

FCC PART 15.247

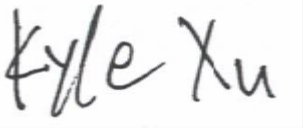
TEST REPORT

For

Zhejiang Sunseeker Industrial Co., Ltd.

Jinde Road 988, Jiangdong Industrial Park, Jinhua, Zhejiang, China

FCC ID: 2BFD7-ESPWROOM32UE

Report Type: Original Report	Product Name: 2.4G Wi-Fi&Bluetooth module
Report Number: <u>RKSA240801002-00A</u>	
Report Date: <u>2024-12-10</u>	
Reviewed By: <u>Bard Liu</u>	
Approved By: <u>Kyle Xu</u>	
Prepared By: Bay Area Compliance Laboratories Corp. (Kunshan) No.248 Chenghu Road, Kunshan, Jiangsu Province, China Tel: +86-512-86175000 Fax: +86-512-88934268 www.baclcorp.com.cn	

Note: This test report is prepared for the customer shown above and for the device described herein. It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp. (Kunshan). This report must not be used by the customer to claim product certification, approval, or endorsement by NVLAP, or any agency of the U.S.Government.

TABLE OF CONTENTS

REPORT REVISION HISTORY.....	4
GENERAL INFORMATION.....	5
PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT)	5
OBJECTIVE	5
TEST METHODOLOGY	6
MEASUREMENT UNCERTAINTY	6
TEST FACILITY	6
SYSTEM TEST CONFIGURATION.....	7
DESCRIPTION OF TEST CONFIGURATION	7
EQUIPMENT MODIFICATIONS	7
EUT EXERCISE SOFTWARE	8
SUPPORT EQUIPMENT LIST AND DETAILS	10
EXTERNAL I/O CABLE.....	10
BLOCK DIAGRAM OF TEST SETUP	10
SUMMARY OF TEST RESULTS	12
TEST EQUIPMENT LIST	13
FCC §1.1310 & §2.1091 - MAXIMUM PERMISSIBLE EXPOSURE (MPE).....	14
FCC §15.203 - ANTENNA REQUIREMENT.....	15
APPLICABLE STANDARD	15
ANTENNA CONNECTOR CONSTRUCTION	15
FCC §15.207 (a) - AC LINE CONDUCTED EMISSIONS.....	16
APPLICABLE STANDARD	16
TEST SYSTEM SETUP.....	16
EMI TEST RECEIVER SETUP.....	16
TEST PROCEDURE	17
TEST RESULTS SUMMARY	17
TEST DATA: SEE APPENDIX	17
FCC §15.209, §15.205 & §15.247(d) - SPURIOUS EMISSIONS.....	18
APPLICABLE STANDARD	18
TEST SYSTEM SETUP.....	18
EMI TEST RECEIVER SETUP.....	19
TEST PROCEDURE	19
TEST RESULTS SUMMARY	20
TEST DATA: SEE APPENDIX	20
FCC §15.247(A) (2) - 6 DB EMISSION BANDWIDTH.....	21
APPLICABLE STANDARD	21
TEST PROCEDURE	21
TEST DATA: SEE APPENDIX	21
FCC §15.247(B) (3) - MAXIMUM CONDUCTED OUTPUT POWER.....	22
APPLICABLE STANDARD	22
TEST PROCEDURE	22
TEST DATA: SEE APPENDIX	22
FCC §15.247(D) – 100 KHZ BANDWIDTH OF FREQUENCY BAND EDGE	23
APPLICABLE STANDARD	23
TEST PROCEDURE	23
TEST DATA: SEE APPENDIX	23

FCC §15.247(E) - POWER SPECTRAL DENSITY.....	24
APPLICABLE STANDARD	24
TEST PROCEDURE	24
TEST DATA: SEE APPENDIX	24
APPENDIX - TEST DATA.....	25
ENVIRONMENTAL CONDITIONS & TEST INFORMATION.....	25
AC LINE CONDUCTED EMISSIONS	27
SPURIOUS EMISSIONS	35
6 dB EMISSION BANDWIDTH	105
MAXIMUM CONDUCTED OUTPUT POWER.....	109
100 KHZ BANDWIDTH OF FREQUENCY BAND EDGE.....	111
POWER SPECTRAL DENSITY	113
EUT PHOTOGRAPHS.....	117
TEST SETUP PHOTOGRAPHS.....	118

REPORT REVISION HISTORY

Number of Revisions	Report No.	Version	Issue Date	Description
0	RKSA240801002-00A	R1V1	2024-12-10	Initial Release

GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

Applicant	Zhejiang Sunseeker Industrial Co., Ltd.
Tested Model	ESP32-WROOM-32UE
Product Name	2.4G Wi-Fi&Bluetooth module
Power Supply	DC 3.3V
RF Function:	2.4G Wi-Fi; BLE
Operating Band/Frequency:	2.4G Wi-Fi: 2412~2462 MHz(802.11b/g/n20), 2422~2452 MHz(802.11n40) BLE(1Mbps): 2402-2480 MHz
Maximum Peak Output Power:	2.4G Wi-Fi: 802.11b: 20.35 dBm 802.11g: 22.22 dBm 802.11n20: 22.71 dBm 802.11n40: 22.42 dBm BLE(1Mbps): 5.30 dBm
Channel Number:	2.4G Wi-Fi: 11(802.11b/g/n20), 7(802.11n40) BLE(1Mbps): 40
Channel Separation:	2.4G Wi-Fi: 5 MHz BLE: 2 MHz
Modulation Type:	2.4G Wi-Fi: DSSS, OFDM BLE: GFSK
★Maximum Antenna Gain:	Monopole Antenna: 3.95 dBi Dipole Antenna: 2.37 dBi

Note: The maximum antenna gain was declared by the manufacturer.

All measurement and test data in this report was gathered from production sample serial number: RKSA240801002-1 (Assigned by the BACL (Kunshan). The EUT supplied by the applicant was received on 2024-08-01.)

Objective

This report is prepared for *Zhejiang Sunseeker Industrial Co., Ltd.* in accordance with Part 2-Subpart J, Part 15-Subparts A and C of the Federal Communication Commissions' rules.

The tests were performed in order to determine 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 C63.10-2020, 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		3.19dB
RF conducted test with spectrum		0.9dB
RF Output Power with Power meter		0.5dB
Radiated emission	9 kHz~150 kHz	3.8dB
	150 kHz~30 MHz	3.4dB
	30MHz~1GHz	6.11dB
	1GHz~6GHz	4.45dB
	6GHz~18GHz	5.23dB
	18GHz~40GHz	5.65dB
Occupied Bandwidth		0.5kHz
Temperature		1.0°C
Humidity		6%

Test Facility

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

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

SYSTEM TEST CONFIGURATION

Description of Test Configuration

Channel List for BLE mode:

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	2402	14	2430	28	2458
1	2404	15	2432	29	2460
2	2406	16	2434	30	2462
3	2408	17	2436	31	2464
4	2410	18	2438	32	2466
5	2412	19	2440	33	2468
6	2414	20	2442	34	2470
7	2416	21	2444	35	2472
8	2418	22	2446	36	2474
9	2420	23	2448	37	2476
10	2422	24	2450	38	2478
11	2424	25	2452	39	2480
12	2426	26	2454	/	/
13	2428	27	2456	/	/

EUT was tested with channel 0, 19 and 39.

Channel List for Wi-Fi Mode:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	2412	7	2442
2	2417	8	2447
3	2422	9	2452
4	2427	10	2457
5	2432	11	2462
6	2437	/	/

For 802.11b, 802.11g and 802.11n-HT20 mode, EUT was tested with Channel 1, 6 and 11.

For 802.11n-HT40 mode, EUT was tested with Channel 3, 6 and 9.

Equipment Modifications

No modification was made to the EUT tested.

EUT Exercise Software

RF test software: Xshell

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

Mode	Data Rate	★Power Level
802.11b	1 Mbps	0
802.11g	6 Mbps	0
802.11n-HT20	MCS0	0
802.11n-HT40	MCS0	0
BLE(1Mbps)	1Mbps	0

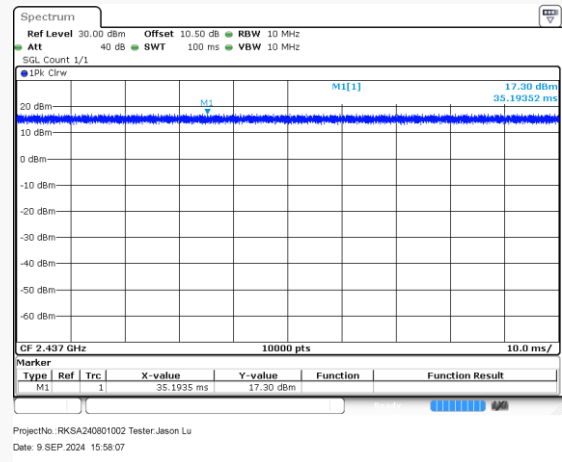
Note: The power level was declared by the applicant.

Mode	Duty Cycle (%)	Ton(ms)	Ton+off(ms)	10log(1/x) (dB)
802.11b	100	100	100	/
802.11g	100	100	100	/
802.11n-HT20	100	100	100	/
802.11n-HT40	100	100	100	/
BLE(1Mbps)	77.81	8.26	10.616	1.09

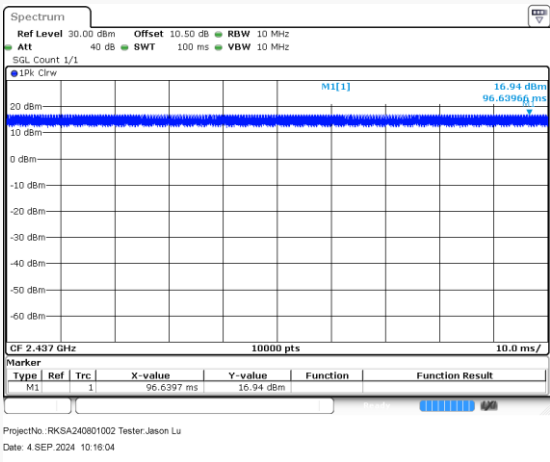
Note: “x” means the Duty Cycle.

Duty Cycle:

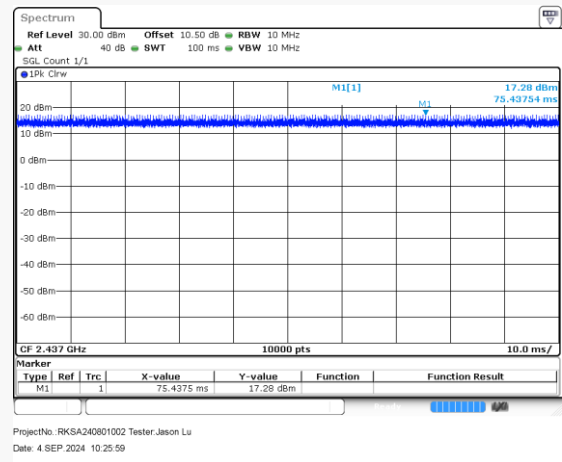
802.11b Mode Middle Channel



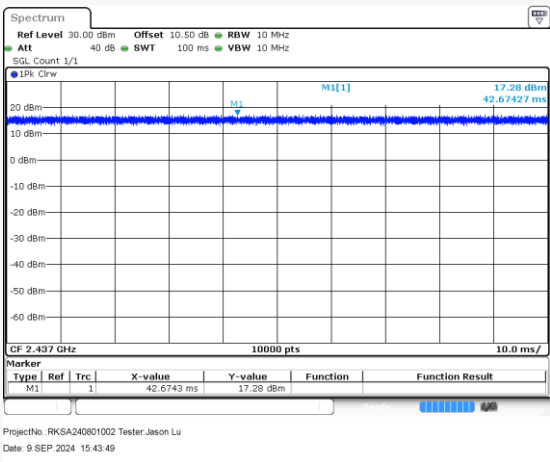
802.11g Mode Middle Channel



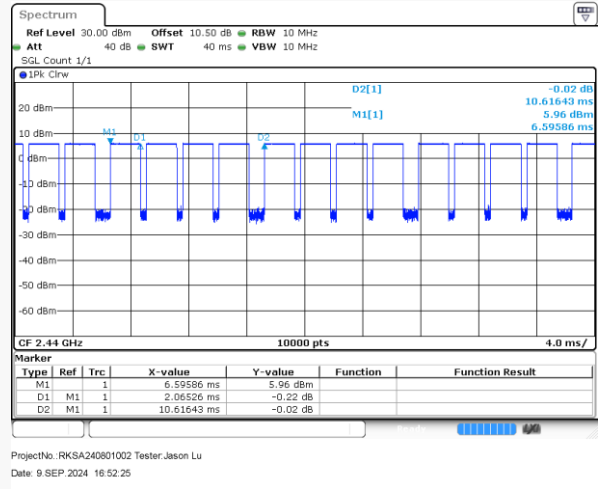
802.11n-HT20 Mode Middle Channel



802.11n-HT40 Mode Middle Channel



BLE(1Mbps) Mode Middle Channel

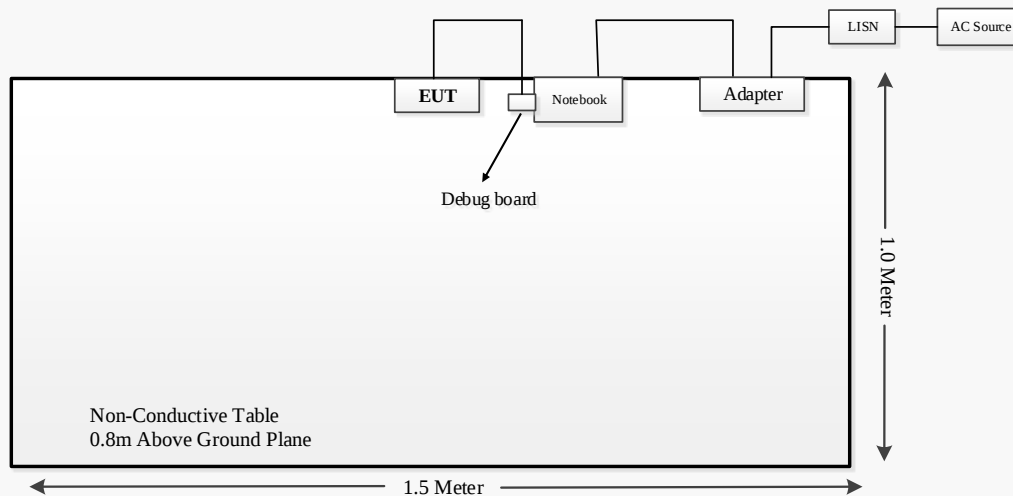


Support Equipment List and Details

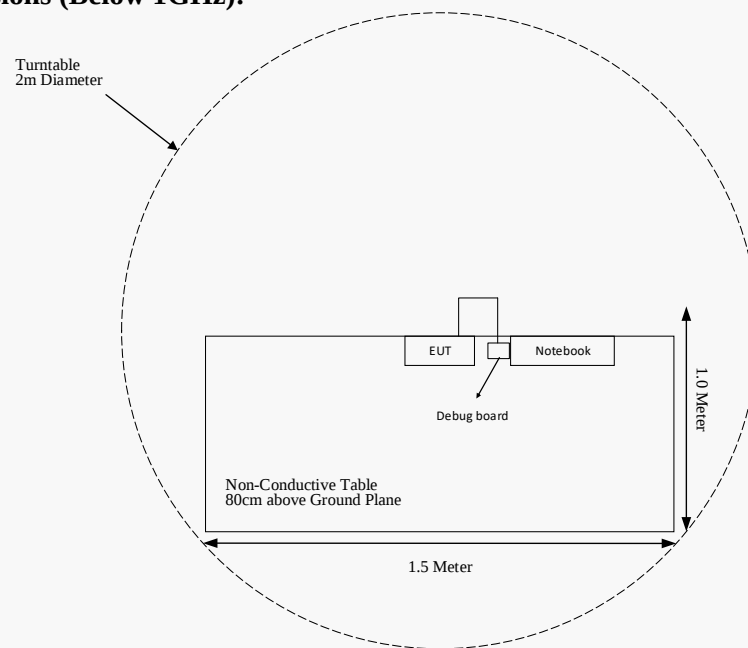
Manufacturer	Description	Model	Serial Number
Lenovo	Notebook	Y700P	PF2B7PL5
/	Debug board	/	/
/	Adapter	/	/

External I/O Cable

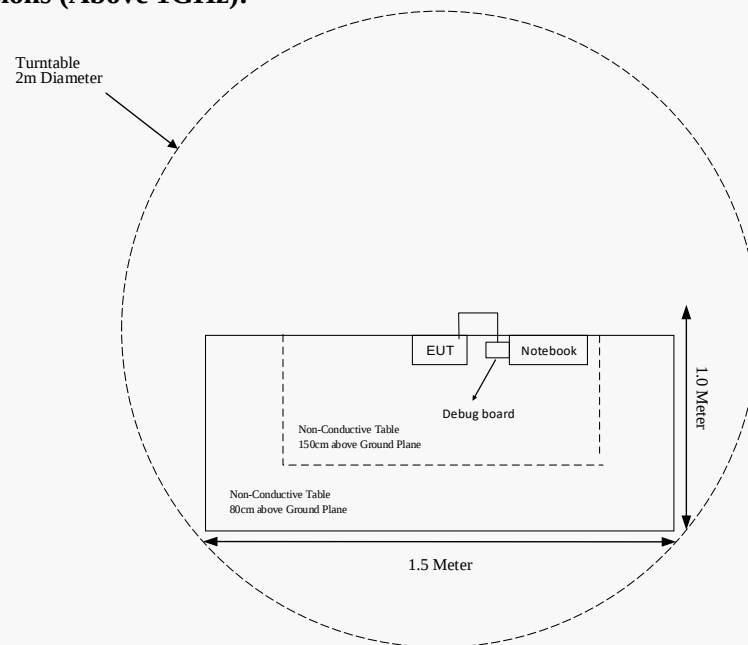
Cable Description	Length (m)	From Port	To
Power Cable 1	1.5	Notebook	Adapter
Power Cable 2	1.0	Adapter	AC Source/LISN
Data Cable	0.2	EUT	Debug Board

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

For Radiated Emissions (Below 1GHz):



For Radiated Emissions (Above 1GHz):



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§1.1310, §2.1091	Maximum Permissible Exposure (MPE)	Compliant
§15.203	Antenna Requirement	Compliant
§15.207 (a)	AC Line Conducted Emissions	Compliant
§15.205, §15.209, §15.247(d)	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

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	2024-04-23	2025-04-22
Sunol Sciences	Broadband Antenna	JB3	A090314-1	2023-11-11	2024-11-10
Narda	6dB Attenuator	773-6	10690812-2-1	2023-11-11	2024-11-10
ETS-LINDGREN	Loop Antenna	6512	108100	2023-11-09	2024-11-08
Sonoma Instrument	Pre-amplifier	310N	171205	2024-04-23	2025-04-22
Rohde & Schwarz	Auto Test Software	EMC32	100361	N/A	N/A
MICRO-COAX	Coaxial Cable	Cable-8	008	2024-04-23	2025-04-22
MICRO-COAX	Coaxial Cable	Cable-9	009	2024-04-23	2025-04-22
MICRO-COAX	Coaxial Cable	Cable-10	010	2024-04-23	2025-04-22
Radiated Emission Test (Chamber #2)					
Rohde & Schwarz	EMI Test Receiver	ESU40	100207/040	2024-04-25	2025-04-24
ETS-LINDGREN	Horn Antenna	3115	9311-4159	2023-12-02	2024-12-01
ETS-LINDGREN	Horn Antenna	3116	2516	2023-12-08	2024-12-07
A.H.Systems, inc	Amplifier	PAM-0118P	512	2024-04-25	2025-04-24
SELECTOR	Amplifier	EM18G40G	060726	2024-04-25	2025-04-24
MICRO-TRONICS	Band Reject Filter	BRM50702	G024	2024-08-05	2025-08-04
Narda	Attenuator	10dB	010	2024-04-23	2025-04-22
Rohde & Schwarz	Auto test Software	EMC32	100361	N/A	N/A
MICRO-COAX	Coaxial Cable	Cable-6	006	2024-04-23	2025-04-22
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	Signal Analyzer	FSV40-N	103298	2024-04-24	2025-04-23
Narda	Attenuator	10dB	010	2024-04-23	2025-04-22
Anritsu	Power Sensor	MA24418A	12621	2024-04-23	2025-04-22
Conducted Emission Test					
Rohde & Schwarz	EMI Test Receiver	ESR	1316.3003K03-101746-zn	2024-07-28	2025-07-27
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	100552	2024-04-23	2025-04-22
MICRO-COAX	Coaxial Cable	Cable-15	015	2024-04-23	2025-04-22

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

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

Applicable Standard

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

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

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

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

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

Calculated Formulary

Predication of MPE limit at a given distance

$S = PG/4\pi R^2$ = power density (in appropriate units, e.g. mW/cm²);

P = power input to the antenna (in appropriate units, e.g., mW);

G = power gain of the antenna in the direction of interest relative to an isotropic radiator, the power gain factor, is normally numeric gain;

R = distance to the center of radiation of the antenna (appropriate units, e.g., cm);

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)			
2.4G Wi-Fi	2412-2462	3.95	2.48	23.0	199.53	20	0.0984	1.0
BLE	2402-2480	3.95	2.48	5.5	3.55	20	0.0018	1.0
Classic BT	2402-2480	3.95	2.48	9.0	7.94	20	0.0039	1.0

Note:

1. For the above tune up power were declared by the manufacturer.
2. 2.4G Wi-Fi and Classic BT/BLE cannot transmit simultaneously.

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

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 Dipole Antenna, the antenna gain is 2.37 dBi and Monopole Antenna, the antenna gain is 3.95 dBi for 2.4G Wi-Fi & BLE, which use a unique type of connector to attach to the EUT, fulfill the requirement of this section. Please refer to the EUT photos.

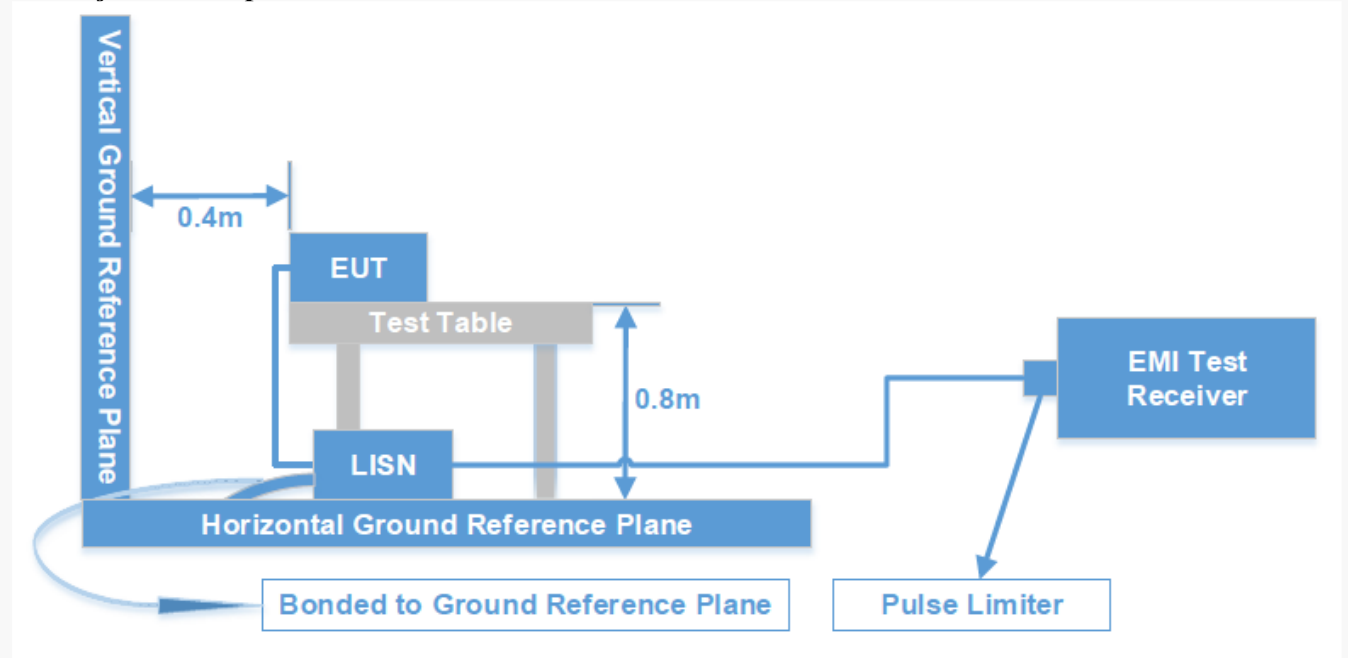
Result: Compliant.

FCC §15.207 (a) - AC LINE CONDUCTED EMISSIONS

Applicable Standard

FCC §15.207(a)

Test System Setup



The measurement procedure of EUT setup is according with ANSI C63.10-2020. The related limit was specified in FCC Part 15.207.

The spacing between the peripherals was 10 cm.

EMI Test Receiver Setup

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

Frequency Range	RBW	VBW
150 kHz - 30 MHz	9 kHz	30 kHz

Test Procedure

ANSI C63.10-2020 clause 6.2

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

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

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

Level & Over Limit Calculation

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

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

Level (dBμV) = Read level (dBμV) + Factor (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) = Level (dBμV) - Limit (dBμV)

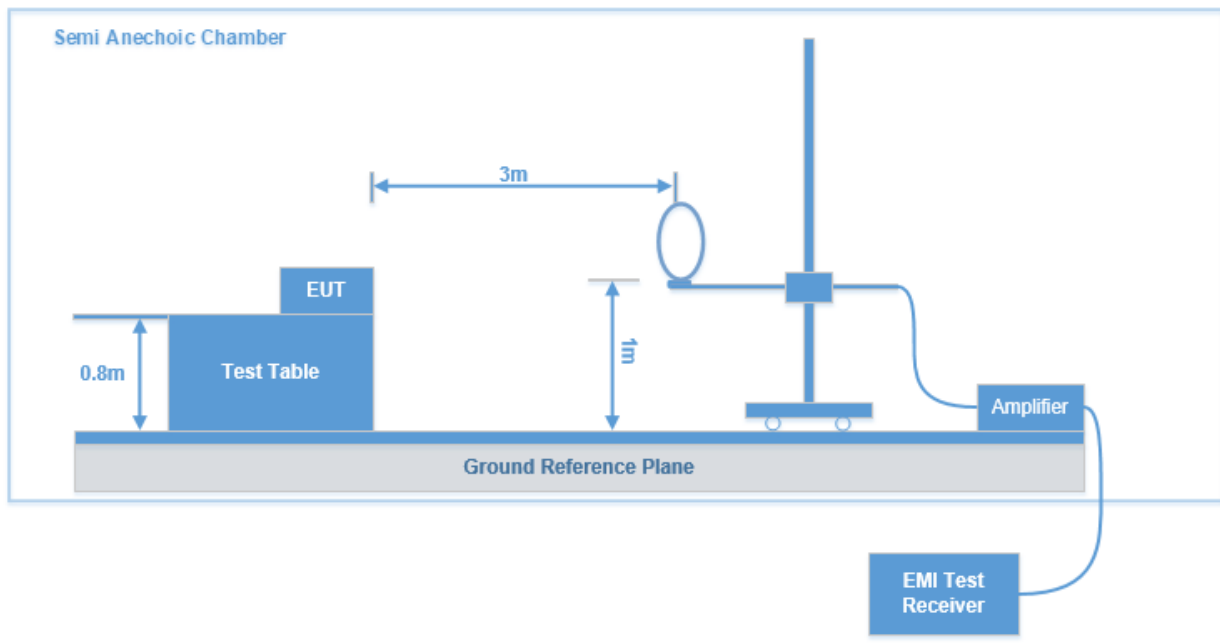
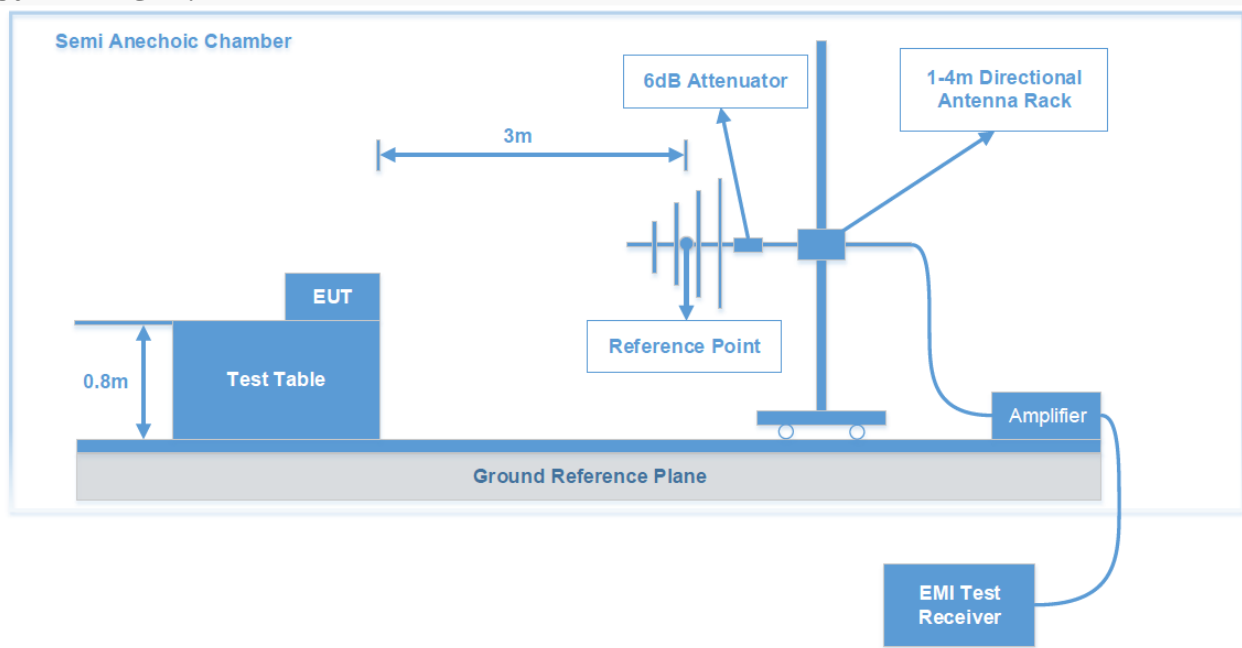
Test Results Summary

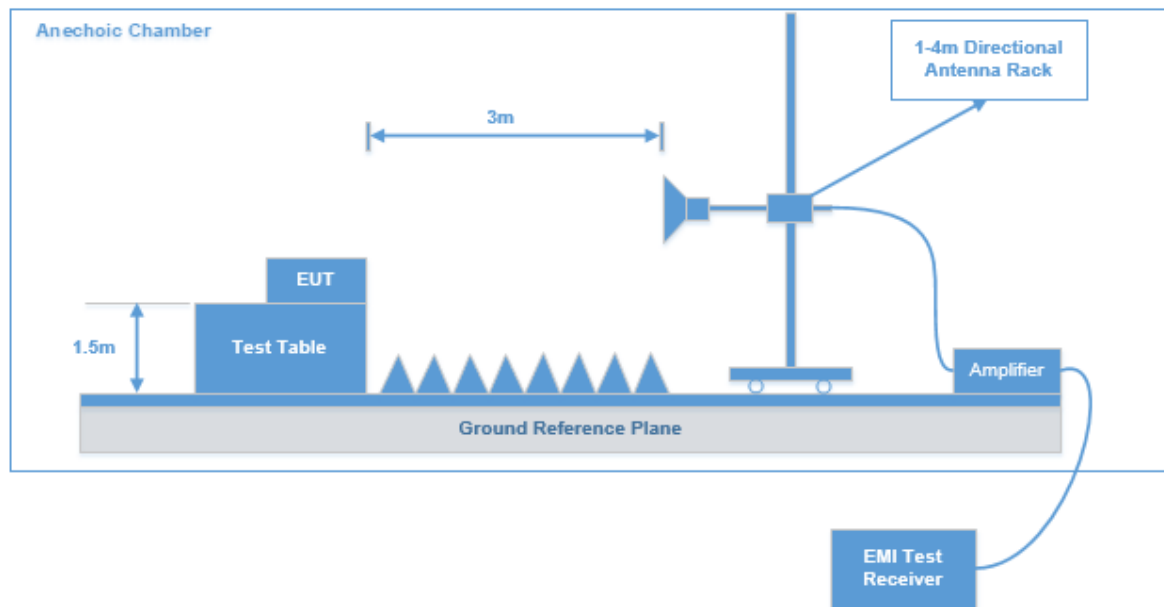
According to the recorded data in following table, the EUT complied with the FCC Part 15.207.

Test Data: See Appendix

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

FCC §15.247 (d); §15.209; §15.205;

Test System Setup**9 kHz-30 MHz:****30 MHz-1 GHz:**

Above 1 GHz:

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

EMI Test Receiver Setup

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

Frequency Range	RBW	VBW	IF B/W	Measurement
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

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

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

If the measured peak level of the emissions that the measuring receiver reading level plus corrected factor is at least 6 dB below the QP emission limit, there's no need to record the measured QP level of the emissions in the report.

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

Corrected Amplitude & Margin Calculation

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

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

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

Margin (dB) = Limit (dB μ V/m) – Corrected Amplitude (dB μ V/m)

Test Results Summary

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

Test Data: See Appendix

FCC §15.247(A) (2) - 6 DB EMISSION BANDWIDTH

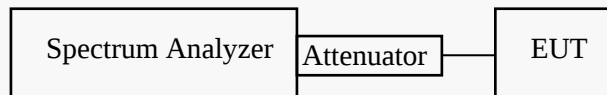
Applicable Standard

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 C63.10-2020 sub-clause 11.8.1

- 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 $\geq [3 \times \text{RBW}]$.
- 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.



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

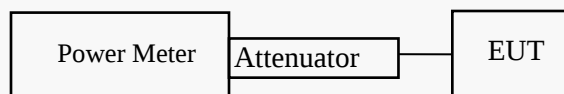
For 2.4G Wi-Fi:

According to ANSI C63.10-2020 sub-clause 11.9.1.2

The maximum peak conducted output power may be measured using a broadband peak RF power meter. The power meter shall have a video bandwidth that is greater than or equal to the DTS bandwidth and shall use a fast-responding diode detector.

11.9.2.3.2 Method AVGPM-G

Method AVGPM-G is a measurement using a gated RF average power meter. Alternatively, measurements may be performed using a wideband gated RF power meter provided that the gate parameters are adjusted such that the power is measured only when the EUT is transmitting at its maximum power control level. Because the measurement is made only during the ON time of the transmitter, no duty cycle correction factor is required.



For BLE:

According to ANSI C63.10-2020 sub-clause 11.9.1.1

- a) Set the RBW $\geq$ DTS bandwidth.
- b) Set VBW $\geq$ $[3 \times \text{RBW}]$.
- c) Set span $\geq$ $[3 \times \text{RBW}]$.
- 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.



Test Data: See Appendix

FCC §15.247(D) – 100 KHZ BANDWIDTH OF FREQUENCY BAND EDGE

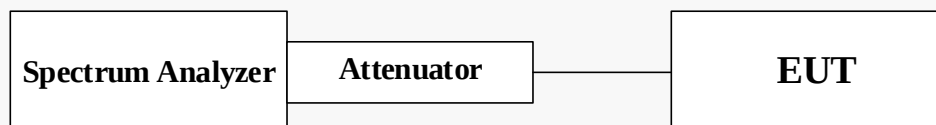
Applicable Standard

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 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 C63.10-2020 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 C63.10-2020 sub-clause 11.10.2

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

- 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 $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$.
- d) Set the VBW $\geq [3 \times \text{RBW}]$.
- 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.



Test Data: See Appendix

APPENDIX - TEST DATA

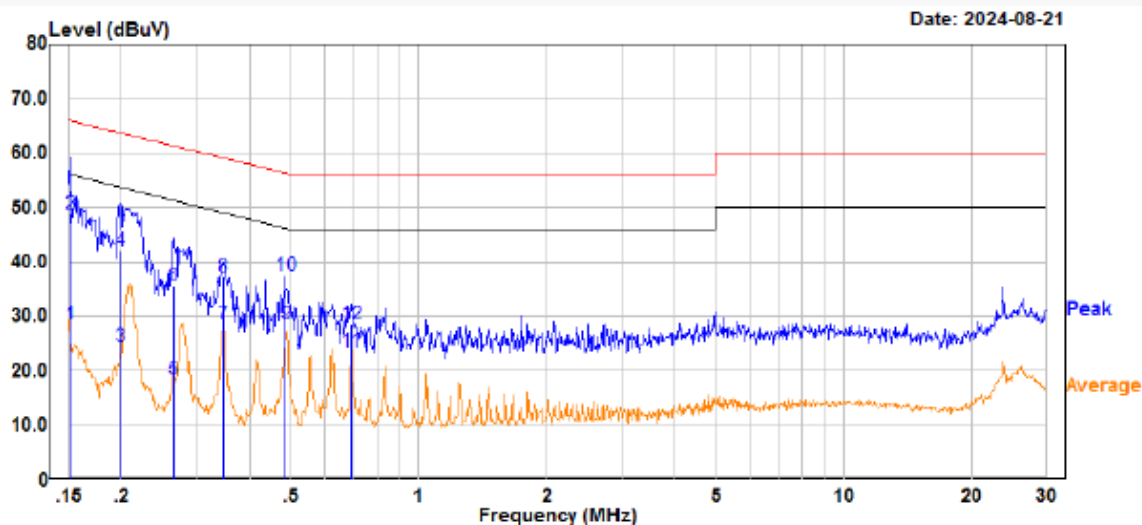
Environmental Conditions & Test Information

Test Item:	Duty Cycle	AC LINE CONDUCTED EMISSIONS	
Test Date:	2024-09-04&2024-09-09	2024-08-21	2024-08-28
Temperature:	20.3 °C~24.7 °C	24.7 °C	27.2 °C
Relative Humidity:	51 %~52 %	44 %	50 %
ATM Pressure:	100.7 kPa~101.1 kPa	100.3 kPa	100.6 kPa
Test Result:	/	Pass	Pass
Test Engineer:	Jason Lu	Richard Wen	Leah Li

Test Item:	RADIATED EMISSIONS					
	9 kHz - 1GHz		1 GHz – 18 GHz		18 GHz - 25 GHz	
Test Date:	2024-08-16	2024-09-06	2024-08-21	2024-09-03	2024-08-25	2024-09-19
Temperature:	24.7 °C	25.4 °C	24.7 °C	24.3 °C	24.5°C	24.8 °C
Relative Humidity:	56 %	44 %	44 %	47 %	52 %	51 %
ATM Pressure:	100.8 kPa	101.2 kPa	100.3 kPa	100.3 kPa	101.0kPa	100.7 kPa
Test Result:	Pass	Pass	Pass	Pass	Pass	Pass
Test Engineer:	Grace Luo		Klein Zhu& Peter Wang& Destine Hu		Hugh Wu	

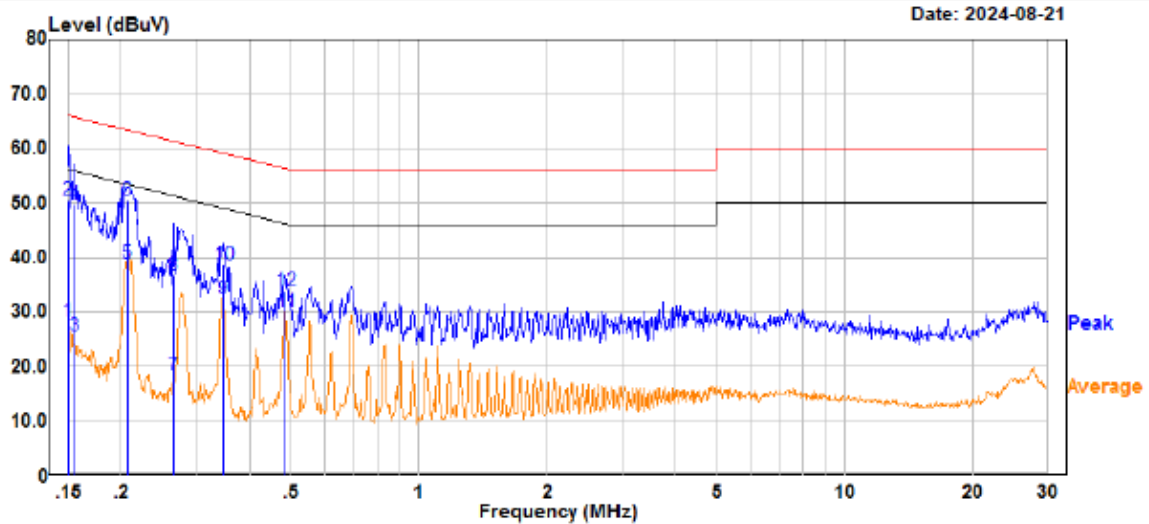
Test Item:	6 DB EMISSION BANDWIDTH		MAXIMUM CONDUCTED OUTPUT POWER	100 KHZ BANDWIDTH OF FREQUENCY BAND EDGE	
Test Date:	2024-09-04	2024-12-09	2024-09-04	2024-09-04	2024-09-09
Temperature:	24.7 °C	21.5 °C	24.7 °C	24.7 °C	20.3 °C
Relative Humidity:	51 %	54 %	51 %	51 %	52 %
ATM Pressure:	100.7 kPa	102.3 kPa	100.7 kPa	100.7 kPa	101.1 kPa
Test Result:	Pass	Pass	Pass	Pass	Pass
Test Engineer:	Jason Lu	Jason Lu	Jason Lu	Jason Lu	Jason Lu

Test Item:	POWER SPECTRAL DENSITY	
Test Date:	2024-12-02	2024-09-04
Temperature:	24.8 °C	24.7 °C
Relative Humidity:	54 %	51 %
ATM Pressure:	101.5 kPa	100.7 kPa
Test Result:	Pass	Pass
Test Engineer:	Jason Lu	Jason Lu

AC LINE CONDUCTED EMISSIONS**Dipole Antenna:****For Wi-Fi Mode:***EUT operation mode: Transmitting in maximum output power mode and channel 802.11g mode high channel*

Site : CE
Condition : limit\FCC PART 15.207
: DET:Peak
Project No. : RKSA240801002
Model : ESP32-WROOM-32UE
Phase : N
Voltage : AC 120V
Mode : 2.4G WIFI
Test Equipment : ENV216,ESR
Temperature : 24.7°C
Humidity : 44%
Atmospheric pressure: 100.3kPa
Test Engineer : Richard Wen

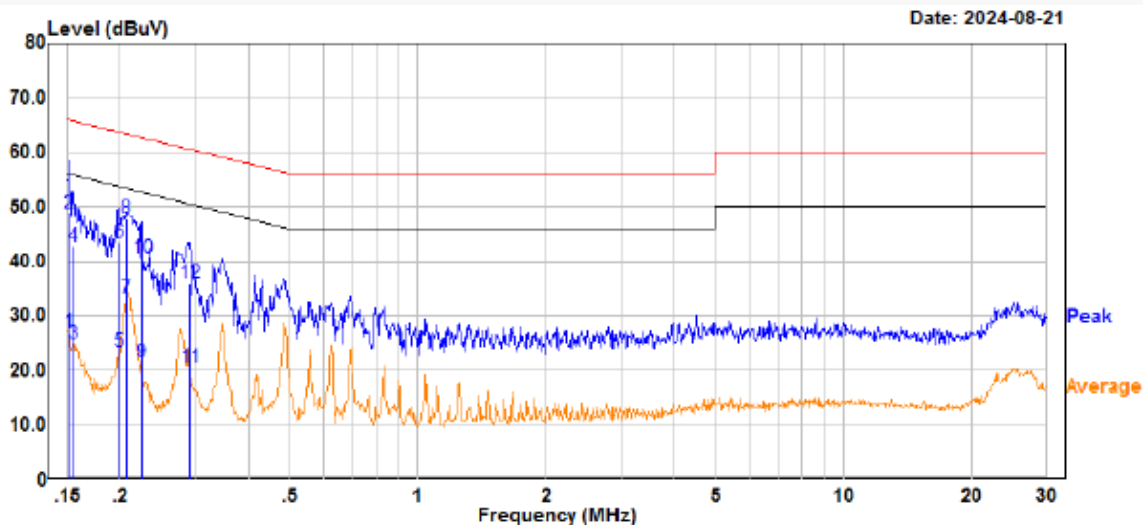
		Read			Limit	Over	
	Freq	Level	Factor	Level	Line	Limit	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	
1	0.152	8.51	20.12	28.63	55.92	-27.29	Average
2	0.152	28.73	20.12	48.85	65.92	-17.07	QP
3	0.198	4.26	20.11	24.37	53.68	-29.31	Average
4	0.198	21.89	20.11	42.00	63.68	-21.68	QP
5	0.265	-1.75	20.15	18.40	51.28	-32.88	Average
6	0.265	15.41	20.15	35.56	61.28	-25.72	QP
7	0.347	8.36	20.19	28.55	49.05	-20.50	Average
8	0.347	17.12	20.19	37.31	59.05	-21.74	QP
9	0.486	8.42	20.16	28.58	46.23	-17.65	Average
10	0.486	17.39	20.16	37.55	56.23	-18.68	QP
11	0.693	3.47	20.07	23.54	46.00	-22.46	Average
12	0.693	8.36	20.07	28.43	56.00	-27.57	QP



Trace: 1

Site : CE
Condition : limit\FCC PART 15.207
Project No. : RKSA240801002
Model : ESP32-WROOM-32UE
Phase : L
Voltage : AC 120V
Mode : 2.4G WIFI
Test Equipment : ENV216,ESR
Temperature : 24.7°C
Humidity : 44%
Atmospheric pressure: 100.3kPa
Test Engineer : Richard Wen

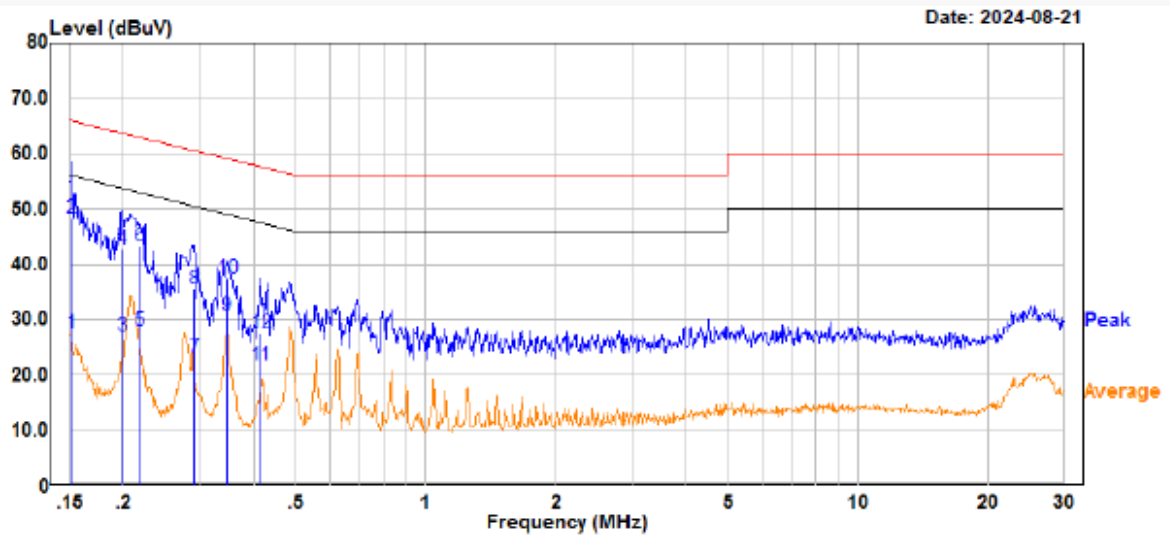
	Freq	Read		Limit	Over	
	MHz	Level	Factor	Level	Line	Limit Remark
	MHz	dBuV	dB	dBuV	dBuV	dB
1	0.150	8.24	20.12	28.36	56.00	-27.64 Average
2	0.150	30.29	20.12	50.41	66.00	-15.59 QP
3	0.155	5.60	20.11	25.71	55.75	-30.04 Average
4	0.155	29.57	20.11	49.68	65.75	-16.07 QP
5	0.206	18.88	20.12	39.00	53.35	-14.35 Average
6	0.206	30.51	20.12	50.63	63.35	-12.72 QP
7	0.265	-1.80	20.15	18.35	51.28	-32.93 Average
8	0.265	16.56	20.15	36.71	61.28	-24.57 QP
9	0.347	12.15	20.19	32.34	49.05	-16.71 Average
10	0.347	18.46	20.19	38.65	59.05	-20.40 QP
11	0.486	9.90	20.16	30.06	46.23	-16.17 Average
12	0.486	13.68	20.16	33.84	56.23	-22.39 QP

For BLE Mode: Transmitting in maximum output power mode low channel

Trace: 1

Site : CE
Condition : limit\FCC PART 15.207
: DET:Peak
Project No. : RKSA240801002
Model : ESP32-WROOM-32UE
Phase : N
Voltage : AC 120V
Mode : BLE 1M
Test Equipment : ENV216,ESR
Temperature : 24.7°C
Humidity : 44%
Atmospheric pressure: 100.3kPa
Test Engineer : Richard Wen

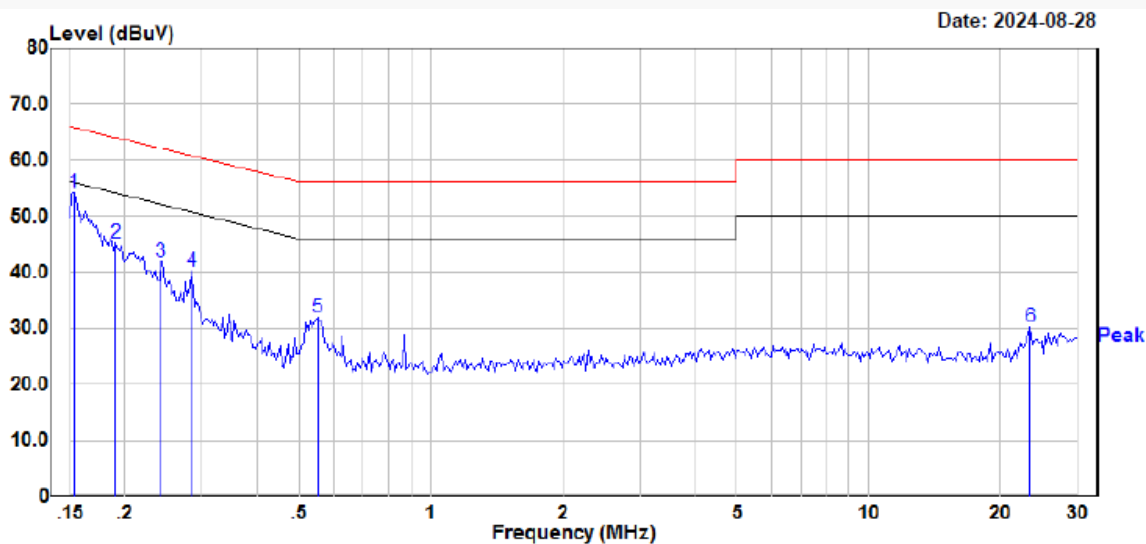
		Read			Limit	Over	
	Freq	Level	Factor	Level	Line	Limit	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	
1	0.152	7.02	20.12	27.14	55.92	-28.78	Average
2	0.152	28.79	20.12	48.91	65.92	-17.01	QP
3	0.155	4.83	20.11	24.94	55.71	-30.77	Average
4	0.155	22.58	20.11	42.69	65.71	-23.02	QP
5	0.198	3.25	20.11	23.36	53.68	-30.32	Average
6	0.198	23.39	20.11	43.50	63.68	-20.18	QP
7	0.206	13.08	20.12	33.20	53.35	-20.15	Average
8	0.206	27.85	20.12	47.97	63.35	-15.38	QP
9	0.225	1.33	20.13	21.46	52.65	-31.19	Average
10	0.225	20.52	20.13	40.65	62.65	-22.00	QP
11	0.291	0.42	20.16	20.58	50.49	-29.91	Average
12	0.291	15.83	20.16	35.99	60.49	-24.50	QP



Trace: 1

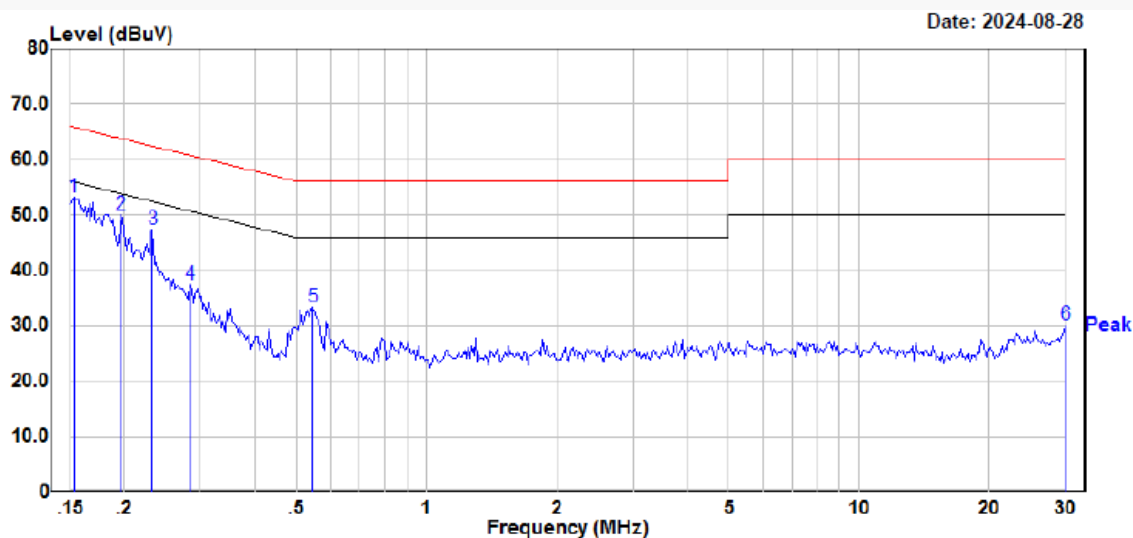
Site : CE
Condition : limit\FCC PART 15.207
: DET:Peak
Project No. : RKSA240801002
Model : ESP32-WROOM-32UE
Phase : L
Voltage : AC 120V
Mode : BLE 1M
Test Equipment : ENV216,ESR
Temperature : 24.7°C
Humidity : 44%
Atmospheric pressure: 100.3kPa
Test Engineer : Richard Wen

	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	
1	0.152	7.36	20.12	27.48	55.92	-28.44	Average
2	0.152	28.13	20.12	48.25	65.92	-17.67	QP
3	0.198	6.97	20.11	27.08	53.68	-26.60	Average
4	0.198	22.65	20.11	42.76	63.68	-20.92	QP
5	0.218	7.92	20.12	28.04	52.90	-24.86	Average
6	0.218	23.07	20.12	43.19	62.90	-19.71	QP
7	0.291	3.12	20.16	23.28	50.49	-27.21	Average
8	0.291	15.44	20.16	35.60	60.49	-24.89	QP
9	0.347	10.53	20.19	30.72	49.05	-18.33	Average
10	0.347	17.36	20.19	37.55	59.05	-21.50	QP
11	0.415	1.57	20.21	21.78	47.55	-25.77	Average
12	0.415	7.25	20.21	27.46	57.55	-30.09	QP

Monopole Antenna:**For Wi-Fi Mode:***EUT operation mode: Transmitting in maximum output power mode and channel 802.11g mode high channel*

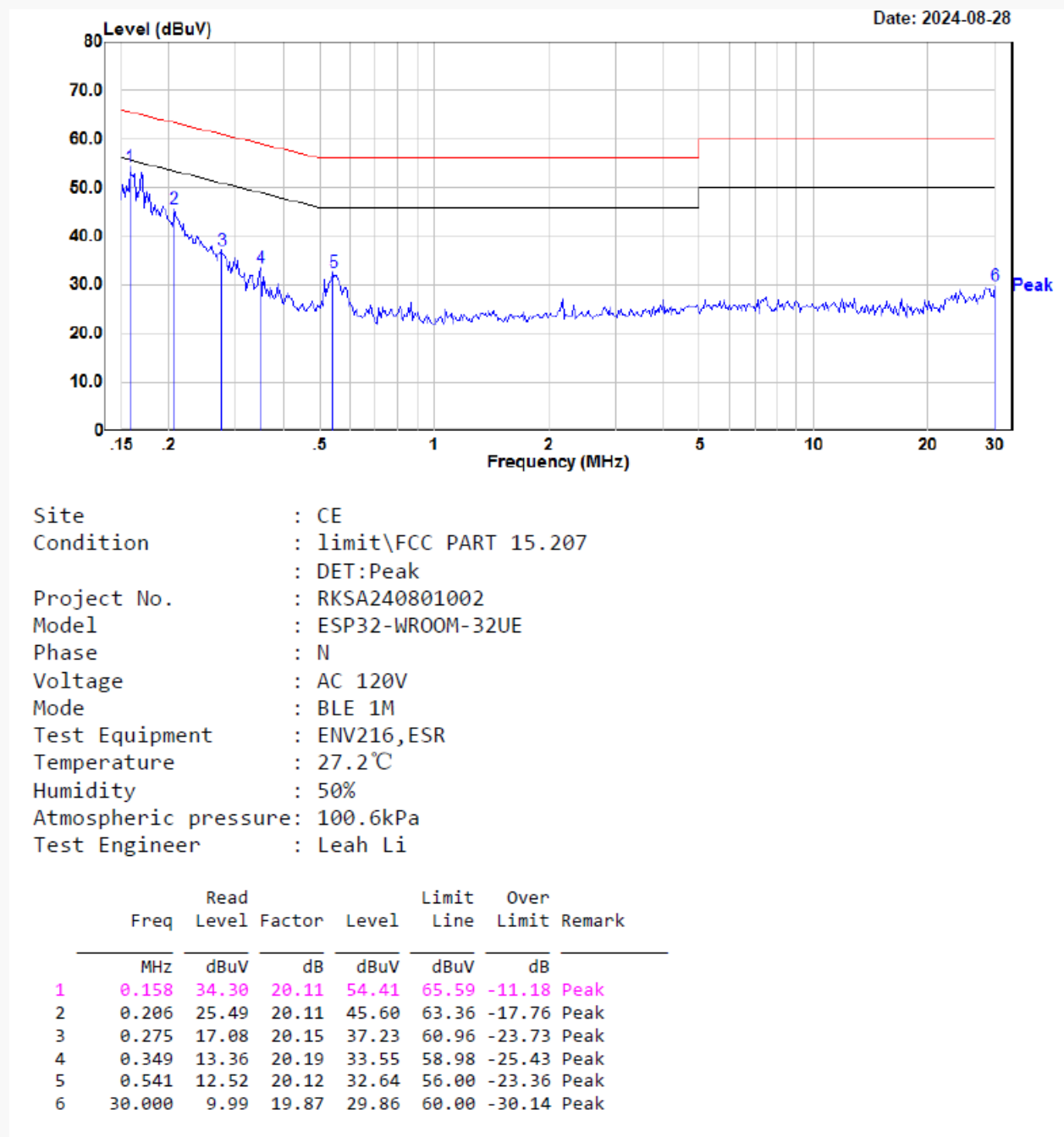
Site : CE
Condition : limit\FCC PART 15.207
DET:Peak
Project No. : RKSA240801002
Model : ESP32-WROOM-32UE
Phase : N
Voltage : AC 120V
Mode : 2.4G WIFI
Test Equipment : ENV216,ESR
Temperature : 27.2℃
Humidity : 50%
Atmospheric pressure: 100.6kPa
Test Engineer : Leah Li

	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	
1	0.153	34.12	20.12	54.24	65.83	-11.59	Peak
2	0.190	25.18	20.11	45.29	64.02	-18.73	Peak
3	0.242	21.67	20.13	41.80	62.04	-20.24	Peak
4	0.283	20.03	20.16	40.19	60.72	-20.53	Peak
5	0.552	11.88	20.11	31.99	56.00	-24.01	Peak
6	23.399	10.44	19.79	30.23	60.00	-29.77	Peak

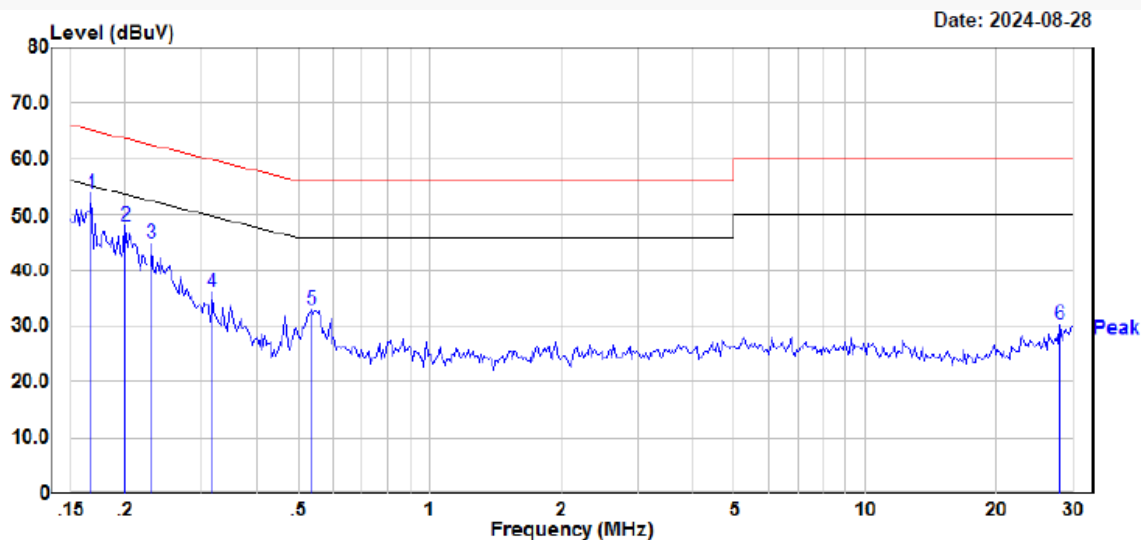


Site : CE
Condition : limit\FCC PART 15.207
: DET:Peak
Project No. : RKSA240801002
Model : ESP32-WROOM-32UE
Phase : L
Voltage : AC 120V
Mode : 2.4G WIFI
Test Equipment : ENV216,ESR
Temperature : 27.2°C
Humidity : 50%
Atmospheric pressure: 100.6kPa
Test Engineer : Leah Li

	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	
1	0.153	32.98	20.12	53.10	65.83	-12.73	Peak
2	0.196	30.04	20.11	50.15	63.77	-13.62	Peak
3	0.232	27.17	20.12	47.29	62.37	-15.08	Peak
4	0.283	17.37	20.16	37.53	60.72	-23.19	Peak
5	0.546	13.25	20.11	33.36	56.00	-22.64	Peak
6	30.000	10.29	19.87	30.16	60.00	-29.84	Peak

For BLE Mode: Transmitting in maximum output power mode low channel

Site : CE
Condition : limit\FCC PART 15.207
: DET:Peak
Project No. : RKSA240801002
Model : ESP32-WROOM-32UE
Phase : N
Voltage : AC 120V
Mode : BLE 1M
Test Equipment : ENV216,ESR
Temperature : 27.2°C
Humidity : 50%
Atmospheric pressure: 100.6kPa
Test Engineer : Leah Li



Site : CE
Condition : limit\FCC PART 15.207
: DET:Peak
Project No. : RKSA240801002
Model : ESP32-WROOM-32UE
Phase : L
Voltage : AC 120V
Mode : BLE 1M
Test Equipment : ENV216,ESR
Temperature : 27.2°C
Humidity : 50%
Atmospheric pressure: 100.6kPa
Test Engineer : Leah Li

	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	
1	0.167	33.88	20.11	53.99	65.09	-11.10	Peak
2	0.200	27.99	20.11	48.10	63.61	-15.51	Peak
3	0.230	24.73	20.12	44.85	62.45	-17.60	Peak
4	0.316	15.74	20.17	35.91	59.81	-23.90	Peak
5	0.535	12.88	20.12	33.00	56.00	-23.00	Peak
6	27.983	10.29	19.85	30.14	60.00	-29.86	Peak

SPURIOUS EMISSIONS

Test Result: Compliant

EUT operation mode: Transmitting

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

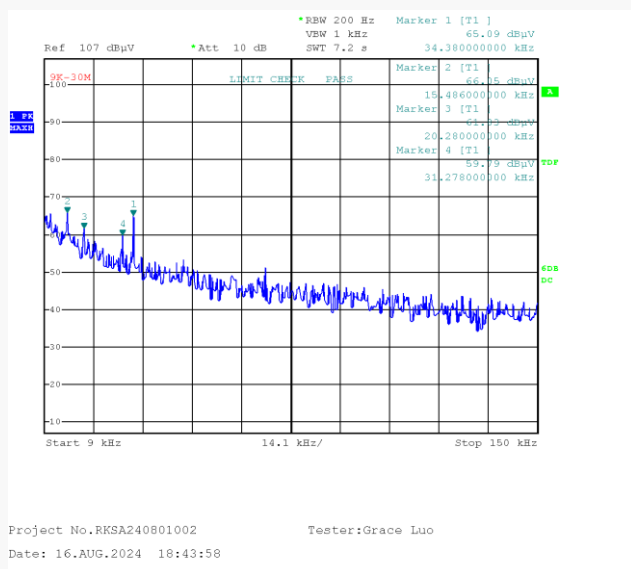
Dipole Antenna:

For Wi-Fi Mode:

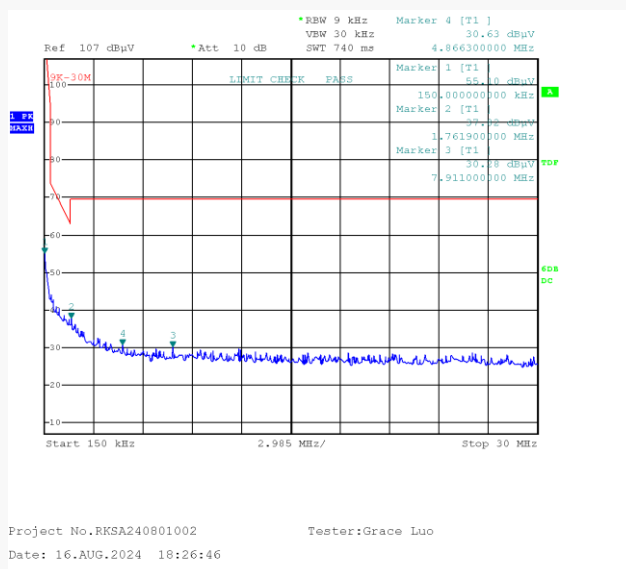
9 kHz-30MHz: (Transmitting in maximum output power mode and channel 802.11g mode high channel)

Parallel(worst case)

9kHz-150kHz



150kHz-30MHz



9kHz-150kHz

Frequency (MHz)	Corrected Amplitude (dBμV/m) @3m	Detector PK/QP/Ave.	Corrected Factor (dB/m)	Limit (dBμV/m) @3m	Margin (dB)
0.03	65.09	PK	46.06	116.88	51.79
0.02	66.05	PK	52.87	123.81	57.76
0.02	61.83	PK	49.92	121.46	59.63
0.03	59.79	PK	46.87	117.70	57.91

150kHz-30MHz

Frequency (MHz)	Corrected Amplitude (dBμV/m) @3m	Detector PK/QP/Ave.	Corrected Factor (dB/m)	Limit (dBμV/m) @3m	Margin (dB)
0.15	55.10	PK	50.90	104.08	48.98
1.76	37.82	PK	11.31	69.54	31.72
7.91	30.28	PK	6.44	69.54	39.26
4.87	30.63	PK	9.73	69.54	38.91

30MHz-1GHz (802.11g mode is worst case):

Low channel: 2412MHz

Common Information

Project No:

EUT Model:

Test Mode:

Standard:

Test Equipment:

Temperature:

Humidity:

Barometric Pressure:

Test Engineer:

Test Date:

RKSA240801002

ESP32-WROOM-32UE

Transmitting in 802.11g mode low channel

FCC Part 15.205 & FCC Part 15.209&FCC Part 15.247

ESCI, JB3, 310N

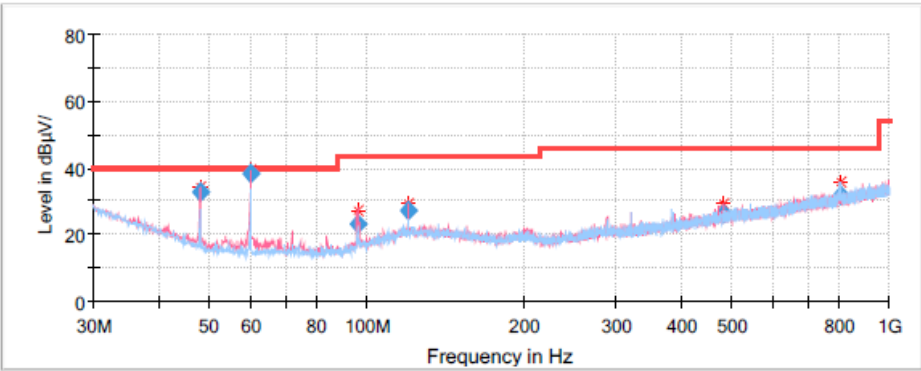
24.7℃

56%

100.8kPa

Grace Luo

2024/8/16

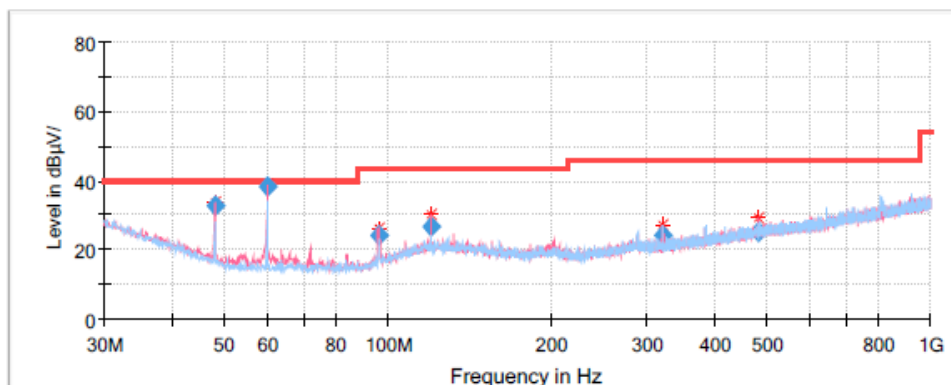


Final Result

Frequency (MHz)	QuasiPeak (dBμ V/m)	Limit (dBμ V/m)	Margin (dB)	Pol	Corr. (dB/m)
47.984600	32.80	40.00	7.20	V	-15.7
60.005450	38.30	40.00	1.70	V	-17.6
96.359650	22.97	43.50	20.53	V	-15.4
120.022700	27.42	43.50	16.08	V	-10.9
479.991500	26.30	46.00	19.70	V	-5.9
806.296600	31.78	46.00	14.22	H	-0.7

Middle channel: 2437MHz**Common Information**

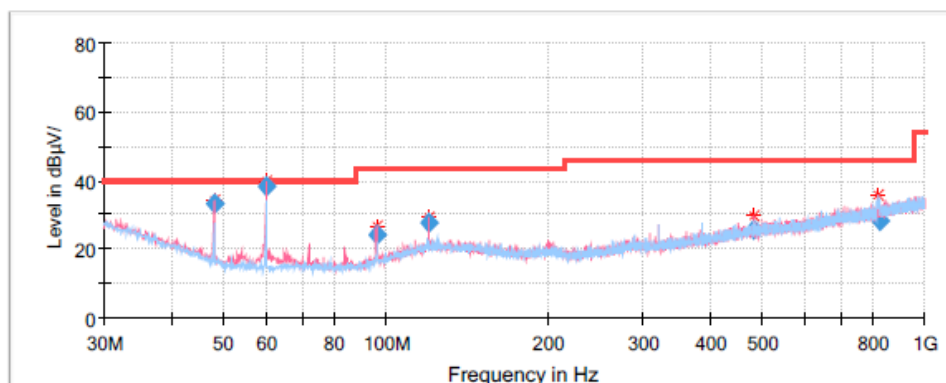
Project No: RKSA240801002
EUT Model: ESP32-WROOM-32UE
Test Mode: Transmitting in 802.11g mode middle channel
Standard: FCC Part 15.205 & FCC Part 15.209 & FCC Part 15.247
Test Equipment: ESCI, JB3, 310N
Temperature: 24.7°C
Humidity: 56%
Barometric Pressure: 100.8kPa
Test Engineer: Grace Luo
Test Date: 2024/8/16

**Final Result**

Frequency (MHz)	QuasiPeak (dBμ V/m)	Limit (dBμ V/m)	Margin (dB)	Pol	Corr. (dB/m)
48.004700	32.53	40.00	7.47	V	-15.7
60.006650	38.45	40.00	1.55	V	-17.6
96.081250	24.17	43.50	19.33	V	-15.4
119.999600	26.65	43.50	16.85	V	-10.9
319.986800	24.15	46.00	21.85	V	-10.0
479.967750	25.25	46.00	20.75	V	-5.9

High Channel: 2462MHz**Common Information**

Project No:	RKSA240801002
EUT Model:	ESP32-WROOM-32UE
Test Mode:	Transmitting in 802.11g mode high channel
Standard:	FCC Part 15.205 & FCC Part 15.209 & FCC Part 15.247
Test Equipment:	ESCI, JB3, 310N
Temperature:	24.7°C
Humidity:	56%
Barometric Pressure:	100.8kPa
Test Engineer:	Grace Luo
Test Date:	2024/8/16

**Final Result**

Frequency (MHz)	QuasiPeak (dBμ V/m)	Limit (dBμ V/m)	Margin (dB)	Pol	Corr. (dB/m)
47.998100	33.07	40.00	6.93	V	-15.7
59.998250	38.10	40.00	1.90	V	-17.6
96.399700	24.12	43.50	19.38	V	-15.3
120.013100	27.53	43.50	15.97	V	-10.9
480.004700	25.89	46.00	20.11	V	-5.9
822.513850	28.10	46.00	17.90	H	-0.4

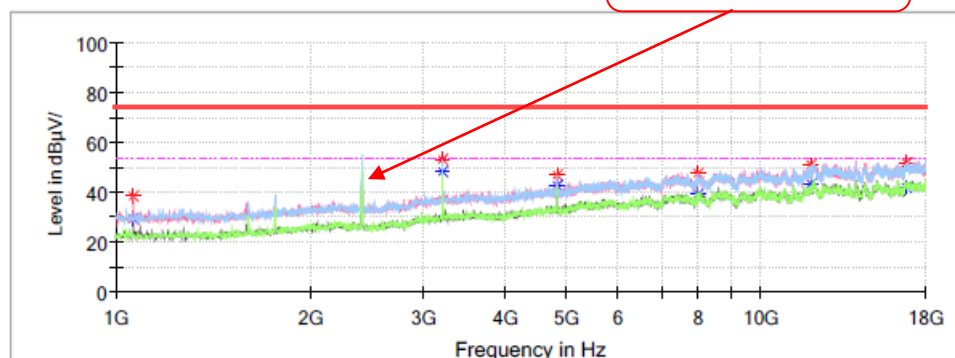
**1GHz-18GHz:
802.11b Mode:**

Low Channel: 2412MHz

Common Information

Project No.: RKSA240801002
 Test Mode: Transmitting in 802.11b mode 2412 channel
 Standard: FCC Part 15.247&FCC Part 15.205&FCC Part 15.209
 Test Engineer: Klein Zhu

Full Spectrum

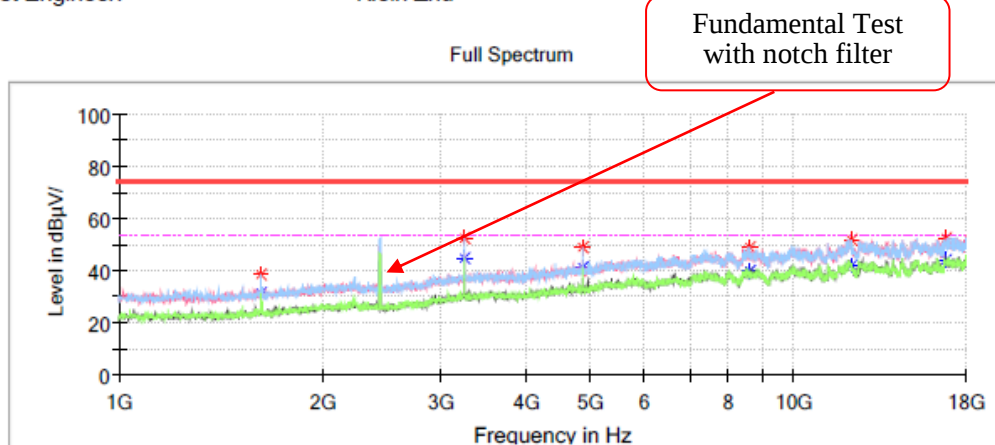


Critical_Freqs

Frequency (MHz)	MaxPeak (dB μ V/m)	Average (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Pol	Corr. (dB/m)
1062.900000	38.13	---	74.00	35.87	V	-15.4
1062.900000	---	29.50	54.00	24.50	V	-15.4
3215.100000	---	48.60	54.00	5.40	H	-7.5
3215.100000	53.23	---	74.00	20.77	H	-7.5
4823.300000	---	42.70	54.00	11.30	H	-3.1
4823.300000	47.02	---	74.00	26.98	H	-3.1
8005.700000	---	39.00	54.00	15.00	V	3.9
8005.700000	47.36	---	74.00	26.64	V	3.9
11936.100000	---	43.36	54.00	10.64	V	9.0
11936.100000	51.31	---	74.00	22.69	V	9.0
16842.300000	---	42.08	54.00	11.92	H	11.8
16842.300000	51.93	---	74.00	22.07	H	11.8

Middle Channel: 2437MHz**Common Information**

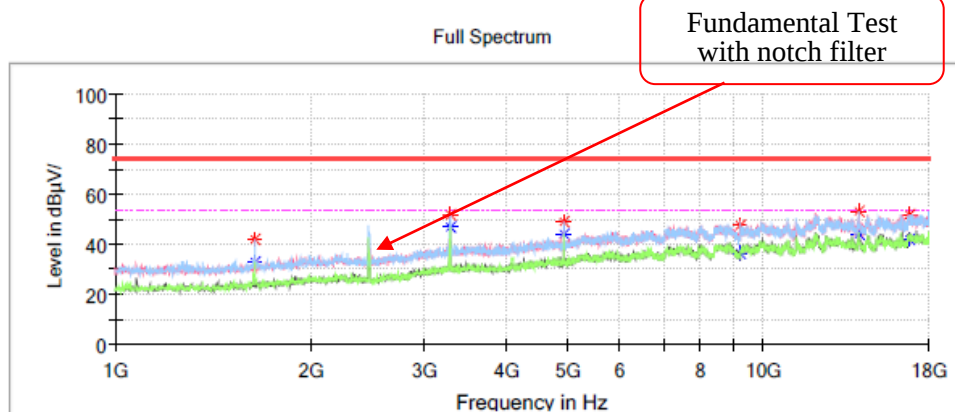
Project No.: RKSA240801002
 Test Mode: Transmitting in 802.11b mode 2437 channel
 Standard: FCC Part 15.247&FCC Part 15.205&FCC Part 15.209
 Test Engineer: Klein Zhu

**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)
1623.900000	---	31.43	54.00	22.57	H	-14.0
1623.900000	38.76	---	74.00	35.24	H	-14.0
3249.100000	---	45.08	54.00	8.92	H	-7.4
3249.100000	52.78	---	74.00	21.22	H	-7.4
4872.600000	---	40.95	54.00	13.05	H	-2.9
4872.600000	48.64	---	74.00	25.36	H	-2.9
8621.100000	---	39.63	54.00	14.37	H	5.4
8621.100000	49.07	---	74.00	24.93	H	5.4
12167.300000	---	42.28	54.00	11.72	V	9.2
12167.300000	52.03	---	74.00	21.97	V	9.2
16764.100000	---	43.95	54.00	10.05	V	11.6
16764.100000	52.54	---	74.00	21.46	V	11.6

High Channel: 2462MHz**Common Information**

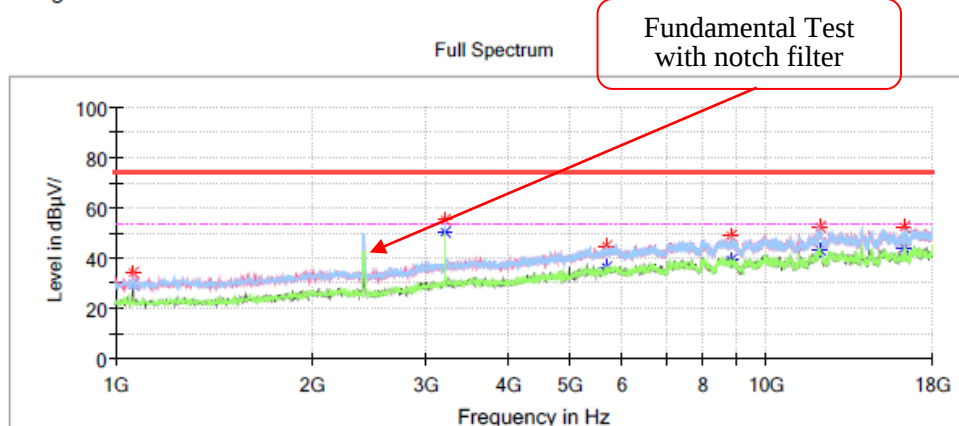
Project No.: RKSA240801002
Test Mode: Transmitting in 802.11b mode 2462 channel
Standard: FCC Part 15.247&FCC Part 15.205&FCC Part 15.209
Test Engineer: Klein Zhu

**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)
1640.900000	---	32.68	54.00	21.32	H	-13.9
1640.900000	41.71	---	74.00	32.29	H	-13.9
3281.400000	---	47.06	54.00	6.94	H	-7.3
3281.400000	52.06	---	74.00	21.94	H	-7.3
4923.600000	---	43.95	54.00	10.05	H	-2.7
4923.600000	49.23	---	74.00	24.77	H	-2.7
9239.900000	---	36.70	54.00	17.30	H	5.4
9239.900000	47.55	---	74.00	26.45	H	5.4
14005.000000	---	44.30	54.00	9.70	V	9.8
14005.000000	53.05	---	74.00	20.95	V	9.8
16852.500000	---	42.29	54.00	11.71	V	11.8
16852.500000	52.05	---	74.00	21.95	V	11.8

802.11g Mode:**Low Channel: 2412MHz****Common Information**

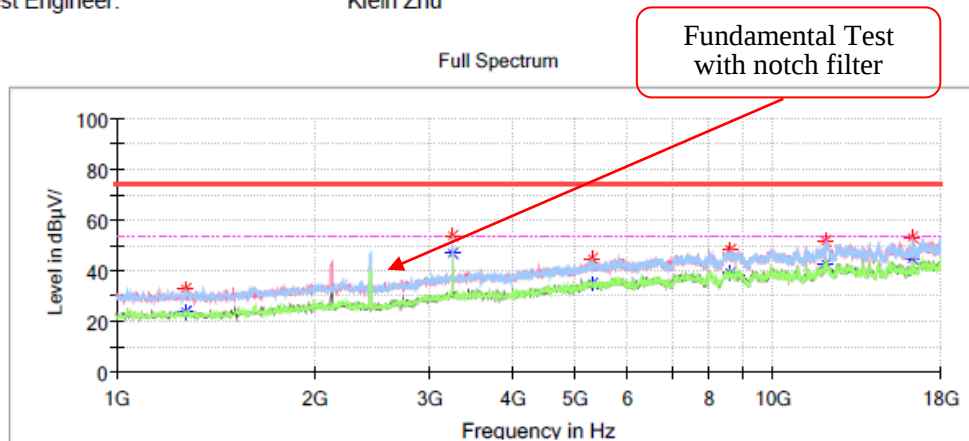
Project No.: RKSA240801002
Test Mode: Transmitting in 802.11g mode 2412 channel
Standard: FCC Part 15.247&FCC Part 15.205&FCC Part 15.209
Test Engineer: Klein Zhu

**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)
1061.200000	---	29.23	54.00	24.77	V	-15.4
1061.200000	34.01	---	74.00	39.99	V	-15.4
3215.100000	---	50.23	54.00	3.77	H	-7.5
3215.100000	55.52	---	74.00	18.48	H	-7.5
5668.200000	---	36.40	54.00	17.60	H	-0.2
5668.200000	44.85	---	74.00	29.15	H	-0.2
8804.700000	---	39.28	54.00	14.72	V	5.4
8804.700000	48.85	---	74.00	25.15	V	5.4
12065.300000	---	43.26	54.00	10.74	V	9.1
12065.300000	52.76	---	74.00	21.24	V	9.1
16303.400000	---	43.94	54.00	10.06	H	10.2
16303.400000	52.18	---	74.00	21.82	H	10.2

Middle Channel: 2437MHz**Common Information**

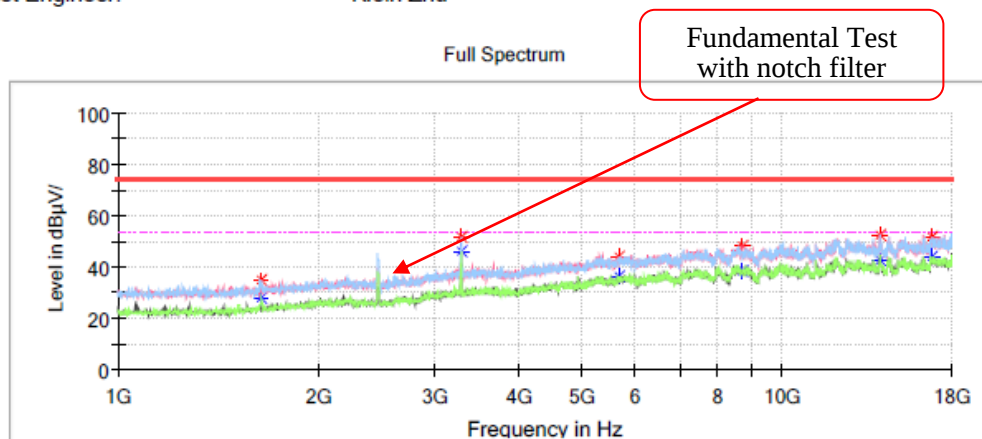
Project No.: RKSA240801002
 Test Mode: Transmitting in 802.11g mode 2437 channel
 Standard: FCC Part 15.247&FCC Part 15.205&FCC Part 15.209
 Test Engineer: Klein Zhu

**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)
1275.400000	---	23.59	54.00	30.41	H	-15.1
1275.400000	32.64	---	74.00	41.36	H	-15.1
3249.100000	---	46.67	54.00	7.33	H	-7.4
3249.100000	53.71	---	74.00	20.29	H	-7.4
5307.800000	---	35.09	54.00	18.91	V	-1.1
5307.800000	44.45	---	74.00	29.55	V	-1.1
8597.300000	---	38.89	54.00	15.11	H	5.4
8597.300000	48.19	---	74.00	25.81	H	5.4
12060.200000	---	42.56	54.00	11.44	V	9.1
12060.200000	51.93	---	74.00	22.07	V	9.1
16305.100000	---	45.01	54.00	8.99	V	10.2
16305.100000	52.95	---	74.00	21.05	V	10.2

High Channel: 2462MHz**Common Information**

Project No.: RKSA240801002
Test Mode: Transmitting in 802.11g mode 2462 channel
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)
1646.000000	---	27.83	54.00	26.17	H	-13.9
1646.000000	35.25	---	74.00	38.75	H	-13.9
3281.400000	51.56	---	74.00	22.44	H	-7.3
3281.400000	---	45.94	54.00	8.06	H	-7.3
5690.300000	---	36.04	54.00	17.96	H	-0.2
5690.300000	43.85	---	74.00	30.15	H	-0.2
8736.700000	---	38.38	54.00	15.62	V	5.4
8736.700000	47.99	---	74.00	26.01	V	5.4
14010.100000	---	42.83	54.00	11.17	V	9.8
14010.100000	52.70	---	74.00	21.30	V	9.8
16840.600000	---	44.31	54.00	9.69	H	11.8
16840.600000	51.70	---	74.00	22.30	H	11.8

802.11n-HT20 Mode :

Low Channel: 2412MHz

Common Information

Project No.:

RKSA240801002

Test Mode:

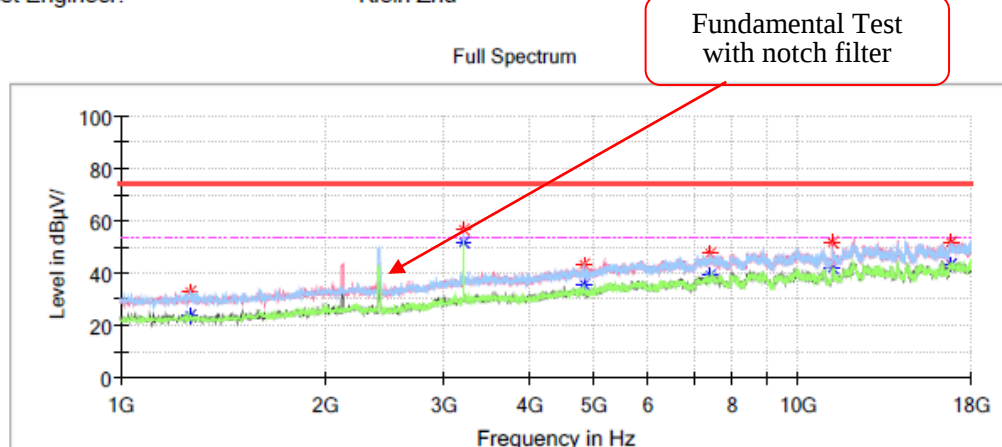
Transmitting in 802.11n20 mode 2412 channel

Standard:

FCC Part 15.247&FCC Part 15.205&FCC Part 15.209

Test Engineer:

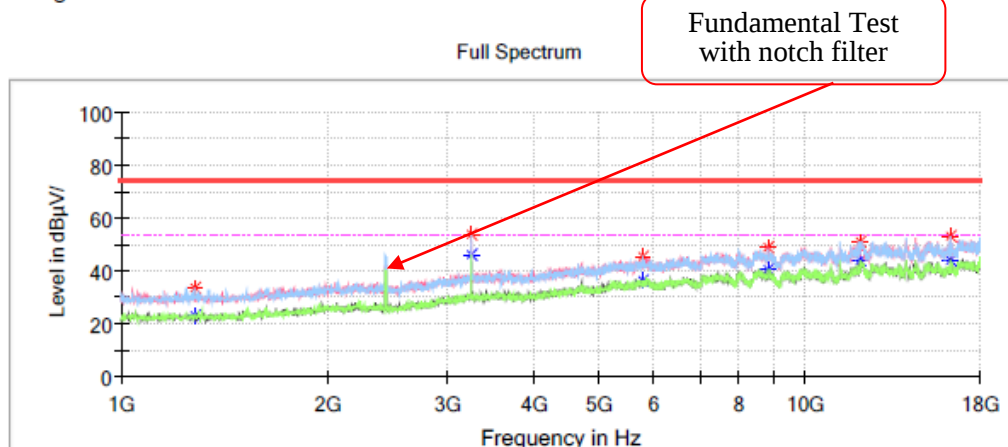
Klein Zhu

**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)
1268.600000	---	23.48	54.00	30.52	H	-15.1
1268.600000	32.81	---	74.00	41.19	H	-15.1
3215.100000	---	51.41	54.00	2.59	H	-7.5
3215.100000	56.73	---	74.00	17.27	H	-7.5
4828.400000	---	36.01	54.00	17.99	H	-3.1
4828.400000	43.10	---	74.00	30.90	H	-3.1
7398.800000	---	39.40	54.00	14.60	V	3.6
7398.800000	47.68	---	74.00	26.32	V	3.6
11206.800000	---	42.13	54.00	11.87	V	7.9
11206.800000	51.88	---	74.00	22.12	V	7.9
16798.100000	---	43.19	54.00	10.81	H	11.7
16798.100000	52.04	---	74.00	21.96	H	11.7

Middle Channel: 2437MHz**Common Information**

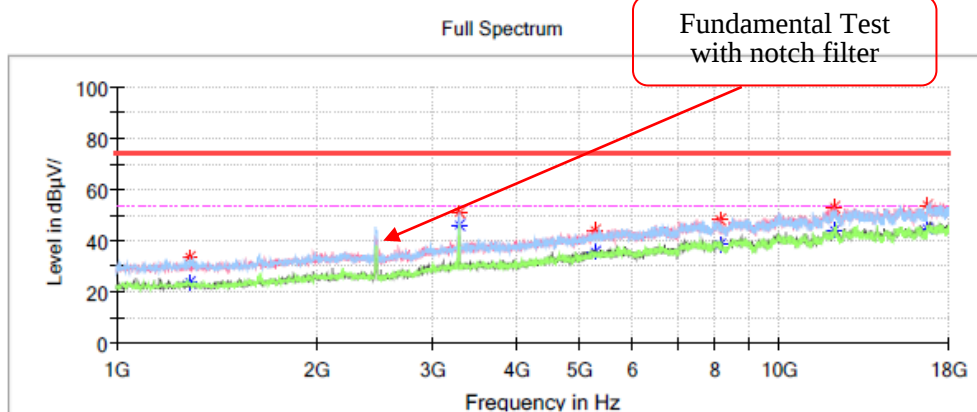
Project No.: RKSA240801002
Test Mode: Transmitting in 802.11n20 mode 2437 channel
Standard: FCC Part 15.247&FCC Part 15.205&FCC Part 15.209
Test Engineer: Klein Zhu

**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)
1278.800000	---	23.11	54.00	30.89	H	-15.1
1278.800000	33.40	---	74.00	40.60	H	-15.1
3249.100000	---	46.49	54.00	7.51	H	-7.4
3249.100000	54.05	---	74.00	19.95	H	-7.4
5790.600000	---	36.26	54.00	17.74	H	-0.1
5790.600000	45.62	---	74.00	28.38	H	-0.1
8803.000000	---	40.88	54.00	13.12	V	5.4
8803.000000	48.94	---	74.00	25.06	V	5.4
12061.900000	---	43.75	54.00	10.25	V	9.1
12061.900000	51.32	---	74.00	22.68	V	9.1
16305.100000	---	43.95	54.00	10.05	H	10.2
16305.100000	52.88	---	74.00	21.12	H	10.2

High Channel: 2462MHz**Common Information**

Project No.: RKSA240801002
 Test Mode: Transmitting in 802.11n20 mode 2462 channel
 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)
1290.700000	---	23.64	54.00	30.36	H	-15.0
1290.700000	33.47	---	74.00	40.53	H	-15.0
3281.400000	---	46.31	54.00	7.69	H	-7.3
3281.400000	51.17	---	74.00	22.83	H	-7.3
5280.600000	---	35.78	54.00	18.22	V	-1.3
5280.600000	44.36	---	74.00	29.64	V	-1.3
8129.800000	---	38.61	54.00	15.39	V	4.3
8129.800000	48.17	---	74.00	25.83	V	4.3
12124.800000	---	44.40	54.00	9.60	V	9.1
12124.800000	53.41	---	74.00	20.59	V	9.1
16733.500000	---	44.99	54.00	9.01	H	11.5
16733.500000	53.91	---	74.00	20.09	H	11.5

802.11n-HT40 Mode :

Low Channel: 2422MHz

Common Information

Project No.:

RKSA240801002

Test Mode:

Transmitting in 802.11n40 mode 2422 channel

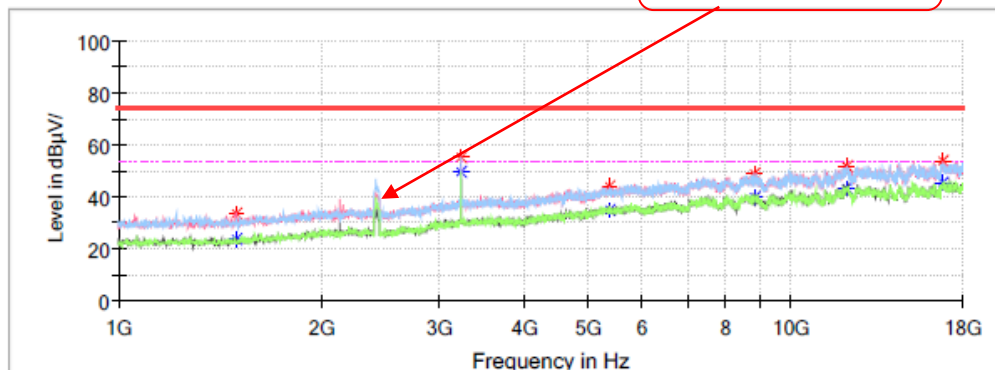
Standard:

FCC Part 15.247&FCC Part 15.205&FCC Part 15.209

Test Engineer:

Klein Zhu

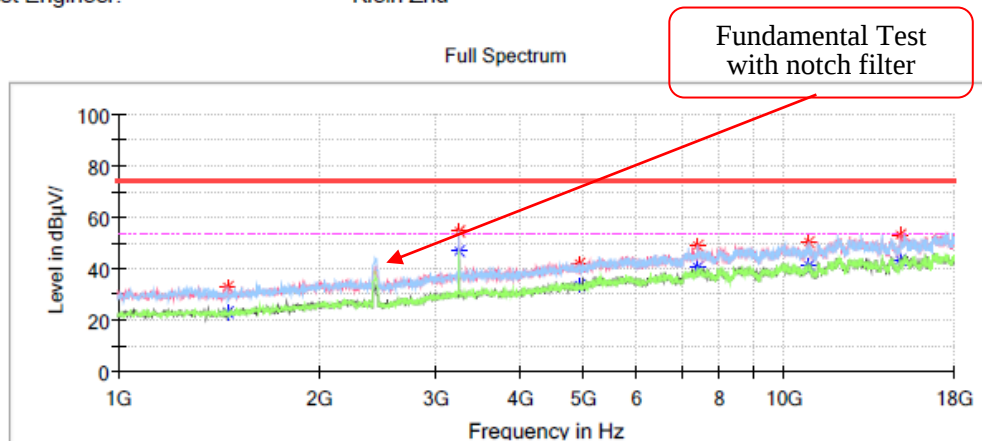
Full Spectrum

Fundamental Test
with notch filter**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)
1493.000000	---	23.60	54.00	30.40	V	-14.7
1493.000000	33.35	---	74.00	40.65	V	-14.7
3228.700000	---	49.57	54.00	4.43	H	-7.5
3228.700000	55.04	---	74.00	18.96	H	-7.5
5358.800000	---	34.82	54.00	19.18	V	-0.9
5358.800000	44.26	---	74.00	29.74	V	-0.9
8804.700000	---	39.91	54.00	14.09	H	5.4
8804.700000	49.13	---	74.00	24.87	H	5.4
12111.200000	---	43.31	54.00	10.69	V	9.1
12111.200000	52.01	---	74.00	21.99	V	9.1
16835.500000	---	45.47	54.00	8.53	H	11.8
16835.500000	53.78	---	74.00	20.22	H	11.8

Middle Channel: 2437MHz**Common Information**

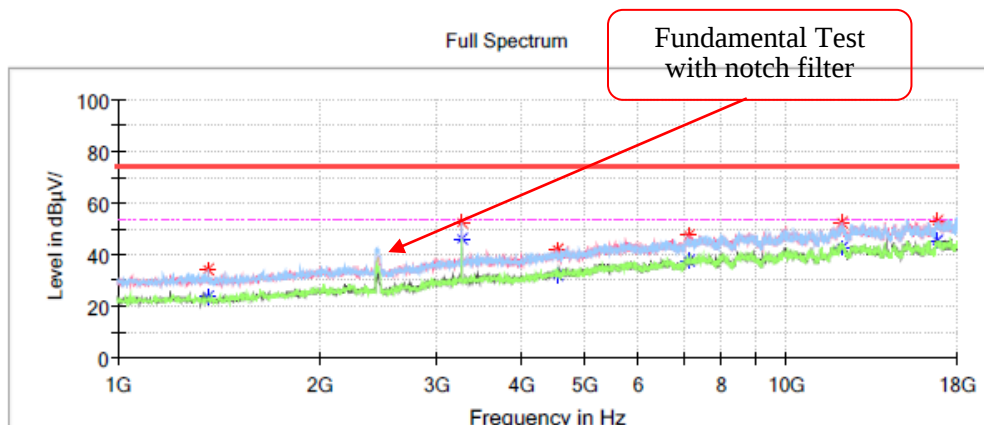
Project No.: RKSA240801002
Test Mode: Transmitting in 802.11n40 mode 2437 channel
Standard: FCC Part 15.247&FCC Part 15.205&FCC Part 15.209
Test Engineer: Klein Zhu

**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)
1462.400000	---	23.37	54.00	30.63	H	-14.8
1462.400000	32.99	---	74.00	41.01	H	-14.8
3249.100000	---	46.53	54.00	7.47	H	-7.4
3249.100000	54.36	---	74.00	19.64	H	-7.4
4925.300000	---	33.89	54.00	20.11	V	-2.7
4925.300000	42.05	---	74.00	31.95	V	-2.7
7431.100000	---	40.40	54.00	13.60	H	3.7
7431.100000	49.04	---	74.00	24.96	H	3.7
10863.400000	---	40.95	54.00	13.05	V	7.3
10863.400000	50.66	---	74.00	23.34	V	7.3
14967.200000	---	43.21	54.00	10.79	H	9.3
14967.200000	53.33	---	74.00	20.67	H	9.3

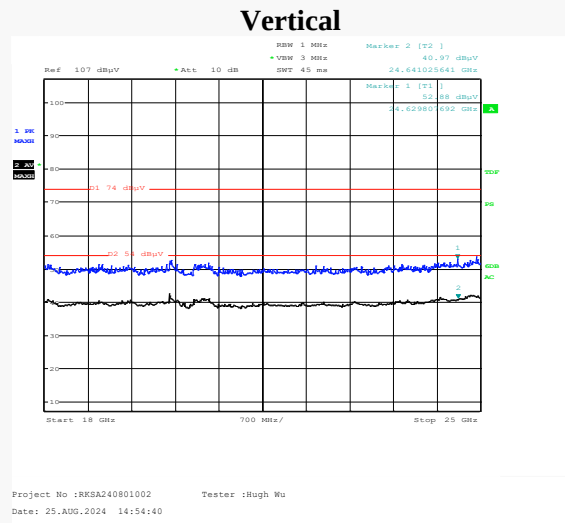
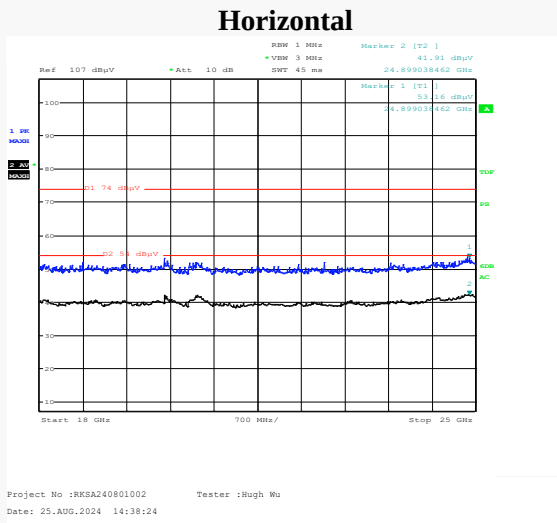
High Channel: 2452MHz**Common Information**

Project No.: RKSA240801002
Test Mode: Transmitting in 802.11n40 mode 2452 channel
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)
1362.100000	---	23.45	54.00	30.55	H	-14.9
1362.100000	34.42	---	74.00	39.58	H	-14.9
3267.800000	---	46.46	54.00	7.54	H	-7.3
3267.800000	52.70	---	74.00	21.30	H	-7.3
4544.500000	---	32.28	54.00	21.72	V	-4.1
4544.500000	42.02	---	74.00	31.98	V	-4.1
7155.700000	---	37.68	54.00	16.32	V	3.0
7155.700000	47.42	---	74.00	26.58	V	3.0
12077.200000	---	42.90	54.00	11.10	H	9.1
12077.200000	52.14	---	74.00	21.86	H	9.1
16772.600000	---	45.13	54.00	8.87	V	11.6
16772.600000	53.01	---	74.00	20.99	V	11.6

18GHz-25GHz: Transmitting in maximum output power mode and channel



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

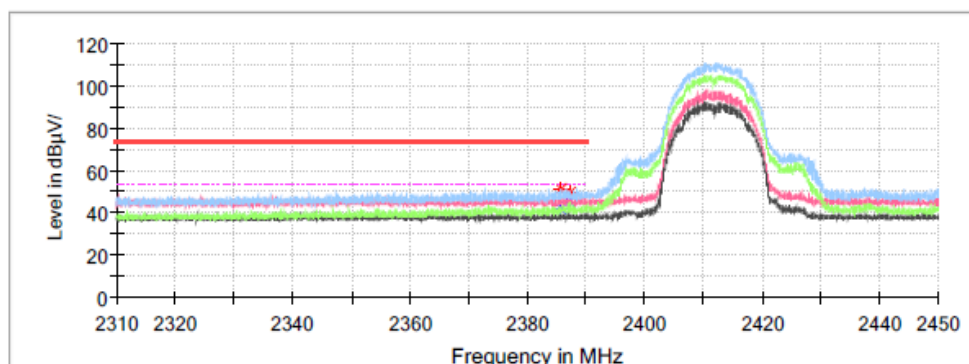
Band Edge:
802.11b Mode:

Low Channel

Common Information

Project No.:	RKSA240801002
Test Mode:	Transmitting in 802.11b mode 2412 channel
Standard:	FCC Part 15.247&FCC Part 15.205&FCC Part 15.209
Test Engineer:	Klein Zhu

Full Spectrum



Critical Freqs

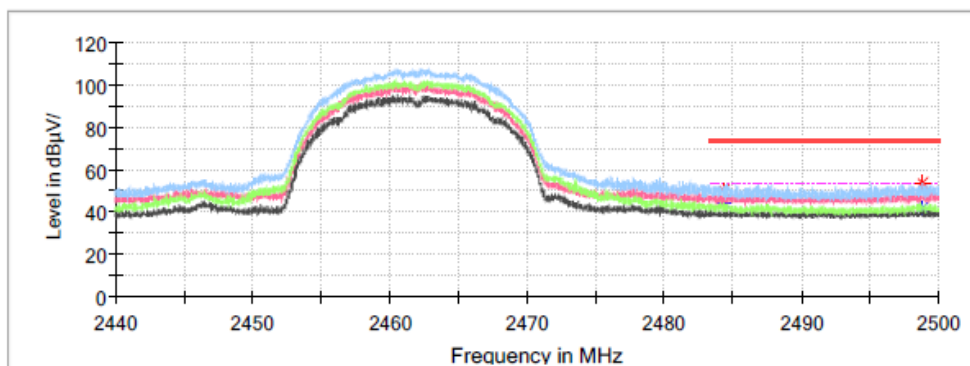
Frequency (MHz)	MaxPeak (dB μ V/m)	Average (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Pol	Corr. (dB/m)
2385.824000	51.33	---	74.00	22.67	H	-0.6
2385.824000	---	41.77	54.00	12.23	H	-0.6
2387.308000	49.81	---	74.00	24.19	V	-0.6
2387.308000	---	45.21	54.00	8.79	V	-0.6

High Channel

Common Information

Project No.: RKSA240801002
Test Mode: Transmitting in 802.11b mode 2462 channel
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)
2484.334000	---	44.19	54.00	9.81	H	-0.3
2484.334000	50.61	---	74.00	23.39	H	-0.3
2498.782000	---	42.32	54.00	11.68	V	-0.2
2498.782000	53.33	---	74.00	20.67	V	-0.2

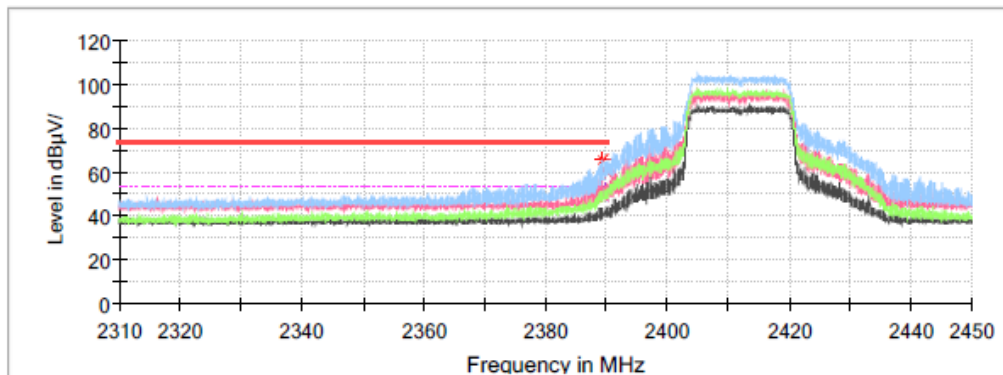
802.11g Mode :

Low Channel

Common Information

Project No.: RKSA240801002
Test Mode: Transmitting in 802.11g mode 2412 channel
Standard: FCC Part 15.247&FCC Part 15.205&FCC Part 15.209
Test Engineer: Klein Zhu

Full Spectrum



Critical Freqs

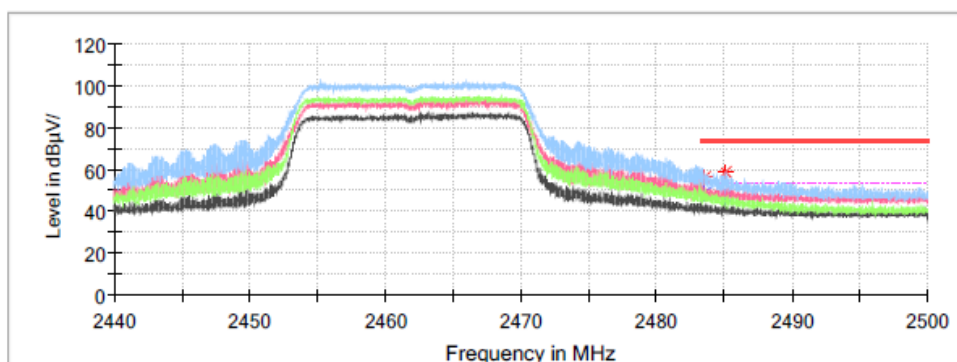
Frequency (MHz)	MaxPeak (dB µ V/m)	Average (dB µ V/m)	Limit (dB µ V/m)	Margin (dB)	Pol	Corr. (dB/m)
2389.422000	65.38	---	74.00	8.62	H	-0.6
2389.422000	---	49.80	54.00	4.20	H	-0.6
2389.968000	60.10	---	74.00	13.90	V	-0.6
2389.968000	---	51.70	54.00	2.30	V	-0.6

High Channel

Common Information

Project No.: RKSA240801002
Test Mode: Transmitting in 802.11g mode 2462 channel
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	56.03	---	74.00	17.97	H	-0.3
2483.518000	---	48.81	54.00	5.19	H	-0.3
2485.096000	58.66	---	74.00	15.34	V	-0.3
2485.096000	---	46.67	54.00	7.33	V	-0.3

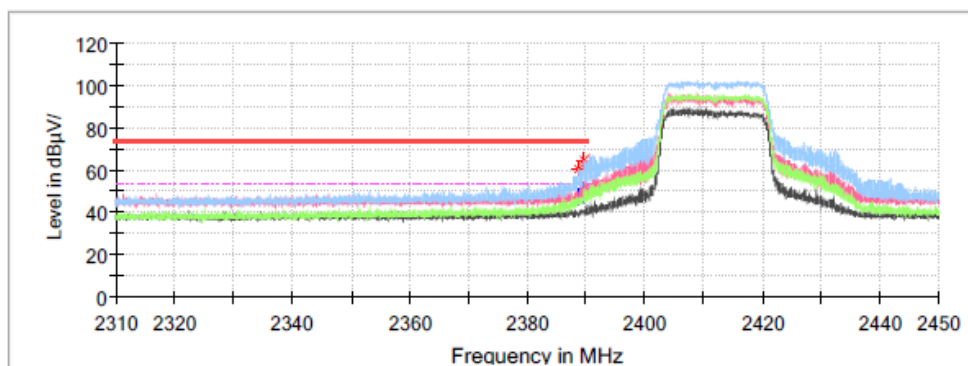
802.11n-HT20 Mode:

Low Channel

Common Information

Project No.:	RKSA240801002
Test Mode:	Transmitting in 802.11n20 mode 2412 channel
Standard:	FCC Part 15.247&FCC Part 15.205&FCC Part 15.209
Test Engineer:	Klein Zhu

Full Spectrum



Critical_Freqs

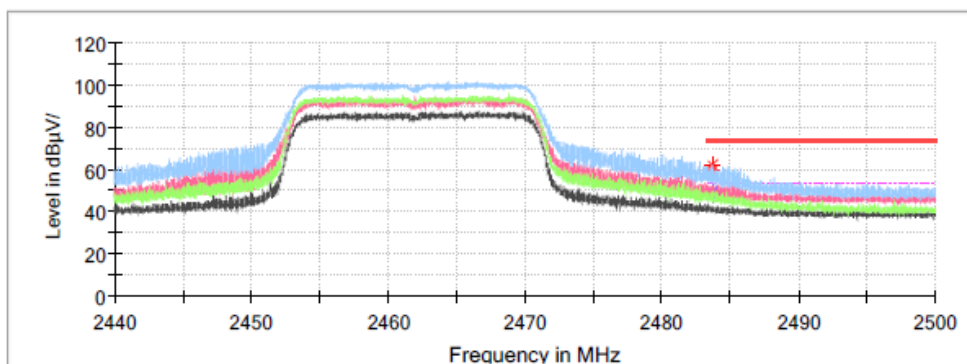
Frequency (MHz)	MaxPeak (dB µ V/m)	Average (dB µ V/m)	Limit (dB µ V/m)	Margin (dB)	Pol	Corr. (dB/m)
2388.778000	---	46.73	54.00	7.27	H	-0.6
2388.778000	60.59	---	74.00	13.41	H	-0.6
2389.674000	---	51.43	54.00	2.57	V	-0.6
2389.674000	64.72	---	74.00	9.28	V	-0.6

High Channel

Common Information

Project No.: RKSA240801002
Test Mode: Transmitting in 802.11n20 mode 2462 channel
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)
2483.662000	59.82	---	74.00	14.18	H	-0.3
2483.662000	---	49.76	54.00	4.24	H	-0.3
2483.722000	61.89	---	74.00	12.11	V	-0.3
2483.722000	---	48.08	54.00	5.92	V	-0.3

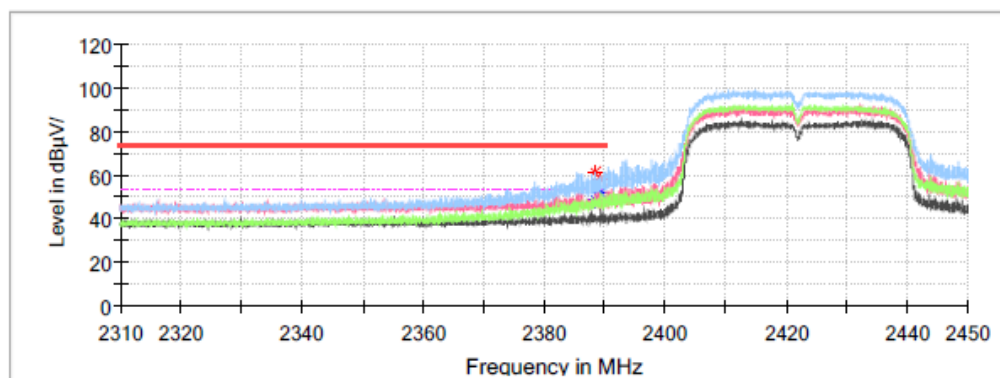
802.11n-HT40 Mode:

Low Channel

Common Information

Project No.: RKSA240801002
Test Mode: Transmitting in 802.11n40 mode 2422 channel
Standard: FCC Part 15.247&FCC Part 15.205&FCC Part 15.209
Test Engineer: Klein Zhu

Full Spectrum



Critical_Freqs

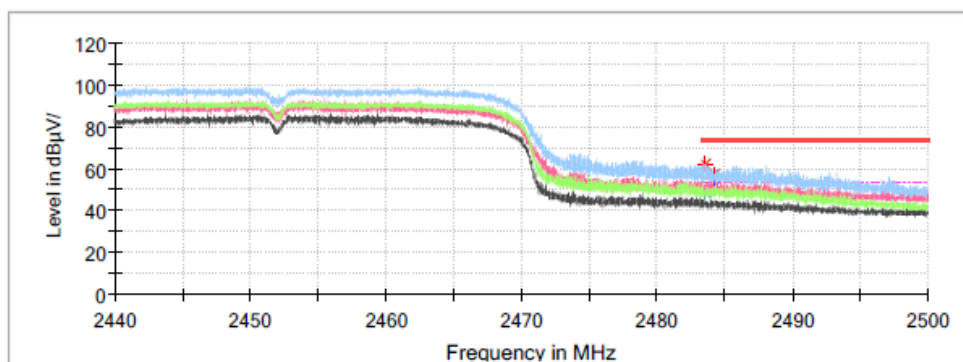
Frequency (MHz)	MaxPeak (dB μ V/m)	Average (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Pol	Corr. (dB/m)
2388.428000	61.45	---	74.00	12.55	H	-0.6
2388.428000	---	48.75	54.00	5.25	H	-0.6
2389.436000	57.80	---	74.00	16.20	V	-0.6
2389.436000	---	52.01	54.00	1.99	V	-0.6

High Channel

Common Information

Project No.: RKSA240801002
Test Mode: Transmitting in 802.11n40 mode 2452 channel
Standard: FCC Part 15.247&FCC Part 15.205&FCC Part 15.209
Test Engineer: Klein Zhu

Full Spectrum



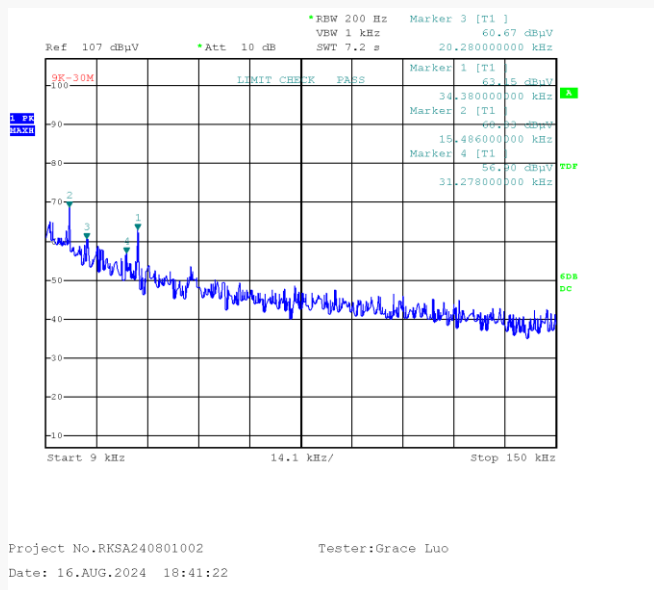
Critical_Freqs

Frequency (MHz)	MaxPeak (dB µ V/m)	Average (dB µ V/m)	Limit (dB µ V/m)	Margin (dB)	Pol	Corr. (dB/m)
2483.590000	62.16	---	74.00	11.84	H	-0.3
2483.590000	---	48.97	54.00	5.03	H	-0.3
2484.274000	56.75	---	74.00	17.25	V	-0.3
2484.274000	---	51.51	54.00	2.49	V	-0.3

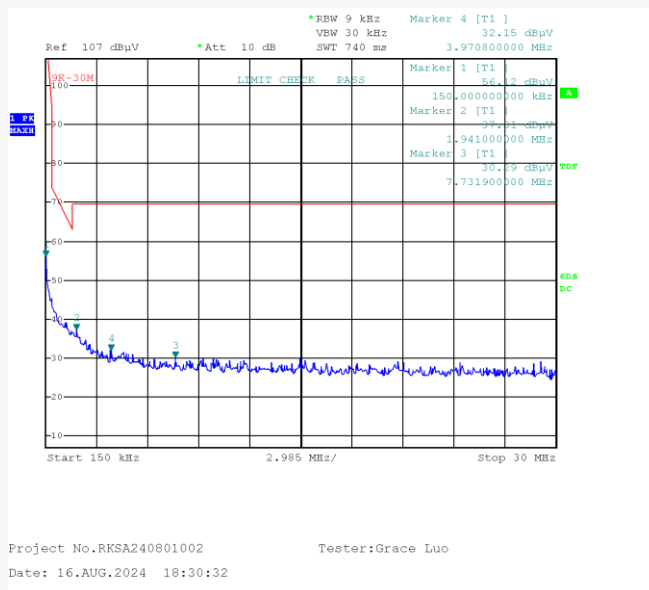
For BLE Mode:

**9 kHz-30MHz:
Parallel(worst case)**

9kHz-150kHz



150kHz-30MHz



9 kHz-150 kHz

Frequency (MHz)	Corrected Amplitude (dBμV/m) @3m	Detector PK/QP/Ave.	Corrected Factor (dB/m)	Limit (dBμV/m) @3m	Margin (dB)
0.03	63.15	PK	46.06	116.88	53.73
0.02	68.83	PK	52.87	123.81	54.98
0.02	60.67	PK	49.92	121.46	60.79
0.03	56.90	PK	46.87	117.70	60.80

150 kHz-30 MHz

Frequency (MHz)	Corrected Amplitude (dBμV/m) @3m	Detector PK/QP/Ave.	Corrected Factor (dB/m)	Limit (dBμV/m) @3m	Margin (dB)
0.15	56.12	PK	50.90	104.08	47.96
1.94	37.31	PK	13.63	69.54	32.23
7.73	30.29	PK	6.51	69.54	39.25
3.97	32.15	PK	18.74	69.54	37.39

30MHz-1GHz

Low Channel: 2402MHz

Common Information

Project No:

EUT Model:

Test Mode:

Standard:

Test Equipment:

Temperature:

Humidity:

Barometric Pressure:

Test Engineer:

Test Date:

RKSA240801002

ESP32-WROOM-32UE

Transmitting in BLE-1M mode low channel

FCC Part 15.205 & FCC Part 15.209 & FCC Part 15.247

ESCI, JB3, 310N

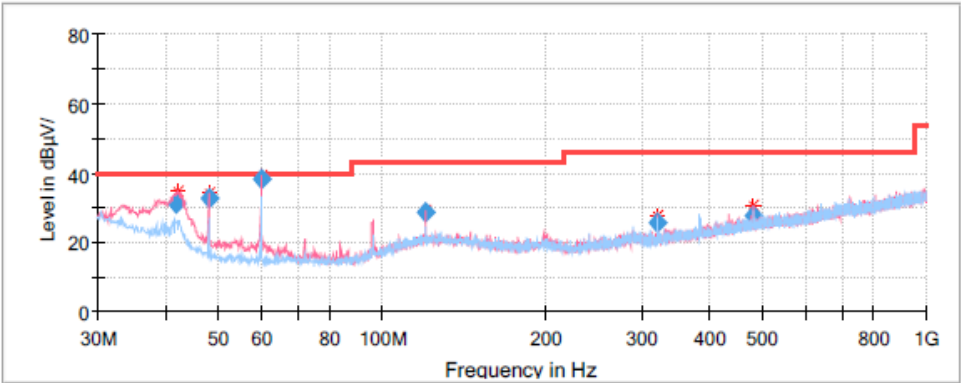
24.7℃

56%

100.8kPa

Grace Luo

2024/8/16



Final Result

Frequency (MHz)	QuasiPeak (dBµ V/m)	Limit (dBµ V/m)	Margin (dB)	Pol	Corr. (dB/m)
41.862450	30.97	40.00	9.03	V	-12.4
47.998700	32.78	40.00	7.22	V	-15.7
60.000050	38.03	40.00	1.97	V	-17.6
119.998400	28.83	43.50	14.67	V	-10.9
319.981700	25.84	46.00	20.16	V	-10.0
480.010650	27.52	46.00	18.48	V	-5.9

Middle Channel: 2440MHz

Common Information

Project No:

EUT Model:

Test Mode:

Standard:

Test Equipment:

Temperature:

Humidity:

Barometric Pressure:

Test Engineer:

Test Date:

RKSA240801002

ESP32-WROOM-32UE

Transmitting in BLE-1M mode middle channel

FCC Part 15.205 &FCC Part 15.209&FCC Part 15.247

ESCI, JB3, 310N

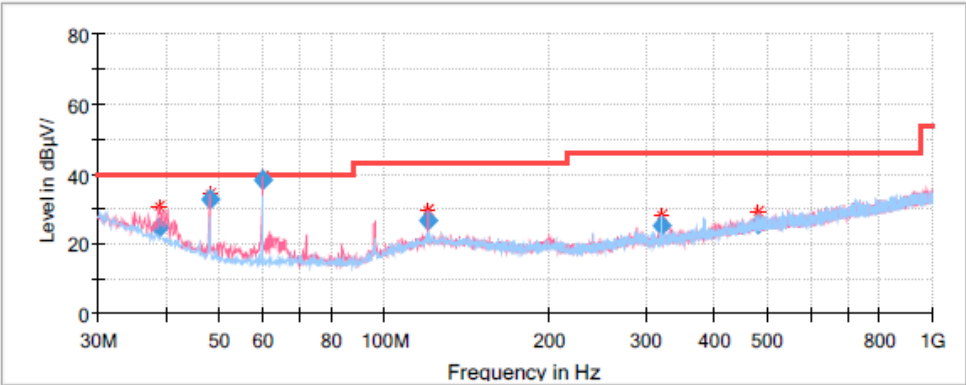
24.7℃

56%

100.8kPa

Grace Luo

2024/8/16

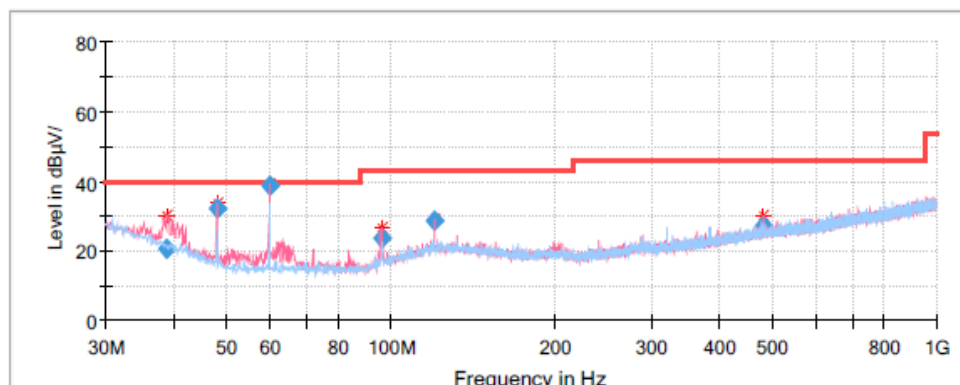


Final Result

Frequency (MHz)	QuasiPeak (dBµ V/m)	Limit (dBµ V/m)	Margin (dB)	Pol	Corr. (dB/m)
38.851000	24.48	40.00	15.52	V	-10.9
48.002900	32.65	40.00	7.35	V	-15.7
60.008750	38.34	40.00	1.66	V	-17.6
120.025700	26.73	43.50	16.77	V	-10.9
319.982000	25.20	46.00	20.80	V	-10.0
479.958000	25.57	46.00	20.43	V	-4.9

High Channel: 2480MHz**Common Information**

Project No: RKSA240801002
EUT Model: ESP32-WROOM-32UE
Test Mode: Transmitting in BLE-1M mode high channel
Standard: FCC Part 15.205 & FCC Part 15.209 & FCC Part 15.247
Test Equipment: ESCI, JB3, 310N
Temperature: 24.7°C
Humidity: 56%
Barometric Pressure: 100.8kPa
Test Engineer: Grace Luo
Test Date: 2024/8/16

**Final Result**

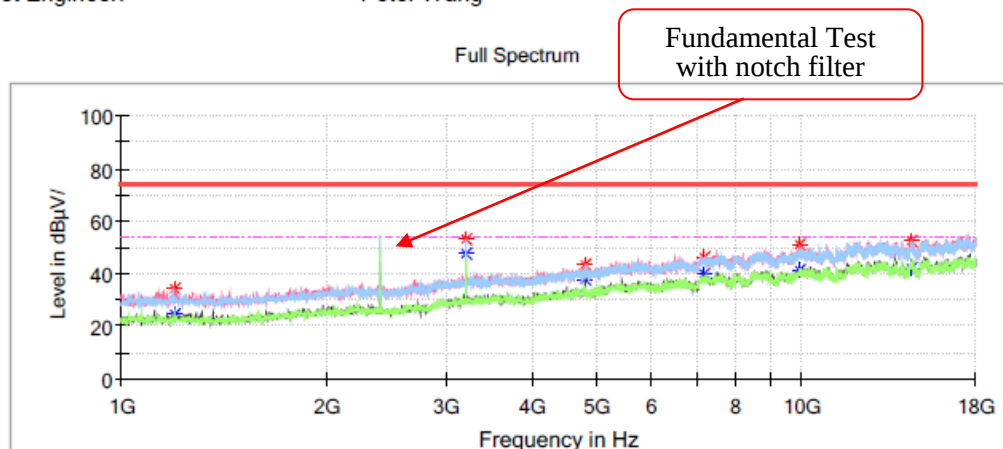
Frequency (MHz)	QuasiPeak (dBμ V/m)	Limit (dBμ V/m)	Margin (dB)	Pol	Corr. (dB/m)
38.972500	20.87	40.00	19.13	V	-11.0
47.986400	32.22	40.00	7.78	V	-15.7
60.001250	38.69	40.00	1.31	V	-17.6
96.099900	23.72	43.50	19.78	V	-15.4
120.000500	28.53	43.50	14.97	V	-10.9
480.020550	27.17	46.00	18.83	V	-5.9

1GHz-18GHz:

Low Channel: 2402MHz

Common Information

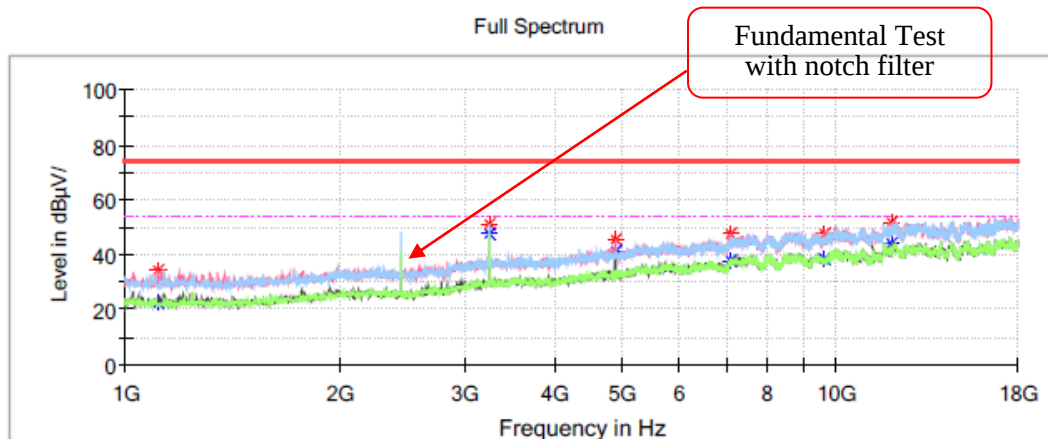
Project No.: RKSA240801002
 Test Mode: BLE 1M
 Standard: FCC Part 15.247 & FCC Part 15.205 & FCC Part 15.209
 Test Engineer: Peter Wang

**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)
1195.500000	---	24.35	54.00	29.65	V	-15.2
1195.500000	34.00	---	74.00	40.00	V	-15.2
3201.500000	---	47.71	54.00	6.29	H	-7.6
3201.500000	52.93	---	74.00	21.07	H	-7.6
4802.900000	---	37.44	54.00	16.56	V	-3.2
4802.900000	43.23	---	74.00	30.77	V	-3.2
7206.700000	---	40.00	54.00	14.00	V	3.2
7206.700000	46.11	---	74.00	27.89	V	3.2
9919.900000	---	41.18	54.00	12.82	V	6.9
9919.900000	51.03	---	74.00	22.97	V	6.9
14513.300000	---	42.17	54.00	11.83	H	9.4
14513.300000	52.25	---	74.00	21.75	H	9.4

Middle Channel: 2440MHz**Common Information**

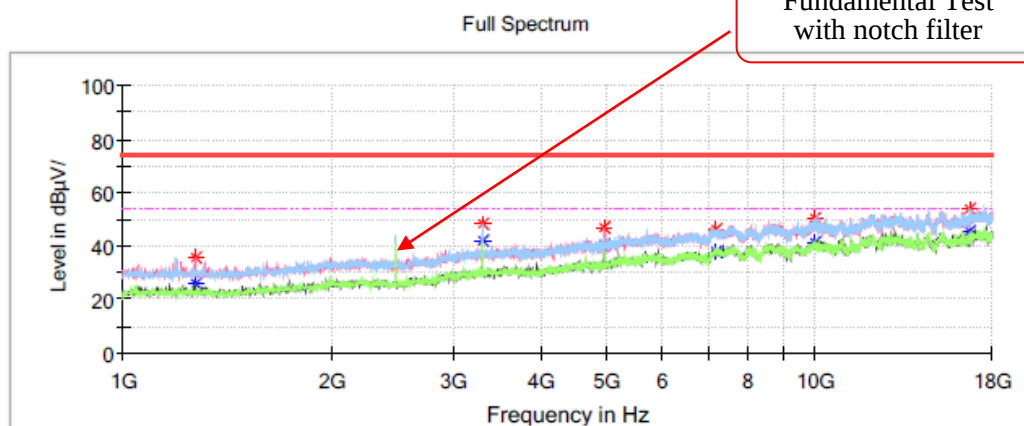
Project No.: RKSA240801002
 Test Mode: BLE 1M
 Standard: FCC Part 15.247 & FCC Part 15.205 & FCC Part 15.209
 Test Engineer: Peter Wang

**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)
1110.500000	---	22.60	54.00	31.40	V	-15.3
1110.500000	34.32	---	74.00	39.68	V	-15.3
3252.500000	---	47.78	54.00	6.22	H	-7.4
3252.500000	50.94	---	74.00	23.06	H	-7.4
4879.400000	---	41.15	54.00	12.85	V	-2.9
4879.400000	45.51	---	74.00	28.49	V	-2.9
7113.200000	---	38.02	54.00	15.98	H	2.9
7113.200000	47.31	---	74.00	26.69	V	2.9
9605.400000	---	38.18	54.00	15.82	V	5.8
9605.400000	47.81	---	74.00	26.19	V	5.8
11941.200000	---	44.07	54.00	9.93	V	9.0
11941.200000	52.05	---	74.00	21.95	V	9.0

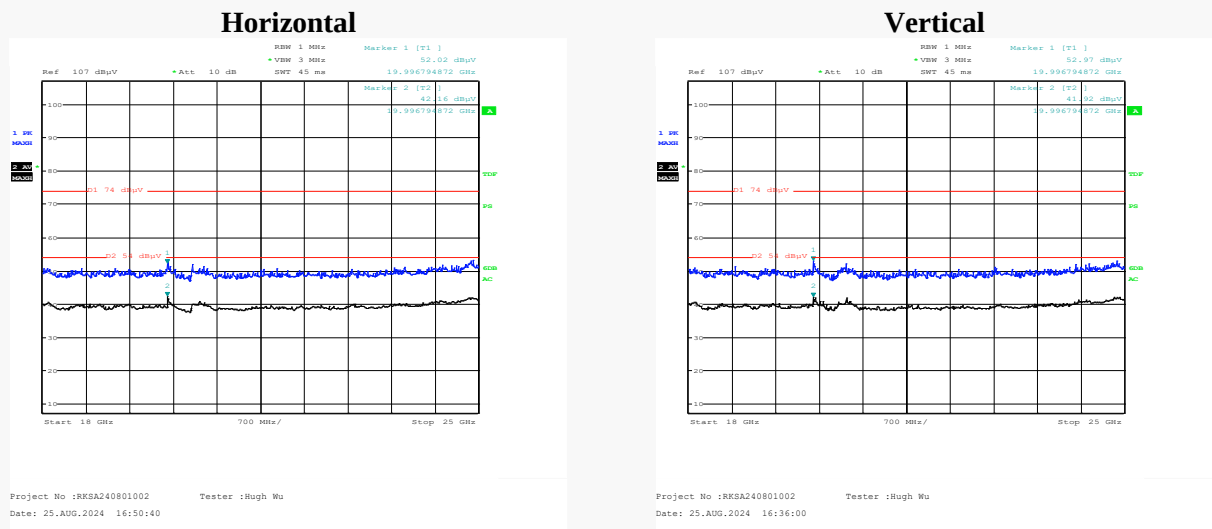
High Channel: 2480MHz**Common Information**

Project No.: RKSA240801002
 Test Mode: BLE 1M
 Standard: FCC Part 15.247 & FCC Part 15.205 & FCC Part 15.209
 Test Engineer: Peter Wang

**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)
1270.300000	---	25.71	54.00	28.29	V	-15.1
1270.300000	35.46	---	74.00	38.54	V	-15.1
3305.200000	---	41.79	54.00	12.21	H	-7.2
3305.200000	48.43	---	74.00	25.57	H	-7.2
4959.300000	---	40.91	54.00	13.09	V	-2.6
4959.300000	46.72	---	74.00	27.28	V	-2.6
7199.900000	---	37.66	54.00	16.34	H	3.1
7199.900000	46.40	---	74.00	27.60	H	3.1
9981.100000	---	41.21	54.00	12.79	H	7.1
9981.100000	50.00	---	74.00	24.00	H	7.1
16750.500000	---	45.59	54.00	8.41	V	11.5
16750.500000	53.55	---	74.00	20.45	H	11.5

18GHz-25GHz: Transmitting in maximum output power mode and channel

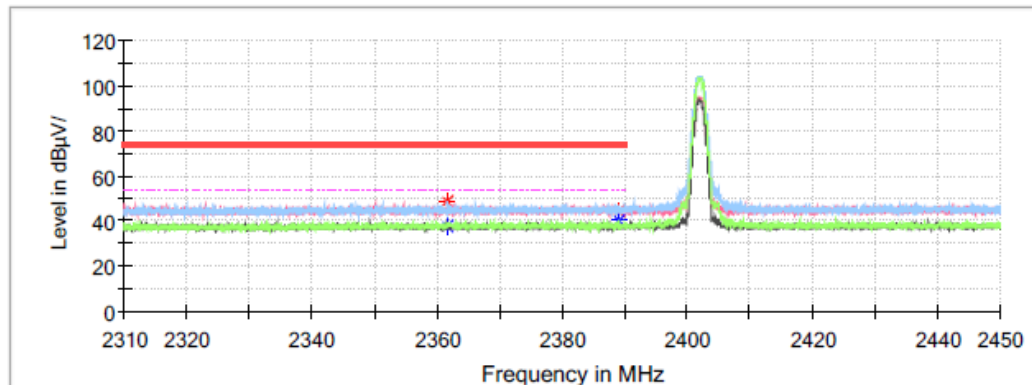


Note: The test distance is 3m. The limit is 74dBμV/m(Peak) and 54dBμV/m(Average).

Band Edge:**Low Channel****Common Information**

Project No.:	RKSA240801002
Test Mode:	BLE 1M
Standard:	FCC Part 15.247 & FCC Part 15.205 & FCC Part 15.209
Test Engineer:	Peter Wang

Full Spectrum

**Critical Freqs**

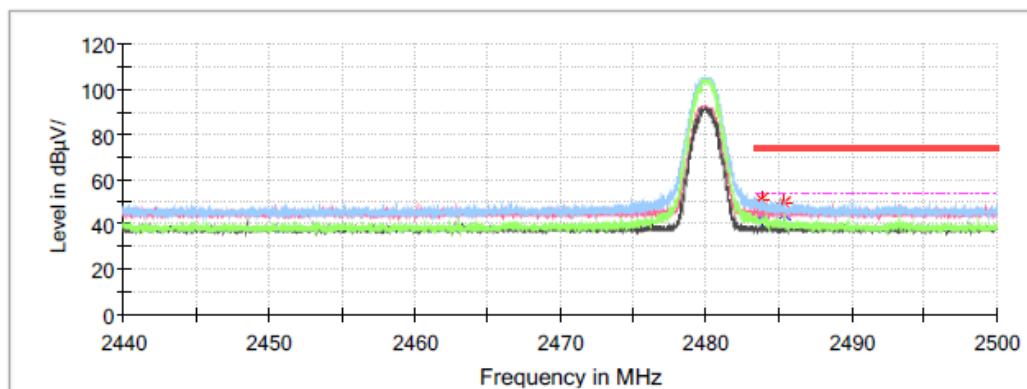
Frequency (MHz)	MaxPeak (dB μ V/m)	Average (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Pol	Corr. (dB/m)
2361.744000	48.50	---	74.00	25.50	H	-0.7
2361.744000	---	37.75	54.00	16.25	H	-0.7
2388.946000	44.59	---	74.00	29.41	H	-0.6
2388.946000	---	40.20	54.00	13.80	H	-0.6

High Channel

Common Information

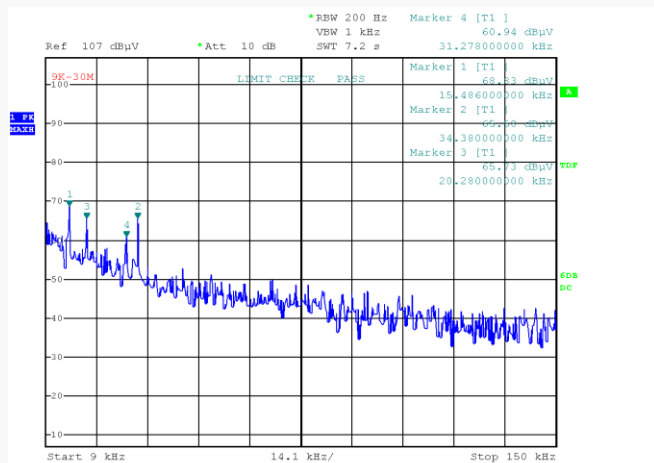
Project No.: RKSA240801002
Test Mode: BLE 1M
Standard: FCC Part 15.247 & FCC Part 15.205 & FCC Part 15.209
Test Engineer: Peter Wang

Full Spectrum

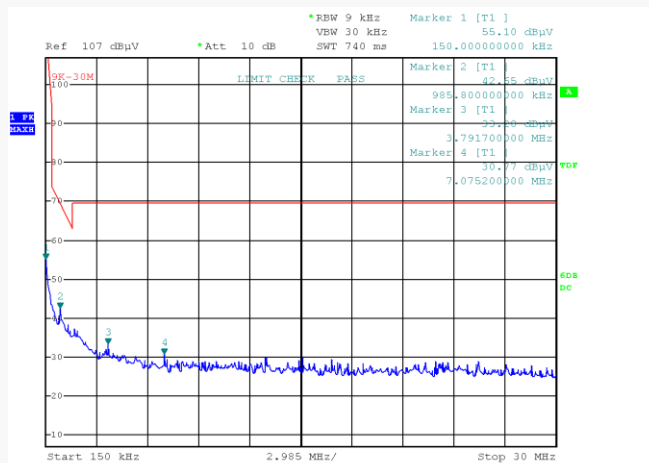


Critical Freqs

Frequency (MHz)	MaxPeak (dB μ V/m)	Average (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Pol	Corr. (dB/m)
2483.782000	51.55	---	74.00	22.45	H	-0.3
2483.782000	---	42.86	54.00	11.14	H	-0.3
2485.336000	49.19	---	74.00	24.81	H	-0.2
2485.336000	---	44.47	54.00	9.53	H	-0.2

Monopole Antenna:**For Wi-Fi Mode:****9 kHz-30MHz:** (Transmitting in maximum output power mode and channel 802.11g mode high channel)**Parallel(worst case)****9kHz-150kHz**Project No. RKSA240801002
Date: 6.SEP.2024 23:25:41

Tester: Grace Luo

150kHz-30MHzProject No. RKSA240801002
Date: 6.SEP.2024 23:13:51

Tester: Grace Luo

9 kHz-150 kHz

Frequency (MHz)	Corrected Amplitude (dBμV/m) @3m	Detector PK/QP/Ave.	Corrected Factor (dB/m)	Limit (dBμV/m) @3m	Margin (dB)
0.02	68.83	PK	52.87	123.81	54.98
0.03	65.58	PK	46.06	116.88	51.30
0.02	65.73	PK	49.92	121.46	55.73
0.03	60.94	PK	46.87	117.70	56.76

150 kHz-30 MHz

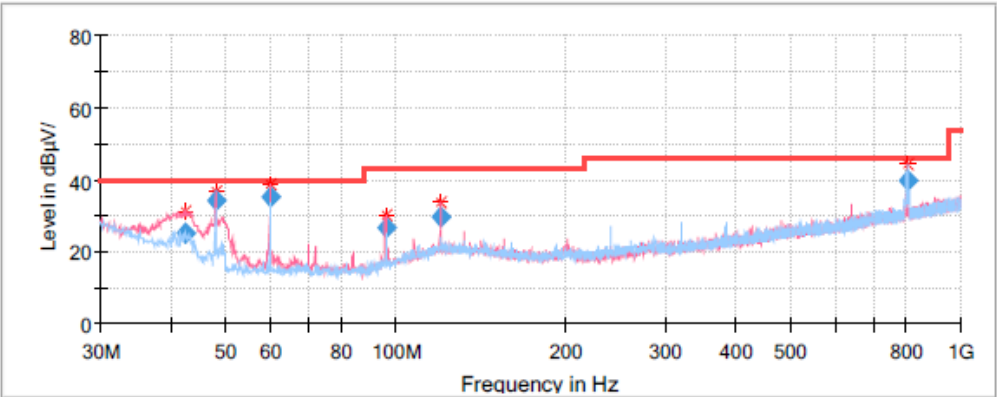
Frequency (MHz)	Corrected Amplitude (dBμV/m) @3m	Detector PK/QP/Ave.	Corrected Factor (dB/m)	Limit (dBμV/m) @3m	Margin (dB)
0.15	55.10	PK	50.90	104.08	48.98
0.99	42.65	PK	17.65	67.73	25.08
3.79	33.28	PK	17.17	69.54	36.26
7.08	30.77	PK	6.77	69.54	38.77

30MHz-1GHz (802.11g mode is worst case):

Low channel: 2412MHz

Common Information

Project No:	RKSA240801002
EUT Model:	ESP32-WROOM-32UE
Test Mode:	Transmitting in 802.11g mode low channel
Standard:	FCC Part 15.205 & FCC Part 15.209 & FCC Part 15.247
Test Equipment:	ESCI, JB3, 310N
Temperature:	25.4℃
Humidity:	44%
Barometric Pressure:	101.2kPa
Test Engineer:	Grace Luo
Test Date:	2024/9/6

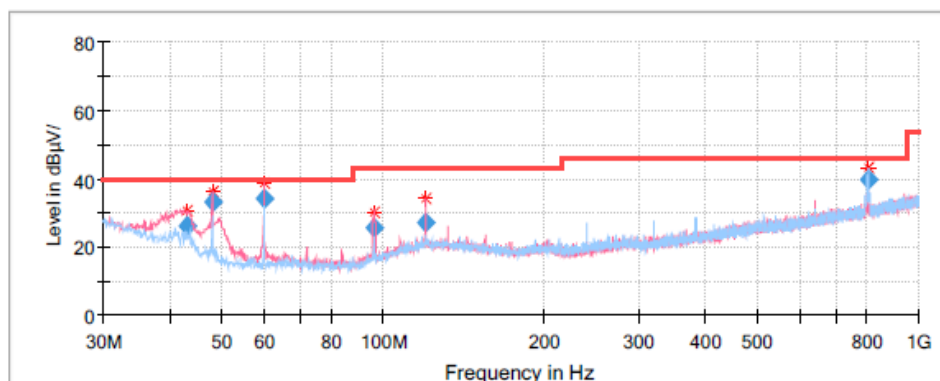


Final Result

Frequency (MHz)	QuasiPeak (dBμ V/m)	Limit (dBμ V/m)	Margin (dB)	Pol	Corr. (dB/m)
42.488000	25.39	40.00	14.61	V	-13.3
48.019700	34.04	40.00	5.96	V	-15.7
60.000050	35.34	40.00	4.66	V	-17.6
96.225050	26.78	43.50	16.72	V	-15.4
120.023900	29.93	43.50	13.57	V	-10.9
805.614050	39.65	46.00	6.35	H	-0.7

Middle channel: 2437MHz**Common Information**

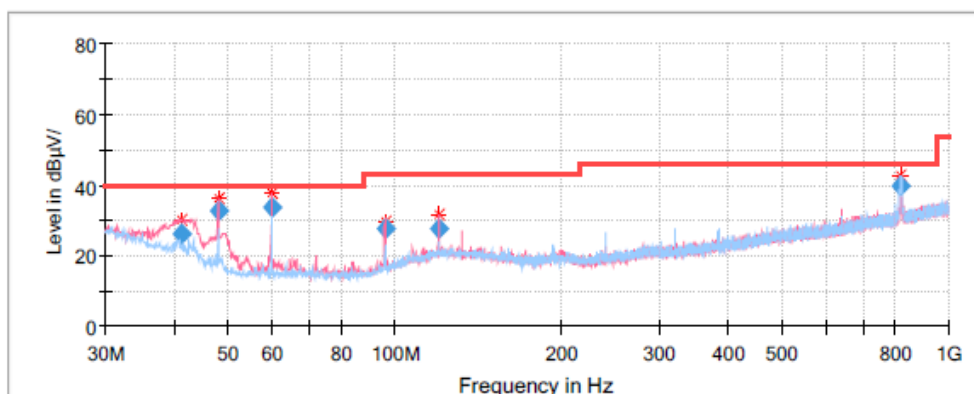
Project No: RKSA240801002
EUT Model: ESP32-WROOM-32UE
Test Mode: Transmitting in 802.11g mode middle channel
Standard: FCC Part 15.205 & FCC Part 15.209 & FCC Part 15.247
Test Equipment: ESCI, JB3, 310N
Temperature: 25.4°C
Humidity: 44%
Barometric Pressure: 101.2kPa
Test Engineer: Grace Luo
Test Date: 2024/9/6

**Final Result**

Frequency (MHz)	QuasiPeak (dBμ V/m)	Limit (dBμ V/m)	Margin (dB)	Pol	Corr. (dB/m)
43.095000	25.94	40.00	14.06	V	-12.8
48.008600	33.28	40.00	6.72	V	-15.7
60.012950	34.04	40.00	5.96	V	-17.6
96.485500	25.59	43.50	17.91	V	-15.3
120.025700	27.24	43.50	16.26	V	-10.9
805.581650	39.92	46.00	6.08	H	-0.7

High Channel: 2462MHz**Common Information**

Project No: RKSA240801002
EUT Model: ESP32-WROOM-32UE
Test Mode: Transmitting in 802.11g mode high channel
Standard: FCC Part 15.205 & FCC Part 15.209 & FCC Part 15.247
Test Equipment: ESCI, JB3, 310N
Temperature: 25.4°C
Humidity: 44%
Barometric Pressure: 101.2kPa
Test Engineer: Grace Luo
Test Date: 2024/9/6

**Final Result**

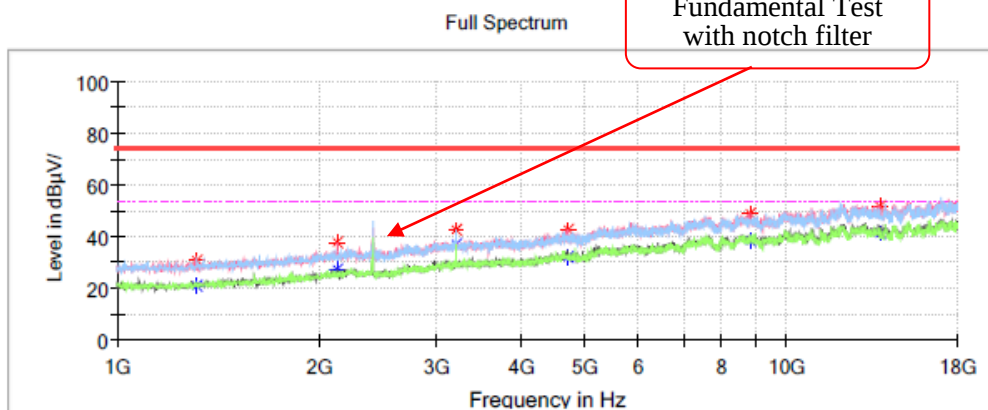
Frequency (MHz)	QuasiPeak (dBμ V/m)	Limit (dBμ V/m)	Margin (dB)	Pol	Corr. (dB/m)
41.155000	26.00	40.00	14.00	V	-12.5
48.002600	32.89	40.00	7.11	V	-15.7
59.986850	33.67	40.00	6.33	V	-17.6
96.225800	27.59	43.50	15.91	V	-15.4
120.017300	27.68	43.50	15.82	V	-10.9
817.780650	39.96	46.00	6.04	H	-0.5

1GHz-18GHz:
802.11b Mode:

Low Channel: 2412MHz

Common Information

Project No.: RKSA240801002
Test Mode: Transmitting in 802.11b mode 2412 channel
Standard: FCC Part 15.247&FCC Part 15.205&FCC Part 15.209
Test Engineer: Destine Hu

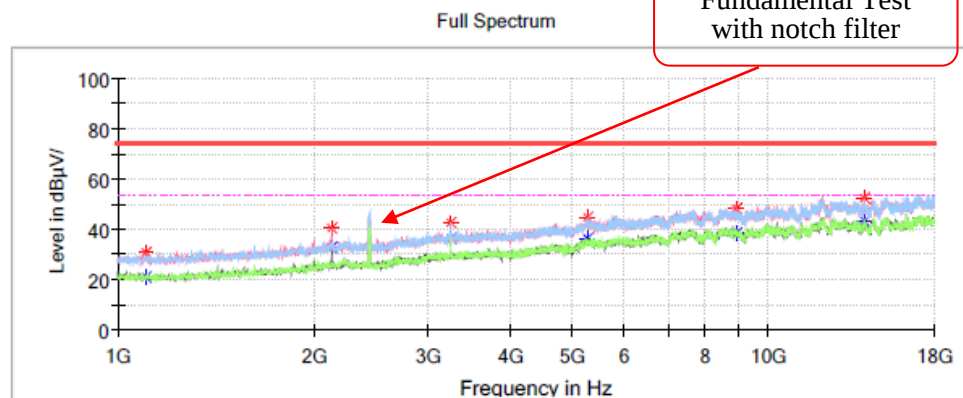


Critical_Freqs

Frequency (MHz)	MaxPeak (dB µ V/m)	Average (dB µ V/m)	Limit (dB µ V/m)	Margin (dB)	Pol	Corr. (dB/m)
1316.200000	---	21.04	54.00	32.96	H	-15.0
1316.200000	30.91	---	74.00	43.09	H	-15.0
2130.500000	---	27.28	54.00	26.72	V	-11.3
2130.500000	37.47	---	74.00	36.53	V	-11.3
3215.100000	---	37.14	54.00	16.86	H	-7.5
3215.100000	42.68	---	74.00	31.32	H	-7.5
4704.300000	---	32.47	54.00	21.53	V	-3.5
4704.300000	42.59	---	74.00	31.41	V	-3.5
8801.300000	---	38.78	54.00	15.22	H	5.4
8801.300000	48.76	---	74.00	25.24	H	5.4
13785.700000	---	41.38	54.00	12.62	V	9.7
13785.700000	51.83	---	74.00	22.17	V	9.7

Middle Channel: 2437MHz**Common Information**

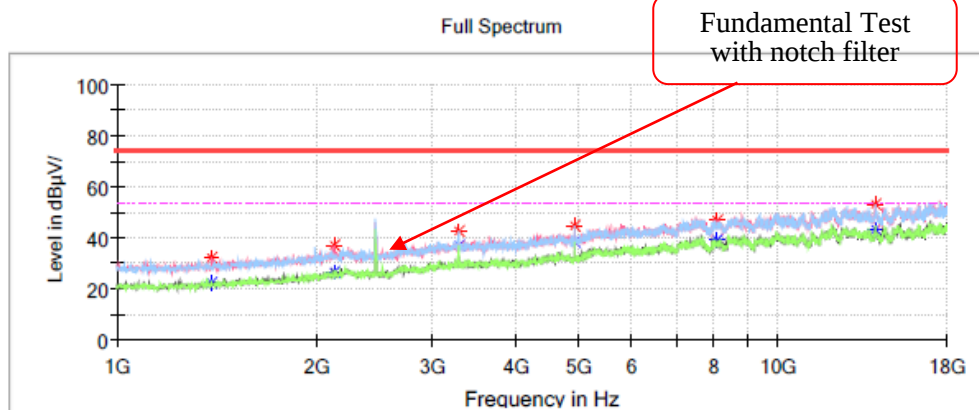
Project No.: RKSA240801002
 Test Mode: Transmitting in 802.11b mode 2437 channel
 Standard: FCC Part 15.247&FCC Part 15.205&FCC Part 15.209
 Test Engineer: Destine Hu

**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)
1103.700000	---	21.25	54.00	32.75	H	-15.3
1103.700000	30.61	---	74.00	43.39	H	-15.3
2127.100000	---	32.55	54.00	21.45	V	-11.3
2127.100000	40.60	---	74.00	33.40	V	-11.3
3249.100000	---	36.37	54.00	17.63	H	-7.4
3249.100000	42.56	---	74.00	31.44	H	-7.4
5275.500000	---	36.10	54.00	17.90	V	-1.3
5275.500000	44.56	---	74.00	29.44	V	-1.3
8957.700000	---	38.78	54.00	15.22	H	5.4
8957.700000	48.47	---	74.00	25.53	H	5.4
14057.700000	---	43.09	54.00	10.91	H	9.8
14057.700000	52.12	---	74.00	21.88	H	9.8

High Channel: 2462MHz**Common Information**

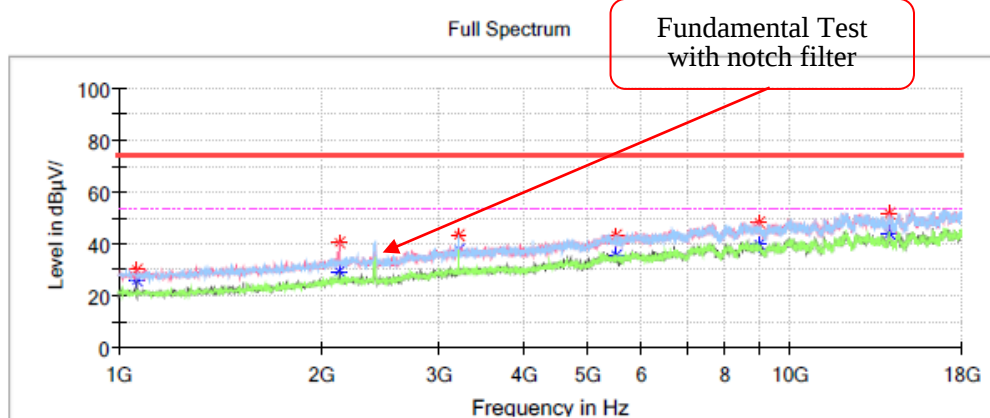
Project No.: RKSA240801002
Test Mode: Transmitting in 802.11b mode 2462 channel
Standard: FCC Part 15.247&FCC Part 15.205&FCC Part 15.209
Test Engineer: Destine Hu

**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)
1391.000000	---	22.36	54.00	31.64	V	-14.9
1391.000000	32.13	---	74.00	41.87	V	-14.9
2130.500000	---	26.46	54.00	27.54	V	-11.3
2130.500000	37.06	---	74.00	36.94	V	-11.3
3281.400000	---	37.24	54.00	16.76	H	-7.3
3281.400000	42.78	---	74.00	31.22	H	-7.3
4923.600000	---	38.74	54.00	15.26	H	-2.7
4923.600000	45.01	---	74.00	28.99	H	-2.7
8087.300000	---	39.20	54.00	14.80	V	4.2
8087.300000	47.05	---	74.00	26.95	V	4.2
14013.500000	---	43.43	54.00	10.57	H	9.8
14013.500000	53.27	---	74.00	20.73	H	9.8

802.11g Mode:**Low Channel: 2412MHz****Common Information**

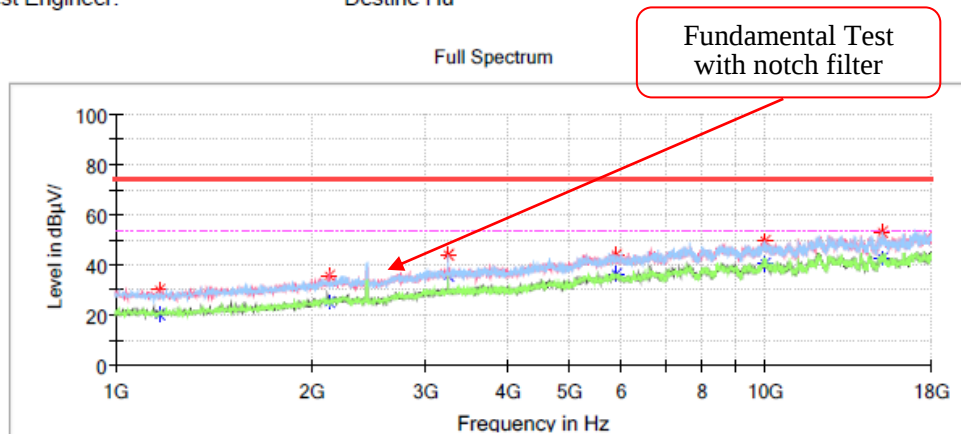
Project No.: RKSA240801002
 Test Mode: Transmitting in 802.11g mode 2412 channel
 Standard: FCC Part 15.247&FCC Part 15.205&FCC Part 15.209
 Test Engineer: Destine Hu

**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)
1064.600000	---	26.14	54.00	27.86	V	-15.4
1064.600000	30.28	---	74.00	43.72	V	-15.4
2128.800000	---	29.35	54.00	24.65	V	-11.3
2128.800000	40.37	---	74.00	33.63	V	-11.3
3215.100000	---	38.05	54.00	15.95	H	-7.5
3215.100000	43.07	---	74.00	30.93	H	-7.5
5515.200000	---	35.52	54.00	18.48	H	-0.3
5515.200000	43.18	---	74.00	30.82	H	-0.3
8995.100000	---	39.52	54.00	14.48	V	5.4
8995.100000	48.24	---	74.00	25.76	V	5.4
14016.900000	---	43.97	54.00	10.03	V	9.8
14016.900000	51.70	---	74.00	22.30	V	9.8

Middle Channel: 2437MHz**Common Information**

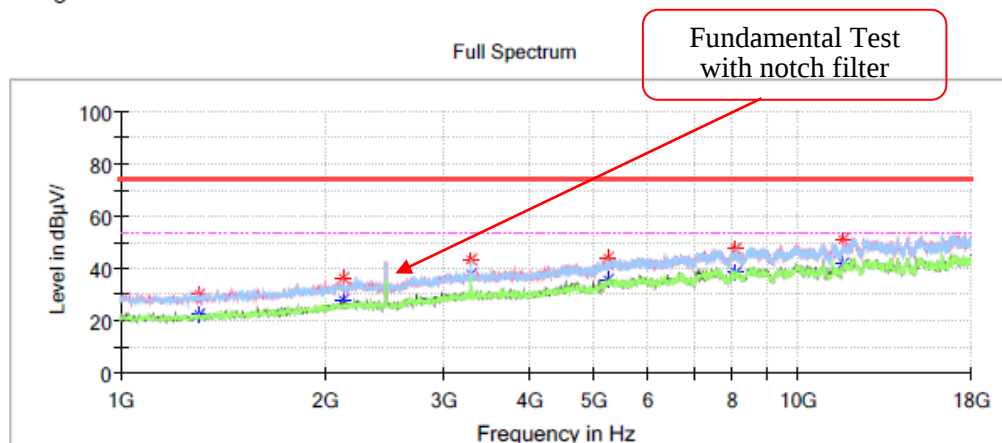
Project No.: RKSA240801002
Test Mode: Transmitting in 802.11g mode 2437 channel
Standard: FCC Part 15.247&FCC Part 15.205&FCC Part 15.209
Test Engineer: Destine Hu

**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)
1166.600000	30.10	---	74.00	43.90	H	-15.2
1166.600000	---	20.29	54.00	33.71	H	-15.2
2125.400000	35.80	---	74.00	38.20	V	-11.3
2125.400000	---	25.46	54.00	28.54	V	-11.3
3249.100000	44.12	---	74.00	29.88	H	-7.4
3249.100000	---	35.90	54.00	18.10	H	-7.4
5892.600000	---	36.66	54.00	17.34	V	-0.1
5892.600000	44.26	---	74.00	29.74	V	-0.1
10011.700000	---	40.59	54.00	13.41	V	7.2
10011.700000	49.72	---	74.00	24.28	V	7.2
15140.600000	---	42.96	54.00	11.04	H	9.5
15140.600000	53.49	---	74.00	20.51	H	9.5

High Channel: 2462MHz**Common Information**

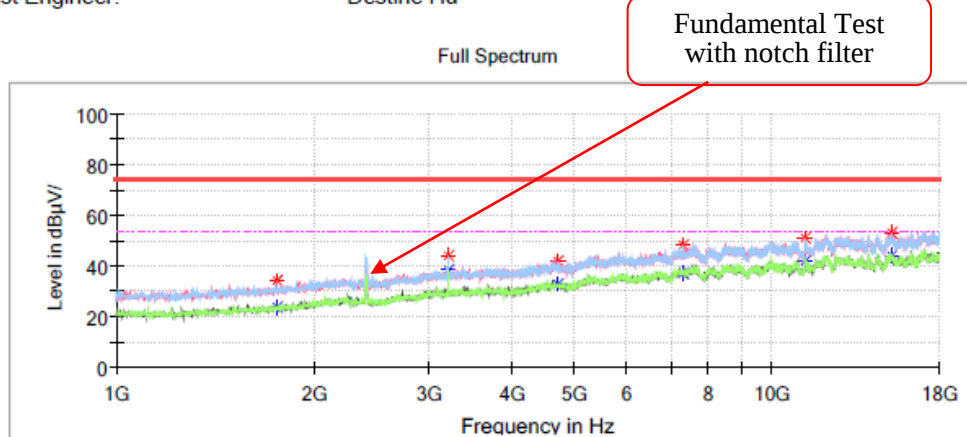
Project No.: RKSA240801002
Test Mode: Transmitting in 802.11g mode 2462 channel
Standard: FCC Part 15.247&FCC Part 15.205&FCC Part 15.209
Test Engineer: Destine Hu

**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)
1302.600000	30.41	---	74.00	43.59	H	-15.0
1302.600000	---	22.10	54.00	31.90	H	-15.0
2130.500000	36.62	---	74.00	37.38	V	-11.3
2130.500000	---	28.01	54.00	25.99	V	-11.3
3281.400000	43.31	---	74.00	30.69	H	-7.3
3281.400000	---	38.02	54.00	15.98	H	-7.3
5251.700000	43.71	---	74.00	30.29	V	-1.4
5251.700000	---	35.77	54.00	18.23	V	-1.4
8107.700000	47.48	---	74.00	26.52	H	4.2
8107.700000	---	38.13	54.00	15.87	H	4.2
11650.500000	---	42.22	54.00	11.78	V	8.9
11650.500000	50.95	---	74.00	23.05	V	8.9

802.11n-HT20 Mode :**Low Channel: 2412MHz****Common Information**

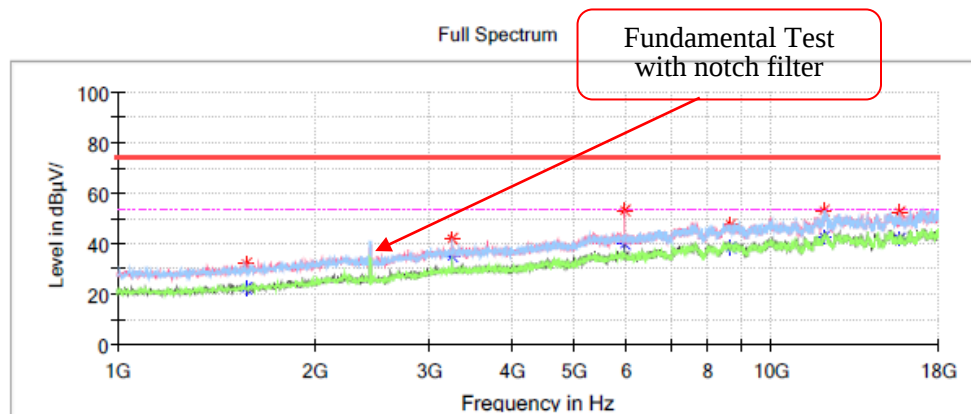
Project No.: RKSA240801002
 Test Mode: Transmitting in 802.11n20 mode 2412 channel
 Standard: FCC Part 15.247&FCC Part 15.205&FCC Part 15.209
 Test Engineer: Destine Hu

**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)
1756.500000	33.99	---	74.00	40.01	V	-13.2
1756.500000	---	23.91	54.00	30.09	V	-13.2
3215.100000	44.17	---	74.00	29.83	H	-7.5
3215.100000	---	38.36	54.00	15.64	H	-7.5
4706.000000	41.74	---	74.00	32.26	V	-3.5
4706.000000	---	32.99	54.00	21.01	V	-3.5
7307.000000	---	37.12	54.00	16.88	H	3.4
7307.000000	48.29	---	74.00	25.71	H	3.4
11206.800000	---	41.85	54.00	12.15	V	7.9
11206.800000	50.84	---	74.00	23.16	V	7.9
15266.400000	---	43.75	54.00	10.25	V	9.6
15266.400000	53.17	---	74.00	20.83	V	9.6

Middle Channel: 2437MHz**Common Information**

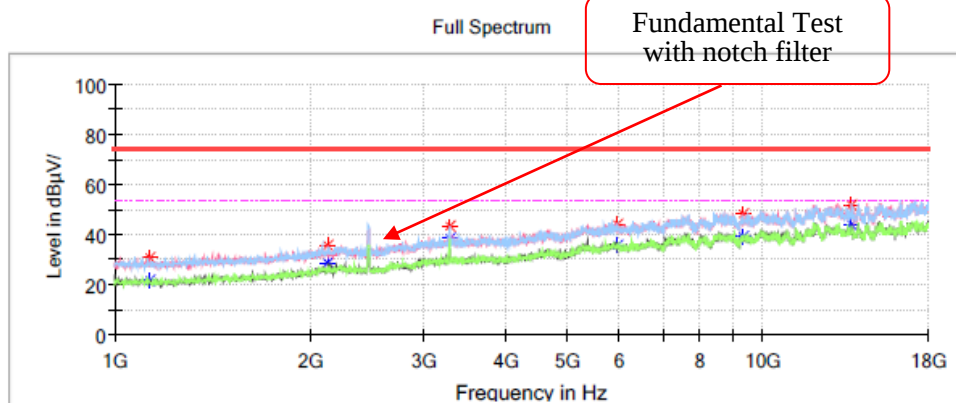
Project No.: RKSA240801002
Test Mode: Transmitting in 802.11n20 mode 2437 channel
Standard: FCC Part 15.247&FCC Part 15.205&FCC Part 15.209
Test Engineer: Destine Hu

**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)
1571.200000	31.93	---	74.00	42.07	V	-14.3
1571.200000	---	22.63	54.00	31.37	V	-14.3
3249.100000	41.97	---	74.00	32.03	H	-7.4
3249.100000	---	34.63	54.00	19.37	H	-7.4
5981.000000	52.84	---	74.00	21.16	V	0.0
5981.000000	---	40.05	54.00	13.95	V	0.0
8633.000000	---	38.56	54.00	15.44	H	5.4
8633.000000	47.63	---	74.00	26.37	H	5.4
12058.500000	---	42.63	54.00	11.37	H	9.1
12058.500000	52.98	---	74.00	21.02	H	9.1
15716.900000	---	41.98	54.00	12.02	H	9.7
15716.900000	52.31	---	74.00	21.69	H	9.7

High Channel: 2462MHz**Common Information**

Project No.: RKSA240801002
 Test Mode: Transmitting in 802.11n20 mode 2462 channel
 Standard: FCC Part 15.247&FCC Part 15.205&FCC Part 15.209
 Test Engineer: Destine Hu

**Critical_Freqs**

Frequency (MHz)	MaxPeak (dB μ V/m)	Average (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Pol	Corr. (dB/m)
1132.600000	30.87	---	74.00	43.13	V	-15.3
1132.600000	---	21.68	54.00	32.32	V	-15.3
2130.500000	35.68	---	74.00	38.32	V	-11.3
2130.500000	---	28.73	54.00	25.27	V	-11.3
3281.400000	43.10	---	74.00	30.90	H	-7.3
3281.400000	---	38.49	54.00	15.51	H	-7.3
5958.900000	---	35.72	54.00	18.28	H	0.0
5958.900000	44.32	---	74.00	29.68	H	0.0
9306.200000	---	39.41	54.00	14.59	V	5.4
9306.200000	47.92	---	74.00	26.08	V	5.4
13676.900000	---	44.09	54.00	9.91	V	9.7
13676.900000	51.79	---	74.00	22.21	V	9.7

802.11n-HT40 Mode :

Low Channel: 2422MHz

Common Information

Project No.:

RKSA240801002

Test Mode:

Transmitting in 802.11n40 mode 2422 channel

Standard:

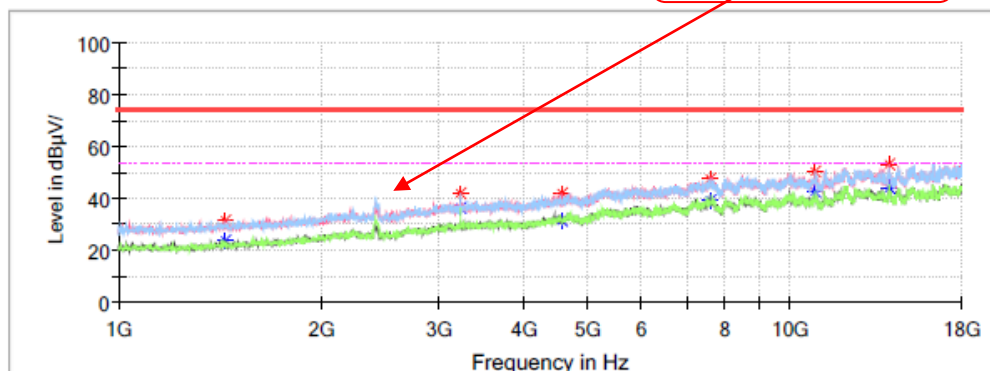
FCC Part 15.247&FCC Part 15.205&FCC Part 15.209

Test Engineer:

Destine Hu

Fundamental Test
with notch filter

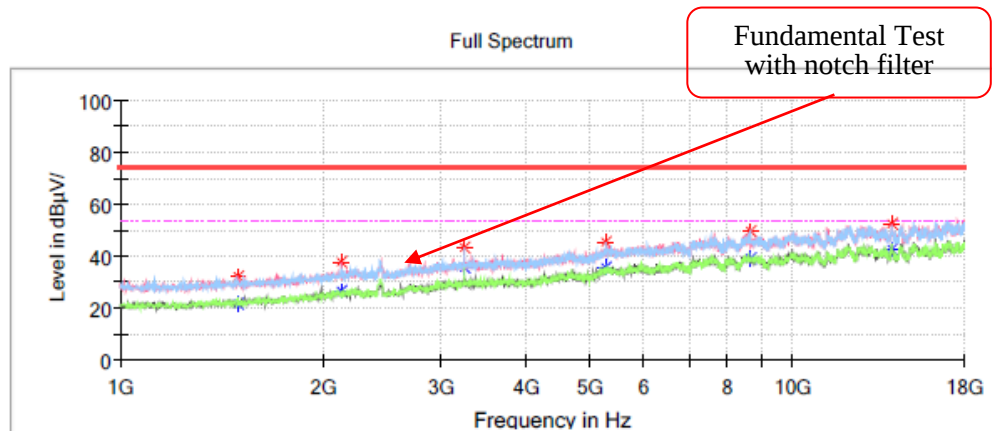
Full Spectrum

**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)
1443.700000	---	23.44	54.00	30.56	V	-14.8
1443.700000	31.22	---	74.00	42.78	V	-14.8
3228.700000	---	36.41	54.00	17.59	H	-7.5
3228.700000	41.88	---	74.00	32.12	H	-7.5
4566.600000	---	31.69	54.00	22.31	V	-4.0
4566.600000	42.10	---	74.00	31.90	V	-4.0
7621.500000	---	39.05	54.00	14.95	V	3.9
7621.500000	47.84	---	74.00	26.16	V	3.9
10861.700000	---	42.33	54.00	11.67	H	7.3
10861.700000	50.27	---	74.00	23.73	H	7.3
14015.200000	---	43.74	54.00	10.26	V	9.8
14015.200000	53.06	---	74.00	20.94	V	9.8

Middle Channel: 2437MHz**Common Information**

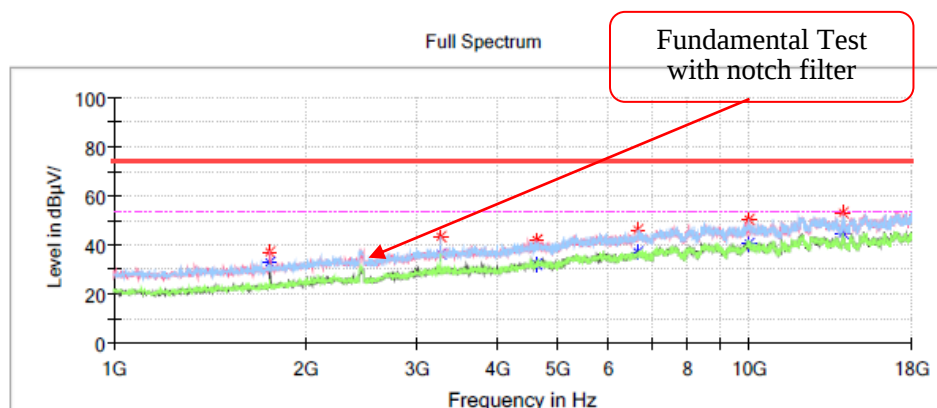
Project No.: RKSA240801002
Test Mode: Transmitting in 802.11n40 mode 2437 channel
Standard: FCC Part 15.247&FCC Part 15.205&FCC Part 15.209
Test Engineer: Destine Hu

**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)
1494.700000	32.21	---	74.00	41.79	V	-14.7
1494.700000	---	21.59	54.00	32.41	V	-14.7
2128.800000	37.48	---	74.00	36.52	V	-11.3
2128.800000	---	26.92	54.00	27.08	V	-11.3
3249.100000	43.49	---	74.00	30.51	H	-7.4
3249.100000	---	35.90	54.00	18.10	H	-7.4
5280.600000	---	35.72	54.00	18.28	H	-1.3
5280.600000	45.18	---	74.00	28.82	H	-1.3
8631.300000	---	39.06	54.00	14.94	V	5.4
8631.300000	49.53	---	74.00	24.47	V	5.4
14023.700000	---	42.88	54.00	11.12	V	9.8
14023.700000	52.18	---	74.00	21.82	V	9.8

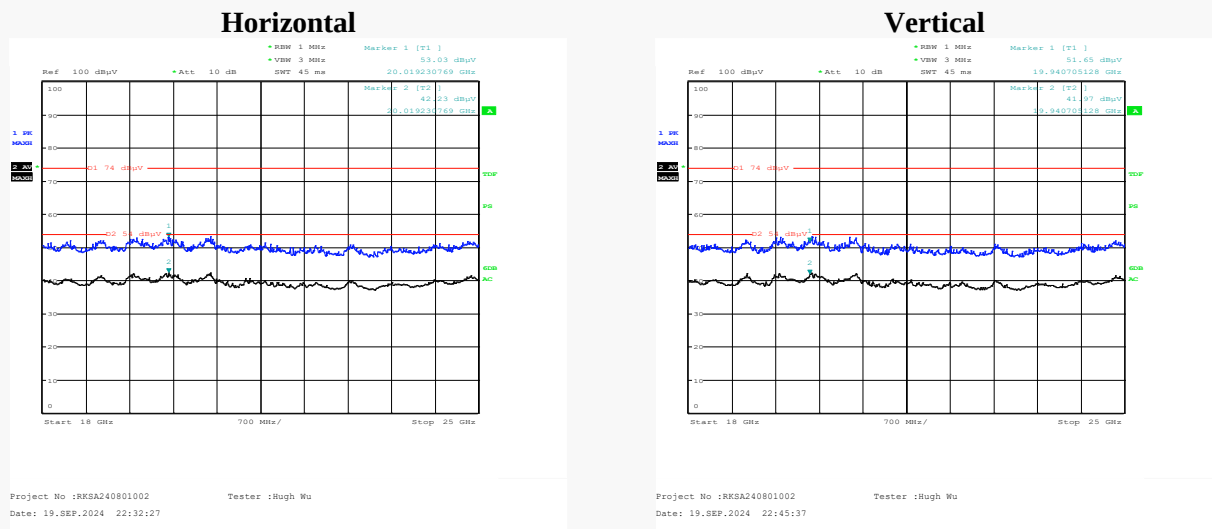
High Channel: 2452MHz**Common Information**

Project No.: RKSA240801002
Test Mode: Transmitting in 802.11n40 mode 2452 channel
Standard: FCC Part 15.247&FCC Part 15.205&FCC Part 15.209
Test Engineer: Destine Hu

**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)
1763.300000	---	32.89	54.00	21.11	V	-13.2
1763.300000	37.31	---	74.00	36.69	V	-13.2
3267.800000	---	36.57	54.00	17.43	H	-7.3
3267.800000	43.62	---	74.00	30.38	H	-7.3
4627.800000	---	32.39	54.00	21.61	V	-3.8
4627.800000	42.08	---	74.00	31.92	V	-3.8
6678.000000	---	37.04	54.00	16.96	H	1.3
6678.000000	45.83	---	74.00	28.17	H	1.3
10003.200000	---	40.65	54.00	13.35	H	7.2
10003.200000	50.07	---	74.00	23.93	H	7.2
14003.300000	---	44.71	54.00	9.29	V	9.8
14003.300000	53.07	---	74.00	20.93	V	9.8

18GHz-25GHz: Transmitting in maximum output power mode and channel



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

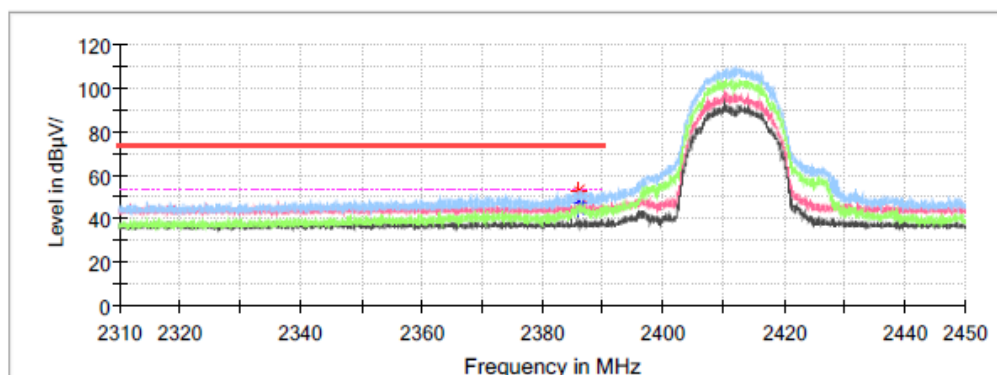
Band Edge:
802.11b Mode:

Low Channel

Common Information

Project No.:	RKSA240801002
Test Mode:	Transmitting in 802.11b mode 2412 channel
Standard:	FCC Part 15.247&FCC Part 15.205&FCC Part 15.209
Test Engineer:	Destine Hu

Full Spectrum



Critical_Freqs

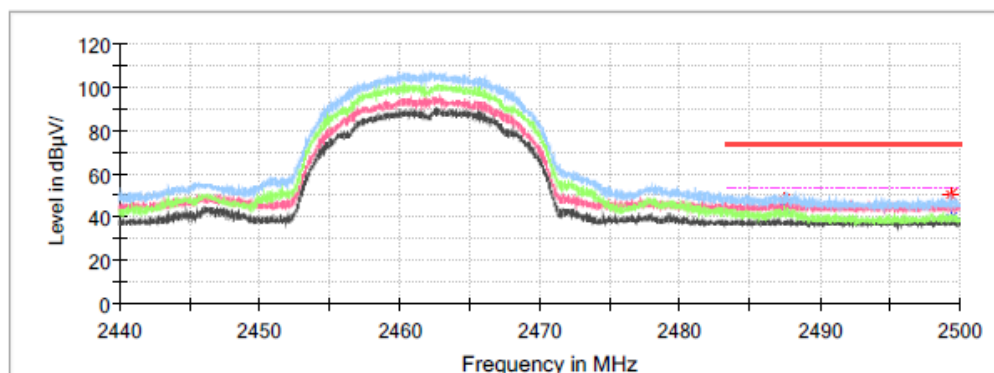
Frequency (MHz)	MaxPeak (dB µ V/m)	Average (dB µ V/m)	Limit (dB µ V/m)	Margin (dB)	Pol	Corr. (dB/m)
2385.992000	52.72	---	74.00	21.28	H	-0.6
2385.992000	---	44.71	54.00	9.29	H	-0.6
2386.342000	50.68	---	74.00	23.32	H	-0.6
2386.342000	---	47.12	54.00	6.88	H	-0.6

High Channel

Common Information

Project No.: RKSA240801002
Test Mode: Transmitting in 802.11b mode 2462 channel
Standard: FCC Part 15.247&FCC Part 15.205&FCC Part 15.209
Test Engineer: Destine Hu

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)
2487.520000	---	44.42	54.00	9.58	H	-0.2
2487.520000	47.91	---	74.00	26.09	H	-0.2
2499.298000	---	39.84	54.00	14.16	H	-0.2
2499.298000	50.04	---	74.00	23.96	H	-0.2

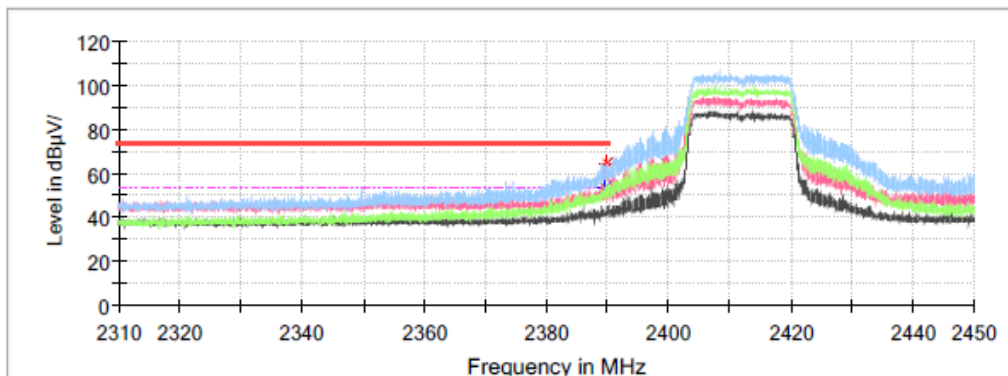
802.11g Mode :

Low Channel

Common Information

Project No.: RKSA240801002
Test Mode: Transmitting in 802.11g mode 2412 channel
Standard: FCC Part 15.247&FCC Part 15.205&FCC Part 15.209
Test Engineer: Destine Hu

Full Spectrum



Critical_Freqs

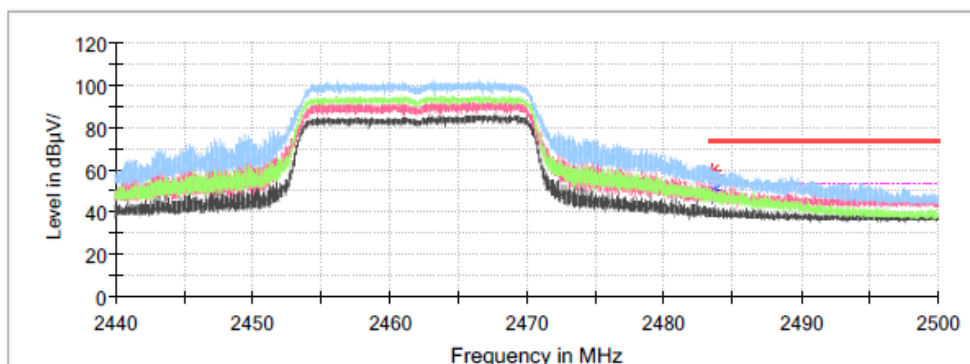
Frequency (MHz)	MaxPeak (dB µ V/m)	Average (dB µ V/m)	Limit (dB µ V/m)	Margin (dB)	Pol	Corr. (dB/m)
2389.702000	58.86	---	74.00	15.14	H	-0.6
2389.702000	---	53.70	54.00	0.30	H	-0.6
2389.870000	65.00	---	74.00	9.00	H	-0.6
2389.870000	---	51.27	54.00	2.73	H	-0.6

High Channel

Common Information

Project No.: RKSA240801002
Test Mode: Transmitting in 802.11g mode 2462 channel
Standard: FCC Part 15.247&FCC Part 15.205&FCC Part 15.209
Test Engineer: Destine Hu

Full Spectrum



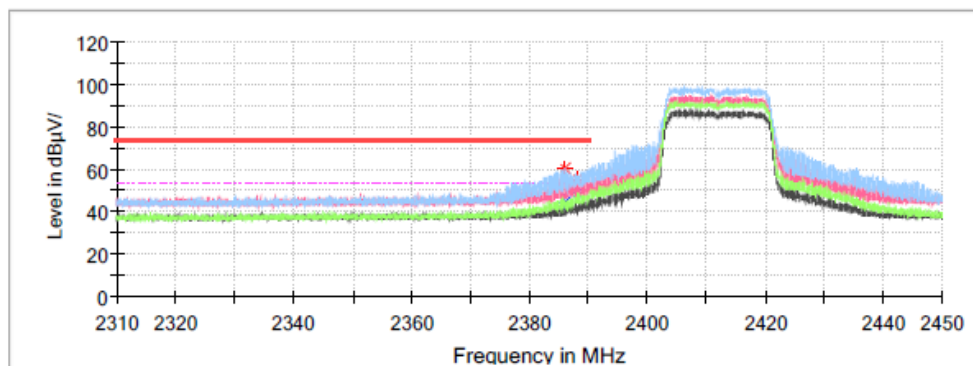
Critical Freqs

Frequency (MHz)	MaxPeak (dB µ V/m)	Average (dB µ V/m)	Limit (dB µ V/m)	Margin (dB)	Pol	Corr. (dB/m)
2483.590000	59.62	---	74.00	14.38	H	-0.3
2483.590000	---	48.09	54.00	5.91	H	-0.3
2483.668000	57.38	---	74.00	16.62	H	-0.3
2483.668000	---	50.76	54.00	3.24	H	-0.3

802.11n-HT20 Mode:**Low Channel****Common Information**

Project No.: RKSA240801002
Test Mode: Transmitting in 802.11n20 mode 2412 channel
Standard: FCC Part 15.247&FCC Part 15.205&FCC Part 15.209
Test Engineer: Destine Hu

Full Spectrum

**Critical_Freqs**

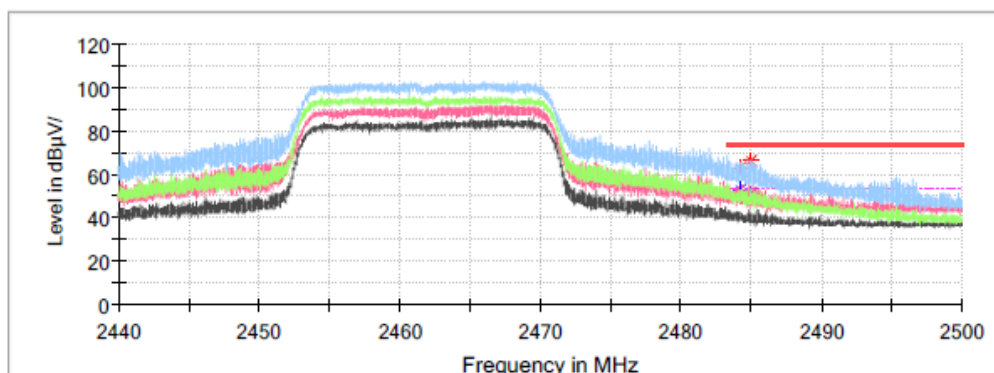
Frequency (MHz)	MaxPeak (dB µ V/m)	Average (dB µ V/m)	Limit (dB µ V/m)	Margin (dB)	Pol	Corr. (dB/m)
2386.132000	60.19	---	74.00	13.81	H	-0.6
2386.132000	---	44.40	54.00	9.60	H	-0.6
2388.232000	55.58	---	74.00	18.42	H	-0.6
2388.232000	---	48.76	54.00	5.24	H	-0.6

High Channel

Common Information

Project No.: RKSA240801002
Test Mode: Transmitting in 802.11n20 mode 2462 channel
Standard: FCC Part 15.247&FCC Part 15.205&FCC Part 15.209
Test Engineer: Destine Hu

Full Spectrum



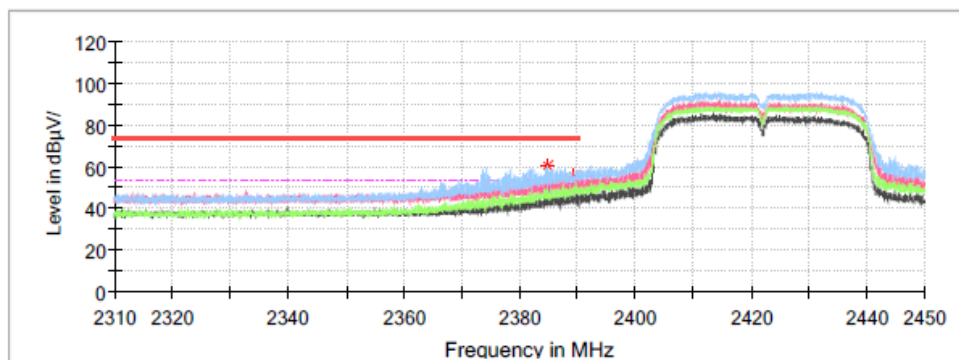
Critical_Freqs

Frequency (MHz)	MaxPeak (dB µ V/m)	Average (dB µ V/m)	Limit (dB µ V/m)	Margin (dB)	Pol	Corr. (dB/m)
2484.244000	---	53.16	54.00	0.84	H	-0.3
2484.244000	63.16	---	74.00	10.84	H	-0.3
2485.060000	---	51.18	54.00	2.82	H	-0.3
2485.060000	66.24	---	74.00	7.76	H	-0.3

802.11n-HT40 Mode:**Low Channel****Common Information**

Project No.:	RKSA240801002
Test Mode:	Transmitting in 802.11n40 mode 2422 channel
Standard:	FCC Part 15.247&FCC Part 15.205&FCC Part 15.209
Test Engineer:	Destine Hu

Full Spectrum

**Critical Freqs**

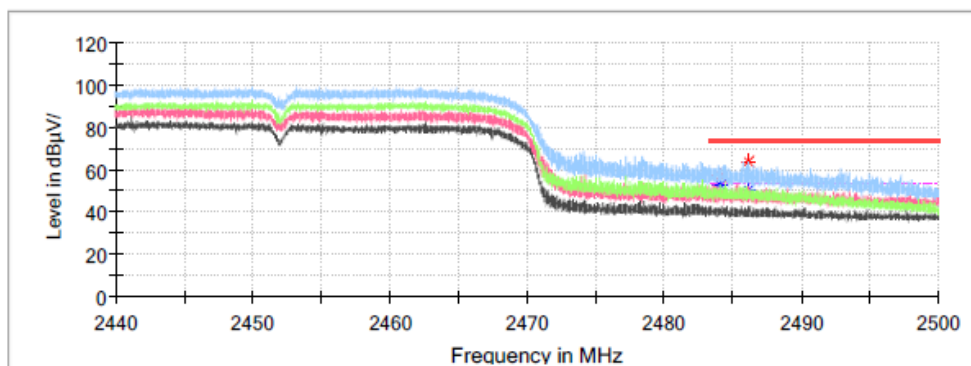
Frequency (MHz)	MaxPeak (dB μ V/m)	Average (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Pol	Corr. (dB/m)
2384.886000	60.15	---	74.00	13.85	H	-0.6
2384.886000	---	49.86	54.00	4.14	H	-0.6
2389.422000	55.68	---	74.00	18.32	H	-0.6
2389.422000	---	50.73	54.00	3.27	H	-0.6

High Channel

Common Information

Project No.: RKSA240801002
Test Mode: Transmitting in 802.11n40 mode 2452 channel
Standard: FCC Part 15.247&FCC Part 15.205&FCC Part 15.209
Test Engineer: Destine Hu

Full Spectrum

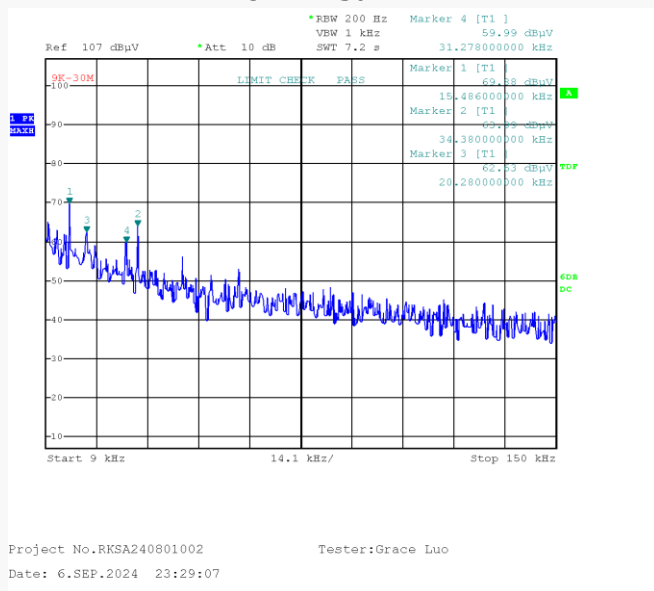


Critical_Freqs

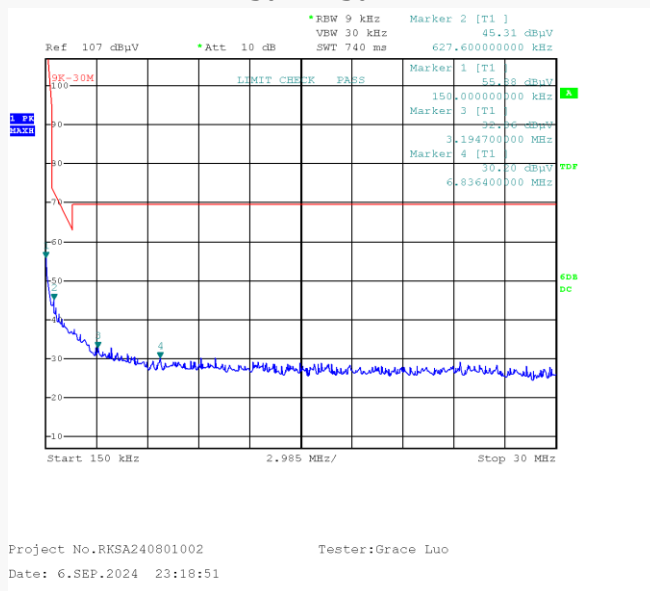
Frequency (MHz)	MaxPeak (dB μ V/m)	Average (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Pol	Corr. (dB/m)
2484.124000	---	52.63	54.00	1.37	H	-0.3
2484.124000	57.33	---	74.00	16.67	H	-0.3
2486.128000	---	50.64	54.00	3.36	H	-0.2
2486.128000	63.99	---	74.00	10.01	H	-0.2

**For BLE Mode:
9 kHz-30MHz:
Parallel(worst case)**

9kHz-150kHz



150kHz-30MHz



9 kHz-150 kHz

Frequency (MHz)	Corrected Amplitude (dBμV/m) @3m	Detector PK/QP/Ave.	Corrected Factor (dB/m)	Limit (dBμV/m) @3m	Margin (dB)
0.02	69.88	PK	52.87	123.81	53.93
0.03	63.99	PK	46.06	116.88	52.89
0.02	62.63	PK	49.92	121.46	58.83
0.03	59.99	PK	46.87	117.70	57.71

150 kHz-30 MHz

Frequency (MHz)	Corrected Amplitude (dBμV/m) @3m	Detector PK/QP/Ave.	Corrected Factor (dB/m)	Limit (dBμV/m) @3m	Margin (dB)
0.15	55.88	PK	50.90	104.08	48.20
0.63	45.31	PK	21.51	71.65	26.34
3.19	32.86	PK	11.91	69.54	36.68
6.84	30.20	PK	6.87	69.54	39.34

For BLE Mode:
30MHz-1GHz

Low Channel: 2402MHz

Common Information

Project No:

EUT Model:

Test Mode:

Standard:

Test Equipment:

Temperature:

Humidity:

Barometric Pressure:

Test Engineer:

Test Date:

RKSA240801002

ESP32-WROOM-32UE

BLE 1M

FCC Part 15.205 &FCC Part 15.209&FCC Part 15.247

ESCI, JB3, 310N

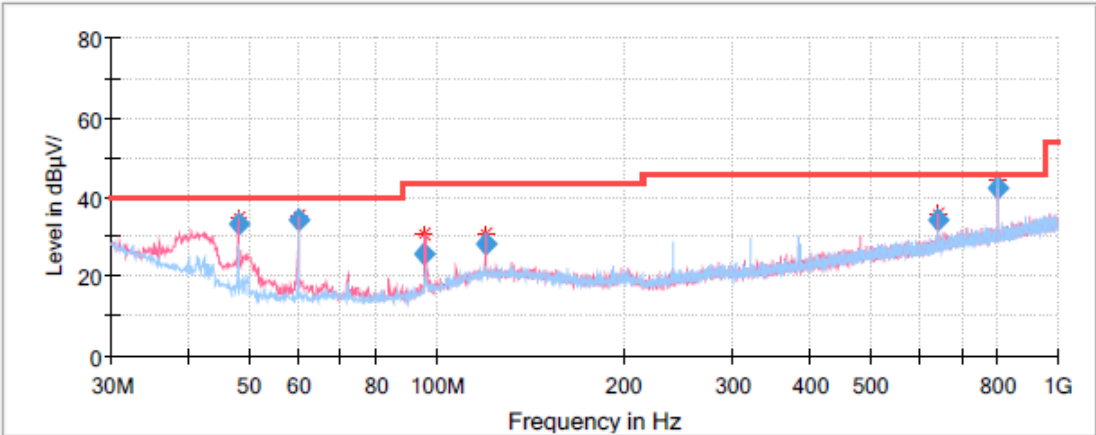
25.4℃

44%

101.2kPa

Grace Luo

2024/9/6

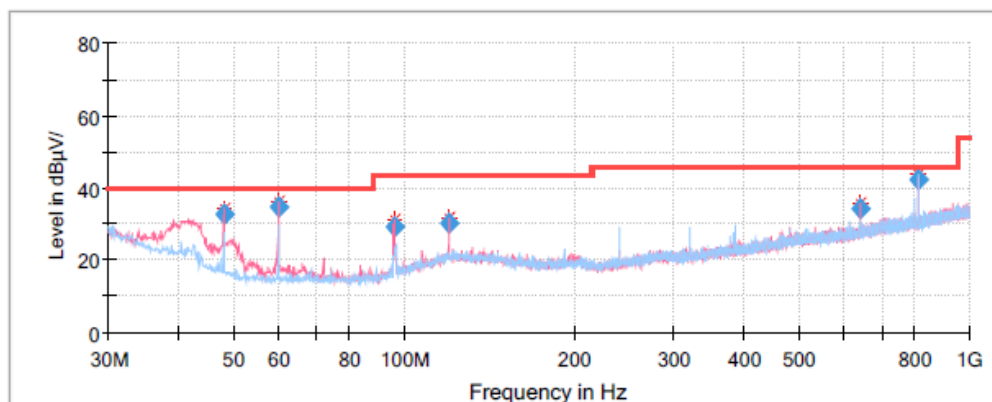


Final Result

Frequency (MHz)	QuasiPeak (dBµ V/m)	Limit (dBµ V/m)	Margin (dB)	Pol	Corr. (dB)
47.997200	33.17	40.00	6.83	V	-15.7
59.996150	34.03	40.00	5.97	V	-17.6
95.838000	25.61	43.50	17.89	V	-15.3
119.999600	28.15	43.50	15.35	V	-10.9
640.012950	34.30	46.00	11.70	V	-3.3
801.337900	42.48	46.00	3.52	H	-0.8

Middle Channel: 2440MHz**Common Information**

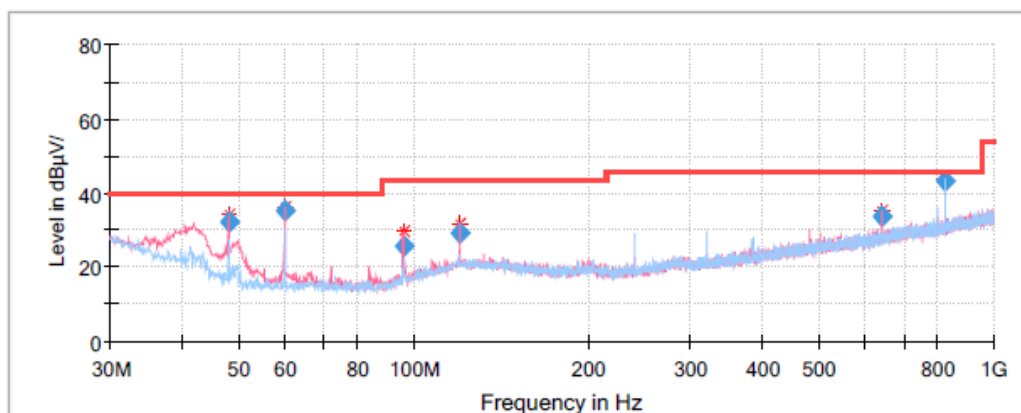
Project No: RKSA240801002
EUT Model: ESP32-WROOM-32UE
Test Mode: BLE 1M
Standard: FCC Part 15.205 & FCC Part 15.209 & FCC Part 15.247
Test Equipment: ESCI, JB3, 310N
Temperature: 25.4°C
Humidity: 44%
Barometric Pressure: 101.2kPa
Test Engineer: Grace Luo
Test Date: 2024/9/6

**Final Result**

Frequency (MHz)	QuasiPeak (dBμ V/m)	Limit (dBμ V/m)	Margin (dB)	Pol	Corr. (dB/m)
48.016700	32.61	40.00	7.39	V	-15.7
60.007850	34.72	40.00	5.28	V	-17.6
96.416150	29.01	43.50	14.49	V	-15.3
120.013700	30.22	43.50	13.28	V	-10.9
640.011450	34.10	46.00	11.90	V	-3.3
813.994700	42.31	46.00	3.69	H	-0.5

High Channel: 2480MHz**Common Information**

Project No: RKSA240801002
EUT Model: ESP32-WROOM-32UE
Test Mode: BLE 1M
Standard: FCC Part 15.205 & FCC Part 15.209 & FCC Part 15.247
Test Equipment: ESCI, JB3, 310N
Temperature: 25.4°C
Humidity: 44%
Barometric Pressure: 101.2kPa
Test Engineer: Grace Luo
Test Date: 2024/9/6

**Final Result**

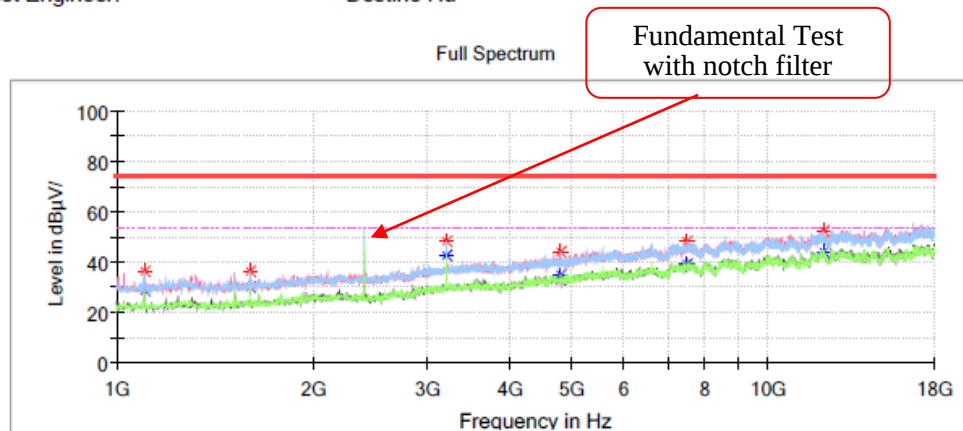
Frequency (MHz)	QuasiPeak (dBμ V/m)	Limit (dBμ V/m)	Margin (dB)	Pol	Corr. (dB/m)
48.007100	32.26	40.00	7.74	V	-15.7
59.998250	35.40	40.00	4.60	V	-17.6
96.494950	25.46	43.50	18.04	V	-15.3
119.988500	29.39	43.50	14.11	V	-10.9
640.008750	33.58	46.00	12.42	V	-3.3
826.674350	43.07	46.00	2.93	H	-0.3

1GHz-18GHz:

Low Channel: 2402MHz

Common Information

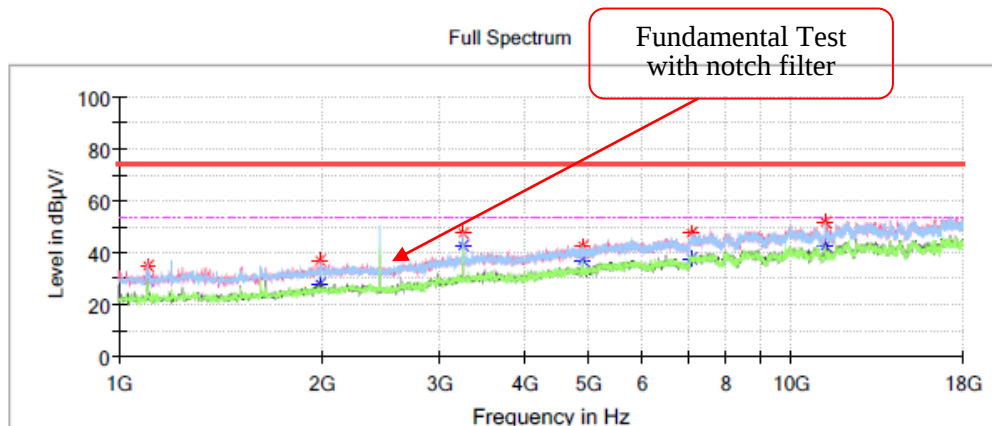
Project No.: RKSA240801002
 Test Mode: BLE 1M
 Standard: FCC Part 15.247&FCC Part 15.205&FCC Part 15.209
 Test Engineer: Destine Hu

**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)
1102.000000	---	28.75	54.00	25.25	H	-15.3
1102.000000	36.10	---	74.00	37.90	H	-15.3
1600.100000	---	29.91	54.00	24.09	H	-14.1
1600.100000	36.05	---	74.00	37.95	H	-14.1
3201.500000	---	42.89	54.00	11.11	H	-7.6
3201.500000	48.44	---	74.00	25.56	H	-7.6
4802.900000	---	34.85	54.00	19.15	H	-3.2
4802.900000	43.79	---	74.00	30.21	H	-3.2
7521.200000	---	39.47	54.00	14.53	V	3.9
7521.200000	48.51	---	74.00	25.49	V	3.9
12191.100000	---	43.77	54.00	10.23	V	9.2
12191.100000	52.70	---	74.00	21.30	V	9.2

Middle Channel: 2440MHz**Common Information**

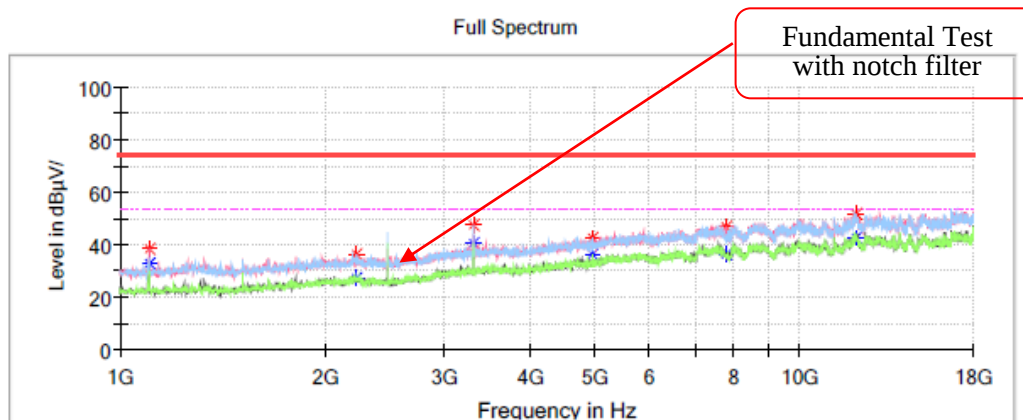
Project No.: RKSA240801002
Test Mode: BLE 1M
Standard: FCC Part 15.247&FCC Part 15.205&FCC Part 15.209
Test Engineer: Destine Hu

**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)
1103.700000	---	29.47	54.00	24.53	V	-15.3
1103.700000	35.26	---	74.00	38.74	V	-15.3
1994.500000	---	27.94	54.00	26.06	V	-11.8
1994.500000	37.13	---	74.00	36.87	V	-11.8
3252.500000	47.27	---	74.00	26.73	H	-7.4
3252.500000	---	42.97	54.00	11.03	H	-7.4
4879.400000	42.52	---	74.00	31.48	H	-2.9
4879.400000	---	37.08	54.00	16.92	H	-2.9
7080.900000	---	37.60	54.00	16.40	V	2.8
7080.900000	47.45	---	74.00	26.55	V	2.8
11203.400000	---	42.35	54.00	11.65	H	7.9
11203.400000	51.98	---	74.00	22.02	H	7.9

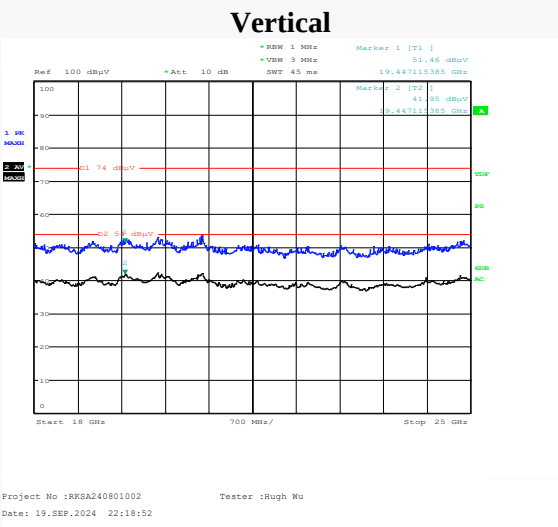
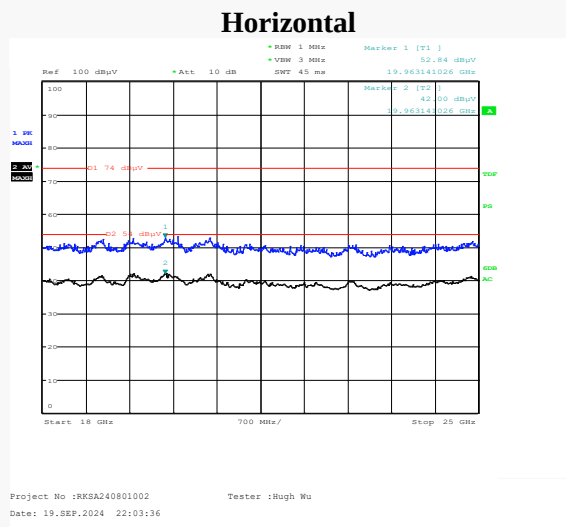
High Channel: 2480MHz**Common Information**

Project No.: RKSA240801002
Test Mode: BLE 1M
Standard: FCC Part 15.247&FCC Part 15.205&FCC Part 15.209
Test Engineer: Destine Hu

**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)
1103.700000	---	32.57	54.00	21.43	V	-15.3
1103.700000	38.12	---	74.00	35.88	V	-15.3
2225.700000	---	26.96	54.00	27.04	V	-11.0
2225.700000	36.50	---	74.00	37.50	V	-11.0
3305.200000	---	40.67	54.00	13.33	H	-7.2
3305.200000	47.24	---	74.00	26.76	H	-7.2
4959.300000	---	36.31	54.00	17.69	H	-2.6
4959.300000	42.88	---	74.00	31.12	H	-2.6
7789.800000	---	36.14	54.00	17.86	V	3.9
7789.800000	46.65	---	74.00	27.35	V	3.9
12072.100000	---	42.93	54.00	11.07	H	9.1
12072.100000	51.92	---	74.00	22.08	H	9.1

18GHz-25GHz: Transmitting in maximum output power mode and channel

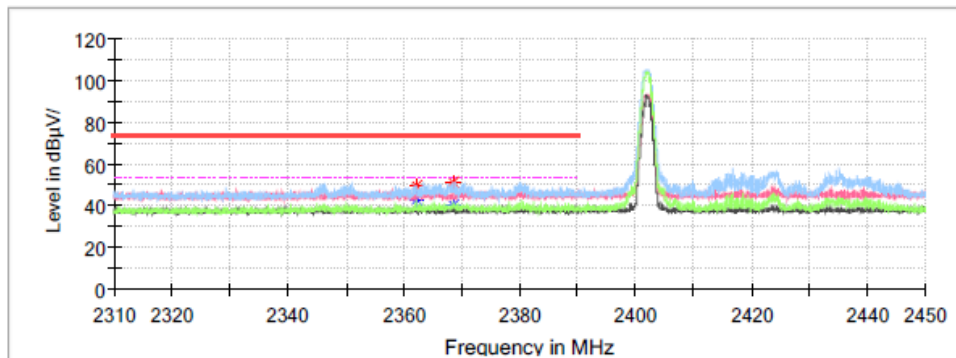


Note: The test distance is 3m. The limit is 74dBμV/m(Peak) and 54dBμV/m(Average).

Band Edge:**Low Channel****Common Information**

Project No.: RKSA240801002
Test Mode: BLE 1M
Standard: FCC Part 15.247&FCC Part 15.205&FCC Part 15.209
Test Engineer: Destine Hu

Full Spectrum

**Critical_Freqs**

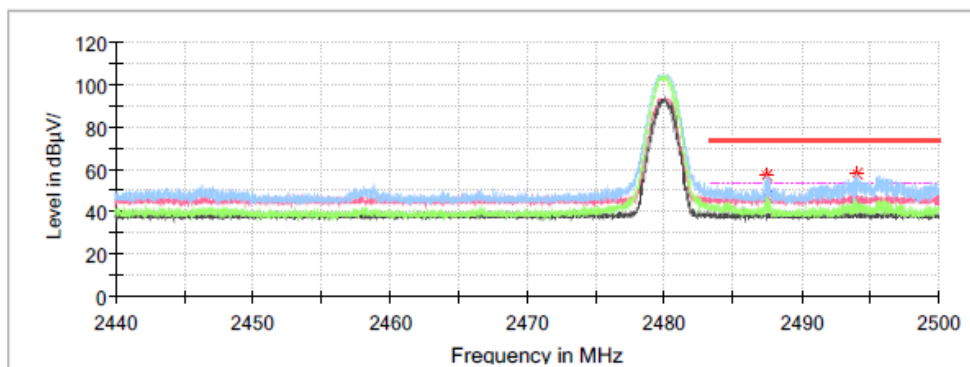
Frequency (MHz)	MaxPeak (dB µ V/m)	Average (dB µ V/m)	Limit (dB µ V/m)	Margin (dB)	Pol	Corr. (dB/m)
2362.332000	49.77	---	74.00	24.23	H	-0.7
2362.332000	---	42.43	54.00	11.57	H	-0.7
2368.450000	51.28	---	74.00	22.72	H	-0.6
2368.450000	---	40.50	54.00	13.50	H	-0.6

High Channel

Common Information

Project No.: RKSA240801002
Test Mode: BLE 1M
Standard: FCC Part 15.247&FCC Part 15.205&FCC Part 15.209
Test Engineer: Destine Hu

Full Spectrum



Critical_Freqs

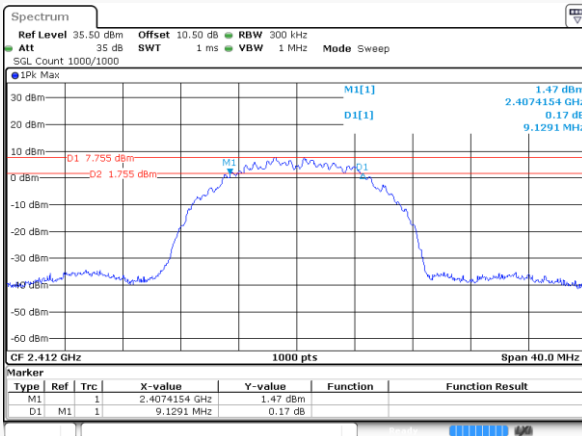
Frequency (MHz)	MaxPeak (dB µ V/m)	Average (dB µ V/m)	Limit (dB µ V/m)	Margin (dB)	Pol	Corr. (dB/m)
2487.484000	---	47.12	54.00	6.88	H	-0.2
2487.484000	56.77	---	74.00	17.23	H	-0.2
2494.066000	---	44.38	54.00	9.62	H	-0.2
2494.066000	57.89	---	74.00	16.11	H	-0.2

6 dB EMISSION BANDWIDTH**Test Result:** Compliant.*EUT operation mode: Transmitting***For Wi-Fi Mode:**

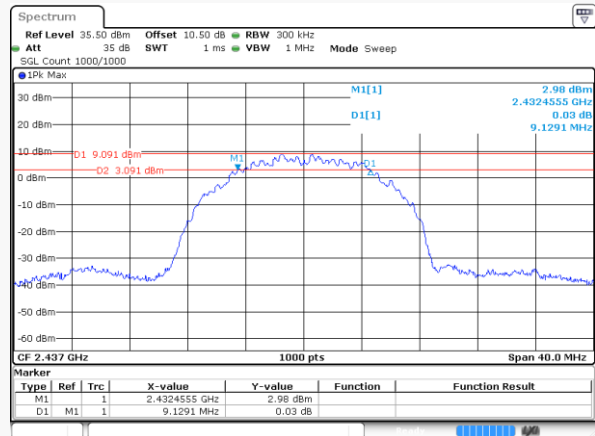
Channel	Frequency (MHz)	6 dB Emission Bandwidth (MHz)	Limit (MHz)	Result
802.11b Mode				
Low	2412	9.129	≥ 0.5	Pass
Middle	2437	9.129	≥ 0.5	Pass
High	2462	9.209	≥ 0.5	Pass
802.11g Mode				
Low	2412	16.416	≥ 0.5	Pass
Middle	2437	16.416	≥ 0.5	Pass
High	2462	16.457	≥ 0.5	Pass
802.11n-HT20 Mode				
Low	2412	17.177	≥ 0.5	Pass
Middle	2437	17.217	≥ 0.5	Pass
High	2462	17.297	≥ 0.5	Pass
802.11n-HT40 Mode				
Low	2422	34.034	≥ 0.5	Pass
Middle	2437	33.794	≥ 0.5	Pass
High	2452	32.753	≥ 0.5	Pass

For BLE Mode:

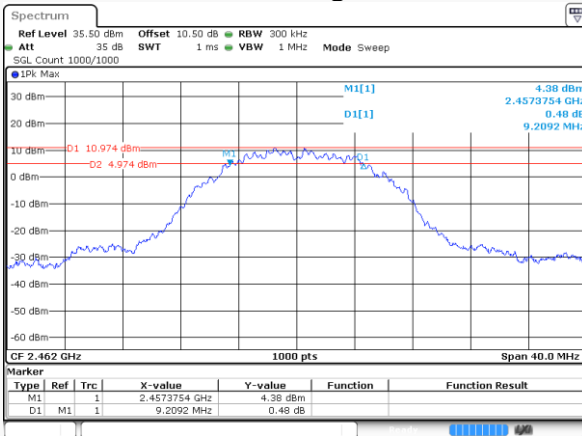
Channel	Frequency (MHz)	6 dB Emission Bandwidth (MHz)	Limit (MHz)	Result
Low	2402	0.661	≥ 0.5	Pass
Middle	2440	0.661	≥ 0.5	Pass
High	2480	0.657	≥ 0.5	Pass

**For Wi-Fi Mode:
802.11b Mode Low Channel**

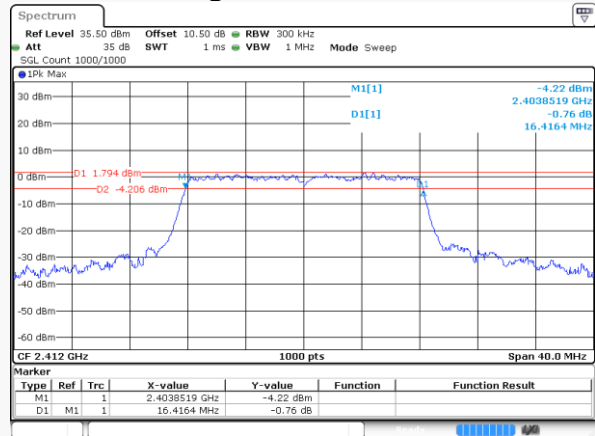
ProjectNo: RKSA240801002 Tester:Jason Lu
Date: 9 DEC 2024 19:33:05

802.11b Mode Middle Channel

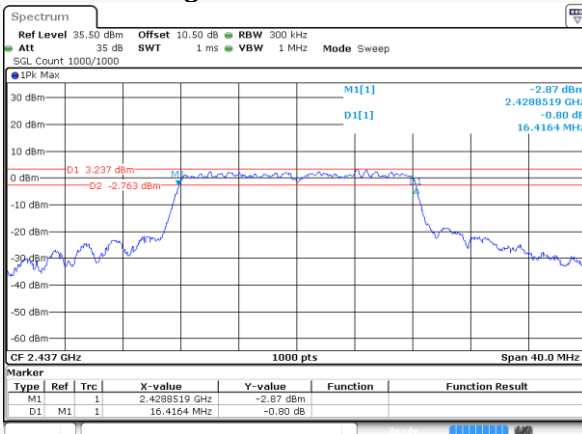
ProjectNo: RKSA240801002 Tester:Jason Lu
Date: 9 DEC 2024 19:34:11

802.11b Mode High Channel

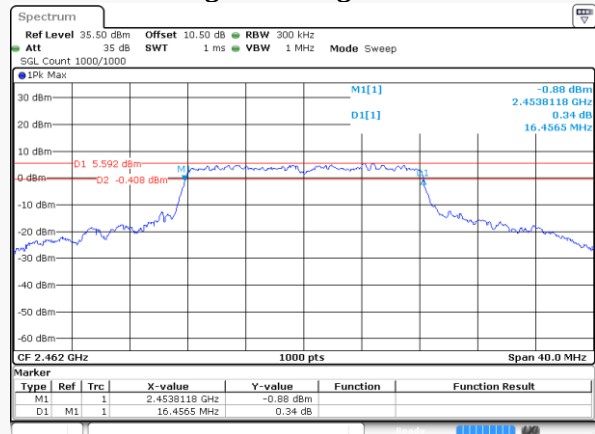
ProjectNo: RKSA240801002 Tester:Jason Lu
Date: 9 DEC 2024 19:34:32

802.11g Mode Low Channel

ProjectNo: RKSA240801002 Tester:Jason Lu
Date: 9 DEC 2024 19:34:59

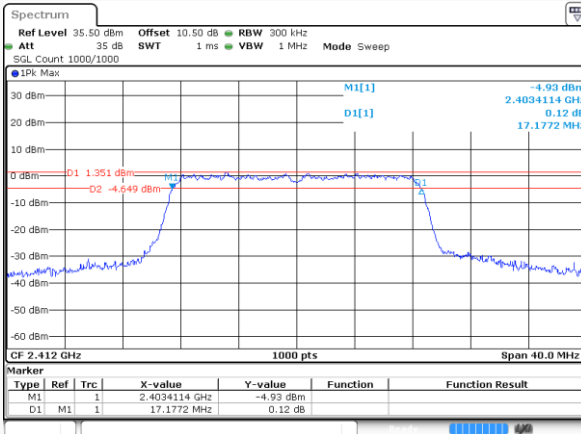
802.11g Mode Middle Channel

ProjectNo: RKSA240801002 Tester:Jason Lu
Date: 9 DEC 2024 19:35:20

802.11g Mode High Channel

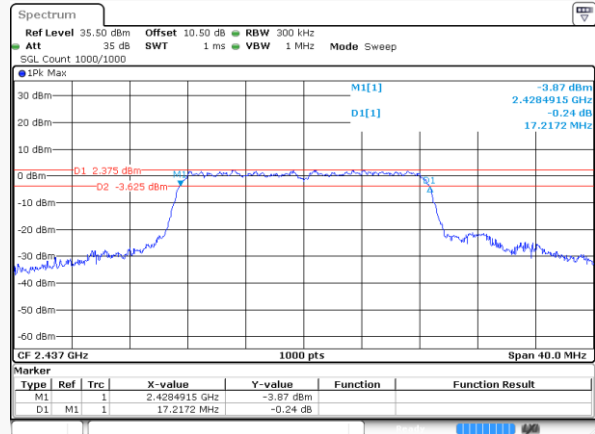
ProjectNo: RKSA240801002 Tester:Jason Lu
Date: 9 DEC 2024 19:35:39

802.11n-HT20 Mode Low Channel



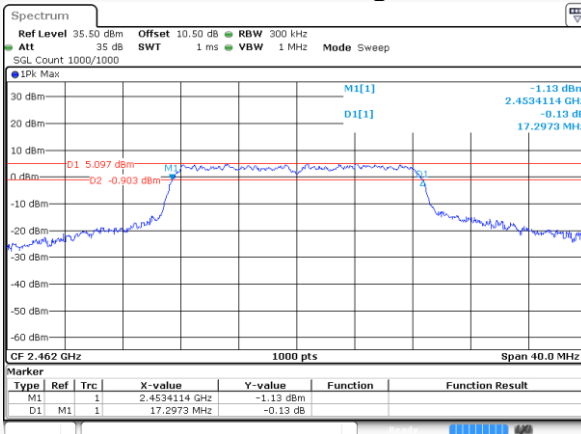
ProjectNo: RKSA240801002 Tester:Jason Lu
Date: 9 DEC 2024 19:36:04

802.11n-HT20 Mode Middle Channel



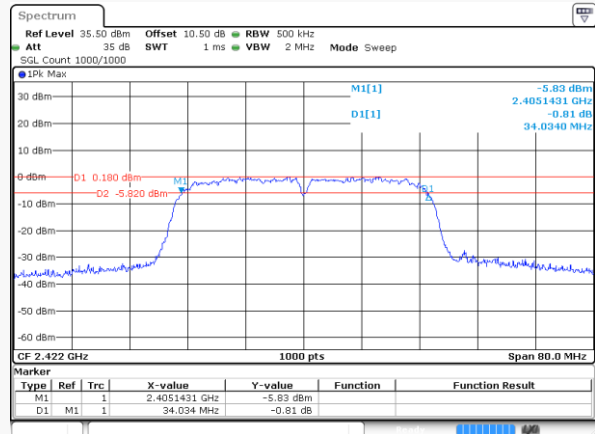
ProjectNo: RKSA240801002 Tester:Jason Lu
Date: 9 DEC 2024 19:36:23

802.11n-HT20 Mode High Channel



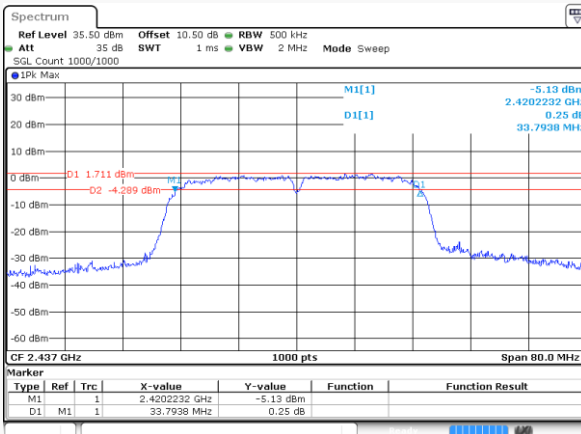
ProjectNo: RKSA240801002 Tester:Jason Lu
Date: 9 DEC 2024 19:36:59

802.11n-HT40 Mode Low Channel



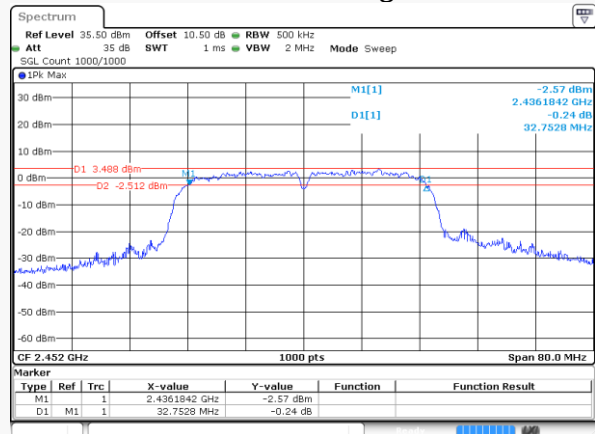
ProjectNo: RKSA240801002 Tester:Jason Lu
Date: 9 DEC 2024 19:37:23

802.11n-HT40 Mode Middle Channel



ProjectNo: RKSA240801002 Tester:Jason Lu
Date: 9 DEC 2024 19:37:41

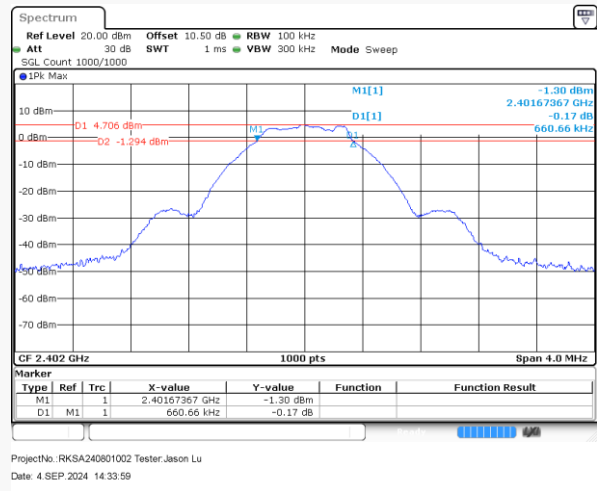
802.11n-HT40 Mode High Channel



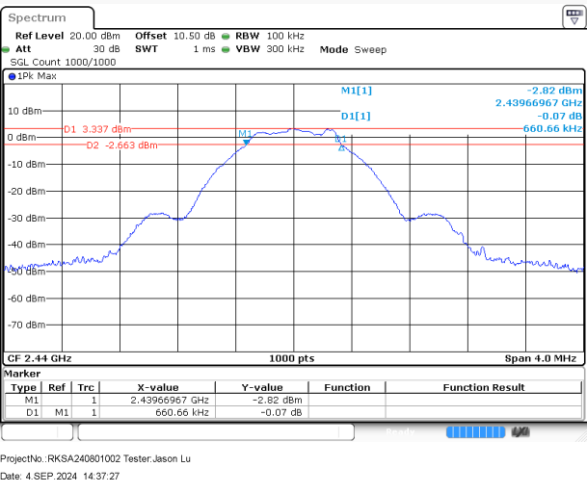
ProjectNo: RKSA240801002 Tester:Jason Lu
Date: 9 DEC 2024 19:38:15

For BLE Mode:

Low Channel



Middle Channel



High Channel

