FCC PART 15.247
TEST REPORT

For

Xinwei Electronic Co., Ltd., Quanzhou

Wan An Tang Xi Industrial Area, Luo Jiang, Quanzhou City, Fujian Province, China

FCC ID: UUPNF-781D

Report Type:	**Product Name:**
Original Report	Two Way Radio

Report Number:	2407S50596E-RF-03
Report Date:	2024-08-13
Reviewed By:	Stein Peng
Approved By:	Miles Chen
Prepared By:	Bay Area Compliance Laboratories Corp. (Xiamen) Unit 102, No. 902 Meifeng South Road, Binhai West Avenue, Science and Technology Innovation Park, Torch High tech Zone XiaMen Tel: +86-592-3200111 www.baclcorp.com.cn

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REPORT REVISION HISTORY

Number of Revisions	Report No.	Version	Issue Date	Description
0	2407S50596E-RF-03	R1V1	2024-08-13	Initial Release

GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

Product Name:		Two Way Radio
Tested Model:		NF-781D
Power Supply:		DC 3.7V from battery or DC 5V from chager or DC 5V from adapter
Maximum Output Power (Conducted):		GFSK:-6.39dBm π/4-DQPSK:-5.67dBm 8DPSK:-5.04 dBm
Adapter Information	Model:	XZ0500-2000UU
	Input:	AC100-240V 50/60Hz, 0.4A
	Output:	DC 5.0V, 2A
Charger Information	Model:	CHARGER FOR NF-781
	Input:	DC 5V, 2A
	Output:	DC 5V, 2A
RF Function:		Classic BT
Operating Band/Frequency:		2402-2480 MHz
Channel Number:		79
Channel Separation:		1 MHz
Modulation Type:		GFSK, π/4-DQPSK, 8DPSK
Antenna Type:		Ceramic chip Antenna
★Maximum Antenna Gain:		2.5 dBi
EUT Received Status:		Good

Note:
1. The Maximum Antenna Gain was declared by manufacturer.
2. The model difference please refer to declaration letter.
2. All measurement and test data in this report was gathered from production sample serial number: 2407S50596E-RF-1 (Assigned by the BACL(Xiamen). The EUT supplied by the applicant was received on 2024-04-17)

Objective

This test report is prepared for *Xinwei Electronic Co., Ltd., Quanzhou* in accordance with Part 2-Subpart J, Part 15-Subparts A and C of the Federal Communication Commissions rules.

The tests were performed in order to determine Compliance with FCC Part 15, Subpart C, section 15.203, 15.205, 15.207, 15.209 and 15.247 rules.

Test Methodology

All measurements contained in this report were conducted with ANSI C63.10-2020, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices and 558074 D01 15.247 Meas Guidance v05r02.

Test Facility

The Test site used by Bay Area Compliance Laboratories Corp. (Xiamen) to collect test data is located on the Unit 102, No. 902 Meifeng South Road, Binhai West Avenue, Science and Technology Innovation Park, Torch High tech Zone XiaMen.

Bay Area Compliance Laboratories Corp. (Xiamen) Lab is accredited to ISO/IEC 17025 by A2LA (Certificate Number: 7134.01) and the lab has been recognized as the FCC accredited lab under the KDB 974614 D01, the FCC Designation No. : CN1384.

Measurement Uncertainty

Item		U_{lab}
AC Power Lines Conducted Emissions	150kHz-30MHz	2.33 dB
Radiated emission	9kHz-30MHz	2.59 dB
	30MHz~1GHz	4.79 dB
	1GHz~6GHz	4.6 dB
	6GHz~18GHz	5.42 dB
	18GHz~26.5GHz	5.37 dB
Occupied Bandwidth		±0.10MHz
Transmitter Conducted Power		±0.624 dB
Conducted Spurious Emission		±2.52 dB
Temperature		±1℃
Humidity		±5%

Note: The extended uncertainty given in this report is obtained by combining the standard uncertainty times the coverage factor K with the 95% confidence interval. Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty.

SYSTEM TEST CONFIGURATION

Test Mode and Voltage

The system was configured for testing in a typical mode (as normally used by a typical user).	
Test mode:	Test mode 1: Transmitting
Test voltage:	Test mode 1: DC 3.7V
Remark:	During all emission tests, the EUT was configured to measure its highest possible emission level and the worst case's test data was presented in this test report.

Description of Test Configuration

Channel list:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	2402	40	2442
1	2403	…	…
…	…	…	…
…	…	78	2480
39	2441	/	/

EUT was tested with Channel 0, 39 and 78.

EUT Exercise Software

RF Test Tool: FCC_assist_exe

★Power level: 10

Note: The power level was declared by the applicant.

Special Accessories

No special accessory.

Equipment Modifications

No modification was made to the EUT tested.

Support Equipment List and Details

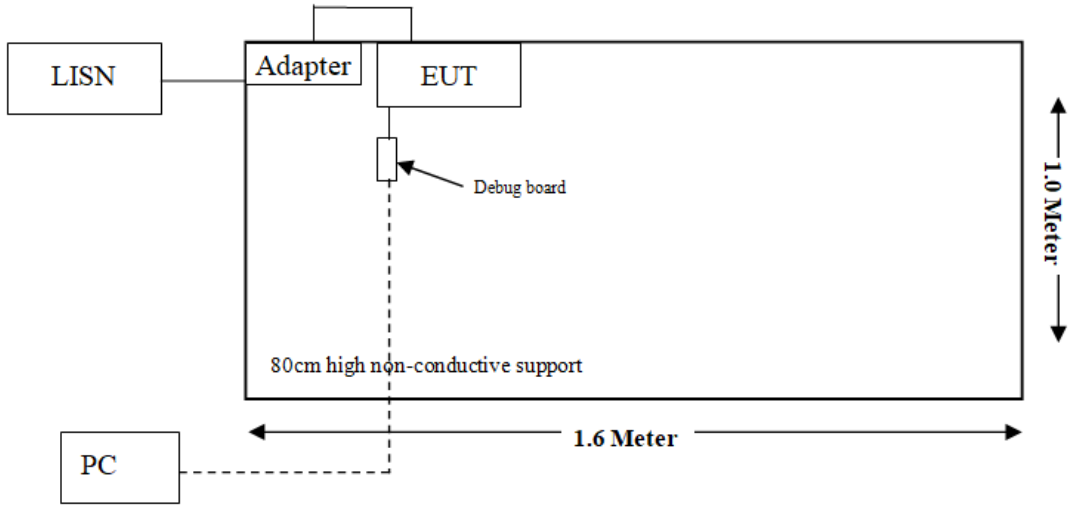
Manufacturer	Description	Model	Serial Number
Xiamen Xdroid Tech Co.,Ltd	Adapter	XZ0500-2000UU	/
USB to RISYM	Debug board	CH340G	/
Lenovo	PC	Lenovo 14w Gen 2	PW01PJ6E

External I/O Cable

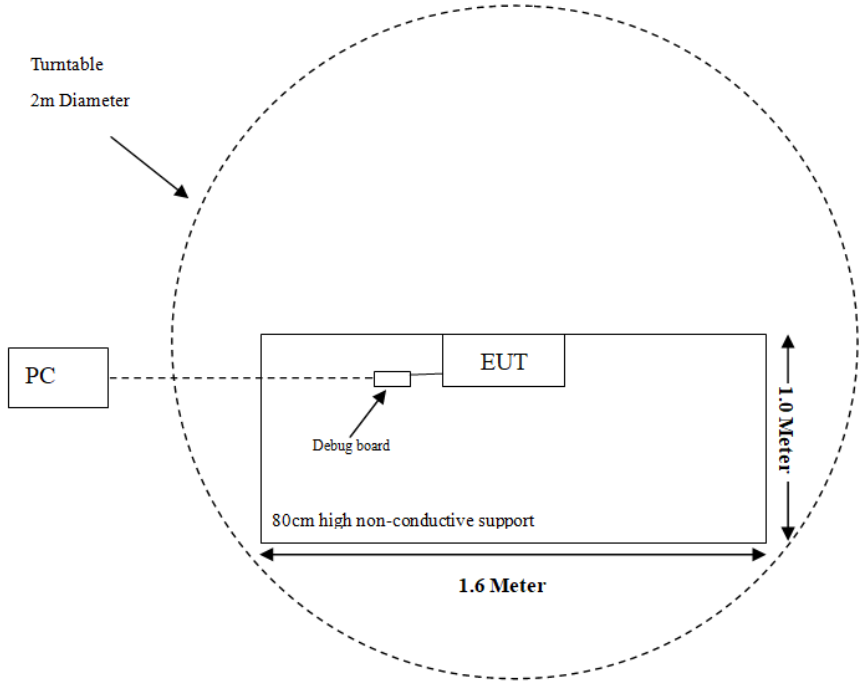
Cable Description	Length (m)	From Port	To
Type-C USB Cable	1.0	Adapter	EUT
Power cable	0.8	Adapter	LISN
Dupont Line	0.1	Debug board	EUT
Type-C USB Cable	2	Debug board	PC

Block Diagram of Test Setup

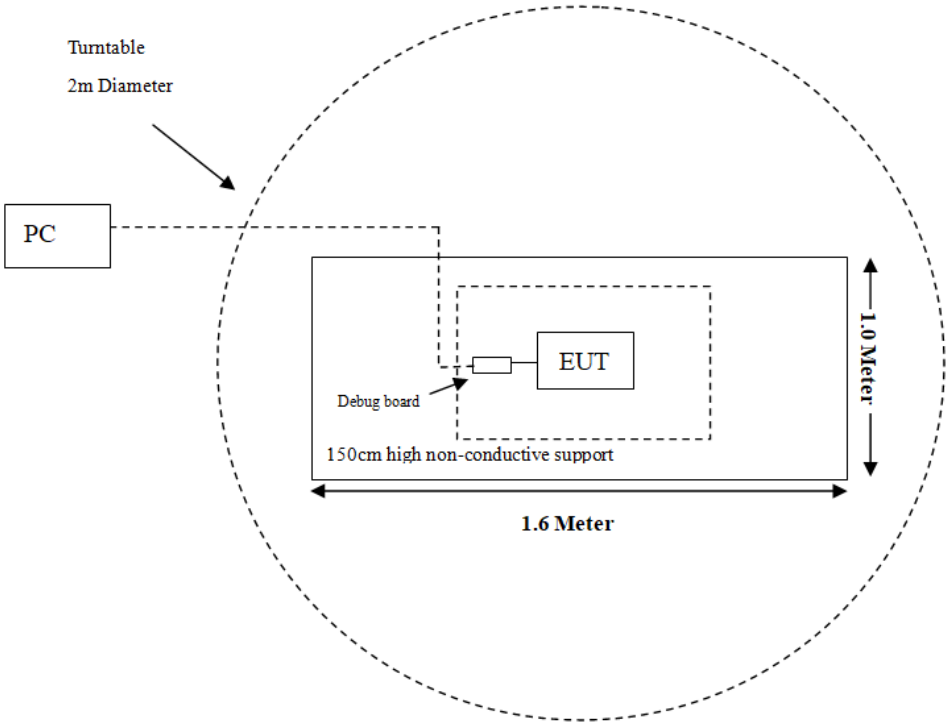
Conducted Emission:



Radiated Emission：
Below 1GHz



Above 1GHz:



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§15.203	Antenna Requirement	Compliant
§15.207(a)	AC Line Conducted Emissions	Compliant
§15.205, §15.209 & §15.247(d)	Radiated Emissions & Restricted Bands Emissions & Conducted Spurious Emissions at Antenna Port	Compliant
§15.247(a)(1)	20 dB Emission Bandwidth	Compliant
§15.247(a)(1)	Channel Separation Test	Compliant
§15.247(a)(1)(iii)	Time of Occupancy (Dwell Time)	Compliant
§15.247(a)(1)(iii)	Quantity of hopping channel Test	Compliant
§15.247(b)(1)	Peak Output Power Measurement	Compliant
§15.247(d)	Band edges	Compliant

TEST EQUIPMENT LIST

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Conducted Emission Test					
EMI Test Receiver	Rohde & Schwarz	ESR	103105	2023/09/12	2024/09/11
LISN	Rohde & Schwarz	ENV216	100129	2023/09/12	2024/09/11
Pulse Limiter	Rohde & Schwarz	ESH3-Z2	0357.8810.54	2023/09/12	2024/09/11
Coaxial Cable	XINHANGWEIBO	XH400T-N-4M	CC001	2023/08/29	2024/08/28
Test Software	Audix	E3	18621a	N/A	N/A
Radiated Emissions Below 1GHz					
EMI Test Receiver	Rohde & Schwarz	ESR	103103	2023/09/12	2024/09/11
Loop Antenna	Rohde & Schwarz	HFH2-Z2	830749/001	2023/07/27	2026/07/26
Antenna	Sunol Sciences	JB6	A122022-5	2023/07/27	2026/07/26
Amplifier	Sonoma	310B	120903	2023/09/12	2024/09/11
Coaxial Cable	XINHANGWEIBO	XH400T-N-4M	CC002	2023/08/29	2024/08/28
Coaxial Cable	XINHANGWEIBO	XH460B-N-2M	CC006	2023/08/29	2024/08/28
Coaxial Cable	XINHANGWEIBO	XH460B-N-12M	CC007	2023/08/29	2024/08/28
Coaxial Cable	XINHANGWEIBO	HFH2-CC	335.3609	2023/09/20	2026/09/19
Filter Switch Unit	Decentest	DT7220FSU	DS79904	2024/02/23	2025/02/22
Multiplex Switch Test Control Set	Decentest	DT7220SCU	DS79901	2024/02/23	2025/02/22
Test Software	Audix	E3	18621a	N/A	N/A
Radiated Emission Above 1 GHz					
Spectrum Analyzer	Rohde & Schwarz	FSV40-N	102051	2023/09/12	2024/09/11
Double Ridge Guide Horn Antenna	A.H.Systems	SAS-571	1980	2023/07/28	2026/07/27
Horn Antenna	EMCO	3116	9407-2232	2023/07/31	2026/07/30
Preamplifier	A.H.Systems	PAM-0118P	489	2023/09/12	2024/09/11
Preamplifier	A.H.Systems	PAM-1840	200	2023/09/12	2024/09/11
Filter Switch Unit	Decentest	DT7220FSU	DS79904	2024/02/23	2025/02/22
Multiplex Switch Test Control Set	Decentest	DT7220SCU	DS79901	2024/02/23	2025/02/22
Coaxial Cable	XINHANGWEIBO	XH800A-N-6M	CC004	2023/08/29	2024/08/28
Coaxial Cable	XINHANGWEIBO	XH800A-N-1M	CC005	2023/08/29	2024/08/28
Test Software	Audix	E3	18621a	N/A	N/A
RF Conducted Test					
Spectrum Analyzer	Rohde & Schwarz	FSU	100405	2023/09/12	2024/09/11
Spectrum Analyzer	Rohde & Schwarz	FSV40-N	102051	2024/03/29	2025/03/28
Coaxial Cable	N/A	N/A	N/A	Each time	N/A

Statement of Traceability: Bay Area Compliance Laboratories Corp. (Xiamen) attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

FCC §15.203 – ANTENNA REQUIREMENT

Applicable Standard

According to FCC § 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. 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. The structure and application of the EUT were analyzed to determine compliance with section §15.203 of the rules. §15.203 state that the subject device must meet the following criteria:

a. Antenna must be permanently attached to the unit.
b. Antenna must use a unique type of connector to attach to the EUT.
c. Unit must be professionally installed, and installer shall be responsible for verifying that the correct antenna is employed with the unit.

And according to FCC 47 CFR section 15.247 (b), if the transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Antenna Connector Construction

The EUT has one Ceramic chip antenna for Bluetooth, which was permanently attached and the antenna gain is 2.5 dBi, fulfill the requirement of this section. Please refer to the EUT photos.

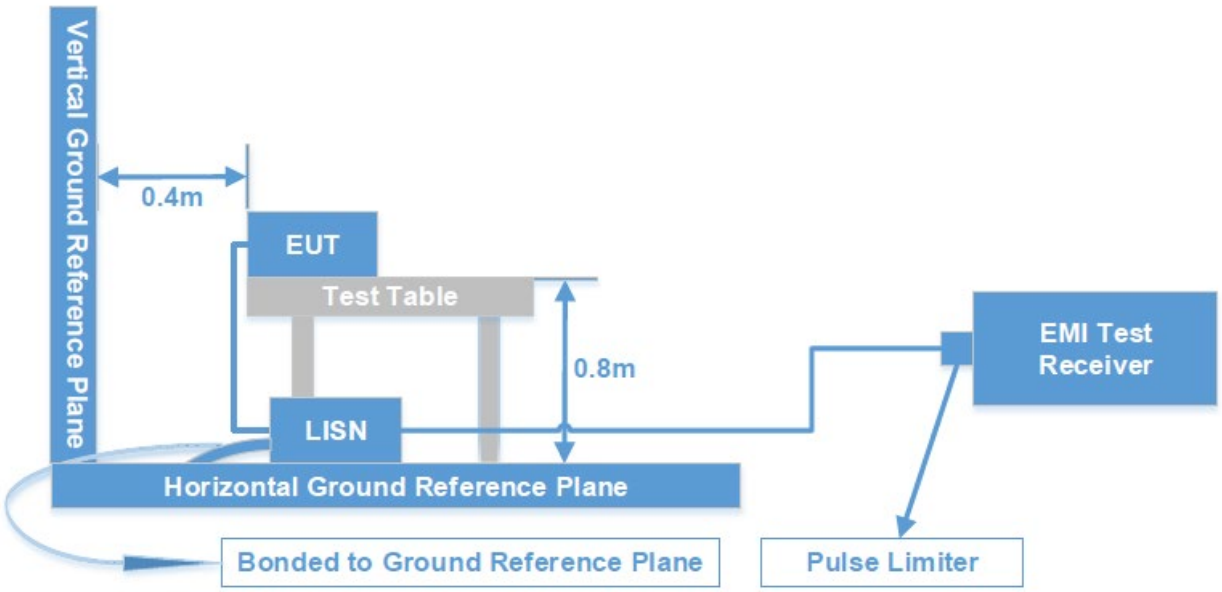
Result: Compliance

FCC §15.207 (a) – AC LINE CONDUCTED EMISSIONS

Applicable Standard

FCC §15.207(a)

Test System Setup



The measurement procedure of EUT setup is according with ANSI C63.10-2020. The related limit was specified in FCC Part 15.207.

EMI Test Receiver Setup

The EMI test receiver was set to investigate the spectrum from 150 kHz to 30 MHz.

During the conducted emission test, the EMI test receiver was set with the following configurations:

Frequency Range	RBW	VBW	Detector
150 kHz – 30 MHz	9 kHz	30 kHz	QP/AV

Test Procedure

ANSI C63.10-2020 clause 6.2

During the conducted emission test, the adapter was connected to the outlet of the LISN.

Maximizing procedure was performed on the six (6) highest emissions of the EUT.

If the maximum peak value of the emissions is below the average limit, the QP value and average value measurement will not need to be performed and only record the maximum peak measured value to meet the requirements.

Level &Margin Calculation

The Level is calculated by adding LISN VDF (Voltage Division Factor), Cable Loss and Transient Limiter Attenuation from the Meter Reading. The basic equation is as follows:

Factor (dB) = LISN VDF (dB) + Cable Loss (dB) + Transient Limiter Attenuation (dB)
Level (dBμV) = Reading (dBμV) + Factor (dB)

The "**Margin**" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of 7dB means the emission is 7dB below the limit. The equation for margin calculation is as follows:

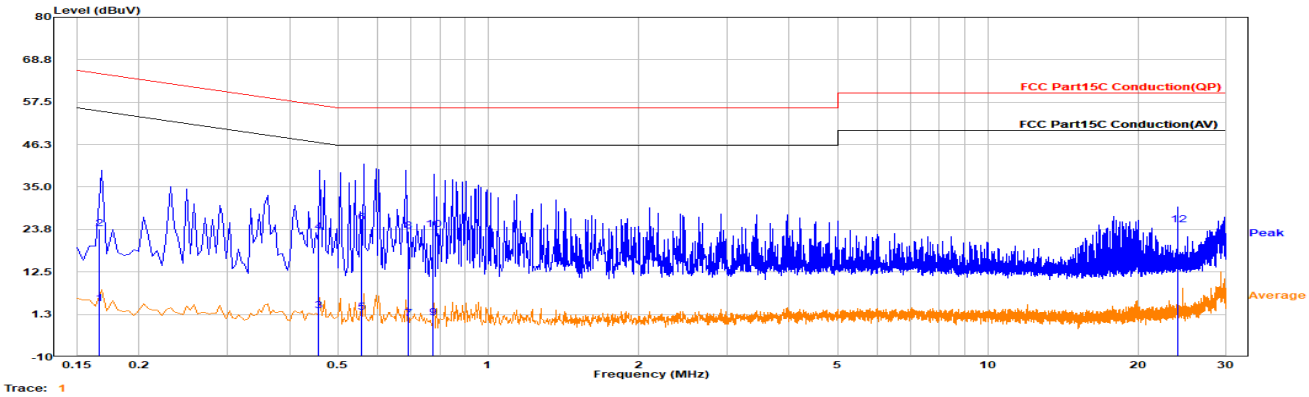
Margin (dB) = Limit (dBμV) – Level (dBμV)

Test Data

EUT operation mode: Transmitting in EDR high channel (8DPSK) (worst case)

Date: 2024-06-03

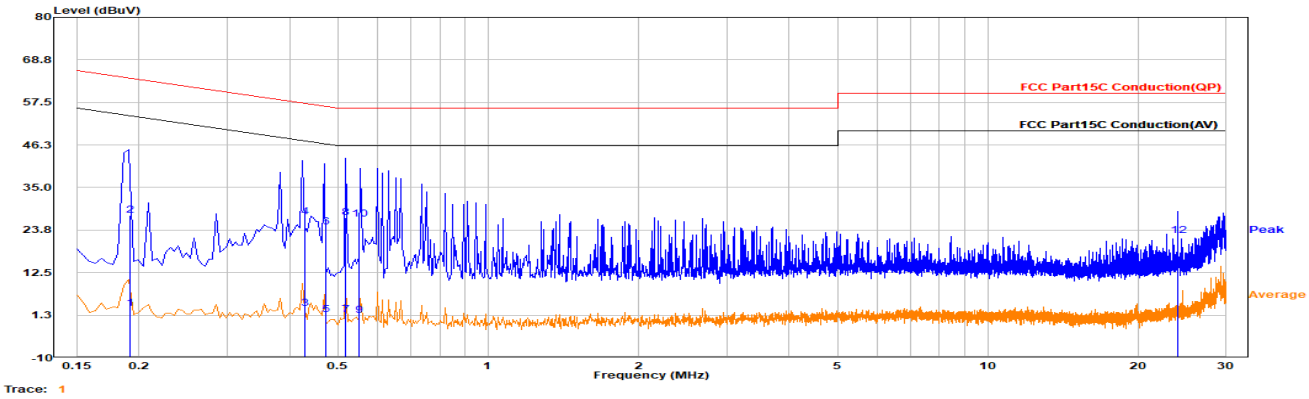
Project No. : 2407S50596E-RF Temp/Humi: 22.2℃/58%
Test Mode : EDR 3DH1 2480-L Tested by: Toby Chen



Freq MHz	Reading dBuV	Factor dB	Level dBuV	Limit dBµV	Margin dB	Phase	Remark
0.167	-15.35	19.51	4.16	55.12	50.96	Line	Average
0.167	4.51	19.51	24.01	65.12	41.11	Line	QP
0.457	-17.39	19.60	2.21	46.75	44.54	Line	Average
0.457	3.57	19.60	23.17	56.75	33.58	Line	QP
0.558	-17.89	19.60	1.71	46.00	44.29	Line	Average
0.558	5.96	19.60	25.55	56.00	30.45	Line	QP
0.692	-19.42	19.59	0.17	46.00	45.83	Line	Average
0.692	3.73	19.59	23.32	56.00	32.68	Line	QP
0.776	-19.25	19.60	0.36	46.00	45.64	Line	Average
0.776	4.08	19.60	23.68	56.00	32.32	Line	QP
24.001	-6.09	20.18	14.09	50.00	35.91	Line	Average
24.001	4.78	20.18	24.96	60.00	35.04	Line	QP

Date: 2024-06-03

Project No. : 2407S50596E-RF Temp/Humi: 22.2℃/58%
Test Mode: EDR 3DH1 2480-N Tested by: Toby Chen



Freq	Reading	Factor	Level	Limit	Margin	Phase	Remark
MHz	dBuV	dB	dBuV	dBµV	dB		
0.192	-16.40	19.48	3.07	53.94	50.87	Neutral	Average
0.192	8.15	19.48	27.63	63.94	36.31	Neutral	QP
0.429	-16.57	19.61	3.04	47.28	44.24	Neutral	Average
0.429	7.67	19.61	27.28	57.28	30.00	Neutral	QP
0.473	-18.27	19.62	1.36	46.46	45.10	Neutral	Average
0.473	5.03	19.62	24.65	56.46	31.80	Neutral	QP
0.517	-18.17	19.62	1.45	46.00	44.55	Neutral	Average
0.517	7.33	19.62	26.95	56.00	29.05	Neutral	QP
0.550	-18.40	19.60	1.21	46.00	44.79	Neutral	Average
0.550	7.02	19.60	26.63	56.00	29.37	Neutral	QP
24.005	-7.47	20.20	12.73	50.00	37.27	Neutral	Average
24.005	2.04	20.20	22.24	60.00	37.76	Neutral	QP

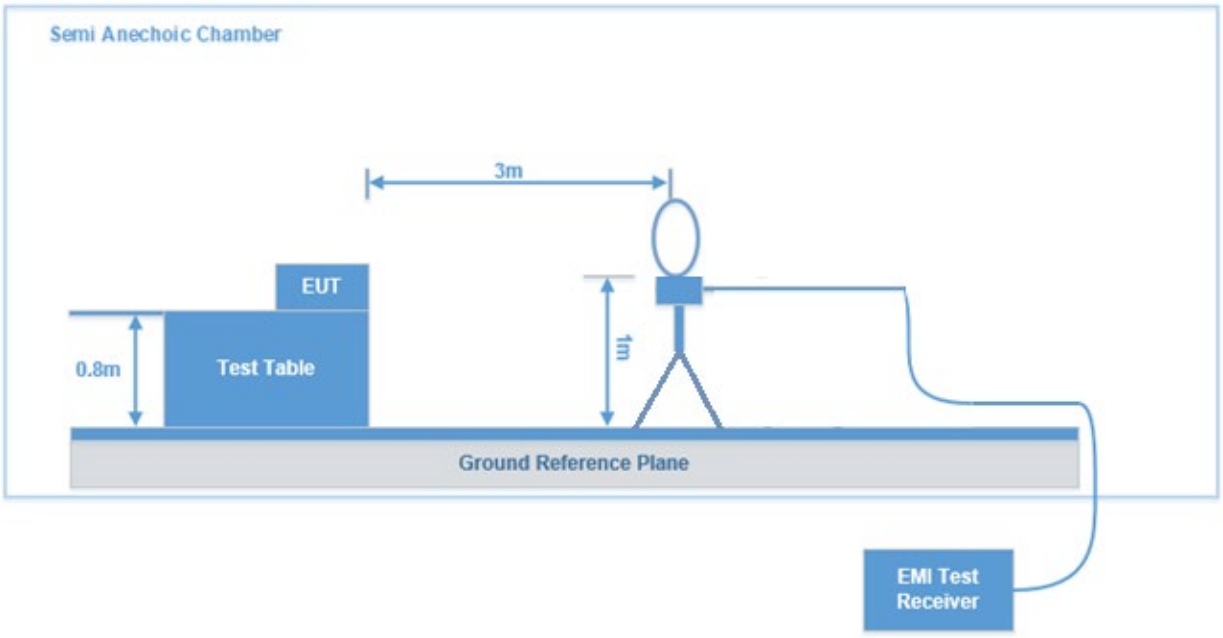
FCC §15.205, §15.209 & §15.247(d) – RADIATED EMISSIONS

Applicable Standard

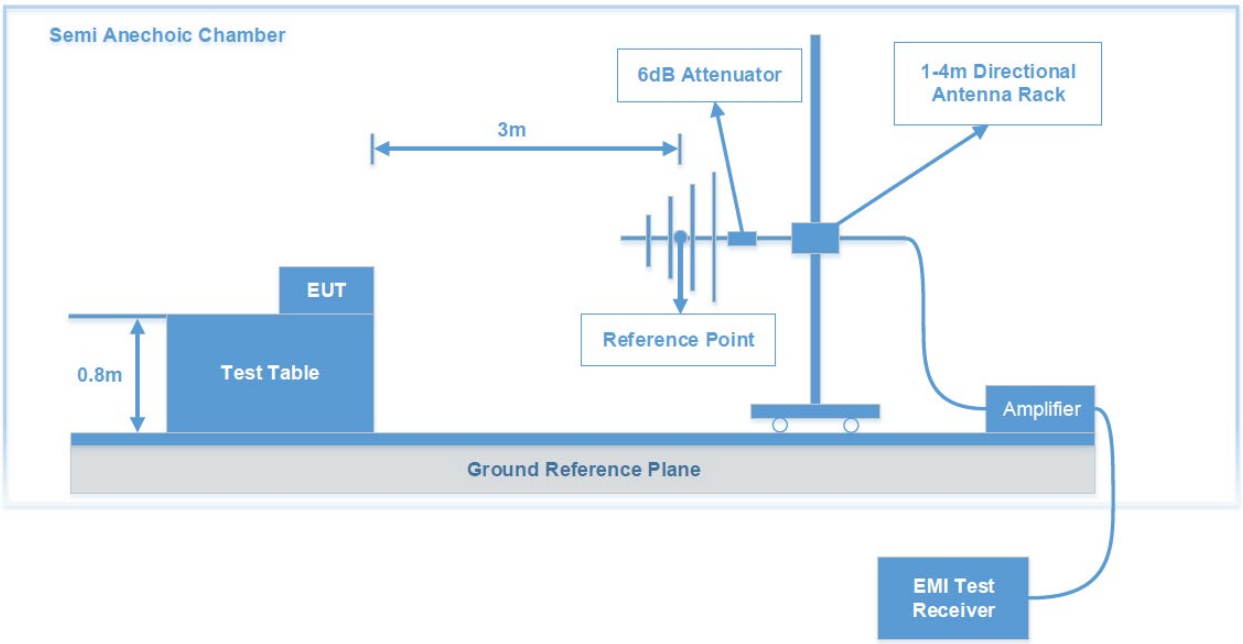
FCC §15.205; §15.209; §15.247(d)

Test System Setup

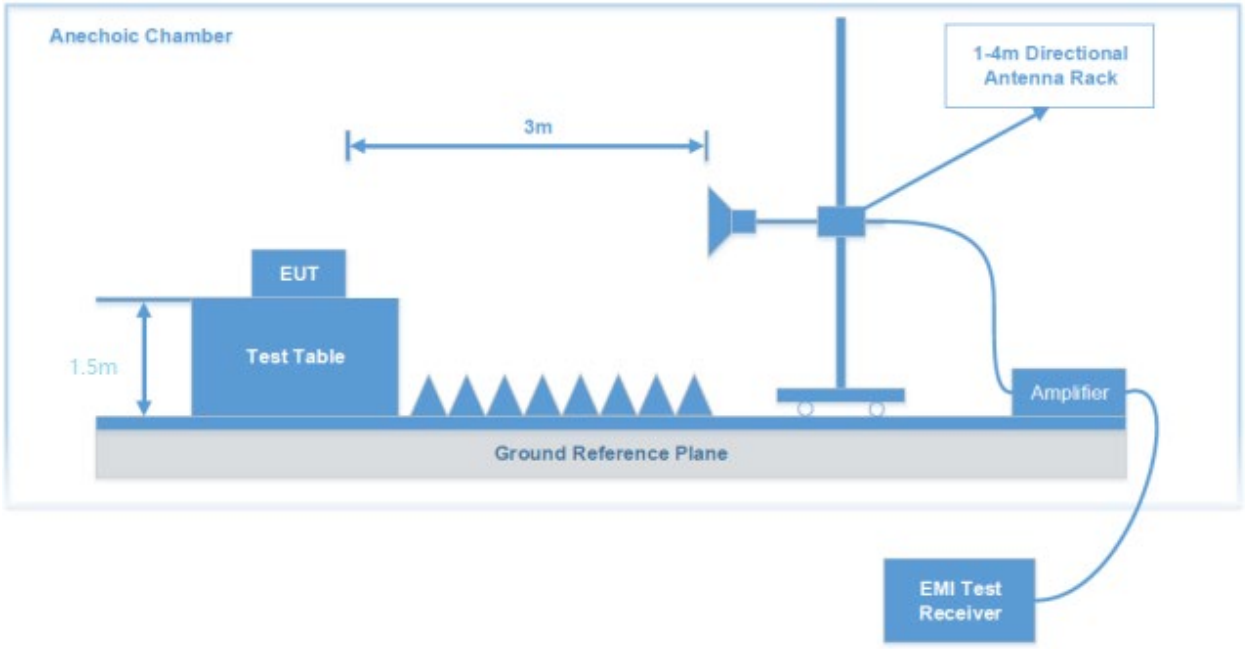
9 kHz-30MHz



Below 1 GHz:



Above 1GHz:



The radiated emission tests were performed in the 3 meters, using the setup accordance with the ANSI C63.10-2020. The specification used was the FCC 15.209 and FCC 15.247 limits.

EMI Test Receiver Setup

The system was investigated from 9 kHz to 25 GHz.

During the radiated emission test, the EMI test receiver Setup was set with the following configurations:

Frequency Range	RBW	VBW	IF B/W	Measurement
9 kHz – 150 kHz	200Hz	1 kHz	/	PK
	/	/	200Hz	QP/AV
150 kHz – 30 MHz	10 kHz	30 kHz	/	PK
	/	/	9kHz	QP/AV
30 MHz – 1000 MHz	100 kHz	300 kHz	/	PK
	/	/	120kHz	QP
Above 1 GHz	1 MHz	3 MHz	/	PK
	1 MHz	/	10Hz	AV

Test Procedure

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

For each measurement antenna alignment, the EUT shall be rotated through 0° to 360° on a turntable. The report shall list the six emissions with the smallest margin relative to the limit, for each of the three antenna orientations (parallel, perpendicular, and ground parallel) unless the margin is greater than 20 dB, then the following statement shall be made: "all emissions were greater than 20 dB below the limit."

If the measured peak level of the emissions that the measuring receiver reading level plus corrected factor is at least 10 dB below the QP emission limit, there's no need to record the measured QP level of the emissions in the report.

Level &Margin Calculation

The Level is calculated by adding the Antenna Factor and Cable Loss, and subtracting the Amplifier Gain from the Meter Reading. The basic equation is as follows:

Factor (dB/m) =Antenna Factor (dB/m) + Cable Loss (dB) - Amplifier Gain (dB)
Level (dBμV/m) = Reading (dBμV) + Factor (dB/m)

The "**Margin**" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of 7dB means the emission is 7dB below the limit. The equation for margin calculation is as follows:

Margin (dB) = Limit (dBμV/m) –Level (dBμV/m)

Test Data

Please refer to the below table and plots.
After pre-scan in the X, Y and Z axes of orientation, the worst case is below:

Frequency Range:	Below 1 GHz	Above 1 GHz	Conducted Spurious Emissions at Antenna Port
Temperature:	22.3℃	20℃	23.9℃
Relative Humidity:	55 %	62%	60%
ATM Pressure:	101kPa	101.1 kPa	99.8 kPa
Test Date:	2024-06-04	2024-06-05~2024-06-07	2024-07-25
Test Engineer:	Wlif Wu	Wlif Wu	Ash Lin

1) 9 kHz ~30MHz

EUT operation mode: Transmitting in EDR high channel (8DPSK) (worst case)

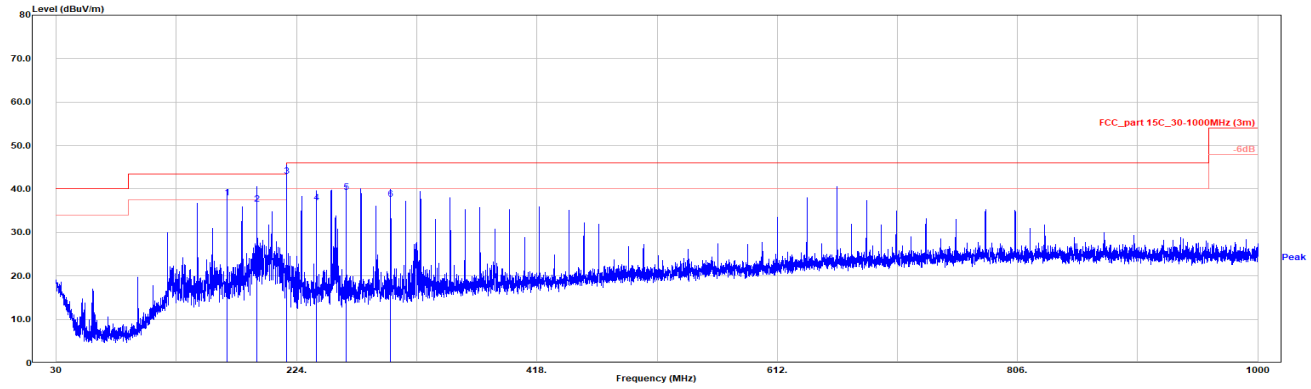
Pre-scan in parallel, ground-parallel and perpendicular of orientation of loop antenna, the amplitude of spurious emissions attenuated is more than 20 dB below the permissible value, which is not required to be report.

2) 30MHz-1GHz

EUT operation mode: Transmitting in EDR high channel (8DPSK) (worst case)

Date: 2024-06-04

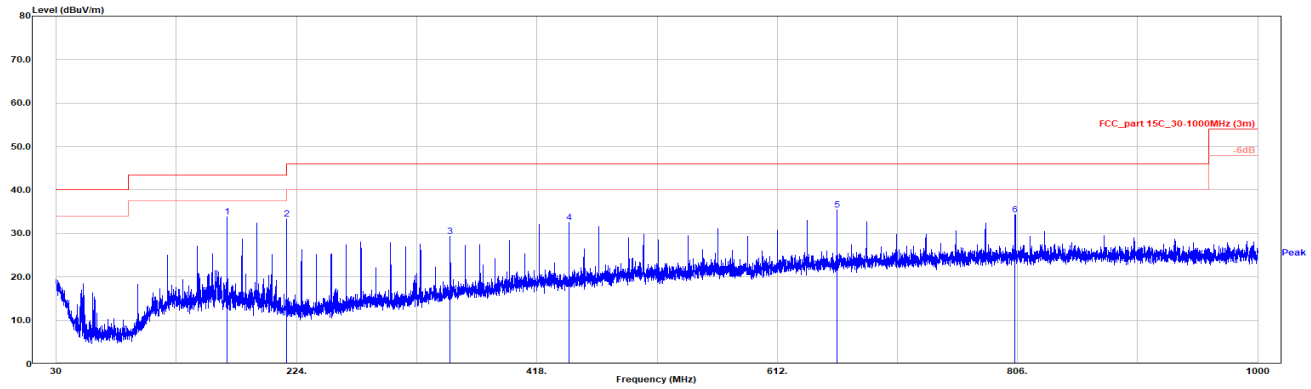
Project No. : 2407S50596E-RF Temp/Humi: 22.3℃/55%
Test Mode : Transmitting Tested by: Wlif Wu



Freq MHz	Reading dBuV	Factor dB/m	Level dBuV/m	Limit dBuV/m	Margin dB	Pol	Remark
168.031	49.72	-11.68	38.04	43.50	5.46	Horizontal	QP
191.990	48.76	-12.17	36.59	43.50	6.91	Horizontal	QP
216.020	55.62	-12.68	42.94	43.50	0.56	Horizontal	QP
240.005	48.64	-11.69	36.95	46.00	9.05	Horizontal	QP
263.964	49.73	-10.47	39.26	46.00	6.74	Horizontal	QP
300.048	46.82	-9.17	37.65	46.00	8.35	Horizontal	QP

Date: 2024-06-04

Project No. : 2407S50596E-RF Temp/Humi: 22.3℃/55%
Test Mode: Transmitting Tested by: Wlif Wu



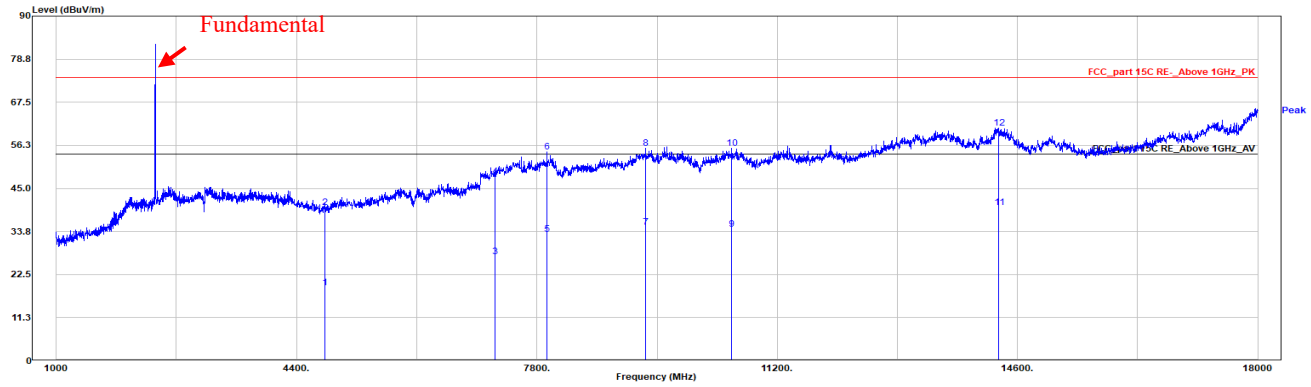
Freq MHz	Reading dBuV	Factor dB/m	Level dBuV/m	Limit dBuV/m	Margin dB	Pol	Remark
168.031	45.52	-11.68	33.84	43.50	9.66	Vertical	QP
215.949	46.09	-12.69	33.40	43.50	10.10	Vertical	QP
347.966	37.44	-8.10	29.34	46.00	16.66	Vertical	QP
443.996	37.59	-4.97	32.62	46.00	13.38	Vertical	QP
660.112	36.25	-0.87	35.38	46.00	10.62	Vertical	QP
804.060	33.04	1.26	34.30	46.00	11.70	Vertical	QP

3) 1 GHz-18 GHz

EUT operation mode: Transmitting in EDR (8DPSK) (worst case)

Date: 2024-06-05

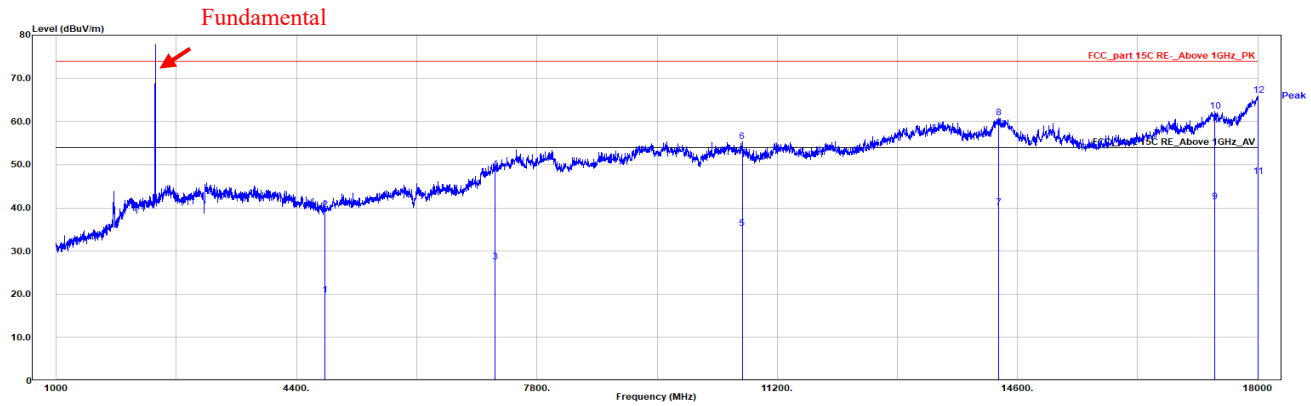
Project No.: 2407S50596E-RF Temp/Humi: 20°C/62%
Test Mode: EDR 3DH1 2402-H Tested by: Wlif Wu



Freq MHz	Reading dBuV	Factor dB/m	Level dBuV/m	Limit dBuV/m	Margin dB	Pol	Remark
4804.000	21.79	-2.73	19.06	54.00	34.94	horizontal	Average
4804.000	42.79	-2.73	40.06	74.00	33.94	horizontal	Peak
7206.000	22.06	5.07	27.13	54.00	26.87	horizontal	Average
7206.000	43.06	5.07	48.13	74.00	25.87	horizontal	Peak
7942.800	26.45	6.65	33.10	54.00	20.90	horizontal	Average
7942.800	47.81	6.65	54.46	74.00	19.54	horizontal	Peak
9336.800	26.45	8.51	34.96	54.00	19.04	horizontal	Average
9336.800	46.99	8.51	55.50	74.00	18.50	horizontal	Peak
10550.600	24.57	9.75	34.32	54.00	19.68	horizontal	Average
10550.600	45.64	9.75	55.39	74.00	18.61	horizontal	Peak
14338.200	25.46	14.63	40.09	54.00	13.91	horizontal	Average
14338.200	46.20	14.63	60.83	74.00	13.17	horizontal	Peak

Date: 2024-06-05

Project No.: 2407S50596E-RF Temp/Humi: 20°C/62%
Test Mode: EDR 3DH1 2402-V Tested by: Wlif Wu

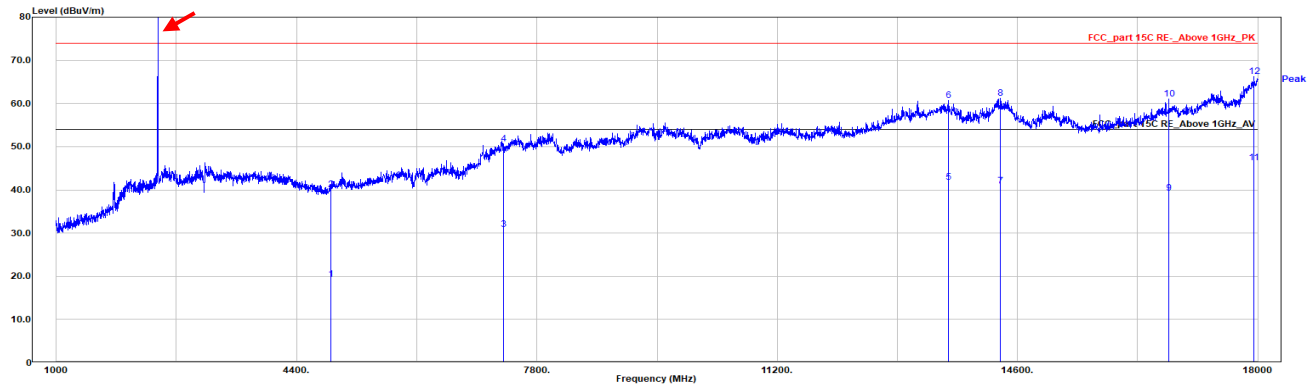


Freq	Reading	Factor	Level	Limit	Margin	Pol	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		
4804.000	22.48	-2.73	19.75	54.00	34.25	vertical	Average
4804.600	42.31	-2.73	39.58	74.00	34.42	vertical	Peak
7206.000	22.46	5.07	27.53	54.00	26.47	vertical	Average
7206.000	43.90	5.07	48.97	74.00	25.03	vertical	Peak
10703.600	25.45	9.73	35.18	54.00	18.82	vertical	Average
10703.600	45.57	9.73	55.30	74.00	18.70	vertical	Peak
14338.200	25.43	14.63	40.06	54.00	13.94	vertical	Average
14338.200	46.26	14.63	60.89	74.00	13.11	vertical	Peak
17391.400	26.43	14.97	41.40	54.00	12.60	vertical	Average
17391.400	47.42	14.97	62.39	74.00	11.61	vertical	Peak
18000.000	28.46	18.77	47.23	54.00	6.77	vertical	Average
18000.000	47.29	18.77	66.06	74.00	7.94	vertical	Peak

Date: 2024-06-05

Project No.: 2407S50596E-RF Temp/Humi: 20°C/62%
Test Mode: EDR 3DH1 2441-H Tested by: Wlif Wu

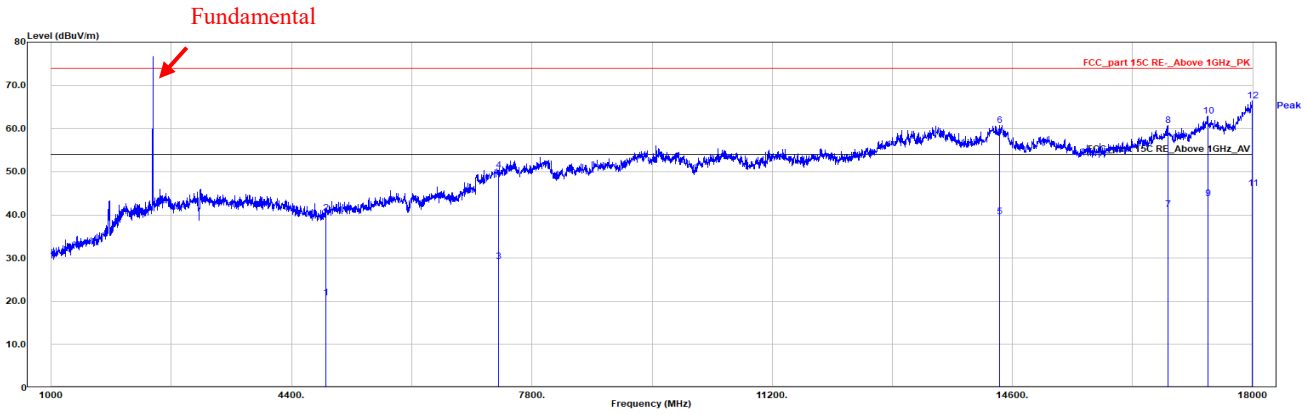
Fundamental



Freq	Reading	Factor	Level	Limit	Margin	Pol	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		
4882.800	20.98	-1.73	19.25	54.00	34.75	horizontal	Average
4882.800	41.89	-1.73	40.16	74.00	33.84	horizontal	Peak
7323.000	25.32	5.60	30.92	54.00	23.08	horizontal	Average
7323.000	45.06	5.60	50.66	74.00	23.34	horizontal	Peak
13617.400	27.35	14.49	41.84	54.00	12.16	horizontal	Average
13617.400	46.23	14.49	60.72	74.00	13.28	horizontal	Peak
14358.600	26.35	14.52	40.87	54.00	13.13	horizontal	Average
14358.600	46.68	14.52	61.20	74.00	12.80	horizontal	Peak
16738.600	26.13	13.15	39.28	54.00	14.72	horizontal	Average
16738.600	47.89	13.15	61.04	74.00	12.96	horizontal	Peak
17938.800	27.85	18.41	46.26	54.00	7.74	horizontal	Average
17938.800	47.78	18.41	66.19	74.00	7.81	horizontal	Peak

Date: 2024-06-05

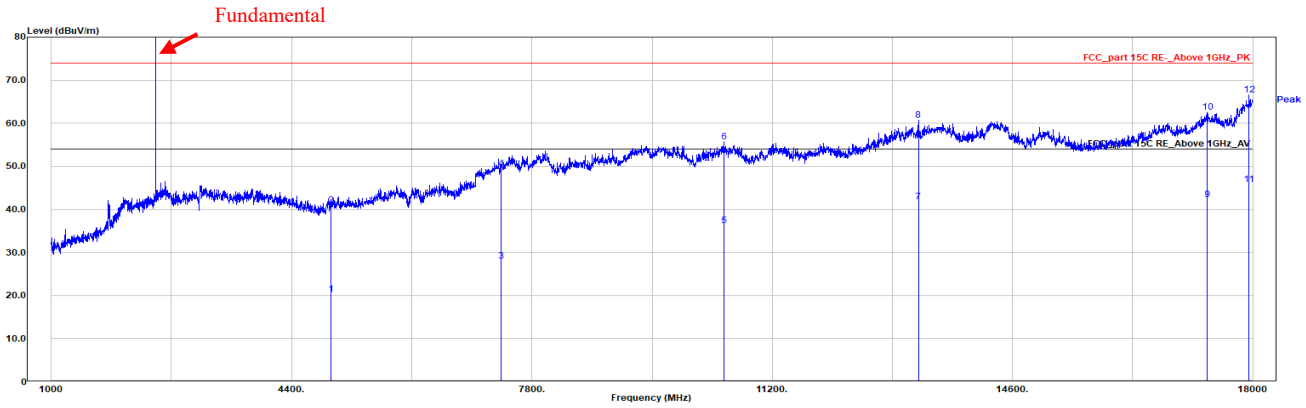
Project No.: 2407S50596E-RF Temp/Humi: 20°C/62%
Test Mode: EDR 3DH1 2441-V Tested by: Wlif Wu



Freq	Reading	Factor	Level	Limit	Margin	Pol	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		
4882.000	22.56	-1.75	20.81	54.00	33.19	vertical	Average
4882.800	42.11	-1.73	40.38	74.00	33.62	vertical	Peak
7323.000	23.55	5.60	29.15	54.00	24.85	vertical	Average
7323.000	44.67	5.60	50.27	74.00	23.73	vertical	Peak
14419.800	25.33	14.26	39.59	54.00	14.41	vertical	Average
14419.800	46.48	14.26	60.74	74.00	13.26	vertical	Peak
16796.400	27.46	13.80	41.26	54.00	12.74	vertical	Average
16796.400	46.92	13.80	60.72	74.00	13.28	vertical	Peak
17360.800	28.89	14.90	43.79	54.00	10.21	vertical	Average
17360.800	47.97	14.90	62.87	74.00	11.13	vertical	Peak
17993.200	27.32	18.73	46.05	54.00	7.95	vertical	Average
17993.200	47.69	18.73	66.42	74.00	7.58	vertical	Peak

Date: 2024-06-05

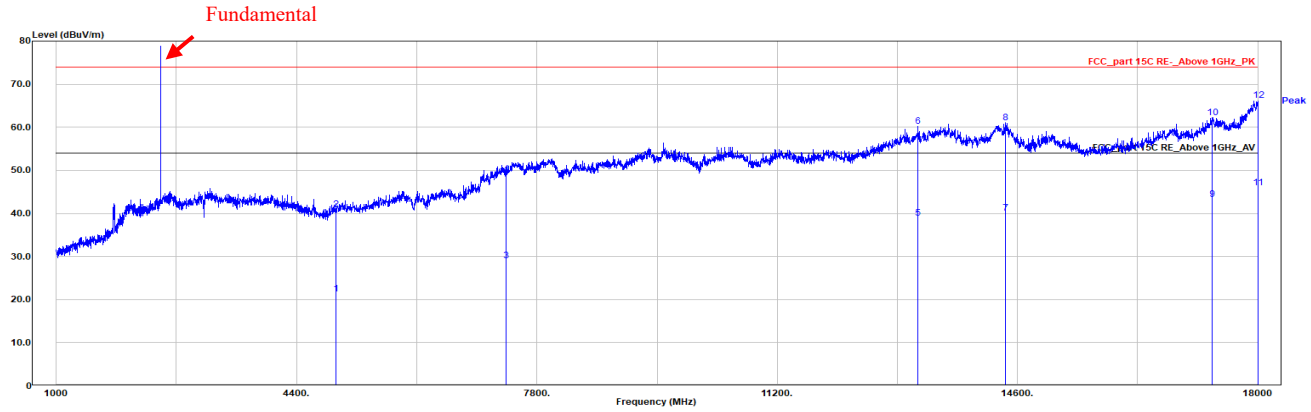
Project No.: 2407S50596E-RF Temp/Humi: 20°C/62%
Test Mode: EDR 3DH1 2480-H Tested by: Wlif Wu



Freq	Reading	Factor	Level	Limit	Margin	Pol	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		
4961.000	21.34	-0.98	20.36	54.00	33.64	horizontal	Average
4961.000	41.91	-0.98	40.93	74.00	33.07	horizontal	Peak
7360.000	22.37	5.57	27.94	54.00	26.06	horizontal	Average
7360.000	43.89	5.57	49.46	74.00	24.54	horizontal	Peak
10513.200	26.35	9.88	36.23	54.00	17.77	horizontal	Average
10513.200	45.88	9.88	55.76	74.00	18.24	horizontal	Peak
13267.200	27.34	14.35	41.69	54.00	12.31	horizontal	Average
13267.200	46.36	14.35	60.71	74.00	13.29	horizontal	Peak
17357.400	27.35	14.89	42.24	54.00	11.76	horizontal	Average
17357.400	47.73	14.89	62.62	74.00	11.38	horizontal	Peak
17942.200	27.34	18.44	45.78	54.00	8.22	horizontal	Average
17942.200	48.18	18.44	66.62	74.00	7.38	horizontal	Peak

Date: 2024-06-05

Project No.: 2407S50596E-RF Temp/Humi: 20°C/62%
Test Mode: EDR 3DH1 2480-V Tested by: Wlif Wu



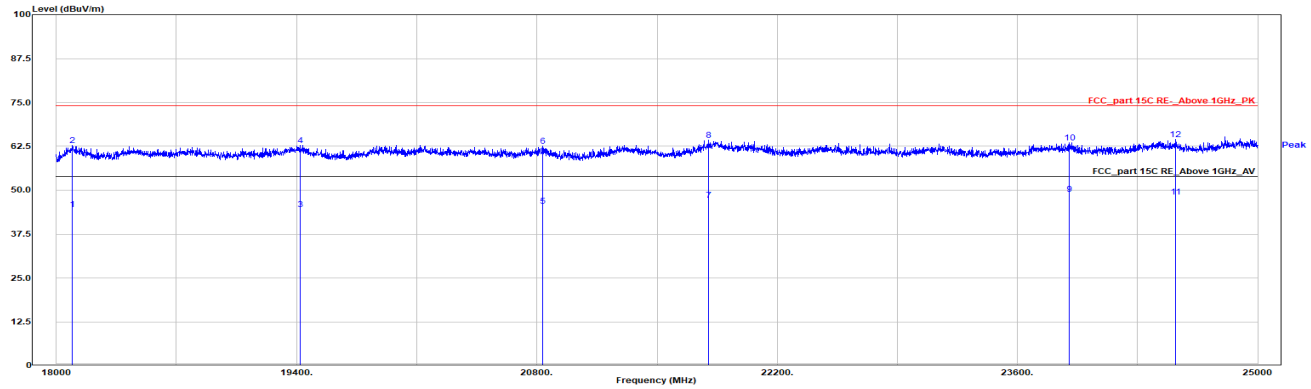
Freq	Reading	Factor	Level	Limit	Margin	Pol	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		
4960.000	22.34	-0.98	21.36	54.00	32.64	vertical	Average
4960.000	41.85	-0.98	40.87	74.00	33.13	vertical	Peak
7360.000	23.47	5.57	29.04	54.00	24.96	vertical	Average
7360.000	43.63	5.57	49.20	74.00	24.80	vertical	Peak
13189.000	24.31	14.62	38.93	54.00	15.07	vertical	Average
13189.000	45.59	14.62	60.21	74.00	13.79	vertical	Peak
14433.400	25.75	14.25	40.00	54.00	14.00	vertical	Average
14433.400	46.79	14.25	61.04	74.00	12.96	vertical	Peak
17357.400	28.44	14.89	43.33	54.00	10.67	vertical	Average
17357.400	47.29	14.89	62.18	74.00	11.82	vertical	Peak
18000.000	27.14	18.77	45.91	54.00	8.09	vertical	Average
18000.000	47.45	18.77	66.22	74.00	7.78	vertical	Peak

4) 18 GHz - 25 GHz

EUT operation mode: Transmitting in EDR high channel (8DPSK) (worst case)

Date: 2024-06-07

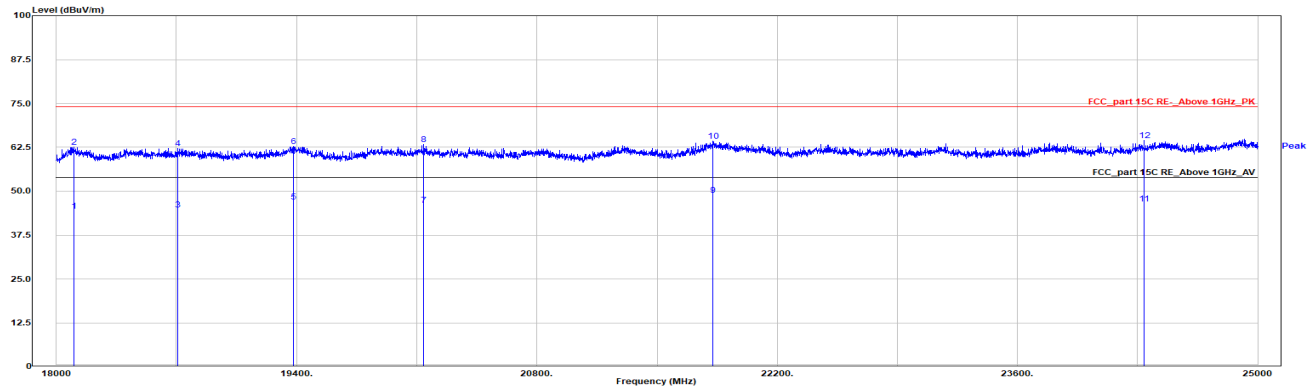
Project No.: 2407S50596E-RF Temp/Humi: 20°C/62%
Test Mode: Transmitting Tested by: Wlif Wu



Freq MHz	Reading dBuV	Factor dB/m	Level dBuV/m	Limit dBuV/m	Margin dB	Pol	Remark
18095.200	20.45	24.11	44.56	54.00	9.44	horizontal	Average
18095.200	38.61	24.11	62.72	74.00	11.28	horizontal	Peak
19422.400	20.04	24.60	44.64	54.00	9.36	horizontal	Average
19422.400	38.14	24.60	62.74	74.00	11.26	horizontal	Peak
20835.000	20.31	25.23	45.54	54.00	8.46	horizontal	Average
20835.000	37.39	25.23	62.62	74.00	11.38	horizontal	Peak
21801.000	21.34	25.91	47.25	54.00	6.75	horizontal	Average
21801.000	38.37	25.91	64.28	74.00	9.72	horizontal	Peak
23899.600	21.33	27.48	48.81	54.00	5.19	horizontal	Average
23899.600	36.00	27.48	63.48	74.00	10.52	horizontal	Peak
24518.400	19.52	28.57	48.09	54.00	5.91	horizontal	Average
24518.400	35.81	28.57	64.38	74.00	9.62	horizontal	Peak

Date: 2024-06-07

Project No.: 2407S50596E-RF Temp/Humi: 20°C/62%
Test Mode: Transmitting Tested by: Wlif Wu



Freq	Reading	Factor	Level	Limit	Margin	Pol	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		
18103.600	20.26	24.11	44.37	54.00	9.63	vertical	Average
18103.600	38.50	24.11	62.61	74.00	11.39	vertical	Peak
18708.400	20.37	24.44	44.81	54.00	9.19	vertical	Average
18708.400	37.78	24.44	62.22	74.00	11.78	vertical	Peak
19380.400	22.33	24.58	46.91	54.00	7.09	vertical	Average
19380.400	38.21	24.58	62.79	74.00	11.21	vertical	Peak
20142.000	21.07	24.89	45.96	54.00	8.04	vertical	Average
20142.000	38.52	24.89	63.41	74.00	10.59	vertical	Peak
21826.200	23.04	25.90	48.94	54.00	5.06	vertical	Average
21826.200	38.43	25.90	64.33	74.00	9.67	vertical	Peak
24336.400	18.24	28.26	46.50	54.00	7.50	vertical	Average
24336.400	36.26	28.26	64.52	74.00	9.48	vertical	Peak

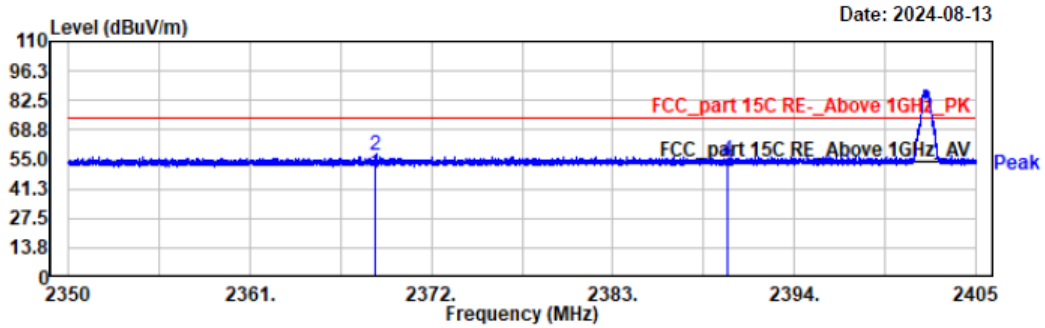
Restricted Bands Emissions:

Pre-Scan with GFSK, π/4-DQPSK, 8DPSK modes of operation in the X, Y and Z axes of orientation, the mode in Z-axis of orientation was recorded

Note:
Factor (dB/m) =Antenna Factor (dB/m) + Cable Loss (dB) - Amplifier Gain (dB)
Level (dBμV/m) = Reading (dBμV) + Factor (dB/m)
Margin (dB) = Limit (dBμV/m) –Level (dBμV/m)

Project No.: 2407S50596E-RF
Test Mode: BT 1DH1 2402
EUT Model: NF-781D
Test distance: 3m

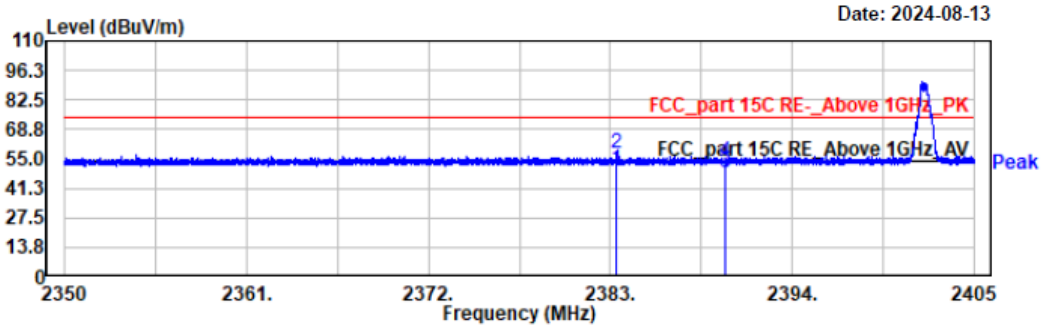
Temp/Humi: 23.8℃/57%
Tested by: Wlif Wu
Power Source: DC 3.7V



Freq MHz	Reading dBuV	Factor dB/m	Result dBuV/m	Limit dBuV/m	Margin dB	Polarity	Remark
2368.56	11.79	36.65	48.44	54.00	5.56	horizontal	Peak
2368.56	20.14	36.65	56.79	74.00	17.21	horizontal	Peak
2390.00	12.46	36.93	49.39	54.00	4.61	horizontal	Average
2390.00	17.38	36.93	54.31	74.00	19.69	horizontal	Peak

Project No.: 2407S50596E-RF
Test Mode: BT 1DH1 2402
EUT Model: NF-781D
Test distance: 3m

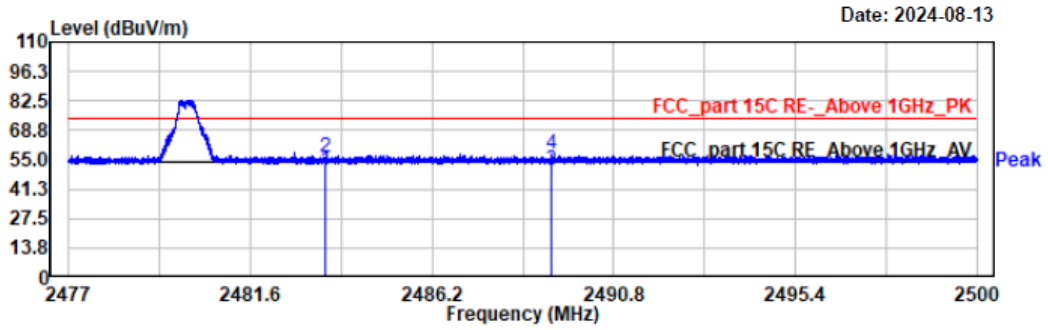
Temp/Humi: 23.8℃/57%
Tested by: Wlif Wu
Power Source: DC 3.7V



Freq MHz	Reading dBuV	Factor dB/m	Result dBuV/m	Limit dBuV/m	Margin dB	Polarity	Remark
2383.39	12.86	36.85	49.71	54.00	4.29	vertical	Average
2383.39	20.84	36.85	57.69	74.00	16.31	vertical	Peak
2390.00	11.35	36.93	48.28	54.00	5.72	vertical	Average
2390.00	16.94	36.93	53.87	74.00	20.13	vertical	Peak

Project No.: 2407S50596E-RF
Test Mode: BT 1DH1 2480
EUT Model: NF-781D
Test distance: 3m

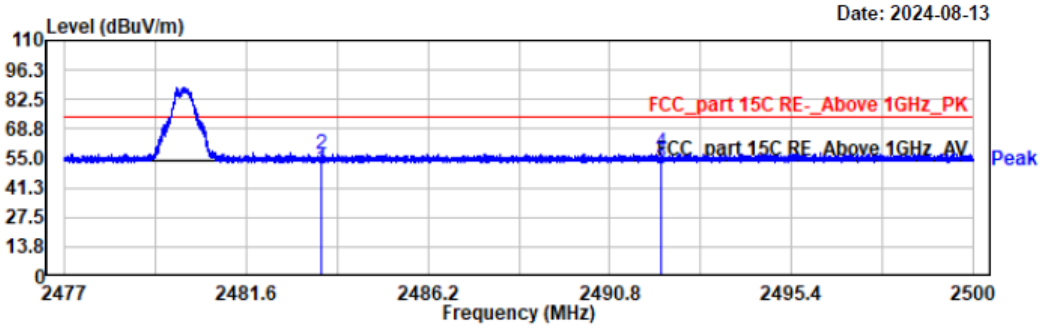
Temp/Humi: 23.8℃/57%
Tested by: Wlif Wu
Power Source: DC 3.7V



Freq MHz	Reading dBuV	Factor dB/m	Result dBuV/m	Limit dBuV/m	Margin dB	Polarity	Remark
2483.50	12.13	37.75	49.88	54.00	4.12	horizontal	Average
2483.50	18.68	37.75	56.43	74.00	17.57	horizontal	Peak
2489.23	12.47	37.85	50.32	54.00	3.68	horizontal	Average
2489.23	19.47	37.85	57.32	74.00	16.68	horizontal	Peak

Project No.: 2407S50596E-RF
Test Mode: BT 1DH1 2480
EUT Model: NF-781D
Test distance: 3m

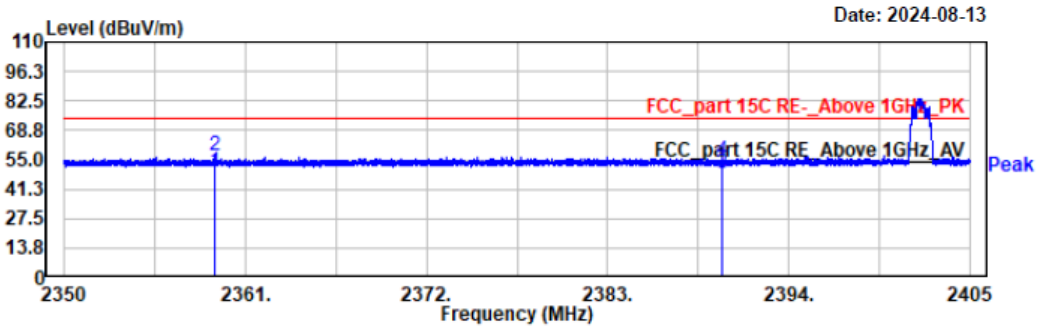
Temp/Humi: 23.8℃/57%
Tested by: Wlif Wu
Power Source: DC 3.7V



Freq MHz	Reading dBuV	Factor dB/m	Result dBuV/m	Limit dBuV/m	Margin dB	Polarity	Remark
2483.50	12.43	37.75	50.18	54.00	3.82	vertical	Average
2483.50	18.86	37.75	56.61	74.00	17.39	vertical	Peak
2492.12	12.50	37.91	50.41	54.00	3.59	vertical	Average
2492.12	19.91	37.91	57.82	74.00	16.18	vertical	Peak

Project No.: 2407S50596E-RF
Test Mode: BT 2DH1 2402
EUT Model: NF-781D
Test distance: 3m

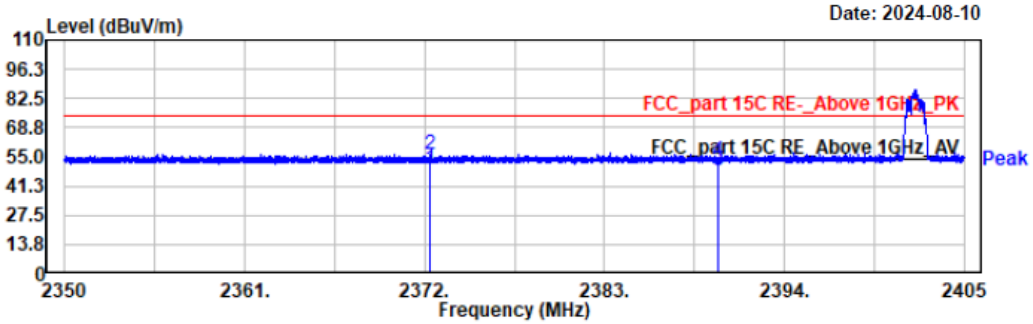
Temp/Humi: 23.8℃/57%
Tested by: Wlif Wu
Power Source: DC 3.7V



Freq MHz	Reading dBuV	Factor dB/m	Result dBuV/m	Limit dBuV/m	Margin dB	Polarity	Remark
2359.11	12.46	36.53	48.99	54.00	5.01	horizontal	Average
2359.11	20.30	36.53	56.83	74.00	17.17	horizontal	Peak
2390.00	11.64	36.93	48.57	54.00	5.43	horizontal	Average
2390.00	17.35	36.93	54.28	74.00	19.72	horizontal	Peak

Project No.: 2407S50596E-RF
Test Mode: BT 2DH1 2402
EUT Model: NF-781D
Test distance: 3m

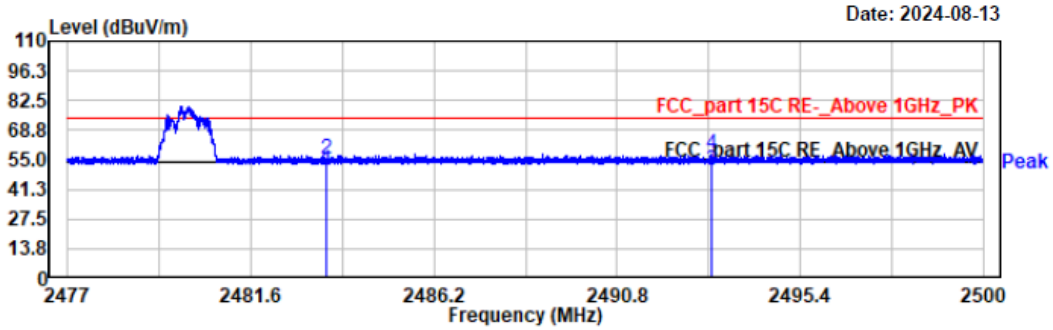
Temp/Humi: 23.8℃/57%
Tested by: Wlif Wu
Power Source: DC 3.7V



Freq MHz	Reading dBuV	Factor dB/m	Result dBuV/m	Limit dBuV/m	Margin dB	Polarity	Remark
2372.32	12.35	36.70	49.05	54.00	4.95	vertical	Average
2372.32	19.74	36.70	56.44	74.00	17.56	vertical	Peak
2390.00	11.37	36.93	48.30	54.00	5.70	vertical	Average
2390.00	16.10	36.93	53.03	74.00	20.97	vertical	Peak

Project No.: 2407S50596E-RF
Test Mode: BT 2DH1 2480
EUT Model: NF-781D
Test distance: 3m

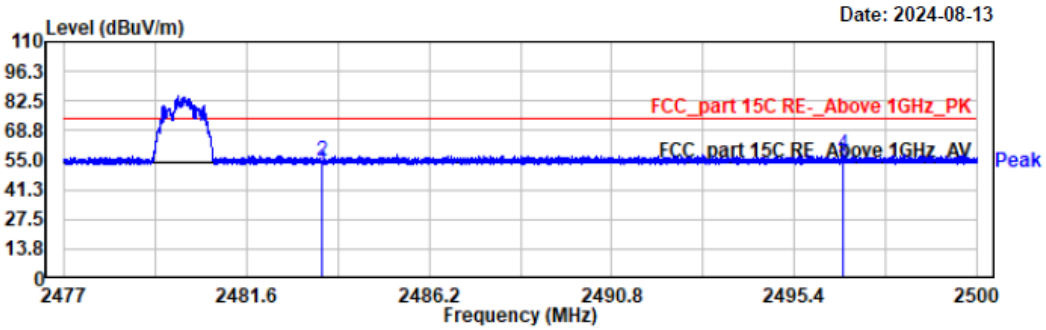
Temp/Humi: 23.8℃/57%
Tested by: Wlif Wu
Power Source: DC 3.7V



Freq MHz	Reading dBuV	Factor dB/m	Result dBuV/m	Limit dBuV/m	Margin dB	Polarity	Remark
2483.50	12.43	37.75	50.18	54.00	3.82	horizontal	Average
2483.50	17.67	37.75	55.42	74.00	18.58	horizontal	Peak
2493.17	12.06	37.93	49.99	54.00	4.01	horizontal	Average
2493.17	19.73	37.93	57.66	74.00	16.34	horizontal	Peak

Project No.: 2407S50596E-RF
Test Mode: BT 2DH1 2480
EUT Model: NF-781D
Test distance: 3m

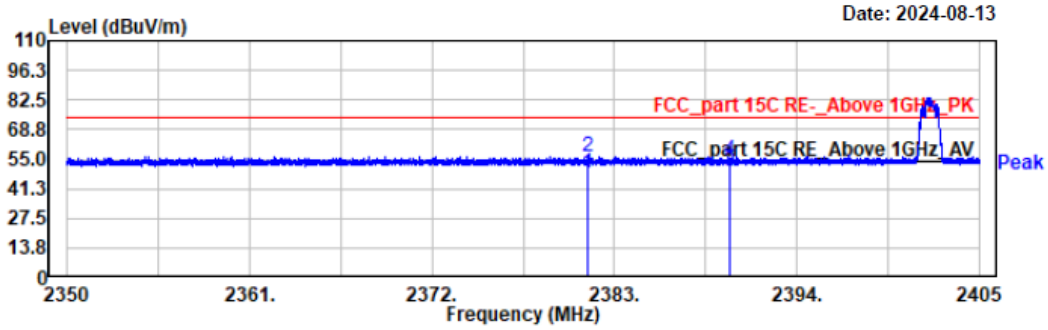
Temp/Humi: 23.8℃/57%
Tested by: Wlif Wu
Power Source: DC 3.7V



Freq MHz	Reading dBuV	Factor dB/m	Result dBuV/m	Limit dBuV/m	Margin dB	Polarity	Remark
2483.50	12.34	37.75	50.09	54.00	3.91	vertical	Average
2483.50	16.88	37.75	54.63	74.00	19.37	vertical	Peak
2496.63	12.48	37.99	50.47	54.00	3.53	vertical	Average
2496.63	19.62	37.99	57.61	74.00	16.39	vertical	Peak

Project No.: 2407S50596E-RF
Test Mode: BT 3DH1 2402
EUT Model: NF-781D
Test distance: 3m

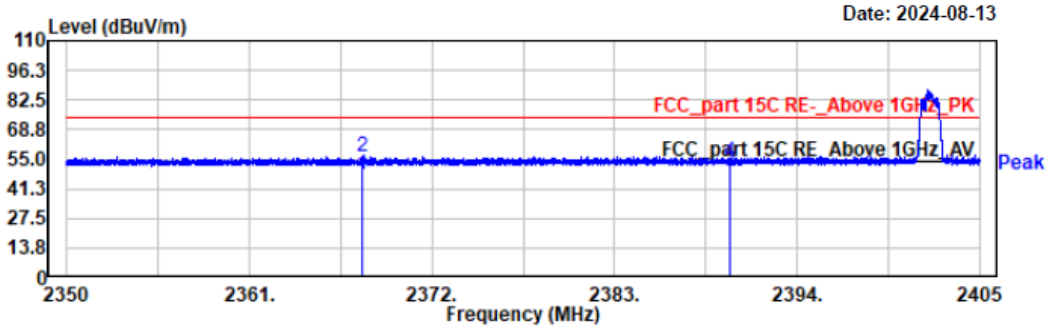
Temp/Humi: 23.8℃/57%
Tested by: Wlif Wu
Power Source: DC 3.7V



Freq MHz	Reading dBuV	Factor dB/m	Result dBuV/m	Limit dBuV/m	Margin dB	Polarity	Remark
2381.41	11.78	36.82	48.60	54.00	5.40	horizontal	Average
2381.41	19.51	36.82	56.33	74.00	17.67	horizontal	Peak
2390.00	12.38	36.93	49.31	54.00	4.69	horizontal	Average
2390.00	17.45	36.93	54.38	74.00	19.62	horizontal	Peak

Project No.: 2407S50596E-RF
Test Mode: BT 3DH1 2402
EUT Model: NF-781D
Test distance: 3m

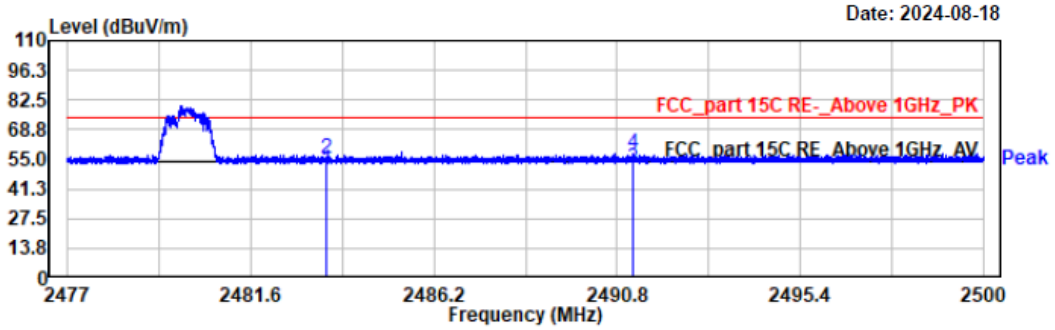
Temp/Humi: 23.8℃/57%
Tested by: Wlif Wu
Power Source: DC 3.7V



Freq MHz	Reading dBuV	Factor dB/m	Result dBuV/m	Limit dBuV/m	Margin dB	Polarity	Remark
2367.78	11.38	36.64	48.02	54.00	5.98	vertical	Average
2367.78	19.43	36.64	56.07	74.00	17.93	vertical	Peak
2390.00	12.37	36.93	49.30	54.00	4.70	vertical	Average
2390.00	17.29	36.93	54.22	74.00	19.78	vertical	Peak

Project No.: 2407S50596E-RF
Test Mode: BT 3DH1 2480
EUT Model: NF-781D
Test distance: 3m

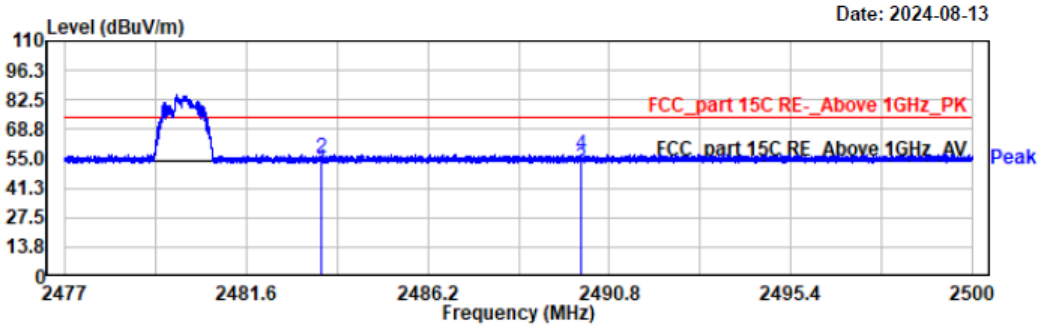
Temp/Humi: 23.8℃/57%
Tested by: Wlif Wu
Power Source: DC 3.7V



Freq MHz	Reading dBuV	Factor dB/m	Result dBuV/m	Limit dBuV/m	Margin dB	Polarity	Remark
2483.50	12.48	37.75	50.23	54.00	3.77	horizontal	Average
2483.50	17.36	37.75	55.11	74.00	18.89	horizontal	Peak
2491.21	12.89	37.89	50.78	54.00	3.22	horizontal	Average
2491.21	19.79	37.89	57.68	74.00	16.32	horizontal	Peak

Project No.: 2407S50596E-RF
Test Mode: BT 3DH1 2480
EUT Model: NF-781D
Test distance: 3m

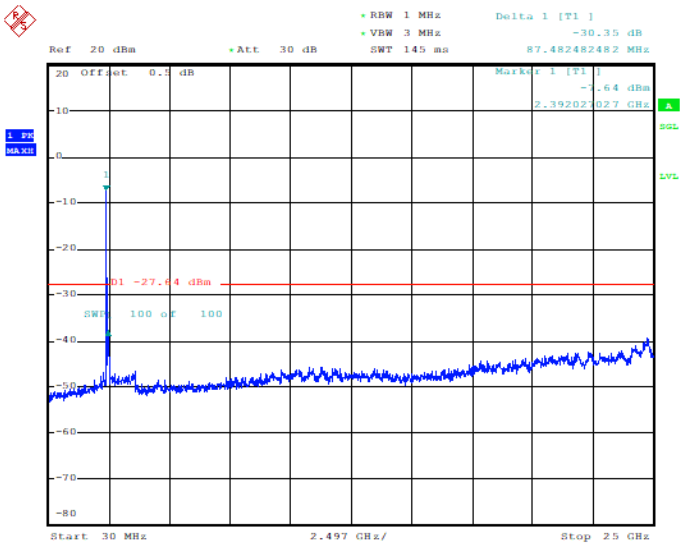
Temp/Humi: 23.8℃/57%
Tested by: Wlif Wu
Power Source: DC 3.7V



Freq MHz	Reading dBuV	Factor dB/m	Result dBuV/m	Limit dBuV/m	Margin dB	Polarity	Remark
2483.50	12.31	37.75	50.06	54.00	3.94	vertical	Average
2483.50	17.59	37.75	55.34	74.00	18.66	vertical	Peak
2490.09	12.69	37.87	50.56	54.00	3.44	vertical	Average
2490.09	19.26	37.87	57.13	74.00	16.87	vertical	Peak

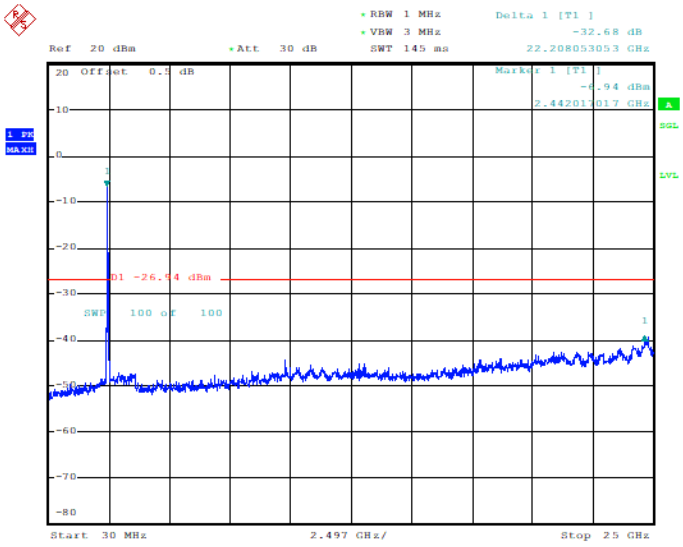
Conducted Spurious Emissions at Antenna Port

BDR (GFSK): Low Channel



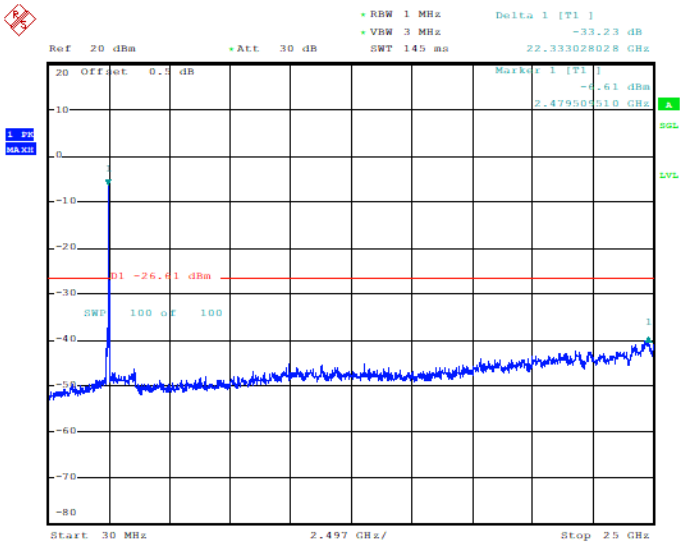
ProjectNo.:2407S50596E-RF Tester:Ash Lin
Date: 25.JUL.2024 12:55:30

BDR (GFSK): Middle Channel



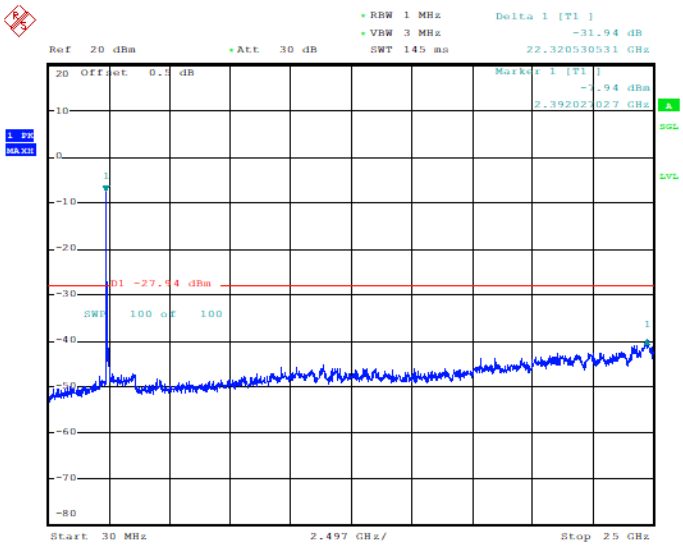
ProjectNo.:2407S50596E-RF Tester:Ash Lin
Date: 25.JUL.2024 12:57:28

BDR (GFSK): High Channel



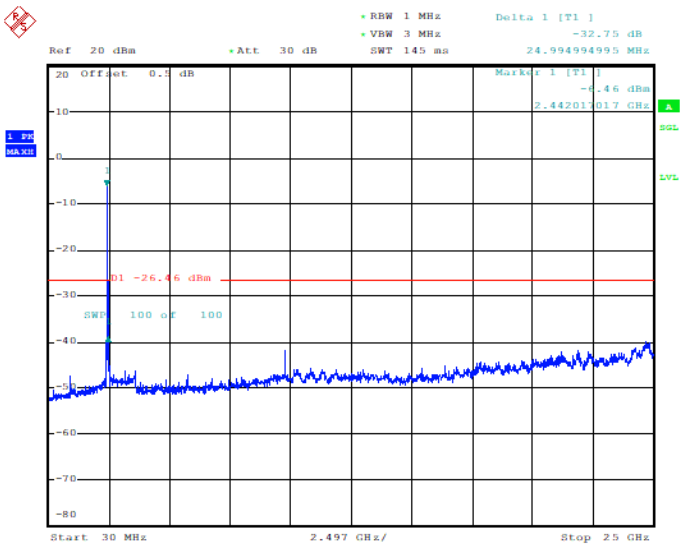
ProjectNo.:2407S50596E-RF Tester:Ash Lin
Date: 25.JUL.2024 12:58:24

EDR (π/4-DQPSK): Low Channel



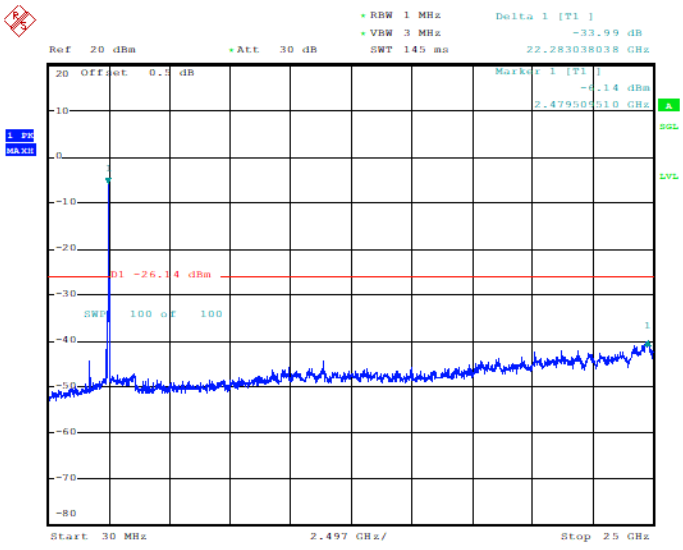
ProjectNo.:2407S50596E-RF Tester:Ash Lin
Date: 25.JUL.2024 12:59:15

EDR (π/4-DQPSK): Middle Channel



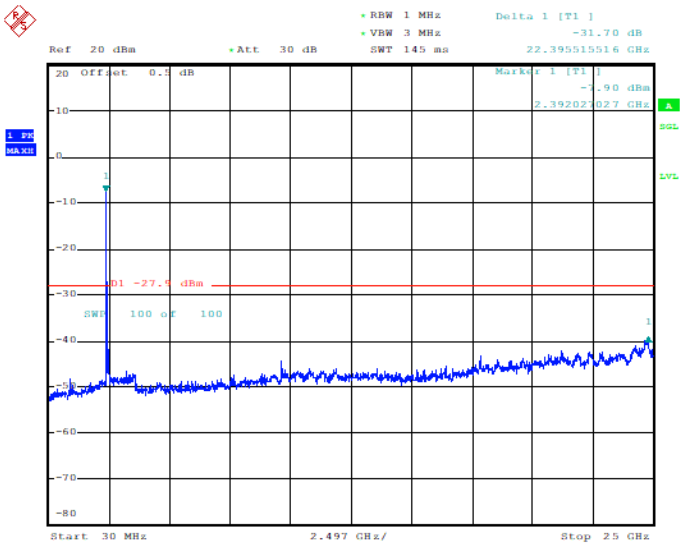
ProjectNo.:2407S50596E-RF Tester:Ash Lin
Date: 25.JUL.2024 13:01:41

EDR (π/4-DQPSK): High Channel



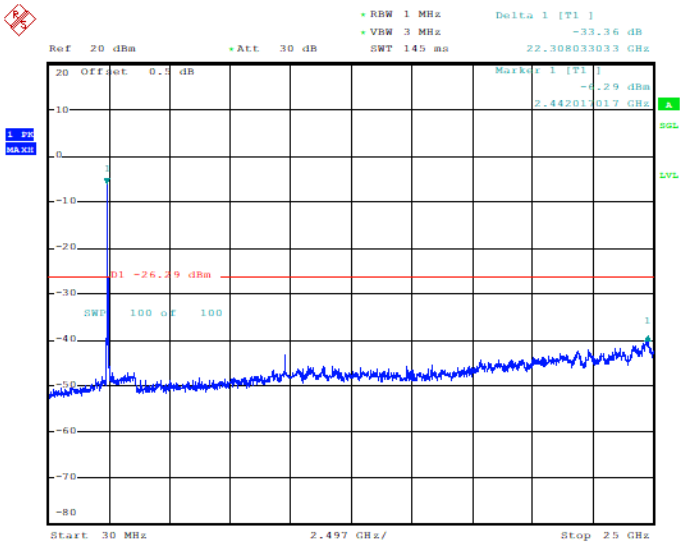
ProjectNo.:2407S50596E-RF Tester:Ash Lin
Date: 25.JUL.2024 13:02:31

EDR (8DPSK): Low Channel



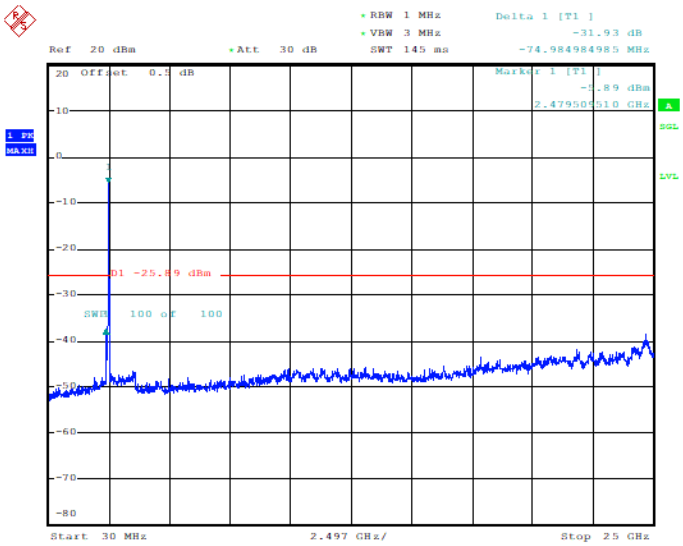
ProjectNo.:2407S50596E-RF Tester:Ash Lin
Date: 25.JUL.2024 13:03:30

EDR (8DPSK): Middle Channel



ProjectNo.:2407S50596E-RF Tester:Ash Lin
Date: 25.JUL.2024 13:04:21

EDR (8DPSK): High Channel



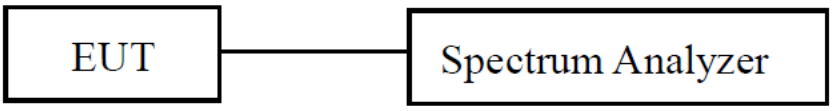
ProjectNo.:2407S50596E-RF Tester:Ash Lin
Date: 25.JUL.2024 13:05:15

FCC §15.247(a) (1)-CHANNEL SEPARATION TEST

Applicable Standard

Frequency hopping systems shall have hoping 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.

EUT Setup



Test 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: Auto.
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.

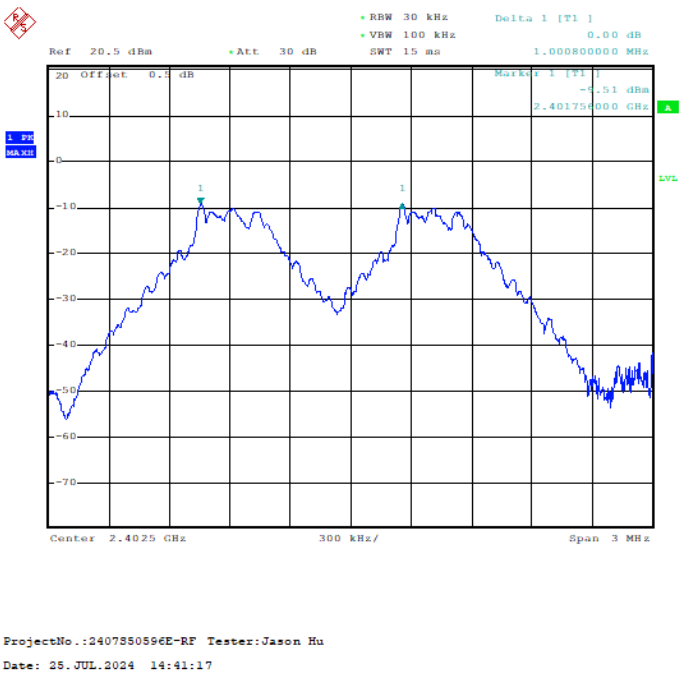
Test Data

Test Mode:	Transmitting	Test Engineer:	Jason Hu
Test Date:	2024-07-25	Environment:	Temp.: 23.9℃ Humi.: 60% Atm :99.8kPa

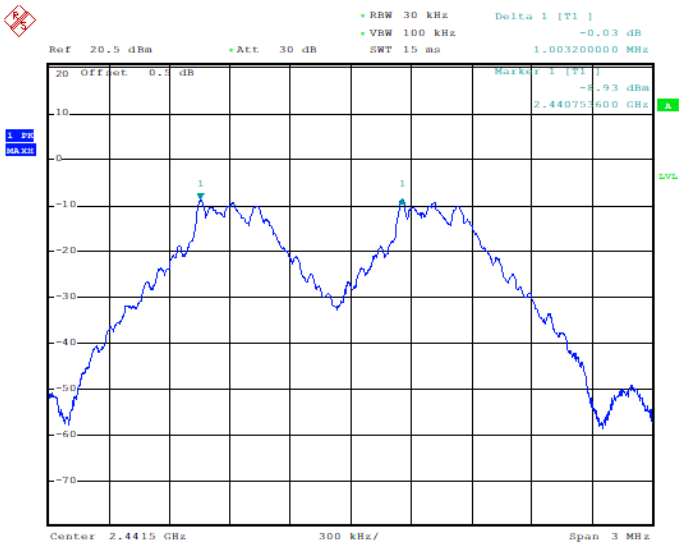
Mode	Channel	Frequency (MHz)	Channel Separation (MHz)	Limit (MHz)	Result
BDR (GFSK)	Low	2402	1.001	0.592	Pass
	Middle	2441	1.003	0.592	Pass
	High	2480	1.001	0.592	Pass
EDR (π/4-DQPSK)	Low	2402	1.003	0.837	Pass
	Middle	2441	1.001	0.837	Pass
	High	2480	1.001	0.837	Pass
EDR (8DPSK)	Low	2402	1.003	0.815	Pass
	Middle	2441	0.998	0.815	Pass
	High	2480	0.998	0.816	Pass

Note: Limit = 20 dB bandwidth*2/3

BDR (GFSK): Low Channel

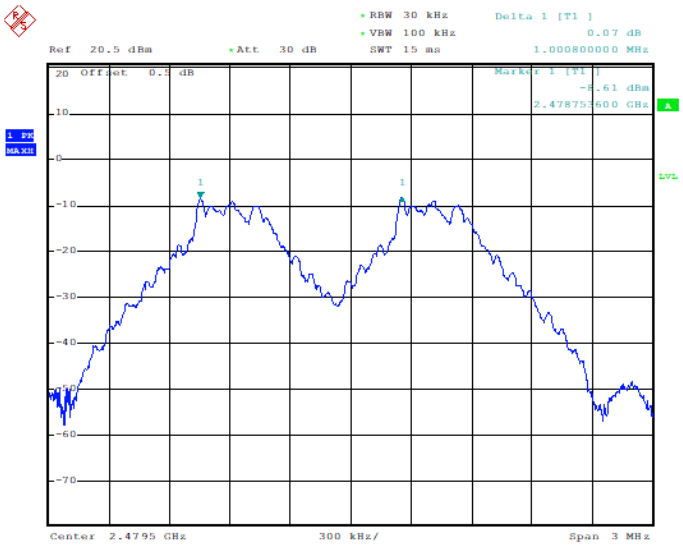


BDR (GFSK): Middle Channel



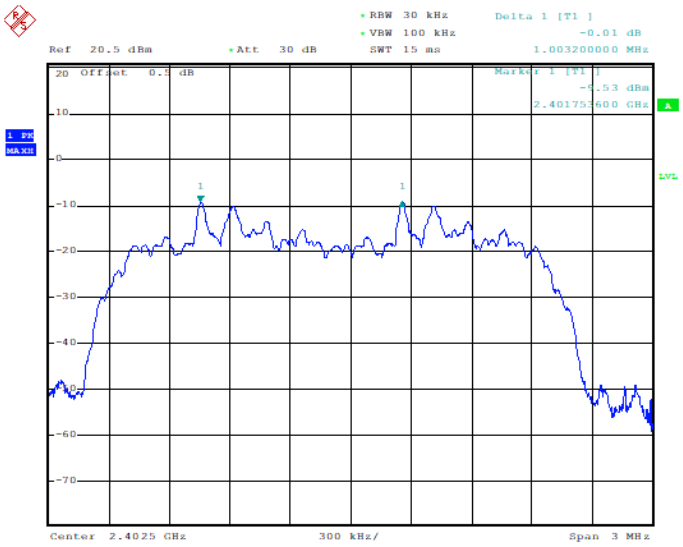
ProjectNo.:2407S50596E-RF Tester:Jason Hu
Date: 25.JUL.2024 14:43:40

BDR (GFSK): High Channel



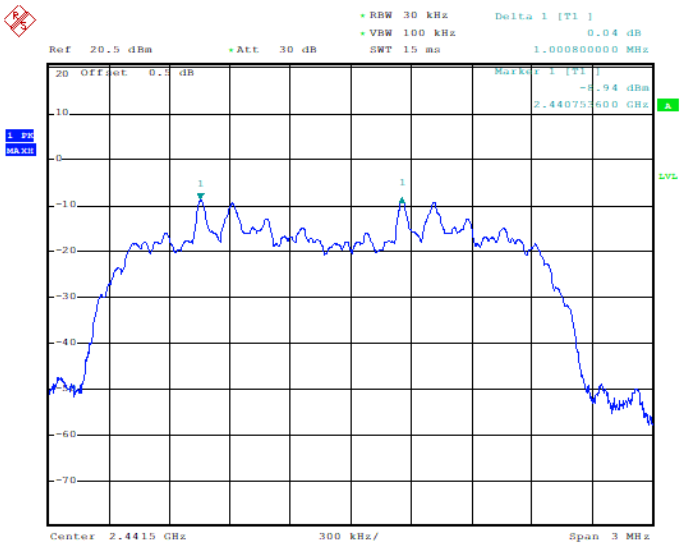
ProjectNo.:2407S50596E-RF Tester:Jason Hu
Date: 25.JUL.2024 14:48:45

EDR (π/4-DQPSK): Low Channel



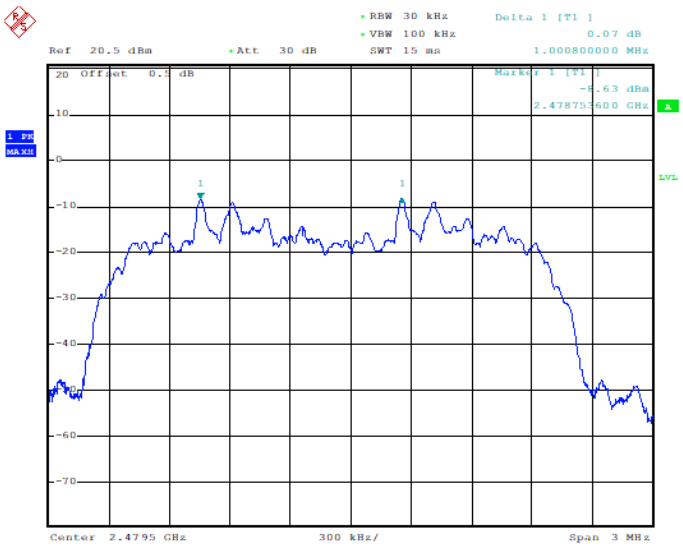
ProjectNo.:2407S50596E-RF Tester:Jason Hu
Date: 25.JUL.2024 14:50:51

EDR (π/4-DQPSK): Middle Channel



ProjectNo.:2407S50596E-RF Tester:Jason Hu
Date: 25.JUL.2024 14:53:07

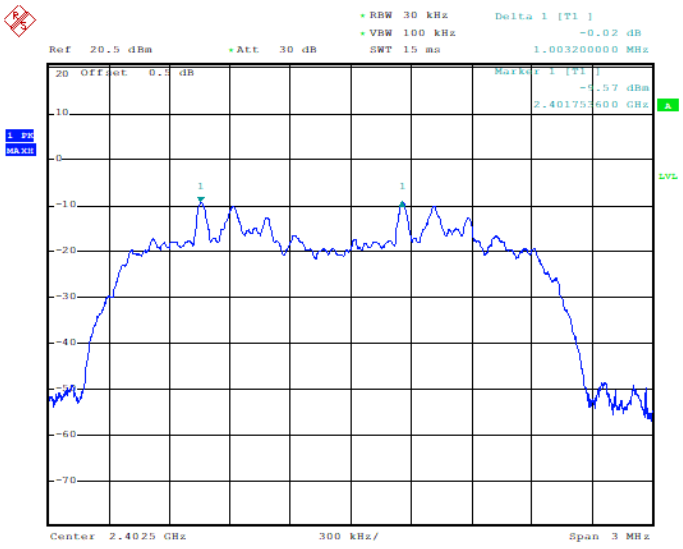
EDR (π/4-DQPSK): High Channel



ProjectNo.:2407S50596E-RF Tester:Jason Hu

Date: 25.JUL.2024 14:56:10

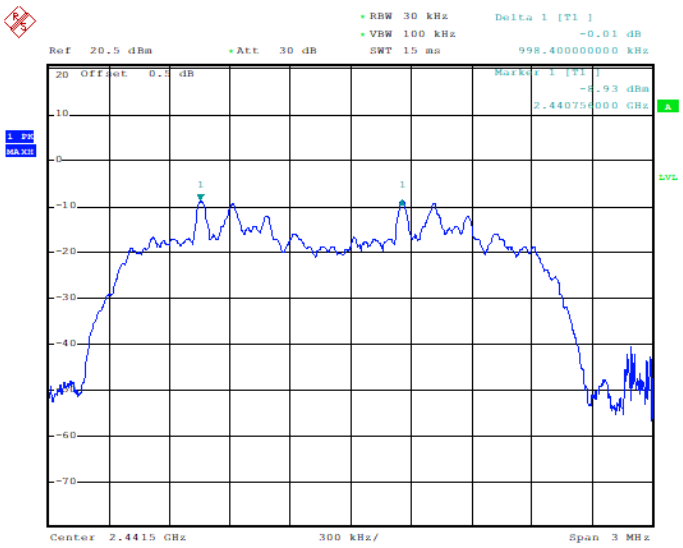
EDR (8DPSK): Low Channel



ProjectNo.:2407S50596E-RF Tester:Jason Hu

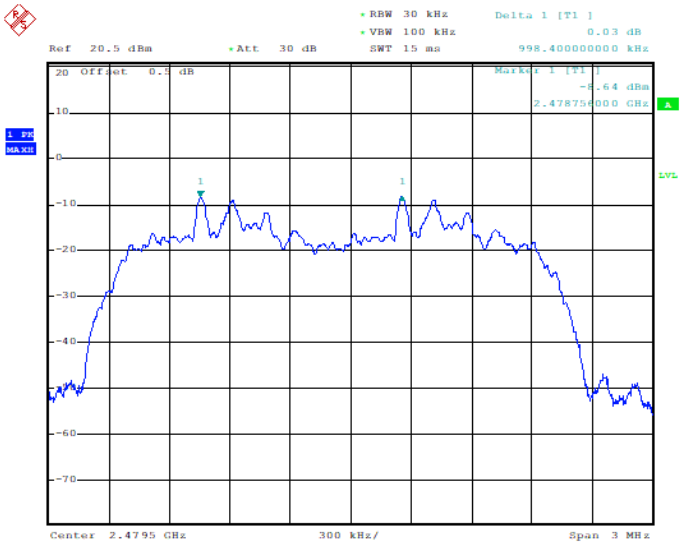
Date: 25.JUL.2024 14:57:34

EDR (8DPSK): Middle Channel



ProjectNo.:2407S50596E-RF Tester:Jason Hu
Date: 25.JUL.2024 15:00:40

EDR (8DPSK): High Channel



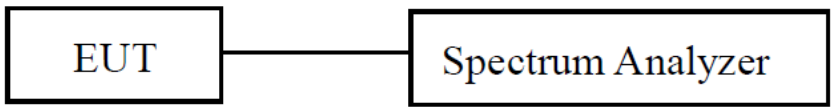
ProjectNo.:2407S50596E-RF Tester:Jason Hu
Date: 25.JUL.2024 15:05:05

FCC §15.247(a) (1) – 20 dB EMISSION BANDWIDTH

Applicable Standard

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.

EUT Setup



Test Procedure

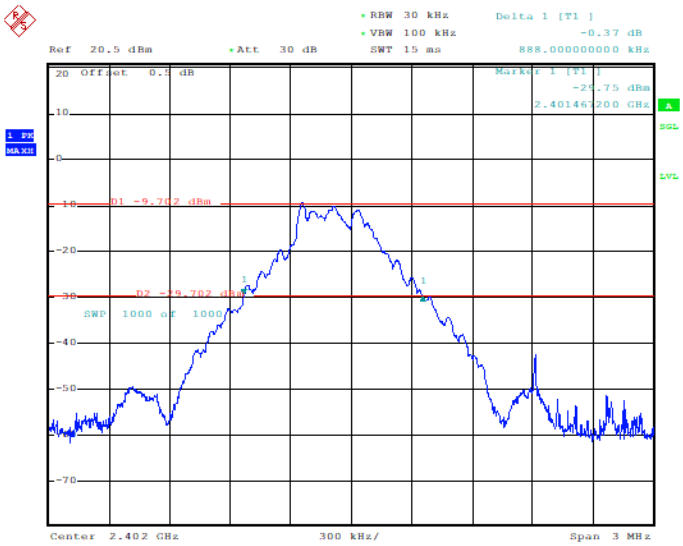
1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
3. Measure the frequency difference of two frequencies that were attenuated 20 dB from the reference level. Record the frequency difference as the emission bandwidth.
4. Repeat above procedures until all frequencies measured were complete.

Test Data

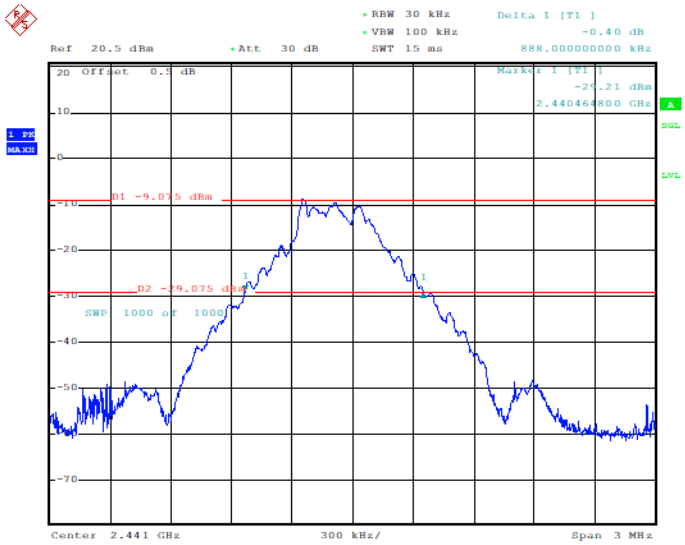
Test Mode:	Transmitting	Test Engineer:	Jason Hu
Test Date:	2024-07-25	Environment:	Temp.: 23.9℃ Humi.: 60% Atm :99.8kPa

Mode	Channel	Frequency (MHz)	20 dB Emission Bandwidth (MHz)
BDR Mode (GFSK)	Low	2402	0.888
	Middle	2441	0.888
	High	2480	0.888
EDR (π/4-DQPSK)	Low	2402	1.255
	Middle	2441	1.255
	High	2480	1.255
EDR (8DPSK)	Low	2402	1.222
	Middle	2441	1.222
	High	2480	1.224

BDR(GFSK) : Low Channel



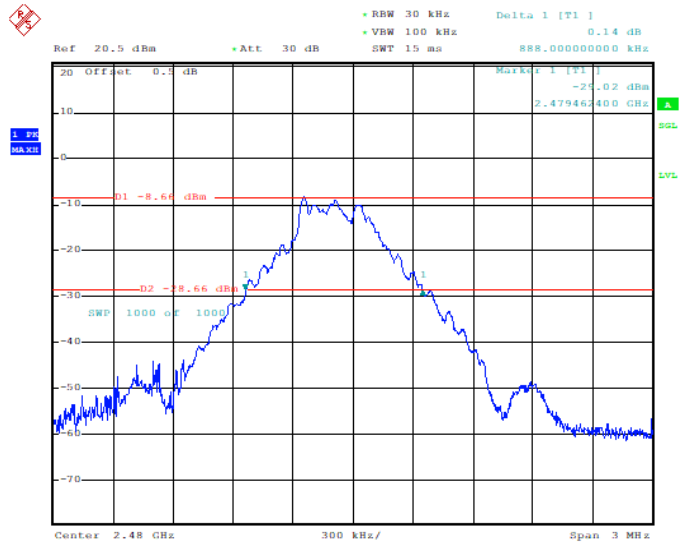
BDR(GFSK) : Middle Channel



ProjectNo.:2407S50596E-RF Tester:Jason Hu

Date: 25.JUL.2024 11:08:00

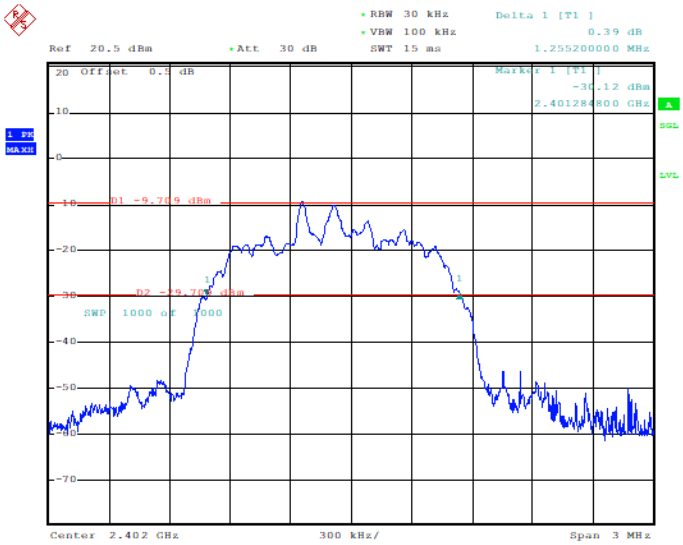
BDR(GFSK) : High Channel



ProjectNo.:2407S50596E-RF Tester:Jason Hu

Date: 25.JUL.2024 11:09:12

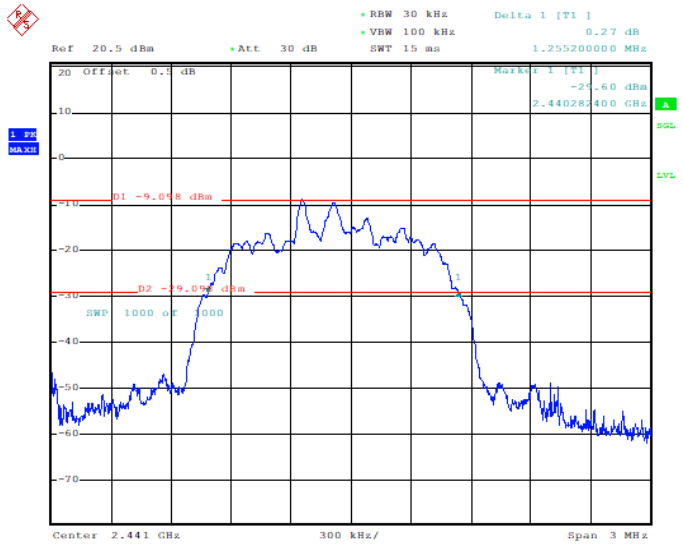
EDR (π/4-DQPSK): Low Channel



ProjectNo.:2407S50596E-RF Tester:Jason Hu

Date: 25.JUL.2024 11:10:23

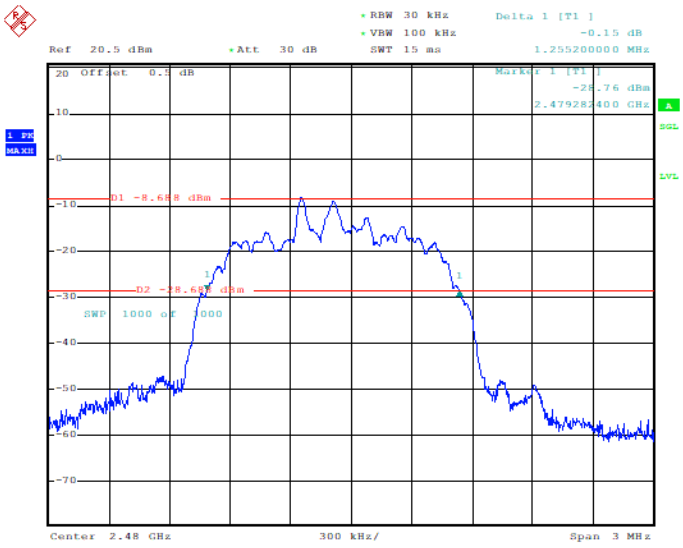
EDR(π/4-DQPSK): Middle Channel



ProjectNo.:2407S50596E-RF Tester:Jason Hu

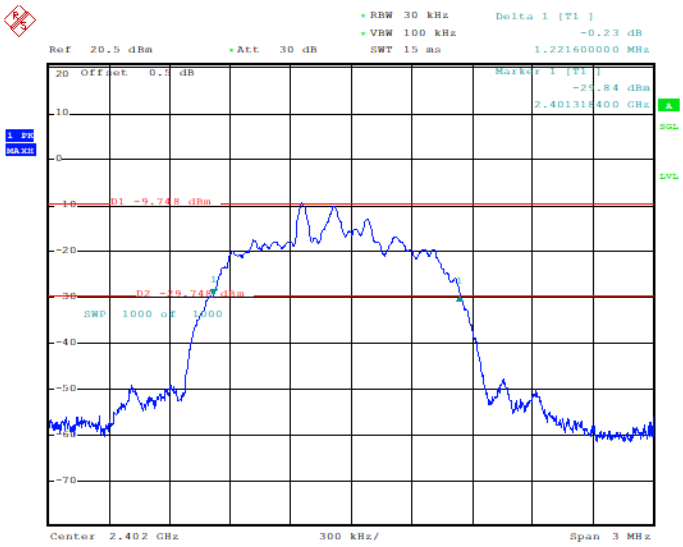
Date: 25.JUL.2024 11:12:19

EDR (π/4-DQPSK): High Channel



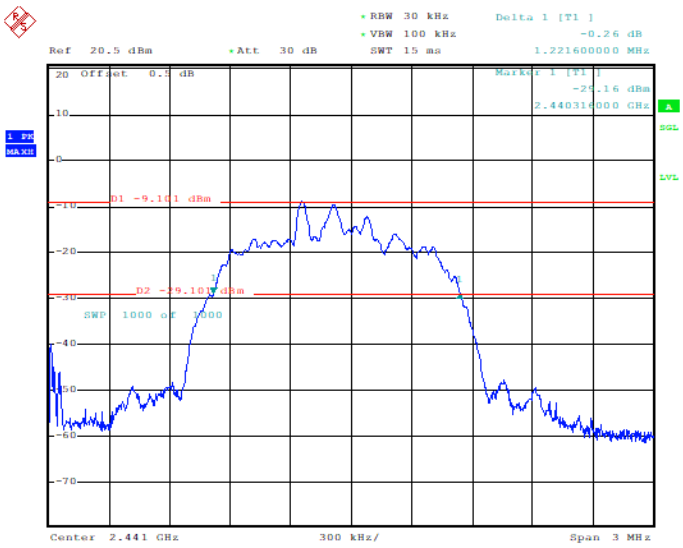
ProjectNo.:2407S50596E-RF Tester:Jason Hu
Date: 25.JUL.2024 11:13:33

EDR (8DPSK): Low Channel



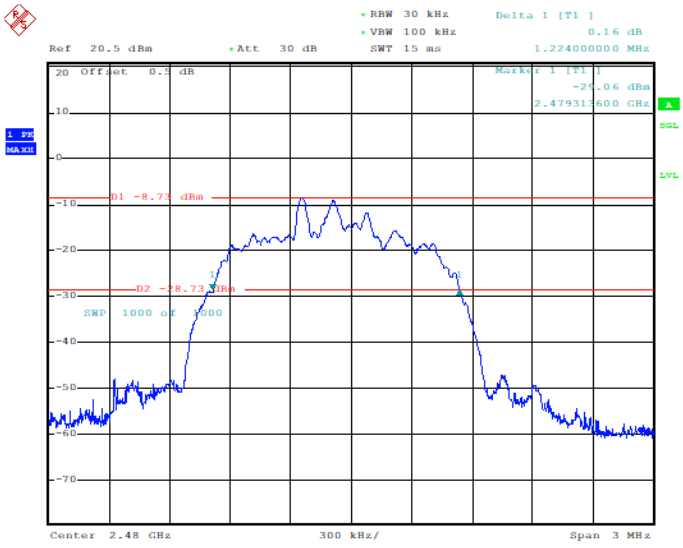
ProjectNo.:2407S50596E-RF Tester:Jason Hu
Date: 25.JUL.2024 11:14:40

EDR (8DPSK): Middle Channel



ProjectNo.:2407S50596E-RF Tester:Jason Hu
Date: 25.JUL.2024 11:15:46

EDR (8DPSK): High Channel



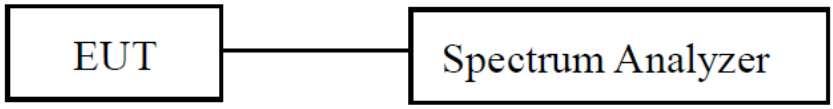
ProjectNo.:2407S50596E-RF Tester:Jason Hu
Date: 25.JUL.2024 11:16:58

FCC §15.247(a) (1) (iii)-QUANTITY OF HOPPING CHANNEL TEST

Applicable Standard

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.

EUT Setup



Test 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 may 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: Auto.
e. Detector function: Peak.
f. Trace: Max hold.
g. Allow the trace to stabilize.

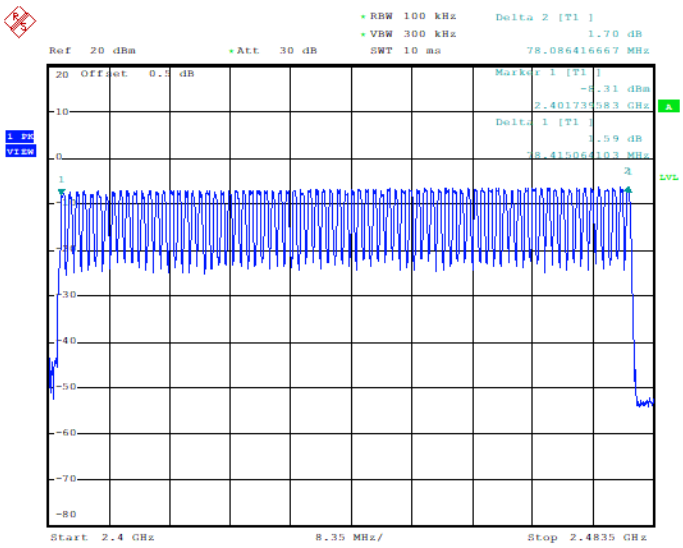
It might prove necessary to break the span up into subranges to show clearly all of the hopping frequencies.

Test Data

Test Mode:	Transmitting	Test Engineer:	Jason Hu
Test Date:	2024-07-25	Environment:	Temp.: 23.9℃ Humi.: 60% Atm :99.8kPa

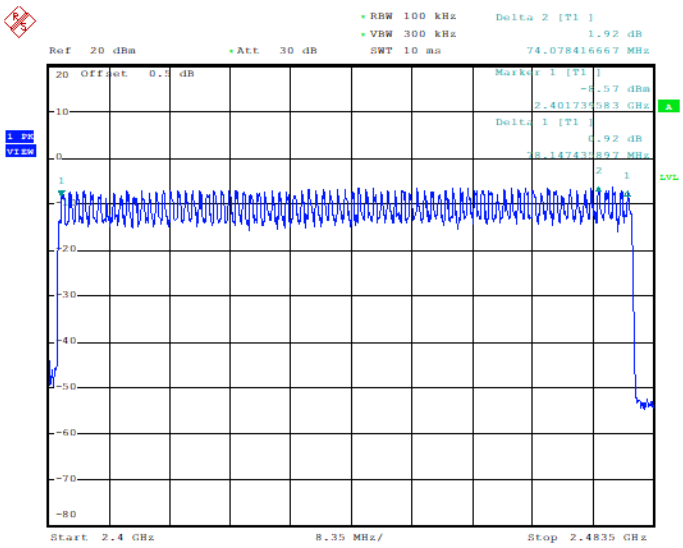
Mode	Frequency Range (MHz)	Number of Hopping Channel (CH)	Limit (CH)
BDR (GFSK)	2400-2483.5	79	≥15
EDR (π/4-DQPSK)	2400-2483.5	79	≥15
EDR (8DPSK)	2400-2483.5	79	≥15

BDR (GFSK): Number of Hopping Channels



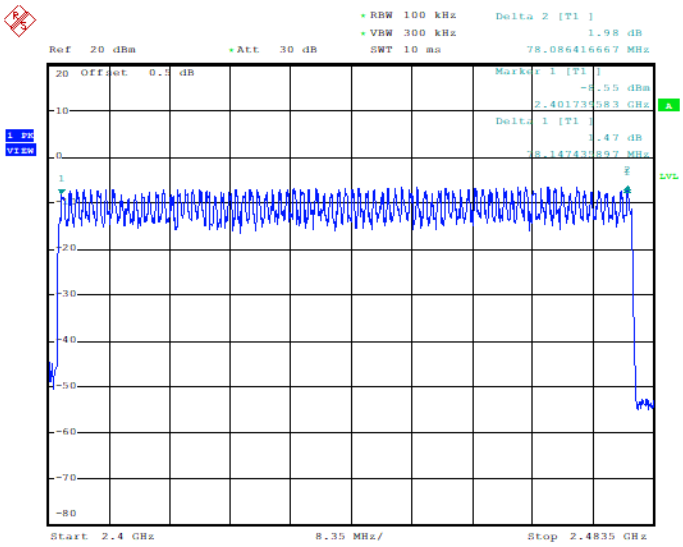
ProjectNo.:2407S50596E-RF Tester:Jason Hu
Date: 25.JUL.2024 15:21:43

EDR (π/4-DQPSK): Number of Hopping Channels



ProjectNo.:2407S50596E-RF Tester:Jason Hu
Date: 25.JUL.2024 15:27:17

EDR (8DPSK): Number of Hopping Channels



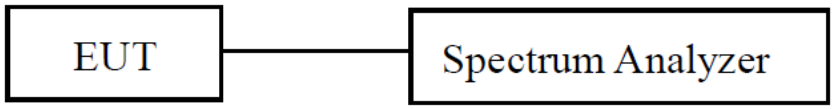
ProjectNo.:2407S50596E-RF Tester:Jason Hu
Date: 25.JUL.2024 15:32:53

FCC §15.247(a) (1) (iii) - TIME OF OCCUPANCY (DWELL TIME)

Applicable Standard

Frequency hopping systems in the 2400-2483.5 MHz 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.

EUT Setup



Test Procedure

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

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

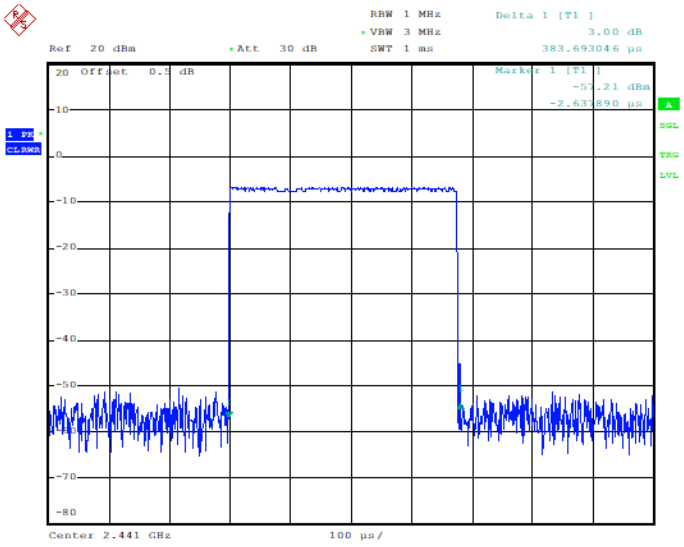
Test Data

Test Mode:	Transmitting	**Test Engineer:**	Jason Hu
Test Date:	2024-07-25	**Environment:**	Temp.: 23.9℃ Humi.: 60% Atm :99.8kPa

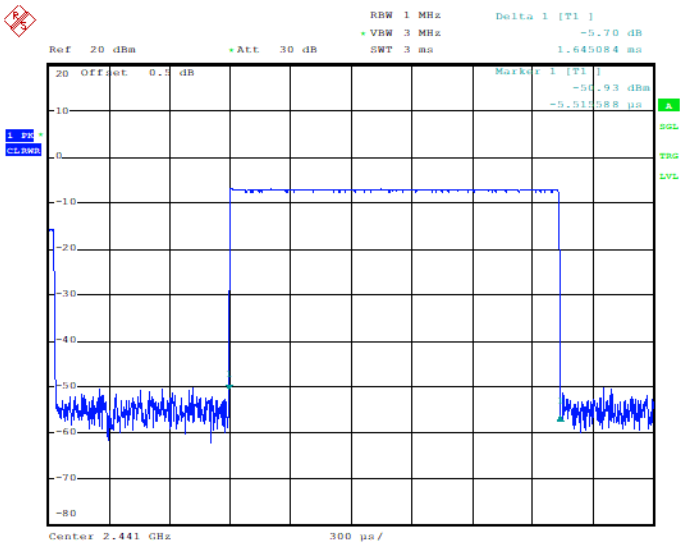
Test Modes	Packet Type	Test Frequency (MHz)	Pulse width (ms)	Dwell times (s)	Limit (s)
BDR Mode (GFSK)	DH1	2441	0.384	0.123	0.400
	DH3	2441	1.645	0.263	0.400
	DH5	2441	2.902	0.310	0.400
EDR Mode (π/4-DQPSK)	2DH1	2441	0.394	0.126	0.400
	2DH3	2441	1.647	0.264	0.400
	2DH5	2441	2.910	0.310	0.400
EDR Mode (8DPSK)	3DH1	2441	0.396	0.127	0.400
	3DH3	2441	1.652	0.264	0.400
	3DH5	2441	2.910	0.310	0.400

DH1/2DH1/3DH1:Dwell time=Pulse time (ms) × (1600/2/79) ×31.6 s
DH3/2DH3/3DH3:Dwell time=Pulse time (ms) × (1600/4/79) ×31.6 s
DH5/2DH5/3DH5:Dwell time=Pulse time (ms) × (1600/6/79) ×31.6 s

BDR (GFSK)_Hopping_DH1

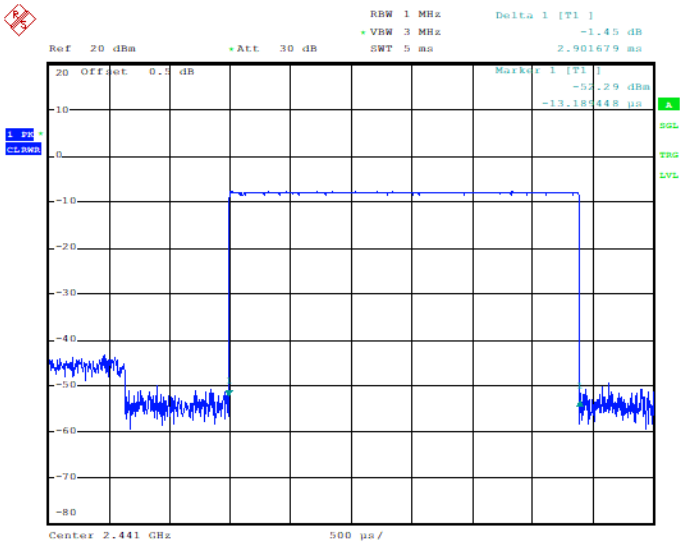


BDR (GFSK)_Hopping_DH3



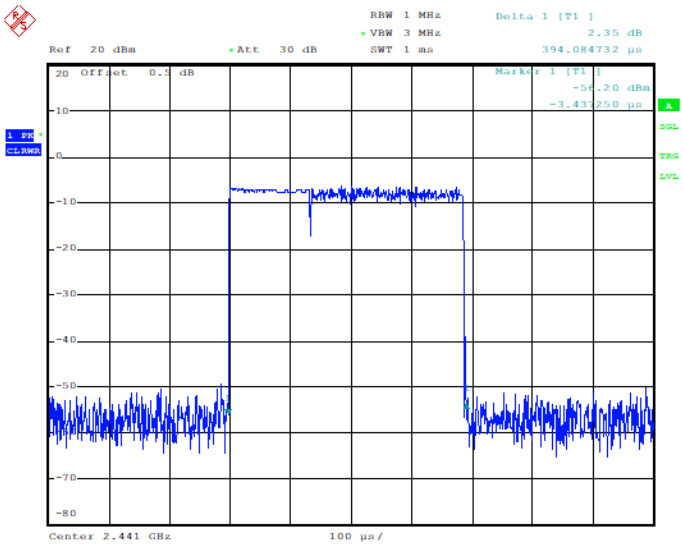
ProjectNo.:2407S50596E-RF Tester:Jason Hu
Date: 25.JUL.2024 13:10:21

BDR (GFSK)_Hopping_DH5



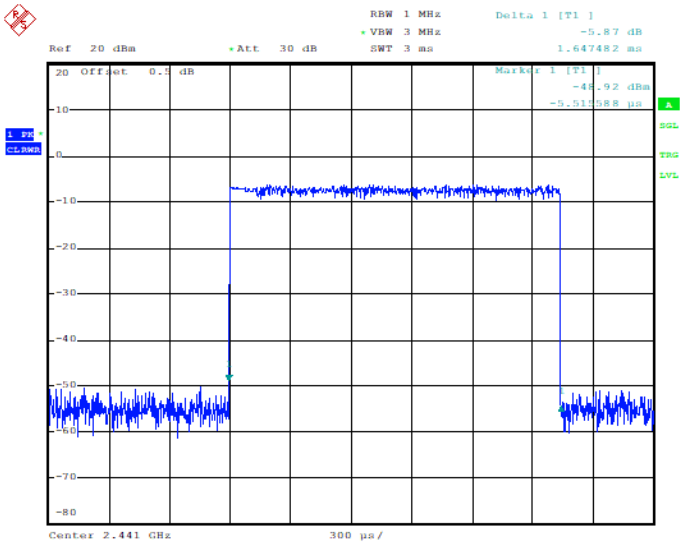
ProjectNo.:2407S50596E-RF Tester:Jason Hu
Date: 25.JUL.2024 13:10:51

EDR (π/4-DQPSK)_Hopping_2DH1



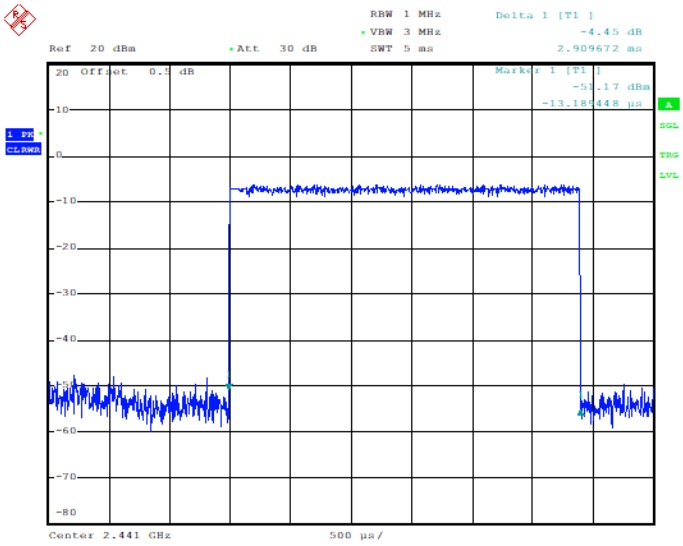
ProjectNo.:2407S50596E-RF Tester:Jason Hu
Date: 25.JUL.2024 13:11:27

EDR (π/4-DQPSK)_Hopping_2DH3



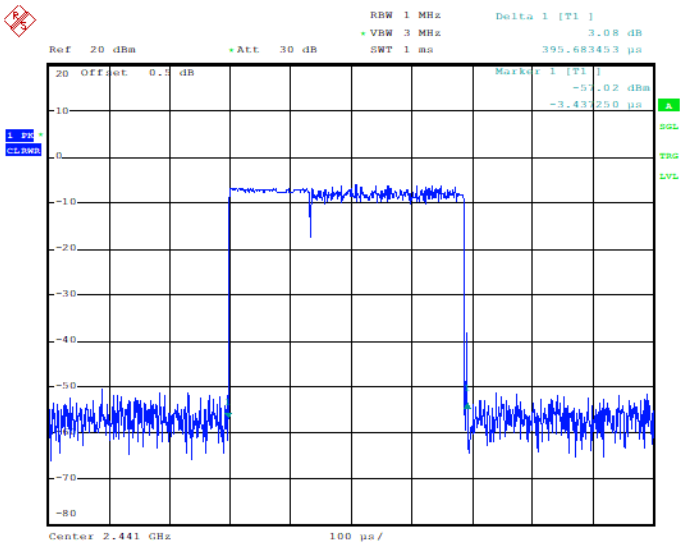
ProjectNo.:2407S50596E-RF Tester:Jason Hu
Date: 25.JUL.2024 13:11:58

EDR (π/4-DQPSK)_Hopping_2DH5



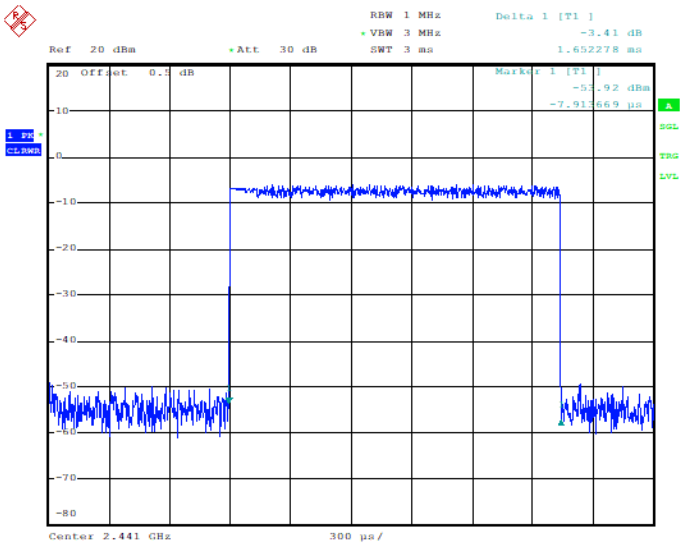
ProjectNo.:2407S50596E-RF Tester:Jason Hu
Date: 25.JUL.2024 13:12:26

EDR (8DPSK) _Hopping_3DH1



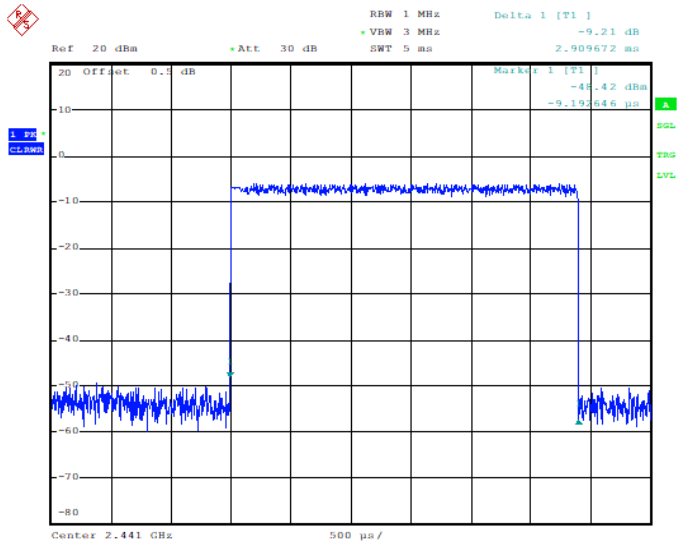
ProjectNo.:2407S50596E-RF Tester:Jason Hu
Date: 25.JUL.2024 13:12:54

EDR (8DPSK) _Hopping_3DH3



ProjectNo.:2407S50596E-RF Tester:Jason Hu
Date: 25.JUL.2024 13:34:02

EDR (8DPSK) _Hopping_3DH5



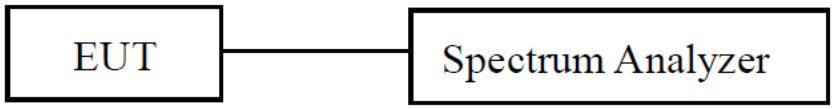
ProjectNo.:2407S50596E-RF Tester:Jason Hu
Date: 25.JUL.2024 13:34:34

FCC §15.247(b) (1) - PEAK OUTPUT POWER MEASUREMENT

Applicable Standard

According to §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. And for all other frequency hopping systems in the 2400–2483.5 MHz band: 0.125 watts.

EUT Setup



Test Procedure

a. Use the following spectrum analyzer settings:
   1) Span: Approximately five times the 20 dB bandwidth, centered on a hopping channel.
   2) RBW > 20 dB bandwidth of the emission being measured.
   3) VBW ≥ RBW.
   4) Sweep: Auto.
   5) Detector function: Peak.
   6) Trace: Max hold.

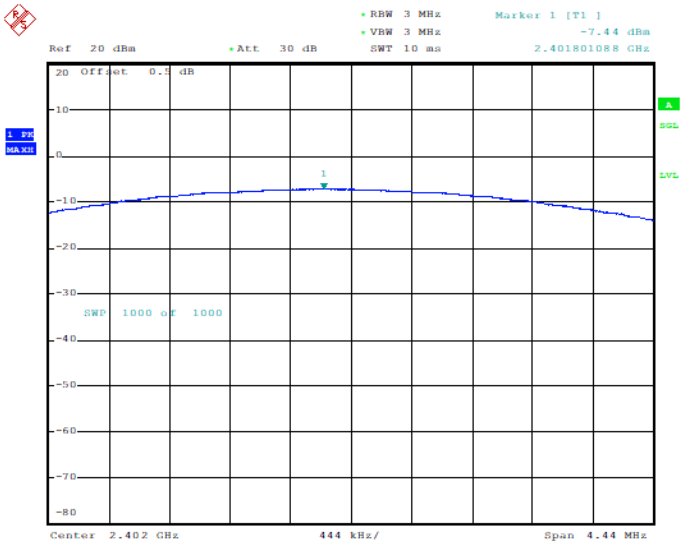
b. Allow trace to stabilize.
c. Use the marker-to-peak function to set the marker to the peak of the emission.
d. The indicated level is the peak output power, after any corrections for external attenuators and cables.
e. A plot of the test results and setup description shall be included in the test report.

Test Data

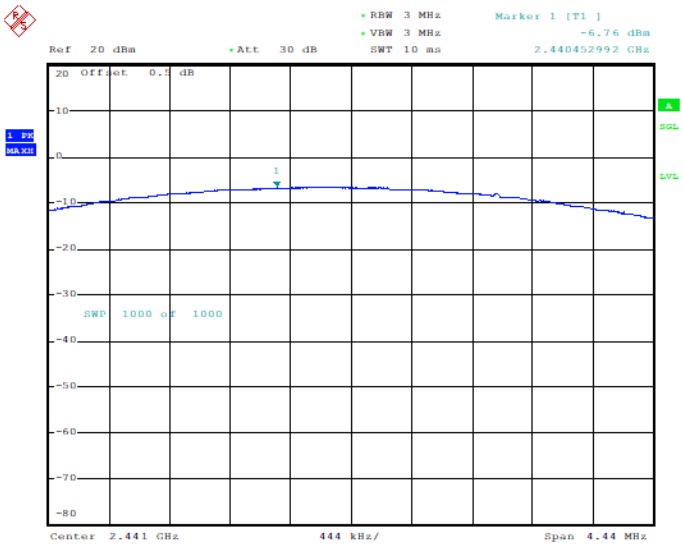
Test Mode:	Transmitting	Test Engineer:	Jason Hu
Test Date:	2024-07-25	Environment:	Temp.: 23.9℃ Humi.: 60% Atm :99.8kPa

Mode	Frequency (MHz)	Peak Conducted Output Power (dBm)	Limit (dBm)
BDR (GFSK)	2402	-7.44	21
	2441	-6.76	21
	2480	-6.39	21
EDR (π/4-DQPSK)	2402	-6.65	21
	2441	-5.99	21
	2480	-5.67	21
EDR (8DPSK)	2402	-6.09	21
	2441	-5.43	21
	2480	-5.04	21

BDR(GFSK): 2402MHz

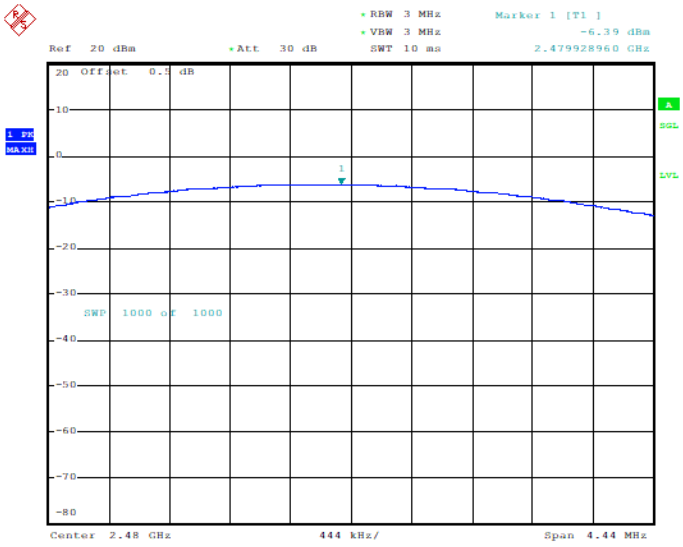


BDR(GFSK): 2441MHz



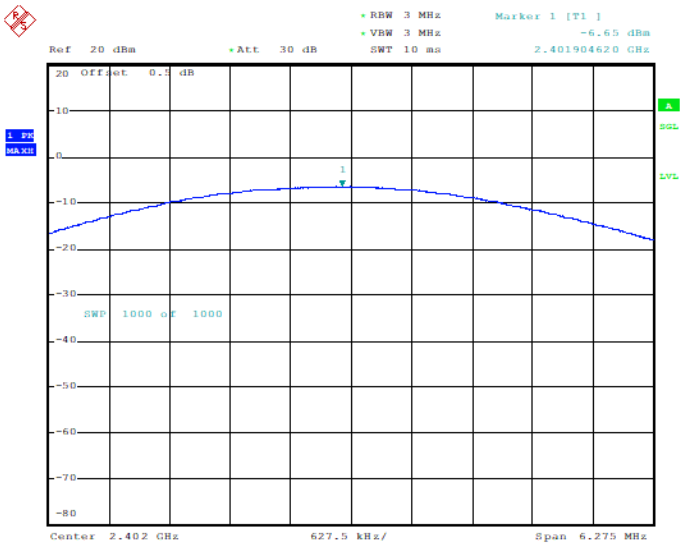
ProjectNo.:2407S50596E-RF Tester:Jason Hu
Date: 25.JUL.2024 11:30:14

BDR(GFSK): 2480MHz



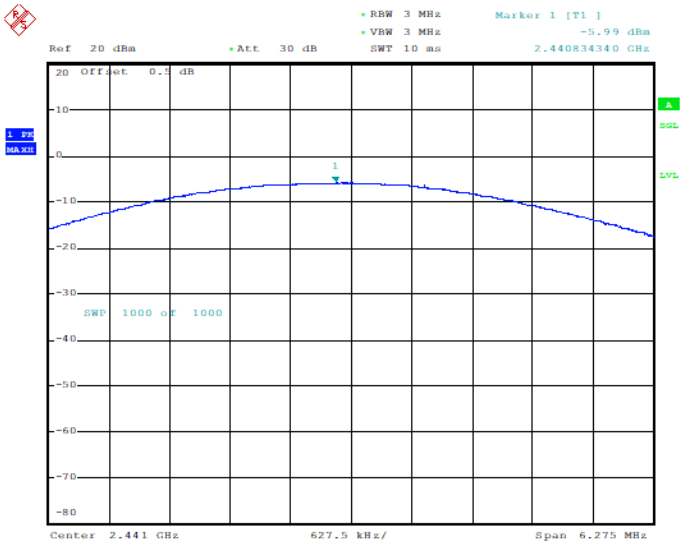
ProjectNo.:2407S50596E-RF Tester:Jason Hu
Date: 25.JUL.2024 11:31:16

EDR(π/4-DQPSK): 2402MHz



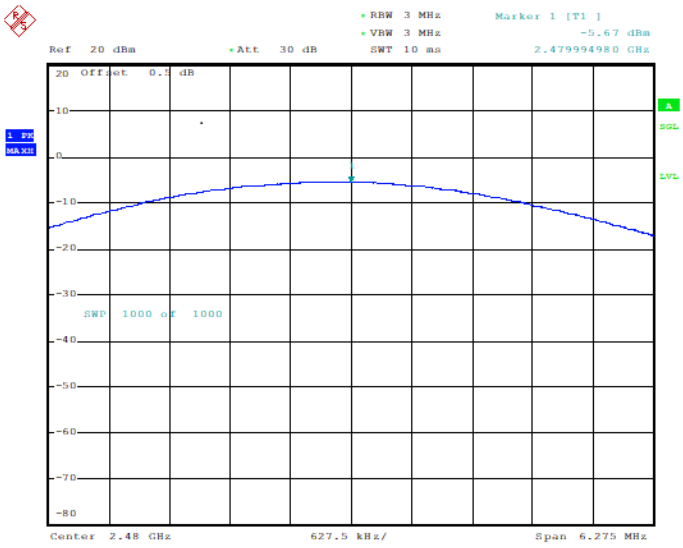
ProjectNo.:2407S50596E-RF Tester:Jason Hu
Date: 25.JUL.2024 11:32:20

EDR(π/4-DQPSK): 2441MHz



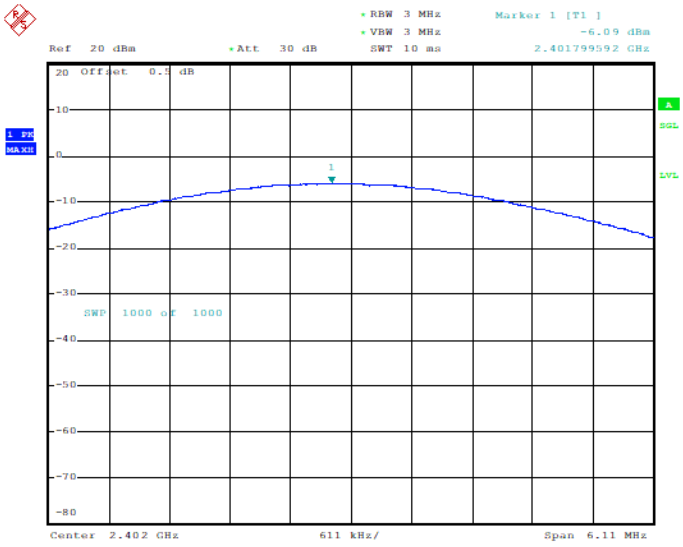
ProjectNo.:2407S50596E-RF Tester:Jason Hu
Date: 25.JUL.2024 11:33:28

EDR(π/4-DQPSK): 2480MHz



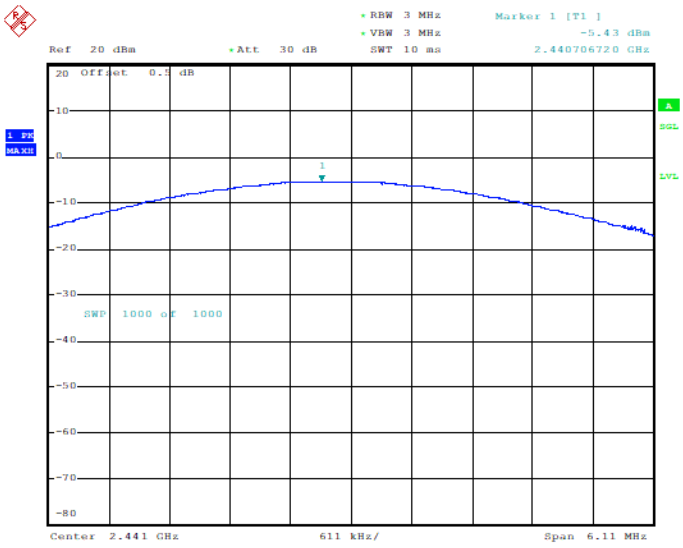
ProjectNo.:2407S50596E-RF Tester:Jason Hu
Date: 25.JUL.2024 11:34:27

EDR(8DPSK): 2402MHz



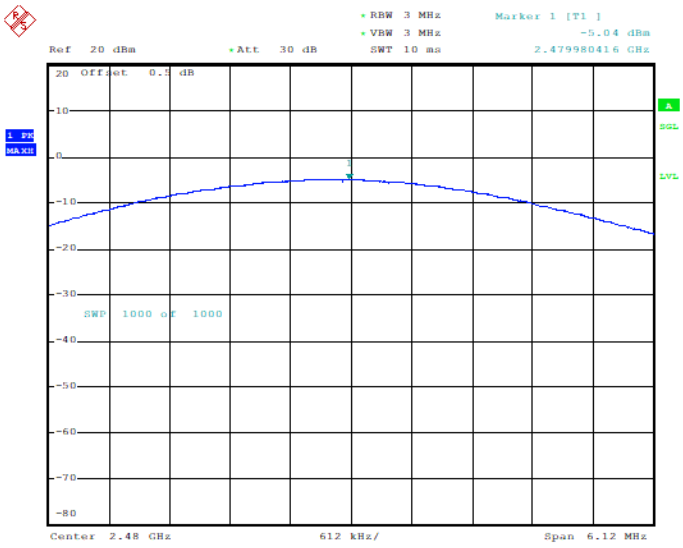
ProjectNo.:2407S50596E-RF Tester:Jason Hu
Date: 25.JUL.2024 11:35:28

EDR(8DPSK): 2441MHz



ProjectNo.:2407S50596E-RF Tester:Jason Hu
Date: 25.JUL.2024 11:37:49

EDR(8DPSK): 2480MHz



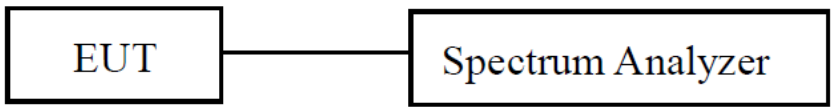
ProjectNo.:2407S50596E-RF Tester:Jason Hu
Date: 25.JUL.2024 11:39:21

FCC §15.247(d) - BAND EDGES TESTING

Applicable Standard

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. 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)).

EUT Setup



Test Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Remove the antenna from the EUT and then connect to a low loss RF cable from the antenna port to a EMI test receiver, then turn on the EUT and make it operate in transmitting mode. Then set it to Low Channel and High Channel within its operating range, and make sure the instrument is operated in its linear range.
3. Set RBW of spectrum analyzer to 100 kHz with a convenient frequency span including 100 kHz bandwidth from band edge.
4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
5. Repeat above procedures until all measured frequencies were complete.

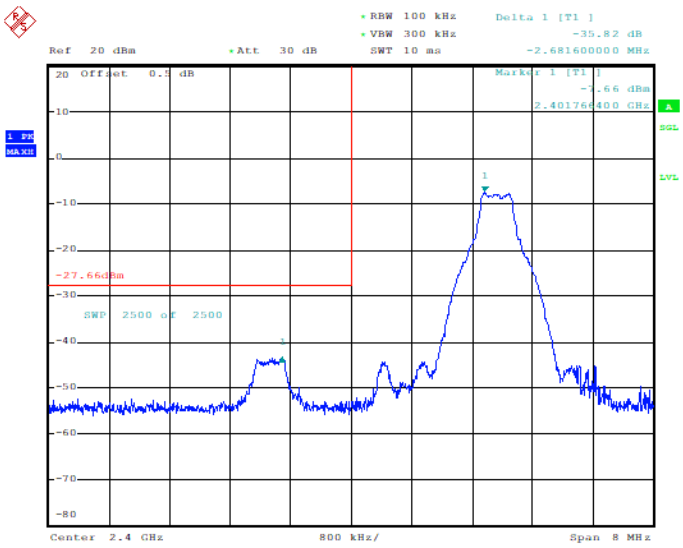
Test Data

Test Mode:	Transmitting	Test Engineer:	Jason Hu
Test Date:	2024-07-25	Environment:	Temp.: 23.9℃ Humi.: 60% Atm :99.8kPa

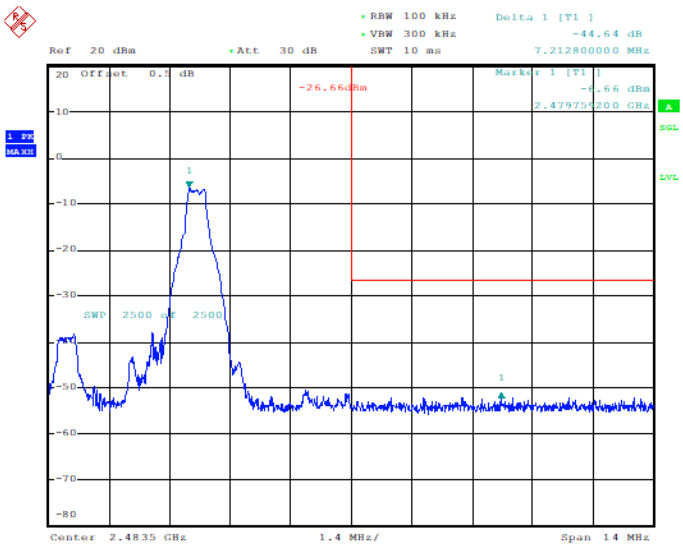
Please refer to the below plots:

Band Edge

BDR (GFSK): Left Side



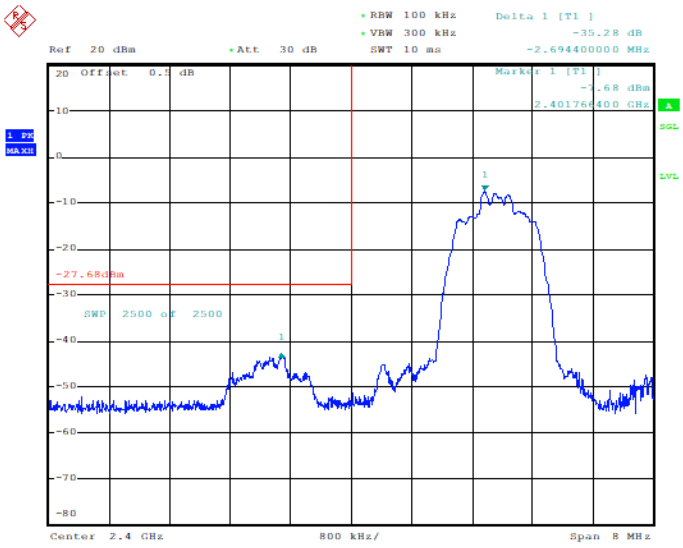
BDR (GFSK): Right Side



ProjectNo.:2407S50596E-RF Tester:Jason Hu

Date: 25.JUL.2024 12:23:27

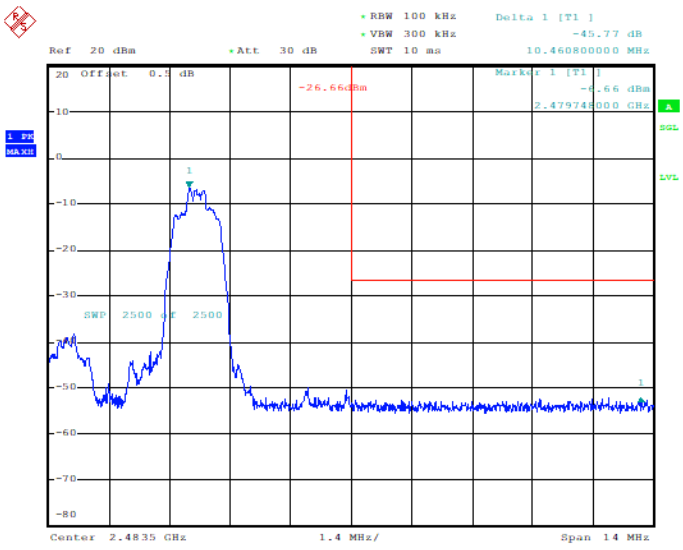
EDR (π /4-DQPSK_): Left Side



ProjectNo.:2407S50596E-RF Tester:Jason Hu

Date: 25.JUL.2024 12:28:35

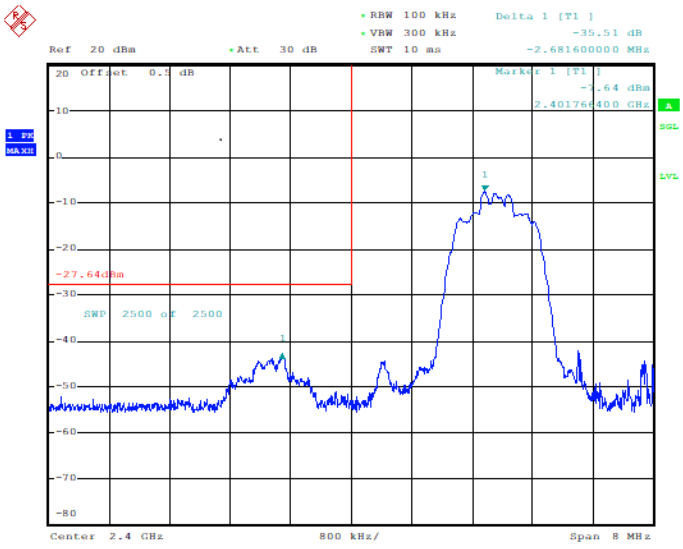
EDR (π/4-DQPSK): Right Side



ProjectNo.:2407S50596E-RF Tester:Jason Hu

Date: 25.JUL.2024 12:39:39

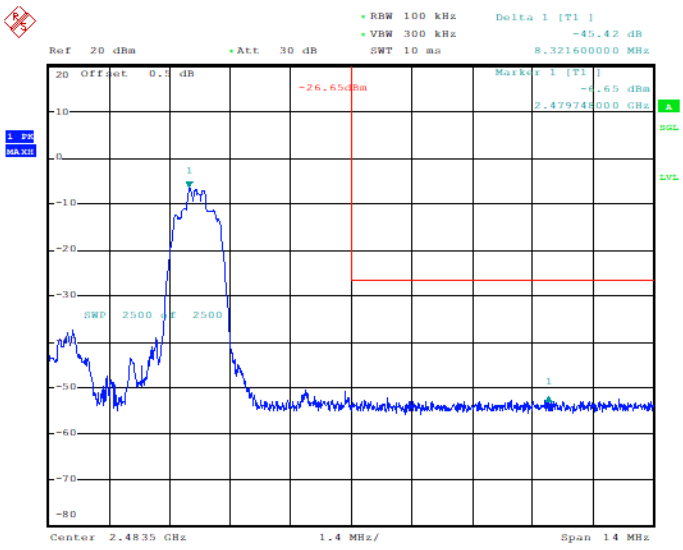
EDR (8DPSK): Left Side



ProjectNo.:2407S50596E-RF Tester:Jason Hu

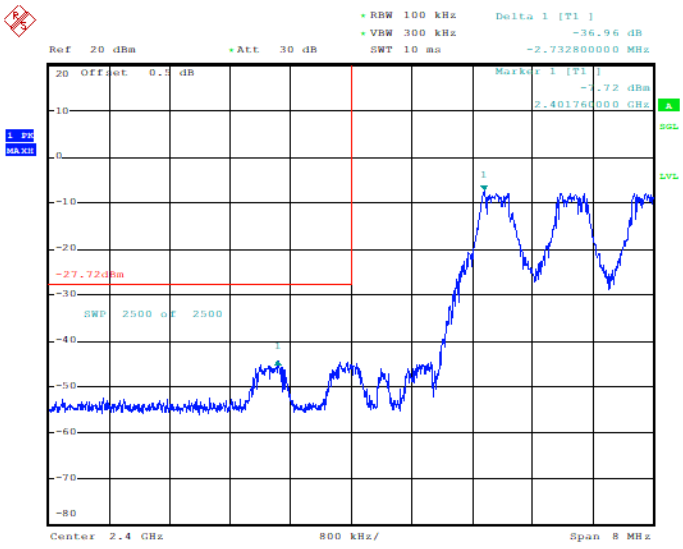
Date: 25.JUL.2024 12:41:54

EDR (8DPSK): Right Side



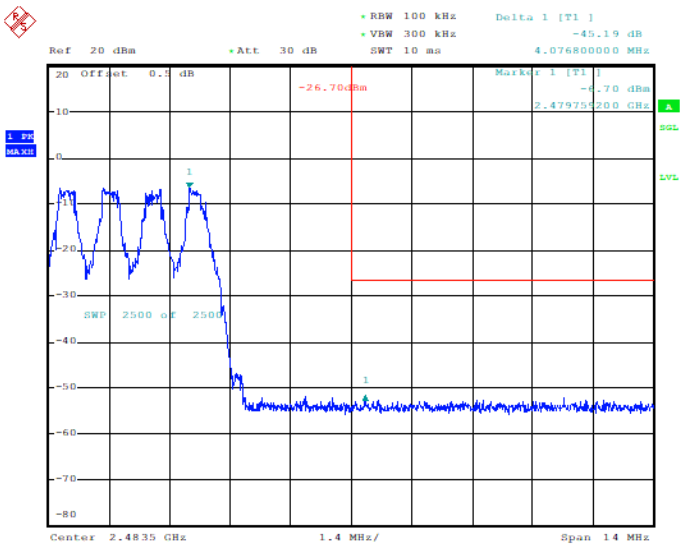
ProjectNo.:2407S50596E-RF Tester:Jason Hu
Date: 25.JUL.2024 12:53:16

BDR (GFSK): Left Side - Hopping



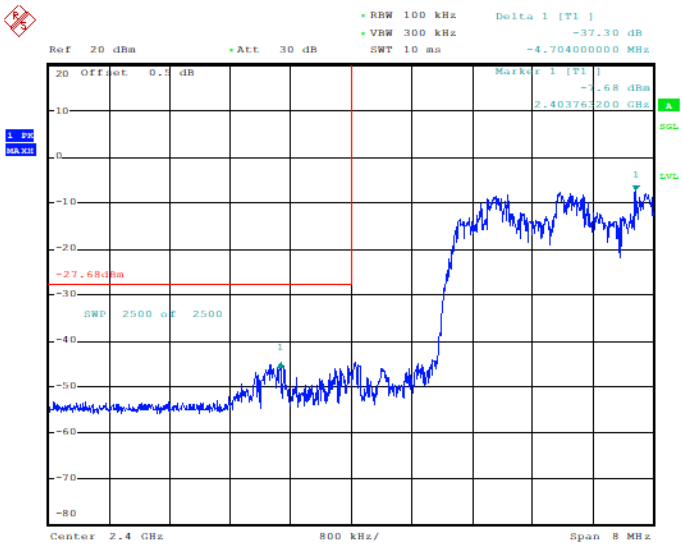
ProjectNo.:2407S50596E-RF Tester:Jason Hu
Date: 25.JUL.2024 12:12:14

BDR (GFSK): Right Side - Hopping



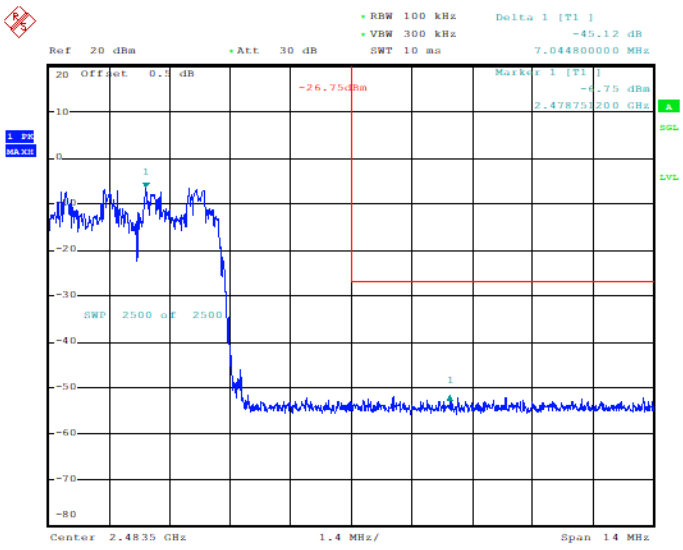
ProjectNo.:2407S50596E-RF Tester:Jason Hu
Date: 25.JUL.2024 12:15:28

EDR (π/4-DQPSK): Left Side - Hopping



ProjectNo.:2407S50596E-RF Tester:Jason Hu
Date: 25.JUL.2024 12:31:34

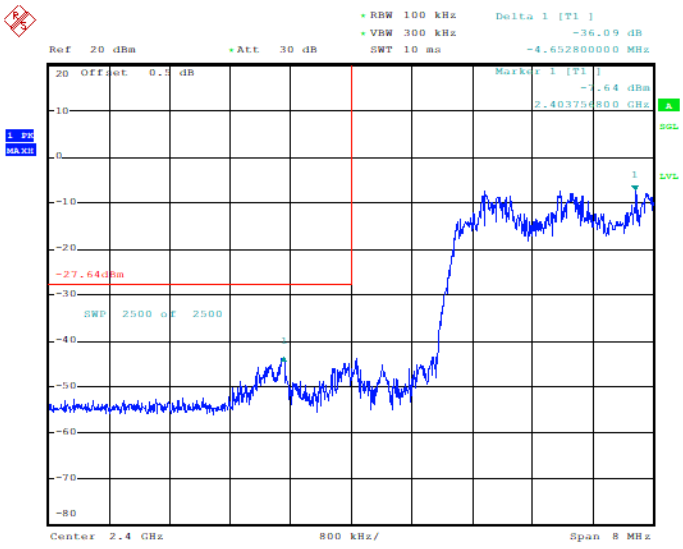
EDR (π/4-DQPSK): Right Side - Hopping



ProjectNo.:2407S50596E-RF Tester:Jason Hu

Date: 25.JUL.2024 12:34:54

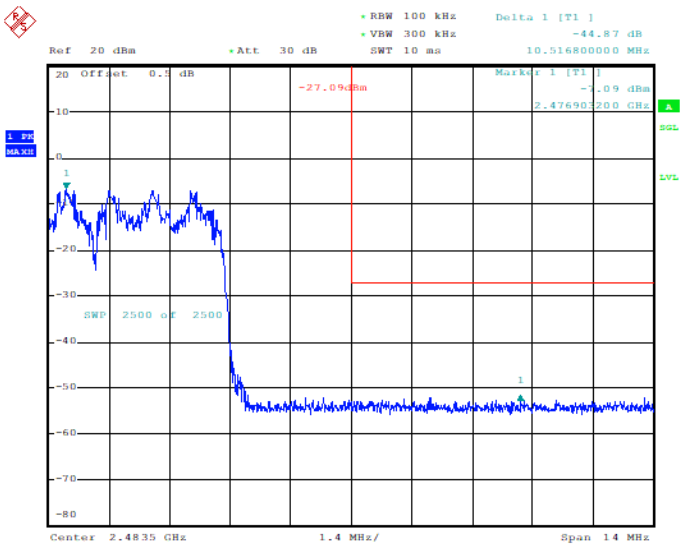
EDR (8DPSK): Left Side - Hopping



ProjectNo.:2407S50596E-RF Tester:Jason Hu

Date: 25.JUL.2024 12:47:17

EDR (8DPSK): Right Side - Hopping



ProjectNo.:2407S50596E-RF Tester:Jason Hu
Date: 25.JUL.2024 12:50:01

EUT PHOTOGRAPHS

Please refer to the attachment 2407S50596E-RF-EXP EUT EXTERNAL PHOTOGRAPHS and 2407S50596E-RF-INP EUT INTERNAL PHOTOGRAPHS.

TEST SETUP PHOTOGRAPHS

Please refer to the attachment 2407S50596E-RF-02-TSP_TEST SETUP PHOTOGRAPHS.

Declarations

1. Bay Area Compliance Laboratories Corp. (Xiamen) is not responsible for authenticity of any information provided by the applicant. Information from the applicant that may affect test results are marked with an asterisk "★".

2. Unless otherwise stated, the results shown in this test report refer only to the sample(s) tested.

3. Unless required by the rule provided by the applicant or product regulations, then decision rule in this report did not consider the uncertainty.

4. The extended uncertainty given in this report is obtained by combining the standard uncertainty times the coverage factor k=2 with the 95.45% confidence interval.

5. This report cannot be reproduced except in full, without prior written approval of Bay Area Compliance Laboratories Corp. (Xiamen).

6. This report is valid only with a valid digital signature. The digital signature may be available only under the adobe software above version 7.0.

******* END OF REPORT *******