FCC PART 15.247
TEST REPORT

For

SingularXYZ Intelligent Technology Ltd.

Floor 2, Building A, No. 599 Gaojing Road, Shanghai, China

FCC ID: 2A4O3-X1

Report Type:	**Product Name:**
Original Report	GNSS Receiver

Report Number:	RKSA240425001-00B
Report Date:	2024-11-01
Reviewed By:	Bard Liu
Approved By:	Kyle Xu
Prepared By:	Bay Area Compliance Laboratories Corp. (Kunshan) No.248 Chenghu Road, Kunshan, Jiangsu Province, China Tel: +86-512-86175000 Fax: +86-512-88934268 www.baclcorp.com.cn

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REPORT REVISION HISTORY

Number of Revisions	Report No.	Version	Issue Date	Description
0	RKSA240425001-00B	R1V1	2024-11-01	Initial Release

GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

Applicant:	SingularXYZ Intelligent Technology Ltd.
Product Name:	GNSS Receiver
Tested Model	X1
Series Model:	X1 Lite, X1 Pro, E1, E1 Plus, E1 Pro
Model Difference:	SIM card slot, top cover, model name, see the declaration letter for details
Power Supply:	DC 5~12V from type C port or DC 9V~28V from external power supply or DC 7.2V from battery
RF Function:	Classic BT
Operating Band/Frequency:	2402-2480 MHz
Maximum Output Power:	GFSK: -4.21 dBm π/4-DQPSK: -2.35 dBm 8DPSK: -1.90 dBm
Channel Number:	79
Channel Separation:	1 MHz
Modulation Type:	GFSK, π/4-DQPSK, 8DPSK
Antenna Type:	Patch antenna
★Maximum Antenna Gain:	0.1 dBi

Note: 1.The maximum antenna gain was declared by the manufacturer.
2. Pre-scan powered by type c port and RS232 port, only the worst case powered by type C port was record.

All measurement and test data in this report was gathered from production sample serial number: RKSA240425001-1（X1 for full test）, RKSA240425001-1 (X1 Lite for Spot check the output power and Radiated Emissions below 1GHz) (Assigned by the BACL (Kunshan). The EUT supplied by the applicant was received on 2024-04-25.)

Objective

This test report is prepared for *SingularXYZ Intelligent Technology Ltd.* 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 C63.10-2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices and 558074 D01 15.247 Meas Guidance v05r02.

Measurement Uncertainty

Item		Uncertainty
AC Power Lines Conducted Emissions		3.19dB
RF conducted test with spectrum		0.9dB
RF Output Power with Power meter		0.5dB
Radiated emission	9 kHz~150 kHz	3.8dB
	150 kHz~30 MHz	3.4dB
	30MHz~1GHz	6.11dB
	1GHz~6GHz	4.45dB
	6GHz~18GHz	5.23dB
	18GHz~40GHz	5.65dB
Occupied Bandwidth		0.5kHz
Temperature		1.0℃
Humidity		6%

Test Facility

The Test site used by Bay Area Compliance Laboratories Corp. (Kunshan) to collect test data is located on the No.248 Chenghu Road, Kunshan, Jiangsu Province, China.

Bay Area Compliance Laboratories Corp. (Kunshan) is accredited in accordance with ISO/IEC 17025:2017 by NVLAP (Lab code: 600338-0), and the lab has been recognized as the FCC accredited lab under the KDB 974614 D01, the FCC Designation No. : CN5055.

SYSTEM TEST CONFIGURATION

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: ESP32

★Power level: Default

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

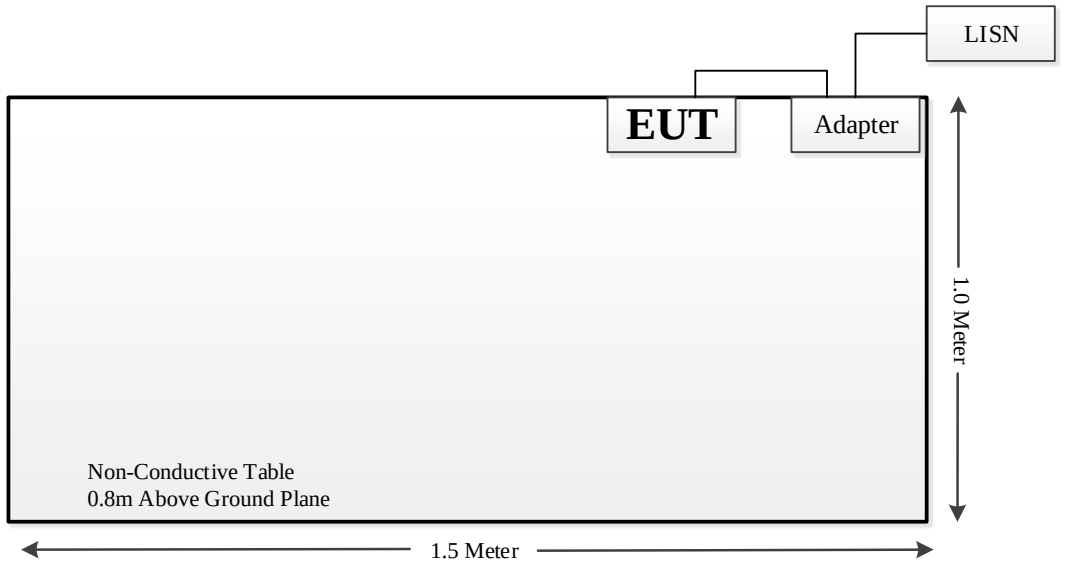
Manufacturer	Description	Model	Serial Number
Power on Tools Co.,Ltd.	Adapter	DA-00052000UL001	Unknown

External I/O Cable

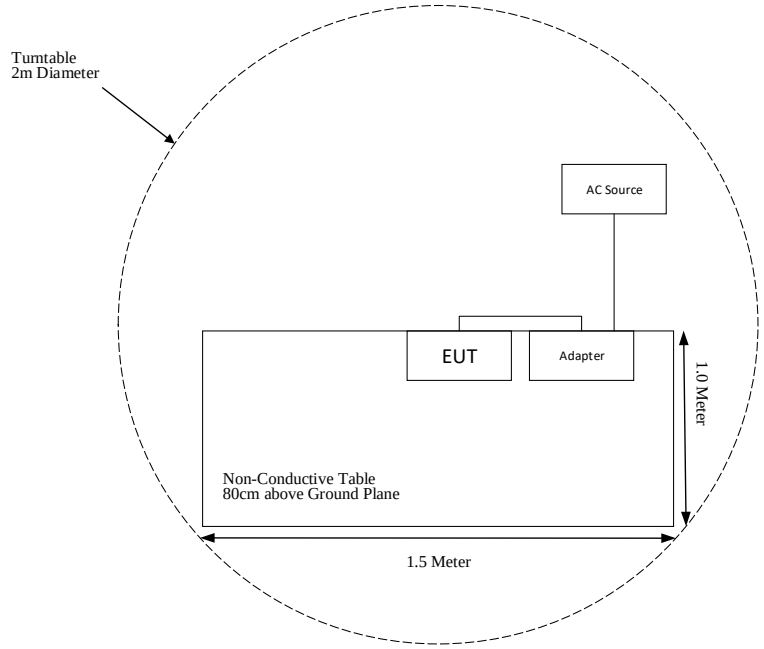
Cable Description	Length (m)	From Port	To
Power Cable 1	1.0	AC Source/LISN	Adapter
Power Cable 2	1.5	Adapter	EUT

Block Diagram of Test Setup

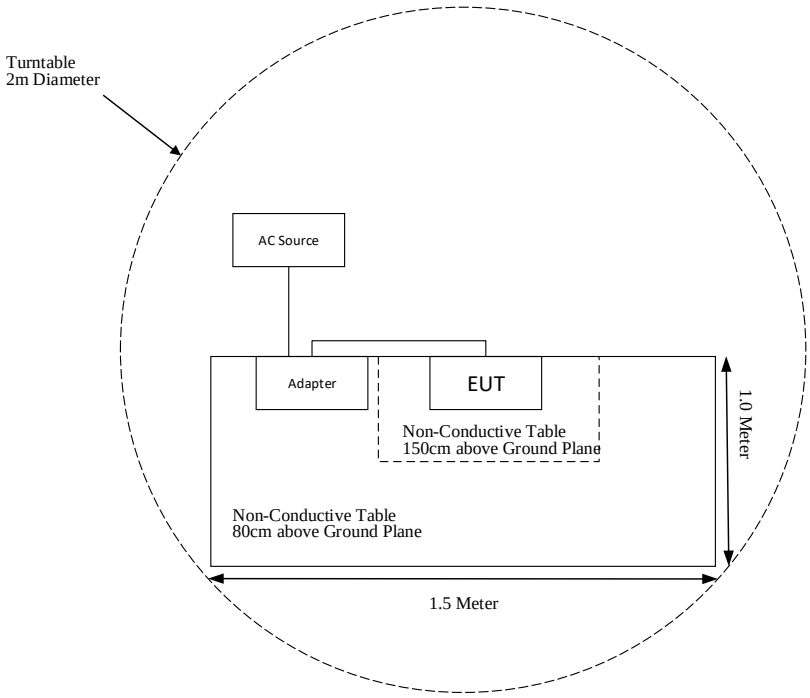
For Conducted Emissions:



For Radiated Emissions(Below 1GHz):



For Radiated Emissions(Above 1GHz):



TEST EQUIPMENT LIST

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Radiated Emission Test (Chamber #1)					
Rohde & Schwarz	EMI Test Receiver	ESCI	100195	2024-04-23	2025-04-22
Sunol Sciences	Hybrid Antenna	JB3	A090314-1	2023-11-11	2024-11-10
ETS-LINDGREN	Loop Antenna	6512	108100	2023-11-09	2024-11-08
Narda	6dB Attenuator	773-6	10690812-2-1	2023-11-11	2024-11-10
Sonoma Instrument	Amplifier	310N	171205	2024-04-23	2025-04-22
MICRO-COAX	Coaxial Cable	Cable-8	008	2024-04-23	2025-04-22
MICRO-COAX	Coaxial Cable	Cable-9	009	2024-04-23	2025-04-22
MICRO-COAX	Coaxial Cable	Cable-10	010	2024-04-23	2025-04-22
Radiated Emission Test (Chamber #2)					
Rohde & Schwarz	EMI Test Receiver	ESU40	100207	2024-04-25	2025-04-24
ETS-LINDGREN	Horn Antenna	3115	9207-3900	2024-06-27	2025-06-26
ETS-LINDGREN	Horn Antenna	3116	2516	2023-12-08	2024-12-07
A.H.Systems, inc	Amplifier	PAM-0118P（2641-1）	512	2024-04-25	2025-04-24
EM Electronics Corporation	Amplifier	EM18G40G	060726	2024-04-25	2025-04-24
MICRO-TRONICS	Band Reject Filter	BRM50702	G024	2024-04-25	2025-04-24
Narda	Attenuator	20dB	020	2024-04-25	2025-04-24
Rohde & Schwarz	Auto Test Software	EMC32	100361	N/A	N/A
MICRO-COAX	Coaxial Cable	Cable-6	006	2024-04-23	2025-04-22
MICRO-COAX	Coaxial Cable	Cable-11	011	2024-04-25	2025-04-24
MICRO-COAX	Coaxial Cable	Cable-12	012	2024-04-25	2025-04-24
MICRO-COAX	Coaxial Cable	Cable-13	013	2024-04-25	2025-04-24
RF Conducted Test					
Rohde & Schwarz	Spectrum Analyzer	FSU26	200103	2024-04-24	2025-04-23
Narda	Attenuator	10dB	N/A	2024-04-23	2025-04-22
Conducted Emission Test					
Rohde & Schwarz	EMI Test Receiver	ESR	101746	2024-04-23	2025-04-22
Rohde & Schwarz	LISN	ENV216	101115	2024-04-23	2025-04-22
Audix	Test Software	e3	V9	N/A	N/A
Rohde & Schwarz	Pulse Limiter	ESH3-Z2	0357.8810.54	2024-04-23	2025-04-22
MICRO-COAX	Coaxial Cable	Cable-15	015	2024-04-23	2025-04-22

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

SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§1.1310 & §2.1091	MAXIMUM PERMISSIBLE EXPOSURE (MPE)	Compliant
§15.203	Antenna Requirement	Compliant
§15.207(a)	AC Line Conducted Emissions	Compliant
§15.205, §15.209 & §15.247(d)	Radiated Emissions & Band Edge Emissions	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

FCC §1.1310 & §2.1091 - MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Applicable Standard

According to subpart §2.1091 and subpart §1.1310, systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.

Limits for Maximum Permissible Exposure (MPE) (§1.1310, §2.1091)

Limits for Occupational/Controlled Exposure				
Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/cm^2)	Averaging Time |E|, |H| or S (minutes)
0.3- 3.0	614	1.63	(100)*	6
3.0 - 30	1842/f	4.89/f	($900/f^2$)*	6
30-300	61.4	0.163	1.0	6
300-1500	/	/	f/300	6
1500-100,000	/	/	5	6

Limits for General Population/Uncontrolled Exposure				
Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm^2)	Averaging Time (minutes)
0.3-1.34	614	1.63	*(100)	30
1.34-30	824/f	2.19/f	*($180/f^2$)	30
30-300	27.5	0.073	0.2	30
300-1500	/	/	f/1500	30
1500-100,000	/	/	1.0	30

f = frequency in MHz; * = Plane-wave equivalent power density;

According to §1.1310 and §2.1091 RF exposure is calculated.

Calculated Formulary

Predication of MPE limit at a given distance
$S = PG/4\pi R^2$ = power density (in appropriate units, e.g. mW/cm^2);
P = power input to the antenna (in appropriate units, e.g., mW);
G = power gain of the antenna in the direction of interest relative to an isotropic radiator, the power gain factor, is normally numeric gain;
R = distance to the center of radiation of the antenna (appropriate units, e.g., cm);

$$\sum_i \frac{S_i}{S_{Limit,i}} \leq 1$$

Calculated Data:

General Population/Uncontrolled

Mode	Frequency Range (MHz)	Antenna Gain		★Tune-up Output Power		Evaluation Distance (cm)	Power Density (mW/cm^2)	MPE Limit (mW/cm^2)	MPE ratio
		(dBi)	(numeric)	(dBm)	(mW)				
Classic BT	2402-2480	0.1	1.02	-1.5	0.71	20	0.0001	1.0	0.0001
2.4G Wi-Fi	2412-2462	1.34	1.36	10.5	11.22	20	0.0030	1.0	0.0030
GSM 850	824-849	-6.24	0.24	25.81	381.07	20	0.0182	0.55	0.0331
PCS 900	1850-1910	-2.95	0.51	22.81	190.99	20	0.0194	1.0	0.0194
WCDMA band 2	1850-1910	-2.95	0.51	25.00	316.23	20	0.0321	1.0	0.0321
WCDMA band 4	1710-1755	-5.48	0.28	25.00	316.23	20	0.0176	1.0	0.0176
WCDMA band 5	824-849	-6.24	0.24	25.00	316.23	20	0.0150	0.55	0.0273
LTE Band 2	1850-1910	-2.95	0.51	25.00	316.23	20	0.0321	1.0	0.0321
LTE Band 4	1710-1755	-5.48	0.28	25.00	316.23	20	0.0176	1.0	0.0176
LTE Band 5	824-849	-6.24	0.24	25.00	316.23	20	0.0150	0.55	0.0273
LTE Band 7	2500-2570	-4.89	0.32	25.00	316.23	20	0.0201	1.0	0.0201
LTE Band 12	699-716	-15.37	0.03	25.00	316.23	20	0.0018	0.47	0.0038
LTE Band 13	777-787	-10.27	0.09	25.00	316.23	20	0.0059	0.52	0.0113
LTE Band 25	1850-1915	-2.95	0.51	25.00	316.23	20	0.0321	1.0	0.0321
LTE Band 26	814-849	-6.24	0.24	25.00	316.23	20	0.0150	0.54	0.028
LTE Band 38	2570-2620	-6.40	0.23	25.00	316.23	20	0.0145	1.0	0.0145
LTE Band 41	2496-2690	-2.62	0.55	25.00	316.23	20	0.0346	1.0	0.0346

Occupational/Controlled

Mode	Frequency Range (MHz)	Antenna Gain		★Tune-up Output Power		Evaluation Distance (cm)	Power Density (mW/cm^2)	MPE Limit (mW/cm^2)	MPE ratio
		(dBi)	(numeric)	(dBm)	(mW)				
UHF	410-470	-3.33	0.46	30.5	1122.02	20	0.1027	1.3667	0.0751

Note:
1. For the above tune up power were declared by the manufacturer.
2. The WWAN module FCC ID: XMR201903EG25G (Grant on: 03/29/2019).
3. 2.4G Wi-Fi/BT, WWAN and UHF can transmit simultaneously; the worst condition as below:

$$\sum_i \frac{S_i}{S_{Limit,i}}$$ =0.0030+0.0346+0.0751=0.1127< 1.0

Result: The device meet FCC MPE at 20 cm distance.

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.

Antenna Connector Construction

The EUT has a patch antenna for Bluetooth, and the antenna gain is 0.1 dBi, which is permanently attached to the unit, fulfill the requirement of this section. Please refer to the EUT photos.

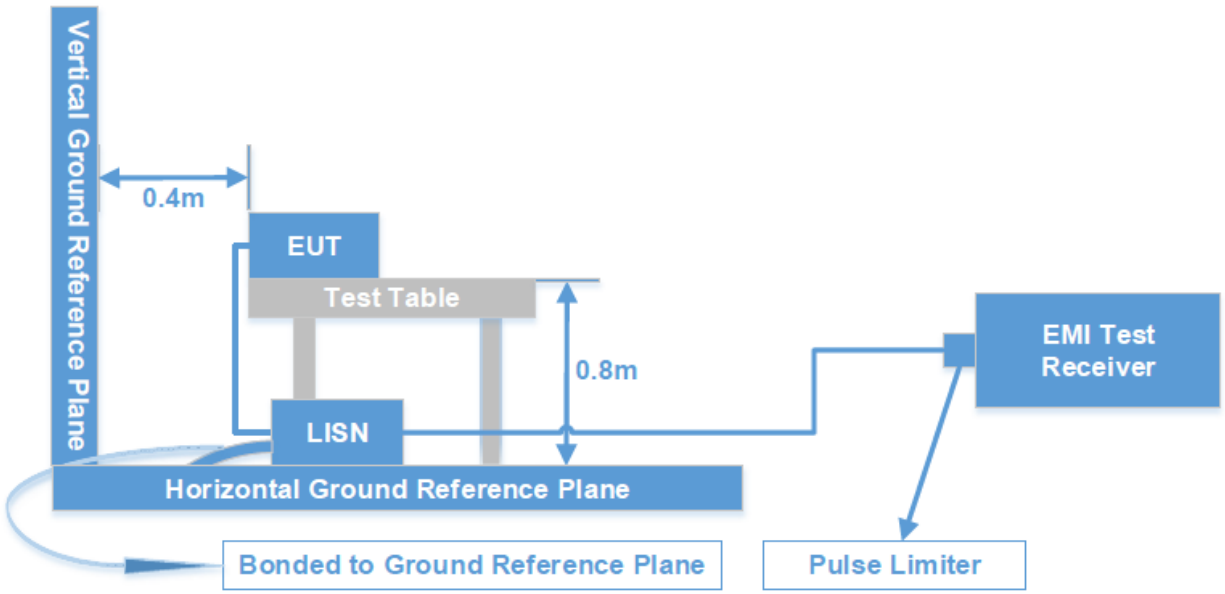
Result: Compliant.

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 C63.10-2013. 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
150 kHz - 30 MHz	9 kHz	30 kHz

Test Procedure

ANSI C63.10-2013 clause 6.2

During the conducted emission test, the EUT or 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 & Over Limit 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) = Read level (dBμV) + Factor (dB)

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

Over Limit (dB) = Level (dBμV) - Limit (dBμV)

Test Results Summary

According to the recorded data in following table, the EUT complied with the FCC Part 15.207.

Test Data: See Appendix

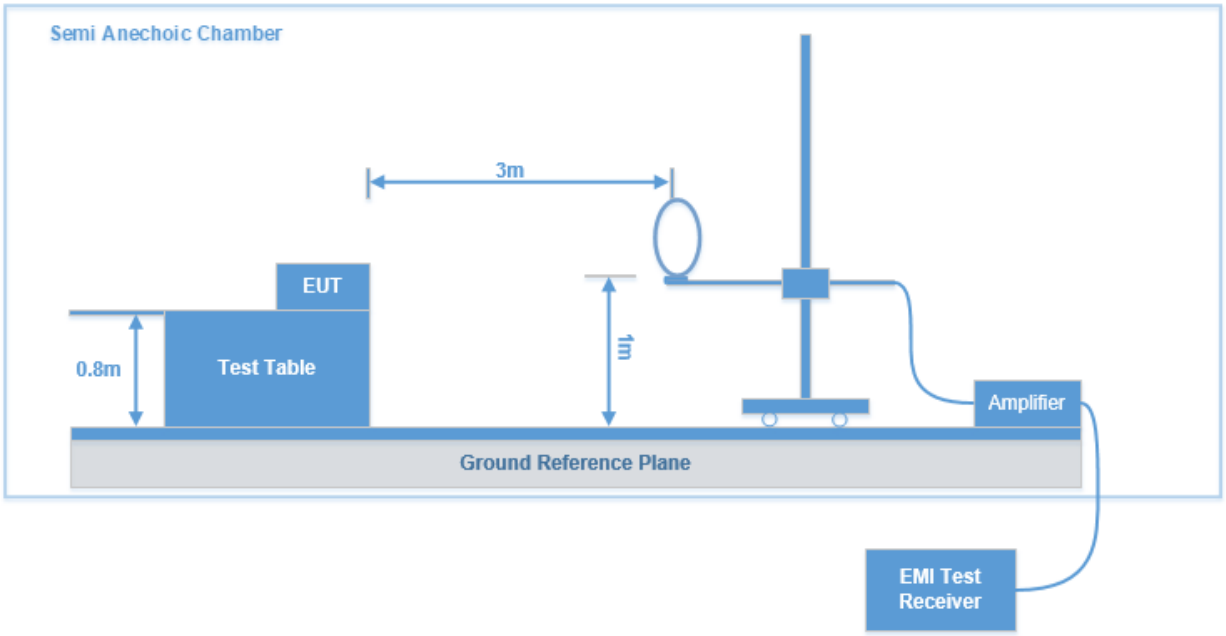
FCC §15.205, §15.209 & §15.247(d) – RADIATED EMISSIONS

Applicable Standard

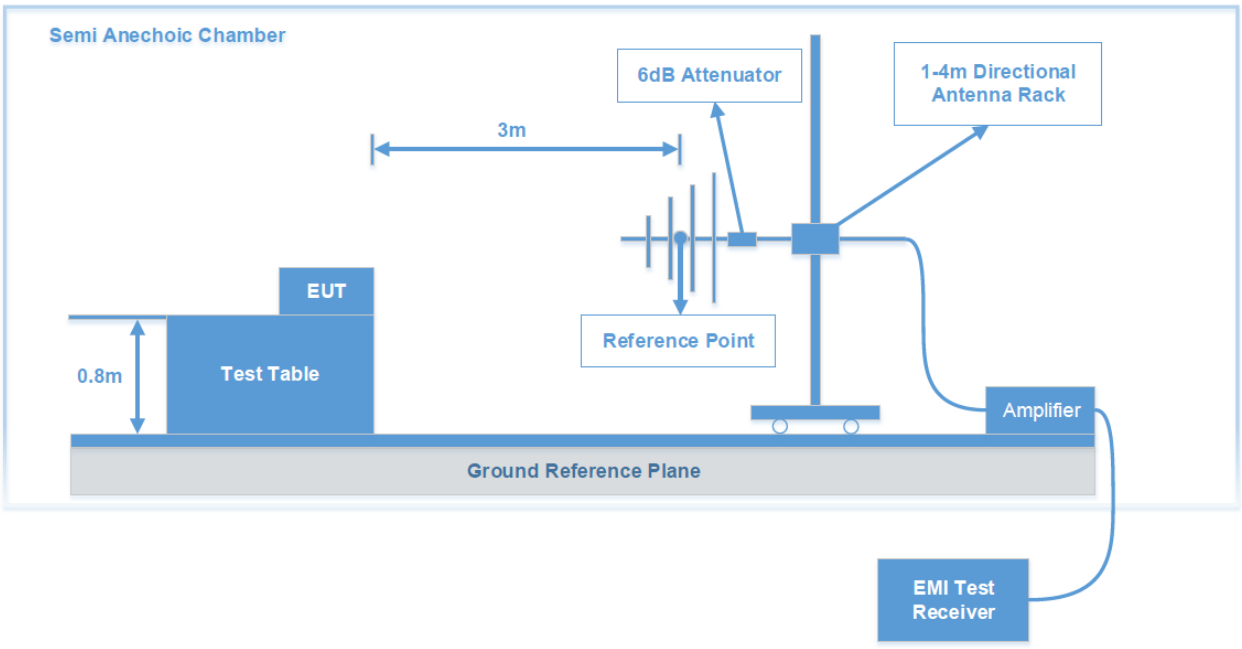
FCC §15.205; §15.209; §15.247(d)

Test System Setup

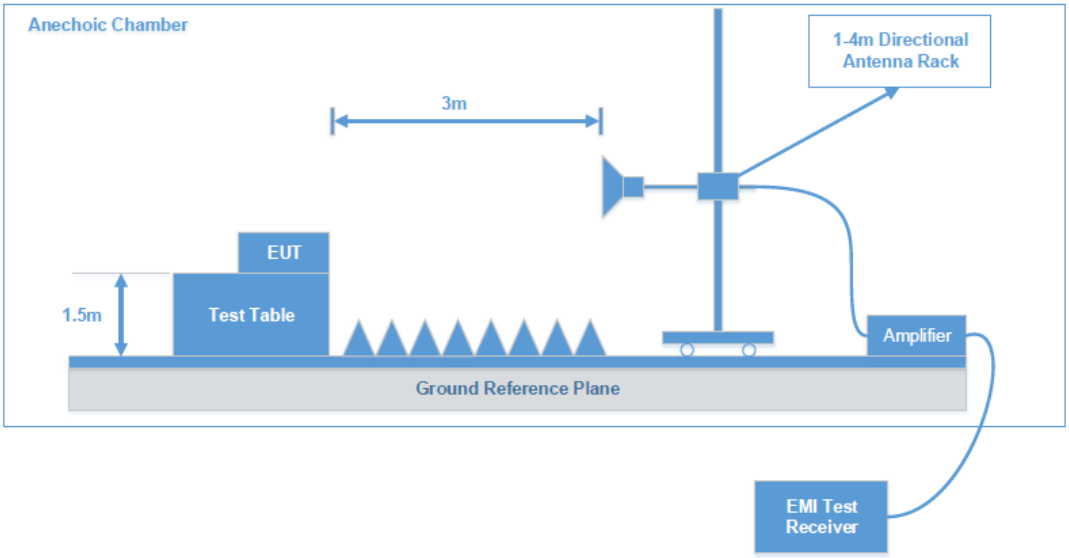
9 kHz - 30 MHz:



30 MHz - 1 GHz:



Above 1GHz:



The radiated emission tests were performed in the 3 meters, using the setup accordance with the ANSI C63.10-2013. 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	Detector
9 kHz – 150 kHz	200 Hz	1 kHz	200 Hz	QP/Average
150 kHz – 30 MHz	9 kHz	30 kHz	9 kHz	QP/ Average
30 MHz – 1000 MHz	100 kHz	300 kHz	/	Peak
	/	/	120 kHz	QP
Above 1GHz	1MHz	3 MHz	/	Peak
	1MHz	3 MHz	/	Average

Test Procedure

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

If the measured peak level of the emissions that the measuring receiver reading level plus corrected factor is at least 6 dB below the QP emission limit, there's no need to record the measured QP level of the emissions in the report.

For 9 kHz-30MHz test, the lowest height of the magnetic antenna shall be 1 m above the ground and three antenna orientations (parallel, perpendicular, and ground-parallel) shall be measured.

Corrected Amplitude & Margin Calculation

The Corrected Amplitude 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:

Corrected Amplitude (dBμV/m) = Meter Reading (dBμV) + Antenna Factor (dB/m) + Cable Loss (dB) - Amplifier Gain (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/m) – Corrected Amplitude (dBμV/m)

Note: The QuasiPeak (dBμV/m), MaxPeak (dBμV/m), Average (dBμV/m) which shown in the data table are all Corrected Amplitude.

Test Results Summary

According to the recorded data in following table, the EUT complied with the FCC Title 47, Part 15, Subpart C, section 15.205, 15.209 and 15.247.

Test Data: See Appendix

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

Applicable Standard

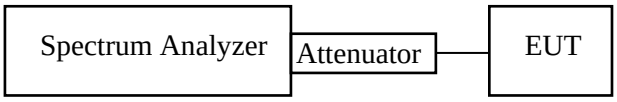
Frequency hopping systems shall have hoping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that 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.

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 Datd: See Appendix

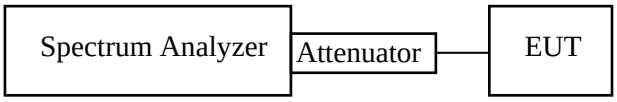
FCC §15.247(a) (1) – 20 dB EMISSION BANDWIDTH

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.

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 Datd: See Appendix

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

Applicable Standard

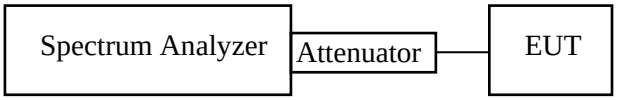
Frequency hopping systems in the 2400–2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress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

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 Datd: See Appendix

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

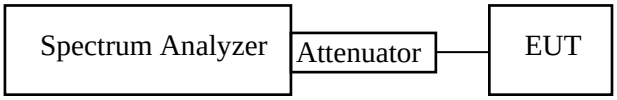
Applicable Standard

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.

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 Datd: See Appendix

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

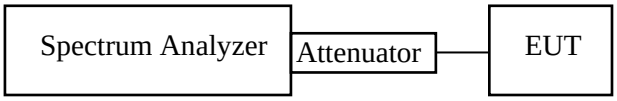
Applicable Standard

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.

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 Datd: See Appendix

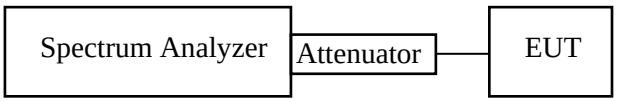
FCC §15.247(d) - BAND EDGES TESTING

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)).

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 Datd: See Appendix

EUT PHOTOGRAPHS

Please refer to the attachment EXHIBIT A - EUT EXTERNAL PHOTOGRAPHS and EXHIBIT B - EUT INTERNAL PHOTOGRAPHS.

TEST SETUP PHOTOGRAPHS

Please refer to the attachment EXHIBIT C - TEST SETUP PHOTOGRAPHS.

APPENDIX - TEST DATA

Environmental Conditions & Test Information

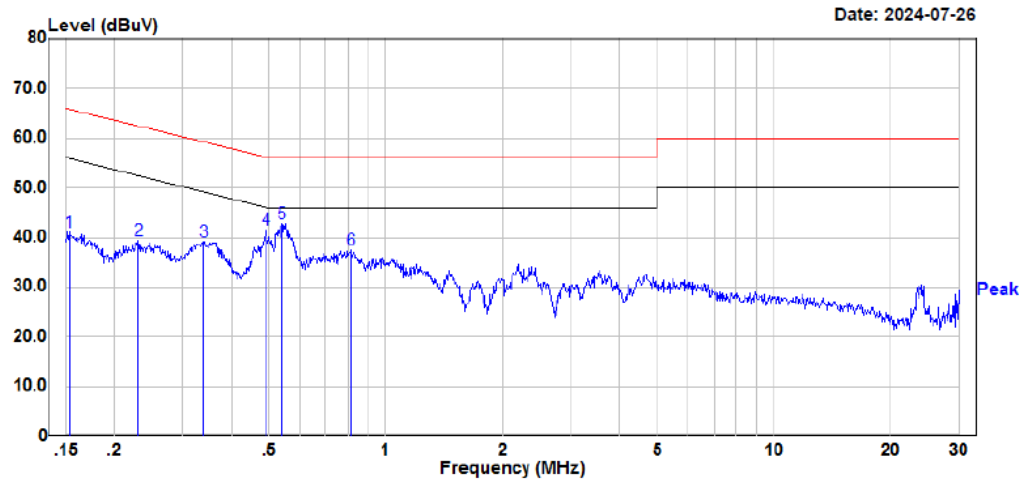
Test Item:	AC LINE CONDUCTED EMISSIONS	RADIATED EMISSIONS			CHANNEL SEPARATION TEST
		9kHz - 1GHz	1 GHz - 18 GHz	18 GHz - 25 GHz	
Test Date:	2024-07-26	2024-07-30 to 2024-10-31	2024-07-31	2024-07-23	2024-06-21
Temperature:	24.7 ℃	20.5-25.2 ℃	24.9 ℃	25.3 ℃	22.5 ℃
Relative Humidity:	46 %	56-64 %	58 %	58 %	52 %
ATM Pressure:	99.9 kPa	100.8-102.0 kPa	100.3 kPa	100.4 kPa	100.8 kPa
Test Result:	Pass	Pass	Pass	Pass	Pass
Test Engineer:	Hardy Huang	Grace Luo &Jerry Yan	Klein Zhu	Hugh Wu	Bard Liu

Test Item:	20 DB BANDWIDTH TEST	OCCUPIED BANDWIDTH	Quantity Of Hopping Channel Test	Time Of Occupancy (Dwell Time)	PEAK OUTPUT POWER MEASUREMENT	BAND EDGES TESTING
Test Date:	2024-06-21	2024-06-21	2024-06-21	2024-06-21 to 2024-10-25	2024-06-21 to 2024-10-23	2024-06-21
Temperature:	22.5 ℃	22.5 ℃	22.5 ℃	22.5-22.7 ℃	22.3-26.1 ℃	22.5 ℃
Relative Humidity:	52 %	52 %	52 %	52-56 %	52-59 %	52 %
ATM Pressure:	100.8 kPa	100.8 kPa	100.8 kPa	100.8-101.9 kPa	100.4-101.8 kPa	100.8 kPa
Test Result:	Pass	Pass	Pass	Pass	Pass	Pass
Test Engineer:	Bard Liu	Bard Liu	Bard Liu	Bard Liu	Bard Liu & Neil Zhou	Bard Liu

AC LINE CONDUCTED EMISSIONS

EUT operation mode: Transmitting in 8DPSK Mode low channel (maximum output power mode)

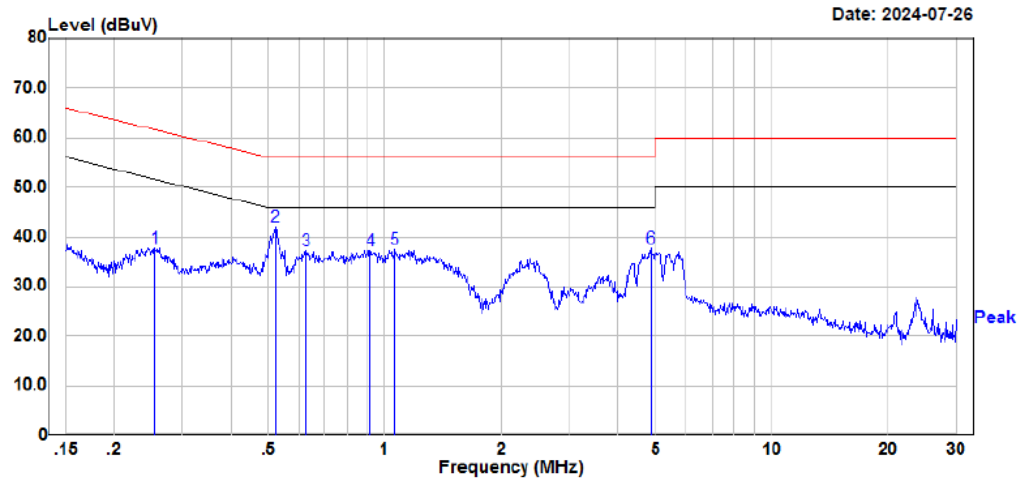
AC 120V/60 Hz, Line




```
Site                : CE
Condition           : FCC Part 15.207
                    : DET:Peak
Project No.         : RKSA240425001
Model               : X1
Phase               : L
Voltage             : 120V/60Hz
Mode                : BT
Test Equipment      : ENV216,ESR
Temperature         : 24.7℃
Humidity            : 46%
Atmospheric pressure: 99.9kPa
Test Engineer       : Hardy Huang
```

	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	
1	0.153	21.09	20.12	41.21	65.83	-24.62	Peak
2	0.230	19.31	20.12	39.43	62.44	-23.01	Peak
3	0.338	19.00	20.19	39.19	59.25	-20.06	Peak
4	0.491	21.44	20.15	41.59	56.15	-14.56	Peak
5	0.540	22.68	20.12	42.80	56.00	-13.20	Peak
6	0.813	17.48	19.92	37.40	56.00	-18.60	Peak

AC 120V/60 Hz, Neutral




```
Site                : CE
Condition           : FCC Part 15.207
                    : DET:Peak
Project No.         : RKSA240425001
Model               : X1
Phase               : N
Voltage             : 120V/60Hz
Mode                : BT
Test Equipment      : ENV216,ESR
Temperature         : 24.7℃
Humidity            : 46%
Atmospheric pressure: 99.9kPa
Test Engineer       : Hardy Huang
```

	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	
1	0.254	17.68	20.14	37.82	61.61	-23.79	Peak
2	0.522	21.86	20.12	41.98	56.00	-14.02	Peak
3	0.624	17.21	20.08	37.29	56.00	-18.71	Peak
4	0.916	17.53	19.81	37.34	56.00	-18.66	Peak
5	1.058	17.74	19.75	37.49	56.00	-18.51	Peak
6	4.864	17.32	20.29	37.61	56.00	-18.39	Peak

RADIATED EMISSIONS & RESTRICTED BANDS EMISSIONS

EUT operation mode: Transmitting

After pre-scan in the X, Y and Z axes of orientation, the worst case is below:

9 kHz-30 MHz: *(Transmitting maximum output power 8 DPSK mode and low channel)*

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

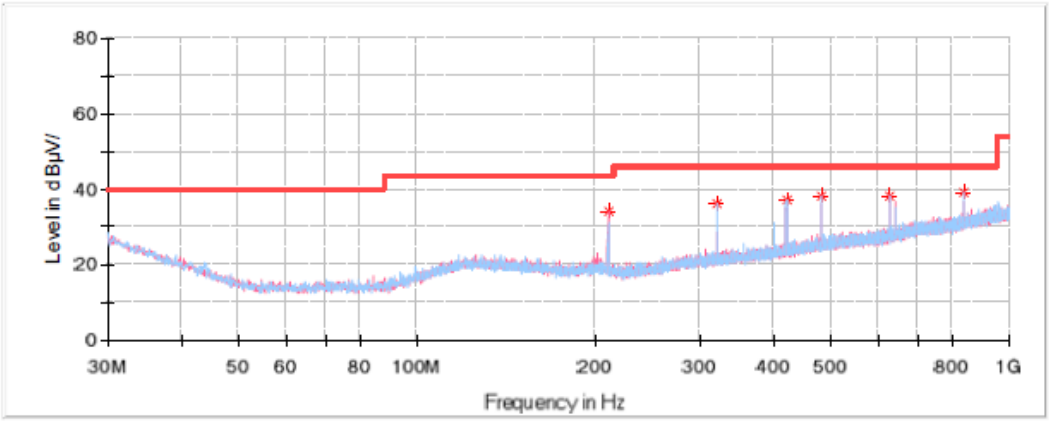
Model: X1

30 MHz - 1 GHz (Transmitting in maximum output power 8DPSK mode):

Low Channel: 2402 MHz

Common Information

Project No:	RKSA240425001
EUT Model:	X1
Test Mode:	BT
Standard:	FCC Part 15.247 & FCC Part 15.205 & FCC Part 15.209
Test Equipment:	ESCI, JB3, 310N
Temperature:	25.2℃
Humidity:	56%
Barometric Pressure:	100.8kPa
Test Engineer:	Grace Luo
Test Date:	2024/7/30



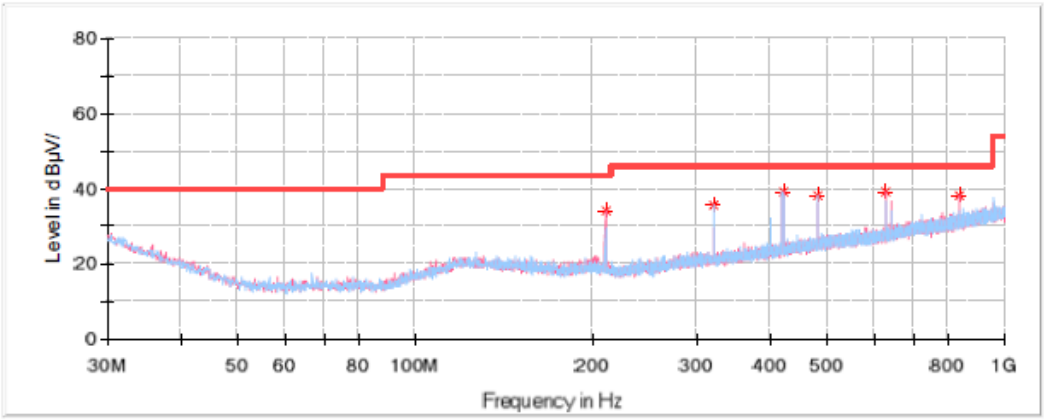
Critical_Freqs

Frequency (MHz)	MaxPeak (dBµ V/m)	Limit (dBµ V/m)	Margin (dB)	Pol	Corr. (dB/m)
210.056250	34.00	43.50	9.50	V	-12.8
320.030000	36.09	46.00	9.91	H	-10.0
420.061250	37.00	46.00	9.00	H	-7.5
479.958750	38.00	46.00	8.00	H	-5.9
630.066250	38.26	46.00	7.74	H	-3.6
840.192500	39.00	46.00	7.00	H	-0.1

Middle Channel: 2441 MHz

Common Information

Project No:	RKSA240425001
EUT Model:	X1
Test Mode:	BT
Standard:	FCC Part 15.247 & FCC Part 15.205 & FCC Part 15.209
Test Equipment:	ESCI, JB3, 310N
Temperature:	25.2℃
Humidity:	56%
Barometric Pressure:	100.8kPa
Test Engineer:	Grace Luo
Test Date:	2024/7/30



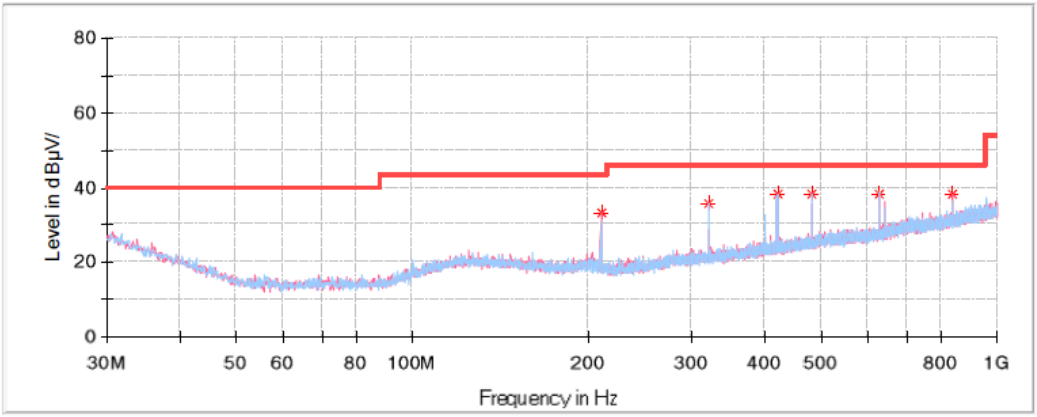
Critical_Freqs

Frequency (MHz)	MaxPeak (dBµ V/m)	Limit (dBµ V/m)	Margin (dB)	Pol	Corr. (dB/m)
209.935000	34.00	43.50	9.50	V	-12.8
320.030000	35.83	46.00	10.17	H	-10.0
420.061250	39.00	46.00	7.00	V	-7.5
480.080000	38.00	46.00	8.00	H	-5.9
629.945000	39.00	46.00	7.00	V	-3.6
840.071250	38.00	46.00	8.00	V	-0.1

High Channel:2480 MHz

Common Information

Project No:	RKSA240425001
EUT Model:	X1
Test Mode:	BT
Standard:	FCC Part 15.247 & FCC Part 15.205 & FCC Part 15.209
Test Equipment:	ESCI, JB3, 310N
Temperature:	25.2℃
Humidity:	56%
Barometric Pressure:	100.8kPa
Test Engineer:	Grace Luo
Test Date:	2024/7/30



Critical_Freqs

Frequency (MHz)	MaxPeak (dBµ V/m)	Limit (dBµ V/m)	Margin (dB)	Pol	Corr. (dB/m)
210.056250	33.00	43.50	10.50	V	-12.8
320.030000	35.86	46.00	10.14	H	-10.0
420.061250	38.00	46.00	8.00	H	-7.5
479.958750	38.00	46.00	8.00	H	-5.9
629.945000	38.00	46.00	8.00	V	-3.6
840.071250	38.09	46.00	7.91	V	-0.1

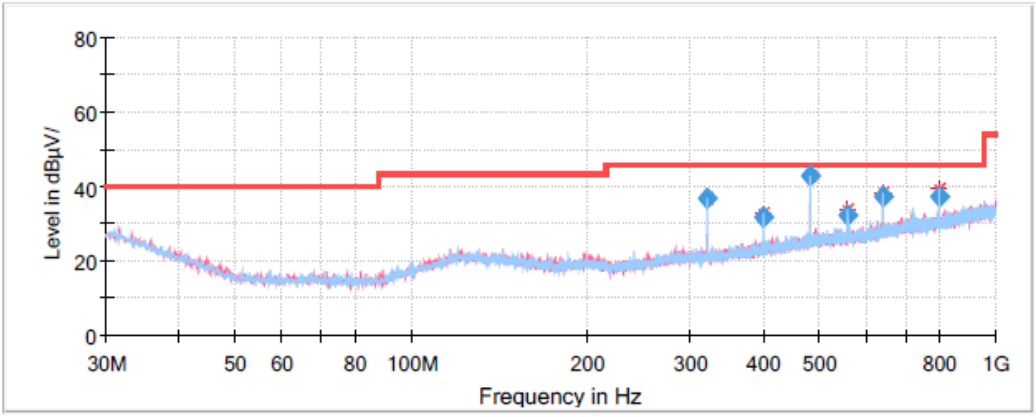
Model: X1 Lite

30 MHz - 1 GHz (Transmitting in maximum output power 8DPSK mode):

Low Channel: 2402 MHz

Common Information

Project No:	RKSA240425001
EUT Model:	X1 Lite
Test Mode:	BT
Standard:	FCC Part 15.247 & FCC Part 15.205 & FCC Part 15.209
Test Equipment:	ESCI, JB3, 310N
Temperature:	20.5℃
Humidity:	64%
Barometric Pressure:	102.0kPa
Test Engineer:	Jerry Yan
Test Date:	2024/10/31



Final_Result

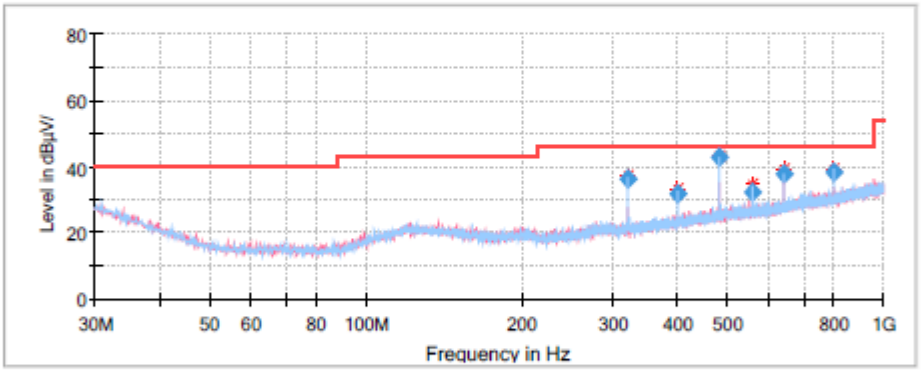
Frequency (MHz)	QuasiPeak (dBµ V/m)	Limit (dBµ V/m)	Margin (dB)	Pol	Corr. (dB/m)
319.994300	36.55	46.00	9.45	H	-10.0
399.998000	31.91	46.00	14.09	H	-8.0
479.994150	42.87	46.00	3.13	H	-5.9
560.014650	32.42	46.00	13.58	H	-4.7
640.002150	37.24	46.00	8.76	H	-3.3
799.974150	37.14	46.00	8.86	H	-0.8

L

Middle Channel: 2441 MHz

Common Information

Project No:	RKSA240425001
EUT Model:	X1 Lite
Test Mode:	BT
Standard:	FCC Part 15.247 & FCC Part 15.205 & FCC Part 15.209
Test Equipment:	ESCI, JB3, 310N
Temperature:	20.5℃
Humidity:	64%
Barometric Pressure:	102.0kPa
Test Engineer:	Jerry Yan
Test Date:	2024/10/31



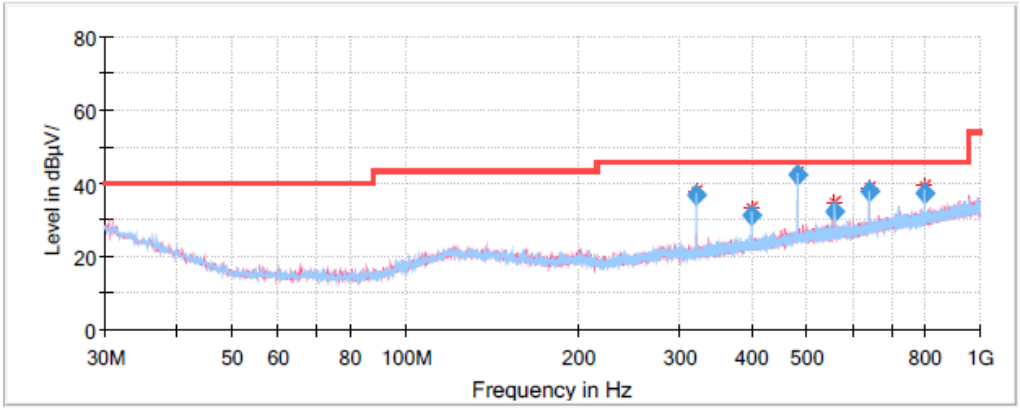
Final_Result

Frequency (MHz)	QuasiPeak (dBµ V/m)	Limit (dBµ V/m)	Margin (dB)	Pol	Corr. (dB/m)
319.989500	36.26	46.00	9.74	H	-10.0
399.983550	31.81	46.00	14.19	H	-8.0
479.994450	42.60	46.00	3.40	H	-5.9
560.012550	32.43	46.00	13.57	H	-4.7
639.991350	37.53	46.00	8.47	H	-3.3
799.996950	38.01	46.00	7.99	H	-0.8

High Channel:2480 MHz

Common Information

Project No:	RKSA240425001
EUT Model:	X1 Lite
Test Mode:	BT
Standard:	FCC Part 15.247 & FCC Part 15.205 & FCC Part 15.209
Test Equipment:	ESCI, JB3, 310N
Temperature:	20.5℃
Humidity:	64%
Barometric Pressure:	102.0kPa
Test Engineer:	Jerry Yan
Test Date:	2024/10/31



Final_Result

Frequency (MHz)	QuasiPeak (dBµ V/m)	Limit (dBµ V/m)	Margin (dB)	Pol	Corr. (dB/m)
320.003000	36.55	46.00	9.45	H	-10.0
399.980250	31.34	46.00	14.66	H	-8.0
479.993250	42.18	46.00	3.82	H	-5.9
559.972950	32.12	46.00	13.88	H	-4.7
639.991950	37.59	46.00	8.41	H	-3.3
799.990650	37.22	46.00	8.78	H	-0.8

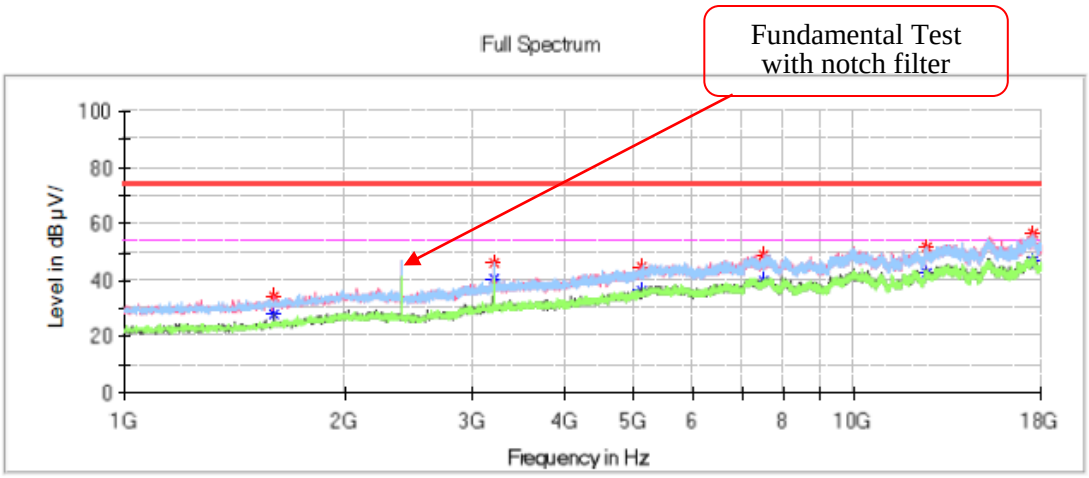
1 GHz - 18 GHz:

GFSK:

Low Channel: 2402 MHz

Common Information

Project No.:	RKSA240425001
Test Mode:	BT
Standard:	FCC Part 15.247 & FCC Part 15.205 & FCC Part 15.209
Test Engineer:	Klein Zhu



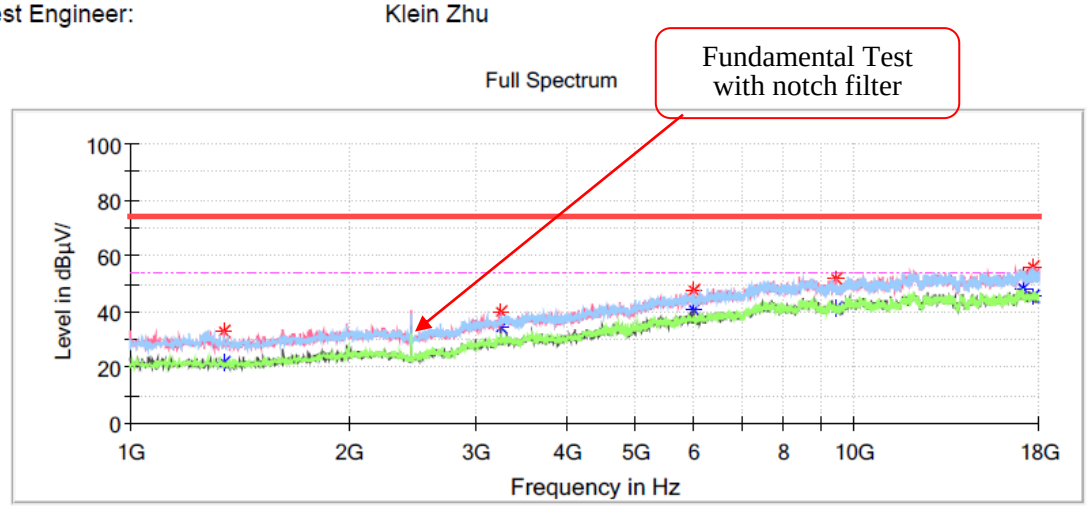
Critical_Freqs

Frequency (MHz)	MaxPeak (dB µ V/m)	Average (dB µ V/m)	Limit (dB µ V/m)	Margin (dB)	Pol	Corr. (dB/m)
1600.100000	---	27.71	54.00	26.29	V	-13.3
1600.100000	34.61	---	74.00	39.39	V	-13.3
3201.500000	---	40.40	54.00	13.60	H	-7.3
3201.500000	45.89	---	74.00	28.11	H	-7.3
5115.700000	---	36.38	54.00	17.62	V	-0.7
5115.700000	45.03	---	74.00	28.97	V	-0.7
7529.700000	---	39.56	54.00	14.44	V	4.2
7529.700000	49.10	---	74.00	24.90	V	4.2
12548.100000	---	42.41	54.00	11.59	H	8.5
12548.100000	51.96	---	74.00	22.04	H	8.5
17510.400000	---	46.82	54.00	7.18	H	13.6
17510.400000	56.65	---	74.00	17.35	H	13.6

Middle Channel: 2441 MHz

Common Information

Project No.:	RKSA240425001
Test Mode:	BT
Standard:	FCC Part 15.247 & FCC Part 15.205 & FCC Part 15.209
Test Engineer:	Klein Zhu



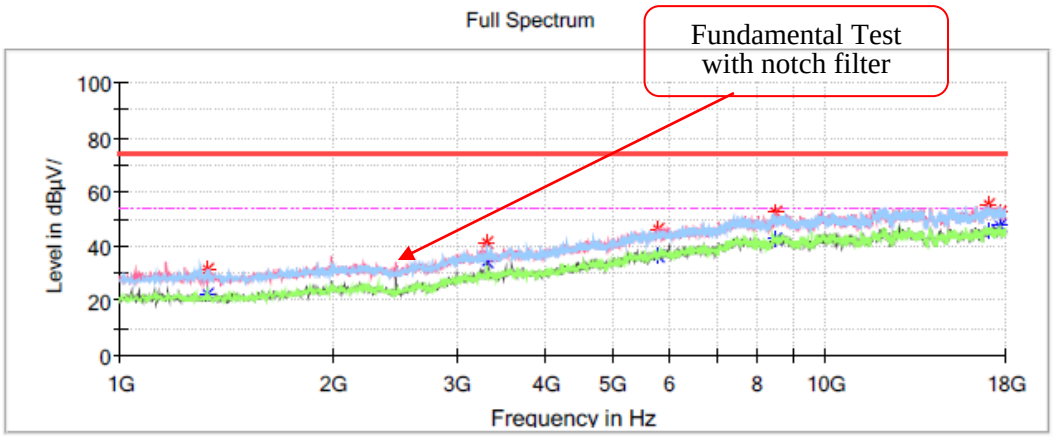
Critical_Freqs

Frequency (MHz)	MaxPeak (dB µ V/m)	Average (dB µ V/m)	Limit (dB µ V/m)	Margin (dB)	Pol	Corr. (dB/m)
1346.800000	---	21.55	54.00	32.45	H	-15.0
1346.800000	32.57	---	74.00	41.43	H	-15.0
3254.200000	---	33.96	54.00	20.04	V	-7.4
3254.200000	40.18	---	74.00	33.82	V	-7.4
5999.700000	---	40.57	54.00	13.43	V	0.0
5999.700000	47.41	---	74.00	26.59	V	0.0
9415.000000	---	41.55	54.00	12.45	V	5.4
9415.000000	51.41	---	74.00	22.59	V	5.4
17117.700000	53.27	---	74.00	20.73	H	12.1
17117.700000	---	47.91	54.00	6.09	H	12.1
17636.200000	55.69	---	74.00	18.31	H	11.6
17636.200000	---	45.31	54.00	8.69	H	11.6

High Channel: 2480 MHz

Common Information

Project No.:	RKSA240425001
Test Mode:	BT
Standard:	FCC Part 15.247 & FCC Part 15.205 & FCC Part 15.209
Test Engineer:	Klein Zhu



Critical_Freqs

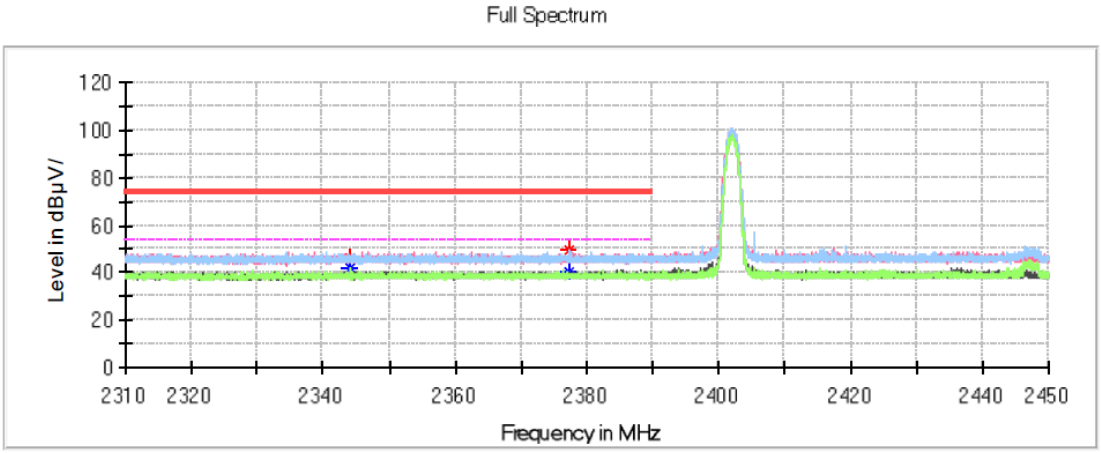
Frequency (MHz)	MaxPeak (dB µ V/m)	Average (dB µ V/m)	Limit (dB µ V/m)	Margin (dB)	Pol	Corr. (dB/m)
1328.100000	31.45	---	74.00	42.55	V	-15.0
1328.100000	---	22.35	54.00	31.65	V	-15.0
3305.200000	41.29	---	74.00	32.71	V	-7.2
3305.200000	---	34.39	54.00	19.61	V	-7.2
5773.600000	---	36.20	54.00	17.80	V	-0.1
5773.600000	46.36	---	74.00	27.64	V	-0.1
8497.000000	---	42.43	54.00	11.57	V	5.4
8497.000000	52.61	---	74.00	21.39	V	5.4
17039.500000	---	45.58	54.00	8.42	H	12.2
17039.500000	55.01	---	74.00	18.99	H	12.2
17685.500000	---	47.42	54.00	6.58	H	11.7
17685.500000	52.17	---	74.00	21.83	H	11.7

Band Edge:

Left Side

Common Information

Project No.:	RKSA240425001
Test Mode:	BT
Standard:	FCC Part 15.247 & FCC Part 15.205 & FCC Part 15.209
Test Engineer:	Klein Zhu



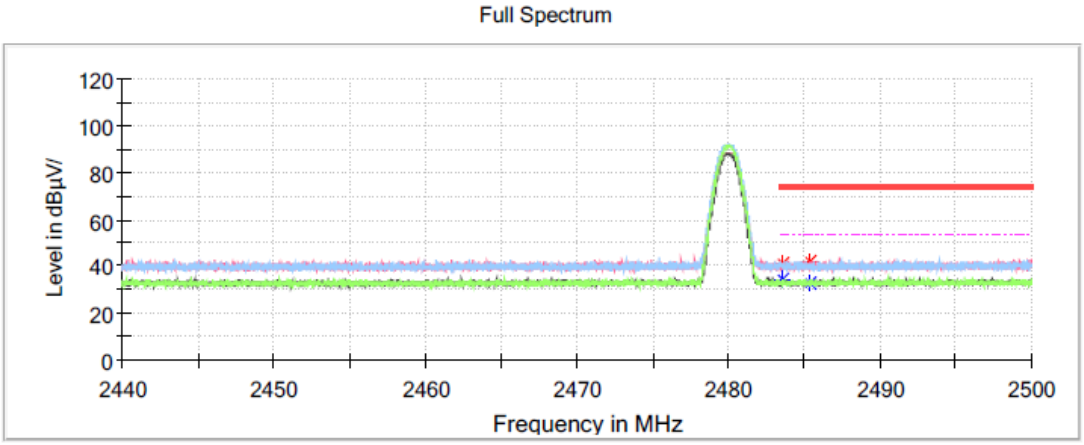
Critical_Freqs

Frequency (MHz)	MaxPeak (dB µ V/m)	Average (dB µ V/m)	Limit (dB µ V/m)	Margin (dB)	Pol	Corr. (dB/m)
2344.118000	---	41.78	54.00	12.22	H	0.0
2344.118000	45.99	---	74.00	28.01	H	0.0
2377.200000	---	40.36	54.00	13.64	V	0.0
2377.200000	49.09	---	74.00	24.91	V	0.0

Right Side

Common Information

Project No.:	RKSA240425001
Test Mode:	BT
Standard:	FCC Part 15.247 & FCC Part 15.205 & FCC Part 15.209
Test Engineer:	Klein Zhu



Critical_Freqs

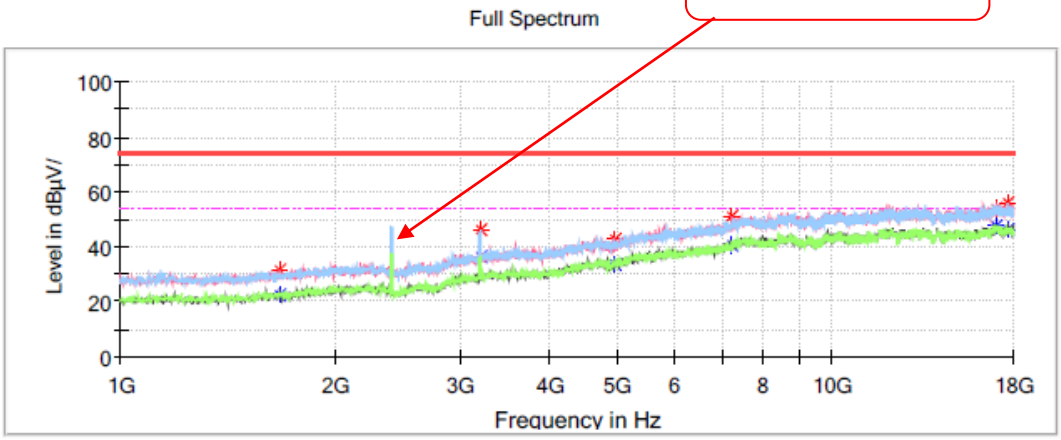
Frequency (MHz)	MaxPeak (dB µ V/m)	Average (dB µ V/m)	Limit (dB µ V/m)	Margin (dB)	Pol	Corr. (dB/m)
2483.554000	---	34.64	54.00	19.36	H	-4.3
2483.554000	41.10	---	74.00	32.90	H	-4.3
2485.330000	---	32.80	54.00	21.20	V	-4.2
2485.330000	42.12	---	74.00	31.88	V	-4.2

π/4-DQPSK:

Low Channel: 2402 MHz

Common Information

Project No.:	RKSA240425001
Test Mode:	BT
Standard:	FCC Part 15.247 & FCC Part 15.205 & FCC Part 15.209
Test Engineer:	Klein Zhu



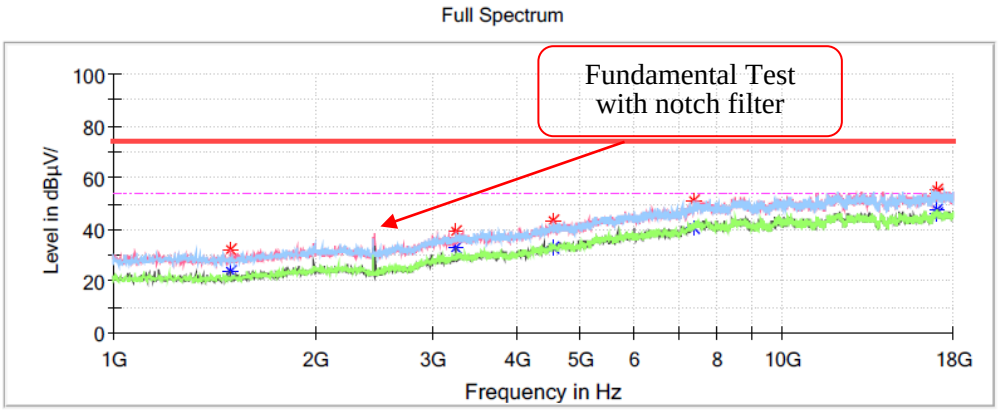
Critical_Freqs

Frequency (MHz)	MaxPeak (dB µ V/m)	Average (dB µ V/m)	Limit (dB µ V/m)	Margin (dB)	Pol	Corr. (dB/m)
1674.900000	31.45	---	74.00	42.55	V	-13.7
1674.900000	---	22.50	54.00	31.50	V	-13.7
3201.500000	45.92	---	74.00	28.08	H	-7.6
3201.500000	---	36.54	54.00	17.46	H	-7.6
4942.300000	---	33.73	54.00	20.27	V	-2.7
4942.300000	42.81	---	74.00	31.19	V	-2.7
7235.600000	---	40.36	54.00	13.64	H	3.2
7235.600000	50.73	---	74.00	23.27	H	3.2
17075.200000	---	47.86	54.00	6.14	V	12.2
17075.200000	53.54	---	74.00	20.46	V	12.2
17711.000000	---	46.42	54.00	7.58	H	11.7
17711.000000	55.96	---	74.00	18.04	H	11.7

Middle Channel: 2441 MHz

Common Information

Project No.:	RKSA240425001
Test Mode:	BT
Standard:	FCC Part 15.247 & FCC Part 15.205 & FCC Part 15.209
Test Engineer:	Klein Zhu



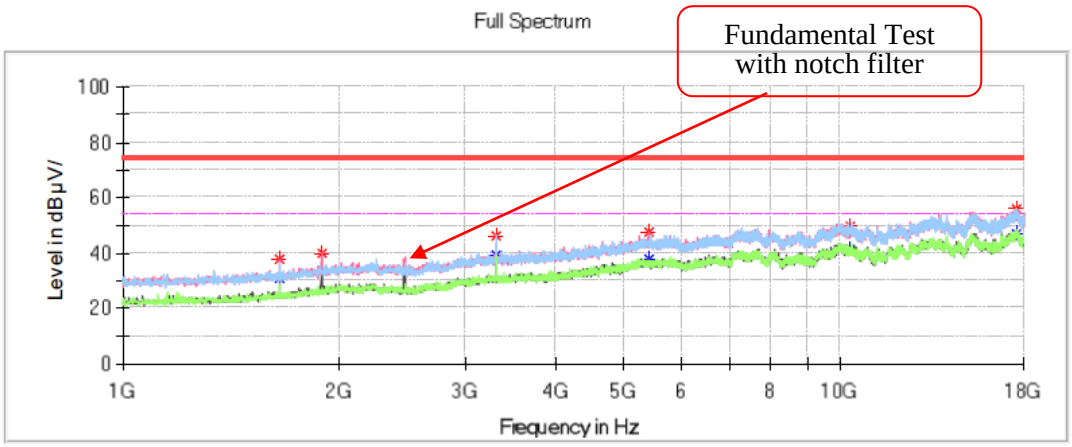
Critical_Freqs

Frequency (MHz)	MaxPeak (dB µ V/m)	Average (dB µ V/m)	Limit (dB µ V/m)	Margin (dB)	Pol	Corr. (dB/m)
1494.700000	---	23.46	54.00	30.54	V	-14.7
1494.700000	32.35	---	74.00	41.65	V	-14.7
3254.200000	---	32.55	54.00	21.45	V	-7.4
3254.200000	39.49	---	74.00	34.51	V	-7.4
4546.200000	---	32.77	54.00	21.23	H	-4.1
4546.200000	43.45	---	74.00	30.55	H	-4.1
7368.200000	---	40.42	54.00	13.58	H	3.6
7368.200000	51.25	---	74.00	22.75	H	3.6
17008.900000	---	46.11	54.00	7.89	H	12.3
17008.900000	55.23	---	74.00	18.77	H	12.3
17037.800000	53.90	---	74.00	20.10	H	12.2
17037.800000	---	47.67	54.00	6.33	H	12.2

High Channel: 2480 MHz

Common Information

Project No.:	RKSA240425001
Test Mode:	BT
Standard:	FCC Part 15.247 & FCC Part 15.205 & FCC Part 15.209
Test Engineer:	Klein Zhu



Critical_Freqs

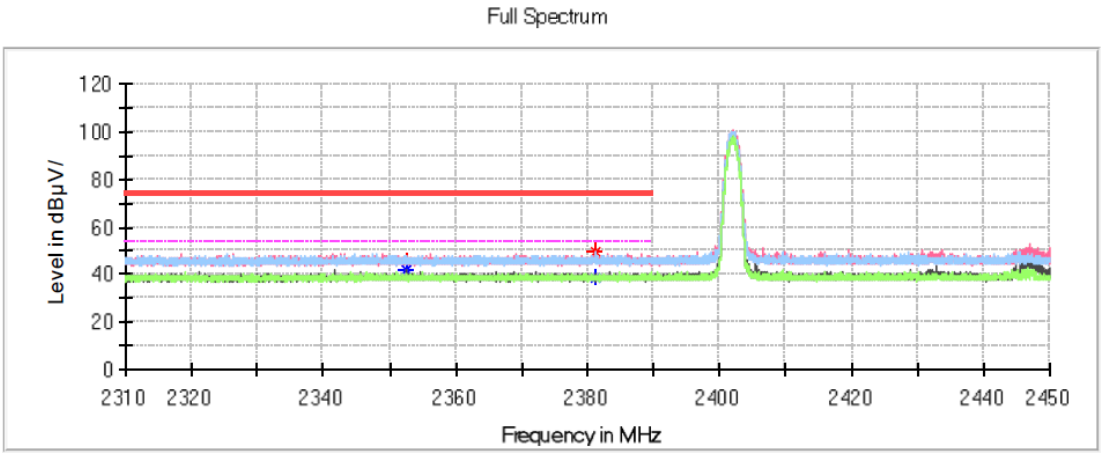
Frequency (MHz)	MaxPeak (dB µ V/m)	Average (dB µ V/m)	Limit (dB µ V/m)	Margin (dB)	Pol	Corr. (dB/m)
1652.800000	37.82	---	74.00	36.18	V	-12.9
1652.800000	---	31.04	54.00	22.96	V	-12.9
1890.800000	---	33.40	54.00	20.60	V	-11.3
1890.800000	39.78	---	74.00	34.22	V	-11.3
3305.200000	---	39.31	54.00	14.69	H	-6.9
3305.200000	46.32	---	74.00	27.68	H	-6.9
5387.700000	---	37.61	54.00	16.39	V	0.4
5387.700000	47.27	---	74.00	26.73	V	0.4
10312.600000	---	41.19	54.00	12.81	H	7.5
10312.600000	49.78	---	74.00	24.22	H	7.5
17546.100000	---	47.11	54.00	6.89	V	13.4
17546.100000	56.05	---	74.00	17.95	V	13.4

Band Edge:

Left Side

Common Information

Project No.:	RKSA240425001
Test Mode:	BT
Standard:	FCC Part 15.247 & FCC Part 15.205 & FCC Part 15.209
Test Engineer:	Klein Zhu



Critical_Freqs

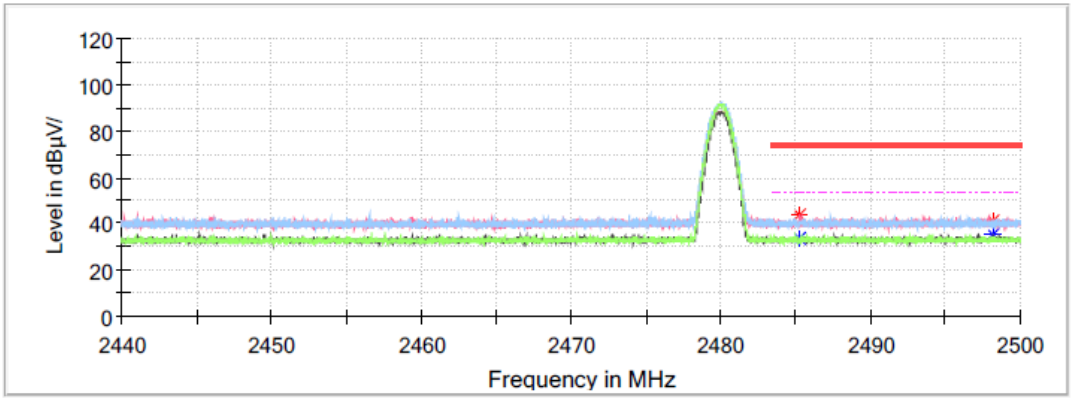
Frequency (MHz)	MaxPeak (dB µ V/m)	Average (dB µ V/m)	Limit (dB µ V/m)	Margin (dB)	Pol	Corr. (dB/m)
2352.532000	---	41.62	54.00	12.38	V	0.0
2352.532000	45.61	---	74.00	28.39	V	0.0
2381.232000	---	38.20	54.00	15.80	H	0.0
2381.232000	49.14	---	74.00	24.86	H	0.0

Right Side

Common Information

Project No.:	RKSA240425001
Test Mode:	BT
Standard:	FCC Part 15.247 & FCC Part 15.205 & FCC Part 15.209
Test Engineer:	Klein Zhu

Full Spectrum



Critical_Freqs

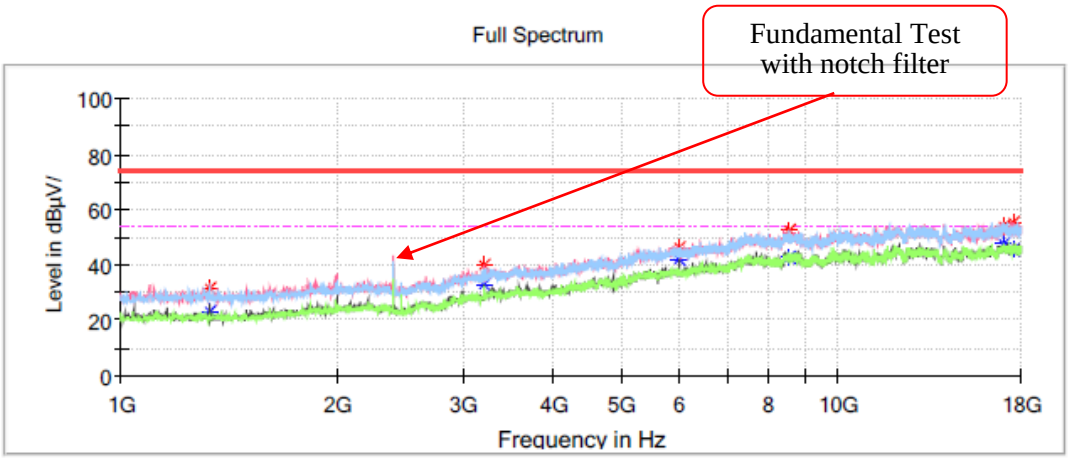
Frequency (MHz)	MaxPeak (dB µ V/m)	Average (dB µ V/m)	Limit (dB µ V/m)	Margin (dB)	Pol	Corr. (dB/m)
2485.282000	43.89	---	74.00	30.11	V	-4.2
2485.282000	---	33.92	54.00	20.08	V	-4.2
2498.212000	41.19	---	74.00	32.81	H	-4.2
2498.212000	---	35.20	54.00	18.80	H	-4.2

8DPSK:

Low Channel: 2402 MHz

Common Information

Project No.:	RKSA240425001
Test Mode:	BT
Standard:	FCC Part 15.247 & FCC Part 15.205 & FCC Part 15.209
Test Engineer:	Klein Zhu



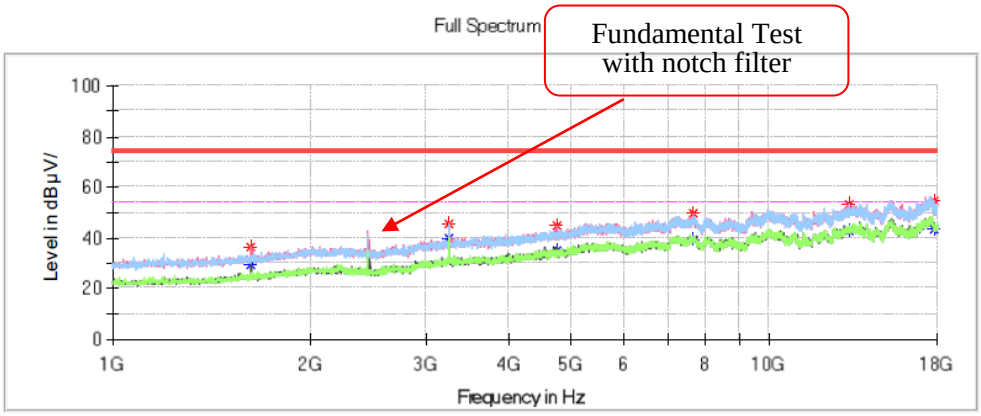
Critical_Freqs

Frequency (MHz)	MaxPeak (dB µ V/m)	Average (dB µ V/m)	Limit (dB µ V/m)	Margin (dB)	Pol	Corr. (dB/m)
1326.400000	---	22.86	54.00	31.14	H	-15.0
1326.400000	31.47	---	74.00	42.53	H	-15.0
3201.500000	---	32.64	54.00	21.36	V	-7.6
3201.500000	40.02	---	74.00	33.98	V	-7.6
5999.700000	---	41.94	54.00	12.06	V	0.0
5999.700000	46.35	---	74.00	27.65	V	0.0
8527.600000	---	42.49	54.00	11.51	V	5.4
8527.600000	52.51	---	74.00	21.49	V	5.4
17025.900000	53.61	---	74.00	20.39	H	12.2
17025.900000	---	47.84	54.00	6.16	H	12.2
17575.000000	---	45.47	54.00	8.53	V	11.6
17575.000000	55.30	---	74.00	18.70	V	11.6

Middle Channel: 2441 MHz

Common Information

Project No.:	RKSA240425001
Test Mode:	BT
Standard:	FCC Part 15.247 & FCC Part 15.205 & FCC Part 15.209
Test Engineer:	Klein Zhu



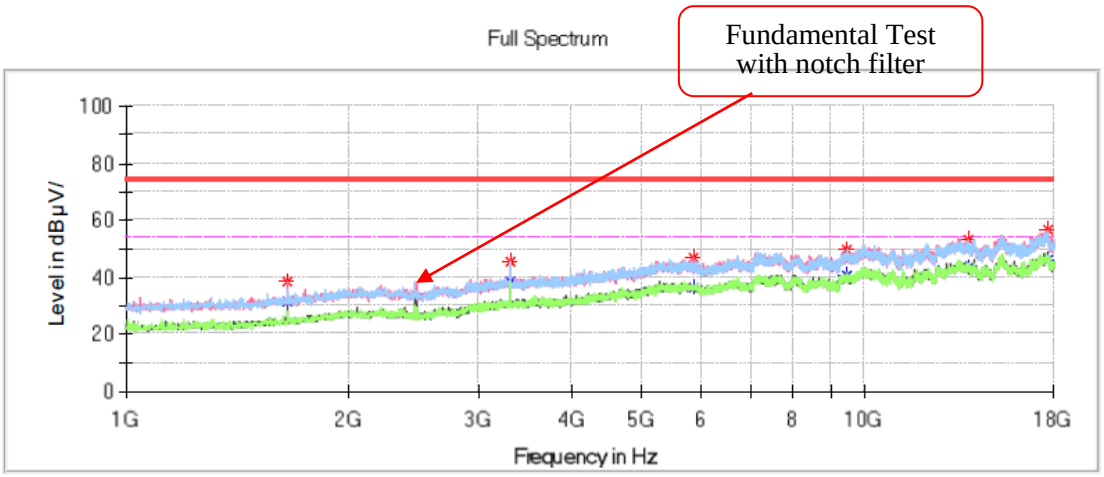
Critical_Freqs

Frequency (MHz)	MaxPeak (dB µ V/m)	Average (dB µ V/m)	Limit (dB µ V/m)	Margin (dB)	Pol	Corr. (dB/m)
1625.600000	---	29.72	54.00	24.28	V	-13.1
1625.600000	36.33	---	74.00	37.67	V	-13.1
3254.200000	---	39.81	54.00	14.19	H	-7.0
3254.200000	45.26	---	74.00	28.74	H	-7.0
4738.300000	---	34.84	54.00	19.16	V	-2.6
4738.300000	44.85	---	74.00	29.15	V	-2.6
7648.700000	---	39.45	54.00	14.55	H	4.1
7648.700000	49.61	---	74.00	24.39	H	4.1
13195.800000	---	42.89	54.00	11.11	V	9.8
13195.800000	52.82	---	74.00	21.18	V	9.8
17816.400000	---	43.54	54.00	10.46	V	12.3
17816.400000	54.27	---	74.00	19.73	V	12.3

High Channel: 2480 MHz

Common Information

Project No.:	RKSA240425001
Test Mode:	BT
Standard:	FCC Part 15.247 & FCC Part 15.205 & FCC Part 15.209
Test Engineer:	Klein Zhu



Critical_Freqs

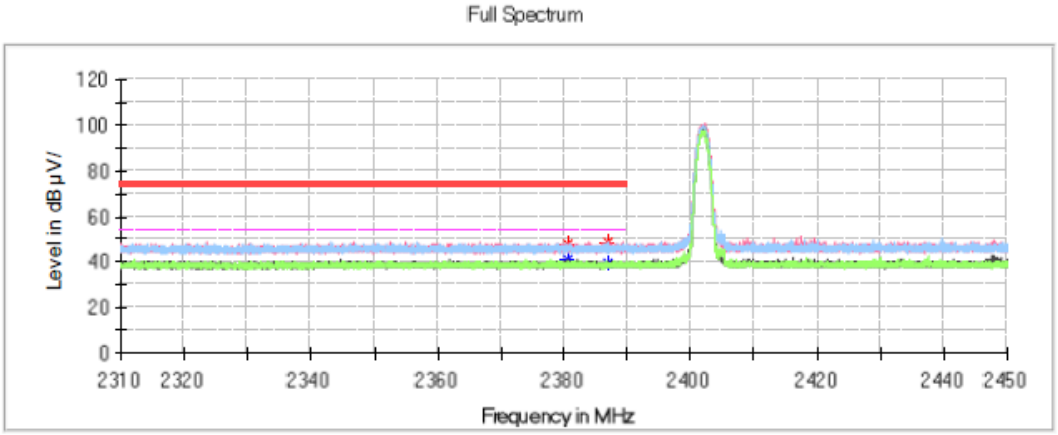
Frequency (MHz)	MaxPeak (dB µ V/m)	Average (dB µ V/m)	Limit (dB µ V/m)	Margin (dB)	Pol	Corr. (dB/m)
1652.800000	38.33	---	74.00	35.67	V	-12.9
1652.800000	---	31.13	54.00	22.87	V	-12.9
3305.200000	45.39	---	74.00	28.61	H	-6.9
3305.200000	---	38.68	54.00	15.32	H	-6.9
5846.700000	---	36.17	54.00	17.83	H	0.4
5846.700000	46.51	---	74.00	27.49	H	0.4
9452.400000	---	40.58	54.00	13.42	V	6.0
9452.400000	49.47	---	74.00	24.53	V	6.0
13758.500000	---	43.62	54.00	10.38	H	10.8
13758.500000	53.49	---	74.00	20.51	H	10.8
17668.500000	---	46.00	54.00	8.00	V	12.9
17668.500000	56.43	---	74.00	17.57	V	12.9

Band Edge:

Left Side

Common Information

Project No.:	RKSA240425001
Test Mode:	BT
Standard:	FCC Part 15.247 & FCC Part 15.205 & FCC Part 15.209
Test Engineer:	Klein Zhu



Critical_Freqs

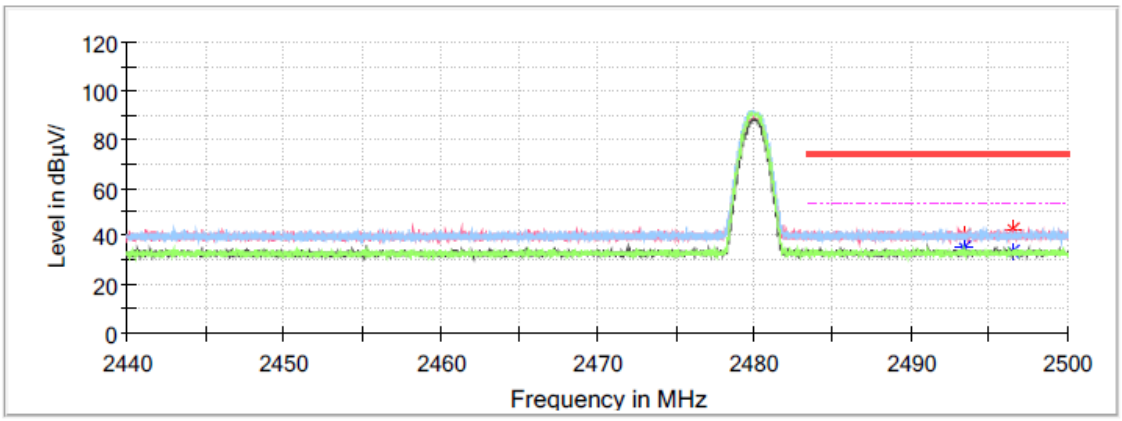
Frequency (MHz)	MaxPeak (dB µ V/m)	Average (dB µ V/m)	Limit (dB µ V/m)	Margin (dB)	Pol	Corr. (dB/m)
2380.462000	---	41.49	54.00	12.51	V	0.0
2380.462000	48.12	---	74.00	25.88	V	0.0
2386.972000	---	39.43	54.00	14.57	H	0.1
2386.972000	48.90	---	74.00	25.10	H	0.1

Right Side

Common Information

Project No.:	RKSA240425001
Test Mode:	BT
Standard:	FCC Part 15.247 & FCC Part 15.205 & FCC Part 15.209
Test Engineer:	Klein Zhu

Full Spectrum

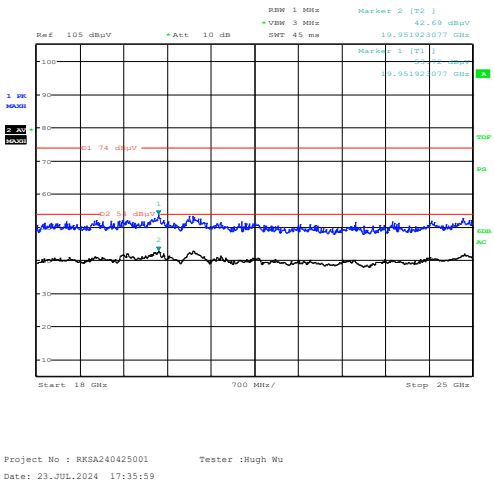


Critical_Freqs

Frequency (MHz)	MaxPeak (dB µ V/m)	Average (dB µ V/m)	Limit (dB µ V/m)	Margin (dB)	Pol	Corr. (dB/m)
2493.352000	---	35.14	54.00	18.86	V	-4.2
2493.352000	40.23	---	74.00	33.77	V	-4.2
2496.526000	---	33.21	54.00	20.79	H	-4.2
2496.526000	42.79	---	74.00	31.21	H	-4.2

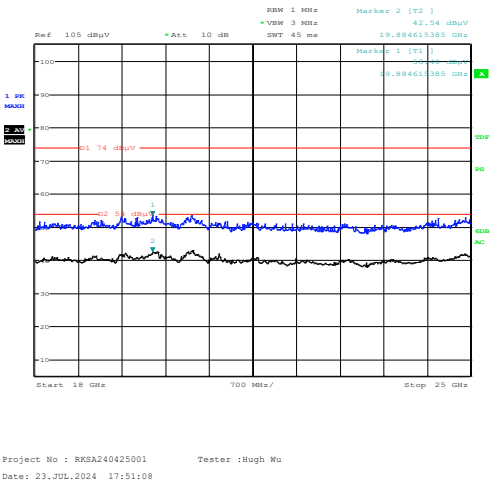
18 GHz - 25 GHz (8DPSK Mode low channel):

Horizontal



Project No : RKSA240425001 Tester :Hugh Wu
Date: 23.JUL.2024 17:35:59

Vertical



Project No : RKSA240425001 Tester :Hugh Wu
Date: 23.JUL.2024 17:51:08

Note: The test distance is 3m. The limit is 74dBµV/m(Peak) and 54dBµV/m(Average).

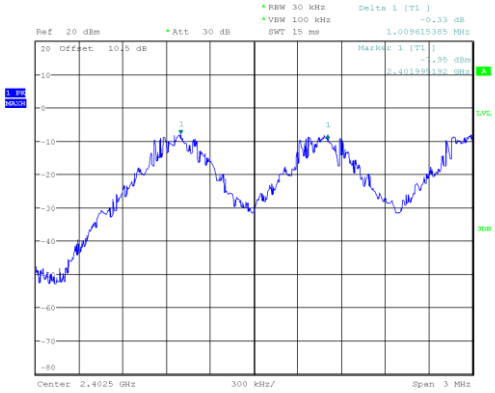
CHANNEL SEPARATION TEST

EUT operation mode: Transmitting

Mode	Channel	Channel frequency (MHz)	Result (MHz)	Limit (MHz)
GFSK	Low	2402-2403	1.010	0.625
	Middle	2441-2442	1.005	0.623
	High	2480-2479	1.005	0.621
π/4 DQPSK	Low	2402-2403	1.005	0.855
	Middle	2441-2442	1.010	0.867
	High	2480-2479	1.005	0.869
8DPSK	Low	2402-2403	1.005	0.853
	Middle	2441-2442	1.005	0.855
	High	2480-2479	1.005	0.855

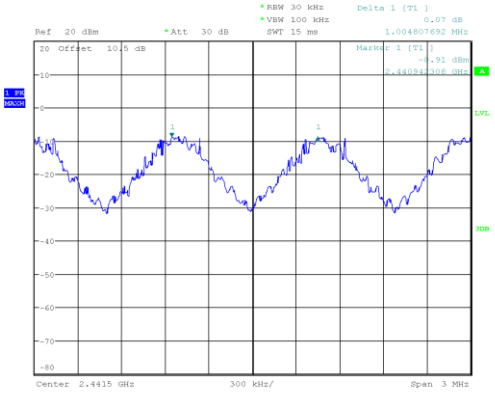
Note: Limit = 20 dB bandwidth*2/3

BDR (GFSK): Low Channel



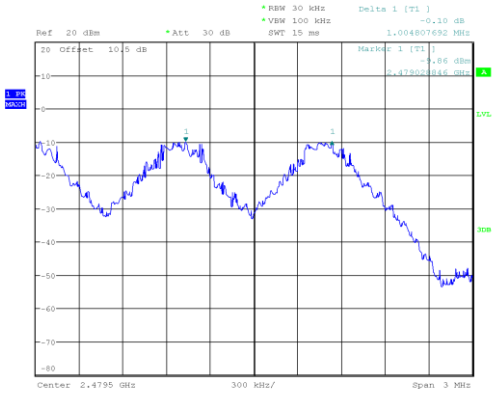
ProjectNo.:RKSA240425001 Tester:Bard Liu
Date: 21.JUN.2024 14:50:12

BDR (GFSK): Middle Channel



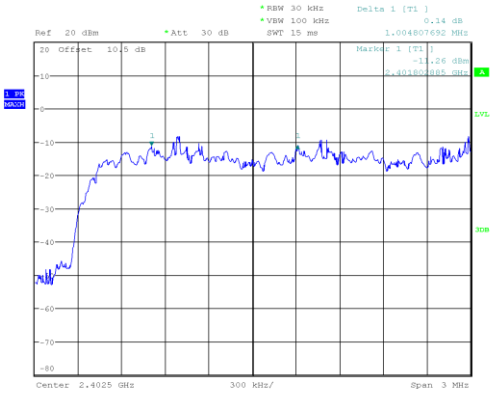
ProjectNo.:RKSA240425001 Tester:Bard Liu
Date: 21.JUN.2024 14:53:53

BDR (GFSK): High Channel



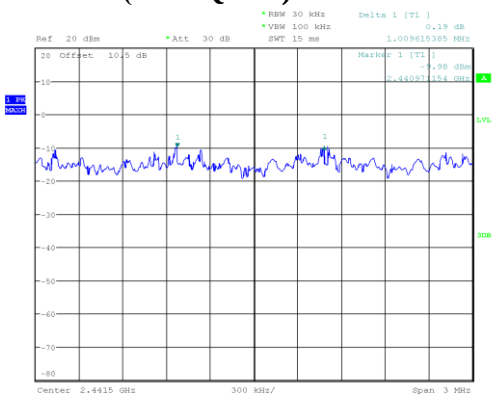
ProjectNo.:RKSA240425001 Tester:Bard Liu
Date: 21.JUN.2024 14:57:00

EDR (π/4-DQPSK): Low Channel



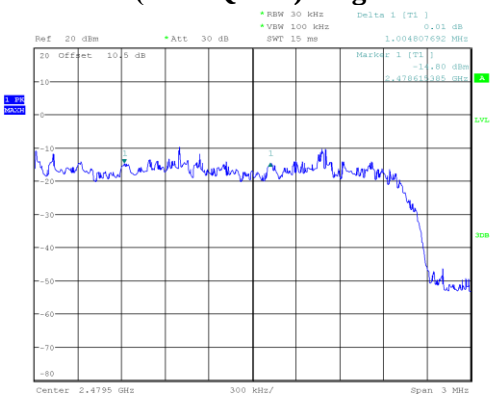
ProjectNo.:RKSA240425001 Tester:Bard Liu
Date: 21.JUN.2024 15:24:03

EDR (π/4-DQPSK): Middle Channel



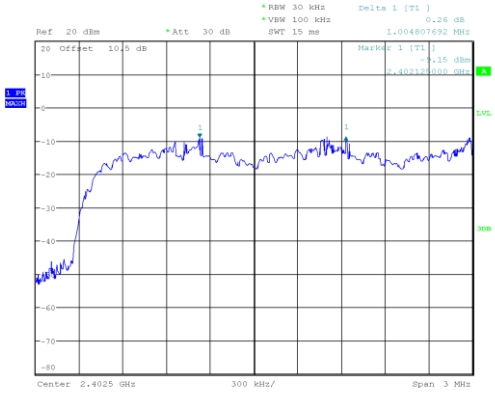
ProjectNo.:RKSA240425001 Tester:Bard Liu
Date: 21.JUN.2024 15:15:09

EDR (π/4-DQPSK): High Channel



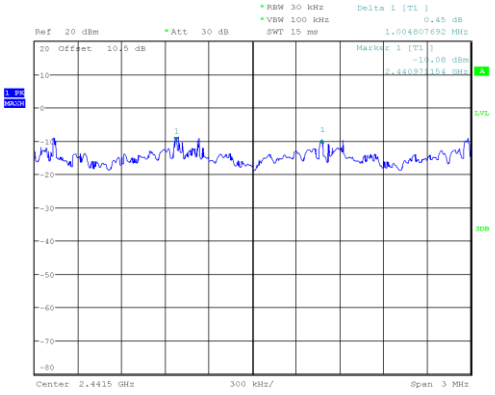
ProjectNo.:RKSA240425001 Tester:Bard Liu
Date: 21.JUN.2024 14:59:38

EDR (8DPSK): Low Channel



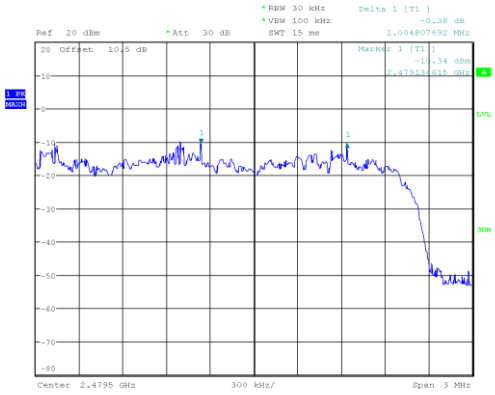
ProjectNo.:RKSA240425001 Tester:Bard Liu
Date: 21.JUN.2024 15:21:35

EDR (8DPSK): Middle Channel



ProjectNo.:RKSA240425001 Tester:Bard Liu
Date: 21.JUN.2024 15:18:01

EDR (8DPSK): High Channel



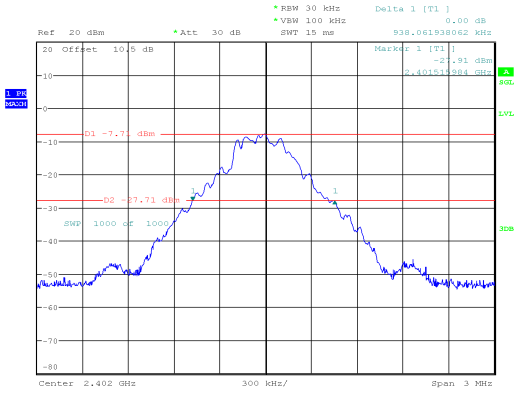
ProjectNo.:RKSA240425001 Tester:Bard Liu
Date: 21.JUN.2024 15:02:31

20 dB BANDWIDTH TEST

EUT operation mode: Transmitting

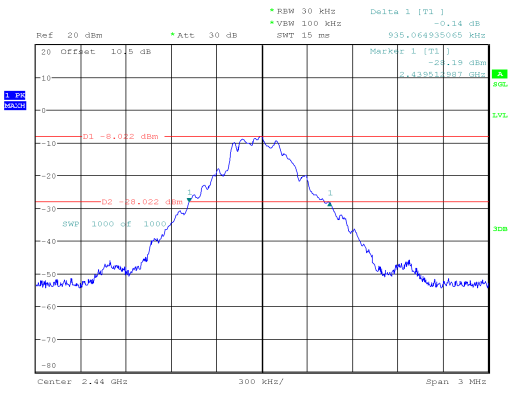
Mode	Channel	Frequency (MHz)	20 dB Emission Bandwidth (MHz)
BDR (GFSK)	Low	2402	0.938
	Middle	2441	0.935
	High	2480	0.932
EDR (π/4-DQPSK)	Low	2402	1.283
	Middle	2441	1.301
	High	2480	1.304
EDR (8DPSK)	Low	2402	1.280
	Middle	2441	1.283
	High	2480	1.283

BDR (GFSK): Low Channel



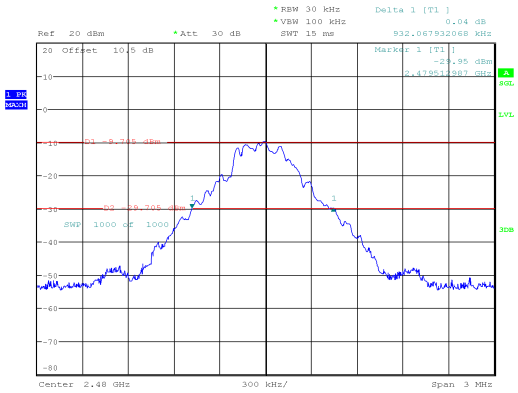
ProjectNo.:RKSA240425001 Tester:Bard Liu
Date: 21.JUN.2024 10:27:56

BDR (GFSK): Middle Channel



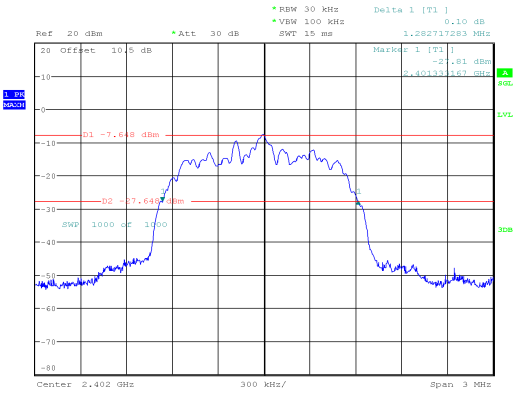
ProjectNo.:RKSA240425001 Tester:Bard Liu
Date: 21.JUN.2024 10:33:00

BDR (GFSK): High Channel



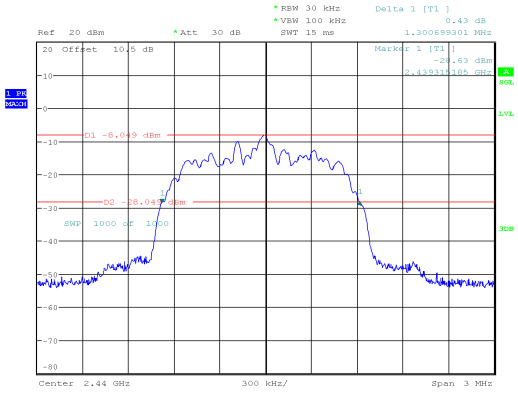
ProjectNo.:RKSA240425001 Tester:Bard Liu
Date: 21.JUN.2024 10:35:09

EDR (π/4-DQPSK): Low Channel



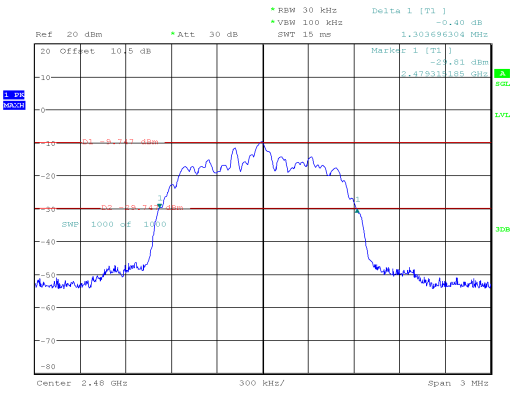
ProjectNo.:RKSA240425001 Tester:Bard Liu
Date: 21.JUN.2024 10:37:40

EDR(π/4-DQPSK): Middle Channel



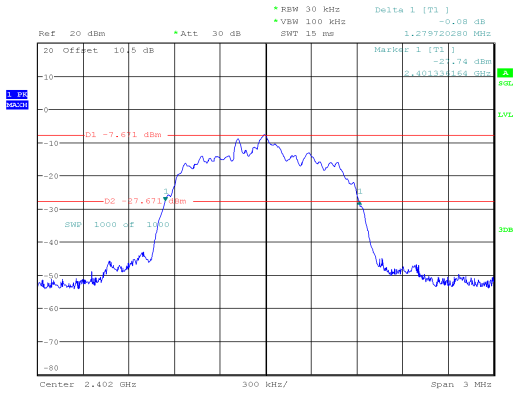
ProjectNo.:RKSA240425001 Tester:Bard Liu
Date: 21.JUN.2024 10:40:01

EDR (π/4-DQPSK): High Channel



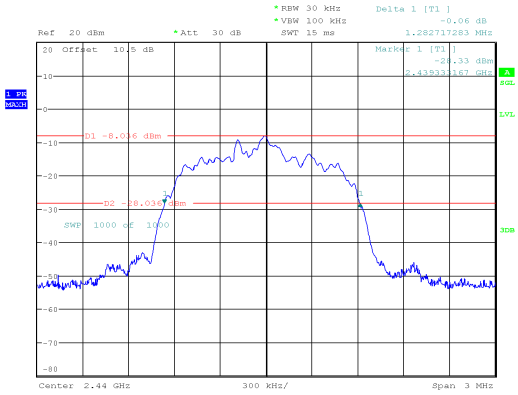
ProjectNo.:RKSA240425001 Tester:Bard Liu
Date: 21.JUN.2024 10:48:02

EDR (8DPSK): Low Channel



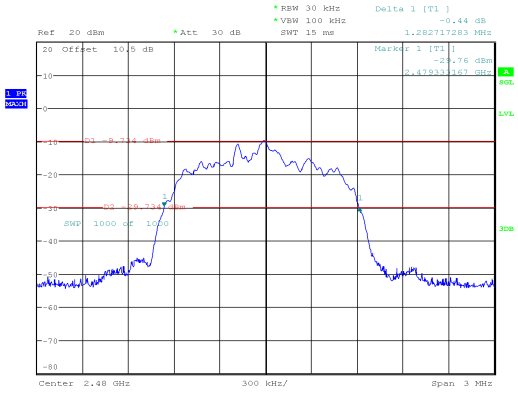
ProjectNo.:RKSA240425001 Tester:Bard Liu
Date: 21.JUN.2024 10:50:31

EDR (8DPSK): Middle Channel



ProjectNo.:RKSA240425001 Tester:Bard Liu
Date: 21.JUN.2024 10:52:58

EDR (8DPSK): High Channel



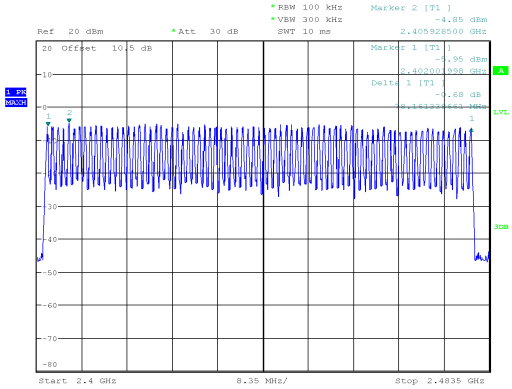
ProjectNo.:RKSA240425001 Tester:Bard Liu
Date: 21.JUN.2024 10:55:23

QUANTITY OF HOPPING CHANNEL TEST

EUT operation mode: Hopping

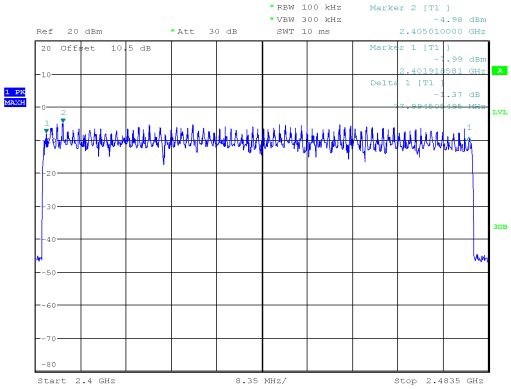
Mode	Frequency Range (MHz)	Number of Hopping Channel (CH)	Limit (CH)
BDR (GFSK)	2400-2483.5	79	≥15
EDR (π/4-DQPSK)	2400-2483.5	79	≥15
EDR (8DPSK)	2400-2483.5	79	≥15

BDR (GFSK):Number of Hopping Channels



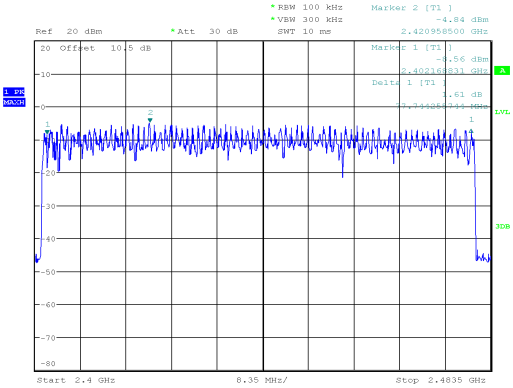
ProjectNo.:RKSA240425001 Tester:Bard Liu
Date: 21.JUN.2024 13:58:27

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



ProjectNo.:RKSA240425001 Tester:Bard Liu
Date: 21.JUN.2024 14:04:40

EDR (8DPSK): Number of Hopping Channels



ProjectNo.:RKSA240425001 Tester:Bard Liu
Date: 21.JUN.2024 14:11:52

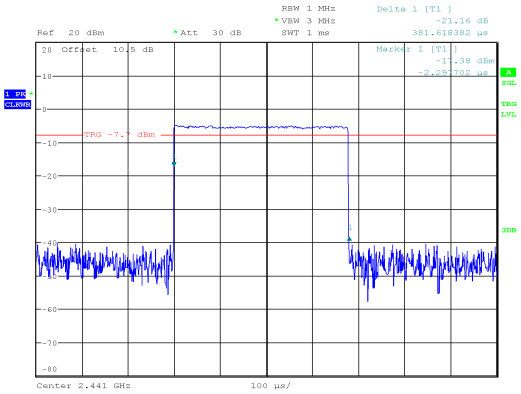
TIME OF OCCUPANCY (DWELL TIME)

EUT operation mode: Hopping

Mode	Pulse width (ms)	Dwell time (s)	Limit (s)	Result
GFSK_Hopping_DH1	0.382	0.122	0.400	Pass
GFSK_Hopping_DH3	1.653	0.264	0.400	Pass
GFSK_Hopping_DH5	2.915	0.310	0.400	Pass
π/4-DQPSK_Hopping_2DH1	0.395	0.129	0.400	Pass
π/4-DQPSK_Hopping_2DH3	1.660	0.266	0.400	Pass
π/4-DQPSK_Hopping_2DH5	2.921	0.312	0.400	Pass
8DPSK_Hopping_3DH1	0.395	0.129	0.400	Pass
8DPSK_Hopping_3DH3	1.665	0.266	0.400	Pass
8DPSK_Hopping_3DH5	2.937	0.313	0.400	Pass

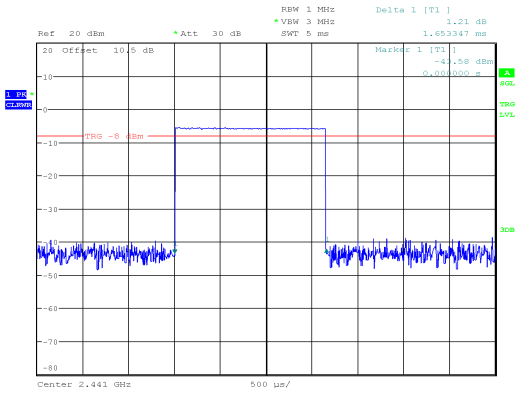
Note:
DH1:Dwell time=Pulse time (ms) × (1600/2/79) ×31.6 s
DH3:Dwell time=Pulse time (ms) × (1600/4/79) ×31.6 s
DH5:Dwell time=Pulse time (ms) × (1600/6/79) ×31.6 s
2DH1: Dwell time=Pulse time (ms) × (1600/2/79) ×31.6 s
2DH3: Dwell time=Pulse time (ms) × (1600/4/79) ×31.6 s
2DH5: Dwell time=Pulse time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

BDR (GFSK): Pulse time, Middle Channel, DH1



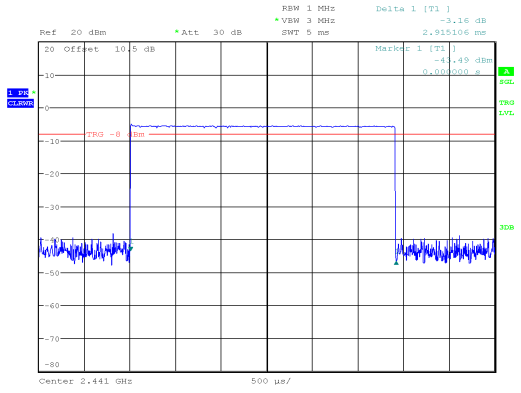
ProjectNo.:RKSA240425001 Tester:Bard Liu
Date: 21.JUN.2024 14:35:39

BDR (GFSK): Pulse time, Middle Channel, DH3



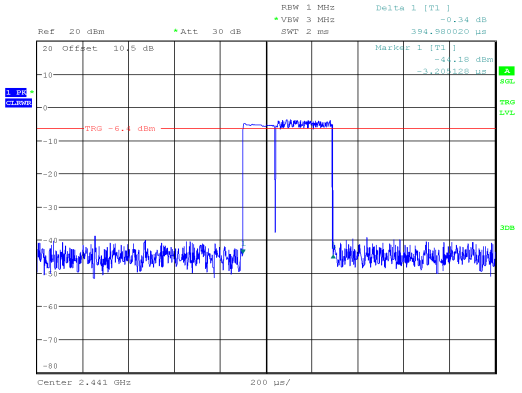
ProjectNo.:RKSA240425001 Tester:Bard Liu
Date: 21.JUN.2024 14:01:36

BDR (GFSK): Pulse time, Middle Channel, DH5



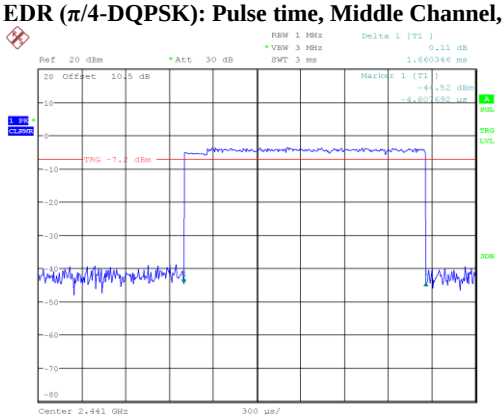
ProjectNo.:RKSA240425001 Tester:Bard Liu
Date: 21.JUN.2024 14:02:38

EDR (π/4-DQPSK): Pulse time, Middle Channel, 2DH1



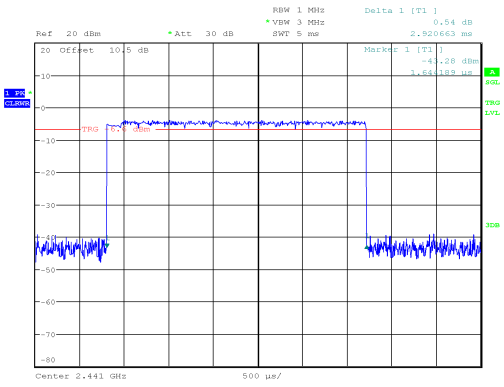
ProjectNo.:RKSA240425001 Tester:Bard Liu
Date: 21.JUN.2024 14:06:48

EDR (π/4-DQPSK): Pulse time, Middle Channel, 2DH3



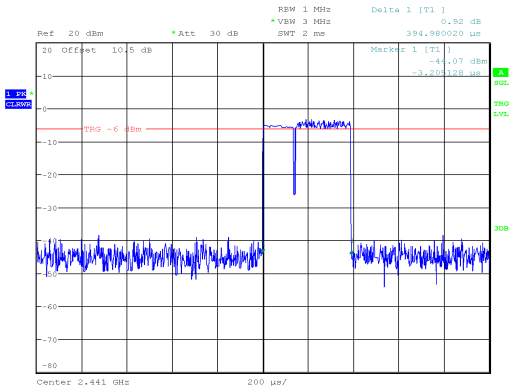
ProjectNo.:RKSA240425001 Tester:Bard Liu
Date: 25.OCT.2024 14:28:25

EDR (π/4-DQPSK): Pulse time, Middle Channel, 2DH5



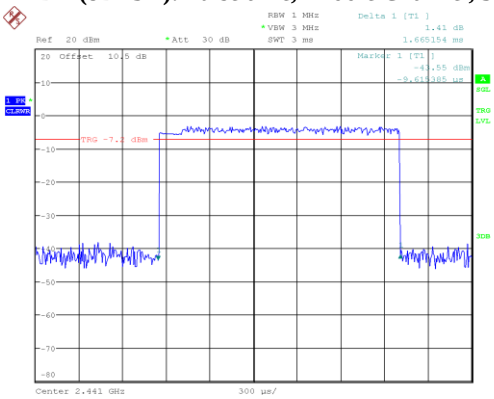
ProjectNo.:RKSA240425001 Tester:Bard Liu
Date: 21.JUN.2024 14:10:09

EDR (8DPSK): Pulse time, Middle Channel, 3DH1



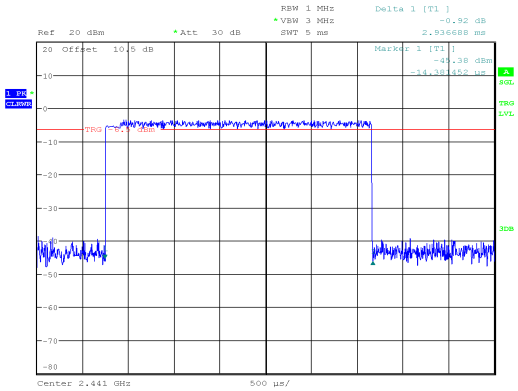
ProjectNo.:RKSA240425001 Tester:Bard Liu
Date: 21.JUN.2024 14:13:01

EDR (8DPSK): Pulse time, Middle Channel, 3DH3



ProjectNo.:RKSA240425001 Tester:Bard Liu
Date: 25.OCT.2024 14:29:55

EDR (8DPSK): Pulse time, Middle Channel, 3DH5



ProjectNo.:RKSA240425001 Tester:Bard Liu
Date: 21.JUN.2024 14:16:00

PEAK OUTPUT POWER MEASUREMENT

EUT operation mode: Transmitting

Model: X1

Mode	Channel	Frequency (MHz)	Result (dBm)	Limit (dBm)
GFSK	Low	2402	-4.29	21
	Middle	2441	-4.61	
	High	2480	-6.12	
π/4 DQPSK	Low	2402	-2.42	
	Middle	2441	-2.82	
	High	2480	-2.54	
8DPSK	Low	2402	-2.22	
	Middle	2441	-2.59	
	High	2480	-3.57	

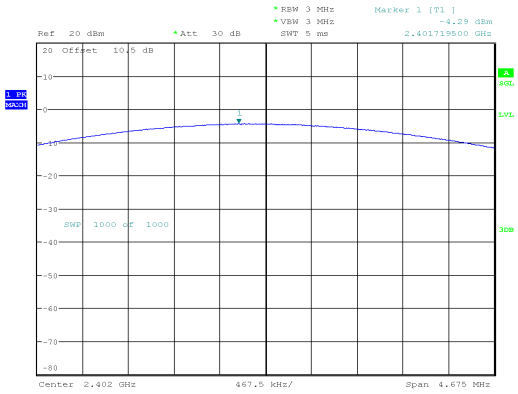
Spot check with Model: X1 Lite

Mode	Channel	Frequency (MHz)	Result (dBm)	Limit (dBm)
GFSK	Low	2402	-4.26	21
	Middle	2441	-4.21	
	High	2480	-5.71	
π/4 DQPSK	Low	2402	-2.35	
	Middle	2441	-2.55	
	High	2480	-2.36	
8DPSK	Low	2402	-1.90	
	Middle	2441	-2.35	
	High	2480	-3.46	

Result：The test data results are close

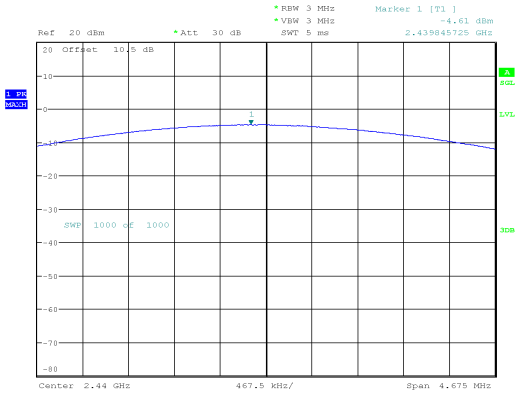
Model: X1

BDR (GFSK): 2402MHz



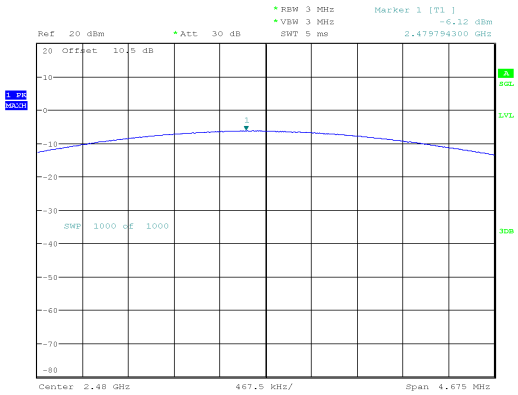
ProjectNo.:RKSA240425001 Tester:Bard Liu
Date: 21.JUN.2024 11:02:14

BDR (GFSK): 2441MHz



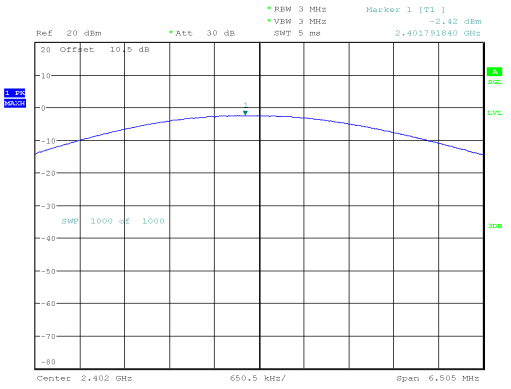
ProjectNo.:RKSA240425001 Tester:Bard Liu
Date: 21.JUN.2024 11:04:21

BDR (GFSK): 2480MHz



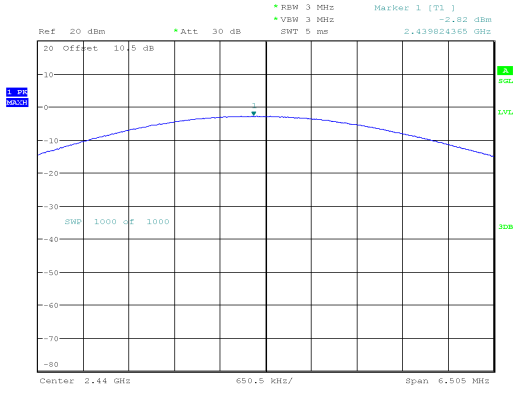
ProjectNo.:RKSA240425001 Tester:Bard Liu
Date: 21.JUN.2024 11:11:04

EDR(π/4-DQPSK): 2402MHz



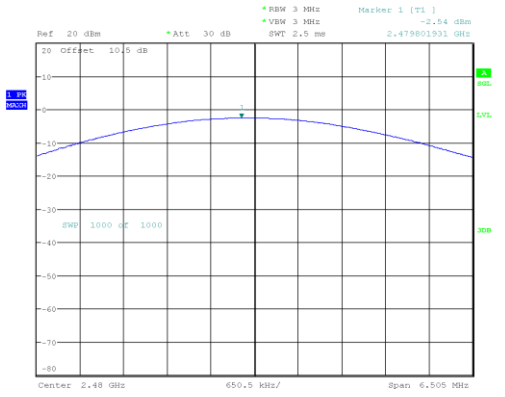
ProjectNo.:RKSA240425001 Tester:Bard Liu
Date: 21.JUN.2024 13:54:07

EDR(π/4-DQPSK): 2441MHz



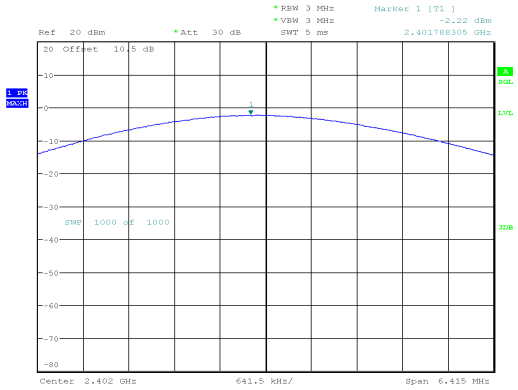
ProjectNo.:RKSA240425001 Tester:Bard Liu
Date: 21.JUN.2024 11:42:51

EDR(π/4-DQPSK): 2480MHz



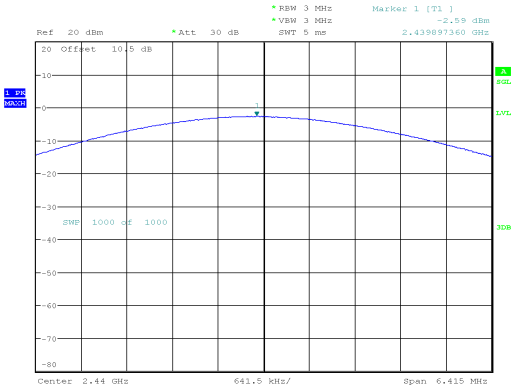
ProjectNo.:RKSA240425001 Tester:Neil Zhou
Date: 14.AUG.2024 15:51:00

EDR(8DPSK): 2402MHz



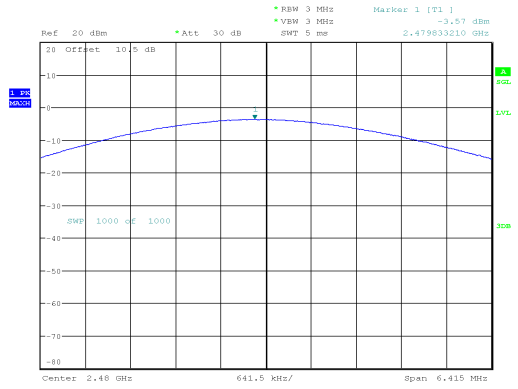
ProjectNo.:RKSA240425001 Tester:Bard Liu
Date: 21.JUN.2024 13:37:38

EDR(8DPSK): 2441MHz



ProjectNo.:RKSA240425001 Tester:Bard Liu
Date: 21.JUN.2024 13:39:18

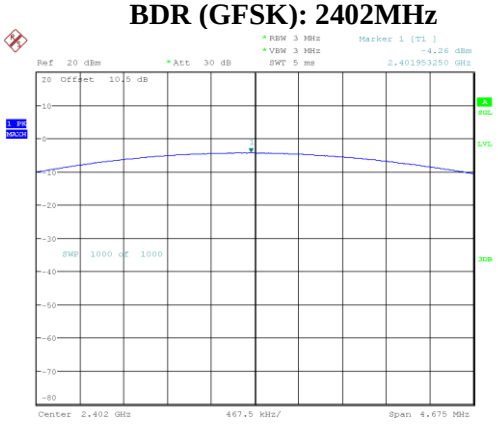
EDR(8DPSK): 2480MHz



ProjectNo.:RKSA240425001 Tester:Bard Liu
Date: 21.JUN.2024 13:45:00

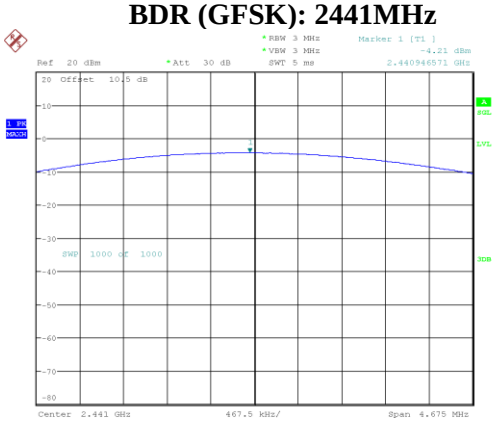
Model: X1 Lite

BDR (GFSK): 2402MHz



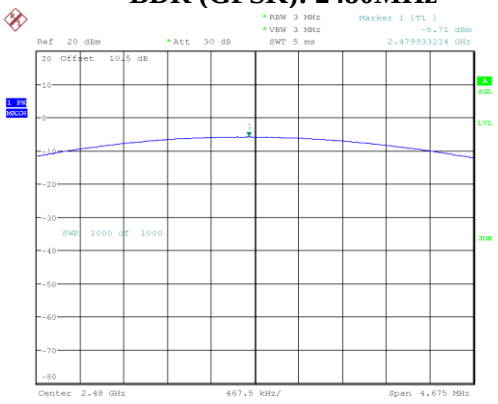
ProjectNo.:RKSA240425001 Tester:Bard Liu
Date: 23.OCT.2024 19:08:53

BDR (GFSK): 2441MHz



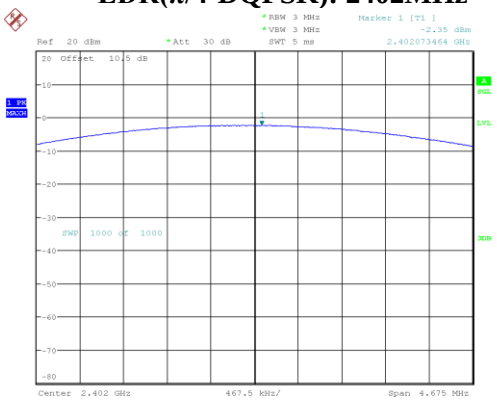
ProjectNo.:RKSA240425001 Tester:Bard Liu
Date: 23.OCT.2024 19:10:05

BDR (GFSK): 2480MHz



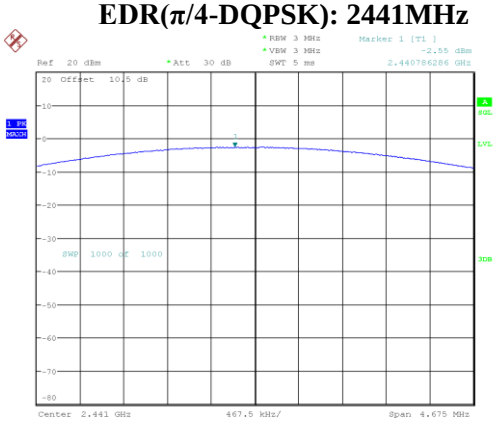
ProjectNo.:RKSA240425001 Tester:Bard Liu
Date: 23.OCT.2024 19:13:46

EDR(π/4-DQPSK): 2402MHz



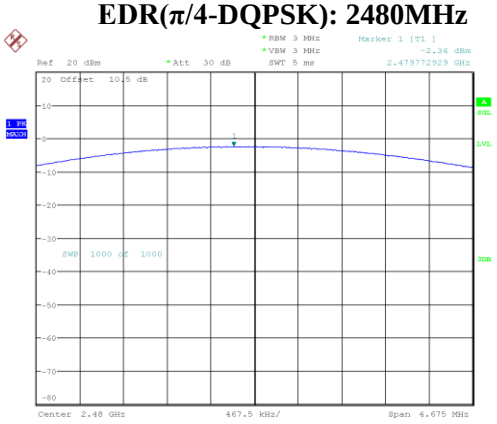
ProjectNo.:RKSA240425001 Tester:Bard Liu
Date: 23.OCT.2024 19:18:55

EDR(π/4-DQPSK): 2441MHz



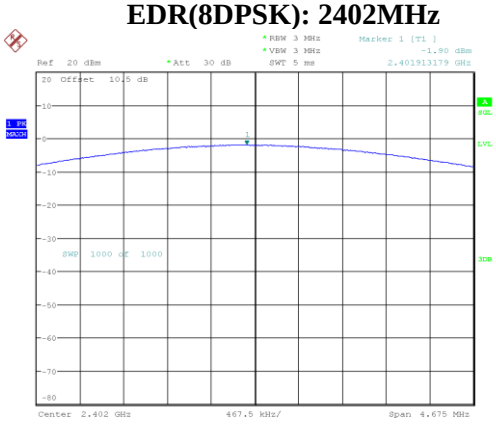
ProjectNo.:RKSA240425001 Tester:Bard Liu
Date: 23.OCT.2024 19:17:39

EDR(π/4-DQPSK): 2480MHz



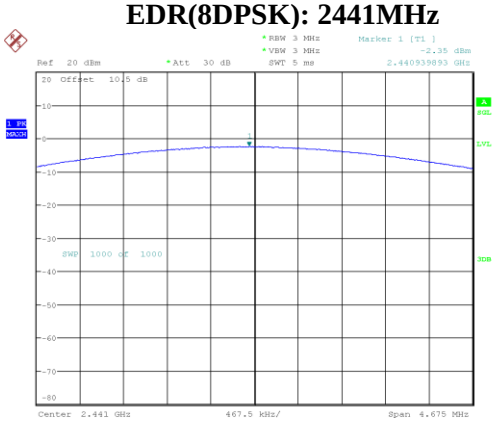
ProjectNo.:RKSA240425001 Tester:Bard Liu
Date: 23.OCT.2024 19:15:06

EDR(8DPSK): 2402MHz



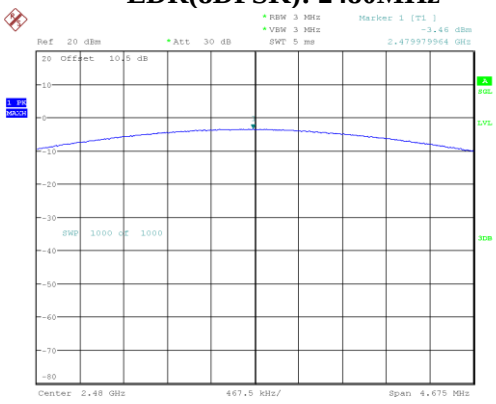
ProjectNo.:RKSA240425001 Tester:Bard Liu
Date: 23.OCT.2024 19:22:22

EDR(8DPSK): 2441MHz



ProjectNo.:RKSA240425001 Tester:Bard Liu
Date: 23.OCT.2024 19:26:21

EDR(8DPSK): 2480MHz



ProjectNo.:RKSA240425001 Tester:Bard Liu
Date: 23.OCT.2024 19:28:22

BAND EDGES

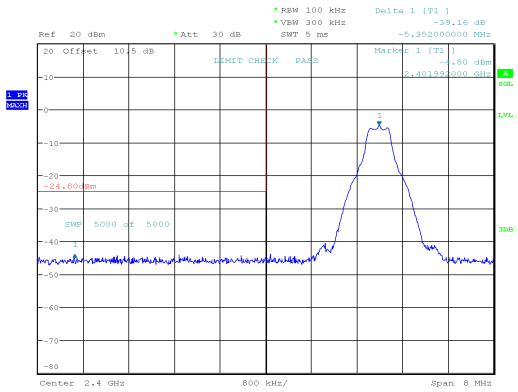
EUT operation mode: Transmitting & Hopping

Test Result: Compliant.

Mode	Channel	Frequency (MHz)	Result (dBc)	Limit (dBc)
GFSK	Low	2402	39.16	20
	High	2480	37.03	
π/4 DQPSK	Low	2402	39.32	
	High	2480	36.86	
8DPSK	Low	2402	38.84	
	High	2480	37.60	
GFSK (Hopping)	Low	2402	39.05	
	High	2480	36.20	
π/4 DQPSK (Hopping)	Low	2402	38.79	
	High	2480	37.68	
8DPSK (Hopping)	Low	2402	38.81	
	High	2480	37.44	

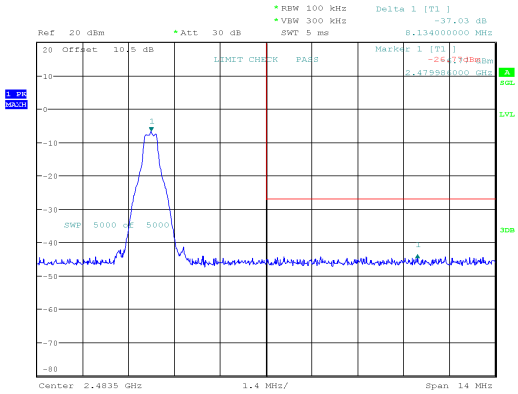
Band Edge

BDR (GFSK): Left Side



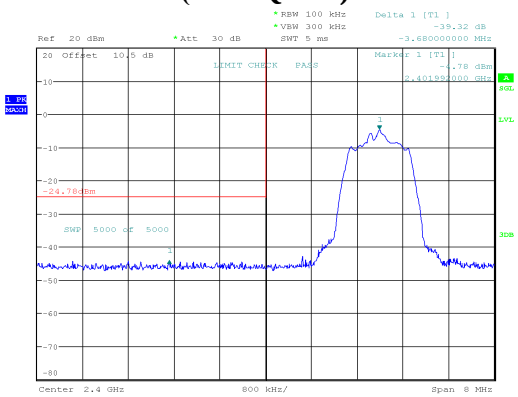
ProjectNo.:RKSA240425001 Tester:Bard Liu
Date: 21.JUN.2024 11:00:47

BDR (GFSK): Right Side



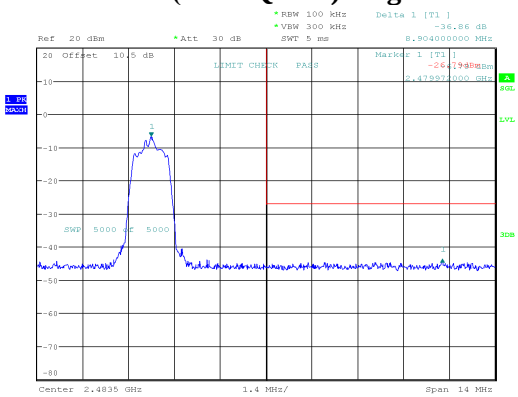
ProjectNo.:RKSA240425001 Tester:Bard Liu
Date: 21.JUN.2024 11:09:44

EDR (π/4-DQPSK): Left Side



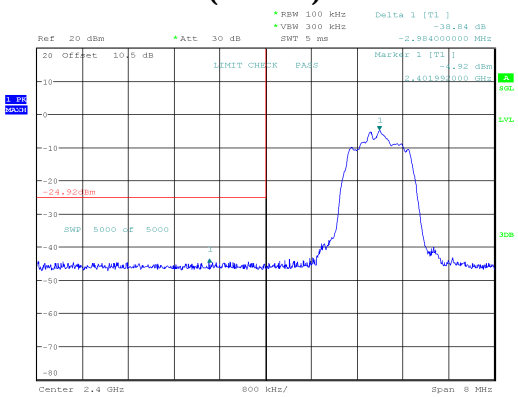
ProjectNo.:RKSA240425001 Tester:Bard Liu
Date: 21.JUN.2024 11:22:15

EDR (π/4-DQPSK): Right Side



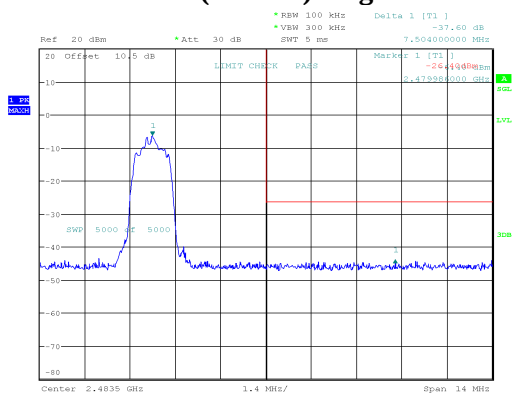
ProjectNo.:RKSA240425001 Tester:Bard Liu
Date: 21.JUN.2024 11:47:15

EDR (8DPSK): Left Side



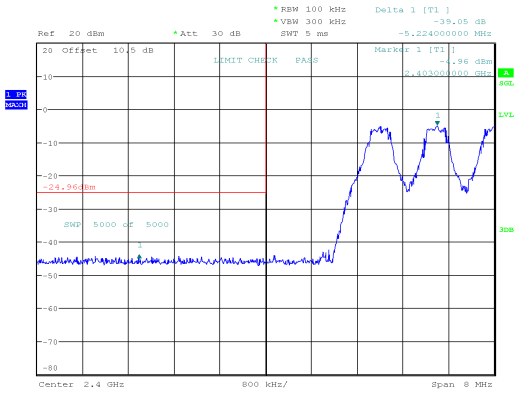
ProjectNo.:RKSA240425001 Tester:Bard Liu
Date: 21.JUN.2024 13:35:59

EDR (8DPSK): Right Side



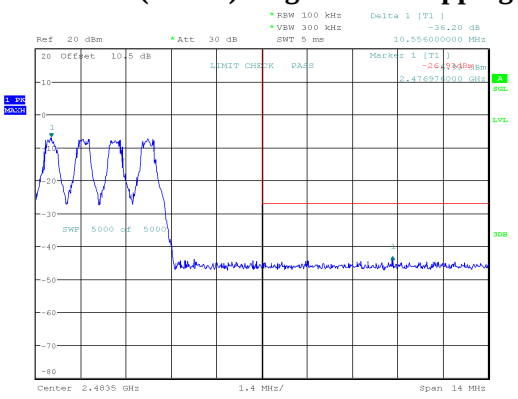
ProjectNo.:RKSA240425001 Tester:Bard Liu
Date: 21.JUN.2024 13:43:38

BDR (GFSK): Left Side - Hopping



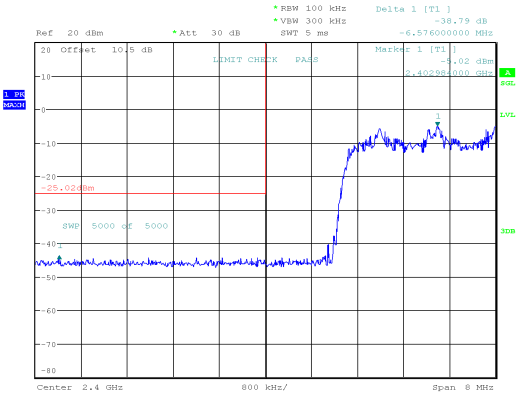
ProjectNo.:RKSA240425001 Tester:Bard Liu
Date: 21.JUN.2024 11:14:31

BDR (GFSK): Right Side- Hopping



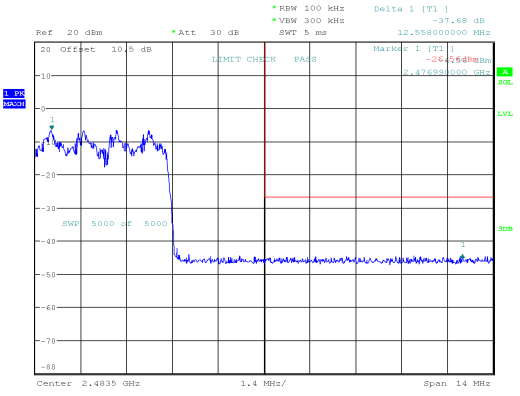
ProjectNo.:RKSA240425001 Tester:Bard Liu
Date: 21.JUN.2024 11:18:45

EDR (π/4-DQPSK): Left Side- Hopping



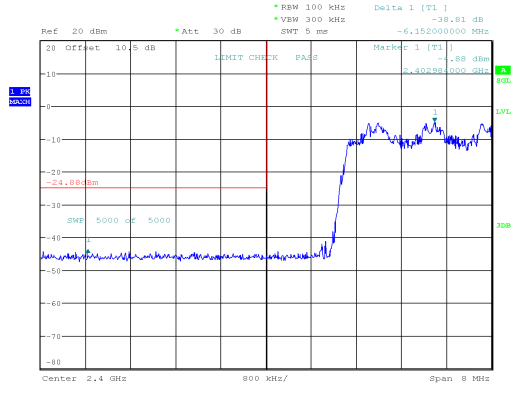
ProjectNo.:RKSA240425001 Tester:Bard Liu
Date: 21.JUN.2024 13:27:54

EDR (π/4-DQPSK): Right Side- Hopping



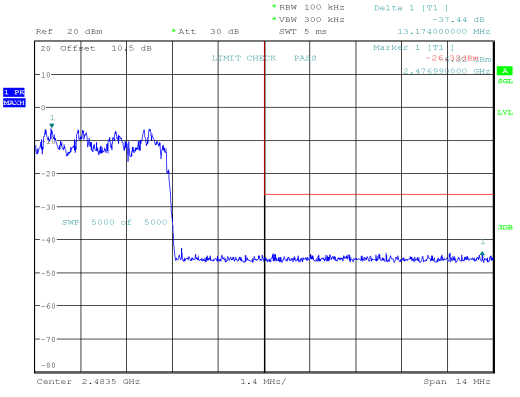
ProjectNo.:RKSA240425001 Tester:Bard Liu
Date: 21.JUN.2024 13:32:29

EDR (8DPSK): Left Side- Hopping



ProjectNo.:RKSA240425001 Tester:Bard Liu
Date: 21.JUN.2024 13:48:32

EDR (8DPSK): Right Side- Hopping



ProjectNo.:RKSA240425001 Tester:Bard Liu
Date: 21.JUN.2024 13:52:41

Declarations

1. The laboratory is not responsible for the authenticity of any information provided by the applicant. Information from the applicant that may affect test results is marked with "★".

2. The test data was only valid for the test sample(s).

3. 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.

4. Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty.

5. 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.

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