



TEST REPORT

Applicant: Shenzhen Hongshang Technology Co., Ltd
Address of Applicant: 4th Floor, Building A, Henghaofeng Science and Technology Park, Minzhu, Shajing Sub-district, Bao'an District, Shenzhen City China
Manufacturer: Shenzhen Hongshang Technology Co., Ltd
Address of Manufacturer: 4th Floor, Building A, Henghaofeng Science and Technology Park, Minzhu, Shajing Sub-district, Bao'an District, Shenzhen City China
Product Name: Portable loudspeaker
Model No.: D16, D16-A, D16-B, FH5, FH5-A, FH5-B
Trade Mark: N/A
FCC ID: 2BNKP-D16
Applicable standards: 47CFR Part 15.247
Date of Test: Oct.10, 2025-Oct.29, 2025
Date of report issued: Oct.30, 2025

Remark:

The results shown in this test report refer only to the sample(s) tested , this test report cannot be reproduced, except in full without prior written permission of the company.

The report would be invalid without specific stamp of test institute and the signatures of compiler and approver

Prepared By

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1 Test Summary

Test Item	Section	Result	Test by
Antenna Requirement	47CRF Part15.203/15.247 (b) (4)	Pass	/
AC Power Line Conducted Emission	47CRF Part 15.207	Pass	Jason Huang
Conducted Peak Output Power&EIRP	47CRF Part 15.247 (b)(1)	Pass	Kara Wu
20dB Occupied Bandwidth	47CRF Part 15.247 (a)(1)	Pass	Kara Wu
Carrier Frequencies Separation	47CRF Part 15.247 (a)(1)	Pass	Kara Wu
Hopping Channel Number	47CRF Part 15.247 (a)(1)(iii)	Pass	Kara Wu
Dwell Time	47CRF Part 15.247 (a)(1)(iii)	Pass	Kara Wu
Radiated Emission	47CRF Part 15.205/15.209	Pass	Jason Huang
Band Edge	47CRF Part 15.247(d) 47CRF part 15.205/15.209	Pass	Kara Wu

Remarks:

1. Pass: The EUT complies with the essential requirements in the standard.
2. Test according to ANSI C63.10:2020 and KDB558074 D01 15.247 Meas Guidance v05r02.
3. Note: Compliance determination rules
 - 1).The Compliance determination of test results does not take into account measurement uncertainty. Measurement results are determined based on regulatory limitations or requirements specified by the applicant/manufacture. If measurement uncertainty is taken into account, the applicant/manufacture will bear all possible risks of non-compliance.
 - 2).The measurement uncertainty please refer to each test result in the "Measurement Uncertainty"

Measurement Uncertainty

Test Item	Measurement Uncertainty	Notes
Occupied Channel Bandwidth	0.55%	(1)
RF output power, conducted	±0.57 dB	(1)
Power Spectral Density, conducted	±0.61 dB	(1)
Unwanted Emissions, conducted	±0.64 dB	(1)
AC Power Line Conducted Emission	± 2.55 dB	(1)
Radiated emissions 9K-30MHz	±3.79 dB	(1)
Radiated emissions 30M- 1GHz	± 4.24 dB	(1)
Radiated emissions 1GHz-18GHz	± 4.26 dB	(1)
Radiated emissions 18GHz-40GHz	±4.17 dB	(1)
Frequency error	Uc=1X10 ⁻⁷	(1)
Dewll Time	±5%	(1)

Note (1): The measurement uncertainty is for coverage factor of k=2 and a level of confidence of 95%.

2 General Information

2.1 General Description of EUT

Product Name:	Portable loudspeaker
Model No.:	D16, D16-A, D16-B, FH5, FH5-A, FH5-B
Test Model:	All models have the same circuit and RF module, except for the model name and color
Difference of model(s)	D16
Hardware Version:	N/A
Software Version:	N/A
Sample(s) Status	Engineer sample
Operation Frequency:	2402MHz~2480MHz
Channel numbers:	79
Channel separation:	1MHz
Modulation type:	GFSK, $\pi/4$ -DQPSK
Antenna Type:	PCB Antenna
Antenna gain:	0.83dBi (Declare by applicant) (Note: Antenna information is provided by applicant, Testing lab is not responsible for the accuracy of the information.)
Power supply:	DC 5V From Adapter or DC 3.7V From Battery
Adapter:	N/A
Battery:	DC 3.7V 1200mAh

Remark: For more details, refer to the user's manual of the EUT.

Operation Frequency each of channel							
Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
1	2402MHz	21	2422MHz	41	2442MHz	61	2462MHz
2	2403MHz	22	2423MHz	42	2443MHz	62	2463MHz
3	2404MHz	23	2424MHz	43	2444MHz	63	2464MHz
4	2405MHz	24	2425MHz	44	2445MHz	64	2465MHz
5	2406MHz	25	2426MHz	45	2446MHz	65	2466MHz
6	2407MHz	26	2427MHz	46	2447MHz	66	2467MHz
7	2408MHz	27	2428MHz	47	2448MHz	67	2468MHz
8	2409MHz	28	2429MHz	48	2449MHz	68	2469MHz
9	2410MHz	29	2430MHz	49	2450MHz	69	2470MHz
10	2411MHz	30	2431MHz	50	2451MHz	70	2471MHz
11	2412MHz	31	2432MHz	51	2452MHz	71	2472MHz
12	2413MHz	32	2433MHz	52	2453MHz	72	2473MHz
13	2414MHz	33	2434MHz	53	2454MHz	73	2474MHz
14	2415MHz	34	2435MHz	54	2455MHz	74	2475MHz
15	2416MHz	35	2436MHz	55	2456MHz	75	2476MHz
16	2417MHz	36	2437MHz	56	2457MHz	76	2477MHz
17	2418MHz	37	2438MHz	57	2458MHz	77	2478MHz
18	2419MHz	38	2439MHz	58	2459MHz	78	2479MHz
19	2420MHz	39	2440MHz	59	2460MHz	79	2480MHz
20	2421MHz	40	2441MHz	60	2461MHz		

Note:

In section 15.31(m), regards to the operating frequency range over 10 MHz, the Lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test, and the selected channel see below:

Channel	Frequency
The lowest channel	2402MHz
The middle channel	2441MHz
The Highest channel	2480MHz



2.2 Test mode

Transmitting mode	Keep the EUT in continuously transmitting mode.
Remark: For battery operated equipment, the EUT was performed using a new DC 3.7V battery.	

2.3 Description of Support Units

No.	Description	Manufacturer	Model	Serial Number
1	Adapter	Xiaomi	MDY-11-EM	/

2.4 Test Facility

Test laboratory:	Shenzhen ETR Standard Technology Co., Ltd.
CNAS Registration Number:	L11864
A2LA Certificate Number:	6640.01
FCC Designation Number:	CN1326
FCC Test Firm Registration:	183064
IC Company Number:	28440
Laboratory location:	No.103, No.10, Phase I, Zone 3, Xinxing Industrial Park, Xinhe, Fuhai Street, Bao'an District, Shenzhen, Guangdong, China

2.5 Additional Instructions

Test Software	ab5600_fcc_20231201
Power level setup	Default

3 Test Instruments list

Item	Equipment name	Manufacturer	Model	Serial No.	Calibration date	Due date
1	EMI Test Receiver	Rohde&schwarz	ESCI7	100605	2025.3.06	2026.3.05
2	EMI Test Receiver	Rohde&schwarz	ESCI3	102696	2025.3.06	2026.3.05
3	Loop Antenna	schwarabeck	FMZB 1519 B	FMZB 1519 B	2024.3.22	2026.3.21
4	Broadband antenna	schwarabeck	VULB9168	1064	2024.3.26	2026.3.25
5	Horn antenna	schwarabeck	BBHA9120D	9120D-1145	2024.3.22	2026.3.21
6	amplifier	EMtrace	RP01A	50117	2025.3.06	2026.3.05
7	AMN	schwarabeck	NSLK8127	8127483	2025.3.06	2026.3.05
8	AMN	ETS	3186/2NM	1132	2025.3.06	2026.3.05
9	10dB attenuator	HUBER+SUHN R	10dB	/	2025.3.06	2026.3.05
10	amplifier	Space-Dtronics	EWLAN0118G-P40	19113001	2025.3.06	2026.3.05
11	Filter	Xingbo	XBLBQ-GTA19	210410-3-1	2025.3.06	2026.3.05
12	Spectrum analyzer	KEYSIGHT	N9020A	MY55370280	2025.3.06	2026.3.05
13	Power control box	MWRFTtest	MW100-PSB	MW201020JYT	2025.3.06	2026.3.05
14	Power Sensor	Keysight	U2021XA	MY54111006	2025.3.06	2026.3.05
15	amplifier	SKET	LNPA_1840-50 (18-40GHz)	SK2019040302	2025.3.06	2026.3.05
16	Horn antenna	schwarabeck	BBHA 9170	946	2024.3.22	2026.3.21
17	Spectrum analyzer	Rohde&schwarz	FSU40	1166.1660K43	2025.3.06	2026.3.05
18	Temp. & Humidity Chamber	Jiecheng Instrument	QA-LP-80	20160705001	2025.3.07	2026.3.06

Note: the calibration interval of the above test instruments is 12 or 24 months and the calibrations are traceable to international system unit (SI).

Software Name	Manufacturer	Model	Version
RF test software	MWRFTtest	MTS 8310	V2.0.0.0
Conducted test software	EZ-EMC	Farad	Ver.EMC-CON 3A1.1
Radiated test software	EZ-EMC	Farad	Ver.FA-03A2 RE

4 Test results and Measurement Data

4.1 Antenna requirement

Standard requirement:	FCC Part15 C Section 15.203 /247(b) (4)
15.203 requirement: 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, 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.	
15.247(b) (4) requirement: The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.	
E.U.T Antenna:	
The antenna is PCB antenna, the best case gain of the is 0.83dBi, reference to the below for details .	

4.2 Conducted Emissions

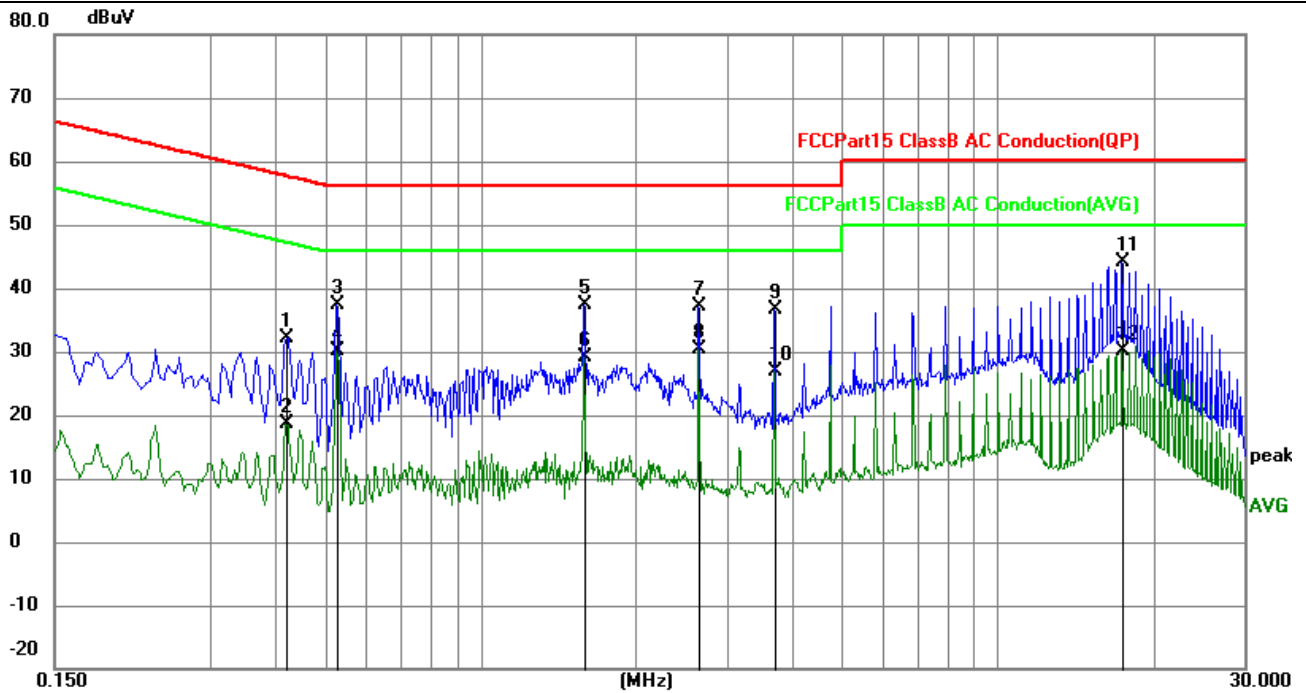
Test Requirement:	47CRF Part 15.207					
Test Method:	ANSI C63.10:2020 §6.2					
Test Frequency Range:	150KHz to 30MHz					
Receiver setup:	RBW=9KHz, VBW=30KHz, Sweep time=auto					
Limit:	Frequency range (MHz)	Limit (dBUV)				<i>* Decreases with the logarithm of the frequency.</i>
		Quasi-peak		Average		
	0.15-0.5	66 to 56*		56 to 46*		
	0.5-5	56		46		
	5-30	60		50		
Test setup:	Reference Plane 40cm LISN AUX Equipment E.U.T 80cm LISN Filter AC power EMI Receiver Test table/Insulation plane Remark: E.U.T: Equipment Under Test LISN: Line Impedance Stabilization Network Test table height=0.8m					
Test procedure:	1. The E.U.T and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm/50uH coupling impedance for the measuring equipment. 2. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination. (Please refer to the block diagram of the test setup and photographs). 3. Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10:2020 on conducted measurement.					
Test Instruments:	Refer to section 3.0 for details					
Test mode:	Refer to section 2.2 for details					
Test environment:	Temp.:	24.1°C	Humid.:	50%	Press.:	1002 mbar
Test voltage:	AC 120V, 60Hz					
Test results:	Pass					

Remark:

1. Both high voltage and low voltage have been tested, and the report only shows the worst case data with AC 120V/60Hz.
2. Pre-scan all test modes, the report only shows the worst mode GFSK (2402MHz) data.

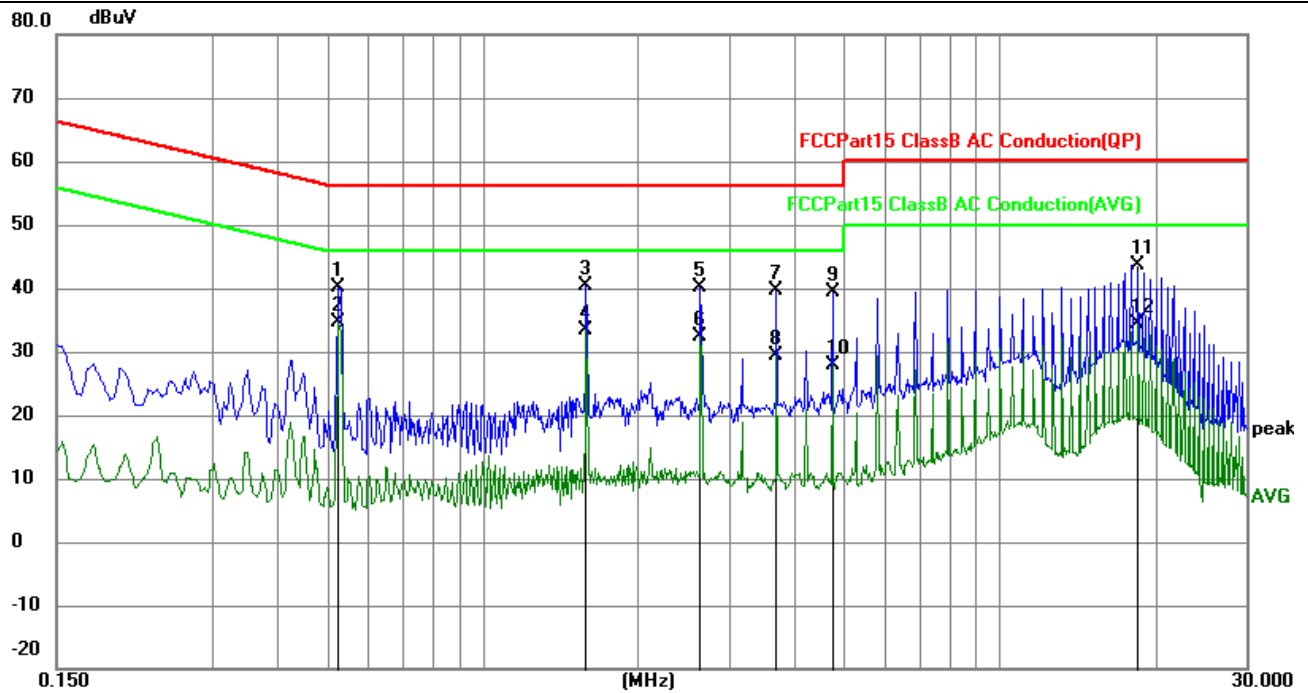
Measurement data:

Line:



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1	0.4200	22.34	9.90	32.24	57.45	-25.21	QP
2	0.4200	8.63	9.90	18.53	47.45	-28.92	AVG
3	0.5279	27.39	9.94	37.33	56.00	-18.67	QP
4	0.5279	20.10	9.94	30.04	46.00	-15.96	AVG
5	1.5854	27.36	9.90	37.26	56.00	-18.74	QP
6	1.5854	19.18	9.90	29.08	46.00	-16.92	AVG
7	2.6430	27.18	9.85	37.03	56.00	-18.97	QP
8	2.6430	20.52	9.85	30.37	46.00	-15.63	AVG
9	3.7005	26.74	9.84	36.58	56.00	-19.42	QP
10	3.7005	17.12	9.84	26.96	46.00	-19.04	AVG
11	17.4660	34.49	9.71	44.20	60.00	-15.80	QP
12	17.4660	20.48	9.71	30.19	50.00	-19.81	AVG

Neutral:

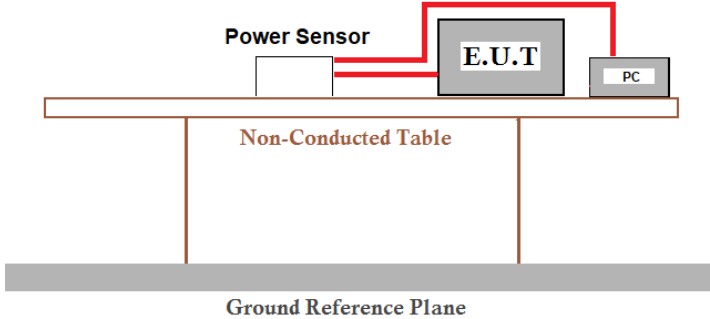


No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1	0.5265	30.26	9.94	40.20	56.00	-15.80	QP
2	0.5265	24.60	9.94	34.54	46.00	-11.46	AVG
3	1.5850	30.54	9.90	40.44	56.00	-15.56	QP
4	1.5850	23.43	9.90	33.33	46.00	-12.67	AVG
5	2.6360	30.38	9.85	40.23	56.00	-15.77	QP
6	2.6360	22.64	9.85	32.49	46.00	-13.51	AVG
7	3.7001	29.89	9.84	39.73	56.00	-16.27	QP
8	3.7001	19.48	9.84	29.32	46.00	-16.68	AVG
9	4.7463	29.58	9.83	39.41	56.00	-16.59	QP
10	4.7463	17.98	9.83	27.81	46.00	-18.19	AVG
11	18.5236	33.83	9.70	43.53	60.00	-16.47	QP
12	18.5236	24.75	9.70	34.45	50.00	-15.55	AVG

Notes:

1. An initial pre-scan was performed on the line and neutral lines with peak detector.
2. Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission.
3. Final Level = Receiver Read level + LISN Factor + Cable Loss

4.3 Conducted Peak Output Power & EIRP

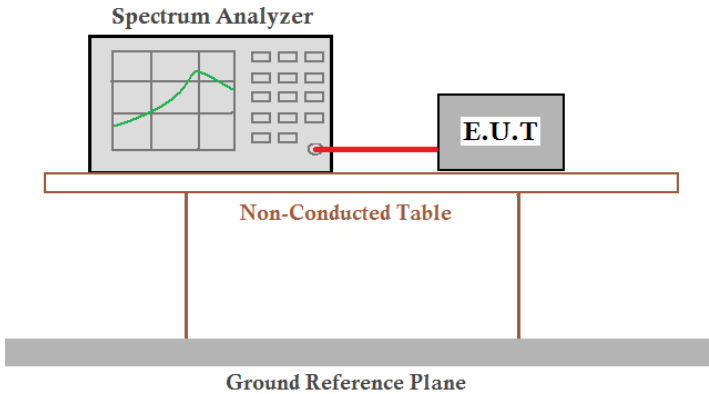
Test Requirement:	47CRF Part 15.247 (b)(1)	
Test Method:	KDB558074 D01 15.247 Meas Guidance v05r02 ANSI C63.10-2020 §7.8.5	
Limit:	Output Power :30dBm	
Test setup:	 The diagram illustrates the test setup. A Power Sensor is connected to an E.U.T. (Equipment Under Test) and a PC. The E.U.T. and PC are placed on a Non-Conducted Table, which is supported by a Ground Reference Plane.	
Test Instruments:	Refer to section 3.0 for details	
Test mode:	Refer to section 2.2 for details	
Test environment:	Temp.: 23.9°C	Humid.: 63%RH
Test voltage:	DC 3.7V From Battery	
Test results:	Pass	



Measurement Result

Mode	Test channel	Peak Output Power (dBm)	Limit (dBm)	Result
GFSK	Lowest	1.22	30	Pass
	Middle	1.18		
	Highest	1.05		
$\pi/4$ -DQPSK	Lowest	1.18	30	Pass
	Middle	1.20		
	Highest	1.07		

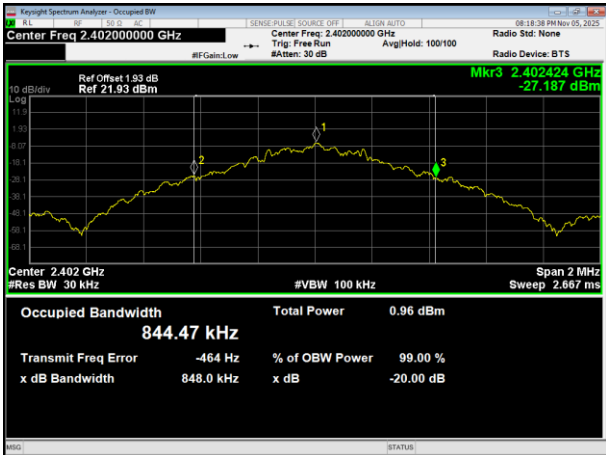
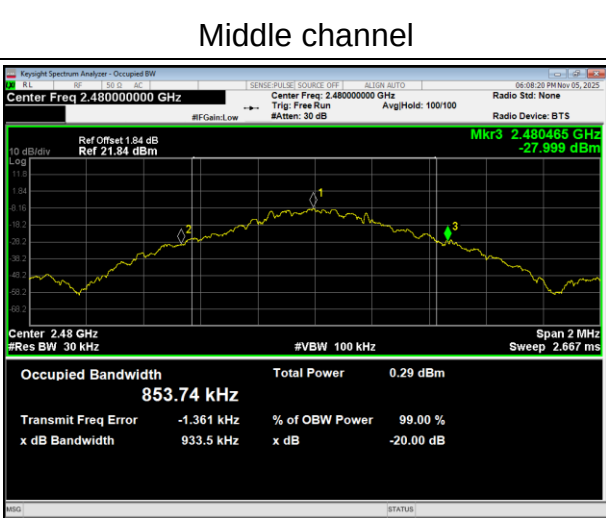
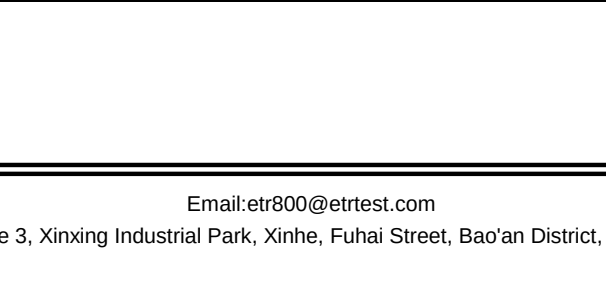
4.4 20dB Emission Bandwidth

Test Requirement:	47CRF Part 15.247 (a)(1)	
Test Method:	ANSI C63.10-2020 §6.9.2	
Limit:	N/A	
Test setup:		
Test Instruments:	Refer to section 3.0 for details	
Test mode:	Refer to section 2.2 for details	
Test environment:	Temp.: 23.9°C	Humid.: 63%RH
Test voltage:	DC 3.7V From Battery	
Test results:	Pass	

Measurement Data

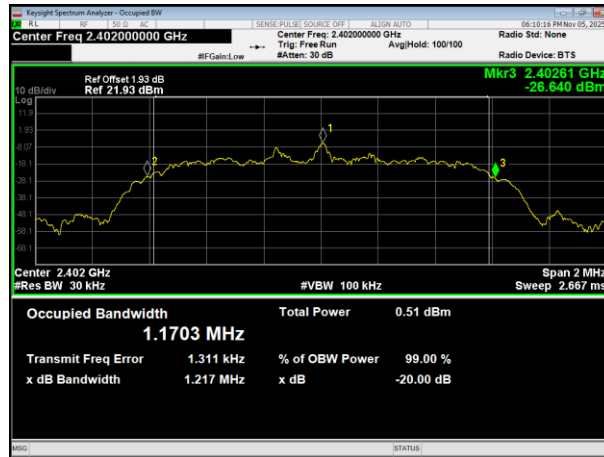
Mode	Test channel	20dB Emission Bandwidth (MHz)	99% Bandwidth (MHz)	Result
GFSK	Lowest	0.848	0.84447	Pass
	Middle	0.938	0.85688	
	Highest	0.934	0.85374	
$\pi/4$ -DQPSK	Lowest	1.217	1.1703	Pass
	Middle	1.217	1.1747	
	Highest	1.216	1.1650	

Test plot as follows:

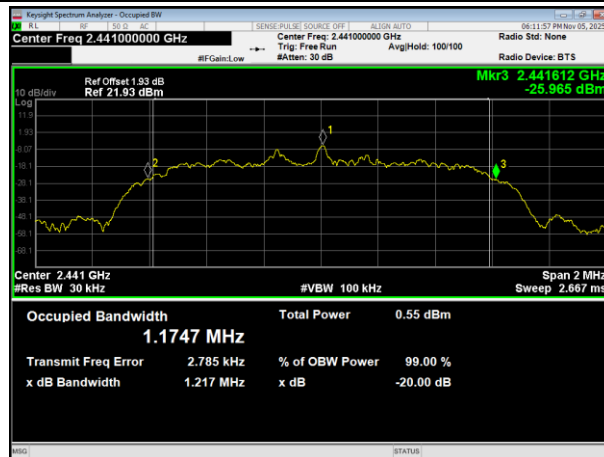
Test mode:	GFSK mode
	 KeySight Spectrum Analyzer - Occupied BW Center Freq 2.402000000 GHz Ref Offset 1.93 dB Ref 21.93 dBm Mkr3 2.402424 GHz -27.187 dBm Center 2.402 GHz #Res BW 30 kHz #VBW 100 kHz Span 2 MHz Sweep 2.667 ms Occupied Bandwidth 844.47 kHz Total Power 0.96 dBm Transmit Freq Error -464 Hz % of OBW Power 99.00 % x dB Bandwidth 848.0 kHz x dB -20.00 dB
Lowest channel	
	 KeySight Spectrum Analyzer - Occupied BW Center Freq 2.441000000 GHz Ref Offset 1.93 dB Ref 21.93 dBm Mkr3 2.441472 GHz -28.643 dBm Center 2.441 GHz #Res BW 30 kHz #VBW 100 kHz Span 2 MHz Sweep 2.667 ms Occupied Bandwidth 856.88 kHz Total Power 0.70 dBm Transmit Freq Error 2.802 kHz % of OBW Power 99.00 % x dB Bandwidth 937.8 kHz x dB -20.00 dB
Middle channel	
	 KeySight Spectrum Analyzer - Occupied BW Center Freq 2.480000000 GHz Ref Offset 1.84 dB Ref 21.84 dBm Mkr3 2.480465 GHz -27.999 dBm Center 2.48 GHz #Res BW 30 kHz #VBW 100 kHz Span 2 MHz Sweep 2.667 ms Occupied Bandwidth 853.74 kHz Total Power 0.29 dBm Transmit Freq Error -1.361 kHz % of OBW Power 99.00 % x dB Bandwidth 933.5 kHz x dB -20.00 dB
Highest channel	

Test mode:

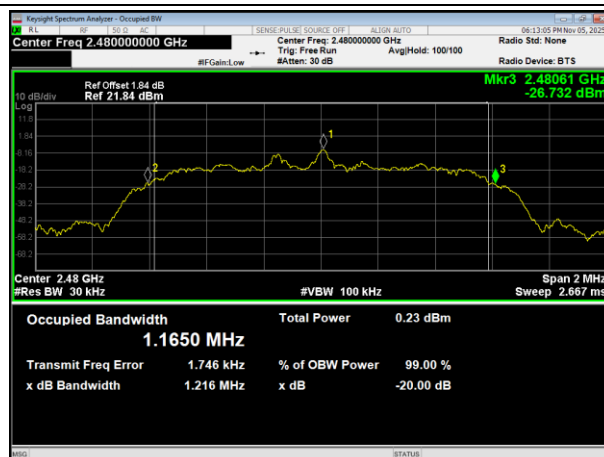
$\pi/4$ -DQPSK mode



Lowest channel

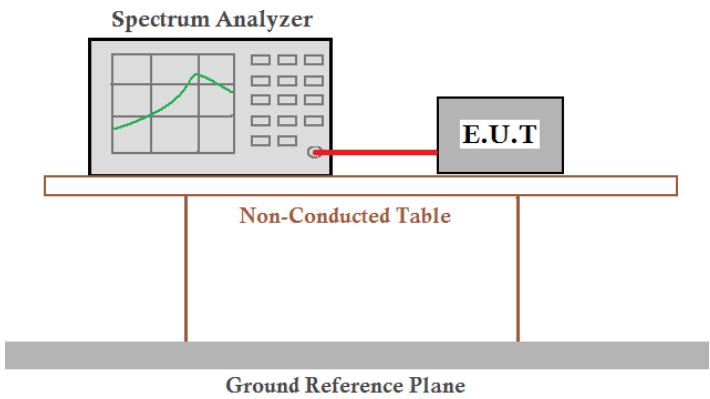


Middle channel



Highest channel

4.5 Carrier Frequencies Separation

Test Requirement:	47CRF Part 15.247 (a)(1)	
Test Method:	ANSI C63.10-2020 §7.8.2	
Receiver setup:	RBW=300KHz, VBW=1000KHz, detector=Peak	
Limit:	>0.025MHz or 2/3 of the 20dB bandwidth (whichever is greater)	
Test setup:		
Test Instruments:	Refer to section 3.0 for details	
Test mode:	Refer to section 2.2 for details	
Test environment:	Temp.: 23.9°C	Humid.: 63%RH
Test voltage:	DC 3.7V From Battery	
Test results:	Pass	

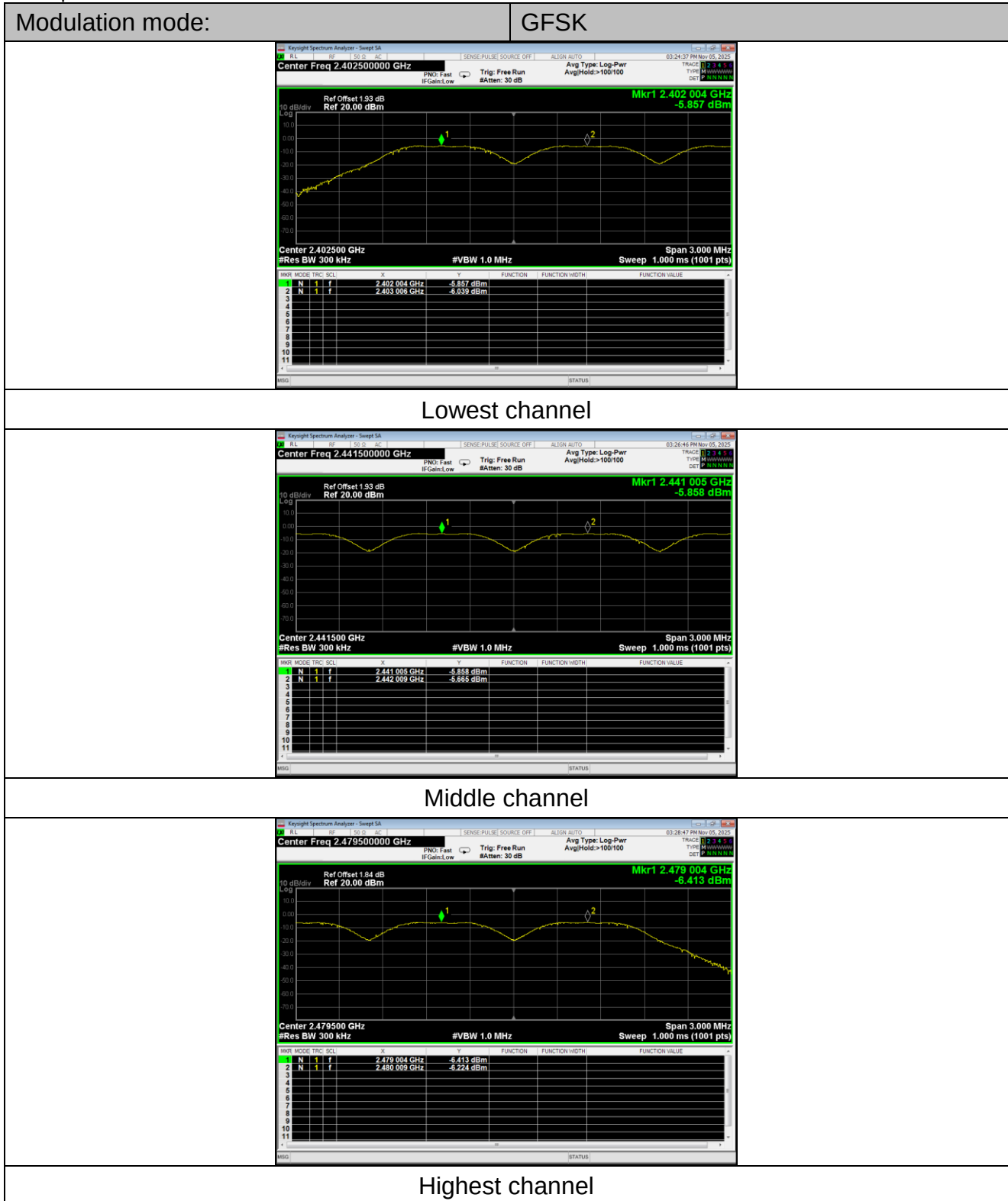
Measurement Data

Mode	Test channel	Carrier Frequencies Separation (MHz)	Limit (MHz)	Result
GFSK	Lowest	1.0020	0.5653	Pass
	Middle	1.0035	0.6253	Pass
	Highest	1.0050	0.6227	Pass
$\pi/4$ -DQPSK	Lowest	1.0710	0.8113	Pass
	Middle	1.2540	0.8113	Pass
	Highest	1.0035	0.8107	Pass

Note:

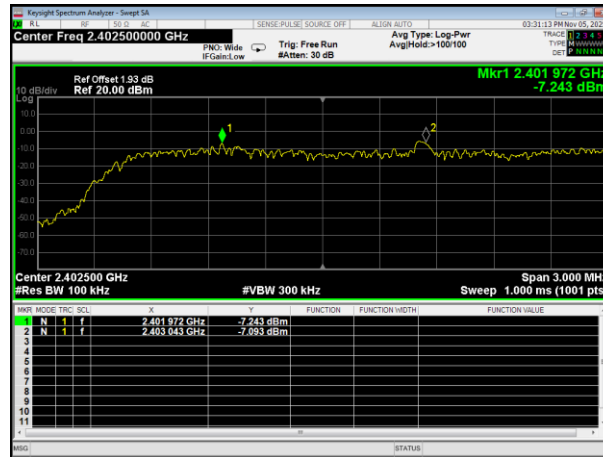
1.Limit According to section 4.4.

Test plot as follows:

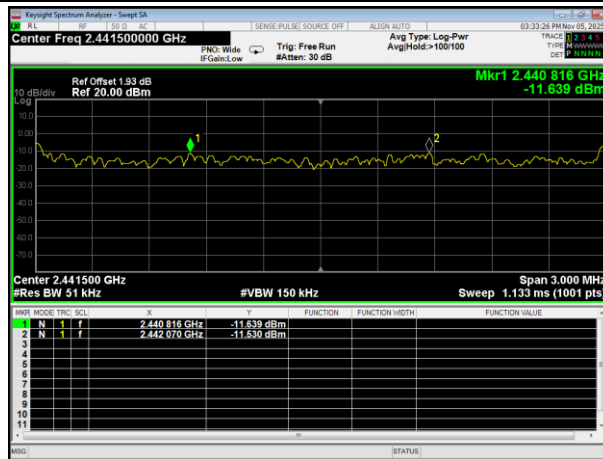


Test mode:

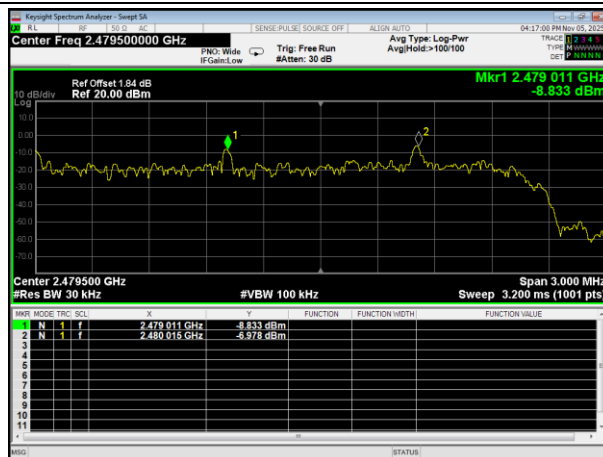
$\pi/4$ -DQPSK



Lowest channel

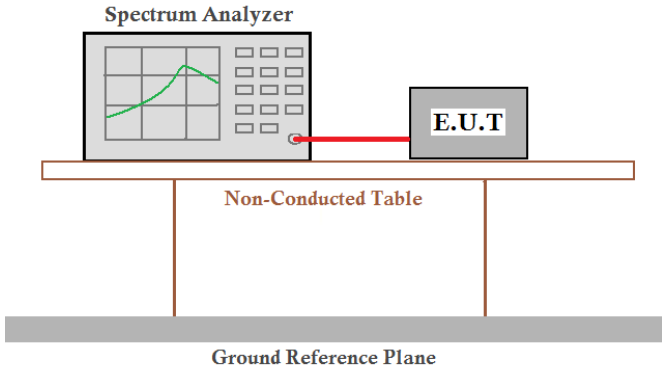


Middle channel



Highest channel

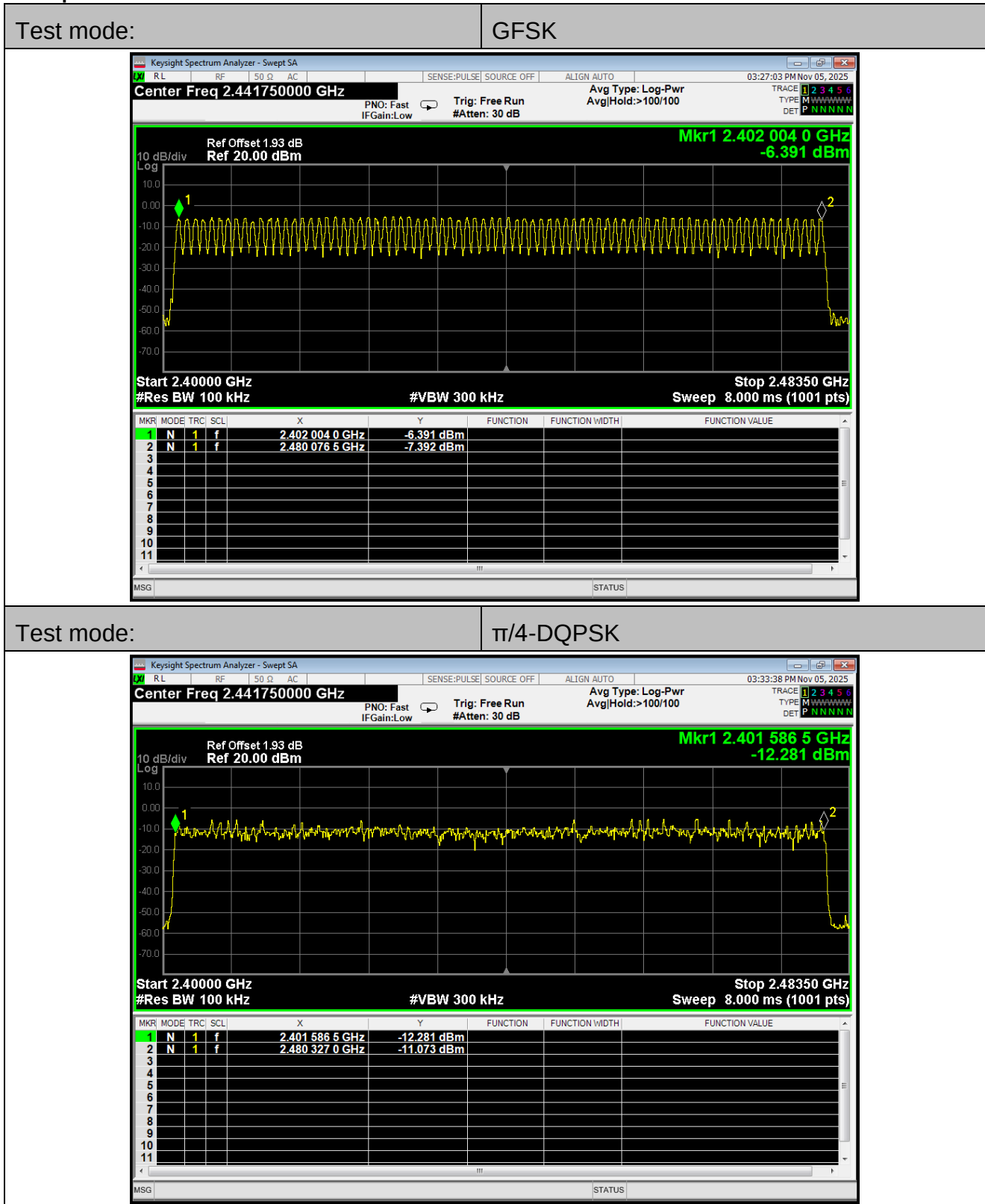
4.6 Hopping Channel Number

Test Requirement:	47CRF Part 15.247 (a)(1)(iii)	
Test Method:	ANSI C63.10-2020 §7.8.3	
Receiver setup:	RBW=100kHz, VBW=300kHz, Frequency range=2400MHz-2483.5MHz, Detector=Peak	
Limit:	15 channels	
Test setup:	 The diagram illustrates the test setup. A Spectrum Analyzer is connected via a red cable to an E.U.T. (Equipment Under Test). Both are placed on a Non-Conducted Table. Below the table is a Ground Reference Plane.	
Test Instruments:	Refer to section 3.0 for details	
Test mode:	Refer to section 2.2 for details	
Test environment:	Temp.: 23.9°C	Humid.: 63%RH
Test voltage:	DC 3.7V From Battery	
Test results:	Pass	

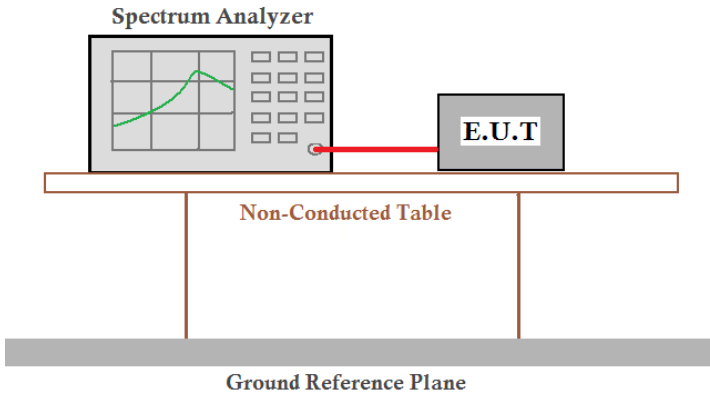
Measurement Data:

Mode	Hopping channel numbers	Limit	Result
GFSK	79	15	Pass
$\pi/4$ -DQPSK	79	15	Pass

Test plot as follows:



4.7 Dwell Time

Test Requirement:	47CRF Part 15.247 (a)(1)(iii)	
Test Method:	ANSI C63.10-2020 §7.8.4	
Receiver setup:	RBW=1MHz, VBW=3MHz, Span=0Hz, Detector=Peak	
Limit:	0.4 Second	
Test setup:		
Test Instruments:	Refer to section 3.0 for details	
Test mode:	Refer to section 2.2 for details	
Test environment:	Temp.: 23.9°C	Humid.: 63%RH
Test voltage:	DC 3.7V From Battery	
Test results:	Pass	

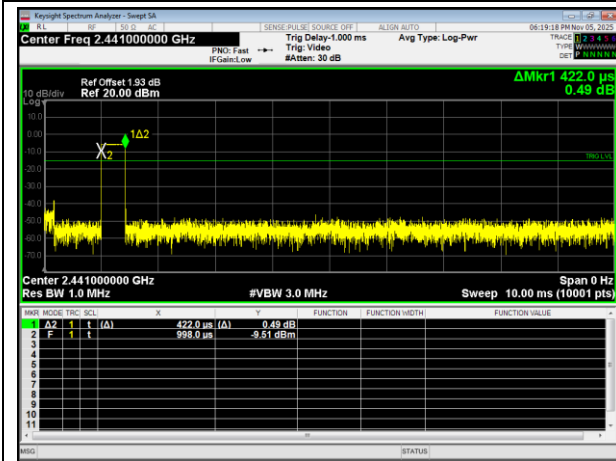


Measurement Result

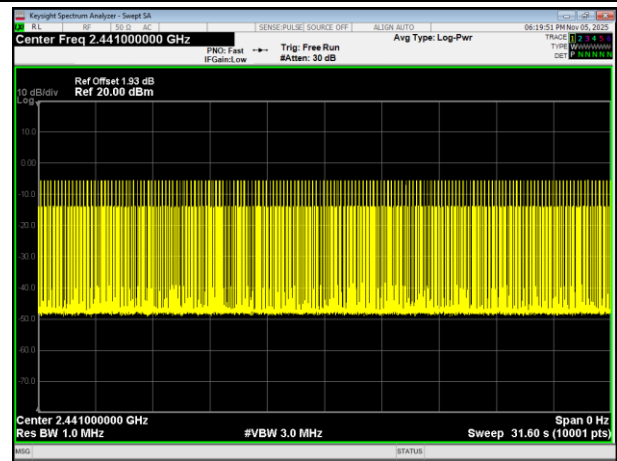
Mode	Frequency (MHz)	Pulse Time (ms)	Total Dwell Time (ms)	Burst Count	Period Time (ms)	Limit (ms)	Result
1-DH1	2441	0.422	133.774	317	31600	400	Pass
1-DH3	2441	1.678	263.446	157	31600	400	Pass
1-DH5	2441	2.926	324.786	111	31600	400	Pass
2-DH1	2441	0.432	137.376	318	31600	400	Pass
2-DH3	2441	1.684	257.652	153	31600	400	Pass
2-DH5	2441	2.932	237.492	81	31600	400	Pass

Test plot as follows:

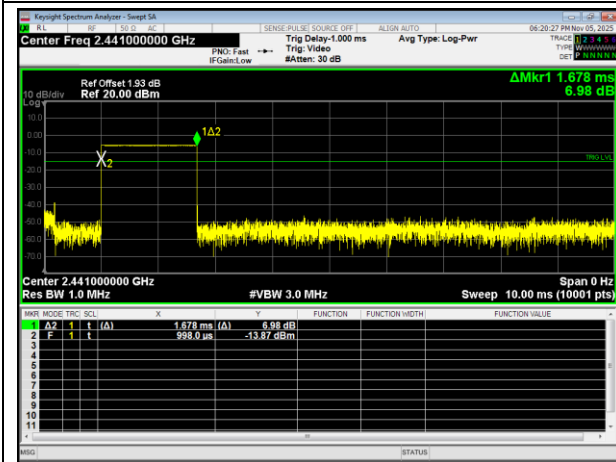
1DH1-2441MHz-One burst



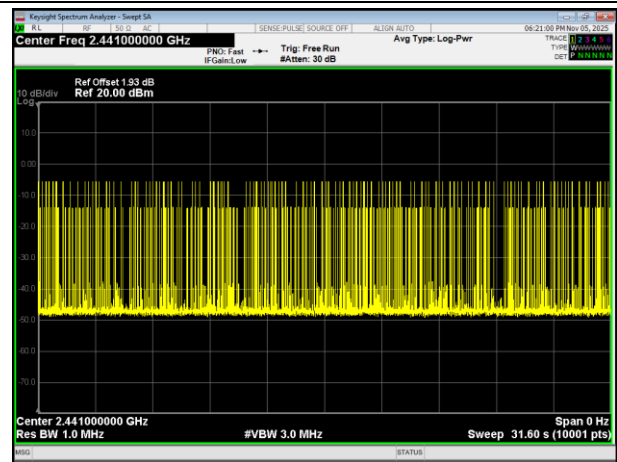
1DH1-2441MHz-Accumulated



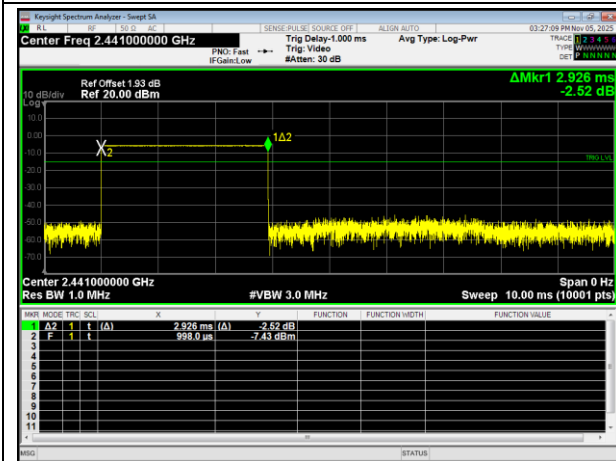
1DH3-2441MHz-One burst



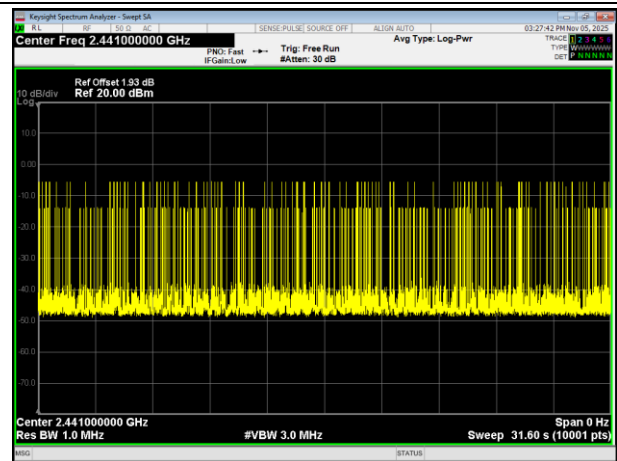
1DH3-2441MHz-Accumulated



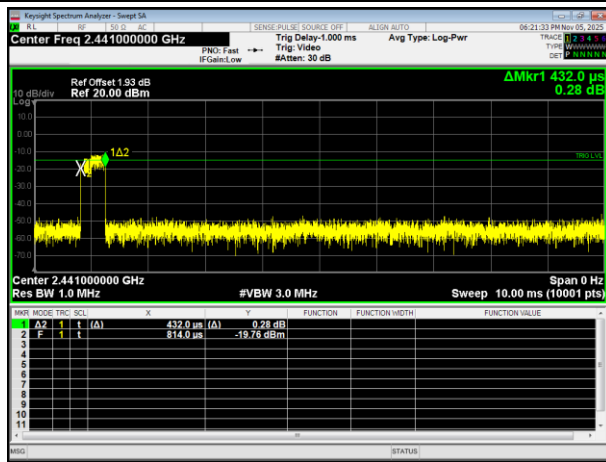
1DH5-2441MHz-One burst



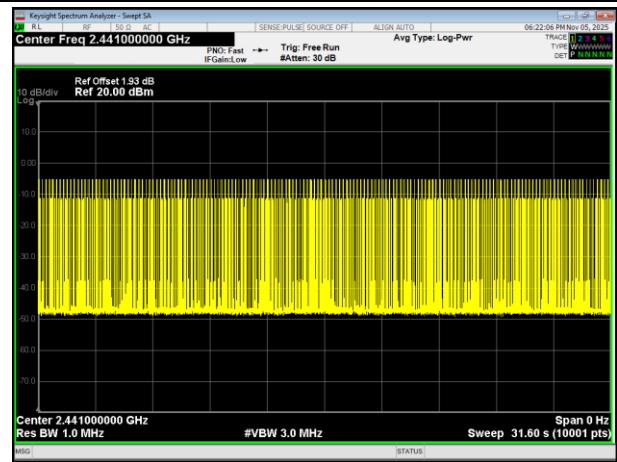
1DH5-2441MHz-Accumulated



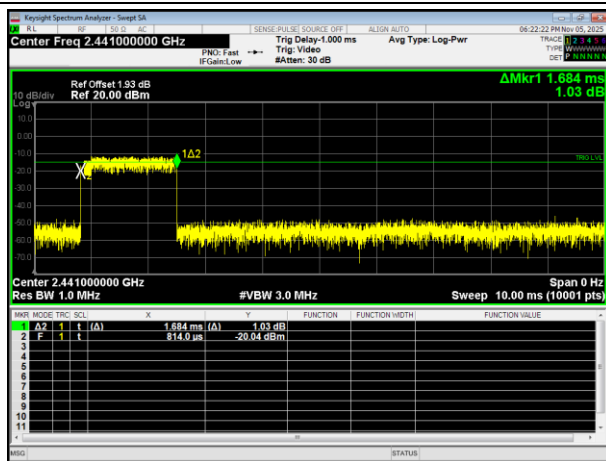
2DH1-2441MHz-One burst



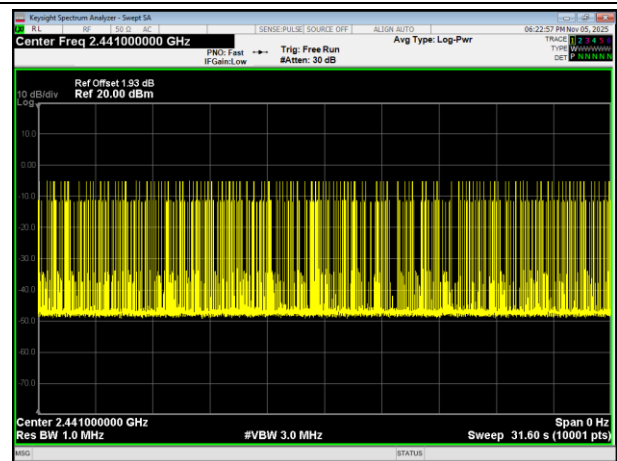
2DH1-2441MHz-Accumulated



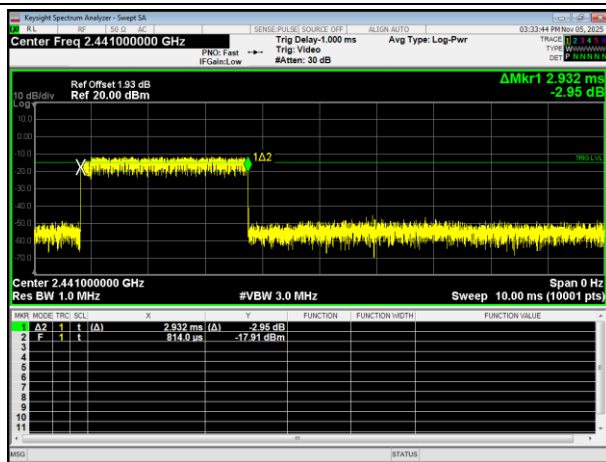
2DH3-2441MHz-One burst



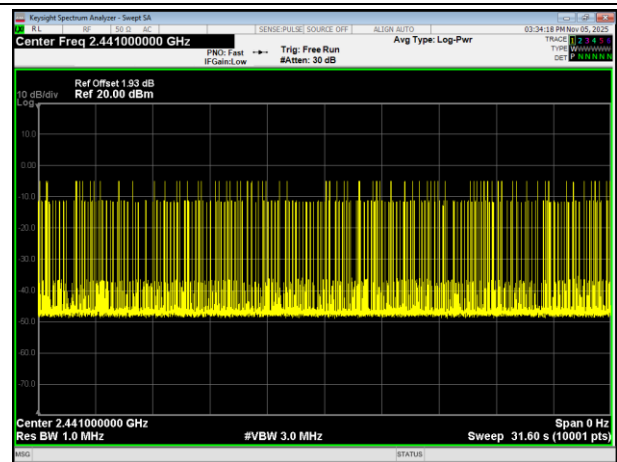
2DH3-2441MHz-Accumulated



2DH5-2441MHz-One burst

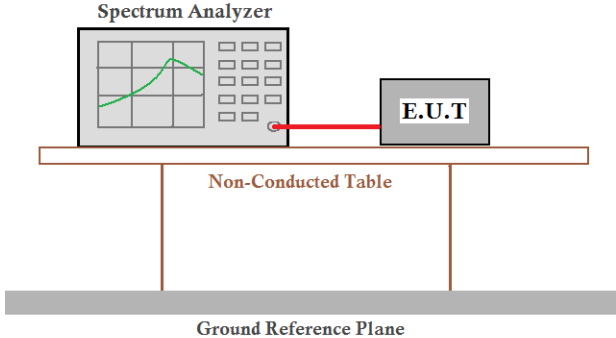


2DH5-2441MHz-Accumulated



4.8 Band Edge

4.8.1 Conducted Emission Method

Test Requirement:	47CRF Part 15.247 (d)	
Test Method:	ANSI C63.10-2020 §7.8.6	
Receiver setup:	RBW=100kHz, VBW=300kHz, Detector=Peak	
Limit:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum 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.	
Test setup:		
Test Instruments:	Refer to section 3.0 for details	
Test mode:	Refer to section 2.2 for details	
Test environment:	Temp.: 23.9°C	Humid.: 63%RH
Test voltage:	DC 3.7V From Battery	
Test results:	Pass	



Test plot as follows:

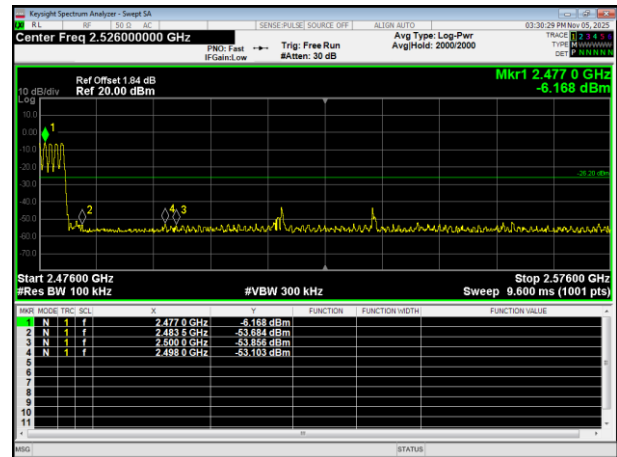
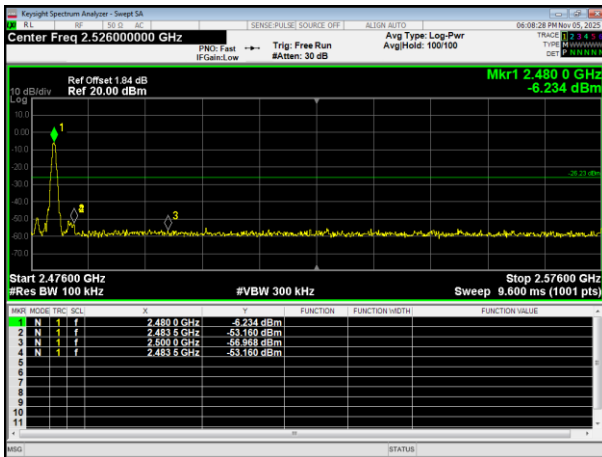
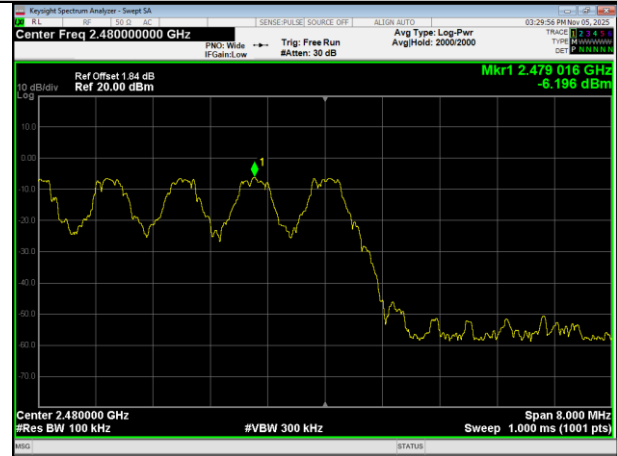
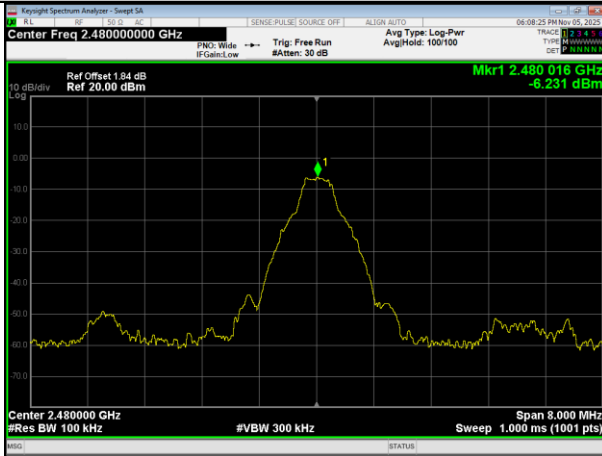




GFSK Mode

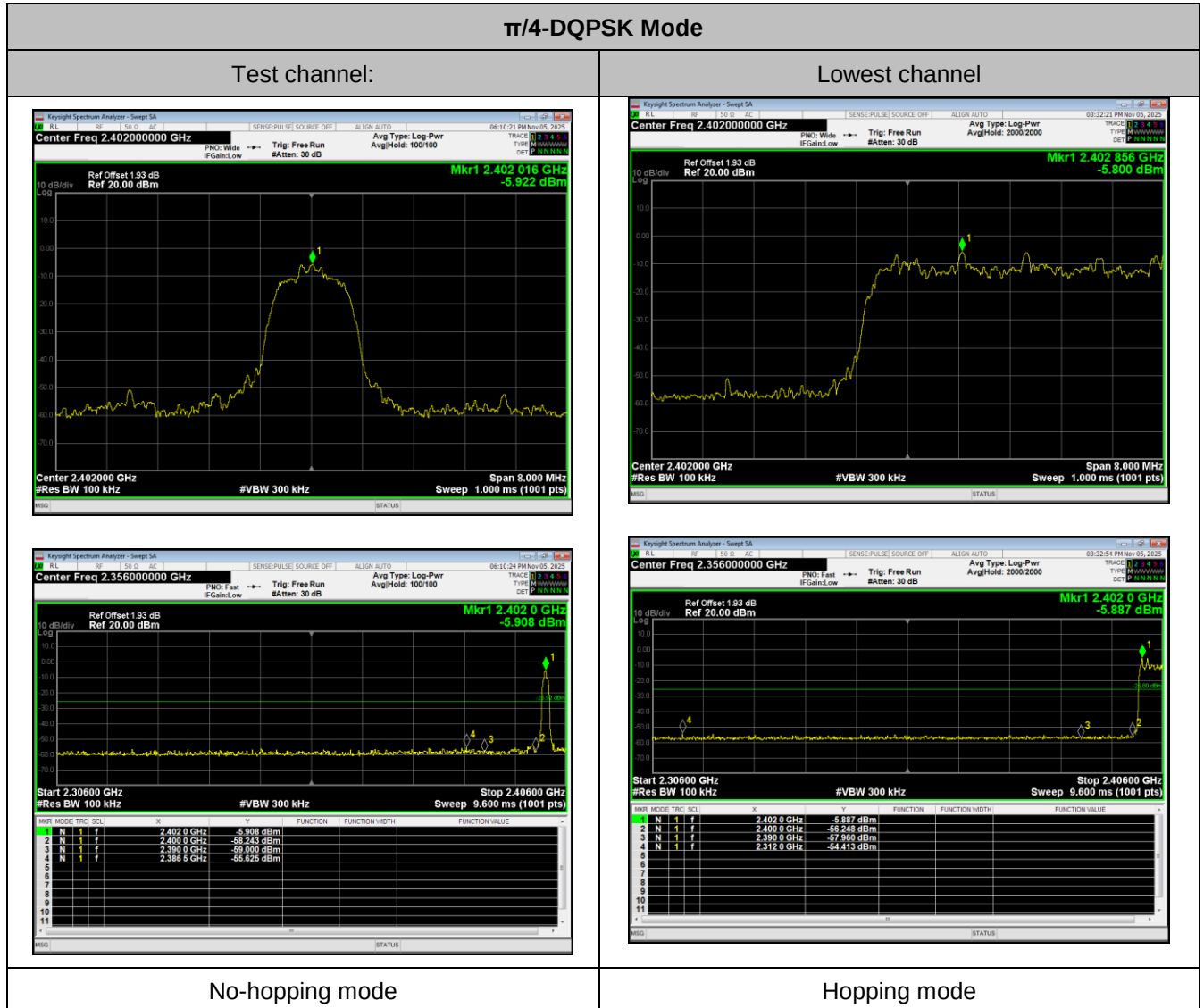
Test channel:

Highest channel



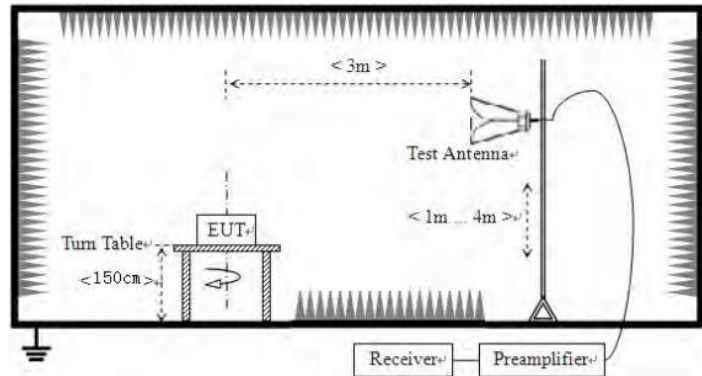
No-hopping mode

Hopping mode





4.8.2 Radiated Emission Method

Test Requirement:	FCC Part15 C Section 15.209 and 15.205				
Test Method:	ANSI C63.10:2020				
Test Frequency Range:	All of the restrict bands were tested, only the worst band's (2310MHz to 2500MHz) data was showed.				
Test site:	Measurement Distance: 3m				
Receiver setup:	Frequency	Detector	RBW	VBW	Remark
	Above 1GHz	Peak	1MHz	3MHz	Peak Value
		Peak	1MHz	10Hz	Average Value
Limit:	Frequency		Limit (dBuV/m @3m)		Remark
	Above 1GHz		54.00		Average Value
			74.00		Peak Value
Test setup:					
Test Procedure:	1. The EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation. 2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower. 3. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement. 4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rota table was turned from 0 degrees to 360 degrees to find the maximum reading. 5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. 6. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.				
Test Instruments:	Refer to section 3.0 for details				
Test mode:	Refer to section 2.2 for details				
Test environment:	Temp.: 23.9°C			Humid.: 63%RH	
Test voltage:	DC 3.7V From Battery				
Test results:	Pass				

Remark:

During the test, pre-scan the GFSK, $\pi/4$ -DQPSK, modulation, and found the GFSK modulation is worse case. the report only show the worse case data

Measurement Data

Test channel:	Lowest
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Peak value:

Frequency (MHz)	Read Level (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Polarization
2310.00	56.53	-13.36	43.17	74.00	-30.83	Horizontal
2390.00	61.81	-13.03	48.78	74.00	-25.22	Horizontal
2310.00	57.22	-13.36	43.86	74.00	-30.14	Vertical
2390.00	61.73	-13.03	48.70	74.00	-25.30	Vertical

Average value:

Frequency (MHz)	Read Level (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
2310.00	45.37	-13.36	32.01	54.00	-21.99	Horizontal
2390.00	50.43	-13.03	37.40	54.00	-16.60	Horizontal
2310.00	44.92	-13.36	31.56	54.00	-22.44	Vertical
2390.00	50.09	-13.03	37.06	54.00	-16.94	Vertical

Test channel:	Highest
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Peak value:

Frequency (MHz)	Read Level (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
2483.50	61.80	-12.64	49.16	74.00	-24.84	Horizontal
2500.00	58.10	-12.57	45.53	74.00	-28.47	Horizontal
2483.50	62.11	-12.64	49.47	74.00	-24.53	Vertical
2500.00	58.05	-12.57	45.48	74.00	-28.52	Vertical

Average value:

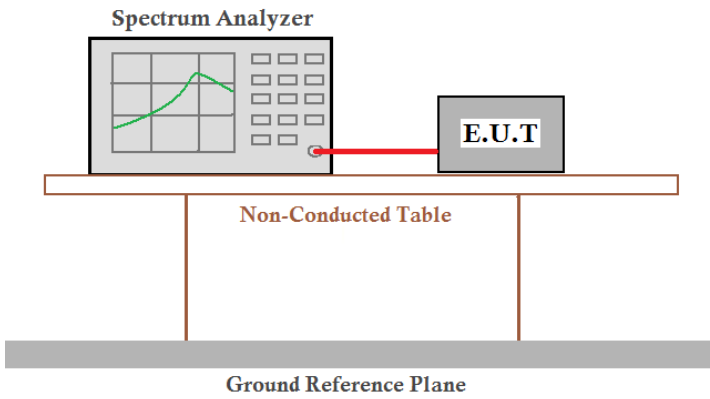
Frequency (MHz)	Read Level (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
2483.50	50.77	-12.64	38.13	54.00	-15.87	Horizontal
2500.00	47.40	-12.57	34.83	54.00	-19.17	Horizontal
2483.50	51.38	-12.64	38.74	54.00	-15.26	Vertical
2500.00	46.39	-12.57	33.82	54.00	-20.18	Vertical

Remarks:

1. Level = Read level + Factor
2. Factor=Antenna Factor + Cable Loss – Preamplifier Factor
3. The emission levels of other frequencies are very lower than the limit and not show in test report.
4. The pre-test were performed on lowest, middle and highest frequencies, only the worst case's (lowest and highest frequencies) data was showed.
5. During the test, pre-scan the GFSK, $\pi/4$ -DQPSK, 8-DPSK modulation, and found the 8-DPSK modulation which it is worse case.

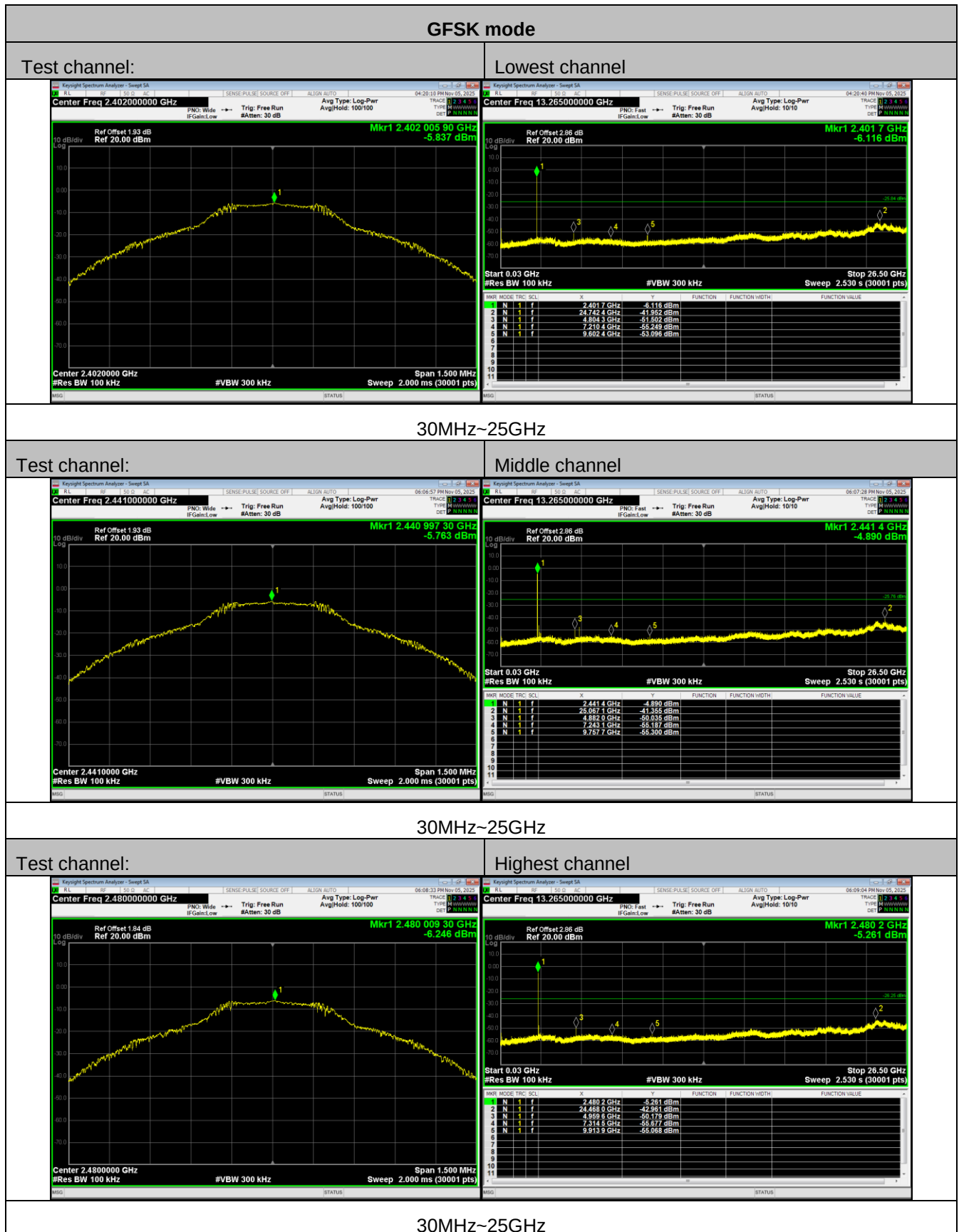
4.9 Spurious Emission

4.9.1 Conducted Emission Method

Test Requirement:	47CRF Part 15.247 (d), 47CRF Part 15.209 and 15.205	
Test Method:	ANSI C63.10:2020 §7.8.7	
Limit:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum 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.	
Test setup:	 The diagram illustrates the test setup for conducted emission measurement. A Spectrum Analyzer is connected via a red cable to an E.U.T (Equipment Under Test). Both are placed on a Non-Conducted Table, which is supported by a Ground Reference Plane.	
Test Instruments:	Refer to section 3.0 for details	
Test mode:	Refer to section 2.2 for details	
Test environment:	Temp.: 23.9°C	Humid.: 63%RH
Test voltage:	DC 3.7V From Battery	
Test results:	Pass	

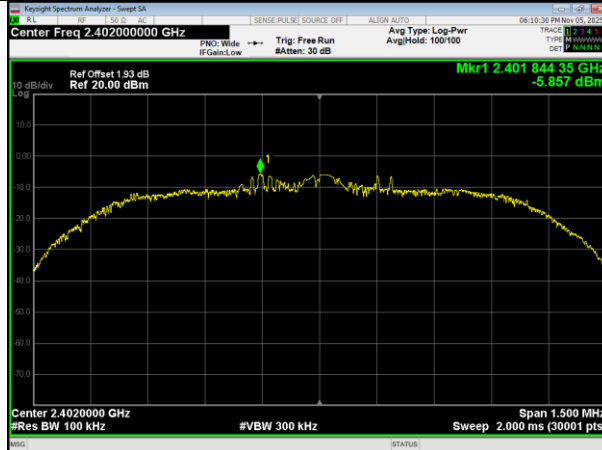
Remark:

1. Cable loss data included in Offset.

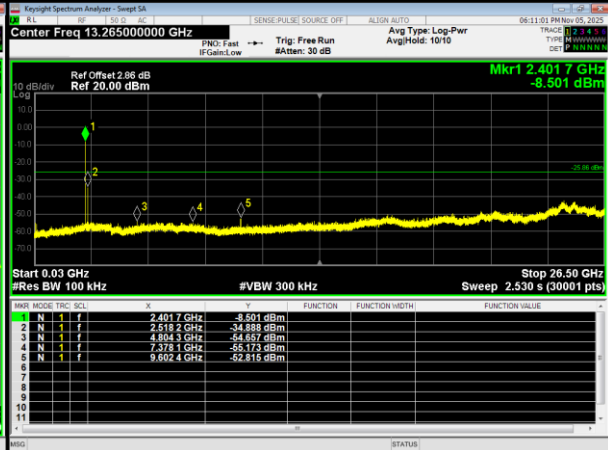


$\pi/4$ -DQPSK mode

Test channel:

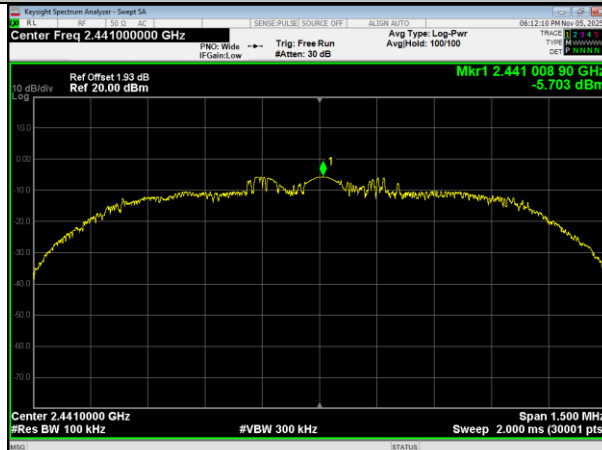


Lowest channel

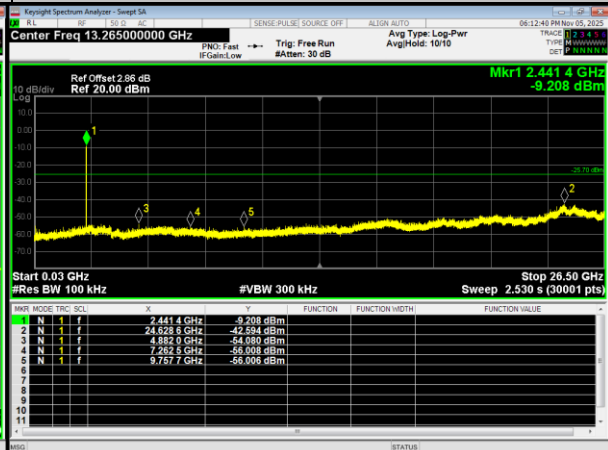


30MHz~25GHz

Test channel:

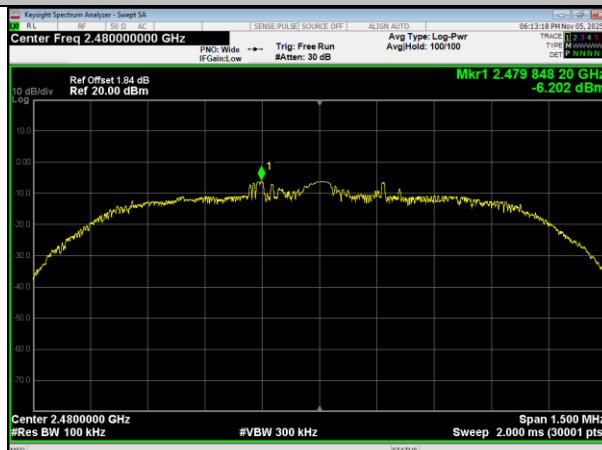


Middle channel

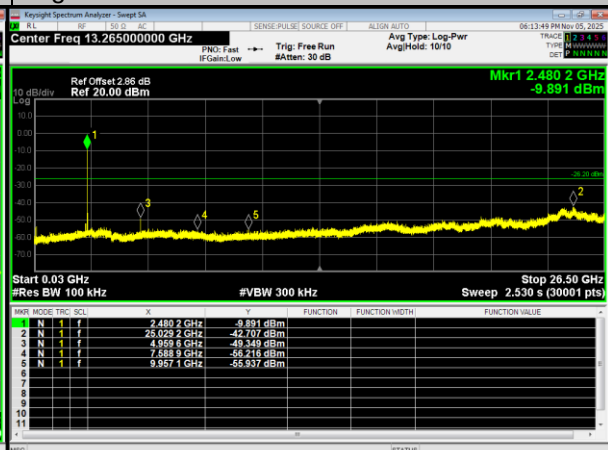


30MHz~25GHz

Test channel:

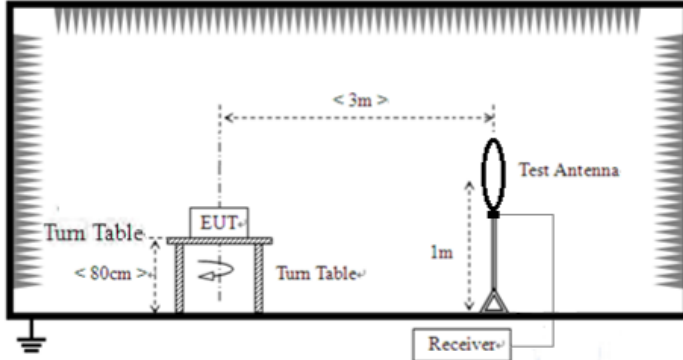


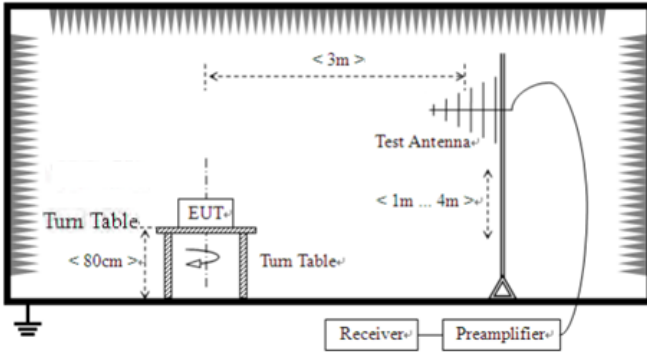
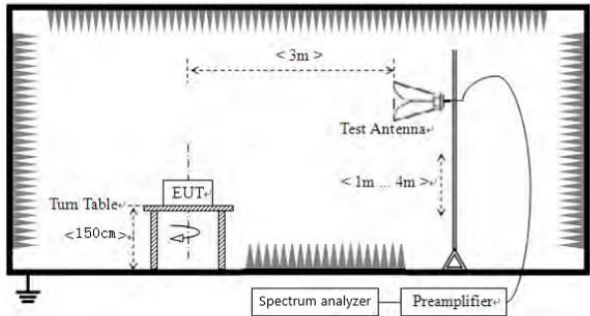
Highest channel



30MHz~25GHz

4.9.2 Radiated Emission Method

Test Requirement:	47CRF Part 15.247 (d), 47CRF Part 15.209 and 15.205				
Test Method:	ANSI C63.10:2020 § 6.4&6.5&6.6				
Test Frequency Range:	9kHz to 25GHz				
Test site:	Measurement Distance: 3m				
Receiver setup:	Frequency	Detector	RBW	VBW	Value
	9KHz-150KHz	Quasi-peak	200Hz	600Hz	Quasi-peak
	150KHz-30MHz	Quasi-peak	9KHz	30KHz	Quasi-peak
	30MHz-1GHz	Quasi-peak	120KHz	300KHz	Quasi-peak
	Above 1GHz	Peak	1MHz	3MHz	Peak
		Peak	1MHz	10Hz	Average
Limit:	Frequency	Limit (uV/m)	Value	Measurement Distance	
	0.009MHz-0.490MHz	6.37/F(KHz)	QP	300m	
	0.490MHz-1.705MHz	63.7/F(KHz)	QP	30m	
	1.705MHz-30MHz	0.08	QP	30m	
	30MHz-88MHz	100	QP	3m	
	88MHz-216MHz	150	QP		
	216MHz-960MHz	200	QP		
	960MHz-1GHz	500	QP		
	Above 1GHz	500	Average		
		5000	Peak		
Test setup:	For radiated emissions from 9kHz to 30MHz				
					

	For radiated emissions from 30MHz to1GHz  For radiated emissions above 1GHz 					
Test Procedure:	1. The EUT was placed on the top of a rotating table (0.8m for below 1G and 1.5m for above 1G) above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation. 2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower. 3. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement. 4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rota table was turned from 0 degrees to 360 degrees to find the maximum reading. 5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. 6. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.					
Test Instruments:	Refer to section 3.0 for details					
Test mode:	Refer to section 2.2 for details					
Test environment:	Temp.:	23.9 °C	Humid.:	63%	Press.:	1012mbar
Test voltage:	DC 3.7V From Battery					
Test results:	Pass					



Measurement data:

Remarks:

1. *The report only shows the worst mode.*
2. *Pre-scan all kind of the place mode (X-axis, Y-axis, Z-axis), and found the Y-axis which it is worse case.*

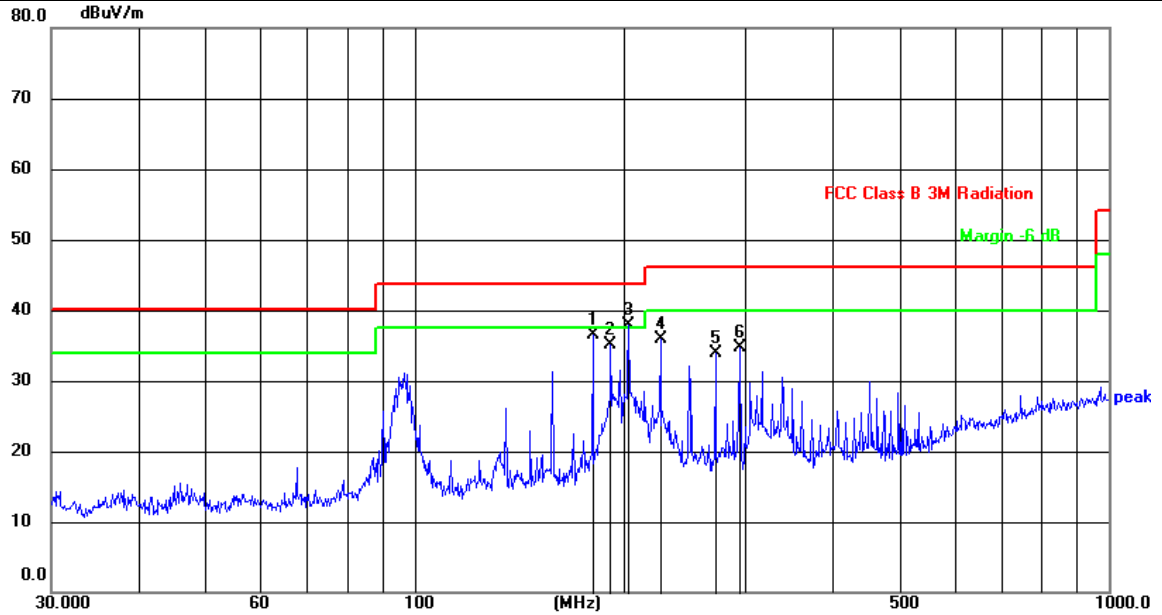
■ **9kHz~30MHz**

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 RSS-Gen 6.13.2 was not reported.

■ **Below 1GHz**

Pre-scan all test modes, found worst case at GFSK (2402MHz), and so only show the test result of GFSK (2402MHz)

Horizontal:

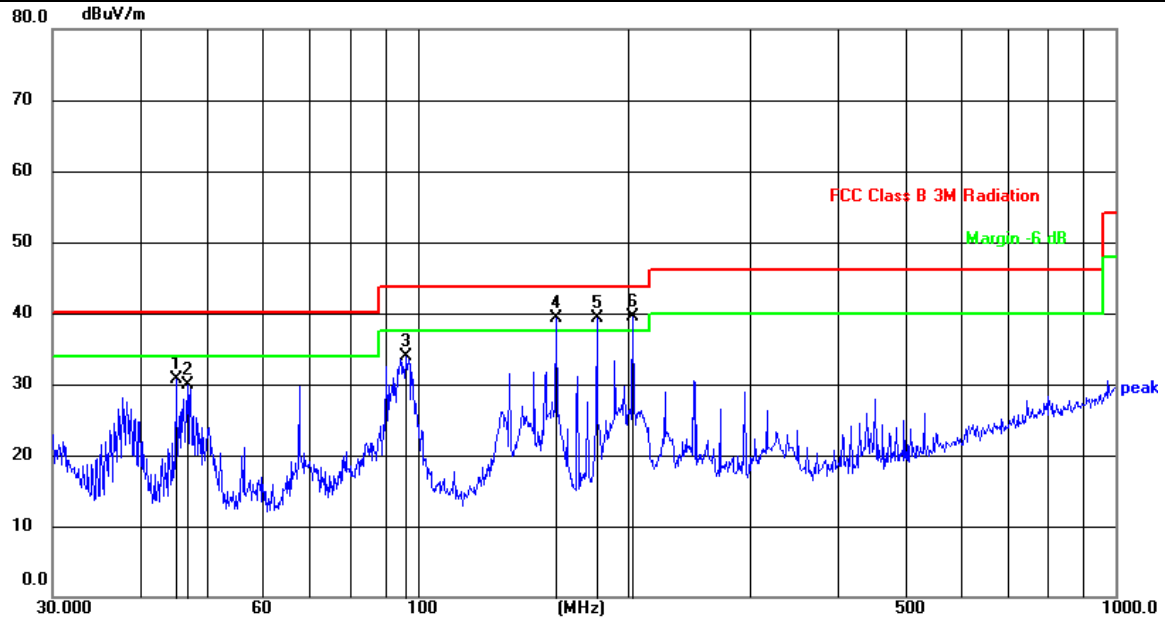


No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	180.6487	54.63	-18.13	36.50	43.50	-7.00	QP
2	191.7450	53.18	-18.13	35.05	43.50	-8.45	QP
3	203.5226	56.44	-18.60	37.84	43.50	-5.66	QP
4	226.0994	54.34	-18.49	35.85	46.00	-10.15	QP
5	271.3245	52.14	-18.32	33.82	46.00	-12.18	QP
6	294.1136	53.33	-18.54	34.79	46.00	-11.21	QP

Factor= Antenna Factor + Cable Loss – Preamplifier Factor

Level = Reading + Factor, Margin=level-Limit

Vertical:



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	45.0583	51.55	-20.93	30.62	40.00	-9.38	QP
2	46.8301	50.90	-20.95	29.95	40.00	-10.05	QP
3	96.4360	53.88	-20.03	33.85	43.50	-9.65	QP
4	158.1123	58.10	-18.87	39.23	43.50	-4.27	QP
5	180.6487	57.69	-18.45	39.24	43.50	-4.26	QP
6	203.5226	58.30	-18.84	39.46	43.50	-4.04	QP

Level = Reading + Factor, Margin=level-Limit

Factor= Antenna Factor + Cable Loss – Preamplifier Factor



■ Above 1GHz

Test channel:	Lowest
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Peak value:

Frequency (MHz)	Read Level (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
4804.00	56.40	-7.69	48.71	74.00	-25.29	Vertical
7206.00	52.65	-1.70	50.95	74.00	-23.05	Vertical
9608.00	54.04	1.31	55.35	74.00	-18.65	Vertical
12010.00	*	--	--	74.00	--	Vertical
14412.00	*	--	--	74.00	--	Vertical
4804.00	55.56	-7.69	47.87	74.00	-26.13	Horizontal
7206.00	52.92	-1.70	51.22	74.00	-22.78	Horizontal
9608.00	52.93	1.31	54.24	74.00	-19.76	Horizontal
12010.00	*	--	--	74.00	--	Horizontal
14412.00	*	--	--	74.00	--	Horizontal

Average value:

Frequency (MHz)	Read Level (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
4804.00	45.05	-7.69	37.36	54.00	-16.64	Vertical
7206.00	40.39	-1.70	38.69	54.00	-15.31	Vertical
9608.00	39.60	1.31	40.91	54.00	-13.09	Vertical
12010.00	*	--	--	54.00	--	Vertical
14412.00	*	--	--	54.00	--	Vertical
4804.00	45.09	-7.69	37.40	54.00	-16.60	Horizontal
7206.00	40.08	-1.70	38.38	54.00	-15.62	Horizontal
9608.00	38.71	1.31	40.02	54.00	-13.98	Horizontal
12010.00	*	--	--	54.00	--	Horizontal
14412.00	*	--	--	54.00	--	Horizontal



Test channel:	Middle
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Peak value:

Frequency (MHz)	Read Level (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
4882.00	55.51	-7.56	47.95	74.00	-26.05	Vertical
7323.00	49.07	-1.38	47.69	74.00	-26.31	Vertical
9764.00	50.33	1.19	51.52	74.00	-22.48	Vertical
12205.00	*	--	--	74.00	--	Vertical
14646.00	*	--	--	74.00	--	Vertical
4882.00	54.88	-7.56	47.32	74.00	-26.68	Horizontal
7323.00	49.84	-1.38	48.46	74.00	-25.54	Horizontal
9764.00	51.28	1.19	52.47	74.00	-21.53	Horizontal
12205.00	*	--	--	74.00	--	Horizontal
14646.00	*	--	--	74.00	--	Horizontal

Average value:

Frequency (MHz)	Read Level (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
4882.00	45.92	-7.56	38.36	54.00	-15.64	Vertical
7323.00	40.15	-1.38	38.77	54.00	-15.23	Vertical
9764.00	39.80	1.19	40.99	54.00	-13.01	Vertical
12205.00	*	--	--	54.00	--	Vertical
14646.00	*	--	--	54.00	--	Vertical
4882.00	45.84	-7.56	38.28	54.00	-15.72	Horizontal
7323.00	41.06	-1.38	39.68	54.00	-14.32	Horizontal
9764.00	40.46	1.19	41.65	54.00	-12.35	Horizontal
12205.00	*	--	--	54.00	--	Horizontal
14646.00	*	--	--	54.00	--	Horizontal

Test channel:	Highest
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Peak value:

Frequency (MHz)	Read Level (dBUV)	Factor (dB/m)	Level (dBUV/m)	Limit Line (dBUV/m)	Over Limit (dB)	Polarization
4960.00	53.79	-7.43	46.36	74.00	-27.64	Vertical
7440.00	50.53	-1.02	49.51	74.00	-24.49	Vertical
9920.00	52.71	1.08	53.79	74.00	-20.21	Vertical
12400.00	*	--	--	74.00	--	Vertical
14880.00	*	--	--	74.00	--	Vertical
4960.00	55.11	-7.43	47.68	74.00	-26.32	Horizontal
7440.00	52.29	-1.02	51.27	74.00	-22.73	Horizontal
9920.00	51.17	1.08	52.25	74.00	-21.75	Horizontal
12400.00	*	--	--	74.00	--	Horizontal
14880.00	*	--	--	74.00	--	Horizontal

Average value:

Frequency (MHz)	Read Level (dBUV)	Factor (dB/m)	Level (dBUV/m)	Limit Line (dBUV/m)	Over Limit (dB)	Polarization
4960.00	45.26	-7.43	37.83	54.00	-16.17	Vertical
7440.00	41.84	-1.02	40.82	54.00	-13.18	Vertical
9920.00	40.98	1.08	42.06	54.00	-11.94	Vertical
12400.00	*	--	--	54.00	--	Vertical
14880.00	*	--	--	54.00	--	Vertical
4960.00	44.18	-7.43	36.75	54.00	-17.25	Horizontal
7440.00	41.25	-1.02	40.23	54.00	-13.77	Horizontal
9920.00	41.16	1.08	42.24	54.00	-11.76	Horizontal
12400.00	*	--	--	54.00	--	Horizontal
14880.00	*	--	--	54.00	--	Horizontal

Remarks:

1. Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor
2. “*”, means this data is the too weak instrument of signal is unable to test.
3. The emission levels of other frequencies are very lower than the limit and not show in test report.
4. The test data shows only the worst case 8-DPSK mode



5 Test Setup Photo

Reference to the file No.: ET-25093762SP for details.

6 EUT Constructional Details

Reference to the file No.: ET-25093762EP and ET-25093762IP for details.

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