TEST REPORT

Applicant Name:	FCC: Porta Phone Company Inc IC: PORTA PHONE CO., INC.
Address:	FCC: 145 Dean Knauss Drive Narragansett, Rhode Island 02882 United States IC: 145 Dean Knauss Drive Narragansett, RI 02882, United States of America
Report Number:	2401V84618E-RFA
FCC ID:	B4HEPAK2M
IC:	3064A-EPAK2M

Test Standard (s)

FCC PART 15.247; RSS-GEN ISSUE 5, FEBRUARY 2021 AMENDMENT 2;
RSS-247 ISSUE 3, AUGUST 2023

Sample Description

Product Type:	Full Duplex 2.4 GHz Transceiver-Main
Model No.:	EPAK2-M
Multiple Model(s) No.:	N/A
Trade Mark:	EVADE PAK2
Date Received:	2024/07/10
Issue Date:	2024/10/24
Test Result:	Pass▲

▲ In the configuration tested, the EUT complied with the standards above.

Prepared and Checked By:

Jojo Guo
RF Engineer

Approved By:

Nancy Wang
RF Supervisor

TABLE OF CONTENTS

DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	2401V84618E-RFA	Original Report	2024/10/24

GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

HVIN	EPAK2-M
FVIN	N/A
Product	Full Duplex 2.4 GHz Transceiver-Main
Tested Model	EPAK2-M
Multiple Model(s)	N/A
Frequency Range	Bluetooth: 2402-2480MHz
Transmit Power	0.86dBm
Modulation Technique	Bluetooth: GFSK, π/4-DQPSK, 8DPSK
Antenna Specification[#]	1dBi (provided by the applicant)
Voltage Range	DC 3.7V from battery
Sample serial number	2O3L-2 for Radiated Emissions Test 2O3L-1 for RF Conducted Test (Assigned by BACL, Shenzhen)
Sample/EUT Status	Good condition
Adapter Information	N/A

Objective

This test report is in accordance with Part 2-Subpart J, Part 15-Subparts A and C of the Federal Communication Commissions rules and RSS-247 Issue 3, August 2023, RSS-GEN Issue 5, Feb. 2021Amendment 2 of the Innovation, Science and Economic Development Canada rules.

Test Methodology

All measurements contained in this report were conducted with ANSI C63.10-2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices and RSS-247 Issue 3, August 2023, RSS-GEN Issue 5, Feb. 2021Amendment 2 of the Innovation, Science and Economic Development Canada rules.

All emissions measurement was performed at Bay Area Compliance Laboratories Corp. (Shenzhen). The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

Each test item follows test standards and with no deviation.

Measurement Uncertainty

Parameter		Uncertainty
Occupied Channel Bandwidth		±5%
RF output power, conducted		0.72 dB(k=2, 95% level of confidence)
AC Power Lines Conducted Emissions	9kHz-150kHz	3.94dB(k=2, 95% level of confidence)
	150kHz-30MHz	3.84dB(k=2, 95% level of confidence)
Radiated Emissions	9kHz - 30MHz	3.30dB(k=2, 95% level of confidence)
	30MHz~200MHz (Horizontal)	4.48dB(k=2, 95% level of confidence)
	30MHz~200MHz (Vertical)	4.55dB(k=2, 95% level of confidence)
	200MHz~1000MHz (Horizontal)	4.85dB(k=2, 95% level of confidence)
	200MHz~1000MHz (Vertical)	5.05dB(k=2, 95% level of confidence)
	1GHz - 6GHz	5.35dB(k=2, 95% level of confidence)
	6GHz - 18GHz	5.44dB(k=2, 95% level of confidence)
	18GHz - 40GHz	5.16dB(k=2, 95% level of confidence)
Temperature		±1℃
Humidity		±1%
Supply voltages		±0.4%

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.

Test Facility

The Test site used by Bay Area Compliance Laboratories Corp. (Shenzhen) to collect test data is located on the 5F(B-West) , 6F, 7F, the 3rd Phase of Wan Li Industrial Building D, Shihua Rd, FuTian Free Trade Zone, Shenzhen, China.

The lab has been recognized as the FCC accredited lab under the KDB 974614 D01 and is listed in the FCC Public Access Link (PAL) database, FCC Registration No. : 715558, the FCC Designation No. : CN5045.

The lab has been recognized by Innovation, Science and Economic Development Canada to test to Canadian radio equipment requirements, the CAB identifier: CN0023.

SYSTEM TEST CONFIGURATION

Description of Test Configuration

The system was configured for testing in an engineering mode.

Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	2402	40	2442
1	2403	41	2443
2	2404	42	2444
…	…	…	…
…	…	…	…
36	2438	75	2477
37	2439	76	2478
38	2440	77	2479
39	2441	78	2480

EUT was tested with Channel 0, 39 and 78.

EUT Exercise Software

Software " AY BLUE TOOL .EXE$^{\#}$" was used and the power level is 0x3$^{\#}$. The software and power level was provided by the applicant.

Special Accessories

No special accessory.

Equipment Modifications

No modification was made to the EUT tested.

Support Equipment List and Details

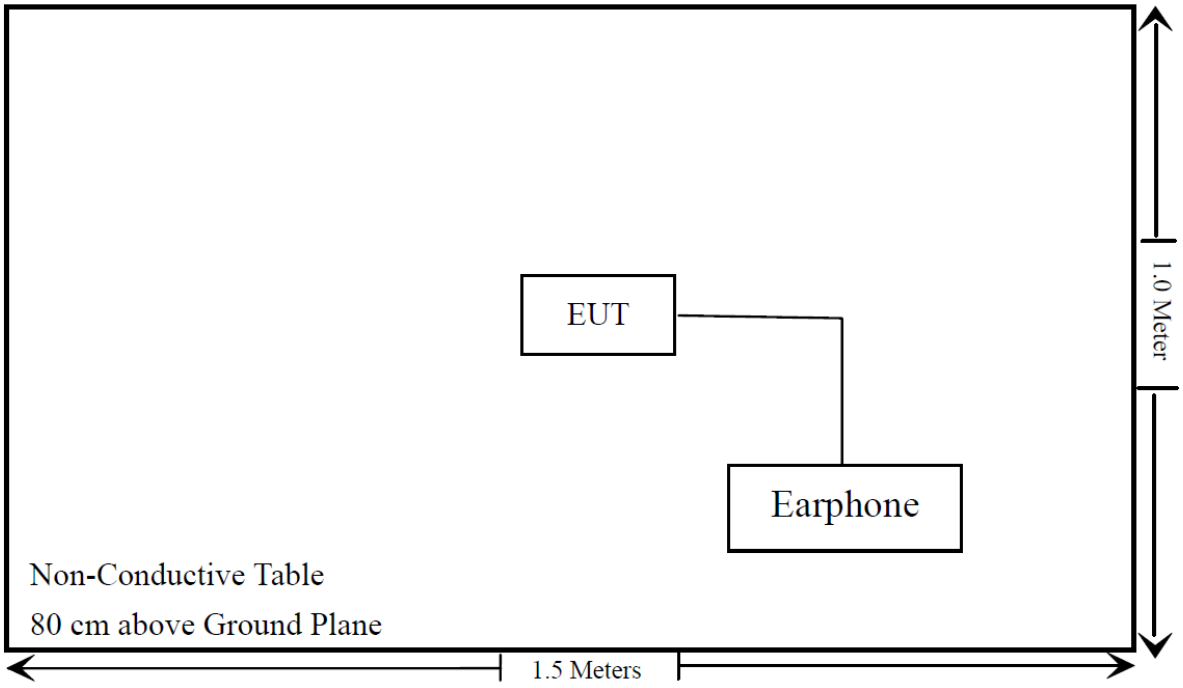
Manufacturer	Description	Model	Serial Number
/	/	/	/

External I/O Cable

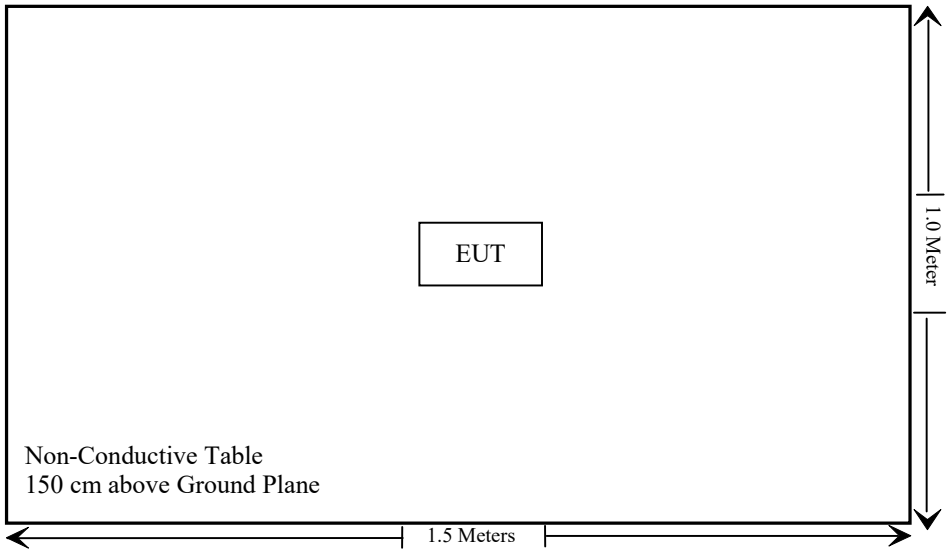
Cable Description	Length (m)	From Port	To
/	/	/	/

Block Diagram of Test Setup

For Radiated Emissions below 1GHz:



For Radiated Emissions above 1GHz:



SUMMARY OF TEST RESULTS

FCC Rules	RSS Rules	Description of Test	Result
§1.1307 ,§2.1093	RSS-102 § 2.5.1	RF Exposure & Exemption Limits For Routine Evaluation-SAR evaluation	Compliant
FCC §15.203	RSS-Gen §6.8	Antenna Requirement	Compliant
FCC §15.207(a)	RSS-Gen §8.8	AC Line Conducted Emissions	Not Applicable
FCC §15.205, §15.209, §15.247(d)	RSS-247 § 5.5, RSS-GEN § 8.10	Radiated Emissions	Compliant
FCC §15.247(a)(1)	RSS-247 § 5.1(a), RSS-GEN § 6.7	20 dB Emission Bandwidth & 99% Occupied Bandwidth	Compliant
FCC §15.247(a)(1)	RSS-247 § 5.1 (b)	Channel Separation Test	Compliant
FCC §15.247(a)(1)(iii)	RSS-247 § 5.1 (d)	Time of Occupancy (Dwell Time)	Compliant
FCC §15.247(a)(1)(iii)	RSS-247 § 5.1 (d)	Quantity of hopping channel Test	Compliant
FCC §15.247(b)(1)	RSS-247 § 5.1(b) &§ 5.4(b)	Peak Output Power Measurement	Compliant
FCC §15.247(d)	RSS-247 § 5.5	Band edges	Compliant

Not Applicable: EUT only powered by battery.

TEST EQUIPMENT LIST

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Radiated Emission Test					
Rohde & Schwarz	EMI Test Receiver	ESR3	102455	2024/01/16	2025/01/15
Sonoma instrument	Pre-amplifier	310 N	186238	2024/05/21	2025/05/20
Sunol Sciences	Broadband Antenna	JB1	A040904-1	2023/07/20	2026/07/19
Unknown	Cable	Chamber A Cable 1	N/A	2024/06/18	2025/06/17
Unknown	Cable	XH500C	J-10M-A	2024/06/18	2025/06/17
BACL	Active Loop Antenna	1313-1A	4031911	2024/05/14	2027/05/13
Unknown	Cable	2Y194	0735	2024/05/21	2025/05/20
Unknown	Cable	PNG214	1354	2024/05/21	2025/05/20
Audix	EMI Test software	E3	19821b(V9)	NCR	NCR
Rohde & Schwarz	Spectrum Analyzer	FSV40	101605	2024/03/27	2025/03/26
COM-POWER	Pre-amplifier	PA-122	181919	2024/06/18	2025/06/17
Schwarzbeck	Horn Antenna	BBHA9120D(1201)	1143	2023/07/26	2026/07/25
Unknown	RF Cable	KMSE	735	2024/06/18	2025/06/17
Unknown	RF Cable	UFA147	219661	2024/06/18	2025/06/17
SNSD	2.4G Band Reject filter	BSF2402-2480MN-0898-001	2.4G filter	2024/06/27	2025/06/26
Audix	EMI Test software	E3	191218(V9)	NCR	NCR
A.H.System	Pre-amplifier	PAM-1840VH	190	2024/06/18	2025/06/17
Electro-Mechanics Co	Horn Antenna	3116	9510-2270	2023/09/18	2026/09/17
UTIFLEX	RF Cable	NO. 13	232308-001	2024/06/18	2025/06/17
RF Conducted Test					
R&S	SPECTRUM ANALYZER	FSU26	200120	2024/01/08	2025/01/07
MARCONI	10dB Attenuator	6534/3	2942	2024/06/27	2025/06/26

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

FCC§15.247 (i), §1.1307 (b) (1) &§2.1093 - RF EXPOSURE

Applicable Standard

According to FCC §2.1093 and §1.1307(b) (1), systems operating under the provisions of this section shall be operated in a manner that ensure that the public is not exposed to radio frequency energy level in excess of the Commission's guideline.

According to KDB 447498 D01 General RF Exposure Guidance

The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances ≤ 50 mm are determined by:
[(max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)] · [√f(GHz)] ≤ 3.0 for 1-g SAR and ≤ 7.5 for 10-g extremity SAR, where
1. f(GHz) is the RF channel transmit frequency in GHz.
2. Power and distance are rounded to the nearest mW and mm before calculation.
3. The result is rounded to one decimal place for comparison.
4. When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test Exclusion.

Measurement Result

For worst case:

Mode	Frequency (MHz)	Max tune-up conducted power# (dBm)	Max tune-up conducted power# (mW)	Distance (mm)	Calculated value	Threshold (1-g SAR)	SAR Test Exclusion
BT	2402-2480	1.0	1.26	5	0.4	3.0	**Yes**

Result: Compliant

RSS-102 § 2.5.1 - EXEMPTION LIMITS FOR ROUTINE EVALUATION-SAR EVALUATION

Applicable Standard

According to RSS-102 Issue 5§ (2.5.1), SAR evaluation is required if the separation distance between the user and/or bystander and the antenna and/or radiating element of the device is less than or equal to 20 cm, except when the device operates at or below the applicable output power level (adjusted for tune-up tolerance) for the specified separation distance defined in Table 1.

Table 1: SAR evaluation – Exemption limits for routine evaluation based on frequency and separation distance[4,5]

Frequency (MHz)	Exemption Limits (mW)				
	At separation distance of ≤5 mm	At separation distance of 10 mm	At separation distance of 15 mm	At separation distance of 20 mm	At separation distance of 25 mm
≤300	71 mW	101 mW	132 mW	162 mW	193 mW
450	52 mW	70 mW	88 mW	106 mW	123 mW
835	17 mW	30 mW	42 mW	55 mW	67 mW
1900	7 mW	10 mW	18 mW	34 mW	60 mW
2450	4 mW	7 mW	15 mW	30 mW	52 mW
3500	2 mW	6 mW	16 mW	32 mW	55 mW
5800	1 mW	6 mW	15 mW	27 mW	41 mW

Frequency (MHz)	Exemption Limits (mW)				
	At separation distance of 30 mm	At separation distance of 35 mm	At separation distance of 40 mm	At separation distance of 45 mm	At separation distance of ≥50 mm
≤300	223 mW	254 mW	284 mW	315 mW	345 mW
450	141 mW	159 mW	177 mW	195 mW	213 mW
835	80 mW	92 mW	105 mW	117 mW	130 mW
1900	99 mW	153 mW	225 mW	316 mW	431 mW
2450	83 mW	123 mW	173 mW	235 mW	309 mW
3500	86 mW	124 mW	170 mW	225 mW	290 mW
5800	56 mW	71 mW	85 mW	97 mW	106 mW

4. The exemption limits in Table 1 are based on measurements and simulations of half-wave dipole antennas at separation distances of 5 mm to 25 mm from a flat phantom, providing a SAR value of approximately 0.4 W/kg for 1 g of tissue. For low frequencies (300 MHz to 835 MHz), the exemption limits are derived from a linear fit. For high frequencies (1900 MHz and above), the exemption limits are derived from a third order polynomial fit.
5. Transmitters operating between 0.003-10 MHz, meeting the exemption from routine SAR evaluation, shall demonstrate compliance to the instantaneous limits in Section 4.

Output power level shall be the higher of the maximum conducted or equivalent isotropically radiated power (e.i.r.p.) source-based, time-averaged output power. For controlled use devices where the 8 W/kg for 1 gram of tissue applies, the exemption limits for routine evaluation in Table 1 are multiplied by a factor of 5. For limb-worn devices where the 10 gram value applies, the exemption limits for routine evaluation in Table 1 are multiplied by a factor of 2.5. If the operating frequency of the device is between two frequencies located in Table 1, linear interpolation shall be applied for the applicable separation distance. For test separation distance less than 5 mm, the exemption limits for a separation distance of 5 mm can be applied to determine if a routine evaluation is required.

For medical implants devices, the exemption limit for routine evaluation is set at 1 mW. The output power of a medical implants device is defined as the higher of the conducted or e.i.r.p to determine whether the device is exempt from the SAR evaluation.

Test Result:

For worst case:

For BT mode:

The higher of the conducted or equivalent isotropically radiated power (e.i.r.p.) source-based, time-averaged output power:

(2480-2450)/(3500-2450)= (4-P)/(4-2)

The exemption limit of 2480MHz is P= 3.94mW

The maximum tune up conducted power is 1.0dBm

The antenna gain# is 1.0dBi

So the maximum output power is 2.0dBm (1.58mW), which less than 3.94mW@2480MHz exemption limit

So the stand-alone SAR test is not required.

FCC §15.203 & RSS-GEN §6.8 - 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.

According to FCC § 15.203, the applicant for equipment certification shall provide a list of all antenna types that may be used with the transmitter, where applicable (i.e. for transmitters with detachable antenna), indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna. The test report shall demonstrate the compliance of the transmitter with the limit for maximum equivalent isotropically radiated power (e.i.r.p.) specified in the applicable RSS, when the transmitter is equipped with any antenna type, selected from this list.

For expediting the testing, measurements may be performed using only the antenna with highest gain of each combination of transmitter and antenna type, with the transmitter output power set at the maximum level. However, the transmitter shall comply with the applicable requirements under all operational conditions and when in combination with any type of antenna from the list provided in the test report (and in the notice to be included in the user manual, provided below).

When measurements at the antenna port are used to determine the RF output power, the effective gain of the device's antenna shall be stated, based on a measurement or on data from the antenna's manufacturer.

The test report shall state the RF power, output power setting and spurious emission measurements with each antenna type that is used with the transmitter being tested.

For licence-exempt equipment with detachable antennas, the user manual shall also contain the following notice in a conspicuous location:

This radio transmitter [enter the device's ISED certification number] has been approved by Innovation, Science and Economic Development Canada to operate with the antenna types listed below, with the maximum permissible gain indicated. Antenna types not included in this list that have a gain greater than the maximum gain indicated for any type listed are strictly prohibited for use with this device.
Immediately following the above notice, the manufacturer shall provide a list of all antenna types which can be used with the transmitter, indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna type.

Antenna Connector Construction

The EUT has one internal antenna arrangement which was permanently attached for Bluetooth and the maximum antenna gain[#] is 1dBi, fulfill the requirement of this section. Please refer to the EUT photos.

Antenna Type	Antenna Gain[#]	Impedance	Frequency Range
PCB	1dBi	50Ω	2.4~2.5GHz

Result: Compliant

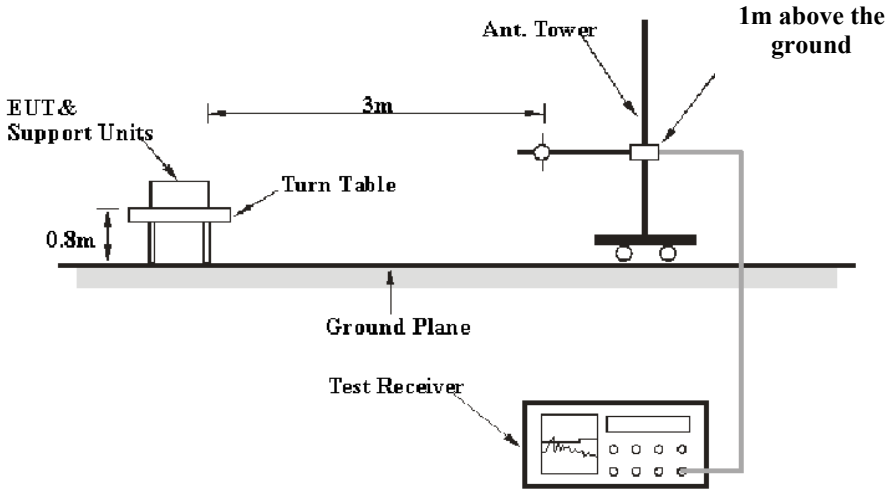
FCC §15.209, §15.205 & §15.247(D) & RSS-247§ 5.5 - SPURIOUS EMISSIONS

Applicable Standard

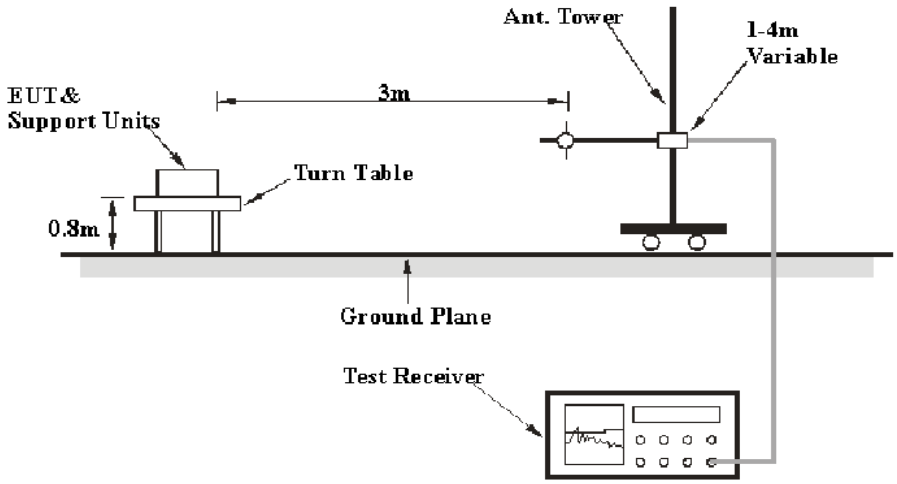
FCC §15.205; §15.209; §15.247(d); RSS-247§ 5.5; RSS-GEN § 8.10

EUT Setup

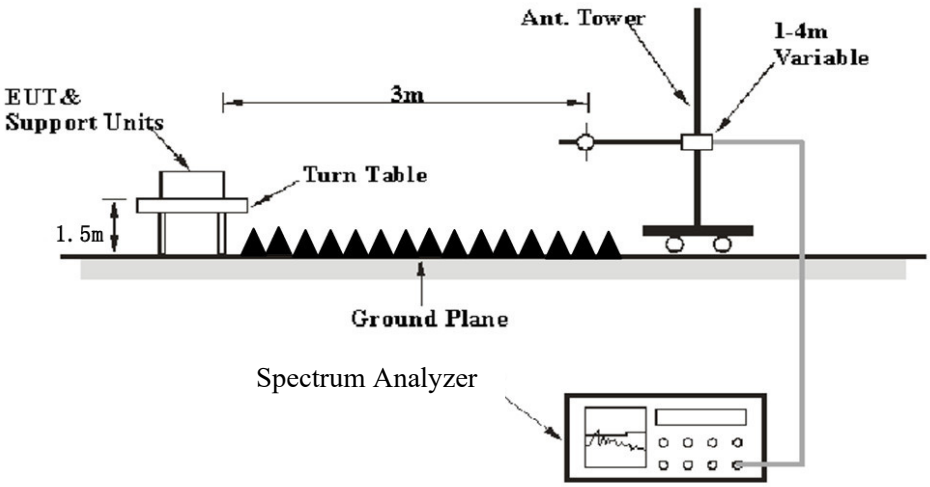
9 kHz-30MHz:



30MHz-1GHz:



Above 1GHz:



The radiated emission performed in the 3 meters, using the setup accordance with the ANSI C63.10-2013. The specification used was the FCC 15.209, FCC 15.247, RSS-247, RSS-Gen limits.

EMI Test Receiver & Spectrum Analyzer Setup

The EMI test receiver & Spectrum Analyzer Setup were set with the following configurations:

Frequency Range	RBW	Video B/W	IF B/W	Measurement
9 kHz – 150 kHz	/	/	200 Hz	QP
	300 Hz	1 kHz	/	PK
150 kHz – 30 MHz	/	/	9 kHz	QP
	10 kHz	30 kHz	/	PK
30 MHz – 1000 MHz	/	/	120 kHz	QP
	100 kHz	300 kHz	/	PK
Above 1 GHz	Harmonics & Band Edge			
	1MHz	3 MHz	/	PK
	Average Emission Level=Peak Emission Level+20*log(Duty cycle)			
	Other Emissions			
	1MHz	3 MHz	/	PK
	1MHz	10 Hz	/	Average

For Duty cycle measurement:

Use the duty cycle factor correction factor method per 15.35(c).
Duty cycle=On time/100milliseconds, On time=N1*L1+N2*L2+…Nn-1*Ln-1+Nn*Ln,
Where N1 is number of type 1 pulses, L1 is length of type 1 pulse, etc.

Test Procedure

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

All final data was recorded in Quasi-peak detection mode except for the frequency bands 9–90 kHz, 110–490 kHz and above 1000 MHz, average detection modes for frequency bands 9–90 kHz and 110–490 kHz, peak and average detection modes for frequencies above 1 GHz.

For 9 kHz-30MHz, 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.

If the maximized peak measured value complies with under the QP/Average limit more than 6dB, then it is unnecessary to perform an QP/Average measurement.

All emissions under the average limit and under the noise floor have not recorded in the report.

Factor & Over Limit/Margin Calculation

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

Factor = Antenna Factor + Cable Loss - Amplifier Gain

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

Over Limit/Margin = Level / Corrected Amplitude – Limit
Level / Corrected Amplitude = Read Level + Factor

Test Data

Environmental Conditions

Temperature:	22~25.6 ℃
Relative Humidity:	50~54 %
ATM Pressure:	101.0 kPa

The testing was performed by Anson Su on 2024-08-02 for below 1GHz and Dylan Yang from 2024-08-02 to 2024-10-24 for above 1GHz.

EUT operation mode: Transmitting

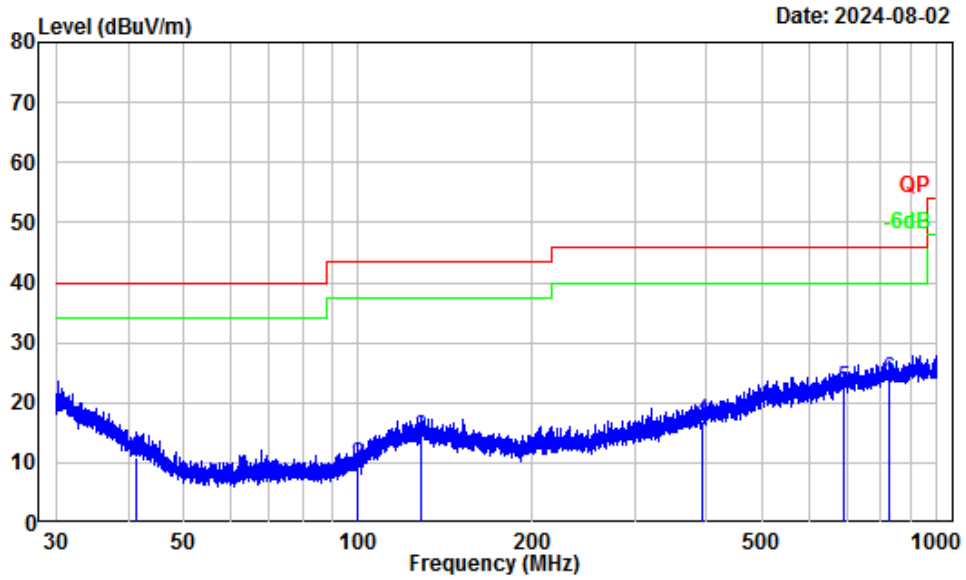
Note: Pre-scan in the X, Y and Z axes of orientation, the worst case Z-axis of orientation was recorded.

9 kHz-30MHz: *(Maximum output power mode, GFSK High Channel)*

The amplitude of spurious emissions attenuated more than 20 dB below the limit was not recorded.

30MHz-1GHz: *(Maximum output power mode, GFSK High Channel)*

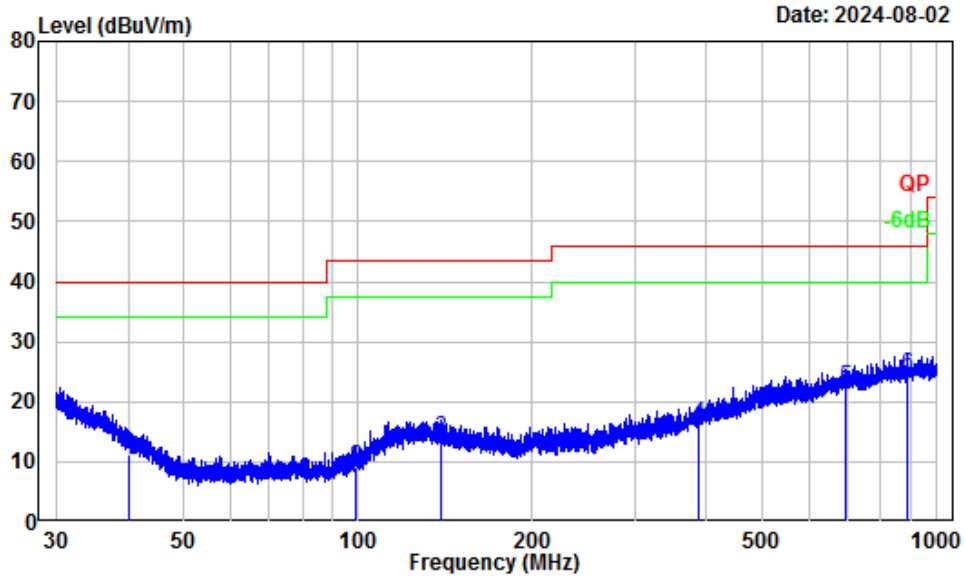
Horizontal



Site : Chamber A
Condition : 3m Horizontal
Project Number: 2401V84618E-RF
Test Mode : BT
Tester : Anson Su

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	41.35	-13.13	24.06	10.93	40.00	-29.07	QP
2	99.48	-16.00	25.57	9.57	43.50	-33.93	QP
3	127.94	-11.26	25.50	14.24	43.50	-29.26	QP
4	393.13	-8.64	25.59	16.95	46.00	-29.05	QP
5	691.99	-3.62	25.86	22.24	46.00	-23.76	QP
6	826.41	-1.92	25.85	23.93	46.00	-22.07	QP

Vertical



Site : Chamber A
Condition : 3m Vertical
Project Number: 2401V84618E-RF
Test Mode : BT
Tester : Anson Su

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	40.21	-12.48	23.65	11.17	40.00	-28.83	QP
2	99.27	-16.05	25.20	9.15	43.50	-34.35	QP
3	138.93	-11.82	25.72	13.90	43.50	-29.60	QP
4	388.67	-8.81	25.00	16.19	46.00	-29.81	QP
5	693.50	-3.60	25.98	22.38	46.00	-23.62	QP
6	886.44	-1.42	26.00	24.58	46.00	-21.42	QP

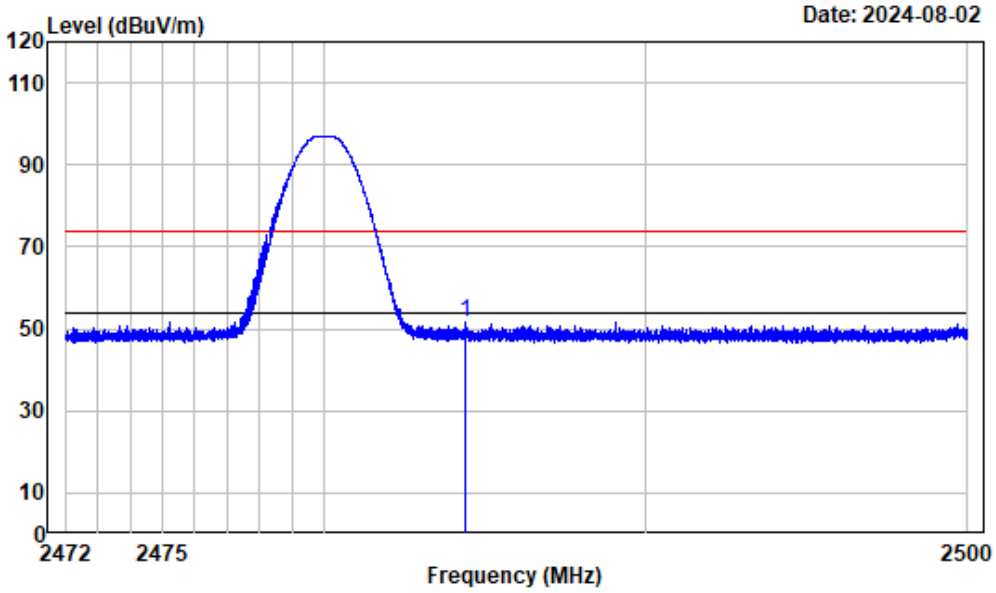
Above 1GHz:

Frequency (MHz)	Receiver		Polar (H/V)	Factor (dB/m)	Corrected Amplitude (dBµV/m)	Limit (dBµV/m)	Margin (dB)
	Reading (dBµV)	PK/Ave					
Maximum output power mode, GFSK							
Low Channel 2402MHz							
2360.07	54.51	PK	H	-2.93	51.58	74.00	-22.42
2367.02	53.96	PK	V	-2.93	51.03	74.00	-22.97
4804.00	45.87	PK	H	1.69	47.56	74.00	-26.44
4804.00	46.02	PK	V	1.69	47.71	74.00	-26.29
Middle Channel 2441MHz							
4882.00	45.65	PK	H	1.69	47.34	74.00	-26.66
4882.00	46.83	PK	V	1.69	48.52	74.00	-25.48
High Channel 2480MHz							
2484.39	54.79	PK	H	-3.17	51.62	74.00	-22.38
2494.74	54.22	PK	V	-3.19	51.03	74.00	-22.97
4960.00	46.01	PK	H	2.77	48.78	74.00	-25.22
4960.00	46.82	PK	V	2.77	49.59	74.00	-24.41

Note:
Factor = Antenna factor (RX) + Cable Loss – Amplifier Factor
Corrected Amplitude = Factor + Reading
Margin = Corrected. Amplitude - Limit
The other spurious emission which is in the noise floor level was not recorded.
The test result of peak was less than the limit of average, so just peak values were recorded.

Test plots for worst Band Edge Measurements (Radiated):

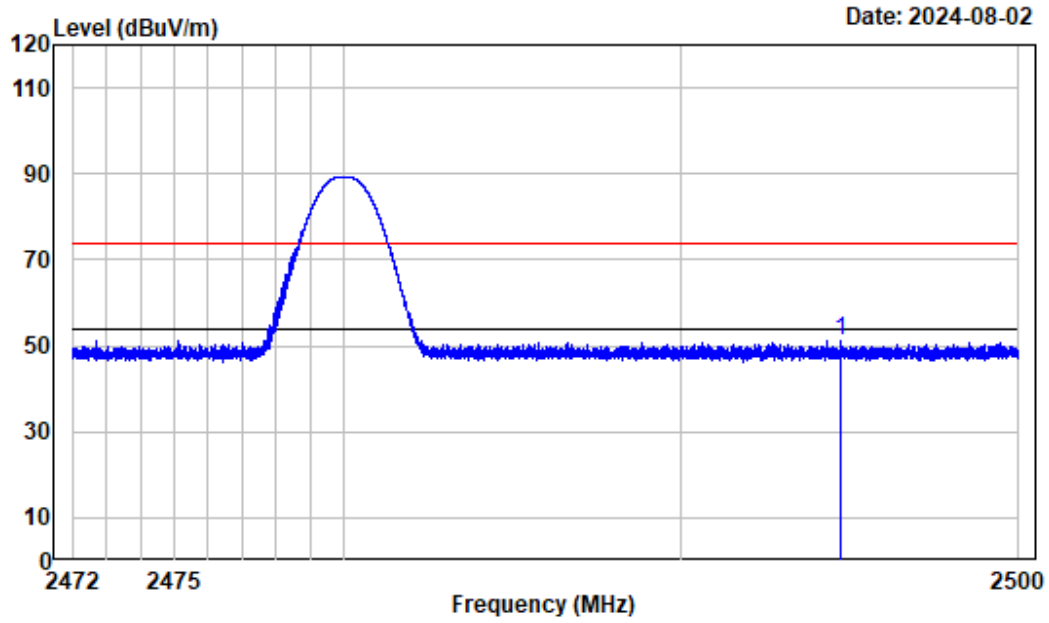
GFSK			
Test Channel:	**2480MHz**	**Ant. Polar. :**	**Horizontal**




```
Condition   : Horizontal
Project No.: 2401V84618E-RF
Tester      : Dylan
Note        : BT_3DH5_2480
```

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	2484.390	-3.17	54.79	51.62	74.00	-22.38	peak

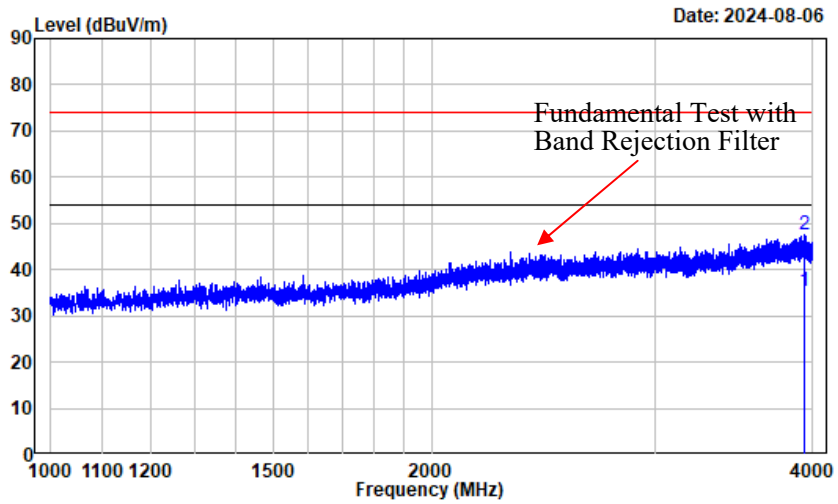
GFSK			
Test Channel:	**2480MHz**	**Ant. Polar. :**	**Vertical**



Condition : Vertical
Project No.: 2401V84618E-RF
Tester : Dylan
Note : BT_3DH5_2480

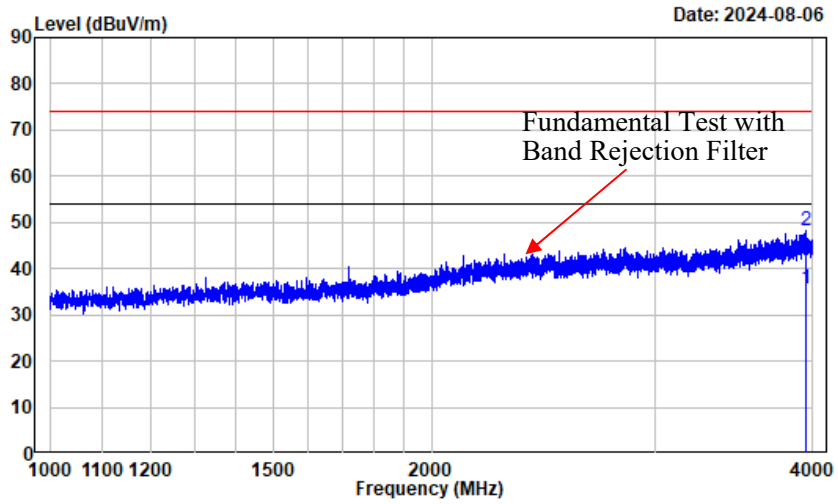
	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	2494.740	-3.19	54.22	51.03	74.00	-22.97	peak

Test plots for worst Harmonic and Emissions Measurements:

Horizontal	
1-4GHz	 Condition : Horizontal Project No.: 2401V84618E-RF Tester : Dylan Note : BT_DH5_2480 Freq / Factor / Read Level / Limit Level / Limit Line / Over Limit / Remark 1 3937.750 -0.25 35.61 35.36 54.00 -18.64 Average 2 3937.750 -0.25 47.76 47.51 74.00 -26.49 Peak

Vertical

1-4GHz

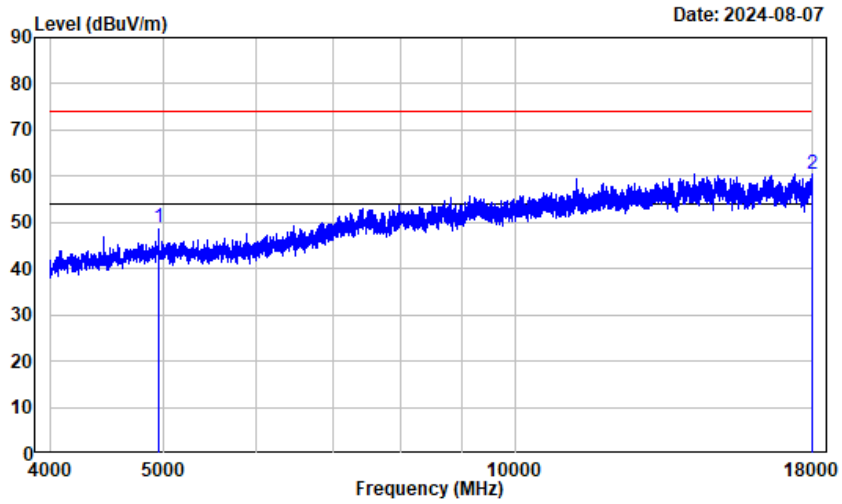


Condition : Vertical
Project No.: 2401V84618E-RF
Tester : Dylan
Note : BT_DH5_2480

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	3946.750	-0.20	35.89	35.69	54.00	-18.31	Average
2	3946.750	-0.20	48.47	48.27	74.00	-25.73	Peak

Horizontal-Peak

4-18GHz

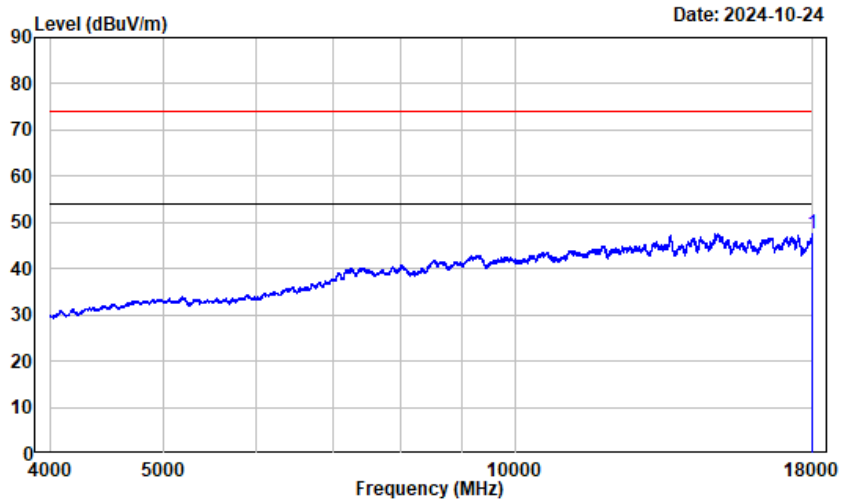


Condition : Horizontal
Project No.: 2401V84618E-RF
Tester : Dylan
Note : BT_DH5_2480

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	4960.000	2.77	46.01	48.78	74.00	-25.22	Peak
2	17959.750	24.34	36.22	60.56	74.00	-13.44	Peak

Horizontal-Average

4-18GHz

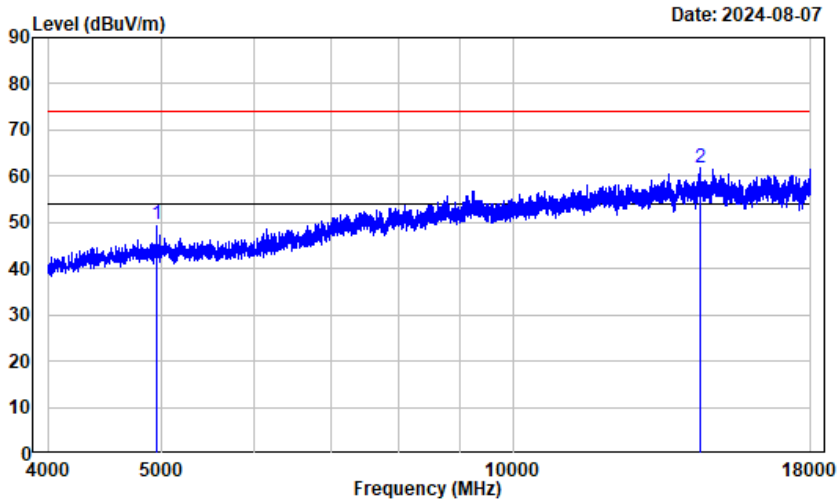


Condition : Horizontal
Project No.: 2401V84618E-RF
Tester : Dylan.Yang
Note : BT_DH5_2480

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	17970.250	24.41	23.06	47.47	54.00	-6.53	Average

Vertical-Peak

4-18GHz

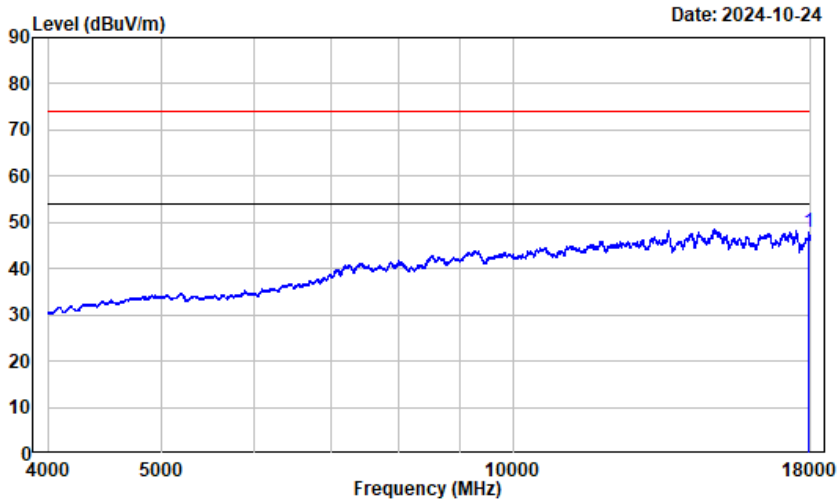


Condition : Vertical
Project No.: 2401V84618E-RF
Tester : Dylan
Note : BT_DH5_2480

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	4960.000	2.77	46.82	49.59	74.00	-24.41	Peak
2	14477.250	17.43	44.27	61.70	74.00	-12.30	Peak

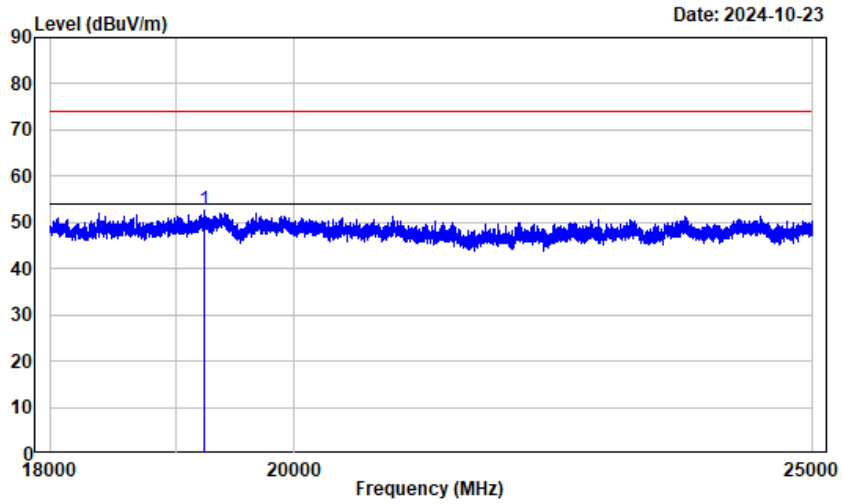
Vertical-Average

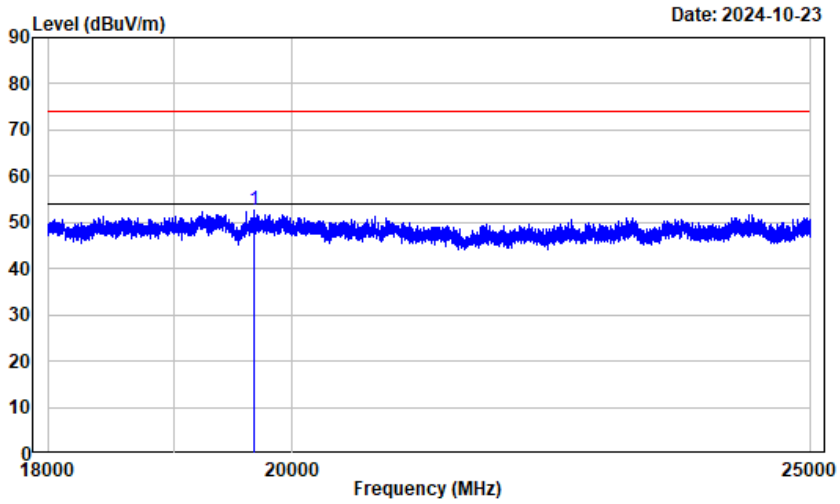
4-18GHz



Condition : Vertical
Project No.: 2401V84618E-RF
Tester : Dylan.Yang
Note : BT_DH5_2480

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	17954.490	24.30	23.52	47.82	54.00	-6.18	Average

Horizontal	
18-25GHz	 Condition : Horizontal Project No.: 2401V84618E-RF Tester : Dylan.Yang Note : BT_DH5_2480 Freq / Factor / Read Level / Limit Level / Limit Line / Over Limit / Remark MHz / dB/m / dBuV / dBuV/m / dBuV/m / dB 1 19238.280 15.28 37.33 52.61 74.00 -21.39 Peak

Vertical	
18-25GHz	 Condition : Vertical Project No.: 2401V84618E-RF Tester : Dylan.Yang Note : BT_DH5_2480 Freq / Factor / Read Level / Level / Limit Line / Over Limit / Remark MHz / dB/m / dBuV / dBuV/m / dBuV/m / dB 1 19671.460 15.39 37.15 52.54 74.00 -21.46 Peak

FCC §15.247(a) (1) & RSS-247 § 5.1 (b) - CHANNEL SEPARATION TEST

Applicable Standard

According to FCC §15.247(a) (1):

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. The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudo randomly ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

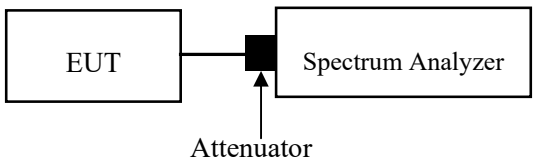
According to RSS-247 § 5.1 (b):

Frequency hopping systems (FHSs) shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the -20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, FHSs operating in the band 2400-2483.5 MHz 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 that the systems operate with an output power no greater than 0.125 W. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

Test Procedure

Test Method: ANSI C63.10-2013 Clause 7.8.2

1. Set the EUT in transmitting mode, max hold the channel.
2. Set the adjacent channel of the EUT and max hold another trace.
3. Measure the channel separation.



Test Data

Environmental Conditions

Temperature:	26 ℃
Relative Humidity:	59 %
ATM Pressure:	101.0 kPa

The testing was performed by Allen Bai on 2024-08-01.

EUT operation mode: Transmitting

Test Result: Compliant.

BDR

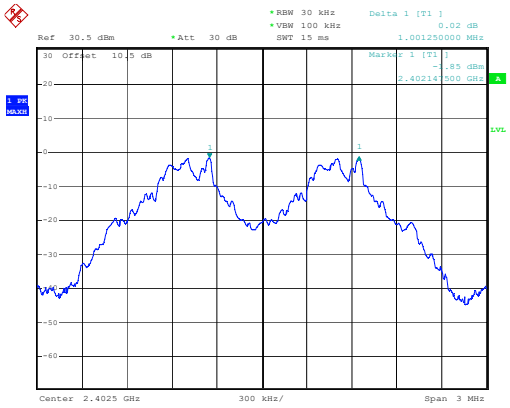
Mode	Value (MHz)	Limit (MHz)	Result
GFSK_Low	**1.001**	0.687	Pass
GFSK_Middle	**1.001**	0.687	Pass
GFSK_High	**1.001**	0.693	Pass

EDR

Mode	Value (MHz)	Limit (MHz)	Result
π/4-DQPSK_Low	1.001	0.880	Pass
π/4-DQPSK_Middle	**1.005**	0.880	Pass
π/4-DQPSK_High	0.998	0.893	Pass
8DPSK_Low	**1.005**	0.853	Pass
8DPSK_Middle	1.001	0.850	Pass
8DPSK_High	1.001	0.853	Pass

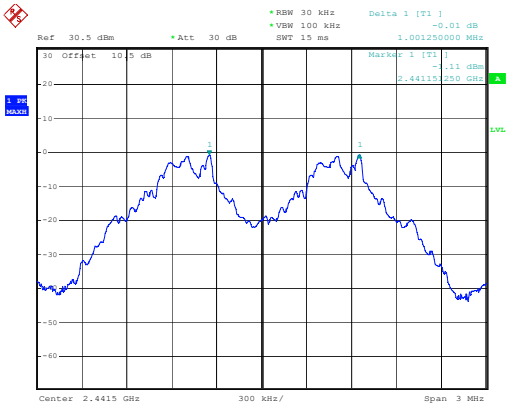
BDR

GFSK_Low 1.001MHz



ProjectNo.:2401V84618E-RF Tester:Allen Bai
Date: 1.AUG.2024 22:07:15

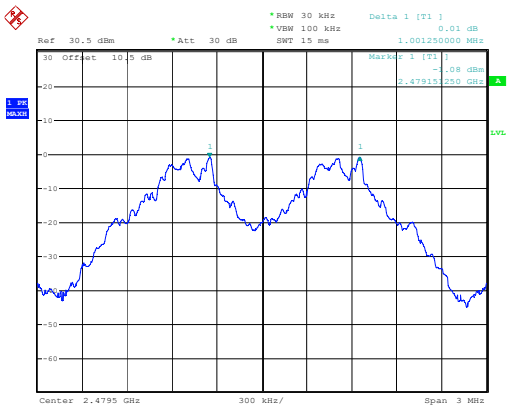
GFSK_Middle 1.001MHz



ProjectNo.:2401V84618E-RF Tester:Allen Bai
Date: 1.AUG.2024 22:09:39

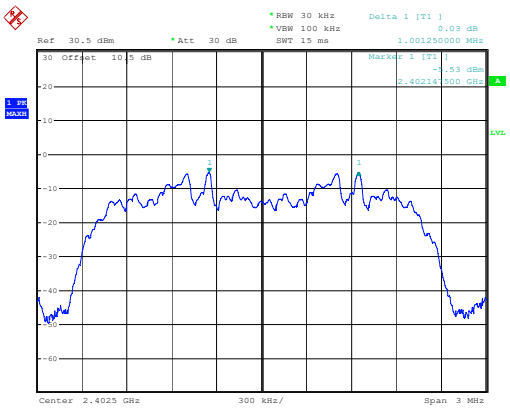
EDR

GFSK_High 1.001MHz



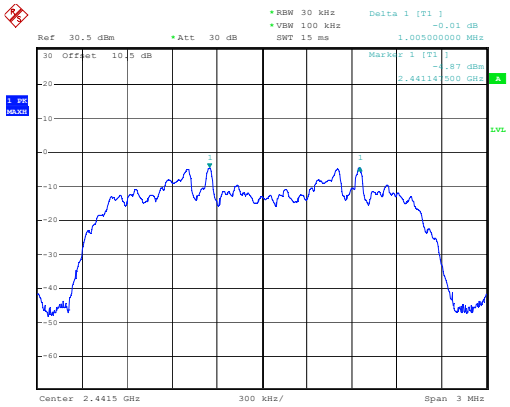
ProjectNo.:2401V84618E-RF Tester:Allen Bai
Date: 1.AUG.2024 22:13:32

π/4-DQPSK_Low 1.001MHz



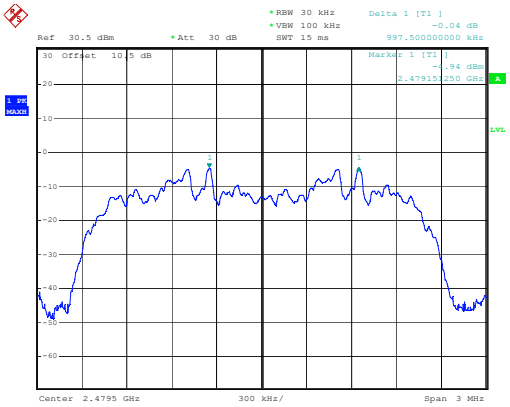
ProjectNo.:2401V84618E-RF Tester:Allen Bai
Date: 1.AUG.2024 22:23:32

π/4-DQPSK_Middle 1.005MHz



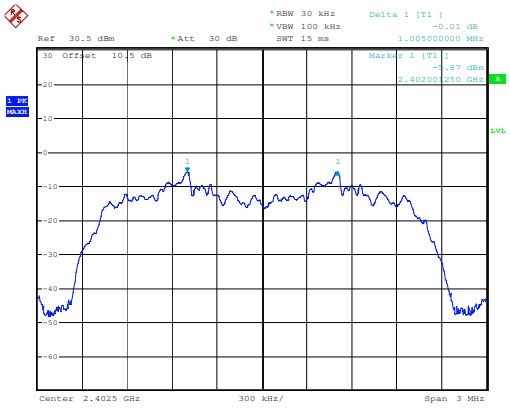
ProjectNo.:2401V84618E-RF Tester:Allen Bai
Date: 1.AUG.2024 22:25:28

π/4-DQPSK_High 0.998MHz



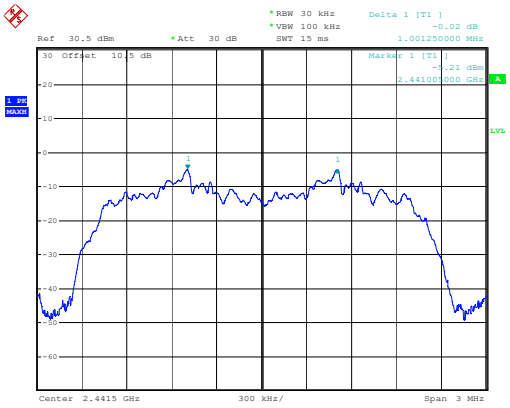
ProjectNo.:2401V84618E-RF Tester:Allen Bai
Date: 1.AUG.2024 22:29:54

8DPSK_Low 1.005MHz



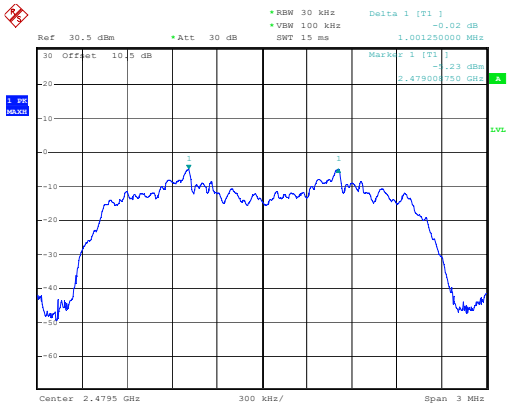
ProjectNo.:2401V84618E-RF Tester:Allen Bai
Date: 1.AUG.2024 22:40:46

8DPSK_Middle 1.001MHz



ProjectNo.:2401V84618E-RF Tester:Allen Bai
Date: 1.AUG.2024 22:42:29

8DPSK_High 1.001MHz



ProjectNo.:2401V84618E-RF Tester:Allen Bai
Date: 1.AUG.2024 22:47:02

FCC §15.247(a) (1) & RSS-247 § 5.1 (a), RSS-GEN § 6.7 - 20 dB EMISSION BANDWIDTH & 99% OCCUPIED BANDWIDTH

Applicable Standard

According to FCC §15.247(a) (1):

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.

According to RSS-247 § 5.1 (a), RSS-GEN § 6.7:

The occupied bandwidth or the "99% emission bandwidth" is defined as the frequency range between two points, one above and the other below the carrier frequency, within which 99% of the total transmitted power of the fundamental transmitted emission is contained. The occupied bandwidth shall be reported for all equipment in addition to the specified bandwidth required in the applicable RSSs.

In some cases, the "20 dB bandwidth" is required, which is defined as the frequency range between two points, one at the lowest frequency below and one at the highest frequency above the carrier frequency, at which the maximum power level of the transmitted emission is attenuated 20 dB below the maximum in-band power level of the modulated signal, where the two points are on the outskirts of the in-band emission.

Test Procedure

Test Method: ANSI C63.10-2013 Clause 7.8.7 & Clause 6.9.2

The following conditions shall be observed for measuring the occupied bandwidth and 20 dB bandwidth:

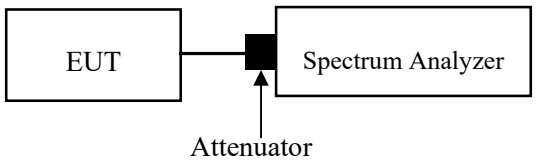
• The transmitter shall be operated at its maximum carrier power measured under normal test conditions.

• The span of the spectrum analyzer shall be set large enough to capture all products of the modulation process, including the emission skirts, around the carrier frequency, but small enough to avoid having other emissions (e.g. on adjacent channels) within the span.

• The detector of the spectrum analyzer shall be set to "Sample". However, a peak, or peak hold, may be used in place of the sampling detector since this usually produces a wider bandwidth than the actual bandwidth (worst-case measurement). Use of a peak hold (or "Max Hold") may be necessary to determine the occupied / 20 dB bandwidth if the device is not transmitting continuously.

• The resolution bandwidth (RBW) shall be in the range of 1% to 5% of the actual occupied / 20 dB bandwidth and the video bandwidth (VBW) shall not be smaller than three times the RBW value. Video averaging is not permitted.

Note: It may be necessary to repeat the measurement a few times until the RBW and VBW are in compliance with the above requirement.
For the 99% emission bandwidth, the trace data points are recovered and directly summed in linear power level terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached, and that frequency recorded. The process is repeated for the highest frequency data points (starting at the highest frequency, at the right side of the span, and going down in frequency). This frequency is then recorded. The difference between the two recorded frequencies is the occupied bandwidth (or the 99% emission bandwidth).



Test Data

Environmental Conditions

Temperature:	26~27 ℃
Relative Humidity:	48~59 %
ATM Pressure:	101.0 kPa

The testing was performed by Allen Bai on 2024-08-01 and Cheeb Huang on 2024-08-15.

EUT operation mode: Transmitting

Test Result: Compliant.

20 dB Emissions

BDR

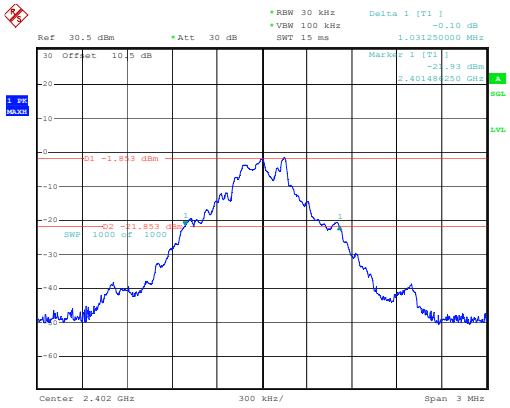
Mode	Value (MHz)
GFSK_Low	1.031
GFSK_Middle	1.031
GFSK_High	**1.039**

EDR

Mode	Value (MHz)
π/4-DQPSK_Low	1.320
π/4-DQPSK_Middle	1.320
π/4-DQPSK_High	**1.339**
8DPSK_Low	1.279
8DPSK_Middle	1.275
8DPSK_High	1.279

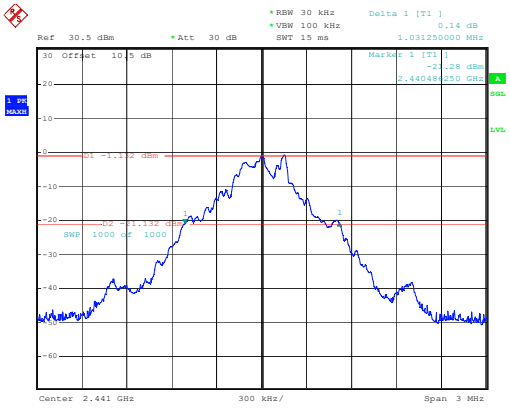
BDR

GFSK_Low 1.031MHz



ProjectNo.:2401V84618E-RF Tester:Allen Bai
Date: 1.AUG.2024 22:05:06

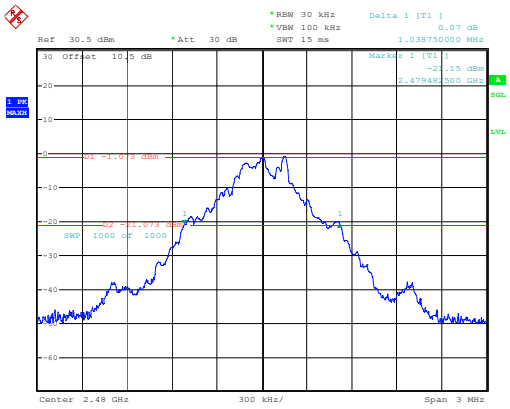
GFSK_Middle 1.031MHz



ProjectNo.:2401V84618E-RF Tester:Allen Bai
Date: 1.AUG.2024 22:08:18

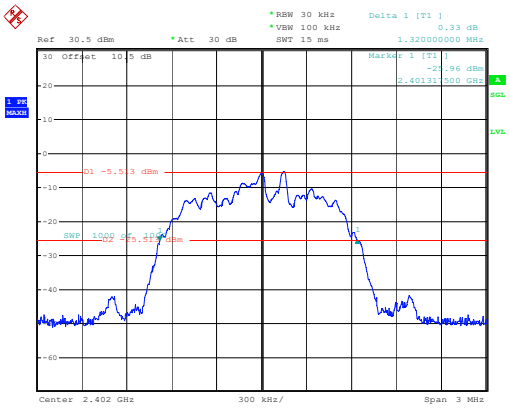
EDR

GFSK_High 1.039MHz



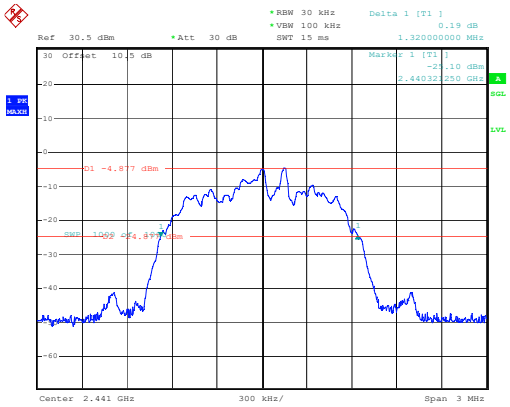
ProjectNo.:2401V84618E-RF Tester:Allen Bai
Date: 1.AUG.2024 22:10:36

π/4-DQPSK_Low 1.320MHz



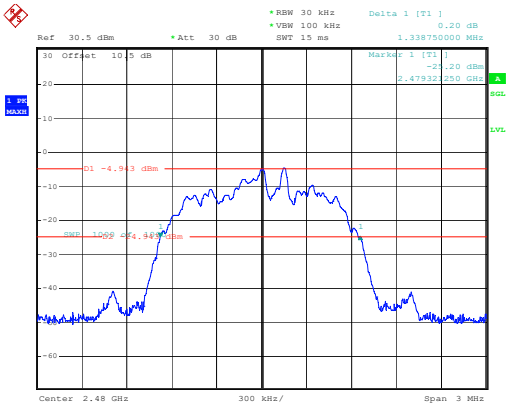
ProjectNo.:2401V84618E-RF Tester:Allen Bai
Date: 1.AUG.2024 22:21:14

π/4-DQPSK_Middle 1.320MHz



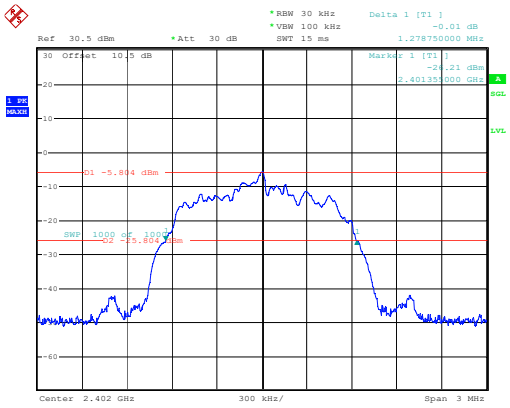
ProjectNo.:2401V84618E-RF Tester:Allen Bai
Date: 1.AUG.2024 22:24:28

π/4-DQPSK_High 1.339MHz



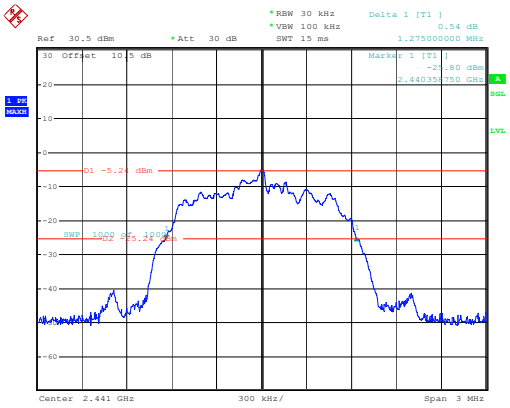
ProjectNo.:2401V84618E-RF Tester:Allen Bai
Date: 1.AUG.2024 22:26:19

8DPSK_Low 1.279MHz



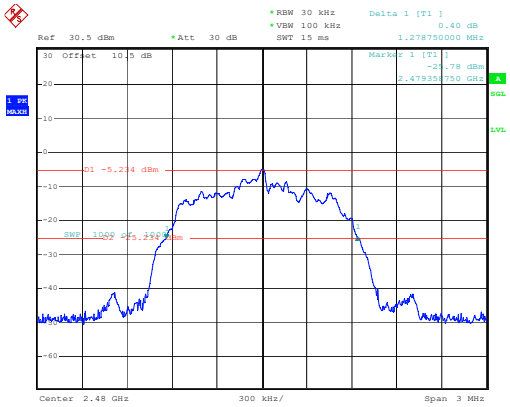
ProjectNo.:2401V84618E-RF Tester:Allen Bai
Date: 1.AUG.2024 22:38:15

8DPSK_Middle 1.275MHz



ProjectNo.:2401V84618E-RF Tester:Allen Bai
Date: 1.AUG.2024 22:41:44

8DPSK_High 1.279MHz



ProjectNo.:2401V84618E-RF Tester:Allen Bai
Date: 1.AUG.2024 22:43:19

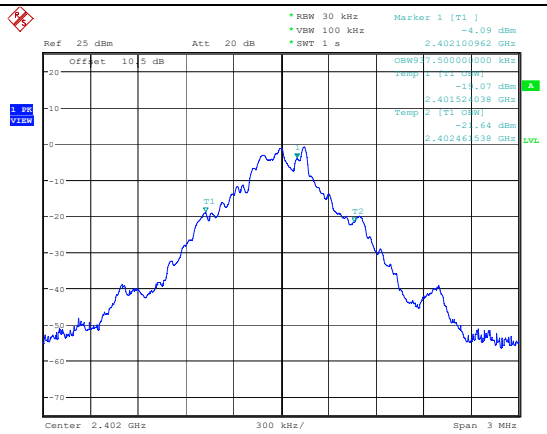
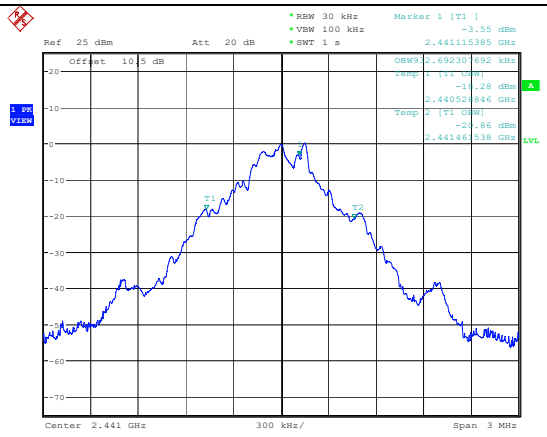
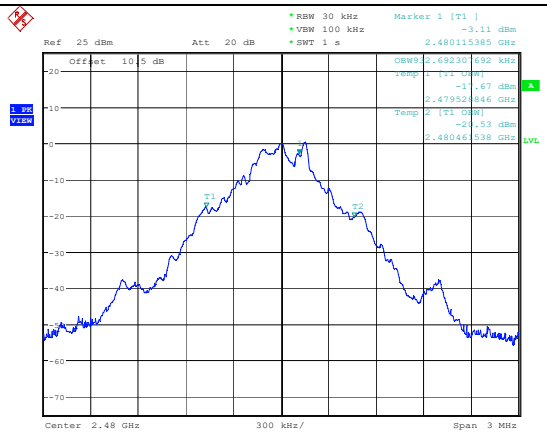
99% Occupied Bandwidth

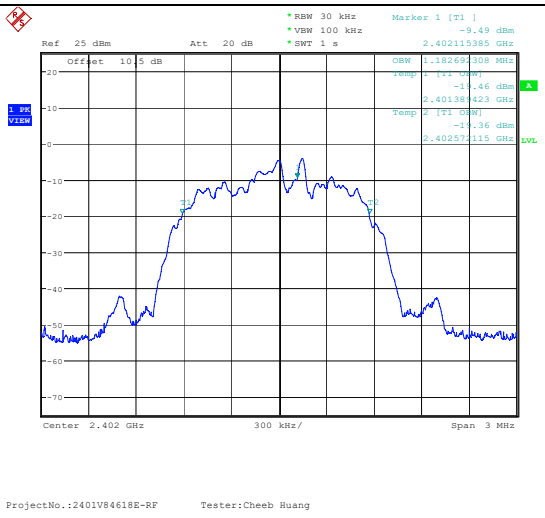
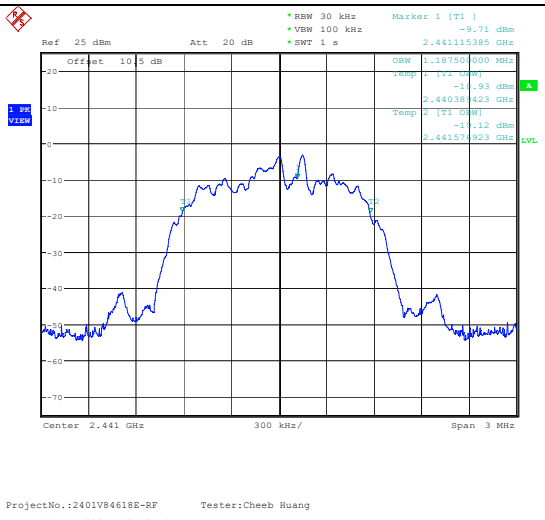
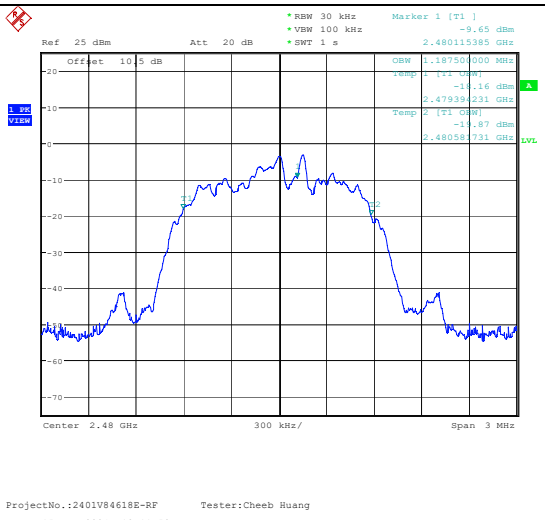
BDR

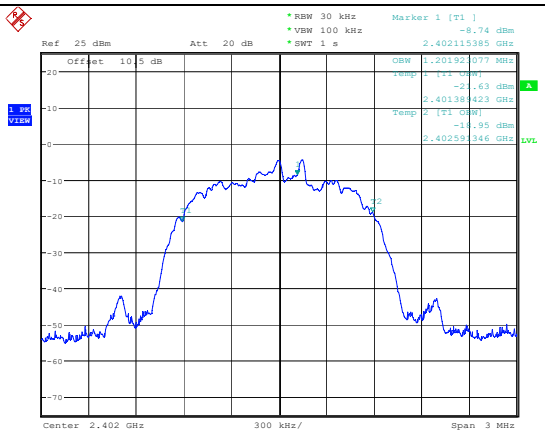
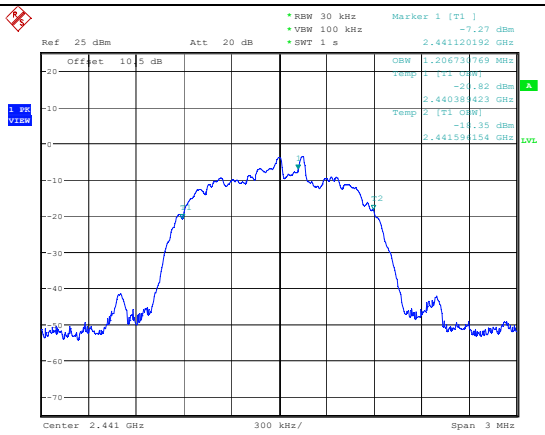
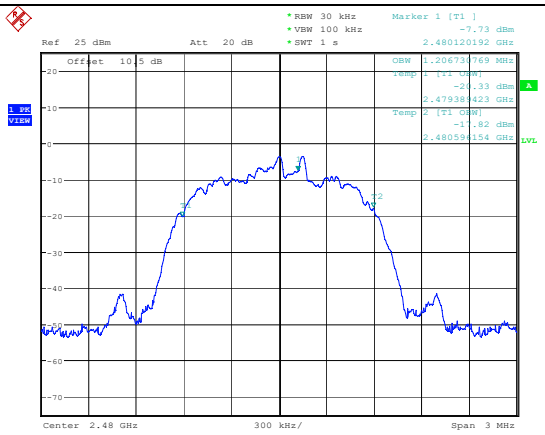
Mode	99% OBW (MHz)
GFSK_Low	**0.938**
GFSK_Middle	**0.933**
GFSK_High	0.933

EDR

Mode	99% OBW (MHz)
π/4-DQPSK_Low	1.183
π/4-DQPSK_Middle	1.188
π/4-DQPSK_High	**1.188**
8DPSK_Low	1.202
8DPSK_Middle	1.207
8DPSK_High	1.207

BDR Mode (GFSK)	
Low Channel	 ProjectNo.:2401V84618E-RF Tester:Cheeb Huang Date: 15.AUG.2024 10:09:30
Middle Channel	 ProjectNo.:2401V84618E-RF Tester:Cheeb Huang Date: 15.AUG.2024 10:10:40
High Channel	 ProjectNo.:2401V84618E-RF Tester:Cheeb Huang Date: 15.AUG.2024 10:11:20

EDR Mode (π/4-DQPSK)	
Low Channel	 ProjectNo.:2401V84618E-RF Tester:Cheeb Huang Date: 15.AUG.2024 10:13:31
Middle Channel	 ProjectNo.:2401V84618E-RF Tester:Cheeb Huang Date: 15.AUG.2024 10:12:45
High Channel	 ProjectNo.:2401V84618E-RF Tester:Cheeb Huang Date: 15.AUG.2024 10:11:52

EDR Mode (8DPSK)	
Low Channel	 ProjectNo.:2401V84618E-RF Tester:Cheeb Huang Date: 15.AUG.2024 10:15:15
Middle Channel	 ProjectNo.:2401V84618E-RF Tester:Cheeb Huang Date: 15.AUG.2024 10:15:51
High Channel	 ProjectNo.:2401V84618E-RF Tester:Cheeb Huang Date: 15.AUG.2024 10:16:35

FCC §15.247(a) (1) (iii) & RSS-247 § 5.1 (d) - QUANTITY OF HOPPING CHANNEL TEST

Applicable Standard

According to FCC §15.247(a) (1) (iii):

Frequency hopping systems in the 2400–2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

According to RSS-247 § 5.1 (d):

Frequency hopping systems (FHSS) operating in the band 2400-2483.5 MHz shall use at least 15 hopping 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. Transmissions on particular hopping frequencies may be avoided or suppressed provided that at least 15 hopping channels are used.

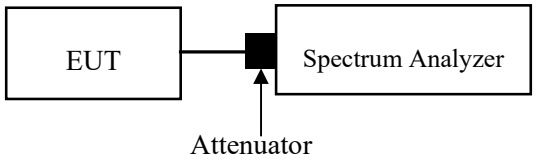
Test Procedure

Test Method: ANSI C63.10-2013 Clause 7.8.3

1. Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.

2. Set the EUT in hopping mode from first channel to last.

3. By using the max-hold function record the quantity of the channel.



Test Data

Environmental Conditions

Temperature:	26 ℃
Relative Humidity:	59 %
ATM Pressure:	101.0 kPa

The testing was performed by Allen Bai on 2024-08-01.

EUT operation mode: Transmitting

Test Result: Compliant.

BDR

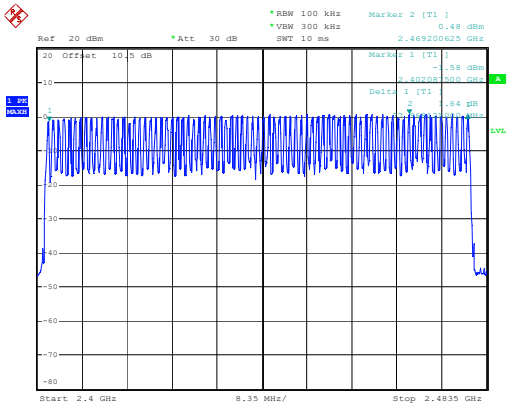
Mode	Value	Limit	Result
GFSK_Hopping	**79**	15	Pass

EDR

Mode	Value	Limit	Result
π/4-DQPSK_Hopping	**79**	15	Pass
8DPSK_Hopping	**79**	15	Pass

BDR

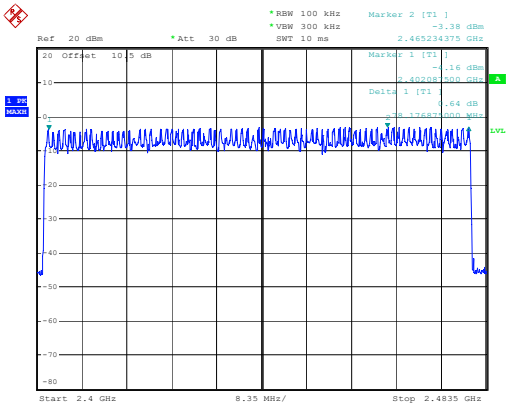
GFSK_Hopping 79



ProjectNo.:2401V84618E-RF Tester:Allen Bai
Date: 1.AUG.2024 22:19:56

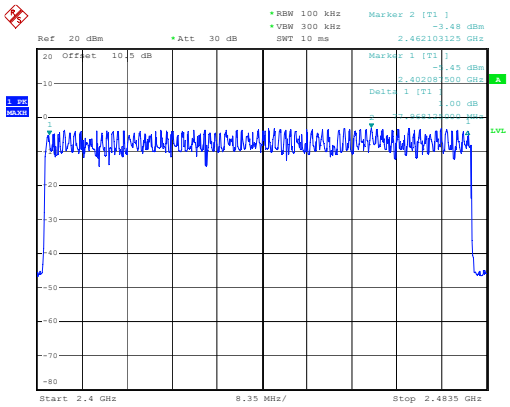
EDR

π/4-DQPSK_Hopping 79



ProjectNo.:2401V84618E-RF Tester:Allen Bai
Date: 1.AUG.2024 22:37:02

8DPSK_Hopping 79



ProjectNo.:2401V84618E-RF Tester:Allen Bai
Date: 1.AUG.2024 22:56:29

FCC §15.247(a) (1) (iii) & RSS-247 § 5.1 (d) - TIME OF OCCUPANCY (DWELL TIME)

Applicable Standard

According to FCC §15.247(a) (1) (iii):

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.

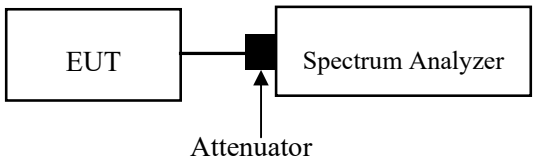
According to RSS-247 § 5.1 (d):

Frequency hopping systems (FHSs) operating in the band 2400-2483.5 MHz shall use at least 15 hopping 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. Transmissions on particular hopping frequencies may be avoided or suppressed provided that at least 15 hopping channels are used.

Test Procedure

Test Method: ANSI C63.10-2013 Clause 7.8.4

1. The EUT was worked in channel hopping.
2. Set the RBW to: 1MHz.
3. Set the VBW ≥ 3×RBW.
4. Set the span to 0Hz.
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Recorded the time of single pulses



Test Data

Environmental Conditions

Temperature:	26 ℃
Relative Humidity:	59 %
ATM Pressure:	101.0 kPa

The testing was performed by Allen Bai on 2024-08-01.

EUT operation mode: Transmitting

Test Result: Compliant.

BDR

Mode	Pulse width (ms)	Dwell time (s)	Limit (s)	Result
GFSK_Hopping_DH1	0.400	0.128	0.400	Pass
GFSK_Hopping_DH3	1.665	0.266	0.400	Pass
GFSK_Hopping_DH5	2.931	0.313	0.400	Pass

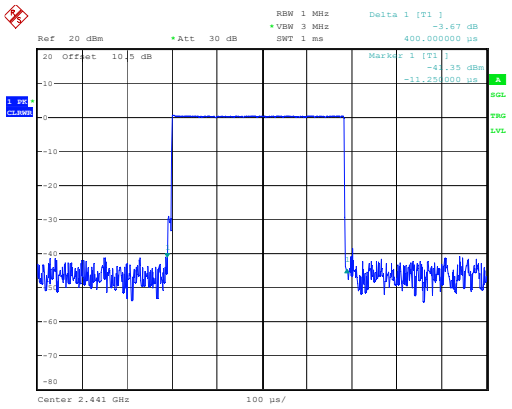
EDR

Mode	Pulse width (ms)	Dwell time (s)	Limit (s)	Result
π/4-DQPSK_Hopping_2DH1	0.405	0.130	0.400	Pass
π/4-DQPSK_Hopping_2DH3	1.665	0.266	0.400	Pass
π/4-DQPSK_Hopping_2DH5	2.938	0.313	0.400	Pass
8DPSK_Hopping_3DH1	0.405	0.130	0.400	Pass
8DPSK_Hopping_3DH3	1.669	0.267	0.400	Pass
8DPSK_Hopping_3DH5	2.938	0.313	0.400	Pass

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

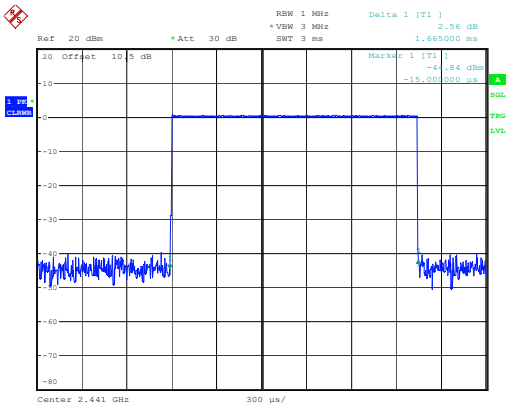
BDR

GFSK_Hopping_DH1 0.400ms



ProjectNo.:2401V84618E-RF Tester:Allen Bai
Date: 1.AUG.2024 23:01:41

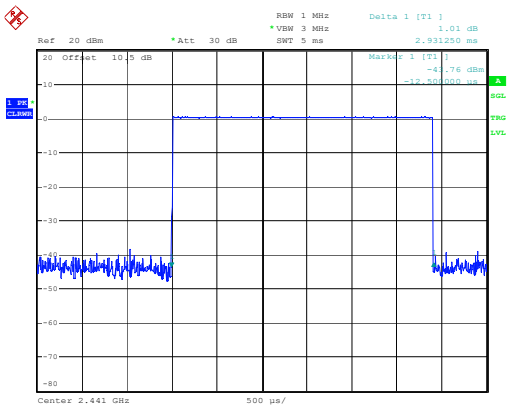
GFSK_Hopping_DH3 1.665ms



ProjectNo.:2401V84618E-RF Tester:Allen Bai
Date: 1.AUG.2024 23:02:26

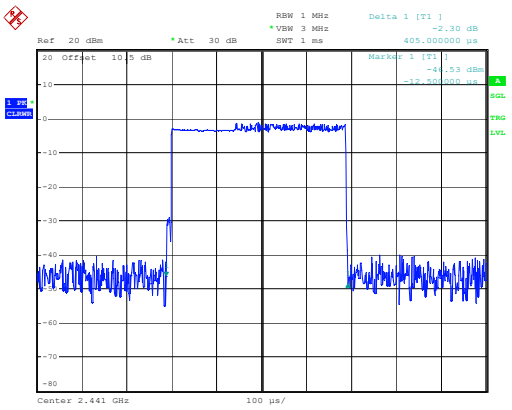
EDR

GFSK_Hopping_DH5 2.931ms



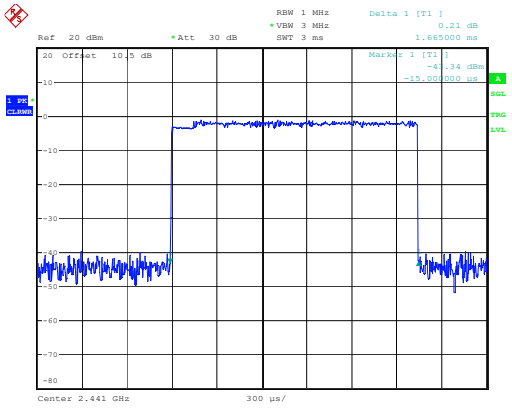
ProjectNo.:2401V84618E-RF Tester:Allen Bai
Date: 1.AUG.2024 23:03:02

π/4-DQPSK_Hopping_2DH1 0.405ms



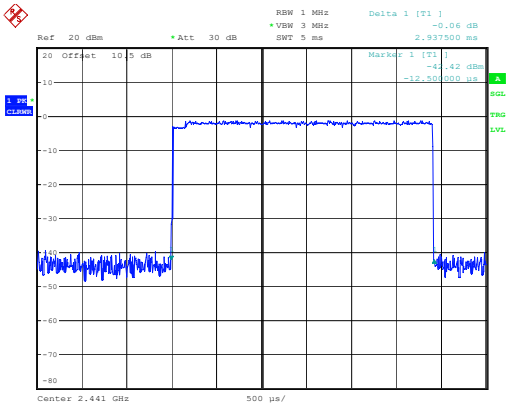
ProjectNo.:2401V84618E-RF Tester:Allen Bai
Date: 1.AUG.2024 23:03:38

π/4-DQPSK_Hopping_2DH3 1.665ms



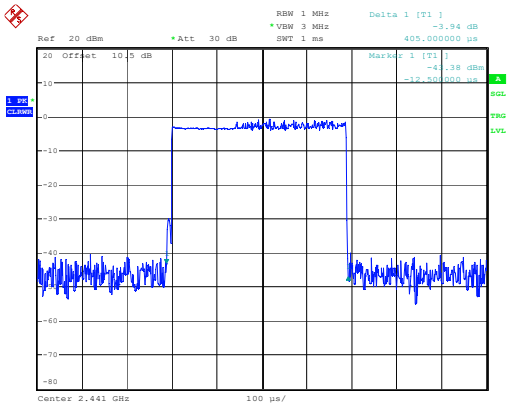
ProjectNo.:2401V84618E-RF Tester:Allen Bai
Date: 1.AUG.2024 23:04:32

π/4-DQPSK_Hopping_2DH5 2.938ms



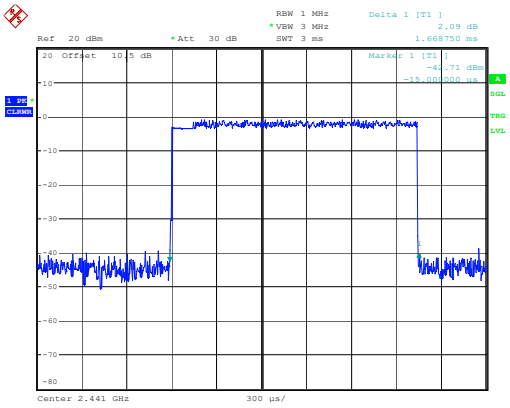
ProjectNo.:2401V84618E-RF Tester:Allen Bai
Date: 1.AUG.2024 23:05:16

8DPSK_Hopping_3DH1 0.405ms



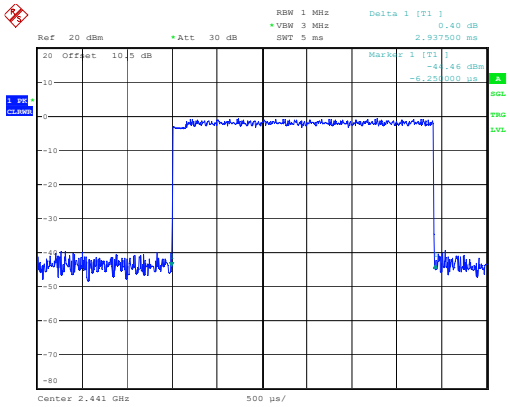
ProjectNo.:2401V84618E-RF Tester:Allen Bai
Date: 1.AUG.2024 23:06:10

8DPSK_Hopping_3DH3 1.669ms



ProjectNo.:2401V84618E-RF Tester:Allen Bai
Date: 1.AUG.2024 23:06:44

8DPSK_Hopping_3DH5 2.938ms



ProjectNo.:2401V84618E-RF Tester:Allen Bai
Date: 1.AUG.2024 23:07:22

FCC §15.247(b) (1) & RSS-247§ 5.1(b) &§ 5.4(b) - PEAK OUTPUT POWER MEASUREMENT

Applicable Standard

According to FCC §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.

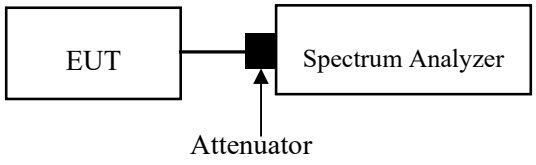
According to RSS-247§ 5.1(b) &§ 5.4(b):

For frequency hopping systems (FHSs) operating in the band 2400-2483.5 MHz, the maximum peak conducted output power shall not exceed 1.0 W if the hopset uses 75 or more hopping channels; the maximum peak conducted output power shall not exceed 0.125 W if the hopset uses less than 75 hopping channels. The e.i.r.p. shall not exceed 4 W (see Section 5.4(e) for exceptions).

Frequency hopping systems (FHSs) shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the -20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, FHSs operating in the band 2400-2483.5 MHz 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 that the systems operate with an output power no greater than 0.125 W.

Test Procedure

Test Method: ANSI C63.10-2013 Clause 7.8.5
1. Place the EUT on a bench and set in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to one test equipment.
3. Add a correction factor to the display.



Test Data

Environmental Conditions

Temperature:	26 ℃
Relative Humidity:	59 %
ATM Pressure:	101.0 kPa

The testing was performed by Allen Bai on 2024-08-01.

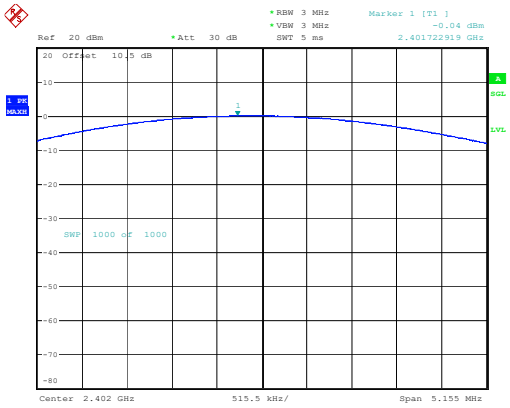
EUT operation mode: Transmitting

Test Result: Compliant.

Mode	Value (dBm)	Limit (dBm)	Result
GFSK_Low	-0.04	21.00	Pass
GFSK_Middle	0.70	21.00	Pass
GFSK_High	**0.86**	21.00	Pass
π/4-DQPSK_Low	-1.41	21.00	Pass
π/4-DQPSK_Middle	-0.76	21.00	Pass
π/4-DQPSK_High	-0.70	21.00	Pass
8DPSK_Low	-0.90	21.00	Pass
8DPSK_Middle	-0.28	21.00	Pass
8DPSK_High	-0.22	21.00	Pass
Max.EIRP(dBm):	1.86		
EIRP Limit for RSS-247:36 dBm			

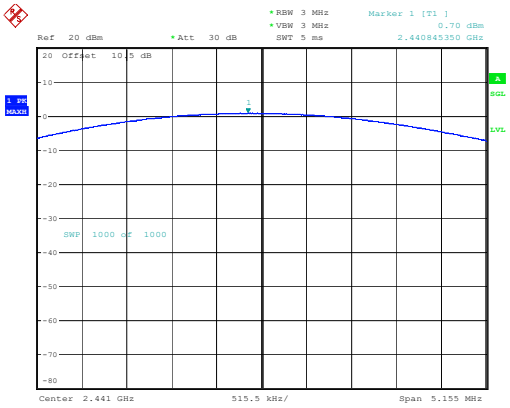
BDR

GFSK_Low -0.04dBm



ProjectNo.:2401V84618E-RF Tester:Allen Bai
Date: 1.AUG.2024 21:56:27

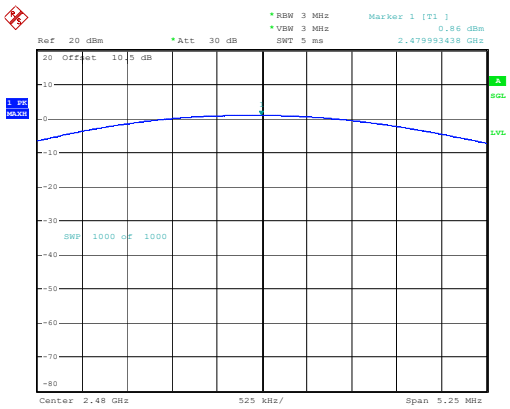
GFSK_Middle 0.70dBm



ProjectNo.:2401V84618E-RF Tester:Allen Bai
Date: 1.AUG.2024 21:57:14

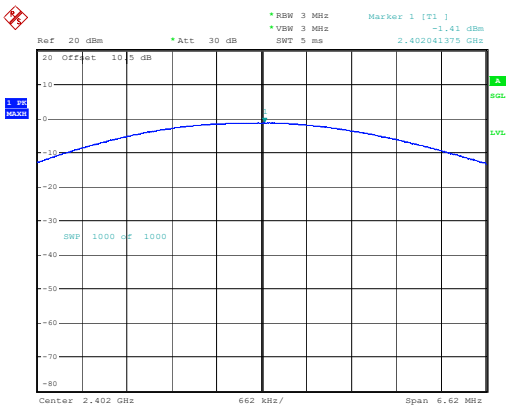
EDR

GFSK_High 0.86dBm



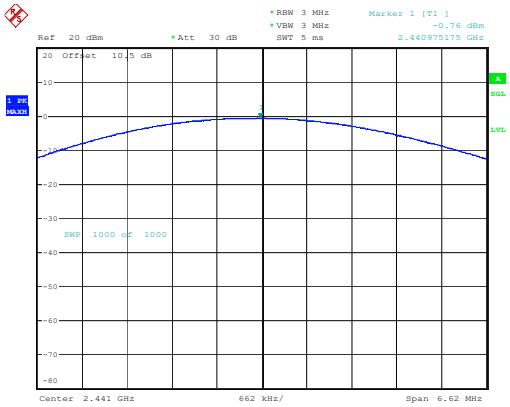
ProjectNo.:2401V84618E-RF Tester:Allen Bai
Date: 1.AUG.2024 21:58:04

π/4-DQPSK_Low -1.41dBm



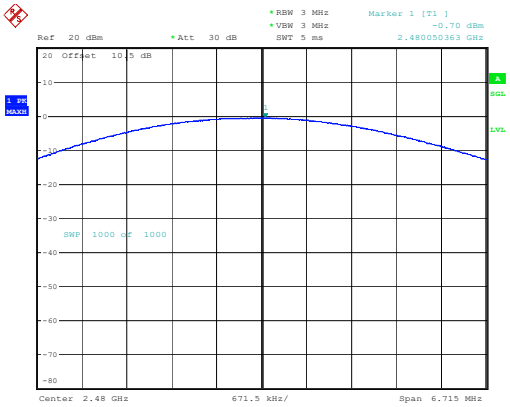
ProjectNo.:2401V84618E-RF Tester:Allen Bai
Date: 1.AUG.2024 21:59:15

π/4-DQPSK_Middle -0.76dBm



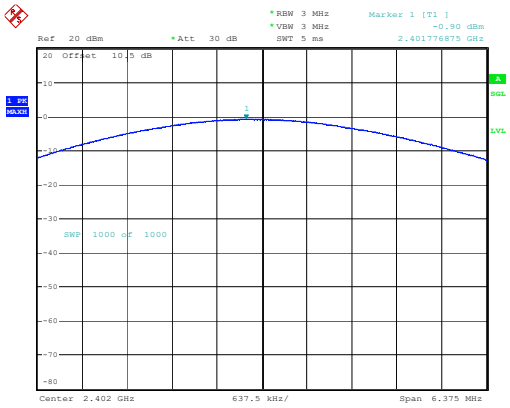
ProjectNo.:2401V84618E-RF Tester:Allen Bai
Date: 1.AUG.2024 22:00:11

π/4-DQPSK_High -0.70dBm



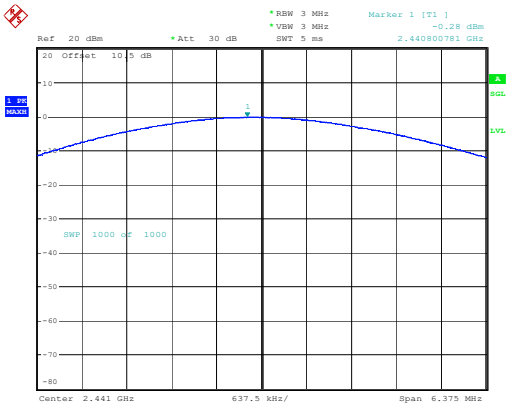
ProjectNo.:2401V84618E-RF Tester:Allen Bai
Date: 1.AUG.2024 22:00:54

8DPSK_Low -0.90dBm



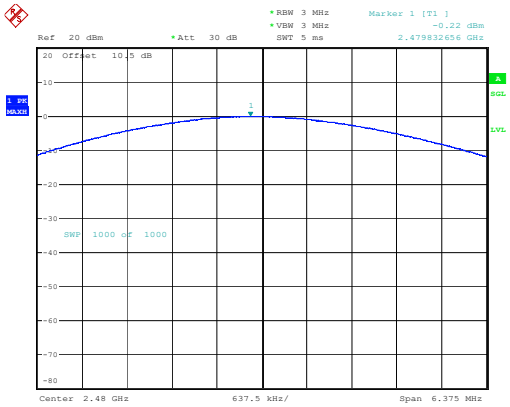
ProjectNo.:2401V84618E-RF Tester:Allen Bai
Date: 1.AUG.2024 22:02:03

8DPSK_Middle -0.28dBm



ProjectNo.:2401V84618E-RF Tester:Allen Bai
Date: 1.AUG.2024 22:02:39

8DPSK_High -0.22dBm



ProjectNo.:2401V84618E-RF Tester:Allen Bai
Date: 1.AUG.2024 22:03:21

FCC §15.247(d) & RSS-247 § 5.5 - BAND EDGES TESTING

Applicable Standard

According to FCC §15.247(d).

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, 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)).

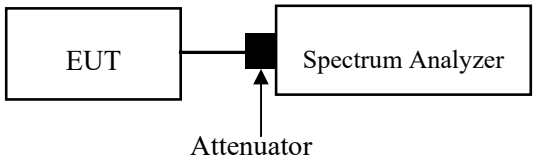
According to RSS-247 § 5.5.

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced 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 that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under Section 5.4(e), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

Test Procedure

Test Method: ANSI C63.10-2013 Clause 7.8.6 & Clause 6.10

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

Environmental Conditions

Temperature:	26 °C
Relative Humidity:	59 %
ATM Pressure:	101.0 kPa

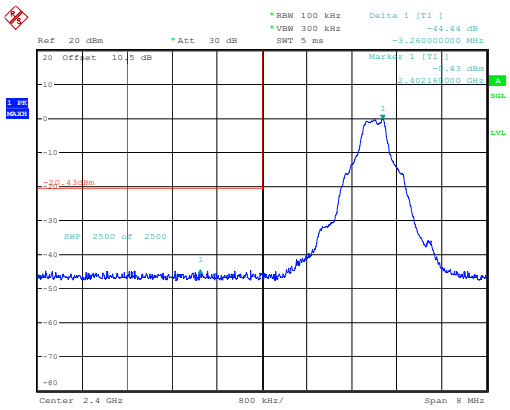
The testing was performed by Allen Bai on 2024-08-01.

EUT operation mode: Transmitting

Test Result: Compliant.

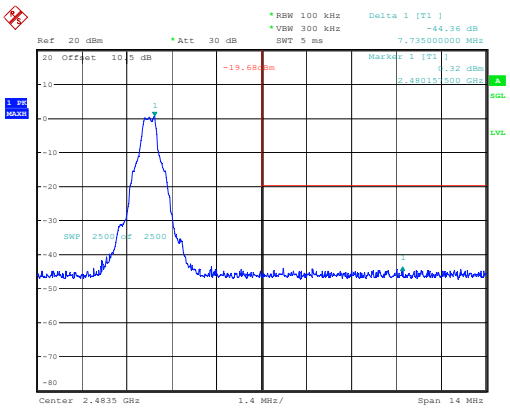
BDR

GFSK_Low



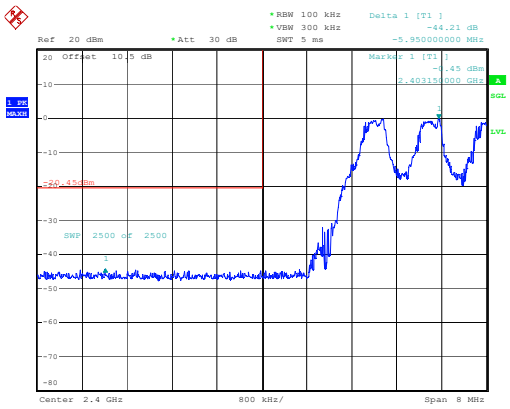
ProjectNo.:2401V84618E-RF Tester:Allen Bai
Date: 1.AUG.2024 22:06:23

GFSK_High



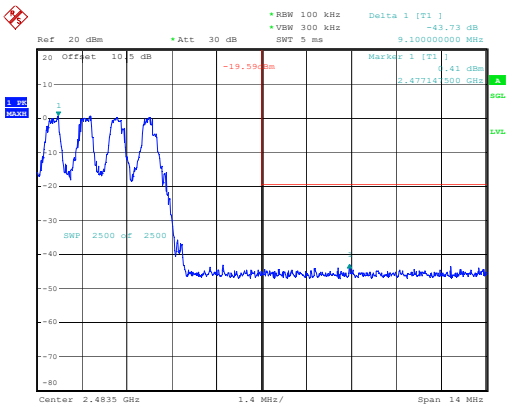
ProjectNo.:2401V84618E-RF Tester:Allen Bai
Date: 1.AUG.2024 22:12:37

GFSK_Hopping_Lower



ProjectNo.:2401V84618E-RF Tester:Allen Bai
Date: 1.AUG.2024 22:15:11

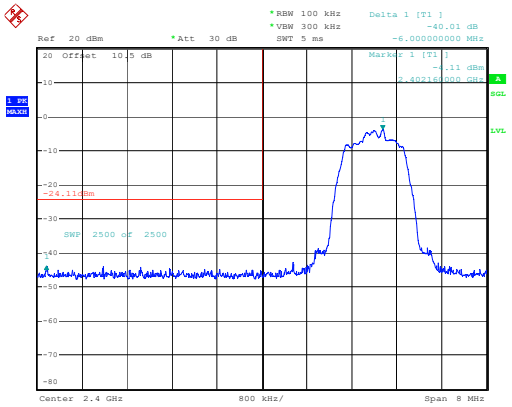
GFSK_Hopping_Upper



ProjectNo.:2401V84618E-RF Tester:Allen Bai
Date: 1.AUG.2024 22:18:02

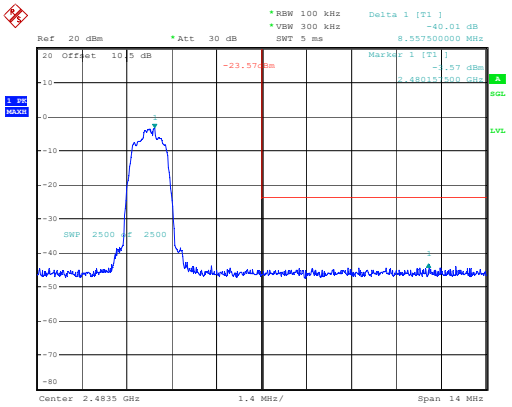
EDR

π/4-DQPSK_Low



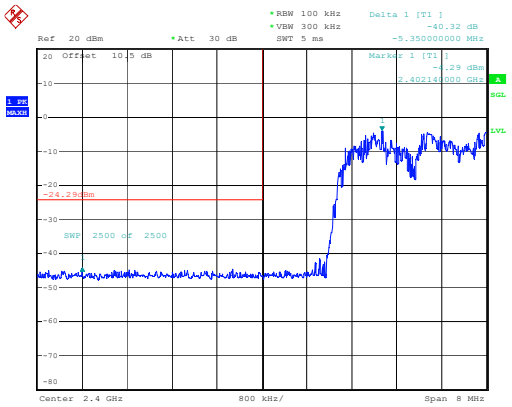
ProjectNo.:2401V84618E-RF Tester:Allen Bai
Date: 1.AUG.2024 22:22:31

π/4-DQPSK_High



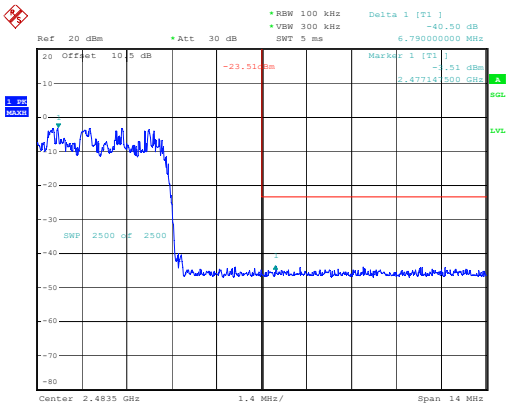
ProjectNo.:2401V84618E-RF Tester:Allen Bai
Date: 1.AUG.2024 22:28:19

π/4-DQPSK_Hopping_Lower



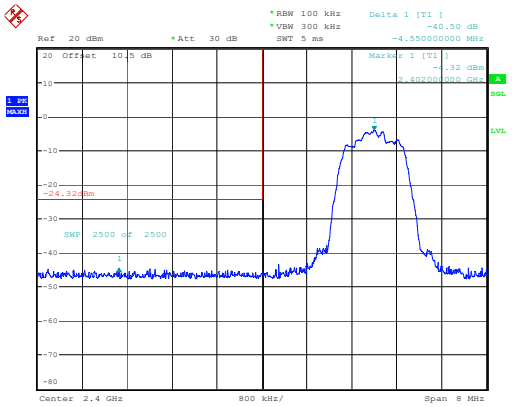
ProjectNo.:2401V84618E-RF Tester:Allen Bai
Date: 1.AUG.2024 22:31:51

π/4-DQPSK_Hopping_Upper



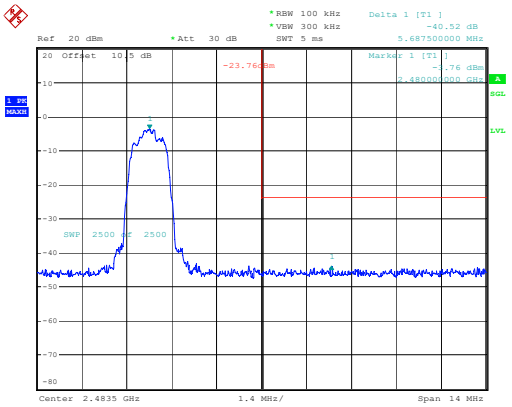
ProjectNo.:2401V84618E-RF Tester:Allen Bai
Date: 1.AUG.2024 22:34:45

8DPSK_Low



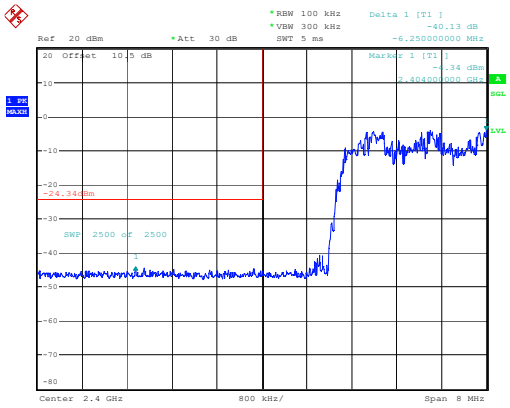
ProjectNo.:2401V84618E-RF Tester:Allen Bai
Date: 1.AUG.2024 22:39:33

8DPSK_High



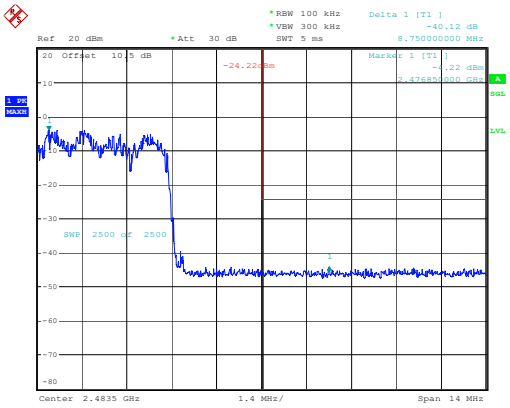
ProjectNo.:2401V84618E-RF Tester:Allen Bai
Date: 1.AUG.2024 22:45:20

8DPSK_Hopping_Lower



ProjectNo.:2401V84618E-RF Tester:Allen Bai
Date: 1.AUG.2024 22:51:36

8DPSK_Hopping_Upper



ProjectNo.:2401V84618E-RF Tester:Allen Bai
Date: 1.AUG.2024 22:54:51

EUT PHOTOGRAPHS

Please refer to the attachment 2401V84618E-RF External photo and 2401V84618E-RF Internal photo.

TEST SETUP PHOTOGRAPHS

Please refer to the attachment 2401V84618E-RF Test Setup photo.

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