

# TEST REPORT

**Applicant:** NAYAX LTD  
**Address:** 3 Arik Einstein St., Herzliya, 4659071, Israel  
**Equipment Type:** POS Payment Device  
**Model Name:** VPOSMS S (refer to section 2.3)  
**Brand Name:** Nayax  
**FCC ID:** 2AK6L-VPOSMS  
**ISED Number:** 10840A-VPOSMS  
**Test Standard:** 47 CFR Part 15 Subpart C  
RSS-Gen Issue 5  
RSS-247 Issue 3  
(refer to section 3.1)  
**Sample Arrival Date:** Apr. 14, 2025  
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**ISSUED BY:**

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### Revision History

Version	Issue Date	Revisions
<u>Rev. 01</u>	<u>Jul. 07, 2025</u>	<u>Initial Issue</u>

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# 1 GENERAL INFORMATION

## 1.1 Test Laboratory

Name	Shanghai Tejet Communications Technology Co., Ltd. Testing Center
Address	1-2/F., Building 1, No.222, Xuanlan Road, Xuanqiao, Pudong New District, Shanghai, China

## 1.2 Test Location

Name	Shanghai Tejet Communications Technology Co., Ltd. Testing Center
Location	1-2/F., Building 1, No.222, Xuanlan Road, Xuanqiao, Pudong New District, Shanghai, China
Accreditation Certificate	<p>The laboratory is a testing organization accredited by FCC as a accredited testing laboratory. The designation number is CN1352.</p> <p>The laboratory has been listed by Industry Canada to perform electromagnetic emission measurements. The recognition numbers of test site are 29671.</p>

## 2 PRODUCT INFORMATION

### 2.1 Applicant Information

Applicant	NAYAX LTD
Address	3 Arik Einstein St., Herzliya, 4659071, Israel

### 2.2 Manufacturer Information

Manufacturer	NAYAX LTD
Address	3 Arik Einstein St., Herzliya, 4659071, Israel

### 2.3 General Description for Equipment under Test (EUT)

EUT Name	POS Payment Device			
Model Name Under Test	VPOS M S			
Series Model Name	VPOS M S-CLS, VPOS M S-FM			
Description of Model name differentiation	Model name	VPOS M S	VPOS M S-CLS	VPOS M S-FM
	Machine head	Yellow	Yellow or Black	Yellow
	External charging board	VPOS M-S	VPOS M-S-CUBE	VPOS M-S-CUBE
	Enclosure structure	Structure 1	Structure 2	Structure 3
	Except for the above differences, all other information is the same (this information provided by the customer).			
Sample Number	SC-SH2540026-S06(radiated)			
Hardware Version	VPOSMSx415223xxxx			
Software Version	6202.30.xxxx.xxx.xxx			
Dimensions (Approx.)	N/A			
Weight (Approx.)	N/A			

## 2.4 Technical Information

Network and Wireless connectivity	2G Network GPRS/EDGE 850/1900MHz 3G Network WCDMA/HSDPA/HSUPA Band 2/4/5 4G Network FDD LTE Band 2/4/5/7/12/17 TDD LTE Band 38/41 Bluetooth (BR+EDR+BLE+HS3.0) 2.4G WiFi 802.11b, 802.11g, 802.11n(HT20) 5G WiFi 802.11a, 802.11n(HT20/40) GPS, BeiDou, GLONASS, NFC
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The requirement for the following technical information of the EUT was tested in this report:

Modulation Technology	FHSS
Modulation Type	GFSK, $\pi/4$ -DQPSK, 8-DPSK
Transfer Rate	DH5: 1 Mbps 2DH5: 2 Mbps 3DH5: 3 Mbps
Frequency Range	The frequency range used is 2400 MHz to 2483.5 MHz.
Number of Channel	79 (at intervals of 1 MHz)
Tested Channel	0 (2402 MHz), 39 (2441 MHz), 78 (2480 MHz)
Antenna Type	PIFA Antenna
Antenna Gain	2.03 dBi
Antenna Impedance	50 $\Omega$
Antenna System (MIMO Smart Antenna)	N/A

All channel was listed on the following table:

Channel number	Freq. (MHz)	Channel number	Freq. (MHz)	Channel number	Freq. (MHz)	Channel number	Freq. (MHz)
<b>0</b>	<b>2402</b>	21	2423	42	2444	63	2465
1	2403	22	2424	43	2445	64	2466
2	2404	23	2425	44	2446	65	2467
3	2405	24	2426	45	2447	66	2468
4	2406	25	2427	46	2448	67	2469
5	2407	26	2428	47	2449	68	2470
6	2408	27	2429	48	2450	69	2471
7	2409	28	2430	49	2451	70	2472
8	2410	29	2431	50	2452	71	2473
9	2411	30	2432	51	2453	72	2474
10	2412	31	2433	52	2454	73	2475
11	2413	32	2434	53	2455	74	2476
12	2414	33	2435	54	2456	75	2477
13	2415	34	2436	55	2457	76	2478
14	2416	35	2437	56	2458	77	2479
15	2417	36	2438	57	2459	<b>78</b>	<b>2480</b>
16	2418	37	2439	58	2460	-	-
17	2419	38	2440	59	2461	-	-
18	2420	<b>39</b>	<b>2441</b>	60	2462	-	-
19	2421	40	2442	61	2463	-	-
20	2422	41	2443	62	2464	-	-

### 3 SUMMARY OF TEST RESULTS

#### 3.1 Test Standards

No.	Identity	Document Title
1	47 CFR Part 15 Subpart C	Intentional radiators of radio frequency equipment
2	RSS-Gen Issue 5	General Requirements for Compliance of Radio Apparatus
3	RSS-247 Issue 3	Digital Transmission Systems (DTSs), Frequency Hopping Systems(FHSs) and Licence-Exemp Local Area Network (LE-LAN) Devices
4	ANSI C63.10-2013	American National Standard for Testing Unlicensed Wireless Devices
5	KDB 558074 D01 15.247 Meas Guidance v05r02	Guidance for compliance measurements on digital transmission system, frequency hopping spread spectrum system, and hybrid system devices operating under section 15.247 of the FCC rules



### 3.2 Test Verdict

No.	Description	FCC Part No.	ISED Part No.	Channel	Test Result	Verdict	Remark
1	Antenna Requirement	15.203	RSS-247, 5.4 (f)	N/A	--	Pass	Note <sup>1</sup>
2	Number of Hopping Frequencies	15.247(a)	RSS-247, 5.1 (d)	Hopping Mode	ANNEX A.1	N/A	Note <sup>2</sup>
3	Peak Output Power and E.I.R.P	15.247(b)	RSS-247, 5.4 (b)	Low/Middle/High	ANNEX A.2	N/A	--
4	Occupied Bandwidth	15.247(a)	RSS-247, 5.1 (a)	Low/Middle/High	ANNEX A.3	N/A	Note <sup>2</sup>
5	Carrier Frequency Separation	15.247(a)	RSS-247, 5.1 (b)	Hopping Mode	ANNEX A.4	N/A	Note <sup>2</sup>
6	Time of Occupancy (Dwell time)	15.247(a)	RSS-247, 5.1 (d)	Hopping Mode	ANNEX A.5	N/A	Note <sup>2</sup>
7	Conducted Spurious Emission & Authorized-band band-edge	15.247(d)	RSS-247, 5.5	Hopping Mode, Low/Middle/High	ANNEX A.6	N/A	Note <sup>2</sup>
8	Conducted Emission	15.207	RSS-GEN, 8.8	Low/Middle/High	ANNEX A.7	Pass	Note <sup>2</sup>
9	Radiated Spurious Emission	15.209 15.247(d)	RSS-247, 5.5	Hopping Mode, Low/Middle/High	ANNEX A.8	Pass	Note <sup>2</sup>
10	Band Edge(Restricted-band band-edge)	15.209 15.247(d)	RSS-247, 5.5	Hopping Mode, Low/Middle/High	ANNEX A.9	Pass	Note <sup>2</sup>
11	Receiver Spurious Emission	--	RSS-Gen, 7.3	--	--	N/A	Note <sup>3</sup>

Note <sup>1</sup>: The EUT has a permanently and irreplaceable attached antenna, which complies with the requirement FCC 15.203.

Note <sup>2</sup>:  $\pi/4$ -DQPSK is the EDR 2M rate mode, 8-DPSK is the EDR 3M rate mode. The consistency of test results in  $\pi/4$ -DQPSK and 8-DPSK is very high. So we chose 8-DPSK as a typical representative to appear on the report. Another we will show all the modes on the RF output power test item.

Note <sup>3</sup>: Only radio communication receivers operating in stand-alone mode within the band 30-960 MHz, as well as scanner receivers, are subject to Industry Canada requirements, so this test is not applicable.

## 4 GENERAL TEST CONFIGURATIONS

### 4.1 Test Environments

During the measurement, the normal environmental conditions were within the listed ranges:

Relative Humidity	53% to 58%	
Atmospheric Pressure	100 kPa to 102 kPa	
Temperature	NT (Normal Temperature)	+23.1°C to +23.8°C
Working Voltage of the EUT	NV (Normal Voltage)	5.0 V

### 4.2 Test Equipment List

Description	Manufacturer	Model	Equipment No.	Cal. Date	Cal. Due
EMI Receiver	KEYSIGHT	N9038A	BH-EMC-L015	2024.07.09	2025.07.08
Test Antenna-Loop(9 kHz-30 MHz)	SCHWARZBECK	FMZB 1519 B	BH-EMC-L067	2024.03.11	2027.03.10
Test Antenna-Bi-Log(30 MHz-3 GHz)	SCHWARZBECK	VULB 9163	BH-EMC-L008	2024.03.11	2027.03.10
Test Antenna-Horn(1-18 GHz)	SCHWARZBECK	BBHA 9120D	BH-EMC-L044	2024.03.11	2027.03.10
Test Antenna-Horn (18-40 GHz)	A-INFO	LB-180400-KF	BH-EMC-L061	2024.03.11	2027.03.10
Anechoic Chamber	YiHeng	9m*6m*6m	BH-EMC-L001	2024.04.18	2027.04.17
EMI Receiver	KEYSIGHT	N9038A	BH-EMC-L127	2025.02.12	2026.02.11
LISN	SCHWARZBECK	NSLK 8127	BH-EMC-L011	2025.02.11	2026.02.10
10dB Limiter	SCHWARZBECK	VTSD 9561-F	BH-EMC-L014	2025.02.11	2026.02.10
Shielded Room	YiHeng	5m*4m*3.2m	BH-EMC-L006	2024.02.22	2027.02.21

### 4.3 Test Software List

Description	Manufacturer	Software Version	Serial No.	Applicable Test Setup
BL410E	BALUN	V21.919	N/A	The section 4.6.2&4.6.3&4.6.4&4.6.5

## 4.4 Decision Rule

☐ No Need

☒ Use General conformity decision rule (Consider uncertainty or not ☒No ☐Yes)

☐ Use Special Conformity Decision Rule (Consider uncertainty or not ☐No ☐Yes)

## 4.5 Measurement Uncertainty

The following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2.

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of  $k=2$ .

Parameters	Uncertainty
Occupied Channel Bandwidth	2.4 %
RF output power, conducted	0.41 dB
Power Spectral Density, conducted	1.73 dB
Unwanted Emissions, conducted	1.73 dB
All emissions, radiated	3.70 dB
Temperature	0.82 °C
Humidity	4.1 %

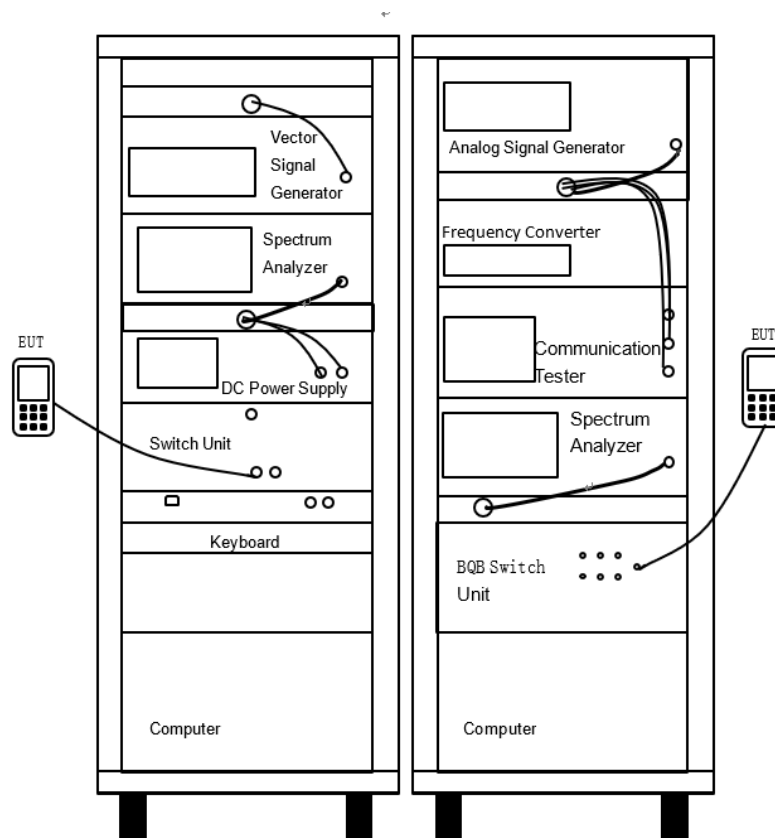
## 4.6 Description of Test Setup

### 4.6.1 For Antenna Port Test

Conducted value (dBm) = Measurement value (dBm) + cable loss (dB)

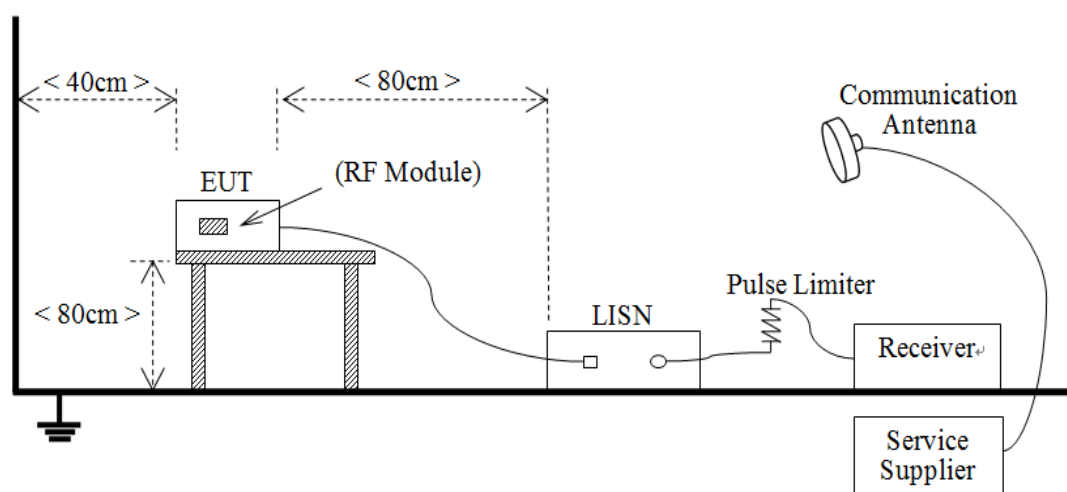
For example: the measurement value is 10 dBm and the cable 0.5 dB used, then the final result of EUT:

Conducted value (dBm) = 10 dBm + 0.5 dB = 10.5 dBm



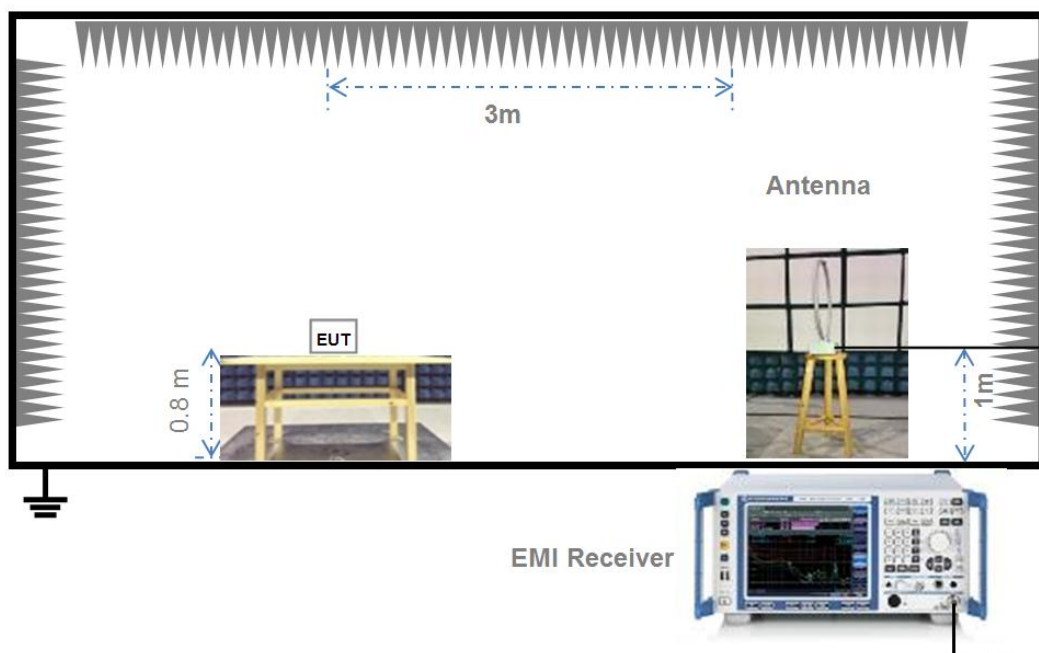
(Diagram 1)

### 4.6.2 For AC Power Supply Port Test



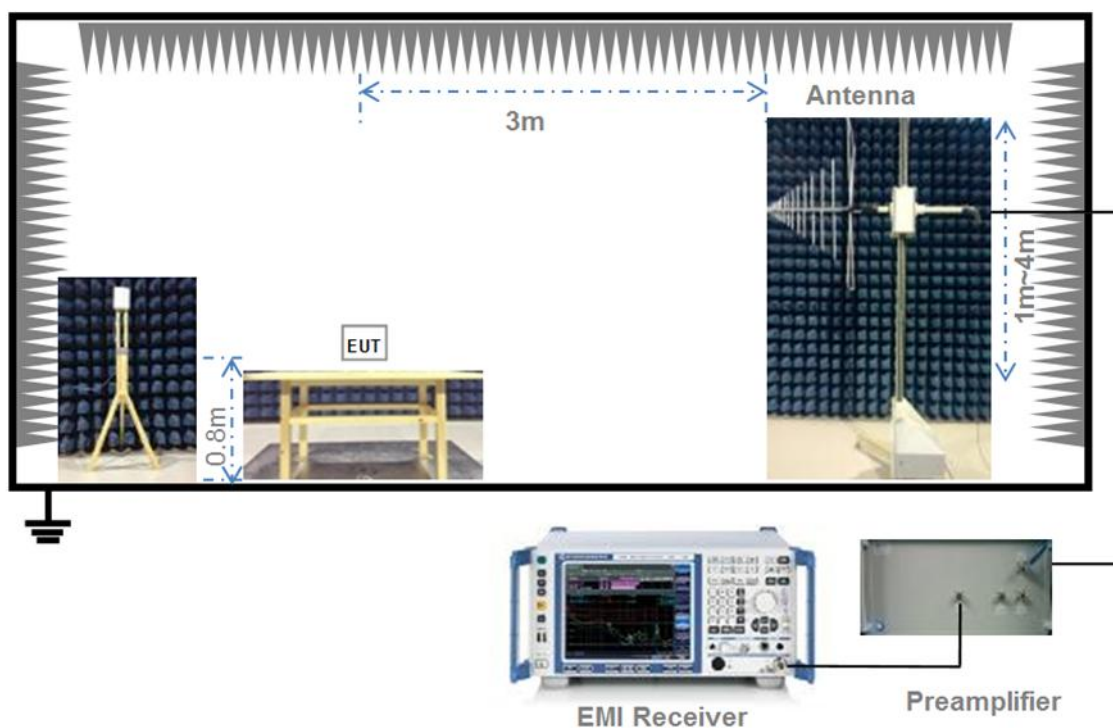
(Diagram 2)

## 4.6.3 For Radiated Test (Below 30 MHz)



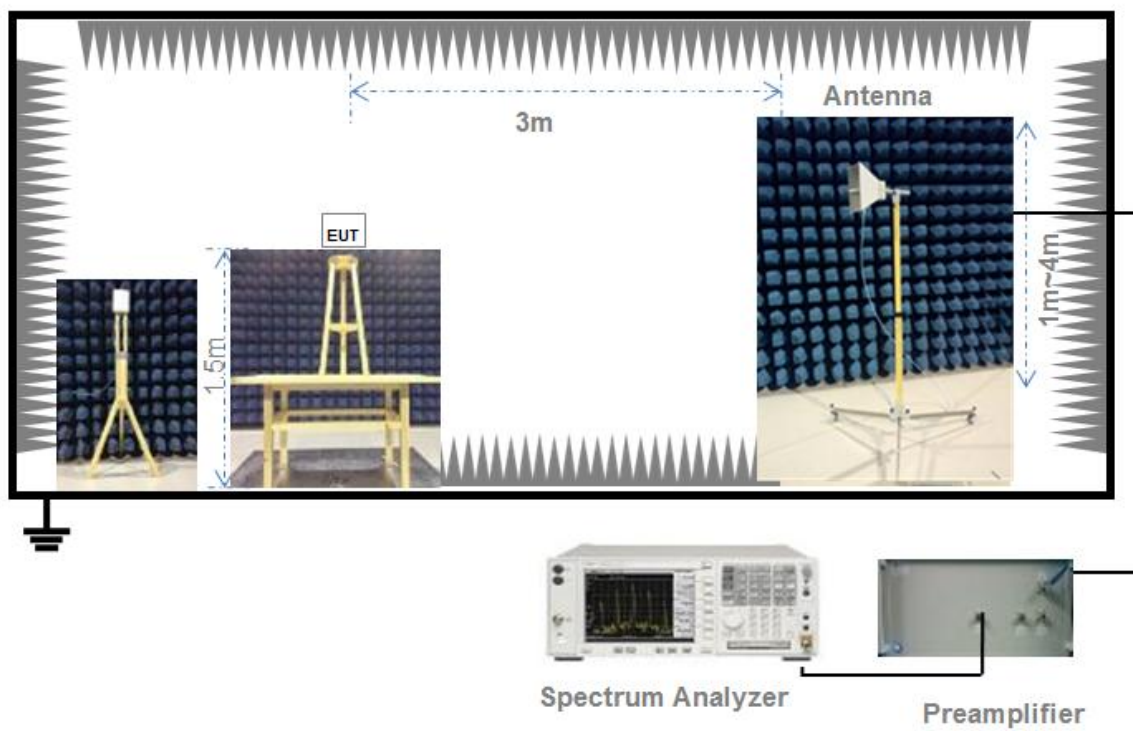
(Diagram 3)

## 4.6.4 For Radiated Test (30 MHz-1 GHz)



(Diagram 4)

## 4.6.5 For Radiated Test (Above 1 GHz)



(Diagram 5)

## 4.7 Measurement Results Explanation Example

### 4.7.1 For conducted test items:

The offset level is set in the spectrum analyzer to compensate the RF cable loss and attenuator between EUT conducted output port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level is exactly the EUT RF output level.

The spectrum analyzer offset is derived from RF cable loss and attenuator factor.

Offset = RF cable loss + attenuator factor.

## 5 TEST ITEMS

### 5.1 Antenna Requirements

#### 5.1.1 Relevant Standards

FCC §15.203 & 15.247(b); RSS-247, 5.4 (f)

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. This requirement does not apply to carrier current devices or to devices operated under the provisions of § 15.211, § 15.213, § 15.217, § 15.219, or § 15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with § 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

If directional gain of transmitting antennas is greater than 6 dBi, the power shall be reduced by the same level in dB comparing to gain minus 6 dBi. For the fixed point-to-point operation, the power shall be reduced by one dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi. 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 FCC rule.

#### 5.1.2 Antenna Anti-Replacement Construction

The Antenna Anti-Replacement as following method:

Protected Method	Description
The antenna is embedded in the product.	An embedded-in antenna design is used.

Reference Documents	Item
Photo	Please refer to the EUT Photo documents.

#### 5.1.3 Antenna Gain

The antenna peak gain of EUT is less than 6 dBi. Therefore, it is not necessary to reduce maximum peak output power limit.



## 5.2 Frequency Hopping Systems

### 5.2.1 Relevant Standards

FCC §15.247(a) (1) (i) (ii) (iii) (iv); FCC §15.247(g); FCC §15.247(h)

Describe how the hopping sequence is generated. Provide an example of the hopping sequence channels, to demonstrate that the sequence meets the requirement specified in the definition of an FHSS system. Per the definition in Section 2.1(c), the hop set shall appear as random in the near term, shall appear as evenly distributed in the long term, and sequential hops shall be randomly distributed in both direction and magnitude of change.

Describe how each individual EUT meets the requirement that each of its hopping channels is used equally on average (e.g., that each new transmission event begins on the next channel in the hopping sequence after the final channel used in the previous transmission event).

Describe how the associated receiver(s) complies with the requirement that the input bandwidth (either RF or IF) matches the bandwidth of the transmitted signal.

Describe how the associated receiver(s) has the ability to shift frequencies in synchronization with the transmitted signals.

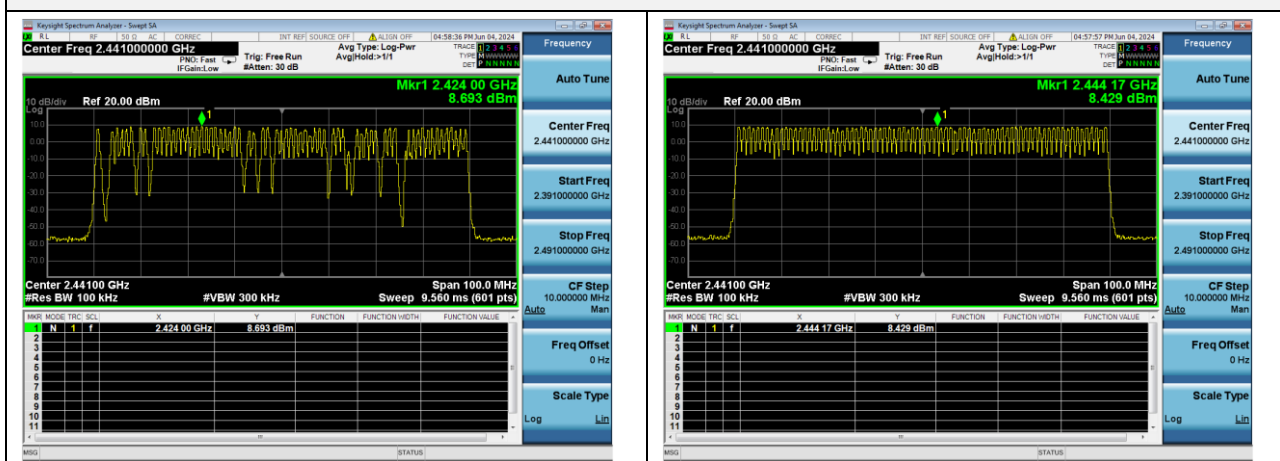
For short burst systems, describe how the EUT complies with the requirement that it be designed to be capable of operating as a true frequency hopping system. Specifically, the device shall comply with the equal frequency use and pseudorandom hopping sequence requirement when transmitting in short bursts, and shall be designed to comply when presented with continuous data (or information) stream.

Describe how the EUT complies with the requirement that it not have the ability to be coordinated with other FHSS systems in an effort to avoid the simultaneous occupancy of individual hopping frequencies by multiple transmitters.

### 5.2.2 Description of the systems

1. According to the preset procedure of the whole network, all the stations in the automatic control network synchronously change the frequency multiple times within one second, and temporarily stay on each frequency hopping channel. Periodic synchronization signaling is sent from the primary station, instructing all slaves to simultaneously change the operating frequency, then the hopping sequence is generated.
2. The hop set shall appear as random in the near term, shall appear as evenly distributed in the long term, and sequential hops shall be randomly distributed in both direction and magnitude of change.

#### Reference Documents



3. Channels are classified into two categories, used and unused, where used channels are part of the hopping sequence and unused channels are replaced in the hopping sequence by used channels in a pseudo-random way. Make each individual EUT meets the requirement that each of its hopping channels is used equally on average.
4. The input bandwidth and transmitted bandwidth are both 1MHz, the associated receiver(s) complies with the requirement that the input bandwidth matches the bandwidth of the transmitted signal.
5. Connected devices communicate on the same physical channel by synchronizing with a common clock and hopping sequence.
6. EUT isn't short burst systems.
7. EUT can't have the ability to be coordinated with other FHSS systems in an effort.

## 5.3 Number of Hopping Frequencies

### 5.3.1 Limit

FCC §15.247(a) (1) (iii); RSS-247, 5.1 (d)

Frequency hopping systems operating in the 2400 MHz to 2483.5 MHz bands shall use at least 15 hopping frequencies.

### 5.3.2 Test Setup

See section 4.6.1 for test setup description for the antenna port. The photo of test setup please refer to ANNEX B.

### 5.3.3 Test Procedure

The EUT must have its hopping function enabled. Use the following spectrum analyzer settings:

Span = The frequency band of operation

RBW = To identify clearly the individual channels, set the RBW to less than 30% of the channel spacing or the 20 dB bandwidth, whichever is smaller.

VBW  $\geq$  RBW

Sweep = auto

Detector function = peak

Trace = max hold

Allow the trace to stabilize

### 5.3.4 Test Result

Please refer to ANNEX A.1.

## 5.4 Peak Output Power and E.I.R.P

### 5.4.1 Test Limit

#### FCC § 15.247(b)

For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels band: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts.

#### RSS-247, 5.4 (b)

For FHSs operating in the band 2400-2483.5 MHz, the maximum peak conducted output power shall not exceed 1.0 W and the e.i.r.p. shall not exceed 4 W if the hopset uses 75 or more hopping channels; the maximum peak conducted output power shall not exceed 0.125 W and the e.i.r.p. shall not exceed 0.5 W if the hopset uses less than 75 hopping channels (see Section 5.4(5) for exceptions).

### 5.4.2 Test Setup

See section 4.6.1 for test setup description for the antenna port. The photo of test setup please refer to ANNEX B.

### 5.4.3 Test Procedure

The Module operates at hopping-off test mode. The lowest, middle and highest channels are selected to perform testing to verify the conducted RF output peak power of the Module.

Use the following spectrum analyzer settings:

Span = approximately 5 times the 20 dB bandwidth, centered on a hopping channel

RBW > the 20 dB bandwidth of the emission being measured

VBW  $\geq$  RBW

Sweep = auto

Detector function = peak

Trace = max hold

Allow the trace to stabilize.

### 5.4.4 Test Result

Please refer to ANNEX A.2.

## 5.5 Occupied Bandwidth

### 5.5.1 Limit

FCC §15.247(a); RSS-247, 5.1 (a)

Measurement of the 20dB bandwidth of the modulated signal.

### 5.5.2 Test Setup

See section 4.6.1 for test setup description for the antenna port. The photo of test setup please refer to ANNEX B.

### 5.5.3 Test Procedure

Use the following spectrum analyzer settings:

Span = approximately 2 to 5 times the 20 dB bandwidth, centered on a hopping channel

RBW = in the range of 1% to 5% of the OBW

VBW  $\geq$  RBW

Sweep = auto

Detector function = peak

Trace = max hold

The EUT should be transmitting at its maximum data rate, Allow the trace to stabilize.

### 5.5.4 Test Result

Please refer to ANNEX A.3.

## 5.6 Carrier Frequency Separation

### 5.6.1 Limit

FCC §15.247(a); RSS-247, 5.1 (b)

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 2/3 of the 20 dB bandwidth of the hopping channel, whichever is greater.

### 5.6.2 Test Setup

See section 4.6.1 for test setup description for the antenna port. The photo of test setup please refer to ANNEX B.

### 5.6.3 Test Procedure

The EUT must have its hopping function enabled. Use the following spectrum analyzer settings:

Span = wide enough to capture the peaks of two adjacent channels

Resolution (or IF) Bandwidth (RBW)  $\geq 1\%$  of the span

Video (or Average) Bandwidth (VBW)  $\geq$  RBW

Sweep = auto

Detector function = peak

Trace = max hold

Allow the trace to stabilize. Use the marker-delta function to determine the separation between the peaks of the adjacent channels.

### 5.6.4 Test Result

Please refer to ANNEX A.4.

## 5.7 Time of Occupancy (Dwell time)

### 5.7.1 Limit

FCC §15.247(a); RSS-247, 5.1 (d)

Frequency hopping systems in the 2400 MHz - 2483.5 MHz band shall use at least 15 non-overlapping channels. 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.

### 5.7.2 Test Setup

See section 4.6.1 for test setup description for the antenna port. The photo of test setup please refer to ANNEX B.

### 5.7.3 Test Procedure

The EUT shall have its hopping function enabled. Use the following spectrum analyzer settings:

Span: Zero span, centered on a hopping channel

RBW shall be  $\leq$  channel spacing and where possible RBW should be set  $\gg 1/T$ , where T is the expected dwell time per channel

Sweep: As necessary to capture the entire dwell time per hopping channel; where possible use a video trigger and trigger delay so that the transmitted signal starts a little to the right of the start of the plot. The trigger level might need slight adjustment to prevent triggering when the system hops on an adjacent channel; a second plot might be needed with a longer sweep time to show two successive hops on a channel

Detector function: Peak

Trace: Max hold

Use the marker-delta function to determine the transmit time per hop. If this value varies with different modes of operation (data rate, modulation format, number of hopping channels, etc.), then repeat this test for each variation in transmit time.

The average time of occupancy on any channel within the Period can be calculated with formulas:

For GFSK and 8-DPSK:

For DH1 package type

$$\{\text{Total of Dwell}\} = \{\text{Pulse Time}\} * (1600 / 2) / \{\text{Number of Hopping Frequency}\} * \{\text{Period}\}$$

$$\{\text{Period}\} = 0.4 \text{ s} * \{\text{Number of Hopping Frequency}\}$$

For DH3 package type

$$\{\text{Total of Dwell}\} = \{\text{Pulse Time}\} * (1600 / 4) / \{\text{Number of Hopping Frequency}\} * \{\text{Period}\}$$

$$\{\text{Period}\} = 0.4 \text{ s} * \{\text{Number of Hopping Frequency}\}$$

For DH5 package type

$$\{\text{Total of Dwell}\} = \{\text{Pulse Time}\} * (1600 / 6) / \{\text{Number of Hopping Frequency}\} * \{\text{Period}\}$$

$$\{\text{Period}\} = 0.4 \text{ s} * \{\text{Number of Hopping Frequency}\}$$

For AFH Mode:

For DH1 package type

$$\{\text{Total of Dwell}\} = \{\text{Pulse Time}\} * (800 / 2) / \{\text{Number of Hopping Frequency}\} * \{\text{Period}\}$$

$$\{\text{Period}\} = 0.4 \text{ s} * \{\text{Number of Hopping Frequency}\}$$

For DH3 package type

$$\{\text{Total of Dwell}\} = \{\text{Pulse Time}\} * (800 / 4) / \{\text{Number of Hopping Frequency}\} * \{\text{Period}\}$$
$$\{\text{Period}\} = 0.4 \text{ s} * \{\text{Number of Hopping Frequency}\}$$

For DH5 package type

$$\{\text{Total of Dwell}\} = \{\text{Pulse Time}\} * (800 / 6) / \{\text{Number of Hopping Frequency}\} * \{\text{Period}\}$$
$$\{\text{Period}\} = 0.4 \text{ s} * \{\text{Number of Hopping Frequency}\}$$

The lowest, middle and highest channels are selected to perform testing to record the dwell time of each occupation measured in this channel, which is called Pulse Time here.

#### 5.7.4 Test Result

Please refer to ANNEX A.5.



## 5.8 Conducted Spurious Emission & Authorized-band band-edge

### 5.8.1 Limit

FCC §15.247(d); RSS-247, 5.5

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.

### 5.8.2 Test Setup

See section 4.6.1 for test setup description for the antenna port. The photo of test setup please refer to ANNEX B.

### 5.8.3 Test Procedure

Use the following spectrum analyzer settings:

Span = wide enough to capture the peak level of the in-band emission and all spurious emissions (e.g., harmonics) from the lowest frequency generated in the EUT up through the 10th harmonic. Typically, several plots are required to cover this entire span.

RBW = 100 kHz

VBW = 300 kHz

Sweep = auto

Detector function = peak

Trace = max hold

Allow the trace to stabilize

### 5.8.4 Test Result

Please refer to ANNEX A.6.

## 5.9 Conducted Emission

### 5.9.1 Limit

FCC §15.207; RSS-GEN, 8.8

For an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 $\mu$ H/50 $\Omega$  line impedance stabilization network (LISN).

Frequency range (MHz)	Conducted Limit (dB $\mu$ V)	
	Quai-peak	Average
0.15 - 0.50	66 to 56	56 to 46
0.50 - 5	56	46
0.50 - 30	60	50

### 5.9.2 Test Setup

See section 4.6.2 for test setup description for the AC power supply port. The photo of test setup please refer to ANNEX B.

### 5.9.3 Test Procedure

The maximum conducted interference is searched using Peak (PK), if the emission levels more than the AV and QP limits, and that have narrow margins from the AV and QP limits will be re-measured with AV and QP detectors. Tests for both L phase and N phase lines of the power mains connected to the EUT are performed. Refer to recorded points and plots below.

Devices subject to Part 15 must be tested for all available U.S. voltages and frequencies (such as a nominal 120 VAC, 50/60 Hz and 240 VAC, 50/60 Hz) for which the device is capable of operation. A device rated for 50/60 Hz operation need not be tested at both frequencies provided the radiated and line conducted emissions are the same at both frequencies.

### 5.9.4 Test Result

Please refer to ANNEX A.7.

## 5.10 Radiated Spurious Emission

### 5.10.1 Limit

FCC §15.209&15.247(d); RSS-247, 5.5

Radiated emission outside the frequency band attenuation below the general limits specified in FCC section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in FCC section 15.205(a), must also comply with the radiated emission limits specified in FCC section 15.209(a).

According to FCC section 15.209 (a), except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength ( $\mu\text{V}/\text{m}$ )	Measurement Distance (m)
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
Above 960	500	3

Note:

1. Field Strength ( $\text{dB}\mu\text{V}/\text{m}$ ) =  $20 \cdot \log[\text{Field Strength } (\mu\text{V}/\text{m})]$ .
2. In the emission tables above, the tighter limit applies at the band edges.
3. For Above 1000 MHz, the emission limit in this paragraph is based on measurement instrumentation employing an average detector, measurement using instrumentation with a peak detector function, corresponding to 20dB above the maximum permitted average limit.
4. For above 1000 MHz, limit field strength of harmonics: 54dBuV/m@3m (AV) and 74dBuV/m@3m (PK).

### 5.10.2 Test Setup

See section 4.6.3 to 4.6.5 for test setup description for the antenna port. The photo of test setup please refer to ANNEX B.

### 5.10.3 Test Procedure

The measurement frequency range is from 9 kHz to the 10th harmonic of the fundamental frequency. The Turn Table is actuated to turn from 0° to 360°, and both horizontal and vertical polarizations of the Test Antenna are used to find the maximum radiated power. Mid channels on all channel bandwidth verified. Only the worst RB size/offset presented.

The power of the EUT transmitting frequency should be ignored.

All Spurious Emission tests were performed in X, Y, Z axis direction. And only the worst axis test condition was recorded in this test report.

Use the following spectrum analyzer settings:

Span = wide enough to fully capture the emission being measured

RBW = 1 MHz for  $f \geq 1$  GHz, 100 kHz for  $f < 1$  GHz

VBW  $\geq$  RBW

Sweep = auto

Detector function = peak

Trace = max hold

For measurement below 1GHz, 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.

#### 5.10.4 Test Result

Please refer to ANNEX A.8.

## 5.11 Band Edge (Restricted-band band-edge)

### 5.11.1 Limit

FCC §15.209&15.247(d)

Radiated emission outside the frequency band attenuation below the general limits specified in FCC section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in FCC section 15.205(a), must also comply with the radiated emission limits specified in FCC section 15.209(a).

### 5.11.2 Test Setup

See section 4.6.3 to 4.6.5 for test setup description for the antenna port. The photo of test setup please refer to ANNEX B.

### 5.11.3 Test Procedure

The measurement frequency range is from 9 kHz to the 10th harmonic of the fundamental frequency. The Turn Table is actuated to turn from 0° to 360°, and both horizontal and vertical polarizations of the Test Antenna are used to find the maximum radiated power. Mid channels on all channel bandwidth verified. Only the worst RB size/offset presented.

The power of the EUT transmitting frequency should be ignored.

All Spurious Emission tests were performed in X, Y, Z axis direction. And only the worst axis test condition was recorded in this test report.

Use the following spectrum analyzer settings:

Span = wide enough to fully capture the emission being measured

RBW = 1 MHz for  $f \geq 1$  GHz, 100 kHz for  $f < 1$  GHz

VBW  $\geq$  RBW

Sweep = auto

Detector function = peak

Trace = max hold

For measurement below 1GHz, 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.

### 5.11.4 Test Result

Please refer to ANNEX A.9.

## ANNEX A TEST RESULT

### A.1 Number of Hopping Frequencies

Note: Not applicable.

### A.2 Peak Output Power and E.I.R.P

#### Peak Power Test Data

Note: Not applicable.

#### E.I.R.P Test Data (For ISSED)

Channel	E.I.R.P						Limit		Verdict
	GFSK		$\pi/4$ -DQPSK		8-DPSK		dBm	mW	
	dBm	mW	dBm	mW	dBm	mW			
Low	10.33	10.79	9.29	8.49	9.77	9.48	36	4000	Pass
Middle	10.35	10.84	9.63	9.18	9.75	9.44			Pass
High	10.42	11.02	9.70	9.33	9.83	9.62			Pass

### **A.3 Occupied Bandwidth**

Note: Not applicable.

### **A.4 Carrier Frequency Separation**

Note: Not applicable.

### **A.5 Time of Occupancy (Dwell time)**

Note: Not applicable.

### **A.6 Conducted Spurious Emissions & Authorized-band band-edge**

Note: Not applicable.

## A.7 Conducted Emission

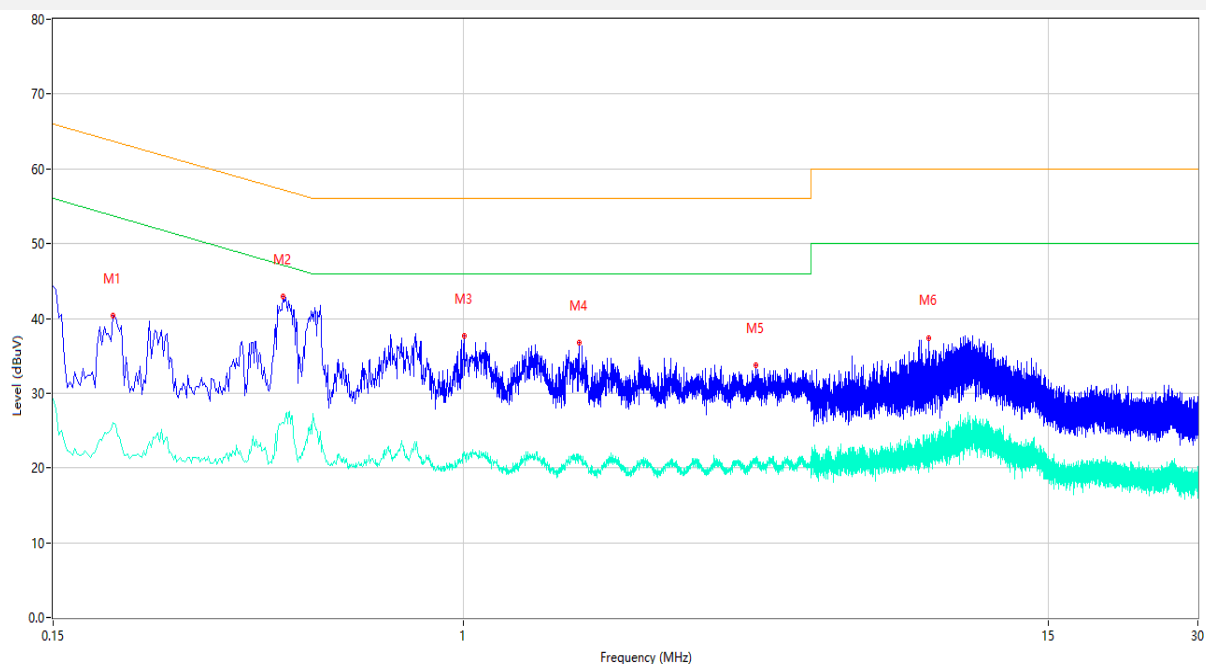
Note 1: The EUT is working in the Normal link mode. All modes have been tested and normal link mode is worst.

Note 2: Devices subject to Part 15 must be tested for all available U.S. voltages and frequencies (such as a nominal 120 VAC, 60 Hz and 240 VAC, 50 Hz) for which the device is capable of operation. So, The configuration 120 VAC, 60 Hz and 240 VAC, 50 Hz were tested respectively, but only the worst configuration (120 VAC, 60 Hz ) shown here.

Note 3: Results (dBuV) = Original reading level of Spectrum Analyzer (dBuV) + Factor (dB)

### Test Data and Plots

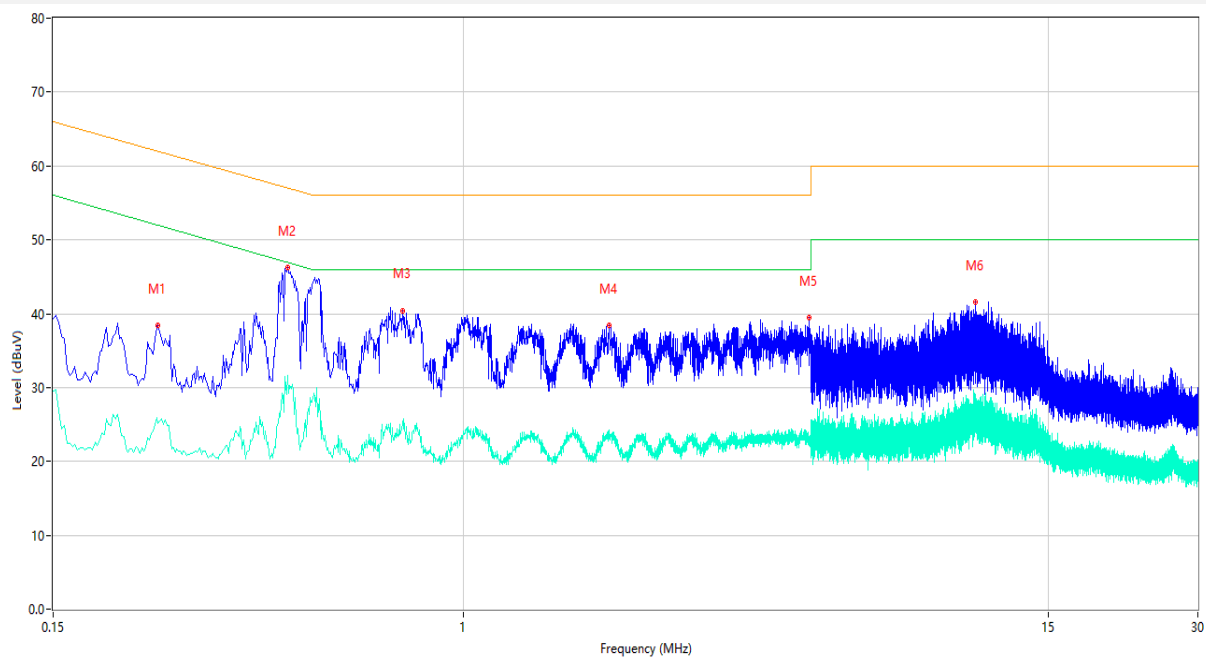
#### PHASE L



No.	Frequency (MHz)	Results (dBuV)	Factor (dB)	Limit (dBuV)	Margin (dB)	Detector	Line	Verdict
1	0.198	40.42	9.78	63.69	23.27	Peak	L	Pass
1**	0.198	26.08	9.78	53.69	27.61	AV	L	Pass
2	0.434	42.92	9.77	57.18	14.26	Peak	L	Pass
2**	0.434	26.09	9.77	47.18	21.09	AV	L	Pass
3	1.004	37.66	9.78	56.00	18.34	Peak	L	Pass
3**	1.004	22.10	9.78	46.00	23.90	AV	L	Pass
4	1.712	36.70	9.69	56.00	19.30	Peak	L	Pass
4**	1.712	21.18	9.69	46.00	24.82	AV	L	Pass
5	3.886	33.74	9.62	56.00	22.26	Peak	L	Pass
5**	3.886	20.84	9.62	46.00	25.16	AV	L	Pass
6	8.650	37.42	9.25	60.00	22.58	Peak	L	Pass
6**	8.650	22.64	9.25	50.00	27.36	AV	L	Pass



## PHASE N



No.	Frequency (MHz)	Results (dBuV)	Factor (dB)	Limit (dBuV)	Margin (dB)	Detector	Line	Verdict
1	0.244	38.42	9.73	61.96	23.54	Peak	N	Pass
1**	0.244	25.23	9.73	51.96	26.73	AV	N	Pass
2	0.444	46.28	9.75	56.99	10.71	Peak	N	Pass
2**	0.444	31.57	9.75	46.99	15.42	AV	N	Pass
3	0.756	40.36	9.72	56.00	15.64	Peak	N	Pass
3**	0.756	25.23	9.72	46.00	20.77	AV	N	Pass
4	1.964	38.40	9.76	56.00	17.60	Peak	N	Pass
4**	1.964	24.28	9.76	46.00	21.72	AV	N	Pass
5	4.958	39.52	9.60	56.00	16.48	Peak	N	Pass
5**	4.958	23.36	9.60	46.00	22.64	AV	N	Pass
6	10.704	41.58	9.13	60.00	18.42	Peak	N	Pass
6**	10.704	28.34	9.13	50.00	21.66	AV	N	Pass

## A.8 Radiated Spurious Emission

Note 1: The symbol of "--" in the table which means not application.

Note 2: For the test data above 1 GHz, according the ANSI C63.10-2013, where limits are specified for both average and peak (or quasi-peak) detector functions, if the peak (or quasi-peak) measured value complies with the average limit, it is unnecessary to perform an average measurement.

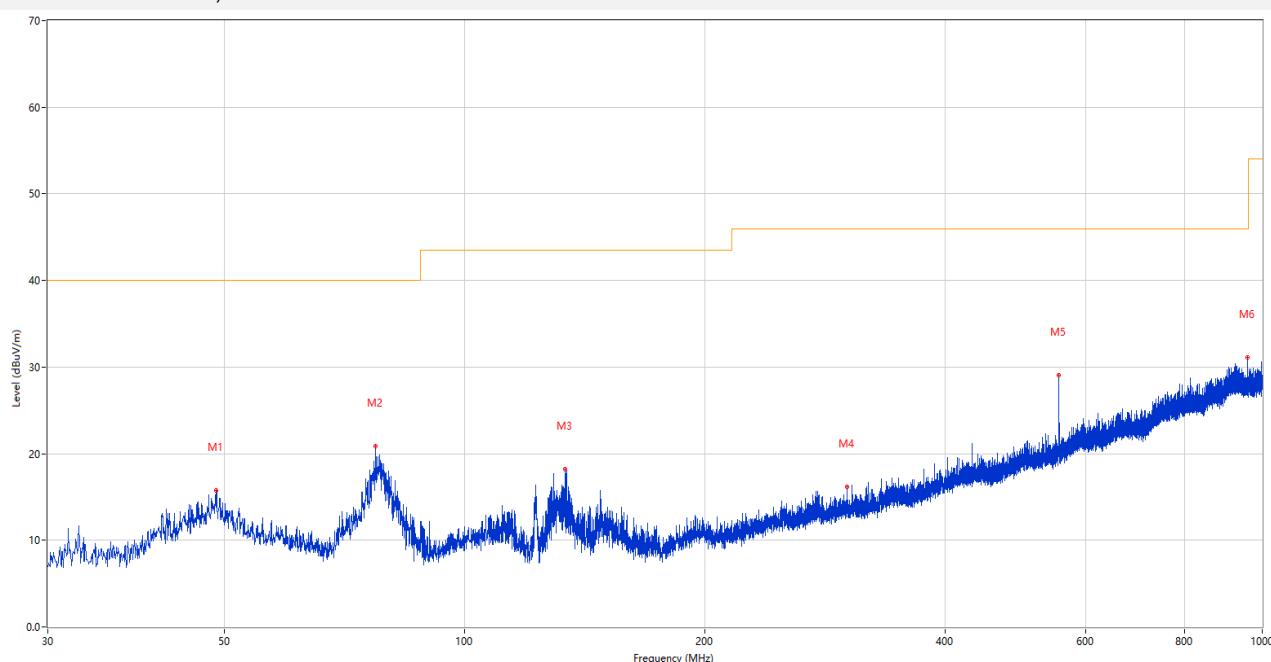
Note 3: The EUT is working in the Normal link mode below 1 GHz. All modes have been tested and DH5-High mode is the worst.

Note 4: Results (dBuV/m) = Original reading level of Spectrum Analyzer (dBuV) + Factor (dB)

Note 5: The low frequency, which started from 9 kHz to 30 MHz, was pre-scanned and the result which was 20 dB lower than the limit line per 15.31(o) was not reported.

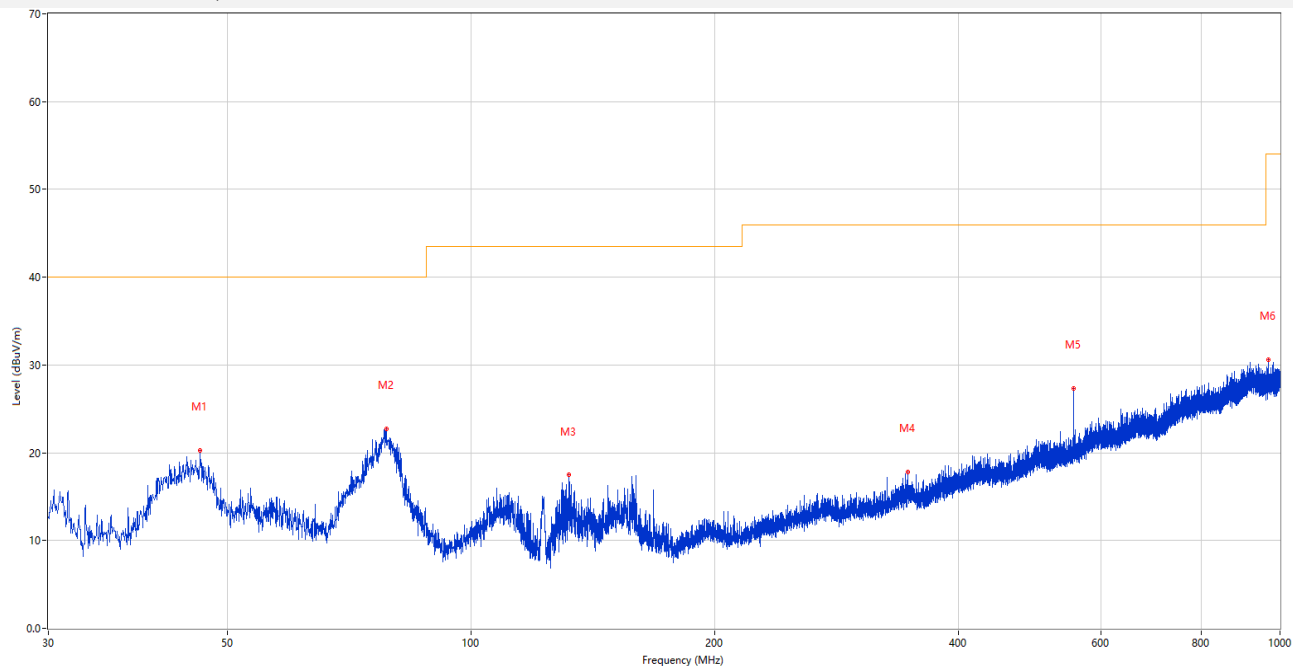
### Test Data and Plots

30 MHz to 1 GHz, ANT H



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	48.818	15.79	-25.72	40.0	24.21	Peak	130.00	100	Horizontal	Pass
2	77.336	20.91	-31.71	40.0	19.09	Peak	85.00	200	Horizontal	Pass
3	133.693	18.26	-30.05	43.5	25.24	Peak	238.00	200	Horizontal	Pass
4	301.842	16.14	-23.75	46.0	29.86	Peak	320.00	200	Horizontal	Pass
5	556.031	29.05	-17.47	46.0	16.95	Peak	352.00	200	Horizontal	Pass
6	958.193	31.15	-9.31	46.0	14.85	Peak	136.00	200	Horizontal	Pass

## 30 MHz to 1 GHz, ANT V

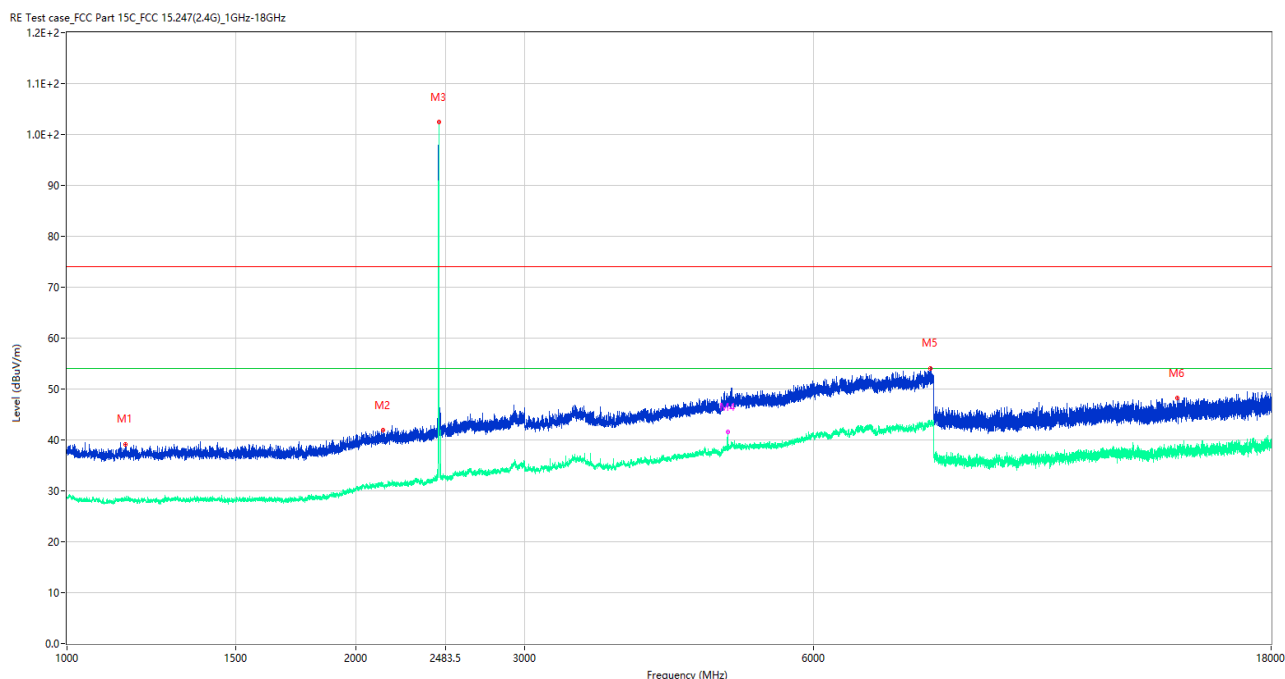


No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	46.248	20.30	-25.89	40.0	19.70	Peak	223.00	100	Vertical	Pass
2	78.500	22.74	-31.82	40.0	17.26	Peak	6.00	200	Vertical	Pass
3	131.947	17.45	-29.95	43.5	26.05	Peak	86.00	100	Vertical	Pass
4	346.705	17.79	-22.11	46.0	28.21	Peak	95.00	200	Vertical	Pass
5	556.031	27.32	-17.47	46.0	18.68	Peak	198.00	100	Vertical	Pass
6	967.796	30.64	-9.22	54.0	23.36	Peak	325.00	100	Vertical	Pass

Note 1: The marked spikes near 2400 MHz with circle should be ignored because they are Fundamental signal.

Note 2: The spurious from 18GHz-25GHz is noise only, do not show on the report.

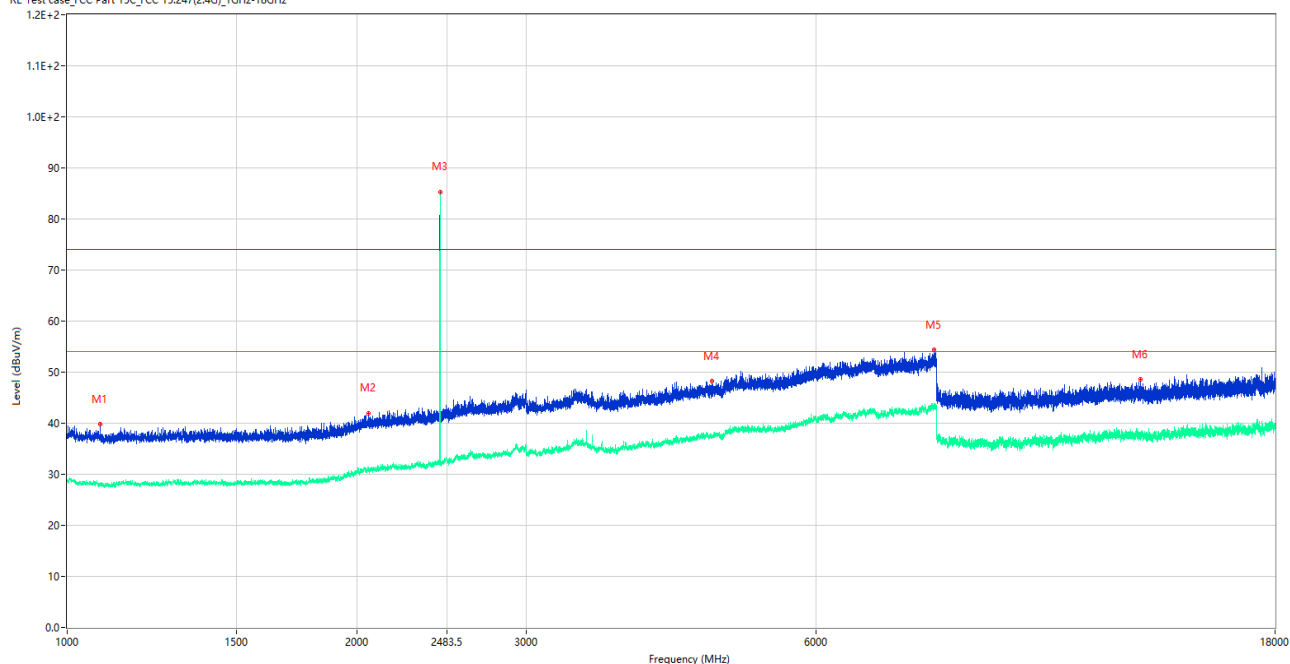
### GFSK Middle CHANNEL 1 GHz to 18 GHz, ANT H



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1151.250	39.04	-15.65	74.0	34.96	Peak	260.00	150	Horizontal	Pass
1**	1151.250	28.05	-15.65	54.0	25.95	AV	260.00	150	Horizontal	Pass
2	2134.000	41.87	-13.43	74.0	32.13	Peak	77.00	150	Horizontal	Pass
2**	2134.000	30.88	-13.43	54.0	23.12	AV	77.00	150	Horizontal	Pass
3	2440.750	102.40	-12.38	74.0	-28.40	Peak	37.00	150	Horizontal	N/A
3**	2440.750	100.82	-12.38	54.0	-46.82	AV	37.00	150	Horizontal	N/A
4	4882.000	47.55	-2.31	74.0	26.45	Peak	360.00	150	Horizontal	Pass
4**	4882.000	40.97	-2.31	54.0	13.03	AV	360.00	150	Horizontal	Pass
5	7949.500	53.98	2.05	74.0	20.02	Peak	201.00	150	Horizontal	Pass
5**	7949.500	42.93	2.05	54.0	11.07	AV	201.00	150	Horizontal	Pass
6	14362.000	48.17	-1.55	74.0	25.83	Peak	0.00	150	Horizontal	Pass
6**	14362.000	38.65	-1.55	54.0	15.35	AV	0.00	150	Horizontal	Pass

## GFSK Middle CHANNEL 1 GHz to 18 GHz, ANT V

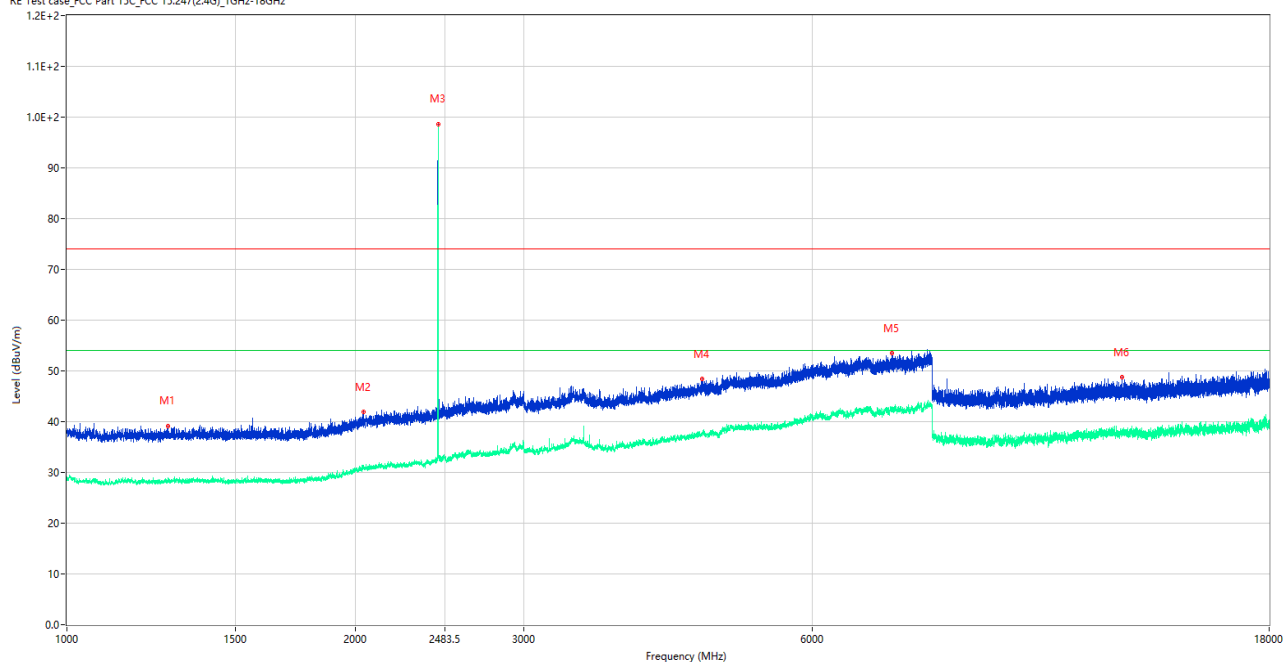
RE Test case\_FCC Part 15C\_FCC 15.247(2.4G)\_1GHz-18GHz



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1082.000	39.80	-15.64	74.0	34.20	Peak	360.00	150	Vertical	Pass
1**	1082.000	27.81	-15.64	54.0	26.19	AV	360.00	150	Vertical	Pass
2	2055.250	41.91	-13.80	74.0	32.09	Peak	360.00	150	Vertical	Pass
2**	2055.250	31.18	-13.80	54.0	22.82	AV	360.00	150	Vertical	Pass
3	2440.750	85.29	-12.38	74.0	-11.29	Peak	248.00	150	Vertical	N/A
3**	2440.750	83.68	-12.38	54.0	-29.68	AV	248.00	150	Vertical	N/A
4	4678.500	48.24	-3.71	74.0	25.76	Peak	249.00	150	Vertical	Pass
4**	4678.500	37.10	-3.71	54.0	16.90	AV	249.00	150	Vertical	Pass
5	7963.500	54.31	2.36	74.0	19.69	Peak	20.00	150	Vertical	Pass
5**	7963.500	43.27	2.36	54.0	10.73	AV	20.00	150	Vertical	Pass
6	13050.000	48.51	-1.90	74.0	25.49	Peak	349.00	150	Vertical	Pass
6**	13050.000	37.88	-1.90	54.0	16.12	AV	349.00	150	Vertical	Pass

## 8-DPSK Middle CHANNEL 1 GHz to 18 GHz, ANT H

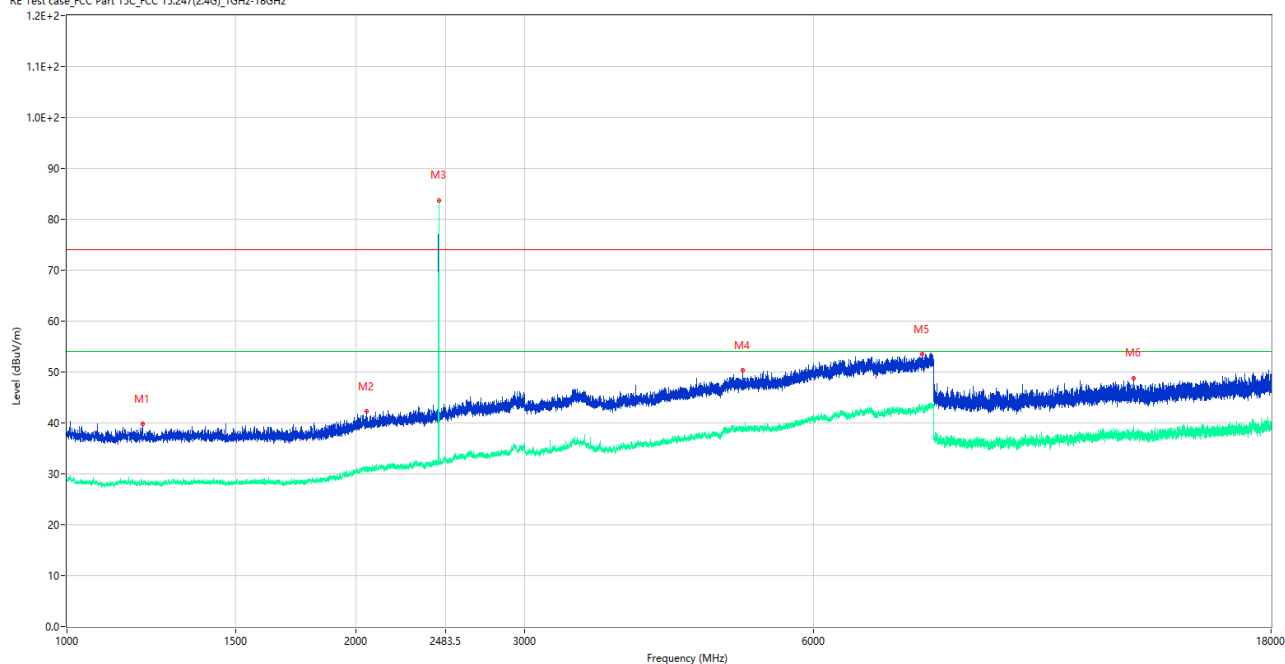
RE Test case\_FCC Part 15C\_FCC 15.247(2.4G)\_1GHz-18GHz



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1274.250	39.20	-15.82	74.0	34.80	Peak	360.00	150	Horizontal	Pass
1**	1274.250	28.18	-15.82	54.0	25.82	AV	360.00	150	Horizontal	Pass
2	2040.250	41.85	-13.30	74.0	32.15	Peak	112.00	150	Horizontal	Pass
2**	2040.250	30.91	-13.30	54.0	23.09	AV	112.00	150	Horizontal	Pass
3	2441.250	98.67	-12.40	74.0	-24.67	Peak	16.00	150	Horizontal	N/A
3**	2441.250	98.07	-12.40	54.0	-44.07	AV	16.00	150	Horizontal	N/A
4	4605.500	48.41	-3.63	74.0	25.59	Peak	0.00	150	Horizontal	Pass
4**	4605.500	37.63	-3.63	54.0	16.37	AV	0.00	150	Horizontal	Pass
5	7271.500	53.43	0.41	74.0	20.57	Peak	88.00	150	Horizontal	Pass
5**	7271.500	42.53	0.41	54.0	11.47	AV	88.00	150	Horizontal	Pass
6	12638.500	48.75	-3.07	74.0	25.25	Peak	322.00	150	Horizontal	Pass
6**	12638.500	37.54	-3.07	54.0	16.46	AV	322.00	150	Horizontal	Pass

## 8-DPSK Middle CHANNEL 1 GHz to 18 GHz, ANT V

RE Test case\_FCC Part 15C\_FCC 15.247(2.4G)\_1GHz-18GHz



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1199.000	39.75	-15.75	74.0	34.25	Peak	0.00	150	Vertical	Pass
1**	1199.000	28.16	-15.75	54.0	25.84	AV	0.00	150	Vertical	Pass
2	2053.500	42.29	-13.74	74.0	31.71	Peak	202.00	150	Vertical	Pass
2**	2053.500	31.01	-13.74	54.0	22.99	AV	202.00	150	Vertical	Pass
3	2441.000	83.71	-12.39	74.0	-9.71	Peak	211.00	150	Vertical	N/A
3**	2441.000	82.95	-12.39	54.0	-28.95	AV	211.00	150	Vertical	N/A
4	5062.500	50.39	-2.35	74.0	23.61	Peak	124.00	150	Vertical	Pass
4**	5062.500	38.65	-2.35	54.0	15.35	AV	124.00	150	Vertical	Pass
5	7785.500	53.48	1.55	74.0	20.52	Peak	329.00	150	Vertical	Pass
5**	7785.500	42.78	1.55	54.0	11.22	AV	329.00	150	Vertical	Pass
6	12939.500	48.80	-2.02	74.0	25.20	Peak	214.00	150	Vertical	Pass
6**	12939.500	38.03	-2.02	54.0	15.97	AV	214.00	150	Vertical	Pass

## A.9 Band Edge (Restricted-band band-edge)

Note 1: The lowest and highest channels are tested to verify the band edge emissions. Please refer to the following the plots for emissions values.

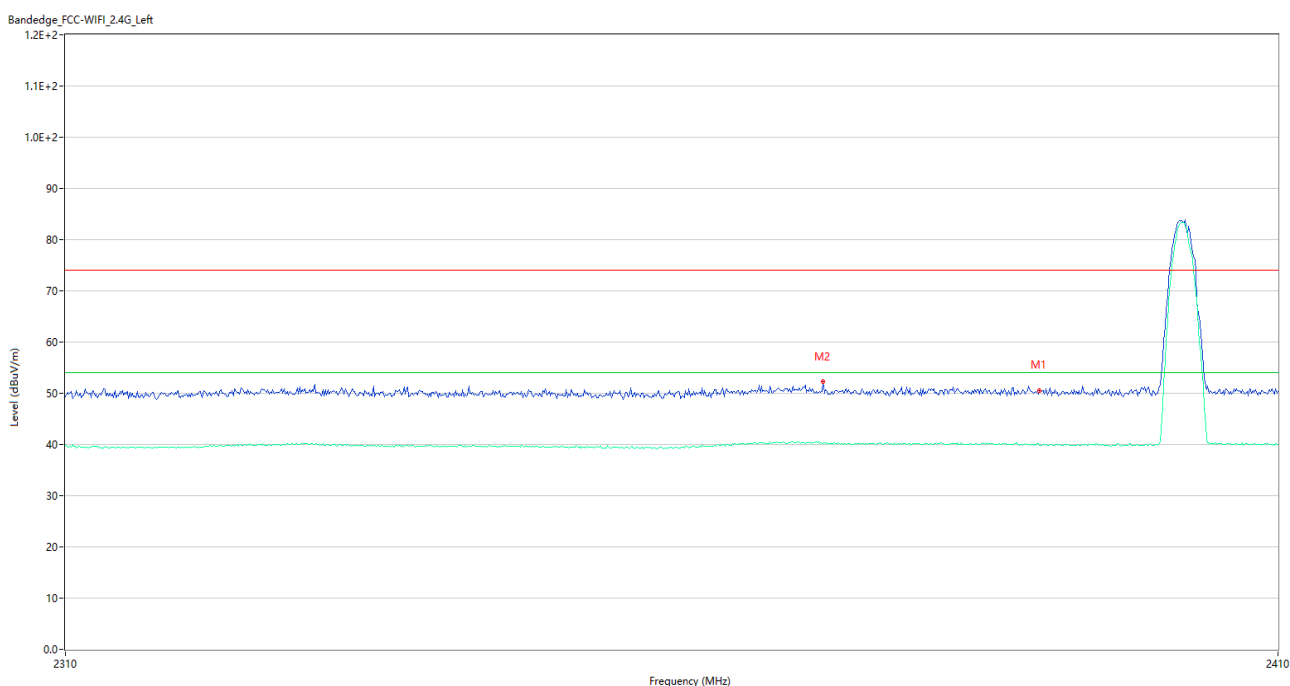
Note 2: The test data all are tested in the vertical and horizontal antenna which the trace is max hold. So these plots have shown the worst case.

Note 3: According the ANSI C63.10-2013, where limits are specified for both average and peak (or quasi-peak) detector functions, if the peak (or quasi-peak) measured value complies with the average limit, it is unnecessary to perform an average measurement.

Note 4: The Level (dBuV/m) has been corrected by factor.

### Test Data and Plots

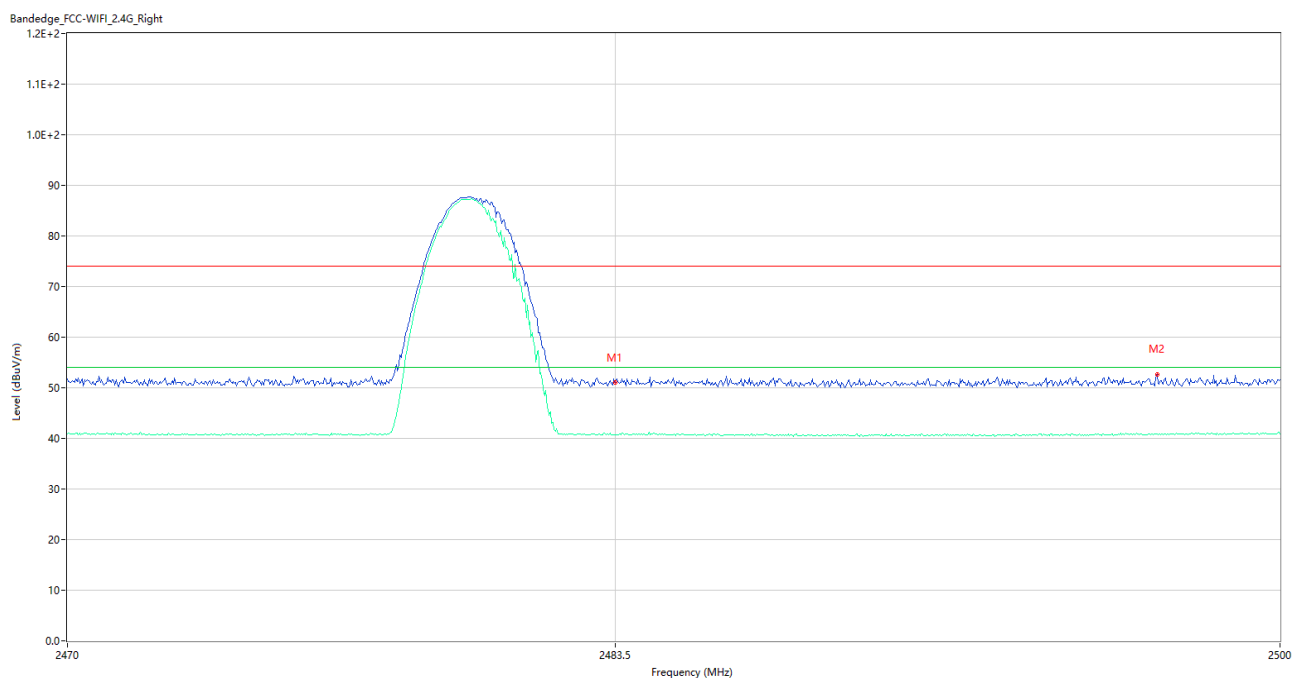
#### GFSK LOW CHANNEL



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	2390.000	50.56	-4.87	74.0	23.44	Peak	0.00	150	Vertical	Pass
1**	2390.000	39.77	-4.87	54.0	14.23	AV	0.00	150	Vertical	Pass
2	2372.000	52.28	-4.07	74.0	21.72	Peak	194.00	150	Vertical	Pass
2**	2372.000	40.09	-4.07	54.0	13.91	AV	194.00	150	Vertical	Pass

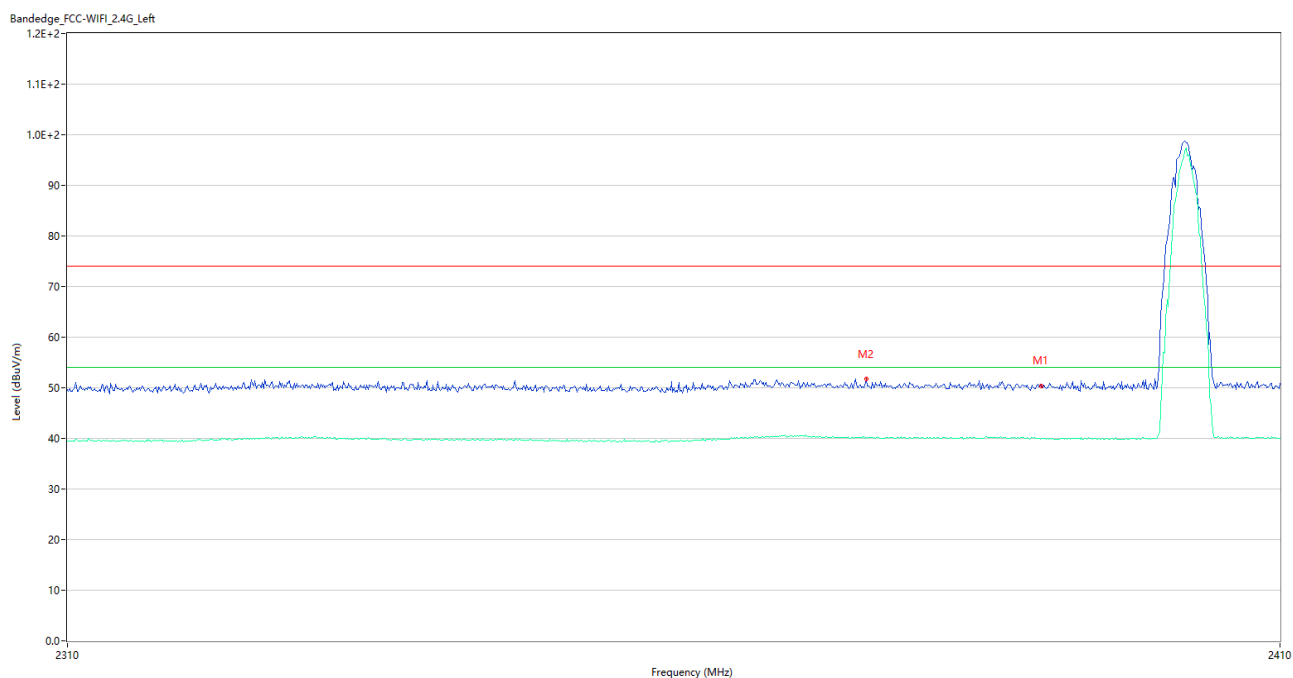


## GFSK HIGH CHANNEL



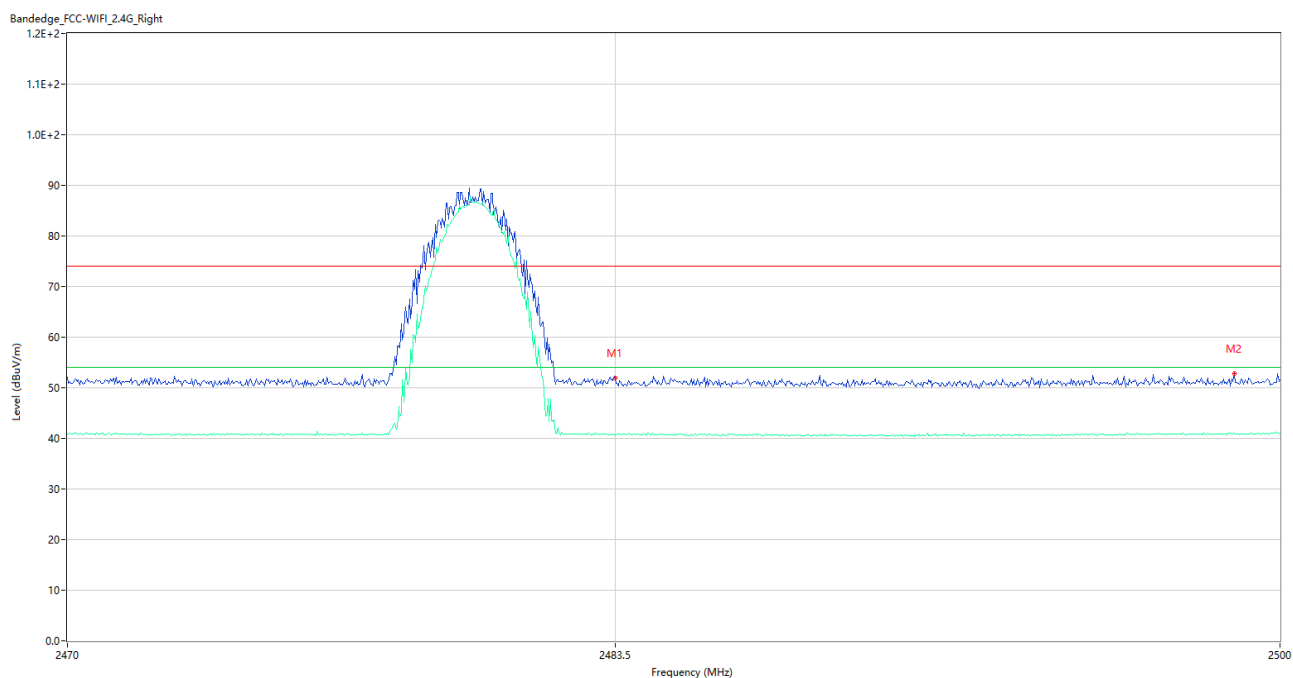
No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	2483.500	51.09	-3.78	74.0	22.91	Peak	180.00	150	Vertical	Pass
1**	2483.500	40.77	-3.78	54.0	13.23	AV	180.00	150	Vertical	Pass
2	2496.940	52.64	-3.95	74.0	21.36	Peak	28.00	150	Vertical	Pass
2**	2496.940	40.89	-3.95	54.0	13.11	AV	28.00	150	Vertical	Pass

## 8-DPSK LOW CHANNEL



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	2390.000	50.38	-4.87	74.0	23.62	Peak	245.98	150	Horizontal	Pass
1**	2390.000	40.00	-4.87	54.0	14.00	AV	245.98	150	Horizontal	Pass
2	2375.400	51.74	-4.17	74.0	22.26	Peak	54.00	150	Horizontal	Pass
2**	2375.400	40.13	-4.17	54.0	13.87	AV	54.00	150	Horizontal	Pass

## 8-DPSK HIGH CHANNEL



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	2483.500	51.85	-3.78	74.0	22.15	Peak	0.00	150	Vertical	Pass
1**	2483.500	40.73	-3.78	54.0	13.27	AV	0.00	150	Vertical	Pass
2	2498.860	52.83	-3.98	74.0	21.17	Peak	0.00	150	Vertical	Pass
2**	2498.860	41.05	-3.98	54.0	12.95	AV	0.00	150	Vertical	Pass

## **ANNEX B TEST SETUP PHOTOS**

Please refer the document “BL-SH2540355-AR-1.PDF”.

## **ANNEX C EUT EXTERNAL PHOTOS**

Please refer the document “BL-SH2540355-AW.PDF”.

## **ANNEX D EUT INTERNAL PHOTOS**

Please refer the document “BL-SH2540355-AI.PDF”.

## Statement

1. The Testing Center guarantees the scientificity, accuracy and impartiality of the test, and is responsible for all the information in the report, except the information provided by the customer. The customer is responsible for the impact of the information provided on the validity of the results.
2. For the report with Accreditation Symbol, the items marked with "☆" are not within the accredited scope.
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--END OF REPORT--