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MEASUREMENT REPORT FCC Part 15.247 / ISED RSS-247 Bluetooth

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

Date of Testing:
01/03/2024 - 03/18/2024
Test Report Issue Date:
3/20/2024
Test Site/Location:
Element lab., Columbia, MD, USA
Test Report Serial No.:
1M2311170118-04.C3K

FCC ID:	C3K2085
IC:	3048A-2085
APPLICANT:	Microsoft Corporation

Application Type:	Certification
Model/HVIN:	2085
EUT Type:	Portable Computing Device
Max. RF Output Power:	124.194 mW (20.94 dBm) Peak Conducted
Frequency Range:	2402 – 2480MHz
Type of Modulation:	GFSK, $\pi/4$ -DQPSK, 8DPSK
FCC Classification:	FCC Part 15 Spread Spectrum Transmitter (DSS)
ISED Specification:	RSS-247 Issue 3
Test Procedure(s):	ANSI C63.10-2013, 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 C63.10-2013. 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



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Test Report S/N: «Report_SN_BT_FCC»	Test Dates: «Date_of_Testing»	EUT Type: «EUT_Type»	Page 1 of 137

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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: C3K2085**. The test data contained in this report pertains only to the emissions due to the EUT's Bluetooth transmitter.

- This Bluetooth module has been tested by a Bluetooth Qualification Lab, and we confirm the following:
 - A) The hopping sequence is pseudorandom
 - B) All channels are used equally on average
 - C) The receiver input bandwidth equals the transmit bandwidth
 - D) The receiver hops in sequence with the transmit signal
- 15.247(g): In accordance with the Bluetooth Industry Standard, the system is designed to comply with all of the regulations in Section 15.247 when the transmitter is presented with a continuous data (or information) system.
- 15.247(h): In accordance with the Bluetooth Industry Standard, the system does not coordinate its channels selection/hopping sequence with other frequency hopping systems for the express purpose of avoiding the simultaneous occupancy of individual hopping frequencies by multiple transmitters.
- 15.247(h): The EUT employs Adaptive Frequency Hopping (AFH) which identifies sources of interference namely devices operating in 802.11 WLAN and excludes them from the list of available channels. The process of re-mapping reduces the number of test channels from 79 channels to a minimum number of 20 channels.

Test Device Serial No.: 1P4X2, 1P4R2, 1P4D2

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)
00	2402
:	:
39	2441
:	:
78	2480

Table 2-1. Frequency/ Channel Operations

Note: This device is capable of operating in hopping and non-hopping mode. The EUT can hop between 79 different channels in the 2400 – 2483.5MHz band.

2.3 Antenna Description

The following antenna was used for the testing.

Frequency [GHz]	ANT1	ANT2	Antenna Gain (dBi)
2.4	2.3	0.3	4.37

Table 2-2. Antenna Peak Gain

Note: This device is capable of operating in hopping and non-hopping mode. The EUT can hop between 79 different channels in the 2400 – 2483.5MHz band.

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2.4 Test Configuration

The EUT was tested per the guidance of ANSI C63.10-2013. ANSI C63.10-2013 was also 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, 3.3 for radiated emissions test setups, and 7.2, 7.3, 7.4, 7.5, 7.6, 7.7, and 7.8 for antenna port conducted emissions test setups. The worst case radiated emissions data is shown in this report.

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

The emissions below 1GHz and above 18GHz were tested with the highest transmitting power channel and the worst-case configuration.

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 cable with wire charger
- EUT powered by host PC via USB cable with wire charger

$\pi/4$ -DQPSK has been investigated and confirmed as not the worst case.

2.5 Software and Firmware

The test was conducted with software/firmware version 2024.111.46 installed on the EUT.

2.6 EMI Suppression Device(s)/Modifications

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

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3.0 DESCRIPTION OF TESTS

3.1 Evaluation Procedure

The measurement procedure described in the American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices (ANSI C63.10-2013) 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 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 7.12. 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 connection to an external antenna.

Conclusion:

The EUT 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 C63.10-2013. 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 (\pm dB)
Conducted Bench Top Measurements	1.13
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). Measurement 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
N/A	WL25-1	Conducted Cable Set (25GHz)	11/15/2023	Annual	11/15/2024	WL25-1
N/A	WL25-2	WLAN Cable Set (25GHz)	11/15/2023	Annual	11/15/2024	WL25-2
N/A	WL40-1	WLAN Cable Set (40GHz)	11/15/2023	Annual	11/15/2024	WL40-1
N/A	AP1-002	EMC Cable and Switch System	11/15/2023	Annual	11/15/2024	AP1-002
N/A	AP2-001	EMC Cable and Switch System	11/15/2023	Annual	11/15/2024	AP2-001
N/A	AP2-002	EMC Cable and Switch System	11/15/2023	Annual	11/15/2024	AP2-002
Keysight Technologies	N9038A	MXE EMI Receiver	8/30/2023	Annual	8/30/2024	MY51210133
Keysight Technologies	N9030A	PXA Signal Analyzer	2/29/2024	Annual	3/1/2025	MY55410501
Keysight Technologies	N9020A	MXA Signal Analyzer	3/15/2023	Annual	3/15/2024	MY54500644
Pasternack	NMLC-2	Line Conducted Emissions Cable (NM)	11/15/2023	Annual	11/15/2024	NMLC-2
Rohde & Schwarz	ESU26	EMI Test Receiver (26.5GHz)	9/25/2023	Annual	9/25/2024	100342
Rohde & Schwarz	ESU40	EMI Test Receiver (40GHz)	9/11/2023	Annual	9/11/2024	100348
Sunol Sciences	DRH-118	Horn (Small)	2/21/2024	Biennial	2/21/2026	A050307
Sunol Sciences	JB5	Bi-Log Antenna (30M-5GHz)	8/30/2022	Biennial	8/30/2024	A051107

Table 6-1. Annual Test Equipment Calibration Schedule

Notes:

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.

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7.0 TEST RESULTS

7.1 Summary

Company Name: Microsoft Corporation
 FCC ID: C3K2085
 Method/System: Frequency Hopping Spread Spectrum (FHSS)
 Number of Channels: 79

FCC Part Section(s)	RSS Section(s)	Test Description	Test Limit	Test Condition	Test Result	Reference
15.247(a)(1)(iii)	RSS-247 [5.1(1)]	20dB Bandwidth	N/A	CONDUCTED	PASS	Section 7.2
15.247(b)(1)	RSS-247 [5.4(2)]	Peak Transmitter Output Power	< 1 Watt if ≥ 75 non-overlapping channels used		PASS	Section 7.3
15.247(a)(1)	RSS-247 [5.1(2)]	Channel Separation	> 2/3 of 20 dB BW for systems with Output Power < 125mW		PASS	Section 7.5
15.247(a)(1)(iii)	RSS-247 [5.1(4)]	Number of Channels	> 15 Channels		PASS	Section 7.7
15.247(a)(1)(iii)	RSS-247 [5.1(4)]	Time of Occupancy	< 0.4 sec in 31.6 sec period		PASS	Section 7.6
15.247(d)	RSS-247 [5.5]	Band Edge / Out-of-Band Emissions	Conducted > 20dBc		PASS	Section 7.4, Section 7.8
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-247 limits)	RADIATED	PASS	Section 7.9, Section 7.10, Section 0
15.207	RSS-Gen [8.8]	AC Conducted Emissions 150kHz – 30MHz	< FCC 15.207 limits (RSS-Gen [8.8] limits)	LINE CONDUCTED	PASS	Section 7.12

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, directional couplers, and attenuators used as part of the system to maintain a link between the call box and the EUT 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, attenuators, and couplers.
- 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 “BT Auto,” 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.

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7.2 20dB Bandwidth Measurement

§15.247 (a.1.iii); RSS-247 [5.1(1)]

Test Overview and Limit

The bandwidth at 20dB down from the highest in-band spectral density is measured with a spectrum analyzer connected to the receive antenna while the EUT is operating in transmission mode at the appropriate frequencies.

Test Procedure Used

ANSI C63.10-2013 – Section 6.9.2

Test Settings

1. The signal analyzers' automatic bandwidth measurement capability of the spectrum analyzer was used to perform the 20dB bandwidth measurement. The "X" dB bandwidth parameter was set to $X = 20$. The bandwidth measurement was not influenced by any intermediate power nulls in the fundamental emission.
2. $RBW = 1 - 5\% OBW$
3. $VBW \geq 3 \times RBW$
4. Reference level set to keep signal from exceeding maximum input mixer level for linear operation.
5. Detector = Peak
6. Trace mode = max hold
7. Sweep = auto couple
8. The trace was allowed to stabilize

Test Setup

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



Figure 7-1. Test Instrument & Measurement Setup

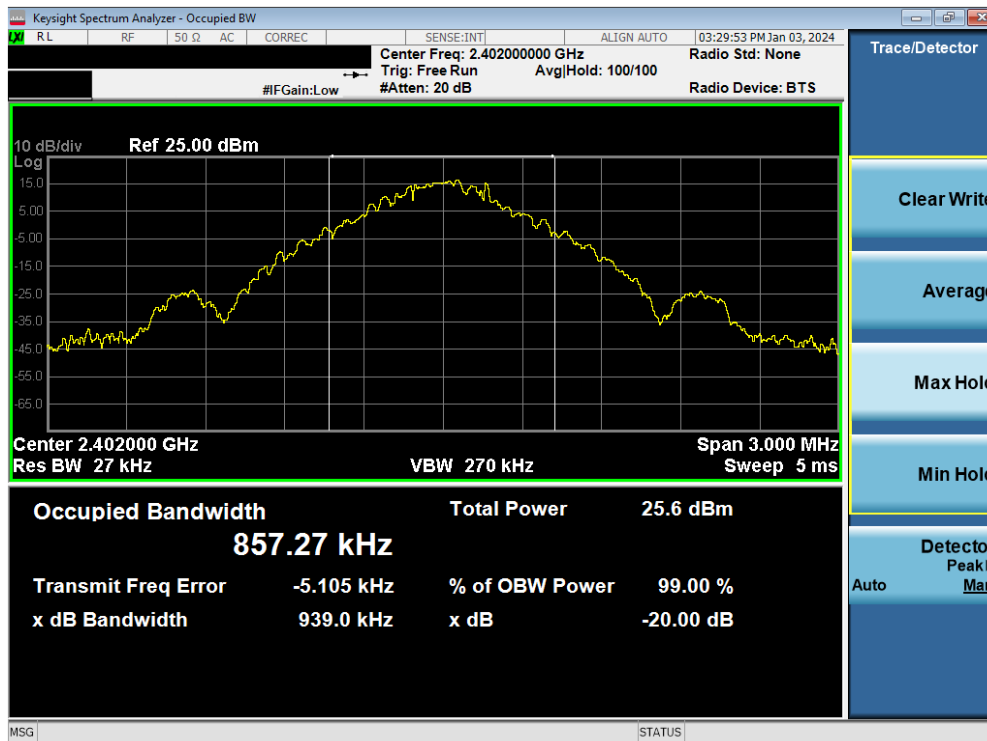
Test Notes

None

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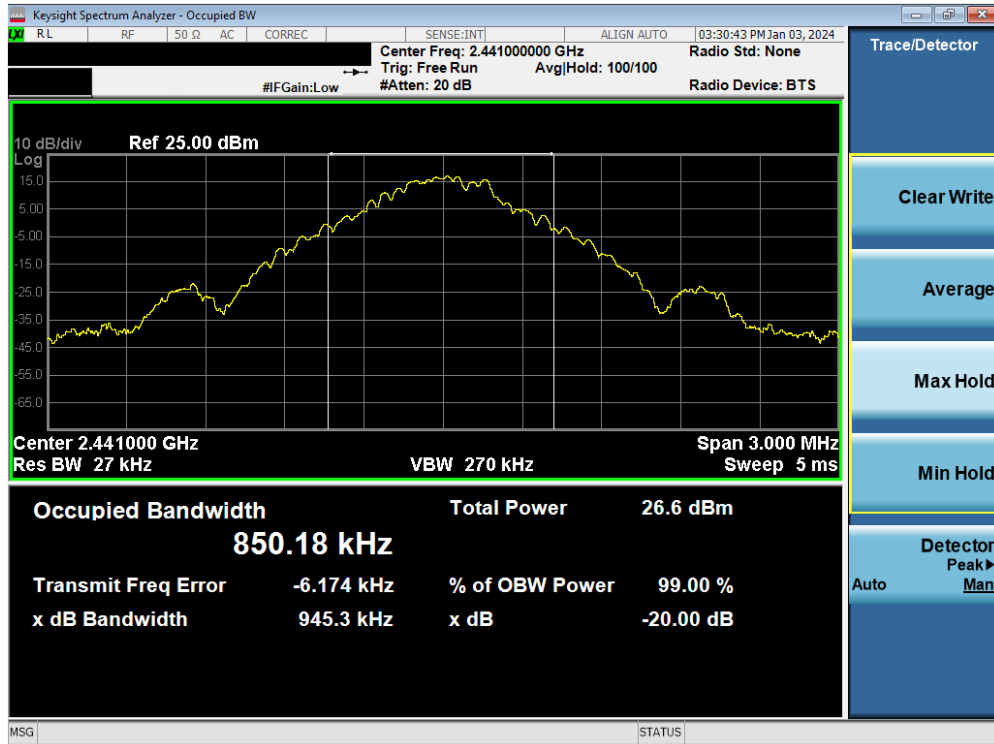
Frequency [MHz]	Data Rate [Mbps]	Mod.	Channel No.	20dB Bandwidth Test Results [kHz]
2402	1.0	GFSK	0	939.00
2441	1.0	GFSK	39	945.30
2480	1.0	GFSK	78	945.40
2402	2.0	$\pi/4$ -DQPSK	0	1320.00
2441	2.0	$\pi/4$ -DQPSK	39	1318.00
2480	2.0	$\pi/4$ -DQPSK	78	1340.00
2402	3.0	8DPSK	0	1315.00
2441	3.0	8DPSK	39	1301.00
2480	3.0	8DPSK	78	1327.00

Table 7-2. Conducted 20dB Bandwidth Measurements – SISO ANT1

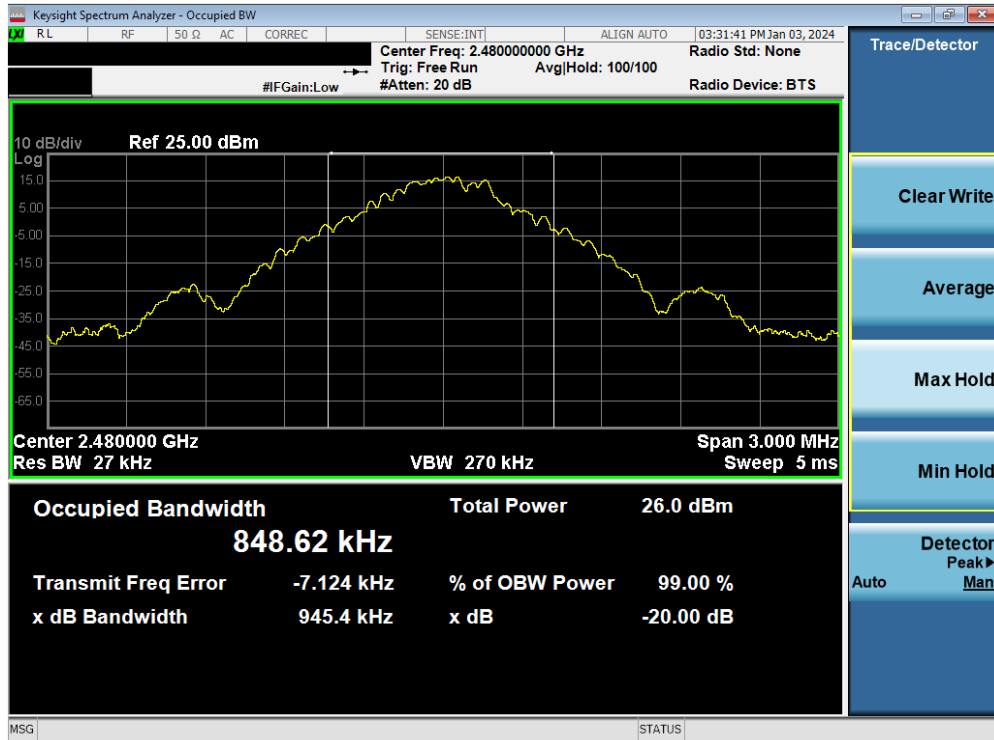


Plot 7-1. 20dB Bandwidth Plot (Bluetooth, 1Mbps – Ch. 0)

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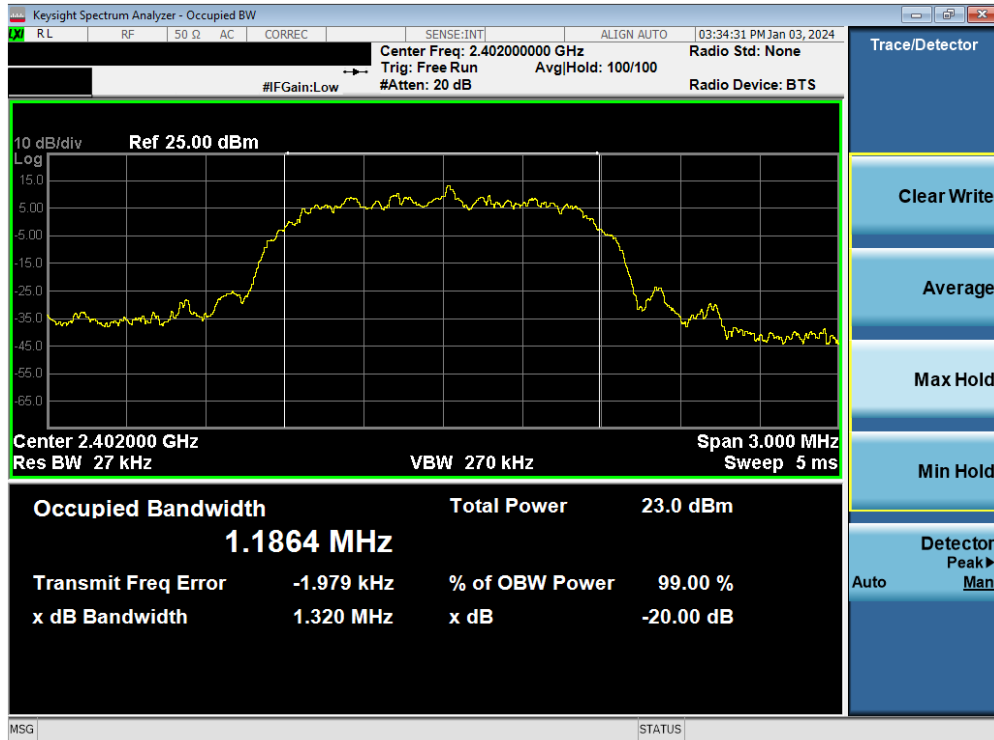


Plot 7-2. 20dB Bandwidth Plot (Bluetooth, 1Mbps – Ch. 39)

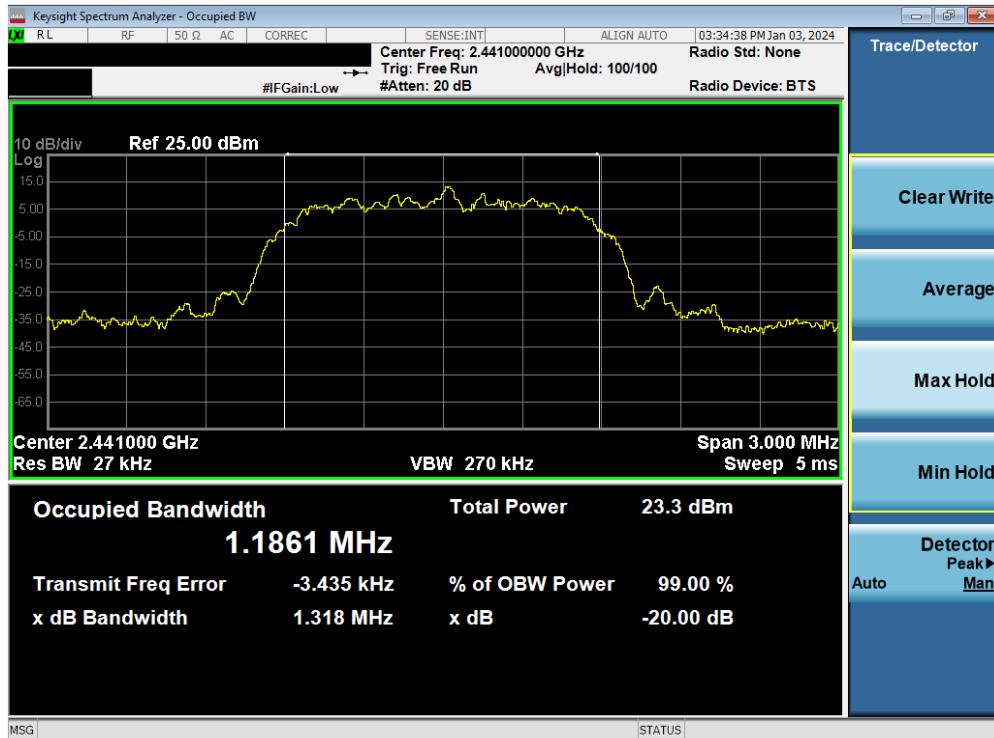


Plot 7-3. 20dB Bandwidth Plot (Bluetooth, 1Mbps – Ch. 78)

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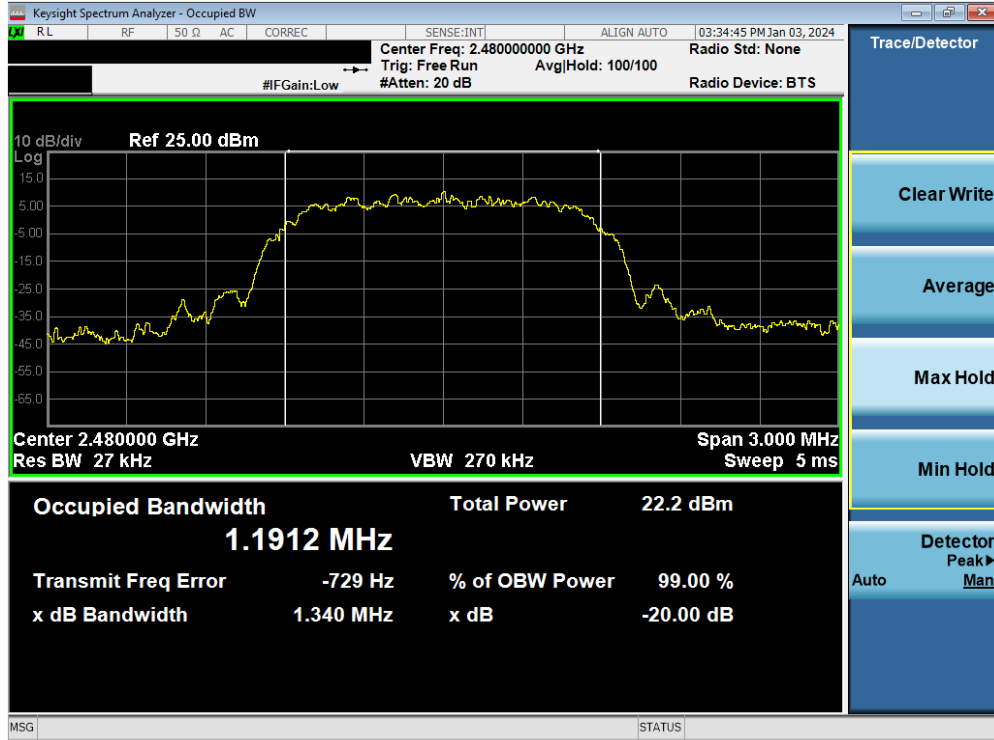


Plot 7-4. 20dB Bandwidth Plot (Bluetooth, 2Mbps – Ch. 0)

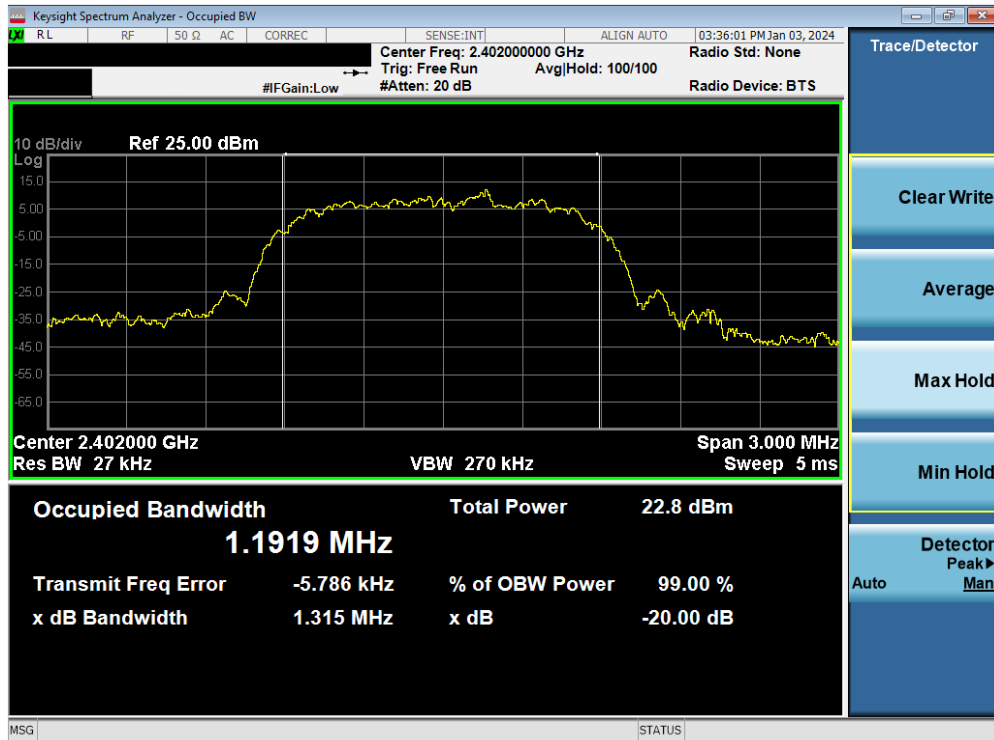


Plot 7-5. 20dB Bandwidth Plot (Bluetooth, 2Mbps – Ch. 39)

FCC ID: «FCC_ID» IC: 3048A-2085	MEASUREMENT REPORT («APPLICATION_TYPE»)		Approved by: Technical Manager
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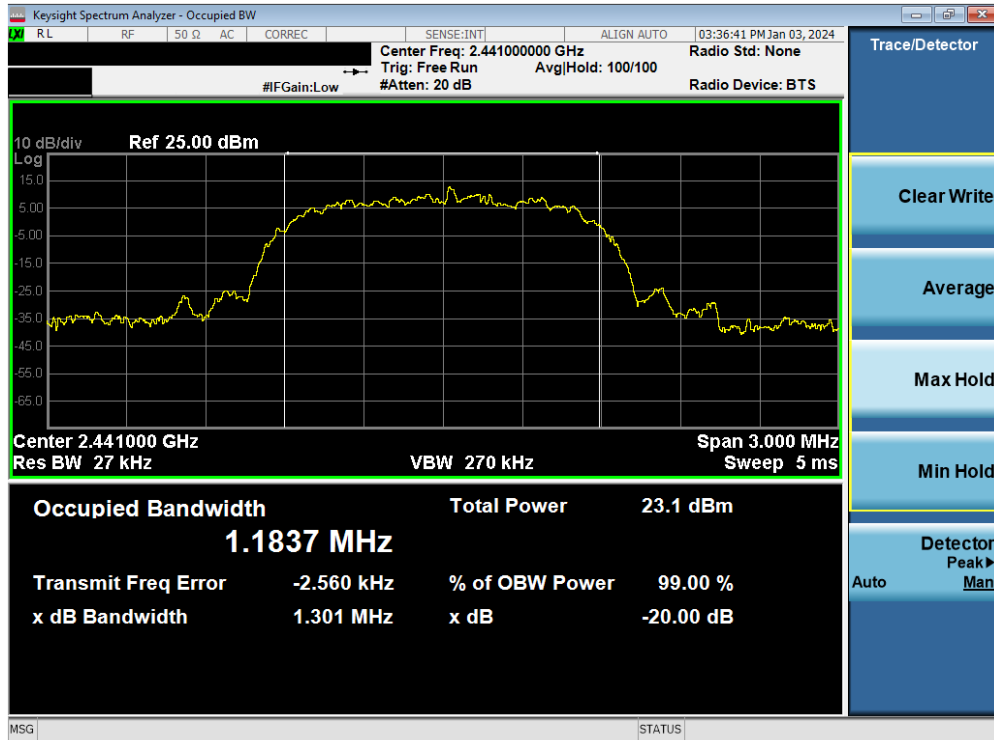


Plot 7-6. 20dB Bandwidth Plot (Bluetooth, 2Mbps – Ch. 78)

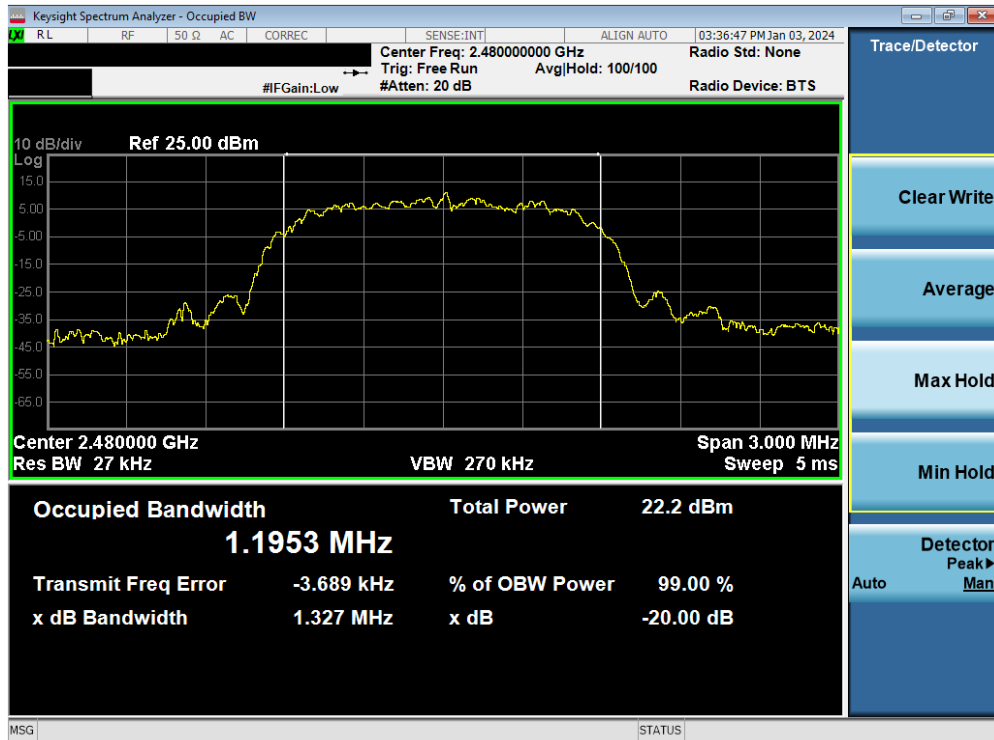


Plot 7-7. 20dB Bandwidth Plot (Bluetooth, 3Mbps – Ch. 0)

FCC ID: «FCC_ID» IC: 3048A-2085	MEASUREMENT REPORT («APPLICATION_TYPE»)		Approved by: Technical Manager
Test Report S/N: «Report_SN_BT_FCC»	Test Dates: «Date_of_Testing»	EUT Type: «EUT_Type»	Page 16 of 137



Plot 7-8. 20dB Bandwidth Plot (Bluetooth, 3Mbps – Ch. 39)

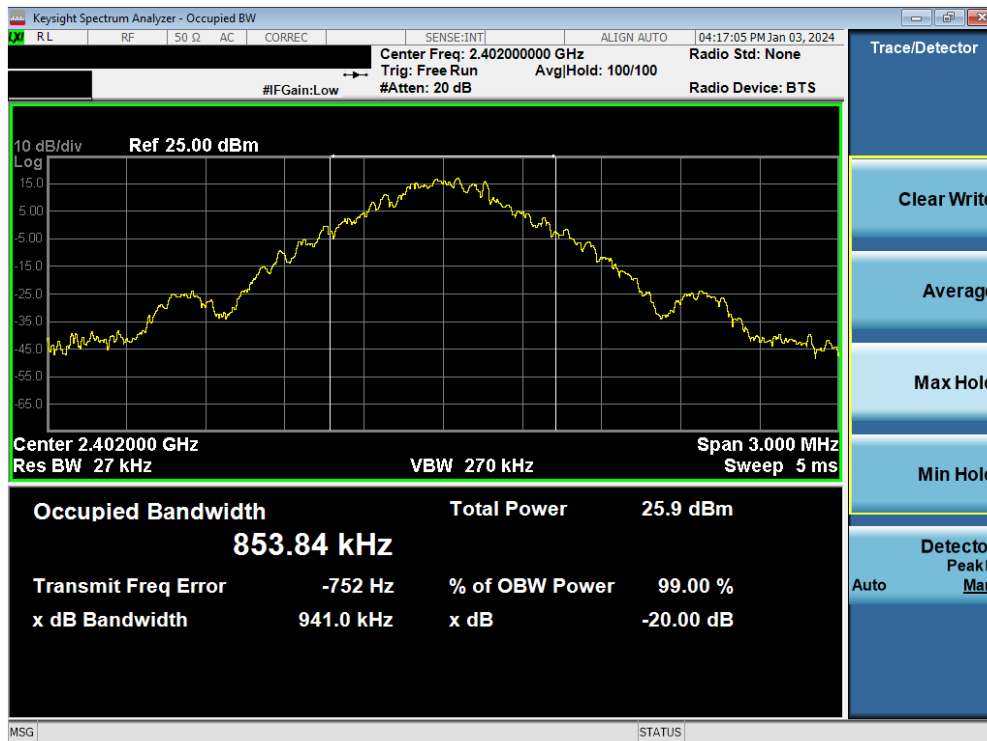


Plot 7-9. 20dB Bandwidth Plot (Bluetooth, 3Mbps – Ch. 78)

FCC ID: «FCC_ID» IC: 3048A-2085	MEASUREMENT REPORT («APPLICATION_TYPE»)		Approved by: Technical Manager
Test Report S/N: «Report_SN_BT_FCC»	Test Dates: «Date_of_Testing»	EUT Type: «EUT_Type»	Page 17 of 137

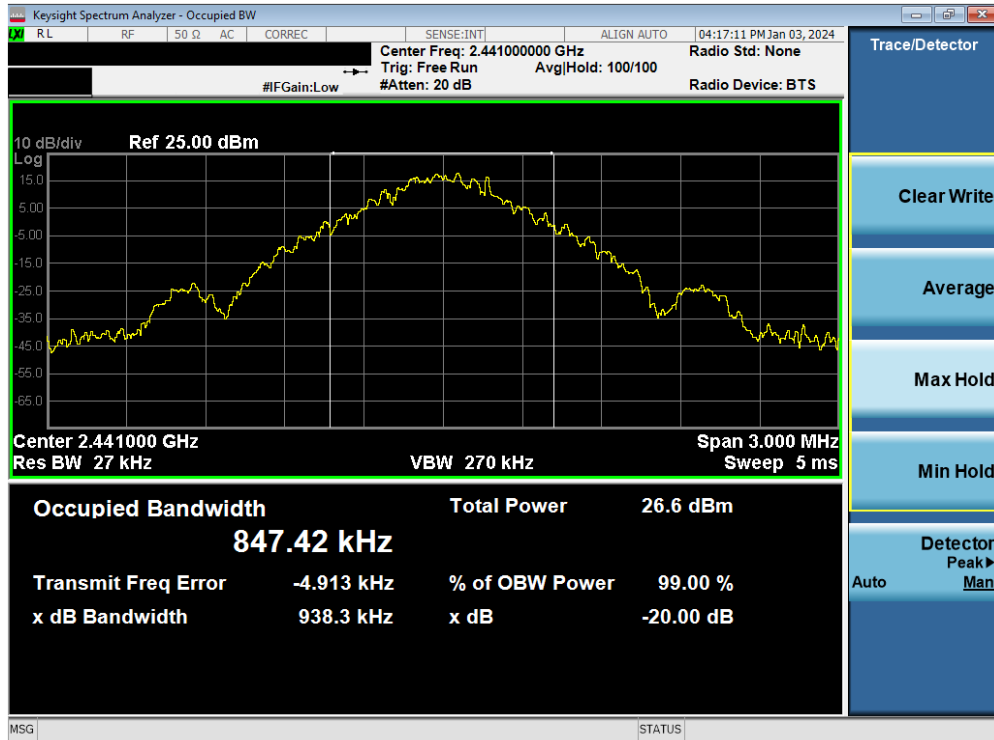
Frequency [MHz]	Data Rate [Mbps]	Mod.	Channel No.	20dB Bandwidth Test Results [kHz]
2402	1.0	GFSK	0	941.00
2441	1.0	GFSK	39	938.30
2480	1.0	GFSK	78	946.20
2402	2.0	$\pi/4$ -DQPSK	0	1326.00
2441	2.0	$\pi/4$ -DQPSK	39	1326.00
2480	2.0	$\pi/4$ -DQPSK	78	1327.00
2402	3.0	8DPSK	0	1351.00
2441	3.0	8DPSK	39	1331.00
2480	3.0	8DPSK	78	1315.00

Table 7-3. Conducted 20dB Bandwidth Measurements – SISO ANT2

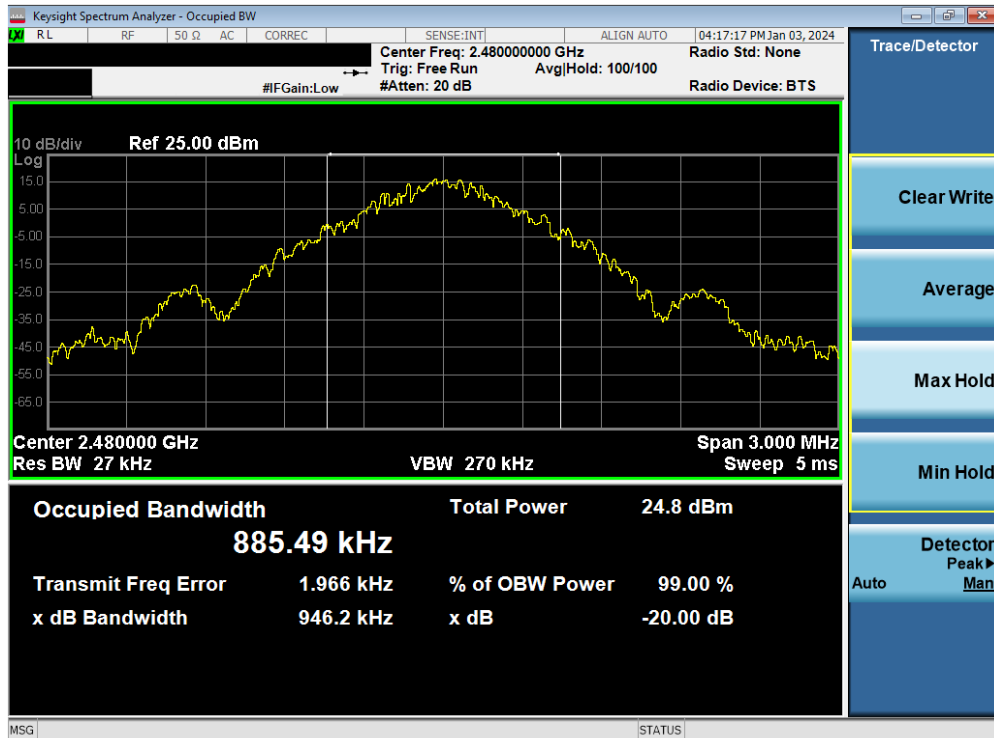


Plot 7-10. 20dB Bandwidth Plot (Bluetooth, 1Mbps – Ch. 0)

FCC ID: «FCC_ID» IC: 3048A-2085	MEASUREMENT REPORT («APPLICATION_TYPE»)		Approved by: Technical Manager
Test Report S/N: «Report_SN_BT_FCC»	Test Dates: «Date_of_Testing»	EUT Type: «EUT_Type»	Page 18 of 137

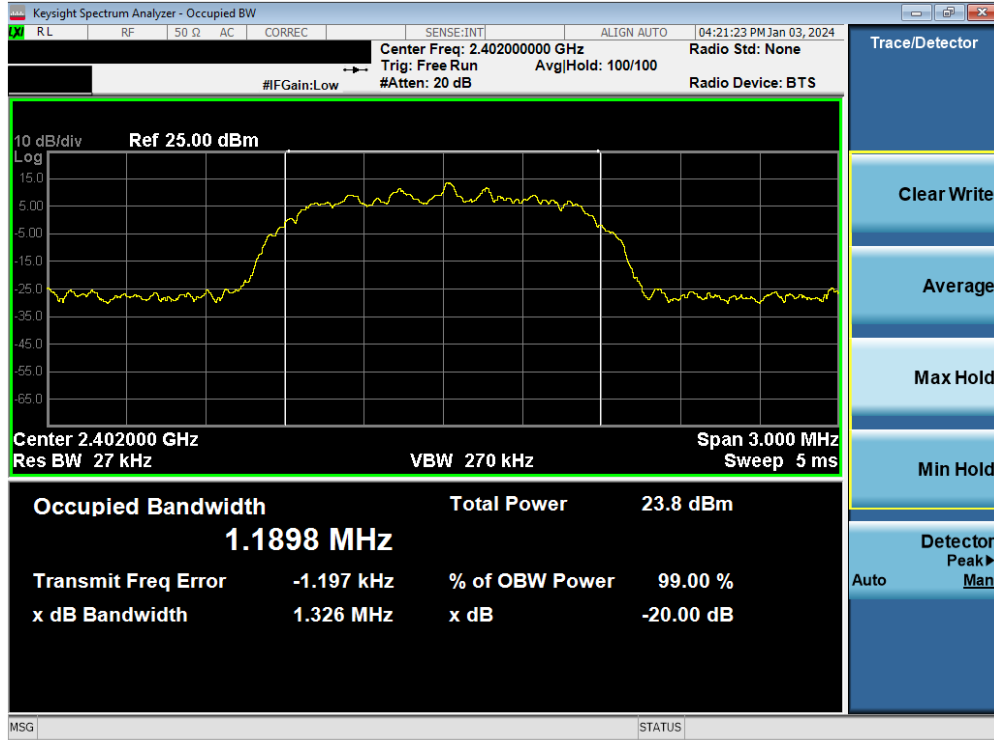


Plot 7-11. 20dB Bandwidth Plot (Bluetooth, 1Mbps – Ch. 39)

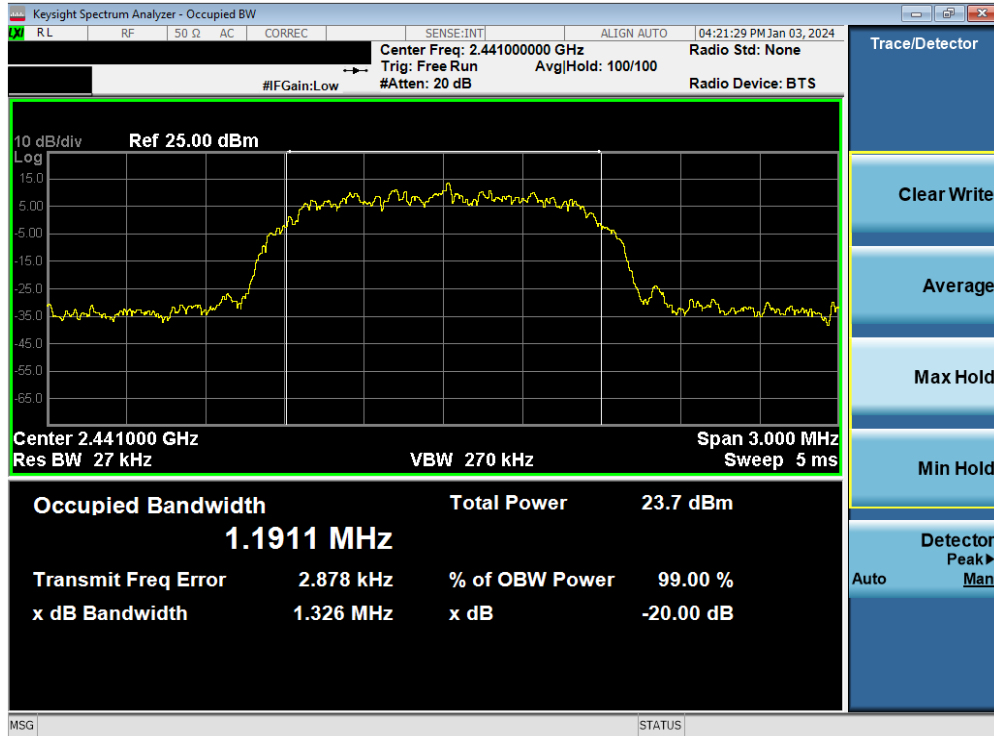


Plot 7-12. 20dB Bandwidth Plot (Bluetooth, 1Mbps – Ch. 78)

FCC ID: «FCC_ID» IC: 3048A-2085		MEASUREMENT REPORT («APPLICATION_TYPE»)		Approved by: Technical Manager
Test Report S/N: «Report_SN_BT_FCC»	Test Dates: «Date_of_Testing»	EUT Type: «EUT_Type»		Page 19 of 137

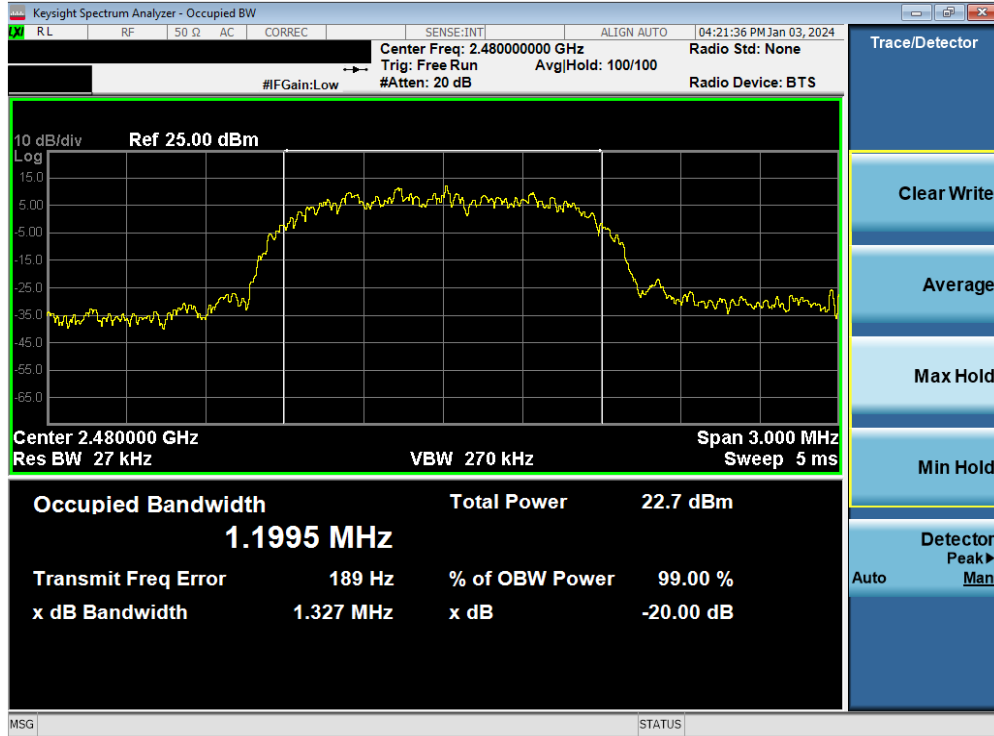


Plot 7-13. 20dB Bandwidth Plot (Bluetooth, 2Mbps – Ch. 0)

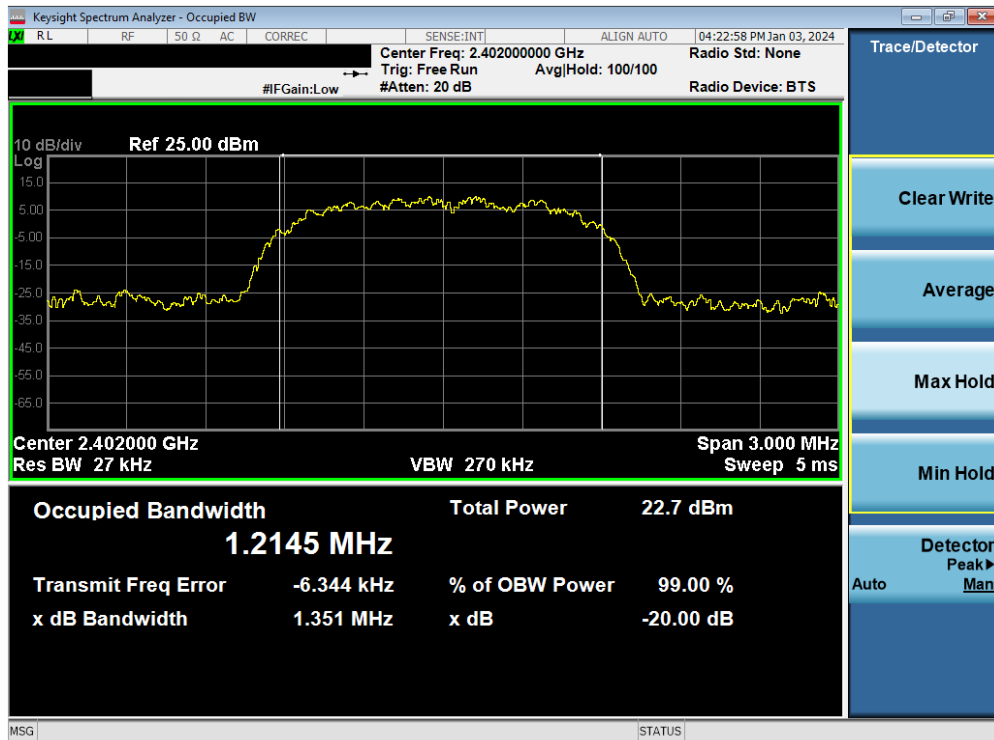


Plot 7-14. 20dB Bandwidth Plot (Bluetooth, 2Mbps – Ch. 39)

FCC ID: «FCC_ID» IC: 3048A-2085	MEASUREMENT REPORT («APPLICATION_TYPE»)		Approved by: Technical Manager
Test Report S/N: «Report_SN_BT_FCC»	Test Dates: «Date_of_Testing»	EUT Type: «EUT_Type»	Page 20 of 137

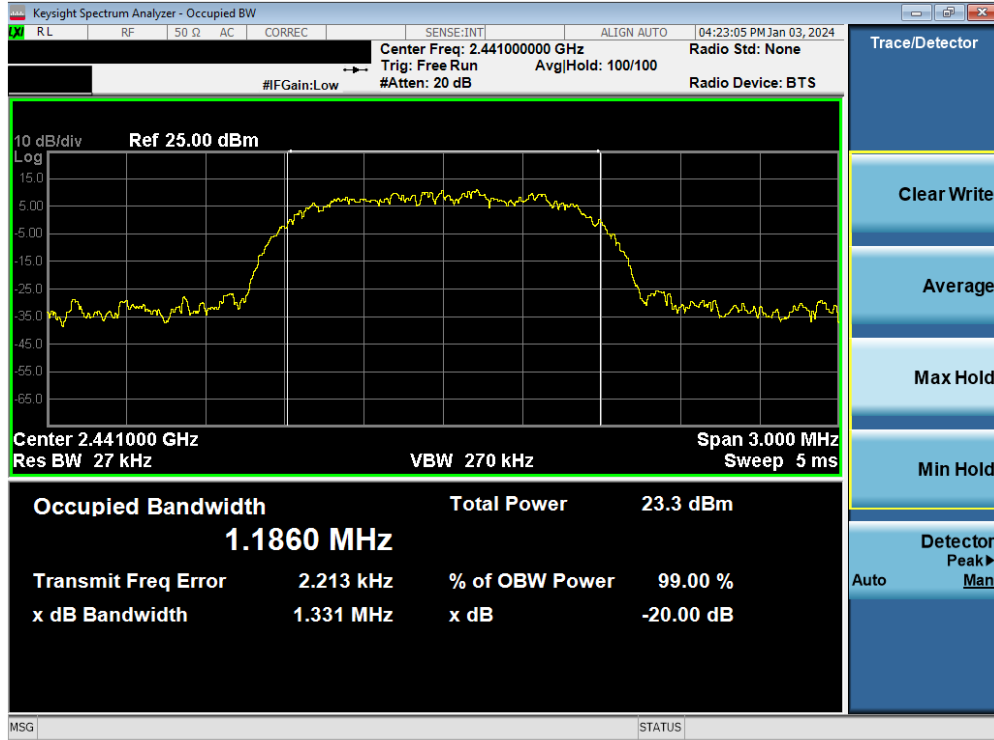


Plot 7-15. 20dB Bandwidth Plot (Bluetooth, 2Mbps – Ch. 78)

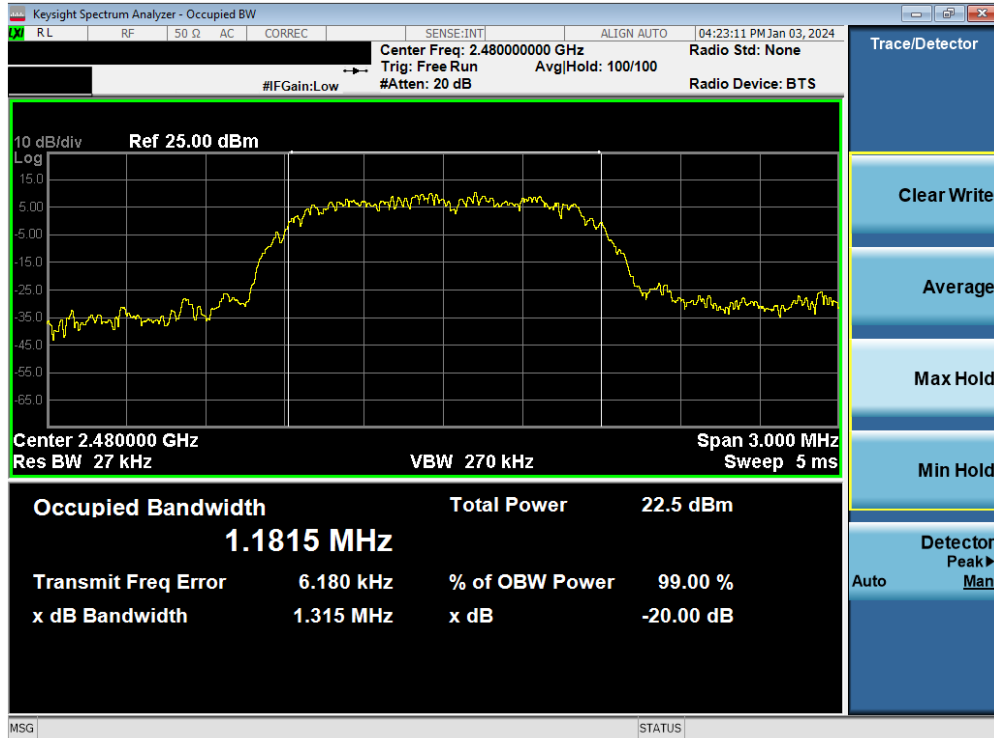


Plot 7-16. 20dB Bandwidth Plot (Bluetooth, 3Mbps – Ch. 0)

FCC ID: «FCC_ID» IC: 3048A-2085	MEASUREMENT REPORT («APPLICATION_TYPE»)		Approved by: Technical Manager
Test Report S/N: «Report_SN_BT_FCC»	Test Dates: «Date_of_Testing»	EUT Type: «EUT_Type»	Page 21 of 137



Plot 7-17. 20dB Bandwidth Plot (Bluetooth, 3Mbps – Ch. 39)

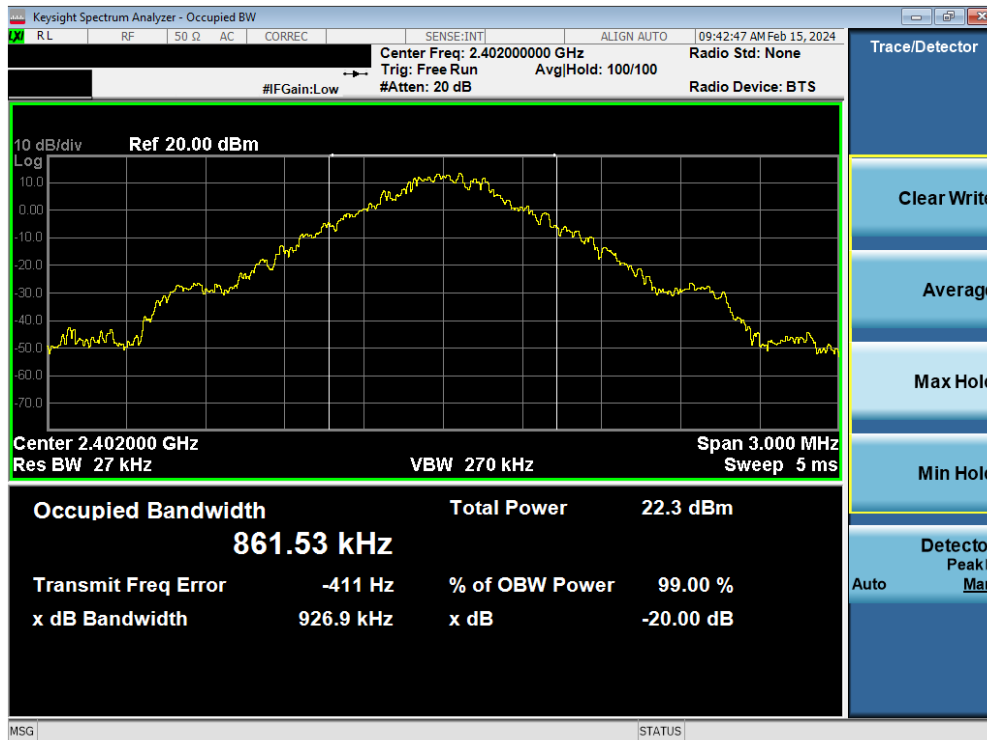


Plot 7-18. 20dB Bandwidth Plot (Bluetooth, 3Mbps – Ch. 78)

FCC ID: «FCC_ID» IC: 3048A-2085	MEASUREMENT REPORT («APPLICATION_TYPE»)		Approved by: Technical Manager
Test Report S/N: «Report_SN_BT_FCC»	Test Dates: «Date_of_Testing»	EUT Type: «EUT_Type»	Page 22 of 137

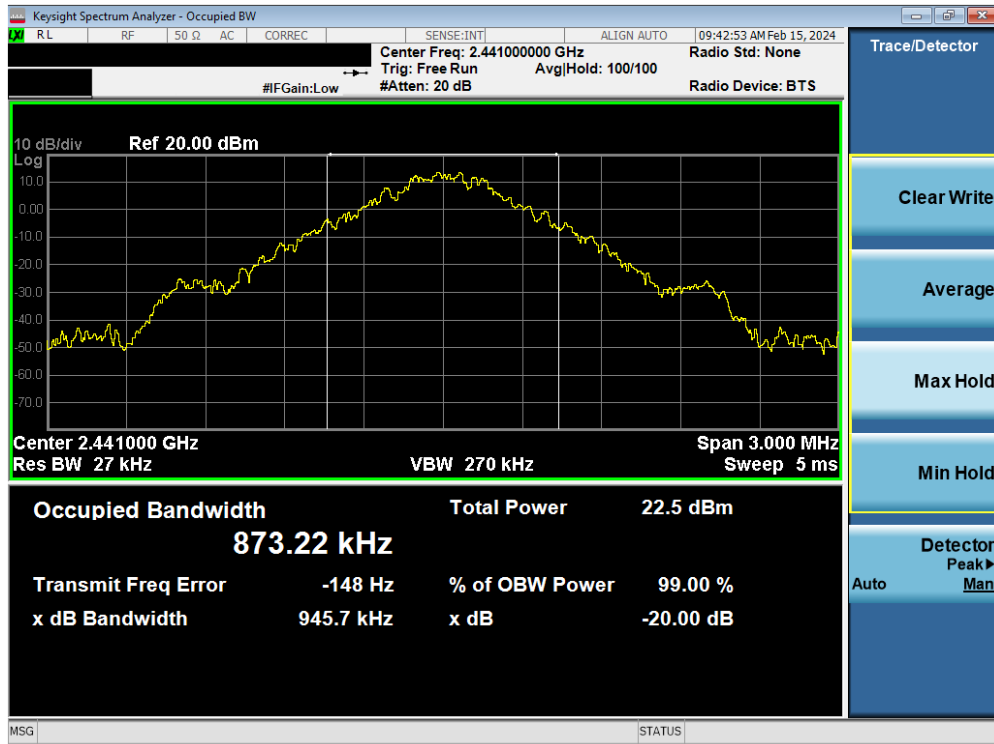
Frequency [MHz]	Data Rate [Mbps]	Mod.	Channel No.	20dB Bandwidth Test Results [kHz]
2402	1.0	GFSK	0	926.90
2441	1.0	GFSK	39	945.70
2480	1.0	GFSK	78	894.50
2402	2.0	$\pi/4$ -DQPSK	0	1338.00
2441	2.0	$\pi/4$ -DQPSK	39	1316.00
2480	2.0	$\pi/4$ -DQPSK	78	1345.00
2402	3.0	8DPSK	0	1346.00
2441	3.0	8DPSK	39	1297.00
2480	3.0	8DPSK	78	1345.00

Table 7-4. Conducted 20dB Bandwidth Measurements – DUAL ANT1

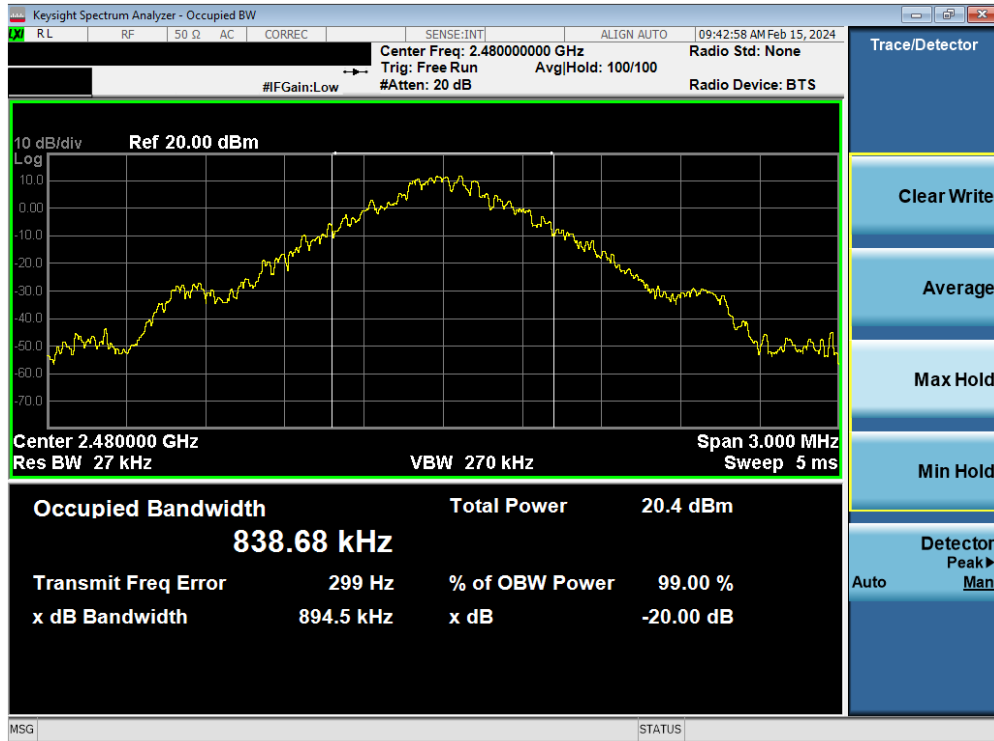


Plot 7-19. 20dB Bandwidth Plot (Bluetooth, 1Mbps – Ch. 0)

FCC ID: «FCC_ID» IC: 3048A-2085	MEASUREMENT REPORT («APPLICATION_TYPE»)		Approved by: Technical Manager
Test Report S/N: «Report_SN_BT_FCC»	Test Dates: «Date_of_Testing»	EUT Type: «EUT_Type»	Page 23 of 137

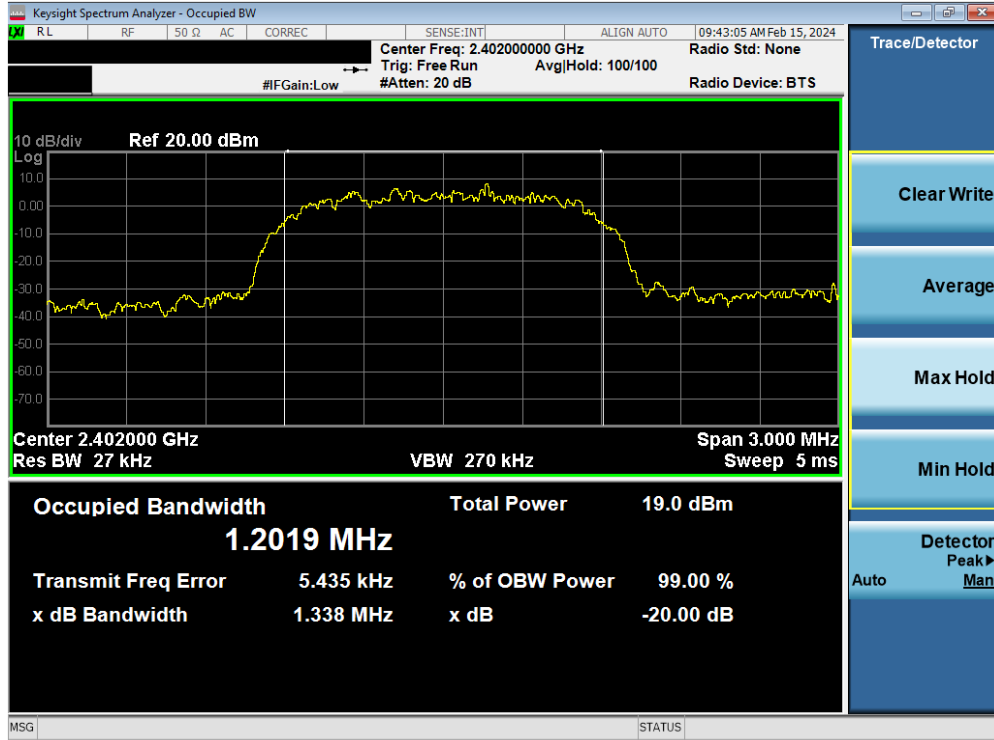


Plot 7-20. 20dB Bandwidth Plot (Bluetooth, 1Mbps – Ch. 39)

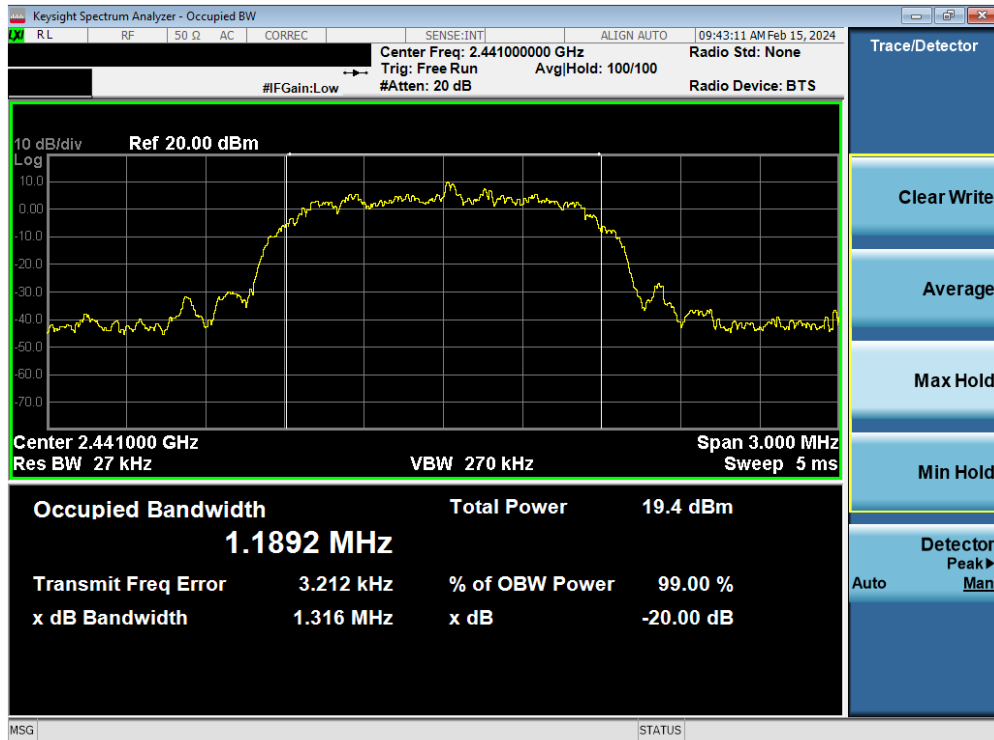


Plot 7-21. 20dB Bandwidth Plot (Bluetooth, 1Mbps – Ch. 78)

FCC ID: «FCC_ID» IC: 3048A-2085	MEASUREMENT REPORT («APPLICATION_TYPE»)		Approved by: Technical Manager
Test Report S/N: «Report_SN_BT_FCC»	Test Dates: «Date_of_Testing»	EUT Type: «EUT_Type»	Page 24 of 137

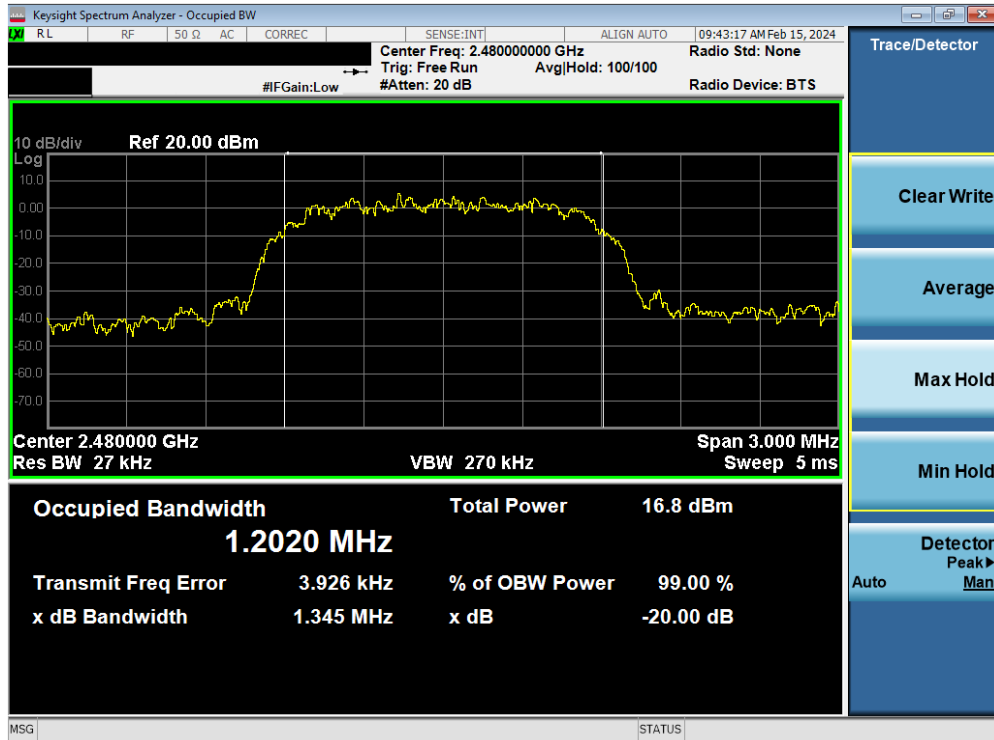


Plot 7-22. 20dB Bandwidth Plot (Bluetooth, 2Mbps – Ch. 0)

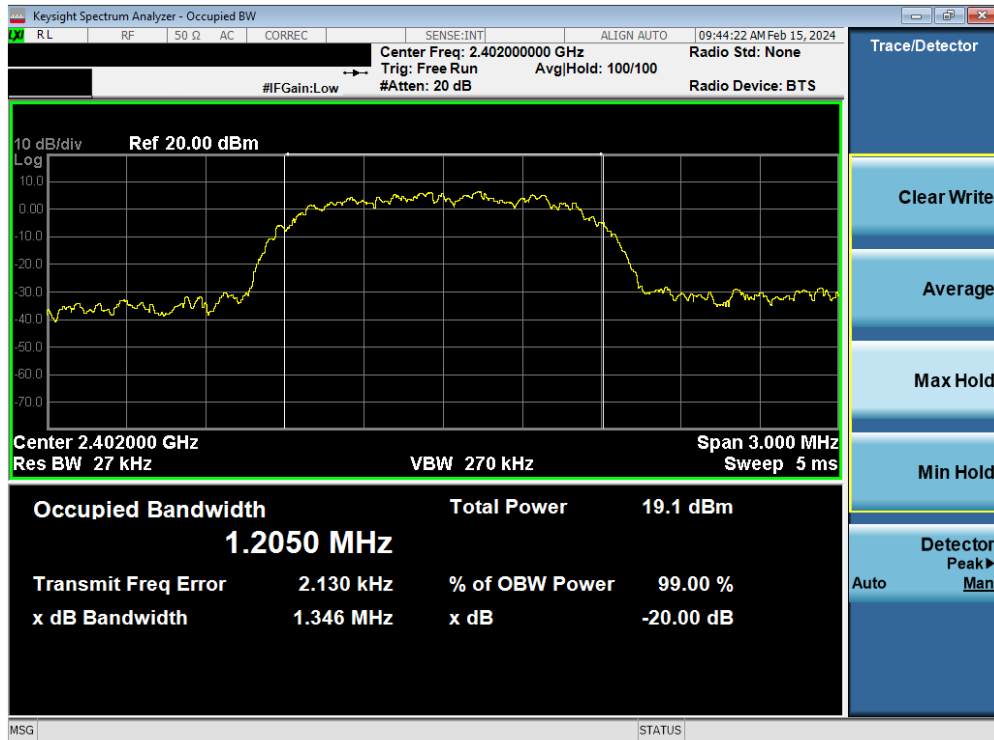


Plot 7-23. 20dB Bandwidth Plot (Bluetooth, 2Mbps – Ch. 39)

FCC ID: «FCC_ID» IC: 3048A-2085	MEASUREMENT REPORT («APPLICATION_TYPE»)		Approved by: Technical Manager
Test Report S/N: «Report_SN_BT_FCC»	Test Dates: «Date_of_Testing»	EUT Type: «EUT_Type»	Page 25 of 137

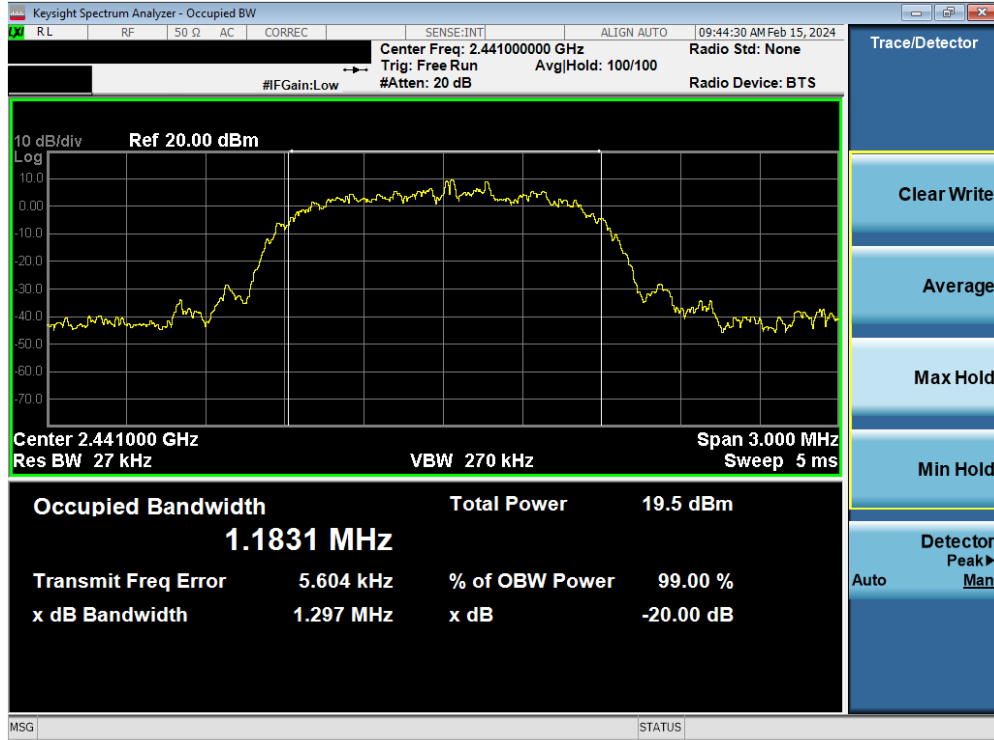


Plot 7-24. 20dB Bandwidth Plot (Bluetooth, 2Mbps – Ch. 78)

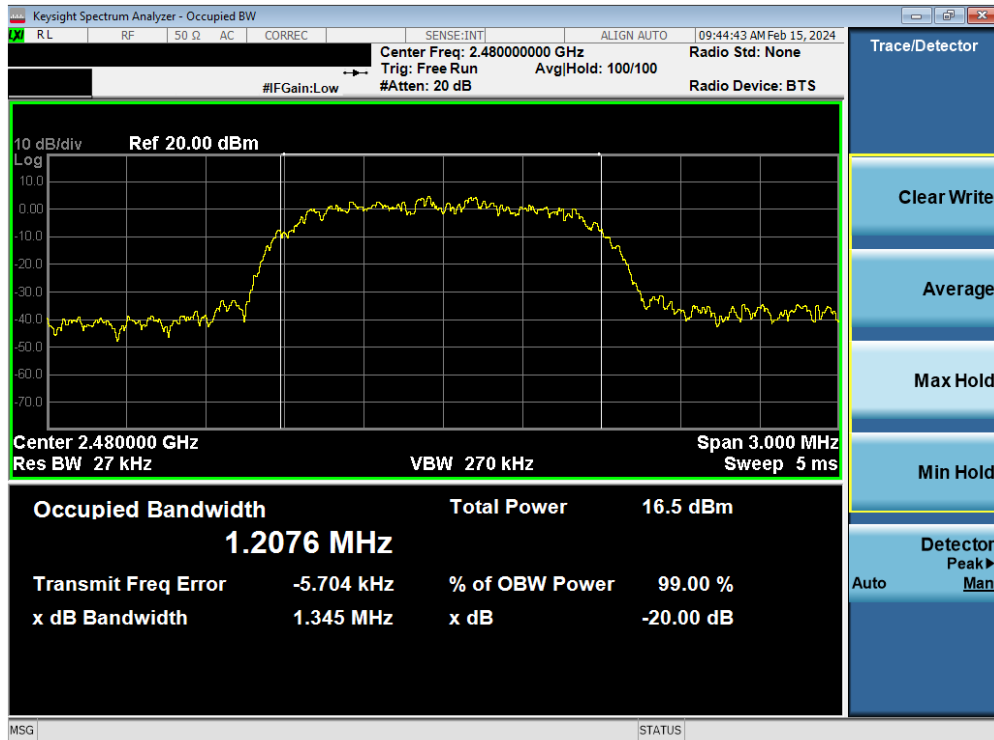


Plot 7-25. 20dB Bandwidth Plot (Bluetooth, 3Mbps – Ch. 0)

FCC ID: «FCC_ID» IC: 3048A-2085	MEASUREMENT REPORT («APPLICATION_TYPE»)		Approved by: Technical Manager
Test Report S/N: «Report_SN_BT_FCC»	Test Dates: «Date_of_Testing»	EUT Type: «EUT_Type»	Page 26 of 137



Plot 7-26. 20dB Bandwidth Plot (Bluetooth, 3Mbps – Ch. 39)

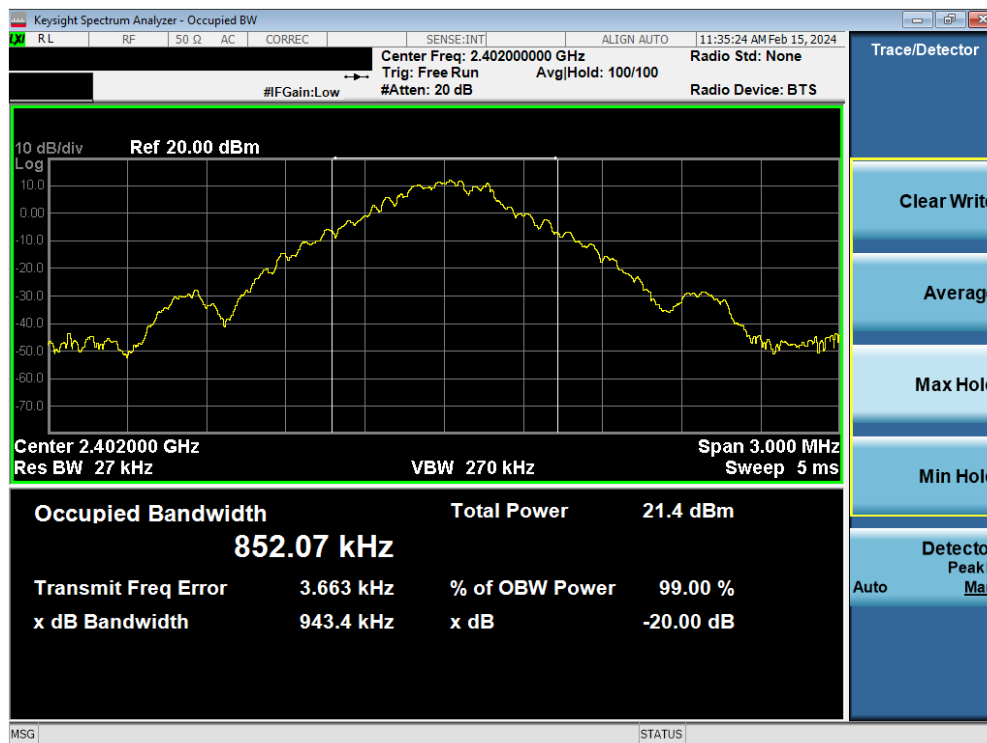


Plot 7-27. 20dB Bandwidth Plot (Bluetooth, 3Mbps – Ch. 78)

FCC ID: «FCC_ID» IC: 3048A-2085	MEASUREMENT REPORT («APPLICATION_TYPE»)		Approved by: Technical Manager
Test Report S/N: «Report_SN_BT_FCC»	Test Dates: «Date_of_Testing»	EUT Type: «EUT_Type»	Page 27 of 137

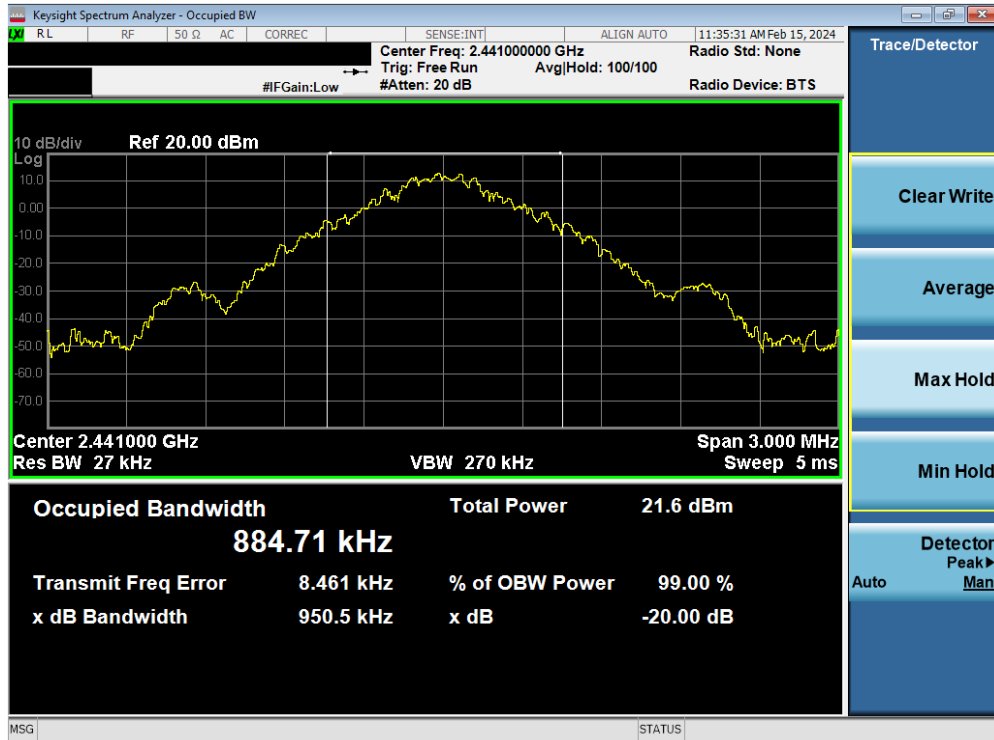
Frequency [MHz]	Data Rate [Mbps]	Mod.	Channel No.	20dB Bandwidth Test Results [kHz]
2402	1.0	GFSK	0	943.40
2441	1.0	GFSK	39	950.50
2480	1.0	GFSK	78	861.70
2402	2.0	$\pi/4$ -DQPSK	0	1339.00
2441	2.0	$\pi/4$ -DQPSK	39	1335.00
2480	2.0	$\pi/4$ -DQPSK	78	1337.00
2402	3.0	8DPSK	0	1307.00
2441	3.0	8DPSK	39	1327.00
2480	3.0	8DPSK	78	1272.00

Table 7-5. Conducted 20dB Bandwidth Measurements – DUAL ANT2

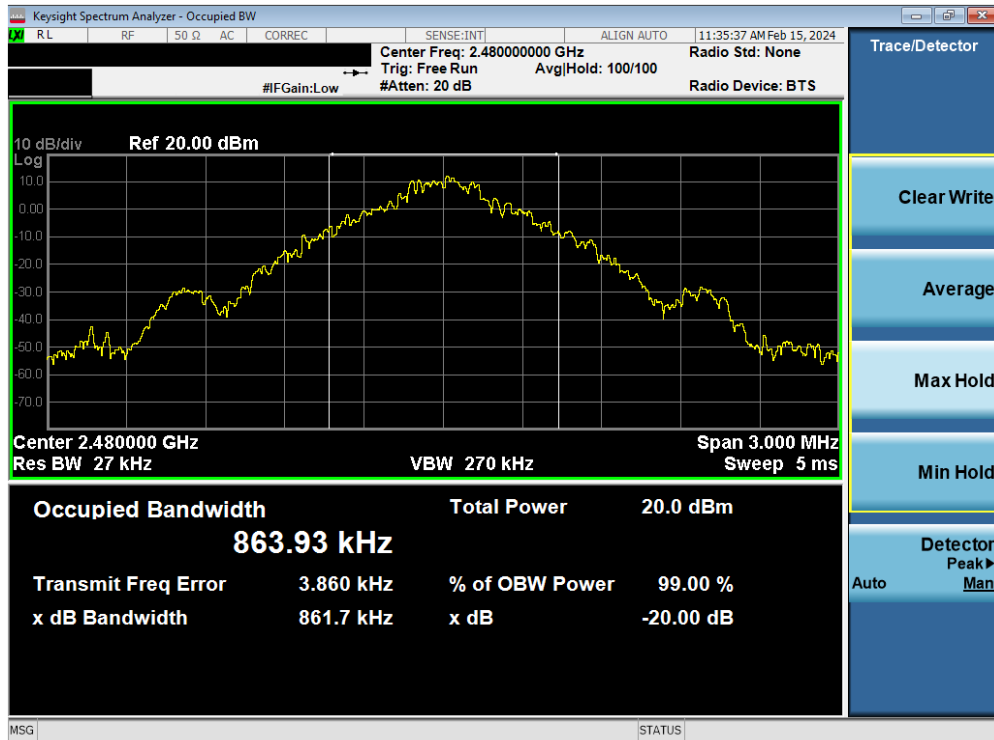


Plot 7-28. 20dB Bandwidth Plot (Bluetooth, 1Mbps – Ch. 0)

FCC ID: «FCC_ID» IC: 3048A-2085	MEASUREMENT REPORT («APPLICATION_TYPE»)		Approved by: Technical Manager
Test Report S/N: «Report_SN_BT_FCC»	Test Dates: «Date_of_Testing»	EUT Type: «EUT_Type»	Page 28 of 137

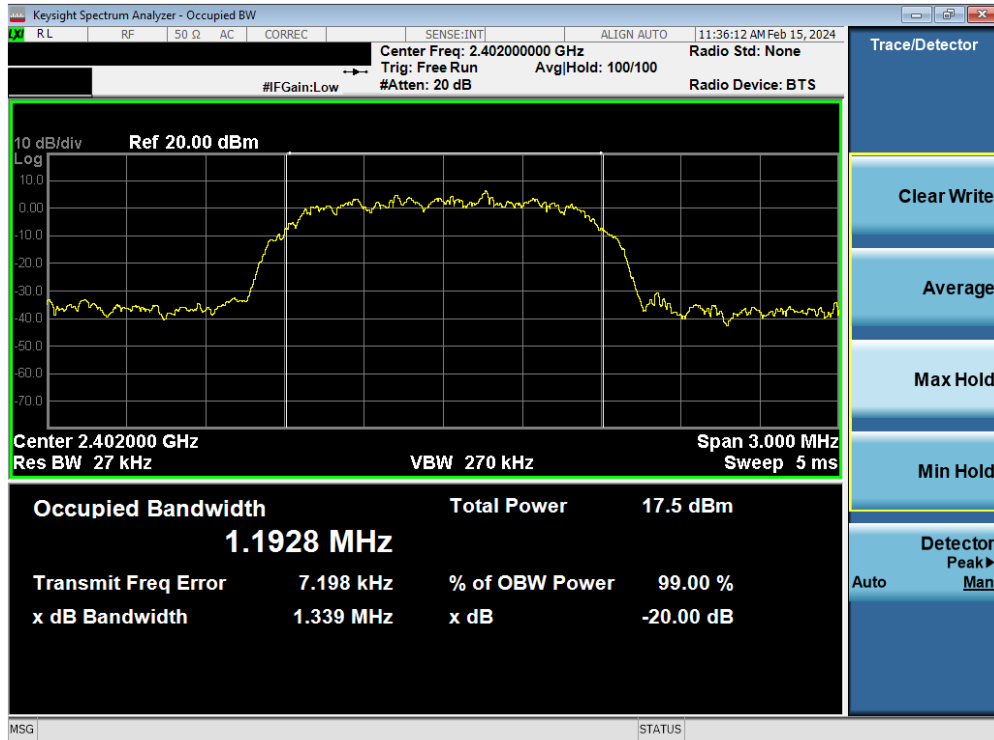


Plot 7-29. 20dB Bandwidth Plot (Bluetooth, 1Mbps – Ch. 39)

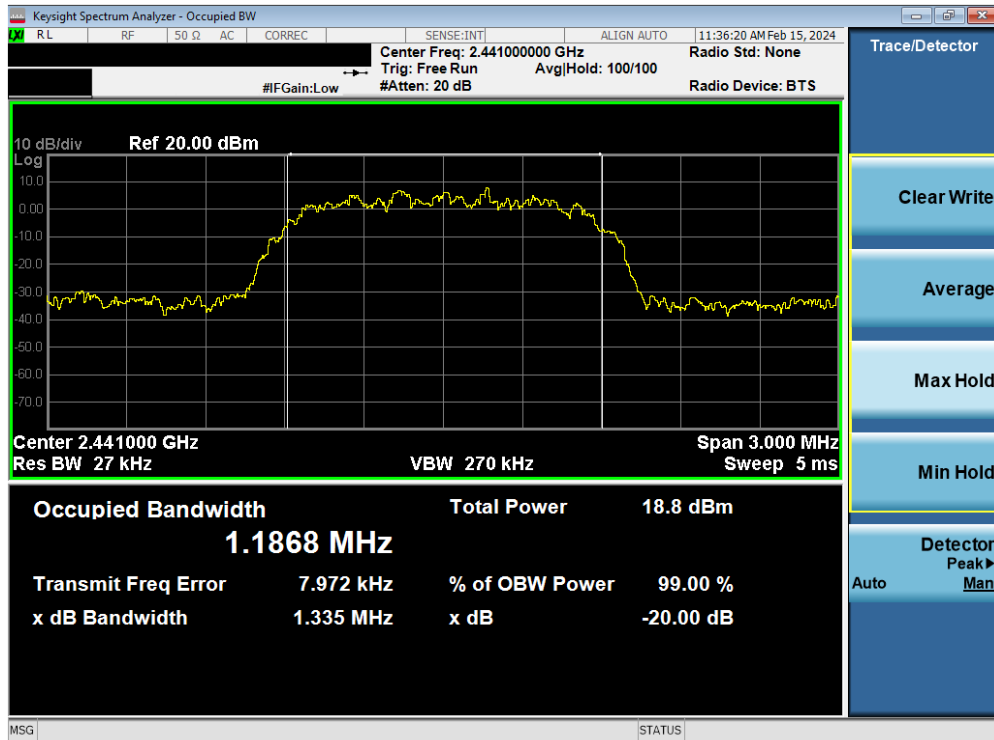


Plot 7-30. 20dB Bandwidth Plot (Bluetooth, 1Mbps – Ch. 78)

FCC ID: «FCC_ID» IC: 3048A-2085	MEASUREMENT REPORT («APPLICATION_TYPE»)		Approved by: Technical Manager
Test Report S/N: «Report_SN_BT_FCC»	Test Dates: «Date_of_Testing»	EUT Type: «EUT_Type»	Page 29 of 137

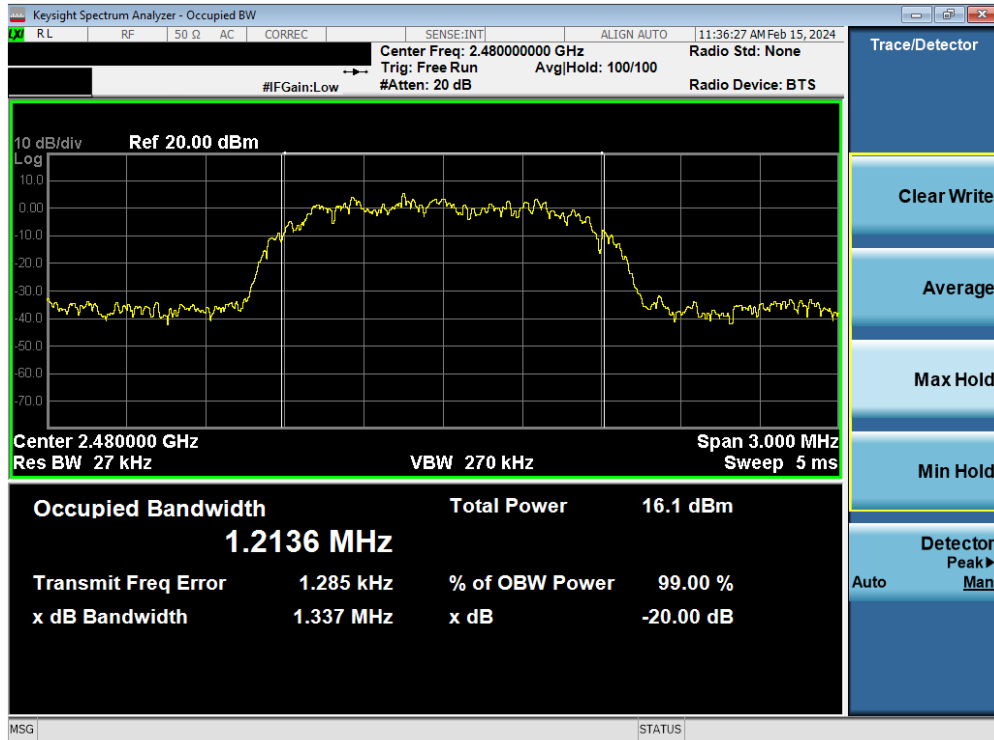


Plot 7-31. 20dB Bandwidth Plot (Bluetooth, 2Mbps – Ch. 0)

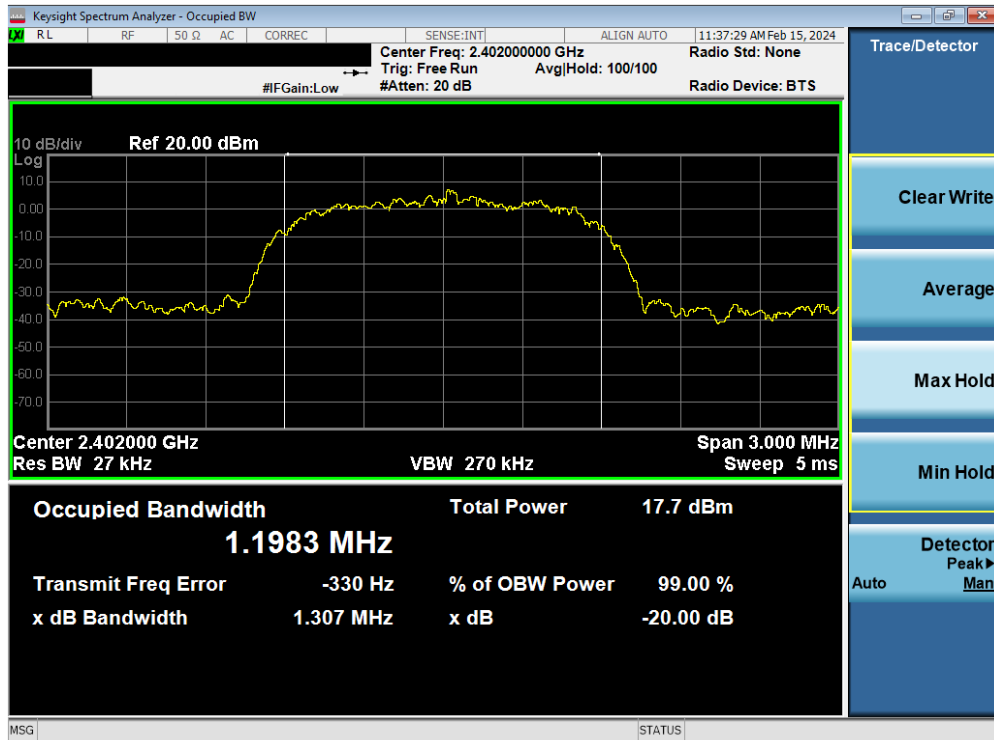


Plot 7-32. 20dB Bandwidth Plot (Bluetooth, 2Mbps – Ch. 39)

FCC ID: «FCC_ID» IC: 3048A-2085	MEASUREMENT REPORT («APPLICATION_TYPE»)		Approved by: Technical Manager
Test Report S/N: «Report_SN_BT_FCC»	Test Dates: «Date_of_Testing»	EUT Type: «EUT_Type»	Page 30 of 137

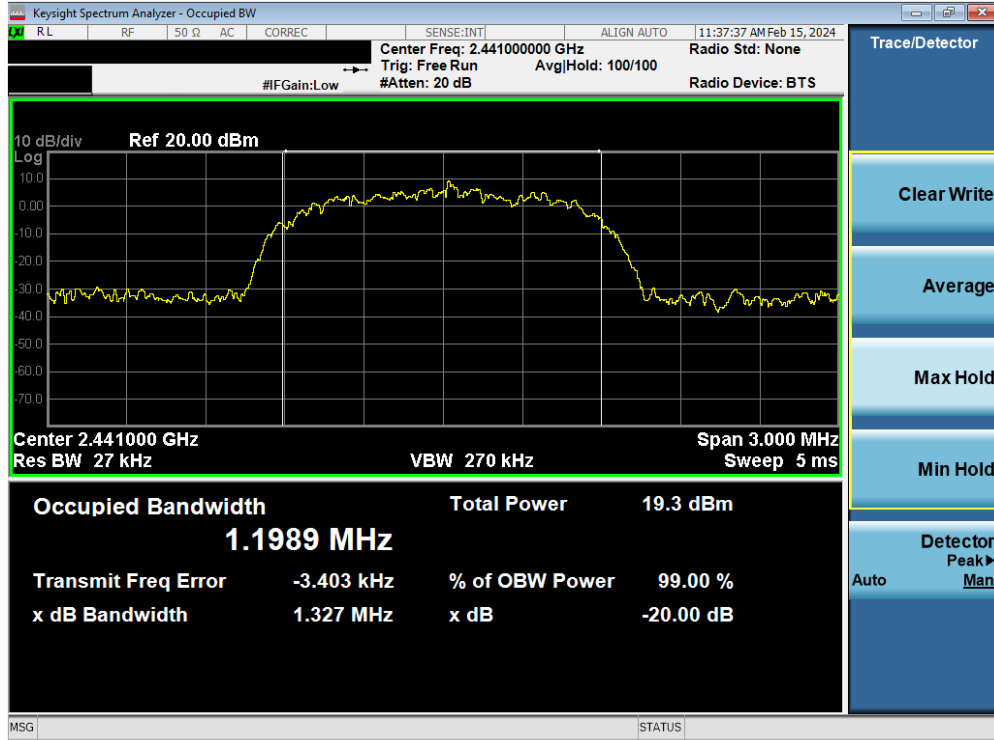


Plot 7-33. 20dB Bandwidth Plot (Bluetooth, 2Mbps – Ch. 78)

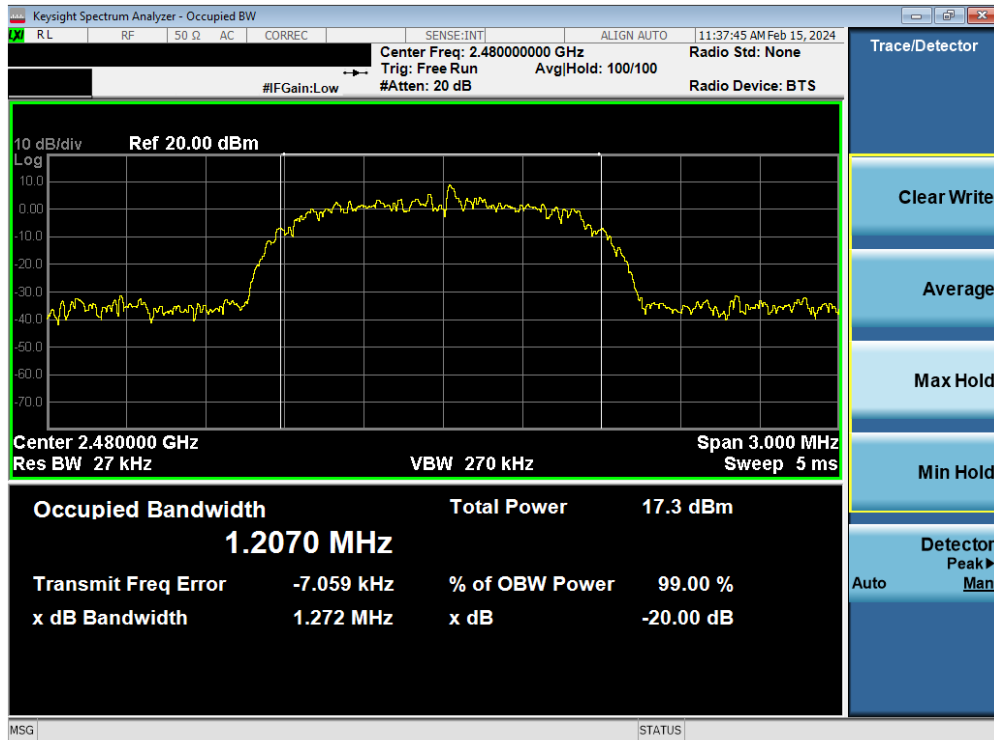


Plot 7-34. 20dB Bandwidth Plot (Bluetooth, 3Mbps – Ch. 0)

FCC ID: «FCC_ID» IC: 3048A-2085	MEASUREMENT REPORT («APPLICATION_TYPE»)		Approved by: Technical Manager
Test Report S/N: «Report_SN_BT_FCC»	Test Dates: «Date_of_Testing»	EUT Type: «EUT_Type»	Page 31 of 137



Plot 7-35. 20dB Bandwidth Plot (Bluetooth, 3Mbps – Ch. 39)



Plot 7-36. 20dB Bandwidth Plot (Bluetooth, 3Mbps – Ch. 78)

FCC ID: «FCC_ID» IC: 3048A-2085	MEASUREMENT REPORT («APPLICATION_TYPE»)		Approved by: Technical Manager
Test Report S/N: «Report_SN_BT_FCC»	Test Dates: «Date_of_Testing»	EUT Type: «EUT_Type»	Page 32 of 137

7.3 Output Power Measurement

§15.247 (b.1); RSS-247 [5.4(2)]

Test Overview and Limits

Measurement is made while the EUT is operating in non-hopping transmission mode. The powers shown below were measured using a spectrum analyzer with a Bluetooth signaling test set (Agilent Model: N4010A) used only to maintain a Bluetooth link with the EUT. Average power measurements are performed using the analyzer's "burst power" function with RBW = 3MHz. The burst power function triggers on a single set burst set to maximum power and measures the maximum average power on the on-time.

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

Test Procedure Used

ANSI C63.10-2013 – Section 7.8.5

ANSI C63.10-2013 – Section 11.9.2.3.2 method AVGPM-G

Test Settings

Peak Power Measurement

1. Span = approximately 5x 20dB bandwidth, centered on hopping channel
2. RBW > 20dB bandwidth of emission being measured
3. VBW ≥ RBW
4. Sweep = auto
5. Detector = peak
6. Trace mode = max hold
7. The trace was allowed to stabilize

Test Setup

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



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

FCC ID: «FCC_ID» IC: 3048A-2085		MEASUREMENT REPORT («APPLICATION_TYPE»)		Approved by: Technical Manager
Test Report S/N: «Report_SN_BT_FCC»	Test Dates: «Date_of_Testing»	EUT Type: «EUT_Type»		Page 33 of 137



Note

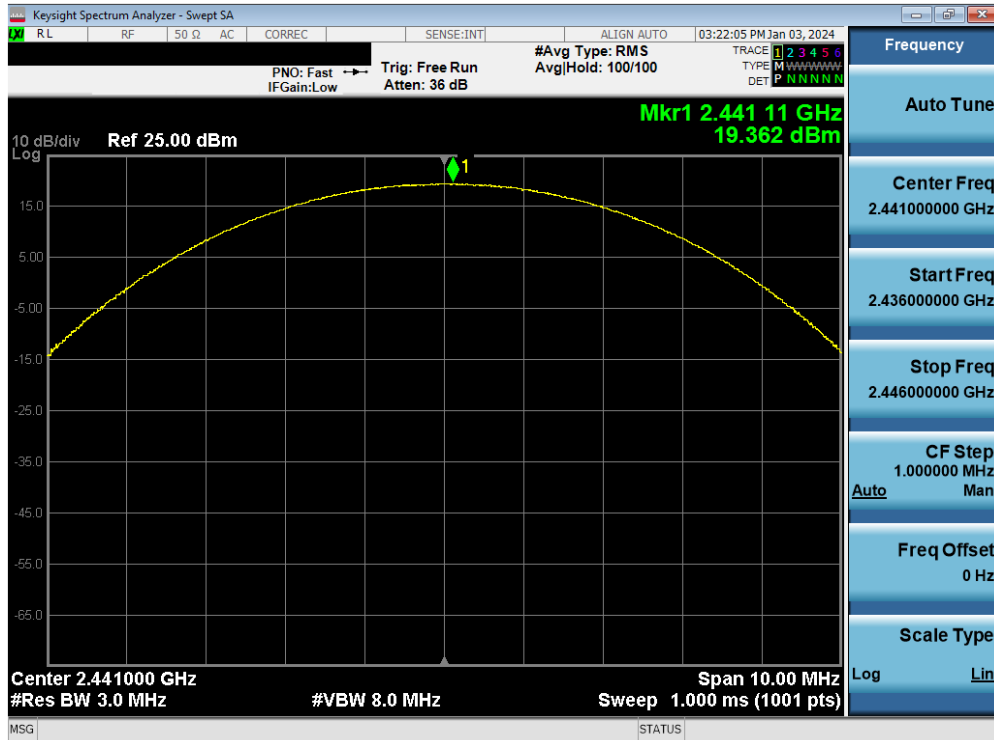
This unit was tested with all possible data rates and the highest peak power is reported with the unit transmitting at 1Mbps. The EUT was tested for the average power with a broadband power meter for reporting purposes only. Final results were obtained using calibrated couplers, attenuators and cables. The following formula was used:

$$\text{Output Power (dBm)} = \text{Raw Analyzer Level (dBm)} + \text{Cable Loss (dB)} + \text{Loss in Directional Coupler/Insertion Loss (dB)}$$

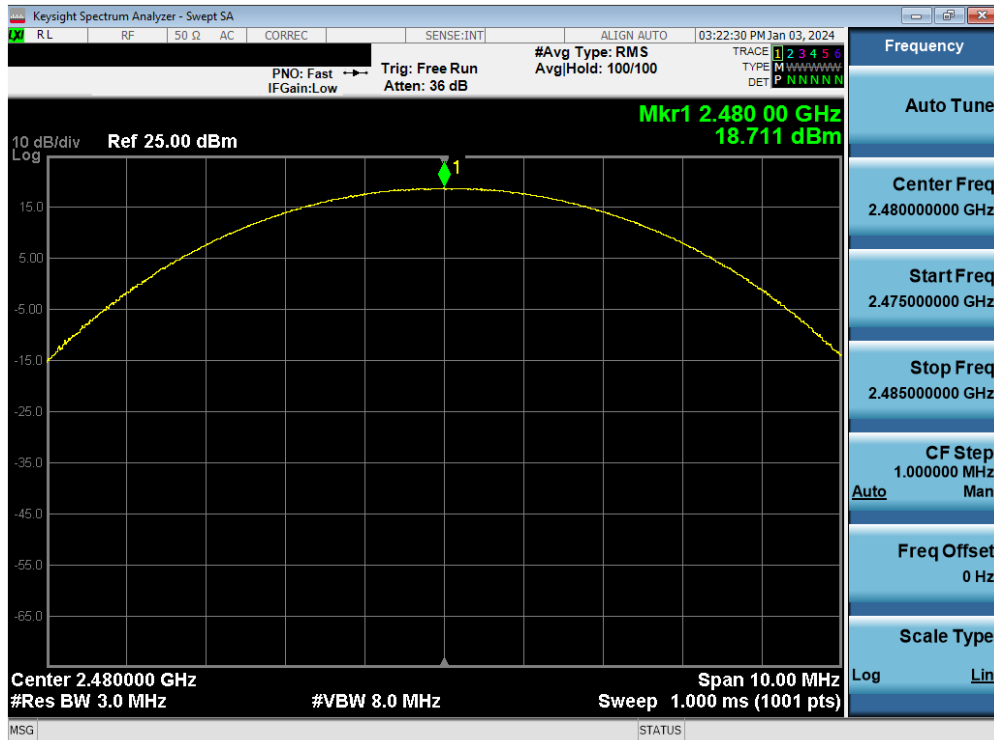
Frequency [MHz]	Data Rate [Mbps]	Channel No.	Peak Conducted Power		Avg Conducted Power		Ant. Gain [dBi]	EIRP	Limit	Margin
			[dBm]	[mW]	[dBm]	[mW]				
2402	1.0	0	19.69	93.025	19.21	83.279	2.30	21.99	36.02	-14.03
2441	1.0	39	20.13	103.039	19.77	94.838	2.30	22.43	36.02	-13.59
2480	1.0	78	19.64	92.024	18.82	76.174	2.30	21.94	36.02	-14.08
2402	2.0	0	18.82	76.173	16.07	40.492	2.30	21.12	36.02	-14.90
2441	2.0	39	19.36	86.338	16.35	43.114	2.30	21.66	36.02	-14.36
2480	2.0	78	18.71	74.319	15.60	36.281	2.30	21.01	36.02	-15.01
2402	3.0	0	19.88	97.364	16.07	40.459	2.30	22.18	36.02	-13.84
2441	3.0	39	19.97	99.380	16.42	43.817	2.30	22.27	36.02	-13.75
2480	3.0	78	19.28	84.645	15.65	36.764	2.30	21.58	36.02	-14.44

Table 7-6. Conducted Output Power Measurements – SISO ANT1

FCC ID: «FCC_ID» IC: 3048A-2085	MEASUREMENT REPORT («APPLICATION_TYPE»)		Approved by: Technical Manager
Test Report S/N: «Report_SN_BT_FCC»	Test Dates: «Date_of_Testing»	EUT Type: «EUT_Type»	Page 34 of 137

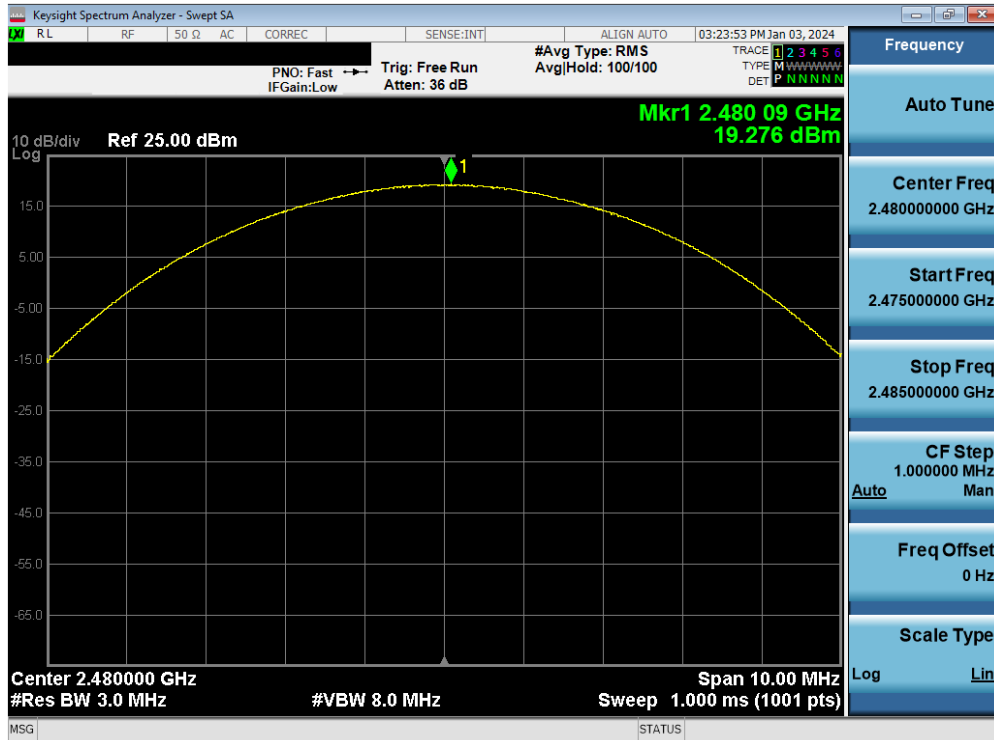


Plot 7-41. Peak Conducted Power (2Mbps – Ch. 39)



Plot 7-42. Peak Conducted Power (2Mbps – Ch. 78)

FCC ID: «FCC_ID» IC: 3048A-2085	MEASUREMENT REPORT («APPLICATION_TYPE»)		Approved by: Technical Manager
Test Report S/N: «Report_SN_BT_FCC»	Test Dates: «Date_of_Testing»	EUT Type: «EUT_Type»	Page 37 of 137

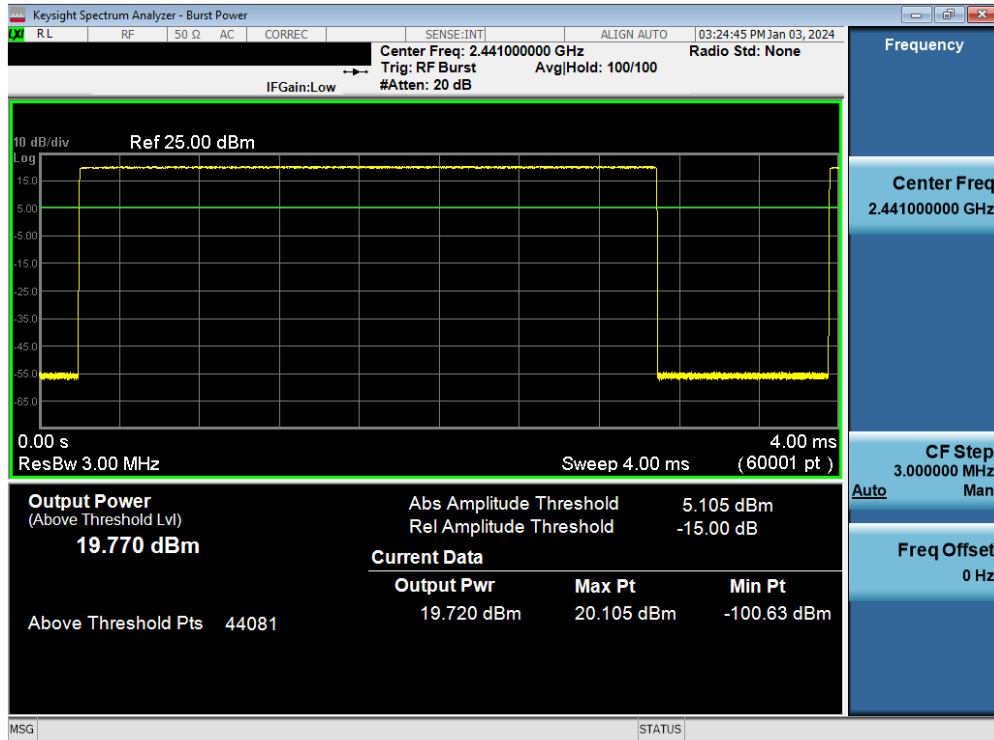


Plot 7-45. Peak Conducted Power (3Mbps – Ch. 78)

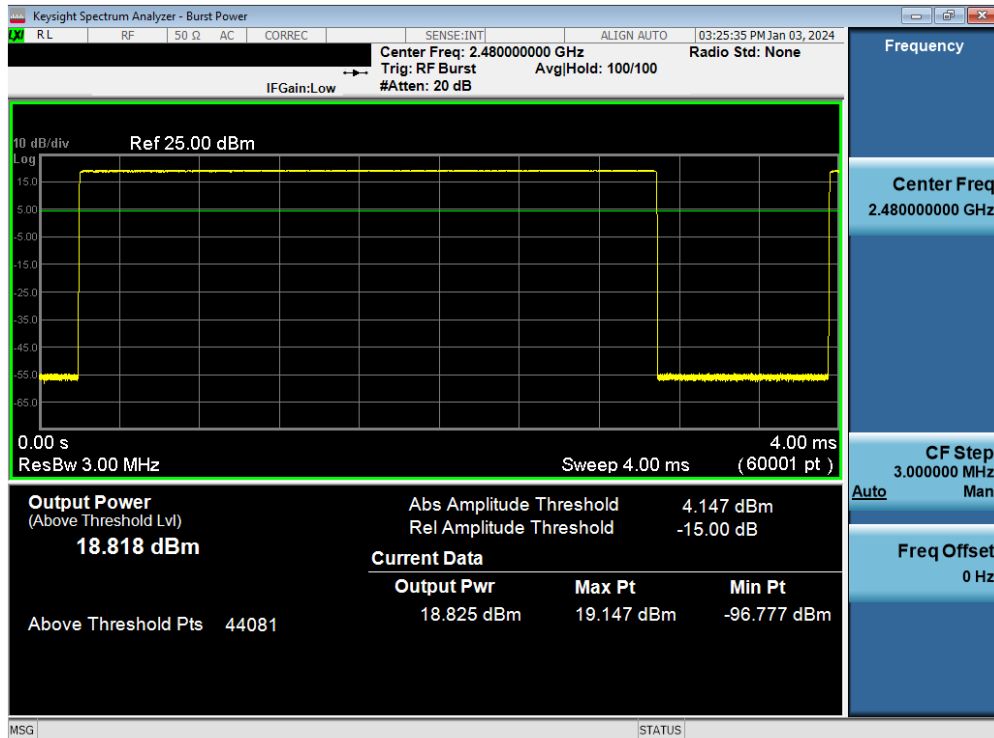


Plot 7-46. Average Conducted Power (1Mbps – Ch. 0)

FCC ID: «FCC_ID» IC: 3048A-2085	MEASUREMENT REPORT («APPLICATION_TYPE»)		Approved by: Technical Manager
Test Report S/N: «Report_SN_BT_FCC»	Test Dates: «Date_of_Testing»	EUT Type: «EUT_Type»	Page 39 of 137

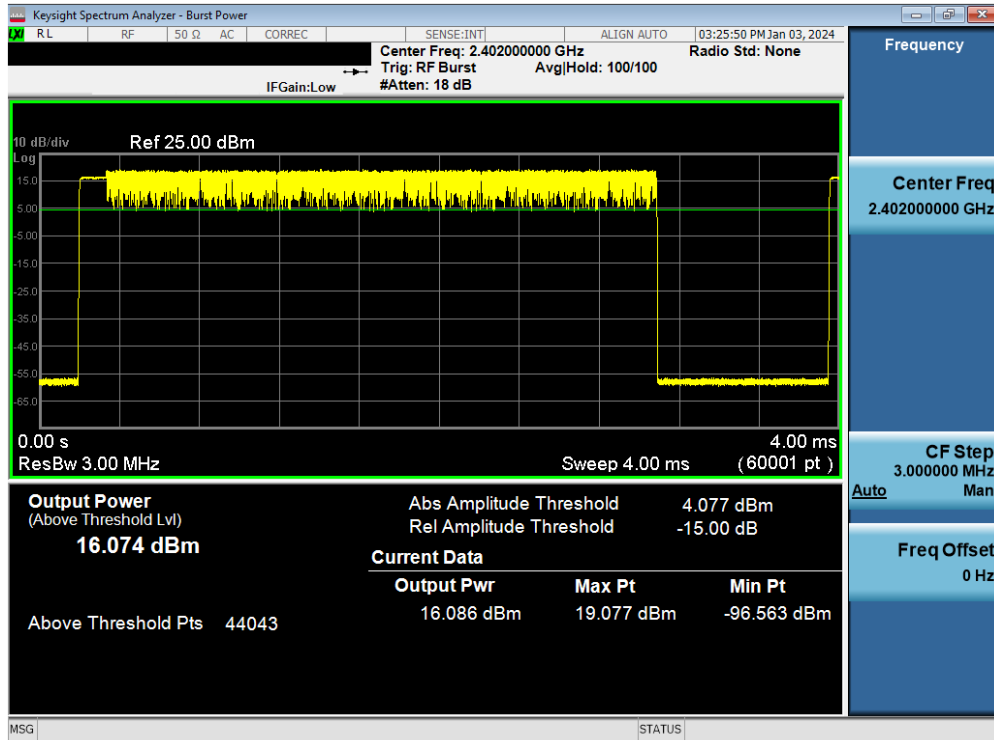


Plot 7-47. Average Conducted Power (1Mbps – Ch. 39)

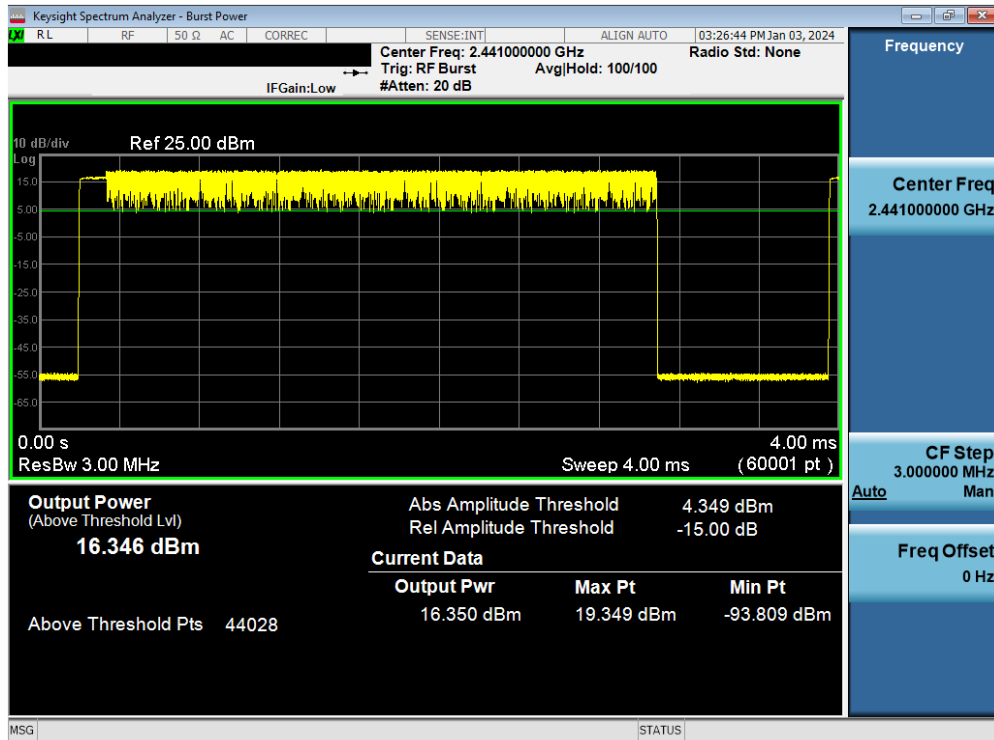


Plot 7-48. Average Conducted Power (1Mbps – Ch. 78)

FCC ID: «FCC_ID» IC: 3048A-2085	MEASUREMENT REPORT («APPLICATION_TYPE»)		Approved by: Technical Manager
Test Report S/N: «Report_SN_BT_FCC»	Test Dates: «Date_of_Testing»	EUT Type: «EUT_Type»	Page 40 of 137

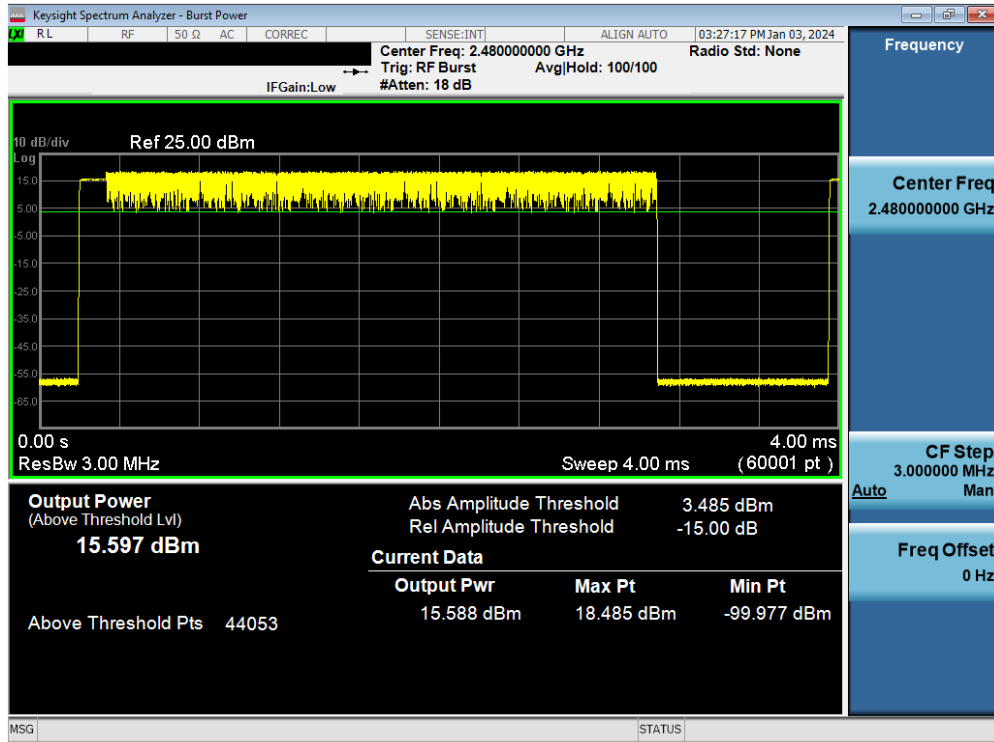


Plot 7-49. Average Conducted Power (2Mbps – Ch. 0)

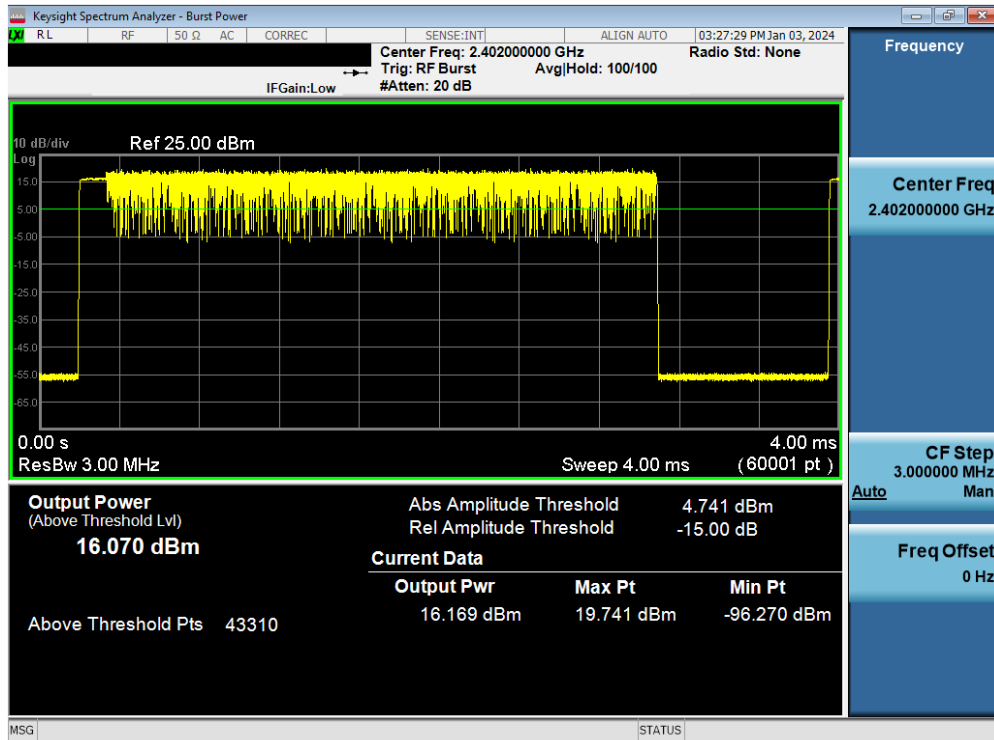


Plot 7-50. Average Conducted Power (2Mbps – Ch. 39)

FCC ID: «FCC_ID» IC: 3048A-2085	MEASUREMENT REPORT («APPLICATION_TYPE»)		Approved by: Technical Manager
Test Report S/N: «Report_SN_BT_FCC»	Test Dates: «Date_of_Testing»	EUT Type: «EUT_Type»	Page 41 of 137

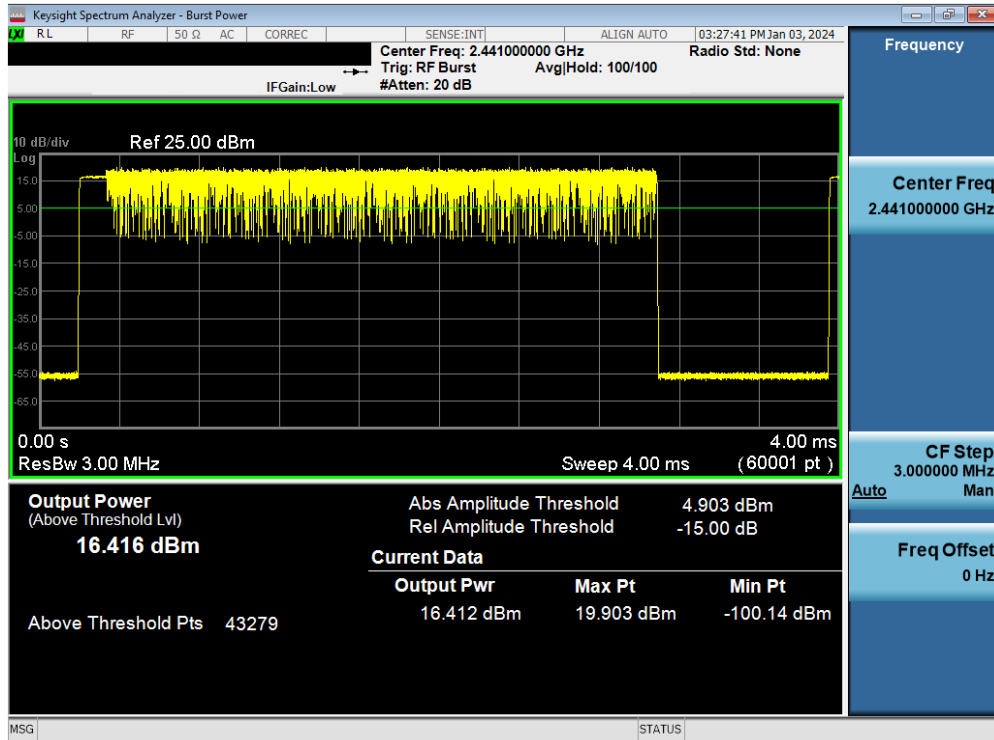


Plot 7-51. Average Conducted Power (2Mbps – Ch. 78)

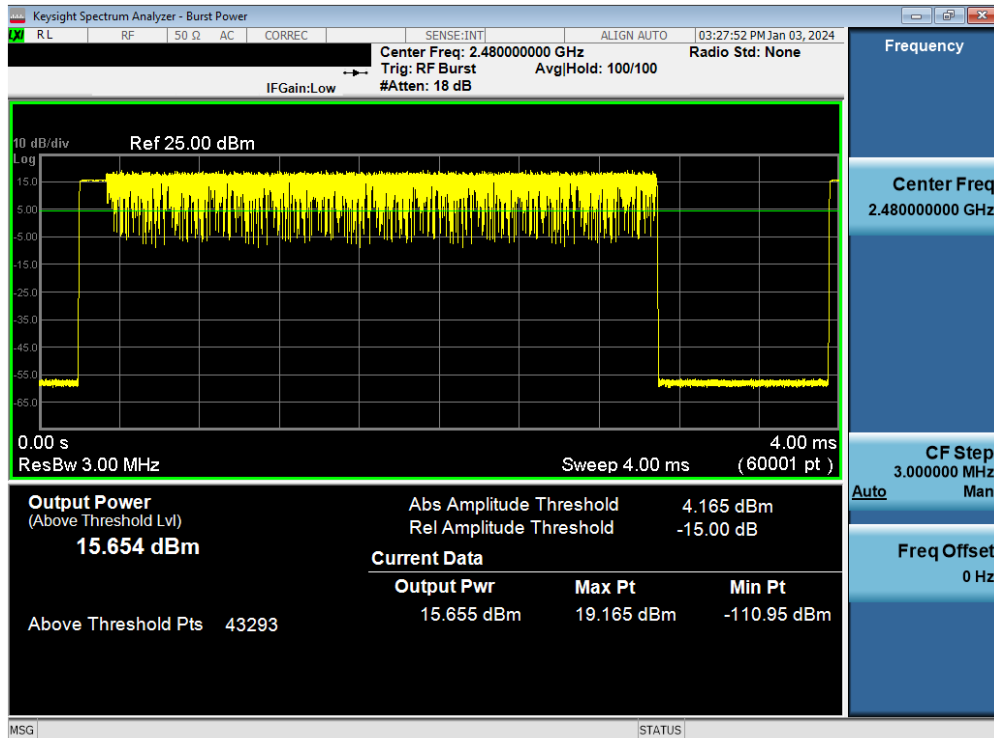


Plot 7-52. Average Conducted Power (3Mbps – Ch. 0)

FCC ID: «FCC_ID» IC: 3048A-2085	MEASUREMENT REPORT («APPLICATION_TYPE»)		Approved by: Technical Manager
Test Report S/N: «Report_SN_BT_FCC»	Test Dates: «Date_of_Testing»	EUT Type: «EUT_Type»	Page 42 of 137



Plot 7-53. Average Conducted Power (3Mbps – Ch. 39)

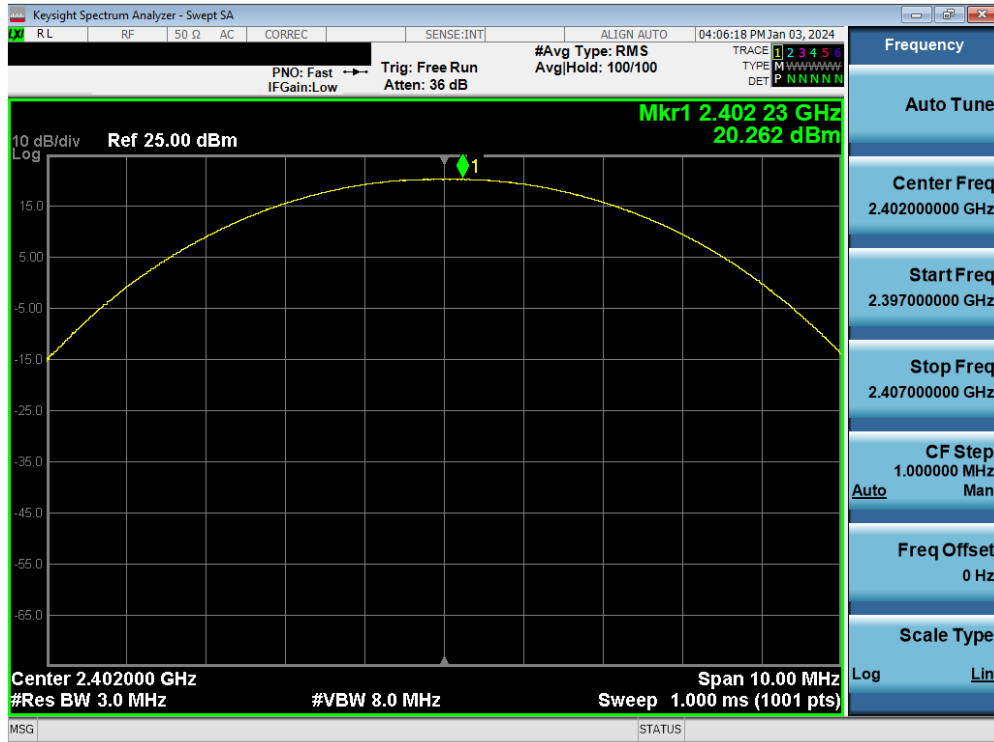


Plot 7-54. Average Conducted Power (3Mbps – Ch. 78)

FCC ID: «FCC_ID» IC: 3048A-2085	MEASUREMENT REPORT («APPLICATION_TYPE»)		Approved by: Technical Manager
Test Report S/N: «Report_SN_BT_FCC»	Test Dates: «Date_of_Testing»	EUT Type: «EUT_Type»	Page 43 of 137

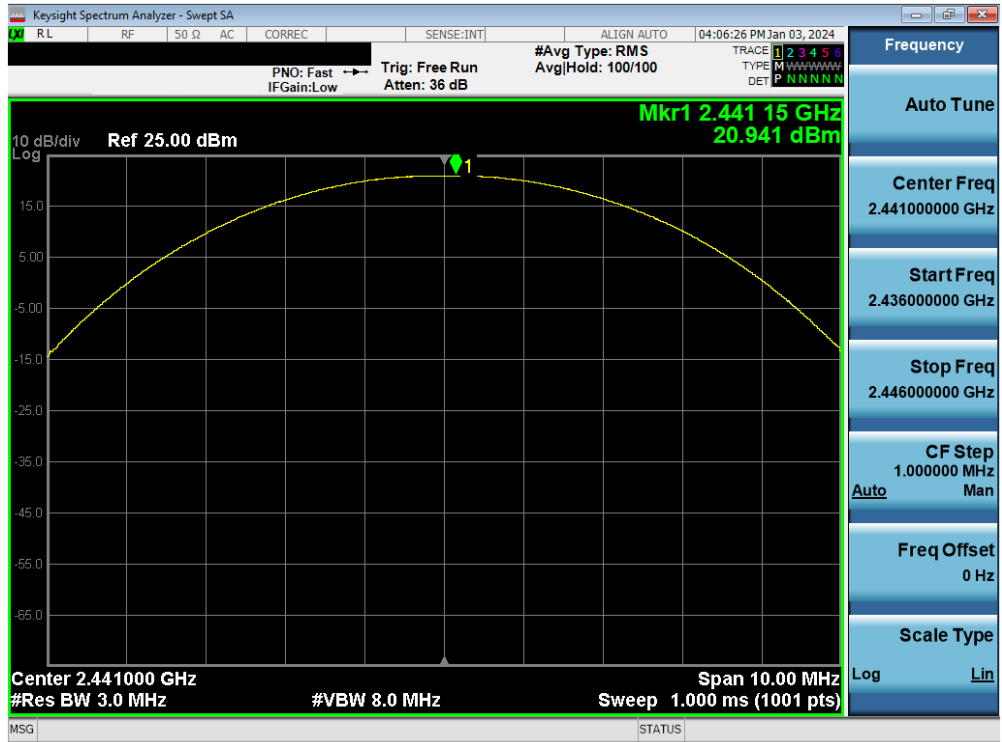
Frequency [MHz]	Data Rate [Mbps]	Channel No.	Peak Conducted Power		Avg Conducted Power		Ant. Gain [dBi]	EIRP	Limit	Margin
			[dBm]	[mW]	[dBm]	[mW]				
2402	1.0	0	20.26	106.218	20.13	103.130	0.30	20.56	36.02	-15.46
2441	1.0	39	20.94	124.194	20.58	114.168	0.30	21.24	36.02	-14.78
2480	1.0	78	20.51	112.409	20.06	101.285	0.30	20.81	36.02	-15.21
2402	2.0	0	18.43	69.631	16.60	45.690	0.30	18.73	36.02	-17.29
2441	2.0	39	19.58	90.824	17.07	50.876	0.30	19.88	36.02	-16.14
2480	2.0	78	19.74	94.254	16.71	46.920	0.30	20.04	36.02	-15.98
2402	3.0	0	19.02	79.708	16.69	46.707	0.30	19.32	36.02	-16.71
2441	3.0	39	20.28	106.758	17.12	51.502	0.30	20.58	36.02	-15.44
2480	3.0	78	20.25	105.925	16.77	47.538	0.30	20.55	36.02	-15.47

Table 7-7. Conducted Output Power Measurements – SISO ANT2

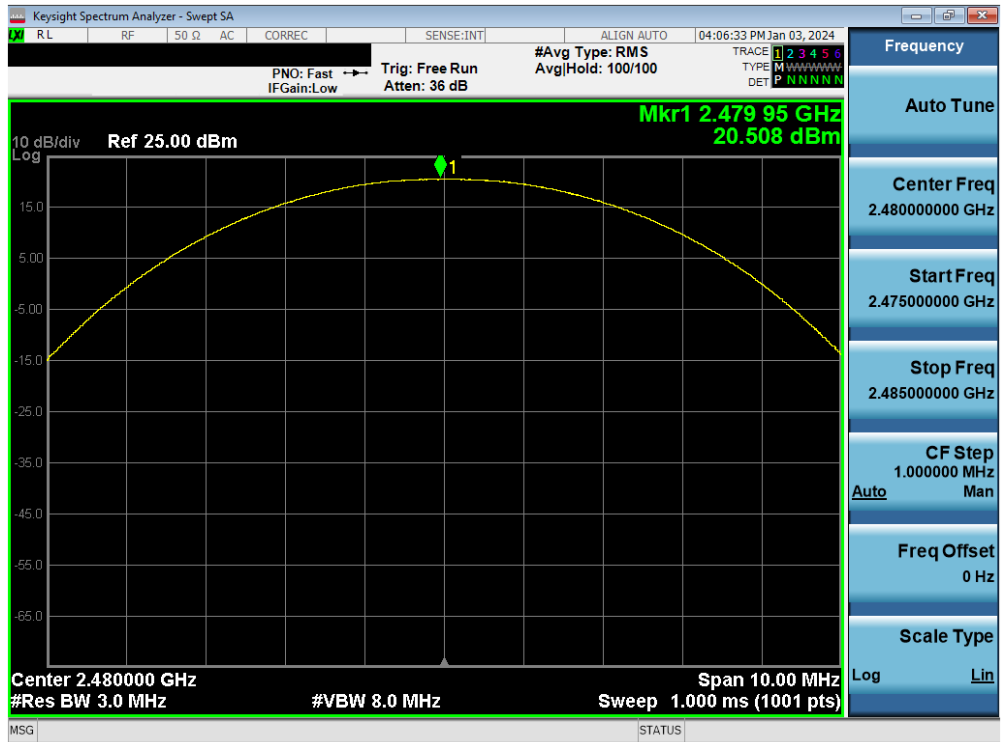


Plot 7-55. Peak Conducted Power (1Mbps – Ch. 0)

FCC ID: «FCC_ID» IC: 3048A-2085	MEASUREMENT REPORT («APPLICATION_TYPE»)		Approved by: Technical Manager
Test Report S/N: «Report_SN_BT_FCC»	Test Dates: «Date_of_Testing»	EUT Type: «EUT_Type»	Page 44 of 137

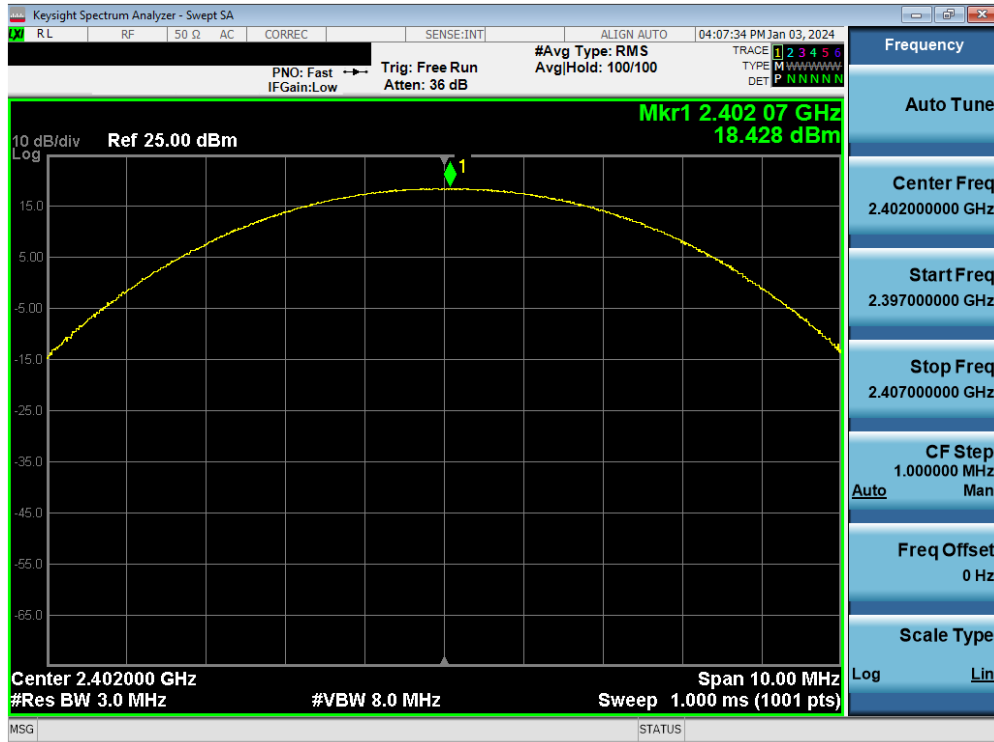


Plot 7-56. Peak Conducted Power (1Mbps – Ch. 39)

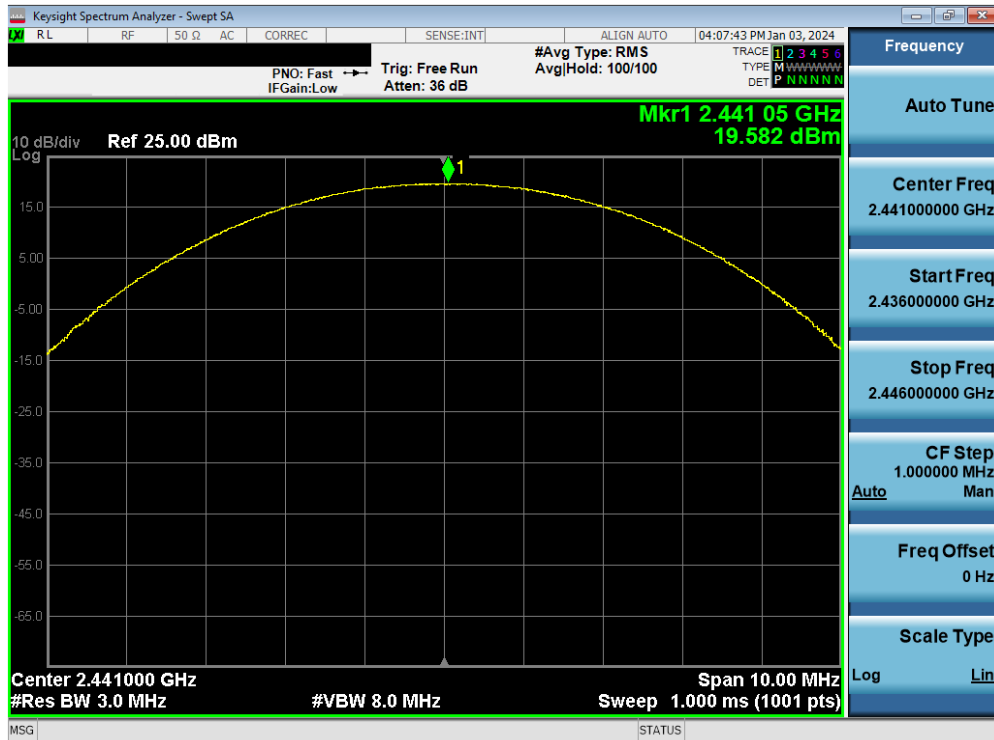


Plot 7-57. Peak Conducted Power (1Mbps – Ch. 78)

FCC ID: «FCC_ID» IC: 3048A-2085		MEASUREMENT REPORT («APPLICATION_TYPE»)		Approved by: Technical Manager
Test Report S/N: «Report_SN_BT_FCC»	Test Dates: «Date_of_Testing»	EUT Type: «EUT_Type»		Page 45 of 137

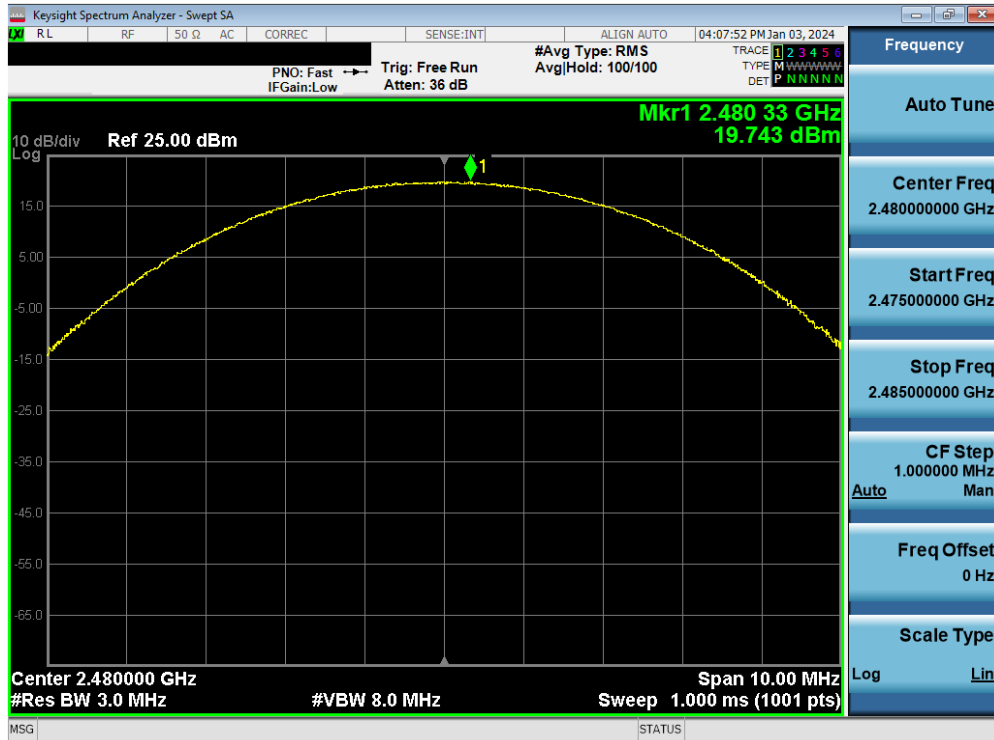


Plot 7-58. Peak Conducted Power (2Mbps – Ch. 0)

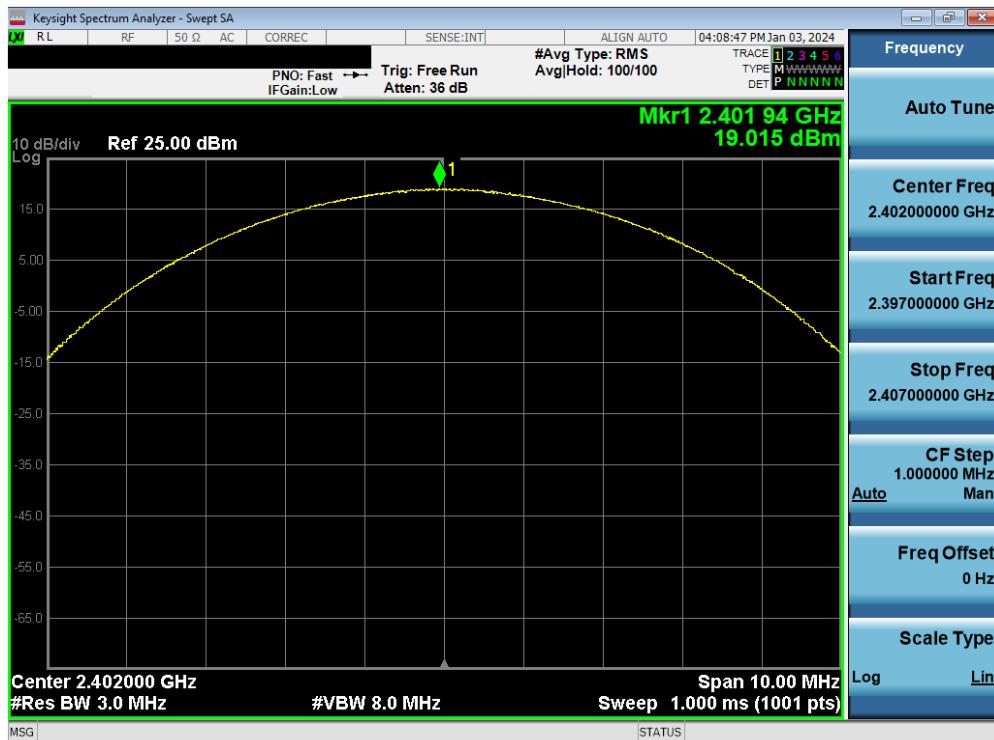


Plot 7-59. Peak Conducted Power (2Mbps – Ch. 39)

FCC ID: «FCC_ID» IC: 3048A-2085	MEASUREMENT REPORT («APPLICATION_TYPE»)		Approved by: Technical Manager
Test Report S/N: «Report_SN_BT_FCC»	Test Dates: «Date_of_Testing»	EUT Type: «EUT_Type»	Page 46 of 137

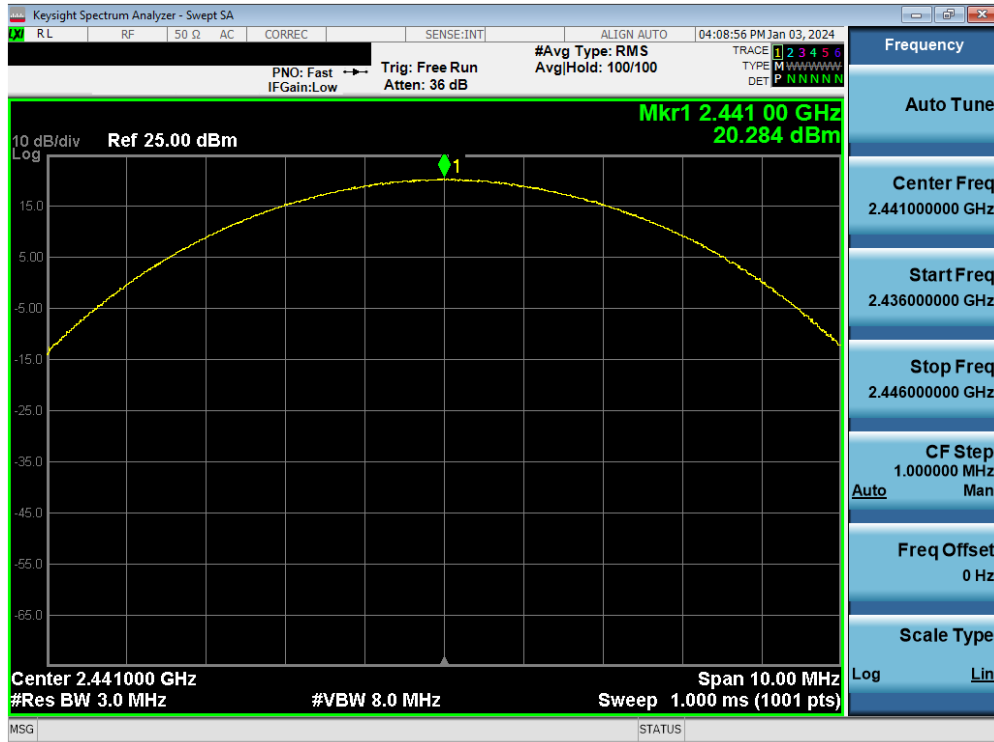


Plot 7-60. Peak Conducted Power (2Mbps – Ch. 78)

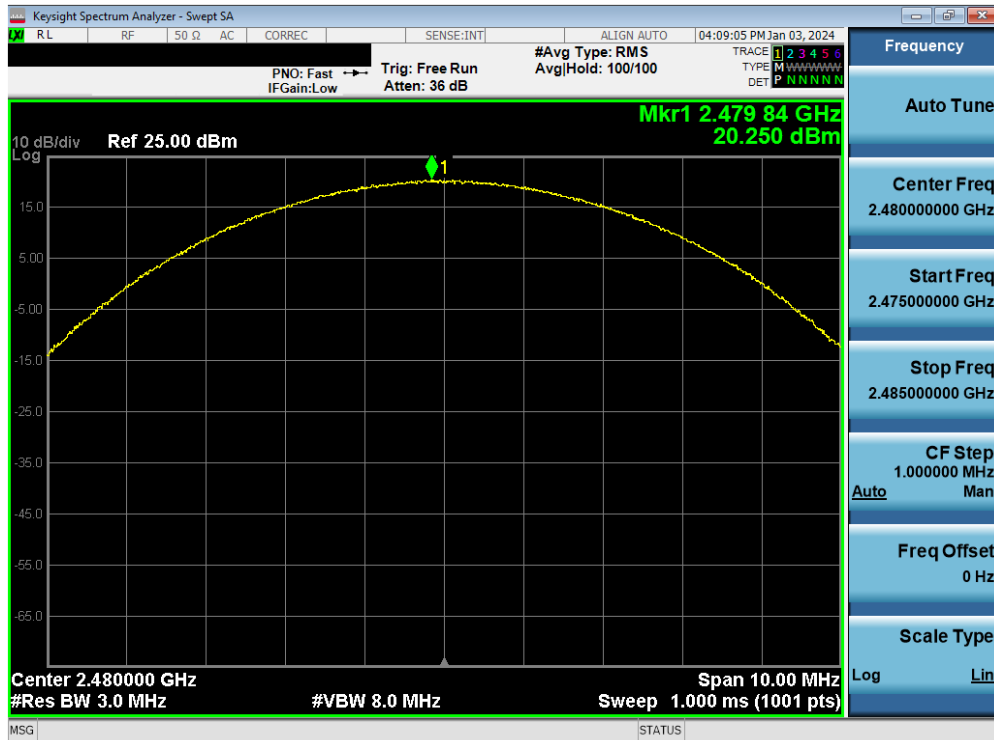


Plot 7-61. Peak Conducted Power (3Mbps – Ch. 0)

FCC ID: «FCC_ID» IC: 3048A-2085	MEASUREMENT REPORT («APPLICATION_TYPE»)		Approved by: Technical Manager
Test Report S/N: «Report_SN_BT_FCC»	Test Dates: «Date_of_Testing»	EUT Type: «EUT_Type»	Page 47 of 137

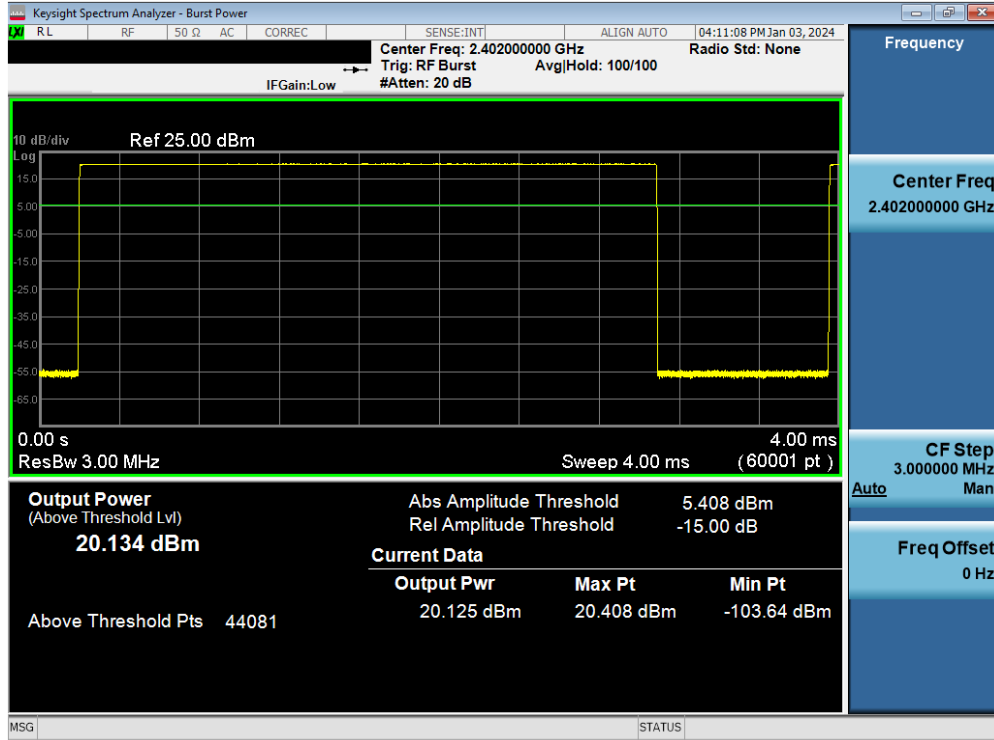


Plot 7-62. Peak Conducted Power (3Mbps – Ch. 39)

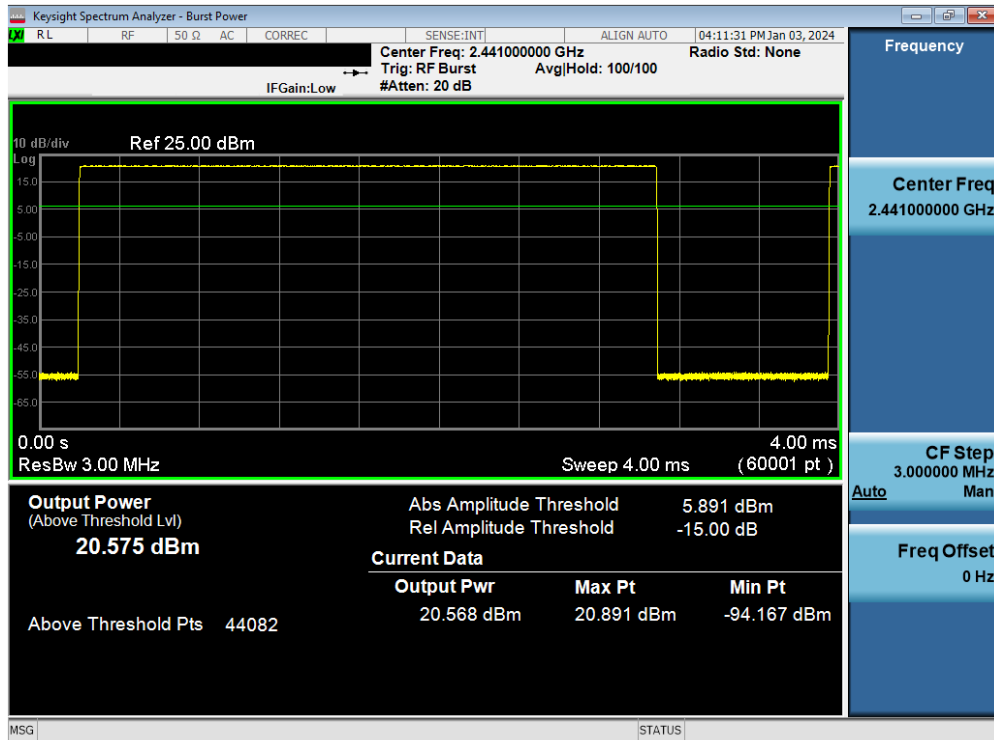


Plot 7-63. Peak Conducted Power (3Mbps – Ch. 78)

FCC ID: «FCC_ID» IC: 3048A-2085	MEASUREMENT REPORT («APPLICATION_TYPE»)		Approved by: Technical Manager
Test Report S/N: «Report_SN_BT_FCC»	Test Dates: «Date_of_Testing»	EUT Type: «EUT_Type»	Page 48 of 137

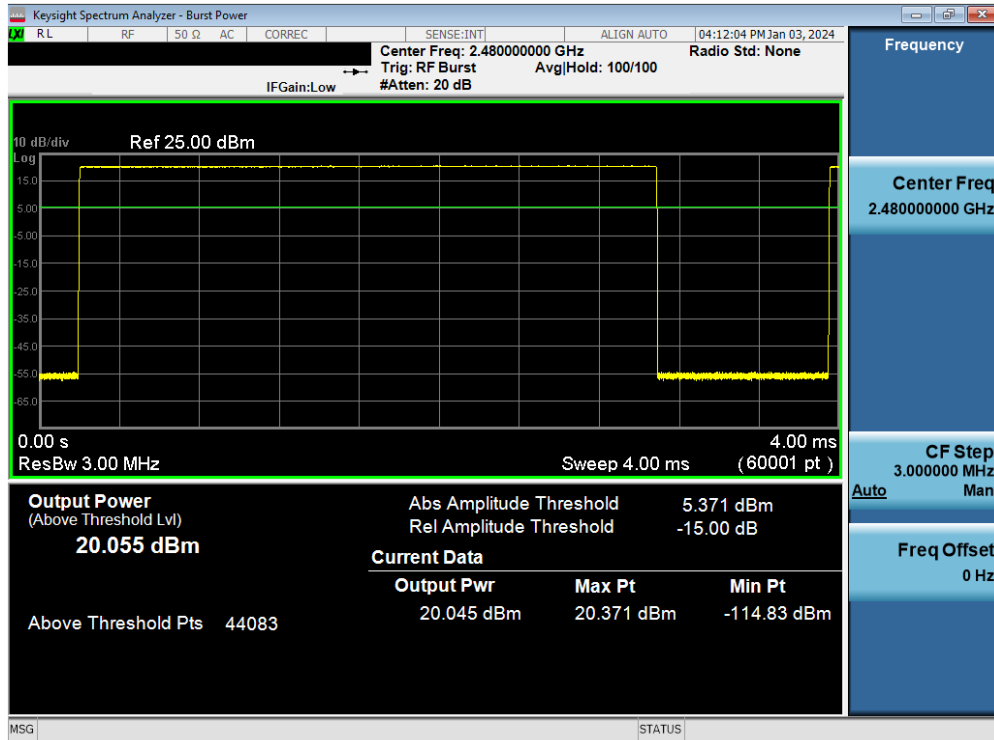


Plot 7-64. Average Conducted Power (1Mbps – Ch. 0)

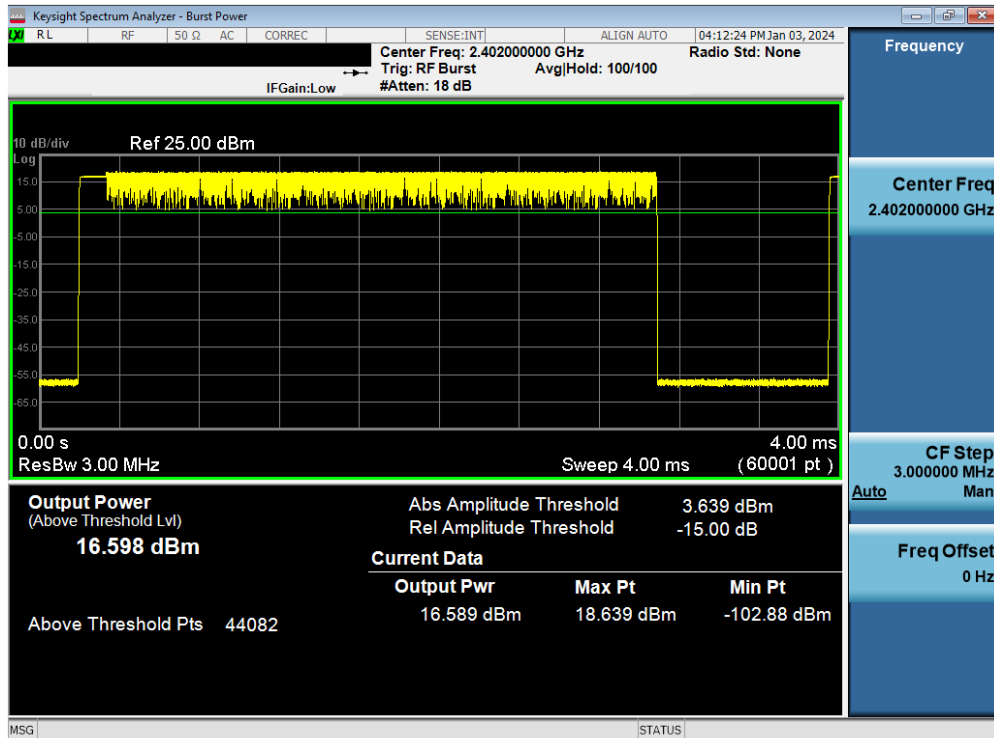


Plot 7-65. Average Conducted Power (1Mbps – Ch. 39)

FCC ID: «FCC_ID» IC: 3048A-2085	MEASUREMENT REPORT («APPLICATION_TYPE»)		Approved by: Technical Manager
Test Report S/N: «Report_SN_BT_FCC»	Test Dates: «Date_of_Testing»	EUT Type: «EUT_Type»	Page 49 of 137

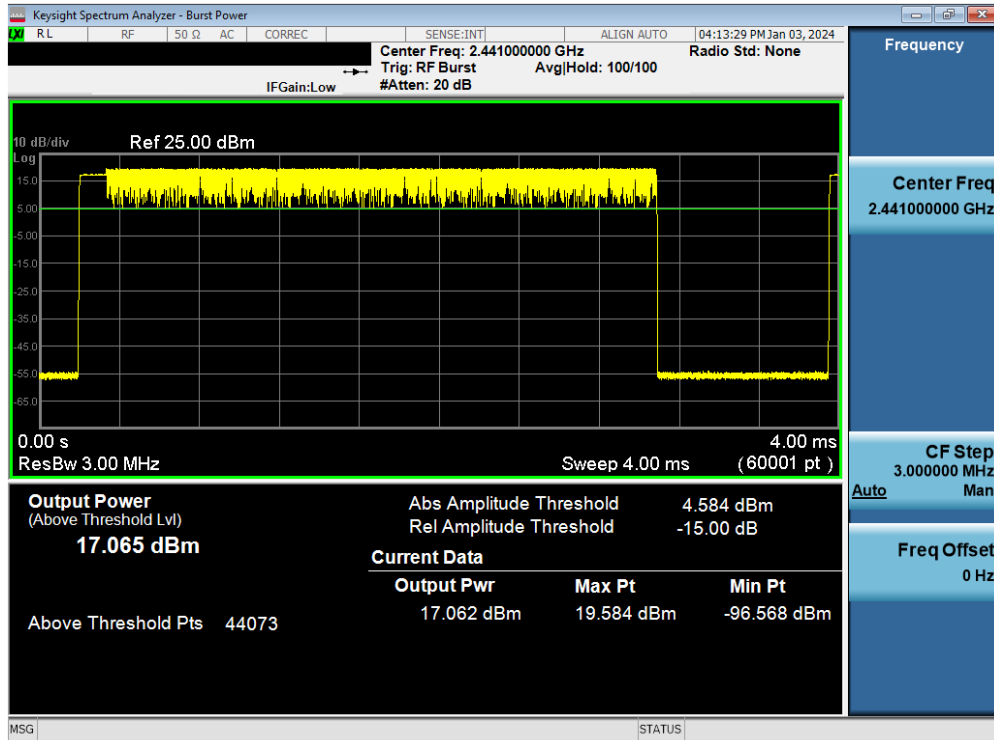


Plot 7-66. Average Conducted Power (1Mbps – Ch. 78)

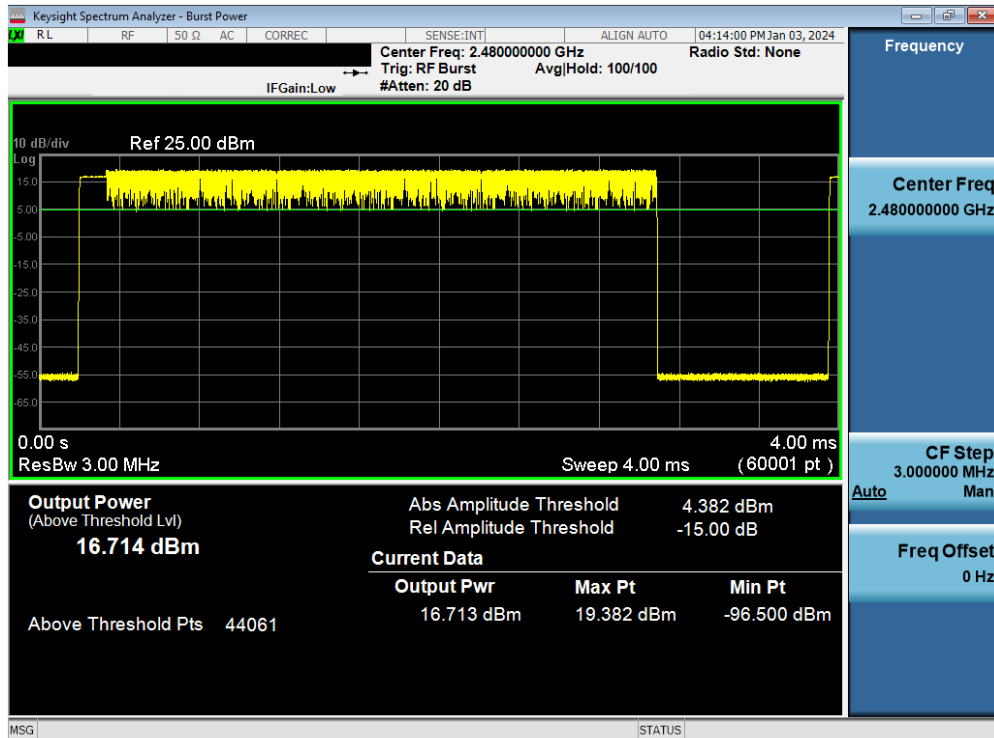


Plot 7-67. Average Conducted Power (2Mbps – Ch. 0)

FCC ID: «FCC_ID» IC: 3048A-2085	MEASUREMENT REPORT («APPLICATION_TYPE»)		Approved by: Technical Manager
Test Report S/N: «Report_SN_BT_FCC»	Test Dates: «Date_of_Testing»	EUT Type: «EUT_Type»	Page 50 of 137

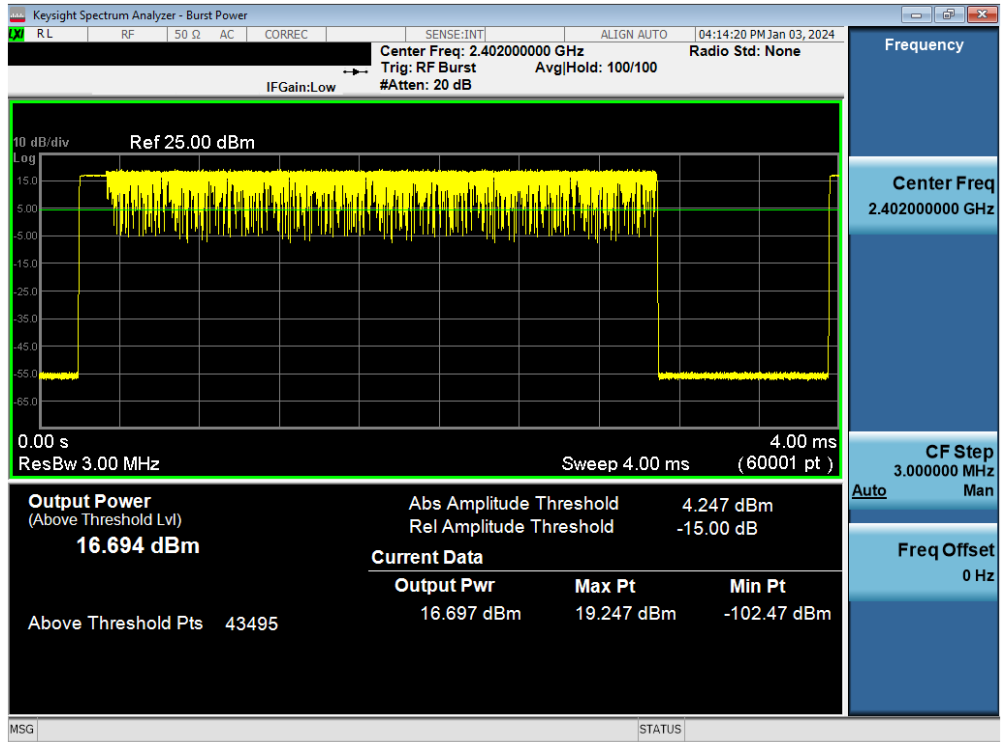


Plot 7-68. Average Conducted Power (2Mbps – Ch. 39)

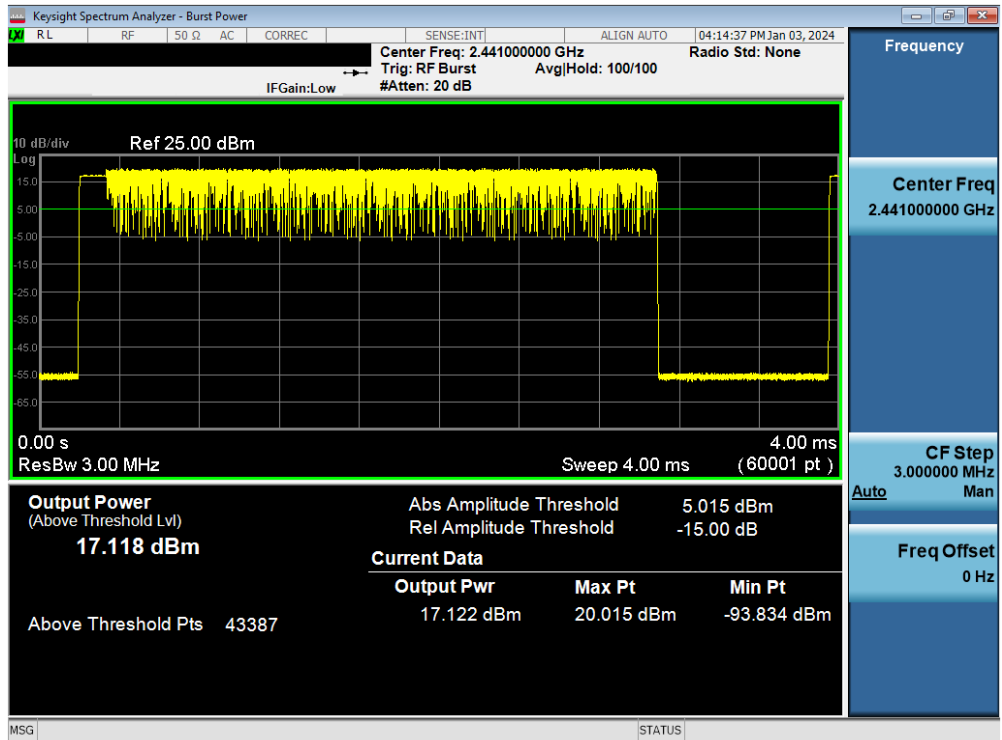


Plot 7-69. Average Conducted Power (2Mbps – Ch. 78)

FCC ID: «FCC_ID» IC: 3048A-2085	MEASUREMENT REPORT («APPLICATION_TYPE»)		Approved by: Technical Manager
Test Report S/N: «Report_SN_BT_FCC»	Test Dates: «Date_of_Testing»	EUT Type: «EUT_Type»	Page 51 of 137

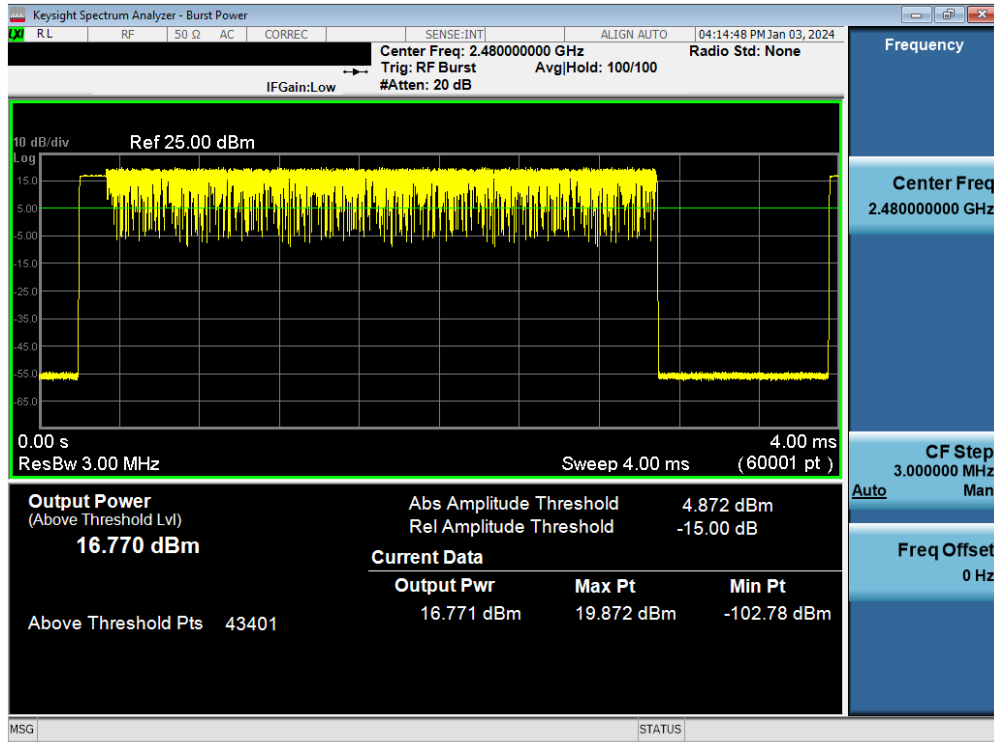


Plot 7-70. Average Conducted Power (3Mbps – Ch. 0)



Plot 7-71. Average Conducted Power (3Mbps – Ch. 39)

FCC ID: «FCC_ID» IC: 3048A-2085	MEASUREMENT REPORT («APPLICATION_TYPE»)		Approved by: Technical Manager
Test Report S/N: «Report_SN_BT_FCC»	Test Dates: «Date_of_Testing»	EUT Type: «EUT_Type»	Page 52 of 137



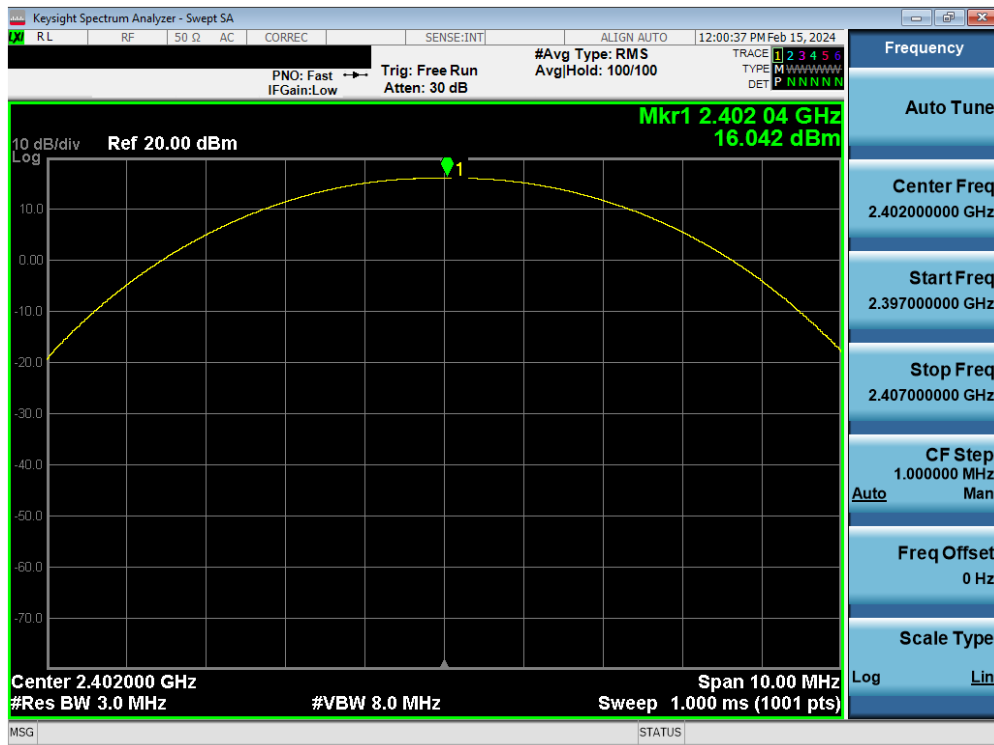
Plot 7-72. Average Conducted Power (3Mbps – Ch. 78)

FCC ID: «FCC_ID» IC: 3048A-2085	MEASUREMENT REPORT («APPLICATION_TYPE»)		Approved by: Technical Manager
Test Report S/N: «Report_SN_BT_FCC»	Test Dates: «Date_of_Testing»	EUT Type: «EUT_Type»	Page 53 of 137

Frequency [MHz]	Data Rate [Mbps]	Channel No.	Peak Conducted Power -Chain 0		Peak Conducted Power -Chain 1		Peak Conducted Power - Dual		Avg Conducted Power -Chain 0		Avg Conducted Power -Chain 1		Avg Conducted Power - Dual		Ant. Gain [dBi]	EIRP	Limit	Margin
			[dBm]	[mW]	[dBm]	[mW]	[dBm]	[mW]	[dBm]	[mW]	[dBm]	[mW]	[dBm]	[mW]				
2402	1.0	0	16.04	40.198	15.29	33.783	18.69	73.981	15.85	38.458	15.04	31.910	18.47	70.368	4.37	23.06	36.02	-12.96
2441	1.0	39	16.13	40.983	15.36	34.332	18.77	75.315	15.98	39.610	15.17	32.913	18.60	72.523	4.37	23.14	36.02	-12.88
2480	1.0	78	14.51	28.229	15.10	32.352	17.82	60.581	14.49	28.105	14.84	30.445	17.68	58.551	4.37	22.19	36.02	-13.83
2402	2.0	0	15.29	33.838	14.40	27.549	17.88	61.386	12.51	17.819	11.76	14.996	15.16	32.815	4.37	22.25	36.02	-13.77
2441	2.0	39	16.12	40.917	14.62	29.000	18.45	69.917	12.94	19.685	12.04	16.007	15.53	35.692	4.37	22.82	36.02	-13.20
2480	2.0	78	13.64	23.099	14.13	25.900	16.90	48.999	11.43	13.894	11.48	14.051	14.46	27.944	4.37	21.27	36.02	-14.75
2402	3.0	0	15.63	36.568	14.88	30.740	18.28	67.308	12.57	18.076	11.83	15.233	15.23	33.309	4.37	22.65	36.02	-13.37
2441	3.0	39	16.68	46.602	15.12	32.524	18.98	79.125	13.21	20.961	12.10	16.222	15.70	37.183	4.37	23.35	36.02	-12.67
2480	3.0	78	14.04	25.363	14.64	29.114	17.36	54.477	11.49	14.084	11.64	14.594	14.58	28.678	4.37	21.73	36.02	-14.29

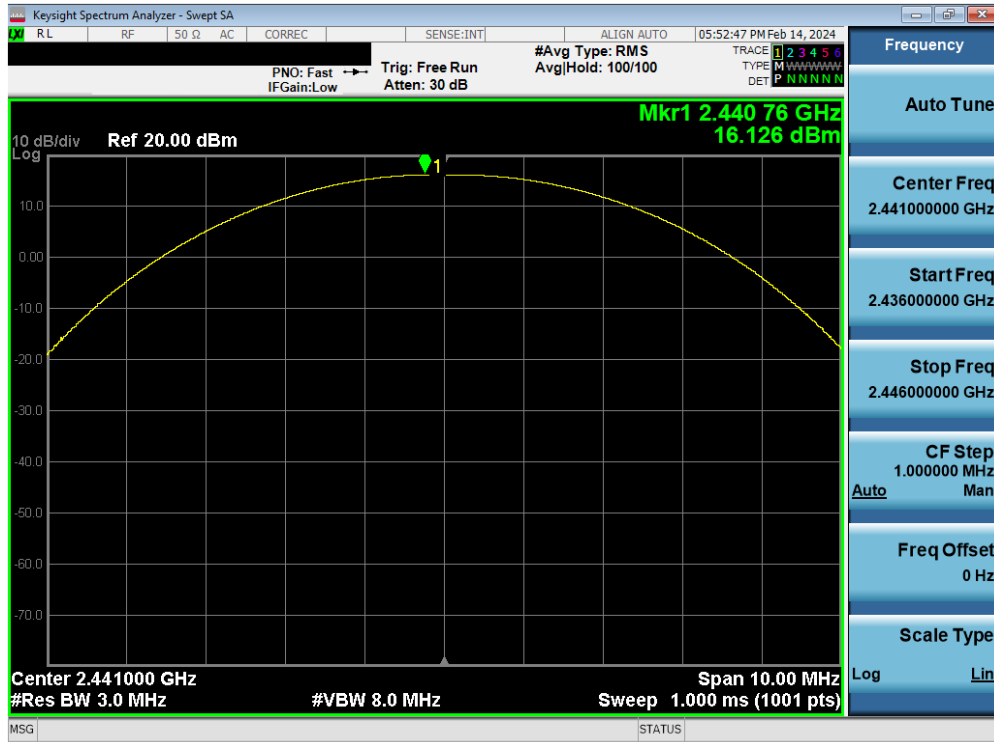
Table 7-8. Conducted Output Power Measurements – DUAL

DUAL ANT1

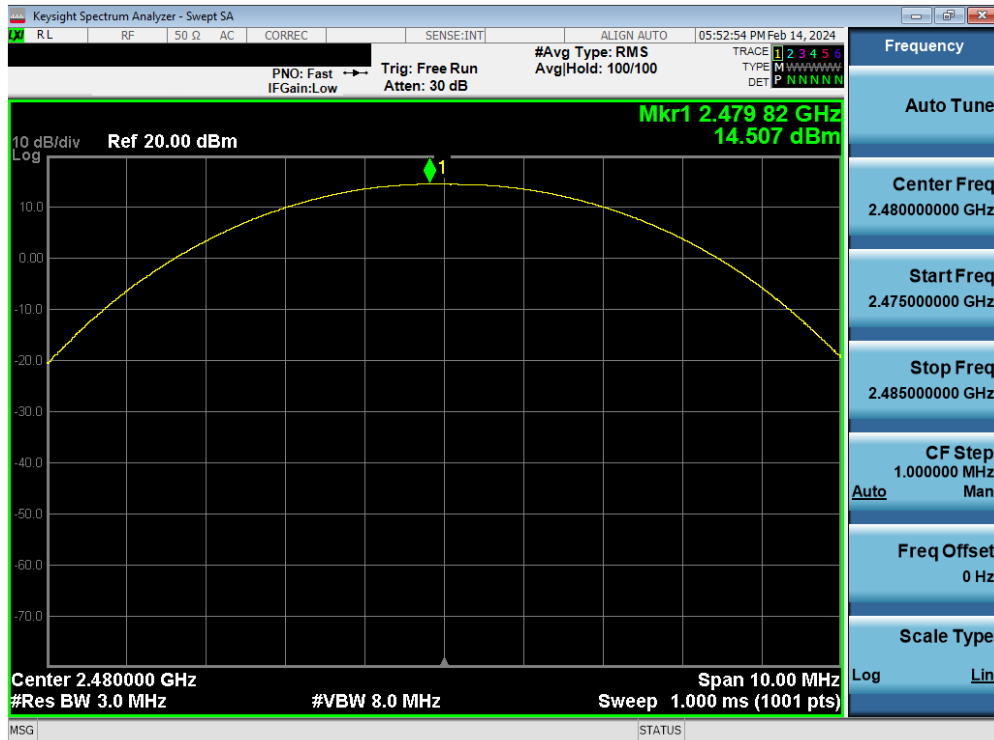


Plot 7-73. Peak Conducted Power (1Mbps – Ch. 0)

FCC ID: «FCC_ID» IC: 3048A-2085	MEASUREMENT REPORT («APPLICATION_TYPE»)		Approved by: Technical Manager
Test Report S/N: «Report_SN_BT_FCC»	Test Dates: «Date_of_Testing»	EUT Type: «EUT_Type»	Page 54 of 137

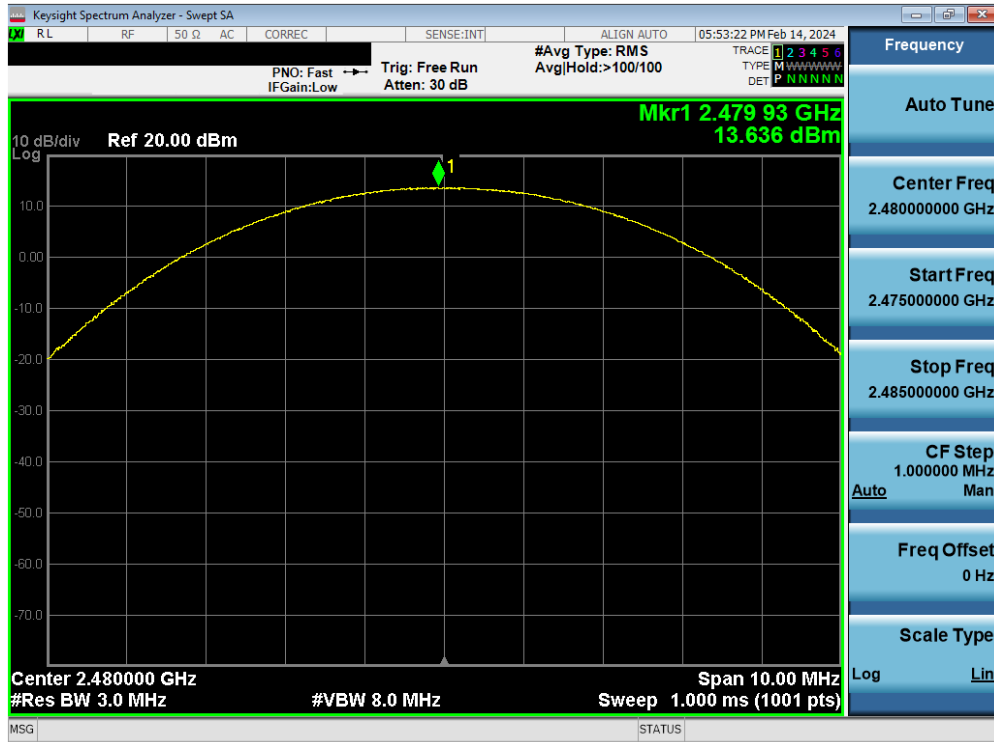


Plot 7-74. Peak Conducted Power (1Mbps – Ch. 39)

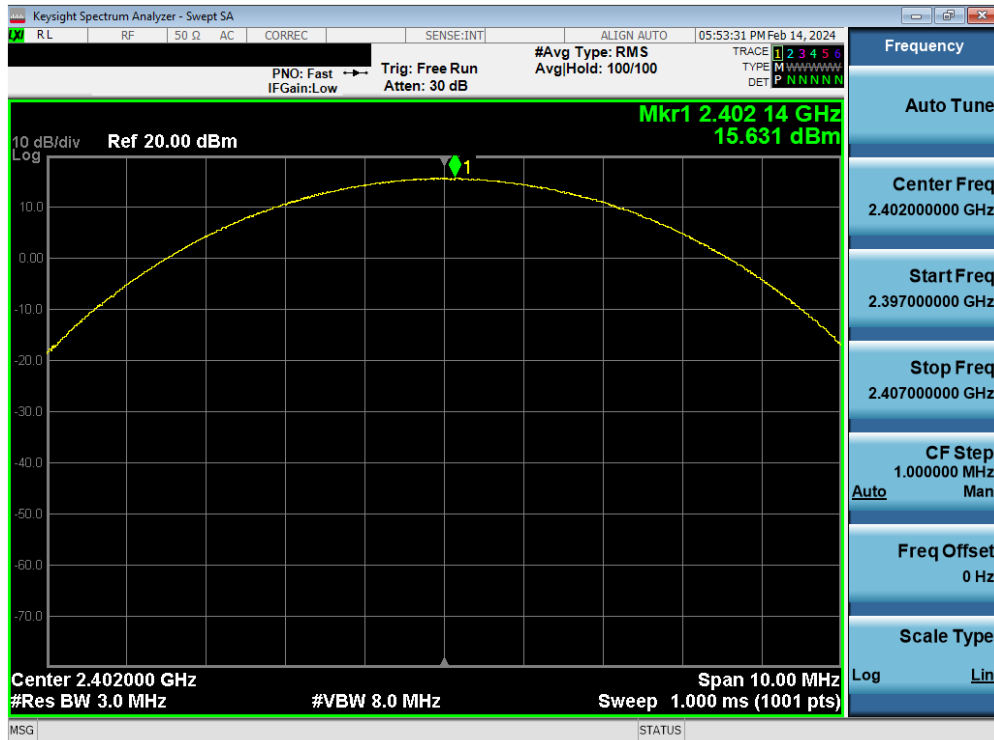


Plot 7-75. Peak Conducted Power (1Mbps – Ch. 78)

FCC ID: «FCC_ID» IC: 3048A-2085	MEASUREMENT REPORT («APPLICATION_TYPE»)		Approved by: Technical Manager
Test Report S/N: «Report_SN_BT_FCC»	Test Dates: «Date_of_Testing»	EUT Type: «EUT_Type»	Page 55 of 137

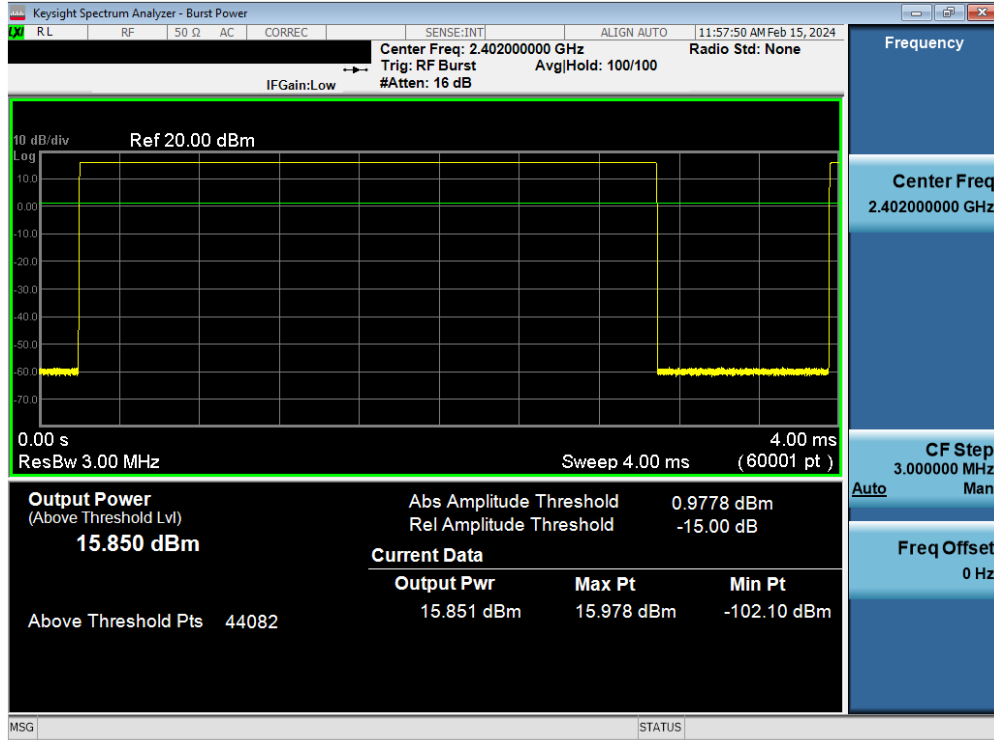


Plot 7-78. Peak Conducted Power (2Mbps – Ch. 78)

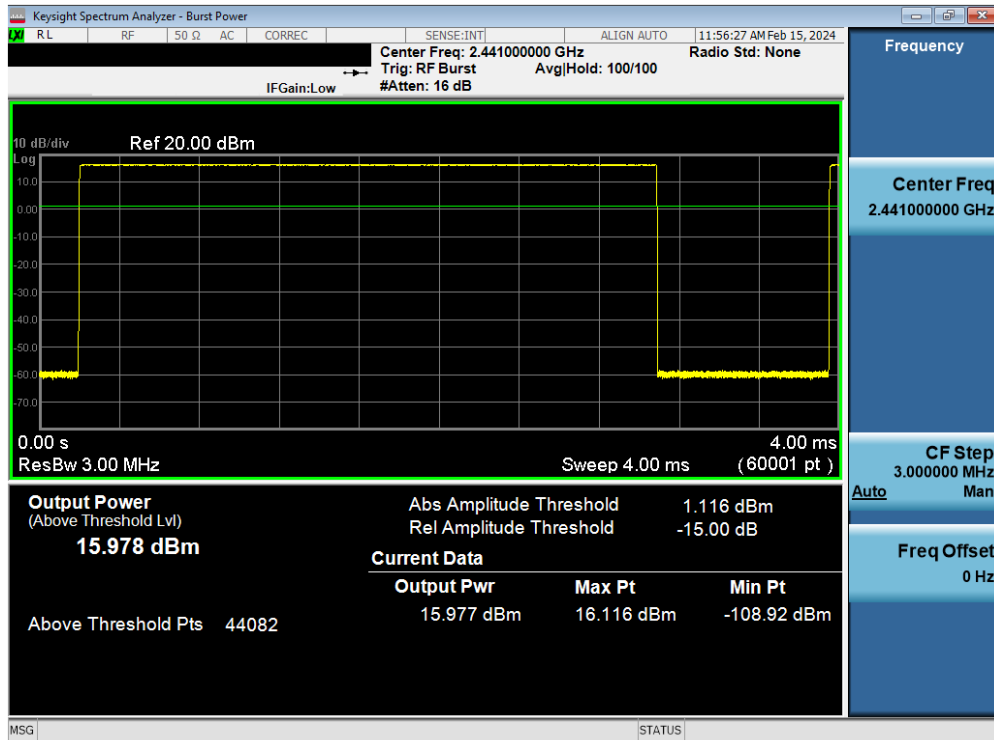


Plot 7-79. Peak Conducted Power (3Mbps – Ch. 0)

FCC ID: «FCC_ID» IC: 3048A-2085	MEASUREMENT REPORT («APPLICATION_TYPE»)		Approved by: Technical Manager
Test Report S/N: «Report_SN_BT_FCC»	Test Dates: «Date_of_Testing»	EUT Type: «EUT_Type»	Page 57 of 137

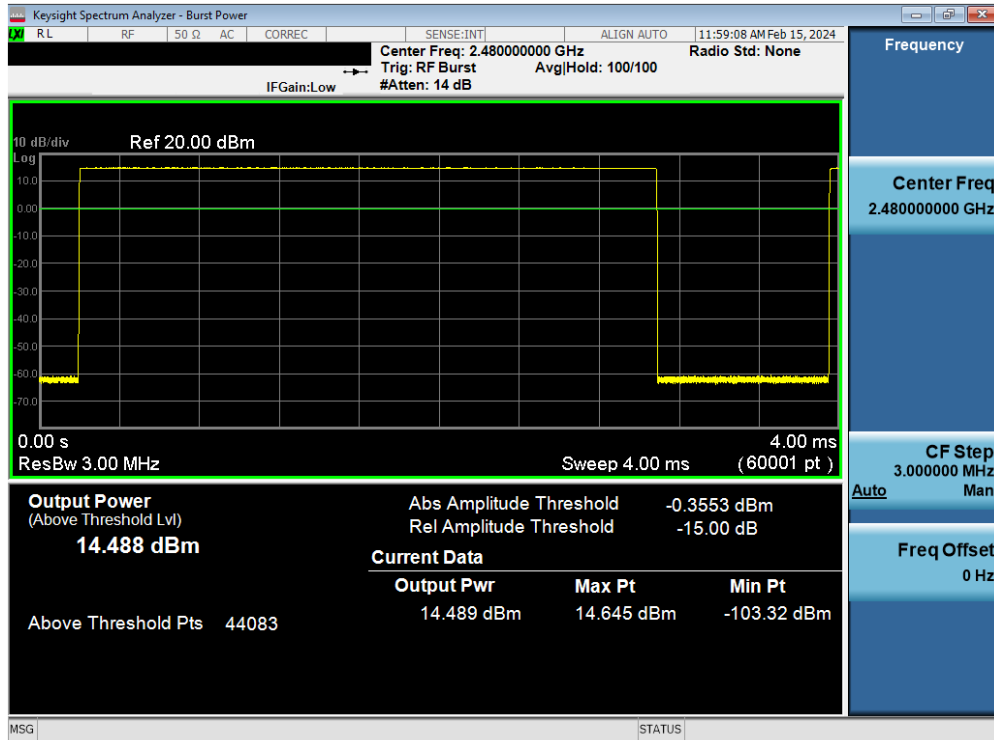


Plot 7-82. Average Conducted Power (1Mbps – Ch. 0)

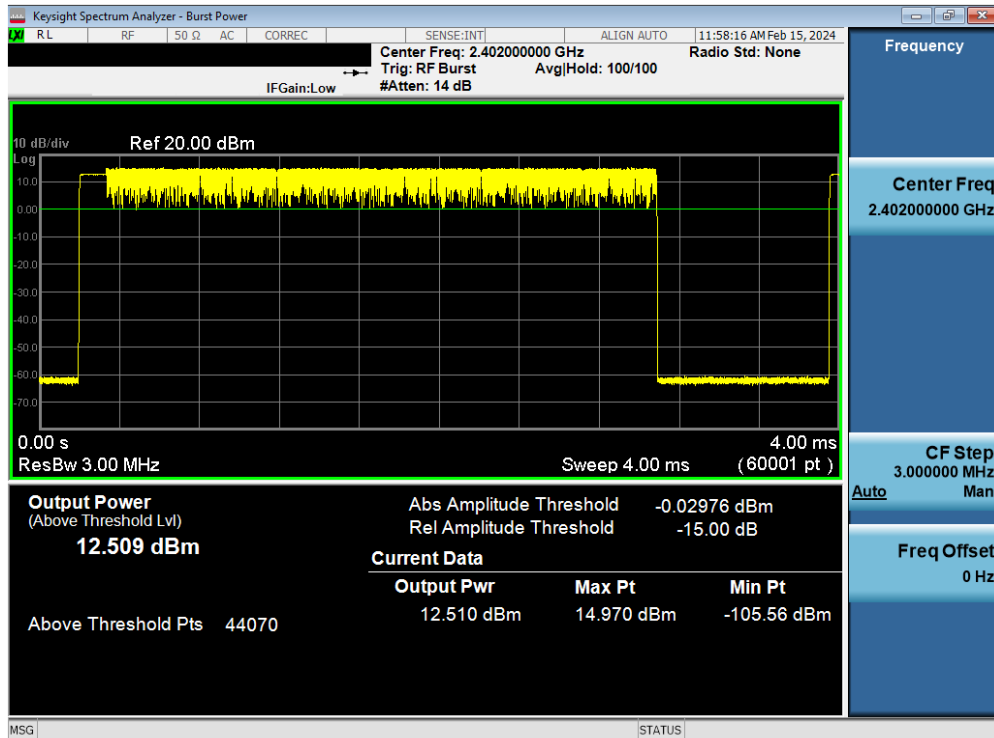


Plot 7-83. Average Conducted Power (1Mbps – Ch. 39)

FCC ID: «FCC_ID» IC: 3048A-2085	MEASUREMENT REPORT («APPLICATION_TYPE»)		Approved by: Technical Manager
Test Report S/N: «Report_SN_BT_FCC»	Test Dates: «Date_of_Testing»	EUT Type: «EUT_Type»	Page 59 of 137

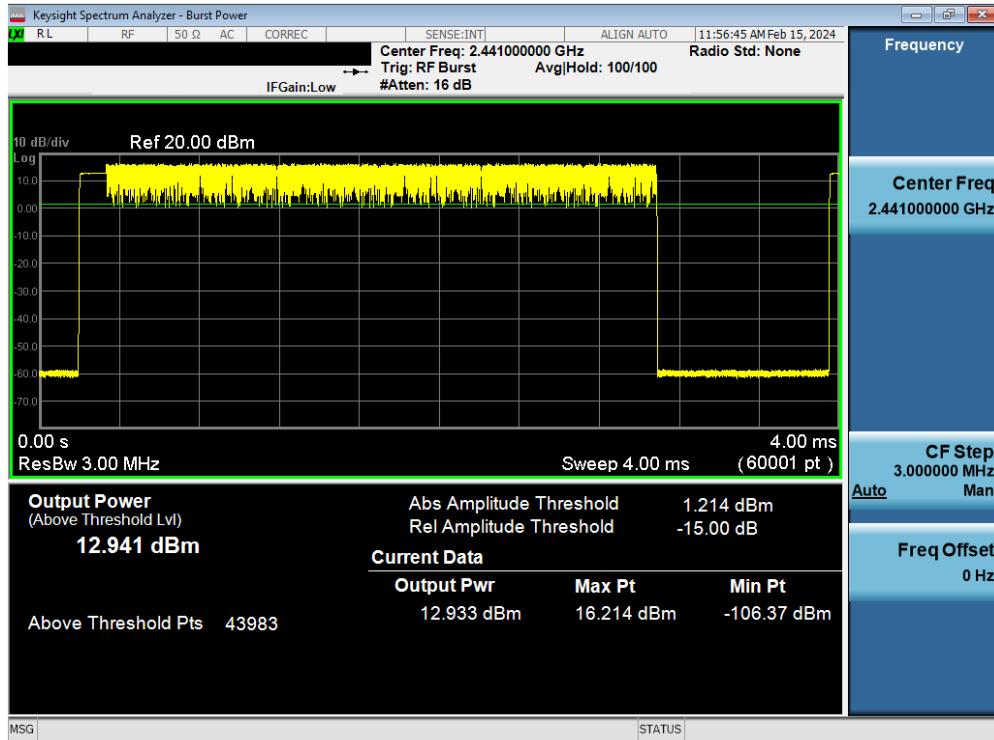


Plot 7-84. Average Conducted Power (1Mbps – Ch. 78)

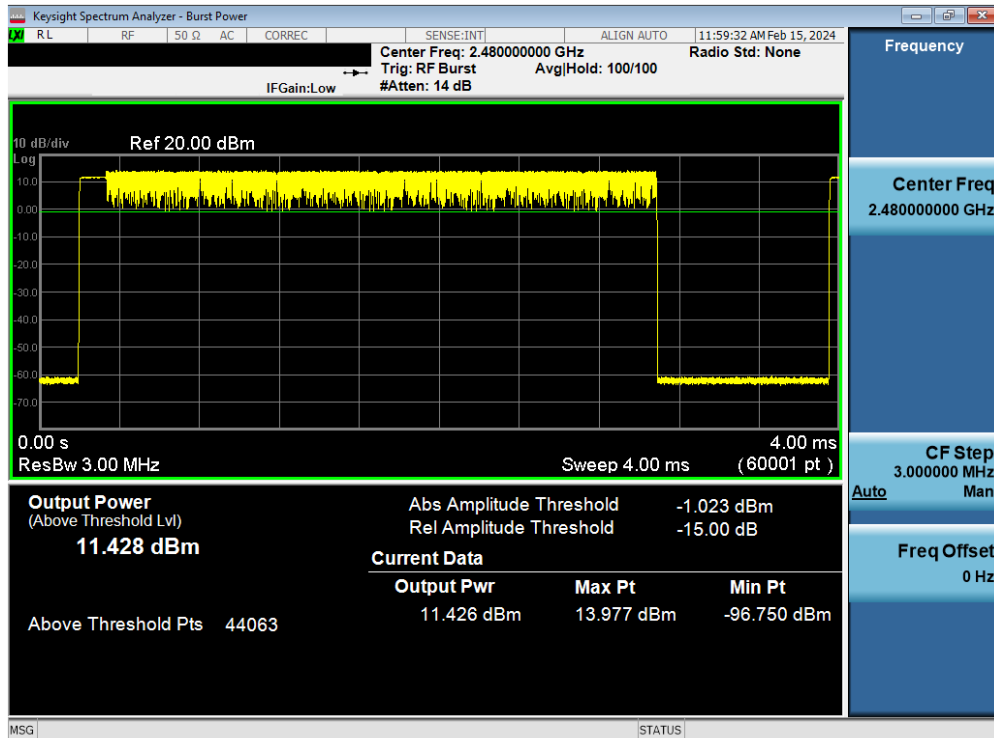


Plot 7-85. Average Conducted Power (2Mbps – Ch. 0)

FCC ID: «FCC_ID» IC: 3048A-2085	MEASUREMENT REPORT («APPLICATION_TYPE»)		Approved by: Technical Manager
Test Report S/N: «Report_SN_BT_FCC»	Test Dates: «Date_of_Testing»	EUT Type: «EUT_Type»	Page 60 of 137

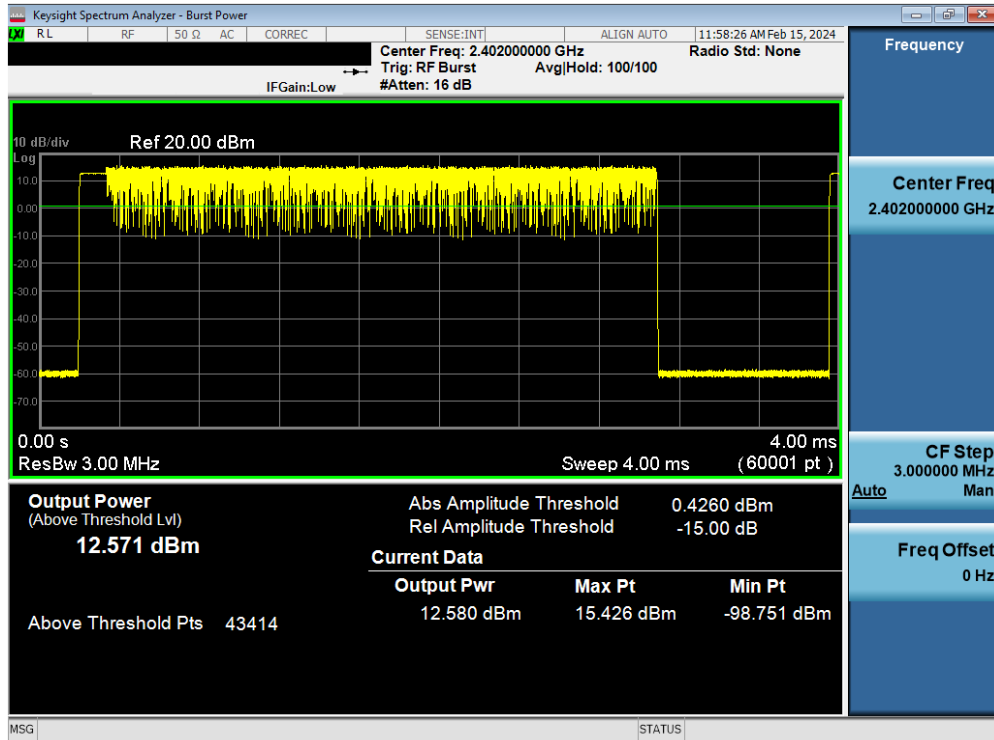


Plot 7-86. Average Conducted Power (2Mbps – Ch. 39)

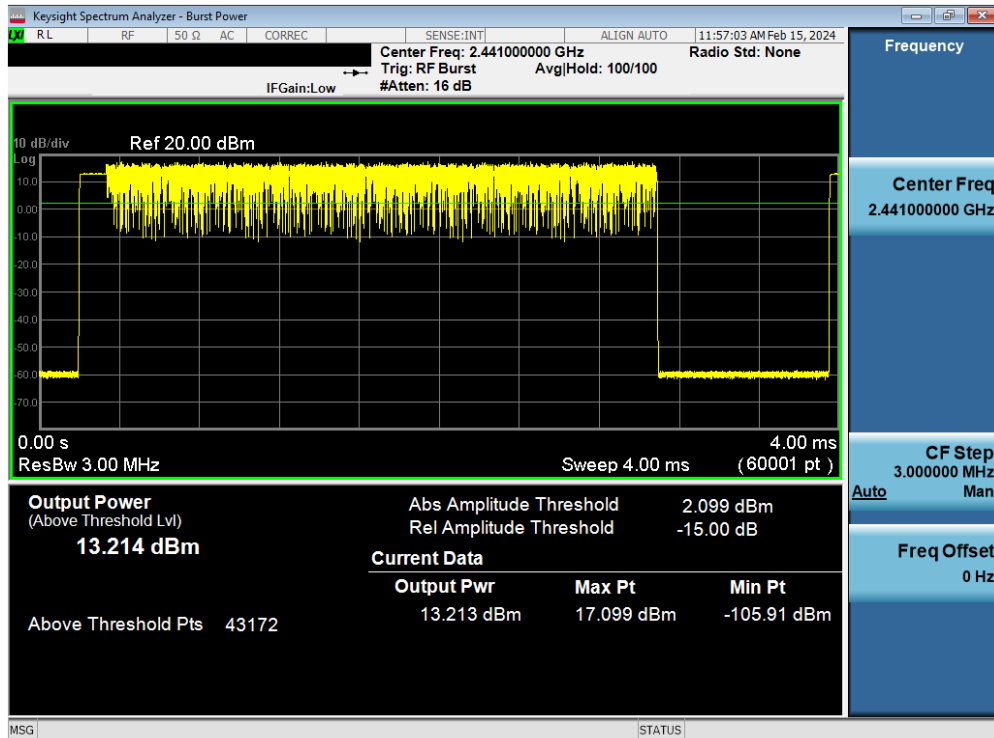


Plot 7-87. Average Conducted Power (2Mbps – Ch. 78)

FCC ID: «FCC_ID» IC: 3048A-2085	MEASUREMENT REPORT («APPLICATION_TYPE»)		Approved by: Technical Manager
Test Report S/N: «Report_SN_BT_FCC»	Test Dates: «Date_of_Testing»	EUT Type: «EUT_Type»	Page 61 of 137

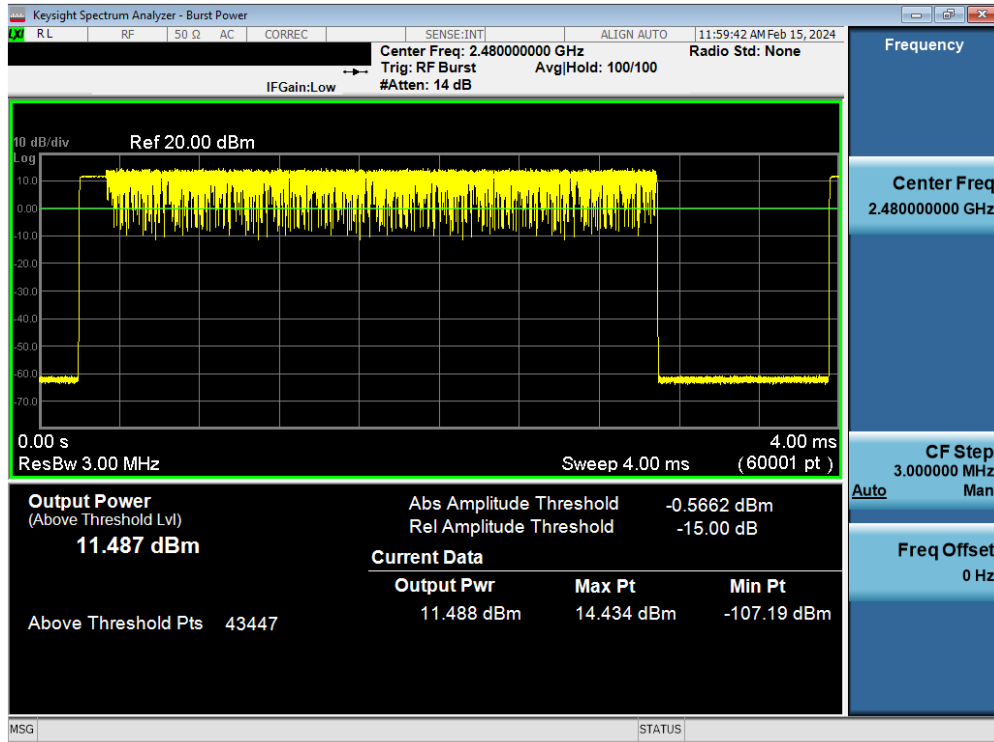


Plot 7-88. Average Conducted Power (3Mbps – Ch. 0)



Plot 7-89. Average Conducted Power (3Mbps – Ch. 39)

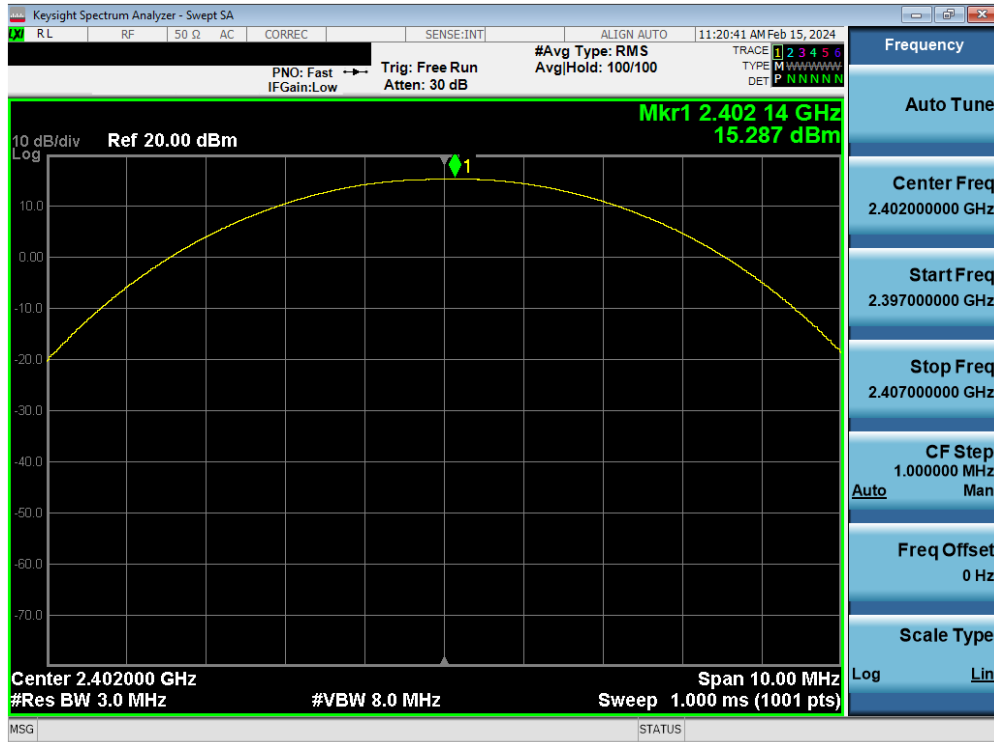
FCC ID: «FCC_ID» IC: 3048A-2085	MEASUREMENT REPORT («APPLICATION_TYPE»)		Approved by: Technical Manager
Test Report S/N: «Report_SN_BT_FCC»	Test Dates: «Date_of_Testing»	EUT Type: «EUT_Type»	Page 62 of 137



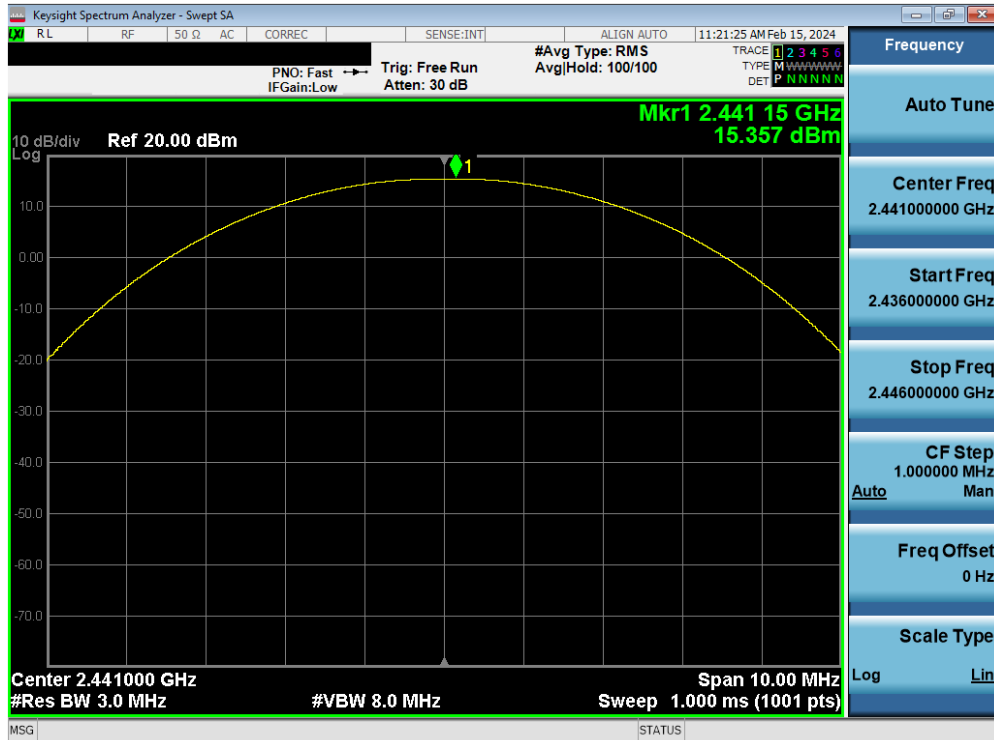
Plot 7-90. Average Conducted Power (3Mbps – Ch. 78)

FCC ID: «FCC_ID» IC: 3048A-2085	MEASUREMENT REPORT («APPLICATION_TYPE»)		Approved by: Technical Manager
Test Report S/N: «Report_SN_BT_FCC»	Test Dates: «Date_of_Testing»	EUT Type: «EUT_Type»	Page 63 of 137

DUAL ANT2

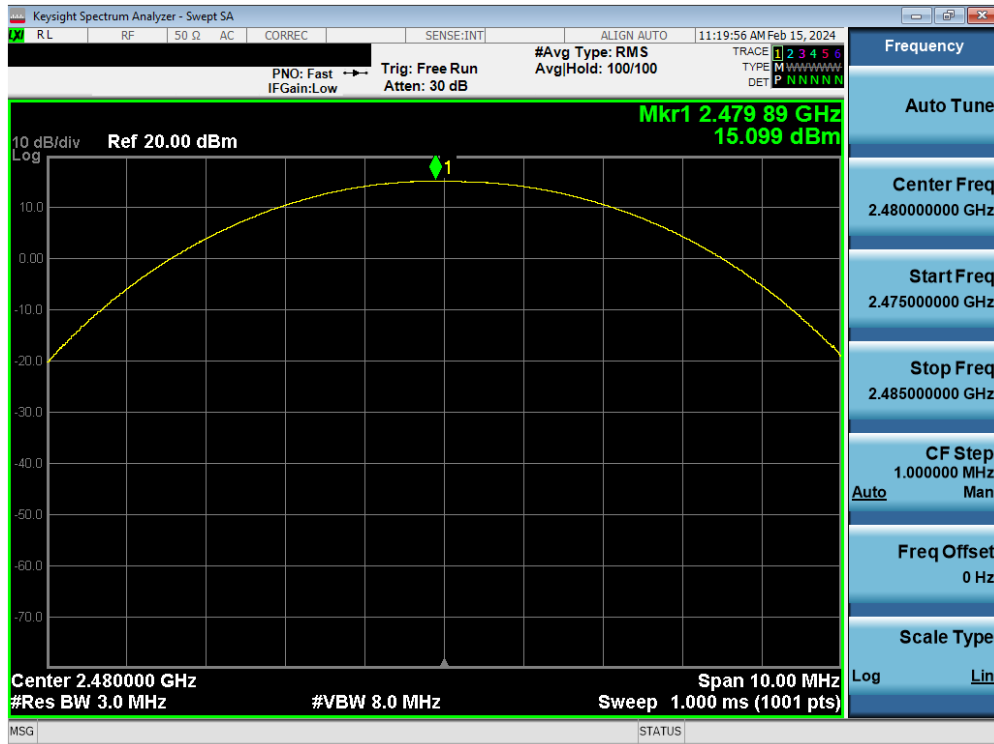


Plot 7-91. Peak Conducted Power (1Mbps – Ch. 0)

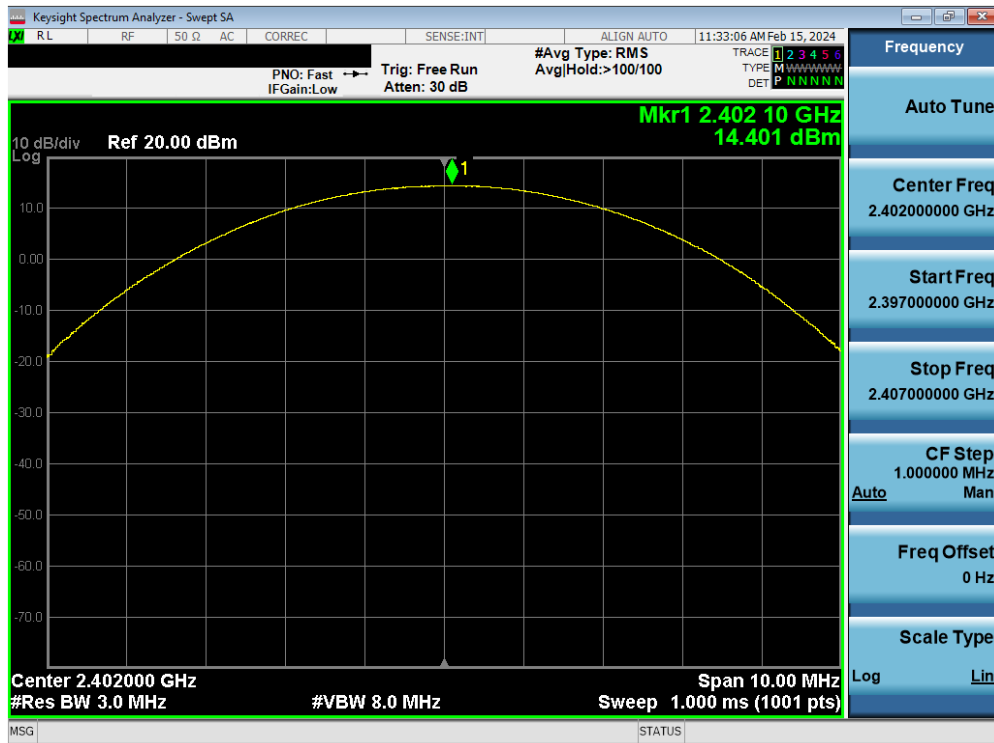


Plot 7-92. Peak Conducted Power (1Mbps – Ch. 39)

FCC ID: «FCC_ID» IC: 3048A-2085	MEASUREMENT REPORT («APPLICATION_TYPE»)		Approved by: Technical Manager
Test Report S/N: «Report_SN_BT_FCC»	Test Dates: «Date_of_Testing»	EUT Type: «EUT_Type»	Page 64 of 137

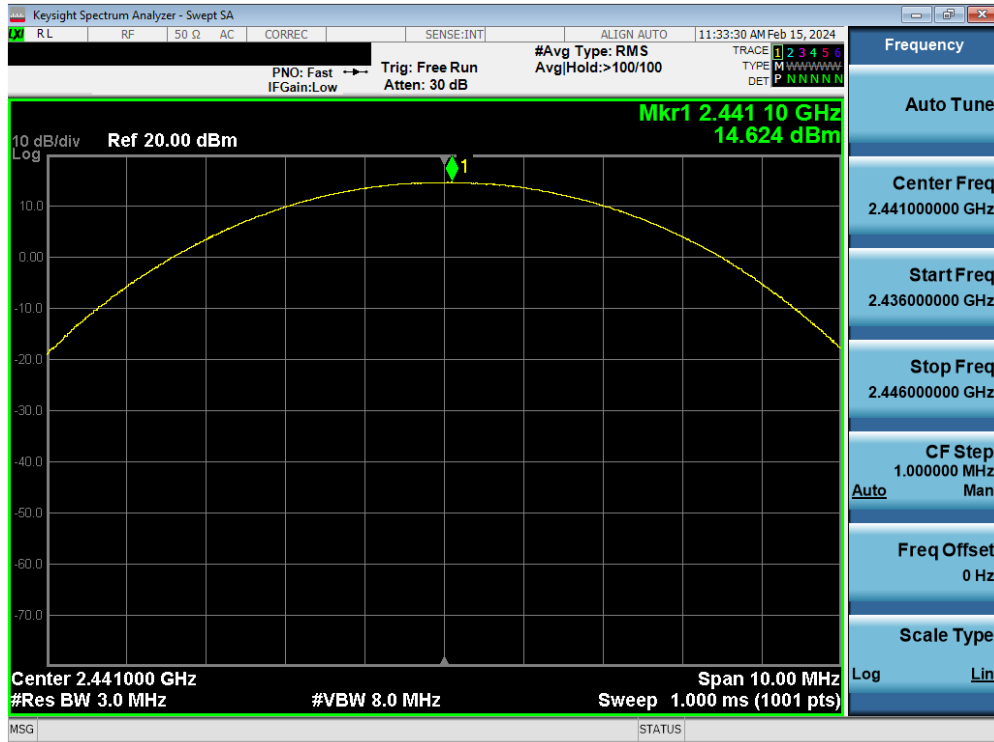


Plot 7-93. Peak Conducted Power (1Mbps – Ch. 78)

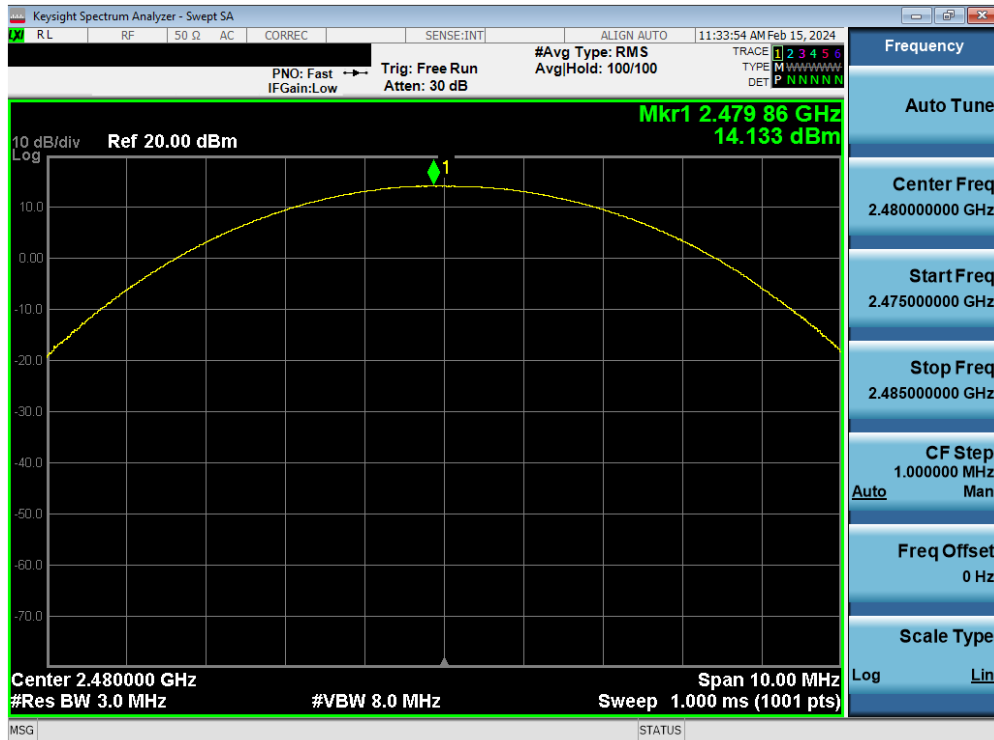


Plot 7-94. Peak Conducted Power (2Mbps – Ch. 0)

FCC ID: «FCC_ID» IC: 3048A-2085	MEASUREMENT REPORT («APPLICATION_TYPE»)		Approved by: Technical Manager
Test Report S/N: «Report_SN_BT_FCC»	Test Dates: «Date_of_Testing»	EUT Type: «EUT_Type»	Page 65 of 137

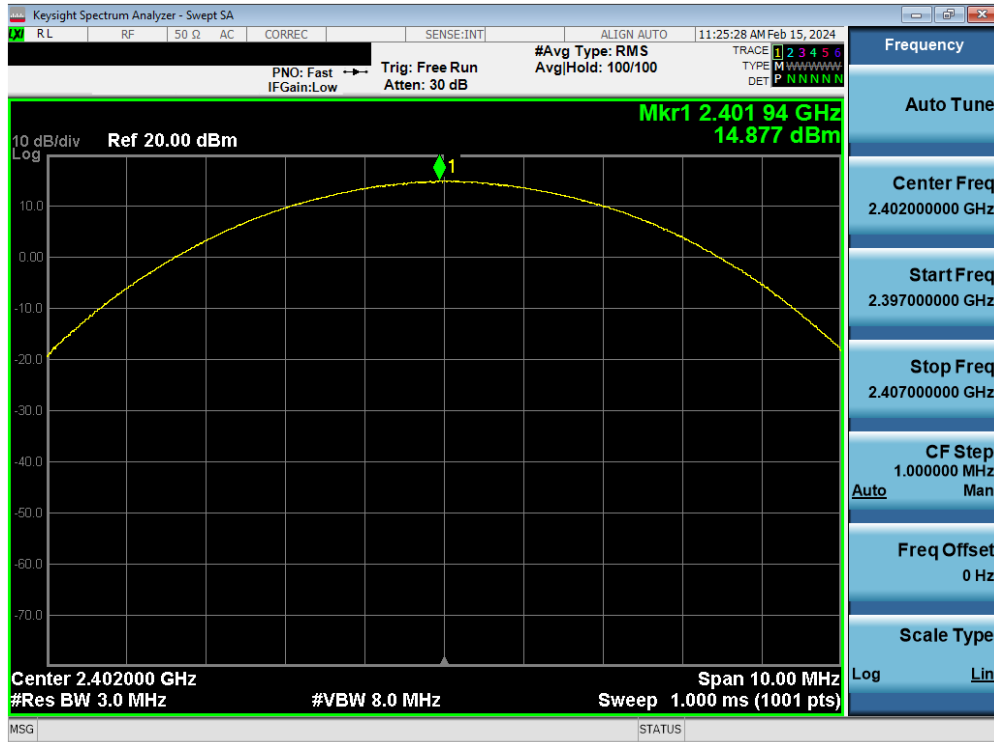


Plot 7-95. Peak Conducted Power (2Mbps – Ch. 39)

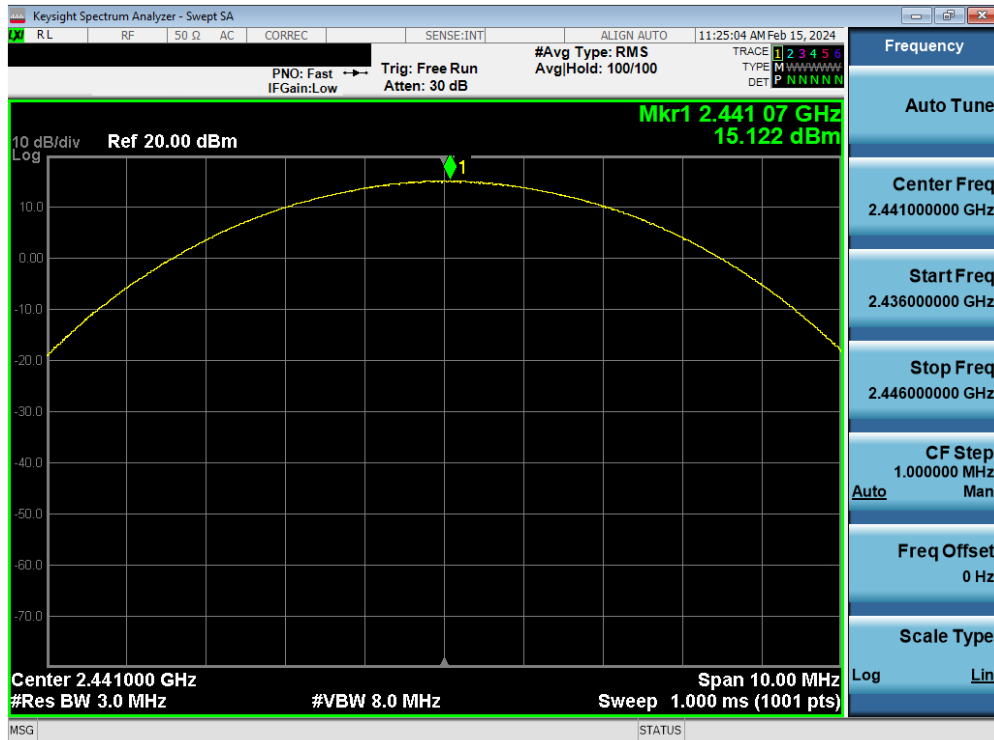


Plot 7-96. Peak Conducted Power (2Mbps – Ch. 78)

FCC ID: «FCC_ID» IC: 3048A-2085	MEASUREMENT REPORT («APPLICATION_TYPE»)		Approved by: Technical Manager
Test Report S/N: «Report_SN_BT_FCC»	Test Dates: «Date_of_Testing»	EUT Type: «EUT_Type»	Page 66 of 137

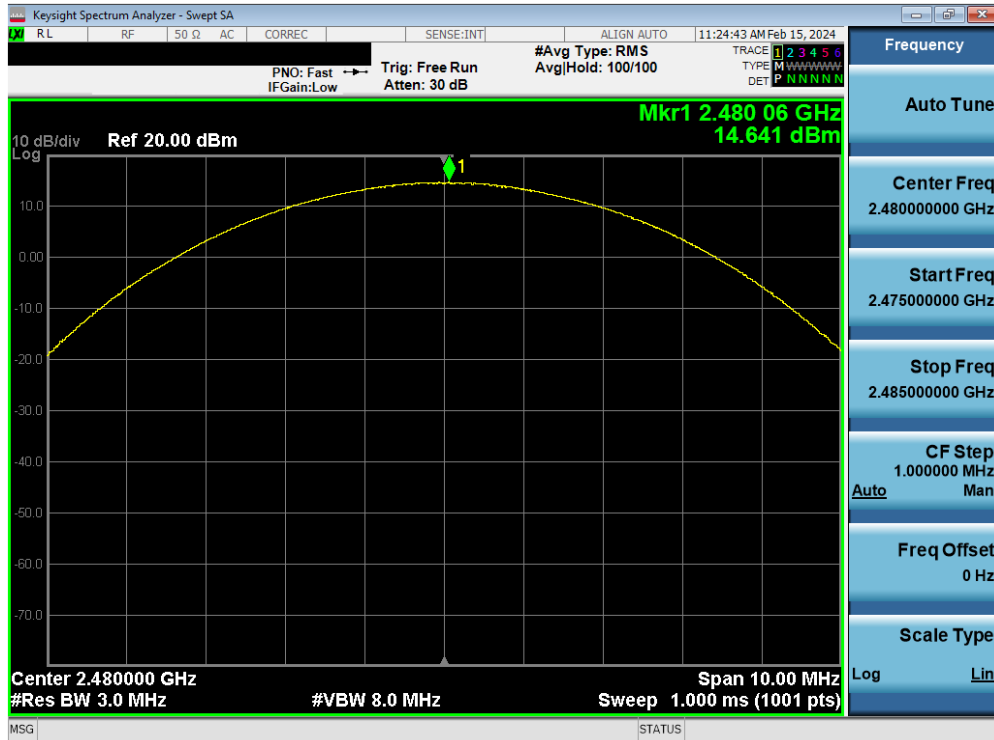


Plot 7-97. Peak Conducted Power (3Mbps – Ch. 0)

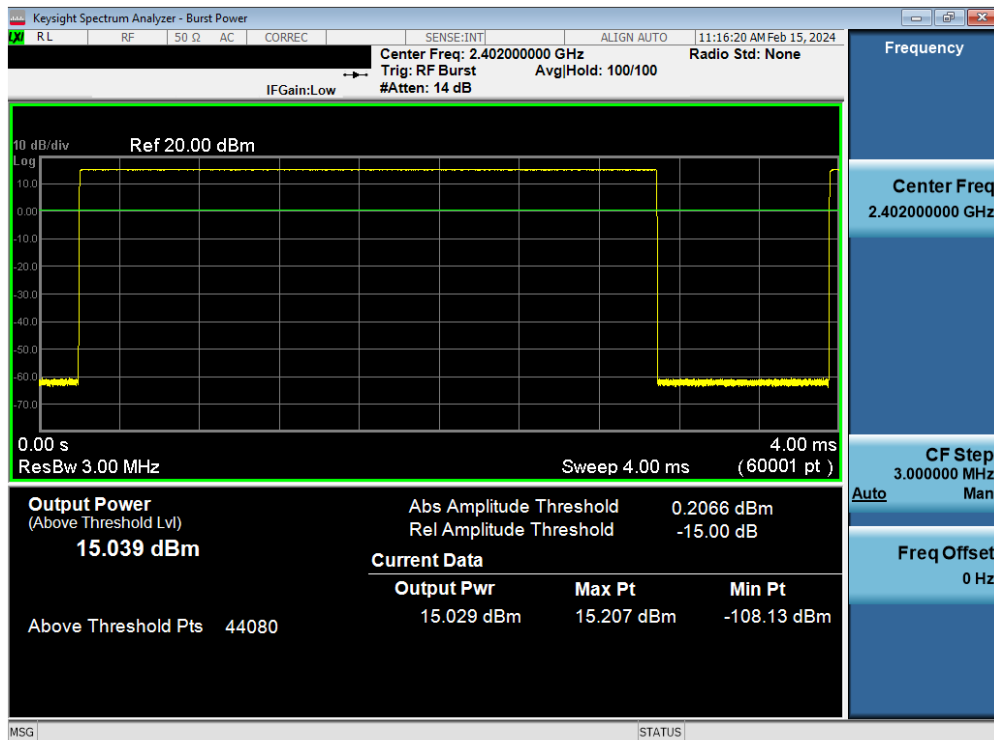


Plot 7-98. Peak Conducted Power (3Mbps – Ch. 39)

FCC ID: «FCC_ID» IC: 3048A-2085	MEASUREMENT REPORT («APPLICATION_TYPE»)		Approved by: Technical Manager
Test Report S/N: «Report_SN_BT_FCC»	Test Dates: «Date_of_Testing»	EUT Type: «EUT_Type»	Page 67 of 137

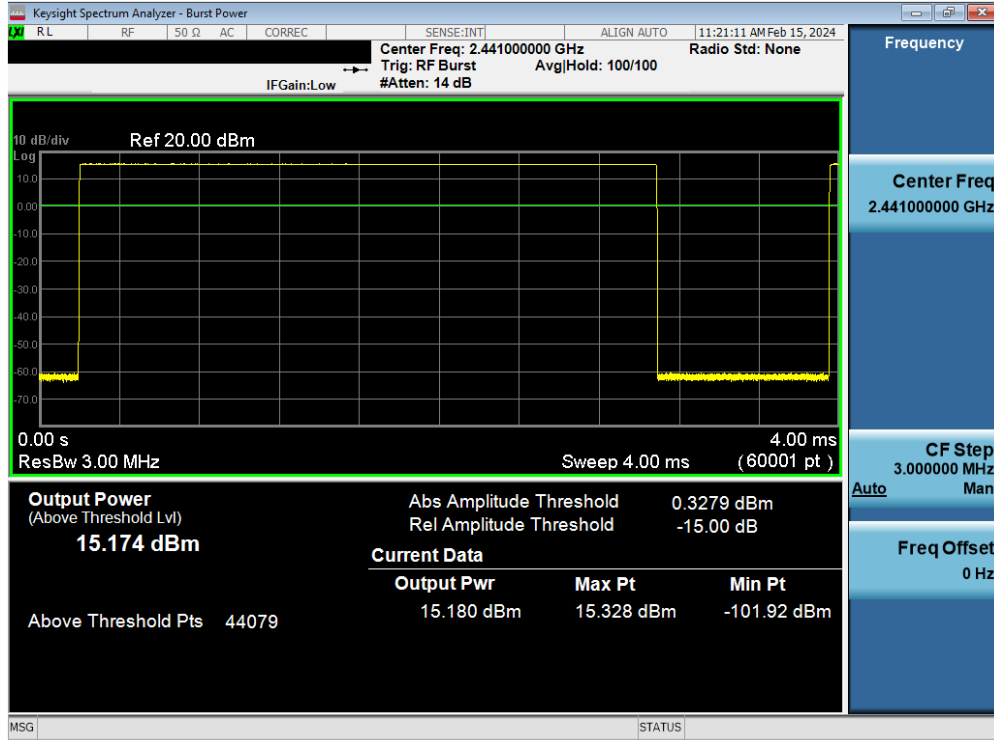


Plot 7-99. Peak Conducted Power (3Mbps – Ch. 78)

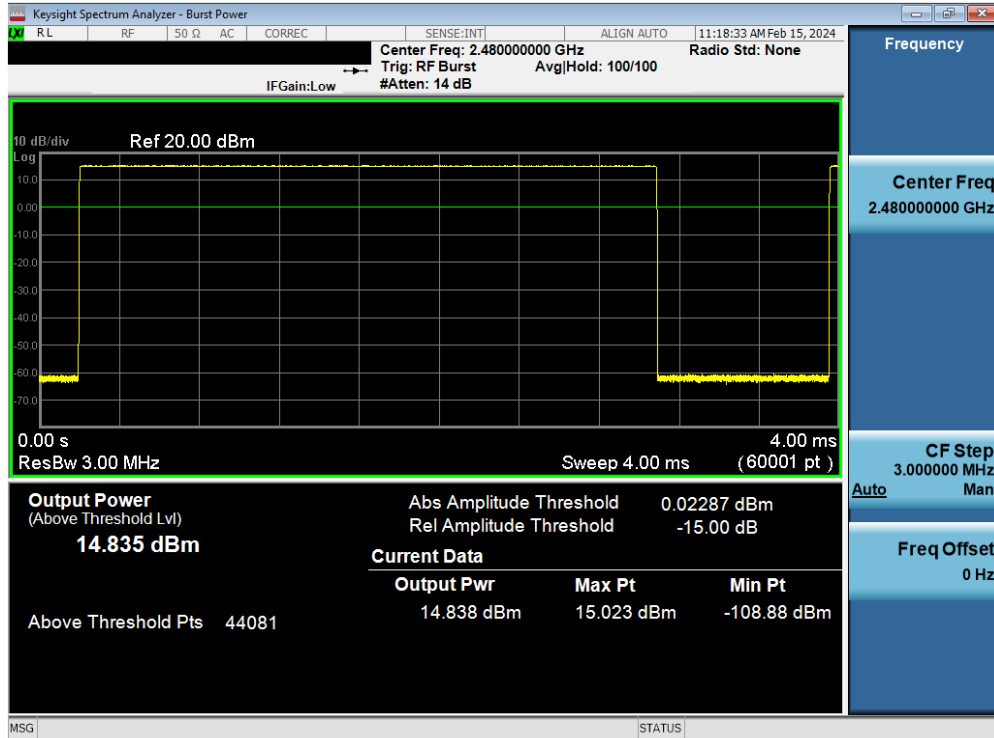


Plot 7-100. Average Conducted Power (1Mbps – Ch. 0)

FCC ID: «FCC_ID» IC: 3048A-2085	MEASUREMENT REPORT («APPLICATION_TYPE»)		Approved by: Technical Manager
Test Report S/N: «Report_SN_BT_FCC»	Test Dates: «Date_of_Testing»	EUT Type: «EUT_Type»	Page 68 of 137

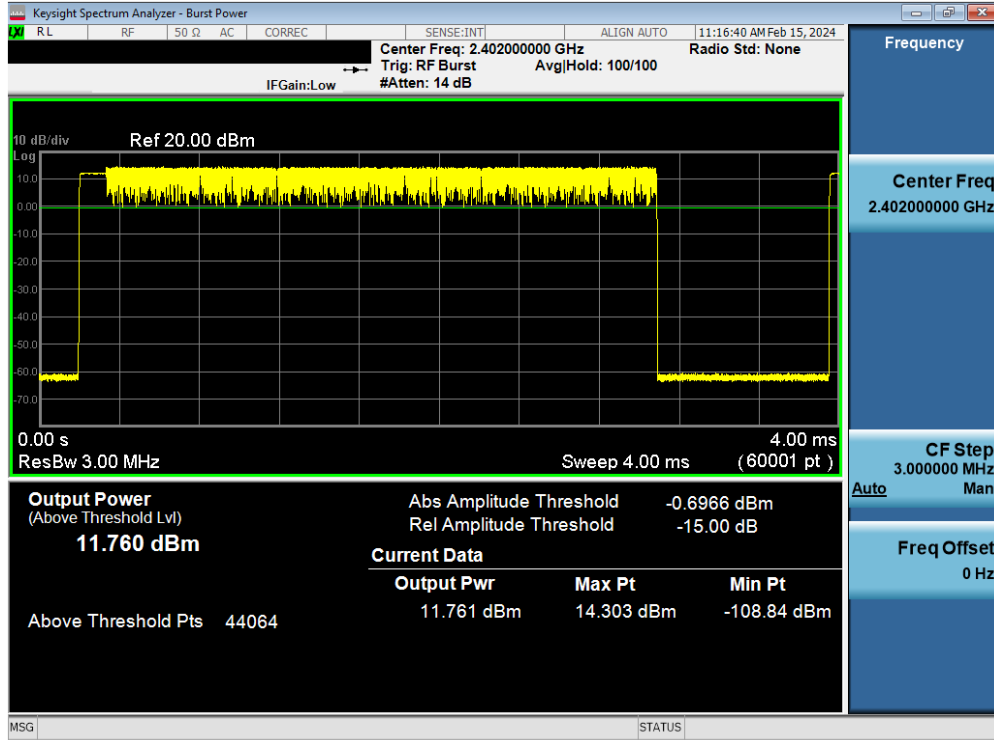


Plot 7-101. Average Conducted Power (1Mbps - Ch. 39)

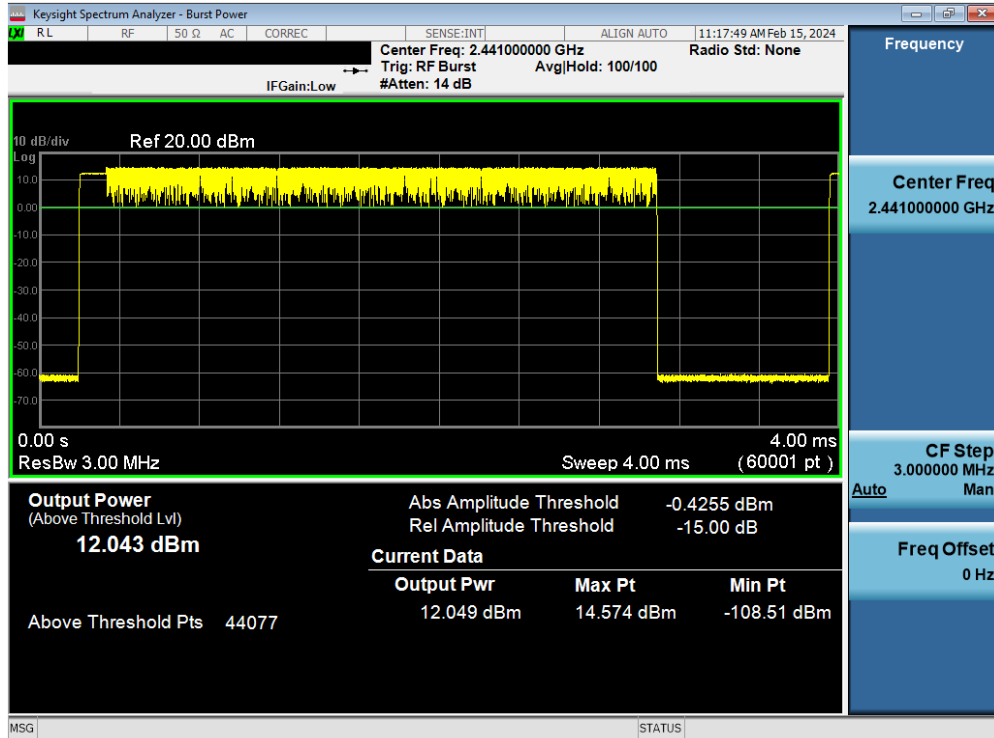


Plot 7-102. Average Conducted Power (1Mbps - Ch. 78)

FCC ID: «FCC_ID» IC: 3048A-2085	MEASUREMENT REPORT («APPLICATION_TYPE»)		Approved by: Technical Manager
Test Report S/N: «Report_SN_BT_FCC»	Test Dates: «Date_of_Testing»	EUT Type: «EUT_Type»	Page 69 of 137

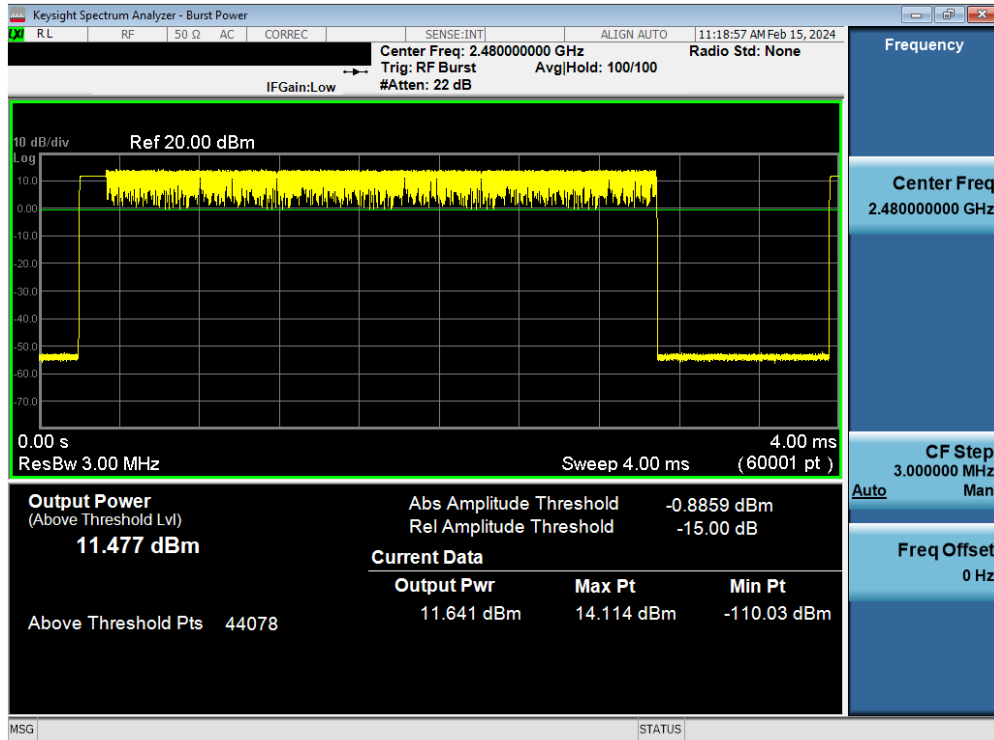


Plot 7-103. Average Conducted Power (2Mbps – Ch. 0)

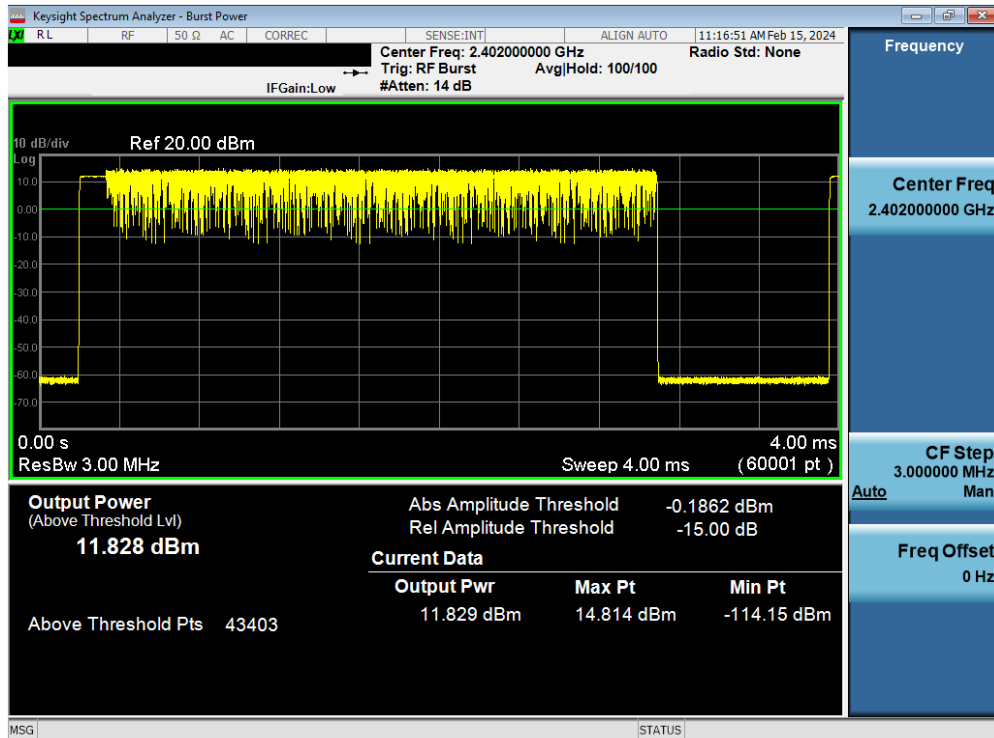


Plot 7-104. Average Conducted Power (2Mbps – Ch. 39)

FCC ID: «FCC_ID» IC: 3048A-2085	MEASUREMENT REPORT («APPLICATION_TYPE»)		Approved by: Technical Manager
Test Report S/N: «Report_SN_BT_FCC»	Test Dates: «Date_of_Testing»	EUT Type: «EUT_Type»	Page 70 of 137

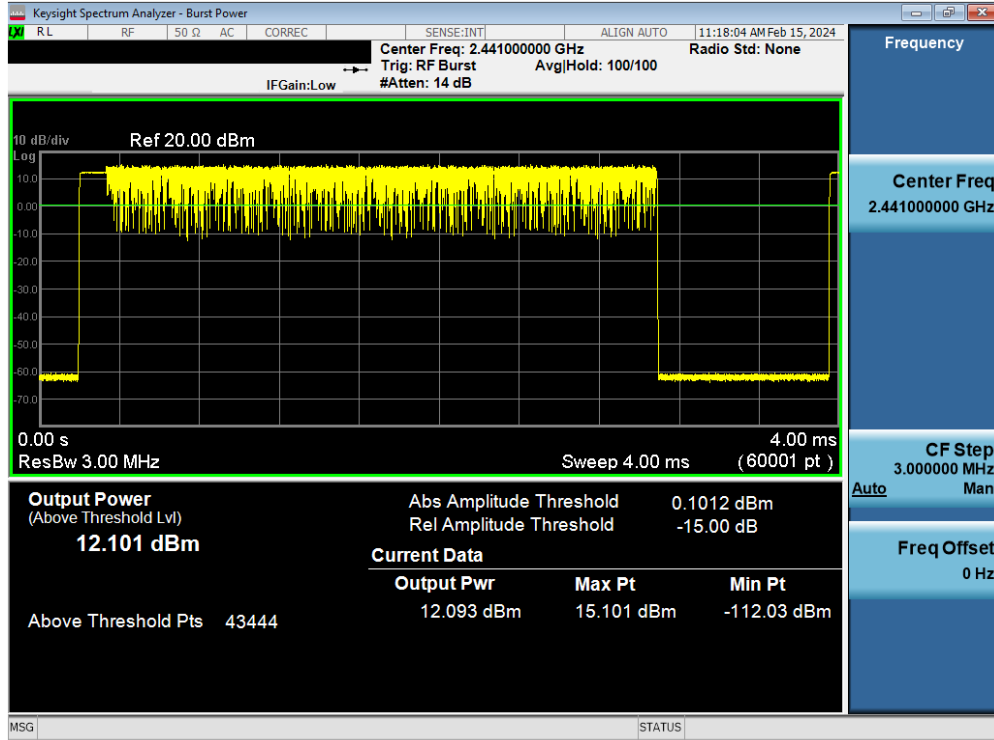


Plot 7-105. Average Conducted Power (2Mbps – Ch. 78)

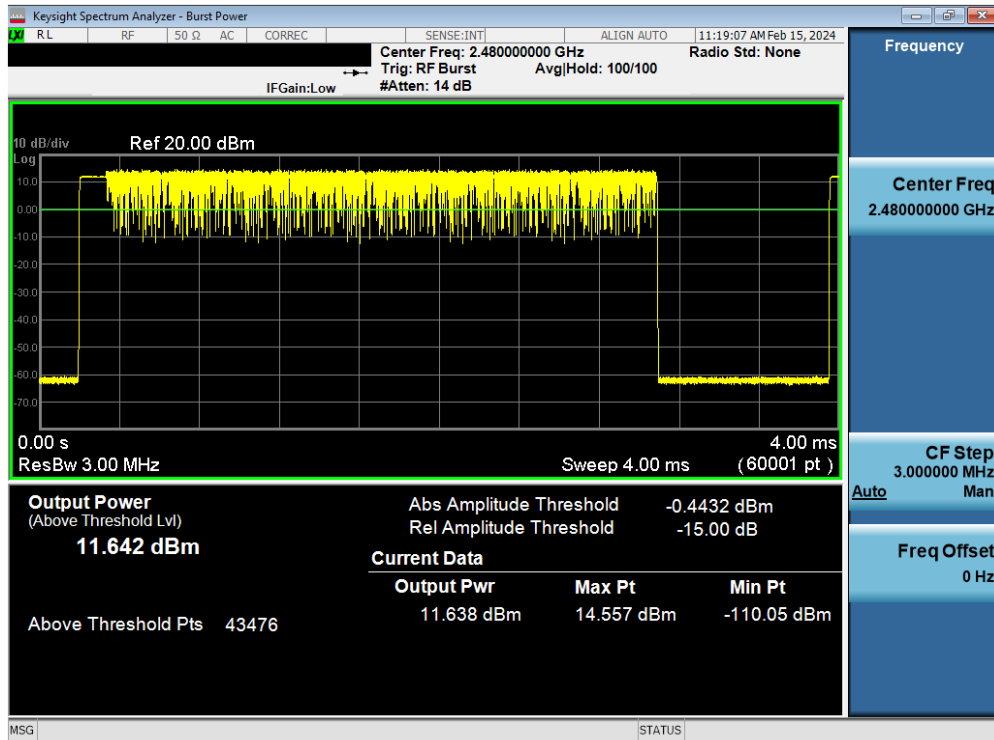


Plot 7-106. Average Conducted Power (3Mbps – Ch. 0)

FCC ID: «FCC_ID» IC: 3048A-2085	MEASUREMENT REPORT («APPLICATION_TYPE»)		Approved by: Technical Manager
Test Report S/N: «Report_SN_BT_FCC»	Test Dates: «Date_of_Testing»	EUT Type: «EUT_Type»	Page 71 of 137



Plot 7-107. Average Conducted Power (3Mbps – Ch. 39)



Plot 7-108. Average Conducted Power (3Mbps – Ch. 78)

FCC ID: «FCC_ID» IC: 3048A-2085	MEASUREMENT REPORT («APPLICATION_TYPE»)		Approved by: Technical Manager
Test Report S/N: «Report_SN_BT_FCC»	Test Dates: «Date_of_Testing»	EUT Type: «EUT_Type»	Page 72 of 137

7.4 Band Edge Compliance

§15.247 (d); RSS-247 [5.5]

Test Overview and Limits

EUT operates in hopping and non-hopping transmission mode. Measurement is taken at the highest point located outside of the emission bandwidth. **The maximum permissible out-of-band emission level is 20 dBc.**

Test Procedure Used

ANSI C63.10-2013 – Section 6.10.4

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 = 300kHz
5. Detector = Peak
6. Number of sweep points $\geq 2 \times \text{Span/RBW}$
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.



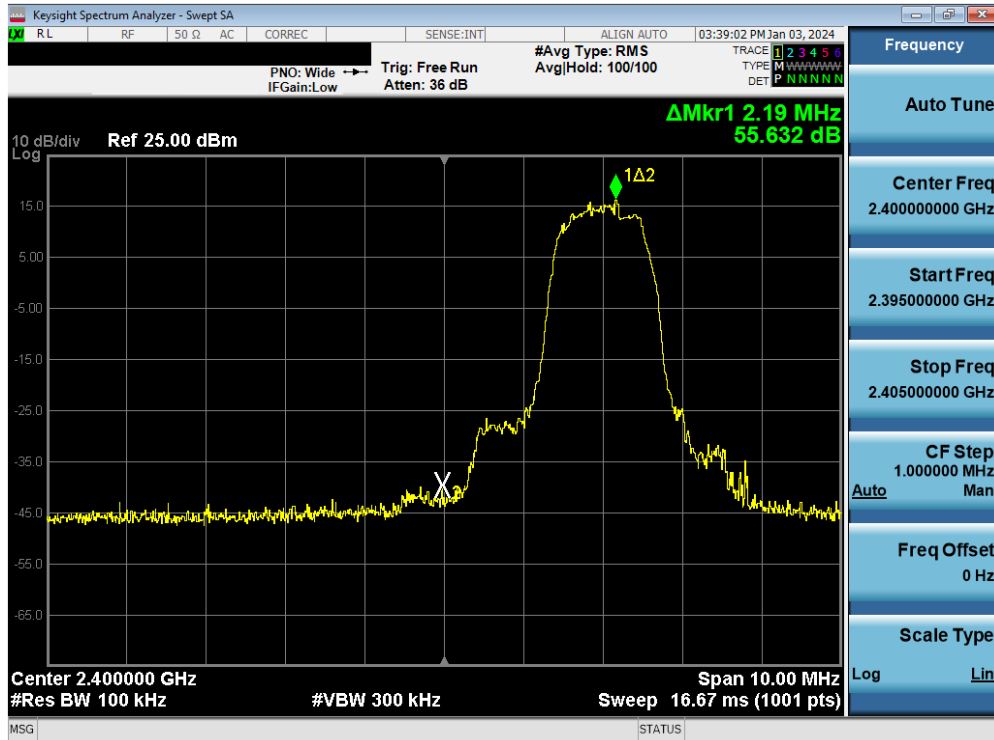
Figure 7-3. Test Instrument & Measurement Setup

Test Notes

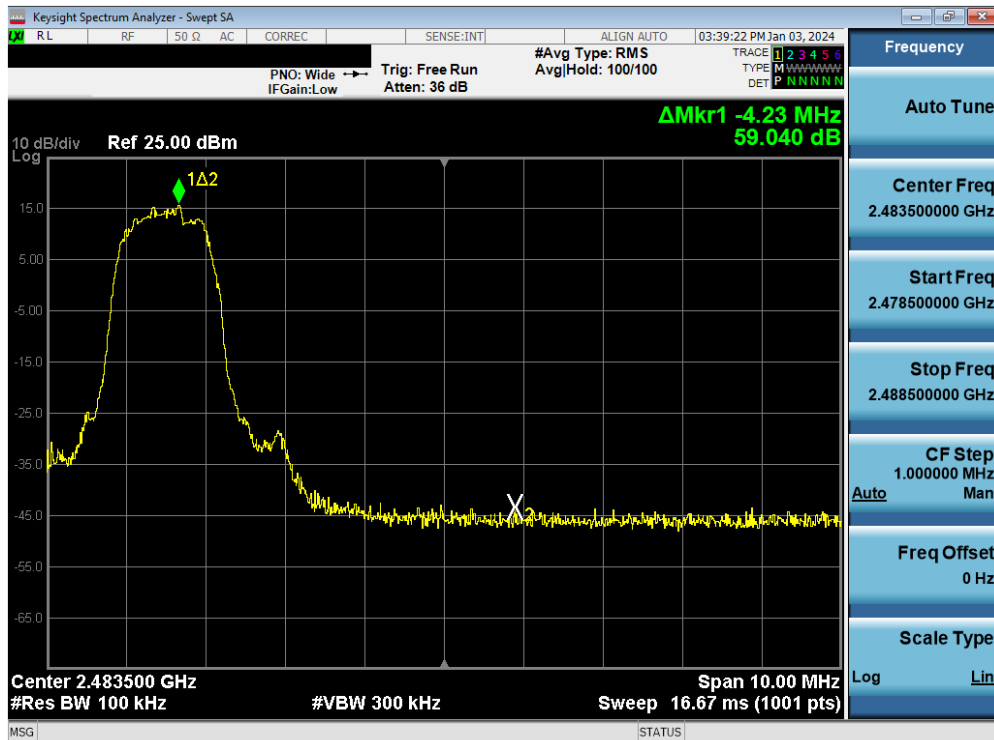
Out of band conducted spurious emissions at the band edge were investigated for all data rates in hopping and non-hopping modes. The worst case emissions were found with the EUT transmitting at 3 Mbps. Band edge emissions were also investigated with the EUT transmitting in all data rates. Plots of the worst case emissions are shown below.

FCC ID: «FCC_ID» IC: 3048A-2085	MEASUREMENT REPORT («APPLICATION_TYPE»)		Approved by: Technical Manager
Test Report S/N: «Report_SN_BT_FCC»	Test Dates: «Date_of_Testing»	EUT Type: «EUT_Type»	Page 73 of 137

SISO ANT 1

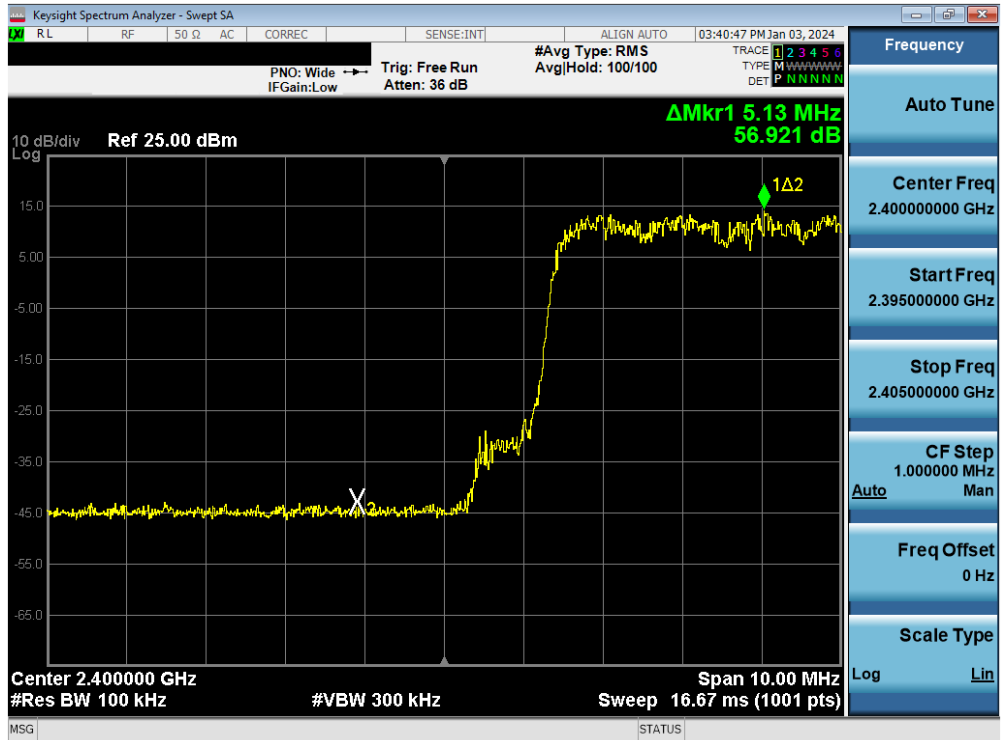


Plot 7-109. Band Edge Plot (Bluetooth with Hopping Disabled, 3 Mbps – Ch. 0)

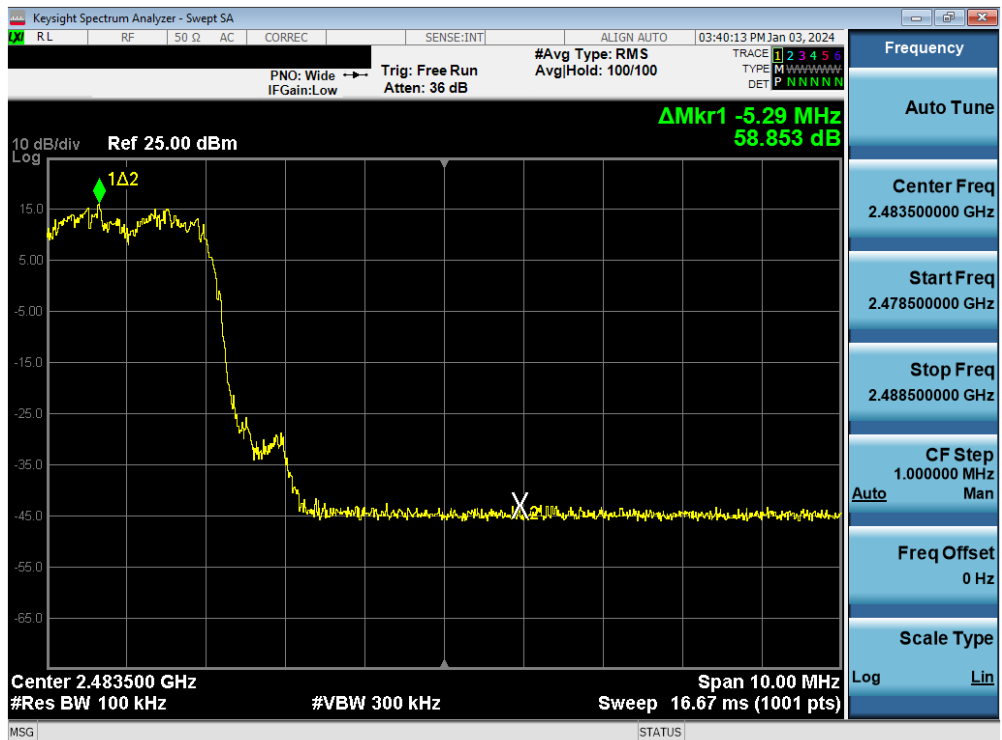


Plot 7-110. Band Edge Plot (Bluetooth with Hopping Disabled, 3 Mbps – Ch. 78)

FCC ID: «FCC_ID» IC: 3048A-2085	MEASUREMENT REPORT («APPLICATION_TYPE»)		Approved by: Technical Manager
Test Report S/N: «Report_SN_BT_FCC»	Test Dates: «Date_of_Testing»	EUT Type: «EUT_Type»	Page 74 of 137



Plot 7-111. Band Edge Plot (Bluetooth with Hopping Enabled, 3 Mbps)



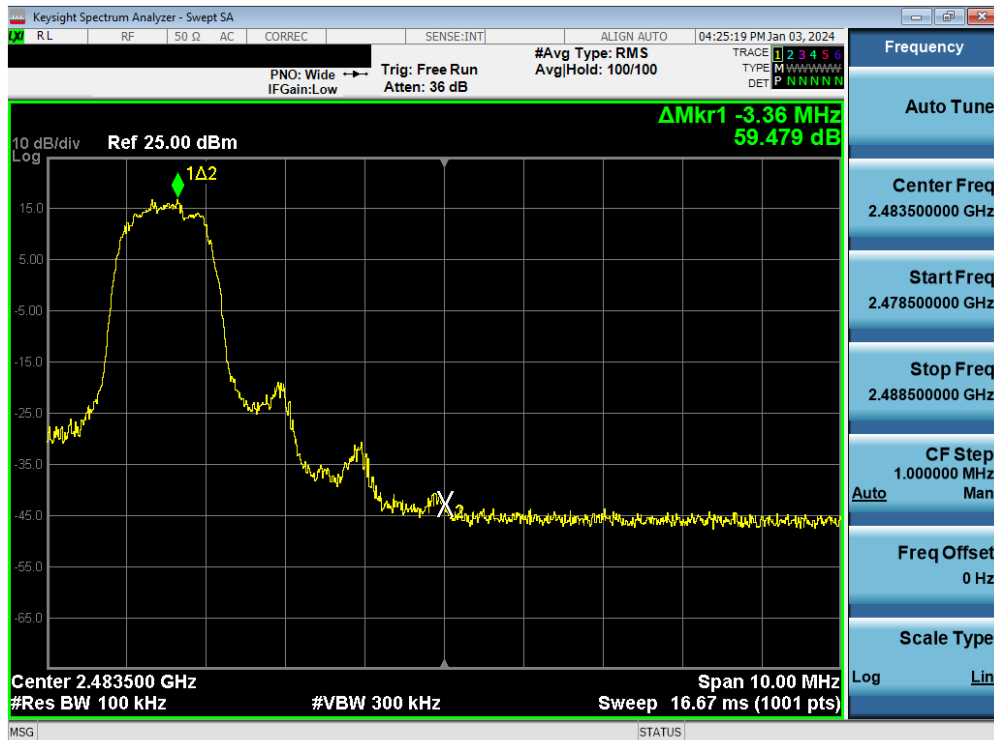
Plot 7-112. Band Edge Plot (Bluetooth with Hopping Enabled, 3 Mbps)

FCC ID: «FCC_ID» IC: 3048A-2085	MEASUREMENT REPORT («APPLICATION_TYPE»)		Approved by: Technical Manager
Test Report S/N: «Report_SN_BT_FCC»	Test Dates: «Date_of_Testing»	EUT Type: «EUT_Type»	Page 75 of 137

SISO ANT 2



Plot 7-113. Band Edge Plot (Bluetooth with Hopping Disabled, 3 Mbps – Ch. 0)

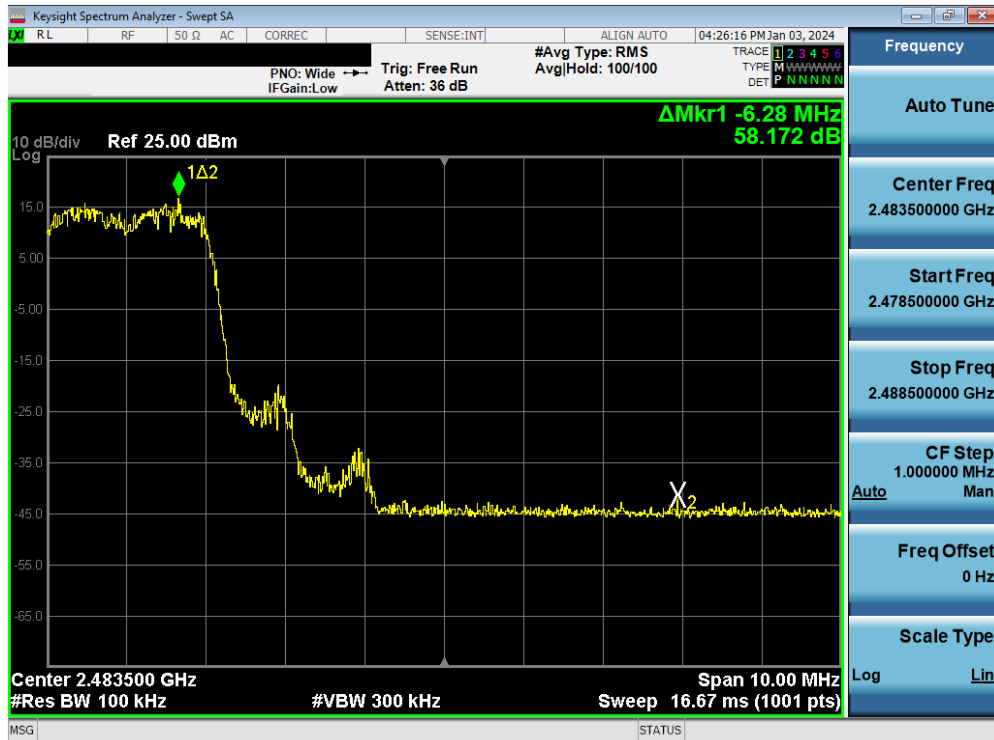


Plot 7-114. Band Edge Plot (Bluetooth with Hopping Disabled, 3 Mbps – Ch. 78)

FCC ID: «FCC_ID» IC: 3048A-2085	MEASUREMENT REPORT («APPLICATION_TYPE»)		Approved by: Technical Manager
Test Report S/N: «Report_SN_BT_FCC»	Test Dates: «Date_of_Testing»	EUT Type: «EUT_Type»	Page 76 of 137



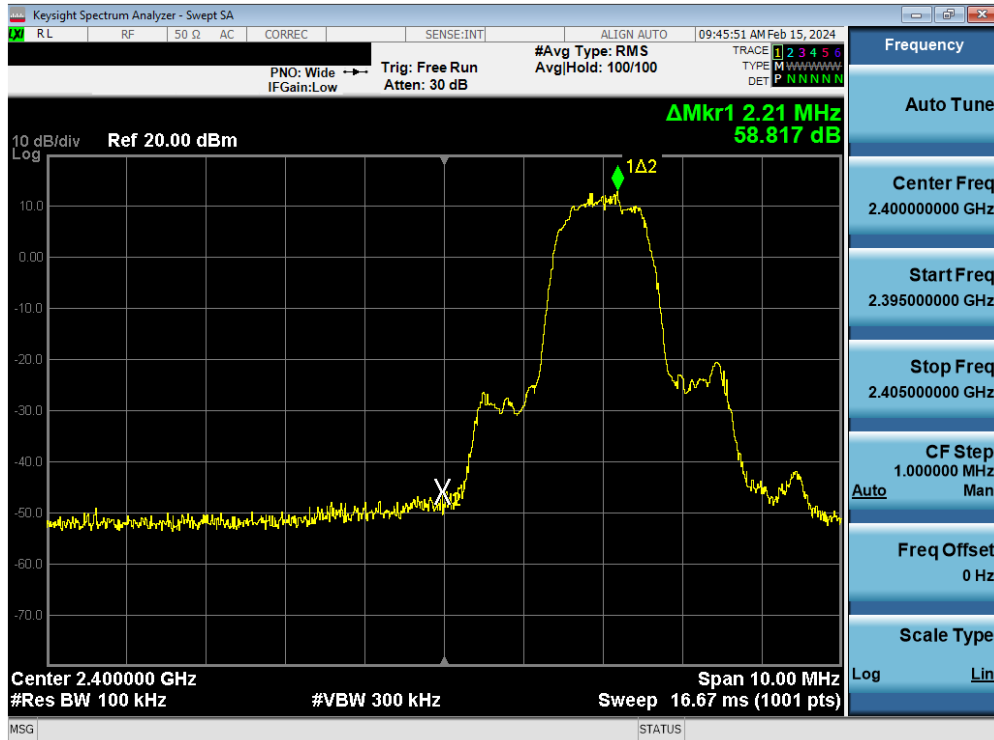
Plot 7-115. Band Edge Plot (Bluetooth with Hopping Enabled, 3 Mbps)



Plot 7-116. Band Edge Plot (Bluetooth with Hopping Enabled, 3 Mbps)

FCC ID: «FCC_ID» IC: 3048A-2085	MEASUREMENT REPORT («APPLICATION_TYPE»)		Approved by: Technical Manager
Test Report S/N: «Report_SN_BT_FCC»	Test Dates: «Date_of_Testing»	EUT Type: «EUT_Type»	Page 77 of 137

DUAL ANT 1



Plot 7-117. Band Edge Plot (Bluetooth with Hopping Disabled, 3 Mbps – Ch. 0)

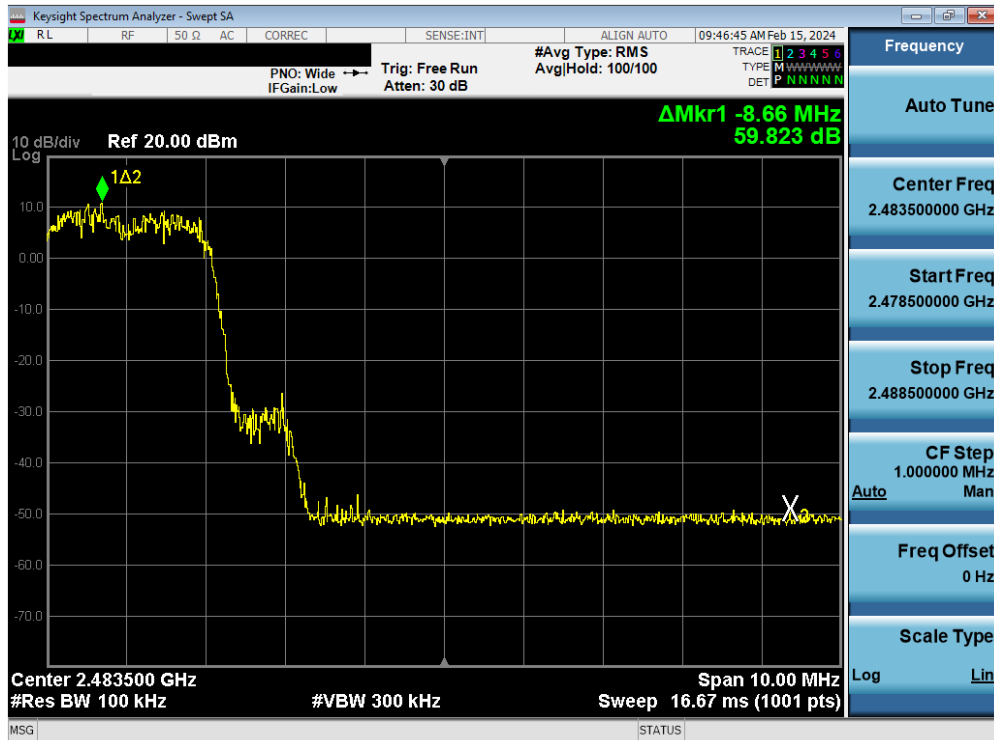


Plot 7-118. Band Edge Plot (Bluetooth with Hopping Disabled, 3 Mbps – Ch. 78)

FCC ID: «FCC_ID» IC: 3048A-2085		MEASUREMENT REPORT («APPLICATION_TYPE»)		Approved by: Technical Manager
Test Report S/N: «Report_SN_BT_FCC»	Test Dates: «Date_of_Testing»	EUT Type: «EUT_Type»		Page 78 of 137



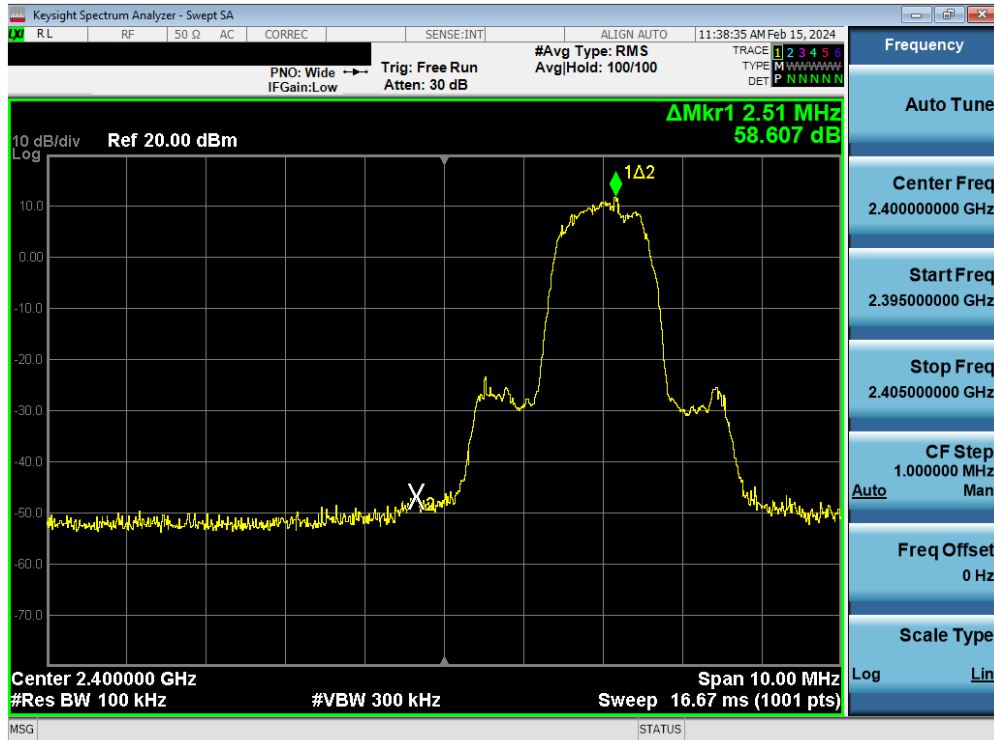
Plot 7-119. Band Edge Plot (Bluetooth with Hopping Enabled, 3 Mbps)



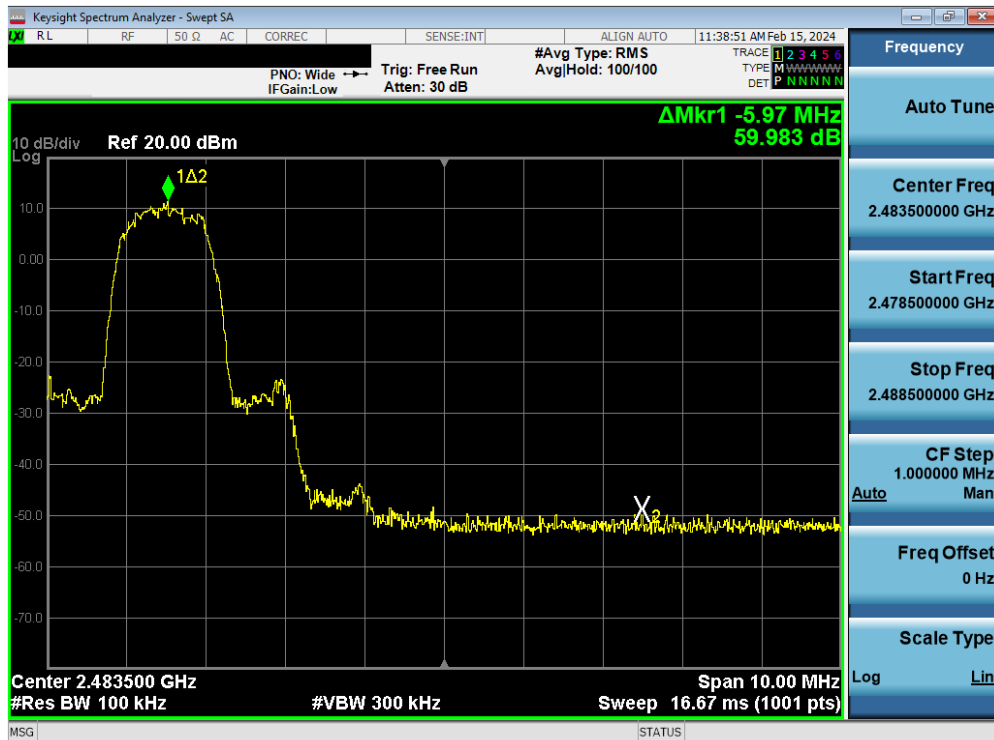
Plot 7-120. Band Edge Plot (Bluetooth with Hopping Enabled, 3 Mbps)

FCC ID: «FCC_ID» IC: 3048A-2085	MEASUREMENT REPORT («APPLICATION_TYPE»)		Approved by: Technical Manager
Test Report S/N: «Report_SN_BT_FCC»	Test Dates: «Date_of_Testing»	EUT Type: «EUT_Type»	Page 79 of 137

DUAL ANT 2



Plot 7-121. Band Edge Plot (Bluetooth with Hopping Disabled, 3 Mbps – Ch. 0)



Plot 7-122. Band Edge Plot (Bluetooth with Hopping Disabled, 3 Mbps – Ch. 78)

FCC ID: «FCC_ID» IC: 3048A-2085	MEASUREMENT REPORT («APPLICATION_TYPE»)		Approved by: Technical Manager
Test Report S/N: «Report_SN_BT_FCC»	Test Dates: «Date_of_Testing»	EUT Type: «EUT_Type»	Page 80 of 137



Plot 7-123. Band Edge Plot (Bluetooth with Hopping Enabled, 3 Mbps)



Plot 7-124. Band Edge Plot (Bluetooth with Hopping Enabled, 3 Mbps)

FCC ID: «FCC_ID» IC: 3048A-2085	MEASUREMENT REPORT («APPLICATION_TYPE»)		Approved by: Technical Manager
Test Report S/N: «Report_SN_BT_FCC»	Test Dates: «Date_of_Testing»	EUT Type: «EUT_Type»	Page 81 of 137

7.5 Carrier Frequency Separation

§15.247 (a.1); RSS-247 [5.1(2)]

Test Overview and Limit

Measurement is made with EUT operating in hopping mode. **The minimum permissible channel separation for this system is 2/3 the value of the 20dB BW.**

Test Procedure Used

ANSI C63.10-2013 – Section 7.8.2

Test Settings

1. Span = Wide enough to capture peaks of two adjacent channels
2. RBW = 30% of channel spacing. Adjust as necessary to best identify center of each individual channel
3. VBW \geq RBW
4. Sweep = Auto
5. Detector = Peak
6. Trace mode = max hold
7. The trace was allowed to stabilize.
8. Marker-delta function used to determine separation between peaks of the adjacent channels

Test Setup

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



Figure 7-4. Test Instrument & Measurement Setup

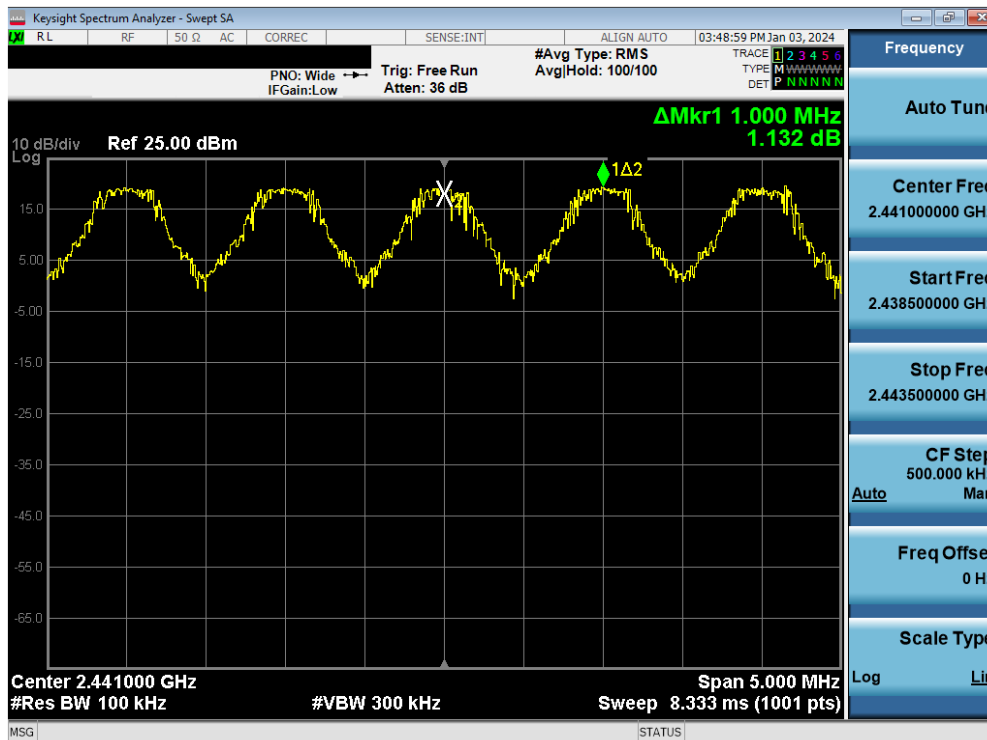
Test Notes

The EUT complies with the minimum channel separation requirement when it is operating in 1x/EDR mode using 79 channels and when operating in AFH mode using 20 channels.

FCC ID: «FCC_ID» IC: 3048A-2085	MEASUREMENT REPORT («APPLICATION_TYPE»)		Approved by: Technical Manager
Test Report S/N: «Report_SN_BT_FCC»	Test Dates: «Date_of_Testing»	EUT Type: «EUT_Type»	Page 82 of 137

Frequency [MHz]	Data Rate [Mbps]	Mod.	Channel No.	Min. Channel Separation [MHz]
2402	1.0	GFSK	0	0.626
2441	1.0	GFSK	39	0.630
2480	1.0	GFSK	78	0.630
2402	2.0	$\pi/4$ -DQPSK	0	0.880
2441	2.0	$\pi/4$ -DQPSK	39	0.879
2480	2.0	$\pi/4$ -DQPSK	78	0.893
2402	3.0	8DPSK	0	0.877
2441	3.0	8DPSK	39	0.867
2480	3.0	8DPSK	78	0.885

Table 7-9. Minimum Channel Separation – SISO ANT1

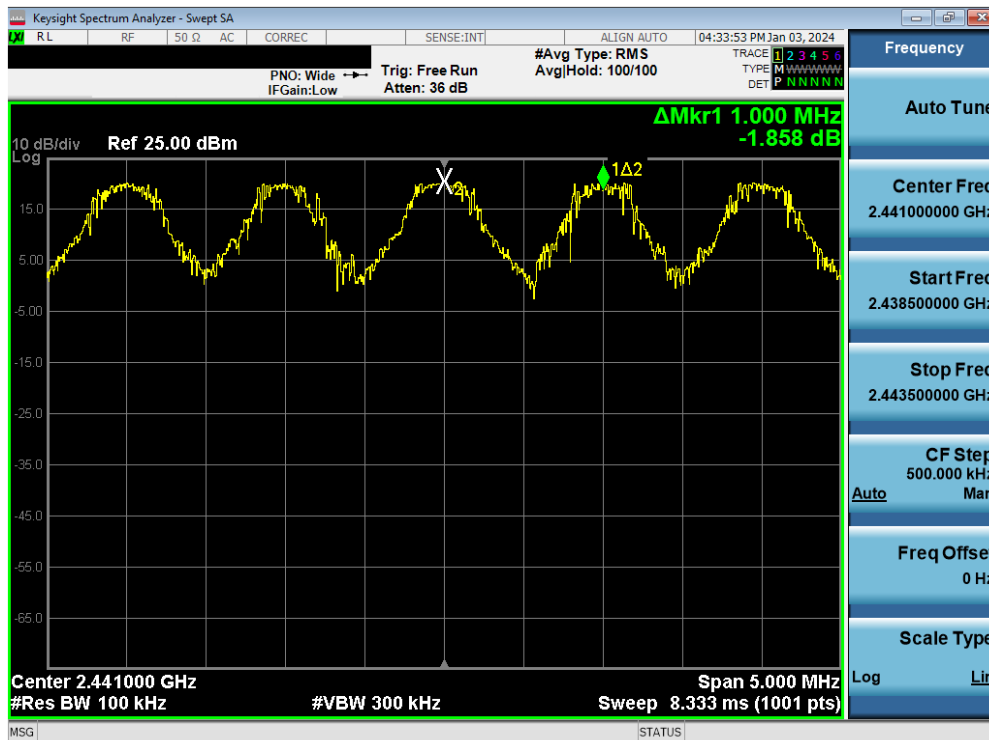


Plot 7-125. Channel Spacing Plot (Bluetooth) – SISO ANT1

FCC ID: «FCC_ID» IC: 3048A-2085	MEASUREMENT REPORT («APPLICATION_TYPE»)		Approved by: Technical Manager
Test Report S/N: «Report_SN_BT_FCC»	Test Dates: «Date_of_Testing»	EUT Type: «EUT_Type»	Page 83 of 137

Frequency [MHz]	Data Rate [Mbps]	Mod.	Channel No.	Min. Channel Separation [MHz]
2402	1.0	GFSK	0	0.627
2441	1.0	GFSK	39	0.626
2480	1.0	GFSK	78	0.631
2402	2.0	$\pi/4$ -DQPSK	0	0.884
2441	2.0	$\pi/4$ -DQPSK	39	0.884
2480	2.0	$\pi/4$ -DQPSK	78	0.885
2402	3.0	8DPSK	0	0.901
2441	3.0	8DPSK	39	0.887
2480	3.0	8DPSK	78	0.877

Table 7-10. Minimum Channel Separation – SISO ANT2

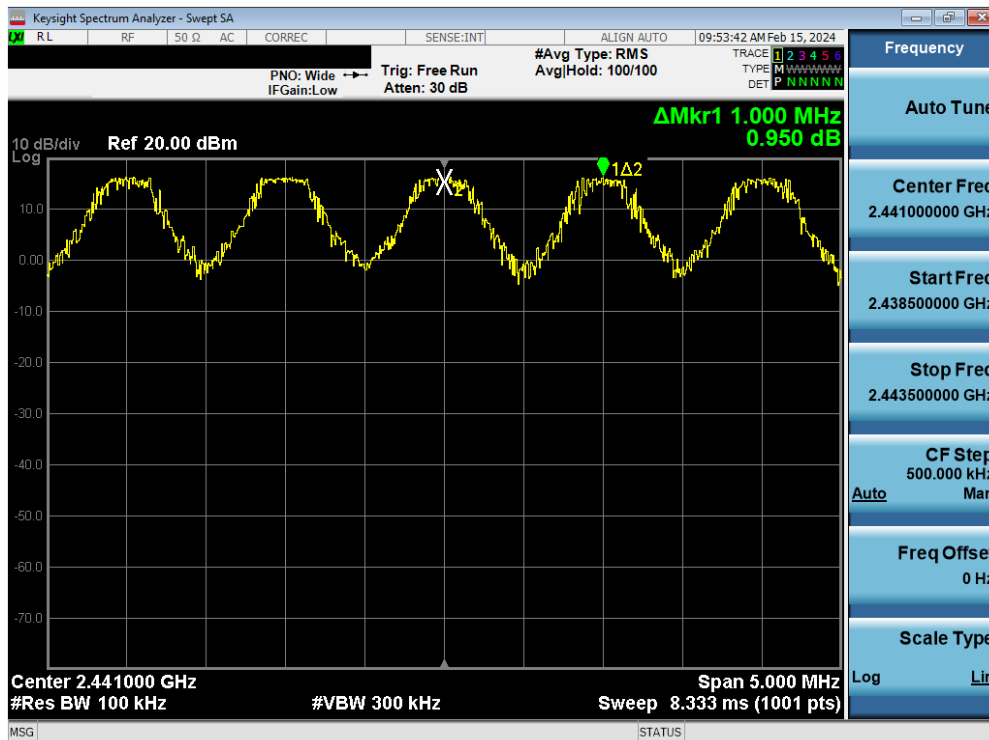


Plot 7-126. Channel Spacing Plot (Bluetooth) – SISO ANT2

FCC ID: «FCC_ID» IC: 3048A-2085	MEASUREMENT REPORT («APPLICATION_TYPE»)		Approved by: Technical Manager
Test Report S/N: «Report_SN_BT_FCC»	Test Dates: «Date_of_Testing»	EUT Type: «EUT_Type»	Page 84 of 137

Frequency [MHz]	Data Rate [Mbps]	Mod.	Channel No.	Min. Channel Separation [MHz]
2402	1.0	GFSK	0	0.618
2441	1.0	GFSK	39	0.630
2480	1.0	GFSK	78	0.617
2402	2.0	$\pi/4$ -DQPSK	0	0.892
2441	2.0	$\pi/4$ -DQPSK	39	0.877
2480	2.0	$\pi/4$ -DQPSK	78	0.897
2402	3.0	8DPSK	0	0.897
2441	3.0	8DPSK	39	0.865
2480	3.0	8DPSK	78	0.897

Table 7-11. Minimum Channel Separation – DUAL ANT1



Plot 7-127. Channel Spacing Plot (Bluetooth) – DUAL ANT1

FCC ID: «FCC_ID» IC: 3048A-2085	MEASUREMENT REPORT («APPLICATION_TYPE»)		Approved by: Technical Manager
Test Report S/N: «Report_SN_BT_FCC»	Test Dates: «Date_of_Testing»	EUT Type: «EUT_Type»	Page 85 of 137