TEST REPORT

Report No.	CISRR26052018101
Project No.	CISR260520181
FCC ID	2BTLR-Z02
Applicant	Shenzhen Cantianshu Information Technology Co., Ltd.
Address	Room 2803B, West Tower, Xinghe WORLD Twin Towers, No. 8 Yaxing Road, Nankeng Community, Bantian Subdistrict, Longgang District, Shenzhen
Manufacturer	Shenzhen Cantianshu Information Technology Co., Ltd.
Address	Room 2803B, West Tower, Xinghe WORLD Twin Towers, No. 8 Yaxing Road, Nankeng Community, Bantian Subdistrict, Longgang District, Shenzhen
Product Name	ZNP Bluetooth AI Companion
Trade mark	ZNP
Model/Type reference	ZNP Z02
Listed Model(s)	-
Standard	47 CFR Part 15.247
Date of sample receipt	May 22, 2026
Test date	May 22, 2026 to June 1, 2026
Issue date	June 1, 2026
Test result	**Complied**

Morgan Tan

Reviewed by: Morgan Tan

Approved by: Hans Hu

The test results relate only to the tested samples.
The test report should not be reproduced except in full without the written approval of Shenzhen Bangce Testing Technology Co., Ltd.

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1. STANDARD AND APPLICABLE TEST METHODS

The tests were performed according to following standards:

47 CFR Part 15.247: Operation within the bands 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz

ANSI C63.10-2020: American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.

2. REPORT VERSION

Version No.	Issue date	Description
00	June 1, 2026	Original

3. TEST DESCRIPTION

No.	Test Item	Standard Requirement	Result
1	Antenna Requirement	47 CFR 15.203	Pass
2	Conducted Emission at AC power line	47 CFR 15.207(a)	Pass
3	20dB Bandwidth	47 CFR 15.247(a)(1)	Pass
4	Maximum Conducted Output Power	47 CFR 15.247(b)(1)	Pass
5	Channel Separation	47 CFR 15.247(a)(1)	Pass
6	Number of Hopping Frequencies	47 CFR 15.247(a)(1)(iii)	Pass
7	Dwell Time	47 CFR 15.247(a)(1)(iii)	Pass
8	Conducted band edge and spurious emission	47 CFR 15.247(d)	Pass
9	Radiated band edge emission	47 CFR 15.247(d), 15.209, 15.205	Pass
10	Radiated Spurious Emission (below 1GHz)	47 CFR 15.247(d), 15.209, 15.205	Pass
11	Radiated Spurious Emission (Above 1GHz)	47 CFR 15.247(d), 15.209, 15.205	Pass

Note:

– The measurement uncertainty is not included in the test result.

4. SUMMARY

4.1. Product Description *

Main unit information:	
Product Name:	ZNP Bluetooth AI Companion
Trade mark:	ZNP
Model No.:	ZNP Z02
Listed Model(s):	-
Model difference:	-
Power supply:	DC 5V by USB-C DC 3.7V by internal battery
Hardware version:	-
Software version:	-
Accessory unit (AU) information:	
Battery information:	DC 3.7V 500mAh

4.2. Radio Specification Description *

Modulation type:	GFSK, π/4 DQPSK, 8DPSK
Operation frequency:	2402MHz to 2480MHz
Channel number:	79
Channel separation:	1MHz
Antenna type:	PCB Antenna
Antenna gain:	-0.58dBi

Note:

1) *: As the above information is provided by the applicant, all relevant results and conclusions of this report are based solely on such information. Bangce lab shall not be liable for the authenticity, integrity, and resulting outcomes of the information, and/or the validity of the conclusions herein.
2) Operation frequency list as follow:

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	2402	20	2422	40	2442	60	2462
1	2403	21	2423	41	2443	61	2463
2	2404	22	2424	42	2444	62	2464
3	2405	23	2425	43	2445	63	2465
4	2406	24	2426	44	2446	64	2466
5	2407	25	2427	45	2447	65	2467

6	2408	26	2428	46	2448	66	2468
7	2409	27	2429	47	2449	67	2469
8	2410	28	2430	48	2450	68	2470
9	2411	29	2431	49	2451	69	2471
10	2412	30	2432	50	2452	70	2472
11	2413	31	2433	51	2453	71	2473
12	2414	32	2434	52	2454	72	2474
13	2415	33	2435	53	2455	73	2475
14	2416	34	2436	54	2456	74	2476
15	2417	35	2437	55	2457	75	2477
16	2418	36	2438	56	2458	76	2478
17	2419	37	2439	57	2459	77	2479
18	2420	38	2440	58	2460	78	2480
19	2421	39	2441	59	2461	-	-

4.3. Modification of EUT

No modifications are made to the EUT during all test items.

4.4. Deviation from standards

None

4.5. Testing Site

Laboratory Name	Shenzhen Bangce Testing Technology Co., Ltd.
Laboratory Location	101, building 10, Yunli Intelligent Park, Shutianpu community, Matian Street, Guangming District, Shenzhen，Guangdong, China
Contact information	Tel: 86-755-2319 6848, email: service@cis-cn.net Website: http://www.cis-cn.net/
FCC registration number	736346
FCC designation number	CN1372

5. TEST CONFIGURATION

5.1. Test frequency list

Lowest Channel (LCH) (MHz)	Middle Channel (MCH) (MHz)	Highest Channel (HCH) (MHz)
2402	2441	2480

5.2. Descriptions of test mode

No	Test mode	Description
TM1	TX-GFSK (Non-Hopping)	Keep the EUT in continuously transmitting mode (non-hopping) with GFSK modulation at lowest, middle and highest channel.
TM2	TX-Pi/4DQPSK (Non-Hopping)	Keep the EUT in continuously transmitting mode (non-hopping) with Pi/4DQPSK modulation at lowest, middle and highest channel.
TM3	TX-8DPSK (Non-Hopping)	Keep the EUT in continuously transmitting mode (non-hopping) with 8DPSK modulation at lowest, middle and highest channel.
TM4	TX-GFSK (Hopping)	Keep the EUT in continuously transmitting mode (hopping) with GFSK modulation,.
TM5	TX-Pi/4DQPSK (Hopping)	Keep the EUT in continuously transmitting mode (hopping) with Pi/4DQPSK modulation.
TM6	TX-8DPSK (Hopping)	Keep the EUT in continuously transmitting mode (hopping) with 8DPSK modulation.
TM7	Link mode	Keep the EUT in Bluetooth linking mode with AE.

5.3. Support unit used in test configuration

The EUT has been associated with peripherals and configuration operated in a manner tended to maximize its emission characteristics in a typical application.

The following peripheral devices and interface cables were connected during the measurement:

Item	Equipment name	Trade Name	Model No.
1	Adapter	Guangdong Sangu Technology Co. ltd	SG-0501000AU

5.4. Test sample information

Type	Sample No.
Engineer sample	CISR260520181-S01
Normal sample	CISR260520181-S02

5.5. Environmental conditions

Type	Requirement
Temperature:	15~35°C
Relative Humidity:	25~75%
Air Pressure:	860~1060mbar

5.6. Statement of the measurement uncertainty

No.	Test Items	Measurement Uncertainty
1	Conducted Emission at AC power line (150kHz ~ 30MHz)	3.52dB
2	Bandwidth	0.19%
3	Conducted output power	1.38dB
4	Time	2.3ns
5	Conducted spurious emission	1.40dB

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=1.96.

5.7. Equipment Used during the Test

Conducted Emission at AC power line

Item	Equipment name	Manufacturer	Model	Serial No.	Calibration date	Due date
1	8*4*3 Shielding room	SKET	8m*4m*3 m	CIS-EE012	2024-09-02	2027-09-01
2	EMI Test Receiver	ROHDE&SCHWARZ	ESPI7	CIS-EE043	2026-01-06	2027-01-05
3	LISN	SCHWARZBECK	NSLK 8127	CIS-EE044	2026-01-06	2027-01-05
4	LISN-AE	ETS	3810/2NM	CIS-EE075	2026-01-06	2027-01-05
5	RF Cable	SKET	-	CIS-EE071	2026-01-06	2027-01-05
6	Power Strip	BULL	GNIN-413	CIS-EE087	2026-01-06	2027-01-05
7	Test software	FARAD	EZ-CON	CIS-EE095	/	/
8	Thermohygrometer	DeLi	8866	CIS-EE069	2026-01-06	2027-01-05

Number of Hopping Frequencies
Dwell Time
Emissions in non-restricted frequency bands
20dB Bandwidth
Maximum Conducted Output Power
Channel Separation

Item	Equipment name	Manufacturer	Model	Serial No.	Calibration date	Due date
1	Spectrum analyzer	ROHDE&SCHWARZ	FSV-40N	CIS-EE076	2026-01-06	2027-01-05
2	Notch Filter Assembly	WCS	SMU-1003	CIS-EE093	2026-01-06	2027-01-05
3	Vector Signal Generator	Agilent	N5182A	CIS-RE012	2026-01-06	2027-01-05
4	Analog Signal Generator	Agilent	N5181A	CIS-RE013	2026-01-06	2027-01-05
5	Test software	WCS	WCN-Regulatory	CIS-EE103	/	/

Band edge emissions (Radiated)
Emissions in frequency bands (below 1GHz)
Emissions in frequency bands (above 1GHz)

Item	Equipment name	Manufacturer	Model	Serial No.	Calibration date	Due date
1	9*6*6 anechoic chamber	SKET	9.3*6.3*6	N/A	2024-09-02	2027-09-01
2	Spectrum analyzer	Agilent	N9020A	MY50530263	2026-01-06	2027-01-05
3	Spectrum analyzer	R&S	FSV-40N	102130	2026-01-06	2027-01-05

4	Bilog Antenna	Schwarzbeck	VULB 9163	1463	2026-01-06	2029-01-05
5	Horn Antenna	SCHWARZBECK	BBHA 9120 D	2487	2026-01-06	2029-01-05
6	Active Loop Antenna	SCHWARZBECK	FMZB 1519B	/	2026-01-06	2029-01-05
7	RF Cable	Tonscend	Cable 1	/	2026-01-06	2027-01-05
8	RF Cable	Tonscend	Cable 2	/	2026-01-06	2027-01-05
9	RF Cable	SKET	Cable 3	/	2026-01-06	2027-01-05
10	L.I.S.N.#1	Schwarzbeck	NSLK8127	/	2026-01-06	2027-01-05
11	L.I.S.N.#2	ROHDE&SCHWARZ	ENV216	/	2026-01-06	2027-01-05
12	Horn Antenna	SCHWARZBECK	BBHA9170	1130	2026-01-06	2029-01-05
13	Preamplifier	Tonscend	TAP18040048	AP21C806126	2026-01-06	2027-01-05
14	Variable-frequency power source	Pinhong	PH1110	/	2026-01-06	2027-01-05
15	6dB Attenuator	SKET	DC-6G	/	2026-01-06	2027-01-05
16	Antenna tower	SKT	Bk-4AT-BS	AT2021040101-V1	2026-01-06	2027-01-05

6. TEST RESULTS

6.1. Evaluation Results (Evaluation)

6.1.1. Antenna Requirement

Test Requirement:	Refer to 47 CFR Part 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.
Test Method:	---

6.1.1.1. Test Result

Pass

6.1.1.2. Conclusion:

The EUT antenna is PCB Antenna. It comply with the standard requirement. In case of replacement of broken antenna the same antenna type must be used.Antenna structure please refer to the EUT internal photographs antenna photo.

6.2. Radio Spectrum Matter Test Results (RF)

6.2.1. Conducted Emission at AC power line

Test Requirement:	Refer to 47 CFR 15.207(a), Except as shown in paragraphs (b)and (c)of this section, 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 or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 μH/50 ohms line impedance stabilization network (LISN).
Test Limit:	

Frequency of emission (MHz)	Conducted limit (dBμV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

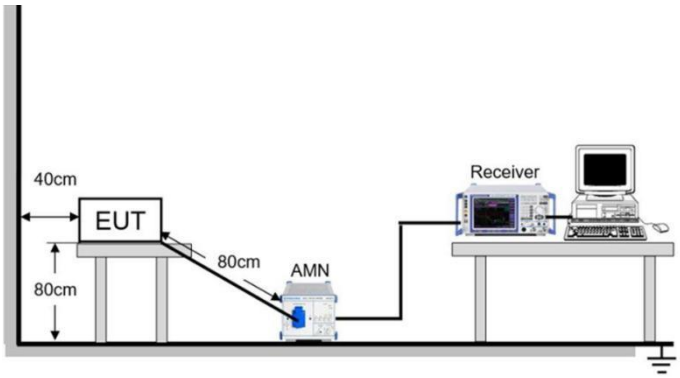
*Decreases with the logarithm of the frequency.

Test Method:	ANSI C63.10-2020 section 6.2
Procedure:	1>. The EUT was setup according to ANSI C63.10 requirements. 2>. The EUT was placed on a platform of nominal size, 1 m by 1.5 m, raised 80 cm above the conducting ground plane. The vertical conducting plane was located 40 cm to the rear of the EUT. All other surfaces of EUT were at least 80 cm from any other grounded conducting surface. 3>. The EUT and simulators are connected to the main power through a line impedances stabilization network (LISN). The LISN provides a 50 ohm /50uH coupling impedance for the measuring equipment. 4>. The peripheral devices are also connected to the main power through a LISN. (Refer to the block diagram of the test setup and photographs) 5>. Each current-carrying conductor of the EUT power cord, except the ground (safety) conductor, was individually connected through a LISN to the input power source. 6>. The excess length of the power cord between the EUT and the LISN receptacle were folded back and forth at the center of the lead to form a bundle not exceeding 40 cm in length. 7>. Conducted emissions were investigated over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9 kHz. 8>. During the above scans, the emissions were maximized by cable manipulation.

6.2.1.1. E.U.T. Operation

Operating Environment:					
Temperature:	22.1 °C	Humidity:	56.5 %	Atmospheric Pressure:	102.5 kPa
Pre test mode:	TM7				
Final test mode:	TM7				

6.2.1.2. Test Setup Diagram

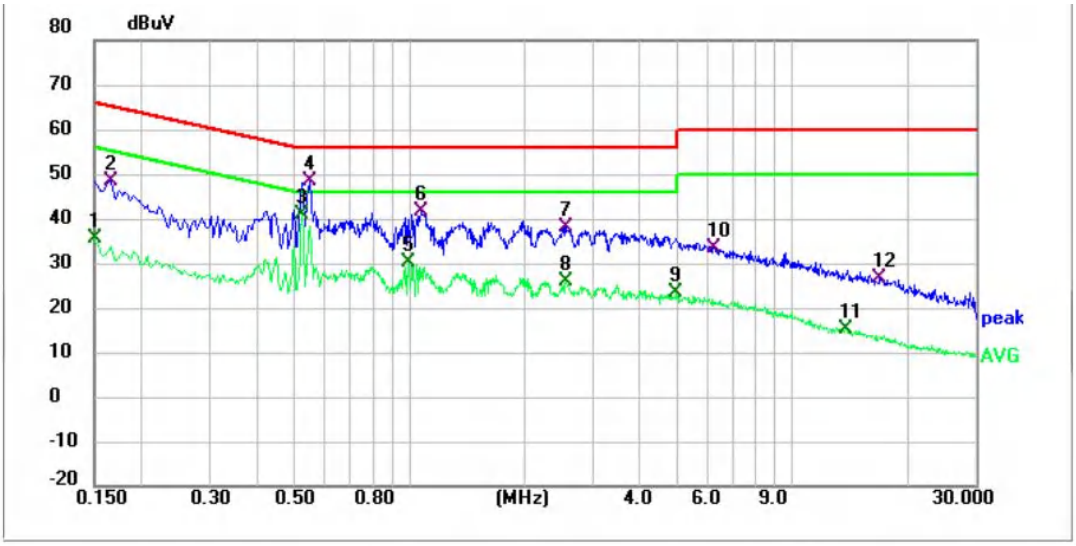


6.2.1.3. Test Result

Pass

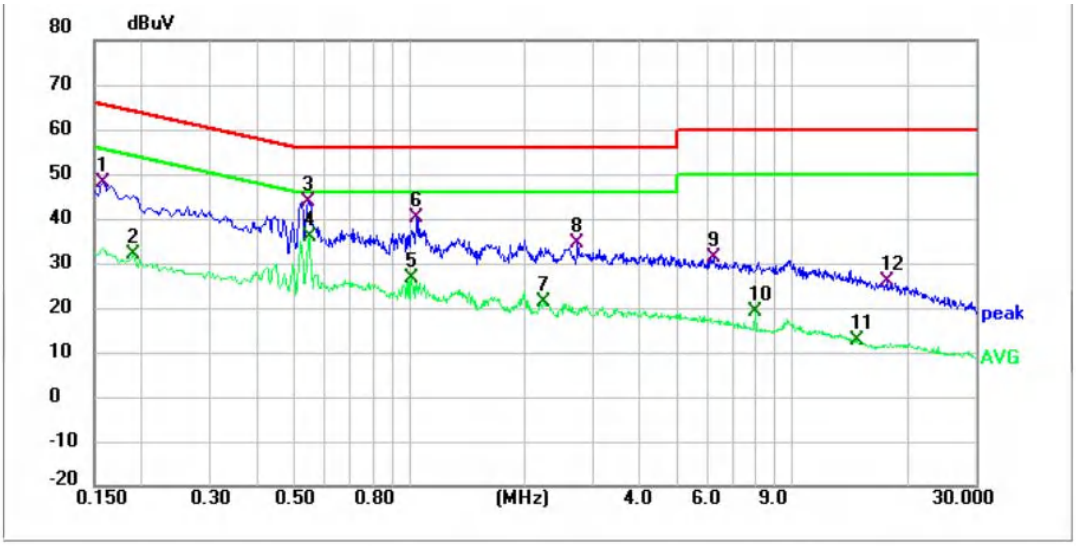
6.2.1.4. Test Data

Mode7 / Line: Line



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1	0.1500	25.24	10.20	35.44	56.00	20.56	AVG
2	0.1660	38.22	10.19	48.41	65.16	16.75	QP
3 *	0.5220	30.64	10.16	40.80	46.00	5.20	AVG
4	0.5500	38.18	10.16	48.34	56.00	7.66	QP
5	0.9940	20.15	10.19	30.34	46.00	15.66	AVG
6	1.0740	31.33	10.19	41.52	56.00	14.48	QP
7	2.5540	27.81	10.29	38.10	56.00	17.90	QP
8	2.5540	15.64	10.29	25.93	46.00	20.07	AVG
9	4.9740	12.90	10.38	23.28	46.00	22.72	AVG
10	6.2300	23.22	10.35	33.57	60.00	26.43	QP
11	13.8220	4.72	10.49	15.21	50.00	34.79	AVG
12	16.9060	15.91	10.66	26.57	60.00	33.43	QP

Mode7 / Line: Neutral



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1	0.1580	38.00	10.16	48.16	65.57	17.41	QP
2	0.1900	21.82	10.14	31.96	54.04	22.08	AVG
3	0.5420	33.79	10.12	43.91	56.00	12.09	QP
4 *	0.5460	25.79	10.12	35.91	46.00	10.09	AVG
5	1.0140	16.36	10.16	26.52	46.00	19.48	AVG
6	1.0460	30.06	10.16	40.22	56.00	15.78	QP
7	2.2420	10.97	10.24	21.21	46.00	24.79	AVG
8	2.7500	24.09	10.27	34.36	56.00	21.64	QP
9	6.2460	20.72	10.36	31.08	60.00	28.92	QP
10	8.0020	8.68	10.36	19.04	50.00	30.96	AVG
11	14.8060	2.36	10.46	12.82	50.00	37.18	AVG
12	17.6020	15.03	10.70	25.73	60.00	34.27	QP

Note:
1>. Level = Reading +Factor (Voltage Division Coefficient + Cable Loss + Attenuator Factor)
2>. Margin = Limit - Level

6.2.2. 20dB Bandwidth

Test Requirement:	47 CFR 15.247(a)(1)
Test Limit:	Refer to 47 CFR 15.215(c), intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§ 15.217 through 15.257 and in subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated.
Test Method:	ANSI C63.10-2020, section 7.8.6, For occupied bandwidth measurements, use the procedure in 6.9.3. Frequency hopping shall be disabled for this test.
Procedure:	The occupied bandwidth is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers are each equal to 0.5% of the total mean power of the given emission. The following procedure shall be used for measuring 99% power bandwidth: a) The instrument center frequency is set to the nominal EUT channel center frequency. The frequency span for the spectrum analyzer shall be between 1.5 times and 5.0 times the OBW. b) The nominal IF filter bandwidth (3 dB RBW) shall be in the range of 1% to 5% of the OBW, and VBW shall be at least three times the RBW, unless otherwise specified by the applicable requirement. c) Set the reference level of the instrument as required, keeping the signal from exceeding the maximum input mixer level for linear operation. In general, the peak of the spectral envelope shall be more than [10 log (OBW/RBW)] below the reference level. Specific guidance is given in 4.1.6.2. d) Step a) through step c) might require iteration to adjust within the specified range. e) Video averaging is not permitted. Where practical, a sample detection and single sweep mode shall be used. Otherwise, peak detection and max-hold mode (until the trace stabilizes) shall be used. f) Use the 99% power bandwidth function of the instrument (if available) and report the measured bandwidth. g) If the instrument does not have a 99% power bandwidth function, then the trace data points are recovered and directly summed in linear power terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached; that frequency is recorded as the lower frequency. The process is repeated until 99.5% of the total is reached; that frequency is recorded as the upper frequency. The 99% power bandwidth is the difference between these two frequencies. h) The occupied bandwidth shall be reported by providing spectral plot(s) of the measuring instrument display; the plot axes and the scale units per division shall be clearly labeled. Tabular data may be reported in addition to the plot(s).

6.2.2.1. E.U.T. Operation

Operating Environment:					
Temperature:	22.8 °C	Humidity:	55.5 %	Atmospheric Pressure:	102.2 kPa
Pre test mode:	TM1, TM2, TM3				
Final test mode:	TM1, TM2, TM3				

6.2.2.2. Test Setup Diagram

6.2.2.3. Test Result

Pass

6.2.2.4. Test Data

Please Refer to Appendix for Details.

6.2.3. Maximum Conducted Output Power

Test Requirement:	47 CFR 15.247(b)(1)
Test Limit:	Refer to 47 CFR 15.247(b)(1), For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts.
Test Method:	ANSI C63.10-2020, section 7.8.5
Procedure:	This is an RF-conducted test to evaluate maximum peak output power. Use a direct connection between the antenna port of the unlicensed wireless device and the spectrum analyzer, through suitable attenuation. Frequency hopping shall be disabled for this test. Use the following spectrum analyzer settings: a) Span: Approximately five times the 20 dB bandwidth, centered on a hopping channel. b) RBW > 20 dB bandwidth of the emission being measured. c) VBW ≥ RBW. d) Sweep: No faster than coupled (auto) time. e) Detector function: Peak. f) Trace: Max-hold. g) Allow trace to stabilize. h) Use the marker-to-peak function to set the marker to the peak of the emission. i) The indicated level is the peak output power, after any corrections for external attenuators and cables. j) A spectral plot of the test results and setup description shall be included in the test report. NOTE—A peak responding power meter may be used, where the power meter and sensor system video bandwidth is greater than the occupied bandwidth of the unlicensed wireless device, rather than a spectrum analyzer.

6.2.3.1. E.U.T. Operation

Operating Environment:					
Temperature:	22.8 °C	Humidity:	56.7 %	Atmospheric Pressure:	102.2 kPa
Pre test mode:	TM1, TM2, TM3				
Final test mode:	TM1, TM2, TM3				

6.2.3.2. Test Setup Diagram

6.2.3.3. Test Result

Pass

6.2.3.4. Test Data

Please Refer to Appendix for Details.

6.2.4. Channel Separation

Test Requirement:	47 CFR 15.247(a)(1)
Test Limit:	Refer to 47 CFR 15.247(a)(1), Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.
Test Method:	ANSI C63.10-2020, section 7.8.2
Procedure:	The EUT shall have its hopping function enabled. Use the following spectrum analyzer settings: a) Span: Wide enough to capture the peaks of two adjacent channels. b) RBW: Start with the RBW set to approximately 30% of the channel spacing; adjust as necessary to best identify the center of each individual channel. c) Video (or average) bandwidth (VBW) ≥ RBW. d) Sweep: No faster than coupled (auto) time. e) Detector function: Peak. f) Trace: Max-hold. g) Allow the trace to stabilize. Use the marker-delta function to determine the separation between the peaks of the adjacent channels. Compliance of an EUT with the appropriate regulatory limit shall be determined. A spectral plot of the data shall be included in the test report.

6.2.4.1. E.U.T. Operation

Operating Environment:					
Temperature:	22.2 °C	Humidity:	55.2 %	Atmospheric Pressure:	102.2 kPa
Pre test mode:	TM4, TM5, TM6				
Final test mode:	TM4, TM5, TM6				

6.2.4.2. Test Setup Diagram

6.2.4.3. Test Result

Pass

6.2.4.4. Test Data

Please Refer to Appendix for Details.

6.2.5. Number of Hopping Frequencies

Test Requirement:	47 CFR 15.247(a)(1)(iii)
Test Limit:	Refer to 47 CFR 15.247(a)(1)(iii), Fequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 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.
Test Method:	ANSI C63.10-2020, section 7.8.3
Procedure:	The EUT shall have its hopping function enabled. Use the following spectrum analyzer settings: a) Span: The frequency band of operation. Depending on the number of channels the device supports, it could be necessary to divide the frequency range of operation across multiple spans, to allow the individual channels to be clearly seen. b) 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. c) VBW ≥ RBW. d) Sweep: No faster than coupled (auto) time. e) Detector function: Peak. f) Trace: Max-hold. g) Allow the trace to stabilize. It might prove necessary to break the span up into subranges to show clearly all of the hopping frequencies. Compliance of an EUT with the appropriate regulatory limit shall be determined for the number of hopping channels. A spectral plot of the data shall be included in the test report.

6.2.5.1. E.U.T. Operation

Operating Environment:					
Temperature:	23.5 °C	Humidity:	56.4 %	Atmospheric Pressure:	102.2 kPa
Pre test mode:	TM4, TM5, TM6				
Final test mode:	TM4, TM5, TM6				

6.2.5.2. Test Setup Diagram

6.2.5.3. Test Result

Pass

6.2.5.4. Test Data

Please Refer to Appendix for Details.

6.2.6. Dwell Time

Test Requirement:	47 CFR 15.247(a)(1)(iii)
Test Limit:	Refer to 47 CFR 15.247(a)(1)(iii), Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 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.
Test Method:	ANSI C63.10-2020, section 7.8.4
Procedure:	The dwell time per hop on a channel is the time from the start of the first transmission to the end of the last transmission for that hop. If the device has a single transmission per hop then the dwell time is the duration of that transmission. If the device has a multiple transmissions per hop then the dwell time is measured from the start of the first transmission to the end of the last transmission. The time of occupancy is the total time that the device dwells on a channel over an observation period specified in the regulatory requirement. To determine the time of occupancy the spectrum analyzer will be configured to measure both the dwell time per hop and the number of times the device transmits on a specific channel in a given period. The EUT shall have its hopping function enabled. Compliance with the requirements shall be made with the minimum and with the maximum number of channels enabled. If the dwell time per channel does not vary with the number of channels than compliance with the requirements may be based on the minimum number of channels. If the device supports different dwell times per channel (example Bluetooth devices can dwell on a channel for 1, 3 or 5 time slots) then measurements can be limited to the longest dwell time with the minimum number of channels. Use the following spectrum analyzer settings to determine the dwell time per hop: a) Span: Zero span, centered on a hopping channel. b) RBW shall be ≤ channel spacing and where possible RBW should be set >> 1 / T, where T is the expected transmission time per hop. c) Sweep time: Set so that the start of the first transmission and end of the last transmission for the hop are clearly captured. Setting the sweep time to be slightly longer than the hopping period per channel (hopping period = 1/hopping rate) should achieve this. d) Use a video trigger, where possible with a trigger delay, so that the start of the transmission is clearly observed. The trigger level might need adjustment to reduce the chance of triggering when the system hops on an adjacent channel. e) Detector function: Peak. f) Trace: Clear-write, single sweep. g) Place markers at the start of the first transmission on the channel and at the end of the last transmission. The dwell time per hop is the time between these two markers. To determine the number of hops on a channel in the regulatory observation period repeat the measurement using a longer sweep time. When the device uses a single hopping sequence the period of measurement should be sufficient to capture at least 2 hops. When the device uses a dynamic hopping sequence, or the sequence varies, the period of measurement may need to capture multiple hops to better determine the average time of occupancy. Count the number of hops on the channel across the sweep time. The average number of hops on the same channel within the regulatory observation period is calculated from the number of hops on the channel divided by the spectrum analyzer sweep time multiplied by the regulatory observation period. For example, if three hops are counted with an analyzer sweep time of 500 ms and

	the regulatory observation period is 10 s, then the number of hops in that ten seconds is 3 / 0.5 × 10, or 60 hops. The average time of occupancy is calculated by multiplying the dwell time per hop by the number of hops in the observation period.

6.2.6.1. E.U.T. Operation

Operating Environment:					
Temperature:	23.1 °C	Humidity:	55.2 %	Atmospheric Pressure:	102.2 kPa
Pre test mode:	TM4, TM5, TM6				
Final test mode:	TM4, TM5, TM6				

6.2.6.2. Test Setup Diagram

6.2.6.3. Test Result

Pass

6.2.6.4. Test Data

Please Refer to Appendix for Details.

6.2.7. Conducted band edge and spurious emission

Test Requirement:	47 CFR 15.247(d)
Test Limit:	Refer to 47 CFR 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, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in § 15.209(a) is not required.
Test Method:	ANSI C63.10-2020 section 7.8.7 ANSI C63.10-2020+Cor 1-2023 section 7.8.7 ANSI C63.10-2020+C63.10a-2024 section 7.8.7
Procedure:	7.8.7.1 General considerations To demonstrate compliance with the relative out-of-band emissions requirements conducted spurious emissions shall be measured for the transmit frequencies, per 5.5 and 5.6, and at the maximum transmit powers. Frequency hopping shall be disabled for this test with the exception of measurements at the allocated band-edges which shall be repeated with hopping enabled. Connect the primary antenna port through an attenuator to the spectrum analyzer input; in the results, account for all losses between the unlicensed wireless device output and the spectrum analyzer. The frequency range of testing shall span 30 MHz to 10 times the operating frequency and this may be done in a single sweep or, to aid resolution, across a number of sweeps. The resolution bandwidth shall be 100 kHz, video bandwidth 300 kHz, and a coupled sweep time with a peak detector. The limit is based on the highest in-band level across all channels measured using the same instrument settings (resolution bandwidth of 100 kHz, video bandwidth of 300 kHz, and a coupled sweep time with a peak detector). To help clearly demonstrate compliance a display line may be set at the required offset (typically 20 dB) below the highest in-band level. Where the highest in-band level is not clearly identified in the out-of-band measurements a separate spectral plot showing the in-band level shall be provided. When conducted measurements cannot be made (for example a device with integrated, non-removable antenna) radiated measurements shall be used. The reference level for determining the limit shall be established by maximizing the field strength from the highest power channel and measuring using the resolution and video bandwidth settings and peak detector as described above. The field strength limit for spurious emissions outside of restricted-bands shall then be set at the required offset (typically 20 dB) below the highest in-band level. Radiated measurements will follow the standards measurement procedures described in Clause 6 with the exception that the resolution bandwidth shall be 100 kHz, video bandwidth 300 kHz, and a coupled sweep time with a peak detector. Note that use of wider measurement bandwidths are acceptable for measuring the spurious emissions provided that the peak detector is used and that the measured value of spurious emissions are compared to the highest in-band level measured with the 100 kHz / 300 kHz bandwidth settings to determine compliance. 7.8.7.2 Band-edges Compliance with a relative limit at the band-edges (e.g., −20 dBc) shall be made on the lowest and on the highest channels with frequency hopping disabled and repeated with frequency hopping enabled. For the latter test the hopping sequence shall include the lowest and highest channels.

	For measurements with the hopping disabled the analyzer screen shall clearly show compliance with the requirement within 10 MHz of the allocated band-edge. For measurements with the hopping enabled the analyzer screen shall clearly show compliance with the requirement within 10 MHz of both of the allocated band-edges. This could require separate spectral plots for each band-edge.

6.2.7.1. E.U.T. Operation

Operating Environment:					
Temperature:	22.7 °C	Humidity:	55.5 %	Atmospheric Pressure:	102.2 kPa
Pre test mode:	TM1, TM2, TM3, TM4, TM5, TM6				
Final test mode:	TM1, TM2, TM3, TM4, TM5, TM6				

6.2.7.2. Test Setup Diagram

6.2.7.3. Test Result

Pass

6.2.7.4. Test Data

Please Refer to Appendix for Details.

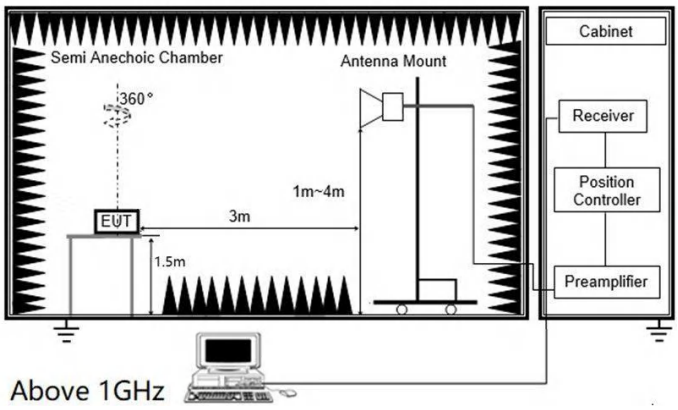
6.2.8. Radiated band edge emission

<table>
<tr><td>Test Requirement:</td><td>Refer to 47 CFR 15.247(d), In addition, radiated emissions which fall in the restricted bands, as defined in § 15.205(a), must also comply with the radiated emission limits specified in § 15.209(a)(see § 15.205(c)).</td></tr>
<tr><td>Test Limit:</td><td>
<table>
<tr><td>Frequency (MHz)</td><td>Field strength (microvolts/meter)</td><td>Measurement distance (meters)</td></tr>
<tr><td>0.009-0.490</td><td>2400/F(kHz)</td><td>300</td></tr>
<tr><td>0.490-1.705</td><td>24000/F(kHz)</td><td>30</td></tr>
<tr><td>1.705-30.0</td><td>30</td><td>30</td></tr>
<tr><td>30-88</td><td>100 **</td><td>3</td></tr>
<tr><td>88-216</td><td>150 **</td><td>3</td></tr>
<tr><td>216-960</td><td>200 **</td><td>3</td></tr>
<tr><td>Above 960</td><td>500</td><td>3</td></tr>
</table>
** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this part, e.g., §§ 15.231 and 15.241.
In the emission table above, the tighter limit applies at the band edges.
The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9–90 kHz, 110–490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.
</td></tr>
<tr><td>Test Method:</td><td>ANSI C63.10-2020 section 6.10</td></tr>
<tr><td>Procedure:</td><td>1>. EUT was setup and tested according to ANSI C63.10 .
2>. The EUT is placed on a turn table which is 1.5 meter above ground. The turn table is rotated 360 degrees to determine the position of the maximum emission level.
3>. The EUT was positioned such that the distance from antenna to the EUT was 3 meters.
4>. The antenna is scanned from 1 meter to 4 meters to find out the maximum emission level. Thisis repeated for both horizontal and vertical polarization of the antenna. In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.10 on radiated measurement.
5>. Use the following spectrum analyzer settings:
a) Span shall wide enough to fully capture the emission being measured
b) Set RBW=1MHz, VBW=3MHz for >1GHz, Sweep time=auto, Detector=peak, Trace=max hold for Peak measurement
For average measurement: use duty cycle correction factor method (DCCF), Average level = Peak level + DCCF</td></tr>
</table>

6.2.8.1. E.U.T. Operation

Operating Environment:					
Temperature:	23.2 °C	Humidity:	55.5 %	Atmospheric Pressure:	102.5 kPa
Pre test mode:	TM1, TM2, TM3				
Final test mode:	All of the listed pre-test mode were tested, only the data of the worst mode (TM1) is recorded in the report				

6.2.8.2. Test Setup Diagram

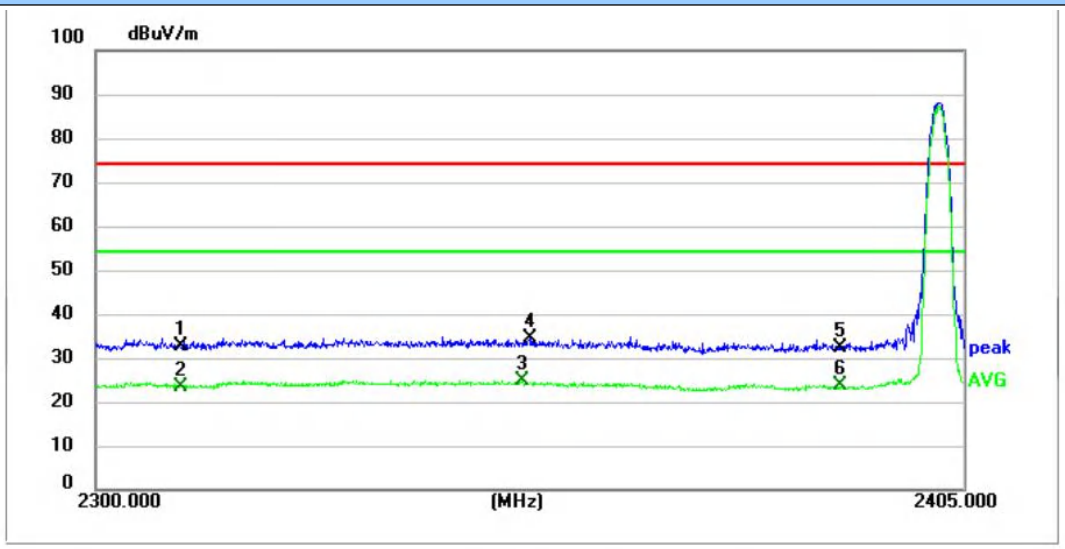


6.2.8.3. Test Result

Pass

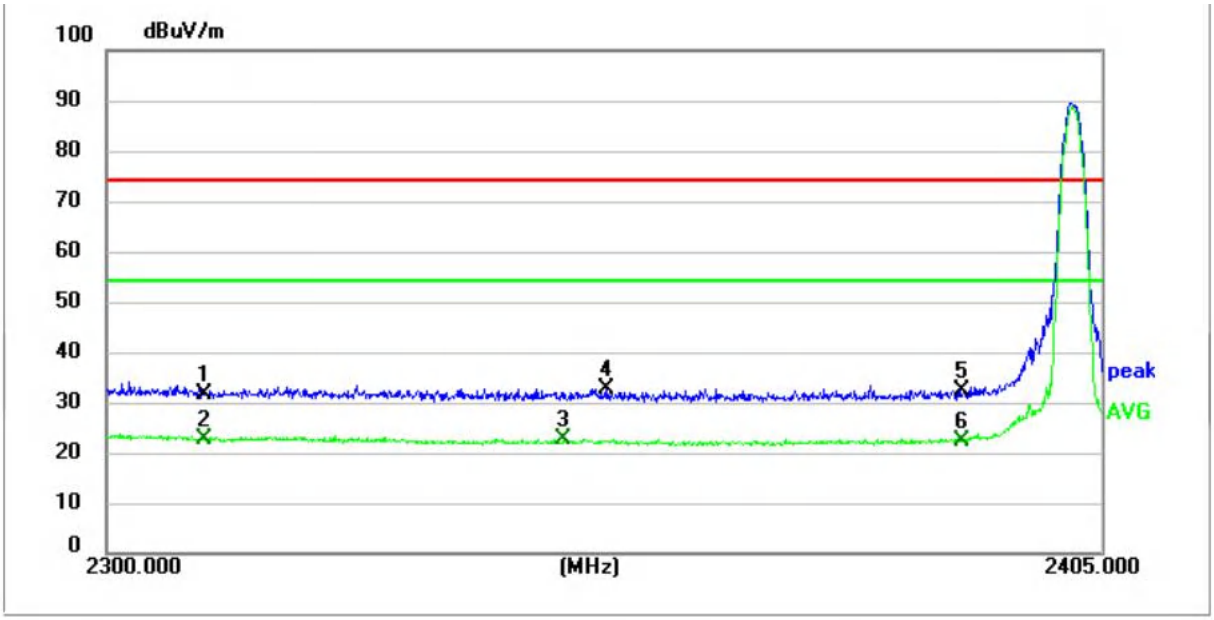
6.2.8.4. Test Data

Mode1 / Polarization: Horizontal / CH: L



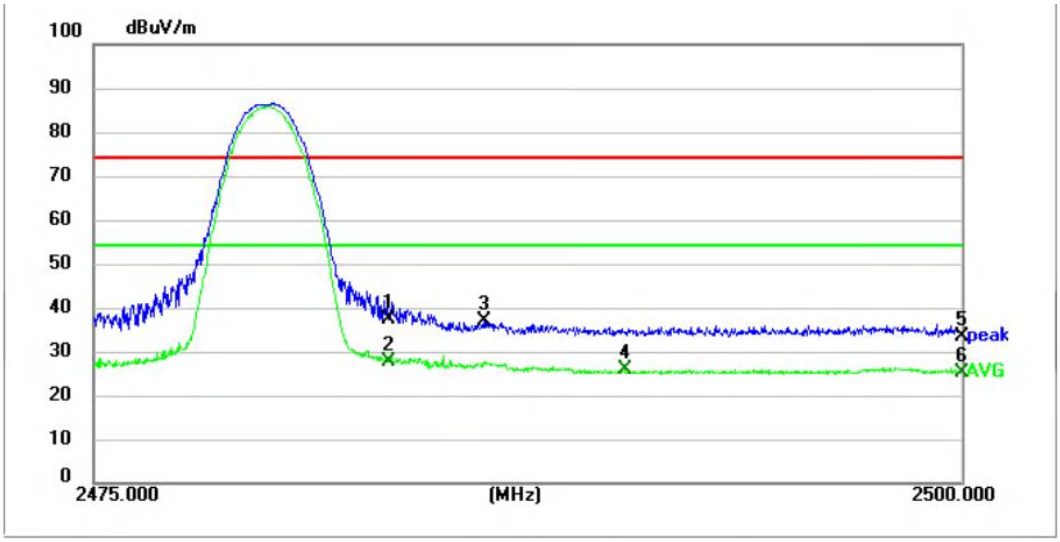
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	2310.0000	50.25	-17.52	32.73	74.00	41.27	peak
2	2310.0000	40.98	-17.52	23.46	54.00	30.54	AVG
3 *	2351.1770	42.18	-17.45	24.73	54.00	29.27	AVG
4	2351.9960	51.77	-17.45	34.32	74.00	39.68	peak
5	2390.0000	49.71	-17.32	32.39	74.00	41.61	peak
6	2390.0000	41.03	-17.32	23.71	54.00	30.29	AVG

Mode1 / Polarization: Vertical / CH: L



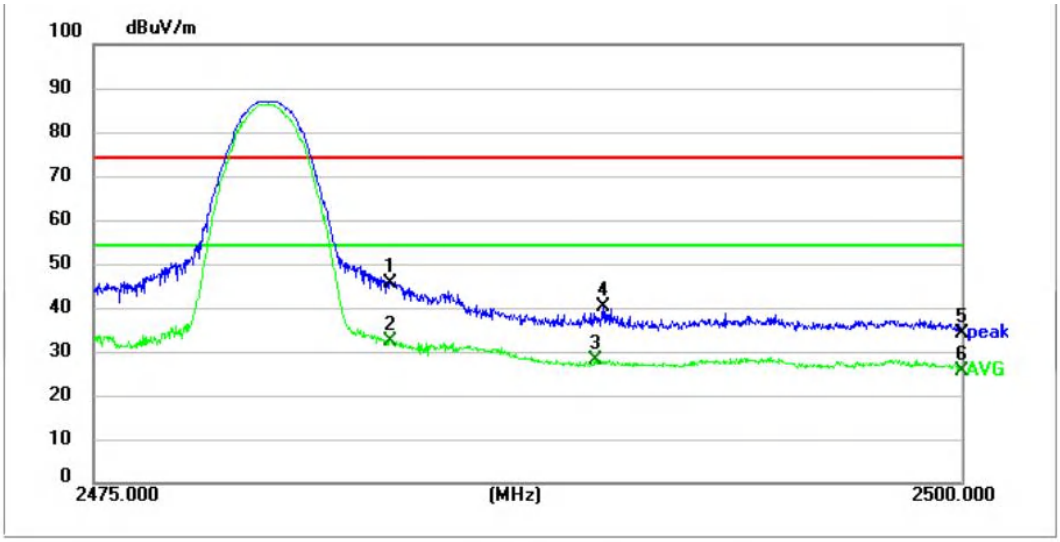
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	2310.0000	48.99	-17.52	31.47	74.00	42.53	peak
2 *	2310.0000	40.30	-17.52	22.78	54.00	31.22	AVG
3	2347.7330	40.20	-17.46	22.74	54.00	31.26	AVG
4	2352.3004	50.29	-17.45	32.84	74.00	41.16	peak
5	2390.0000	49.47	-17.32	32.15	74.00	41.85	peak
6	2390.0000	39.81	-17.32	22.49	54.00	31.51	AVG

Mode1 / Polarization: Horizontal / CH: H



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	2483.5000	54.52	-17.03	37.49	74.00	36.51	peak
2 *	2483.5000	44.75	-17.03	27.72	54.00	26.28	AVG
3	2486.2274	54.13	-17.02	37.11	74.00	36.89	peak
4	2490.2775	42.82	-16.99	25.83	54.00	28.17	AVG
5	2500.0000	50.38	-16.94	33.44	74.00	40.56	peak
6	2500.0000	42.19	-16.94	25.25	54.00	28.75	AVG

Mode1 / Polarization: Vertical / CH: H



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	2483.5000	62.64	-17.03	45.61	74.00	28.39	peak
2 *	2483.5000	49.21	-17.03	32.18	54.00	21.82	AVG
3	2489.4625	45.08	-16.99	28.09	54.00	25.91	AVG
4	2489.6900	57.15	-16.99	40.16	74.00	33.84	peak
5	2500.0000	51.01	-16.94	34.07	74.00	39.93	peak
6	2500.0000	42.35	-16.94	25.41	54.00	28.59	AVG

6.2.9. Radiated Spurious Emission (below 1GHz)

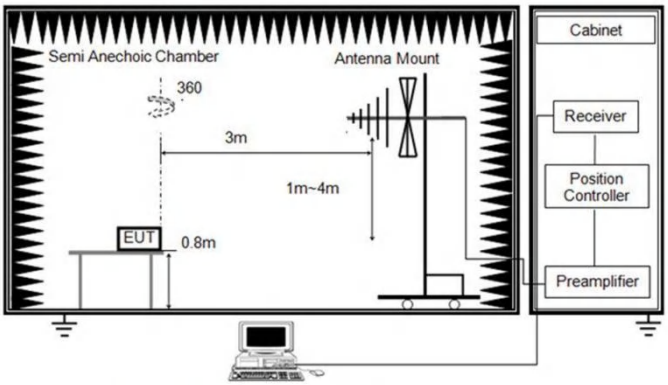
<table>
<tr><td>Test Requirement:</td><td>Refer to 47 CFR 15.247(d), In addition, radiated emissions which fall in the restricted bands, as defined in § 15.205(a), must also comply with the radiated emission limits specified in § 15.209(a)(see § 15.205(c)).</td></tr>
<tr><td>Test Limit:</td><td>
<table>
<tr><td>Frequency (MHz)</td><td>Field strength (microvolts/meter)</td><td>Measurement distance (meters)</td></tr>
<tr><td>0.009-0.490</td><td>2400/F(kHz)</td><td>300</td></tr>
<tr><td>0.490-1.705</td><td>24000/F(kHz)</td><td>30</td></tr>
<tr><td>1.705-30.0</td><td>30</td><td>30</td></tr>
<tr><td>30-88</td><td>100 **</td><td>3</td></tr>
<tr><td>88-216</td><td>150 **</td><td>3</td></tr>
<tr><td>216-960</td><td>200 **</td><td>3</td></tr>
<tr><td>Above 960</td><td>500</td><td>3</td></tr>
</table>
** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this part, e.g., §§ 15.231 and 15.241.
In the emission table above, the tighter limit applies at the band edges.
The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9–90 kHz, 110–490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.</td></tr>
<tr><td>Test Method:</td><td>ANSI C63.10-2020 section 6.5.4</td></tr>
<tr><td>Procedure:</td><td>1>. The EUT was setup and tested according to ANSI C63.10.
2>. The EUT is placed on a turn table which is 0.8 meter above ground for below 1 GHz, and 1.5 m for above 1 GHz. The turn table is rotated 360 degrees to determine the position of the maximum emission level.
3>. The EUT was set 3 meters from the receiving antenna, which was mounted on the top of a variable height antenna tower.
4>. For each suspected emission, the EUT was arranged to its worst case and then tune the Antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level to comply with the guidelines.
5>. Set to the maximum power setting and enable the EUT transmit continuously.
6>. Use the following spectrum analyzer settings
a) Span shall wide enough to fully capture the emission being measured;
b) RBW=120 kHz, VBW=300 kHz, Sweep=auto, Detector function=peak, Trace=max hold;

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.</td></tr>
</table>

6.2.9.1. E.U.T. Operation

Operating Environment:					
Temperature:	23 °C	Humidity:	56.1 %	Atmospheric Pressure:	102.5 kPa
Pre test mode:	TM1				
Final test mode:	TM1				

6.2.9.2. Test Setup Diagram



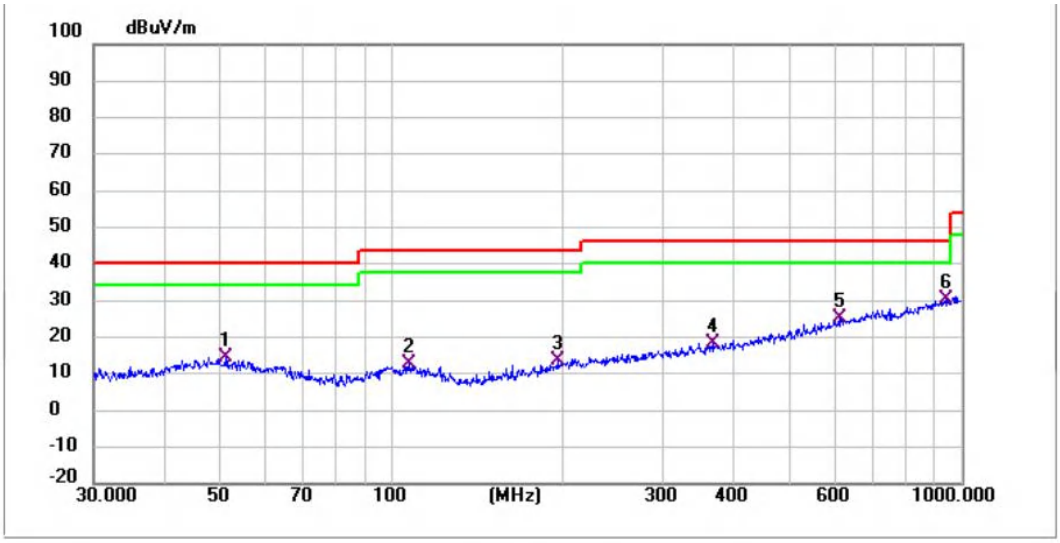
Below 1 GHz and above 30 MHz

6.2.9.3. Test Result

Pass

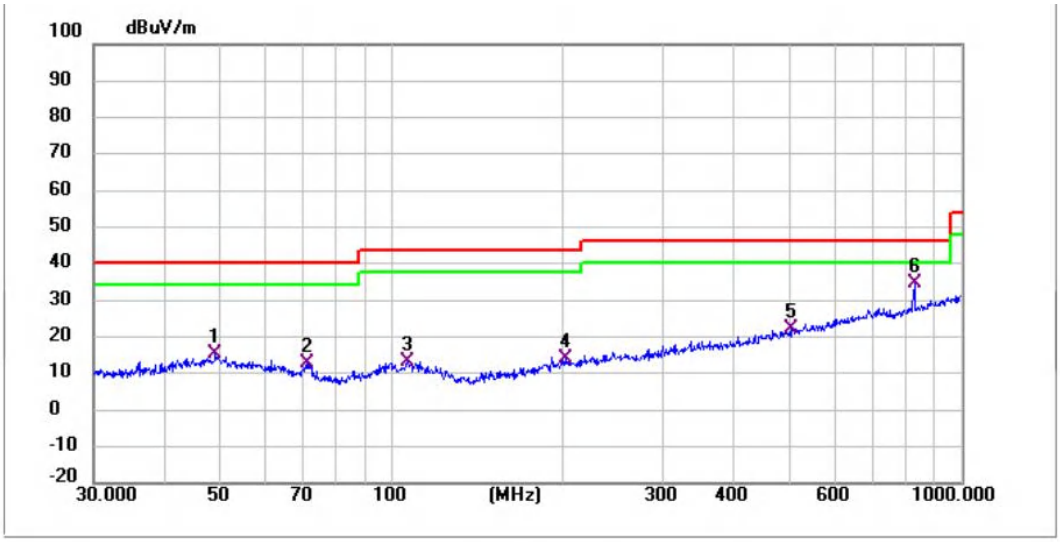
6.2.9.4. Test Data

Mode1 / Polarization: Horizontal / CH: L



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	51.1210	43.88	-29.37	14.51	40.00	25.49	QP
2	107.1337	43.36	-30.67	12.69	43.50	30.81	QP
3	196.5098	43.90	-30.17	13.73	43.50	29.77	QP
4	365.5390	43.88	-25.58	18.30	46.00	27.70	QP
5	612.0641	44.15	-18.95	25.20	46.00	20.80	QP
6 *	938.8326	44.63	-14.39	30.24	46.00	15.76	QP

Mode1 / Polarization: Vertical / CH: L



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	49.0144	44.59	-29.17	15.42	40.00	24.58	QP
2	71.3300	46.26	-33.28	12.98	40.00	27.02	QP
3	106.7587	43.86	-30.69	13.17	43.50	30.33	QP
4	202.8103	43.69	-29.73	13.96	43.50	29.54	QP
5	504.7062	44.15	-21.85	22.30	46.00	23.70	QP
6 *	827.4934	50.88	-16.27	34.61	46.00	11.39	QP

Note:
1>. For 9 kHz ~ 30 MHz Measurement
The EUT was pre-scanned this frequency band, found the radiated level 20dB lower than the limit, so don't show data on this report.
2>. Level= Reading + Factor (Antenna Factor+ Cable Loss- Preamp Factor)
3>. Margin = Limit – Level

6.2.10. Radiated Spurious Emission (Above 1GHz)

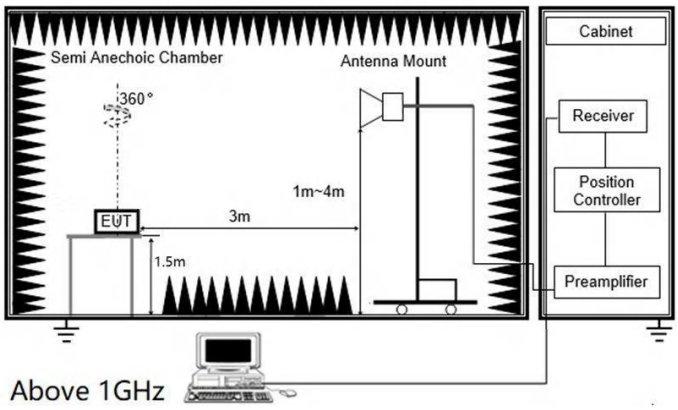
<table>
<tr><td>Test Requirement:</td><td>Refer to 47 CFR 15.247(d), in addition, radiated emissions which fall in the restricted bands, as defined in § 15.205(a), must also comply with the radiated emission limits specified in § 15.209(a)(see § 15.205(c)).</td></tr>
<tr><td>Test Limit:</td><td>
<table>
<tr><td>Frequency (MHz)</td><td>Field strength (microvolts/meter)</td><td>Measurement distance (meters)</td></tr>
<tr><td>0.009-0.490</td><td>2400/F(kHz)</td><td>300</td></tr>
<tr><td>0.490-1.705</td><td>24000/F(kHz)</td><td>30</td></tr>
<tr><td>1.705-30.0</td><td>30</td><td>30</td></tr>
<tr><td>30-88</td><td>100 **</td><td>3</td></tr>
<tr><td>88-216</td><td>150 **</td><td>3</td></tr>
<tr><td>216-960</td><td>200 **</td><td>3</td></tr>
<tr><td>Above 960</td><td>500</td><td>3</td></tr>
</table>
** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this part, e.g., §§ 15.231 and 15.241.
In the emission table above, the tighter limit applies at the band edges.
The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9–90 kHz, 110–490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.
</td></tr>
<tr><td>Test Method:</td><td>ANSI C63.10-2020 section 6.5.4</td></tr>
<tr><td>Procedure:</td><td>1>. The EUT was setup and tested according to ANSI C63.10.
2>. The EUT is placed on a turn table which is 0.8 meter above ground for 1.5 m for above 1 GHz. The turn table is rotated 360 degrees to determine the position of the maximum emission level.
3>. The EUT was set 3 meters from the receiving antenna, which was mounted on the top of a variable height antenna tower.
4>. For each suspected emission, the EUT was arranged to its worst case and then tune the Antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level to comply with the guidelines.
5>. Set to the maximum power setting and enable the EUT transmit continuously.
6>. Use the following spectrum analyzer settings
a) Span shall wide enough to fully capture the emission being measured;
b) Set RBW=1MHz, VBW=3MHz, Sweep time=auto, Detector=peak, Trace=max hold for Peak measurement

For average measurement: use duty cycle correction factor method (DCCF)
Average level = Peak level + DCCF</td></tr>
</table>

6.2.10.1. E.U.T. Operation

<table>
<tr><td colspan="6">Operating Environment:</td></tr>
<tr><td>Temperature:</td><td>23.2 °C</td><td>Humidity:</td><td>56.2 %</td><td>Atmospheric Pressure:</td><td>102.5 kPa</td></tr>
<tr><td colspan="2">Pre test mode:</td><td colspan="4">TM1, TM2, TM3, TM4, TM5, TM6, TM7</td></tr>
<tr><td colspan="2">Final test mode:</td><td colspan="4">All of the listed pre-test mode were tested, only the data of the worst mode (TM1) is recorded in the report</td></tr>
</table>

6.2.10.2. Test Setup Diagram

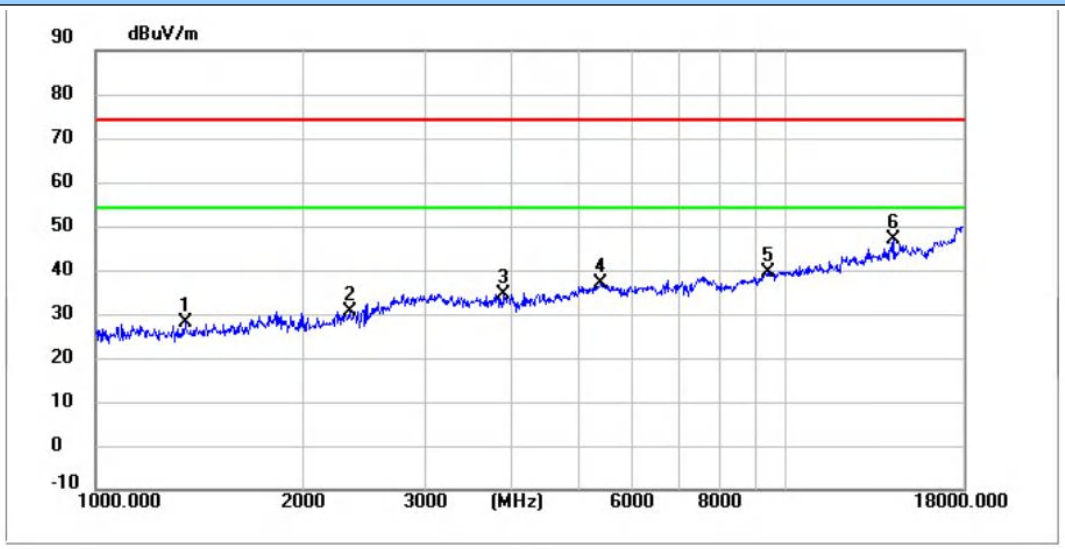


6.2.10.3. Test Result

Pass

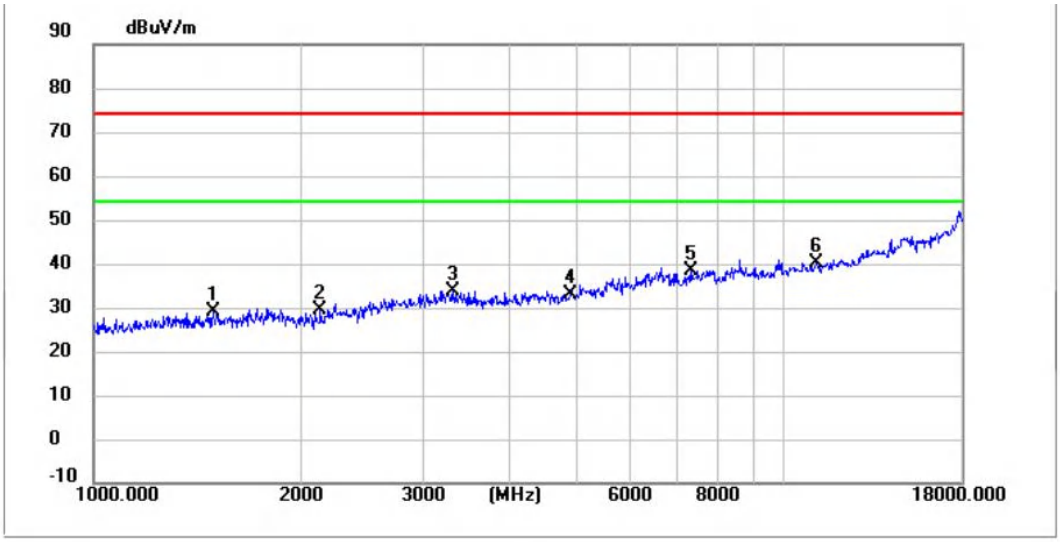
6.2.10.4. Test Data

Mode1 / Polarization: Horizontal / CH: L



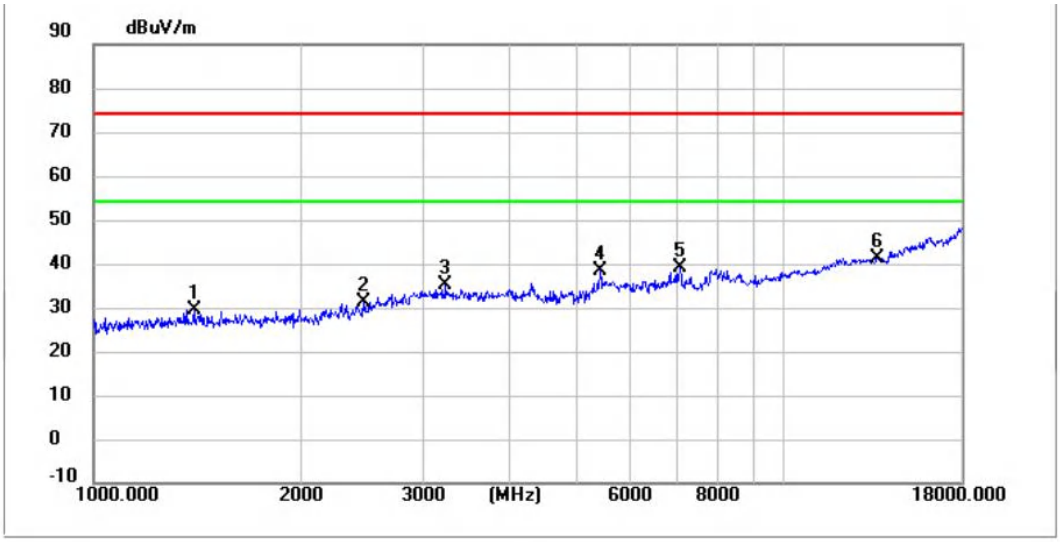
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	1346.8000	49.24	-21.20	28.04	74.00	45.96	peak
2	2336.2000	48.03	-17.47	30.56	74.00	43.44	peak
3	3912.1000	47.20	-12.56	34.64	74.00	39.36	peak
4	5406.4000	43.27	-6.43	36.84	74.00	37.16	peak
5	9433.7000	30.04	9.59	39.63	74.00	34.37	peak
6 *	14253.2000	28.36	18.54	46.90	74.00	27.10	peak

Mode1 / Polarization: Vertical / CH: L



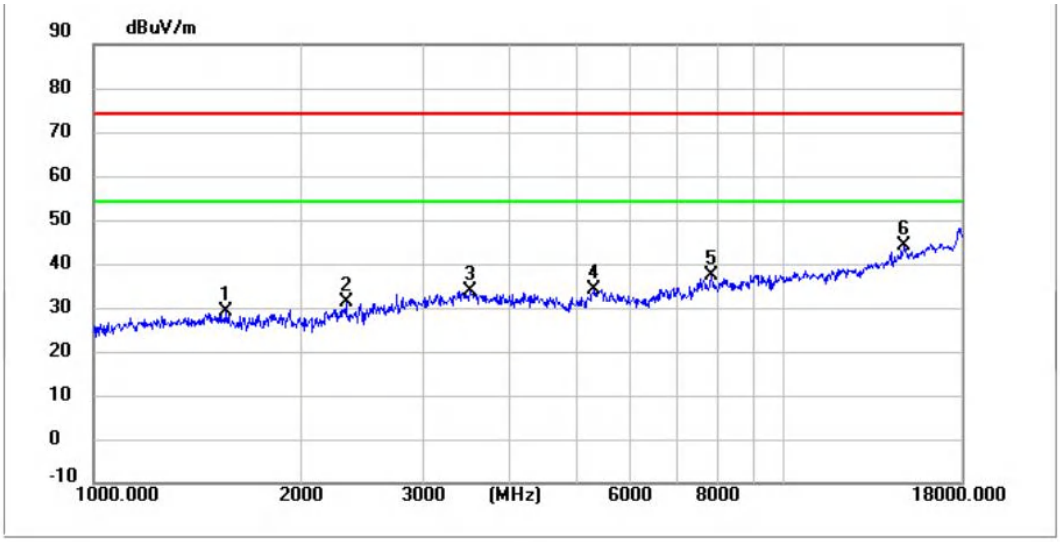
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	1493.0000	49.70	-20.75	28.95	74.00	45.05	peak
2	2130.5000	47.37	-18.07	29.30	74.00	44.70	peak
3	3325.6000	47.82	-13.90	33.92	74.00	40.08	peak
4	4906.6000	42.28	-9.31	32.97	74.00	41.03	peak
5	7322.3000	33.83	4.71	38.54	74.00	35.46	peak
6 *	11126.9000	26.53	13.53	40.06	74.00	33.94	peak

Mode1 / Polarization: Horizontal / CH: M



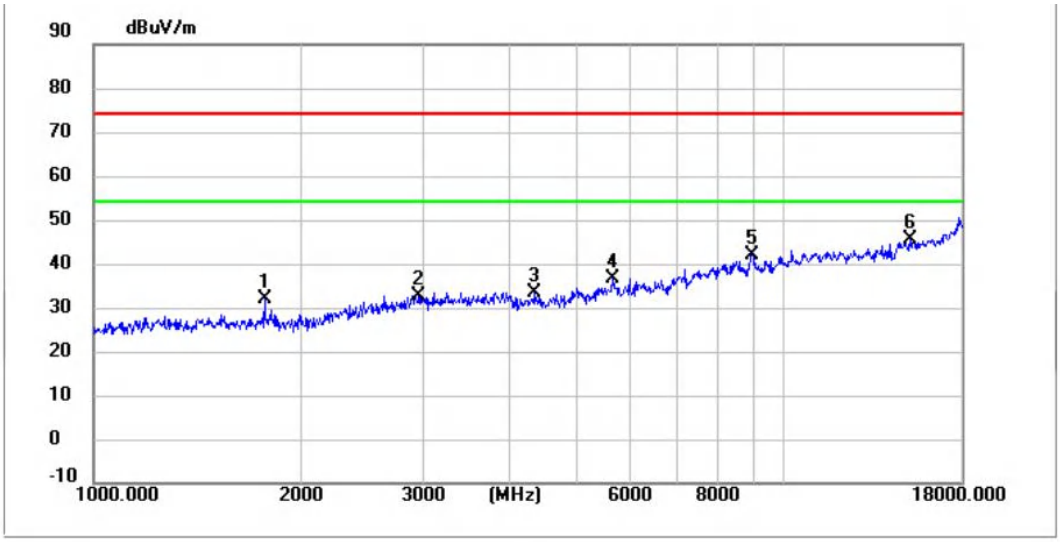
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	1401.2000	50.58	-21.11	29.47	74.00	44.53	peak
2	2462.0000	48.29	-17.15	31.14	74.00	42.86	peak
3	3238.9000	49.23	-13.96	35.27	74.00	38.73	peak
4	5411.5000	44.84	-6.50	38.34	74.00	35.66	peak
5	7074.1000	35.25	3.95	39.20	74.00	34.80	peak
6 *	13642.9000	23.90	17.44	41.34	74.00	32.66	peak

Mode1 / Polarization: Vertical / CH: M



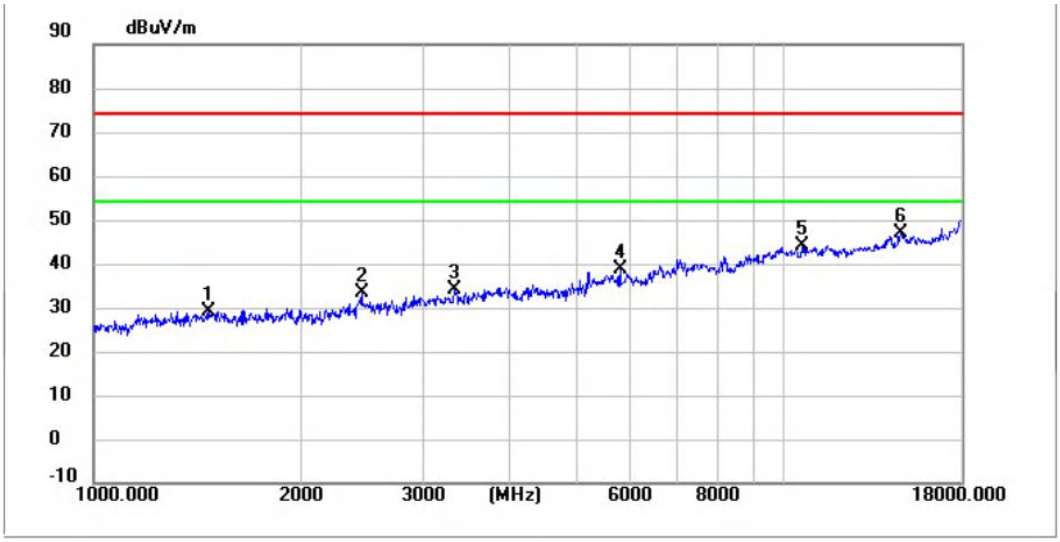
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	1557.6000	49.63	-20.62	29.01	74.00	44.99	peak
2	2319.2000	48.59	-17.50	31.09	74.00	42.91	peak
3	3519.4000	47.42	-13.69	33.73	74.00	40.27	peak
4	5304.4000	41.85	-7.60	34.25	74.00	39.75	peak
5	7837.4000	31.31	5.89	37.20	74.00	36.80	peak
6 *	14934.9000	26.32	17.81	44.13	74.00	29.87	peak

Mode1 / Polarization: Horizontal / CH: H



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	1771.8000	51.52	-19.67	31.85	74.00	42.15	peak
2	2960.1000	47.60	-14.76	32.84	74.00	41.16	peak
3	4366.0000	44.90	-11.45	33.45	74.00	40.55	peak
4	5654.6000	43.03	-6.44	36.59	74.00	37.41	peak
5	8974.7000	33.98	8.16	42.14	74.00	31.86	peak
6 *	15205.2000	27.95	17.67	45.62	74.00	28.38	peak

Mode1 / Polarization: Vertical / CH: H



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	1472.6000	49.80	-20.78	29.02	74.00	44.98	peak
2	2443.3000	50.44	-17.22	33.22	74.00	40.78	peak
3	3337.5000	47.96	-13.87	34.09	74.00	39.91	peak
4	5780.4000	44.87	-6.19	38.68	74.00	35.32	peak
5	10579.5000	31.95	12.10	44.05	74.00	29.95	peak
6 *	14737.7000	28.87	18.10	46.97	74.00	27.03	peak

Note:
1>. Level= Reading + Factor (Antenna Factor+ Cable Loss- Preamp Factor)
2>. Margin = Limit – Level
3>. Average measurement was not performed if peak level is lower than average limit (54dBuV/m) above 1GHz.

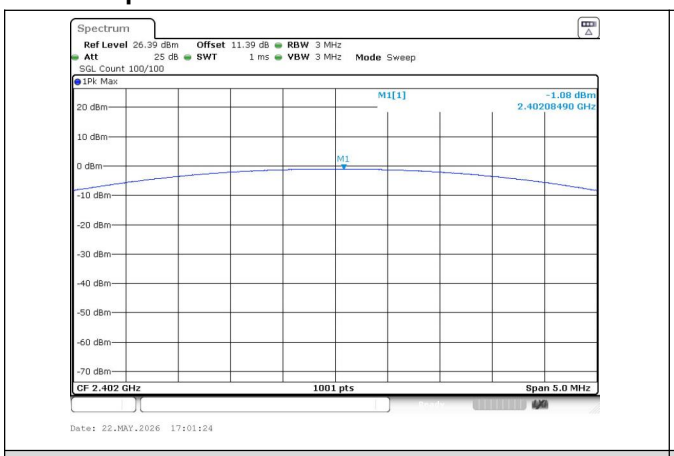
7. APPENDIX REPORT

7.1. Conducted Output Power

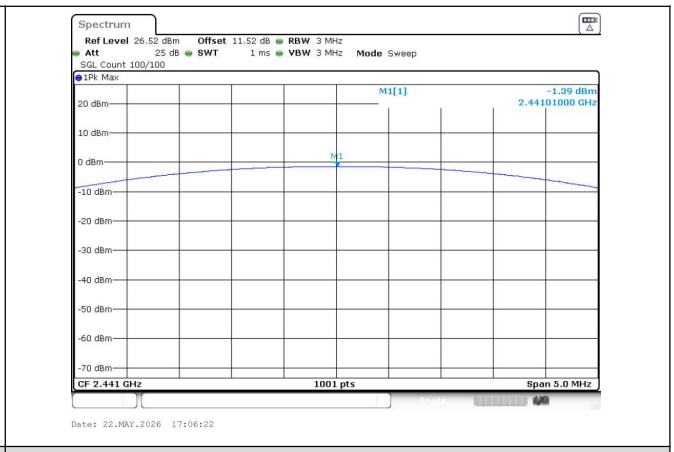
Test Result

Modulation	Packet Type	Channel	Peak Output Power (dBm)	Peak Output Power (mW)	Limit (dBm)	Result
GFSK	DH5	0	-1.08	0.78	≤30	PASS
		39	-1.39	0.73		PASS
		78	-1.31	0.74		PASS
π/4DQPSK	2-DH5	0	-0.21	0.95		PASS
		39	-0.68	0.86		PASS
		78	-0.53	0.89		PASS
8DPSK	3-DH5	0	0.29	1.07		PASS
		39	-0.17	0.96		PASS
		78	0.00	1.00		PASS

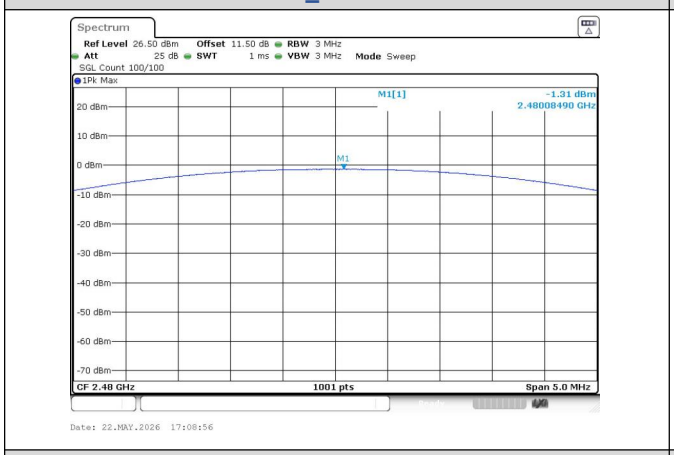
Test Graphs



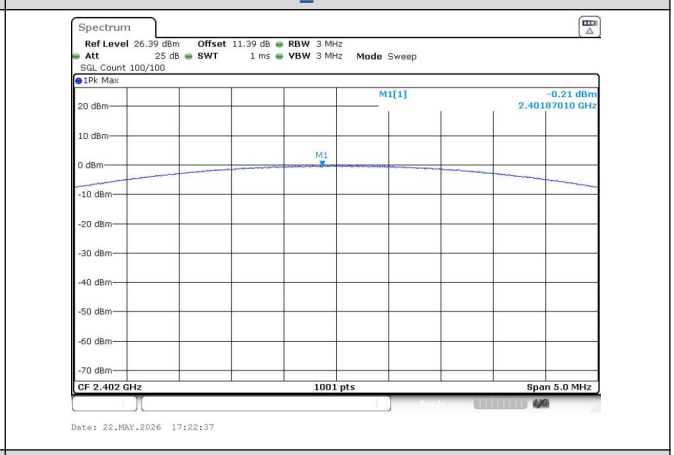
Peak Output Power
GFSK_Channel 0



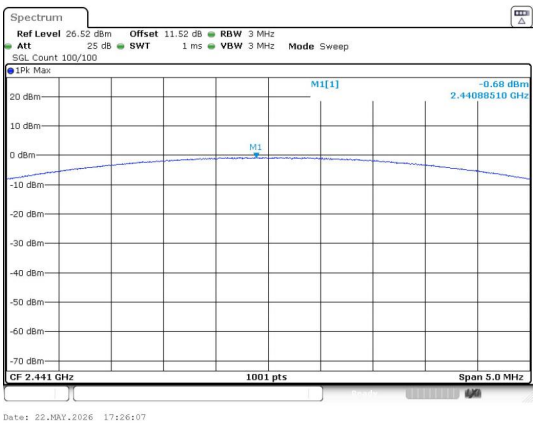
Peak Output Power
GFSK_Channel 39



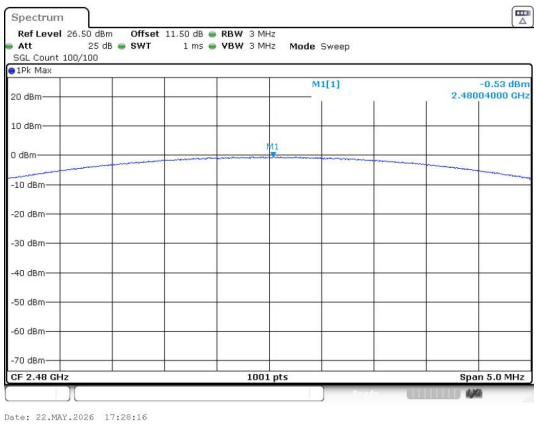
Peak Output Power
GFSK_Channel 78



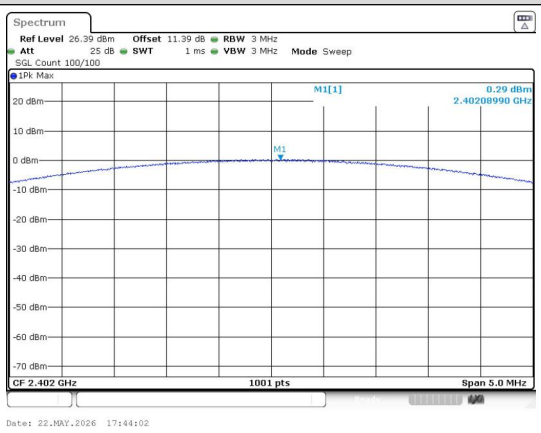
Peak Output Power
π/4DQPSK_Channel 0



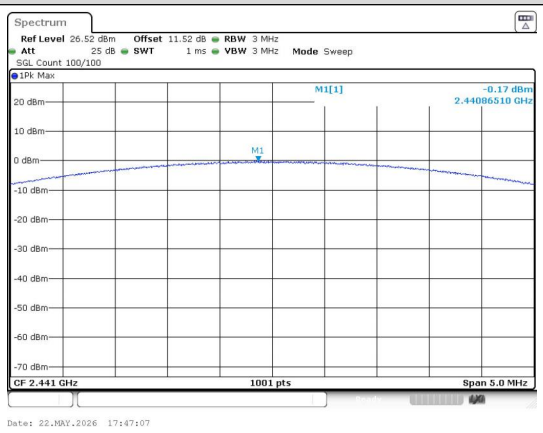
Peak Output Power
π/4DQPSK_Channel 39



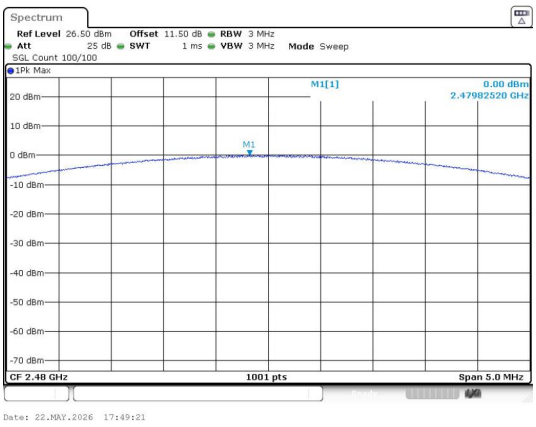
Peak Output Power
π/4DQPSK_Channel 78



Peak Output Power
8DPSK_Channel 0



Peak Output Power
8DPSK_Channel 39



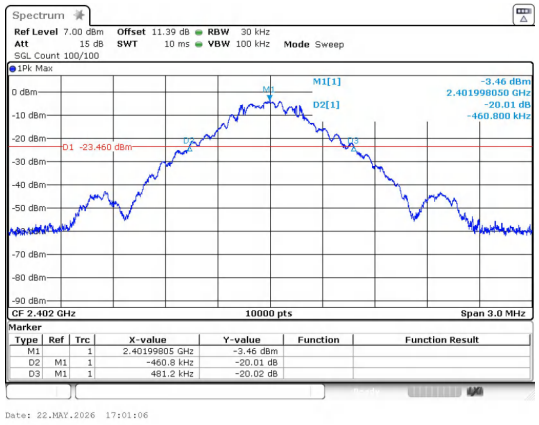
Peak Output Power
8DPSK_Channel 78

7.2. 20dB Bandwidth

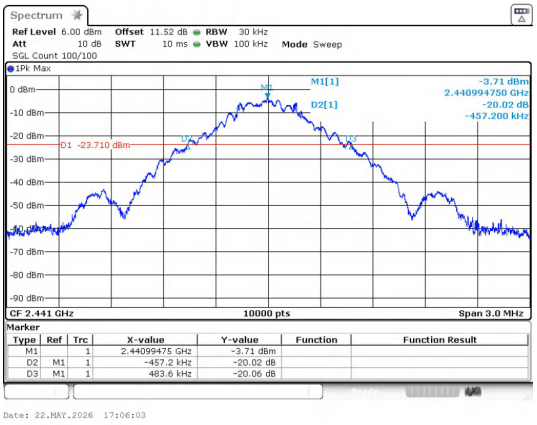
Test Result

Modulation	Channel	Center Frequency (MHz)	20 dB Bandwidth (MHz)
GFSK	0	2402 MHz	0.9400
	39	2441 MHz	0.9400
	78	2480 MHz	0.9400
π/4DQPSK	0	2402 MHz	1.280
	39	2441 MHz	1.280
	78	2480 MHz	1.250
8DPSK	0	2402 MHz	1.280
	39	2441 MHz	1.290
	78	2480 MHz	1.280

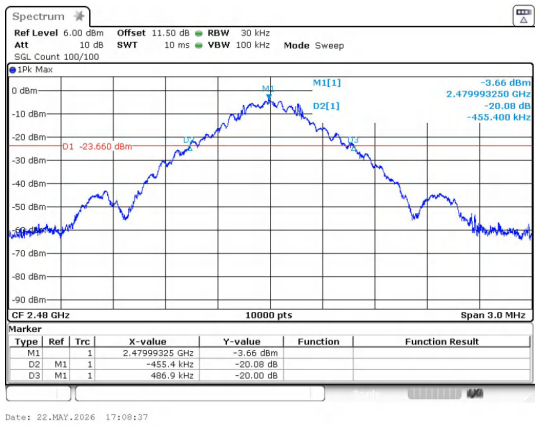
Test Graphs



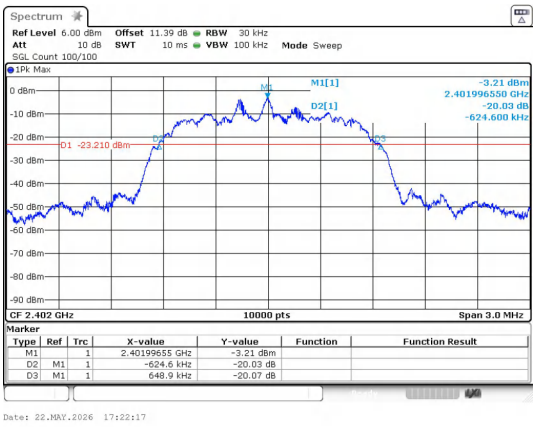
GFSK_DH5_Channel 0



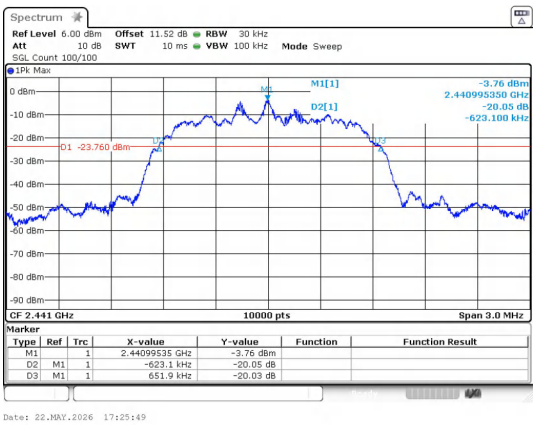
GFSK_DH5_Channel 39



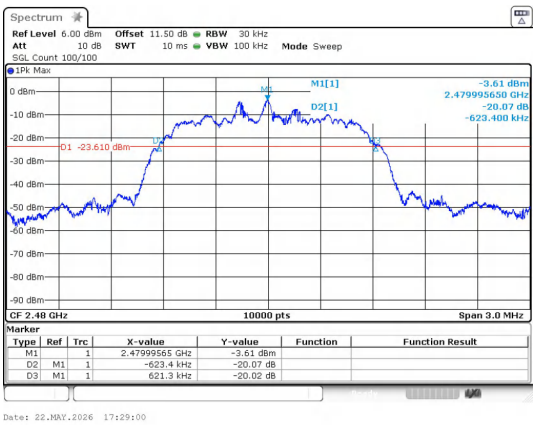
GFSK_DH5_Channel 78



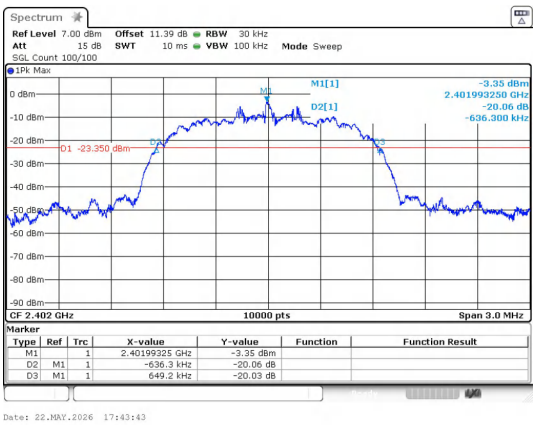
π/4DQPSK_2-DH5_Channel 0



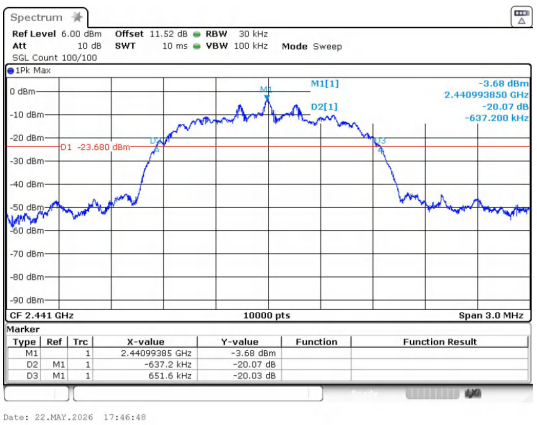
π/4DQPSK_2-DH5_Channel 39



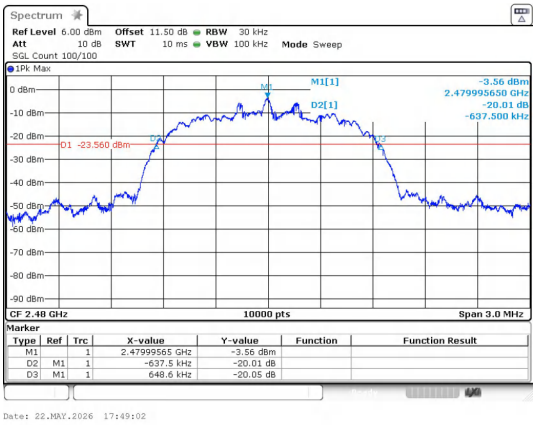
π/4DQPSK_2-DH5_Channel 78



8DPSK_3-DH5_Channel 0



8DPSK_3-DH5_Channel 39



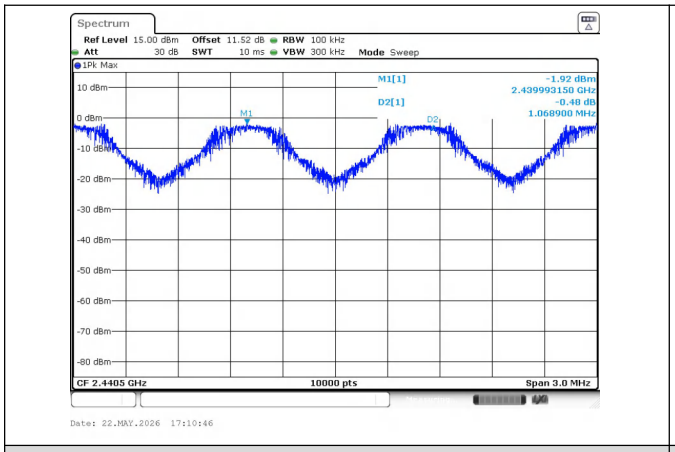
8DPSK_3-DH5_Channel 78

7.3. Carrier Frequencies Separation

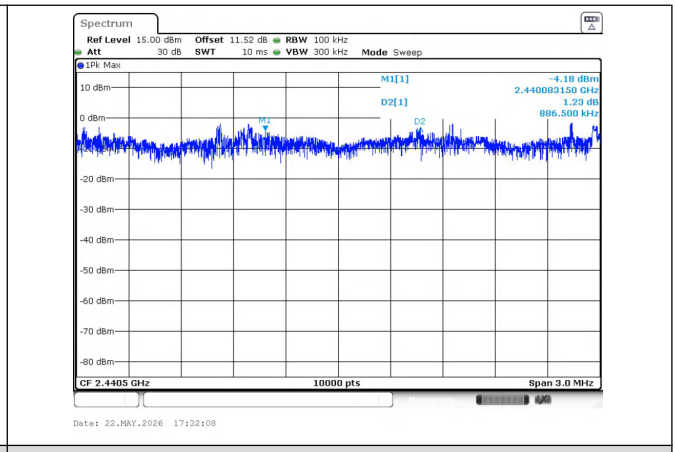
Test Result

Modulation	Packet	Left Center frequency (MHz)	Right Center frequency (MHz)	Hopping Frequency Separation (MHz)	Minimum Limit (MHz)	Result
GFSK	DH5	2439.9931	2441.062	1.0689	0.94	PASS
π/4DQPSK	2-DH5	2440.0831	2440.9697	0.8865	0.853	PASS
8DPSK	3-DH5	2439.9716	2441.0698	1.0983	0.86	PASS

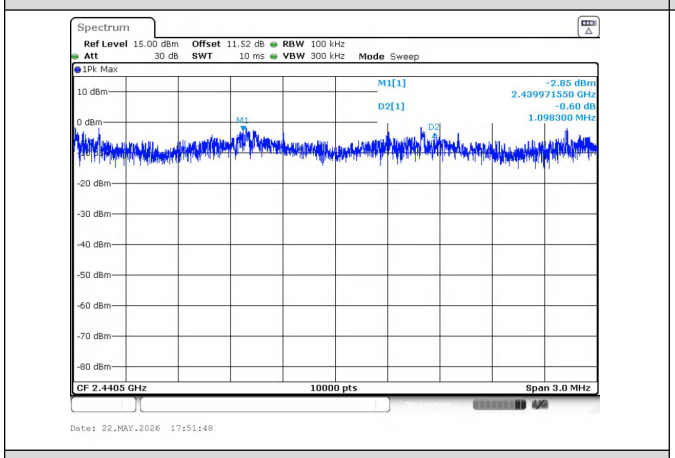
Test Graphs



GFSK



π/4DQPSK



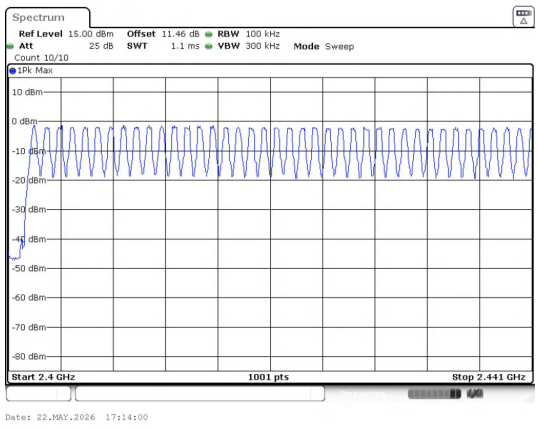
8DPSK

7.4. Number Of Hopping Channel

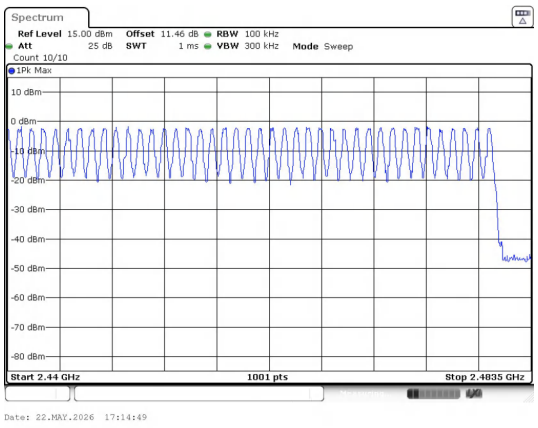
Test Result

Modulation	Packet	Number of Hopping Channel	Limit	Result
GFSK	DH5	79	15	PASS
π/4DQPSK	2-DH5	79	15	PASS
8DPSK	3-DH5	79	15	PASS

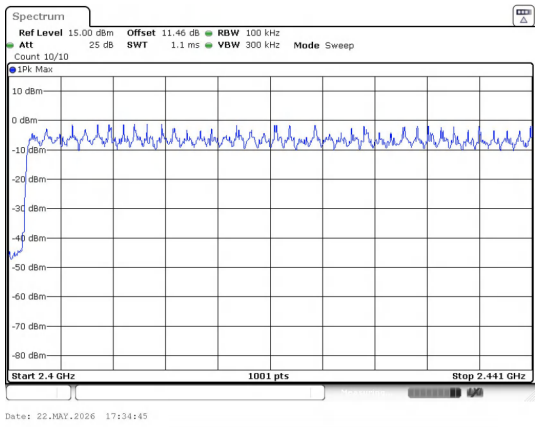
Test Graphs



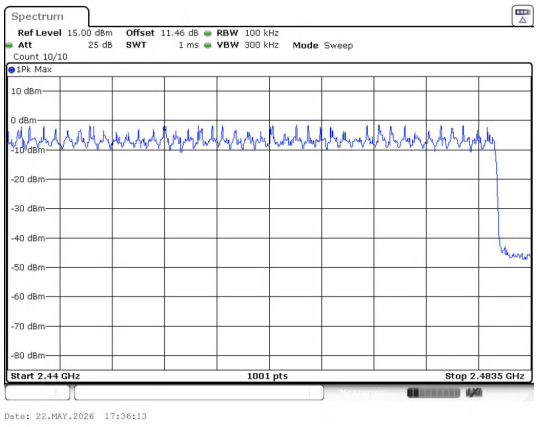
Low End Spectrum Channel Hopping Plot
GFSK



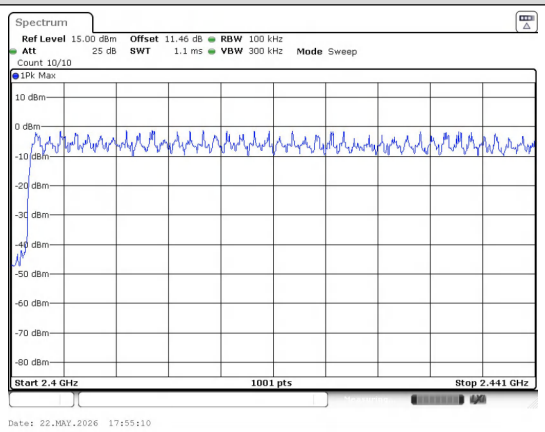
High End Spectrum Channel Hopping Plot
GFSK



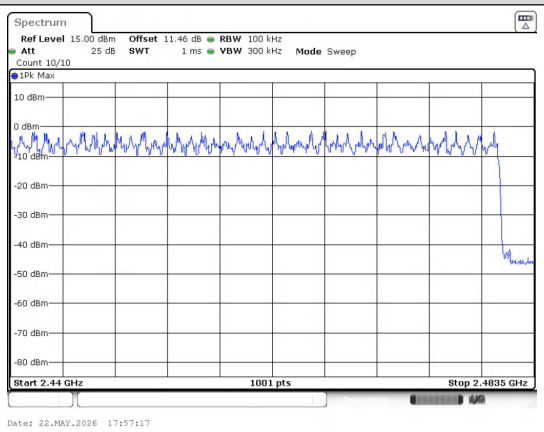
Low End Spectrum Channel Hopping Plot
π/4DQPSK



High End Spectrum Channel Hopping Plot
π/4DQPSK



Low End Spectrum Channel Hopping Plot
8DPSK



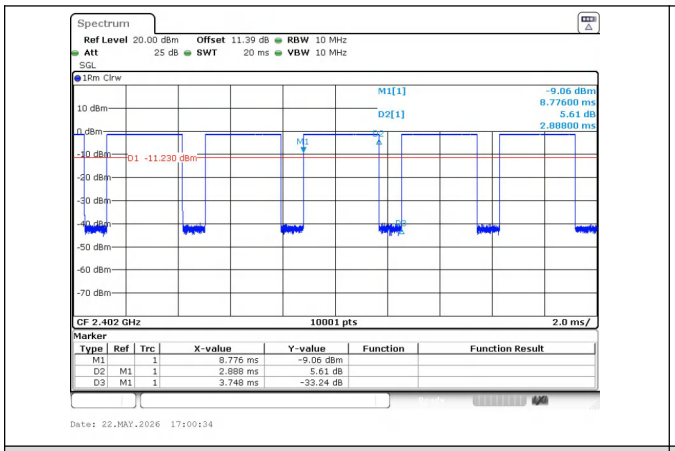
High End Spectrum Channel Hopping Plot
8DPSK

7.5. Duty Cycle

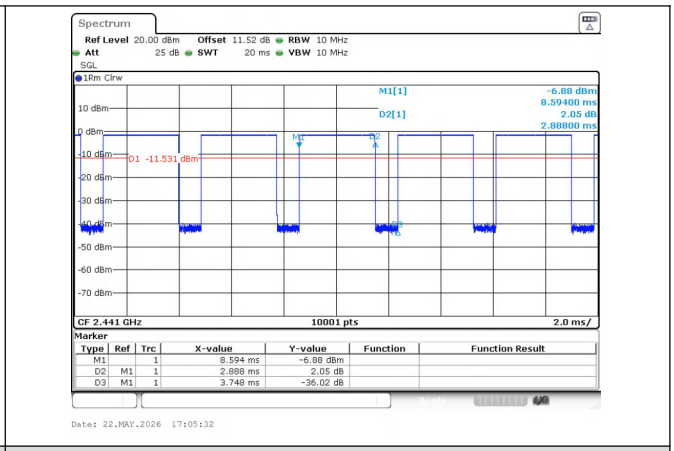
Test Result

Modulation	Packets	Channel	On Time (ms)	Period (ms)	Duty Cycle (%)	Duty Cycle (linear)	Duty Cycle Factor (dB)	1/T
GFSK	DH5	0	2.888	3.748	77.05	0.7705	1.1323	0.3463
		39	2.888	3.748	77.05	0.7705	1.1323	0.3463
		78	2.888	3.748	77.05	0.7705	1.1323	0.3463
π/4DQPSK	2-DH5	0	2.894	3.748	77.21	0.7721	1.1233	0.3455
		39	2.892	3.748	77.16	0.7716	1.1261	0.3458
		78	2.894	3.748	77.21	0.7721	1.1233	0.3455
8DPSK	3-DH5	0	2.896	3.748	77.27	0.7727	1.1199	0.3453
		39	2.896	3.748	77.27	0.7727	1.1199	0.3453
		78	2.894	3.748	77.21	0.7721	1.1233	0.3455

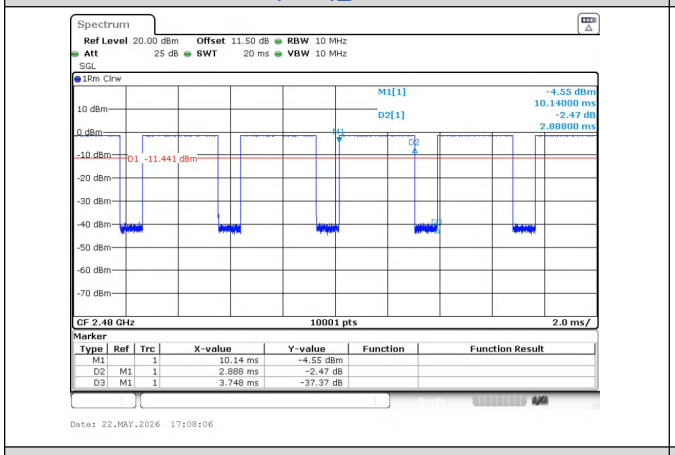
Test Graphs



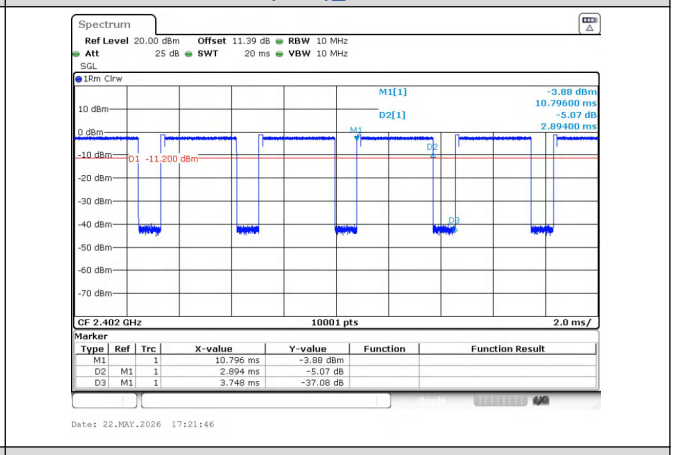
GFSK(DH5)_Channel 0



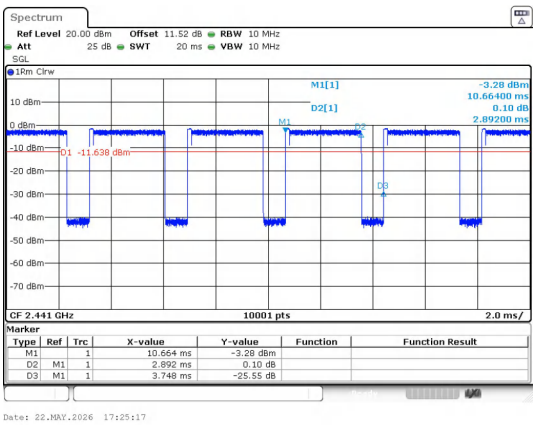
GFSK(DH5)_Channel 39



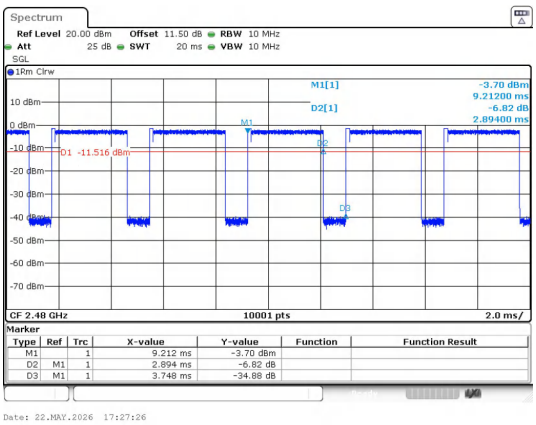
GFSK(DH5)_Channel 78



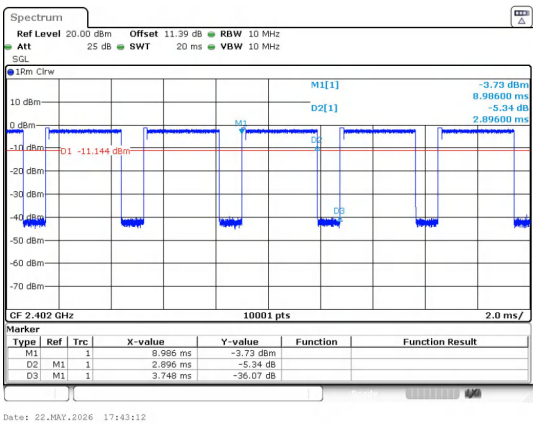
π/4DQPSK(2-DH5)_Channel 0



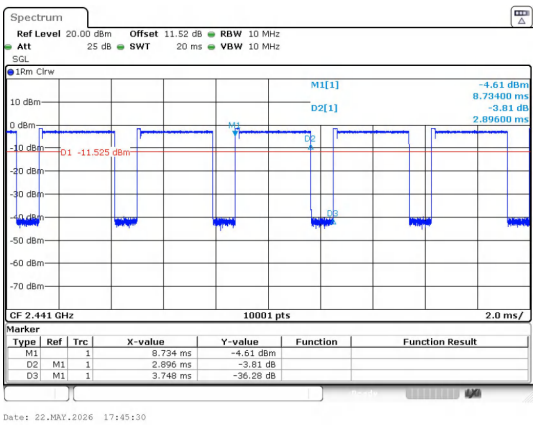
π/4DQPSK(2-DH5)_Channel 39



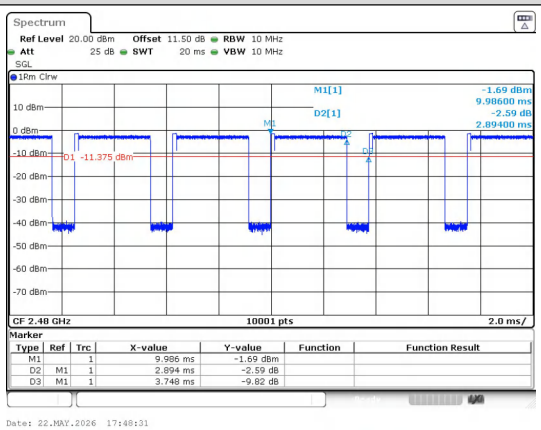
π/4DQPSK(2-DH5)_Channel 78



8DPSK(3-DH5)_Channel 0



8DPSK(3-DH5)_Channel 39



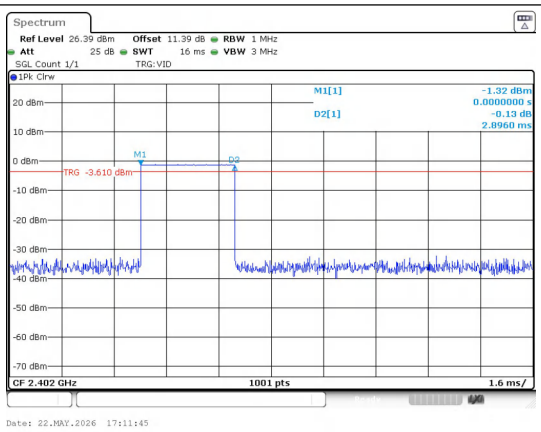
8DPSK(3-DH5)_Channel 78

7.6. Dwell Time

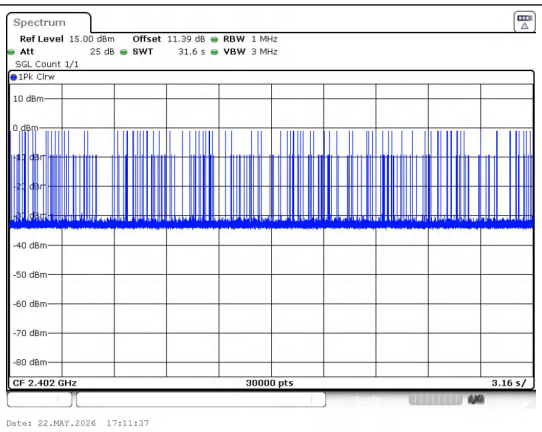
Test Result

Modulation	Packet	Channel	Pulse Width (ms)	Number of Pulses in 31.6 seconds	Dwell Time (ms)	Limit (ms)	Result
GFSK	DH5	Hopping	2.896	91	263.54	< 400	PASS
π/4DQPSK	2-DH5		2.896	103	298.29		PASS
8DPSK	3-DH5		2.896	117	338.83		PASS
Note: Dwell time=Pulse time(ms)*Number of Pulses in 31.6 seconds							

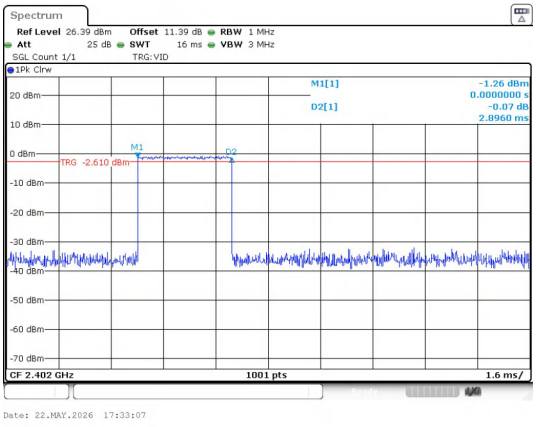
Test Graphs



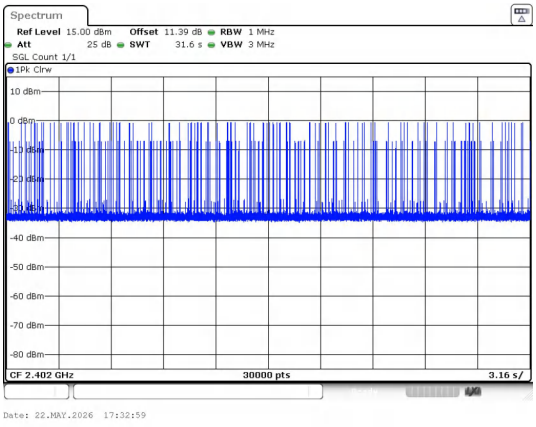
Pulse Width GFSK_DH5



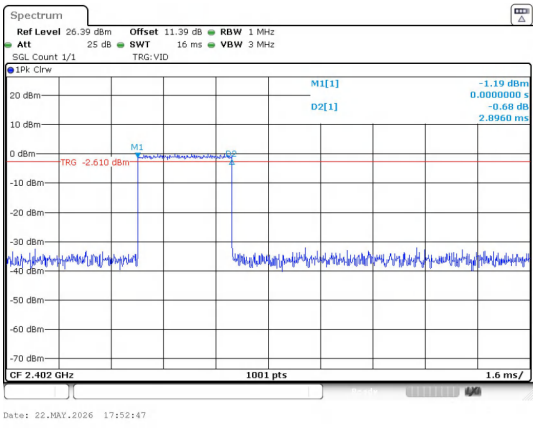
Number of Pulses in 31.6 seconds GFSK_DH5

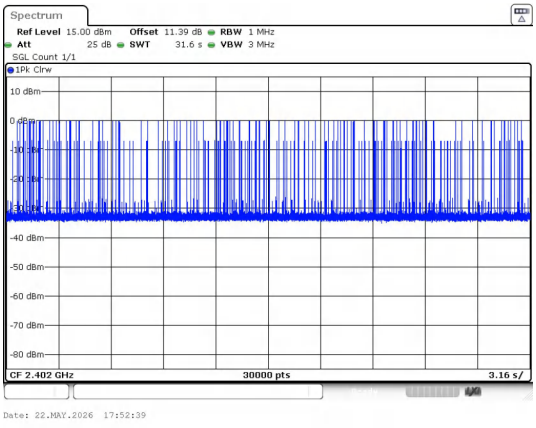


Pulse Width π/4DQPSK_2-DH5



Number of Pulses in 31.6 seconds π/4DQPSK_2-DH5





Pulse Width 8DPSK_3-DH5	Number of Pulses in 31.6 seconds 8DPSK_3-DH5

7.7. Conducted Spurious & Band Edge Emission

Test Result

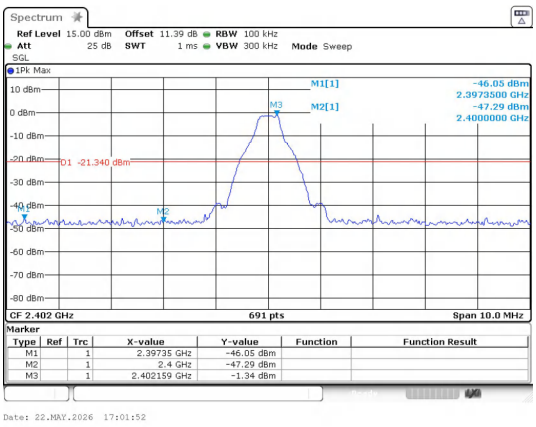
Non-Hopping

Modulation	Packet	Channel	OOB Emission Frequency (MHz)	OOB Emission Level (dBm)	Limit (dBm)	Over Limit (dB)	Result
GFSK	DH5	0	2397.35	-46.047	-21.34	-24.707	PASS
			2400.00	-47.290	-21.34	-25.950	PASS
			4803.80	-46.609	-21.34	-25.269	PASS
		39	9763.72	-45.031	-21.85	-23.181	PASS
		78	2483.50	-47.930	-21.74	-26.190	PASS
			9920.20	-44.358	-21.74	-22.618	PASS
π/4DQPSK	2-DH5	0	2397.20	-45.902	-21.32	-24.582	PASS
			2400.00	-47.100	-21.32	-25.780	PASS
			6906.30	-47.035	-21.32	-25.715	PASS
		39	6924.63	-47.304	-21.87	-25.434	PASS
		78	2483.50	-47.810	-21.69	-26.120	PASS
			9920.20	-45.027	-21.69	-23.337	PASS
8DPSK	3-DH5	0	2400.00	-45.180	-21.2	-23.980	PASS
			6946.27	-47.601	-21.2	-26.401	PASS
		39	9763.72	-45.777	-21.76	-24.017	PASS
		78	2483.50	-47.630	-21.47	-26.160	PASS
			9920.20	-43.380	-21.47	-21.910	PASS
Note: input compensation coeffcient (dB)= Cable Loss (dB)							

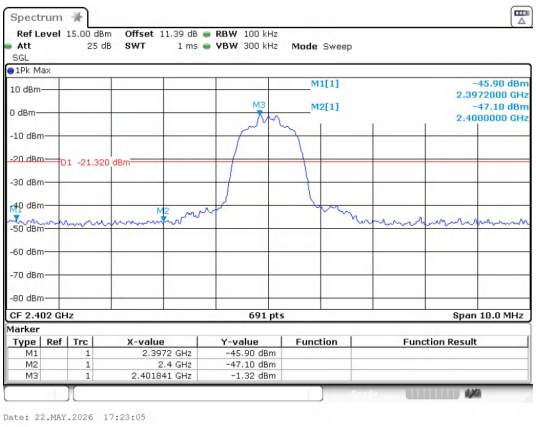
Hopping

Modulation	Packet	Channel	OOB Emission Frequency (MHz)	OOB Emission Level (dBm)	Limit (dBm)	Over Limit (dB)	Result
GFSK	DH5	Hopping	2397.00	-44.162	-21.43	-22.732	PASS
			2400.00	-45.690	-21.43	-24.260	PASS
			2483.50	-44.950	-21.69	-23.260	PASS
π/4DQPSK	2-DH5		2397.11	-44.777	-21.39	-23.387	PASS
			2400.00	-46.880	-21.39	-25.490	PASS
			2483.50	-44.740	-21.58	-23.160	PASS
8DPSK	3-DH5		2396.89	-44.664	-21.24	-23.424	PASS
			2400.00	-45.810	-21.24	-24.570	PASS
			2483.50	-45.000	-21.59	-23.410	PASS
Note: input compensation coeffcient (dB)= Cable Loss (dB)							

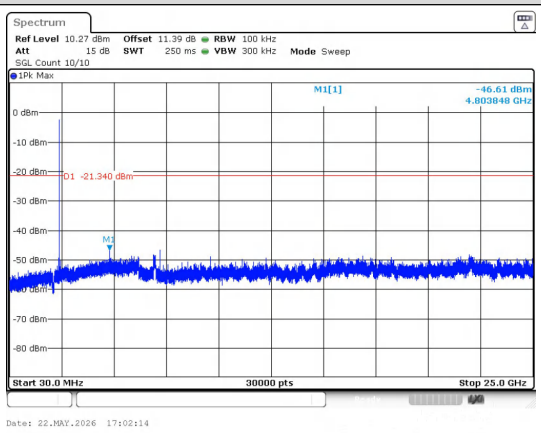
Test Graphs



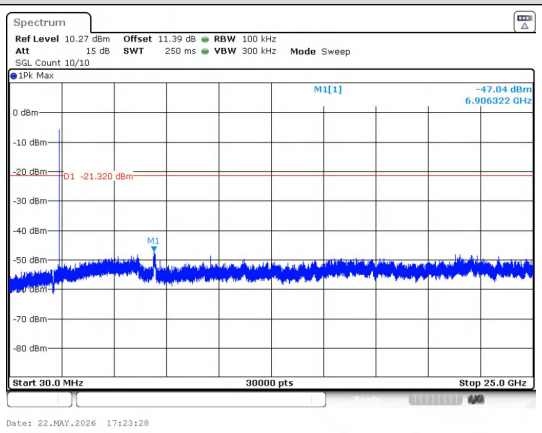
Out Of Band Emission
GFSK_DH5_Channel 0



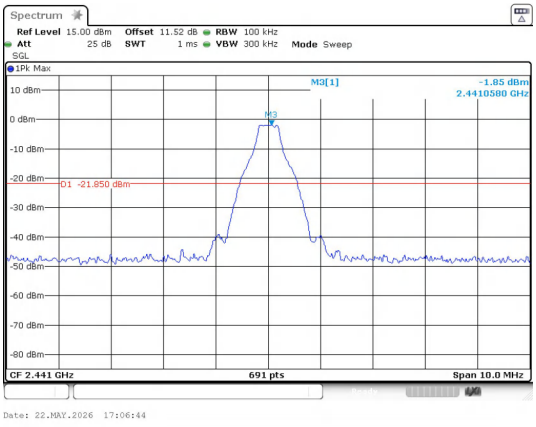
Out Of Band Emission
π/4DQPSK_2-DH5_Channel 0



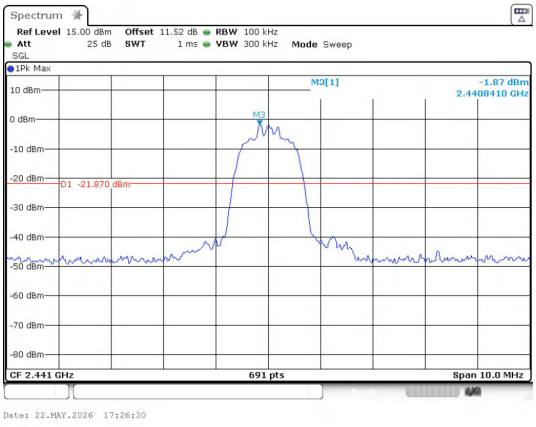
30.0 MHz - 25000.0 MHz
GFSK_DH5_Channel 0



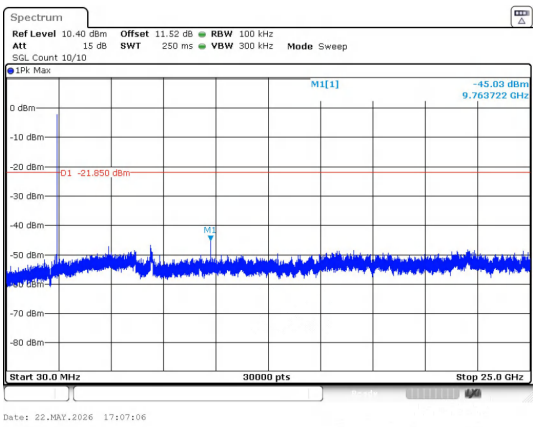
30.0 MHz - 25000.0 MHz
π/4DQPSK_2-DH5_Channel 0



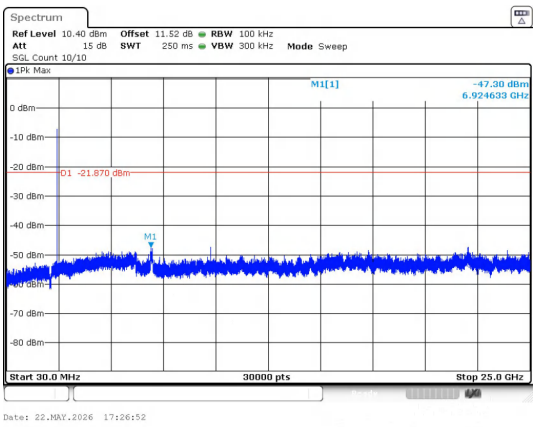
Out Of Band Emission
GFSK_DH5_Channel 39



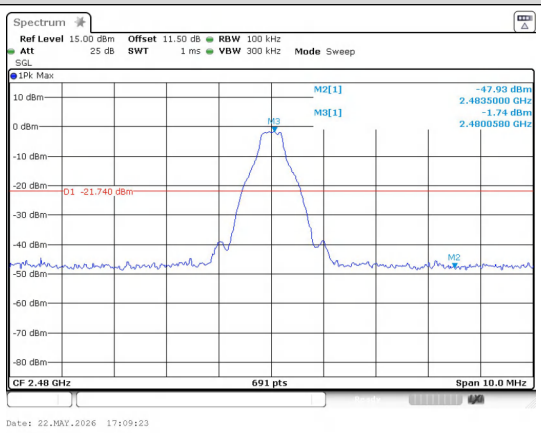
Out Of Band Emission
π/4DQPSK_2-DH5_Channel 39



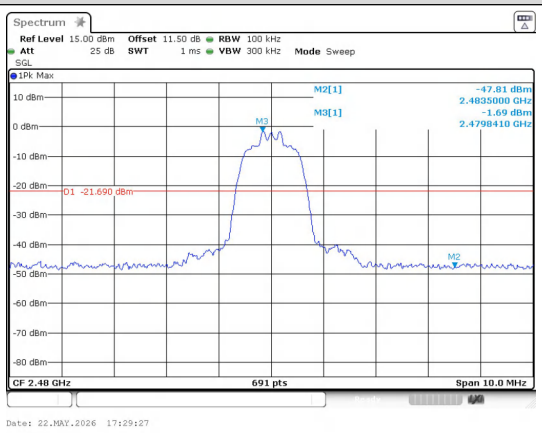
30.0 MHz - 25000.0 MHz
GFSK_DH5_Channel 39



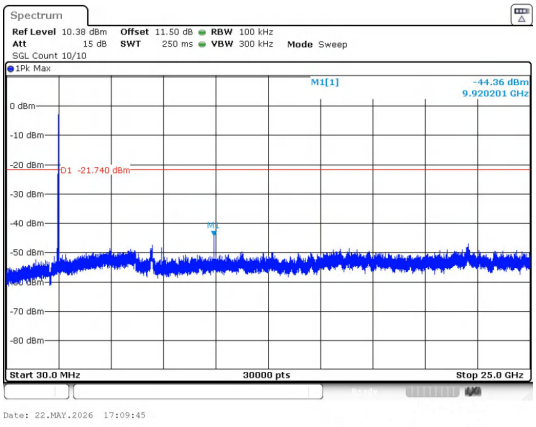
30.0 MHz - 25000.0 MHz
π/4DQPSK_2-DH5_Channel 39



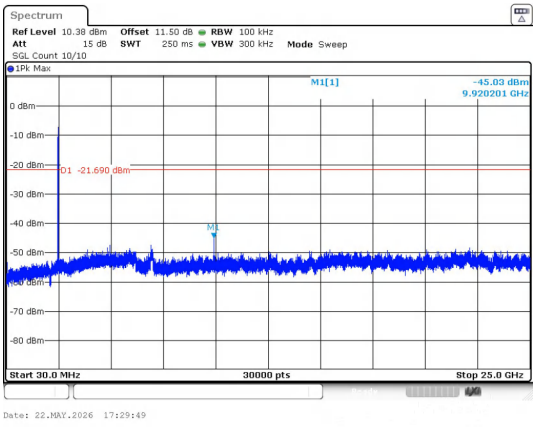
Out Of Band Emission
GFSK_DH5_Channel 78



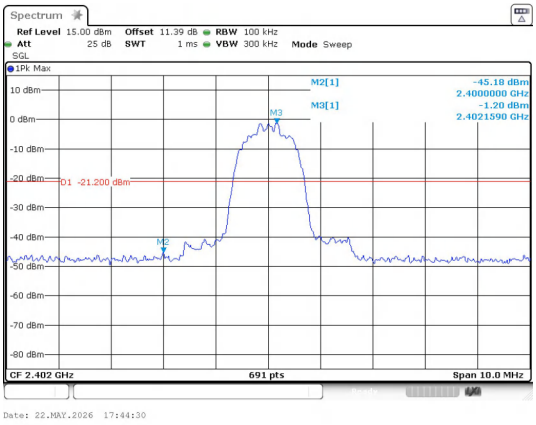
Out Of Band Emission
π/4DQPSK_2-DH5_Channel 78



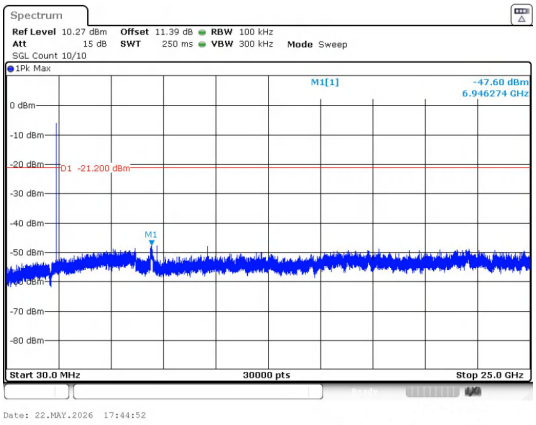
30.0 MHz - 25000.0 MHz
GFSK_DH5_Channel 78



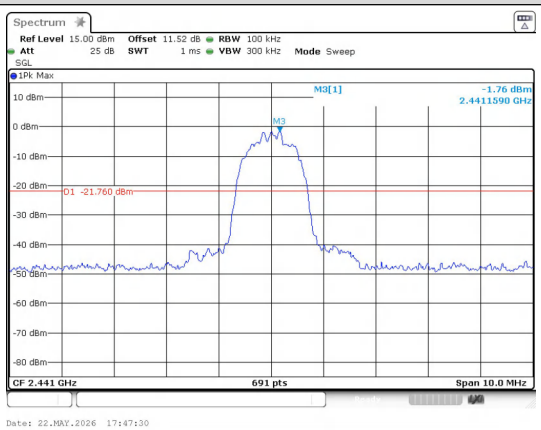
30.0 MHz - 25000.0 MHz
π/4DQPSK_2-DH5_Channel 78



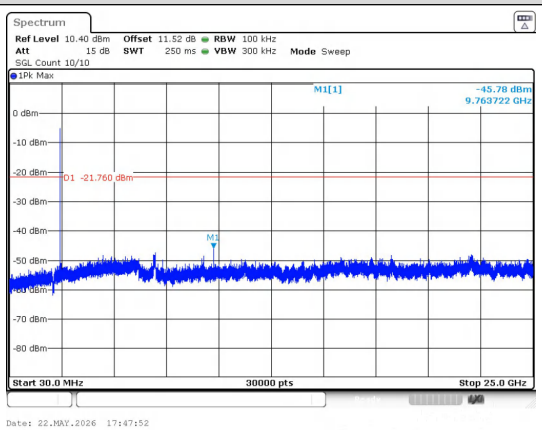
Out Of Band Emission
8DPSK_3-DH5_Channel 0



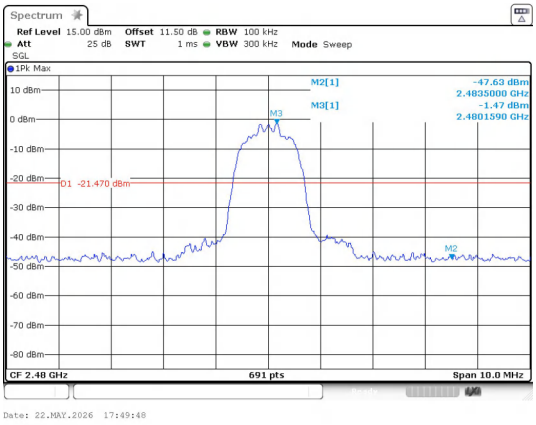
30.0 MHz - 25000.0 MHz
8DPSK_3-DH5_Channel 0



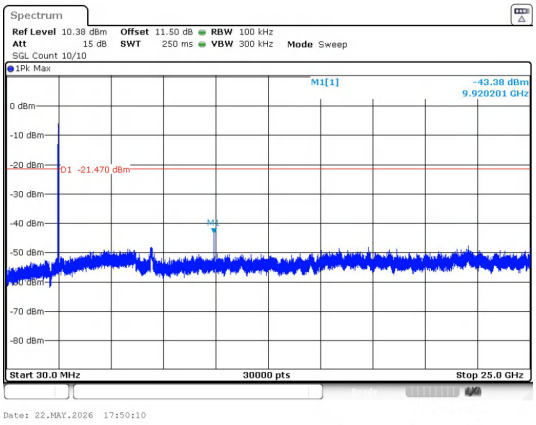
Out Of Band Emission
8DPSK_3-DH5_Channel 39



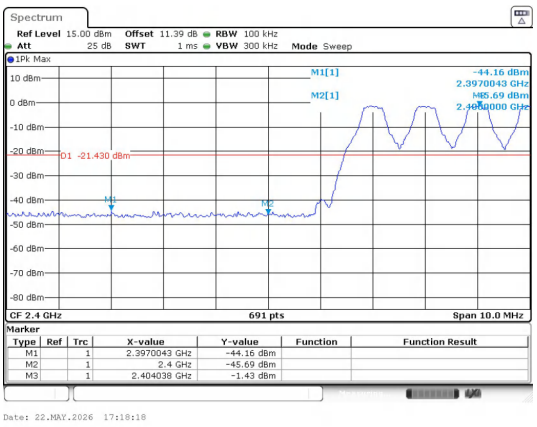
30.0 MHz - 25000.0 MHz
8DPSK_3-DH5_Channel 39



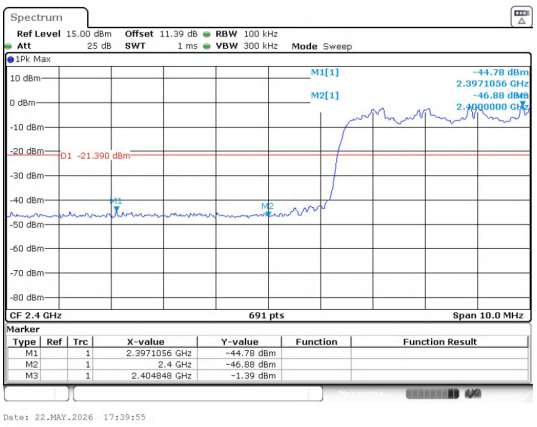
Out Of Band Emission
8DPSK_3-DH5_Channel 78



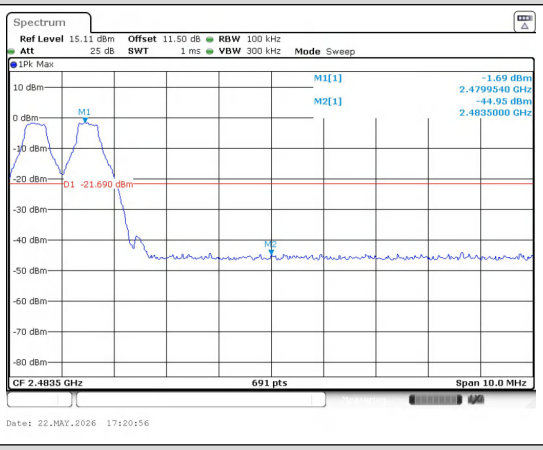
30.0 MHz - 25000.0 MHz
8DPSK_3-DH5_Channel 78



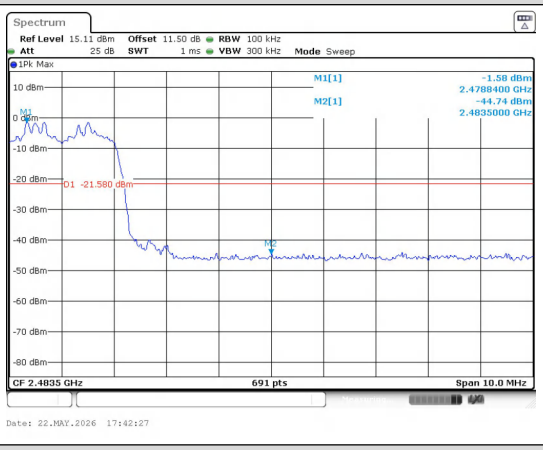
Out Of Band Emission(Left)
GFSK_DH5_Channel Hopping



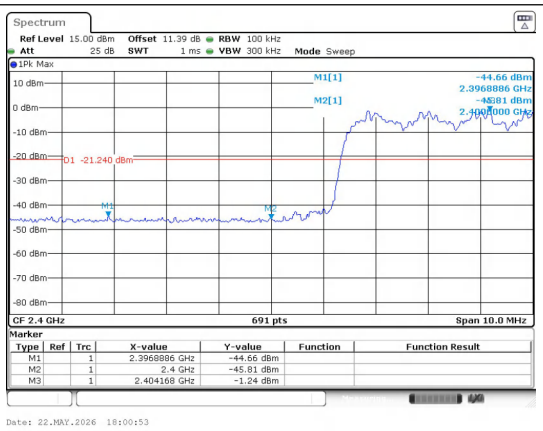
Out Of Band Emission(Left)
π/4DQPSK_2-DH5_Channel Hopping



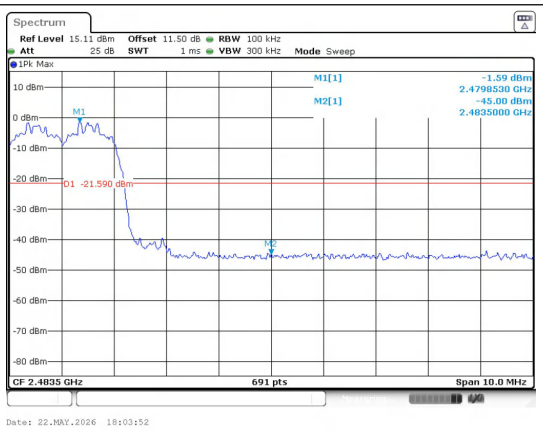
Out Of Band Emission(Right)
GFSK_DH5_Channel Hopping



Out Of Band Emission(Right)
π/4DQPSK_2-DH5_Channel Hopping



Out Of Band Emission(Left)
8DPSK_3-DH5_Channel Hopping



Out Of Band Emission(Right)
8DPSK_3-DH5_Channel Hopping

------End of the report-----