FCC PART 15.247

TEST REPORT

For

Altenergy Power System Inc.

Building 2, No. 522, Yatai Road, Jiaxing, China 314050

FCC ID: 2AFGR-APS2530X

Report Type:	**Product Name:**
Original Report	Zigbee module

Report Number:	RSHA240306001-00A
Report Date:	2024-07-23
Reviewed By:	Bard Liu
Approved By:	Oscar Ye
Prepared By:	Bay Area Compliance Laboratories Corp. (Kunshan) No.248, Chenghu Road, Development Zone, Yushan, Kunshan, Suzhou, Jiangsu, China Tel: +86-512-86175000 Fax: +86-512-88934268 www.baclcorp.com.cn

TABLE OF CONTENTS

REPORT REVISION HISTORY

Number of Revisions	Report No.	Version	Issue Date	Description
0	RSHA240306001-00A	R1V1	2024-07-23	Initial Release

GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

Applicant:	Altenergy Power System Inc.
Tested Model:	APS2530X
Product Name:	Zigbee module
Power Supply:	DC 2V~3.6V(Typical：DC 3.3V)
Maximum peak Output Power:	12.85 dBm
RF Function:	Zigbee
Operating Band/Frequency:	2405~2480MHz
Channel Number:	16
Channel Separation:	5MHz
Modulation Type	OQPSK
Antenna Type:	Monopole Antenna
★Maximum Antenna Gain:	3.26 dBi

Note: The antenna gain was provided by the applicant.

All measurement and test data in this report was gathered from production sample serial number: RSHA240306001-1 (Assigned by the BACL (Kuanshan). The EUT supplied by the applicant was received on 2024-03-06.)

Objective

This report is prepared for *Altenergy Power System Inc.* 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 Compliant with FCC Part 15, Subpart C, and 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 Compliant Testing of Unlicensed Wireless Devices and FCC 558074 D01 15.247 Meas Guidance v05r02.

Measurement Uncertainty

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

Test Facility

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

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

SYSTEM TEST CONFIGURATION

Description of Test Configuration

Channel	Frequency (MHz)	Channel	Frequency (MHz)
11	2405	21	2455
12	2410	22	2460
13	2415	23	2465
14	2420	24	2470
15	2425	25	2475
16	2430	26	2480
17	2435	/	/
18	2440	/	/
19	2445	/	/
20	2450	/	/

EUT was tested with Channel 11, 18 and 26.

Equipment Modifications

No modification was made to the EUT tested.

EUT Exercise Software

RF test tool: Smart Studio 7

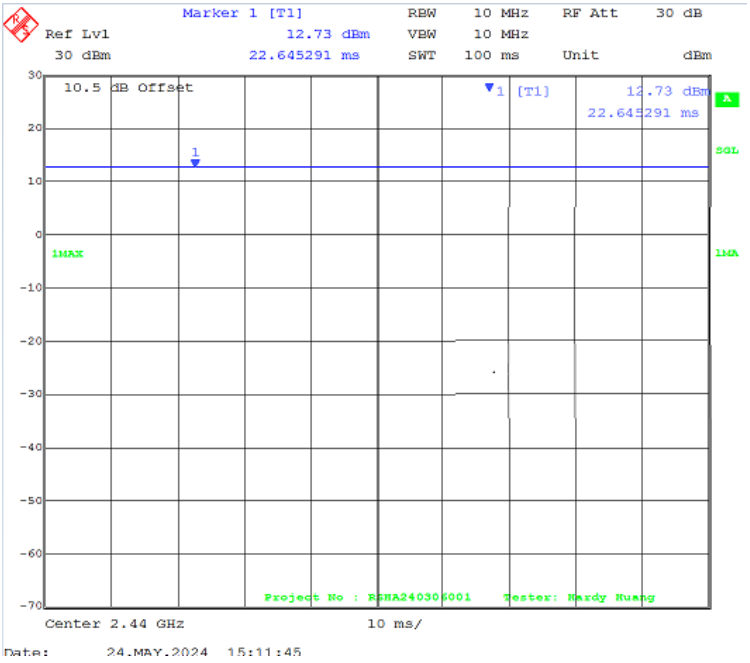
Pre-scan with all the data rates, and the worst case was performed as below:

Channel	Frequency(MHz)	★Power Level
Low	2405	9
Middle	2440	9
High	2480	9

Note: The power level setting was declared by the applicant.

Duty Cycle:

Middle Channel: 2440MHz



Mode	Duty Cycle(%)	Ton(ms)	Ton+off(ms)	10log(1/x)
Zigbee	100	100	100	0

Note: "x" means the Duty Cycle.

Support Equipment List and Details

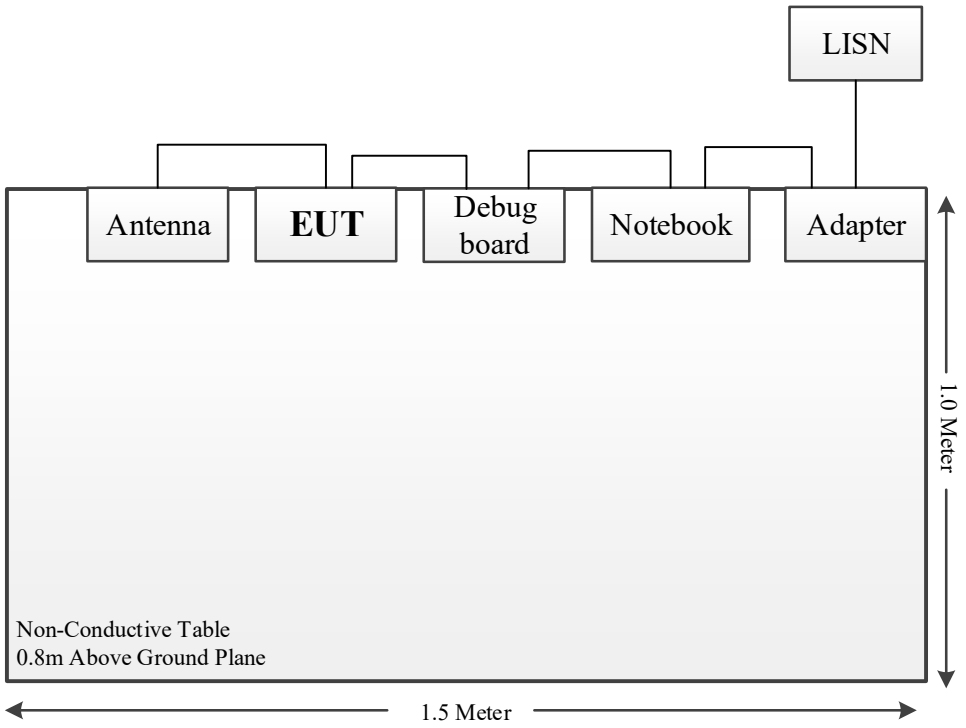
Manufacturer	Description	Model	Serial Number
Dell	Notebook	latitude E5430	FLONLV1
/	Debug board	/	/

External I/O Cable

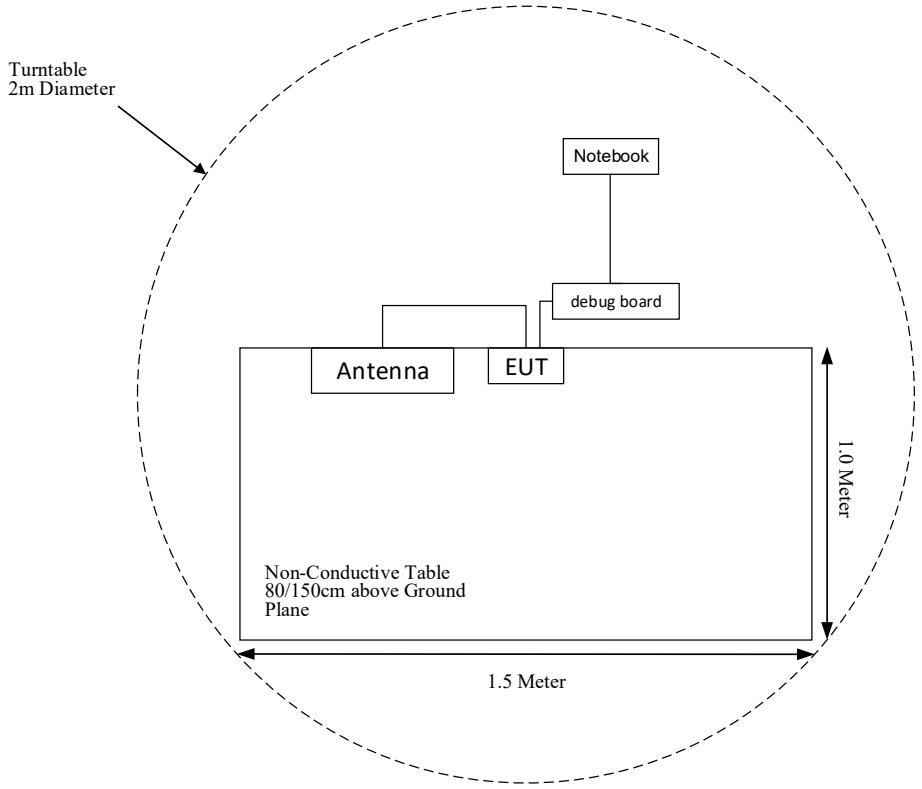
Cable Description	Length (m)	From Port	To Port
Data Cable	0.3	EUT	Debug board
USB Cable	1.5/7	Debug board	Notebook
Power Cable1	1.0	Notebook	Adapter
Power Cable2	1.5	Adapter	LISN

Block Diagram of Test Setup

For Conducted Emissions:



For Radiated Emissions (Below 1GHz & above 1 GHz):



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)	Spurious Emissions	Compliant
§15.247 (a)(2)	6 dB Emission Bandwidth	Compliant
§15.247(b)(3)	Maximum Conducted Output Power	Compliant
§15.247(d)	Band Edge	Compliant
§15.247(e)	Power Spectral Density	Compliant
FCC §1.1310 & §2.1091	MAXIMUM PERMISSIBLE EXPOSURE (MPE)	Compliant

TEST EQUIPMENT LIST

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Radiated Emission Test (Chamber 1#)					
Rohde & Schwarz	EMI Test Receiver	ESCI	100195	2023-05-23	2024-05-22
Sunol Sciences	Hybrid Antenna	JB3	A090314-1	2023-11-11	2024-11-10
ETS-LINDGREN	Loop Antenna	6512	108100	2023-11-09	2024-11-08
Narda	6dB Attenuator	773-6	10690812-2-1	2023-11-11	2024-11-10
Sonoma Instrument	Amplifier	310N	171205	2023-05-23	2024-05-22
MICRO-COAX	Coaxial Cable	Cable-8	008	2023-05-23	2024-05-22
MICRO-COAX	Coaxial Cable	Cable-9	009	2023-05-23	2024-05-22
MICRO-COAX	Coaxial Cable	Cable-10	010	2023-05-23	2024-05-22
Rohde & Schwarz	Test Software	EMC32	100361	N/A	N/A
Radiated Emission Test (Chamber 2#)					
Rohde & Schwarz	EMI Test Receiver	ESU40	100207	2024-04-25	2025-04-24
ETS-LINDGREN	Horn Antenna	3115	9207-3900	2023-06-27	2024-06-26
ETS-LINDGREN	Horn Antenna	3116	2516	2024-01-06	2025-01-05
A.H.Systems, inc	Amplifier	PAM-0118P	512	2024-04-25	2025-04-24
EM Electronics Corporation	Amplifier	EM18G40G	060726	2024-04-25	2025-04-24
MICRO-TRONICS	Band Reject Filter	BRM50702	G024	2023-08-05	2024-08-04
Narda	Attenuator	20dB	020	2024-04-23	2025-04-22
Rohde & Schwarz	Auto Test Software	EMC32	100361	N/A	N/A
MICRO-COAX	Coaxial Cable	Cable-6	006	2024-04-25	2025-04-24
MICRO-COAX	Coaxial Cable	Cable-11	011	2024-04-25	2025-04-24
MICRO-COAX	Coaxial Cable	Cable-12	012	2024-04-25	2025-04-24
MICRO-COAX	Coaxial Cable	Cable-13	013	2024-04-25	2025-04-24
RF Conducted Test					
Rohde & schwarz	Spectrum Analyzer	FSIQ26	100048	2024-04-24	2025-04-23
Narda	Attenuator	10dB	010	2024-04-23	2025-04-22
XHFDZ	RG316 Coaxial Cable	SMA-316	XHF-1175	Each time	N/A
Conducted Emission Test					
Rohde & Schwarz	EMI Test Receiver	ESR	101746	2024-04-23	2025-04-22
Rohde & Schwarz	LISN	ENV216	101115	2024-04-23	2025-04-22
Audix	Test Software	e3	V9	N/A	N/A
Rohde & Schwarz	Pulse Limiter	ESH3-Z2	0357.8810.54	2024-04-24	2025-04-23
MICRO-COAX	Coaxial Cable	Cable-15	015	2024-04-23	2025-04-22

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

FCC §15.203 - ANTENNA REQUIREMENT

Applicable Standard

According to § 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 user of a standard antenna jack or electrical connector is prohibited. The structure and application of the EUT were analyzed to determine Compliant 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 a monopole antenna and the antenna gain is 3.26 dBi, which use a unique type of connector to attach to the EUT. Fulfill the requirement of this section. Please refer to the EUT photos.

Result: Compliant.

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

Applicable Standard

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

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

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

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

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

Calculated Formulary

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

Calculated Data:

Mode	Frequency Range (MHz)	Antenna Gain		★Tune-up Output Power		Evaluation Distance (cm)	Power Density (mW/cm^2)	MPE Limit (mW/cm^2)
		(dBi)	(numeric)	(dBm)	(mW)			
Zigbee	2405~2480	3.26	2.12	13	19.95	20	0.0084	1.0

Note:
1. For the above tune up power were declared by the manufacturer.

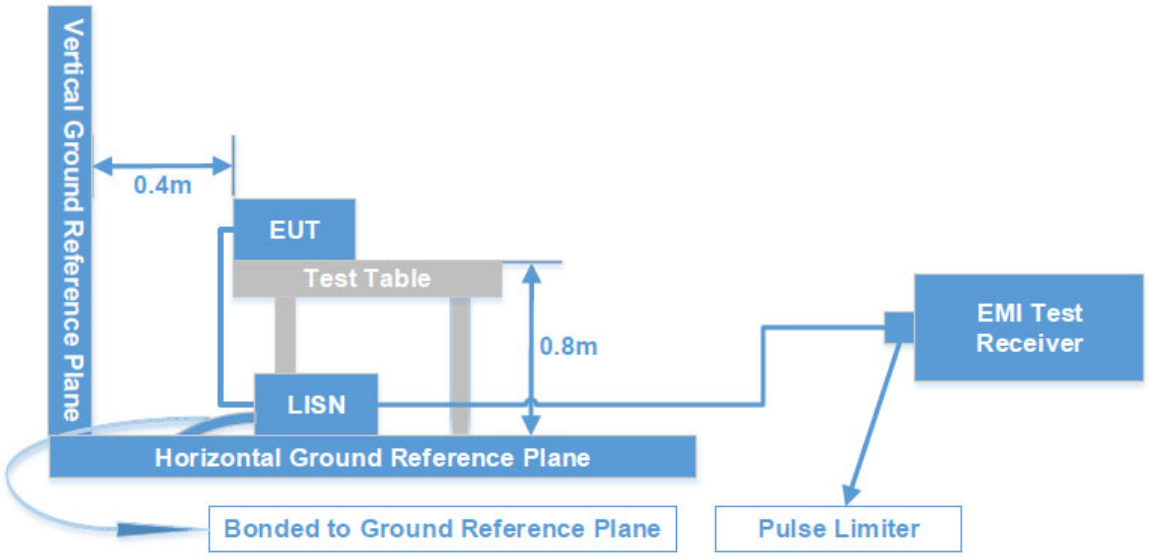
Result: The device meet FCC MPE at 20 cm distance.

FCC §15.207 (a) - AC LINE CONDUCTED EMISSIONS

Applicable Standard

FCC §15.207(a)

EUT Setup



The measurement procedure of EUT setup is according with ANSI C63.10-2013. The related limit was specified in FCC Part 15.207.

The spacing between the peripherals was 10 cm.

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	IF B/W
150 kHz – 30 MHz	9 kHz

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.

Factor & Over Limit Calculation

The Factor is calculated by adding LISN VDF (Voltage Division Factor), Cable Loss and Transient Limiter Attenuation. The basic equation is as follows:

Factor (dB) = LISN VDF (dB) + Cable Loss (dB) + Transient Limiter Attenuation (dB)

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

Over Limit (dB) = Read level (dBμV) + Factor (dB) - Limit (dBμV)

Test Results Summary

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

Test Data: See Appendix

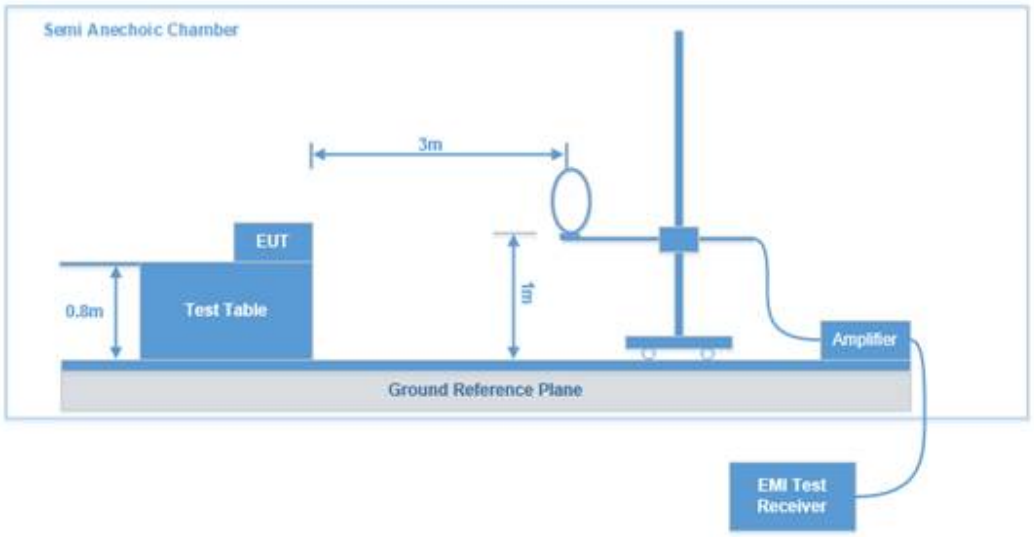
FCC §15.209, §15.205 & §15.247(d) - SPURIOUS EMISSIONS

Applicable Standard

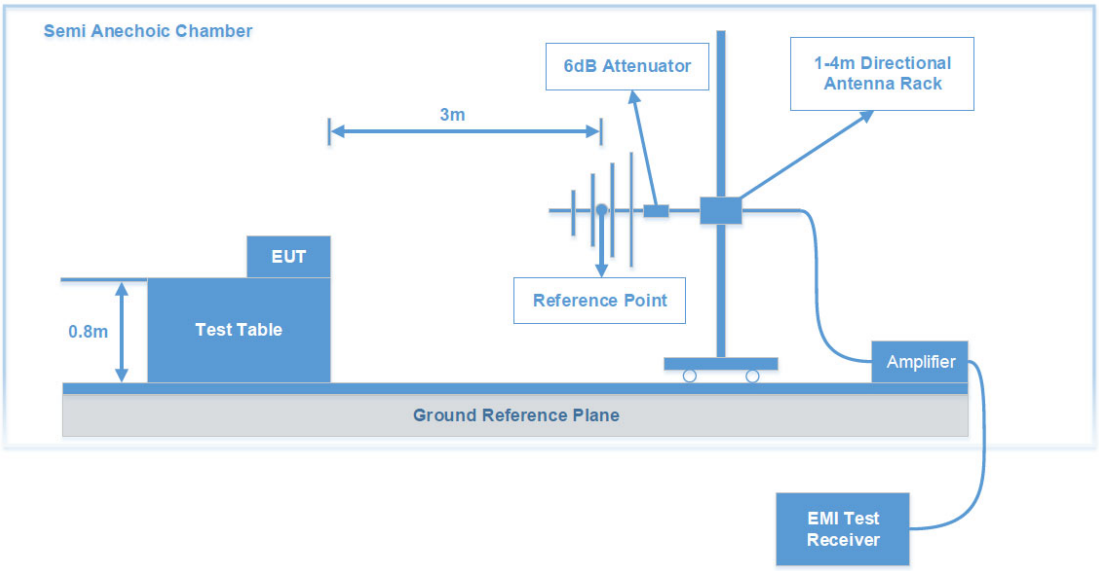
FCC §15.247 (d); §15.209; §15.205;

EUT Setup

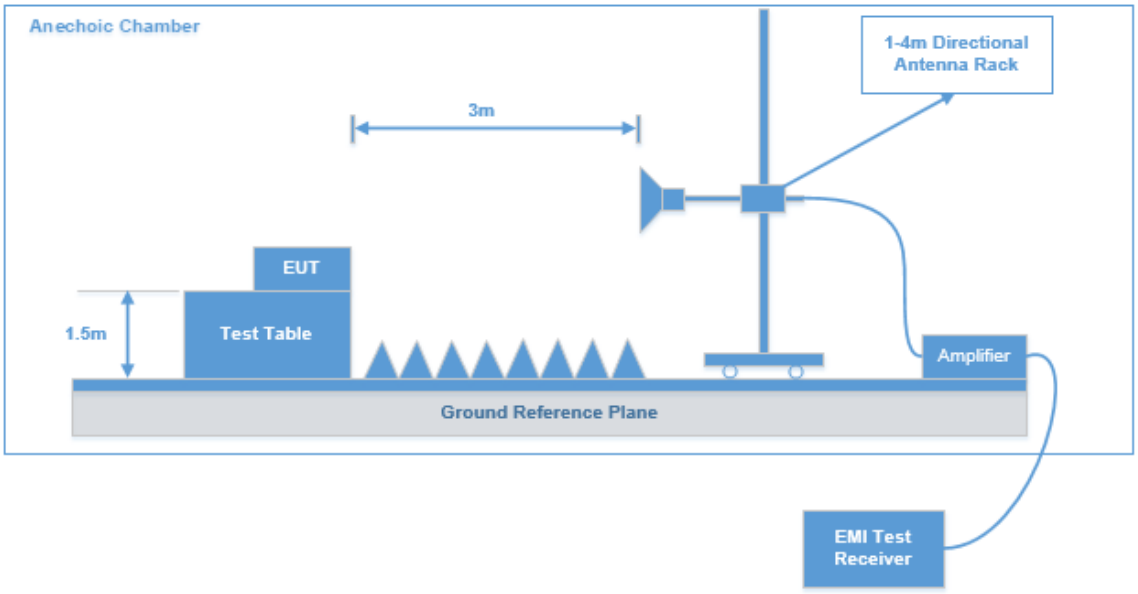
9 kHz - 30 MHz:



30 MHz - 1 GHz:



1 GHz -25 GHz:



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

EMI Test Receiver Setup

The system was investigated from 9 kHz to 25 GHz.

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

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

Test Procedure

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

Data was recorded in Quasi-peak detection mode for frequency range of 9 kHz-1 GHz, peak and Average detection mode for frequencies above 1 GHz.

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

Corrected Amplitude & Margin Calculation

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

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

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

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

Margin (dB) = Limit (dBμV/m) - Corrected Amplitude (dBμV/m)

Test Results Summary

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

Test Data: See Appendix

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

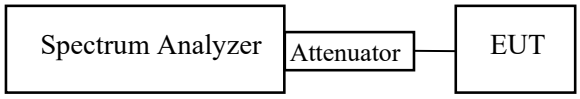
Applicable Standard

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

According to ANSI C63.10-2013 sub-clause 11.8.1

1. Set RBW = 100 kHz.
2. Set the video bandwidth (VBW) ≥ 3 x RBW.
3. Detector = Peak.
4. Trace mode = max hold.
5. Sweep = auto couple.
6. Allow the trace to stabilize.
7. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.



Test Data: See Appendix

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

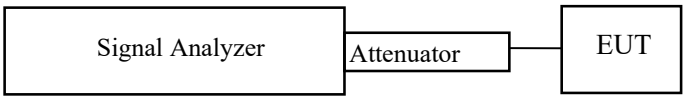
Applicable Standard

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, Compliant 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

According to ANSI C63.10-2013 sub-clause 11.9.1.3

1. Set the RBW ≥ DTS bandwidth.
2. Set VBW ≥ 3 x RBW.
3. Set span ≥ 3 x RBW
4. Sweep time = auto couple.
5. Detector = peak.
6. Trace mode = max hold.
7. Allow trace to fully stabilize.
8. Use peak marker function to determine the peak amplitude level.



Test Data: See Appendix

FCC §15.247(d) - BAND EDGE

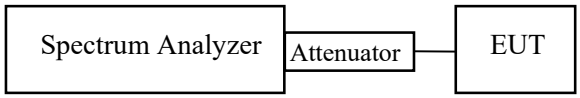
Applicable Standard

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 Compliant with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

Test Procedure

According to ANSI C63.10-2013 sub-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. Position the EUT without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
3. Set RBW to 100 kHz and VBW of spectrum analyzer to 300 kHz with a convenient frequency span including 100 kHz bandwidth from band edge.
4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
5. Repeat above procedures until all measured frequencies were complete.



Test Data: See Appendix

FCC §15.247(e) - POWER SPECTRAL DENSITY

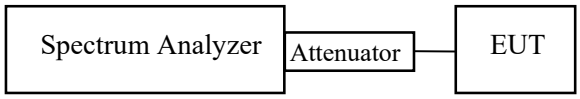
Applicable Standard

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

According to ANSI C63.10-2013 sub-clause 11.10.2

1. Use this procedure when the maximum peak conducted output power in the fundamental emission is used to demonstrate Compliant.
2. Set the RBW to: 3kHz≤ RBW≤100 kHz.
3. Set the VBW ≥ 3×RBW.
4. Set the span to 1.5 times the DTS bandwidth.
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Use the peak marker function to determine the maximum amplitude level within the RBW.
10. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.



Test Data: See Appendix

APPENDIX - TEST DATA

Environmental Conditions & Test Information

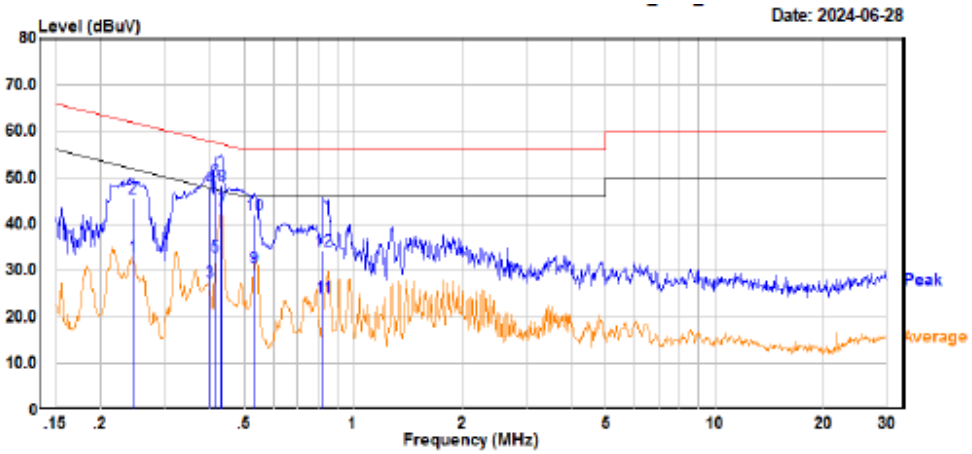
Test Item:	Duty Cycle	AC Line Conducted Emissions	Spurious Emissions		
			9kHz~1GHz	1GHz~18GHz	18GHz~25GHz
Test Date:	2024-05-24	2024-06-28	2024-03-20	2024-06-05	2024-06-14
Temperature:	23.1℃	24.1℃	17 ℃	24.7℃	24.1℃
Relative Humidity:	48%	65 %	47 %	43 %	51 %
ATM Pressure:	101.1 kPa	100.9 kPa	102.8kPa	101.5 kPa	100.3 kPa
Test Result:	/	Pass	Pass	Pass	Pass
Test Engineer:	Hardy Huang	Joe Zhang	Leah Li	Klein Zhu	Hugh Wu

Test Item:	6 dB Emission Bandwidth	Maximum Conducted Output Power	Band Edge	Power Spectral Density
Test Date:	2024-05-24			
Temperature:	23.1℃			
Relative Humidity:	48%			
ATM Pressure:	101.1 kPa			
Test Result:	Pass			
Test Engineer:	Hardy Huang			

AC LINE CONDUCTED EMISSIONS

EUT operation mode: Transmitting in maximum output power mode Low channel

AC 120V/60 Hz, Line

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Site                 : CE
Condition            : limit\FCC PART 15.207
                     : DET:Peak
Project No.          : RSHA240306001
Model                : APS2530X
Phase                : L
Voltage              : 120V/60Hz
Mode                 : ZigBee
Test Equipment       : ENV216,ESR
Temperature          : 24.1℃
Humidity             : 65%
Atmospheric pressure: 100.9kPa
Test Engineer        : Joe Zhang
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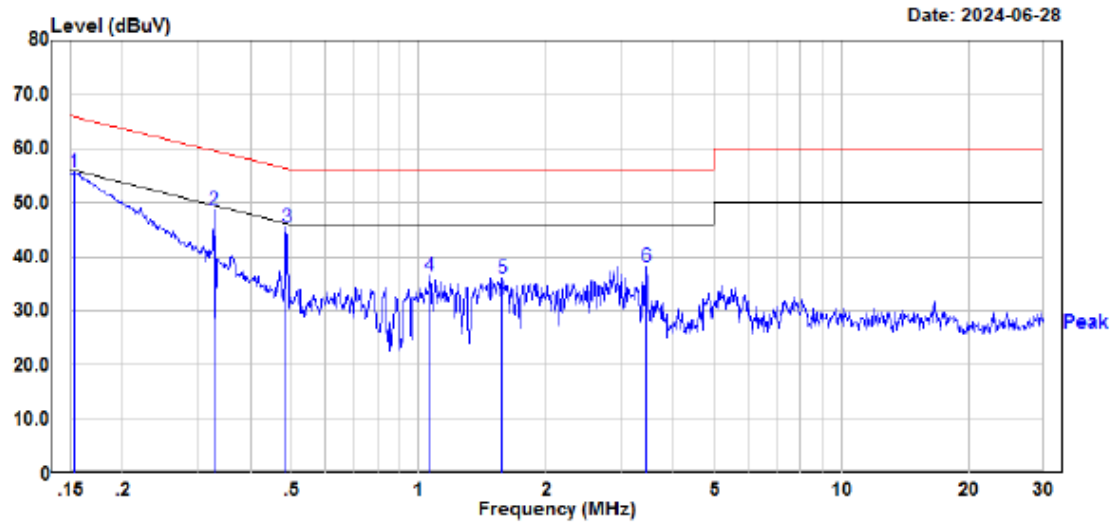
	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	
1	0.244	12.90	20.13	33.03	51.94	-18.91	Average
2	0.244	25.50	20.13	45.63	61.94	-16.31	QP
3	0.398	7.40	20.20	27.60	47.89	-20.29	Average
4	0.398	27.50	20.20	47.70	57.89	-10.19	QP
5	0.415	12.90	20.21	33.11	47.55	-14.44	Average
6	0.415	29.40	20.21	49.61	57.55	-7.94	QP
7	0.432	22.69	20.23	42.92	47.22	-4.30	Average
8	0.432	28.19	20.23	48.42	57.22	-8.80	QP
9	0.529	10.70	20.12	30.82	46.00	-15.18	Average
10	0.529	22.00	20.12	42.12	56.00	-13.88	QP
11	0.825	4.20	19.91	24.11	46.00	-21.89	Average
12	0.825	14.40	19.91	34.31	56.00	-21.69	QP

AC 120V/60 Hz, Neutral



Site : CE
Condition : limit\FCC PART 15.207
: DET:Peak
Project No. : RSHA240306001
Model : APS2530X
Phase : N
Voltage : 120V/60Hz
Mode : ZigBee
Test Equipment : ENV216,ESR
Temperature : 24.1℃
Humidity : 65%
Atmospheric pressure: 100.9kPa
Test Engineer : Joe Zhang

	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	
1	0.153	35.54	20.12	55.66	65.83	-10.17	Peak
2	0.328	28.37	20.18	48.55	59.50	-10.95	Peak
3	0.486	25.35	20.16	45.51	56.23	-10.72	Peak
4	1.058	16.87	19.75	36.62	56.00	-19.38	Peak
5	1.577	16.10	20.00	36.10	56.00	-19.90	Peak
6	3.449	18.06	20.24	38.30	56.00	-17.70	Peak

SPURIOUS EMISSIONS

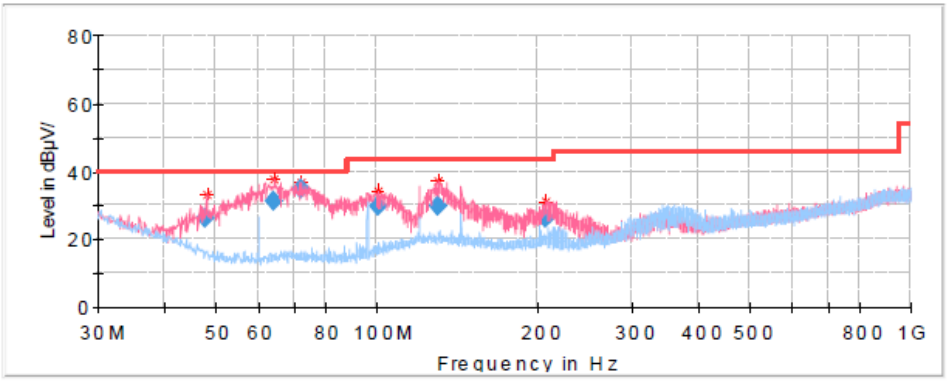
EUT operation mode: Transmitting

After pre-scan in the X, Y and Z axes of orientation, the worst case is below:
***9 kHz-30 MHz**:(Transmitting in maximum output power channel)*
The amplitude of spurious emissions attenuated more than 20 dB below the limit was not be recorded.

30 MHz - 1 GHz:
low channel: 2405MHz

Common Information

Project No:	RSHA240306001
EUT Model:	APS2530X
Test Mode:	TX
Standard:	FCC Part 15.247 & FCC Part 15.205 & FCC Part 15.209
Test Equipment:	ESCI、JB3、310N
Temperature:	17.0℃
Humidity:	47%
Barometric Pressure:	102.8kPa
Test Engineer:	Leah Li
Test Date:	2024/3/20



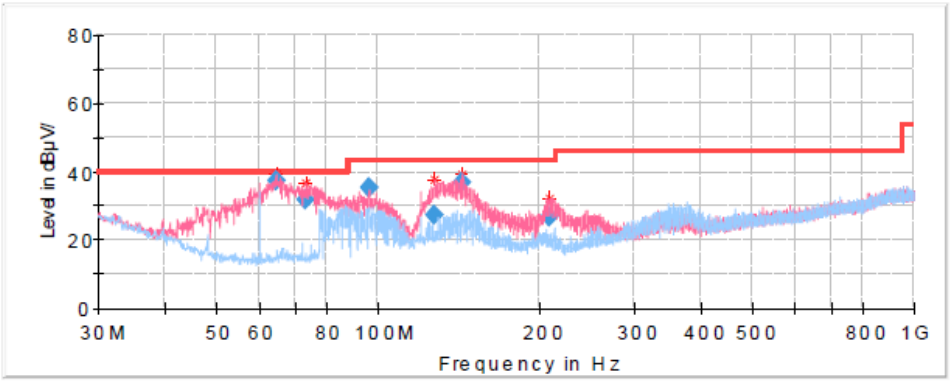
Final_Result

Frequency (MHz)	QuasiPeak (dBu V/m)	Limit (dBu V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
47.940000	26.30	40.00	13.70	100.0	V	300.0	-15.5
64.190000	31.06	40.00	8.94	100.0	V	294.0	-17.3
72.070000	34.86	40.00	5.14	100.0	V	90.0	-17.0
100.560000	29.73	43.50	13.77	100.0	V	141.0	-14.7
130.750000	29.73	43.50	13.77	100.0	V	56.0	-11.4
208.230000	26.22	43.50	17.28	100.0	V	60.0	-13.0

Middle channel: 2440MHz

Common Information

Project No:	RSHA240306001
EUT Model:	APS2530X
Test Mode:	TX
Standard:	FCC Part 15.247 & FCC Part 15.205 & FCC Part 15.209
Test Equipment:	ESCI、JB3、310N
Temperature:	17.0℃
Humidity:	47%
Barometric Pressure:	102.8kPa
Test Engineer:	Leah Li
Test Date:	2024/3/20



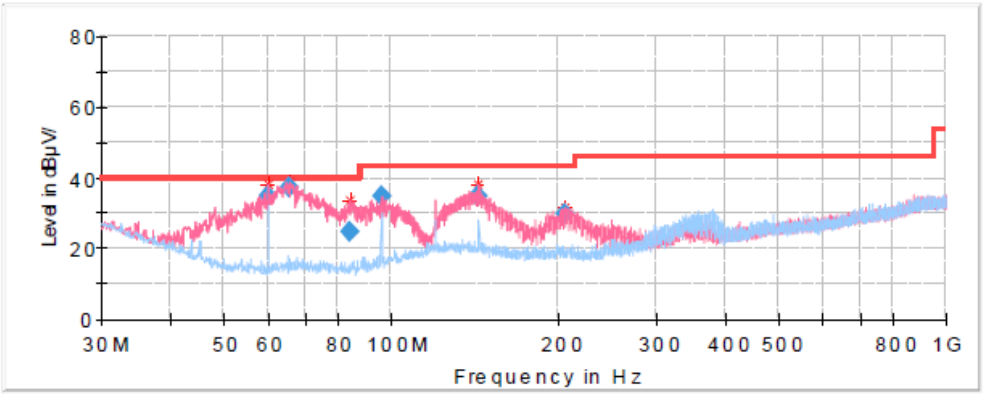
Final_Result

Frequency (MHz)	QuasiPeak (dBu V/m)	Limit (dBu V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
64.430000	37.03	40.00	2.97	100.0	V	290.0	-17.1
73.520000	31.56	40.00	8.44	100.0	V	34.0	-17.0
95.960000	35.14	43.50	8.36	100.0	V	2.0	-15.7
127.360000	27.27	43.50	16.23	100.0	V	136.0	-11.3
143.970000	36.52	43.50	6.98	100.0	V	79.0	-11.7
208.840000	26.43	43.50	17.07	100.0	V	75.0	-13.0

High channel: 2480MHz

Common Information

Project No:	RSHA240306001
EUT Model:	APS2530X
Test Mode:	TX
Standard:	FCC Part 15.247 & FCC Part 15.205 & FCC Part 15.209
Test Equipment:	ESCI、JB3、310N
Temperature:	17.0℃
Humidity:	47%
Barometric Pressure:	102.8kPa
Test Engineer:	Leah Li
Test Date:	2024/3/20



Final_Result

Frequency (MHz)	QuasiPeak (dBu V/m)	Limit (dBu V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
59.940000	34.48	40.00	5.52	100.0	V	327.0	-17.4
65.640000	37.43	40.00	2.57	100.0	V	171.0	-17.1
84.070000	24.70	40.00	15.30	100.0	V	18.0	-17.4
95.960000	34.79	43.50	8.71	100.0	V	44.0	-15.7
143.970000	34.67	43.50	8.83	100.0	V	18.0	-11.7
205.570000	29.72	43.50	13.78	100.0	V	54.0	-12.9

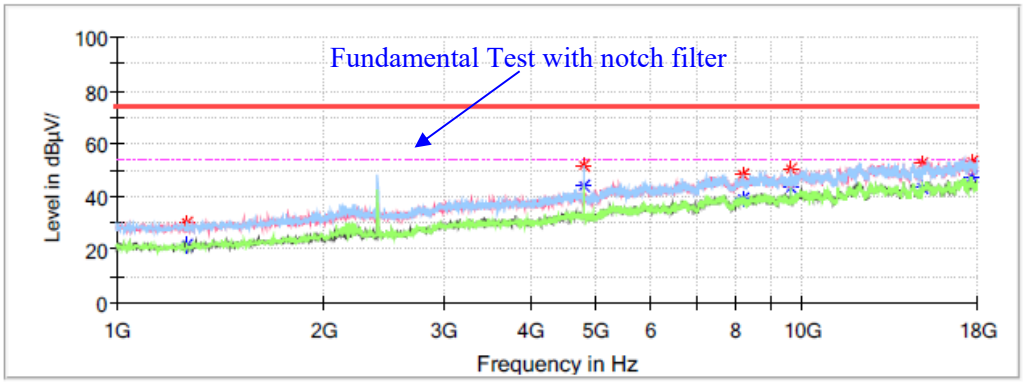
1 GHz - 18 GHz:

Low Channel: 2405 MHz

Common Information

Project No.:	RSHA240306001
Test Mode:	Zigbee
Standard:	FCC Part 15.247&FCC Part 15.205&FCC Part 15.209
Test Engineer:	Klein Zhu

Full Spectrum



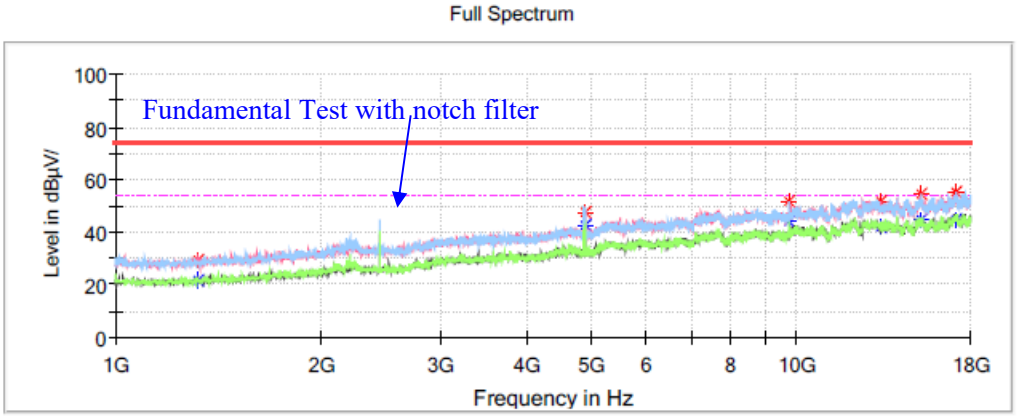
Critical_Freqs

Frequency (MHz)	MaxPeak (dB µ V/m)	Average (dB µ V/m)	Limit (dB µ V/m)	Margin (dB)	Pol	Corr. (dB/m)
1268.600000	---	21.81	54.00	32.19	V	-15.1
1268.600000	29.93	---	74.00	44.07	V	-15.1
4808.000000	51.85	---	74.00	22.15	H	-3.1
4808.000000	---	43.77	54.00	10.23	H	-3.1
8194.400000	48.57	---	74.00	25.43	H	4.5
8194.400000	---	39.22	54.00	14.78	H	4.5
9617.300000	50.11	---	74.00	23.89	H	5.8
9617.300000	---	43.13	54.00	10.87	H	5.8
14928.100000	52.63	---	74.00	21.37	H	9.3
14928.100000	---	43.21	54.00	10.79	H	9.3
17626.000000	53.41	---	74.00	20.59	H	11.6
17626.000000	---	47.42	54.00	6.58	H	11.6

Middle Channel: 2440 MHz

Common Information

Project No.:	RSHA240306001
Test Mode:	Zigbee
Standard:	FCC Part 15.247&FCC Part 15.205&FCC Part 15.209
Test Engineer:	Klein Zhu



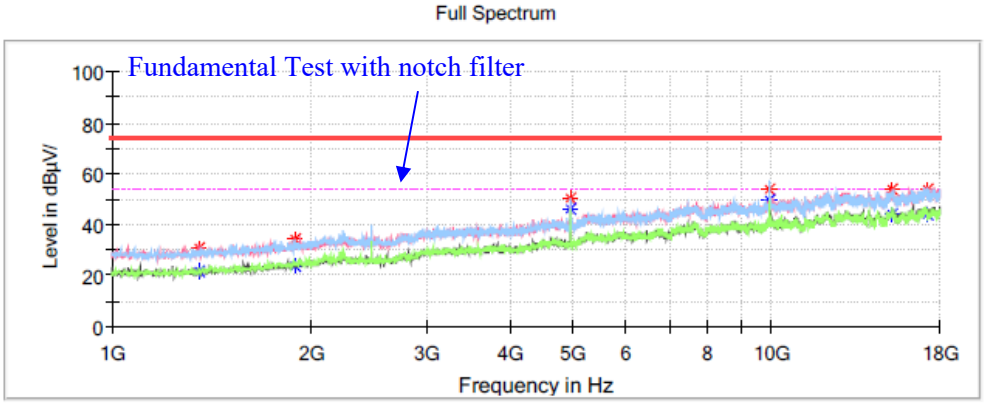
Critical_Freqs

Frequency (MHz)	MaxPeak (dB µ V/m)	Average (dB µ V/m)	Limit (dB µ V/m)	Margin (dB)	Pol	Corr. (dB/没\)
1324.700000	---	21.96	54.00	32.04	H	-15.0
1324.700000	29.17	---	74.00	44.83	H	-15.0
4879.400000	---	42.65	54.00	11.35	H	-2.9
4879.400000	47.46	---	74.00	26.54	H	-2.9
9756.700000	51.68	---	74.00	22.32	H	6.2
9756.700000	---	44.16	54.00	9.84	H	6.2
13251.900000	51.58	---	74.00	22.42	V	9.6
13251.900000	---	42.26	54.00	11.74	V	9.6
15256.200000	---	44.51	54.00	9.49	H	9.6
15256.200000	54.49	---	74.00	19.51	H	9.6
17078.600000	55.16	---	74.00	18.84	V	12.2
17078.600000	---	44.61	54.00	9.39	V	12.2

High Channel: 2480 MHz

Common Information

Project No.:	RSHA240306001
Test Mode:	Zigbee
Standard:	FCC Part 15.247&FCC Part 15.205&FCC Part 15.209
Test Engineer:	Klein Zhu



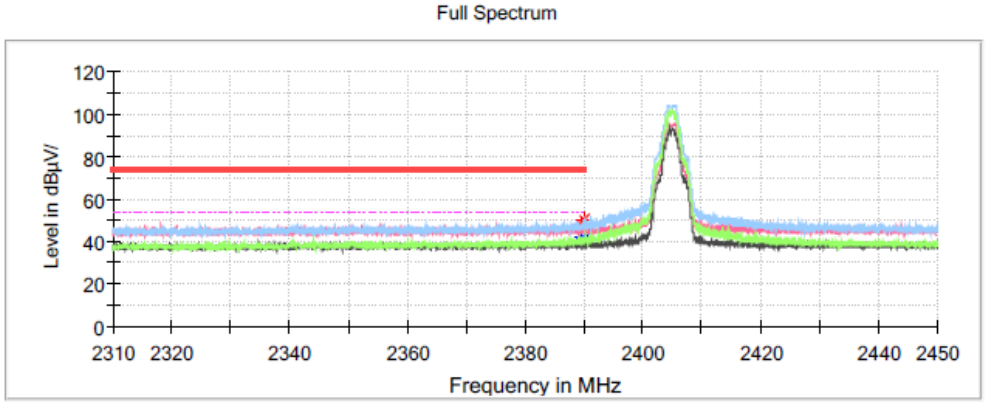
Critical_Freqs

Frequency (MHz)	MaxPeak (dB µ V/m)	Average (dB µ V/m)	Limit (dB µ V/m)	Margin (dB)	Pol	Corr. (dB/m)
1357.000000	30.42	---	74.00	43.58	V	-14.9
1357.000000	---	21.86	54.00	32.14	V	-14.9
1897.600000	---	23.68	54.00	30.32	V	-12.4
1897.600000	34.15	---	74.00	39.85	V	-12.4
4959.300000	50.46	---	74.00	23.54	H	-2.6
4959.300000	---	46.43	54.00	7.57	H	-2.6
9921.600000	54.13	---	74.00	19.87	H	6.8
9921.600000	---	49.49	54.00	4.51	H	6.8
15200.100000	---	44.14	54.00	9.86	H	9.5
15200.100000	53.94	---	74.00	20.06	H	9.5
17280.900000	---	43.88	54.00	10.12	V	11.9
17280.900000	53.77	---	74.00	20.23	V	11.9

Band edge:

Common Information

Project No.:	RSHA240306001
Test Mode:	Zigbee
Standard:	FCC Part 15.247&FCC Part 15.205&FCC Part 15.209
Test Engineer:	Klein Zhu



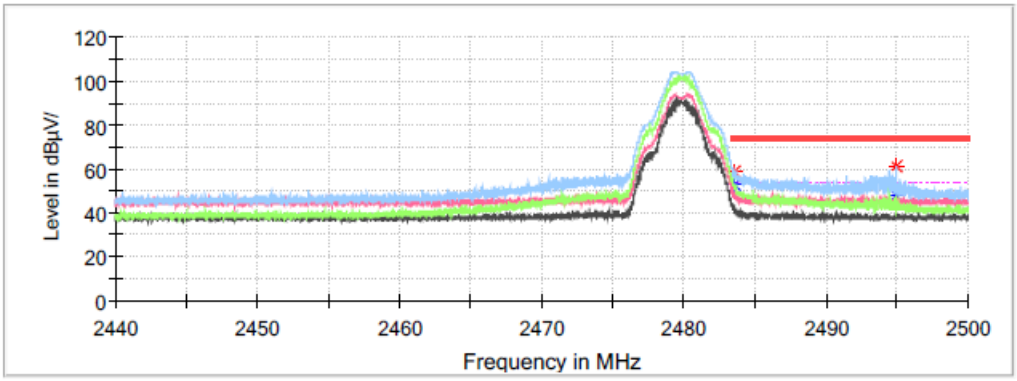
Critical_Freqs

Frequency (MHz)	MaxPeak (dB µ V/m)	Average (dB µ V/m)	Limit (dB µ V/m)	Margin (dB)	Pol	Corr. (dB/m)
2389.688000	---	42.31	54.00	11.69	H	-0.6
2389.688000	48.11	---	74.00	25.89	H	-0.6
2389.940000	---	41.10	54.00	12.90	H	-0.6
2389.940000	50.30	---	74.00	23.70	H	-0.6

Common Information

Project No.:	RSHA240306001
Test Mode:	Zigbee
Standard:	FCC Part 15.247&FCC Part 15.205&FCC Part 15.209
Test Engineer:	Klein Zhu

Full Spectrum



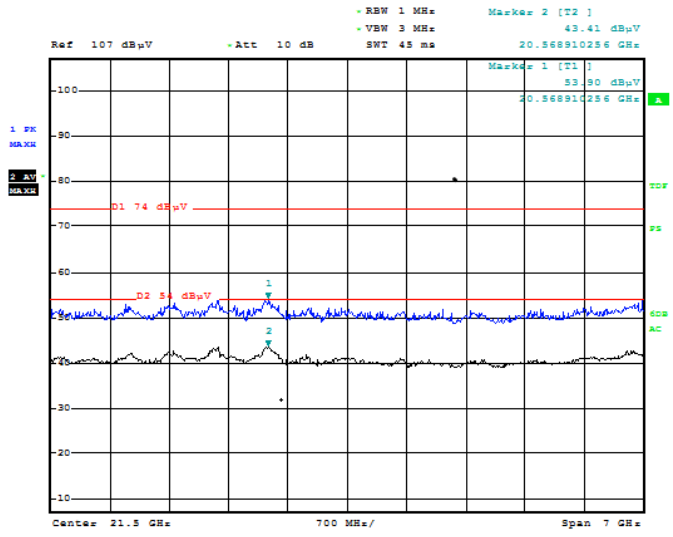
Critical_Freqs

Frequency (MHz)	MaxPeak (dB µ V/m)	Average (dB µ V/m)	Limit (dB µ V/m)	Margin (dB)	Pol	Corr. (dB/m)
2483.518000	59.03	---	74.00	14.97	H	-0.3
2483.518000	---	52.88	54.00	1.12	H	-0.3
2494.906000	61.43	---	74.00	12.57	H	-0.2
2494.906000	---	47.48	54.00	6.52	H	-0.2

18 GHz - 25 GHz:

*(Pre-scan with low channel, middle channel and high channel of operation in the X,Y and Z axes of orientation, the worst case **low channel of operation in X-axis of orientation** was recorded)*

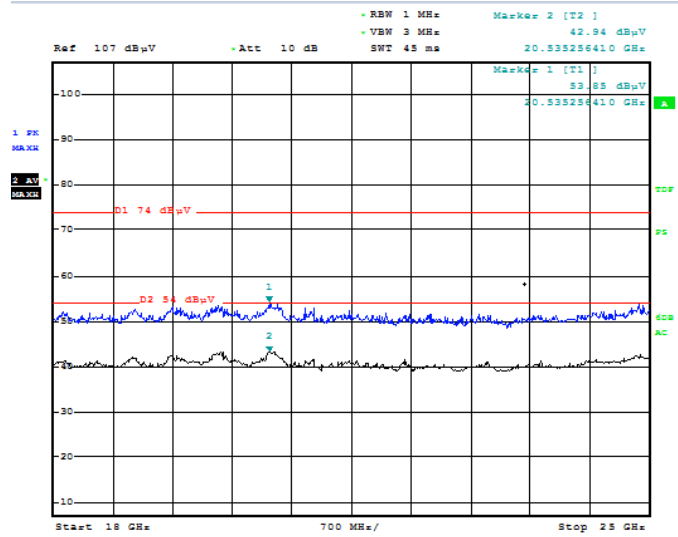
Horizontal



Project No : RSHA240306001 Tester :Hugh Wu

Date: 14.JUN.2024 19:07:13

Vertical



Project No : RSHA240306001 Tester :Hugh Wu

Date: 14.JUN.2024 19:25:58

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

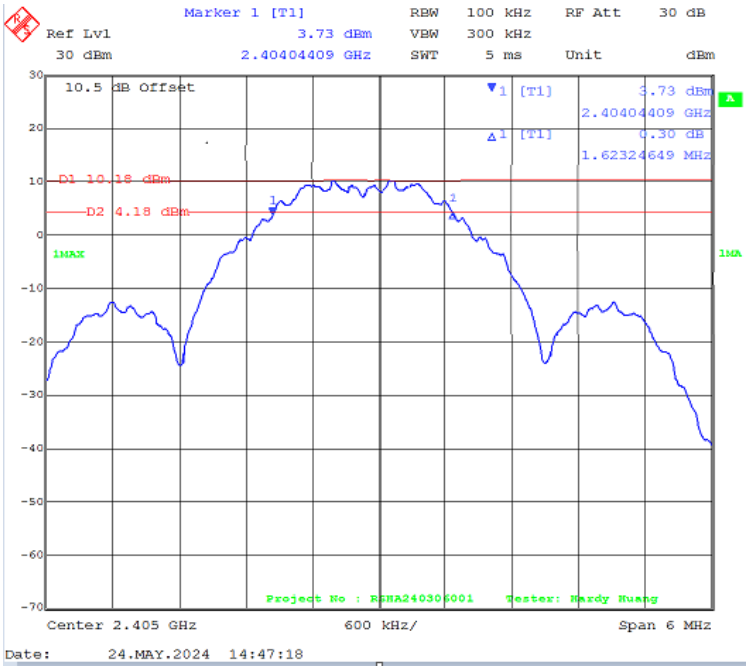
6 dB EMISSION BANDWIDTH

Test Result: Compliant.

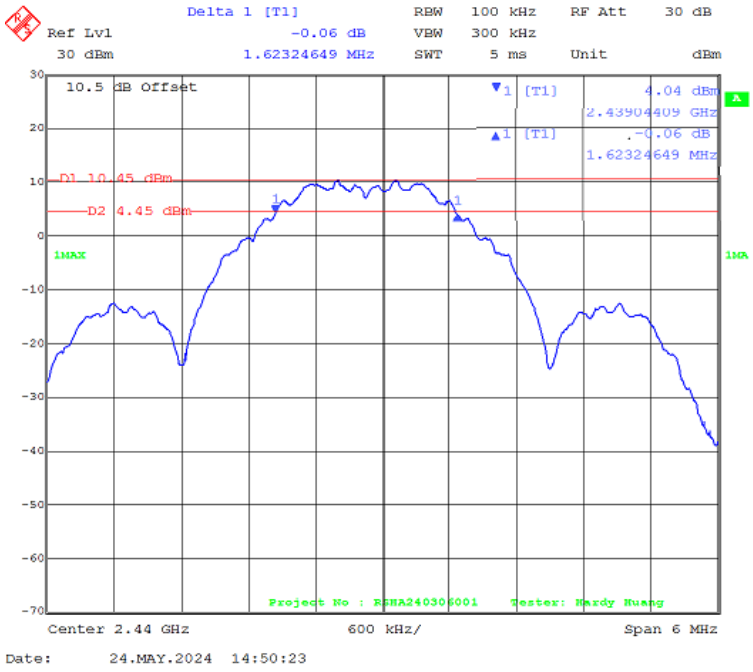
EUT operation mode: Transmitting

Channel	Frequency (MHz)	6 dB Emission Bandwidth (MHz)	Limit (MHz)
Low	2405	1.623	≥0.5
Middle	2440	1.623	≥0.5
High	2480	1.599	≥0.5

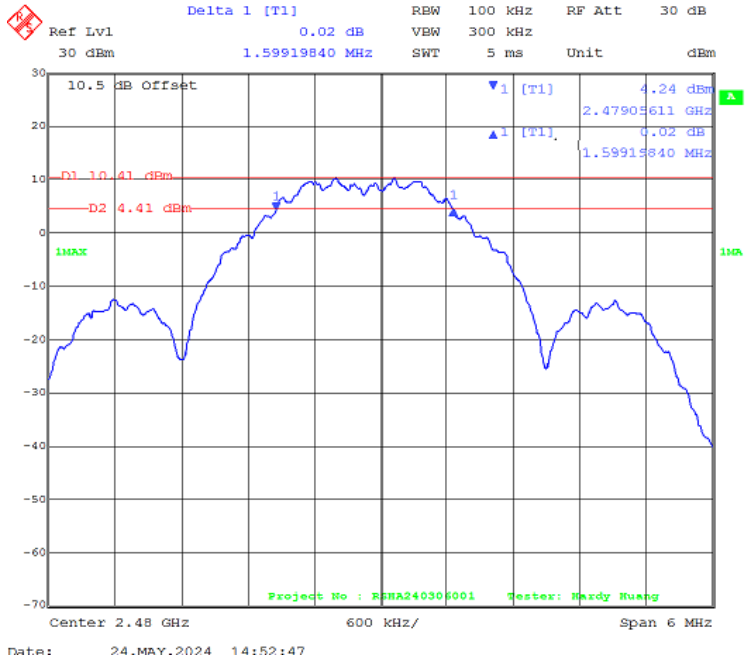
Low Channel



Middle Channel



High Channel

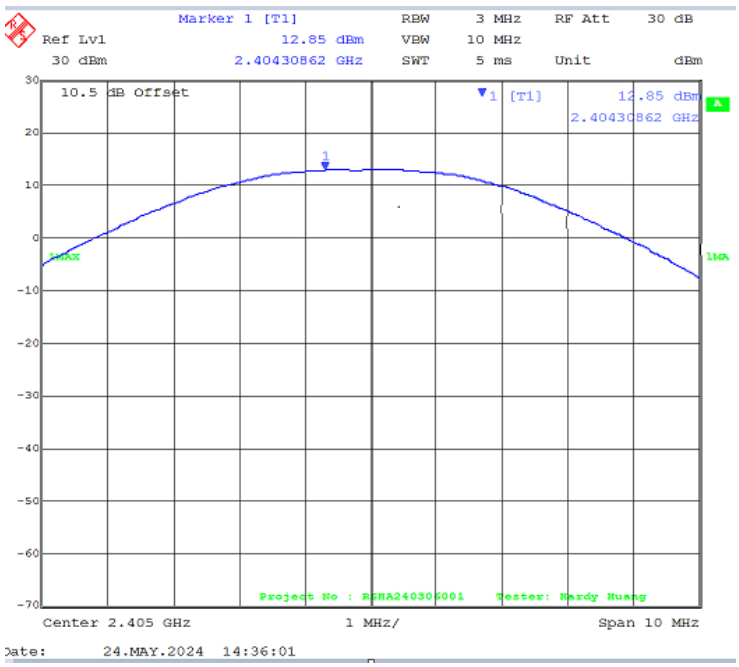


MAXIMUM CONDUCTED OUTPUT POWER

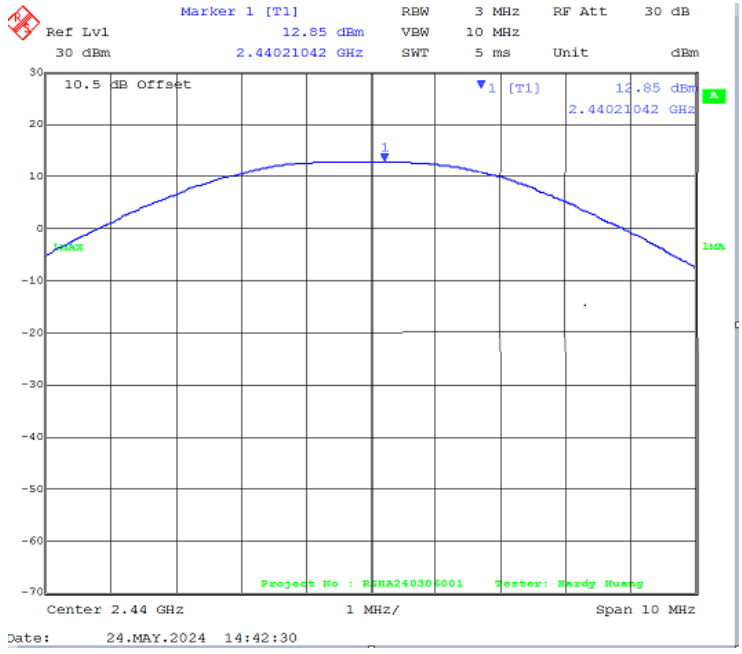
EUT operation mode: Transmitting

Channel	Frequency (MHz)	Max Conducted Peak Output Power (dBm)	Limit (dBm)	Result
Low	2405	12.85	30	Pass
Middle	2440	12.85	30	Pass
High	2480	12.73	30	Pass

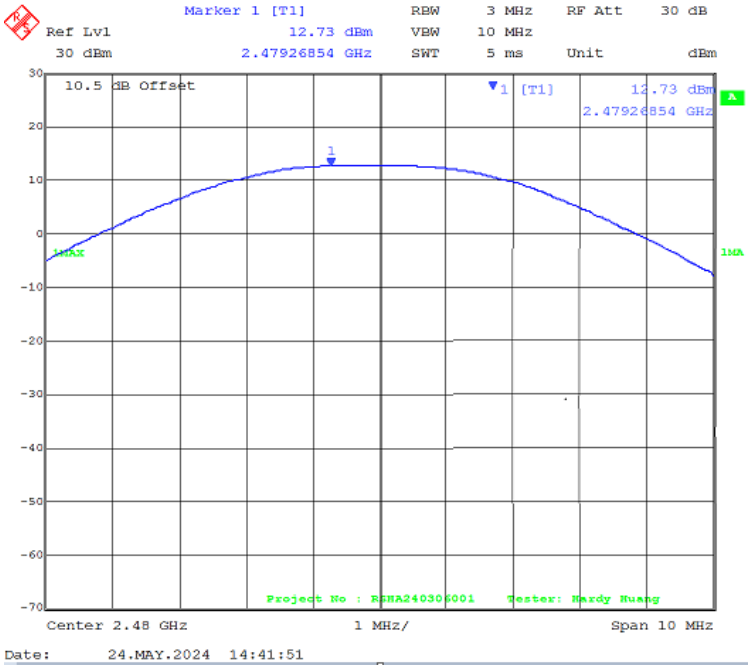
Low Channel



Middle Channel



High Channel

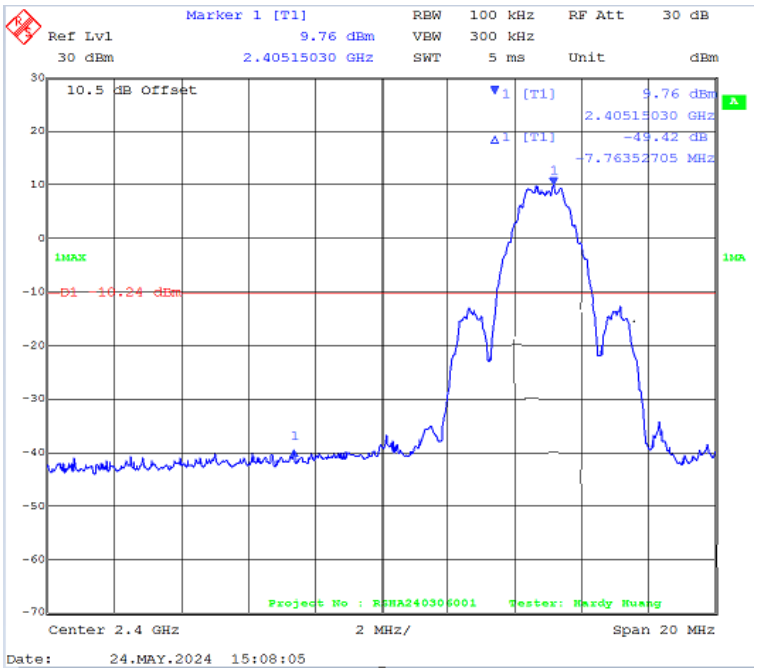


BAND EDGE

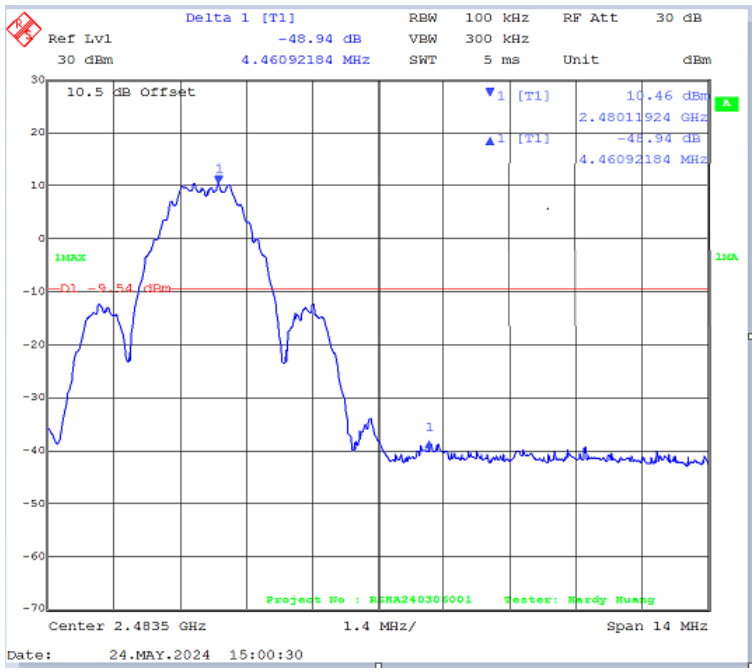
EUT operation mode: Transmitting

Test Result: Compliant.

Left Side



Right Side



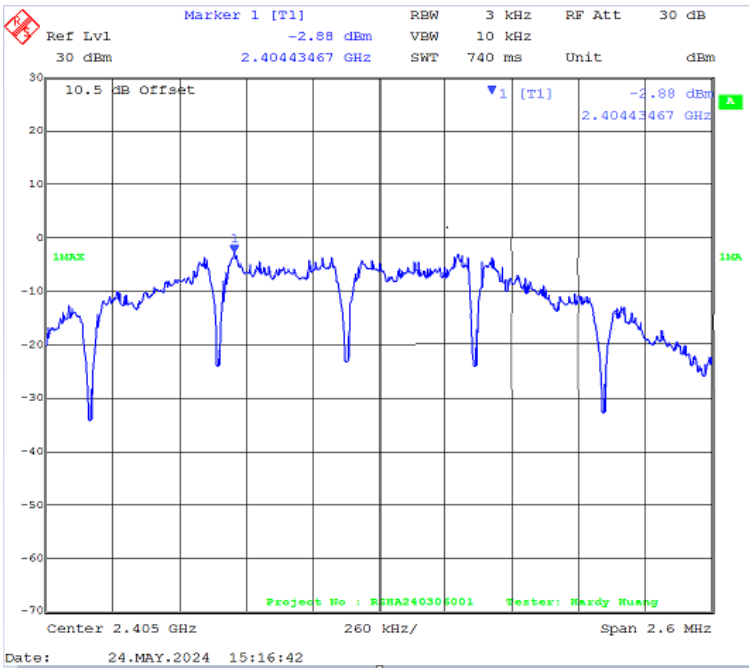
POWER SPECTRAL DENSITY

EUT operation mode: Transmitting

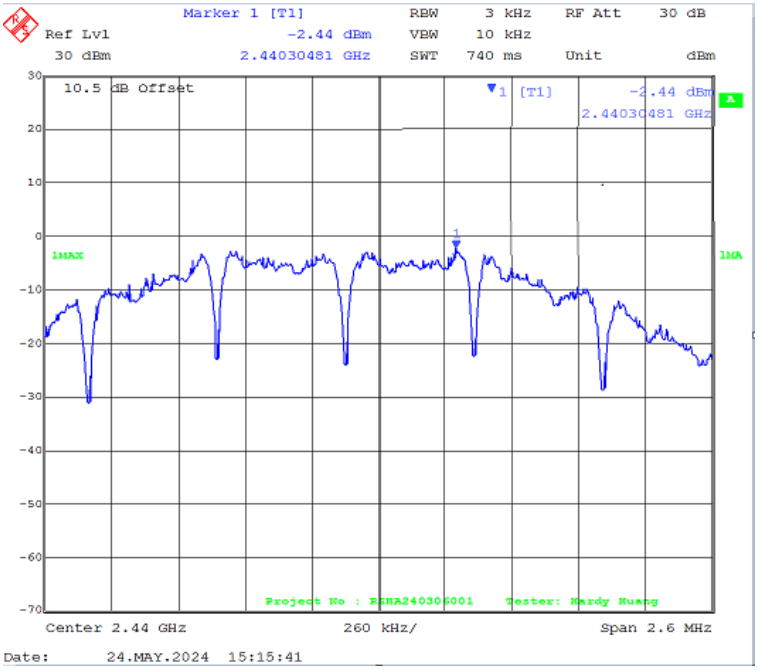
Test Result: Compliant.

Channel	Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)
Low	2405	-2.88	≤8
Middle	2440	-2.44	≤8
High	2480	-2.56	≤8

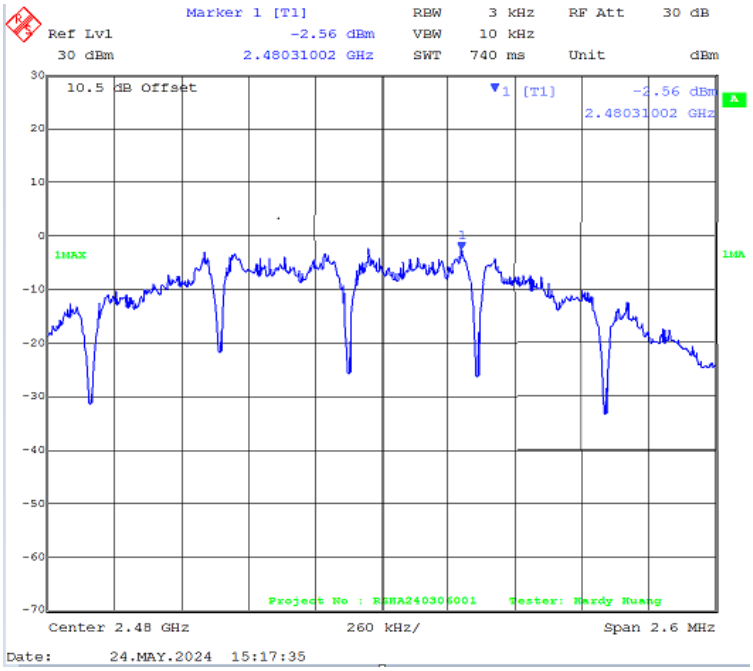
Low Channel



Middle Channel



High Channel



EUT PHOTOGRAPHS

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

TEST SETUP PHOTOGRAPHS

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

Declarations

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

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

3. This report is valid only with a valid digital signature. The digital signature may be available only under the Adobe software above version 7.0.

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

5. The extended uncertainty given in this report is obtained by combining the standard uncertainty times the coverage factor k=2 with the 95.45% confidence interval.

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