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MEASUREMENT REPORT Bluetooth (Low Energy)

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:
4/10/2024
Test Site/Location:
Element lab., Columbia, MD, USA
Test Report Serial No.:
1M2312190129-05.C3K

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

Application Type: Certification
Model/HVIN: 2076
EUT Type: Portable Computing Device
Max. RF Output Power: 120.948 mW (20.83 dBm) Peak Conducted
Frequency Range: 2402 – 2480MHz
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 C63.10-2013, KDB 558074 D01 v05r02, KDB 484596 D01 v02r03

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 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



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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 U.S. and Canada Mutual Recognition Agreements (MRAs).

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2.0 PRODUCT INFORMATION

2.1 Equipment Description

The Equipment Under Test (EUT) is the **Microsoft Corporation Portable Computing Device FCC ID: C3K2076**. The data found in this test report was taken with the EUT operating in Bluetooth low energy mode. While in low energy mode, the Bluetooth transmitter hops pseudo-randomly between 40 channels, three of which are “advertising channels”. When the transmitter is hopping only between the three advertising channels, the EUT does not fall under the category of a “hopper” as defined in 15.247(a)(iii) which states that a “frequency hopping systems in the 2400–2483.5 MHz band shall use at least 15 channels.” As operation on only the advertising channels does not qualify the EUT as a hopper, the EUT is certified as a DTS device in this mode. The data found in this report is representative of the device when it transmits on its advertising channels. Typical Bluetooth operation is covered under the DSS report found with this application.

Test Device Serial No.: 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)

Ch.	Frequency (MHz)
0	2402
:	:
19	2440
:	:
39	2480

Table 2-1. Frequency / Channel Operations

2.3 Antenna Description

Following antenna was used for the testing.

Frequency [GHz]	ANT1	ANT2	Directional 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 and KDB 558074 D01 v05r02. ANSI C63.10-2013 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, 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 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

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/or no modifications were made during testing.

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3.0 DESCRIPTION OF TESTS

3.1 Evaluation Procedure

The measurement procedures described in the American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices (ANSI C63.10-2013) 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 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 those 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. 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 antenna(s) 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
Line Conducted Disturbance	3.09
Radiated Disturbance (<1GHz)	4.98
Radiated Disturbance (>1GHz)	5.07
Radiated Disturbance (>18GHz)	5.09

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6.0 TEST EQUIPMENT CALIBRATION DATA

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

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
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

Note:

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

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7.0 TEST RESULTS

7.1 Summary

Company Name: Microsoft Corporation
 FCC ID: C3K2076
 FCC Classification: Digital Transmission System (DTS)
 Number of Channels: 40

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 0
15.247(b)(3)	RSS-247 [5.4(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])	LINE CONDUCTED	PASS	Section 7.9

Table 7-1. Summary of Test Results

Notes:

- All modes of operation were investigated. The test results shown in the following sections represent the worst case emissions.
- 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.
- 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.
- 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 “Bluetooth LE Automation,” Version 3.6.
- 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.
- Data was leveraged from test report 1M2311170118-05, FCC ID: C3K2085. See Table 7-2 for spot-check results.

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FCC Rules	Test Item	Test Cases	Units	Limit	Reference FCC ID: 2085	Variant FCC ID: 2076	Deviation	Max Deviation	Pass/Fail
15247(b)(3)	Conducted Output Power	1Mbps, Ch.17, ANT2	dBm	30.00	20.83	20.17	-0.66	3.00	PASS
15.209	Radiated Spurious Emissions	1Mbps, Ch.39, MIMO	dBuV/m	53.98	38.21	36.61	-1.60	3.00	PASS
15.209	Radiated Band Edge Emissions	1Mbps, Ch.39, ANT2	dBuV/m	53.98	46.90	47.14	0.24	3.00	PASS

Table 7-2. Spot-check Results

Frequency [MHz]	Data Rate [Mbps]	Channel No.	Bluetooth Mode	Peak Conducted Power	
				[dBm]	[mW]
2440	1 Mbps	17	LE	20.17	104.088

Table 7-3. Conducted Output Power Measurements (Spot-check)

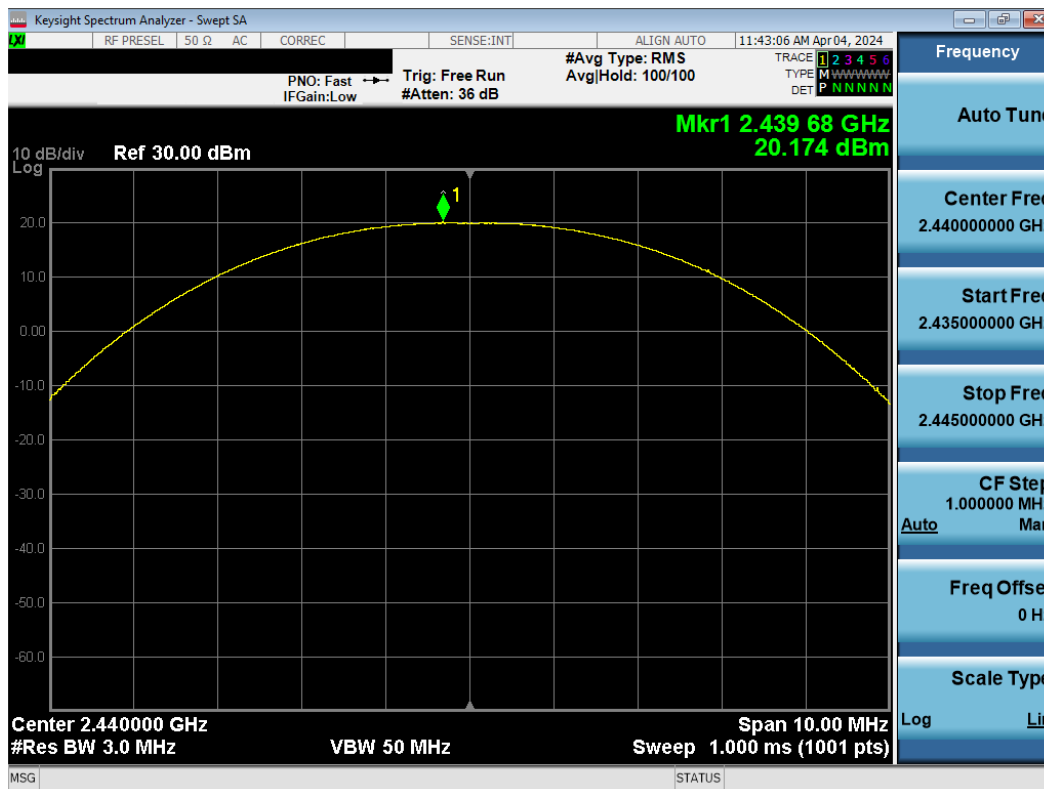


Table 7-4. Average Conducted Power Plot (Spot-check, 1Mbps – Ch. 17)

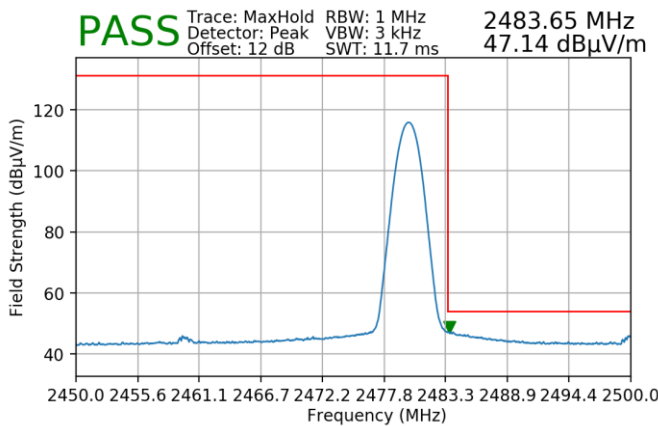
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Bluetooth Mode: LE
 Distance of Measurements: 3 Meters
 Operating Frequency: 2480MHz
 Channel: 39

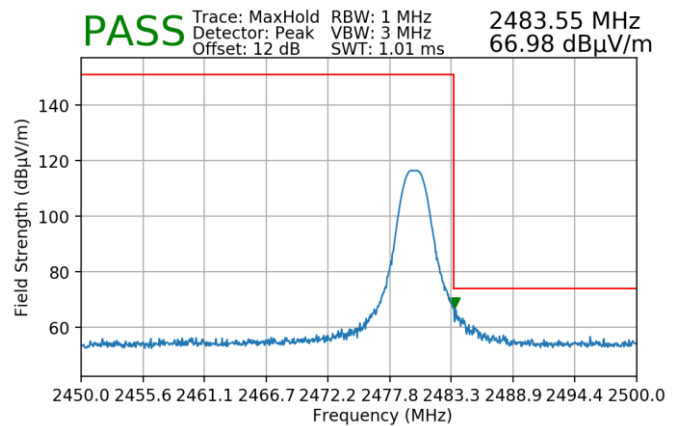
Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBμV/m]	Limit [dBμV/m]	Margin [dB]
4960.00	Avg	V	146	195	-77.20	6.81	36.61	53.98	-17.37

Table 7-5. Radiated Spurious Emission Measurements (spot-check)

Bluetooth Mode: LE
 Measurement Distance: 3 Meters
 Operating Frequency: 2480MHz
 Channel: 39



Plot 7-1. Radiated Restricted Upper Band Edge Measurement (Average) – SISO ANT2 (spot-check)



Plot 7-2. Radiated Restricted Upper Band Edge Measurement (Peak) – SISO ANT2 (spot-check)

- 1) Each spot check test on the EUT was performed using the same procedure and setting that were used to perform the test on the corresponding reference device. And the worst-case RSE data is determined by an actual emission and not by noise floor.
- 2) This report contains the data from the originally filed reference model (FCC ID: C3K2085), and all test cases were performed to verify the variant EUT is still in compliance with the spot checked results to the reference device and was performed using the guidance of ANSI C63.10-2013.

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7.2 6dB Bandwidth Measurement – Bluetooth (LE)

§15.247(a.2); RSS-247 [5.2]

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 maximum power and at the appropriate frequencies. 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 C63.10-2013 – Section 11.8.2 Option 2
KDB 558074 D01 v05r02 – Section 8.2

Test Settings

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

Test Setup

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



Figure 7-1. Test Instrument & Measurement Setup

Test Notes

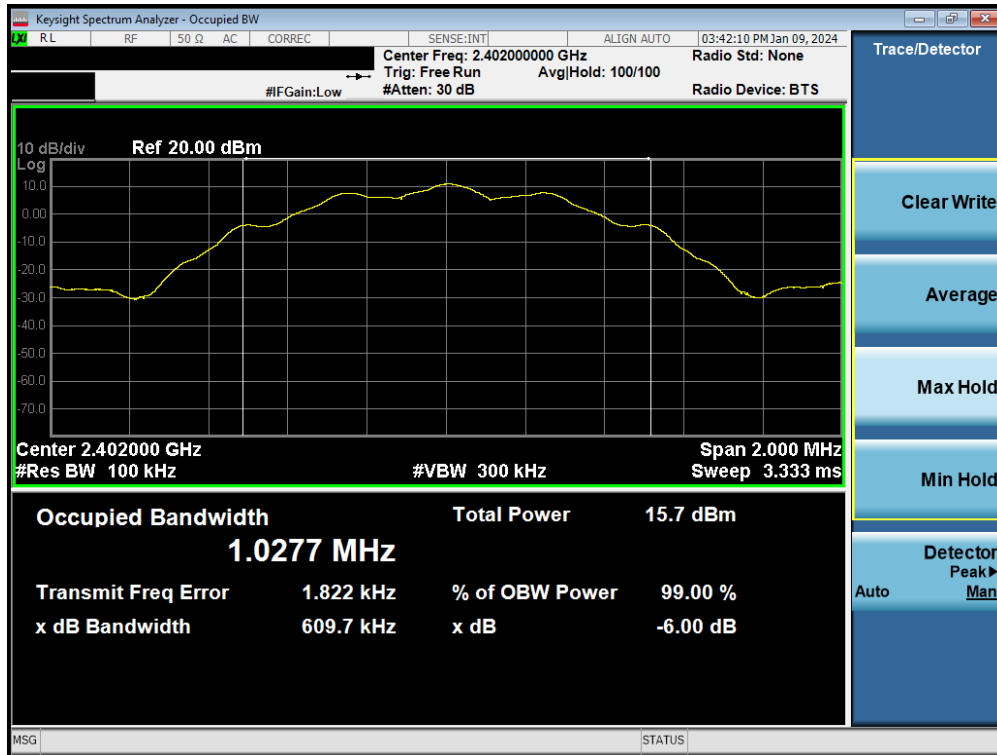
None

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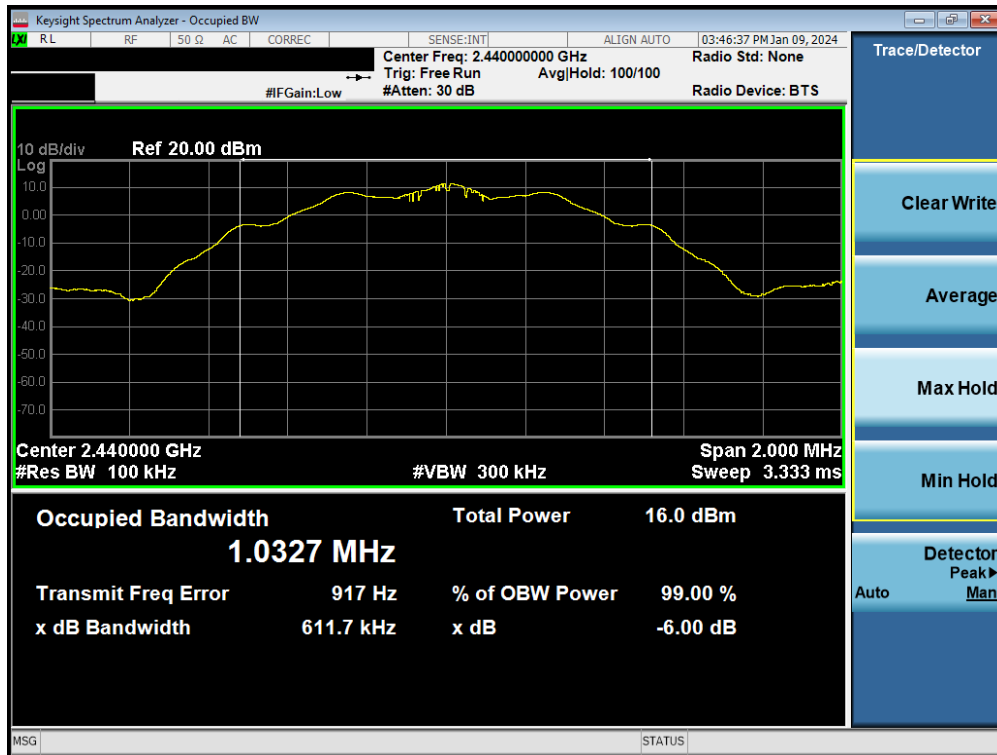
Frequency [MHz]	Data Rate	Channel No.	Bluetooth Mode	Measured Bandwidth [kHz]	Minimum Bandwidth [kHz]	Pass / Fail
2402	125 kbps	37	LE	609.7	500	Pass
2440	125 kbps	17	LE	611.7	500	Pass
2480	125 kbps	39	LE	610.9	500	Pass
2402	500 kbps	37	LE	661.4	500	Pass
2440	500 kbps	17	LE	660.6	500	Pass
2480	500 kbps	39	LE	658.5	500	Pass
2402	1 Mbps	37	LE	710.0	500	Pass
2440	1 Mbps	17	LE	711.0	500	Pass
2480	1 Mbps	39	LE	711.6	500	Pass
2404	2 Mbps	0	LE	1162.8	500	Pass
2440	2 Mbps	17	LE	1161.1	500	Pass
2478	2 Mbps	36	LE	1159.1	500	Pass

Table 7-6. Conducted Bandwidth Measurements – SISO ANT1

FCC ID: C3K2076 IC: 3048A-2076	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2312190129-05.C3K	Test Dates: 01/03/2024 - 03/18/2024	EUT Type: Portable Computing Device	Page 15 of 122

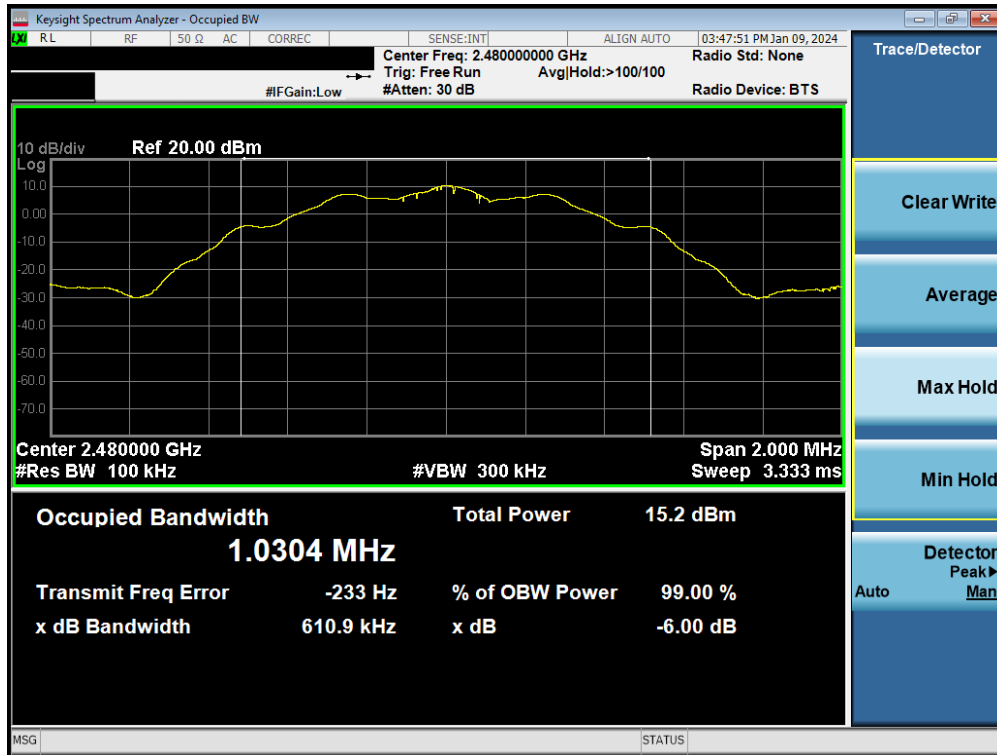


Plot 7-3. 6dB Bandwidth Plot (Bluetooth (LE), 125kbps – Ch. 37)

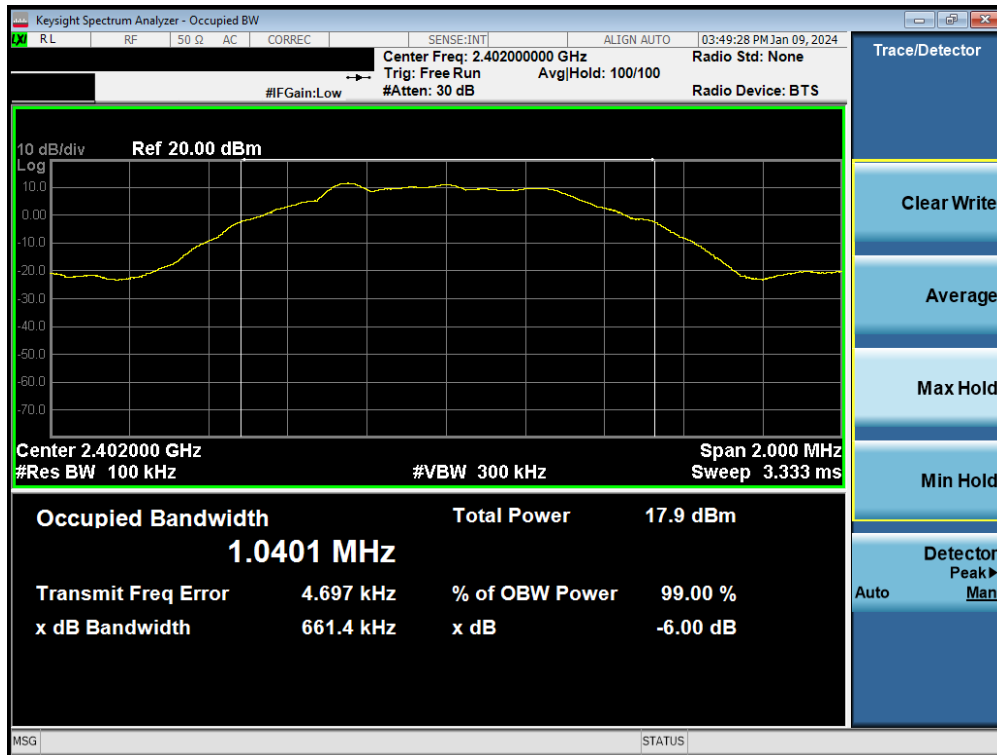


Plot 7-4. 6dB Bandwidth Plot (Bluetooth (LE), 125kbps – Ch. 17)

FCC ID: C3K2076 IC: 3048A-2076		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2312190129-05.C3K	Test Dates: 01/03/2024 - 03/18/2024	EUT Type: Portable Computing Device	Page 16 of 122	

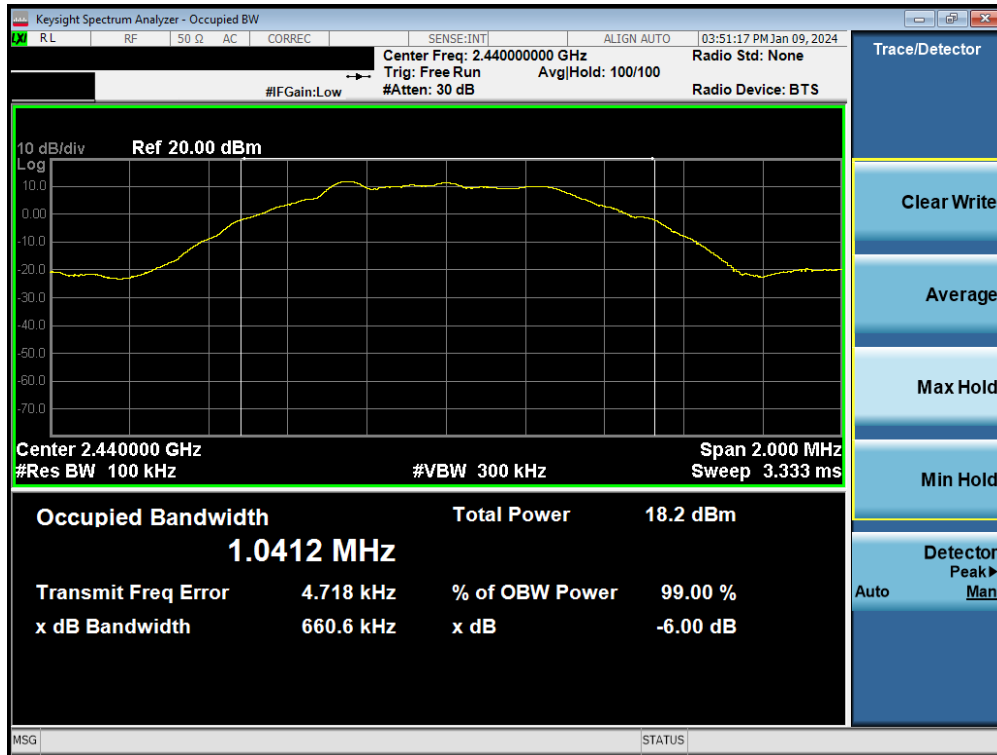


Plot 7-5. 6dB Bandwidth Plot (Bluetooth (LE), 125kbps – Ch. 39)

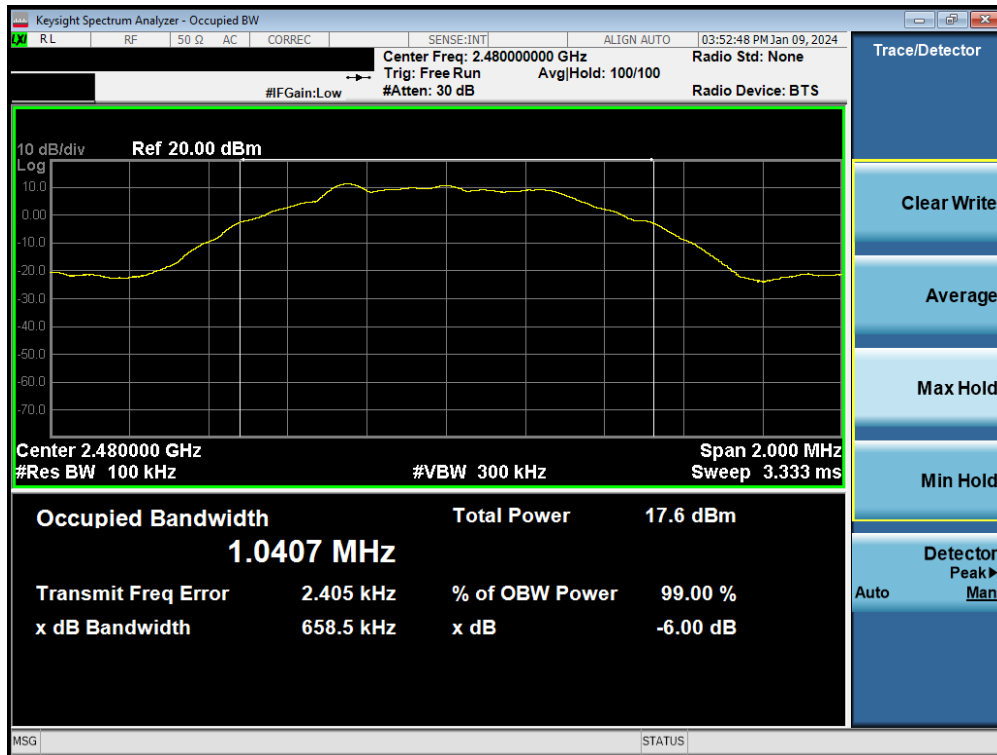


Plot 7-6. 6dB Bandwidth Plot (Bluetooth (LE), 500kbps – Ch. 37)

FCC ID: C3K2076 IC: 3048A-2076	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2312190129-05.C3K	Test Dates: 01/03/2024 - 03/18/2024	EUT Type: Portable Computing Device	Page 17 of 122

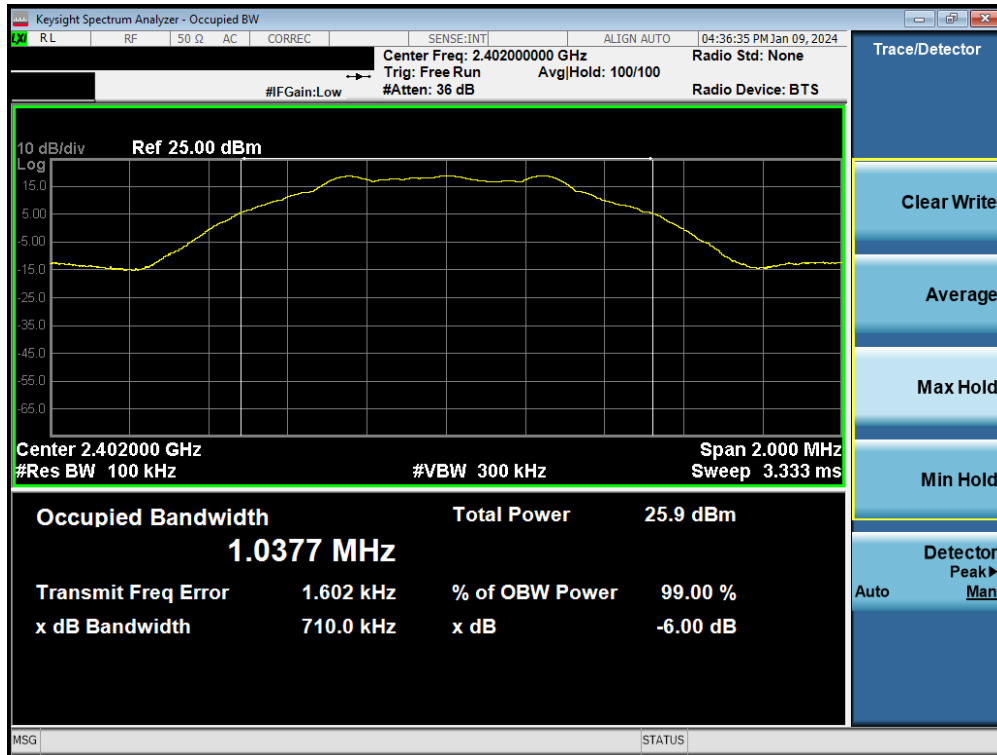


Plot 7-7. 6dB Bandwidth Plot (Bluetooth (LE), 500kbps – Ch. 17)

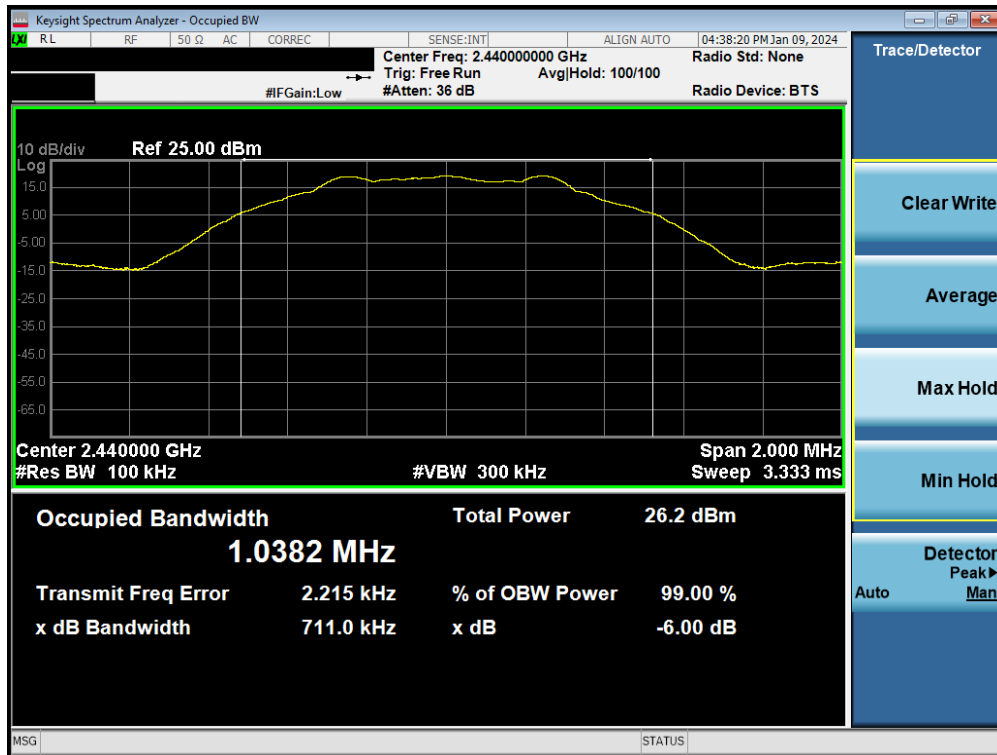


Plot 7-8. 6dB Bandwidth Plot (Bluetooth (LE), 500kbps – Ch. 39)

FCC ID: C3K2076 IC: 3048A-2076	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2312190129-05.C3K	Test Dates: 01/03/2024 - 03/18/2024	EUT Type: Portable Computing Device	Page 18 of 122

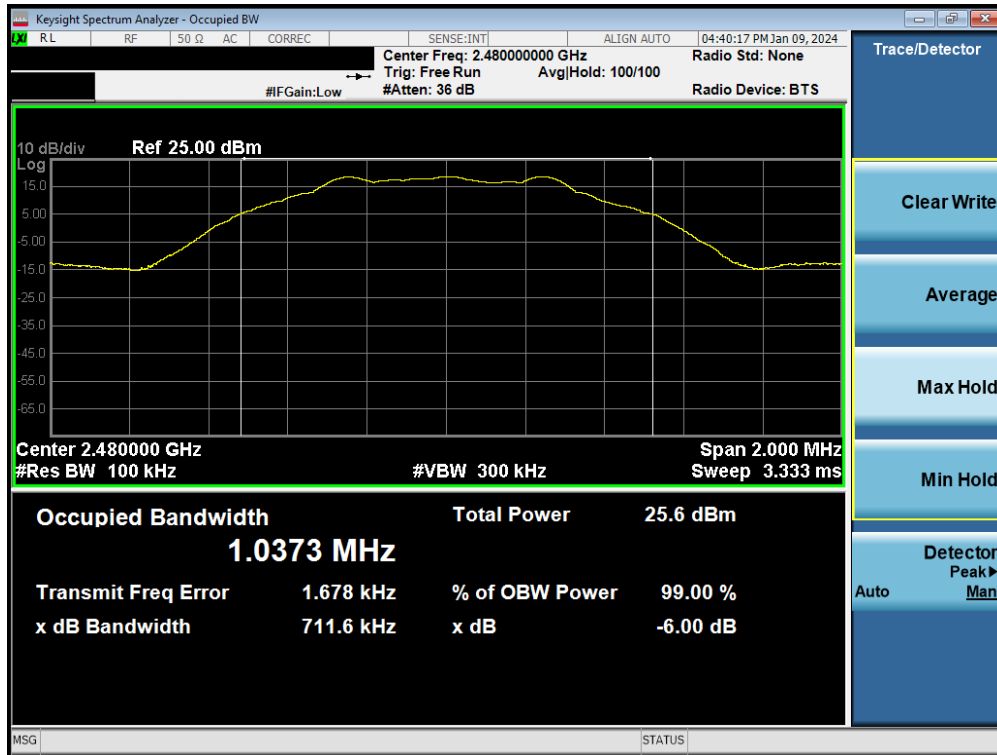


Plot 7-9. 6dB Bandwidth Plot (Bluetooth (LE), 1Mbps – Ch. 37)

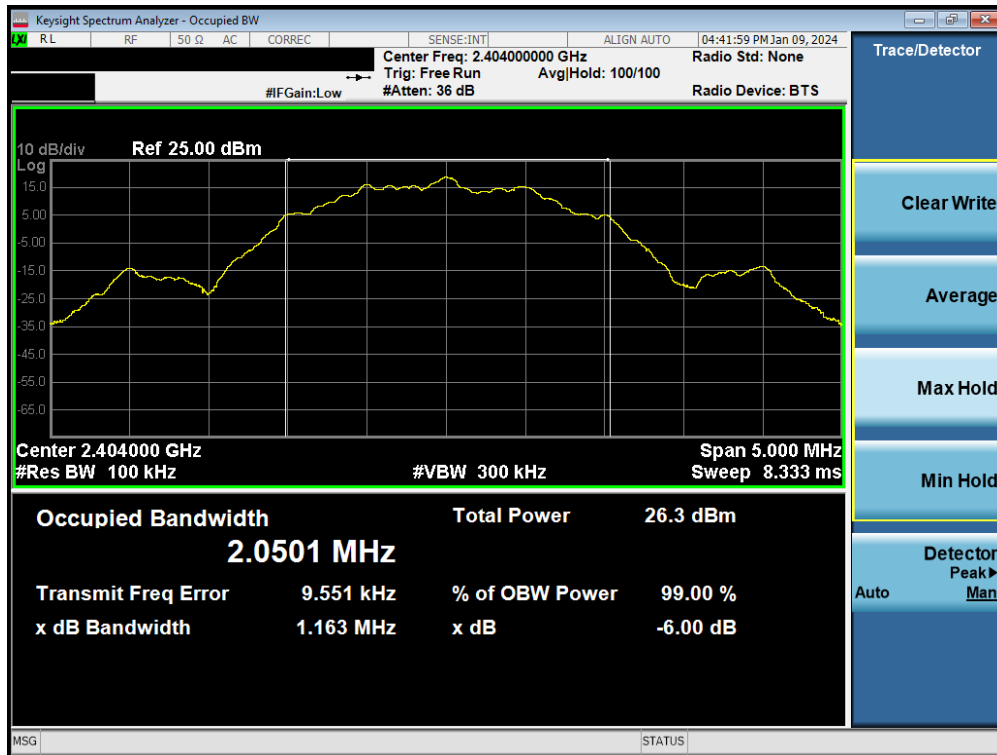


Plot 7-10. 6dB Bandwidth Plot (Bluetooth (LE), 1Mbps – Ch. 17)

FCC ID: C3K2076 IC: 3048A-2076	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2312190129-05.C3K	Test Dates: 01/03/2024 - 03/18/2024	EUT Type: Portable Computing Device	Page 19 of 122

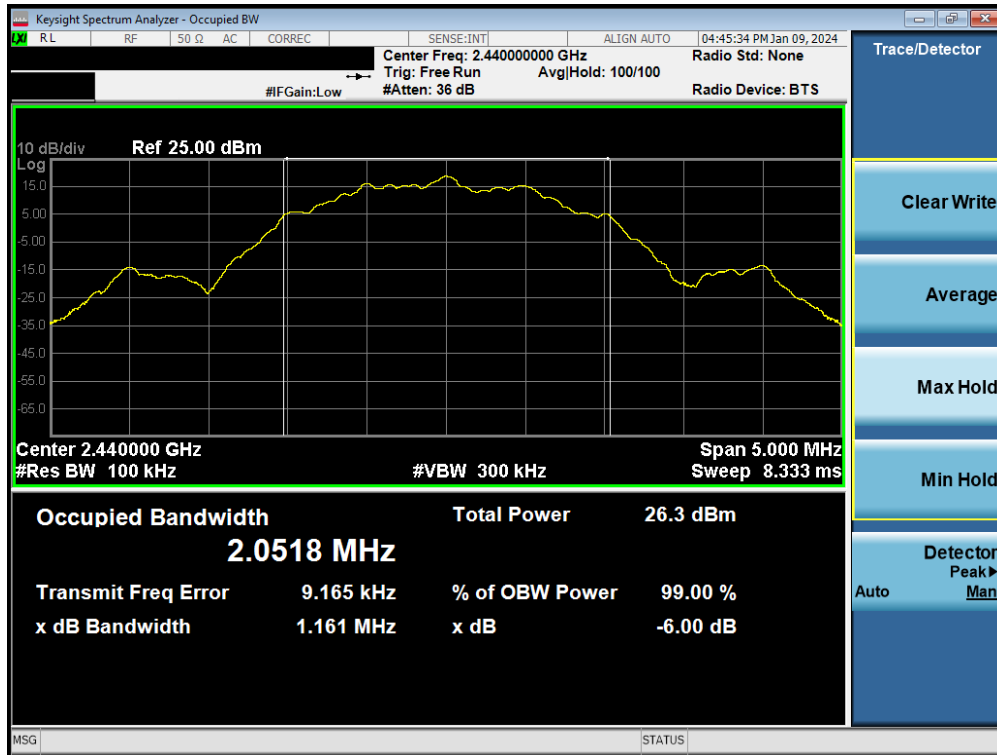


Plot 7-11. 6dB Bandwidth Plot (Bluetooth (LE), 1Mbps – Ch. 39)

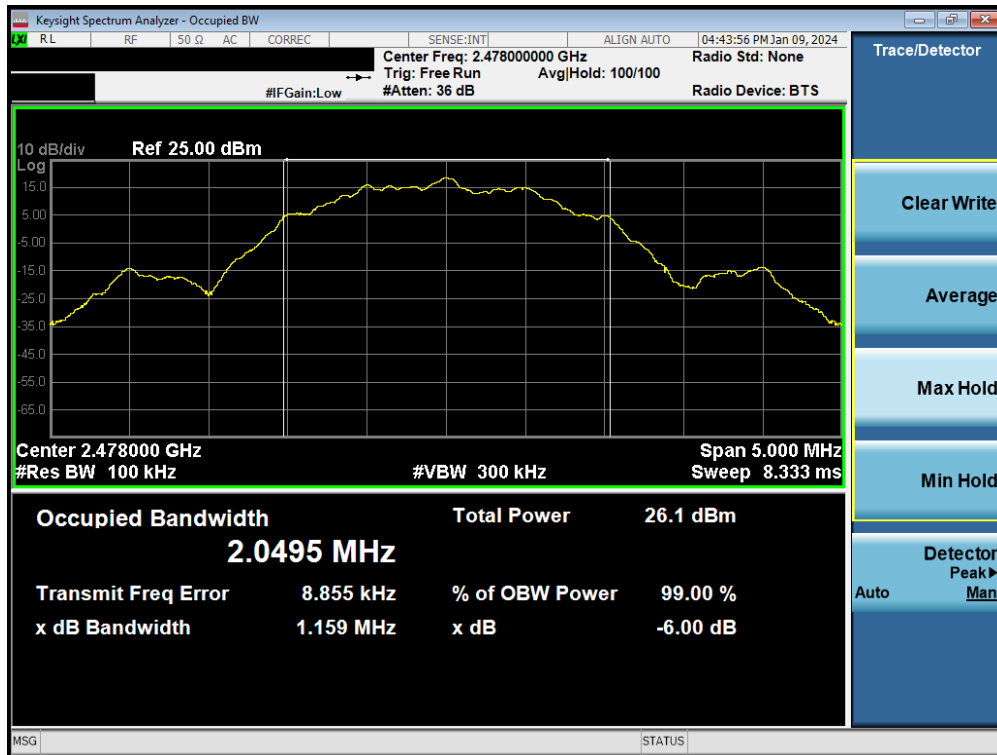


Plot 7-12. 6dB Bandwidth Plot (Bluetooth (LE), 2Mbps – Ch. 0)

FCC ID: C3K2076 IC: 3048A-2076		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2312190129-05.C3K	Test Dates: 01/03/2024 - 03/18/2024	EUT Type: Portable Computing Device		Page 20 of 122



Plot 7-13. 6dB Bandwidth Plot (Bluetooth (LE), 2Mbps – Ch. 17)



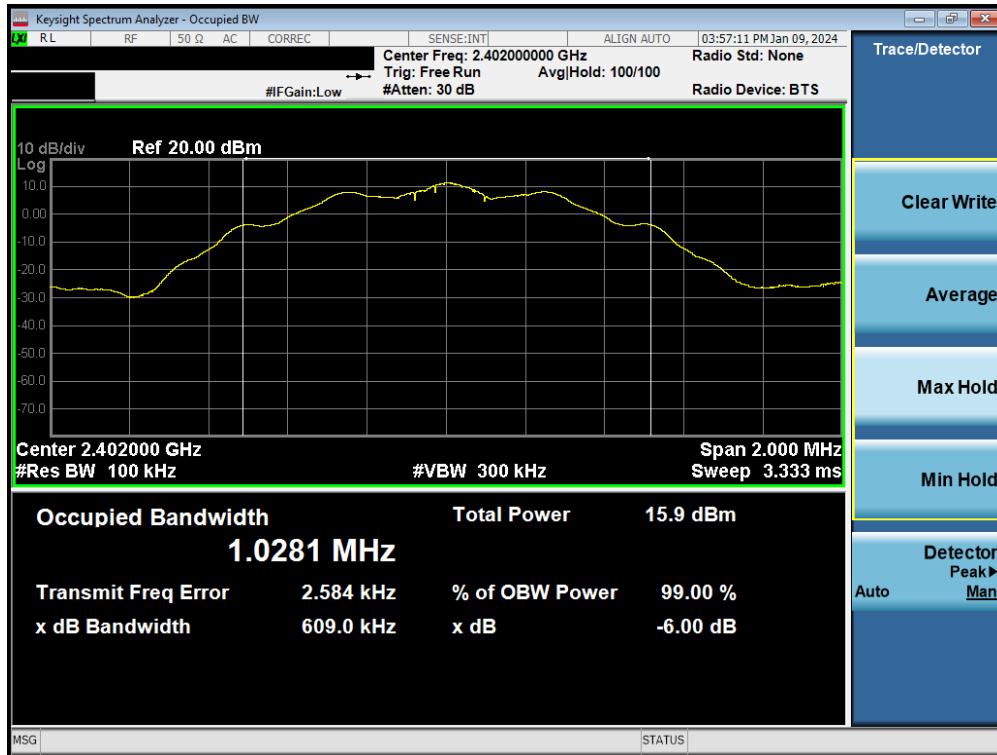
Plot 7-14. 6dB Bandwidth Plot (Bluetooth (LE), 2Mbps – Ch. 36)

FCC ID: C3K2076 IC: 3048A-2076	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2312190129-05.C3K	Test Dates: 01/03/2024 - 03/18/2024	EUT Type: Portable Computing Device	Page 21 of 122

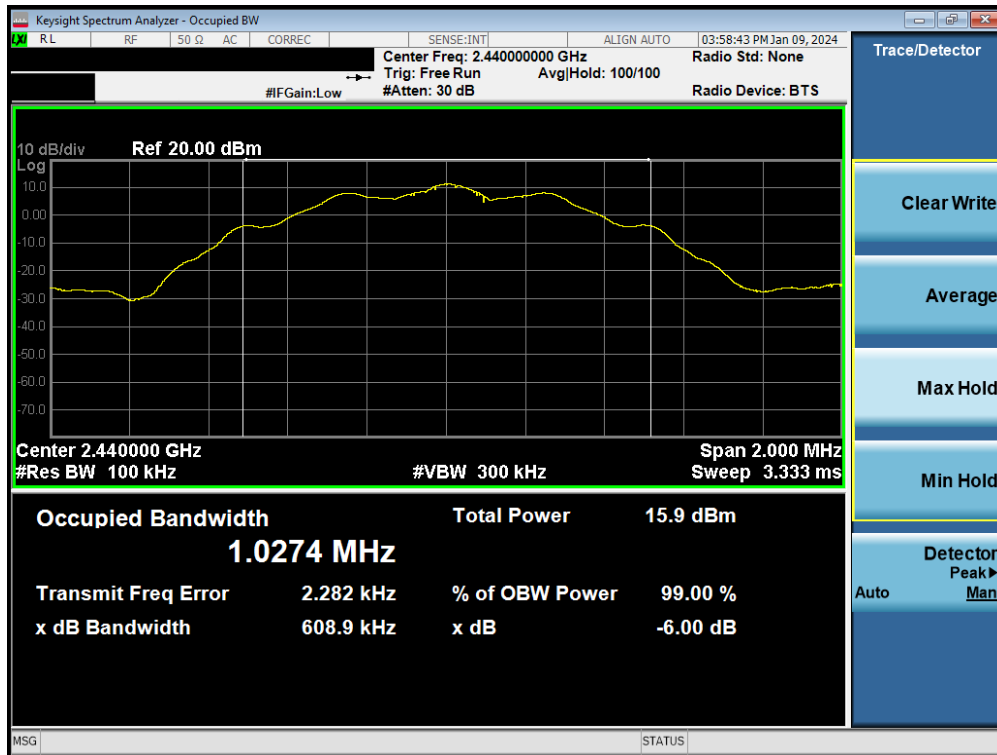
Frequency [MHz]	Data Rate	Channel No.	Bluetooth Mode	Measured Bandwidth [kHz]	Minimum Bandwidth [kHz]	Pass / Fail
2402	125 kbps	37	LE	609.0	500	Pass
2440	125 kbps	17	LE	608.9	500	Pass
2480	125 kbps	39	LE	608.8	500	Pass
2402	500 kbps	37	LE	656.9	500	Pass
2440	500 kbps	17	LE	660.7	500	Pass
2480	500 kbps	39	LE	657.5	500	Pass
2402	1 Mbps	37	LE	689.8	500	Pass
2440	1 Mbps	17	LE	689.8	500	Pass
2480	1 Mbps	39	LE	687.4	500	Pass
2404	2 Mbps	0	LE	1147.0	500	Pass
2440	2 Mbps	17	LE	1149.3	500	Pass
2478	2 Mbps	36	LE	1148.6	500	Pass

Table 7-7. Conducted Bandwidth Measurements – SISO ANT2

FCC ID: C3K2076 IC: 3048A-2076	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2312190129-05.C3K	Test Dates: 01/03/2024 - 03/18/2024	EUT Type: Portable Computing Device	Page 22 of 122

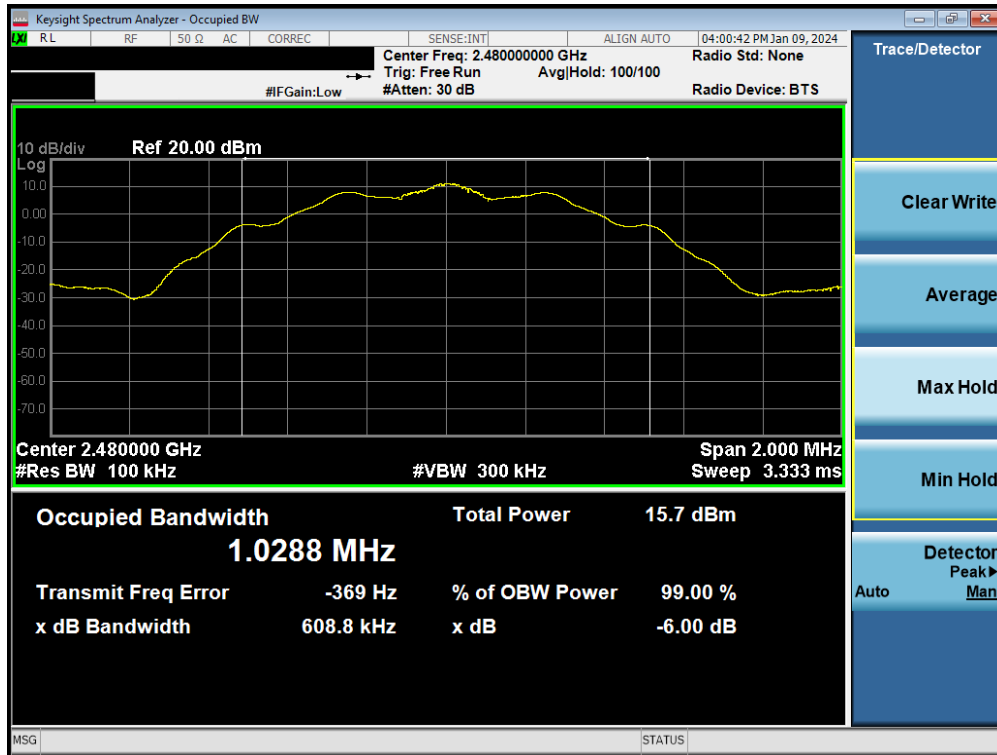


Plot 7-15. 6dB Bandwidth Plot (Bluetooth (LE), 125kbps – Ch. 37)

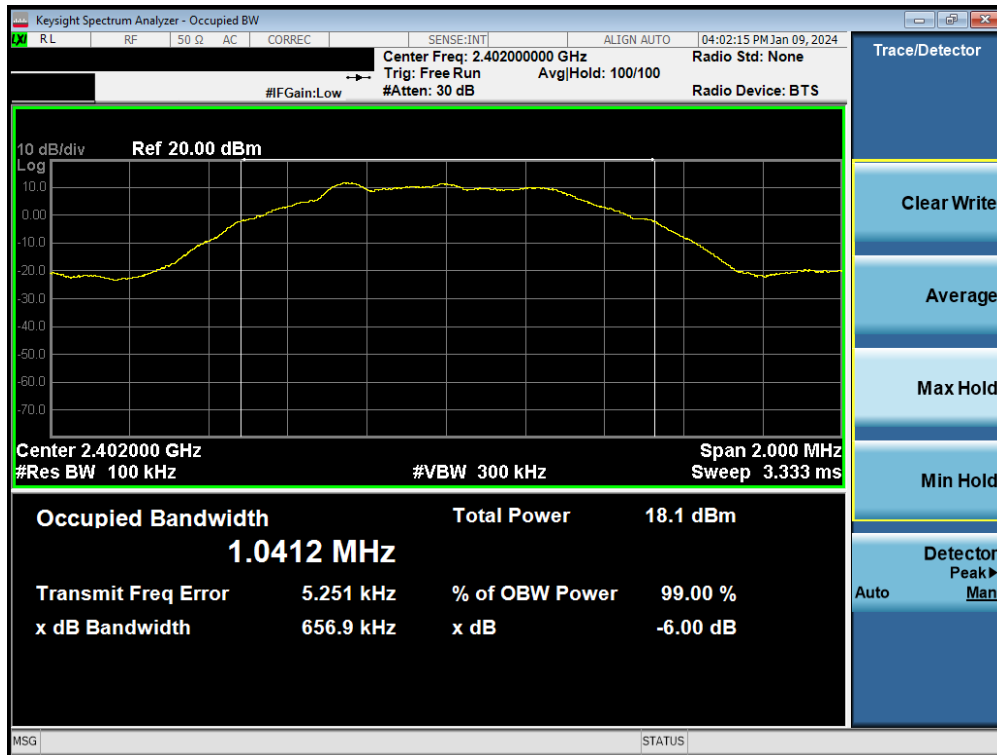


Plot 7-16. 6dB Bandwidth Plot (Bluetooth (LE), 125kbps – Ch. 17)

FCC ID: C3K2076 IC: 3048A-2076	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2312190129-05.C3K	Test Dates: 01/03/2024 - 03/18/2024	EUT Type: Portable Computing Device	Page 23 of 122

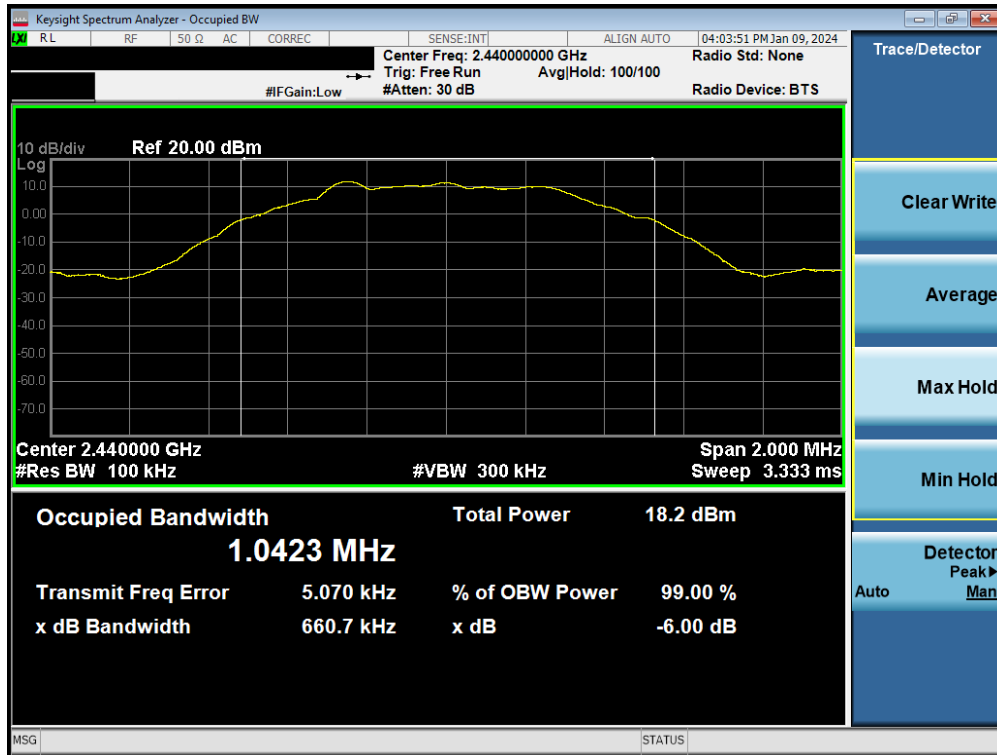


Plot 7-17. 6dB Bandwidth Plot (Bluetooth (LE), 125kbps – Ch. 39)

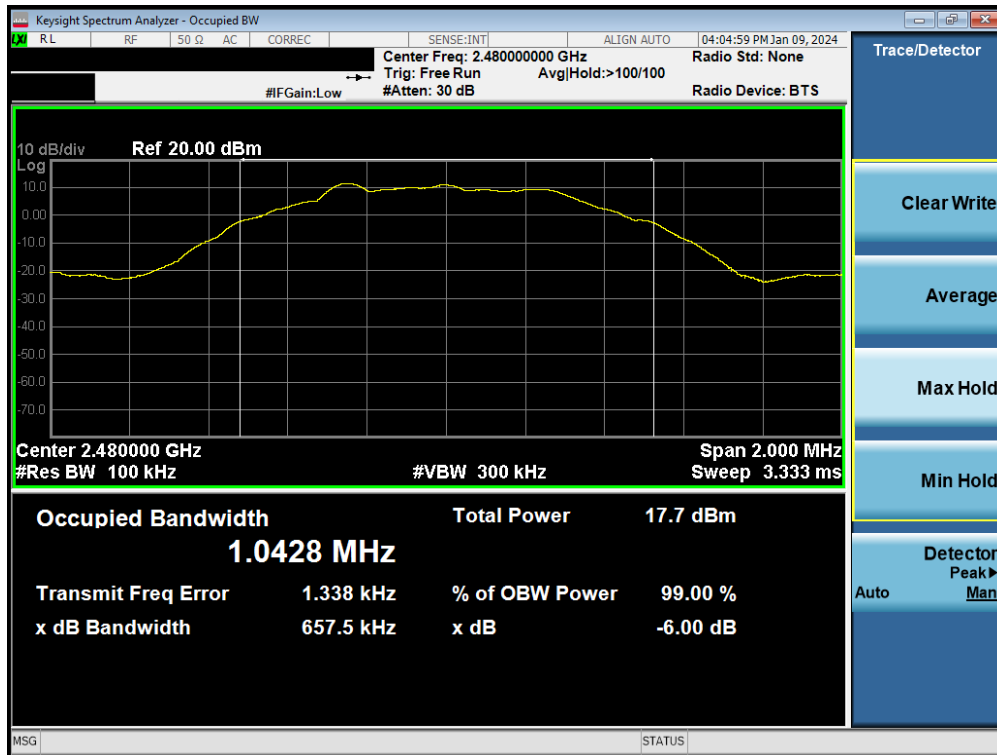


Plot 7-18. 6dB Bandwidth Plot (Bluetooth (LE), 500kbps – Ch. 37)

FCC ID: C3K2076 IC: 3048A-2076	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2312190129-05.C3K	Test Dates: 01/03/2024 - 03/18/2024	EUT Type: Portable Computing Device	Page 24 of 122

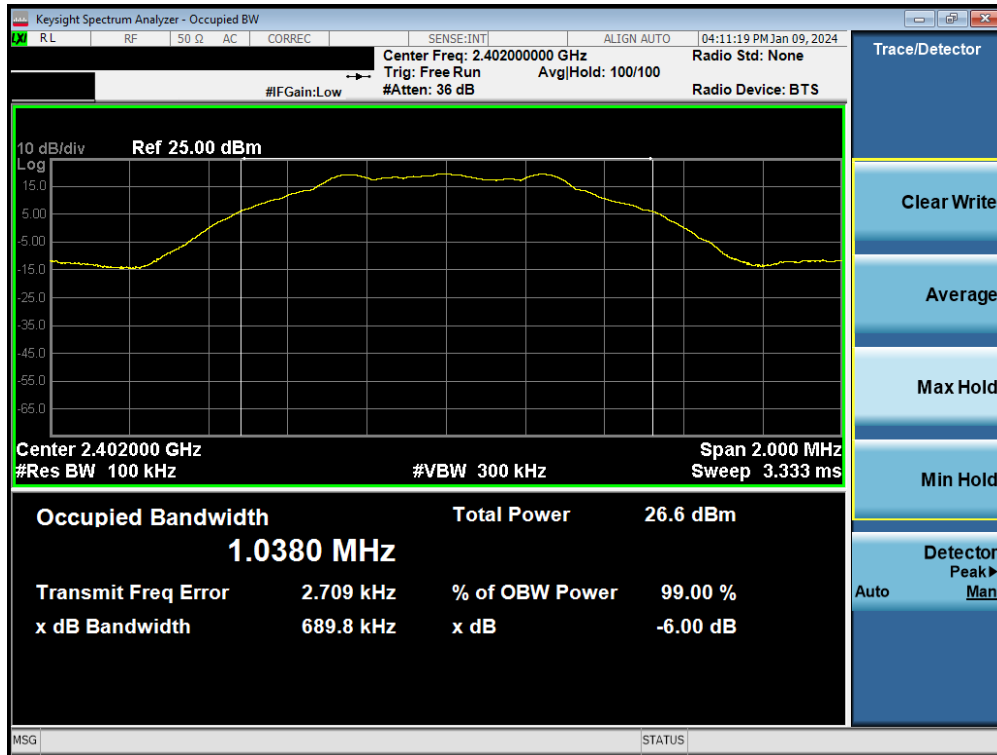


Plot 7-19. 6dB Bandwidth Plot (Bluetooth (LE), 500kbps – Ch. 17)

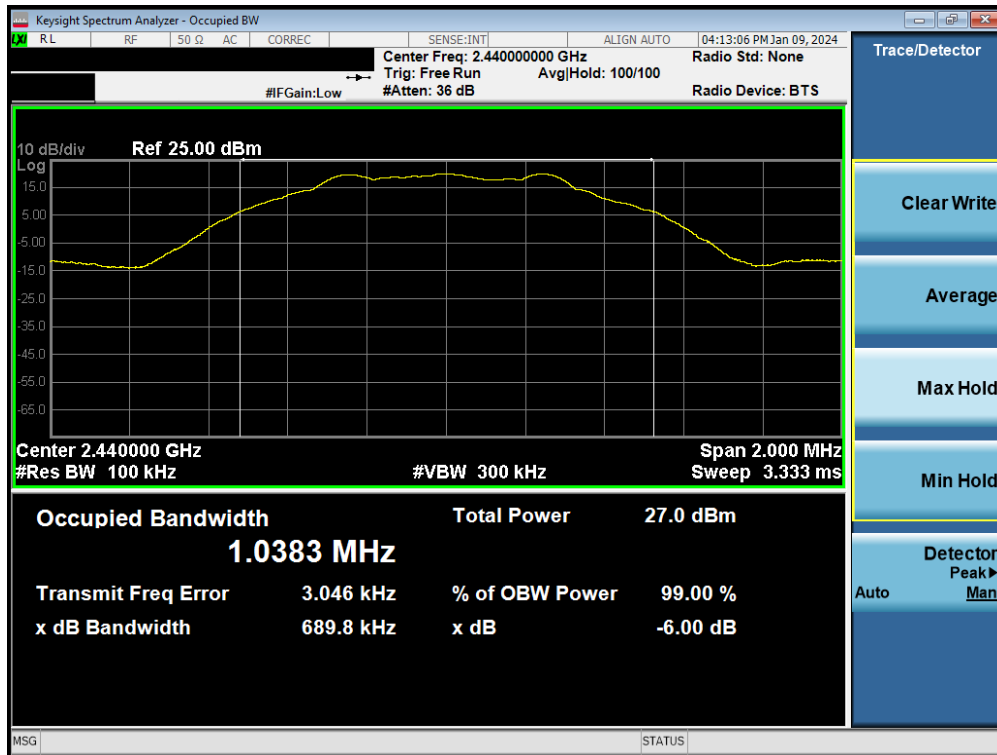


Plot 7-20. 6dB Bandwidth Plot (Bluetooth (LE), 500kbps – Ch. 39)

FCC ID: C3K2076 IC: 3048A-2076	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2312190129-05.C3K	Test Dates: 01/03/2024 - 03/18/2024	EUT Type: Portable Computing Device	Page 25 of 122

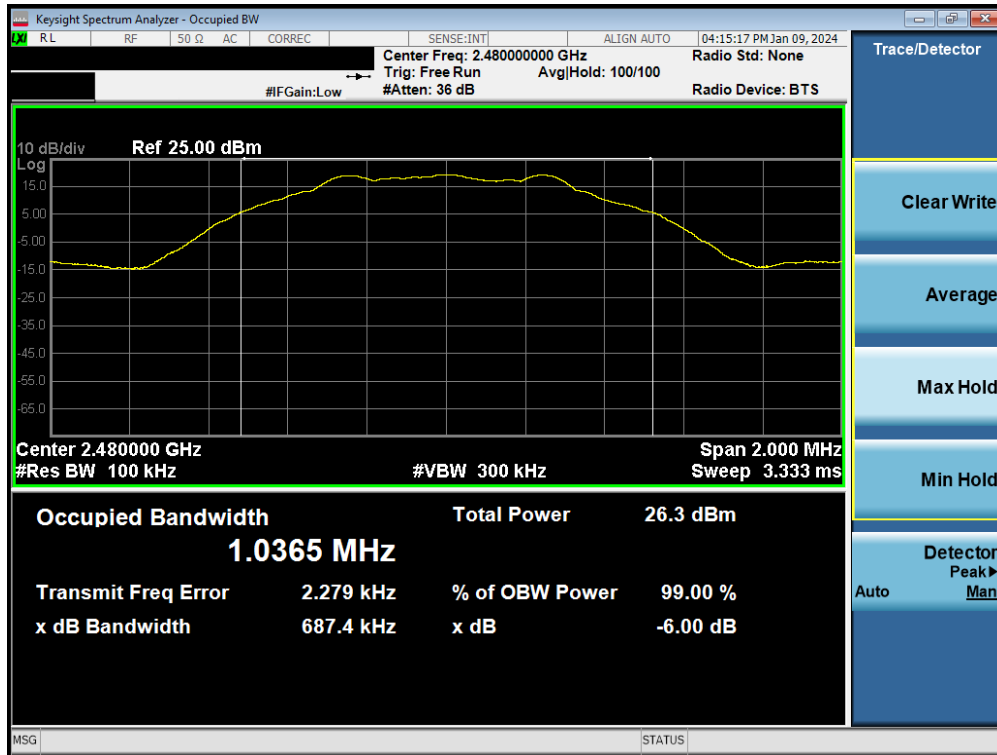


Plot 7-21. 6dB Bandwidth Plot (Bluetooth (LE), 1Mbps – Ch. 37)

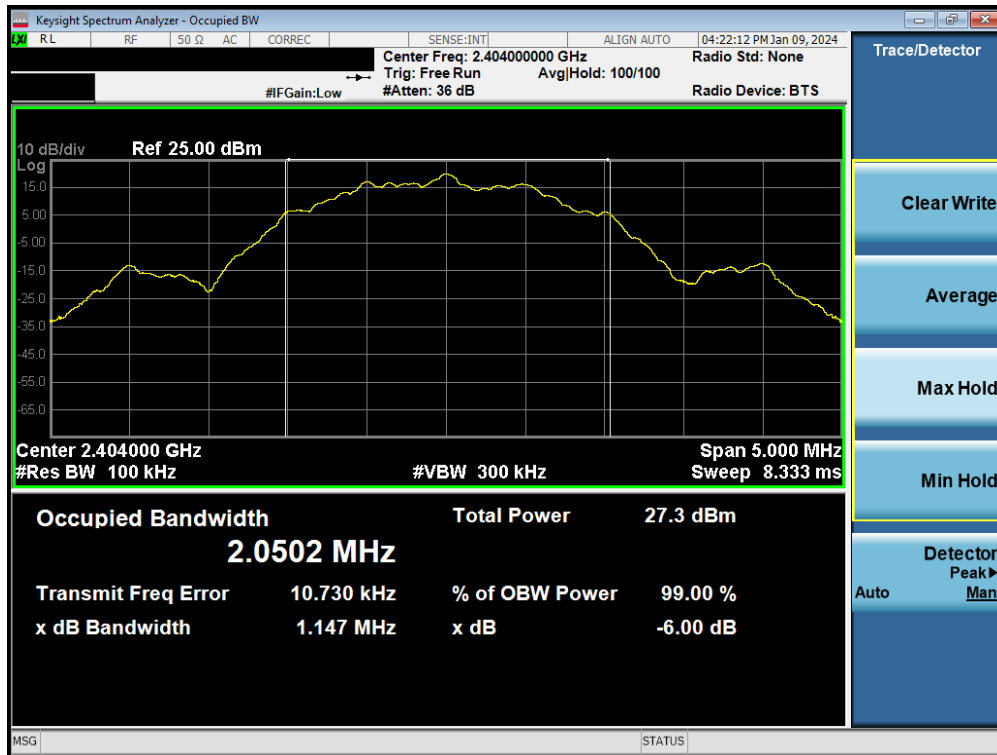


Plot 7-22. 6dB Bandwidth Plot (Bluetooth (LE), 1Mbps – Ch. 17)

FCC ID: C3K2076 IC: 3048A-2076	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2312190129-05.C3K	Test Dates: 01/03/2024 - 03/18/2024	EUT Type: Portable Computing Device	Page 26 of 122

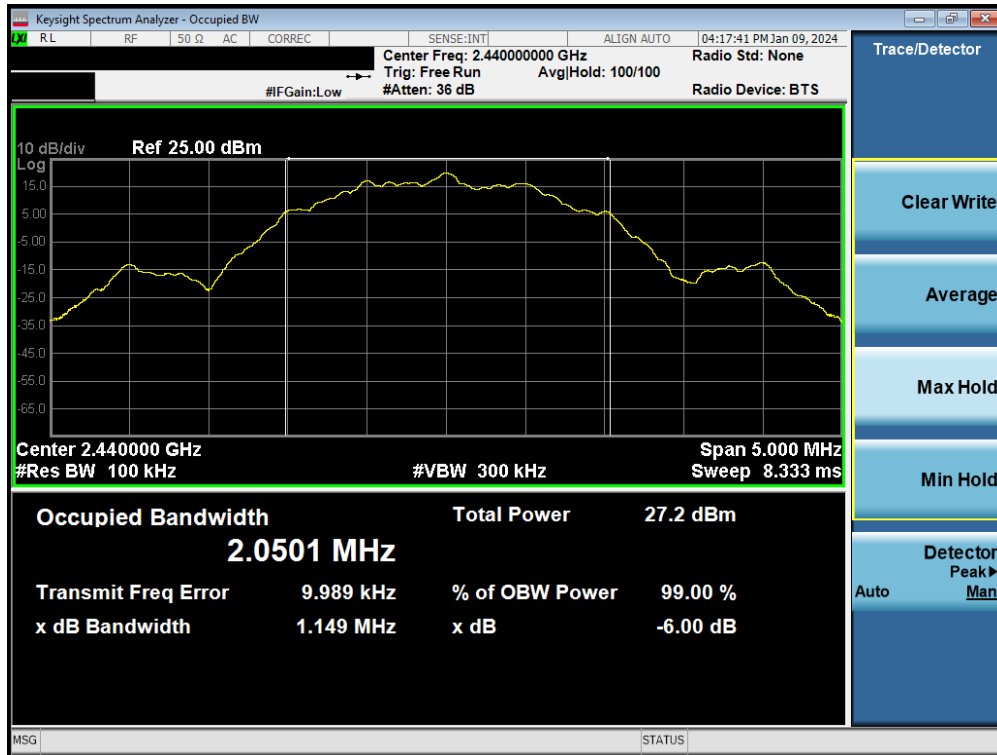


Plot 7-23. 6dB Bandwidth Plot (Bluetooth (LE), 1Mbps – Ch. 39)

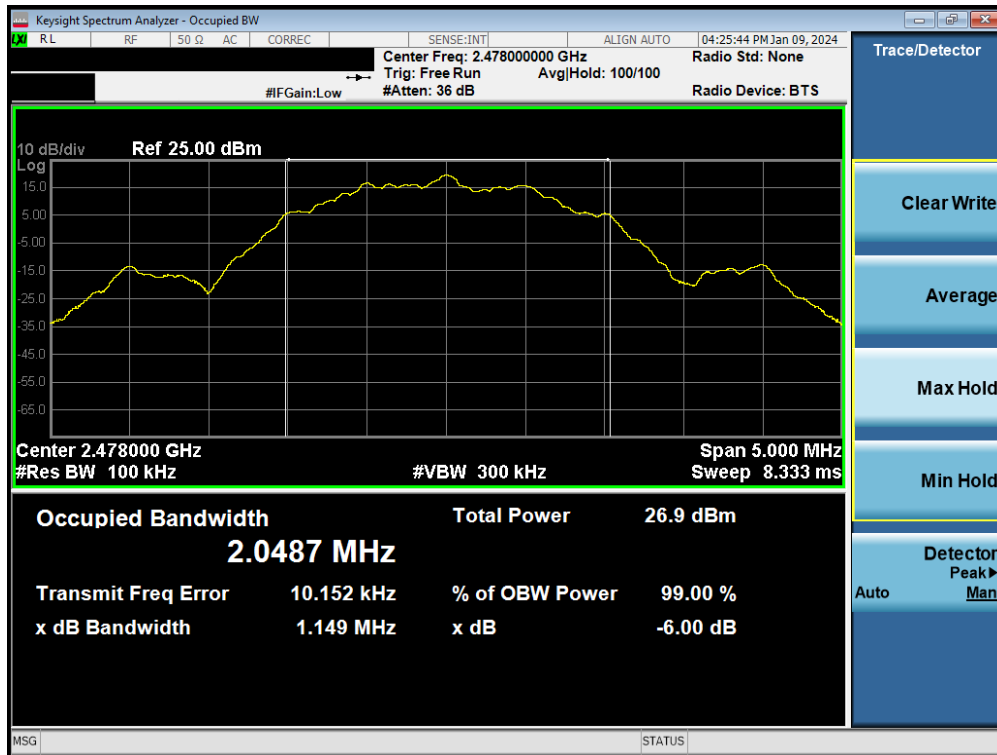


Plot 7-24. 6dB Bandwidth Plot (Bluetooth (LE), 2Mbps – Ch. 0)

FCC ID: C3K2076 IC: 3048A-2076	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2312190129-05.C3K	Test Dates: 01/03/2024 - 03/18/2024	EUT Type: Portable Computing Device	Page 27 of 122



Plot 7-25. 6dB Bandwidth Plot (Bluetooth (LE), 2Mbps – Ch. 17)

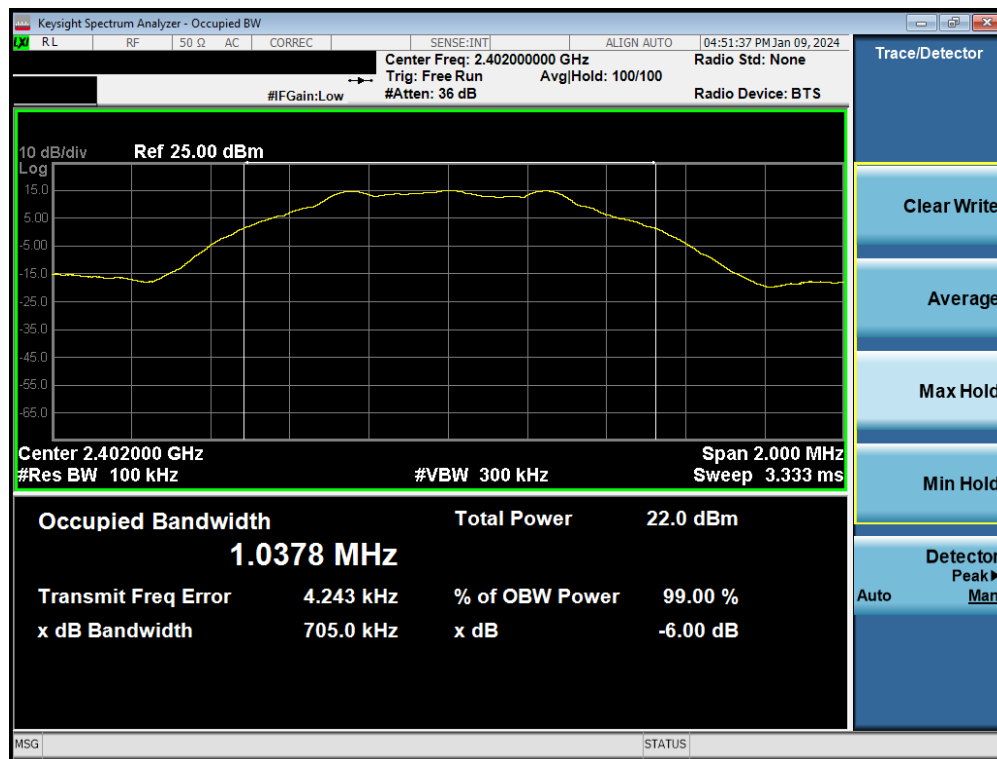


Plot 7-26. 6dB Bandwidth Plot (Bluetooth (LE), 2Mbps – Ch. 36)

FCC ID: C3K2076 IC: 3048A-2076	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2312190129-05.C3K	Test Dates: 01/03/2024 - 03/18/2024	EUT Type: Portable Computing Device	Page 28 of 122

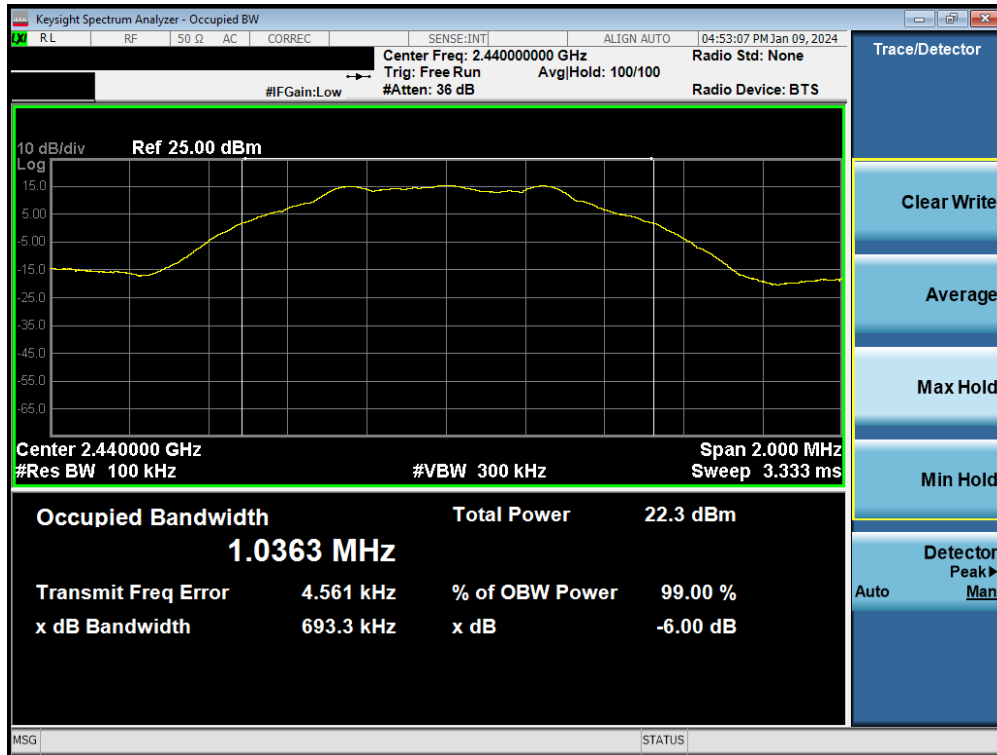
Frequency [MHz]	Data Rate	Channel No.	Bluetooth Mode	Measured Bandwidth [kHz]	Minimum Bandwidth [kHz]	Pass / Fail
2402	1 Mbps	37	LE	705.0	500	Pass
2440	1 Mbps	17	LE	693.3	500	Pass
2480	1 Mbps	39	LE	692.7	500	Pass
2404	2 Mbps	0	LE	1156.6	500	Pass
2440	2 Mbps	17	LE	1152.6	500	Pass
2478	2 Mbps	36	LE	1147.3	500	Pass

Table 7-8. Conducted Bandwidth Measurements – DUAL ANT1

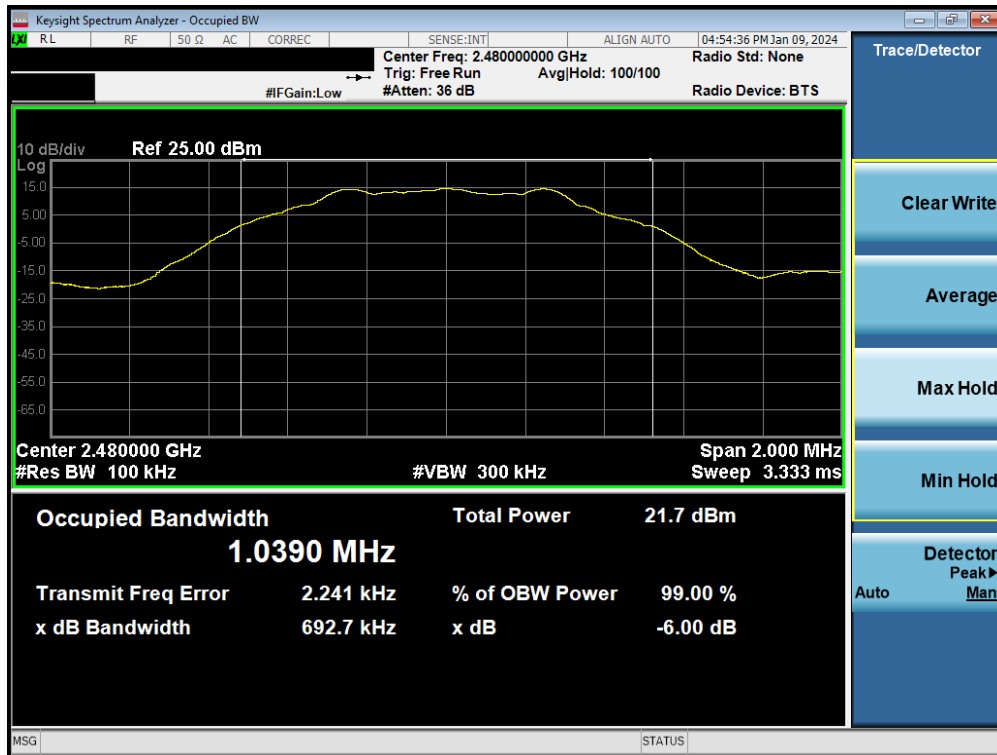


Plot 7-27. 6dB Bandwidth Plot (Bluetooth (LE), 1Mbps – Ch. 37)

FCC ID: C3K2076 IC: 3048A-2076	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2312190129-05.C3K	Test Dates: 01/03/2024 - 03/18/2024	EUT Type: Portable Computing Device	Page 29 of 122

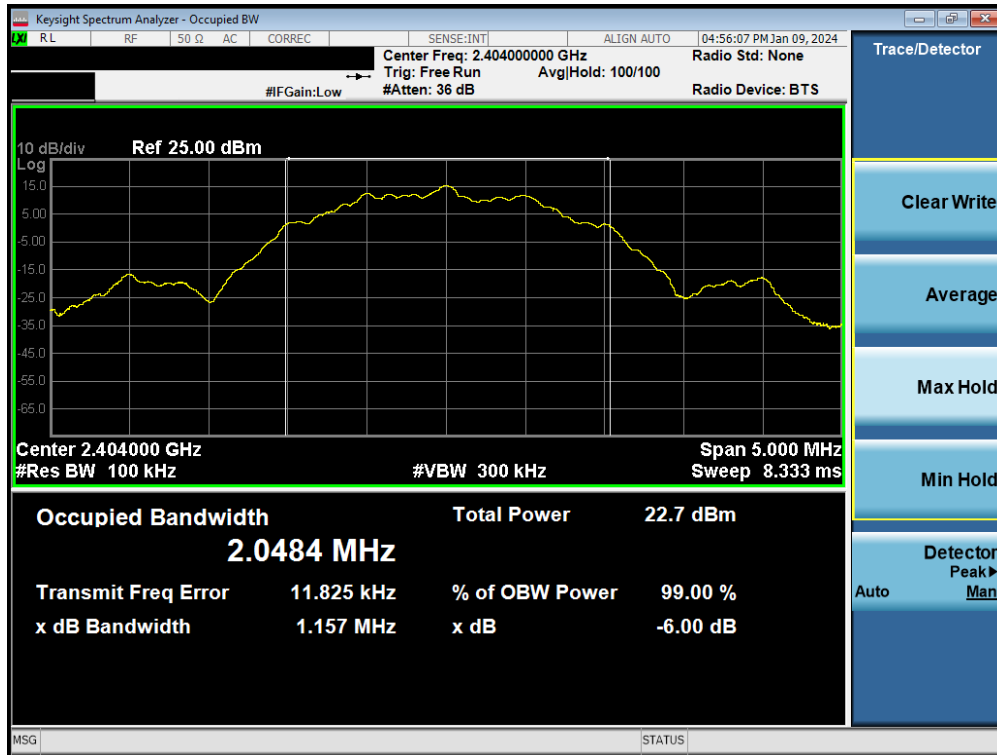


Plot 7-28. 6dB Bandwidth Plot (Bluetooth (LE), 1Mbps – Ch. 17)

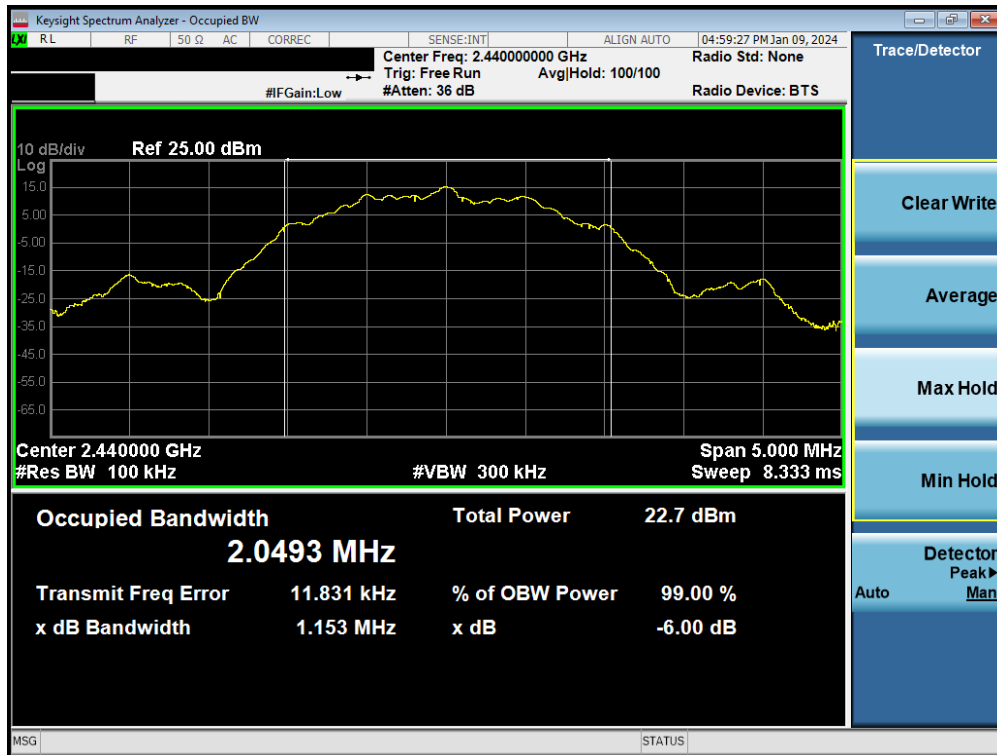


Plot 7-29. 6dB Bandwidth Plot (Bluetooth (LE), 1Mbps – Ch. 39)

FCC ID: C3K2076 IC: 3048A-2076	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2312190129-05.C3K	Test Dates: 01/03/2024 - 03/18/2024	EUT Type: Portable Computing Device	Page 30 of 122

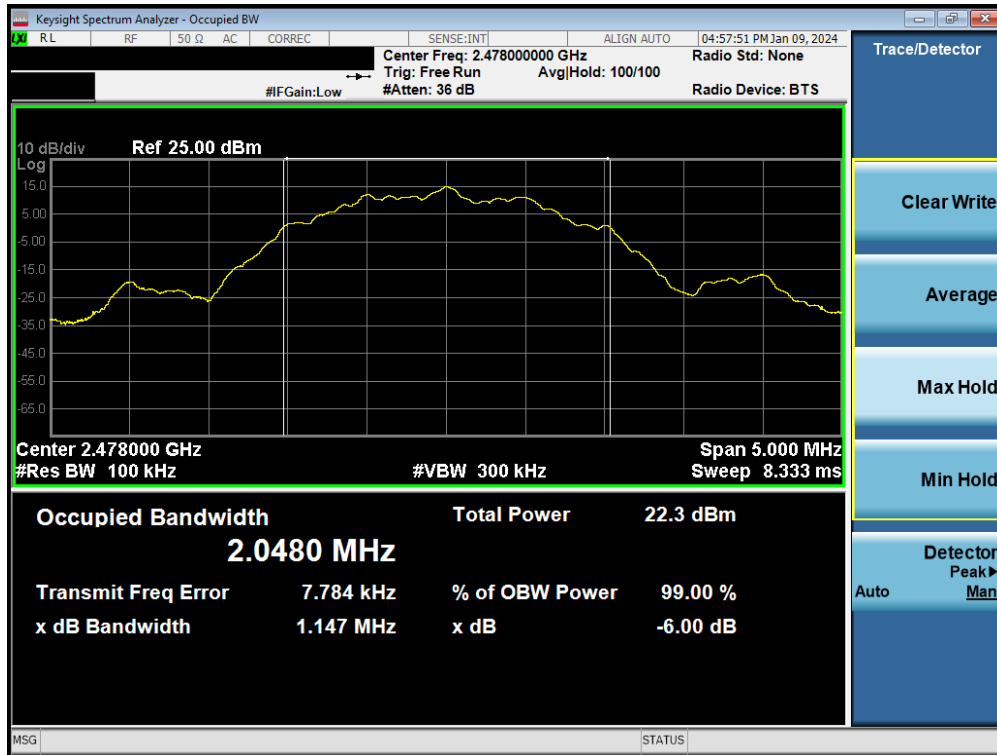


Plot 7-30. 6dB Bandwidth Plot (Bluetooth (LE), 2Mbps – Ch. 0)



Plot 7-31. 6dB Bandwidth Plot (Bluetooth (LE), 2Mbps – Ch. 17)

FCC ID: C3K2076 IC: 3048A-2076	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2312190129-05.C3K	Test Dates: 01/03/2024 - 03/18/2024	EUT Type: Portable Computing Device	Page 31 of 122

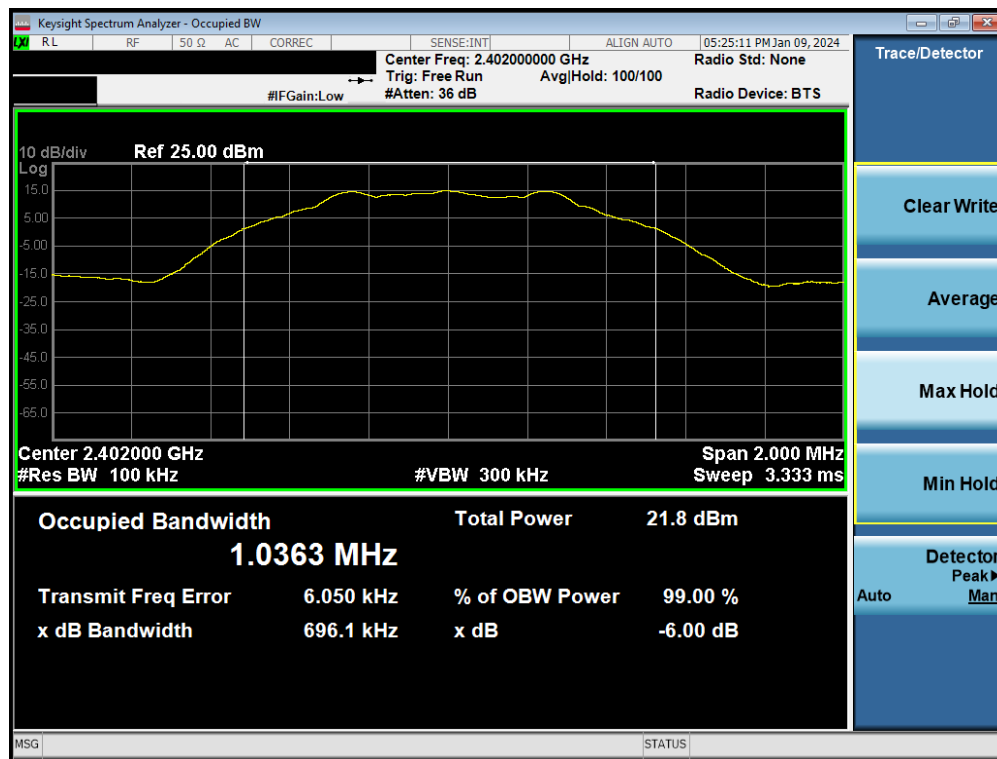


Plot 7-32. 6dB Bandwidth Plot (Bluetooth (LE), 2Mbps – Ch. 36)

FCC ID: C3K2076 IC: 3048A-2076	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2312190129-05.C3K	Test Dates: 01/03/2024 - 03/18/2024	EUT Type: Portable Computing Device	Page 32 of 122

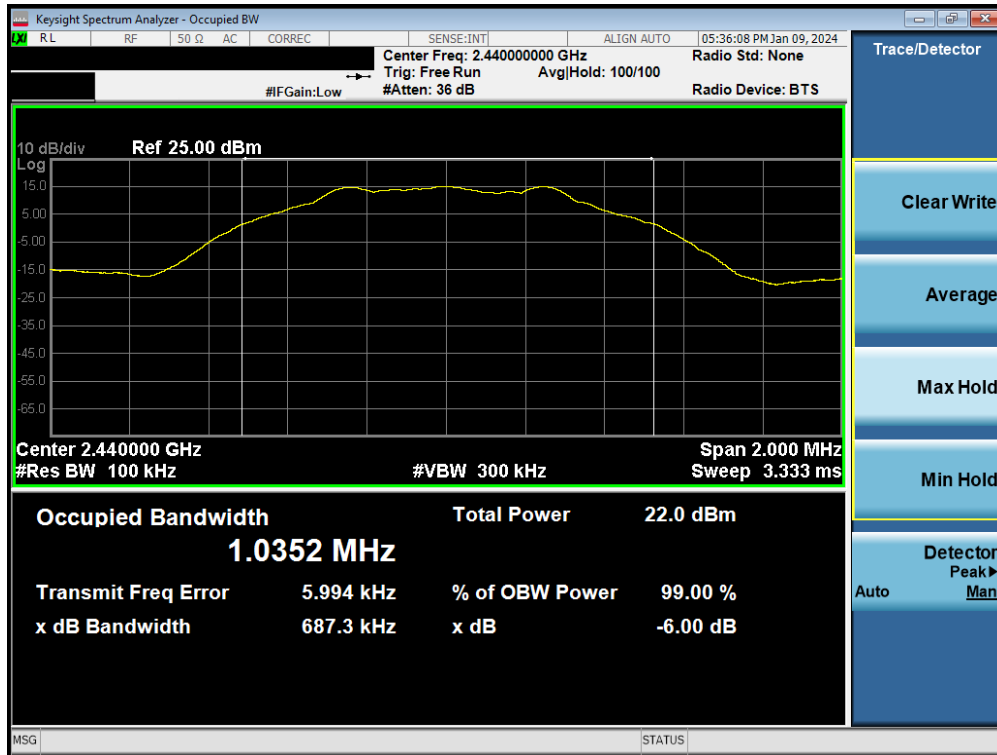
Frequency [MHz]	Data Rate	Channel No.	Bluetooth Mode	Measured Bandwidth [kHz]	Minimum Bandwidth [kHz]	Pass / Fail
2402	1 Mbps	37	LE	696.1	500	Pass
2440	1 Mbps	17	LE	687.3	500	Pass
2480	1 Mbps	39	LE	682.1	500	Pass
2404	2 Mbps	0	LE	1151.3	500	Pass
2440	2 Mbps	17	LE	1149.7	500	Pass
2478	2 Mbps	36	LE	1142.4	500	Pass

Table 7-9. Conducted Bandwidth Measurements – DUAL ANT2

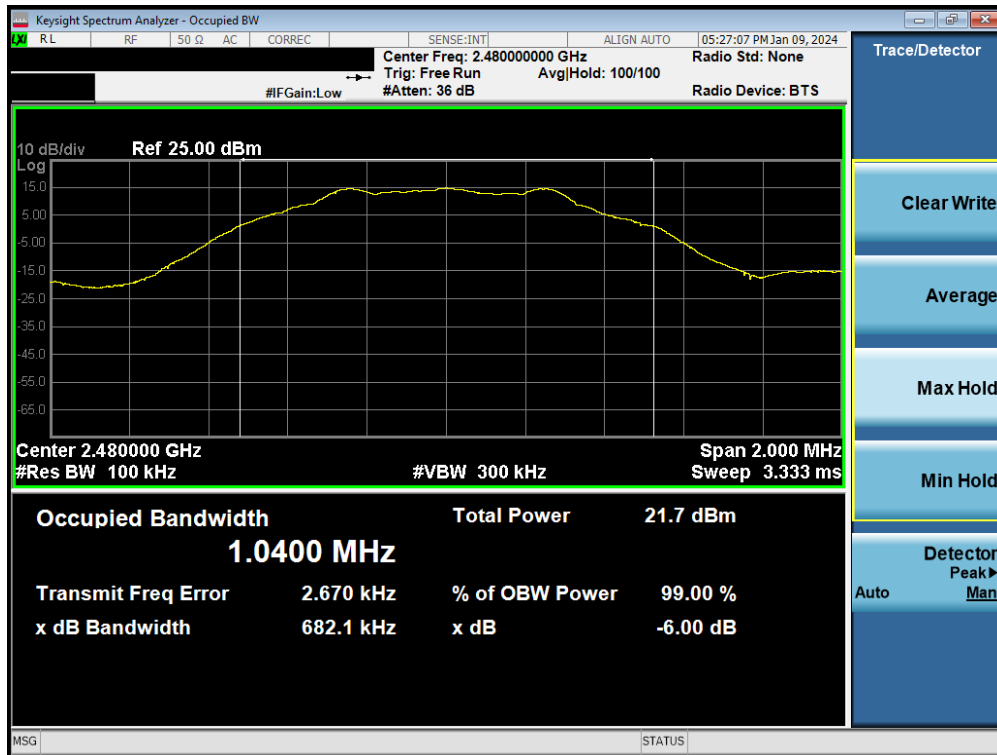


Plot 7-33. 6dB Bandwidth Plot (Bluetooth (LE), 1Mbps – Ch. 37)

FCC ID: C3K2076 IC: 3048A-2076	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2312190129-05.C3K	Test Dates: 01/03/2024 - 03/18/2024	EUT Type: Portable Computing Device	Page 33 of 122

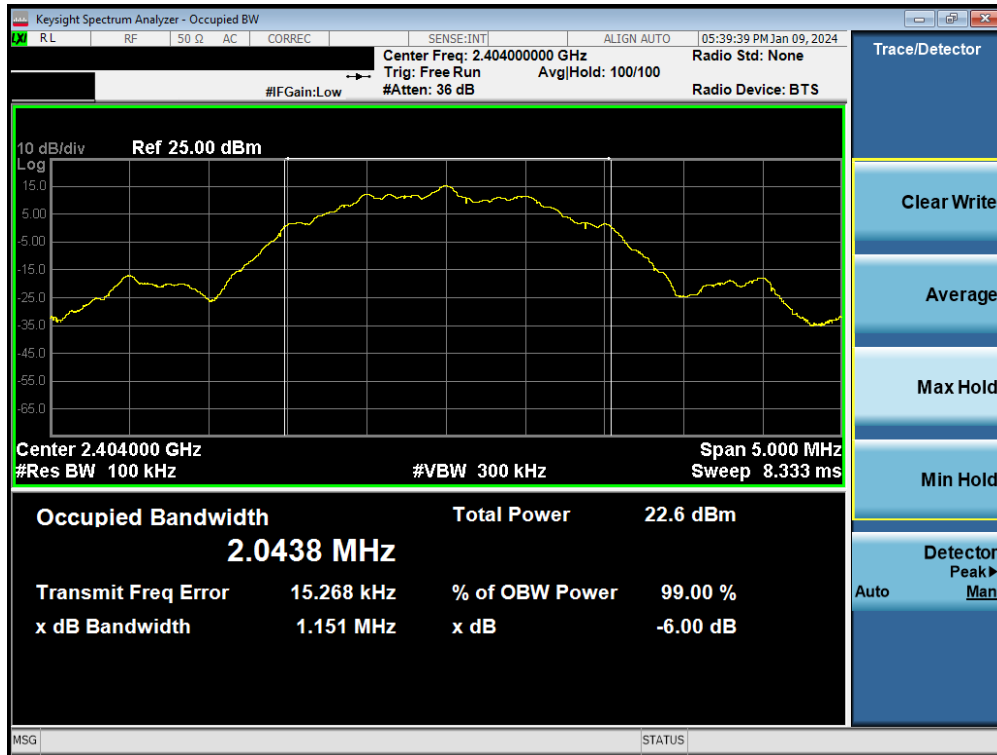


Plot 7-34. 6dB Bandwidth Plot (Bluetooth (LE), 1Mbps – Ch. 17)

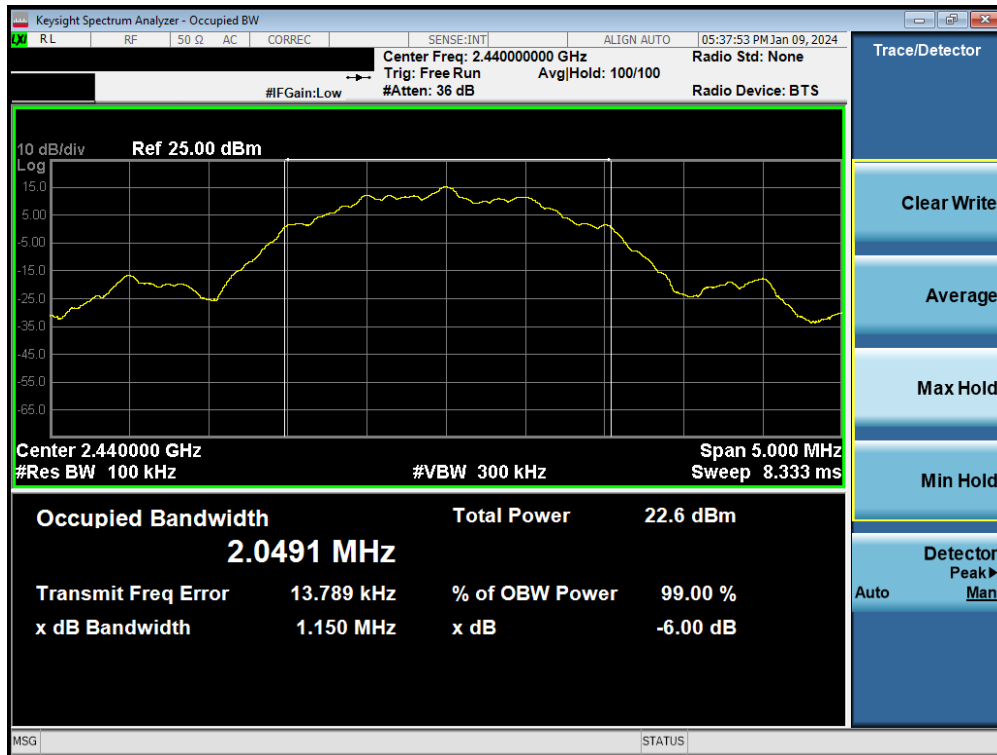


Plot 7-35. 6dB Bandwidth Plot (Bluetooth (LE), 1Mbps – Ch. 39)

FCC ID: C3K2076 IC: 3048A-2076		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2312190129-05.C3K	Test Dates: 01/03/2024 - 03/18/2024	EUT Type: Portable Computing Device		Page 34 of 122

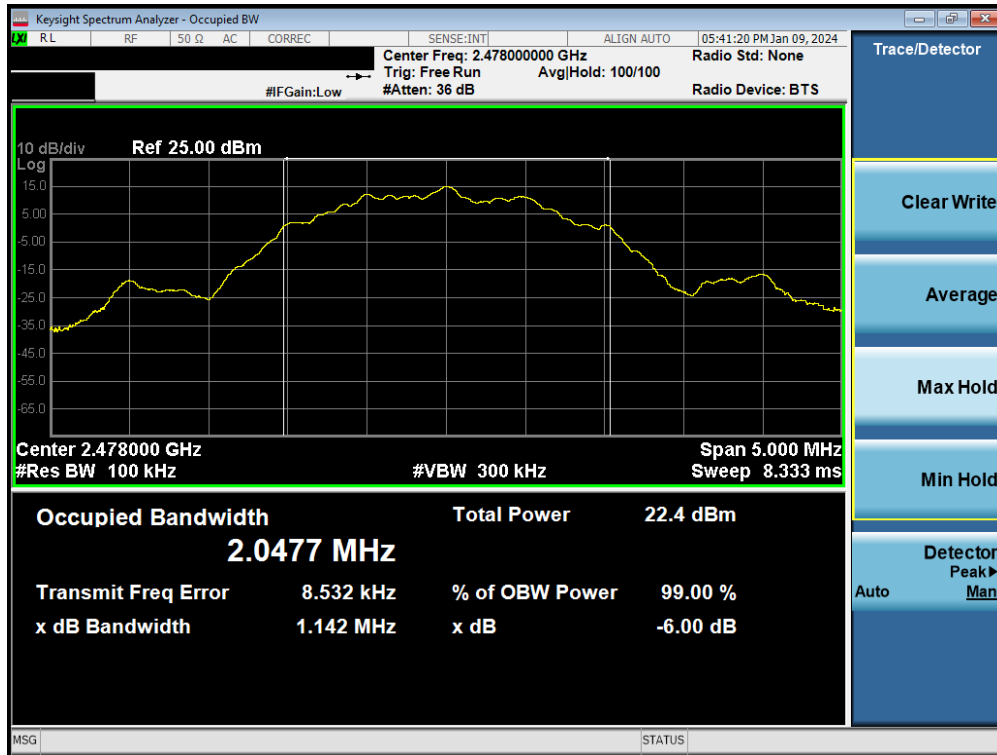


Plot 7-36. 6dB Bandwidth Plot (Bluetooth (LE), 2Mbps – Ch. 0)



Plot 7-37. 6dB Bandwidth Plot (Bluetooth (LE), 2Mbps – Ch. 17)

FCC ID: C3K2076 IC: 3048A-2076	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2312190129-05.C3K	Test Dates: 01/03/2024 - 03/18/2024	EUT Type: Portable Computing Device	Page 35 of 122



Plot 7-38. 6dB Bandwidth Plot (Bluetooth (LE), 2Mbps – Ch. 36)

FCC ID: C3K2076 IC: 3048A-2076	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2312190129-05.C3K	Test Dates: 01/03/2024 - 03/18/2024	EUT Type: Portable Computing Device	Page 36 of 122

7.3 Output Power Measurement – Bluetooth (LE) §15.247(b.3); RSS-247 [5.4(4)]

Test Overview and Limits

The transmitter antenna terminal of the EUT is connected to the input of a spectrum analyzer. Measurements are made while the EUT is operating at maximum power and at the appropriate frequencies.

The maximum permissible conducted 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 11.9.1.1
KDB 558074 D01 v05r02 – Section 8.3.1.1

Test Settings

1. RBW = 3MHz
2. VBW = 50MHz
3. Span $\geq 3 \times$ RBW
4. Sweep = auto couple
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

Test Notes

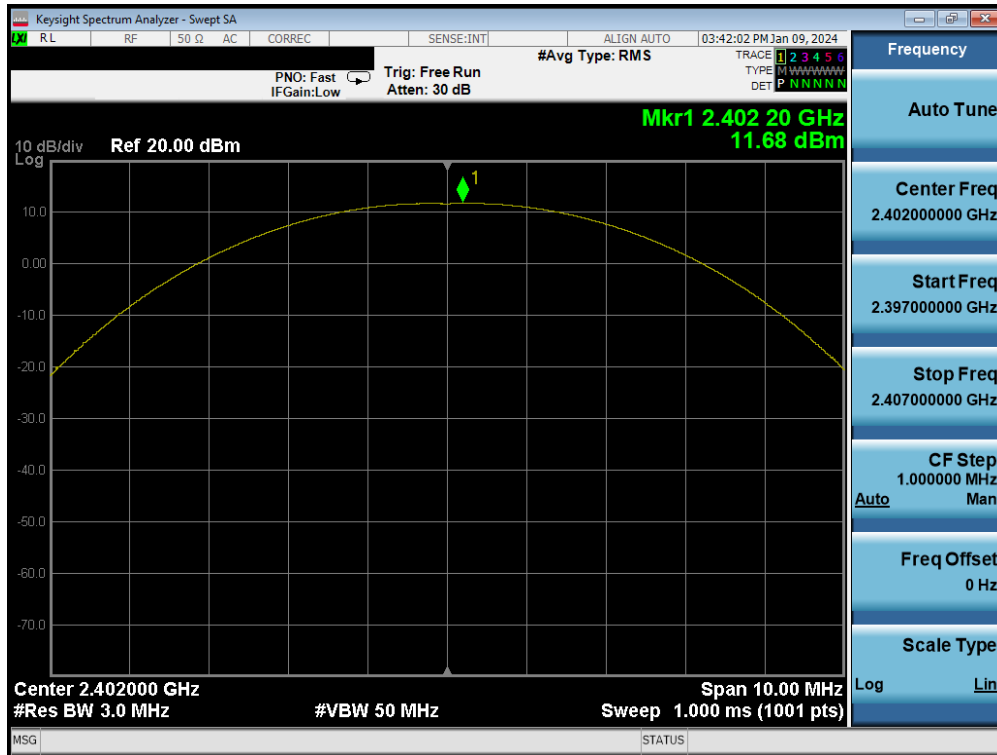
None

FCC ID: C3K2076 IC: 3048A-2076	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2312190129-05.C3K	Test Dates: 01/03/2024 - 03/18/2024	EUT Type: Portable Computing Device	Page 37 of 122

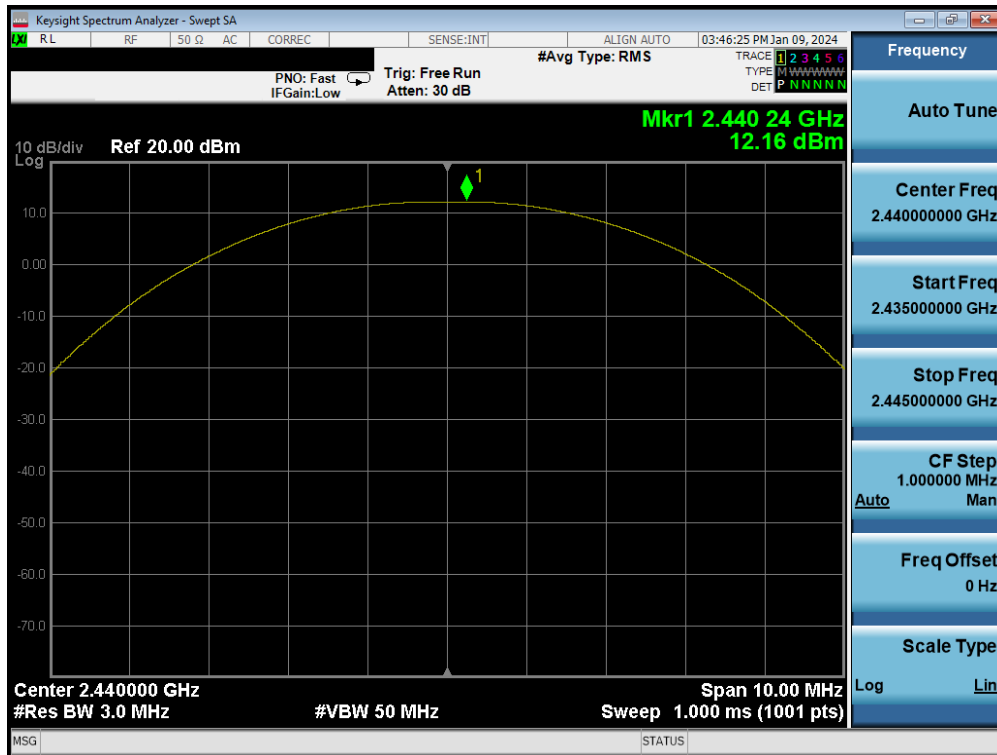
Frequency [MHz]	Data Rate [Mbps]	Channel No.	Bluetooth Mode	Peak Conducted Power	
				[dBm]	[mW]
2402	125 kbps	37	LE	11.68	14.730
2440	125 kbps	17	LE	12.16	16.444
2480	125 kbps	39	LE	11.25	13.348
2402	500 kbps	37	LE	11.69	14.750
2440	500 kbps	17	LE	12.00	15.853
2480	500 kbps	39	LE	11.36	13.690
2402	1 Mbps	37	LE	19.85	96.694
2440	1 Mbps	17	LE	20.17	103.920
2480	1 Mbps	39	LE	19.53	89.660
2404	2 Mbps	0	LE	19.73	93.951
2440	2 Mbps	17	LE	19.77	94.733
2478	2 Mbps	36	LE	19.54	89.908

Table 7-10. Conducted Output Power Measurements (Bluetooth (LE)) – SISO ANT1

FCC ID: C3K2076 IC: 3048A-2076	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2312190129-05.C3K	Test Dates: 01/03/2024 - 03/18/2024	EUT Type: Portable Computing Device	Page 38 of 122

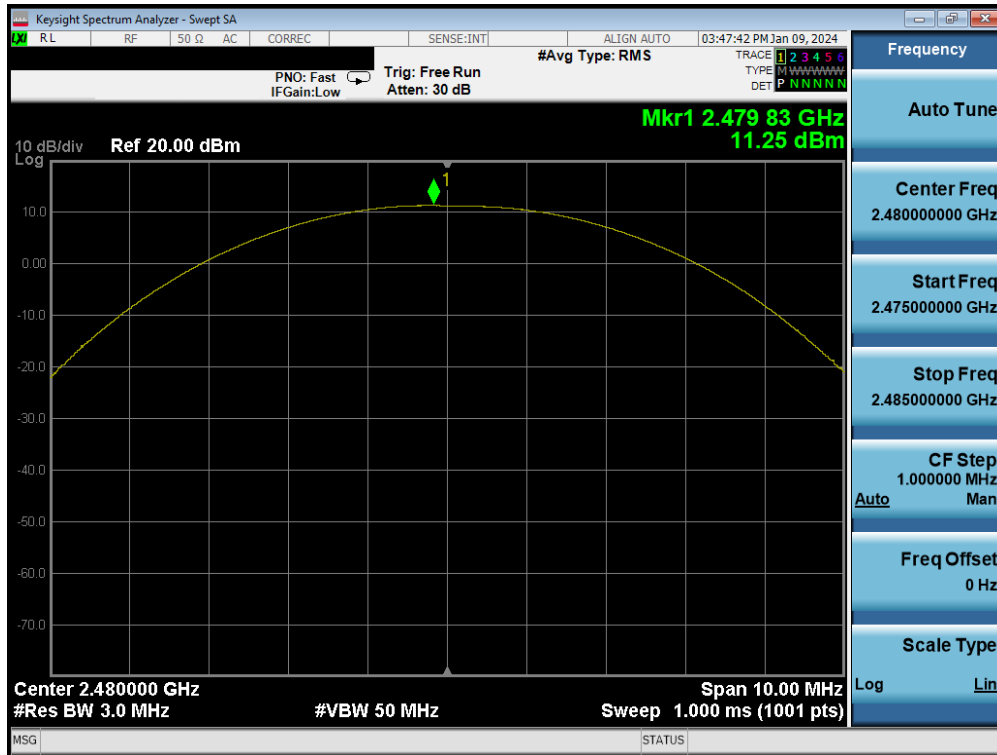


Plot 7-39. Peak Power Plot (Bluetooth (LE), 125kbps – Ch. 37)

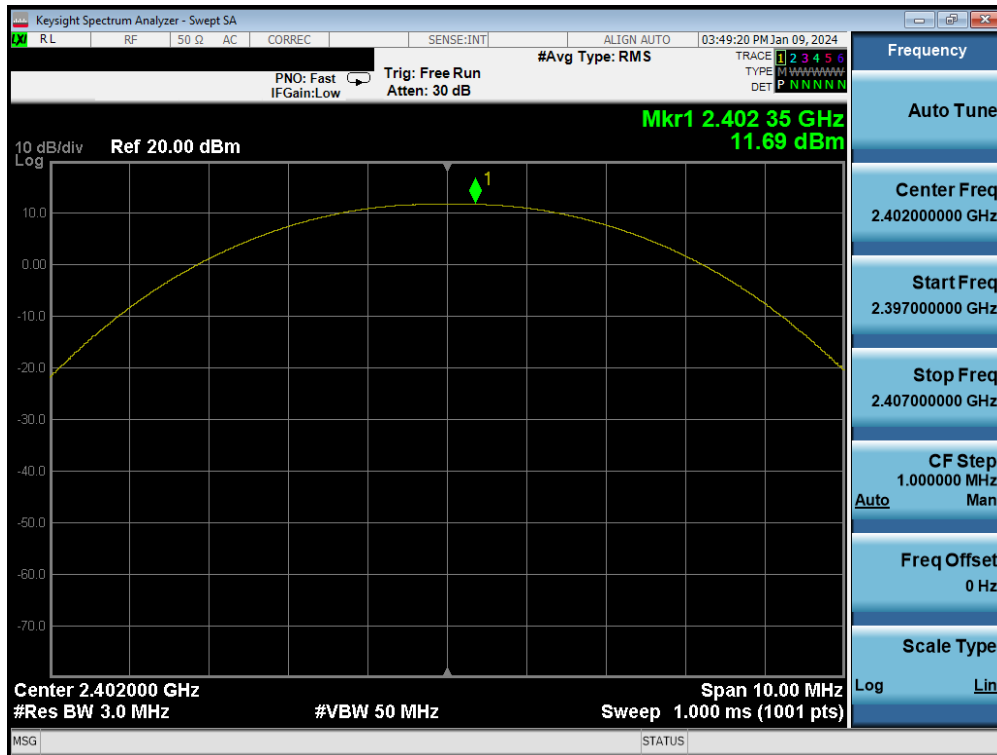


Plot 7-40. Peak Power Plot (Bluetooth (LE), 125kbps – Ch. 17)

FCC ID: C3K2076 IC: 3048A-2076	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2312190129-05.C3K	Test Dates: 01/03/2024 - 03/18/2024	EUT Type: Portable Computing Device	Page 39 of 122

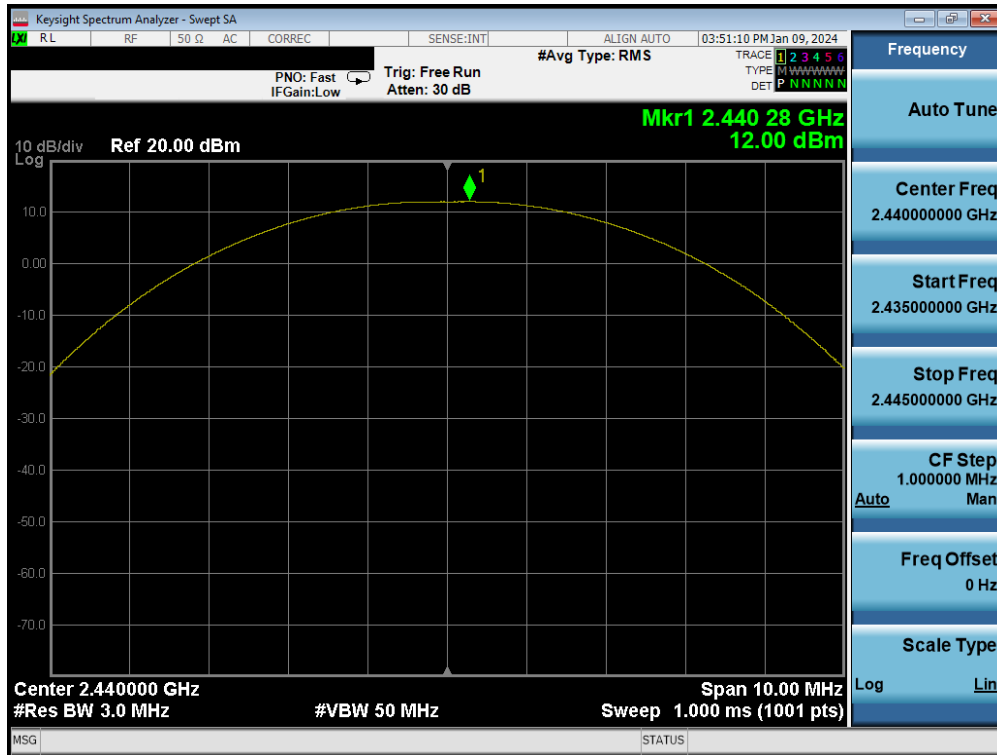


Plot 7-41. Peak Power Plot (Bluetooth (LE), 125kbps – Ch. 39)

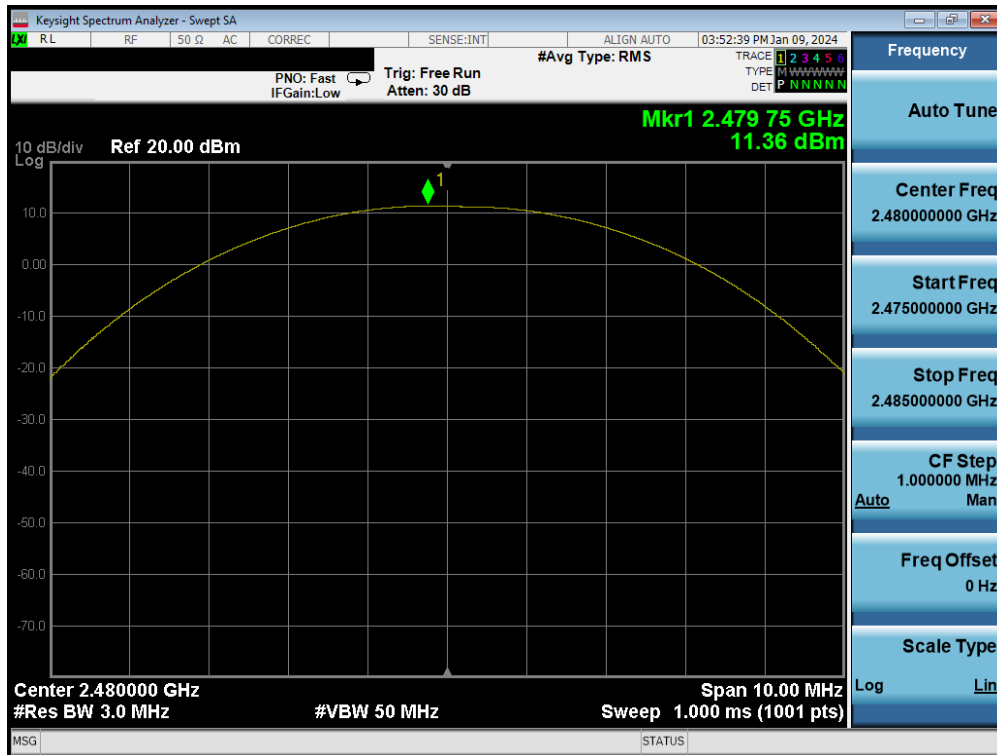


Plot 7-42. Peak Power Plot (Bluetooth (LE), 500kbps – Ch. 37)

FCC ID: C3K2076 IC: 3048A-2076	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2312190129-05.C3K	Test Dates: 01/03/2024 - 03/18/2024	EUT Type: Portable Computing Device	Page 40 of 122

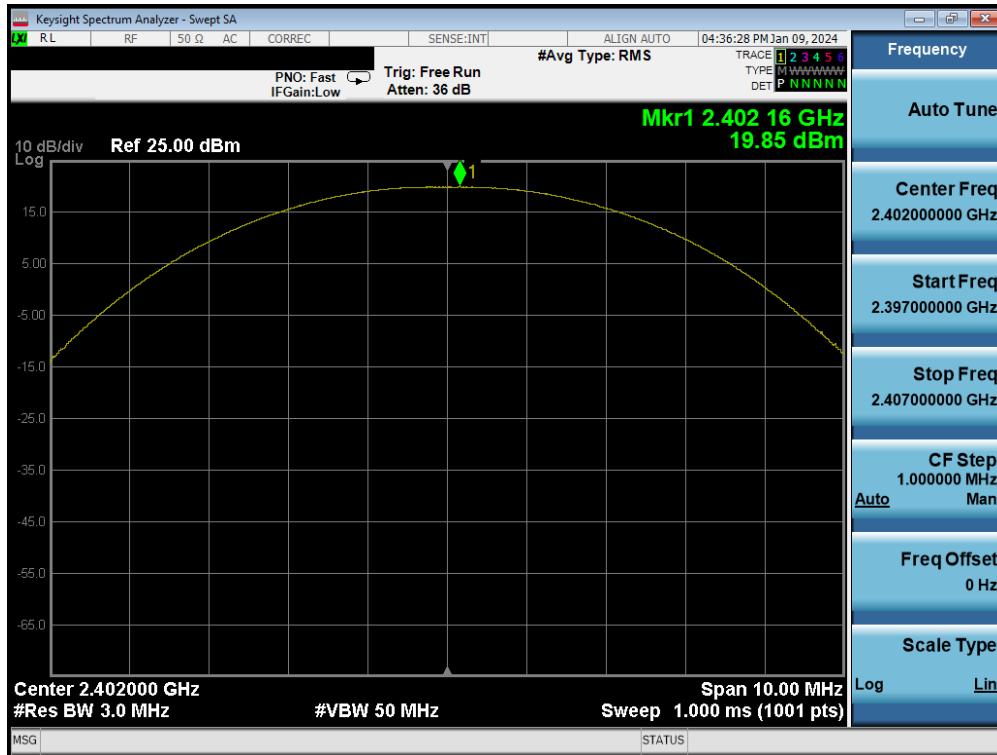


Plot 7-43. Peak Power Plot (Bluetooth (LE), 500kbps – Ch. 17)

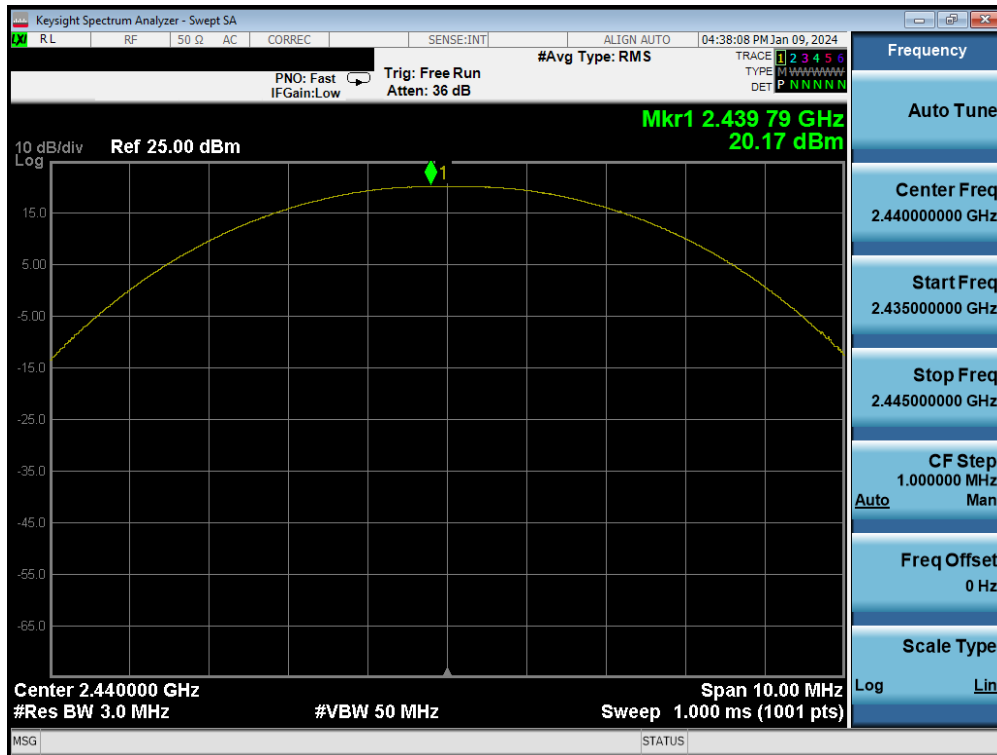


Plot 7-44. Peak Power Plot (Bluetooth (LE), 500kbps – Ch. 39)

FCC ID: C3K2076 IC: 3048A-2076	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2312190129-05.C3K	Test Dates: 01/03/2024 - 03/18/2024	EUT Type: Portable Computing Device	Page 41 of 122

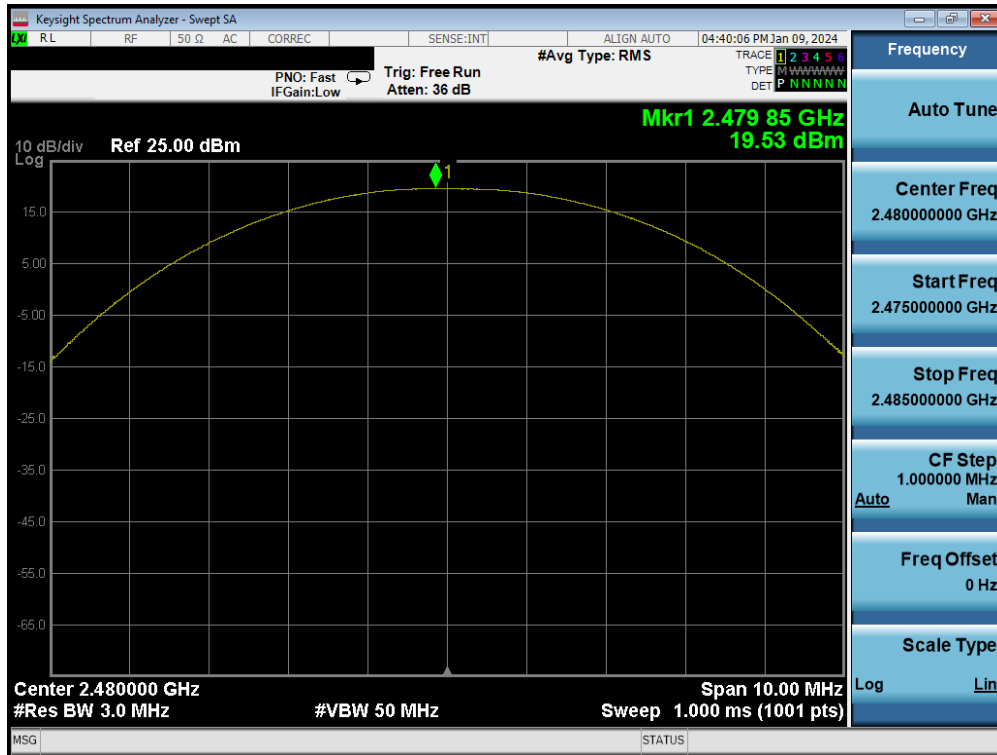


Plot 7-45. Peak Power Plot (Bluetooth (LE), 1Mbps – Ch. 37)

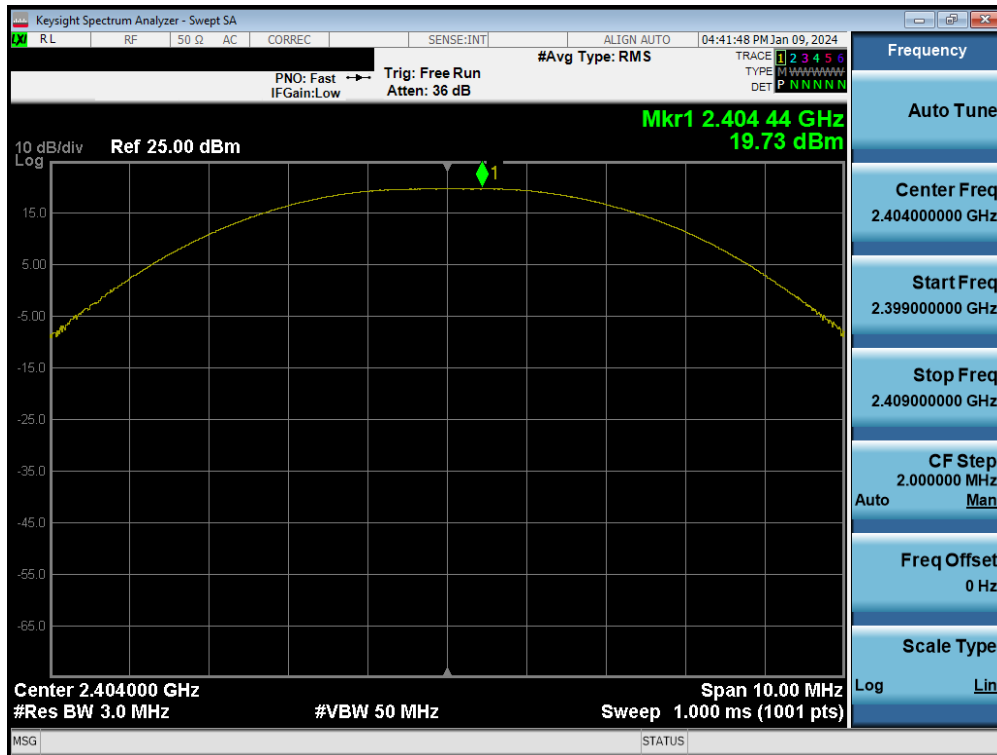


Plot 7-46. Peak Power Plot (Bluetooth (LE), 1Mbps – Ch. 17)

FCC ID: C3K2076 IC: 3048A-2076	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2312190129-05.C3K	Test Dates: 01/03/2024 - 03/18/2024	EUT Type: Portable Computing Device	Page 42 of 122

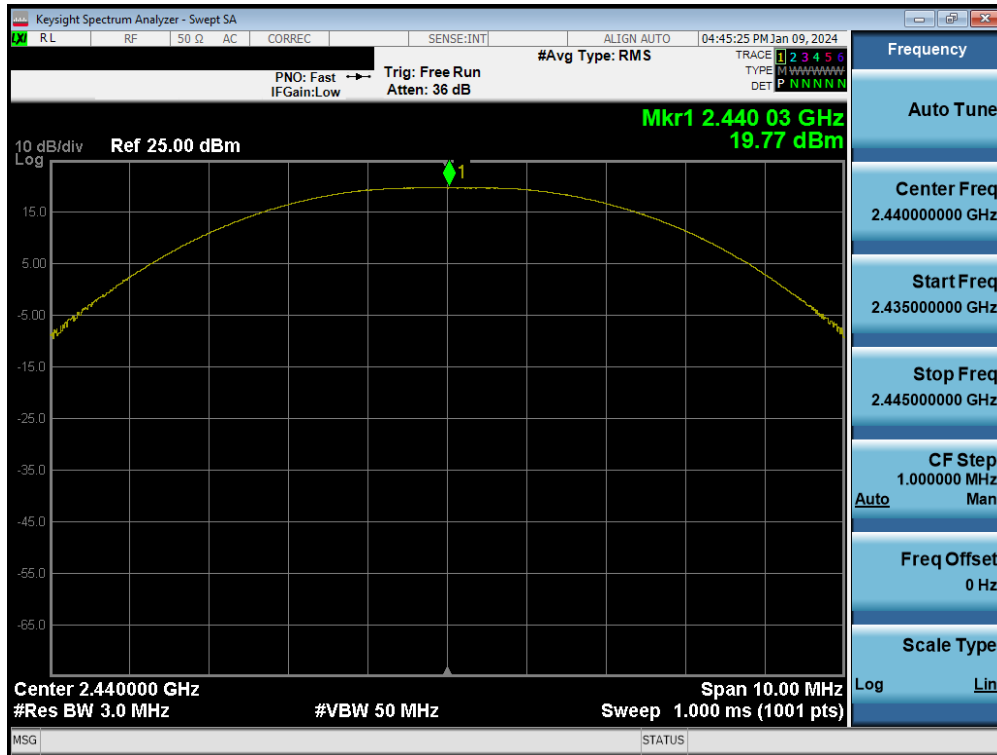


Plot 7-47. Peak Power Plot (Bluetooth (LE), 1Mbps – Ch. 39)

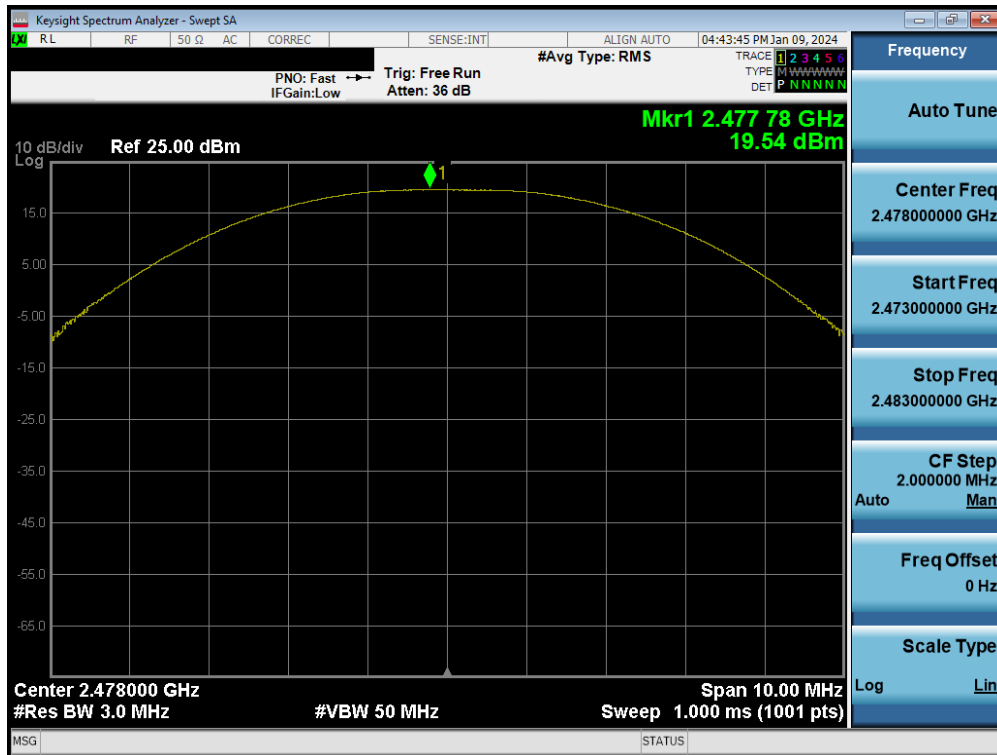


Plot 7-48. Peak Power Plot (Bluetooth (LE), 2Mbps – Ch. 0)

FCC ID: C3K2076 IC: 3048A-2076	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2312190129-05.C3K	Test Dates: 01/03/2024 - 03/18/2024	EUT Type: Portable Computing Device	Page 43 of 122



Plot 7-49. Peak Power Plot (Bluetooth (LE), 2Mbps – Ch. 17)



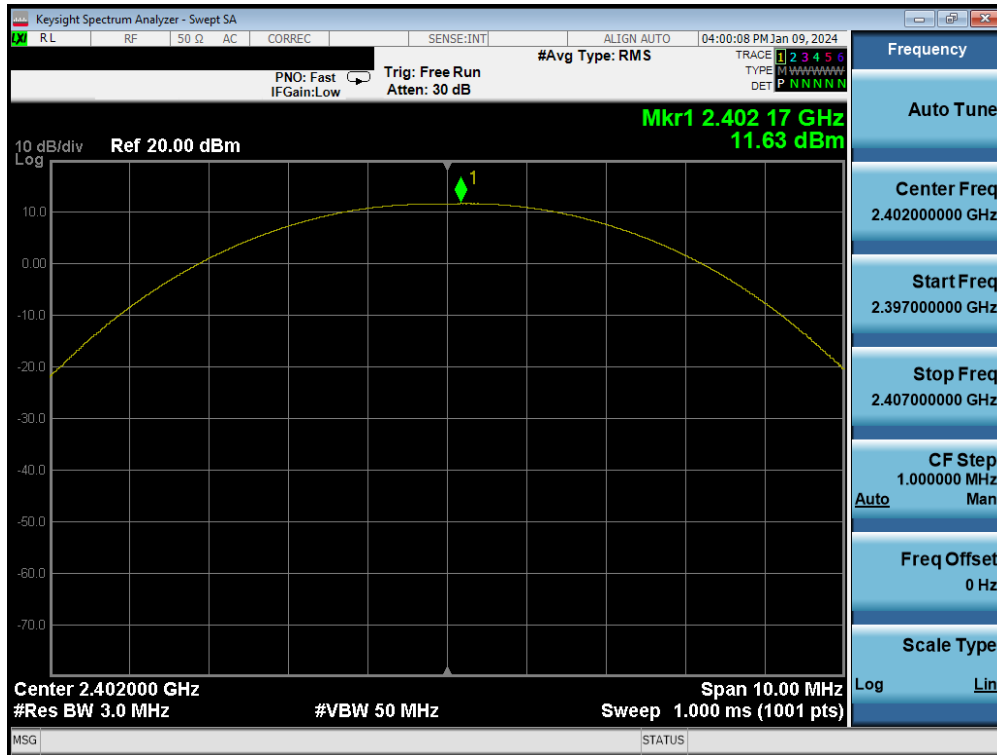
Plot 7-50. Peak Power Plot (Bluetooth (LE), 2Mbps – Ch. 36)

FCC ID: C3K2076 IC: 3048A-2076	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2312190129-05.C3K	Test Dates: 01/03/2024 - 03/18/2024	EUT Type: Portable Computing Device	Page 44 of 122

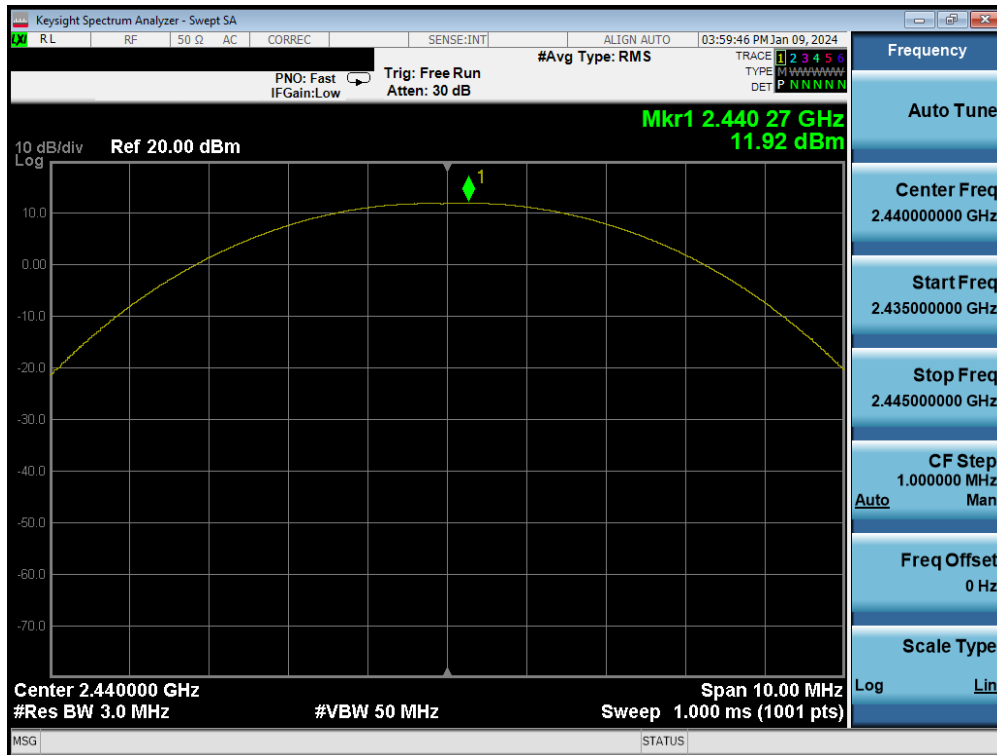
Frequency [MHz]	Data Rate [Mbps]	Channel No.	Bluetooth Mode	Peak Conducted Power	
				[dBm]	[mW]
2402	125 kbps	37	LE	11.63	14.541
2440	125 kbps	17	LE	11.92	15.560
2480	125 kbps	39	LE	11.47	14.022
2402	500 kbps	37	LE	11.67	14.689
2440	500 kbps	17	LE	11.95	15.668
2480	500 kbps	39	LE	11.53	14.227
2402	1 Mbps	37	LE	20.39	109.396
2440	1 Mbps	17	LE	20.83	120.948
2480	1 Mbps	39	LE	20.15	103.443
2404	2 Mbps	0	LE	20.61	115.107
2440	2 Mbps	17	LE	20.60	114.815
2478	2 Mbps	36	LE	20.50	112.305

Table 7-11. Conducted Output Power Measurements (Bluetooth (LE)) – SISO ANT2

FCC ID: C3K2076 IC: 3048A-2076	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2312190129-05.C3K	Test Dates: 01/03/2024 - 03/18/2024	EUT Type: Portable Computing Device	Page 45 of 122

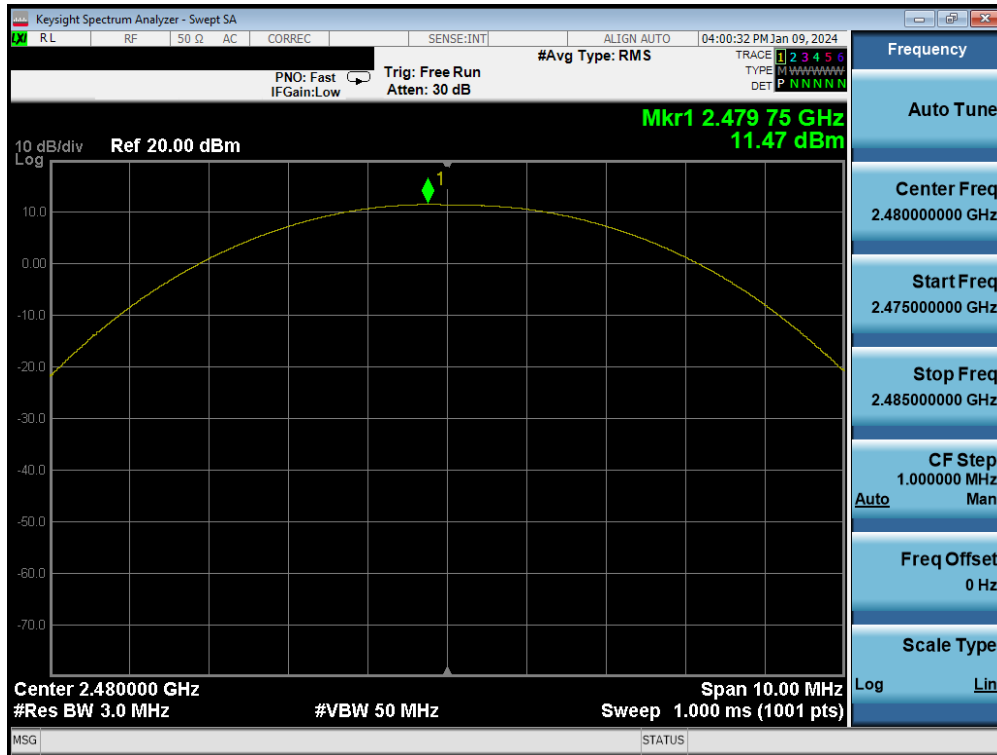


Plot 7-51. Peak Power Plot (Bluetooth (LE), 125kbps – Ch. 37)

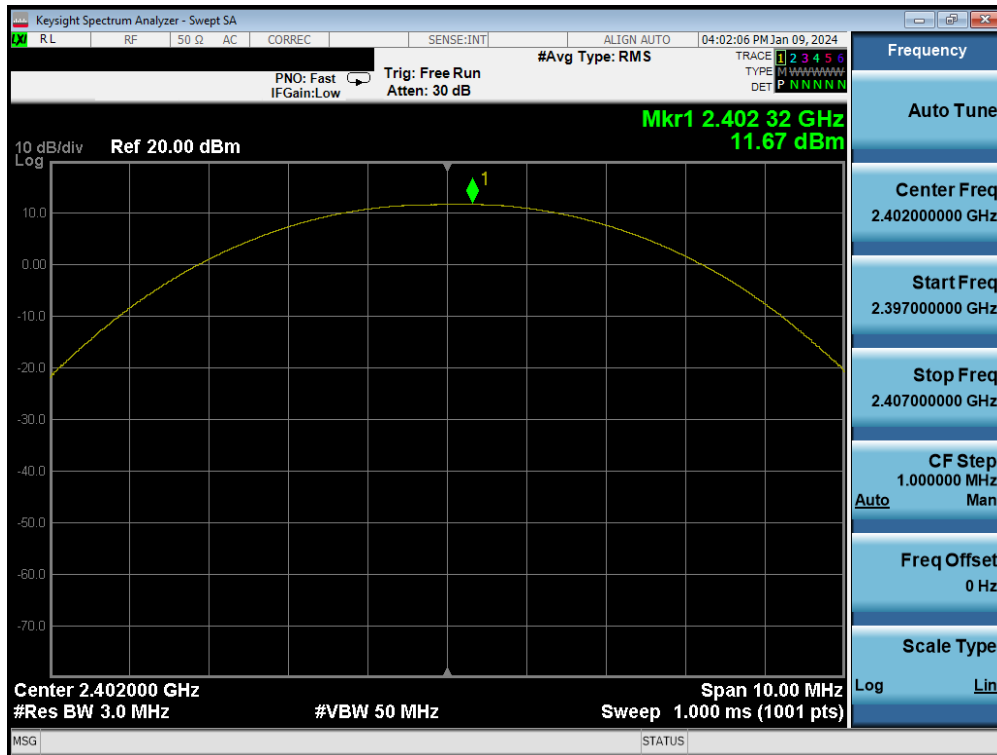


Plot 7-52. Peak Power Plot (Bluetooth (LE), 125kbps – Ch. 17)

FCC ID: C3K2076 IC: 3048A-2076	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2312190129-05.C3K	Test Dates: 01/03/2024 - 03/18/2024	EUT Type: Portable Computing Device	Page 46 of 122

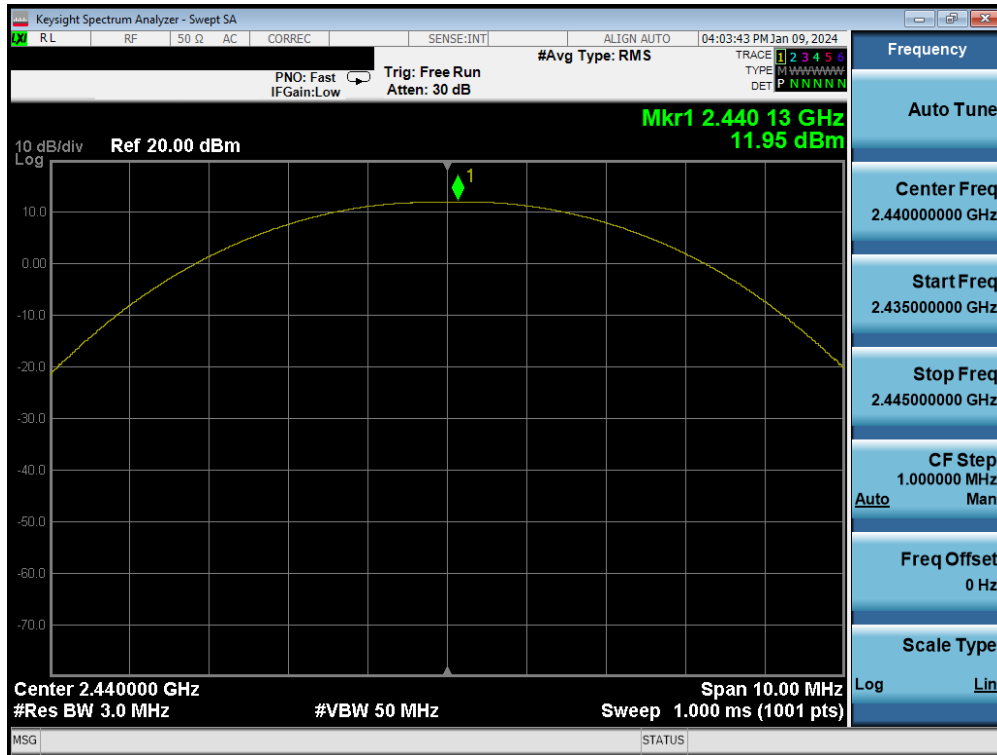


Plot 7-53. Peak Power Plot (Bluetooth (LE), 125kbps – Ch. 39)

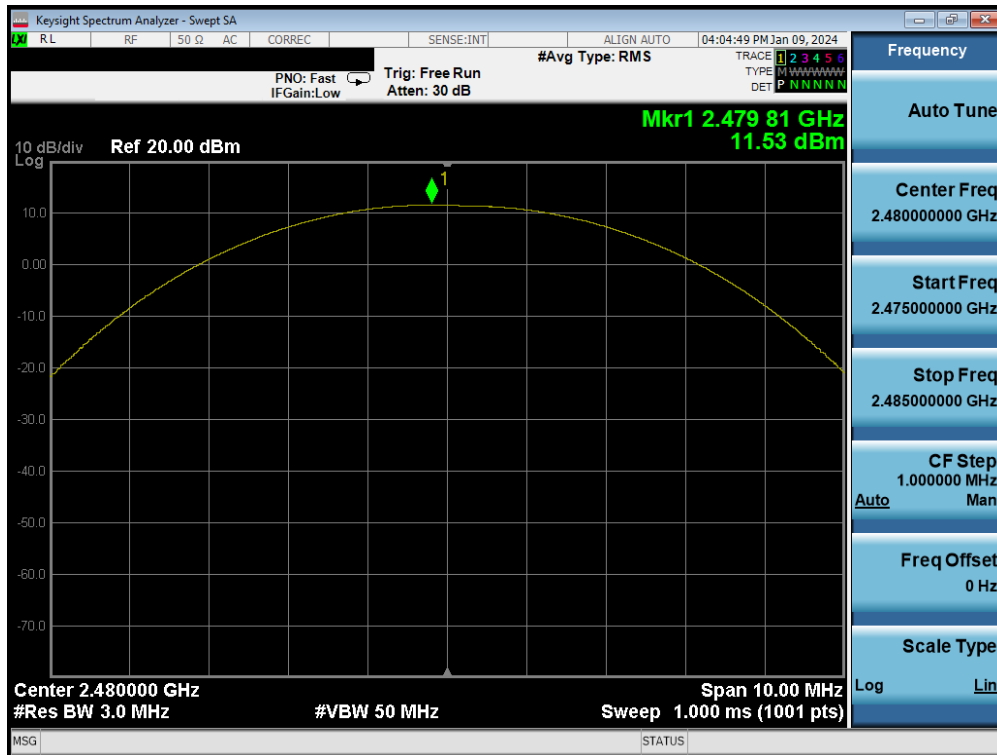


Plot 7-54. Peak Power Plot (Bluetooth (LE), 500kbps – Ch. 37)

FCC ID: C3K2076 IC: 3048A-2076	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2312190129-05.C3K	Test Dates: 01/03/2024 - 03/18/2024	EUT Type: Portable Computing Device	Page 47 of 122

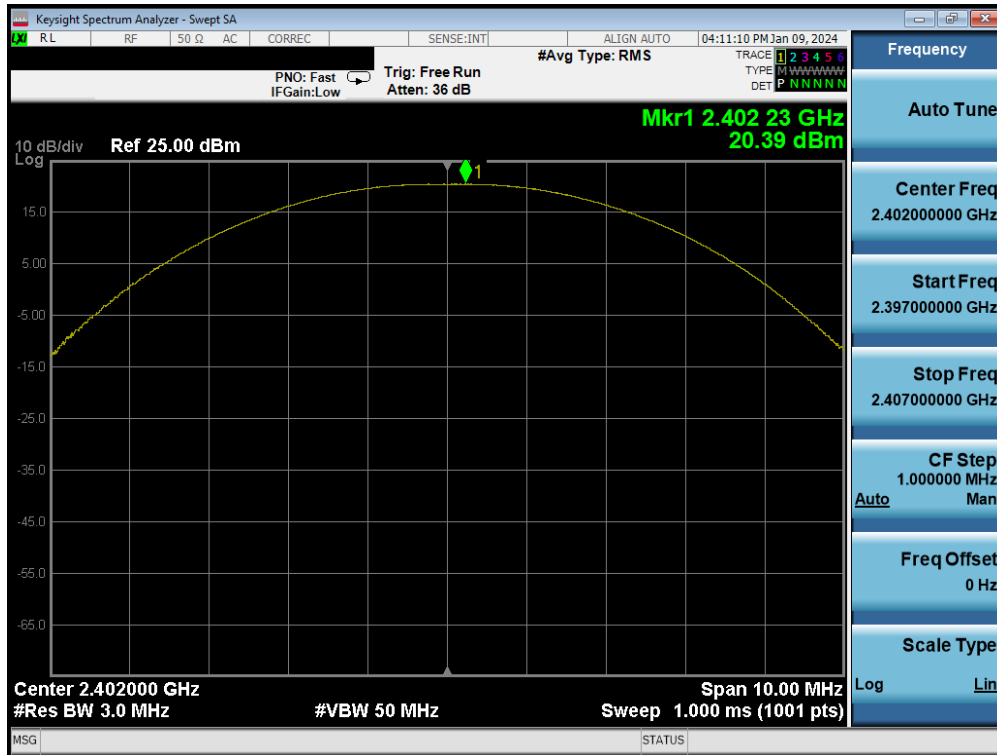


Plot 7-55. Peak Power Plot (Bluetooth (LE), 500kbps – Ch. 17)

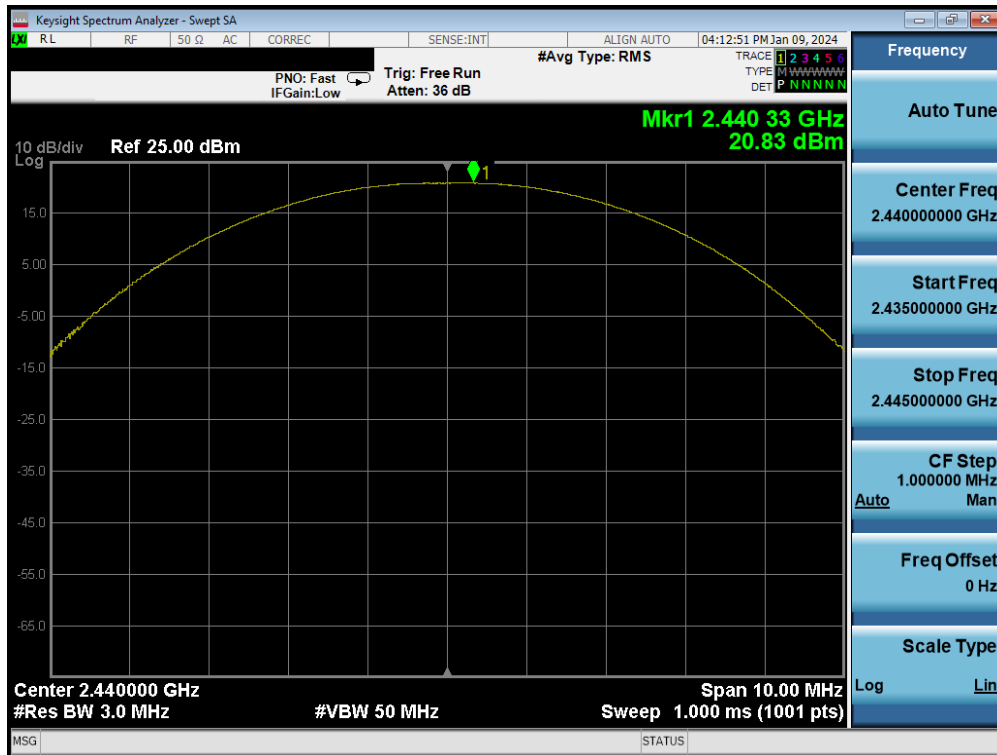


Plot 7-56. Peak Power Plot (Bluetooth (LE), 500kbps – Ch. 39)

FCC ID: C3K2076 IC: 3048A-2076	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2312190129-05.C3K	Test Dates: 01/03/2024 - 03/18/2024	EUT Type: Portable Computing Device	Page 48 of 122

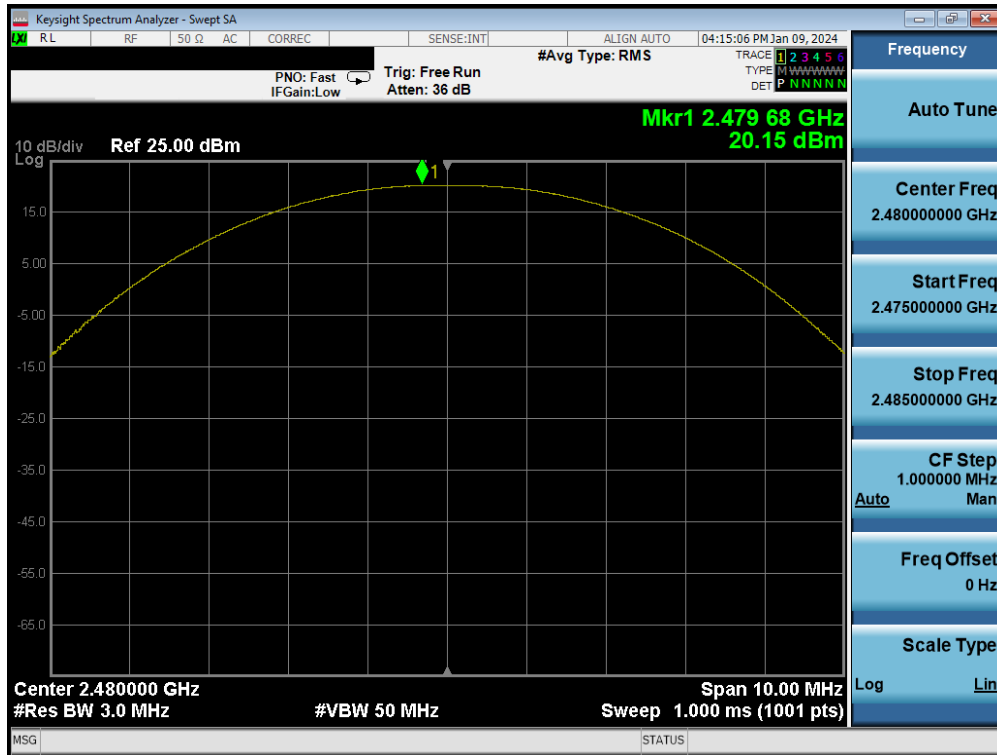


Plot 7-57. Peak Power Plot (Bluetooth (LE), 1Mbps – Ch. 37)

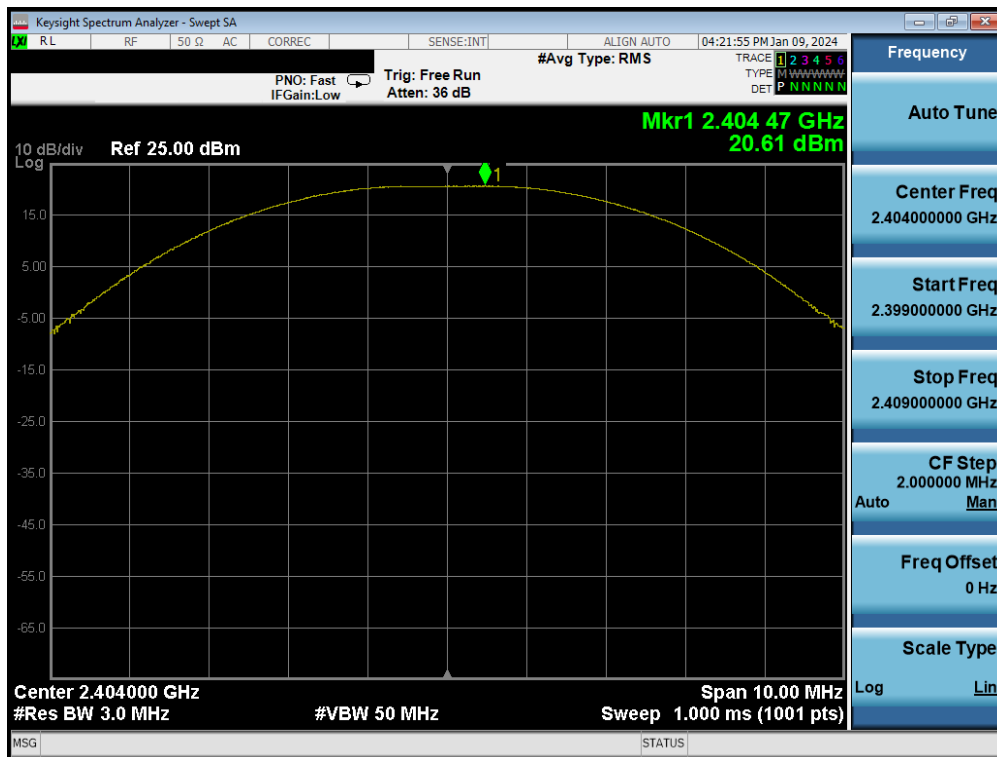


Plot 7-58. Peak Power Plot (Bluetooth (LE), 1Mbps – Ch. 17)

FCC ID: C3K2076 IC: 3048A-2076	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2312190129-05.C3K	Test Dates: 01/03/2024 - 03/18/2024	EUT Type: Portable Computing Device	Page 49 of 122

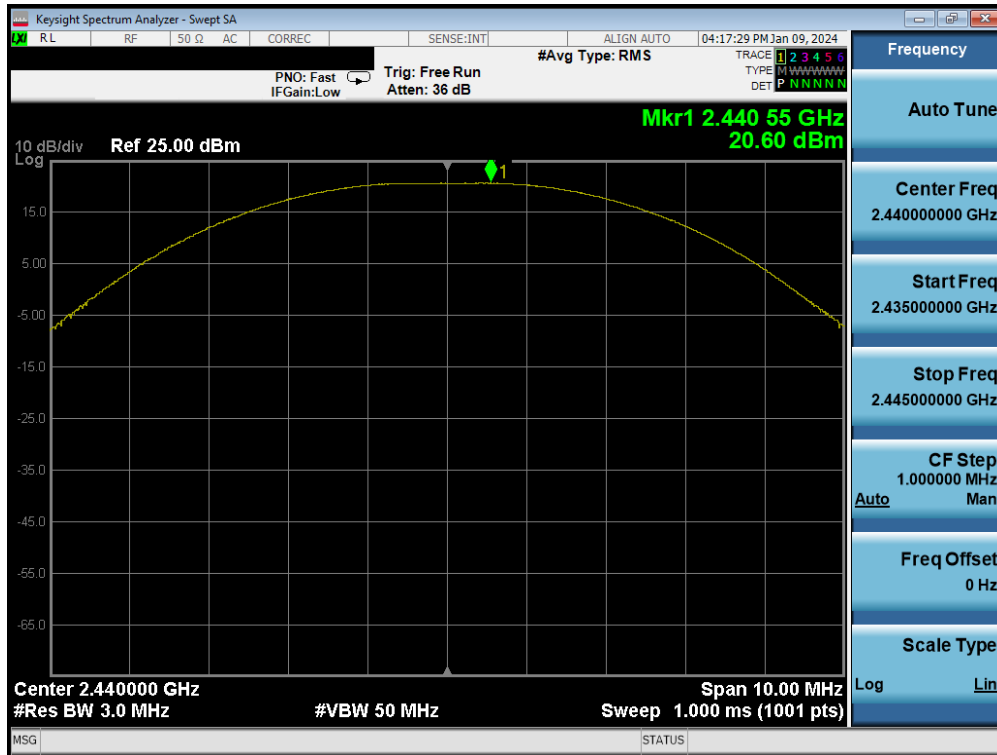


Plot 7-59. Peak Power Plot (Bluetooth (LE), 1Mbps – Ch. 39)

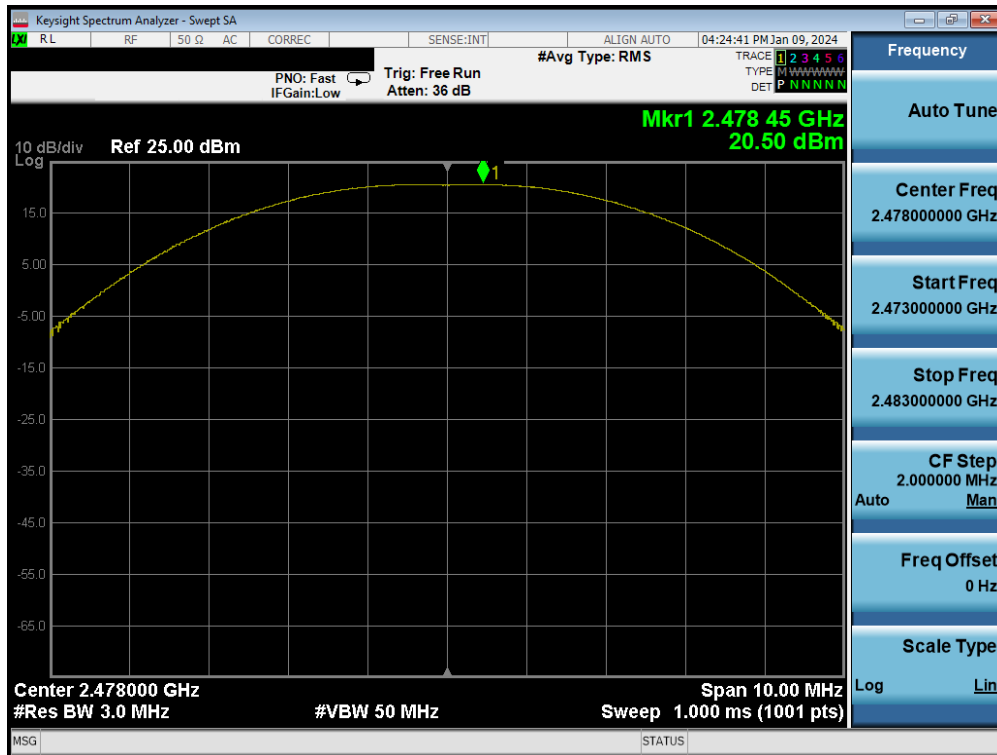


Plot 7-60. Peak Power Plot (Bluetooth (LE), 2Mbps – Ch. 0)

FCC ID: C3K2076 IC: 3048A-2076	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2312190129-05.C3K	Test Dates: 01/03/2024 - 03/18/2024	EUT Type: Portable Computing Device	Page 50 of 122



Plot 7-61. Peak Power Plot (Bluetooth (LE), 2Mbps – Ch. 17)



Plot 7-62. Peak Power Plot (Bluetooth (LE), 2Mbps – Ch. 36)

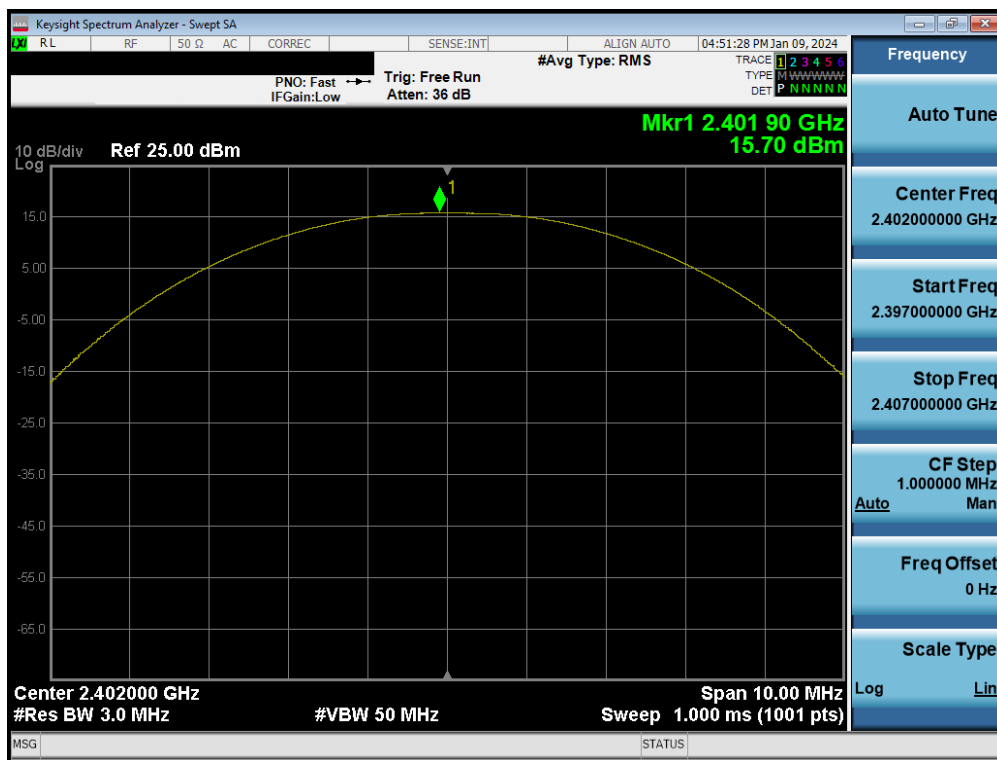
FCC ID: C3K2076 IC: 3048A-2076	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2312190129-05.C3K	Test Dates: 01/03/2024 - 03/18/2024	EUT Type: Portable Computing Device	Page 51 of 122



Frequency [MHz]	Data Rate [Mbps]	Channel No.	Bluetooth Mode	ANT 1 Peak Conducted Power		ANT 2 Peak Conducted Power		Peak Conducted Power		Ant. Gain [dBi]	EIRP	Limit	Margin
				[dBm]	[mW]	[dBm]	[mW]	[dBm]	[mW]				
2402	1 Mbps	37	LE	15.70	37.128	15.59	36.191	18.65	39.69	4.37	23.02	36.02	-13.00
2440	1 Mbps	17	LE	16.05	40.281	15.76	37.679	18.92	42.18	4.37	23.29	36.02	-12.73
2480	1 Mbps	39	LE	15.40	34.698	15.49	35.367	18.45	38.06	4.37	22.82	36.02	-13.20
2404	2 Mbps	0	LE	16.00	39.783	15.93	39.138	18.97	42.48	4.37	23.34	36.02	-12.68
2440	2 Mbps	17	LE	15.98	39.664	15.90	38.869	18.95	42.30	4.37	23.32	36.02	-12.70
2478	2 Mbps	36	LE	15.55	35.876	15.68	36.940	18.62	39.45	4.37	22.99	36.02	-13.03

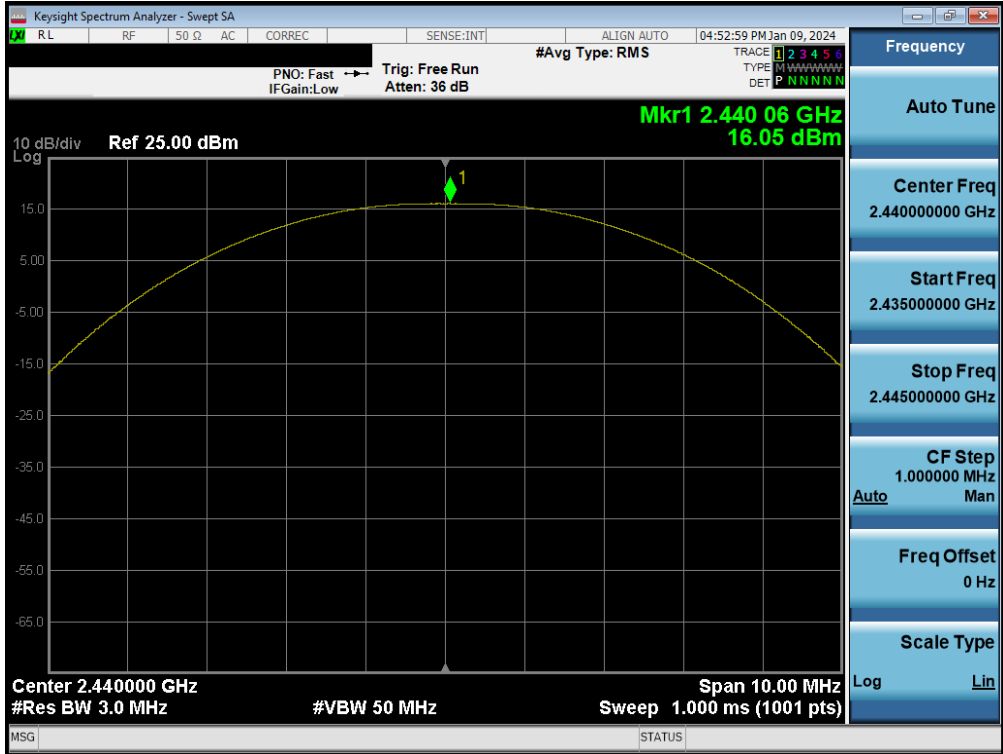
Table 7-12. Conducted Output Power Measurements (Bluetooth (LE)) – DUAL

DUAL ANT1

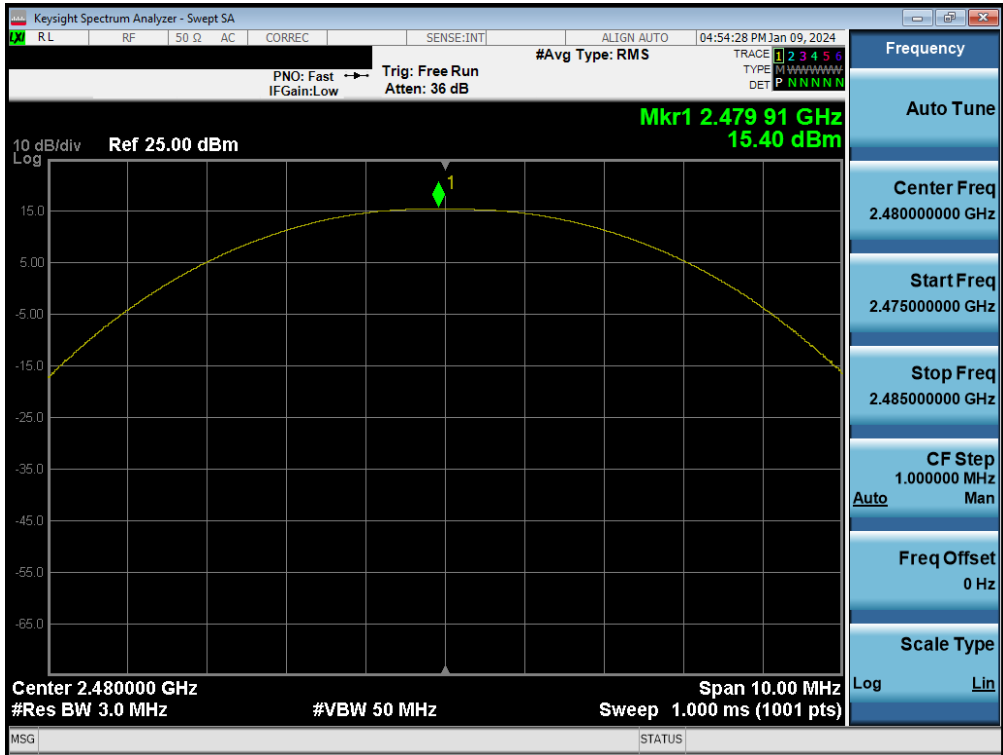


Plot 7-63. Peak Power Plot (Bluetooth (LE), 1Mbps – Ch. 37)

FCC ID: C3K2076 IC: 3048A-2076	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2312190129-05.C3K	Test Dates: 01/03/2024 - 03/18/2024	EUT Type: Portable Computing Device	Page 52 of 122



Plot 7-64. Peak Power Plot (Bluetooth (LE), 1Mbps – Ch. 17)



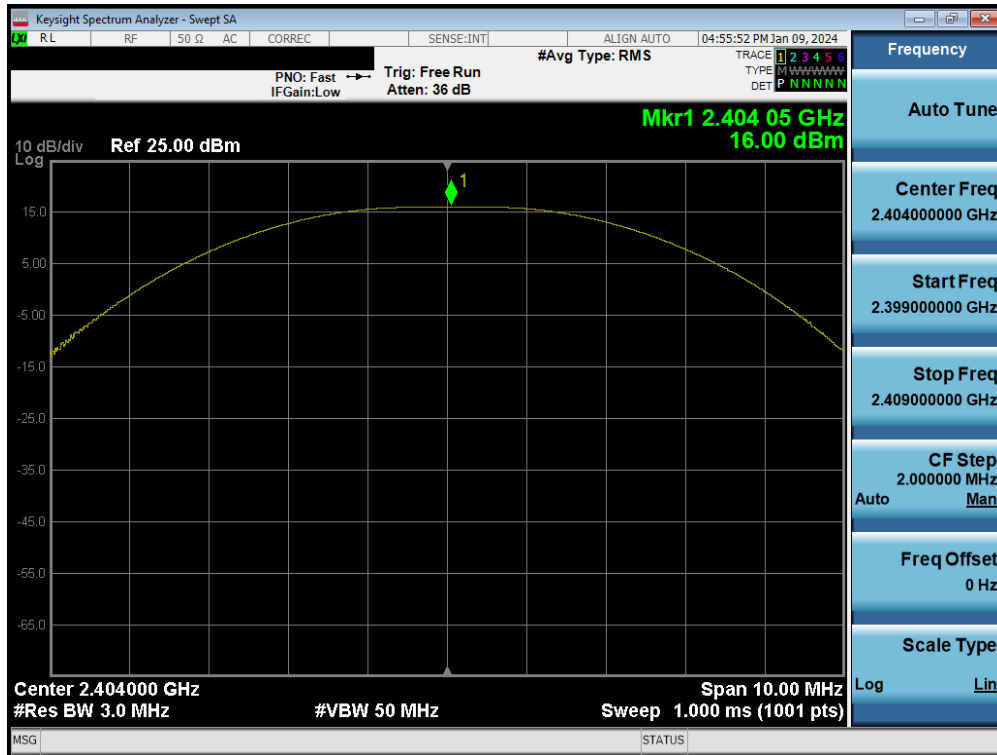
Plot 7-65. Peak Power Plot (Bluetooth (LE), 1Mbps – Ch. 39)

FCC ID: C3K2076 IC: 3048A-2076	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2312190129-05.C3K	Test Dates: 01/03/2024 - 03/18/2024	EUT Type: Portable Computing Device	Page 53 of 122

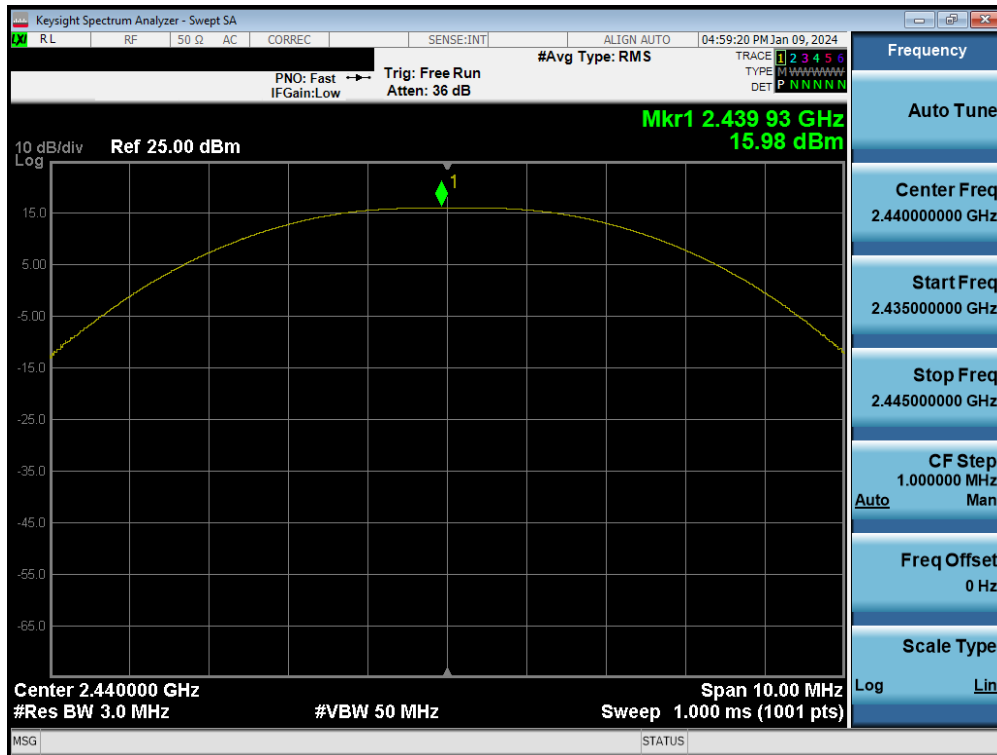
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V11.1 08/28/2023

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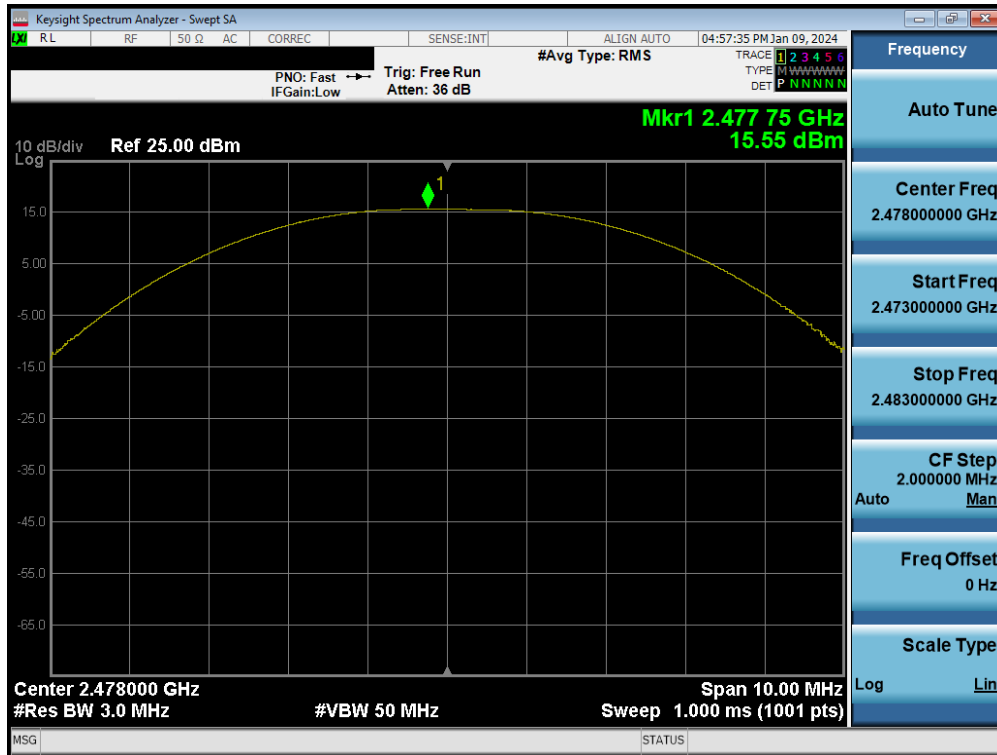


Plot 7-66. Peak Power Plot (Bluetooth (LE), 2Mbps – Ch. 0)



Plot 7-67. Peak Power Plot (Bluetooth (LE), 2Mbps – Ch. 17)

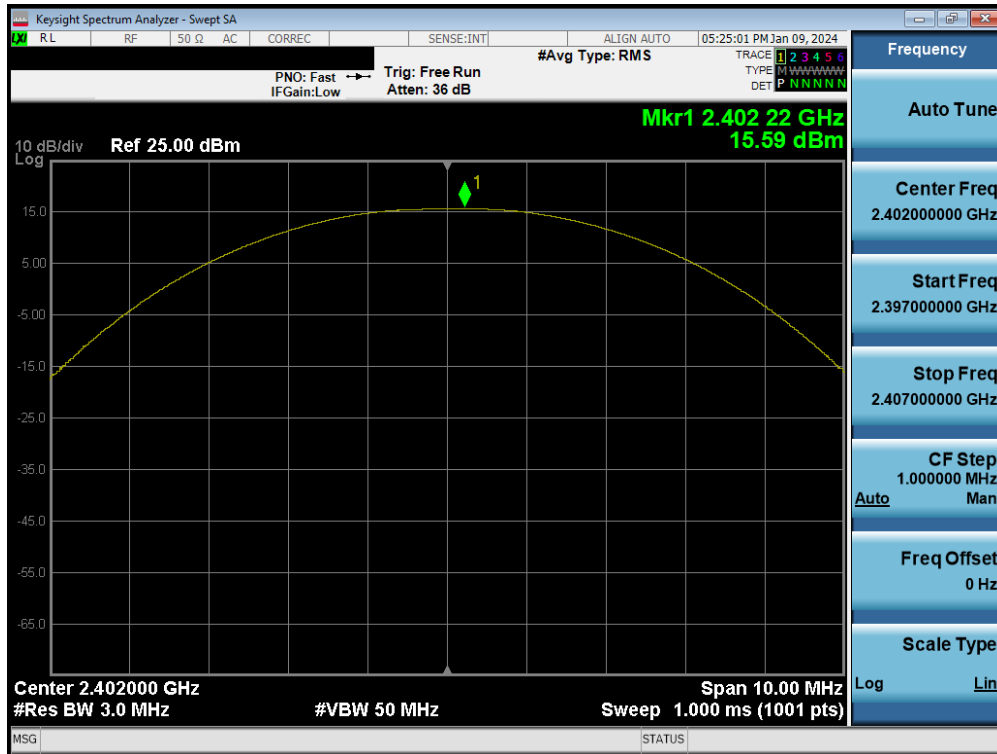
FCC ID: C3K2076 IC: 3048A-2076	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2312190129-05.C3K	Test Dates: 01/03/2024 - 03/18/2024	EUT Type: Portable Computing Device	Page 54 of 122



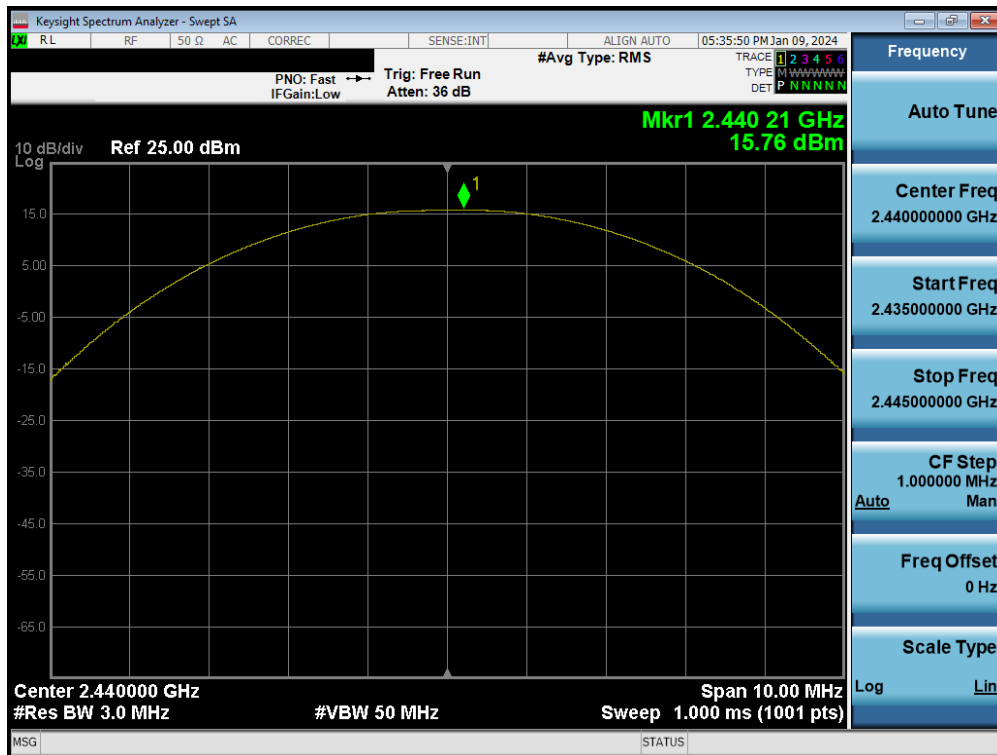
Plot 7-68. Peak Power Plot (Bluetooth (LE), 2Mbps – Ch. 36)

FCC ID: C3K2076 IC: 3048A-2076	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2312190129-05.C3K	Test Dates: 01/03/2024 - 03/18/2024	EUT Type: Portable Computing Device	Page 55 of 122

DUAL ANT2

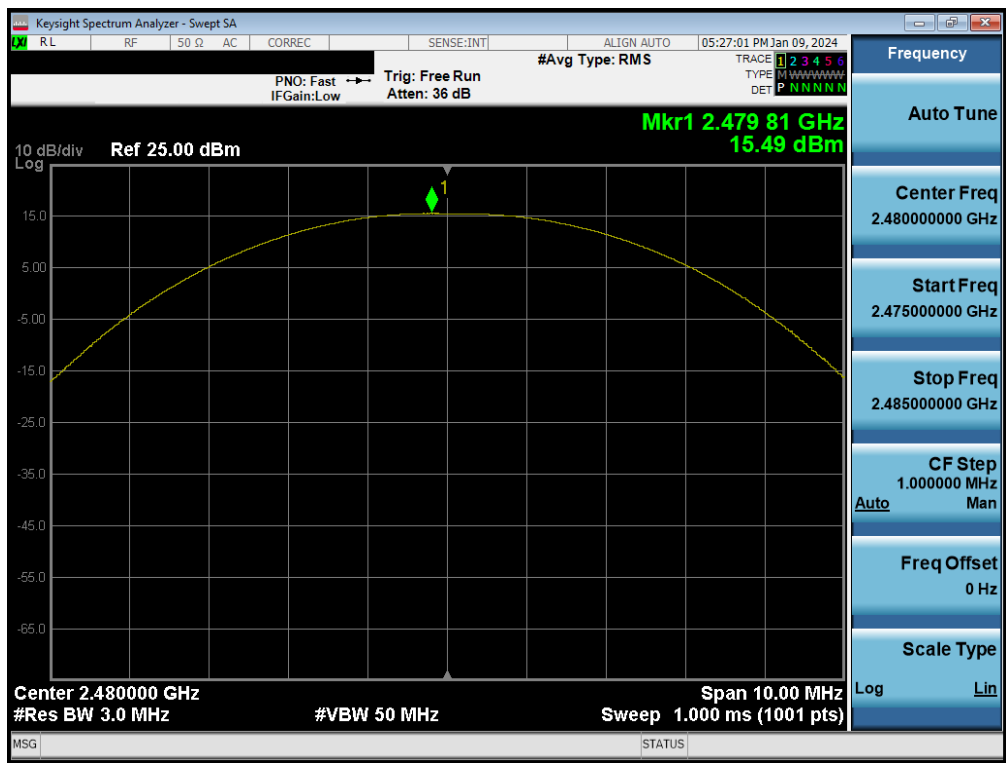


Plot 7-69. Peak Power Plot (Bluetooth (LE), 1Mbps – Ch. 37)

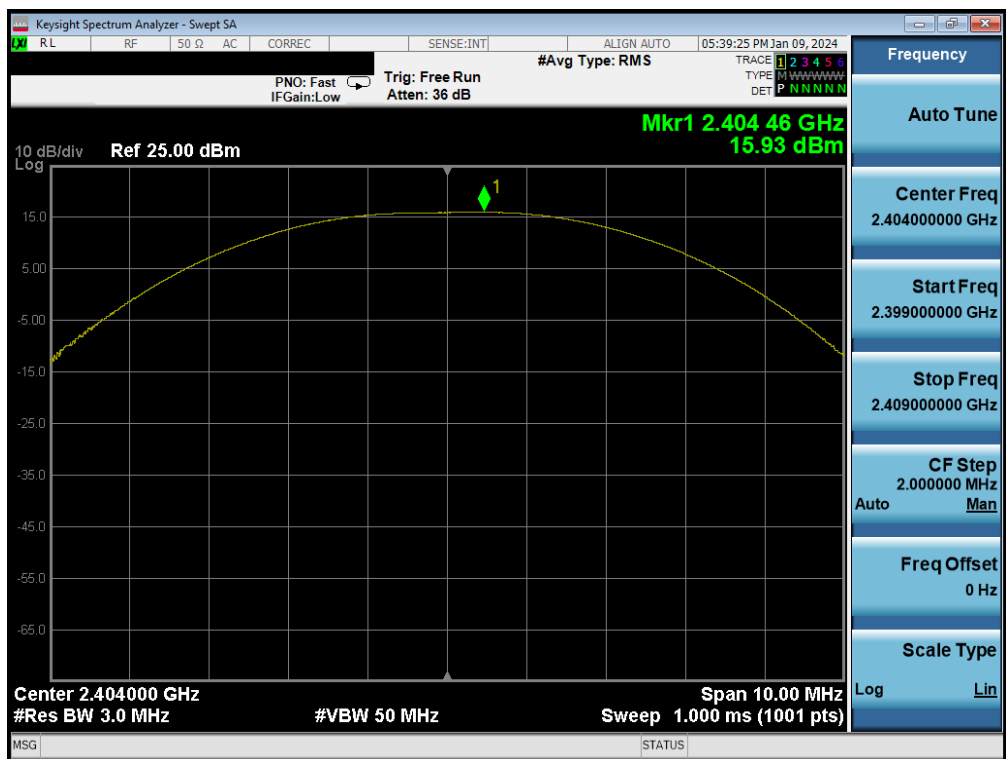


Plot 7-70. Peak Power Plot (Bluetooth (LE), 1Mbps – Ch. 17)

FCC ID: C3K2076 IC: 3048A-2076	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2312190129-05.C3K	Test Dates: 01/03/2024 - 03/18/2024	EUT Type: Portable Computing Device	Page 56 of 122

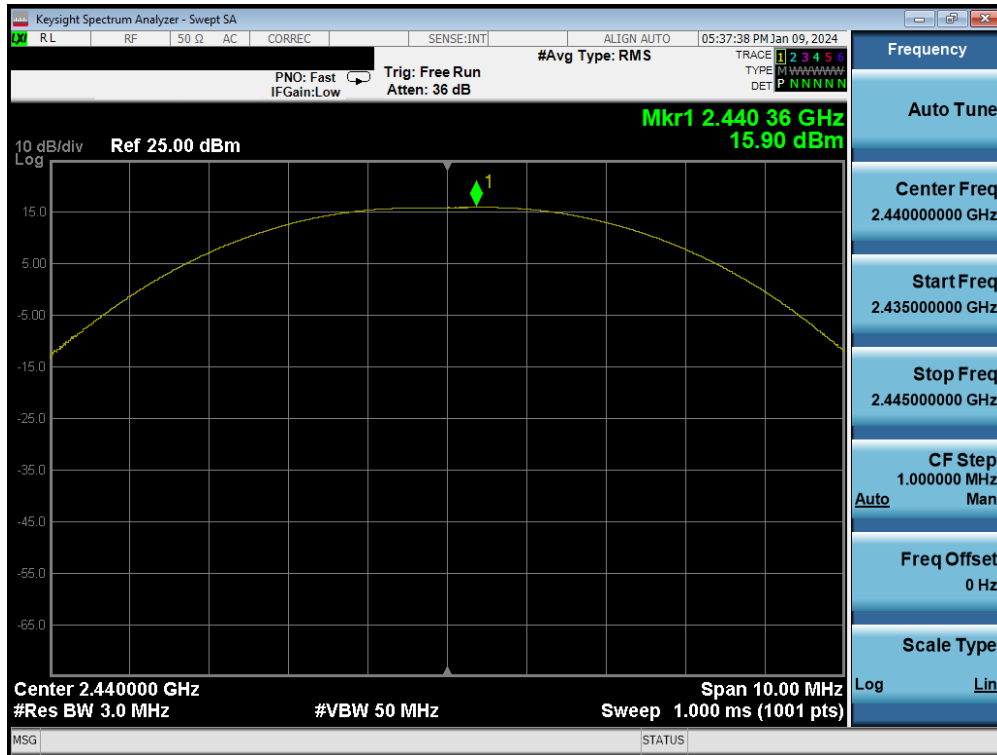


Plot 7-71. Peak Power Plot (Bluetooth (LE), 1Mbps – Ch. 39)

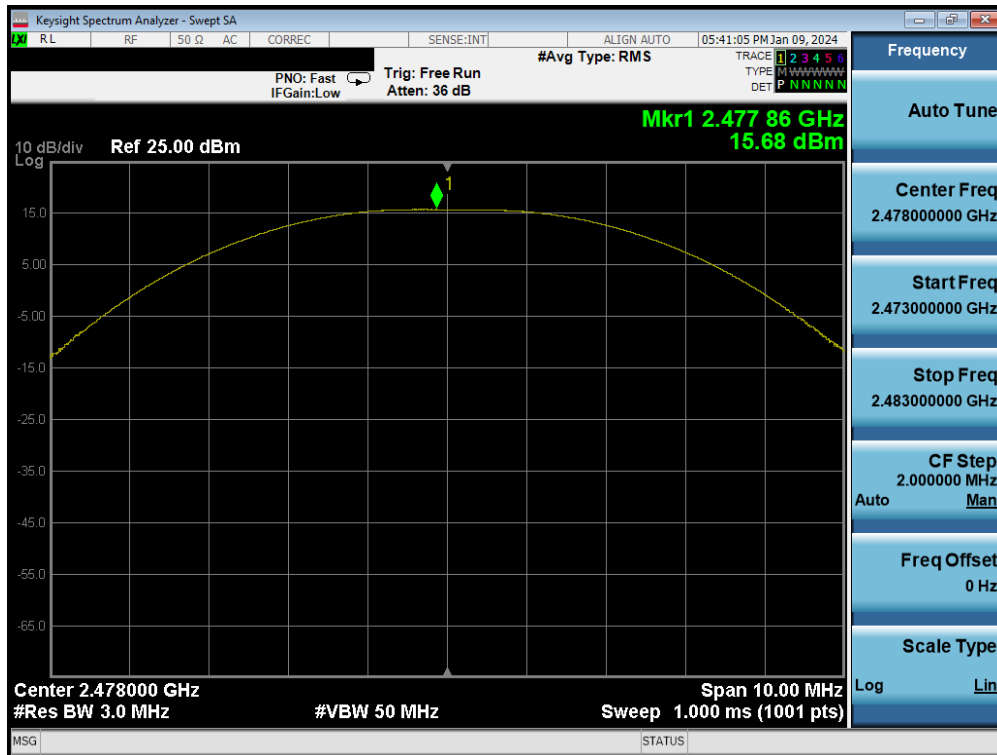


Plot 7-72. Peak Power Plot (Bluetooth (LE), 2Mbps – Ch. 0)

FCC ID: C3K2076 IC: 3048A-2076		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2312190129-05.C3K	Test Dates: 01/03/2024 - 03/18/2024	EUT Type: Portable Computing Device		Page 57 of 122



Plot 7-73. Peak Power Plot (Bluetooth (LE), 2Mbps – Ch. 17)



Plot 7-74. Peak Power Plot (Bluetooth (LE), 2Mbps – Ch. 36)

FCC ID: C3K2076 IC: 3048A-2076	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2312190129-05.C3K	Test Dates: 01/03/2024 - 03/18/2024	EUT Type: Portable Computing Device	Page 58 of 122

7.4 Power Spectral Density – Bluetooth (LE)

§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 maximum power and at the appropriate frequencies.

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

Test Procedure Used

ANSI C63.10-2013 – Section 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 = 1MHz
5. Detector = peak
6. Sweep time = auto couple
7. Trace mode = max hold
8. Trace was allowed to stabilize

Test Setup

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



Figure 7-3. Test Instrument & Measurement Setup

Test Notes

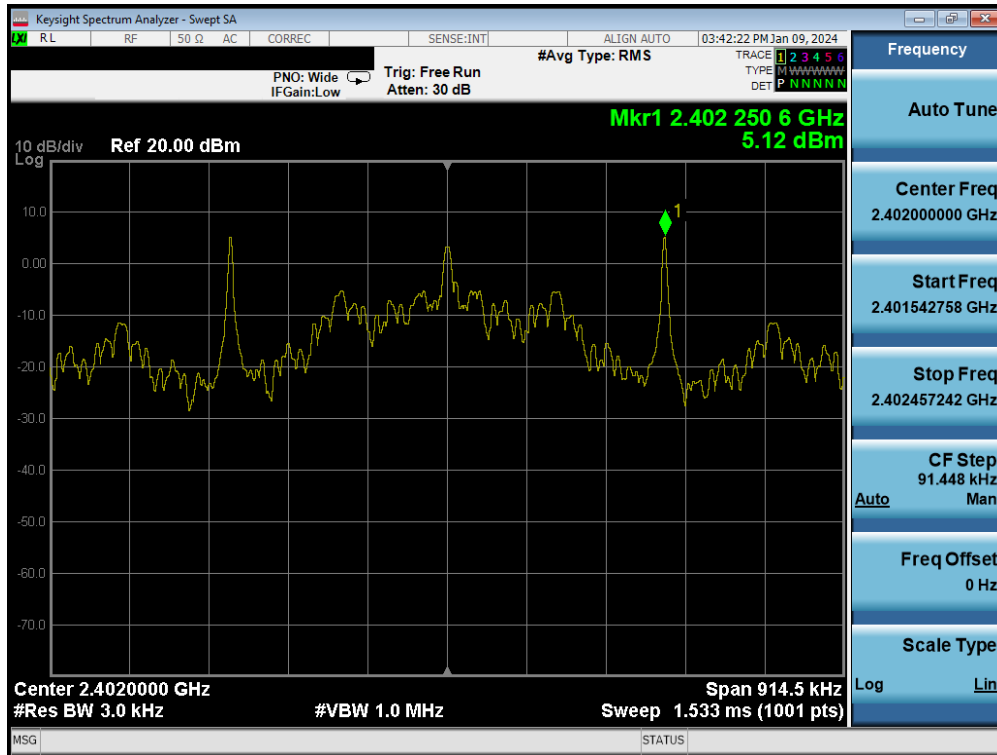
None

FCC ID: C3K2076 IC: 3048A-2076	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2312190129-05.C3K	Test Dates: 01/03/2024 - 03/18/2024	EUT Type: Portable Computing Device	Page 59 of 122

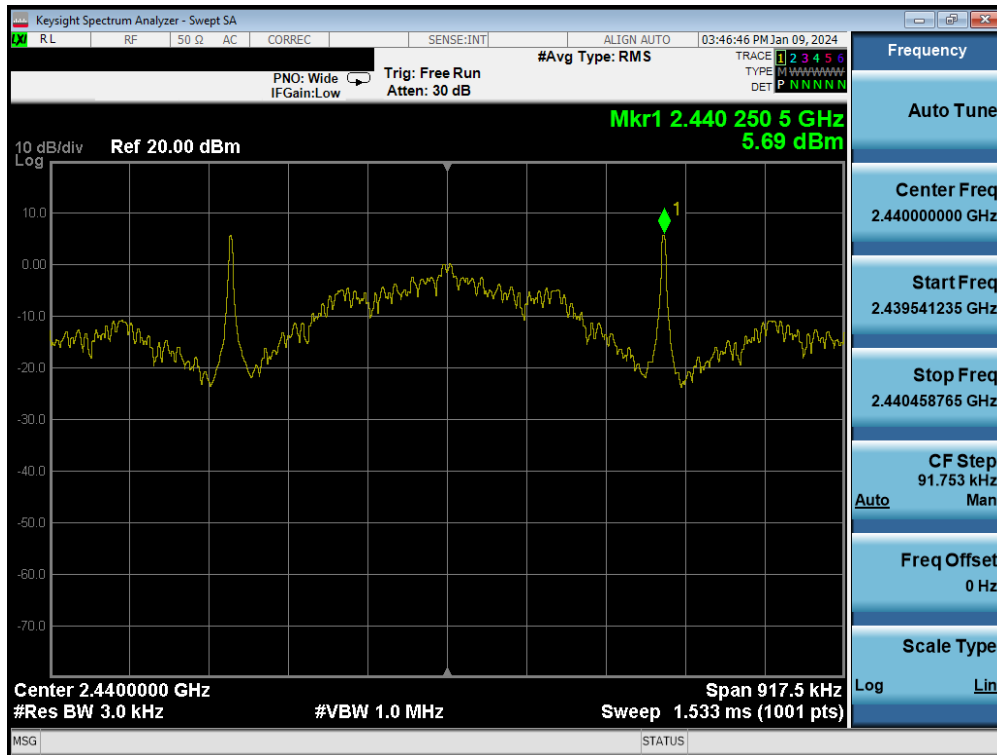
Frequency [MHz]	Data Rate [Mbps]	Channel No.	Bluetooth Mode	Measured Power Spectral Density [dBm]	Maximum Permissible Power Density [dBm / 3kHz]	Margin [dB]
2402	125 kbps	37	LE	5.12	8.0	-2.88
2440	125 kbps	17	LE	5.69	8.0	-2.31
2480	125 kbps	39	LE	4.77	8.0	-3.23
2402	500 kbps	37	LE	4.96	8.0	-3.04
2440	500 kbps	17	LE	5.30	8.0	-2.70
2480	500 kbps	39	LE	4.70	8.0	-3.30
2402	1 Mbps	37	LE	4.07	8.0	-3.93
2440	1 Mbps	17	LE	4.36	8.0	-3.64
2480	1 Mbps	39	LE	3.77	8.0	-4.23
2404	2 Mbps	0	LE	2.10	8.0	-5.90
2440	2 Mbps	17	LE	1.83	8.0	-6.17
2478	2 Mbps	36	LE	1.65	8.0	-6.35

Table 7-13. Conducted Power Density Measurements – SISO ANT1

FCC ID: C3K2076 IC: 3048A-2076	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2312190129-05.C3K	Test Dates: 01/03/2024 - 03/18/2024	EUT Type: Portable Computing Device	Page 60 of 122

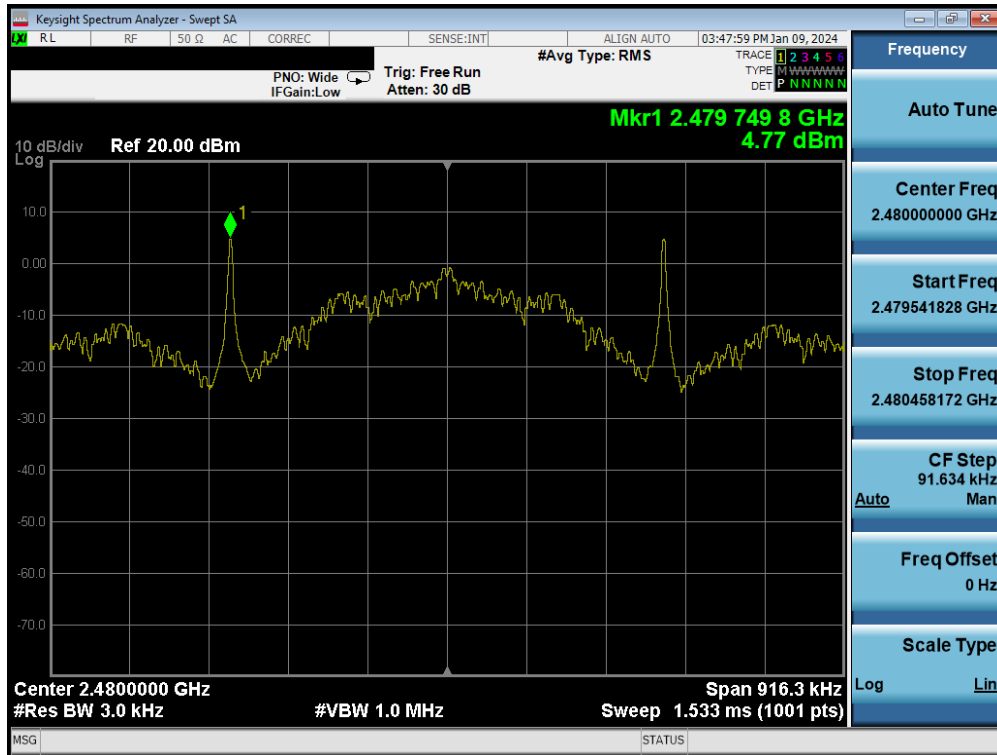


Plot 7-75. Power Spectral Density Plot (Bluetooth (LE), 125kbps – Ch. 37)

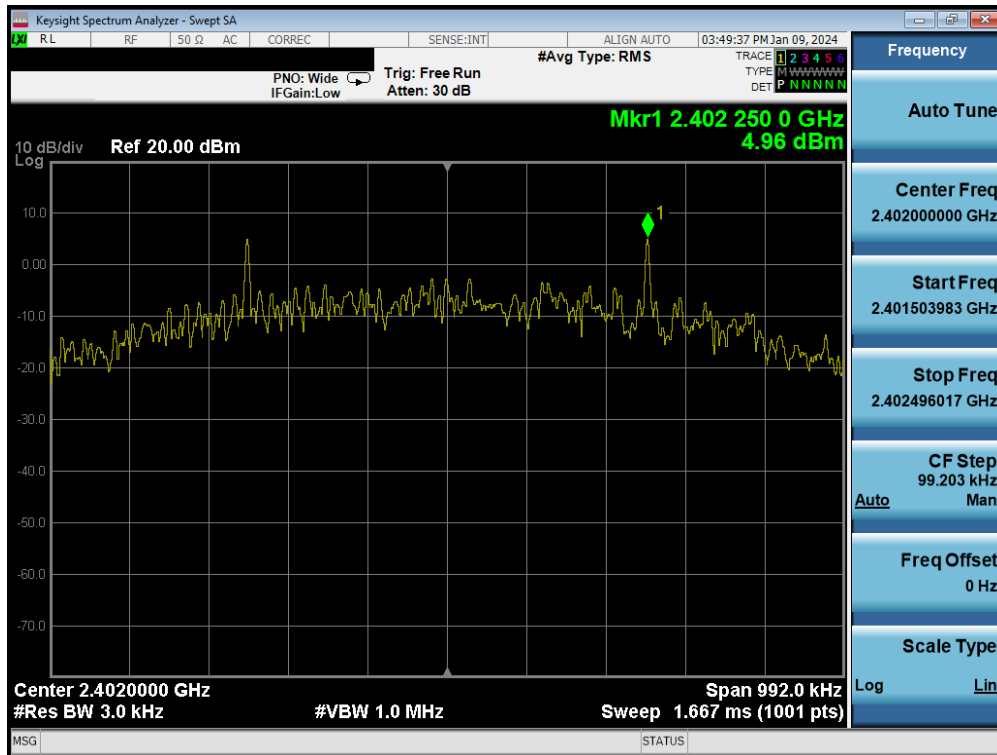


Plot 7-76. Power Spectral Density Plot (Bluetooth (LE), 125kbps – Ch. 17)

FCC ID: C3K2076 IC: 3048A-2076	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2312190129-05.C3K	Test Dates: 01/03/2024 - 03/18/2024	EUT Type: Portable Computing Device	Page 61 of 122

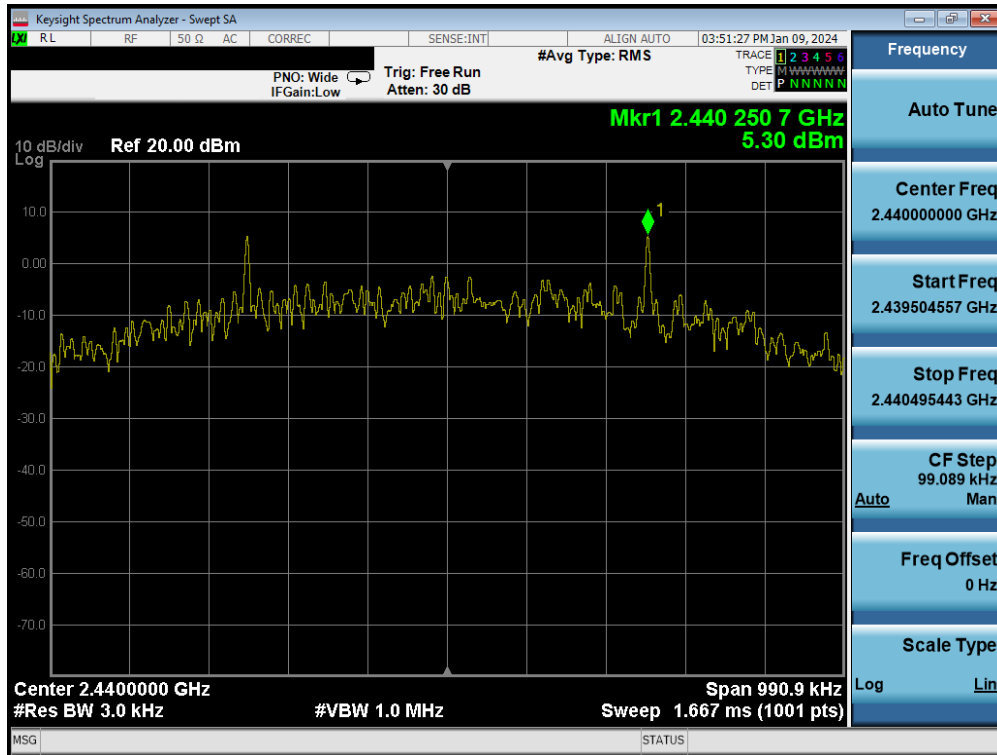


Plot 7-77. Power Spectral Density Plot (Bluetooth (LE), 125kbps – Ch. 39)

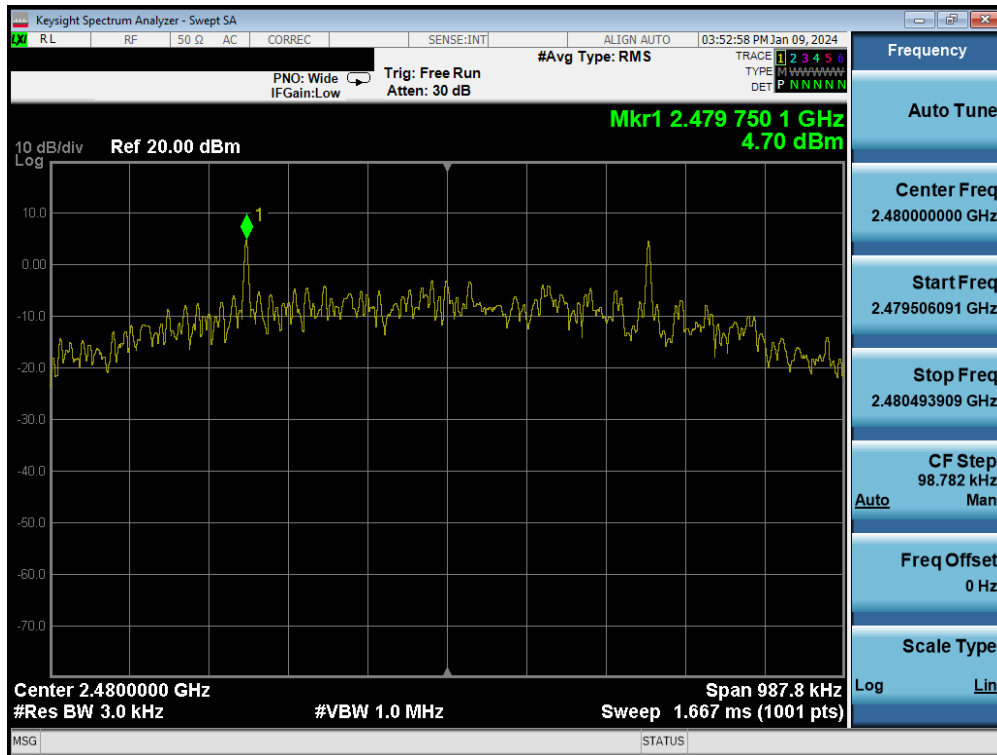


Plot 7-78. Power Spectral Density Plot (Bluetooth (LE), 500kbps – Ch. 37)

FCC ID: C3K2076 IC: 3048A-2076	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2312190129-05.C3K	Test Dates: 01/03/2024 - 03/18/2024	EUT Type: Portable Computing Device	Page 62 of 122

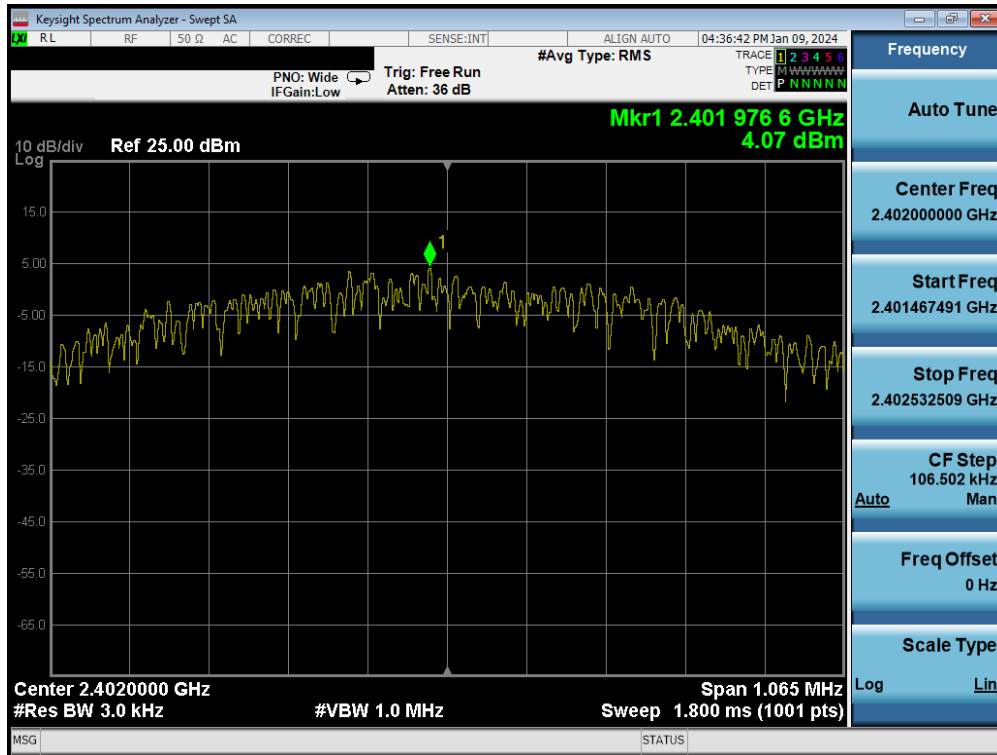


Plot 7-79. Power Spectral Density Plot (Bluetooth (LE), 500kbps – Ch. 17)

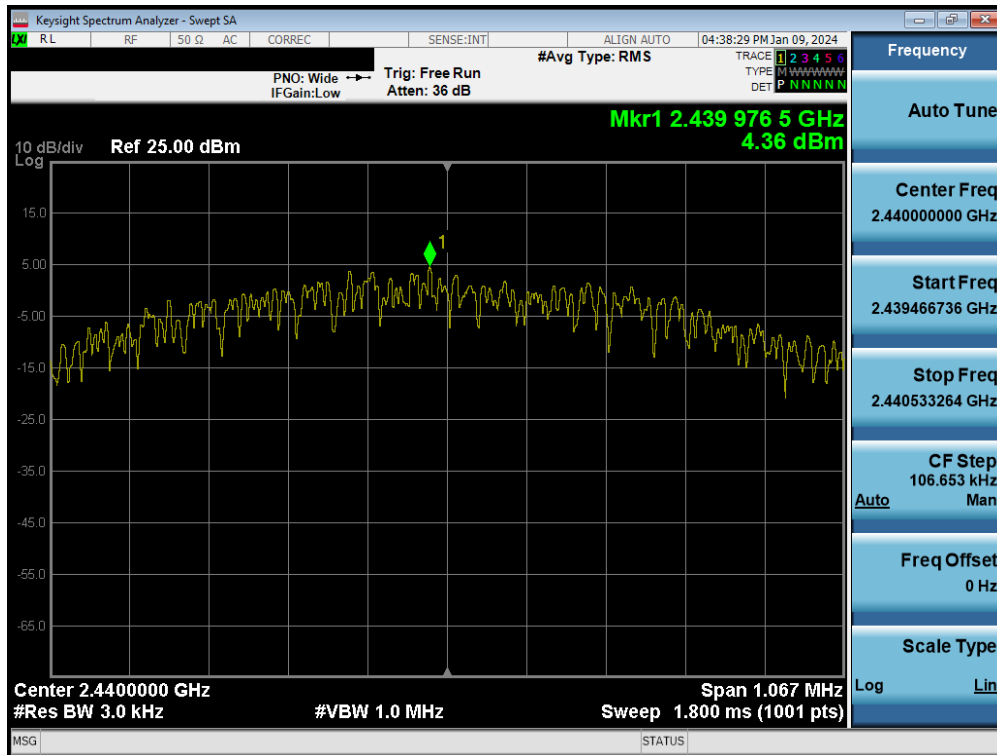


Plot 7-80. Power Spectral Density Plot (Bluetooth (LE), 500kbps – Ch. 39)

FCC ID: C3K2076 IC: 3048A-2076	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2312190129-05.C3K	Test Dates: 01/03/2024 - 03/18/2024	EUT Type: Portable Computing Device	Page 63 of 122

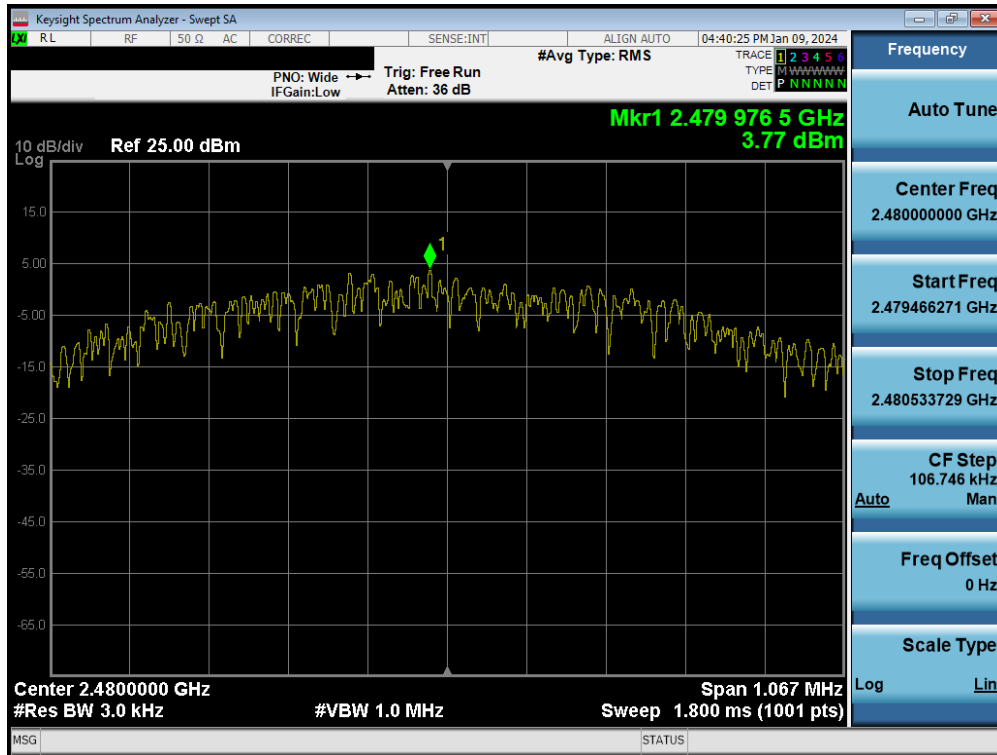


Plot 7-81. Power Spectral Density Plot (Bluetooth (LE), 1Mbps – Ch. 37)

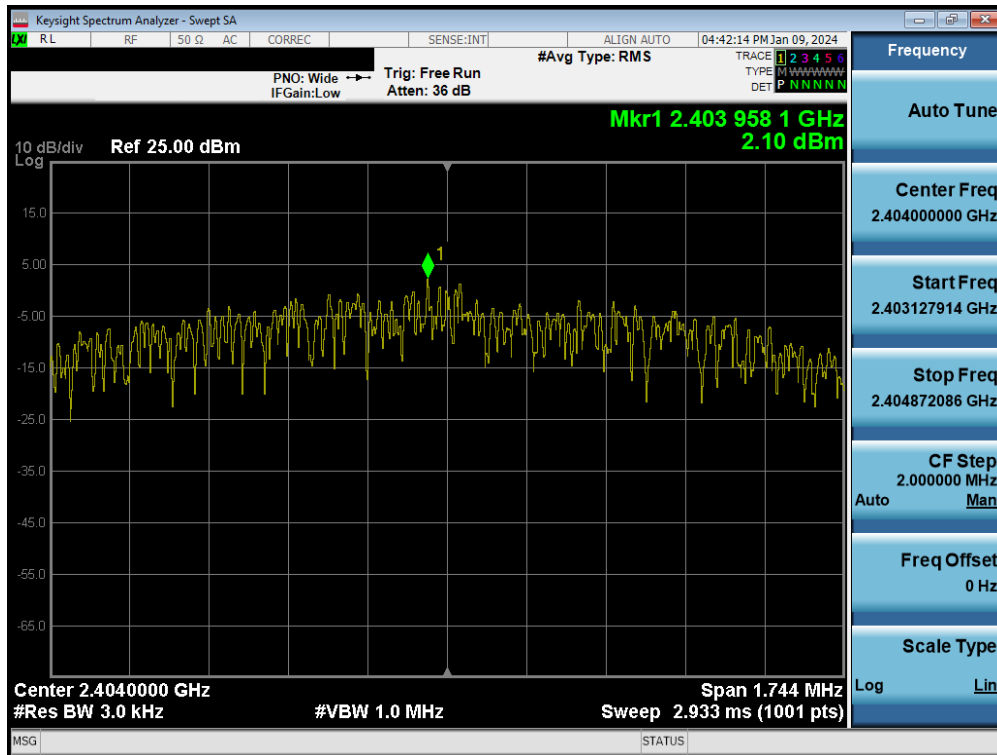


Plot 7-82. Power Spectral Density Plot (Bluetooth (LE), 1Mbps – Ch. 17)

FCC ID: C3K2076 IC: 3048A-2076	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2312190129-05.C3K	Test Dates: 01/03/2024 - 03/18/2024	EUT Type: Portable Computing Device	Page 64 of 122

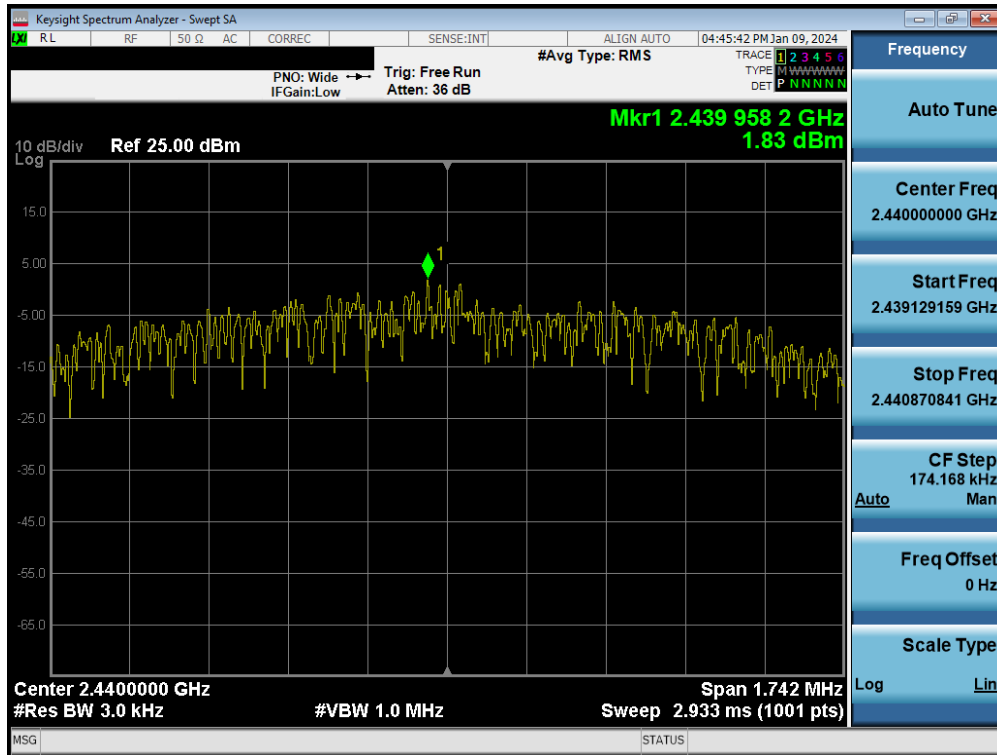


Plot 7-83. Power Spectral Density Plot (Bluetooth (LE), 1Mbps – Ch. 39)

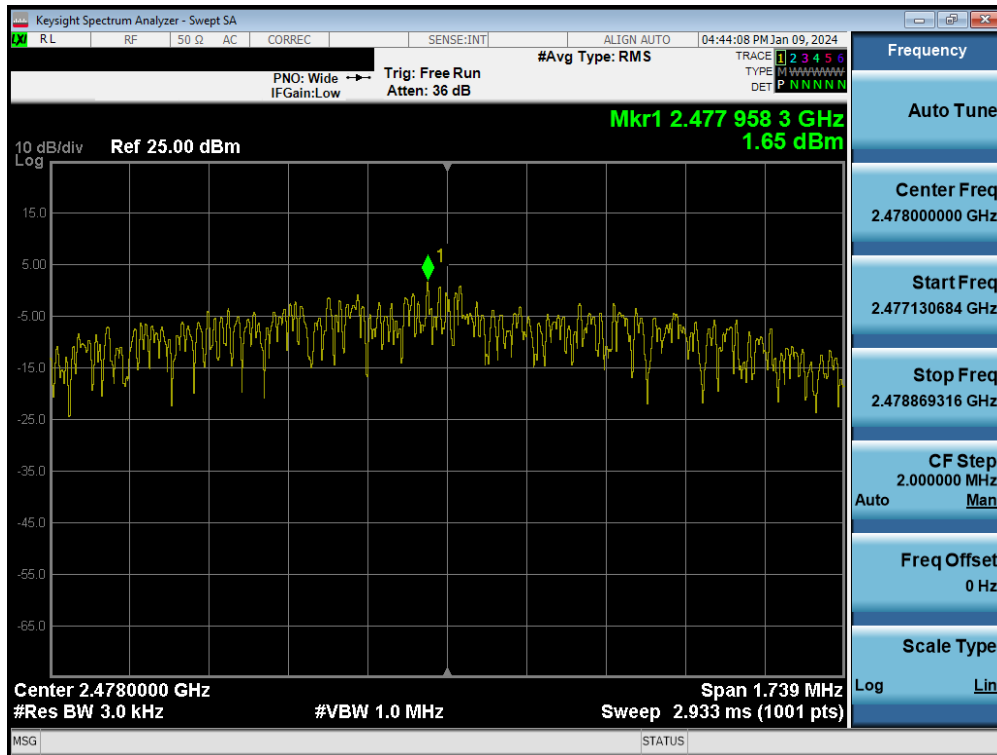


Plot 7-84. Power Spectral Density Plot (Bluetooth (LE), 2Mbps – Ch. 0)

FCC ID: C3K2076 IC: 3048A-2076	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2312190129-05.C3K	Test Dates: 01/03/2024 - 03/18/2024	EUT Type: Portable Computing Device	Page 65 of 122



Plot 7-85. Power Spectral Density Plot (Bluetooth (LE), 2Mbps – Ch. 17)



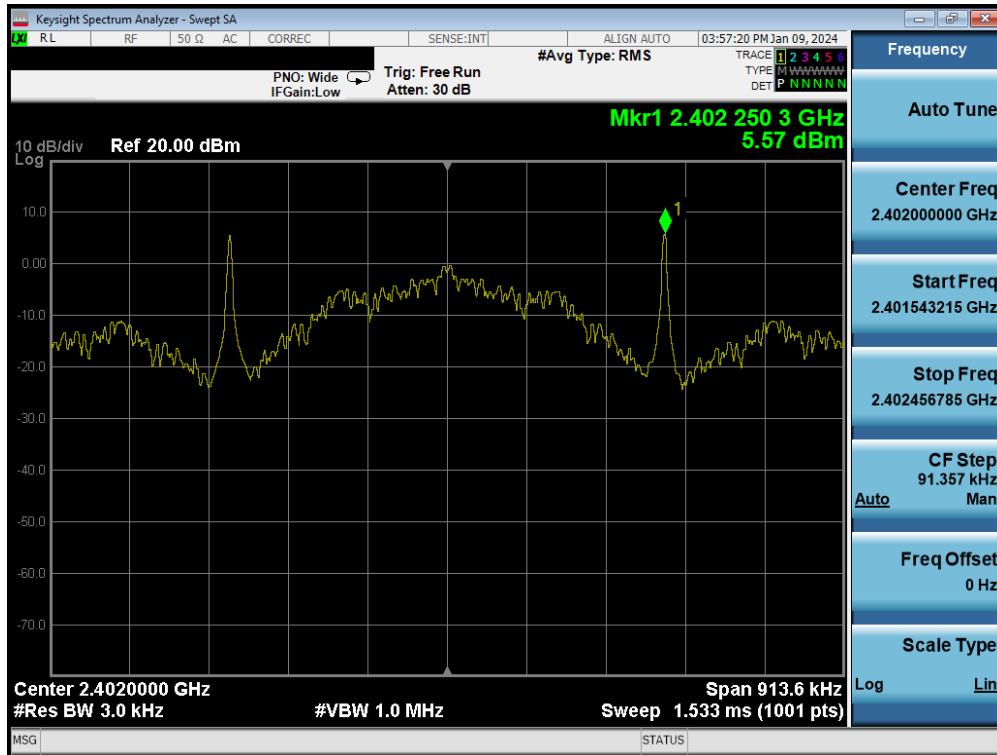
Plot 7-86. Power Spectral Density Plot (Bluetooth (LE), 2Mbps – Ch. 36)

FCC ID: C3K2076 IC: 3048A-2076	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2312190129-05.C3K	Test Dates: 01/03/2024 - 03/18/2024	EUT Type: Portable Computing Device	Page 66 of 122

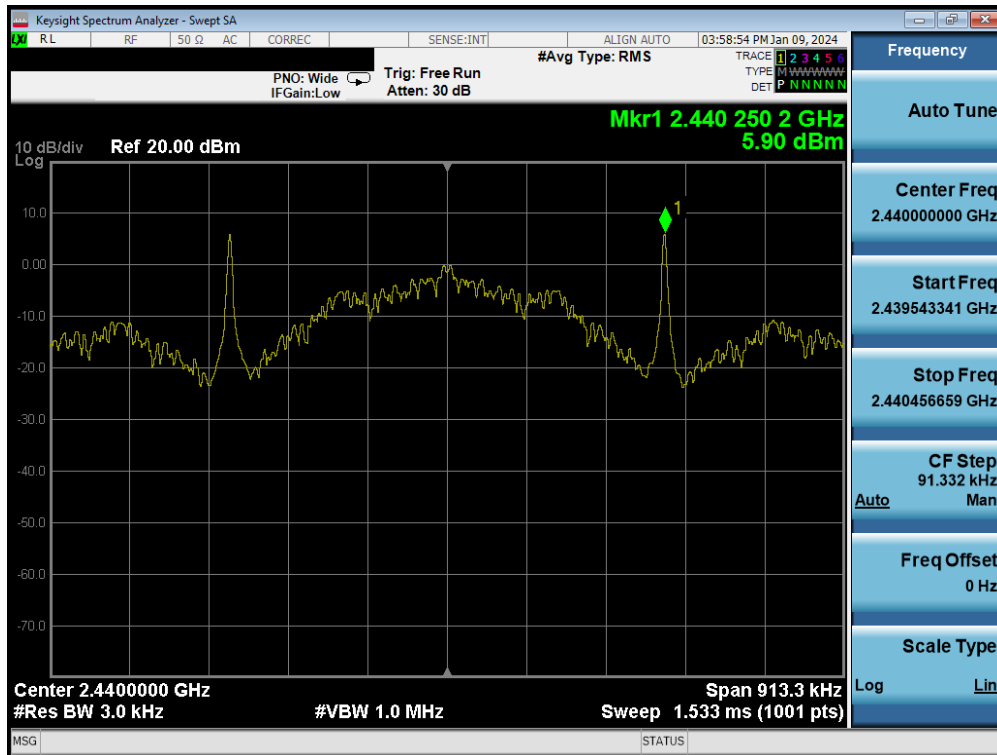
Frequency [MHz]	Data Rate [Mbps]	Channel No.	Bluetooth Mode	Measured Power Spectral Density [dBm]	Maximum Permissible Power Density [dBm / 3kHz]	Margin [dB]
2402	125 kbps	37	LE	5.57	8.0	-2.43
2440	125 kbps	17	LE	5.90	8.0	-2.10
2480	125 kbps	39	LE	5.43	8.0	-2.57
2402	500 kbps	37	LE	5.28	8.0	-2.72
2440	500 kbps	17	LE	5.38	8.0	-2.63
2480	500 kbps	39	LE	4.99	8.0	-3.01
2402	1 Mbps	37	LE	4.72	8.0	-3.28
2440	1 Mbps	17	LE	4.81	8.0	-3.19
2480	1 Mbps	39	LE	4.41	8.0	-3.59
2404	2 Mbps	0	LE	2.81	8.0	-5.19
2440	2 Mbps	17	LE	2.78	8.0	-5.22
2478	2 Mbps	36	LE	2.38	8.0	-5.62

Table 7-14. Conducted Power Density Measurements – SISO ANT2

FCC ID: C3K2076 IC: 3048A-2076	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2312190129-05.C3K	Test Dates: 01/03/2024 - 03/18/2024	EUT Type: Portable Computing Device	Page 67 of 122

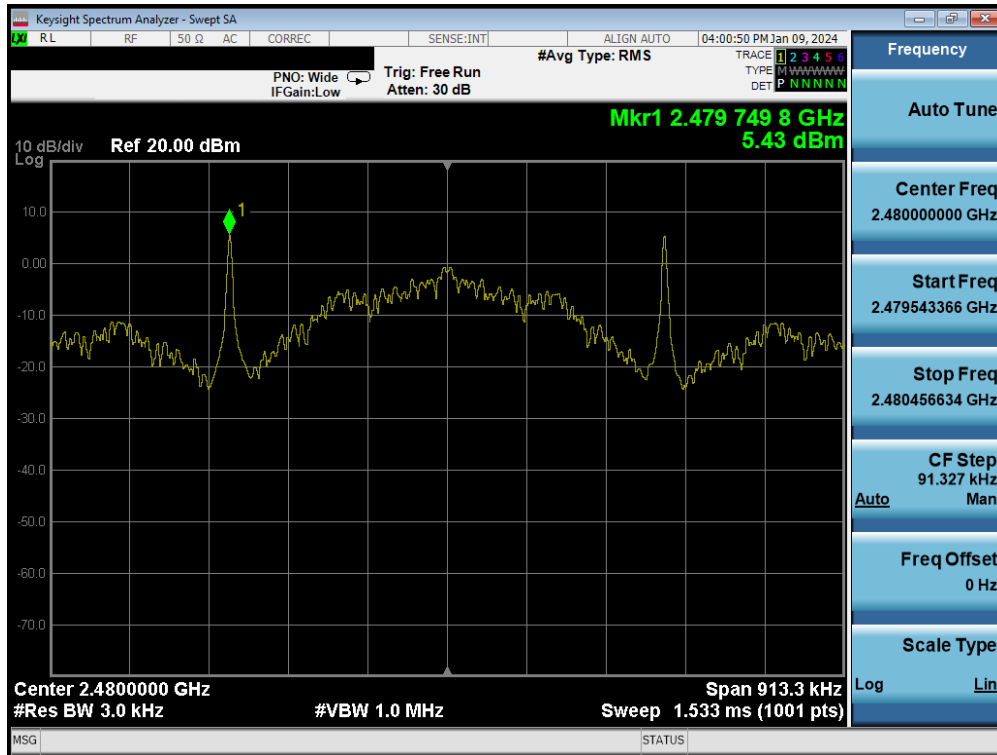


Plot 7-87. Power Spectral Density Plot (Bluetooth (LE), 125kbps – Ch. 37)

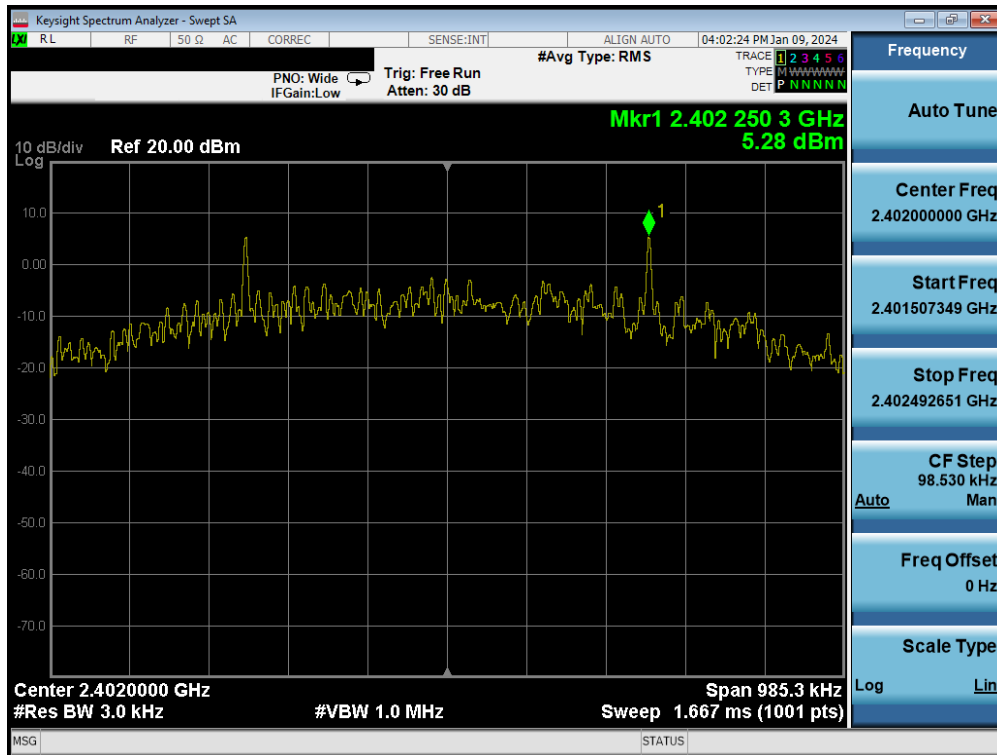


Plot 7-88. Power Spectral Density Plot (Bluetooth (LE), 125kbps – Ch. 17)

FCC ID: C3K2076 IC: 3048A-2076	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2312190129-05.C3K	Test Dates: 01/03/2024 - 03/18/2024	EUT Type: Portable Computing Device	Page 68 of 122

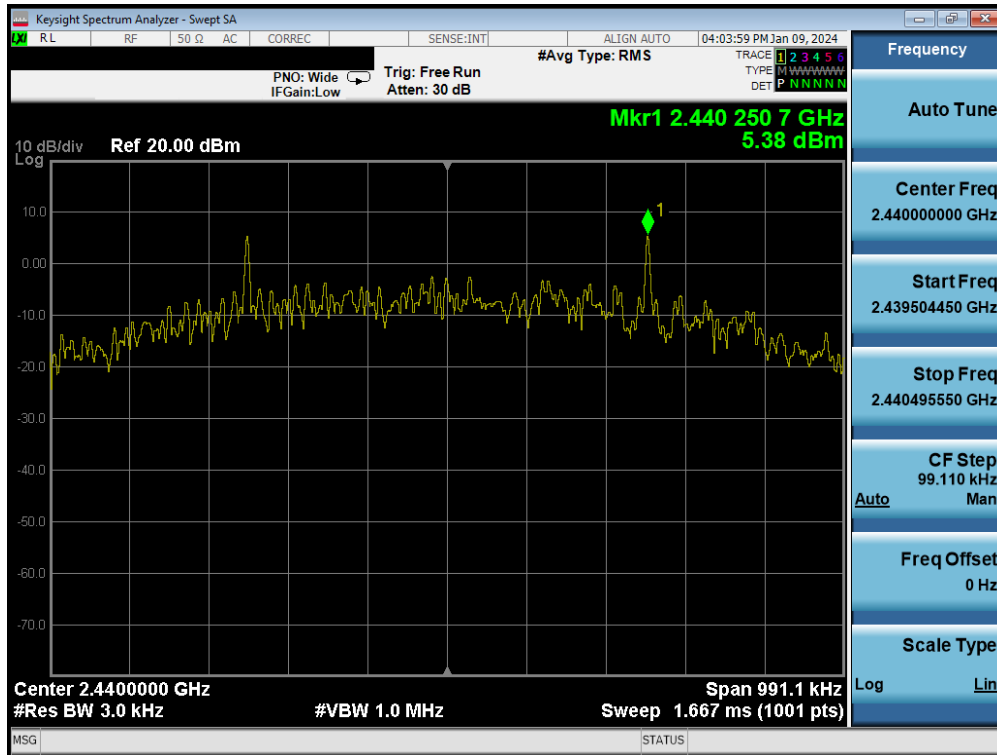


Plot 7-89. Power Spectral Density Plot (Bluetooth (LE), 125kbps – Ch. 39)

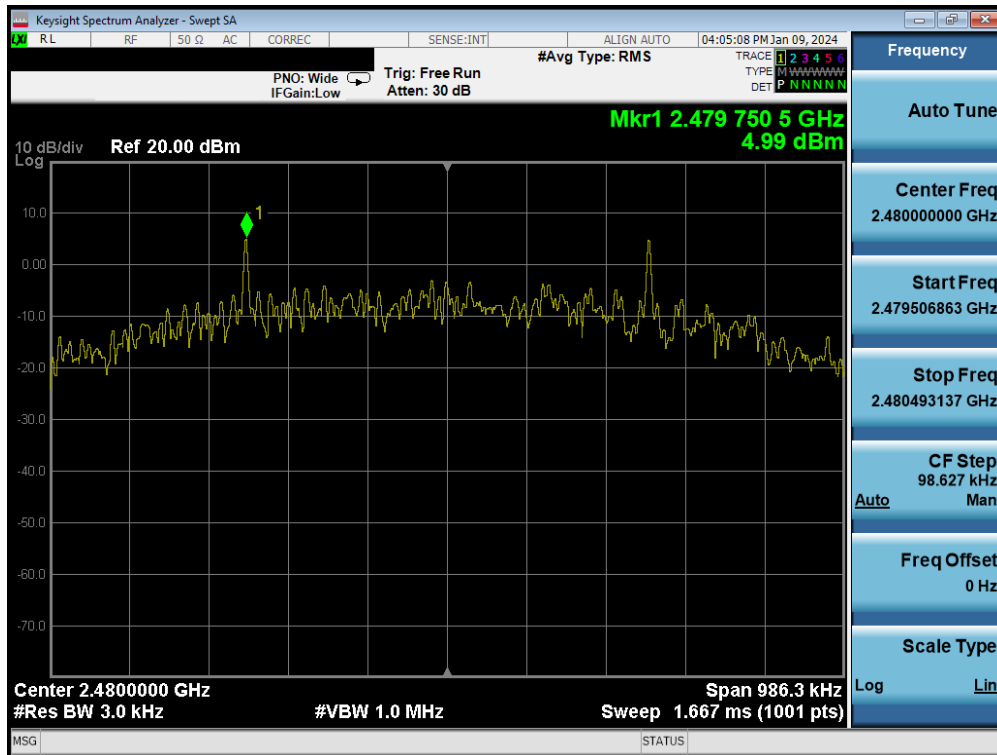


Plot 7-90. Power Spectral Density Plot (Bluetooth (LE), 500kbps – Ch. 37)

FCC ID: C3K2076 IC: 3048A-2076	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2312190129-05.C3K	Test Dates: 01/03/2024 - 03/18/2024	EUT Type: Portable Computing Device	Page 69 of 122

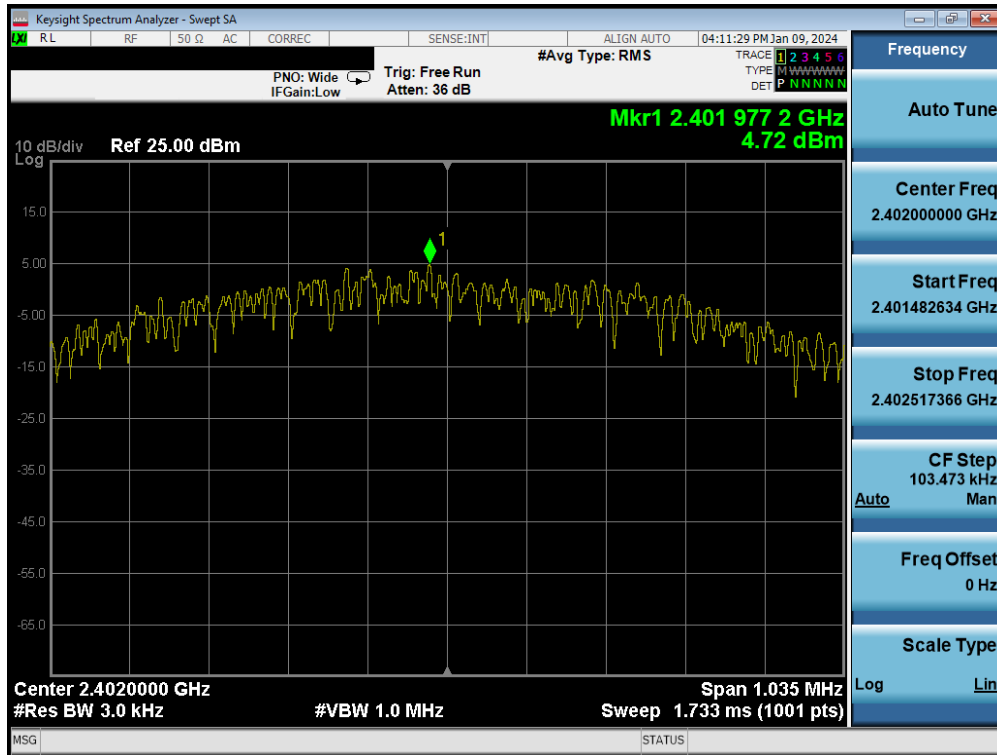


Plot 7-91. Power Spectral Density Plot (Bluetooth (LE), 500kbps – Ch. 17)

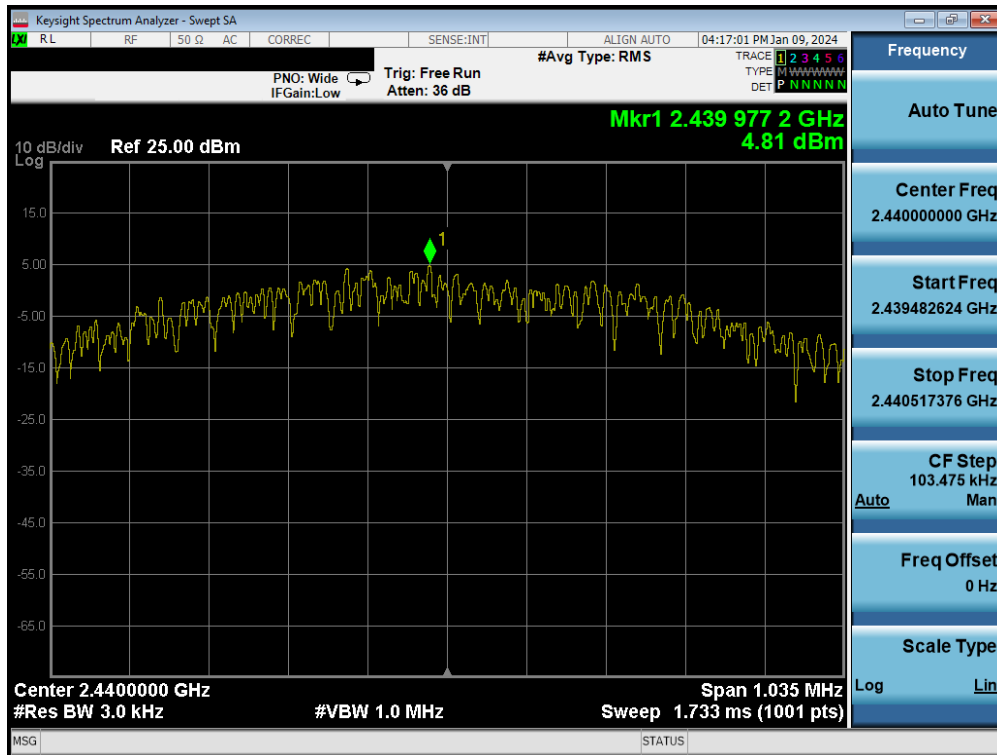


Plot 7-92. Power Spectral Density Plot (Bluetooth (LE), 500kbps – Ch. 39)

FCC ID: C3K2076 IC: 3048A-2076	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2312190129-05.C3K	Test Dates: 01/03/2024 - 03/18/2024	EUT Type: Portable Computing Device	Page 70 of 122

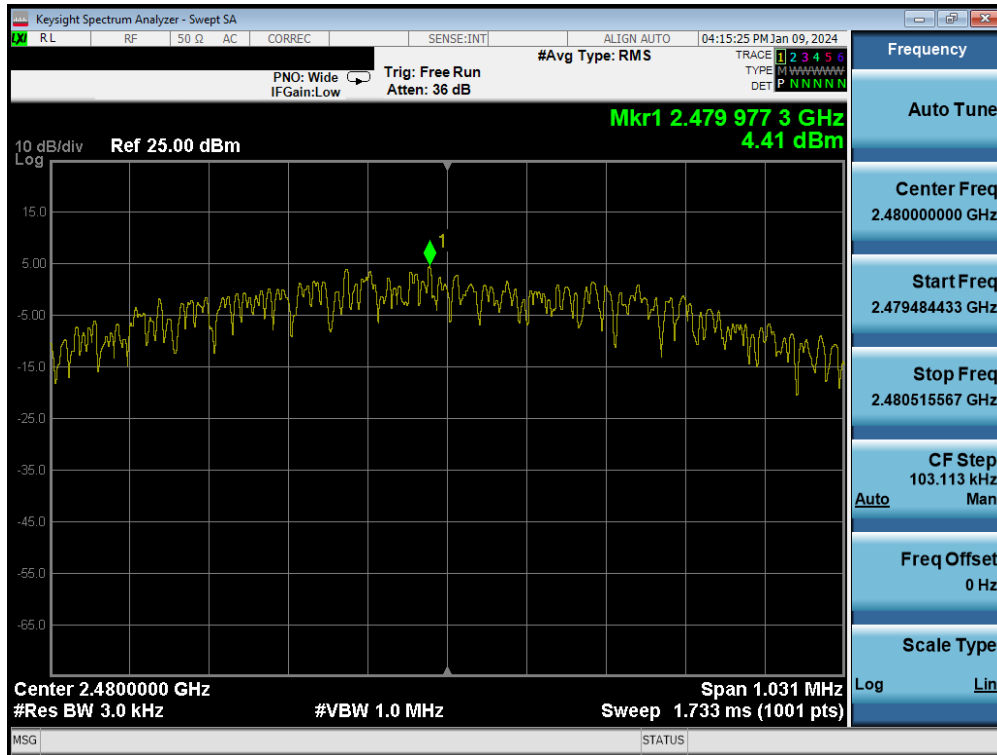


Plot 7-93. Power Spectral Density Plot (Bluetooth (LE), 1Mbps – Ch. 37)

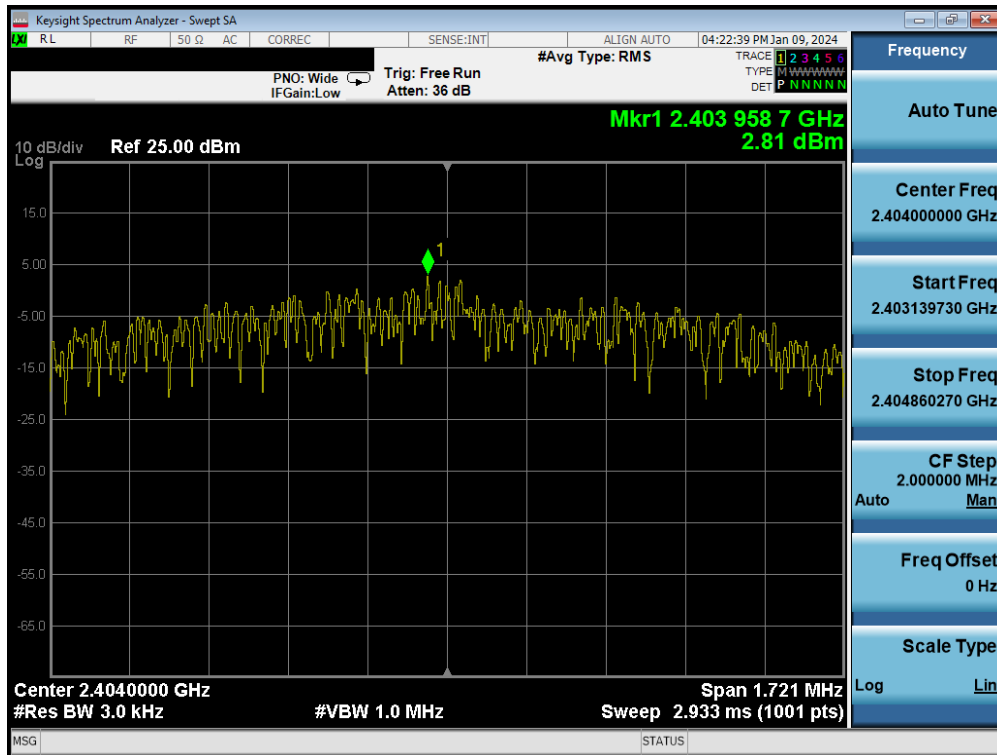


Plot 7-94. Power Spectral Density Plot (Bluetooth (LE), 1Mbps – Ch. 17)

FCC ID: C3K2076 IC: 3048A-2076	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2312190129-05.C3K	Test Dates: 01/03/2024 - 03/18/2024	EUT Type: Portable Computing Device	Page 71 of 122

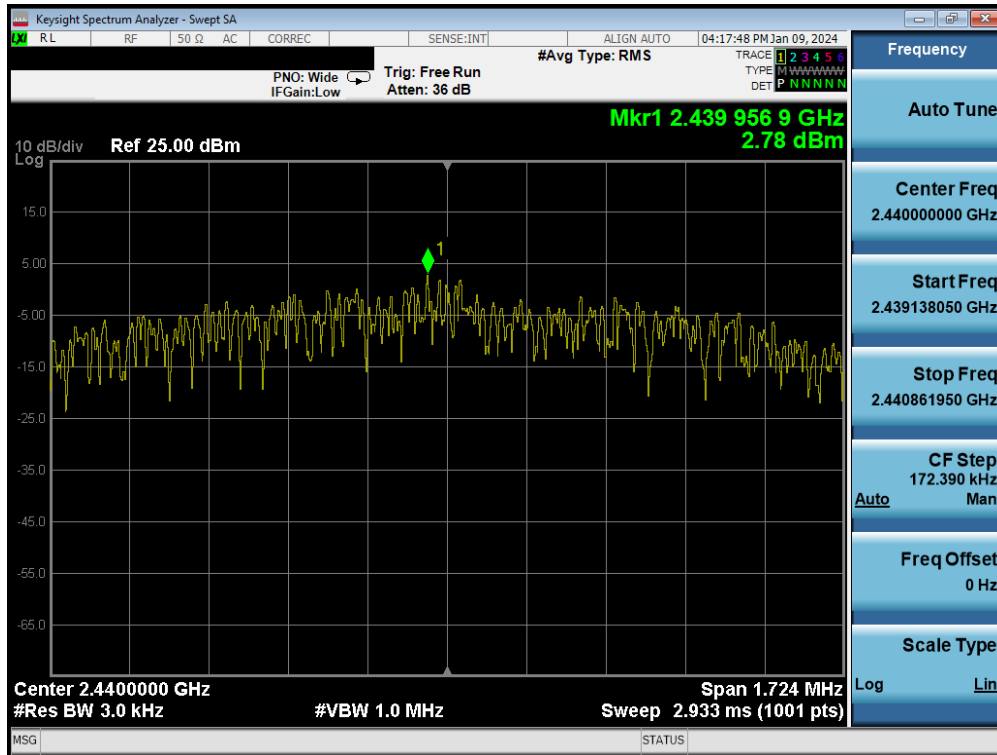


Plot 7-95. Power Spectral Density Plot (Bluetooth (LE), 1Mbps – Ch. 39)

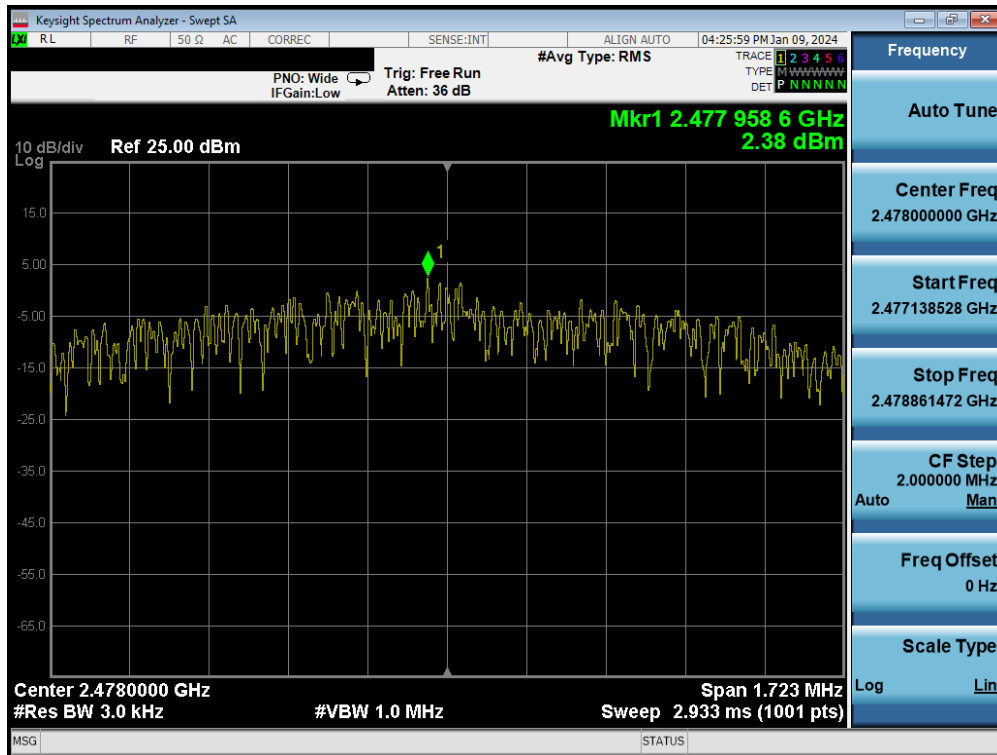


Plot 7-96. Power Spectral Density Plot (Bluetooth (LE), 2Mbps – Ch. 0)

FCC ID: C3K2076 IC: 3048A-2076	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2312190129-05.C3K	Test Dates: 01/03/2024 - 03/18/2024	EUT Type: Portable Computing Device	Page 72 of 122



Plot 7-97. Power Spectral Density Plot (Bluetooth (LE), 2Mbps – Ch. 17)



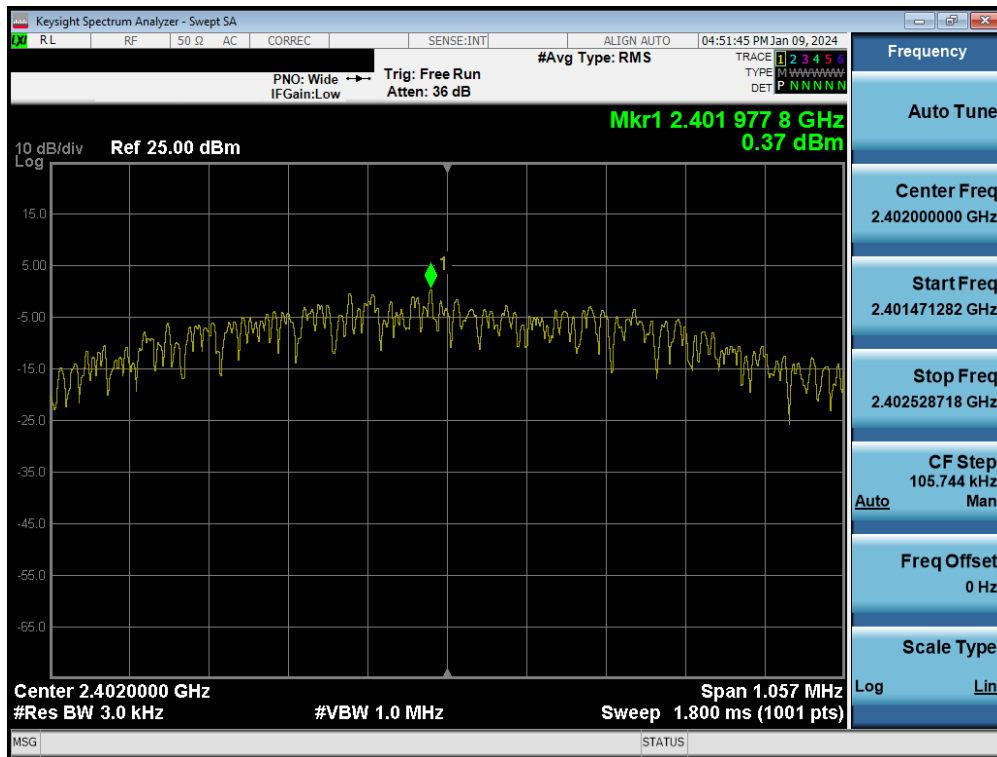
Plot 7-98. Power Spectral Density Plot (Bluetooth (LE), 2Mbps – Ch. 36)

FCC ID: C3K2076 IC: 3048A-2076	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2312190129-05.C3K	Test Dates: 01/03/2024 - 03/18/2024	EUT Type: Portable Computing Device	Page 73 of 122

Frequency [MHz]	Data Rate [Mbps]	Channel No.	Bluetooth Mode	ANT 1 Power Spectral Density [dBm]	ANT 2 Power Spectral Density [dBm]	Summed MIMO Power Spectral Density [dBm]	Maximum Permissible Power Density [dBm / 3kHz]	Margin [dB]
2402	1 Mbps	37	LE	0.37	0.20	3.30	8.0	-4.70
2440	1 Mbps	17	LE	0.60	0.26	3.44	8.0	-4.56
2480	1 Mbps	39	LE	-0.36	-0.26	2.70	8.0	-5.30
2404	2 Mbps	0	LE	-1.41	-1.49	1.56	8.0	-6.44
2440	2 Mbps	17	LE	-1.55	-1.62	1.43	8.0	-6.57
2478	2 Mbps	36	LE	-2.36	-2.43	0.61	8.0	-7.39

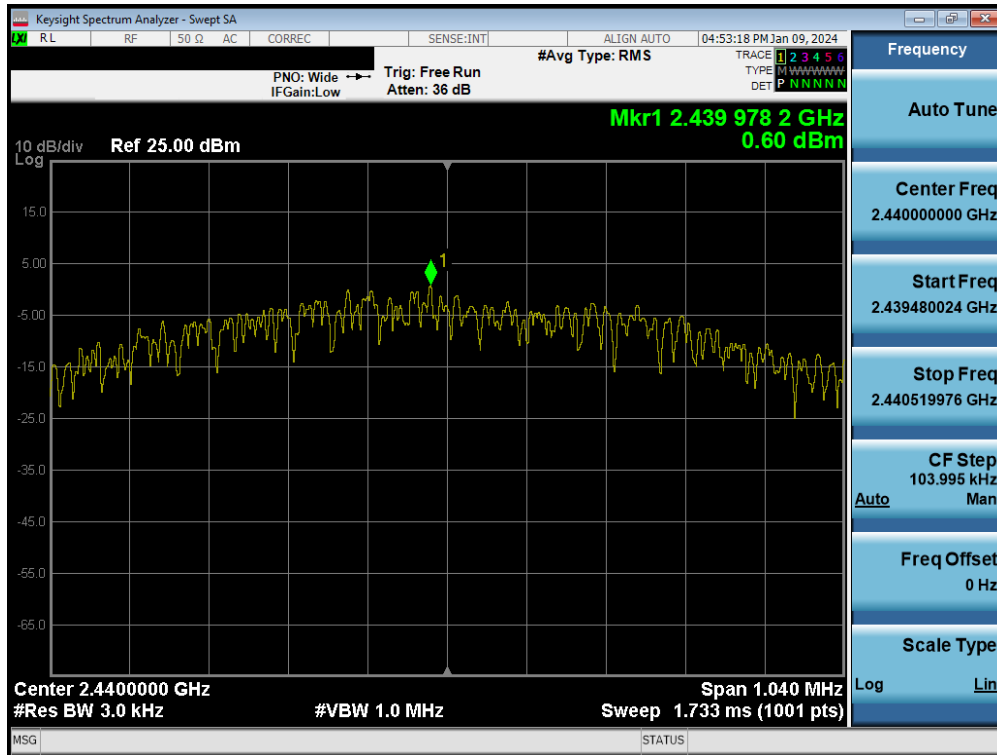
Table 7-15. Conducted Power Density Measurements – DUAL

DUAL ANT1

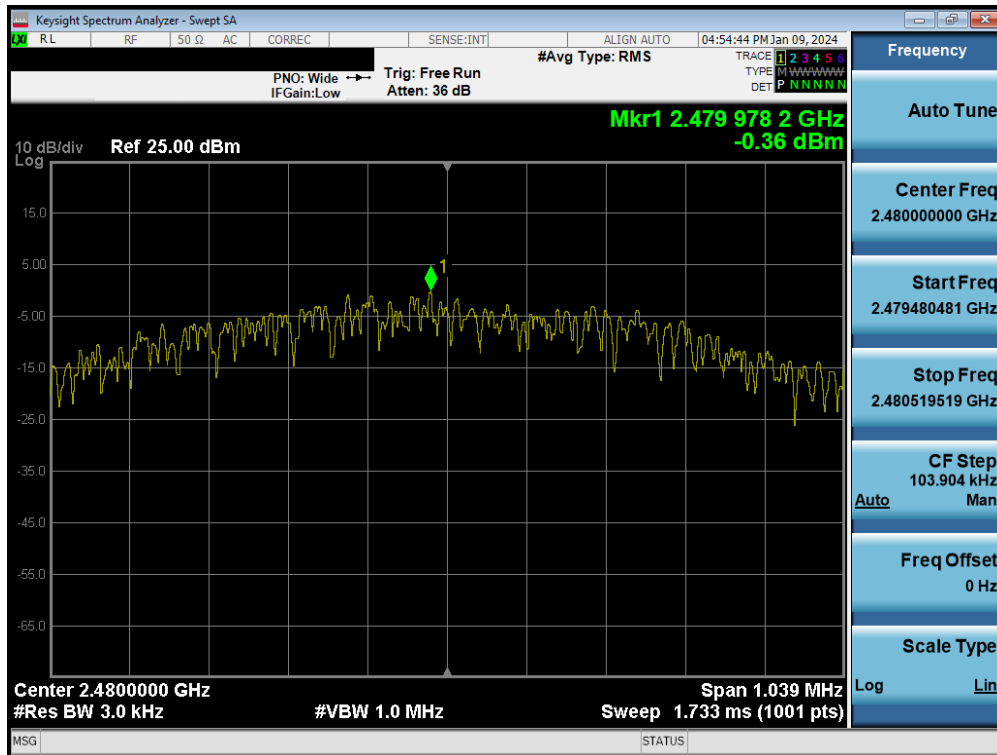


Plot 7-99. Power Spectral Density Plot (Bluetooth (LE), 1Mbps – Ch. 37)

FCC ID: C3K2076 IC: 3048A-2076	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2312190129-05.C3K	Test Dates: 01/03/2024 - 03/18/2024	EUT Type: Portable Computing Device	Page 74 of 122

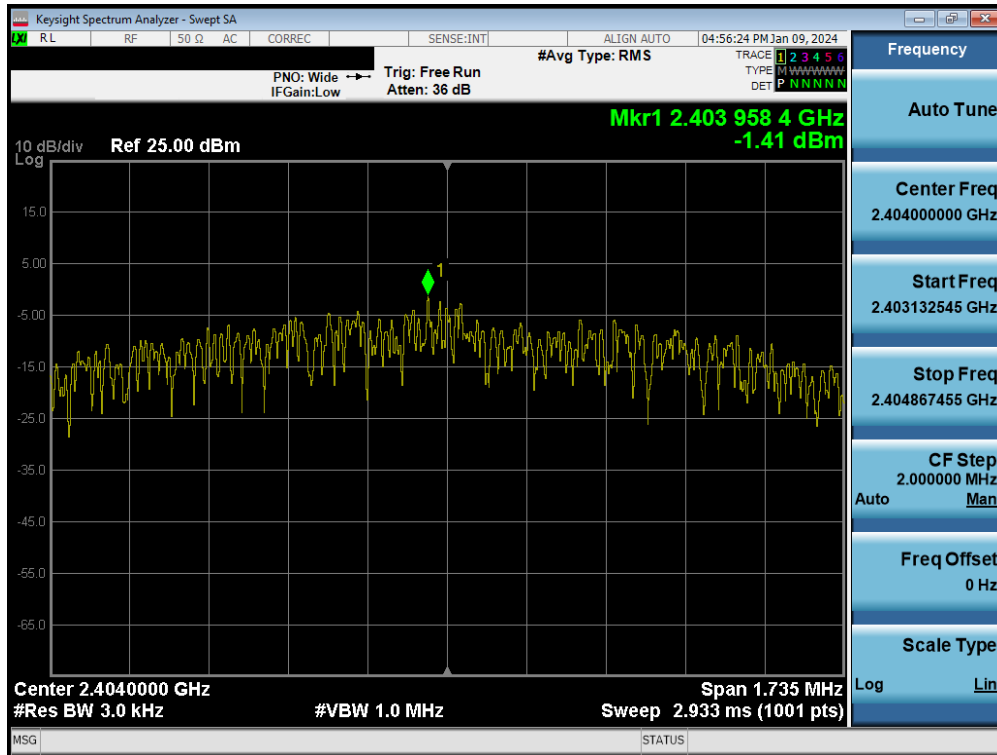


Plot 7-100. Power Spectral Density Plot (Bluetooth (LE), 1Mbps – Ch. 17)

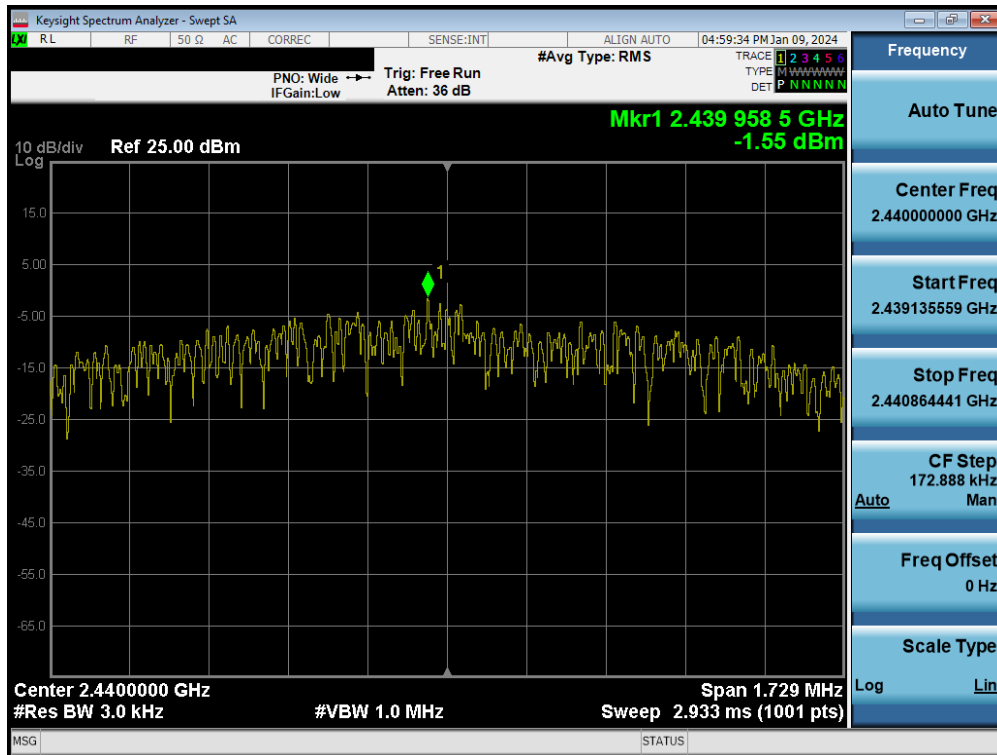


Plot 7-101. Power Spectral Density Plot (Bluetooth (LE), 1Mbps – Ch. 39)

FCC ID: C3K2076 IC: 3048A-2076	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2312190129-05.C3K	Test Dates: 01/03/2024 - 03/18/2024	EUT Type: Portable Computing Device	Page 75 of 122

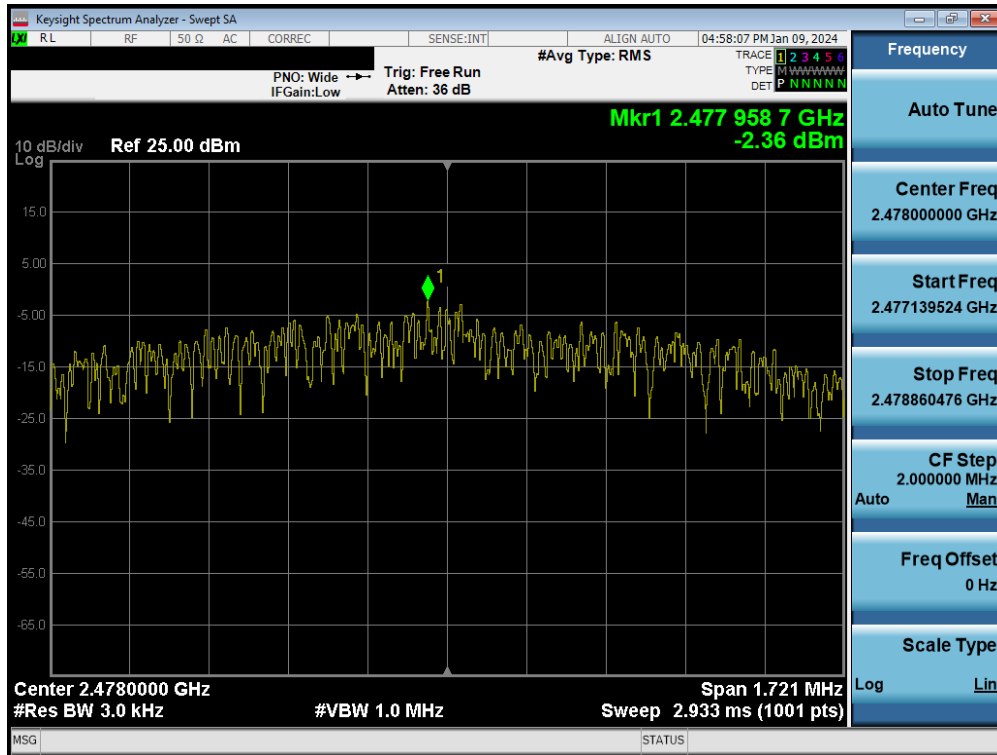


Plot 7-102. Power Spectral Density Plot (Bluetooth (LE), 2Mbps – Ch. 0)



Plot 7-103. Power Spectral Density Plot (Bluetooth (LE), 2Mbps – Ch. 17)

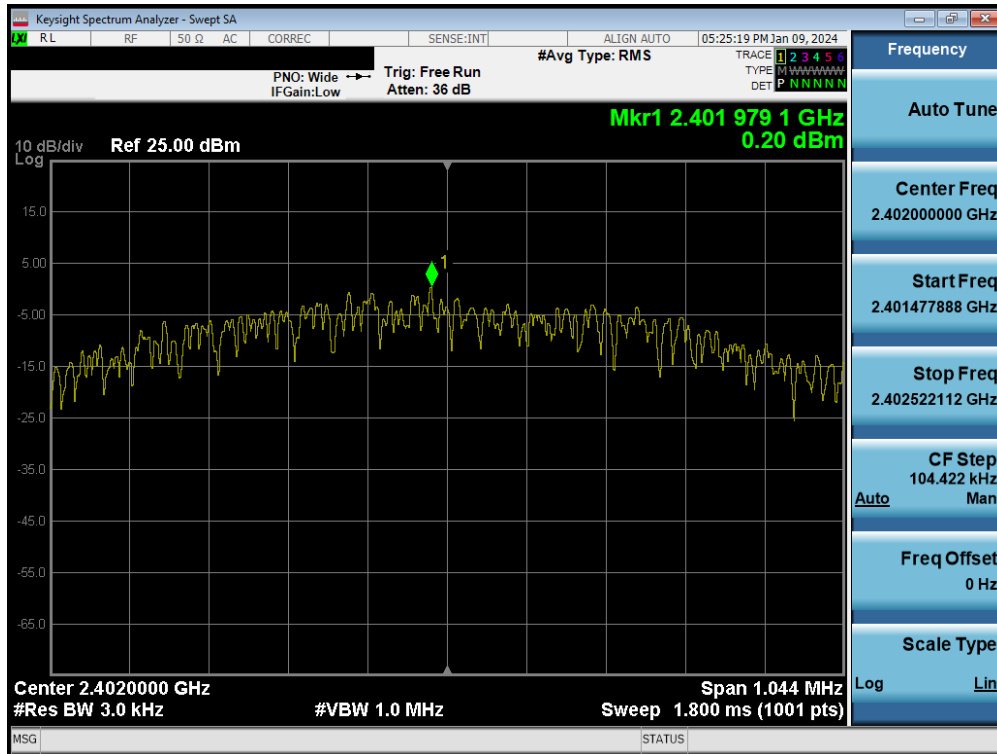
FCC ID: C3K2076 IC: 3048A-2076	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2312190129-05.C3K	Test Dates: 01/03/2024 - 03/18/2024	EUT Type: Portable Computing Device	Page 76 of 122



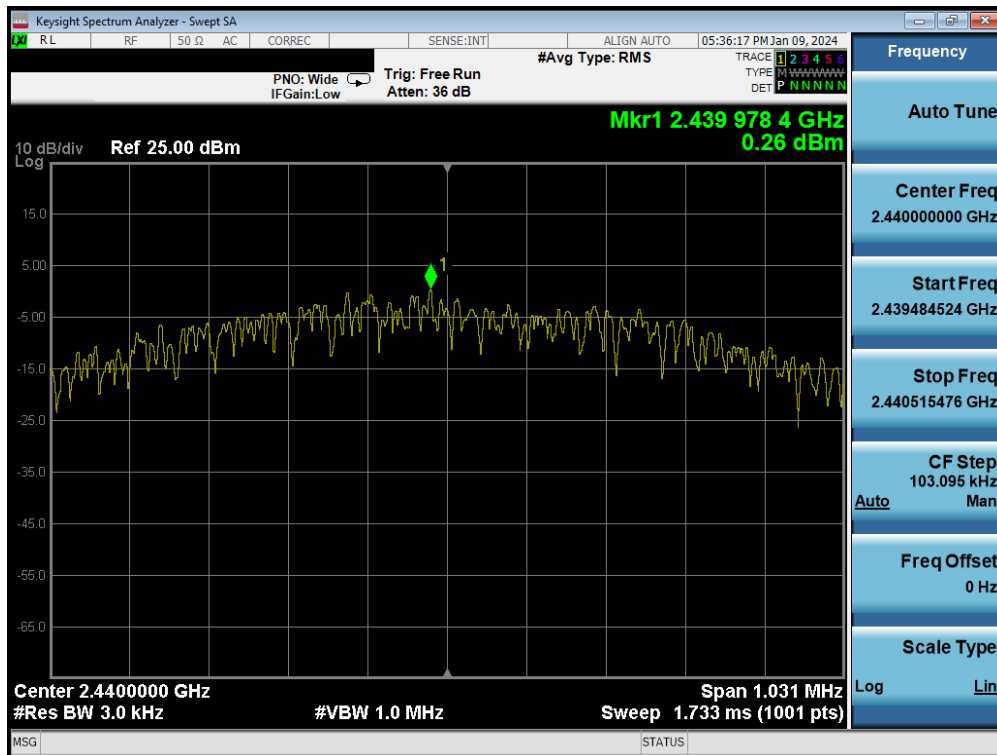
Plot 7-104. Power Spectral Density Plot (Bluetooth (LE), 2Mbps – Ch. 36)

FCC ID: C3K2076 IC: 3048A-2076	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2312190129-05.C3K	Test Dates: 01/03/2024 - 03/18/2024	EUT Type: Portable Computing Device	Page 77 of 122

DUAL ANT2

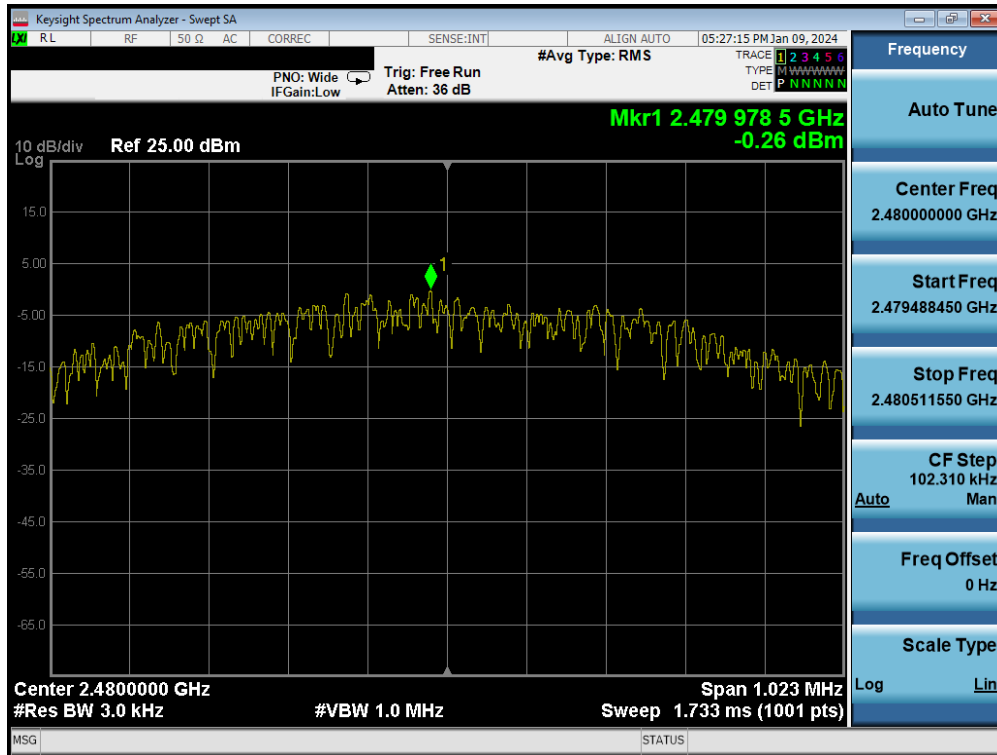


Plot 7-105. Power Spectral Density Plot (Bluetooth (LE), 1Mbps – Ch. 37)

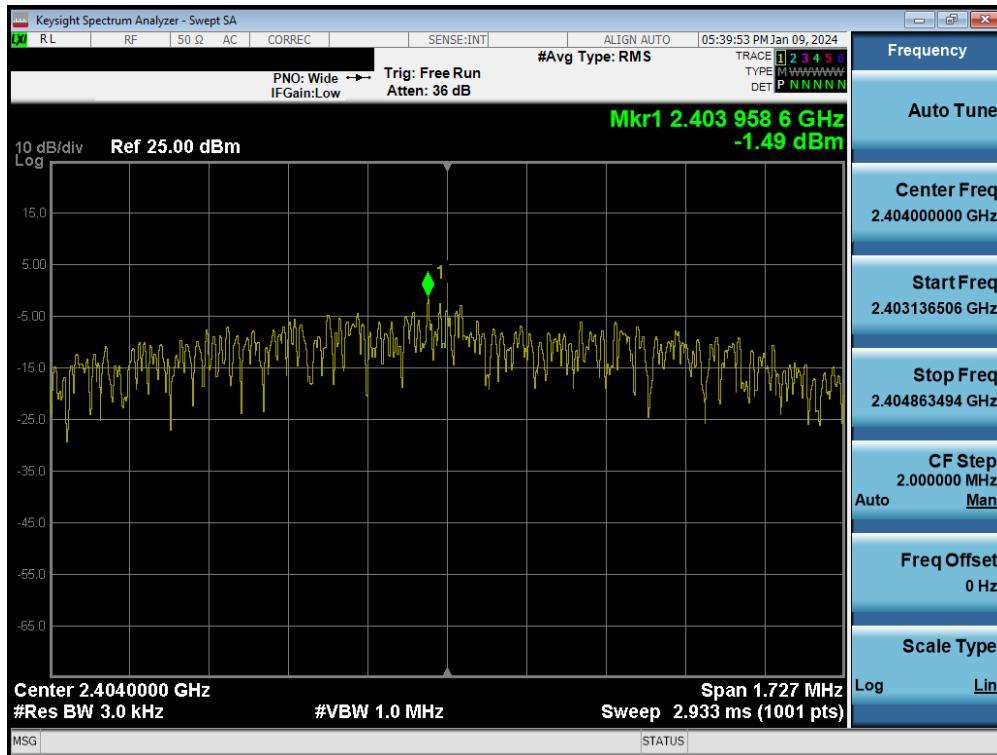


Plot 7-106. Power Spectral Density Plot (Bluetooth (LE), 1Mbps – Ch. 17)

FCC ID: C3K2076 IC: 3048A-2076	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2312190129-05.C3K	Test Dates: 01/03/2024 - 03/18/2024	EUT Type: Portable Computing Device	Page 78 of 122

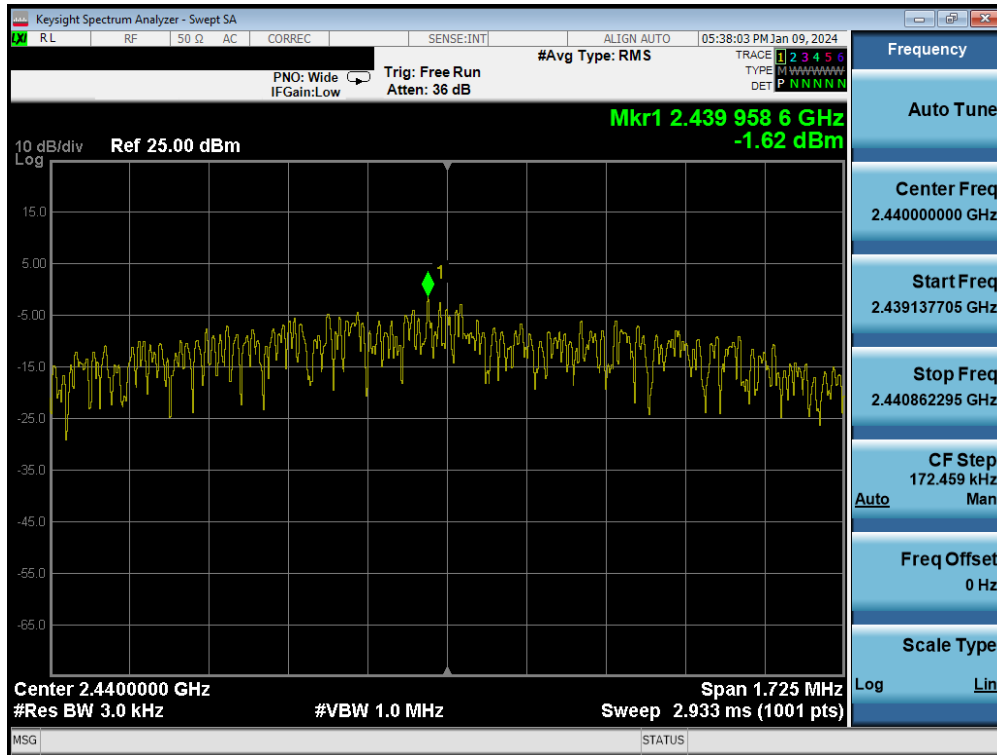


Plot 7-107. Power Spectral Density Plot (Bluetooth (LE), 1Mbps – Ch. 39)

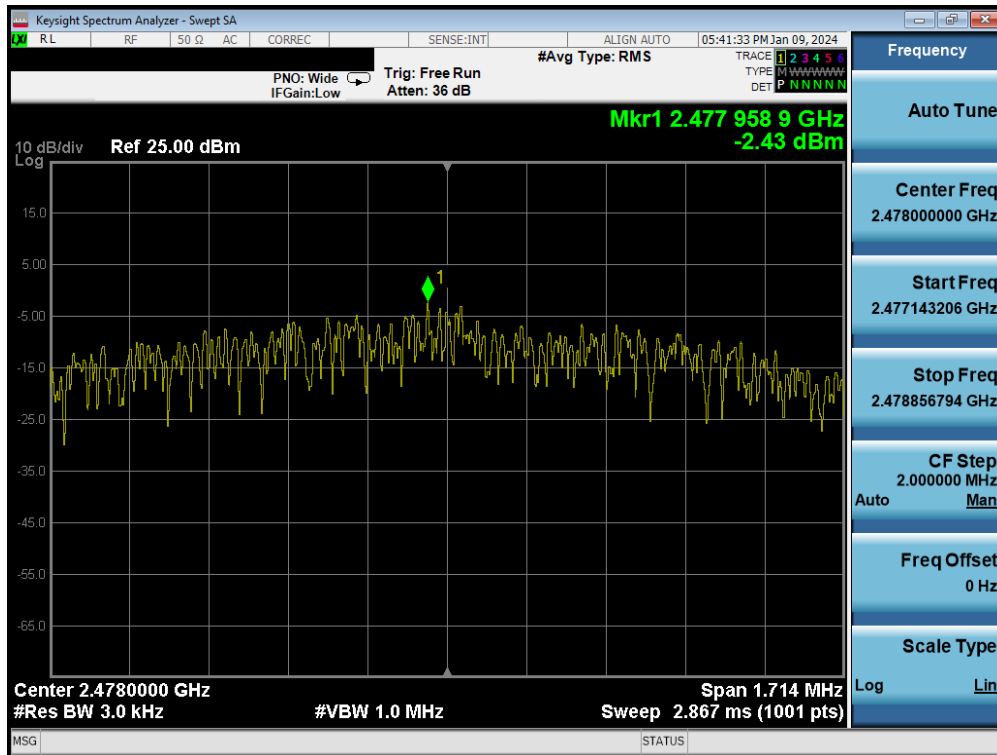


Plot 7-108. Power Spectral Density Plot (Bluetooth (LE), 2Mbps – Ch. 0)

FCC ID: C3K2076 IC: 3048A-2076	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2312190129-05.C3K	Test Dates: 01/03/2024 - 03/18/2024	EUT Type: Portable Computing Device	Page 79 of 122



Plot 7-109. Power Spectral Density Plot (Bluetooth (LE), 2Mbps – Ch. 17)



Plot 7-110. Power Spectral Density Plot (Bluetooth (LE), 2Mbps – Ch. 36)

FCC ID: C3K2076 IC: 3048A-2076	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
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7.5 Conducted Emissions at the Band Edge

§15.247(d); RSS-247 [5.5]

Test Overview and Limit

For the following out of band conducted spurious emissions plots at the band edge, the EUT was set to transmit at maximum power with the largest packet size available. 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.

Test Procedure Used

ANSI C63.10-2013 – Section 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 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.



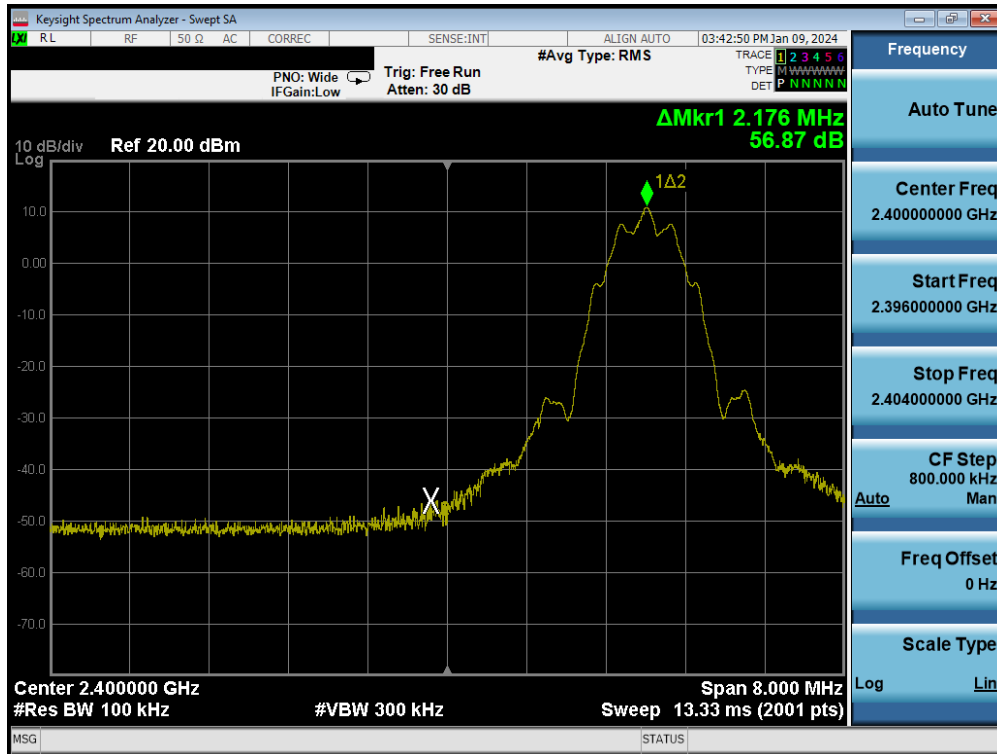
Figure 7-4. Test Instrument & Measurement Setup

Test Notes

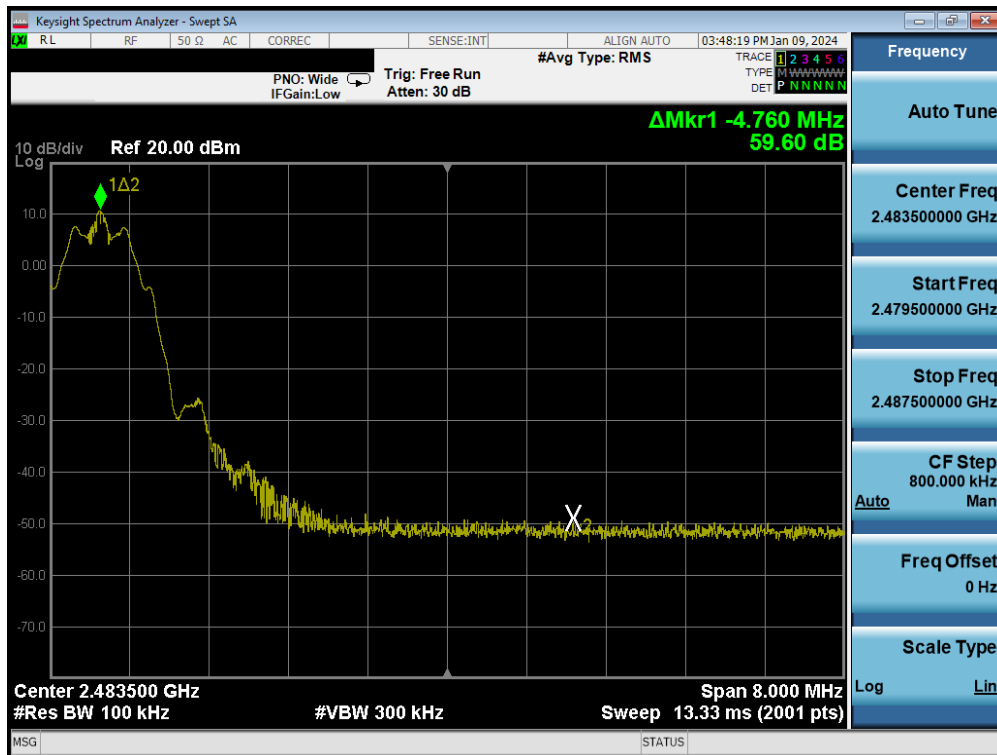
None

FCC ID: C3K2076 IC: 3048A-2076	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2312190129-05.C3K	Test Dates: 01/03/2024 - 03/18/2024	EUT Type: Portable Computing Device	Page 81 of 122

SISO ANT1

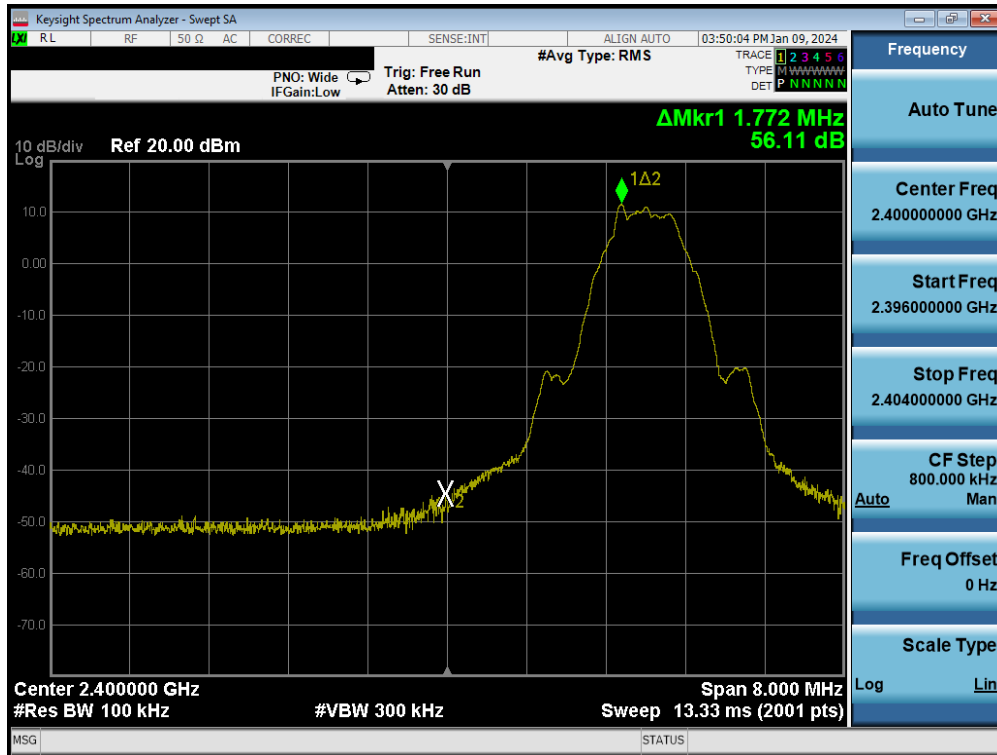


Plot 7-111. Band Edge Plot (Bluetooth (LE), 125kbps – Ch. 37)

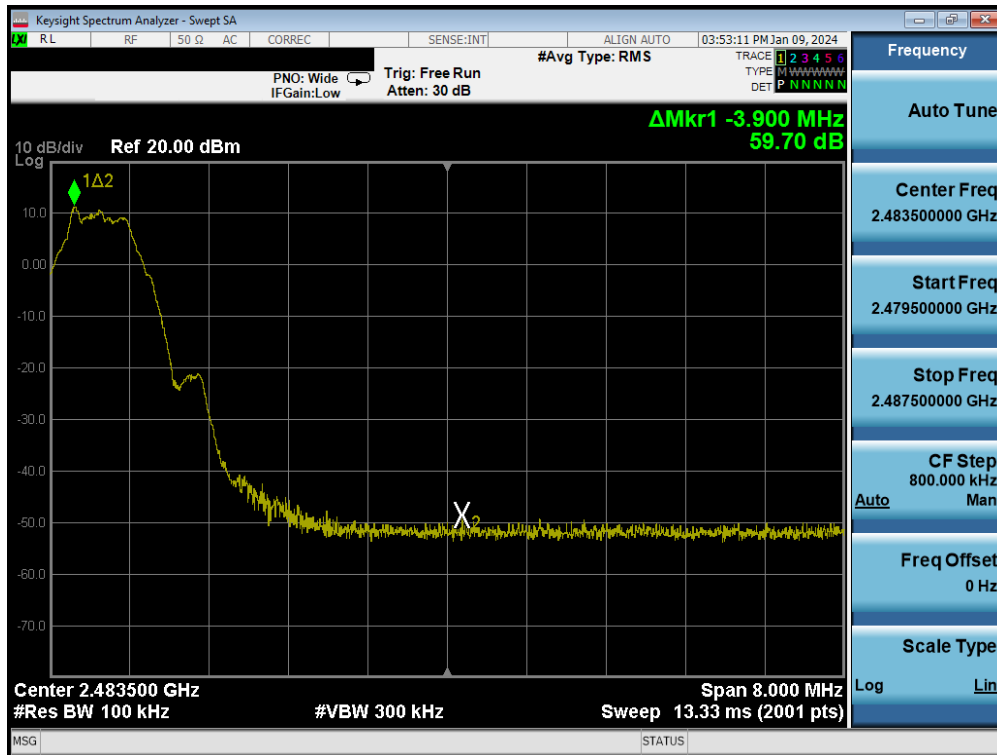


Plot 7-112. Band Edge Plot (Bluetooth (LE), 125kbps – Ch. 39)

FCC ID: C3K2076 IC: 3048A-2076	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2312190129-05.C3K	Test Dates: 01/03/2024 - 03/18/2024	EUT Type: Portable Computing Device	Page 82 of 122

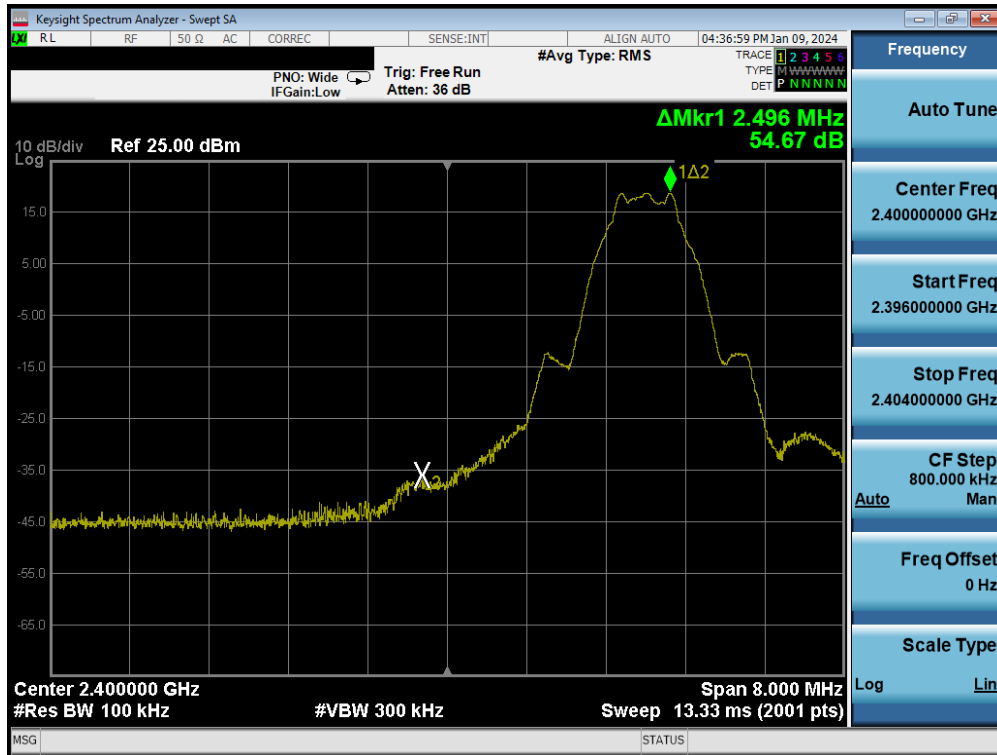


Plot 7-113. Band Edge Plot (Bluetooth (LE), 500kbps – Ch. 37)

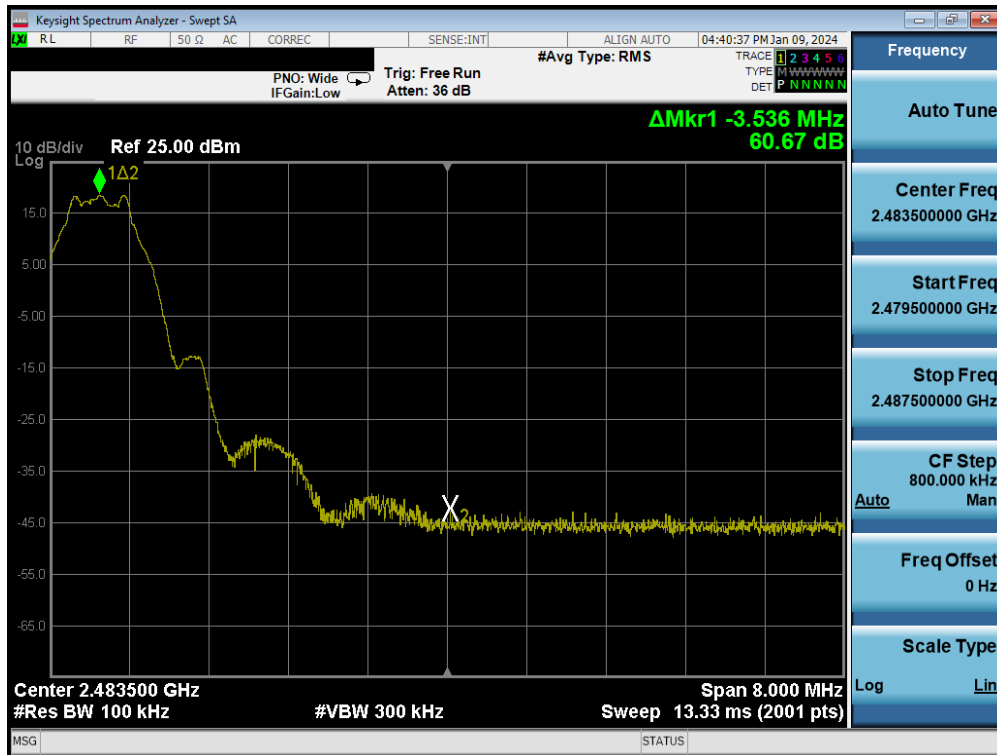


Plot 7-114. Band Edge Plot (Bluetooth (LE), 500kbps – Ch. 39)

FCC ID: C3K2076 IC: 3048A-2076	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2312190129-05.C3K	Test Dates: 01/03/2024 - 03/18/2024	EUT Type: Portable Computing Device	Page 83 of 122

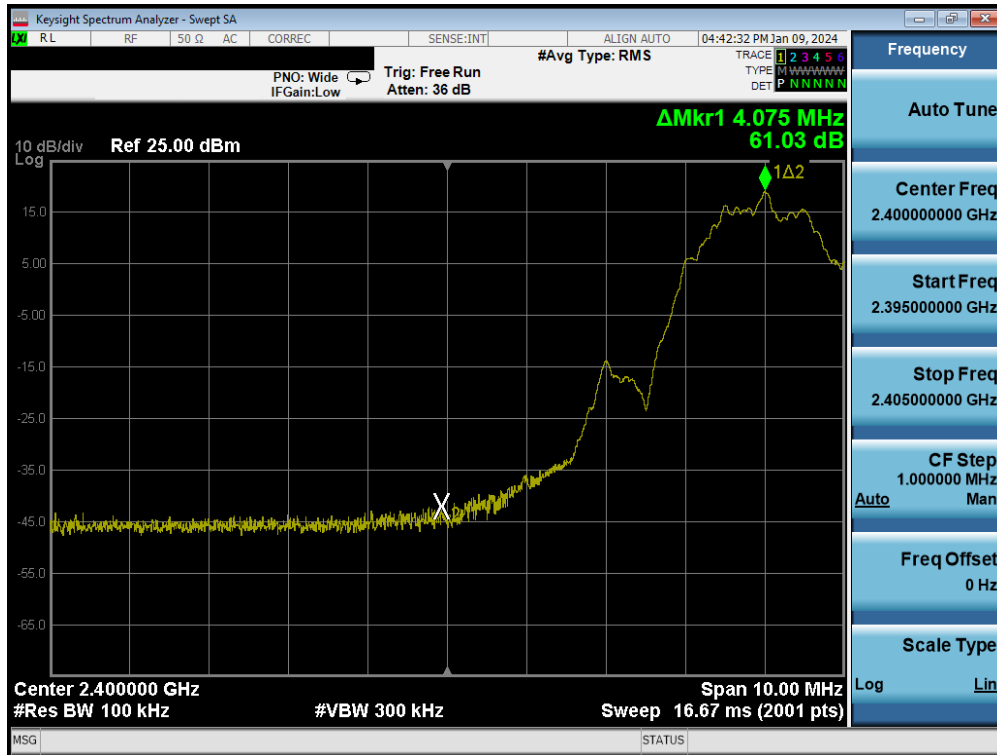


Plot 7-115. Band Edge Plot (Bluetooth (LE), 1Mbps – Ch. 37)

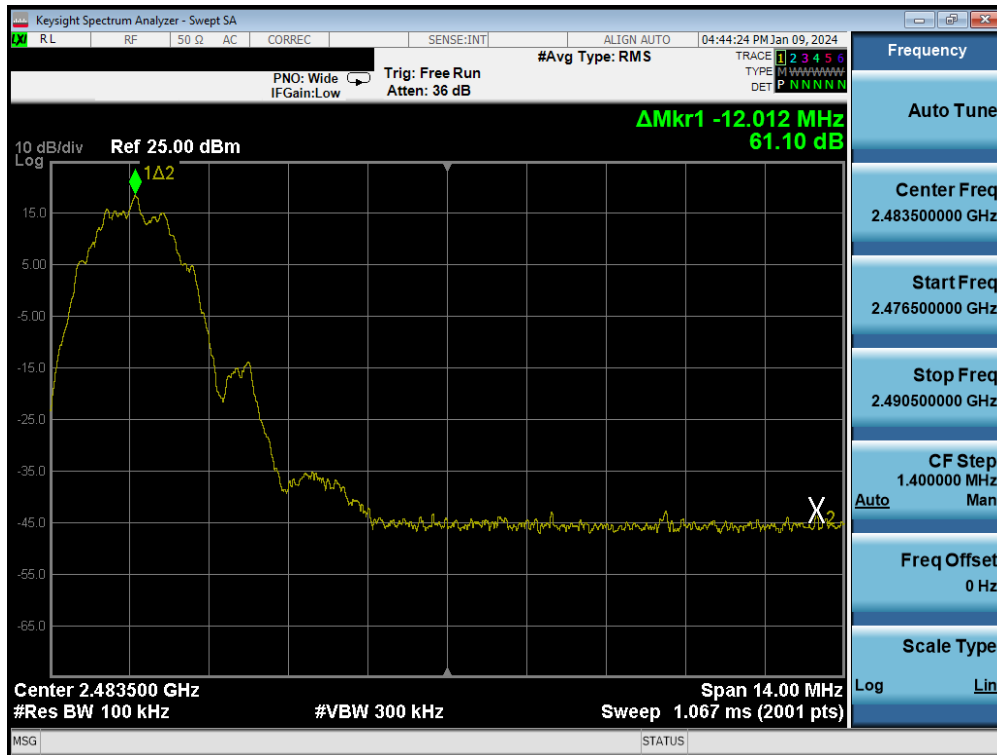


Plot 7-116. Band Edge Plot (Bluetooth (LE), 1Mbps – Ch. 39)

FCC ID: C3K2076 IC: 3048A-2076	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2312190129-05.C3K	Test Dates: 01/03/2024 - 03/18/2024	EUT Type: Portable Computing Device	Page 84 of 122



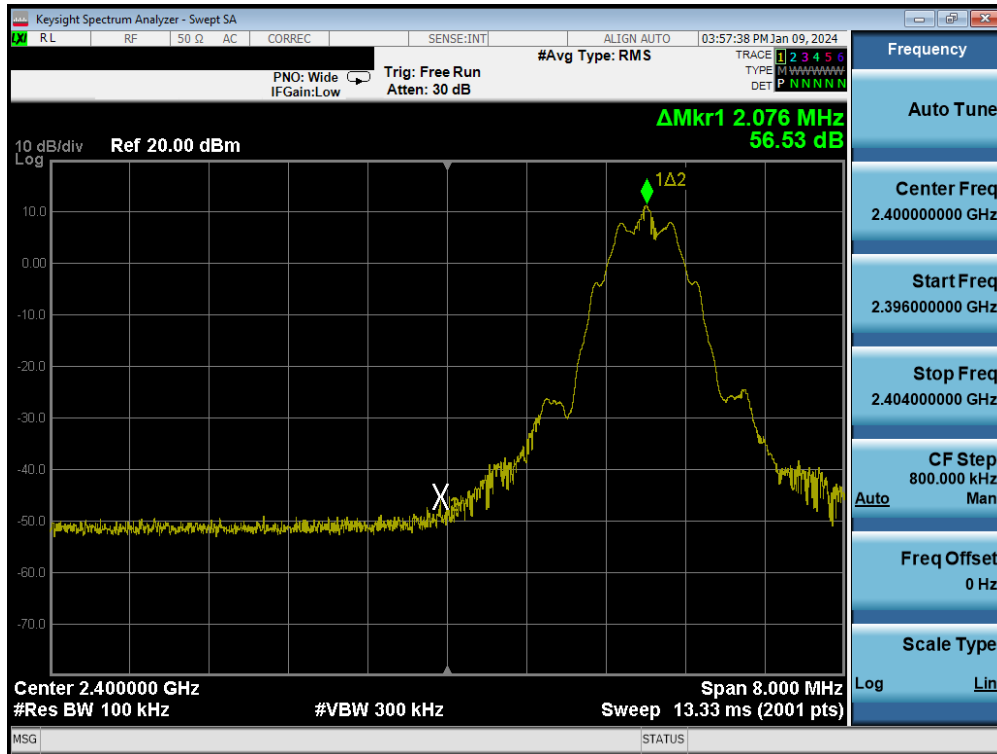
Plot 7-117. Band Edge Plot (Bluetooth (LE), 2Mbps – Ch. 0)



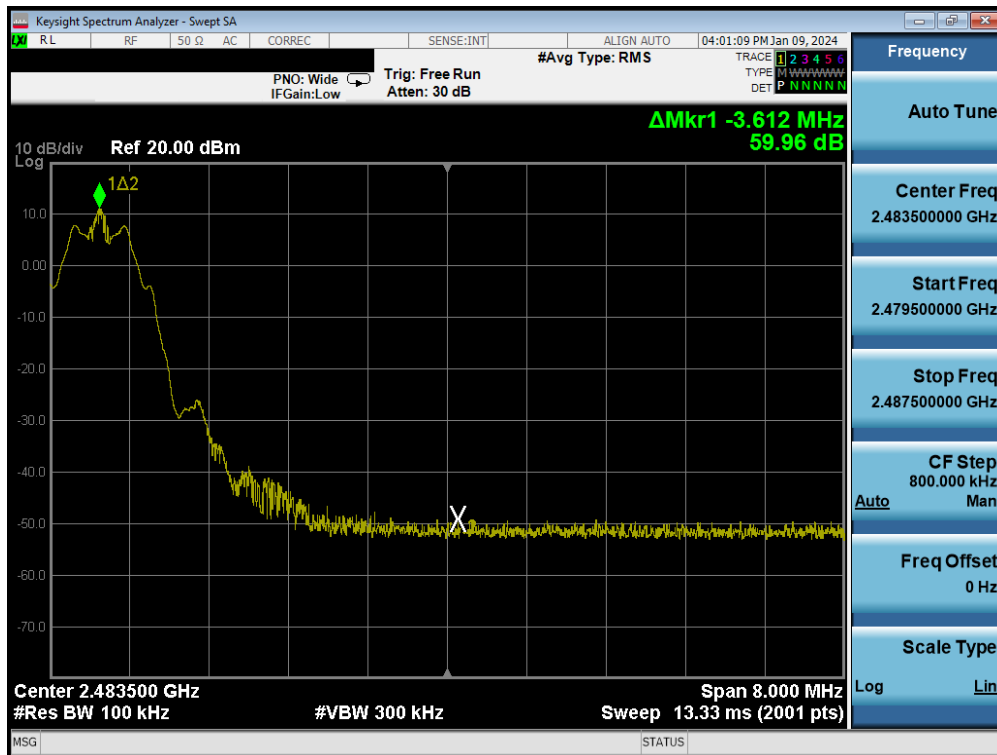
Plot 7-118. Band Edge Plot (Bluetooth (LE), 2Mbps – Ch. 36)

FCC ID: C3K2076 IC: 3048A-2076	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2312190129-05.C3K	Test Dates: 01/03/2024 - 03/18/2024	EUT Type: Portable Computing Device	Page 85 of 122

SISO ANT2

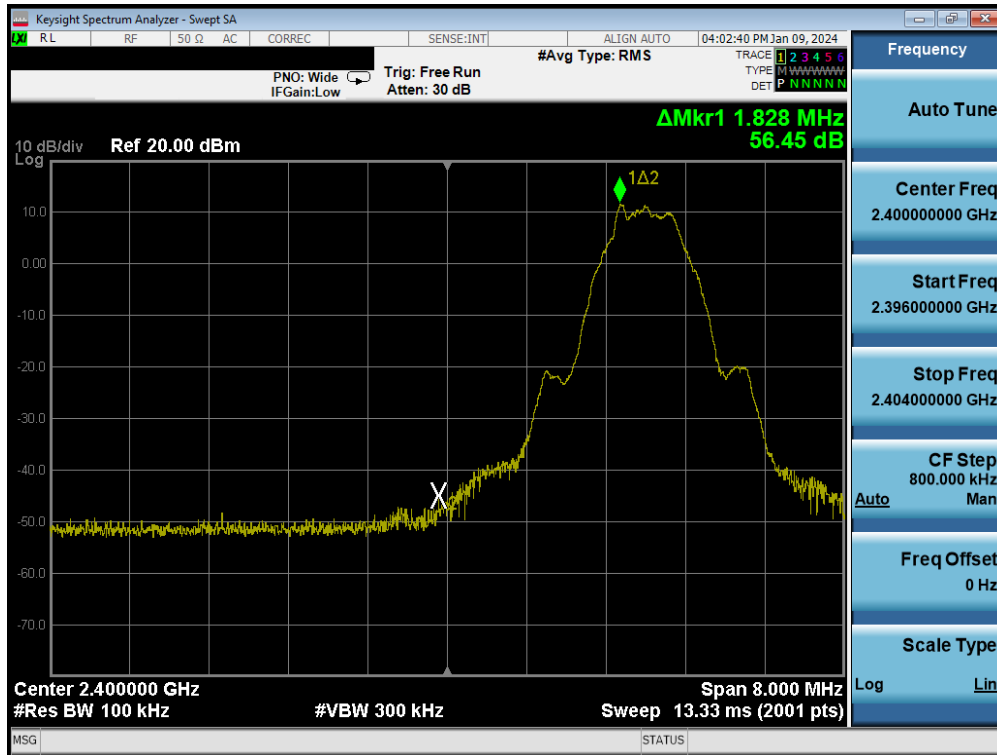


Plot 7-119. Band Edge Plot (Bluetooth (LE), 125kbps – Ch. 37)

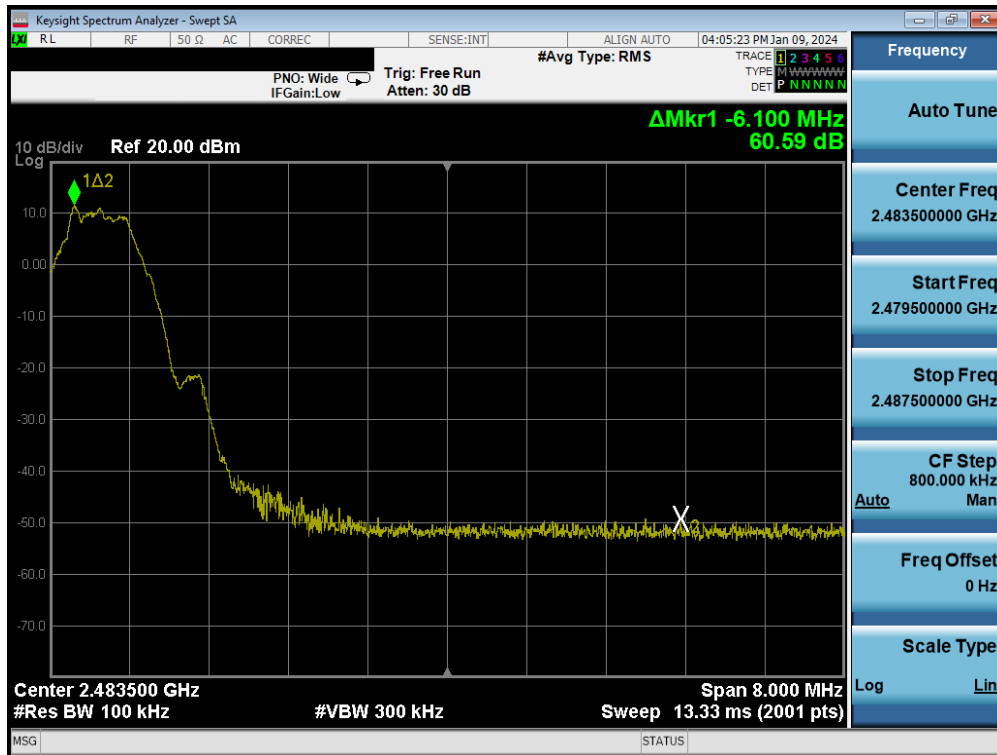


Plot 7-120. Band Edge Plot (Bluetooth (LE), 125kbps – Ch. 39)

FCC ID: C3K2076 IC: 3048A-2076	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
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Plot 7-121. Band Edge Plot (Bluetooth (LE), 500kbps – Ch. 37)



Plot 7-122. Band Edge Plot (Bluetooth (LE), 500kbps – Ch. 39)

FCC ID: C3K2076 IC: 3048A-2076	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2312190129-05.C3K	Test Dates: 01/03/2024 - 03/18/2024	EUT Type: Portable Computing Device	Page 87 of 122