

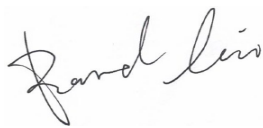
FCC PART 15.247 TEST REPORT

For

Tersus GNSS Inc.

Rm 601, Bldg E2, No. 88, Jinjihu Ave, Suzhou, China

FCC ID: 2AMDJ-TS21

Report Type: Original Report	Product Name: GNSS Receiver
Report Number: <u>RSHA250514001-00C</u>	
Report Date: <u>2025-12-29</u>	
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Approved By:	<u>Kyle Xu</u> 
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Note: This test report is prepared for the customer shown above and for the device described herein. It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp. (Kunshan). This report must not be used by the customer to claim product certification, approval, or endorsement by NVLAP, or any agency of the U.S.Government.

TABLE OF CONTENTS

REPORT REVISION HISTORY.....	4
GENERAL INFORMATION.....	5
PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT)	5
OBJECTIVE	5
TEST METHODOLOGY	5
MEASUREMENT UNCERTAINTY	6
TEST FACILITY	6
SYSTEM TEST CONFIGURATION.....	7
DESCRIPTION OF TEST CONFIGURATION	7
EUT EXERCISE SOFTWARE	7
SPECIAL ACCESSORIES	7
EQUIPMENT MODIFICATIONS	7
SUPPORT EQUIPMENT LIST AND DETAILS	8
EXTERNAL I/O CABLE.....	8
BLOCK DIAGRAM OF TEST SETUP	8
SUMMARY OF TEST RESULTS.....	10
TEST EQUIPMENT LIST	11
FCC §1.1310 & §2.1091 - MAXIMUM PERMISSIBLE EXPOSURE (MPE).....	13
FCC §15.203 – ANTENNA REQUIREMENT	15
APPLICABLE STANDARD	15
ANTENNA CONNECTOR CONSTRUCTION	15
FCC §15.207 (a) – AC LINE CONDUCTED EMISSIONS	16
APPLICABLE STANDARD	16
TEST SYSTEM SETUP.....	16
EMI TEST RECEIVER SETUP.....	16
TEST PROCEDURE	17
TEST RESULTS SUMMARY	17
TEST DATA: SEE APPENDIX	17
FCC §15.205, §15.209 & §15.247(d) – RADIATED EMISSIONS.....	18
APPLICABLE STANDARD	18
TEST SYSTEM SETUP.....	18
EMI TEST RECEIVER SETUP.....	19
TEST PROCEDURE	19
TEST RESULTS SUMMARY	20
TEST DATA: SEE APPENDIX	20
FCC §15.247(a) (1)-CHANNEL SEPARATION TEST	21
APPLICABLE STANDARD	21
TEST PROCEDURE	21
TEST DATD: SEE APPENDIX	21
FCC §15.247(a) (1) – 20 dB EMISSION BANDWIDTH.....	22
APPLICABLE STANDARD	22
TEST PROCEDURE	22
TEST DATD: SEE APPENDIX	22
FCC §15.247(a) (1) (iii)-QUANTITY OF HOPPING CHANNEL TEST	23
APPLICABLE STANDARD	23
TEST PROCEDURE	23

TEST DATD: SEE APPENDIX	23
FCC §15.247(a) (1) (iii) - TIME OF OCCUPANCY (DWELL TIME).....	24
APPLICABLE STANDARD	24
TEST PROCEDURE	24
TEST DATD: SEE APPENDIX	24
FCC §15.247(b) (1) - PEAK OUTPUT POWER MEASUREMENT.....	25
APPLICABLE STANDARD	25
TEST PROCEDURE	25
TEST DATD: SEE APPENDIX	25
FCC §15.247(d) - BAND EDGES & CONDUCTED SPURIOUS EMISSION	26
APPLICABLE STANDARD	26
TEST PROCEDURE	26
TEST DATD: SEE APPENDIX	27
APPENDIX - TEST DATA.....	28
AC LINE CONDUCTED EMISSIONS	28
RADIATED EMISSIONS & RESTRICTED BANDS EMISSIONS	31
CHANNEL SEPARATION TEST	50
20 dB BANDWIDTH TEST	52
QUANTITY OF HOPPING CHANNEL TEST	55
TIME OF OCCUPANCY (DWELL TIME).....	57
PEAK OUTPUT POWER MEASUREMENT	62
BAND EDGES.....	65
CONDUCTED SPURIOUS EMISSION	68
EUT PHOTOGRAPHS.....	71
TEST SETUP PHOTOGRAPHS.....	72

REPORT REVISION HISTORY

Number of Revisions	Report No.	Version	Issue Date	Description
0	RSHA250514001-00C	R1V1	2025-12-29	Initial Release

GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

Applicant:	Tersus GNSS Inc.
Tested Model:	TS21
Series Model:	TS20
Model Difference:	TS21 has two cameras, TS20 has one camera
Product Name:	GNSS Receiver
Power Supply:	DC 5V from adapter or DC 7.4V from battery
Maximum Output Power:	GFSK: 8.07 dBm $\pi/4$ -DQPSK: 8.55 dBm 8DPSK: 8.91 dBm
RF Function:	Classic BT
Operating Band/Frequency:	2402-2480 MHz
Channel Number:	79
Channel Separation:	1 MHz
Modulation Type:	GFSK, $\pi/4$ -DQPSK, 8DPSK
Antenna Type	PCB Antenna
★Maximum Antenna Gain:	1.33 dBi
Sample/EUT Status	Good condition

Adapter Information:

Model: QL015-0503000U1

Input: 100-240V, 50/60Hz, 0.5A

Output: 5.0V, 3.0A

Note: The maximum antenna gain was declared by the manufacturer, after pre-scan, the model TS21 is the worst, only the worst data is recorded in the report.

All measurement and test data in this report was gathered from production sample serial number: RSHA250514001-1 (Assigned by the BACL (Kunshan). The EUT supplied by the applicant was received on 2025-05-14.)

Objective

This test report is prepared for *Tersus GNSS Inc.* in accordance with Part 2-Subpart J, Part 15-Subparts A and C of the Federal Communication Commissions rules.

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

Test Methodology

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

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°C
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

The system was configured for testing in an engineering mode, which was provided by manufacturer

RF Test Tool: QRCT3

★Power level: 9

Note: The power level was declared by the applicant.

Special Accessories

No special accessory.

Equipment Modifications

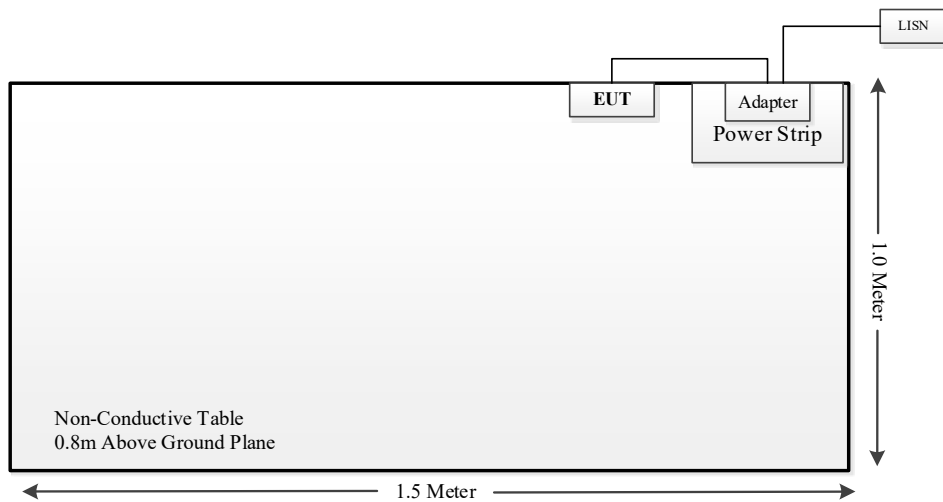
No modification was made to the EUT tested.

Support Equipment List and Details

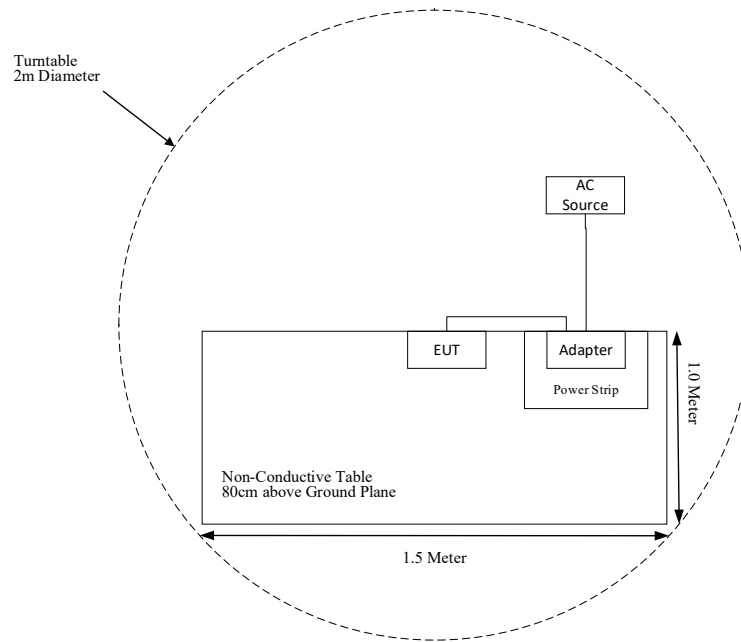
Manufacturer	Description	Model	Serial Number
/	Power Strip	/	/

External I/O Cable

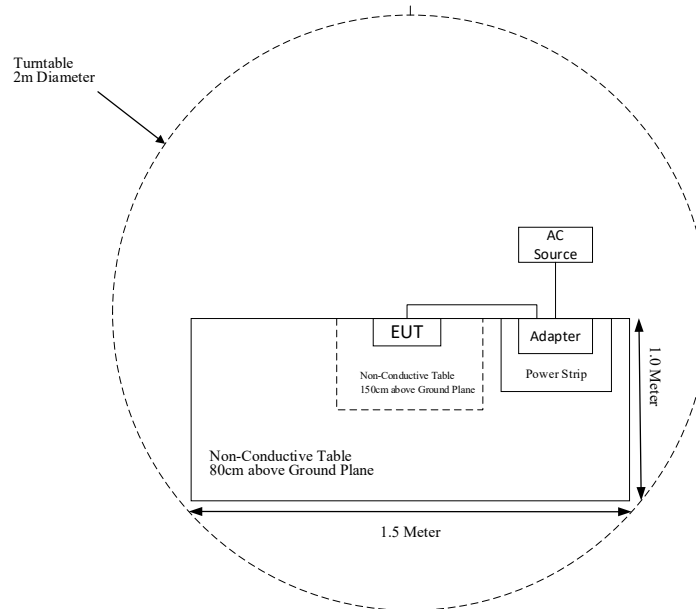
Cable Description	Length (m)	From Port	To Port
Power Cable 1	1.0	AC Source/LISN	Power Strip
Power Cable 2	1.0	Adapter	EUT

Block Diagram of Test Setup**For Conducted Emissions:**

For Radiated Emissions (Below 1GHz):



For Radiated Emissions (Above 1GHz):



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 & Restricted Bands 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 & Conducted Spurious Emission	Compliant

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	2025-04-09	2026-04-08
Sunol Sciences	Broadband Antenna	JB3	A090314-1	2024-11-08	2027-11-07
Narda	6dB Attenuator	773-6	10690812-2-1	2024-11-08	2027-11-07
BACL	Active Loop Antenna	1313-1A	4041511	2024-11-22	2027-11-21
Sonoma Instrument	Pre-amplifier	310N	171205	2025-04-09	2026-04-08
Rohde & Schwarz	Auto Test Software	EMC32	100361	N/A	N/A
MICRO-COAX	Coaxial Cable	Cable-8	008	2025-04-09	2026-04-08
MICRO-COAX	Coaxial Cable	Cable-9	009	2025-04-09	2026-04-08
MICRO-COAX	Coaxial Cable	Cable-10	010	2025-04-09	2026-04-08
Radiated Emission Test (Chamber #2)					
Rohde & Schwarz	EMI Test Receiver	ESU40	100207/040	2025-04-09	2026-04-08
ETS-LINDGREN	Horn Antenna	3115	9311-4159	2024-12-02	2025-12-01
ETS-LINDGREN	Horn Antenna	3116	2516	2024-12-12	2027-12-11
A.H.Systems, inc	Amplifier	PAM-0118P	512	2025-04-09	2026-04-08
SELECTOR	Amplifier	EM18G40G	060726	2025-04-09	2026-04-08
MICRO-TRONICS	Band Reject Filter	BRM50702	G024	2025-04-08	2026-04-07
Narda	Attenuator	10dB	010	2025-04-08	2026-04-07
Rohde & Schwarz	Auto test Software	EMC32	100361	N/A	N/A
MICRO-COAX	Coaxial Cable	Cable-6	006	2025-04-09	2026-04-08
MICRO-COAX	Coaxial Cable	Cable-11	011	2025-04-09	2026-04-08
MICRO-COAX	Coaxial Cable	Cable-12	012	2025-04-09	2026-04-08
MICRO-COAX	Coaxial Cable	Cable-13	013	2025-04-09	2026-04-08
RF Conducted Test					
Rohde & Schwarz	Spectrum Analyzer	FSU26	200103	2025-04-09	2026-04-08
Narda	Attenuator	10dB	010	2025-04-08	2026-04-07
XHFDZ	RG316 Coaxial Cable	SMA-316	XHF-1175	Each time	N/A

Conducted Emission Test					
Rohde & Schwarz	EMI Test Receiver	ESR	1316.3003K03-101746-zn	2025-04-08	2026-04-07
Rohde & Schwarz	LISN	ENV216	101115	2025-04-08	2026-04-07
Audix	Test Software	e3	V9	N/A	N/A
Rohde & Schwarz	Pulse limiter	ESH3-Z2	100552	2025-04-08	2026-04-07
MICRO-COAX	Coaxial Cable	Cable-15	015	2025-04-08	2026-04-07

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).

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

(B) 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/cm²);

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);

For simultaneously transmit system, the calculated power density should comply with:

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

Calculation Data:

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)				
2.4G Wi-Fi	2412-2462	1.33	1.36	14.0	25.12	20	0.0068	1.00	0.0068
BT	2402-2480	1.33	1.36	9.0	7.94	20	0.0021	1.00	0.0021
5G Wi-Fi	5150-5250	-1.32	0.74	8.0	6.31	20	0.0009	1.00	0.0009
	5725-5850	-2.61	0.55	11.0	12.59	20	0.0014	1.00	0.0014
LTE band 2	1850-1910	1.93	1.56	22.5	177.83	20	0.0552	1.0	0.0552
LTE band 4	1710-1755	-2.87	0.52	24.5	281.84	20	0.0292	1.0	0.0292
LTE band 5	824-849	-0.03	0.99	24.5	281.84	20	0.0557	0.5493	0.1014
LTE band 7	2500-2570	0.74	1.19	23.0	199.53	20	0.0472	1.0	0.0472
LTE band 25	1850-1915	1.93	1.56	25.0	316.23	20	0.0981	1.0	0.0981
LTE band 38	2570-2620	0.74	1.19	22.5	177.83	20	0.0421	1.0	0.0421
LTE band 41	2496-2690	0.74	1.19	23.0	199.53	20	0.0472	1.0	0.0472

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	4.29	2.69	33.00	1995.26	20	1.0658	1.3667	0.7798

Note:

- The target output powers are all declared by the Manufacturer.
- Wi-Fi, BT, WWAN and UHF can transmit simultaneously, the worst condition is as below:

$$\sum_i \frac{S_i}{S_{Limit,i}} = 0.0068 + 0.0021 + 0.1014 + 0.7798 = 0.8901 < 1.0$$

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 have a PCB antenna which permanently attached to the unit. Fulfill the requirement of this section. Please refer to the EUT photos.

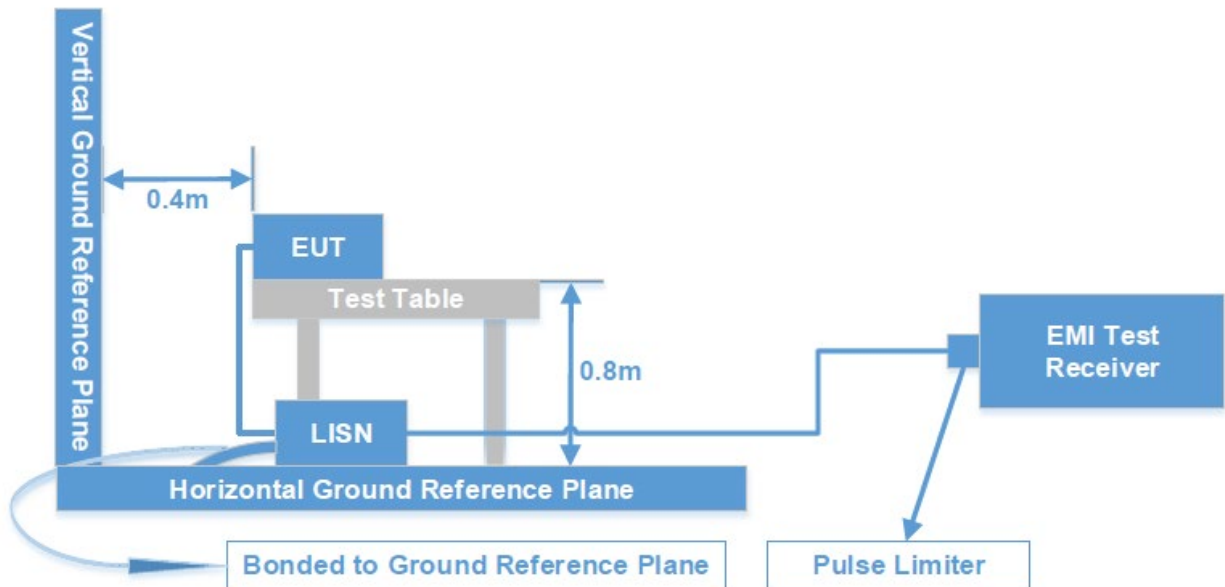
Result: Compliant.

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 C63.10-2020. The related limit was specified in FCC Part 15.207.

EMI Test Receiver Setup

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

Frequency Range	RBW
150 kHz - 30 MHz	9 kHz

Test Procedure

ANSI C63.10-2020 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:

$$\begin{aligned}\text{Factor (dB)} &= \text{LISN VDF (dB)} + \text{Cable Loss (dB)} + \text{Transient Limiter Attenuation (dB)} \\ \text{Level (dB}\mu\text{V)} &= \text{Read level (dB}\mu\text{V)} + \text{Factor (dB)}\end{aligned}$$

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:

$$\text{Over Limit (dB)} = \text{Level (dB}\mu\text{V)} - \text{Limit (dB}\mu\text{V)}$$

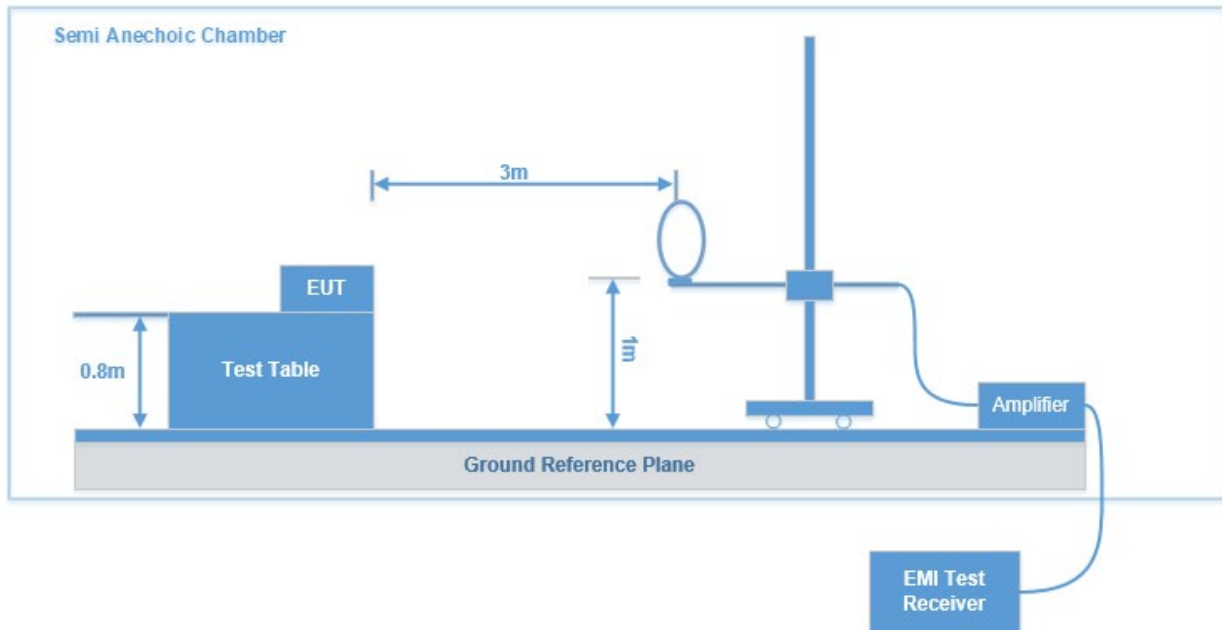
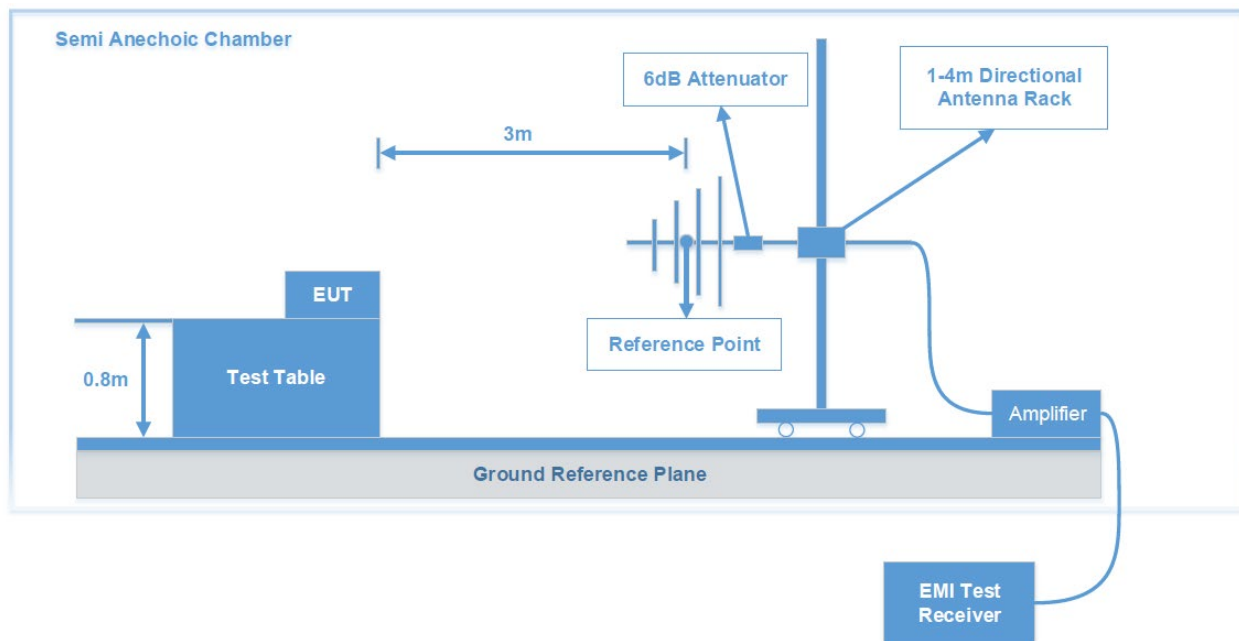
Test Results Summary

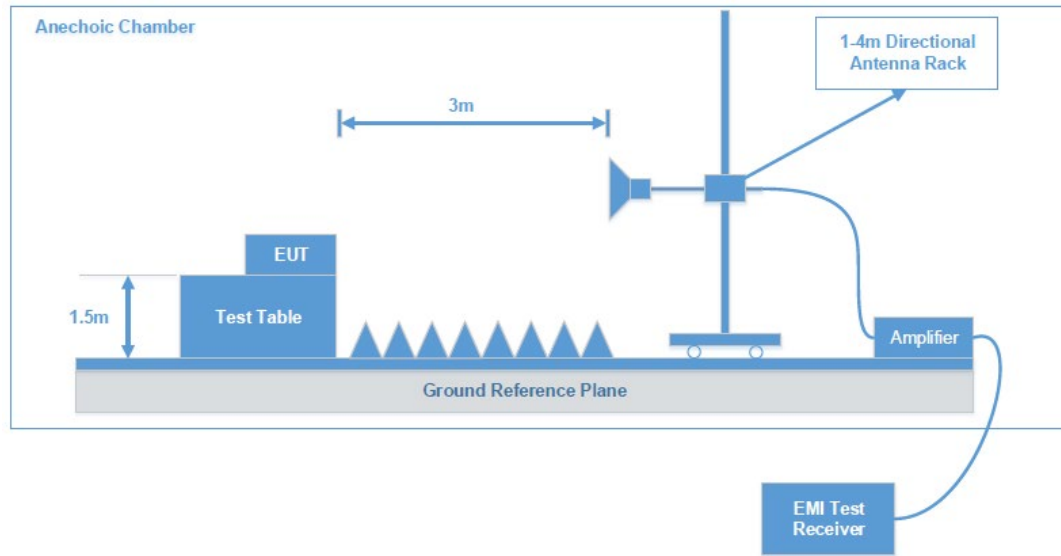
According to the recorded data in following table, the EUT complied with the FCC Part 15.207.

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 1 GHz:

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

EMI Test Receiver Setup

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

Frequency Range	RBW	VBW	IF B/W	Measurement	Detector
9 kHz - 150 kHz	200 Hz	1 kHz	200 Hz	Peak/QP/Average	Peak/QP/Average
150 kHz - 30 MHz	9 kHz	30 kHz	9 kHz	Peak/QP/Average	Peak/QP/Average
30 MHz - 1000 MHz	100 kHz	300 kHz	/	Peak	Peak
	/	/	120 kHz	QP	QP
Above 1GHz	1MHz	3 MHz	/	Peak	Peak
	1MHz	3 MHz	/	Average	Average

Test Procedure

According to ANSI C63.10-2020 clause 6.4, 6.5 and 6.6.

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:

$$\text{Corrected Amplitude (dB}\mu\text{V/m)} = \text{Meter Reading (dB}\mu\text{V)} + \text{Antenna Factor (dB/m)} + \text{Cable Loss (dB)} - \text{Amplifier Gain (dB)}$$

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:

$$\text{Margin (dB)} = \text{Limit (dB}\mu\text{V/m)} - \text{Corrected Amplitude (dB}\mu\text{V/m)}$$

Note: The QuasiPeak (dB μ V/m), MaxPeak (dB μ V/m), Average (dB μ V/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 hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater provided the systems operate with an output power no greater than 125 mW.

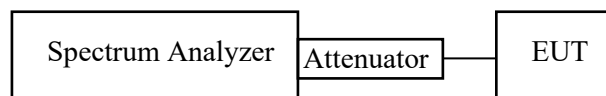
Test Procedure

According to ANSI C63.10-2020 sub-clause 7.8.2

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

- Span: Wide enough to capture the peaks of two adjacent channels.
- 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.
- Video (or average) bandwidth (VBW) $\geq$ RBW.
- Sweep: Auto.
- Detector function: Peak.
- Trace: Max hold.
- Allow the trace to stabilize.

Use the marker-delta function to determine the separation between the peaks of the adjacent channels.



Note: Offset (10.5dB) = Attenuator (10dB) + Cable Loss (0.5dB)

Test Datd: See Appendix

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

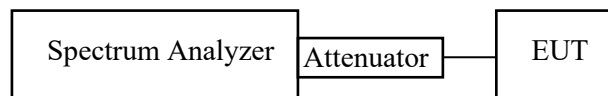
Applicable Standard

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

According to ANSI C63.10-2020 sub-clause 6.9.2

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.



Note: Offset (10.5dB) = Attenuator (10dB) + Cable Loss (0.5dB)

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.

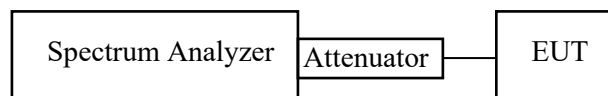
Test Procedure

According to ANSI C63.10-2020 sub-clause 7.8.3

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 $\geq$ 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.



Note: Offset (10.5dB) = Attenuator (10dB) + Cable Loss (0.5dB)

Test Datd: See Appendix

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

Applicable Standard

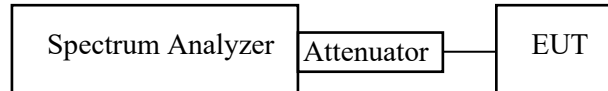
Frequency hopping systems in the 2400-2483.5 MHz shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions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

Test Procedure

According to ANSI C63.10-2020 sub-clause 7.8.4

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 $\leq$ channel spacing and where possible RBW should be set $\geq 1 / T$, 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.



Note: Offset (10.5dB) = Attenuator (10dB) + Cable Loss (0.5dB)

Test Datd: See Appendix

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

Applicable Standard

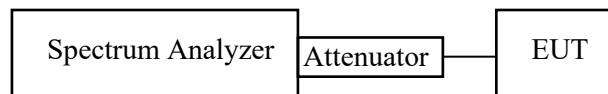
According to §15.247(b) (1), for frequency hopping systems operating in the 2400–2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725–5850 MHz band: 1 watt. And for all other frequency hopping systems in the 2400–2483.5 MHz band: 0.125 watts.

Test Procedure

According to ANSI C63.10-2020 sub-clause 7.8.5

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 $\geq$ 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.



Note: Offset (10.5dB) = Attenuator (10dB) + Cable Loss (0.5dB)

Test Datd: See Appendix

FCC §15.247(d) - BAND EDGES & CONDUCTED SPURIOUS EMISSION

Band Edges

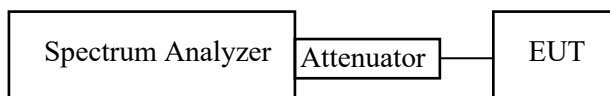
Applicable Standard

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

According to ANSI C63.10-2020 sub-clause 7.8.7

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.



Note: Offset (10.5dB) = Attenuator (10dB) + Cable Loss (0.5dB)

Conducted Spurious Emission

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)).

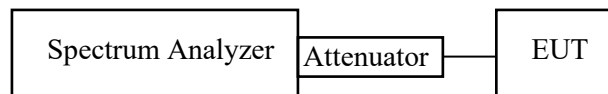
Test Procedure

Test Method: ANSI C63.10-2020 Clause 7.8.7.1

To demonstrate compliance with the relative out-of-band emissions requirements conducted spurious emissions shall be measured for the transmit frequencies, per 5.5 and 5.6, and at the maximum transmit powers. Frequency hopping shall be disabled for this test with the exception of measurements at the allocated band-edges which shall be repeated with hopping enabled.

Connect the primary antenna port through an attenuator to the spectrum analyzer input; in the results, account for all losses between the unlicensed wireless device output and the spectrum analyzer. The frequency range of testing shall span 30 MHz to 10 times the operating frequency and this may be done in a single sweep or, to aid resolution, across a number of sweeps. The resolution bandwidth shall be 100 kHz, video bandwidth 300 kHz, and a coupled sweep time with a peak detector.

The limit is based on the highest in-band level across all channels measured using the same instrument settings (resolution bandwidth of 100 kHz, video bandwidth of 300 kHz, and a coupled sweep time with a peak detector). To help clearly demonstrate compliance a display line may be set at the required offset (typically 20 dB) below the highest in-band level. Where the highest in-band level is not clearly identified in the out-of-band measurements a separate spectral plot showing the in-band level shall be provided.



Note: Offset (11dB) = Attenuator (10dB) + Cable Loss (1.0dB)

Test Datd: See Appendix

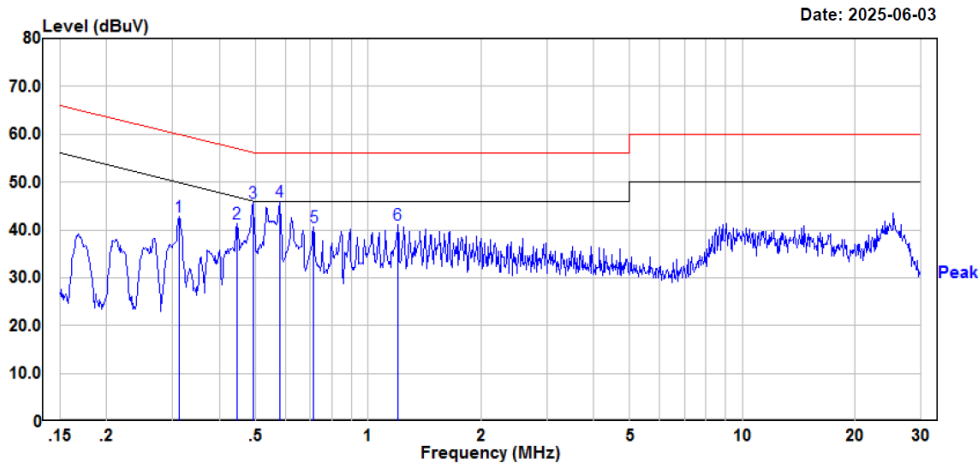
APPENDIX - TEST DATA

AC LINE CONDUCTED EMISSIONS

Environmental Conditions & Test Information

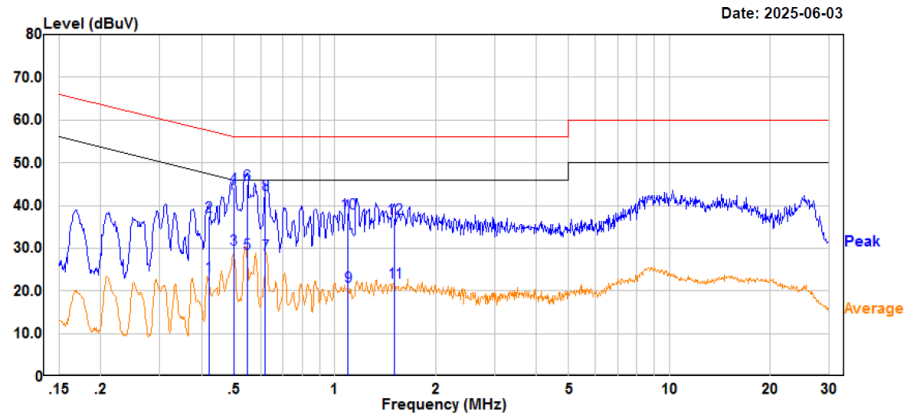
Test Date:	2025-06-03.
Temperature:	22.4 °C
Relative Humidity:	51 %
ATM Pressure:	100.8 kPa
Test Result:	Pass
Test Engineer:	Myles Miao

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



Site : CE
 Condition : limit\FCC PART 15.207
 : DET:Peak
 Project No. : RSHA250514001
 Model : TS21
 Phase : L
 Voltage : 120V/60Hz
 Mode : Bluetooth
 Test Equipment : ENV216,ESR3
 Receiver Setting : RBW: 9 kHz,Sweep Time: Auto
 Temperature : 22.4°C
 Humidity : 51%
 Atmospheric pressure: 100.8KPa
 Test Engineer : Myles Miao

	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV		dB	dBuV	dB	
1	0.312	22.55	20.23	42.78	59.91	-17.13	Peak
2	0.445	21.14	20.25	41.39	56.98	-15.59	Peak
3	0.491	25.57	20.19	45.76	56.15	-10.39	Peak
4	0.579	25.71	20.23	45.94	56.00	-10.06	Peak
5	0.714	20.43	20.29	40.72	56.00	-15.28	Peak
6	1.199	20.88	20.11	40.99	56.00	-15.01	Peak



Site : CE
 Condition : limit\FCC PART 15.207
 : DET:Peak
 Project No. : RSHA250514001
 Model : TS21
 Phase : N
 Voltage : 120V/60Hz
 Mode : Bluetooth
 Test Equipment : ENV216,ESR3
 Receiver Setting : RBW: 9 kHz,Sweep Time: Auto
 Temperature : 22.4℃
 Humidity : 51%
 Atmospheric pressure: 100.8KPa
 Test Engineer : Myles Miao

	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	
1	0.421	3.20	20.24	23.44	47.43	-23.99	Average
2	0.421	17.30	20.24	37.54	57.43	-19.89	QP
3	0.499	9.60	20.17	29.77	46.02	-16.25	Average
4	0.499	24.00	20.17	44.17	56.02	-11.85	QP
5	0.548	8.50	20.21	28.71	46.00	-17.29	Average
6	0.548	24.80	20.21	45.01	56.00	-10.99	QP
7	0.621	8.20	20.25	28.45	46.00	-17.55	Average
8	0.621	22.30	20.25	42.55	56.00	-13.45	QP
9	1.096	0.90	20.10	21.00	46.00	-25.00	Average
10	1.096	18.10	20.10	38.20	56.00	-17.80	QP
11	1.508	2.00	20.12	22.12	46.00	-23.88	Average
12	1.508	16.80	20.12	36.92	56.00	-19.08	QP

RADIATED EMISSIONS & RESTRICTED BANDS EMISSIONS**Environmental Conditions & Test Information**

Test Item:	SPURIOUS EMISSIONS			
	9kHz – 30MHz	30MHz - 1GHz	1 GHz - 18 GHz	18 GHz - 25 GHz
Test Date:	2025-06-16	2025-05-29	2025-06-04	2025-06-20
Temperature:	23.4 °C	24.6 °C	24.4 °C	23.1 °C
Relative Humidity:	48%	47 %	47 %	51 %
ATM Pressure:	101.2 kPa	101.6 kPa	100.9 kPa	100.7 kPa
Test Result:	Pass	Pass	Pass	Pass
Test Engineer:	Jonathan	Jonathan	Danny Zhu	Hugh Wu

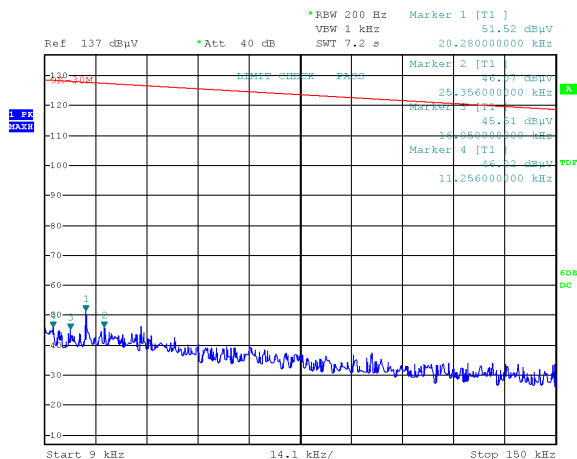
EUT operation mode: Transmitting

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

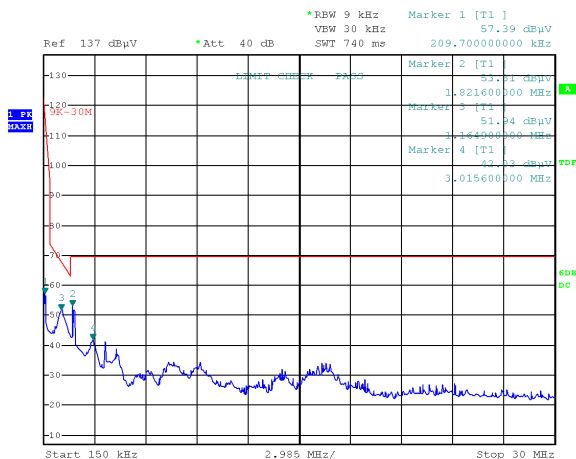
9 kHz-30 MHz: (Transmitting maximum output power 8DPSK Mode low channel)

Parallel(worst case)

9kHz-150kHz



150kHz-30MHz



Project No.RSHA250514001
Date: 16.JUN.2025 21:02:47

Tester:Jonathan

Project No.RSHA250514001
Date: 16.JUN.2025 21:06:35

Tester:Jonathan

9kHz-150kHz

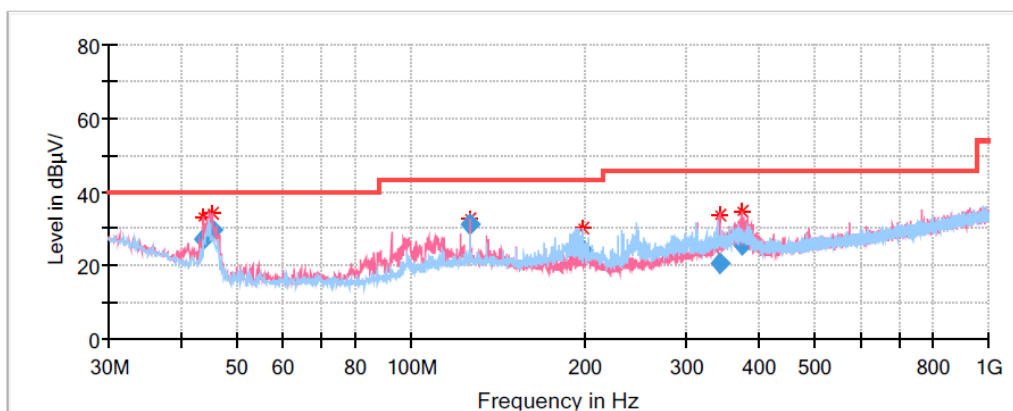
Frequency (MHz)	Corrected Amplitude (dBμV/m) @3m	Detector PK/QP/Ave.	Corrected Factor (dB/m)	Limit (dBμV/m) @3m	Margin (dB)
0.020280	51.52	PK	-0.56	121.46	69.94
0.025356	46.07	PK	-0.59	119.52	73.45
0.016050	45.51	PK	-0.54	123.49	77.98
0.011256	46.02	PK	-0.52	126.58	80.56

150kHz-30MHz

Frequency (MHz)	Corrected Amplitude (dBμV/m) @3m	Detector PK/QP/Ave.	Corrected Factor (dB/m)	Limit (dBμV/m) @3m	Margin (dB)
0.209700	57.39	PK	-13.87	101.17	43.78
1.164900	51.94	PK	-28.15	66.28	14.34
1.821600	53.31	PK	-30.32	69.54	16.23
3.015600	42.03	PK	-31.42	69.54	27.51

30 MHz - 1 GHz (Transmitting in maximum output power 8DPSK Mode low channel):**Low Channel: 2402 MHz****Common Information**

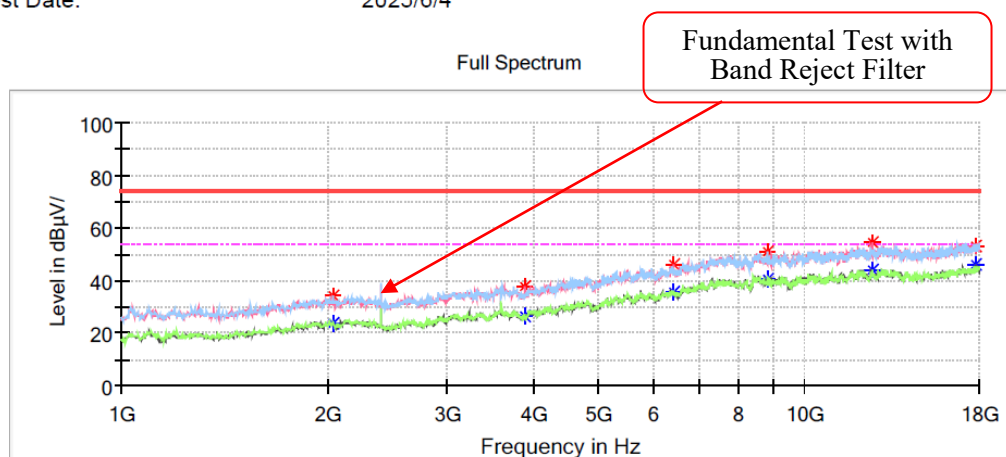
Project No: RSHA250514001
EUT Model: TS21
Test Mode: Transmitting in BT mode low channel
Standard: FCC Part 15.205 & FCC Part 15.209 & FCC Part 15.247
Test Equipment: ESCI, JB3, 310N
Receiver Setting: RBW: 100 kHz, VBW: 300 kHz, Sweep Time: Auto
Temperature: 24.6°C
Humidity: 47%
Barometric Pressure: 101.6 kPa
Test Engineer: Jonathan
Test Date: 2025/5/29

**Final Result**

Frequency (MHz)	QuasiPeak (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Pol	Corr. (dB/m)
43.826000	26.95	40.00	13.05	V	-14.0
45.390750	29.65	40.00	10.35	V	-14.1
126.632650	31.39	43.50	12.11	V	-11.0
198.781600	24.02	43.50	19.48	H	-12.2
341.616000	20.62	46.00	25.38	V	-9.4
373.257112	25.51	46.00	20.49	V	-8.6

1 GHz - 18 GHz:**GFSK:****Low Channel: 2402 MHz****Common Information**

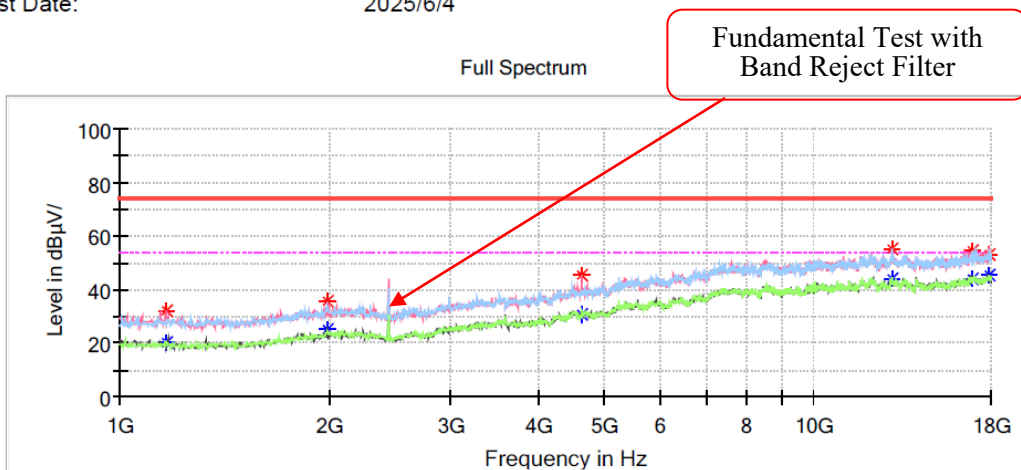
Project No.:	RSHA250514001
EUT Model:	TS21
Test Mode:	BT
Standard:	FCC Part 15.247& FCC Part 15.205& FCC Part 15.209
Test Equipment:	ESU40,3115,PAM-0118P
Receiver Setting:	RBW: 1MHz, VBW: 3MHz, Sweep Time: Auto
Temperature:	24.4℃
Humidity:	47%
Atmospheric Pressure:	100.9kPa
Test Engineer:	Danny Zhu
Test Date:	2025/6/4

**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)
2040.400000	---	23.43	54.00	30.57	V	-10.5
2040.400000	33.98	---	74.00	40.02	V	-10.5
3900.200000	---	26.76	54.00	27.24	H	-6.6
3900.200000	37.70	---	74.00	36.30	H	-6.6
6433.200000	---	35.85	54.00	18.15	H	-0.6
6433.200000	46.26	---	74.00	27.74	H	-0.6
8830.200000	---	40.25	54.00	13.75	H	4.4
8830.200000	51.35	---	74.00	22.65	H	4.4
12587.200000	54.49	---	74.00	19.51	V	8.7
12587.200000	---	43.73	54.00	10.27	V	8.7
17806.200000	53.34	---	74.00	20.66	H	11.2
17806.200000	---	45.81	54.00	8.19	H	11.2

Middle Channel: 2441 MHz**Common Information**

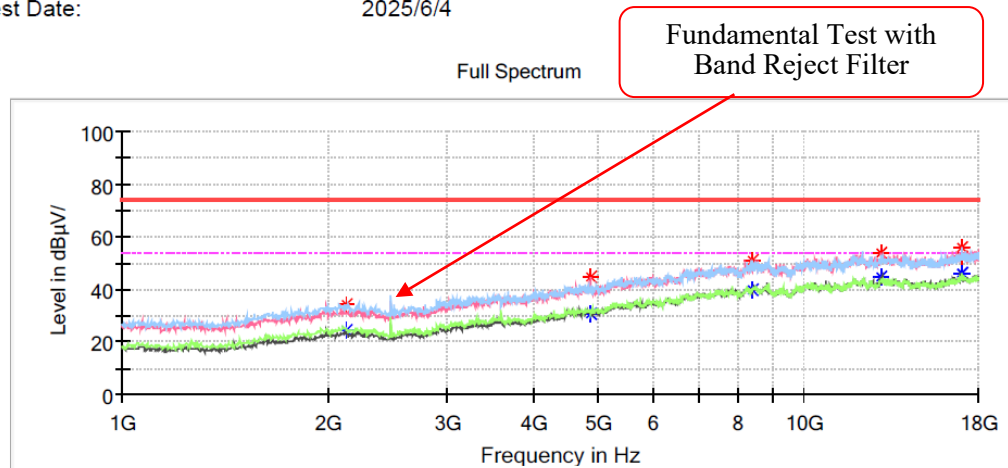
Project No.: RSHA250514001
 EUT Model: TS21
 Test Mode: BT
 Standard: FCC Part 15.247& FCC Part 15.205& FCC Part 15.209
 Test Equipment: ESU40,3115,PAM-0118P
 Receiver Setting: RBW: 1MHz, VBW: 3MHz, Sweep Time: Auto
 Temperature: 24.4°C
 Humidity: 47%
 Atmospheric Pressure: 100.9kPa
 Test Engineer: Danny Zhu
 Test Date: 2025/6/4

**Critical_Freqs**

Frequency (MHz)	MaxPeak (dB μV/m)	Average (dB μV/m)	Limit (dB μV/m)	Margin (dB)	Pol	Corr. (dB/m)
1166.600000	---	20.00	54.00	34.00	V	-15.4
1166.600000	32.32	---	74.00	41.68	V	-15.4
1989.400000	---	25.26	54.00	28.74	V	-10.6
1989.400000	35.90	---	74.00	38.10	V	-10.6
4638.000000	---	30.74	54.00	23.26	H	-4.5
4638.000000	45.74	---	74.00	28.26	H	-4.5
12940.800000	54.93	---	74.00	19.07	H	8.7
12940.800000	---	43.98	54.00	10.02	H	8.7
16966.400000	---	44.34	54.00	9.66	H	11.2
16966.400000	54.69	---	74.00	19.31	H	11.2
17935.400000	53.00	---	74.00	21.00	V	11.6
17935.400000	---	45.18	54.00	8.82	V	11.6

High Channel: 2480 MHz**Common Information**

Project No.: RSHA250514001
 EUT Model: TS21
 Test Mode: BT
 Standard: FCC Part 15.247& FCC Part 15.205& FCC Part 15.209
 Test Equipment: ESU40,3115,PAM-0118P
 Receiver Setting: RBW: 1MHz, VBW: 3MHz, Sweep Time: Auto
 Temperature: 24.4℃
 Humidity: 47%
 Atmospheric Pressure: 100.9kPa
 Test Engineer: Danny Zhu
 Test Date: 2025/6/4

**Critical_Freqs**

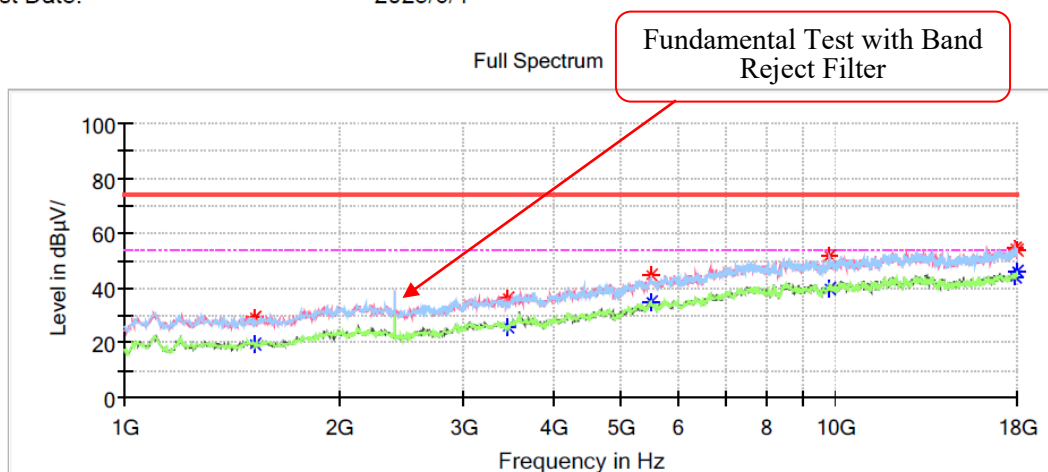
Frequency (MHz)	MaxPeak (dB µ V/m)	Average (dB µ V/m)	Limit (dB µ V/m)	Margin (dB)	Pol	Corr. (dB/m)
2132.200000	---	24.33	54.00	29.67	H	-10.4
2132.200000	34.52	---	74.00	39.48	H	-10.4
4865.800000	---	30.93	54.00	23.07	V	-3.9
4865.800000	44.90	---	74.00	29.10	V	-3.9
8408.600000	---	40.20	54.00	13.80	V	4.1
8408.600000	51.31	---	74.00	22.69	V	4.1
12971.400000	---	44.65	54.00	9.35	V	8.7
12971.400000	54.00	---	74.00	20.00	V	8.7
17065.000000	55.92	---	74.00	18.08	H	11.2
17065.000000	---	45.88	54.00	8.12	H	11.2
17068.400000	52.64	---	74.00	21.36	V	11.1
17068.400000	---	46.41	54.00	7.59	V	11.1

$\pi/4$ -DQPSK:

Low Channel: 2402 MHz

Common Information

Project No.: RSHA250514001
 EUT Model: TS21
 Test Mode: BT
 Standard: FCC Part 15.247& FCC Part 15.205& FCC Part 15.209
 Test Equipment: ESU40,3115,PAM-0118P
 Receiver Setting: RBW: 1MHz, VBW: 3MHz, Sweep Time: Auto
 Temperature: 24.4°C
 Humidity: 47%
 Atmospheric Pressure: 100.9kPa
 Test Engineer: Danny Zhu
 Test Date: 2025/6/4

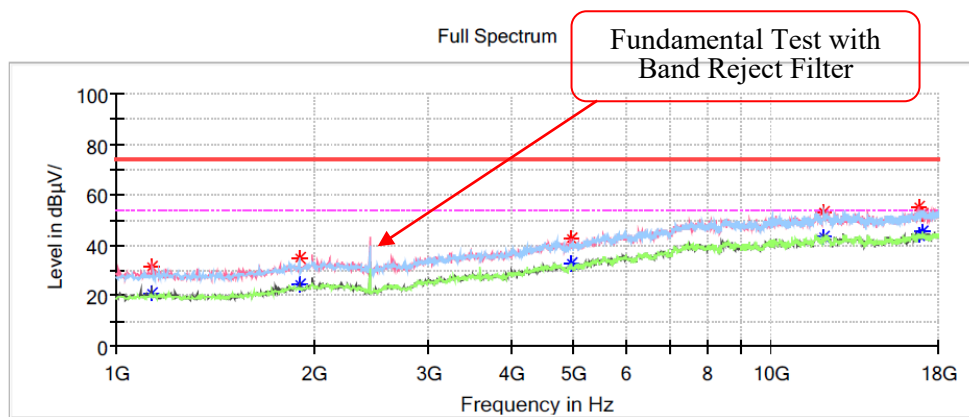


Critical_Freqs

Frequency (MHz)	MaxPeak (dB μ V/m)	Average (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Pol	Corr. (dB/m)
1523.600000	29.39	---	74.00	44.61	V	-14.5
1523.600000	---	19.32	54.00	34.68	V	-14.5
3461.600000	---	25.60	54.00	28.40	V	-7.4
3461.600000	36.10	---	74.00	37.90	V	-7.4
5498.200000	44.58	---	74.00	29.42	H	-1.5
5498.200000	---	34.78	54.00	19.22	H	-1.5
9819.600000	---	40.19	54.00	13.81	V	5.5
9819.600000	51.85	---	74.00	22.15	V	5.5
17908.200000	54.51	---	74.00	19.49	V	11.5
17908.200000	---	44.20	54.00	9.80	V	11.5
17989.800000	53.91	---	74.00	20.09	H	11.7
17989.800000	---	46.10	54.00	7.90	H	11.7

Middle Channel: 2441 MHz**Common Information**

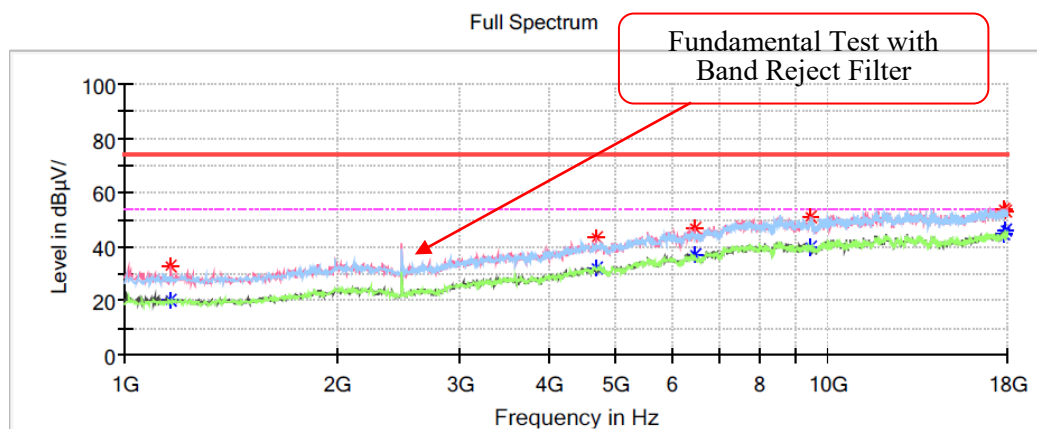
Project No.: RSHA250514001
EUT Model: TS21
Test Mode: BT
Standard: FCC Part 15.247& FCC Part 15.205& FCC Part 15.209
Test Equipment: ESU40,3115,PAM-0118P
Receiver Setting: RBW: 1MHz, VBW: 3MHz, Sweep Time: Auto
Temperature: 24.4°C
Humidity: 47%
Atmospheric Pressure: 100.9kPa
Test Engineer: Danny Zhu
Test Date: 2025/6/4

**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)
1132.600000	31.80	---	74.00	42.20	V	-15.5
1132.600000	---	21.29	54.00	32.71	V	-15.5
1901.000000	---	24.22	54.00	29.78	V	-11.3
1901.000000	35.03	---	74.00	38.97	V	-11.3
4947.400000	42.43	---	74.00	31.57	V	-3.6
4947.400000	---	33.14	54.00	20.86	V	-3.6
12063.600000	---	43.32	54.00	10.68	V	8.1
12063.600000	53.47	---	74.00	20.53	V	8.1
16796.400000	---	44.09	54.00	9.91	V	10.6
16796.400000	54.93	---	74.00	19.07	V	10.6
17044.600000	---	45.50	54.00	8.50	H	11.2
17044.600000	52.61	---	74.00	21.39	H	11.2

High Channel: 2480 MHz**Common Information**

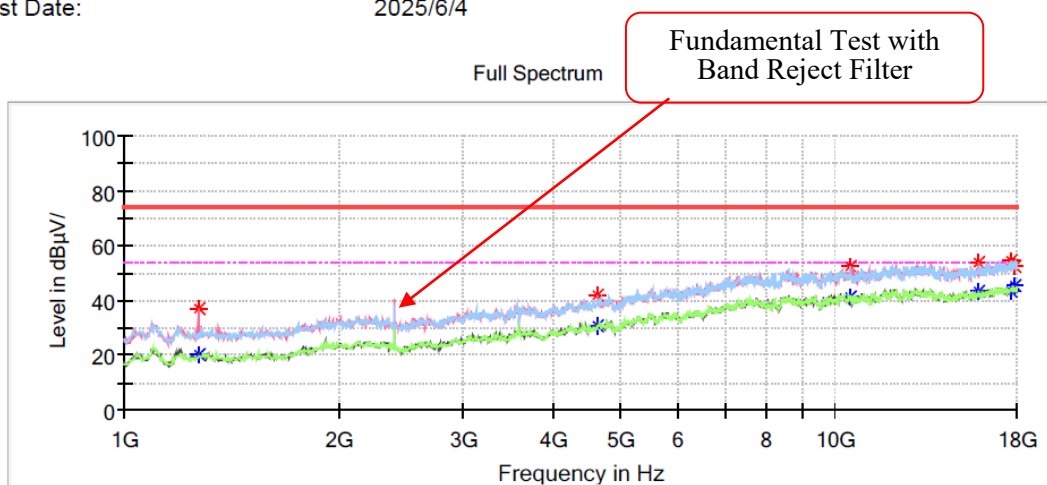
Project No.: RSHA250514001
EUT Model: TS21
Test Mode: BT
Standard: FCC Part 15.247 & FCC Part 15.205 & FCC Part 15.209
Test Equipment: ESU40,3115,PAM-0118P
Receiver Setting: RBW: 1MHz, VBW: 3MHz, Sweep Time: Auto
Temperature: 24.4°C
Humidity: 47%
Atmospheric Pressure: 100.9kPa
Test Engineer: Danny Zhu
Test Date: 2025/6/4

**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)
1163.200000	32.90	---	74.00	41.10	V	-15.4
1163.200000	---	19.93	54.00	34.07	V	-15.4
4689.000000	---	32.07	54.00	21.93	H	-4.4
4689.000000	43.03	---	74.00	30.97	H	-4.4
6457.000000	46.87	---	74.00	27.13	V	-0.6
6457.000000	---	36.81	54.00	17.19	V	-0.6
9459.200000	---	39.73	54.00	14.27	V	4.5
9459.200000	50.89	---	74.00	23.11	V	4.5
17765.400000	54.08	---	74.00	19.92	H	11.1
17765.400000	---	44.82	54.00	9.18	H	11.1
17918.400000	53.04	---	74.00	20.96	H	11.5
17918.400000	---	45.93	54.00	8.07	H	11.5

8DPSK:**Low Channel: 2402 MHz****Common Information**

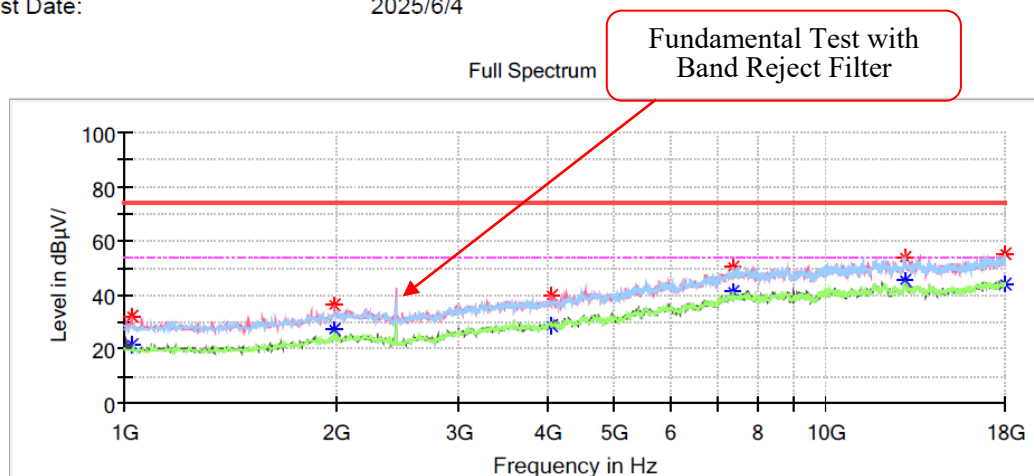
Project No.: RSHA250514001
 EUT Model: TS21
 Test Mode: BT
 Standard: FCC Part 15.247& FCC Part 15.205& FCC Part 15.209
 Test Equipment: ESU40,3115,PAM-0118P
 Receiver Setting: RBW: 1MHz, VBW: 3MHz, Sweep Time: Auto
 Temperature: 24.4°C
 Humidity: 47%
 Atmospheric Pressure: 100.9kPa
 Test Engineer: Danny Zhu
 Test Date: 2025/6/4

**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)
1272.000000	---	20.54	54.00	33.46	V	-15.2
1272.000000	36.83	---	74.00	37.17	V	-15.2
4617.600000	---	30.46	54.00	23.54	H	-4.6
4617.600000	41.74	---	74.00	32.26	H	-4.6
10489.400000	52.17	---	74.00	21.83	H	6.1
10489.400000	---	41.40	54.00	12.60	H	6.1
15926.000000	---	43.19	54.00	10.81	V	8.5
15926.000000	53.63	---	74.00	20.37	V	8.5
17711.000000	54.69	---	74.00	19.31	H	11.0
17711.000000	---	43.71	54.00	10.29	H	11.0
17881.000000	52.24	---	74.00	21.76	V	11.4
17881.000000	---	45.28	54.00	8.72	V	11.4

Middle Channel: 2441 MHz**Common Information**

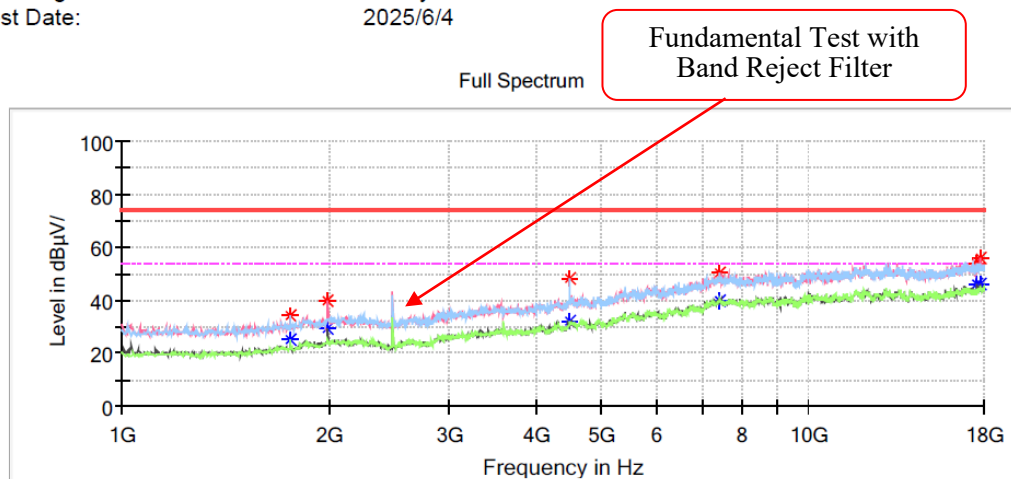
Project No.: RSHA250514001
EUT Model: TS21
Test Mode: BT
Standard: FCC Part 15.247 & FCC Part 15.205 & FCC Part 15.209
Test Equipment: ESU40,3115,PAM-0118P
Receiver Setting: RBW: 1MHz, VBW: 3MHz, Sweep Time: Auto
Temperature: 24.4°C
Humidity: 47%
Atmospheric Pressure: 100.9kPa
Test Engineer: Danny Zhu
Test Date: 2025/6/4

**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)
1023.800000	---	21.37	54.00	32.63	V	-15.7
1023.800000	31.90	---	74.00	42.10	V	-15.7
1989.400000	36.14	---	74.00	37.86	V	-10.6
1989.400000	---	27.06	54.00	26.94	V	-10.6
4073.600000	---	28.67	54.00	25.33	V	-6.2
4073.600000	39.99	---	74.00	34.01	V	-6.2
7368.200000	---	41.29	54.00	12.71	H	2.6
7368.200000	50.01	---	74.00	23.99	H	2.6
12937.400000	---	45.20	54.00	8.80	V	8.7
12937.400000	54.06	---	74.00	19.94	V	8.7
17983.000000	---	44.11	54.00	9.89	H	11.7
17983.000000	54.95	---	74.00	19.05	H	11.7

High Channel: 2480 MHz**Common Information**

Project No.: RSHA250514001
EUT Model: TS21
Test Mode: BT
Standard: FCC Part 15.247& FCC Part 15.205& FCC Part 15.209
Test Equipment: ESU40,3115,PAM-0118P
Receiver Setting: RBW: 1MHz, VBW: 3MHz, Sweep Time: Auto
Temperature: 24.4°C
Humidity: 47%
Atmospheric Pressure: 100.9kPa
Test Engineer: Danny Zhu
Test Date: 2025/6/4

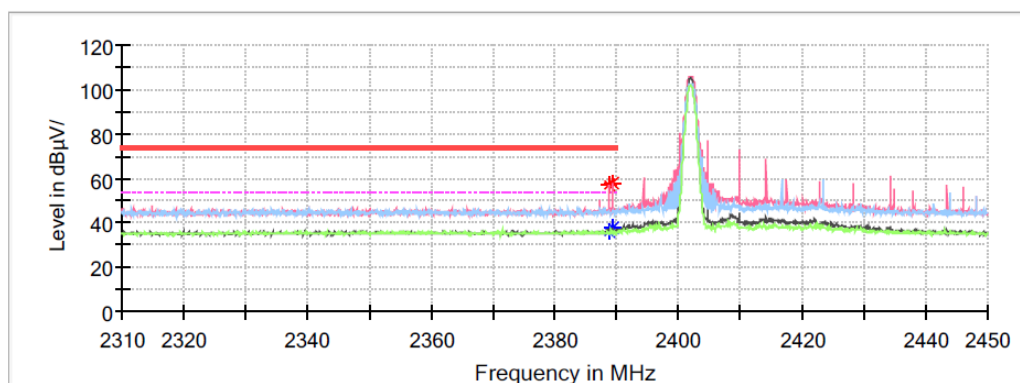
**Critical_Freqs**

Frequency (MHz)	MaxPeak (dB μ V/m)	Average (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Pol	Corr. (dB/m)
1758.200000	---	25.46	54.00	28.54	H	-12.6
1758.200000	34.32	---	74.00	39.68	H	-12.6
1996.200000	40.12	---	74.00	33.88	V	-10.5
1996.200000	---	29.41	54.00	24.59	V	-10.5
4481.600000	---	31.83	54.00	22.17	H	-5.0
4481.600000	47.99	---	74.00	26.01	H	-5.0
7415.800000	---	39.81	54.00	14.19	V	2.7
7415.800000	50.41	---	74.00	23.59	V	2.7
17609.000000	53.96	---	74.00	20.04	V	10.7
17609.000000	---	45.97	54.00	8.03	V	10.7
17806.200000	56.13	---	74.00	17.87	V	11.2
17806.200000	---	45.93	54.00	8.07	V	11.2

**Band Edge:
GFSK:****Left Side****Common Information**

Project No.: RSHA250514001
EUT Model: TS21
Test Mode: BT
Standard: FCC Part 15.247& FCC Part 15.205& FCC Part 15.209
Test Equipment: ESU40,3115,PAM-0118P
Receiver Setting: RBW: 1MHz, VBW: 3MHz, Sweep Time: Auto
Temperature: 24.4℃
Humidity: 47%
Atmospheric Pressure: 100.9kPa
Test Engineer: Danny Zhu
Test Date: 2025/6/4

Full Spectrum

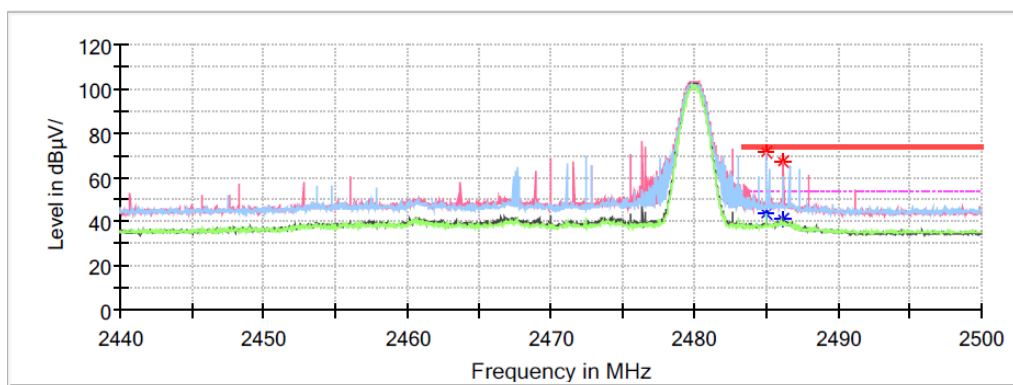
**Critical_Freqs**

Frequency (MHz)	MaxPeak (dB μ V/m)	Average (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Pol	Corr. (dB/m)
2388.680000	---	36.12	54.00	17.88	V	-0.3
2388.680000	57.27	---	74.00	16.73	V	-0.3
2389.352000	---	37.58	54.00	16.42	V	-0.3
2389.352000	57.75	---	74.00	16.25	V	-0.3

Right Side**Common Information**

Project No.: RSHA250514001
EUT Model: TS21
Test Mode: BT
Standard: FCC Part 15.247& FCC Part 15.205& FCC Part 15.209
Test Equipment: ESU40,3115,PAM-0118P
Receiver Setting: RBW: 1MHz, VBW: 3MHz, Sweep Time: Auto
Temperature: 24.4℃
Humidity: 47%
Atmospheric Pressure: 100.9kPa
Test Engineer: Danny Zhu
Test Date: 2025/6/4

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)
2484.976000	---	43.73	54.00	10.27	H	-0.2
2484.976000	71.54	---	74.00	2.46	H	-0.2
2486.224000	---	41.39	54.00	12.61	V	-0.2
2486.224000	67.01	---	74.00	6.99	V	-0.2

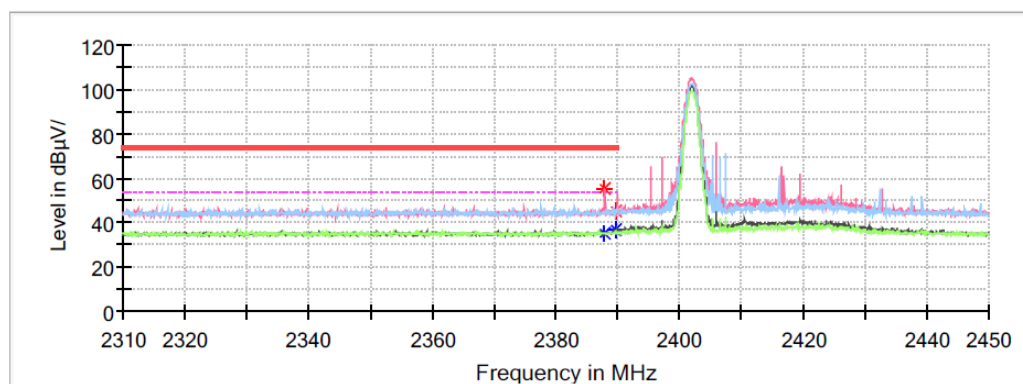
$\pi/4$ -DQPSK:

Left Side

Common Information

Project No.: RSHA250514001
EUT Model: TS21
Test Mode: BT
Standard: FCC Part 15.247& FCC Part 15.205& FCC Part 15.209
Test Equipment: ESU40,3115,PAM-0118P
Receiver Setting: RBW: 1MHz, VBW: 3MHz, Sweep Time: Auto
Temperature: 24.4°C
Humidity: 47%
Atmospheric Pressure: 100.9kPa
Test Engineer: Danny Zhu
Test Date: 2025/6/4

Full Spectrum



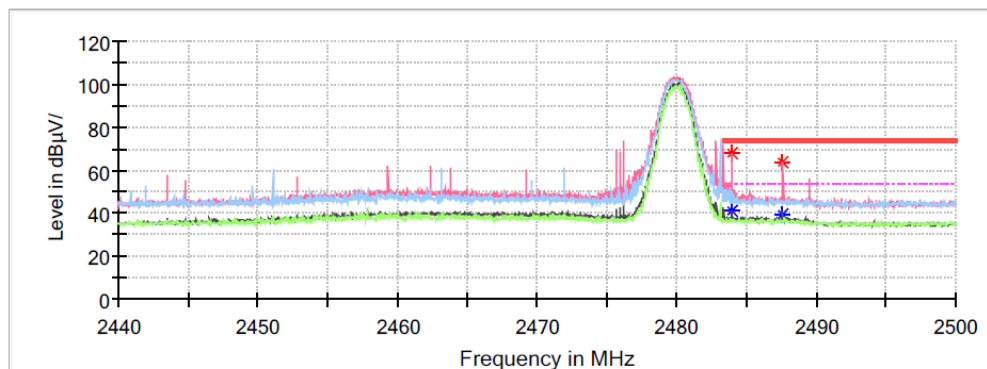
Critical_Freqs

Frequency (MHz)	MaxPeak (dB μ V/m)	Average (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Pol	Corr. (dB/m)
2387.952000	55.13	---	74.00	18.87	V	-0.3
2387.952000	---	35.50	54.00	18.50	V	-0.3
2389.632000	45.53	---	74.00	28.47	H	-0.3
2389.632000	---	36.63	54.00	17.37	H	-0.3

Right Side**Common Information**

Project No.: RSHA250514001
EUT Model: TS21
Test Mode: BT
Standard: FCC Part 15.247& FCC Part 15.205& FCC Part 15.209
Test Equipment: ESU40,3115,PAM-0118P
Receiver Setting: RBW: 1MHz, VBW: 3MHz, Sweep Time: Auto
Temperature: 24.4℃
Humidity: 47%
Atmospheric Pressure: 100.9kPa
Test Engineer: Danny Zhu
Test Date: 2025/6/4

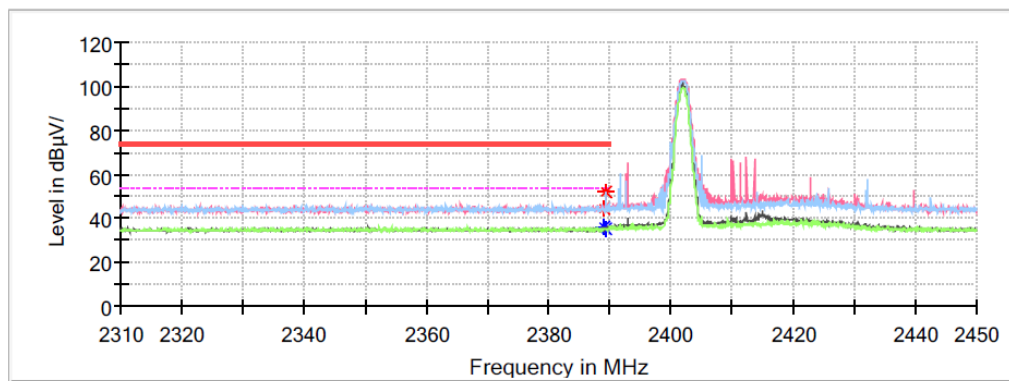
Full Spectrum

**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)
2483.992000	---	40.93	54.00	13.07	V	-0.2
2483.992000	67.63	---	74.00	6.37	V	-0.2
2487.640000	---	39.04	54.00	14.96	V	-0.2
2487.640000	63.76	---	74.00	10.24	V	-0.2

8DPSK:**Left Side****Common Information**

Project No.: RSHA250514001
EUT Model: TS21
Test Mode: BT
Standard: FCC Part 15.247 & FCC Part 15.205 & FCC Part 15.209
Test Equipment: ESU40,3115,PAM-0118P
Receiver Setting: RBW: 1MHz, VBW: 3MHz, Sweep Time: Auto
Temperature: 24.4°C
Humidity: 47%
Atmospheric Pressure: 100.9kPa
Test Engineer: Danny Zhu
Test Date: 2025/6/4

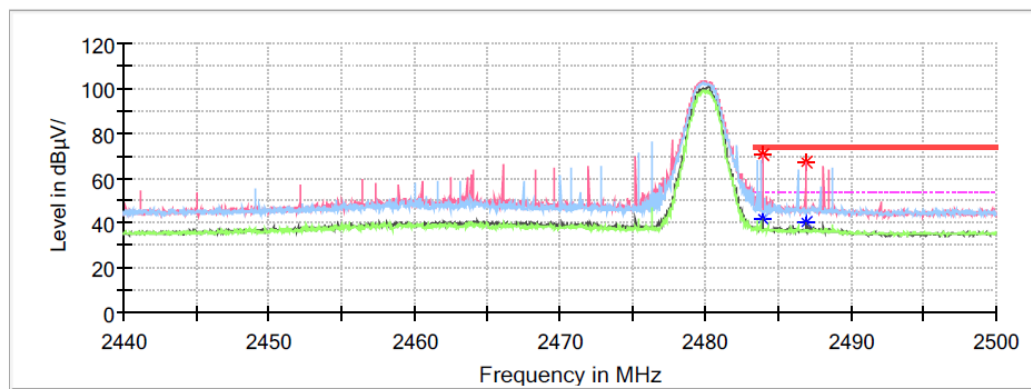
Full Spectrum**Critical_Freqs**

Frequency (MHz)	MaxPeak (dB μ V/m)	Average (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Pol	Corr. (dB/m)
2388.960000	---	36.19	54.00	17.81	V	-0.3
2388.960000	44.64	---	74.00	29.36	V	-0.3
2389.296000	---	35.51	54.00	18.49	H	-0.3
2389.296000	52.13	---	74.00	21.87	H	-0.3

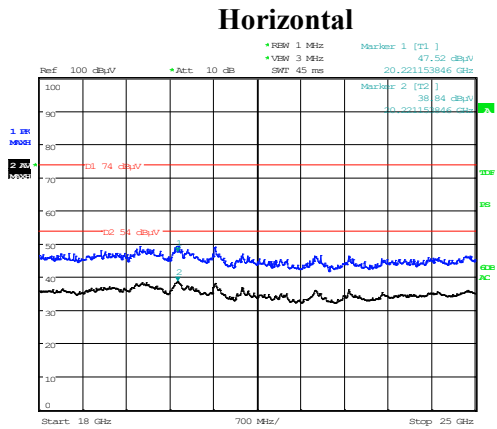
Right Side**Common Information**

Project No.: RSHA250514001
EUT Model: TS21
Test Mode: BT
Standard: FCC Part 15.247& FCC Part 15.205& FCC Part 15.209
Test Equipment: ESU40,3115,PAM-0118P
Receiver Setting: RBW: 1MHz, VBW: 3MHz, Sweep Time: Auto
Temperature: 24.4°C
Humidity: 47%
Atmospheric Pressure: 100.9kPa
Test Engineer: Danny Zhu
Test Date: 2025/6/4

Full Spectrum

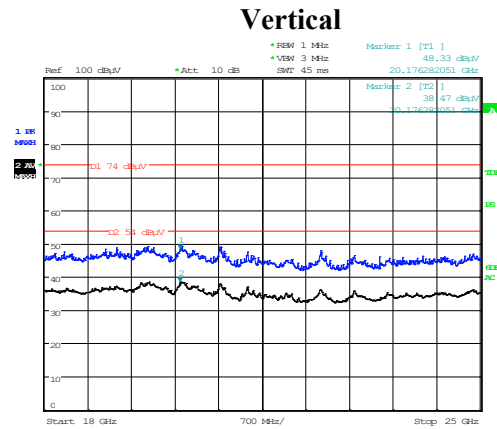
**Critical_Freqs**

Frequency (MHz)	MaxPeak (dB µ V/m)	Average (dB µ V/m)	Limit (dB µ V/m)	Margin (dB)	Pol	Corr. (dB/m)
2483.992000	---	41.73	54.00	12.27	V	-0.2
2483.992000	70.17	---	74.00	3.83	V	-0.2
2486.920000	---	39.94	54.00	14.06	V	-0.2
2486.920000	67.00	---	74.00	7.00	V	-0.2

18 GHz - 25 GHz (Transmitting maximum output power 8DPSK Mode low channel):

Project No : RSHA250514001
Date: 20.JUN.2025 10:16:28

Tester :Hugh Wu



Project No : RSHA250514001
Date: 20.JUN.2025 10:50:17

Tester :Hugh Wu

Frequency (GHz)	MaxPeak (dB μ V/m)	Average (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Pol	Corr. (dB/m)
20.18	---	38.47	54	15.53	V	12.44
20.18	48.33	---	74	25.67	V	12.44
20.22	---	38.84	54	15.16	H	12.48
20.22	47.52	---	74	26.48	H	12.48

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

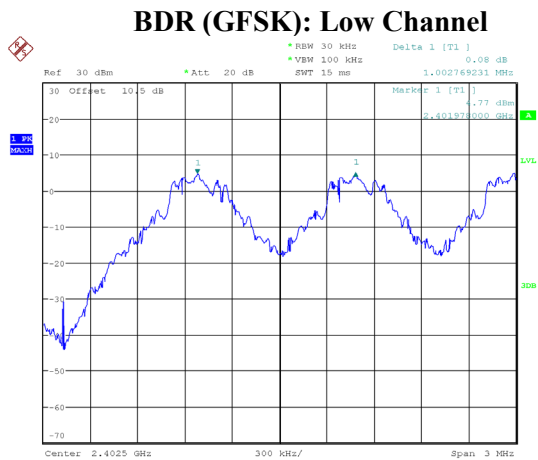
CHANNEL SEPARATION TEST**Environmental Conditions & Test Information**

Test Date:	2025-07-01
Temperature:	24.2 °C
Relative Humidity:	51 %
ATM Pressure:	101.3 kPa
Test Result:	Pass
Test Engineer:	Neil Zhou

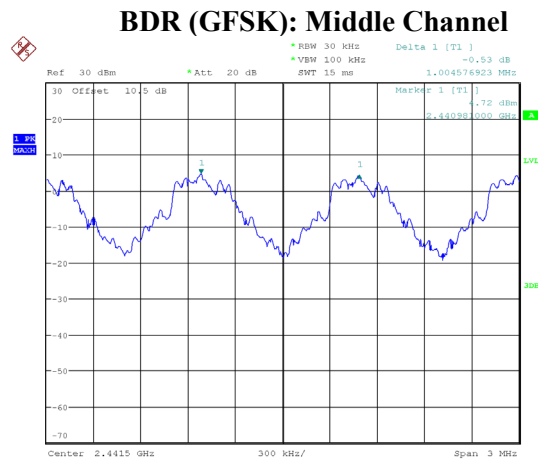
EUT operation mode: Transmitting

Mode	Channel	Result (MHz)	Limit (MHz)	Result
GFSK	Low	1.003	0.846	Pass
	Middle	1.005	0.846	Pass
	High	1.002	0.846	Pass

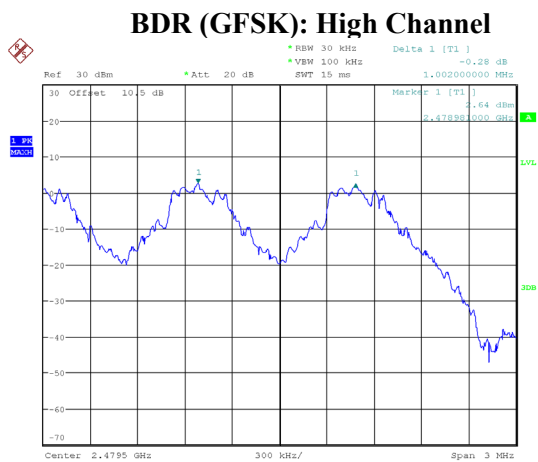
Note: Only GFSK mode result is reported since EDR($\pi/4$ -DQPSK, 8DPSK) has the exact same channel plan.
Limit = 20 dB bandwidth*2/3



ProjectNo.:RSHA250514001 Tester:Neil Zhou
Date: 1.JUL.2025 11:15:44



ProjectNo.:RSHA250514001 Tester:Neil Zhou
Date: 1.JUL.2025 11:26:54



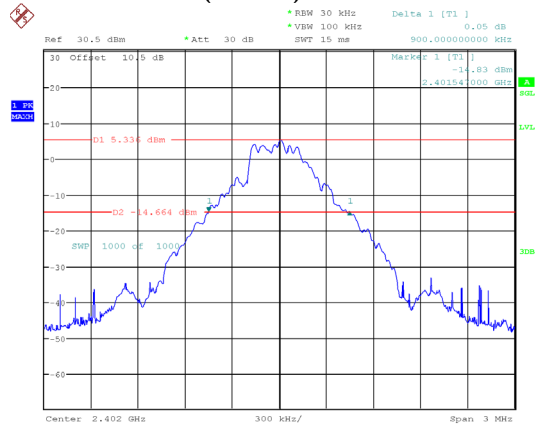
ProjectNo.:RSHA250514001 Tester:Neil Zhou
Date: 1.JUL.2025 11:37:12

20 dB BANDWIDTH TEST**Environmental Conditions & Test Information**

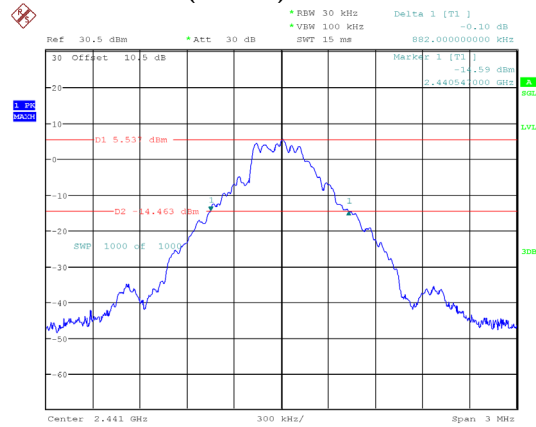
Test Date:	2025-06-23
Temperature:	23.6 °C
Relative Humidity:	49 %
ATM Pressure:	100.7 kPa
Test Result:	Pass
Test Engineer:	Neil Zhou

EUT operation mode: Transmitting

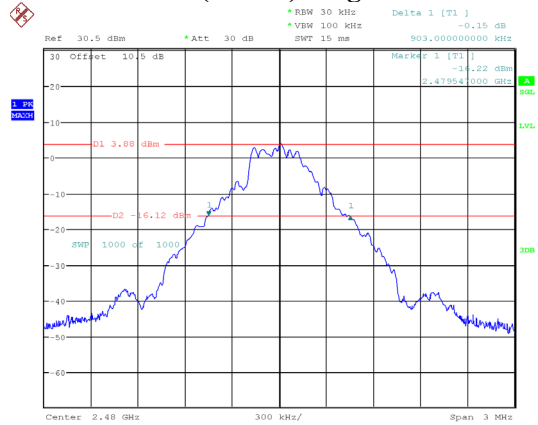
Mode	Channel	Frequency (MHz)	20 dB Emission Bandwidth (MHz)
BDR (GFSK)	Low	2402	0.900
	Middle	2441	0.882
	High	2480	0.903
EDR ($\pi/4$-DQPSK)	Low	2402	1.263
	Middle	2441	1.266
	High	2480	1.269
EDR (8DPSK)	Low	2402	1.251
	Middle	2441	1.257
	High	2480	1.254

BDR (GFSK): Low Channel

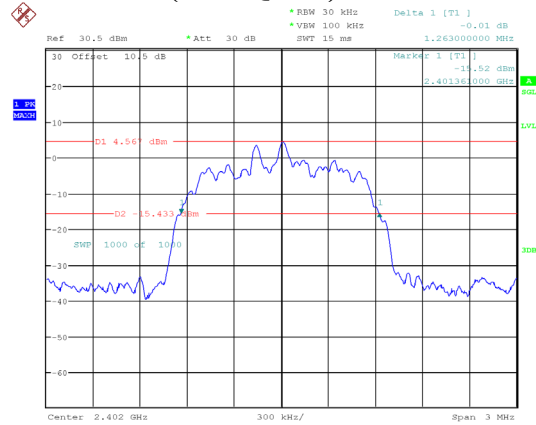
ProjectNo.: RSHA250514001 Tester: Neil Zhou
Date: 23.JUN.2025 09:31:14

BDR (GFSK): Middle Channel

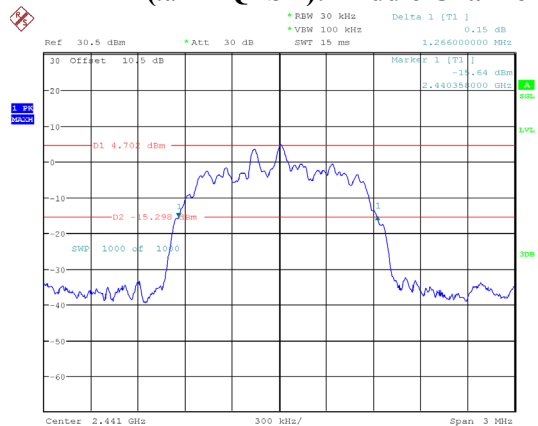
ProjectNo.: RSHA250514001 Tester: Neil Zhou
Date: 23.JUN.2025 09:56:03

BDR (GFSK): High Channel

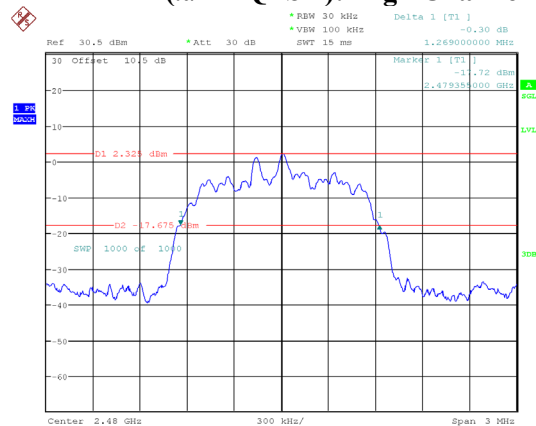
ProjectNo.: RSHA250514001 Tester: Neil Zhou
Date: 23.JUN.2025 10:14:50

EDR ($\pi/4$ -DQPSK): Low Channel

ProjectNo.: RSHA250514001 Tester: Neil Zhou
Date: 23.JUN.2025 10:26:21

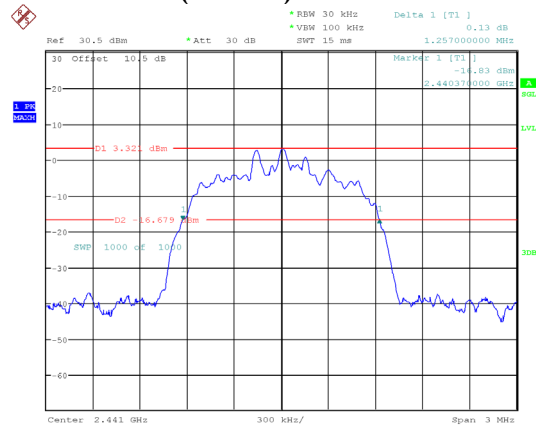
EDR ($\pi/4$ -DQPSK): Middle Channel

ProjectNo.: RSHA250514001 Tester: Neil Zhou
Date: 23.JUN.2025 10:57:54

EDR ($\pi/4$ -DQPSK): High Channel

ProjectNo.: RSHA250514001 Tester: Neil Zhou
Date: 23.JUN.2025 11:20:22

EDR (8DPSK): Middle Channel



ProjectNo.:RSHA250514001 Tester:Neil Zhou
Date: 23.JUN.2025 13:28:19

The screenshot shows a spectrum analyzer interface. At the top, there are several status indicators: a red 'X' icon, 'EM 30 kHz', 'Delta 1 [T1]', 'VM 100 kHz', '0.03 dB', 'Ref 30.5 dBm', 'Att 30 dB', 'SWT 15 ms', and '1.254000000 MHz'. The main display area shows a blue trace of a signal. Two horizontal red lines are drawn across the trace, labeled 'D1 3.315 dBm' and 'D2 -16.685 dBm'. The trace shows a signal that rises from a noise floor, reaches a peak, and then falls back to the noise floor. The x-axis is labeled 'Center 2.48 GHz' and '300 kHz/'. The y-axis is labeled 'Span 3 MHz'. There are also some numerical values on the right side of the trace: 'MARK 1 [T1]', '-14.79 dBm', and '2.479371000 GHz'. The bottom of the screen shows a grid with values from -60 to 30.

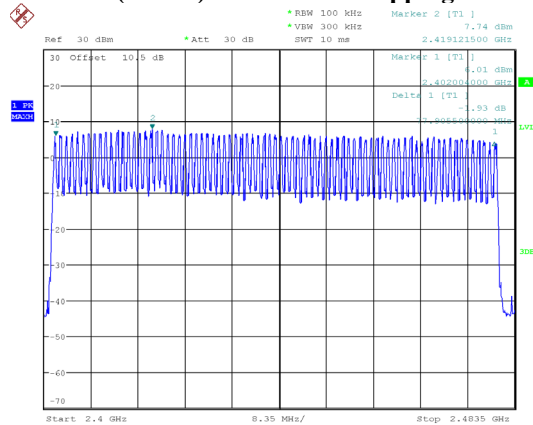
QUANTITY OF HOPPING CHANNEL TEST**Environmental Conditions & Test Information**

Test Date:	2025-07-01
Temperature:	24.2 °C
Relative Humidity:	51 %
ATM Pressure:	101.3 kPa
Test Result:	Pass
Test Engineer:	Neil Zhou

EUT operation mode: Hopping

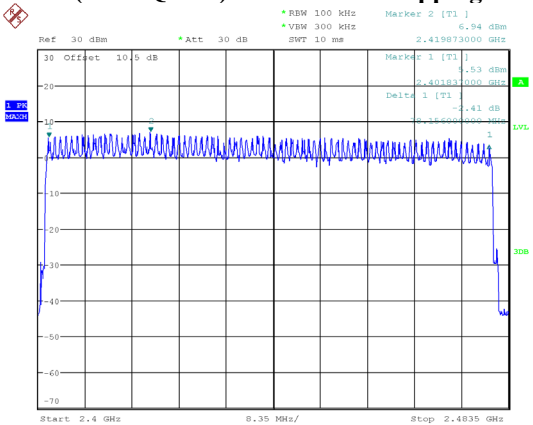
Mode	Frequency Range (MHz)	Number of Hopping Channel (CH)	Limit (CH)
BDR (GFSK)	2400-2483.5	79	≥15
EDR ($\pi/4$ -DQPSK)	2400-2483.5	79	≥15
EDR (8DPSK)	2400-2483.5	79	≥15

BDR (GFSK): Number of Hopping Channels



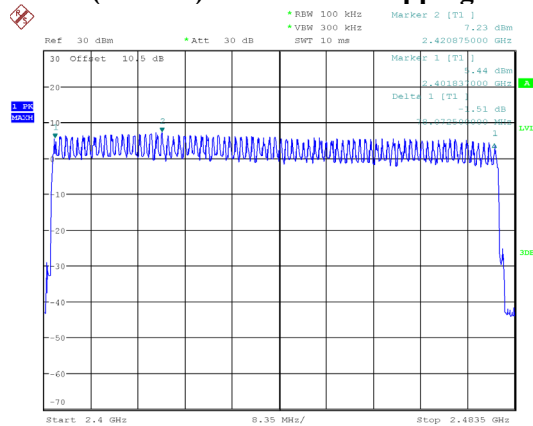
ProjectNo.:RSHA250514001 Tester:Neil Zhou
Date: 1.JUL.2025 10:32:55

EDR ($\pi/4$ -DQPSK): Number of Hopping Channels



ProjectNo.:RSHA250514001 Tester:Neil Zhou
Date: 1.JUL.2025 10:37:13

EDR (8DPSK): Number of Hopping Channels



ProjectNo.:RSHA250514001 Tester:Neil Zhou
Date: 1.JUL.2025 10:51:59

TIME OF OCCUPANCY (DWELL TIME)**Environmental Conditions & Test Information**

Test Date:	2025-12-19
Temperature:	23.2 °C
Relative Humidity:	49 %
ATM Pressure:	101.7 kPa
Test Result:	Pass
Test Engineer:	Neil Zhou

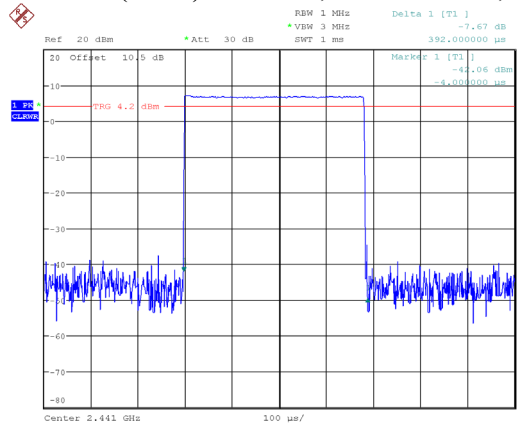
EUT operation mode: Hopping

Mode		Channel	BurstWidth (ms)	TotalHops (Num)	Dwell time (s)	Limit (s)	Result
BDR (GFSK)	DH1	Middle	0.392	320	0.125	0.4	Pass
	DH3		1.656	170	0.282	0.4	Pass
	DH5		2.925	100	0.293	0.4	Pass
EDR ($\pi/4$ -DQPSK)	2DH1		0.402	320	0.129	0.4	Pass
	2DH3		1.662	150	0.249	0.4	Pass
	2DH5		2.925	100	0.293	0.4	Pass
EDR (8DPSK)	3DH1		0.403	320	0.129	0.4	Pass
	3DH3		1.659	160	0.265	0.4	Pass
	3DH5		2.935	120	0.352	0.4	Pass

Note: Dwell time = BurstWidth (Pulse time) * TotalHops

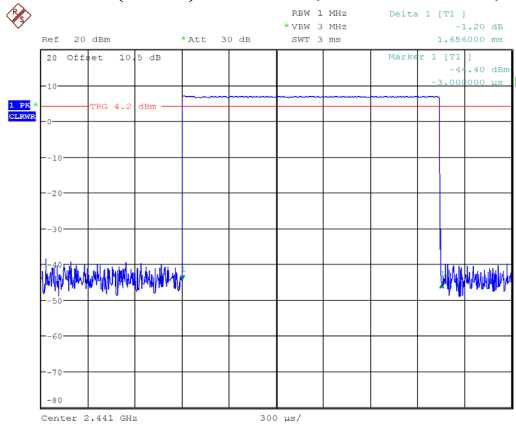
TotalHops (31.6s) = hopping numbers (3.16s)*10

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



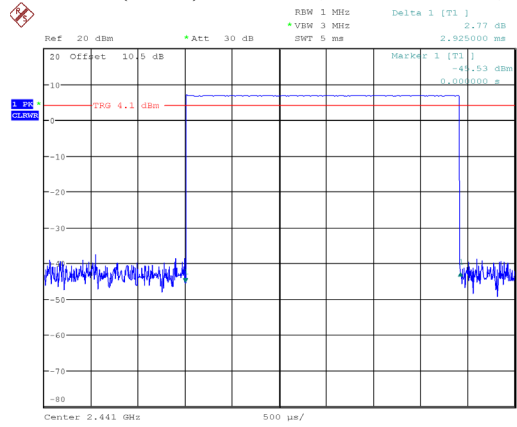
ProjectNo.:RSHA250514001 Tester:Neil Zhou
Date: 19.DEC.2025 13:24:49

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



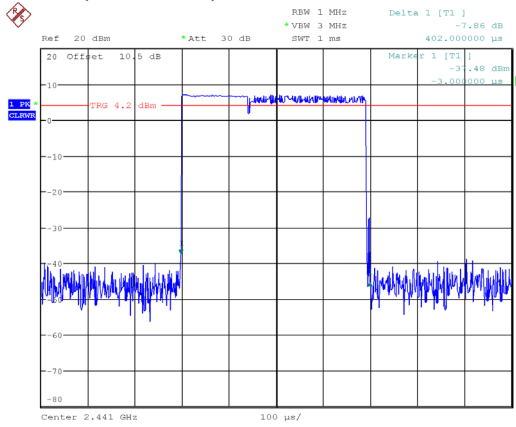
ProjectNo.:RSHA250514001 Tester:Neil Zhou
Date: 19.DEC.2025 13:26:49

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



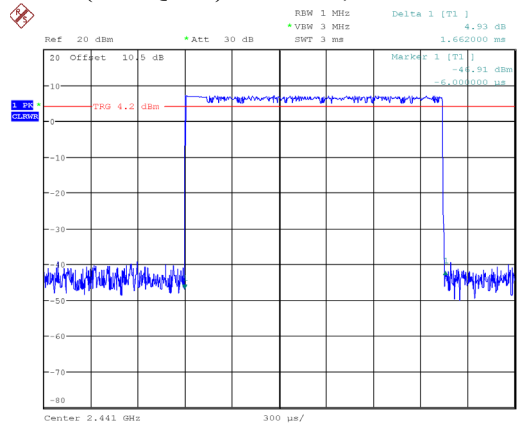
ProjectNo.:RSHA250514001 Tester:Neil Zhou
Date: 19.DEC.2025 13:28:28

EDR ($\pi/4$ -DQPSK): Pulse time, Middle Channel, 2DH1



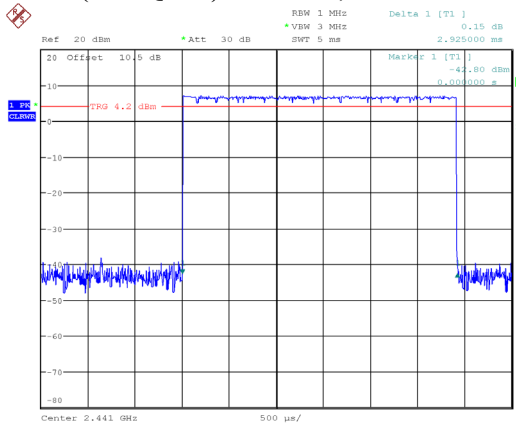
ProjectNo.:RSHA250514001 Tester:Neil Zhou
Date: 19.DEC.2025 13:29:38

EDR ($\pi/4$ -DQPSK): Pulse time, Middle Channel, 2DH3

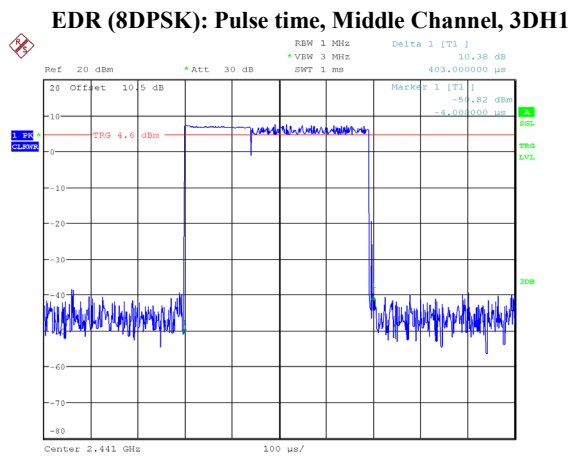


ProjectNo.:RSHA250514001 Tester:Neil Zhou
Date: 19.DEC.2025 13:32:39

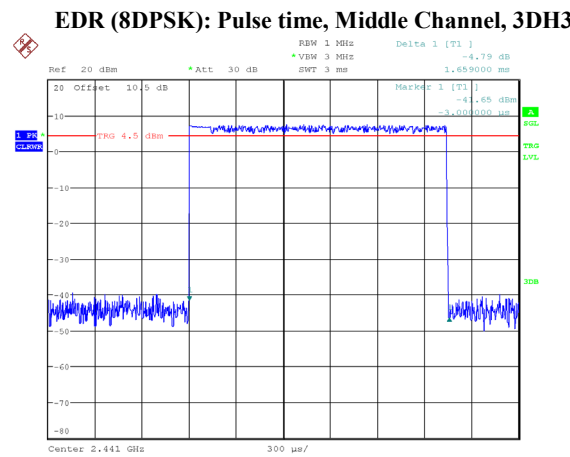
EDR ($\pi/4$ -DQPSK): Pulse time, Middle Channel, 2DH5



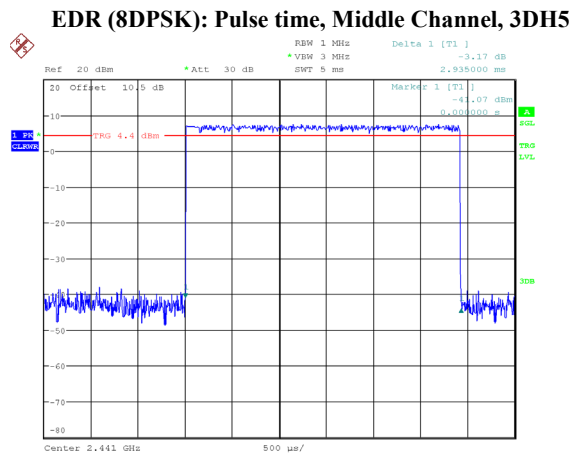
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Date: 19.DEC.2025 13:43:54



ProjectNo.:RSHA250514001 Tester:Neil Zhou
Date: 19.DEC.2025 13:36:33

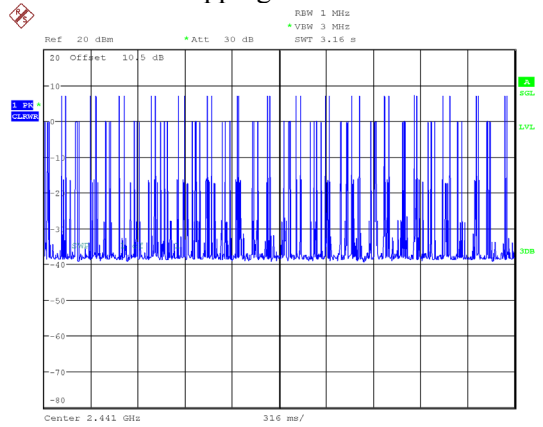


ProjectNo.:RSHA250514001 Tester:Neil Zhou
Date: 19.DEC.2025 13:37:49



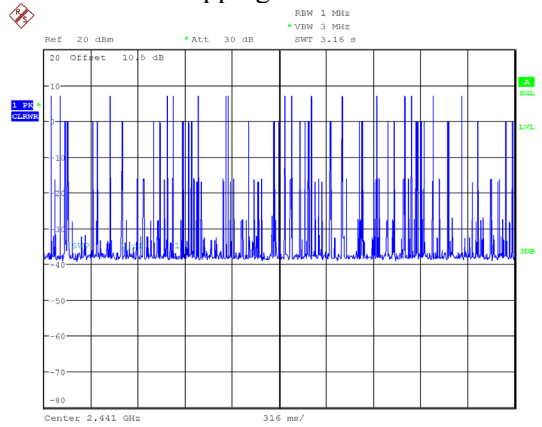
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Date: 19.DEC.2025 13:39:24

Hopping Numbers-DH1



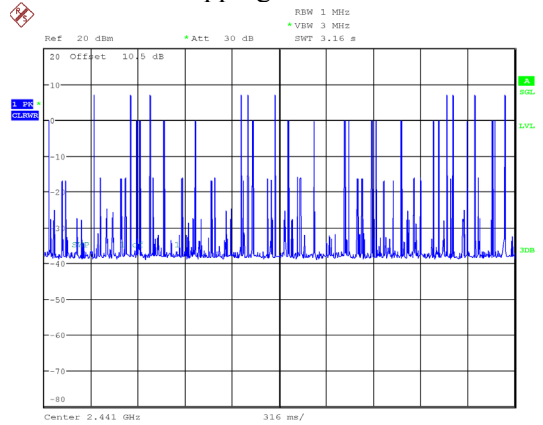
ProjectNo.:RSHA250514001 Tester:Neil Zhou
Date: 19.DEC.2025 13:23:53

Hopping Numbers-DH3



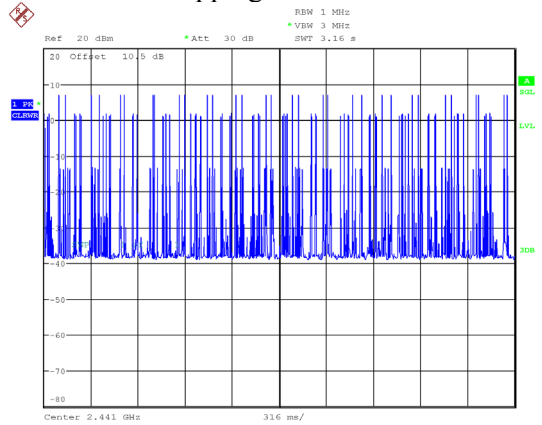
ProjectNo.:RSHA250514001 Tester:Neil Zhou
Date: 19.DEC.2025 13:25:56

Hopping Numbers-DH5



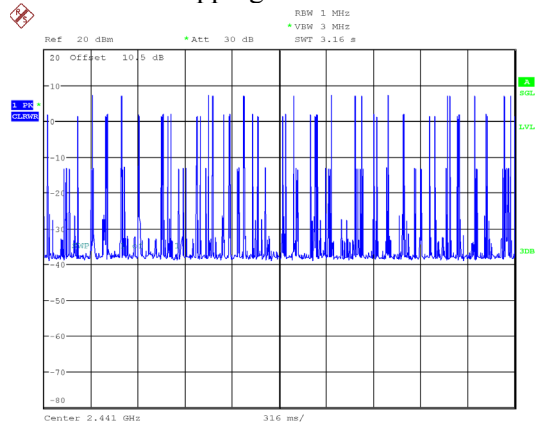
ProjectNo.:RSHA250514001 Tester:Neil Zhou
Date: 19.DEC.2025 13:27:37

Hopping Numbers-2DH1



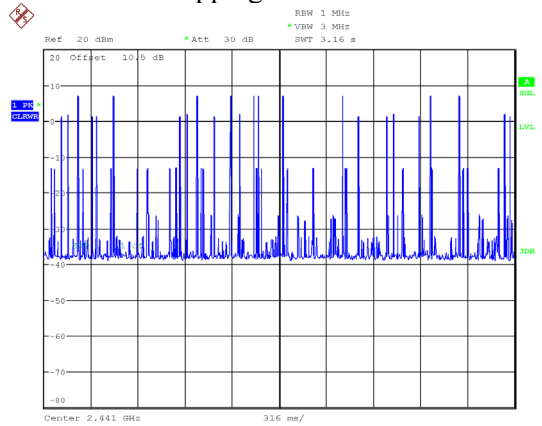
ProjectNo.:RSHA250514001 Tester:Neil Zhou
Date: 19.DEC.2025 13:28:47

Hopping Numbers-2DH3



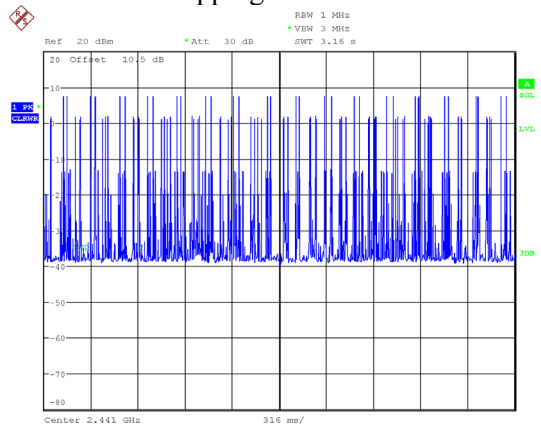
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Date: 19.DEC.2025 13:31:47

Hopping Numbers-2DH5



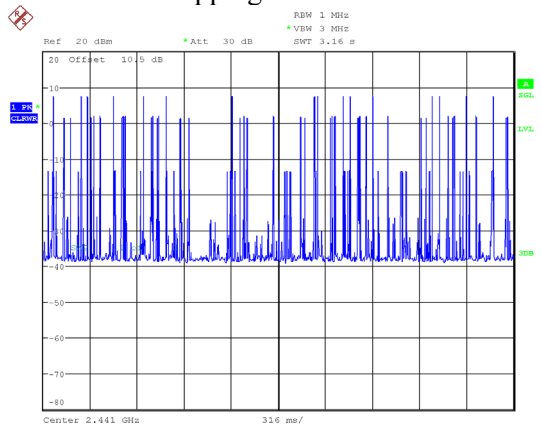
ProjectNo.:RSHA250514001 Tester:Neil Zhou
Date: 19.DEC.2025 13:43:03

Hopping Numbers-3DH1



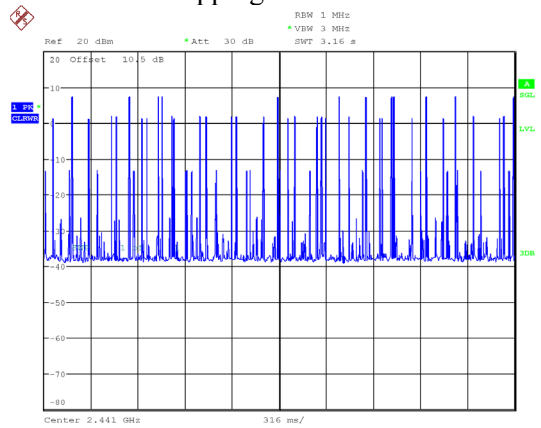
ProjectNo.:RSHA250514001 Tester:Neil Zhou
Date: 19.DEC.2025 13:35:38

Hopping Numbers-3DH3



ProjectNo.:RSHA250514001 Tester:Neil Zhou
Date: 19.DEC.2025 13:36:56

Hopping Numbers-3DH5



ProjectNo.:RSHA250514001 Tester:Neil Zhou
Date: 19.DEC.2025 13:38:21

PEAK OUTPUT POWER MEASUREMENT**Environmental Conditions & Test Information**

Test Date:	2025-06-23 to 2025-07-01
Temperature:	23.6-24.2 °C
Relative Humidity:	49-51 %
ATM Pressure:	100.7-101.3 kPa
Test Result:	Pass
Test Engineer:	Neil Zhou

EUT operation mode: Transmitting

Mode	Channel	Frequency (MHz)	Result (dBm)	Limit (dBm)
GFSK	Low	2402	7.87	21
	Middle	2441	8.07	
	High	2480	6.83	
$\pi/4$ DQPSK	Low	2402	8.40	
	Middle	2441	8.55	
	High	2480	7.17	
8DPSK	Low	2402	8.91	
	Middle	2441	8.02	
	High	2480	7.00	