TEST REPORT

Applicant:	Shenzhen Ziwu Chuangxin Technology Co., Ltd.
Address:	Room 225, Office Area, Floor 2, Xing He Ling Chuang Tianxia Phase II, Nankeng Community, Bantian Street, Longgang District, Shenzhen Guangdong, P.R. China
Equipment Type:	RESO PILOT PRO
Model Name:	KR700 (refer to section 2.3)
Brand Name:	Reso
FCC ID:	2BUIA-KR700
Test Standard:	47 CFR Part 15 Subpart C (refer to section 3.1)
Sample Arrival Date:	Apr. 24, 2026
Test Date:	Apr. 29, 2026 - May 19, 2026
Date of Issue:	Jul. 02, 2026

ISSUED BY:

Shenzhen BALUN Technology Co., Ltd.

CERTIFICATION CONSULTING • SOLUTION • SERVICE BALUN

Tested by: Li Renyu

Li Renyu

Checked by: Li Ganming

Li Ganming

Approved by: Tolan Tu

(Testing Director)

Tolan Tu

Revision History

Version	Issue Date	Revisions
Rev. 01	Jul. 02, 2026	Initial Issue

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1 GENERAL INFORMATION

1.1 Test Laboratory

Name	Shenzhen BALUN Technology Co., Ltd.
Address	601, Building 2, Intelligent Connected Vehicle Industrial Park, No.55, Xiangshan Road, Luotian Community, Yanluo Sub-district, Bao'an District, Shenzhen
Phone Number	+86 755 6685 0100

1.2 Test Location

Name	Shenzhen BALUN Technology Co., Ltd.
Location	☐ Building 2, Intelligent Connected Vehicle Industrial Park, No.55, Xiangshan Road, Luotian Community, Yanluo Sub-district, Bao'an District, Shenzhen, Guangdong
	☑ 1/F., Building B, Ganghongji High-Tech Intelligent Industrial Park, No.1008, Songbai Road, Yangguang Community, Xili Subdistrict, Nanshan District, Shenzhen, Guangdong
Accreditation Certificate	The laboratory is a testing organization accredited by FCC as a accredited testing laboratory. The designation number is CN1196.

2 PRODUCT INFORMATION

2.1 Applicant Information

Applicant	Shenzhen Ziwu Chuangxin Technology Co., Ltd.
Address	Room 225, Office Area, Floor 2, Xing He Ling Chuang Tianxia Phase II, Nankeng Community, Bantian Street, Longgang District, Shenzhen Guangdong, P.R. China

2.2 Manufacturer Information

Manufacturer	Shenzhen Ziwu Chuangxin Technology Co., Ltd.
Address	Room 225, Office Area, Floor 2, Xing He Ling Chuang Tianxia Phase II, Nankeng Community, Bantian Street, Longgang District, Shenzhen Guangdong, P.R. China

2.3 General Description for Equipment under Test (EUT)

EUT Name	RESO PILOT PRO
Model Name Under Test	KR700
Series Model Name	KR701 (Product Name: RESO SYNC PRO)
Description of Model name differentiation	All models are same with electrical parameters and internal circuit structure, but only differ in product name and model name. All other functional, electrical, and environmental characteristics are identical between the two bases. The only differences are the mechanical interface dimensions and alignment features required to physically mate with the two distinct host bottom case designs. (this information provided by the applicant)
Hardware Version	V4
Software Version	0.2.4.84
Dimensions (Approx.)	N/A
Weight (Approx.)	N/A

2.4 Technical Information

Network and Wireless connectivity	Bluetooth (BR+EDR+BLE) WIFI 802.11a, 802.11b, 802.11g and 802.11n 2.4G ISM Band, GPS, GLONASS, Galileo, BDS

The requirement for the following technical information of the EUT was tested in this report:

Modulation Technology	FHSS
Modulation Type	GFSK, π/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	PCB Antenna
Antenna Gain	0.8 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	ANSI C63.10-2020	American National Standard for Procedures for Compliance Testing of Unlicensed Wireless Devices
3	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.	Channel	Test Result	Verdict	Remark
1	Antenna Requirement	15.203	N/A	--	Pass	Note [1]
2	Number of Hopping Frequencies	15.247(a)	Hopping Mode	ANNEX A.1	Pass	Note [2]
3	Peak Output Power	15.247(b)	Low/Middle/High	ANNEX A.2	Pass	--
4	Occupied Bandwidth	15.247(a)	Low/Middle/High	ANNEX A.3	Pass	--
5	Carrier Frequency Separation	15.247(a)	Hopping Mode	ANNEX A.4	Pass	Note [2]
6	Time of Occupancy (Dwell time)	15.247(a)	Hopping Mode	ANNEX A.5	Pass	Note [2]
7	Conducted Spurious Emission & Authorized-band band-edge	15.247(d)	Hopping Mode; Low/Middle/High	ANNEX A.6	Pass	Note [2]
8	Conducted Emission	15.207	Low/Middle/High	ANNEX A.7	Pass	Note [2]
9	Radiated Spurious Emission	15.209 15.247(d)	Low/Middle/High	ANNEX A.8	Pass	Note [2]
10	Band Edge(Restricted-band band-edge)	15.209 15.247(d)	Low/High	ANNEX A.9	Pass	Note [2]

Note [1]: The EUT has a permanently and irreplaceable attached antenna, which complies with the requirement FCC 15.203.
Note [2]: π/4-DQPSK is the EDR 2M rate mode, 8-DPSK is the EDR 3M rate mode. The consistency of test results in π/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.

4 GENERAL TEST CONFIGURATIONS

4.1 Test Environments

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

Relative Humidity	41% to 69%	
Atmospheric Pressure	100 kPa to 102 kPa	
Temperature	NT (Normal Temperature)	+18.3℃ to +26.9℃
Working Voltage of the EUT	NV (Normal Voltage)	3.85 V

4.2 Test Equipment List

Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
Spectrum Analyzer	KEYSIGHT	N9020A	MY54420186	2025.05.21	2026.05.20
Power meter	R&S	NRP8S	101498	2025.07.07	2026.07.06
Spectrum Analyzer	KEYSIGHT	N9020A	MY56060127	2025.12.25	2026.12.24
Test Antenna-Horn	A-INFO	LB-180400KF	J211060273	2024.06.15	2027.06.14
Test Antenna-Bi-Log	Schwarzbeck	VULB 9163	01414	2023.11.03	2026.11.02
Test Antenna-Horn	Schwarzbeck	BBHA 9120D	02459	2023.10.26	2026.10.25
Test Antenna-Loop	SCHWARZBECK	FMZB 1519	1519-037	2024.01.23	2027.01.22
Anechoic Chamber	YIHENG	C8-966	N/A	2024.05.12	2027.05.11
EMI Receiver	Keysight	N9038A	MY55330121	2025.12.26	2026.12.25
Filtering unit	balun	SU319F	LW-SZ19D0001F01	N/A	N/A
Switching unit	BALUN	SU319	LW-SZ19D0001S01	N/A	N/A
EMI Receiver	keysight	N9038B	MY61380132	2025.12.26	2026.12.25
LISN	SCHWARZBECK MESS-ELEKTRONIK	NSLK8127	01009	2025.07.15	2026.07.14
Shielded Enclosure	YiHeng Electronic Co., Ltd	4.3m*2.9m*2.4m	235	2024.11.05	2027.11.04

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.

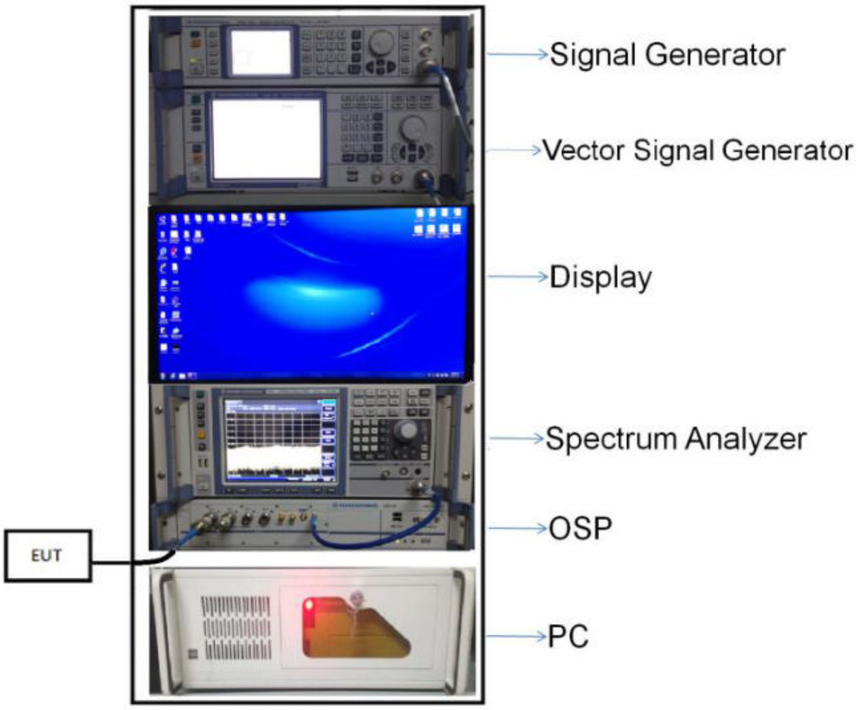
Parameters	Uncertainty
Occupied Channel Bandwidth	2.8%
RF output power, conducted	1.28 dB
Power Spectral Density, conducted	1.30 dB
Unwanted Emissions, conducted	1.84 dB
All emissions, radiated	5.36 dB
Temperature	0.8°C
Humidity	4%

4.5 Description of Test Setup

4.5.1 For Antenna Port Test

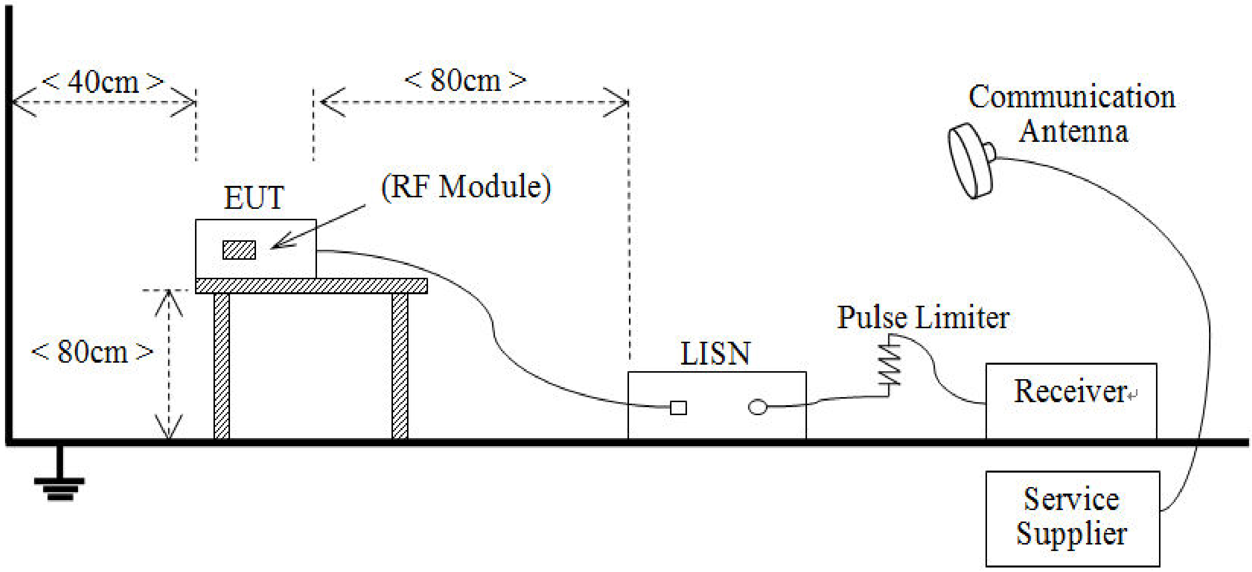
Conducted value (dBm) = Measurement value (dBm) + cable loss (dB)

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



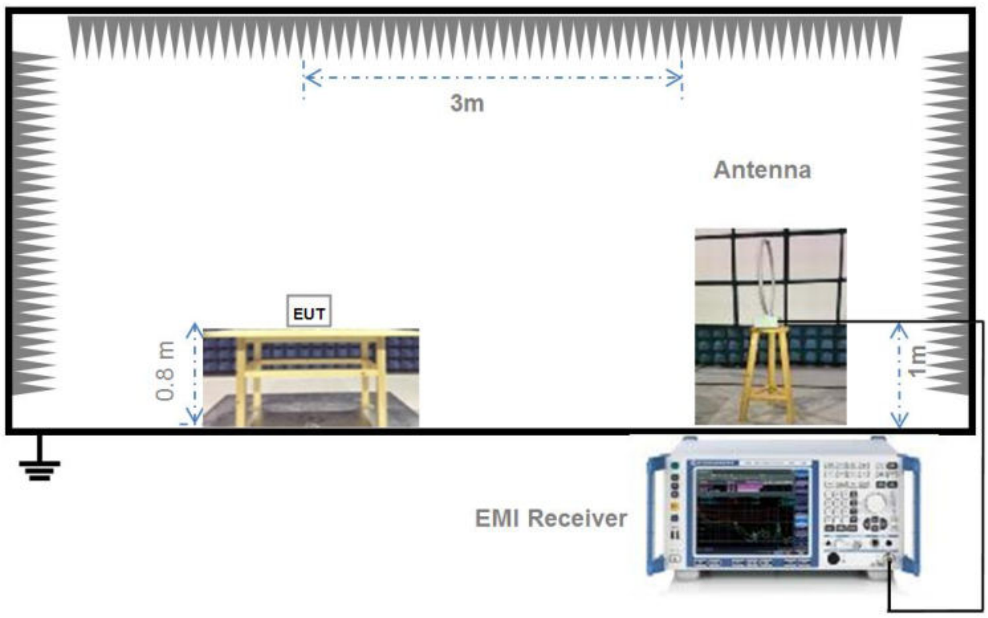
(Diagram 1)

4.5.2 For AC Power Supply Port Test



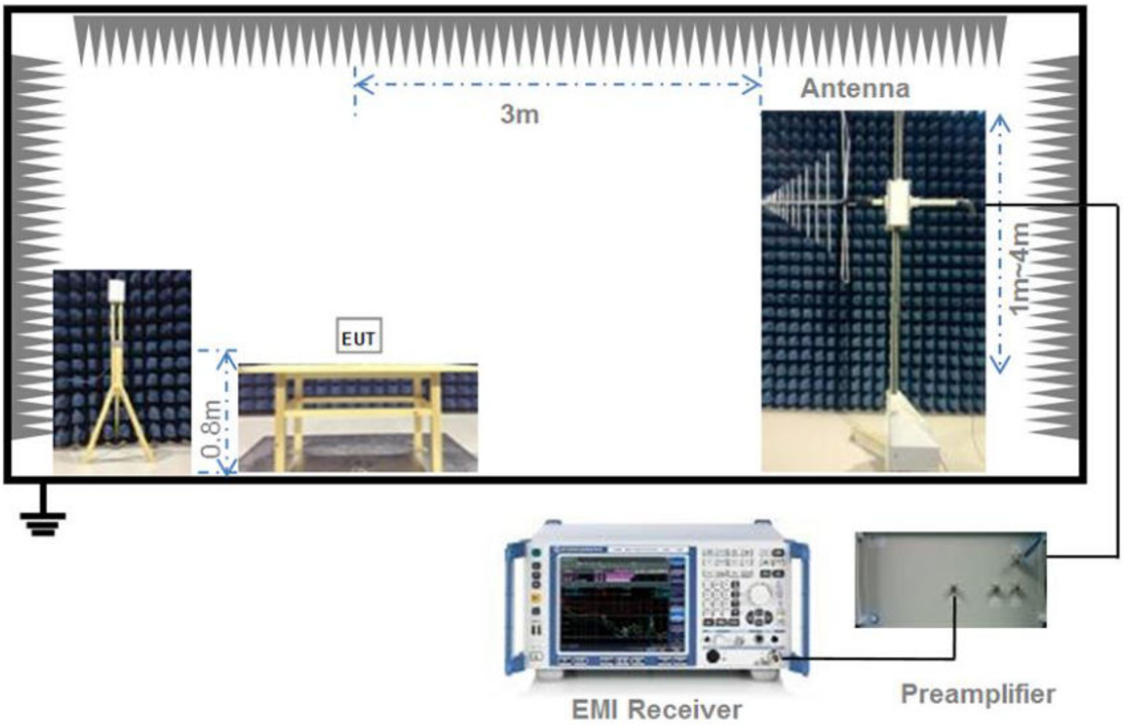
(Diagram 2)

4.5.3 For Radiated Test (Below 30 MHz)



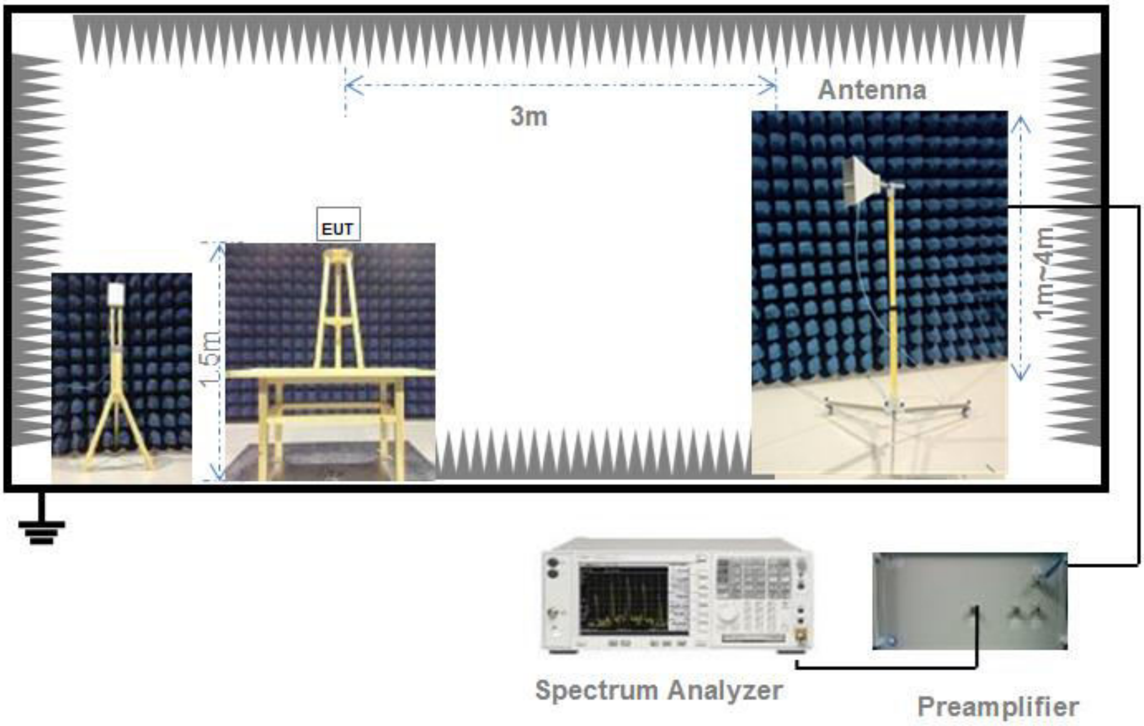
(Diagram 3)

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)
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

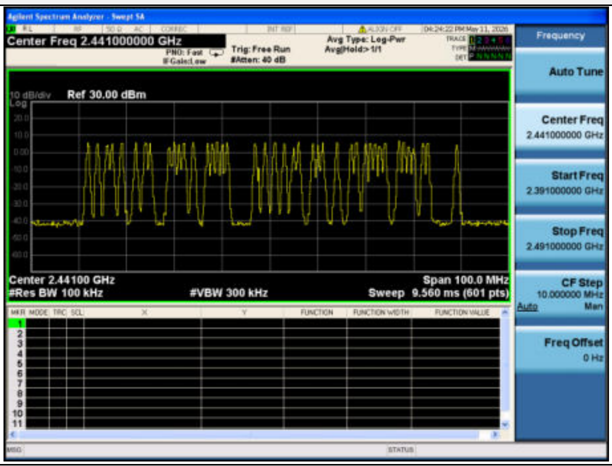
5.2.1 Relevant Standards

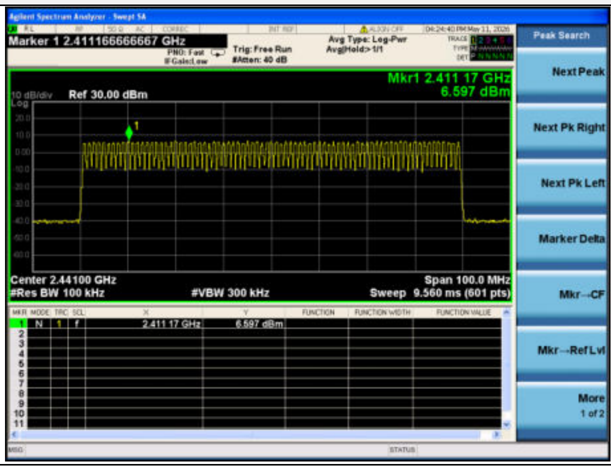
FCC §15.247(a) (1) (i) (ii) (iii) (iv); FCC §15.247(g); FCC §15.247(h);
Describe how the hopping sequence is generated. Provide an example of the hopping sequence channels, to demonstrate that the sequence meets the requirement specified in the definition of an FHSS system. Per the definition in Section 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 bandwith and transmitted bandwith 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)

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 ≥ 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

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.

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 ≥ 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)

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

20dB bandwidth

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 ≥ 3*RBW

Sweep = auto

Detector function = peak

Trace = max hold

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

99% bandwidth

use the following spectrum analyzer settings:

Span = approximately 1.5 to 5 times the 99% bandwidth, centered on a hopping channel

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

VBW ≥ 3*RBW

Sweep = auto

Detector function = peak

Trace = max hold

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

Use the 99% power bandwidth function of the instrument and report the measured bandwidth.

5.5.4 Test Result

Please refer to ANNEX A.3.

5.6 Carrier Frequency Separation

5.6.1 Limit

FCC §15.247(a)

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) ≥ 1% of the span

Video (or Average) Bandwidth (VBW) ≥ 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)

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 ≤ channel spacing and where possible RBW should be set >> 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
{Total of Dwell} = {Pulse Time} * (1600 / 2) / {Number of Hopping Frequency} * {Period}
{Period} = 0.4 s * {Number of Hopping Frequency}
For DH3 package type
{Total of Dwell} = {Pulse Time} * (1600 / 4) / {Number of Hopping Frequency} * {Period}
{Period} = 0.4 s * {Number of Hopping Frequency}
For DH5 package type
{Total of Dwell} = {Pulse Time} * (1600 / 6) / {Number of Hopping Frequency} * {Period}
{Period} = 0.4 s * {Number of Hopping Frequency}
For AFH Mode:
For DH1 package type
{Total of Dwell} = {Pulse Time} * (800 / 2) / {Number of Hopping Frequency} * {Period}

{Period} = 0.4 s * {Number of Hopping Frequency}
For DH3 package type
{Total of Dwell} = {Pulse Time} * (800 / 4) / {Number of Hopping Frequency} * {Period}
{Period} = 0.4 s * {Number of Hopping Frequency}
For DH5 package type
{Total of Dwell} = {Pulse Time} * (800 / 6) / {Number of Hopping Frequency} * {Period}
{Period} = 0.4 s * {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)

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

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 50μH/50Ω line impedance stabilization network (LISN).

Frequency range (MHz)	Conducted Limit (dBμV)	
	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)

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

Since the emission limits are specified in terms of radiated field strength levels, measurements performed to demonstrate compliance have traditionally relied on a radiated test configuration. Radiated measurements remain the principal method for demonstrating compliance to the specified limits; however antenna-port conducted measurements are also now acceptable to demonstrate compliance (see below for details). When radiated measurements are utilized, test site requirements and procedures for maximizing and measuring radiated emissions that are described in ANSI C63.10 shall be followed.

Antenna-port conducted measurements may also be used as an alternative to radiated measurements for demonstrating compliance in the restricted frequency bands. If conducted measurements are performed, then proper impedance matching must be ensured and an additional radiated test for cabinet/case spurious emissions is required.

General Procedure for conducted measurements in restricted bands

a) Measure the conducted output power (in dBm) using the detector specified (see guidance regarding measurement procedures for determining quasi-peak, peak, and average conducted output power, respectively).

b) Add the maximum transmit antenna gain (in dBi) to the measured output power level to determine the EIRP level (see guidance on determining the applicable antenna gain)

c) Add the appropriate maximum ground reflection factor to the EIRP level (6 dB for frequencies ≤ 30 MHz, 4.7 dB for frequencies between 30 MHz and 1000 MHz, inclusive and 0 dB for frequencies > 1000 MHz).

d) For devices with multiple antenna-ports, measure the power of each individual chain and sum the EIRP of all chains in linear terms (e.g., Watts, mW).

e) Convert the resultant EIRP level to an equivalent electric field strength using the following relationship:

$E = EIRP – 20\log D + 104.8$

where:

E = electric field strength in dBμV/m,

EIRP = equivalent isotropic radiated power in dBm

D = specified measurement distance in meters.

f) Compare the resultant electric field strength level to the applicable limit.

g) Perform radiated spurious emission test.

Quasi-Peak measurement procedure

The specifications for measurements using the CISPR quasi-peak detector can be found in Publication 16 of the International Special Committee on Radio Frequency Interference (CISPR) of the International Electrotechnical Commission.

As an alternative to CISPR quasi-peak measurement, compliance can be demonstrated to the applicable emission limits using a peak detector.

Peak power measurement procedure

Peak emission levels are measured by setting the instrument as follows:

a) RBW = as specified in Table 1.

b) VBW ≥ 3 x RBW.

c) Detector = Peak.

d) Sweep time = auto.

e) Trace mode = max hold.

f) Allow sweeps to continue until the trace stabilizes. (Note that the required measurement time may be longer for low duty cycle applications).

Table 1—RBW as a function of frequency

Frequency	RBW
9-150 kHz	200-300 Hz
0.15-30 MHz	9-10 kHz
30-1000 MHz	100-120 kHz
> 1000 MHz	1 MHz

If the peak-detected amplitude can be shown to comply with the average limit, then it is not necessary to perform a separate average measurement.

Trace averaging across on and off times of the EUT transmissions followed by duty cycle correction

If continuous transmission of the EUT (i.e., duty cycle ≥ 98 percent) cannot be achieved and the duty cycle is constant (i.e., duty cycle variations are less than ± 2 percent), then the following procedure shall be used:

a) The EUT shall be configured to operate at the maximum achievable duty cycle.

b) Measure the duty cycle, x, of the transmitter output signal as described in section 6.0.

c) RBW = 1 MHz (unless otherwise specified).

d) VBW ≥ 3 x RBW.

e) Detector = RMS, if span/(# of points in sweep) ≤ (RBW/2). Satisfying this condition may require increasing the number of points in the sweep or reducing the span. If this condition cannot be satisfied, then the detector mode shall be set to peak.

f) Averaging type = power (i.e., RMS).

1) As an alternative, the detector and averaging type may be set for linear voltage averaging.

2) Some instruments require linear display mode in order to use linear voltage averaging. Log or dB averaging shall not be used.

g) Sweep time = auto.

h) Perform a trace average of at least 100 traces.

i) A correction factor shall be added to the measurement results prior to comparing to the emission limit in order to compute the emission level that would have been measured had the test been performed at 100 percent duty cycle. The correction factor is computed as follows:

1) If power averaging (RMS) mode was used in step f), then the applicable correction factor is 10 log(1/x), where x is the duty cycle.

2) If linear voltage averaging mode was used in step f), then the applicable correction factor is 20 log(1/x), where x is the duty cycle.

3) If a specific emission is demonstrated to be continuous (≥ 98 percent duty cycle) rather than turning on and off with the transmit cycle, then no duty cycle correction is required for that emission.

NOTE: Reduction of the measured emission amplitude levels to account for operational duty factor is not permitted. Compliance is based on emission levels occurring during transmission - not on an average across on and off times of the transmitter.

Determining the applicable transmit antenna gain

A conducted power measurement will determine the maximum output power associated with a restricted band emission; however, in order to determine the associated EIRP level, the gain of the transmitting antenna (in dBi) must be added to the measured output power (in dBm).

Since the out-of-band characteristics of the EUT transmit antenna will often be unknown, the use of a conservative antenna gain value is necessary. Thus, when determining the EIRP based on the measured conducted power, the upper bound on antenna gain for a device with a single RF output shall be selected as the maximum in-band gain of the antenna across all operating bands, or 2 dBi, whichever is greater. However, for devices that operate in multiple frequency bands while using the same transmit antenna, the highest gain of the antenna within the operating band nearest in frequency to the restricted band emission being measured may be used in lieu of the overall highest gain when the emission is at a frequency that is within 20 percent of the nearest band edge frequency, but in no case shall a value less than 2 dBi be used.

See KDB 662911 for guidance on calculating the additional array gain term when determining the effective antenna gain for a EUT with multiple outputs occupying the same or overlapping frequency ranges in the same band.

Radiated spurious emission test

An additional consideration when performing conducted measurements of restricted band emissions is that unwanted emissions radiating from the EUT cabinet, control circuits, power leads, or intermediate circuit elements will likely go undetected in a conducted measurement configuration. To address this concern, a radiated test shall be performed to ensure that emissions emanating from the EUT cabinet (rather than the antenna port) also comply with the applicable limits.

For these cabinet radiated spurious emission measurements the EUT transmit antenna may be replaced with a termination matching the nominal impedance of the antenna. Procedures for performing radiated measurements are specified in ANSI C63.10. All detected emissions shall comply with the applicable limits.

The measurement frequency range is from 30 MHz 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 ≥ 1 GHz, 100 kHz for f < 1 GHz
VBW ≥ RBW
Sweep = auto
Detector function = peak
Trace = max hold

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 following procedures may be used to determine the average field strength or power of an unwanted emission that is within 2 MHz of the authorized band-edge. Use the procedure described in 11.12.3.2.2 when using an average detector and the EUT can be configured to transmit continuously (i.e., $D \geq 98\%$). Use the procedure described in 11.12.3.2.3 when using an average detector and the EUT cannot be configured to transmit continuously but the duty cycle is constant (i.e., duty cycle variations are less than ±2%). Use the procedure described in 11.12.3.2.4 when using an average detector for those cases where the EUT cannot be configured to transmit continuously and the duty cycle is not constant (duty cycle variations equal or exceed 2%).
If the EUT can be configured or modified to transmit continuously (D ≥ 98%), measured using the following method (with EUT transmitting continuously):

Use the following spectrum analyzer settings:

Set instrument center frequency to the frequency of the emission to be measured (must be within

2 MHz of the authorized band-edge).

RBW = 100 kHz.

VBW ≥ [3 × RBW].

Detector = Power averaging (rms), if [span / (# of points in sweep)] ≤ (RBW / 2).

Averaging type = power (i.e., rms):

As an alternative, the detector and averaging type may be set for linear voltage averaging.

Some instruments require linear display mode to use linear voltage averaging. Log or dB

averaging shall not be used.

Sweep time = auto.

Perform a trace average of at least 100 traces.

Compute the power by integrating the spectrum over 1 MHz using the analyzer’s band-power measurement function with band limits set equal to the emission frequency (femission) ± 0.5 MHz. If the instrument does not have a band-power function, then sum the amplitude levels (in power units) at 100 kHz intervals extending across the 1 MHz spectrum defined by femission) ± 0.5 MHz.

If continuous transmission of the EUT (D ≥ 98%) cannot be achieved and the duty cycle is constant (duty cycle variations are less ±2%), then the following procedure may be used to measure the average power of unwanted emissions within 2 MHz of the authorized band-edge:

RBW = 100 kHz.

VBW ≥ [3 × RBW].

Detector = Power averaging (rms), if [span / (# of points in sweep)] ≤ (RBW / 2).

Averaging type = power (i.e., rms):

Detector = Power averaging (rms), if [span / (# of points in sweep)] ≤ (RBW / 2). Satisfying this condition might require increasing the number of points in the sweep or reducing the span. If this condition cannot be satisfied, then the detector mode shall be set to peak.

Averaging type = power (i.e., rms):

1)As an alternative, the detector and averaging type may be set for linear voltage averaging

2)Some instruments require linear display mode to use linear voltage averaging. Log or dB averaging shall not be used.

Sweep time = auto.

Perform a trace average of at least 100 traces.

Compute the power by integrating the spectrum over 1 MHz using the instrument's band-power measurement function with band limits set equal to the emission frequency (femission) ± 0.5 MHz. If the spectrum analyzer does not have a band-power function, then sum the amplitude levels (in power units) at 100 kHz intervals extending across the 1 MHz spectrum defined by femission ± 0.5 MHz.

A correction factor shall be added to the measurement results prior to comparing with the emission limit to compute the emission level that would have been measured had the test been performed at 100% duty cycle. The correction factor is computed as follows:

1) If power averaging (rms) mode was used in step f), then the applicable correction factor is [10 log (1 / D)], where D is the duty cycle.

2) If linear voltage averaging mode was used in step f), then the applicable correction factor is [20 log (1 / D)], where D is the duty cycle.

3) If a specific emission is demonstrated to be continuous (D ≥ 98%) rather than turning ON and

OFF with the transmit cycle, then no duty cycle correction is required for that emission.

Reduction of the measured emission amplitude levels to account for operational duty cycle is not permitted. Determining compliance is based on emission levels occurring during transmission—it is not based on an average across ON and OFF times of the transmitter.

5.11.4 Test Result

Please refer to ANNEX A.9.

ANNEX A TEST RESULT

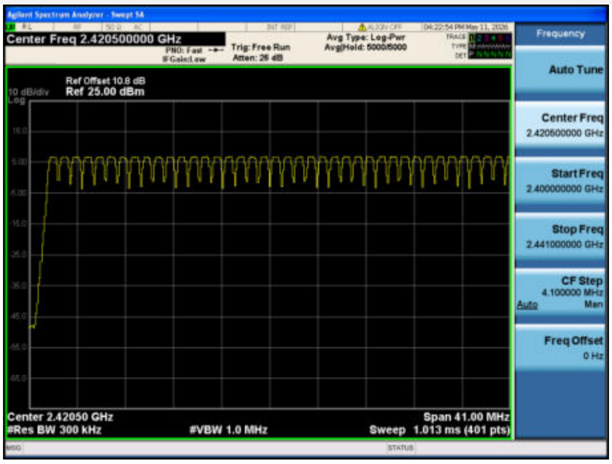
A.1 Number of Hopping Frequency

Test Data

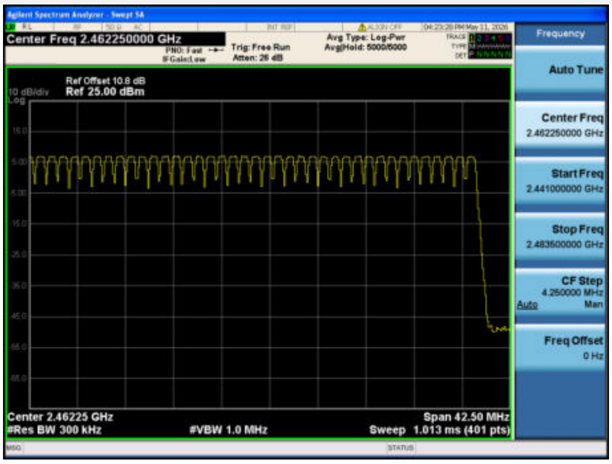
Test Mode	Frequency Block (MHz)	Measured Channel Numbers	Min. Limit	Verdict
GFSK	2400 - 2483.5	79	15	Pass
8-DPSK	2400 - 2483.5	79	15	Pass

Test Plots

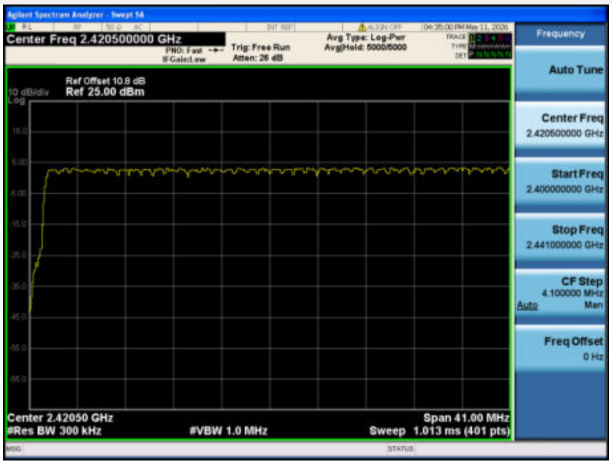
GFSK 2.4 GHz ~ 2.4415 GHz



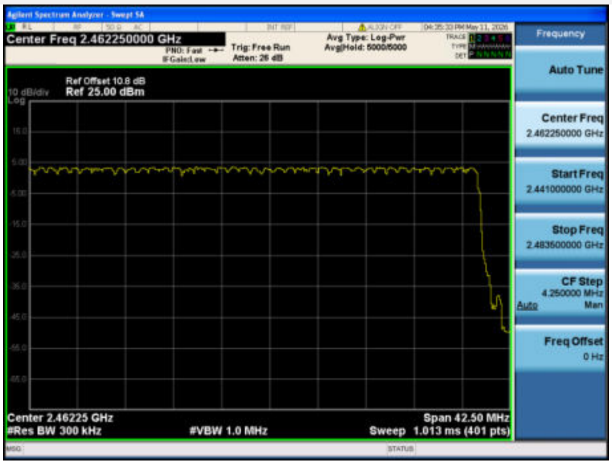
GFSK 2.4415 GHz ~ 2.4835 GHz



8-DPSK 2.4 GHz ~ 2.4415 GHz



8-DPSK 2.4415 GHz ~ 2.4835 GHz



A.2 Peak Output Power

Peak Power Test Data

Channel	Measured Output Peak Power						Limit		Verdict
	GFSK		π/4-DQPSK		8-DPSK		dBm	mW	
	dBm	mW	dBm	mW	dBm	mW			
Low	6.81	4.80	5.94	3.93	6.60	4.57	21	125	Pass
Middle	6.92	4.92	6.23	4.20	6.80	4.78			Pass
High	6.85	4.84	6.20	4.17	6.79	4.78			Pass

Test Plots

GFSK LOW CHANNEL

GFSK MIDDLE CHANNEL

GFSK HIGH CHANNEL

π/4-DQPSK LOW CHANNEL

π/4-DQPSK MIDDLE CHANNEL

π/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	1.049800	0.933740
Middle	1.049800	0.939580
High	1.049800	0.933260
π/4-DQPSK		
Channel	20 dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	1.297400	1.186000
Middle	1.297400	1.185900
High	1.297400	1.185700
8-DPSK		
Channel	20 dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	1.290000	1.181900
Middle	1.290000	1.182600
High	1.290000	1.184300

Test Plots

20 dB Bandwidth

GFSK LOW CHANNEL

GFSK MIDDLE CHANNEL

GFSK HIGH CHANNEL

π/4-DQPSK LOW CHANNEL

π/4-DQPSK MIDDLE CHANNEL

π/4-DQPSK HIGH CHANNEL

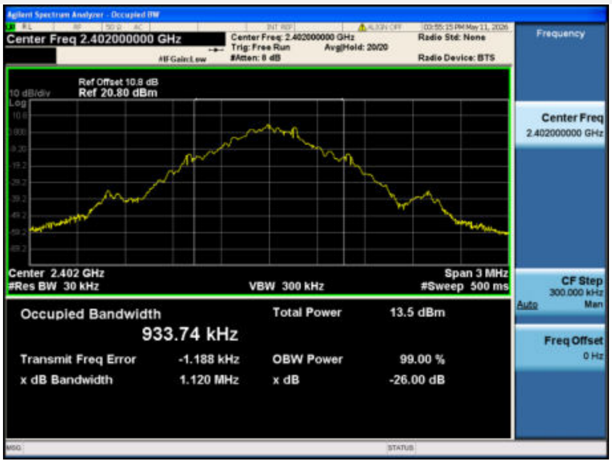
8-DPSK LOW CHANNEL

8-DPSK MIDDLE CHANNEL

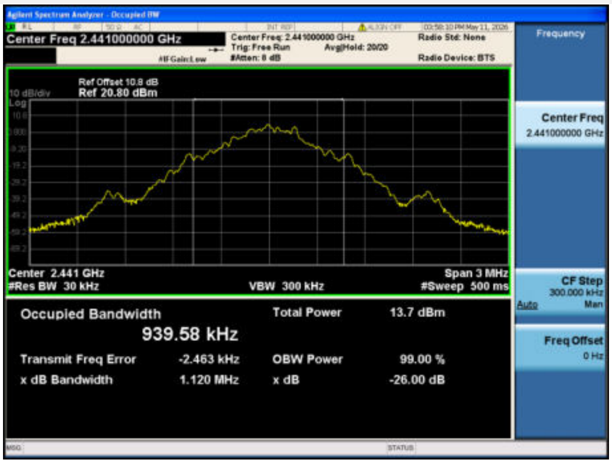
8-DPSK HIGH CHANNEL

99% Bandwidth

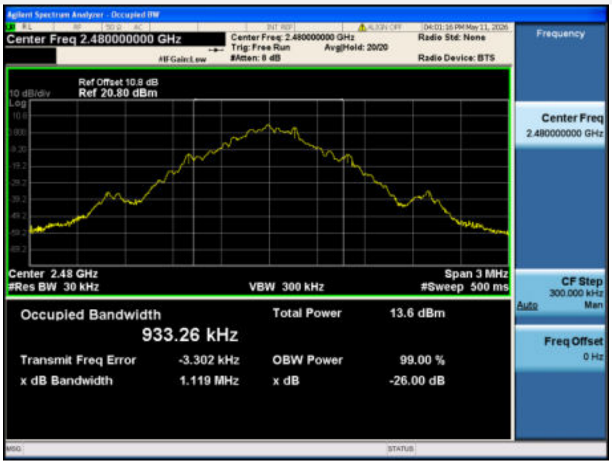
GFSK LOW CHANNEL



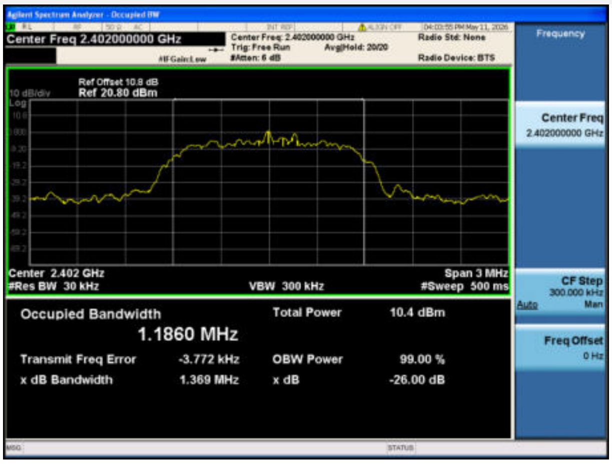
GFSK MIDDLE CHANNEL



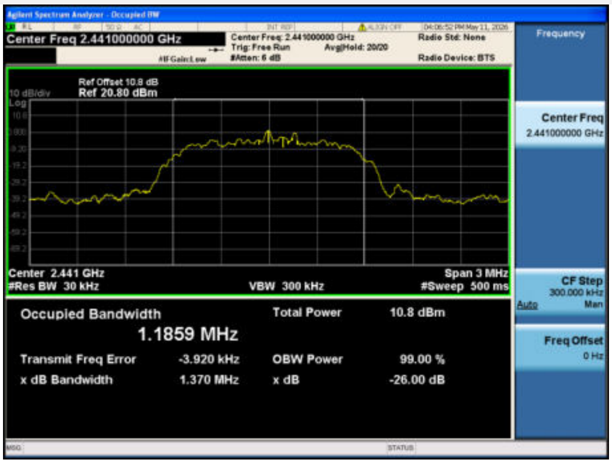
GFSK HIGH CHANNEL



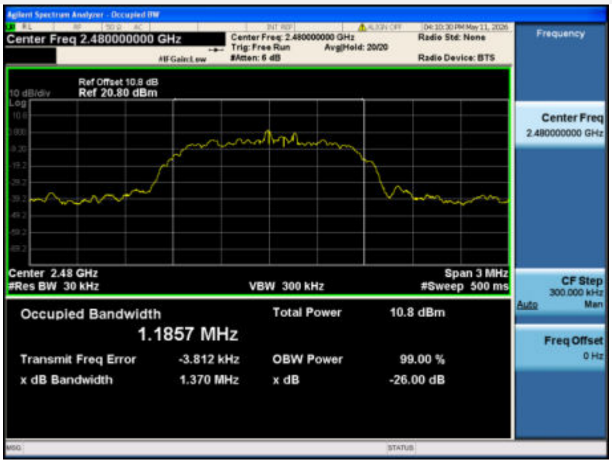
π/4-DQPSK LOW CHANNEL



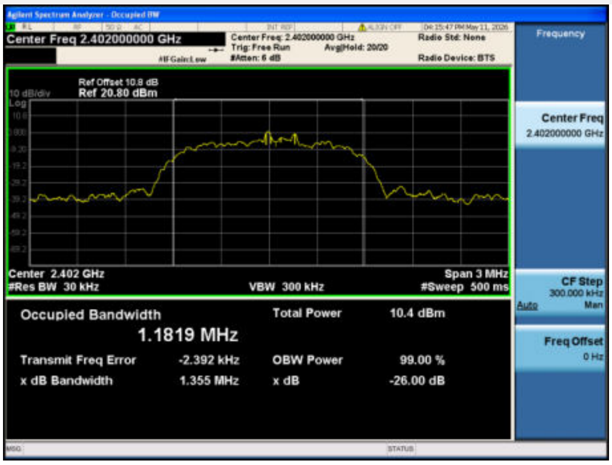
π/4-DQPSK MIDDLE CHANNEL



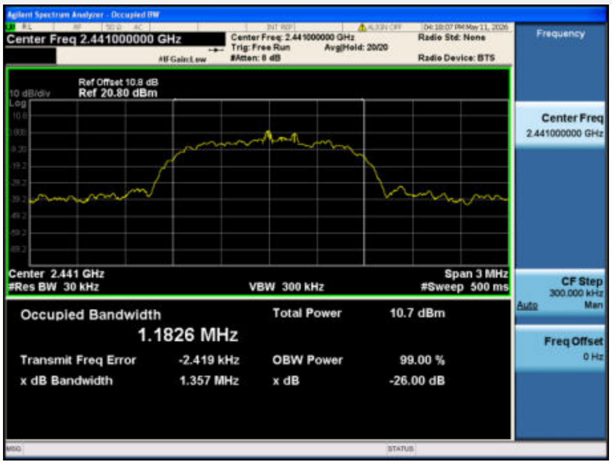
π/4-DQPSK HIGH CHANNEL



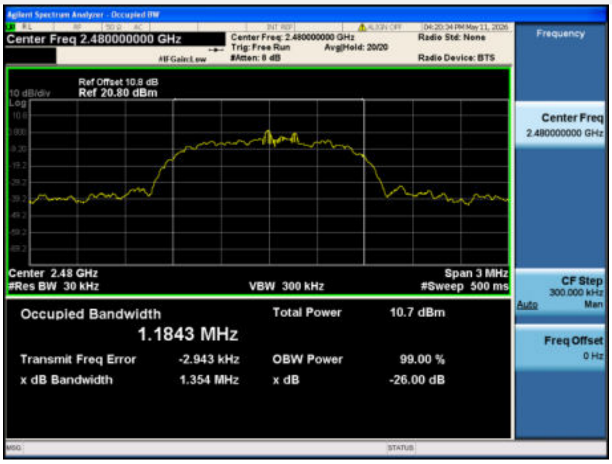
8-DPSK LOW CHANNEL



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	1.005	0.700	Pass
8-DPSK	1.010	0.860	Pass

Test Plots

GFSK

8-DPSK

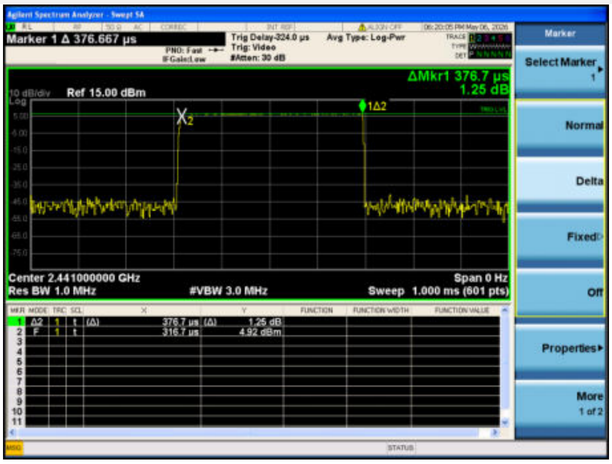
A.5 Average Time of Occupancy

Test Data

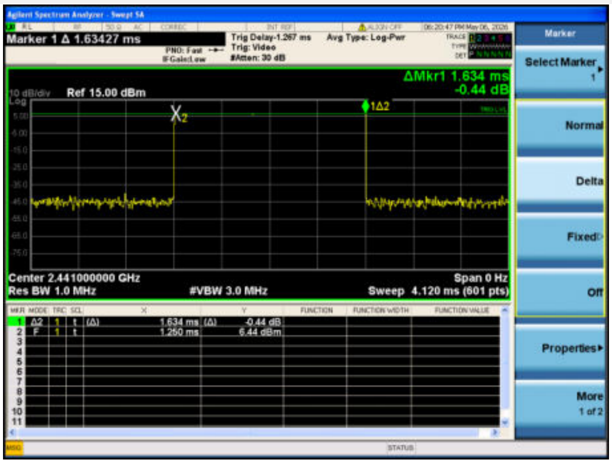
GFSK				
DH Packet	Pulse Width (ms)	Total of Dwell (ms)	Limit (sec)	Verdict
DH 1	0.37670	120.544	0.4	Pass
DH 3	1.63400	261.440	0.4	Pass
DH 5	2.88800	308.053	0.4	Pass
8-DPSK				
DH Packet	Pulse Width (ms)	Total of Dwell (ms)	Limit (sec)	Verdict
3DH 1	0.38670	123.744	0.4	Pass
3DH 3	1.63400	261.440	0.4	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	0.37600	60.160	0.4	Pass
DH 3	1.63400	130.720	0.4	Pass
DH 5	2.87600	153.387	0.4	Pass

Test Plots

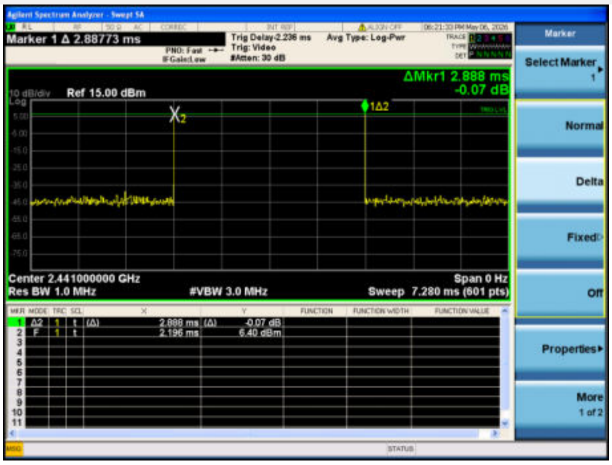
GFSK DH1



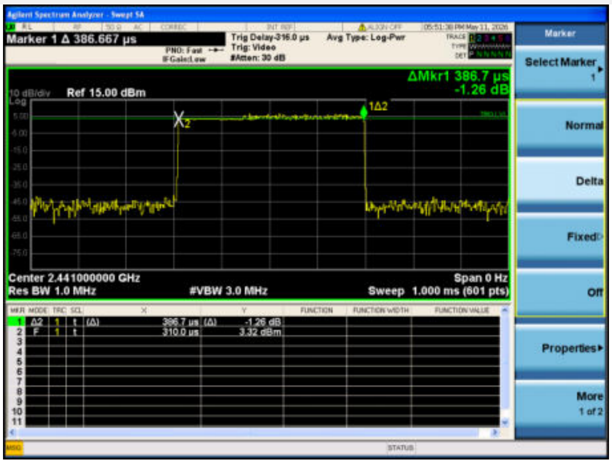
GFSK DH3



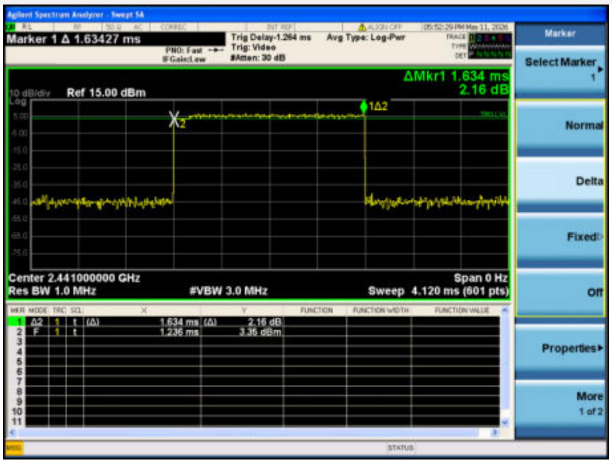
GFSK DH5



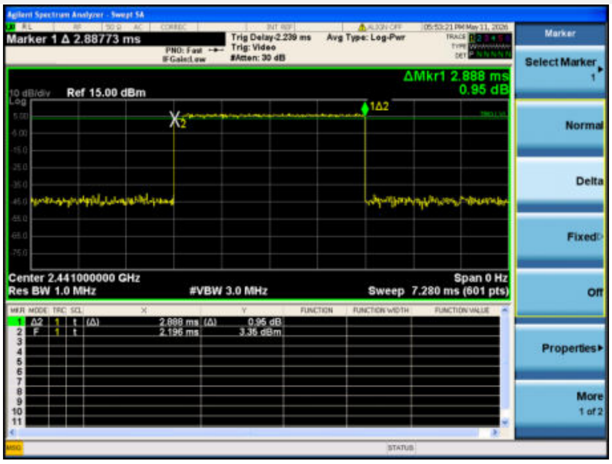
8-DPSK 3DH1



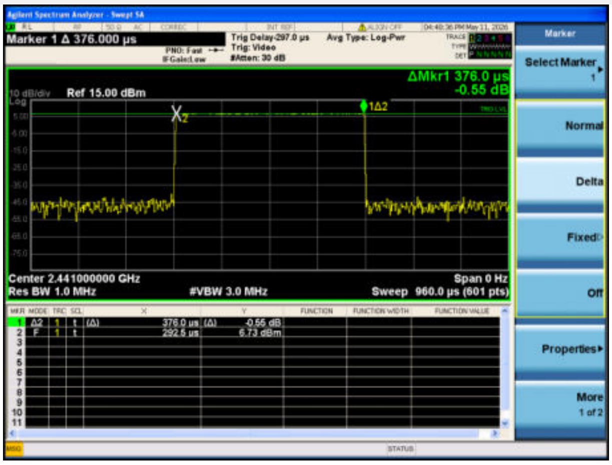
8-DPSK 3DH3



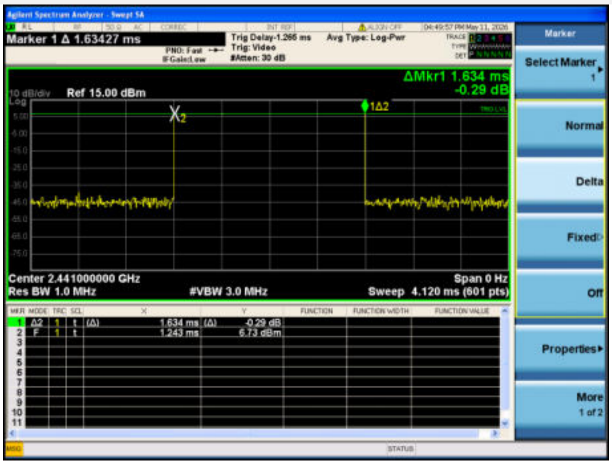
8-DPSK 3DH5



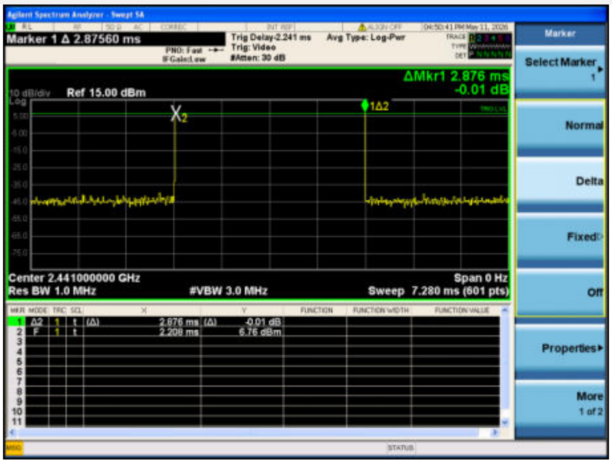
AFH Mode DH1



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	-36.65	6.49	-13.51	Pass
Middle	-36.09	6.61	-13.39	Pass
High	-36.14	6.50	-13.50	Pass
8-DPSK				
Channel	Measured Max. Out of Band Emission (dBm)	Limit (dBm)		Verdict
		Carrier Level	Calculated 20 dBc Limit	
Low	-36.38	2.66	-17.34	Pass
Middle	-36.77	2.98	-17.02	Pass
High	-36.61	3.02	-16.98	Pass

Hopping Mode				
Mode	Measured Max. Out of Band Emission (dBm)	Limit (dBm)		Verdict
		Carrier Level	Calculated 20 dBc Limit	
GFSK	-25.72	6.60	-13.40	Pass
8-DPSK	-25.91	3.07	-16.93	Pass

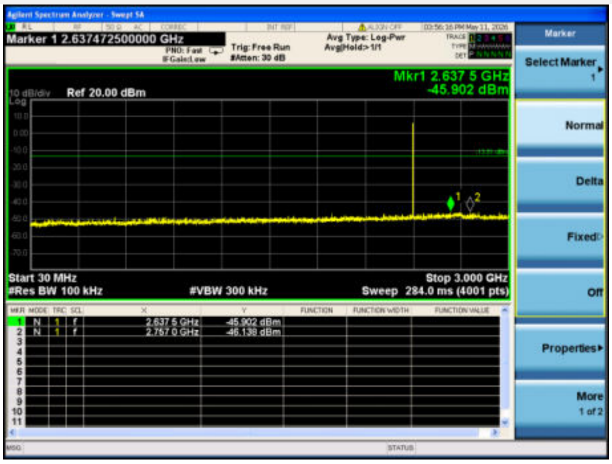
Test Plots

GFSK LOW CHANNEL, CARRIER LEVEL

GFSK LOW CHANNEL, BAND EDGE

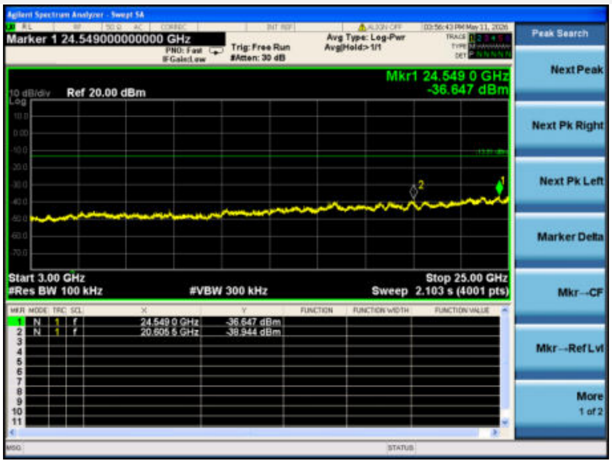
GFSK LOW CHANNEL, SPURIOUS

30 MHz ~ 3 GHz



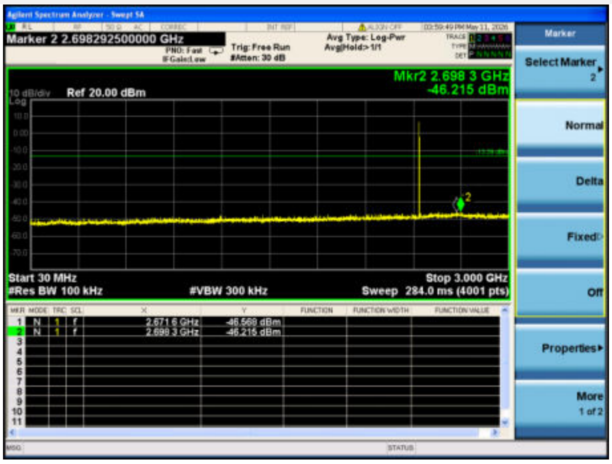
GFSK LOW CHANNEL, SPURIOUS

3 GHz ~ 25 GHz

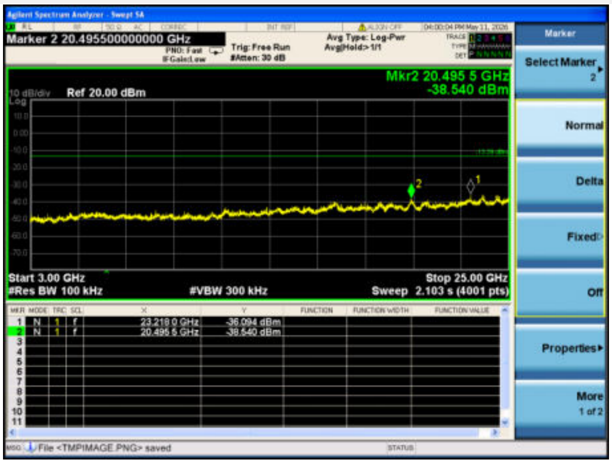


GFSK MIDDLE CHANNEL, CARRIER LEVEL

GFSK MIDDLE CHANNEL, SPURIOUS
30 MHz ~ 3 GHz

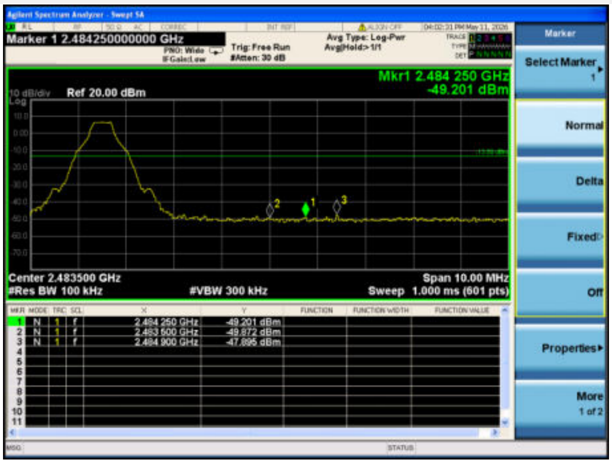


GFSK MIDDLE CHANNEL, SPURIOUS
3 GHz ~ 25 GHz

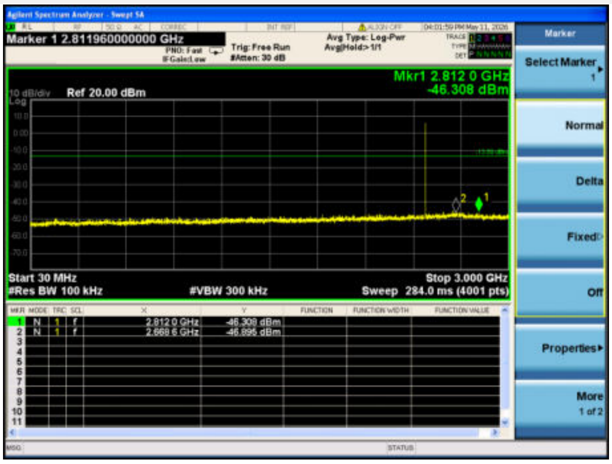


GFSK HIGH CHANNEL, CARRIER LEVEL

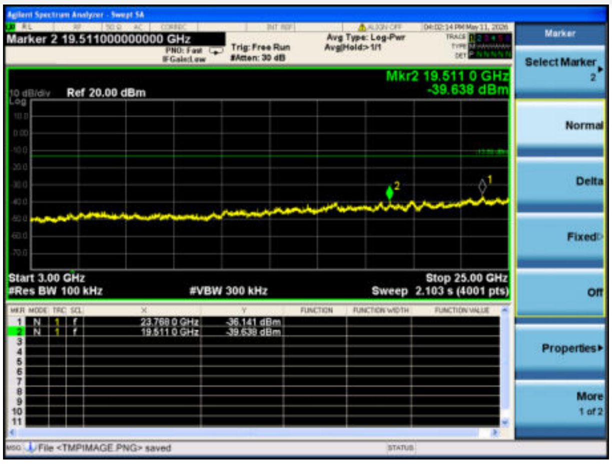
GFSK HIGH CHANNEL, BAND EDGE



GFSK HIGH CHANNEL, SPURIOUS
30 MHz ~ 3 GHz



GFSK HIGH CHANNEL, SPURIOUS
3 GHz ~ 25 GHz

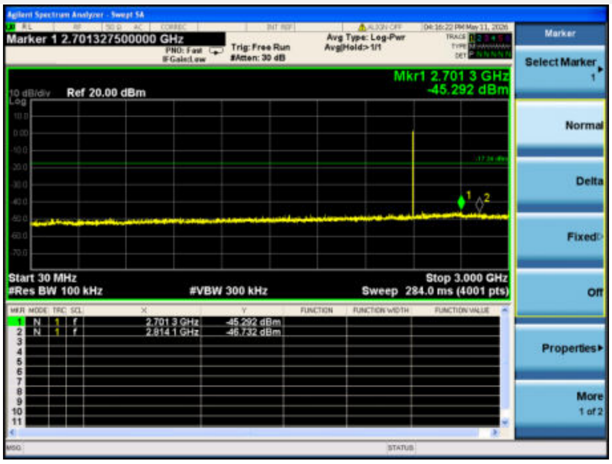


8-DPSK LOW CHANNEL, CARRIER LEVEL

8-DPSK LOW CHANNEL, BAND EDGE

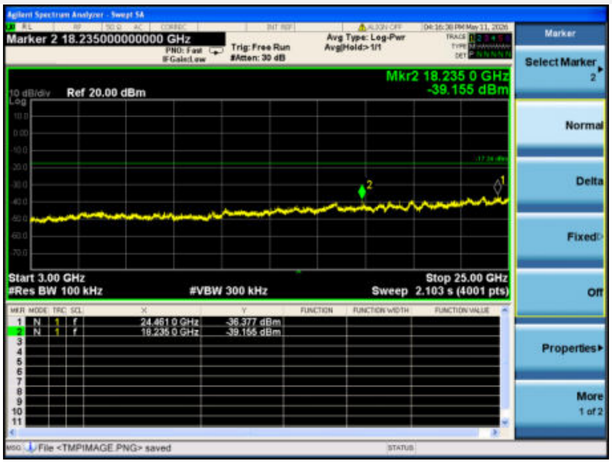
8-DPSK LOW CHANNEL, SPURIOUS

30 MHz ~ 3 GHz



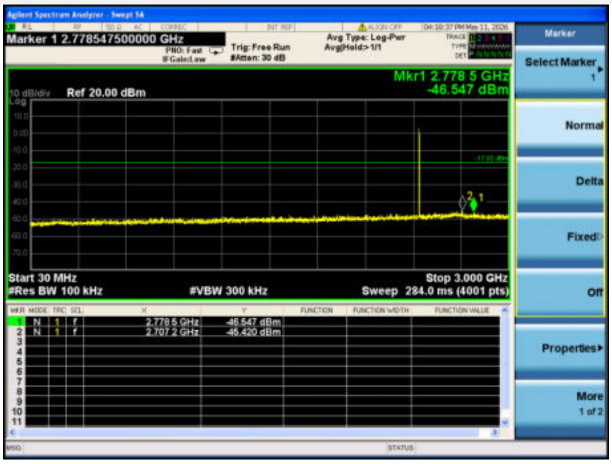
8-DPSK LOW CHANNEL, SPURIOUS

3 GHz ~ 25 GHz

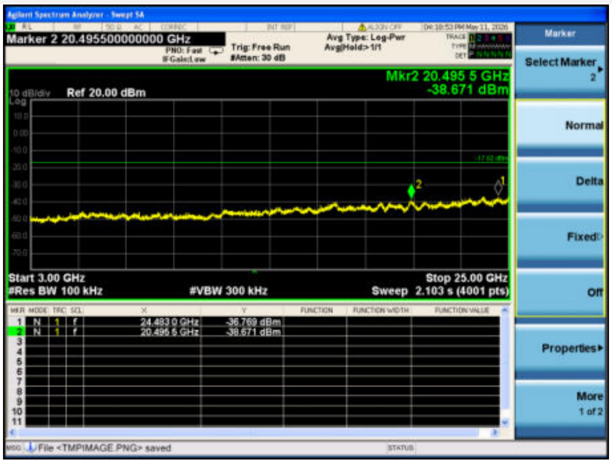


8-DPSK MIDDLE CHANNEL, CARRIER LEVEL

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



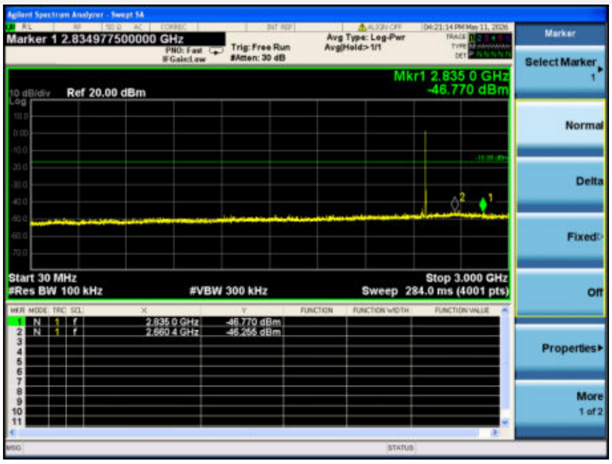
8-DPSK MIDDLE CHANNEL, SPURIOUS
3 GHz ~ 25 GHz



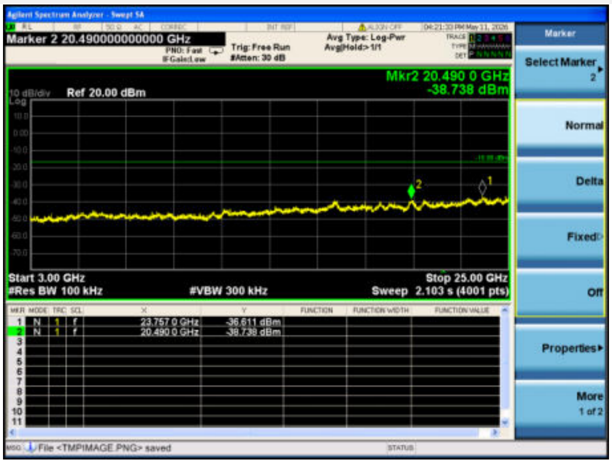
8-DPSK HIGH CHANNEL, CARRIER LEVEL

8-DPSK HIGH CHANNEL, BAND EDGE

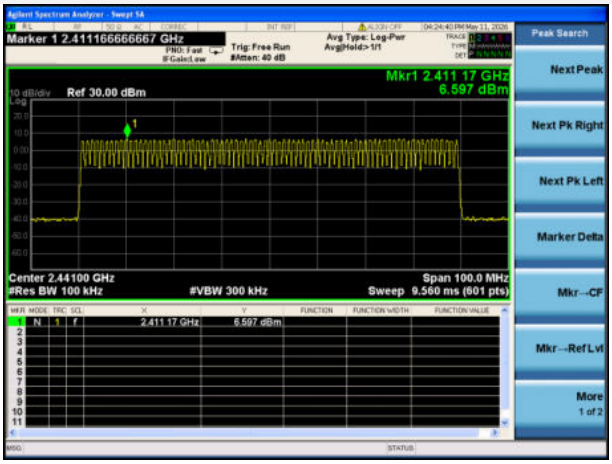
8-DPSK HIGH CHANNEL, SPURIOUS
30 MHz ~ 3 GHz



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



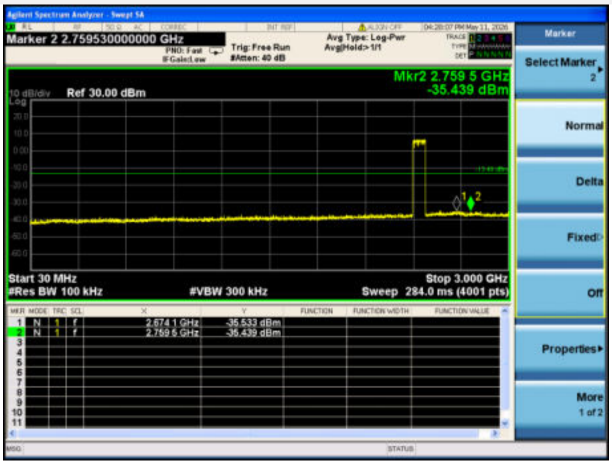
GFSK HOPPING, CARRIER LEVEL



GFSK HOPPING BAND EDGE (LOW)

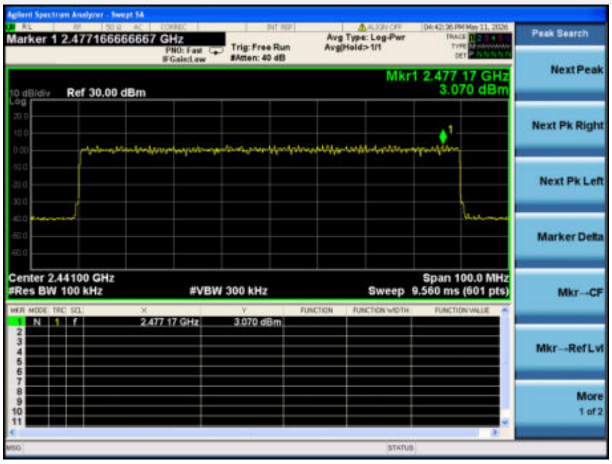
GFSK HOPPING BAND EDGE (HIGH)

GFSK Hopping Mode, SPURIOUS
30 MHz ~ 3 GHz



GFSK Hopping Mode, SPURIOUS
3GHz ~ 25 GHz

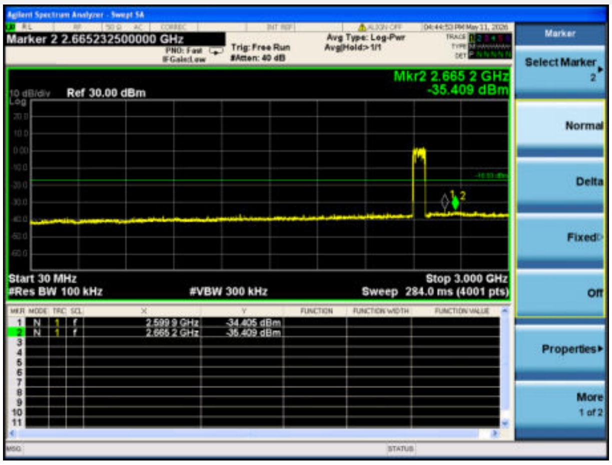
8-DPSK HOPPING, CARRIER LEVEL



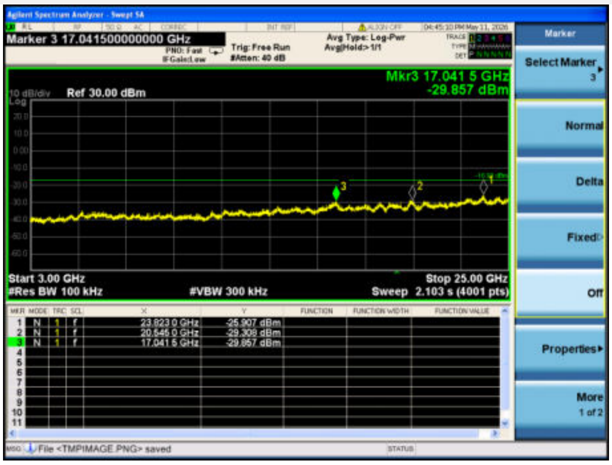
8-DPSK Hopping BAND EDGE (LOW)

8-DPSK Hopping BAND EDGE (HIGH)

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



8-DPSK Hopping Mode, SPURIOUS
3GHz ~ 25 GHz



A.7 Conducted Emissions

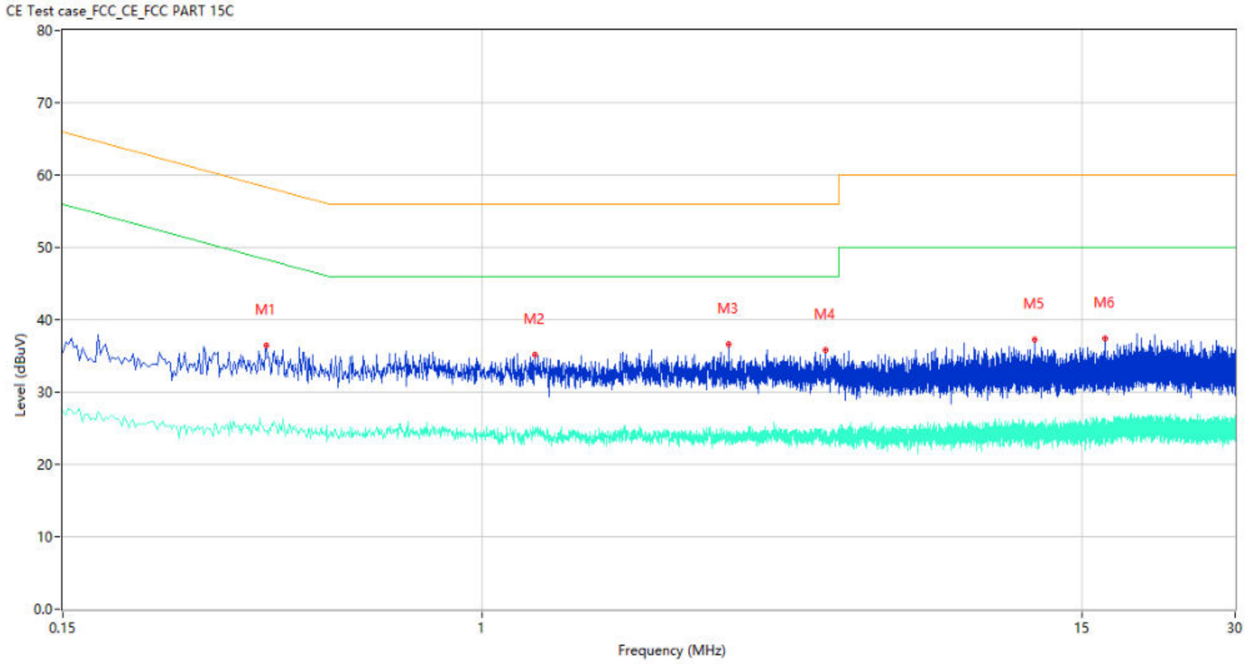
Note [1]: The EUT is working in the Normal link mode. All modes have been tested and normal link mode is worst.

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)

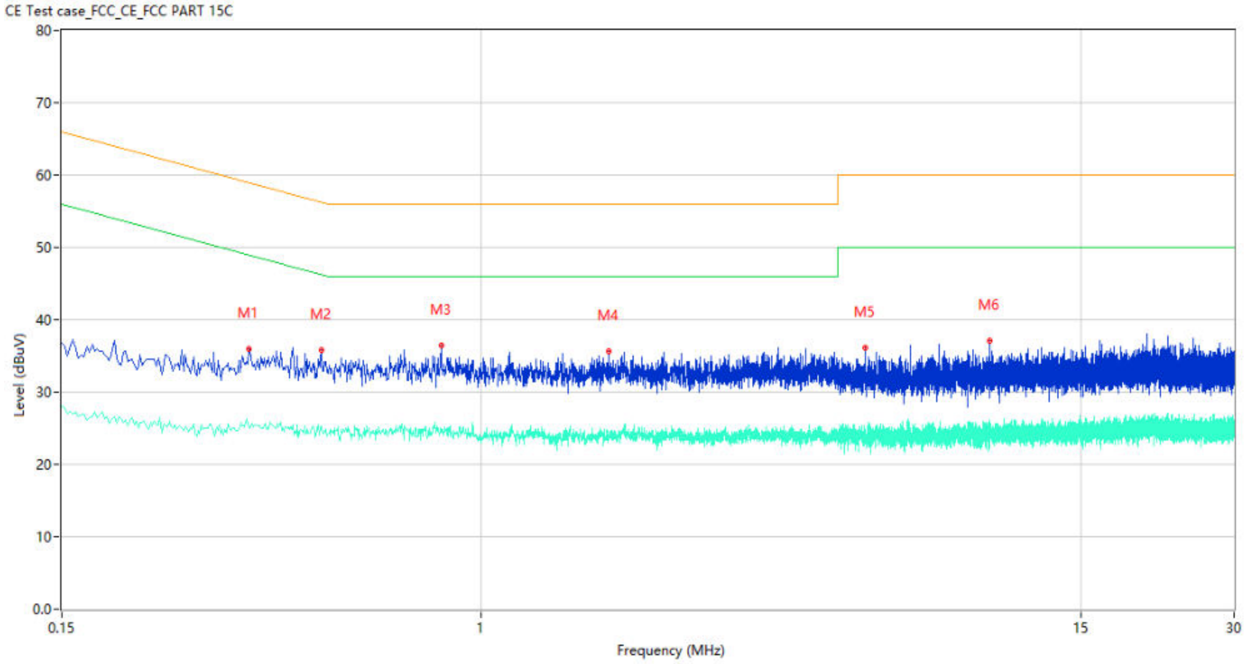
Test Data and Plots

PHASE L



No.	Frequency (MHz)	Results (dBuV)	Factor (dB)	Limit (dBuV)	Margin (dB)	Detector	Line	Verdict
1	0.376	36.52	10.71	58.37	21.85	Peak	L	Pass
1**	0.376	24.75	10.71	48.37	23.62	AV	L	Pass
2	1.266	35.22	10.53	56.00	20.78	Peak	L	Pass
2**	1.266	24.85	10.53	46.00	21.15	AV	L	Pass
3	3.042	36.54	10.17	56.00	19.46	Peak	L	Pass
3**	3.042	24.36	10.17	46.00	21.64	AV	L	Pass
4	4.714	35.86	10.18	56.00	20.14	Peak	L	Pass
4**	4.714	24.73	10.18	46.00	21.27	AV	L	Pass
5	12.134	37.23	10.48	60.00	22.77	Peak	L	Pass
5**	12.134	23.17	10.48	50.00	26.83	AV	L	Pass
6	16.694	37.49	10.75	60.00	22.51	Peak	L	Pass
6**	16.694	24.72	10.75	50.00	25.28	AV	L	Pass

PHASE N



No.	Frequency (MHz)	Results (dBuV)	Factor (dB)	Limit (dBuV)	Margin (dB)	Detector	Line	Verdict
1	0.350	36.00	10.82	58.96	22.96	Peak	N	Pass
1**	0.350	25.37	10.82	48.96	23.59	AV	N	Pass
2	0.486	35.73	10.05	56.24	20.51	Peak	N	Pass
2**	0.486	25.32	10.05	46.24	20.92	AV	N	Pass
3	0.834	36.41	10.65	56.00	19.59	Peak	N	Pass
3**	0.834	24.78	10.65	46.00	21.22	AV	N	Pass
4	1.778	35.59	10.23	56.00	20.41	Peak	N	Pass
4**	1.778	23.87	10.23	46.00	22.13	AV	N	Pass
5	5.674	36.10	10.27	60.00	23.90	Peak	N	Pass
5**	5.674	24.10	10.27	50.00	25.90	AV	N	Pass
6	9.962	37.06	10.59	60.00	22.94	Peak	N	Pass
6**	9.962	25.45	10.59	50.00	24.55	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 C63.10-2020, 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.

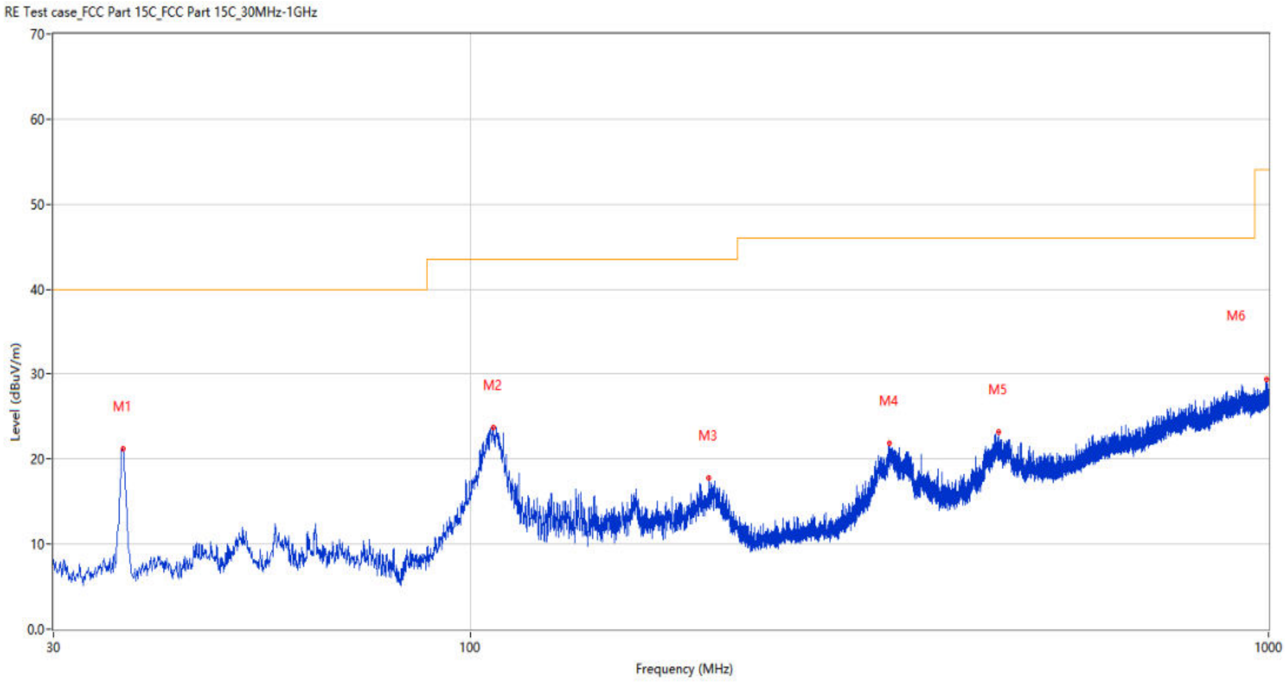
Note [3]: The EUT is working in the Normal link mode below 1 GHz. All modes have been tested and DH5-Hopping mode is the worst.

Note [4]: 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.

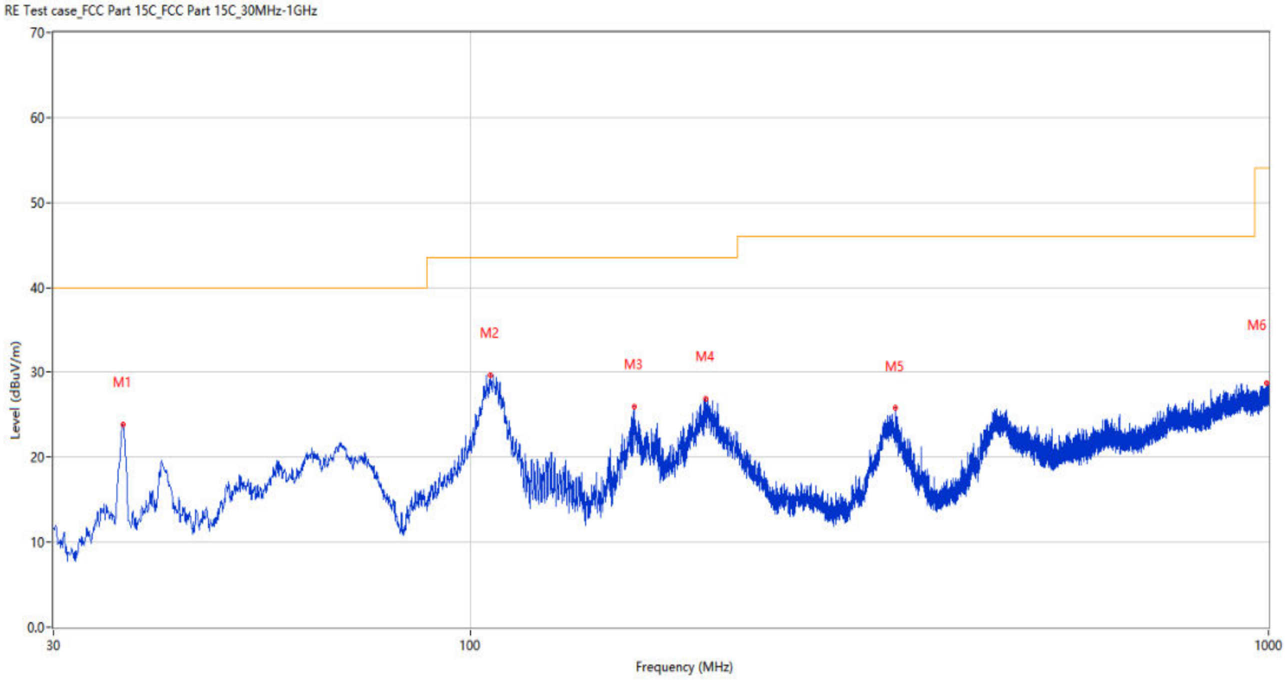
Test Data and Plots

30 MHz to 1 GHz, ANT H



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	36.645	21.26	-30.22	40.0	18.74	Peak	353.40	200	Horizontal	Pass
2	106.581	23.73	-32.29	43.5	19.77	Peak	326.40	200	Horizontal	Pass
3	198.926	17.78	-30.79	43.5	25.72	Peak	0.20	100	Horizontal	Pass
4	335.017	21.84	-25.20	46.0	24.16	Peak	356.10	100	Horizontal	Pass
5	458.546	23.24	-21.16	46.0	22.76	Peak	203.70	100	Horizontal	Pass
6	994.907	29.39	-10.61	54.0	24.61	Peak	26.70	200	Horizontal	Pass

30 MHz to 1 GHz, ANT V

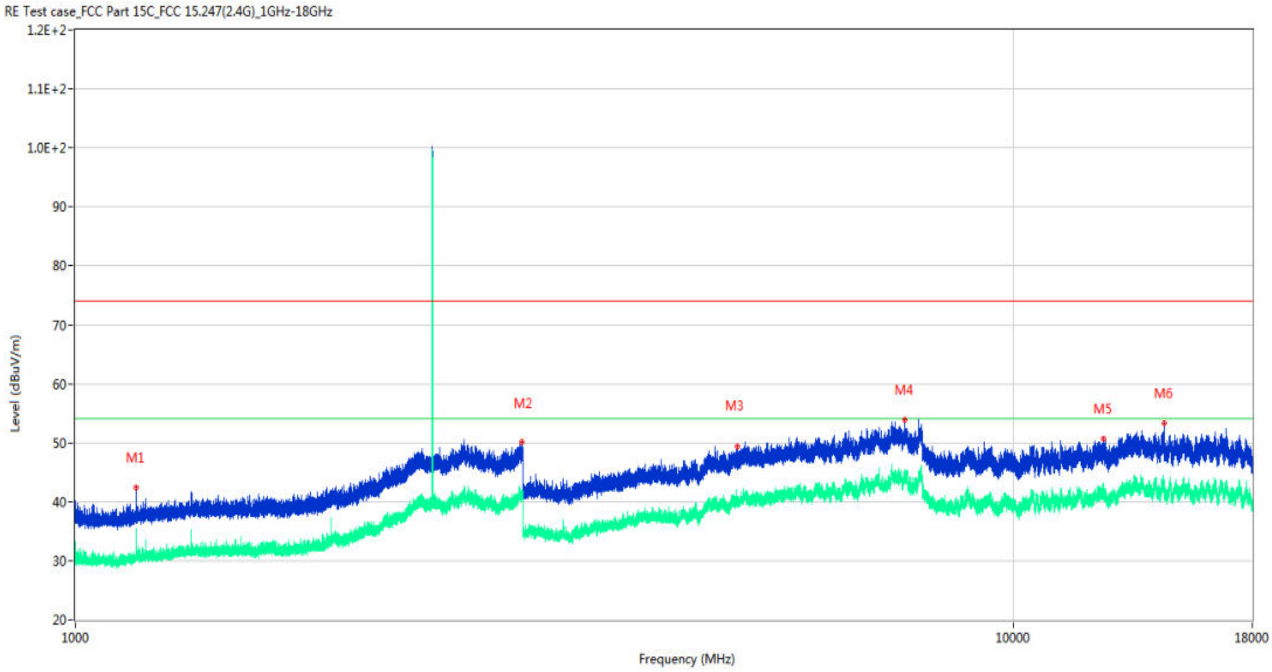


No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	36.645	23.86	-30.22	40.0	16.14	Peak	204.30	200	Vertical	Pass
2	105.709	29.71	-32.43	43.5	13.79	Peak	212.90	100	Vertical	Pass
3	160.174	26.04	-27.94	43.5	17.46	Peak	80.50	100	Vertical	Pass
4	196.792	26.89	-30.91	43.5	16.61	Peak	131.30	100	Vertical	Pass
5	340.303	25.77	-25.12	46.0	20.23	Peak	357.10	100	Vertical	Pass
6	994.326	28.80	-10.68	54.0	25.20	Peak	136.50	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	1163.585	42.48	74.0	31.52	Peak	130.00	300	Horizontal	Pass
1**	1163.585	30.62	54.0	23.38	AV	130.00	300	Horizontal	Pass
2	2990.235	50.17	74.0	23.83	Peak	193.00	400	Horizontal	Pass
2**	2990.235	41.40	54.0	12.60	AV	193.00	400	Horizontal	Pass
3	5082.036	49.67	74.0	24.34	Peak	229.00	200	Horizontal	Pass
3**	5082.036	39.84	54.0	14.16	AV	229.00	200	Horizontal	Pass
4	7672.263	53.89	74.0	20.11	Peak	222.00	300	Horizontal	Pass
4**	7672.263	45.62	54.0	8.38	AV	222.00	300	Horizontal	Pass
5	12497.523	50.93	74.0	23.07	Peak	289.00	200	Horizontal	Pass
5**	12497.523	41.02	54.0	12.98	AV	289.00	200	Horizontal	Pass
6	14482.406	53.57	74.0	20.43	Peak	23.00	400	Horizontal	Pass
6**	14482.406	42.30	54.0	11.70	AV	23.00	400	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	1460.304	42.49	74.0	31.51	Peak	95.00	300	Vertical	Pass
1**	1460.304	33.32	54.0	20.68	AV	95.00	300	Vertical	Pass
2	2988.261	48.00	74.0	26.00	Peak	30.00	100	Vertical	Pass
2**	2988.261	38.50	54.0	15.50	AV	30.00	100	Vertical	Pass
3	6806.304	55.15	74.0	18.85	Peak	57.00	200	Vertical	Pass
3**	6806.304	41.47	54.0	12.53	AV	57.00	200	Vertical	Pass
4	7970.395	56.70	74.0	17.30	Peak	44.00	300	Vertical	Pass
4**	7970.395	44.83	54.0	9.17	AV	44.00	300	Vertical	Pass
5	12494.836	48.97	74.0	25.03	Peak	331.00	300	Vertical	Pass
5**	12494.836	43.20	54.0	10.80	AV	331.00	300	Vertical	Pass
6	17101.858	55.10	74.0	18.90	Peak	308.00	400	Vertical	Pass
6**	17101.858	41.61	54.0	12.39	AV	308.00	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	1159.294	41.65	74.0	32.35	Peak	162.00	300	Horizontal	Pass
1**	1159.294	29.87	54.0	24.13	AV	162.00	300	Horizontal	Pass
2	2988.816	49.69	74.0	24.31	Peak	313.00	200	Horizontal	Pass
2**	2988.816	40.61	54.0	13.39	AV	313.00	200	Horizontal	Pass
3	5080.752	48.89	74.0	25.12	Peak	250.00	200	Horizontal	Pass
3**	5080.752	39.67	54.0	14.33	AV	250.00	200	Horizontal	Pass
4	7669.934	53.43	74.0	20.57	Peak	72.00	300	Horizontal	Pass
4**	7669.934	44.06	54.0	9.94	AV	72.00	300	Horizontal	Pass
5	12498.223	49.95	74.0	24.05	Peak	323.00	300	Horizontal	Pass
5**	12498.223	40.52	54.0	13.48	AV	323.00	300	Horizontal	Pass
6	14481.799	52.76	74.0	21.24	Peak	37.00	200	Horizontal	Pass
6**	14481.799	42.01	54.0	11.99	AV	37.00	200	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	1460.813	42.28	74.0	31.72	Peak	262.00	400	Vertical	Pass
1**	1460.813	33.11	54.0	20.89	AV	262.00	400	Vertical	Pass
2	2992.026	47.22	74.0	26.78	Peak	268.00	200	Vertical	Pass
2**	2992.026	38.30	54.0	15.70	AV	268.00	200	Vertical	Pass
3	6803.217	54.68	74.0	19.32	Peak	306.00	200	Vertical	Pass
3**	6803.217	41.21	54.0	12.79	AV	306.00	200	Vertical	Pass
4	7965.320	55.83	74.0	18.17	Peak	334.00	100	Vertical	Pass
4**	7965.320	44.61	54.0	9.39	AV	334.00	100	Vertical	Pass
5	12494.246	48.43	74.0	25.57	Peak	97.00	400	Vertical	Pass
5**	12494.246	42.91	54.0	11.09	AV	97.00	400	Vertical	Pass
6	17098.779	54.41	74.0	19.59	Peak	16.00	200	Vertical	Pass
6**	17098.779	40.79	54.0	13.21	AV	16.00	200	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	1164.784	42.45	74.0	31.55	Peak	1.00	200	Horizontal	Pass
1**	1164.784	29.84	54.0	24.16	AV	1.00	200	Horizontal	Pass
2	2995.393	49.80	74.0	24.20	Peak	105.00	400	Horizontal	Pass
2**	2995.393	40.79	54.0	13.21	AV	105.00	400	Horizontal	Pass
3	5080.646	48.93	74.0	25.08	Peak	202.00	200	Horizontal	Pass
3**	5080.646	39.02	54.0	14.98	AV	202.00	200	Horizontal	Pass
4	7667.441	53.10	74.0	20.90	Peak	131.00	200	Horizontal	Pass
4**	7667.441	44.11	54.0	9.89	AV	131.00	200	Horizontal	Pass
5	12500.891	50.58	74.0	23.42	Peak	185.00	300	Horizontal	Pass
5**	12500.891	40.23	54.0	13.77	AV	185.00	300	Horizontal	Pass
6	14482.784	52.95	74.0	21.05	Peak	260.00	400	Horizontal	Pass
6**	14482.784	42.18	54.0	11.82	AV	260.00	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	1465.509	42.08	74.0	31.92	Peak	151.00	300	Vertical	Pass
1**	1465.509	33.17	54.0	20.83	AV	151.00	300	Vertical	Pass
2	2990.935	47.94	74.0	26.06	Peak	336.00	100	Vertical	Pass
2**	2990.935	38.09	54.0	15.91	AV	336.00	100	Vertical	Pass
3	6805.514	54.74	74.0	19.26	Peak	14.00	200	Vertical	Pass
3**	6805.514	41.43	54.0	12.57	AV	14.00	200	Vertical	Pass
4	7965.331	56.65	74.0	17.35	Peak	241.00	400	Vertical	Pass
4**	7965.331	44.60	54.0	9.40	AV	241.00	400	Vertical	Pass
5	12494.848	48.65	74.0	25.35	Peak	257.00	300	Vertical	Pass
5**	12494.848	43.09	54.0	10.91	AV	257.00	300	Vertical	Pass
6	17098.710	54.68	74.0	19.32	Peak	149.00	200	Vertical	Pass
6**	17098.710	40.68	54.0	13.32	AV	149.00	200	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	1289.476	42.27	74.0	31.73	Peak	300.00	200	Horizontal	Pass
1**	1289.476	29.89	54.0	24.11	AV	300.00	200	Horizontal	Pass
2	2772.605	50.16	74.0	23.84	Peak	328.00	400	Horizontal	Pass
2**	2772.605	41.26	54.0	12.74	AV	328.00	400	Horizontal	Pass
3	5170.258	49.22	74.0	24.79	Peak	295.00	200	Horizontal	Pass
3**	5170.258	39.43	54.0	14.57	AV	295.00	200	Horizontal	Pass
4	6809.528	53.34	74.0	20.66	Peak	304.00	100	Horizontal	Pass
4**	6809.528	44.02	54.0	9.98	AV	304.00	100	Horizontal	Pass
5	13465.838	50.29	74.0	23.71	Peak	128.00	200	Horizontal	Pass
5**	13465.838	40.43	54.0	13.57	AV	128.00	200	Horizontal	Pass
6	17463.039	52.87	74.0	21.13	Peak	59.00	100	Horizontal	Pass
6**	17463.039	42.07	54.0	11.93	AV	59.00	100	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	1284.439	42.05	74.0	31.95	Peak	201.00	100	Vertical	Pass
1**	1284.439	32.48	54.0	21.52	AV	201.00	100	Vertical	Pass
2	2767.798	47.81	74.0	26.19	Peak	18.00	300	Vertical	Pass
2**	2767.798	38.21	54.0	15.79	AV	18.00	300	Vertical	Pass
3	5162.718	54.19	74.0	19.81	Peak	2.00	200	Vertical	Pass
3**	5162.718	41.29	54.0	12.71	AV	2.00	200	Vertical	Pass
4	6808.999	55.88	74.0	18.12	Peak	241.00	200	Vertical	Pass
4**	6808.999	44.39	54.0	9.61	AV	241.00	200	Vertical	Pass
5	13467.730	48.52	74.0	25.48	Peak	287.00	100	Vertical	Pass
5**	13467.730	42.38	54.0	11.62	AV	287.00	100	Vertical	Pass
6	17467.459	54.91	74.0	19.09	Peak	312.00	300	Vertical	Pass
6**	17467.459	41.22	54.0	12.78	AV	312.00	300	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	1289.228	40.83	74.0	33.17	Peak	274.00	300	Horizontal	Pass
1**	1289.228	29.29	54.0	24.71	AV	274.00	300	Horizontal	Pass
2	2768.373	49.52	74.0	24.48	Peak	94.00	400	Horizontal	Pass
2**	2768.373	40.45	54.0	13.55	AV	94.00	400	Horizontal	Pass
3	5165.406	48.09	74.0	25.92	Peak	289.00	200	Horizontal	Pass
3**	5165.406	39.36	54.0	14.64	AV	289.00	200	Horizontal	Pass
4	6805.807	53.10	74.0	20.90	Peak	97.00	200	Horizontal	Pass
4**	6805.807	43.86	54.0	10.14	AV	97.00	200	Horizontal	Pass
5	13464.847	49.53	74.0	24.47	Peak	57.00	400	Horizontal	Pass
5**	13464.847	39.54	54.0	14.46	AV	57.00	400	Horizontal	Pass
6	17463.413	52.69	74.0	21.31	Peak	329.00	300	Horizontal	Pass
6**	17463.413	41.34	54.0	12.66	AV	329.00	300	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	1285.828	42.24	74.0	31.76	Peak	146.00	200	Vertical	Pass
1**	1285.828	32.45	54.0	21.55	AV	146.00	200	Vertical	Pass
2	2774.749	46.89	74.0	27.11	Peak	159.00	300	Vertical	Pass
2**	2774.749	37.63	54.0	16.37	AV	159.00	300	Vertical	Pass
3	5163.109	53.74	74.0	20.26	Peak	313.00	200	Vertical	Pass
3**	5163.109	41.16	54.0	12.84	AV	313.00	200	Vertical	Pass
4	6809.156	55.28	74.0	18.72	Peak	211.00	200	Vertical	Pass
4**	6809.156	44.49	54.0	9.51	AV	211.00	200	Vertical	Pass
5	13463.814	47.90	74.0	26.10	Peak	175.00	100	Vertical	Pass
5**	13463.814	42.79	54.0	11.21	AV	175.00	100	Vertical	Pass
6	17464.394	54.35	74.0	19.65	Peak	129.00	400	Vertical	Pass
6**	17464.394	40.65	54.0	13.35	AV	129.00	400	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	1288.561	41.53	74.0	32.47	Peak	53.00	200	Horizontal	Pass
1**	1288.561	29.49	54.0	24.51	AV	53.00	200	Horizontal	Pass
2	2774.300	48.90	74.0	25.10	Peak	39.00	300	Horizontal	Pass
2**	2774.300	40.37	54.0	13.63	AV	39.00	300	Horizontal	Pass
3	5164.563	48.06	74.0	25.95	Peak	87.00	200	Horizontal	Pass
3**	5164.563	38.12	54.0	15.88	AV	87.00	200	Horizontal	Pass
4	6802.470	52.59	74.0	21.41	Peak	33.00	300	Horizontal	Pass
4**	6802.470	43.93	54.0	10.07	AV	33.00	300	Horizontal	Pass
5	13464.105	50.15	74.0	23.85	Peak	55.00	300	Horizontal	Pass
5**	13464.105	39.38	54.0	14.62	AV	55.00	300	Horizontal	Pass
6	17463.289	52.81	74.0	21.19	Peak	62.00	200	Horizontal	Pass
6**	17463.289	41.73	54.0	12.27	AV	62.00	200	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	1284.765	41.62	74.0	32.38	Peak	355.00	200	Vertical	Pass
1**	1284.765	32.85	54.0	21.15	AV	355.00	200	Vertical	Pass
2	2773.898	47.78	74.0	26.22	Peak	66.00	400	Vertical	Pass
2**	2773.898	37.98	54.0	16.02	AV	66.00	400	Vertical	Pass
3	5163.660	54.26	74.0	19.74	Peak	269.00	200	Vertical	Pass
3**	5163.660	41.26	54.0	12.74	AV	269.00	200	Vertical	Pass
4	6806.926	55.66	74.0	18.34	Peak	220.00	300	Vertical	Pass
4**	6806.926	44.07	54.0	9.93	AV	220.00	300	Vertical	Pass
5	13465.864	48.61	74.0	25.39	Peak	218.00	400	Vertical	Pass
5**	13465.864	42.40	54.0	11.60	AV	218.00	400	Vertical	Pass
6	17465.056	53.70	74.0	20.30	Peak	312.00	200	Vertical	Pass
6**	17465.056	39.71	54.0	14.29	AV	312.00	200	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.

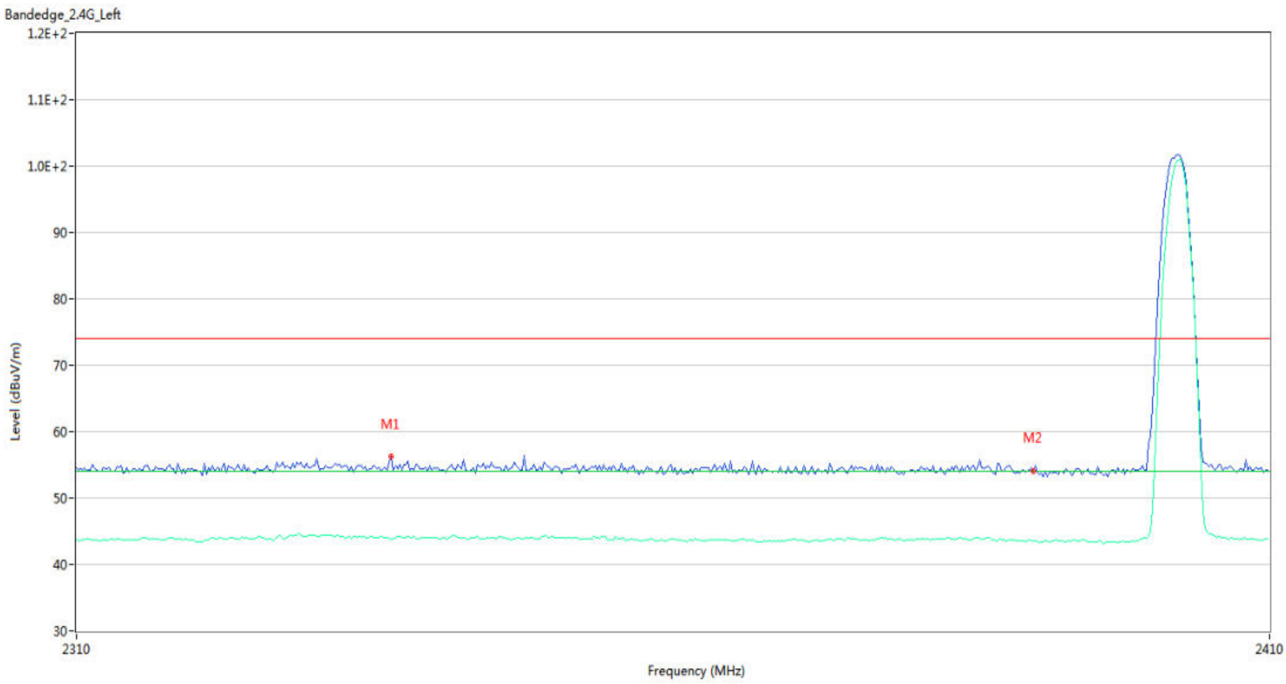
Note [3]: According the ANSI C63.10-2020, where limits are specified for both average and peak (or quasi-peak) detector functions, if the peak (or quasi-peak) measured value complies with the average limit, it is unnecessary to perform an average measurement.

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.

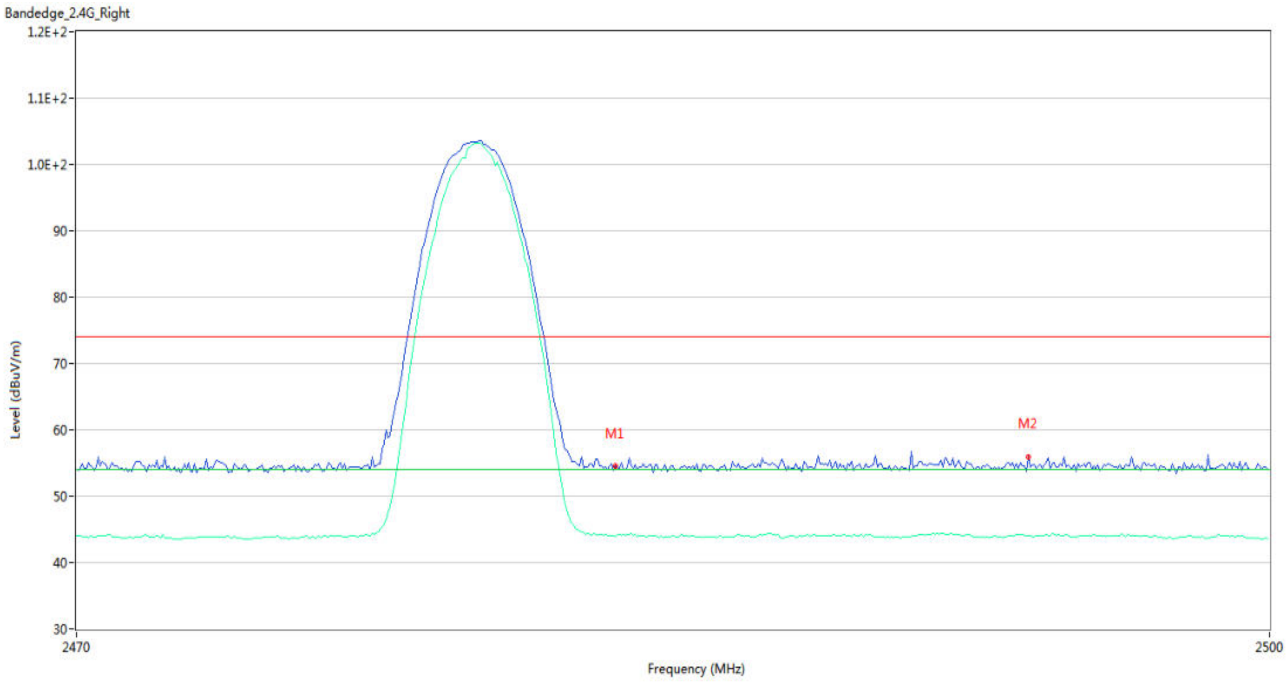
Test Data and Plots

GFSK LOW CHANNEL



No.	Frequency (MHz)	Results (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	2334.831	56.40	74.0	17.60	Peak	167.00	200	Horizontal	Pass
1**	2334.831	44.09	54.0	9.92	AV	167.00	200	Horizontal	Pass
2	2390.000	54.23	74.0	19.77	Peak	341.00	200	Horizontal	Pass
2**	2390.000	43.69	54.0	10.31	AV	341.00	200	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	54.61	74.0	19.39	Peak	226.00	100	Horizontal	Pass
1**	2483.500	44.12	54.0	9.89	AV	226.00	100	Horizontal	Pass
2	2495.130	55.92	74.0	18.08	Peak	136.00	100	Horizontal	Pass
2**	2495.130	44.27	54.0	9.73	AV	136.00	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	2327.853	55.46	74.0	18.54	Peak	278.00	100	Horizontal	Pass
1**	2327.853	43.71	54.0	10.29	AV	278.00	100	Horizontal	Pass
2	2390.000	53.89	74.0	20.11	Peak	189.00	200	Horizontal	Pass
2**	2390.000	43.03	54.0	10.97	AV	189.00	200	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	54.43	74.0	19.57	Peak	349.00	200	Horizontal	Pass
1**	2483.500	43.26	54.0	10.74	AV	349.00	200	Horizontal	Pass
2	2489.496	55.65	74.0	18.35	Peak	229.00	200	Horizontal	Pass
2**	2489.496	43.53	54.0	10.47	AV	229.00	200	Horizontal	Pass

ANNEX B TEST SETUP PHOTOS

Please refer the document “Ti-EE26040641-AR.PDF”.

ANNEX C EUT EXTERNAL PHOTOS

Please refer the document “Ti-EE26040641-AW.PDF”.

ANNEX D EUT INTERNAL PHOTOS

Please refer the document “Ti-EE26040641-AI.PDF”.

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--END OF REPORT--