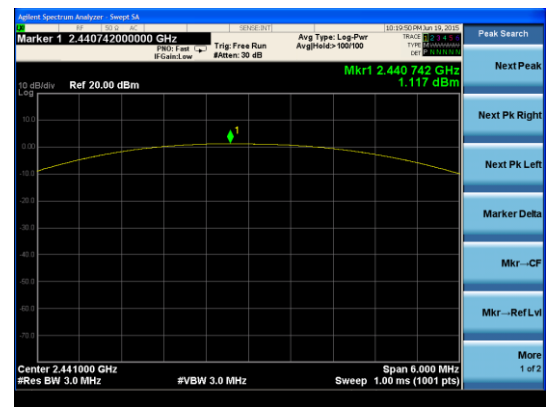
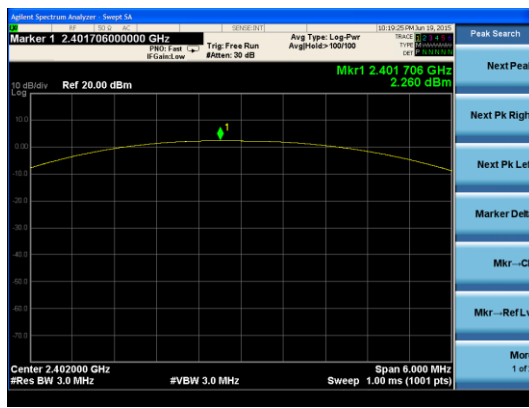
(b) Set the Handheld Rugged Terminal to transmit maximum output power at 2.4GHz and switch off frequency hopping function.

(c) Then set the Handheld Rugged Terminal to transmit at high, middle and low frequency and measure the conducted output power separately.

11.3. TEST RESULTS

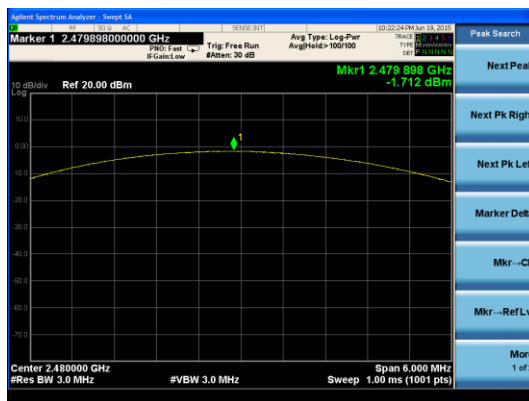
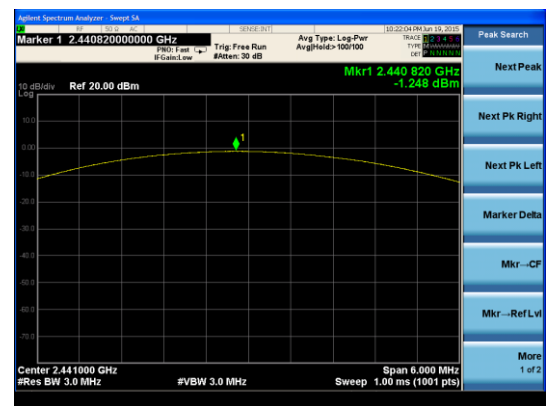
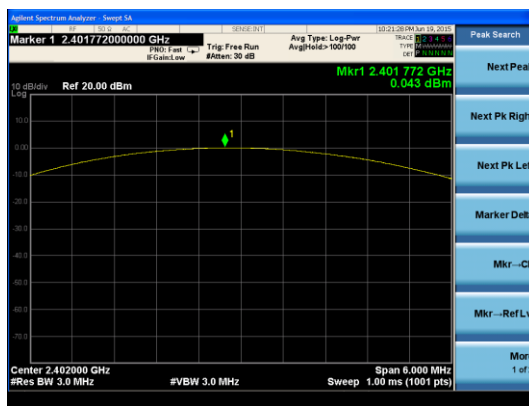
Measurement Results (Modulation:Basic)

Channel	Channel No.	Center Freq. [MHz]	Meas. Level (Cond.) [dBm]	Limit [dBm]	Result
Bottom	0	2402	2.260	< 30	Pass
Middle	39	2441	1.117	< 30	Pass
Top	78	2480	0.763	< 30	Pass



Measurement Results (Modulation: 8DQPSK)

Channel	Channel No.	Center Freq. [MHz]	Meas. Level (Cond.) [dBm]	Limit [dBm]	Result
Bottom	0	2402	0.043	< 21	Pass
Middle	39	2441	-1.248	< 21	Pass
Top	78	2480	-1.712	< 21	Pass



12. BAND EDGES MEASUREMENT

12.1. Limits of Band Edges Measurement

Below –20dB of the highest emission level of operating band (in 100kHz resolution bandwidth).

12.2. TEST PROCEDURE

1. The EUT is placed on a turntable, which is 0.8m above the ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emission.
4. Set the spectrum analyzer in the following setting in order to capture the lower and upper band-edges of the emission:
 - (a) PEAK: RBW=VBW=1MHz / Sweep=AUTO
 - (b) AVERAGE: RBW=1MHz / VBW=10Hz / Sweep=AUTO
5. Repeat the procedures until all the PEAK and AVERAGE versus POLARIZATION are measured.

12.3. Test Results

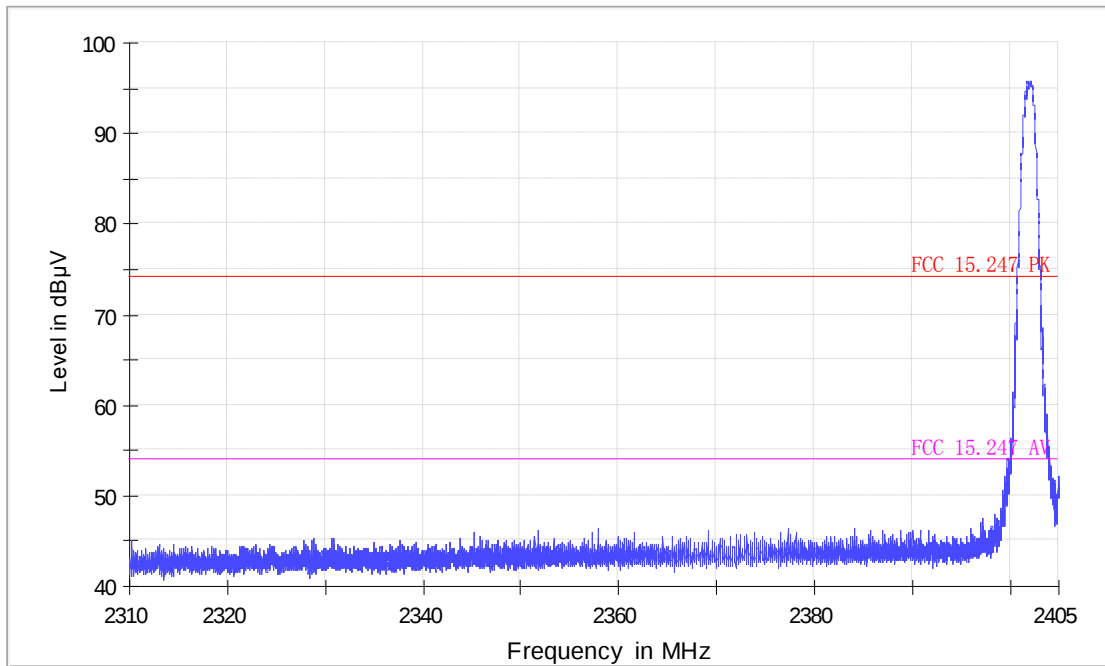
The measured plots are attached on the following. Test data shows compliance with the band edge requirement in part 15.247(d).

Bluetooth Basic Rate

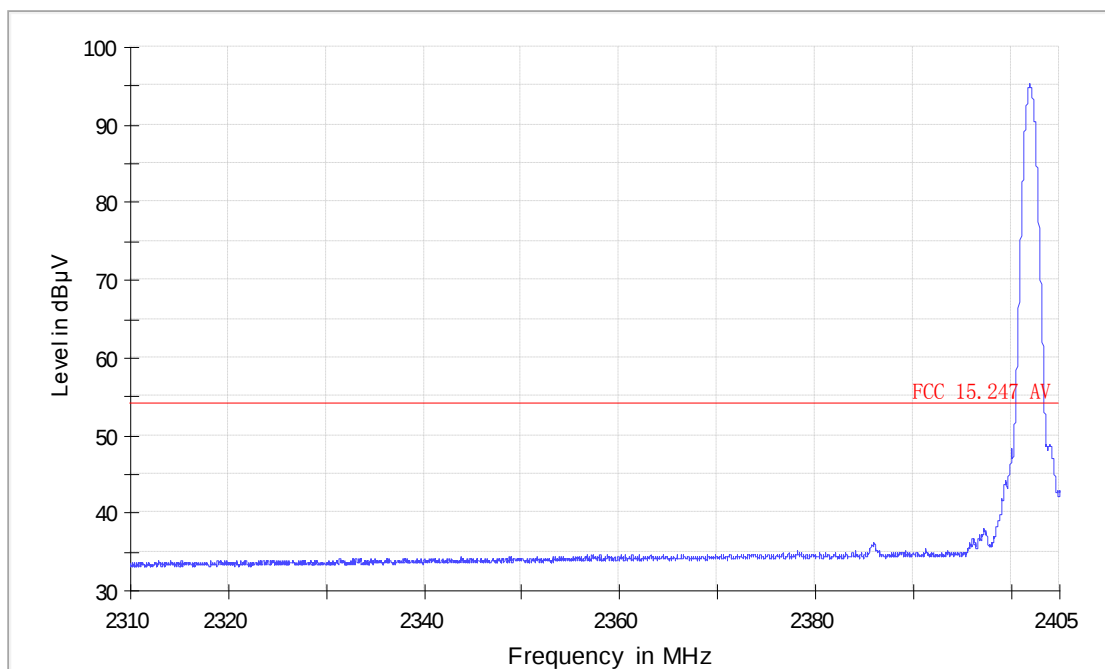
Low edge

Horizontal

FCC Electric Field Strength 2.4GHz Bandedge-PK

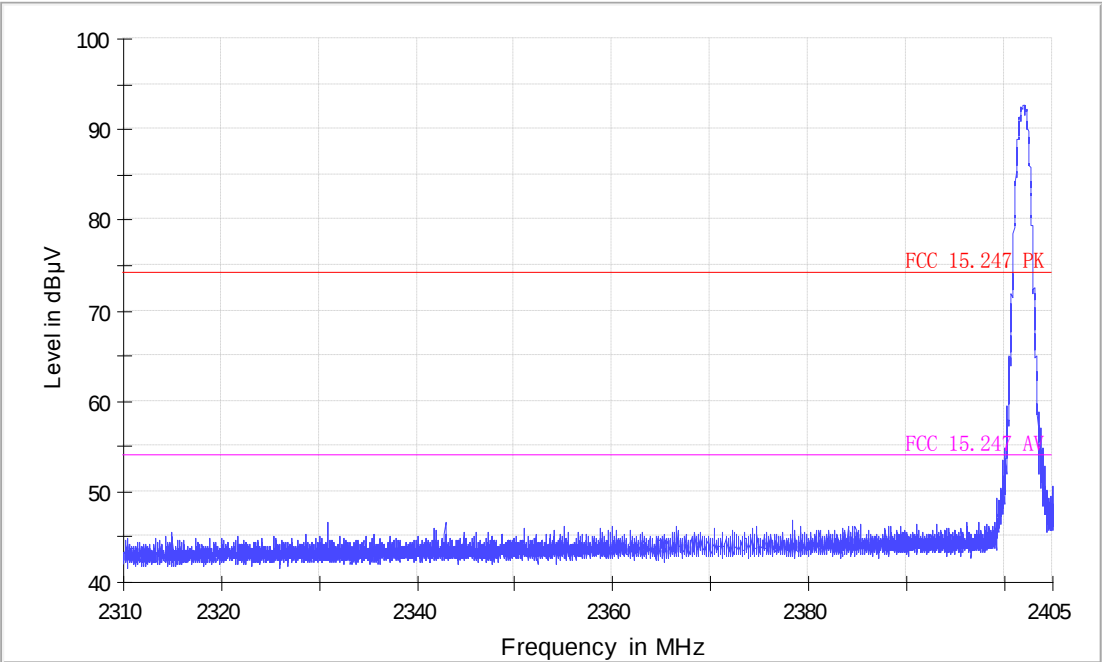


FCC Electric Field Strength 2.4GHz Bandedge-AV

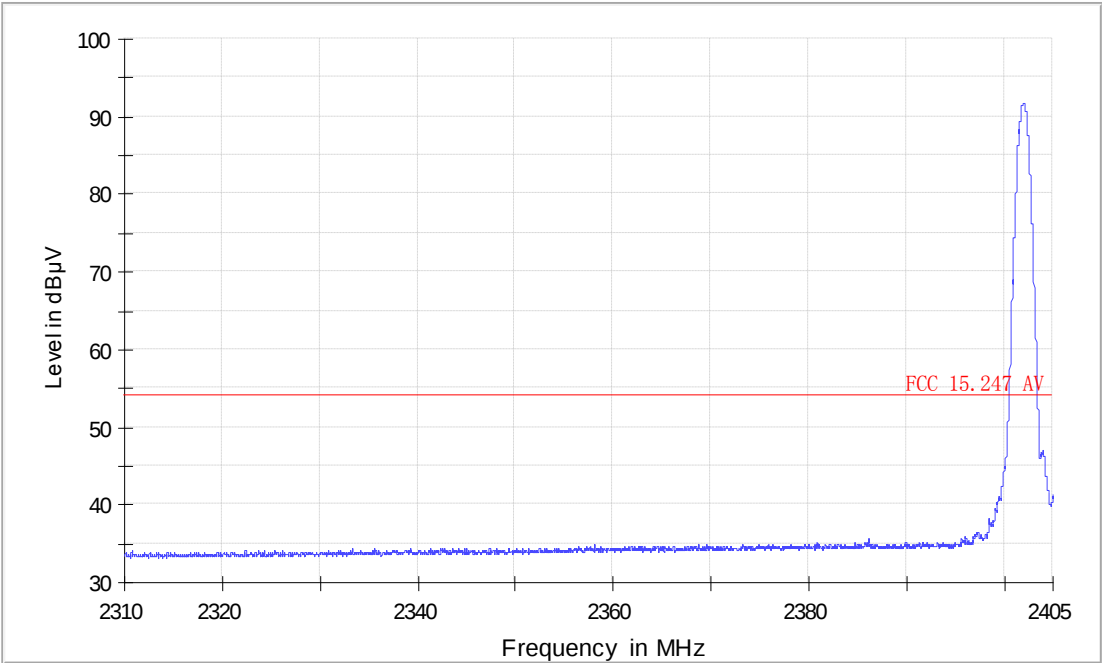


Vertical

FCC Electric Field Strength 2.4GHz Bandedge-PK



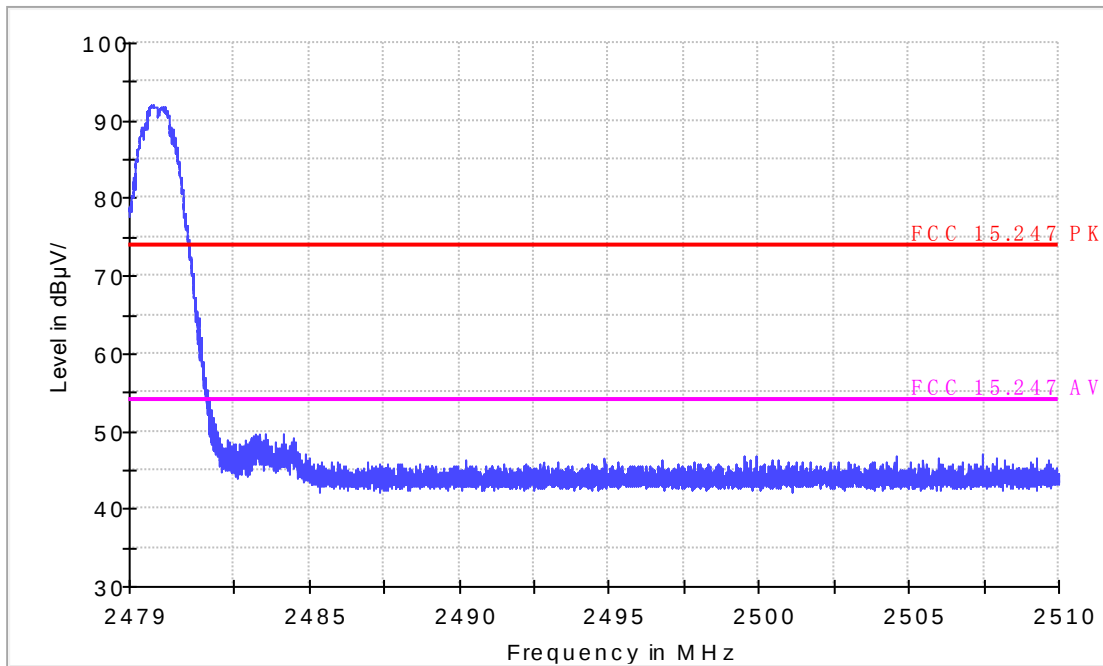
FCC Electric Field Strength 2.4GHz Bandedge-AV



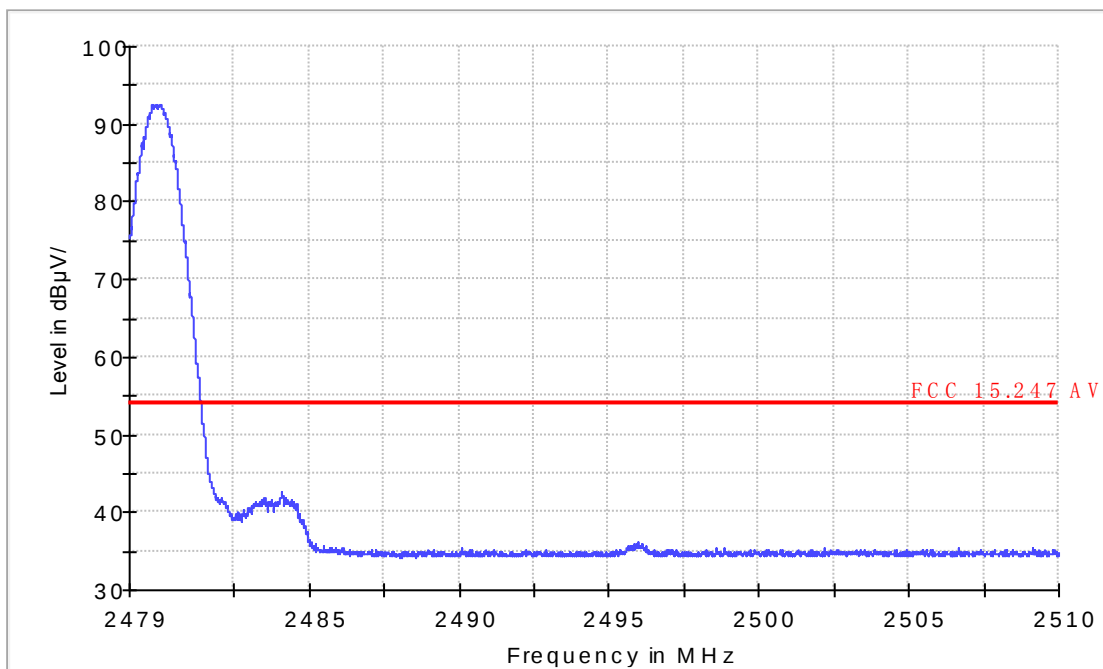
Upper Edge

Horizontal

FCC Electric Field Strength 2.4GHz Bandedge-PK

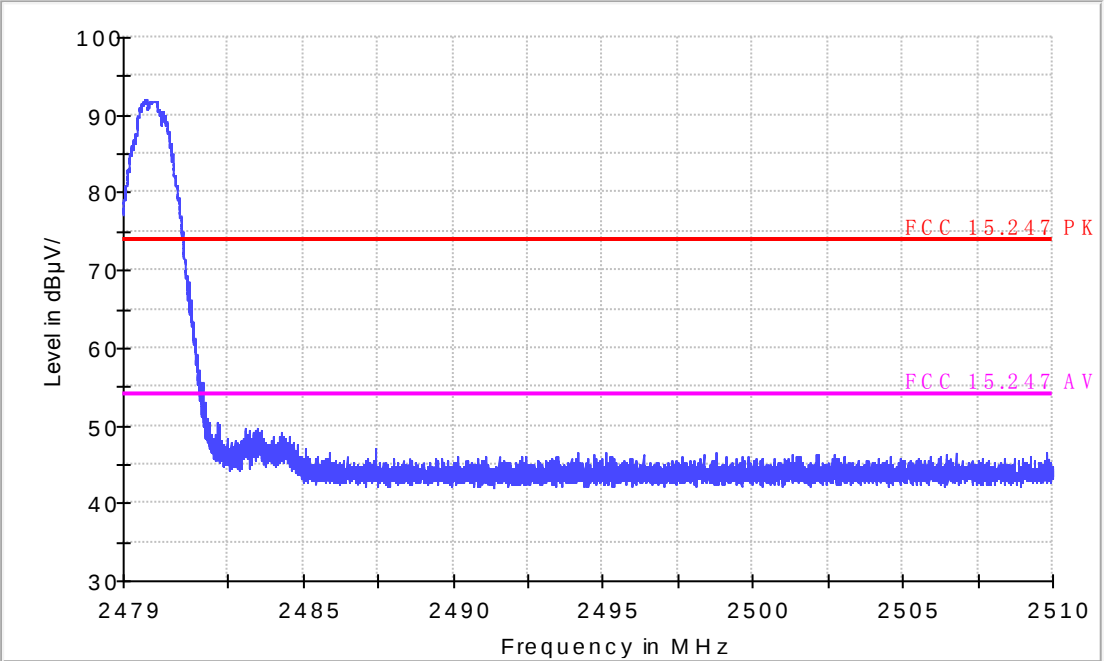


FCC Electric Field Strength 2.4GHz Bandedge-AV

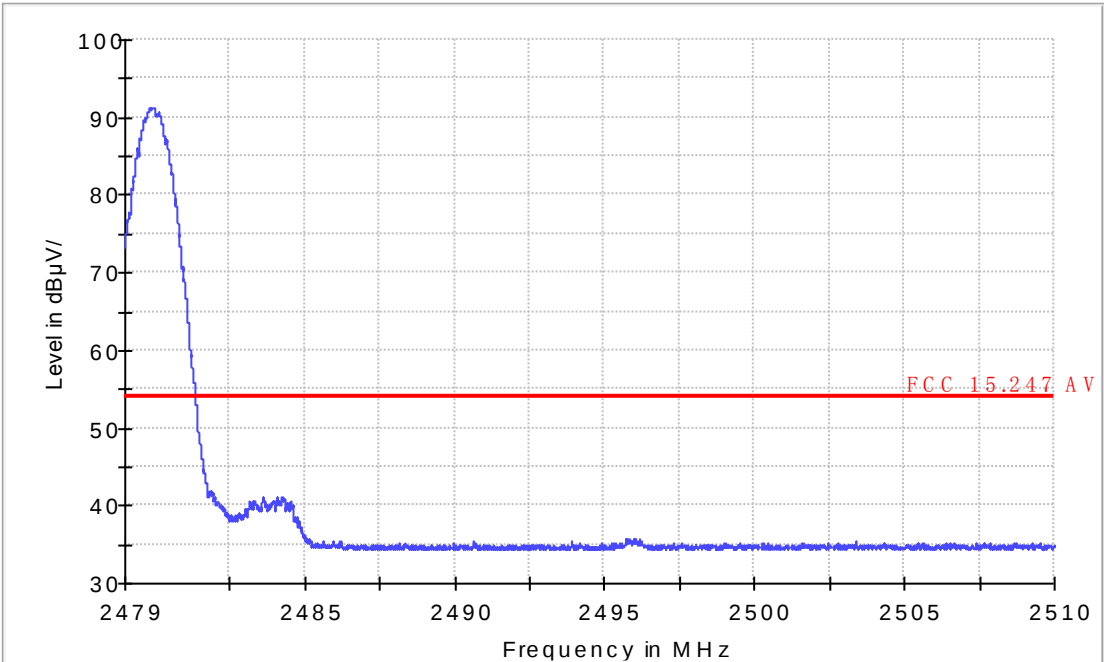


Vertical

FCC Electric Field Strength 2.4GHz Bandedge-PK



FCC Electric Field Strength 2.4GHz Bandedge-AV

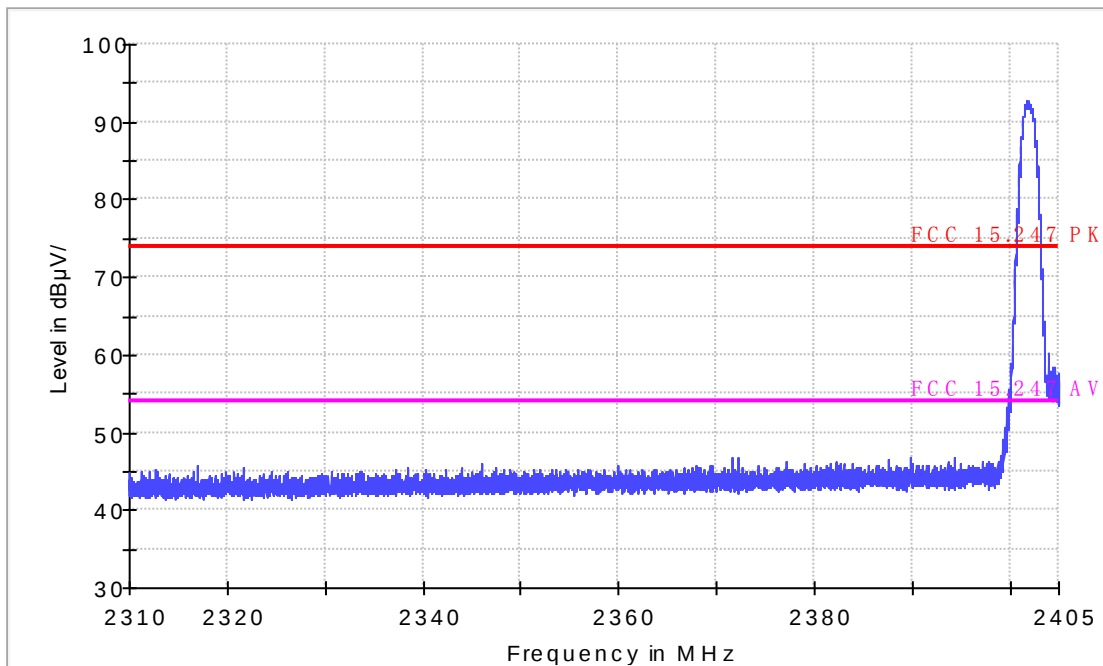


Bluetooth EDR

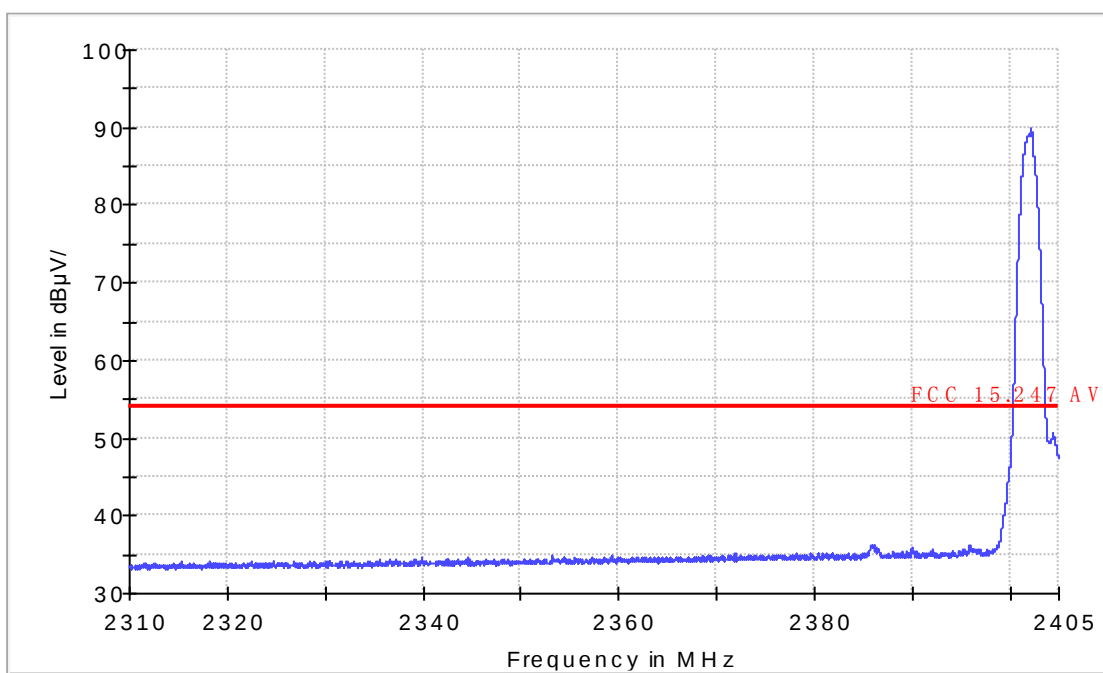
Low edge

Horizontal

FCC Electric Field Strength 2.4GHz Bandedge-PK

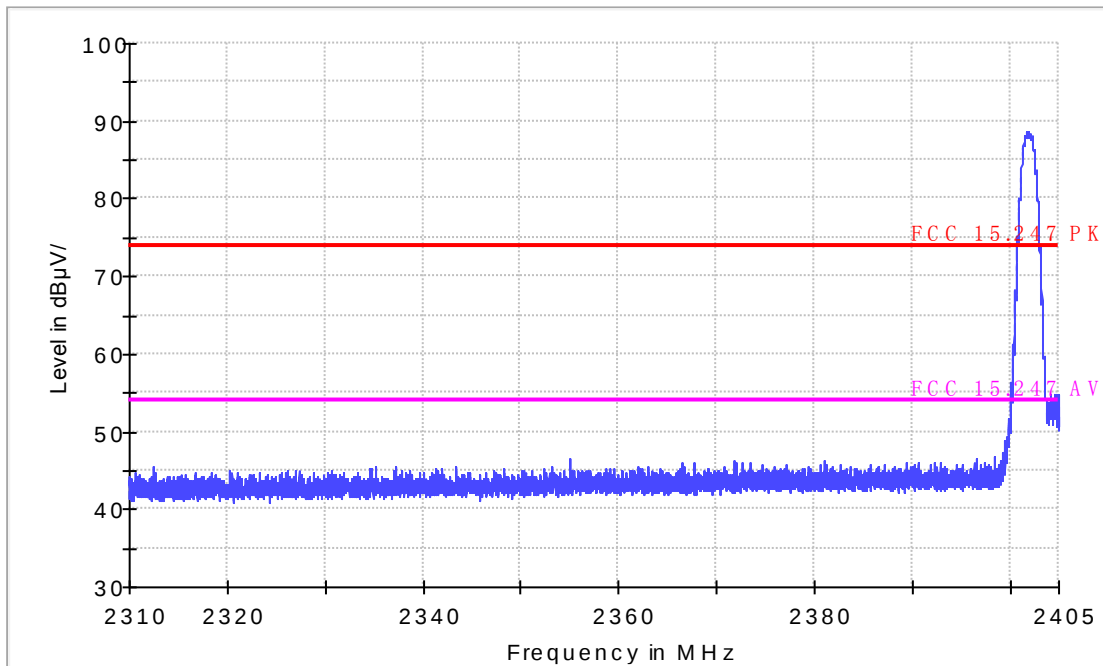


FCC Electric Field Strength 2.4GHz Bandedge-AV

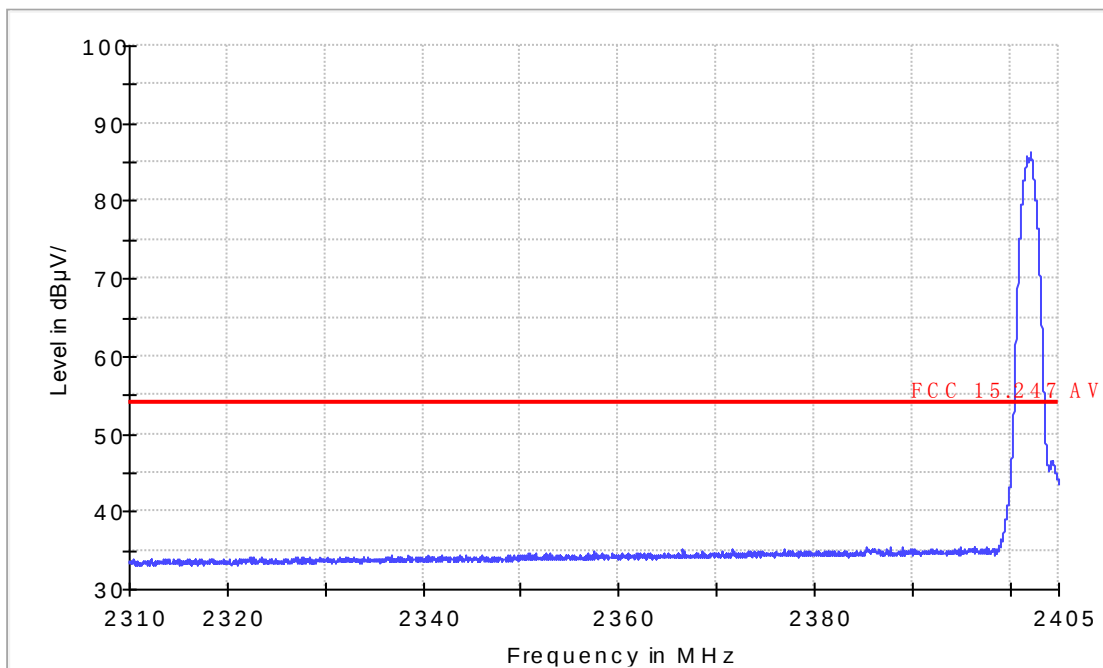


Vertical

FCC Electric Field Strength 2.4GHz Bandedge-PK



FCC Electric Field Strength 2.4GHz Bandedge-AV

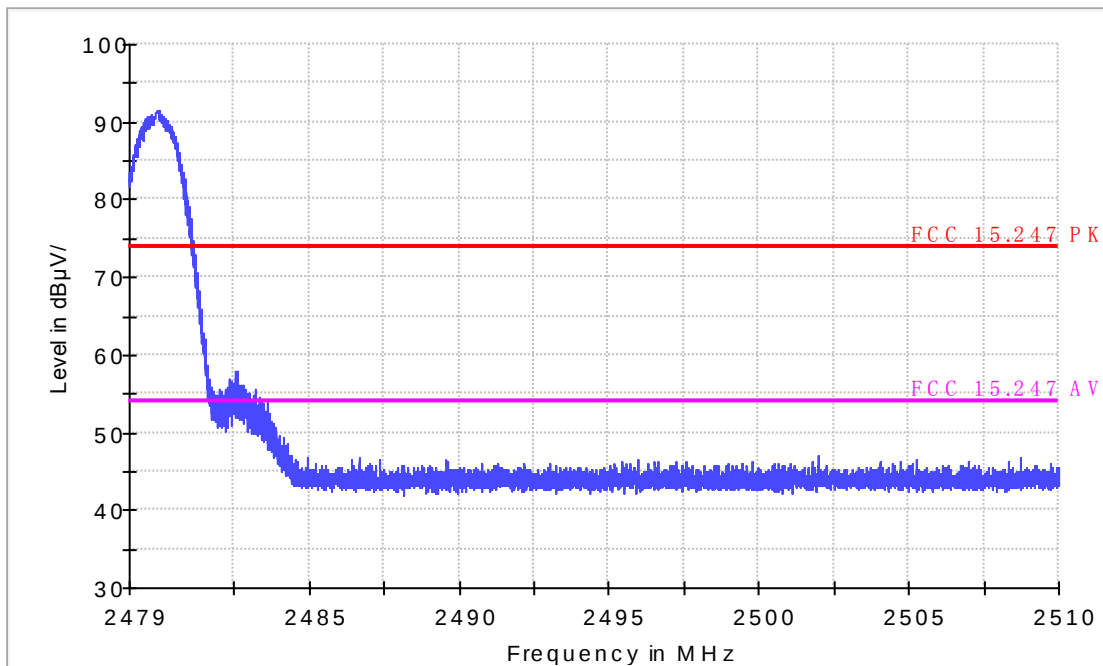


Bluetooth EDR

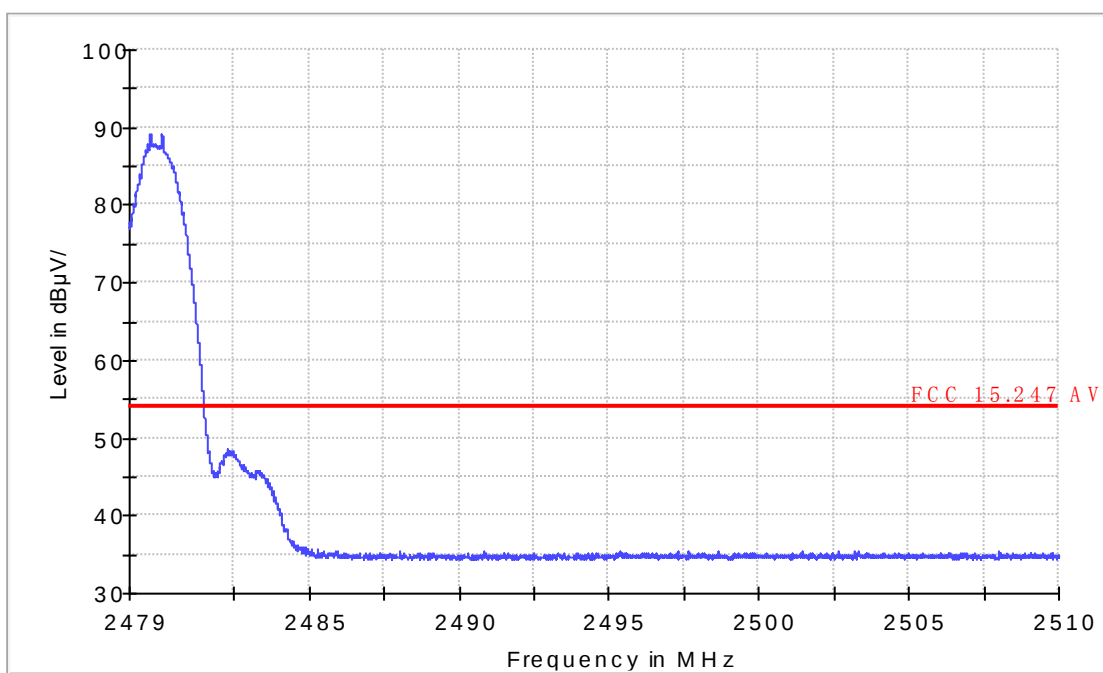
Upper edge

Horizontal

FCC Electric Field Strength 2.4GHz Bandedge-PK

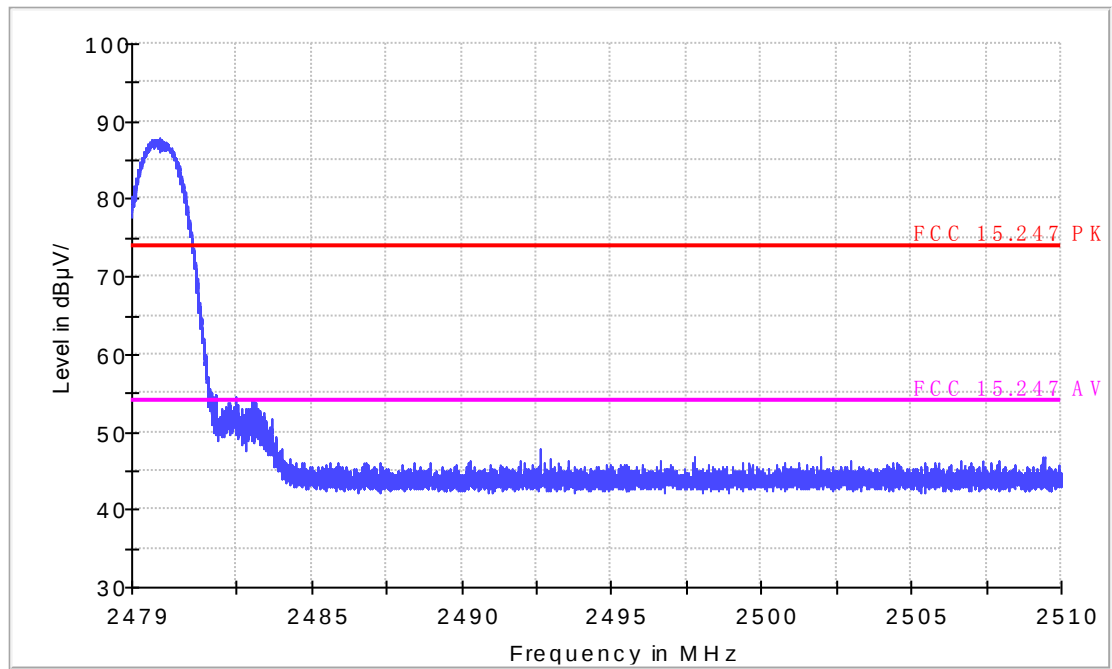


FCC Electric Field Strength 2.4GHz Bandedge-AV

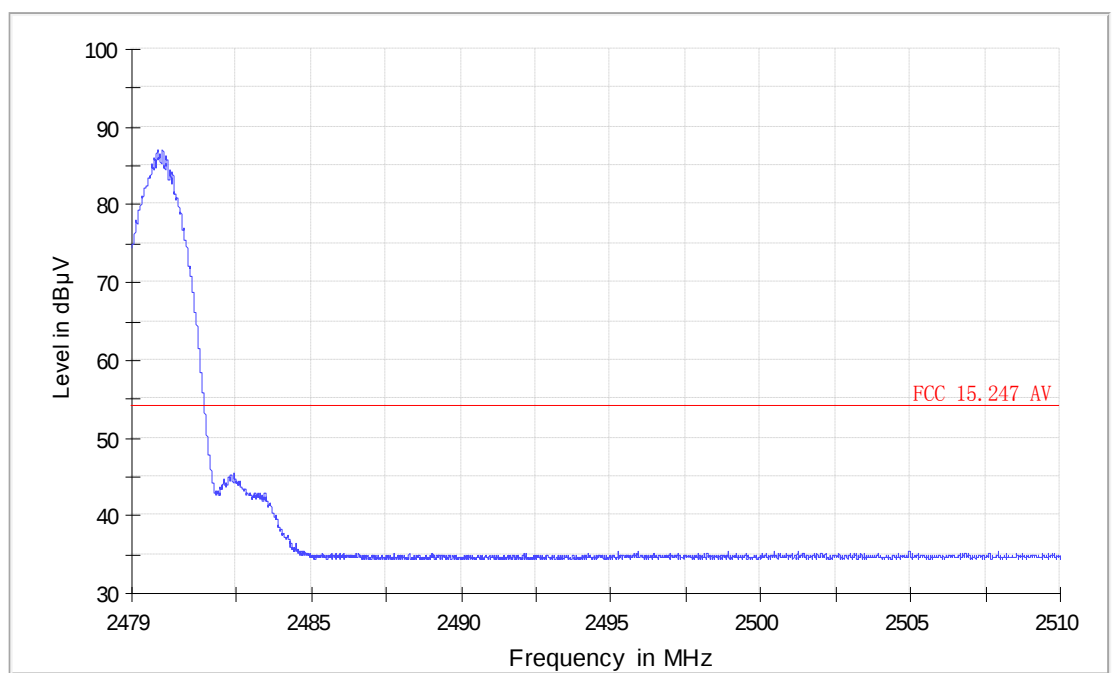


Vertical

FCC Electric Field Strength 2.4GHz Bandedge-PK



FCC Electric Field Strength 2.4GHz Bandedge-AV



13. CONDUCTED SPURIOUS EMISSIONS

13.1. Limits of Band Edges Measurement

Below –20dB of the highest emission level of operating band (in 100kHz resolution bandwidth).

13.2. Test Procedure

The transmitter output and CBT output were connected to the spectrum analyzer through a power divider. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

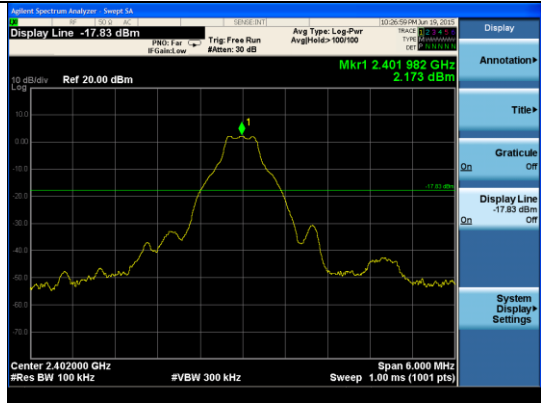
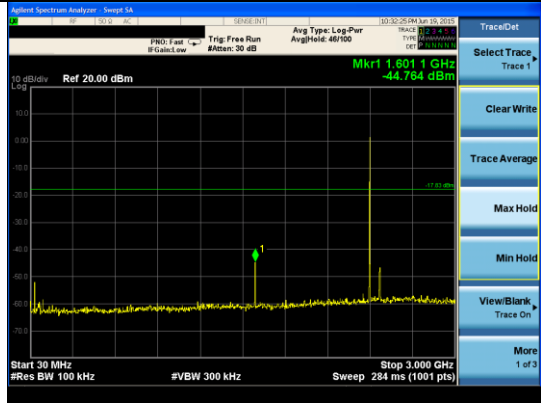
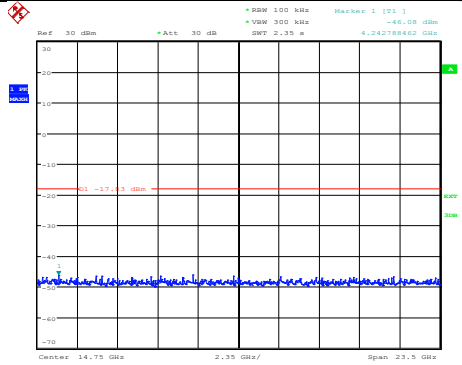
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

The band edges at 2.4 and 2.4835 GHz are investigated with the transmitter set to the normal

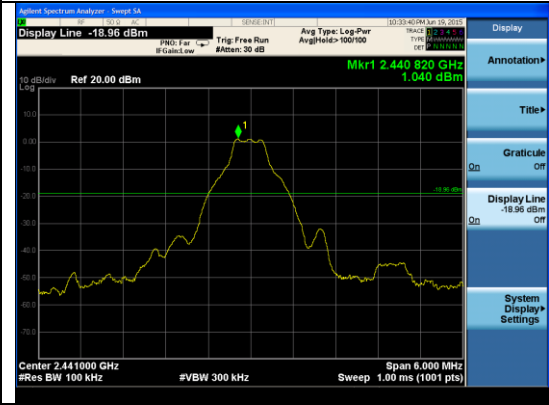
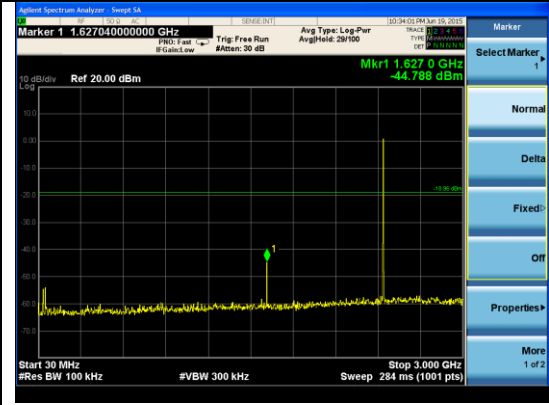
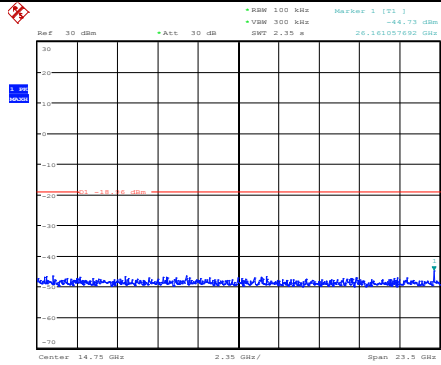
13.3. TEST RESULTS

Bluetooth Basic

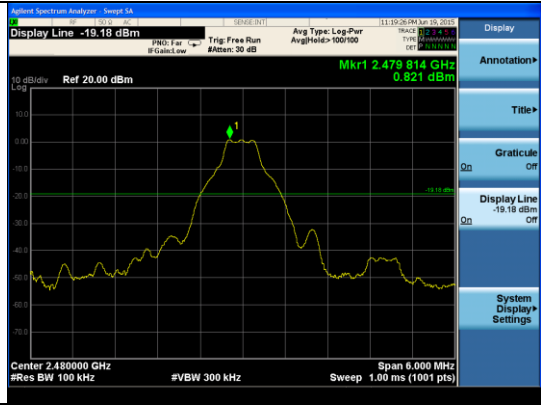
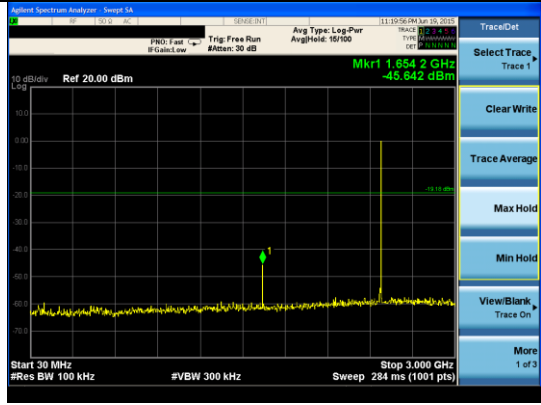
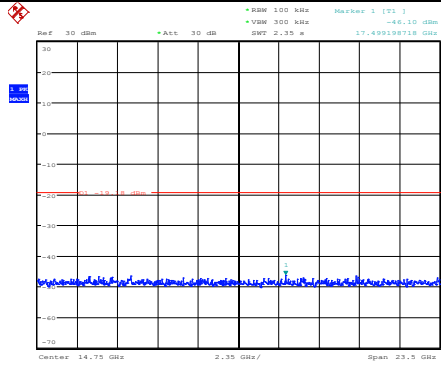
Low channel

Pref	
	
30MHz-3GHz	3GHz-25GHz
	

Bluetooth Basic
Mid channel

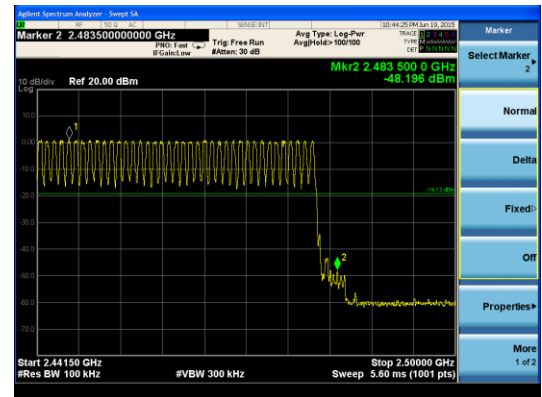
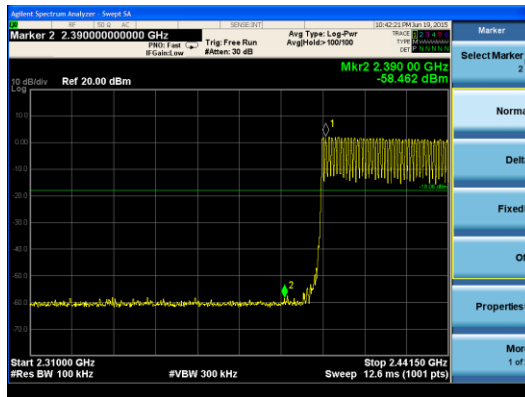
Pref	
	
30MHz-3GHz	3GHz-25GHz
	

Bluetooth Basic
High Channel

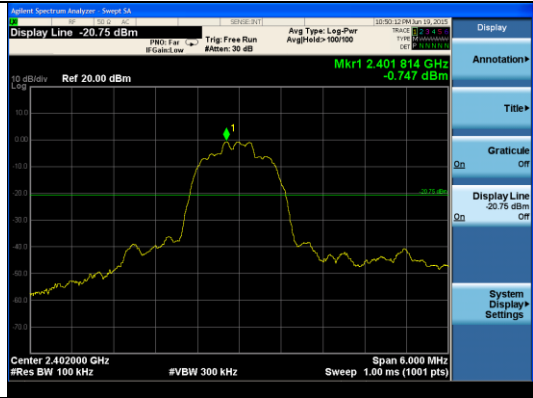
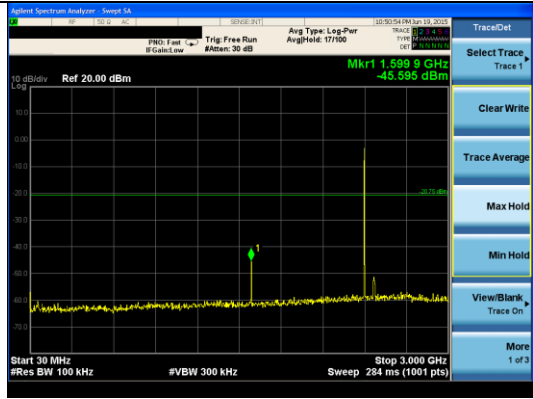
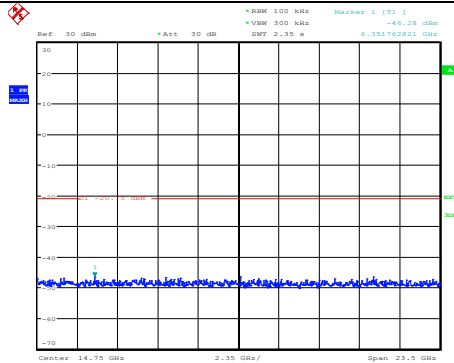
Pref	
	
30MHz-3GHz	3GHz-25GHz
	

Bluetooth Basic

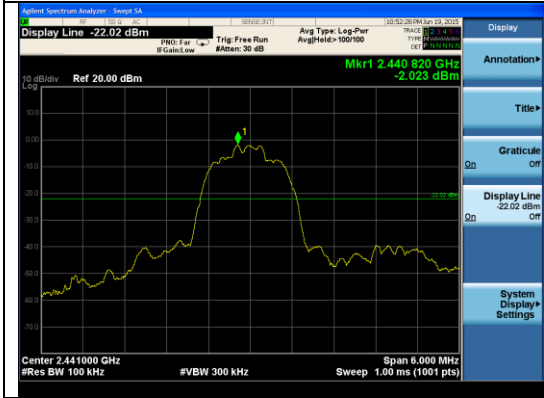
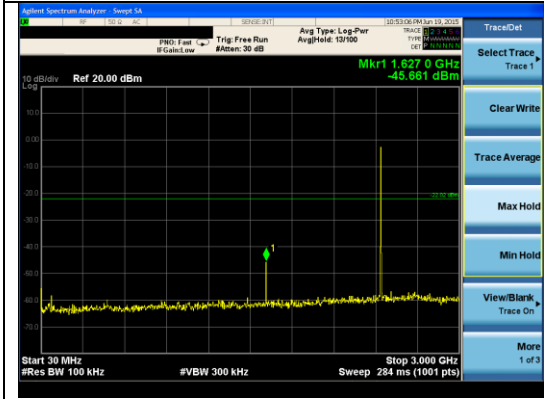
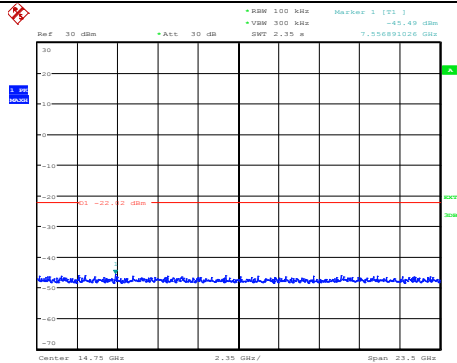
Bandedge hopping On



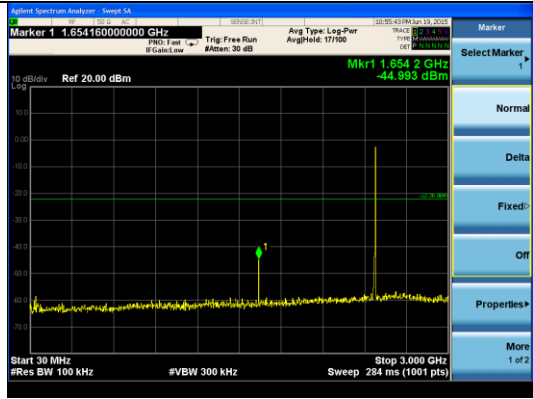
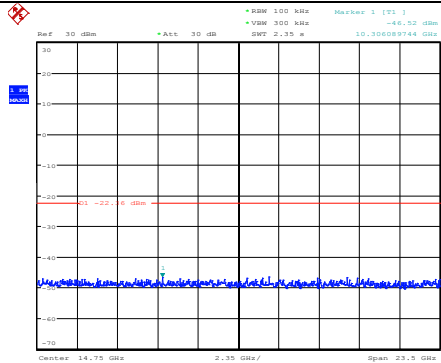
Bluetooth EDR
Low Channel

Pref	
	
30MHz-3GHz	3GHz-25GHz
	

Bluetooth EDR
Mid Channel

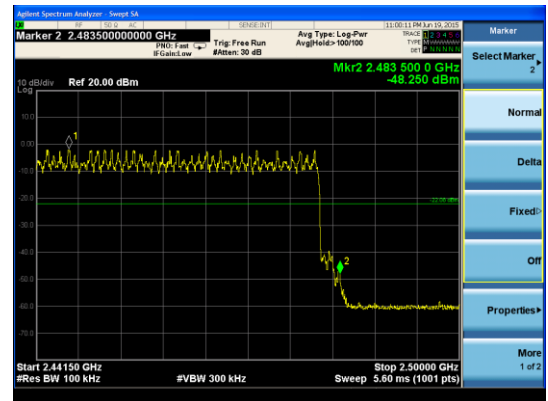
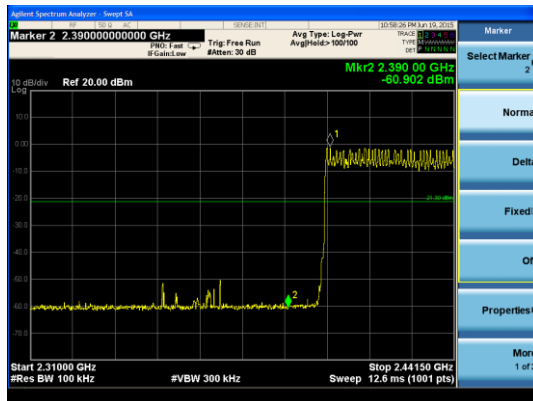
Pref	
	
30MHz-3GHz	3GHz-25GHz
	

Bluetooth EDR
High Channel

Pref	
	
30MHz-3GHz	3GHz-25GHz
	

Bluetooth EDR

Bandedge



14.ANTENNA REQUIREMENT

According to Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

The EUT has a built in antenna which is integrated inside the enclosure, this is permanently attached antenna and meets the requirements of this section.