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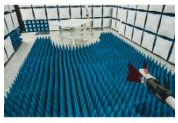

MEASUREMENT REPORT
FCC PART 15.247 / ISED RSS-247 WLAN 802.11b/g/n

Applicant Name:
Apple Inc.
One Apple Park Way
Cupertino, CA 95014
United States

Date of Testing:
6/10/2025 - 7/22/2025
Test Report Issue Date:
8/6/2025
Test Site/Location:
Element Materials Technology Morgan Hill, CA, USA
Test Report Serial No.:
1C2503270032-06.BCG

FCC ID:	**BCG-A3335**
IC:	**579C-A3335**
APPLICANT:	**Apple Inc.**

Application Type:	Certification
Model/HVIN:	A3335, A3452
EUT Type:	Watch
Frequency Range:	2412 – 2472MHz
FCC Classification:	Digital Transmission System (DTS)
FCC Rule Part(s):	Part 15 Subpart C (15.247)
ISED Specification:	RSS-247 Issue 3
Test Procedure(s):	ANSI C63.10-2020, KDB 558074 D01 v05r02

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 and KDB 558074 D01 v05r02. Test results reported herein relate only to the item(s) tested.

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 #2041.02

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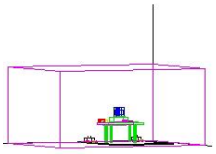
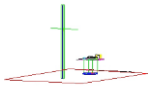


MEASUREMENT REPORT



Mode	Tx Frequency (MHz)	FCM			
		Avg Conducted		Peak Conducted	
		Max. Power (mW)	Max. Power (dBm)	Max. Power (mW)	Max. Power (dBm)
802.11b	2412 - 2472	78.705	18.96	133.660	21.26
802.11g	2412 - 2472	69.343	18.41	201.837	23.05
802.11n	2412 - 2472	69.343	18.41	200.909	23.03

EUT Overview

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 Materials Technology Test Location

These measurement tests were conducted at the Element Materials Technology facility located at 18855 Adams Court, Morgan Hill, CA 95037. The measurement facility is compliant with the test site requirements specified in ANSI C63.4-2014 and KDB 414788 D01 v01r01.

1.3 Test Facility / Accreditations

Measurements were performed at Element Materials Technology located in Morgan Hill, CA 95037, U.S.A.

- Element Materials Technology is an ISO 17025-2017 accredited test facility under the American Association for Laboratory Accreditation (A2LA) with Certificate number 2041.02 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 Materials Technology facility is a registered (22831) 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).

2.0 PRODUCT INFORMATION

2.1 Equipment Description

The Equipment Under Test (EUT) is the **Apple Watch FCC ID: BCG-A3335, IC: 579C-A3335**. The test data contained in this report pertains only to the emissions due to the EUT's WLAN (DTS) transmitter.

Test Device Serial No.: PTQKY2MRPK, MC7DP4YMHF, MFMFQM632K, DLCHFZ001BP0000Q4C

2.2 Device Capabilities

This device contains the following capabilities:

Multi-band LTE, 5G NR (FR1), 802.11b/g/n WLAN, 802.11a/n UNII, 802.15.4 ab-NB, Bluetooth (1x, EDR, HDR4, HDR8, LE1M, LE2M), NFC, UWB, 60.5GHz Transmitter

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. 802.11b/g/n Frequency/ Channel Operations

Note: 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 KDB 558074 D01 v05r02 and ANSI C63.10-2020. 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:

Measured Duty Cycles			
802.11 Mode/Band		FCM	
		Duty Cycle [%]	DCCF [dB]
2.4GHz	b	100.00	N/A
	g	97.99	0.09
	n (MCS0)	98.59	0.06
	n (MCS7)	72.50	1.40

Table 2-2. Measured Duty Cycles

Data Rates Supported: 1Mbps, 2Mbps, 5.5Mbps, 11Mbps (b)
6Mbps, 9Mbps, 12Mbps, 18Mbps, 24Mbps, 36Mbps, 48Mbps, 54Mbps (g)
6.5/7.2Mbps, 13/14.4Mbps, 19.5/21.7Mbps, 26/28.9Mbps, 39/43.3Mbps, 52/57.8Mbps, 58.5/65Mbps, 65/72.2Mbps (n)

This device supports simultaneous transmission operations, which allows multiple transmitters to transmit simultaneously on the same antenna. The table below shows all configurations possible.

Simultaneous Tx Config	Antenna FCM					
	WLAN	Bluetooth	802.15.4ab - NB	LTE/FR1	UNII	UWB
	802.11b/g/n	BDR, EDR, HDR4/8, LE1/2M	O-QPSK	Mid/High Band	802.11a/n	Ch.5/Ch.9
Config 1	✓	×	×	✓	×	✓
Config 2	×	✓	×	✓	×	✓
Config 3	×	✓	✓	✓	×	×
Config 4	✓	×	✓	✓	×	×
Config 5	×	✓	×	✓	✓	×
Config 6	×	✓	×	✓	×	✓
Config 7	✓	×	×	✓	×	×
Config 8	✓	×	✓	×	×	×
Config 9	✓	×	×	×	×	✓
Config 10	×	✓	×	×	✓	×
Config 11	×	✓	×	✓	×	×
Config 12	×	✓	✓	×	×	×
Config 13	×	✓	×	×	×	✓
Config 14	×	×	✓	✓	×	×
Config 15	×	×	×	✓	✓	×
Config 16	×	×	×	✓	×	✓

Table 2-3. Simultaneous Transmission Configurations

✓ = Support; × = Not Support

Note:

All the above simultaneous transmission configurations have been tested and the worst case configuration was found to be Config 5. These results can be found in the RF Bluetooth, RF UNII and RF Part 27b/ RSS-199 reports.

2.3 Antenna Description

The following antenna gain provided by the manufacturer was used for the testing.

Frequency [GHz]	Antenna Gain (dBi)
	FCM
2.4	-7.9

Table 2-4. Highest Antenna Gain

2.4 Test Support Equipment

1	Apple Macbook	Model:	A1398	S/N:	FVFDHG8TP3XY
	w/AC/DC Adapter	Model:	A1435	S/N:	N/A
2	Apple USB-C cable	Model:	N/A	S/N:	N/A
	w/ Charging Dock	Model:	A3276	S/N:	DQ84112013F08V22Z
	w/ Cradle	Model:	N/A	S/N:	CYV4023011Y23SE01MP1F
3	Apple Magnetic Charger	Model:	A2515	S/N:	DLC313306ZQ1NR1A7
	Apple Magnetic Charger	Model:	A2879	S/N:	DLCH5T0012A00000WB
4	Pathfinder Davenport	Model:	920-15901-01	S/N:	DLCH64000270000QA0
	SiP Socket	Model:	P1 N22X S PF 159	S/N:	DLCH8J000H50000WXE
5	DC Power Supply	Model:	SPS3010	S/N:	N/A

Table 2-5. Test Support Equipment List

2.5 Test Configuration

The EUT was tested per the guidance of ANSI C63.10-2020 and KDB 558074 D01 v05r02. ANSI C63.10-2020 was used to reference the appropriate EUT setup for radiated spurious emissions testing and AC line conducted testing. See Sections 3.2 for AC line conducted emissions test setups, Section 3.3 for radiated emissions test setups, and, 7.2, 7.3, 7.4, 7.5, and 7.6 for antenna port conducted emissions test setups.

The worst case configuration was investigated for all combinations of the two materials, aluminum and titanium and various types of wristbands, metal and non-metal wristbands. The EUT was also investigated with and without wireless charger. The worst case configuration found was used for all testing.

For emissions from 1GHz – 18GHz, low, mid, and high channels were tested with highest power and worst case configuration. The emissions below 1GHz and above 18GHz were tested with the highest transmitting power and the worst case channel.

The EUT was manipulated through three orthogonal planes of X-orientation (flatbed), Y-orientation (landscape), and Z-orientation (portrait) during the testing. Only the worst case emissions were reported in this test report.

For AC line conducted and radiated test below 1GHz, following configuration were investigated and EUT powered by AC/DC was the worst case.

- EUT powered by AC/DC adaptor via USB-C cable with magnetic charger
- EUT powered by host PC via USB-C cable with magnetic charger

2.6 Software and Firmware

The test was conducted with firmware version watchOS 26 installed on the EUT.

2.7 EMI Suppression Device(s)/Modifications

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

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) and the guidance provided in KDB 558074 D01 v05r02 were 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 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 65-6. 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 EPCOS 2X60A Power Line Filter (100dB Attenuation, 14kHz-18GHz) and the two EPCOs 2X48A filters (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 ground plane. Power cables for support equipment were routed down to the second LISN while ensuring that the 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 7.9. Automated test software was used to perform the AC line conducted emissions testing. Automated measurement software utilized is Rohde & Schwarz EMC32, Version 10.50.40.

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.

Per KDB 414788 D01 v01r01, radiated emission test sites other than open-field test sites (e.g., shielded anechoic chambers), may be employed for emission measurements below 30MHz if characterized so that the measurements correspond to those obtained at an open-field test site. To determine test site equivalency, a reference sample transmitting at 149kHz was measured on an open field test site (asphalt with no ground plane) and then measured in the 3m semi-anechoic chamber. A calibrated 60cm loop antenna was rotated about its vertical axis while the reference device was rotated through the X, Y and Z axis in order to capture the worst case level. A maximum deviation of 2.77dB at 149kHz was measured when comparing the 3 meter semi-anechoic chamber to the open field site.

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.

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).

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.

5.0 MEASUREMENT UNCERTAINTY

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.23-2012. 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	2.07
Line Conducted Disturbance	1.91
Radiated Disturbance (<30MHz)	4.12
Radiated Disturbance (30MHz -1GHz)	4.85
Radiated Disturbance (1-18GHz)	5.08
Radiated Disturbance (>18GHz)	5.22

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
Agilent Technologies	N9030A	3Hz-26.5GHz PXA Signal Analyzer	10/31/2024	Annual	10/31/2025	MY55330128
Anritsu	ML2496A	Power Meter	10/21/2024	Annual	10/21/2025	2002005
Anritsu	MA2411B	Pulse Power Sensor	9/5/2024	Annual	9/5/2025	1726262
Anritsu	MA2411B	Pulse Power Sensor	10/21/2024	Annual	10/21/2025	1027293
ATM	180-442-KF	20dB Nominal Gain Horn Antenna	3/24/2025	Annual	3/24/2026	T058601-2
ETS-Lindgren	3117	Double Ridged Guide Antenna (1-18 GHz)	9/16/2024	Annual	9/16/2025	240049
ETS-Lindgren	3117	Double Ridged Guide Antenna (1-18 GHz)	9/25/2024	Annual	9/25/2025	240109
Keysight Technology	N9040B	UXA Signal Analyzer	6/9/2025	Annual	6/9/2026	MY57212015
Mini-Circuits	FLC-1.5FT-SMSM+	30MHz-27GHz Conducted Cable w/attenuator*	6/17/2025	Annual	6/17/2026	16113316
Rohde & Schwarz	TS-PR18	Pre-Amplifier (1GHz - 18GHz)	8/14/2024	Annual	8/14/2025	101648
Rohde & Schwarz	FSV40	Signal Analyzer (10Hz-40GHz)	5/20/2025	Annual	5/20/2026	101619
Rohde & Schwarz	ESW44	EMI Test Receiver	10/17/2024	Annual	10/17/2025	101668
Rohde & Schwarz	TS-PR8	Pre-Amplifier (30MHz - 8GHz)	11/15/2024	Annual	11/15/2025	102326
Rohde & Schwarz	TS-PR1840	Pre-Amplifier (18GHz - 40GHz)	6/3/2025	Annual	6/3/2026	100052
Rohde & Schwarz	HFH2-Z2	Loop Antenna	5/12/2025	Annual	5/12/2026	100546
Rohde & Schwarz	ENV216	Two-Line V-Network	4/25/2025	Annual	4/25/2026	101364
Schwarzbeck	VULB 9162	Bilog Antenna (30MHz - 6GHz)	9/18/2024	Annual	9/18/2025	358

Table 6-1. Test Equipment List

Note:

1. 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.
2. * denotes passive equipment that have been internally verified/calibrated.

7.0 TEST RESULTS

7.1 Summary

Company Name: Apple Inc.

FCC ID: BCG-A3335

IC: 579C-A3335

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 [5.2]	6dB Bandwidth	> 500kHz	CONDUCTED	PASS	Section 7.2
2.1049	RSS-Gen [6.7]	Occupied Bandwidth	N/A		N/A	Section 7.2
15.247(b)(3)	RSS-247 [5.4]	Transmitter Output Power	< 1 Watt		PASS	Sections 7.3
15.247(e)	RSS-247 [5.2]	Transmitter Power Spectral Density	< 8dBm / 3kHz Band		PASS	Section 7.4
15.247(d)	RSS-247 [5.5]	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	Sections 7.7, 7.8
15.207	RSS-Gen [8.8]	AC Conducted Emissions 150kHz – 30MHz	< FCC 15.207 limits (RSS-Gen[8.8])	AC LINE CONDUCTED	PASS	Section 7.9

Table 7-1. Summary of Test Results

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 "Conducted Automation Software (CAS)" version 1.4.0.
5. For radiated testing, 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 3.4.2.

7.2 6dB & 99% Bandwidth Measurement

§15.247(a.2); §2.1049; RSS-247 [5.2]; RSS-Gen [6.7]

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 occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission shall be measured. All modes of operation were investigated and the worst case configuration results are reported in this section.

The minimum permissible 6dB bandwidth is 500 kHz.

Test Procedure Used

ANSI C63.10-2020 – Subclause 11.8.2 Option 2
KDB 558074 D01 v05r02 – Section 8.2
RSS-Gen [6.7]

Test Settings

1. The signal analyzers' automatic bandwidth measurement capability of the spectrum analyzer was used to perform the 99% occupied bandwidth and 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
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

Test Setup

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

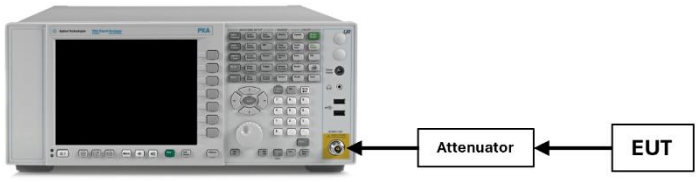


Figure 7-1. Test Instrument & Measurement Setup

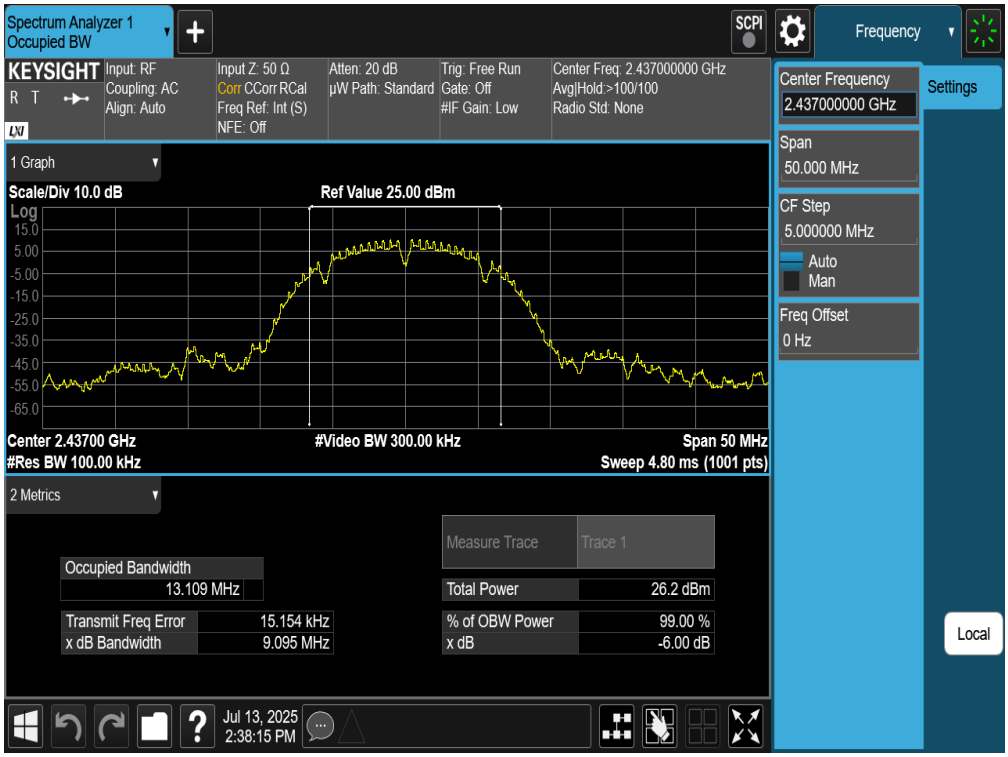
Test Notes

None.

Frequency [MHz]	Channel	802.11 MODE	Data Rate [Mbps]	Measured 99% Occupied Bandwidth [MHz]	Measured 6dB Bandwidth [MHz]	Minimum 6dB Bandwidth [MHz]	Pass/Fail
2412	1	b	1	13.15	9.09	0.50	Pass
2437	6	b	1	13.11	9.09	0.50	Pass
2462	11	b	1	13.13	9.11	0.50	Pass
2412	1	g	6	19.79	18.37	0.50	Pass
2437	6	g	6	19.78	18.40	0.50	Pass
2462	11	g	6	19.79	18.37	0.50	Pass
2412	1	n	6.5/7.2 (MCS0)	19.86	18.61	0.50	Pass
2437	6	n	6.5/7.2 (MCS0)	19.88	18.41	0.50	Pass
2462	11	n	6.5/7.2 (MCS0)	19.90	18.59	0.50	Pass
2412	1	n	65/72.2 (MCS7)	19.51	18.45	0.50	Pass
2437	6	n	65/72.2 (MCS7)	19.49	18.41	0.50	Pass
2462	11	n	65/72.2 (MCS7)	19.48	18.40	0.50	Pass

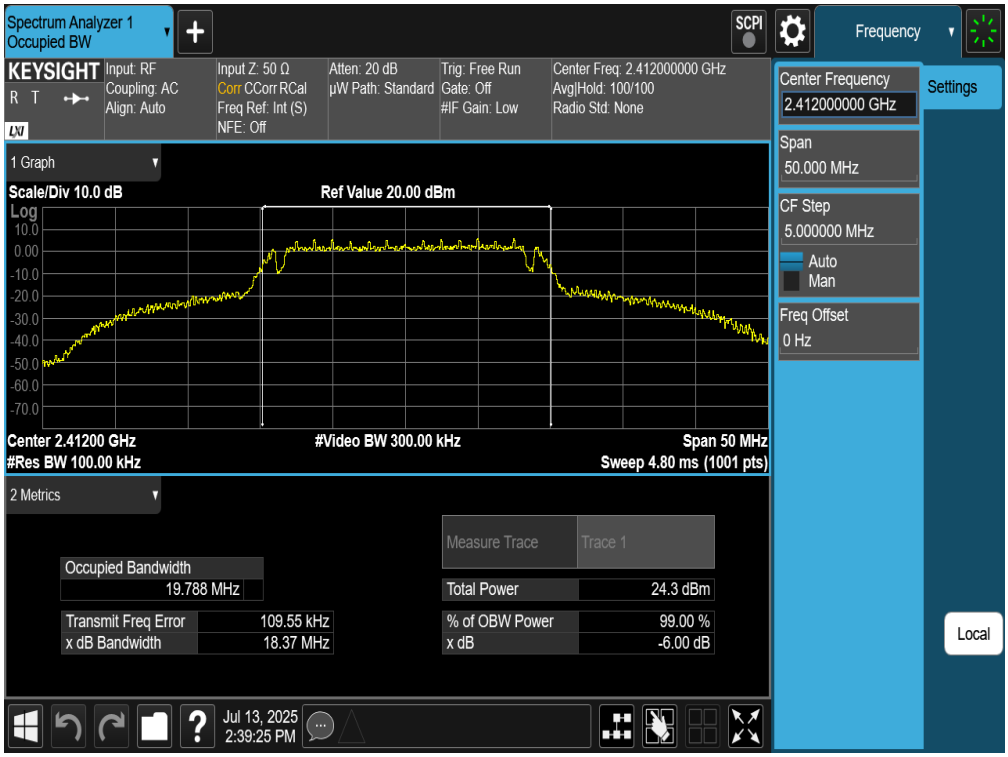
Table 7-2. Conducted Bandwidth Measurements

Plot 7-1. 6dB Bandwidth & 99% OBW Plot (802.11b – Ch. 1) – 1Mbps

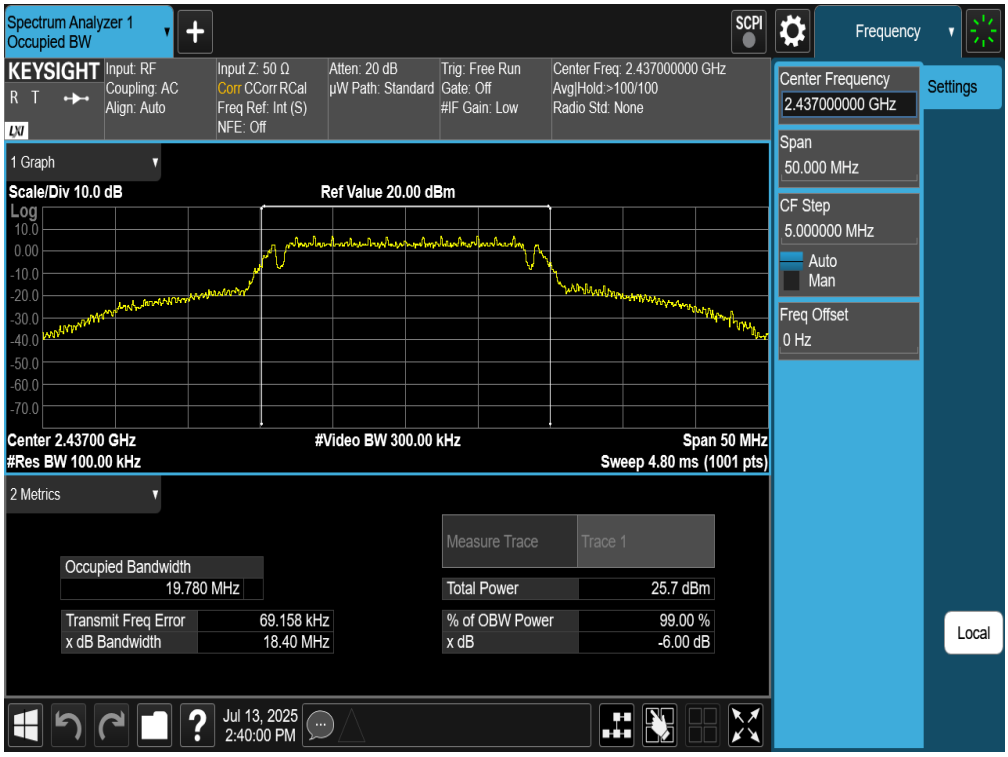


Plot 7-2. 6dB Bandwidth & 99% OBW Plot (802.11b – Ch. 6) – 1Mbps

Plot 7-3. 6dB Bandwidth & 99% OBW Plot (802.11b – Ch. 11) – 1Mbps

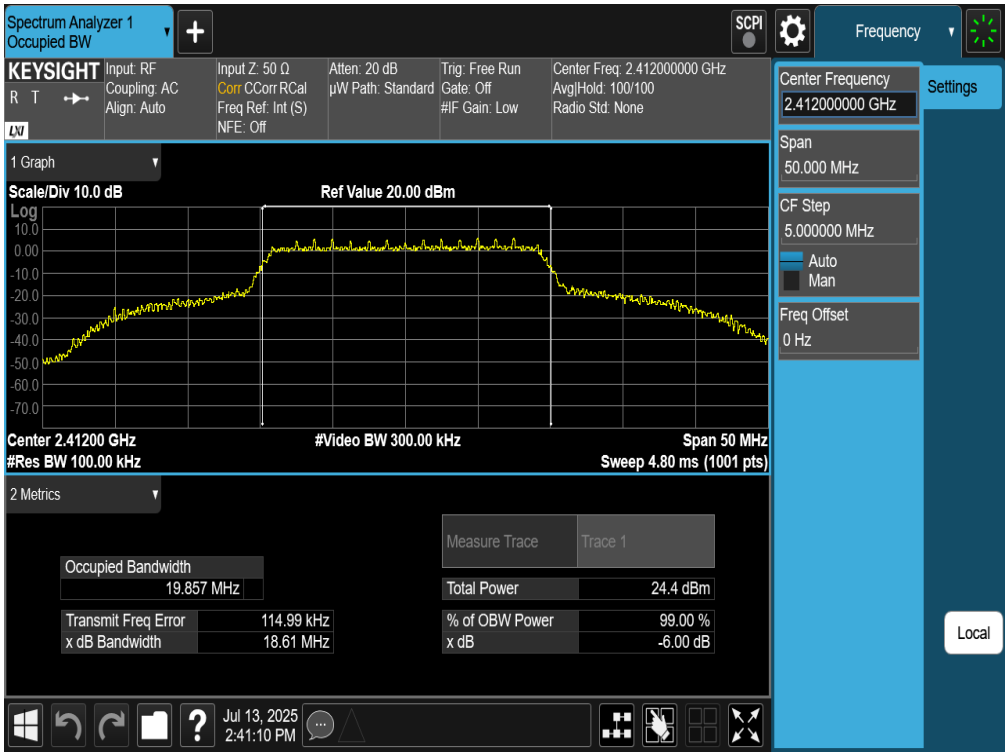


Plot 7-4. 6dB Bandwidth & 99% OBW Plot (802.11g – Ch. 1) – 6Mbps

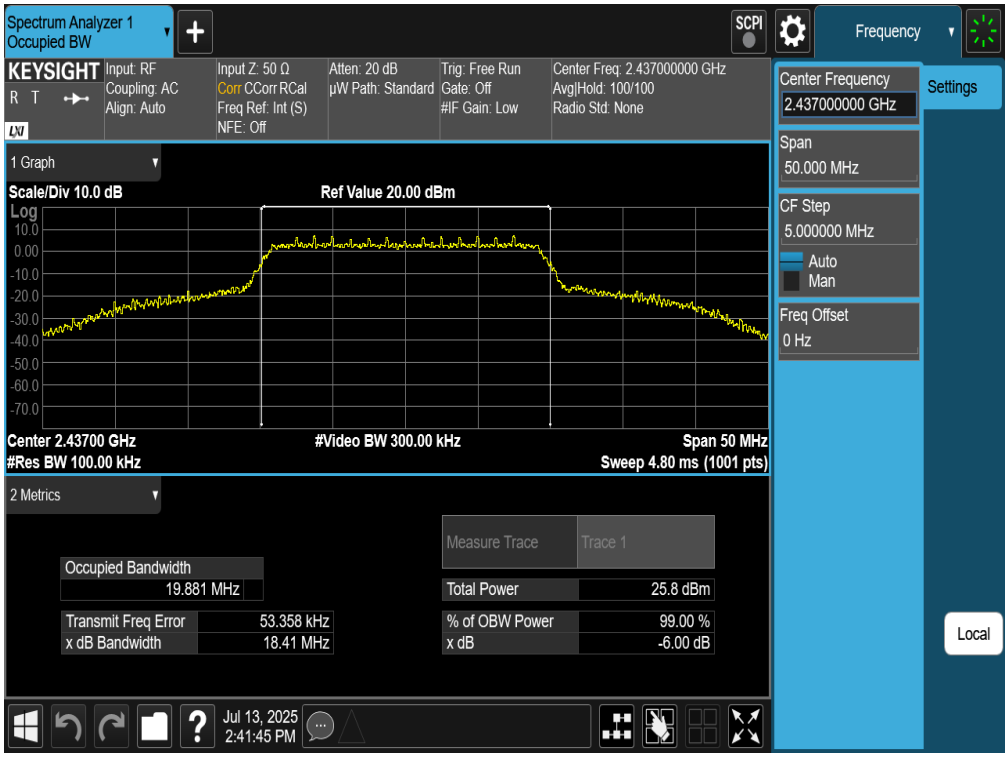


Plot 7-5. 6dB Bandwidth & 99% OBW Plot (802.11g – Ch. 6) – 6Mbps

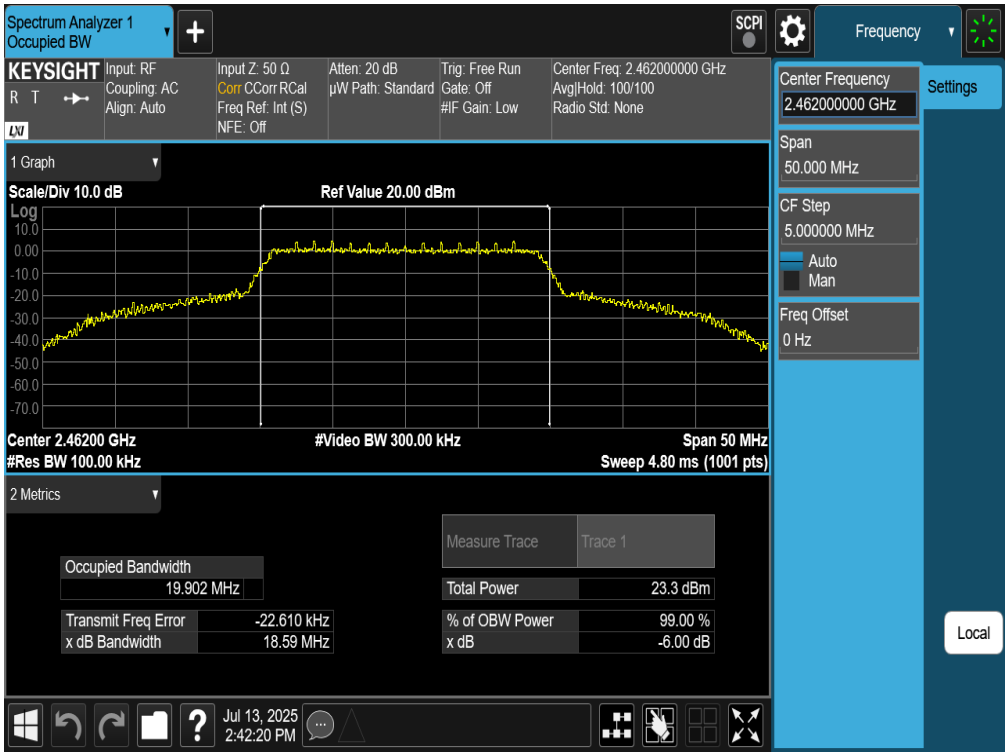
Plot 7-6. 6dB Bandwidth & 99% OBW Plot (802.11g – Ch. 11) – 6Mbps



Plot 7-7. 6dB Bandwidth & 99% OBW Plot (802.11n (2.4GHz) – Ch. 1) – MCS0

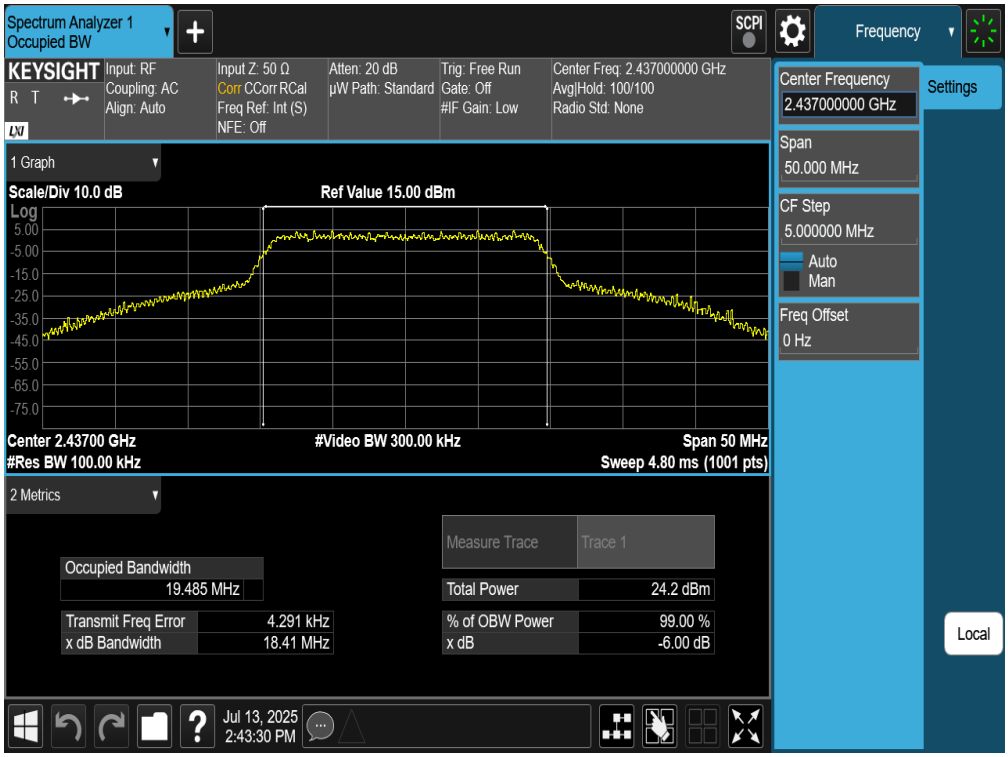


Plot 7-8. 6dB Bandwidth & 99% OBW Plot (802.11n (2.4GHz) – Ch. 6) – MCS0

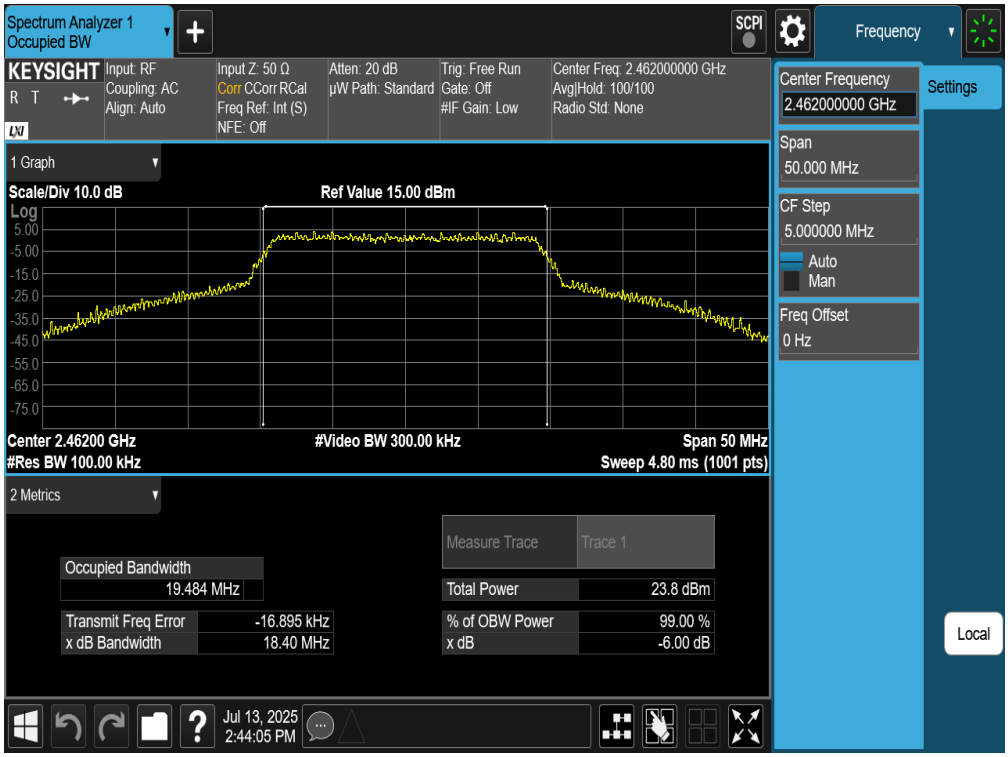


Plot 7-9. 6dB Bandwidth & 99% OBW Plot (802.11n (2.4GHz) – Ch. 11) – MCS0

Plot 7-10. 6dB Bandwidth & 99% OBW Plot (802.11n (2.4GHz) – Ch. 1) – MCS7



Plot 7-11. 6dB Bandwidth & 99% OBW Plot (802.11n (2.4GHz) – Ch. 6) – MCS7



Plot 7-12. 6dB Bandwidth & 99% OBW Plot (802.11n (2.4GHz) – Ch. 11) – MCS7

7.3 Output Power Measurement

§15.247(b.3); RSS-247 [5.4]

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 peak conducted output power of digital modulation systems operating in the 2400-2483.5 MHz band is 1 Watt.

The conducted output power limit on paragraph above is 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.

For DTSs employing digital modulation techniques operating in the band 2400-2483.5 MHz, the maximum peak conducted output power shall not exceed 1 W. The e.i.r.p. shall not exceed 4 W.

Test Procedure Used

ANSI C63.10-2020 – Subclause 11.9.1.2 PKPM1 Peak Power Method
KDB 558074 D01 v05r02 – Section 8.3.1.3 PKPM1 Peak-reading Power Meter Method
ANSI C63.10-2020 – Subclause 11.9.2.3.2 Method AVGPM-G
KDB 558074 D01 v05r02 – Section 8.3.2.3 Measurement using a Power Meter (PM)

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

Average Output Power Measurement

§15.247(b.3); RSS-247 [5.4]

Freq [MHz]	Channel	Detector	Conducted Power [dBm]				Conducted Power Limit [dBm]	Conducted Power Margin [dB]	Ant. Gain [dBi]	Max e.i.r.p. [dBm]	Max e.i.r.p. Limit [dBm]	e.i.r.p. Margin [dB]
			802.11b	802.11g	802.11n (MCS0)	802.11n (MCS7)						
2412	1	AVG	18.86	16.80	16.88	16.42	30.00	-11.14	-7.90	10.96	36.02	-25.06
2417	2	AVG	18.73	18.33	18.40	16.07	30.00	-11.27	-7.90	10.83	36.02	-25.19
2422	3	AVG	18.70	18.39	18.39	16.27	30.00	-11.30	-7.90	10.80	36.02	-25.22
2427	4	AVG	18.57	18.20	18.21	16.15	30.00	-11.43	-7.90	10.67	36.02	-25.35
2432	5	AVG	18.60	18.23	18.25	16.21	30.00	-11.40	-7.90	10.70	36.02	-25.32
2437	6	AVG	18.96	18.15	18.18	16.19	30.00	-11.04	-7.90	11.06	36.02	-24.96
2442	7	AVG	18.65	18.32	18.34	16.20	30.00	-11.35	-7.90	10.75	36.02	-25.27
2447	8	AVG	18.86	18.41	18.41	16.36	30.00	-11.14	-7.90	10.96	36.02	-25.06
2452	9	AVG	18.78	18.40	18.40	16.40	30.00	-11.22	-7.90	10.88	36.02	-25.14
2457	10	AVG	18.70	17.61	17.67	16.28	30.00	-11.30	-7.90	10.80	36.02	-25.22
2462	11	AVG	18.55	15.70	15.76	15.67	30.00	-11.45	-7.90	10.65	36.02	-25.37
2467	12	AVG	17.78	14.18	14.18	14.17	30.00	-12.22	-7.90	9.88	36.02	-26.14
2472	13	AVG	14.93	3.63	3.66	3.76	30.00	-15.07	-7.90	7.03	36.02	-28.99

Table 7-3. Average Conducted Output Power Measurements

Peak Output Power Measurement

§15.247(b.3); RSS-247 [5.4]

Freq [MHz]	Channel	Detector	Conducted Power [dBm]				Conducted Power Limit [dBm]	Conducted Power Margin [dB]	Ant. Gain [dBi]	Max e.i.r.p. [dBm]	Max e.i.r.p. Limit [dBm]	e.i.r.p. Margin [dB]
			802.11b	802.11g	802.11n (MCS0)	802.11n (MCS7)						
2412	1	PEAK	21.16	21.64	21.67	22.83	30.00	-7.17	-7.90	14.93	36.02	-21.09
2417	2	PEAK	21.07	22.99	23.03	22.37	30.00	-6.97	-7.90	15.13	36.02	-20.89
2422	3	PEAK	21.04	22.99	22.96	22.60	30.00	-7.01	-7.90	15.09	36.02	-20.93
2427	4	PEAK	20.89	22.83	22.80	22.40	30.00	-7.17	-7.90	14.93	36.02	-21.09
2432	5	PEAK	20.91	22.88	22.89	22.46	30.00	-7.11	-7.90	14.99	36.02	-21.03
2437	6	PEAK	21.26	22.89	22.88	22.45	30.00	-7.11	-7.90	14.99	36.02	-21.03
2442	7	PEAK	20.98	23.04	23.01	22.60	30.00	-6.96	-7.90	15.14	36.02	-20.88
2447	8	PEAK	21.20	23.04	23.01	22.74	30.00	-6.96	-7.90	15.14	36.02	-20.88
2452	9	PEAK	21.12	23.05	23.01	22.73	30.00	-6.95	-7.90	15.15	36.02	-20.87
2457	10	PEAK	21.01	22.36	22.36	22.59	30.00	-7.41	-7.90	14.69	36.02	-21.33
2462	11	PEAK	20.84	20.63	20.63	22.16	30.00	-7.84	-7.90	14.26	36.02	-21.76
2467	12	PEAK	20.06	19.20	19.17	20.69	30.00	-9.31	-7.90	12.79	36.02	-23.23
2472	13	PEAK	17.24	14.35	14.19	14.01	30.00	-12.76	-7.90	9.34	36.02	-26.68

Table 7-4. Peak Conducted Output Power Measurements

Sample e.i.r.p. Calculation:

At 2412MHz, the average conducted power was calculated to be 18.86 dBm with antenna gain of -7.90 dBi.

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

18.86 dBm + -7.90 dBi = 10.96 dBm

7.4 Power Spectral Density

§15.247(e); RSS-247 [5.2]

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 were investigated and the worst case configuration results are reported in this section.

The maximum permissible power spectral density is 8 dBm in any 3 kHz band.

Test Procedure Used

ANSI C63.10-2020 – Subclause 11.10.2 Method PKPSD
KDB 558074 D01 v05r02 – Section 8.4 DTS Maximum Power Spectral Density level in the fundamental emission

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 = 3kHz
4. VBW ≥ 3 × RBW
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.

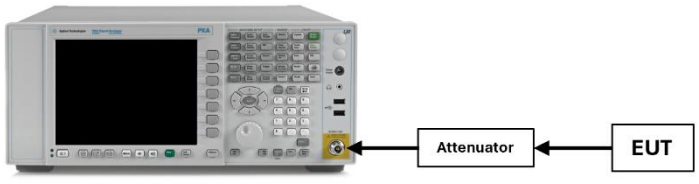


Figure 7-3. Test Instrument & Measurement Setup

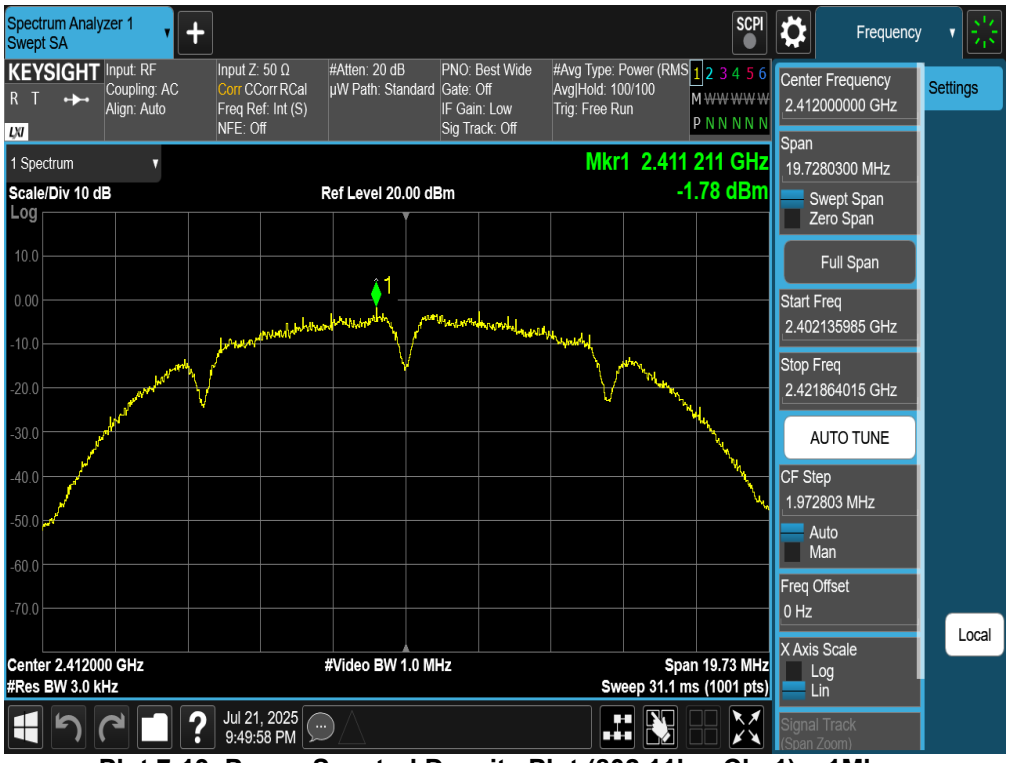
Test Notes

None

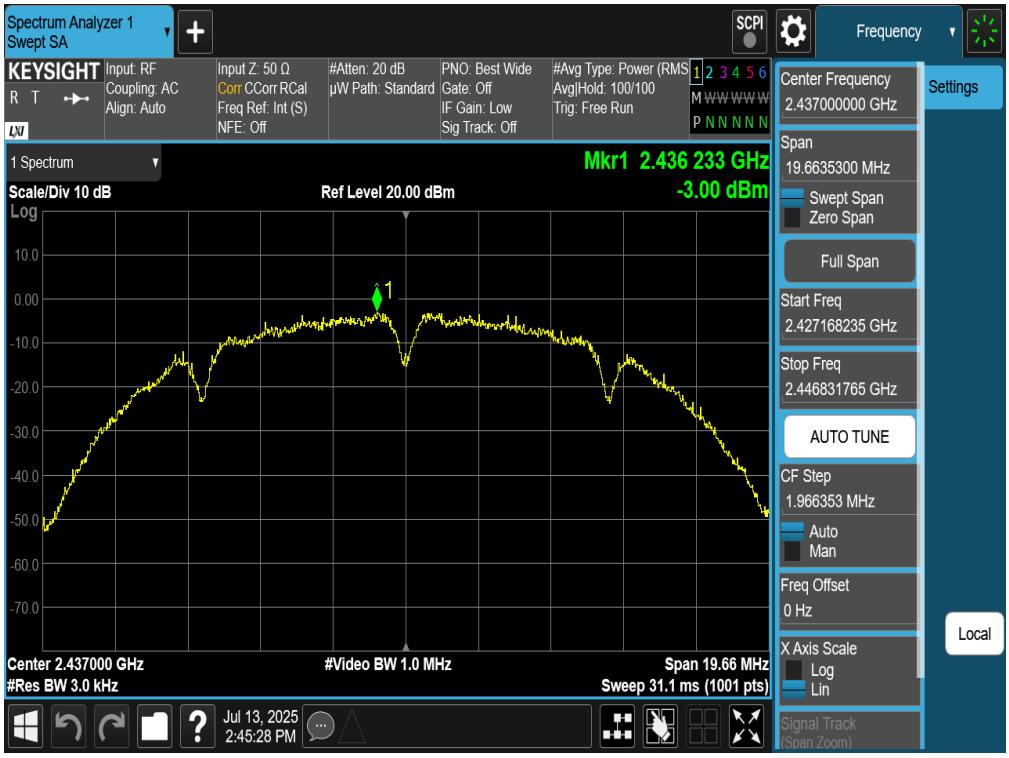
Power Spectral Density Measurements

Frequency [MHz]	Channel No.	802.11 MODE	Data Rate [Mbps]	Measured Power Density [dBm/3kHz]	Max Power Density [dBm/3kHz]	Margin [dB]	Pass/Fail
2412	1	b	1	-1.78	8.00	-9.78	Pass
2437	6	b	1	-3.00	8.00	-11.00	Pass
2462	11	b	1	-3.01	8.00	-11.01	Pass
2412	1	g	6	-8.11	8.00	-16.11	Pass
2437	6	g	6	-6.53	8.00	-14.53	Pass
2462	11	g	6	-8.92	8.00	-16.92	Pass
2412	1	n	6.5/7.2 (MCS0)	-7.32	8.00	-15.32	Pass
2437	6	n	6.5/7.2 (MCS0)	-6.16	8.00	-14.16	Pass
2462	11	n	6.5/7.2 (MCS0)	-8.50	8.00	-16.50	Pass
2412	1	n	65/72.2 (MCS7)	-8.17	8.00	-16.17	Pass
2437	6	n	65/72.2 (MCS7)	-9.03	8.00	-17.03	Pass
2462	11	n	65/72.2 (MCS7)	-9.29	8.00	-17.29	Pass

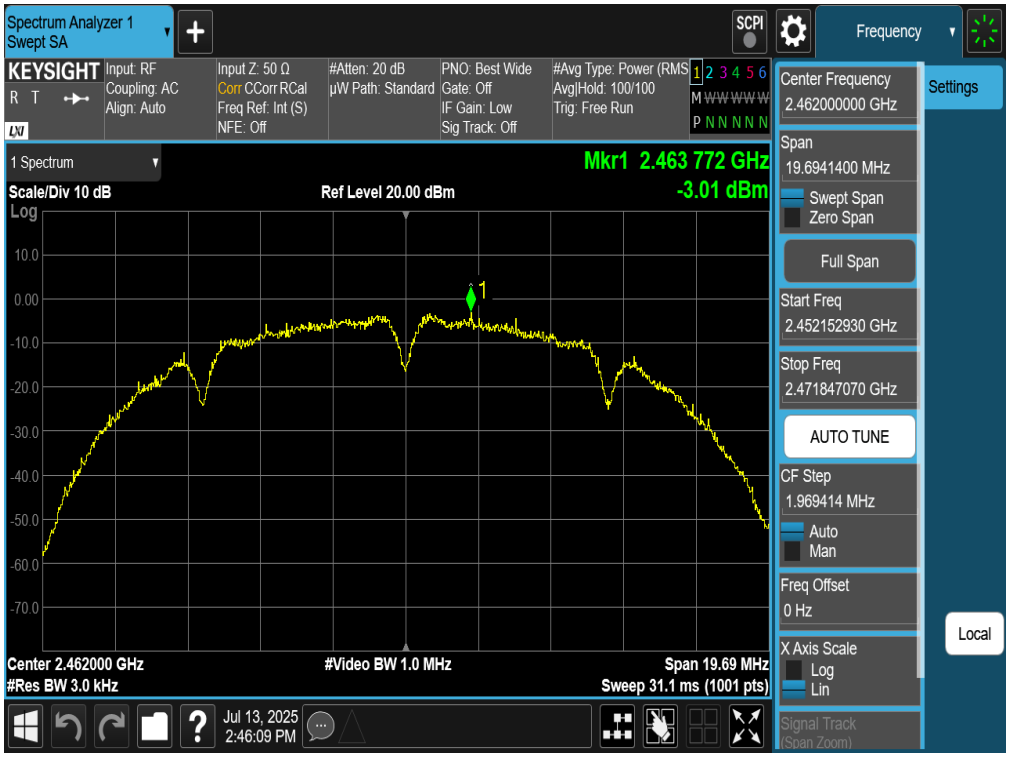
Table 7-5. Conducted Power Density Measurements



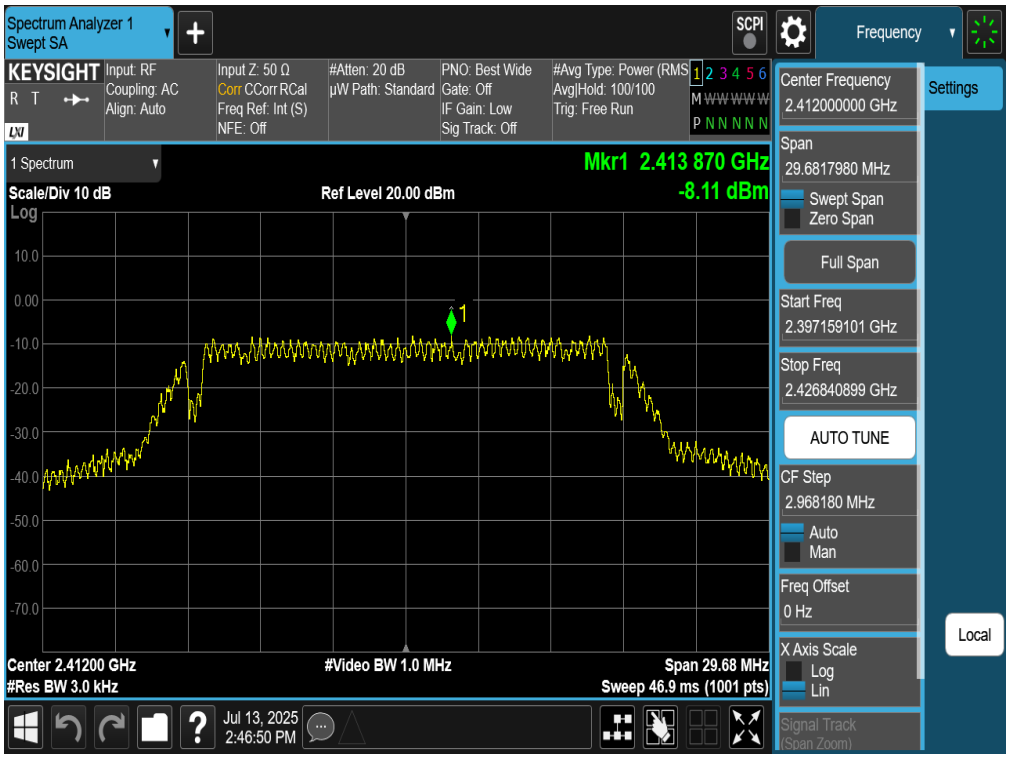
Plot 7-13. Power Spectral Density Plot (802.11b – Ch. 1) – 1Mbps



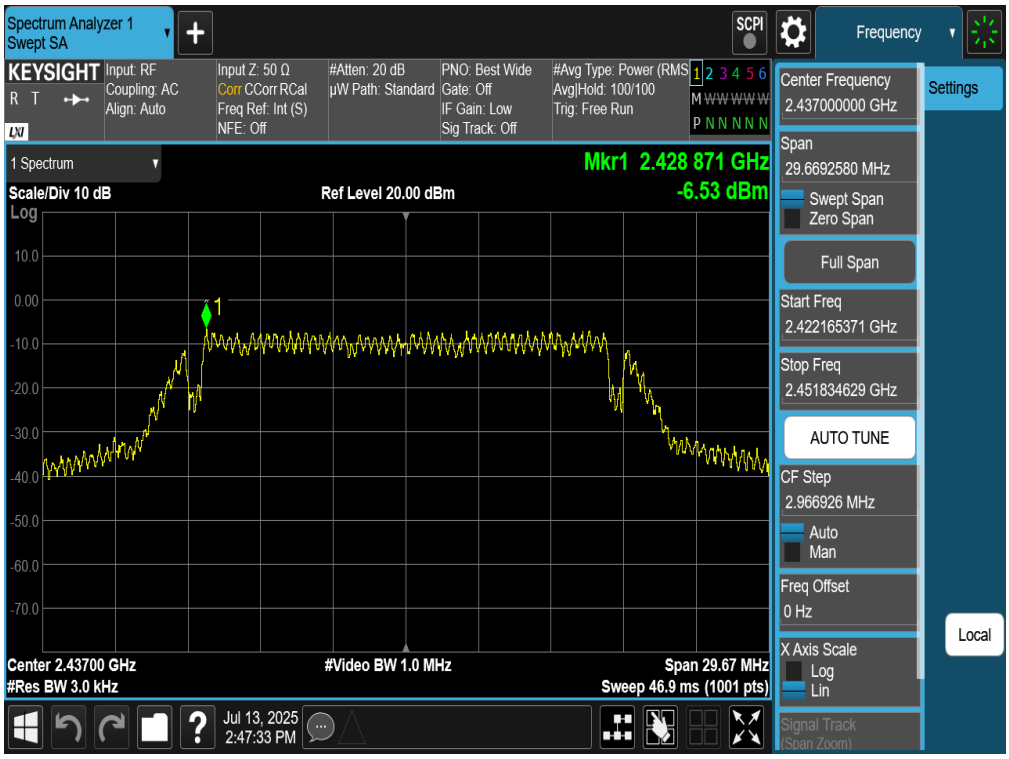
Plot 7-14. Power Spectral Density Plot (802.11b – Ch. 6) – 1Mbps



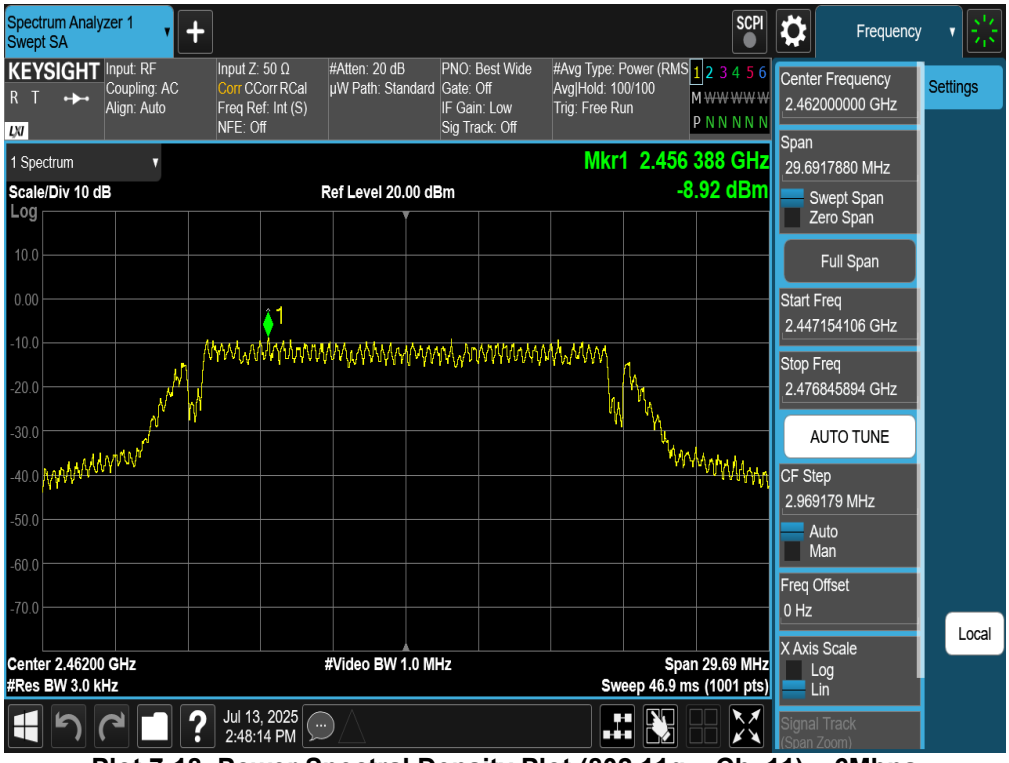
Plot 7-15. Power Spectral Density Plot (802.11b – Ch. 11) – 1Mbps



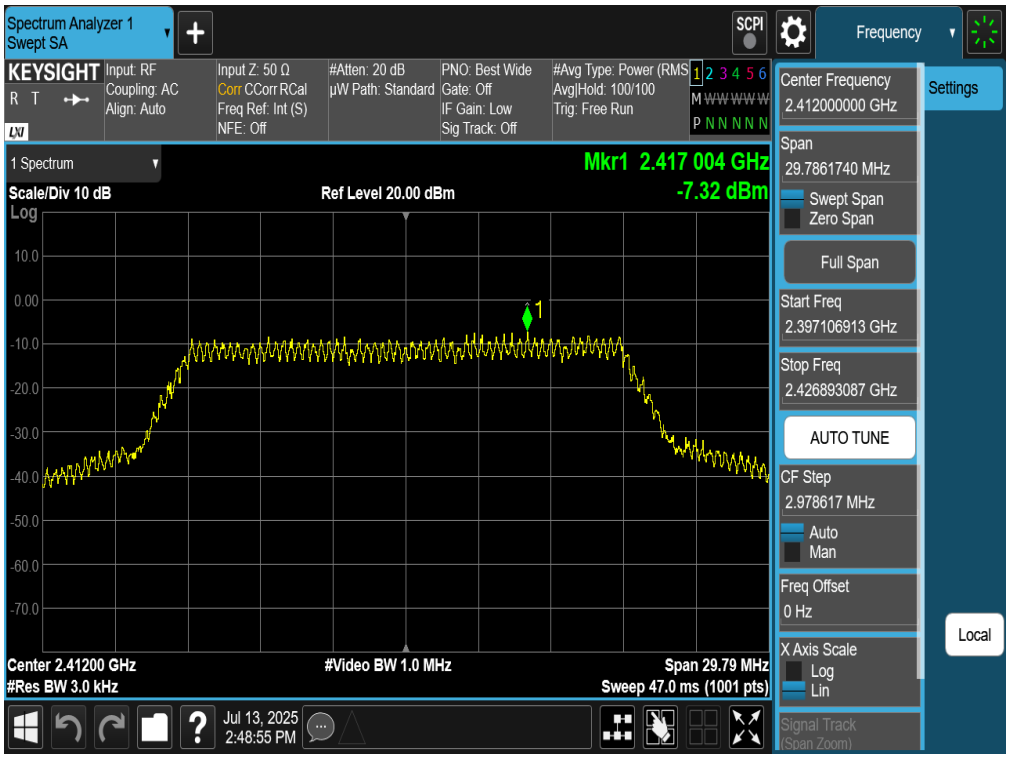
Plot 7-16. Power Spectral Density Plot (802.11g – Ch. 1) – 6Mbps



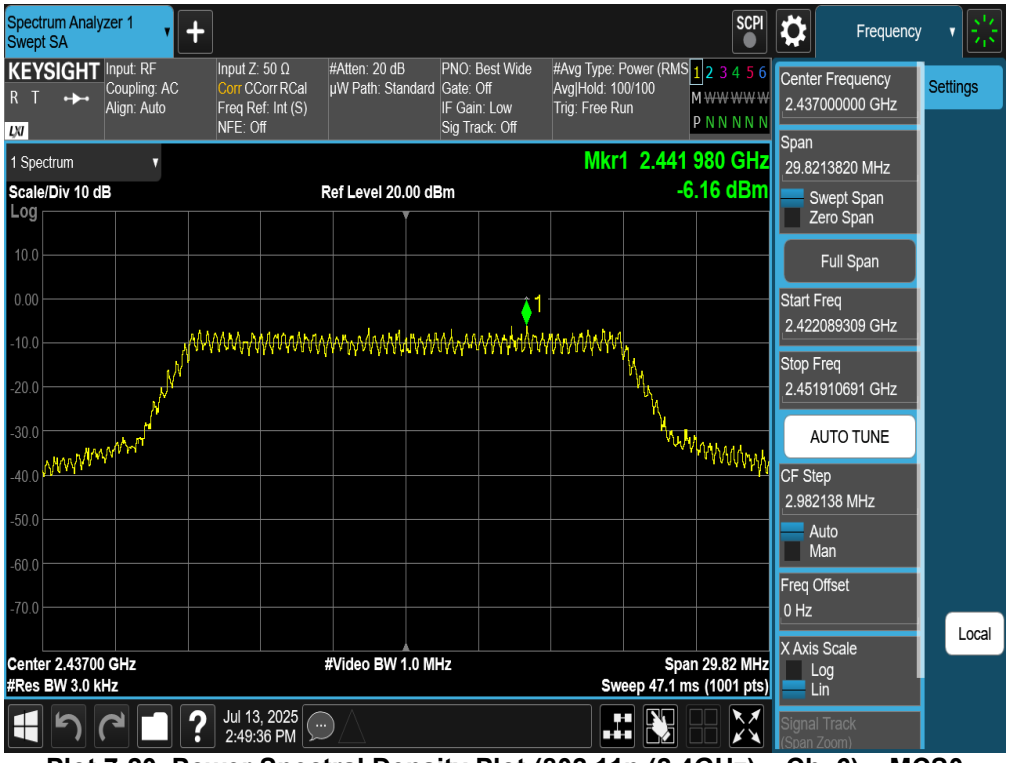
Plot 7-17. Power Spectral Density Plot (802.11g – Ch. 6) – 6Mbps



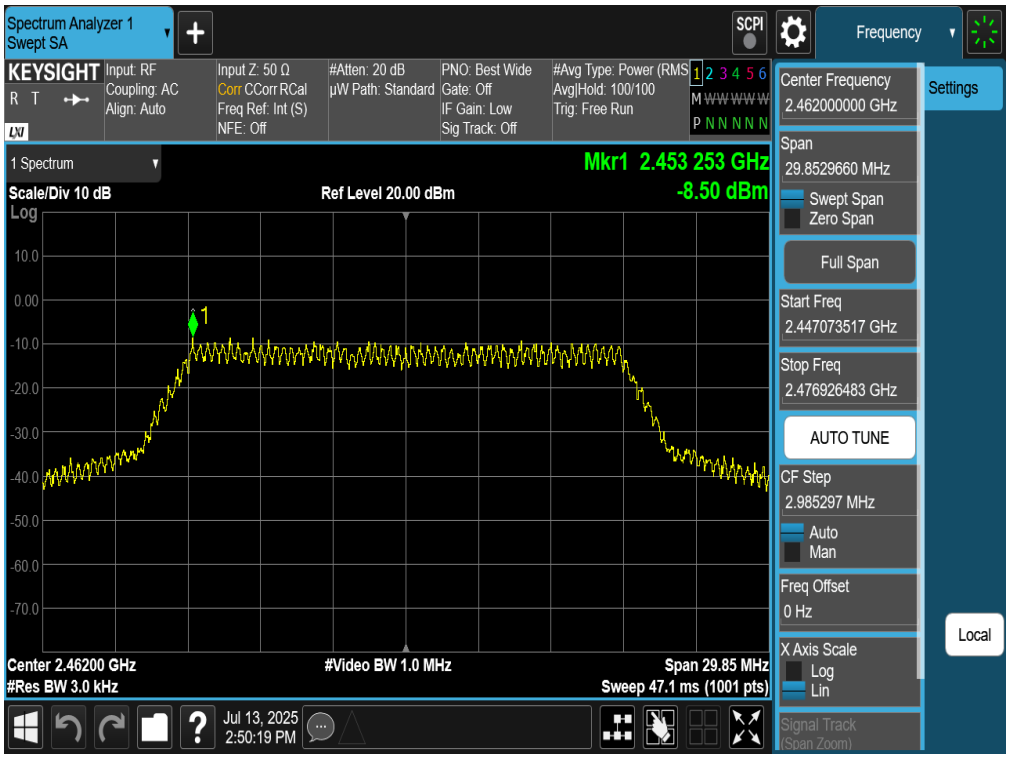
Plot 7-18. Power Spectral Density Plot (802.11g – Ch. 11) – 6Mbps



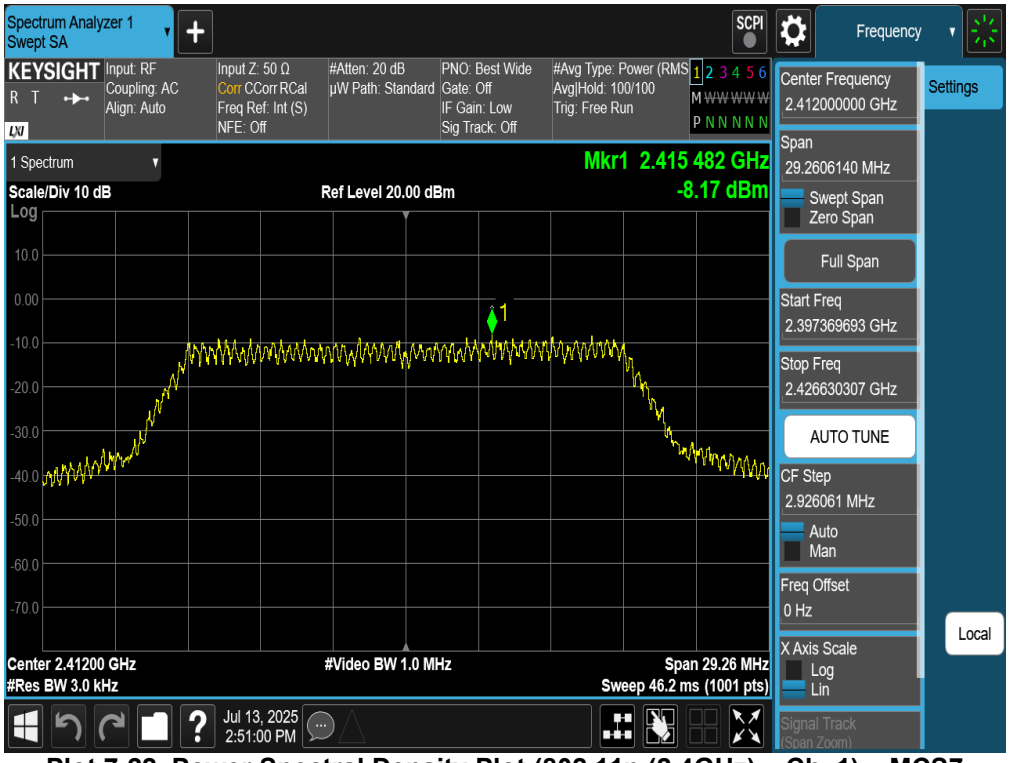
Plot 7-19. Power Spectral Density Plot (802.11n (2.4GHz) – Ch. 1) – MCS0



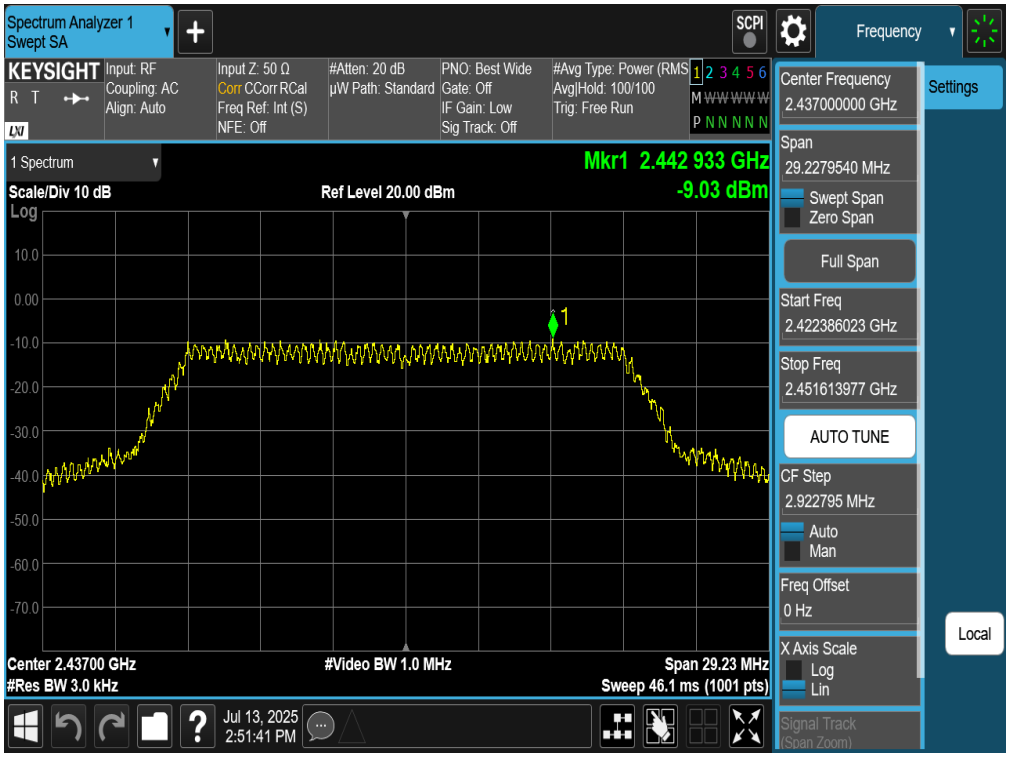
Plot 7-20. Power Spectral Density Plot (802.11n (2.4GHz) – Ch. 6) – MCS0



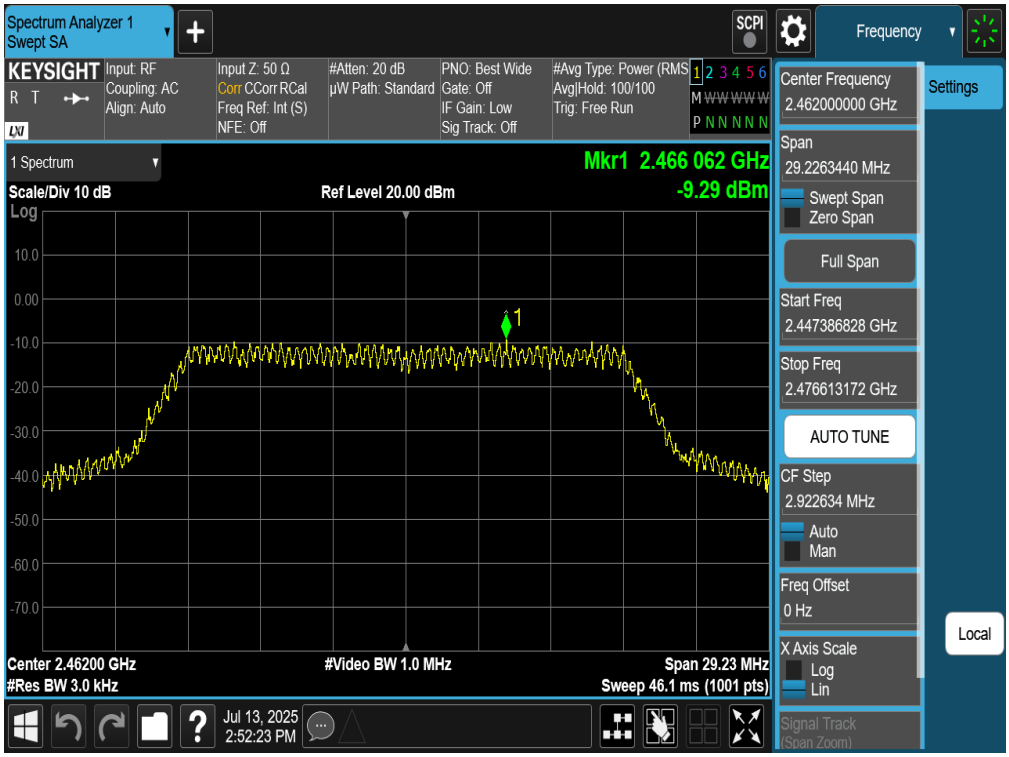
Plot 7-21. Power Spectral Density Plot (802.11n (2.4GHz) – Ch. 11) – MCS0



Plot 7-22. Power Spectral Density Plot (802.11n (2.4GHz) – Ch. 1) – MCS7



Plot 7-23. Power Spectral Density Plot (802.11n (2.4GHz) – Ch. 6) – MCS7



Plot 7-24. Power Spectral Density Plot (802.11n (2.4GHz) – Ch. 11) – MCS7

7.5 Conducted Authorized Band Edge

§15.247(d); RSS-247 [5.5]

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, 6.5/7.2 & 65/72.2Mbps for “n” 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 – Subclause 11.11.3
KDB 558074 D01 v05r02 – Section 8.7.2

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 to capture all out of band emissions near the band edge
3. RBW = 100kHz
4. VBW ≥ 3 × RBW
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.

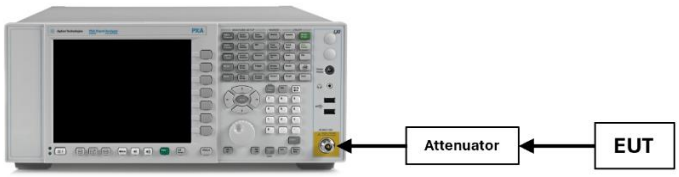
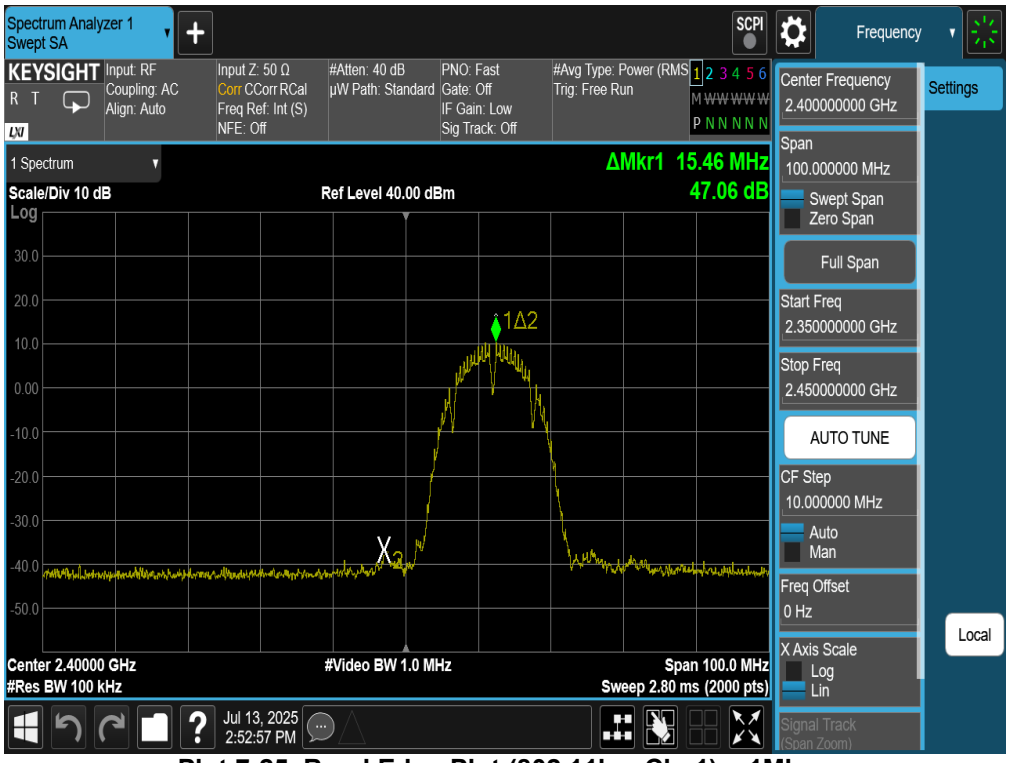


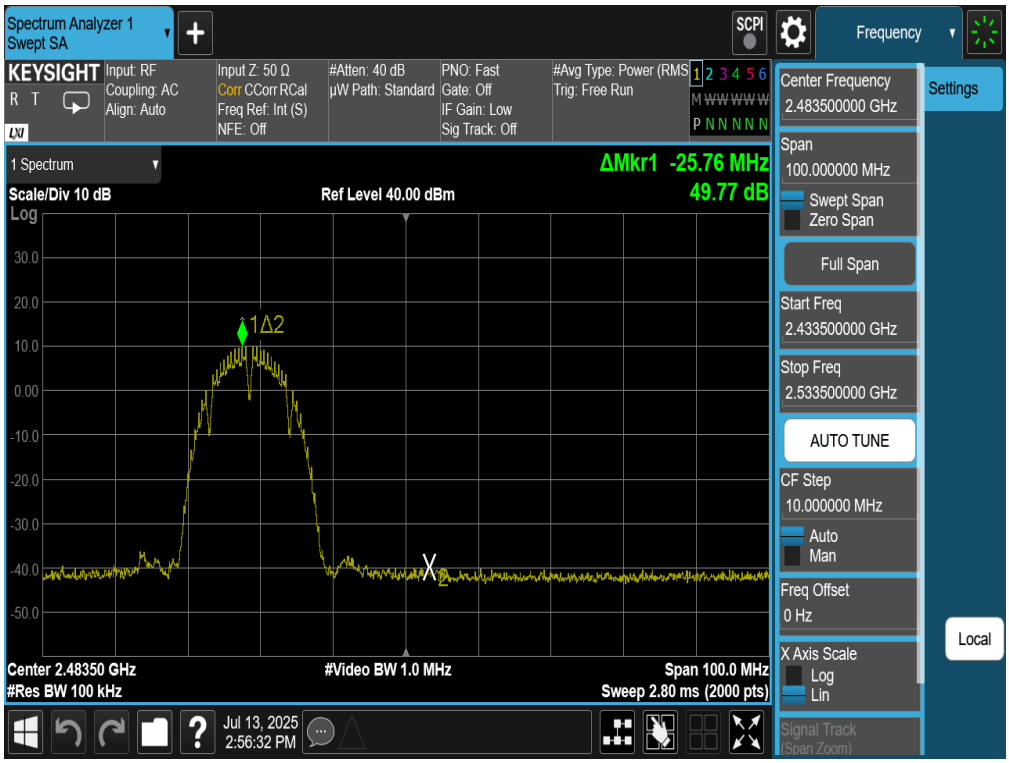
Figure 7-4. Test Instrument & Measurement Setup

Test Notes

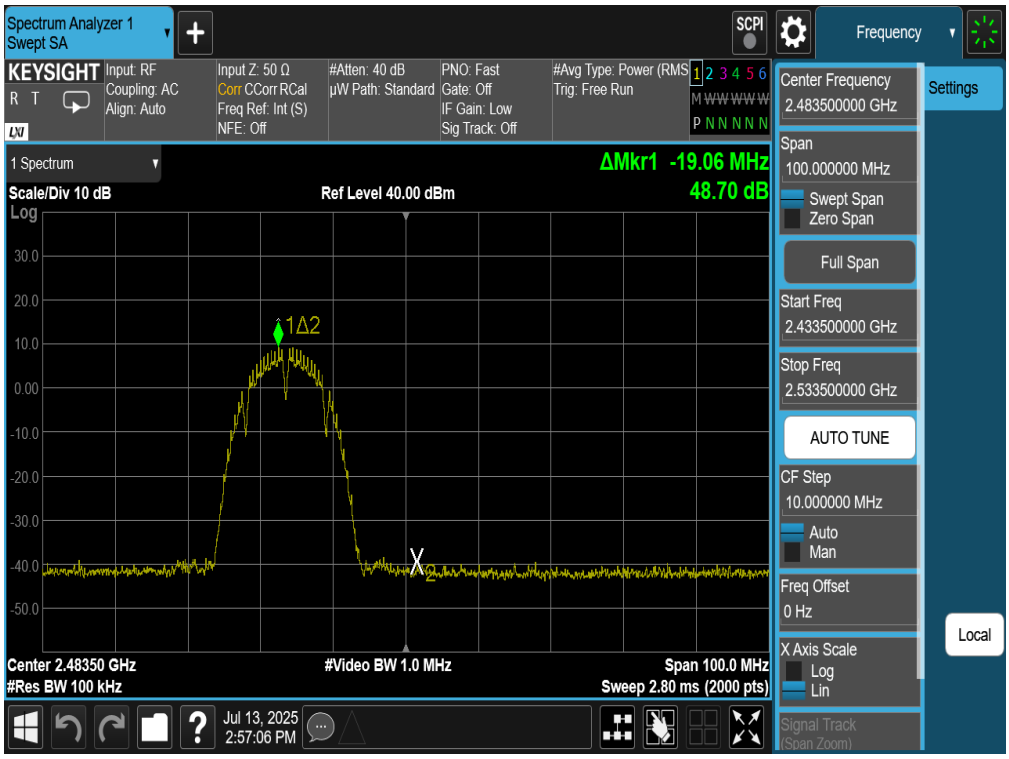
None.



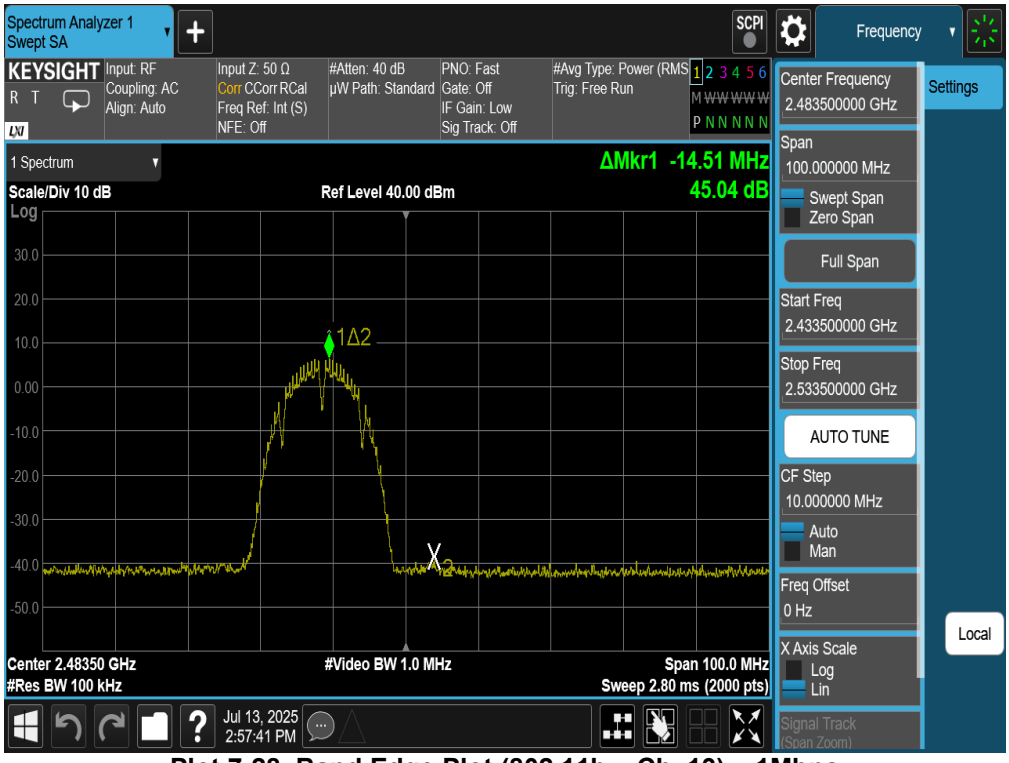
Plot 7-25. Band Edge Plot (802.11b – Ch. 1) – 1Mbps



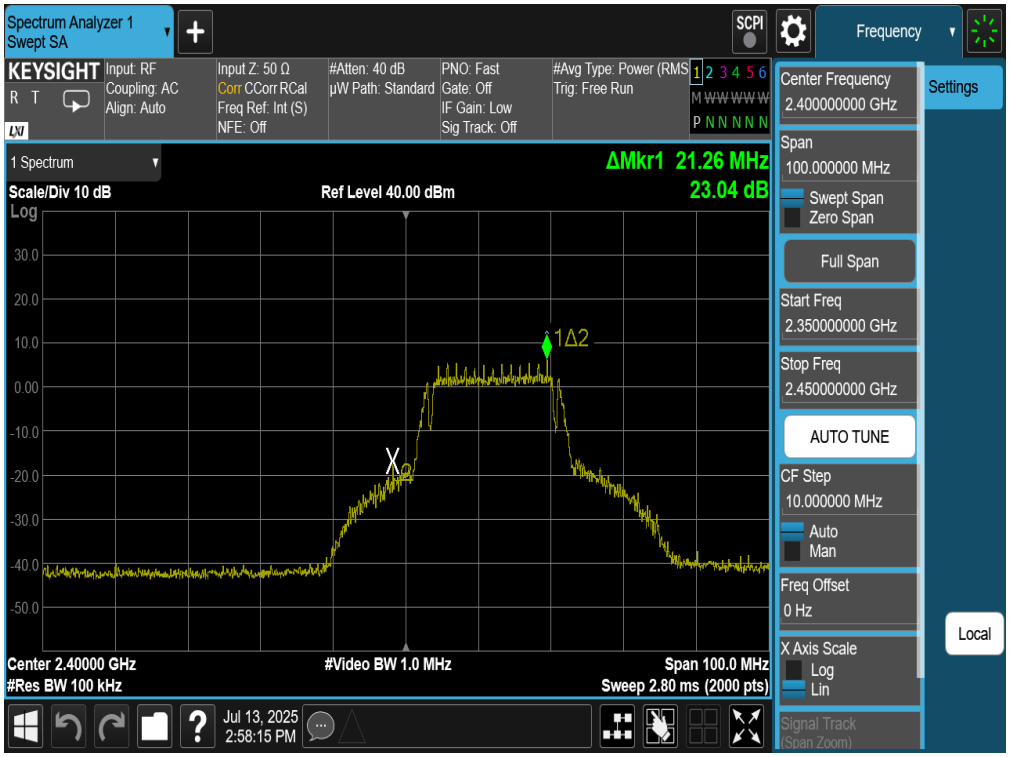
Plot 7-26. Band Edge Plot (802.11b – Ch. 11) – 1Mbps



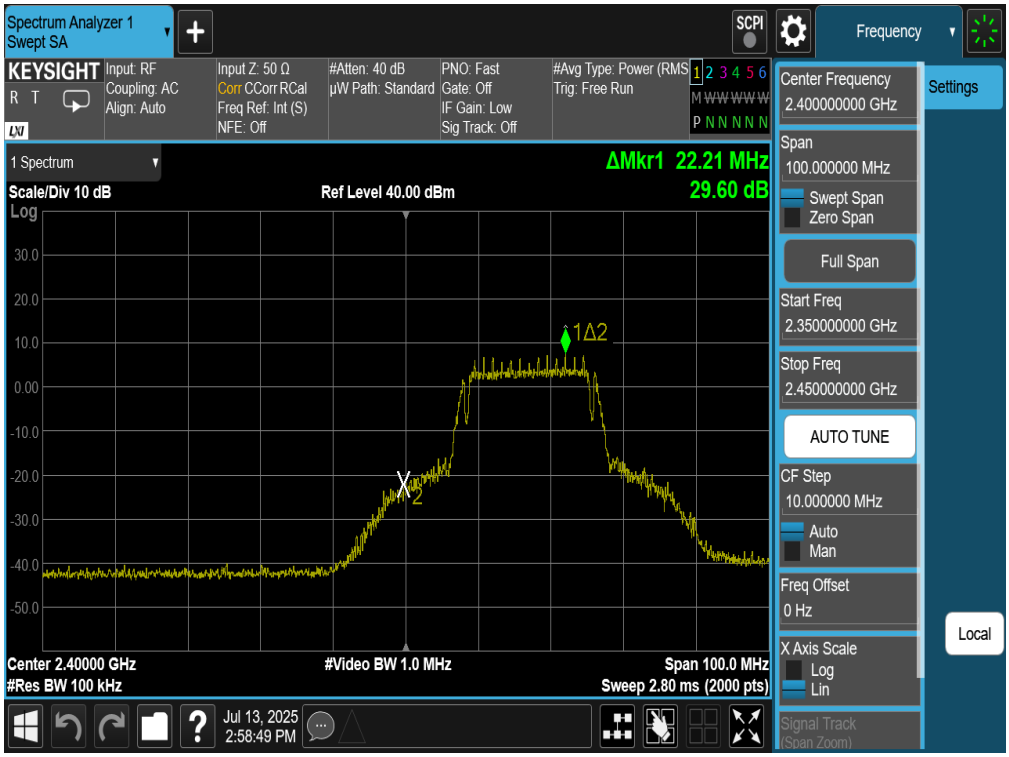
Plot 7-27. Band Edge Plot (802.11b – Ch. 12) – 1Mbps



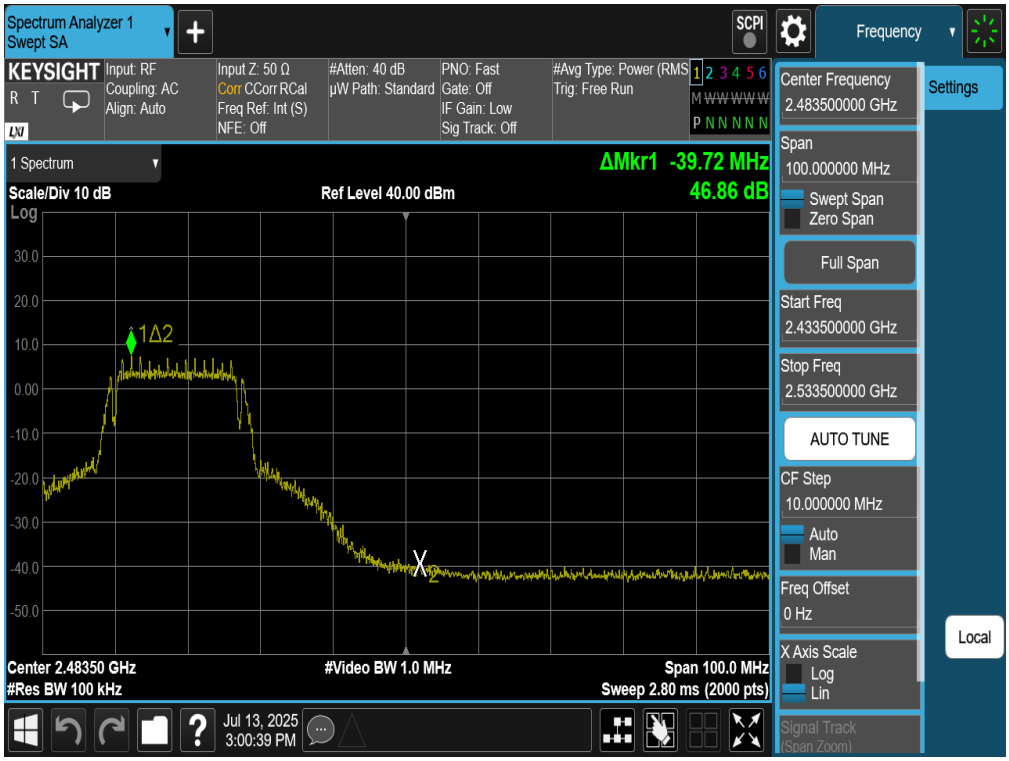
Plot 7-28. Band Edge Plot (802.11b – Ch. 13) – 1Mbps



Plot 7-29. Band Edge Plot (802.11g– Ch. 1) – 6Mbps

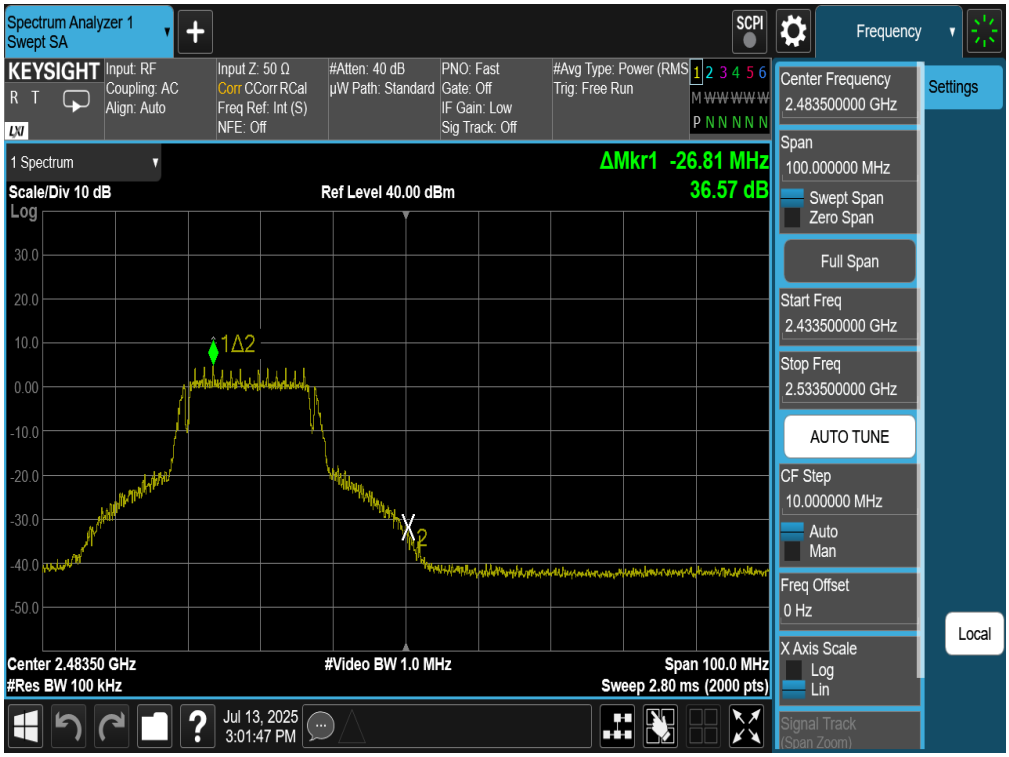


Plot 7-30. Band Edge Plot (802.11g– Ch. 2) – 6Mbps

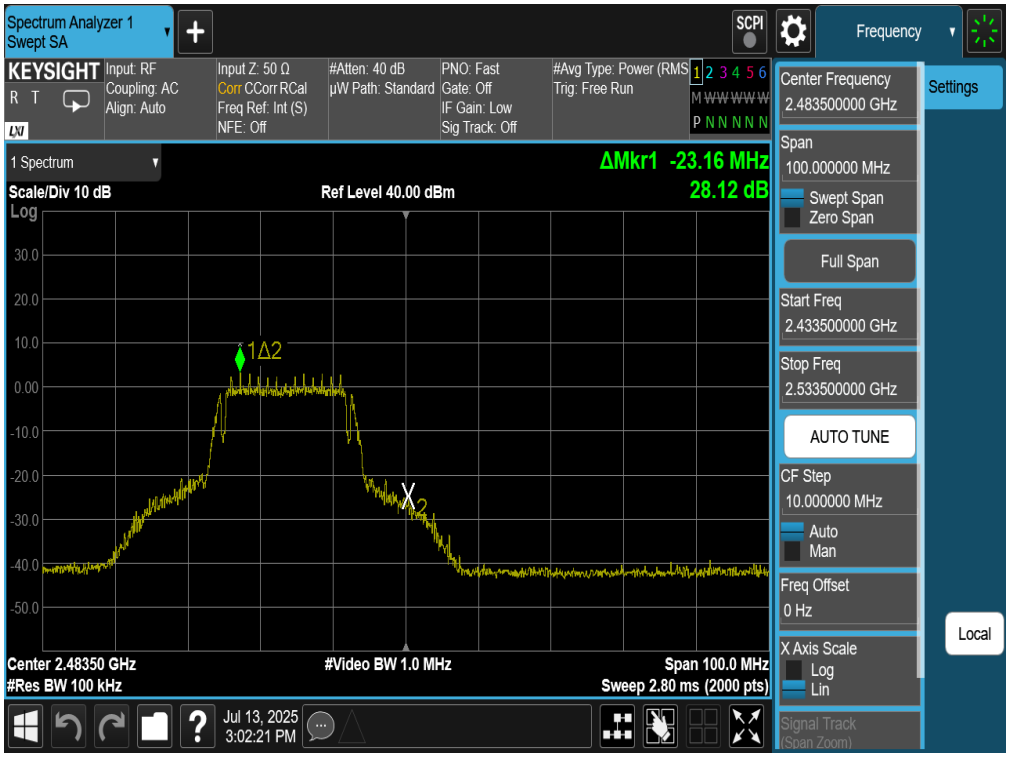


Plot 7-31. Band Edge Plot (802.11g – Ch. 9) – 6Mbps

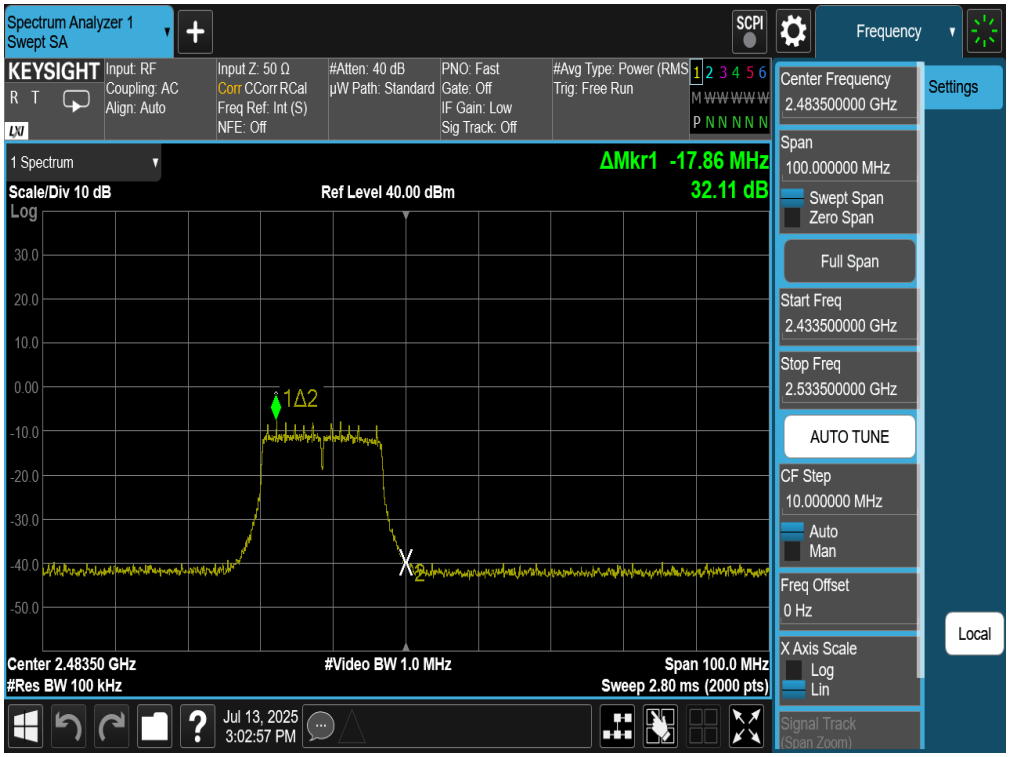
Plot 7-32. Band Edge Plot (802.11g – Ch. 10) – 6Mbps



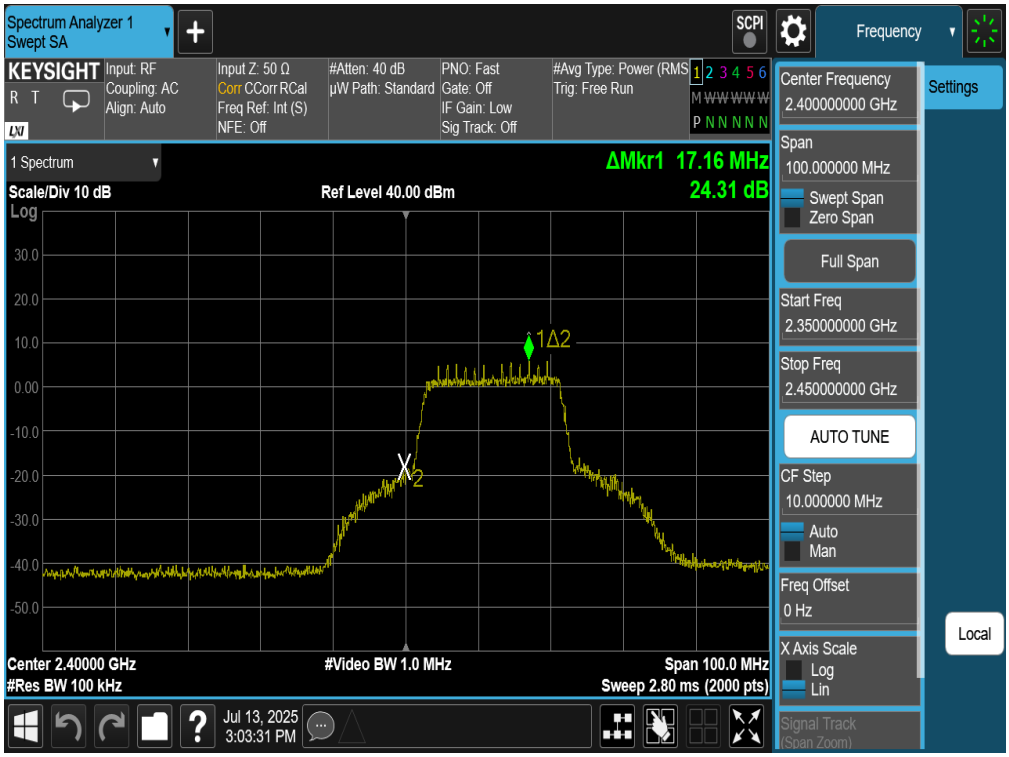
Plot 7-33. Band Edge Plot (802.11g – Ch. 11) – 6Mbps



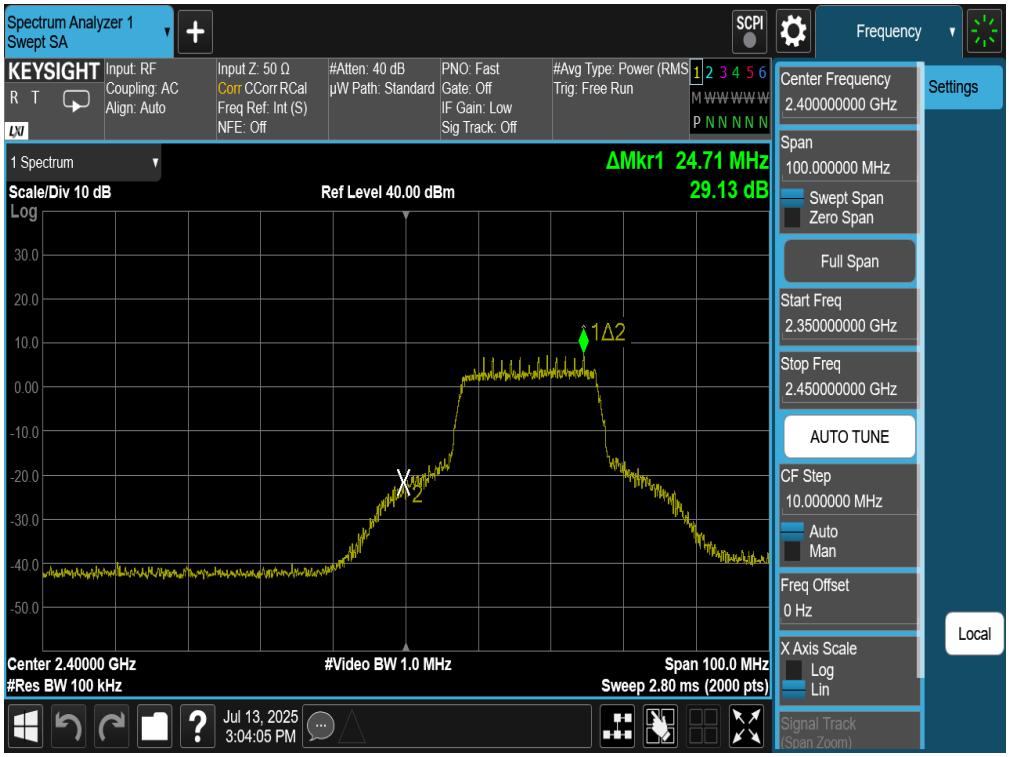
Plot 7-34. Band Edge Plot (802.11g – Ch. 12) – 6Mbps



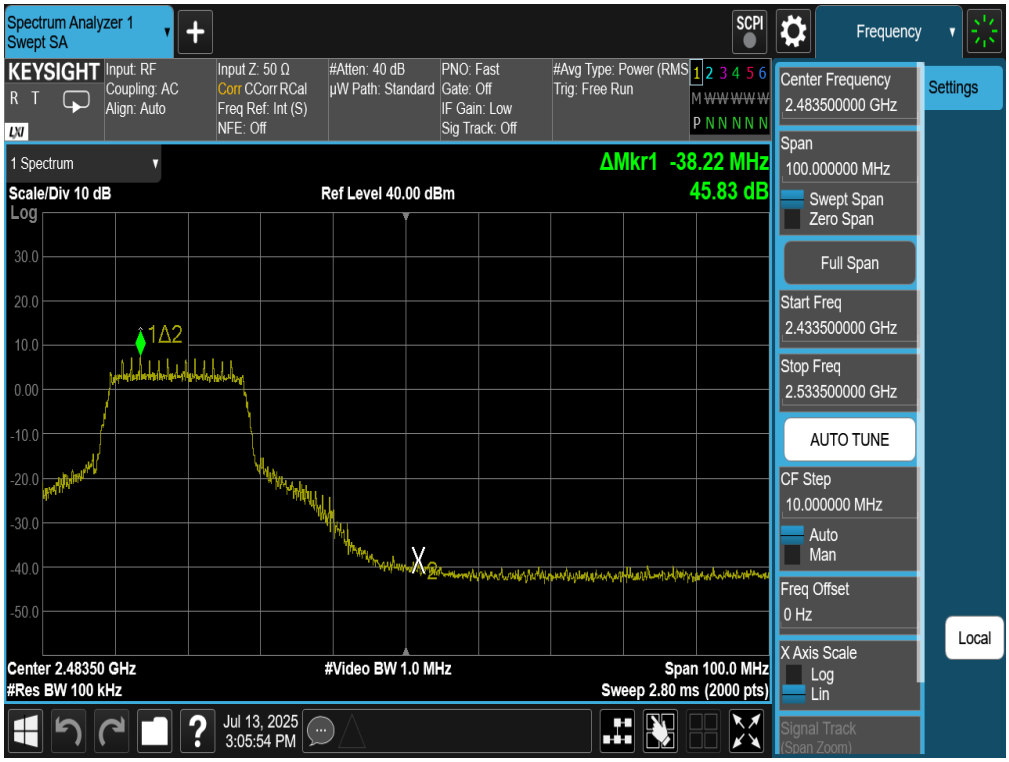
Plot 7-35. Band Edge Plot (802.11g – Ch. 13) – 6Mbps



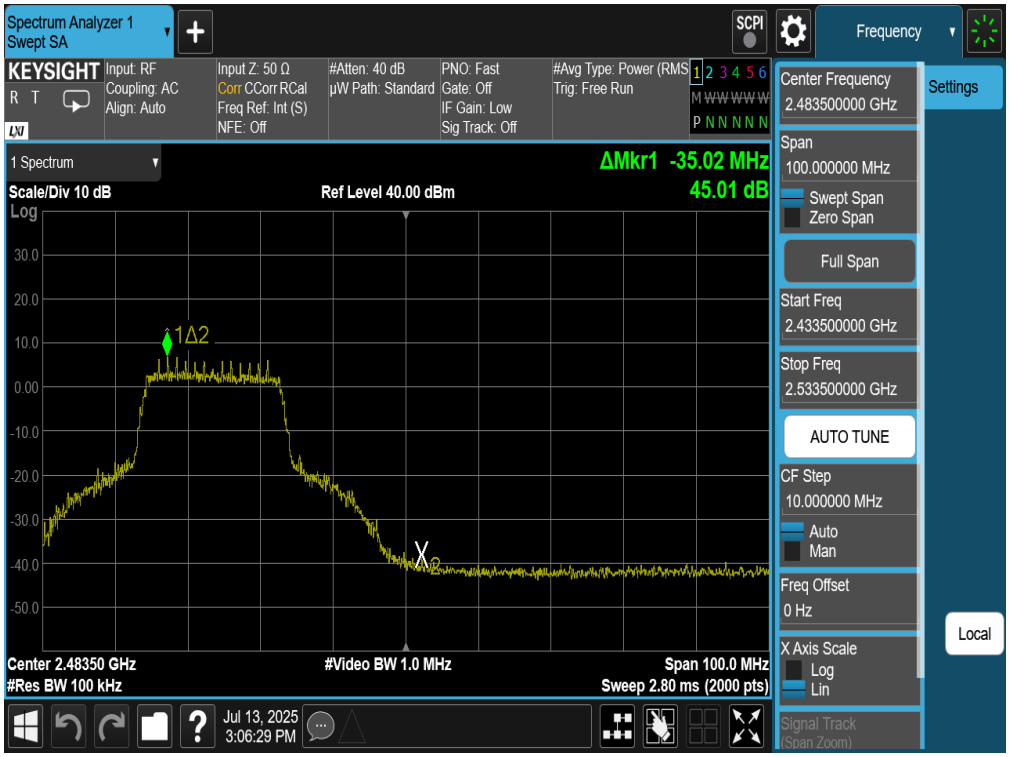
Plot 7-36. Band Edge Plot (802.11n (2.4GHz) – Ch. 1) – MCS0



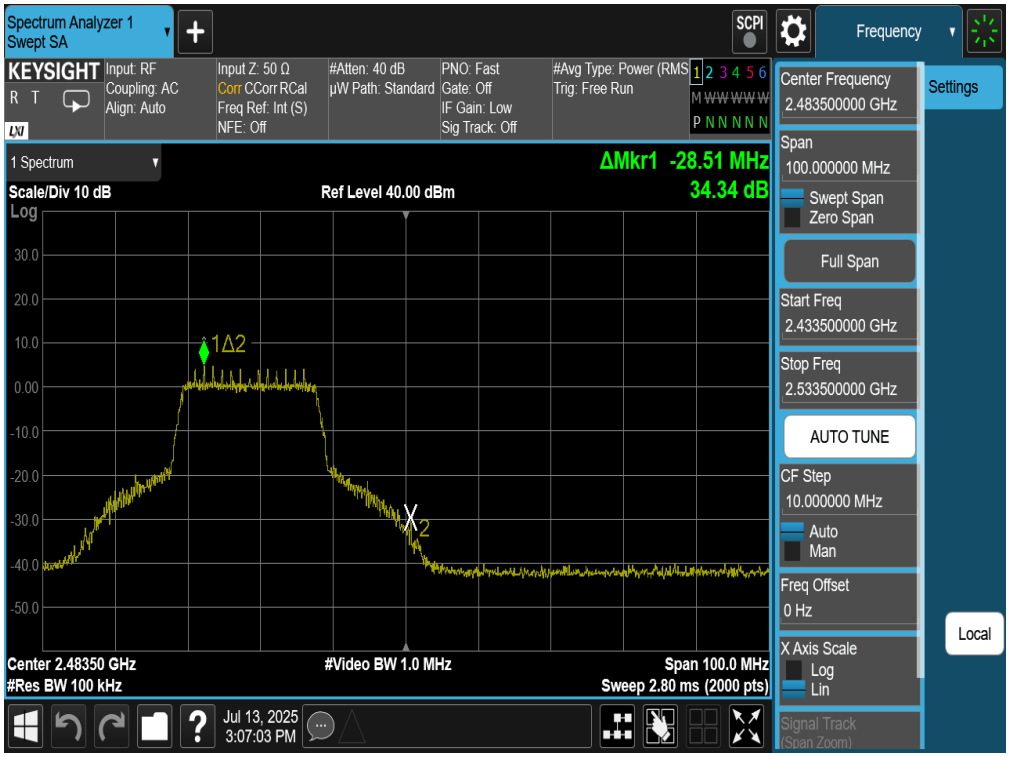
Plot 7-37. Band Edge Plot (802.11n (2.4GHz) – Ch. 2) – MCS0



Plot 7-38. Band Edge Plot (802.11n (2.4GHz) – Ch. 9) – MCS0



Plot 7-39. Band Edge Plot (802.11n (2.4GHz) – Ch. 10) – MCS0



Plot 7-40. Band Edge Plot (802.11n (2.4GHz) – Ch. 11) – MCS0