



# **TEST REPORT**

**Report Number:** 15496249-E4V2

**Applicant :** APPLE, INC.  
1 APPLE PARK WAY  
CUPERTINO, CA 95014, U.S. A

**Model :** A3257(Parent)  
A3525, A3526, A3527 (Variants)

**Brand :** APPLE

**FCC ID :** BCG-E8950A (Parent)  
BCG-E8960A, BCG-E8961A, BCG-E8962A (Variants)

**IC :** BCG-E8950A (Parent)  
BCG-E8960A, BCG-E8961A, BCG-E8962A (Variants)

**EUT Description :** SMARTPHONE

**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:**  
2025-08-11

**Prepared by:**  
UL Verification Services Inc.  
47173 Benicia Street  
Fremont, CA 94538 U.S.A.  
TEL: (510) 319-4000  
FAX: (510) 661-0888



## REPORT REVISION HISTORY

Rev.	Issue Date	Revisions	Revised By
V1	2025-06-06	Initial issue	Gerardo Abrego
V2	2025-08-11	Updated Sections 6,8,9,13, and 9.4	Gerardo Abrego

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## 1. ATTESTATION OF TEST RESULTS

Applicant Name and Address	APPLE INC. 1 APPLE PARK WAY CUPERTINO, CA 95014, U.S.A.
Model	A3257(Parent) A3525, A3526, A3527 (Variants)
Brand	APPLE
FCC ID	BCG-E8950A (Parent) BCG-E8960A, BCG-E8961A, BCG-E8962A (Variants)
IC	579C-E8950A (Parent) 579C-E8960A, 579C-E8961A, 579C-E8962A (Variants)
EUT Description	Smartphone
Serial Number	HVHHCY0001P0000YEE, HVHHHD0004U0000YE8 (Conducted) FV33DQJ970 (Radiated)
Sample Receipt Date	2025-02-21
Date Tested	2025-03-05 to 2025-08-12
Applicable Standards	FCC 47 CFR Part 15 Subpart C ISED RSS-247 Issue 3 ISED RSS-GEN Issue 5 + A1 + A2
Test Results	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.

Approved & Released By:  	Prepared & Reviewed By:  
Richard Lee Staff Engineer UL Verification Services, Inc.	Gerardo Abrego Senior Test Engineer UL Verification Services, Inc.

## 2. TEST RESULTS SUMMARY

This report contains data provided by the customer, which can impact the validity of the 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 6.2)
2. Cable loss (see section 6.2)

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	Complies	None.
15.247 (b) (3)	RSS-247 5.4 (d)	Output Power (Average)	Complies	Per ANSI C63.10, Section 11.9.2.3.2.
15.247 (e)	RSS-247 5.2 (b)	PSD	Complies	None.
15.247 (d)	RSS-247 5.5	Conducted Spurious Emissions	Complies	None.
15.209, 15.205	RSS-GEN 8.9, 8.10	Radiated Emissions	Complies	None.
15.207	RSS-Gen 8.8	AC Mains Conducted Emissions	Complies	None.

## 3. TEST METHODOLOGY

The tests documented in this report were performed in accordance with;

The tests documented in this report were performed in accordance with;

- FCC 47 CFR Part 2
- FCC 47 CFR Part 15C
- \*ANSI C63.10-2020+Cor. 1-2023+C63.10a-2024
- KDB 558074 D01 15.247 Meas Guidance
- KDB 414788 D01 Radiated Test Site
- KDB 662911 D01 Multiple Transmitter Output
- KDB 484596 D01 Referencing Test Data
- RSS-GEN Issue 5 + A1 + A2
- RSS-247 Issue 3

\*Note: The use of ANSI C63.10-2020 + Cor. 1-2023 + C63.10a-2024 does not deviate from the testing procedures of ANSI C63.10-2020

## 4. FACILITIES AND ACCREDITATION

UL Verification Inc. is accredited by A2LA, certification #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
<input type="checkbox"/>	Building 1: 47173 Benicia Street, Fremont, CA 94538, USA	US0104	2324A	550739
<input checked="" type="checkbox"/>	Building 2: 47266 Benicia Street, Fremont, CA 94538, USA			
<input checked="" type="checkbox"/>	Building 3: 843 Auburn Court, Fremont, CA 94538, USA			
<input checked="" type="checkbox"/>	Building 4: 47658 Kato Rd, Fremont, CA 94538, USA			
<input checked="" type="checkbox"/>	Building 5: 47670 Kato Rd, Fremont, CA 94538, USA			

## 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 manufacturer's 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	$U_{LAB}$
Conducted Antenna Port Emission Measurement	1.94 dB
Power Spectral Density	2.466 dB
Time Domain Measurements Using SA	3.39 %
RF Power Measurement Direct Method Using Power Meter	1.3 dB (Pk), 0.45 dB (Ave)
Radio Frequency (Spectrum Analyzer)	141.16 Hz
Occupied Bandwidth	1.22 %
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, 9 kHz 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
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Uncertainty figures are valid to a confidence level of 95%.

## 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)

$$36.5 \text{ dBuV} + 18.7 \text{ dB/m} + 0.6 \text{ dB} - 26.9 \text{ dB} = 28.9 \text{ dBuV/m}$$

### 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.

$$36.5 \text{ dBuV} + 0 \text{ dB} + 10.1 \text{ dB} + 0 \text{ dB} = 46.6 \text{ dBuV}$$

## 6. EQUIPMENT UNDER TEST

### 6.1. EUT DESCRIPTION

The Apple iPhone is a smartphone with cellular GSM, GPRS, EGPRS, WCDMA, LTE, 5GNR1, 5GNR2, IEEE 802.11a/b/g/n/ac/ax/be, Bluetooth (BT), Ultra-Wideband (UWB), Global Positioning System (GPS), Near-Field Communication (NFC), Narrow-Band (NB) UNII, 802.15.4, 802.15.4ab-Narrow Band (NB), Wireless Power Transfer (WPT) and Mobile Satellite Service (MSS) technologies. The rechargeable battery is not user accessible.

### 6.2. DESCRIPTION OF AVAILABLE ANTENNAS AND CABLE LOSS

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

Frequency Band (GHz)	Antenna Type	Antenna Peak Gain ANT 2 (dBi)	Antenna Peak Gain ANT 1 (dBi)	Cable Loss ANT 2 (dB)	Cable Loss ANT 1 (dB)
2.4	IFA	-1.1	-3.1	2.1	1.9

The cables were used for RF antenna port tests that had been offset to the test equipment during testing.

### 6.3. SOFTWARE AND FIRMWARE

The EUT firmware is 23A258.

## 6.4. MAXIMUM OUTPUT POWER

The transmitter has a maximum conducted output power as follows:

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
<b>1Tx</b>			
2412 - 2472	802.11b	21.19	131.52
	802.11g	Covered by 802.11n HT20 1TX	
	802.11n HT20	21.18	131.22
	802.11ax HE20	Covered by 802.11be EHT20 1TX	
	802.11be EHT20	21.20	131.83
<b>2Tx</b>			
2412 - 2472	802.11b CDD	23.99	250.61
	802.11n HT20 CDD	23.97	249.46
	802.11g SDM/STBC	Covered by 802.11n HT20 2TX CDD	
	802.11ax HE20	Covered by 802.11be EHT20 OFDMA	
	802.11be EHT20 OFDMA	23.99	250.61

## 6.5. WORST-CASE CONFIGURATION AND MODE

EUT was investigated in three orthogonal orientations X (Flatbed), Y (Landscape), and Z (Portrait) on ANT 2, ANT 1, and 2TX. It was determined that X (Flatbed) orientation was worst-case orientation for ANT 2, ANT 1 and 2TX

With same power on Full RU and SU higher data rate, investigation was performed on both bandedge to determine the worst case, and SU mode was determined to be the worst case.

Radiated band edge, harmonic, and spurious emissions from 1GHz to 18GHz were performed with the EUT set to transmit at highest power on Low/Middle/High channels.

Radiated emissions below 1GHz, 18-26GHz and power line conducted emissions were performed with the EUT transmits at the channel with the highest output power as worst-case scenario. There were no emissions found below 30MHz within 20dB of the limit.

For radiated harmonics spurious below 1GHz, 1-18GHz L/M/H channels, 18-26GHz, and power line conducted emissions were performed with the EUT set at the 2TX CDD mode among the CDD modes and SDM modes with power setting equal or higher than SISO modes as worst-case scenario. 802.11g mode is covered by HT20 mode since it has the same power as HT20.

The target power of SDM mode is equal to or lower than that of CDD mode. CDD correlated antenna gain is also worst-case, so CDD mode is performed in the test to represent worst-case reporting.

Below 30MHz, 30-1000MHz emissions spurious tests were performed with EUT connected to AC power adapter and set at X orientation as the worst case; and for above 1GHz tests, the worst-case configuration reported was with EUT only. For AC line conducted emission, test was investigated with AC power adapter and with laptop.

The modulation and bandwidth of 802.11ax and 802.11be modes are similar, and the target power of 802.11ax mode is equal to or lower than that of 802.11be mode. The data rate of 802.11be mode is higher than 802.11ax mode; therefore, 802.11be mode is performed in the test to represent worst-case reporting.

The output power and PSD for the 802.11be mode were investigated across all different tones, and we found that the SU mode had the highest output power and RU26 had the highest PSD readings. And after investigation, antenna port conducted tests were performed on both SU and lowest tones; radiated spurious emission and radiated band edge tests were performed on SU and lowest tones. Please see the worst-case summary table below.

WIFI DTS 2.4GHz - 802.11be					
BW (MHz)	Tone (T)	RU Index	RU Index from Chipset support	Worst Case Tone	
				Power	PSD
20	26	0 ~ 8	0 ~ 8		X
	52	37 ~ 40	37 ~ 40		
	52 + 26	70 ~ 81	70, 71, 72		
	106	53 ~ 54	53 ~ 54		
	106 + 26	82 ~ 89	82, 83		
	242	61	61		
	SU	--	--	X	

Low data rate was used to test on antenna port conducted tests and radiated spurious emissions since it has the highest maximum power. For radiated bandedge, the following are the worst-case data rates set for the test:

802.11b mode: 1 Mbps

802.11n HT20 mode: MCS7

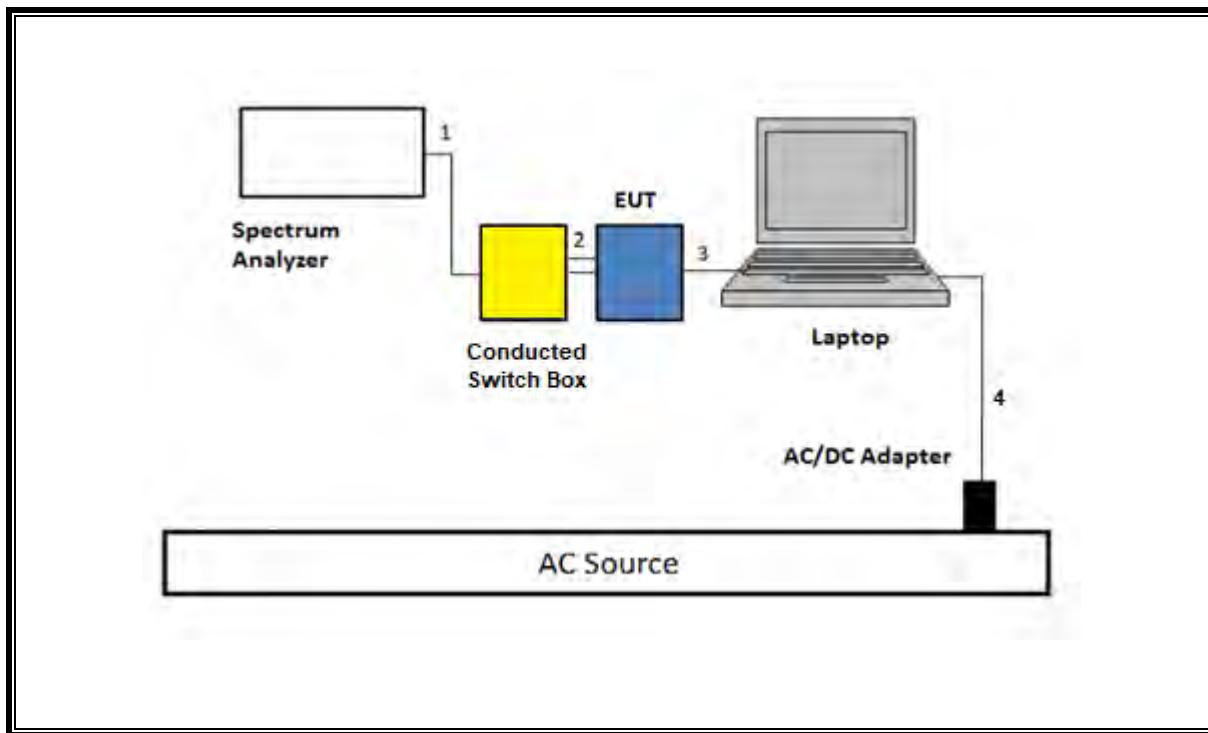
802.11be EHT20 RU26 and SU, MCS9

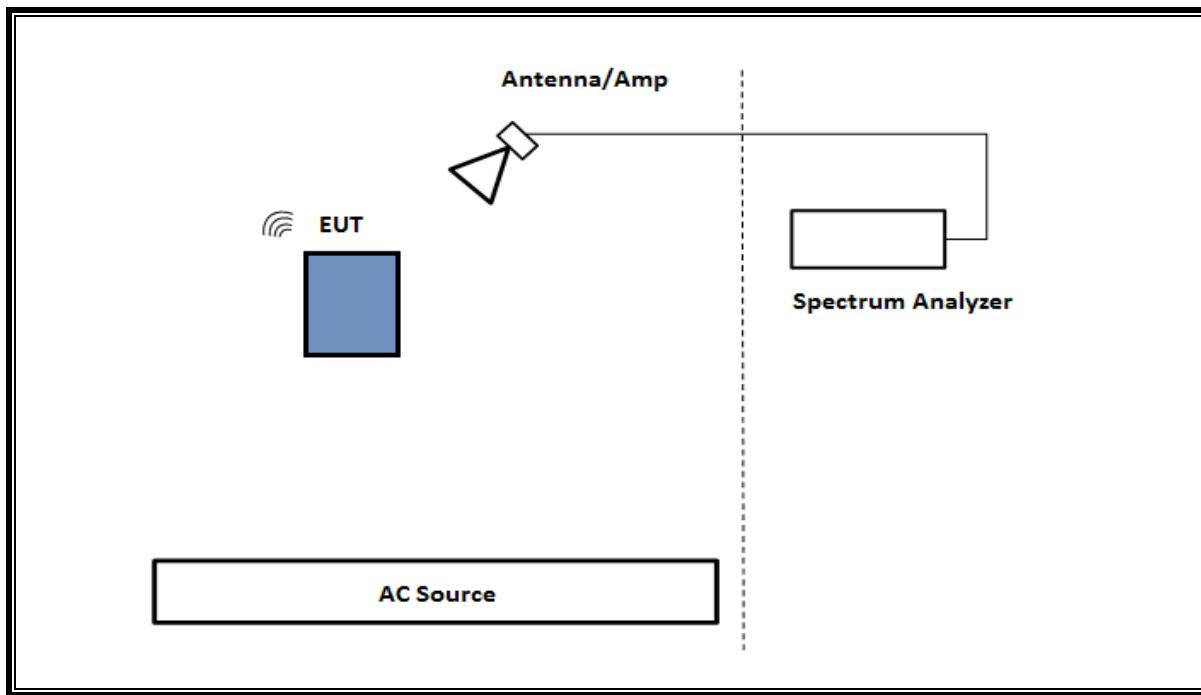
## 6.6. DESCRIPTION OF TEST SETUP

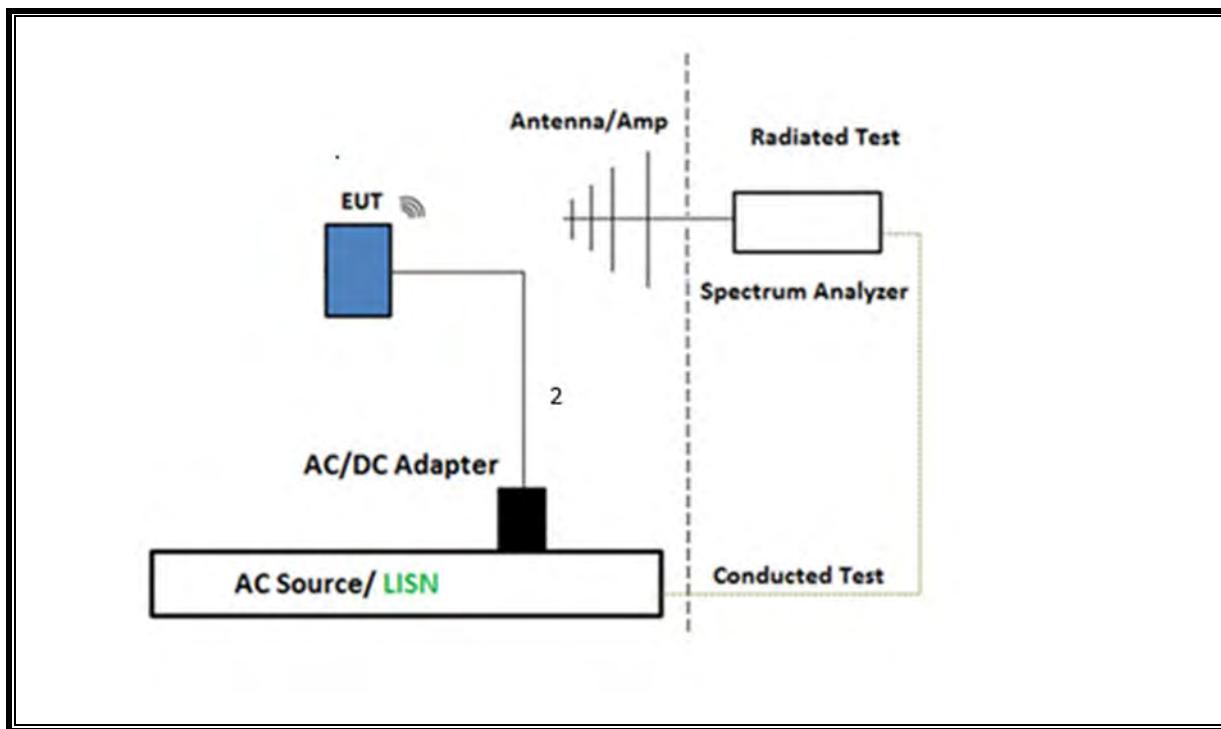
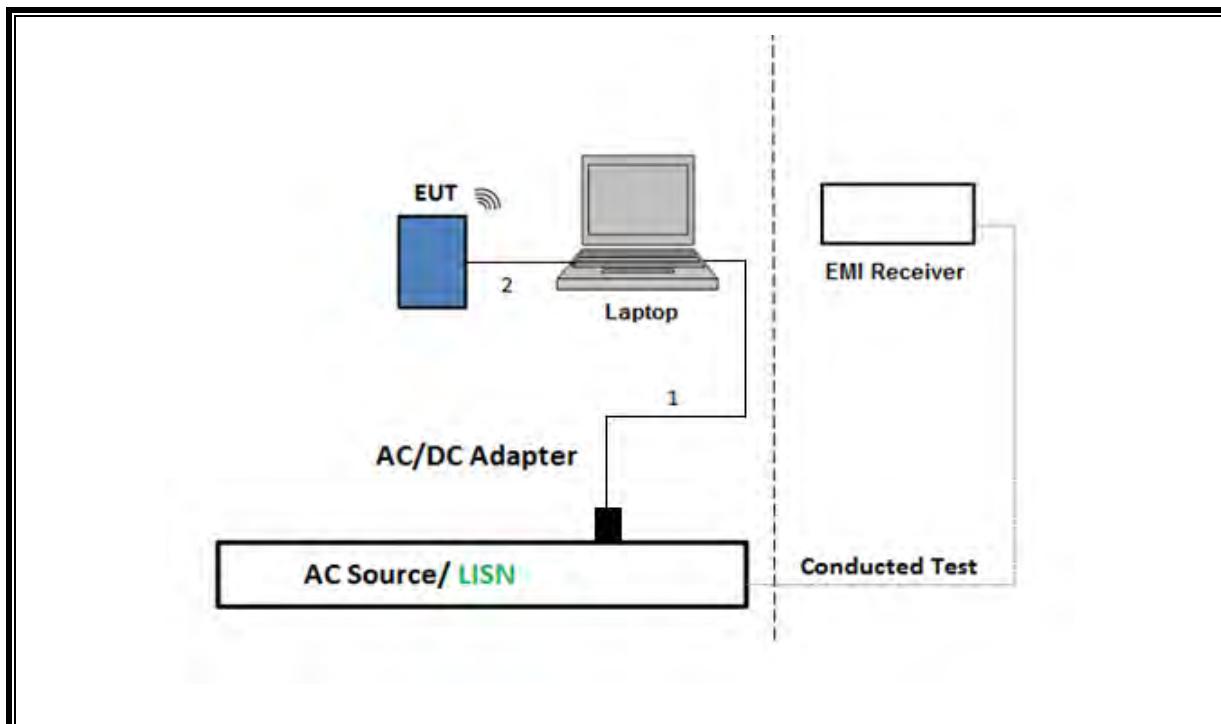
SUPPORT TEST EQUIPMENT					
Description	Manufacturer	Model	Serial Number	FCC ID/ DoC	
Laptop	Apple	Macbook Pro	C02VD7SAHV22	BCGA1708	
Laptop AC/DC adapter	Liteon Technology	A1424	NSW25679		DoC
EUT AC/DC adapter	Apple	A1720	C3D8417A7R93KVPA8		DoC
Conducted Switch Box	UL	N/A	245781		N/A
I/O CABLES (RF CONDUCTED TEST)					
Cable No.	Port	# of Identical Ports	Connector Type	Cable Type	Cable Length (m)
1	SMA	1	SMA	Shielded	0.2
2	Antenna	1	SMA	Shielded	0.2
3	USB	1	USB-C	Shield	1.0
4	DC	1	DC	Shield	2.0
I/O CABLES (RF RADIATED AND AC LINE CONDUCTED TEST)					
Cable No.	Port	# of Identical Ports	Connector Type	Cable Type	Cable Length (m)
1	DC	1	DC	Shielded	2
2	USB	1	USB-C	Shielded	1

### TEST SETUP

The EUT setup is shown as below. Test software exercised the radio card.

**SETUP DIAGRAM FOR CONDUCTED TESTS**

**SETUP DIAGRAM FOR RADIATED TESTS Above 1 GHz**

SETUP DIAGRAM FOR Below 1GHz and AC LINE CONDUCTED TESTTEST SETUP- AC LINE CONDUCTED: LAPTOP CONFIGURATION

## 7. MEASUREMENT METHOD

Test Item	Test Method
6 dB BW	ANSI C63.10 Section 11.8.1 RBW $\geq$ DTS BW
99% BW	ANSI C63.10 Section 6.9.3.
Output Power	ANSI C63.10 Section 11.9.2.3.2 Method AVGPM G (Measurement using an RF average-reading power meter)
PSD	ANSI C63.10 Section 11.10.6 Method AVGPSD-1
Radiated emissions non-restricted frequency bands	ANSI C63.10 Section 11.11 and 13
Radiated emissions restricted frequency bands	ANSI C63.10 Section 11.12.1 and 13
Conducted emissions in restricted frequency bands	ANSI C63.10 Section 11.12.2
Band-edge	ANSI C63.10 Section 11.13.3.2 and 13: Integration method - Peak detection
Band-edge	ANSI C63.10 Section 11.13.3.3 and 13: Integration method - Trace averaging with continuous transmission at full power
Radiated Spurious Emissions Below 30MHz	ANSI C63.10 Section 6.4 and 13
AC Power Line Conducted Emissions	ANSI C63.10 Section 6.2

## 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
Antenna, Horn 1-18GHz	ETS-Lindgren	3117	226674	2026-01-31
RF Filter Box, 1-18GHz	UL-FR1	Rats 1.0	250156	2025-10-31
EMI Test Receiver	Rohde & Schwarz	ESW44	225683	2026-02-28
Antenna, Horn 1-18GHz	ETS-Lindgren	3117	226673	2026-02-28
RF Filter Box, 1-18GHz	UL-FR1	Rats 2.0	231874	2026-06-29
EMI Test Receiver	Rohde & Schwarz	ESW44	PRE0179372	2026-02-28
Antenna, Horn 1-18GHz	ETS-Lindgren	3117	80707	2026-06-30
RF Filter Box, 1-18GHz	UL-FR1	Rats 1.0	171875	2026-03-31
EMI Test Receiver	Rohde & Schwarz	ESW44	245268	2026-02-28
Antenna, Horn 1-18GHz	ETS-Lindgren	3117	206808	2026-04-30
RF Filter Box, 1-18GHz	UL-FR1	Rats 1.0	197920	2026-03-31
EMI Test Receiver	Rohde & Schwarz	ESW44	225688	2026-02-28
Antenna, Horn 1-18GHz	ETS-Lindgren	3117	200897	2026-08-30
RF Filter Box, 1-18GHz	UL-FR1	Frankenstein	217255	2026-01-31
EMI Test Receiver	Rohde & Schwarz	ESW44	191430	2026-02-28
Antenna, Horn 1-18GHz	ETS-Lindgren	3117	222741	2026-09-30
RF Filter Box, 1-18GHz	UL-FR1	Frankenstein	217521	2025-08-31
EMI Test Receiver	Rohde & Schwarz	ESW44	223461	2026-02-28
Antenna, Horn 1-18GHz	ETS-Lindgren	3117	200896	2026-04-30
RF Filter Box, 1-18GHz	UL-FR1	Frankenstein	216812	2026-01-31
EMI Test Receiver	Rohde & Schwarz	ESW44	230548	2026-02-28
Antenna, Passive Loop 30Hz - 1MHz	ELECTRO-METRICS	EM-6871	170013	2025-07-31
Antenna, Passive Loop 100KHz - 30MHz	ELECTRO-METRICS	EM-6872	170015	2025-07-31
Antenna, Horn 18 to 26.5GHz	A.R.A.	MWH-1826/B	199658	2026-02-02
Link File, RF Amplifier Assembly, 18-26.5GHz, 60dB Gain	AMPLICAL	AMP18G26.5-60	234683	2026-02-28
Antenna, Broadband Hybrid, 30MHz to 2000MHz	Sunol Sciences Corp.	JB3	85150	2025-12-30
Link File, @3m, 9kHz-1GHz Hybrid/Loop Path Loss	UL-FR1	Port 0 Factors	208807	2026-01-31
DC Power Supply	TDK-LAMBDA	GEN 60-25	PRE0074753	N/A
DC Power Supply	TDK-LAMBDA	GEN 60-25	PRE0074756	N/A
Spectrum Analyzer, PXA, 3Hz to 44GHz	N9030A	Keysight Technologies Inc	80397	2026-01-31
Spectrum Analyzer, PXA, 3Hz to 44GHz	N9030A	Keysight Technologies Inc	125179	2026-02-28
Conducted Switch Box	UL-FR1	CSB	*245782	2025-07-31
Conducted Switch Box	UL-FR1	CSB	245781	2026-04-30
Power Meter, P-series single channel	Keysight Technologies Inc	N1911A	90715	2026-01-31
Power Sensor, P - series, 50MHz to 18GHz, Wideband	Keysight Technologies Inc	N1921A	81319	2026-01-31
Power Meter, P-series single channel	Keysight Technologies Inc	N1911A	90718	2026-01-31
Power Sensor, P - series, 50MHz to 18GHz, Wideband	Keysight Technologies Inc	N1921A	90419	2026-01-31

AC Line Conducted				
Description	Manufacturer	Model	ID Num	Cal Due
EMI Test Receiver 9kHz-7GHz	Rohde & Schwarz	ESR	171646	2026-02-28
LISN for Conducted Emissions CISPR-16	Fischer Custom Communications	FCC-LISN-50/250-25-2-01-480V	175765	2026-01-31
Transient Limiter	TE	TBFL1	207996	2025-09-30

UL AUTOMATION SOFTWARE			
Radiated Software	UL	UL EMC	Ver 9.5, May 1, 2023, Ver 9.5, May 1, 2024, Ver 9.5, August 1, 2024
Conducted Software	UL	UL EMC	2023.2.23
AC Line Conducted Software	UL	UL EMC	Ver 9.5, Mar 3, 2023

\*Testing is completed before equipment expiration date.

## 9. ANTENNA PORT TEST RESULTS

### 9.1. ON TIME AND DUTY CYCLE LIMITS

None; for reporting purposes only.

#### PROCEDURE

ANSI C63.10, Section 11.6: Zero-Span Spectrum Analyzer Method.

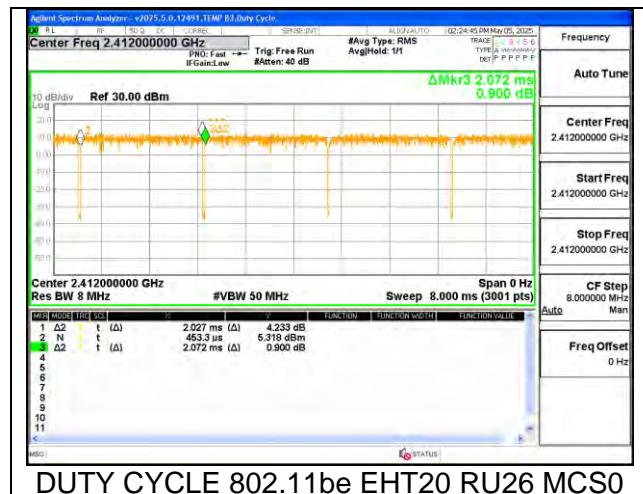
#### ON TIME AND DUTY CYCLE RESULTS

Mode	Tone	Data Rate (Mbps)	ON Time T (msec)	Period (msec)	Duty Cycle x (linear)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)	1/T Minimum VBW (kHz)
b	--	--	12.43	12.470	0.9968	99.68	0.00	0.010
HT20	--	MCS0	3.830	3.855	0.9935	99.35	0.00	0.010
	--	MCS7	5.333	5.353	0.9963	99.63	0.00	0.010
EHT20	SU	MCS0	4.620	4.645	0.9946	99.46	0.00	0.010
		MCS9	5.413	5.440	0.9950	99.50	0.00	0.010
	26	MCS0	2.027	2.072	0.9783	97.83	0.10	0.493
		MCS9	2.027	2.064	0.9821	98.21	0.00	0.010

Note: There is the same duty cycle factor on 1TX and 2TX

Note: Duty cycle 2TX is the same as 1TX.

#### DUTY CYCLE PLOTS



## 9.2. 99% BANDWIDTH

### LIMITS

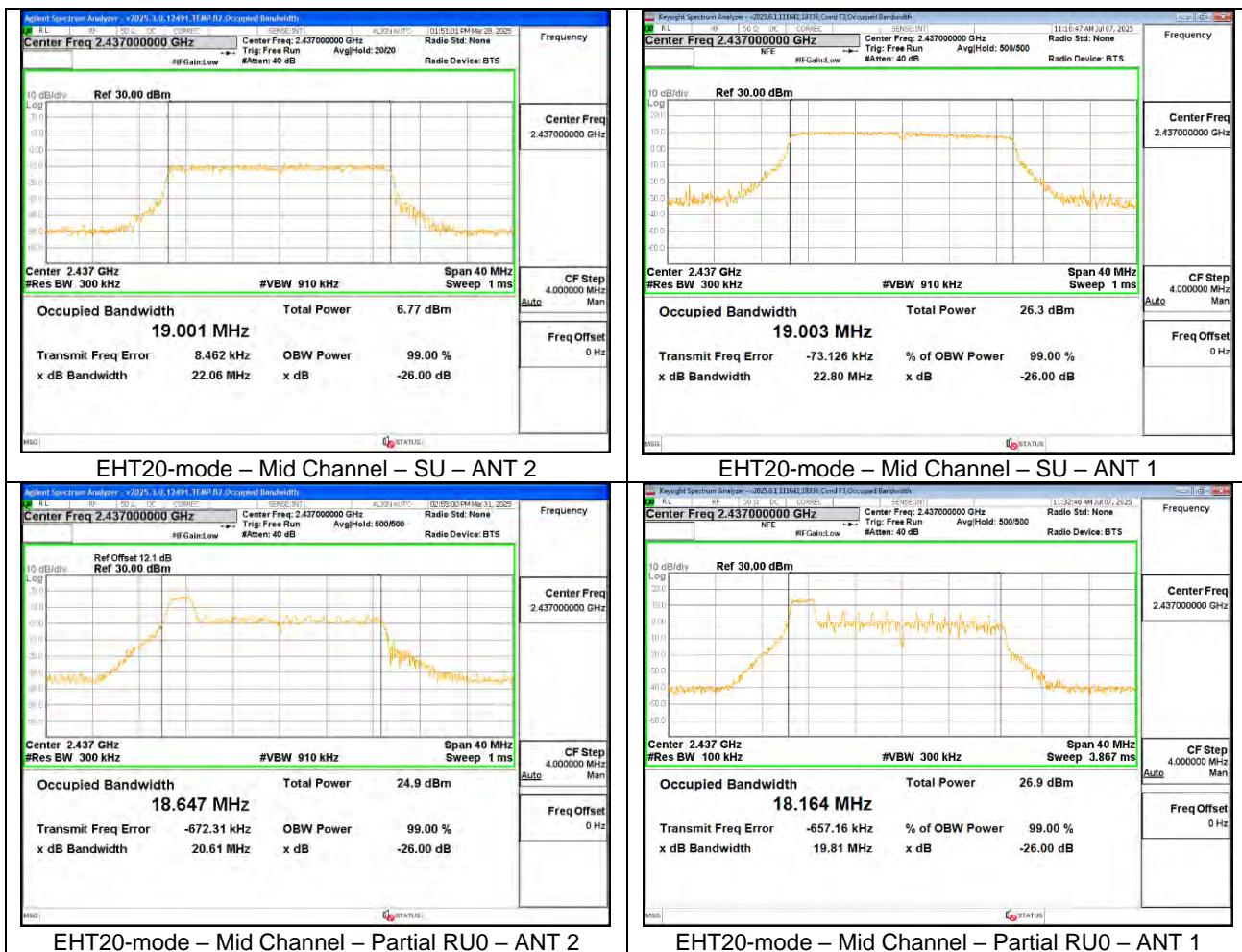
None; for reporting purposes only.

### RESULTS

Only MID channel plot is reported to show setting parameter compliance with testing method/procedure.

Mode	Frequency (MHz)	Channel Number	Tone	RU Index	99% Bandwidth (MHz)	
					ANT 2	ANT 1
<b>b</b>	2412	1	--	--	14.526	14.753
	2437	6	--	--	14.859	14.594
	2472	13	--	--	14.871	14.519
<b>HT20</b>	2412	1	--	--	17.927	17.929
	2437	6	--	--	18.062	17.827
	2472	13	--	--	18.033	17.802
<b>EHT20</b>	2412	1	SU	--	18.951	19.112
			0		18.551	18.335
			26	4	16.913	16.925
			8		18.613	18.060
	2437	6	SU	--	19.001	19.003
			0		18.647	18.164
			26	4	17.143	16.833
			8		18.673	18.302
	2472	13	SU	--	19.021	18.079
			0		18.449	18.267
			26	4	17.197	16.970
			8		18.647	18.288





### 9.3. 6dB BANDWIDTH

#### LIMITS

FCC §15.247 (a) (2)

RSS-247 5.2 (a)

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

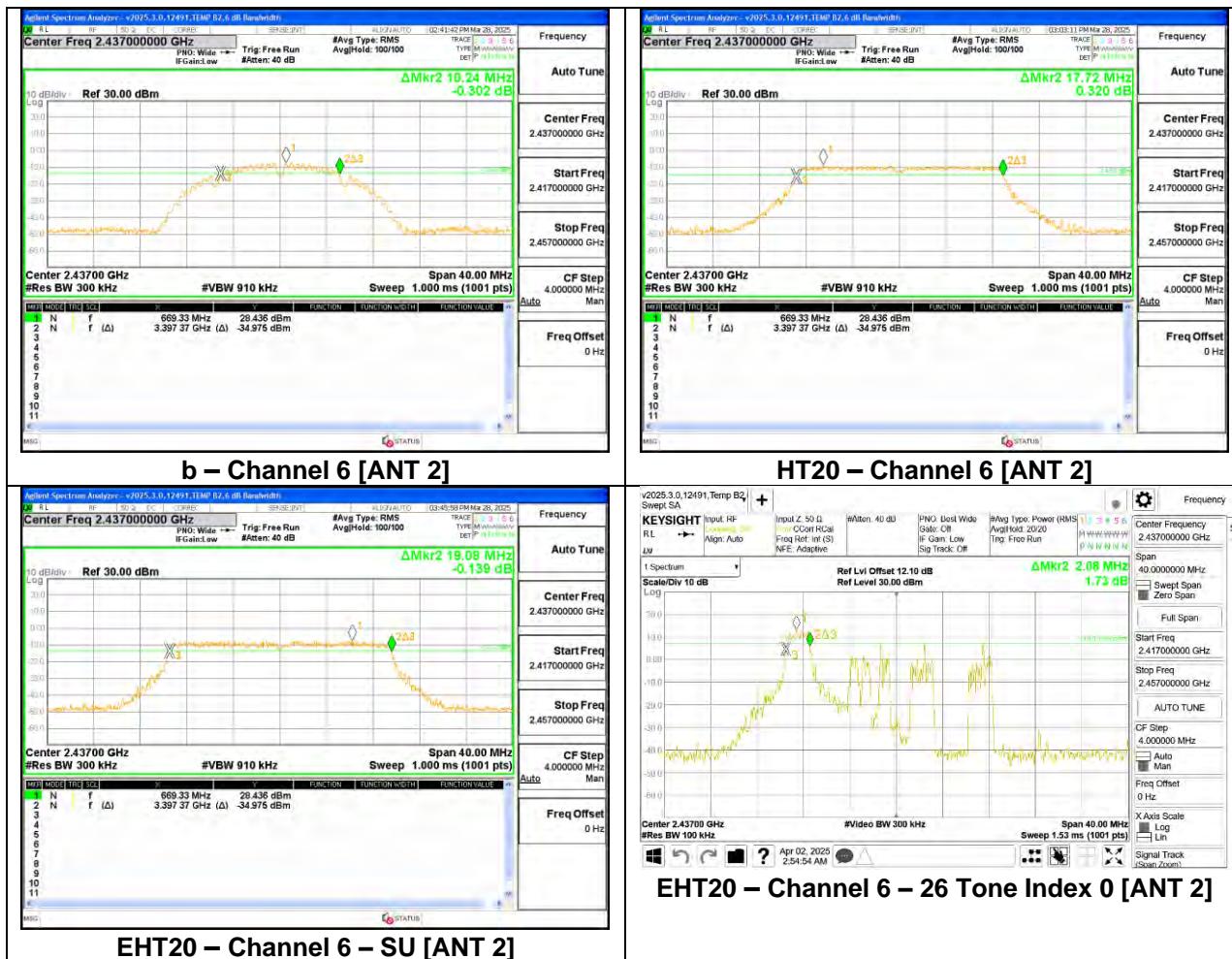
#### RESULTS

The 6dB bandwidth was measured for the narrowest bandwidth mode, b Mode and 11be Mode 26-Tones as worst case to demonstrate compliance with the minimum required bandwidth of 500 kHz to cover all OFDMA modes.

Only Mid channel plot is reported to show setting parameter complies with testing method/procedure.

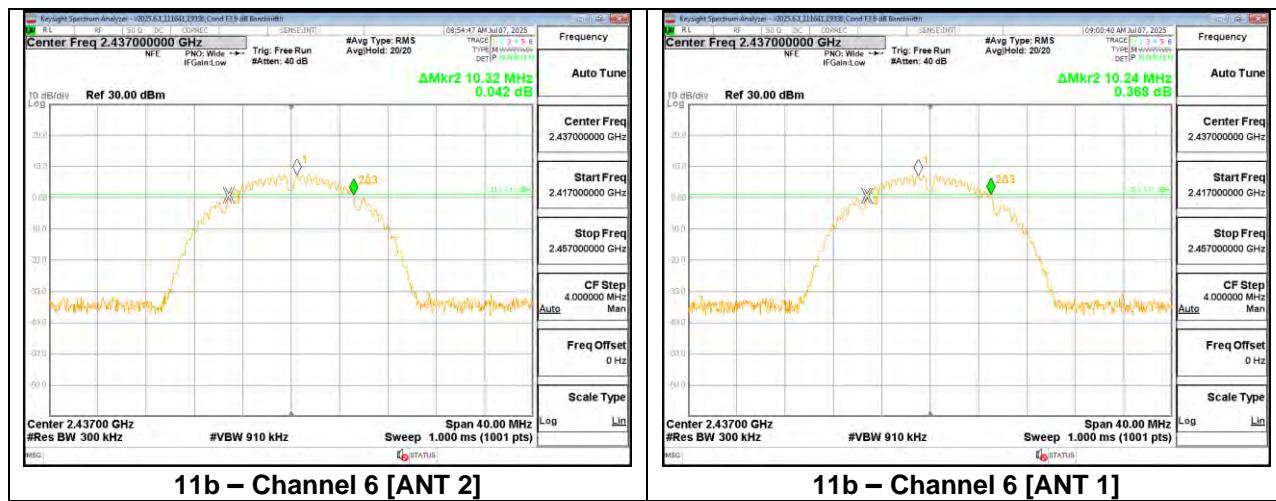
### 9.3.1. 802.11b/n/be SISO MODE

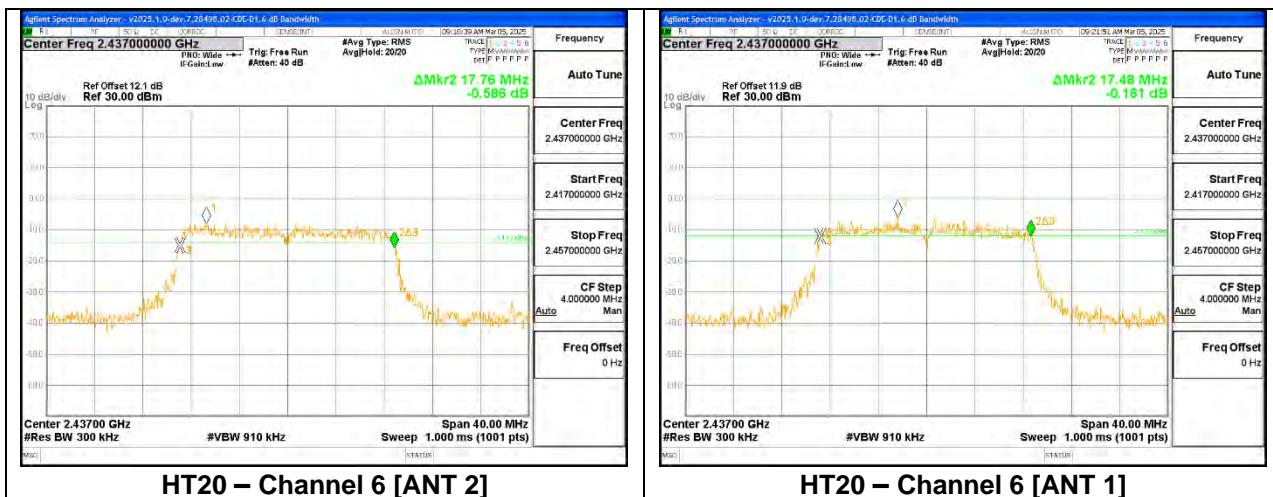
Mode (SISO)	Frequency (MHz)	Channel Number	Tone	RU Index	6dB Bandwidth (MHz)	
					ANT 2	ANT 1
<b>b</b>	2412	1	--	--	9.76	10.24
	2437	6	--	--	10.24	10.20
	2472	13	--	--	10.28	10.20
<b>HT20</b>	2412	1	--	--	17.60	17.76
	2437	6	--	--	17.72	17.72
	2472	13	--	--	17.80	17.52
<b>EHT20</b>	2412	1	SU	--	18.80	19.12
			26	0	2.08	2.12
				4	2.64	2.72
				8	2.12	2.04
	2437	6	SU	--	19.08	19.08
			26	0	2.08	2.04
				4	2.64	2.64
				8	2.12	2.16
	2472	13	SU	--	19.12	18.88
			26	0	2.08	2.04
				4	1.87	2.60
				8	2.00	2.08

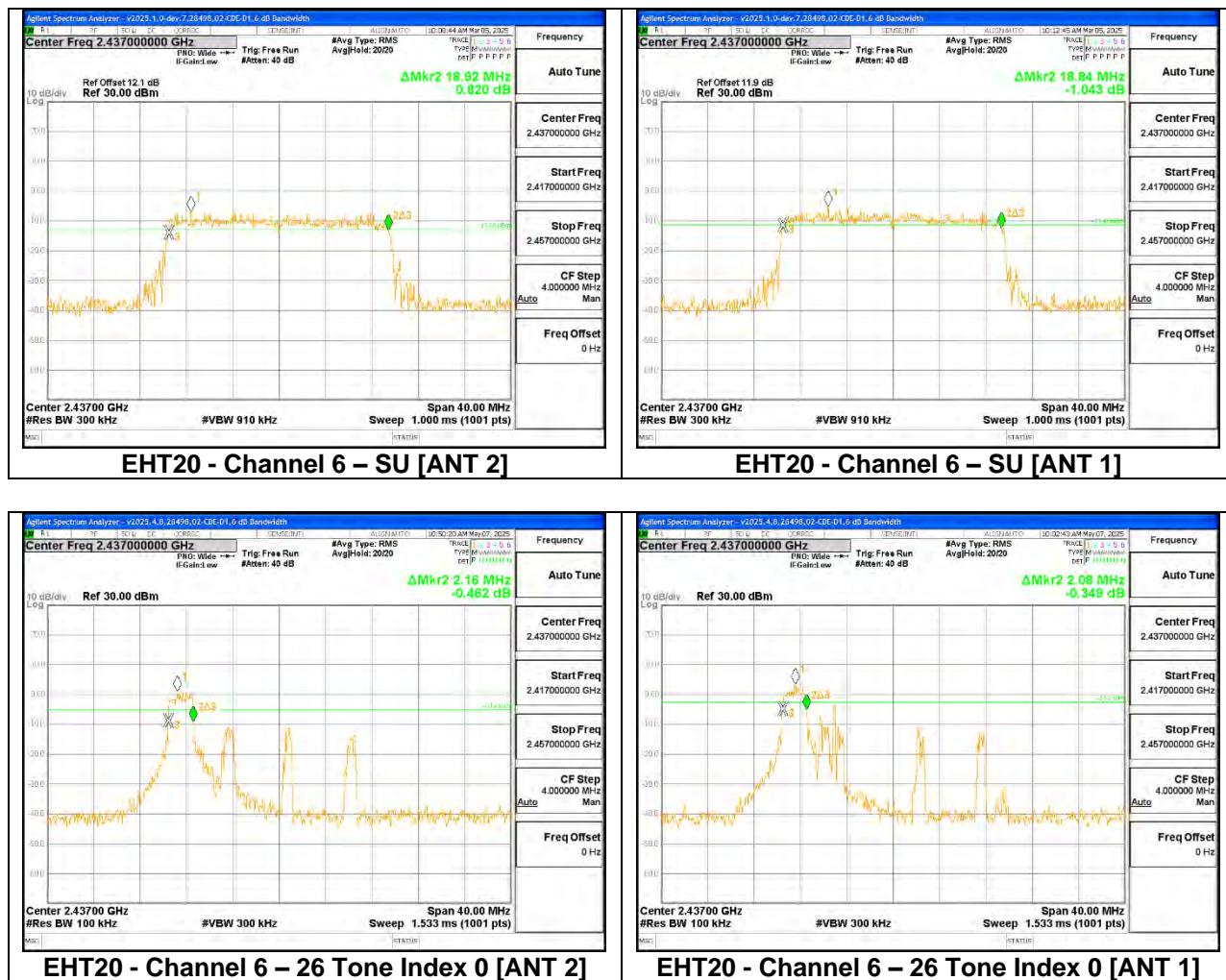


### 9.3.2. 802.11n/be MIMO CDD MODE

Mode (MIMO)	Frequency (MHz)	Channel Number	Tone	RU Index	6dB Bandwidth (MHz)	
					ANT 2	ANT 1
11b	2412	1	-	-	10.2	10.28
	2437	6	-	-	10.32	10.24
	2472	13	-	-	10.28	9.76
HT20	2412	1	--	--	17.52	17.56
	2437	6	--	--	17.76	17.48
	2472	13	--	--	17.64	17.64
EHT20	2412	1	SU	--	18.6	18.92
			26	0	2.08	2.00
				4	2.72	2.6
				8	2.08	2.08
	2437	6	SU	--	18.92	18.84
			26	0	2.16	2.08
				4	2.76	2.64
				8	2.08	2.16
	2472	13	SU	--	19.04	18.84
			26	0	2.08	2.08
				4	2.60	2.6
				8	2.08	2.12







## 9.4. OUTPUT POWER AND POWER SPECTRAL DENSITY

### LIMITS

FCC §15.247 (b) (3) & (e)

RSS-247 5.4 (d) & 5.2 (b)

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.

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.

### TEST PROCEDURE

Measurements are performed using a wideband RF power meter.

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

### RESULTS

Only the mid-channel plot is reported to show setting parameter complies with the testing method/procedure.

### DIRECTIONAL ANTENNA GAIN

For 1 TX:

There is only one transmitter output; the directional gain equals the 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:

Band (GHz)	ANT 2	ANT 1	Uncorrelated Chains Directional Gain (dBi)	Correlated Chains Directional Gain (dBi)
	Gain (dBi)	Gain (dBi)	Gain (dBi)	Gain (dBi)
2.40	-1.10	-3.10	-1.99	0.97

**DIRECTIONAL GAIN CALCULATION:**

ANSI C63.10-2020 section 14.4.3

$$\text{Uncorrelated Directional Gain} = 10 * \text{LOG} \left[ \frac{10^{\frac{\text{ANT2}}{10}} + 10^{\frac{\text{ANT1}}{10}}}{2} \right]$$

$$\text{Correlated Directional Gain} = 10 * \text{LOG} \left[ \frac{\left( 10^{\frac{\text{ANT2}}{20}} + 10^{\frac{\text{ANT1}}{20}} \right)^2}{2} \right]$$

Sample Calculation:

ANT 2 = -1.10 dB

ANT 1 = -3.10 dB

$$\text{Uncorrelated Directional Gain} = 10 * \text{LOG} \left[ \frac{10^{\frac{-1.10}{10}} + 10^{\frac{-3.1}{10}}}{2} \right] = .97 \text{ dBi}$$

$$\text{Correlated Directional Gain} = 10 * \text{LOG} \left[ \frac{\left( 10^{\frac{-1.10}{20}} + 10^{\frac{-3.1}{20}} \right)^2}{2} \right] = -1.99 \text{ dBi}$$

**RESULTS**

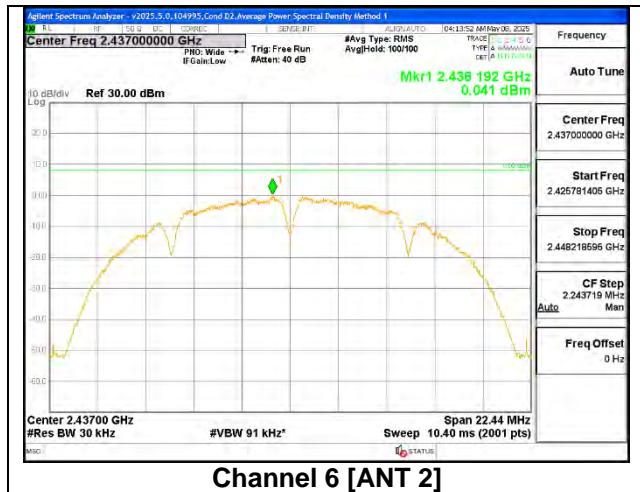
Only the mid-channel plot is reported to show setting parameters complied with the testing method/procedure.

Note: RBW setting is used greater than 3 kHz on PSD measurement

### 9.4.1. 802.11b SISO MODE

DCCF (dB)	0.00
ANT 2 (dBi)	-1.10
ANT 1 (dBi)	-3.10

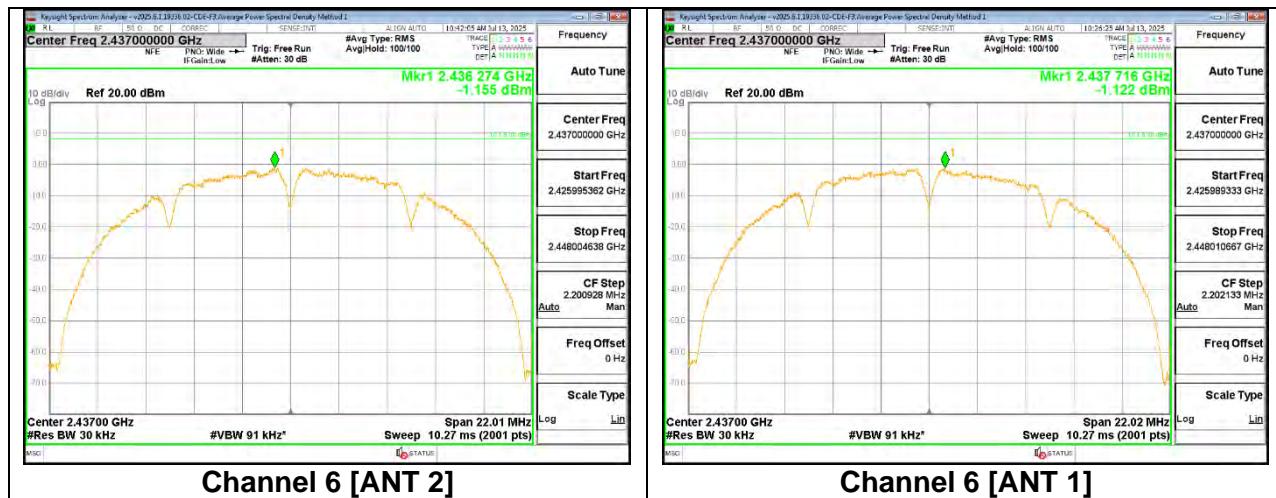
Mode (SISO)	Freq (MHz)	Ch. #	Power		Output Power		Total		PSD		PSD		Total	
			ANT 2	ANT 1	ANT 2	ANT 1	ANT 2	ANT 1	ANT 2	ANT 1	ANT 2	ANT 1	ANT 2	ANT 1
b	2412	1	30.00	30.00	20.91	21.16	20.91	21.16	8.000	8.000	0.250	1.039	0.250	1.039
	2437	6			20.76	21.19	20.76	21.19			0.041	1.106	0.041	1.106
	2472	13			20.44	20.93	20.44	20.93			-0.384	1.066	-0.384	1.066



### 9.4.2. 802.11b MIMO MODE

DCCF (dB)	0.00
Uncorrelated Gain	0.97
Correlated Gain	-1.99

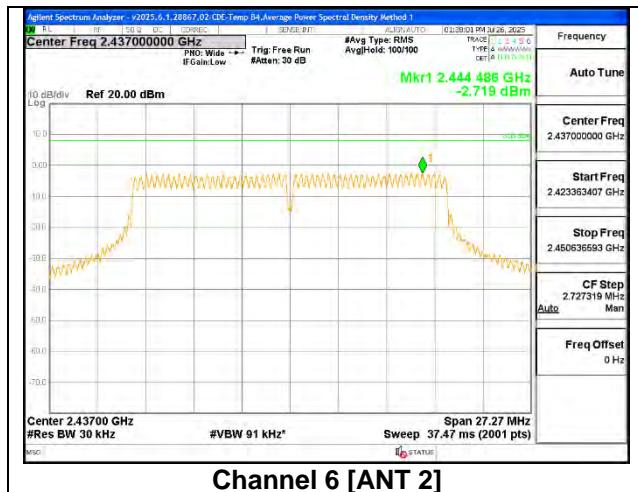
Mode (SISO)	Freq (MHz)	Ch. #	Power Limit (dBm)	Output Power (Gated) (dBm)		Total MIMO Corrected Power (dBm)	PSD Limit (dBm/3kHz)	PSD (dBm/kHz)		Total Corrected PSD (dBm/kHz)
				ANT 2	ANT 1			ANT 2	ANT 1	
11b	2412	1	30.00	20.41	20.45	23.44	8.000	-1.629	-1.525	1.434
	2437	6		20.97	20.99	23.99		-1.155	-1.122	1.872
	2472	13		19.49	19.43	22.47		-1.742	-1.937	1.172



### 9.4.3. 802.11n HT20 SISO MODE

DCCF (MCS0) (dB)	0.00
ANT 2 (dBi)	-1.10
ANT 1 (dBi)	-3.10

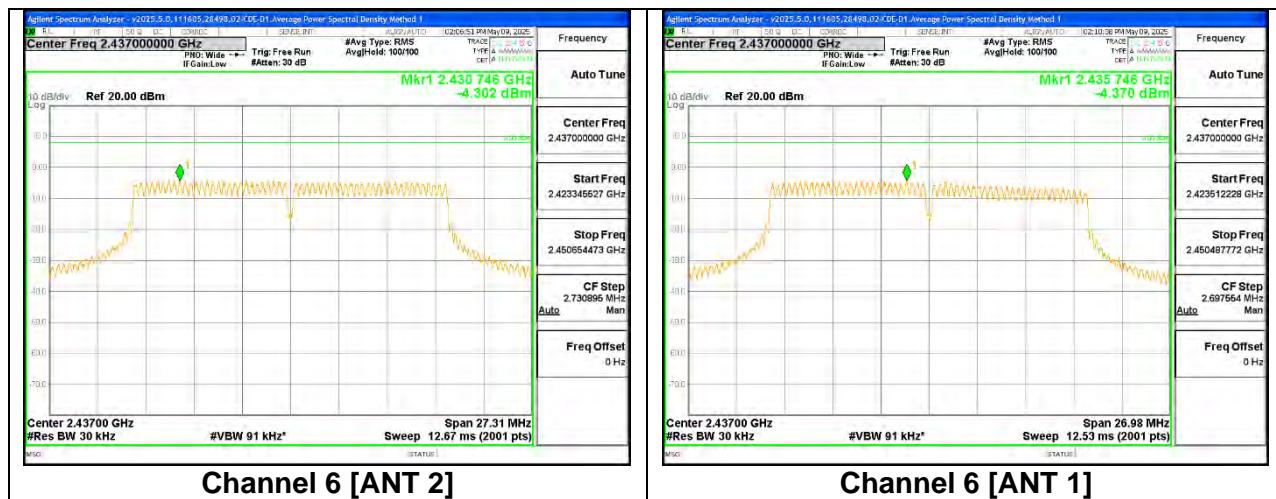
Mode (SISO)	Freq (MHz)	Ch. #	Power Limit (dBm)		Output Power (Gated) (dBm)		Total Corrected Power (dBm)		PSD Limit (dBm/3kHz)		PSD (dBm/kHz)		Total Corrected PSD (dBm/kHz)	
			ANT 2	ANT 1	ANT 2	ANT 1	ANT 2	ANT1	ANT 2	ANT 1	ANT 2	ANT 1	ANT 2	ANT 1
HT20	2412	1	30.00	30.00	17.45	17.95	17.45	17.95	8.000	8.000	-6.353	-6.066	-6.353	-6.066
	2417	2			20.43	20.96	20.43	20.96			-3.063	-3.148	-3.063	-3.148
	2437	6			20.98	21.18	20.98	21.18			-2.719	-2.833	-2.719	-2.833
	2457	10			20.34	20.92	20.34	20.92			-3.086	-3.710	-3.086	-3.710
	2462	11			18.48	18.94	18.48	18.94			-4.889	-5.391	-4.889	-5.391
	2467	12			16.47	16.98	16.47	16.98			-6.631	-7.052	-6.631	-7.052
	2472	13			14.99	15.48	14.99	15.48			-8.408	-8.861	-8.408	-8.861



#### 9.4.4. 802.11n HT20 MIMO MODE

DCCF (MCS0) (dB)	0.00
Uncorrelated Gain	0.97
Correlated Gain	-1.99

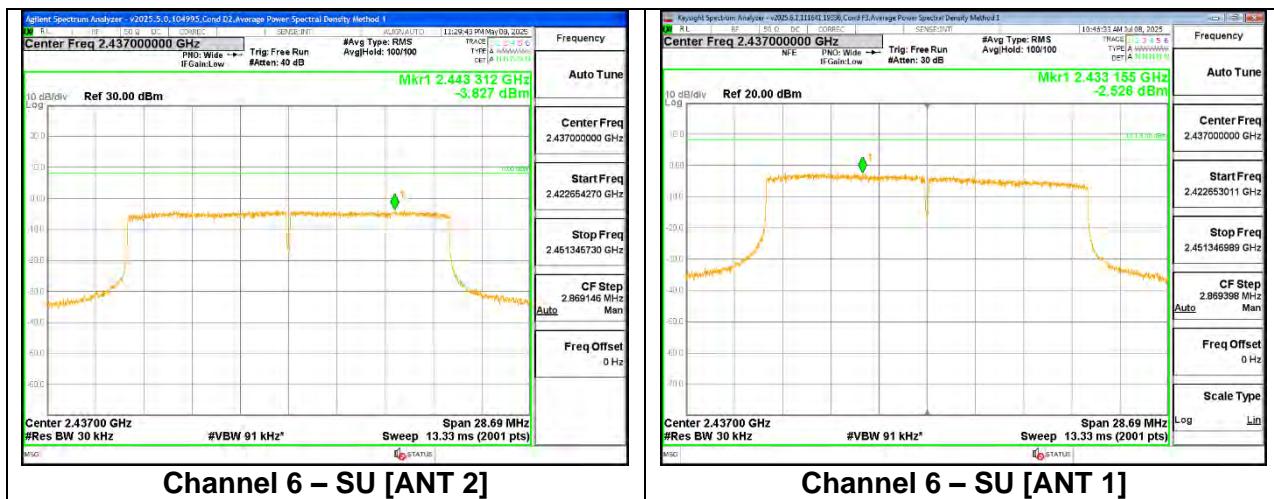
Mode (SISO)	Freq (MHz)	Ch. #	Power Limit (dBm)	Output Power (Gated) (dBm)		Total MIMO Corrected Power (dBm)	PSD Limit (dBm/3kHz)	PSD (dBm/kHz)		Total Corrected PSD (dBm/kHz)
				ANT 2	ANT 1			ANT 2	ANT 1	
HT20	2412	1	30.00	16.94	16.96	19.96	8.000	-7.831	-8.183	-4.993
	2417	2		19.43	19.46	22.46		-5.031	-5.185	-2.097
	2437	6		20.92	20.99	23.97		-4.302	-4.370	-1.326
	2457	10		19.47	19.47	22.48		-4.673	-4.927	-1.788
	2462	11		17.49	17.48	20.50		-7.018	-7.026	-4.012
	2467	12		14.94	14.85	17.91		-8.533	-8.992	-5.746
	2472	13		14.47	14.49	17.49		-9.908	-10.376	-7.125

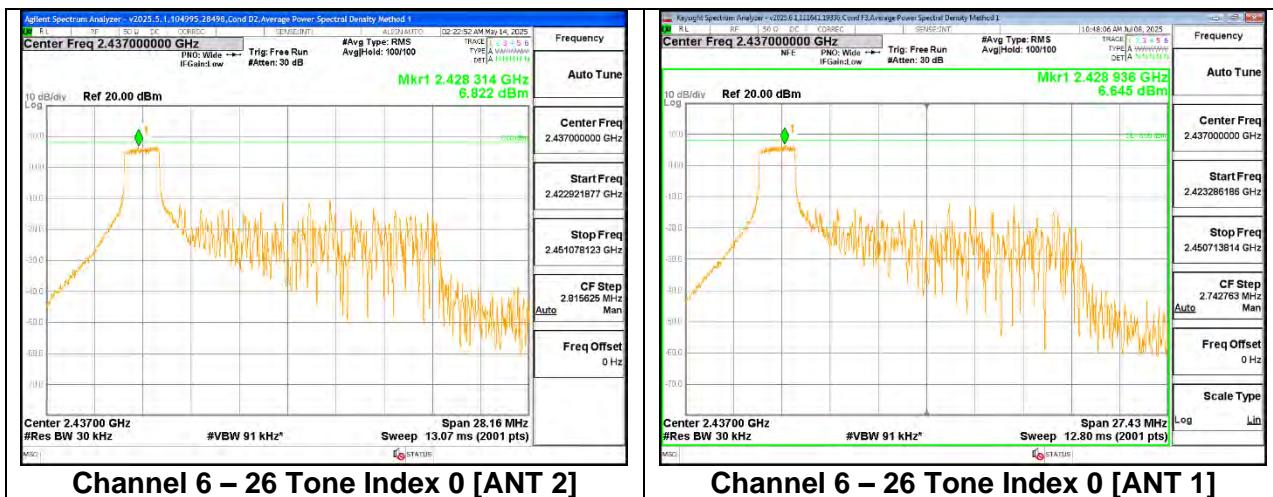


### 9.4.5. 802.11be EHT20 SISO MODE

	SU	26 Tone
DCCF (MCS0) (dB)	0.00	0.10
ANT 2 (dBi)	-1.10	
ANT 1 (dBi)	-3.10	

Mode (SISO)	Freq (MHz)	Ch. #	Tone	RU Index	Power Limit (dBm)		Output Power (Gated) (dBm)		Total Corrected Power (dBm)		PSD Limit (dBm/3kHz)		PSD (dBm/kHz)		Total Corrected PSD (dBm/kHz)	
					ANT 2	ANT 1	ANT 2	ANT 1	ANT 2	ANT 1	ANT 2	ANT 1	ANT 2	ANT 1	ANT 2	ANT 1
EHT20	2412	1	SU	-	30.00	30.00	16.95	17.48	16.95	17.48	8.000	8.000	-7.497	-6.709	-7.497	-6.709
				0			15.92	16.48	15.92	16.48			0.726	1.925	0.826	2.025
				4			15.95	16.50	15.95	16.50			0.411	0.880	0.511	0.980
				8			15.98	16.45	15.98	16.45			0.702	1.148	0.802	1.248
	2417	2	SU	-			18.98	19.44	18.98	19.44			-5.664	-4.136	-5.664	-4.136
				0			17.88	18.44	17.88	18.44			2.575	3.491	2.675	3.591
				4			17.90	18.42	17.90	18.42			2.470	2.876	2.570	2.976
				8			17.79	18.48	17.79	18.48			2.508	4.038	2.608	4.138
	2422	3	SU	-			20.99	21.17	20.99	21.17			-3.918	-2.570	-3.918	-2.570
				0			19.99	20.49	19.99	20.49			5.513	5.416	5.613	5.516
				4			19.95	20.48	19.95	20.48			5.488	5.349	5.588	5.449
				8			19.79	20.45	19.79	20.45			5.433	5.429	5.533	5.529
	2437	6	SU	-			20.99	21.18	20.99	21.18			-3.827	-2.526	-3.827	-2.526
				0			20.98	21.14	20.98	21.14			6.822	6.645	6.922	6.745
				4			20.90	21.18	20.90	21.18			6.547	6.215	6.647	6.315
				8			20.84	21.16	20.84	21.16			6.703	6.824	6.803	6.924
	2452	9	SU	-			20.99	21.20	20.99	21.20			-3.736	-2.407	-3.736	-2.407
				0			19.91	20.48	19.91	20.48			4.680	3.655	4.780	3.755
				4			19.94	20.47	19.94	20.47			4.521	3.797	4.621	3.897
				8			19.78	20.49	19.78	20.49			4.775	3.924	4.875	4.024
	2457	10	SU	-			18.97	19.40	18.97	19.40			-5.750	-3.914	-5.750	-3.914
				0			17.93	18.49	17.93	18.49			2.766	3.655	2.866	3.755
				4			17.97	18.42	17.97	18.42			2.778	3.797	2.878	3.897
				8			17.99	18.47	17.99	18.47			3.028	3.924	3.128	4.024
	2462	11	SU	-			16.97	17.45	16.97	17.45			-7.516	-6.742	-7.516	-6.742
				0			15.99	16.47	15.99	16.47			0.542	1.581	0.642	1.681
				4			15.96	16.50	15.96	16.50			0.427	1.480	0.527	1.580
				8			15.97	16.43	15.97	16.43			0.344	1.429	0.444	1.529
	2467	12	SU	-			14.95	15.42	14.95	15.42			-9.101	-8.018	-9.101	-8.018
				0			13.85	14.49	13.85	14.49			-1.527	-0.205	-1.427	-0.105
				4			13.81	14.46	13.81	14.46			1.577	-0.116	1.677	-0.016
				8			13.97	14.42	13.97	14.42			-1.592	-0.630	-1.492	-0.530
	2472	13	SU	-			9.94	10.44	9.94	10.44			-14.432	-12.603	-14.432	-12.603
				0			0.96	1.45	0.96	1.45			-14.415	-12.844	-14.315	-12.744
				4			0.99	1.47	0.99	1.47			-14.617	-12.337	-14.517	-12.237
				8			0.96	1.46	0.96	1.46			-14.455	-13.235	-14.355	-13.135

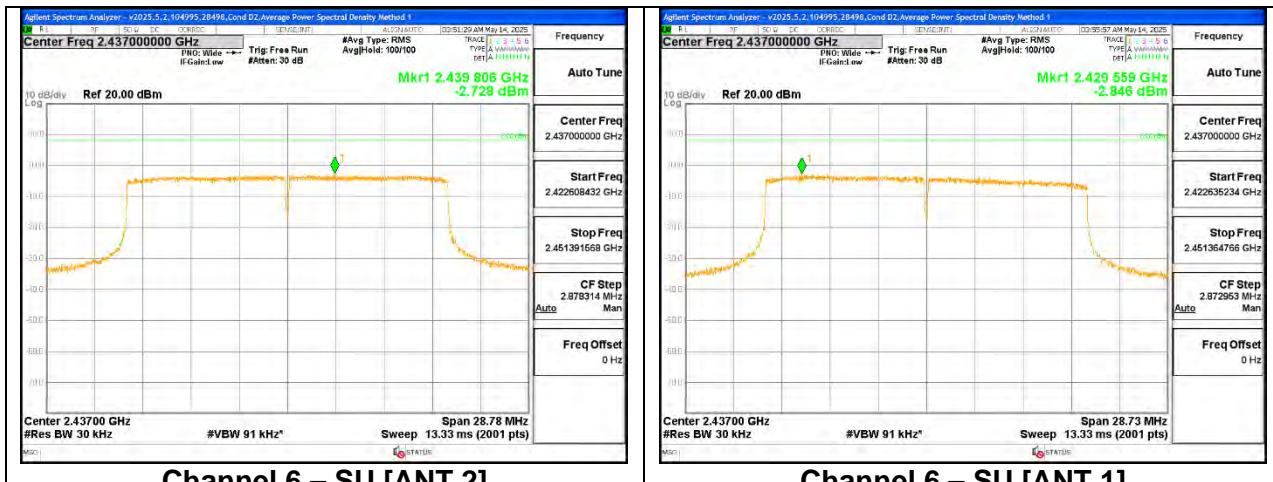




#### 9.4.6. 802.11be EHT20 MIMO MODE

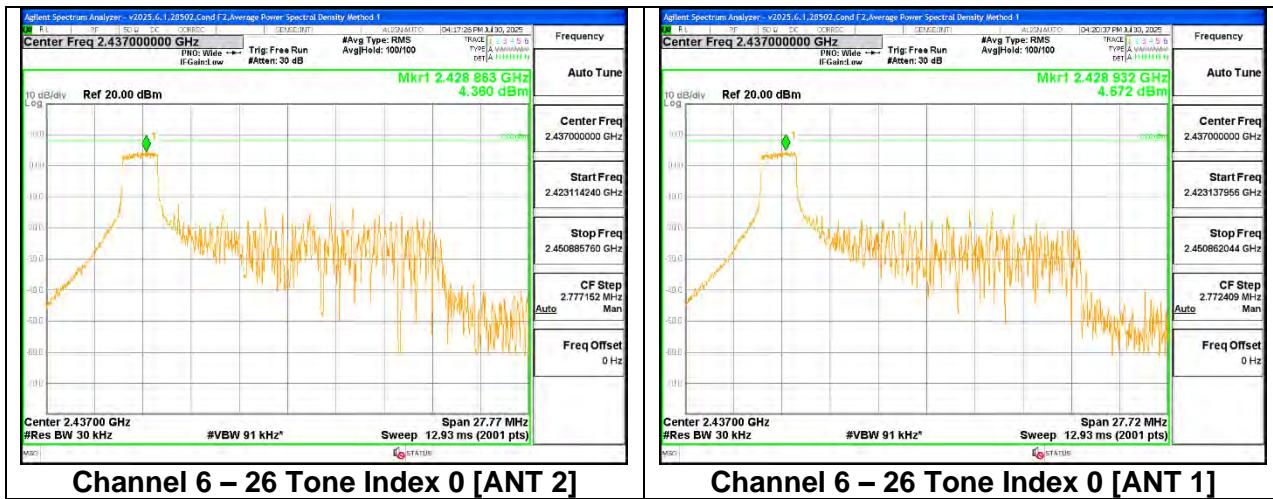
	SU	26 Tone
DCCF (MCS0) (dB)	0.00	0.10
Uncorrelated Gain	0.97	0.97
Correlated Gain	-1.99	-1.99

Mode (MIMO)	Freq (MHz)	Ch. #	Tone	RU Index	Power Limit (dBm)	Output Power (Gated) (dBm)		Total MIMO Corrected Power (dBm)	PSD Limit (dBm/3kHz)	PSD (dBm/kHz)		Total Corrected PSD (dBm/kHz)
						ANT 2	ANT 1			ANT 2	ANT 1	
						ANT 2	ANT 1			ANT 2	ANT 1	
EHT20	2412	1	SU	--	30.00	15.96	15.73	18.86	8.000	-7.302	-7.814	-4.540
				0		14.78	14.99	17.90		-1.148	-0.979	2.048
				4		14.90	14.97	17.95		-1.021	-1.096	2.052
				8		14.99	14.93	17.97		-0.900	-0.863	2.229
	2417	2	SU	--		17.98	17.99	21.00		-5.336	-5.436	-2.375
				0		16.99	16.95	19.98		1.032	-0.232	3.556
				4		16.90	16.98	19.95		1.334	0.119	3.879
				8		16.95	16.99	19.98		1.114	-0.211	3.612
	2422	3	SU	--		19.99	19.98	23.00		-3.335	-3.665	-0.487
				0		18.93	18.97	21.96		3.081	3.066	6.184
				4		18.99	18.99	22.00		3.082	2.973	6.138
				8		18.94	18.93	21.95		3.004	3.336	6.283
	2427	4	26T	0		20.96	20.98	23.98		4.365	4.867	7.734
				4		20.78	20.98	23.89		3.654	4.940	7.455
				8		20.94	20.89	23.93		3.987	4.568	7.398
	2437	6	SU	--		20.81	20.98	23.91		-2.728	-2.846	0.224
				0		20.97	20.91	23.95		4.360	4.672	7.629
				4		20.94	20.74	23.85		4.265	3.269	6.906
				8		20.84	20.98	23.92		4.422	3.571	7.128
	2447	8	26	0		20.98	20.98	23.99		4.109	4.234	7.282
				4		20.82	20.99	23.92		4.113	3.489	6.922
				8		20.94	20.99	23.98		4.500	3.682	7.221
	2452	9	SU	--		19.49	19.49	22.50		-3.899	-4.095	-0.986
				0		18.46	18.47	21.48		3.011	2.304	5.782
				4		18.48	18.49	21.50		2.644	1.634	5.279
				8		18.49	18.45	21.48		2.888	2.947	6.028
	2457	10	SU	--		17.98	17.98	20.99		-5.388	-5.721	-2.541
				0		16.99	16.96	19.99		1.254	0.474	3.992
				4		16.97	16.86	19.93		0.937	0.577	3.871
				8		16.95	16.98	19.98		1.449	0.494	4.108
	2462	11	SU	--		15.95	15.98	18.98		-7.019	-7.479	-4.233
				0		14.89	14.96	17.94		-0.938	-1.302	1.994
				4		14.98	14.98	17.99		-0.819	-0.926	2.238
				8		14.99	14.99	18.00		-1.011	-0.820	2.196
	2467	12	SU	--		13.46	13.48	16.48		-9.243	-9.999	-6.594
				0		12.41	12.45	15.44		-3.443	-3.524	-0.373
				4		12.48	12.49	15.50		-3.387	-2.885	-0.018
				8		12.47	12.48	15.49		-3.449	-3.523	-0.376
	2472	13	SU	--		8.98	8.90	11.95		-13.804	-14.052	-10.916
				0		-0.05	-0.02	2.98		-15.520	-16.269	-12.768
				4		-0.16	-0.09	2.89		-16.096	-16.166	-13.021
				8		-0.02	-0.01	3.00		-15.392	-15.981	-12.566



Channel 6 - SU [ANT 2]

Channel 6 - SU [ANT 1]



Channel 6 - 26 Tone Index 0 [ANT 2]

Channel 6 - 26 Tone Index 0 [ANT 1]

## 9.5. CONDUCTED SPURIOUS EMISSIONS

### LIMITS

FCC §15.247 (d)

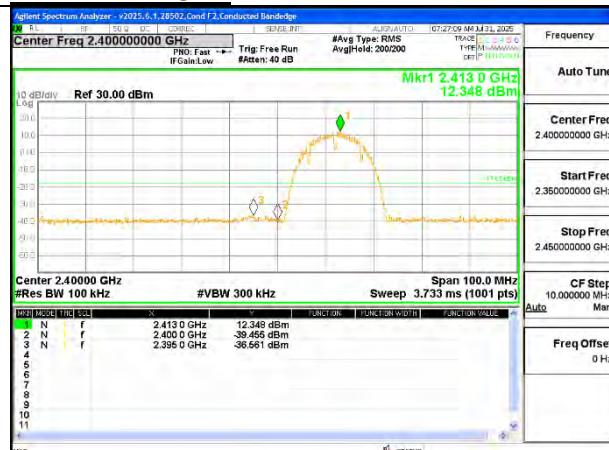
RSS-247 5.5

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

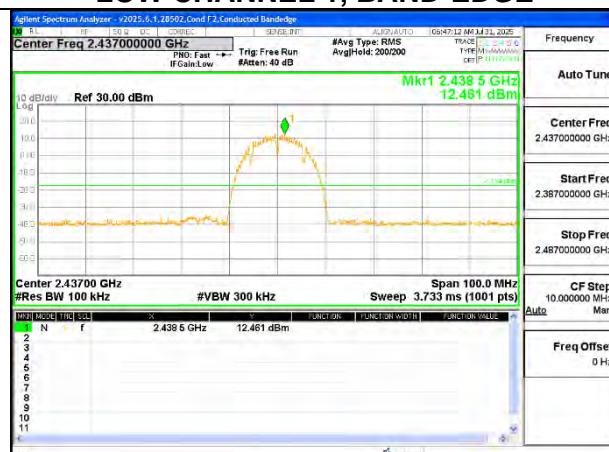
### RESULTS

### 9.5.1. 802.11b MODE 1TX

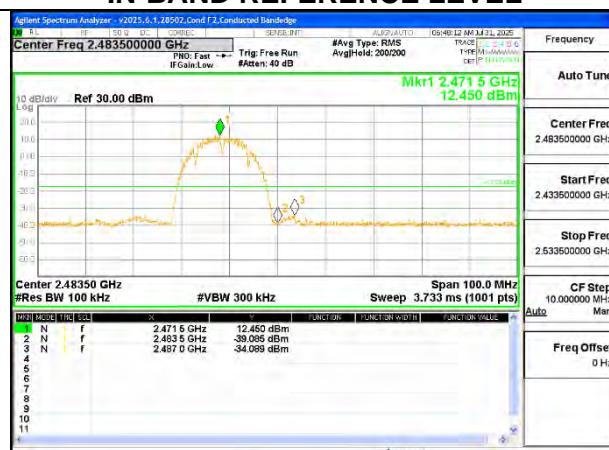
## 1TX ANT 2 MODE



## LOW CHANNEL 1. BAND-EDGE



## IN-BAND REFERENCE LEVEL



4G STATUS



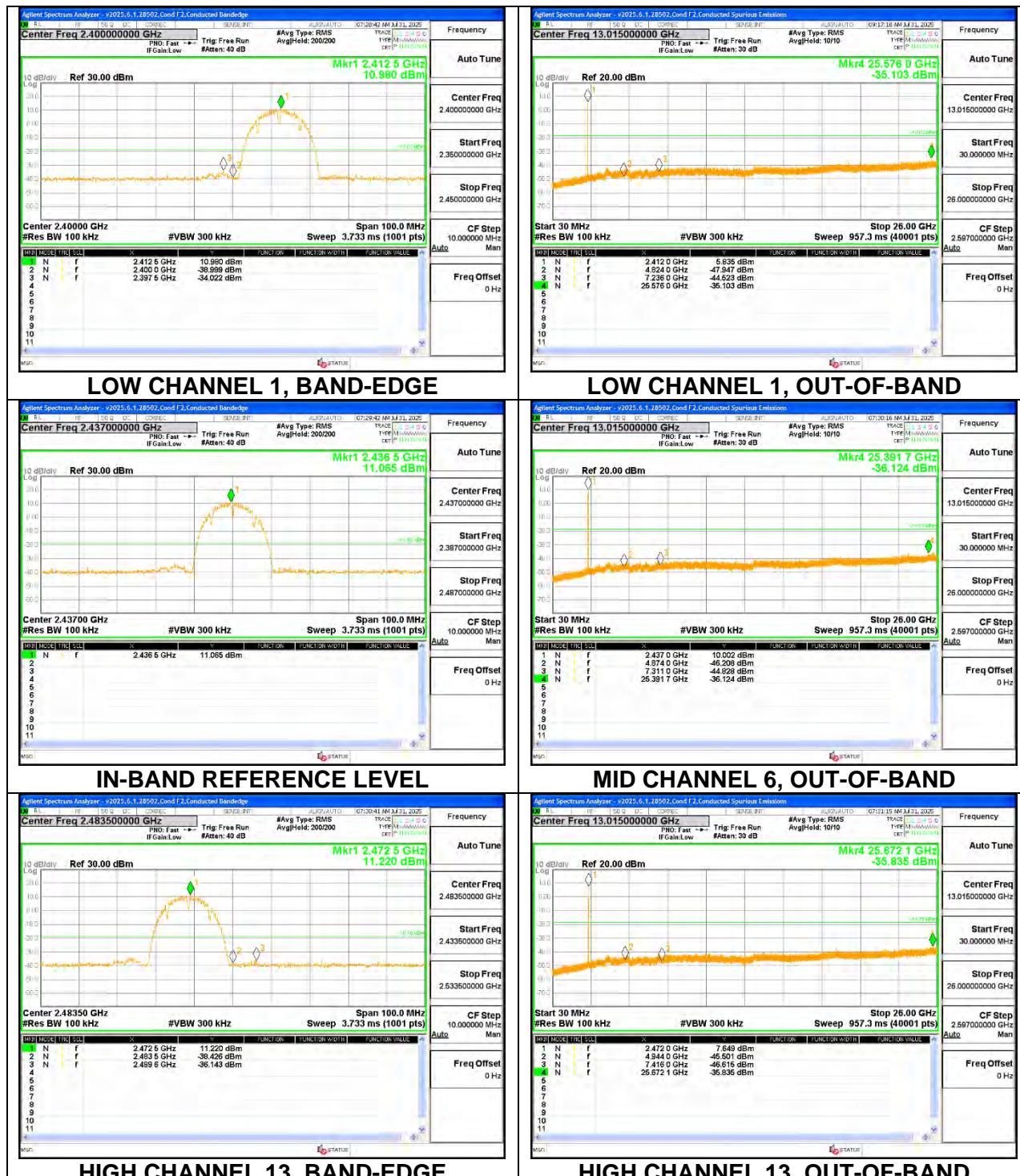
## LOW CHANNEL 1. OUT-OF-BAND



#### **MID CHANNEL 6. OUT-OF-BAND**

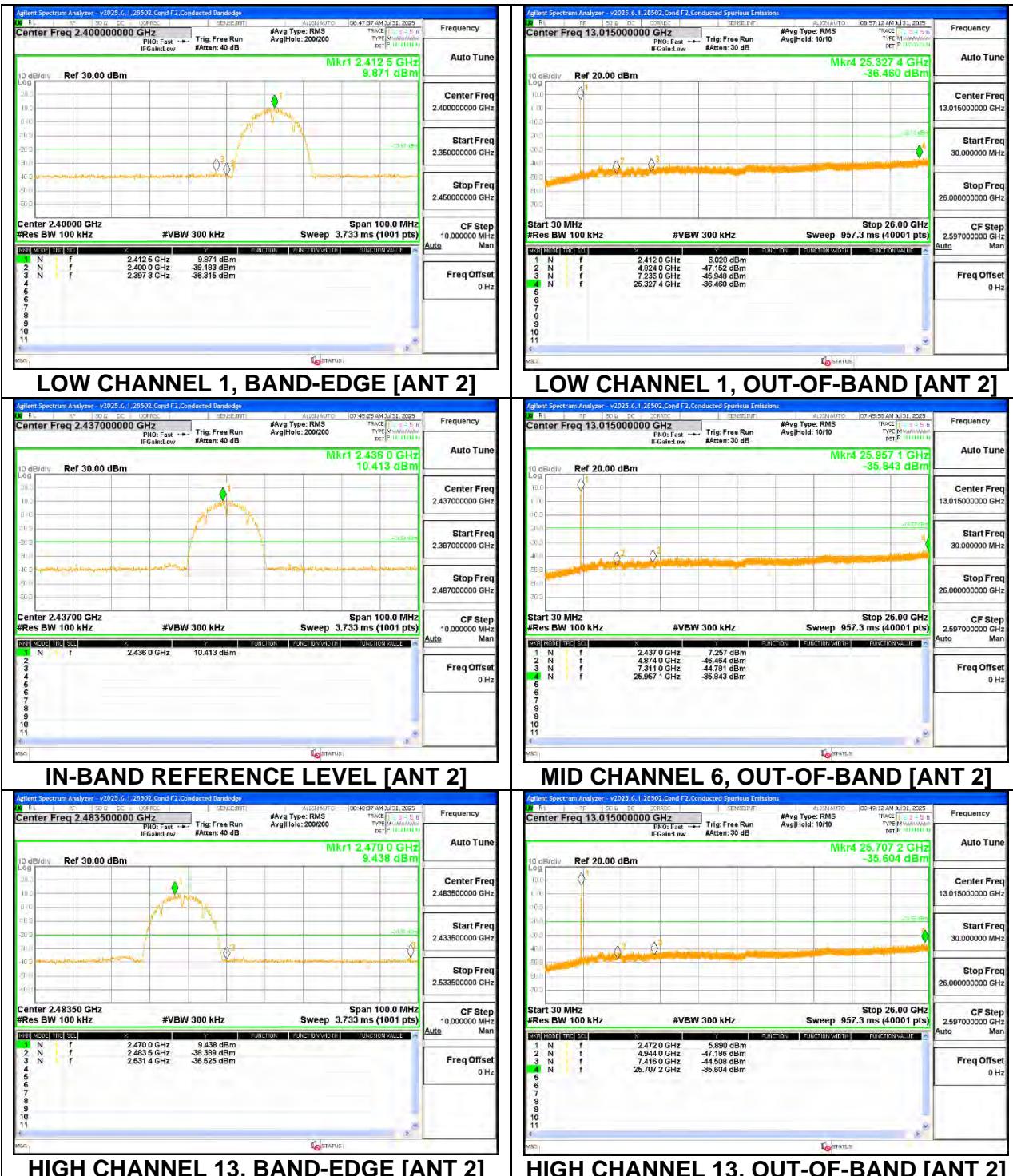


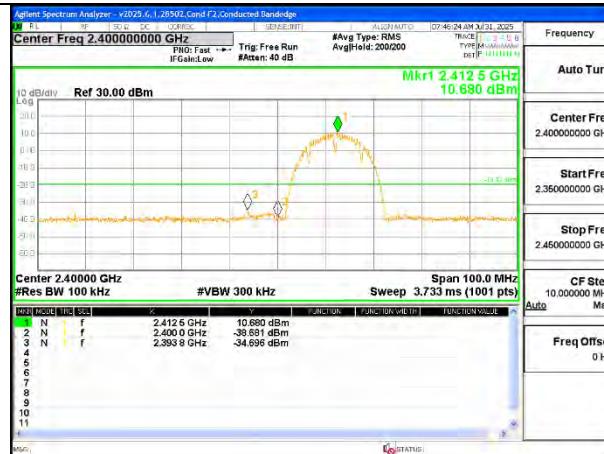
HIGH CHANNEL 13 OUT-OF-BAND

**1TX ANT 1 MODE**

## 9.5.2. 802.11b CDD MODE 2TX

### ANT 2 + ANT 1 2TX MODE

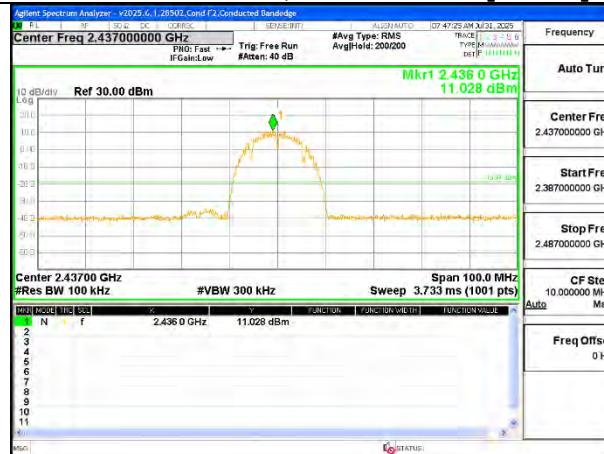




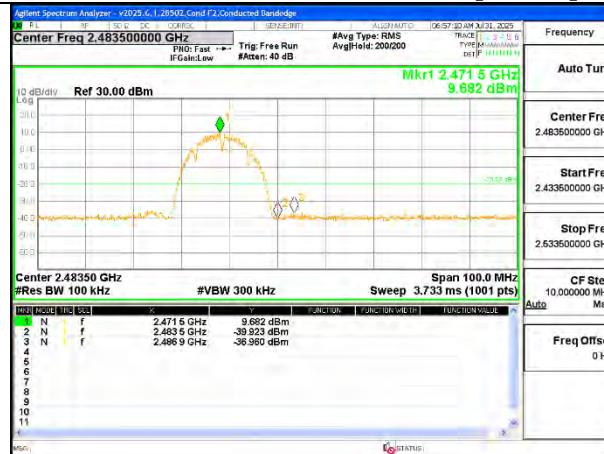
## LOW CHANNEL 1, BAND-EDGE [ANT 1]



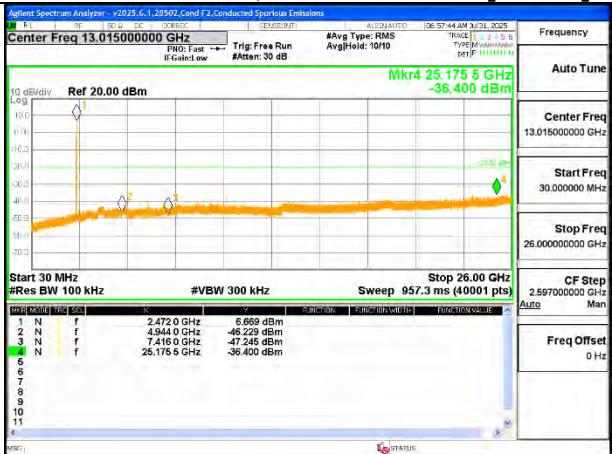
## LOW CHANNEL 1, OUT-OF-BAND [ANT 1]



## IN-BAND REFERENCE LEVEL [ANT 1]



## MID CHANNEL 6, OUT-OF-BAND [ANT 1]

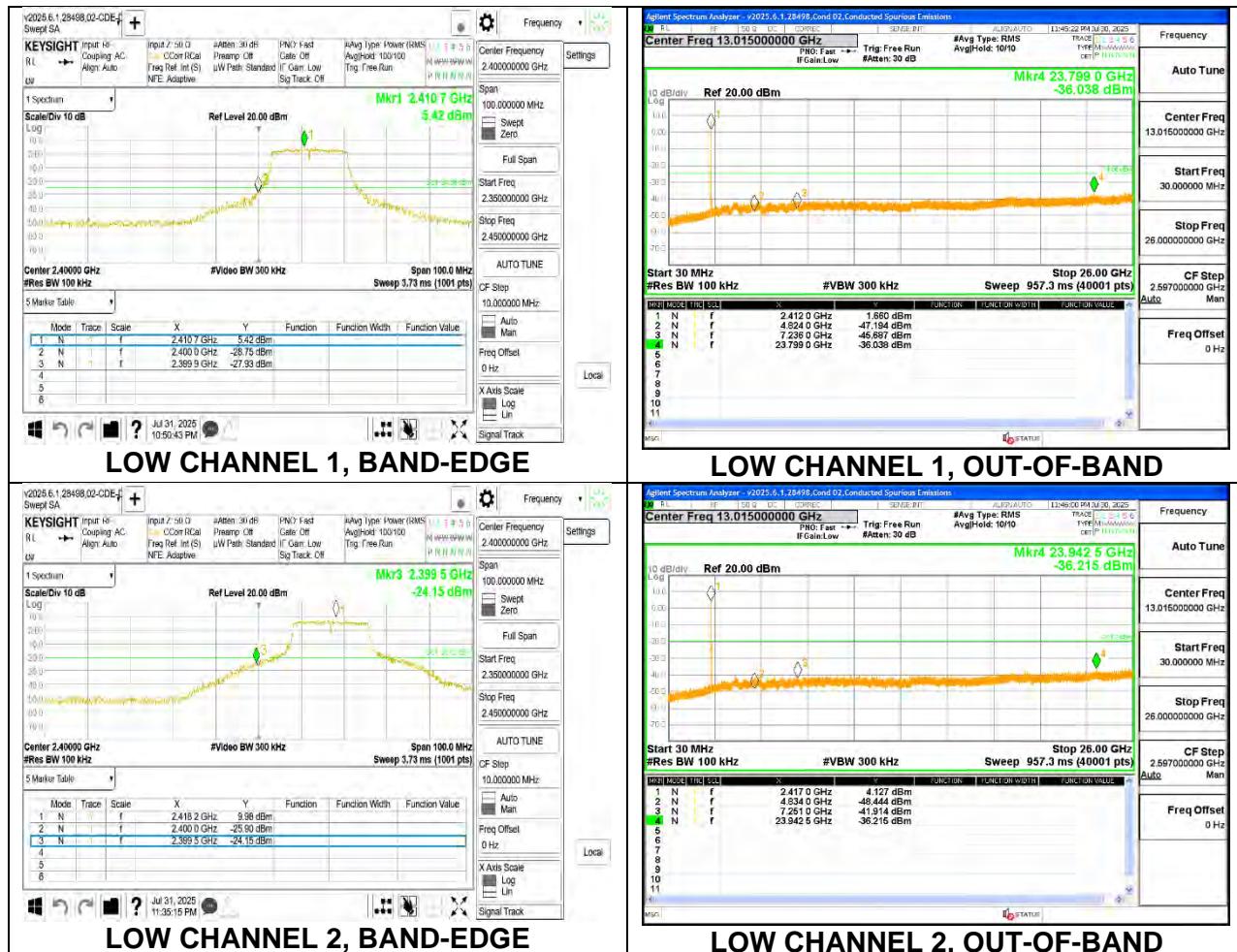


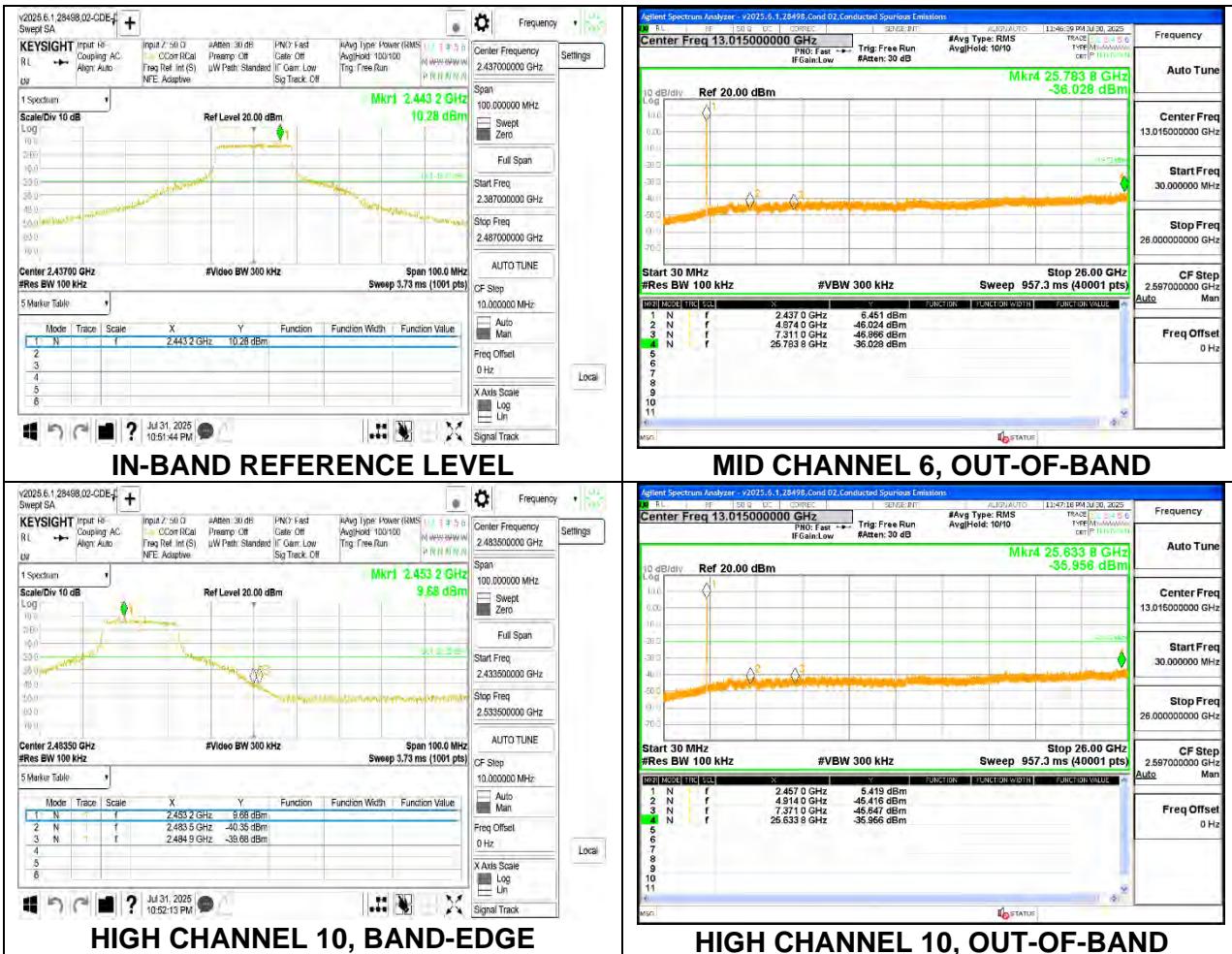
## HIGH CHANNEL 13, BAND-EDGE [ANT 1]

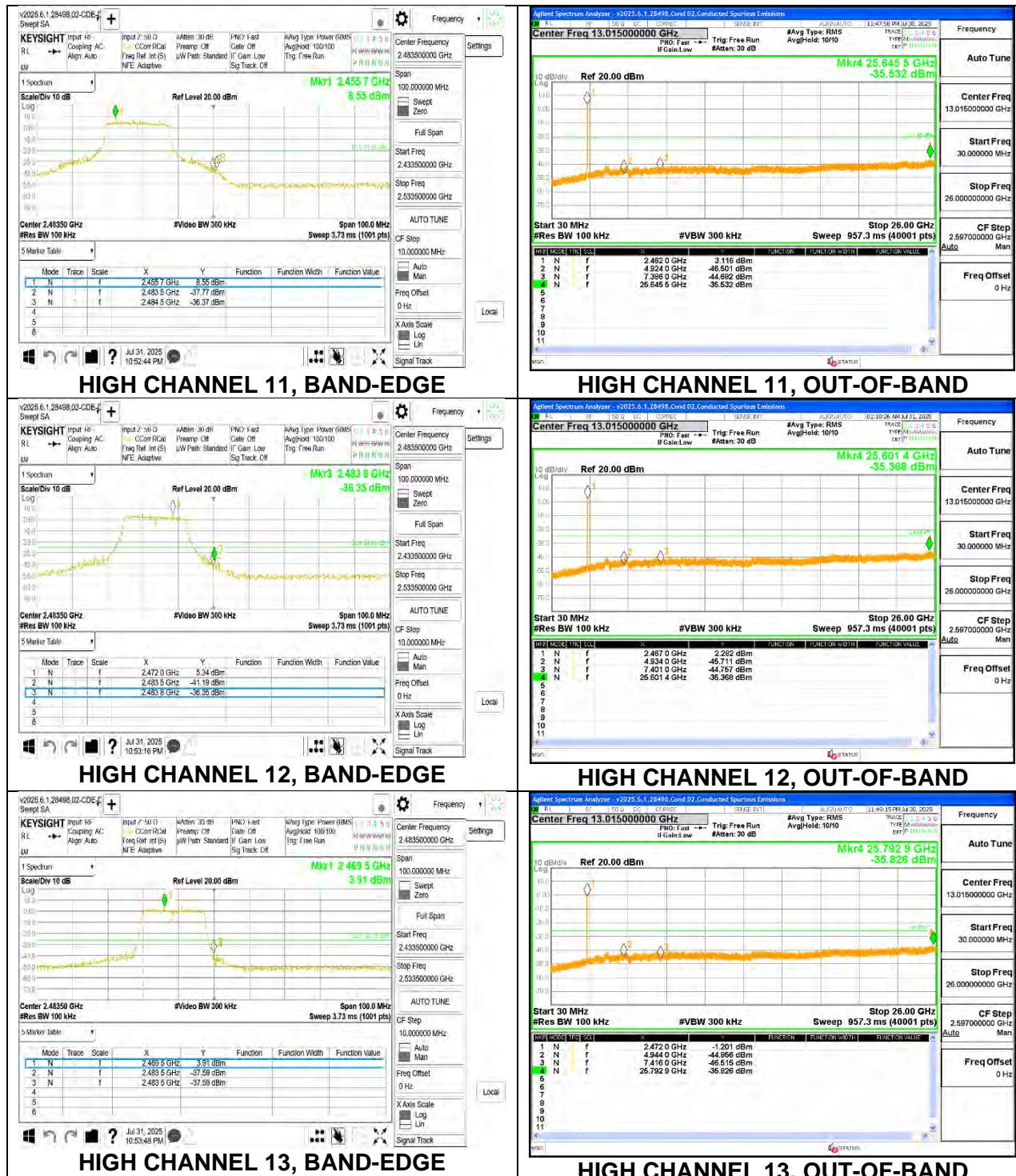
## HIGH CHANNEL 13, OUT-OF-BAND [ANT 1]

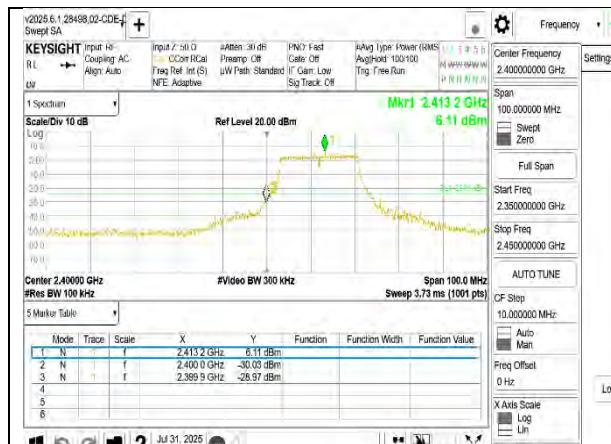
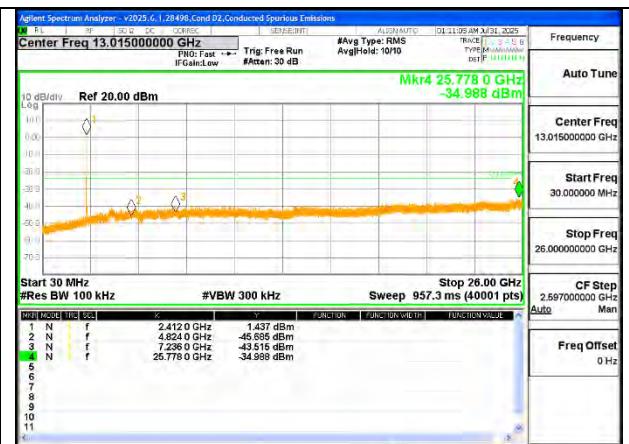
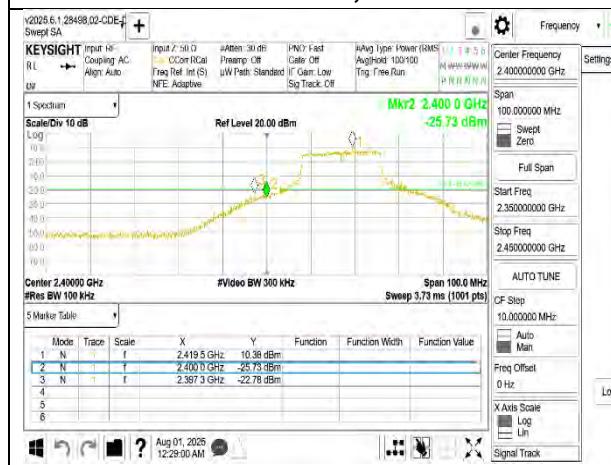
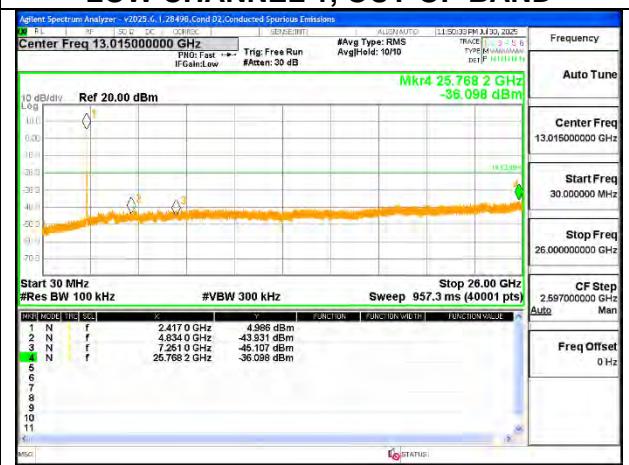
### 9.5.3. 802.11n HT20 SISO MODE

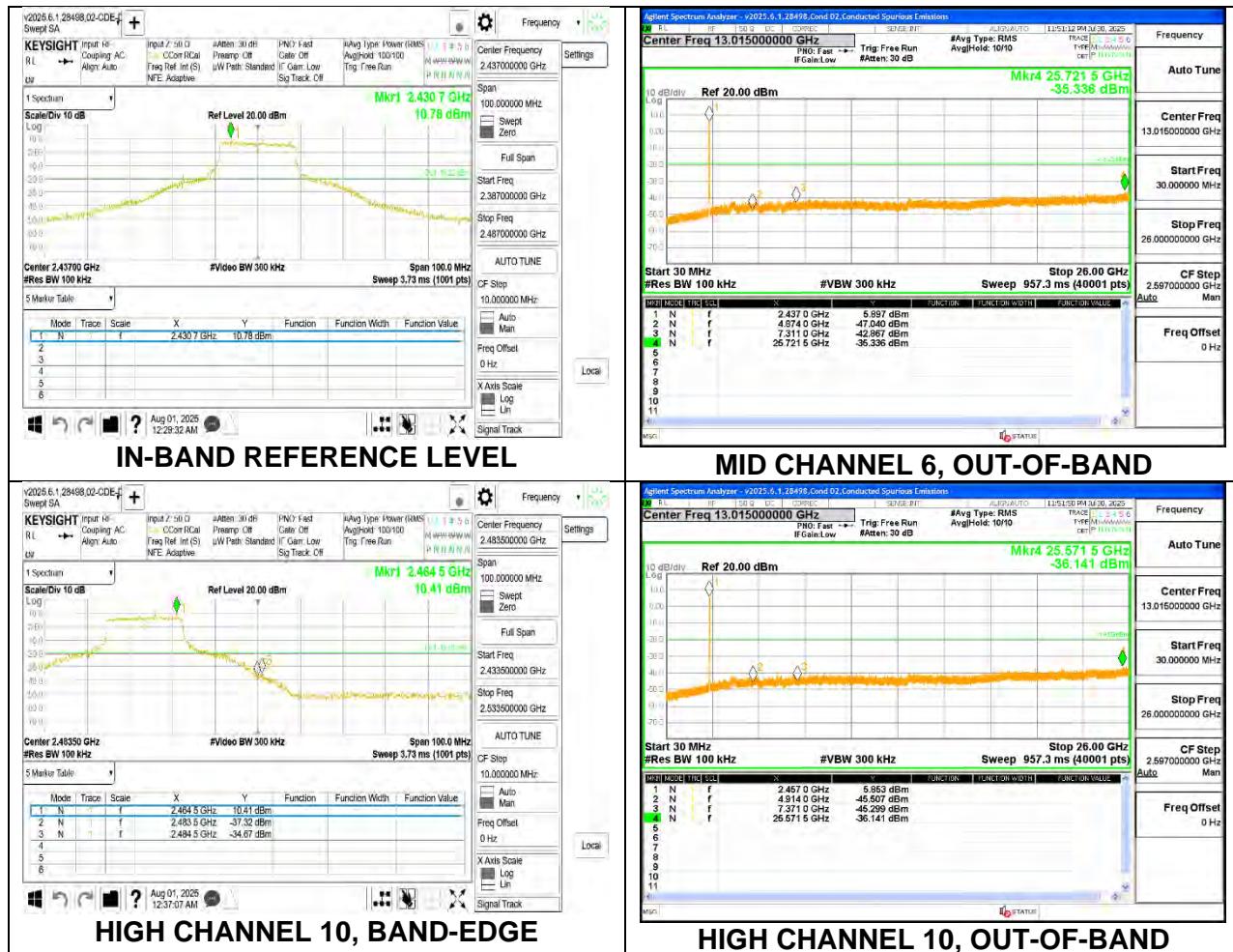
#### 1TX ANT 2 MODE

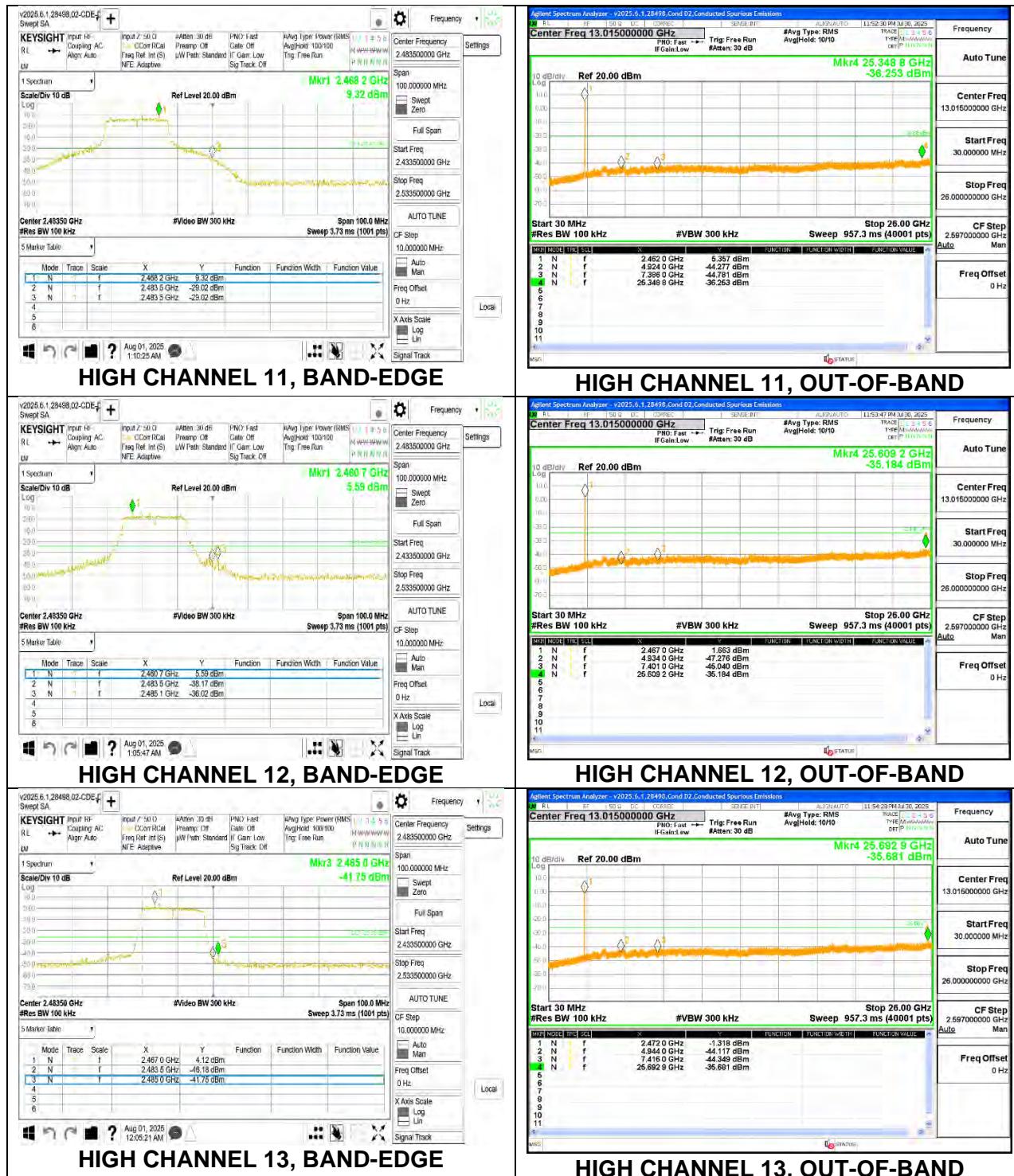






**1TX ANT 1 MODE****LOW CHANNEL 1, BAND-EDGE****LOW CHANNEL 1, OUT-OF-BAND****LOW CHANNEL 2, BAND-EDGE****LOW CHANNEL 2, OUT-OF-BAND**

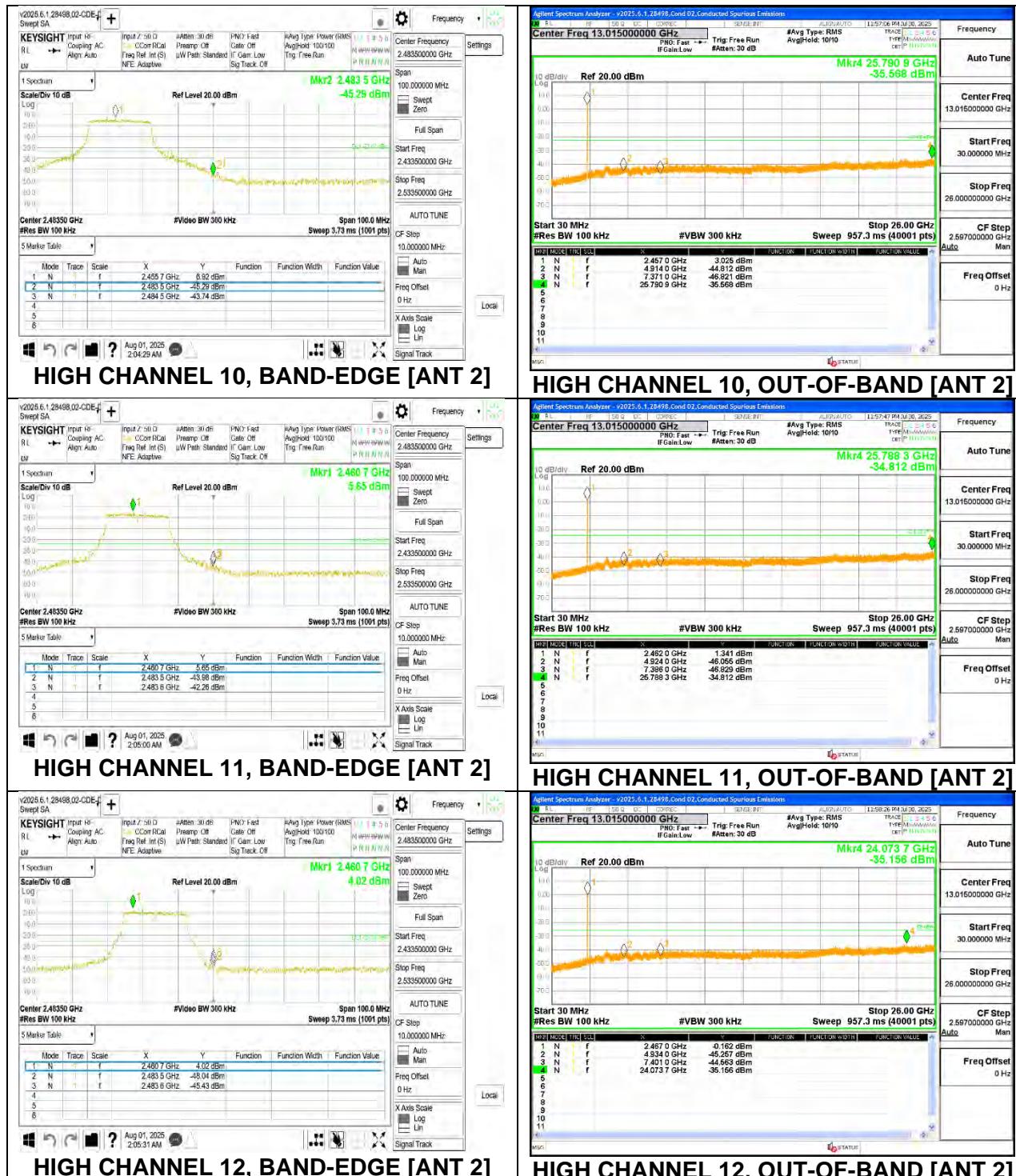


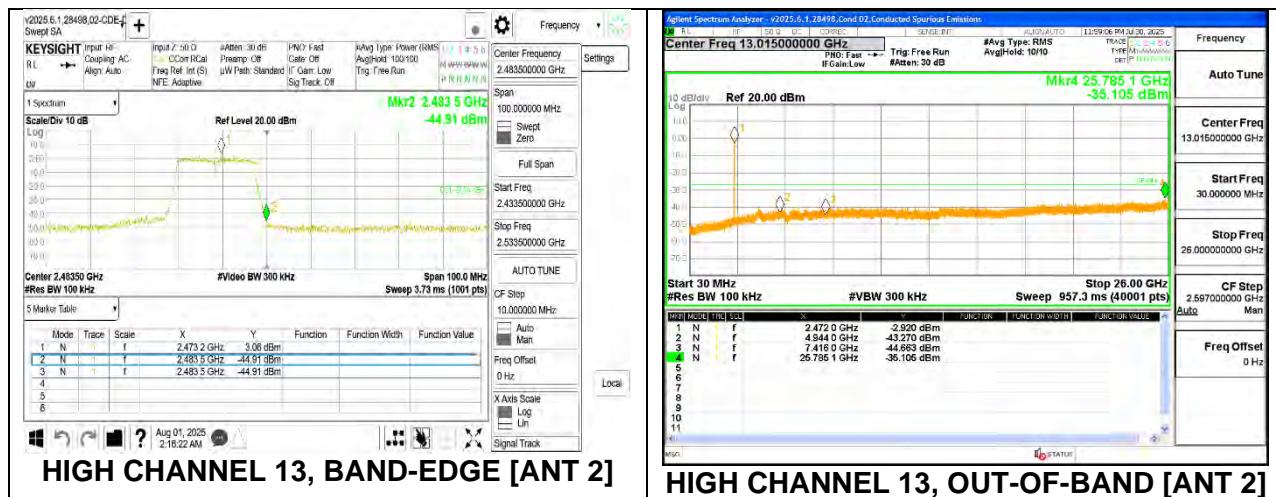


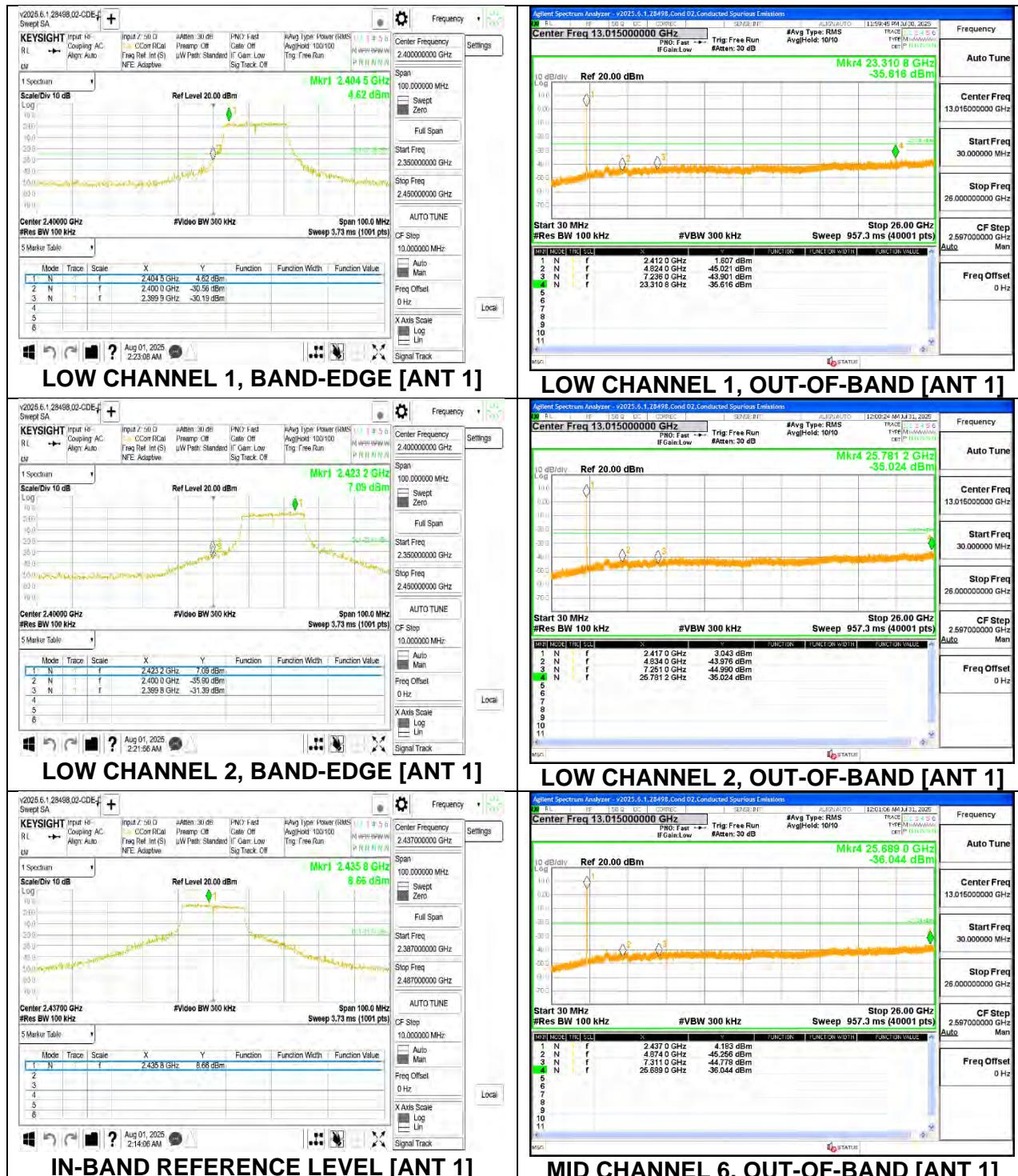
### 9.5.4. 802.11n HT20 CDD MODE 2TX

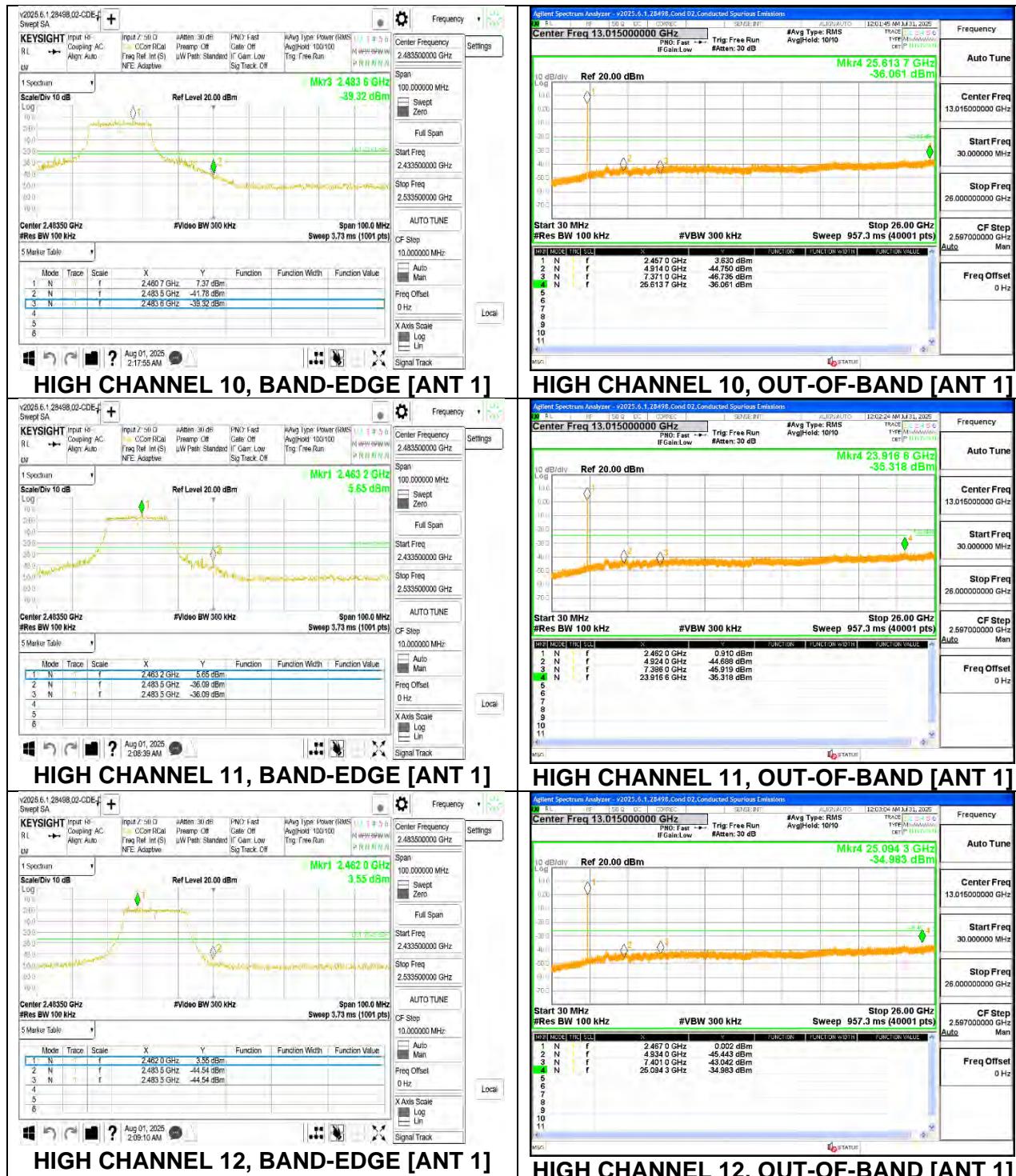
#### ANT 2 + ANT 1 2TX MODE

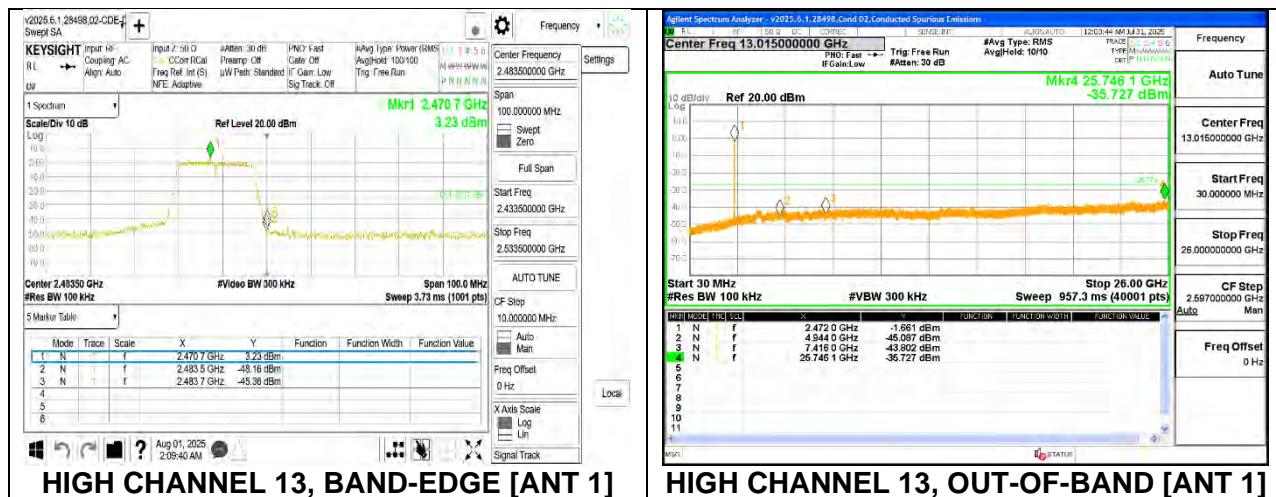












### 9.5.5. 802.11be EHT20 SISO MODE

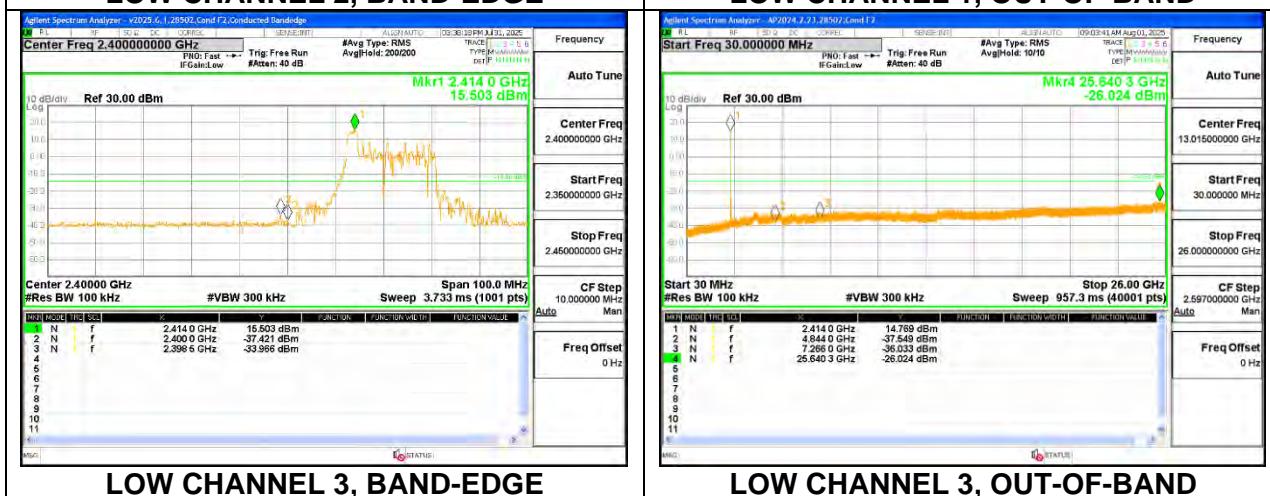
#### 1TX ANT 2 MODE, 26-Tone RU Index



#### LOW CHANNEL 1, BAND-EDGE



#### LOW CHANNEL 2, BAND-EDGE

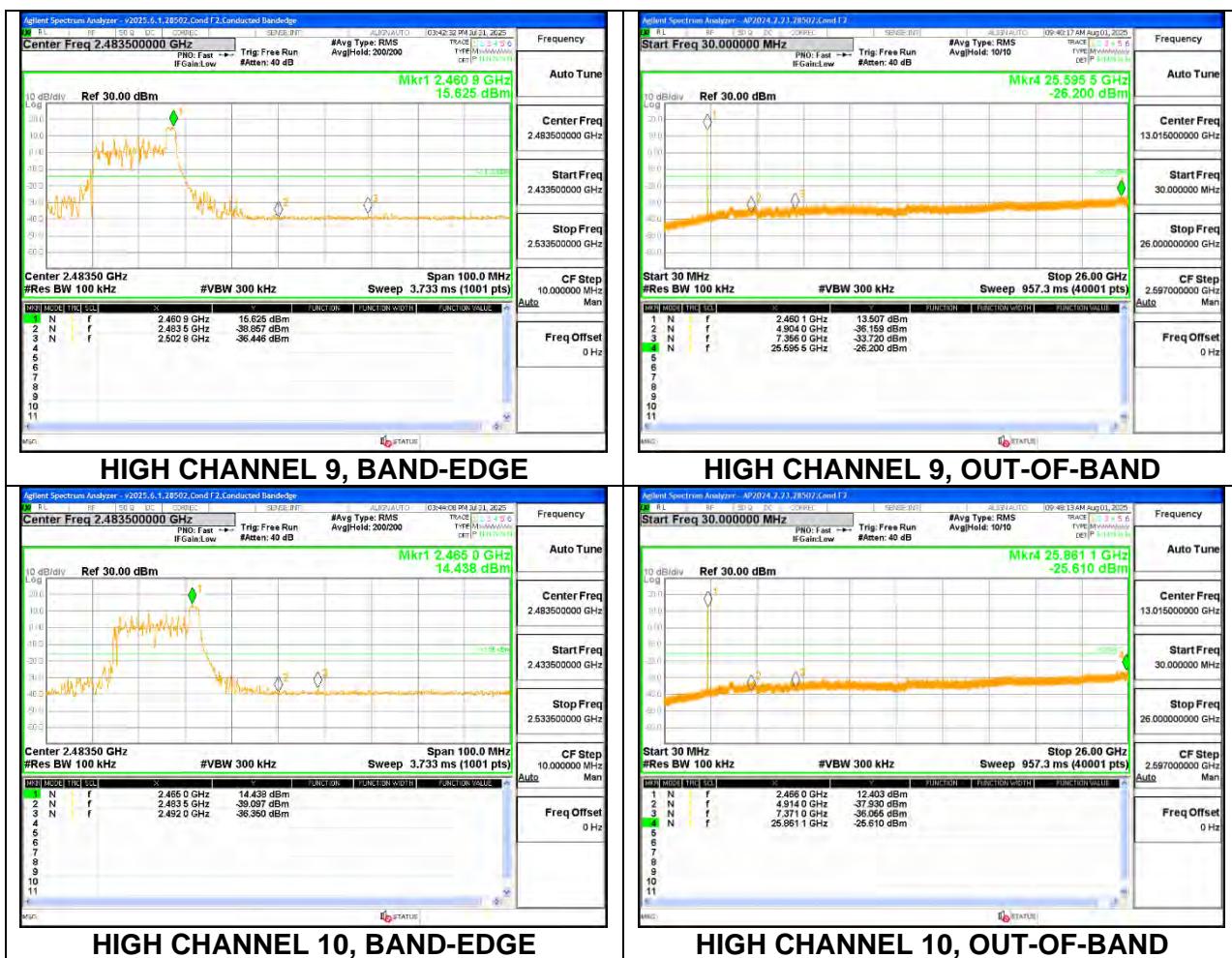


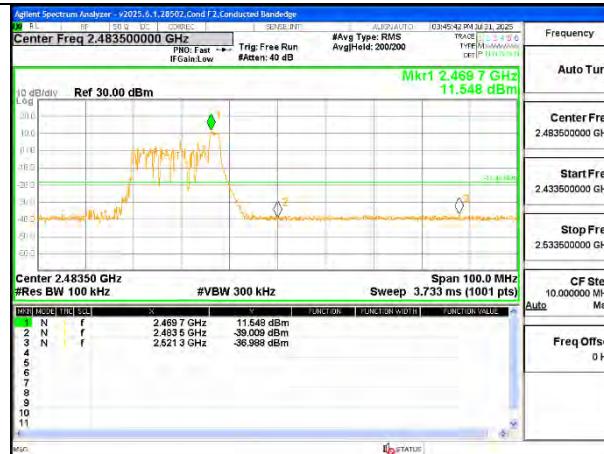
#### LOW CHANNEL 3, BAND-EDGE

## ANT 2: 26-Tone RU Index 4

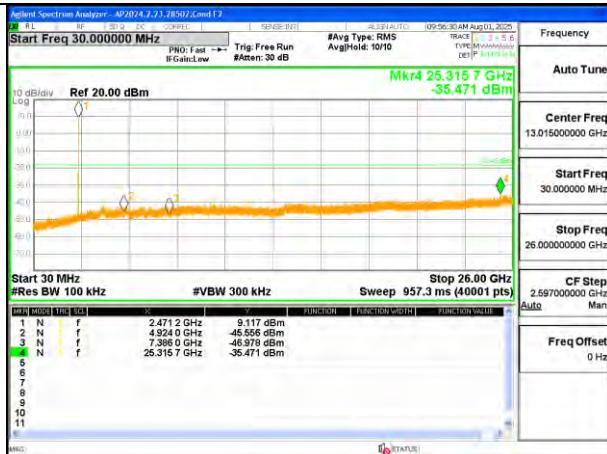


## ANT 2: 26-Tone RU Index 8





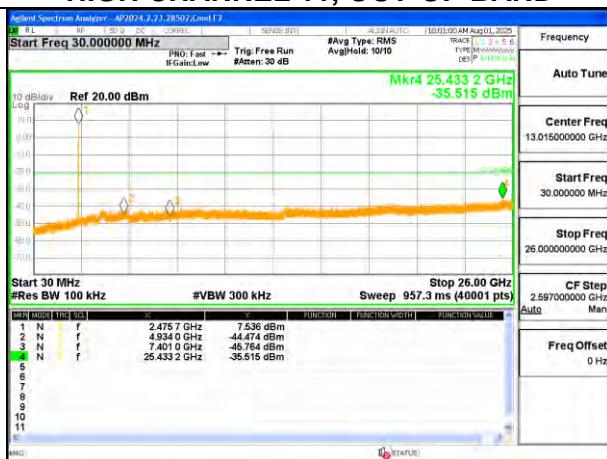
## HIGH CHANNEL 11, BAND-EDGE



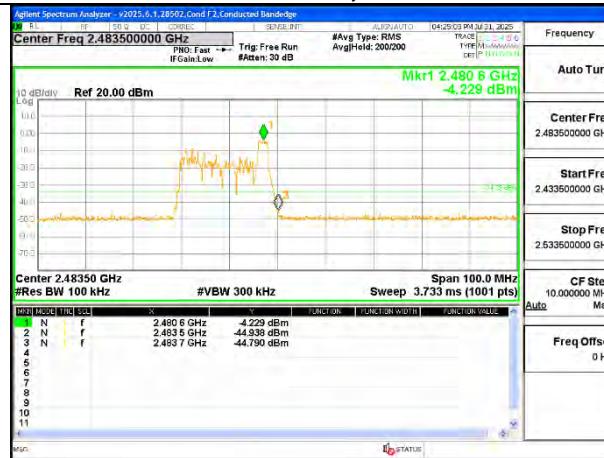
## HIGH CHANNEL 11, OUT-OF-BAND



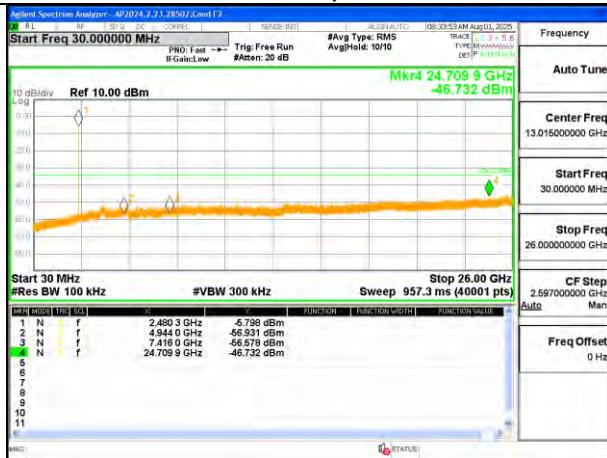
## HIGH CHANNEL 12, BAND-EDGE



## HIGH CHANNEL 12, OUT-OF-BAND

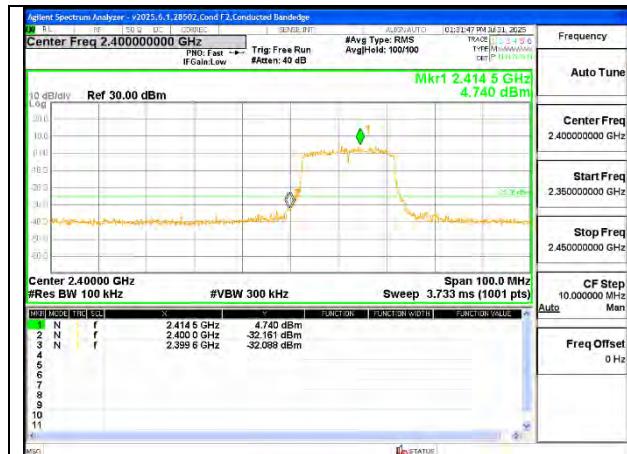


## HIGH CHANNEL 13, BAND-EDGE



## HIGH CHANNEL 13, OUT-OF-BAND

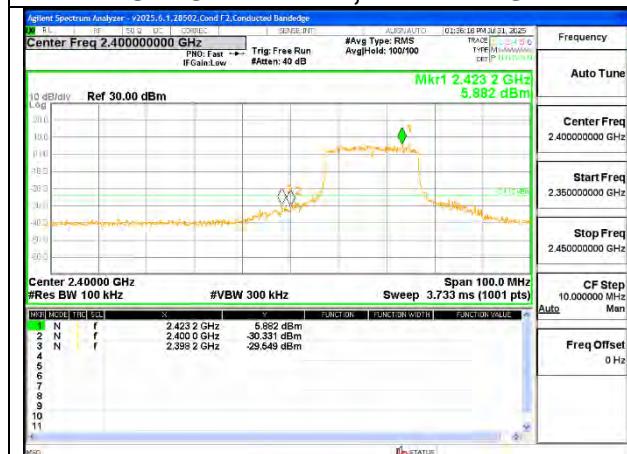
## **ANT 2: SU**



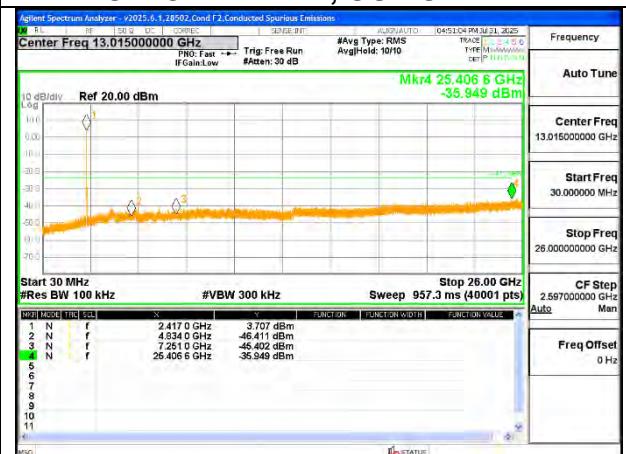
## LOW CHANNEL 1, BAND-EDGE



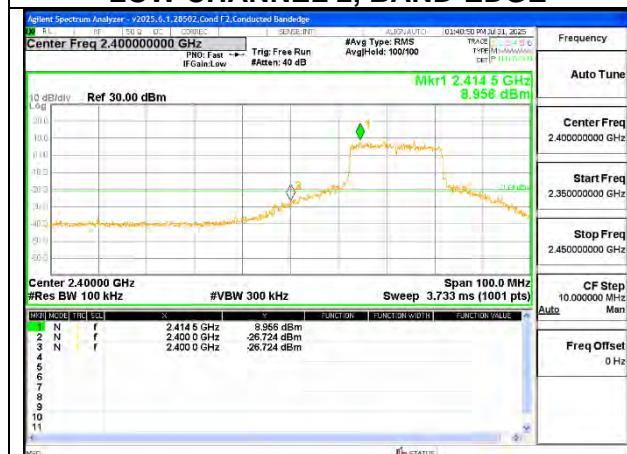
## LOW CHANNEL 1, OUT-OF-BAND



## LOW CHANNEL 2, BAND-EDGE



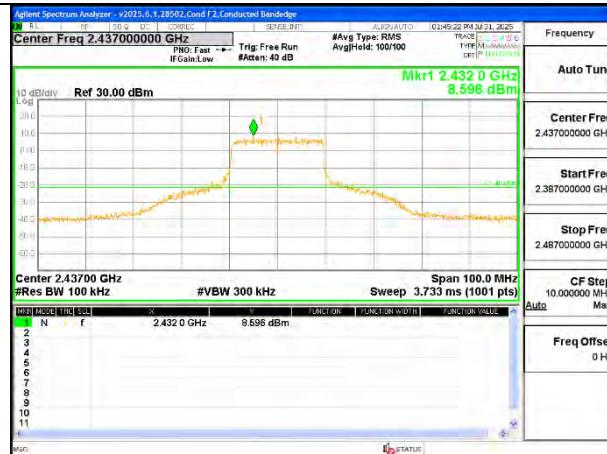
## LOW CHANNEL 2. OUT-OF-BAND



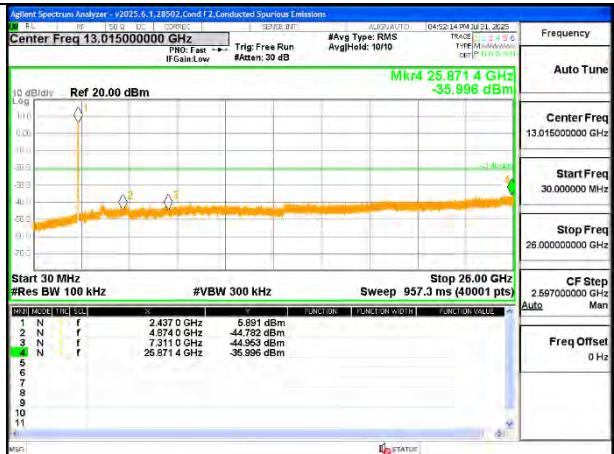
### LOW CHANNEL 3, BAND-EDGE



#### LOW CHANNEL 3. OUT-OF-BAND



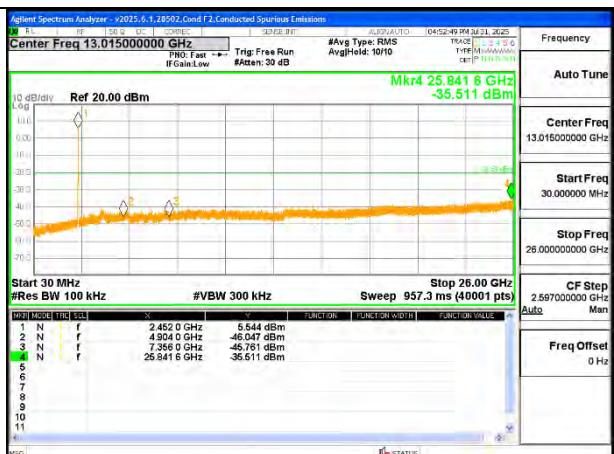
## IN-BAND REFERENCE LEVEL



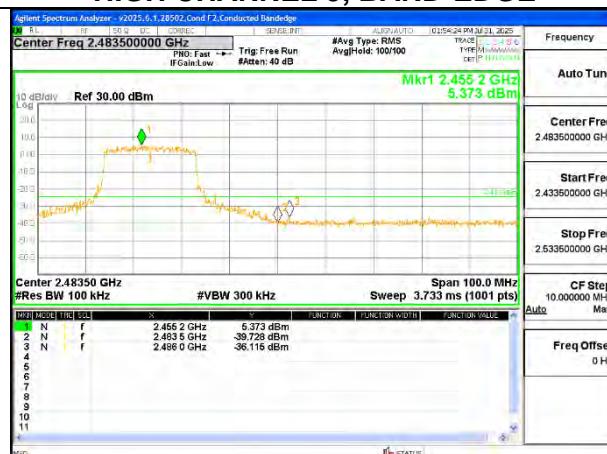
## MID CHANNEL 6, OUT-OF-BAND



## HIGH CHANNEL 9, BAND-EDGE



## HIGH CHANNEL 9, OUT-OF-BAND



## HIGH CHANNEL 10, BAND-EDGE



## HIGH CHANNEL 10, OUT-OF-BAND

