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MEASUREMENT REPORT

FCC PART 15.247 / ISED RSS-247 802.11b/g/n/ac/ax/be (OFDM)

Applicant Name:
Microsoft Corporation
One Microsoft Way
Redmond, WA 98052
United States

Date of Testing:
12/16/2025 - 03/11/2026
Test Report Issue Date:
3/24/2026
Test Site/Location:
Element lab., Columbia, MD, USA
Test Report Serial No.:
1M2511240098-07-R1.C3K

FCC ID:	**C3K2076**
IC:	**3048A-2076**
APPLICANT:	**Microsoft Corporation**

Application Type:	Class II Permissive Change
Model/HVIN:	2076
EUT Type:	Portable Computing Device
Frequency Range:	2412 – 2472MHz
Modulation Type:	CCK, DSSS, OFDM
FCC Classification:	Digital Transmission System (DTS)
FCC Rule Part(s):	Part 15 Subpart C (15.247)
ISED Specification:	RSS-247 Issue 4
FCC Test Procedure(s):	ANSI C63.10:2020 + Cor. 1:2023, KDB 558074 D01 v05r02
ISED Test Procedure(s):	ANSI C63.10:2020 + Cor. 1:2023 + C63.10a:2024 + Errata to C63.10a:2024, KDB 558074 D01 v05r02
Class II Permissive Change:	Please see FCC change document
Original Grant Date:	5/14/2024

This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in ANSI C63.10-2020. Test results reported herein relate only to the item(s) tested.

This revised Test Report (S/N: 1M2511240098-07-R1.C3K) supersedes and replaces the previously issued test report (S/N: 1M2511240098-07.C3K) on the same subject device for the same type of testing as indicated. Please discard and destroy the previously issued test report(s) and dispose of it accordingly.

I attest to the accuracy of data. All measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

RJ Ortanez
Executive Vice President

ACCREDITED
CERT #2041.01

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TEST REPORT REVISION HISTORY

Rev. No.	Description	Issue Date	Revised By
-	Initial Release	3/12/2026	WKR0000005826
1	Addressed comments made by TCB Reviewer	3/24/2026	WKR0000020239

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Channel Bandwidth [MHz]	IEEE Mode	Tx Frequency [MHz]	MIMO			
			Avg. Conducted		Peak Conducted	
			Max. Power [mW]	Max. Power [dBm]	Max. Power [mW]	Max. Power [dBm]
20	802.11b	2412 - 2472	246.60	23.92	492.90	26.93
	802.11g	2412 - 2472	151.01	21.79	656.57	28.17
	802.11n	2412 - 2472	120.50	20.81	524.00	27.19
	802.11ac	2412 - 2472	120.50	20.81	533.19	27.27
	802.11ax	2412 - 2472	122.46	20.88	602.60	27.80
	802.11be	2412 - 2472	120.78	20.82	620.74	27.93
40	802.11n	2422 - 2462	59.57	17.75	277.52	24.43
	802.11ac	2422 - 2462	59.57	17.75	294.15	24.69
	802.11ax	2422 - 2462	60.81	17.84	289.82	24.62
	802.11be	2422 - 2462	57.41	17.59	311.02	24.93

EUT Overview

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1.0 INTRODUCTION

1.1 Scope

Measurement and determination of electromagnetic emissions (EMC) of radio frequency devices including intentional and\\or unintentional radiators for compliance with the technical rules and regulations of the Federal Communications Commission and the Innovation, Science and Economic Development Canada.

1.2 Element Test Location

These measurement tests were conducted at the Element laboratory located at 7185 Oakland Mills Road, Columbia, MD 21046. The measurement facility is compliant with the test site requirements specified in ANSI C63.4-2014.

1.3 Test Facility / Accreditations

Measurements were performed at Element lab located in Columbia, MD 21046, U.S.A.

- Element Washington DC LLC is an ISO 17025-2017 accredited test facility under the American Association for Laboratory Accreditation (A2LA) with Certificate number 2041.01 for Specific Absorption Rate (SAR), Hearing Aid Compatibility (HAC) testing, where applicable, and Electromagnetic Compatibility (EMC) testing for FCC and Innovation, Science, and Economic Development Canada rules.

- Element Washington DC LLC TCB is a Telecommunication Certification Body (TCB) accredited to ISO\\IEC 17065-2012 by A2LA (Certificate number 2041.03) in all scopes of FCC Rules and ISED Standards (RSS).

- Element Washington DC LLC facility is a registered (2451B) test laboratory with the site description on file with ISED.

- Element Washington DC LLC is a Recognized U.S. Certification Assessment Body (CAB # US0110) for ISED Canada as designated by NIST under the U.S. and Canada Mutual Recognition Agreements (MRAs).

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2.0 PRODUCT INFORMATION

2.1 Equipment Description

The Equipment Under Test (EUT) is the **Microsoft Corporation Portable Computing Device FCC ID: C3K2076, IC:3048A-2076**. The test data contained in this report pertains only to the emissions due to the EUT's WLAN (DTS) transmitter.

This report is being issued as a Class II Permissive Change due to an antenna enclosure change that is made. Full details are provided in the change description. The test data in this report demonstrates the continued compliance to FCC Part 15 and ISED RSS-247.

The authorization for this device utilizes data referencing from FCC ID: C3K2085 as permitted per KDB 484596 D01 v03. Additionally, data referencing is being utilized from IC ID: 3048A-2085 as per the original authorization for this device per ISED Inquiry confirmation April 2, 2024 (included in filing). Data referencing data test results are included in Appendix A of this report.

Test Device Serial No.: 343V2, 96T92, DM332, 96T82, DM392, 34342

2.2 Device Capabilities

This device contains the following capabilities:

802.11b/g/n/ac/ax/be WLAN, 802.11a/n/ac/ax/be UNII (5GHz and 6GHz), Bluetooth (1x, EDR, LE), NFC

Ch.	Frequency (MHz)	Ch.	Frequency (MHz)
1	2412	8	2447
2	2417	9	2452
3	2422	10	2457
4	2427	11	2462
5	2432	12	2467
6	2437	13	2472
7	2442		

Table 2-1. Frequency \ Channel Operations

Notes:

1. The maximum achievable duty cycles for all modes were determined based on measurements performed on a spectrum analyzer in zero-span mode with RBW = 8MHz, VBW = 50MHz, and detector = peak per the guidance of Section 6.0 b) of ANSI C63.10-2020 and KDB 558074 D01 v05r02. The RBW and VBW were both greater than 50\T, where T is the minimum transmission duration, and the number of sweep points across T was greater than 100. The duty cycles are as follows:

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802.11 Mode/Band		MIMO (1+2) Duty Cycle [%]
2.4GHz	b	98.91
	g	99.05
	n (HT20)	98.79
	ac (VHT20)	98.66
	ax (HE20)	98.58
	be (EHT20)	98.52
	n (HT40)	98.09
	ac (VHT40)	98.30
	ax (HE40)	98.40
	be (EHT40)	98.32

Table 2-2. Measured Duty Cycles

2. The device employs MIMO technology. Below are the possible configurations.

WiFi Configurations		SDM		CDD	
		ANT1	ANT2	ANT1	ANT2
2.4GHz	11b	×	×	✓	✓
	11g	×	×	✓	✓
	11n	✓	✓	✓	✓
	11ac	✓	✓	✓	✓
	11ax	✓	✓	✓	✓
	11be	✓	✓	✓	✓

Table 2-3. Antenna / Technology Configuration

✓= Support; × = NOT Support
SISO = Single Input Single Output
SDM = Spatial Diversity Multiplexing – MIMO function
CDD = Cyclic Delay Diversity - 2Tx Function

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3. The device supports the following data rates (shown in Mbps):

802.11b	802.11a/g	MCS Index			OFDM (802.11n)				OFDM (802.11ax/be)					
20MHz	20MHz				20MHz		40MHz		20MHz			40MHz		
		HT	HE	EHT	0.8µs GI	0.4µs GI	0.8µs GI	0.4µs GI	0.8µs GI	1.6µs GI	3.2µs GI	0.8µs GI	1.6µs GI	3.2µs GI
1	6	0	0	0	6.5	7.2	13.5	15	8.6	8.1	7.3	17.2	16.3	14.6
2	9	1	1	1	13	14.4	27	30	17.2	16.3	14.6	34.4	32.5	29.3
5.5	12	2	2	2	19.5	21.7	40.5	45	25.8	24.4	21.9	51.6	48.8	43.9
11	18	3	3	3	26	28.9	54	60	34.4	32.5	29.3	68.8	65	58.5
	24	4	4	4	39	43.3	81	90	51.6	48.8	43.9	103.2	97.5	87.8
	36	5	5	5	52	57.8	108	120	68.8	65	58.5	137.6	130	117
	48	6	6	6	58.5	65	121.5	135	77.4	73.1	65.8	154.9	146.3	131.6
	54	7	7	7	65	72.2	135	150	86	81.3	73.1	172.1	162.5	146.3
			8	8		`	162	180	103.2	97.5	87.8	206.5	195	175.5
			9	9			180	200	114.7	108.3	97.5	229.4	216.7	195
			10	10					129	121.9	109.7			
			11	11					143.4	135.4	121.9			
				12					154.9	146.3	131.6	309.7	292.5	263.3
				13	`				172.1	162.5	146.3	344.1	325	292.5
1	6	8	0	0	13	14.4	27	30	17.2	16.3	14.6	34.4	32.5	29.3
2	9	9	1	1	26	28.9	54	60	34.4	32.5	29.3	68.8	65	58.5
5.5	12	10	2	2	39	43.3	81	90	51.6	48.8	43.9	103.2	97.5	87.8
11	18	11	3	3	52	57.8	108	120	68.8	65	58.5	137.6	130	117
	24	12	4	4	78	86.7	162	180	103.2	97.5	87.8	206.5	195	175.5
	36	13	5	5	104	115.6	216	240	137.6	130	117	275.3	260	234
	48	14	6	6	117	130	243	270	154.9	146.3	131.6	309.7	292.5	263.3
	54	15	7	7	130	144.4	270	300	172.1	162.5	146.3	344.1	325	292.5
			8	8	156	173.3	324	360	206.5	195	175.5	412.9	390	351
			9	9	N/A	N/A	360	400	229.4	216.7	195	458.8	433.3	390
			10	10					258.1	243.8	219.4			
			11	11					286.8	270.8	243.8			
				12					309.7	292.5	263.3	619.4	585	526.5
				13					344.1	325	292.5	688.2	650	585

Table 2-4. Supported Data Rates

This device supports simultaneous transmission operation, which allows for two SISO channels to operate independently of one another in the 2.4GHz and 5GHz bands simultaneously on each antenna. The following tables show the worst-case configurations determined during testing.

Configuration 1: MIMO transmitting in 2.4GHz mode and MIMO in 5GHz mode.

Description	2.4 GHz Emission	5 GHz Emission
Antenna	1, 2	1, 2
Channel	6	157
Operating Frequency (MHz)	2437	5785
Data Rate (Mbps)	1	6
Mode	802.11b	802.11a

Table 2-5. Config-1 (MIMO 2.4GHz & MIMO 5GHz)

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Configuration 2: MIMO transmitting in 2.4GHz mode and MIMO in 6GHz mode.

Description	2.4 GHz Emission	6 GHz Emission
Antenna	1, 2	1, 2
Channel	6	2
Operating Frequency (MHz)	2437	5935
Data Rate (Mbps)	1	6
Mode	802.11b	802.11a

Table 2-6. Config-1 (MIMO 2.4GHz & MIMO 6GHz)

2.3 Test Configuration

The device has either an OLED or LCD display type. Testing was performed with both display types and only worst-case emissions are reported.

ANSI C63.10-2020 was used to reference the appropriate EUT setup for radiated spurious emissions testing and AC line conducted testing. See Sections 7.8 for AC line conducted emissions test setups, 7.7 for radiated emissions test setups, and 7.2, 7.3, 7.4, 7.5, and 7.6 for antenna port conducted emissions test setups.

2.4 Antenna Description

Frequency [GHz]	Antenna-1 Gain [dBi]	Antenna-2 Gain [dBi]	Directional Gain [dBi]
2.4	1.91	3.27	5.63

Table 2-7. Antenna Peak Gain - LCD

Frequency [GHz]	Antenna-1 Gain [dBi]	Antenna-2 Gain [dBi]	Directional Gain [dBi]
2.4	-0.28	2.45	4.20

Table 2-8. Antenna Peak Gain - OLED

The manufacturer provided the antenna gains which can affect the validity of test results used for determination of compliance. The following antenna gains are used in this device per the "Unlicensed Band Antenna Gain" document provided by the client. This document is also included in the filing as a public exhibit.

2.5 Software and Firmware

The test was conducted with firmware version 2025.1111.11121401 installed on the UUT.

2.6 EMI Suppression Device(s) / Modifications

No EMI suppression device(s) were added and\or no modifications were made during testing.

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3.0 DESCRIPTION OF TESTS

3.1 Evaluation Procedure

The measurement procedures described in the American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices (ANSI C63.10-2020) was used in the measurement of the EUT**.**

Deviation from measurement procedure…….....None

3.2 AC Line Conducted Emissions

The line-conducted facility is located inside a 10'x16'x9' shielded enclosure. The shielded enclosure is manufactured by ETS Lindgren RF Enclosures The line-conducted facility is located inside a 7m x 3.66m x 2.7m shielded enclosure. The shielded enclosure is manufactured by AP Americas. The shielding effectiveness of the shielded room is in accordance with MIL-Std-285 or NSA 65-5. A 1m x 1.5m wooden table 80cm high is placed 40cm away from the vertical wall and 80cm away from the sidewall of the shielded room. Two 10kHz-30MHz, 50Ω\\50μH Line-Impedance Stabilization Networks (LISNs) are bonded to the shielded room floor. Power to the LISNs is filtered by external high-current high-insertion loss power line filters. The external power line filter is an ETS Lindgren Model LPRX-4X30 (100dB Attenuation, 14kHz-18GHz) and the two EMI\\RFI filters are ETS Lindgren Model LRW-2030-S1 (100dB Minimum Insertion Loss, 14kHz – 10GHz). These filters attenuate ambient signal noise from entering the measurement lines. These filters are also bonded to the shielded enclosure.

The EUT is powered from one LISN and the support equipment is powered from the second LISN. If the EUT is a DC-powered device, power will be derived from the source power supply it normally will be powered from and this supply line(s) will be connected to the second LISN. All interconnecting cables more than 1 meter were shortened to a 1 meter length by non-inductive bundling (serpentine fashion) and draped over the back edge of the test table. All cables were at least 40cm above the horizontal reference groundplane. Power cables for support equipment were routed down to the second LISN while ensuring that that cables were not draped over the second LISN.

Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. The RF output of the LISN was connected to the spectrum analyzer and exploratory measurements were made to determine the frequencies producing the maximum emission from the EUT. The spectrum was scanned from 150kHz to 30MHz with a spectrum analyzer. The detector function was set to peak mode for exploratory measurements while the bandwidth of the analyzer was set to 10kHz. The EUT, support equipment, and interconnecting cables were arranged and manipulated to maximize each emission. Once the worst case emissions have been identified, the one EUT cable configuration\\arrangement and mode of operation that produced these emissions is used for final measurements on the same test site. The analyzer is set to CISPR quasi-peak and average detectors with a 9kHz resolution bandwidth for final measurements.

Line conducted emissions test results are shown in Section 7.8. The EMI Receiver mode of the Agilent MXE was used to perform AC line conducted emissions testing.

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3.3 Radiated Emissions

The radiated test facilities consisted of an indoor 3 meter semi-anechoic chamber used for final measurements and exploratory measurements, when necessary. The measurement area is contained within the semi-anechoic chamber which is shielded from any ambient interference. The test site inside the chamber is a 6m x 5.2m elliptical, obstruction-free area in accordance with Figure 5.7 of Clause 5 in ANSI C63.4-2014. Absorbers are arranged on the floor between the turn table and the antenna mast in such a way so as to maximize the reduction of reflections for measurements above 1GHz. An 80cm tall test table made of Styrodur is placed on top of the turn table. For measurements above 1GHz, an additional Styrodur pedestal is placed on top of the test table to bring the total table height to 1.5m.

For all measurements, the spectrum was scanned through all EUT azimuths and from 1 to 4 meter receive antenna height using a broadband antenna from 30MHz up to the upper frequency shown in 15.33 depending on the highest frequency generated or used in the device or on which the device operates or tunes. For frequencies above 1GHz, linearly polarized double ridge horn antennas were used. For frequencies below 30MHz, a calibrated loop antenna was used. When exploratory measurements were necessary, they were performed at 1 meter test distance inside the semi-anechoic chamber using broadband antennas, broadband amplifiers, and spectrum analyzers to determine the frequencies and modes producing the maximum emissions. Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. The test set-up was placed on top of the 1 x 1.5 meter table. The EUT, support equipment, and interconnecting cables were arranged and manipulated to maximize each emission. Appropriate precaution was taken to ensure that all emissions from the EUT were maximized and investigated. The system configuration, mode of operation, turntable azimuth, and receive antenna height was noted for each frequency found.

Final measurements were made in the semi-anechoic chamber using calibrated, linearly polarized broadband and horn antennas. The test setup was configured to the setup that produced the worst case emissions. The spectrum analyzer was set to investigate all frequencies required for testing to compare the highest radiated disturbances with respect to the specified limits. The turntable containing the EUT was rotated through 360 degrees and the height of the receive antenna was varied 1 to 4 meters and stopped at the azimuth and height producing the maximum emission. Each emission was maximized by changing the orientation of the EUT through three orthogonal planes and changing the polarity of the receive antenna, whichever produced the worst-case emissions.

All radiated measurements are performed in a chamber that meets the site requirements per ANSI C63.4-2014. Additionally, radiated emissions below 30MHz are also validated on an Open Area Test Site to assert correlation with the chamber measurements per the requirements of KDB 414788 D01 v01r01.

3.4 Environmental Conditions

The temperature is controlled within range of 15°C to 35°C. The relative humidity is controlled within range of 10% to 75%. The atmospheric pressure is monitored within the range 86-106kPa (860-1060mbar).

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4.0 ANTENNA REQUIREMENTS

Excerpt from §15.203 of the FCC Rules\Regulations:
"An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can 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 antennas of the EUT are **permanently attached.**
- There are no provisions for connections to an external antenna.

Conclusion:

The EUT unit complies with the requirement of §15.203.

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5.0 MEASUREMENT UNCERTAINTY

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.10-2020. All measurement uncertainty values are shown with a coverage factor of k = 2 to indicate a 95% level of confidence. The measurement uncertainty shown below meets or exceeds the U_{CISPR} measurement uncertainty values specified in CISPR 16-4-2 and, thus, can be compared directly to specified limits to determine compliance.

Contribution	Expanded Uncertainty (±dB)
Conducted Bench Top Measurements	1.13
Line Conducted Disturbance	3.09
Radiated Disturbance (<1GHz)	4.98
Radiated Disturbance (>1GHz)	5.07
Radiated Disturbance (>18GHz)	5.09

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6.0 TEST EQUIPMENT CALIBRATION DATA

Test Equipment Calibration is traceable to the National Institute of Standards and Technology (NIST). Measurements antennas used during testing were calibrated in accordance to the requirements of ANSI C63.5-2017.

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
-	MD 1M 18-40	EMC Cable and Switch System	2/25/2025	Annual	2/25/2026	MD 1M 40
-	AP2-001	EMC Cable and Switch System	2/25/2025	Annual	2/25/2026	AP2-001
-	AP2-002	EMC Cable and Switch System	2/25/2025	Annual	2/25/2026	AP2-002
-	ETS-001	EMC Cable and Switch System	1/29/2026	Annual	1/29/2027	ETS-001
-	ETS-002	EMC Cable and Switch System	1/29/2026	Annual	1/29/2027	ETS-002
-	WL25-1	Conducted Cable Set (25GHz)	2/25/2025	Annual	2/25/2026	WL25-1
-	WL40-1	Conducted Cable Set (40GHz)	2/25/2025	Annual	2/25/2026	WL40-1
Rohde & Schwarz	ESU40	EMI Test Receiver (40GHz)	1/16/2026	Annual	1/16/2027	100348
Rohde & Schwarz	ESW44	EMI Test Receiver 2Hz to 44 GHz	3/25/2025	Annual	3/25/2026	101716
Agilent	N9038A	MXE EMI Receiver	11/10/2025	Annual	11/10/2026	MY51210133
Agilent	N9030A	3Hz-44GHz PXA Signal Analyzer	9/15/2025	Annual	9/15/2026	MY49430494
Rohde & Schwarz	ENV216	Two-Line V-Network	3/21/2025	Biennial	3/21/2027	101380
ETS Lindgren	3117	1-18 GHz DRG Horn (Medium)	6/4/2025	Biennial	6/4/2027	125518
Rohde & Schwarz	TC-TA18	Cross Polarized Vivaldi Test Antenna	4/15/2024	Biennial	4/15/2026	101058
Sunol	JB5	Bi-Log Antenna (30M - 5GHz)	9/11/2024	Biennial	9/11/2026	A051107
Sunol	JB6	Bi-Log Antenna (30M - 6GHz)	3/24/2025	Biennial	3/24/2027	A082816
Keysight Technologies	N9030A	PXA Signal Analyzer (44GHz)	6/6/2025	Annual	6/6/2026	MY52350166
Keysight Technologies	N9020A	MXA Signal Analyzer	5/7/2025	Annual	5/7/2026	US46470561
Keysight Technologies	N9020A	MXA Signal Analyzer	6/4/2025	Annual	6/4/2026	MY54500644
EMCO	3116	Horn Antenna (18-40GHz)	7/5/2024	Biennial	7/5/2026	9203-2178
Sunol Sciences	DRH-118	Horn Antenna (1-18GHz)	3/19/2025	Biennial	3/19/2027	A102416-2
Anritsu	MA24408A	Microwave Peak Power Sensor	5/30/2025	Annual	5/30/2026	11675
Anritsu	MA24406A	Microwave Peak Power Sensor	5/30/2025	Annual	5/30/2026	11240

Table 6-1. Annual Test Equipment Calibration Schedule

Note:

For equipment listed above that has a calibration date or calibration due date that falls within the test date range, care was taken to ensure that this equipment was used after the calibration date and before the calibration due date.

Component	Serial Number
MegaPhase Cable TM26-S1S1-36	18160103 003
Pasternack 6dB Attenuator PE7005-6	N/A

Table 6-2. WL25-1 Conducted Cable Set Components

Component	Serial Number
MegaPhase Cable TM40K1K1-36	18160102 001
MCL 10dB Attenuator BW-K10 2W44+	1902

Table 6-3. WL40-1 Conducted Cable Set Components

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Component	Serial Number
Pasternak Cable RG214/U	111815
Sucoflex Cable 106A	246420-001
Rohde & Schwarz SF Unit	102134

Table 6-4. ETS-001 EMC Cable and Switch System Components

Component	Serial Number
MiniCircuits Cable CBL-0.5M-SMNM+	47261
Micro-Coax Utiflex Cable UFB311A-Q-3346-50U50U MFR 64639	231978-001
Micro-Coax Utiflex Cable UFB311A-1-0629-50U50U MFR 64639	231986-002
MegaPhase Cable NC29-N1N1-324	19046401 001
MegaPhase Flex Cable 10511-1	15044701-006
Micro-Coas Utiflex Cable UFB311A-Q-3446-50U50U MFR 64639	231978-002
Micro-Coas Utiflex Cable UFB311A-1-0629-50U50U MFR 64639	231986-001
Micro-Coas Utiflex Cable UFB142A-0-0659-50U50U MFR 64639	232069-001
Rohde & Schwarz SF Unit	102138

Table 6-5. AP2-001 EMC Cable and Switch System Components

Component	Serial Number
MegaPhase Cable TM40-K1K1-30	20233002-004
UTIPLEX Cable	64639 232063-001
Rohde & Schwarz Pre-amp RS-PR1840 18G-40G	9037.7670.02

Table 6-6. MD 1M 18-40 EMC Cable and Switch System Components

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7.0 TEST RESULTS

7.1 Summary

Company Name: Microsoft Corporation

FCC ID: C3K2076

IC: 3048A-2076

FCC Classification: Digital Transmission System (DTS)

FCC Part Section(s)	RSS Section(s)	Test Description	Test Limit	Test Condition	Test Result	Reference
15.247(a)(2)	RSS-247 [6.3.1(a)]	6dB Bandwidth	The minimum 6 dB bandwidth shall be at least 500 kHz.	CONDUCTED	PASS	Section 7.2
15.247(b)(3)	RSS-247 [6.3.2]	Transmitter Output Power	shall not exceed 1 W		PASS	Section 7.3
N\A	RSS-247 [6.3.2]	e.i.r.p.	shall not exceed 4 W		PASS	Section 7.3
15.247(e)	RSS-247 [6.3.1(b)]	Transmitter Power Spectral Density	shall not be greater than 8 dBm in any 3 kHz band		PASS	Section 7.4
15.247(d)	RSS-247 [6.6]	Band Edge \\ Out-of-Band Emissions	≥ 20dBc		PASS	Sections 7.5, 7.6
15.205 15.209	RSS-Gen [8.9]	General Field Strength Limits (Restricted Bands and Radiated Emission Limits)	Emissions in restricted bands must meet the radiated limits detailed in 15.209 (RSS-Gen [8.9])	RADIATED	PASS	Section 7.7
15.207	RSS-Gen [8.8]	AC Conducted Emissions 150kHz – 30MHz	< FCC 15.207 limits (RSS-Gen [8.8])	LINE CONDUCTED	PASS	Section 7.8

Table 7-1. Summary of Test Results

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Notes:

1) All modes of operation and data rates were investigated. The test results shown in the following sections represent the worst-case emissions.
2) The analyzer plots shown in this section were all taken with a correction table loaded into the analyzer. The correction table was used to account for the losses of the cables and attenuators used as part of the system to connect the EUT to the analyzer at all frequencies of interest.
3) All antenna port conducted emissions testing was performed on a test bench with the antenna port of the EUT connected to the spectrum analyzer through calibrated cables and attenuators.
4) For conducted spurious emissions, automated test software was used to measure emissions and capture the corresponding plots necessary to show compliance. The measurement software utilized is Element "WLAN Automation," Version 3.5.
5) For radiated band edge, automated test software was used to measure emissions and capture the corresponding plots necessary to show compliance. The measurement software utilized is Element "Chamber Automation," Version 1.3.1.
6) Data was referenced from model C3K2086 for the certification of C3K2076. See Section 9.0 for spotcheck results.

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7.2 6dB Bandwidth & Occupied Bandwidth Measurement

Test Overview and Limit

The bandwidth at 6dB down from the highest in-band spectral density is measured with a spectrum analyzer connected to the transmitter antenna terminal of the EUT while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies. All data rates were investigated and the worst case configuration results are reported in this section.

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

Test Procedure Used

ANSI C63.10:2020 – Section 11.8.2

Test Settings - 6dB Bandwidth

1. The signal analyzer's automatic bandwidth measurement capability was used to perform the 6dB bandwidth measurement. The "X" dB bandwidth parameter was set to X = 6. The bandwidth measurement was not influenced by any intermediate power nulls in the fundamental emission.
2. RBW = 100kHz
3. VBW ≥ 3 x RBW
4. Detector = Peak
5. Trace mode = max hold
6. Sweep = auto couple
7. The trace was allowed to stabilize

Test Settings - Occupied Bandwidth

1. The signal analyzer's automatic bandwidth measurement capability was used to perform the 99% occupied bandwidth. The bandwidth measurement was not influenced by any intermediate power nulls in the fundamental emission.
2. RBW = 1 – 5% of the expected OBW
3. VBW ≥ 3 x RBW
4. Detector = Peak
5. Trace mode = max hold
6. Sweep = auto couple
7. The trace was allowed to stabilize
8. If necessary, steps 2 – 7 were repeated after changing the RBW such that it would be within 1 – 5% of the 99% occupied bandwidth observed in Step 7

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Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.

Figure 7-1. Test Instrument & Measurement Setup

Test Notes

None.

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6dB Bandwidth Measurements

Frequency [MHz]	Channel No.	802.11 Mode	Data Rate [Mbps]	Antenna-1 6dB Bandwidth [MHz]	Antenna-2 6dB Bandwidth [MHz]	Minimum Bandwidth [MHz]
2412	1	b	1	8.04	7.16	0.500
2437	6	b	1	7.13	8.07	0.500
2462	11	b	1	8.04	8.08	0.500
2412	1	g	6	16.42	16.40	0.500
2437	6	g	6	16.42	16.41	0.500
2462	11	g	6	16.40	16.39	0.500
2412	1	n	6.5/7.2 (MCS0)	17.65	17.66	0.500
2437	6	n	6.5/7.2 (MCS0)	17.66	17.67	0.500
2462	11	n	6.5/7.2 (MCS0)	17.67	17.68	0.500
2412	1	be	6.5/7.2 (MCS0)	19.04	19.04	0.500
2437	6	be	6.5/7.2 (MCS0)	19.17	19.03	0.500
2462	11	be	6.5/7.2 (MCS0)	19.05	18.84	0.500

Table 7-2. Conducted 6dB Bandwidth Measurements MIMO

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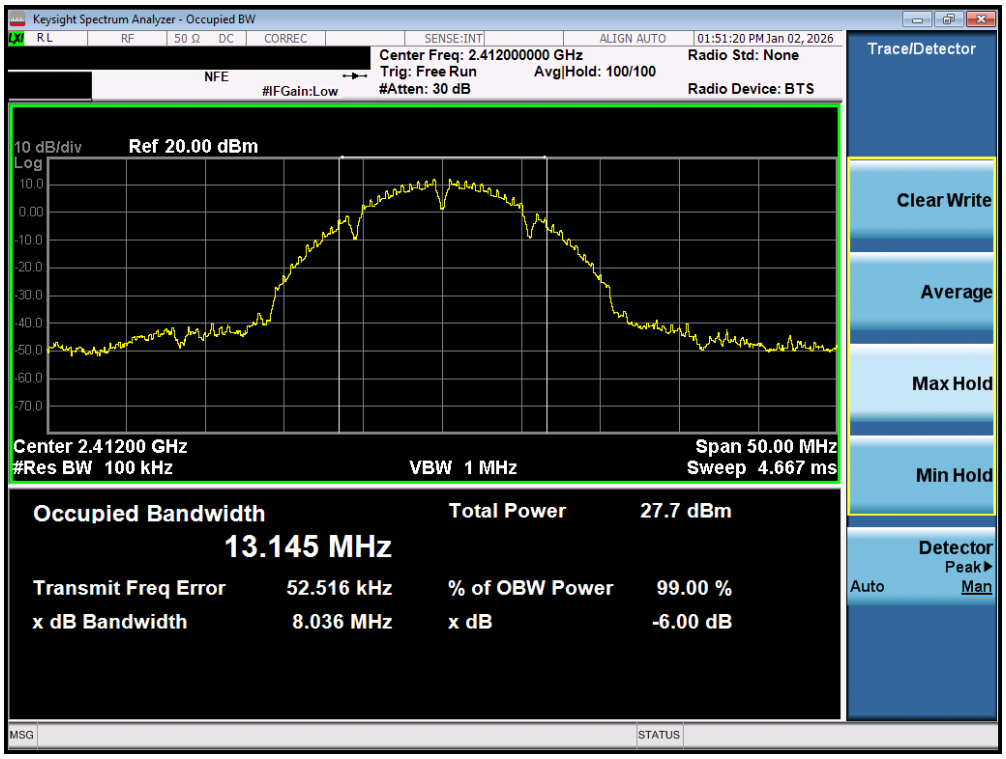
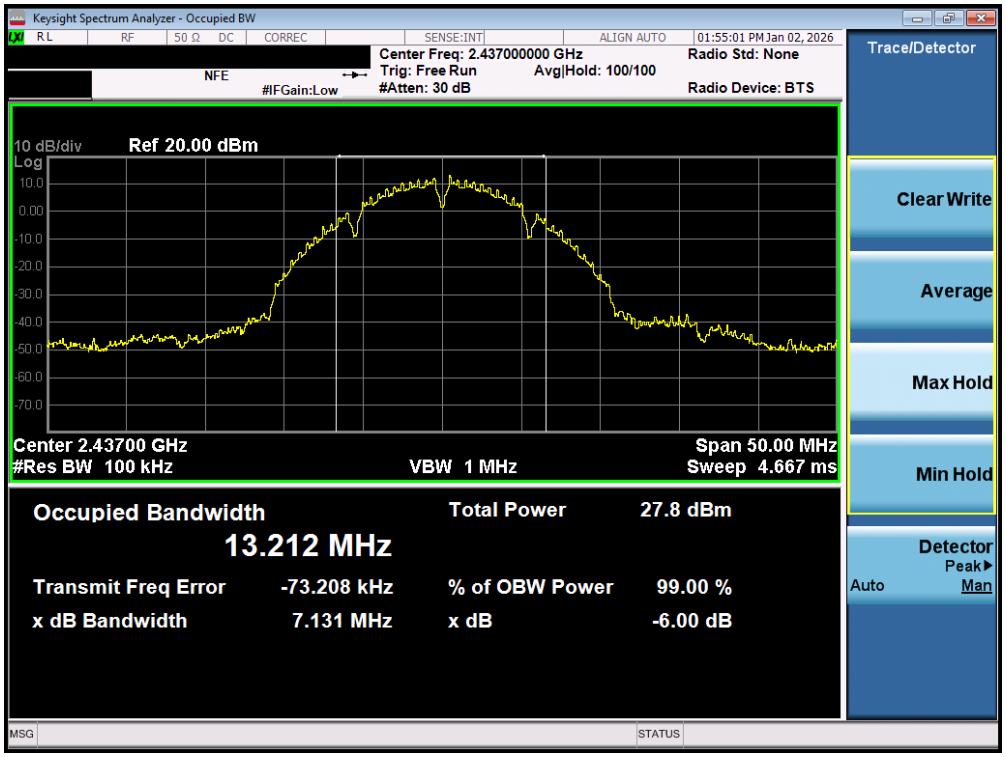
7.2.1 MIMO 6dB Bandwidth Measurements - MIMO ANT1 – 20MHz



Plot 7-1. 6dB Bandwidth Plot MIMO ANT1 (802.11b – Ch. 1) – MIMO ANT1



Plot 7-2. 6dB Bandwidth Plot MIMO ANT1 (802.11b – Ch. 6) – MIMO ANT1

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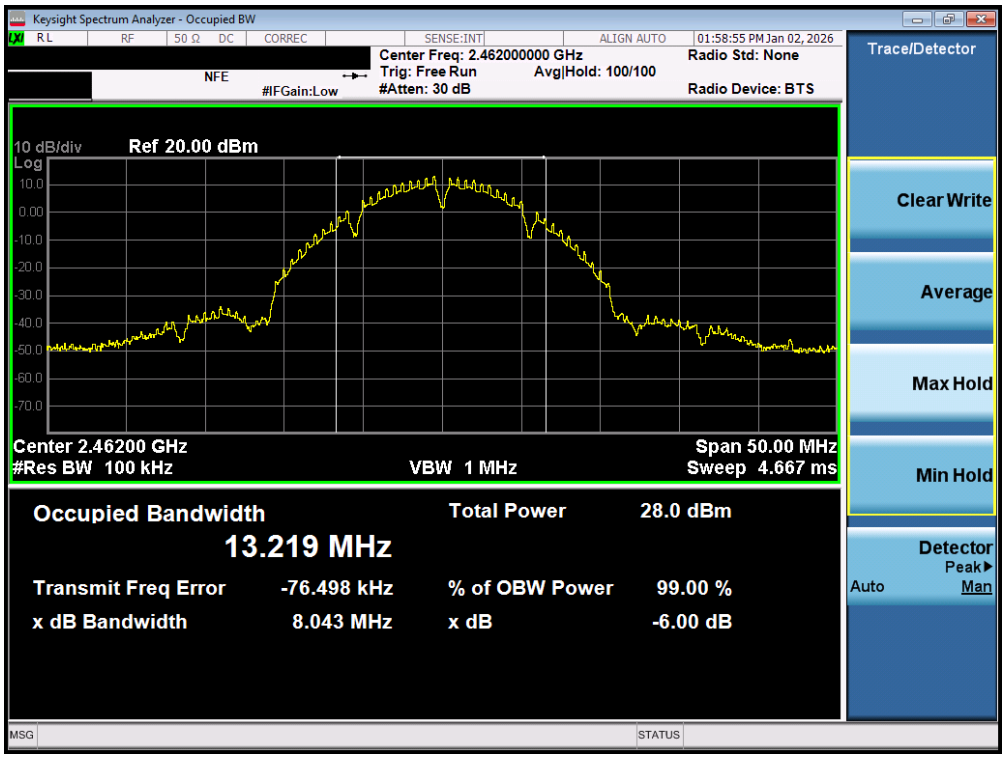
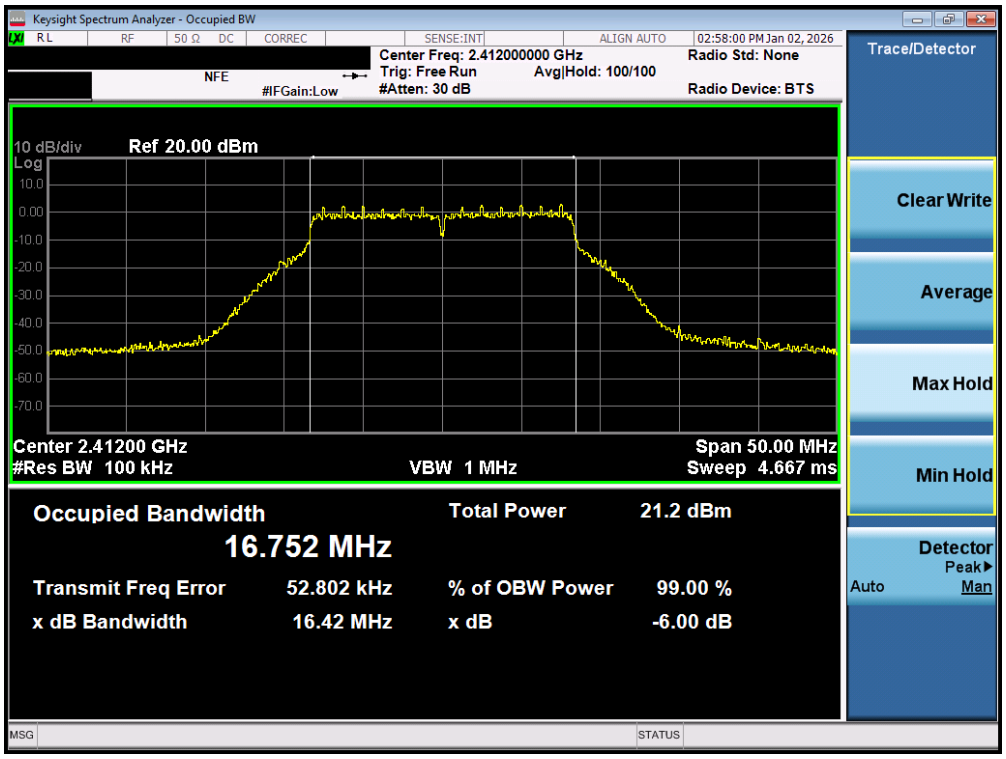


Plot 7-3. 6dB Bandwidth Plot MIMO ANT1 (802.11b – Ch. 11) – MIMO ANT1



Plot 7-4. 6dB Bandwidth Plot MIMO ANT1 (802.11g – Ch. 1) – MIMO ANT1

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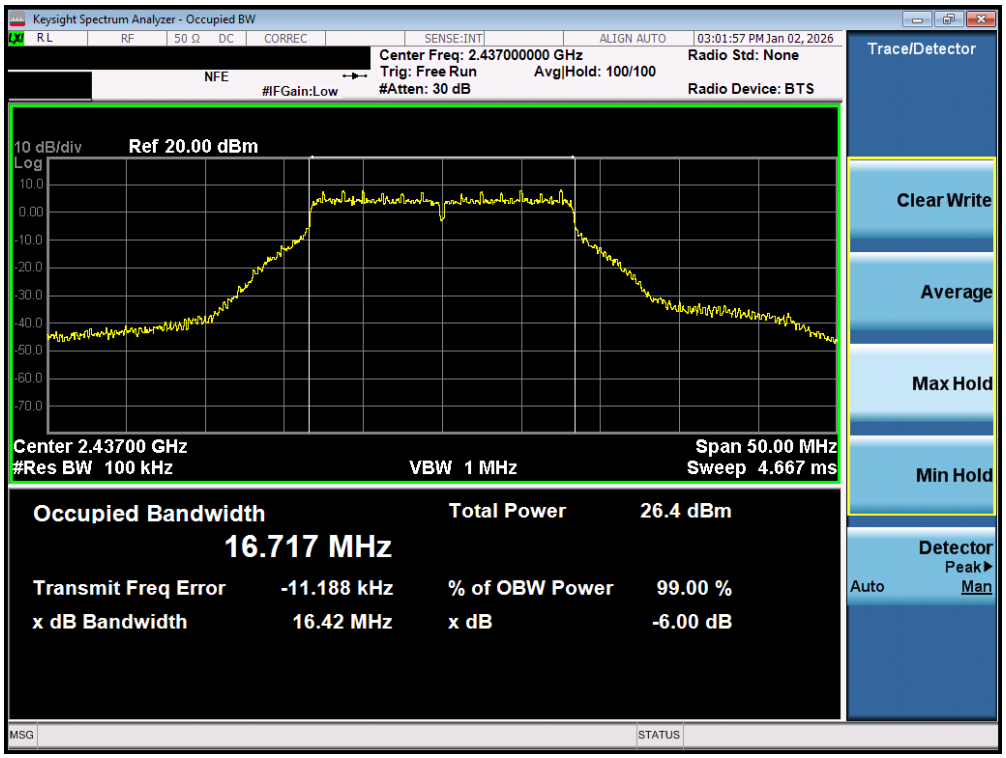
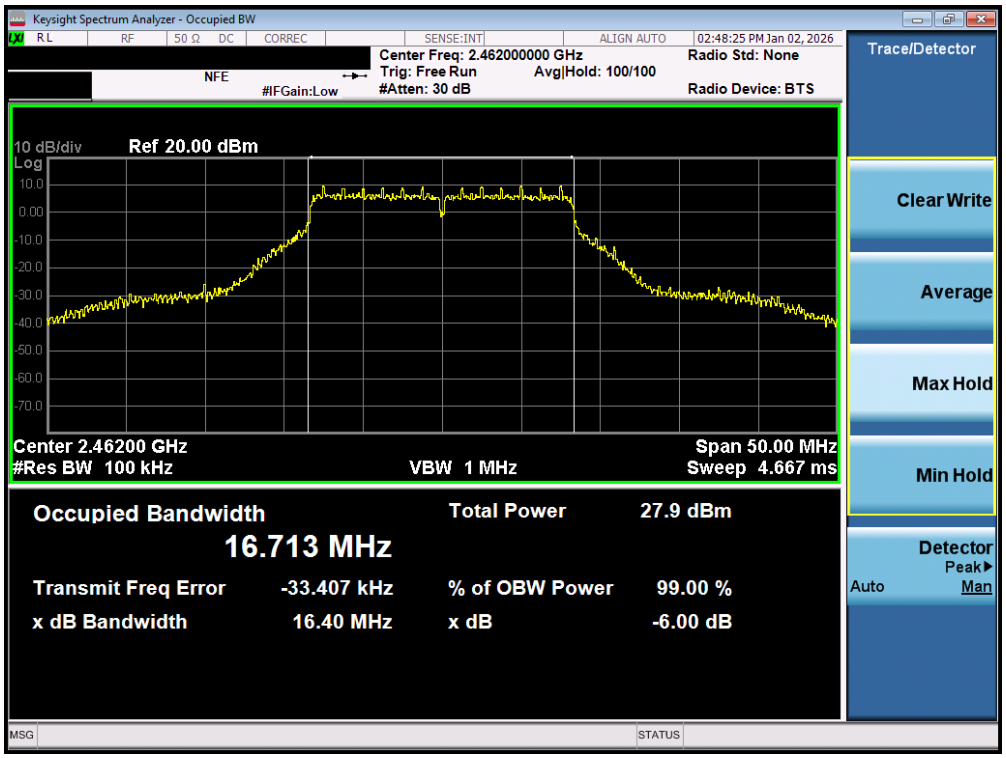


Plot 7-5. 6dB Bandwidth Plot MIMO ANT1 (802.11g – Ch. 6) – MIMO ANT1



Plot 7-6. 6dB Bandwidth Plot MIMO ANT1 (802.11g – Ch. 11) – MIMO ANT1

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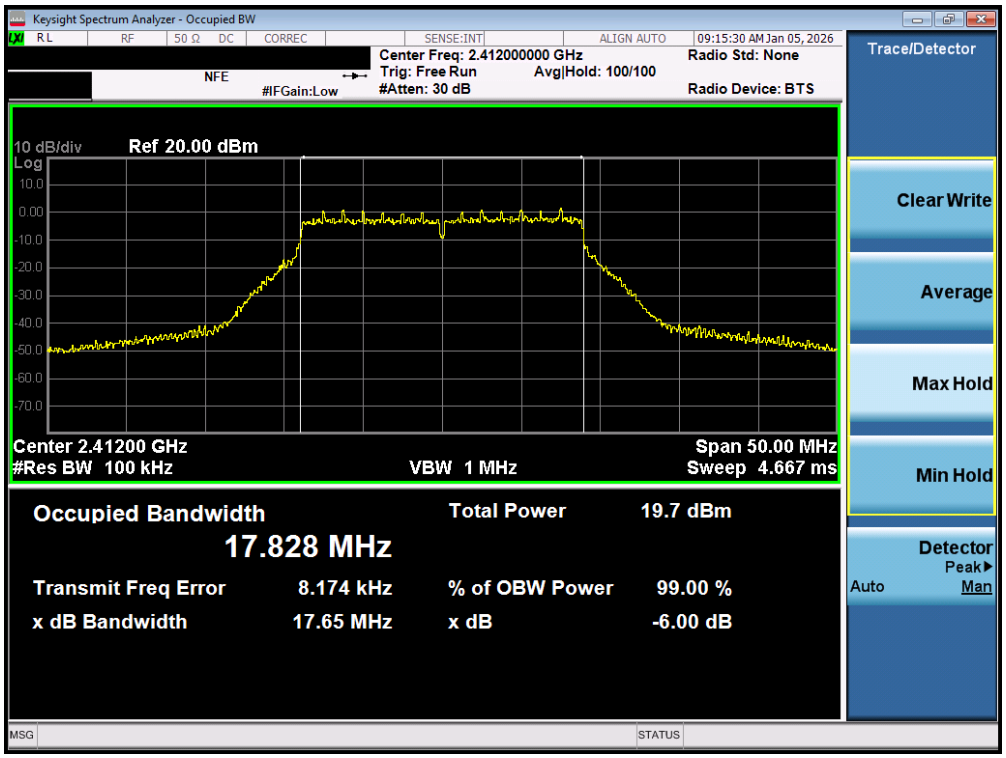
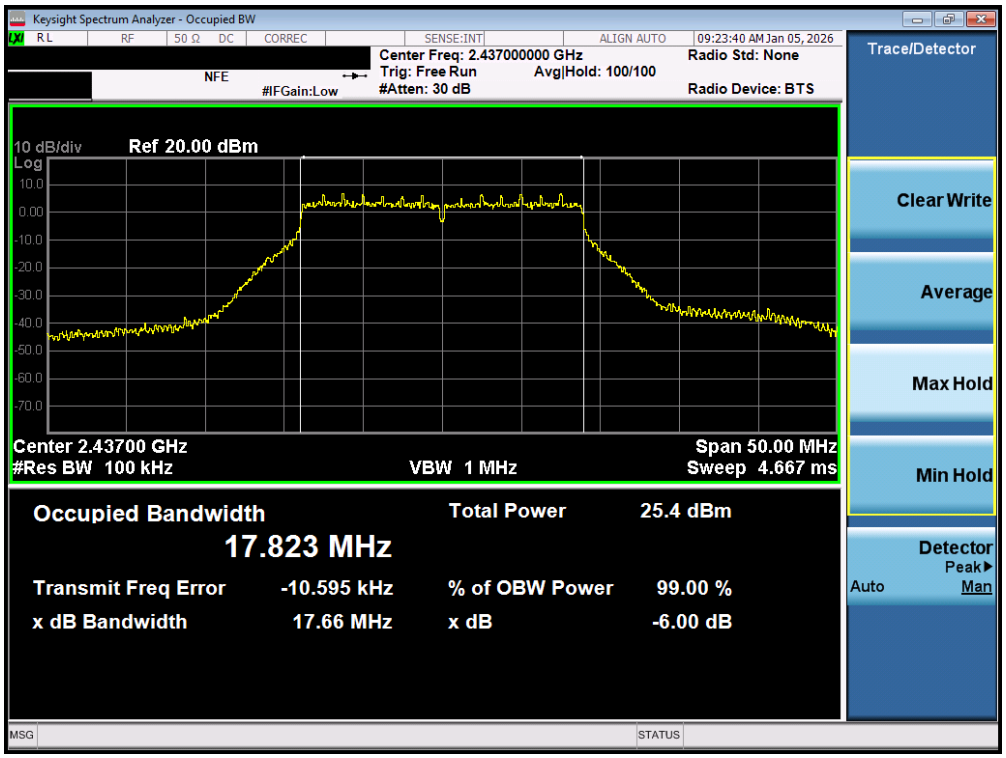


Plot 7-7. 6dB Bandwidth Plot MIMO ANT1 (802.11n 20MHz (2.4GHz) – Ch. 1) – MIMO ANT1



Plot 7-8. 6dB Bandwidth Plot MIMO ANT1 (802.11n 20MHz (2.4GHz) – Ch. 6) – MIMO ANT1

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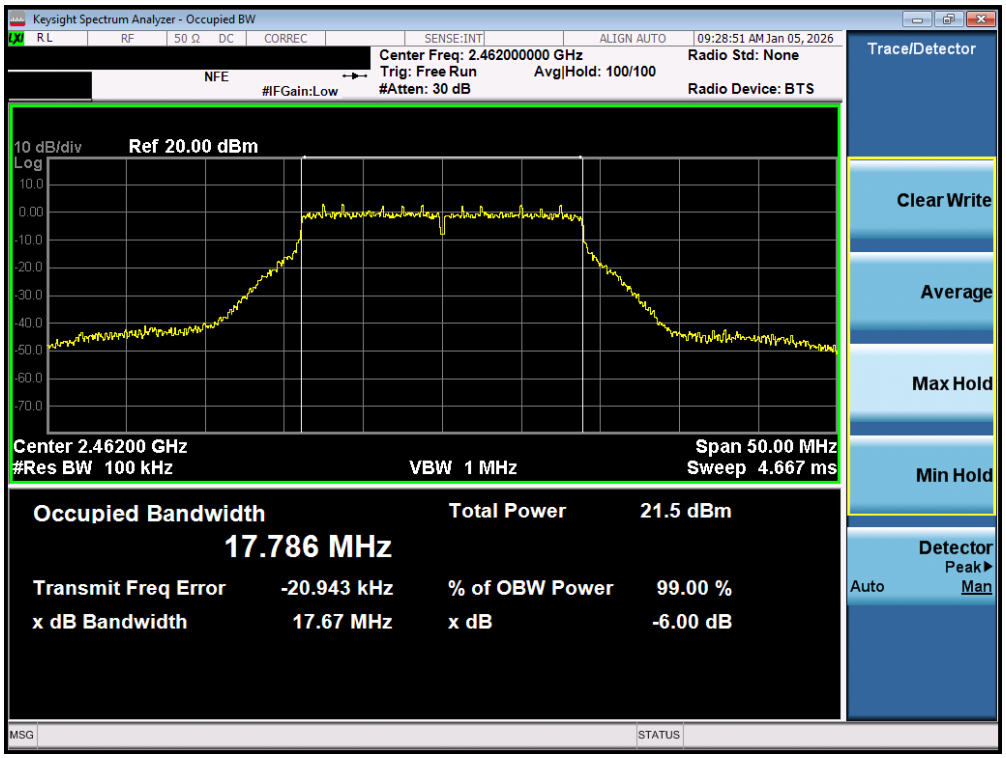
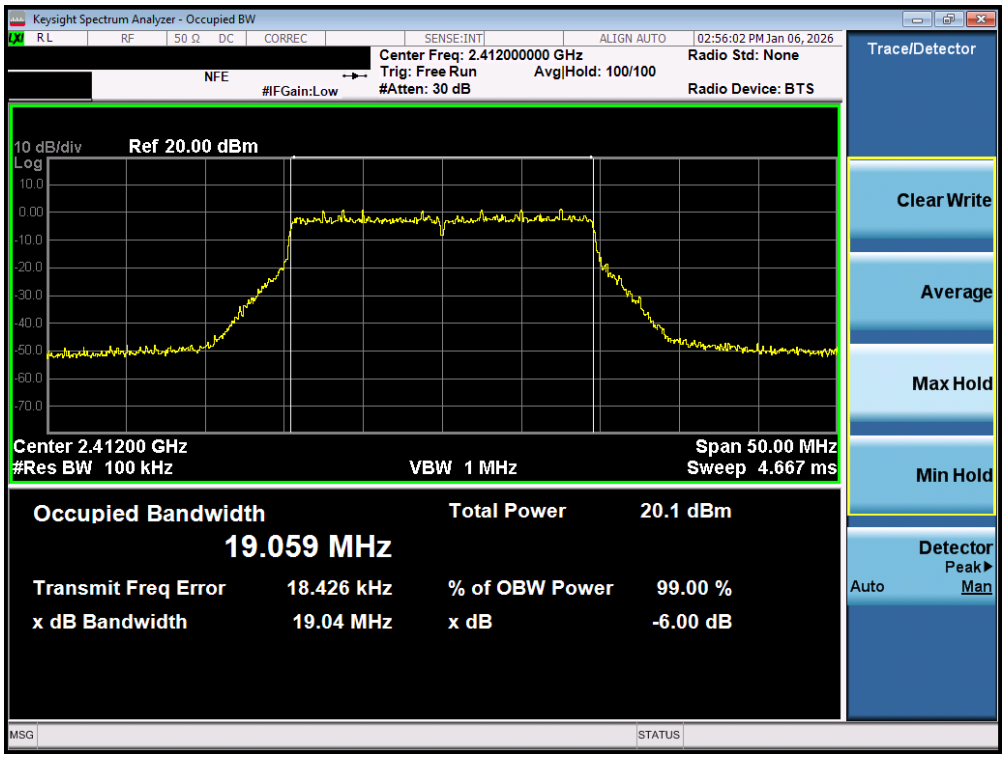


Plot 7-9. 6dB Bandwidth Plot MIMO ANT1 (802.11n 20MHz (2.4GHz) – Ch. 11) – MIMO ANT1



Plot 7-10. 6dB Bandwidth Plot MIMO ANT1 (802.11be 20MHz (2.4GHz) – Ch. 1) – MIMO ANT1

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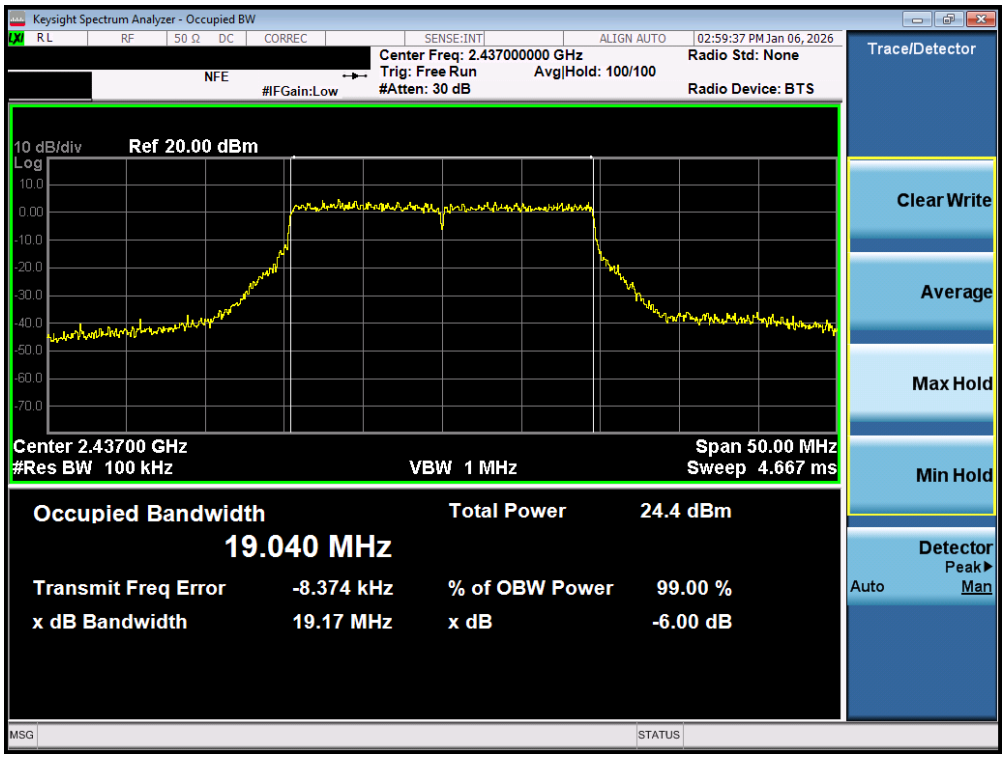
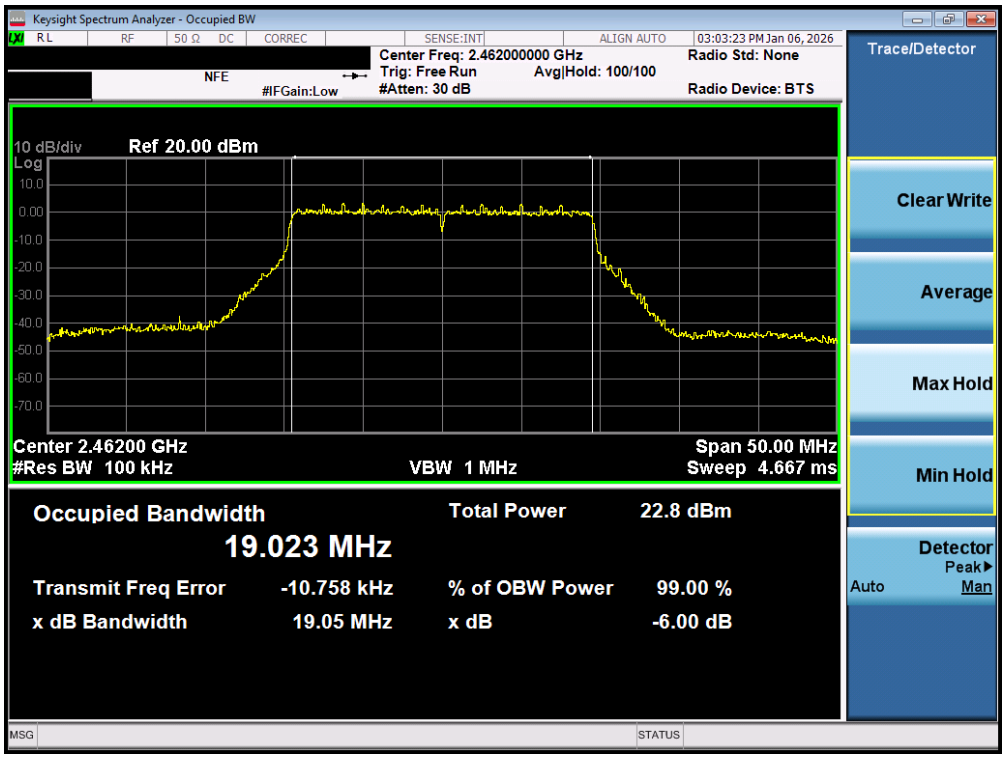


Plot 7-11. 6dB Bandwidth Plot MIMO ANT1 (802.11be 20MHz (2.4GHz) – Ch. 6) – MIMO ANT1



Plot 7-12. 6dB Bandwidth Plot MIMO ANT1 (802.11be 20MHz (2.4GHz) – Ch. 11) – MIMO ANT1

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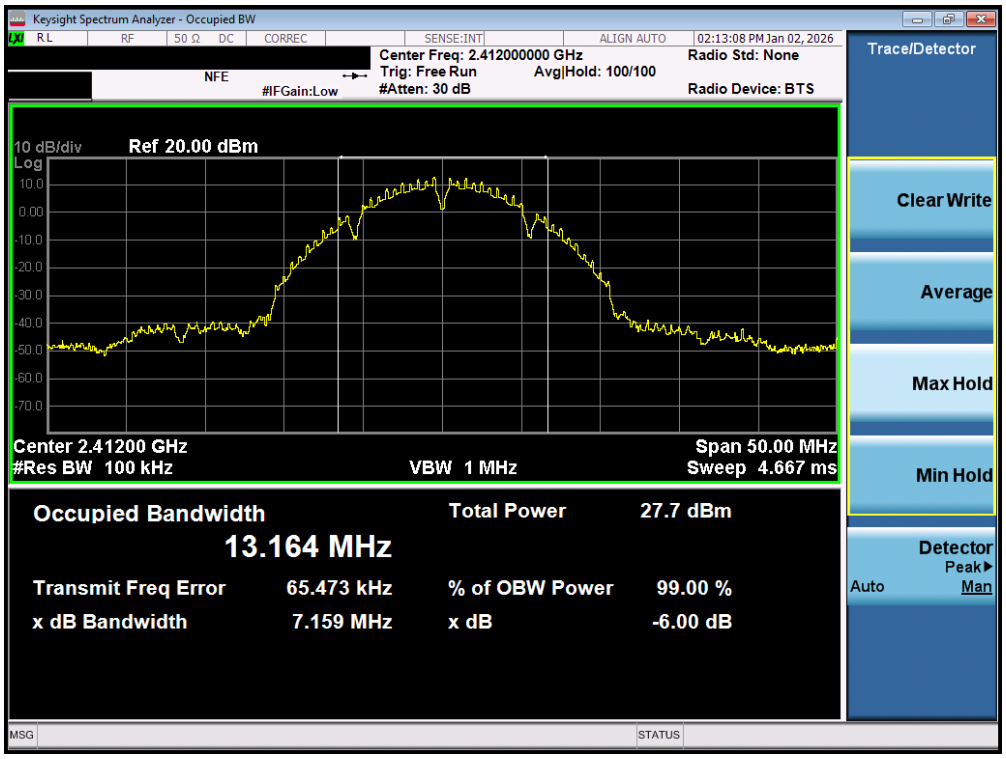
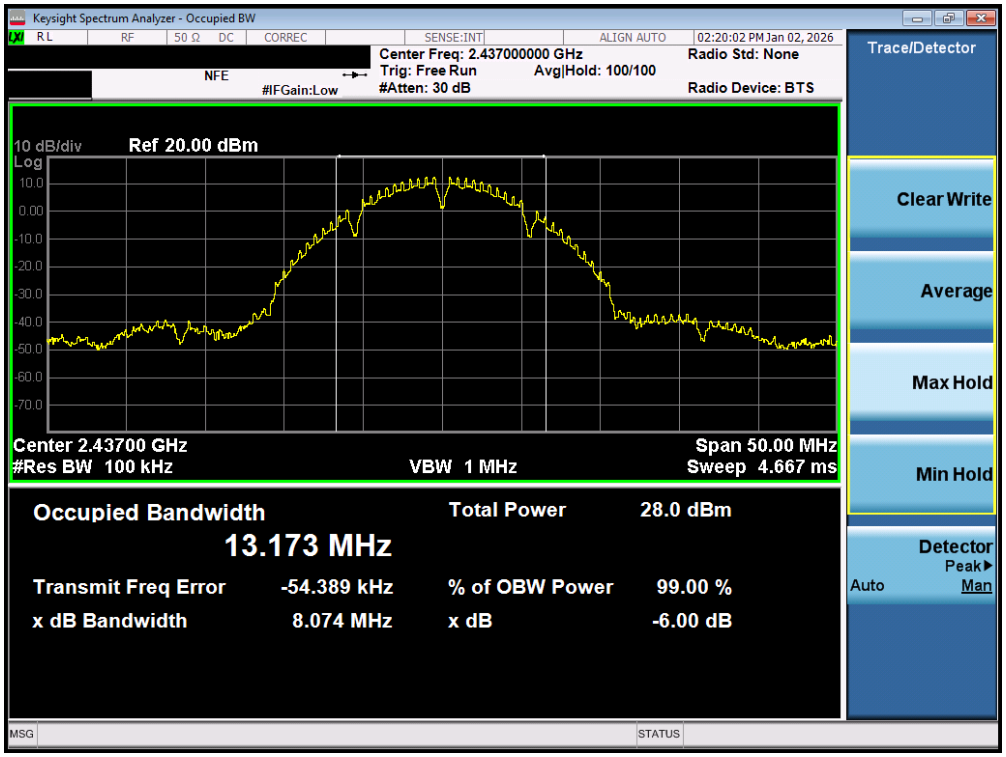
7.2.2 MIMO 6dB Bandwidth Measurements – MIMO ANT2 – 20MHz



Plot 7-13. 6dB Bandwidth Plot MIMO ANT2 (802.11b – Ch. 1) – MIMO ANT2



Plot 7-14. 6dB Bandwidth Plot MIMO ANT2 (802.11b – Ch. 6) – MIMO ANT2

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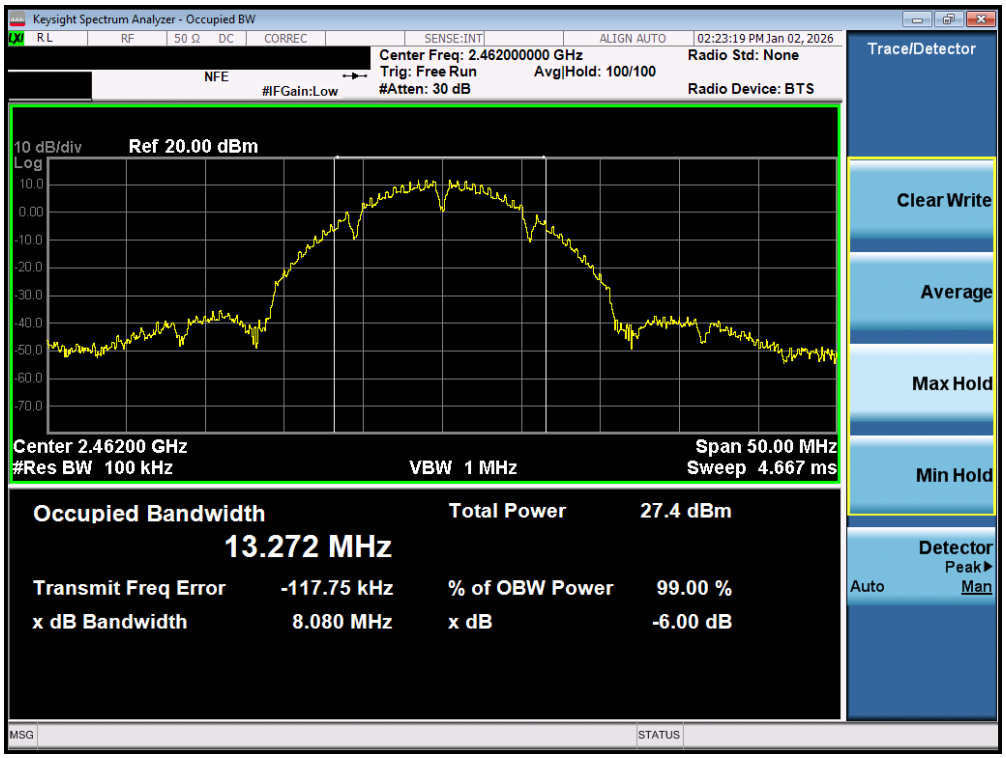
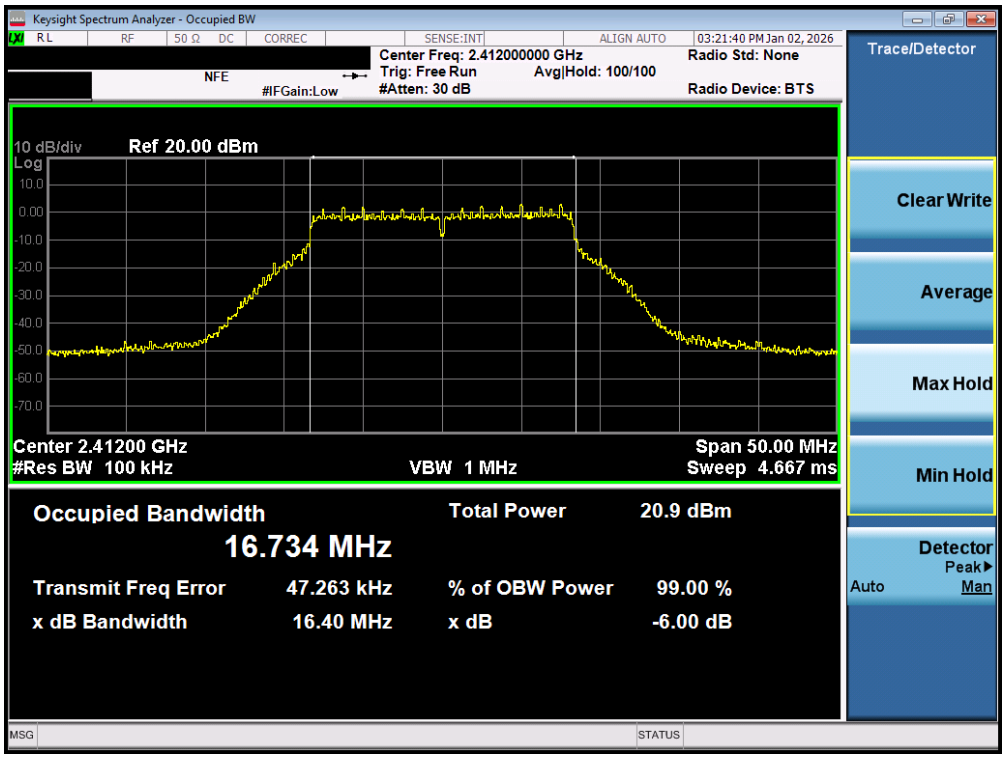


Plot 7-15. 6dB Bandwidth Plot MIMO ANT2 (802.11b – Ch. 11) – MIMO ANT2



Plot 7-16. 6dB Bandwidth Plot MIMO ANT2 (802.11g – Ch. 1) – MIMO ANT2

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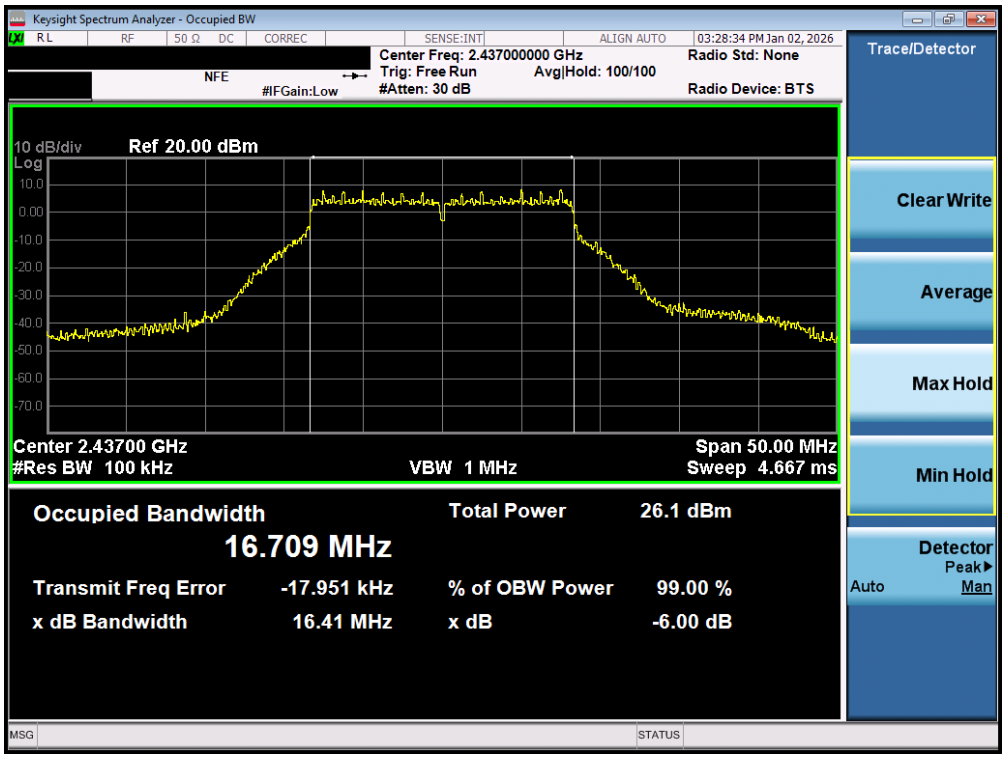
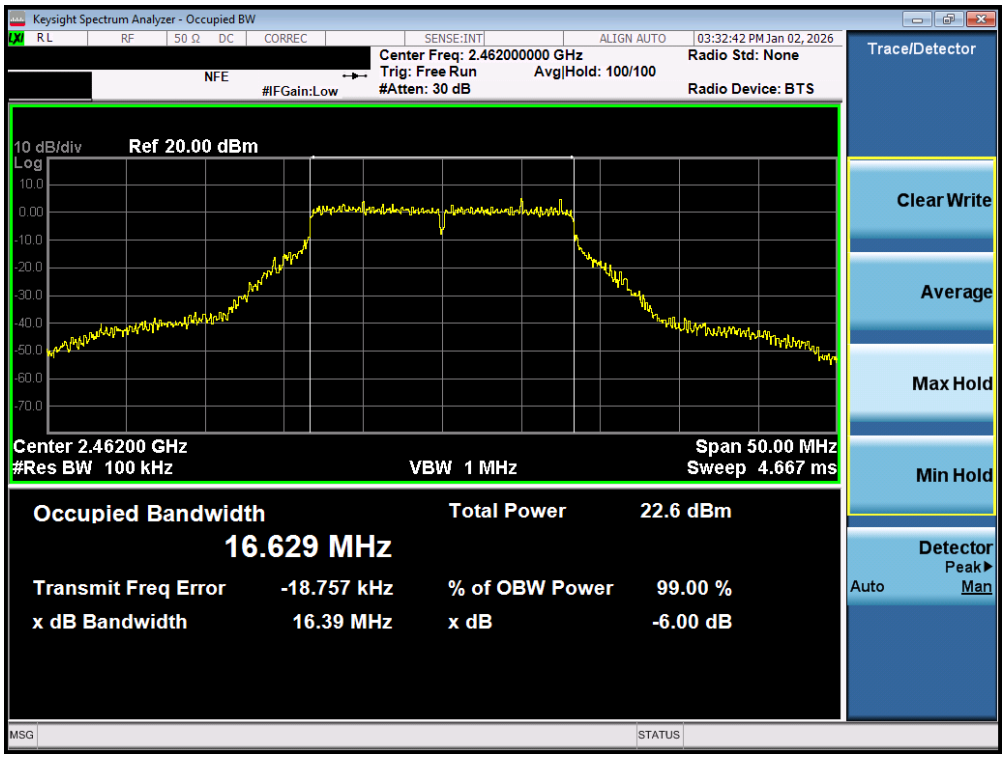


Plot 7-17. 6dB Bandwidth Plot MIMO ANT2 (802.11g – Ch. 6) – MIMO ANT2



Plot 7-18. 6dB Bandwidth Plot MIMO ANT2 (802.11g – Ch. 11) – MIMO ANT2

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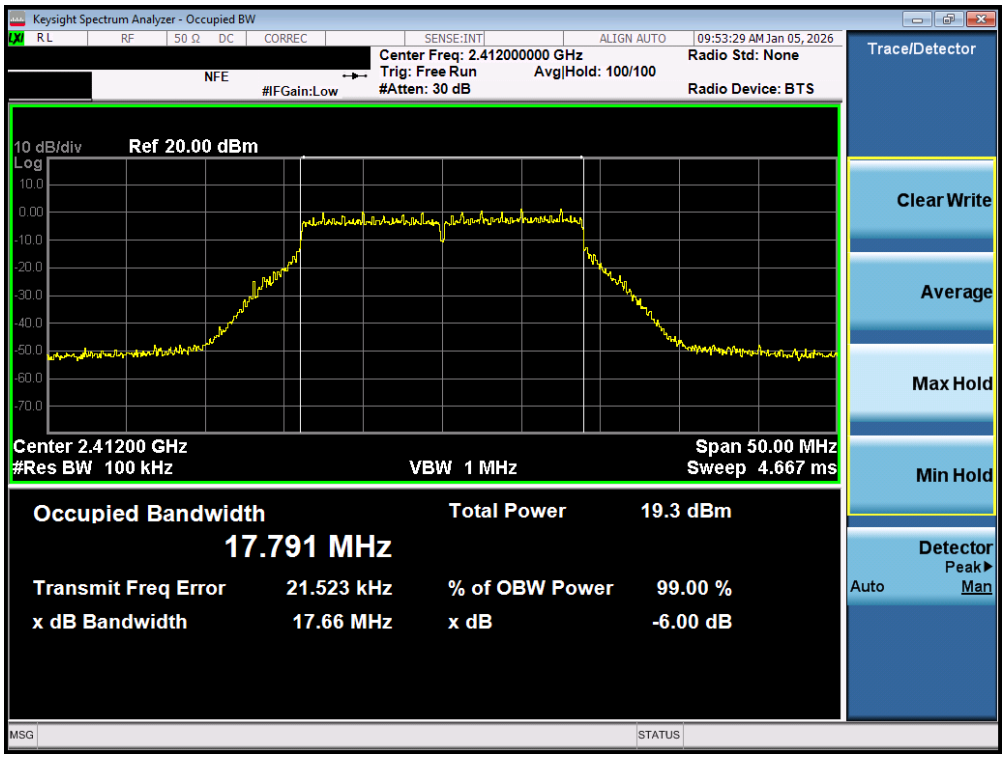
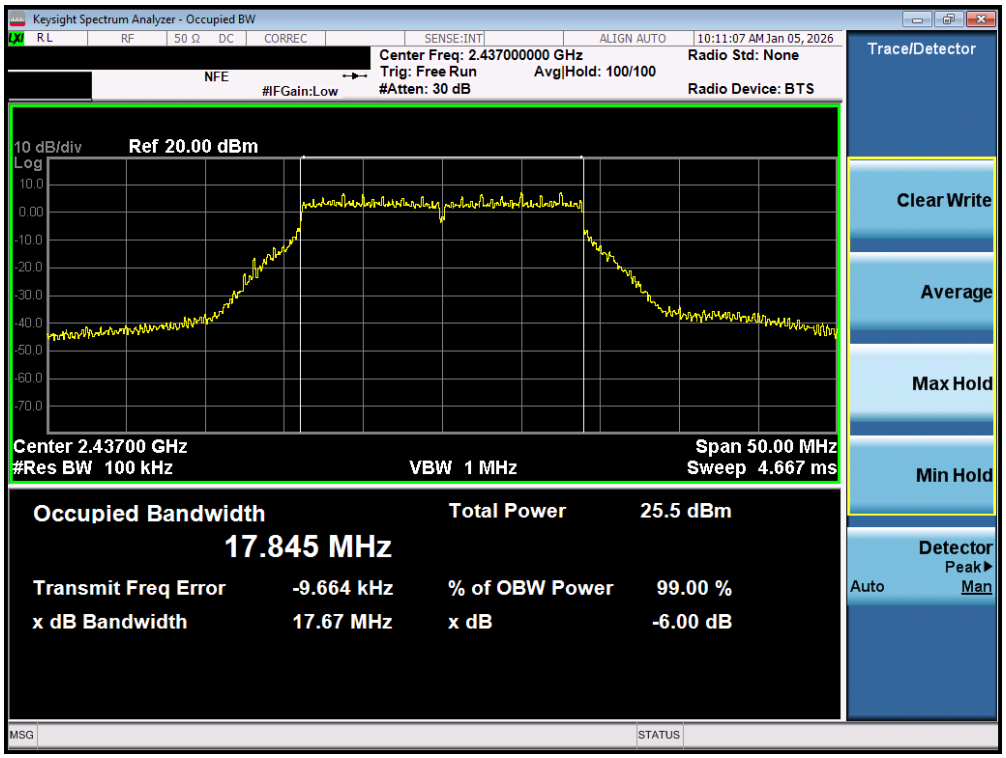


Plot 7-19. 6dB Bandwidth Plot MIMO ANT2 (802.11n 20MHz (2.4GHz) – Ch. 1) – MIMO ANT2



Plot 7-20. 6dB Bandwidth Plot MIMO ANT2 (802.11n 20MHz (2.4GHz) – Ch. 6) – MIMO ANT2

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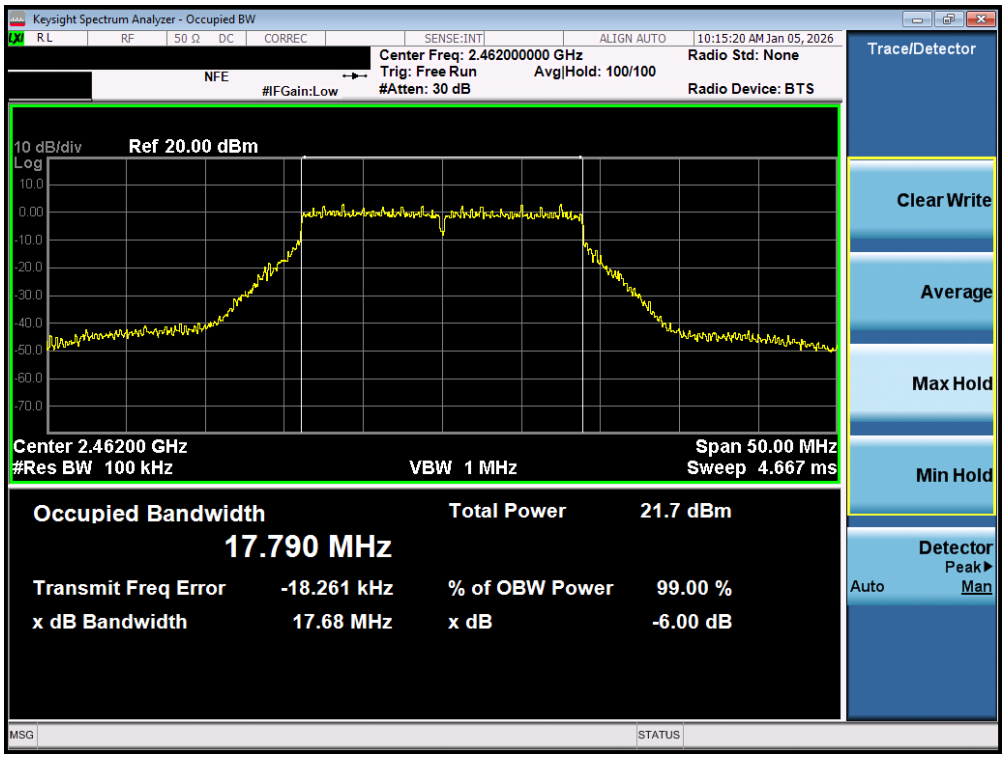
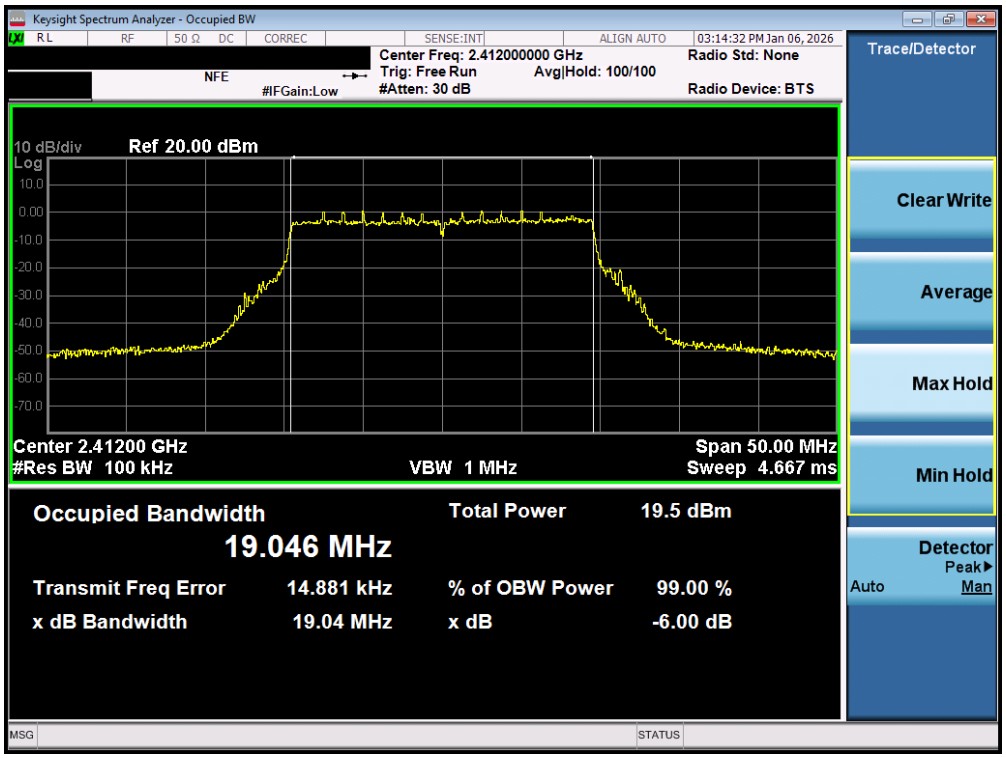


Plot 7-21. 6dB Bandwidth Plot MIMO ANT2 (802.11n 20MHz (2.4GHz) – Ch. 11) – MIMO ANT2



Plot 7-22. 6dB Bandwidth Plot MIMO ANT2 (802.11be 20MHz (2.4GHz) – Ch. 1) – MIMO ANT2

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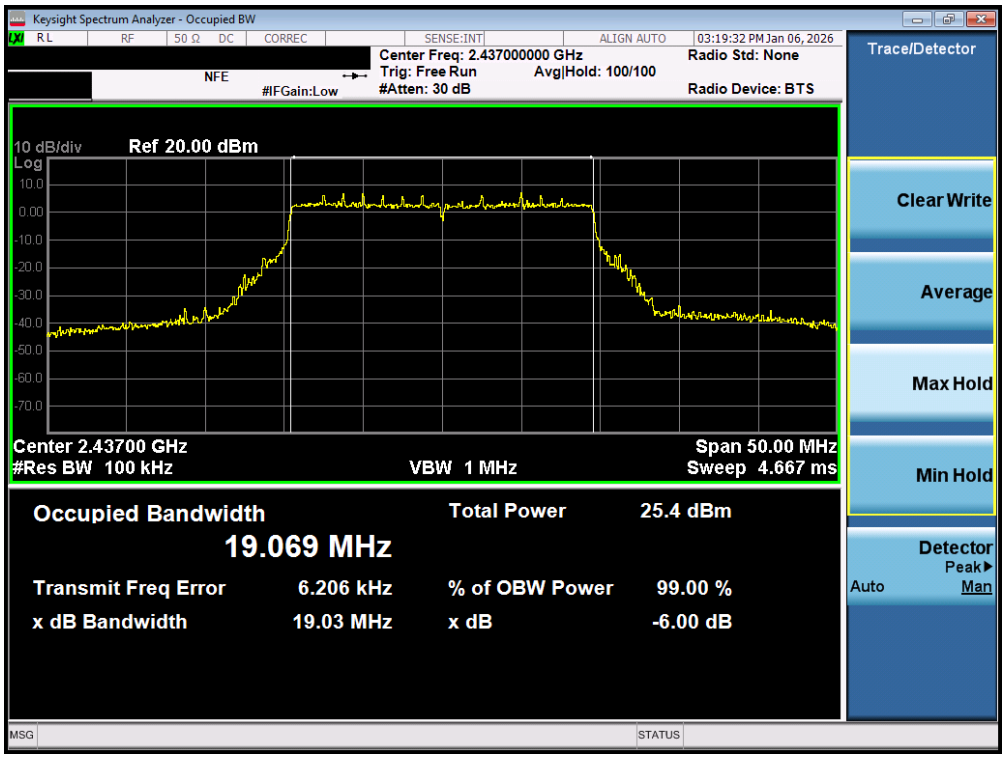
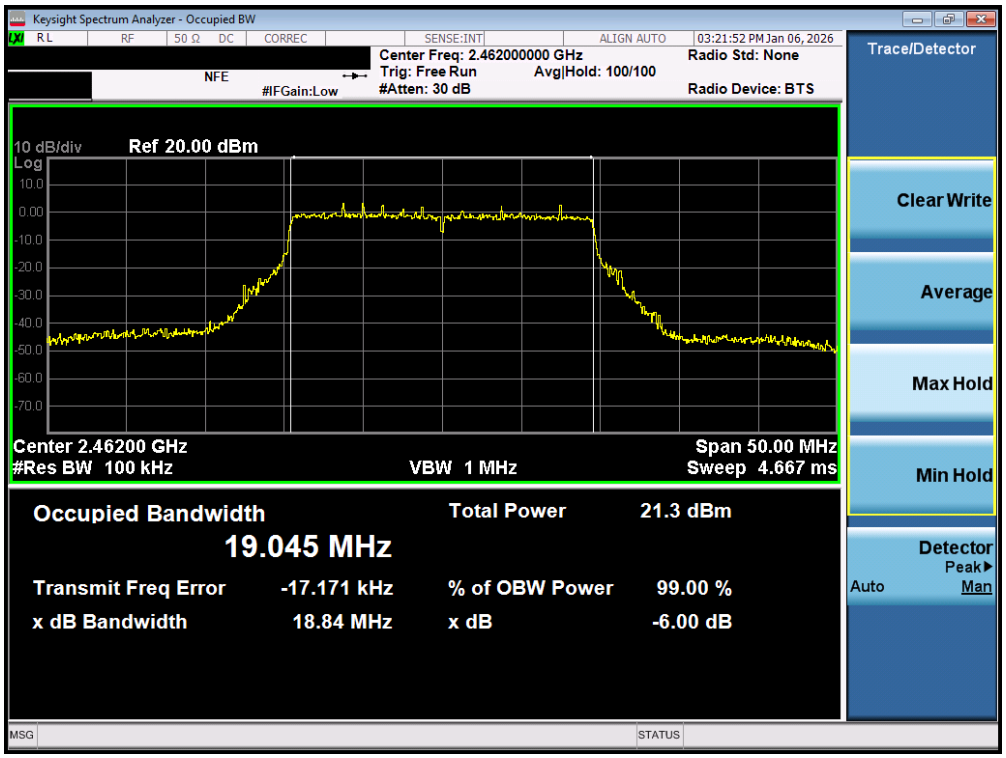


Plot 7-23. 6dB Bandwidth Plot MIMO ANT2 (802.11be 20MHz (2.4GHz) – Ch. 6) – MIMO ANT2



Plot 7-24. 6dB Bandwidth Plot MIMO ANT2 (802.11be 20MHz (2.4GHz) – Ch. 11) – MIMO ANT2

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6dB Bandwidth Measurements – 40MHz

Frequency [MHz]	Channel No.	802.11 Mode	Data Rate [Mbps]	Antenna-1 6dB Bandwidth [MHz]	Antenna-2 6dB Bandwidth [MHz]	Minimum Bandwidth [MHz]
2412	3	n	6.5/7.2 (MCS0)	36.45	36.46	0.500
2437	6	n	6.5/7.2 (MCS0)	36.53	36.52	0.500
2462	11	n	6.5/7.2 (MCS0)	36.46	36.49	0.500
2412	3	be	6.5/7.2 (MCS0)	38.17	38.08	0.500
2437	6	be	6.5/7.2 (MCS0)	38.19	38.05	0.500
2462	11	be	6.5/7.2 (MCS0)	37.96	37.89	0.500

Table 7-3. Conducted 6dB Bandwidth Measurements MIMO

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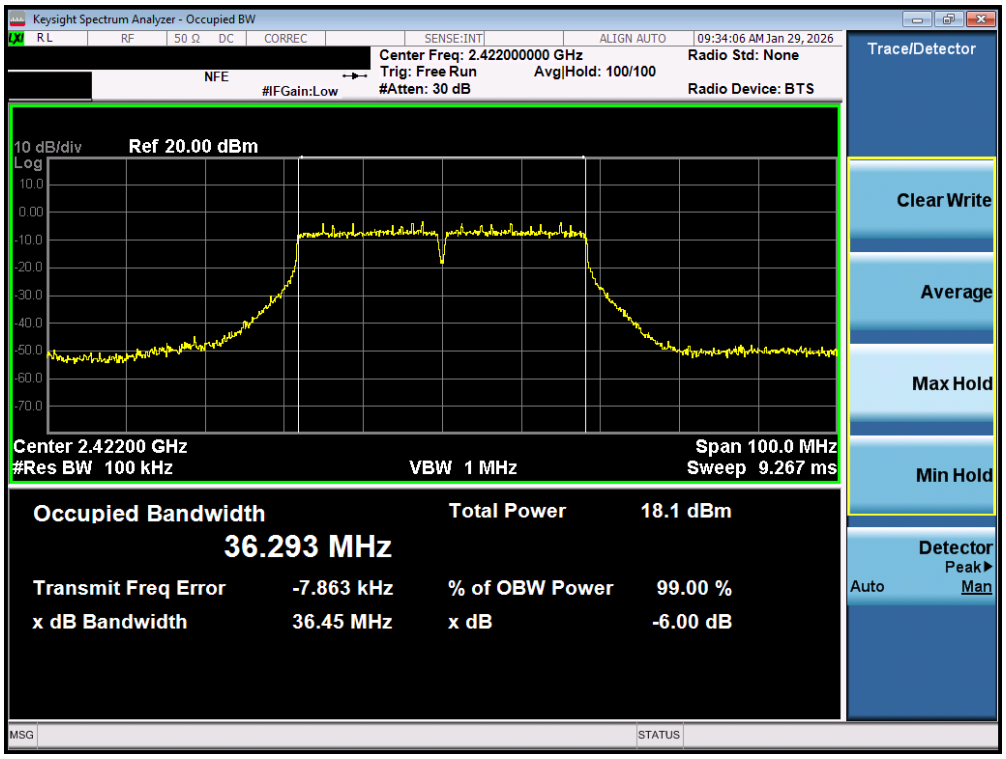
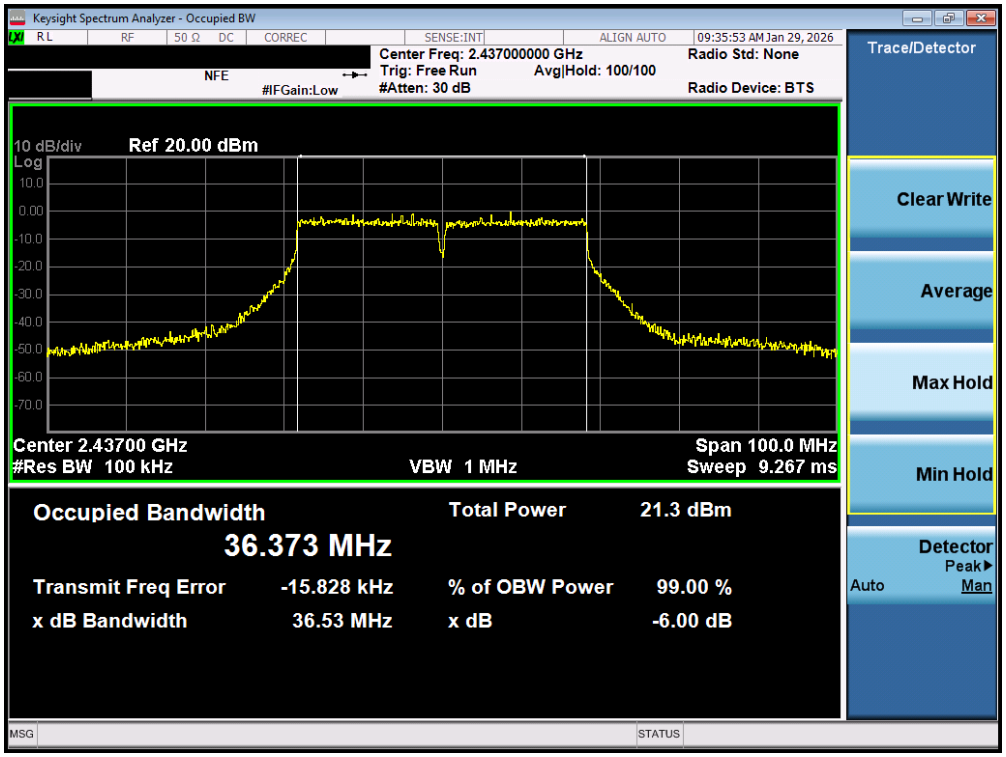
7.2.3 MIMO 6dB Bandwidth Measurements - MIMO ANT1 – 40MHz



Plot 7-25. 6dB Bandwidth Plot MIMO ANT1 (802.11n 40MHz (2.4GHz) – Ch. 3) – MIMO ANT1



Plot 7-26. 6dB Bandwidth Plot MIMO ANT1 (802.11n 40MHz (2.4GHz) – Ch. 6) – MIMO ANT1

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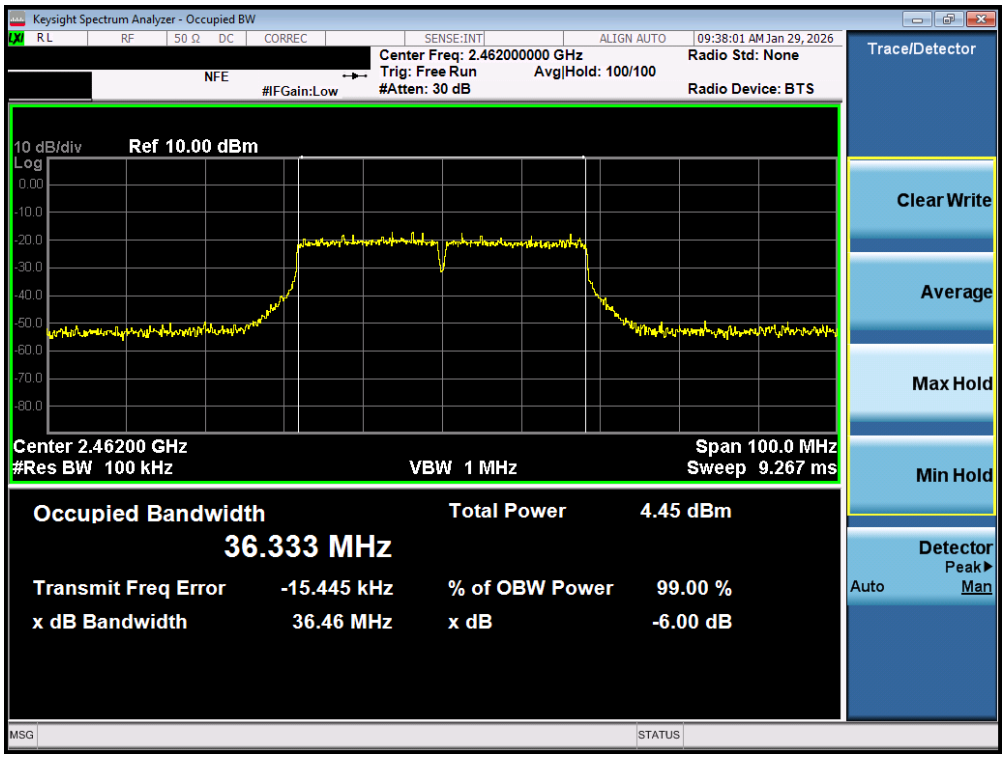

Plot 7-27. 6dB Bandwidth Plot MIMO ANT1 (802.11n 40MHz (2.4GHz) – Ch. 11) – MIMO ANT1

Plot 7-28. 6dB Bandwidth Plot MIMO ANT1 (802.11be 40MHz (2.4GHz) – Ch. 3) – MIMO ANT1

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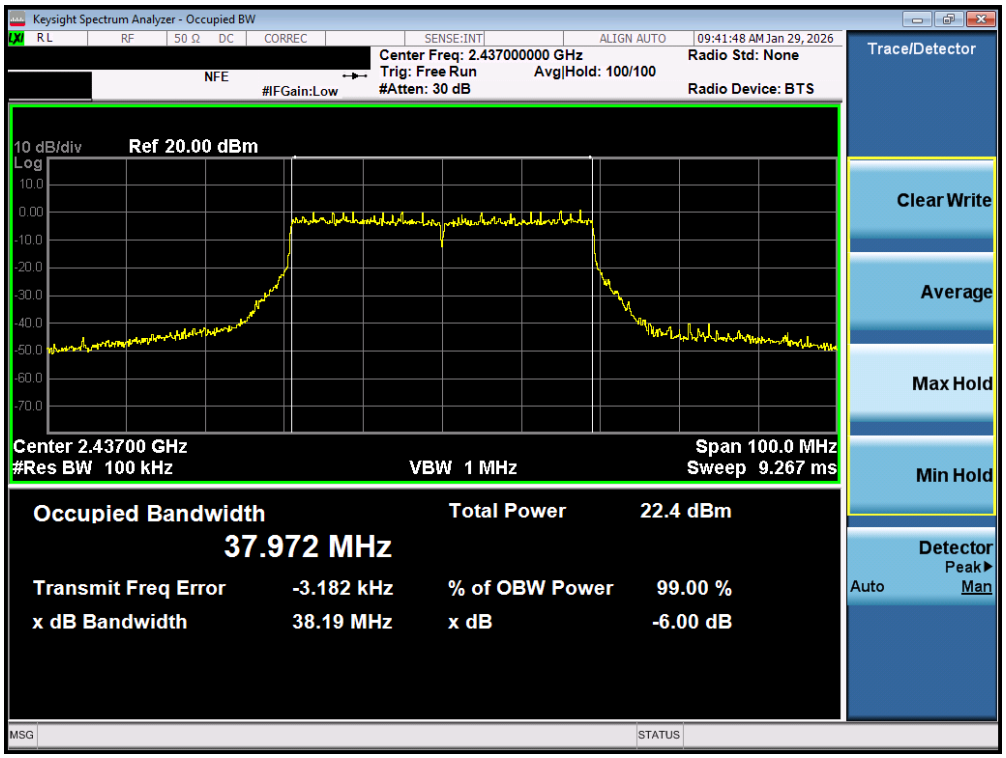
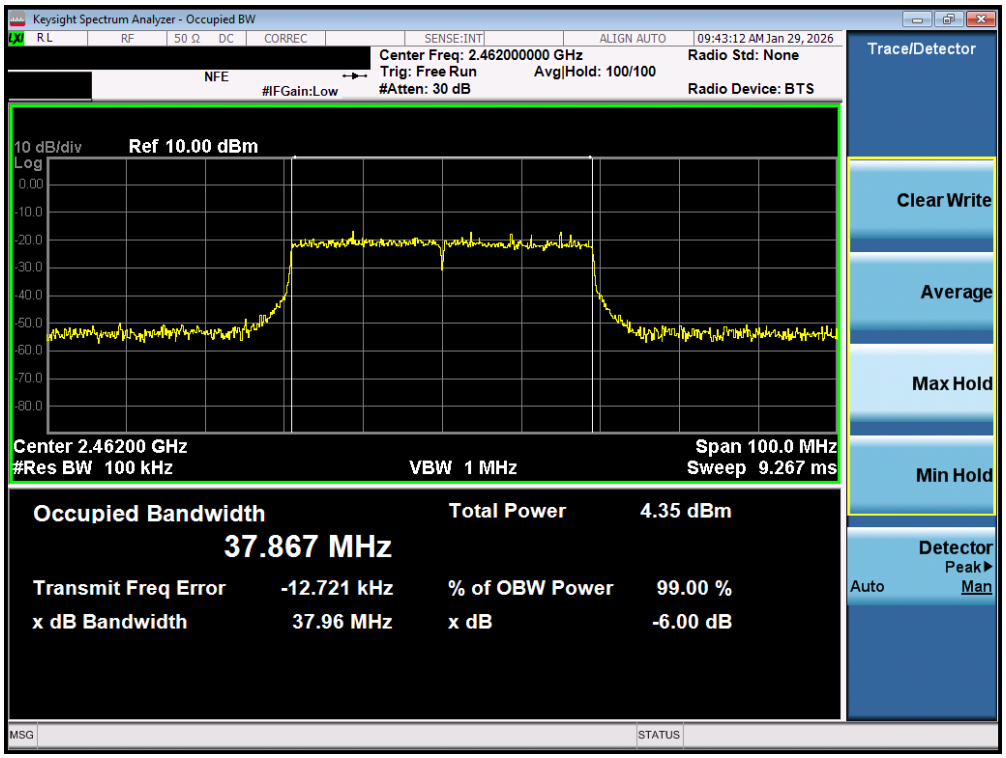


Plot 7-29. 6dB Bandwidth Plot MIMO ANT1 (802.11be 40MHz (2.4GHz) – Ch. 6) – MIMO ANT1



Plot 7-30. 6dB Bandwidth Plot MIMO ANT1 (802.11be 40MHz (2.4GHz) – Ch. 11) – MIMO ANT1

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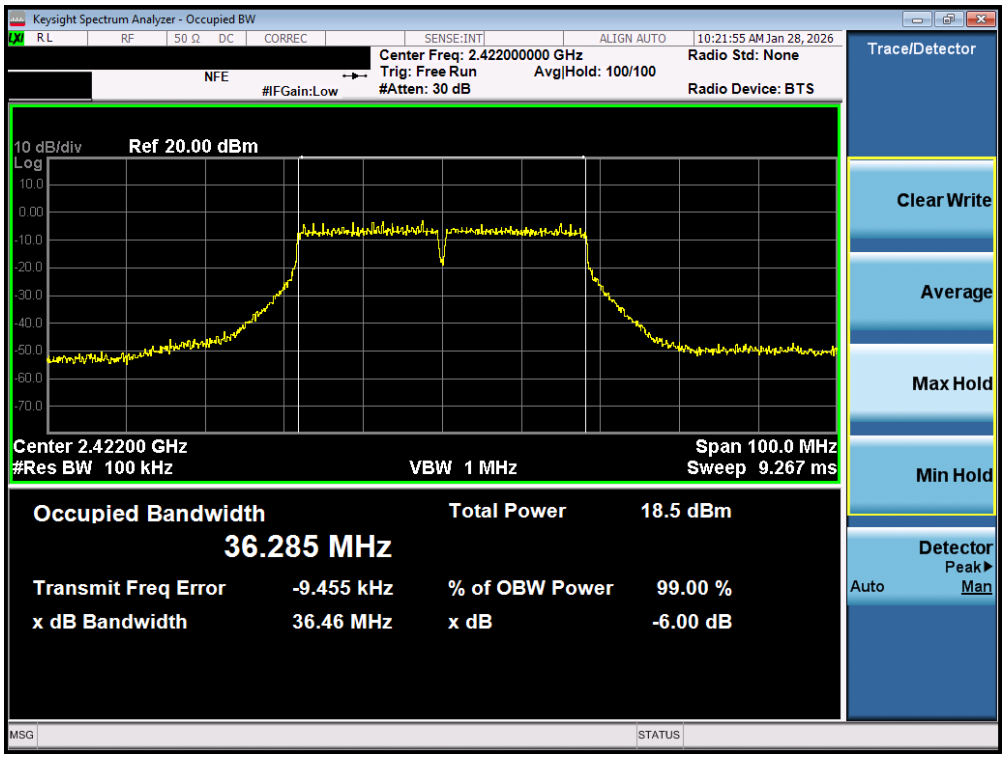
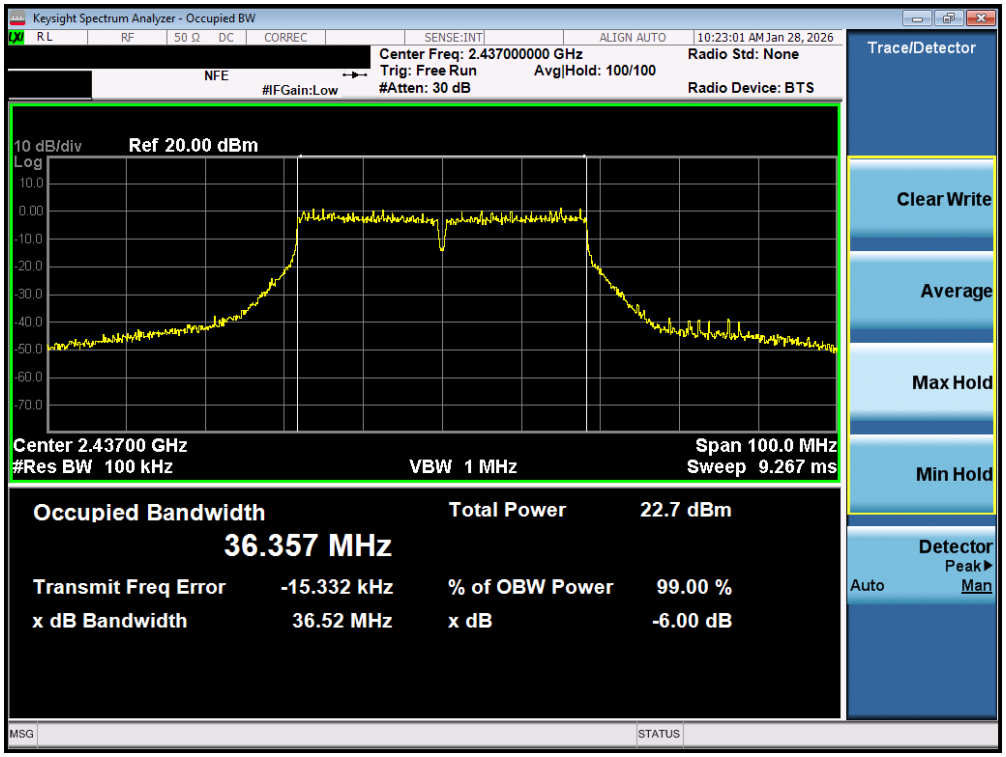
7.2.4 MIMO 6dB Bandwidth Measurements – MIMO ANT2 – 40MHz



Plot 7-31. 6dB Bandwidth Plot MIMO ANT2 (802.11n 40MHz (2.4GHz) – Ch. 3) – MIMO ANT2



Plot 7-32. 6dB Bandwidth Plot MIMO ANT2 (802.11n 40MHz (2.4GHz) – Ch. 6) – MIMO ANT2

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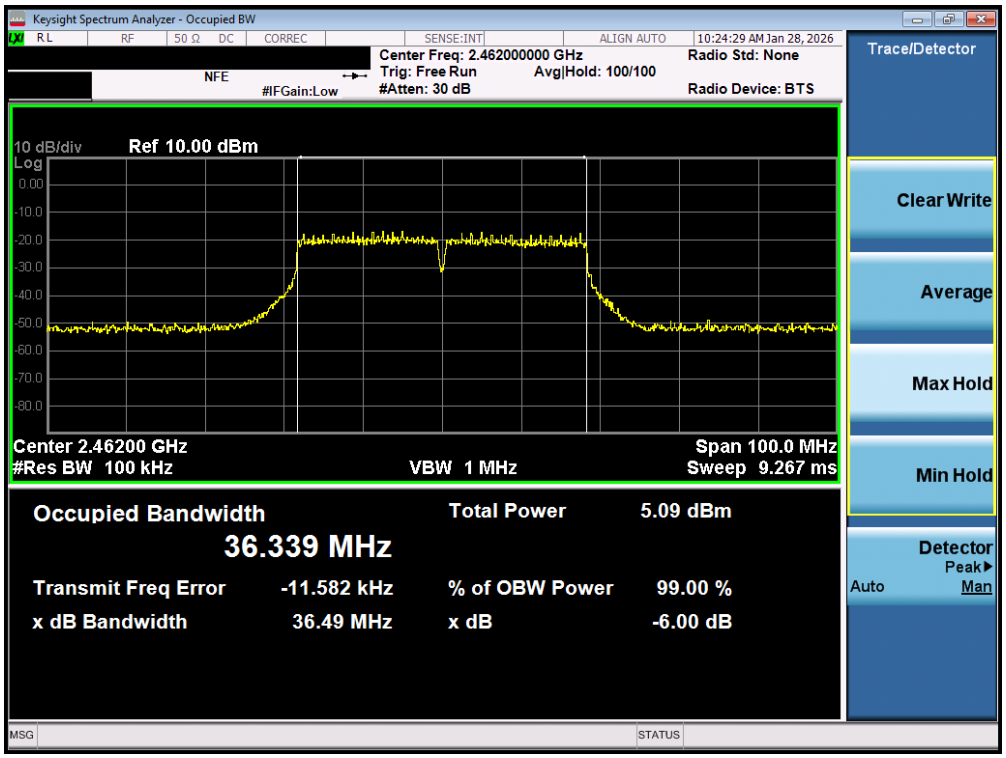
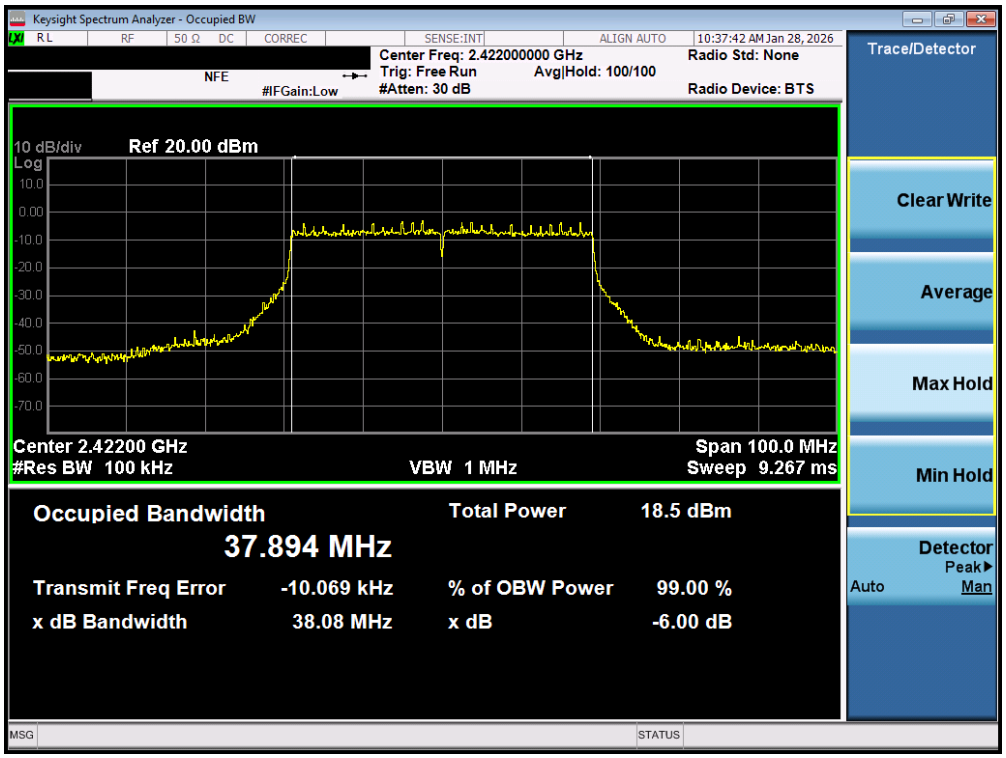


Plot 7-33. 6dB Bandwidth Plot MIMO ANT2 (802.11n 40MHz (2.4GHz) – Ch. 11) – MIMO ANT2



Plot 7-34. 6dB Bandwidth Plot MIMO ANT2 (802.11be 40MHz (2.4GHz) – Ch. 3) – MIMO ANT2

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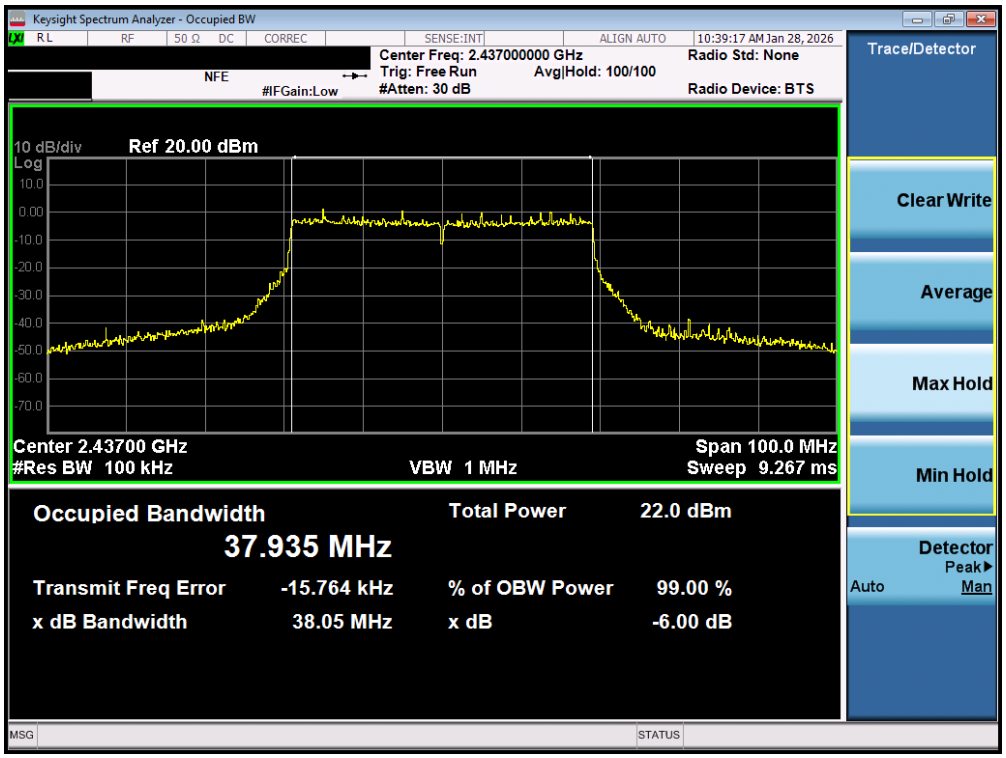
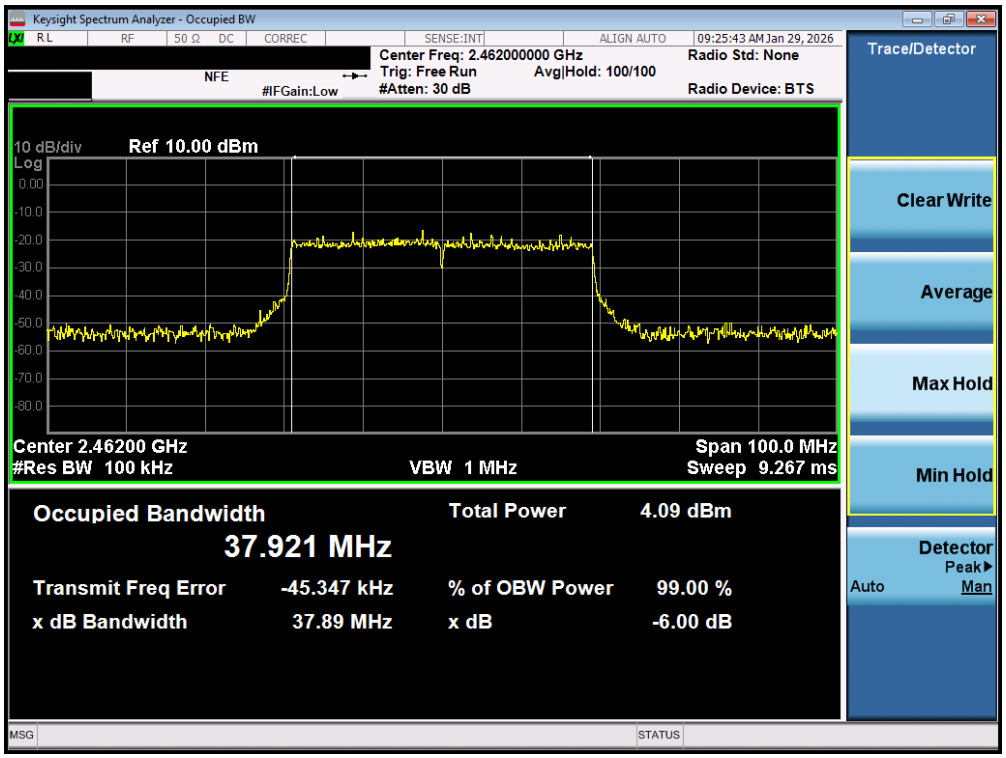


Plot 7-35. 6dB Bandwidth Plot MIMO ANT2 (802.11be 40MHz (2.4GHz) – Ch. 6) – MIMO ANT2



Plot 7-36. 6dB Bandwidth Plot MIMO ANT2 (802.11be 40MHz (2.4GHz) – Ch. 11) – MIMO ANT2

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OBW Measurements

Frequency [MHz]	Channel	802.11 MODE	Antenna-1 OBW [MHz]	Antenna-2 OBW [MHz]
2412	1	b	13.22	13.29
2437	6	b	13.29	13.35
2462	11	b	13.26	13.19
2412	1	g	17.74	17.46
2437	6	g	17.89	17.41
2462	11	g	17.63	17.47
2412	1	n	18.53	18.24
2437	6	n	18.56	18.27
2462	11	n	18.56	18.20
2412	1	be SU	19.40	19.35
2437	6	be SU	19.41	19.40
2462	11	be SU	19.38	19.35

Table 7-4. Conducted OBW Measurements MIMO

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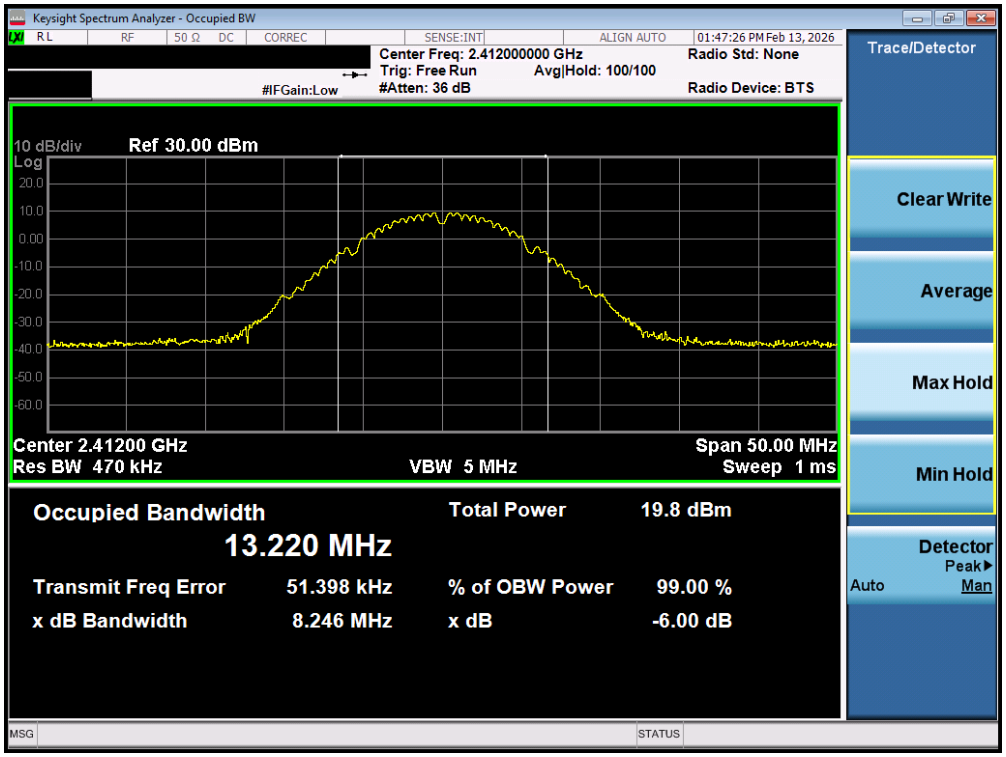
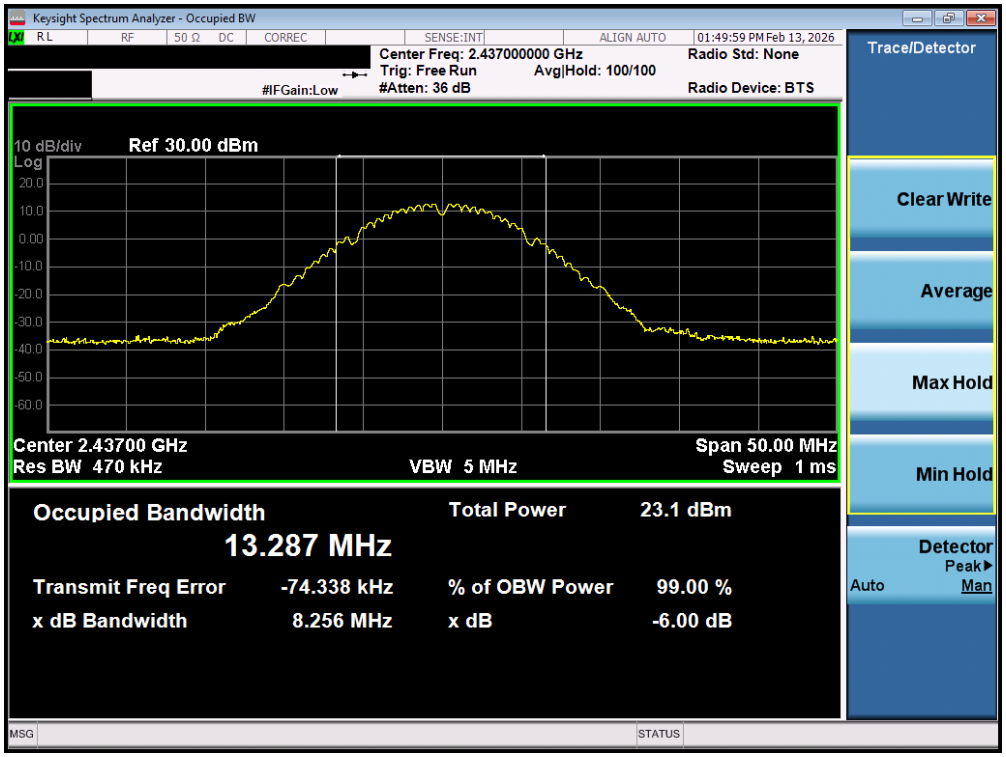
OBW **Measurements**



Plot 7-37. OBW Plot MIMO ANT1 (802.11b – Ch. 1)



Plot 7-38. OBW Plot MIMO ANT1 (802.11b – Ch. 6)

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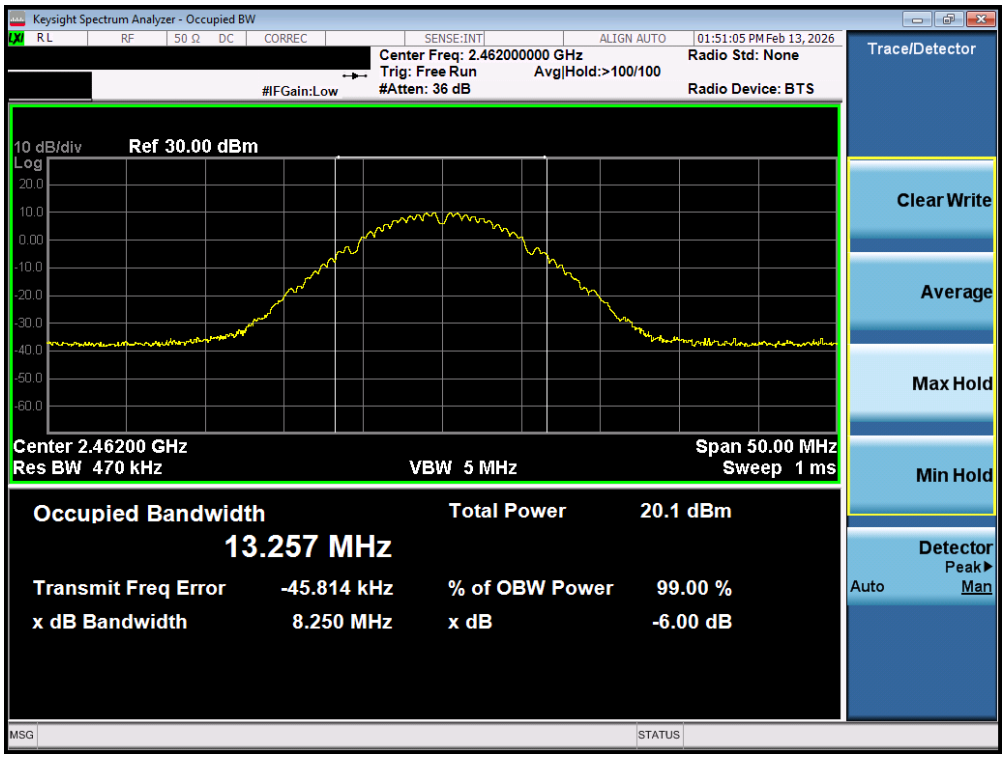
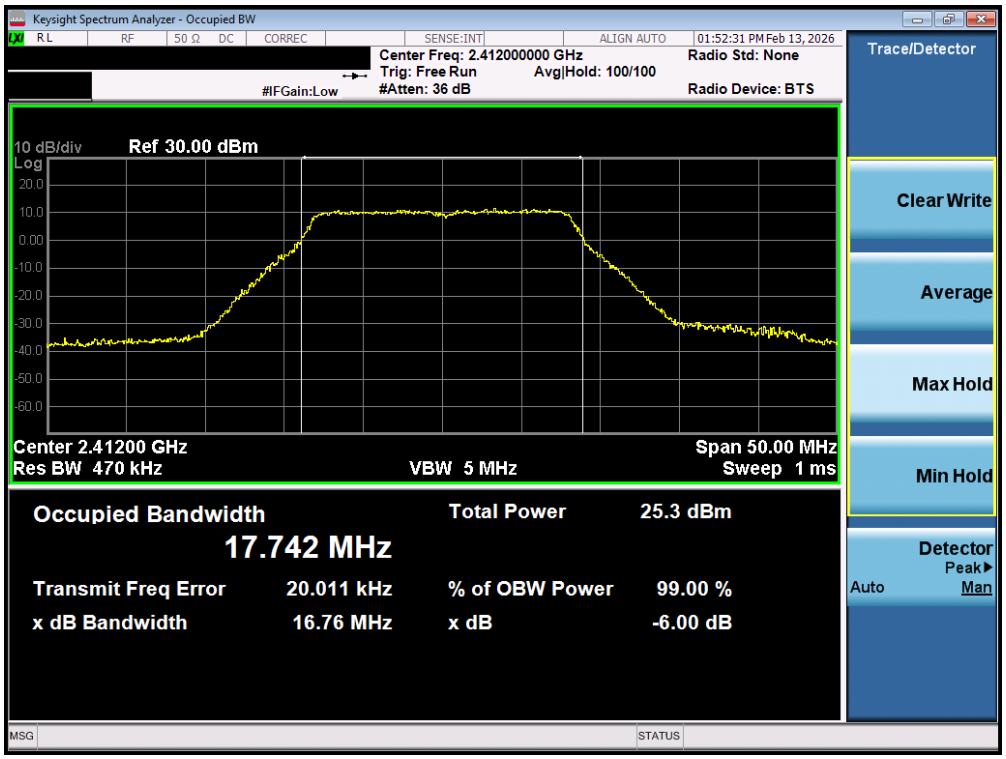


Plot 7-39. OBW Plot MIMO ANT1 (802.11b – Ch. 11)



Plot 7-40. OBW Plot MIMO ANT1 (802.11g – Ch. 1)

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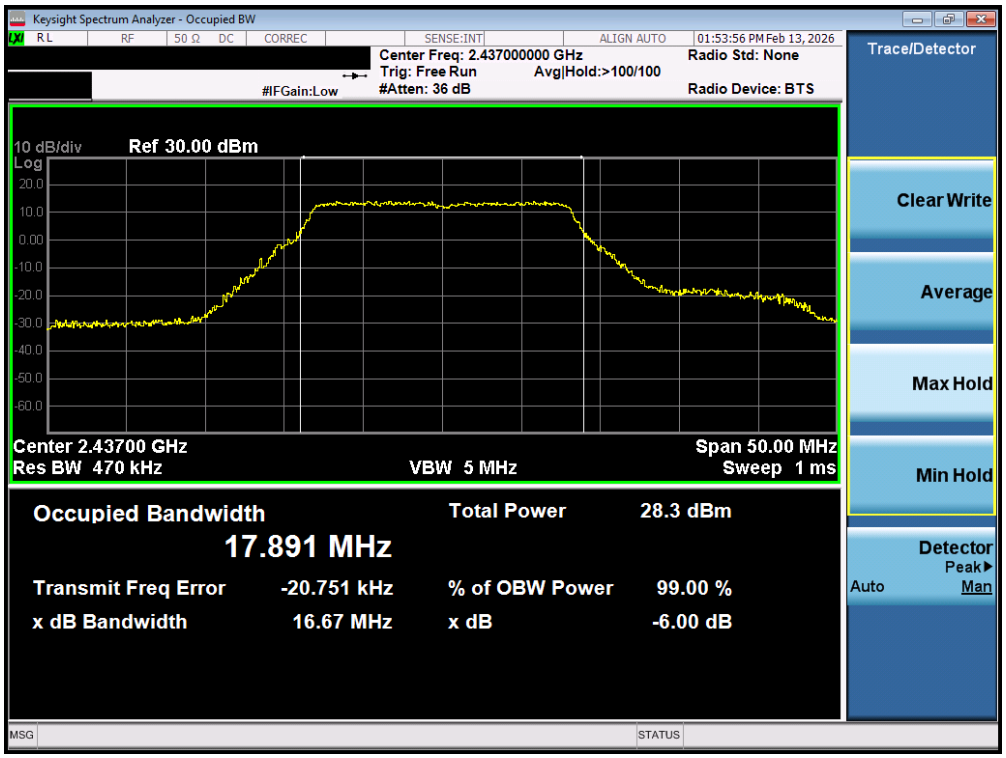
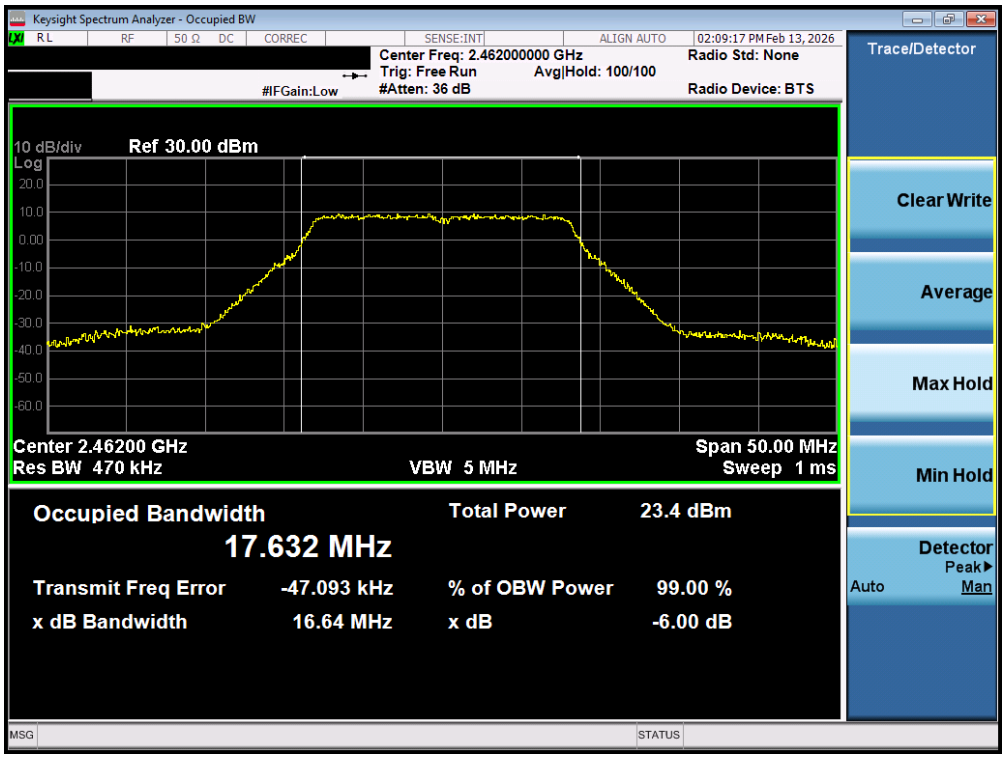


Plot 7-41. OBW Plot MIMO ANT1 (802.11g – Ch. 6)



Plot 7-42. OBW Plot MIMO ANT1 (802.11g – Ch. 11)

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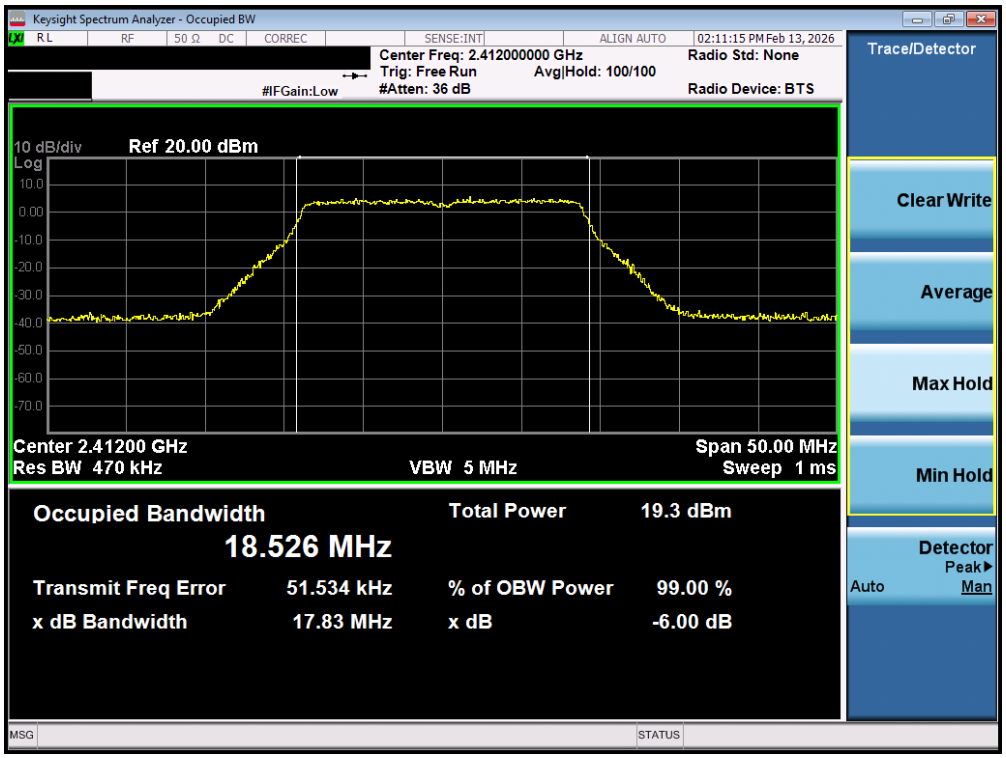
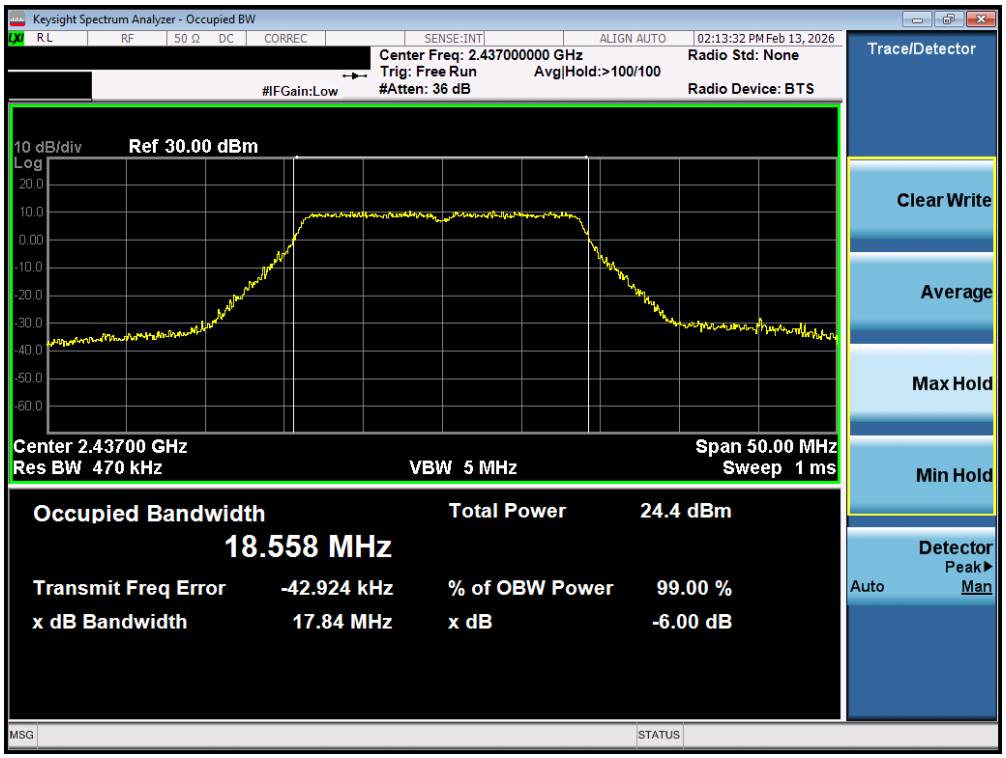


Plot 7-43. OBW Plot MIMO ANT1 (802.11n/ac (2.4GHz) – Ch. 1)



Plot 7-44. OBW Plot MIMO ANT1 (802.11n/ac (2.4GHz) – Ch. 6)

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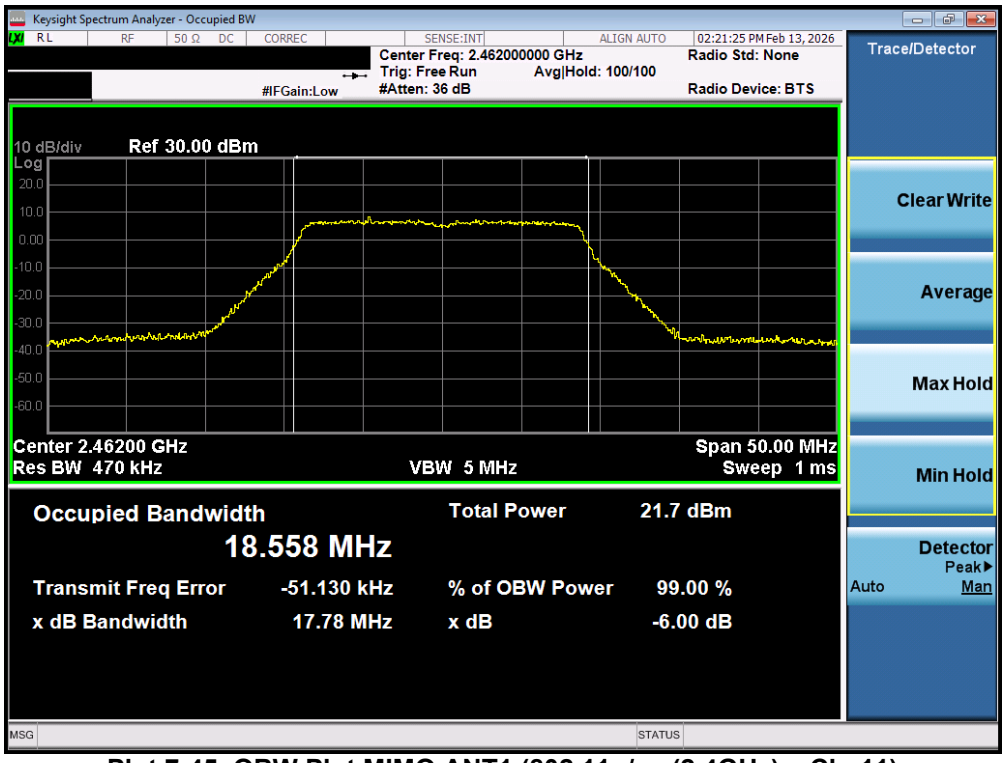
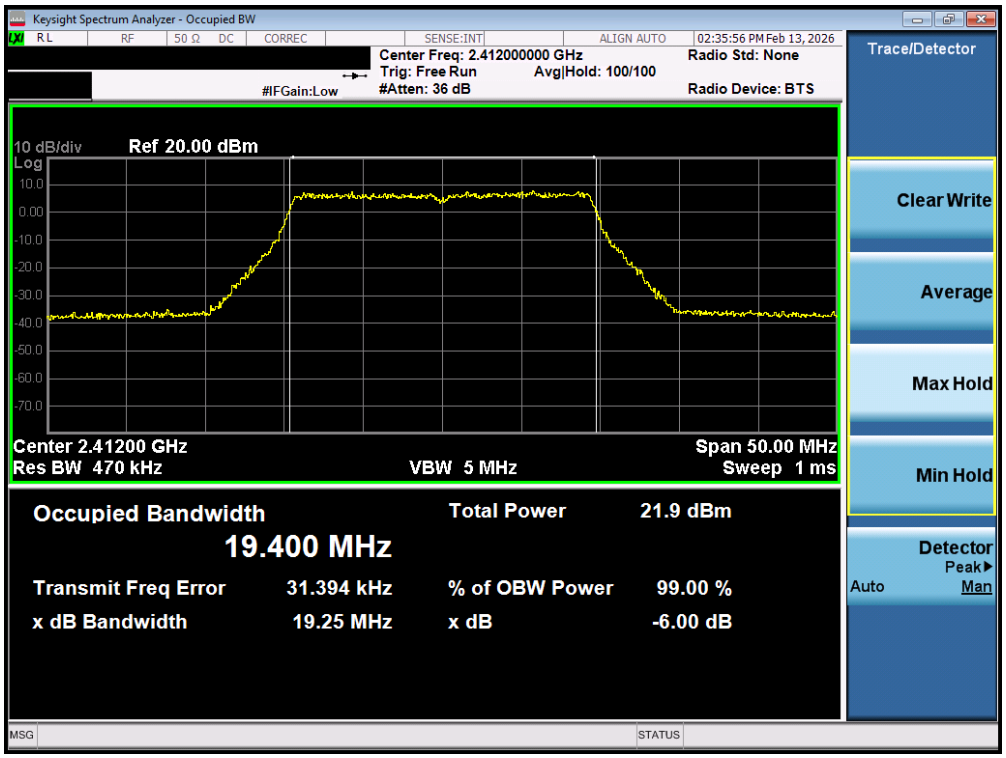


Plot 7-45. OBW Plot MIMO ANT1 (802.11n/ac (2.4GHz) – Ch. 11)



Plot 7-46. OBW Plot MIMO ANT1 (802.11be (2.4GHz) – Ch. 1)

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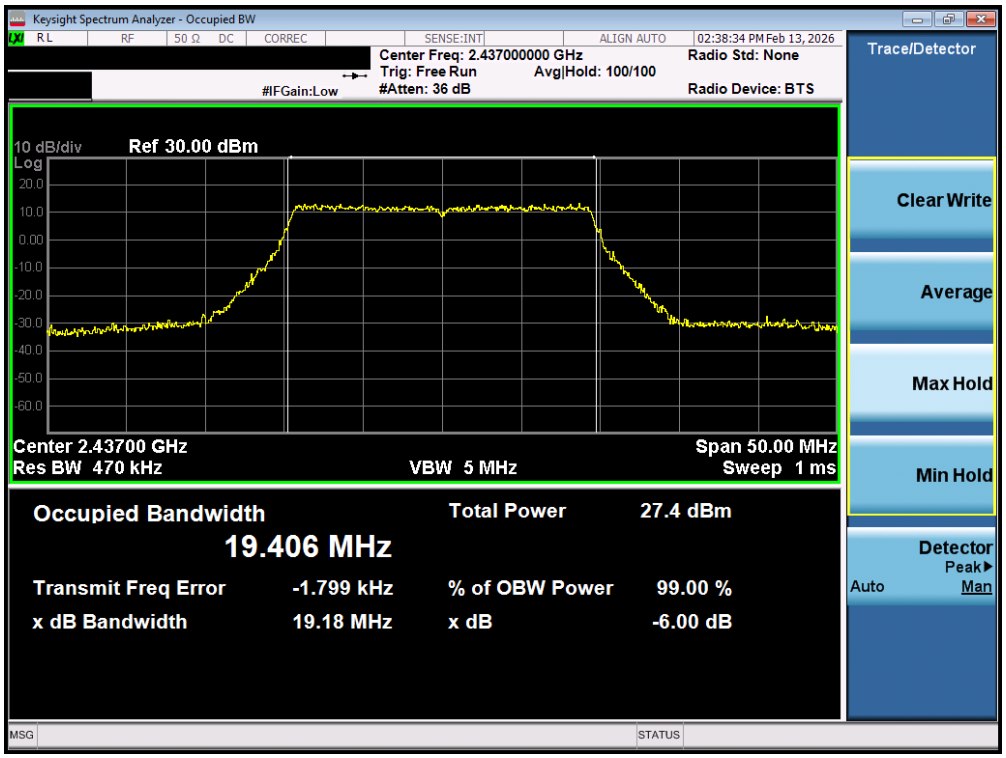
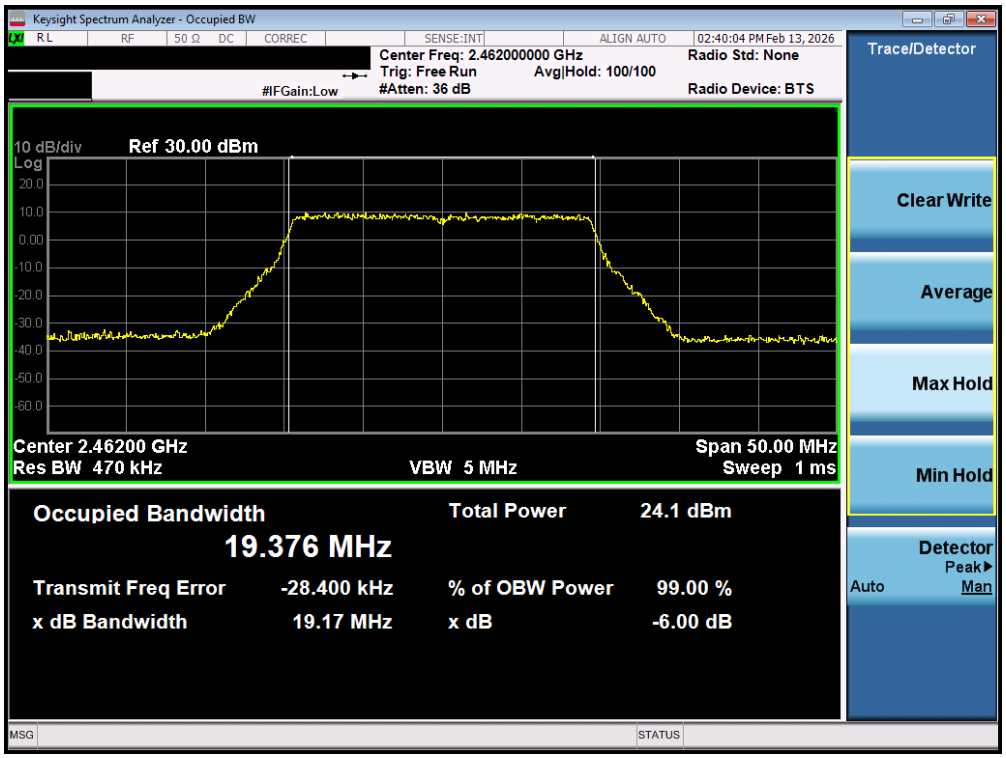


Plot 7-47. OBW Plot MIMO ANT1 (802.11be (2.4GHz) – Ch. 6)



Plot 7-48. OBW Plot MIMO ANT1 (802.11be (2.4GHz) – Ch. 11)

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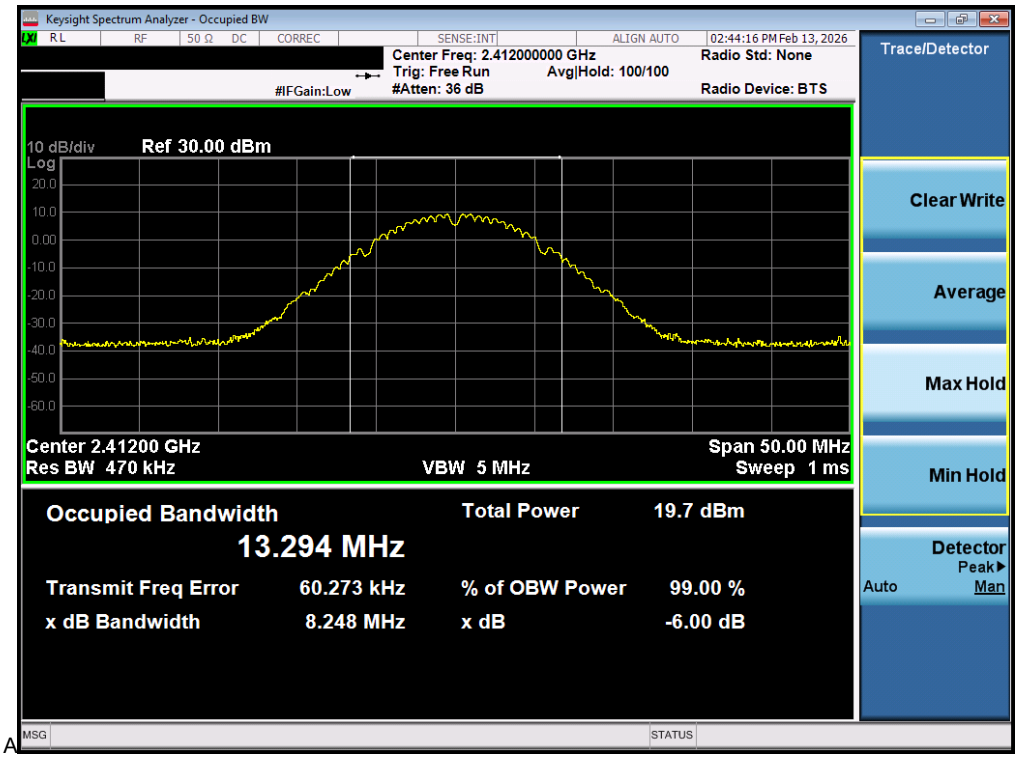
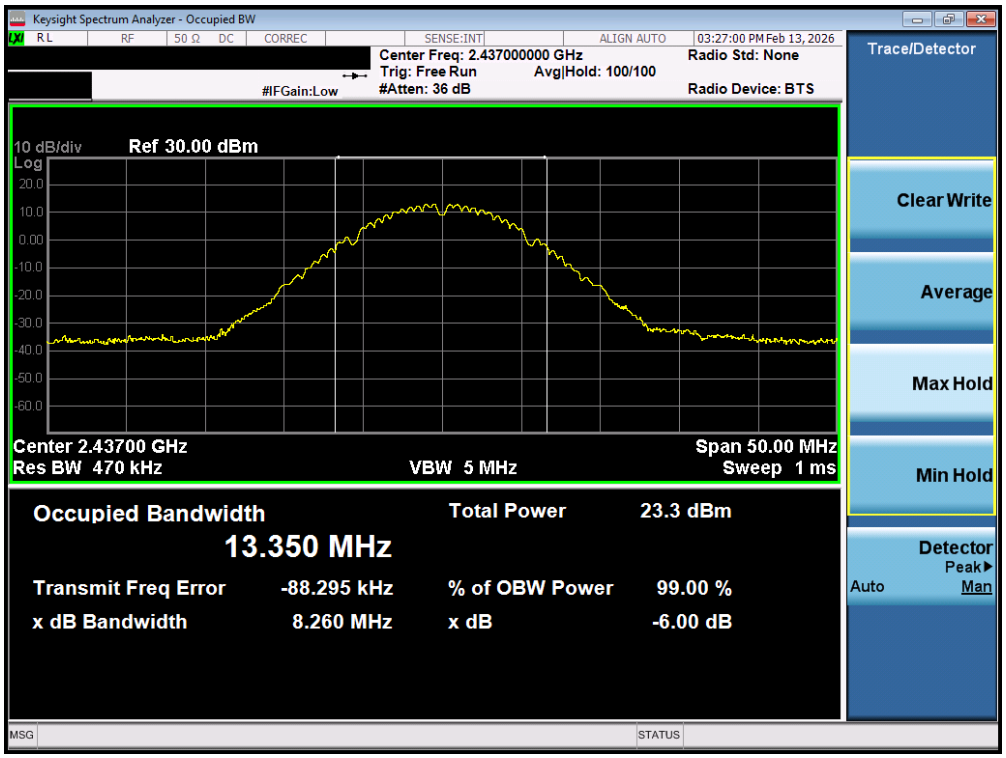


Plot 7-49. OBW Plot MIMO ANT2 (802.11b – Ch. 1)



Plot 7-50. OBW Plot MIMO ANT2 (802.11b – Ch. 6)

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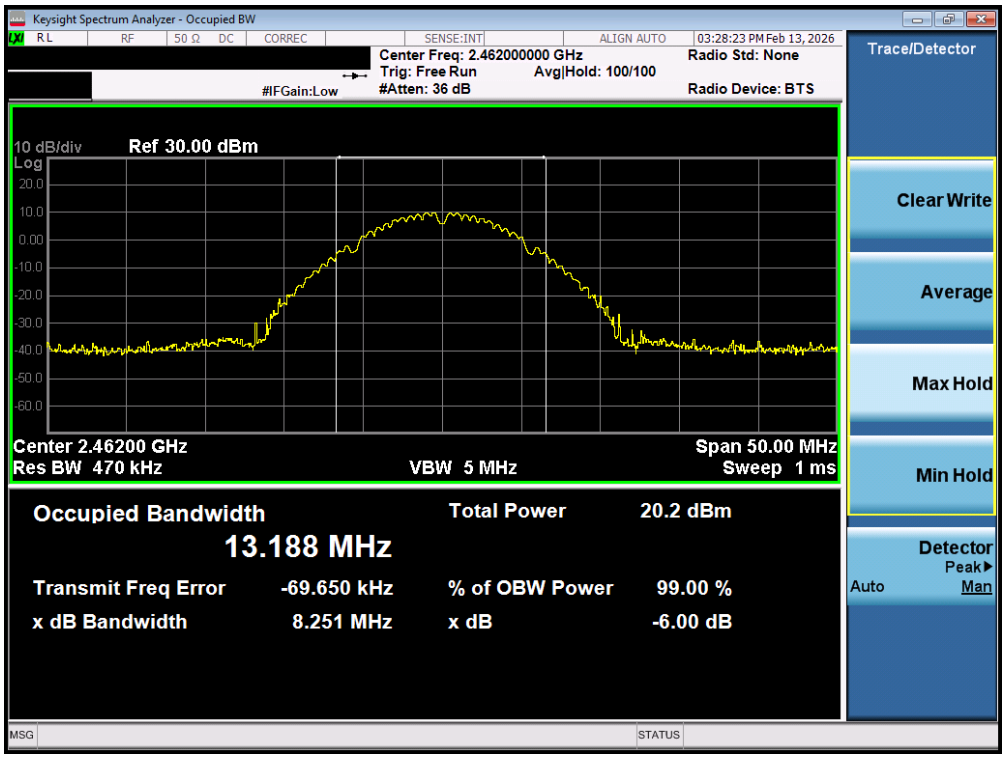
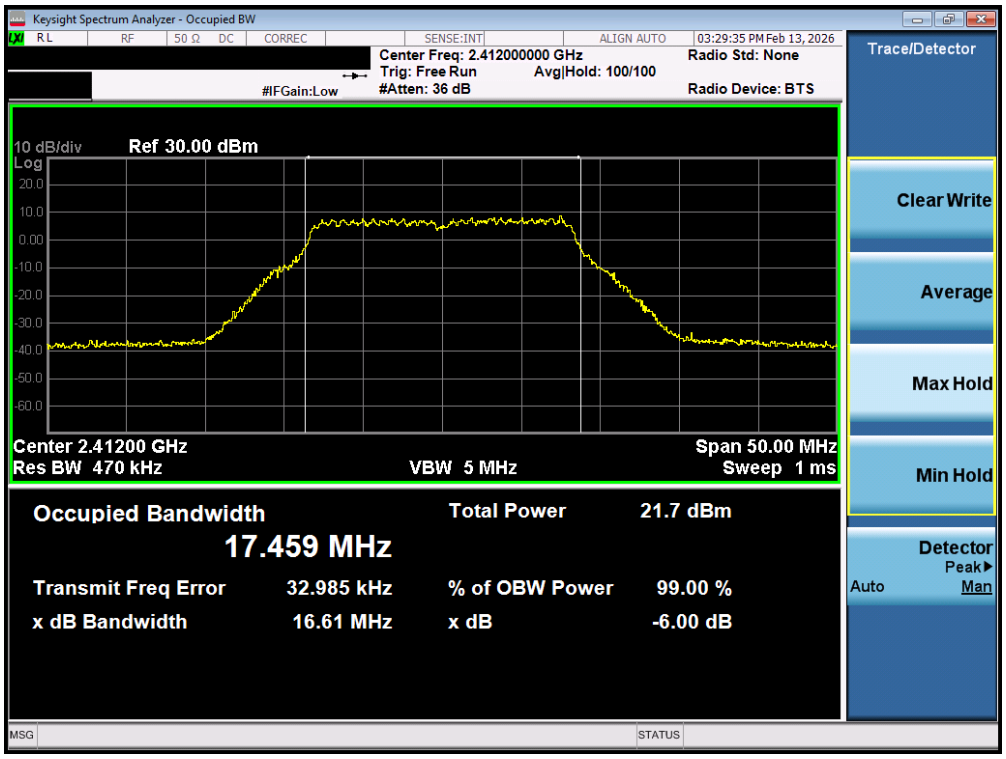


Plot 7-51. OBW Plot MIMO ANT2 (802.11b – Ch. 11)



Plot 7-52. OBW Plot MIMO ANT2 (802.11g – Ch. 1)

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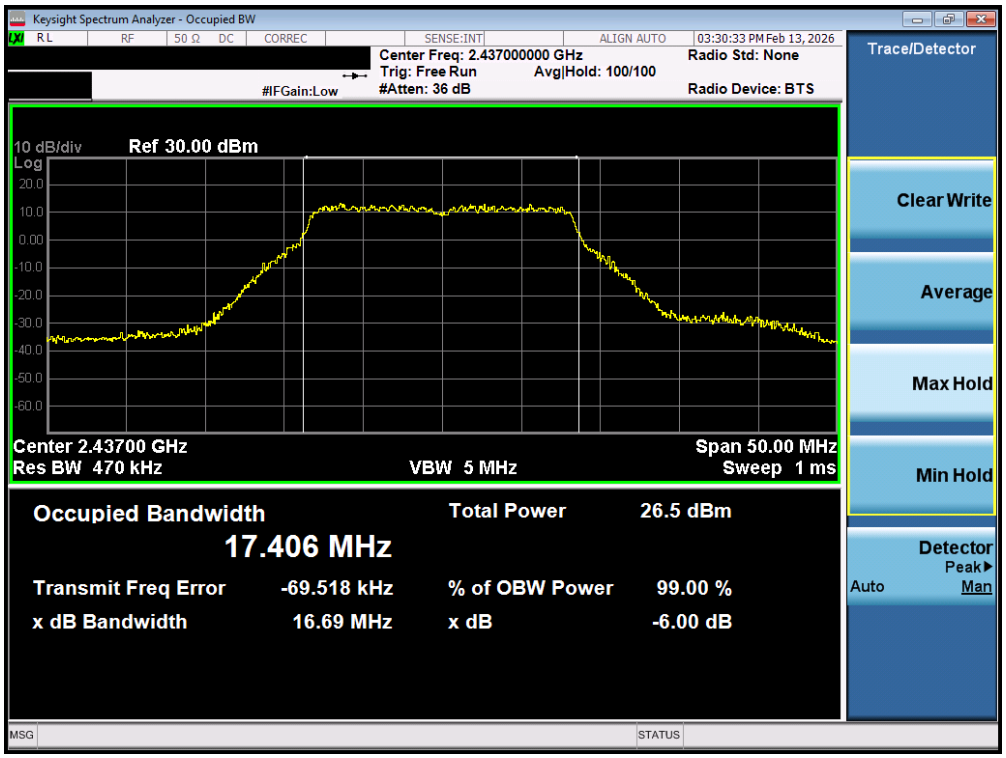
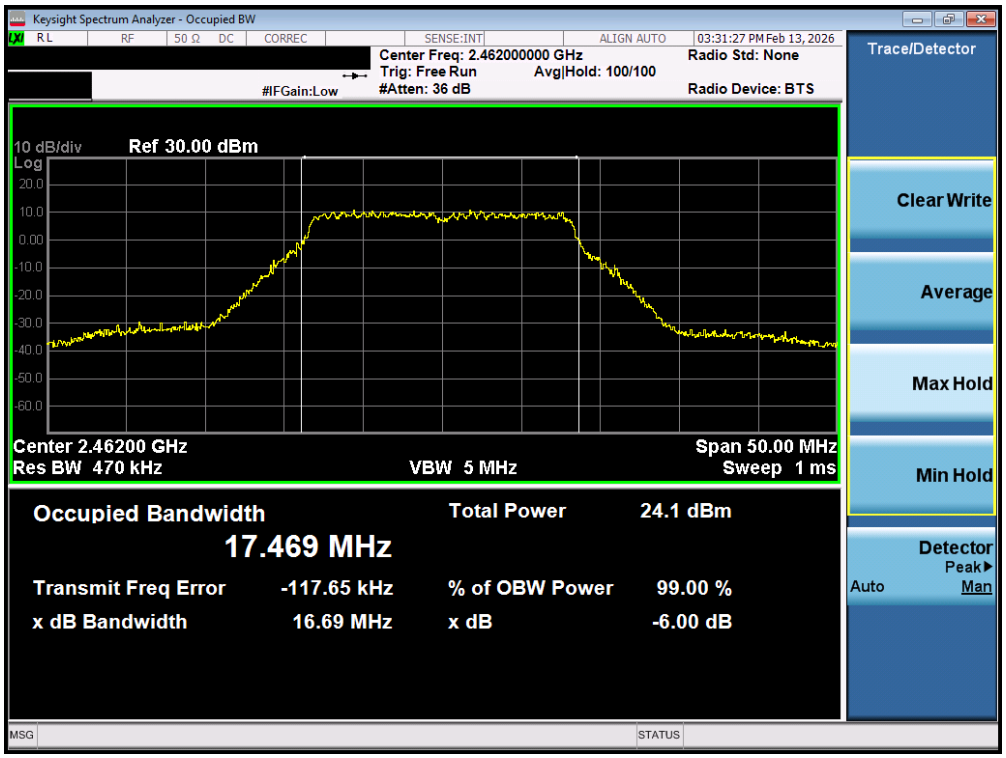


Plot 7-53. OBW Plot MIMO ANT2 (802.11g – Ch. 6)



Plot 7-54. OBW Plot MIMO ANT2 (802.11g – Ch. 11)

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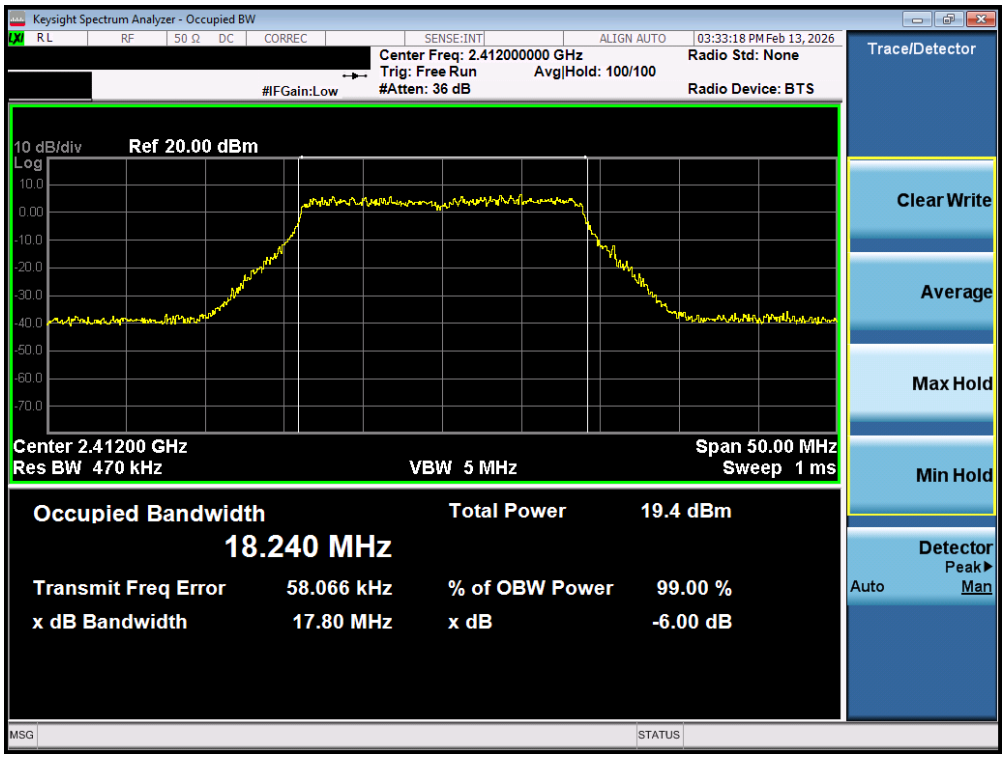
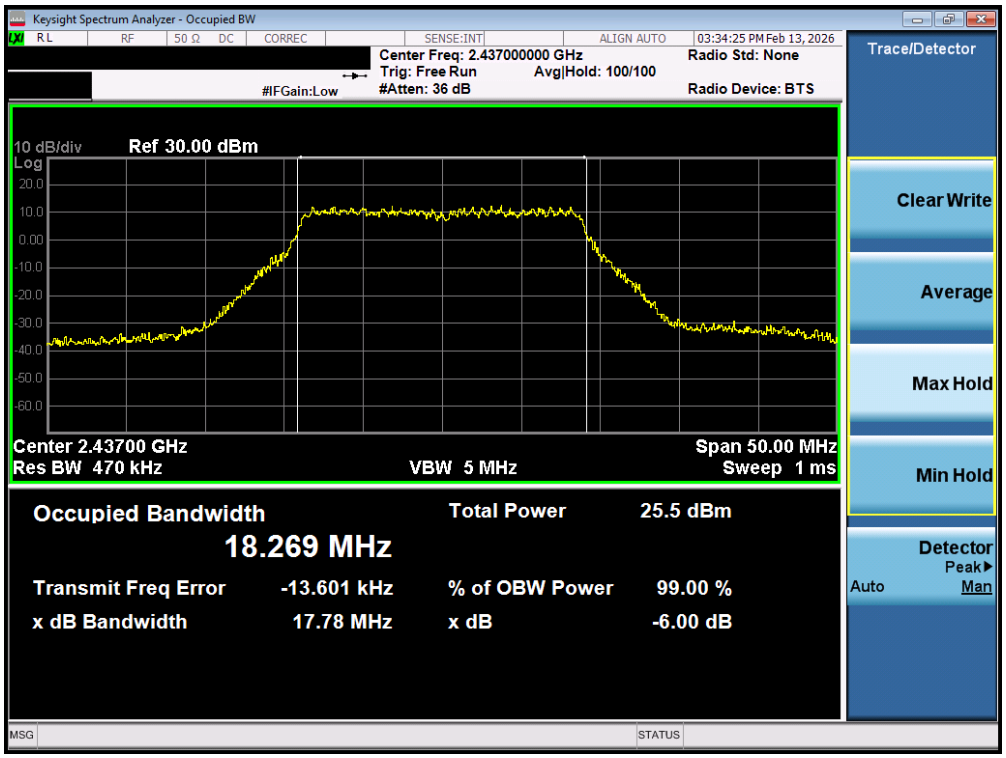


Plot 7-55. OBW Plot MIMO ANT2 (802.11n/ac (2.4GHz) – Ch. 1)



Plot 7-56. OBW Plot MIMO ANT2 (802.11n/ac (2.4GHz) – Ch. 6)

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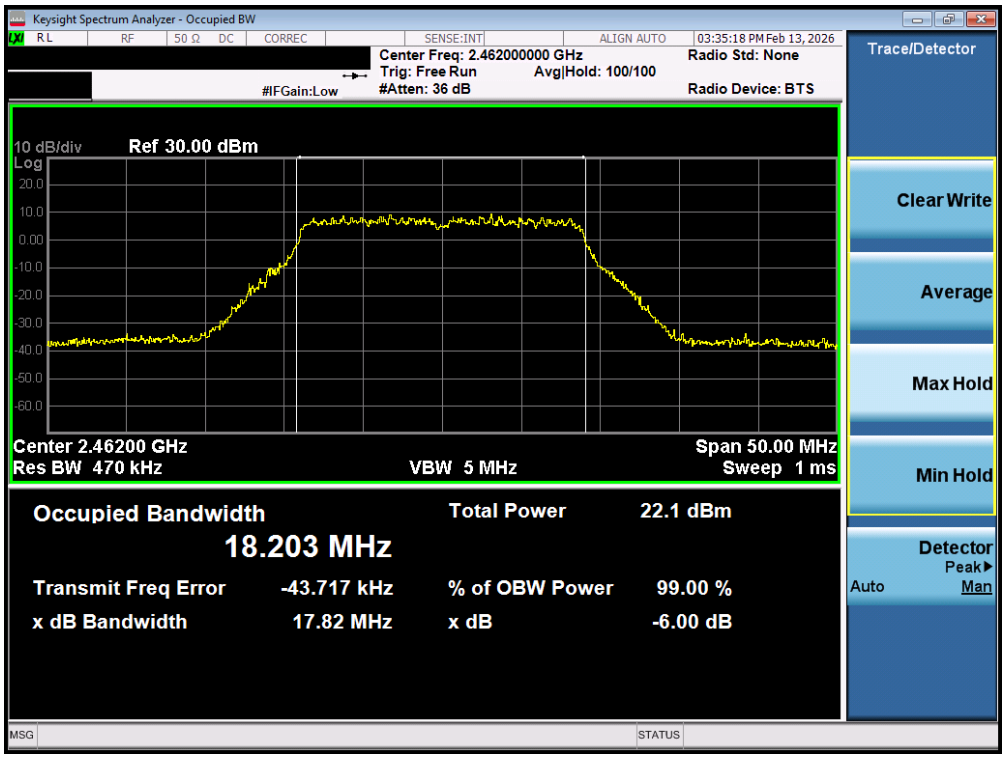
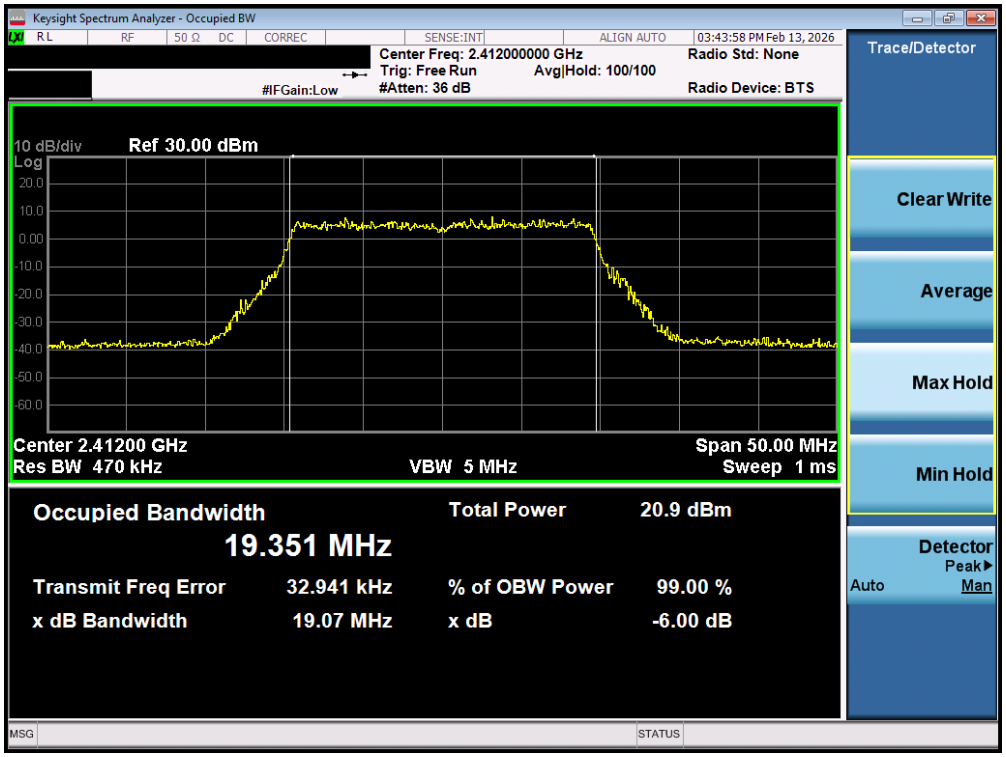


Plot 7-57. OBW Plot MIMO ANT2 (802.11n/ac (2.4GHz) – Ch. 11)



Plot 7-58. OBW Plot MIMO ANT2 (802.11be (2.4GHz) – Ch. 1)

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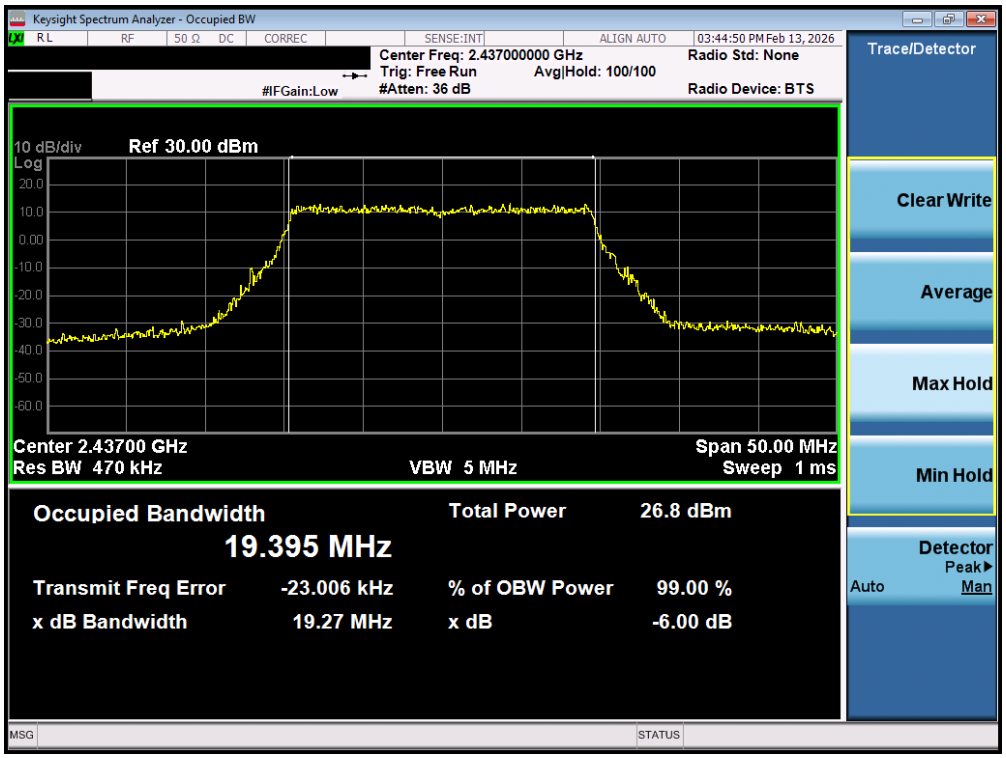
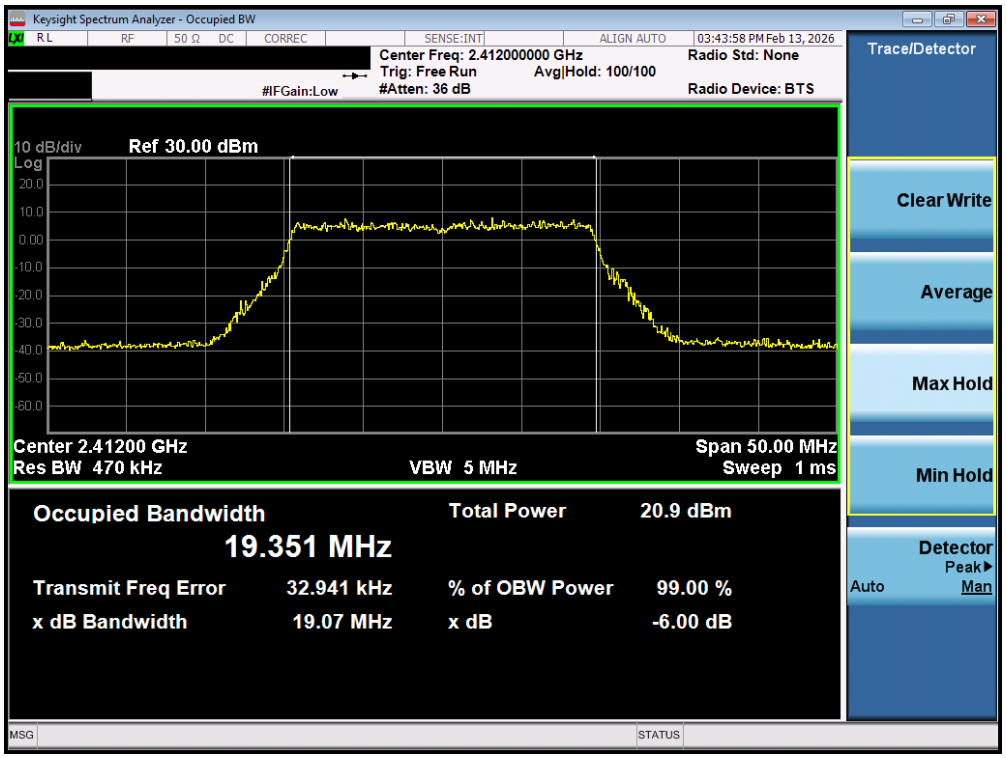


Plot 7-59. OBW Plot MIMO ANT2 (802.11be (2.4GHz) – Ch. 6)



Plot 7-60. OBW Plot MIMO ANT2 (802.11be (2.4GHz) – Ch. 11)

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7.3 Output Power Measurement

Test Overview and Limits

A transmitter antenna terminal of EUT is connected to the input of an RF power sensor. Measurement is made using a broadband power meter capable of making peak and average measurements while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies.

The maximum permissible conducted output power is 1 Watt per 15.247 and RSS-247. The e.i.r.p. shall not exceed 4 W per RSS-247.

Test Procedure Used

ANSI C63.10-2020 – Section 11.9.1.3 PKPM1 Peak Power Method
ANSI C63.10-2020 – Section 11.9.2.3.2 Method AVGPM-G
ANSI C63.10-2020 – Section 14.2 Measure-and-Sum Technique

Test Settings

Method PKPM1 (Peak Power Measurement)

Peak power measurements were performed only when the EUT was transmitting at its maximum power control level using a broadband power meter with a pulse sensor. The pulse sensor employs a VBW = 50MHz so this method was only used for signals whose DTS bandwidth was less than or equal to 50MHz.

Method AVGPM-G (Average Power Measurement)

Average power measurements were performed only when the EUT was transmitting at its maximum power control level using a broadband power meter with a pulse sensor. The power meter implemented triggering and gating capabilities which were set up such that power measurements were recorded only during the ON time of the transmitter. The trace was averaged over 100 traces to obtain the final measured average power.

Test Setup

The EUT and measurement equipment were set up as shown in the diagrams below.

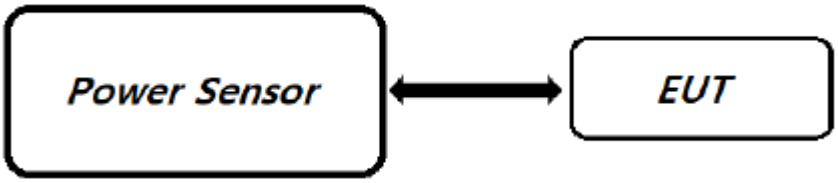

Figure 7-2. Test Instrument & Measurement Setup for Power Meter Measurements

Test Notes

None.

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2.4GHz WIFI (20MHz 802.11b MIMO)						Conducted Power Limit [dBm]	Conducted Power Margin [dB]	Directional Ant. Gain [dBi]	Max e.i.r.p [dBm]	e.i.r.p Limit [dBm]	e.i.r.p Margin [dB]
Freq [MHz]	Channel	Detector	Conducted Power [dBm]								
			ANT1	ANT2	MIMO						
2412	1	Average	17.48	17.31	20.41	30.00	-9.59	5.63	26.04	36.02	-9.98
2417	2		17.99	17.89	20.95	30.00	-9.05	5.63	26.58	36.02	-9.44
2422	3		20.86	20.73	23.81	30.00	-6.19	5.63	29.44	36.02	-6.58
2437	6		20.81	20.84	23.83	30.00	-6.17	5.63	29.46	36.02	-6.56
2457	10		20.99	20.83	23.92	30.00	-6.08	5.63	29.55	36.02	-6.47
2462	11		17.77	17.78	20.78	30.00	-9.22	5.63	26.41	36.02	-9.61
2467	12		16.68	16.67	19.69	30.00	-10.31	5.63	25.32	36.02	-10.70
2472	13		14.56	14.86	17.72	30.00	-12.28	5.63	23.35	36.02	-12.67
2412	1	Peak	20.42	20.21	23.32	30.00	-6.68	5.63	28.95	36.02	-7.07
2417	2		20.83	20.77	23.81	30.00	-6.19	5.63	29.43	36.02	-6.59
2422	3		23.90	23.67	26.79	30.00	-3.21	5.63	32.42	36.02	-3.60
2437	6		23.82	23.87	26.85	30.00	-3.15	5.63	32.48	36.02	-3.54
2457	10		24.02	23.81	26.93	30.00	-3.07	5.63	32.55	36.02	-3.47
2462	11		20.72	20.74	23.74	30.00	-6.26	5.63	29.37	36.02	-6.65
2467	12		19.59	19.52	22.57	30.00	-7.43	5.63	28.19	36.02	-7.83
2472	13		17.44	17.77	20.62	30.00	-9.38	5.63	26.24	36.02	-9.78

Table 7-5. Conducted Output Power Measurements MIMO (802.11b)

2.4GHz WIFI (20MHz 802.11g MIMO)						Conducted Power Limit [dBm]	Conducted Power Margin [dB]	Directional Ant. Gain [dBi]	Max e.i.r.p [dBm]	e.i.r.p Limit [dBm]	e.i.r.p Margin [dB]
Freq [MHz]	Channel	Detector	Conducted Power [dBm]								
			ANT1	ANT2	MIMO						
2412	1	Average	13.99	13.96	16.98	30.00	-13.02	5.63	22.61	36.02	-13.41
2417	2		15.49	15.41	18.46	30.00	-11.54	5.63	24.09	36.02	-11.93
2422	3		16.64	16.52	19.59	30.00	-10.41	5.63	25.22	36.02	-10.80
2427	4		18.88	18.68	21.79	30.00	-8.21	5.63	27.42	36.02	-8.60
2437	6		18.76	18.73	21.75	30.00	-8.25	5.63	27.38	36.02	-8.64
2457	10		18.83	18.68	21.77	30.00	-8.23	5.63	27.40	36.02	-8.62
2462	11		16.06	16.19	19.14	30.00	-10.86	5.63	24.77	36.02	-11.25
2467	12		11.89	11.99	14.95	30.00	-15.05	5.63	20.58	36.02	-15.44
2472	13		-4.75	-4.51	-1.62	30.00	-31.62	5.63	4.01	36.02	-32.01
2412	1	Peak	20.37	20.27	23.33	30.00	-6.67	5.63	28.96	36.02	-7.06
2417	2		21.61	21.64	24.64	30.00	-5.36	5.63	30.26	36.02	-5.76
2422	3		22.87	22.97	25.93	30.00	-4.07	5.63	31.56	36.02	-4.46
2427	4		25.16	25.17	28.17	30.00	-1.83	5.63	33.80	36.02	-2.22
2437	6		25.05	24.95	28.01	30.00	-1.99	5.63	33.64	36.02	-2.38
2457	10		25.01	25.06	28.04	30.00	-1.96	5.63	33.67	36.02	-2.35
2462	11		22.36	22.49	25.43	30.00	-4.57	5.63	31.06	36.02	-4.96
2467	12		18.33	18.57	21.46	30.00	-8.54	5.63	27.09	36.02	-8.93
2472	13		1.70	2.11	4.92	30.00	-25.08	5.63	10.54	36.02	-25.48

Table 7-6. Conducted Output Power Measurements MIMO (802.11g)

2.4GHz WIFI (20MHz 802.11n MIMO)						Conducted Power Limit [dBm]	Conducted Power Margin [dB]	Directional Ant. Gain [dBi]	Max e.i.r.p [dBm]	e.i.r.p Limit [dBm]	e.i.r.p Margin [dB]
Freq [MHz]	Channel	Detector	Conducted Power [dBm]								
			ANT1	ANT2	MIMO						
2412	1	Average	12.49	12.43	15.47	30.00	-14.53	5.63	21.10	36.02	-14.92
2417	2		14.13	13.92	17.04	30.00	-12.96	5.63	22.67	36.02	-13.35
2422	3		16.67	16.52	19.61	30.00	-10.39	5.63	25.24	36.02	-10.78
2427	4		17.94	17.66	20.81	30.00	-9.19	5.63	26.44	36.02	-9.58
2437	6		17.68	17.72	20.71	30.00	-9.29	5.63	26.34	36.02	-9.68
2452	9		17.66	17.75	20.72	30.00	-9.28	5.63	26.35	36.02	-9.67
2457	10		16.68	16.52	19.62	30.00	-10.38	5.63	25.25	36.02	-10.77
2462	11		14.46	14.49	17.49	30.00	-12.51	5.63	23.12	36.02	-12.90
2467	12		11.90	12.13	15.03	30.00	-14.97	5.63	20.66	36.02	-15.36
2472	13		-5.71	-5.35	-2.52	30.00	-32.52	5.63	3.11	36.02	-32.91
2412	1	Peak	18.82	18.75	21.80	30.00	-8.20	5.63	27.42	36.02	-8.60
2417	2		20.57	20.17	23.39	30.00	-6.61	5.63	29.01	36.02	-7.01
2422	3		23.05	22.85	25.96	30.00	-4.04	5.63	31.59	36.02	-4.43
2427	4		24.36	24.00	27.19	30.00	-2.81	5.63	32.82	36.02	-3.20
2437	6		24.20	24.07	27.14	30.00	-2.86	5.63	32.77	36.02	-3.25
2452	9		24.20	24.12	27.17	30.00	-2.83	5.63	32.80	36.02	-3.22
2457	10		23.01	22.73	25.88	30.00	-4.12	5.63	31.51	36.02	-4.51
2462	11		21.07	20.88	23.98	30.00	-6.02	5.63	29.61	36.02	-6.41
2467	12		18.15	17.77	20.97	30.00	-9.03	5.63	26.60	36.02	-9.42
2472	13		0.94	1.14	4.05	30.00	-25.95	5.63	9.68	36.02	-26.34

Table 7-7. Conducted Output Power Measurements MIMO (802.11n)

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2.4GHz WIFI (20MHz 802.11ac MIMO)						Conducted Power Limit [dBm]	Conducted Power Margin [dB]	Directional Ant. Gain [dBi]	Max e.i.r.p [dBm]	e.i.r.p Limit [dBm]	e.i.r.p Margin [dB]
Freq [MHz]	Channel	Detector	Conducted Power [dBm]								
			ANT1	ANT2	MIMO						
2412	1	Average	12.49	12.45	15.48	30.00	-14.52	5.63	21.11	36.02	-14.91
2417	2		14.10	13.91	17.01	30.00	-12.99	5.63	22.64	36.02	-13.38
2422	3		16.66	16.54	19.61	30.00	-10.39	5.63	25.24	36.02	-10.78
2427	4		17.92	17.67	20.81	30.00	-9.19	5.63	26.44	36.02	-9.58
2437	6		17.69	17.71	20.71	30.00	-9.29	5.63	26.34	36.02	-9.68
2452	9		17.64	17.74	20.70	30.00	-9.30	5.63	26.33	36.02	-9.69
2457	10		16.68	16.53	19.62	30.00	-10.38	5.63	25.25	36.02	-10.77
2462	11		14.46	14.49	17.49	30.00	-12.51	5.63	23.12	36.02	-12.90
2467	12		11.89	12.15	15.03	30.00	-14.97	5.63	20.66	36.02	-15.36
2472	13		-5.73	-5.39	-2.54	30.00	-32.54	5.63	3.09	36.02	-32.93
2412	1	Peak	18.97	18.61	21.80	30.00	-8.20	5.63	27.43	36.02	-8.59
2417	2		20.62	20.22	23.44	30.00	-6.56	5.63	29.06	36.02	-6.96
2422	3		23.41	22.98	26.21	30.00	-3.79	5.63	31.83	36.02	-4.19
2427	4		24.46	24.05	27.27	30.00	-2.73	5.63	32.90	36.02	-3.12
2437	6		24.19	0.12	24.20	30.00	-5.80	5.63	29.83	36.02	-6.19
2452	9		24.05	24.12	27.10	30.00	-2.90	5.63	32.72	36.02	-3.30
2457	10		23.06	22.95	26.01	30.00	-3.99	5.63	31.64	36.02	-4.38
2462	11		21.05	21.14	24.11	30.00	-5.89	5.63	29.73	36.02	-6.29
2467	12		18.42	18.33	21.38	30.00	-8.62	5.63	27.01	36.02	-9.01
2472	13		0.85	1.10	3.99	30.00	-26.01	5.63	9.61	36.02	-26.41

Table 7-8. Conducted Output Power Measurements MIMO (802.11ac)

2.4GHz WIFI (20MHz 802.11ax MIMO)						Conducted Power Limit [dBm]	Conducted Power Margin [dB]	Directional Ant. Gain [dBi]	Max e.i.r.p [dBm]	e.i.r.p Limit [dBm]	e.i.r.p Margin [dB]
Freq [MHz]	Channel	Detector	Conducted Power [dBm]								
			ANT1	ANT2	MIMO						
2412	1	Average	12.49	12.46	15.49	30.00	-14.51	5.63	21.12	36.02	-14.90
2417	2		14.21	13.99	17.11	30.00	-12.89	5.63	22.74	36.02	-13.28
2422	3		16.77	16.64	19.72	30.00	-10.28	5.63	25.35	36.02	-10.67
2427	4		17.99	17.75	20.88	30.00	-9.12	5.63	26.51	36.02	-9.51
2437	6		17.79	17.81	20.81	30.00	-9.19	5.63	26.44	36.02	-9.58
2452	9		17.74	17.82	20.79	30.00	-9.21	5.63	26.42	36.02	-9.60
2457	10		16.81	16.60	19.72	30.00	-10.28	5.63	25.35	36.02	-10.67
2462	11		14.16	14.19	17.19	30.00	-12.81	5.63	22.82	36.02	-13.20
2467	12		11.98	12.25	15.13	30.00	-14.87	5.63	20.76	36.02	-15.26
2472	13		-5.64	-5.29	-2.45	30.00	-32.45	5.63	3.18	36.02	-32.84
2412	1	Peak	19.57	19.27	22.43	30.00	-7.57	5.63	28.06	36.02	-7.96
2417	2		20.90	20.71	23.81	30.00	-6.19	5.63	29.44	36.02	-6.58
2422	3		24.01	23.42	26.74	30.00	-3.26	5.63	32.36	36.02	-3.66
2427	4		24.80	24.78	27.80	30.00	-2.20	5.63	33.43	36.02	-2.59
2437	6		24.68	24.56	27.63	30.00	-2.37	5.63	33.26	36.02	-2.76
2452	9		24.63	24.64	27.64	30.00	-2.36	5.63	33.27	36.02	-2.75
2457	10		23.62	23.45	26.55	30.00	-3.45	5.63	32.17	36.02	-3.85
2462	11		21.02	20.93	23.98	30.00	-6.02	5.63	29.61	36.02	-6.41
2467	12		18.73	18.97	21.86	30.00	-8.14	5.63	27.49	36.02	-8.53
2472	13		1.28	1.66	4.48	30.00	-25.52	5.63	10.11	36.02	-25.91

Table 7-9. Conducted Output Power Measurements MIMO (802.11ax)

2.4GHz WIFI (20MHz 802.11be MIMO)						Conducted Power Limit [dBm]	Conducted Power Margin [dB]	Directional Ant. Gain [dBi]	Max e.i.r.p [dBm]	e.i.r.p Limit [dBm]	e.i.r.p Margin [dB]
Freq [MHz]	Channel	Detector	Conducted Power [dBm]								
			ANT1	ANT2	MIMO						
2412	1	Average	12.49	12.46	15.49	30.00	-14.51	5.63	21.12	36.02	-14.90
2417	2		14.19	14.00	17.10	30.00	-12.90	5.63	22.73	36.02	-13.29
2422	3		16.76	16.62	19.70	30.00	-10.30	5.63	25.33	36.02	-10.69
2427	4		17.88	17.75	20.82	30.00	-9.18	5.63	26.45	36.02	-9.57
2437	6		17.78	17.80	20.80	30.00	-9.20	5.63	26.43	36.02	-9.59
2452	9		17.74	17.86	20.81	30.00	-9.19	5.63	26.44	36.02	-9.58
2457	10		16.76	16.60	19.69	30.00	-10.31	5.63	25.32	36.02	-10.70
2462	11		14.15	14.18	17.17	30.00	-12.83	5.63	22.80	36.02	-13.22
2467	12		11.96	12.24	15.11	30.00	-14.89	5.63	20.74	36.02	-15.28
2472	13		-5.61	-5.26	-2.42	30.00	-32.42	5.63	3.21	36.02	-32.81
2412	1	Peak	19.49	19.58	22.55	30.00	-7.45	5.63	28.17	36.02	-7.85
2417	2		21.20	20.53	23.89	30.00	-6.11	5.63	29.51	36.02	-6.51
2422	3		23.88	23.29	26.60	30.00	-3.40	5.63	32.23	36.02	-3.79
2427	4		25.00	24.83	27.93	30.00	-2.07	5.63	33.56	36.02	-2.46
2437	6		24.81	24.46	27.65	30.00	-2.35	5.63	33.27	36.02	-2.75
2452	9		24.64	24.54	27.60	30.00	-2.40	5.63	33.23	36.02	-2.79
2457	10		23.65	23.31	26.49	30.00	-3.51	5.63	32.12	36.02	-3.90
2462	11		21.17	20.75	23.98	30.00	-6.02	5.63	29.61	36.02	-6.41
2467	12		18.73	18.93	21.84	30.00	-8.16	5.63	27.47	36.02	-8.55
2472	13		1.15	1.75	4.47	30.00	-25.53	5.63	10.10	36.02	-25.92

Table 7-10. Conducted Output Power Measurements MIMO (802.11be)

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2.4GHz WIFI (40MHz 802.11n MIMO)						Conducted Power Limit [dBm]	Conducted Power Margin [dB]	Directional Ant. Gain [dBi]	Max e.i.r.p [dBm]	e.i.r.p Limit [dBm]	e.i.r.p Margin [dB]
Freq [MHz]	Channel	Detector	Conducted Powers [dBm]								
			ANT1	ANT2	MIMO						
2422	3	Average	10.83	10.89	13.87	30.00	-16.13	5.63	19.50	36.02	-16.52
2427	4		12.38	12.42	15.41	30.00	-14.59	5.63	21.04	36.02	-14.98
2432	5		13.98	13.97	16.98	30.00	-13.02	5.63	22.61	36.02	-13.41
2437	6		14.70	14.78	17.75	30.00	-12.25	5.63	23.38	36.02	-12.64
2442	7		11.99	11.96	14.99	30.00	-15.01	5.63	20.62	36.02	-15.40
2447	8		11.34	11.18	14.27	30.00	-15.73	5.63	19.90	36.02	-16.12
2452	9		11.35	11.42	14.39	30.00	-15.61	5.63	20.02	36.02	-16.00
2457	10		10.92	10.99	13.96	30.00	-16.04	5.63	19.59	36.02	-16.43
2462	11		-3.01	-2.87	0.07	30.00	-29.93	5.63	5.70	36.02	-30.32
2422	3	Peak	17.61	17.88	20.76	30.00	-9.24	5.63	26.38	36.02	-9.64
2427	4		19.00	19.11	22.07	30.00	-7.93	5.63	27.69	36.02	-8.33
2432	5		20.65	20.63	23.65	30.00	-6.35	5.63	29.27	36.02	-6.75
2437	6		21.40	21.45	24.43	30.00	-5.57	5.63	30.06	36.02	-5.96
2442	7		19.02	28.76	29.19	30.00	-0.81	5.63	34.82	36.02	-1.20
2447	8		18.46	17.96	21.23	30.00	-8.77	5.63	26.85	36.02	-9.17
2452	9		18.14	18.05	21.11	30.00	-8.89	5.63	26.73	36.02	-9.29
2457	10		17.74	17.83	20.79	30.00	-9.21	5.63	26.42	36.02	-9.60
2462	11		3.87	4.14	7.02	30.00	-22.98	5.63	12.65	36.02	-23.37

Table 7-11. Conducted Output Power Measurements MIMO (802.11n) – 40MHz

2.4GHz WIFI (40MHz 802.11ac MIMO)						Conducted Power Limit [dBm]	Conducted Power Margin [dB]	Directional Ant. Gain [dBi]	Max e.i.r.p [dBm]	e.i.r.p Limit [dBm]	e.i.r.p Margin [dB]
Freq [MHz]	Channel	Detector	Conducted Powers [dBm]								
			ANT1	ANT2	MIMO						
2422	3	Average	10.82	10.89	13.87	30.00	-16.13	5.63	19.50	36.02	-16.52
2427	4		12.40	12.42	15.42	30.00	-14.58	5.63	21.05	36.02	-14.97
2432	5		13.98	13.95	16.97	30.00	-13.03	5.63	22.60	36.02	-13.42
2437	6		14.70	14.79	17.75	30.00	-12.25	5.63	23.38	36.02	-12.64
2442	7		11.99	11.96	14.99	30.00	-15.01	5.63	20.62	36.02	-15.40
2447	8		11.35	11.22	14.30	30.00	-15.70	5.63	19.93	36.02	-16.09
2452	9		11.33	11.41	14.38	30.00	-15.62	5.63	20.01	36.02	-16.01
2457	10		10.93	10.99	13.97	30.00	-16.03	5.63	19.60	36.02	-16.42
2462	11		-3.02	-2.86	0.07	30.00	-29.93	5.63	5.70	36.02	-30.32
2422	3	Peak	18.07	17.74	20.92	30.00	-9.08	5.63	26.54	36.02	-9.48
2427	4		19.59	19.45	22.53	30.00	-7.47	5.63	28.16	36.02	-7.86
2432	5		21.21	21.01	24.12	30.00	-5.88	5.63	29.75	36.02	-6.27
2437	6		21.62	21.73	24.69	30.00	-5.31	5.63	30.31	36.02	-5.71
2442	7		18.87	18.68	21.79	30.00	-8.21	5.63	27.41	36.02	-8.61
2447	8		18.32	17.95	21.15	30.00	-8.85	5.63	26.78	36.02	-9.24
2452	9		18.33	18.33	21.34	30.00	-8.66	5.63	26.97	36.02	-9.05
2457	10		17.81	17.95	20.89	30.00	-9.11	5.63	26.52	36.02	-9.50
2462	11		3.86	4.01	6.94	30.00	-23.06	5.63	12.57	36.02	-23.45

Table 7-12. Conducted Output Power Measurements MIMO (802.11ac) – 40MHz

2.4GHz WIFI (40MHz 802.11ax MIMO)						Conducted Power Limit [dBm]	Conducted Power Margin [dB]	Directional Ant. Gain [dBi]	Max e.i.r.p [dBm]	e.i.r.p Limit [dBm]	e.i.r.p Margin [dB]
Freq [MHz]	Channel	Detector	Conducted Powers [dBm]								
			ANT1	ANT2	MIMO						
2422	3	Average	10.83	10.90	13.88	30.00	-16.12	5.63	19.51	36.02	-16.51
2427	4		12.39	12.42	15.42	30.00	-14.58	5.63	21.05	36.02	-14.97
2432	5		13.99	13.96	16.98	30.00	-13.02	5.63	22.61	36.02	-13.41
2437	6		14.82	14.83	17.84	30.00	-12.16	5.63	23.47	36.02	-12.55
2442	7		11.99	11.96	14.99	30.00	-15.01	5.63	20.62	36.02	-15.40
2447	8		11.35	11.22	14.30	30.00	-15.70	5.63	19.93	36.02	-16.09
2452	9		11.32	11.42	14.38	30.00	-15.62	5.63	20.01	36.02	-16.01
2457	10		10.91	10.99	13.96	30.00	-16.04	5.63	19.59	36.02	-16.43
2462	11		-3.02	-2.85	0.08	30.00	-29.92	5.63	5.71	36.02	-30.31
2422	3	Peak	17.66	17.69	20.69	30.00	-9.31	5.63	26.31	36.02	-9.71
2427	4		19.41	19.08	22.26	30.00	-7.74	5.63	27.88	36.02	-8.14
2432	5		20.74	20.69	23.72	30.00	-6.28	5.63	29.35	36.02	-6.67
2437	6		21.59	21.63	24.62	30.00	-5.38	5.63	30.25	36.02	-5.77
2442	7		19.15	19.19	22.18	30.00	-7.82	5.63	27.81	36.02	-8.21
2447	8		18.46	18.12	21.31	30.00	-8.69	5.63	26.93	36.02	-9.09
2452	9		18.37	18.42	21.41	30.00	-8.59	5.63	27.03	36.02	-8.99
2457	10		18.04	18.06	21.06	30.00	-8.94	5.63	26.68	36.02	-9.34
2462	11		4.02	4.33	7.19	30.00	-22.81	5.63	12.81	36.02	-23.21

Table 7-13. Conducted Output Power Measurements MIMO (802.11ax) – 40MHz

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2.4GHz WIFI (40MHz 802.11be MIMO)						Conducted Power Limit [dBm]	Conducted Power Margin [dB]	Directional Ant. Gain [dBi]	Max e.i.r.p [dBm]	e.i.r.p Limit [dBm]	e.i.r.p Margin [dB]
Freq [MHz]	Channel	Detector	Conducted Powers [dBm]								
			ANT1	ANT2	MIMO						
2422	3	Average	10.66	10.71	13.69	30.00	-16.31	5.63	19.32	36.02	-16.70
2427	4		12.21	12.23	15.23	30.00	-14.77	5.63	20.86	36.02	-15.16
2432	5		13.81	13.79	16.81	30.00	-13.19	5.63	22.44	36.02	-13.58
2437	6		14.53	14.64	17.59	30.00	-12.41	5.63	23.22	36.02	-12.80
2442	7		11.87	11.82	14.85	30.00	-15.15	5.63	20.48	36.02	-15.54
2447	8		11.18	11.02	14.11	30.00	-15.89	5.63	19.74	36.02	-16.28
2452	9		11.13	11.26	14.21	30.00	-15.79	5.63	19.84	36.02	-16.18
2457	10		10.73	10.85	13.80	30.00	-16.20	5.63	19.43	36.02	-16.59
2462	11		-3.02	-2.86	0.08	30.00	-29.92	5.63	5.71	36.02	-30.31
2422	3	Peak	18.02	17.83	20.94	30.00	-9.06	5.63	26.56	36.02	-9.46
2427	4		19.52	19.56	22.55	30.00	-7.45	5.63	28.18	36.02	-7.84
2432	5		21.13	20.93	24.04	30.00	-5.96	5.63	29.67	36.02	-6.35
2437	6		21.90	21.93	24.93	30.00	-5.07	5.63	30.55	36.02	-5.47
2442	7		19.25	19.13	22.20	30.00	-7.80	5.63	27.83	36.02	-8.19
2447	8		18.46	18.40	21.44	30.00	-8.56	5.63	27.07	36.02	-8.95
2452	9		18.53	18.40	21.48	30.00	-8.52	5.63	27.10	36.02	-8.92
2457	10		18.00	18.04	21.03	30.00	-8.97	5.63	26.65	36.02	-9.37
2462	11		4.41	4.41	7.42	30.00	-22.58	5.63	13.05	36.02	-22.97

Table 7-14. Conducted Output Power Measurements MIMO (802.11be) – 40MHz

Note:

Per ANSI C63.10-2020 Section 14.2, the conducted powers at Antenna 1 and Antenna 2 were first measured separately during MIMO transmission as shown in the section above. The measured values were then summed in linear power units then converted back to dBm.

Sample MIMO Calculation:

At 2412MHz the average conducted output power was measured to be 17.48 dBm for Antenna 1 and 17.31 dBm for Antenna 2.

Antenna 1 + Antenna 2 = MIMO

(17.48 dBm + 17.31 dBm) = (55.98 mW + 53.83 mW) = 109.81 mW = 20.41 dBm

Sample e.i.r.p. Calculation:

At 2412MHz the average MIMO conducted output power was calculated to be 20.41 dBm with directional gain of 5.63 dBi.

e.i.r.p. (dBm) = Conducted Power (dBm) + Ant gain (dBi)

20.41 dBm + 5.63 dBi = 26.04dBm

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7.4 Power Spectral Density

Test Overview and Limit

The peak power density is measured with a spectrum analyzer connected to the antenna terminal of the EUT while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies. All data rates are investigated and the worst-case configuration results are reported in this section.

The maximum permissible power spectral density shall not be greater than 8 dBm in any 3 kHz band.

Test Procedure Used

ANSI C63.10-2020 – Section 11.10.2 Method PKPSD
ANSI C63.10-2020 – Section 14.3.1 Measure-and-Sum Technique

Test Settings

1. Analyzer was set to the center frequency of the DTS channel under investigation
2. Span = 1.5 times the DTS channel bandwidth
3. RBW = 10kHz
4. VBW = 1MHz
5. Detector = peak
6. Sweep time = auto couple
7. Trace mode = max hold
8. Trace was allowed to stabilize

Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.

Figure 7-3. Test Instrument & Measurement Setup

Test Notes

None.

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Power Spectral Density Measurements

Frequency [MHz]	Channel No.	802.11 Mode	Data Rate [Mbps]	ANT 1 Power Spectral Density [dBm]	ANT 2 Power Spectral Density [dBm]	Summed MIMO Power Spectral Density [dBm]	Maximum Permissible Power Density [dBm / 3kHz]	Margin [dB]	Pass / Fail
2412	1	b	1	4.73	2.57	6.79	8.00	-8.02	Pass
2437	6	b	1	3.28	2.30	5.83	8.00	-7.93	Pass
2462	11	b	1	3.40	4.58	7.04	8.00	-8.14	Pass
2412	1	g	6	-5.37	-4.53	-1.92	8.00	-10.32	Pass
2437	6	g	6	-0.14	0.15	3.02	8.00	-11.90	Pass
2462	11	g	6	0.27	-2.85	1.99	8.00	-12.20	Pass
2412	1	n	6.5/7.2 (MCS0)	-6.86	-7.48	-4.14	8.00	-10.63	Pass
2437	6	n	6.5/7.2 (MCS0)	-2.15	-1.68	1.10	8.00	-10.81	Pass
2462	11	n	6.5/7.2 (MCS0)	-4.88	-5.95	-2.37	8.00	-11.52	Pass
2412	1	be	6.5/7.2 (MCS0)	-9.55	-9.23	-6.38	8.00	-12.24	Pass
2437	6	be	6.5/7.2 (MCS0)	-3.22	-3.00	-0.10	8.00	-11.99	Pass
2462	11	be	6.5/7.2 (MCS0)	-6.84	-7.42	-4.11	8.00	-13.07	Pass

Table 7-15. Conducted Power Spectral Density Measurements MIMO

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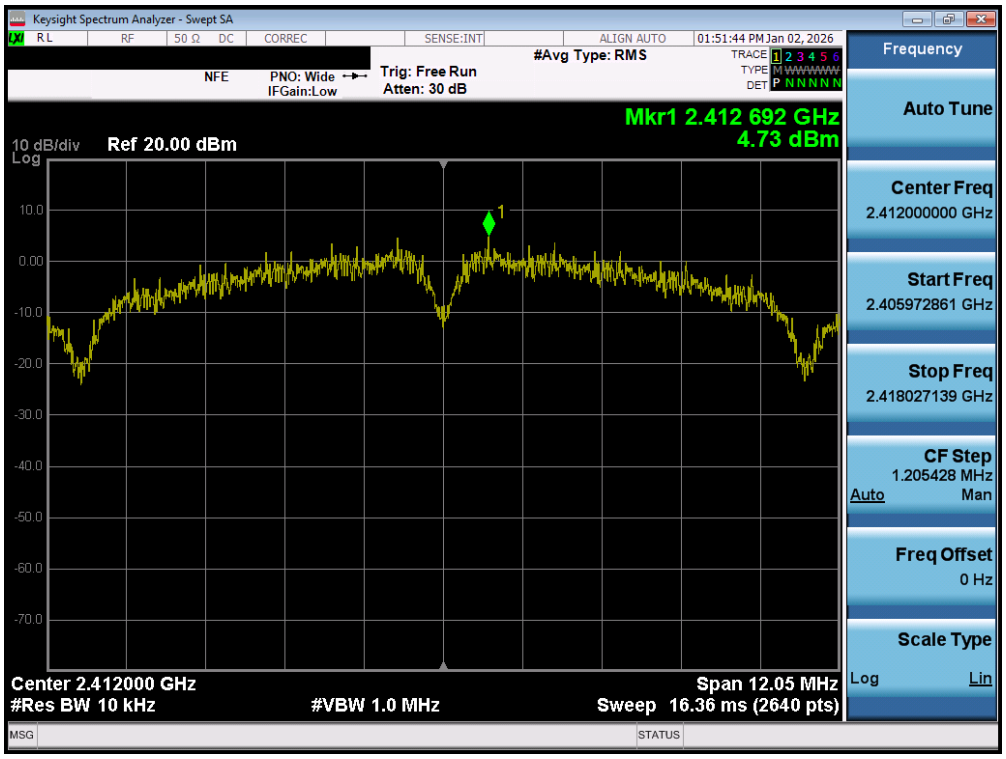
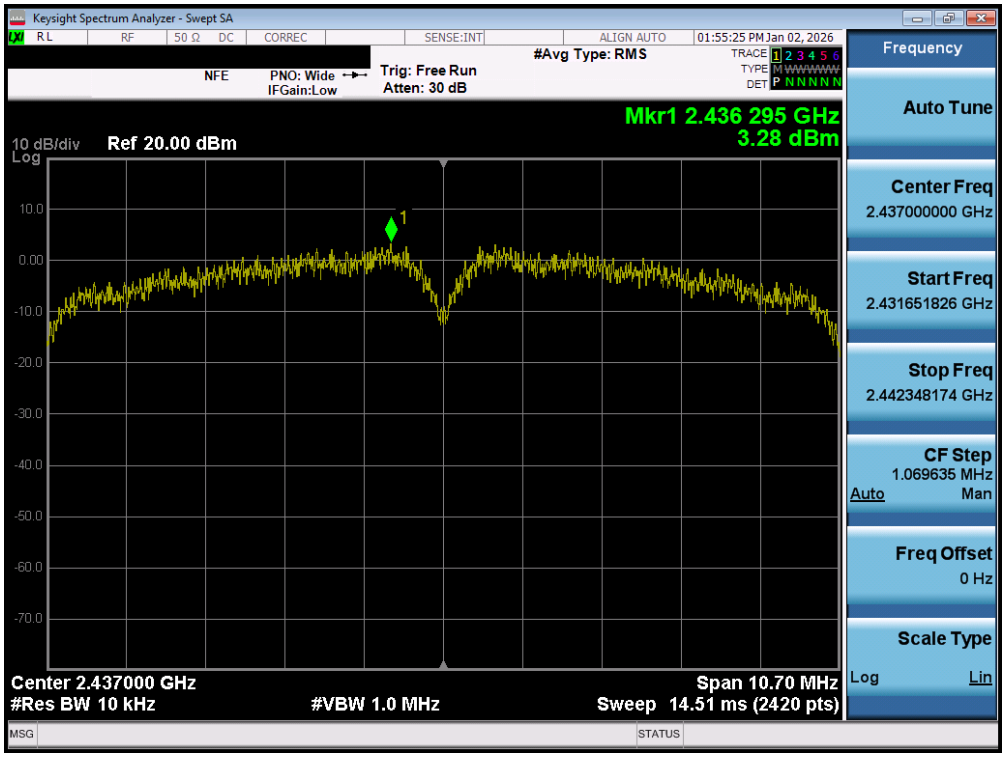
7.4.1 MIMO Power Spectral Density Measurements – MIMO ANT1 – 20MHz



Plot 7-61. Power Spectral Density Plot MIMO ANT1 (802.11b – Ch. 1) – MIMO ANT1



Plot 7-62. Power Spectral Density Plot MIMO ANT1 (802.11b – Ch. 6) – MIMO ANT1

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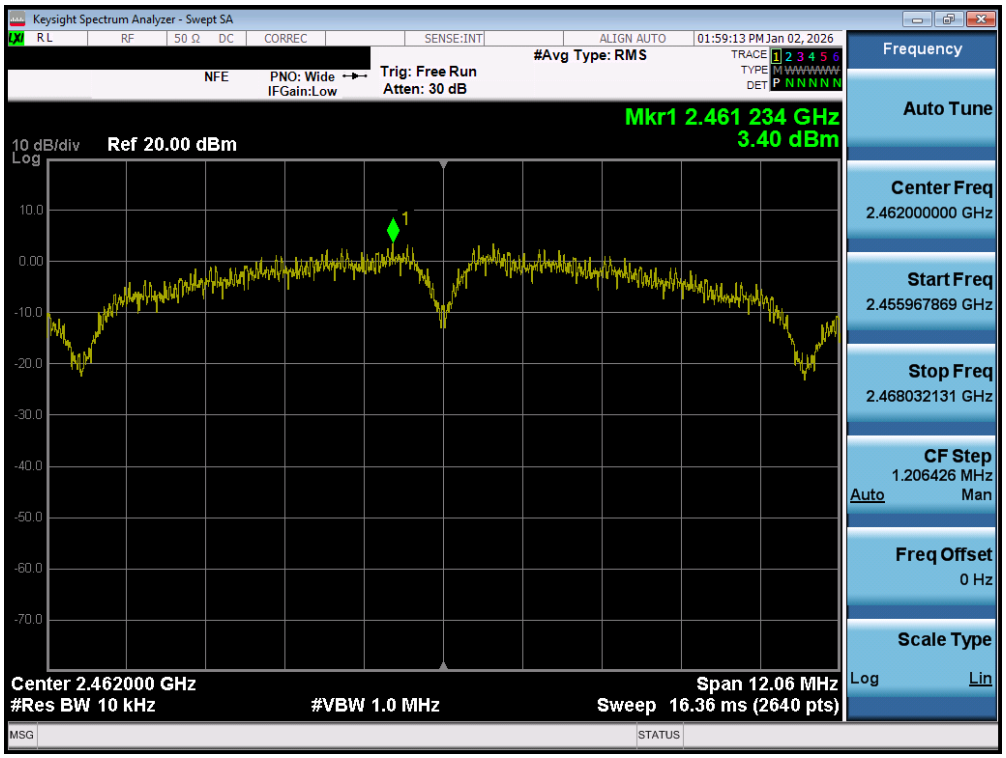
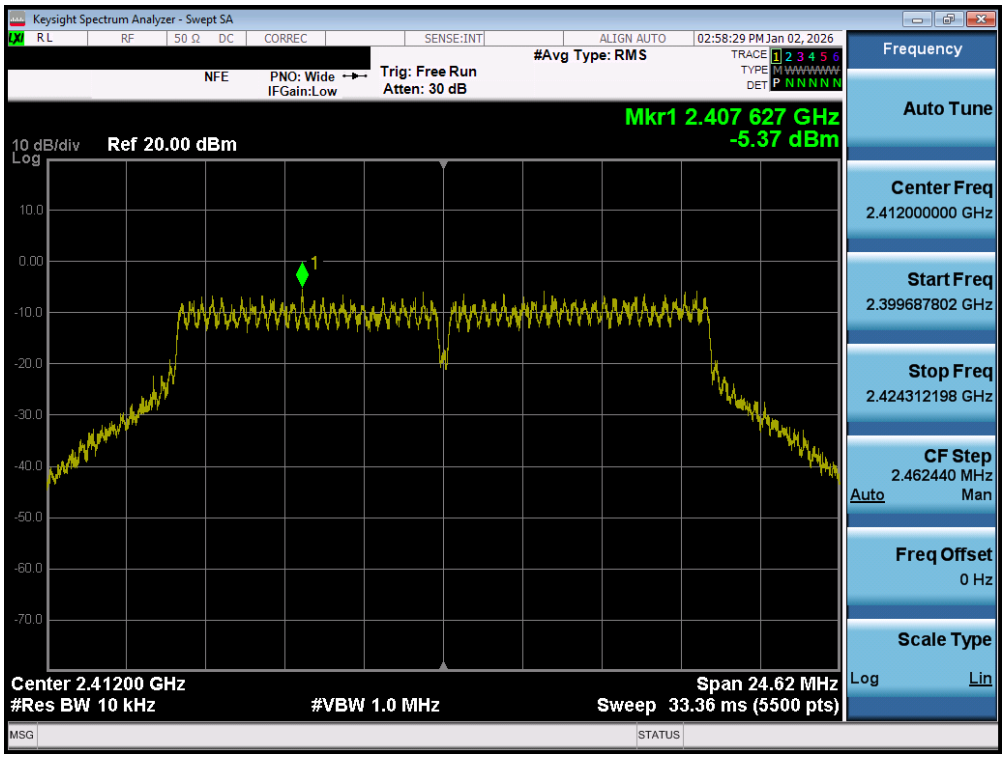


Plot 7-63. Power Spectral Density Plot MIMO ANT1 (802.11b – Ch. 11) – MIMO ANT1



Plot 7-64. Power Spectral Density Plot MIMO ANT1 (802.11g – Ch. 1) – MIMO ANT1

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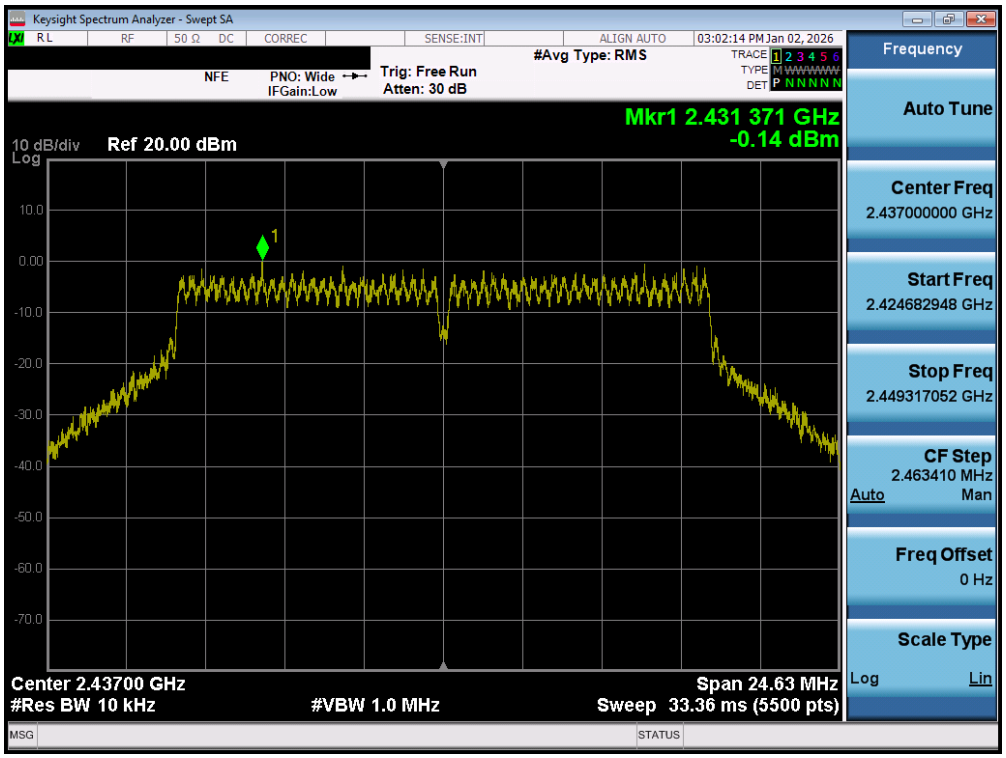
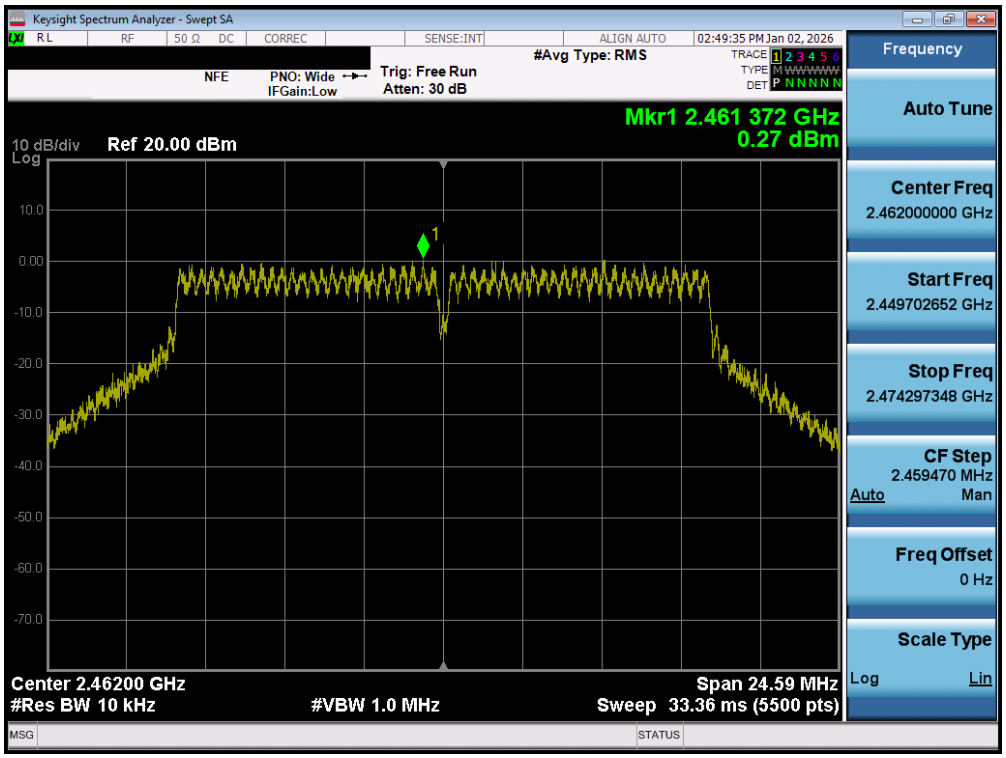


Plot 7-65. Power Spectral Density Plot MIMO ANT1 (802.11g – Ch. 6) – MIMO ANT1



Plot 7-66. Power Spectral Density Plot MIMO ANT1 (802.11g – Ch. 11) – MIMO ANT1

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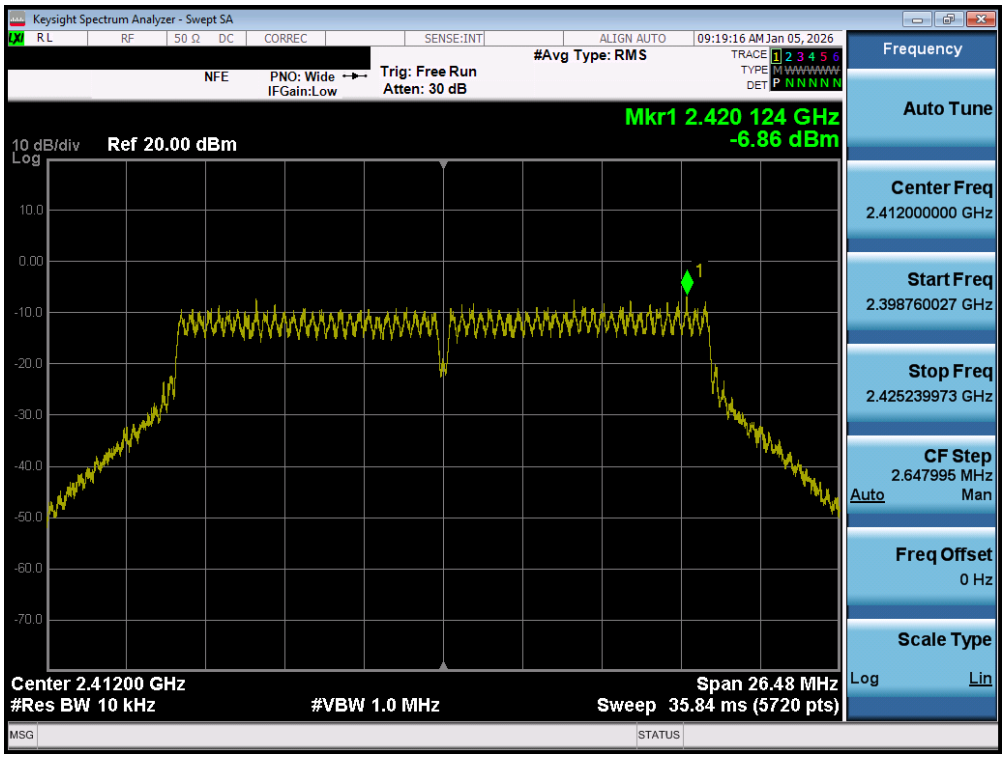
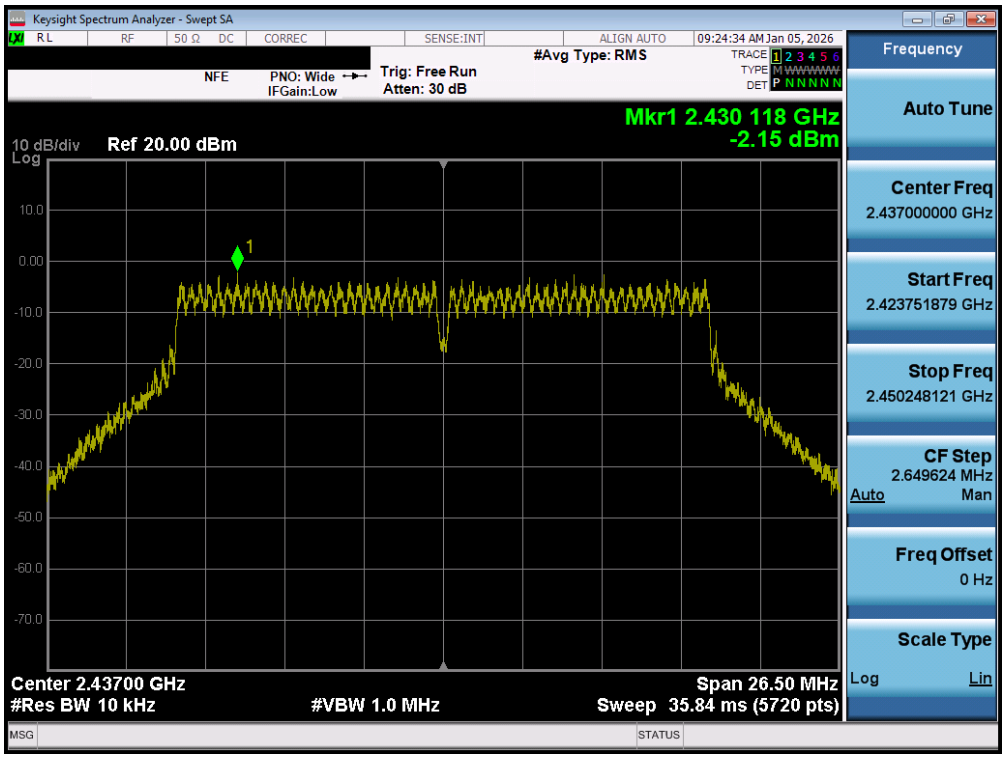


Plot 7-67. Power Spectral Density Plot MIMO ANT1 (802.11n 20MHz (2.4GHz) – Ch. 1) – MIMO ANT1



Plot 7-68. Power Spectral Density Plot MIMO ANT1 (802.11n 20MHz (2.4GHz) – Ch. 6) – MIMO ANT1

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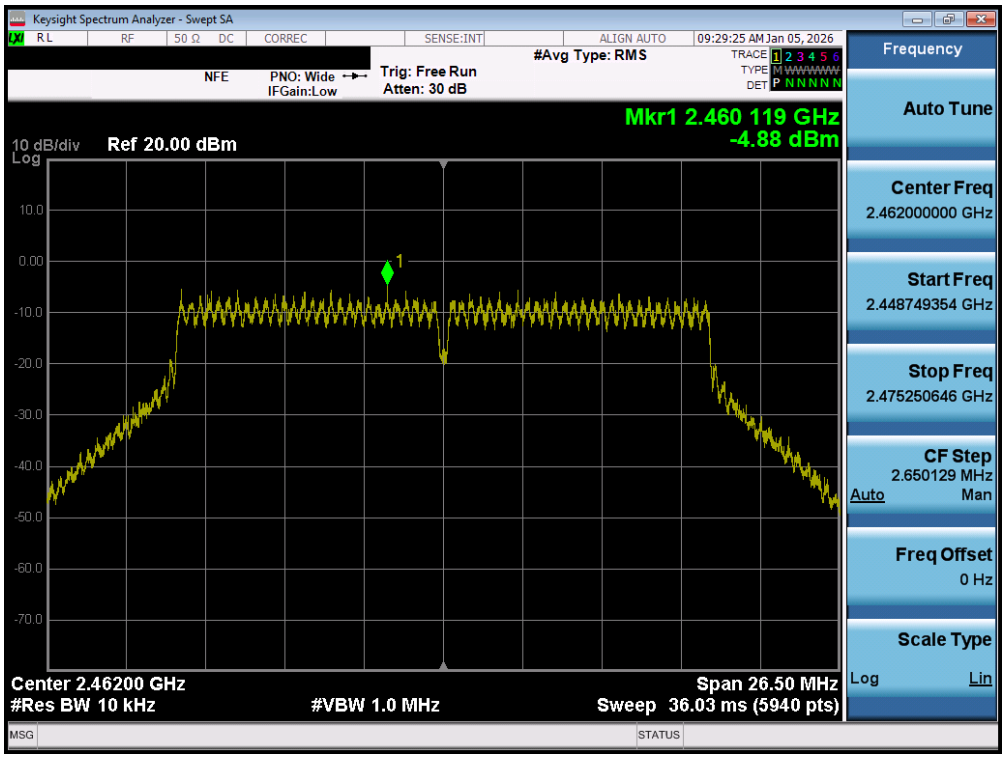
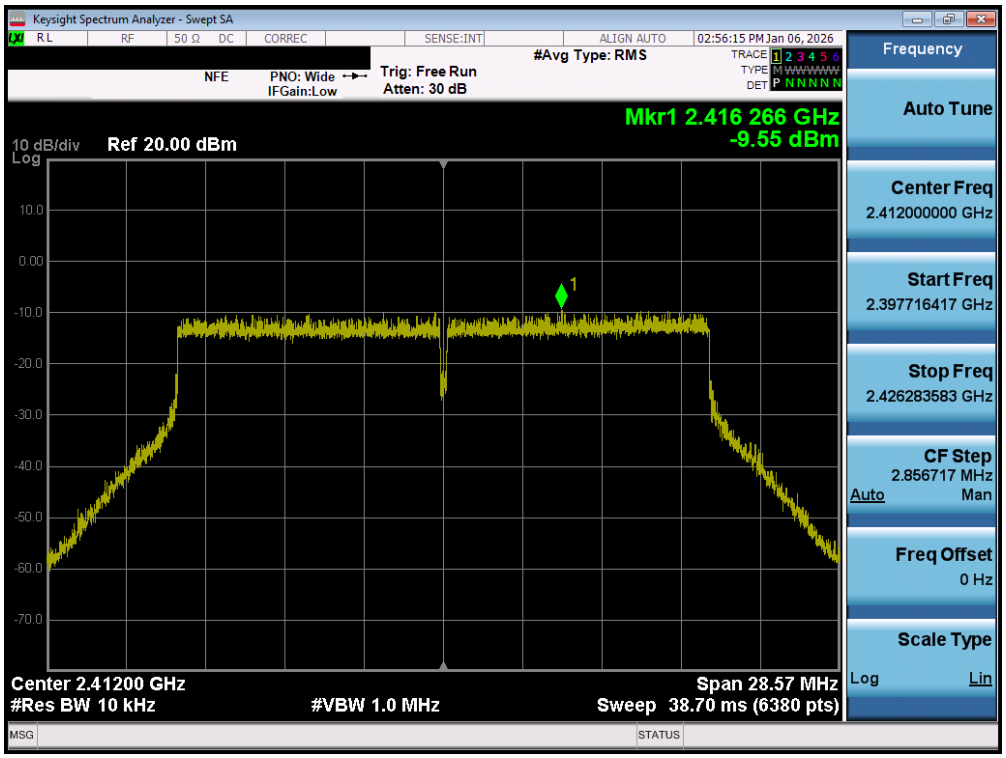


Plot 7-69. Power Spectral Density Plot MIMO ANT1 (802.11n 20MHz (2.4GHz) – Ch. 11) – MIMO ANT1



Plot 7-70. Power Spectral Density Plot MIMO ANT1 (802.11be 20MHz (2.4GHz) – Ch. 1) – MIMO ANT1

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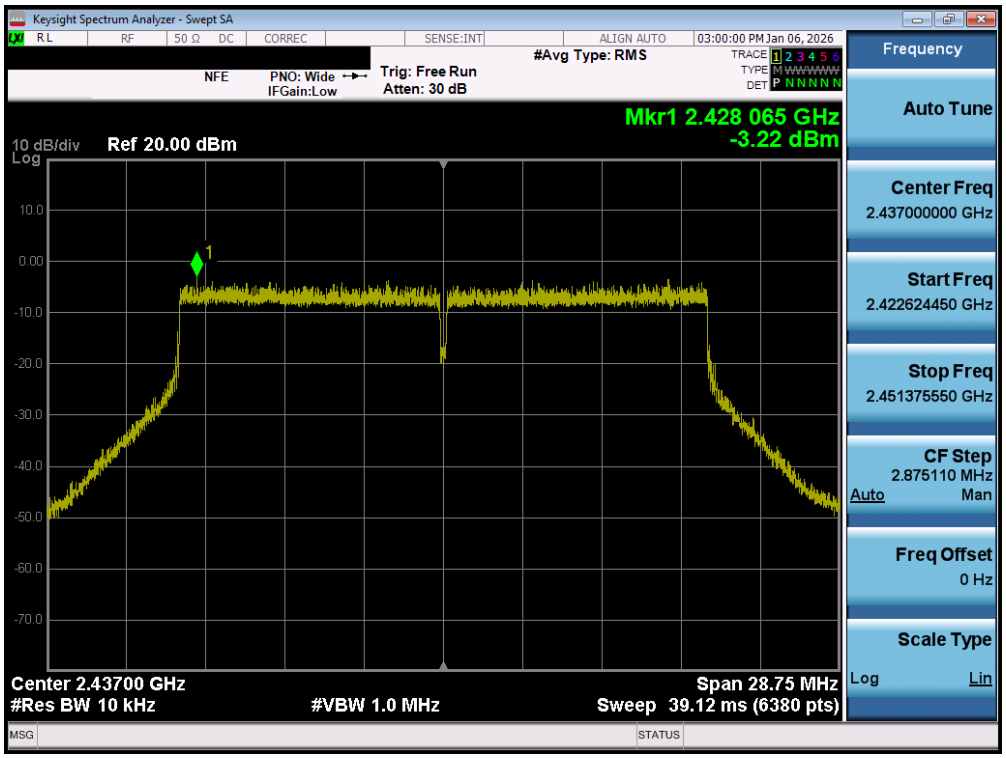
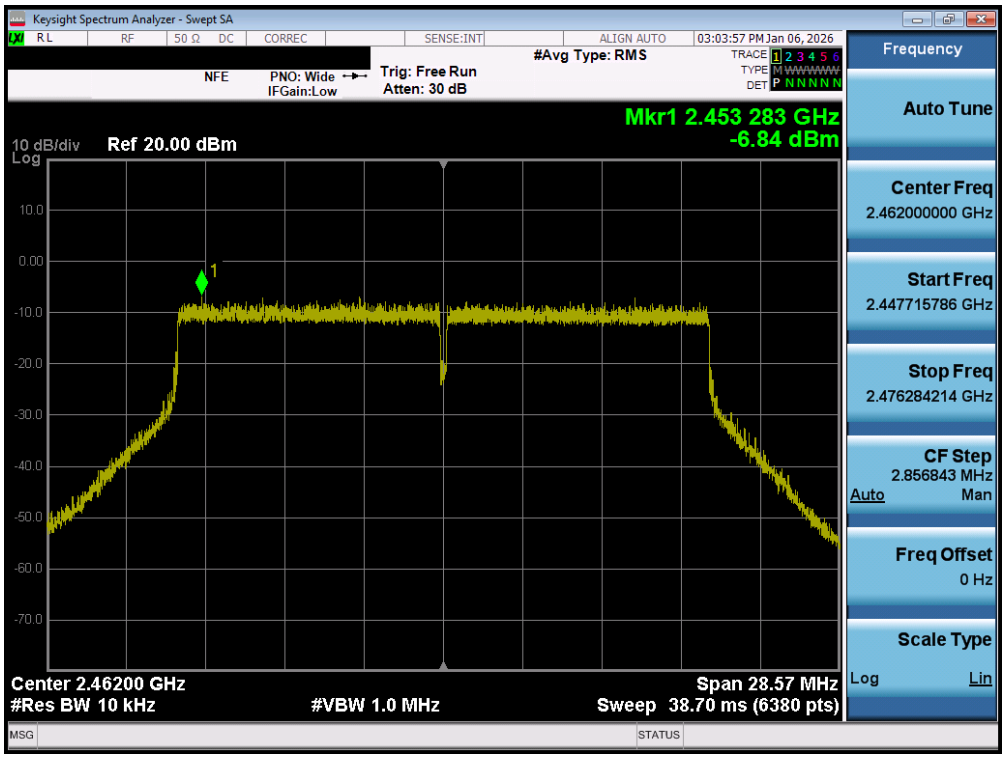


Plot 7-71. Power Spectral Density Plot MIMO ANT1 (802.11be 20MHz (2.4GHz) – Ch. 6) – MIMO ANT1



Plot 7-72. Power Spectral Density Plot MIMO ANT1 (802.11be 20MHz (2.4GHz) – Ch. 11) – MIMO ANT1

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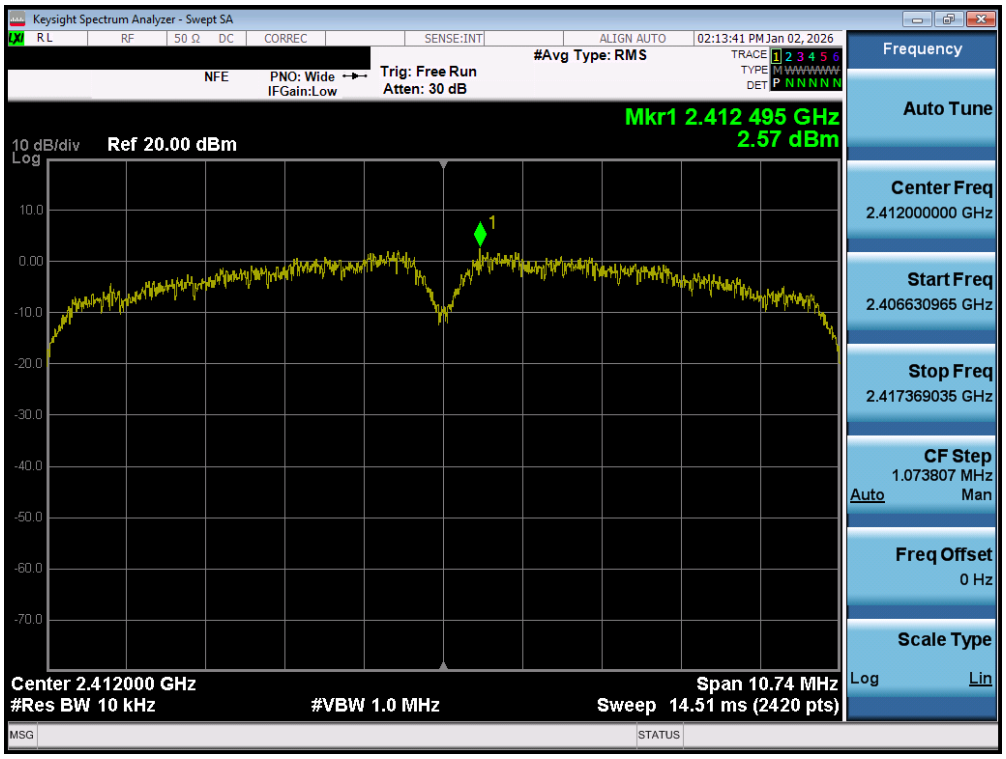
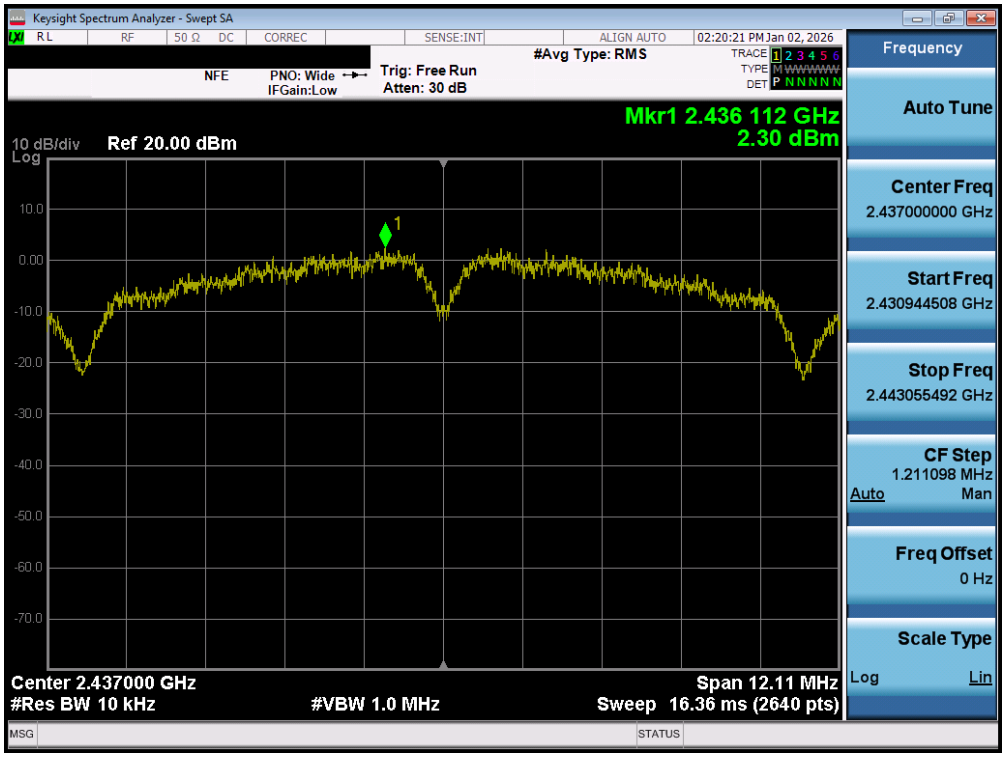
7.4.2 MIMO Power Spectral Density Measurements – MIMO ANT2 – 20MHz



Plot 7-73. Power Spectral Density Plot MIMO ANT2 (802.11b – Ch. 1) – MIMO ANT2



Plot 7-74. Power Spectral Density Plot MIMO ANT2 (802.11b – Ch. 6) – MIMO ANT2

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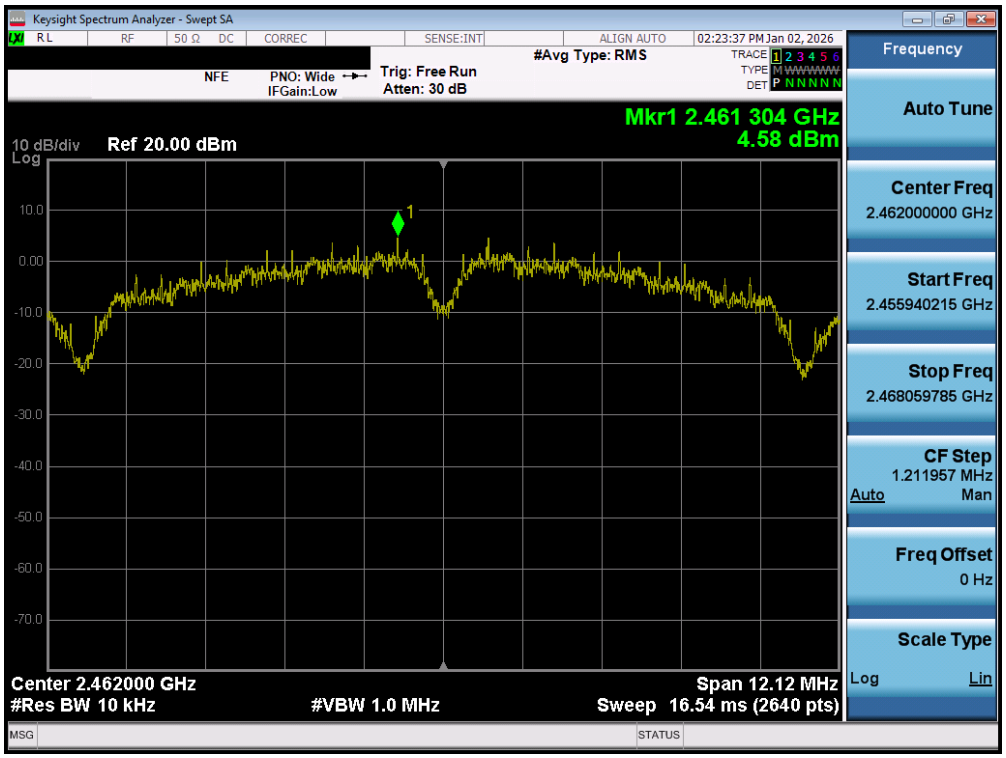
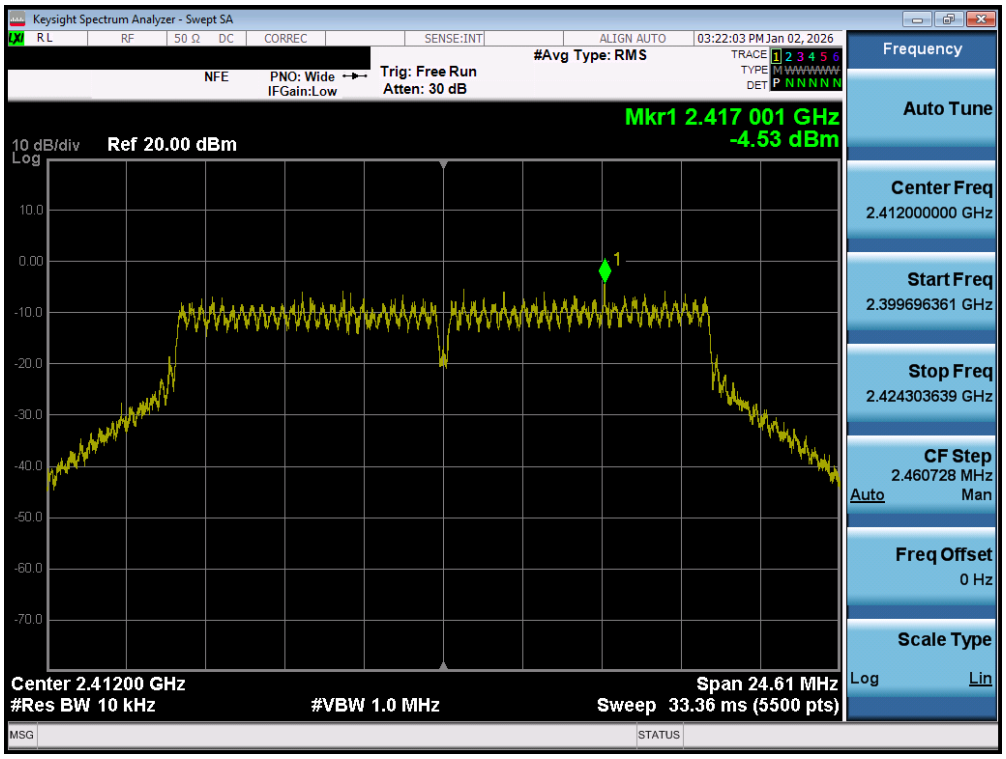


Plot 7-75. Power Spectral Density Plot MIMO ANT2 (802.11b – Ch. 11) – MIMO ANT2



Plot 7-76. Power Spectral Density Plot MIMO ANT2 (802.11g – Ch. 1) – MIMO ANT2

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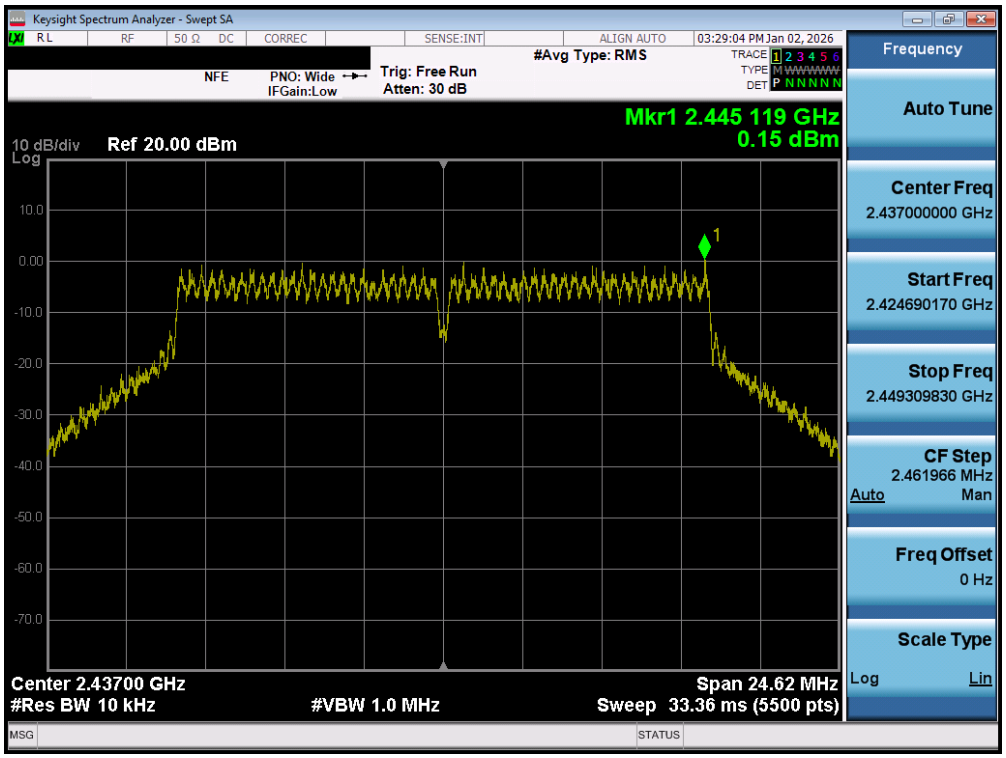
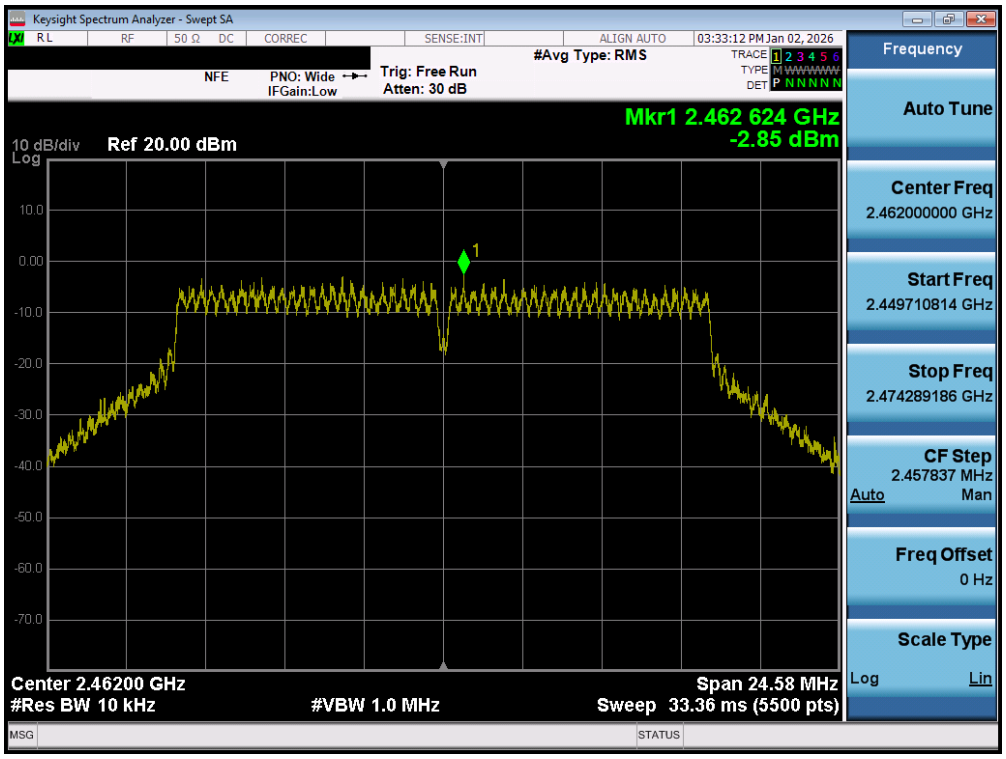


Plot 7-77. Power Spectral Density Plot MIMO ANT2 (802.11g – Ch. 6) – MIMO ANT2



Plot 7-78. Power Spectral Density Plot MIMO ANT2 (802.11g – Ch. 11) – MIMO ANT2

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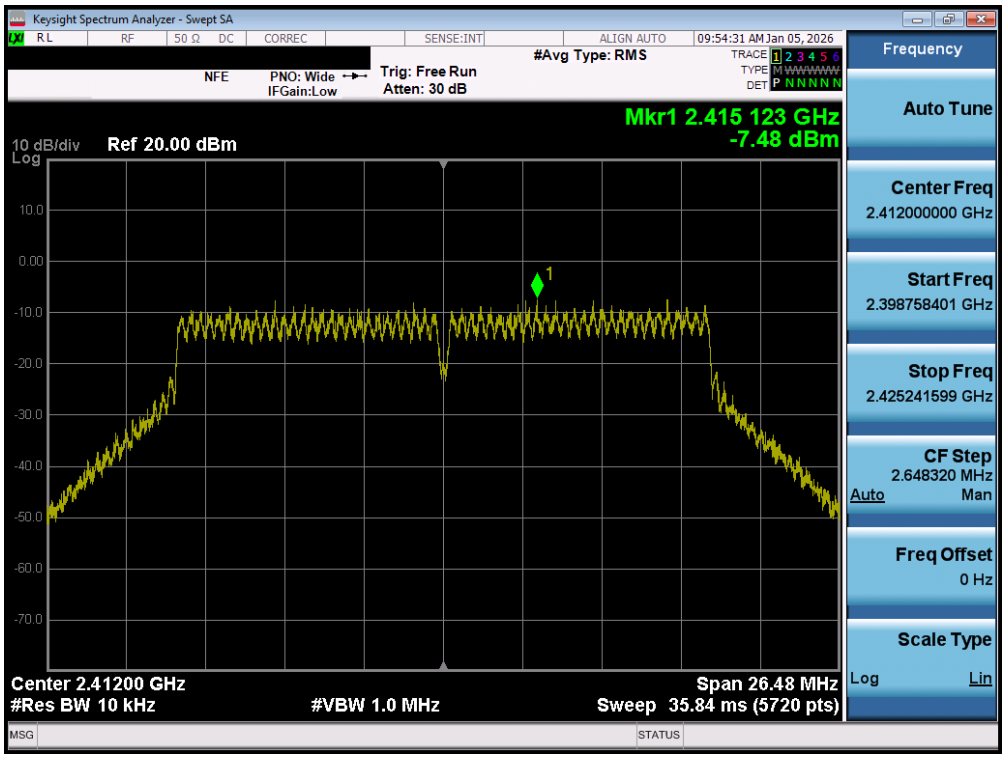
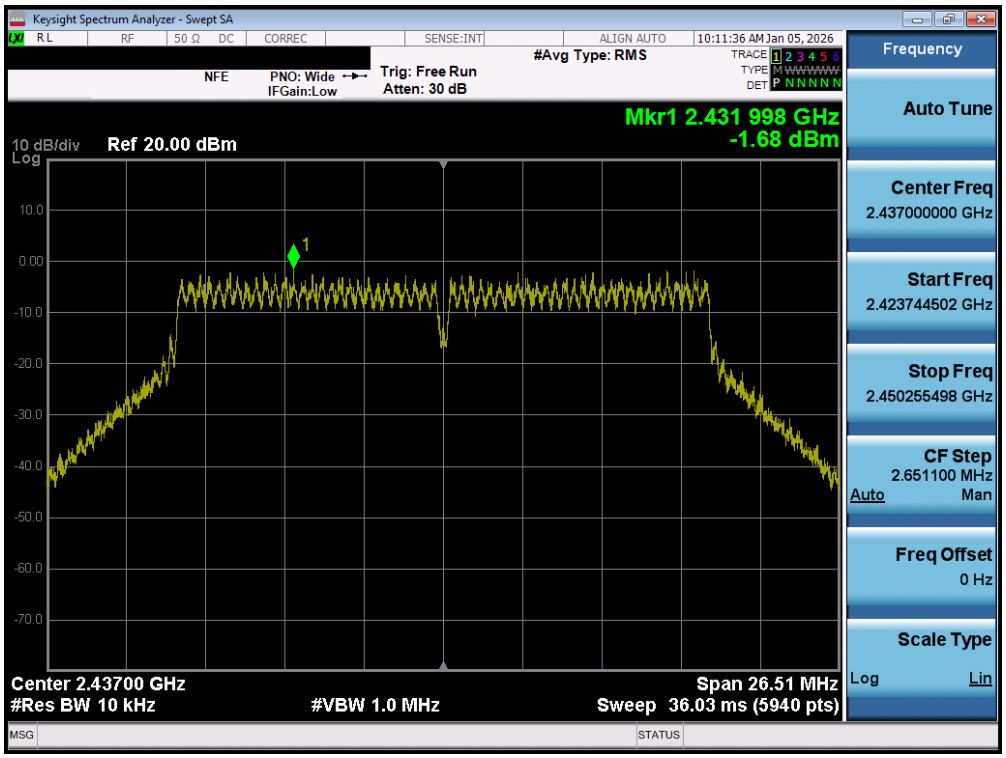


Plot 7-79. Power Spectral Density Plot MIMO ANT2 (802.11n 20MHz (2.4GHz) – Ch. 1) – MIMO ANT2



Plot 7-80. Power Spectral Density Plot MIMO ANT2 (802.11n 20MHz (2.4GHz) – Ch. 6) – MIMO ANT2

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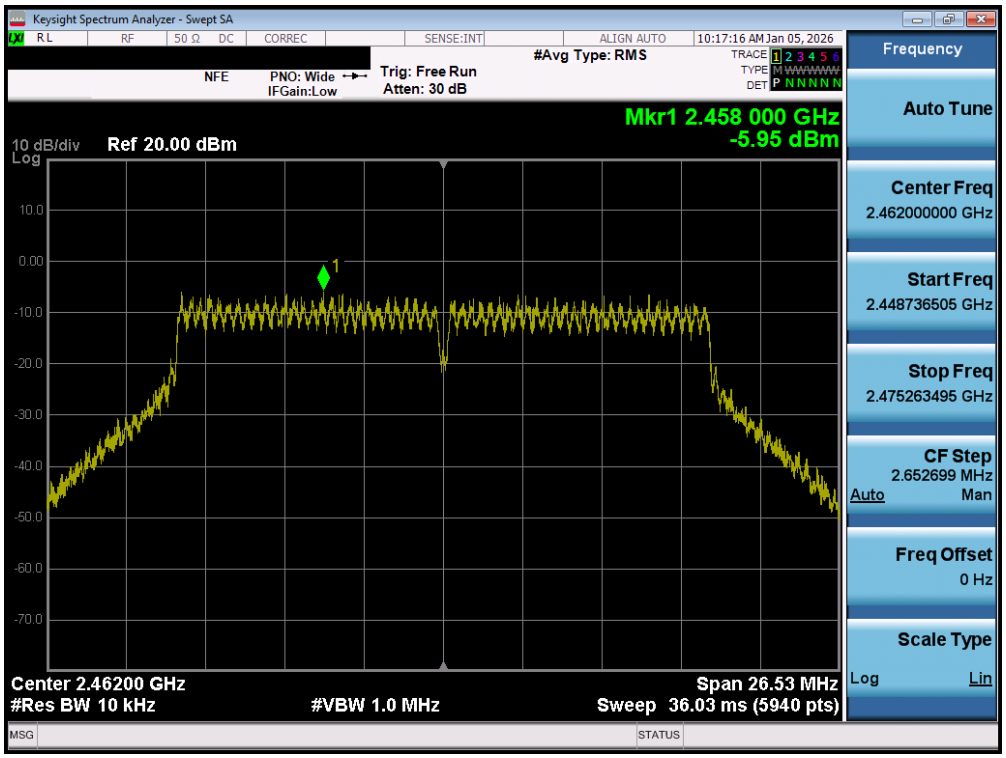
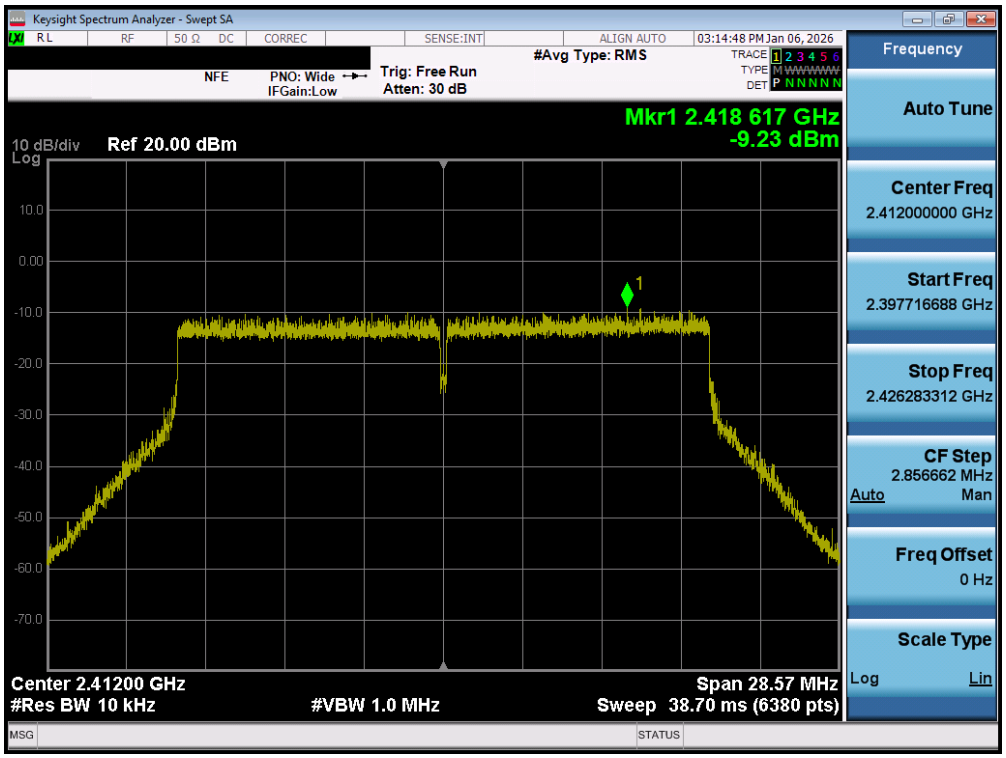


Plot 7-81. Power Spectral Density Plot MIMO ANT2 (802.11n 20MHz (2.4GHz) – Ch. 11) – MIMO ANT2



Plot 7-82. Power Spectral Density Plot MIMO ANT2 (802.11be 20MHz (2.4GHz) – Ch. 1) – MIMO ANT2

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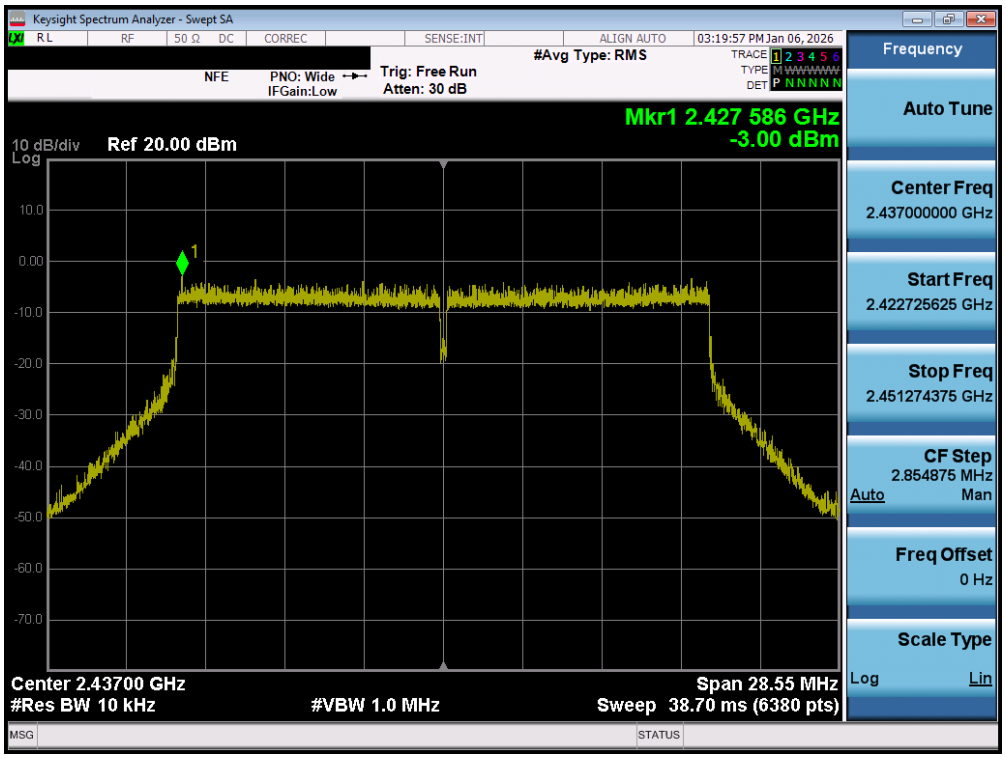
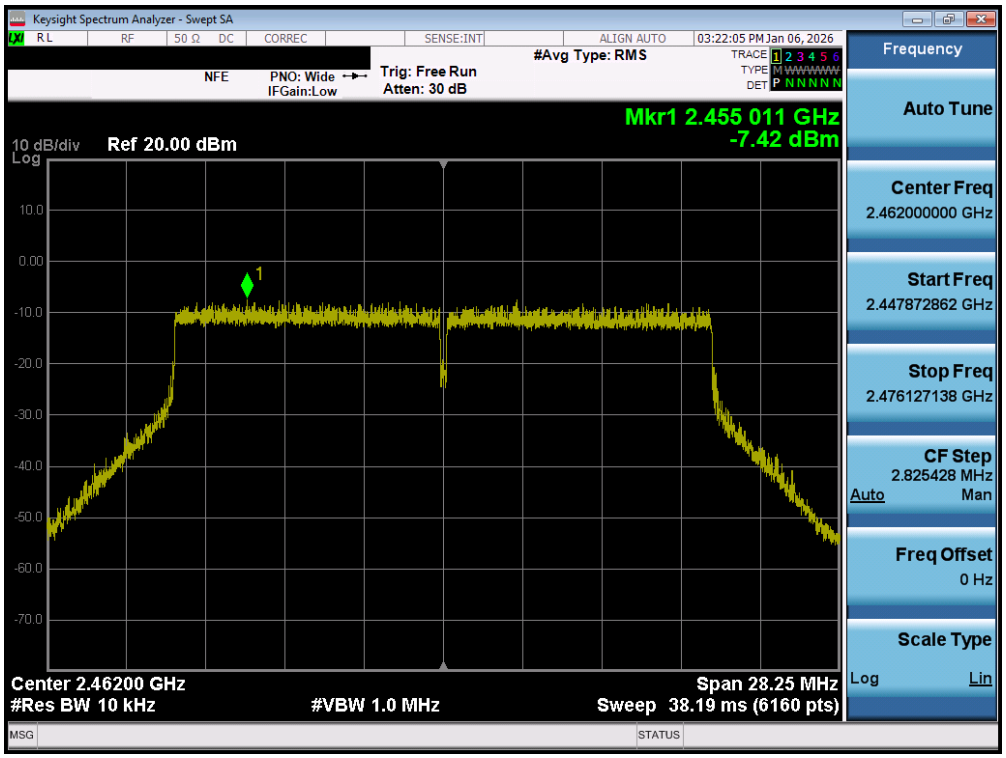


Plot 7-83. Power Spectral Density Plot MIMO ANT2 (802.11be 20MHz (2.4GHz) – Ch. 6) – MIMO ANT2



Plot 7-84. Power Spectral Density Plot MIMO ANT2 (802.11be 20MHz (2.4GHz) – Ch. 11) – MIMO ANT2

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Power Spectral Density Measurements – 40MHz

Frequency [MHz]	Channel No.	802.11 Mode	Data Rate [Mbps]	ANT 1 Power Spectral Density [dBm]	ANT 2 Power Spectral Density [dBm]	Summed MIMO Power Spectral Density [dBm]	Maximum Permissible Power Density [dBm / 3kHz]	Margin [dB]	Pass / Fail
2412	3	n	6.5/7.2 (MCS0)	-9.84	-5.10	-3.84	8.00	-8.02	Pass
2437	6	n	6.5/7.2 (MCS0)	-4.21	-6.41	-2.16	8.00	-7.93	Pass
2462	11	n	6.5/7.2 (MCS0)	-24.94	-24.47	-21.69	8.00	-8.14	Pass
2412	3	be	6.5/7.2 (MCS0)	-12.46	-12.17	-9.30	8.00	-10.32	Pass
2437	6	be	6.5/7.2 (MCS0)	-8.45	-8.57	-5.50	8.00	-11.90	Pass
2462	11	be	6.5/7.2 (MCS0)	-26.52	-25.58	-23.01	8.00	-12.20	Pass

Table 7-16. Conducted Power Spectral Density Measurements MIMO – 40MHz

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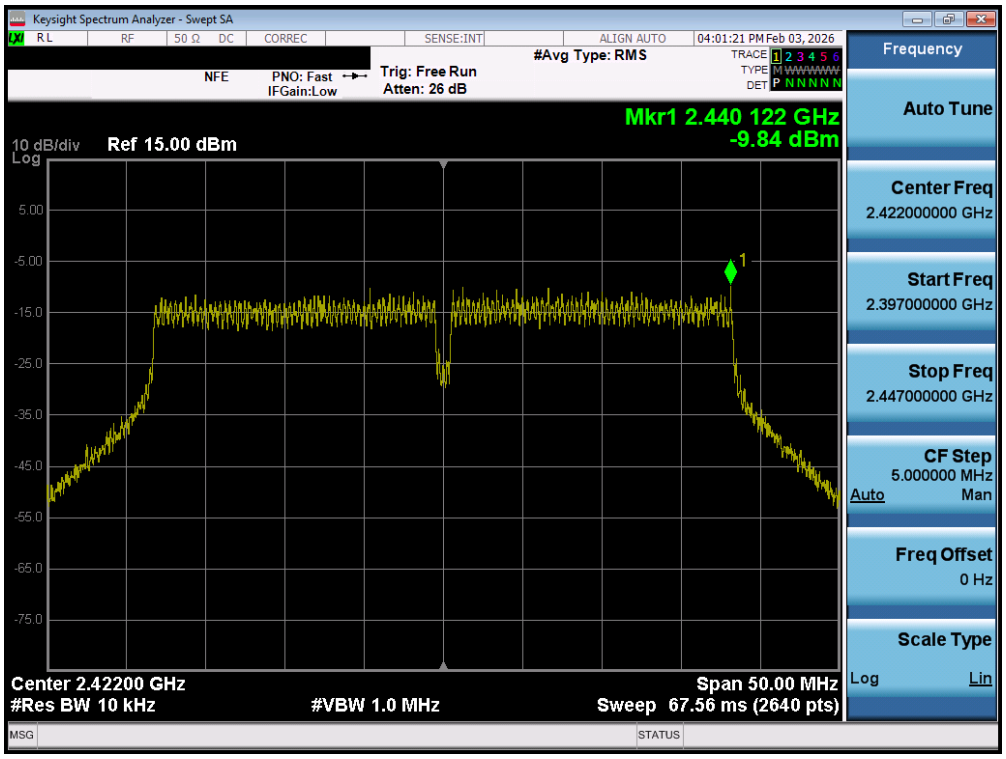
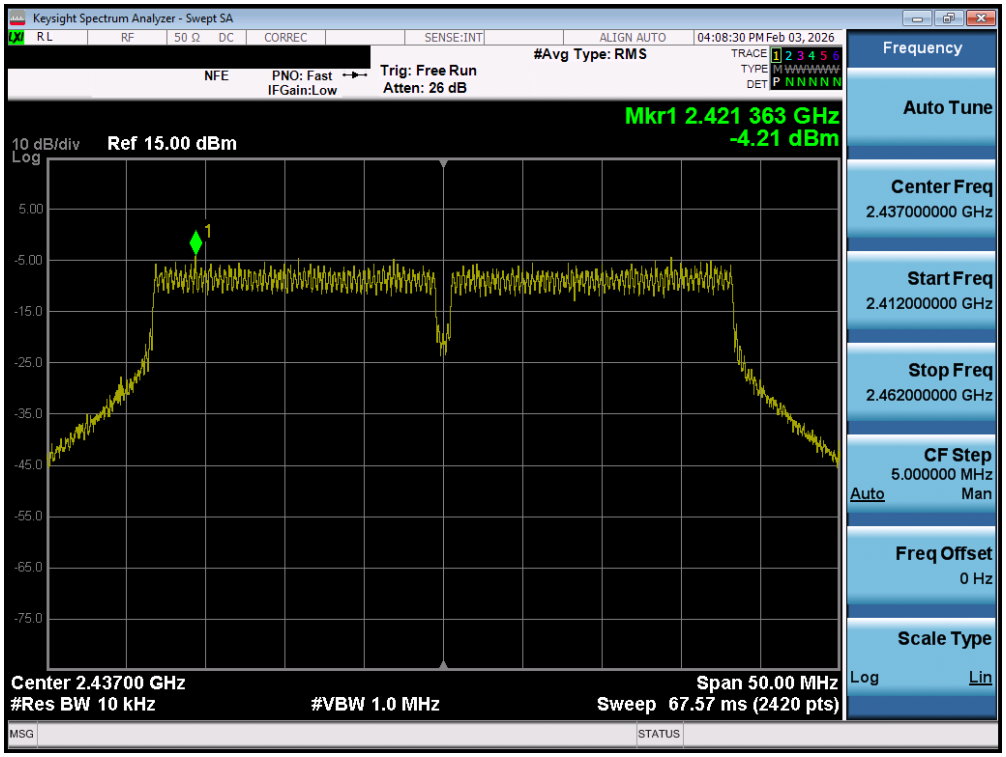
7.4.3 MIMO Power Spectral Density Measurements – MIMO ANT1 – 40MHz



Plot 7-85. Power Spectral Density Plot MIMO ANT1 (802.11n 40MHz (2.4GHz) – Ch. 3) – MIMO ANT1



Plot 7-86. Power Spectral Density Plot MIMO ANT1 (802.11n 40MHz (2.4GHz) – Ch. 6) – MIMO ANT1

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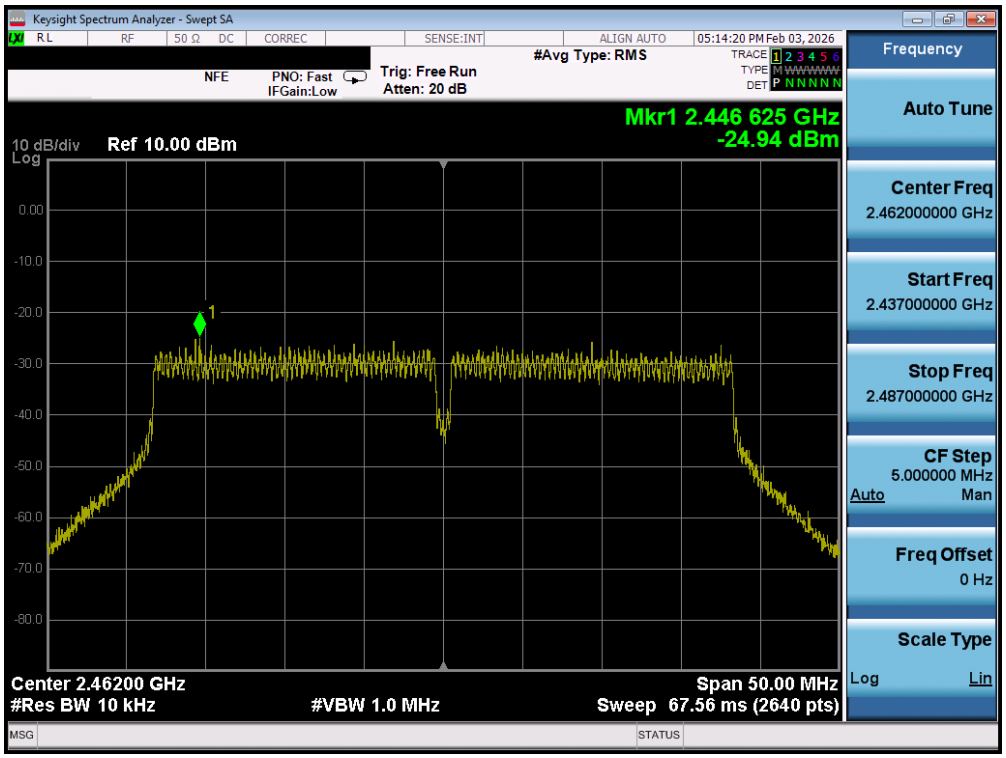
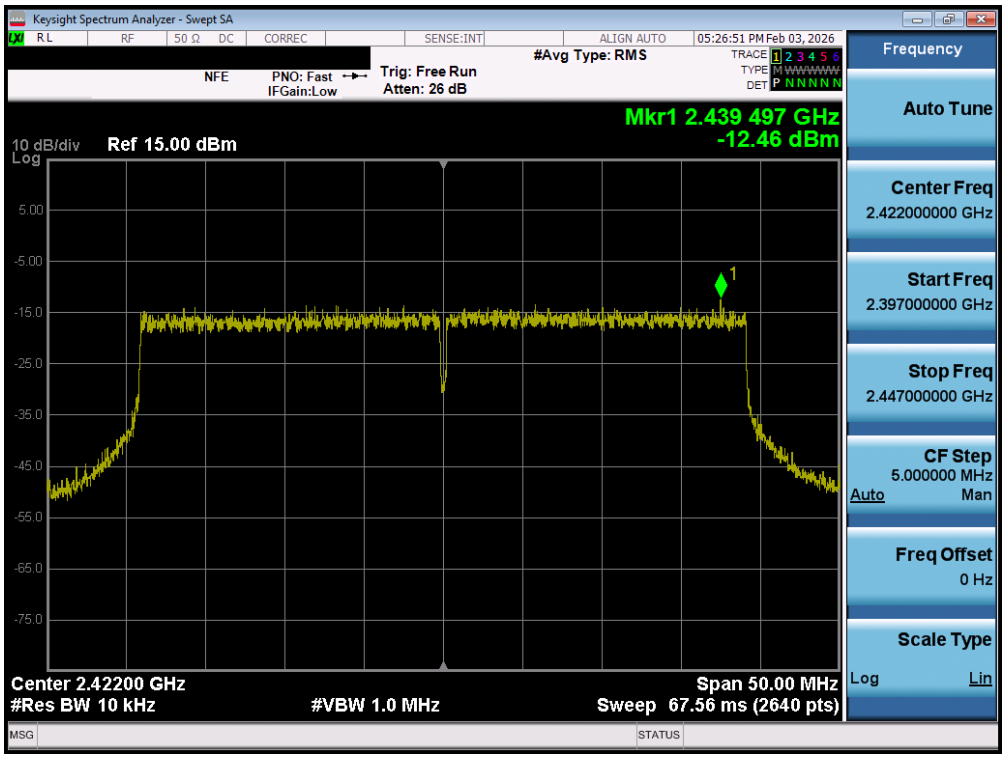


Plot 7-87. Power Spectral Density Plot MIMO ANT1 (802.11n 40MHz (2.4GHz) – Ch. 11) – MIMO ANT1



Plot 7-88. Power Spectral Density Plot MIMO ANT1 (802.11be 40MHz (2.4GHz) – Ch. 3) – MIMO ANT1

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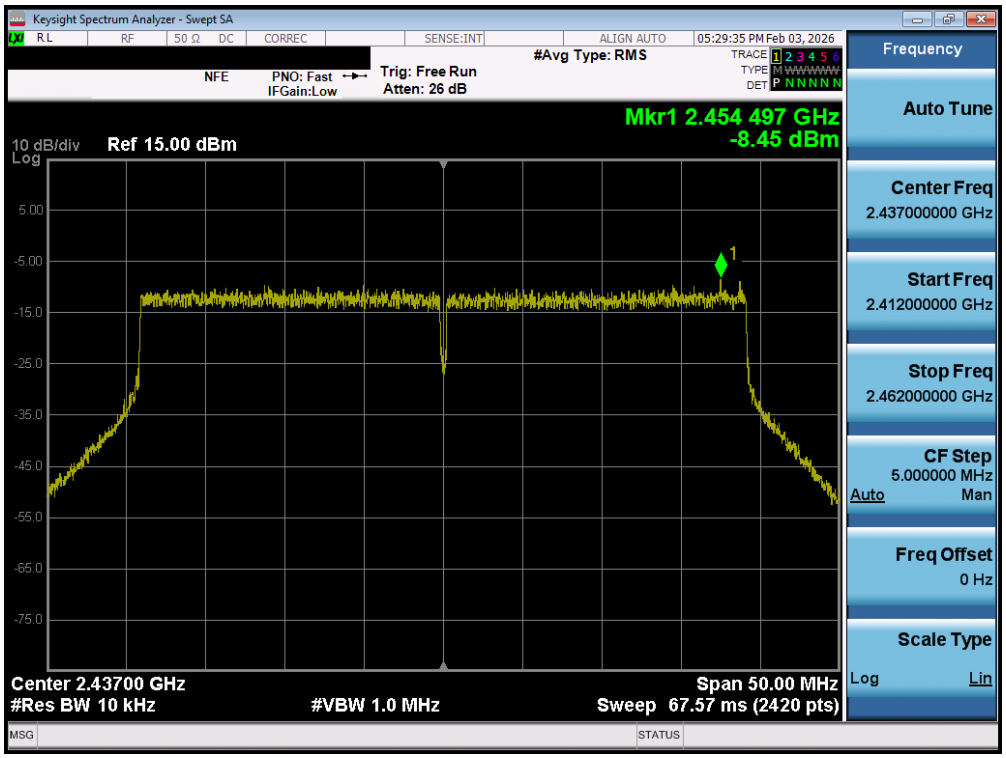
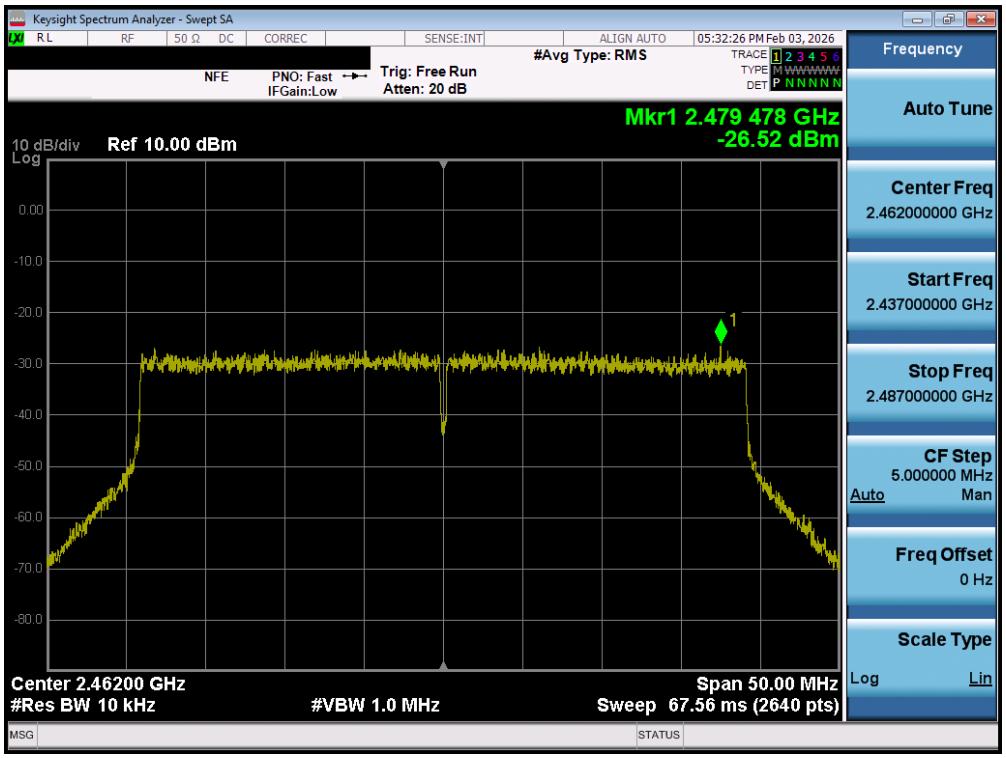


Plot 7-89. Power Spectral Density Plot MIMO ANT1 (802.11be 40MHz (2.4GHz) – Ch. 6) – MIMO ANT1



Plot 7-90. Power Spectral Density Plot MIMO ANT1 (802.11be 40MHz (2.4GHz) – Ch. 11) – MIMO ANT1

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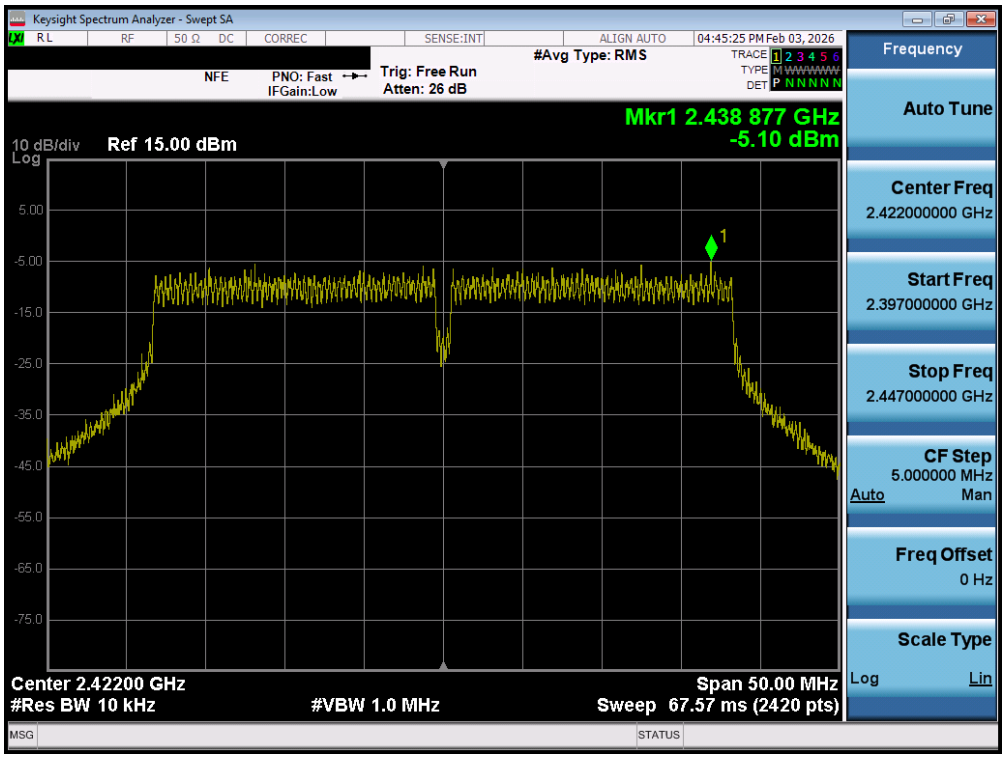
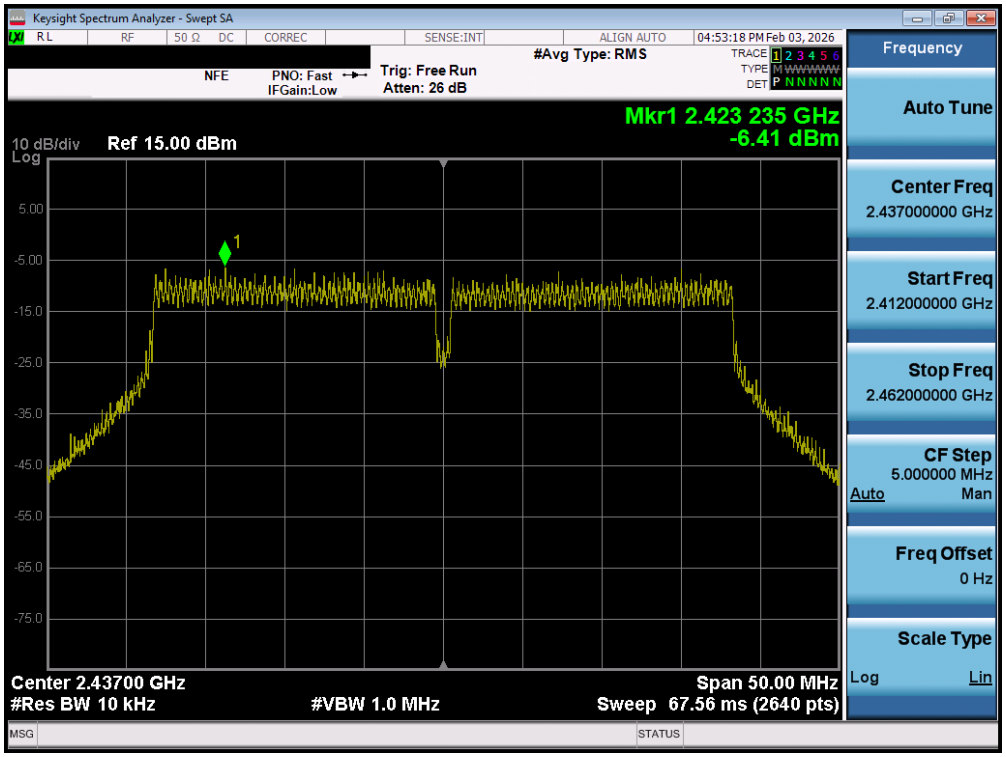
7.4.4 MIMO Power Spectral Density Measurements – MIMO ANT2 – 40MHz



Plot 7-91. Power Spectral Density Plot MIMO ANT2 (802.11n 40MHz (2.4GHz) – Ch. 3) – MIMO ANT2



Plot 7-92. Power Spectral Density Plot MIMO ANT2 (802.11n 40MHz (2.4GHz) – Ch. 6) – MIMO ANT2

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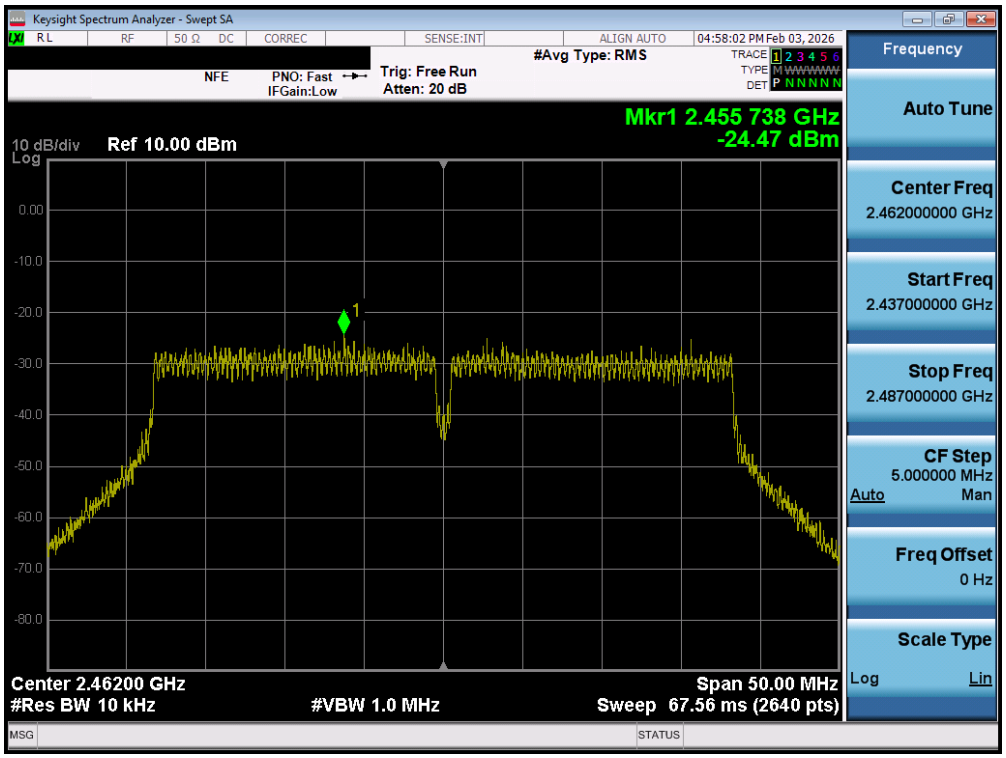
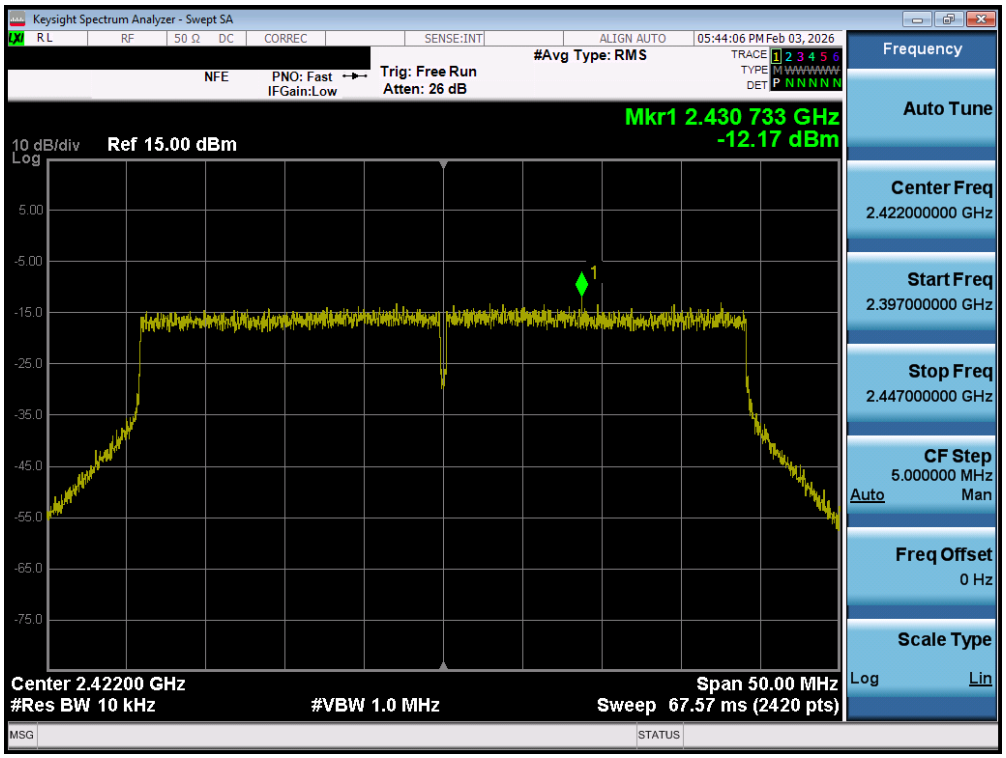


Plot 7-93. Power Spectral Density Plot MIMO ANT2 (802.11n 40MHz (2.4GHz) – Ch. 11) – MIMO ANT2



Plot 7-94. Power Spectral Density Plot MIMO ANT2 (802.11be 40MHz (2.4GHz) – Ch. 3) – MIMO ANT2

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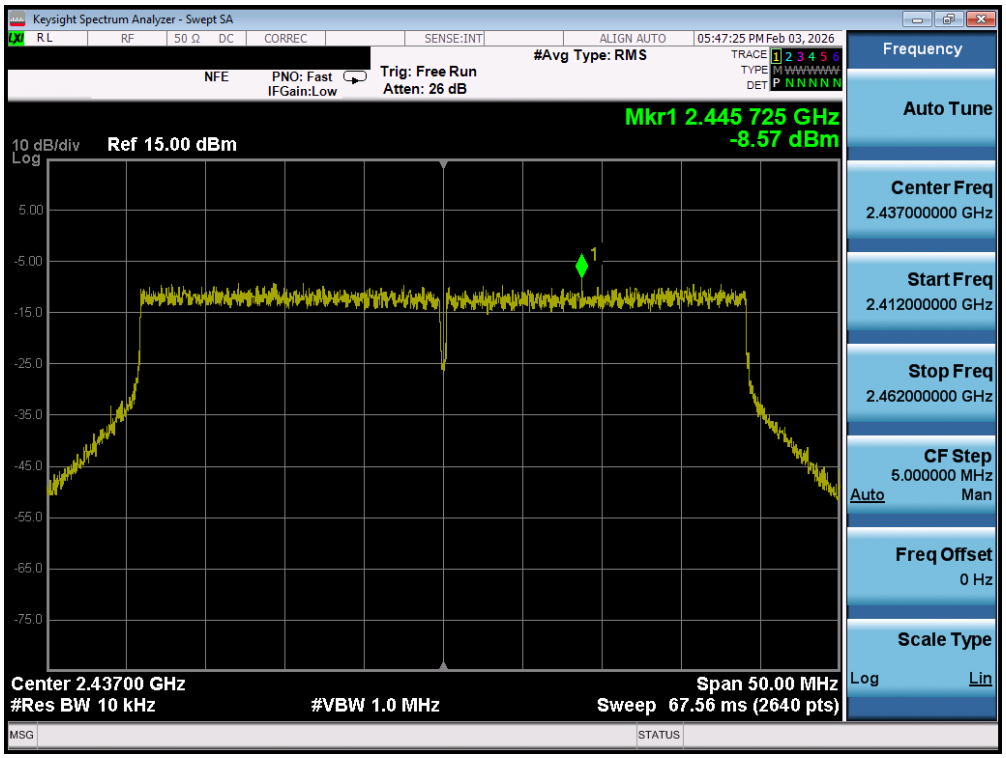
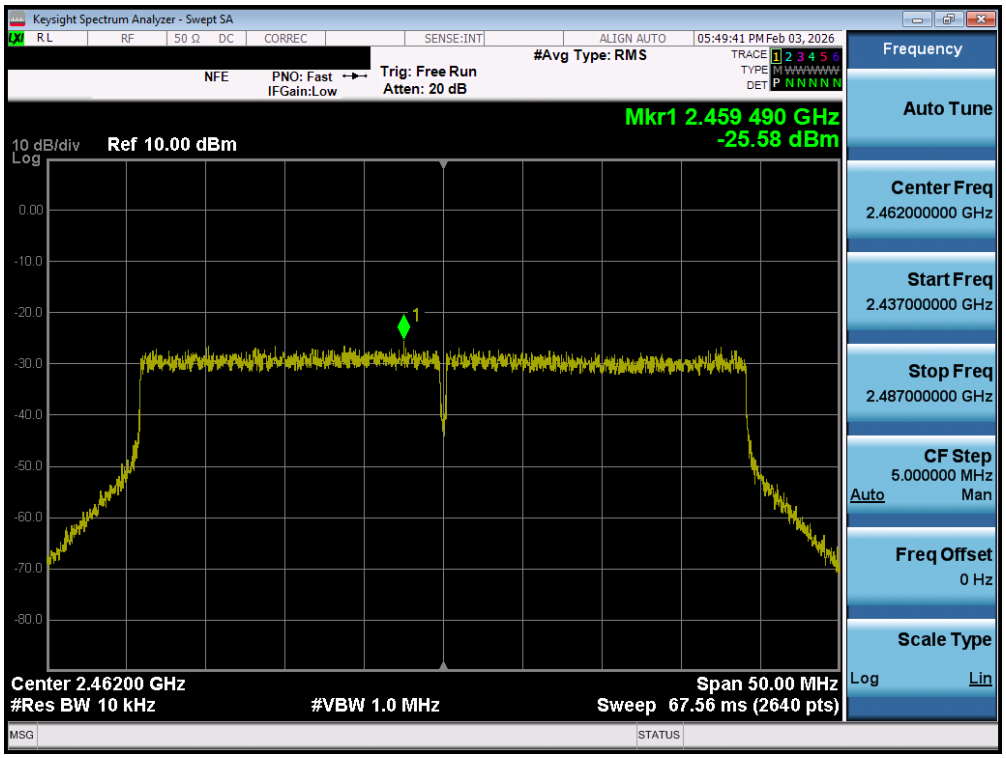


Plot 7-95. Power Spectral Density Plot MIMO ANT2 (802.11be 40MHz (2.4GHz) – Ch. 6) – MIMO ANT2



Plot 7-96. Power Spectral Density Plot MIMO ANT2 (802.11be 40MHz (2.4GHz) – Ch. 11) – MIMO ANT2

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Note:

Per ANSI C63.10-2020 Section 14.3.1, the power spectral density at Antenna 1 and Antenna 2 were first measured separately as shown in the section above. The measured values were then summed in linear power units then converted back to dBm.

Sample MIMO Calculation:

At 2412MHz the average conducted power spectral density was measured to be 4.73 dBm for Antenna 1 and 2.57 dBm for Antenna 2.

Antenna 1 + Antenna 2 = MIMO

(4.73 dBm + 2.57 dBm) = (2.97 mW + 1.81 mW) = 4.78 mW = 6.79 dBm

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7.5 Conducted Band Edge Emissions

Test Overview and Limit

All out of band emissions are measured with a spectrum analyzer connected to the antenna terminal of the EUT while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies. All data rates were investigated to determine the worst-case configuration. For the following out of band conducted spurious emissions plots at the band edge, the EUT was set at a data rate of 1Mbps for “b” mode, 6 Mbps for “g” mode, 6.5\\7.2Mbps for “n” mode, and 8.6Mbps for “ax” mode as these settings produced the worst-case emissions.

The limit for out-of-band spurious emissions at the band edge is 20dB below the fundamental emission level, as determined from the in-band power measurement of the DTS channel performed in a 100kHz bandwidth per the PSD procedure (Section 7.4).

Test Procedure Used

ANSI C63.10-2020 – Section 11.11.3

Test Settings

1. Start and stop frequency were set such that the band edge would be placed in the center of the plot
2. Span was set large enough so as to capture all out of band emissions near the band edge
3. RBW = 100kHz
4. VBW = 1MHz
5. Detector = Peak
6. Number of sweep points ≥ 2 x Span\\RBW
7. Trace mode = max hold
8. Sweep time = auto couple
9. The trace was allowed to stabilize

Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.

Figure 7-4. Test Instrument & Measurement Setup

Test Notes

None.

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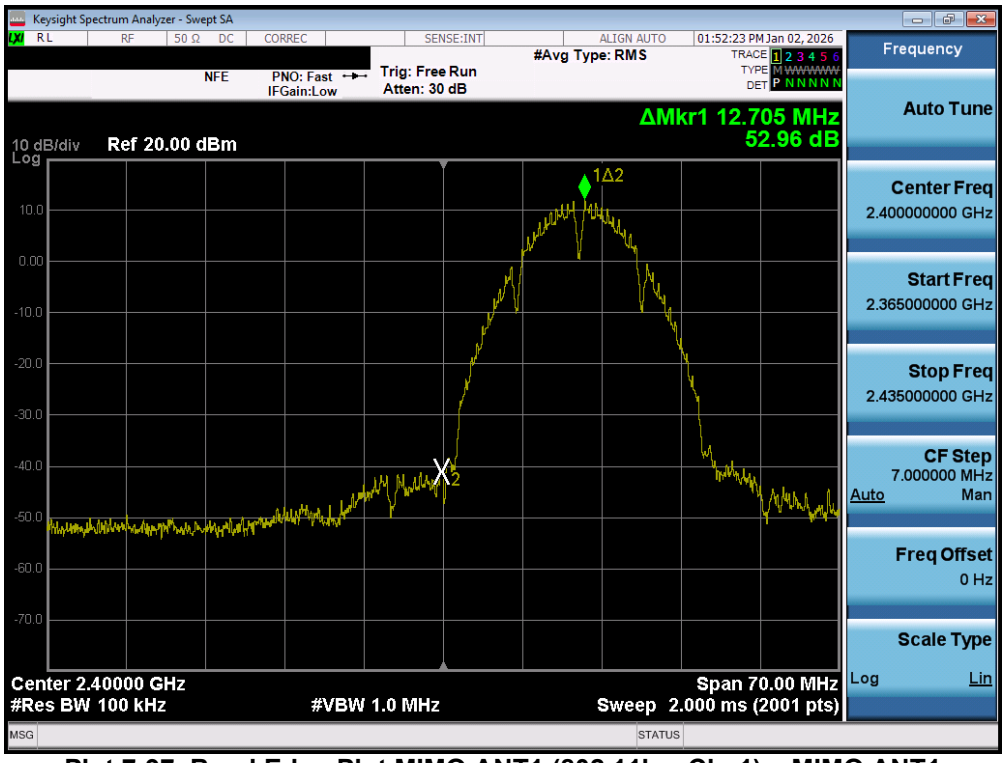
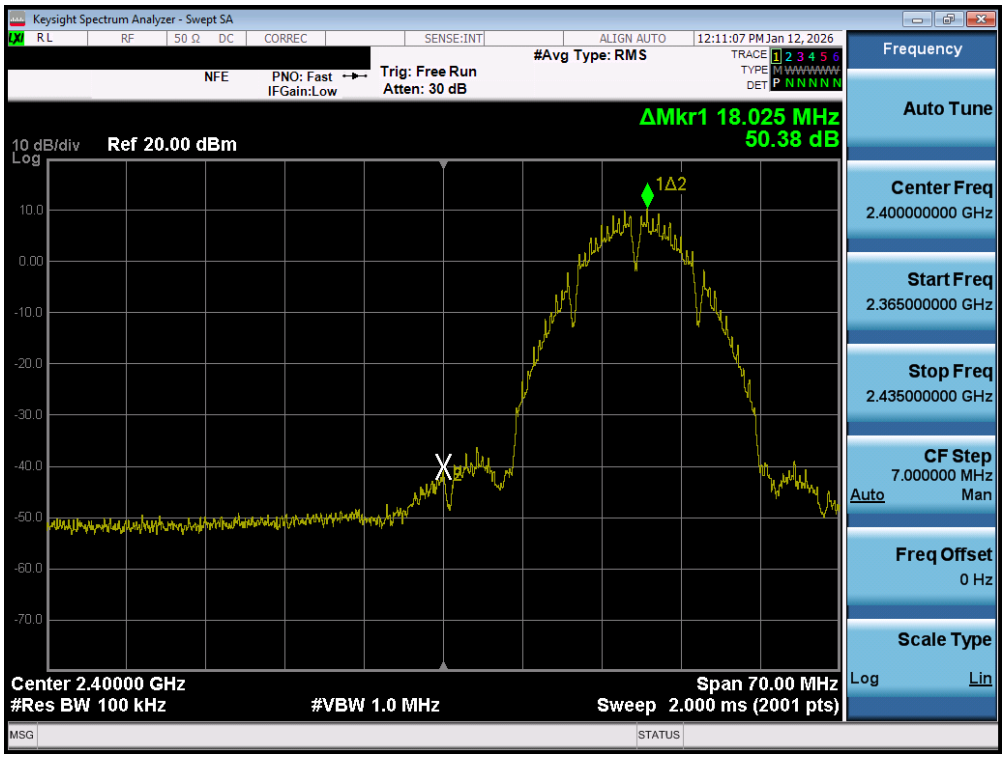
7.5.1 MIMO Conducted Band Edge Emissions – MIMO ANT1 – 20MHz



Plot 7-97. Band Edge Plot MIMO ANT1 (802.11b – Ch. 1) – MIMO ANT1



Plot 7-98. Band Edge Plot MIMO ANT1 (802.11b – Ch. 2) – MIMO ANT1

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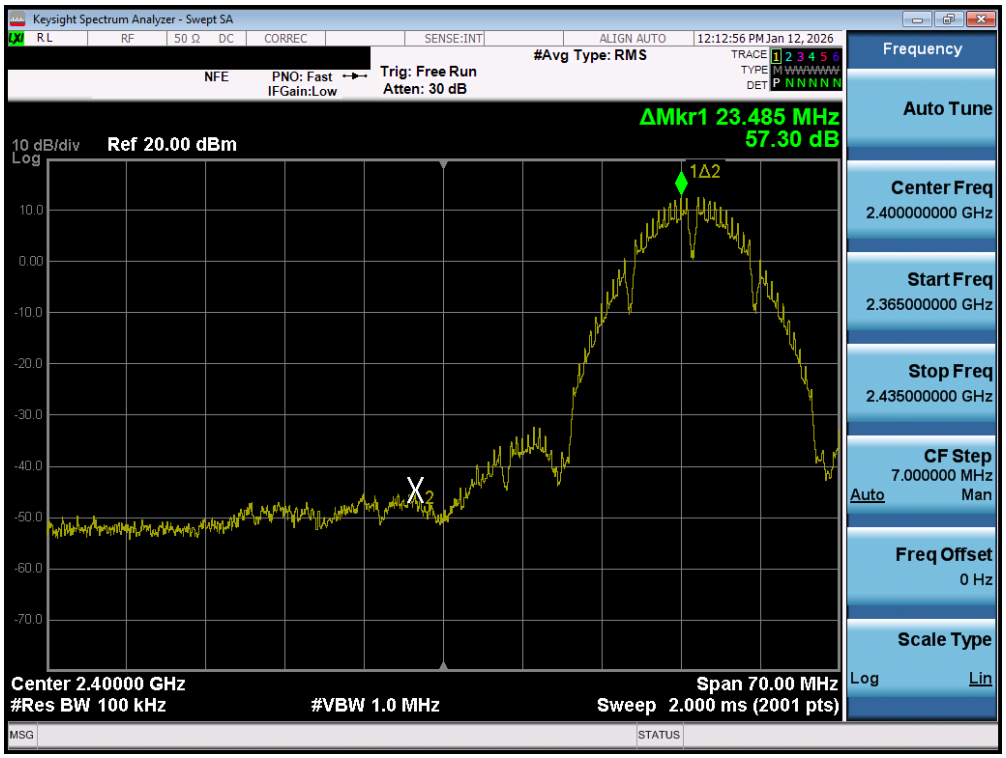
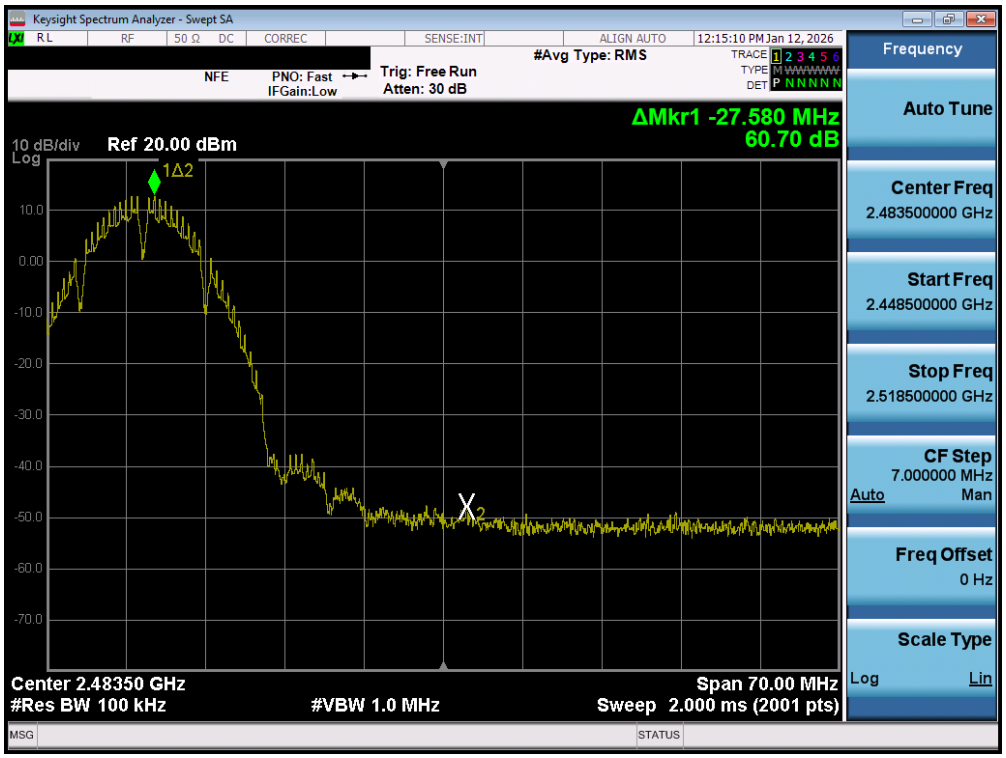


Plot 7-99. Band Edge Plot MIMO ANT1 (802.11b – Ch. 3) – MIMO ANT1



Plot 7-100. Band Edge Plot MIMO ANT1 (802.11b – Ch. 10) – MIMO ANT1

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