TEST REPORT

Report Number: 15126863-E2V1

Applicant	:	Sonos Inc. 301 Coromar Dr. Goleta, CA 93117 USA
Model	:	S55
Brand		Sonos
FCC ID	:	SBVRM055
IC	:	5373A-RM055
EUT Description	:	Wireless Smart Speaker
Test Standard(s)	:	FCC 47 CFR PART 15 SUBPART C ISED RSS-247 ISSUE 3 ISED RSS-GEN ISSUE 5 + A1 + A2

Date Of Issue:
2024-05-30

Prepared by:
UL VERIFICATION SERVICES
47173 Benicia Street
Fremont, CA 94538 U.S.A.
TEL: (510) 319-4000
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ACCREDITED
CERT #0751.05

REPORT REVISION HISTORY

Rev.	Issue Date	Revisions	Revised By
V1	2024-05-30	Initial Issue	---

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: Sonos Inc.
301 Coromar Dr.
Goleta, CA 93117 USA

EUT DESCRIPTION: Wireless Smart Speaker

MODEL: S55

BRAND: Sonos

SERIAL NUMBER: Radiated: 000E58BF9FD11
Conducted: 000E58661EF23

SAMPLE RECEIPT DATE: 2024-04-01

DATE TESTED: 2024-04-01 to 2024-05-13

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
FCC 47 CFR Part 15 Subpart C	Complies
ISED RSS-247 Issue 3	Complies
ISED RSS-GEN Issue 5 + A1 + A2	Complies

UL Verification Services Inc. tested the above equipment in accordance with the requirements set forth in the above standards. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical components. All samples tested were in good operating condition throughout the entire test program. Measurement Uncertainties are published for informational purposes only and were not taken into account unless noted otherwise.

This document may not be altered or revised in any way unless done so by UL Verification Services Inc. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Verification Services Inc. will constitute fraud and shall nullify the document.

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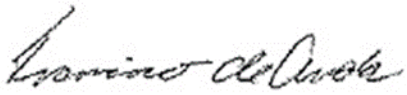
Approved & Released For
UL Verification Services Inc. By:



Francisco de Anda
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Prepared By:

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2. TEST RESULTS SUMMARY

This report contains data provided by the customer which can impact the validity of results. UL Verification Services Inc. is only responsible for correctly integrating customer-provided data with measurements performed by UL Verification Services Inc.

Below is a list of the data provided by the customer:
1) Antenna gain and type (see section 6.3)

FCC Clause	ISED Clause	Requirement	Result	Comment
See Comment		Duty Cycle	Reporting purposes only	ANSI C63.10 Section 11.6.
-	RSS-GEN 6.7	99% OBW	Reporting purposes only	ANSI C63.10 Section 6.9.3.
15.247 (a) (2)	RSS-247 5.2 (a)	6dB BW	Compliant	None.
15.247 (b) (3)	RSS-247 5.4 (d)	Output Power	Compliant	None.
See Comment		Average power	Reporting purposes only	Per ANSI C63.10, Section 11.9.2.3.2.
15.247 (e)	RSS-247 5.2 (b)	PSD	Compliant	None.
15.247 (d)	RSS-247 5.5	Conducted Spurious Emissions	Compliant	None.
15.209, 15.205	RSS-GEN 8.9, 8.10	Radiated Emissions	Compliant	None.
15.207	RSS-Gen 8.8	AC Mains Conducted Emissions	Compliant	None.

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3. TEST METHODOLOGY

The tests documented in this report were performed in accordance with FCC 47 CFR Part 2, FCC 47 CFR Part 15, ANSI C63.10-2013, KDB 558074 D01 15.247 Meas Guidance v05r02, KDB 414788 D01 Radiated Test Site v01r01, RSS-GEN Issue 5 + A1 + A2, and RSS-247 Issue 3.

4. FACILITIES AND ACCREDITATION

UL Verification Services Inc. is accredited by A2LA, Certificate Number 0751.05, for all testing performed within the scope of this report. Testing was performed at the locations noted below.

	Address	ISED CABID	ISED Company Number	FCC Registration
☒	Building 1: 47173 Benicia Street, Fremont, CA 94538, USA	US0104	2324A	550739
☐	Building 2: 47266 Benicia Street, Fremont, CA 94538, USA			
☐	Building 3: 843 Auburn Court, Fremont, CA 94538, USA			
☒	Building 4: 47658 Kato Rd, Fremont, CA 94538, USA			
☐	Building 5: 47670 Kato Rd, Fremont, CA 94538, USA			

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5. DECISION RULES AND MEASUREMENT UNCERTAINTY

5.1. METROLOGICAL TRACEABILITY

All test and measuring equipment utilized to perform the tests documented in this report are calibrated on a regular basis, with a maximum time between calibrations of one year or the manufacturers' recommendation, whichever is less, and where applicable is traceable to recognized national standards.

5.2. DECISION RULES

The Decision Rule is based on Simple Acceptance in accordance with ISO Guide 98-4:2012 Clause 8.2. (Measurement uncertainty is not taken into account when stating conformity with a specified requirement.)

5.3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

PARAMETER	U_{Lab}
Radio Frequency (Spectrum Analyzer)	141.16 Hz
Occupied Bandwidth	1.22%
Power Spectral Density	2.47 dB
RF Power Measurement Direct Method Using Power Meter	1.3 dB (PK) / 0.45 dB (AV)
Unwanted Emissions, Conducted	1.94 dB
Worst Case Conducted Disturbance, 9KHz to 0.15 MHz	3.78 dB
Worst Case Conducted Disturbance, 0.15 to 30 MHz	3.40 dB
Worst Case Radiated Disturbance, 9KHz to 30 MHz	2.87 dB
Worst Case Radiated Disturbance, 30 to 1000 MHz	6.01 dB
Worst Case Radiated Disturbance, 1000 to 18000 MHz	4.73 dB
Worst Case Radiated Disturbance, 18000 to 26000 MHz	4.51 dB
Worst Case Radiated Disturbance, 26000 to 40000 MHz	5.29 dB
Time Domain Measurements	3.39%
Temperature	0.57˚C
Relative Humidity	3.39%
DC Supply Voltages	0.57%

Uncertainty figures are valid to a confidence level of 95%.

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5.4. SAMPLE CALCULATION

RADIATED EMISSIONS

Where relevant, the following sample calculation is provided:
Field Strength (dBuV/m) = Measured Voltage (dBuV) + Antenna Factor (dB/m) + Cable Loss (dB) – Preamp Gain (dB)
36.5 dBuV + 18.7 dB/m + 0.6 dB – 26.9 dB = 28.9 dBuV/m

MAINS CONDUCTED EMISSIONS

Where relevant, the following sample calculation is provided:
Final Voltage (dBuV) = Measured Voltage (dBuV) + Cable Loss (dB) + Limiter Factor (dB) + LISN Insertion Loss.
36.5 dBuV + 0 dB +10.1 dB+ 0 dB = 46.6 dBuV

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6. EQUIPMENT UNDER TEST

6.1. EUT DESCRIPTION

The EUT is a Wireless Smart Speaker

This report covers non-ax 2.4GHz Wifi radio.

6.2. MAXIMUM OUTPUT POWER

The transmitter has a maximum peak conducted output power as follows:

2.4GHz BAND

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
2Tx			
2412 - 2462	802.11b	26.92	492.04
2412 - 2462	802.11g	27.08	510.50
2412 - 2462	802.11n HT20 CDD	26.43	439.54

6.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes 4 antennas for diversity, chain 0 connects ANT 1 and ANT2, chain 1 connects to ANT3 and ANT 4. The manufacturer has declared that antenna 1 and antenna 3 are worst-case combinations and result in worst-case antenna gains

The antenna(s) gain and type, as provided by the manufacturer' are as follows:

Mode	Type	Declared Uncorrelated Gain (dBi)	Declared correlated Gain (dBi)
2412-2462	PCB	5.2	8

6.4. SOFTWARE AND FIRMWARE

The EUT firmware installed during testing was 78.1-48130-diag-jaws-dev-woosung-202312211600.

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6.5. WORST-CASE CONFIGURATION AND MODE

Radiated emissions below 1GHz, above 18GHz, and power line conducted emission were performed with the EUT set to transmit at the channel with highest output power as worst-case scenario.

Band edge and radiated emissions between 1GHz and 18GHz were performed with the EUT set to transmit at the highest power on low, middle and high channels.

The fundamental of the EUT was investigated in three orthogonal orientations X,Y, & Z. It was determined that X orientation was worst-case orientation; therefore, all final radiated testing was performed with the EUT in X orientation.

Worst-case data rates as provided by the client were:

802.11b mode: 1 Mbps
802.11g mode: 6 Mbps
802.11n HT20mode: MCS0

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6.6. DESCRIPTION OF TEST SETUP

SUPPORT TEST EQUIPMENT				
Description	**Manufacturer**	**Model**	**Serial Number**	**FCC ID/ DoC**
Laptop	Lenovo	X1 Carbon	R90HKAXZ	Doc
Laptop AC/DC AC/DC Adapter	Lenovo	ADLX90NLC2A	11S45N0247Z1ZS9B54B8EJ	Doc
USB-A to Ethernet Adapter	Plugable	USB2-E100	8CAE4CEBE0D9	Doc

I/O CABLES (CONDUCTED TEST)						
Cable No.	**Port**	**# of Identical Ports**	**Connector Type**	**Cable Type**	**Cable Length (m)**	**Remarks**
1	AC	3	AC	Un-shielded	1.25	AC Mains to Spectrum Analyzer/AC/DC Adapter
2	DC	1	DC	Un-shielded	1	AC/DC Adapter to Laptop
3	USB-A to Ethernet Adapter	1	USB-A	Shielded	0.5	Laptop to EUT
4	Ethernet	1	RJ45	Un-shielded	1	Laptop to USB Ethernet Adapter
5	SMA Cable	1	SMA	Un-Shielded	1.0	EUT to Spectrum Analyzer

I/O CABLES (RADIATED TEST)						
Cable No.	**Port**	**# Of Identical Ports**	**Connector Type**	**Cable Type**	**Cable Length (m)**	**Remarks**
1	AC	3	AC	Un-shielded	1.25	AC Mains to Spectrum Analyzer/AC/DC Adapter
2	DC	1	DC	Un-shielded	1	AC/DC Adapter to Laptop
3	USB-A to Ethernet Adapter	1	USB-A	Shielded	0.5	Laptop to EUT
4	Ethernet	1	RJ45	Un-shielded	1	Laptop to USB Ethernet Adapter
5	SMA Cable	1	SMA	Un-Shielded	10	EUT to Horn Antenna

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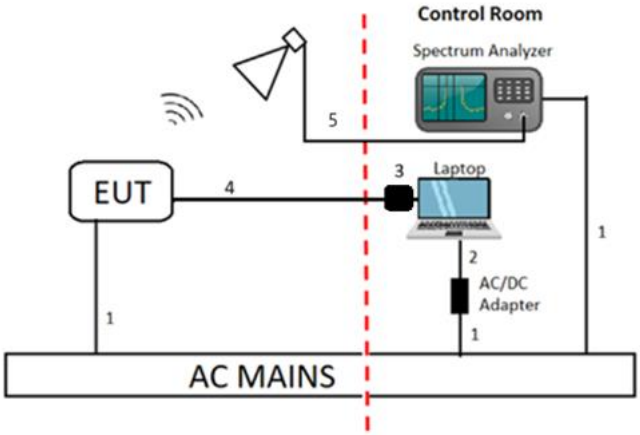
TEST SETUP

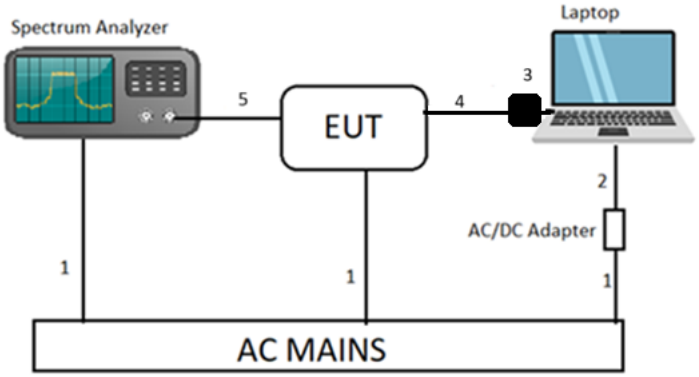
The EUT is a stand-alone unit, and the radio is exercised remotely by Sonos Compliance GUI test utility software via ethernet.

SETUP DIAGRAM

Radiated Configuration



Conducted/AC Line Configuration



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7. MEASUREMENT METHOD

On Time and Duty Cycle: ANSI C63.10 Section 11.6.

Occupied BW (99%): ANSI C63.10-2013 Section 6.9.3

6 dB BW: ANSI C63.10 Subclause -11.8.1 RBW ≥ DTS BW

Output Power: ANSI C63.10 Subclause -11.9.1.3 Method PKPM1 Peak-reading power meter

Output Power: ANSI C63.10 Subclause -11.9.2.3.2 Method AVGPM-G (Measurement using a gated RF average-reading power meter)

PSD: ANSI C63.10 Subclause -11.10.2 Method PKPSD (peak PSD)

Radiated emissions non-restricted frequency bands: ANSI C63.10 Subclause -11.11

Radiated emissions restricted frequency bands: ANSI C63.10 Subclause -11.12.1

Conducted emissions in restricted frequency bands: ANSI C63.10 Subclause -11.12.2

Band-edge: ANSI C63.10 Subclause -11.13.3.2 Integration method -Peak detection
Band-edge: ANSI C63.10 Subclause -11.13.3.4 Integration method -Trace averaging across ON and OFF times DC correction

AC Power Line Conducted Emissions: ANSI C63.10-2013, Section 6.2.

Radiated Spurious Emissions Below 30MHz: ANSI C63.10-2013 Section 6.4

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8. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

TEST EQUIPMENT LIST					
Description	**Manufacturer**	**Model**	**ID Num**	**Cal Due**	**Last Cal**
Antenna, Broadband Hybrid, 30MHz to 2GHz	Sunol Sciences Corp.	JB1	80293	2025-04-30	2023-04-11
Amplifier, 9KHz to 1GHz, 32dB	SONOMA INSTRUMENT	310	213877	2025-03-31	2024-03-25
Antenna, Horn 1-18GHz	ETS-Lindgren (Cedar Park, Texas)	3117	206805	2024-07-31	2023-07-11
RF Filter Box, 1-18GHz	FREMONT	6 Port Silver box	171013	2025-12-02	2024-02-02
RF Filter Box, 1-18GHz	FREMONT	n/a	171875	2025-03-31	2024-03-23
EMI TEST RECEIVER	Rohde & Schwarz	ESW44	191429	2025-02-28	2024-02-11
EMI TEST RECEIVER	Rohde & Schwarz	ESW44	230547	2025-02-28	2024-02-11
EMI TEST RECEIVER	Rohde & Schwarz	ESW44	225688	2025-02-11	2024-02-11
Antenna, Horn 18 to 26.5GHz	ARA	MWH-1826/B	199659	2024-12-31	2022-12-06
Amplifier 18-26.5GHz, +5Vdc, 60dB min	AMPLICAL	AMP18G26.5-60	234683	2025-05-31	2024-05-13
Antenna, Passive Loop 30Hz - 1MHz	ELECTRO METRICS	EM-6871	219908	2024-09-30	2023-09-13
Antenna, Passive Loop 100KHz - 30MHz	ELECTRO METRICS	EM-6872	219910	2024-05-31	2023-05-31
Spectrum Analyzer, PXA, 2Hz to 26.5GHz	Keysight Technologies Inc	N9030B	245121	2025-02-07	2024-02-07
Power Meter, P-series single channel	Keysight Technologies Inc	N1911A	90718	2025-01-31	2024-01-25
Power Sensor, P - series, 50MHz to 18GHz, Wideband	Keysight Technologies Inc	N1921A	90388	2024-06-30	2023-06-23
AC Line Conducted					
LISN	Fischer Custom Communications, Inc`	FCC-LISN-50/250-25-2-01-480V	175765	2025-01-31	2024-01-26
EMI TEST RECEIVER	Rohde & Schwarz	ESR	171646	2025-02-28	2024-02-27
Transient Limiter	TE	TBFL1	127455	2025-02-28	2024-02-27
UL TEST SOFTWARE LIST					
Radiated Software	UL	UL EMC	Ver 2023-01-18, , 2023-05-01		
Antenna Port Software	UL	UL RF	Rev 9.5, 2023-01-18		
AC Line Conducted Software	UL	UL EMC	Rev 9.5, 2023-03-03		

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9. ANTENNA PORT TEST RESULTS

9.1. ON TIME AND DUTY CYCLE

LIMITS

None; for reporting purposes only.

PROCEDURE

KDB 558074 Zero-Span Spectrum Analyzer Method.

ON TIME AND DUTY CYCLE RESULTS

Mode	ON Time B (msec)	Period (msec)	Duty Cycle x (linear)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)	1/B Minimum VBW (kHz)
2.4GHz Band						
802.11b	8.383	9.006	0.931	93.08	0.31	0.119
802.11g	2.755	3.420	0.806	80.56	0.94	0.363
802.11n HT20	5.082	5.829	0.872	87.18	0.60	0.197

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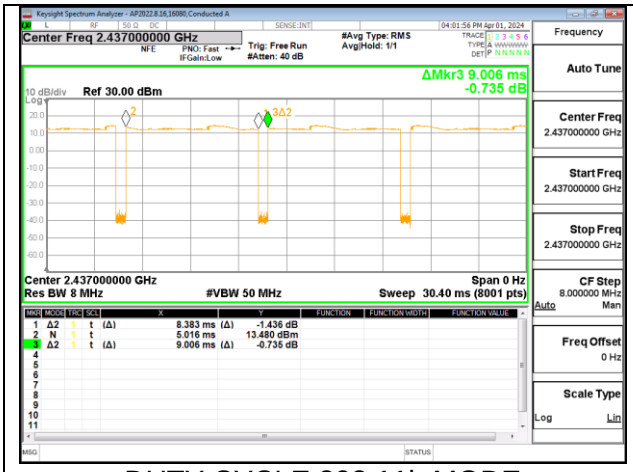
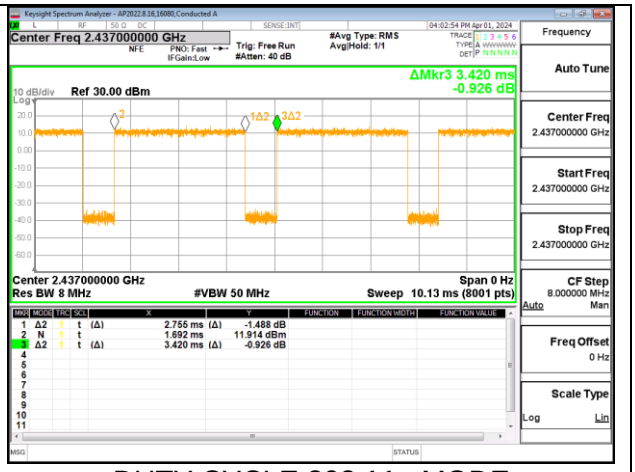
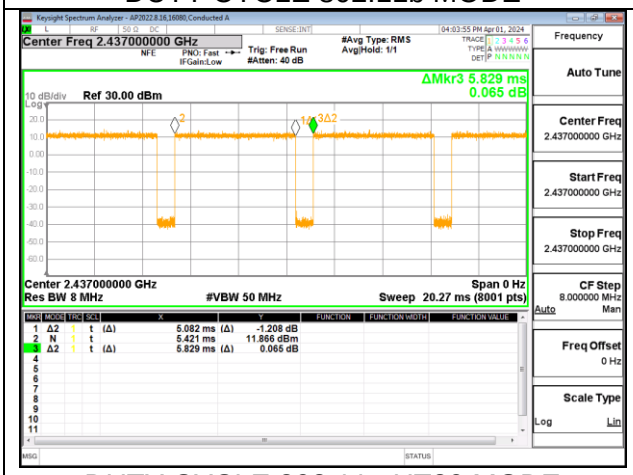
DUTY CYCLE PLOTS



DUTY CYCLE 802.11b MODE



DUTY CYCLE 802.11g MODE



DUTY CYCLE 802.11n HT20 MODE

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9.2. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

RESULTS

9.2.1. 802.11b MODE

2TX Antenna 1 + Antenna 3 CDD MODE

Channel	Frequency (MHz)	99% Bandwidth Antenna 1 (MHz)	99% Bandwidth Antenna 3 (MHz)
Low 1	2412	12.698	12.376
Low 2	2417	12.976	12.958
Mid 6	2437	14.863	15.106
High 11	2462	13.216	12.886

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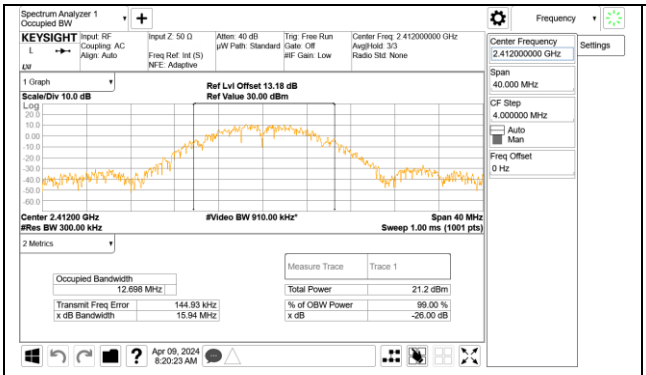
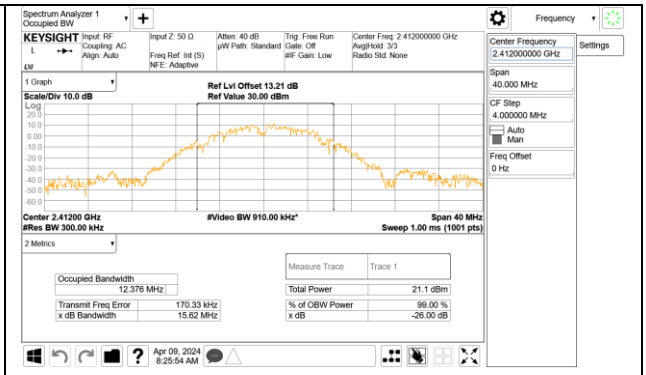
LOW CHANNEL 1

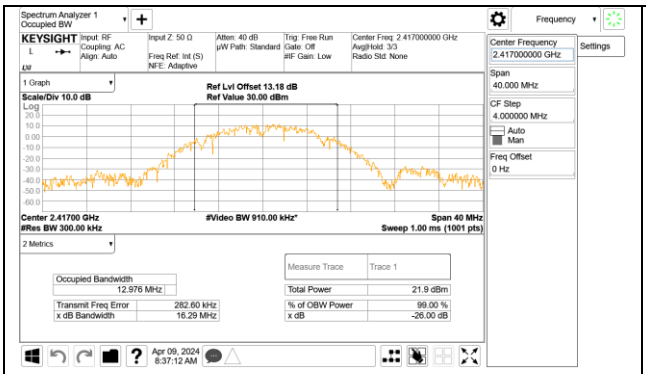


LOW CHANNEL 1 ANTENNA 1

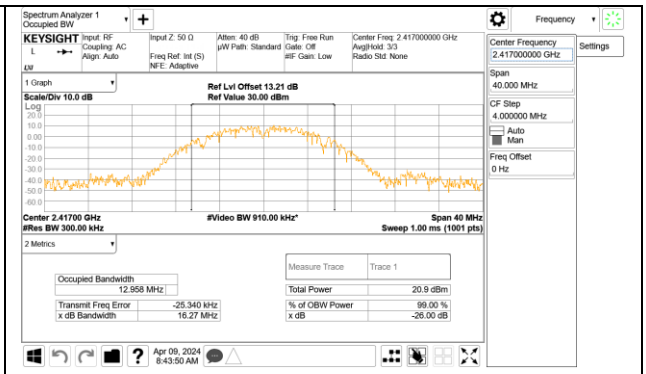


LOW CHANNEL 1 ANTENNA 3

LOW CHANNEL 2

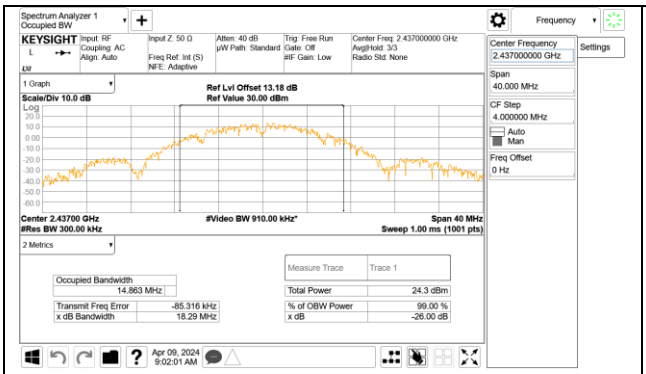


LOW CHANNEL 2 ANTENNA 1

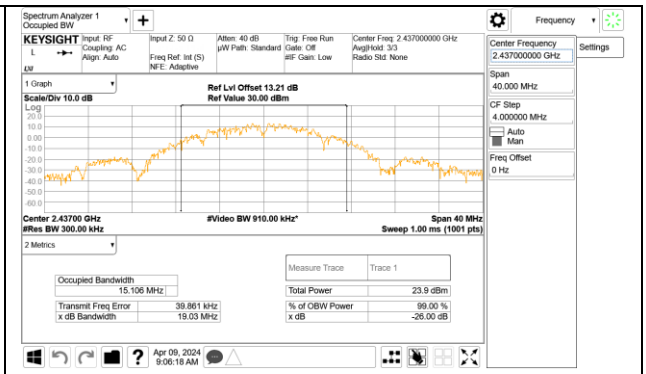


LOW CHANNEL 2 ANTENNA 3

MID CHANNEL 6



MID CHANNEL 6 Antenna 1



MID CHANNEL 6 Antenna 3

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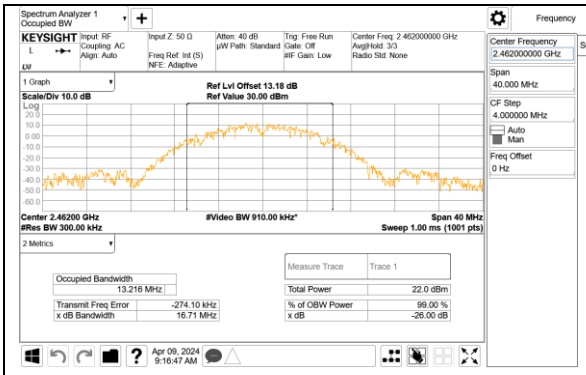
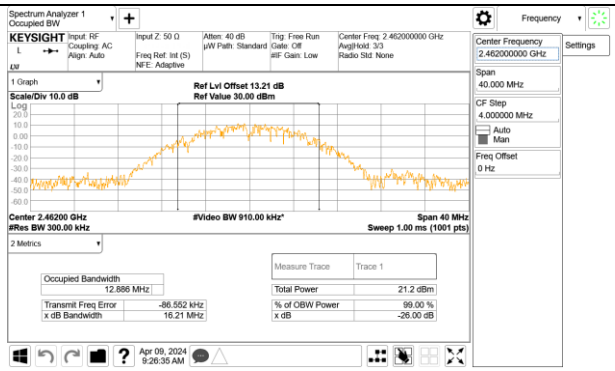
HIGH CHANNEL 11



HIGH CHANNEL 11 Antenna 1



HIGH CHANNEL 11 Antenna 3

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9.2.2. 802.11g MODE

2TX Antenna 1 + Antenna 3 CDD MODE

Channel	Frequency (MHz)	99% Bandwidth Antenna 1 (MHz)	99% Bandwidth Antenna 3 (MHz)
Low 1	2412	16.713	16.650
Mid 6	2437	16.474	16.593
High 11	2462	16.847	16.608

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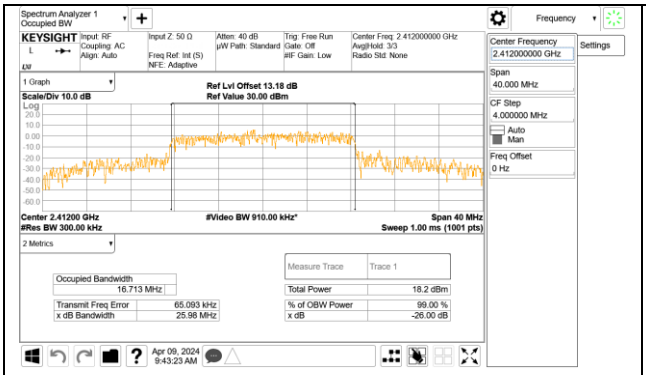
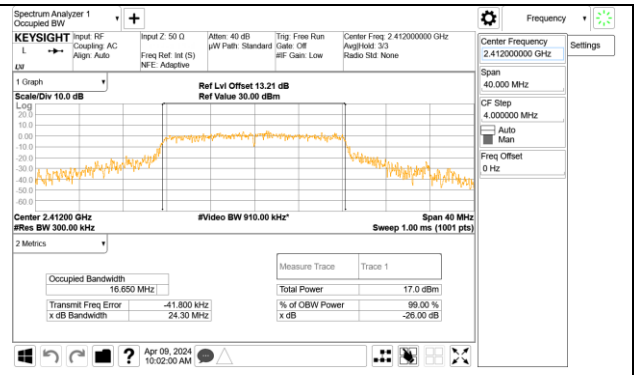
LOW CHANNEL 1

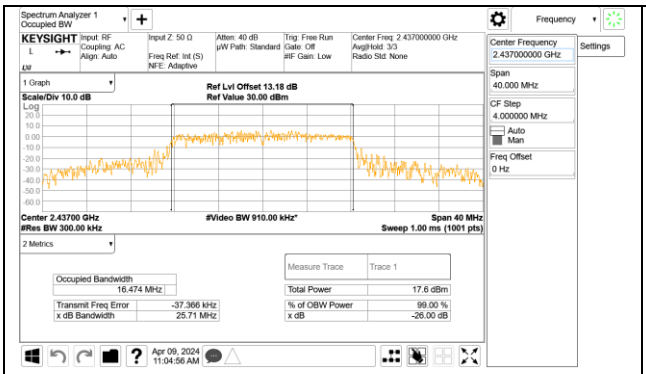


LOW CHANNEL 1 Antenna 1

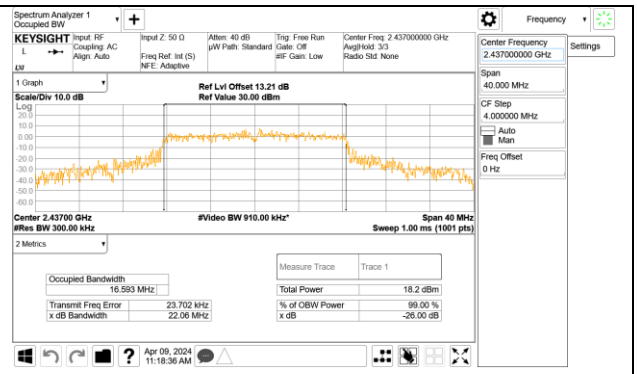


LOW CHANNEL 1 Antenna 3

MID CHANNEL 6

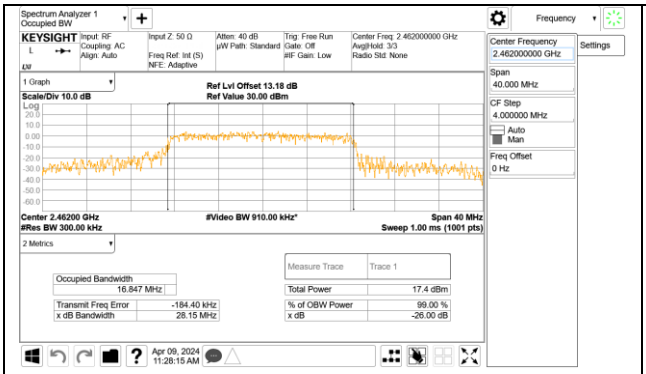


MID CHANNEL 6 Antenna 1

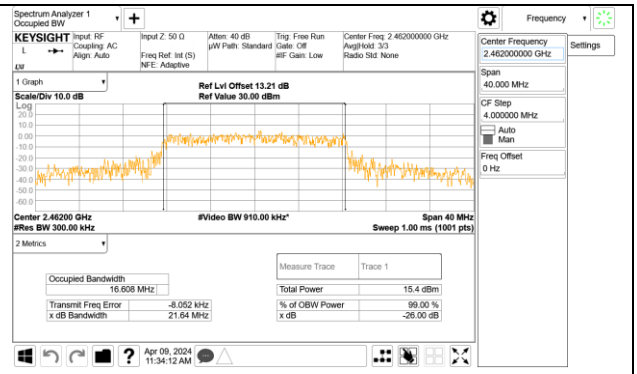


MID CHANNEL 6 Antenna 3

HIGH CHANNEL 11



HIGH CHANNEL 11 Antenna 1



HIGH CHANNEL 11 Antenna 3

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9.2.3. 802.11n HT20 MODE

2TX Antenna 1 + Antenna 3 CDD MODE

Channel	Frequency (MHz)	99% Bandwidth Antenna 1 (MHz)	99% Bandwidth Antenna 3 (MHz)
Low 1	2412	17.807	17.690
Low 2	2417	17.834	17.823
Mid 6	2437	17.810	17.735
High 11	2462	17.882	17.717

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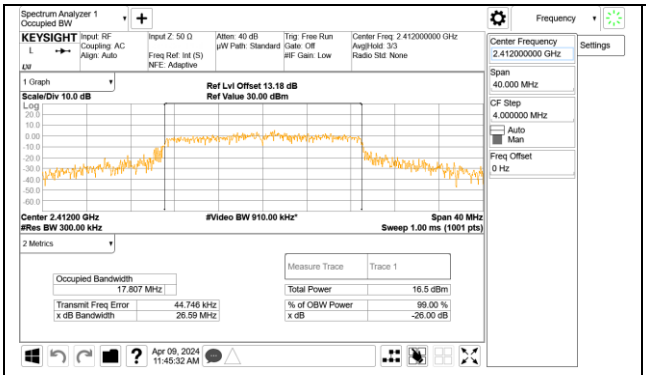
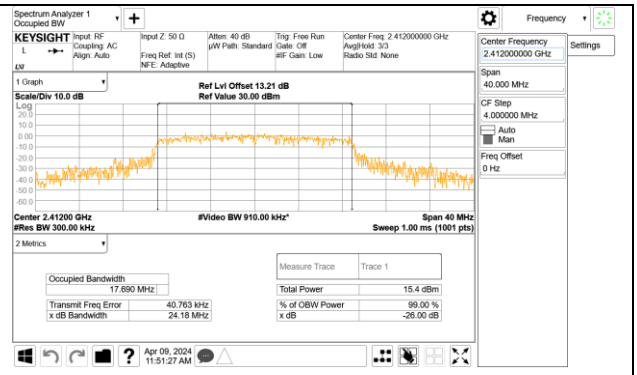
LOW CHANNEL 1

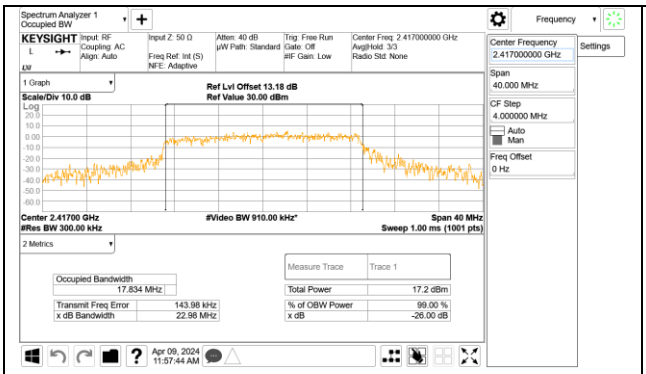


LOW CHANNEL 1 Antenna 1

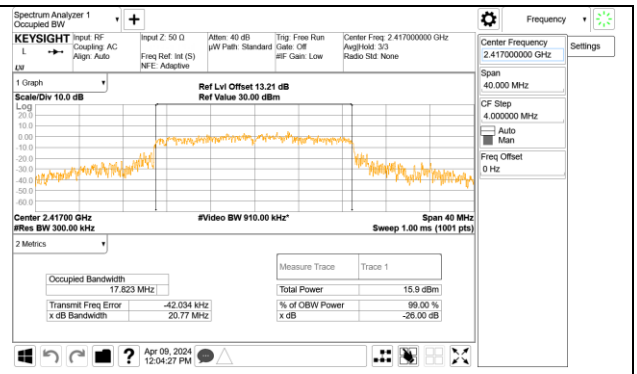


LOW CHANNEL 1 Antenna 3

LOW CHANNEL 2

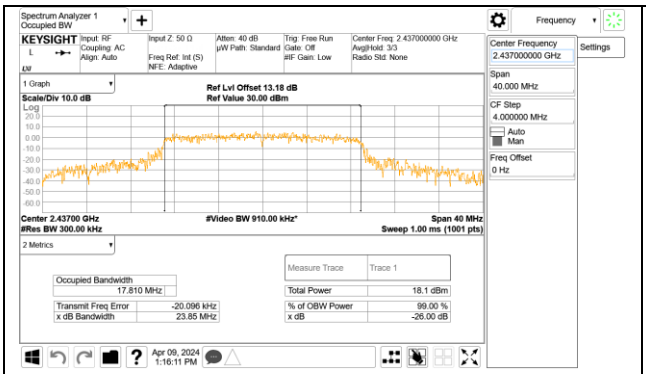


LOW CHANNEL 2 Antenna 1

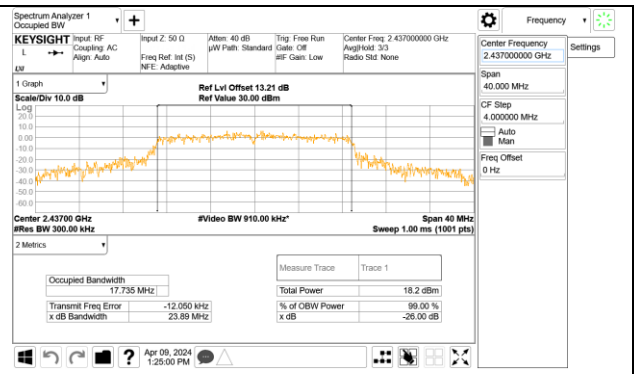


LOW CHANNEL 2 Antenna 3

MID CHANNEL 6



MID CHANNEL 6 Antenna 1



MID CHANNEL 6 Antenna 3

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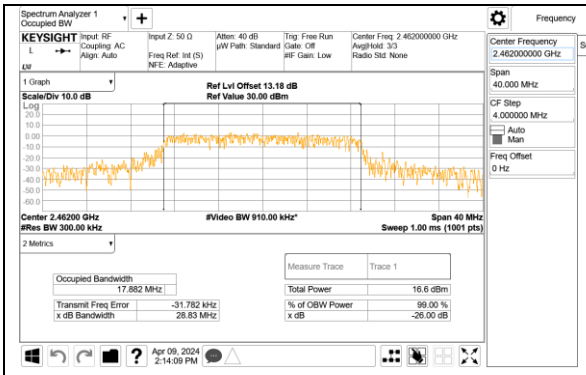
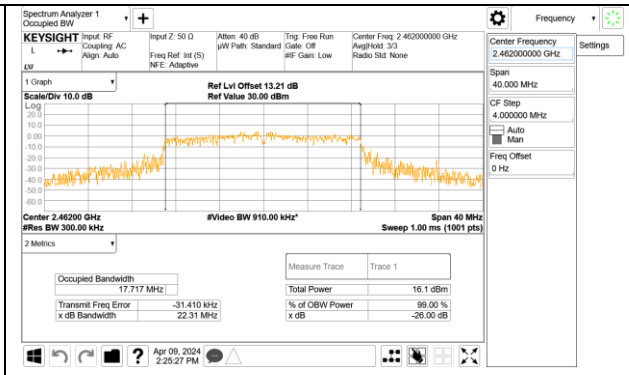
HIGH CHANNEL 11



HIGH CHANNEL 11 Antenna 1



HIGH CHANNEL 11 Antenna 3

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9.3. 6 dB BANDWIDTH

LIMITS

FCC §15.247 (a) (2)

RSS-247 5.2 (a)

The minimum 6 dB bandwidth shall be at least 500 kHz.

RESULTS

UL VERIFICATION SERVICES
47173 Benicia Street, Fremont, CA 94538; USA TEL:(510) 319-4000 FAX:(510) 661-0888

9.3.1. 802.11b MODE

2TX Antenna 1 + Antenna 3 CDD MODE

Channel	Frequency (MHz)	6 dB BW Antenna 1 (MHz)	6 dB BW Antenna 3 (MHz)	Minimum Limit (MHz)
Low 1	2412	7.800	7.680	0.5
Low 2	2417	7.320	7.160	0.5
Mid 6	2437	7.720	7.680	0.5
High 11	2462	8.320	8.600	0.5

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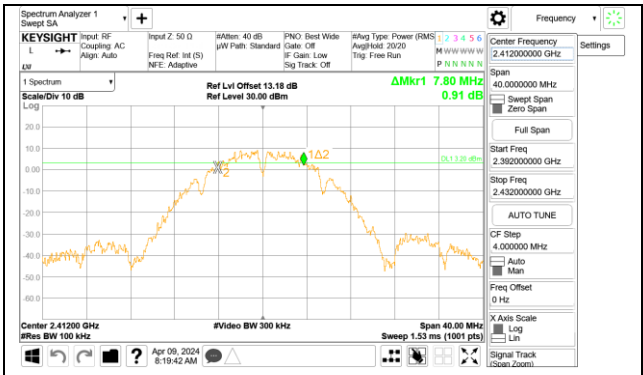
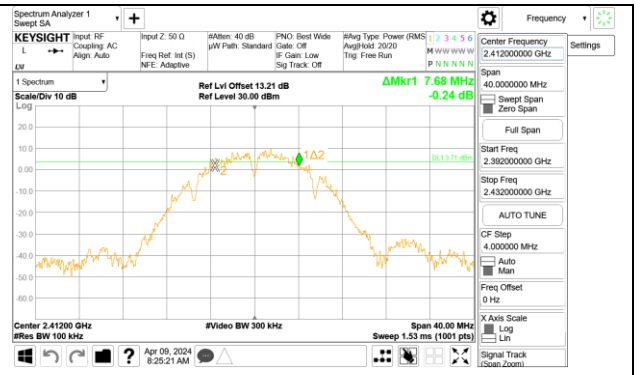
LOW CHANNEL 1

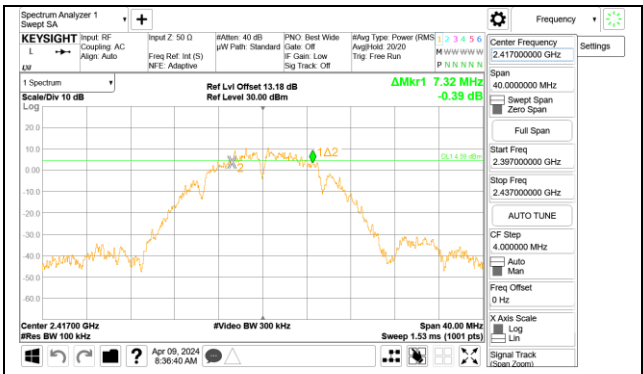


LOW CHANNEL 1 Antenna 1

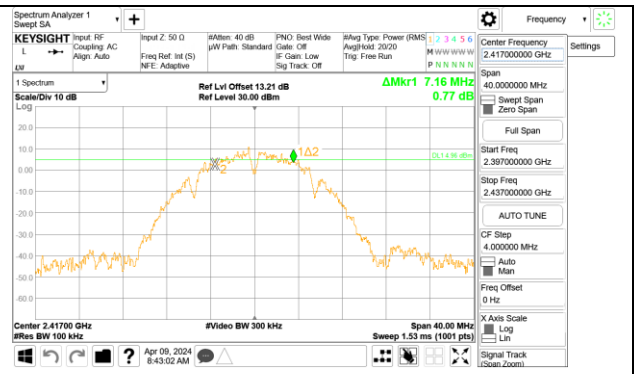


LOW CHANNEL 1 Antenna 3

LOW CHANNEL 2

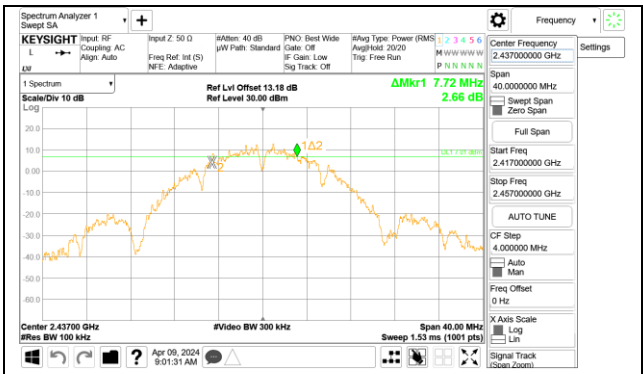


LOW CHANNEL 2 Antenna 1

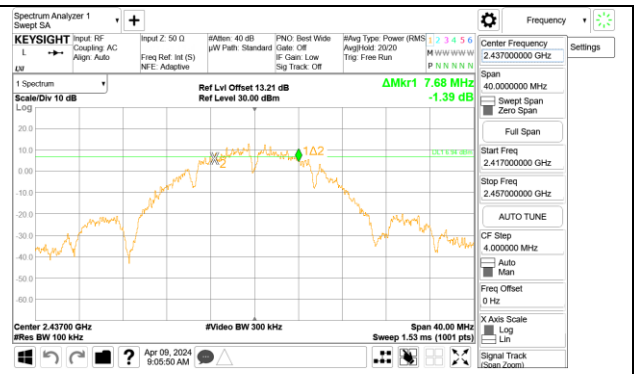


LOW CHANNEL 2 Antenna 3

MID CHANNEL 6



MID CHANNEL 6 Antenna 1



MID CHANNEL 6 Antenna 3

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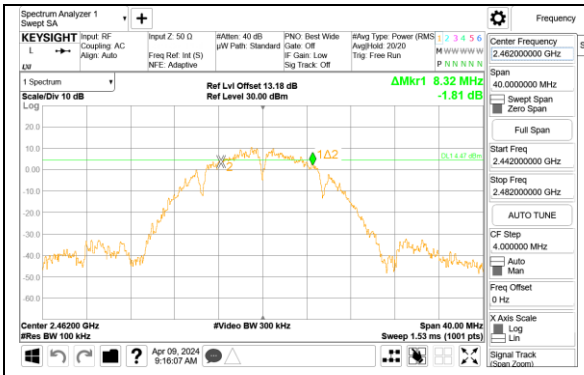
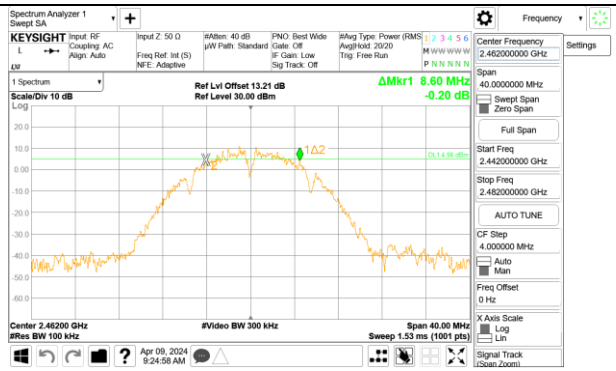
HIGH CHANNEL 11



HIGH CHANNEL 11 Antenna 1



HIGH CHANNEL 11 Antenna 3

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9.3.2. 802.11g MODE

2TX Antenna 1 + Antenna 3 CDD MODE

Frequency (MHz)	6 dB BW Antenna 1 (MHz)	6 dB BW Antenna 3 (MHz)	Minimum Limit (MHz)
2412	16.560	16.480	0.5
2437	16.440	16.480	0.5
2462	16.440	16.520	0.5

UL VERIFICATION SERVICES
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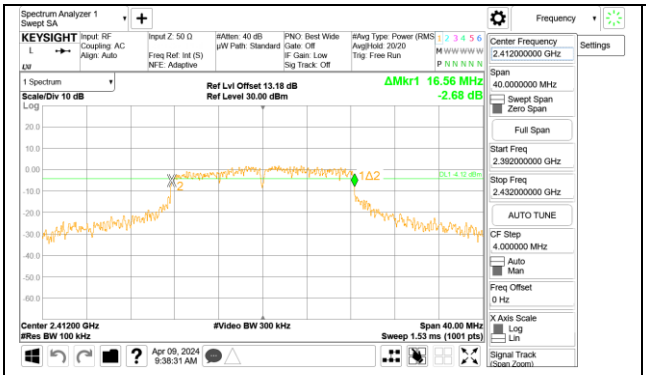
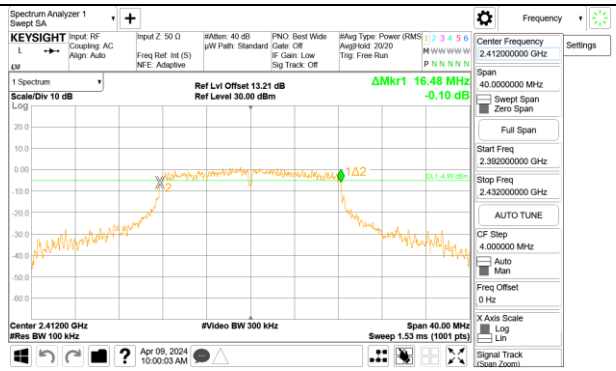
LOW CHANNEL 1

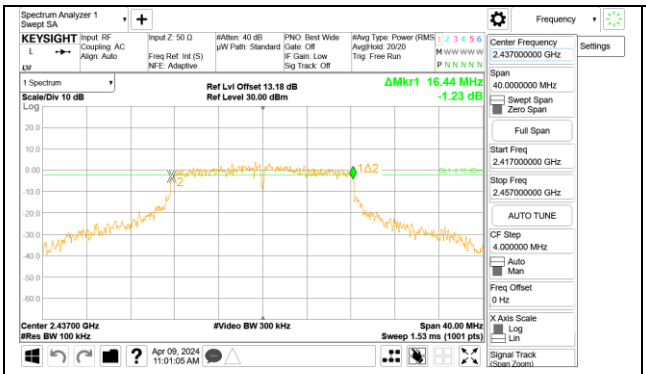


LOW CHANNEL 1 Antenna 1

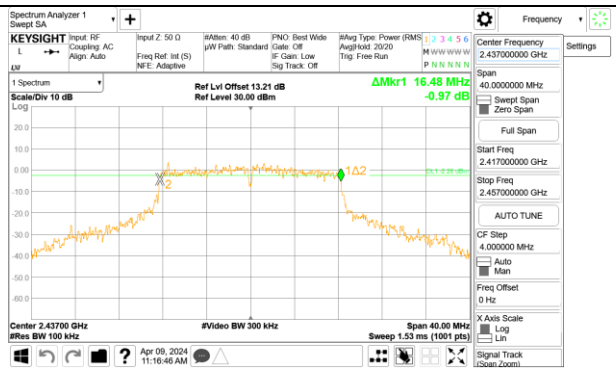


LOW CHANNEL 1 Antenna 3

MID CHANNEL 6

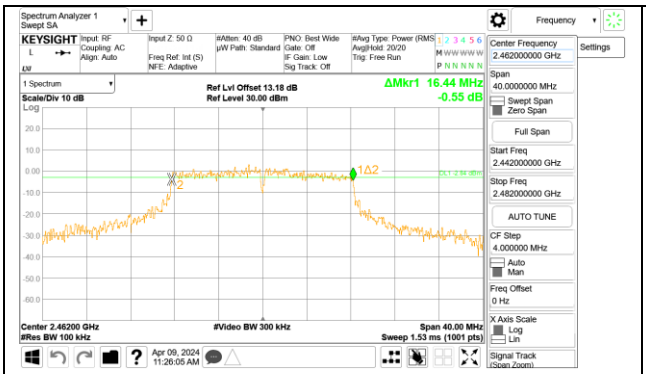


MID CHANNEL 6 Antenna 1

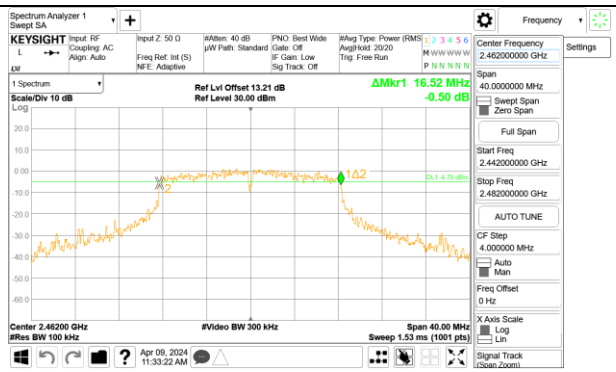


MID CHANNEL 6 Antenna 3

HIGH CHANNEL 11



HIGH CHANNEL 11 Antenna 1



HIGH CHANNEL 11 Antenna 3

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9.3.3. 802.11n HT20 MODE

2TX Antenna 1 + Antenna 3 CDD MODE

Channel	Frequency (MHz)	6 dB BW Antenna 1 (MHz)	6 dB BW Antenna 3 (MHz)	Minimum Limit (MHz)
Low 1	2412	17.480	17.680	0.5
Low 2	2417	17.520	17.720	0.5
Mid 6	2437	17.520	17.680	0.5
High 11	2462	17.800	17.680	0.5

UL VERIFICATION SERVICES
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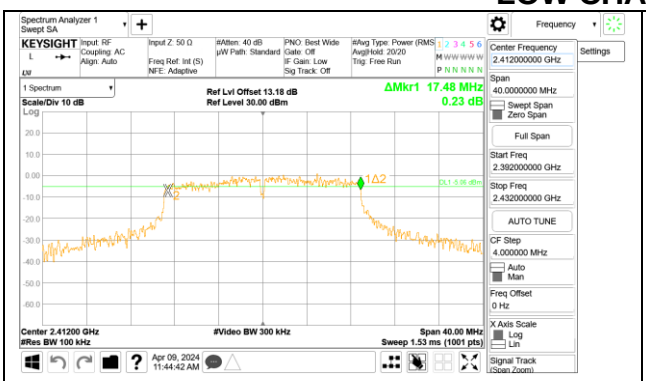
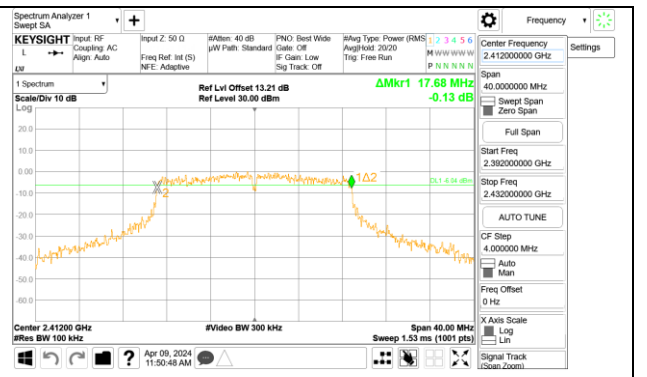
LOW CHANNEL 1

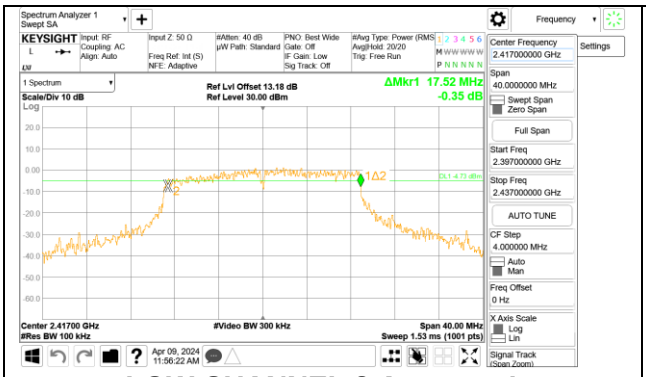


LOW CHANNEL 1 Antenna 1

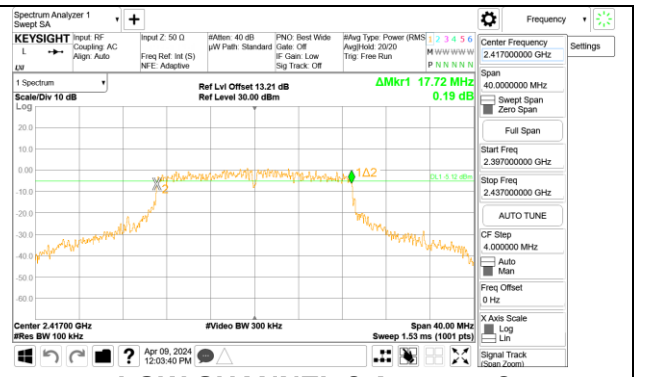


LOW CHANNEL 1 Antenna 3

LOW CHANNEL 2

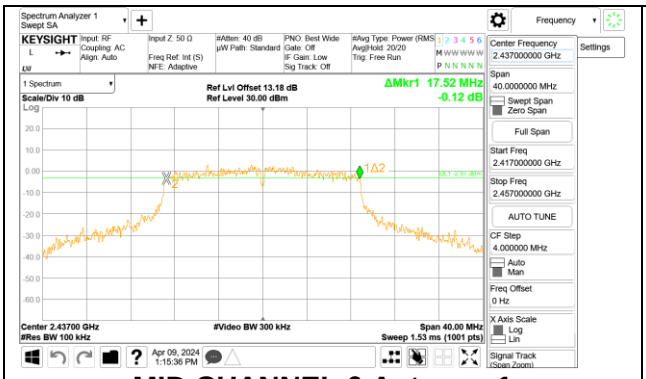


LOW CHANNEL 2 Antenna 1

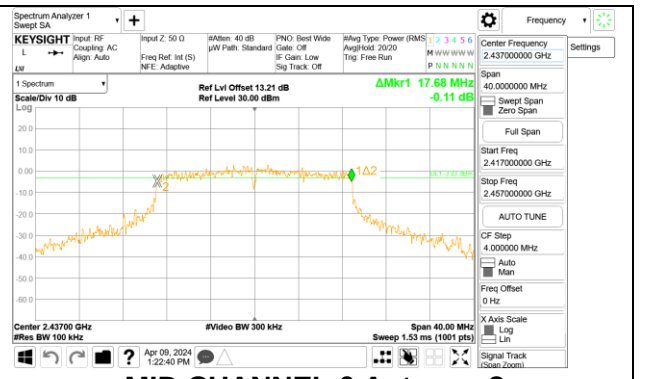


LOW CHANNEL 2 Antenna 3

MID CHANNEL 6



MID CHANNEL 6 Antenna 1



MID CHANNEL 6 Antenna 3

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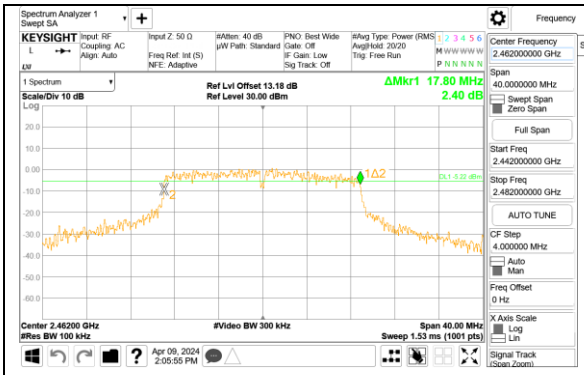
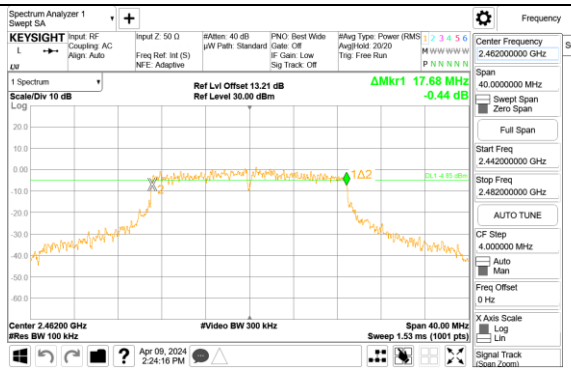
HIGH CHANNEL 11



HIGH CHANNEL 11 Antenna 1



HIGH CHANNEL 11 Antenna 3

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9.4. OUTPUT POWER

LIMITS

FCC §15.247 (b) (3)

RSS-247 5.4 (d)

For systems using digital modulation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands: 1 Watt, based on the use of antennas with directional gains that do not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

TEST PROCEDURE

The transmitter output is connected to a power meter.

The power output was measured on the EUT antenna port using SMA cable with 10dB attenuator connected to a power meter via wideband power sensor. Peak output power was read directly from power meter.

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DIRECTIONAL ANTENNA GAIN

For 2 TX:

Tx chains are uncorrelated for power and correlated for PSD due to the device supporting CDD in all MIMO modes. The directional gains are as follows:

NOTE: Antenna 1 and Antenna 3 are the worst-case combinations.

Antenna 1 + **Antenna 3 (Worst-Case)**

Vertical Polarity

Band (GHz)	Uncorrelated Chains Directional Gain (dBi)	Correlated Chains Directional Gain (dBi)
2.4	5.20	8.00

Directional Gain value was determined by manufacturer measurement procedure.

UL VERIFICATION SERVICES
47173 Benicia Street, Fremont, CA 94538; USA TEL:(510) 319-4000 FAX:(510) 661-0888

RESULTS

9.4.1. 802.11b MODE

2TX Antenna 1 + Antenna 3 CDD MODE

Test Engineer:	16080 ZS
Test Date:	2024-04-13

Limits

Channel	Frequency (MHz)	Directional Gain (dBi)	FCC/ISED Power Limit (dBm)	ISED EIRP Limit (dBm)	Max Power (dBm)
Low 1	2412	5.20	30.00	36	30.00
Low 2	2417	5.20	30.00	36	30.00
Mid 6	2437	5.20	30.00	36	30.00
High 11	2462	5.20	30.00	36	30.00

Duty Cycle CF (dB)	0.31	**Included in Calculations of Corr'd Power**

Results

Channel	Frequency (MHz)	Antenna 1 Meas Power (dBm)	Antenna 3 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Margin (dB)
Low 1	2412	21.96	21.70	24.84	30.00	-5.16
Low 2	2417	24.14	23.67	26.92	30.00	-3.08
Mid 6	2437	23.95	23.69	26.83	30.00	-3.17
High 11	2462	22.60	22.42	25.52	30.00	-4.48

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9.4.2. 802.11g MODE

2TX Antenna 1 + Antenna 3 CDD MODE

Test Engineer:	16080 ZS
Test Date:	2024-04-13

Limits

Channel	Frequency (MHz)	Directional Gain (dBi)	FCC/ISED Power Limit (dBm)	ISED EIRP Limit (dBm)	Max Power (dBm)
Low 1	2412	5.20	30.00	36	30.00
Mid 6	2437	5.20	30.00	36	30.00
High 11	2462	5.20	30.00	36	30.00

Duty Cycle CF (dB)	0.94	**Included in Calculations of Corr'd Power**

Results

Channel	Frequency (MHz)	Antenna 1 Meas Power (dBm)	Antenna 3 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Margin (dB)
Low 1	2412	22.46	22.09	25.29	30.00	-4.71
Mid 6	2437	24.17	23.96	27.08	30.00	-2.92
High 11	2462	22.51	22.29	25.41	30.00	-4.59

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47173 Benicia Street, Fremont, CA 94538; USA TEL:(510) 319-4000 FAX:(510) 661-0888

9.4.3. 802.11n HT20 MODE

2TX Antenna 1 + Antenna 3 CDD MODE

Test Engineer:	16080 ZS
Test Date:	2024-04-13

Limits

Channel	Frequency (MHz)	Directional Gain (dBi)	FCC/ISED Power Limit (dBm)	ISED EIRP Limit (dBm)	Max Power (dBm)
Low 1	2412	5.20	30.00	36	30.00
Low 2	2417	5.20	30.00	36	30.00
Mid 6	2437	5.20	30.00	36	30.00
High 11	2462	5.20	30.00	36	30.00

Duty Cycle CF (dB)	0.60	**Included in Calculations of Corr'd Power**

Results

Channel	Frequency (MHz)	Antenna 1 Meas Power (dBm)	Antenna 3 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Margin (dB)
Low 1	2412	22.20	21.26	24.77	30.00	-5.23
Low 2	2417	22.84	22.52	25.69	30.00	-4.31
Mid 6	2437	24.08	22.65	26.43	30.00	-3.57
High 11	2462	22.10	21.34	24.75	30.00	-5.25

UL VERIFICATION SERVICES
47173 Benicia Street, Fremont, CA 94538; USA TEL:(510) 319-4000 FAX:(510) 661-0888

9.5. AVERAGE POWER

LIMITS

None; for reporting purposes only

TEST PROCEDURE

The transmitter output is connected to a power meter.

The power output was measured on the EUT antenna port using SMA cable with 10dB attenuator connected to a power meter via wideband power sensor. Gated average output power was read directly from power meter.

UL VERIFICATION SERVICES
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RESULTS

9.5.1. 802.11b MODE

2TX Antenna 1 + Antenna 3 CDD MODE

Test Engineer:	16080 ZS
Test Date:	2024-04-13

Channel	Frequency (MHz)	Antenna 1 Power (dBm)	Antenna 3 Power (dBm)	Total Power (dBm)
Low 1	2412	19.33	19.10	22.23
Low 2	2417	22.35	21.85	25.12
Mid 6	2437	22.01	21.85	24.94
High 11	2462	20.13	20.01	23.08

9.5.2. 802.11g MODE

2TX Antenna 1 + Antenna 3 CDD MODE

Test Engineer:	16080 ZS
Test Date:	2024-04-13

Channel	Frequency (MHz)	Antenna 1 Power (dBm)	Antenna 3 Power (dBm)	Total Power (dBm)
Low 1	2412	15.62	15.48	18.56
Mid 6	2437	17.07	16.92	20.01
High 11	2462	15.45	15.35	18.41

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9.5.3. 802.11n HT20 MODE

2TX Antenna 1 + Antenna 3 CDD MODE

Test Engineer:	16080 ZS
Test Date:	2024-04-13

Channel	Frequency (MHz)	Antenna 1 Power (dBm)	Antenna 3 Power (dBm)	Total Power (dBm)
Low 1	2412	14.28	14.06	17.18
Low 2	2417	15.12	15.22	18.18
Mid 6	2437	16.42	16.36	19.40
High 11	2462	14.56	14.63	17.61

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9.6. POWER SPECTRAL DENSITY

LIMITS

FCC §15.247 (e)

RSS-247 (5.2) (b)

The power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

RESULTS

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9.6.1. 802.11b MODE

2TX Antenna 1 + Antenna 3 CDD MODE

Duty Cycle CF (dB)	0.31	Included in Calculations of Corr'd PSD

PSD Results

Channel	Frequency (MHz)	Antenna 1 Meas (dBm/ 3kHz)	Antenna 3 Meas (dBm/ 3kHz)	Total Corr'd PSD (dBm/ 3kHz)	Limit (dBm/ 3kHz)	Margin (dB)
Low 1	2412	-1.96	-2.74	0.99	8.0	-7.0
Low 2	2417	-1.16	-1.38	2.05	8.0	-5.9
Mid 6	2437	-2.38	-1.72	1.28	8.0	-6.7
High 11	2462	-2.32	-2.85	0.74	8.0	-7.3

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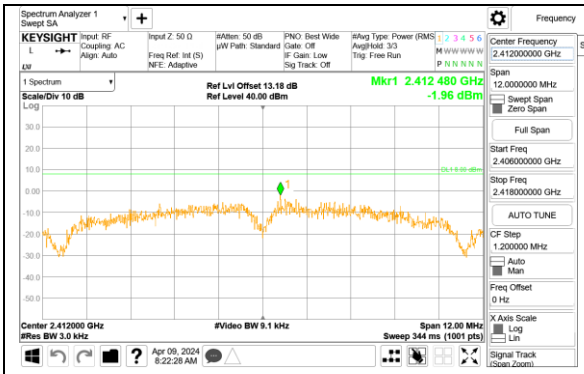
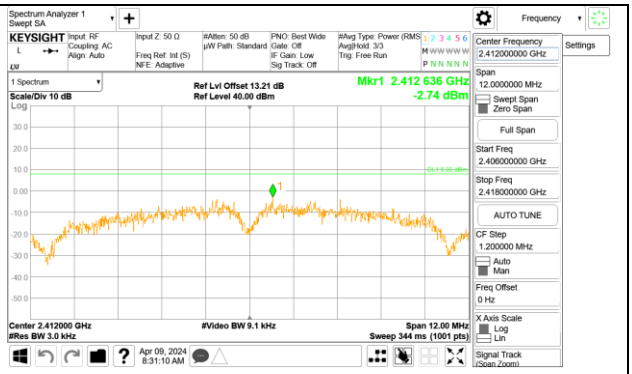
LOW CHANNEL 1

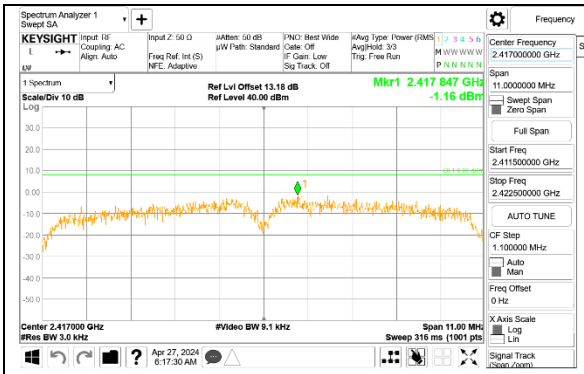


LOW CHANNEL 1 Antenna 1

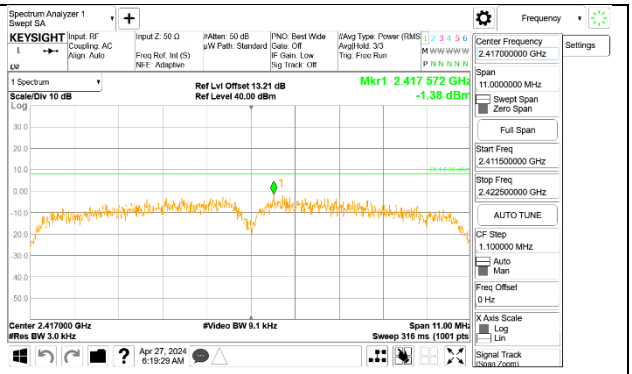


LOW CHANNEL 1 Antenna 3

LOW CHANNEL 2

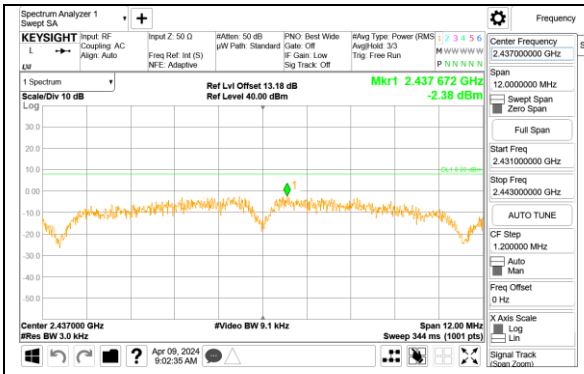


LOW CHANNEL 2 Antenna 1

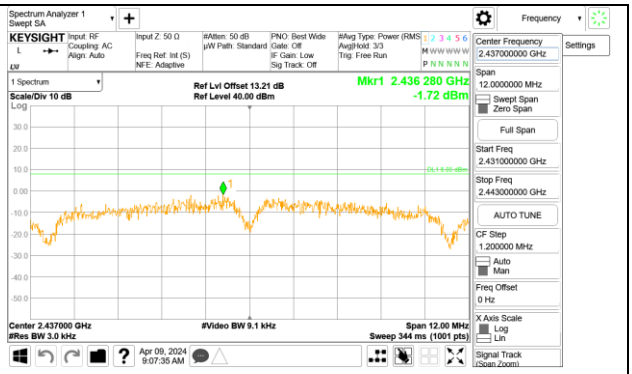


LOW CHANNEL 2 Antenna 3

MID CHANNEL 6



MID CHANNEL 6 Antenna 1



MID CHANNEL 6 Antenna 3

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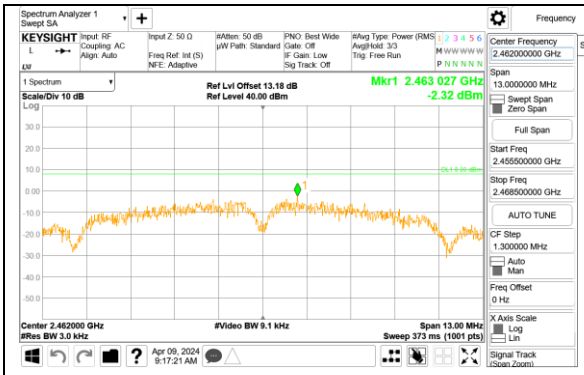
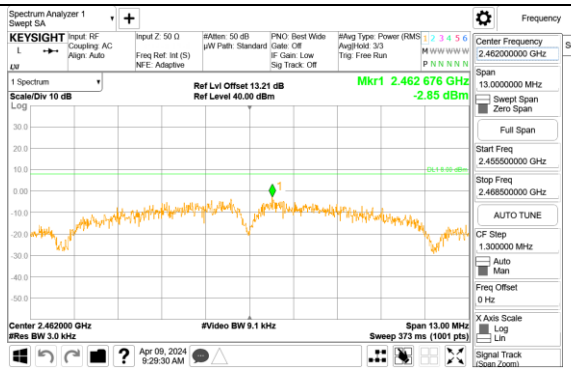
HIGH CHANNEL 11



HIGH CHANNEL 11 Antenna 1



HIGH CHANNEL 11 Antenna 3

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9.6.2. 802.11g MODE

2TX Antenna 1 + Antenna 3 CDD MODE

Duty Cycle CF (dB)	0.94	Included in Calculations of Corr'd PSD	

PSD Results

Channel	Frequency (MHz)	Antenna 1 Meas (dBm/ 3kHz)	Antenna 3 Meas (dBm/ 3kHz)	Total Corr'd PSD (dBm/ 3kHz)	Limit (dBm/ 3kHz)	Margin (dB)
Low 1	2412	-11.38	-12.85	-8.10	8.0	-16.1
Mid 6	2437	-10.26	-11.39	-6.84	8.0	-14.8
High 11	2462	-12.53	-11.11	-7.81	8.0	-15.8

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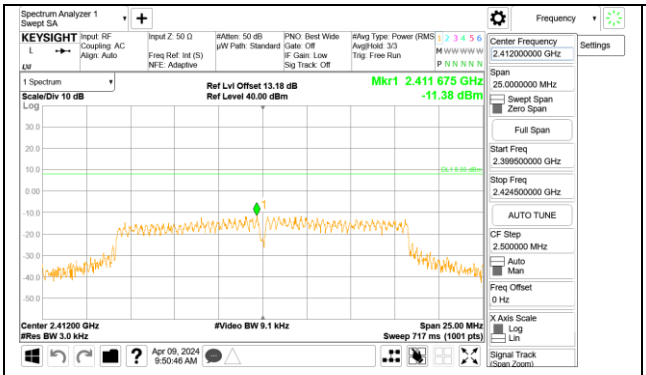
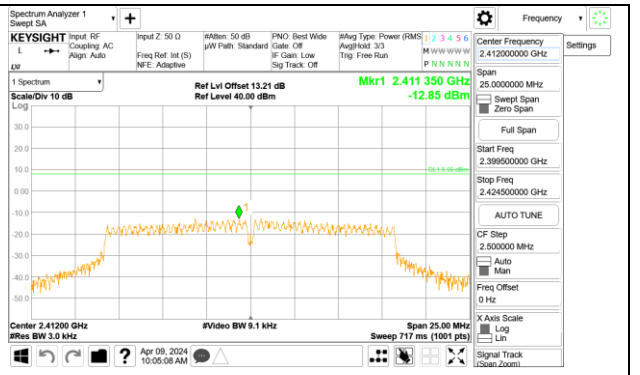
LOW CHANNEL 1

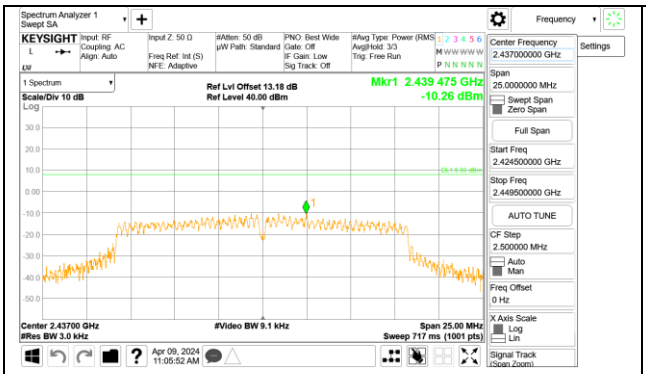


LOW CHANNEL 1 Antenna 1



LOW CHANNEL 1 Antenna 3

MID CHANNEL 6



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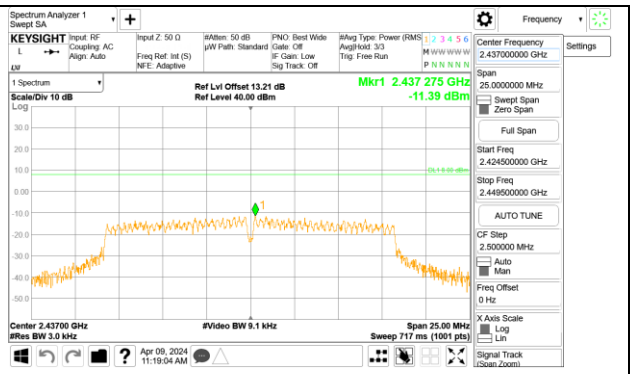
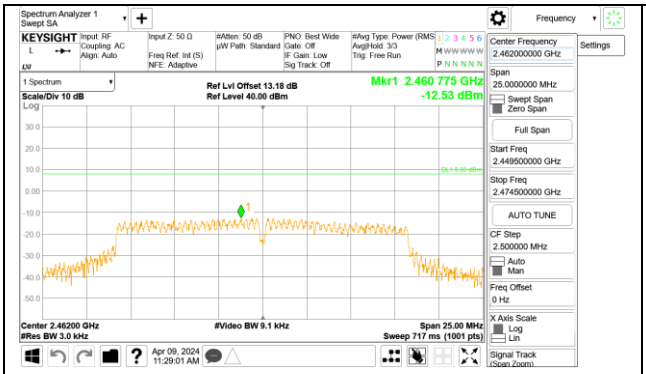
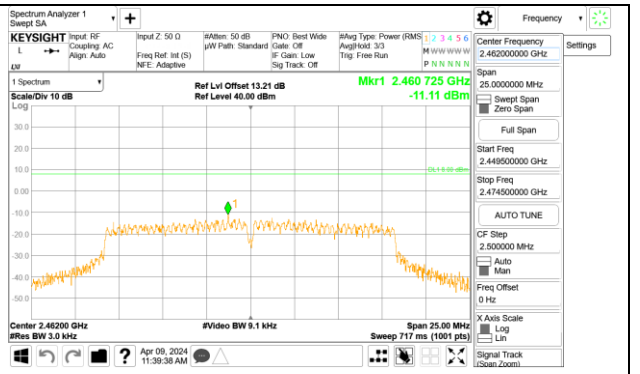


MID CHANNEL 6 Antenna 3

HIGH CHANNEL 11



HIGH CHANNEL 11 Antenna 1



HIGH CHANNEL 11 Antenna 3

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9.6.3. 802.11n HT20 MODE

2TX Antenna 1 + Antenna 3 CDD MODE

Duty Cycle CF (dB)	0.60	Included in Calculations of Corr'd PSD	

PSD Results

Channel	Frequency (MHz)	Antenna 1 Meas (dBm/ 3kHz)	Antenna 3 Meas (dBm/ 3kHz)	Total Corr'd PSD (dBm/ 3kHz)	Limit (dBm/ 3kHz)	Margin (dB)
Low 1	2412	-11.49	-12.11	-8.18	8.0	-16.2
Low 2	2417	-9.05	-11.45	-6.48	8.0	-14.5
Mid 6	2437	-8.92	-9.52	-5.60	8.0	-13.6
High 11	2462	-10.97	-11.04	-7.39	8.0	-15.4

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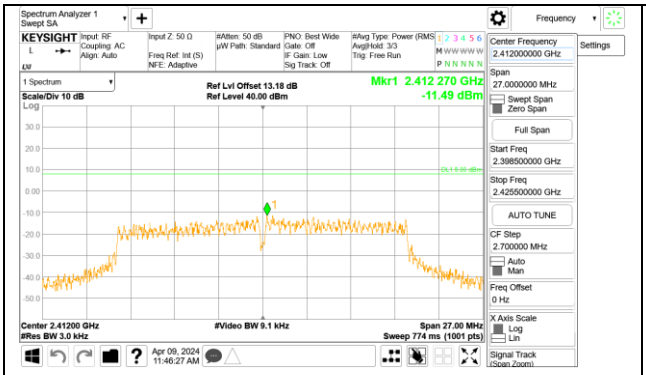
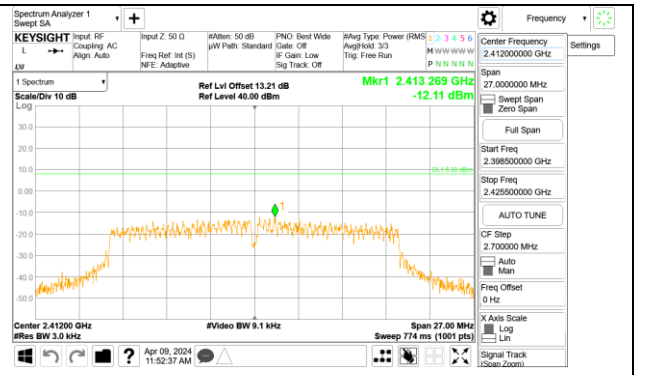
LOW CHANNEL 1

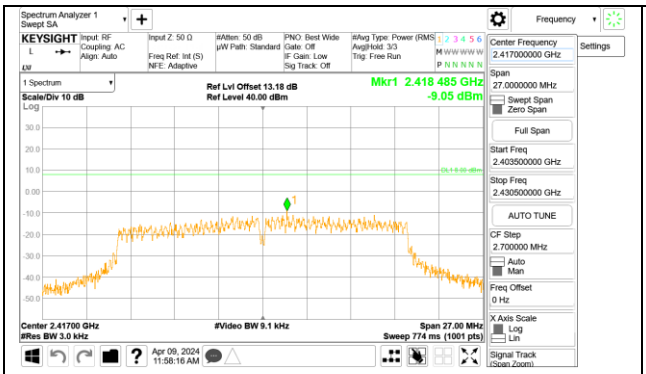


LOW CHANNEL 1 Antenna 1

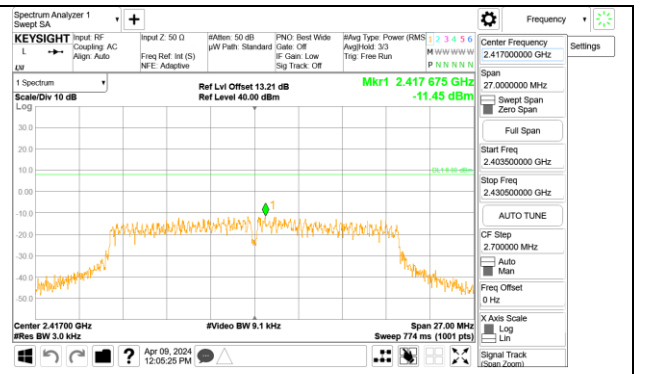


LOW CHANNEL 1 CHAIN 3

LOW CHANNEL 2

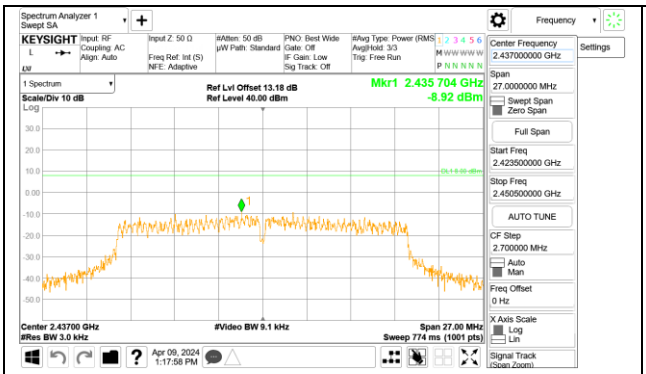


LOW CHANNEL 2 Antenna 1

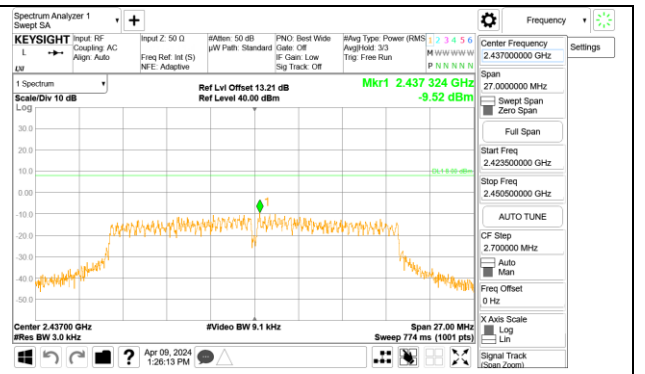


LOW CHANNEL 2 Antenna 3

MID CHANNEL 6



MID CHANNEL 6 Antenna 1



MID CHANNEL 6 Antenna 3

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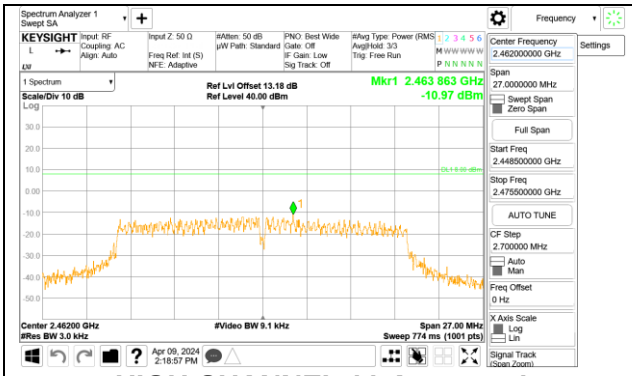
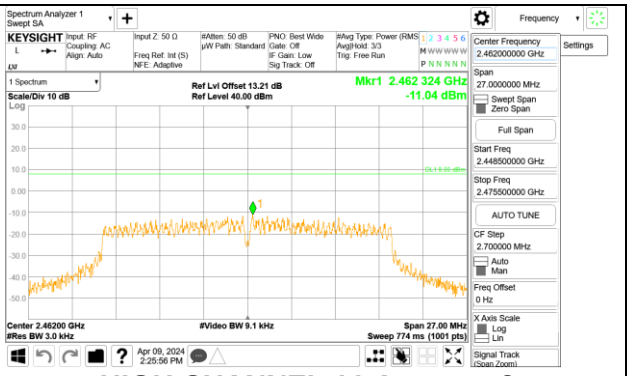
HIGH CHANNEL 11



HIGH CHANNEL 11 Antenna 1



HIGH CHANNEL 11 Antenna 3

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9.7. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

RSS-247 5.5

Output power was measured based on the use of peak measurement, therefore the required attenuation is 20 dB.

RESULTS

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