TEST REPORT

Applicant Name:	Tritech Technology Limited
Address:	Unit D, 15th Floor, Chinabest International Centre No.8 Kwai On Road, Kwai Chung New Territories Hong Kong
Report Number:	2401A112064E-RF-00
FCC ID:	2AYEMBSZ-GK01OK

Test Standard (s)

FCC PART 15.247

Sample Description

Product Type:	Outdoor Keypad
Model No.:	BSZ-GK01OK
Multiple Model(s) No.:	N/A
Trade Mark:	N/A
Date Received:	2024/12/26
Issue Date:	2025/06/12

Test Result:	Pass▲

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

Prepared and Checked By:

Allen. Bai

Allen Bai
RF Engineer

Approved By:

Michelle Zeng

Michelle Zeng
RF Supervisor

Note: The information marked# is provided by the applicant, the laboratory is not responsible for its authenticity and this information can affect the validity of the result in the test report. Customer model name, addresses, names, trademarks etc. are included.
This report cannot be reproduced except in full, without prior written approval of the Company. Unless otherwise stated the results shown in this test report refer only to the sample(s) tested. This report is valid only with a valid digital signature. The digital signature may be available only under the Adobe software above version 7.0.
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.
This report may contain data that are not covered by the NVLAP accreditation and are marked with an asterisk "▼".

TABLE OF CONTENTS

DOCUMENT 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
- EQUIPMENT MODIFICATIONS 7
- EUT EXERCISE SOFTWARE 7
- SUPPORT EQUIPMENT LIST AND DETAILS 7
- EXTERNAL I/O CABLE 7
- BLOCK DIAGRAM OF TEST SETUP 8

SUMMARY OF TEST RESULTS **9**

TEST EQUIPMENT LIST **10**

FCC§15.247 (I), §1.1307 (B) (1) & §2.1093 - RF EXPOSURE **11**
- APPLICABLE STANDARD 11
- MEASUREMENT RESULT 11

FCC §15.203 - ANTENNA REQUIREMENT **12**
- APPLICABLE STANDARD 12
- ANTENNA CONNECTOR CONSTRUCTION 12

FCC §15.209, §15.205 & §15.247(D) - SPURIOUS EMISSIONS **13**
- APPLICABLE STANDARD 13
- EUT SETUP 13
- EMI TEST RECEIVER & SPECTRUM ANALYZER SETUP 14
- TEST PROCEDURE 15
- FACTOR & OVER LIMIT/MARGIN CALCULATION 15
- TEST DATA 16

FCC §15.247(A) (2) - 6 DB EMISSION BANDWIDTH **36**
- APPLICABLE STANDARD 36
- TEST PROCEDURE 36
- TEST DATA 37

FCC §15.247(B) (3) - MAXIMUM CONDUCTED OUTPUT POWER **39**
- APPLICABLE STANDARD 39
- TEST PROCEDURE 39
- TEST DATA 40

FCC §15.247(D) - 100 KHZ BANDWIDTH OF FREQUENCY BAND EDGE **42**
- APPLICABLE STANDARD 42
- TEST PROCEDURE 42
- TEST DATA 43

FCC §15.247(E) - POWER SPECTRAL DENSITY **44**
APPLICABLE STANDARD 44
TEST PROCEDURE 44
TEST DATA 45
C63.10 §11.6- DUTY CYCLE **47**
TEST PROCEDURE 47
TEST DATA 47
EUT PHOTOGRAPHS **49**
TEST SETUP PHOTOGRAPHS **50**

DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	2401A112064E-RF-00	Original Report	2025/06/12

GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

Product	Outdoor Keypad
Tested Model	BSZ-GK01OK
Multiple Model(s)	N/A
Frequency Range	2405-2480MHz
Maximum Conducted Peak Output Power	4.74 dBm
Modulation Technique	O-QPSK
Antenna Specification#	2.17dBi (provided by the applicant)
Voltage Range	DC 9V from battery
Sample serial number	2WFZ-2 for Radiated Emissions Test 2WFZ-1 for RF Conducted Test (Assigned by BACL, Shenzhen)
Sample/EUT Status	Good condition
Adapter Information	N/A

Objective

This test report is in accordance with Part 2-Subpart J, Part 15-Subparts A and C of the Federal Communication Commission's rules.

The tests were performed in order to determine compliance with FCC Part 15, Subpart C, and section 15.203, 15.205, 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 KDB 558074 D01 15.247 Meas Guidance v05r02.

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

Each test item follows test standards and with no deviation.

Measurement Uncertainty

Parameter		Uncertainty
Occupied Channel Bandwidth		109.2kHz(k=2, 95% level of confidence)
RF output power, conducted		0.86dB(k=2, 95% level of confidence)
Power Spectral Density		0.90dB(k=2, 95% level of confidence)
AC Power Lines Conducted Emissions	9kHz~150 kHz	3.63dB(k=2, 95% level of confidence)
	150 kHz ~30MHz	3.66dB(k=2, 95% level of confidence)
Radiated Emissions	0.009MHz~30MHz	3.60dB(k=2, 95% level of confidence)
	30MHz~200MHz (Horizontal)	5.32dB(k=2, 95% level of confidence)
	30MHz~200MHz (Vertical)	5.43dB(k=2, 95% level of confidence)
	200MHz~1000MHz (Horizontal)	5.77dB(k=2, 95% level of confidence)
	200MHz~1000MHz (Vertical)	5.73dB(k=2, 95% level of confidence)
	1GHz - 6GHz	5.34dB(k=2, 95% level of confidence)
	6GHz - 18GHz	5.40dB(k=2, 95% level of confidence)
	18GHz - 40GHz	5.64dB(k=2, 95% level of confidence)
Temperature		±1℃
Humidity		±1%
Supply voltages		±0.4%

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

Test Facility

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

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

SYSTEM TEST CONFIGURATION

Description of Test Configuration

Frequency List#

Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)
11	**2405**	12	2410	13	2415	14	2420
15	2425	16	2430	17	2435	18	2440
19	**2445**	20	2450	21	2455	22	2460
23	2465	24	2470	25	2475	**26**	**2480**

EUT was tested with Channel 11, 19 and 26.

Equipment Modifications

No modification was made to the EUT tested.

EUT Exercise Software

Test in the engineering mode and the power level is default#. The power level was provided by the manufacturer.

Support Equipment List and Details

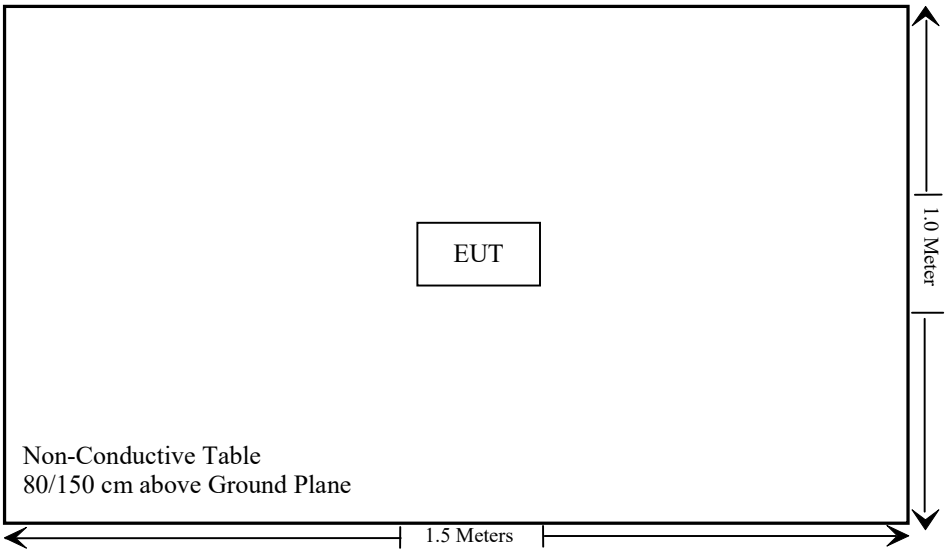
Manufacturer	Description	Model	Serial Number
/	/	/	/

External I/O Cable

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

Block Diagram of Test Setup

For Radiated Emissions:



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§15.247 (i), §1.1307 (b) (1) & §2.1093	RF Exposure	Compliant
§15.203	Antenna Requirement	Compliant
§15.207 (a)	AC Line Conducted Emissions	Not Applicable
§15.205, §15.209, §15.247(d)	Spurious Emissions	Compliant
§15.247 (a)(2)	6 dB Emission Bandwidth	Compliant
§15.247(b)(3)	Maximum Conducted Output Power	Compliant
§15.247(d)	100 kHz Bandwidth of Frequency Band Edge	Compliant
§15.247(e)	Power Spectral Density	Compliant
C63.10 §11.6	Duty Cycle	/

Not Applicable: The EUT is powered by battery.

TEST EQUIPMENT LIST

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Radiated Emissions Test					
Rohde & Schwarz	EMI Test Receiver	ESR3	102455	2024/12/04	2025/12/03
Sonoma instrument	Pre-amplifier	310 N	186238	2024/05/21	2025/05/20
Sunol Sciences	Broadband Antenna	JB1	A040904-1	2023/07/20	2026/07/19
Unknown	Cable	Chamber A Cable 1	N/A	2024/06/18	2025/06/17
Unknown	Cable	XH500C	J-10M-A	2024/06/18	2025/06/17
BACL	Active Loop Antenna	1313-1A	4031911	2024/05/14	2027/05/13
Unknown	Cable	2Y194	0735	2024/12/04	2025/12/03
Unknown	Cable	PNG214	1354	2024/12/04	2025/12/03
Rohde & Schwarz	Spectrum Analyzer	FSV40	101605	2024/03/27	2025/03/26
A.H.System	Preamplifier	PAM-0118P	489	2024/11/15	2025/11/14
Schwarzbeck	Horn Antenna	BBHA9120D (1201)	1143	2023/07/26	2026/07/25
Unknown	RF Cable	KMSE	735	2024/12/06	2025/12/05
Unknown	RF Cable	UFA147	219661	2024/12/06	2025/12/05
Unknown	RF Cable	XH750A-N	J-10M	2024/12/06	2025/12/05
JD	Filter Switch Unit	DT7220FSU	DS79906	2024/09/09	2025/09/08
JD	Multiplex Switch Test Control Set	DT7220SCU	DS79903	2024/09/09	2025/09/08
A.H.System	Pre-amplifier	PAM-1840VH	190	2024/06/18	2025/06/17
Electro-Mechanics Co	Horn Antenna	3116	9510-2270	2023/09/18	2026/09/17
UTIFLEX	RF Cable	NO. 13	232308-001	2024/12/18	2025/12/17
Audix	EMI Test software	E3	191218(V9)	NCR	NCR
RF Conducted Test					
Rohde & Schwarz	Spectrum Analyzer	FSU26	200982	2024/09/20	2025/09/19
MARCONI	10dB Attenuator	6534/3	2942	2024/06/27	2025/06/26
Micro-Tronics	RF Cable	8082135	W1113	2024/06/27	2025/06/26

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

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

Applicable Standard

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

According to KDB 447498 D01 General RF Exposure Guidance v06.

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

Measurement Result

For worst case:

Mode	Frequency (MHz)	Max tune-up conducted power# (dBm)	Max tune-up conducted power# (mW)	Distance (mm)	Calculated value	Threshold (1-g SAR)	SAR Test Exclusion
Zigbee	2405-2480	5.00	3.16	5	1.0	3	Yes

Result: No SAR test is required

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.

Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with § 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

Antenna Connector Construction

The EUT has a PCB antenna arrangement, which was permanently attached and the antenna gain# is 2.17 dBi, fulfill the requirement of this section. Please refer to the EUT photos.

Result: Compliant

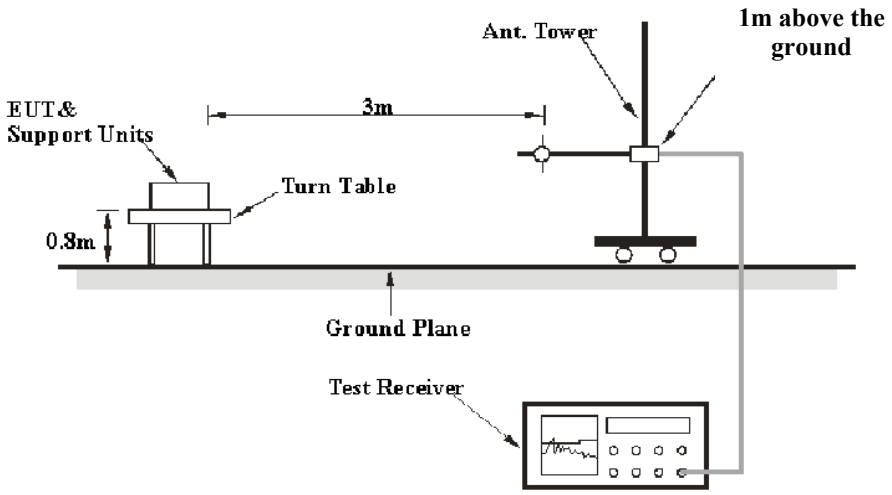
FCC §15.209, §15.205 & §15.247(d) - SPURIOUS EMISSIONS

Applicable Standard

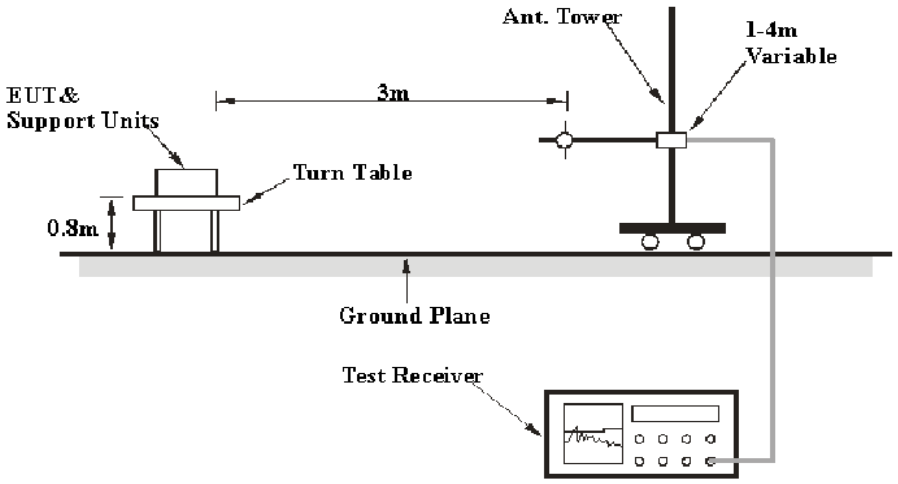
FCC §15.247 (d); §15.209; §15.205;

EUT Setup

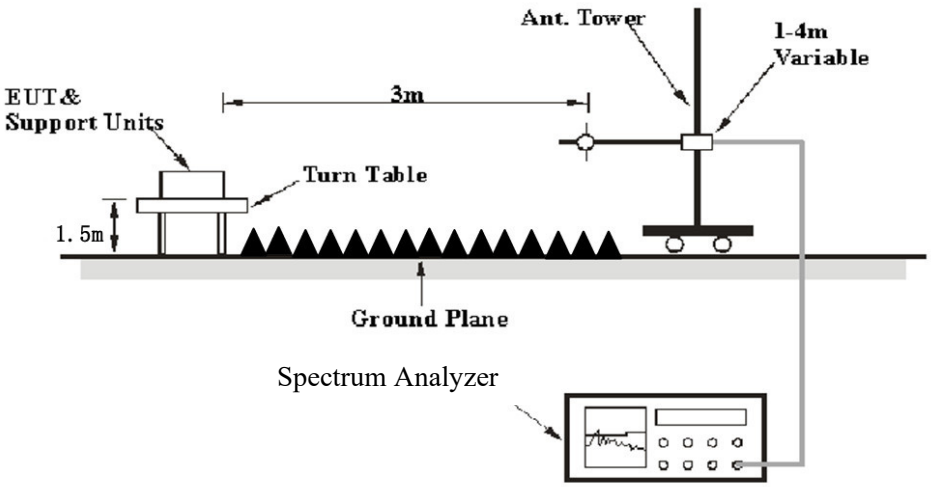
9 kHz-30MHz:



30MHz-1GHz:



Above 1GHz:



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

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 were set with the following configurations:

9 kHz-1GHz:

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

1-25GHz:
Pre-scan

Measurement	Duty cycle	RBW	Video B/W	Detector
PK	Any	1MHz	3 MHz	Peak
AV	>98%	1MHz	1 kHz	Peak
	<98%	1MHz	≥1/Ton, not less than 1 kHz	Peak

For band edge test, VBW=10 Hz was used for AV measurement

Final measurement for emission identified during pre-scan

Measurement	Duty cycle	RBW	Video B/W	Detector
PK	Any	1MHz	3 MHz	Peak
AV	>98%	1MHz	10 Hz	Peak
	<98%	1MHz	≥1/Ton	Peak

Note: Ton is minimum transmission duration

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

Test Procedure

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

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

For 9 kHz-30MHz, the report shall list the six emissions with the smallest margin relative to the limit, for each of the three antenna orientations (parallel, perpendicular, and ground-parallel) unless the margin is greater than 20 dB.

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

Factor & Over Limit/Margin Calculation

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

Factor = Antenna Factor + Cable Loss - Amplifier Gain

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

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

Test Data

Environmental Conditions

Temperature:	21.6~23.8 °C
Relative Humidity:	44~50.1 %
ATM Pressure:	101.3~101.5 kPa

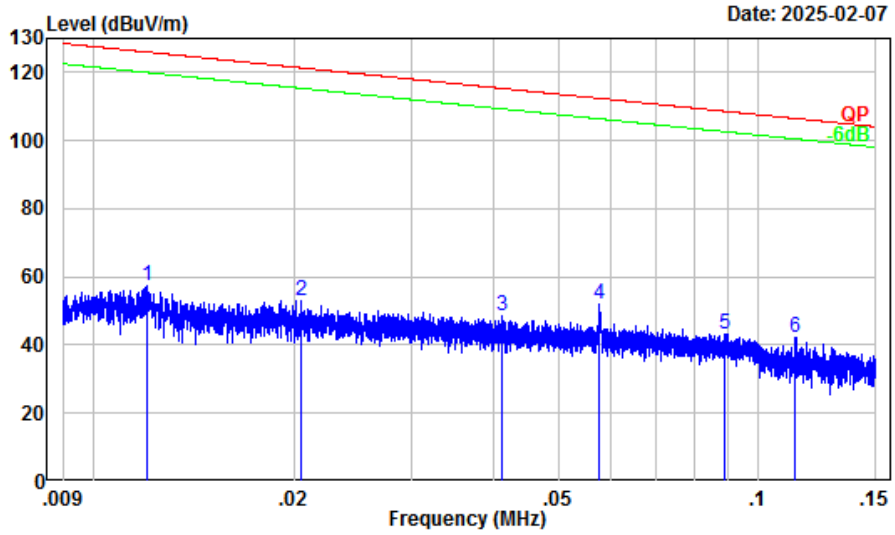
The testing was performed by Anson Su on 2025-02-07 for below 1GHz and Zenos Qiao on 2025-03-08 for above 1GHz.

EUT operation mode: Transmitting

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

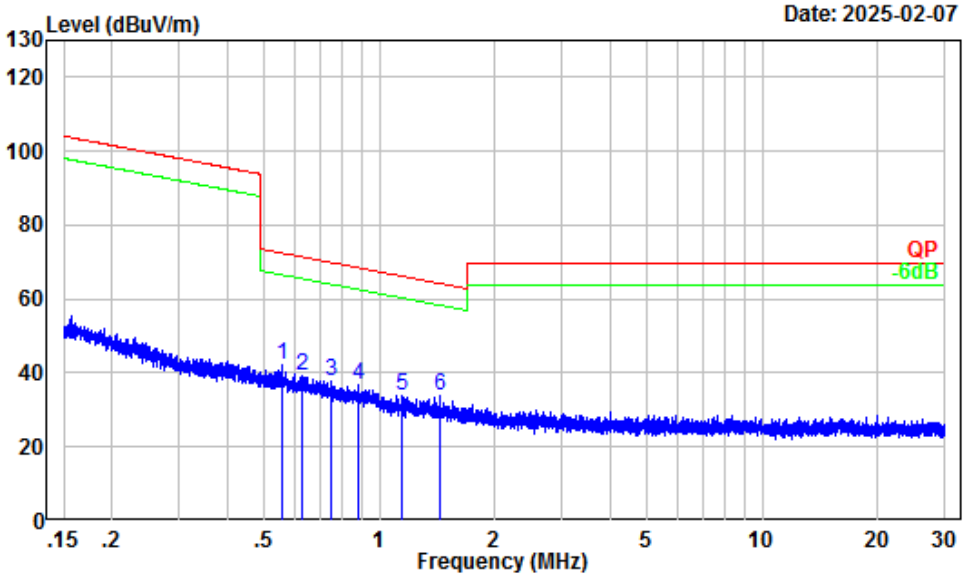
9 kHz-30MHz: (Maximum output power mode, high Channel)

Note: When the test result of peak was less than the limit of QP/Average more than 6dB, just peak value were recorded.
Parallel (worst case)




```
Site                    : Chamber A
Condition               : 3m
Project Number          : 2401A112064E-RF
Test Mode               : Transmitting
Detector: Peak RBW/VBW: 0.3/1kHz
Tester                  : Anson Su
```

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	0.01	31.92	25.69	57.61	126.01	-68.40	Peak
2	0.02	30.29	22.70	52.99	121.34	-68.35	Peak
3	0.04	27.33	21.31	48.64	115.32	-66.68	Peak
4	0.06	25.64	26.23	51.87	112.40	-60.53	Peak
5	0.09	22.76	20.59	43.35	108.60	-65.25	Peak
6	0.11	21.19	21.24	42.43	106.49	-64.06	Peak

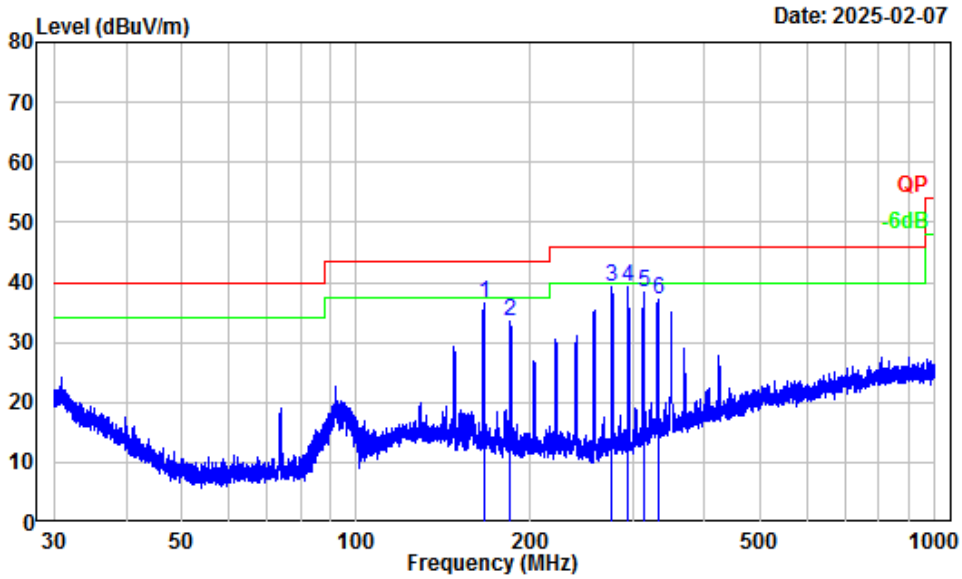


Site : Chamber A
Condition : 3m
Project Number : 2401A112064E-RF
Test Mode : Transmitting
Detector: Peak RBW/VBW: 10/30kHz
Tester : Anson Su

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	0.55	5.72	36.35	42.07	72.70	-30.63	Peak
2	0.63	4.83	34.50	39.33	71.61	-32.28	Peak
3	0.75	3.32	34.38	37.70	70.03	-32.33	Peak
4	0.89	2.06	34.53	36.59	68.55	-31.96	Peak
5	1.14	0.80	33.06	33.86	66.28	-32.42	Peak
6	1.44	-0.04	33.77	33.73	64.22	-30.49	Peak

30MHz-1GHz: (Maximum output power mode, high Channel)
Note: When the test result of peak was less than the limit of QP more than 6dB, just peak value were recorded.

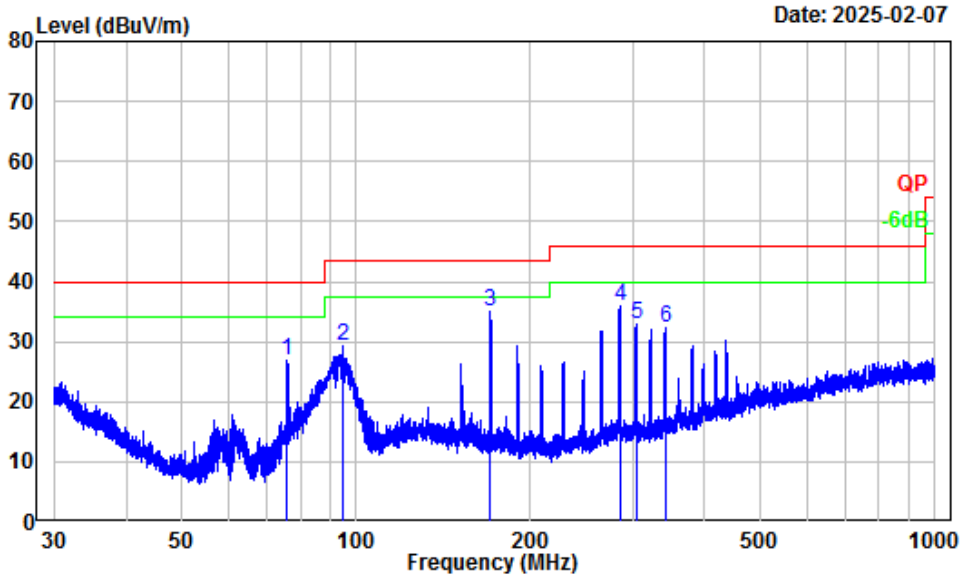
Horizontal



Site : Chamber A
Condition : 3m Horizontal
Project Number : 2401A112064E-RF
Test Mode : Transmitting
Detector: Peak RBW/VBW: 100/300kHz
Tester : Anson Su

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	166.43	-12.95	49.42	36.47	43.50	-7.03	Peak
2	184.33	-13.95	47.39	33.44	43.50	-10.06	Peak
3	276.73	-11.31	50.70	39.39	46.00	-6.61	Peak
4	295.02	-11.21	50.31	39.10	46.00	-6.90	Peak
5	313.69	-10.97	49.21	38.24	46.00	-7.76	Peak
6	332.52	-10.60	47.86	37.26	46.00	-8.74	Peak

Vertical



Site : Chamber A
Condition : 3m Vertical
Project Number : 2401A112064E-RF
Test Mode : Transmitting
Detector: Peak RBW/VBW: 100/300kHz
Tester : Anson Su

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	75.78	-17.83	44.60	26.77	40.00	-13.23	Peak
2	94.93	-17.34	46.53	29.19	43.50	-14.31	Peak
3	170.27	-13.13	48.19	35.06	43.50	-8.44	Peak
4	285.23	-11.23	47.08	35.85	46.00	-10.15	Peak
5	304.48	-11.09	43.85	32.76	46.00	-13.24	Peak
6	342.58	-10.34	42.53	32.19	46.00	-13.81	Peak

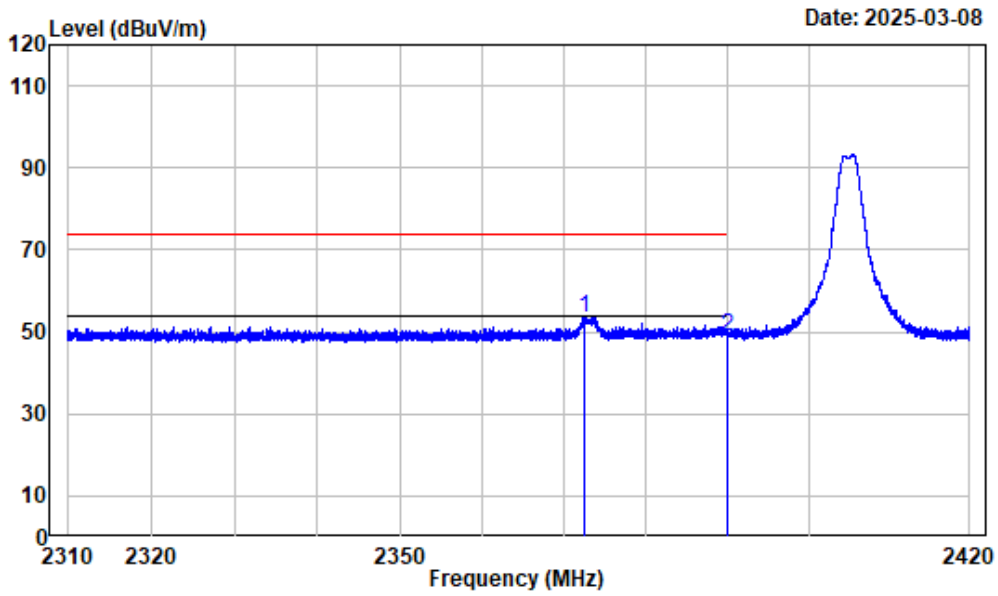
1-25 GHz:

Frequency (MHz)	Reading (dBµV)	PK/AV	Polar (H/V)	Factor (dB/m)	Corrected Amplitude (dBµV/m)	Limit (dBµV/m)	Margin (dB)
Low Channel							
4810.00	68.90	PK	H	-7.78	61.12	74	-12.88
4810.00	57.24	AV	H	-7.78	49.46	54	-4.54
4810.00	67.37	PK	V	-7.78	59.59	74	-14.41
4810.00	56.45	AV	V	-7.78	48.67	54	-5.33
Middle Channel							
4890.00	69.96	PK	H	-7.56	62.40	74	-11.60
4890.00	58.53	AV	H	-7.56	50.97	54	-3.03
4890.00	68.45	PK	V	-7.56	60.89	74	-13.11
4890.00	57.71	AV	V	-7.56	50.15	54	-3.85
High Channel							
4960.00	65.87	PK	H	-7.57	58.30	74	-15.70
4960.00	56.29	AV	H	-7.57	48.72	54	-5.28
4960.00	64.34	PK	V	-7.57	56.77	74	-17.23
4960.00	55.48	AV	V	-7.57	47.91	54	-6.09

Note:
Factor = Antenna factor (RX) + Cable Loss – Amplifier Factor
Corrected Amplitude/Level = Factor + Reading
Margin = Corrected Amplitude/Level - Limit
The other spurious emission which is in the noise floor level was not recorded.

Test plots for Bandedge Measurements (Radiated):

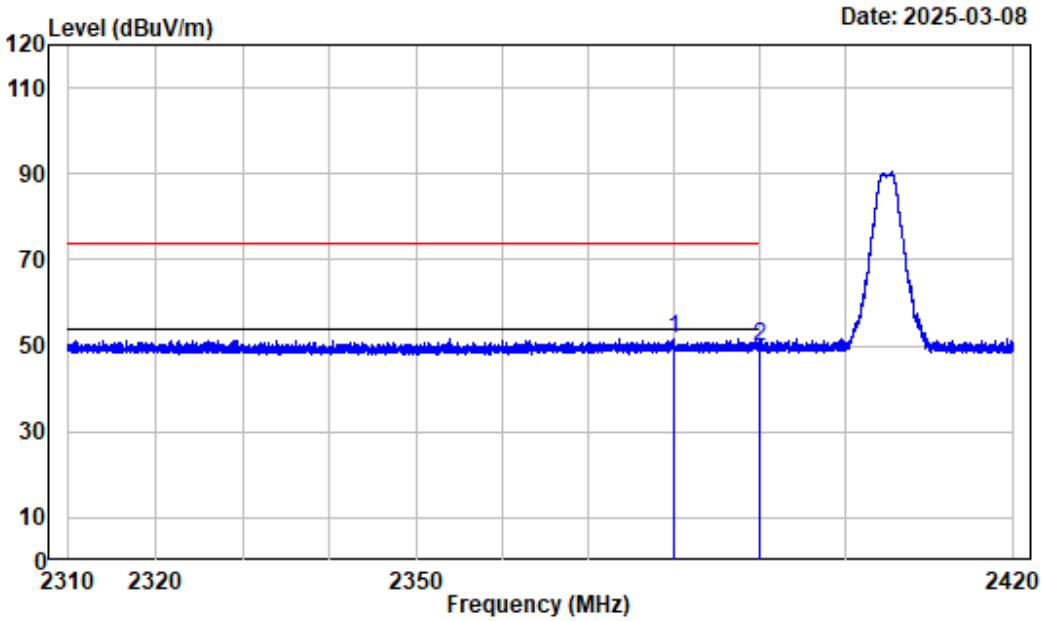
Test Channel:	2405MHz	Ant. Polar. :	Horizontal



Condition : Horizontal
Project No. : 2401A112064E-RF
Tester : Zenos Qiao
Spectrum setting: Peak reading:RBW:1MHz VBW:3MHz Detector:Peak
Note : Zigbee-2405

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	2372.498	-10.94	64.57	53.63	74.00	-20.37	Peak
2	2390.000	-10.98	59.74	48.76	74.00	-25.24	Peak

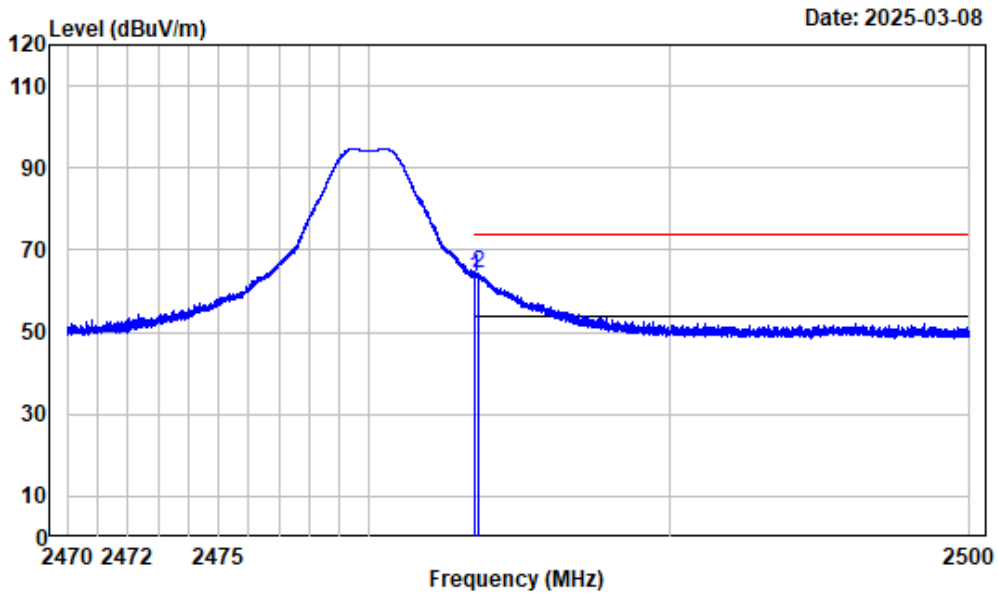
Test Channel:	2405MHz	Ant. Polar. :	Vertical



Condition : Vertical
Project No. : 2401A112064E-RF
Tester : Zenos Qiao
Spectrum setting: Peak reading:RBW:1MHz VBW:3MHz Detector:Peak
Note : Zigbee-2405

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	2379.845	-10.96	62.80	51.84	74.00	-22.16	Peak
2	2390.000	-10.98	60.84	49.86	74.00	-24.14	Peak

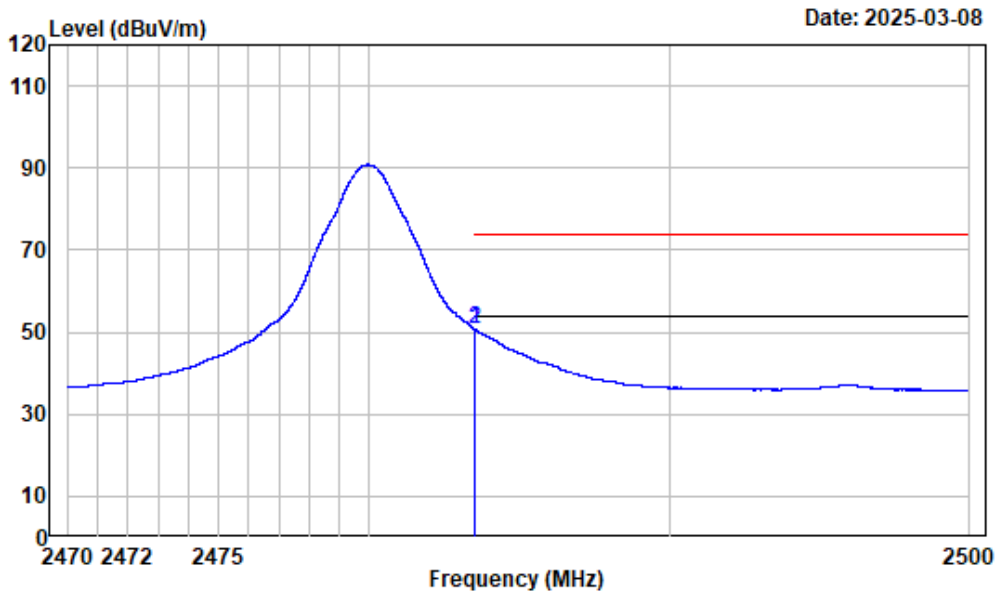
Test Channel:	2480MHz	Ant. Polar. :	Horizontal_Peak



Condition : Horizontal
Project No. : 2401A112064E-RF
Tester : Zenos Qiao
Spectrum setting: Peak reading:RBW:1MHz VBW:3MHz Detector:Peak
Note : Zigbee-2480

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	2483.500	-10.97	74.57	63.60	74.00	-10.40	Peak
2	2483.633	-10.97	75.48	64.51	74.00	-9.49	Peak

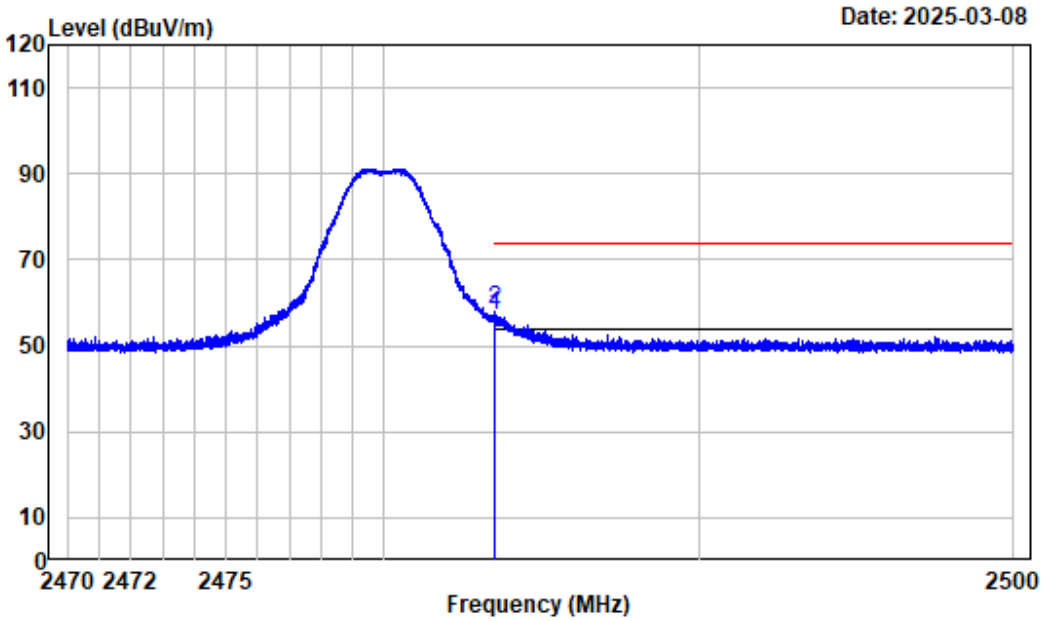
Test Channel:	2480MHz	Ant. Polar. :	Horizontal_Average



Condition : Horizontal
Project No. : 2401A112064E-RF
Tester : Zenos Qiao
Spectrum setting: Average reading:RBW:1MHz VBW:10Hz Detector:Peak
Note : Zigbee-2480

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	2483.500	-10.97	61.74	50.77	54.00	-3.23	Average
2	2483.519	-10.97	61.87	50.90	54.00	-3.10	Average

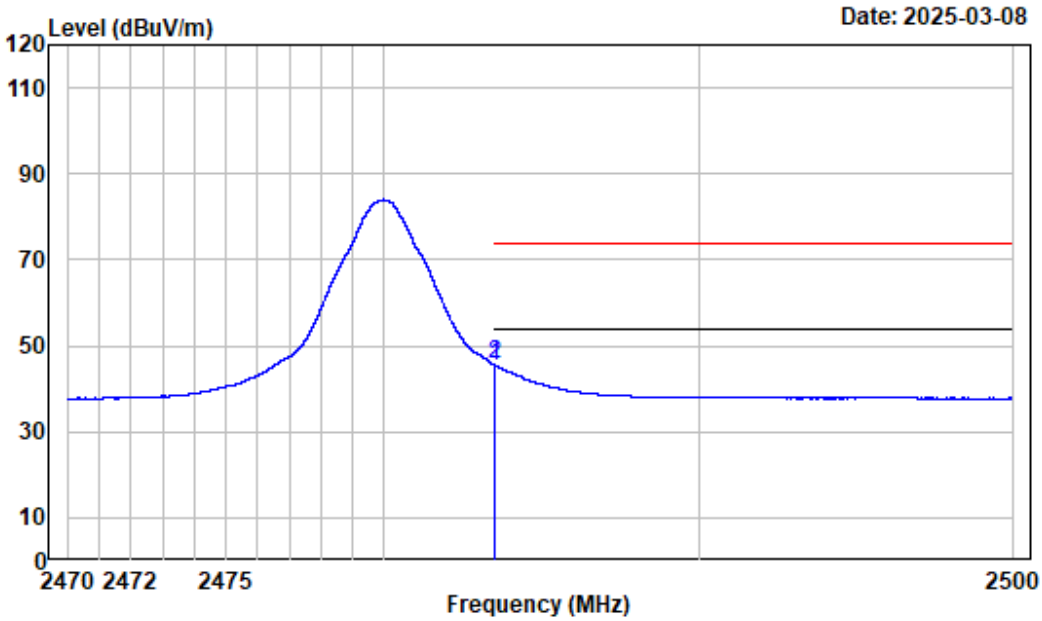
Test Channel:	2480MHz	Ant. Polar. :	Vertical_Peak



Condition : Vertical
Project No. : 2401A112064E-RF
Tester : Zenos Qiao
Spectrum setting: Peak reading:RBW:1MHz VBW:3MHz Detector:Peak
Note : Zigbee-2480

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	2483.500	-10.97	68.17	57.20	74.00	-16.80	Peak
2	2483.532	-10.97	69.25	58.28	74.00	-15.72	Peak

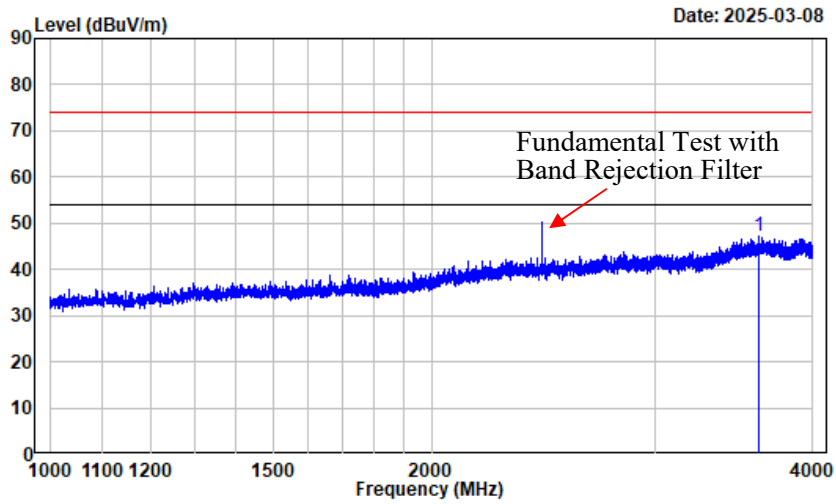
Test Channel:	2480MHz	Ant. Polar. :	Vertical_Average



Condition : Vertical
Project No. : 2401A112064E-RF
Tester : Zenos Qiao
Spectrum setting: Average reading:RBW:1MHz VBW:10Hz Detector:Peak
Note : Zigbee-2480

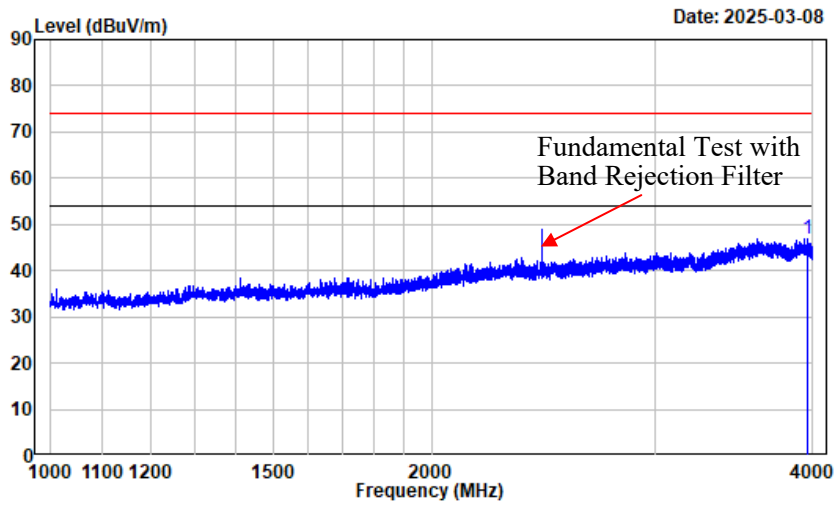
	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	2483.500	-10.97	56.46	45.49	54.00	-8.51	Average
2	2483.525	-10.97	56.59	45.62	54.00	-8.38	Average

Listed with the worst harmonic margin test plots: (Middle channel)

Horizontal	
1-4GHz	 Condition : Horizontal Project No. : 2401A112064E-RF Tester : Zenos Qiao Spectrum setting: Peak reading:RBW:1MHz VBW:3MHz Detector:Peak Note : Zigbee-2445 Freq Factor Read Level Level Limit Line Over Limit Remark MHz dB/m dBuV dBuV/m dBuV/m dB 1 3629.079 -9.94 57.06 47.12 74.00 -26.88 Peak

Vertical

1-4GHz

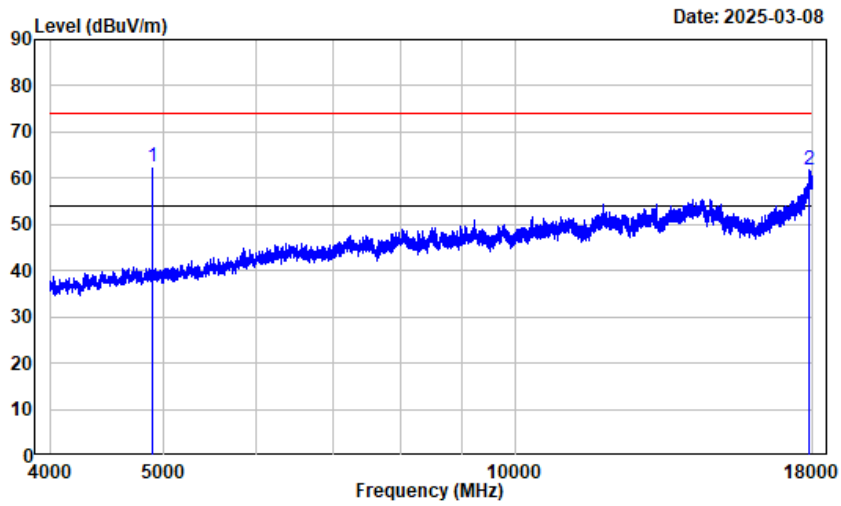



```
Condition        : Vertical
Project No.      : 2401A112064E-RF
Tester           : Zenos Qiao
Spectrum setting: Peak reading:RBW:1MHz VBW:3MHz Detector:Peak
Note             : Zigbee-2445
```

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	3962.120	-9.30	56.15	46.85	74.00	-27.15	Peak

Horizontal_Peak

4-18GHz

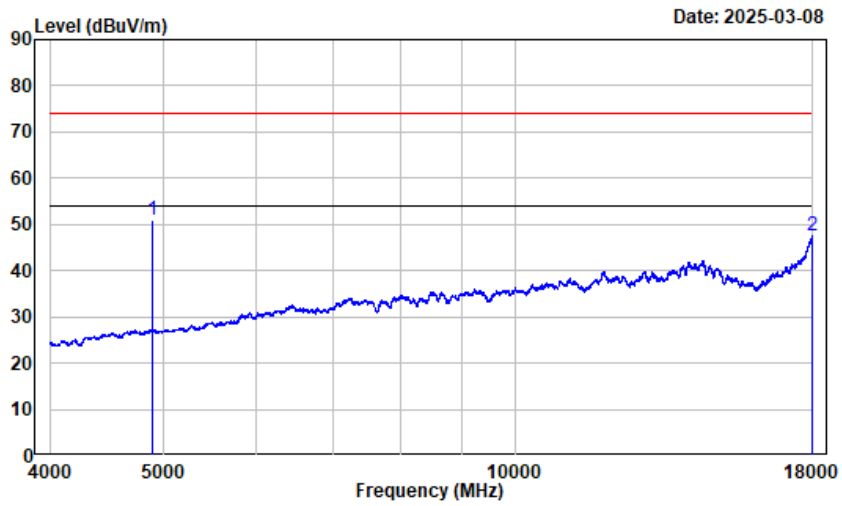



```
Condition        : Horizontal
Project No.      : 2401A112064E-RF
Tester           : Zenos Qiao
Spectrum setting: Peak reading:RBW:1MHz VBW:3MHz Detector:Peak
Note             : Zigbee-2445
```

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	4890.000	-7.56	69.96	62.40	74.00	-11.60	Peak
2	17887.990	12.48	49.38	61.86	74.00	-12.14	Peak

Horizontal_Average

4-18GHz

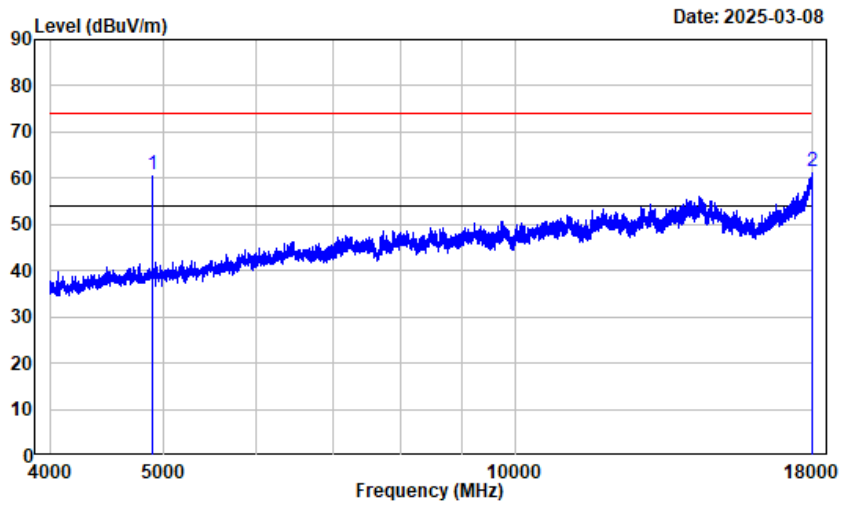


Condition : Horizontal
Project No. : 2401A112064E-RF
Tester : Zenos Qiao
Spectrum setting: Average reading:RBW:1MHz VBW:1kHz Detector:Peak
Note : Zigbee-2445

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	4890.000	-7.56	58.53	50.97	54.00	-3.03	Average
2	17984.250	13.12	34.32	47.44	54.00	-6.56	Average

Vertical_Peak

4-18GHz

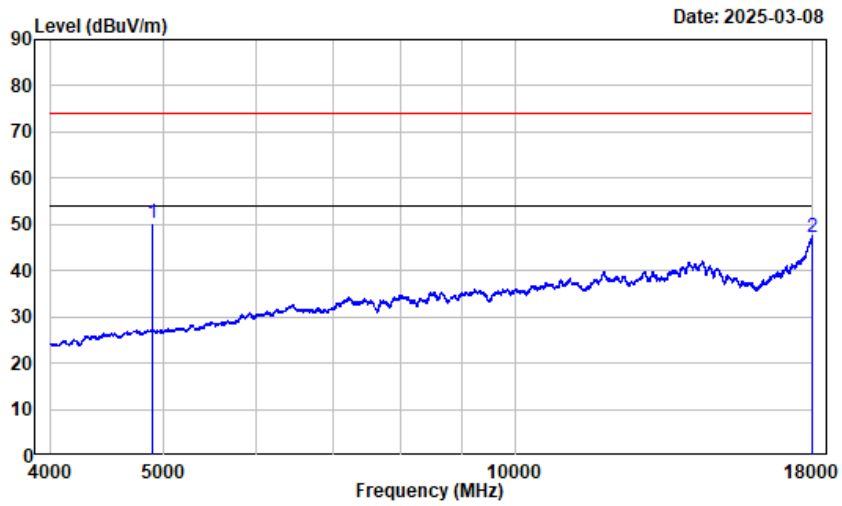



```
Condition        : Vertical
Project No.      : 2401A112064E-RF
Tester           : Zenos Qiao
Spectrum setting: Peak reading:RBW:1MHz VBW:3MHz Detector:Peak
Note             : Zigbee-2445
```

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	4890.000	-7.56	68.45	60.89	74.00	-13.11	Peak
2	17998.630	13.20	48.24	61.44	74.00	-12.56	Peak

Vertical_Average

4-18GHz

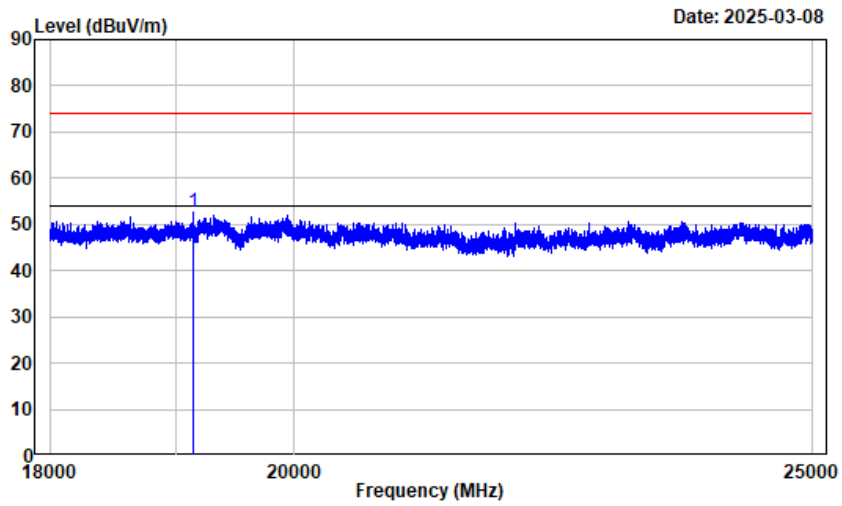


Condition : Vertical
Project No. : 2401A112064E-RF
Tester : Zenos Qiao
Spectrum setting: Average reading:RBW:1MHz VBW:1kHz Detector:Peak
Note : Zigbee-2445

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	4890.000	-7.56	57.71	50.15	54.00	-3.85	Average
2	17998.250	13.19	34.04	47.23	54.00	-6.77	Average

Horizontal

18-25GHz

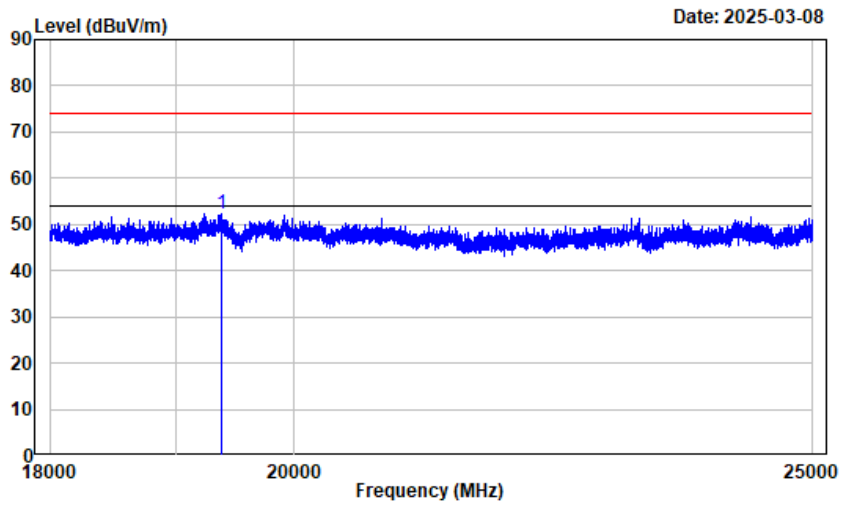


Condition : Horizontal
Project No. : 2401A112064E-RF
Tester : Zenos Qiao
Spectrum setting: Peak reading:RBW:1MHz VBW:3MHz Detector:Peak
Note : Zigbee-2445

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	19141.140	15.30	37.21	52.51	74.00	-21.49	Peak

Vertical

18-25GHz



Condition : Vertical
Project No. : 2401A112064E-RF
Tester : Zenos Qiao
Spectrum setting: Peak reading:RBW:1MHz VBW:3MHz Detector:Peak
Note : Zigbee-2445

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	19383.550	15.11	37.08	52.19	74.00	-21.81	Peak

FCC §15.247(a) (2) - 6 dB EMISSION BANDWIDTH

Applicable Standard

According to FCC §15.247(a) (2)
Systems using digital modulation techniques may operate in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

Test Procedure

Test Method: ANSI C63.10-2020 Clause 11.8.1 & Clause 6.9.3

The steps for the first option are as follows:

a) Set RBW = shall be in the range of 1% to 5% of the OBW but not less than 100 kHz.

b) Set the VBW ⩾ [3 × RBW].

c) Detector = peak.

d) Trace mode = max-hold.

e) Sweep = No faster than coupled (auto) time.

f) Allow the trace to stabilize.

g) Measure the maximum width of the emission by placing two markers, one at the lowest frequency and the other at the highest frequency of the envelope of the spectral display, such that each marker is at or slightly below the "−6 dB down amplitude". If a marker is below this "−6 dB down amplitude" value, then it shall be as close as possible to this value.

The occupied bandwidth is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers are each equal to 0.5% of the total mean power of the given emission. The following procedure shall be used for measuring 99% power bandwidth:

a) The instrument center frequency is set to the nominal EUT channel center frequency. The frequency span for the spectrum analyzer shall be between 1.5 times and 5.0 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 VBW shall be at least three times the 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 4.1.6.2.

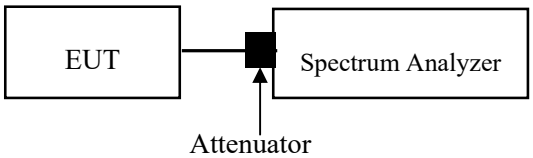
d) Step a) through step c) might require iteration to adjust within the specified range.

e) Video averaging is not permitted. Where practical, a sample detection and single sweep mode shall be used. Otherwise, peak detection and max-hold mode (until the trace stabilizes) shall be used.

f) Use the 99% power bandwidth function of the instrument (if available) and report the measured bandwidth.

g) If the instrument does not have a 99% power bandwidth function, then the trace data points are recovered and directly summed in linear power terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached; that frequency is recorded as the lower frequency. The process is repeated until 99.5% of the total is reached; that frequency is recorded as the upper frequency. The 99% power bandwidth is the difference between these two frequencies.

h) The occupied bandwidth shall be reported by providing spectral plot(s) of the measuring instrument display; the plot axes and the scale units per division shall be clearly labeled. Tabular data may be reported in addition to the plot(s).



Test Data

Environmental Conditions

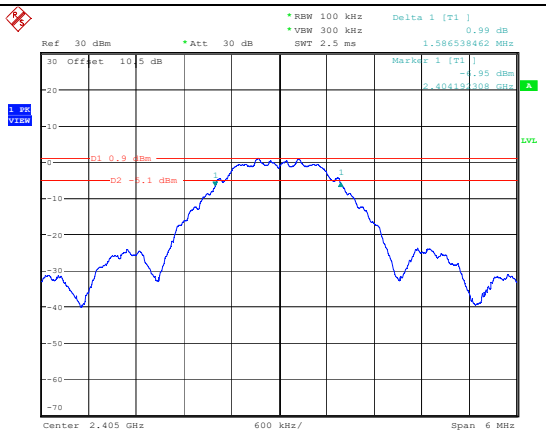
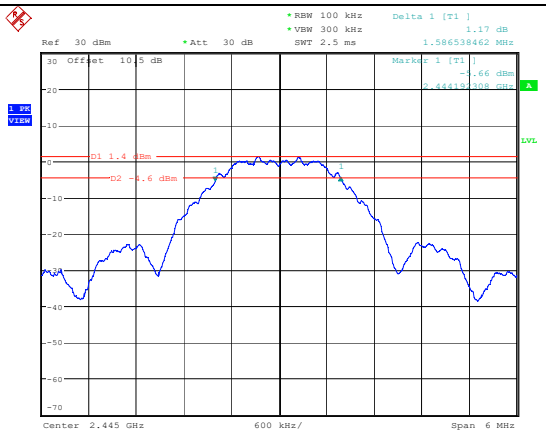
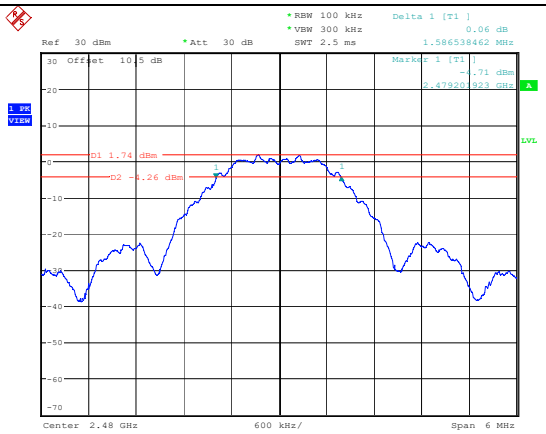
Temperature:	24.1 °C
Relative Humidity:	44 %
ATM Pressure:	101.1 kPa

The testing was performed by Rainbow Zhu on 2025-03-22.

EUT operation mode: Transmitting

Test Result: Compliant.

Test Channel	Test Frequency (MHz)	6 dB Bandwidth (MHz)	Limit (MHz)
Low	2405	1.587	≥0.5
Middle	2445	1.587	≥0.5
High	2480	1.587	≥0.5

Low Channel	 ProjectNo.:2401A112064E-RF Tester:Rainbow Zhu Date: 22.MAR.2025 15:25:54
Middle Channel	 ProjectNo.:2401A112064E-RF Tester:Rainbow Zhu Date: 22.MAR.2025 15:21:54
High Channel	 ProjectNo.:2401A112064E-RF Tester:Rainbow Zhu Date: 22.MAR.2025 14:51:41

FCC §15.247(b) (3) - MAXIMUM CONDUCTED OUTPUT POWER

Applicable Standard

According to FCC §15.247(b) (3), for systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.

Test Procedure

Test Method: ANSI C63.10-2020 Clause 11.9.1.1

The following procedure shall be used when an instrument with a resolution bandwidth that is greater than the DTS bandwidth is available to perform the measurement:

a) Set the RBW ⩾ DTS bandwidth.

b) Set VBW ⩾ [3 × RBW].

c) Set span ⩾ [3 × RBW].

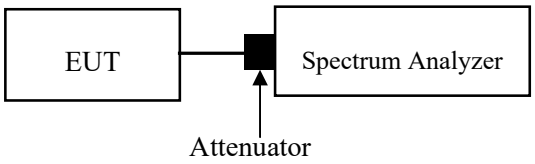
d) Sweep time = No faster than coupled (auto) time.

e) Detector = peak.

f) Trace mode = max-hold.

g) Allow trace to fully stabilize.

h) Use peak marker function to determine the peak amplitude level.



Note: A short RF cable with low cable loss connected to the EUT antenna port,which was provided by client or lab, the cable loss was add with offset into test equipment, the total offset consists of attenuator and/or RF cable loss

Test Data

Environmental Conditions

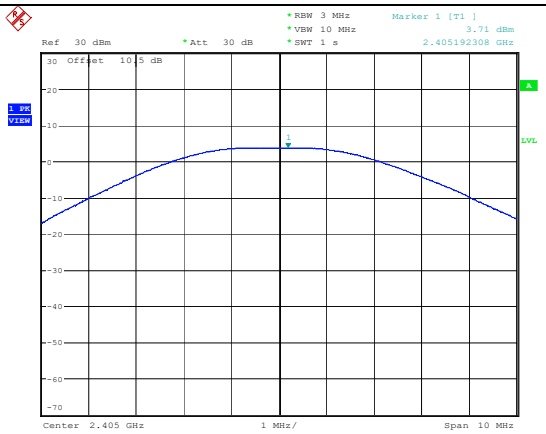
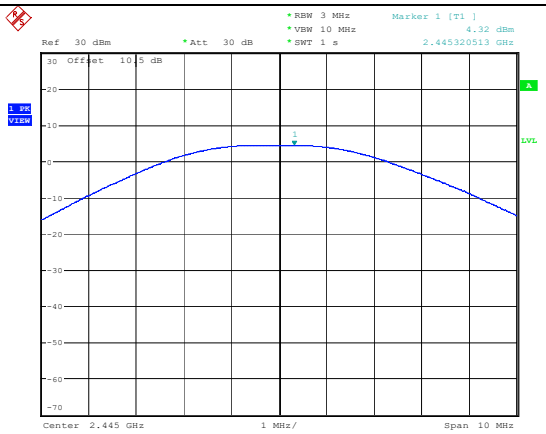
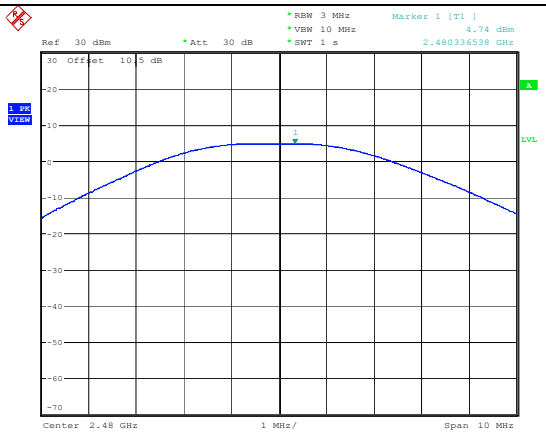
Temperature:	24.1 °C
Relative Humidity:	44 %
ATM Pressure:	101.1 kPa

The testing was performed by Rainbow Zhu on 2025-03-22.

EUT operation mode: Transmitting

Test Result: Compliant.

Test Channel	Test Frequency (MHz)	Maximum Conducted Peak Output Power (dBm)	Limit (dBm)
Low	2405	3.71	≤30
Middle	2445	4.32	≤30
High	2480	4.74	≤30

Low Channel	 ProjectNo.:2401A112064E-RF Tester:Rainbow Zhu Date: 22.MAR.2025 14:41:41
Middle Channel	 ProjectNo.:2401A112064E-RF Tester:Rainbow Zhu Date: 22.MAR.2025 14:42:51
High Channel	 ProjectNo.:2401A112064E-RF Tester:Rainbow Zhu Date: 22.MAR.2025 14:47:02

FCC §15.247(d) - 100 kHz BANDWIDTH OF FREQUENCY BAND EDGE

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 11.11.3

Establish a reference level by using the following procedure:

a) Set instrument center frequency to DTS channel center frequency.

b) Set the RBW = 100 kHz.

c) Set the VBW ⩾ [3 × RBW].

d) Detector = peak.

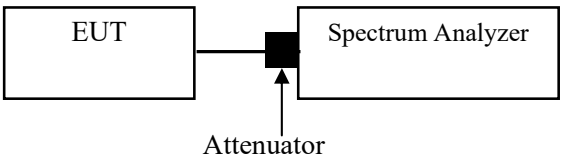
e) Sweep time = No faster than coupled (auto) time.

f) Trace mode = max-hold.

g) Allow trace to fully stabilize.

h) Use the peak marker function to determine the maximum PSD level.

Note that the channel found to contain the maximum PSD level can be used to establish the reference level.



Test Data

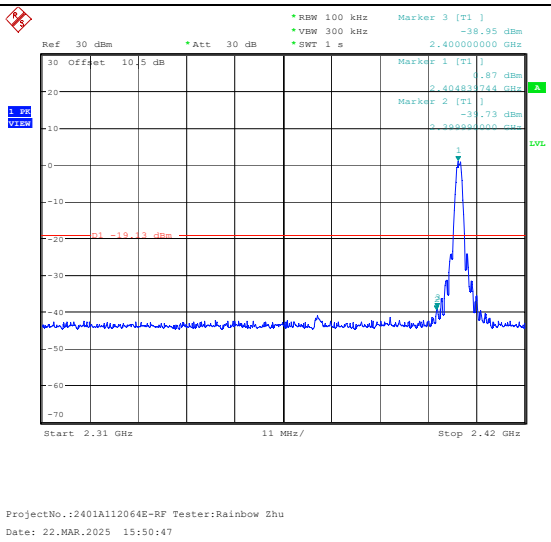
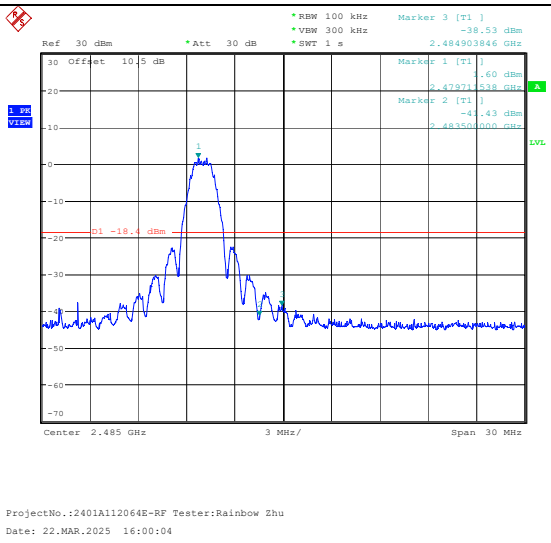
Environmental Conditions

Temperature:	24.1 °C
Relative Humidity:	44 %
ATM Pressure:	101.1 kPa

The testing was performed by Rainbow Zhu on 2025-03-22.

EUT operation mode: Transmitting

Test Result: Compliant

Band Edge	
Left Side	
Right Side	

FCC §15.247(e) - POWER SPECTRAL DENSITY

Applicable Standard

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

Test Procedure

Test Method: ANSI C63.10-2020 Clause 11.10.2

The following procedure shall be used if maximum peak conducted output power was used to determine compliance, and it is optional if the maximum conducted (average) output power was used to determine compliance:

a) Set analyzer center frequency to DTS channel center frequency.

b) Set the span >1.5 times the DTS bandwidth.

c) Set the RBW to 3 kHz ⩽ RBW ⩽ 100 kHz.

d) Set the VBW ⩾ [3 × RBW].

e) Detector = peak.

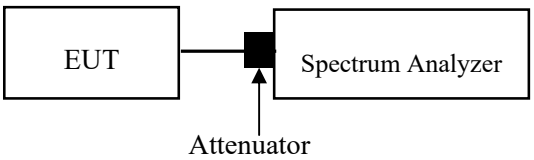
f) Sweep time = No faster than coupled (auto) time.

g) Trace mode = max-hold.

h) Allow trace to fully stabilize.

i) Use the peak marker function to determine the maximum amplitude level within the RBW.

j) If measured value exceeds requirement, then reduce RBW (but no less than 3 kHz) and repeat.



Note: A short RF cable with low cable loss connected to the EUT antenna port,which was provided by client or lab, the cable loss was add with offset into test equipment, the total offset consists of attenuator and/or RF cable loss

Test Data

Environmental Conditions

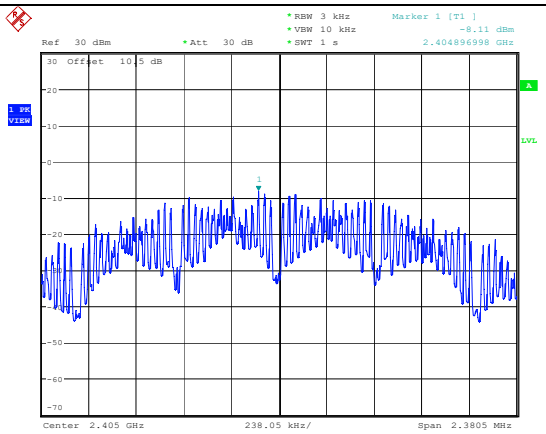
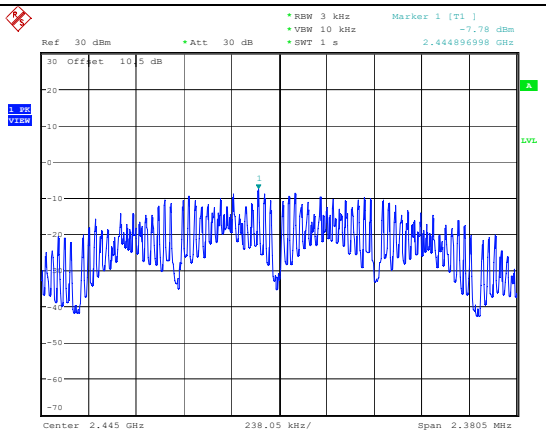
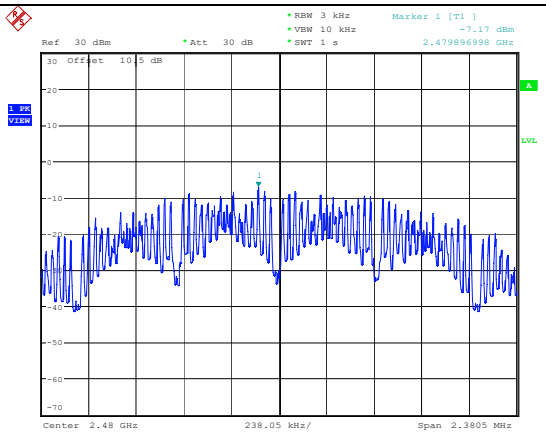
Temperature:	24.1 °C
Relative Humidity:	44 %
ATM Pressure:	101.1 kPa

The testing was performed by Rainbow Zhu on 2025-03-22.

EUT operation mode: Transmitting

Test Result: Compliant.

Test Channel	Test Frequency (MHz)	Power Spectral Density (dBm/3kHz)	Limit (dBm/3kHz)
Low	2405	-8.11	≤8.00
Middle	2445	-7.78	≤8.00
High	2480	-7.17	≤8.00

Low Channel	 ProjectNo.:2401A112064E-RF Tester:Rainbow Zhu Date: 22.MAR.2025 15:37:01
Middle Channel	 ProjectNo.:2401A112064E-RF Tester:Rainbow Zhu Date: 22.MAR.2025 15:39:08
High Channel	 ProjectNo.:2401A112064E-RF Tester:Rainbow Zhu Date: 22.MAR.2025 15:41:57

C63.10 §11.6- DUTY CYCLE

Test Procedure

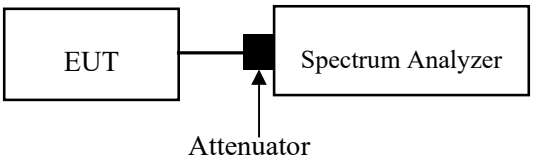
According to ANSI C63.10-2020 Section 11.6

Measurements of duty cycle and transmission duration shall be performed using one of the following techniques:

a) A diode detector and an oscilloscope that together have a sufficiently short response time to permit accurate measurements of the ON and OFF times of the transmitted signal.

b) The zero-span mode on a spectrum analyzer or EMI receiver if the response time and spacing between bins on the sweep are sufficient to permit accurate measurements of the ON and OFF times of the transmitted signal:

1) Set the center frequency of the instrument to the center frequency of the transmission.
2) Set RBW ≥ OBW if possible; otherwise, set RBW to the largest available value.
3) Set VBW ≥ RBW. Set detector = peak or average.
4) The zero-span measurement method shall not be used unless both RBW and VBW are > 50/T and the number of sweep points across duration T exceeds 100. (For example, if VBW and/or RBW are limited to 3 MHz, then the zero-span method of measuring the duty cycle shall not be used if T ≤ 16.7 μs.)



Test Data

Environmental Conditions

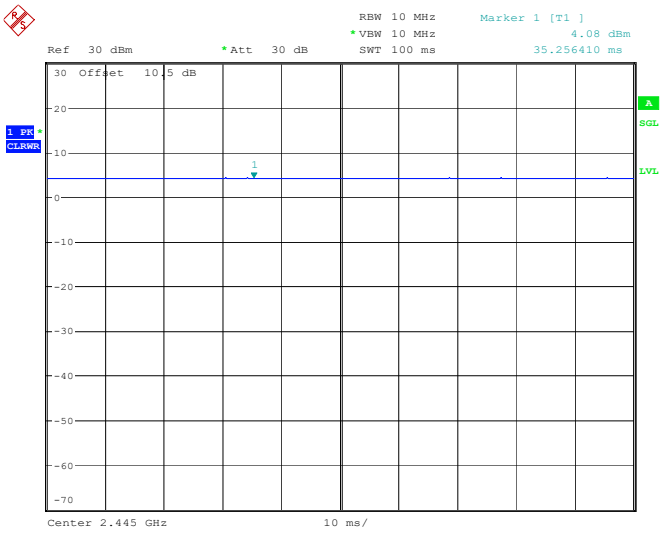
Temperature:	24.1 °C
Relative Humidity:	44 %
ATM Pressure:	101.1 kPa

The testing was performed by Rainbow Zhu on 2025-03-22.

EUT operation mode: Transmitting

Test Result: Compliant.

Test Channel	Ton (ms)	Ton+off (ms)	Duty Cycle (%)	1/Ton (Hz)	VBW Setting (Hz)
Middle	100	100	100.00	/	10



ProjectNo.:2401A112064E-RF Tester:Rainbow Zhu

Date: 22.MAR.2025 15:46:29

EUT PHOTOGRAPHS

Please refer to the attachment 2401A112064E-RF External photo and 2401A112064E-RF Internal photo.

TEST SETUP PHOTOGRAPHS

Please refer to the attachment 2401A112064E-RF Test Setup photo.

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