



**FCC 47 CFR PART 15 SUBPART C  
ISED RSS-247 ISSUE 2**

**CERTIFICATION TEST REPORT**

*For*

**Communication Module**

**MODEL NUMBER: LBEE6ZZ1FD**

**FCC ID: VPYLB1FD**

**IC: 772C-LB1FD**

**REPORT NUMBER: 4788224831-2**

**ISSUE DATE: Feb. 10, 2018**

*Prepared for*

**Murata Manufacturing Co.,Ltd.**

*Prepared by*

**UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch  
Room 101, Building 10, Innovation Technology Park,  
Song Shan Lake Hi tech Development Zone, Dongguan, 523808, China**

**Tel: +86 769 33817100**

**Fax: +86 769 33244054**

**Website: [www.ul.com](http://www.ul.com)**

Revision History

<u>Rev.</u>	<u>Issue Date</u>	<u>Revisions</u>	<u>Revised By</u>
--	02/11/2018	Initial Issue	

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# 1. ATTESTATION OF TESCT RESULTS

## Applicant Information

Company Name: Murata Manufacturing Co.,Ltd.  
Address: 10-1,Higashikotari 1-chome,Nagaokakyo-shi,Kyoto  
617-8555,Japan

## Manufacturer Information

Company Name: Murata Manufacturing Co.,Ltd.  
Address: 10-1,Higashikotari 1-chome,Nagaokakyo-shi,Kyoto  
617-8555,Japan

## Factory Information

Company Name: Murata Manufacturing Co.,Ltd.  
Address: 10-1,Higashikotari 1-chome,Nagaokakyo-shi,Kyoto  
617-8555,Japan

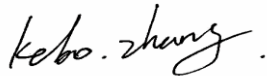
## EUT Description

Product Name Communication Module  
Model Name LBEE6ZZ1FD  
Sample ID 1308669-001  
Sample Status Good  
Sample Received date Dec .7, 2017  
Date Tested Dec .10, 2017 ~ Feb. 10, 2018

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
CFR 47 Part 15 Subpart C	PASS
ISED RSS-247 Issue 2	PASS
ISED RSS-GEN Issue 4	PASS

Summary of Test Results			
Clause	Test Items	FCC/IC Rules	Test Results
1	6db DTS Bandwidth	FCC 15.247 (a) (2) RSS-247 Clause 5.2	Note1
2	Peak Conducted Power	FCC 15.247 (b) (3) RSS-247 Clause 5.4	Note1
3	Power Spectral Density	FCC 15.247 (e) RSS-247 Clause 5.2	Note1
4	Conducted Band edge And Spurious emission	FCC 15.247 (d) RSS-247 Clause 5.4	Note1
5	Radiated Band edges and Spurious emission	FCC 15.247 (d) FCC 15.209 FCC 15.205 RSS-247 Clause 5.4 RSS-GEN Clause 8.9	PASS
6	Conducted Emission Test For AC Power Port	FCC 15.207	NA
7	Antenna Requirement	FCC 15.203 RSS-GEN Clause 8.3	Complied
Note: 1.For the test data, please refer to the report of the <b>FCC ID: VPYLB1FD, IC: 772C-LB1FD</b> 2. "N/A" denotes test is not applicable in this Test Report 3:Duty cycle factor refer to the original report			

Tested By:




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Kebo Zhang  
 Engineer

Checked By:




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Shawn Wen  
 Laboratory Leader

Approved By:




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Stephen Guo  
 Laboratory Manager

## 2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with DA 00-705, KDB414788 D01 Radiated Test Site v01, ANSI C63.10-2013, FCC CFR 47 Part 2, FCC CFR 47 Part 15, RSS-GEN Issue 4, and RSS-247 Issue 2.

## 3. FACILITIES AND ACCREDITATION

Test Location	UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch.
Address	Building 10, Innovation Technology Park, Song Shan Lake Hi tech Development Zone, Dongguan, 523808, China
Accreditation Certificate	UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch. EMC Laboratory has been accredited by A2LA for technical competence in the field of electrical testing, and proved to be in compliance with ISO/IEC 17025: 2005 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing. The Certificate Registration Number is 4102.01. UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch. EMC Laboratory has been registered and fully described in a report filed with the FCC (Federal Communications Commission). The Designation Number is CN1187. UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch. EMC Laboratory has been registered and fully described in a report filed with Industry Canada. The Company Number is 21320.

Note: The test anechoic chamber in UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch had been calibrated and compared to the open field sites.

## 4. CALIBRATION AND UNCERTAINTY

### 4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

### 4.2. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

Test Item	Uncertainty
Uncertainty for Conduction emission test	2.90dB
Uncertainty for Radiation Emission test(include Fundamental emission) (9KHz-30MHz)	2.2dB
Uncertainty for Radiation Emission test(include Fundamental emission) (30MHz-1GHz)	4.52dB
Uncertainty for Radiation Emission test (1GHz to 26GHz)( include Fundamental emission)	5.04dB(1-6GHz)
	5.30dB (6GHz-18Gz)
	5.23dB (18GHz-26Gz)
Note: This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.	

## 5. EQUIPMENT UNDER TEST

### 5.1. DESCRIPTION OF EUT

Equipment	Communication Module		
Model Name	LBEE6ZZ1FD		
Product Description	Operation Frequency	2402 MHz ~ 2480 MHz	
	Modulation Type	Data Rate	
	GFSK	1Mbps	
	π/4-DQPSK	2Mbps	
	8DPSK	3Mbps	
Power Supply	DC3.6V		
Bluetooth Version	BT 4.1+EDR Remark: This test report just include the data of the classic mode		
Hardware Version	V1.0		
Software Version	9.35.48.73		

### 5.2. MAXIMUM OUTPUT POWER

Bluetooth Mode	Frequency (MHz)	Channel Number	Max Output Power (dBm)	Max Output Power (W)
GFSK	2402-2480	0-78[79]	6.99	0.005
8DPSK	2402-2480	0-78[79]	8.45	0.007

### 5.3. PACKET TYPE CONFIGURATION

Test Mode	Packet Type	Setting(Packet Length)
GFSK	DH1	27
	DH3	183
	DH5	339
π/4-DQPSK	2-DH1	54
	2-DH3	367
	2-DH5	679
8DPSK	3-DH1	83
	3-DH3	552
	3-DH5	1021



**5.4. CHANNEL LIST**

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
00	2402	20	2422	40	2442	60	2462
01	2403	21	2423	41	2443	61	2463
02	2404	22	2424	42	2444	62	2464
03	2405	23	2425	43	2445	63	2465
04	2406	24	2426	44	2446	64	2466
05	2407	25	2427	45	2447	65	2467
06	2408	26	2428	46	2448	66	2468
07	2409	27	2429	47	2449	67	2469
08	2410	28	2430	48	2450	68	2470
09	2411	29	2431	49	2451	69	2471
10	2412	30	2432	50	2452	70	2472
11	2413	31	2433	51	2453	71	2473
12	2414	32	2434	52	2454	72	2474
13	2415	33	2435	53	2455	73	2475
14	2416	34	2436	54	2456	74	2476
15	2417	35	2437	55	2457	75	2477
16	2418	36	2438	56	2458	76	2478
17	2419	37	2439	57	2459	77	2479
18	2420	38	2440	58	2460	78	2480
19	2421	39	2441	59	2461		

**5.5. TEST CHANNEL CONFIGURATION**

Test Mode	Test Channel Number	Test Channel
GFSK	CH 00, CH 39, CH 78	Low, Middle, High
8DPSK	CH 00, CH 39, CH 78	Low, Middle, High

**5.6. THE WORSE CASE POWER SETTING PARAMETER**

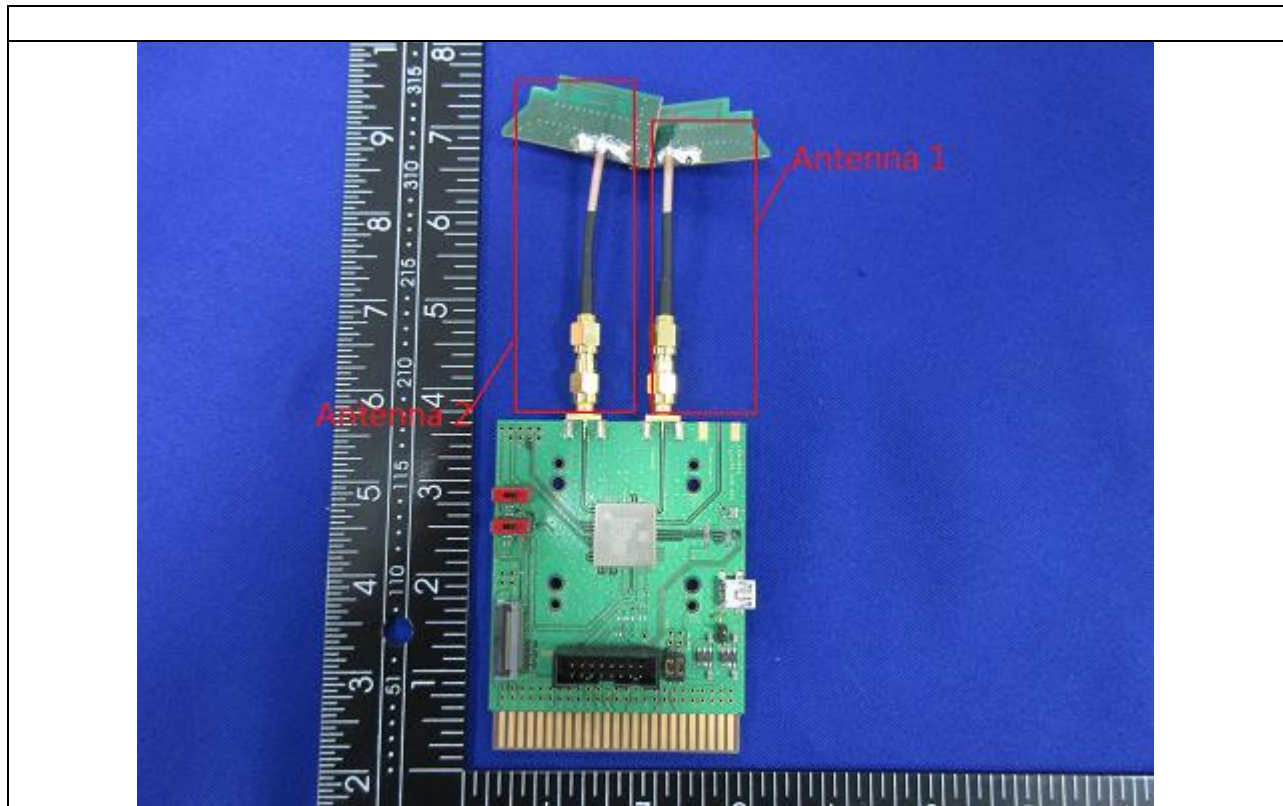
The Worst Case Power Setting Parameter under 2400 ~ 2483.5MHz Band				
Test Software		Bule Tool		
Modulation Type	Transmit Antenna Number	Test Channel		
		CH 00	CH 39	CH 78
GFSK	1	6	6	6
8DPSK	1	6	6	6

### 5.7. DESCRIPTION OF AVAILABLE ANTENNAS

Ant.	Frequency (MHz)	Antenna Type	Antenna Gain (dBi)
1	2402-2480	PCB Antenna	1

Note: There are two antenna in the EUT, only antenna 1 support BT mode.

Test Mode	Transmit and Receive Mode	Description
GFSK	1TX, 1RX	Antenna 1 can be used as transmitting/receiving antenna.
8DPSK	1TX, 1RX	Antenna 1 can be used as transmitting/receiving antenna.



### 5.8. WORST-CASE CONFIGURATIONS

Bluetooth Mode	Modulation Technology	Modulation Type	Data Rate (Mbps)
BR	FHSS	GFSK	1Mbit/s
EDR	FHSS	8DPSK	3Mbit/s

Note: Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates.

### 5.9. TEST ENVIRONMENT

Environment Parameter	Selected Values During Tests	
Relative Humidity	55 ~ 65%	
Atmospheric Pressure:	1025Pa	
Temperature	TN	23 ~ 28 °C
Voltage :	VL	N/A
	VN	DC 3.6V
	VH	N/A

Note: VL= Lower Extreme Test Voltage  
 VN= Nominal Voltage.  
 VH= Upper Extreme Test Voltage  
 TN= Normal Temperature

## 5.10. DESCRIPTION OF TEST SETUP

### SUPPORT EQUIPMENT

Item	Equipment	Brand Name	Model Name	P/N
1	Laptop	ThinkPad	T410	N/A
2	Fixed Frequency Board	Supply by customer	N/A	N/A
3	Adapter	Supply by UL EMC Lab	N/A	N/A

### I/O CABLES

Cable No	Port	Connector Type	Cable Type	Cable Length(m)	Remarks
1	N/A	N/A	N/A	N/A	N/A

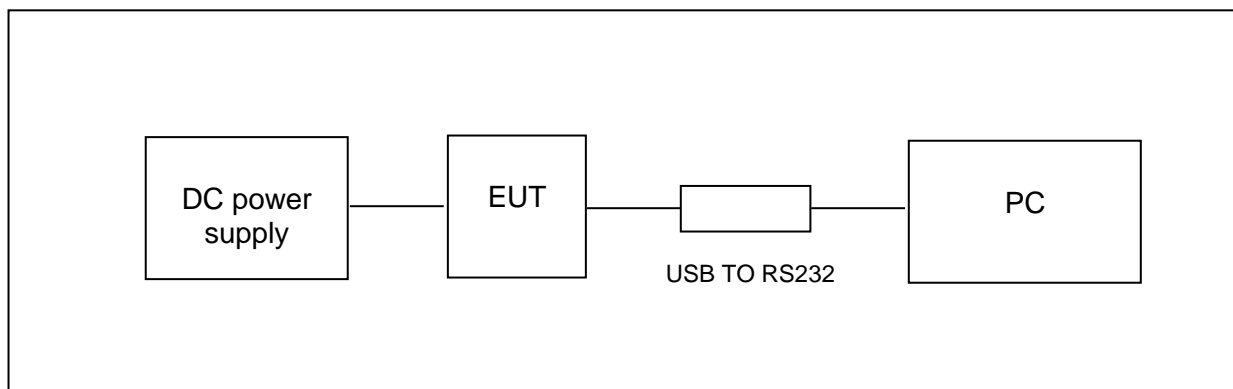
### ACCESSORY

Item	Accessory	Brand Name	Model Name	Description
1	N/A	N/A	N/A	N/A

### TEST SETUP

The EUT can work in an engineer mode with a software through a PC.

### SETUP DIAGRAM FOR TESTS



### 5.11. MEASURING INSTRUMENT AND SOFTWARE USED

Conducted Emissions							
Used	Equipment	Manufacturer	Model No.	Serial No.	Upper Last Cal.	Last Cal.	Next Cal.
<input checked="" type="checkbox"/>	EMI Test Receiver	R&S	ESR3	101961	Dec.20, 2016	Dec.12, 2017	Dec.11, 2018
<input checked="" type="checkbox"/>	Two-Line V-Network	R&S	ENV216	101983	Dec.20, 2016	Dec.12, 2017	Dec.11, 2018
<input checked="" type="checkbox"/>	Artificial Mains Networks	Schwarzbeck	NSLK 8126	8126465	Feb.10, 2017	Dec.12, 2017	Dec.11, 2018
Software							
Used	Description	Manufacturer	Name	Version			
<input checked="" type="checkbox"/>	Test Software for Conducted disturbance	UL	Antenna port	Ver. 7.2			
Radiated Emissions							
Used	Equipment	Manufacturer	Model No.	Serial No.	Upper Last Cal.	Last Cal.	Next Cal.
<input checked="" type="checkbox"/>	MXE EMI Receiver	KESIGHT	N9038A	MY56400036	Feb.24, 2017	Dec.12, 2017	Dec.11, 2018
<input checked="" type="checkbox"/>	Hybrid Log Periodic Antenna	TDK	HLP-3003C	130960	N/A	Jan.09, 2016	Jan.08, 2016
<input checked="" type="checkbox"/>	Preamplifier	HP	8447D	2944A09099	Feb.13, 2017	Dec.12, 2017	Dec.11, 2018
<input checked="" type="checkbox"/>	EMI Measurement Receiver	R&S	ESR26	101377	Dec.20, 2016	Dec.12, 2017	Dec.11, 2018
<input checked="" type="checkbox"/>	Horn Antenna	TDK	HRN-0118	130939	N/A	Jan. 09, 2016	Jan. 08, 2019
<input checked="" type="checkbox"/>	High Gain Horn Antenna	Schwarzbeck	BBHA-9170	691	N/A	Jan.06, 2016	Jan.05, 2019
<input checked="" type="checkbox"/>	Preamplifier	TDK	PA-02-0118	TRS-305-00066	Jan.14, 2017	Dec.12, 2017	Dec.11, 2018
<input checked="" type="checkbox"/>	Preamplifier	TDK	PA-02-2	TRS-307-00003	Dec.20, 2016	Dec.12, 2017	Dec.11, 2018
<input checked="" type="checkbox"/>	Loop antenna	Schwarzbeck	1519B	00008	N/A	Mar. 26, 2016	Mar. 25, 2019
Software							
Used	Description	Manufacturer	Name	Version			
<input checked="" type="checkbox"/>	Test Software for Radiated disturbance	Farad	EZ-EMC	Ver. UL-3A1			
Other instruments							
Used	Equipment	Manufacturer	Model No.	Serial No.	Upper Last Cal.	Last Cal.	Next Cal.
<input checked="" type="checkbox"/>	Spectrum Analyzer	Keysight	N9030A	MY55410512	Dec.20, 2016	Dec.12, 2017	Dec.11, 2018
<input checked="" type="checkbox"/>	Power Meter	Keysight	N9031A	MY55416024	Feb.13, 2017	Dec.12, 2017	Dec.11, 2018
<input checked="" type="checkbox"/>	Power Sensor	Keysight	N9323A	MY55440013	Feb.13, 2017	Dec.12, 2017	Dec.11, 2018

## 6. RADIATED TEST RESULTS

### 6.1. LIMITS AND PROCEDURE

#### LIMITS

Please refer to FCC §15.205 and §15.209

Please refer to SS-GEN Clause 8.9 and Clause 8.10

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

Note: 1) At frequencies at or above 30 MHz, measurements may be performed at a distance other than what is specified provided: measurements are not made in the near field except where it can be shown that near field measurements are appropriate due to the characteristics of the device; and it can be demonstrated that the signal levels needed to be measured at the distance employed can be detected by the measurement equipment. Measurements shall not be performed at a distance greater than 30 meters unless it can be further demonstrated that measurements at a distance of 30 meters or less are impractical. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade (inverse linear-distance for field strength measurements; inverse-linear-distance-squared for power density measurements).

(2) At frequencies below 30 MHz, measurements may be performed at a distance closer than that specified in the regulations; however, an attempt should be made to avoid making measurements in the near field. Pending the development of an appropriate measurement procedure for measurements performed below 30 MHz, when performing measurements at a closer distance than specified, the results shall be extrapolated to the specified distance by either making measurements at a minimum of two distances on at least one radial to determine the proper extrapolation factor or by using the square of an inverse linear distance extrapolation factor (40 dB/decade). This paragraph (f) shall not apply to Access BPL devices operating below 30 MHz.

Radiation Disturbance Test Limit for FCC (Above 1G)

Frequency (MHz)	dB(uV/m) (at 3 meters)	
	Peak	Average
Above 1000	74	54

Restricted bands of operation

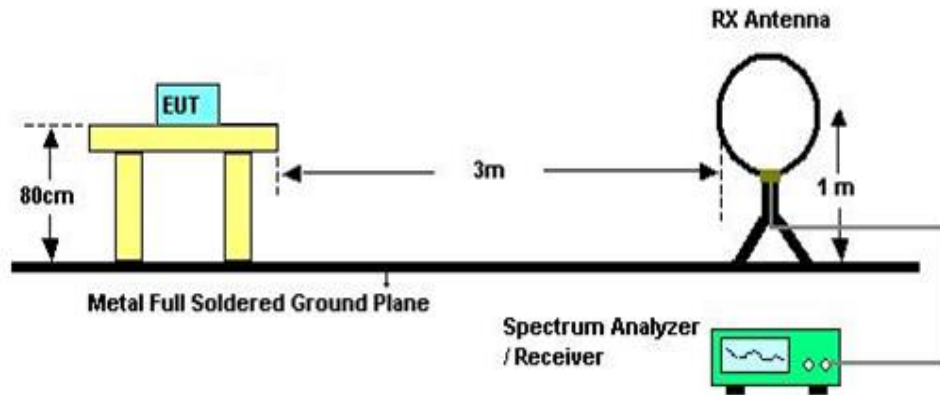
MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
<sup>1</sup> 0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	( <sup>2</sup> )
13.36-13.41			

Note: <sup>1</sup>Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

<sup>2</sup>Above 38.6c

**TEST SETUP AND PROCEDURE**

Below 30MHz



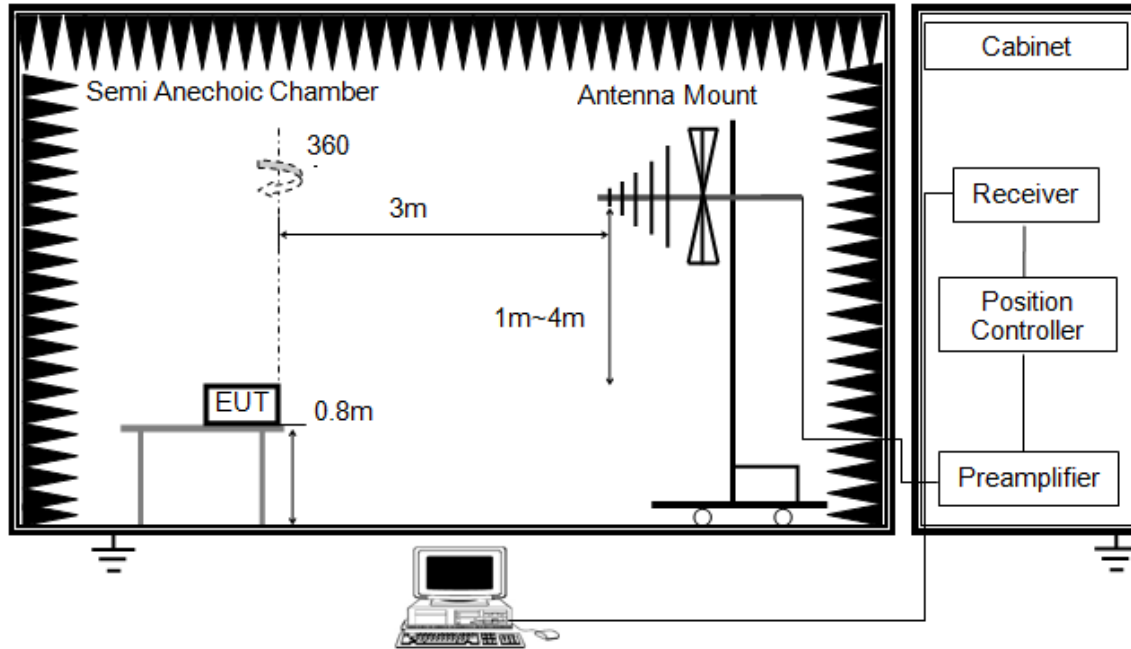
The setting of the spectrum analyser

RBW	200Hz (From 9kHz to 0.15MHz)/ 9KHz (From 0.15MHz to 30MHz)
VBW	200Hz (From 9kHz to 0.15MHz)/ 9KHz (From 0.15MHz to 30MHz)
Sweep	Auto
Trace	Max hold

1. The testing follows the guidelines in ANSI C63.10-2013
2. The EUT was arranged to its worst case and then turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
3. The EUT was placed on a turntable with 80cm meter above ground.
4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
5. The radiated emission limits are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.
6. For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 3 MHz for peak measurements and 1 MHz resolution bandwidth with set  $VBW \leq RBW/100$ , but not less than 10Hz video bandwidth with peak detector, max hold to be run for at least 50 traces for average measurements.
7. For the actual test configuration, please refer to the related item in this test report (Photographs of the Test Configuration)



Below 1G and above 30MHz

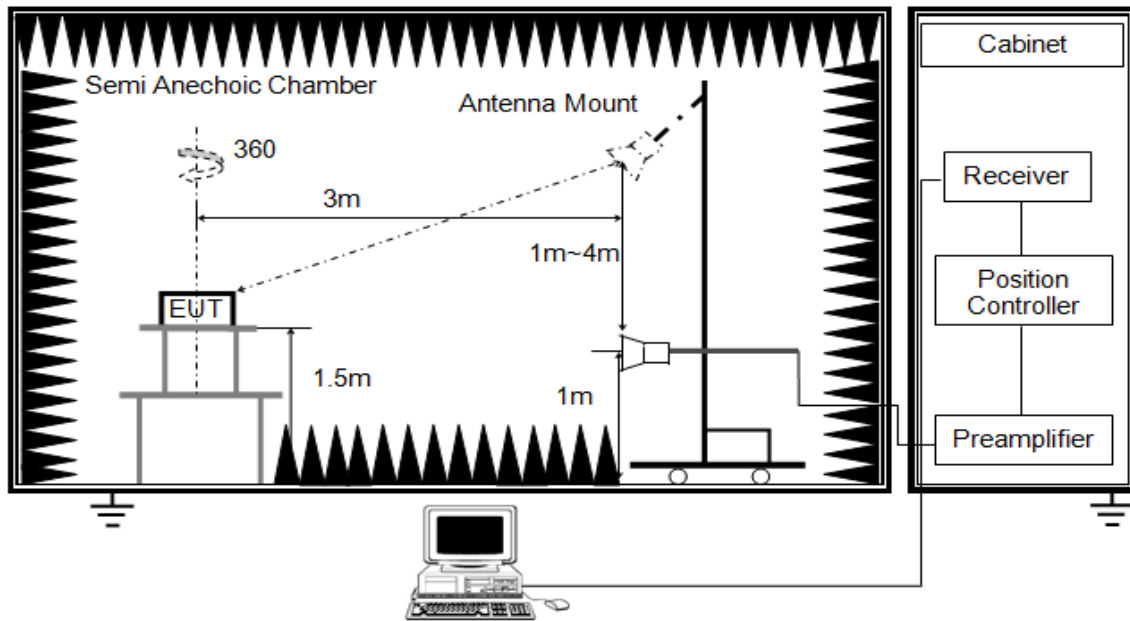


The setting of the spectrum analyser

RBW	120K
VBW	300K
Sweep	Auto
Trace	Max hold

1. The testing follows the guidelines in ANSI C63.10-2013.
2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
3. The EUT was placed on a turntable with 80cm above ground.
4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
5. For measurement below 1GHz, the initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured. If the emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.
6. For the actual test configuration, please refer to the related item in this test report.

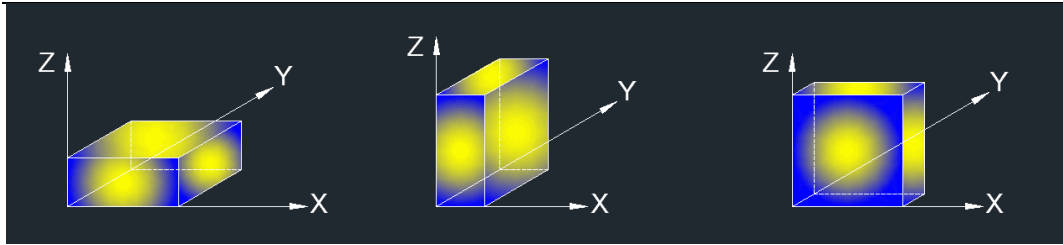
Above 1G



RBW	1M
VBW	PEAK: 3M AVG: see note 6
Sweep	Auto
Detector	Peak
Trace	Max hold

1. The testing follows the guidelines in ANSI C63.10-2013.
2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
3. The EUT was placed on a turntable with 80cm above ground.
4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
5. For measurement above 1GHz, the emission measurement will be measured by the peak detector. This peak level, once corrected, must comply with the limit specified in Section 15.209.
6. For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 3 MHz for peak measurements and 1 MHz resolution bandwidth with 1/T video bandwidth.
7. For the actual test configuration, please refer to the related item in this test report (Photographs of the Test Configuration)

X axis, Y axis, Z axis positions:

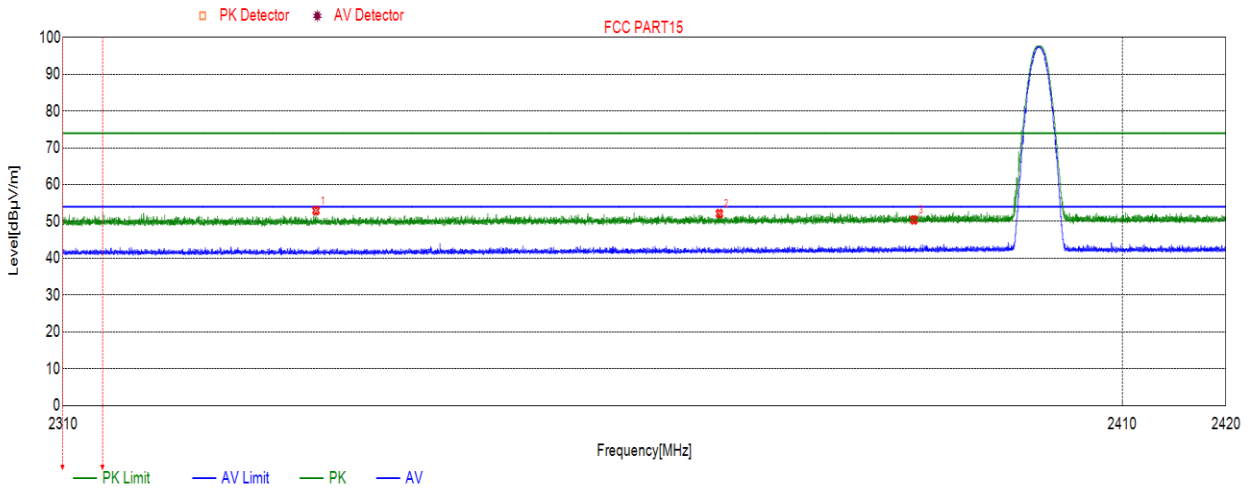


Note: For all radiated test, EUT in each of three orthogonal axis emissions had been tested, but only the worst case (X axis) data recorded in the report.

## 6.2. RESTRICTED BANDEDGE

### 6.2.1. GFSK MODE

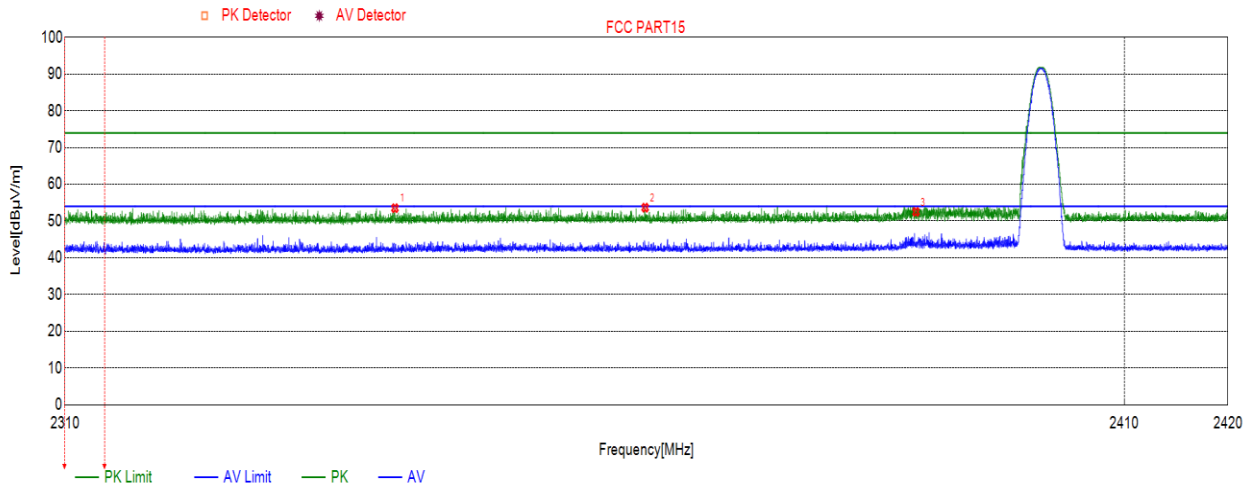
#### RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



No.	Frequency (MHz)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2333.5094	52.98	74.00	-21.02	peak
2	2371.4741	52.15	74.00	-21.85	peak
3	2390.000	50.43	74.00	-23.57	peak

Note: 1. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.  
 2. Peak: Peak detector.

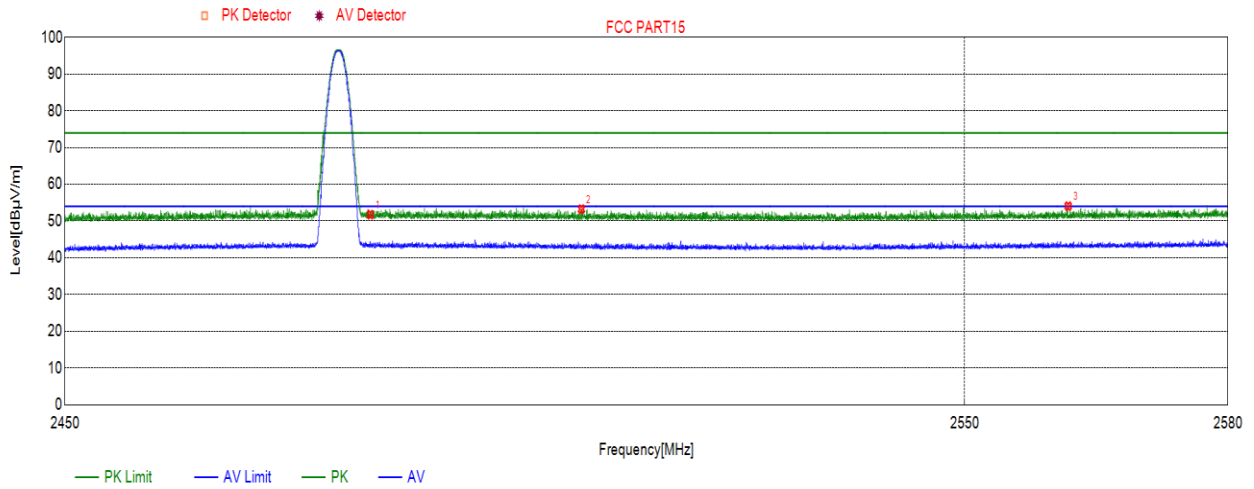
**RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)**



No.	Frequency (MHz)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2340.7041	53.51	74.00	-20.49	peak
2	2364.2464	53.65	74.00	-20.35	peak
3	2390.000	52.52	74.00	-21.48	peak

Note: 1. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.  
 2. Peak: Peak detector.

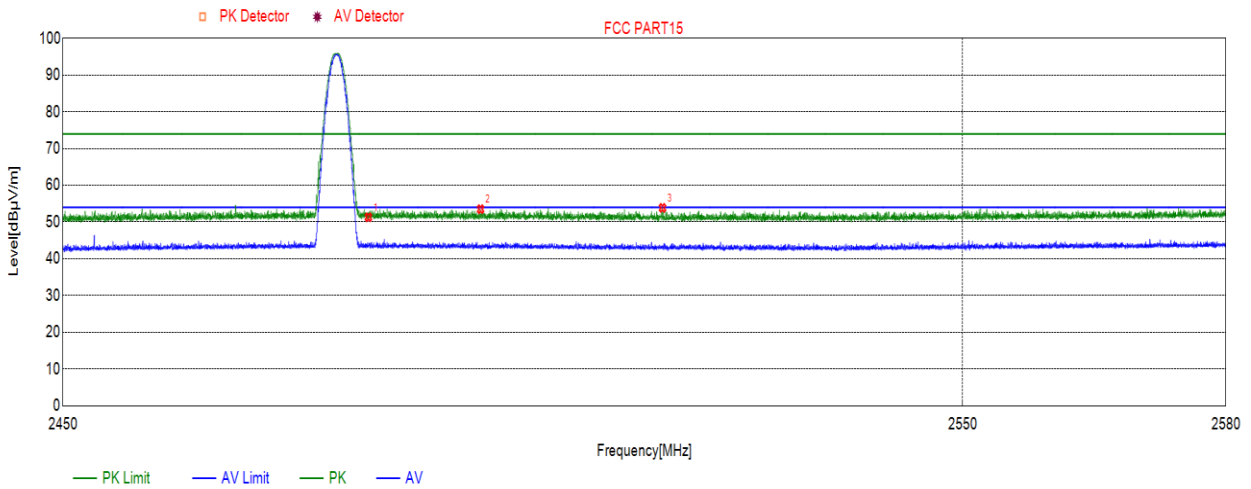
**RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)**



No.	Frequency (MHz)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2483.500	51.74	74.00	-22.26	peak
2	2506.9197	53.25	74.00	-20.75	peak
3	2561.7592	53.86	74.00	-20.14	peak

Note: 1. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.  
 2. Peak: Peak detector.

**RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)**

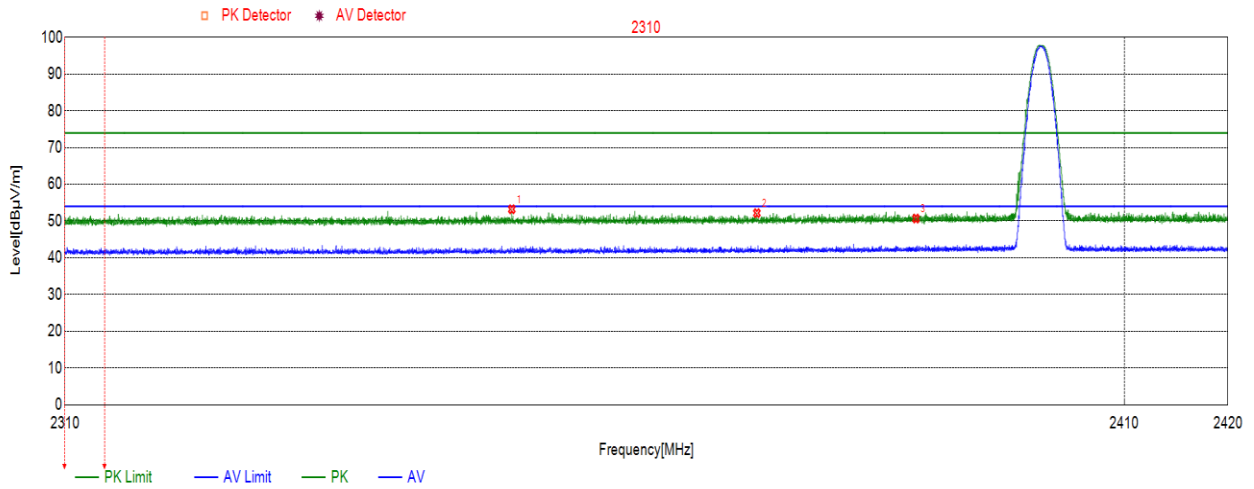


No.	Frequency (MHz)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2483.500	51.31	74.00	-22.69	peak
2	2495.9206	53.52	74.00	-20.48	peak
3	2516.1896	53.86	74.00	-20.14	peak

Note: 1. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.  
 2. Peak: Peak detector.

### 6.2.2. 8DPSK MODE

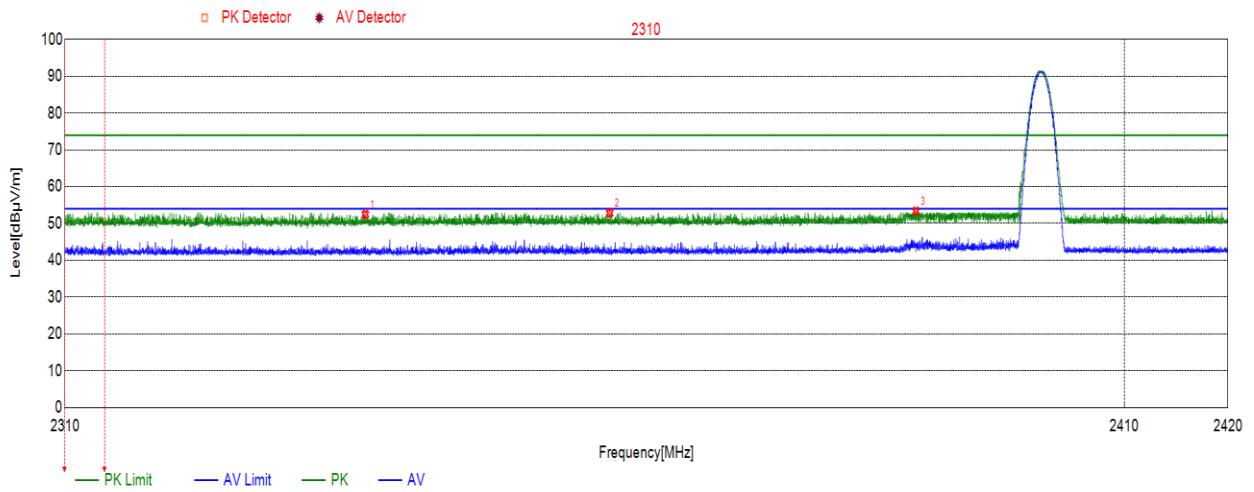
#### RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



No.	Frequency (MHz)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2351.6722	53.21	74.00	-20.79	peak
2	2374.8405	52.17	74.00	-21.83	peak
3	2390.000	50.68	74.00	-23.32	peak

Note: 1. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.  
 2. Peak: Peak detector.

**RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)**

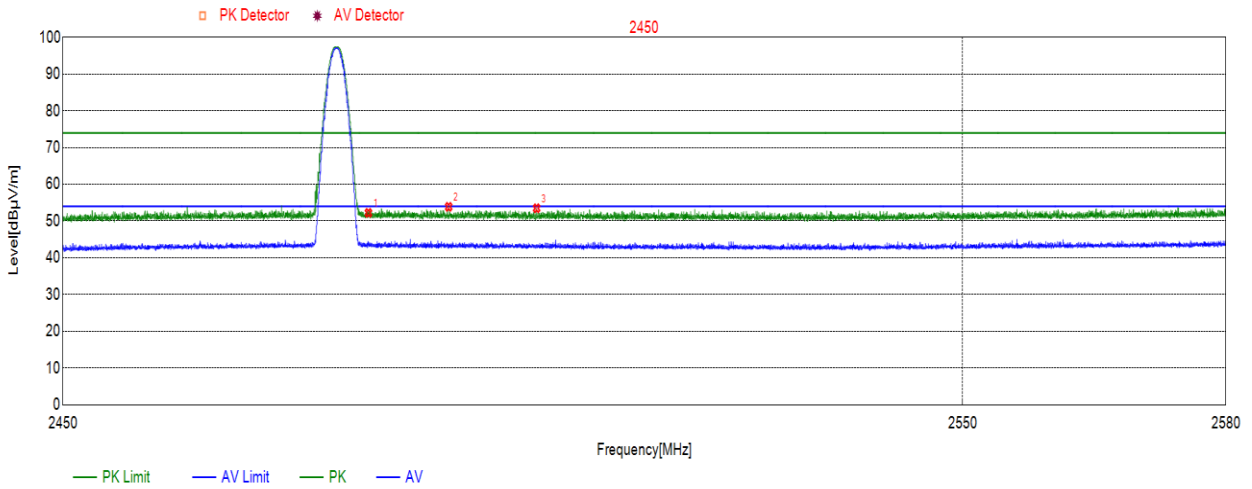


No.	Frequency (MHz)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2337.9318	52.46	74.00	-21.54	peak
2	2360.9021	52.85	74.00	-21.15	peak
3	2390.000	53.32	74.00	-20.68	peak

Note: 1. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.  
 2. Peak: Peak detector.



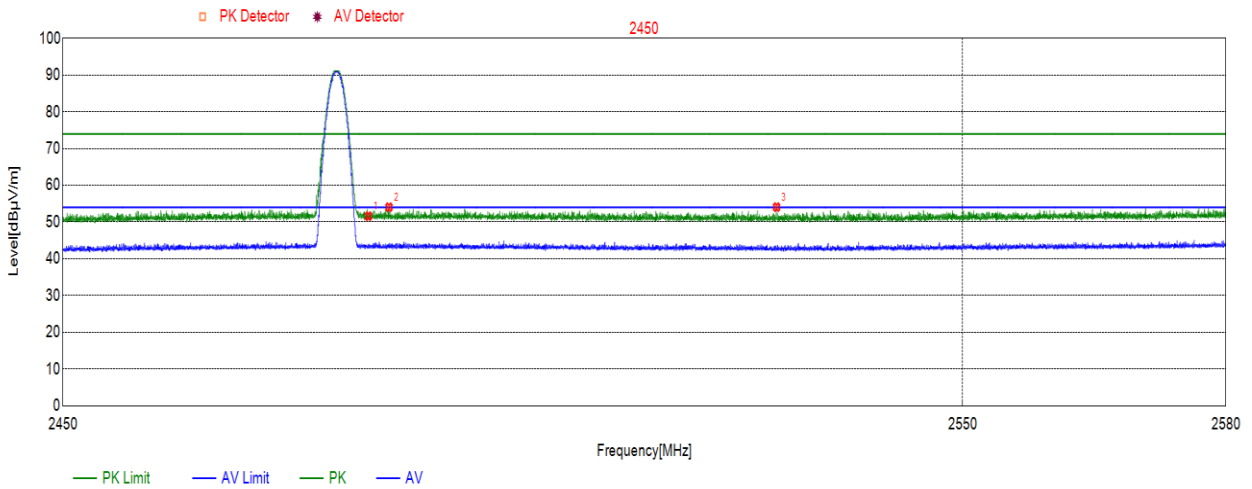
**RESTRICTED BANDEGE (HIGH CHANNEL, HORIZONTAL)**



No.	Frequency (MHz)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2483.500	52.23	74.00	-21.77	peak
2	2492.3842	53.88	74.00	-20.12	peak
3	2502.1482	53.49	74.00	-20.51	peak

Note: 1. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.  
 2. Peak: Peak detector.

**RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)**



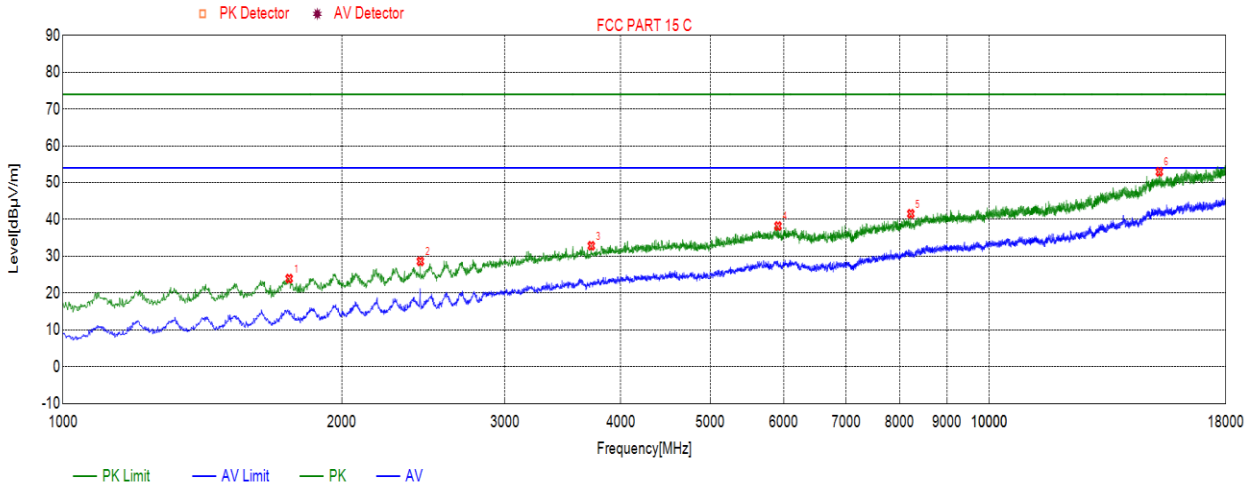
No.	Frequency (MHz)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2483.500	51.60	74.00	-22.40	peak
2	2485.7796	53.84	74.00	-20.16	peak
3	2528.9829	53.87	74.00	-20.13	peak

Note: 1. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.  
 2. Peak: Peak detector.

### 6.3. SPURIOUS EMISSIONS (1~18GHz)

#### 6.3.1. GFSK MODE

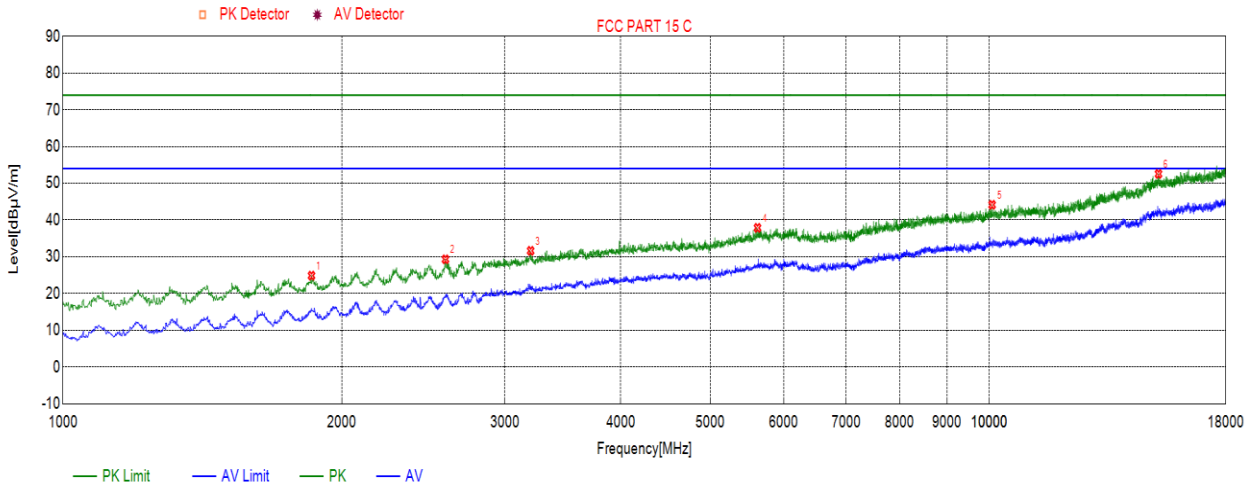
##### HARMONICS AND SPURIOUS EMISSIONS (LOW CHANNEL, HORIZONTAL)



No.	Frequency (MHz)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1754.8755	23.95	74.00	-50.05	Peak
2	2431.5432	28.62	74.00	-45.38	Peak
3	3718.5719	32.86	74.00	-41.14	Peak
4	5915.1915	38.23	74.00	-35.77	Peak
5	8227.4227	41.56	74.00	-32.44	Peak
6	15259.3259	52.96	74.00	-21.04	Peak

Note: 1. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.  
 2. Peak: Peak detector.

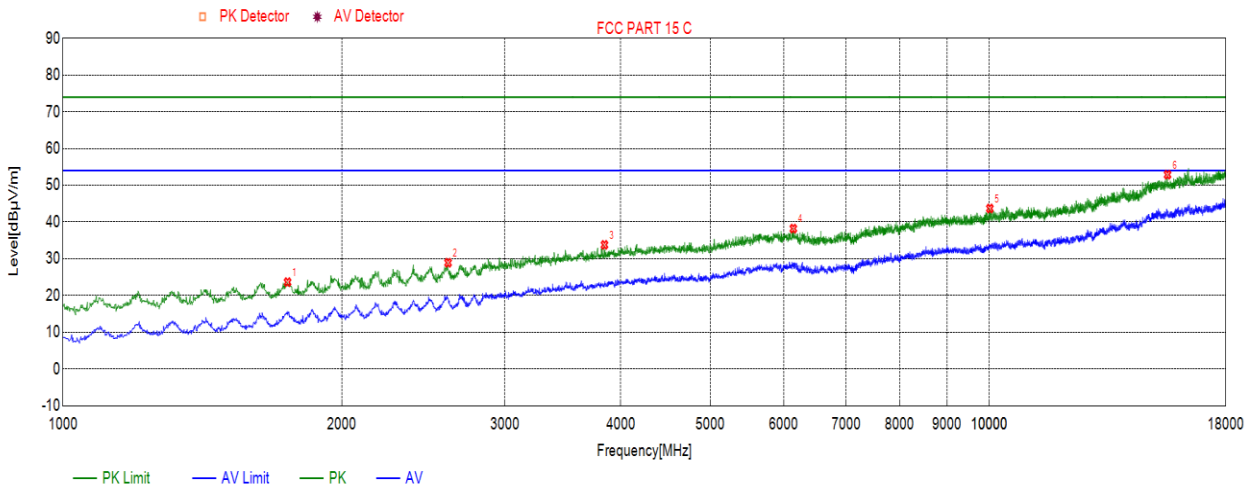
**HARMONICS AND SPURIOUS EMISSIONS (LOW CHANNEL, VERTICAL)**



No.	Frequency (MHz)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1855.1855	24.88	74.00	-49.12	Peak
2	2587.9588	29.32	74.00	-44.68	Peak
3	3198.3198	31.64	74.00	-42.36	Peak
4	5621.0621	37.88	74.00	-36.12	Peak
5	10070.4070	44.16	74.00	-29.84	Peak
6	15228.7229	52.57	74.00	-21.43	Peak

Note: 1. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.  
 2. Peak: Peak detector.

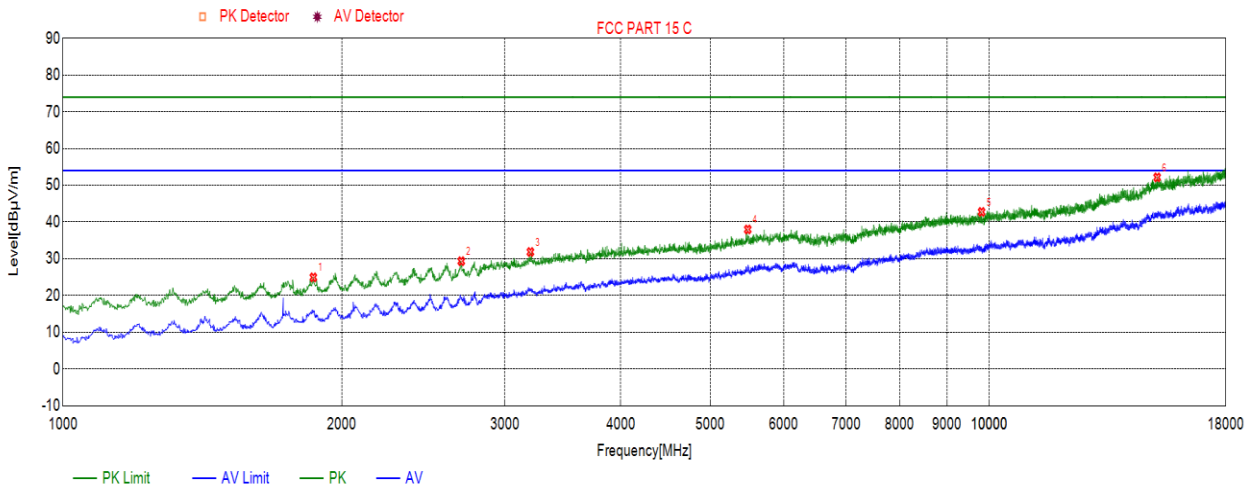
**HARMONICS AND SPURIOUS EMISSIONS (MID CHANNEL, HORIZONTAL)**



No.	Frequency (MHz)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1748.0748	23.65	74.00	-50.35	Peak
2	2604.9605	28.93	74.00	-45.07	Peak
3	3842.6843	33.80	74.00	-40.20	Peak
4	6144.7145	38.22	74.00	-35.78	Peak
5	10014.3014	43.70	74.00	-30.30	Peak
6	15575.5576	52.90	74.00	-21.10	Peak

Note: 1. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.  
 2. Peak: Peak detector.

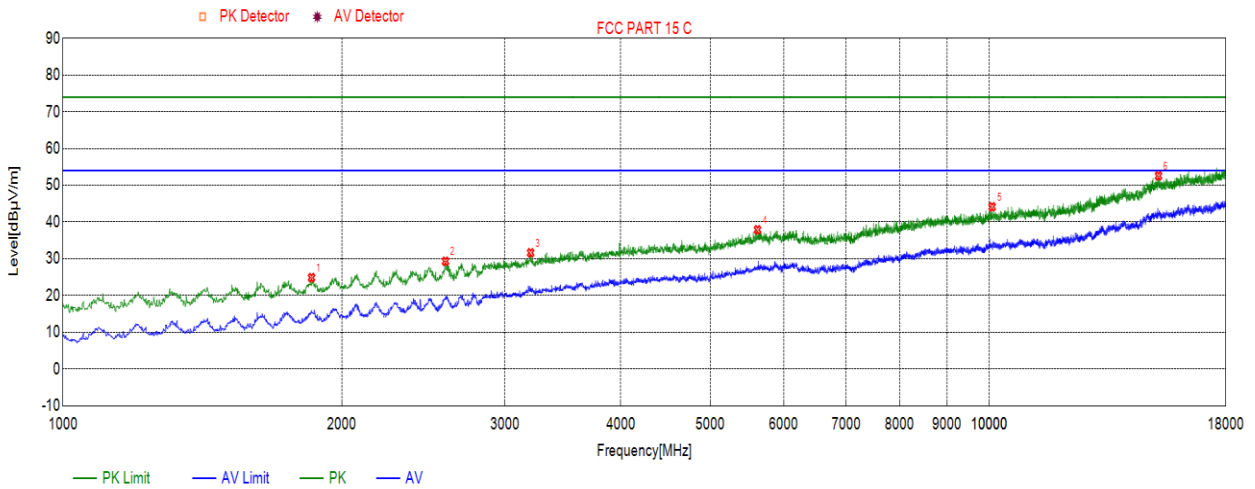
**HARMONICS AND SPURIOUS EMISSIONS (MID CHANNEL, VERTICAL)**



No.	Frequency (MHz)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1863.6864	24.95	74.00	-49.05	Peak
2	2691.6692	29.35	74.00	-44.65	Peak
3	3196.6197	31.86	74.00	-42.14	Peak
4	5486.7487	37.99	74.00	-36.01	Peak
5	9810.2810	42.76	74.00	-31.24	Peak
6	15177.7178	52.17	74.00	-21.83	Peak

Note: 1. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.  
 2. Peak: Peak detector.

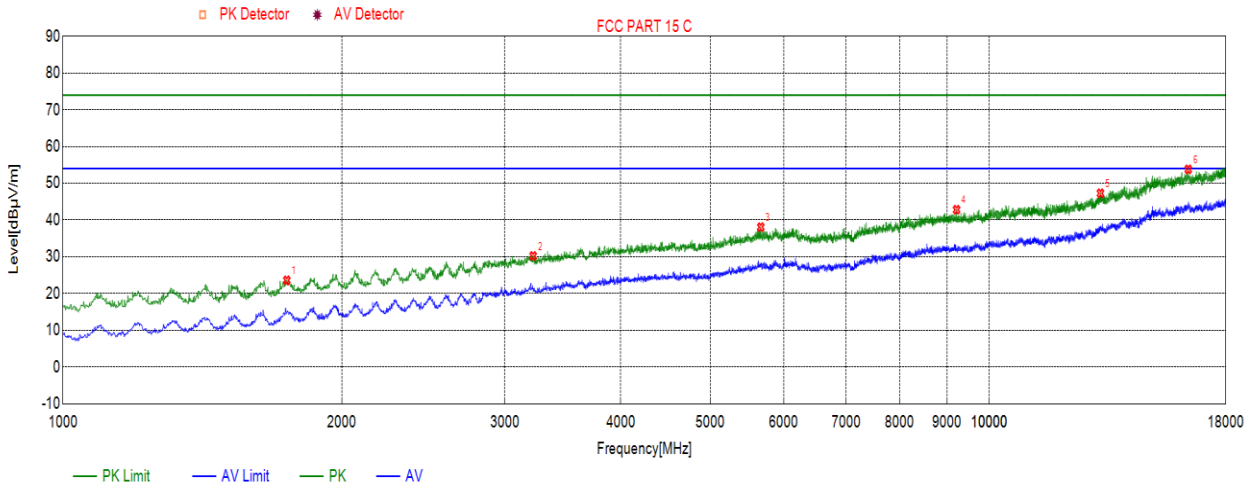
**HARMONICS AND SPURIOUS EMISSIONS (HIGH CHANNEL, HORIZONTAL)**



No.	Frequency (MHz)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1742.9743	24.04	74.00	-49.96	Peak
2	2596.4596	28.72	74.00	-45.28	Peak
3	3897.0897	33.99	74.00	-40.01	Peak
4	6175.3175	37.63	74.00	-36.37	Peak
5	9135.3135	43.78	74.00	-30.22	Peak
6	15269.5270	52.18	74.00	-21.82	Peak

Note: 1. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.  
 2. Peak: Peak detector.

**HARMONICS AND SPURIOUS EMISSIONS (HIGH CHANNEL, VERTICAL)**



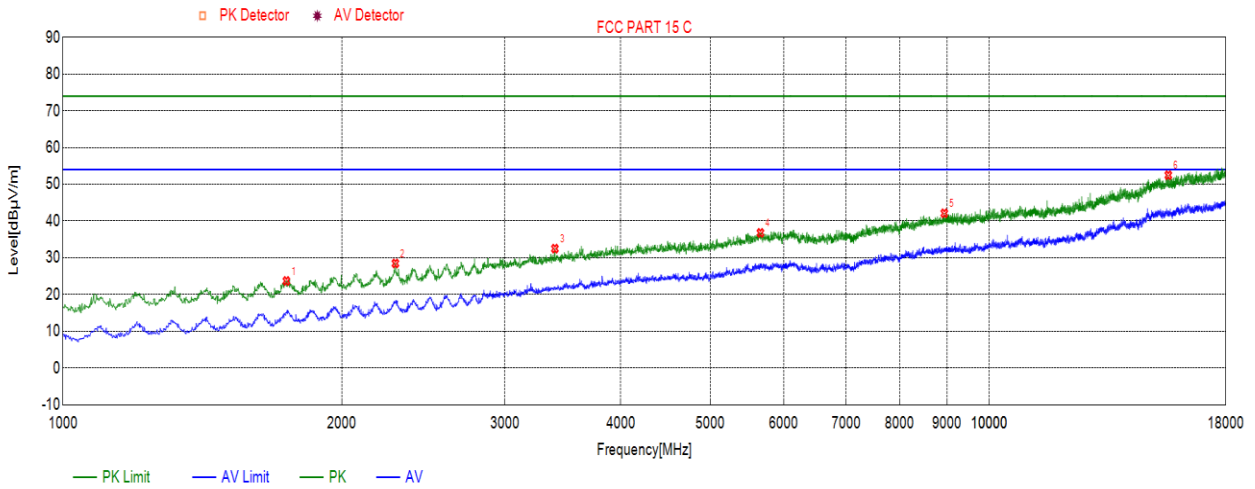
No.	Frequency (MHz)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1744.6745	23.59	74.00	-50.41	Peak
2	3218.7219	30.23	74.00	-43.77	Peak
3	5666.9667	38.08	74.00	-35.92	Peak
4	9218.6219	42.82	74.00	-31.18	Peak
5	13183.4183	47.30	74.00	-26.70	Peak
6	16396.7397	53.80	74.00	-20.20	Peak

Note: 1. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.  
 2. Peak: Peak detector.



### 6.3.2. 8DPSK MODE

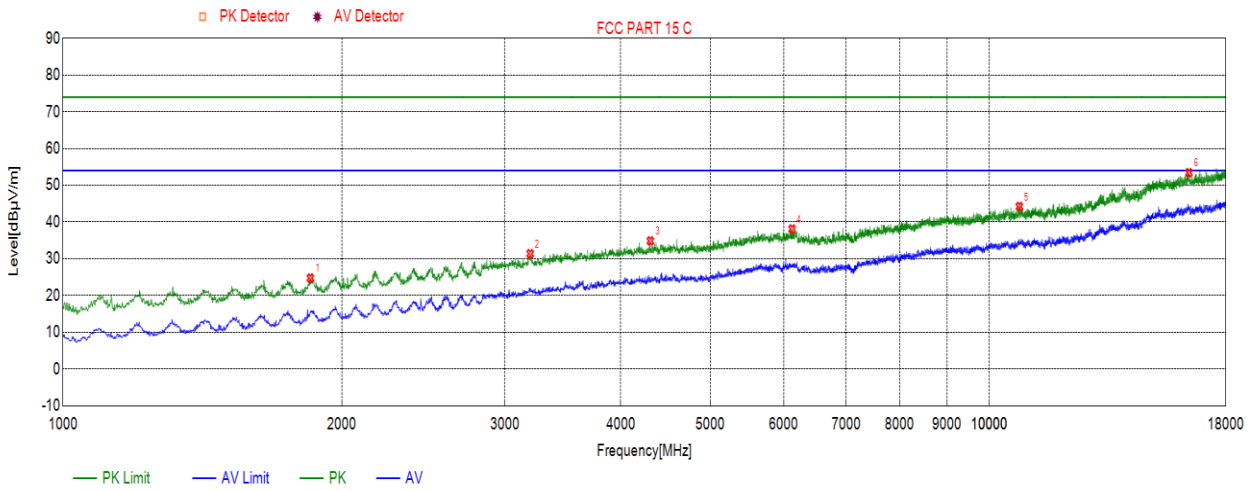
#### HARMONICS AND SPURIOUS EMISSIONS (LOW CHANNEL, HORIZONTAL)



No.	Frequency (MHz)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1742.9743	23.69	74.00	-50.31	Peak
2	2285.3285	28.48	74.00	-45.52	Peak
3	3397.2397	32.50	74.00	-41.50	Peak
4	5661.8662	36.79	74.00	-37.21	Peak
5	8943.1943	42.11	74.00	-31.89	Peak
6	15606.1606	52.49	74.00	-21.51	Peak

Note: 1. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.  
 2. Peak: Peak detector.

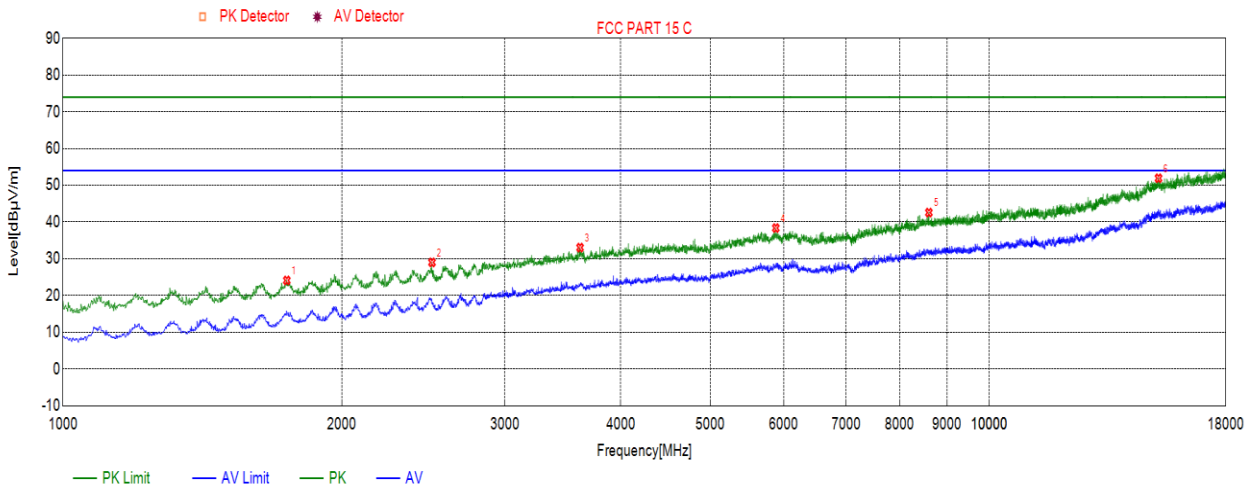
**HARMONICS AND SPURIOUS EMISSIONS (LOW CHANNEL, VERTICAL)**



No.	Frequency (MHz)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1850.0850	24.75	74.00	-49.25	Peak
2	3194.9195	31.40	74.00	-42.60	Peak
3	4306.8307	34.87	74.00	-39.13	Peak
4	6126.0126	38.11	74.00	-35.89	Peak
5	10775.9776	44.22	74.00	-29.78	Peak
6	16425.6426	53.42	74.00	-20.58	Peak

Note: 1. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.  
 2. Peak: Peak detector.

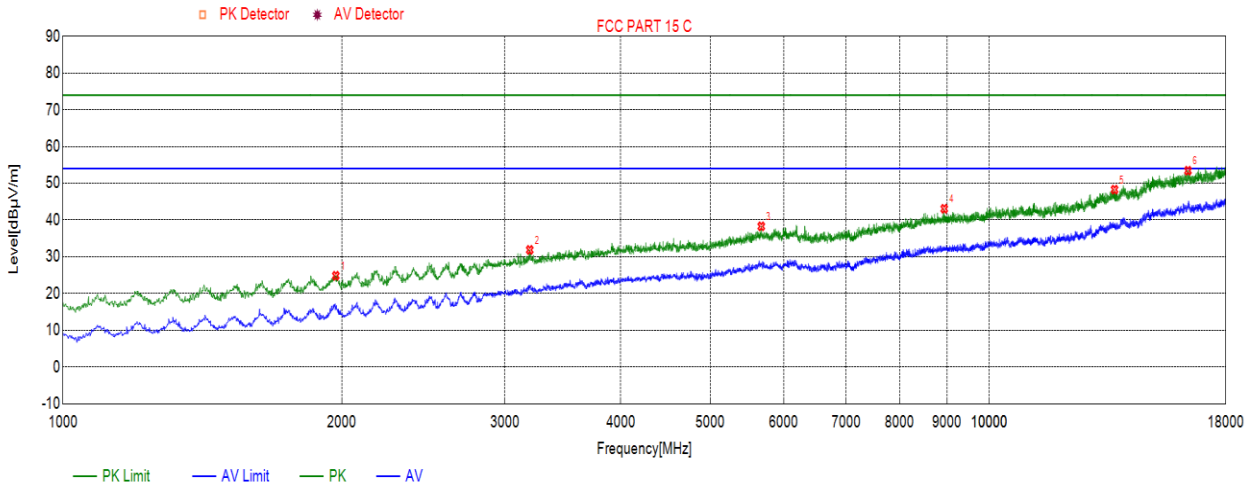
**HARMONICS AND SPURIOUS EMISSIONS (MID CHANNEL, HORIZONTAL)**



No.	Frequency (MHz)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1744.6745	24.12	74.00	-49.88	Peak
2	2502.9503	29.02	74.00	-44.98	Peak
3	3616.5617	33.05	74.00	-40.95	Peak
4	5882.8883	38.37	74.00	-35.63	Peak
5	8606.5607	42.58	74.00	-31.42	Peak
6	15228.7229	51.93	74.00	-22.07	Peak

Note: 1. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.  
 2. Peak: Peak detector.

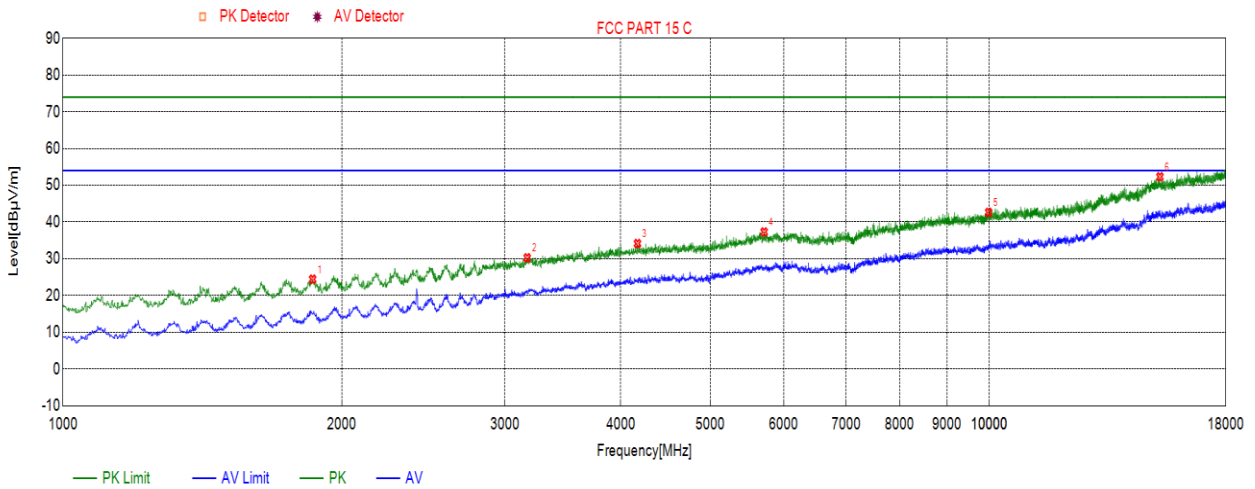
**HARMONICS AND SPURIOUS EMISSIONS (MID CHANNEL, VERTICAL)**



No.	Frequency (MHz)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1970.7971	24.85	74.00	-49.15	Peak
2	3191.5192	31.88	74.00	-42.12	Peak
3	5673.7674	38.29	74.00	-35.71	Peak
4	8941.4941	43.07	74.00	-30.93	Peak
5	13654.3654	48.29	74.00	-25.71	Peak
6	16386.5387	53.44	74.00	-20.56	Peak

Note: 1. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.  
 2. Peak: Peak detector.

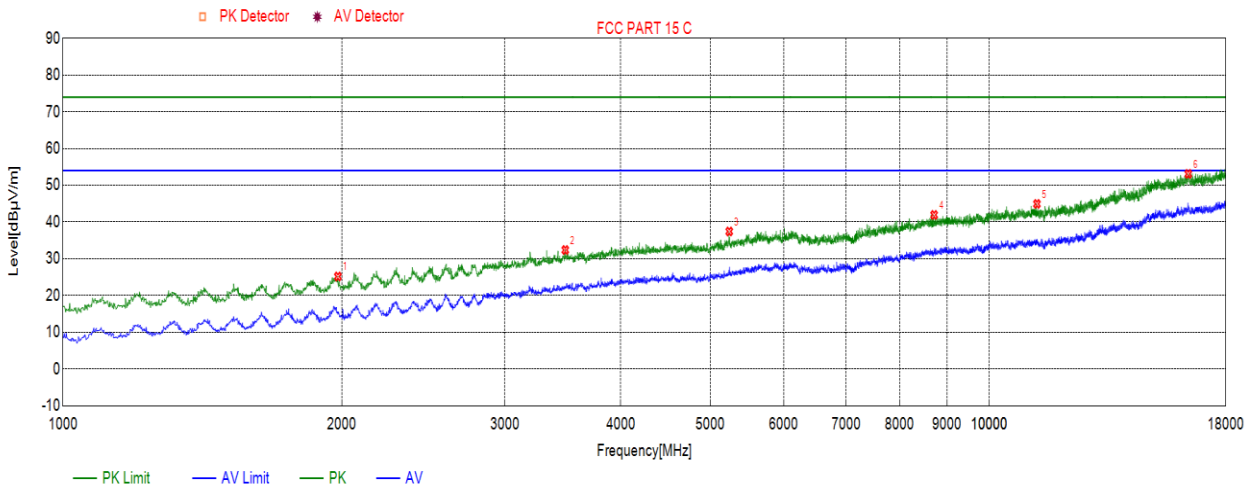
**HARMONICS AND SPURIOUS EMISSIONS (HIGH CHANNEL, HORIZONTAL)**



No.	Frequency (MHz)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1860.2860	24.44	74.00	-49.56	Peak
2	3171.1171	30.25	74.00	-43.75	Peak
3	4170.8171	34.15	74.00	-39.85	Peak
4	5714.5715	37.29	74.00	-36.71	Peak
5	9985.3985	42.61	74.00	-31.39	Peak
6	15283.1283	52.31	74.00	-21.69	Peak

Note: 1. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.  
 2. Peak: Peak detector.

**HARMONICS AND SPURIOUS EMISSIONS (HIGH CHANNEL, VERTICAL)**



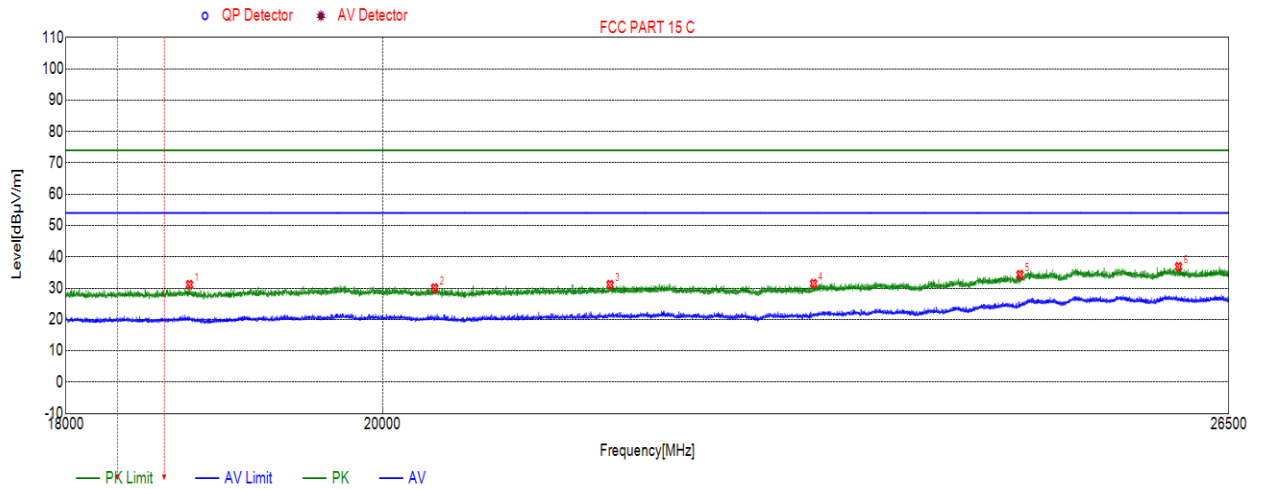
No.	Frequency (MHz)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1980.9981	25.19	74.00	-48.81	Peak
2	3485.6486	32.40	74.00	-41.60	Peak
3	5240.2240	37.44	74.00	-36.56	Peak
4	8718.7719	41.94	74.00	-32.06	Peak
5	11257.1257	44.95	74.00	-29.05	Peak
6	16398.4398	53.11	74.00	-20.89	Peak

Note: 1. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.  
 2. Peak: Peak detector.

## 6.4. SPURIOUS EMISSIONS 18G ~ 26GHz

### 6.4.1. GFSK MODE

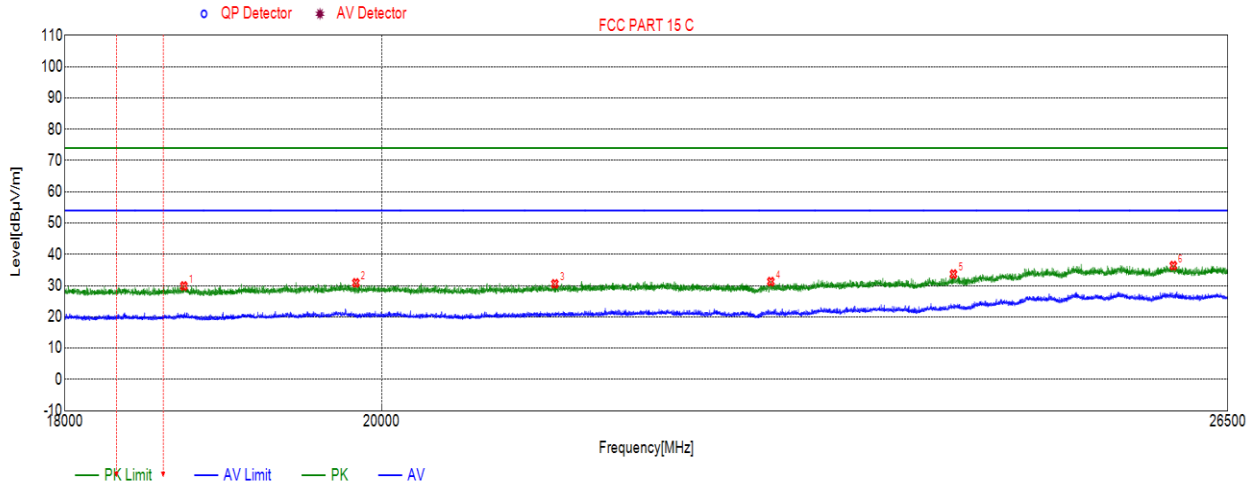
#### SPURIOUS EMISSIONS (MID CHANNEL, WORST-CASE CONFIGURATION, HORIZONTAL)



No.	Frequency (MHz)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	18755.7256	31.12	74.00	-42.88	peak
2	20348.7849	30.04	74.00	-43.96	peak
3	21571.2071	31.13	74.00	-42.87	peak
4	23081.8082	31.46	74.00	-42.54	peak
5	24721.6222	34.32	74.00	-39.68	peak
6	26061.3561	36.84	74.00	-37.16	peak

- Note: 1. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.  
 2. Peak: Peak detector.  
 3. All the modes had been tested, but only the worst data were recorded in the report.  
 4. Pre-test all the modes, then choose the worst case as final result.

**SPURIOUS EMISSIONS (MID CHANNEL, WORST-CASE CONFIGURATION, VERTICAL)**



No.	Frequency (MHz)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	18726.8227	29.86	74.00	-44.14	peak
2	19829.3829	30.88	74.00	-43.12	peak
3	21186.1186	30.56	74.00	-43.44	peak
4	22763.8764	31.27	74.00	-42.73	peak
5	24189.4689	33.67	74.00	-40.33	peak
6	26024.8025	36.38	74.00	-37.62	peak

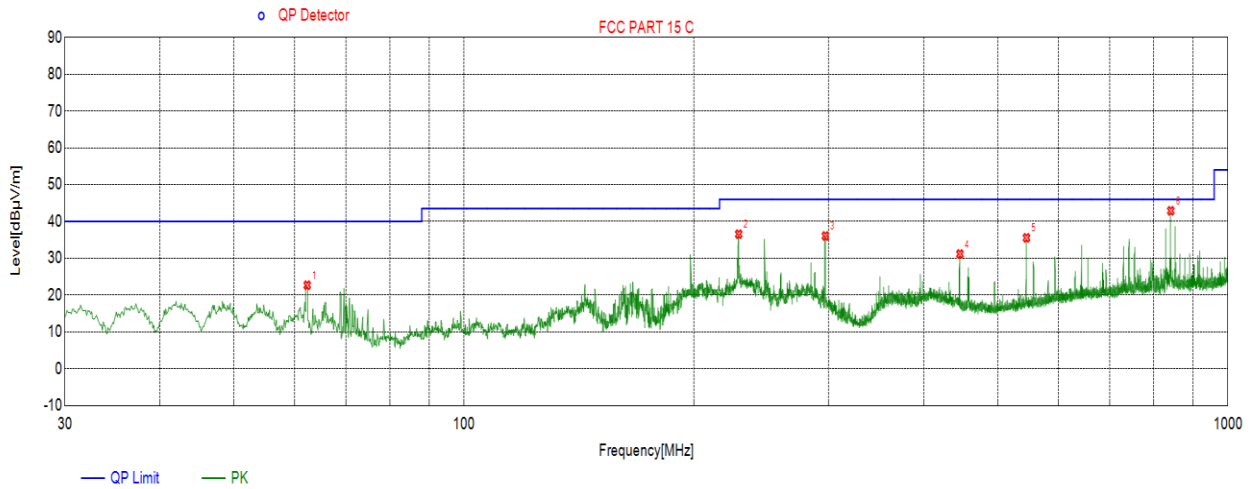
- Note: 1. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.  
 2. Peak: Peak detector.  
 3. All the modes had been tested, but only the worst data were recorded in the report.  
 4. Pre-test all the modes, then choose the worst case as final result.



## 6.5. SPURIOUS EMISSIONS 30M ~ 1 GHz

### 6.5.1. GFSK MODE

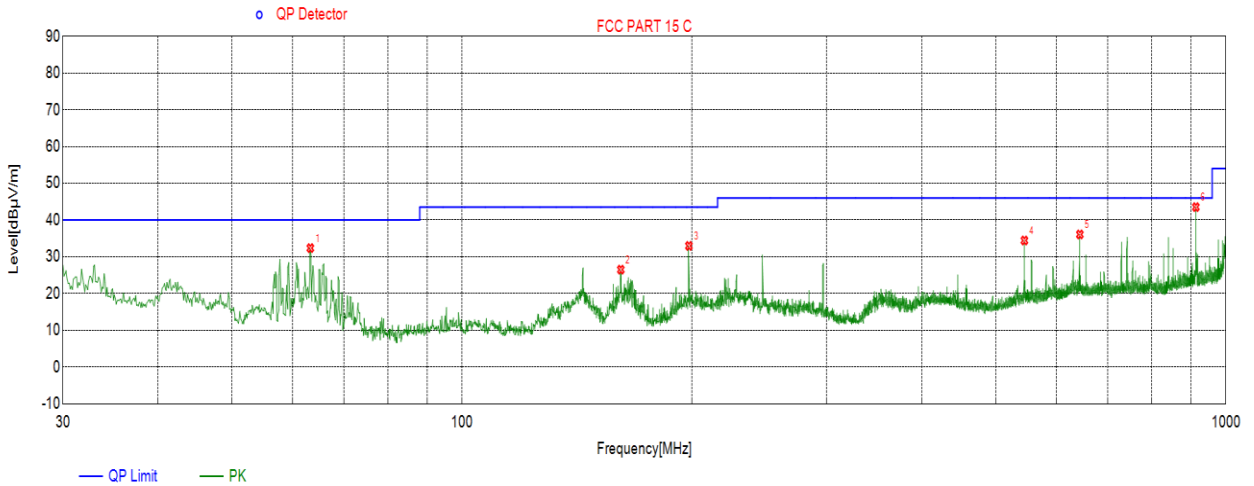
#### SPURIOUS EMISSIONS (MID CHANNEL, WORST-CASE CONFIGURATION, HORIZONTAL)



No.	Frequency (MHz)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	62.3042	22.70	40.00	-17.30	QP
2	228.8699	36.56	46.00	-9.44	QP
3	297.2617	36.08	46.00	-9.92	QP
4	445.9776	31.18	46.00	-14.82	QP
5	545.0245	35.56	46.00	-10.44	QP
6	842.2622	42.92	46.00	-3.08	QP

- Note: 1. If Peak Result complies with QP limit, QP Result is deemed to comply with QP limit.  
 2. Test setup: RBW: 120 kHz, VBW: 300 kHz, Sweep time: auto.  
 3. All the modes had been tested, but only the worst data were recorded in the report.  
 4. Pre-test all the modes, then choose the worst case as final result.

**SPURIOUS EMISSIONS (MID CHANNEL, WORST-CASE CONFIGURATION, VERTICAL)**



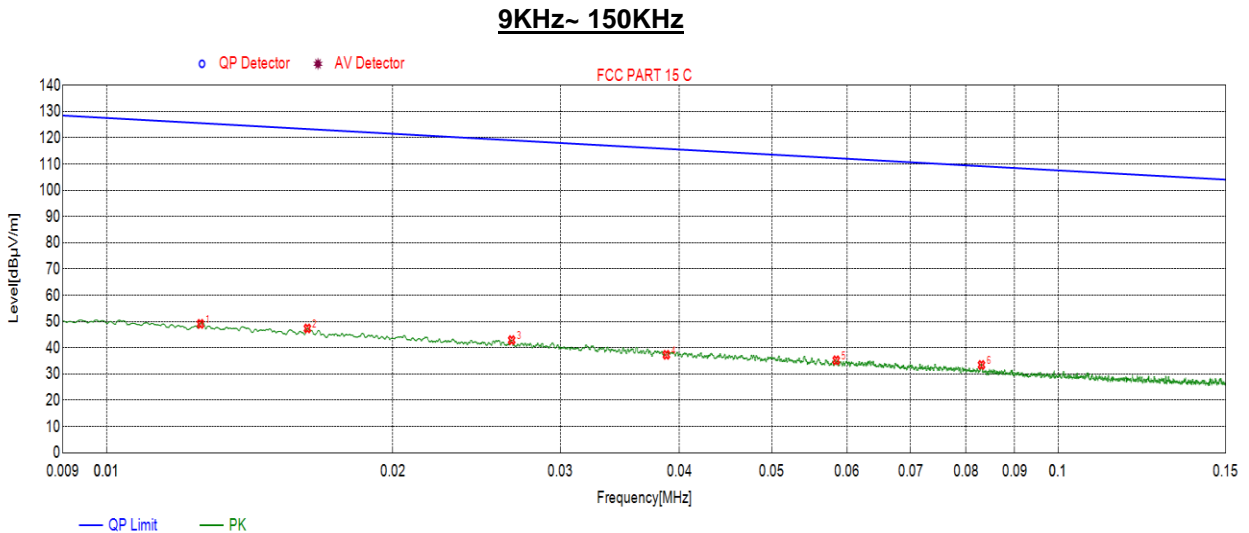
No.	Frequency (MHz)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	63.2743	32.38	40.00	-7.62	QP
2	161.3511	26.51	43.50	-16.99	QP
3	198.1178	32.98	43.50	-10.52	QP
4	544.9275	34.44	46.00	-11.56	QP
5	644.0714	36.09	46.00	-9.91	QP
6	913.8554	43.53	46.00	-2.47	QP

- Note: 1. If Peak Result complies with QP limit, QP Result is deemed to comply with QP limit.  
 2. Test setup: RBW: 120 kHz, VBW: 300 kHz, Sweep time: auto.  
 3. All the modes had been tested, but only the worst data were recorded in the report.  
 4. Pre-test all the modes, then choose the worst case as final result.

## 6.6. SPURIOUS EMISSIONS BELOW 30M

### 6.6.1. GFSK MODE

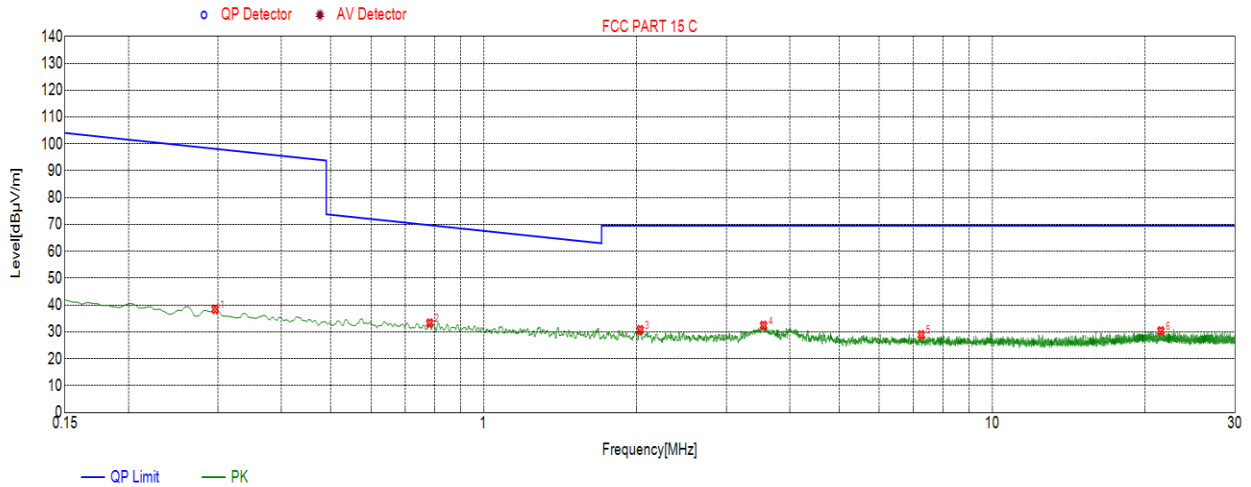
#### SPURIOUS EMISSIONS (MID CHANNEL, WORST-CASE CONFIGURATION, HORIZONTAL)



No.	Frequency (MHz)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	0.0126	49.12	125.57	-76.45	peak
2	0.0163	47.37	123.36	-75.99	peak
3	0.0267	42.93	119.07	-76.14	peak
4	0.0388	37.33	115.81	-78.48	peak
5	0.0585	35.23	112.26	-77.03	peak
6	0.0831	33.47	109.20	-75.73	peak

- Note: 1. All the modes had been tested, but only the worst data were recorded in the report.  
 2. If Peak Result complies with AV and QP limit, AV and QP Result are deemed to comply with AV limit.  
 3. Pre-test all the modes, then choose the worst case as final result.

**150KHz ~ 30M**

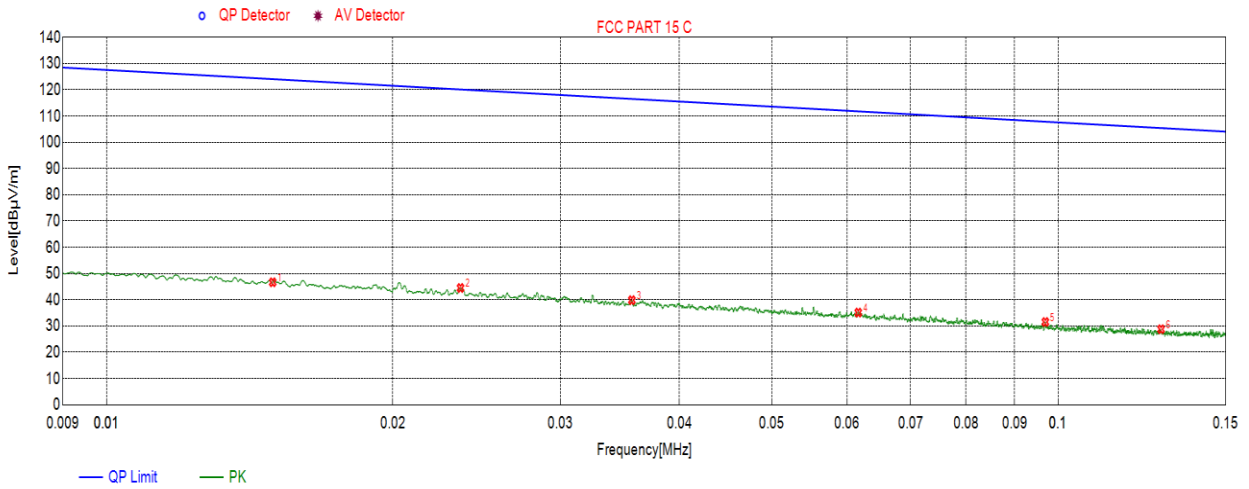


No.	Frequency (MHz)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	0.2963	38.43	98.17	-59.74	peak
2	0.7829	33.26	69.74	-36.48	peak
3	2.0307	30.77	69.50	-38.73	peak
4	3.5503	32.42	69.50	-37.08	peak
5	7.2520	28.91	69.50	-40.59	peak
6	21.4650	30.35	69.50	-39.15	peak

- Note:
1. All the modes had been tested, but only the worst data were recorded in the report.
  2. If Peak Result complies with AV and QP limit, AV and QP Result are deemed to comply with AV limit.
  3. Pre-test all the modes, then choose the worst case as final result.

**SPURIOUS EMISSIONS (MID CHANNEL, WORST-CASE CONFIGURATION, VERTICAL)**

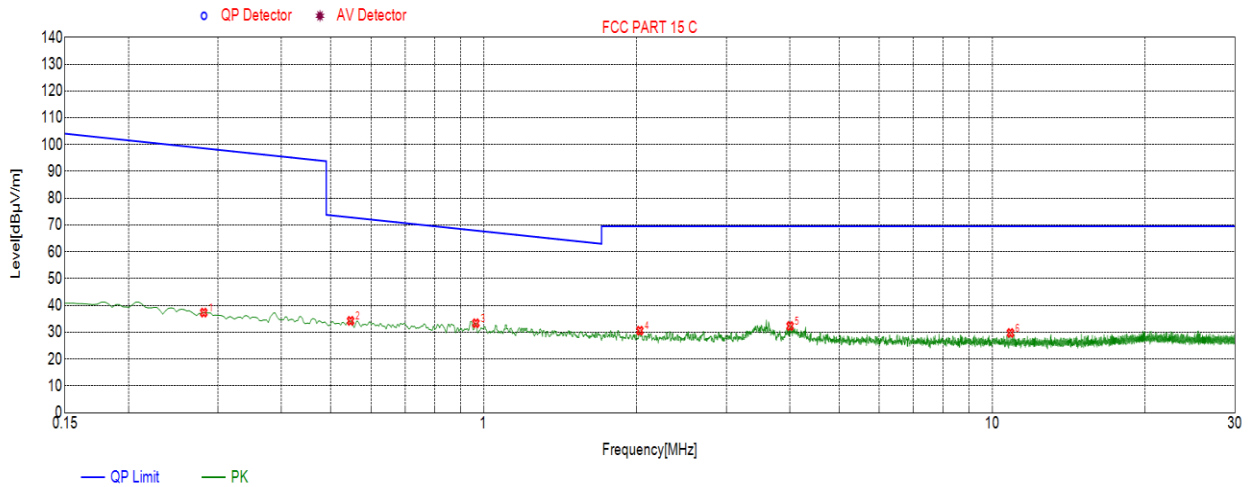
**9KHz~ 150KHz**



No.	Frequency (MHz)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	0.0150	46.68	124.06	-77.38	peak
2	0.0236	44.51	120.15	-75.64	peak
3	0.0357	39.86	116.55	-76.69	peak
4	0.0617	35.13	111.79	-76.66	peak
5	0.0970	31.54	107.86	-76.32	peak
6	0.1283	28.79	105.44	-76.65	peak

- Note:
1. All the modes had been tested, but only the worst data were recorded in the report.
  2. If Peak Result complies with AV and QP limit, AV and QP Result are deemed to comply with AV limit.
  3. Pre-test all the modes, then choose the worst case as final result.

**150KHz ~ 30M**



No.	Frequency (MHz)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	0.2814	37.34	98.62	-61.28	peak
2	0.5470	34.26	72.85	-38.59	peak
3	0.9650	33.37	67.93	-34.56	peak
4	2.0278	30.60	69.50	-38.90	peak
5	4.0040	32.32	69.50	-37.18	peak
6	10.8613	29.75	69.50	-39.75	peak

- Note:
1. All the modes had been tested, but only the worst data were recorded in the report.
  2. If Peak Result complies with AV and QP limit, AV and QP Result are deemed to comply with AV limit.
  3. Pre-test all the modes, then choose the worst case as final result.

## **7. ANTENNA REQUIREMENTS**

### **APPLICABLE REQUIREMENTS**

Please refer to FCC §15.203

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. 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.

Please refer to FCC §15.247(b)(4)

The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

### **ANTENNA CONNECTOR**

EUT has an PCB antenna with antenna connector, it will be installed in a specific environment and users cannot change the antenna.

### **ANTENNA GAIN**

The antenna gain of EUT is less than 6 dBi.

**END OF REPORT**

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