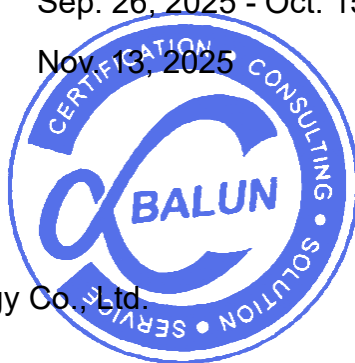


TEST REPORT

Applicant: Hansong(Nanjing) Technology Ltd.
Address: 8th Kangping Road Jiangning Economy and Technology Development Zone, Nanjing, 211106, China.
Equipment Type: Bluetooth Module
Model Name: HSBT5181
Brand Name: Platin
FCC ID: XCO-HSBT5181
ISED Number: 7756A-HSBT5181
Test Standard: 47 CFR Part 15 Subpart C
RSS-Gen Issue 5
RSS-247 Issue 4
(refer to section 3.1)
Sample Arrival Date: Sep. 18, 2025
Test Date: Sep. 26, 2025 - Oct. 15, 2025
Date of Issue: Nov. 13, 2025

ISSUED BY:

Shenzhen BALUN Technology Co., Ltd.

**Tested by:** He Yuyang**Checked by:** Ye Hongji**Approved by:** Sunny Zou
(Technical Director)

Revision History

Version	Issue Date	Revisions
<u>Rev. 01</u>	<u>Nov. 13, 2025</u>	<u>Initial Issue</u>

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1 GENERAL INFORMATION

1.1 Test Laboratory

Name	Shenzhen BALUN Technology Co., Ltd.
Address	Block B, 1/F, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China
Phone Number	+86 755 6685 0100

1.2 Test Location

Name	Shenzhen BALUN Technology Co., Ltd.
Location	☒ Block B, 1/F, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China
	☐ 1/F, Building B, Ganghongji High-tech Intelligent Industrial Park, No. 1008, Songbai Road, Yangguang Community, Xili Sub-district, Nanshan District, Shenzhen, Guangdong Province, P. R. China
Accreditation Certificate	The laboratory is a testing organization accredited by FCC as a accredited testing laboratory. The designation number is CN1196. The laboratory has been listed by Industry Canada to perform electromagnetic emission measurements. The recognition numbers of test site are 11524A.

2 PRODUCT INFORMATION

2.1 Applicant Information

Applicant	Hansong(Nanjing) Technology Ltd.
Address	8th Kangping Road Jiangning Economy and Technology Development Zone, Nanjing, 211106, China.

2.2 Manufacturer Information

Manufacturer	Hansong(Nanjing) Technology Ltd.
Address	8th Kangping Road Jiangning Economy and Technology Development Zone, Nanjing, 211106, China.

2.3 General Description for Equipment under Test (EUT)

EUT Name	Bluetooth Module
Model Name Under Test	HSBT5181
Series Model Name	N/A
Description of Model name differentiation	N/A
Serial Number	H23X518100001
Hardware Version	V1.0
Software Version	V1.0
Dimensions (Approx.)	N/A
Weight (Approx.)	N/A

2.4 Technical Information

Network and Wireless connectivity	Bluetooth (BR+EDR+BLE)
-----------------------------------	------------------------

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
Product Type		☒ Mobile ☐ Portable ☐ Fix Location
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		FPC Antenna
		PCB-onboard Antenna
		PCB-External Antenna
		Dipole Antenna
		Copper Tube Antenna
Antenn a Gain	FPC Antenna	3.43 dBi
	PCB-onboard Antenna	1.97 dBi
	PCB-External Antenna	4.20 dBi
	Dipole Antenna	2.00 dBi
	Copper Tube Antenna	3.20 dBi
Antenna Impedance		50 Ω
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)
0	2402	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	78	2480
16	2418	37	2439	58	2460	-	-
17	2419	38	2440	59	2461	-	-
18	2420	39	2441	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 4	Digital Transmission Systems, Frequency Hopping Systems and Licence Exempt Local Area Network Devices in 902-928 MHz, 2400-2483.5 MHz, 5150-5350 MHz, and 5470-5895 MHz bands
4	ANSI C63.10-2020	American National Standard of Procedures for Compliance Testing of 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 ¹
2	Number of Hopping Frequencies	15.247(a)	RSS-247, 5.1 (d)	Hopping Mode	ANNEX A.1	Pass	Note ²
3	Peak Output Power and E.I.R.P	15.247(b)	RSS-247, 5.4 (b)	Low/Middle/High	ANNEX A.2	Pass	--
4	Occupied Bandwidth	15.247(a)	RSS-247, 5.1 (a)	Low/Middle/High	ANNEX A.3	Pass	--
5	Carrier Frequency Separation	15.247(a)	RSS-247, 5.1 (b)	Hopping Mode	ANNEX A.4	Pass	Note ²
6	Time of Occupancy (Dwell time)	15.247(a)	RSS-247, 5.1 (d)	Hopping Mode	ANNEX A.5	Pass	Note ²
7	Conducted Spurious Emission & Authorized-band band-edge	15.247(d)	RSS-247, 5.5	Hopping Mode; Low/Middle/High	ANNEX A.6	Pass	Note ²
8	Conducted Emission	15.207	RSS-GEN, 8.8	Low/Middle/High	ANNEX A.7	Pass	Note ²
9	Radiated Spurious Emission	15.209 15.247(d)	RSS-247, 5.5	Low/Middle/High	ANNEX A.8	Pass	Note ²
10	Band Edge(Restricted-band band-edge)	15.209 15.247(d)	RSS-247, 5.5	Low/High	ANNEX A.9	Pass	Note ²
11	Receiver Spurious Emissions	--	RSS-Gen, 7.3	--	--	N/A	Note ³

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

Note ²: $\pi/4$ -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 ³: 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	45% to 67%	
Atmospheric Pressure	100 kPa to 102 kPa	
Temperature	NT (Normal Temperature)	+20.8℃ to +25.1℃
Working Voltage of the EUT	NV (Normal Voltage)	5.0V

4.2 Test Equipment List

Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
Spectrum Analyzer	KEYSIGHT	N9020A	MY46471071	2025.06.16	2026.06.15
Spectrum Analyzer	KEYSIGHT	N9020A	MY50531259	2025.06.16	2026.06.15
Test Antenna-Horn	SCHWARZBECK	BBHA 9120D	02460	2024.05.16	2027.05.15
Test Antenna-Horn	A-INFO	LB-180400KF	J211060273	2024.06.15	2027.06.14
Anechoic Chamber	RAINFORD	9m*6m*6m	140	2024.07.28	2027.07.27
Amplifier	COM-MV	LSCX_LNA1-12G-01	7210214	2025.06.17	2026.06.16
Amplifier	COM-MV	XKu_LNA7-18G-01	7210209	2025.06.17	2026.06.16
EMI Receiver	ROHDE&SCHWARZ	ESRP	101036	2025.06.16	2026.06.15
Test Antenna-Bi-Log	SCHWARZBECK	VULB 9168	9168-01162	2023.08.04	2026.08.03
Test Antenna-Loop	SCHWARZBECK	FMZB 1519	1519-037	2024.01.23	2027.01.22
Amplifier	COM-MV	ZT30-1000M	B2018054558	2024.11.28	2025.11.27
Anechoic Chamber	EMC Electronic Co., Ltd	20.10*11.60*7.35m	130	2024.07.13	2027.07.12
EMI Receiver	KEYSIGHT	N9010B	MY57110309	2025.06.16	2026.06.15
LISN	SCHWARZBECK	NSLK 8127	8127-687	2025.04.29	2026.04.28
Shielded Enclosure	YiHeng Electronic Co., Ltd	3.5m*3.1m*2.8m	112	2025.02.14	2028.02.13

4.3 Test Software List

Description	Manufacturer	Software Version	Serial No.	Applicable test Setup
BL410R	BALUN	V2.1.1.488	N/A	The section 4.5.1
BL410E	BALUN	V22.930	N/A	The section 4.5.2&4.5.3&4.5.4&4.5.5

4.4 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	2.8%
RF output power, conducted	1.28 dB
Power Spectral Density, conducted	1.30 dB
Unwanted Emissions, conducted	1.84 dB
All emissions, radiated	5.36 dB
Temperature	0.8°C
Humidity	4%

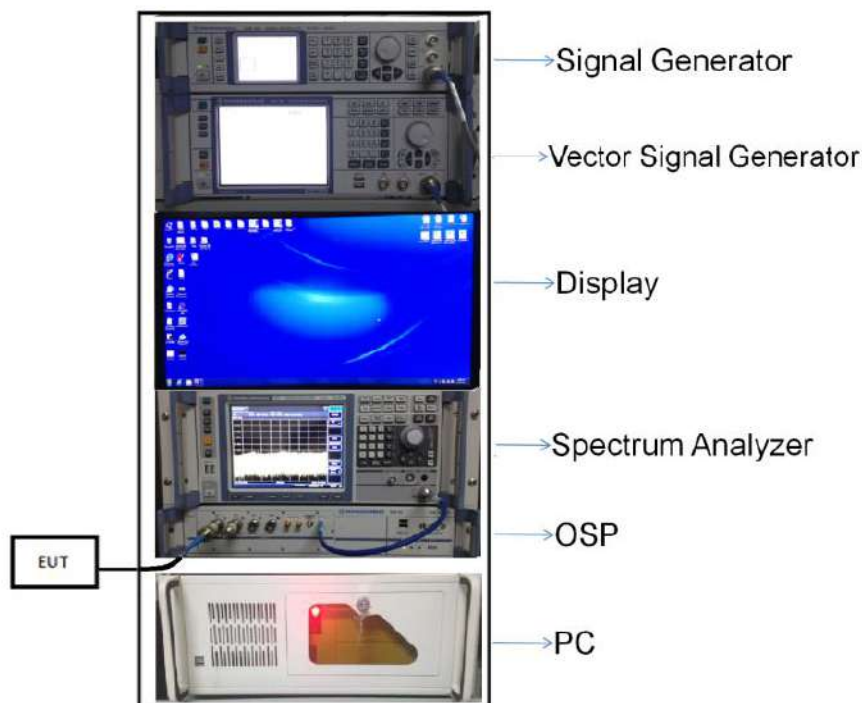
4.5 Description of Test Setup

4.5.1 For Antenna Port Test

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

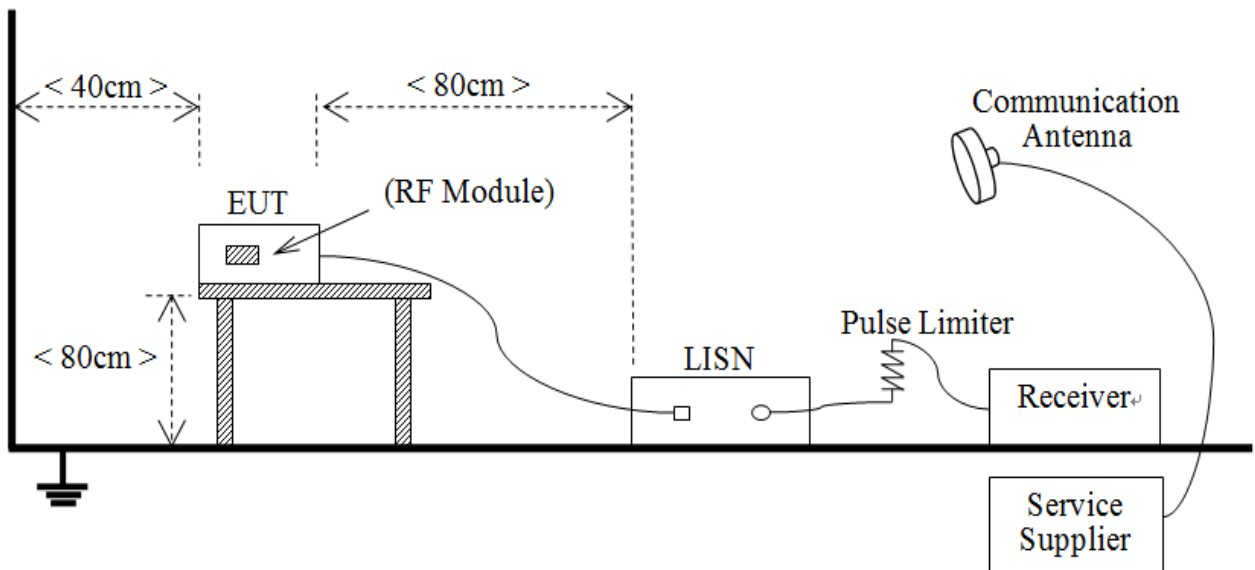
For example: the measurement value is 10 dBm and the cable 0.5dBm used, then the final result of EUT:

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



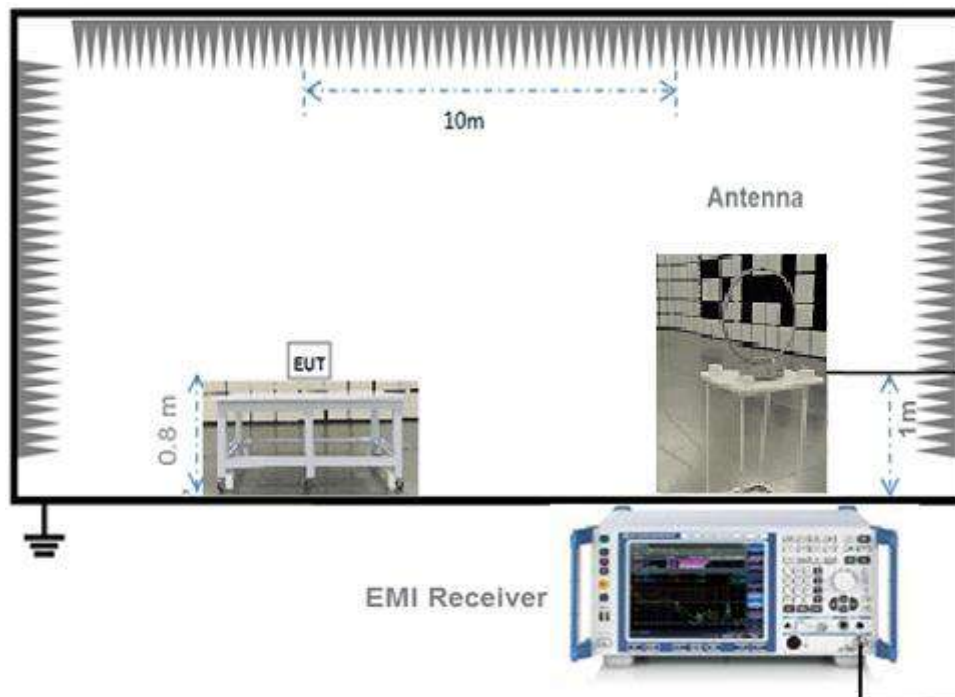
(Diagram 1)

4.5.2 For AC Power Supply Port Test



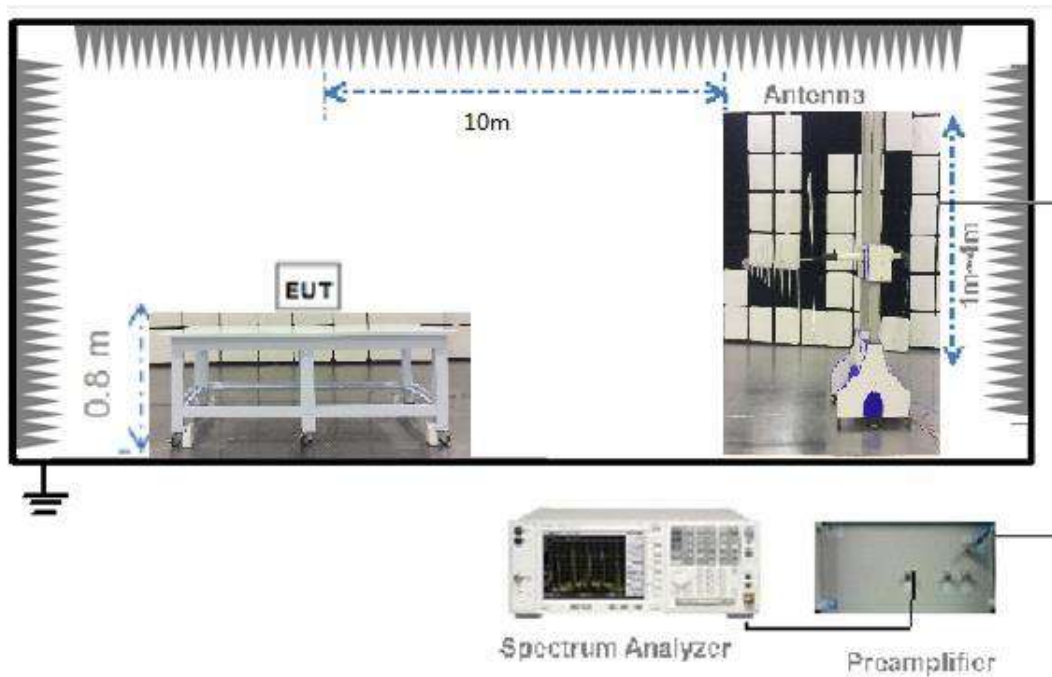
(Diagram 2)

4.5.3 For Radiated Test (Below 30 MHz)



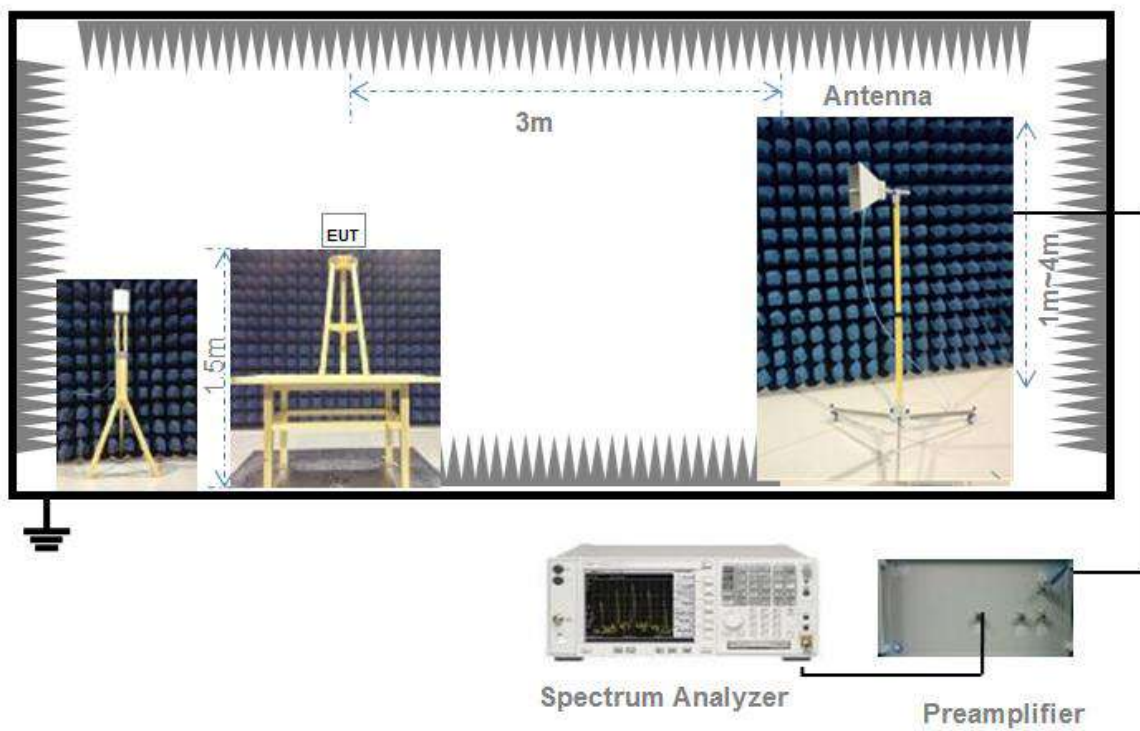
(Diagram 3)

4.5.4 For Radiated Test (30 MHz-1 GHz)



(Diagram 4)

4.5.5 For Radiated Test (Above 1 GHz)



(Diagram 5)

4.6 Measurement Results Explanation Example

4.6.1 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.

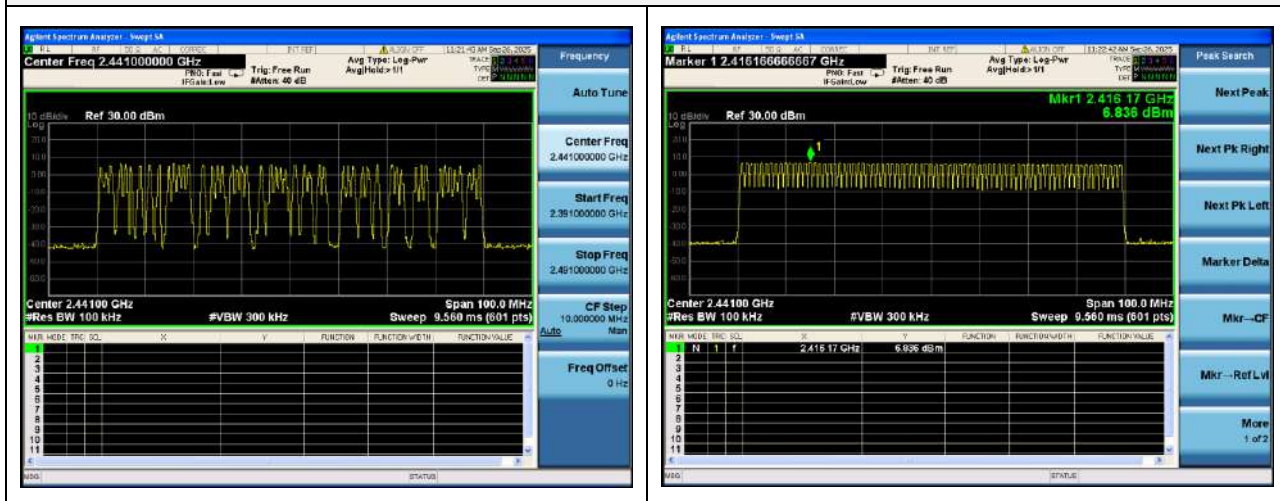
For short burst systems, describe how the EUT complies with the requirement that it be designed to be capable of operating as a true frequency hopping system. Specifically, the device shall comply with the equal frequency use and pseudorandom hopping sequence requirement when transmitting in short bursts, 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 4.5.1 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 4.5.1 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 4.5.1 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 4.5.1 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 4.5.1 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 4.5.1 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 μ H/50 Ω line impedance stabilization network (LISN).

Frequency range (MHz)	Conducted Limit (dB μ 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 4.5.2 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 (μV/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 (dBμV/m) = 20*log[Field Strength (μV/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 4.5.3 to 4.5.5 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 4.5.3 to 4.5.5 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

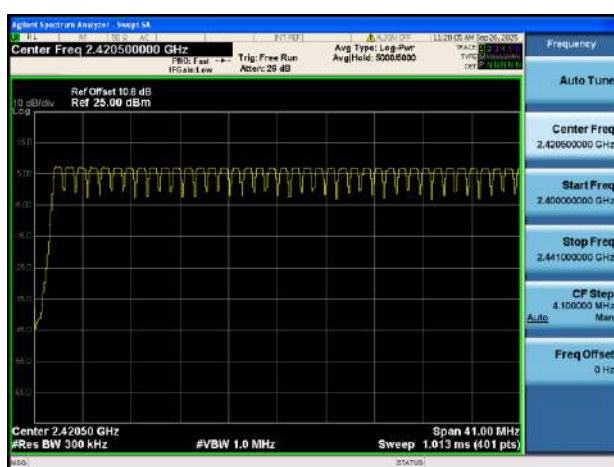
A.1 Number of Hopping Frequency

Test Data

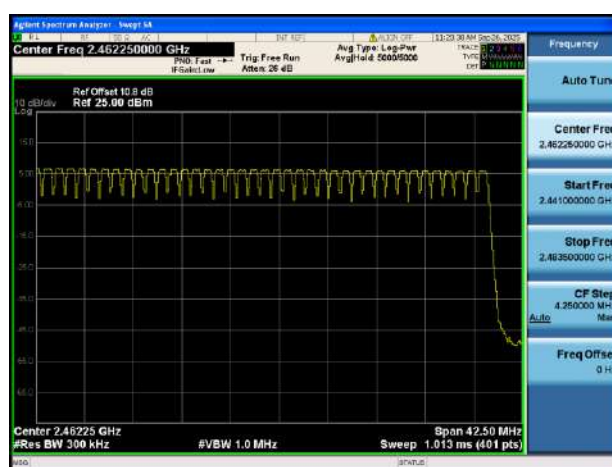
Test Mode	Frequency Block (MHz)	Measured Channel Numbers	Min. Limit	Verdict
GFSK	2400 - 2483.5	79	15	Pass
8-DPSK	2400 - 2483.5	79	15	Pass

Test Plots

GFSK 2.4 GHz ~ 2.4415 GHz



GFSK 2.4415 GHz ~ 2.4835 GHz



8-DPSK 2.4 GHz ~ 2.4415 GHz



8-DPSK 2.4415 GHz ~ 2.4835 GHz



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

Peak Power Test Data

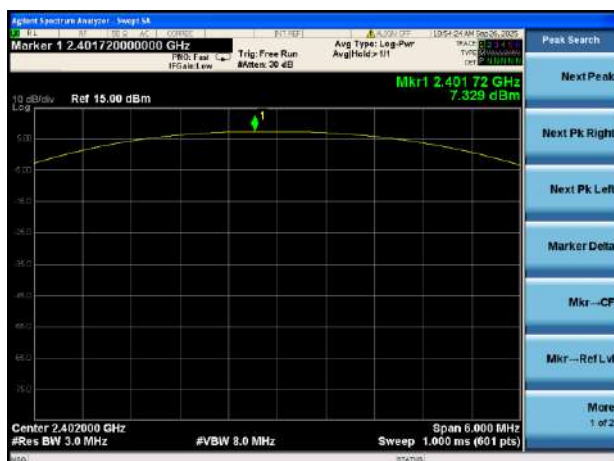
Channel	Measured Output Peak Power						Limit		Verdict
	GFSK		$\pi/4$ -DQPSK		8-DPSK		dBm	mW	
	dBm	mW	dBm	mW	dBm	mW			
Low	7.33	5.41	7.97	6.27	8.53	7.13	21	125	Pass
Middle	6.88	4.87	7.53	5.66	8.09	6.45			Pass
High	6.14	4.11	6.63	4.60	7.21	5.26			Pass

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	10.76	11.91	11.40	13.81	11.96	15.70	36	4000	Pass
Middle	10.31	10.73	10.96	12.46	11.52	14.20			Pass
High	9.57	9.06	10.06	10.14	10.64	11.58			Pass

Test Plots

GFSK LOW CHANNEL



GFSK MIDDLE CHANNEL



GFSK HIGH CHANNEL

 $\pi/4$ -DQPSK LOW CHANNEL $\pi/4$ -DQPSK MIDDLE CHANNEL

$\pi/4$ -DQPSK HIGH CHANNEL



8-DPSK LOW CHANNEL



8-DPSK MIDDLE CHANNEL



8-DPSK HIGH CHANNEL



A.3 20 dB and 99% bandwidth

Test Data

GFSK		
Channel	20 dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	0.967500	0.883240
Middle	0.967500	0.877310
High	0.967500	0.877670
$\pi/4$ -DQPSK		
Channel	20 dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	1.342500	1.187300
Middle	1.342500	1.188200
High	1.342500	1.188400
8-DPSK		
Channel	20 dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	1.312500	1.186900
Middle	1.312500	1.187700
High	1.312500	1.185400

Test Plots

20 dB Bandwidth

GFSK LOW CHANNEL



GFSK MIDDLE CHANNEL



GFSK HIGH CHANNEL

 $\pi/4$ -DQPSK LOW CHANNEL $\pi/4$ -DQPSK MIDDLE CHANNEL

$\pi/4$ -DQPSK HIGH CHANNEL



8-DPSK LOW CHANNEL



8-DPSK MIDDLE CHANNEL



8-DPSK HIGH CHANNEL



99% Bandwidth

GFSK LOW CHANNEL



GFSK MIDDLE CHANNEL



GFSK HIGH CHANNEL

 $\pi/4$ -DQPSK LOW CHANNEL $\pi/4$ -DQPSK MIDDLE CHANNEL

$\pi/4$ -DQPSK HIGH CHANNEL



8-DPSK LOW CHANNEL



8-DPSK MIDDLE CHANNEL



8-DPSK HIGH CHANNEL



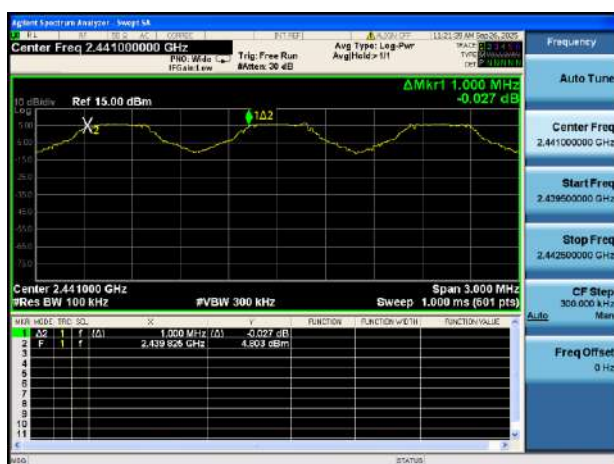
A.4 Hopping Frequency Separation

Test Data

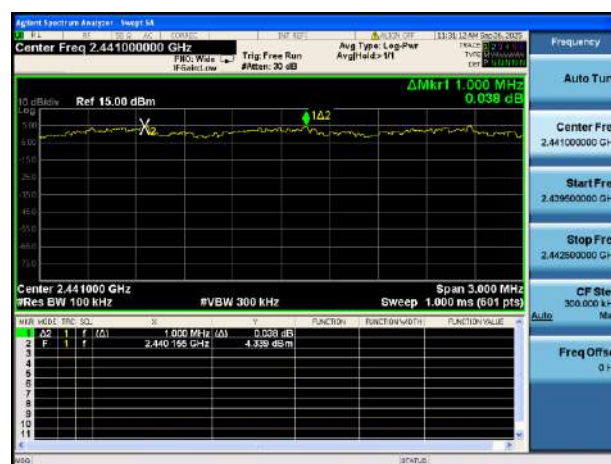
Mode	Frequency separation (MHz)	2/3 of the 20 dB Bandwidth (MHz)	Verdict
GFSK	1.000	0.645	Pass
8-DPSK	1.000	0.875	Pass

Test Plots

GFSK



8-DPSK



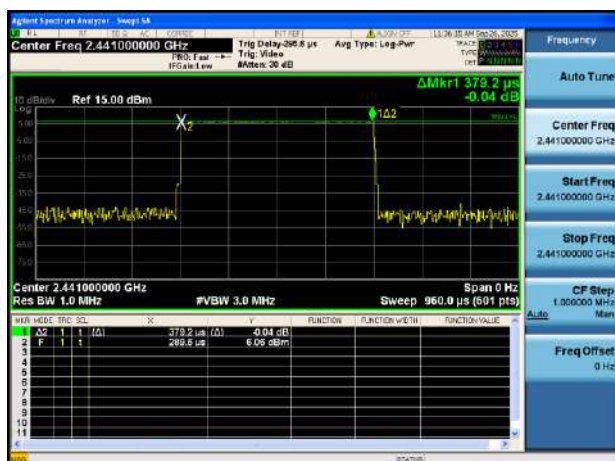
A.5 Average Time of Occupancy

Test Data

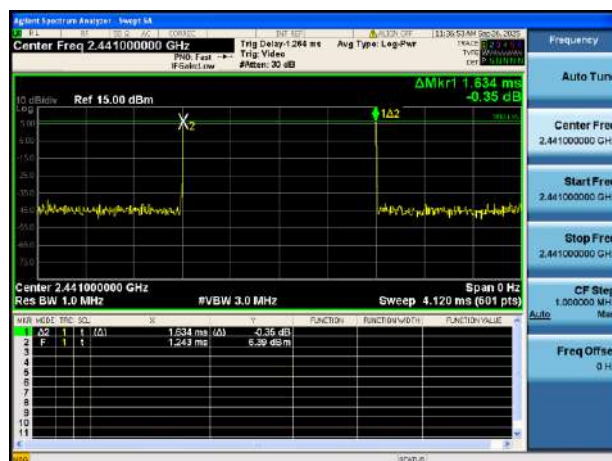
GFSK				
DH Packet	Pulse Width (ms)	Total of Dwell (ms)	Limit (sec)	Verdict
DH 1	0.37920	121.344	0.4	Pass
DH 3	1.63400	261.440	0.4	Pass
DH 5	2.88800	308.053	0.4	Pass
8-DPSK				
DH Packet	Pulse Width (ms)	Total of Dwell (ms)	Limit (sec)	Verdict
3DH 1	0.38240	122.368	0.4	Pass
3DH 3	1.63400	261.440	0.4	Pass
3DH 5	2.88800	308.053	0.4	Pass
AFH Mode				
DH Packet	Pulse Width (ms)	Total of Dwell (ms)	Limit (sec)	Verdict
DH 1	0.38080	60.928	0.4	Pass
DH 3	1.63400	130.720	0.4	Pass
DH 5	2.88800	154.027	0.4	Pass

Test Plots

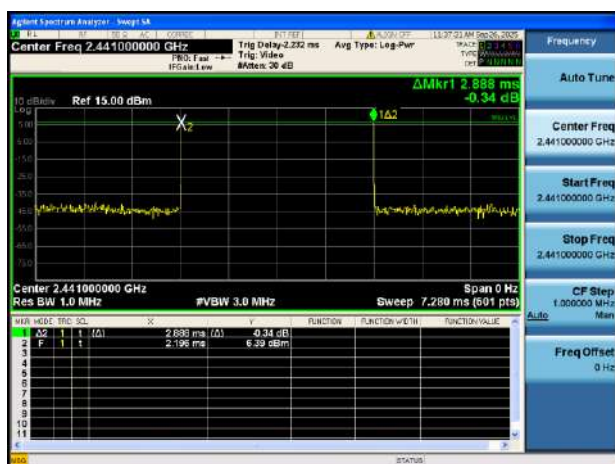
GFSK DH1



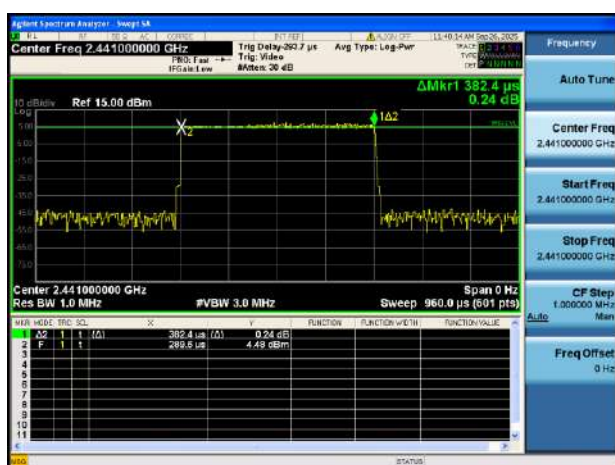
GFSK DH3



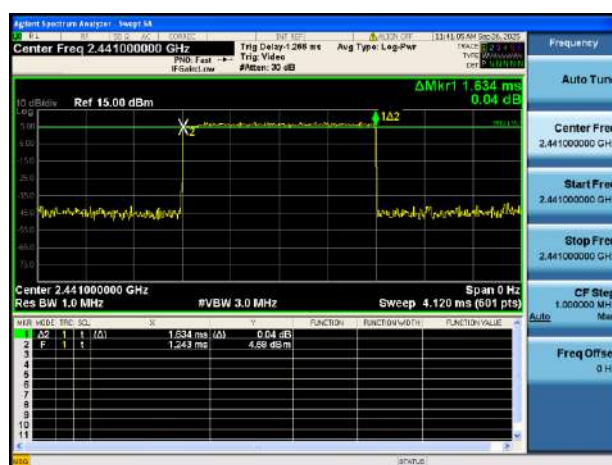
GFSK DH5



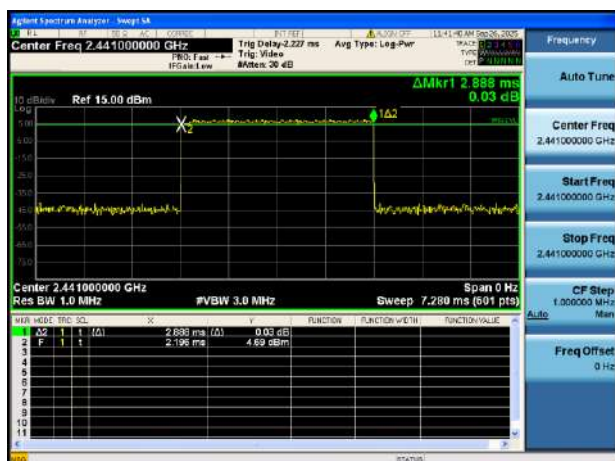
8-DPSK 3DH1



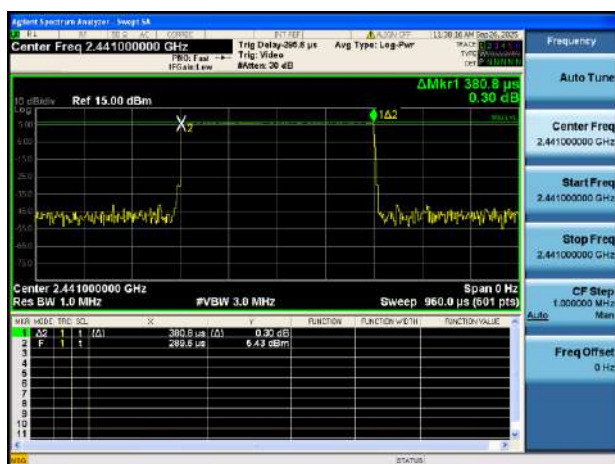
8-DPSK 3DH3



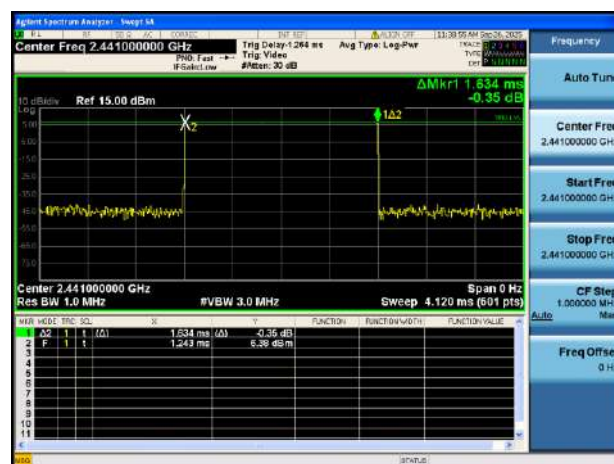
8-DPSK 3DH5



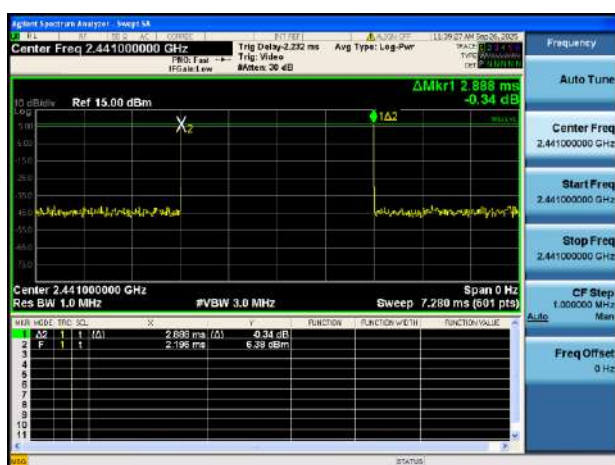
AFH Mode DH1



AFH Mode DH3



AFH Mode DH5



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

Test Data

GFSK				
Channel	Measured Max. Out of Band Emission (dBm)	Limit (dBm)		Verdict
		Carrier Level	Calculated 20 dBc Limit	
Low	-36.55	7.18	-12.82	Pass
Middle	-36.32	6.73	-13.27	Pass
High	-36.45	6.03	-13.97	Pass
8-DPSK				
Channel	Measured Max. Out of Band Emission (dBm)	Limit (dBm)		Verdict
		Carrier Level	Calculated 20 dBc Limit	
Low	-36.47	5.24	-14.76	Pass
Middle	-36.56	4.81	-15.20	Pass
High	-36.62	3.84	-16.16	Pass

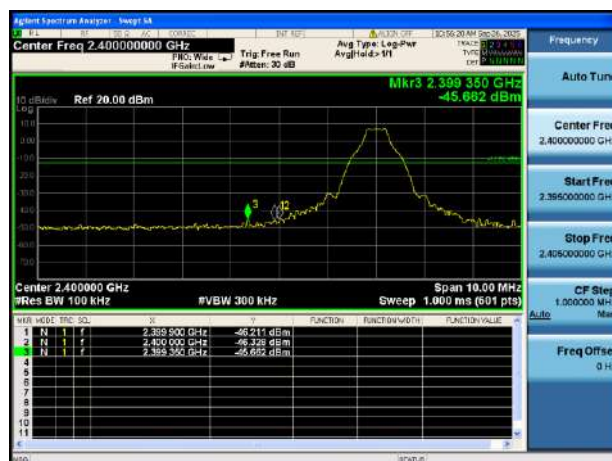
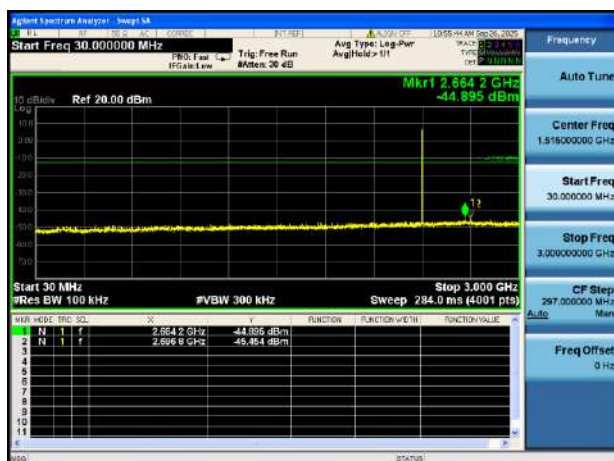
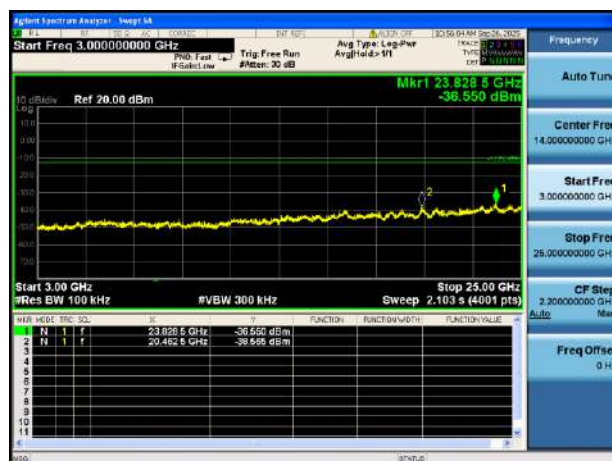
Hopping Mode				
Mode	Measured Max. Out of Band Emission (dBm)	Limit (dBm)		Verdict
		Carrier Level	Calculated 20 dBc Limit	
GFSK	-25.44	6.84	-13.16	Pass
8-DPSK	-25.78	4.97	-15.03	Pass

Test Plots

GFSK LOW CHANNEL, CARRIER LEVEL



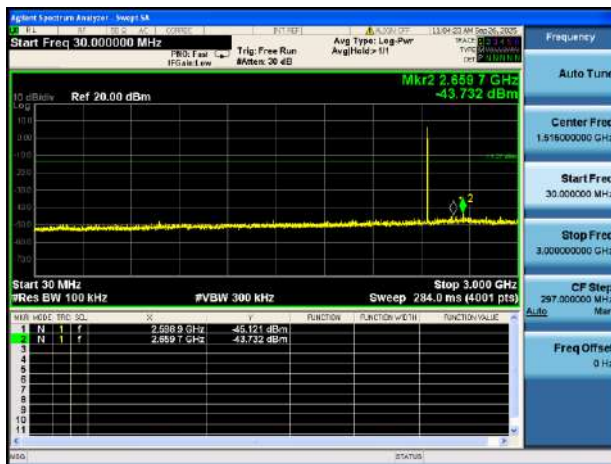
GFSK LOW CHANNEL, BAND EDGE

GFSK LOW CHANNEL, SPURIOUS
30 MHz ~ 3 GHzGFSK LOW CHANNEL, SPURIOUS
3 GHz ~ 25 GHz

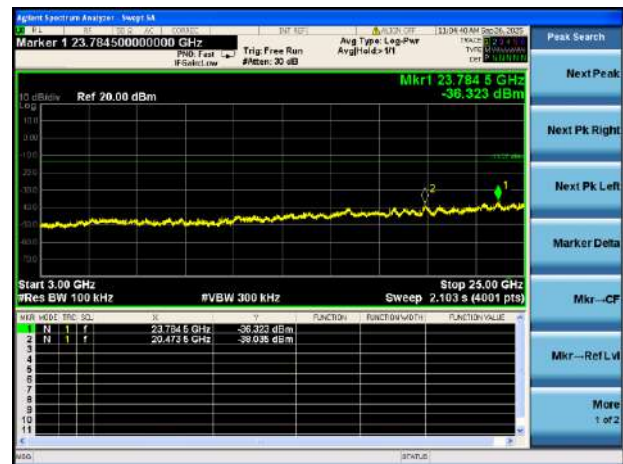
GFSK MIDDLE CHANNEL, CARRIER LEVEL



GFSK MIDDLE CHANNEL, SPURIOUS 30 MHz ~ 3 GHz



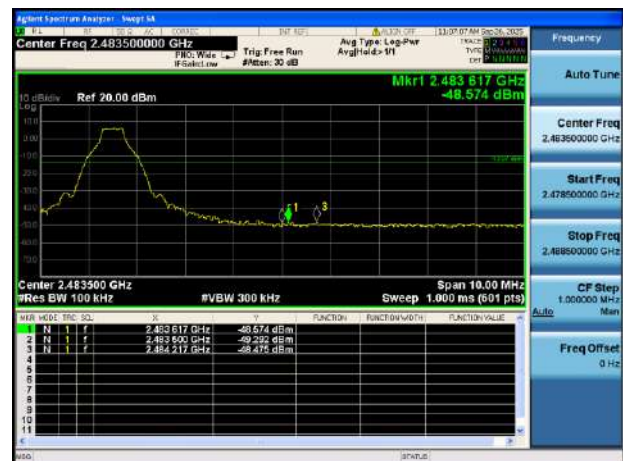
GFSK MIDDLE CHANNEL, SPURIOUS 3 GHz ~ 25 GHz



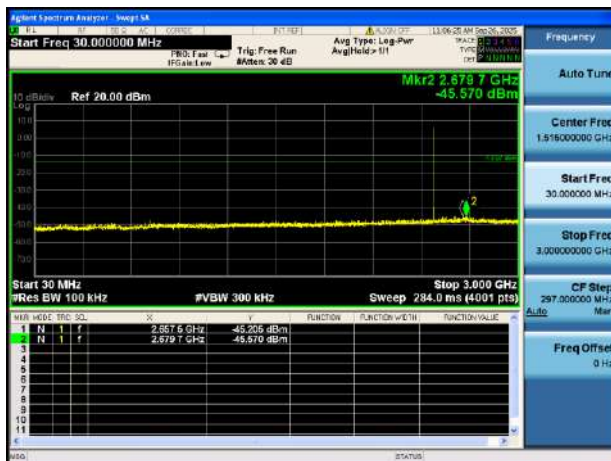
GFSK HIGH CHANNEL, CARRIER LEVEL



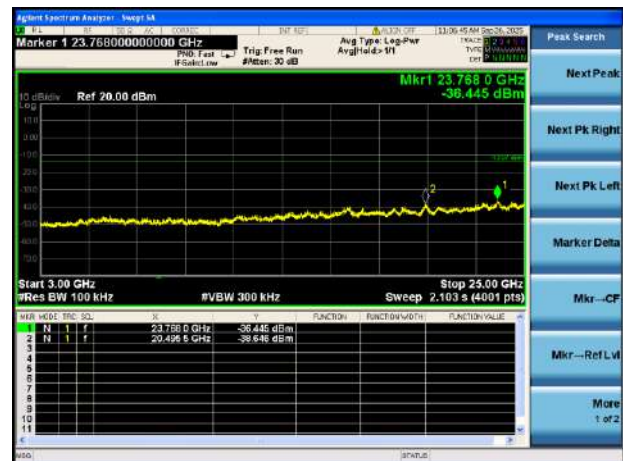
GFSK HIGH CHANNEL, BAND EDGE



GFSK HIGH CHANNEL, SPURIOUS 30 MHz ~ 3 GHz



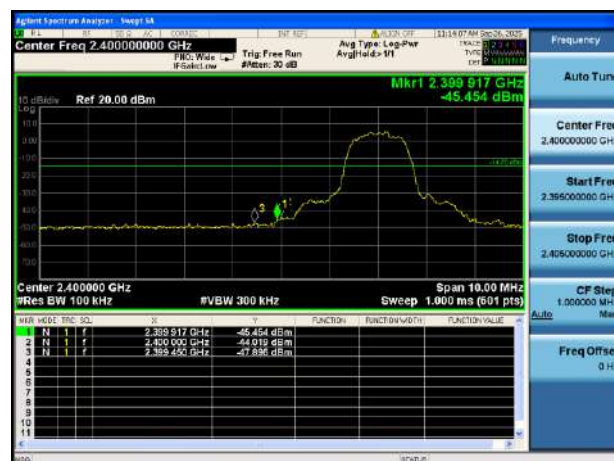
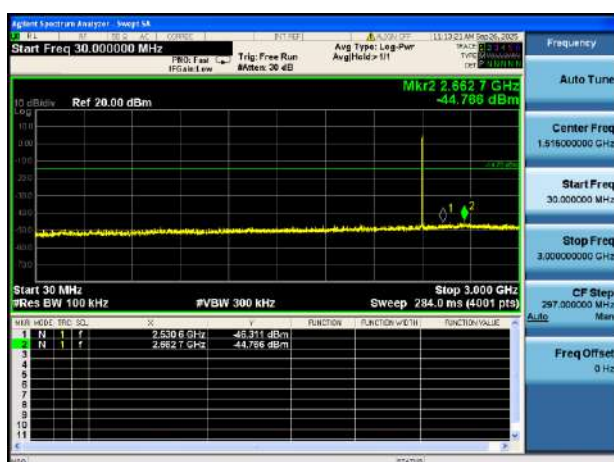
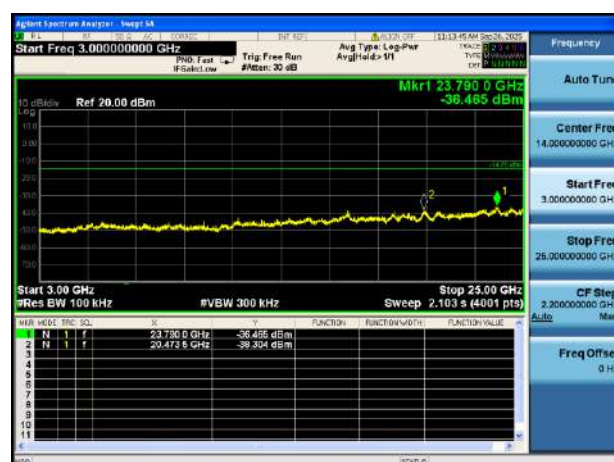
GFSK HIGH CHANNEL, SPURIOUS 3 GHz ~ 25 GHz



8-DPSK LOW CHANNEL, CARRIER LEVEL



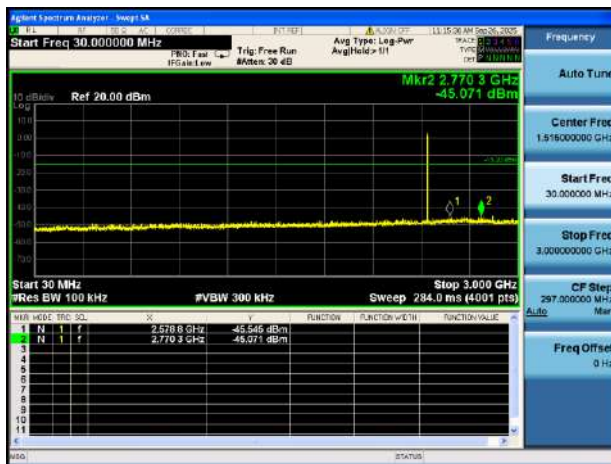
8-DPSK LOW CHANNEL, BAND EDGE

8-DPSK LOW CHANNEL, SPURIOUS
30 MHz ~ 3 GHz8-DPSK LOW CHANNEL, SPURIOUS
3 GHz ~ 25 GHz

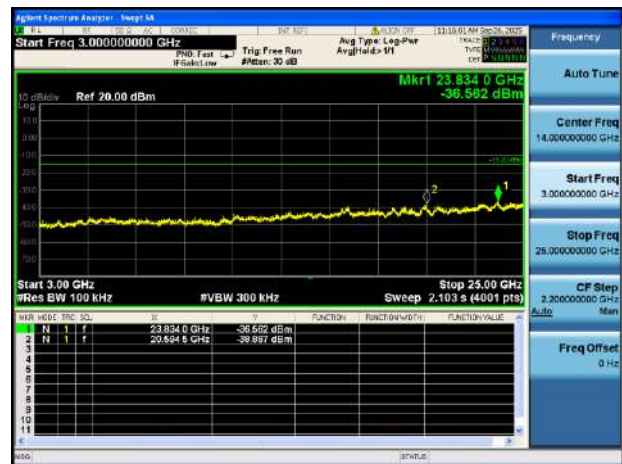
8-DPSK MIDDLE CHANNEL, CARRIER LEVEL



8-DPSK MIDDLE CHANNEL, SPURIOUS 30 MHz ~ 3 GHz



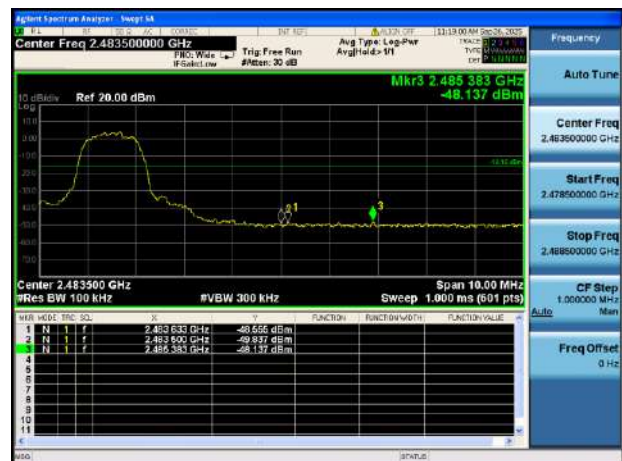
8-DPSK MIDDLE CHANNEL, SPURIOUS 3 GHz ~ 25 GHz



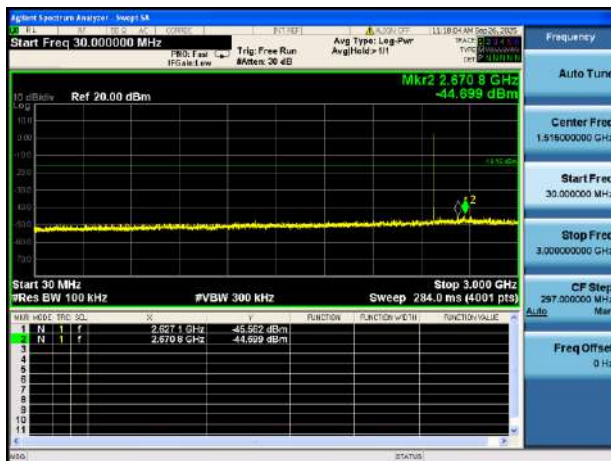
8-DPSK HIGH CHANNEL, CARRIER LEVEL



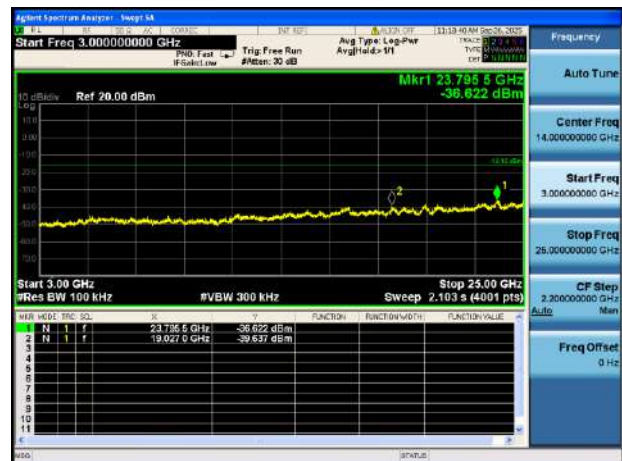
8-DPSK HIGH CHANNEL, BAND EDGE



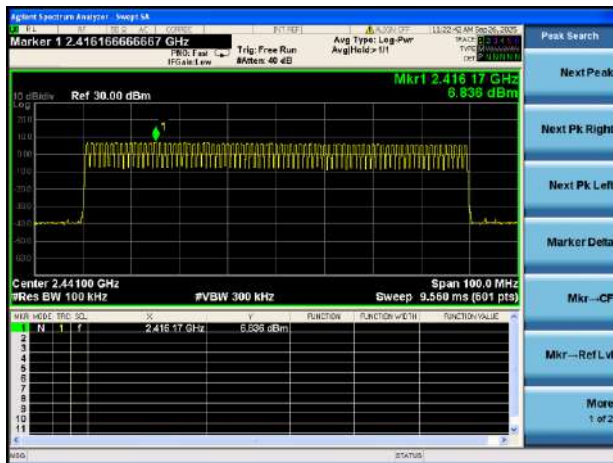
8-DPSK HIGH CHANNEL, SPURIOUS 30 MHz ~ 3 GHz



8-DPSK HIGH CHANNEL, SPURIOUS 3 GHz ~ 25 GHz



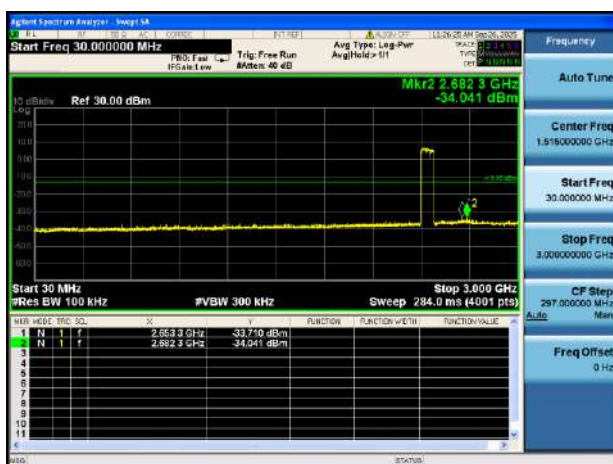
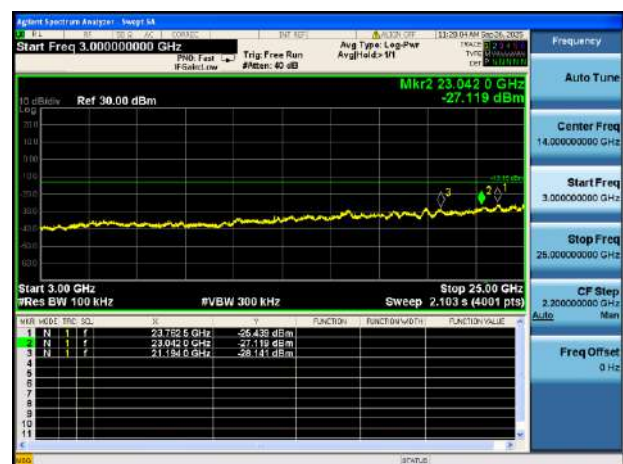
GFSK HOPPING, CARRIER LEVEL



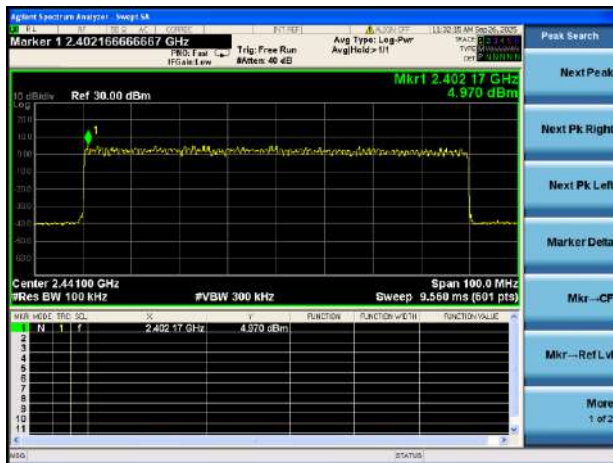
GFSK HOPPING BAND EDGE (LOW)



GFSK HOPPING BAND EDGE (HIGH)

GFSK Hopping Mode, SPURIOUS
30 MHz ~ 3 GHzGFSK Hopping Mode, SPURIOUS
3GHz ~ 25 GHz

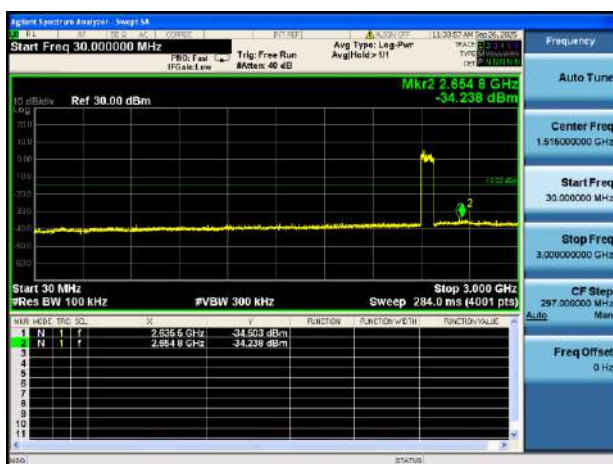
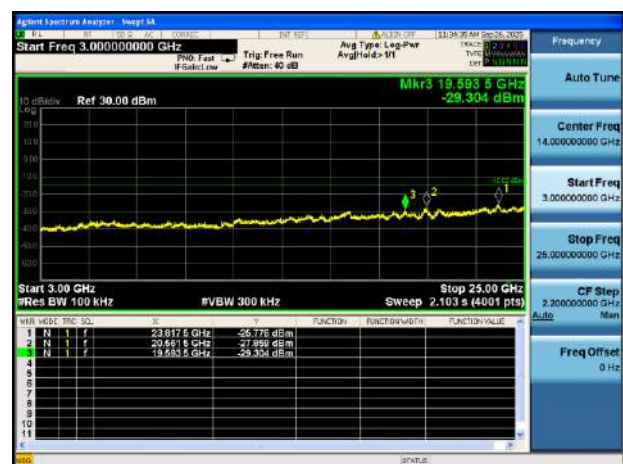
8-DPSK HOPPING, CARRIER LEVEL



8-DPSK Hopping BAND EDGE (LOW)



8-DPSK Hopping BAND EDGE (HIGH)

8-DPSK Hopping Mode, SPURIOUS
30 MHz ~ 3 GHz8-DPSK Hopping Mode, SPURIOUS
3GHz ~ 25 GHz

A.7 Conducted Emissions

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.

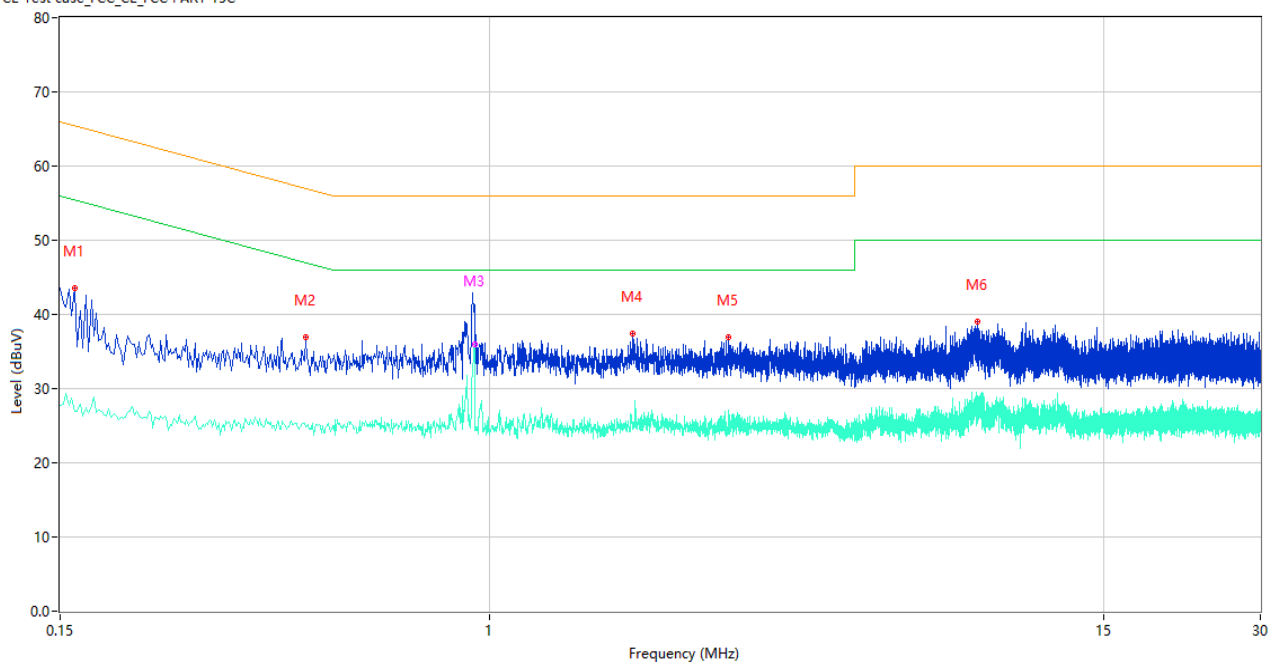
Note ³: Results (dBuV) = Original reading level of Spectrum Analyzer (dBuV) + Factor (dB)

Test Data and Plots

FPC Antenna

PHASE L

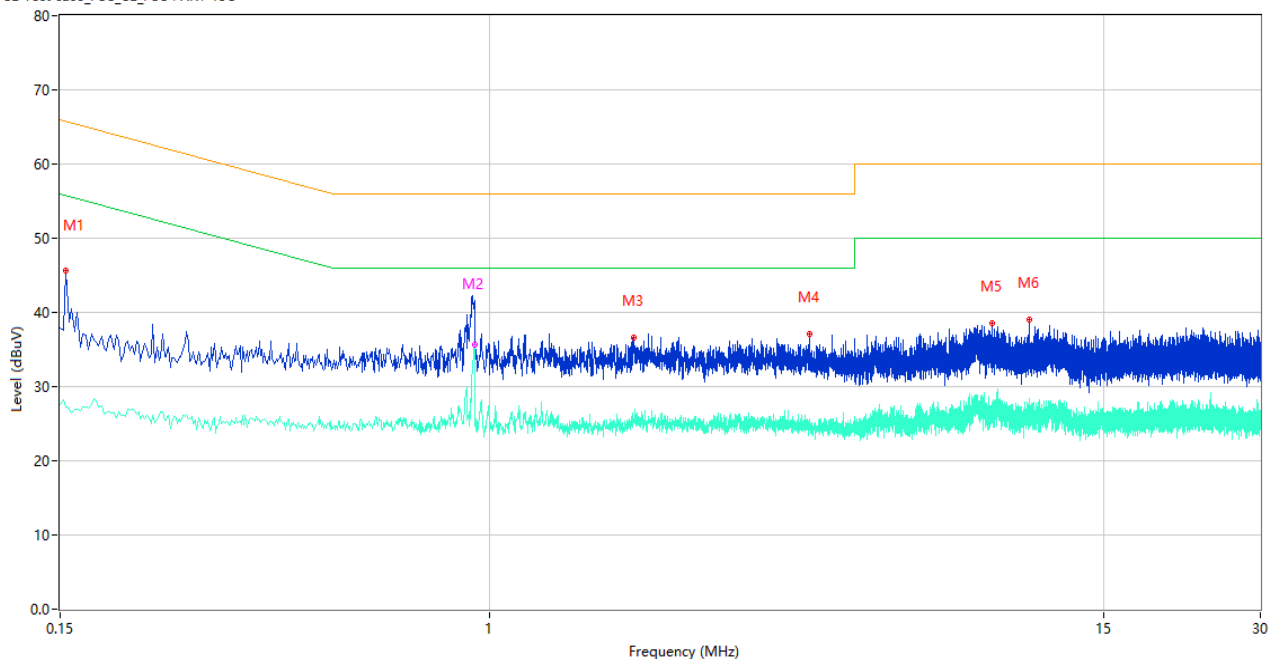
CE Test case_FCC_CE_FCC PART 15C



No.	Frequency (MHz)	Results (dBuV)	Factor (dB)	Limit (dBuV)	Margin (dB)	Detector	Line	Verdict
1	0.160	43.52	9.85	65.46	21.94	Peak	L	Pass
1**	0.160	26.86	9.85	55.46	28.60	AV	L	Pass
2	0.444	36.89	10.15	56.99	20.10	Peak	L	Pass
2**	0.444	24.79	10.15	46.99	22.20	AV	L	Pass
3	0.934	41.23	10.16	56.00	14.77	Peak	L	Pass
3**	0.934	36.01	10.16	46.00	9.99	AV	L	Pass
4	1.882	37.38	10.60	56.00	18.62	Peak	L	Pass
4**	1.882	24.97	10.60	46.00	21.03	AV	L	Pass
5	2.866	36.93	9.90	56.00	19.07	Peak	L	Pass
5**	2.866	27.17	9.90	46.00	18.83	AV	L	Pass
6	8.610	38.96	10.53	60.00	21.04	Peak	L	Pass
6**	8.610	28.17	10.53	50.00	21.83	AV	L	Pass

PHASE N

CE Test case_FCC_CE_FCC PART 15C

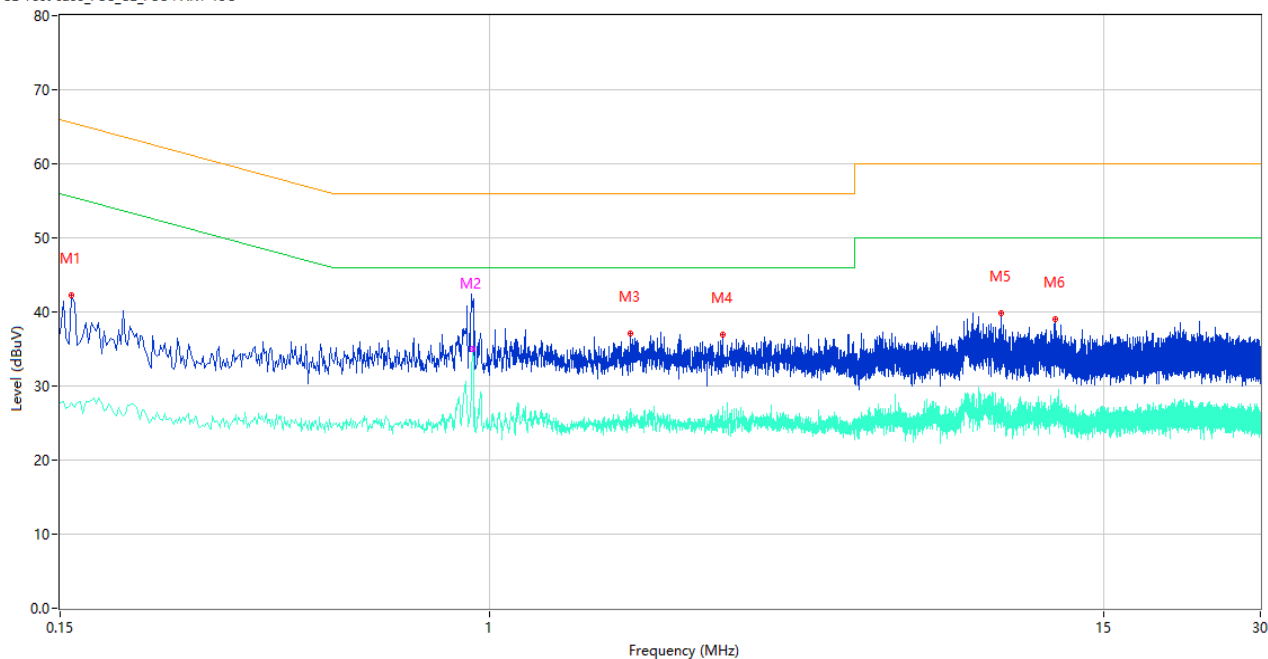


No.	Frequency (MHz)	Results (dBuV)	Factor (dB)	Limit (dBuV)	Margin (dB)	Detector	Line	Verdict
1	0.154	45.68	9.86	65.78	20.10	Peak	N	Pass
1**	0.154	27.27	9.86	55.78	28.51	AV	N	Pass
2	0.934	41.43	10.16	56.00	14.57	Peak	N	Pass
2**	0.934	35.64	10.16	46.00	10.36	AV	N	Pass
3	1.884	36.68	10.62	56.00	19.32	Peak	N	Pass
3**	1.884	25.21	10.62	46.00	20.79	AV	N	Pass
4	4.096	37.15	10.48	56.00	18.85	Peak	N	Pass
4**	4.096	24.79	10.48	46.00	21.21	AV	N	Pass
5	9.174	38.57	10.62	60.00	21.43	Peak	N	Pass
5**	9.174	25.41	10.62	50.00	24.59	AV	N	Pass
6	10.826	39.04	10.62	60.00	20.96	Peak	N	Pass
6**	10.826	26.39	10.62	50.00	23.61	AV	N	Pass

PCB-onboard Antenna

PHASE L

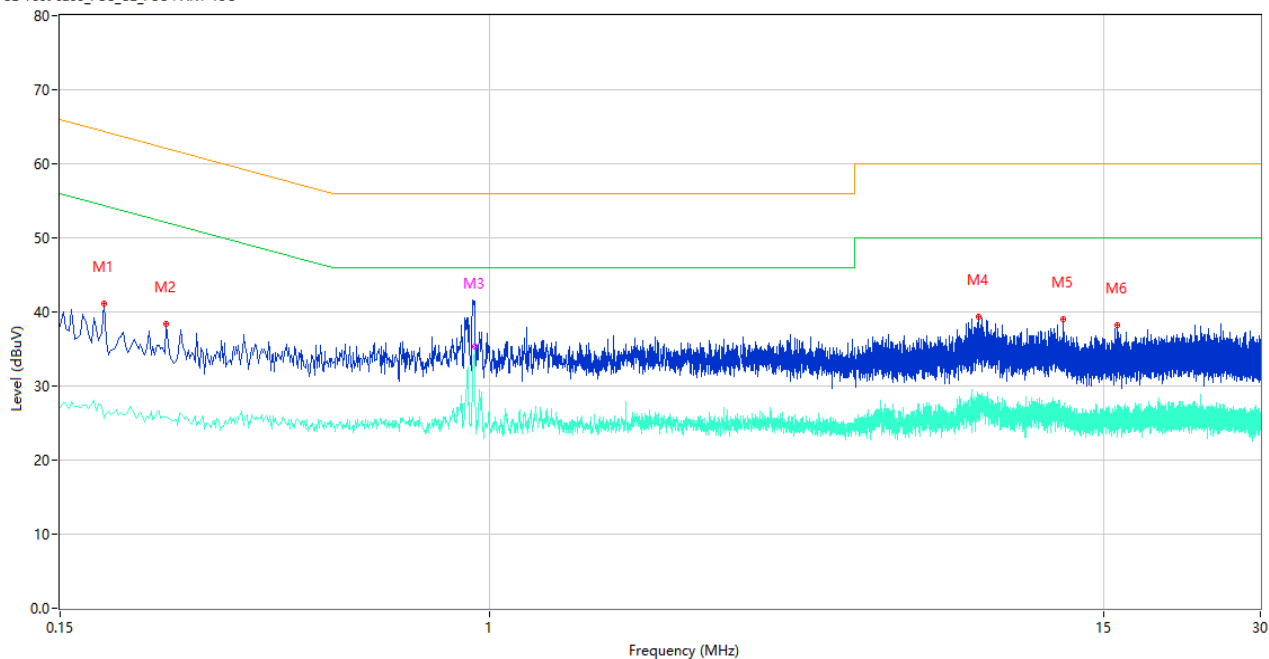
CE Test case_FCC_CE_FCC PART 15C



No.	Frequency (MHz)	Results (dBuV)	Factor (dB)	Limit (dBuV)	Margin (dB)	Detector	Line	Verdict
1	0.174	42.57	9.85	64.77	22.20	Peak	L	Pass
1**	0.174	27.85	9.85	54.77	26.92	AV	L	Pass
2	0.932	42.31	10.17	56.00	13.69	Peak	L	Pass
2**	0.932	36.16	10.17	46.00	9.84	AV	L	Pass
3	1.864	37.02	10.33	56.00	18.98	Peak	L	Pass
3**	1.864	26.91	10.33	46.00	19.09	AV	L	Pass
4	2.982	38.18	10.31	56.00	17.82	Peak	L	Pass
4**	2.982	26.18	10.31	46.00	19.82	AV	L	Pass
5	9.562	39.81	10.18	60.00	20.19	Peak	L	Pass
5**	9.562	28.52	10.18	50.00	21.48	AV	L	Pass
6	12.148	39.07	10.50	60.00	20.93	Peak	L	Pass
6**	12.148	28.16	10.50	50.00	21.84	AV	L	Pass

PHASE N

CE Test case_FCC_CE_FCC PART 15C

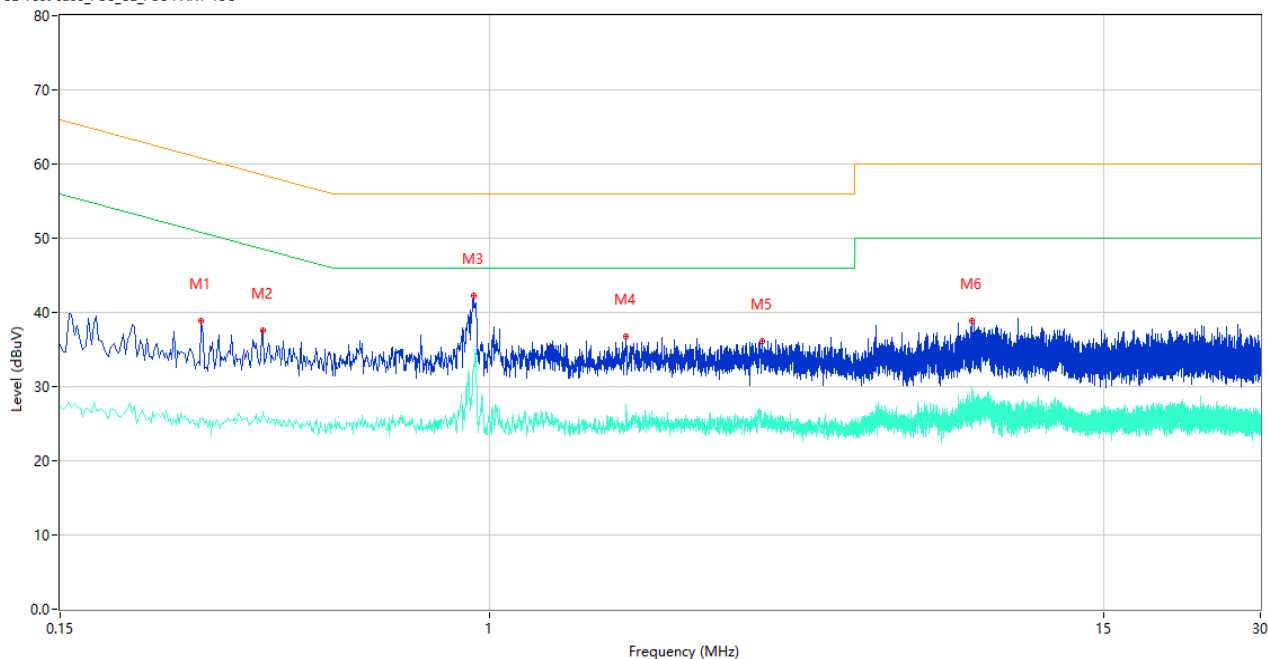


No.	Frequency (MHz)	Results (dBuV)	Factor (dB)	Limit (dBuV)	Margin (dB)	Detector	Line	Verdict
1	0.166	41.51	9.85	65.16	23.65	Peak	N	Pass
1**	0.166	27.61	9.85	55.16	27.55	AV	N	Pass
2	0.280	38.87	9.82	60.82	21.95	Peak	N	Pass
2**	0.280	25.61	9.82	50.82	25.21	AV	N	Pass
3	0.932	42.03	10.17	56.00	13.97	Peak	N	Pass
3**	0.932	35.45	10.17	46.00	10.55	AV	N	Pass
4	1.826	36.78	10.18	56.00	19.22	Peak	N	Pass
4**	1.826	27.61	10.18	46.00	18.39	AV	N	Pass
5	8.392	38.90	10.29	60.00	21.10	Peak	N	Pass
5**	8.392	26.81	10.29	50.00	23.19	AV	N	Pass
6	19.620	36.49	11.02	60.00	23.51	Peak	N	Pass
6**	19.620	24.51	11.02	50.00	25.49	AV	N	Pass

Dipole Antenna

PHASE L

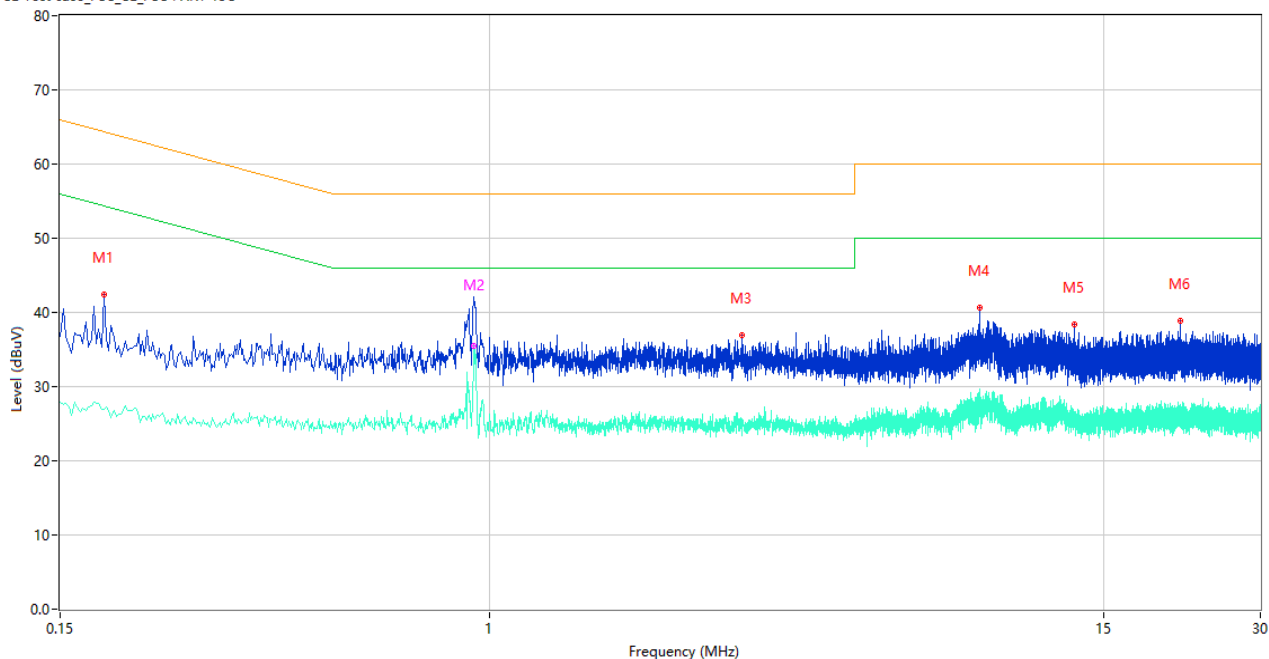
CE Test case_FCC_CE_FCC PART 15C



No.	Frequency (MHz)	Results (dBuV)	Factor (dB)	Limit (dBuV)	Margin (dB)	Detector	Line	Verdict
1	0.280	38.87	9.82	60.82	21.95	Peak	L	Pass
1**	0.280	25.61	9.82	50.82	25.21	AV	L	Pass
2	0.368	37.59	10.74	58.55	20.96	Peak	L	Pass
2**	0.368	26.65	10.74	48.55	21.90	AV	L	Pass
3	0.930	42.18	10.17	56.00	13.82	Peak	L	Pass
3**	0.930	33.13	10.17	46.00	12.87	AV	L	Pass
4	1.826	36.78	10.18	56.00	19.22	Peak	L	Pass
4**	1.826	27.61	10.18	46.00	18.39	AV	L	Pass
5	3.326	36.08	10.45	56.00	19.92	Peak	L	Pass
5**	3.326	25.55	10.45	46.00	20.45	AV	L	Pass
6	8.392	38.90	10.29	60.00	21.10	Peak	L	Pass
6**	8.392	26.81	10.29	50.00	23.19	AV	L	Pass

PHASE N

CE Test case_FCC_CE_FCC PART 15C

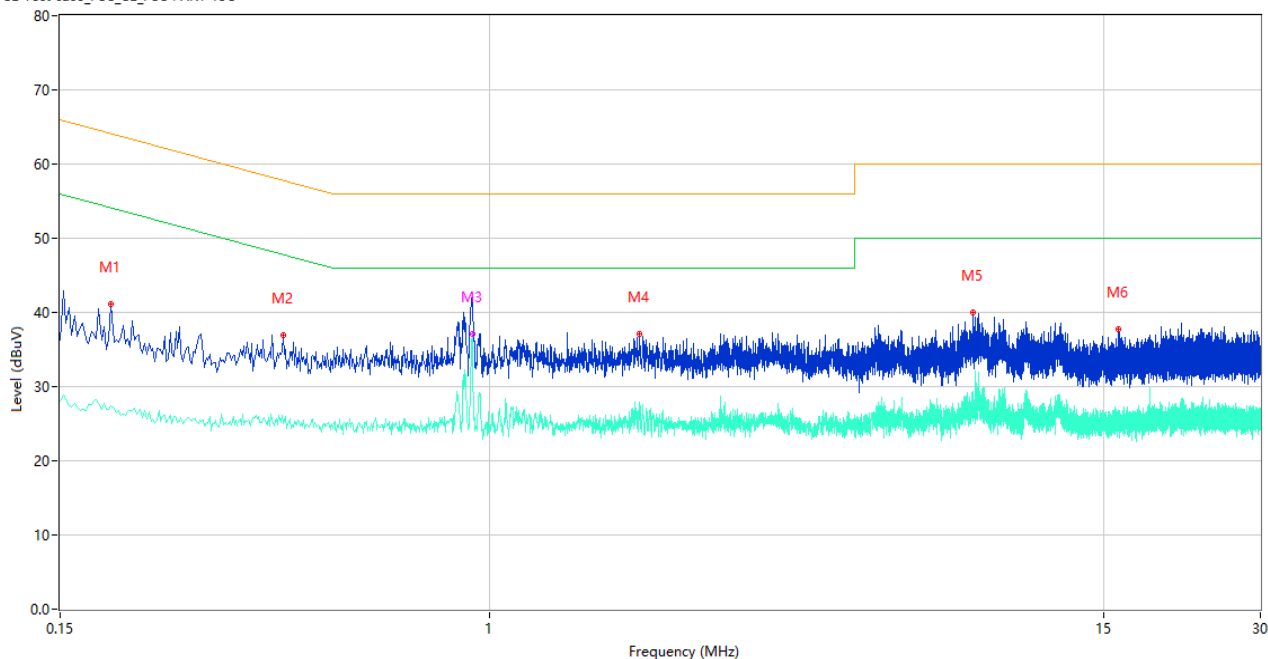


No.	Frequency (MHz)	Results (dBuV)	Factor (dB)	Limit (dBuV)	Margin (dB)	Detector	Line	Verdict
1	0.182	42.44	9.84	64.39	21.95	Peak	N	Pass
1**	0.182	26.88	9.84	54.39	27.51	AV	N	Pass
2	0.932	42.03	10.17	56.00	13.97	Peak	N	Pass
2**	0.932	35.45	10.17	46.00	10.55	AV	N	Pass
3	3.036	36.97	10.19	56.00	19.03	Peak	N	Pass
3**	3.036	25.58	10.19	46.00	20.42	AV	N	Pass
4	8.674	40.68	10.38	60.00	19.32	Peak	N	Pass
4**	8.674	28.93	10.38	50.00	21.07	AV	N	Pass
5	13.180	38.31	10.86	60.00	21.69	Peak	N	Pass
5**	13.180	26.66	10.86	50.00	23.34	AV	N	Pass
6	21.030	38.80	11.38	60.00	21.20	Peak	N	Pass
6**	21.030	27.12	11.38	50.00	22.88	AV	N	Pass

Copper Tube Antenna

PHASE L

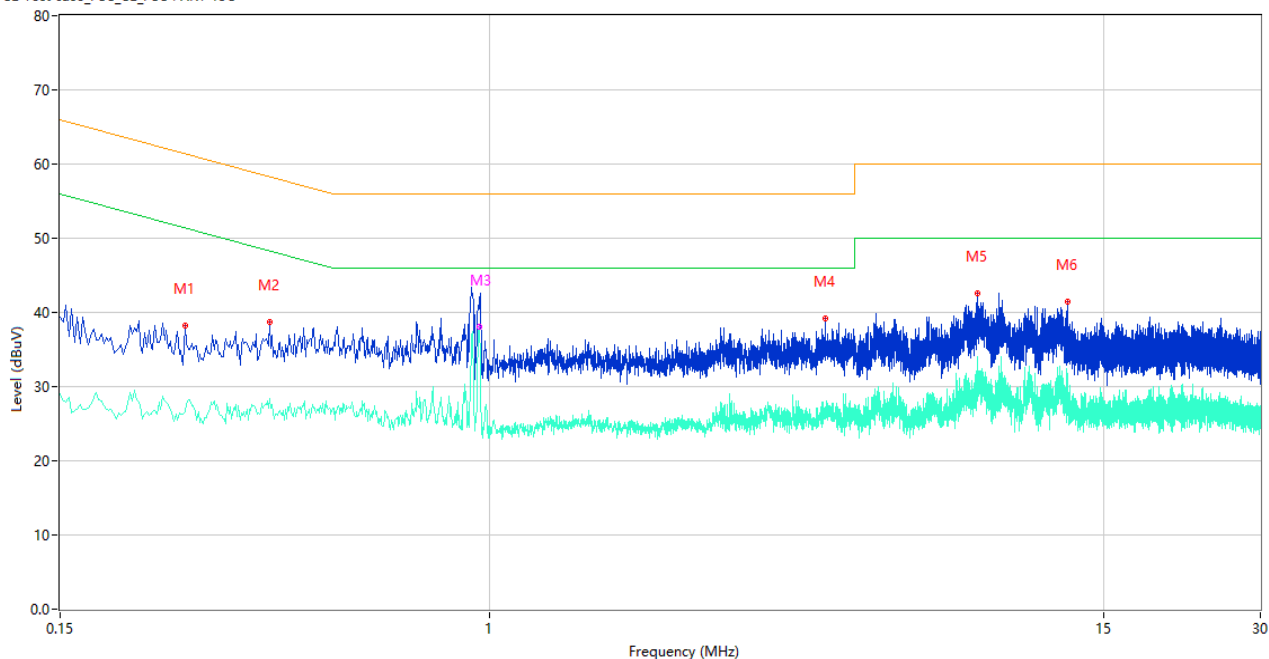
CE Test case_FCC_CE_FCC PART 15C



No.	Frequency (MHz)	Results (dBuV)	Factor (dB)	Limit (dBuV)	Margin (dB)	Detector	Line	Verdict
1	0.188	41.06	9.84	64.12	23.06	Peak	L	Pass
1**	0.188	27.49	9.84	54.12	26.63	AV	L	Pass
2	0.402	37.00	10.59	57.81	20.81	Peak	L	Pass
2**	0.402	25.04	10.59	47.81	22.77	AV	L	Pass
3	0.926	42.02	10.18	56.00	13.98	Peak	L	Pass
3**	0.926	37.17	10.18	46.00	8.83	AV	L	Pass
4	1.934	37.02	10.38	56.00	18.98	Peak	L	Pass
4**	1.934	27.39	10.38	46.00	18.61	AV	L	Pass
5	8.420	40.08	10.23	60.00	19.92	Peak	L	Pass
5**	8.420	29.32	10.23	50.00	20.68	AV	L	Pass
6	16.038	37.70	10.85	60.00	22.30	Peak	L	Pass
6**	16.038	26.01	10.85	50.00	23.99	AV	L	Pass

PHASE N

CE Test case_FCC_CE_FCC PART 15C

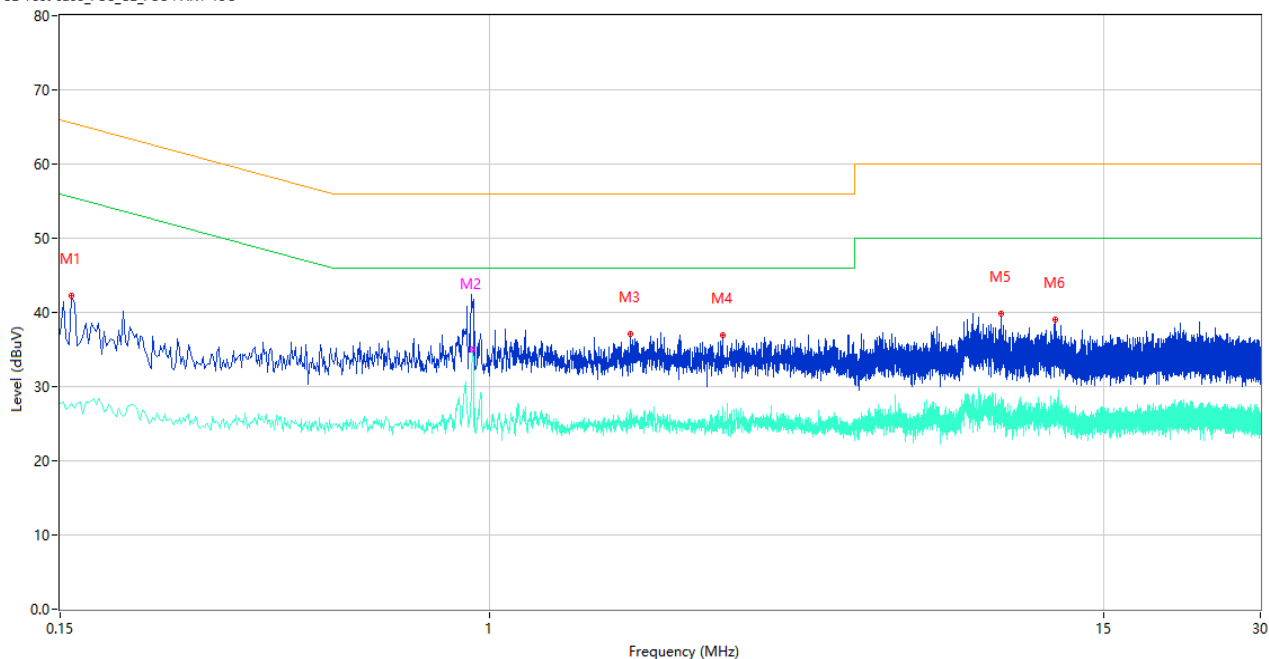


No.	Frequency (MHz)	Results (dBuV)	Factor (dB)	Limit (dBuV)	Margin (dB)	Detector	Line	Verdict
1	0.260	38.17	9.82	61.43	23.26	Peak	N	Pass
1**	0.260	26.60	9.82	51.43	24.83	AV	N	Pass
2	0.378	38.72	10.70	58.32	19.60	Peak	N	Pass
2**	0.378	28.37	10.70	48.32	19.95	AV	N	Pass
3	0.956	42.08	10.11	56.00	13.92	Peak	N	Pass
3**	0.956	38.08	10.11	46.00	7.92	AV	N	Pass
4	4.398	39.21	10.44	56.00	16.79	Peak	N	Pass
4**	4.398	27.08	10.44	46.00	18.92	AV	N	Pass
5	8.604	42.61	10.54	60.00	17.39	Peak	N	Pass
5**	8.604	32.34	10.54	50.00	17.66	AV	N	Pass
6	12.824	41.43	10.58	60.00	18.57	Peak	N	Pass
6**	12.824	31.76	10.58	50.00	18.24	AV	N	Pass

PCB-External Antenna

PHASE L

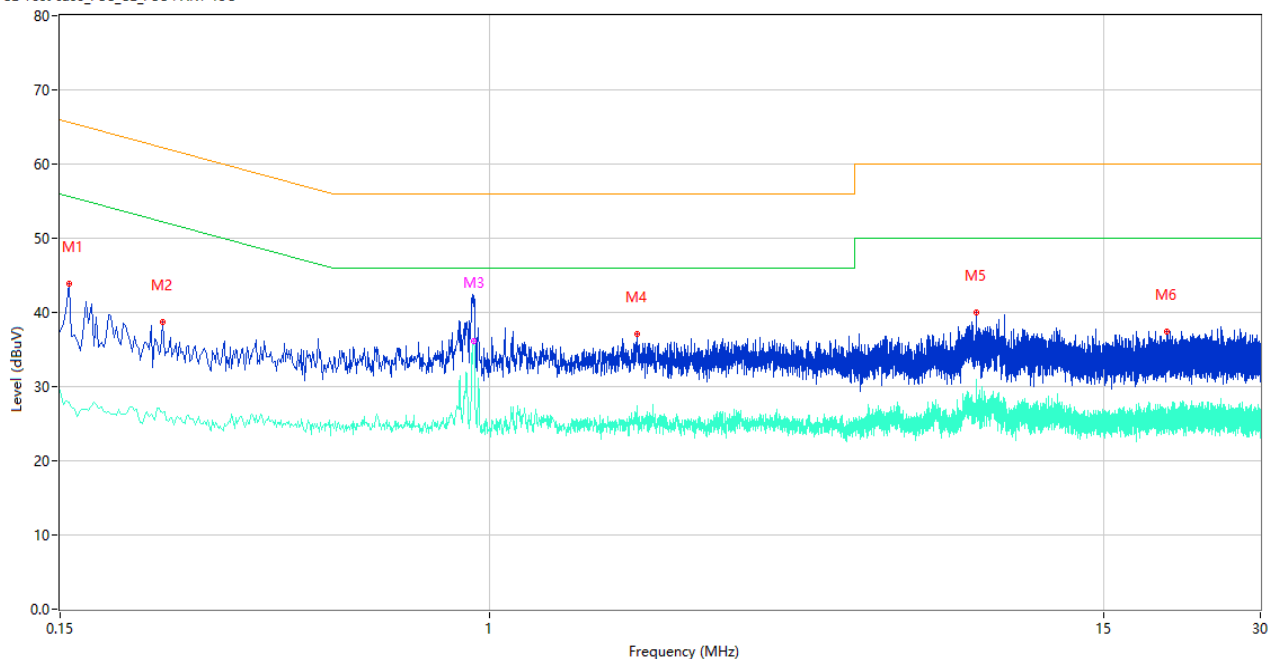
CE Test case_FCC_CE_FCC PART 15C



No.	Frequency (MHz)	Results (dBuV)	Factor (dB)	Limit (dBuV)	Margin (dB)	Detector	Line	Verdict
1	0.158	42.28	9.86	65.57	23.29	Peak	L	Pass
1**	0.158	27.72	9.86	55.57	27.85	AV	L	Pass
2	0.928	41.06	10.18	56.00	14.94	Peak	L	Pass
2**	0.928	34.98	10.18	46.00	11.02	AV	L	Pass
3	1.862	37.02	10.33	56.00	18.98	Peak	L	Pass
3**	1.862	26.91	10.33	46.00	19.09	AV	L	Pass
4	2.796	36.86	10.43	56.00	19.14	Peak	L	Pass
4**	2.796	25.22	10.43	46.00	20.78	AV	L	Pass
5	9.552	39.81	10.18	60.00	20.19	Peak	L	Pass
5**	9.552	28.52	10.18	50.00	21.48	AV	L	Pass
6	12.148	39.07	10.50	60.00	20.93	Peak	L	Pass
6**	12.148	28.16	10.50	50.00	21.84	AV	L	Pass

PHASE N

CE Test case_FCC_CE_FCC PART 15C



No.	Frequency (MHz)	Results (dBuV)	Factor (dB)	Limit (dBuV)	Margin (dB)	Detector	Line	Verdict
1	0.156	43.91	9.86	65.67	21.76	Peak	N	Pass
1**	0.156	27.93	9.86	55.67	27.74	AV	N	Pass
2	0.236	38.65	9.83	62.24	23.59	Peak	N	Pass
2**	0.236	26.49	9.83	52.24	25.75	AV	N	Pass
3	0.932	42.31	10.17	56.00	13.69	Peak	N	Pass
3**	0.932	36.16	10.17	46.00	9.84	AV	N	Pass
4	1.920	37.05	10.54	56.00	18.95	Peak	N	Pass
4**	1.920	25.87	10.54	46.00	20.13	AV	N	Pass
5	8.582	39.94	10.55	60.00	20.06	Peak	N	Pass
5**	8.582	29.30	10.55	50.00	20.70	AV	N	Pass
6	19.820	37.49	11.02	60.00	22.51	Peak	N	Pass
6**	19.820	25.51	11.02	50.00	24.49	AV	N	Pass

A.8 Radiated Spurious Emission

Note¹: The symbol of “--” in the table which means not application.

Note²: For the test data above 1 GHz, according the ANSI C63.10-2020, 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.

Note³: The EUT is working in the Normal link mode below 1 GHz. All modes have been tested and DH5-Hopping mode is the worst.

Note⁴: Results (dBuV/m) = Original reading level of Spectrum Analyzer (dBuV/m) + Factor (dB)

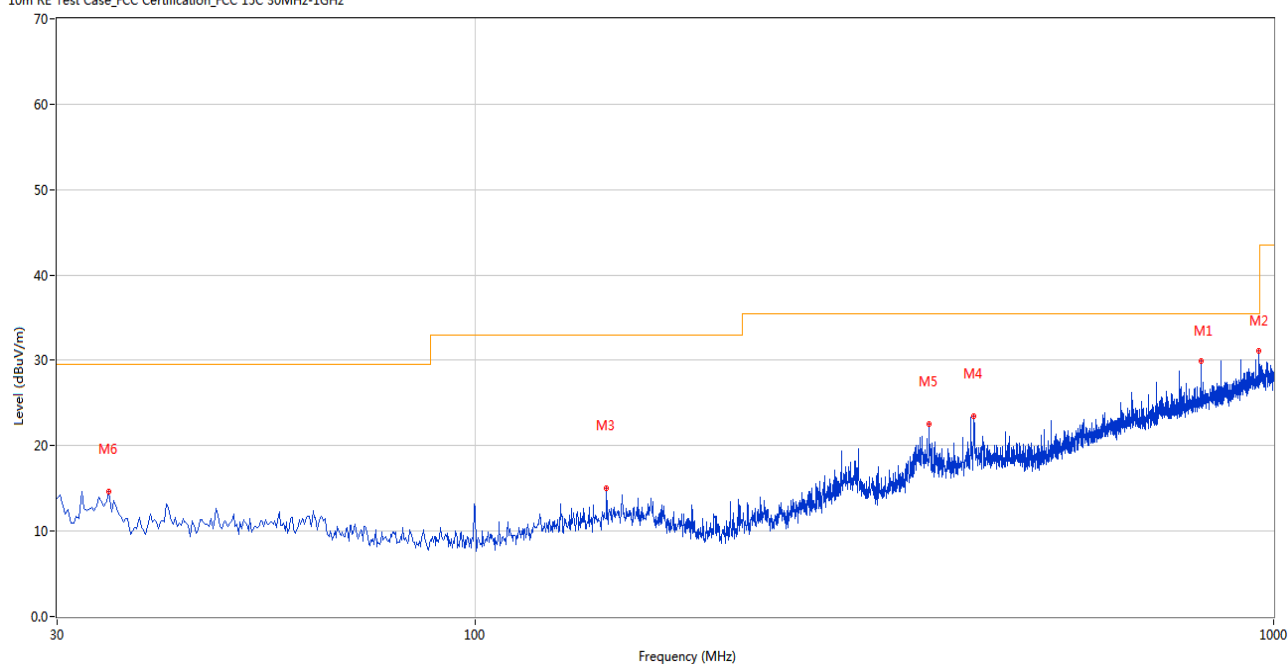
The low frequency, which started from 9 kHz to 30 MHz, was pre-scanned and the result which was 20 dB lower than the limit line per 15.31(o) was not reported.

Test Data and Plots

FPC Antenna

30 MHz to 1 GHz, ANT H

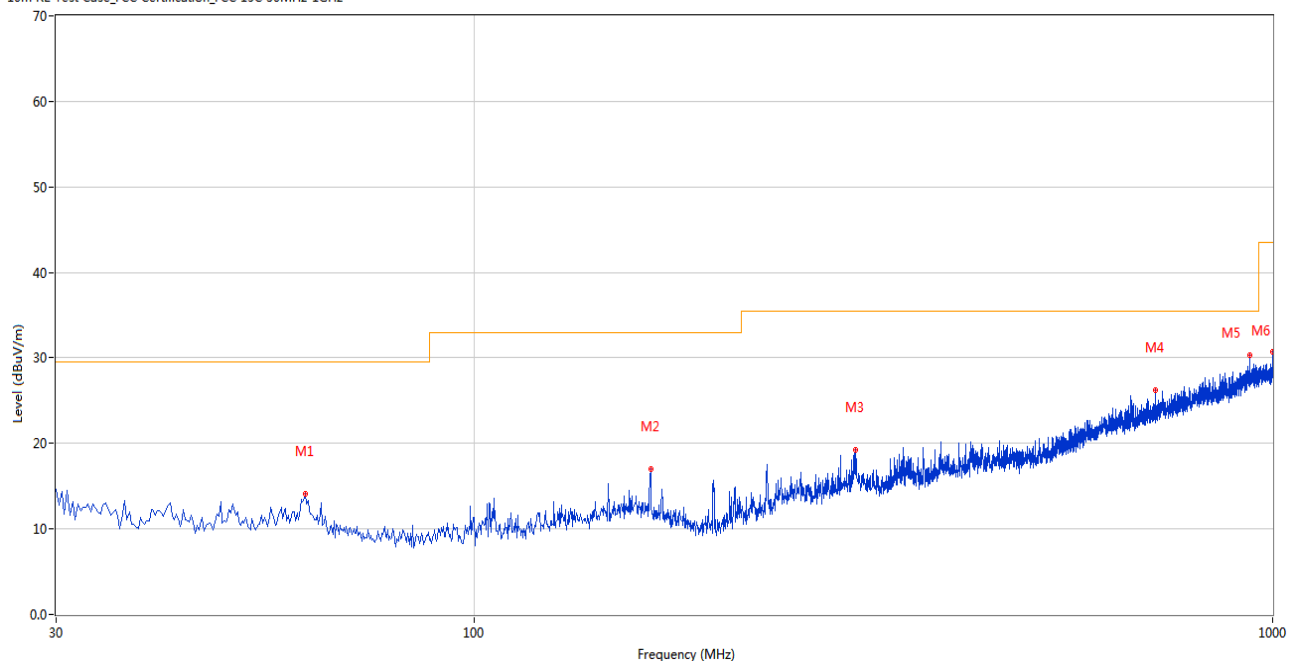
10m RE Test Case_FCC Certification_FCC 15C 30MHz-1GHz



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	810.897	29.88	-12.49	35.5	5.62	Peak	220.00	100	Horizontal	Pass
2	958.300	31.11	-9.78	35.5	4.39	Peak	203.00	100	Horizontal	Pass
3	146.128	14.98	-26.29	33.0	18.02	Peak	166.00	200	Horizontal	Pass
4	421.540	23.48	-22.01	35.5	12.02	Peak	52.00	200	Horizontal	Pass
5	370.627	22.56	-23.51	35.5	12.94	Peak	2.00	200	Horizontal	Pass
6	34.849	14.65	-26.96	29.5	14.85	Peak	0.00	200	Horizontal	Pass

30 MHz to 1 GHz, ANT V

10m RE Test Case_FCC Certification_FCC 15C 30MHz-1GHz



No.	Frequency (MHz)	Results (dBUV/m)	Factor (dB)	Limit (dBUV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	61.517	14.08	-27.62	29.5	15.42	Peak	358.00	100	Vertical	Pass
2	166.493	17.05	-26.33	33.0	15.95	Peak	118.00	100	Vertical	Pass
3	300.805	19.28	-25.44	35.5	16.22	Peak	302.00	100	Vertical	Pass
4	713.194	26.28	-14.89	35.5	9.22	Peak	0.00	100	Vertical	Pass
5	936.238	30.27	-10.03	35.5	5.23	Peak	0.00	200	Vertical	Pass
6	999.515	30.77	-9.01	43.5	12.73	Peak	0.00	200	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 HIGH CHANNEL 1 GHz to 18 GHz, ANT H

No.	Frequency (MHz)	Results (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1328.800	43.21	74.0	30.79	Peak	151.00	200	Horizontal	Pass
1**	1328.800	33.35	54.0	20.65	AV	151.00	200	Horizontal	Pass
2	2479.900	97.17	74.0	-23.17	Peak	294.00	150	Horizontal	N/A
2**	2479.900	96.57	54.0	-42.57	AV	294.00	150	Horizontal	N/A
3	2969.700	51.58	74.0	22.42	Peak	330.00	100	Horizontal	Pass
3**	2969.700	48.56	54.0	5.44	AV	330.00	100	Horizontal	Pass
4	4868.500	50.39	74.0	23.61	Peak	346.00	200	Horizontal	Pass
4**	4868.500	40.58	54.0	13.42	AV	346.00	200	Horizontal	Pass
5	7928.500	53.73	74.0	20.27	Peak	305.00	400	Horizontal	Pass
5**	7928.500	44.67	54.0	9.33	AV	305.00	400	Horizontal	Pass
6	12989.400	53.16	74.0	20.84	Peak	330.00	300	Horizontal	Pass
6**	12989.400	44.54	54.0	9.46	AV	330.00	300	Horizontal	Pass

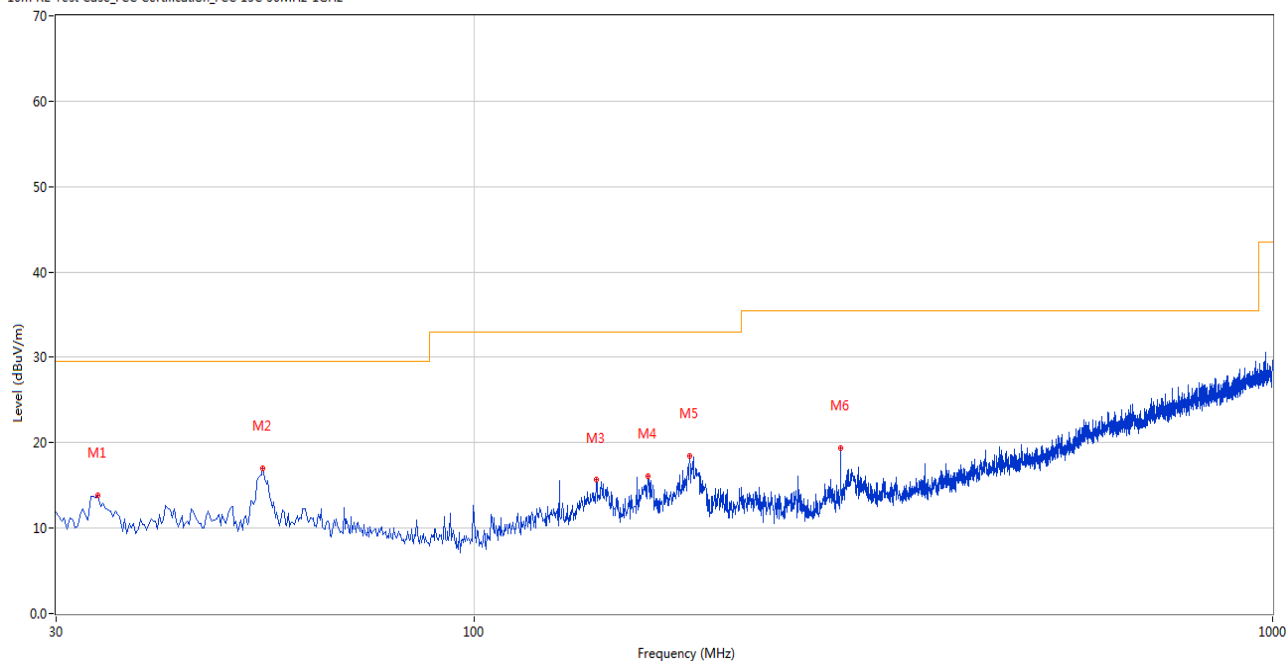
GFSK HIGH CHANNEL 1 GHz to 18 GHz, ANT V

No.	Frequency (MHz)	Results (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1332.900	45.63	74.0	28.37	Peak	273.00	400	Vertical	Pass
1**	1332.900	34.20	54.0	19.80	AV	273.00	400	Vertical	Pass
2	2480.100	91.52	74.0	-17.52	Peak	142.00	200	Vertical	N/A
2**	2480.100	91.34	54.0	-37.34	AV	142.00	200	Vertical	N/A
3	2969.800	50.97	74.0	23.03	Peak	300.00	100	Vertical	Pass
3**	2969.800	48.07	54.0	5.93	AV	300.00	100	Vertical	Pass
4	4812.250	48.86	74.0	25.14	Peak	360.00	100	Vertical	Pass
4**	4812.250	40.63	54.0	13.37	AV	360.00	100	Vertical	Pass
5	7440.500	51.47	74.0	22.53	Peak	5.00	100	Vertical	Pass
5**	7440.500	47.00	54.0	7.00	AV	5.00	100	Vertical	Pass
6	12449.087	53.64	74.0	20.36	Peak	298.00	100	Vertical	Pass
6**	12449.087	44.47	54.0	9.53	AV	298.00	100	Vertical	Pass

PCB-onboard Antenna

30 MHz to 1 GHz, ANT H

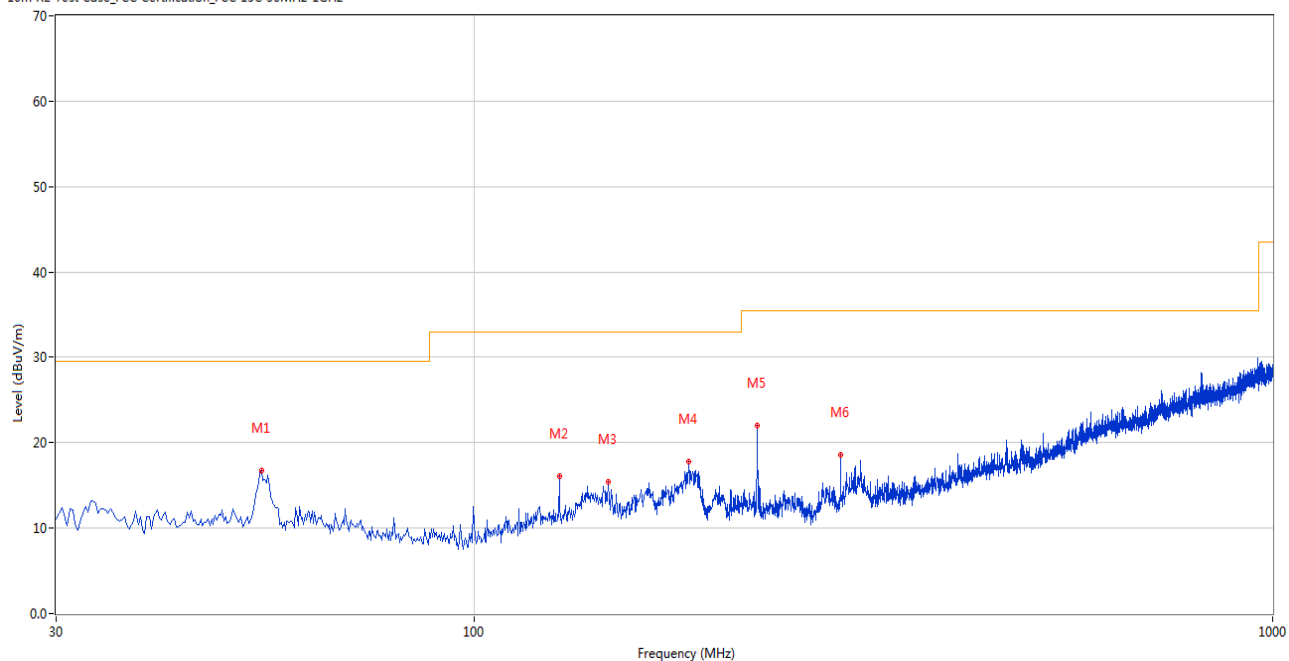
10m RE Test Case_FCC Certification_FCC 15C 30MHz-1GHz



No.	Frequency (MHz)	Results (dBUV/m)	Factor (dB)	Limit (dBUV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	33.879	13.87	-26.96	29.5	15.63	Peak	360.00	200	Horizontal	Pass
2	54.486	17.03	-27.12	29.5	12.47	Peak	20.00	200	Horizontal	Pass
3	142.492	15.62	-26.66	33.0	17.38	Peak	353.00	200	Horizontal	Pass
4	165.039	16.04	-26.20	33.0	16.96	Peak	302.00	200	Horizontal	Pass
5	186.373	18.48	-28.31	33.0	14.52	Peak	140.00	200	Horizontal	Pass
6	287.956	19.43	-25.91	35.5	16.07	Peak	280.00	200	Horizontal	Pass

30 MHz to 1 GHz, ANT V

10m RE Test Case_FCC Certification_FCC 15C 30MHz-1GHz



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	54.244	16.80	-27.10	29.5	12.70	Peak	226.00	100	Horizontal	Pass
2	127.946	16.04	-27.47	33.0	16.96	Peak	0.00	100	Horizontal	Pass
3	147.341	15.39	-26.24	33.0	17.61	Peak	312.00	200	Horizontal	Pass
4	185.646	17.84	-28.25	33.0	15.16	Peak	154.00	200	Horizontal	Pass
5	226.376	21.97	-28.99	35.5	13.53	Peak	160.00	200	Horizontal	Pass
6	287.956	18.53	-25.91	35.5	16.97	Peak	6.00	200	Horizontal	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 HIGH CHANNEL 1 GHz to 18 GHz, ANT H

No.	Frequency (MHz)	Results (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1599.200	41.63	74.0	32.37	Peak	360.00	200	Horizontal	Pass
1**	1599.200	33.75	54.0	20.25	AV	360.00	200	Horizontal	Pass
2	2480.200	99.26	74.0	-25.26	Peak	154.00	100	Horizontal	N/A
2**	2480.200	98.95	54.0	-44.95	AV	154.00	100	Horizontal	N/A
3	4819.200	48.14	74.0	25.86	Peak	0.00	200	Horizontal	Pass
3**	4819.200	39.54	54.0	14.46	AV	0.00	200	Horizontal	Pass
4	7440.737	46.40	74.0	27.60	Peak	0.00	150	Horizontal	Pass
4**	7440.737	43.30	54.0	10.70	AV	0.00	150	Horizontal	Pass
5	12468.825	47.10	74.0	26.90	Peak	338.00	400	Horizontal	Pass
5**	12468.825	38.90	54.0	15.10	AV	338.00	400	Horizontal	Pass
6	17097.262	50.36	74.0	23.64	Peak	130.00	100	Horizontal	Pass
6**	17097.262	40.64	54.0	13.36	AV	130.00	100	Horizontal	Pass

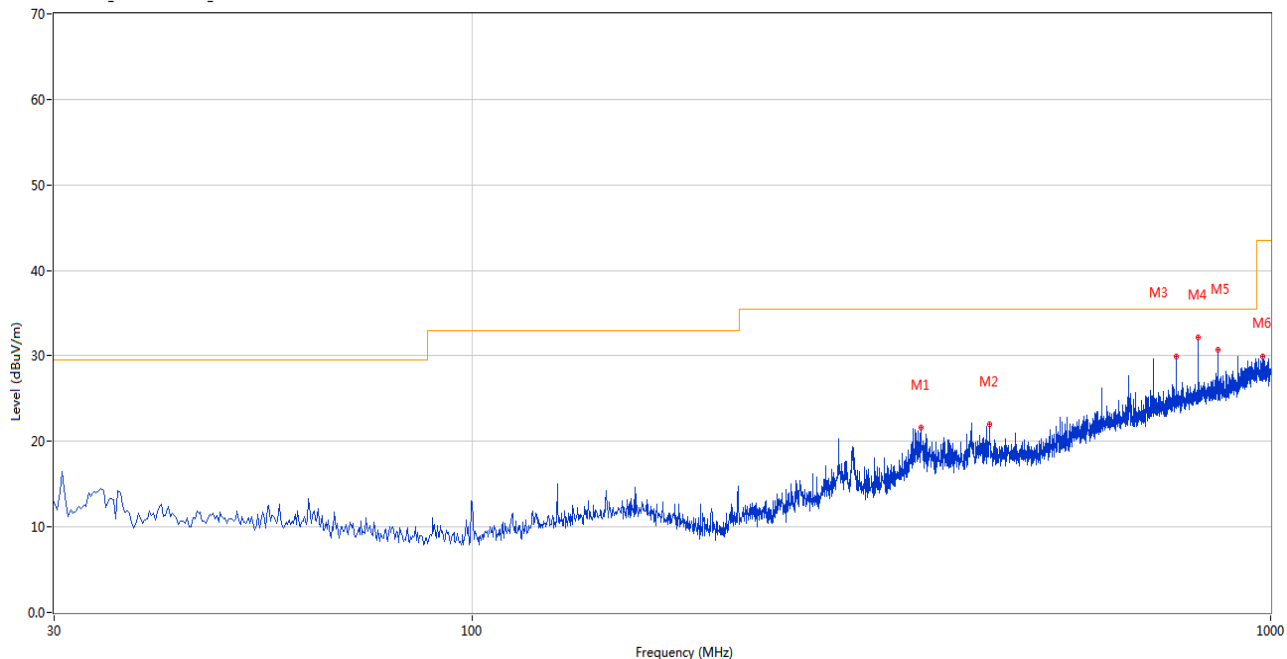
GFSK HIGH CHANNEL 1 GHz to 18 GHz, ANT V

No.	Frequency (MHz)	Results (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1329.900	41.67	74.0	32.33	Peak	204.00	400	Vertical	Pass
1**	1329.900	31.82	54.0	22.18	AV	204.00	400	Vertical	Pass
2	2480.200	88.67	74.0	-14.67	Peak	119.00	100	Vertical	N/A
2**	2480.200	88.44	54.0	-34.44	AV	119.00	100	Vertical	N/A
3	4663.400	48.68	74.0	25.32	Peak	360.00	100	Vertical	Pass
3**	4663.400	38.83	54.0	15.17	AV	360.00	100	Vertical	Pass
4	7440.737	48.00	74.0	26.00	Peak	242.00	150	Vertical	Pass
4**	7440.737	45.15	54.0	8.85	AV	242.00	150	Vertical	Pass
5	11302.150	47.28	74.0	26.72	Peak	169.00	100	Vertical	Pass
5**	11302.150	38.80	54.0	15.20	AV	169.00	100	Vertical	Pass
6	16038.862	50.12	74.0	23.88	Peak	266.00	100	Vertical	Pass
6**	16038.862	39.80	54.0	14.20	AV	266.00	100	Vertical	Pass

Dipole Antenna

30 MHz to 1 GHz, ANT H

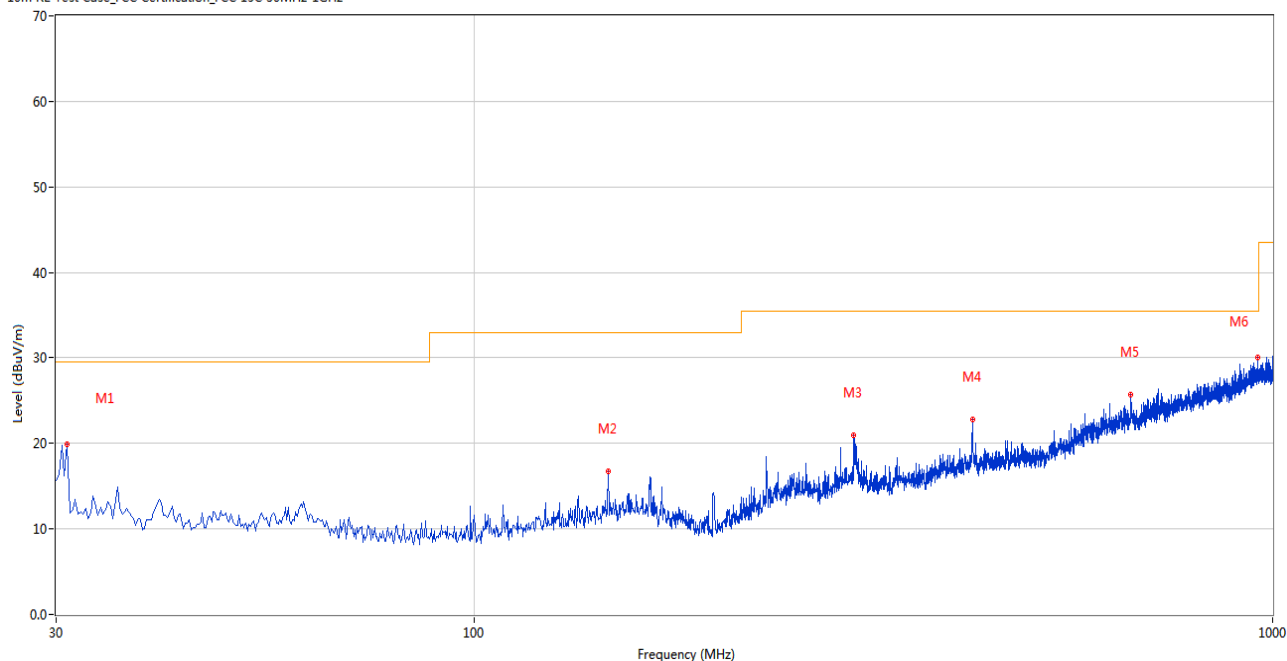
10m RE Test Case_FCC Certification_FCC 15C 30MHz-1GHz



No.	Frequency (MHz)	Results (dBUV/m)	Factor (dB)	Limit (dBUV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	365.294	21.65	-23.77	35.5	13.85	Peak	360.00	200	Horizontal	Pass
2	445.056	22.05	-21.42	35.5	13.45	Peak	251.00	200	Horizontal	Pass
3	761.682	29.97	-13.44	35.5	5.53	Peak	243.00	100	Horizontal	Pass
4	810.897	32.16	-12.49	35.5	3.34	Peak	232.00	100	Horizontal	Pass
5	860.112	30.67	-11.77	35.5	4.83	Peak	221.00	100	Horizontal	Pass
6	977.453	29.96	-9.78	43.5	13.54	Peak	360.00	200	Horizontal	Pass

30 MHz to 1 GHz, ANT V

10m RE Test Case_FCC Certification_FCC 15C 30MHz-1GHz



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	30.970	19.86	-26.88	29.5	9.64	Peak	200.00	100	Vertical	Pass
2	147.341	16.79	-26.24	33.0	16.21	Peak	282.00	100	Vertical	Pass
3	298.865	21.01	-25.46	35.5	14.49	Peak	360.00	200	Vertical	Pass
4	420.812	22.81	-22.05	35.5	12.69	Peak	233.00	100	Vertical	Pass
5	664.949	25.67	-15.62	35.5	9.83	Peak	117.00	200	Vertical	Pass
6	958.543	30.02	-9.79	35.5	5.48	Peak	144.00	200	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 HIGH CHANNEL 1 GHz to 18 GHz, ANT H

No.	Frequency (MHz)	Results (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1596.500	43.11	74.0	30.89	Peak	0.00	100	Horizontal	Pass
1**	1596.500	33.84	54.0	20.16	AV	0.00	100	Horizontal	Pass
2	2480.100	105.34	74.0	-31.34	Peak	85.00	200	Horizontal	N/A
2**	2480.100	105.14	54.0	-51.14	AV	85.00	200	Horizontal	N/A
3	4778.200	48.32	74.0	25.68	Peak	0.00	150	Horizontal	Pass
3**	4778.200	39.06	54.0	14.94	AV	0.00	150	Horizontal	Pass
4	7440.737	44.54	74.0	29.46	Peak	193.00	150	Horizontal	Pass
4**	7440.737	40.72	54.0	13.28	AV	193.00	150	Horizontal	Pass
5	12932.437	48.12	74.0	25.88	Peak	157.00	300	Horizontal	Pass
5**	12932.437	38.60	54.0	15.40	AV	157.00	300	Horizontal	Pass
6	17076.000	50.96	74.0	23.04	Peak	184.00	300	Horizontal	Pass
6**	17076.000	41.31	54.0	12.69	AV	184.00	300	Horizontal	Pass

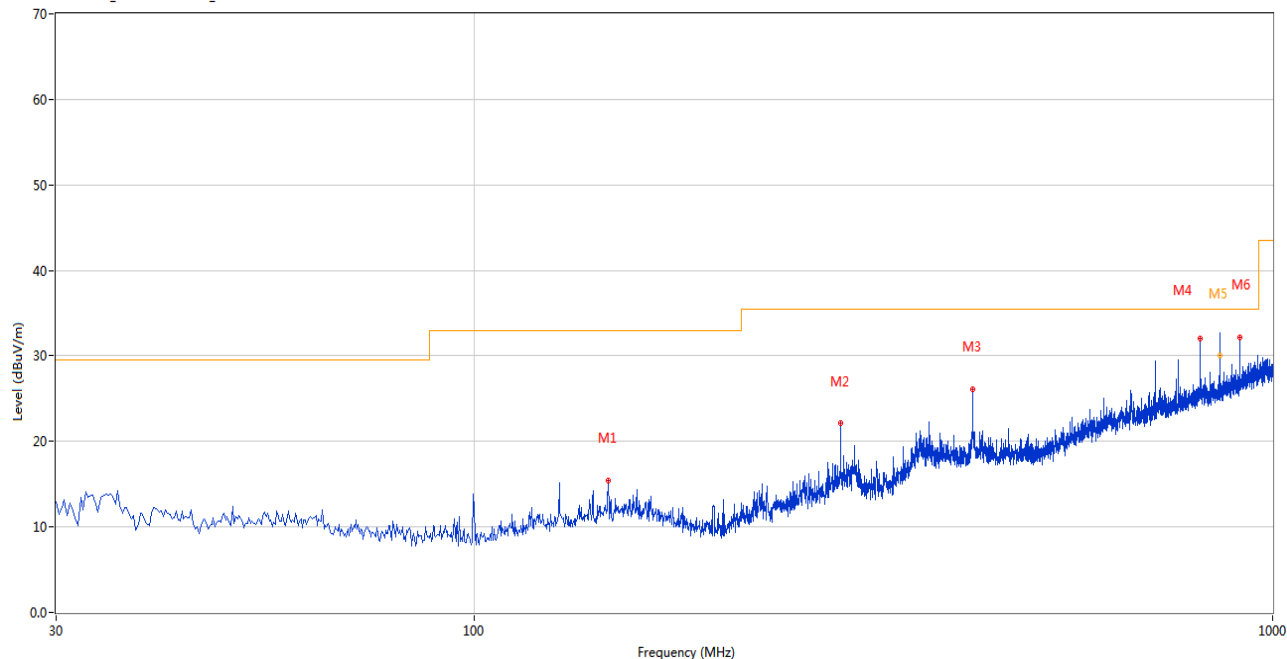
GFSK HIGH CHANNEL 1 GHz to 18 GHz, ANT V

No.	Frequency (MHz)	Results (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1593.700	41.85	74.0	32.15	Peak	0.00	100	Vertical	Pass
1**	1593.700	36.14	54.0	17.86	AV	0.00	100	Vertical	Pass
2	2480.100	91.25	74.0	-17.25	Peak	116.00	150	Vertical	N/A
2**	2480.100	90.87	54.0	-36.87	AV	116.00	150	Vertical	N/A
3	4976.400	48.57	74.0	25.43	Peak	58.00	100	Vertical	Pass
3**	4976.400	40.02	54.0	13.98	AV	58.00	100	Vertical	Pass
4	7440.450	45.25	74.0	28.75	Peak	291.00	150	Vertical	Pass
4**	7440.450	41.71	54.0	12.29	AV	291.00	150	Vertical	Pass
5	11890.950	47.50	74.0	26.50	Peak	0.00	400	Vertical	Pass
5**	11890.950	38.30	54.0	15.70	AV	0.00	400	Vertical	Pass
6	16025.213	50.57	74.0	23.43	Peak	218.00	200	Vertical	Pass
6**	16025.213	40.72	54.0	13.28	AV	218.00	200	Vertical	Pass

Copper Tube Antenna

30 MHz to 1 GHz, ANT H

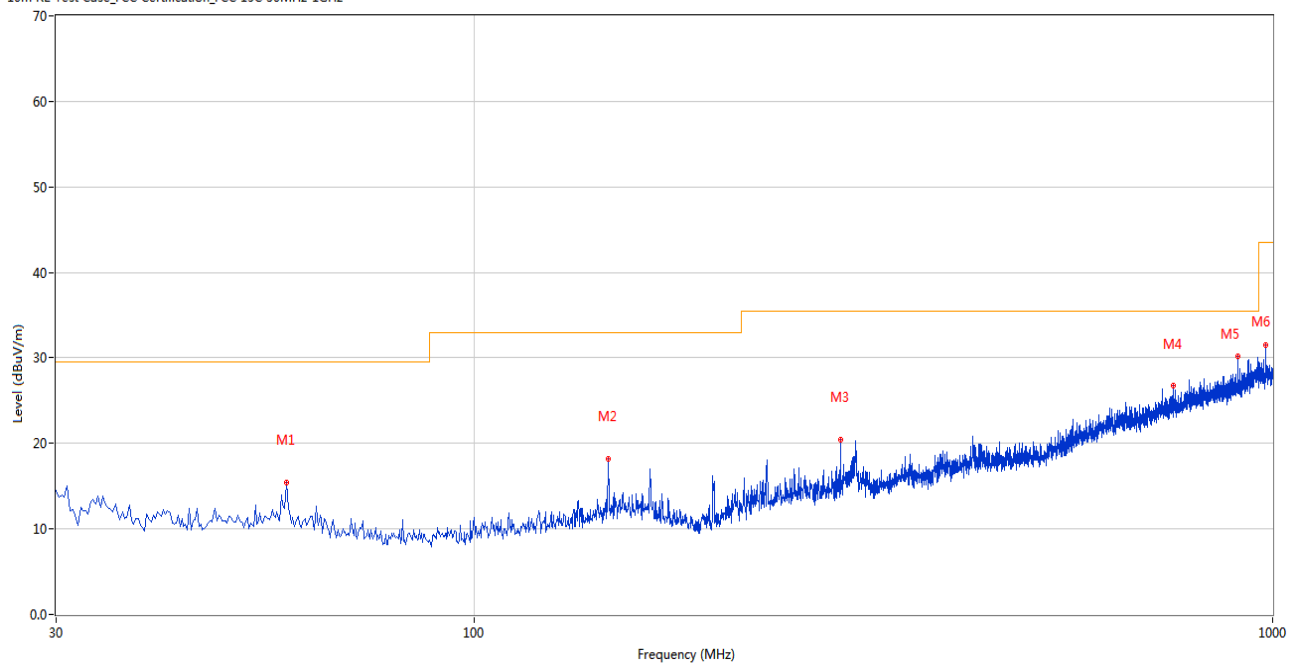
10m RE Test Case_FCC Certification_FCC 15C 30MHz-1GHz



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	147.341	15.39	-26.24	33.0	17.61	Peak	220.00	200	Horizontal	Pass
2	287.956	22.09	-25.91	35.5	13.41	Peak	133.00	200	Horizontal	Pass
3	421.297	26.11	-22.02	35.5	9.39	Peak	291.00	200	Horizontal	Pass
4	810.897	32.08	-12.49	35.5	3.42	Peak	244.00	100	Horizontal	Pass
5	860.155	32.17	-11.77	35.5	3.33	Peak	234.00	110	Horizontal	N/A
5*	860.155	30.04	-11.77	35.5	5.46	QP	234.00	110	Horizontal	Pass
6	909.328	32.15	-10.95	35.5	3.35	Peak	223.00	100	Horizontal	Pass

30 MHz to 1 GHz, ANT V

10m RE Test Case_FCC Certification_FCC 15C 30MHz-1GHz



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	58.365	15.43	-27.29	29.5	14.07	Peak	15.00	100	Vertical	Pass
2	147.341	18.25	-26.24	33.0	14.75	Peak	242.00	100	Vertical	Pass
3	287.956	20.40	-25.91	35.5	15.10	Peak	166.00	100	Vertical	Pass
4	751.257	26.70	-13.53	35.5	8.80	Peak	2.00	100	Vertical	Pass
5	903.752	30.12	-10.64	35.5	5.38	Peak	275.00	200	Vertical	Pass
6	980.120	31.53	-9.26	43.5	11.97	Peak	0.00	200	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 HIGH CHANNEL 1 GHz to 18 GHz, ANT H

No.	Frequency (MHz)	Results (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1597.100	41.30	74.0	32.70	Peak	172.00	400	Horizontal	Pass
1**	1597.100	30.20	54.0	23.80	AV	172.00	400	Horizontal	Pass
2	2480.100	103.70	74.0	-29.70	Peak	221.00	100	Horizontal	N/A
2**	2480.100	103.51	54.0	-49.51	AV	221.00	100	Horizontal	N/A
3	4810.600	48.76	74.0	25.24	Peak	358.00	200	Horizontal	Pass
3**	4810.600	39.26	54.0	14.74	AV	358.00	200	Horizontal	Pass
4	7439.875	47.54	74.0	26.46	Peak	311.00	150	Horizontal	Pass
4**	7439.875	43.67	54.0	10.33	AV	311.00	150	Horizontal	Pass
5	11892.963	47.15	74.0	26.85	Peak	19.00	300	Horizontal	Pass
5**	11892.963	38.95	54.0	15.05	AV	19.00	300	Horizontal	Pass
6	16327.612	50.57	74.0	23.43	Peak	295.00	200	Horizontal	Pass
6**	16327.612	40.37	54.0	13.63	AV	295.00	200	Horizontal	Pass

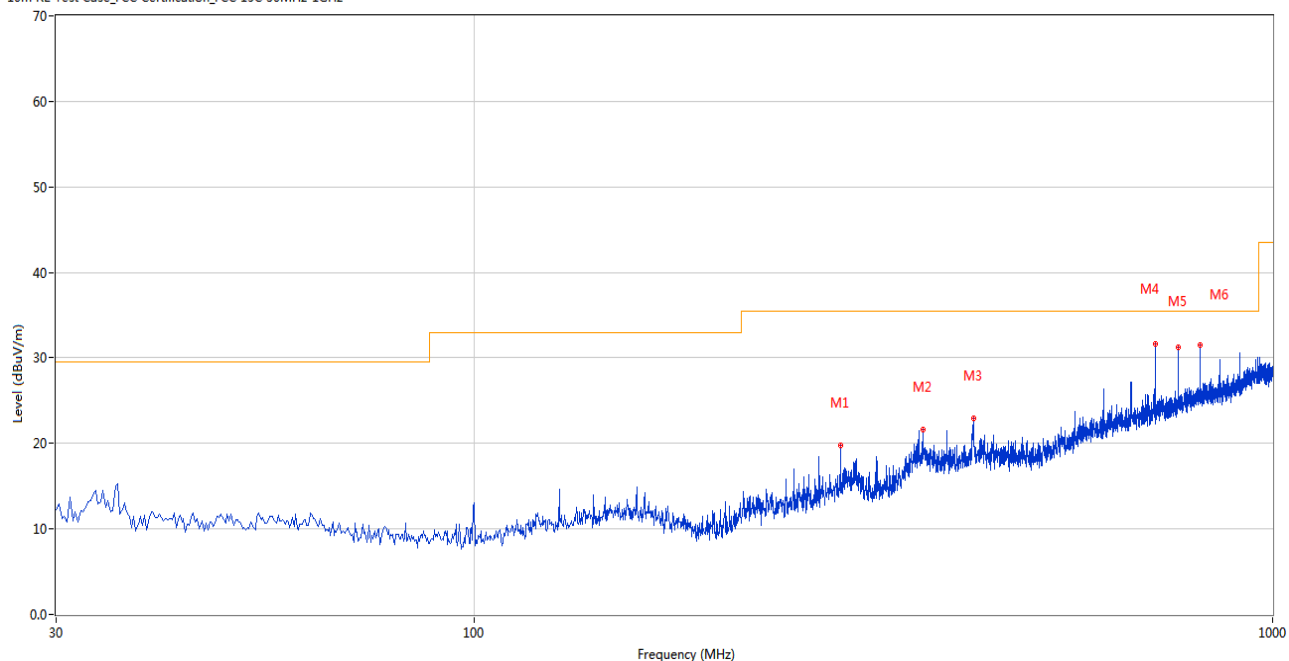
GFSK HIGH CHANNEL 1 GHz to 18 GHz, ANT V

No.	Frequency (MHz)	Results (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1592.500	41.33	74.0	32.67	Peak	53.00	300	Vertical	Pass
1**	1592.500	30.99	54.0	23.01	AV	53.00	300	Vertical	Pass
2	2480.200	92.30	74.0	-18.30	Peak	181.00	100	Vertical	N/A
2**	2480.200	92.05	54.0	-38.05	AV	181.00	100	Vertical	N/A
3	4888.000	48.64	74.0	25.36	Peak	299.00	200	Vertical	Pass
3**	4888.000	39.46	54.0	14.54	AV	299.00	200	Vertical	Pass
4	7440.163	47.73	74.0	26.27	Peak	242.00	150	Vertical	Pass
4**	7440.163	45.17	54.0	8.83	AV	242.00	150	Vertical	Pass
5	11328.026	47.63	74.0	26.37	Peak	218.00	100	Vertical	Pass
5**	11328.026	38.51	54.0	15.49	AV	218.00	100	Vertical	Pass
6	16803.261	50.19	74.0	23.81	Peak	50.00	400	Vertical	Pass
6**	16803.261	40.71	54.0	13.29	AV	50.00	400	Vertical	Pass

PCB-External Antenna

30 MHz to 1 GHz, ANT H

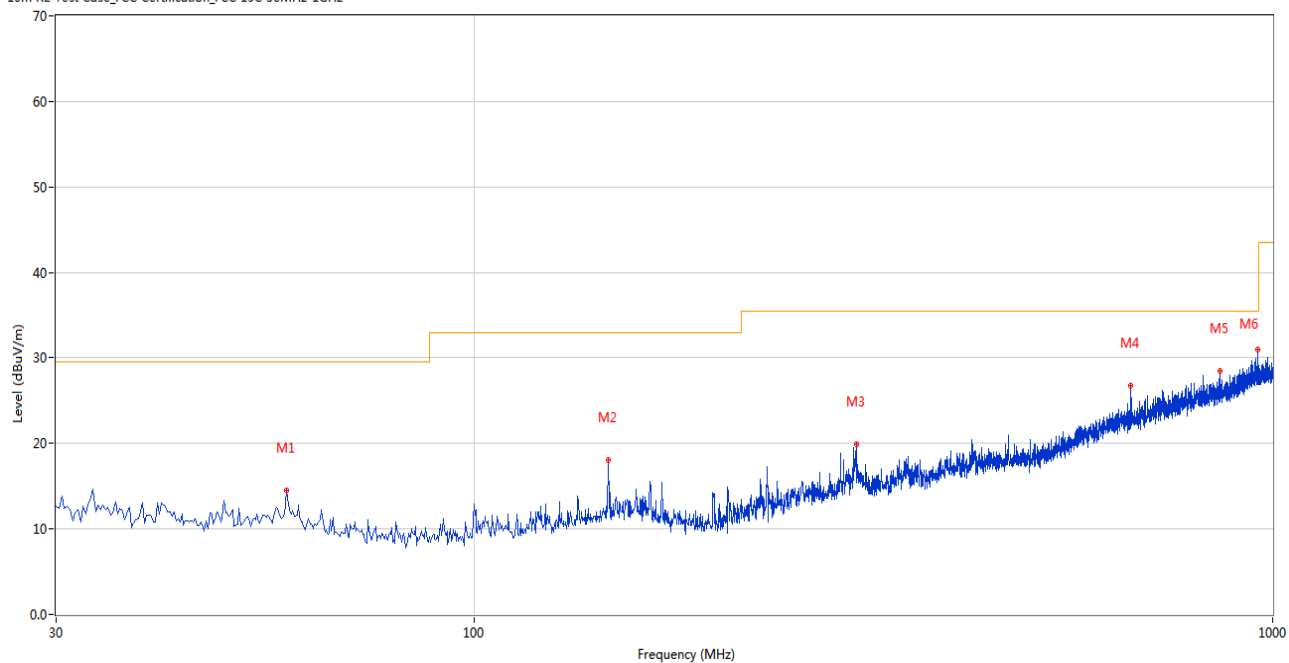
10m RE Test Case_FCC Certification_FCC 15C 30MHz-1GHz



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	287.956	19.80	-25.91	35.5	15.70	Peak	102.00	200	Horizontal	Pass
2	365.294	21.62	-23.77	35.5	13.88	Peak	360.00	200	Horizontal	Pass
3	422.752	22.89	-21.96	35.5	12.61	Peak	275.00	200	Horizontal	Pass
4	712.709	31.58	-14.83	35.5	3.92	Peak	248.00	100	Horizontal	Pass
5	761.682	31.27	-13.44	35.5	4.23	Peak	237.00	100	Horizontal	Pass
6	810.897	31.48	-12.49	35.5	4.02	Peak	237.00	100	Horizontal	Pass

30 MHz to 1 GHz, ANT V

10m RE Test Case_FCC Certification_FCC 15C 30MHz-1GHz



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	58.365	14.56	-27.29	29.5	14.94	Peak	151.00	100	Vertical	Pass
2	147.341	18.07	-26.24	33.0	14.93	Peak	248.00	100	Vertical	Pass
3	301.047	19.92	-25.44	35.5	15.58	Peak	291.00	100	Vertical	Pass
4	664.949	26.71	-15.62	35.5	8.79	Peak	139.00	200	Vertical	Pass
5	860.112	28.43	-11.77	35.5	7.07	Peak	353.00	200	Vertical	Pass
6	958.300	30.99	-9.78	35.5	4.51	Peak	360.00	200	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 LOW CHANNEL 1 GHz to 18 GHz, ANT H

No.	Frequency (MHz)	Results (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1338.267	43.48	74.0	30.52	Peak	336.00	400	Horizontal	Pass
1**	1338.267	33.24	54.0	20.76	AV	336.00	400	Horizontal	Pass
2	2978.884	48.41	74.0	25.59	Peak	3.00	400	Horizontal	Pass
2**	2978.884	38.64	54.0	15.36	AV	3.00	400	Horizontal	Pass
3	4915.644	49.80	74.0	24.20	Peak	159.00	200	Horizontal	Pass
3**	4915.644	39.98	54.0	14.02	AV	159.00	200	Horizontal	Pass
4	7629.722	52.07	74.0	21.93	Peak	44.00	100	Horizontal	Pass
4**	7629.722	44.08	54.0	9.92	AV	44.00	100	Horizontal	Pass
5	12473.010	50.31	74.0	23.69	Peak	156.00	100	Horizontal	Pass
5**	12473.010	43.83	54.0	10.17	AV	156.00	100	Horizontal	Pass
6	16861.577	54.31	74.0	19.69	Peak	45.00	100	Horizontal	Pass
6**	16861.577	46.71	54.0	7.29	AV	45.00	100	Horizontal	Pass

GFSK LOW CHANNEL 1 GHz to 18 GHz, ANT V

No.	Frequency (MHz)	Results (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1462.282	42.73	74.0	31.27	Peak	240.00	100	Vertical	Pass
1**	1462.282	29.90	54.0	24.10	AV	240.00	100	Vertical	Pass
2	2991.187	49.76	74.0	24.24	Peak	89.00	300	Vertical	Pass
2**	2991.187	42.41	54.0	11.59	AV	89.00	300	Vertical	Pass
3	4824.593	46.42	74.0	27.58	Peak	122.00	200	Vertical	Pass
3**	4824.593	38.96	54.0	15.04	AV	122.00	200	Vertical	Pass
4	7966.696	51.52	74.0	22.48	Peak	194.00	100	Vertical	Pass
4**	7966.696	42.49	54.0	11.51	AV	194.00	100	Vertical	Pass
5	12449.284	55.08	74.0	18.92	Peak	127.00	400	Vertical	Pass
5**	12449.284	43.12	54.0	10.88	AV	127.00	400	Vertical	Pass
6	17457.054	54.64	74.0	19.36	Peak	167.00	400	Vertical	Pass
6**	17457.054	48.83	54.0	5.17	AV	167.00	400	Vertical	Pass

GFSK MIDDLE CHANNEL 1 GHz to 18 GHz, ANT H

No.	Frequency (MHz)	Results (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1334.858	44.60	74.0	29.40	Peak	214.00	300	Horizontal	Pass
1**	1334.858	32.51	54.0	21.49	AV	214.00	300	Horizontal	Pass
2	2975.913	53.70	74.0	20.30	Peak	190.00	300	Horizontal	Pass
2**	2975.913	41.15	54.0	12.85	AV	190.00	300	Horizontal	Pass
3	4914.937	52.04	74.0	21.96	Peak	0.00	200	Horizontal	Pass
3**	4914.937	37.69	54.0	16.31	AV	0.00	200	Horizontal	Pass
4	7624.005	56.41	74.0	17.59	Peak	205.00	200	Horizontal	Pass
4**	7624.005	44.52	54.0	9.48	AV	205.00	200	Horizontal	Pass
5	12475.722	52.76	74.0	21.24	Peak	210.00	400	Horizontal	Pass
5**	12475.722	43.51	54.0	10.49	AV	210.00	400	Horizontal	Pass
6	16859.715	55.08	74.0	18.92	Peak	26.00	300	Horizontal	Pass
6**	16859.715	45.97	54.0	8.03	AV	26.00	300	Horizontal	Pass

GFSK MIDDLE CHANNEL 1 GHz to 18 GHz, ANT V

No.	Frequency (MHz)	Results (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1463.654	43.60	74.0	30.40	Peak	357.00	400	Vertical	Pass
1**	1463.654	29.96	54.0	24.04	AV	357.00	400	Vertical	Pass
2	2988.860	52.91	74.0	21.09	Peak	340.00	100	Vertical	Pass
2**	2988.860	37.69	54.0	16.31	AV	340.00	100	Vertical	Pass
3	4824.925	51.96	74.0	22.04	Peak	67.00	200	Vertical	Pass
3**	4824.925	42.54	54.0	11.46	AV	67.00	200	Vertical	Pass
4	7966.764	52.23	74.0	21.77	Peak	58.00	100	Vertical	Pass
4**	7966.764	45.13	54.0	8.87	AV	58.00	100	Vertical	Pass
5	12442.588	52.69	74.0	21.31	Peak	66.00	400	Vertical	Pass
5**	12442.588	45.23	54.0	8.77	AV	66.00	400	Vertical	Pass
6	17454.805	57.00	74.0	17.00	Peak	79.00	400	Vertical	Pass
6**	17454.805	43.64	54.0	10.36	AV	79.00	400	Vertical	Pass

GFSK HIGH CHANNEL 1 GHz to 18 GHz, ANT H

No.	Frequency (MHz)	Results (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1337.670	42.28	74.0	31.72	Peak	82.00	200	Horizontal	Pass
1**	1337.670	29.67	54.0	24.33	AV	82.00	200	Horizontal	Pass
2	2976.889	49.25	74.0	24.75	Peak	346.00	100	Horizontal	Pass
2**	2976.889	43.52	54.0	10.48	AV	346.00	100	Horizontal	Pass
3	4912.119	50.91	74.0	23.09	Peak	122.00	200	Horizontal	Pass
3**	4912.119	38.28	54.0	15.72	AV	122.00	200	Horizontal	Pass
4	7630.548	50.63	74.0	23.37	Peak	132.00	100	Horizontal	Pass
4**	7630.548	41.04	54.0	12.96	AV	132.00	100	Horizontal	Pass
5	12478.884	53.72	74.0	20.28	Peak	162.00	400	Horizontal	Pass
5**	12478.884	46.83	54.0	7.17	AV	162.00	400	Horizontal	Pass
6	16861.964	55.83	74.0	18.17	Peak	77.00	400	Horizontal	Pass
6**	16861.964	43.18	54.0	10.82	AV	77.00	400	Horizontal	Pass

GFSK HIGH CHANNEL 1 GHz to 18 GHz, ANT V

No.	Frequency (MHz)	Results (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1464.772	40.54	74.0	33.46	Peak	175.00	400	Vertical	Pass
1**	1464.772	31.65	54.0	22.35	AV	175.00	400	Vertical	Pass
2	2990.395	51.31	74.0	22.69	Peak	76.00	300	Vertical	Pass
2**	2990.395	41.63	54.0	12.37	AV	76.00	300	Vertical	Pass
3	4824.371	46.47	74.0	27.53	Peak	294.00	200	Vertical	Pass
3**	4824.371	41.37	54.0	12.63	AV	294.00	200	Vertical	Pass
4	7968.322	54.64	74.0	19.36	Peak	224.00	400	Vertical	Pass
4**	7968.322	42.88	54.0	11.12	AV	224.00	400	Vertical	Pass
5	12447.340	52.43	74.0	21.57	Peak	290.00	100	Vertical	Pass
5**	12447.340	45.79	54.0	8.21	AV	290.00	100	Vertical	Pass
6	17458.157	52.17	74.0	21.83	Peak	122.00	300	Vertical	Pass
6**	17458.157	44.01	54.0	9.99	AV	122.00	300	Vertical	Pass

8-DPSK LOW CHANNEL 1 GHz to 18 GHz, ANT H

No.	Frequency (MHz)	Results (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1288.025	39.54	74.0	34.46	Peak	75.00	300	Horizontal	Pass
1**	1288.025	33.30	54.0	20.70	AV	75.00	300	Horizontal	Pass
2	2773.433	53.33	74.0	20.67	Peak	41.00	300	Horizontal	Pass
2**	2773.433	40.92	54.0	13.08	AV	41.00	300	Horizontal	Pass
3	5171.052	53.76	74.0	20.24	Peak	59.00	200	Horizontal	Pass
3**	5171.052	41.35	54.0	12.65	AV	59.00	200	Horizontal	Pass
4	6809.462	56.40	74.0	17.60	Peak	311.00	400	Horizontal	Pass
4**	6809.462	47.55	54.0	6.45	AV	311.00	400	Horizontal	Pass
5	13467.228	54.22	74.0	19.78	Peak	2.00	100	Horizontal	Pass
5**	13467.228	42.92	54.0	11.08	AV	2.00	100	Horizontal	Pass
6	17469.586	56.86	74.0	17.14	Peak	314.00	200	Horizontal	Pass
6**	17469.586	46.72	54.0	7.28	AV	314.00	200	Horizontal	Pass

8-DPSK LOW CHANNEL 1 GHz to 18 GHz, ANT V

No.	Frequency (MHz)	Results (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1285.504	45.11	74.0	28.89	Peak	273.00	200	Vertical	Pass
1**	1285.504	34.84	54.0	19.16	AV	273.00	200	Vertical	Pass
2	2767.440	52.30	74.0	21.70	Peak	64.00	200	Vertical	Pass
2**	2767.440	44.08	54.0	9.92	AV	64.00	200	Vertical	Pass
3	5165.954	56.26	74.0	17.74	Peak	150.00	200	Vertical	Pass
3**	5165.954	45.48	54.0	8.52	AV	150.00	200	Vertical	Pass
4	6804.666	52.24	74.0	21.76	Peak	181.00	300	Vertical	Pass
4**	6804.666	45.48	54.0	8.52	AV	181.00	300	Vertical	Pass
5	13468.327	54.78	74.0	19.22	Peak	195.00	100	Vertical	Pass
5**	13468.327	44.86	54.0	9.14	AV	195.00	100	Vertical	Pass
6	17466.244	59.72	74.0	14.28	Peak	210.00	200	Vertical	Pass
6**	17466.244	45.30	54.0	8.70	AV	210.00	200	Vertical	Pass

8-DPSK MIDDLE CHANNEL 1 GHz to 18 GHz, ANT H

No.	Frequency (MHz)	Results (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1288.274	42.78	74.0	31.22	Peak	277.00	300	Horizontal	Pass
1**	1288.274	30.43	54.0	23.57	AV	277.00	300	Horizontal	Pass
2	2770.646	54.17	74.0	19.83	Peak	357.00	200	Horizontal	Pass
2**	2770.646	41.49	54.0	12.51	AV	357.00	200	Horizontal	Pass
3	5165.122	54.76	74.0	19.24	Peak	24.00	200	Horizontal	Pass
3**	5165.122	45.86	54.0	8.14	AV	24.00	200	Horizontal	Pass
4	6804.236	54.87	74.0	19.13	Peak	165.00	200	Horizontal	Pass
4**	6804.236	43.64	54.0	10.36	AV	165.00	200	Horizontal	Pass
5	13466.193	55.30	74.0	18.70	Peak	105.00	100	Horizontal	Pass
5**	13466.193	46.64	54.0	7.36	AV	105.00	100	Horizontal	Pass
6	17469.510	57.17	74.0	16.83	Peak	353.00	400	Horizontal	Pass
6**	17469.510	48.64	54.0	5.36	AV	353.00	400	Horizontal	Pass

8-DPSK MIDDLE CHANNEL 1 GHz to 18 GHz, ANT V

No.	Frequency (MHz)	Results (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1286.308	44.00	74.0	30.00	Peak	248.00	200	Vertical	Pass
1**	1286.308	34.81	54.0	19.19	AV	248.00	200	Vertical	Pass
2	2774.994	54.05	74.0	19.95	Peak	207.00	300	Vertical	Pass
2**	2774.994	47.07	54.0	6.93	AV	207.00	300	Vertical	Pass
3	5163.639	54.66	74.0	19.34	Peak	197.00	200	Vertical	Pass
3**	5163.639	41.24	54.0	12.76	AV	197.00	200	Vertical	Pass
4	6806.148	55.21	74.0	18.79	Peak	160.00	200	Vertical	Pass
4**	6806.148	48.50	54.0	5.50	AV	160.00	200	Vertical	Pass
5	13471.335	51.96	74.0	22.04	Peak	258.00	200	Vertical	Pass
5**	13471.335	43.71	54.0	10.29	AV	258.00	200	Vertical	Pass
6	17463.163	59.61	74.0	14.39	Peak	153.00	200	Vertical	Pass
6**	17463.163	50.50	54.0	3.50	AV	153.00	200	Vertical	Pass

8-DPSK HIGH CHANNEL 1 GHz to 18 GHz, ANT H

No.	Frequency (MHz)	Results (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1284.450	42.46	74.0	31.54	Peak	23.00	200	Horizontal	Pass
1**	1284.450	33.70	54.0	20.30	AV	23.00	200	Horizontal	Pass
2	2774.424	49.60	74.0	24.40	Peak	28.00	400	Horizontal	Pass
2**	2774.424	42.07	54.0	11.93	AV	28.00	400	Horizontal	Pass
3	5168.979	52.62	74.0	21.38	Peak	93.00	200	Horizontal	Pass
3**	5168.979	41.90	54.0	12.10	AV	93.00	200	Horizontal	Pass
4	6805.906	57.57	74.0	16.43	Peak	149.00	400	Horizontal	Pass
4**	6805.906	43.08	54.0	10.92	AV	149.00	400	Horizontal	Pass
5	13468.701	55.79	74.0	18.21	Peak	269.00	400	Horizontal	Pass
5**	13468.701	43.49	54.0	10.51	AV	269.00	400	Horizontal	Pass
6	17465.123	59.08	74.0	14.92	Peak	262.00	100	Horizontal	Pass
6**	17465.123	48.42	54.0	5.58	AV	262.00	100	Horizontal	Pass

8-DPSK HIGH CHANNEL 1 GHz to 18 GHz, ANT V

No.	Frequency (MHz)	Results (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1285.863	43.81	74.0	30.19	Peak	213.00	300	Vertical	Pass
1**	1285.863	31.53	54.0	22.47	AV	213.00	300	Vertical	Pass
2	2767.609	56.80	74.0	17.20	Peak	315.00	400	Vertical	Pass
2**	2767.609	44.66	54.0	9.34	AV	315.00	400	Vertical	Pass
3	5162.231	56.92	74.0	17.08	Peak	351.00	200	Vertical	Pass
3**	5162.231	44.27	54.0	9.73	AV	351.00	200	Vertical	Pass
4	6802.998	53.94	74.0	20.06	Peak	287.00	200	Vertical	Pass
4**	6802.998	46.91	54.0	7.09	AV	287.00	200	Vertical	Pass
5	13469.420	51.13	74.0	22.87	Peak	233.00	400	Vertical	Pass
5**	13469.420	45.80	54.0	8.20	AV	233.00	400	Vertical	Pass
6	17465.399	59.50	74.0	14.50	Peak	172.00	400	Vertical	Pass
6**	17465.399	44.92	54.0	9.08	AV	172.00	400	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 C63.10-2020, 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.

Note ⁵: Both horizontal and vertical directions were pre tested, only the worst configuration has been reported in this report.

Test Data

FPC Antenna

GFSK HIGH CHANNEL

No.	Frequency (MHz)	Results (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	2483.550	55.19	74.0	18.81	Peak	117.00	100	Horizontal	Pass
1**	2483.550	43.45	54.0	10.55	AV	117.00	100	Horizontal	Pass
2	2484.000	57.69	74.0	16.31	Peak	115.00	150	Horizontal	Pass
2**	2484.000	43.44	54.0	10.56	AV	115.00	150	Horizontal	Pass

PCB-onboard Antenna

GFSK HIGH CHANNEL

No.	Frequency (MHz)	Results (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	2483.550	57.07	74.0	16.93	Peak	118.00	150	Horizontal	Pass
1**	2483.550	43.78	54.0	10.22	AV	118.00	150	Horizontal	Pass
2	2483.750	56.36	74.0	17.64	Peak	152.00	200	Horizontal	Pass
2**	2483.750	43.67	54.0	10.33	AV	152.00	200	Horizontal	Pass

Dipole Antenna

GFSK HIGH CHANNEL

No.	Frequency (MHz)	Results (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	2483.500	62.34	74.0	11.66	Peak	255.00	100	Horizontal	Pass
1**	2483.500	44.88	54.0	9.12	AV	255.00	100	Horizontal	Pass
2	2483.750	61.53	74.0	12.47	Peak	87.00	100	Horizontal	Pass
2**	2483.750	44.52	54.0	9.48	AV	87.00	100	Horizontal	Pass

Copper Tube Antenna**GFSK HIGH CHANNEL**

No.	Frequency (MHz)	Results (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	2483.500	62.60	74.0	11.40	Peak	225.00	200	Horizontal	Pass
1**	2483.500	44.63	54.0	9.37	AV	225.00	200	Horizontal	Pass
2	2483.900	61.46	74.0	12.54	Peak	227.00	100	Horizontal	Pass
2**	2483.900	45.05	54.0	8.95	AV	227.00	100	Horizontal	Pass

PCB-External Antenna**GFSK LOW CHANNEL**

No.	Frequency (MHz)	Results (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	2361.280	56.34	74.0	17.66	Peak	29.00	200	Horizontal	Pass
1**	2361.280	47.43	54.0	6.57	AV	29.00	200	Horizontal	Pass
2	2390.000	54.95	74.0	19.05	Peak	167.00	300	Horizontal	Pass
2**	2390.000	49.37	54.0	4.63	AV	167.00	300	Horizontal	Pass

GFSK HIGH CHANNEL

No.	Frequency (MHz)	Results (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	2483.500	56.28	74.0	17.72	Peak	2.00	100	Horizontal	Pass
1**	2483.500	45.61	54.0	8.39	AV	2.00	100	Horizontal	Pass
2	2485.852	56.51	74.0	17.49	Peak	121.00	100	Horizontal	Pass
2**	2485.852	46.2	54.0	7.80	AV	121.00	100	Horizontal	Pass

8-DPSK LOW CHANNEL

No.	Frequency (MHz)	Results (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	2361.908	57.31	74.0	16.69	Peak	318.00	200	Horizontal	Pass
1**	2361.908	45.23	54.0	8.77	AV	318.00	200	Horizontal	Pass
2	2390.000	56.39	74.0	17.61	Peak	81.00	300	Horizontal	Pass
2**	2390.000	45.91	54.0	8.09	AV	81.00	300	Horizontal	Pass

8-DPSK HIGH CHANNEL

No.	Frequency (MHz)	Results (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	2483.500	56.39	74.0	17.61	Peak	114.00	200	Horizontal	Pass
1**	2483.500	47.58	54.0	6.42	AV	114.00	200	Horizontal	Pass
2	2486.821	59.35	74.0	14.65	Peak	53.00	200	Horizontal	Pass
2**	2486.821	45.36	54.0	8.64	AV	53.00	200	Horizontal	Pass

ANNEX B TEST SETUP PHOTOS

Please refer the document “BL-SZ2591045-AR.PDF”.

ANNEX C EUT EXTERNAL PHOTOS

Please refer the document “BL-SZ2591045-AW.PDF”.

ANNEX D EUT INTERNAL PHOTOS

Please refer the document “BL-SZ2591045-AI.PDF”.

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