TEST REPORT

Applicant Name:	EWAY CAR TECHNOLOGY LIMITED
Address:	FLAT/RM 1405B, 14/F, THE BELGIAN BANK BUILDING NOS.721-725, NATHAN ROAD MONGKOK KL, Hong Kong
Report Number:	2401U80466E-RF-00
FCC ID:	2BG4R-EWCM2301

Test Standard (s)

FCC PART 15.247

Sample Description

Product Type:	RV Wireless Safety Camera
Model No.:	CM2301
Multiple Model(s) No.:	CM2302
Trade Mark:	N/A
Date Received:	2024/06/13
Issue Date:	2024/10/22

Test Result:	Pass▲

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

Prepared and Checked By:

Bruce Lin

Bruce Lin
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 may contain data that are not covered by the NVLAP accreditation and are marked with an asterisk "▼".

TABLE OF CONTENTS

DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	2401U80466E-RF-00	Original Report	2024/10/22

GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

Product	RV Wireless Safety Camera
Tested Model	CM2301
Multiple Model(s)	CM2302
Frequency Range	2406-2478MHz
Maximum conducted peak output power	10.39 dBm
Modulation Technique	QPSK
Antenna Specification#	0dBi (provided by the applicant)
Voltage Range	DC 12~32V
Sample serial number	2MUL-3 (RF Conducted Test for tested model CM2301) 2MUQ-4 (RF Conducted Test for multiple model CM2302) 2MUQ-1 (RF Radiated Test for tested model CM2301) 2MUQ-2 (RF Radiated Test for multiple model CM2302) (Assigned by BACL, Shenzhen)
Sample/EUT Status	Good condition
Adapter Information	N/A
Note: The multiple models are electrically identical in RF schematics with the test model except for appearance, shape and model name. Please refer to the declaration letter# for more detail, which was provided by manufacturer. Due to the differences, we selected CM2301 for fully test, and multiple model CM2302 for partial test such as “Radiated Emissions below 1 GHz” and “Peak Output Power”	

Objective

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

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

Test Methodology

All measurements contained in this report were conducted with ANSI C63.10-2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.

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

Each test item follows test standards and with no deviation.

Measurement Uncertainty

Parameter		Uncertainty
Occupied Channel Bandwidth		±5%
RF Frequency		213.55 Hz(k=2, 95% level of confidence)
RF output power, conducted		0.72 dB(k=2, 95% level of confidence)
Unwanted Emission, conducted		1.75 dB(k=2, 95% level of confidence)
AC Power Lines Conducted Emissions	9 kHz~150 KHz	3.94dB(k=2, 95% level of confidence)
	150 kHz ~30MHz	3.84dB(k=2, 95% level of confidence)
Radiated Emissions	9kHz - 30MHz	3.30dB(k=2, 95% level of confidence)
	30MHz~200MHz (Horizontal)	4.48dB(k=2, 95% level of confidence)
	30MHz~200MHz (Vertical)	4.55dB(k=2, 95% level of confidence)
	200MHz~1000MHz (Horizontal)	4.85dB(k=2, 95% level of confidence)
	200MHz~1000MHz (Vertical)	5.05dB(k=2, 95% level of confidence)
	1GHz - 6GHz	5.35dB(k=2, 95% level of confidence)
	6GHz - 18GHz	5.44dB(k=2, 95% level of confidence)
	18GHz - 40GHz	5.16dB(k=2, 95% level of confidence)
Temperature		±1℃
Humidity		±1%
Supply voltages		±0.4%

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

Test Facility

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

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

SYSTEM TEST CONFIGURATION

Description of Test Configuration

The system was configured for testing in an engineering mode.

Channel list

Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	**2406**	11	2448
2	2409	12	2452
3	2415	13	2455
4	2418	14	2458
5	2422	15	2465
6	2425	16	2468
7	2428	17	2472
8	2432	18	2475
9	2442	19	**2478**
10	**2445**	/	/

Channel 1, 10 and 19 was tested.

Test Voltage: DC 12V (Worst case)

EUT Exercise Software

"SecureCRT Porrable.exe"$^{\#}$ exercise software was used and the power level is $9^{\#}$. The software and power level was provided by the applicant.

Special Accessories

No special accessory.

Equipment Modifications

No modification was made to the EUT tested.

Support Equipment List and Details

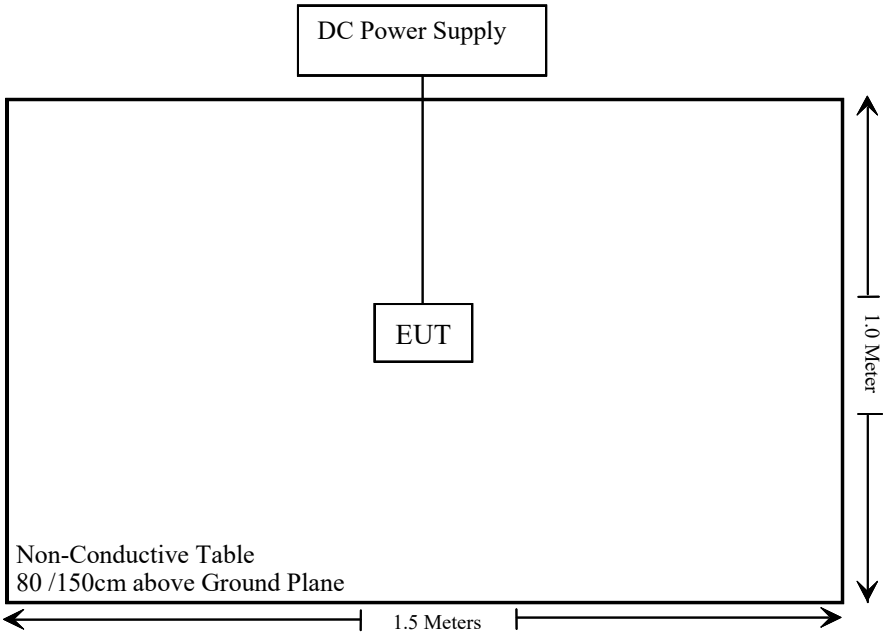
Manufacturer	Description	Model	Serial Number
instek	DC Power Supply	GPS-3030DD	EM832096

External I/O Cable

Cable Description	Length (m)	From/Port	To
Un-shielding Detachable DC Cable	2.0	DC Power Supply	EUT

Block Diagram of Test Setup

For Radiated Emissions:



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§15.247 (i), §1.1307 (b) (3) & §2.1091	Maximum Permissible Exposure(MPE)	Compliant
§15.203	Antenna Requirement	Compliant
§15.207(a)	AC Line Conducted Emissions	Not Applicable
§15.205, §15.209 & §15.247(d)	Radiated Emissions	Compliant
§15.247(a)(1)	20dBEmission Bandwidth&99% Occupied 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

Not Applicable: EUT is used for vehicle environment, so not required.

TEST EQUIPMENT LIST

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Radiated Emission Test					
Rohde & Schwarz	EMI Test Receiver	ESR3	102455	2024/01/16	2025/01/15
Sonoma instrument	Pre-amplifier	310 N	186238	2024/05/21	2025/05/20
Sunol Sciences	Broadband Antenna	JB1	A040904-1	2023/07/20	2026/07/19
Unknown	Cable	Chamber A Cable 1	N/A	2024/05/21	2025/05/20
Unknown	Cable	XH500C	J-10M-A	2024/05/21	2025/05/20
BACL	Active Loop Antenna	1313-1A	4031911	2024/05/14	2027/05/13
Unknown	Cable	2Y194	0735	2024/05/21	2025/05/20
Unknown	Cable	PNG214	1354	2024/05/21	2025/05/20
Audix	EMI Test software	E3	19821b(V9)	NCR	NCR
Rohde & Schwarz	Spectrum Analyzer	FSV40	101605	2024/03/27	2025/03/26
COM-POWER	Pre-amplifier	PA-122	181919	2024/06/18	2025/06/17
Schwarzbeck	Horn Antenna	BBHA9120D(1201)	1143	2023/07/26	2026/07/25
Unknown	RF Cable	KMSE	0735	2023/10/08	2024/10/07
Unknown	RF Cable	UFA147	219661	2023/10/08	2024/10/07
Unknown	RF Cable	XH750A-N	J-10M	2023/10/08	2024/10/07
JD	Multiplex Switch Test Control Set	DT7220FSU	DQ77926	NCR	NCR
A.H.System	Pre-amplifier	PAM-1840VH	190	2024/06/18	2025/06/17
Electro-Mechanics Co	Horn Antenna	3116	9510-2270	2023/09/18	2026/09/17
UTIFLEX	RF Cable	NO. 13	232308-001	2024/06/18	2025/06/17
Audix	EMI Test software	E3	191218(V9)	NCR	NCR
RF Conducted Test					
R&S	Spectrum Analyzer	FSU26	200120	2024/01/08	2025/01/07
MARCONI	10dB Attenuator	6534/3	2942	2024/06/27	2025/06/26
Micro-Tronics	RF Cable	8082176	W6102	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) (3) & §2.1091- MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Applicable Standard

According to subpart 15.247 (i) and subpart 2.1091 systems operating under the provisions of this section shall be operated in a manner that ensures the public is not exposed to RF energy level in excess of the communication guidelines.

According to KDB 447498 D04 Interim General RF Exposure Guidance

MPE-Based Exemption:

General frequency and separation-distance dependent MPE-based effective radiated power(ERP) thresholds are in Table B.1 [Table 1 of § 1.1307(b)(3)(i)(C)] to support an exemption from further evaluation from 300 kHz through 100 GHz.

Table 1 to § 1.1307(b)(3)(i)(C) - Single RF Sources Subject to Routine Environmental Evaluation

RF Source frequency (MHz)	Threshold ERP (watts)
0.3-1.34	1,920 R^2.
1.34-30	3,450 R^2/f^2.
30-300	3.83 R^2.
300-1,500	0.0128 R^2f.
1,500-100,000	19.2R^2.

Ris the minimum separation distance in meters
f = frequency in MHz

Result

Mode	Frequency (MHz)	Tune up conducted power# (dBm)	Antenna Gain#		ERP		Evaluation Distance (m)	ERP Limit (W)
			(dBi)	(dBd)	(dBm)	(W)		
FHSS	2406-2478	11.00	0	-2.15	8.85	0.008	0.2	0.768

Note: The tune up conducted power# and antenna gain# was declared by the applicant.

To maintain compliance with the FCC's RF exposure guidelines, place the equipment at least 20cm from nearby persons.

Result: Compliant.

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 an external antenna with unique antenna connector and the antenna gain[#] is 0dBi, fulfill the requirement of this section. Please refer to the EUT photos.

Result: Compliant

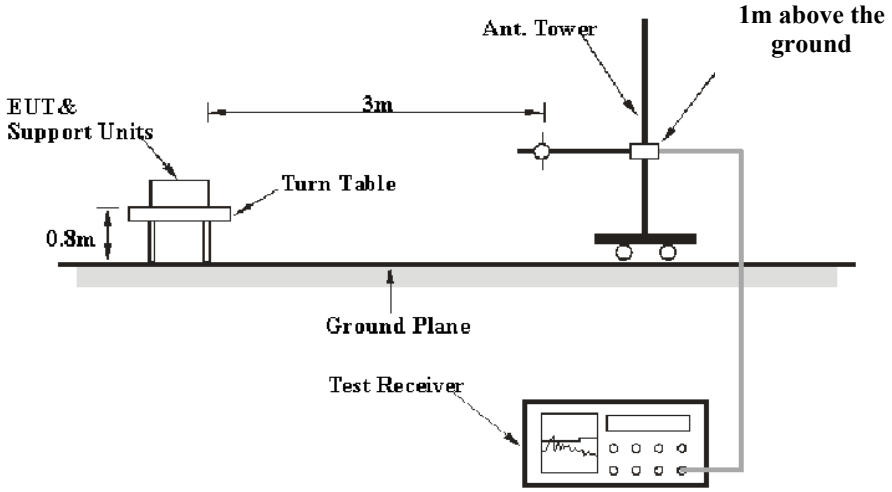
FCC §15.205, §15.209&§15.247(d) – RADIATED EMISSIONS

Applicable Standard

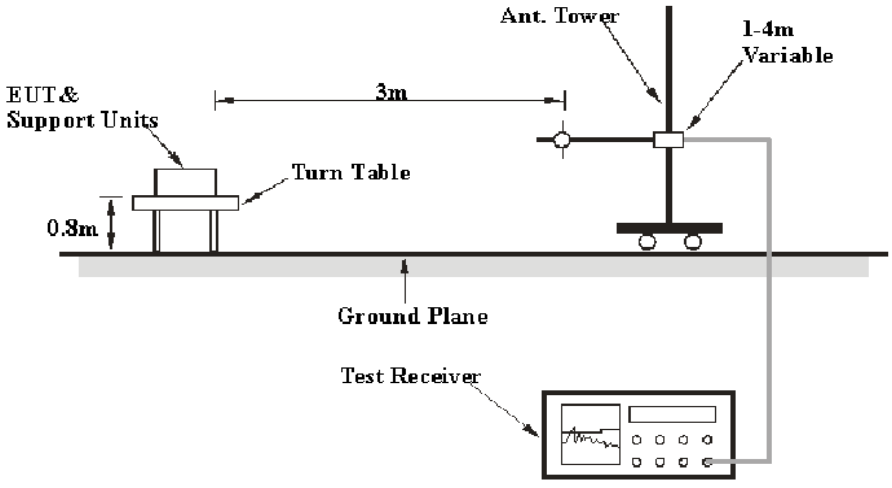
FCC §15.205; §15.209; §15.247(d)

EUT Setup

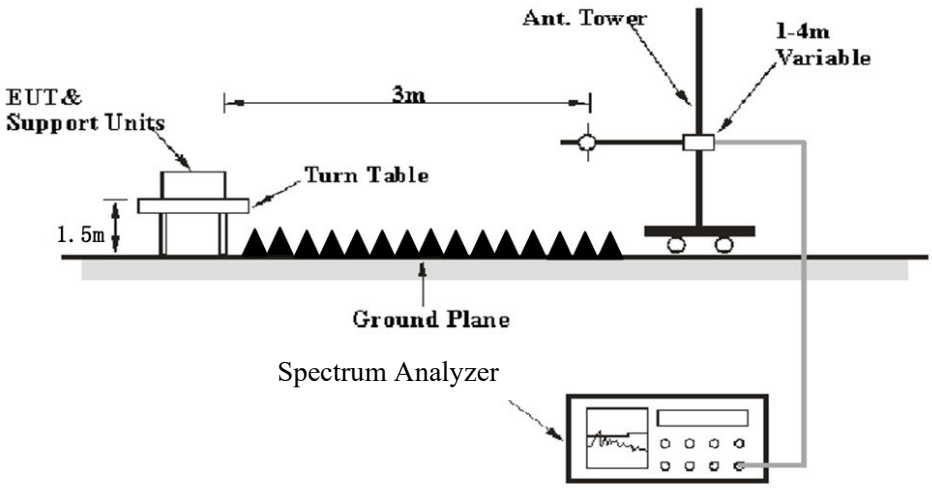
9 kHz-30MHz:



30MHz-1GHz:



Above 1GHz:



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

EMI Test Receiver & Spectrum Analyzer Setup

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

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

For Duty cycle measurement:

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

Test Procedure

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

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

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

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

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

Factor & Over Limit/Margin Calculation

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

Factor = Antenna Factor + Cable Loss - Amplifier Gain

The "**Over Limit or 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 margin calculation is as follows:

Margin/Over Limit = Corrected Amplitude/Level-Limit
Corrected Amplitude/Level = Reading + Factor

Test Data

Environmental Conditions

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

The testing was performed by Anson Su on 2024-07-25 for below 1GHz and Dylan Yang from 2024-07-26 to 2024-08-01 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.

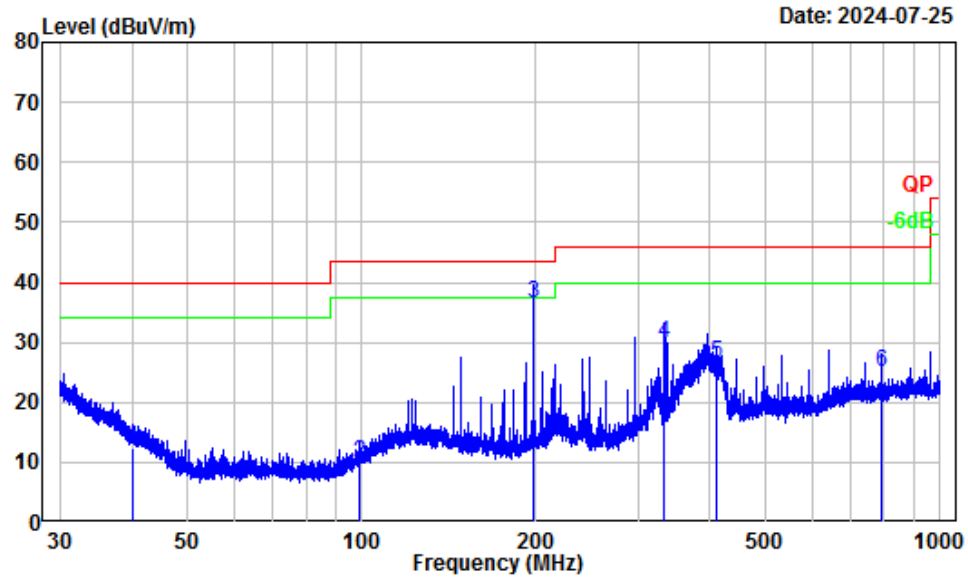
9 kHz-30MHz (Maximum output power mode, low channel)**:**

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

30MHz-1GHz: (Maximum output power mode, low channel)

For Model: CM2301

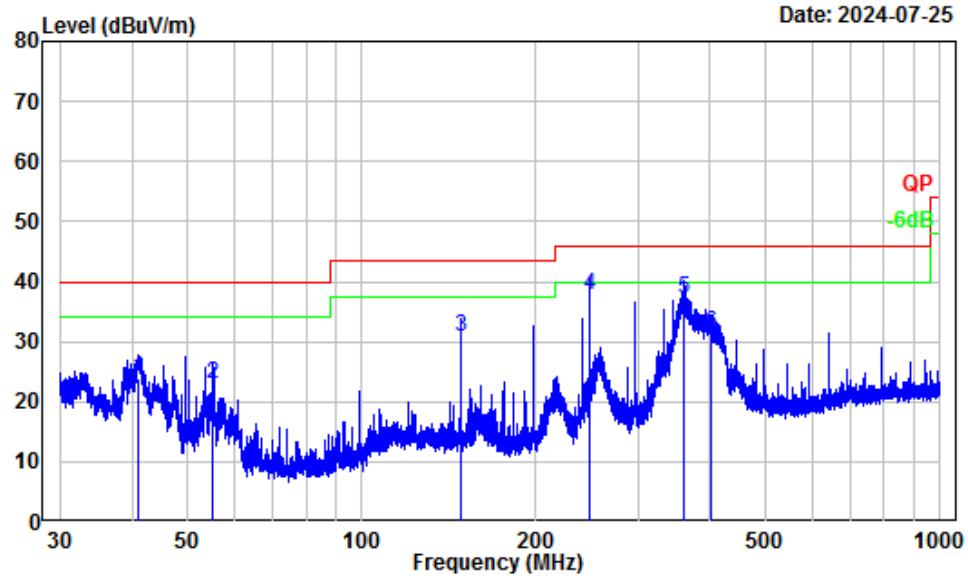
Horizontal



Site : Chamber A
Condition : 3m Horizontal
Project Number: 2401U80466E-RF
Test Mode : TX
Tester : Anson Su

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	40.21	-11.65	24.05	12.40	40.00	-27.60	QP
2	98.92	-15.72	25.79	10.07	43.50	-33.43	QP
3	197.98	-13.73	50.24	36.51	43.50	-6.99	QP
4	333.25	-12.25	42.28	30.03	46.00	-15.97	QP
5	410.92	-10.37	36.94	26.57	46.00	-19.43	QP
6	792.01	-5.35	30.41	25.06	46.00	-20.94	QP

Vertical

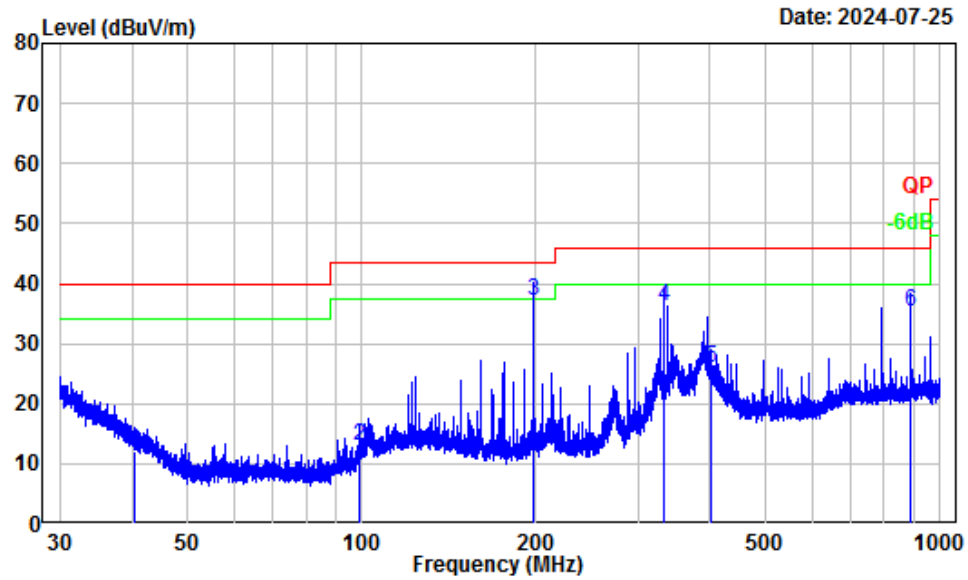


Site : Chamber A
Condition : 3m Vertical
Project Number: 2401U80466E-RF
Test Mode : TX
Tester : Anson Su

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	41.02	-13.60	37.37	23.77	40.00	-16.23	QP
2	55.27	-18.75	41.72	22.97	40.00	-17.03	QP
3	148.38	-13.77	44.44	30.67	43.50	-12.83	QP
4	247.25	-14.92	52.56	37.64	46.00	-8.36	QP
5	359.97	-11.99	49.00	37.01	46.00	-8.99	QP
6	401.13	-10.77	42.24	31.47	46.00	-14.53	QP

For Model: CM2302

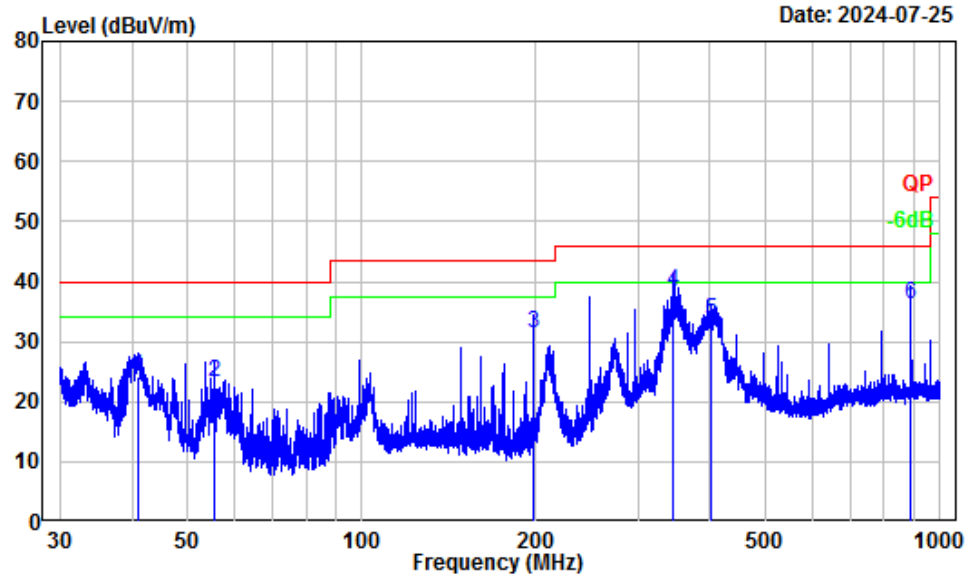
Horizontal



Site : Chamber A
Condition : 3m Horizontal
Project Number: 2401U80466E-RF
Test Mode : TX
Tester : Anson Su

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	40.52	-11.85	23.80	11.95	40.00	-28.05	QP
2	98.92	-15.72	28.71	12.99	43.50	-30.51	QP
3	197.98	-13.73	50.78	37.05	43.50	-6.45	QP
4	333.25	-12.25	48.55	36.30	46.00	-9.70	QP
5	402.72	-10.54	36.61	26.07	46.00	-19.93	QP
6	891.12	-4.50	39.80	35.30	46.00	-10.70	QP

Vertical



Site : Chamber A
Condition : 3m Vertical
Project Number: 2401U80466E-RF
Test Mode : TX
Tester : Anson Su

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	40.92	-13.54	37.68	24.14	40.00	-15.86	QP
2	55.39	-18.75	42.14	23.39	40.00	-16.61	QP
3	197.98	-14.81	46.24	31.43	43.50	-12.07	QP
4	346.20	-12.36	50.59	38.23	46.00	-7.77	QP
5	401.31	-10.77	44.15	33.38	46.00	-12.62	QP
6	891.12	-4.88	41.14	36.26	46.00	-9.74	QP

Above 1GHz:

Frequency (MHz)	Receiver		Polar (H/V)	Factor (dB/m)	Corrected Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	PK/AV					
Low Channel(2406MHz)							
2389.25	57.78	PK	H	-2.93	54.85	74.00	-19.15
2387.28	60.45	PK	V	-2.93	57.52	74.00	-16.48
4812.00	50.61	PK	H	1.69	52.30	74.00	-21.70
4812.00	52.56	PK	V	1.69	54.25	74.00	-19.75
Middle Channel(2445MHz)							
4890.00	50.47	PK	H	1.79	52.26	74.00	-21.74
4890.00	51.78	PK	V	1.79	53.57	74.00	-20.43
High Channel(2478MHz)							
2483.50	73.06	PK	H	-3.17	69.89	74.00	-4.11
2483.52	74.06	PK	V	-3.17	70.89	74.00	-3.11
4956.00	50.23	PK	H	2.77	53.00	74.00	-21.00
4956.00	51.66	PK	V	2.77	54.43	74.00	-19.57

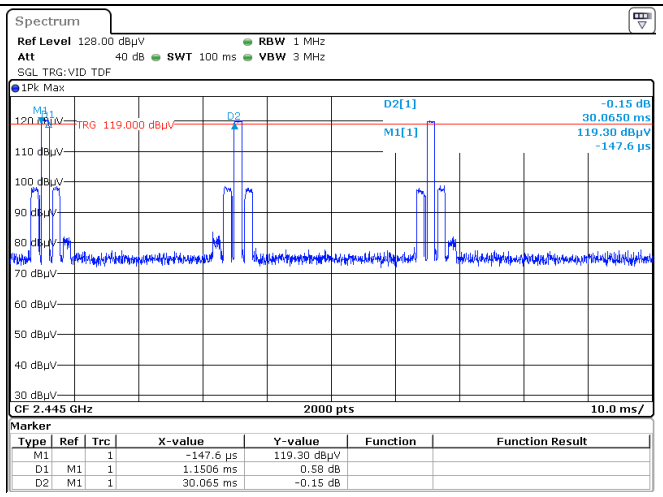
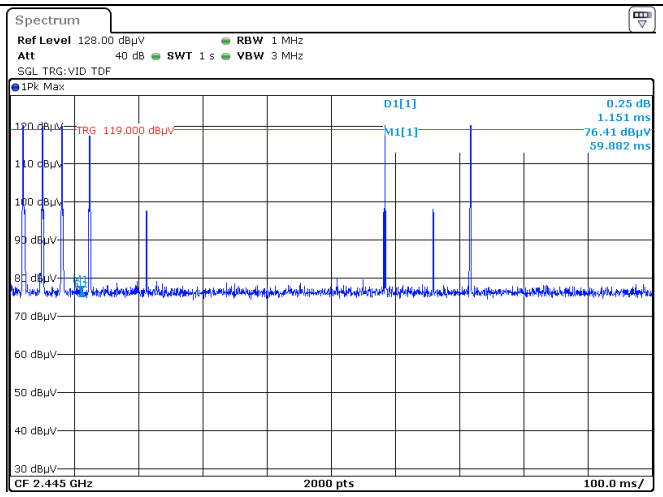
Note:

Corrected Factor = Antenna factor (RX) + Cable Loss – Amplifier Factor
Corrected Amplitude/Level = Corrected Factor + Reading
Margin = Corrected Amplitude/Level - Limit
Other emissions which were more than 20dB below limit or on noise floor level was not recorded.

Field Strength of Average							
Frequency (MHz)	**Peak Measurement @3m (dBµV/m)**	**Polar (H/V)**	**Duty Cycle Corrected Factor (dB)**	**Average Level (dBµV/m)**	**Limit (dBµV/m)**	**Margin (dB)**	**Comment**
Low Channel(2406MHz)							
2389.25	54.85	H	-29.24	25.61	54.00	-28.39	Bandedge
2387.28	57.52	V	-29.24	28.28	54.00	-25.72	Bandedge
4812.00	52.3	H	-29.24	23.06	54.00	-30.94	Harmonic
4812.00	54.25	V	-29.24	25.01	54.00	-28.99	Harmonic
Middle Channel(2445MHz)							
4890.00	52.26	H	-29.24	23.02	54.00	-30.98	Harmonic
4890.00	53.57	V	-29.24	24.33	54.00	-29.67	Harmonic
High Channel(2478MHz)							
2483.50	69.89	H	-29.24	40.65	54.00	-13.35	Bandedge
2483.52	70.89	V	-29.24	41.65	54.00	-12.35	Bandedge
4956.00	53.00	H	-29.24	23.76	54.00	-30.24	Harmonic
4956.00	54.43	V	-29.24	25.19	54.00	-28.81	Harmonic

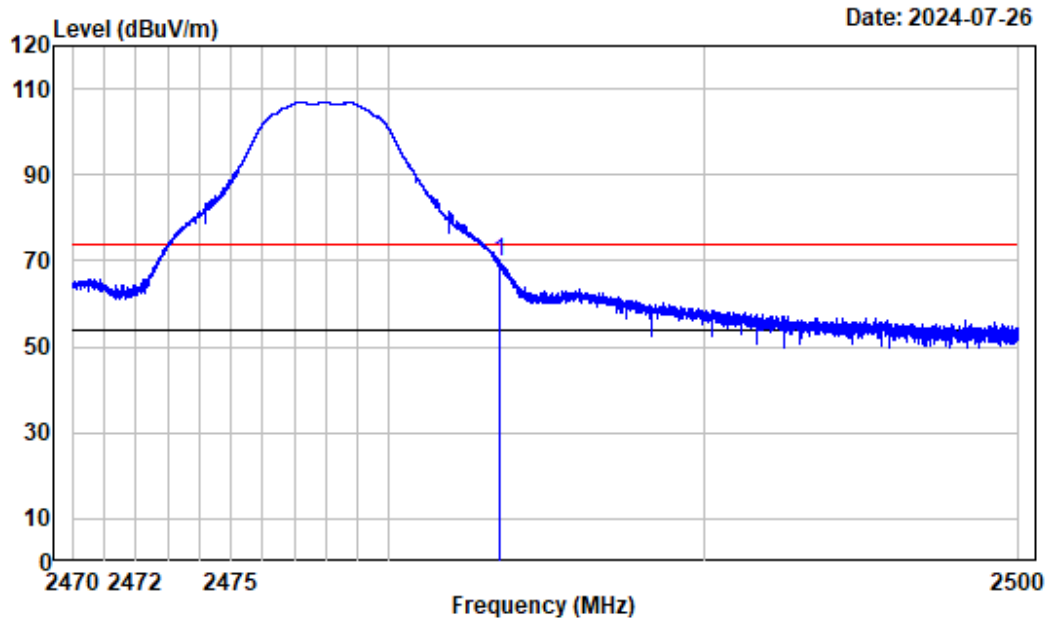
Note: Average level= Peak level+ Duty Cycle Corrected Factor
Margin = Average level - Limit

Worst case duty cycle:
Duty cycle = Ton/100ms = 1.15*3/100=0.0345
Duty Cycle Corrected Factor = 20lg (Duty cycle) = 20lg0.0345= -29.24

Duty Cycle (100ms)	
Duty Cycle (1s)	

Test plots for Band Edge Measurements (Radiated):

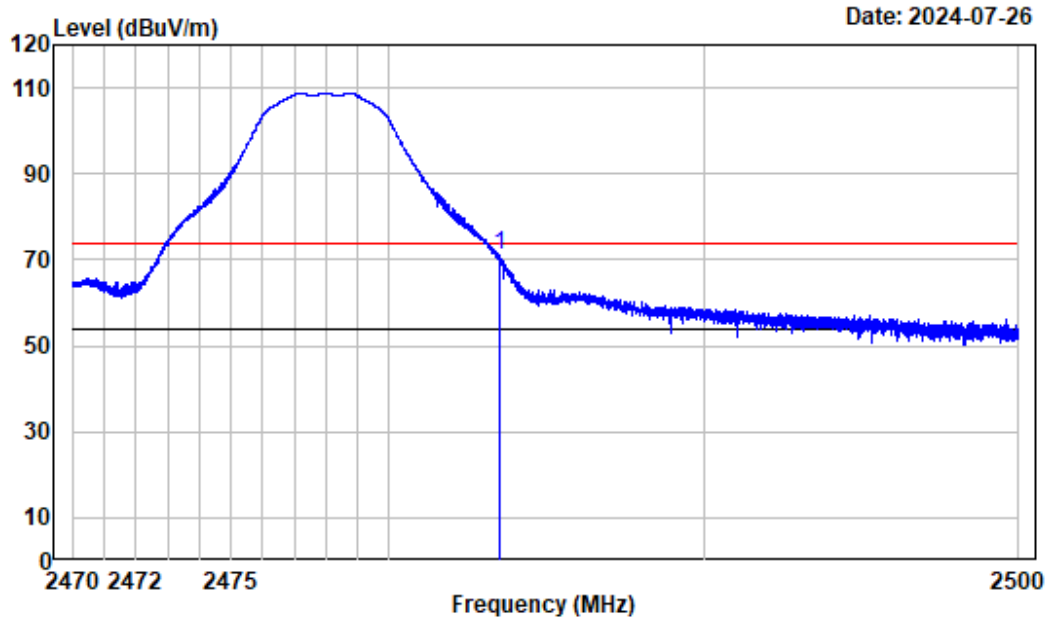
Test Channel:	2478MHz	Ant. Polar. :	Horizontal



Condition : Horizontal
Project No.: 2401U80466E-RF
Tester : Dylan
Note : FHSS_2478

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	2483.504	-3.17	73.06	69.89	74.00	-4.11	Peak

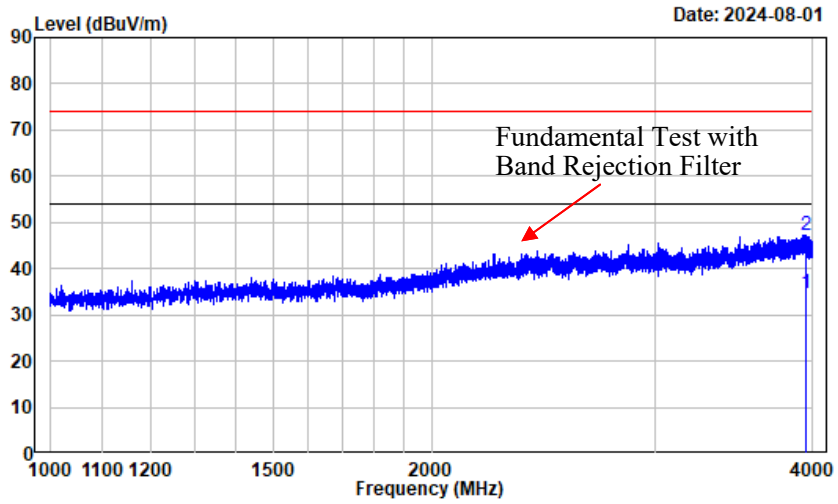
Test Channel:	2478MHz	Ant. Polar. :	Vertical



Condition : Vertical
Project No.: 2401U80466E-RF
Tester : Dylan
Note : FHSS_2478

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	2483.522	-3.17	74.06	70.89	74.00	-3.11	Peak

Listed with the worst harmonic margin test plot:

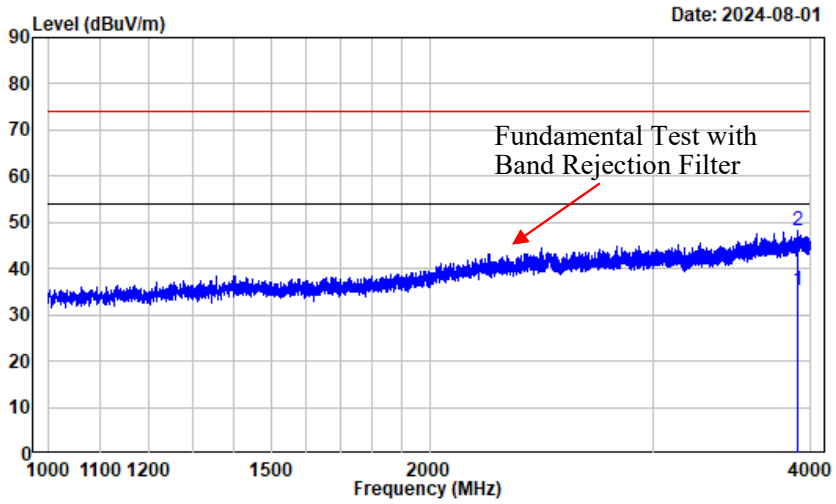
Horizontal	
1-4GHz	


```
Condition   : Horizontal
Project No.: 2401U80466E-RF
Tester      : Dylan
Note        : FHSS_2478
```

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	3947.875	-0.18	34.84	34.66	54.00	-19.34	Average
2	3947.875	-0.18	47.53	47.35	74.00	-26.65	Peak

Vertical

1-4GHz

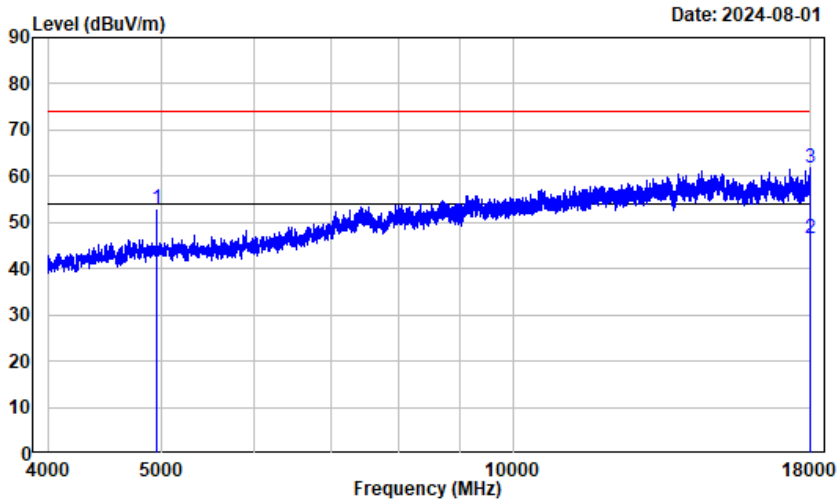


Condition : Vertical
Project No.: 2401U80466E-RF
Tester : Dylan
Note : FHSS_2478

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	3908.500	-0.47	35.69	35.22	54.00	-18.78	Average
2	3908.500	-0.47	48.58	48.11	74.00	-25.89	Peak

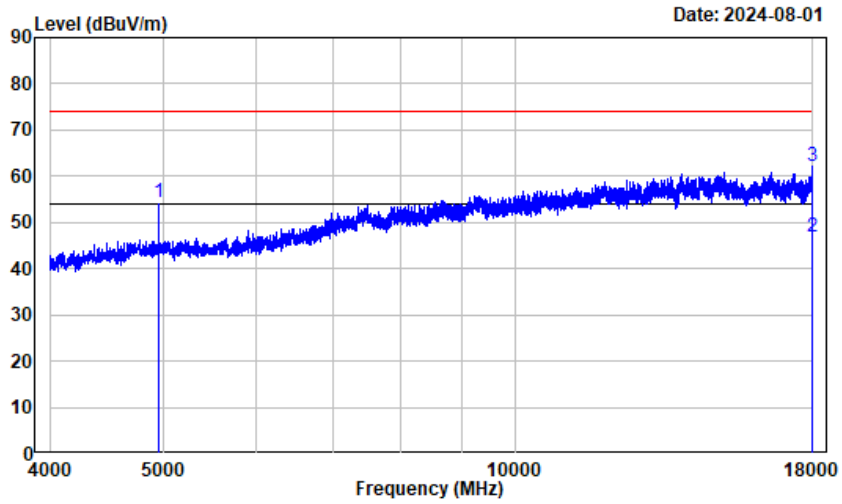
Horizontal

4-18GHz

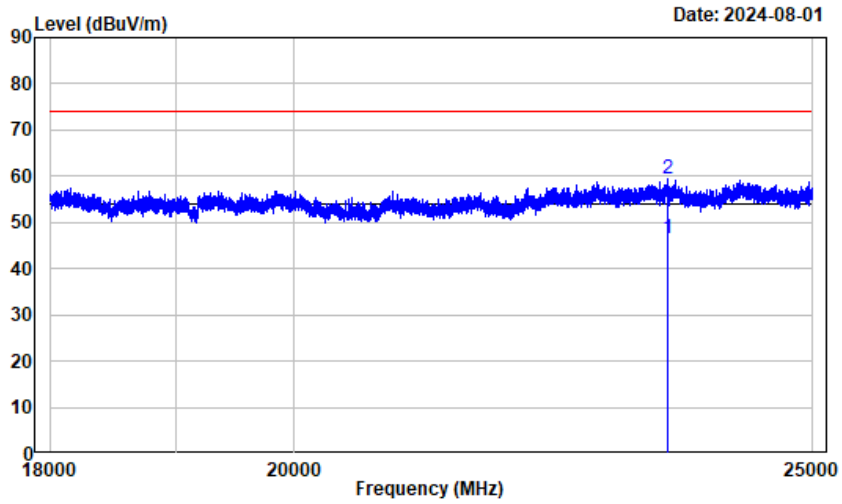


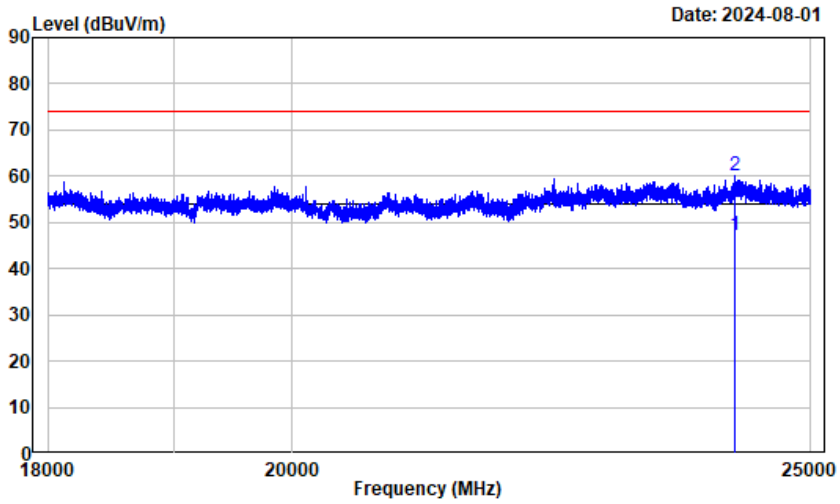
Condition : Horizontal
Project No.: 2401U80466E-RF
Tester : Dylan
Note : FHSS_2478

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	4956.000	2.77	50.23	53.00	74.00	-21.00	Peak
2	17984.250	24.51	22.09	46.60	54.00	-7.40	Average
3	17984.250	24.51	37.14	61.65	74.00	-12.35	Peak

Vertical	
4-18GHz	 Condition : Vertical Project No.: 2401U80466E-RF Tester : Dylan Note : FHSS_2478

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	4956.000	2.77	51.66	54.43	74.00	-19.57	Peak
2	17994.750	24.58	22.41	46.99	54.00	-7.01	Average
3	17994.750	24.58	37.41	61.99	74.00	-12.01	Peak

Horizontal	
18-25GHz	 Condition : Horizontal Project No.: 2401U80466E-RF Tester : Dylan Note : FHSS_2478 Freq / Factor / Read Level / Level / Limit Line / Over Limit / Remark MHz / dB/m / dBuV / dBuV/m / dBuV/m / dB 1 23487.130 17.45 28.98 46.43 54.00 -7.57 Average 2 23487.130 17.45 41.90 59.35 74.00 -14.65 peak

Vertical	
18-25GHz	 Condition : Vertical Project No.: 2401U80466E-RF Tester : Dylan Note : FHSS_2478 Freq / Factor / Read Level / Level / Limit Line / Over Limit / Remark MHz / dB/m / dBuV / dBuV/m / dBuV/m / dB 1 24203.750 18.29 28.96 47.25 54.00 -6.75 Average 2 24203.750 18.29 41.88 60.17 74.00 -13.83 peak

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

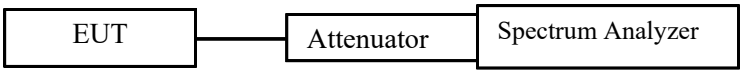
Applicable Standard

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

Test Procedure

Test Method: ANSI C63.10-2013 Clause 7.8.2

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



Note: Limit= Two-thirds of the 20 dB bandwidth

Test Data

Environmental Conditions

Temperature:	25 °C
Relative Humidity:	49 %
ATM Pressure:	101.0 kPa

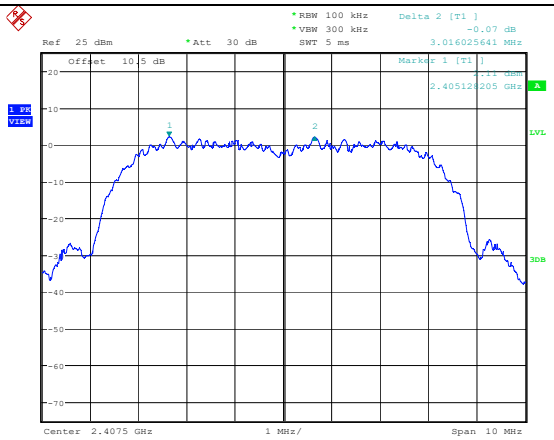
The testing was performed by Allen Bai on2024-08-18.

EUT operation mode: Transmitting

Test Result: Compliant

Test Channel	Test Frequency (MHz)	Channel Separation (MHz)	Limits (MHz)
Hop	2406	3.016	2.999

Please refer to the below plots:

Hop	 RBW 100 kHz VBW 300 kHz SWT 5 ms Delta 2 [T1] -0.07 dB 3.016025641 MHz Ref 25 dBm Att 30 dB Offset 10.5 dB Marker 1 [T1] 2.11 dBm 2.405126205 GHz 1 PK VIEW LVL 3DB Center 2.4075 GHz 1 MHz/ Span 10 MHz ProjectNo.:2401U80466E-RF Tester:Allen Bai Date: 18.AUG.2024 14:20:23

FCC §15.247(a) (1) - 20dBEMISSION BANDWIDTH & 99% OCCUPIED BANDWIDTH

Applicable Standard

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

Test Procedure

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

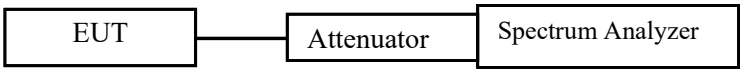
The following conditions shall be observed for measuring the occupied bandwidth and 20 dB bandwidth:
• The transmitter shall be operated at its maximum carrier power measured under normal test conditions.

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

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

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

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



Test Data

Environmental Conditions

Temperature:	25~27 ℃
Relative Humidity:	48~50 %
ATM Pressure:	101.0 kPa

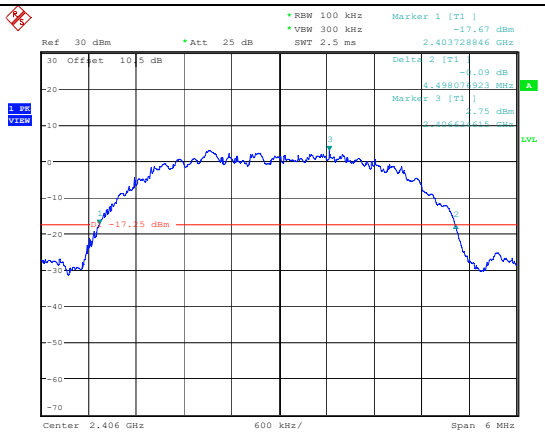
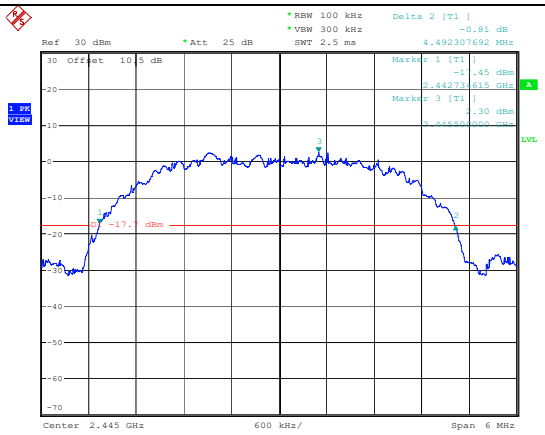
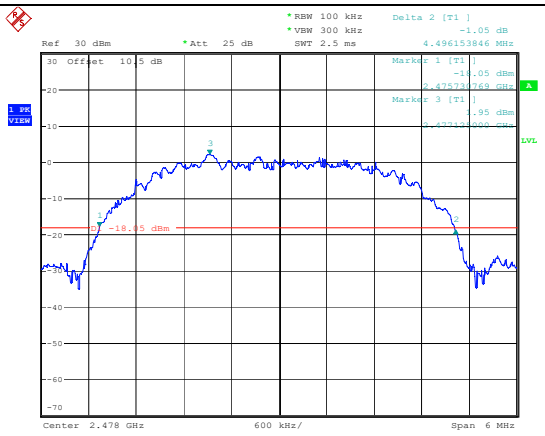
The testing was performed by Allen Bai on 2024-08-18 and Brian Li on 2024-10-21.

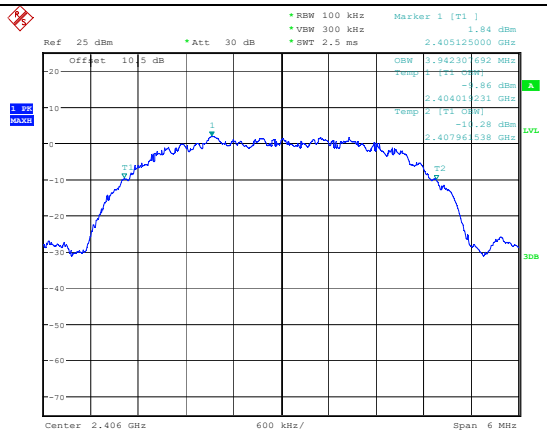
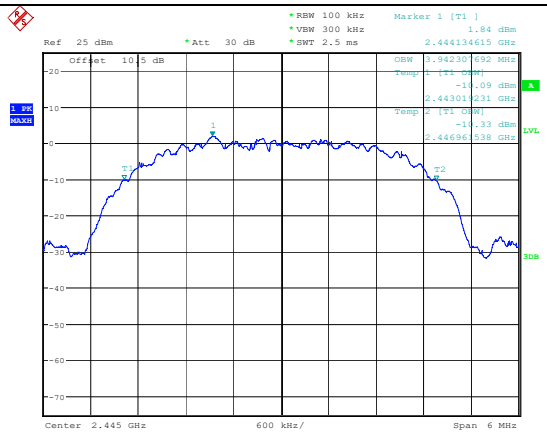
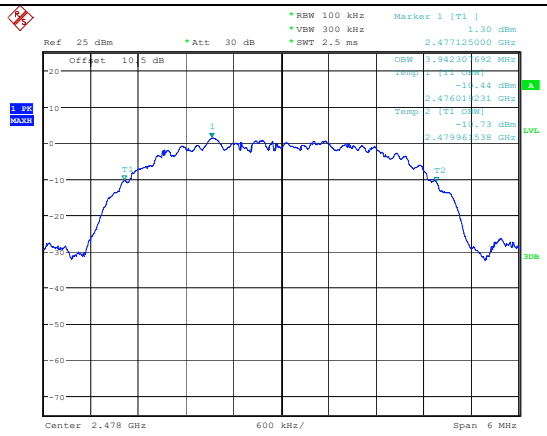
EUT operation mode: Transmitting

Test Result: Compliant

Mode	Channel	Frequency (MHz)	99% Emission Bandwidth (MHz)	20 dB Emission Bandwidth (MHz)
QPSK	Low	2406	3.942	4.498
	Middle	2445	3.942	4.492
	High	2478	3.942	4.496

Please refer to the below plots:

20 dB Bandwidth	
Low Channel	 ProjectNo.:2401U80466E-RF Tester:Brian Li Date: 21.OCT.2024 10:19:37
Middle Channel	 ProjectNo.:2401U80466E-RF Tester:Brian Li Date: 21.OCT.2024 10:13:21
High Channel	 ProjectNo.:2401U80466E-RF Tester:Brian Li Date: 21.OCT.2024 10:09:33

99% Emission Bandwidth	
Low Channel	 ProjectNo.:2401U80466E-RF Tester:Allen Bai Date: 18.AUG.2024 14:06:36
Middle Channel	 ProjectNo.:2401U80466E-RF Tester:Allen Bai Date: 18.AUG.2024 14:09:04
High Channel	 ProjectNo.:2401U80466E-RF Tester:Allen Bai Date: 18.AUG.2024 14:13:49

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

Applicable Standard

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

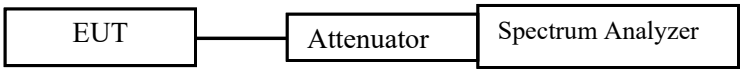
Test Procedure

Test Method: ANSI C63.10-2013 Clause 7.8.3

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

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

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



Test Data

Environmental Conditions

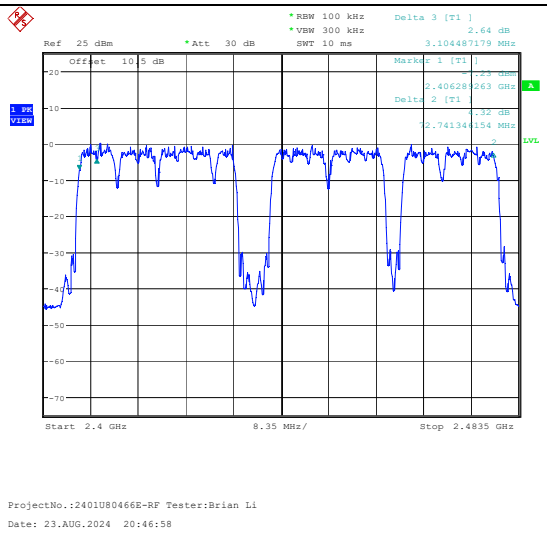
Temperature:	26 ℃
Relative Humidity:	48 %
ATM Pressure:	101.0 kPa

The testing was performed by Brian Li on2024-08-23.

EUT operation mode: Transmitting

Test Result: Compliant

Mode	Frequency Range (MHz)	Number of Hopping Channel (CH)	Limit (CH)
QPSK	2400-2483.5	19	≥15

Hopping Channel	
QPSK	

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

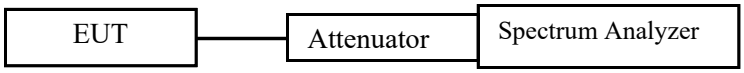
Applicable Standard

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

Test Procedure

Test Method: ANSI C63.10-2013 Clause 7.8.4

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



Test Data

Environmental Conditions

Temperature:	25~27 ℃
Relative Humidity:	48~50 %
ATM Pressure:	101.0 kPa

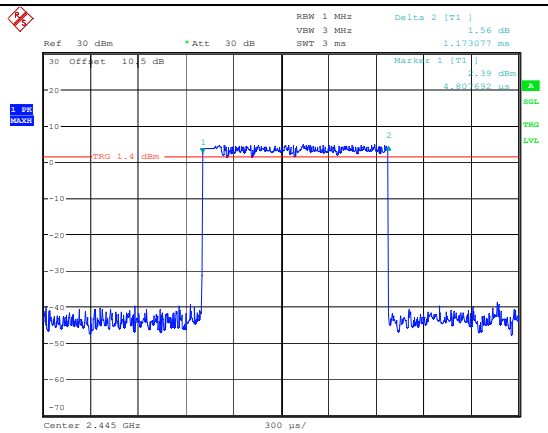
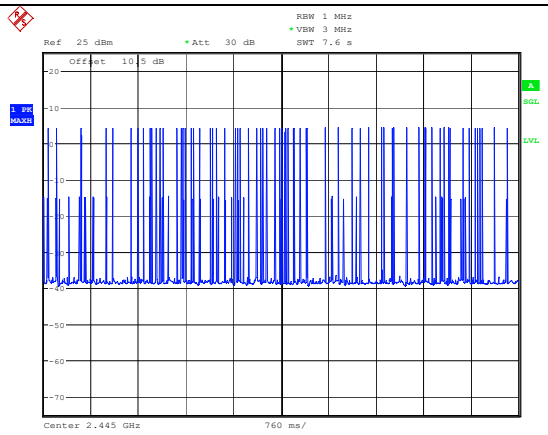
The testing was performed by Brian Li on 2024-08-23 and 2024-10-21.

EUT operation mode: Transmitting

Test Result: Compliant

Test Mode	Test Frequency (MHz)	Pulse width (ms)	Observation time (s)	Hopping Numbers in Observation time	Dwell Time (s)	Limit (s)
QPSK	2445	1.173	7.6	66	0.077	0.400

Note 1: Observation time= Hopping Channel Number× 0.4=19*0.4s= 7.6s
Note 2: Dwell Time = Pulse width *Hopping Numbers in Observation time

QPSK	
Pulse Width	
Hopping Numbers in 7.6s	

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

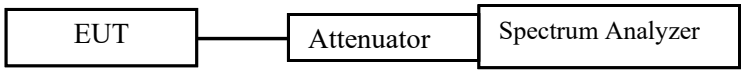
Applicable Standard

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

Test Procedure

Test Method: ANSI C63.10-2013 Clause 7.8.5

1. Place the EUT on a bench and set in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to one test equipment.
3. Add a correction factor to the display.



Test Data

Environmental Conditions

Temperature:	27 °C
Relative Humidity:	50 %
ATM Pressure:	101.0 kPa

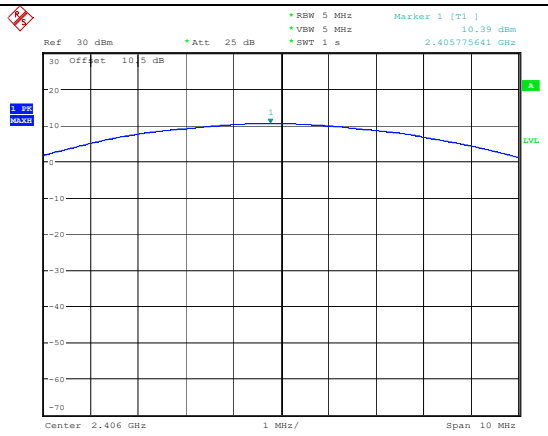
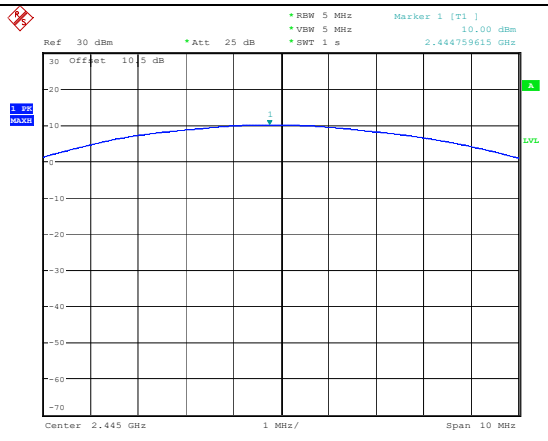
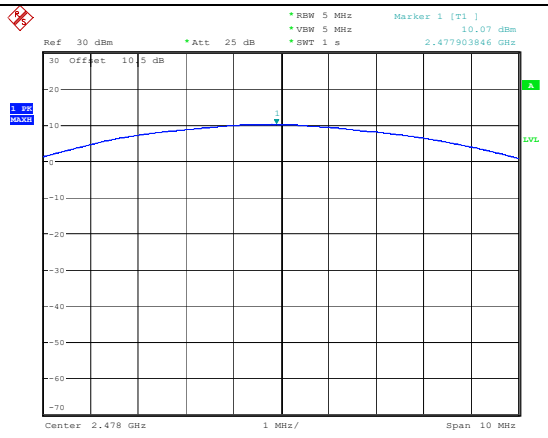
The testing was performed by Brian Li 2024-10-21.

EUT operation mode: Transmitting

Test Result: Compliant

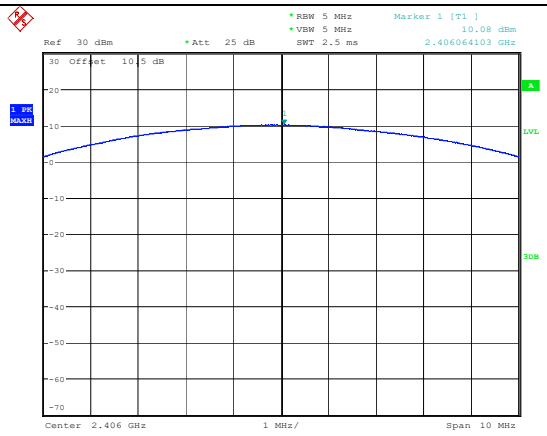
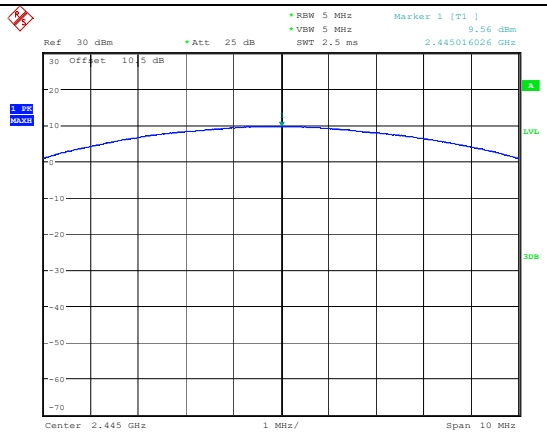
For model: CM2301

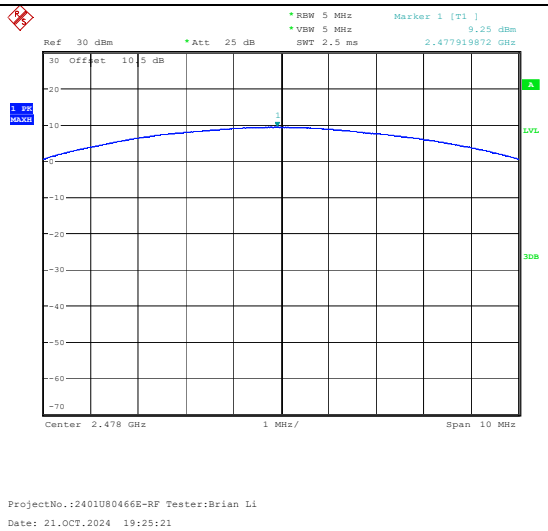
Mode	Channel	Frequency (MHz)	Peak Output Power (dBm)	Limit (dBm)
QPSK	Low	2406	10.39	21
	Middle	2445	10.00	21
	High	2478	10.07	21

Low Channel	
Middle Channel	
High Channel	

For model: CM2302

Mode	Channel	Frequency (MHz)	Peak Output Power (dBm)	Limit (dBm)
QPSK	Low	2406	10.08	21
	Middle	2445	9.56	21
	High	2478	9.25	21

Low Channel	
Middle Channel	

High Channel	

FCC §15.247(d) - BAND EDGES TESTING

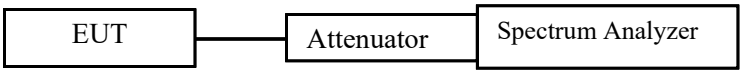
Applicable Standard

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

Test Procedure

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

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Remove the antenna from the EUT and then connect to a low loss RF cable from the antenna port to a EMI test receiver, then turn on the EUT and make it operate in transmitting mode. Then set it to Low Channel and High Channel within its operating range, and make sure the instrument is operated in its linear range.
3. Set RBW of spectrum analyzer to 100 kHz with a convenient frequency span including 100kHz bandwidth from band edge.
4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
5. Repeat above procedures until all measured frequencies were complete.



Test Data

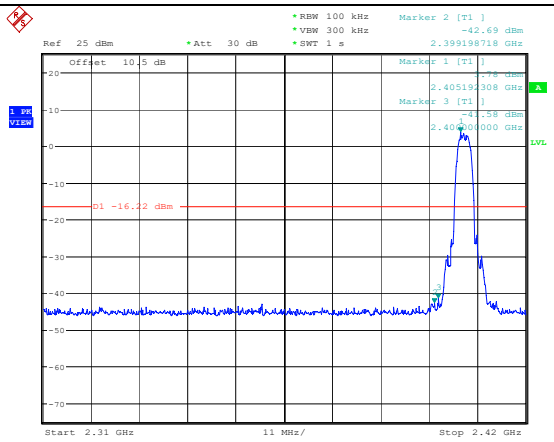
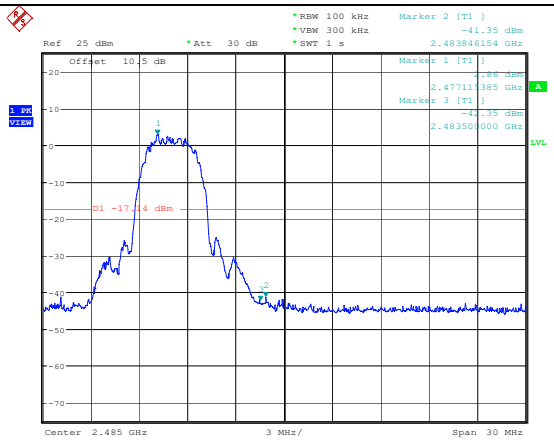
Environmental Conditions

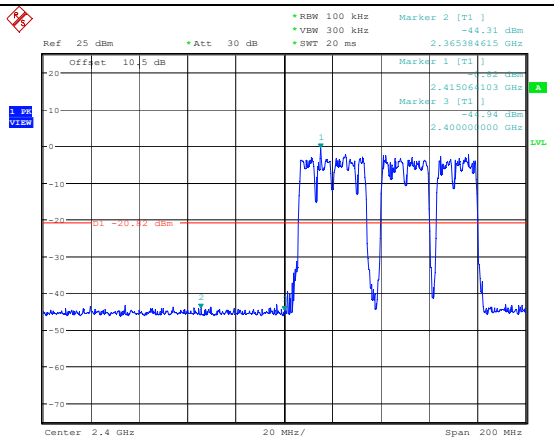
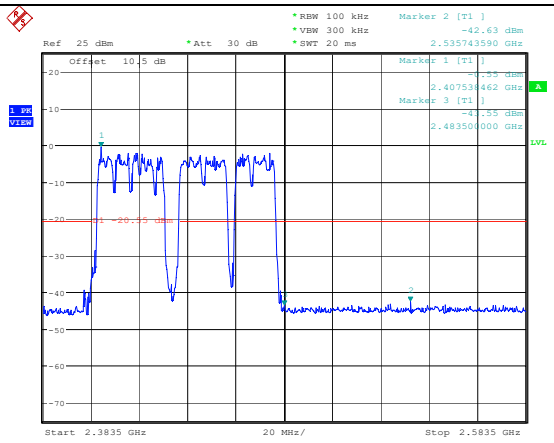
Temperature:	26 ℃
Relative Humidity:	48 %
ATM Pressure:	101.0 kPa

The testing was performed by Cheeb Huang on2024-08-05.

EUT operation mode: Transmitting

Test Result: Compliant

Band Edge, Single Channel	
QPSK, Left Side	
QPSK, Right Side	

Band Edge, Hopping Channel	
QPSK, Left Side	
QPSK, Right Side	

EUT PHOTOGRAPHS

Please refer to the attachment 2401U80466E-RF External photo and 2401U80466E-RF Internal photo.

TEST SETUP PHOTOGRAPHS

Please refer to the attachment 2401U80466E-RF Test Setup photo.

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