



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

**CERTIFICATION TEST REPORT**

*For*

**WiFi Module**

**MODEL NUMBER: SI07A**

**FCC ID: 2AFG6-SI07A**

**IC: 22166- SI07A**

**REPORT NUMBER: 4789708221-1**

**ISSUE DATE: January 21, 2021**

*Prepared for*

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Revision History

Rev.	Issue Date	Revisions	Revised By
V0	01/21/2021	Initial Issue	

Note: This is a spot check report base on 4789708215-4 which is issued by UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch on November 30, 2020. The WiFi module SI07 had already applied for FCC ID (2AFG6-SI07A) and IC (22166- SI07), the new WiFi module SI07A and SI07 are the same except to except for one less module SKI.WB7668CU.1, so we only follow the KDB KDB484596 D01 to add the spot check in this report. For other data, please refer to the original report 4789708215-4.

Parent Model SI07 FCC ID: 2AFG6-SI07, IC: 22166 -SI07

variant model SI07A, FCC ID: 2AFG6-SI07A, IC: 22166 -SI07A

Test Report	802.11 2.4GHz WIFI (DTS)	BLE (DTS)	Bluetooth DSS	802.11 5G WIFI UNII
SI07 Parent	Report #4789708215-6 #4789708215-7	Report #4789708215-5	Report #4789708215-4	Report #4789708215-8 #4789708215-9
SI07A Variant	Report #4789708221-3	Report #4789708221-2	Report #4789708221-1	Report #4789708221-4



Summary of Test Results			
Clause	Test Items	FCC/ISED Rules	Test Results
1	Conducted Output Power	FCC Part 15.247 (b) (3) RSS-247 Clause 5.4 (d)	Pass
2	Radiated Bandedge and Spurious Emission Spot Check	FCC Part 15.247 (d) FCC Part 15.209 FCC Part 15.205 RSS-247 Clause 5.5 RSS-GEN Clause 8.9	Pass
3	Antenna Requirement	FCC Part 15.203 RSS-GEN Clause 6.8	Pass

Note:

1. This test report is only published to and used by the applicant, and it is not for evidence purpose in China.
2. The measurement result for the sample received is <Pass> according to < CFR 47 FCC PART 15 SUBPART C >< ISED RSS-247 > when <Accuracy Method> decision rule is applied.

Test worst case of Conducted Output Power Spot Check					
Test Mode	Test Packet Type	Frequency (MHz)	Result[dBm]	original report Result[dBm]	Deviation(dB)
8DPSK	3DH5	2480	8.17	8.33	-0.15

The worst case of Radiated Bandedge and Spurious Emission Spot Check					
Test Mode	Test Item	Frequency (MHz)	Result[dBuV/m]	original report Result[dBuV/m]	Deviation(dB)
8DPSK	Band Edge	2484.275	49.29	49.98	-0.69
	RSE	2672	52.45	55.74	-3.29

Note: Comparison of two models, upper deviation is within 3 dB range and all test results are under FCC Technical limits.



## TABLE OF CONTENTS

<b>1. ATTESTATION OF TEST RESULTS .....</b>	<b>5</b>
<b>2. TEST METHODOLOGY .....</b>	<b>6</b>
<b>3. FACILITIES AND ACCREDITATION .....</b>	<b>6</b>
<b>4. CALIBRATION AND UNCERTAINTY .....</b>	<b>7</b>
4.1. <i>MEASURING INSTRUMENT CALIBRATION .....</i>	<i>7</i>
4.2. <i>MEASUREMENT UNCERTAINTY.....</i>	<i>7</i>
<b>5. EQUIPMENT UNDER TEST .....</b>	<b>8</b>
5.1. <i>DESCRIPTION OF EUT .....</i>	<i>8</i>
5.2. <i>MAXIMUM PEAK OUTPUT POWER .....</i>	<i>8</i>
5.3. <i>PACKET TYPE CONFIGURATION .....</i>	<i>8</i>
5.4. <i>CHANNEL LIST.....</i>	<i>9</i>
5.5. <i>TEST CHANNEL CONFIGURATION.....</i>	<i>9</i>
5.6. <i>WORST-CASE CONFIGURATIONS.....</i>	<i>9</i>
5.7. <i>THE WORSE CASE POWER SETTING PARAMETER.....</i>	<i>10</i>
5.8. <i>DESCRIPTION OF AVAILABLE ANTENNAS .....</i>	<i>10</i>
5.9. <i>DESCRIPTION OF TEST SETUP.....</i>	<i>11</i>
<b>6. MEASURING INSTRUMENT AND SOFTWARE USED .....</b>	<b>12</b>
<b>7. ANTENNA PORT TEST RESULTS.....</b>	<b>13</b>
7.1. <i>CONDUCTED OUTPUT POWER.....</i>	<i>13</i>
<b>8. RADIATED TEST RESULTS.....</b>	<b>15</b>
8.1. <i>RESTRICTED BANDEDGE .....</i>	<i>21</i>
8.1.1. <i>8DPSK MODE .....</i>	<i>21</i>
8.2. <i>SPURIOUS EMISSIONS (1 GHz ~ 3 GHz).....</i>	<i>22</i>
8.2.1. <i>8DPSK MODE .....</i>	<i>22</i>
8.3. <i>SPURIOUS EMISSIONS (3 GHz ~ 18 GHz).....</i>	<i>24</i>
8.3.1. <i>8DPSK MODE .....</i>	<i>24</i>
8.4. <i>SPURIOUS EMISSIONS (18 GHz ~ 26 GHz).....</i>	<i>26</i>
8.4.1. <i>8DPSK MODE .....</i>	<i>26</i>
8.5. <i>SPURIOUS EMISSIONS (30 MHz ~ 1 GHz).....</i>	<i>28</i>
8.5.1. <i>8DPSK MODE .....</i>	<i>28</i>
8.6. <i>SPURIOUS EMISSIONS BELOW 30 MHz .....</i>	<i>30</i>
8.6.1. <i>8DPSK MODE .....</i>	<i>30</i>
<b>9. ANTENNA REQUIREMENTS.....</b>	<b>33</b>



# 1. ATTESTATION OF TEST RESULTS

## Applicant Information

Company Name: Guangzhou Shirui Electronics Co Ltd  
Address: 192 Kezhu Road, Sciencetech Park, guangzhou Economic Technology Development District Guangzhou China

## Manufacturer Information

Company Name: Guangzhou Shirui Electronics Co Ltd  
Address: 192 Kezhu Road, Sciencetech Park, guangzhou Economic Technology Development District Guangzhou China

## EUT Information

EUT Name: WiFi Module  
Model: SI07A  
Sample Received Date: January 11, 2021  
Sample Status: Normal  
Sample ID: 3616600  
Date of Tested: January 12, 2021~ January 20, 2021

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
CFR 47 FCC PART 15 SUBPART C	PASS
ISED RSS-247 Issue 2	PASS
ISED RSS-GEN Issue 5	PASS

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Approved By:

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## 2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with KDB 558074 D01 15.247 Meas Guidance v05r02, 414788 D01 Radiated Test Site v01r01, CFR 47 FCC Part 2, CFR 47 FCC Part 15, ANSI C63.10-2013, ISED RSS-247 Issue 2 and ISED RSS-GEN Issue 5.

## 3. FACILITIES AND ACCREDITATION

Accreditation Certificate	<p><b>A2LA (Certificate No.: 4102.01)</b> UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch. has been assessed and proved to be in compliance with A2LA.</p> <p><b>FCC (FCC Designation No.: CN1187)</b> UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch. Has been recognized to perform compliance testing on equipment subject to the Commission's Delcaration of Conformity (DoC) and Certification rules</p> <p><b>ISED (Company No.: 21320)</b> UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch. has been registered and fully described in a report filed with ISED. The Company Number is 21320 and the test lab Conformity Assessment Body Identifier (CABID) is CN0046.</p> <p><b>VCCI (Registration No.: G-20019, R-20004, C-20012 and T-20011)</b> UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch. has been assessed and proved to be in compliance with VCCI, the Membership No. is 3793. Facility Name: Chamber D, the VCCI registration No. is G-20019 and R-20004 Shielding Room B , the VCCI registration No. is C-20012 and T-20011</p>
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Note 1: All tests measurement facilities use to collect the measurement data are located at Building 10, Innovation Technology Park, Song Shan Lake Hi tech Development Zone, Dongguan, 523808, China

Note 2: 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 and the test anechoic chamber is shown to be equivalent to or worst case from the open field site.

Note 3: For below 30 MHz, lab had performed measurements at test anechoic chamber and comparing to measurements obtained on an open field site. And these measurements below 30 MHz had been correlated to measurements performed on an OFS.

## 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
Conduction emission	3.62 dB
Radiated Emission (Included Fundamental Emission) (9 kHz ~ 30 MHz)	2.2 dB
Radiated Emission (Included Fundamental Emission) (30 MHz ~ 1 GHz)	4.00 dB
Radiated Emission (Included Fundamental Emission) (1 GHz to 26 GHz)	5.78 dB (1 GHz ~ 18 GHz)
	5.23 dB (18 GHz ~ 26 GHz)
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

EUT Name	WiFi Module		
Model	SI07A		
Technology	Bluetooth – BR & EDR		
Transmit Frequency Range	2402 MHz ~ 2480 MHz		
Mode	Basic Rate	Enhanced Data Rate	
Modulation	GFSK	π/4-DQPSK	8DPSK
Packet Type (Maximum Payload):	DH5	2DH5	3DH5
Data Rate	1 Mbps	2 Mbps	3M bps
Power Supply	DC State	Rate Input:	DC 5 V
Wireless Module	SKI.WB8822CU.1		

### 5.2. MAXIMUM PEAK OUTPUT POWER

Test Mode	Frequency (MHz)	Channel Number	Maximum Peak Output Power (dBm)	Maximum EIRP (dBm)
GFSK	2402 ~ 2480	0-78[79]	5.68	9.43
8DPSK	2402 ~ 2480	0-78[79]	8.17	11.92

### 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	Frequency
GFSK	CH 0(Low Channel), CH 39(MID Channel), CH 78(High Channel)	2402 MHz, 2441 MHz, 2480 MHz
8DPSK	CH 0(Low Channel), CH 39(MID Channel), CH 78(High Channel)	2402 MHz, 2441 MHz, 2480 MHz
GFSK	Hop	2402 MHz ~ 2480 MHz
8DPSK	Hop	2402 MHz ~ 2480 MHz

Note: The hop is hopping mode.

## 5.6. WORST-CASE CONFIGURATIONS

Test Mode	Modulation Technology	Modulation Type	Data Rate	Packet Type
BR	FHSS	GFSK	1Mbit/s	DH5
EDR	FHSS	8DPSK	3Mbit/s	3-DH5

Note: Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates. Only GFSK and 8DPSK test data were report in this report.

### 5.7. THE WORSE CASE POWER SETTING PARAMETER

The Worst Case Power Setting Parameter under 2400 ~ 2483.5 MHz Band				
Test Software		RTLBTAPP		
Test Mode	Transmit Antenna Number	Test Software Setting Value		
		CH 00	CH 39	CH 78
GFSK	1	Default	Default	Default
8DPSK	1	Default	Default	Default

### 5.8. DESCRIPTION OF AVAILABLE ANTENNAS

Antenna	Frequency (MHz)	Antenna Type	MAX Antenna Gain (dBi)
1	2402-2480	FPC antenna	3.75

Note: The value of the antenna gain was declared by customer.

Test Mode	Transmit and Receive Mode	Description
GFSK	<input checked="" type="checkbox"/> 1TX, 1RX	Antenna 1 can be used as transmitting/receiving antenna.
8DPSK	<input checked="" type="checkbox"/> 1TX, 1RX	Antenna 1 can be used as transmitting/receiving antenna.

Note: BT & 2.4 GHz WLAN & 5 GHz WLAN can't transmit simultaneously. (Declared by customer.)

## 5.9. DESCRIPTION OF TEST SETUP

### SUPPORT EQUIPMENT

Item	Equipment	Brand Name	Model Name	P/N
1	PC	Dell	Vostro 3902	8KNDDDB2

### I/O CABLES

Cable No	Port	Connector Type	Cable Type	Cable Length(m)	Remarks
1	USB	/	/	1.0	/

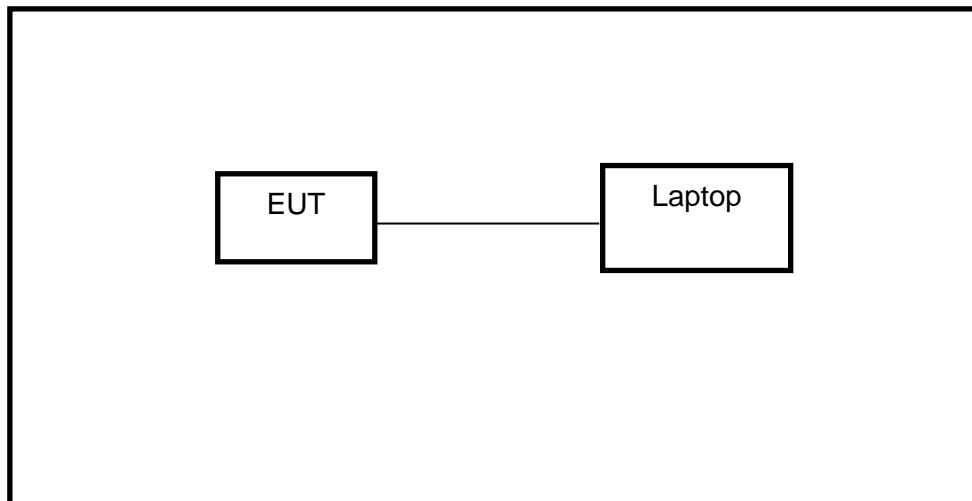
### ACCESSORIES

Item	Accessory	Brand Name	Model Name	Description
/	/	/	/	/

### TEST SETUP

The EUT can work in engineering mode with a software through a Laptop.

### SETUP DIAGRAM FOR TESTS



**6. MEASURING INSTRUMENT AND SOFTWARE USED**

Radiated Emissions					
Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Due Date
MXE EMI Receiver	KESIGHT	N9038A	MY56400036	Nov. 12, 2020	Nov. 11, 2021
Hybrid Log Periodic Antenna	TDK	HLP-3003C	130960	Aug. 11, 2018	Aug. 10, 2021
Preamplifier	HP	8447D	2944A09099	Nov. 12, 2020	Nov. 11, 2021
EMI Measurement Receiver	R&S	ESR26	101377	Nov. 12, 2020	Nov. 11, 2021
Horn Antenna	TDK	HRN-0118	130939	Sept. 17, 2018	Sept. 17, 2021
Preamplifier	TDK	PA-02-0118	TRS-305-00067	Nov. 20, 2020	Nov. 19, 2021
Horn Antenna	Schwarzbeck	BBHA9170	#691	Aug. 11, 2018	Aug. 11, 2021
Preamplifier	TDK	PA-02-2	TRS-307-00003	Nov. 12, 2020	Nov. 11, 2021
Preamplifier	TDK	PA-02-3	TRS-308-00002	Nov. 12, 2020	Nov. 11, 2021
Loop antenna	Schwarzbeck	1519B	00008	Jan.17, 2019	Jan.17,2022
Preamplifier	TDK	PA-02-001-3000	TRS-302-00050	Nov. 12, 2020	Nov. 11, 2021
Preamplifier	Mini-Circuits	ZX60-83LN-S+	SUP01201941	Nov. 20, 2020	Nov. 19, 2021
High Pass Filter	Wi	WHKX10-2700-3000-18000-40SS	23	Nov. 12, 2020	Nov. 11, 2021
Software					
Description			Manufacturer	Name	Version
Test Software for Radiated Emissions			Farad	EZ-EMC	Ver. UL-3A1

Other Instruments					
Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
Spectrum Analyzer	Keysight	N9020A	MY49100060	Nov. 20, 2020	Nov. 19, 2021
Dual Channel Power Meter	Keysight	N1912A	MY55416024	Nov. 20, 2020	Nov. 19, 2021
Power Sensor	Keysight	USB Wideband Power Sensor	MY5100022	Nov. 20, 2020	Nov. 19, 2021

## 7. ANTENNA PORT TEST RESULTS

### 7.1. CONDUCTED OUTPUT POWER

#### LIMITS

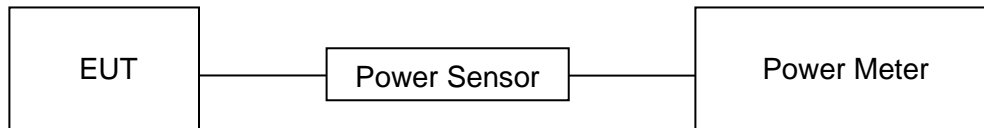
CFR 47 FCC Part15 (15.247), Subpart C ISED RSS-247 ISSUE 2			
Section	Test Item	Limit	Frequency Range (MHz)
CFR 47 FCC 15.247 (b) (1) ISED RSS-247 Clause 5.4 (b)	Peak Conducted Output Power	Hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel: 1 watt or 30 dBm; Hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel: 125 mW or 21 dBm	2400-2483.5

#### TEST PROCEDURE

Connect the EUT to a low loss RF cable from the antenna port to the power sensor (video bandwidth is greater than the occupied bandwidth).

Measure peak emission level, the indicated level is the peak output power, after any corrections for external attenuators and cables.

#### TEST SETUP



#### TEST ENVIRONMENT

Temperature	22.2 °C	Relative Humidity	51 %
Atmosphere Pressure	101 kPa	Test Voltage	DC 5 V

#### RESULTS

Test Packet Type	Antenna	Channel	Result[dBm]	Limit[dBm]	Verdict
DH5	Ant1	2402	5.68	<=30	PASS
		2441	5.29	<=30	PASS
		2480	5.42	<=30	PASS
3DH5	Ant1	2402	8.03	<=30	PASS
		2441	7.88	<=30	PASS
		2480	8.17	<=30	PASS



Test worst case results of Spot Check					
Test Mode	Test Packet Type	Frequency (MHz)	Result[dBm]	original report Result[dBm]	Deviation(dB)
8DPSK	3DH5	2480	8.17	8.33	-0.15

## 8. RADIATED TEST RESULTS

### LIMITS

Please refer to CFR 47 FCC §15.205 and §15.209.

Please refer to ISED RSS-GEN Clause 8.9 and Clause 8.10.

Radiation Disturbance Test Limit for FCC (Class B) (9 kHz-1 GHz)

Emissions radiated outside of the specified frequency bands above 30 MHz		
Frequency Range (MHz)	Field Strength Limit (uV/m) at 3 m	Field Strength Limit (dBuV/m) at 3 m
		Quasi-Peak
30 - 88	100	40
88 - 216	150	43.5
216 - 960	200	46
Above 960	500	54
Above 1000	500	Peak
		Average
		74
		54

FCC Emissions radiated outside of the specified frequency bands below 30 MHz		
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

ISED General field strength limits at frequencies below 30 MHz

Table 6 – General field strength limits at frequencies below 30 MHz		
Frequency	Magnetic field strength (H-Field) (uA/m)	Measurement distance (m)
9 - 490 kHz <sup>Note 1</sup>	6.37/F (F in kHz)	300
490 - 1705 kHz	63.7/F (F in kHz)	30
1.705 - 30 MHz	0.08	30

**Note 1:** The emission limits for the ranges 9-90 kHz and 110-490 kHz are based on measurements employing a linear average detector.



ISED Restricted bands please refer to ISED RSS-GEN Clause 8.10

**Table 7 – Restricted frequency bands<sup>Note 1</sup>**

MHz	MHz	GHz
0.090 - 0.110	149.9 - 150.05	9.0 - 9.2
0.495 - 0.505	156.52475 - 156.52525	9.3 - 9.5
2.1735 - 2.1905	156.7 - 156.9	10.6 - 12.7
3.020 - 3.026	162.0125 - 167.17	13.25 - 13.4
4.125 - 4.128	167.72 - 173.2	14.47 - 14.5
4.17725 - 4.17775	240 - 285	15.35 - 16.2
4.20725 - 4.20775	322 - 335.4	17.7 - 21.4
5.677 - 5.683	399.9 - 410	22.01 - 23.12
6.215 - 6.218	608 - 614	23.6 - 24.0
6.26775 - 6.26825	960 - 1427	31.2 - 31.8
6.31175 - 6.31225	1435 - 1626.5	36.43 - 36.5
8.291 - 8.294	1645.5 - 1646.5	Above 38.6
8.362 - 8.366	1660 - 1710	
8.37625 - 8.38675	1718.8 - 1722.2	
8.41425 - 8.41475	2200 - 2300	
12.29 - 12.293	2310 - 2390	
12.51975 - 12.52025	2483.5 - 2500	
12.57675 - 12.57725	2655 - 2900	
13.36 - 13.41	3260 - 3267	
16.42 - 16.423	3332 - 3339	
16.69475 - 16.69525	3345.8 - 3358	
16.80425 - 16.80475	3500 - 4400	
25.5 - 25.67	4500 - 5150	
37.5 - 38.25	5350 - 5460	
73 - 74.6	7250 - 7750	
74.8 - 75.2	8025 - 8500	
108 - 138		

**Note 1:** Certain frequency bands listed in table 7 and in bands above 38.6 GHz are designated for licence-exempt applications. These frequency bands and the requirements that apply to related devices are set out in the 200 and 300 series of RSSs.

FCC Restricted bands of operation refer to FCC §15.205 (a):

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			

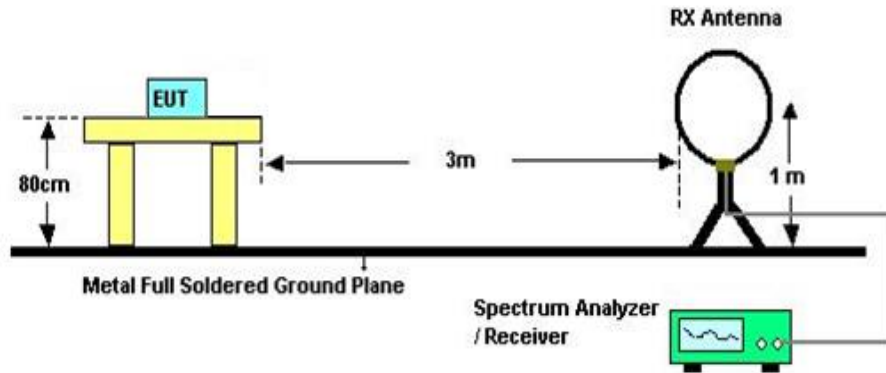
Note: <sup>1</sup>Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

<sup>2</sup>Above 38.6c



**TEST SETUP AND PROCEDURE**

Below 30 MHz

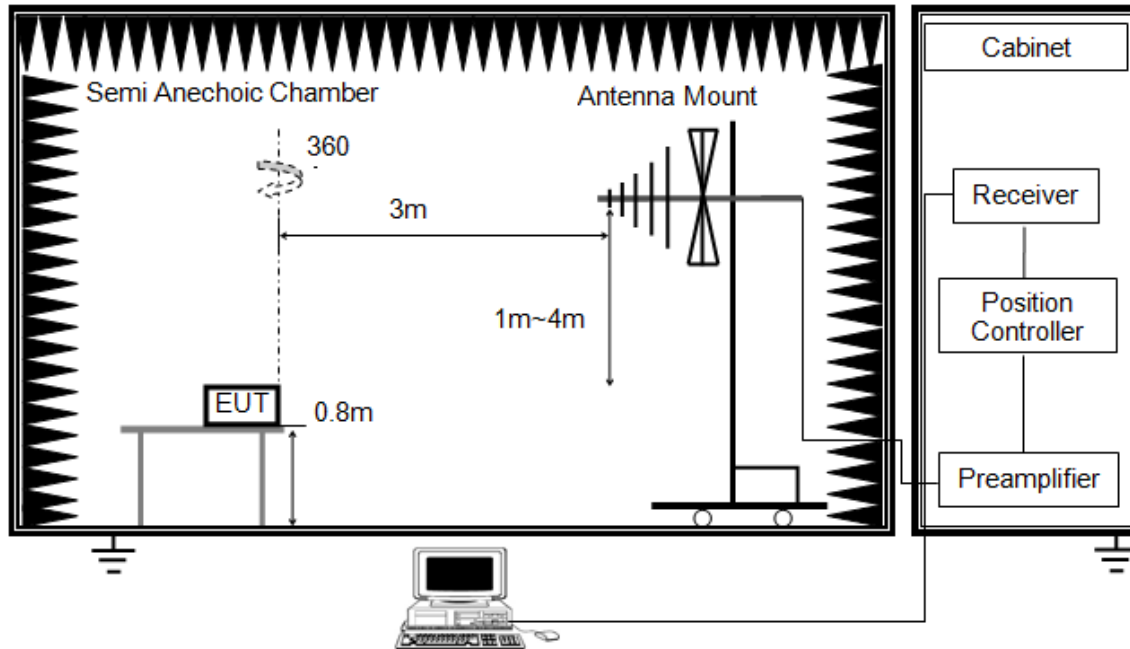


The setting of the spectrum analyser

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

1. The testing follows the guidelines in ANSI C63.10-2013 clause 6.4.
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, Face-on and Face-off polarizations of the antenna are set to make the measurement.
3. The EUT was placed on a turntable with 80 cm above ground.
4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a 1 m 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 measurement below 1 GHz, 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 and average 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 and average detector and reported.
7. Although these tests were performed other than open field site, adequate comparison measurements were confirmed against 30m open field site. Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field site based on KDB 414788.

Below 1 GHz and above 30 MHz

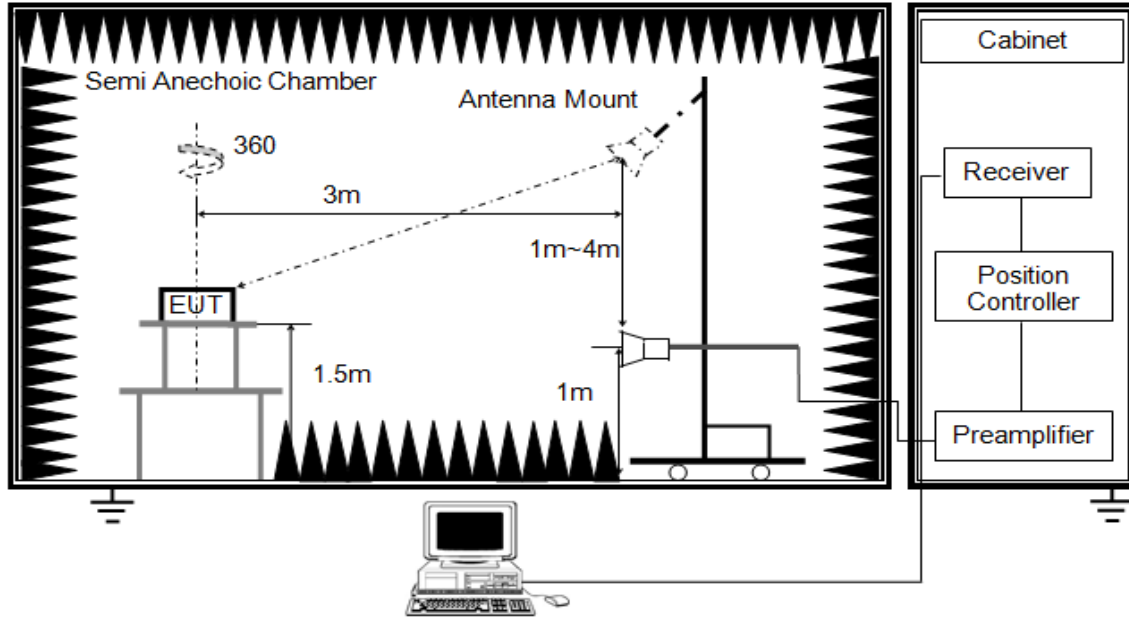


The setting of the spectrum analyser

RBW	120 kHz
VBW	300 kHz
Sweep	Auto
Detector	Peak/QP
Trace	Max hold

1. The testing follows the guidelines in ANSI C63.10-2013 clause 6.5.
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 80 cm 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 1 GHz, 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.

Above 1 GHz

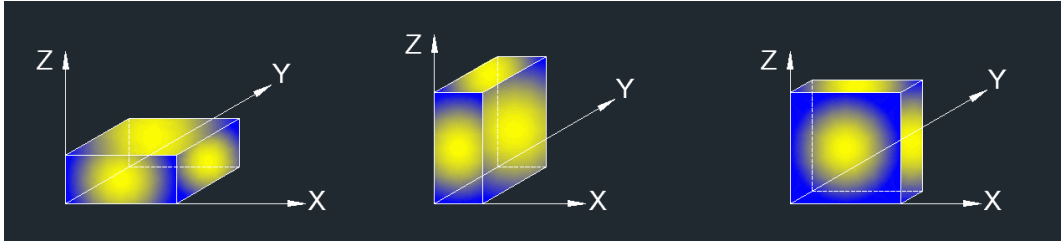


The setting of the spectrum analyser

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

1. The testing follows the guidelines in ANSI C63.10-2013 clause 6.6.
2. The EUT was arranged to its worst case and then tune the antenna tower (1.5 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 1.5 m 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 1 GHz, 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 with peak detector for average measurements. For the Duty Cycle please refer to clause 7.1.ON TIME AND DUTY CYCLE.

X axis, Y axis, Z axis positions:



Note 1: 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.

Note 2: Simultaneous transmission had been evaluated with the 2.4G Hz WiFi, 5 GHz WiFi and BT transmitter and there were no any additional or worse emissions found. Only the worst data was recorded in the test report.

Note 3: The EUT was fully exercised with external accessories during the test. In the case of multiple accessory external ports, an external accessory shall be connected to one of each type of port.

**TEST ENVIRONMENT**

Temperature	24.9 °C	Relative Humidity	57 %
Atmosphere Pressure	101 kPa	Test Voltage	DC 5 V

**RESULTS**

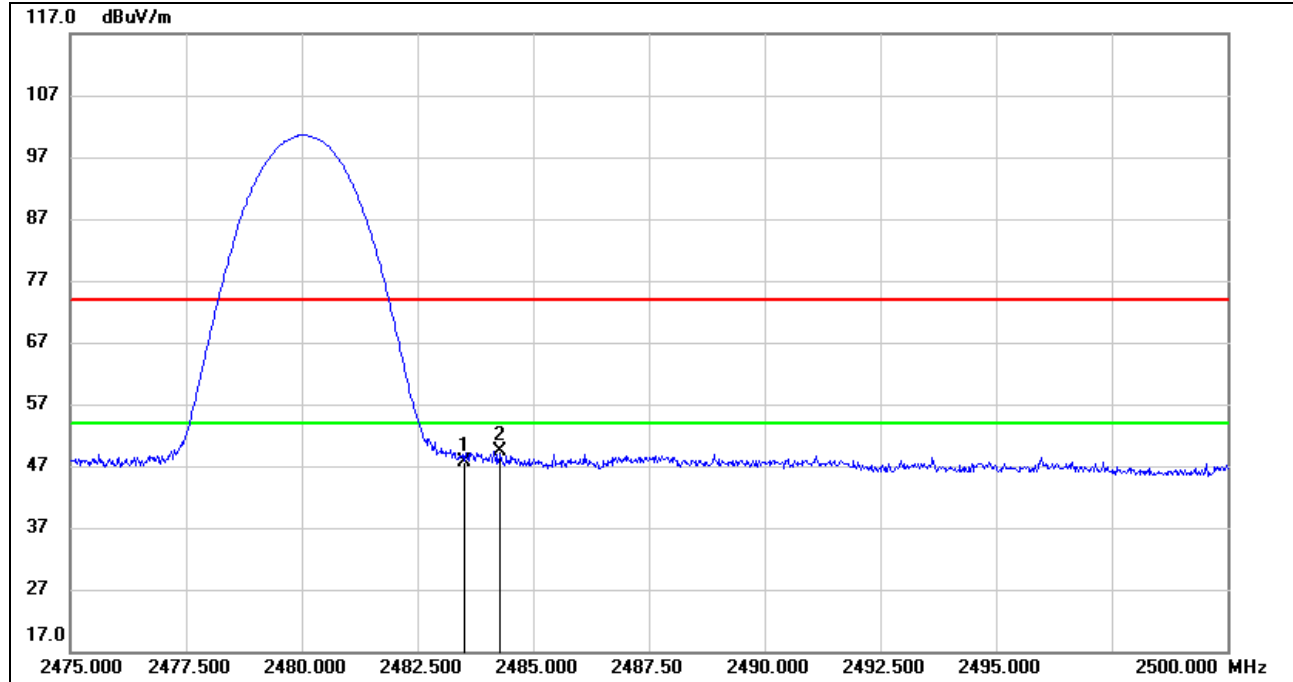
Test worst case results of Spot Check					
Test Mode	Test Item	Frequency (MHz)	Result[dBuV/m]	original report Result[dBuV/m]	Deviation(dB)
8DPSK	Band Edge	2484.275	49.29	49.98	-0.69
	RSE	2672	52.45	55.74	-3.29

Note: Comparison of two models, upper deviation is within 3 dB range and all test results are under FCC Technical limits.

## 8.1. RESTRICTED BANDEDGE

### 8.1.1. 8DPSK MODE

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



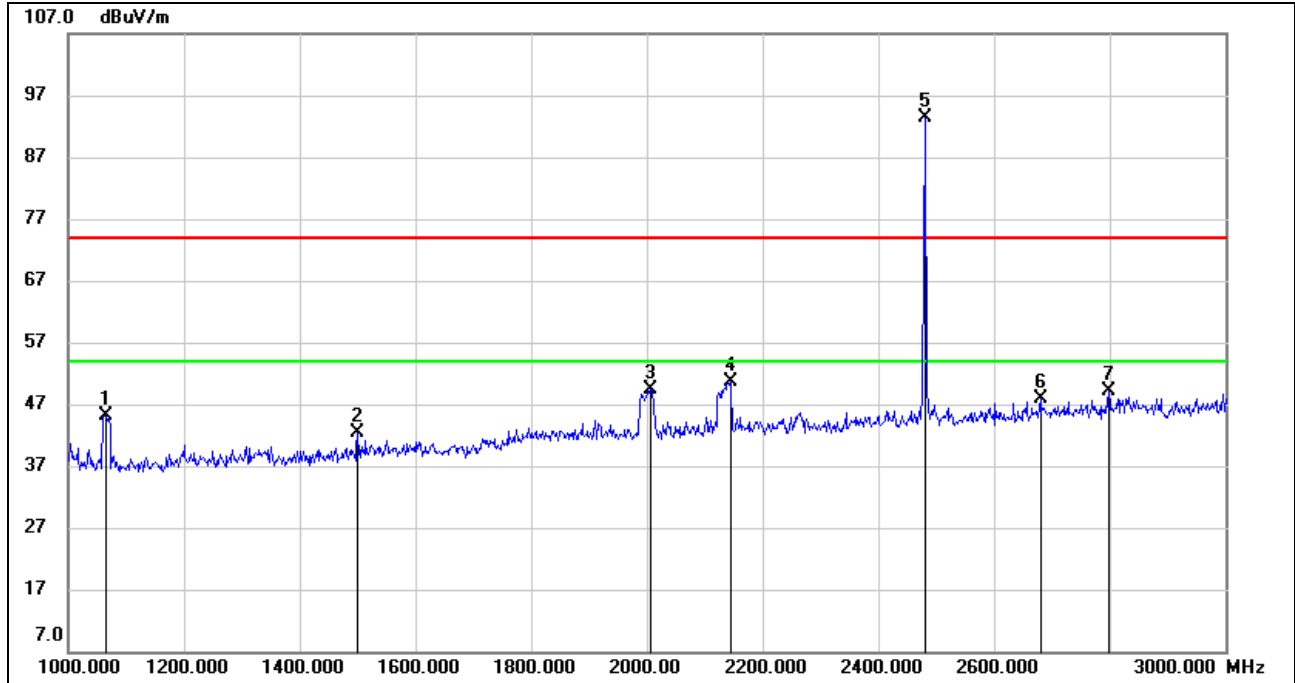
No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2483.500	13.99	33.58	47.57	74.00	-26.43	peak
2	2484.275	15.71	33.58	49.29	74.00	-24.71	peak

- Note: 1. Measurement = Reading Level + Correct Factor.  
 2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.  
 3. Peak: Peak detector.  
 4. Only the worst data was recorded, if it complies with the limit, the other emissions deemed to comply with the limit.

## 8.2. SPURIOUS EMISSIONS (1 GHz ~ 3 GHz)

### 8.2.1. 8DPSK MODE

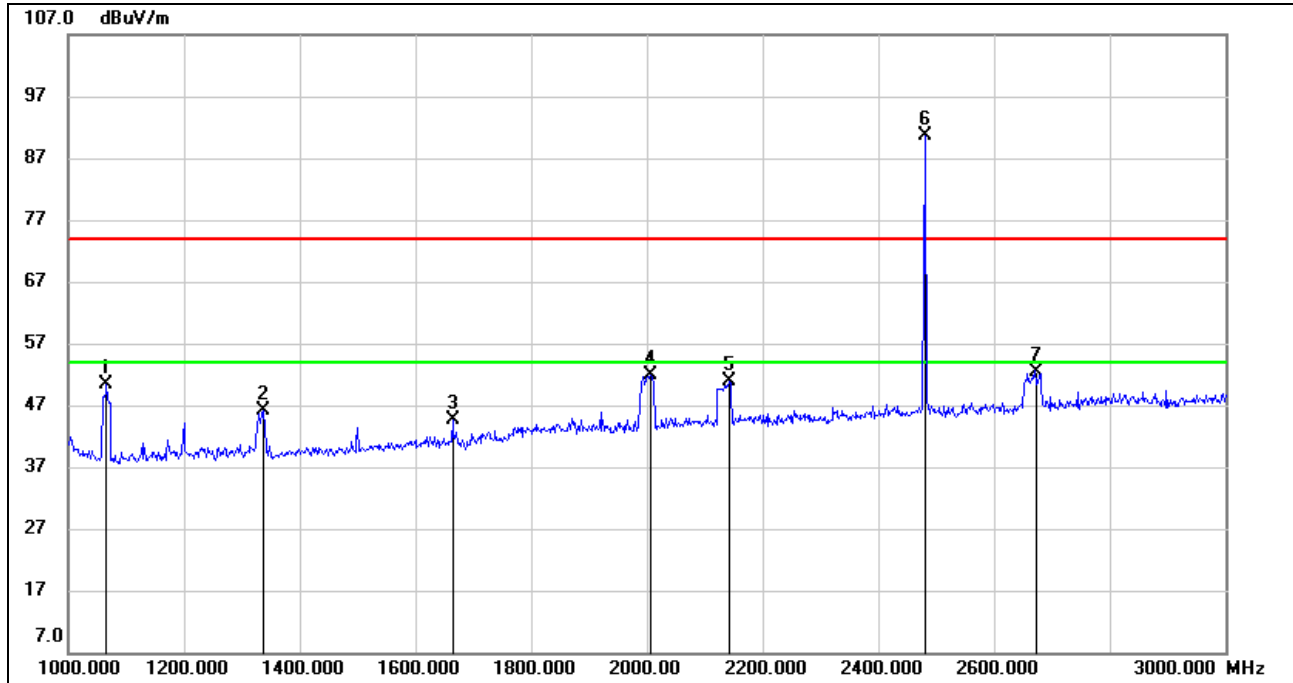
#### HARMONICS AND SPURIOUS EMISSIONS (HIGH CHANNEL, WORST-CASE CONFIGURATION, HORIZONTAL)



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1064.000	39.92	5.30	45.22	74.00	-28.78	peak
2	1500.000	35.52	6.94	42.46	74.00	-31.54	peak
3	2006.000	39.27	10.07	49.34	74.00	-24.66	peak
4	2144.000	39.78	10.89	50.67	74.00	-23.33	peak
5	2480.000	81.49	11.95	93.44	/	/	fundamental
6	2680.000	35.48	12.41	47.89	74.00	-26.11	peak
7	2798.000	35.90	13.21	49.11	74.00	-24.89	peak

- Note: 1. Measurement = Reading Level + Correct Factor.  
 2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.  
 3. Peak: Peak detector.

**HARMONICS AND SPURIOUS EMISSIONS (HIGH CHANNEL, WORST-CASE CONFIGURATION, VERTICAL)**



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1066.000	45.00	5.30	50.30	74.00	-23.70	peak
2	1336.000	39.46	6.68	46.14	74.00	-27.86	peak
3	1664.000	36.69	8.03	44.72	74.00	-29.28	peak
4	2006.000	41.90	10.07	51.97	74.00	-22.03	peak
5	2142.000	40.05	10.89	50.94	74.00	-23.06	peak
6	2480.000	78.57	11.95	90.52	/	/	fundamental
7	2672.000	40.09	12.36	52.45	74.00	-21.55	peak

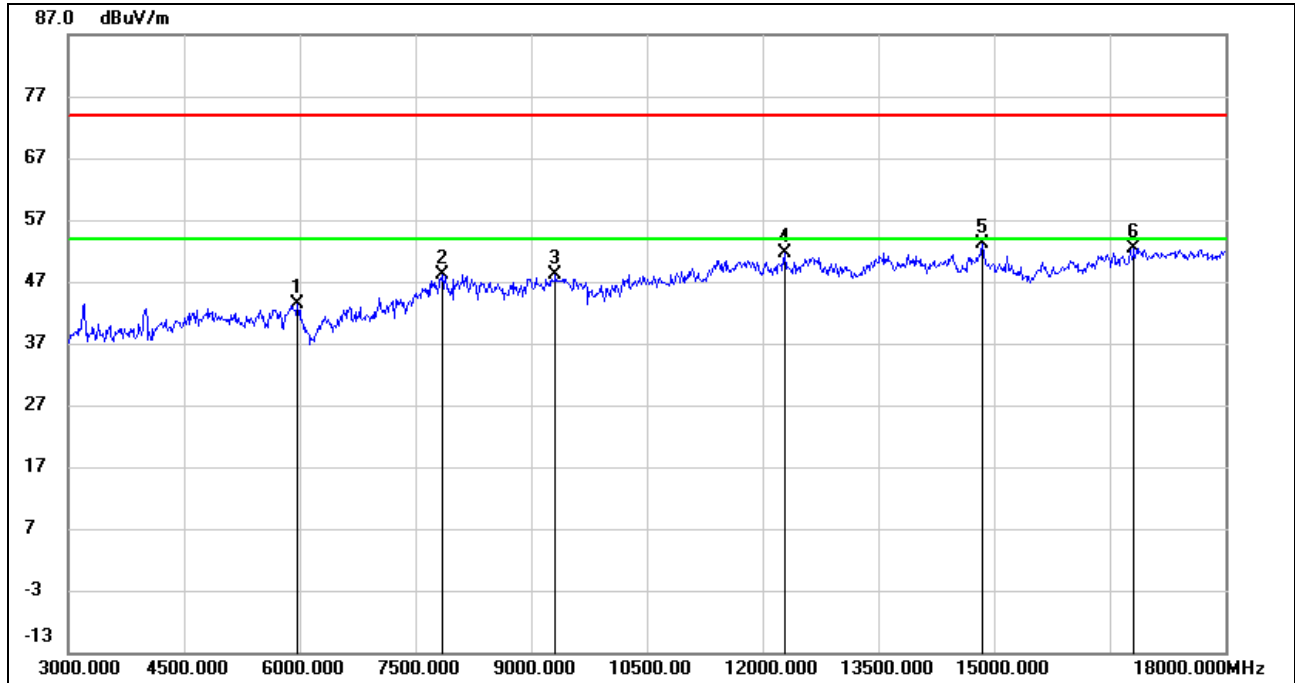
- Note: 1. Measurement = Reading Level + Correct Factor.  
 2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.  
 3. Peak: Peak detector.  
 4. AVG:  $VBW=1/T_{on}$ , where:  $T_{on}$  is the transmitting duration.  
 5. For the transmitting duration, please refer to clause 7.1.

Note: All the modes and channels have been tested, only the worst data was recorded in the report.

### 8.3. SPURIOUS EMISSIONS (3 GHz ~ 18 GHz)

#### 8.3.1. 8DPSK MODE

#### HARMONICS AND SPURIOUS EMISSIONS (HIGH CHANNEL, WORST-CASE CONFIGURATION,, HORIZONTAL)



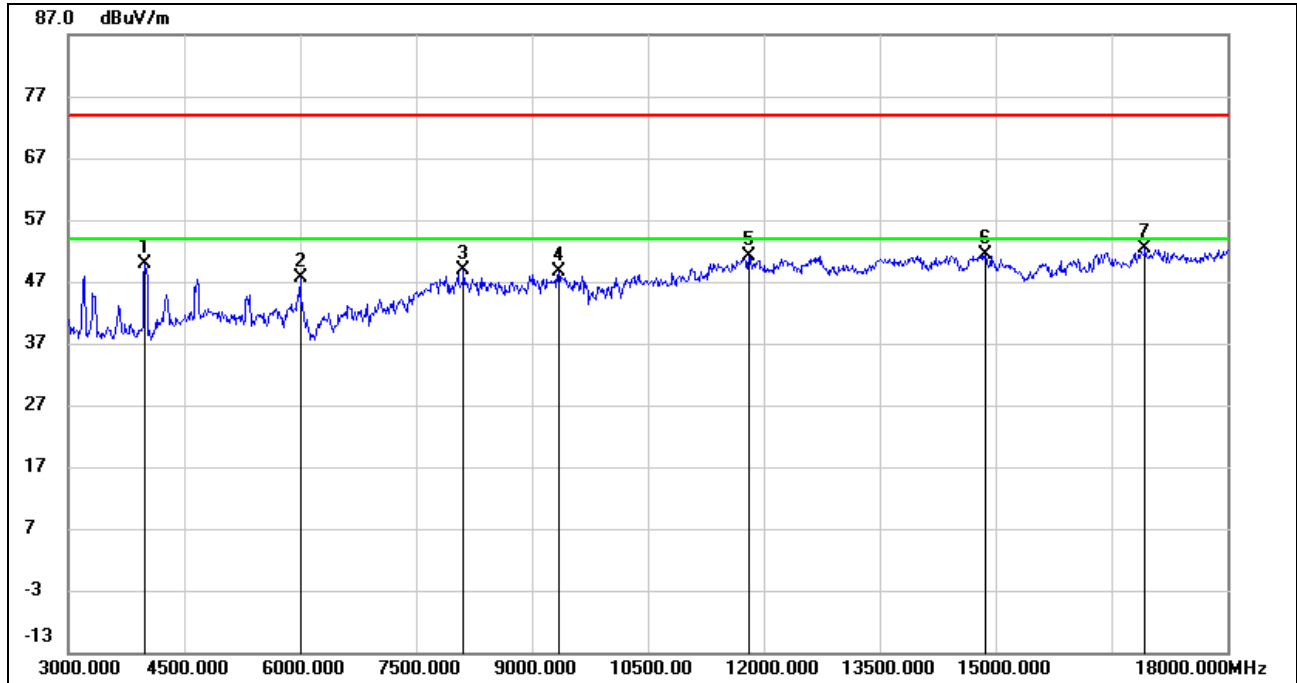
No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	5970.000	39.30	4.15	43.45	74.00	-30.55	peak
2	7845.000	39.03	9.14	48.17	74.00	-25.83	peak
3	9315.000	37.74	10.48	48.22	74.00	-25.78	peak
4	12285.000	35.45	16.08	51.53	74.00	-22.47	peak
5	14850.000	35.52	17.71	53.23	74.00	-20.77	peak
6	16815.000	31.65	20.84	52.49	74.00	-21.51	peak

- Note: 1. Peak Result = Reading Level + Correct Factor.  
 2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.  
 3. Peak: Peak detector.  
 4. Filter losses were only considered in the spurious frequency bands and the authorized band was not corrected for High Pass Filter losses.  
 5. Proper operation of the transmitter prior to adding the filter to the measurement chain.





**HARMONICS AND SPURIOUS EMISSIONS (HIGH CHANNEL, WORST-CASE CONFIGURATION, VERTICAL)**



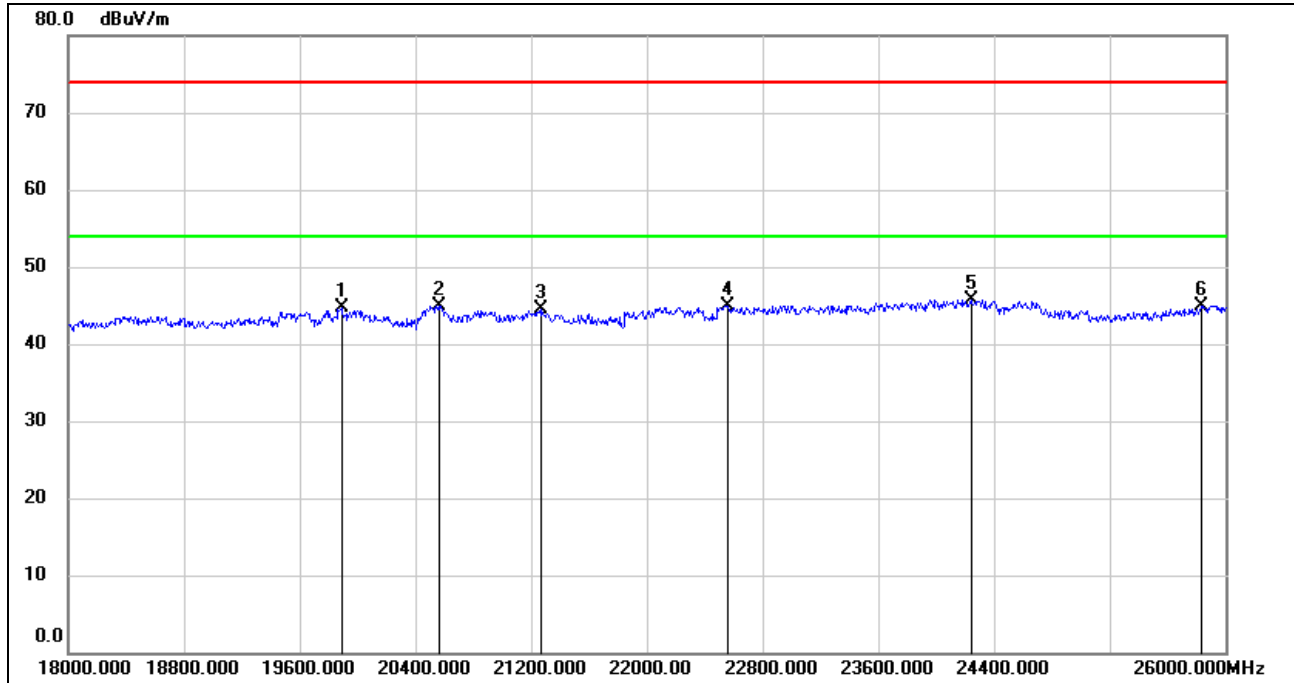
No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	3990.000	52.31	-2.51	49.80	74.00	-24.20	peak
2	6000.000	43.66	4.00	47.66	74.00	-26.34	peak
3	8115.000	38.76	10.13	48.89	74.00	-25.11	peak
4	9345.000	37.98	10.66	48.64	74.00	-25.36	peak
5	11805.000	35.79	15.26	51.05	74.00	-22.95	peak
6	14865.000	33.85	17.61	51.46	74.00	-22.54	peak
7	16935.000	30.82	21.45	52.27	74.00	-21.73	peak

- Note: 1. Peak Result = Reading Level + Correct Factor.  
 2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.  
 3. Peak: Peak detector.  
 4. Filter losses were only considered in the spurious frequency bands and the authorized band was not corrected for High Pass Filter losses.  
 5. Proper operation of the transmitter prior to adding the filter to the measurement chain.

### 8.4. SPURIOUS EMISSIONS (18 GHz ~ 26 GHz)

#### 8.4.1. 8DPSK MODE

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

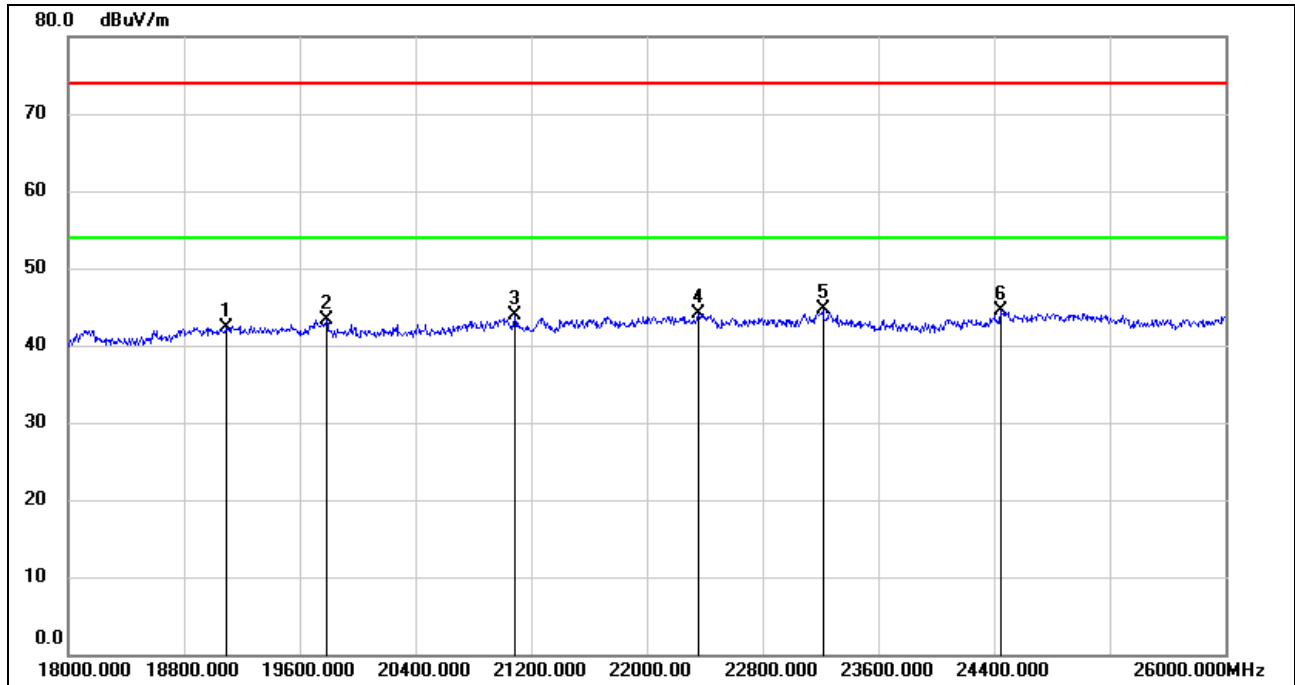


No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	19888.000	50.07	-5.36	44.71	74.00	-29.29	peak
2	20560.000	50.23	-5.30	44.93	74.00	-29.07	peak
3	21272.000	49.17	-4.76	44.41	74.00	-29.59	peak
4	22560.000	48.78	-3.83	44.95	74.00	-29.05	peak
5	24240.000	48.52	-2.83	45.69	74.00	-28.31	peak
6	25832.000	45.72	-0.76	44.96	74.00	-29.04	peak

- Note: 1. Peak Result = Reading Level + Correct Factor.  
 2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.  
 3. Peak: Peak detector.



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



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	19088.000	47.63	-5.35	42.28	74.00	-31.72	peak
2	19784.000	48.57	-5.28	43.29	74.00	-30.71	peak
3	21088.000	48.78	-4.84	43.94	74.00	-30.06	peak
4	22360.000	48.26	-4.07	44.19	74.00	-29.81	peak
5	23216.000	48.01	-3.38	44.63	74.00	-29.37	peak
6	24448.000	46.92	-2.42	44.50	74.00	-29.50	peak

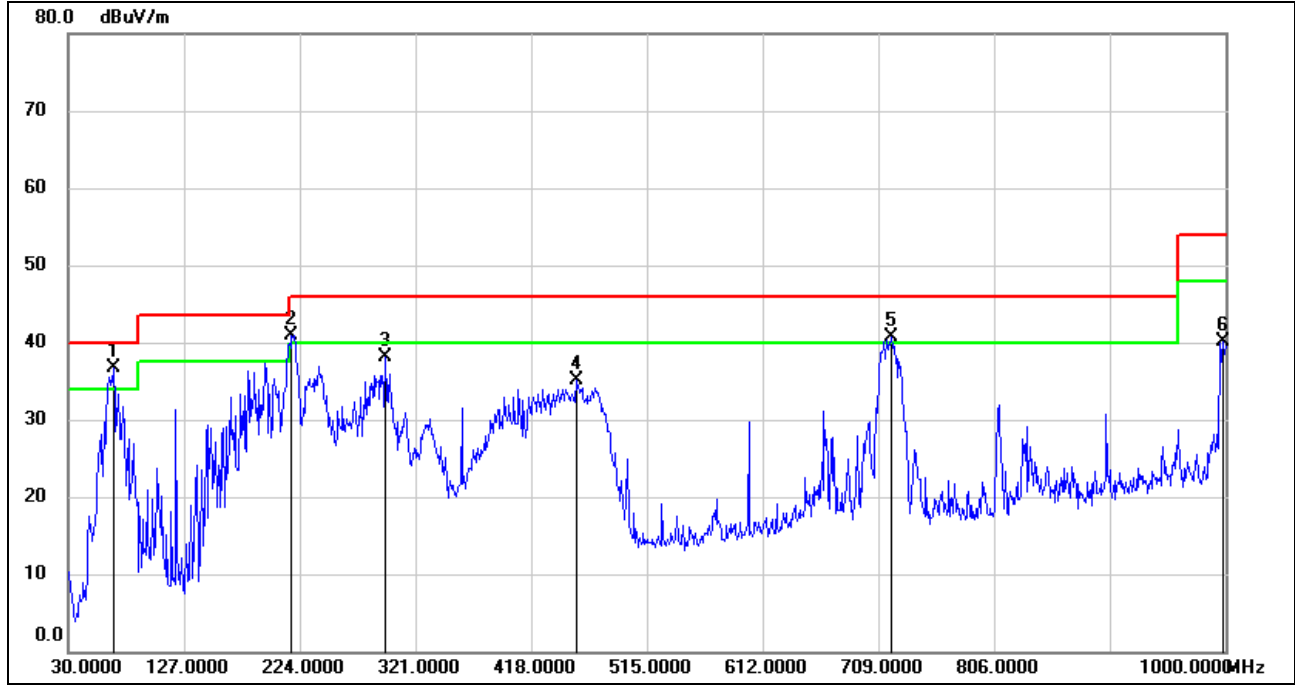
- Note: 1. Peak Result = Reading Level + Correct Factor.  
 2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.  
 3. Peak: Peak detector.

Note: All the modes have been tested, only the worst data was recorded in the report.

## 8.5. SPURIOUS EMISSIONS (30 MHz ~ 1 GHz)

### 8.5.1. 8DPSK MODE

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

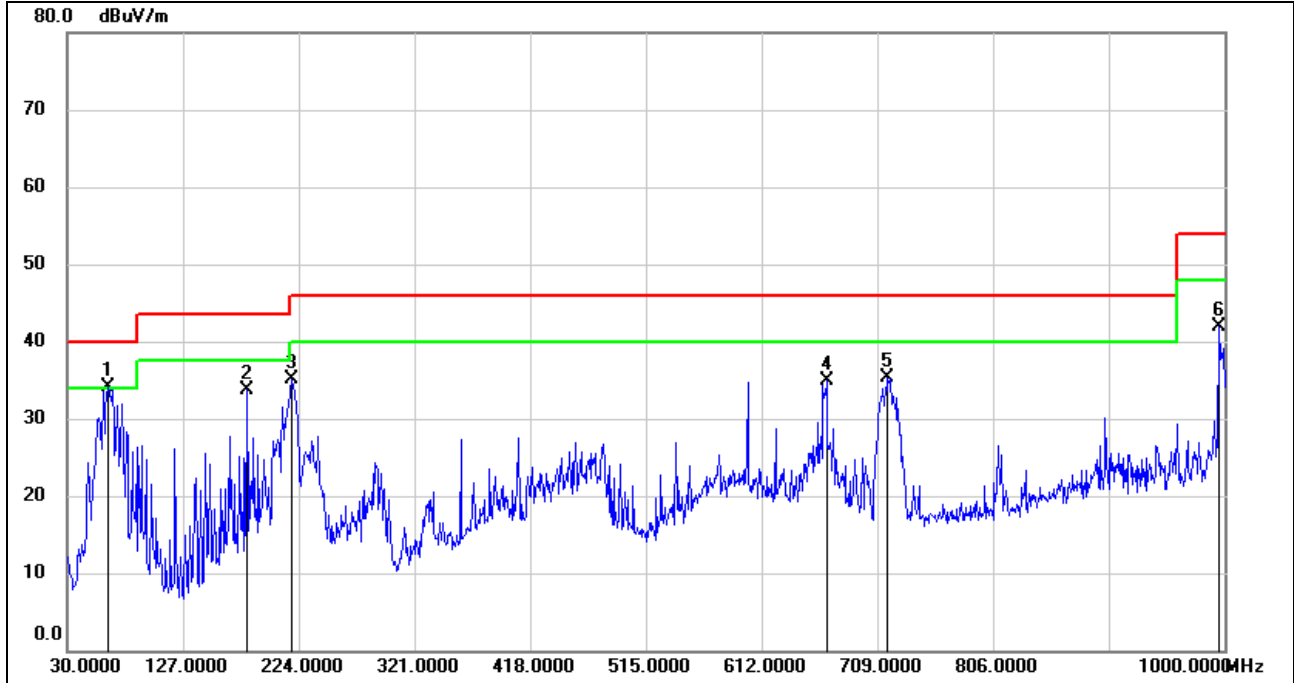


No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	67.8300	57.28	-20.55	36.73	40.00	-3.27	QP
2	217.2100	58.76	-17.93	40.83	46.00	-5.17	QP
3	295.7800	53.76	-15.56	38.20	46.00	-7.80	QP
4	455.8300	47.36	-12.27	35.09	46.00	-10.91	QP
5	719.6700	48.84	-8.08	40.76	46.00	-5.24	QP
6	998.0600	44.21	-4.18	40.03	54.00	-13.97	QP

- Note: 1. Result Level = Read Level + Antenna Factor + Cable loss.  
 2. If Peak Result complies with QP limit, QP Result is deemed to comply with QP limit.  
 3. Test setup: RBW: 120 kHz, VBW: 300 kHz, Sweep time: auto.



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



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	63.9500	54.63	-20.53	34.10	40.00	-5.90	QP
2	180.3500	50.47	-16.82	33.65	43.50	-9.85	QP
3	218.1800	53.17	-18.02	35.15	46.00	-10.85	QP
4	666.3200	43.64	-8.65	34.99	46.00	-11.01	QP
5	717.7300	43.33	-8.11	35.22	46.00	-10.78	QP
6	995.1500	46.11	-4.20	41.91	54.00	-12.09	QP

- Note: 1. Result Level = Read Level + Antenna Factor + Cable loss.  
 2. If Peak Result complies with QP limit, QP Result is deemed to comply with QP limit.  
 3. Test setup: RBW: 120 kHz, VBW: 300 kHz, Sweep time: auto

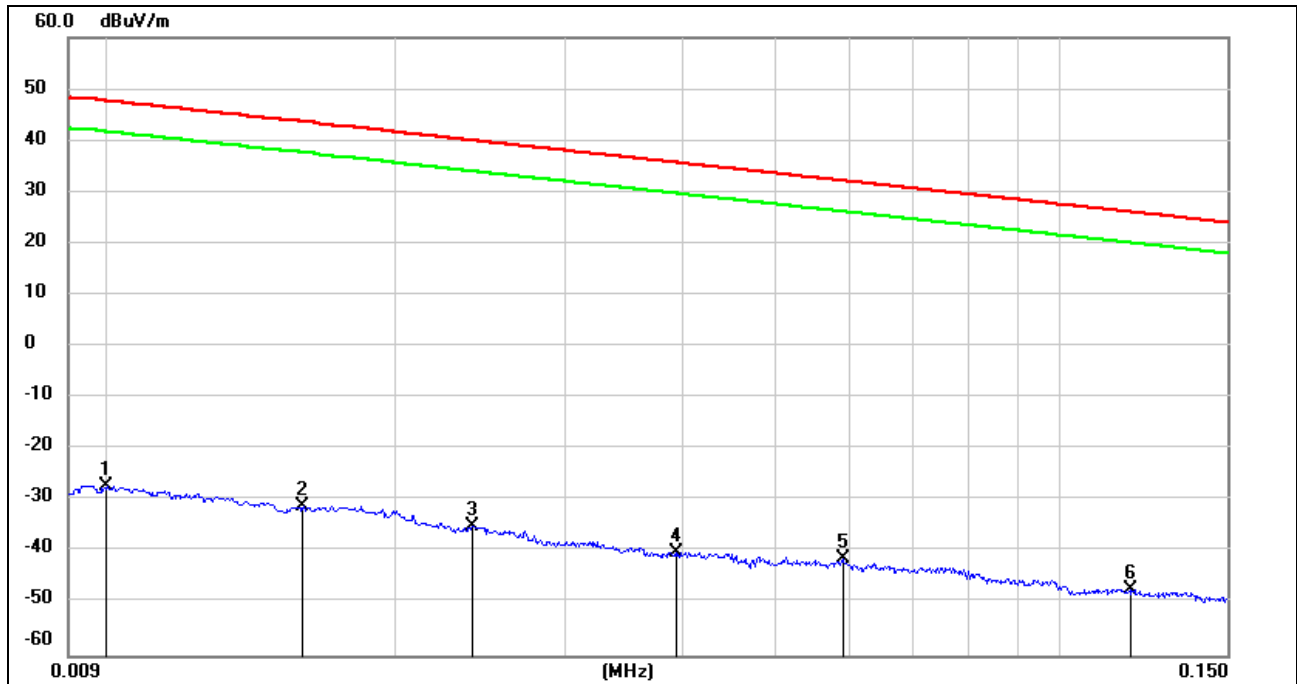
Note: All the modes have been tested, only the worst data was recorded in the report.

## 8.6. SPURIOUS EMISSIONS BELOW 30 MHz

### 8.6.1. 8DPSK MODE

(HIGH CHANNEL, LOOP ANTENNA FACE ON TO THE EUT, WORST-CASE CONFIGURATION)

9 kHz~ 150 kHz



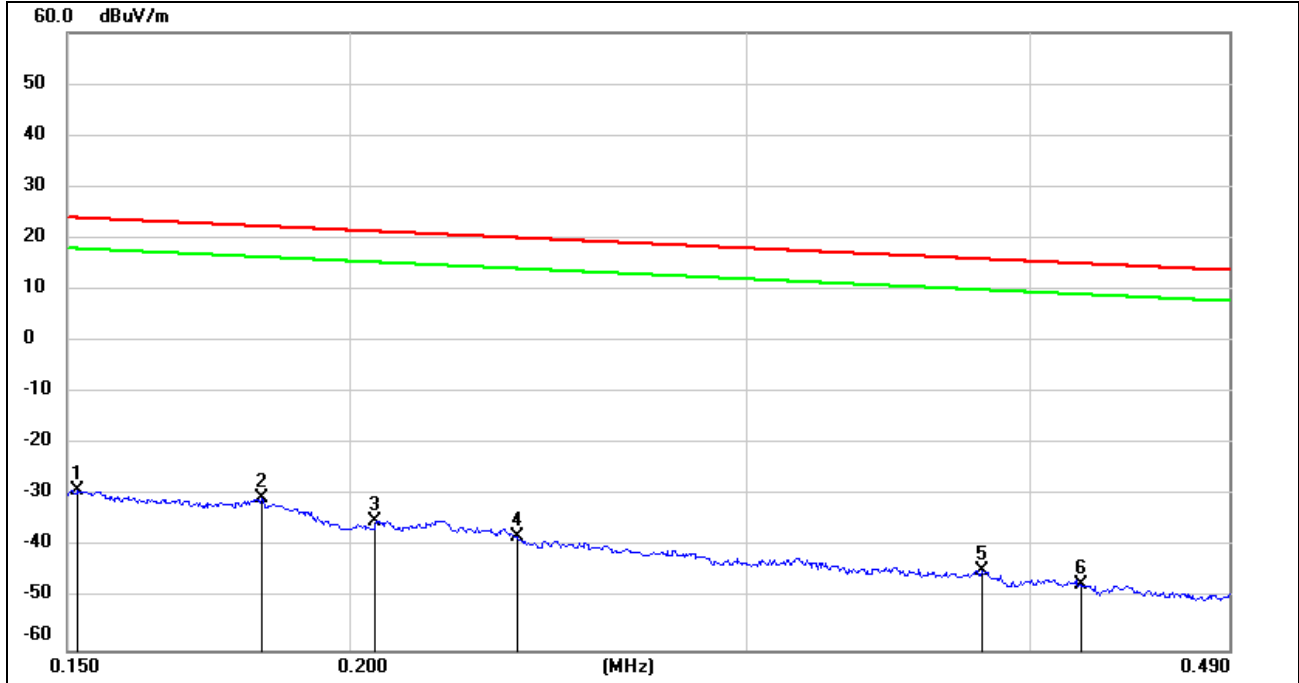
No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	FCC Result (dBuV/m)	FCC Limit (dBuV/m)	ISED Result (dBuA/m)	ISED Limit (dBuA/m)	Margin (dB)	Remark
1	0.0100	74.22	-101.40	-27.18	47.60	-78.68	-3.90	-74.78	peak
2	0.0159	70.36	-101.37	-31.01	43.57	-82.51	-7.93	-74.58	peak
3	0.0240	66.32	-101.36	-35.04	40.00	-86.54	-11.50	-75.04	peak
4	0.0393	61.42	-101.43	-40.01	35.71	-91.51	-15.79	-75.72	peak
5	0.0589	60.31	-101.52	-41.21	32.20	-92.71	-19.30	-73.41	peak
6	0.1184	54.52	-101.74	-47.22	26.14	-98.72	-25.36	-73.36	peak

Note: 1. Measurement = Reading Level + Correct Factor (dBuA/m= dBuV/m- 20Log10[120π] = dBuV/m- 51.5).

2. If Peak Result complies with AV and QP limit, AV and QP Result are deemed to comply with AV limit.

3. All 3 polarizations(Horizontal, Face-on and Face-off) of the loop antenna had been tested, but only the worst data recorded in the report.

**150 kHz ~ 490 kHz**



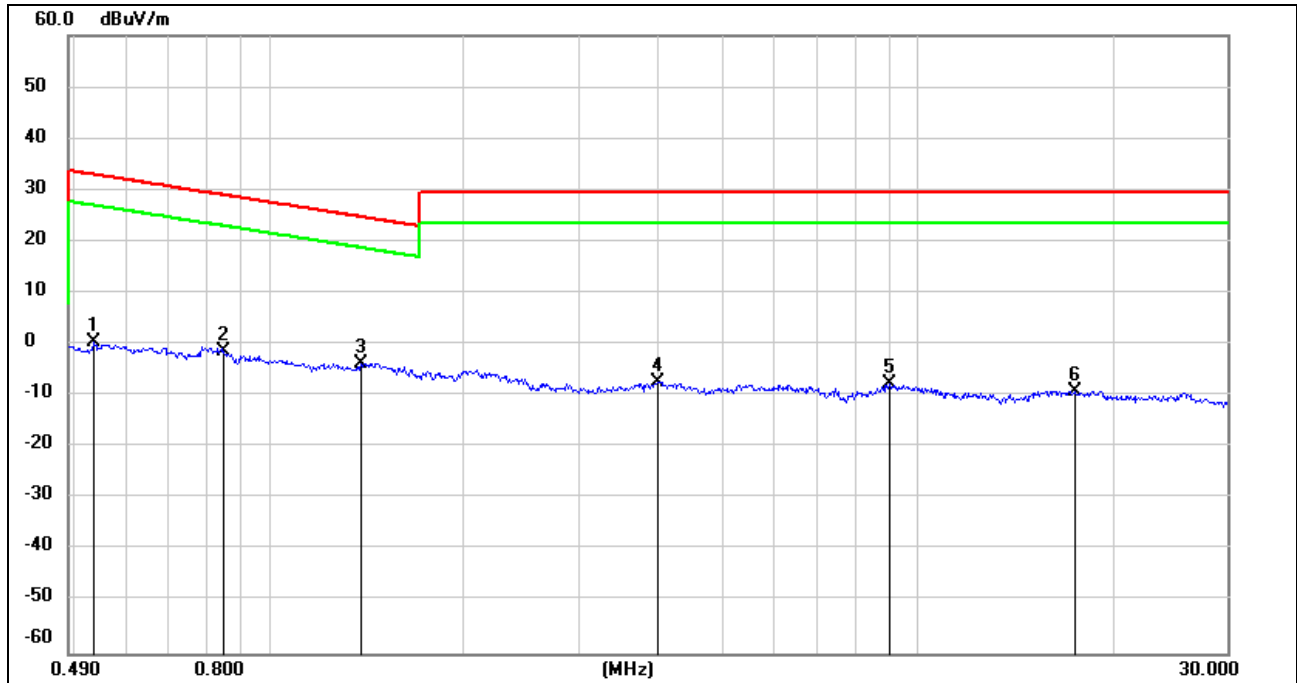
No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	FCC Result (dBuV/m)	FCC Limit (dBuV/m)	ISED Result (dBuA/m)	ISED Limit (dBuA/m)	Margin (dB)	Remark
1	0.1517	72.73	-101.63	-28.90	23.98	-80.40	-27.52	-52.88	peak
2	0.1827	71.17	-101.69	-30.52	22.37	-82.02	-29.13	-52.89	peak
3	0.2053	66.79	-101.73	-34.94	21.35	-86.44	-30.15	-56.29	peak
4	0.2371	63.77	-101.78	-38.01	20.10	-89.51	-31.40	-58.11	peak
5	0.3809	57.41	-101.94	-44.53	15.99	-96.03	-35.51	-60.52	peak
6	0.4213	54.75	-101.98	-47.23	15.11	-98.73	-36.39	-62.34	peak

Note: 1. Measurement = Reading Level + Correct Factor (dBuA/m= dBuV/m- 20Log10[120π] = dBuV/m- 51.5).

2. If Peak Result complies with AV and QP limit, AV and QP Result are deemed to comply with AV limit.

3. All 3 polarizations(Horizontal, Face-on and Face-off) of the loop antenna had been tested, but only the worst data recorded in the report.

**490 kHz ~ 30 MHz**



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	FCC Result (dBuV/m)	FCC Limit (dBuV/m)	ISED Result (dBuA/m)	ISED Limit (dBuA/m)	Margin (dB)	Remark
1	0.5361	62.46	-62.08	0.38	33.02	-51.12	-18.48	-32.64	peak
2	0.8504	60.83	-62.18	-1.35	29.01	-52.85	-22.49	-30.36	peak
3	1.3810	58.47	-62.10	-3.63	24.80	-55.13	-26.70	-28.43	peak
4	3.9721	53.96	-61.34	-7.38	29.54	-58.88	-21.96	-36.92	peak
5	9.0774	53.27	-60.93	-7.66	29.54	-59.16	-21.96	-37.20	peak
6	17.5167	51.90	-60.92	-9.02	29.54	-60.52	-21.96	-38.56	peak

Note: 1. Measurement = Reading Level + Correct Factor (dBuA/m= dBuV/m- 20Log10[120π] = dBuV/m- 51.5).

2. If Peak Result complies with AV and QP limit, AV and QP Result are deemed to comply with AV limit.

3. All 3 polarizations(Horizontal, Face-on and Face-off) of the loop antenna had been tested, but only the worst data recorded in the report.

Note: All the modes have been tested, only the worst data was recorded in the report.





## 9. 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.

### RESULTS

Complies

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**END OF REPORT**