

FCC PART 15.247

TEST REPORT

For

Vagaro, Inc.

4430 Rosewood Drive, Suite 500, Pleasanton, CA 94588

FCC ID: 2BFJHD052

Report Type:

Original Report

Product Name:

PayPro

Report Number: RKSA240328001-00A

Report Date: 2024-06-17

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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.

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REPORT REVISION HISTORY

Number of Revisions	Report No.	Version	Issue Date	Description
0	RKSA240328001-00A	R1V1	2024-06-17	Initial Release

GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

Applicant	Vagaro, Inc.
Tested Model	D052
Product Name	PayPro
Power Supply	DC 24V
RF Function:	2.4G Wi-Fi; BLE
Maximum Peak Output Power:	2.4G Wi-Fi: 802.11b: 20.74 dBm 802.11g: 20.81 dBm 802.11n20: 20.86 dBm 802.11n40: 19.92 dBm BLE(1Mbps): 4.85 dBm
Operating Band/Frequency:	2.4G Wi-Fi: 2412~2462 MHz(802.11b/g/n20), 2422~2452 MHz(802.11n40) BLE(1Mbps): 2402-2480 MHz
Channel Number:	2.4G Wi-Fi: 11(802.11b/g/n20), 7(802.11n40) BLE: 40
Channel Separation:	2.4G Wi-Fi: 5 MHz BLE: 2 MHz
Modulation Type:	2.4G Wi-Fi: DSSS, OFDM BLE: GFSK
Antenna Type:	2.4G Wi-Fi /BLE: FPC Antenna
★Maximum Antenna Gain:	2.4G Wi-Fi /BLE: 4.62 dBi

Adapter Information:

Model: ASSA52-240250

Input: 100-240V, 50/60Hz, 1.5A

Output: 24.0V, 2.5A, 60.0W

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: RKSA240328001-1 (Assigned by the BACL (Kunshan). The EUT supplied by the applicant was received on 2024-03-28.)

Objective

This report is prepared for *Vagaro, Inc.* 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 C63.10-2013, American National Standard of Procedures for Compliant Testing of Unlicensed Wireless Devices and FCC 558074 D01 15.247 Meas Guidance v05r02.

Measurement Uncertainty

Item		Uncertainty
AC Power Lines Conducted Emissions		3.19dB
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: Engineering Mode

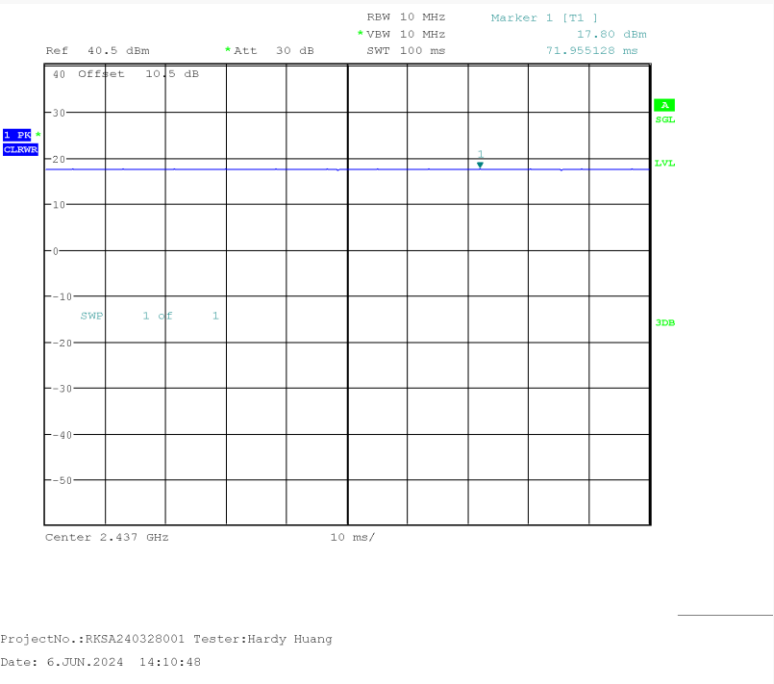
Pre-scan with all the data rates, and the worst case was performed as below:

Mode	Data Rate	★Power Level
802.11b	1 Mbps	20
802.11g	6 Mbps	18
802.11n-HT20	MCS0	18
802.11n-HT40	MCS0	15
BLE(1Mbps)	1Mbps	Default

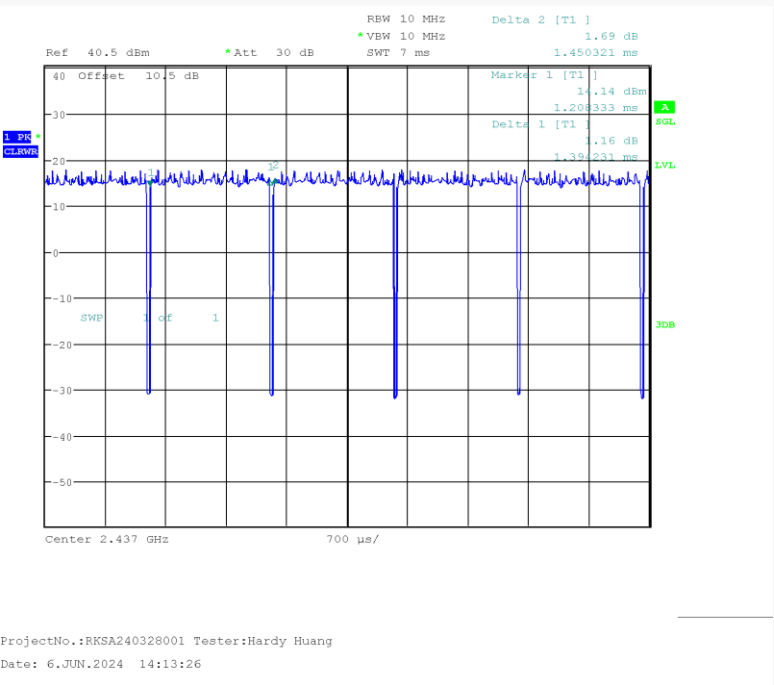
Note: The power level was declared by the applicant.

Duty Cycle:

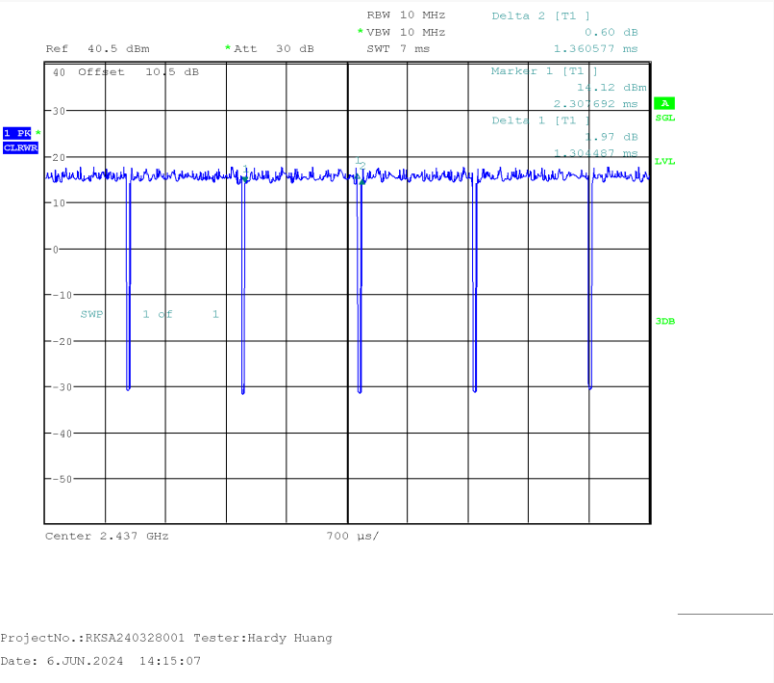
802.11b Mode Middle Channel



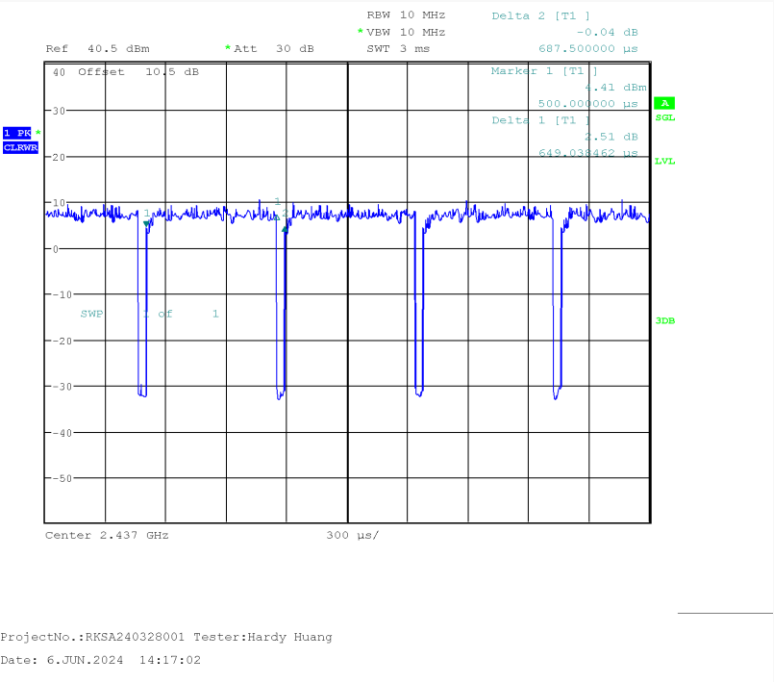
802.11g Mode Middle Channel

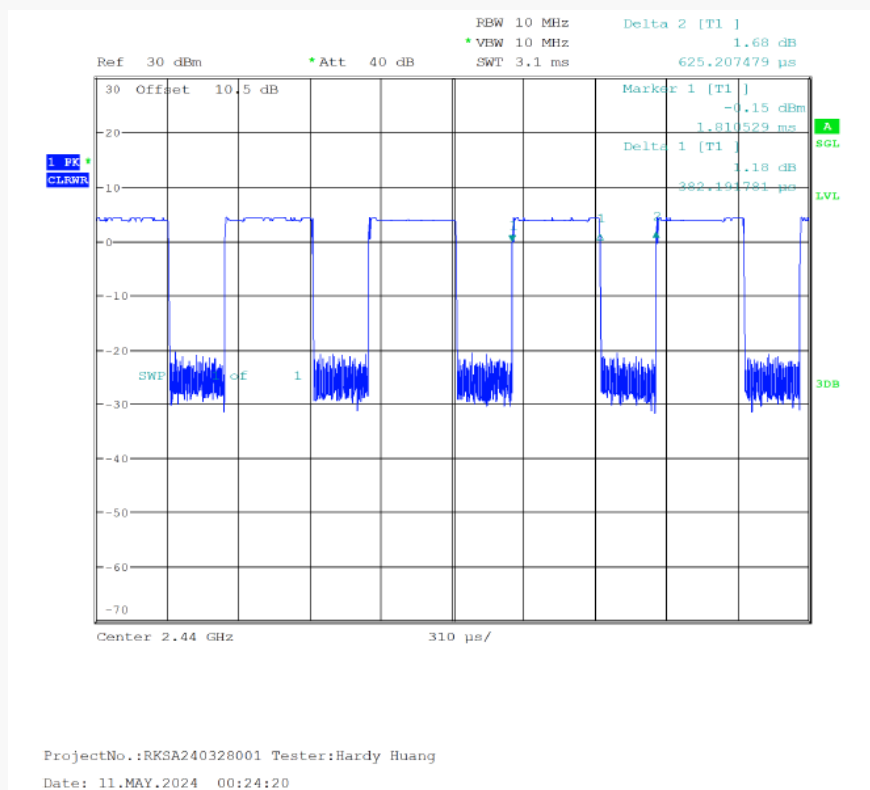


802.11n-HT20 Mode Middle Channel



802.11n-HT40 Mode Middle Channel



BLE(1Mbps) Mode Middle Channel

Mode	Duty Cycle (%)	Ton(ms)	Ton+off(ms)	10log(1/x)
802.11b	100	100	100	0
802.11g	96.14	1.394	1.45	0.17
802.11n-HT20	95.81	1.304	1.361	0.19
802.11n-HT40	94.47	0.649	0.687	0.25
BLE(1Mbps)	61.12	0.382	0.625	2.14

Note: “x” means the Duty Cycle.

Support Equipment List and Details

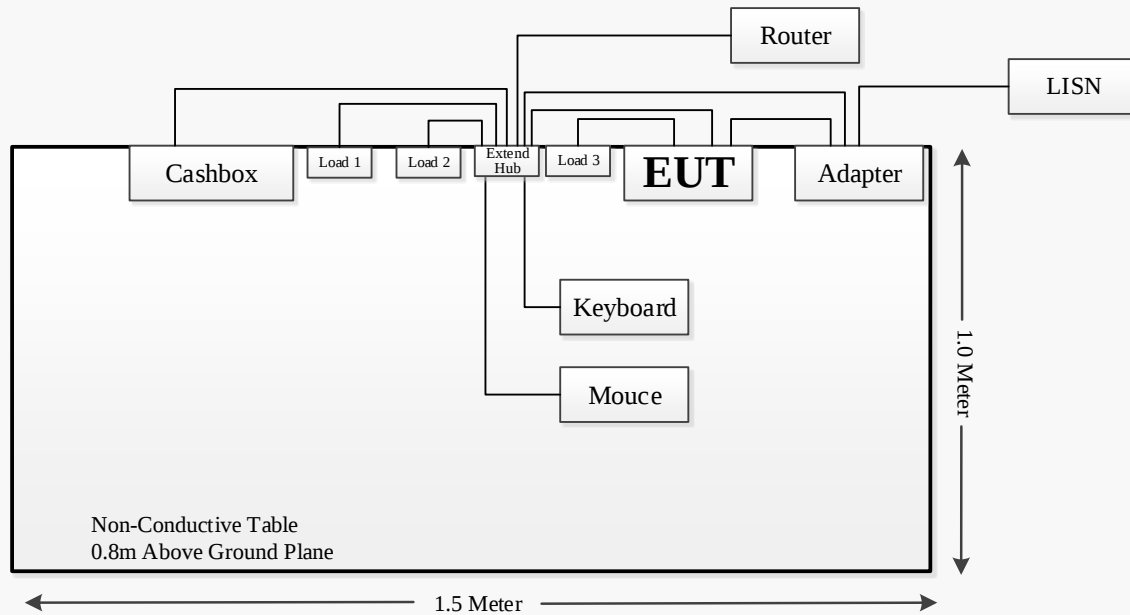
Manufacturer	Description	Model	Serial Number
Lenovo	Mouse	M12Pro	/
/	load*3	/	/
TPLINK	Router	TL XDR3010	12373X0002080
/	cashbox	/	/
/	Keyboard	/	/

External I/O Cable

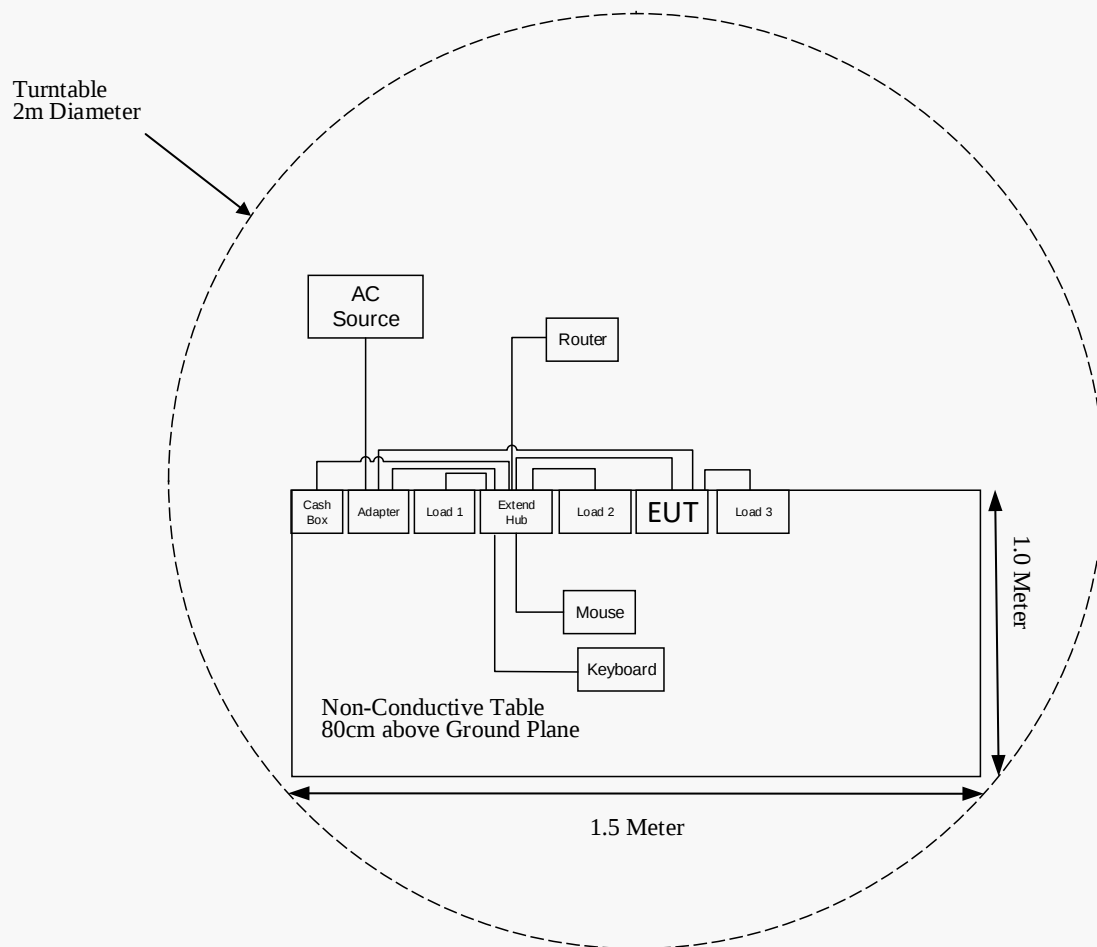
Cable Description	Length (m)	From Port	To
Power cable 1	1.0	AC Source/LISN	Adapter
Power cable 2	1.0	EUT	Extend Hub
RJ45 Cable 1	5.0	Extend Hub	Router
RJ45 Cable 2	1.0	Extend Hub	Cash box
USB Cable 1	1.0	Extend Hub	Mouse
USB Cable 2	1.0	Extend Hub	Keyboard
USB Cable 3	0.5	Extend Hub	Load 1
USB Cable 4	0.5	Extend Hub	Load 2
USB Cable 5	0.5	EUT	Load 3
USB Cable 6	1.5	Adapter	EUT

Block Diagram of Test Setup

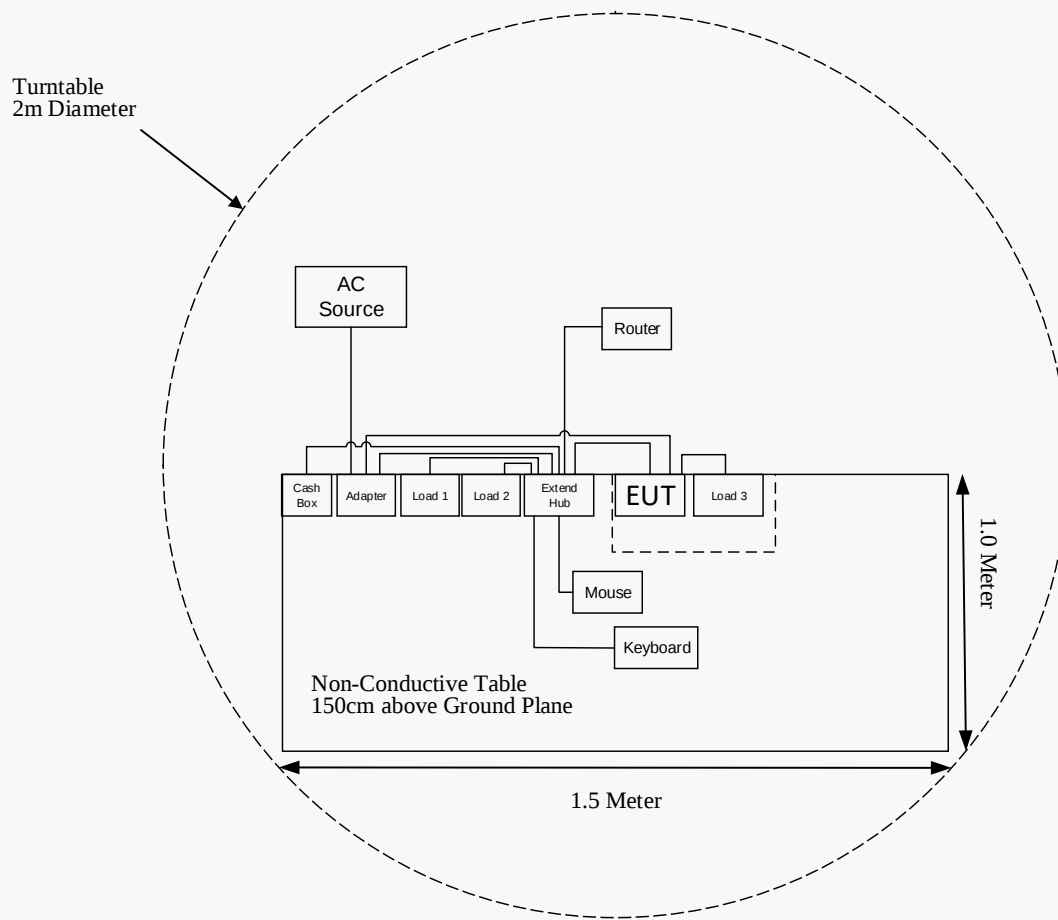
For Conducted Emissions:



For Radiated Emissions (Below 1GHz):



For Radiated Emissions (Above 1 GHz):



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§15.203	Antenna Requirement	Compliant
§15.207 (a)	AC Line Conducted Emissions	Compliant
§15.205, §15.209, §15.247(d)	Spurious Emissions	Compliant
§15.247 (a)(2)	6 dB Emission Bandwidth	Compliant
§15.247(b)(3)	Maximum Conducted Output Power	Compliant
§15.247(d)	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	2023-05-23	2024-05-22
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	2023-05-23	2024-05-22
Rohde & Schwarz	Auto Test Software	EMC32	100361	N/A	N/A
MICRO-COAX	Coaxial Cable	Cable-8	008	2023-05-23	2024-05-22
MICRO-COAX	Coaxial Cable	Cable-9	009	2023-05-23	2024-05-22
MICRO-COAX	Coaxial Cable	Cable-10	010	2023-05-23	2024-05-22
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	2024-04-25	2025-04-24
Narda	Attenuator	10dB	010	2024-04-25	2025-04-24
Rohde & Schwarz	Auto test Software	EMC32	100361	N/A	N/A
MICRO-COAX	Coaxial Cable	Cable-6	006	2024-04-25	2025-04-24
MICRO-COAX	Coaxial Cable	Cable-11	011	2024-04-25	2025-04-24
MICRO-COAX	Coaxial Cable	Cable-12	012	2024-04-25	2025-04-24
MICRO-COAX	Coaxial Cable	Cable-13	013	2024-04-25	2025-04-24
RF Conducted Test					
Rohde & Schwarz	Spectrum Analyzer	FSU26	200103	2024-04-24	2025-04-23
Rohde & Schwarz	Signal Analyzer	FSV40	101116	2024-04-24	2025-04-23
Narda	Attenuator	10dB	010	2024-04-25	2025-04-24
Anritsu	Power Sensor	MA24418A	12621	2024-04-23	2025-04-22
XHFDZ	RG178 Coaxial Cable	SMA-178	XHF-1102	Each time	N/A
Conducted Emission Test					
Rohde & Schwarz	EMI Test Receiver	ESR	1316.3003K03-101746-zn	2023-05-23	2024-05-22
Rohde & Schwarz	LISN	ENV216	101115	2023-05-23	2024-05-22
Audix	Test Software	e3	V9	N/A	N/A
Rohde & Schwarz	Pulse limiter	ESH3-Z2	100552	2023-05-23	2024-05-22
MICRO-COAX	Coaxial Cable	Cable-15	015	2023-05-23	2024-05-22

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 §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 an FPC for 2.4G Wi-Fi & BLE, and the antenna gain is 4.62 dBi, which is permanently attached to the unit, fulfill the requirement of this section. Please refer to the EUT photos.

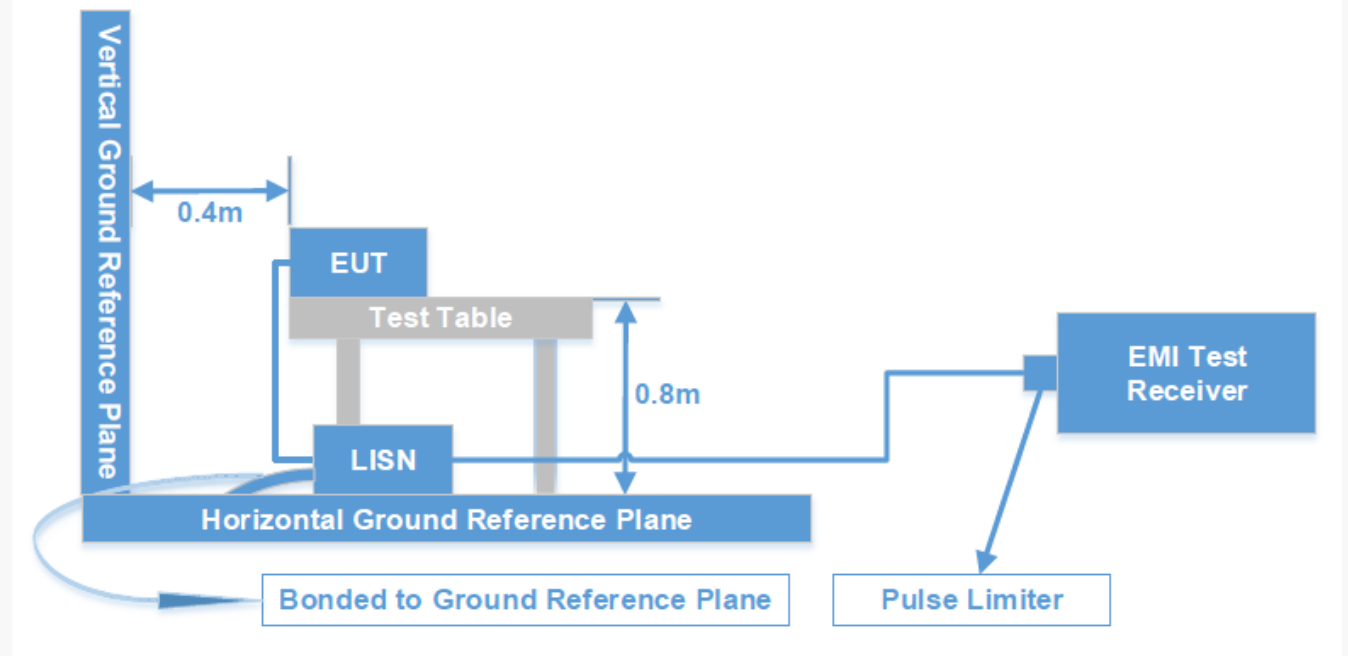
Result: Compliant.

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 C63.10-2013. The related limit was specified in FCC Part 15.207.

The spacing between the peripherals was 10 cm.

EMI Test Receiver Setup

The EMI test receiver was set to investigate the spectrum from 150 kHz to 30 MHz.

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

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

Test Procedure

ANSI C63.10-2013 clause 6.2

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

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

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

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)

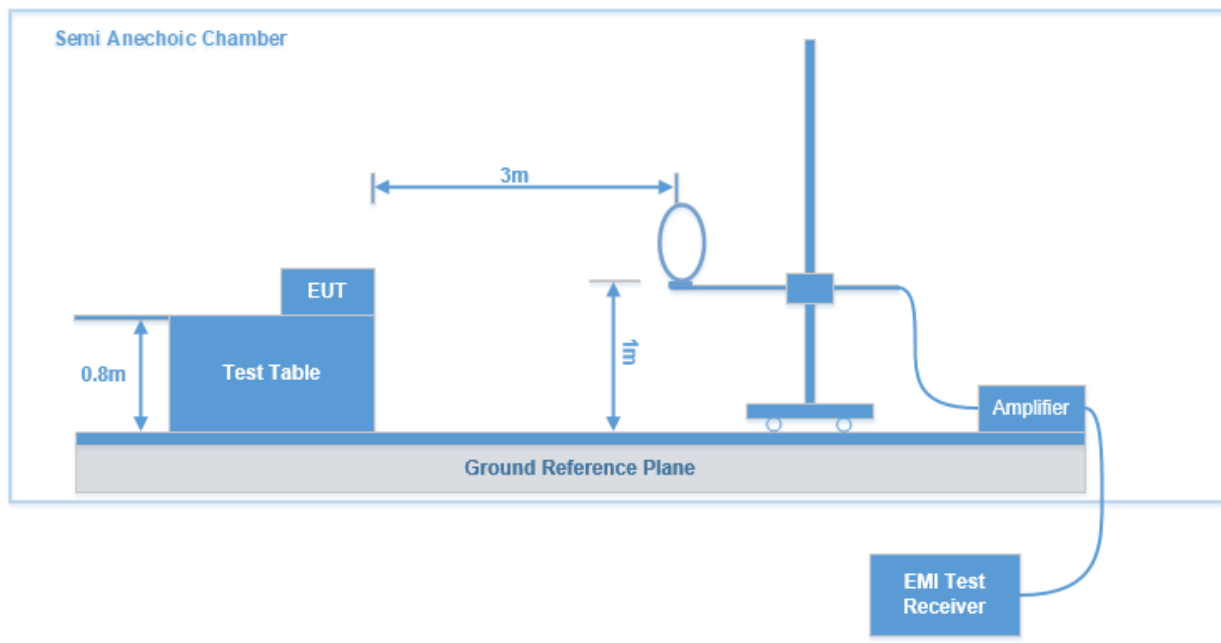
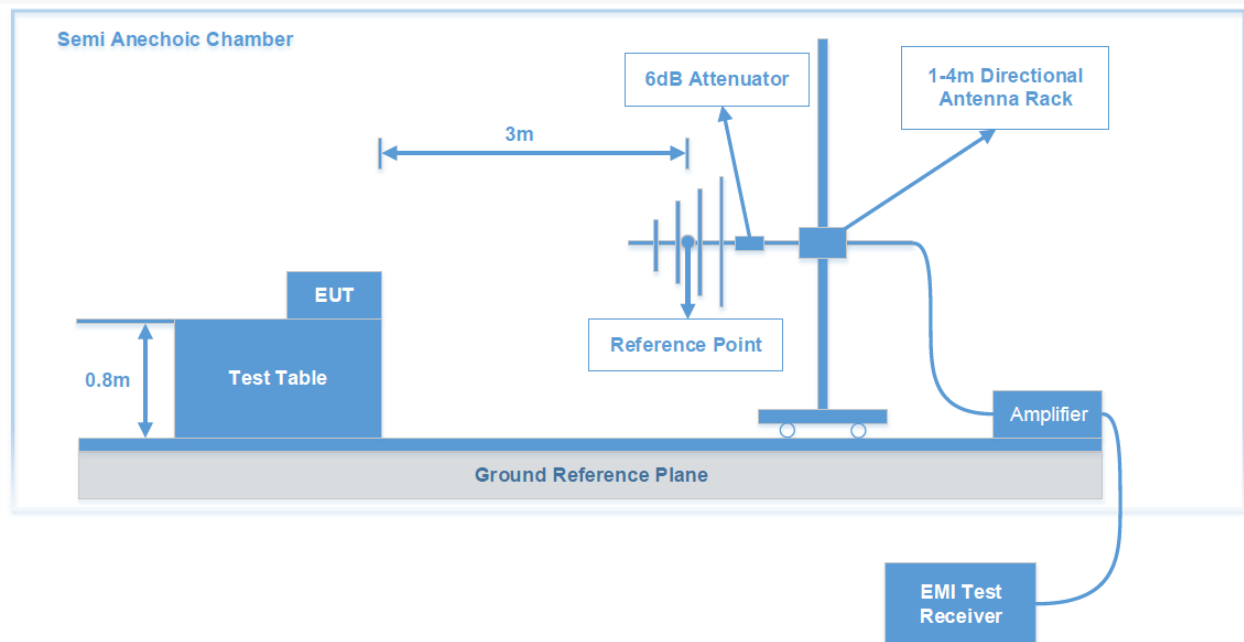
Test Results Summary

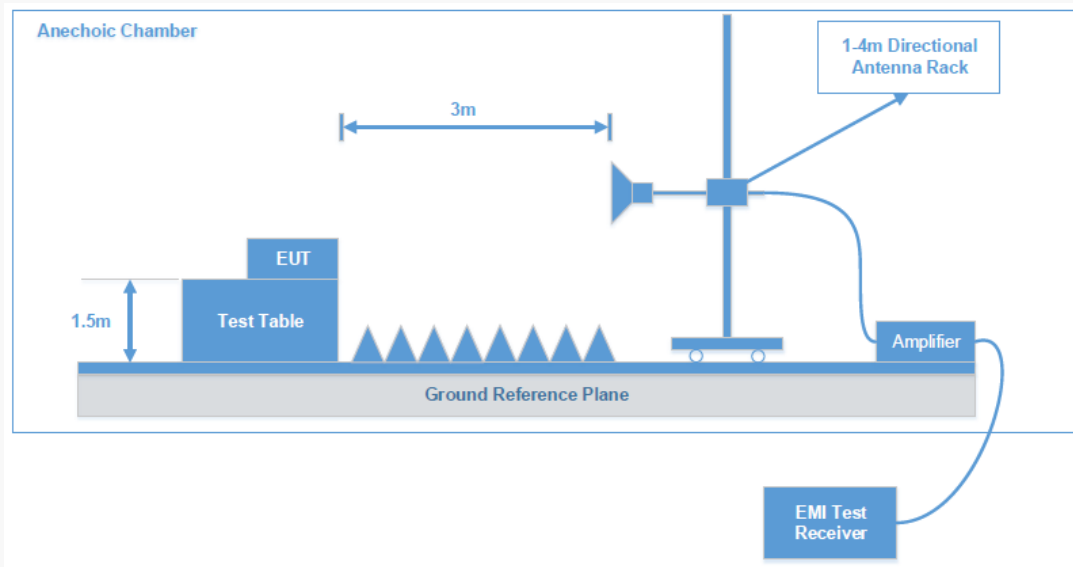
According to the recorded data in following table, the EUT complied with the FCC Part 15.207.

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**9kHz - 30MHz:****30 MHz - 1 GHz:**

Above 1GHz:

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

EMI Test Receiver Setup

The system was investigated from 9 kHz to 25 GHz.

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

Frequency Range	RBW	VBW	IF B/W	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 C63.10-2013 clause 6.5, 6.6 and 6.7.

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, Subpart C, section 15.205, 15.209 and 15.247.

Test Data: See Appendix

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

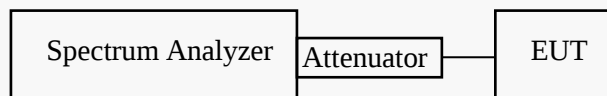
Applicable Standard

Systems using digital modulation techniques may operate in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

Test Procedure

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

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



Test Data: See Appendix

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

Applicable Standard

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

Test Procedure

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

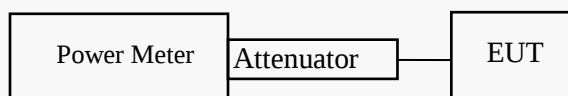
The maximum peak conducted output power may be measured using a broadband peak RF power meter. The power meter shall have a video bandwidth that is greater than or equal to the DTS bandwidth and shall use a fast-responding diode detector.

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

11.9.2.3.2 Method AVGPM-G

Method AVGPM-G is a measurement using a gated RF average power meter.

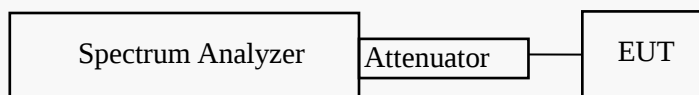
Alternatively, measurements may be performed using a wideband gated RF power meter provided that the gate parameters are adjusted such that the power is measured only when the EUT is transmitting at its maximum power control level. Because the measurement is made only during the ON time of the transmitter,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



According to ANSI C63.10-2013 sub-clause 11.9.1.1

For BLE:

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



Test Data: See Appendix

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

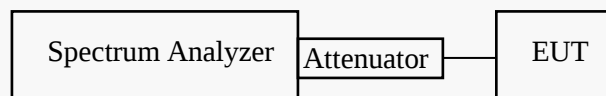
Applicable Standard

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 C63.10-2013 sub-clause 6.10.

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
3. Set RBW to 100 kHz and VBW of spectrum analyzer to 300 kHz with a convenient frequency span including 100 kHz bandwidth from band edge.
4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
5. Repeat above procedures until all measured frequencies were complete.



Test Data: See Appendix

FCC §15.247(E) - POWER SPECTRAL DENSITY

Applicable Standard

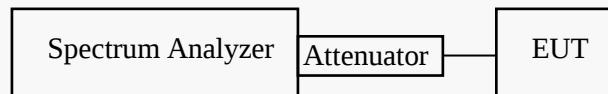
For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of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

Test Procedure

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

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:

1. Set the RBW to: $3\text{kHz} \leq \text{RBW} \leq 100\text{ kHz}$.
2. Set the VBW $\geq 3 * \text{RBW}$.
3. Set the span to 1.5 times the DTS bandwidth.
4. Detector = peak.
5. Sweep time = auto couple.
6. Trace mode = max hold.
7. Allow trace to fully stabilize.
8. Use the peak marker function to determine the maximum amplitude level within the RBW.
9. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.



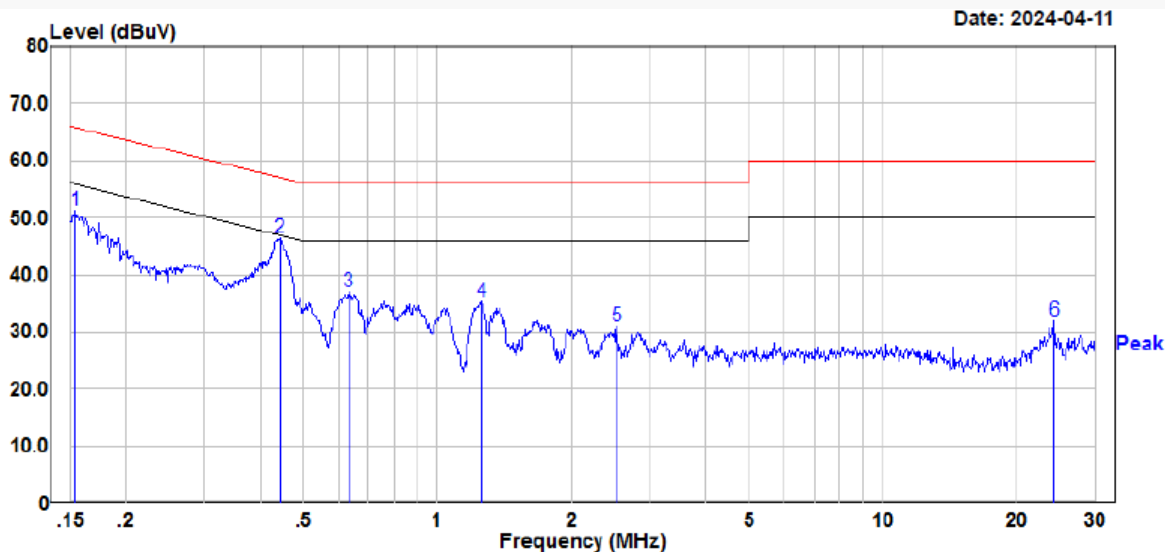
Test Data: See Appendix

Appendix - TEST DATA

Environmental Conditions & Test Information

Test Item:	AC LINE CONDUCTED EMISSIONS	RADIATED EMISSIONS			DUTY CYCLE
		9 kHz-1 GHz	1 GHz - 18 GHz	18 GHz -25 GHz	
Test Date:	2024-04-11	2024-04-13	2024-04-29	2024-06-14	2024-05-11 to 2024-06-06
Temperature:	19.6 °C	19.8 °C	20.3 °C	22.5 °C	19.8-22.3 °C
Relative Humidity:	62 %	61 %	52 %	56 %	46-55 %
ATM Pressure:	101.8 kPa	101.5 kPa	101.5kPa	100.6 kPa	100.6-101.2kPa
Test Result:	Pass	Pass	Pass	Pass	/
Test Engineer:	Frank Liu	Leah Li	Hugh Wu	Hugh Wu	Hardy Huang

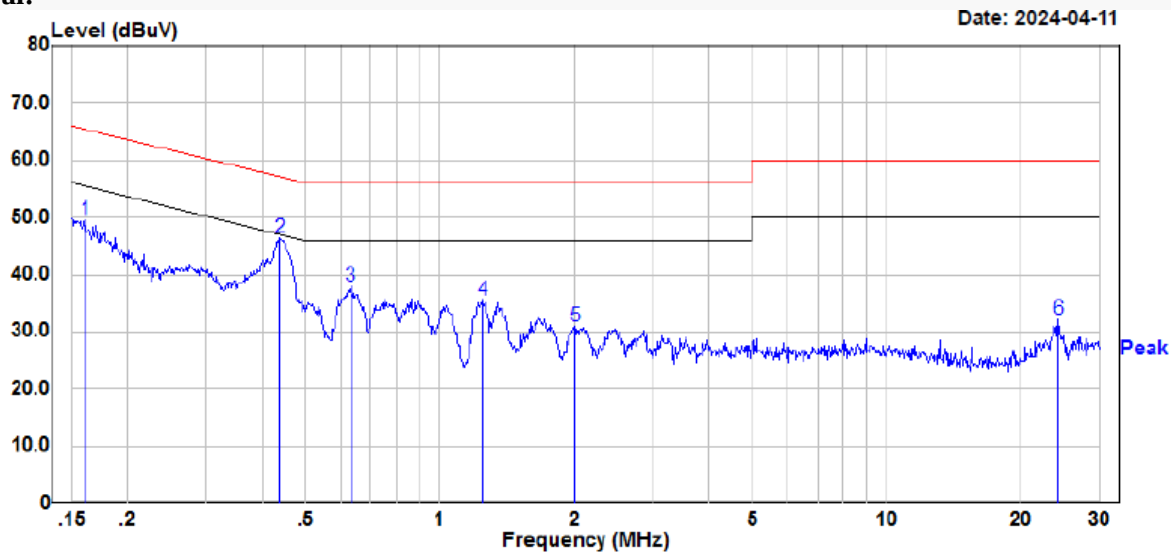
Test Item:	6 DB EMISSION BANDWIDTH	OCCUPIED BANDWIDTH	POWER SPECTRAL DENSITY	TRANSMITTER OUTPUT POWER MEASUREMENT	OUT OF BAND EMISSIONS
Test Date:	2024-05-11 to 2024-06-06	2024-05-11 to 2024-05-17	2024-05-11 to 2024-06-06	2024-05-11	2024-05-11 to 2024-05-17
Temperature:	19.8-22.3 °C	19.8-20.5 °C	19.8-22.3 °C	19.8 °C	19.8-20.5 °C
Relative Humidity:	46-55 %	54-55 %	46-55 %	55 %	54-55 %
ATM Pressure:	100.6-101.2kPa	101.2-101.6kPa	100.6-101.2kPa	101.2kPa	101.2-101.6kPa
Test Result:	Pass	/	Pass	Pass	Pass
Test Engineer:	Hardy Huang	Hardy Huang	Hardy Huang	Hardy Huang	Hardy Huang

AC LINE CONDUCTED EMISSIONS**For Wi-Fi Mode:***EUT operation mode: Transmitting in maximum output power mode 802.11n20 mode Middle channel***Line:**

Site : CE
Condition : FCC PART 15.207
: DET:Peak
Project : RKSA240328001
Model : D052
Phase : L
Voltage : 120V/60Hz
Mode : 2.4G WIFI
Test Equipment : ENV216,ESR
Temperature : 19.6°C
Humidity : 62%
Atmospheric pressure: 101.8kPa
Test Engineer : Frank Liu

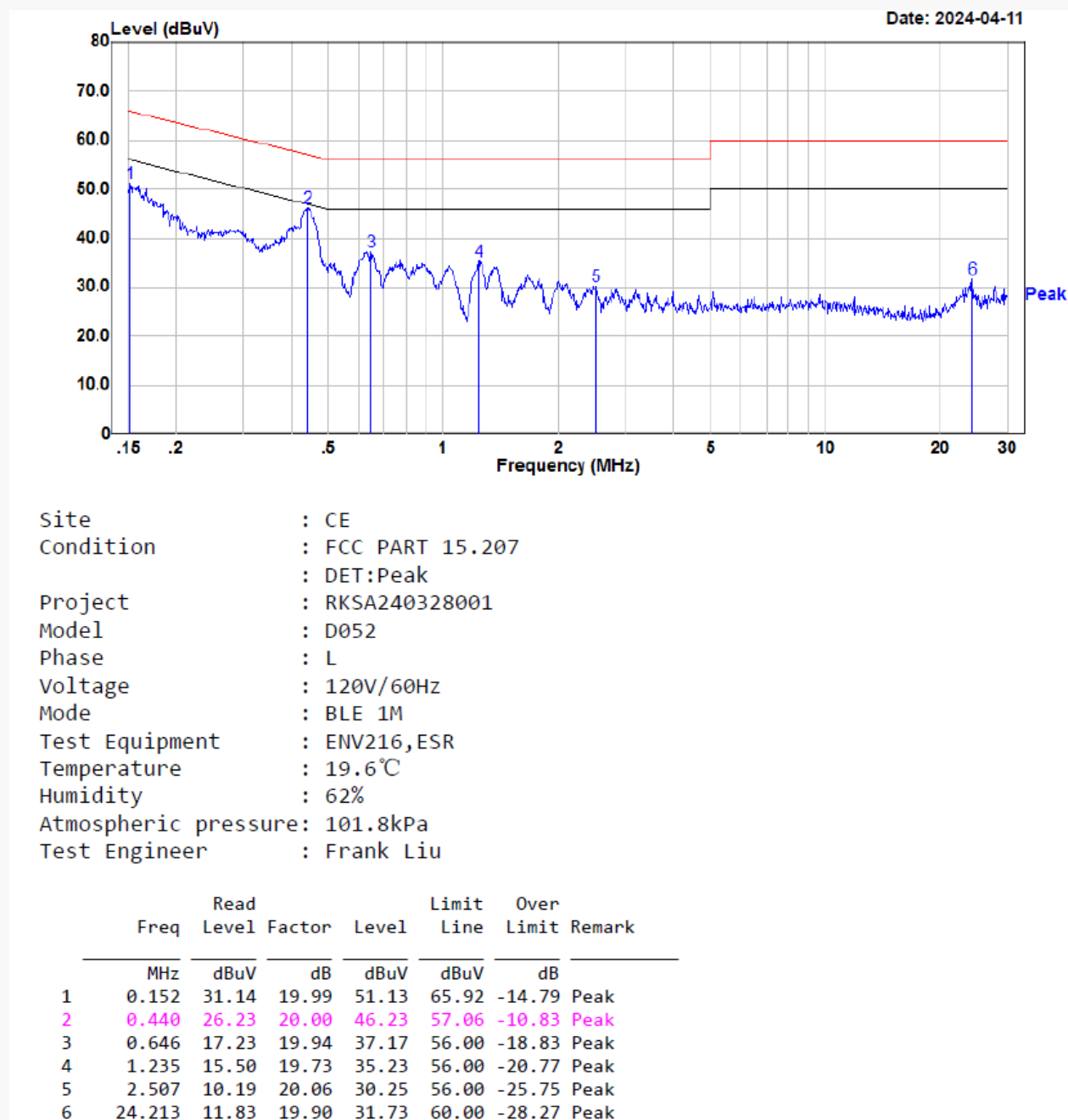
	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	
1	0.154	31.20	19.99	51.19	65.79	-14.60	Peak
2	0.442	26.35	20.00	46.35	57.02	-10.67	Peak
3	0.630	17.02	19.95	36.97	56.00	-19.03	Peak
4	1.254	15.47	19.74	35.21	56.00	-20.79	Peak
5	2.519	10.77	20.06	30.83	56.00	-25.17	Peak
6	24.213	12.01	19.90	31.91	60.00	-28.09	Peak

Neutral:

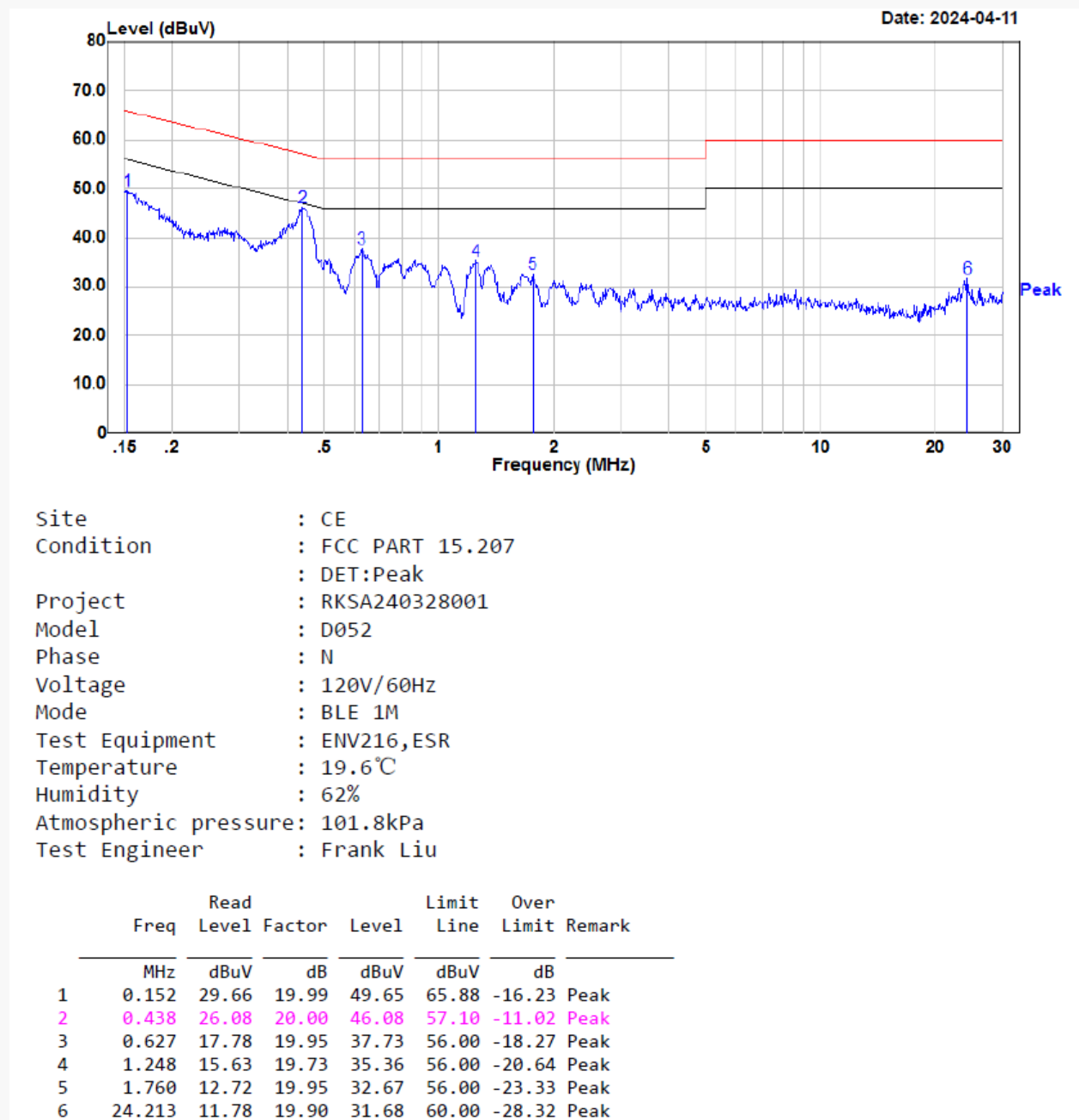


Site : CE
Condition : FCC PART 15.207
: DET:Peak
Project : RKSA240328001
Model : D052
Phase : N
Voltage : 120V/60Hz
Mode : 2.4G WIFI
Test Equipment : ENV216, ESR
Temperature : 19.6°C
Humidity : 62%
Atmospheric pressure: 101.8kPa
Test Engineer : Frank Liu

	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	
1	0.160	29.61	20.00	49.61	65.46	-15.85	Peak
2	0.438	26.44	20.00	46.44	57.10	-10.66	Peak
3	0.630	17.93	19.95	37.88	56.00	-18.12	Peak
4	1.248	15.81	19.73	35.54	56.00	-20.46	Peak
5	2.003	10.87	20.03	30.90	56.00	-25.10	Peak
6	24.213	12.14	19.90	32.04	60.00	-27.96	Peak

For BLE (1 Mbps) Mode:*EUT operation mode: Transmitting in maximum output power mode High channel***Line**

Neutral



SPURIOUS EMISSIONS

Test Result: Compliant

EUT operation mode: Transmitting

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

9 kHz-30MHz:

For Wi-Fi Mode:

Transmitting in maximum output power mode 802.11n20 mode Middle

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

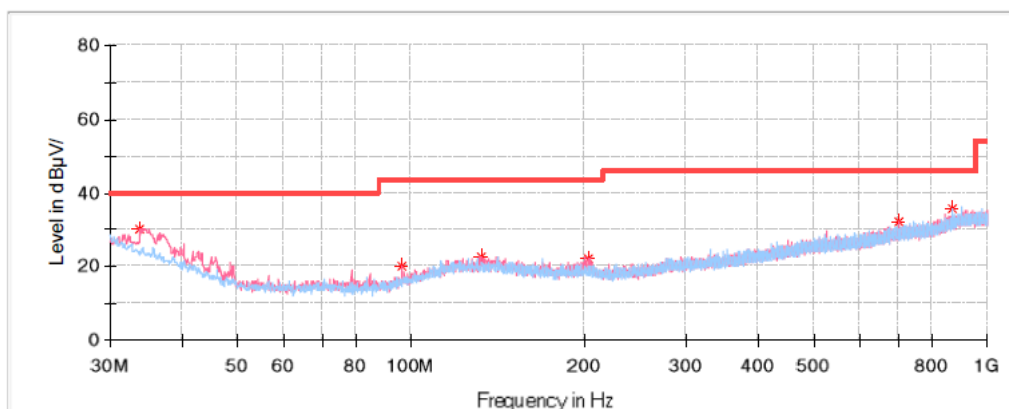
For BLE Mode:

Transmitting in maximum output power mode BLE 1M mode high channel

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

For Wi-Fi Mode:**30MHz-1GHz (802.11n20 mode is worst case) :****Low channel: 2412MHz****Common Information**

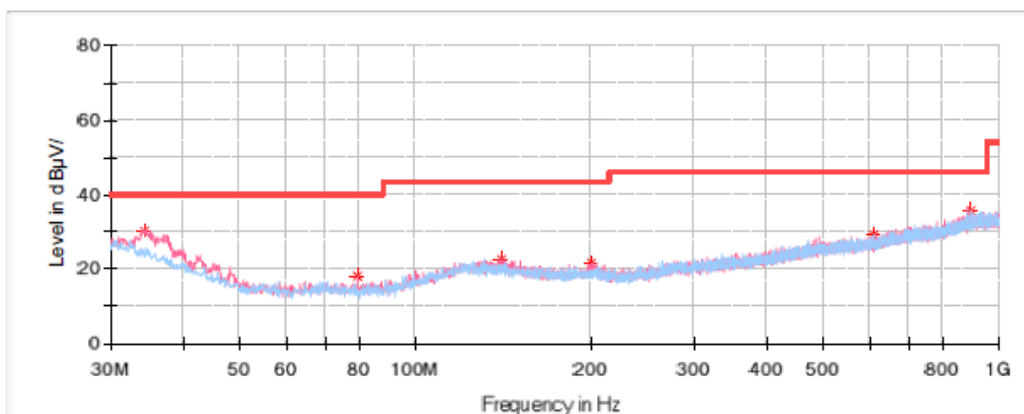
Project No: RKSA240328001
Test Mode: 2.4G WIFI
Standard: FCC Part 15.247 & FCC Part 15.205 & FCC Part 15.209
Test Engineer: Leah Li

**Critical_Freqs**

Frequency (MHz)	MaxPeak (dBμ V/m)	Limit (dBμ V/m)	Margin (dB)	Pol	Corr. (dB/m)
33.758750	30.38	40.00	9.62	V	-7.0
96.323750	20.08	43.50	23.42	V	-15.6
132.335000	22.67	43.50	20.83	V	-11.4
203.630000	22.33	43.50	21.17	V	-12.8
701.603750	32.30	46.00	13.70	V	-2.4
868.322500	35.49	46.00	10.51	H	0.5

Middle channel: 2437MHz**Common Information**

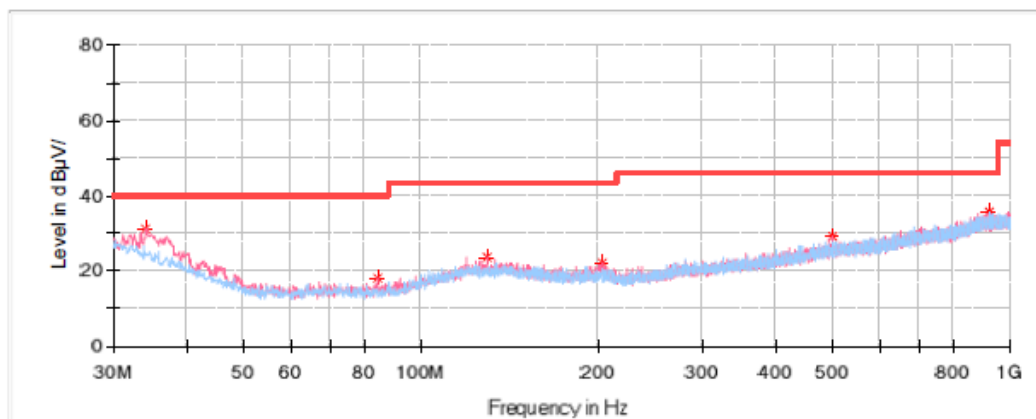
Project No: RKSA240328001
Test Mode: 2.4G WIFI
Standard: FCC Part 15.247 & FCC Part 15.205 & FCC Part 15.209
Test Engineer: Leah Li

**Critical_Freqs**

Frequency (MHz)	MaxPeak (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Pol	Corr. (dB/m)
34.365000	30.34	40.00	9.66	V	-7.4
79.591250	18.36	40.00	21.64	V	-17.5
140.458750	22.55	43.50	20.95	V	-11.6
200.598750	21.42	43.50	22.08	V	-12.6
608.726250	29.27	46.00	16.73	H	-4.6
893.421250	35.85	46.00	10.15	H	1.1

High Channel: 2462MHz**Common Information**

Project No: RKSA240328001
Test Mode: 2.4G WIFI
Standard: FCC Part 15.247 & FCC Part 15.205 & FCC Part 15.209
Test Engineer: Leah Li

**Critical Freqs**

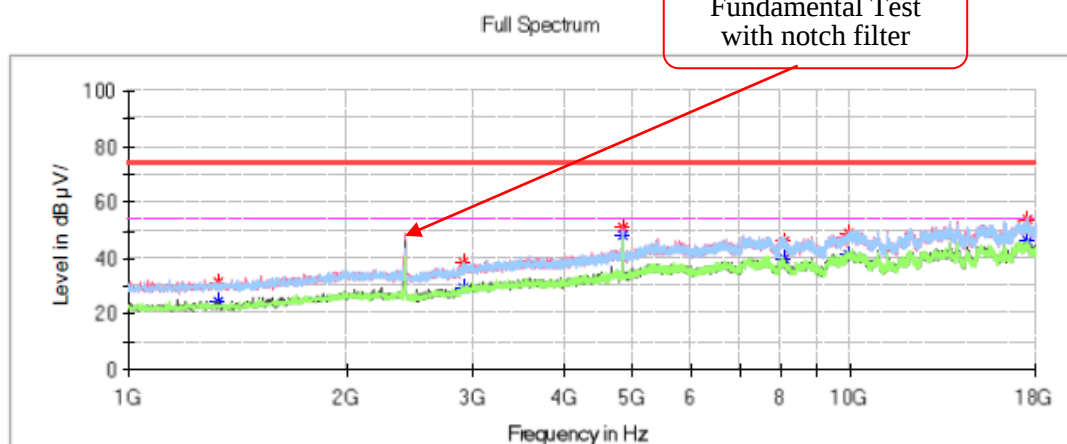
Frequency (MHz)	MaxPeak (dBμ V/m)	Limit (dBμ V/m)	Margin (dB)	Pol	Corr. (dB/m)
34.122500	31.21	40.00	8.79	V	-7.3
84.198750	18.11	40.00	21.89	V	-17.4
129.182500	23.84	43.50	19.66	V	-11.4
203.266250	22.22	43.50	21.28	V	-12.7
498.146250	29.11	46.00	16.89	V	-5.8
921.308750	35.51	46.00	10.49	H	1.4

1GHz-18GHz:
802.11b Mode:

Low Channel: 2412MHz

Common Information

Project No.: RKSA240328001
 Test Mode: 2.4G Wi-Fi 802.11b mode of low channel
 Standard: FCC Part 15.247 & FCC Part 15.205 & FCC Part 15.209
 Test Engineer: Hugh Wu

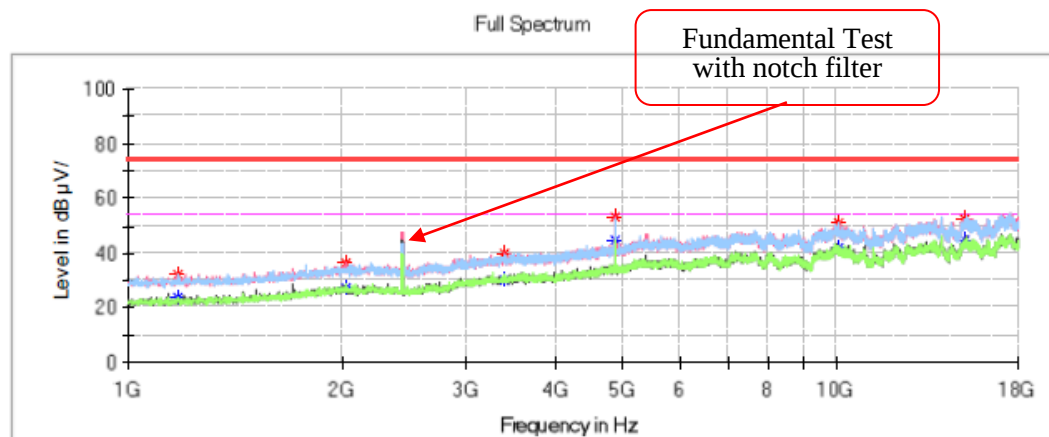


Critical_Freqs

Frequency (MHz)	MaxPeak (dB μ V/m)	Average (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Pol	Corr. (dB/m)
1326.400000	31.26	---	74.00	42.74	V	-14.5
1326.400000	---	24.32	54.00	29.68	V	-14.5
2897.200000	---	29.35	54.00	24.65	H	-8.4
2897.200000	38.80	---	74.00	35.20	H	-8.4
4823.300000	51.22	---	74.00	22.78	V	-2.1
4823.300000	---	47.95	54.00	6.05	V	-2.1
8065.200000	---	39.62	54.00	14.38	V	3.8
8065.200000	46.03	---	74.00	27.97	V	3.8
9908.000000	---	41.58	54.00	12.42	H	7.5
9908.000000	49.25	---	74.00	24.75	H	7.5
17592.000000	---	45.83	54.00	8.17	H	13.2
17592.000000	53.87	---	74.00	20.13	H	13.2

Middle Channel: 2437MHz**Common Information**

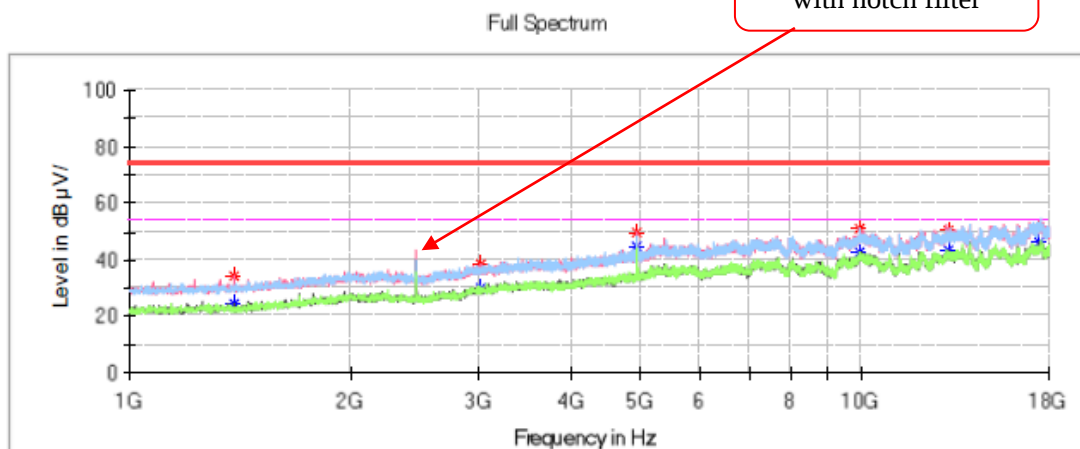
Project No.: RKSA240328001
 Test Mode: 2.4G Wi-Fi 802.11b mode of middle channel
 Standard: FCC Part 15.247 & FCC Part 15.205 & FCC Part 15.209
 Test Engineer: Hugh Wu

**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)
1178.500000	32.16	---	74.00	41.84	H	-15.0
1178.500000	---	23.74	54.00	30.26	H	-15.0
2025.100000	---	27.22	54.00	26.78	V	-10.5
2025.100000	36.26	---	74.00	37.74	V	-10.5
3386.800000	---	29.88	54.00	24.12	V	-6.5
3386.800000	40.00	---	74.00	34.00	V	-6.5
4872.600000	53.05	---	74.00	20.95	V	-1.9
4872.600000	---	45.04	54.00	8.96	V	-1.9
10038.900000	---	42.12	54.00	11.88	H	7.8
10038.900000	51.12	---	74.00	22.88	H	7.8
15135.500000	52.71	---	74.00	21.29	V	10.6
15135.500000	---	44.64	54.00	9.36	V	10.6

High Channel: 2462MHz**Common Information**

Project No.: RKSA240328001
 Test Mode: 2.4G Wi-Fi 802.11b mode of high channel
 Standard: FCC Part 15.247 & FCC Part 15.205 & FCC Part 15.209
 Test Engineer: Hugh Wu

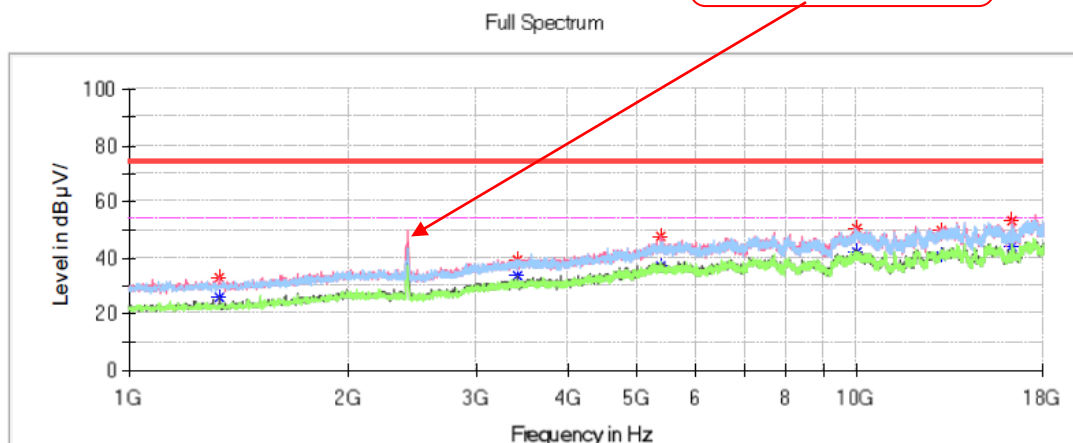
**Critical Freqs**

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	34.05	---	74.00	39.95	V	-14.3
1391.000000	---	24.76	54.00	29.24	V	-14.3
3023.000000	---	29.93	54.00	24.07	V	-7.9
3023.000000	38.49	---	74.00	35.51	V	-7.9
4923.600000	49.51	---	74.00	24.49	V	-1.6
4923.600000	---	44.83	54.00	9.17	V	-1.6
9945.400000	---	42.81	54.00	11.19	V	7.6
9945.400000	50.84	---	74.00	23.16	V	7.6
13078.500000	---	43.15	54.00	10.85	V	9.3
13078.500000	50.34	---	74.00	23.66	V	9.3
17399.900000	51.06	---	74.00	22.94	H	13.4
17399.900000	---	45.86	54.00	8.14	H	13.4

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

Project No.: RKSA240328001
 Test Mode: 2.4G Wi-Fi 802.11g mode of low channel
 Standard: FCC Part 15.247 & FCC Part 15.205 & FCC Part 15.209
 Test Engineer: Hugh Wu

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)
1328.100000	---	26.02	54.00	27.98	V	-14.5
1328.100000	32.90	---	74.00	41.10	V	-14.5
3417.400000	---	33.86	54.00	20.14	H	-6.4
3417.400000	39.48	---	74.00	34.52	H	-6.4
5382.600000	---	37.35	54.00	16.65	V	0.4
5382.600000	47.21	---	74.00	26.79	V	0.4
9976.000000	50.51	---	74.00	23.49	V	7.7
9976.000000	---	41.82	54.00	12.18	V	7.7
13008.800000	49.95	---	74.00	24.05	V	9.1
13008.800000	---	40.67	54.00	13.33	V	9.1
16313.600000	---	44.30	54.00	9.70	V	9.7
16313.600000	53.15	---	74.00	20.85	V	9.7

Middle Channel: 2437MHz**Common Information**

Project No.:

RKSA240328001

Test Mode:

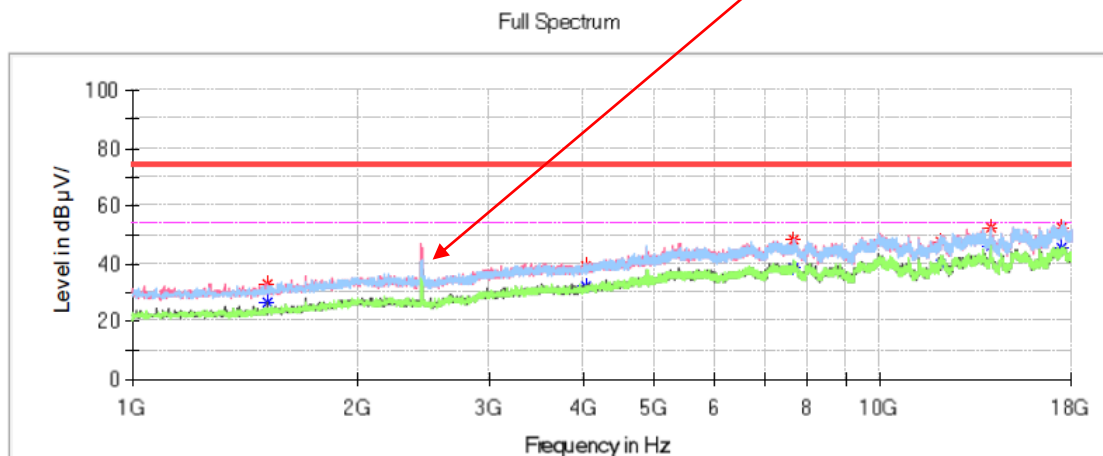
2.4G Wi-Fi 802.11g mode of middle channel

Standard:

FCC Part 15.247 & FCC Part 15.205 & FCC Part 15.209

Test Engineer:

Hugh Wu

Fundamental Test
with notch filter**Critical_Freqs**

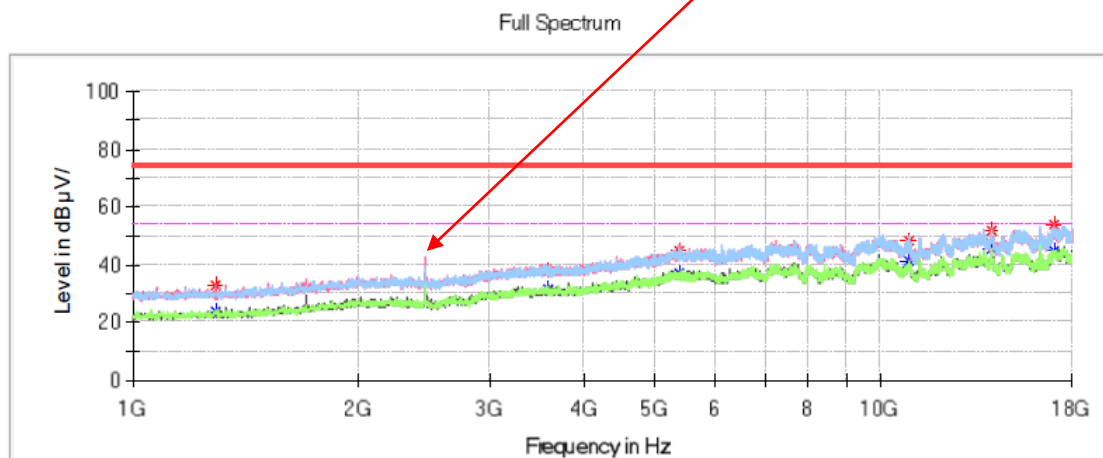
Frequency (MHz)	MaxPeak (dB μ V/m)	Average (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Pol	Corr. (dB/m)
1516.800000	---	26.72	54.00	27.28	V	-13.8
1516.800000	32.89	---	74.00	41.11	V	-13.8
4046.400000	---	31.84	54.00	22.16	H	-4.9
4046.400000	39.13	---	74.00	34.87	H	-4.9
7664.000000	---	38.61	54.00	15.39	V	4.1
7664.000000	47.97	---	74.00	26.03	V	4.1
12012.600000	47.78	---	74.00	26.22	V	6.9
12012.600000	---	40.14	54.00	13.86	V	6.9
14003.300000	---	45.82	54.00	8.18	H	10.5
14003.300000	52.73	---	74.00	21.27	H	10.5
17422.000000	---	45.26	54.00	8.74	H	13.4
17422.000000	52.48	---	74.00	21.52	H	13.4

High Channel: 2462MHz**Common Information**

Project No.:
Test Mode:
Standard:
Test Engineer:

RKSA240328001
2.4G Wi-Fi 802.11g mode of high channel
FCC Part 15.247 & FCC Part 15.205 & FCC Part 15.209
Hugh Wu

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)
1290.700000	---	24.06	54.00	29.94	V	-14.6
1290.700000	32.80	---	74.00	41.20	V	-14.6
3585.700000	37.78	---	74.00	36.22	H	-5.9
3585.700000	---	31.43	54.00	22.57	H	-5.9
5365.600000	---	36.85	54.00	17.15	H	0.3
5365.600000	44.84	---	74.00	29.16	H	0.3
10866.800000	---	41.53	54.00	12.47	V	6.6
10866.800000	48.21	---	74.00	25.79	V	6.6
14001.600000	51.94	---	74.00	22.06	V	10.5
14001.600000	---	45.21	54.00	8.79	V	10.5
17061.600000	---	44.62	54.00	9.38	V	12.5
17061.600000	53.68	---	74.00	20.32	V	12.5

802.11n-HT20 Mode :

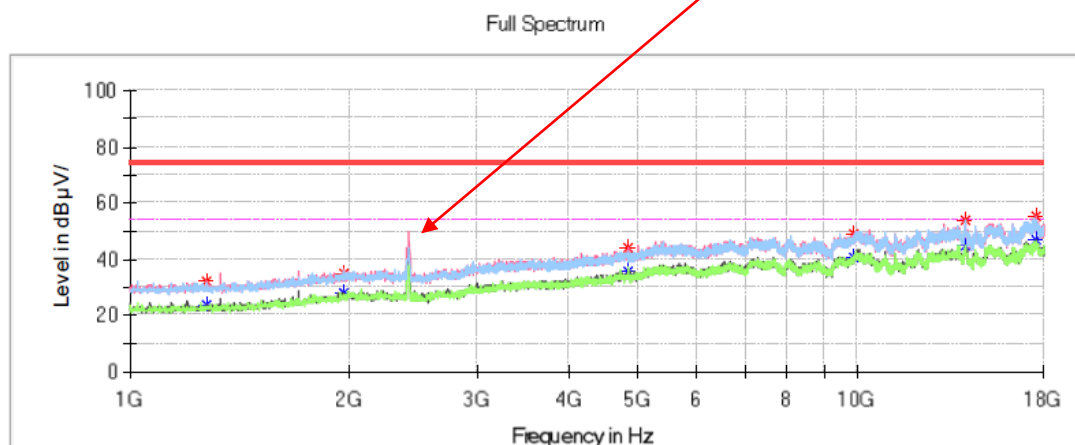
Low Channel: 2412MHz

Common Information

Project No.:
Test Mode:
Standard:
Test Engineer:

RKSA240328001
2.4G Wi-Fi 802.11n20 mode of low channel
FCC Part 15.247 & FCC Part 15.205 & FCC Part 15.209
Hugh Wu

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)
1277.100000	---	23.71	54.00	30.29	V	-14.6
1277.100000	32.08	---	74.00	41.92	V	-14.6
1960.500000	34.89	---	74.00	39.11	V	-10.8
1960.500000	---	28.29	54.00	25.71	V	-10.8
4821.600000	43.76	---	74.00	30.24	V	-2.1
4821.600000	---	35.66	54.00	18.34	V	-2.1
9882.500000	---	40.58	54.00	13.42	V	7.4
9882.500000	49.06	---	74.00	24.94	V	7.4
14001.600000	---	45.02	54.00	8.98	H	10.5
14001.600000	54.00	---	74.00	20.00	H	10.5
17592.000000	---	46.74	54.00	7.26	V	13.2
17592.000000	55.18	---	74.00	18.82	V	13.2

Middle Channel: 2437MHz**Common Information**

Project No.:

RKSA240328001

Test Mode:

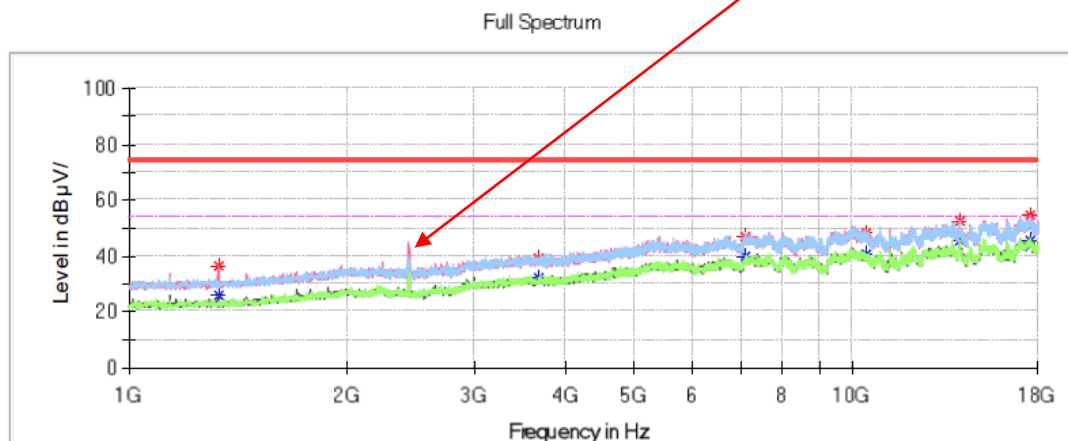
2.4G Wi-Fi 802.11n20 mode of middle channel

Standard:

FCC Part 15.247 & FCC Part 15.205 & FCC Part 15.209

Test Engineer:

Hugh Wu

Fundamental Test
with notch filter**Critical_Freqs**

Frequency (MHz)	MaxPeak (dB µV/m)	Average (dB µV/m)	Limit (dB µV/m)	Margin (dB)	Pol	Corr. (dB/m)
1326.400000	---	26.05	54.00	27.95	V	-14.5
1326.400000	36.06	---	74.00	37.94	V	-14.5
3672.400000	---	32.05	54.00	21.95	H	-5.7
3672.400000	39.33	---	74.00	34.67	H	-5.7
7089.400000	46.78	---	74.00	27.22	H	3.9
7089.400000	---	39.88	54.00	14.12	H	3.9
10446.900000	48.17	---	74.00	25.83	V	7.3
10446.900000	---	40.30	54.00	13.70	V	7.3
14001.600000	---	45.53	54.00	8.47	V	10.5
14001.600000	52.32	---	74.00	21.68	V	10.5
17609.000000	---	45.69	54.00	8.31	V	13.2
17609.000000	54.48	---	74.00	19.52	V	13.2

High Channel: 2462MHz**Common Information**

Project No.:

RKSA240328001

Test Mode:

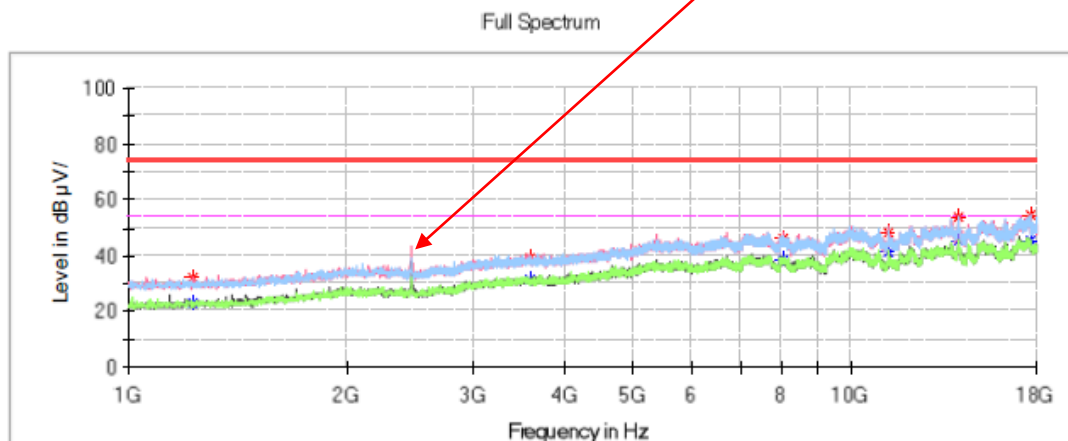
2.4G Wi-Fi 802.11n20 mode of high channel

Standard:

FCC Part 15.247 & FCC Part 15.205 & FCC Part 15.209

Test Engineer:

Hugh Wu

Fundamental Test
with notch filter**Critical Freqs**

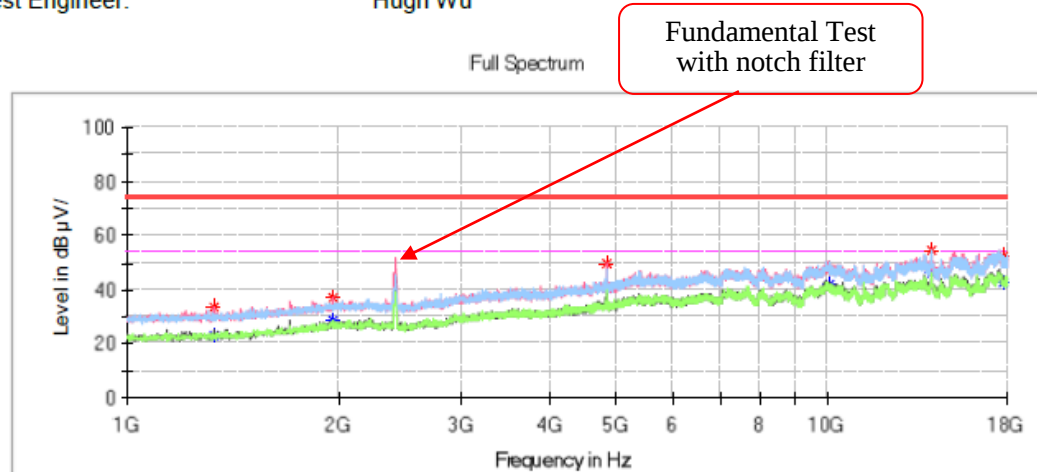
Frequency (MHz)	MaxPeak (dB μ V/m)	Average (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Pol	Corr. (dB/m)
1227.800000	---	23.16	54.00	30.84	V	-14.8
1227.800000	31.99	---	74.00	42.01	V	-14.8
3589.100000	39.12	---	74.00	34.88	H	-5.9
3589.100000	---	31.33	54.00	22.67	H	-5.9
8031.200000	---	38.75	54.00	15.25	V	3.8
8031.200000	46.27	---	74.00	27.73	V	3.8
11201.700000	47.97	---	74.00	26.03	V	6.7
11201.700000	---	41.50	54.00	12.50	V	6.7
14003.300000	---	45.48	54.00	8.52	H	10.5
14003.300000	53.57	---	74.00	20.43	H	10.5
17620.900000	54.50	---	74.00	19.50	H	13.1
17620.900000	---	45.26	54.00	8.74	H	13.1

802.11n-HT40 Mode :

Low Channel: 2422MHz

Common Information

Project No.: RKSA240328001
 Test Mode: 2.4G Wi-Fi 802.11n40 mode of low channel
 Standard: FCC Part 15.247 & FCC Part 15.205 & FCC Part 15.209
 Test Engineer: Hugh Wu

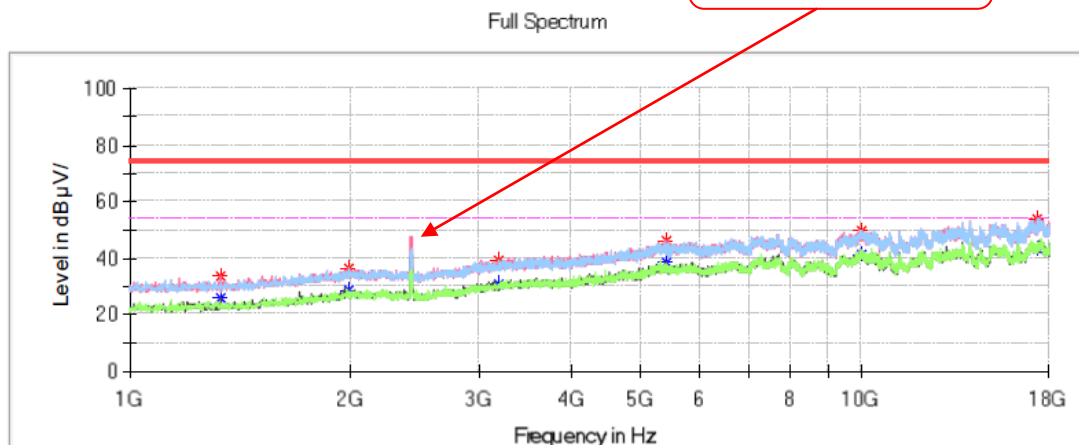
**Critical_Freqs**

Frequency (MHz)	MaxPeak (dB μ V/m)	Average (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Pol	Corr. (dB/m)
1326.400000	33.50	---	74.00	40.50	V	-14.5
1326.400000	---	22.89	54.00	31.11	V	-14.5
1960.500000	37.28	---	74.00	36.72	V	-10.8
1960.500000	---	28.65	54.00	25.35	V	-10.8
4826.700000	49.62	---	74.00	24.38	V	-2.1
4826.700000	---	40.55	54.00	13.45	V	-2.1
10037.200000	---	42.29	54.00	11.71	H	7.8
10037.200000	47.81	---	74.00	26.19	H	7.8
14001.600000	54.29	---	74.00	19.71	H	10.5
14001.600000	---	46.32	54.00	7.68	H	10.5
17755.200000	---	42.65	54.00	11.35	H	12.6
17755.200000	52.24	---	74.00	21.76	H	12.6

Middle Channel: 2437MHz**Common Information**

Project No.: RKSA240328001
 Test Mode: 2.4G Wi-Fi 802.11n40 mode of middle channel
 Standard: FCC Part 15.247 & FCC Part 15.205 & FCC Part 15.209
 Test Engineer: Hugh Wu

Fundamental Test
with notch filter

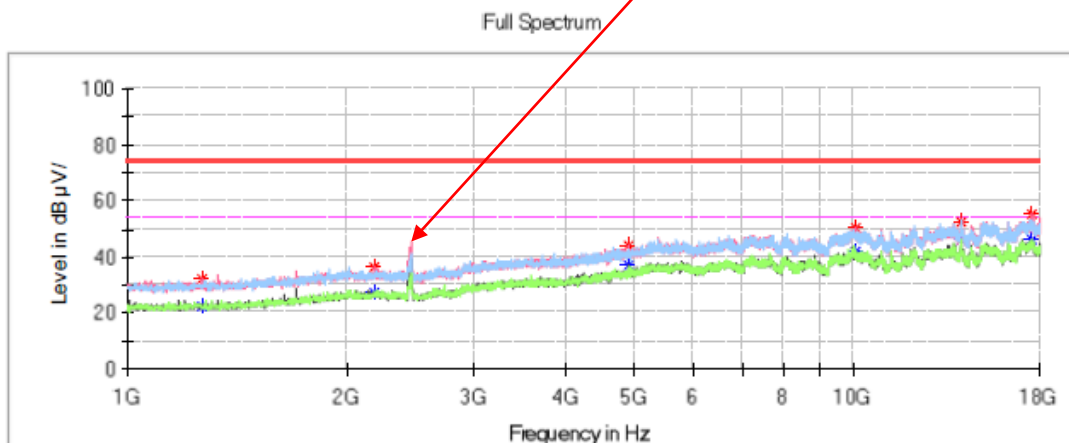
**Critical_Freqs**

Frequency (MHz)	MaxPeak (dB μ V/m)	Average (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Pol	Corr. (dB/m)
1328.100000	33.48	---	74.00	40.52	V	-14.5
1328.100000	---	25.89	54.00	28.11	V	-14.5
1992.800000	---	28.78	54.00	25.22	H	-10.6
1992.800000	36.52	---	74.00	37.48	H	-10.6
3186.200000	38.94	---	74.00	35.06	H	-7.3
3186.200000	---	30.95	54.00	23.05	H	-7.3
5396.200000	45.84	---	74.00	28.16	V	0.4
5396.200000	---	38.41	54.00	15.59	V	0.4
10001.500000	---	41.47	54.00	12.53	H	7.8
10001.500000	49.41	---	74.00	24.59	H	7.8
17325.100000	---	43.37	54.00	10.63	H	13.2
17325.100000	54.14	---	74.00	19.86	H	13.2

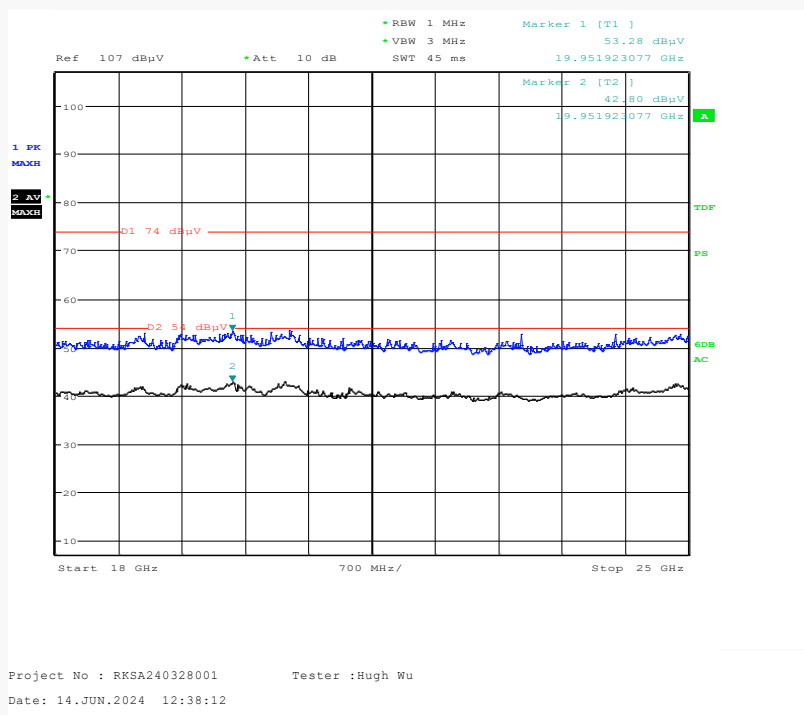
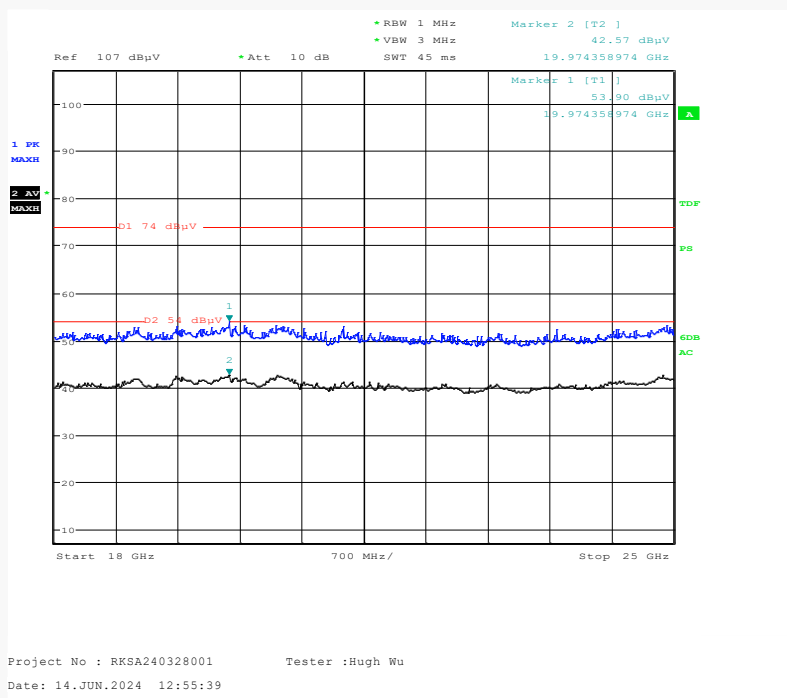
High Channel: 2452MHz**Common Information**

Project No.: RKSA240328001
 Test Mode: 2.4G Wi-Fi 802.11n40 mode of high channel
 Standard: FCC Part 15.247 & FCC Part 15.205 & FCC Part 15.209
 Test Engineer: Hugh Wu

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)
1263.500000	32.20	---	74.00	41.80	V	-14.7
1263.500000	---	22.22	54.00	31.78	V	-14.7
2183.200000	36.41	---	74.00	37.59	V	-10.3
2183.200000	---	27.06	54.00	26.94	V	-10.3
4903.200000	---	36.88	54.00	17.12	V	-1.7
4903.200000	44.00	---	74.00	30.00	V	-1.7
10021.900000	50.59	---	74.00	23.41	V	7.8
10021.900000	---	41.63	54.00	12.37	V	7.8
14001.600000	---	46.25	54.00	7.75	H	10.5
14001.600000	52.73	---	74.00	21.27	H	10.5
17597.100000	---	45.87	54.00	8.13	H	13.2
17597.100000	55.07	---	74.00	18.93	H	13.2

18GHz-25GHz:**Transmitting in 802.11n20 mode middle channel is worst case****Horizontal****Vertical**

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

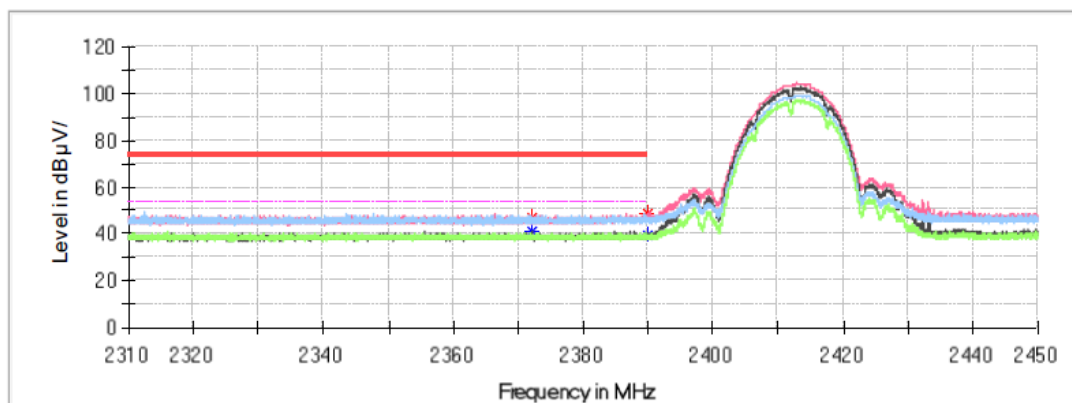
Band Edge:
802.11b Mode:

Low Channel

Common Information

Project No.:	RKSA240328001
Test Mode:	2.4G Wi-Fi 802.11b mode of low channel
Standard:	FCC Part 15.247 & FCC Part 15.205 & FCC Part 15.209
Test Engineer:	Hugh Wu

Full Spectrum



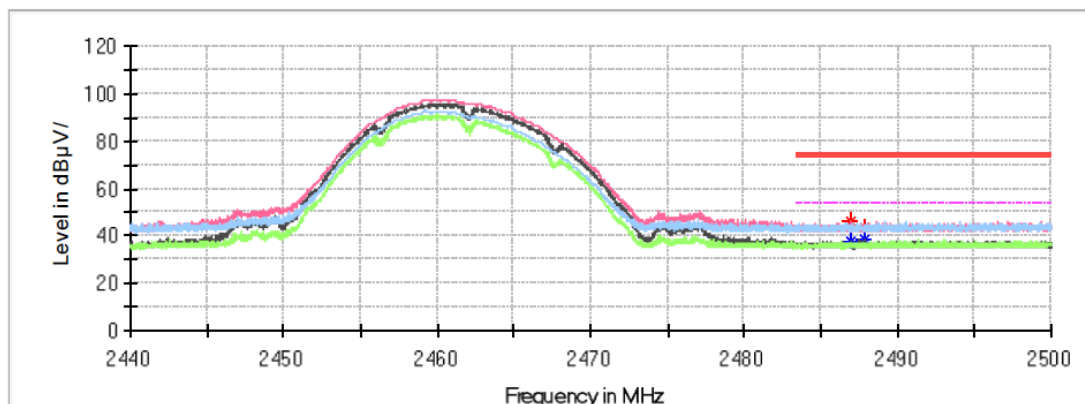
Critical_Freqs

Frequency (MHz)	MaxPeak (dB μ V/m)	Average (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Pol	Corr. (dB/m)
2372.090000	---	41.18	54.00	12.82	V	0.0
2372.090000	46.61	---	74.00	27.39	V	0.0
2389.926000	---	39.32	54.00	14.68	V	0.1
2389.926000	48.92	---	74.00	25.08	V	0.1

High Channel**Common Information**

Project No.: RKSA240328001
Test Mode: 2.4G Wi-Fi 802.11b mode of high channel
Standard: FCC Part 15.247 & FCC Part 15.205 & FCC Part 15.209
Test Engineer: Hugh Wu

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)
2486.890000	46.03	---	74.00	27.97	V	0.2
2486.890000	---	37.89	54.00	16.11	V	0.2
2487.904000	43.61	---	74.00	30.39	V	0.2
2487.904000	---	38.58	54.00	15.42	V	0.2

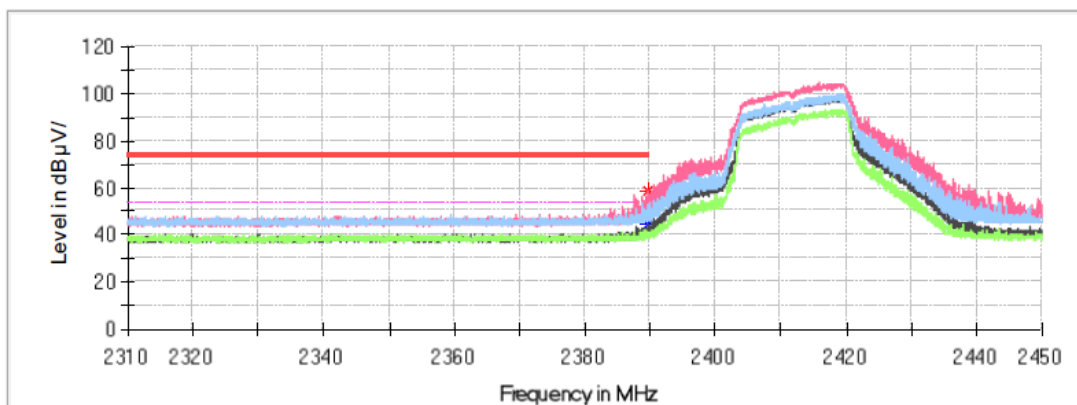
802.11g Mode :

Low Channel

Common Information

Project No.: RKSA240328001
Test Mode: 2.4G Wi-Fi 802.11g mode of low channel
Standard: FCC Part 15.247 & FCC Part 15.205 & FCC Part 15.209
Test Engineer: Hugh Wu

Full Spectrum



Critical_Freqs

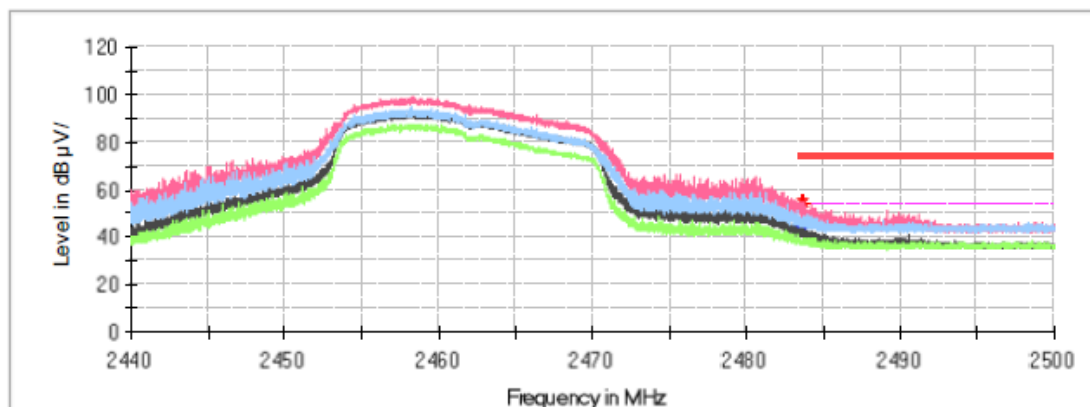
Frequency (MHz)	MaxPeak (dB µ V/m)	Average (dB µ V/m)	Limit (dB µ V/m)	Margin (dB)	Pol	Corr. (dB/m)
2389.772000	---	44.75	54.00	9.25	V	0.1
2389.772000	58.69	---	74.00	15.31	V	0.1

High Channel

Common Information

Project No.: RKSA240328001
Test Mode: 2.4G Wi-Fi 802.11g mode of high channel
Standard: FCC Part 15.247 & FCC Part 15.205 & FCC Part 15.209
Test Engineer: Hugh Wu

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)
2483.614000	---	44.14	54.00	9.86	V	0.2
2483.614000	54.18	---	74.00	19.82	V	0.2
2483.716000	---	43.84	54.00	10.16	V	0.2
2483.716000	54.71	---	74.00	19.29	V	0.2