FCC PART 15.247
TEST REPORT

For

AKUVOX (XIAMEN) NETWORKS CO., LTD.

10/F, No.56 Guanri Road, Software Park II, Xiamen 361009, China

FCC ID: 2AHCR-PH81

Report Type:	**Product Name:**
Original Report	HyPanel Ultra

Report Number:	2407T76694E-RF-01
Report Date:	2024-12-30
Reviewed By:	Ash Lin
Approved By:	Miles Chen
Prepared By:	Bay Area Compliance Laboratories Corp. (Xiamen) Unit 102, No. 902 Meifeng South Road, Binhai West Avenue, Science and Technology Innovation Park, Torch High tech Zone XiaMen Tel: +86-592-3200111 www.baclcorp.com.cn

TABLE OF CONTENTS

REPORT REVISION HISTORY

Number of Revisions	Report No.	Version	Issue Date	Description
0	2407T76694E-RF-01	R1V1	2024-12-30	Initial Release

GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

Product Name:	HyPanel Ultra
Tested Model:	PH81
Power Supply:	DC 12-24V
Maximum Peak Output Power:	5.45dBm
RF Function:	Classic BT
Operating Band/Frequency:	2402-2480 MHz
Channel Number:	79
Channel Separation:	1 MHz
Modulation Type:	GFSK, π/4-DQPSK, 8DPSK
Antenna Type:	FPC Antenna
★Maximum Antenna Gain:	-3.5 dBi
EUT Received Status:	Good

Note:
1. The Maximum Antenna Gain was declared by manufacturer.
2. All measurement and test data in this report was gathered from production sample serial number: 2LM0-1. (Assigned by the BACL(Xiamen). The EUT supplied by the applicant was received on 2024-05-20)

Objective

This test report is prepared for *AKUVOX (XIAMEN) NETWORKS CO., 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 KDB 558074 D01 15.247 Meas Guidance v05r02.

Test Facility

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

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

Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the product as specified in CISPR 16-4-2. This uncertainty represents expanded uncertainty expressed at 95% confidence level using a coverage factor of k=2.

$$u_c(y) = \sqrt{\sum_i c_i^2 \; u^2(x_i)}$$

Item	Frequency Range	U_{lab} = 2 u_c (y) (Confidence of 95%)
Conducted Emissions	150kHz-30MHz	2.33dB
Radiated Spurious Emission	9kHz-30MHz	2.59dB
	30MHz~200MHz	4.38dB
	200MHz~1GHz	4.50dB
	1GHz~6GHz	4.58dB
	6GHz~18GHz	5.43dB
	18GHz~26.5GHz	5.47 dB
Transmitter Conducted Power		0.624 dB
Occupy Bandwidth		0.053kHz
Voltage (DC)		0.4%
Temperature		1℃
Humidity		5%

SYSTEM TEST CONFIGURATION

Test Mode and Voltage

The system was configured for testing in a typical mode (as normally used by a typical user).	
Test mode:	Test Mode: Transmitting
Test voltage:	AC 120V/60Hz
Remark:	During all emission tests, the EUT was configured to measure its highest possible emission level and the worst case's test data was presented in this test report.

Description of Test Configuration

Channel list:

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

EUT was tested with Channel 0, 39 and 78.

★EUT Exercise Software

BT test in the engineer mode.

RF Test Tool: BlueTest3

Test Modes	Power Level Setting		
	Lowest Channel	Middle Channel	Highest Channel
GFSK	default	default	default
π/4-DQPSK	default	default	default
8DPSK	default	default	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

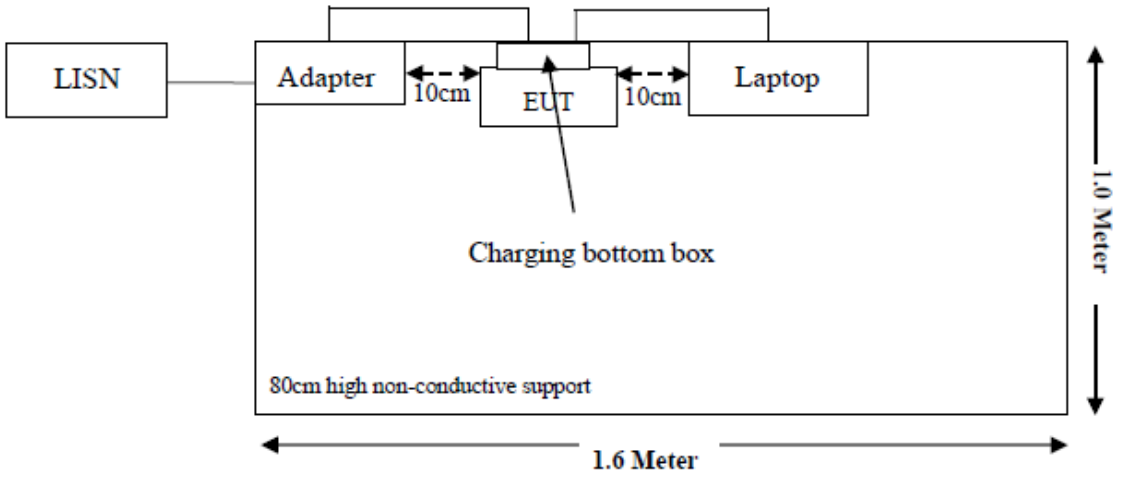
Manufacturer	Description	Model	Serial Number
Lenovo	Laptop	T480	PF1P5K4F
Akuvox	Charging bottom box	FX1-ST	/
KLEC	Switching Adapter	SW-0222	/

External I/O Cable

Cable Description	Length (m)	From Port	To
Adapter cable	1.0	Charging bottom box	Adapter
NETWORK cable	8	Charging bottom box	Laptop

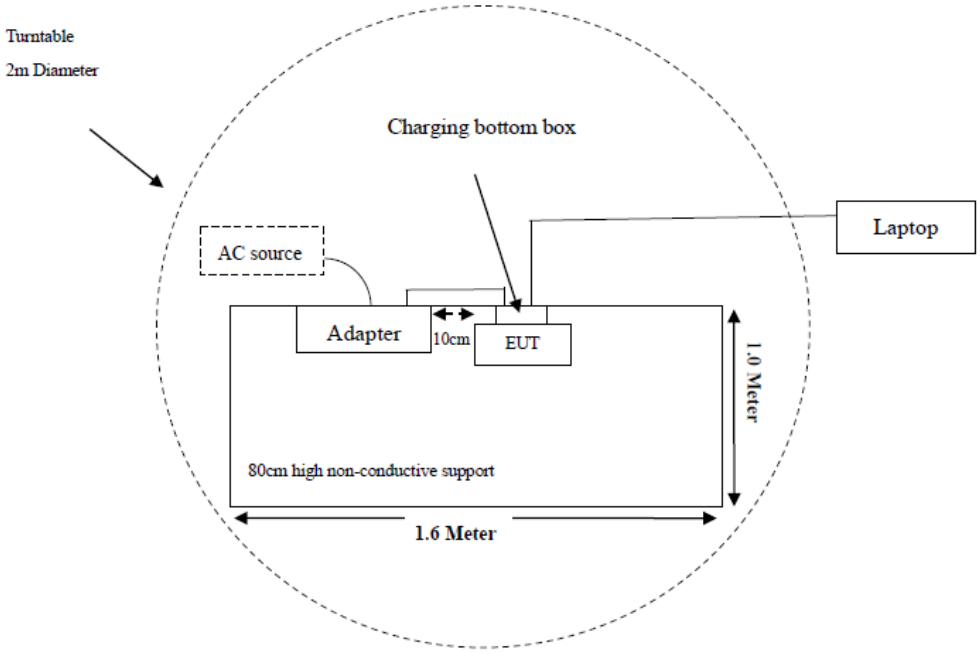
Block Diagram of Test Setup

Conducted Emission:

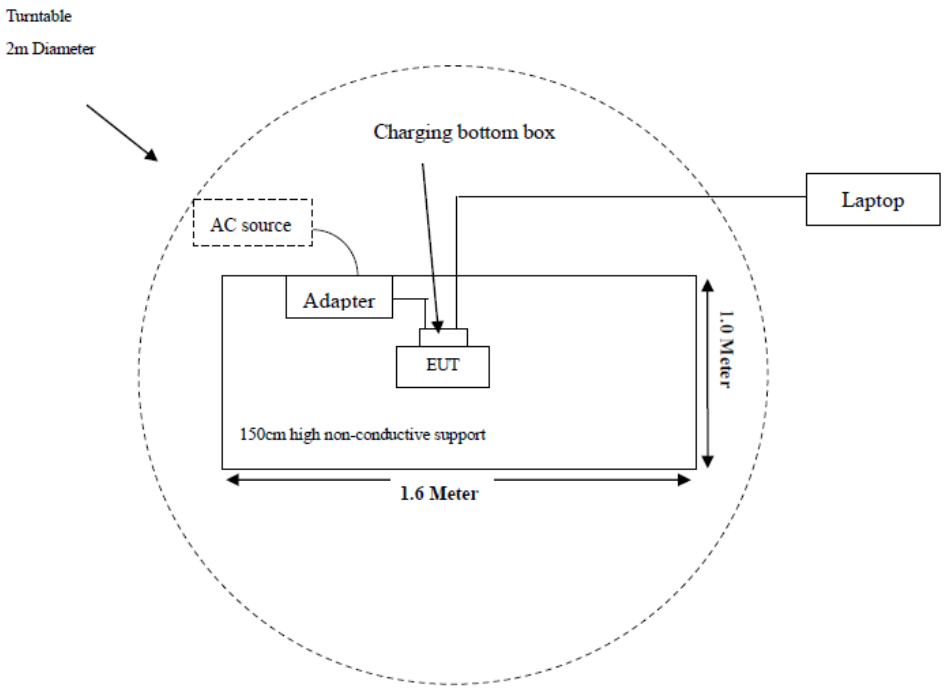


Radiated Emission:

Below 1GHz



Above 1GHz



SUMMARY OF TEST RESULTS

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

TEST EQUIPMENT LIST

Test Equipment	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due Date
Conducted Emissions					
EMI Test Receiver	Rohde & Schwarz	ESR	103105	2024/03/29	2025/03/28
LISN	Rohde & Schwarz	ENV216	100129	2024/03/29	2025/03/28
Pulse Limiter	Rohde & Schwarz	ESH3-Z2	0357.8810.54	2024/03/29	2025/03/28
Coaxial Cable	XINHANGWEIBO	XH400T-N-4M	CC001	2024/03/29	2025/03/28
Test Software	Audix	E3	18621a	N/A	N/A
Radiated Emissions Below 1GHz					
EMI Test Receiver	Rohde & Schwarz	ESR	103103	2024/03/29	2025/03/28
Loop Antenna	Rohde & Schwarz	HFH2-Z2	830749/001	2023/07/27	2026/07/26
Antenna	Sunol Sciences	JB6	A122022-5	2023/07/27	2026/07/26
Amplifier	Sonoma	310B	120903	2024/03/29	2025/03/28
Coaxial Cable	XINHANGWEIBO	XH400T-N-4M	CC002	2024/03/29	2025/03/28
Coaxial Cable	XINHANGWEIBO	XH460B-N-2M	CC006	2024/03/29	2025/03/28
Coaxial Cable	XINHANGWEIBO	XH460B-N-12M	CC007	2024/03/29	2025/03/28
Coaxial Cable	XINHANGWEIBO	HFH2-CC	335.3609	2024/03/29	2025/03/28
Test Software	Audix	E3	18621a	N/A	N/A
Radiated Emissions Above 1 GHz					
Spectrum Analyzer	Rohde & Schwarz	FSV40-N	102051	2024/03/29	2025/03/28
Filter Switch Unit	Decentest	DT7220FSU	DS79904	2024/02/23	2025/02/22
Multiplex Switch Test Control Set	Decentest	DT7220SCU	DS79901	2024/02/23	2025/02/22
Double Ridge Guide Horn Antenna	A.H.Systems	SAS-571	1980	2023/07/28	2026/07/27
Preamplifier	A.H.Systems	PAM-0118P	489	2024/03/29	2025/03/28
Coaxial Cable	XINHANGWEIBO	XH800A-N-6M	CC003	2024/03/29	2025/03/28
Coaxial Cable	XINHANGWEIBO	XH800A-N-1M	CC005	2024/03/29	2025/03/28
Horn Antenna	EMCO	3116	9407-2232	2023/07/31	2026/07/30
Preamplifier	A.H.Systems	PAM-1840	200	2024/03/29	2025/03/28
Coaxial Cable	XINHANGWEIBO	XH360A-2.92-3M	CC008	2024/03/29	2025/03/28
Coaxial Cable	XINHANGWEIBO	XH360A-2.92-1M	CC009	2024/03/29	2025/03/28
Test Software	Audix	E3	18621a	N/A	N/A
RF Conducted Test					
Spectrum Analyzer	Rohde & Schwarz	FSU	100405	2024/03/29	2025/03/28
Coaxial Cable	N/A	N/A	N/A	2024/03/29	2025/03/28

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

FCC §15.203 – ANTENNA REQUIREMENT

Applicable Standard

According to FCC § 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. The structure and application of the EUT were analyzed to determine compliance with section §15.203 of the rules. §15.203 state that the subject device must meet the following criteria:

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

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

Antenna Connector Construction

The EUT has one FPC antenna for Bluetooth, which was permanently attached and the Max. antenna gain is -3.5 dBi, fulfill the requirement of this section. Please refer to the EUT photos.

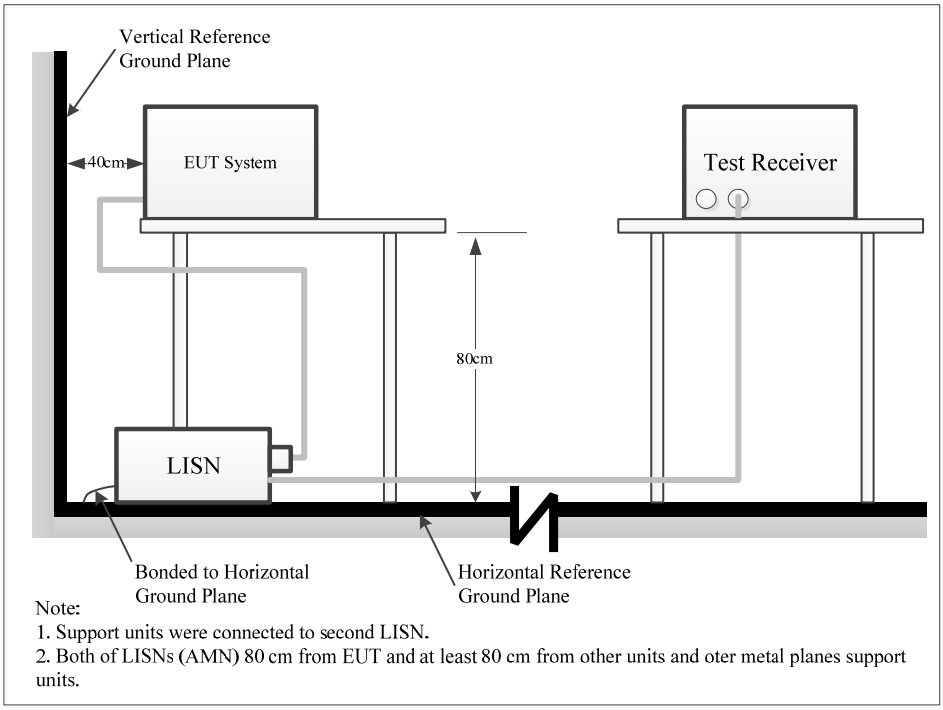
Result: Compliance

FCC §15.207 (a) – AC LINE CONDUCTED EMISSIONS

Applicable Standard

FCC §15.207(a)

Test System Setup



Note:
1. Support units were connected to second LISN.
2. Both of LISNs (AMN) 80 cm from EUT and at least 80 cm from other units and oter metal planes support units.

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	Detector
150 kHz – 30 MHz	9 kHz	30 kHz	QP/AV

Test Procedure

ANSI C63.10-2013 clause 6.2

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

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

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

Result &Margin Calculation

The Result 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)
Result (dBµV) = Reading (dBµV) + Factor (dB)

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

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

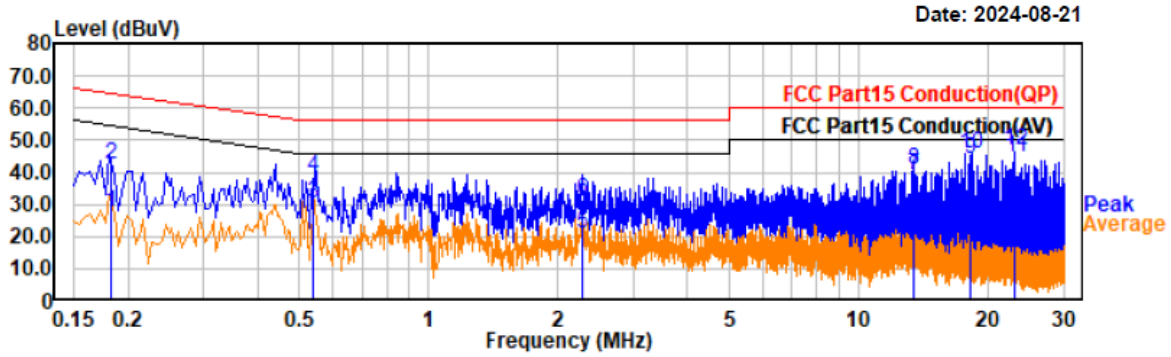
Test Data

Temperature:	23.5℃
Relative Humidity:	54%
ATM Pressure:	101.1kPa
Test Date:	2024-08-21
Test Engineer:	Spike Gao

EUT operation mode: Transmitting in the low channel of BDR (GFSK) mode (worst case)

Project No.: 2407T76694E-RF
Test Mode: BDR 2402MHz
EUT Model: PH81

Temp/Humi/ATM: 23.5℃/54%/101.1kPa
Tested by: Spike Gao
Power Source: AC 120V/60Hz

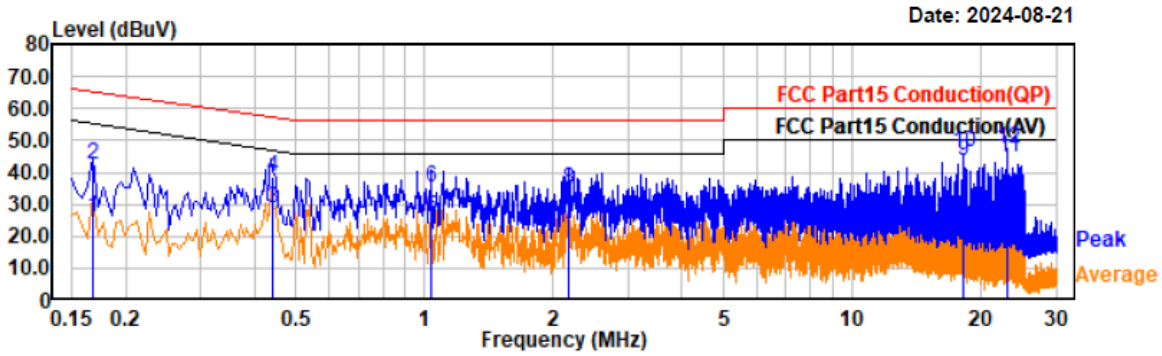


Trace: 1

Freq MHz	Reading dBuV	Factor dB	Result dBuV	Limit dBuV	Margin dB	Phase	Remark
0.18	6.87	20.68	27.55	54.39	26.84	Line	Average
0.18	21.85	20.68	42.53	64.39	21.86	Line	QP
0.54	9.79	20.33	30.12	46.00	15.88	Line	Average
0.54	18.38	20.33	38.71	56.00	17.29	Line	QP
2.28	0.09	21.04	21.13	46.00	24.87	Line	Average
2.28	10.38	21.04	31.42	56.00	24.58	Line	QP
13.48	18.12	20.79	38.91	50.00	11.09	Line	Average
13.48	20.31	20.79	41.10	60.00	18.90	Line	QP
18.24	22.73	21.18	43.91	50.00	6.09	Line	Average
18.24	24.68	21.18	45.86	60.00	14.14	Line	QP
23.13	22.98	21.77	44.75	50.00	5.25	Line	Average
23.13	25.21	21.77	46.98	60.00	13.02	Line	QP

Project No.: 2407T76694E-RF
Test Mode: BDR 2402MHz
EUT Model: PH81

Temp/Humi/ATM: 23.5℃/54%/101.1kPa
Tested by: Spike Gao
Power Source: AC 120V/60Hz



Trace: 1

Freq MHz	Reading dBuV	Factor dB	Result dBuV	Limit dBuV	Margin dB	Phase	Remark
0.17	5.14	20.71	25.85	55.10	29.25	Neutral	Average
0.17	21.54	20.71	42.25	65.10	22.85	Neutral	QP
0.44	8.30	20.43	28.73	47.03	18.30	Neutral	Average
0.44	18.42	20.43	38.85	57.03	18.18	Neutral	QP
1.04	4.92	20.93	25.85	46.00	20.15	Neutral	Average
1.04	14.26	20.93	35.19	56.00	20.81	Neutral	QP
2.17	2.70	21.00	23.70	46.00	22.30	Neutral	Average
2.17	13.53	21.00	34.53	56.00	21.47	Neutral	QP
18.24	22.48	21.18	43.66	50.00	6.34	Neutral	Average
18.24	25.40	21.18	46.58	60.00	13.42	Neutral	QP
23.13	22.77	21.71	44.48	50.00	5.52	Neutral	Average
23.13	25.60	21.71	47.31	60.00	12.69	Neutral	QP

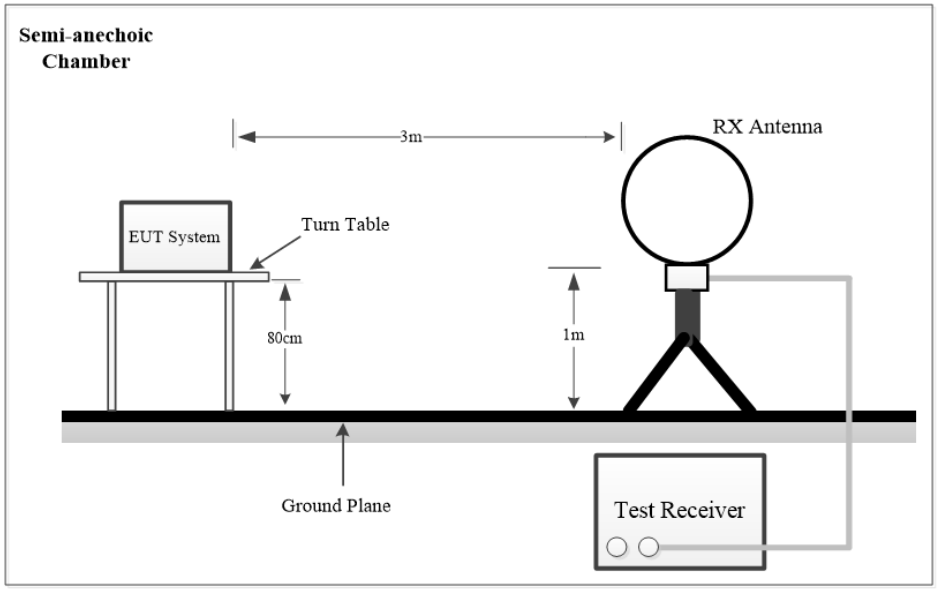
FCC §15.205, §15.209 & §15.247(d) – RADIATED EMISSIONS

Applicable Standard

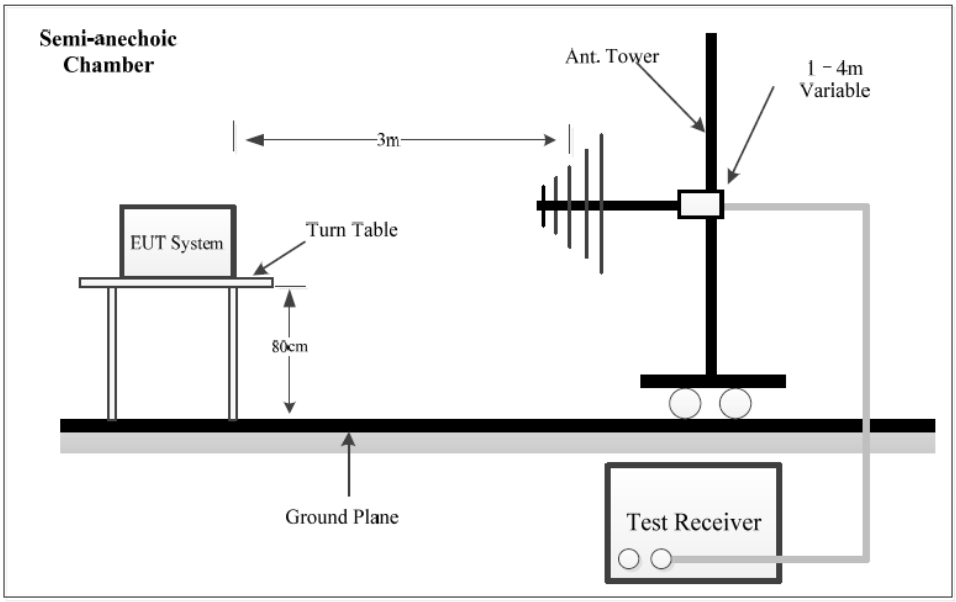
FCC §15.205; §15.209; §15.247(d)

Test System Setup

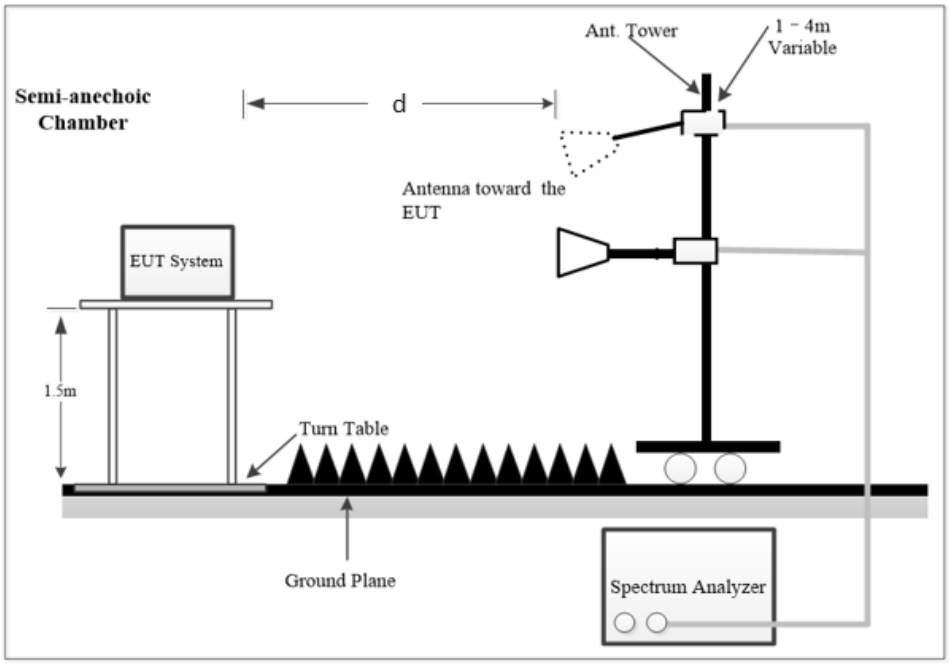
9 kHz-30MHz



Below 1 GHz:



Above 1GHz:



The radiated emission tests using the setup accordance with the ANSI C63.10-2013. The specification used was the FCC 15.209, and FCC 15.247 limits.

NOTE: d is testing distance;
For Radiated Emission test (1GHz-18GHz) and Bandedge Emission test, which was performed at 3 m distance.

For Radiated Emission test (18GHz-25GHz), which was performed at 1.0 m distance, according to ANSI C63.10-2013, the test result shall be extrapolated to the specified distance using an extrapolation Factor of 20dB/decade from 3m to 1.0m.
Distance extrapolation Factor =20 log (specific distance [3m]/test distance [1.0m]) dB= 9.54 dB

EMI Test Receiver & Spectrum Analyzer Setup

The system was investigated from 9 kHz to 25 GHz.

During the radiated emission test, the EMI test receiver & spectrum analyzer setup was set with the following configurations:

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

1GHz~25GHz:
Pre-scan:

Measurement	RBW	Video B/W
PK	1MHz	3MHz
AV	1MHz	5kHz

Final measuurement for emission identifed ding the pre-scan:

Measurement	RBW	Video B/W
PK	1MHz	3MHz
AV	1MHz	10Hz

Test Procedure

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

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

Below 1GHz, 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.

Above 1GHz, if the measured peak level of the emissions that the measuring receiver reading level plus corrected factor is below the AV emission limit, there's no need to record the measured AV level of the emissions in the report.

Result &Margin Calculation

The Result 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:

For 9 kHz to 18GHz Radiated emission test
Factor (dB/m) =Antenna Factor (dB/m) + Cable Loss (dB) - Amplifier Gain (dB)

For 18GHz to 25GHz Radiated emission test and Bandedge emissions test
Factor (dB/m) =Antenna Factor (dB/m) + Cable Loss (dB) - Amplifier Gain (dB) - Extrapolation factor (dB)

Extrapolation factor=9.54dB (distance=1m)

Result (dBμV/m) = Reading (dBμV) + Factor (dB/m)

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

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

Test Data

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

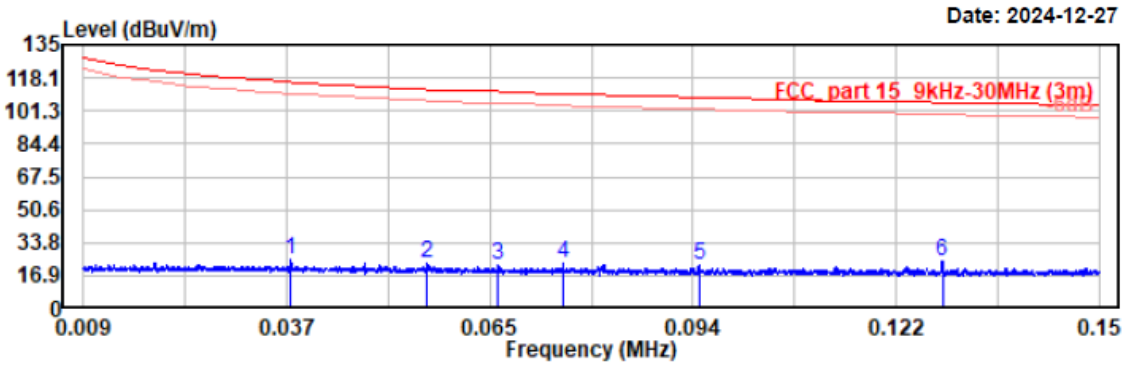
Frequency Range:	Below 1 GHz	Above 1 GHz
Temperature:	22.8℃~23.6℃	23.1℃~23.8℃
Relative Humidity:	50%~56%	53%~58%
ATM Pressure:	100.2kPa ~100.5kPa	100.1 kPa~100.5kPa
Test Date:	2024-08-09~2024-12-27	2024-11-06~2024-12-11
Test Engineer:	Wlif Wu	Wlif Wu

1) 9 kHz ~30MHz

EUT operation mode: Transmitting in the low channel of BDR (GFSK) in parallel (worst case)

Project No.: 2407T76694E-RF
Test Mode: BDR DH1 2402MHz
EUT Model: PH81
Test distance: 3m

Temp/Humi/ATM: 22.8℃/50%/100.2kPa
Tested by: Wlif Wu
Power Source: AC120V/60Hz

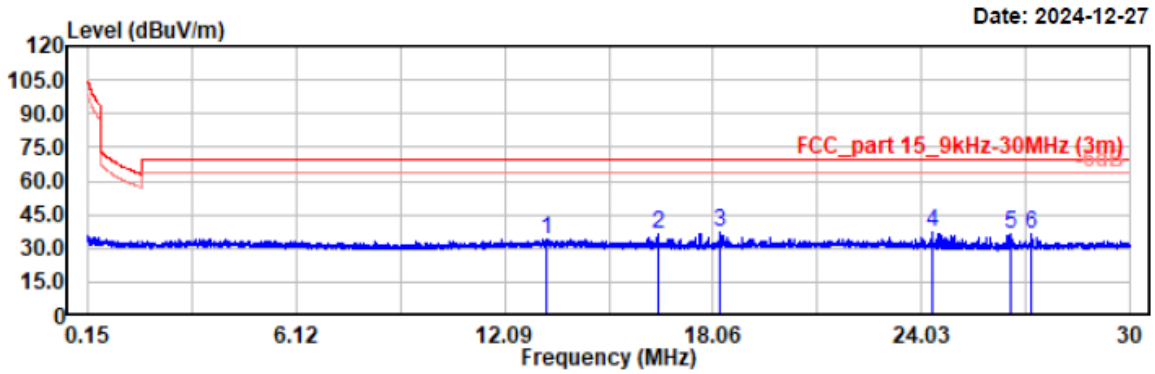


Condition: PK RBW:200Hz VBW:1kHz SWT:auto
QP RBW:200Hz SWT:auto

Freq MHz	Reading dBuV	Factor dB/m	Result dBuV/m	Limit dBuV/m	Margin dB	Remark
0.038	5.01	19.91	24.92	116.07	91.15	Peak
0.057	3.36	19.91	23.27	112.54	89.27	Peak
0.067	2.87	19.84	22.71	111.15	88.44	Peak
0.076	3.38	19.75	23.13	110.04	86.91	Peak
0.094	2.92	19.78	22.70	108.10	85.40	Peak
0.128	4.28	19.73	24.01	105.45	81.44	Peak

Project No.: 2407T76694E-RF
Test Mode: BDR DH1 2402MHz
EUT Model: PH81
Test distance: 3m

Temp/Humi/ATM: 22.8℃/50%/100.2kPa
Tested by: Wlif Wu
Power Source: AC120V/60Hz



Condition: PK RBW:10kHz VBW:30kHz SWT:auto
QP RBW:9kHz SWT:auto

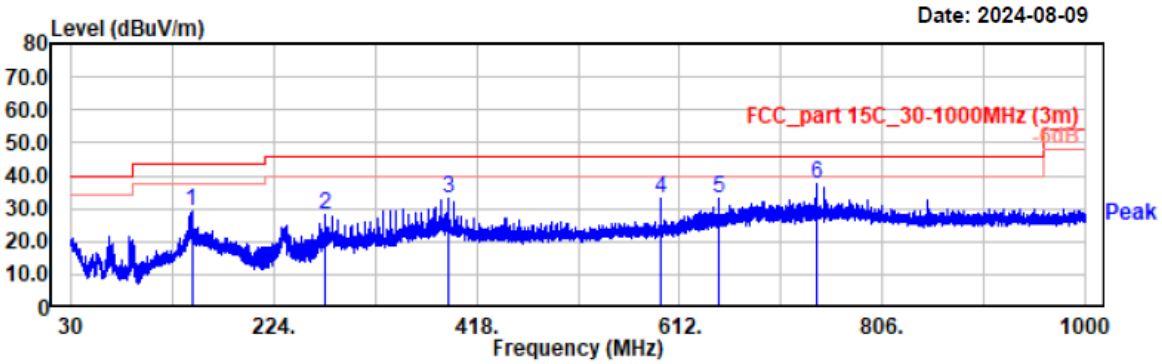
Freq	Reading	Factor	Result	Limit	Margin	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	
13.263	14.35	19.74	34.09	69.54	35.45	Peak
16.472	16.19	19.86	36.05	69.54	33.49	Peak
18.245	17.40	19.97	37.37	69.54	32.17	Peak
24.352	17.13	20.21	37.34	69.54	32.20	Peak
26.612	16.07	20.14	36.21	69.54	33.33	Peak
27.161	16.17	20.11	36.28	69.54	33.26	Peak

2) 30MHz-1GHz

EUT operation mode: Transmitting in the low channel of BDR (GFSK) in Z-axis of orientation (worst case)

Project No.: 2407T76694E-RF
Test Mode:1DH1 2402
EUT Model: PH81
Test distance: 3m

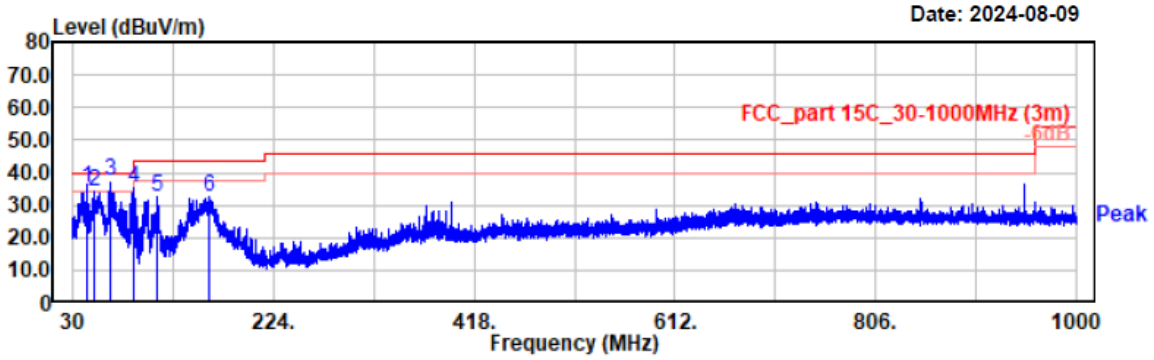
Temp/Humi: 23.6℃/56%/100.5kPa
Tested by: Wlif Wu
Power Source: AC 120V/60Hz



Freq MHz	Reading dBuV	Factor dB/m	Result dBuV/m	Limit dBuV/m	Margin dB	Polarity	Remark
145.24	40.12	-10.97	29.15	43.50	14.35	Horizontal	QP
273.37	37.92	-9.68	28.24	46.00	17.76	Horizontal	QP
390.16	39.88	-6.65	33.23	46.00	12.77	Horizontal	QP
594.06	35.41	-2.44	32.97	46.00	13.03	Horizontal	QP
650.02	34.05	-0.90	33.15	46.00	12.85	Horizontal	QP
742.56	36.91	0.38	37.29	46.00	8.71	Horizontal	QP

Project No.: 2407T76694E-RF
Test Mode:1DH1-2402
EUT Model: PH81
Test distance: 3m

Temp/Humi: 23.6℃/56%/100.5kPa
Tested by: Wlif Wu
Power Source: AC 120V/60Hz

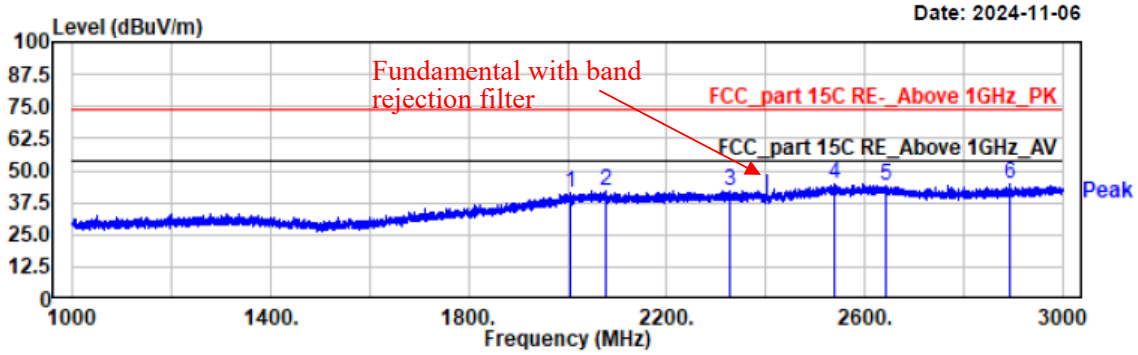


Freq MHz	Reading dBuV	Factor dB/m	Result dBuV/m	Limit dBuV/m	Margin dB	Polarity	Remark
43.81	49.92	-14.45	35.47	40.00	4.53	Vertical	QP
49.89	51.59	-17.32	34.27	40.00	5.73	Vertical	QP
66.30	54.85	-17.27	37.58	40.00	2.42	Vertical	QP
88.88	52.60	-17.18	35.42	43.50	8.08	Vertical	QP
111.58	44.33	-11.60	32.73	43.50	10.77	Vertical	QP
161.14	44.14	-11.53	32.61	43.50	10.89	Vertical	QP

3) 1 GHz-3 GHz

Project No.: 2407T76694E-RF
Test Mode: DH1 2402MHz
EUT Model: PH81
Test distance: 3m

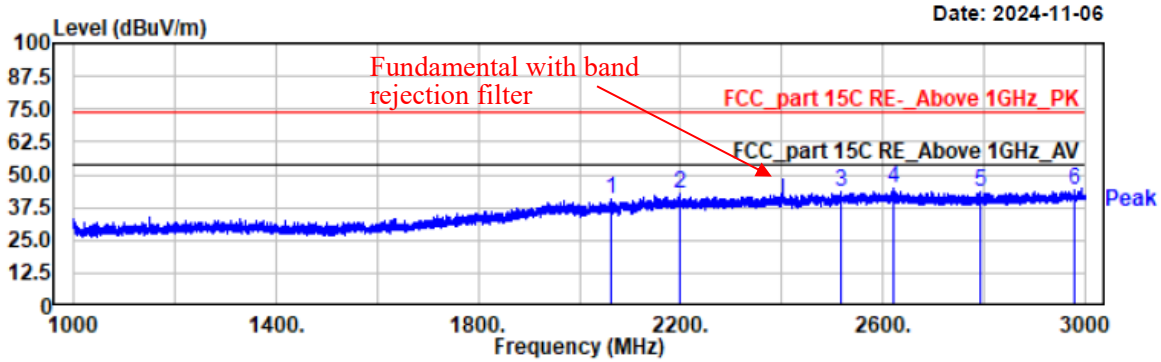
Temp/Humi/ATM: 23.5℃/54%/100.5kPa
Tested by: Wlif Wu
Power Source: AC 120V/60Hz



Freq MHz	Reading dBuV	Factor dB/m	Result dBuV/m	Limit dBuV/m	Margin dB	Polarity	Remark
2005.00	48.38	-6.68	41.70	74.00	32.30	Horizontal	Peak
2075.40	48.14	-6.37	41.77	74.00	32.23	Horizontal	Peak
2326.20	48.33	-6.08	42.25	74.00	31.75	Horizontal	Peak
2538.40	48.12	-3.62	44.50	74.00	29.50	Horizontal	Peak
2643.80	47.74	-3.37	44.37	74.00	29.63	Horizontal	Peak
2895.00	49.54	-4.40	45.14	74.00	28.86	Horizontal	Peak

Project No.: 2407T76694E-RF
Test Mode: DH1 2402MHz
EUT Model: PH81
Test distance: 3m

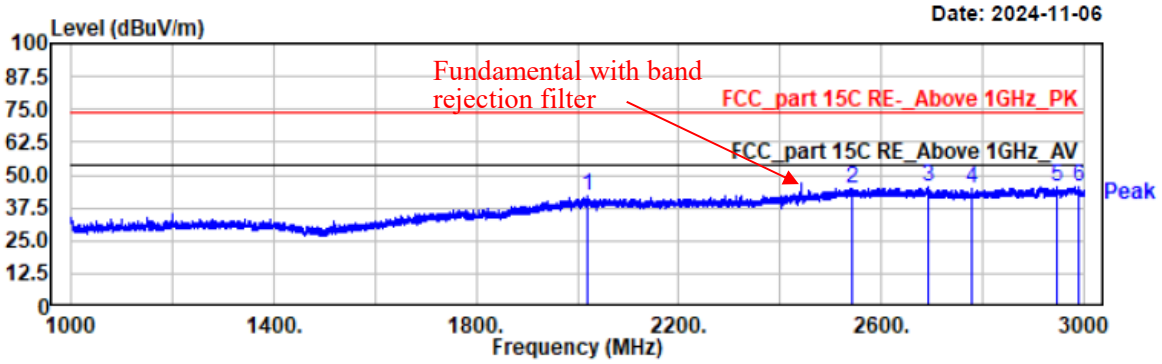
Temp/Humi/ATM: 23.5℃/54%/100.5kPa
Tested by: Wlif Wu
Power Source: AC 120V/60Hz



Freq MHz	Reading dBuV	Factor dB/m	Result dBuV/m	Limit dBuV/m	Margin dB	Polarity	Remark
2062.20	46.59	-6.17	40.42	74.00	33.58	vertical	Peak
2197.80	49.11	-6.27	42.84	74.00	31.16	vertical	Peak
2517.60	47.58	-3.90	43.68	74.00	30.32	vertical	Peak
2620.00	47.97	-3.33	44.64	74.00	29.36	vertical	Peak
2793.00	47.91	-4.71	43.20	74.00	30.80	vertical	Peak
2980.00	48.09	-4.09	44.00	74.00	30.00	vertical	Peak

Project No.: 2407T76694E-RF
Test Mode: DH1 2441MHz
EUT Model: PH81
Test distance: 3m

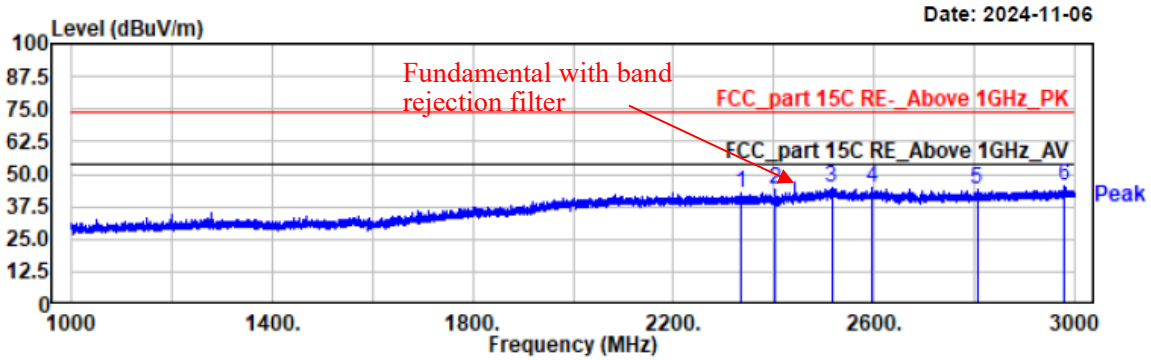
Temp/Humi/ATM: 23.5℃/54%/100.5kPa
Tested by: Wlif Wu
Power Source: AC 120V/60Hz



Freq MHz	Reading dBuV	Factor dB/m	Result dBuV/m	Limit dBuV/m	Margin dB	Polarity	Remark
2021.00	48.51	-6.43	42.08	74.00	31.92	Horizontal	Peak
2540.80	48.64	-3.59	45.05	74.00	28.95	Horizontal	Peak
2691.80	50.14	-4.44	45.70	74.00	28.30	Horizontal	Peak
2780.20	49.47	-4.74	44.73	74.00	29.27	Horizontal	Peak
2947.80	49.44	-4.22	45.22	74.00	28.78	Horizontal	Peak
2991.00	49.54	-4.05	45.49	74.00	28.51	Horizontal	Peak

Project No.: 2407T76694E-RF
Test Mode: DH1 2441MHz
EUT Model: PH81
Test distance: 3m

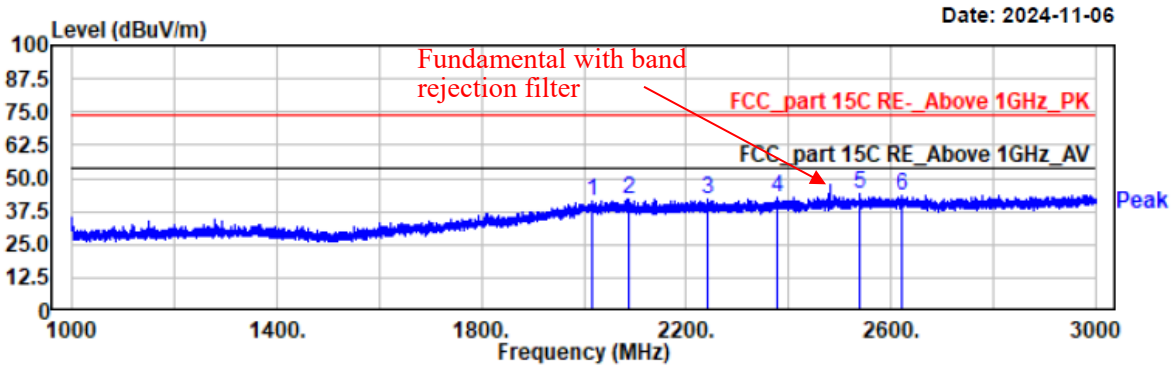
Temp/Humi/ATM: 23.5℃/54%/100.5kPa
Tested by: Wlif Wu
Power Source: AC 120V/60Hz



Freq MHz	Reading dBuV	Factor dB/m	Result dBuV/m	Limit dBuV/m	Margin dB	Polarity	Remark
2333.40	48.62	-6.02	42.60	74.00	31.40	vertical	Peak
2401.20	49.05	-5.19	43.86	74.00	30.14	vertical	Peak
2515.60	48.90	-3.93	44.97	74.00	29.03	vertical	Peak
2596.80	48.20	-3.31	44.89	74.00	29.11	vertical	Peak
2805.60	48.64	-4.68	43.96	74.00	30.04	vertical	Peak
2978.80	49.43	-4.09	45.34	74.00	28.66	vertical	Peak

Project No.: 2407T76694E-RF
Test Mode: DH1 2480MHz
EUT Model: PH81
Test distance: 3m

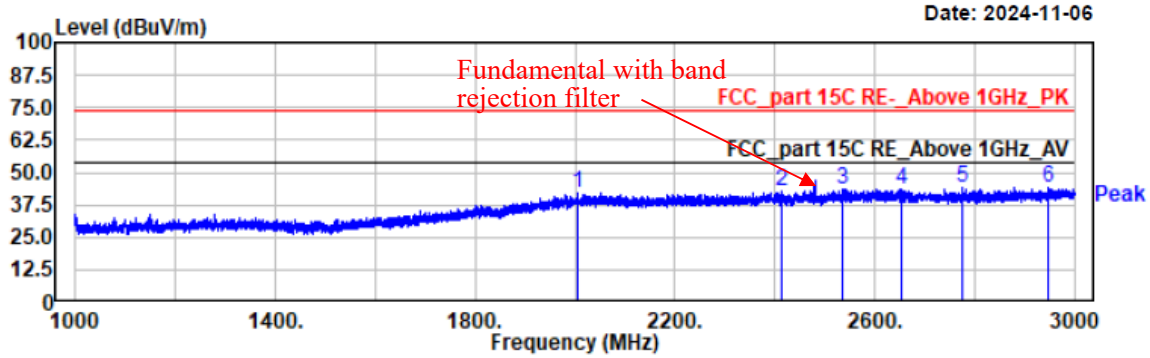
Temp/Humi/ATM: 23.5℃/54%/100.5kPa
Tested by: Wlif Wu
Power Source: AC 120V/60Hz



Freq MHz	Reading dBuV	Factor dB/m	Result dBuV/m	Limit dBuV/m	Margin dB	Polarity	Remark
2015.40	48.05	-6.51	41.54	74.00	32.46	Horizontal	Peak
2086.60	48.79	-6.53	42.26	74.00	31.74	Horizontal	Peak
2242.40	48.44	-6.25	42.19	74.00	31.81	Horizontal	Peak
2377.80	48.55	-5.49	43.06	74.00	30.94	Horizontal	Peak
2539.60	47.92	-3.61	44.31	74.00	29.69	Horizontal	Peak
2622.60	46.59	-3.34	43.25	74.00	30.75	Horizontal	Peak

Project No.: 2407T76694E-RF
Test Mode: DH1 2480MHz
EUT Model: PH81
Test distance: 3m

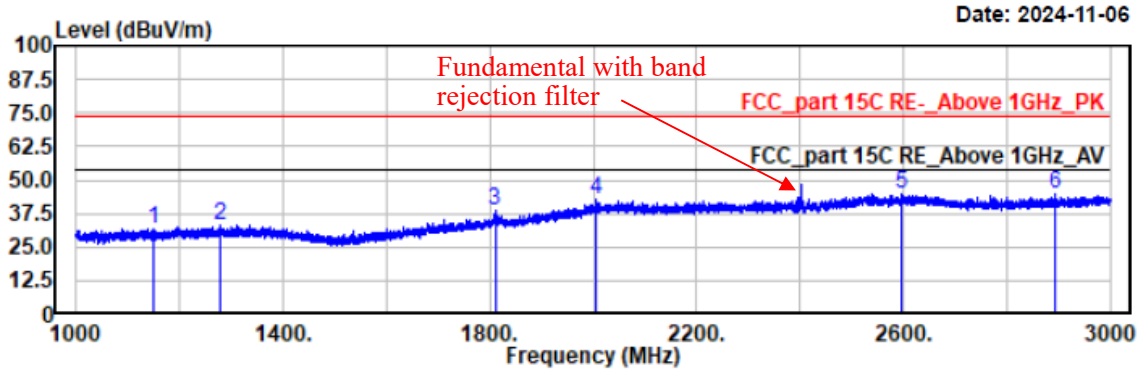
Temp/Humi/ATM: 23.5℃/54%/100.5kPa
Tested by: Wlif Wu
Power Source: AC 120V/60Hz



Freq MHz	Reading dBuV	Factor dB/m	Result dBuV/m	Limit dBuV/m	Margin dB	Polarity	Remark
2003.80	48.96	-6.69	42.27	74.00	31.73	vertical	Peak
2412.00	47.80	-5.17	42.63	74.00	31.37	vertical	Peak
2537.00	47.43	-3.64	43.79	74.00	30.21	vertical	Peak
2652.20	46.82	-3.43	43.39	74.00	30.61	vertical	Peak
2774.00	48.79	-4.76	44.03	74.00	29.97	vertical	Peak
2947.60	48.69	-4.22	44.47	74.00	29.53	vertical	Peak

Project No.: 2407T76694E-RF
Test Mode: 2DH1 2402MHz
EUT Model: PH81
Test distance: 3m

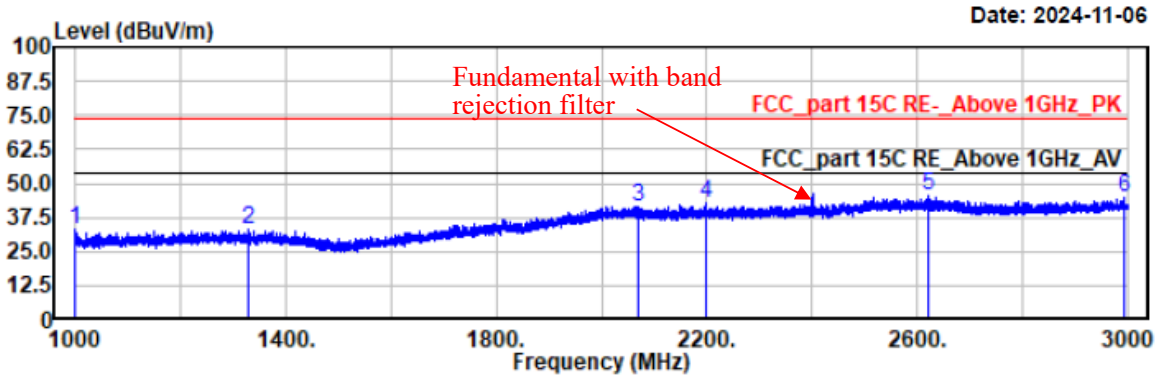
Temp/Humi/ATM: 23.5℃/54%/100.5kPa
Tested by: Wlif Wu
Power Source: AC 120V/60Hz



Freq MHz	Reading dBuV	Factor dB/m	Result dBuV/m	Limit dBuV/m	Margin dB	Polarity	Remark
1149.60	48.22	-16.39	31.83	74.00	42.17	Horizontal	Peak
1279.80	48.58	-15.51	33.07	74.00	40.93	Horizontal	Peak
1810.40	49.84	-11.51	38.33	74.00	35.67	Horizontal	Peak
2005.00	49.38	-6.68	42.70	74.00	31.30	Horizontal	Peak
2595.40	48.18	-3.31	44.87	74.00	29.13	Horizontal	Peak
2895.00	49.54	-4.40	45.14	74.00	28.86	Horizontal	Peak

Project No.: 2407T76694E-RF
Test Mode: 2DH1 2402MHz
EUT Model: PH81
Test distance: 3m

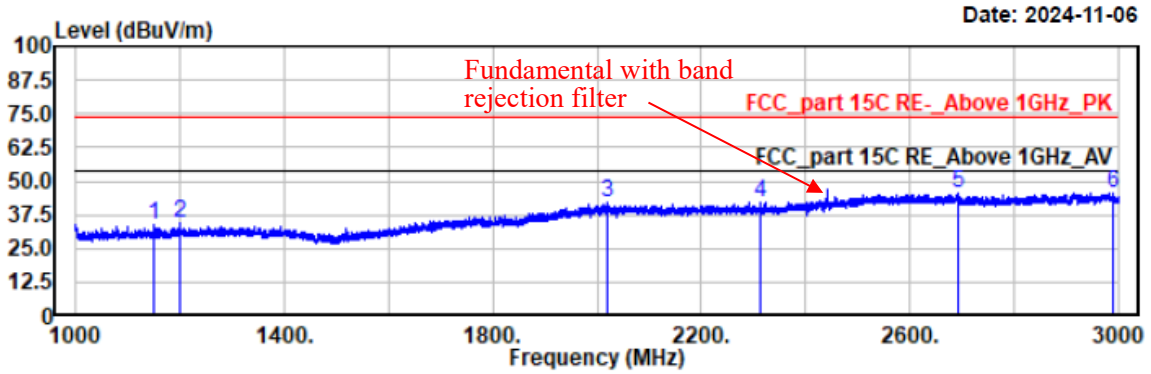
Temp/Humi/ATM: 23.5℃/54%/100.5kPa
Tested by: Wlif Wu
Power Source: AC 120V/60Hz



Freq MHz	Reading dBuV	Factor dB/m	Result dBuV/m	Limit dBuV/m	Margin dB	Polarity	Remark
1000.20	50.01	-17.24	32.77	74.00	41.23	vertical	Peak
1328.80	48.30	-15.46	32.84	74.00	41.16	vertical	Peak
2068.40	47.84	-6.25	41.59	74.00	32.41	vertical	Peak
2197.80	49.11	-6.27	42.84	74.00	31.16	vertical	Peak
2620.00	48.97	-3.33	45.64	74.00	28.36	vertical	Peak
2992.80	48.87	-4.04	44.83	74.00	29.17	vertical	Peak

Project No.: 2407T76694E-RF
Test Mode: 2DH1 2441MHz
EUT Model: PH81
Test distance: 3m

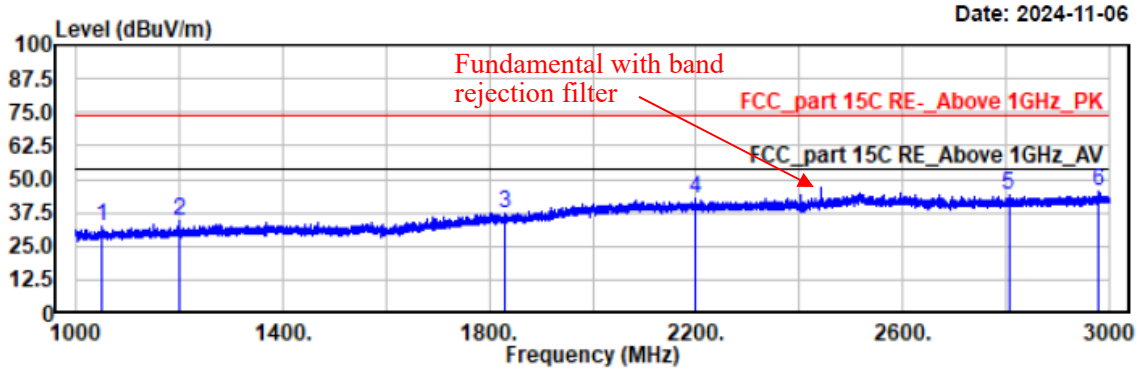
Temp/Humi/ATM: 23.5℃/54%/100.5kPa
Tested by: Wlif Wu
Power Source: AC 120V/60Hz



Freq MHz	Reading dBuV	Factor dB/m	Result dBuV/m	Limit dBuV/m	Margin dB	Polarity	Remark
1149.60	50.41	-16.39	34.02	74.00	39.98	Horizontal	Peak
1200.20	50.82	-16.05	34.77	74.00	39.23	Horizontal	Peak
2021.00	48.51	-6.43	42.08	74.00	31.92	Horizontal	Peak
2313.40	48.04	-6.20	41.84	74.00	32.16	Horizontal	Peak
2691.80	50.14	-4.44	45.70	74.00	28.30	Horizontal	Peak
2991.00	49.54	-4.05	45.49	74.00	28.51	Horizontal	Peak

Project No.: 2407T76694E-RF
Test Mode: 2DH1 2441MHz
EUT Model: PH81
Test distance: 3m

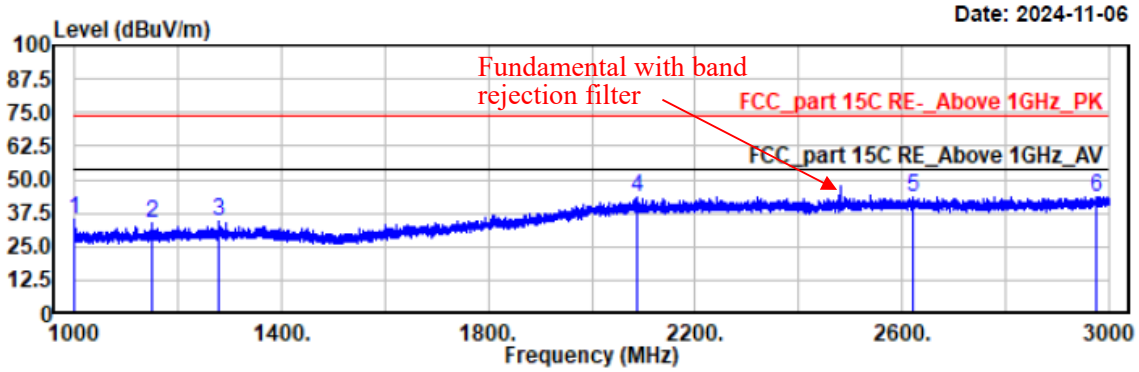
Temp/Humi/ATM: 23.5℃/54%/100.5kPa
Tested by: Wlif Wu
Power Source: AC 120V/60Hz



Freq MHz	Reading dBuV	Factor dB/m	Result dBuV/m	Limit dBuV/m	Margin dB	Polarity	Remark
1050.20	49.26	-17.04	32.22	74.00	41.78	vertical	Peak
1199.60	50.35	-16.05	34.30	74.00	39.70	vertical	Peak
1828.40	48.99	-11.42	37.57	74.00	36.43	vertical	Peak
2199.40	48.72	-6.26	42.46	74.00	31.54	vertical	Peak
2805.60	48.64	-4.68	43.96	74.00	30.04	vertical	Peak
2978.80	49.43	-4.09	45.34	74.00	28.66	vertical	Peak

Project No.: 2407T76694E-RF
Test Mode: 2DH1 2480MHz
EUT Model: PH81
Test distance: 3m

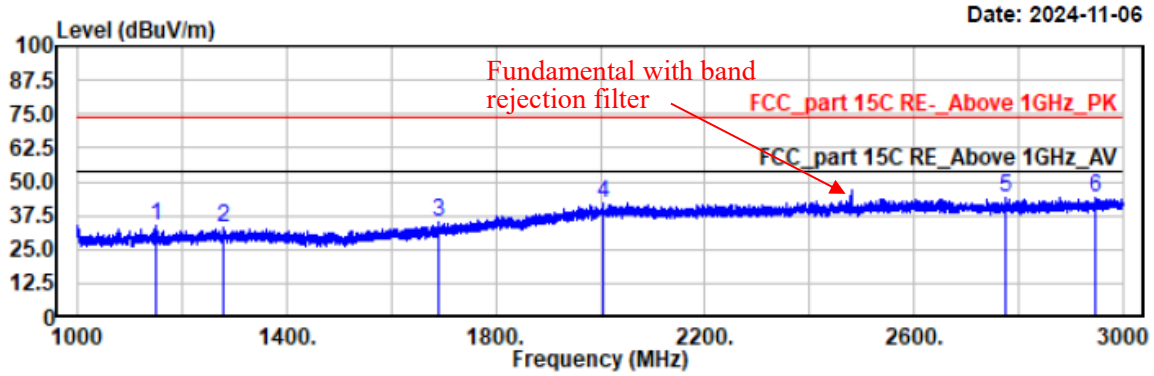
Temp/Humi/ATM: 23.5℃/54%/100.5kPa
Tested by: Wlif Wu
Power Source: AC 120V/60Hz



Freq MHz	Reading dBuV	Factor dB/m	Result dBuV/m	Limit dBuV/m	Margin dB	Polarity	Remark
1000.00	52.27	-17.24	35.03	74.00	38.97	Horizontal	Peak
1149.60	49.85	-16.39	33.46	74.00	40.54	Horizontal	Peak
1280.40	49.83	-15.50	34.33	74.00	39.67	Horizontal	Peak
2086.60	49.79	-6.53	43.26	74.00	30.74	Horizontal	Peak
2622.60	46.59	-3.34	43.25	74.00	30.75	Horizontal	Peak
2976.40	47.69	-4.10	43.59	74.00	30.41	Horizontal	Peak

Project No.: 2407T76694E-RF
Test Mode: 2DH1 2480MHz
EUT Model: PH81
Test distance: 3m

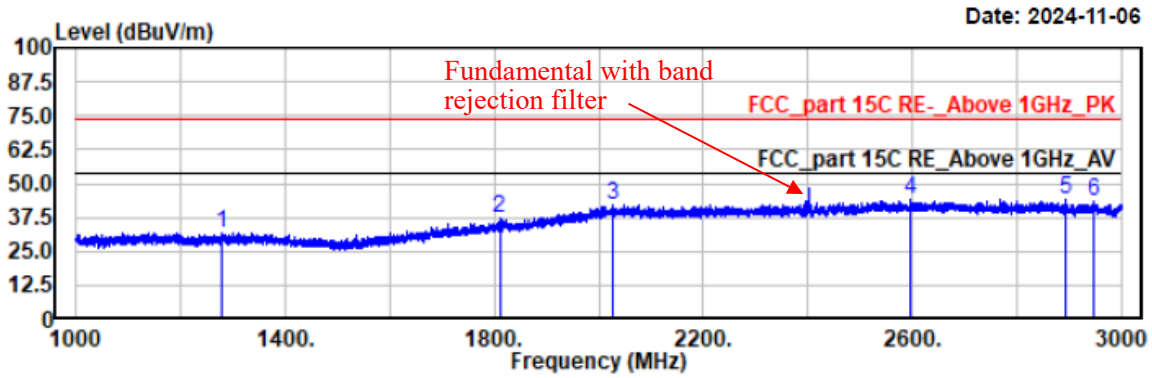
Temp/Humi/ATM: 23.5℃/54%/100.5kPa
Tested by: Wlif Wu
Power Source: AC 120V/60Hz



Freq MHz	Reading dBuV	Factor dB/m	Result dBuV/m	Limit dBuV/m	Margin dB	Polarity	Remark
1150.00	50.19	-16.39	33.80	74.00	40.20	vertical	Peak
1279.80	48.35	-15.51	32.84	74.00	41.16	vertical	Peak
1690.00	49.48	-14.07	35.41	74.00	38.59	vertical	Peak
2003.80	48.96	-6.69	42.27	74.00	31.73	vertical	Peak
2774.00	48.79	-4.76	44.03	74.00	29.97	vertical	Peak
2947.60	48.69	-4.22	44.47	74.00	29.53	vertical	Peak

Project No.: 2407T76694E-RF
Test Mode: 3DH1 2402MHz
EUT Model: PH81
Test distance: 3m

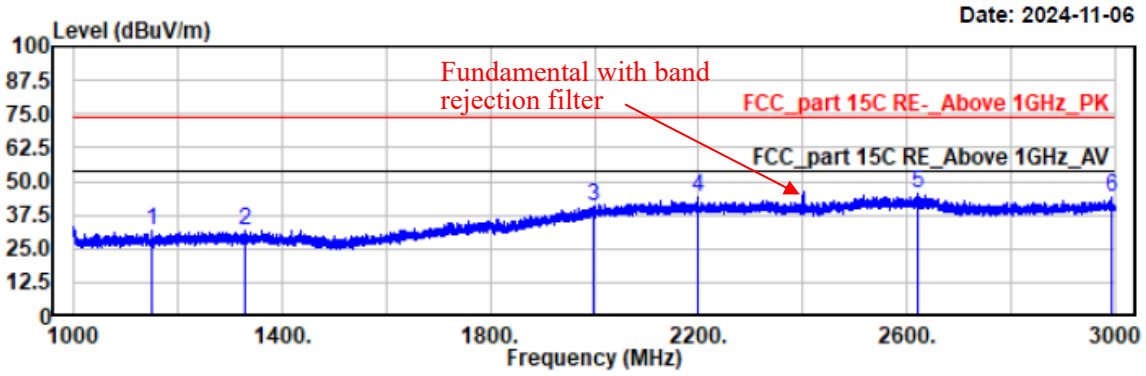
Temp/Humi/ATM: 23.5℃/54%/100.5kPa
Tested by: Wlif Wu
Power Source: AC 120V/60Hz



Freq MHz	Reading dBuV	Factor dB/m	Result dBuV/m	Limit dBuV/m	Margin dB	Polarity	Remark
1279.80	47.58	-15.51	32.07	74.00	41.93	Horizontal	Peak
1810.40	48.84	-11.51	37.33	74.00	36.67	Horizontal	Peak
2025.80	48.19	-6.36	41.83	74.00	32.17	Horizontal	Peak
2595.40	47.18	-3.31	43.87	74.00	30.13	Horizontal	Peak
2895.00	48.54	-4.40	44.14	74.00	29.86	Horizontal	Peak
2948.60	47.66	-4.22	43.44	74.00	30.56	Horizontal	Peak

Project No.: 2407T76694E-RF
Test Mode: 3DH1 2402MHz
EUT Model: PH81
Test distance: 3m

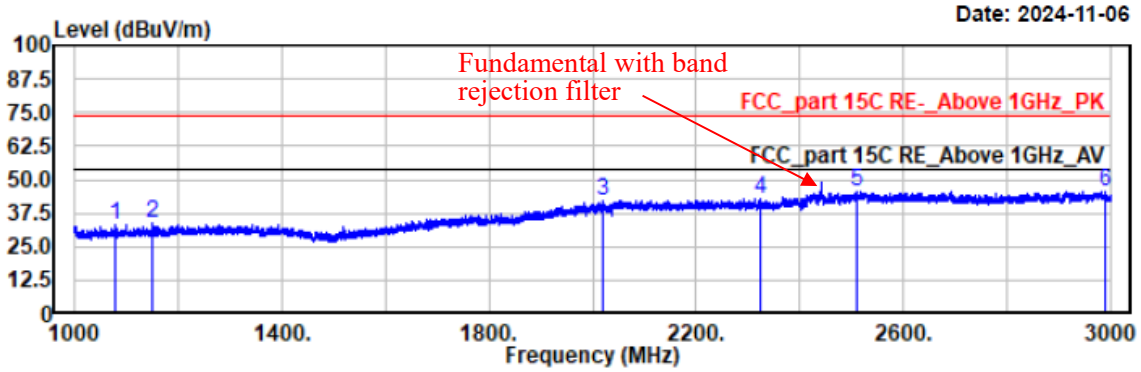
Temp/Humi/ATM: 23.5℃/54%/100.5kPa
Tested by: Wlif Wu
Power Source: AC 120V/60Hz



Freq MHz	Reading dBuV	Factor dB/m	Result dBuV/m	Limit dBuV/m	Margin dB	Polarity	Remark
1150.00	47.93	-16.39	31.54	74.00	42.46	vertical	Peak
1328.80	47.30	-15.46	31.84	74.00	42.16	vertical	Peak
1999.80	47.72	-6.76	40.96	74.00	33.04	vertical	Peak
2197.80	50.11	-6.27	43.84	74.00	30.16	vertical	Peak
2620.00	48.97	-3.33	45.64	74.00	28.36	vertical	Peak
2992.80	47.87	-4.04	43.83	74.00	30.17	vertical	Peak

Project No.: 2407T76694E-RF
Test Mode: 3DH1 2441MHz
EUT Model: PH81
Test distance: 3m

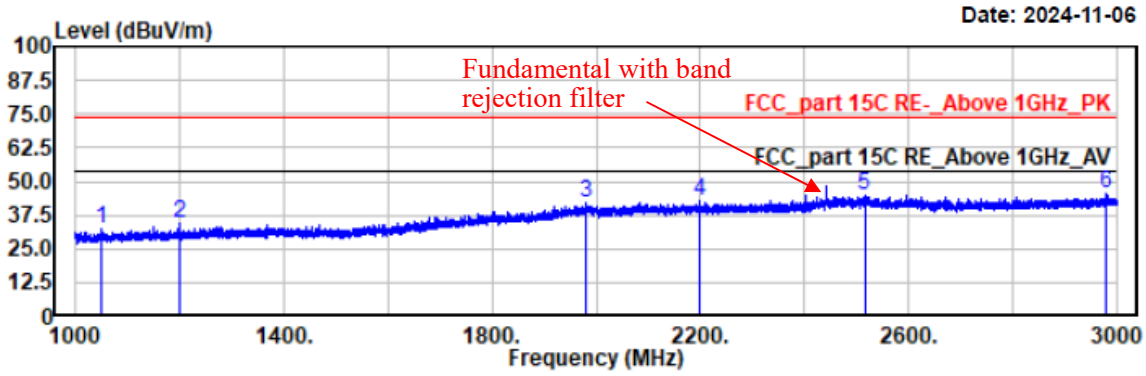
Temp/Humi/ATM: 23.5℃/54%/100.5kPa
Tested by: Wlif Wu
Power Source: AC 120V/60Hz



Freq MHz	Reading dBuV	Factor dB/m	Result dBuV/m	Limit dBuV/m	Margin dB	Polarity	Remark
1078.20	50.16	-16.75	33.41	74.00	40.59	Horizontal	Peak
1149.60	50.41	-16.39	34.02	74.00	39.98	Horizontal	Peak
2021.00	48.51	-6.43	42.08	74.00	31.92	Horizontal	Peak
2323.80	49.01	-6.10	42.91	74.00	31.09	Horizontal	Peak
2509.00	49.80	-4.02	45.78	74.00	28.22	Horizontal	Peak
2991.00	49.54	-4.05	45.49	74.00	28.51	Horizontal	Peak

Project No.: 2407T76694E-RF
Test Mode: 3DH1 2441MHz
EUT Model: PH81
Test distance: 3m

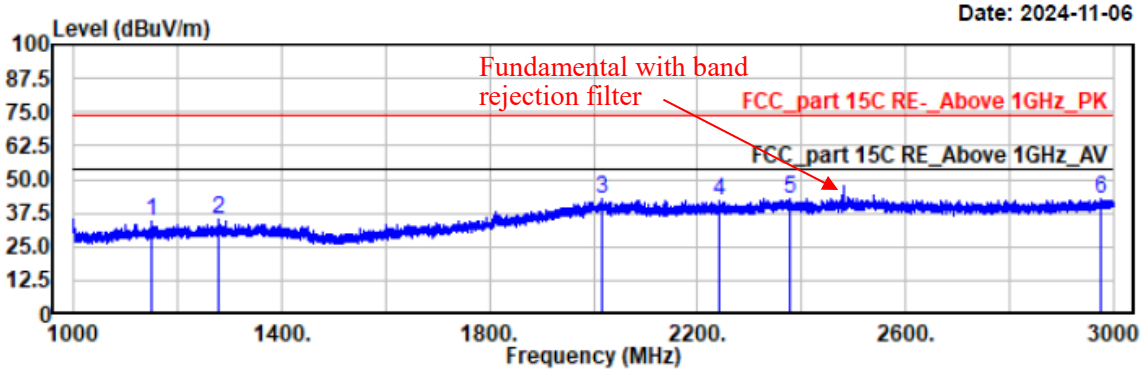
Temp/Humi/ATM: 23.5℃/54%/100.5kPa
Tested by: Wlif Wu
Power Source: AC 120V/60Hz



Freq MHz	Reading dBuV	Factor dB/m	Result dBuV/m	Limit dBuV/m	Margin dB	Polarity	Remark
1050.20	49.26	-17.04	32.22	74.00	41.78	vertical	Peak
1199.60	50.35	-16.05	34.30	74.00	39.70	vertical	Peak
1979.00	49.32	-7.48	41.84	74.00	32.16	vertical	Peak
2199.40	48.72	-6.26	42.46	74.00	31.54	vertical	Peak
2515.60	48.90	-3.93	44.97	74.00	29.03	vertical	Peak
2978.80	49.43	-4.09	45.34	74.00	28.66	vertical	Peak

Project No.: 2407T76694E-RF
Test Mode: 3DH1 2480MHz
EUT Model: PH81
Test distance: 3m

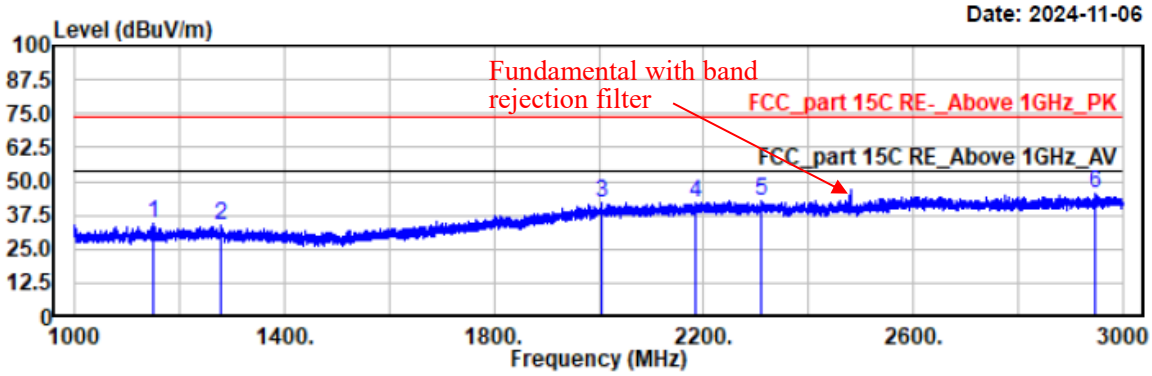
Temp/Humi/ATM: 23.5℃/54%/100.5kPa
Tested by: Wlif Wu
Power Source: AC 120V/60Hz



Freq MHz	Reading dBuV	Factor dB/m	Result dBuV/m	Limit dBuV/m	Margin dB	Polarity	Remark
1149.60	50.85	-16.39	34.46	74.00	39.54	Horizontal	Peak
1280.40	50.83	-15.50	35.33	74.00	38.67	Horizontal	Peak
2015.40	49.05	-6.51	42.54	74.00	31.46	Horizontal	Peak
2242.40	48.44	-6.25	42.19	74.00	31.81	Horizontal	Peak
2377.80	48.55	-5.49	43.06	74.00	30.94	Horizontal	Peak
2976.40	46.69	-4.10	42.59	74.00	31.41	Horizontal	Peak

Project No.: 2407T76694E-RF
Test Mode: 3DH1 2480MHz
EUT Model: PH81
Test distance: 3m

Temp/Humi/ATM: 23.5℃/54%/100.5kPa
Tested by: Wlif Wu
Power Source: AC 120V/60Hz

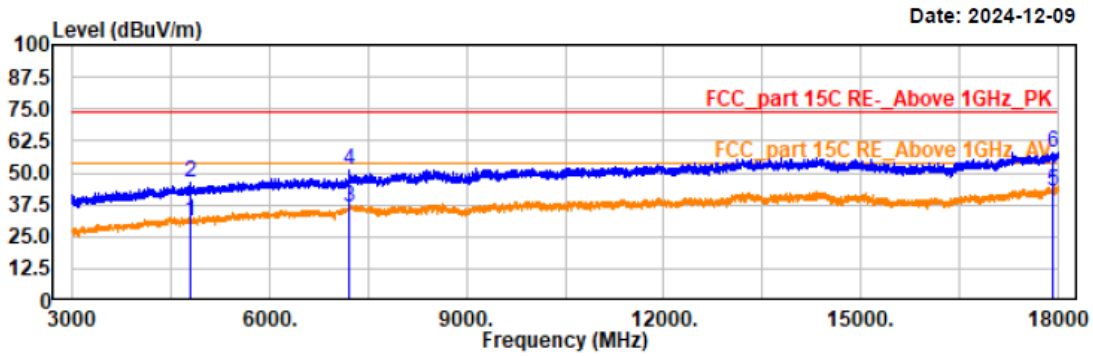


Freq MHz	Reading dBuV	Factor dB/m	Result dBuV/m	Limit dBuV/m	Margin dB	Polarity	Remark
1150.00	51.19	-16.39	34.80	74.00	39.20	vertical	Peak
1279.80	49.35	-15.51	33.84	74.00	40.16	vertical	Peak
2003.80	48.96	-6.69	42.27	74.00	31.73	vertical	Peak
2183.40	48.83	-6.42	42.41	74.00	31.59	vertical	Peak
2309.20	48.91	-6.25	42.66	74.00	31.34	vertical	Peak
2947.60	49.69	-4.22	45.47	74.00	28.53	vertical	Peak

4) 3 GHz-18 GHz

Project No.: 2407T76694E-RF
Test Mode: 1DH1-2402
EUT Model: PH81
Test distance: 3m

Temp/Humi/ATM: 23.1℃/53%/100.1kPa
Tested by: Wlif Wu
Power Source: AC 120V/60Hz

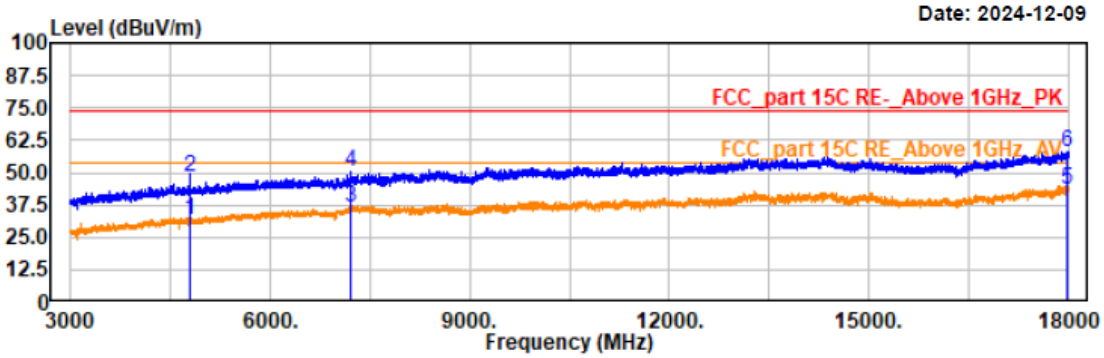


Trace: 1
Condition: PK RBW:1MHz VBW:3MHz SWT:auto
AV RBW:1MHz VBW:5kHz SWT:auto

Freq MHz	Reading dBuV	Factor dB/m	Result dBuV/m	Limit dBuV/m	Margin dB	Polarity	Remark
4804.50	35.67	-4.45	31.22	54.00	22.78	horizontal	Average
4804.50	50.57	-4.45	46.12	74.00	27.88	horizontal	Peak
7206.00	38.39	-1.73	36.66	54.00	17.34	horizontal	Average
7206.00	52.77	-1.73	51.04	74.00	22.96	horizontal	Peak
17934.00	35.01	7.63	42.64	54.00	11.36	horizontal	Average
17934.00	50.05	7.63	57.68	74.00	16.32	horizontal	Peak

Project No.: 2407T76694E-RF
Test Mode: 1DH1-2402
EUT Model: PH81
Test distance: 3m

Temp/Humi/ATM: 23.1℃/53%/100.1kPa
Tested by: Wlif Wu
Power Source: AC 120V/60Hz

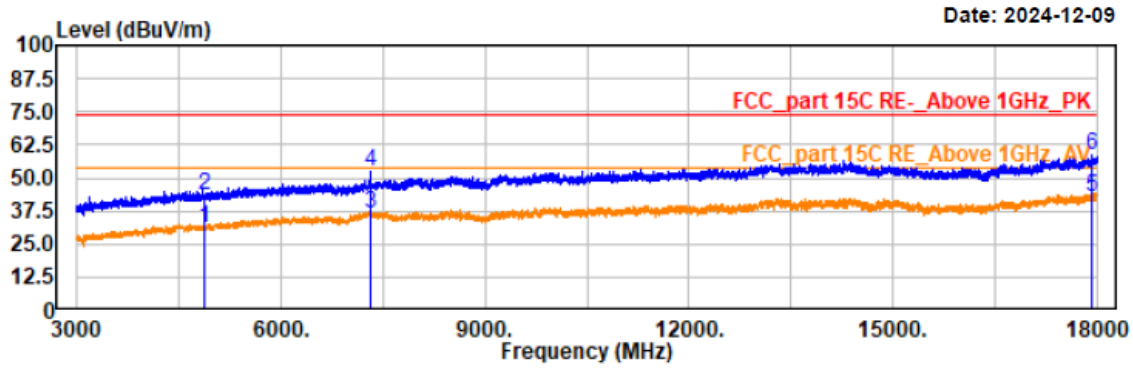


Trace: 1
Condition: PK RBW:1MHz VBW:3MHz SWT:auto
AV RBW:1MHz VBW:5kHz SWT:auto

Freq	Reading	Factor	Result	Limit	Margin	Polarity	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		
4804.50	35.89	-4.45	31.44	54.00	22.56	vertical	Average
4804.50	52.99	-4.45	48.54	74.00	25.46	vertical	Peak
7206.00	37.99	-1.73	36.26	54.00	17.74	vertical	Average
7206.00	51.97	-1.73	50.24	74.00	23.76	vertical	Peak
17988.00	35.59	7.72	43.31	54.00	10.69	vertical	Average
17988.00	50.33	7.72	58.05	74.00	15.95	vertical	Peak

Project No.: 2407T76694E-RF
Test Mode: 1DH1-2441
EUT Model: PH81
Test distance: 3m

Temp/Humi/ATM: 23.1℃/53%/100.1kPa
Tested by: Wlif Wu
Power Source: AC 120V/60Hz

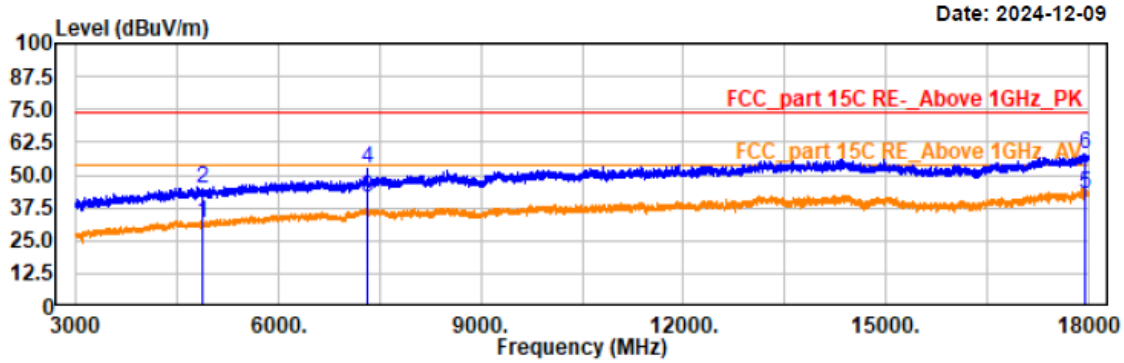


Trace: 1
Condition: PK RBW:1MHz VBW:3MHz SWT:auto
AV RBW:1MHz VBW:5kHz SWT:auto

Freq MHz	Reading dBuV	Factor dB/m	Result dBuV/m	Limit dBuV/m	Margin dB	Polarity	Remark
4882.00	35.00	-4.25	30.75	54.00	23.25	horizontal	Average
4882.00	47.39	-4.25	43.14	74.00	30.86	horizontal	Peak
7323.00	38.06	-1.61	36.45	54.00	17.55	horizontal	Average
7323.00	54.36	-1.61	52.75	74.00	21.25	horizontal	Peak
17929.50	35.24	7.64	42.88	54.00	11.12	horizontal	Average
17929.50	51.22	7.64	58.86	74.00	15.14	horizontal	Peak

Project No.: 2407T76694E-RF
Test Mode: 1DH1-2441
EUT Model: PH81
Test distance: 3m

Temp/Humi/ATM: 23.1℃/53%/100.1kPa
Tested by: Wlif Wu
Power Source: AC 120V/60Hz

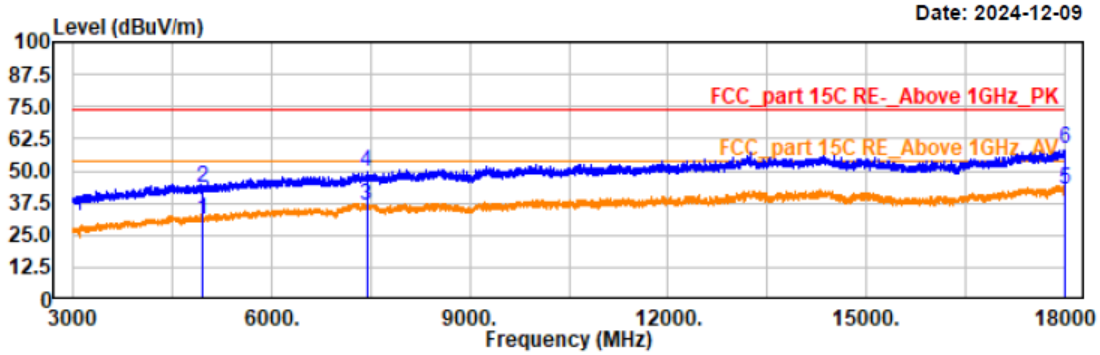


Trace: 1
Condition: PK RBW:1MHz VBW:3MHz SWT:auto
AV RBW:1MHz VBW:5kHz SWT:auto

Freq	Reading	Factor	Result	Limit	Margin	Polarity	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		
4882.50	36.11	-4.24	31.87	54.00	22.13	vertical	Average
4882.50	49.06	-4.24	44.82	74.00	29.18	vertical	Peak
7323.00	42.92	-1.61	41.31	54.00	12.69	vertical	Average
7323.00	54.11	-1.61	52.50	74.00	21.50	vertical	Peak
17950.50	34.79	7.67	42.46	54.00	11.54	vertical	Average
17950.50	50.25	7.67	57.92	74.00	16.08	vertical	Peak

Project No.: 2407T76694E-RF
Test Mode: 1DH1-2480
EUT Model: PH81
Test distance: 3m

Temp/Humi/ATM: 23.1℃/53%/100.1kPa
Tested by: Wlif Wu
Power Source: AC 120V/60Hz

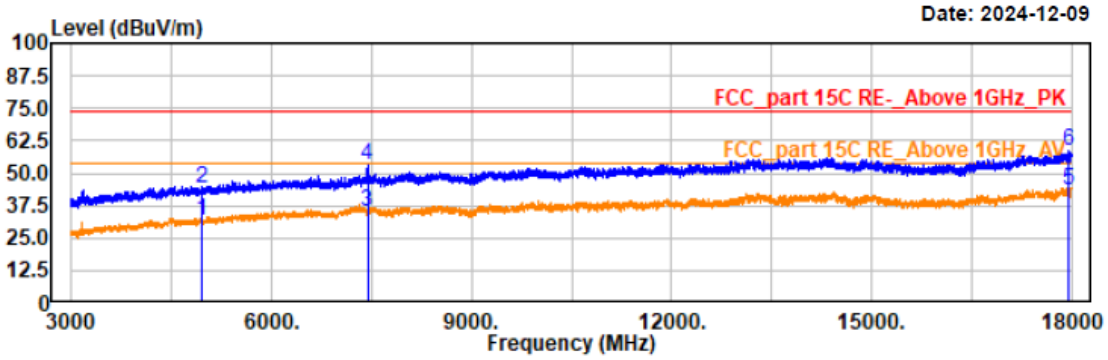


Trace: 1
Condition: PK RBW:1MHz VBW:3MHz SWT:auto
AV RBW:1MHz VBW:5kHz SWT:auto

Freq MHz	Reading dBuV	Factor dB/m	Result dBuV/m	Limit dBuV/m	Margin dB	Polarity	Remark
4960.50	35.23	-4.01	31.22	54.00	22.78	horizontal	Average
4960.50	47.21	-4.01	43.20	74.00	30.80	horizontal	Peak
7440.00	37.88	-1.59	36.29	54.00	17.71	horizontal	Average
7440.00	51.46	-1.59	49.87	74.00	24.13	horizontal	Peak
17999.00	35.29	7.74	43.03	54.00	10.97	horizontal	Average
17999.00	50.71	7.74	58.45	74.00	15.55	horizontal	Peak

Project No.: 2407T76694E-RF
Test Mode: 1DH1-2480
EUT Model: PH81
Test distance: 3m

Temp/Humi/ATM: 23.1℃/53%/100.1kPa
Tested by: Wlif Wu
Power Source: AC 120V/60Hz

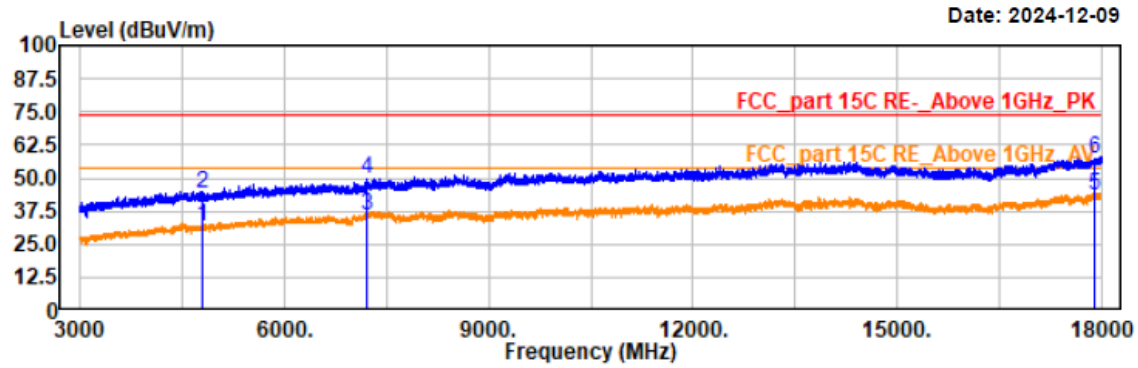


Trace: 1
Condition: PK RBW:1MHz VBW:3MHz SWT:auto
AV RBW:1MHz VBW:5kHz SWT:auto

Freq	Reading	Factor	Result	Limit	Margin	Polarity	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		
4960.00	35.61	-4.01	31.60	54.00	22.40	vertical	Average
4960.00	47.97	-4.01	43.96	74.00	30.04	vertical	Peak
7440.00	36.66	-1.59	35.07	54.00	18.93	vertical	Average
7440.00	54.58	-1.59	52.99	74.00	21.01	vertical	Peak
17941.50	35.68	7.65	43.33	54.00	10.67	vertical	Average
17941.50	50.85	7.65	58.50	74.00	15.50	vertical	Peak

Project No.: 2407T76694E-RF
Test Mode: 2DH1-2402
EUT Model: PH81
Test distance: 3m

Temp/Humi/ATM: 23.1℃/53%/100.1kPa
Tested by: Wlif Wu
Power Source: AC 120V/60Hz

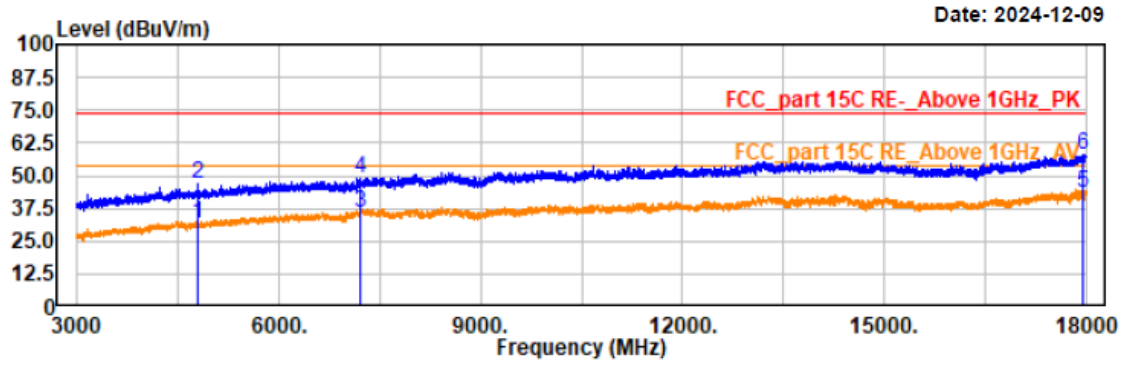


Trace: 1
Condition: PK RBW:1MHz VBW:3MHz SWT:auto
AV RBW:1MHz VBW:5kHz SWT:auto

Freq	Reading	Factor	Result	Limit	Margin	Polarity	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		
4804.00	35.99	-4.45	31.54	54.00	22.46	horizontal	Average
4804.00	48.49	-4.45	44.04	74.00	29.96	horizontal	Peak
7206.00	37.85	-1.73	36.12	54.00	17.88	horizontal	Average
7206.00	51.12	-1.73	49.39	74.00	24.61	horizontal	Peak
17893.50	36.16	7.57	43.73	54.00	10.27	horizontal	Average
17893.50	49.75	7.57	57.32	74.00	16.68	horizontal	Peak

Project No.: 2407T76694E-RF
Test Mode: 2DH1-2402
EUT Model: PH81
Test distance: 3m

Temp/Humi/ATM: 23.1℃/53%/100.1kPa
Tested by: Wlif Wu
Power Source: AC 120V/60Hz

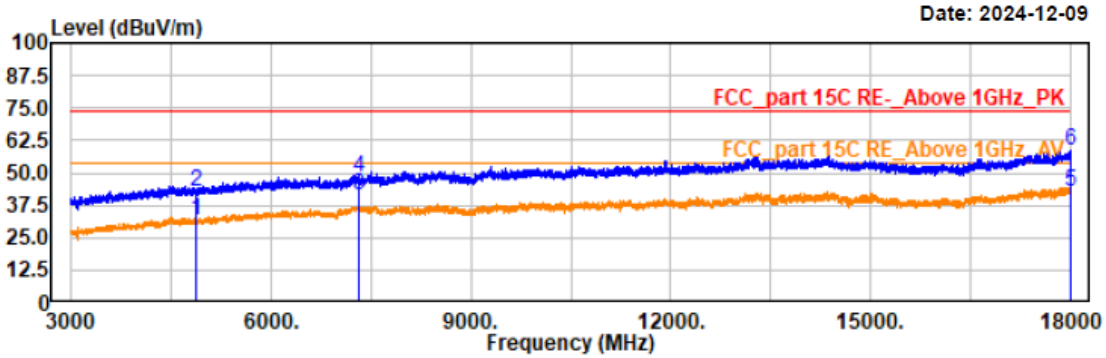


Trace: 1
Condition: PK RBW:1MHz VBW:3MHz SWT:auto
AV RBW:1MHz VBW:5kHz SWT:auto

Freq	Reading	Factor	Result	Limit	Margin	Polarity	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		
4804.50	36.50	-4.45	32.05	54.00	21.95	vertical	Average
4804.50	51.36	-4.45	46.91	74.00	27.09	vertical	Peak
7206.00	37.65	-1.73	35.92	54.00	18.08	vertical	Average
7206.00	50.88	-1.73	49.15	74.00	24.85	vertical	Peak
17958.00	35.67	7.68	43.35	54.00	10.65	vertical	Average
17958.00	50.53	7.68	58.21	74.00	15.79	vertical	Peak

Project No.: 2407T76694E-RF
Test Mode: 2DH1-2441
EUT Model: PH81
Test distance: 3m

Temp/Humi/ATM: 23.1℃/53%/100.1kPa
Tested by: Wlif Wu
Power Source: AC 120V/60Hz

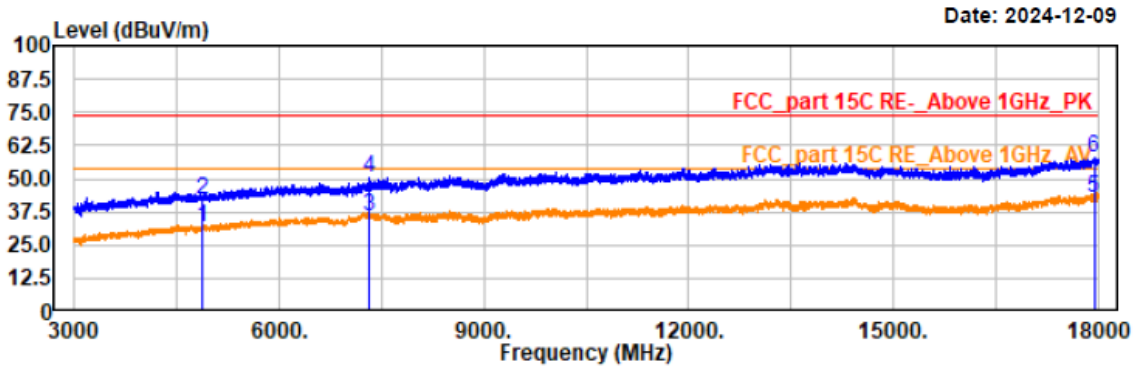


Trace: 1
Condition: PK RBW:1MHz VBW:3MHz SWT:auto
AV RBW:1MHz VBW:5kHz SWT:auto

Freq MHz	Reading dBuV	Factor dB/m	Result dBuV/m	Limit dBuV/m	Margin dB	Polarity	Remark
4882.50	35.73	-4.24	31.49	54.00	22.51	horizontal	Average
4882.50	46.66	-4.24	42.42	74.00	31.58	horizontal	Peak
7323.00	42.84	-1.61	41.23	54.00	12.77	horizontal	Average
7323.00	50.08	-1.61	48.47	74.00	25.53	horizontal	Peak
17994.00	35.28	7.72	43.00	54.00	11.00	horizontal	Average
17994.00	50.63	7.72	58.35	74.00	15.65	horizontal	Peak

Project No.: 2407T76694E-RF
Test Mode: 2DH1-2441
EUT Model: PH81
Test distance: 3m

Temp/Humi/ATM: 23.1℃/53%/100.1kPa
Tested by: Wlif Wu
Power Source: AC 120V/60Hz

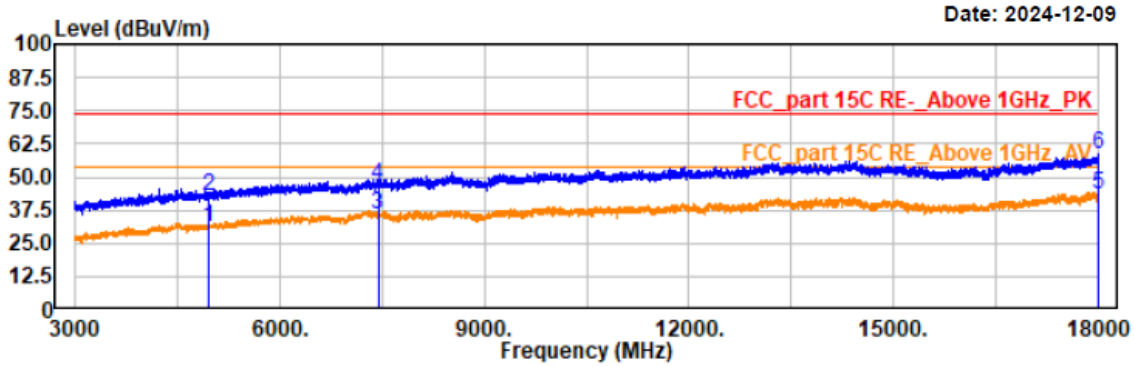


Trace: 1
Condition: PK RBW:1MHz VBW:3MHz SWT:auto
AV RBW:1MHz VBW:5kHz SWT:auto

Freq MHz	Reading dBuV	Factor dB/m	Result dBuV/m	Limit dBuV/m	Margin dB	Polarity	Remark
4882.00	36.03	-4.25	31.78	54.00	22.22	vertical	Average
4882.00	46.29	-4.25	42.04	74.00	31.96	vertical	Peak
7323.00	37.62	-1.61	36.01	54.00	17.99	vertical	Average
7323.00	51.86	-1.61	50.25	74.00	23.75	vertical	Peak
17938.50	34.88	7.65	42.53	54.00	11.47	vertical	Average
17938.50	50.08	7.65	57.73	74.00	16.27	vertical	Peak

Project No.: 2407T76694E-RF
Test Mode: 2DH1-2480
EUT Model: PH81
Test distance: 3m

Temp/Humi/ATM: 23.1℃/53%/100.1kPa
Tested by: Wlif Wu
Power Source: AC 120V/60Hz

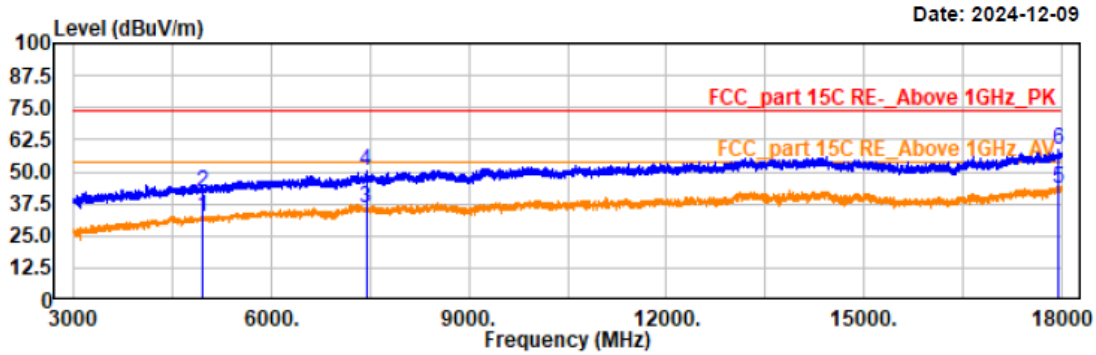


Trace: 1
Condition: PK RBW:1MHz VBW:3MHz SWT:auto
AV RBW:1MHz VBW:5kHz SWT:auto

Freq MHz	Reading dBuV	Factor dB/m	Result dBuV/m	Limit dBuV/m	Margin dB	Polarity	Remark
4960.00	35.38	-4.01	31.37	54.00	22.63	horizontal	Average
4960.00	46.77	-4.01	42.76	74.00	31.24	horizontal	Peak
7440.00	37.28	-1.59	35.69	54.00	18.31	horizontal	Average
7440.00	48.76	-1.59	47.17	74.00	26.83	horizontal	Peak
17997.00	35.92	7.74	43.66	54.00	10.34	horizontal	Average
17997.00	50.56	7.74	58.30	74.00	15.70	horizontal	Peak

Project No.: 2407T76694E-RF
Test Mode: 2DH1-2480
EUT Model: PH81
Test distance: 3m

Temp/Humi/ATM: 23.1℃/53%/100.1kPa
Tested by: Wlif Wu
Power Source: AC 120V/60Hz

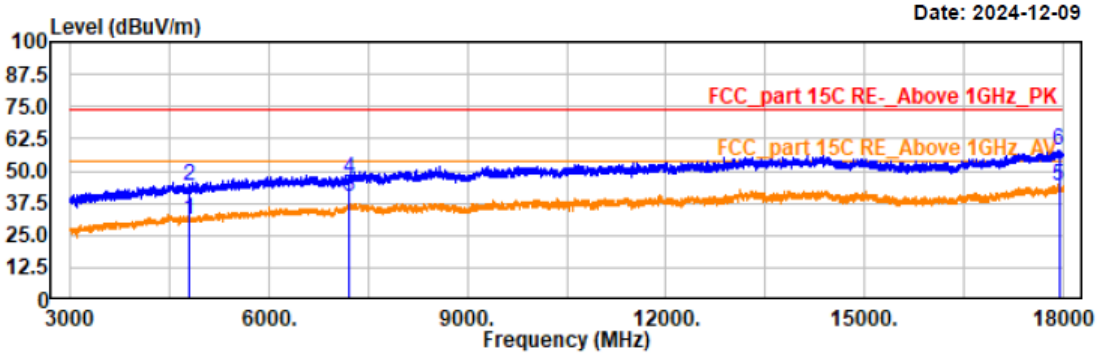


Trace: 1
Condition: PK RBW:1MHz VBW:3MHz SWT:auto
AV RBW:1MHz VBW:5kHz SWT:auto

Freq MHz	Reading dBuV	Factor dB/m	Result dBuV/m	Limit dBuV/m	Margin dB	Polarity	Remark
4960.50	36.40	-4.01	32.39	54.00	21.61	vertical	Average
4960.50	45.81	-4.01	41.80	74.00	32.20	vertical	Peak
7440.00	37.75	-1.59	36.16	54.00	17.84	vertical	Average
7440.00	52.02	-1.59	50.43	74.00	23.57	vertical	Peak
17956.50	36.10	7.68	43.78	54.00	10.22	vertical	Average
17956.50	50.74	7.68	58.42	74.00	15.58	vertical	Peak

Project No.: 2407T76694E-RF
Test Mode: 3DH1-2402
EUT Model: PH81
Test distance: 3m

Temp/Humi/ATM: 23.1℃/53%/100.1kPa
Tested by: Wlif Wu
Power Source: AC 120V/60Hz

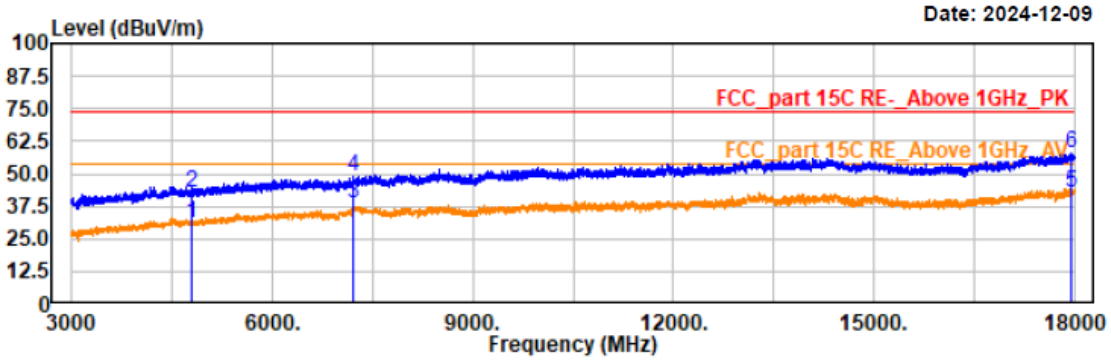


Trace: 1
Condition: PK RBW:1MHz VBW:3MHz SWT:auto
AV RBW:1MHz VBW:5kHz SWT:auto

Freq MHz	Reading dBuV	Factor dB/m	Result dBuV/m	Limit dBuV/m	Margin dB	Polarity	Remark
4804.00	35.65	-4.45	31.20	54.00	22.80	horizontal	Average
4804.00	48.92	-4.45	44.47	74.00	29.53	horizontal	Peak
7206.00	41.60	-1.73	39.87	54.00	14.13	horizontal	Average
7206.00	48.61	-1.73	46.88	74.00	27.12	horizontal	Peak
17938.50	36.75	7.65	44.40	54.00	9.60	horizontal	Average
17938.50	49.98	7.65	57.63	74.00	16.37	horizontal	Peak

Project No.: 2407T76694E-RF
Test Mode: 3DH1-2402
EUT Model: PH81
Test distance: 3m

Temp/Humi/ATM: 23.1℃/53%/100.1kPa
Tested by: Wlif Wu
Power Source: AC 120V/60Hz

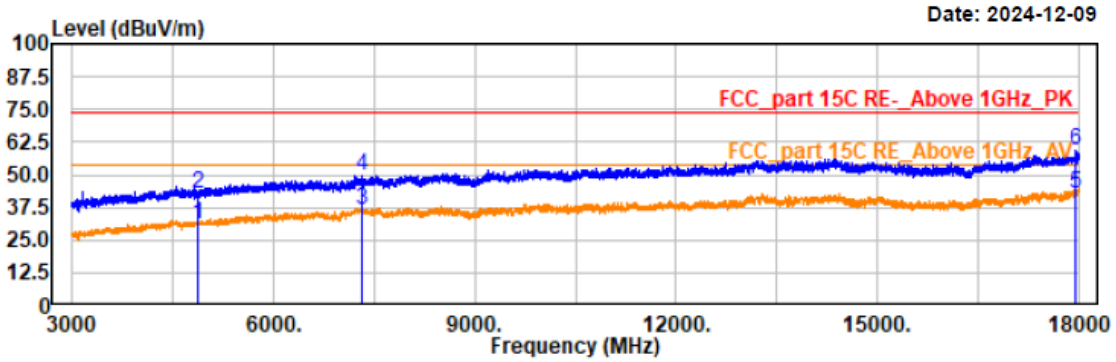


Trace: 1
Condition: PK RBW:1MHz VBW:3MHz SWT:auto
AV RBW:1MHz VBW:5kHz SWT:auto

Freq MHz	Reading dBuV	Factor dB/m	Result dBuV/m	Limit dBuV/m	Margin dB	Polarity	Remark
4804.50	35.70	-4.45	31.25	54.00	22.75	vertical	Average
4804.50	47.31	-4.45	42.86	74.00	31.14	vertical	Peak
7206.00	40.27	-1.73	38.54	54.00	15.46	vertical	Average
7206.00	50.45	-1.73	48.72	74.00	25.28	vertical	Peak
17949.00	34.94	7.67	42.61	54.00	11.39	vertical	Average
17949.00	49.94	7.67	57.61	74.00	16.39	vertical	Peak

Project No.: 2407T76694E-RF
Test Mode: 3DH1-2441
EUT Model: PH81
Test distance: 3m

Temp/Humi/ATM: 23.1℃/53%/100.1kPa
Tested by: Wlif Wu
Power Source: AC 120V/60Hz

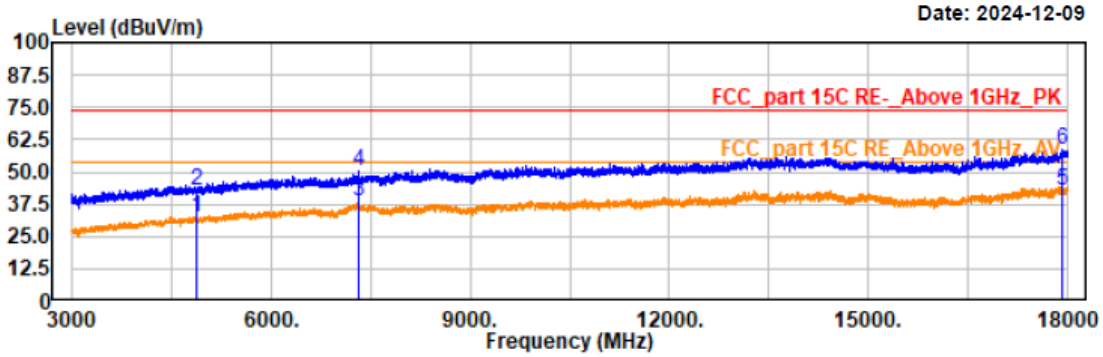


Trace: 1
Condition: PK RBW:1MHz VBW:3MHz SWT:auto
AV RBW:1MHz VBW:5kHz SWT:auto

Freq MHz	Reading dBuV	Factor dB/m	Result dBuV/m	Limit dBuV/m	Margin dB	Polarity	Remark
4882.00	35.05	-4.25	30.80	54.00	23.20	horizontal	Average
4882.00	46.75	-4.25	42.50	74.00	31.50	horizontal	Peak
7323.00	38.29	-1.61	36.68	54.00	17.32	horizontal	Average
7323.00	51.26	-1.61	49.65	74.00	24.35	horizontal	Peak
17944.50	34.78	7.65	42.43	54.00	11.57	horizontal	Average
17944.50	51.49	7.65	59.14	74.00	14.86	horizontal	Peak

Project No.: 2407T76694E-RF
Test Mode: 3DH1-2441
EUT Model: PH81
Test distance: 3m

Temp/Humi/ATM: 23.1℃/53%/100.1kPa
Tested by: Wlif Wu
Power Source: AC 120V/60Hz

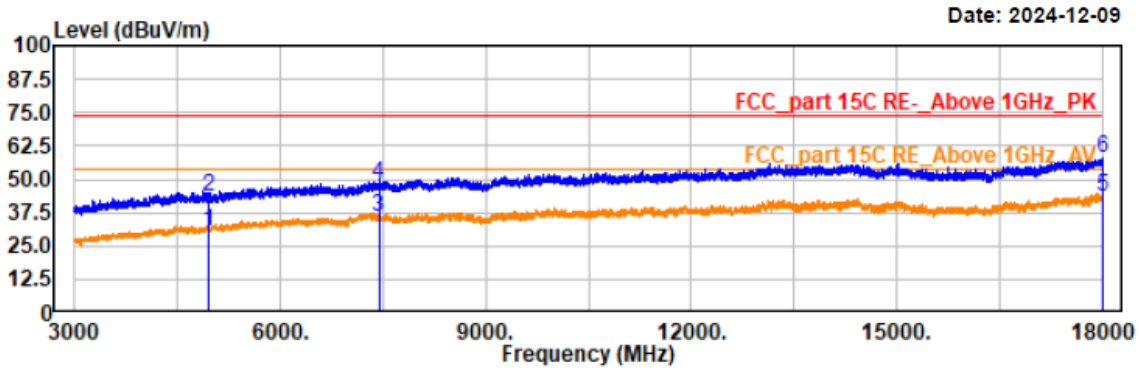


Trace: 1
Condition: PK RBW:1MHz VBW:3MHz SWT:auto
AV RBW:1MHz VBW:5kHz SWT:auto

Freq MHz	Reading dBuV	Factor dB/m	Result dBuV/m	Limit dBuV/m	Margin dB	Polarity	Remark
4882.50	36.57	-4.24	32.33	54.00	21.67	vertical	Average
4882.50	46.81	-4.24	42.57	74.00	31.43	vertical	Peak
7323.00	40.33	-1.61	38.72	54.00	15.28	vertical	Average
7323.00	51.70	-1.61	50.09	74.00	23.91	vertical	Peak
17931.00	35.40	7.63	43.03	54.00	10.97	vertical	Average
17931.00	50.67	7.63	58.30	74.00	15.70	vertical	Peak

Project No.: 2407T76694E-RF
Test Mode: 3DH1-2480
EUT Model: PH81
Test distance: 3m

Temp/Humi/ATM: 23.1℃/53%/100.1kPa
Tested by: Wlif Wu
Power Source: AC 120V/60Hz

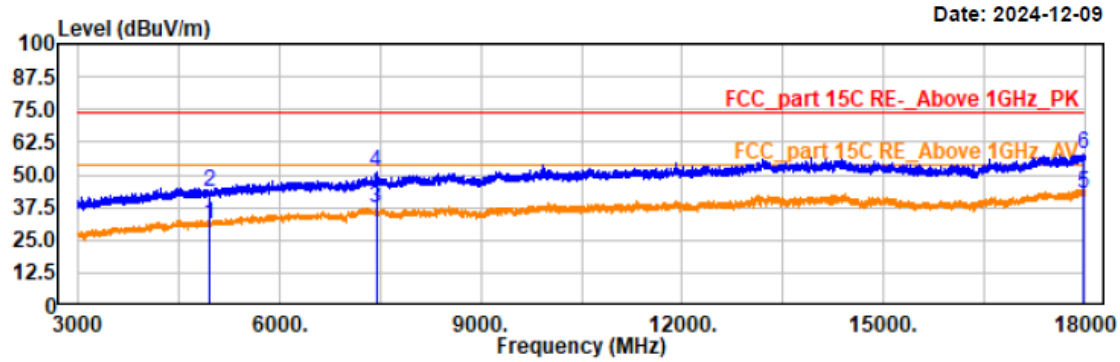


Trace: 1
Condition: PK RBW:1MHz VBW:3MHz SWT:auto
AV RBW:1MHz VBW:5kHz SWT:auto

Freq MHz	Reading dBuV	Factor dB/m	Result dBuV/m	Limit dBuV/m	Margin dB	Polarity	Remark
4960.50	34.66	-4.01	30.65	54.00	23.35	horizontal	Average
4960.50	47.25	-4.01	43.24	74.00	30.76	horizontal	Peak
7440.00	37.15	-1.59	35.56	54.00	18.44	horizontal	Average
7440.00	49.82	-1.59	48.23	74.00	25.77	horizontal	Peak
17995.50	35.40	7.74	43.14	54.00	10.86	horizontal	Average
17995.50	50.18	7.74	57.92	74.00	16.08	horizontal	Peak

Project No.: 2407T76694E-RF
Test Mode: 3DH1-2480
EUT Model: PH81
Test distance: 3m

Temp/Humi/ATM: 23.1℃/53%/100.1kPa
Tested by: Wlif Wu
Power Source: AC 120V/60Hz



Trace: 1
Condition: PK RBW:1MHz VBW:3MHz SWT:auto
AV RBW:1MHz VBW:5kHz SWT:auto

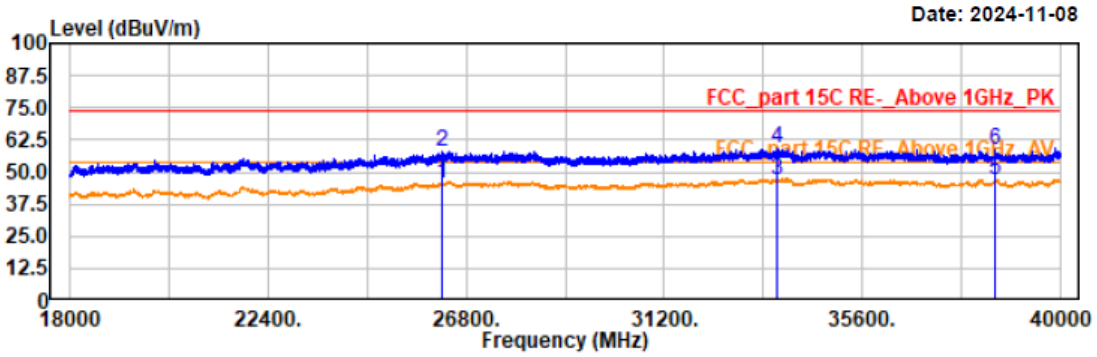
Freq MHz	Reading dBuV	Factor dB/m	Result dBuV/m	Limit dBuV/m	Margin dB	Polarity	Remark
4960.50	35.15	-4.01	31.14	54.00	22.86	vertical	Average
4960.50	47.37	-4.01	43.36	74.00	30.64	vertical	Peak
7440.00	39.03	-1.59	37.44	54.00	16.56	vertical	Average
7440.00	52.29	-1.59	50.70	74.00	23.30	vertical	Peak
17988.00	35.30	7.72	43.02	54.00	10.98	vertical	Average
17988.00	49.98	7.72	57.70	74.00	16.30	vertical	Peak

5) 18 GHz-25 GHz

EUT operation mode: Transmitting in the low channel of BDR (GFSK) in Z-axis of orientation (worst case)

Project No.: 2407T76694E-RF
Test Mode: BDR DH1 2402MHz
EUT Model: PH81
Test distance: 1m

Temp/Humi/ATM: 23.8℃/58%/100.1kPa
Tested by: Wlif Wu
Power Source: AC 120V/60Hz

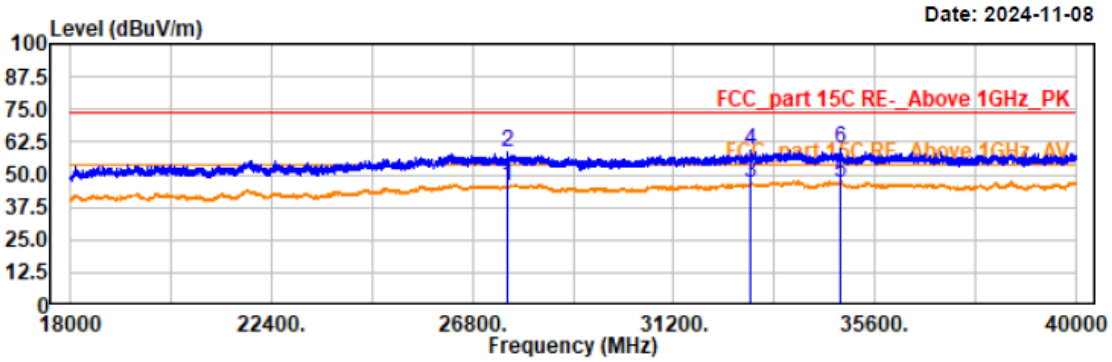


Trace: 1

Freq MHz	Reading dBuV	Factor dB/m	Result dBuV/m	Limit dBuV/m	Margin dB	Polarity	Remark
26265.40	25.24	20.30	45.54	54.00	8.46	horizontal	Average
26265.40	37.94	20.30	58.24	74.00	15.76	horizontal	Peak
33694.80	25.59	21.43	47.02	54.00	6.98	horizontal	Average
33694.80	37.94	21.43	59.37	74.00	14.63	horizontal	Peak
38567.80	29.18	17.49	46.67	54.00	7.33	horizontal	Average
38567.80	41.30	17.49	58.79	74.00	15.21	horizontal	Peak

Project No.: 2407T76694E-RF
Test Mode: BDR DH1 2402MHz
EUT Model: PH81
Test distance: 1m

Temp/Humi/ATM: 23.8℃/58%/100.1kPa
Tested by: Wlif Wu
Power Source: AC 120V/60Hz



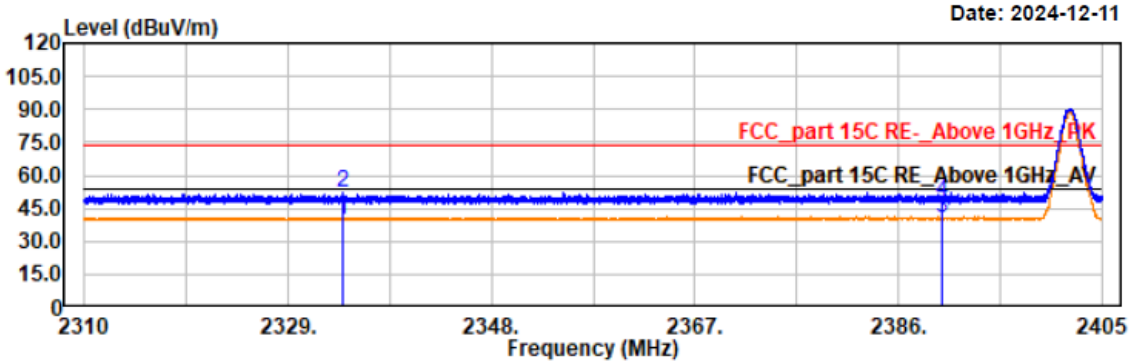
Trace: 1

Freq MHz	Reading dBuV	Factor dB/m	Result dBuV/m	Limit dBuV/m	Margin dB	Polarity	Remark
27576.60	24.93	20.25	45.18	54.00	8.82	vertical	Average
27576.60	38.12	20.25	58.37	74.00	15.63	vertical	Peak
32891.80	26.83	20.28	47.11	54.00	6.89	vertical	Average
32891.80	39.07	20.28	59.35	74.00	14.65	vertical	Peak
34858.60	25.44	21.33	46.77	54.00	7.23	vertical	Average
34858.60	38.63	21.33	59.96	74.00	14.04	vertical	Peak

Restricted Bands Emissions:

Project No.: 2407T76694E-RF
Test Mode: 1DH1-2402
EUT Model: PH81
Test distance: 3m

Temp/Humi/ATM: 23.3℃/54%/100.3kPa
Tested by: Wlif Wu
Power Source: AC 120V/60Hz

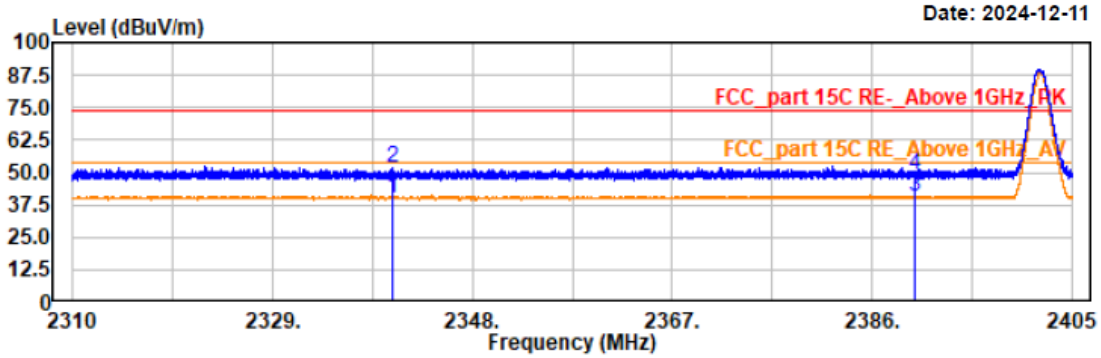


Trace: 1
Condition: PK RBW:1MHz VBW:3MHz SWT:auto
AV RBW:1MHz VBW:5kHz SWT:auto

Freq MHz	Reading dBuV	Factor dB/m	Result dBuV/m	Limit dBuV/m	Margin dB	Polarity	Remark
2334.13	34.94	5.12	40.06	54.00	13.94	horizontal	Average
2334.13	46.82	5.12	51.94	74.00	22.06	horizontal	Peak
2390.00	34.81	5.37	40.18	54.00	13.82	horizontal	Average
2390.00	42.51	5.37	47.88	74.00	26.12	horizontal	Peak

Project No.: 2407T76694E-RF
Test Mode: 1DH1-2402
EUT Model: PH81
Test distance: 3m

Temp/Humi/ATM: 23.3℃/54%/100.3kPa
Tested by: Wlif Wu
Power Source: AC 120V/60Hz

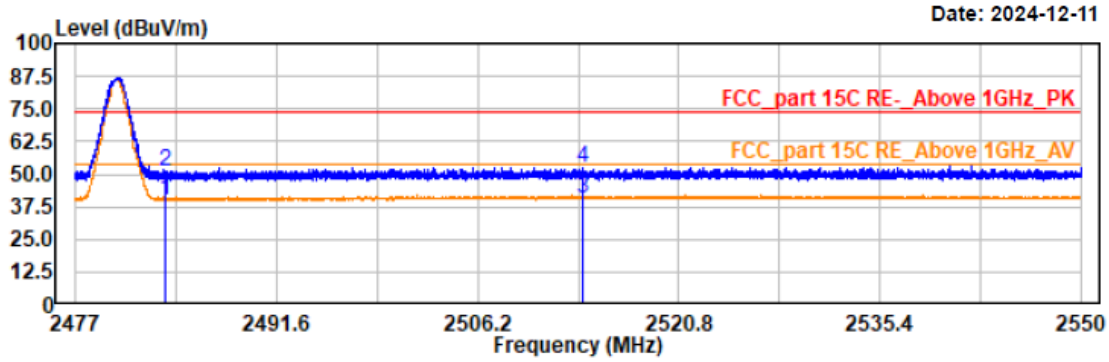


Trace: 1
Condition: PK RBW:1MHz VBW:3MHz SWT:auto
AV RBW:1MHz VBW:5kHz SWT:auto

Freq	Reading	Factor	Result	Limit	Margin	Polarity	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		
2340.49	34.64	5.14	39.78	54.00	14.22	vertical	Average
2340.49	46.45	5.14	51.59	74.00	22.41	vertical	Peak
2390.00	35.17	5.37	40.54	54.00	13.46	vertical	Average
2390.00	43.35	5.37	48.72	74.00	25.28	vertical	Peak

Project No.: 2407T76694E-RF
Test Mode: 1DH1-2480
EUT Model: PH81
Test distance: 3m

Temp/Humi/ATM: 23.3℃/54%/100.3kPa
Tested by: Wlif Wu
Power Source: AC 120V/60Hz

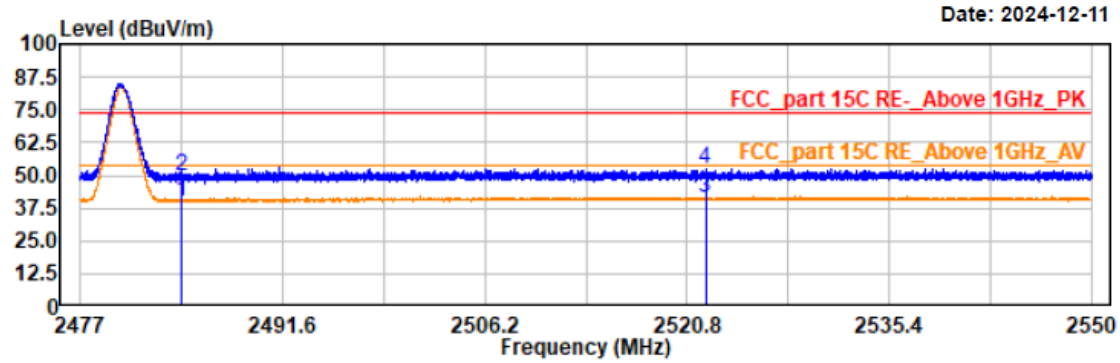


Trace: 1
Condition: PK RBW:1MHz VBW:3MHz SWT:auto
AV RBW:1MHz VBW:5kHz SWT:auto

Freq MHz	Reading dBuV	Factor dB/m	Result dBuV/m	Limit dBuV/m	Margin dB	Polarity	Remark
2483.50	34.34	5.83	40.17	54.00	13.83	horizontal	Average
2483.50	45.07	5.83	50.90	74.00	23.10	horizontal	Peak
2513.84	34.70	5.93	40.63	54.00	13.37	horizontal	Average
2513.84	46.42	5.93	52.35	74.00	21.65	horizontal	Peak

Project No.: 2407T76694E-RF
Test Mode: 1DH1-2480
EUT Model: PH81
Test distance: 3m

Temp/Humi/ATM: 23.3℃/54%/100.3kPa
Tested by: Wlif Wu
Power Source: AC 120V/60Hz

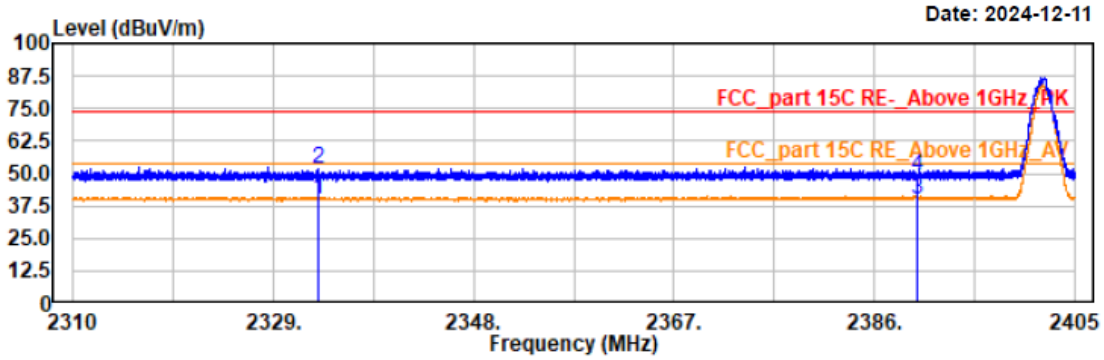


Trace: 1
Condition: PK RBW:1MHz VBW:3MHz SWT:auto
AV RBW:1MHz VBW:5kHz SWT:auto

Freq MHz	Reading dBuV	Factor dB/m	Result dBuV/m	Limit dBuV/m	Margin dB	Polarity	Remark
2484.30	34.22	5.84	40.06	54.00	13.94	vertical	Average
2484.30	43.61	5.84	49.45	74.00	24.55	vertical	Peak
2522.13	35.10	5.94	41.04	54.00	12.96	vertical	Average
2522.13	46.50	5.94	52.44	74.00	21.56	vertical	Peak

Project No.: 2407T76694E-RF
Test Mode: 2DH1-2402
EUT Model: PH81
Test distance: 3m

Temp/Humi/ATM: 23.3℃/54%/100.3kPa
Tested by: Wlif Wu
Power Source: AC 120V/60Hz

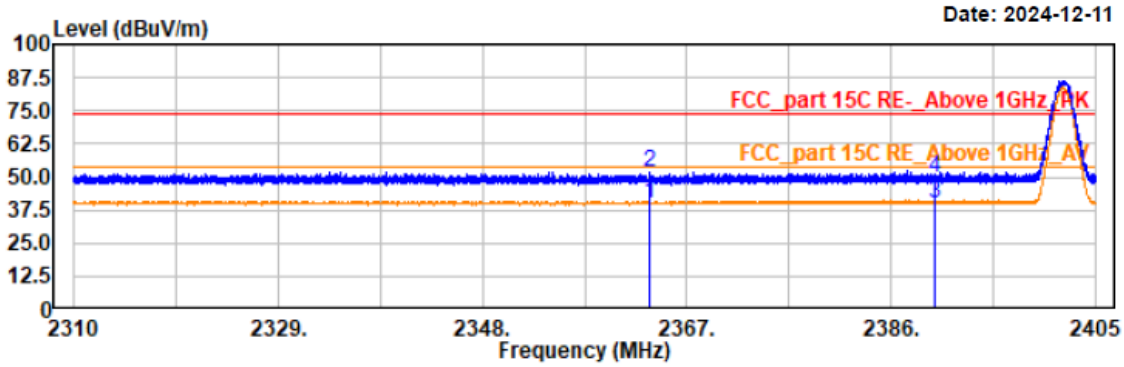


Trace: 1
Condition: PK RBW:1MHz VBW:3MHz SWT:auto
AV RBW:1MHz VBW:5kHz SWT:auto

Freq	Reading	Factor	Result	Limit	Margin	Polarity	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		
2333.32	35.11	5.12	40.23	54.00	13.77	horizontal	Average
2333.32	46.78	5.12	51.90	74.00	22.10	horizontal	Peak
2390.00	34.92	5.37	40.29	54.00	13.71	horizontal	Average
2390.00	43.78	5.37	49.15	74.00	24.85	horizontal	Peak

Project No.: 2407T76694E-RF
Test Mode: 2DH1-2402
EUT Model: PH81
Test distance: 3m

Temp/Humi/ATM: 23.3℃/54%/100.3kPa
Tested by: Wlif Wu
Power Source: AC 120V/60Hz

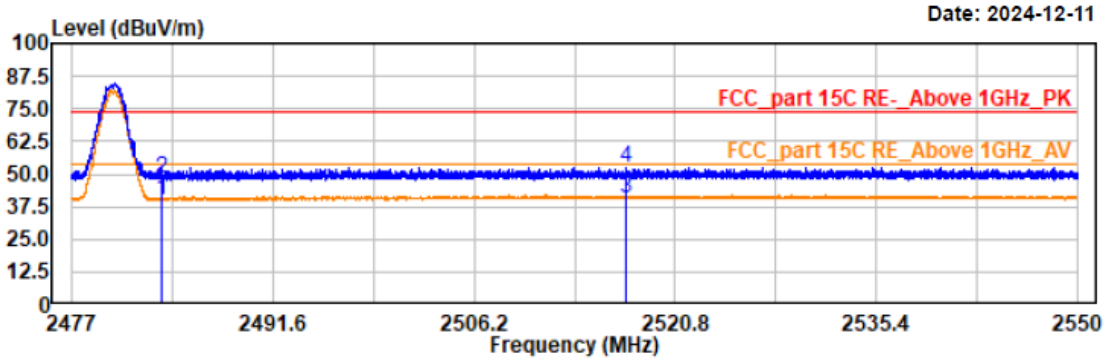


Trace: 1
Condition: PK RBW:1MHz VBW:3MHz SWT:auto
AV RBW:1MHz VBW:5kHz SWT:auto

Freq MHz	Reading dBuV	Factor dB/m	Result dBuV/m	Limit dBuV/m	Margin dB	Polarity	Remark
2363.48	34.79	5.23	40.02	54.00	13.98	vertical	Average
2363.48	46.38	5.23	51.61	74.00	22.39	vertical	Peak
2390.00	34.73	5.37	40.10	54.00	13.90	vertical	Average
2390.00	44.17	5.37	49.54	74.00	24.46	vertical	Peak

Project No.: 2407T76694E-RF
Test Mode: 2DH1-2480
EUT Model: PH81
Test distance: 3m

Temp/Humi/ATM: 23.3℃/54%/100.3kPa
Tested by: Wlif Wu
Power Source: AC 120V/60Hz

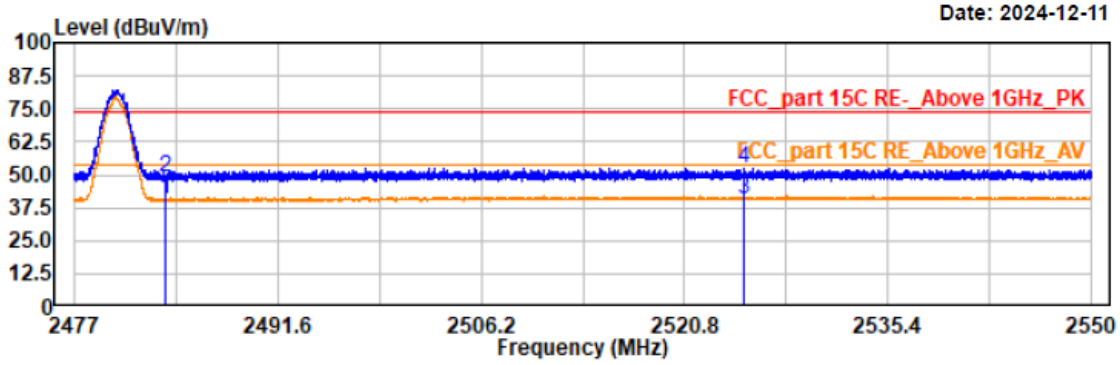


Trace: 1
Condition: PK RBW:1MHz VBW:3MHz SWT:auto
AV RBW:1MHz VBW:5kHz SWT:auto

Freq	Reading	Factor	Result	Limit	Margin	Polarity	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		
2483.50	34.30	5.83	40.13	54.00	13.87	horizontal	Average
2483.50	42.74	5.83	48.57	74.00	25.43	horizontal	Peak
2517.22	35.04	5.93	40.97	54.00	13.03	horizontal	Average
2517.22	46.64	5.93	52.57	74.00	21.43	horizontal	Peak

Project No.: 2407T76694E-RF
Test Mode: 2DH1-2480
EUT Model: PH81
Test distance: 3m

Temp/Humi/ATM: 23.3℃/54%/100.3kPa
Tested by: Wlif Wu
Power Source: AC 120V/60Hz

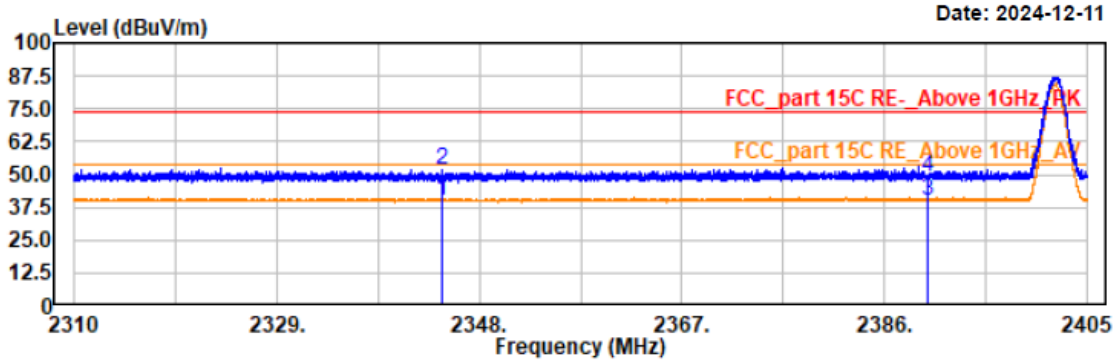


Trace: 1
Condition: PK RBW:1MHz VBW:3MHz SWT:auto
AV RBW:1MHz VBW:5kHz SWT:auto

Freq	Reading	Factor	Result	Limit	Margin	Polarity	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		
2483.50	34.53	5.83	40.36	54.00	13.64	vertical	Average
2483.50	43.40	5.83	49.23	74.00	24.77	vertical	Peak
2525.09	35.07	5.94	41.01	54.00	12.99	vertical	Average
2525.09	46.59	5.94	52.53	74.00	21.47	vertical	Peak

Project No.: 2407T76694E-RF
Test Mode: 3DH1-2402
EUT Model: PH81
Test distance: 3m

Temp/Humi/ATM: 23.3℃/54%/100.3kPa
Tested by: Wlif Wu
Power Source: AC 120V/60Hz

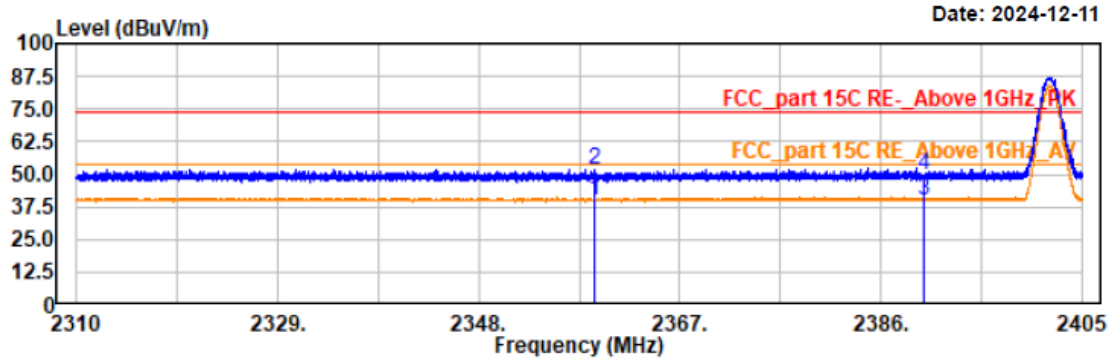


Trace: 1
Condition: PK RBW:1MHz VBW:3MHz SWT:auto
AV RBW:1MHz VBW:5kHz SWT:auto

Freq MHz	Reading dBuV	Factor dB/m	Result dBuV/m	Limit dBuV/m	Margin dB	Polarity	Remark
2344.53	35.10	5.15	40.25	54.00	13.75	horizontal	Average
2344.53	46.33	5.15	51.48	74.00	22.52	horizontal	Peak
2390.00	34.85	5.37	40.22	54.00	13.78	horizontal	Average
2390.00	43.80	5.37	49.17	74.00	24.83	horizontal	Peak

Project No.: 2407T76694E-RF
Test Mode: 3DH1-2402
EUT Model: PH81
Test distance: 3m

Temp/Humi/ATM: 23.3℃/54%/100.3kPa
Tested by: Wlif Wu
Power Source: AC 120V/60Hz

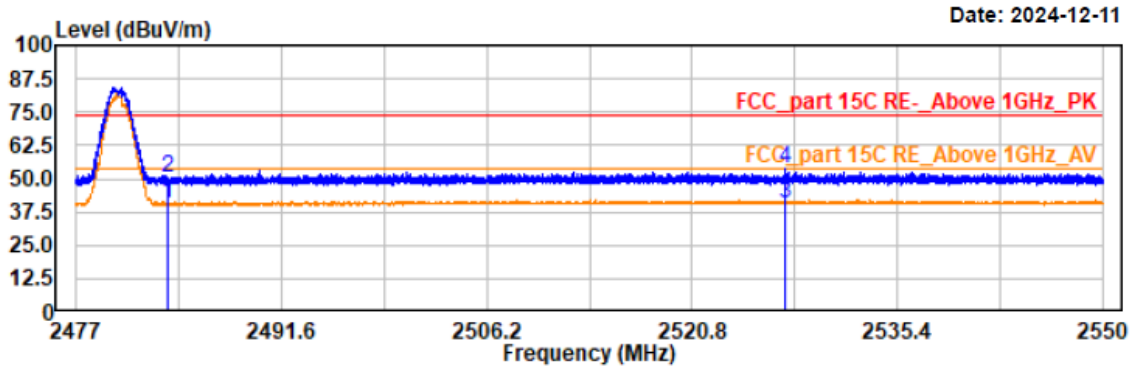


Trace: 1
Condition: PK RBW:1MHz VBW:3MHz SWT:auto
AV RBW:1MHz VBW:5kHz SWT:auto

Freq MHz	Reading dBuV	Factor dB/m	Result dBuV/m	Limit dBuV/m	Margin dB	Polarity	Remark
2358.87	34.55	5.21	39.76	54.00	14.24	vertical	Average
2358.87	46.45	5.21	51.66	74.00	22.34	vertical	Peak
2390.00	34.88	5.37	40.25	54.00	13.75	vertical	Average
2390.00	44.08	5.37	49.45	74.00	24.55	vertical	Peak

Project No.: 2407T76694E-RF
Test Mode: 3DH1-2480
EUT Model: PH81
Test distance: 3m

Temp/Humi/ATM: 23.3℃/54%/100.3kPa
Tested by: Wlif Wu
Power Source: AC 120V/60Hz

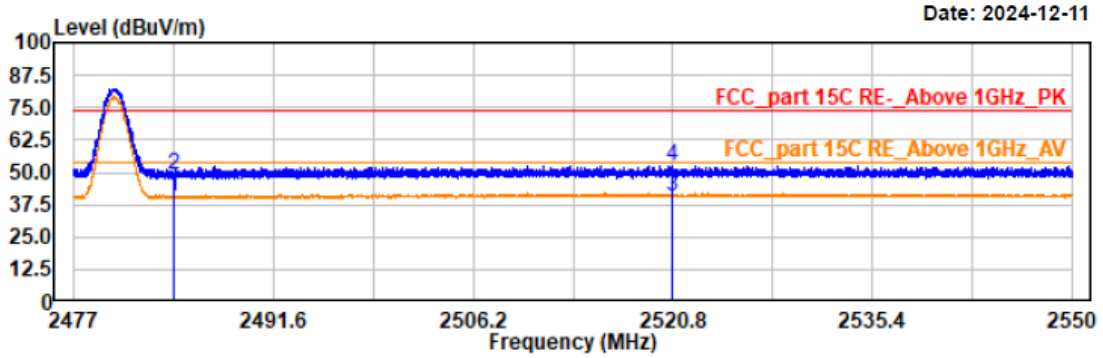


Trace: 1
Condition: PK RBW:1MHz VBW:3MHz SWT:auto
AV RBW:1MHz VBW:5kHz SWT:auto

Freq MHz	Reading dBuV	Factor dB/m	Result dBuV/m	Limit dBuV/m	Margin dB	Polarity	Remark
2483.50	34.61	5.83	40.44	54.00	13.56	horizontal	Average
2483.50	44.17	5.83	50.00	74.00	24.00	horizontal	Peak
2527.38	34.65	5.94	40.59	54.00	13.41	horizontal	Average
2527.38	47.67	5.94	53.61	74.00	20.39	horizontal	Peak

Project No.: 2407T76694E-RF
Test Mode: 3DH1-2480
EUT Model: PH81
Test distance: 3m

Temp/Humi/ATM: 23.3℃/54%/100.3kPa
Tested by: Wlif Wu
Power Source: AC 120V/60Hz



Trace: 1
Condition: PK RBW:1MHz VBW:3MHz SWT:auto
AV RBW:1MHz VBW:5kHz SWT:auto

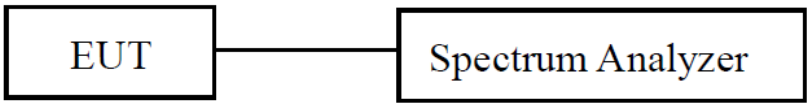
Freq	Reading	Factor	Result	Limit	Margin	Polarity	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		
2484.30	34.69	5.84	40.53	54.00	13.47	vertical	Average
2484.30	43.16	5.84	49.00	74.00	25.00	vertical	Peak
2520.76	35.06	5.94	41.00	54.00	13.00	vertical	Average
2520.76	46.52	5.94	52.46	74.00	21.54	vertical	Peak

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

Applicable Standard

Frequency hopping systems shall have hoping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater provided the systems operate with an output power no greater than 125 mW.

EUT Setup



Test Procedure

According to ANSI C63.10-2013 Section 7.8.2

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

a. Span: Wide enough to capture the peaks of two adjacent channels.
b. RBW: Start with the RBW set to approximately 30% of the channel spacing; adjust as necessary to best identify the center of each individual channel.
c. Video (or average) bandwidth (VBW) ≥ RBW.
d. Sweep: Auto.
e. Detector function: Peak.
f. Trace: Max hold.
g. Allow the trace to stabilize.

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

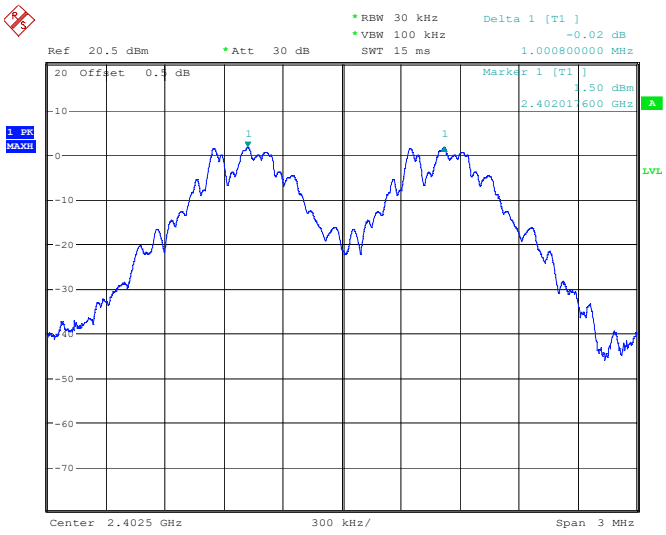
Test Data

Test Mode:	Transmitting	Test Engineer:	Stein Peng
Test Date:	2024-05-22	Environment:	Temp.: 24.2℃ Humi.: 56% Atm:101.1kPa

Mode	Channel	Frequency (MHz)	Channel Separation (MHz)	Limit (MHz)	Result
BDR (GFSK)	Low	2402	1.001	0.869	Pass
	Middle	2441	1.001	0.871	Pass
	High	2480	1.003	0.867	Pass

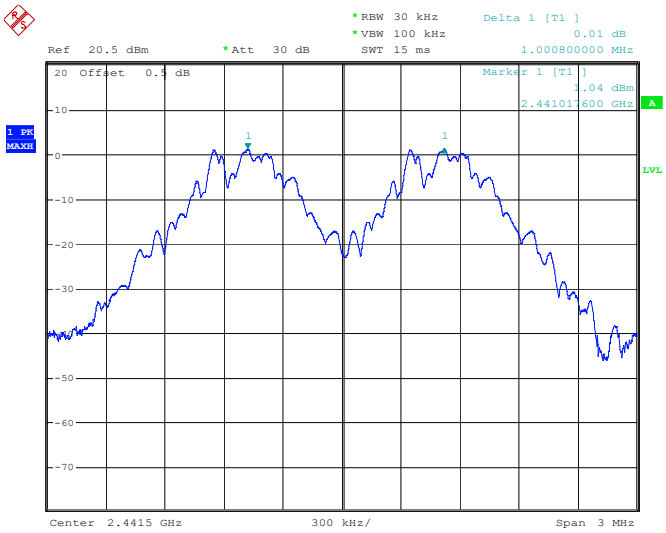
Note:
1. Limit = 20 dB bandwidth*2/3
2. Only BDR(GFSK) mode result is reported since EDR(π/4-DQPSK, 8DPSK) has the same channel plan.

BDR (GFSK): Low Channel



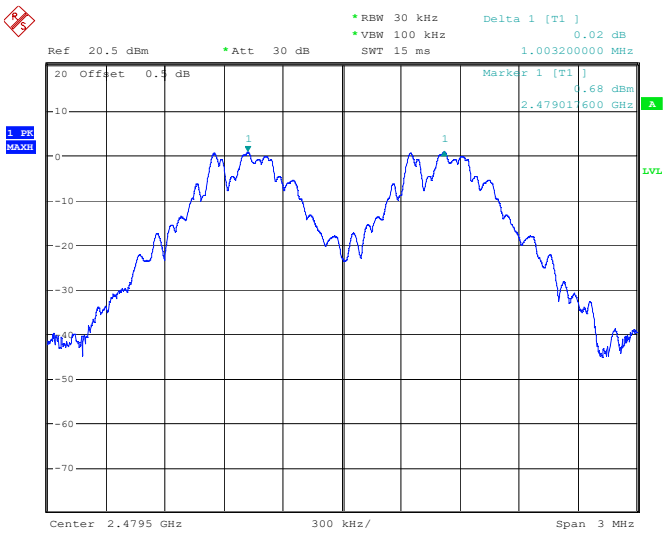
ProjectNo.:2407T76694E-RF Tester:Stein Peng
Date: 22.MAY.2024 11:31:43

BDR (GFSK): Middle Channel



ProjectNo.:2407T76694E-RF Tester:Stein Peng
Date: 22.MAY.2024 11:33:38

BDR (GFSK): High Channel



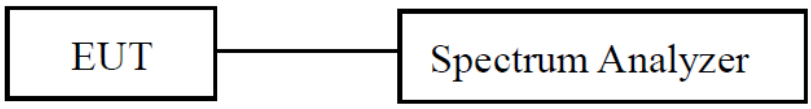
ProjectNo.:2407T76694E-RF Tester:Stein Peng
Date: 22.MAY.2024 11:35:39

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

Applicable Standard

Alternatively, frequency hopping systems operating in the 2400–2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

EUT Setup



Test Procedure

According to ANSI C63.10-2013 Section 6.9.2

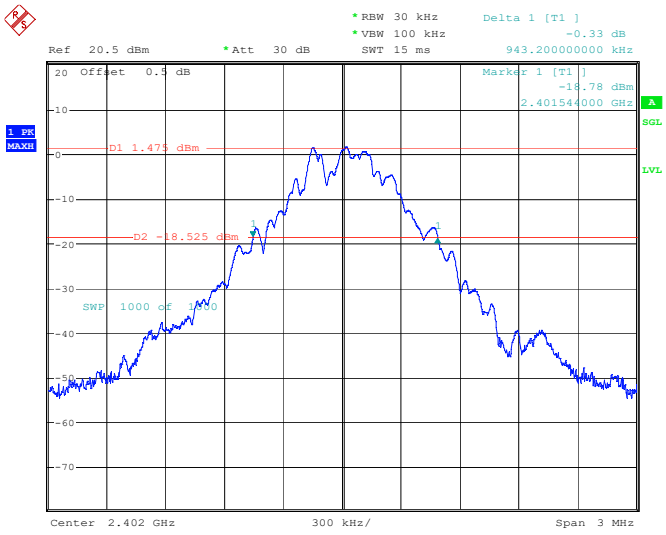
a) The spectrum analyzer center frequency is set to the nominal EUT channel center frequency. The span range for the EMI receiver or spectrum analyzer shall be between two times and five times the OBW.
b) The nominal IF filter bandwidth (3 dB RBW) shall be in the range of 1% to 5% of the OBW and video bandwidth (VBW) shall be approximately three times RBW, unless otherwise specified by the applicable requirement.
c) Set the reference level of the instrument as required, keeping the signal from exceeding the maximum input mixer level for linear operation. In general, the peak of the spectral envelope shall be more than [10 log (OBW/RBW)] below the reference level. Specific guidance is given in 4.1.5.2
d) Steps a) through c) might require iteration to adjust within the specified tolerances.
e) The dynamic range of the instrument at the selected RBW shall be more than 10 dB below the target "−xx dB down" requirement; that is, if the requirement calls for measuring the −20 dB OBW, the instrument noise floor at the selected RBW shall be at least 30 dB below the reference value.
f) Set detection mode to peak and trace mode to max hold.
g) Determine the reference value: Set the EUT to transmit an unmodulated carrier or modulated signal, as applicable. Allow the trace to stabilize. Set the spectrum analyzer marker to the highest level of the displayed trace (this is the reference value).
h) Determine the "−xx dB down amplitude" using [(reference value) − xx]. Alternatively, this calculation may be made by using the marker-delta function of the instrument.
i) If the reference value is determined by an unmodulated carrier, then turn the EUT modulation ON, and either clear the existing trace or start a new trace on the spectrum analyzer and allow the new trace to stabilize. Otherwise, the trace from step g) shall be used for step j).

Test Data

Test Mode:	Transmitting	Test Engineer:	Stein Peng
Test Date:	2024-05-22	Environment:	Temp.: 24.2℃ Humi.: 56% Atm :101.1kPa
Mode	**Channel**	**Frequency (MHz)**	**20 dB Emission Bandwidth (MHz)**
BDR (GFSK)	Low	2402	0.943
	Middle	2441	0.941
	High	2480	0.938
EDR (π/4-DQPSK)	Low	2402	1.303
	Middle	2441	1.306
	High	2480	1.301
EDR (8DPSK)	Low	2402	1.282
	Middle	2441	1.279
	High	2480	1.279

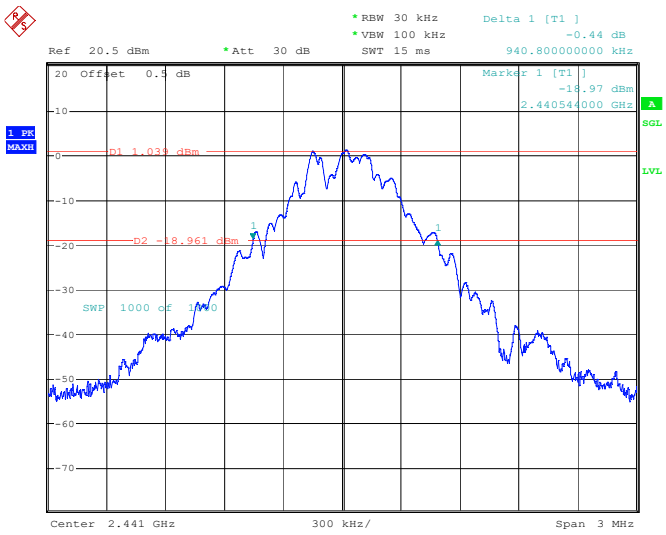
Please refer to below plots:

BDR (GFSK): Low Channel



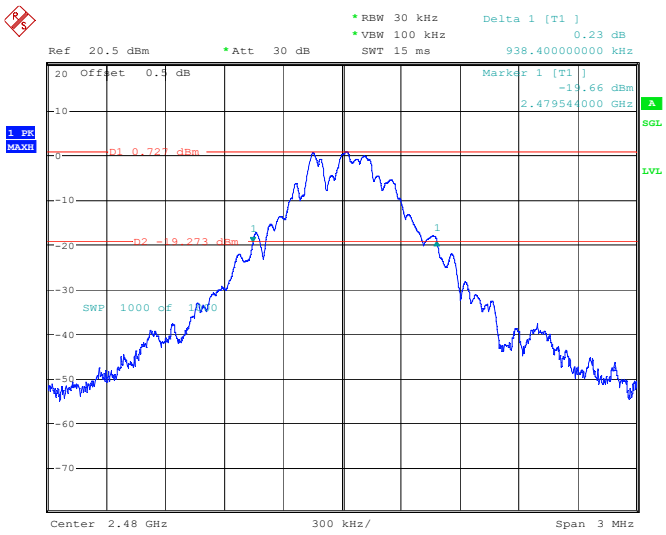
ProjectNo.:2407T76694E-RF Tester:Stein Peng
Date: 22.MAY.2024 09:42:53

BDR (GFSK): Middle Channel



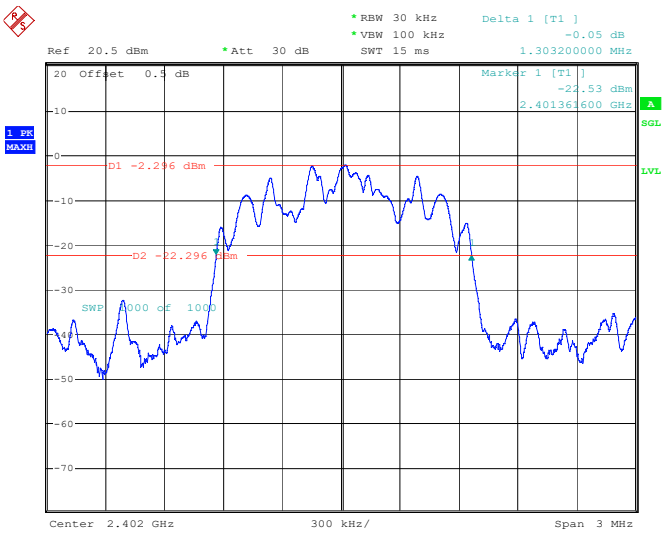
ProjectNo.:2407T76694E-RF Tester:Stein Peng
Date: 22.MAY.2024 09:46:42

BDR (GFSK): High Channel



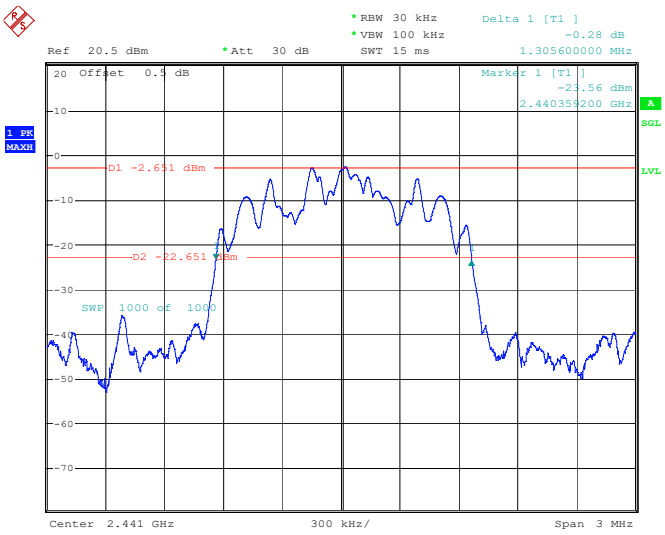
ProjectNo.:2407T76694E-RF Tester:Stein Peng
Date: 22.MAY.2024 09:48:42

EDR (π/4-DQPSK): Low Channel



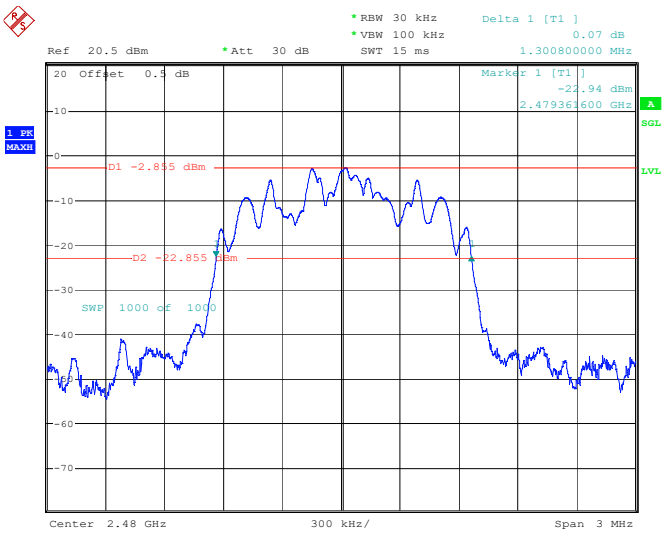
ProjectNo.:2407T76694E-RF Tester:Stein Peng
Date: 22.MAY.2024 09:58:53

EDR(π/4-DQPSK): Middle Channel



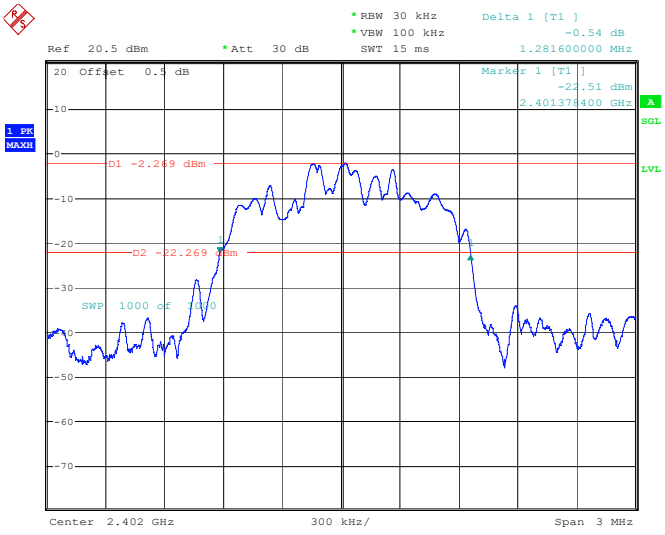
ProjectNo.:2407T76694E-RF Tester:Stein Peng
Date: 22.MAY.2024 10:00:56

EDR (π/4-DQPSK): High Channel



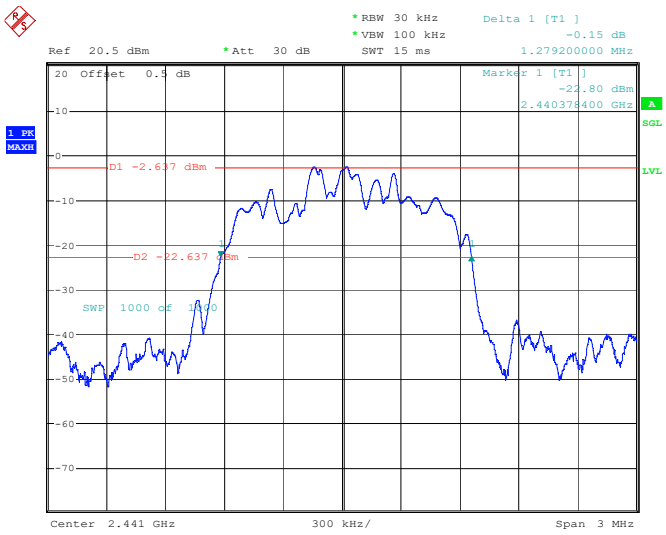
ProjectNo.:2407T76694E-RF Tester:Stein Peng
Date: 22.MAY.2024 10:02:50

EDR (8DPSK): Low Channel



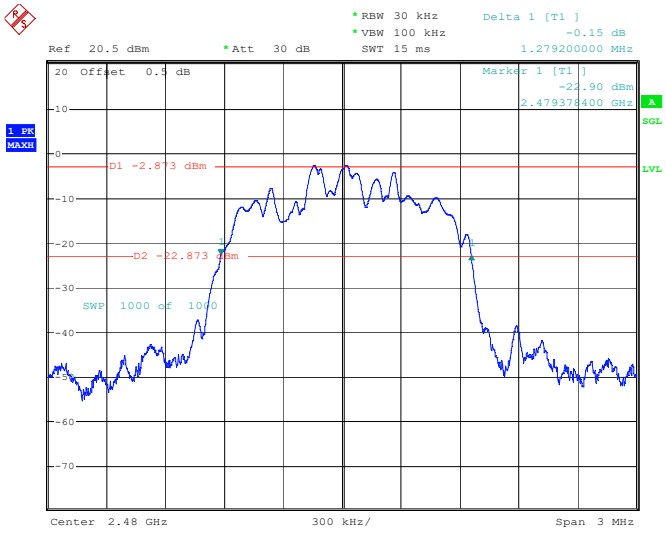
ProjectNo.:2407T76694E-RF Tester:Stein Peng
Date: 22.MAY.2024 10:04:50

EDR (8DPSK): Middle Channel



ProjectNo.:2407T76694E-RF Tester:Stein Peng
Date: 22.MAY.2024 10:06:43

EDR (8DPSK): High Channel



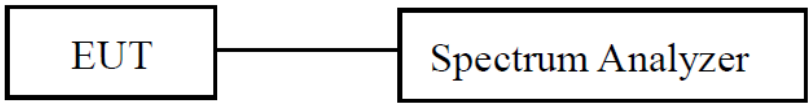
ProjectNo.:2407T76694E-RF Tester:Stein Peng
Date: 22.MAY.2024 10:08:36

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

Applicable Standard

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

EUT Setup



Test Procedure

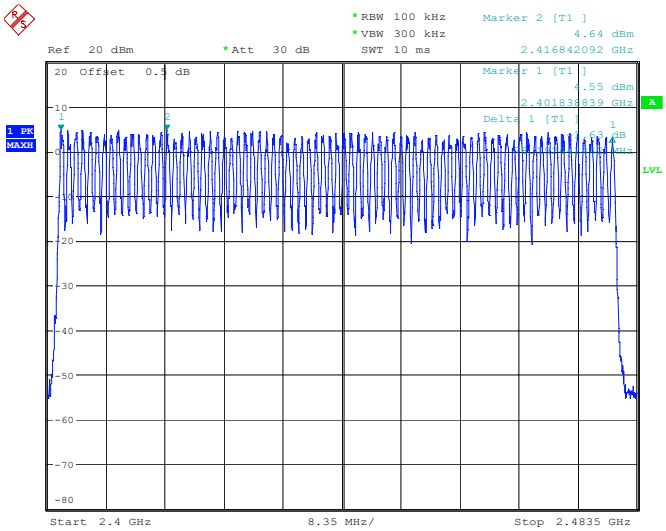
According to ANSI C63.10-2013 Section 7.8.3

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 ⩾ 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. Compliance of an EUT with the appropriate regulatory limit shall be determined for the number of hopping channels. A plot of the data shall be included in the test report.

Test Data

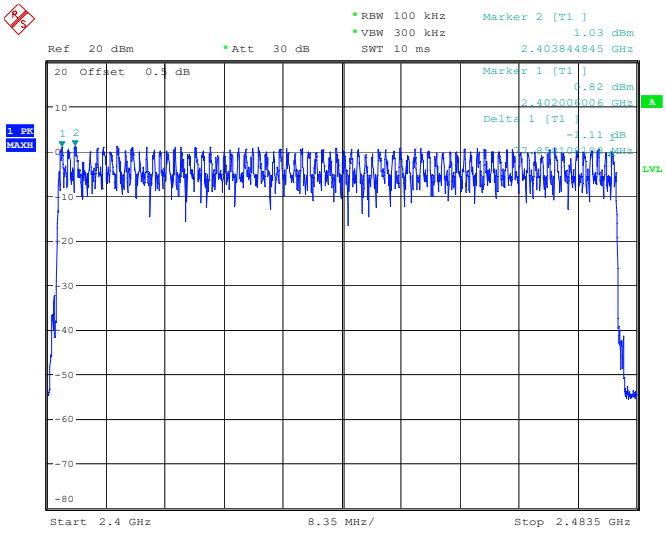
Test Mode:	Transmitting	Test Engineer:	Stein Peng
Test Date:	2024-05-22	Environment:	Temp.: 24.2℃ Humi.: 56% Atm :101.1kPa
Mode	**Frequency Range (MHz)**	**Number of Hopping Channel (CH)**	**Limit (CH)**
BDR (GFSK)	2400-2483.5	79	≥15
EDR (π/4-DQPSK)	2400-2483.5	79	≥15
EDR (8DPSK)	2400-2483.5	79	≥15

BDR (GFSK): Number of Hopping Channels



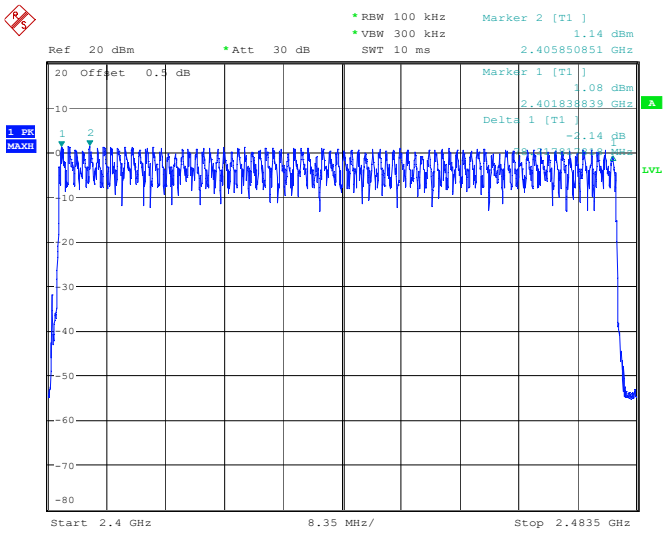
ProjectNo.:2407T76694E-RF Tester:Stein Peng
Date: 22.MAY.2024 11:14:09

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



ProjectNo.:2407T76694E-RF Tester:Stein Peng
Date: 22.MAY.2024 11:18:32

EDR (8DPSK): Number of Hopping Channels



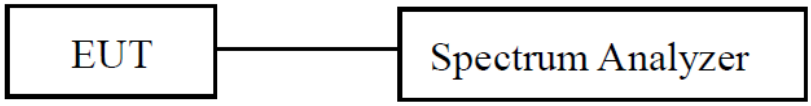
ProjectNo.:2407T76694E-RF Tester:Stein Peng
Date: 22.MAY.2024 11:24:54

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

Applicable Standard

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

EUT Setup



Test Procedure

According to ANSI C63.10-2013 Section 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 ≤ 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.
Use the marker-delta function to determine the transmit time per hop. If this value varies with different modes of operation (data rate, modulation format, number of hopping channels, etc.), then repeat this test for each variation in transmit time.
Repeat the measurement using a longer sweep time to determine the number of hops over the period specified in the requirements. The sweep time shall be equal to, or less than, the period specified in the requirements. Determine the number of hops over the sweep time and calculate the total number of hops in the period specified in the requirements, using the following equation:
(Number of hops in the period specified in the requirements) = (number of hops on spectrum analyzer) × (period specified in the requirements / analyzer sweep time)
The average time of occupancy is calculated from the transmit time per hop multiplied by the number of hops in the period specified in the requirements. If the number of hops in a specific time varies with different modes of operation (data rate, modulation format, number of hopping channels, etc.), then repeat this test for each variation.
The measured transmit time and time between hops shall be consistent with the values described in the operational description for the EUT.

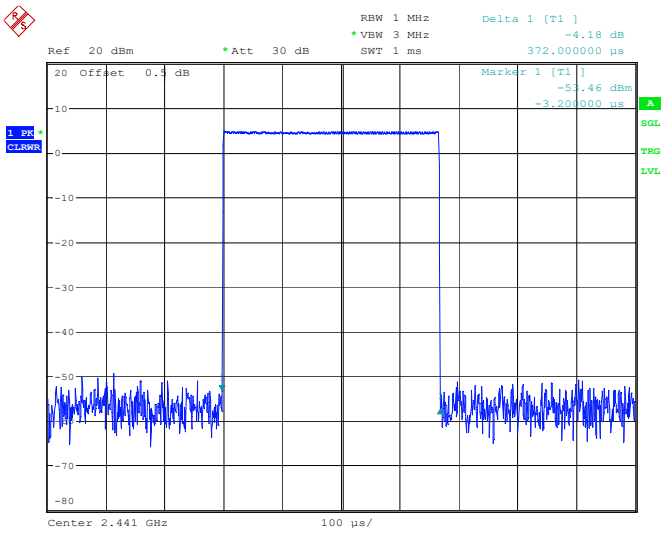
Test Data

Test Mode:	Transmitting	Test Engineer:	Stein Peng
Test Date:	2024-05-22	Environment:	Temp.: 24.2℃ Humi.: 56% Atm :101.1kPa

Mode		Channel	Pulse Width (ms)	Dwell Time (s)	Limit (s)	Result
BDR (GFSK)	DH1	Hopping	0.372	0.119	0.400	Pass
	DH3	Hopping	1.634	0.261	0.400	Pass
	DH5	Hopping	2.892	0.308	0.400	Pass
EDR (π/4-DQPSK)	2DH1	Hopping	0.382	0.122	0.400	Pass
	2DH3	Hopping	1.639	0.262	0.400	Pass
	2DH5	Hopping	2.900	0.309	0.400	Pass
EDR (8DPSK)	3DH1	Hopping	0.382	0.122	0.400	Pass
	3DH3	Hopping	1.639	0.262	0.400	Pass
	3DH5	Hopping	2.900	0.309	0.400	Pass

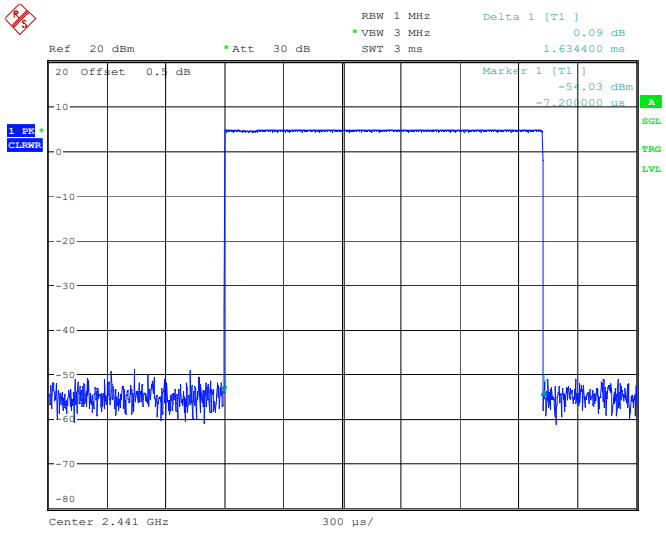
Note:
DH1, 2DH1, 3DH1:Dwell time=Pulse time (ms) × (1600/2/79) ×31.6 s
DH3, 2DH3, 3DH3:Dwell time=Pulse time (ms) × (1600/4/79) ×31.6 s
DH5, 2DH5, 3DH5:Dwell time=Pulse time (ms) × (1600/6/79) ×31.6 s

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



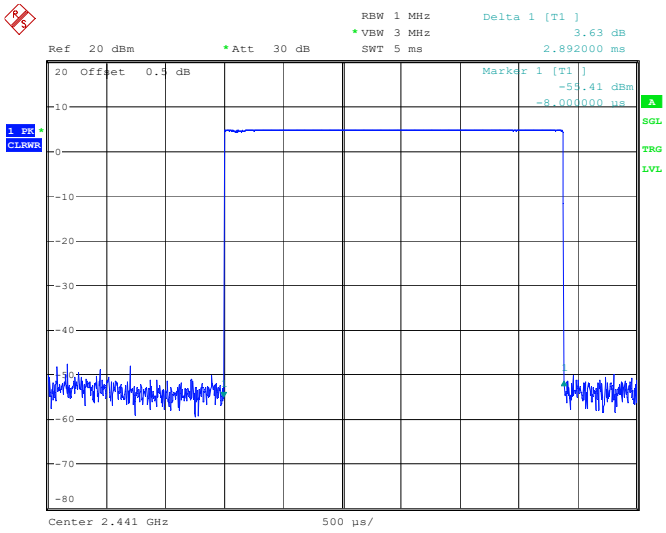
ProjectNo.:2407T76694E-RF Tester:Stein Peng
Date: 22.MAY.2024 10:43:50

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



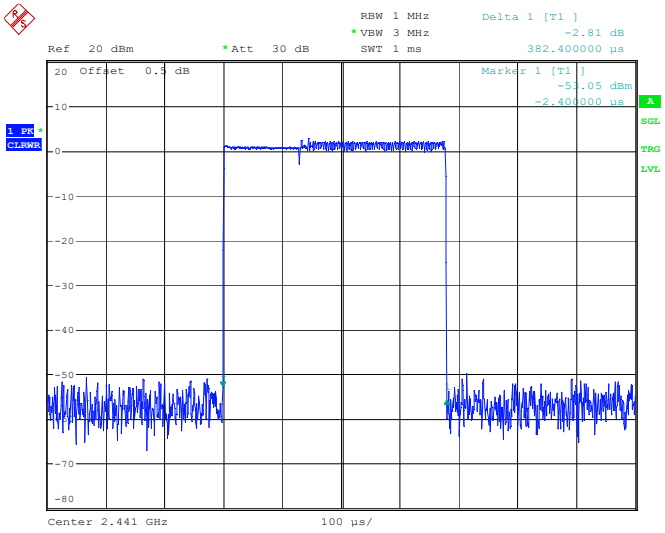
ProjectNo.:2407T76694E-RF Tester:Stein Peng
Date: 22.MAY.2024 10:48:55

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



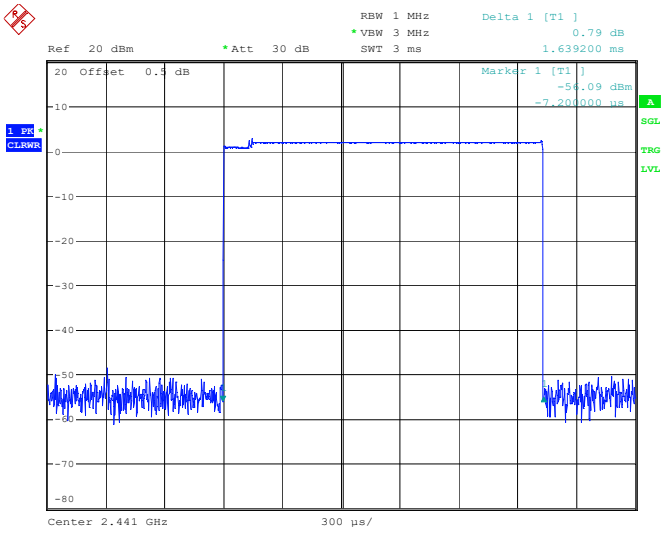
ProjectNo.:2407T76694E-RF Tester:Stein Peng
Date: 22.MAY.2024 10:46:04

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



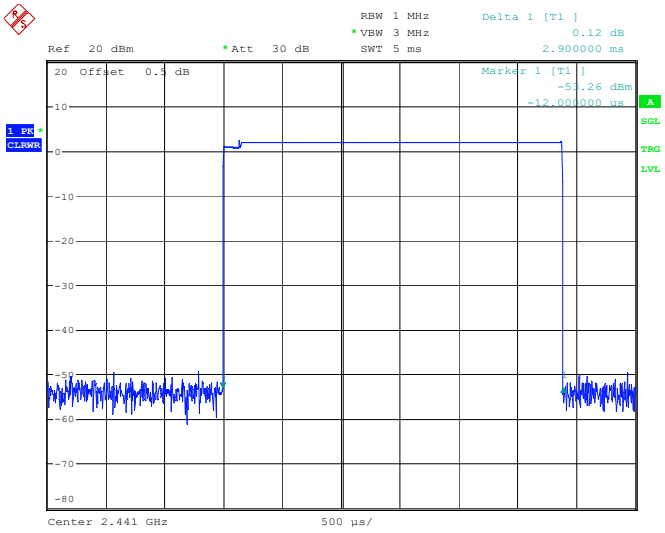
ProjectNo.:2407T76694E-RF Tester:Stein Peng
Date: 22.MAY.2024 10:49:35

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



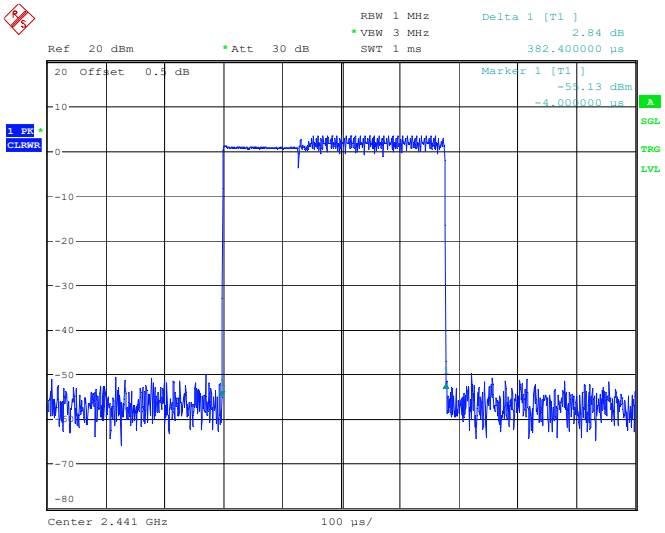
ProjectNo.:2407T76694E-RF Tester:Stein Peng
Date: 22.MAY.2024 10:50:20

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



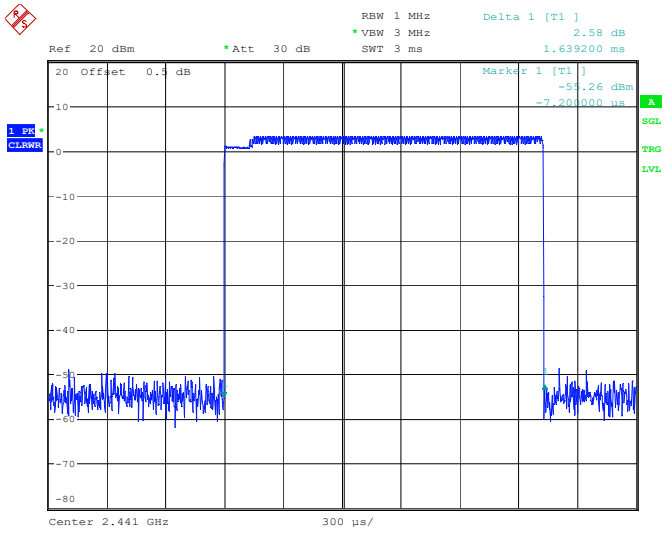
ProjectNo.:2407T76694E-RF Tester:Stein Peng
Date: 22.MAY.2024 10:51:08

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



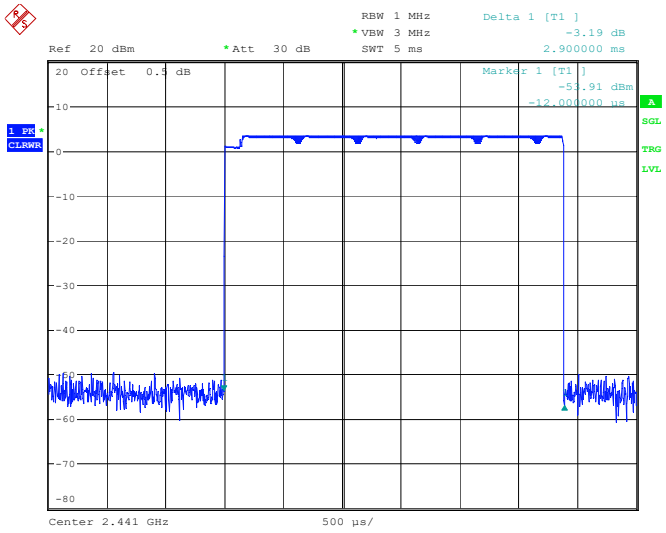
ProjectNo.:2407T76694E-RF Tester:Stein Peng
Date: 22.MAY.2024 10:51:52

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



ProjectNo.:2407T76694E-RF Tester:Stein Peng
Date: 22.MAY.2024 10:52:32

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



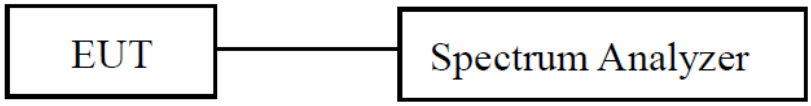
ProjectNo.:2407T76694E-RF Tester:Stein Peng
Date: 22.MAY.2024 10:53:10

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

Applicable Standard

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

EUT Setup



Test Procedure

According to ANSI C63.10-2013 Section 7.8.5

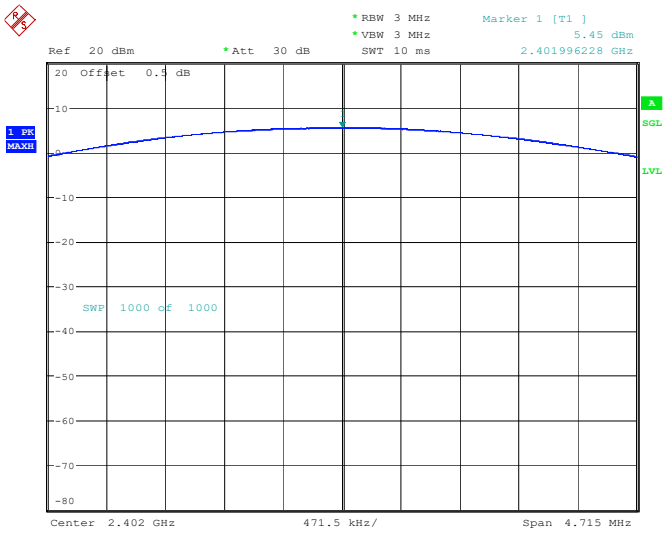
This is an RF-conducted test to evaluate maximum peak output power. Use a direct connection between the antenna port of the unlicensed wireless device and the spectrum analyzer, through suitable attenuation, Offset the Insertion loss of the RF cable, DC Block/ Attenuator into the spectrum analyzer.
The hopping shall be disabled for this test:
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.
NOTE—A peak responding power meter may be used, where the power meter and sensor system video bandwidth is greater than the occupied bandwidth of the unlicensed wireless device, rather than a spectrum analyzer.

Test Data

Test Mode:	Transmitting	Test Engineer:	Stein Peng
Test Date:	2024-05-22	Environment:	Temp.: 24.2℃ Humi.: 56% Atm :101.1kPa
Mode	**Frequency (MHz)**	**Peak Conducted Output Power (dBm)**	**Limit (dBm)**
BDR (GFSK)	2402	5.45	21
	2441	4.99	21
	2480	4.68	21
EDR (π/4-DQPSK)	2402	3.95	21
	2441	3.54	21
	2480	3.22	21
EDR (8DPSK)	2402	4.52	21
	2441	4.08	21
	2480	3.75	21

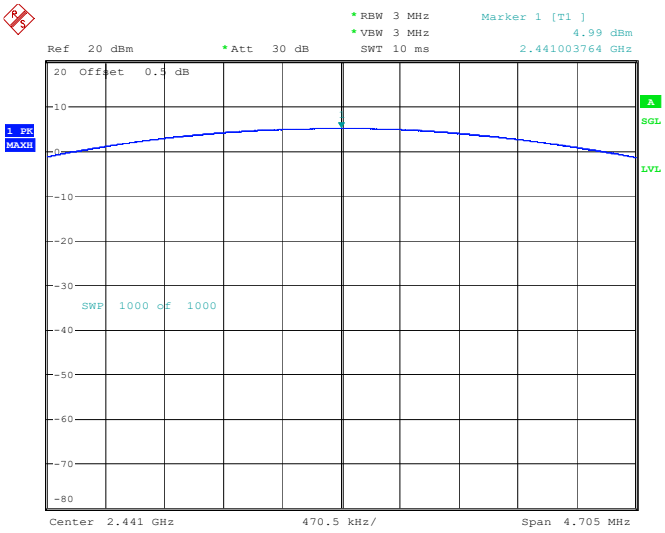
Please refet to below plots:

BDR (GFSK): 2402MHz



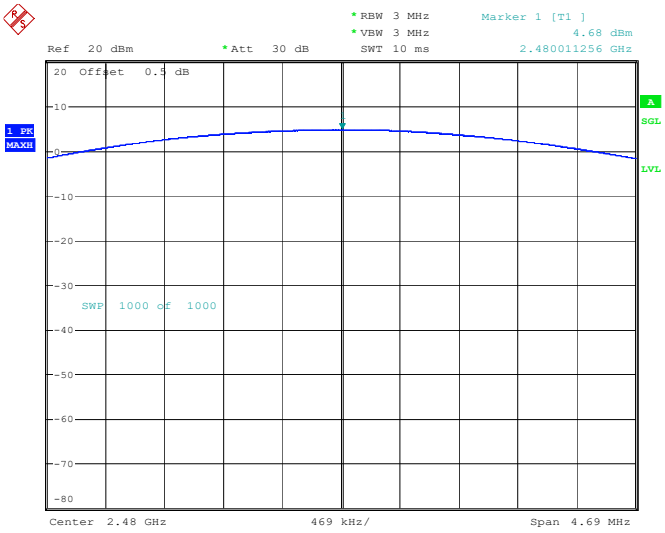
ProjectNo.:2407T76694E-RF Tester:Stein Peng
Date: 22.MAY.2024 09:45:32

BDR (GFSK): 2441MHz



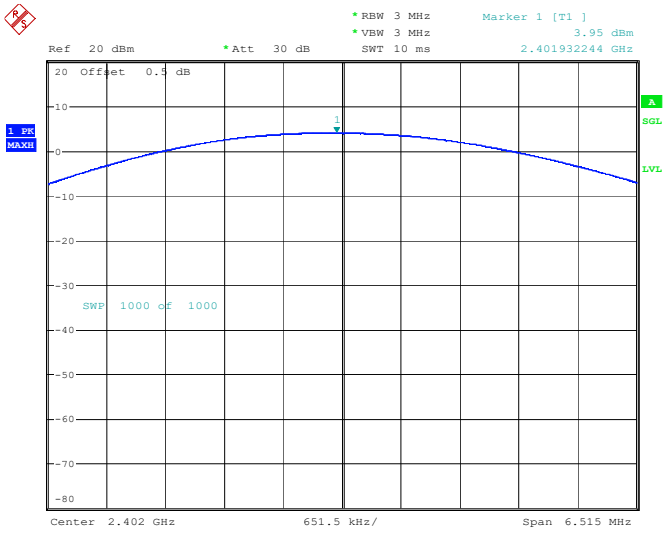
ProjectNo.:2407T76694E-RF Tester:Stein Peng
Date: 22.MAY.2024 09:47:30

BDR (GFSK): 2480MHz



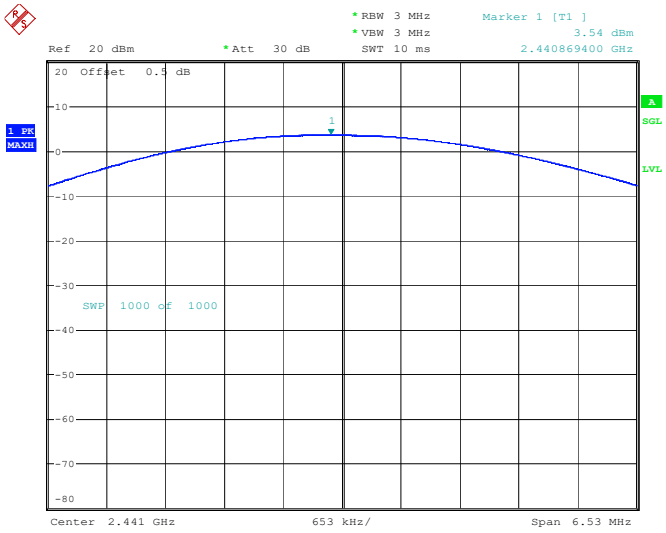
ProjectNo.:2407T76694E-RF Tester:Stein Peng
Date: 22.MAY.2024 09:52:03

EDR(π/4-DQPSK): 2402MHz



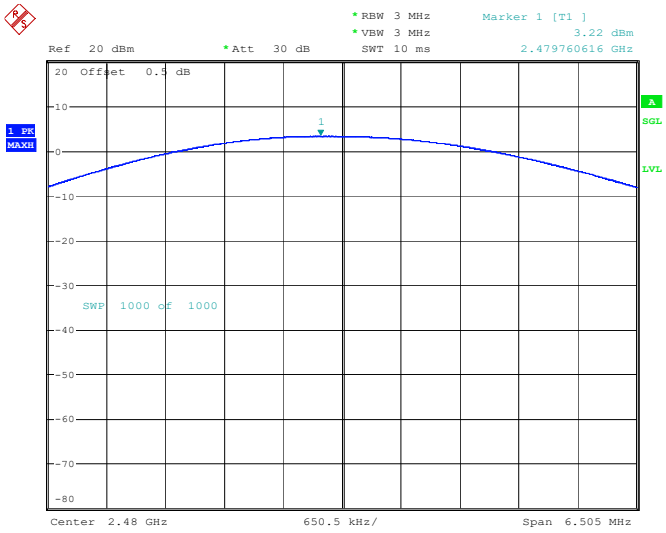
ProjectNo.:2407T76694E-RF Tester:Stein Peng
Date: 22.MAY.2024 09:59:46

EDR(π/4-DQPSK): 2441MHz



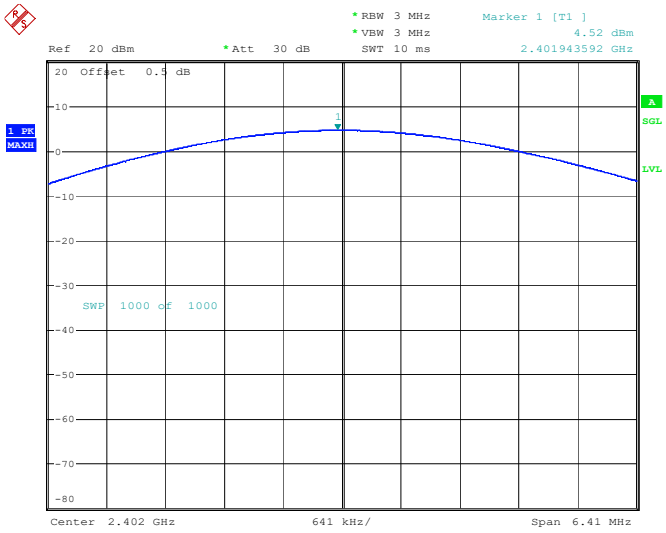
ProjectNo.:2407T76694E-RF Tester:Stein Peng
Date: 22.MAY.2024 10:01:45

EDR(π/4-DQPSK): 2480MHz



ProjectNo.:2407T76694E-RF Tester:Stein Peng
Date: 22.MAY.2024 10:03:37

EDR(8DPSK): 2402MHz



ProjectNo.:2407T76694E-RF Tester:Stein Peng
Date: 22.MAY.2024 10:05:39