



# ELEMENT WASHINGTON DC LLC

7185 Oakland Mills Road, Columbia, MD 21046 USA  
Tel. 410.290.6652 / Fax 410.290.6654  
<http://www.element.com>

## MEASUREMENT REPORT Bluetooth (Low Energy)

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

**Date of Testing:**  
12/14/2023 - 03/05/2024  
**Test Report Issue Date:**  
03/20/2024  
**Test Site/Location:**  
Element lab., Columbia, MD, USA  
**Test Report Serial No.:**  
1M2312040120-16.C3K

<b>FCC ID:</b>	<b>C3K2077</b>
<b>IC:</b>	<b>3048A-2077</b>
<b>APPLICANT:</b>	<b>Microsoft Corporation</b>

**Application Type:** Certification  
**Model/HVIN:** 2077  
**EUT Type:** Portable Computing Device  
**Max. RF Output Power:** 139.894 mW (21.46 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

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: C3K2077**. 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.:** 7CCX2, 7CDJ2, B44G2, B44D2

### 2.2 Device Capabilities

This device contains the following capabilities:

850/1700/1900 WCDMA/HSPA, Multi-band LTE, Multi-band 5G NR (FR1), 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	0.55	0.14	3.36

**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 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  $U_{\text{CISPR}}$  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	ETS-001	EMC Cable and Switch System	11/15/2023	Annual	11/15/2024	ETS-001
N/A	ETS-002	EMC Cable and Switch System	11/15/2023	Annual	11/15/2024	ETS-002
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: C3K2077  
 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 7.2
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.

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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 x 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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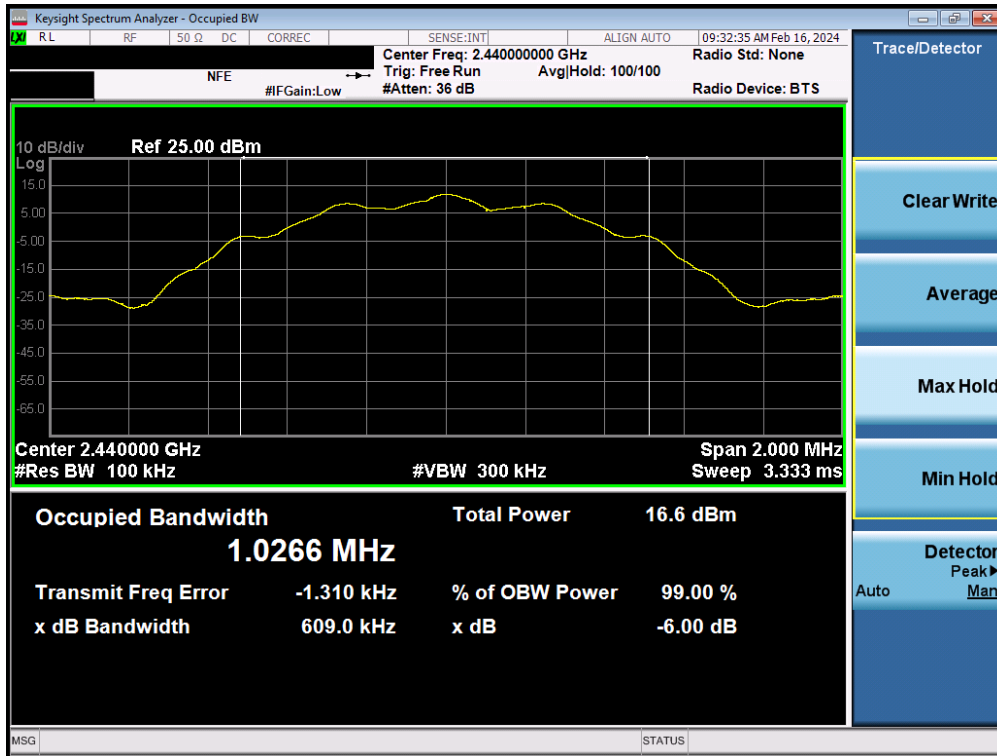
Frequency [MHz]	Data Rate	Channel No.	Bluetooth Mode	Measured Bandwidth [kHz]	Minimum Bandwidth [kHz]	Pass / Fail
2402	125 kbps	37	LE	608.9	500	Pass
2440	125 kbps	17	LE	609.0	500	Pass
2480	125 kbps	39	LE	608.6	500	Pass
2402	500 kbps	37	LE	660.4	500	Pass
2440	500 kbps	17	LE	660.8	500	Pass
2480	500 kbps	39	LE	661.1	500	Pass
2402	1 Mbps	37	LE	697.2	500	Pass
2440	1 Mbps	17	LE	696.4	500	Pass
2480	1 Mbps	39	LE	696.7	500	Pass
2404	2 Mbps	0	LE	1152.4	500	Pass
2440	2 Mbps	17	LE	1154.0	500	Pass
2478	2 Mbps	36	LE	1155.1	500	Pass

**Table 7-2. Conducted Bandwidth Measurements – SISO ANT1**

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Plot 7-1. 6dB Bandwidth Plot (Bluetooth (LE), 125kbps – Ch. 37)

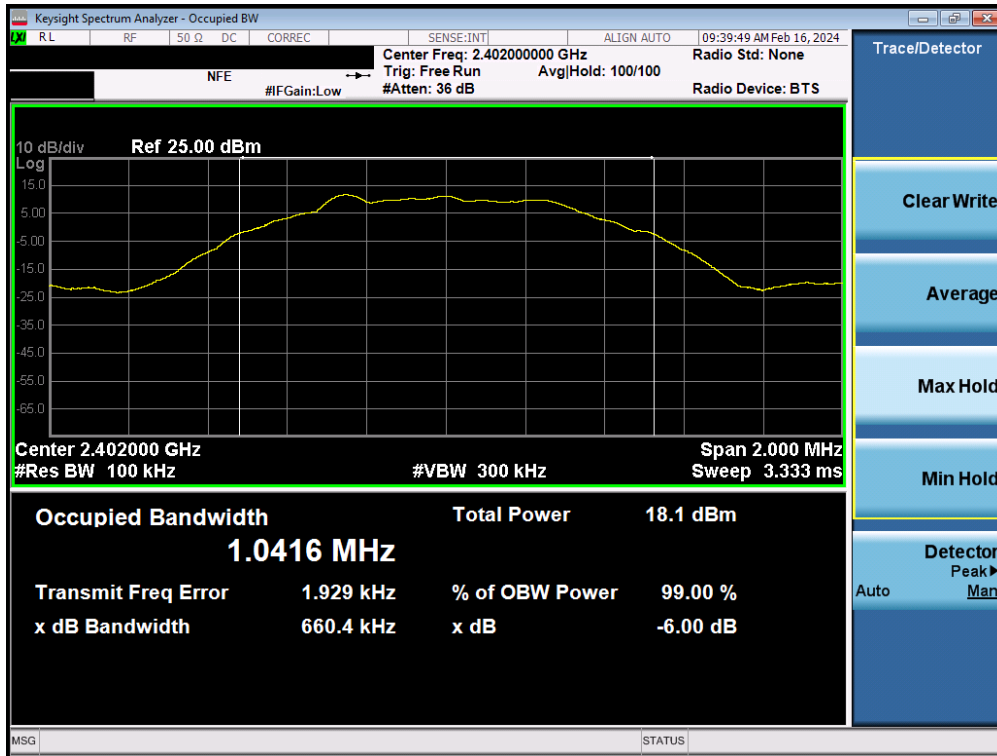


Plot 7-2. 6dB Bandwidth Plot (Bluetooth (LE), 125kbps – Ch. 17)

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Plot 7-3. 6dB Bandwidth Plot (Bluetooth (LE), 125kbps – Ch. 39)

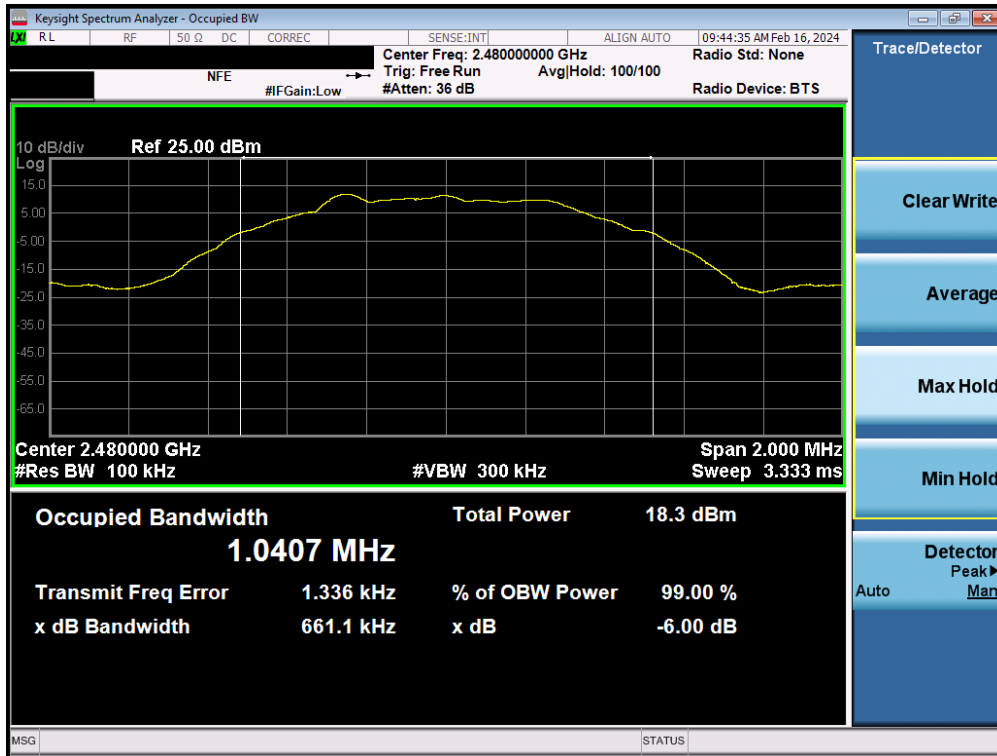


Plot 7-4. 6dB Bandwidth Plot (Bluetooth (LE), 500kbps – Ch. 37)

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Plot 7-5. 6dB Bandwidth Plot (Bluetooth (LE), 500kbps – Ch. 17)



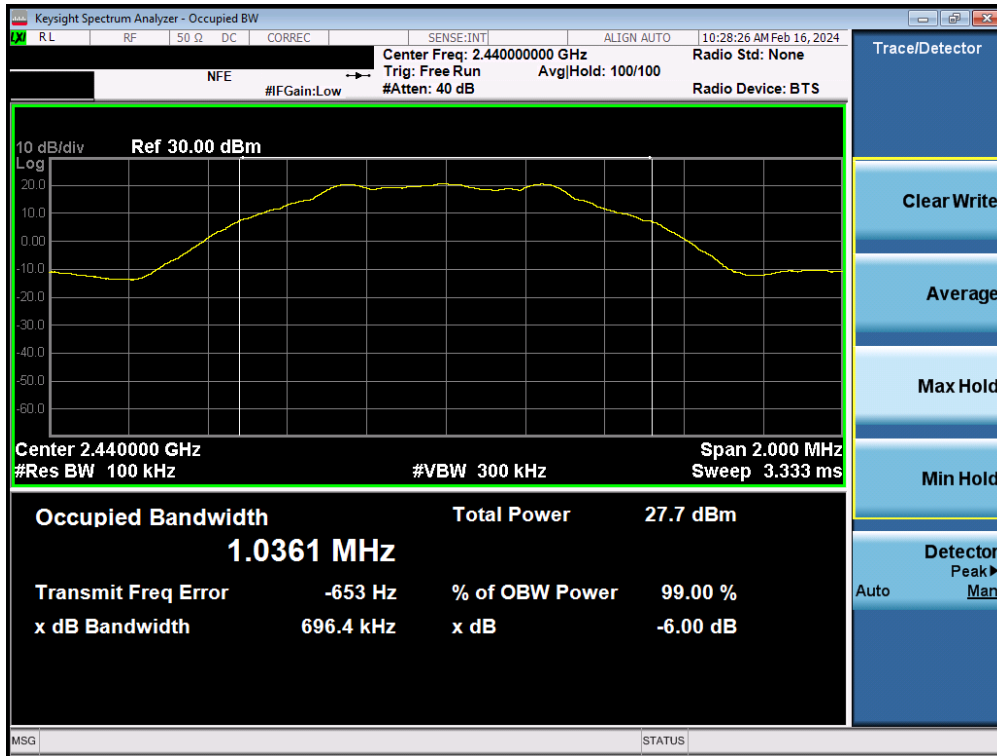
Plot 7-6. 6dB Bandwidth Plot (Bluetooth (LE), 500kbps – Ch. 39)

FCC ID: C3K2077 IC: 3048A-2077	<b>MEASUREMENT REPORT (CERTIFICATION)</b>		Approved by: Technical Manager
Test Report S/N: 1M2312040120-16.C3K	Test Dates: 12/14/2023 - 03/05/2024	EUT Type: Portable Computing Device	Page 16 of 120



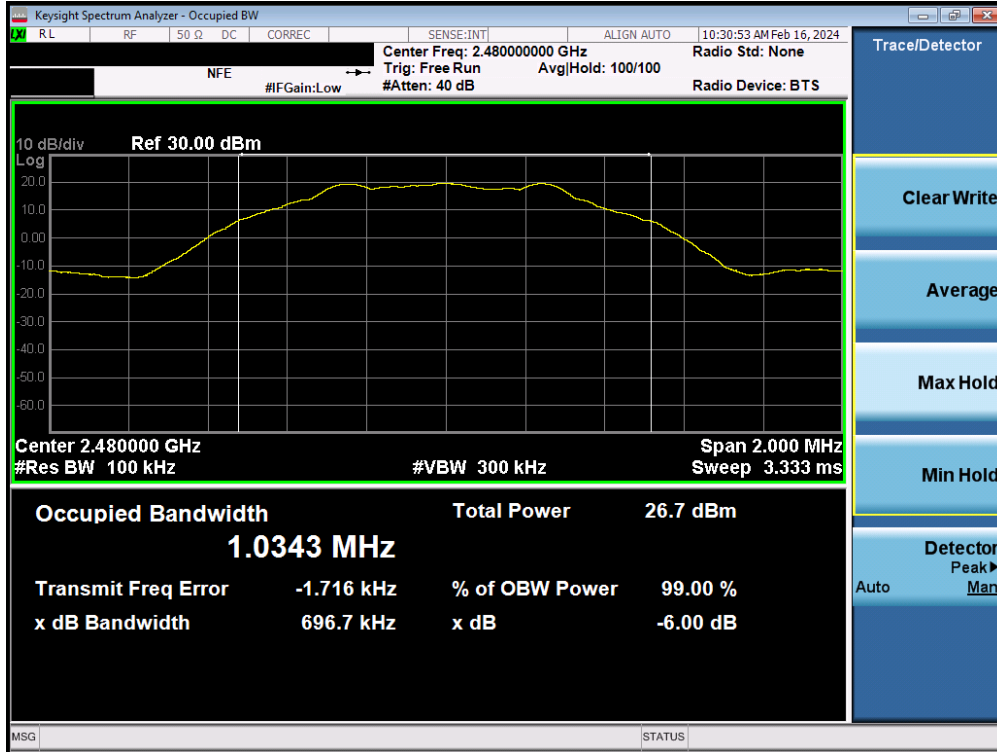


Plot 7-7. 6dB Bandwidth Plot (Bluetooth (LE), 1Mbps – Ch. 37)

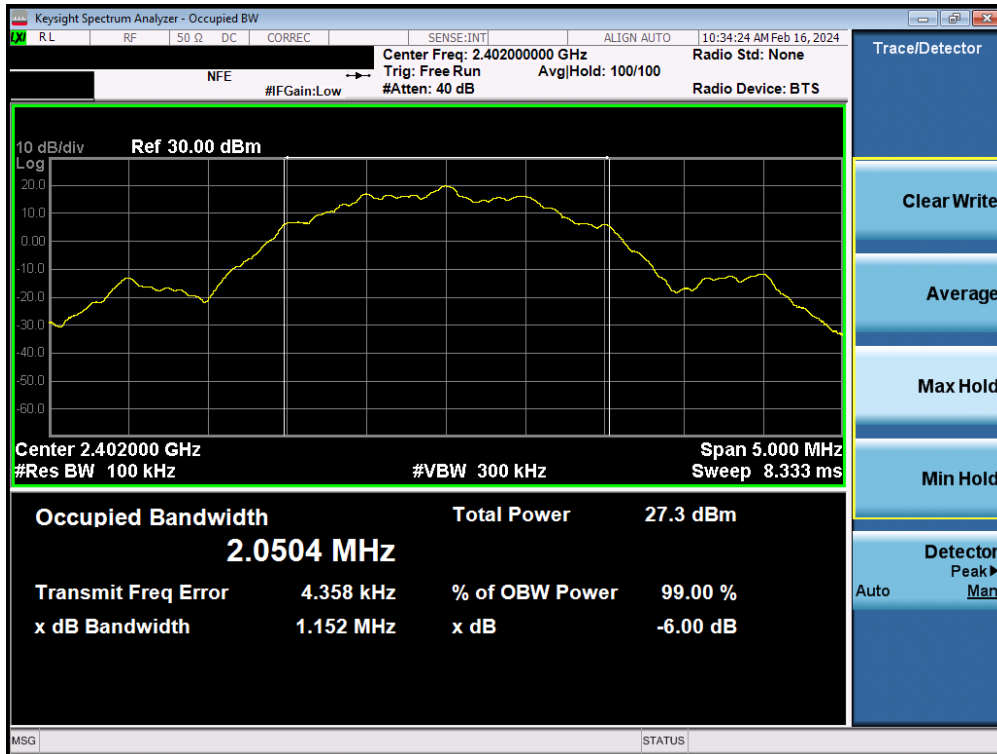


Plot 7-8. 6dB Bandwidth Plot (Bluetooth (LE), 1Mbps – Ch. 17)

FCC ID: C3K2077 IC: 3048A-2077	<b>MEASUREMENT REPORT (CERTIFICATION)</b>		Approved by: Technical Manager
Test Report S/N: 1M2312040120-16.C3K	Test Dates: 12/14/2023 - 03/05/2024	EUT Type: Portable Computing Device	Page 17 of 120

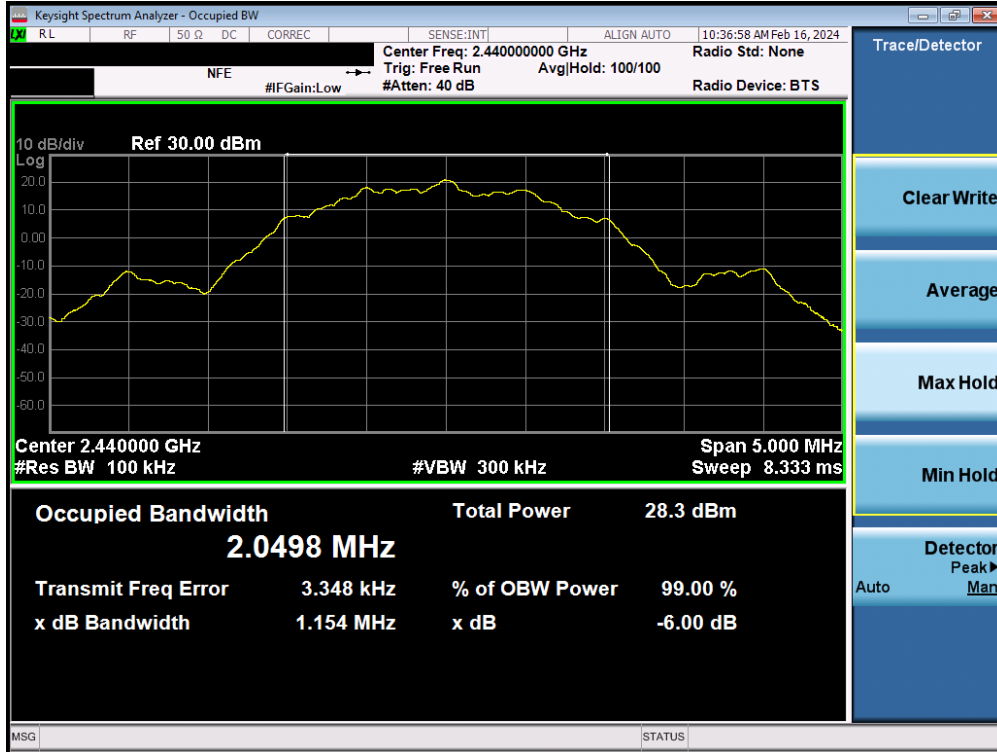


Plot 7-9. 6dB Bandwidth Plot (Bluetooth (LE), 1Mbps – Ch. 39)

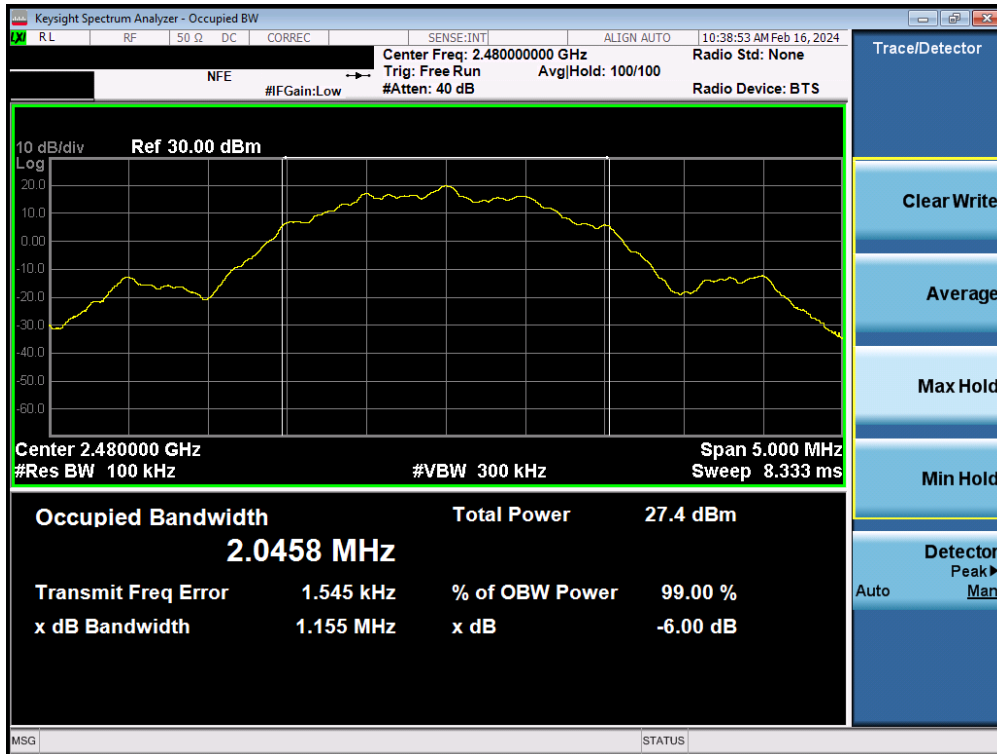


Plot 7-10. 6dB Bandwidth Plot (Bluetooth (LE), 2Mbps – Ch. 0)

FCC ID: C3K2077 IC: 3048A-2077	<b>MEASUREMENT REPORT (CERTIFICATION)</b>		Approved by: Technical Manager
Test Report S/N: 1M2312040120-16.C3K	Test Dates: 12/14/2023 - 03/05/2024	EUT Type: Portable Computing Device	Page 18 of 120



Plot 7-11. 6dB Bandwidth Plot (Bluetooth (LE), 2Mbps – Ch. 17)



Plot 7-12. 6dB Bandwidth Plot (Bluetooth (LE), 2Mbps – Ch. 36)

FCC ID: C3K2077 IC: 3048A-2077	<b>MEASUREMENT REPORT (CERTIFICATION)</b>		Approved by: Technical Manager
Test Report S/N: 1M2312040120-16.C3K	Test Dates: 12/14/2023 - 03/05/2024	EUT Type: Portable Computing Device	Page 19 of 120

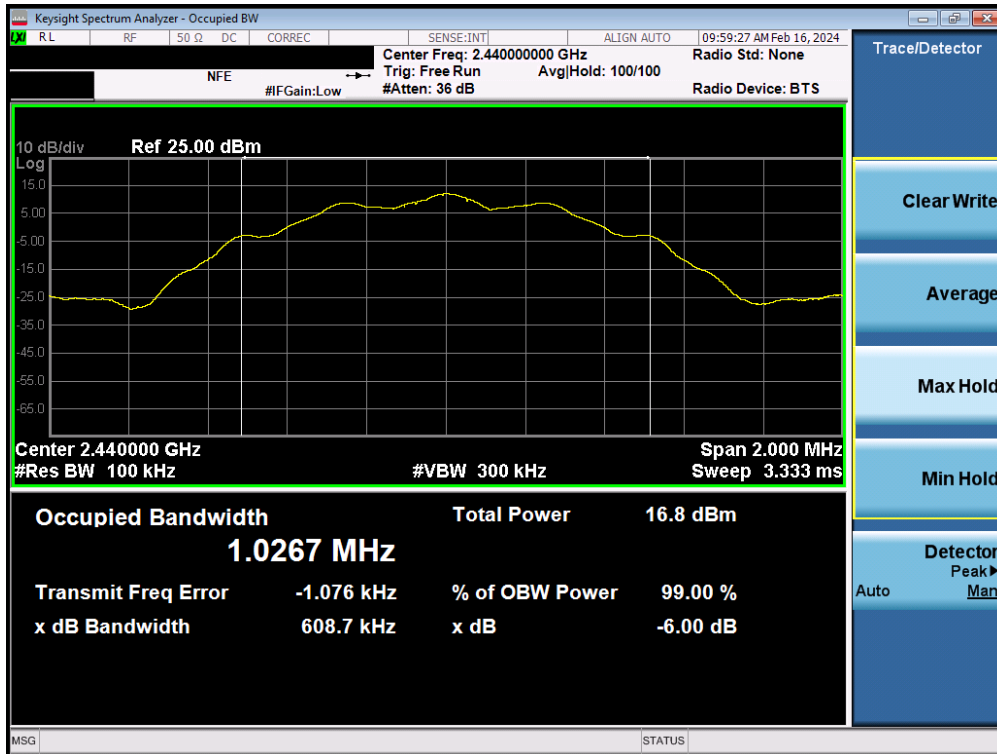
Frequency [MHz]	Data Rate	Channel No.	Bluetooth Mode	Measured Bandwidth [kHz]	Minimum Bandwidth [kHz]	Pass / Fail
2402	125 kbps	37	LE	609.4	500	Pass
2440	125 kbps	17	LE	608.7	500	Pass
2480	125 kbps	39	LE	608.2	500	Pass
2402	500 kbps	37	LE	660.8	500	Pass
2440	500 kbps	17	LE	660.1	500	Pass
2480	500 kbps	39	LE	660.5	500	Pass
2402	1 Mbps	37	LE	690.1	500	Pass
2440	1 Mbps	17	LE	692.7	500	Pass
2480	1 Mbps	39	LE	693.3	500	Pass
2404	2 Mbps	0	LE	1150.2	500	Pass
2440	2 Mbps	17	LE	1148.3	500	Pass
2478	2 Mbps	36	LE	1148.3	500	Pass

**Table 7-3. Conducted Bandwidth Measurements – SISO ANT2**

<b>FCC ID:</b> C3K2077 <b>IC:</b> 3048A-2077	<b>MEASUREMENT REPORT (CERTIFICATION)</b>		<b>Approved by:</b> Technical Manager
<b>Test Report S/N:</b> 1M2312040120-16.C3K	<b>Test Dates:</b> 12/14/2023 - 03/05/2024	<b>EUT Type:</b> Portable Computing Device	Page 20 of 120



Plot 7-13. 6dB Bandwidth Plot (Bluetooth (LE), 125kbps – Ch. 37)

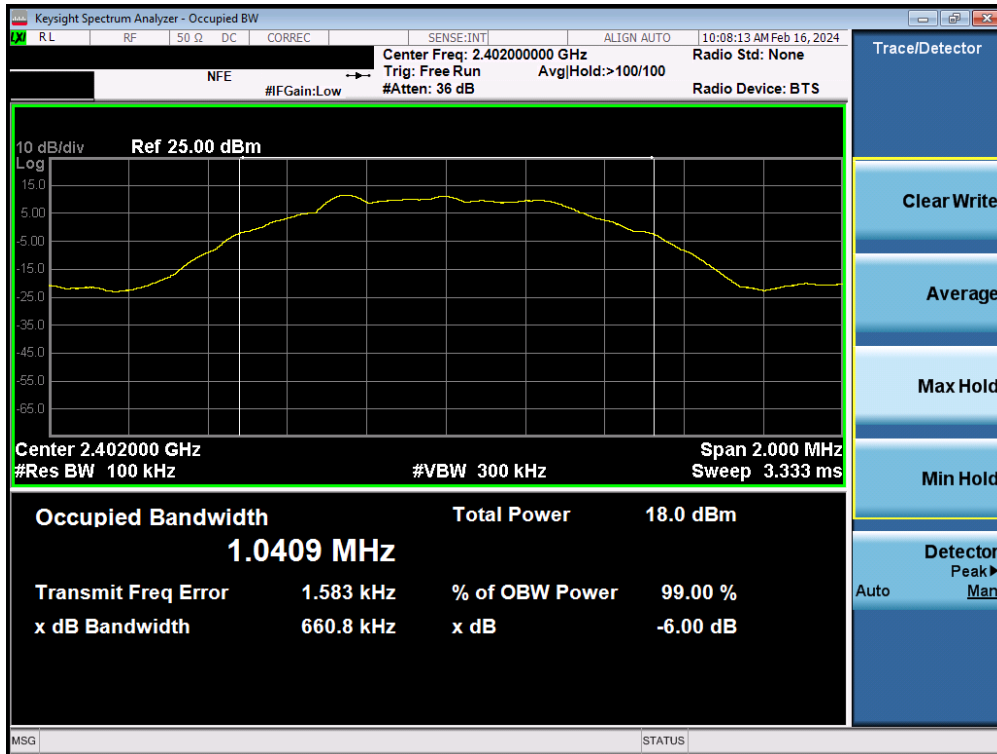


Plot 7-14. 6dB Bandwidth Plot (Bluetooth (LE), 125kbps – Ch. 17)

FCC ID: C3K2077 IC: 3048A-2077	<b>MEASUREMENT REPORT (CERTIFICATION)</b>		Approved by: Technical Manager
Test Report S/N: 1M2312040120-16.C3K	Test Dates: 12/14/2023 - 03/05/2024	EUT Type: Portable Computing Device	Page 21 of 120

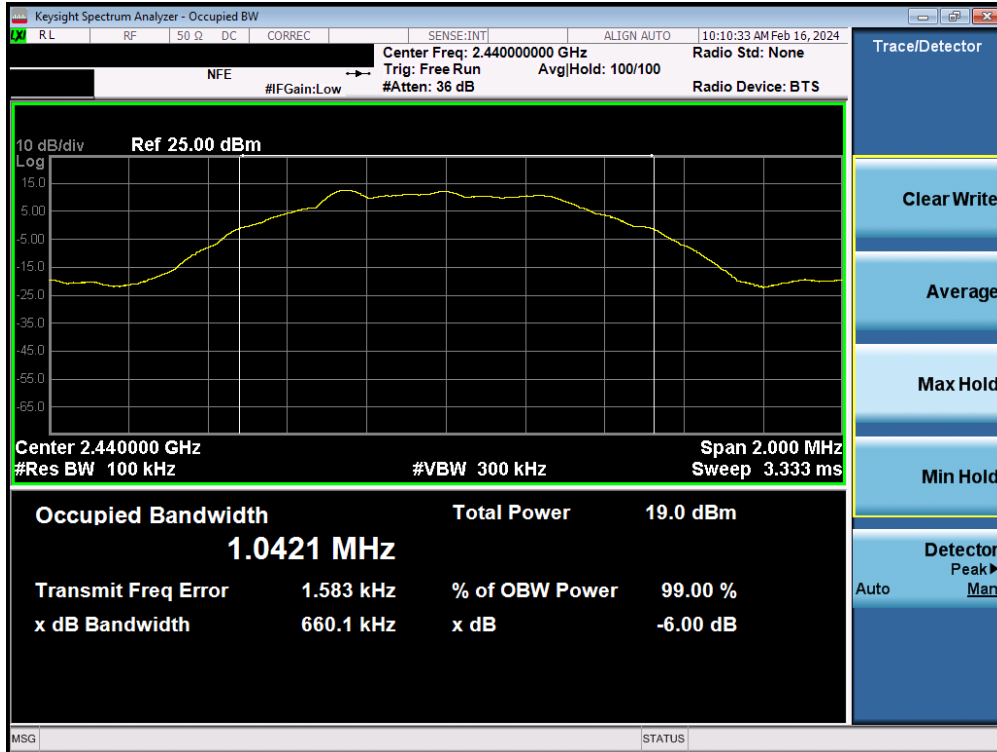


Plot 7-15. 6dB Bandwidth Plot (Bluetooth (LE), 125kbps – Ch. 39)

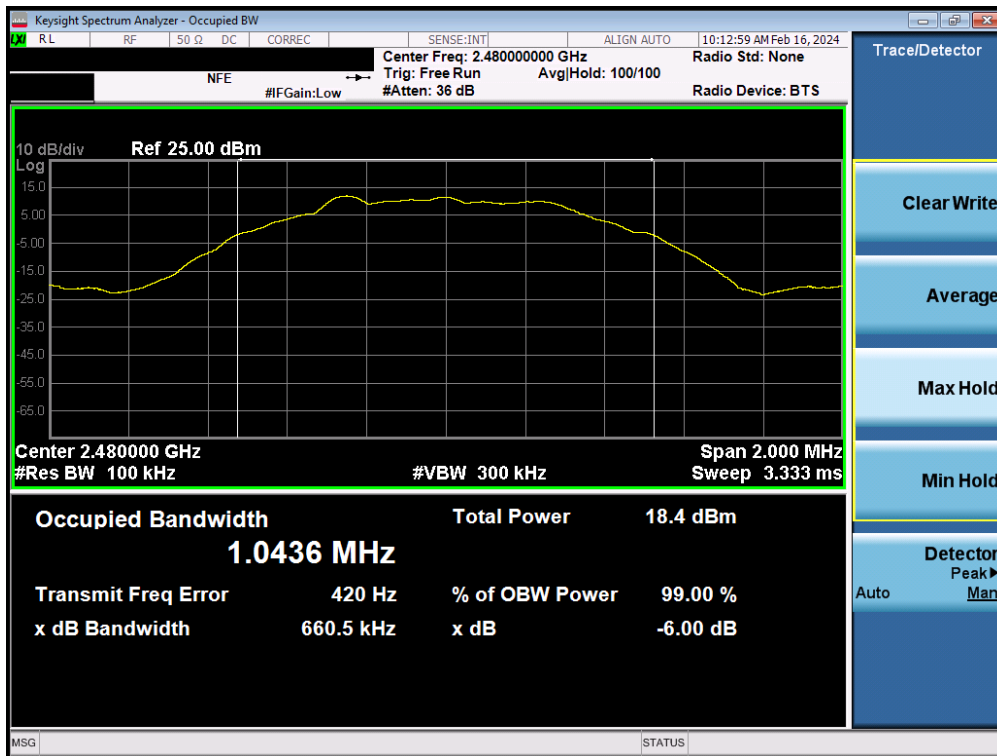


Plot 7-16. 6dB Bandwidth Plot (Bluetooth (LE), 500kbps – Ch. 37)

FCC ID: C3K2077 IC: 3048A-2077	<b>MEASUREMENT REPORT (CERTIFICATION)</b>		Approved by: Technical Manager
Test Report S/N: 1M2312040120-16.C3K	Test Dates: 12/14/2023 - 03/05/2024	EUT Type: Portable Computing Device	Page 22 of 120



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



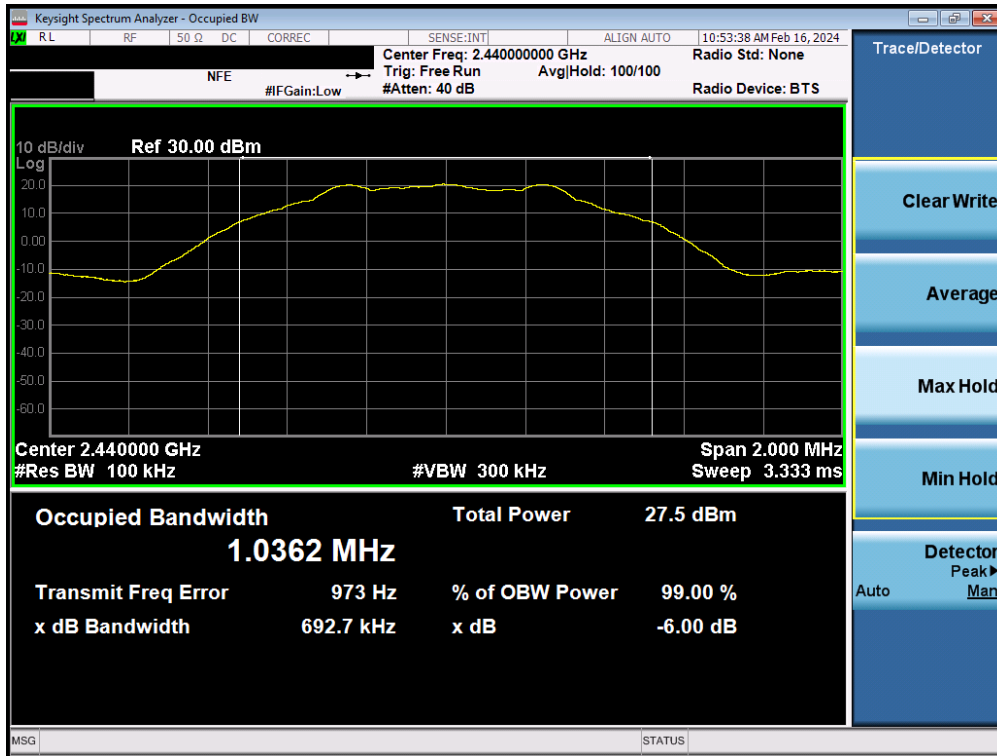
Plot 7-18. 6dB Bandwidth Plot (Bluetooth (LE), 500kbps – Ch. 39)

FCC ID: C3K2077 IC: 3048A-2077	<b>MEASUREMENT REPORT (CERTIFICATION)</b>		Approved by: Technical Manager
Test Report S/N: 1M2312040120-16.C3K	Test Dates: 12/14/2023 - 03/05/2024	EUT Type: Portable Computing Device	Page 23 of 120





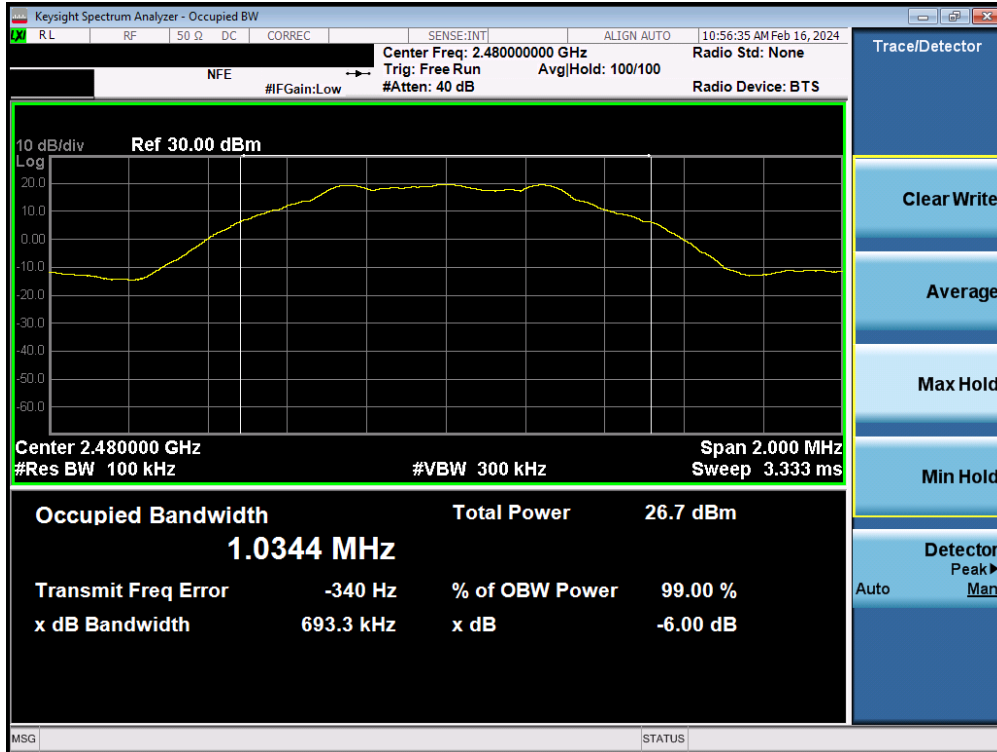
Plot 7-19. 6dB Bandwidth Plot (Bluetooth (LE), 1Mbps – Ch. 37)



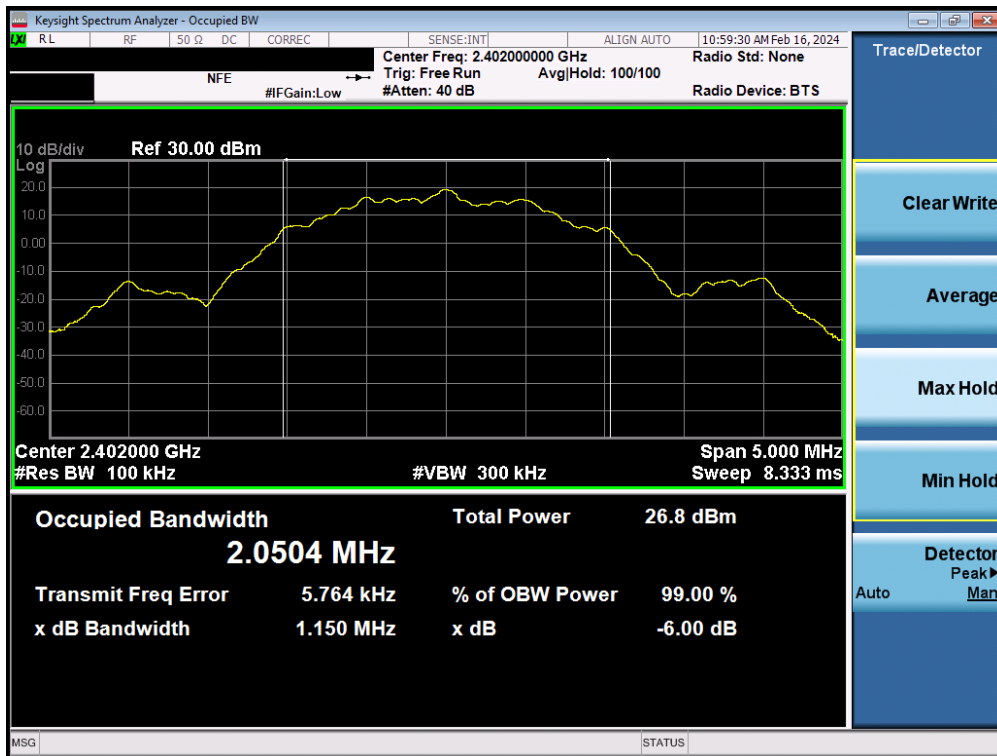
Plot 7-20. 6dB Bandwidth Plot (Bluetooth (LE), 1Mbps – Ch. 17)

FCC ID: C3K2077 IC: 3048A-2077	<b>MEASUREMENT REPORT (CERTIFICATION)</b>		Approved by: Technical Manager
Test Report S/N: 1M2312040120-16.C3K	Test Dates: 12/14/2023 - 03/05/2024	EUT Type: Portable Computing Device	Page 24 of 120



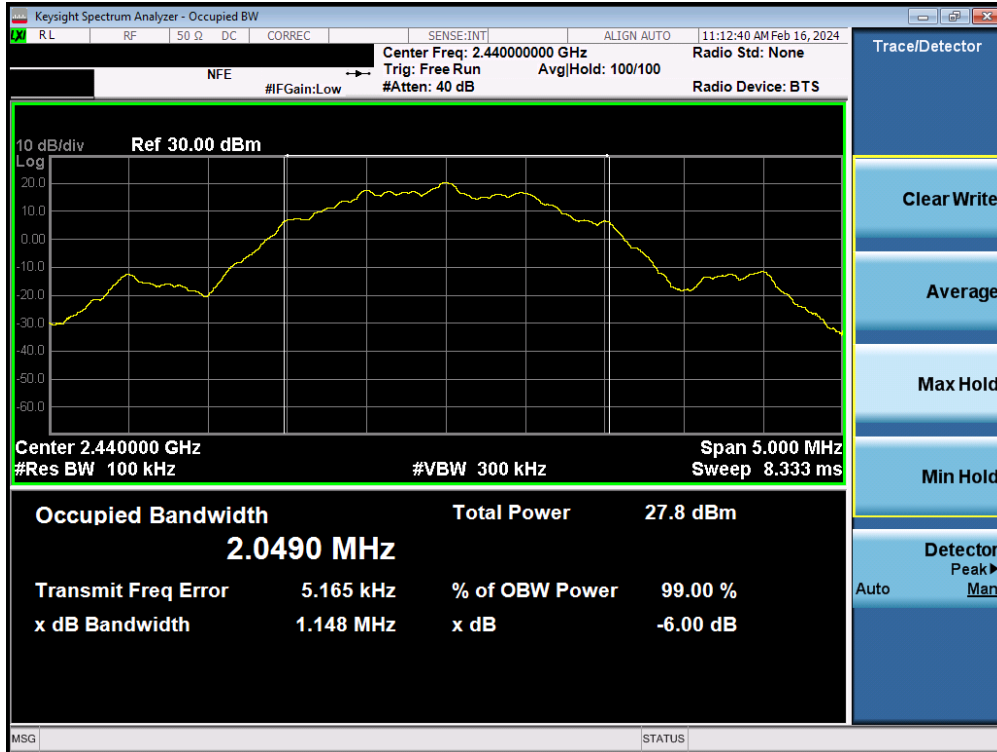


Plot 7-21. 6dB Bandwidth Plot (Bluetooth (LE), 1Mbps – Ch. 39)

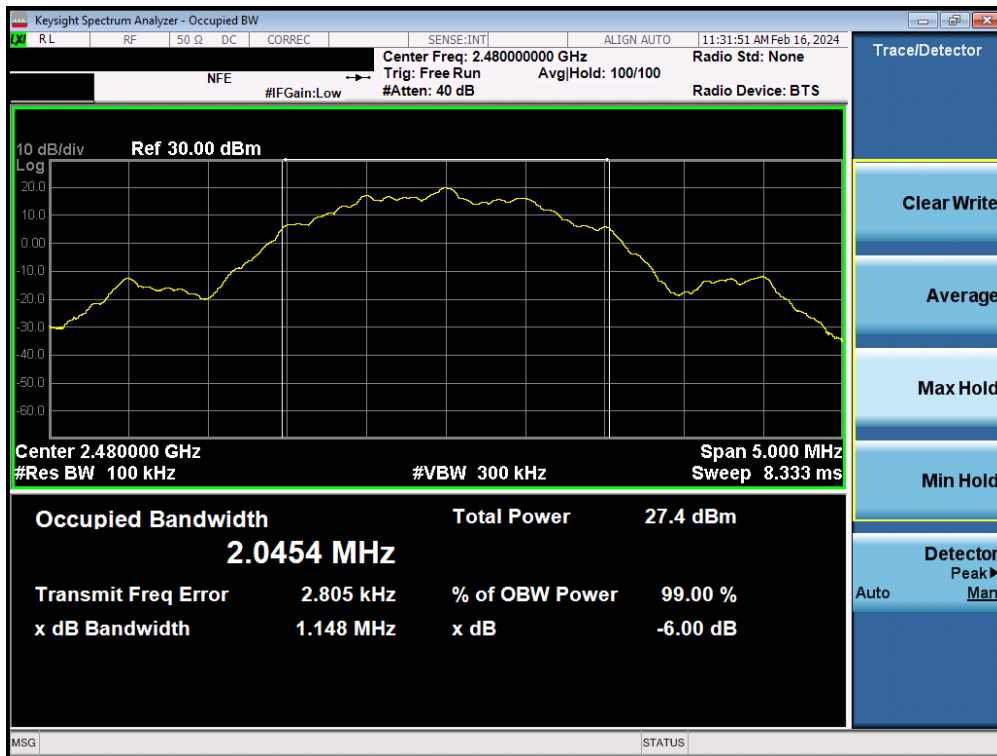


Plot 7-22. 6dB Bandwidth Plot (Bluetooth (LE), 2Mbps – Ch. 0)

FCC ID: C3K2077 IC: 3048A-2077	<b>MEASUREMENT REPORT (CERTIFICATION)</b>		Approved by: Technical Manager
Test Report S/N: 1M2312040120-16.C3K	Test Dates: 12/14/2023 - 03/05/2024	EUT Type: Portable Computing Device	Page 25 of 120



Plot 7-23. 6dB Bandwidth Plot (Bluetooth (LE), 2Mbps – Ch. 17)



Plot 7-24. 6dB Bandwidth Plot (Bluetooth (LE), 2Mbps – Ch. 36)

FCC ID: C3K2077 IC: 3048A-2077	<b>MEASUREMENT REPORT (CERTIFICATION)</b>		Approved by: Technical Manager
Test Report S/N: 1M2312040120-16.C3K	Test Dates: 12/14/2023 - 03/05/2024	EUT Type: Portable Computing Device	Page 26 of 120

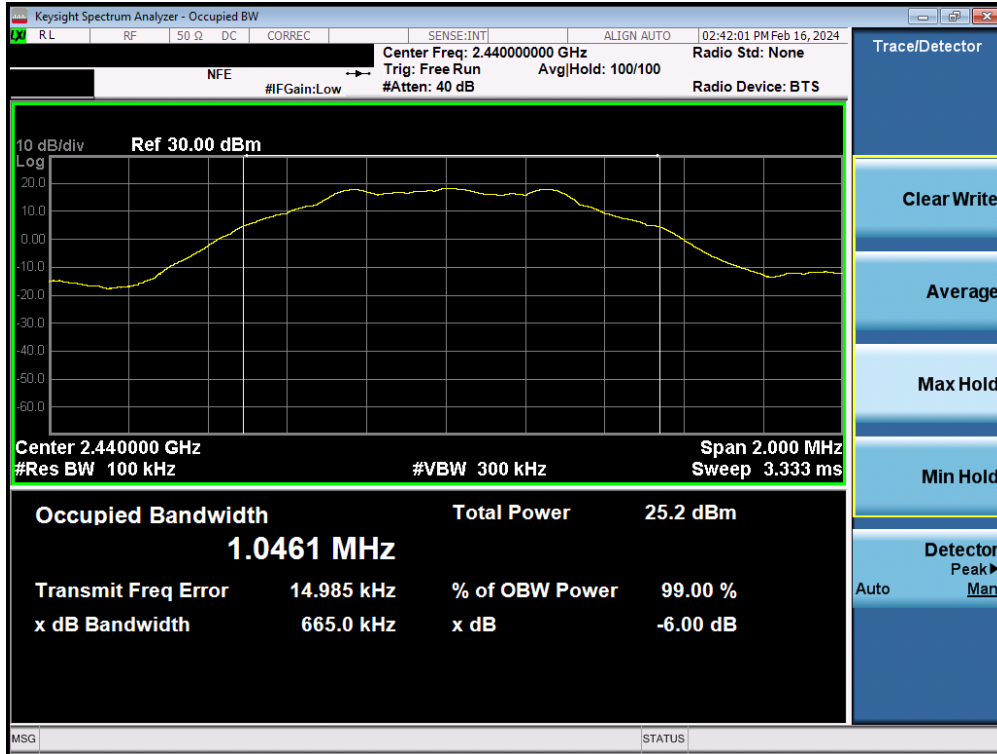
Frequency [MHz]	Data Rate	Channel No.	Bluetooth Mode	Measured Bandwidth [kHz]	Minimum Bandwidth [kHz]	Pass / Fail
2402	1 Mbps	37	LE	683.0	500	Pass
2440	1 Mbps	17	LE	665.0	500	Pass
2480	1 Mbps	39	LE	687.2	500	Pass
2404	2 Mbps	0	LE	1144.0	500	Pass
2440	2 Mbps	17	LE	1136.6	500	Pass
2478	2 Mbps	36	LE	1138.7	500	Pass

Table 7-4. Conducted Bandwidth Measurements – DUAL ANT1

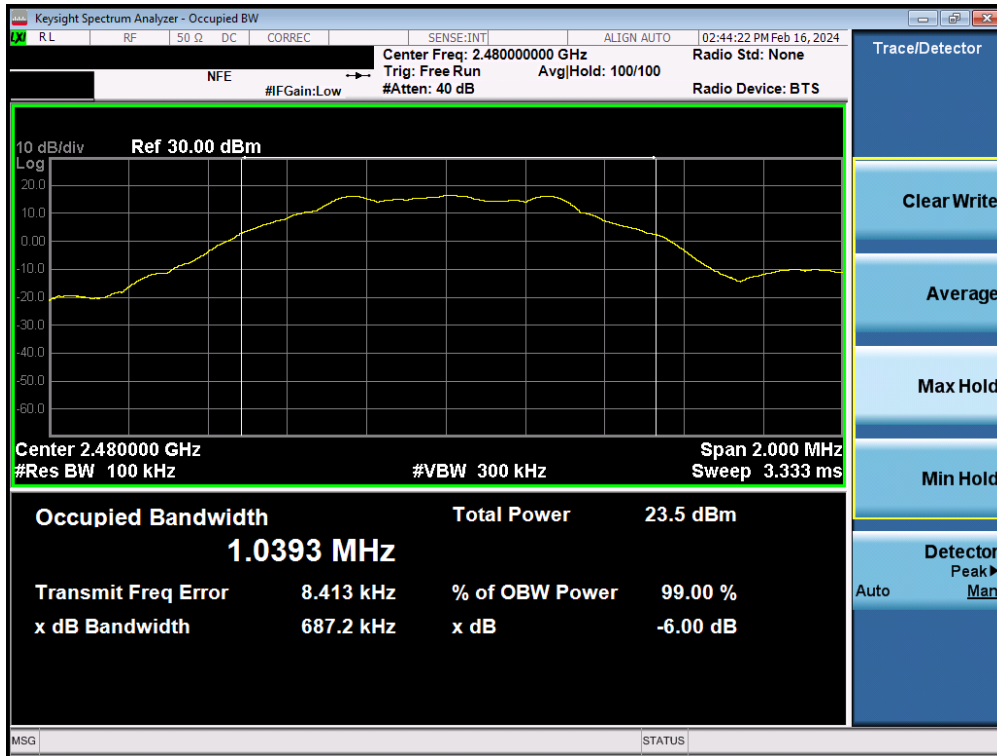


Plot 7-25. 6dB Bandwidth Plot (Bluetooth (LE), 1Mbps – Ch. 37)

FCC ID: C3K2077 IC: 3048A-2077	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2312040120-16.C3K	Test Dates: 12/14/2023 - 03/05/2024	EUT Type: Portable Computing Device	Page 27 of 120

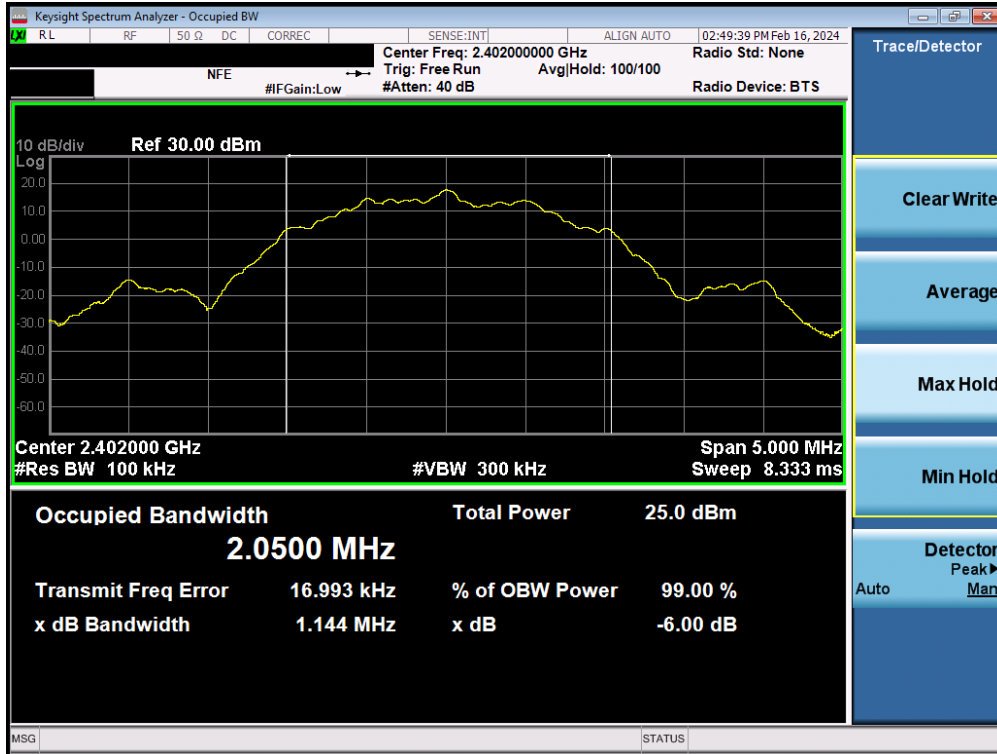


Plot 7-26. 6dB Bandwidth Plot (Bluetooth (LE), 1Mbps – Ch. 17)

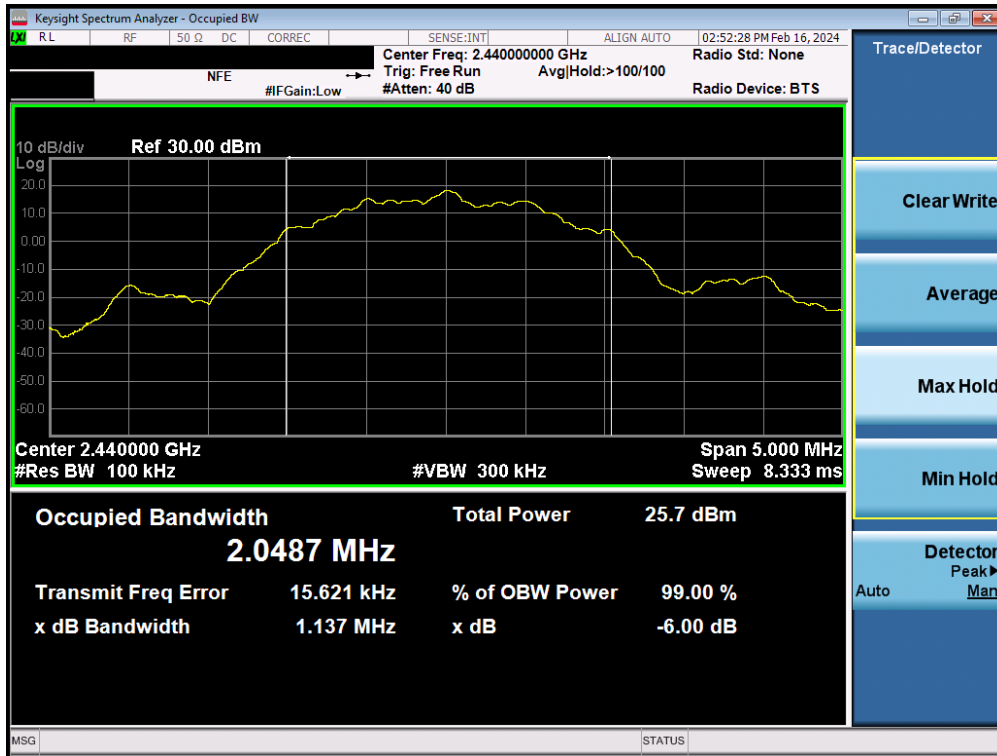


Plot 7-27. 6dB Bandwidth Plot (Bluetooth (LE), 1Mbps – Ch. 39)

FCC ID: C3K2077 IC: 3048A-2077	<b>MEASUREMENT REPORT (CERTIFICATION)</b>		Approved by: Technical Manager
Test Report S/N: 1M2312040120-16.C3K	Test Dates: 12/14/2023 - 03/05/2024	EUT Type: Portable Computing Device	Page 28 of 120

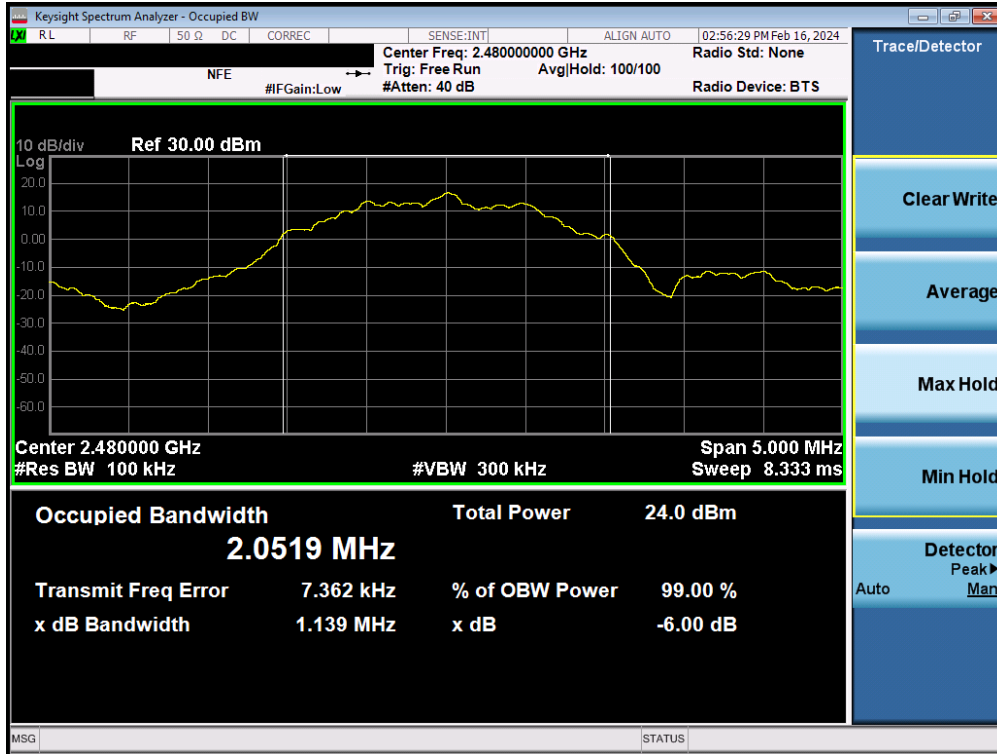


Plot 7-28. 6dB Bandwidth Plot (Bluetooth (LE), 2Mbps – Ch. 0)



Plot 7-29. 6dB Bandwidth Plot (Bluetooth (LE), 2Mbps – Ch. 17)

FCC ID: C3K2077 IC: 3048A-2077	<b>MEASUREMENT REPORT (CERTIFICATION)</b>		Approved by: Technical Manager
Test Report S/N: 1M2312040120-16.C3K	Test Dates: 12/14/2023 - 03/05/2024	EUT Type: Portable Computing Device	Page 29 of 120

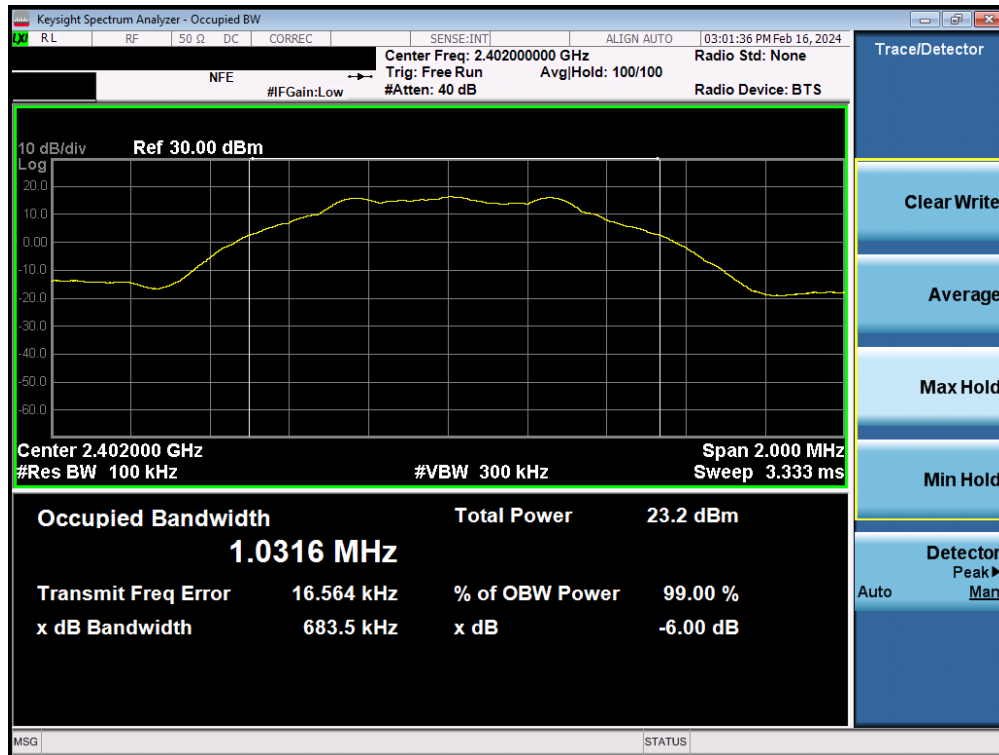


Plot 7-30. 6dB Bandwidth Plot (Bluetooth (LE), 2Mbps – Ch. 36)

FCC ID: C3K2077 IC: 3048A-2077	<b>MEASUREMENT REPORT (CERTIFICATION)</b>		Approved by: Technical Manager
Test Report S/N: 1M2312040120-16.C3K	Test Dates: 12/14/2023 - 03/05/2024	EUT Type: Portable Computing Device	Page 30 of 120

Frequency [MHz]	Data Rate	Channel No.	Bluetooth Mode	Measured Bandwidth [kHz]	Minimum Bandwidth [kHz]	Pass / Fail
2402	1 Mbps	37	LE	683.5	500	Pass
2440	1 Mbps	17	LE	671.9	500	Pass
2480	1 Mbps	39	LE	690.2	500	Pass
2404	2 Mbps	0	LE	1139.4	500	Pass
2440	2 Mbps	17	LE	1140.6	500	Pass
2478	2 Mbps	36	LE	1142.1	500	Pass

Table 7-5. Conducted Bandwidth Measurements – DUAL ANT2



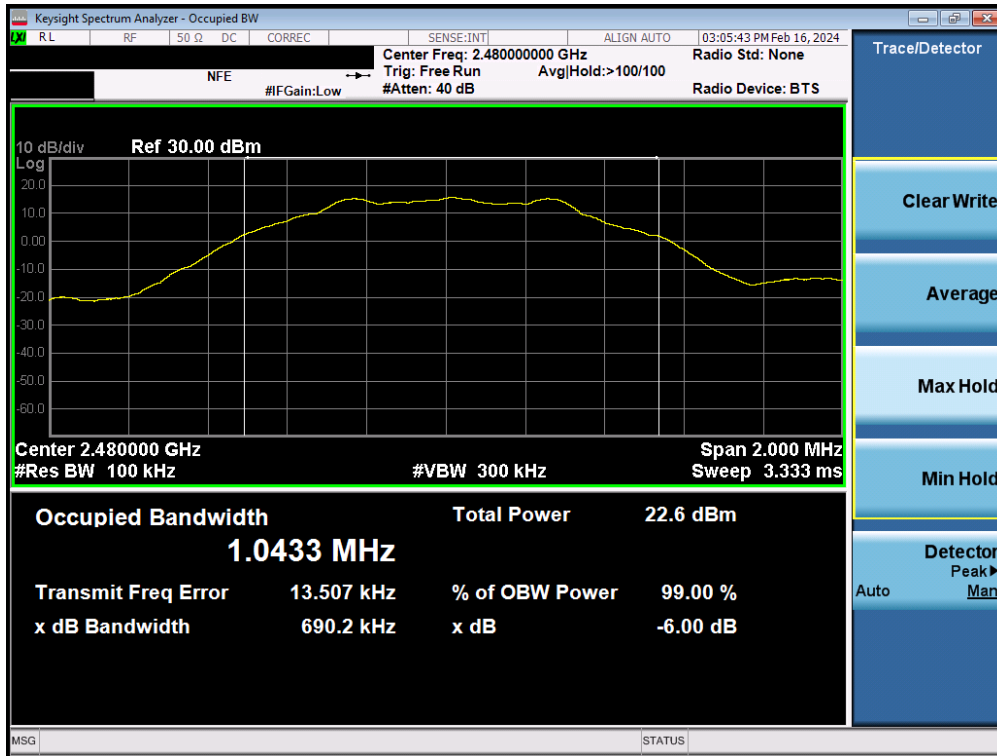
Plot 7-31. 6dB Bandwidth Plot (Bluetooth (LE), 1Mbps – Ch. 37)

FCC ID: C3K2077 IC: 3048A-2077	<b>MEASUREMENT REPORT (CERTIFICATION)</b>		Approved by: Technical Manager
Test Report S/N: 1M2312040120-16.C3K	Test Dates: 12/14/2023 - 03/05/2024	EUT Type: Portable Computing Device	Page 31 of 120





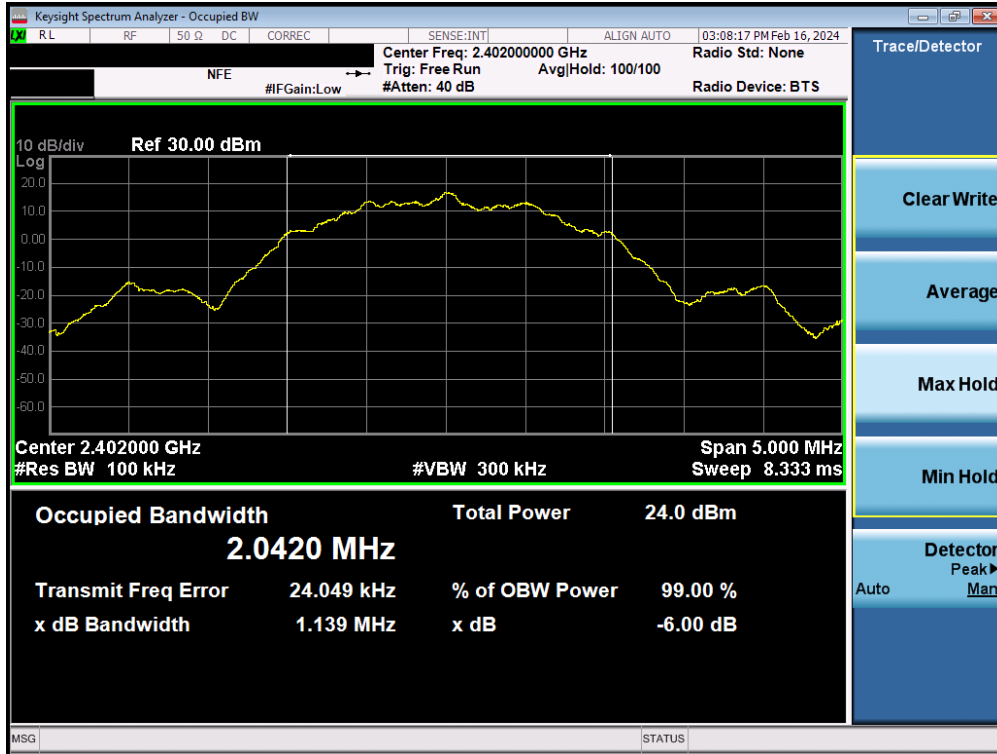
Plot 7-32. 6dB Bandwidth Plot (Bluetooth (LE), 1Mbps – Ch. 17)



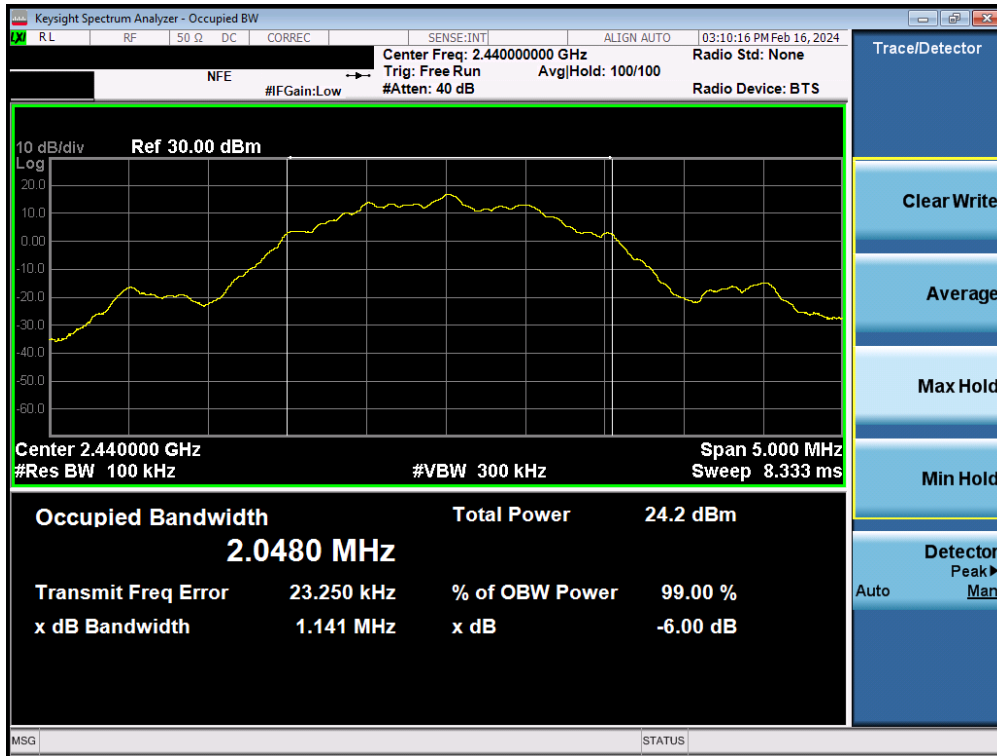
Plot 7-33. 6dB Bandwidth Plot (Bluetooth (LE), 1Mbps – Ch. 39)

FCC ID: C3K2077 IC: 3048A-2077	<b>MEASUREMENT REPORT (CERTIFICATION)</b>		Approved by: Technical Manager
Test Report S/N: 1M2312040120-16.C3K	Test Dates: 12/14/2023 - 03/05/2024	EUT Type: Portable Computing Device	Page 32 of 120



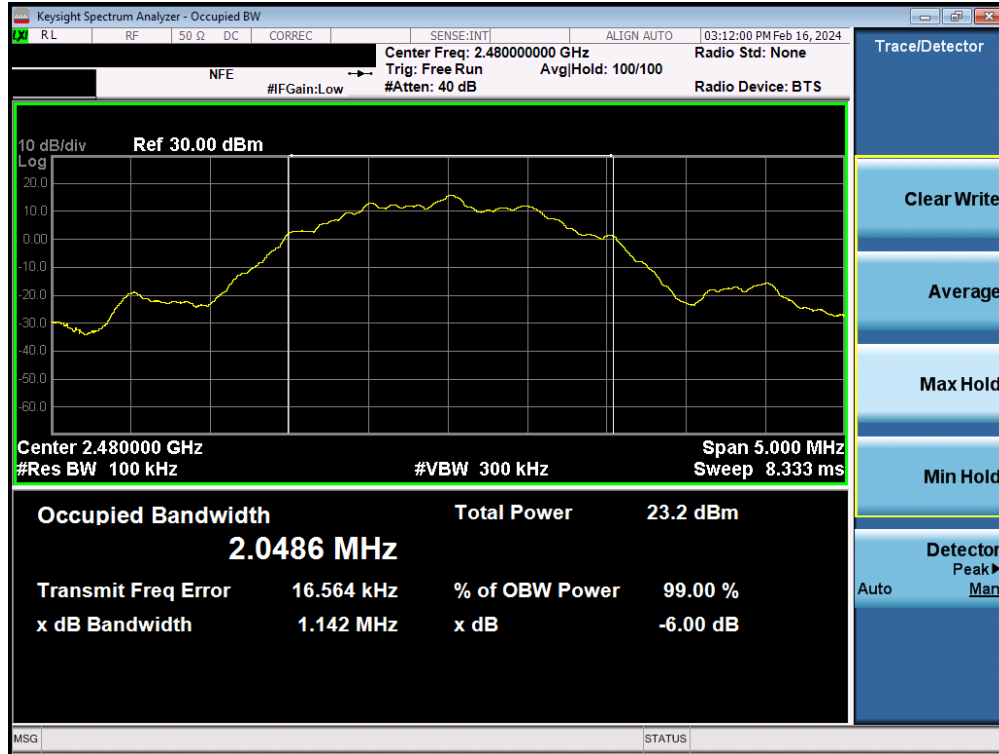


Plot 7-34. 6dB Bandwidth Plot (Bluetooth (LE), 2Mbps – Ch. 0)



Plot 7-35. 6dB Bandwidth Plot (Bluetooth (LE), 2Mbps – Ch. 17)

FCC ID: C3K2077 IC: 3048A-2077	<b>MEASUREMENT REPORT (CERTIFICATION)</b>		Approved by: Technical Manager
Test Report S/N: 1M2312040120-16.C3K	Test Dates: 12/14/2023 - 03/05/2024	EUT Type: Portable Computing Device	Page 33 of 120



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

FCC ID: C3K2077 IC: 3048A-2077	<b>MEASUREMENT REPORT (CERTIFICATION)</b>		Approved by: Technical Manager
Test Report S/N: 1M2312040120-16.C3K	Test Dates: 12/14/2023 - 03/05/2024	EUT Type: Portable Computing Device	Page 34 of 120

### 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

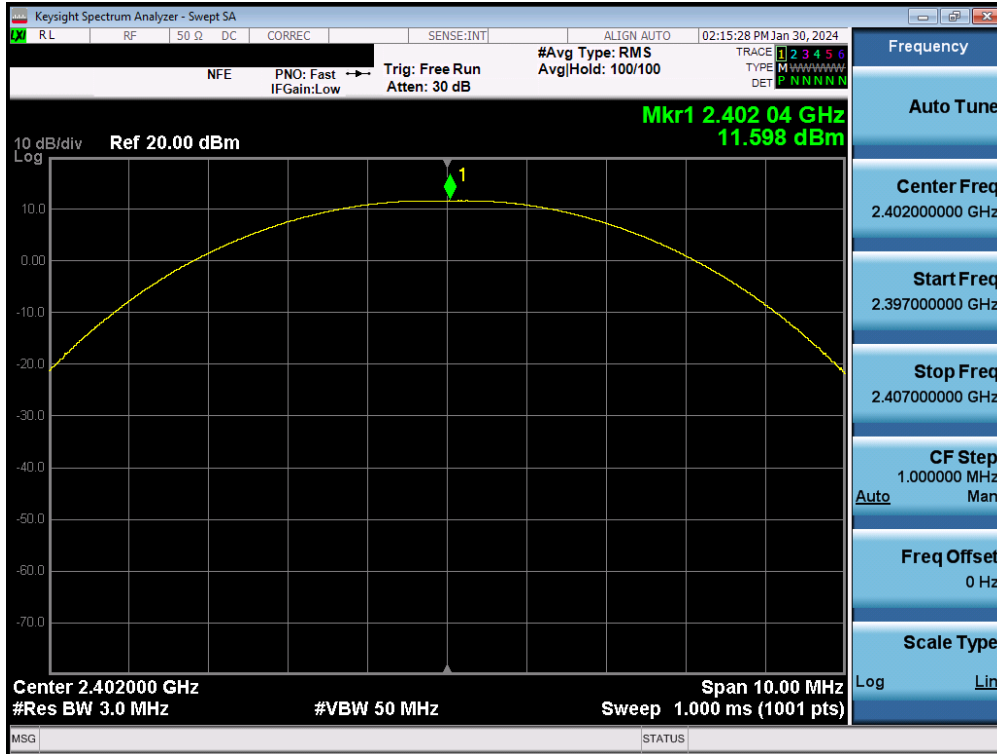
FCC ID: C3K2077 IC: 3048A-2077	<b>MEASUREMENT REPORT (CERTIFICATION)</b>		Approved by: Technical Manager
Test Report S/N: 1M2312040120-16.C3K	Test Dates: 12/14/2023 - 03/05/2024	EUT Type: Portable Computing Device	Page 35 of 120



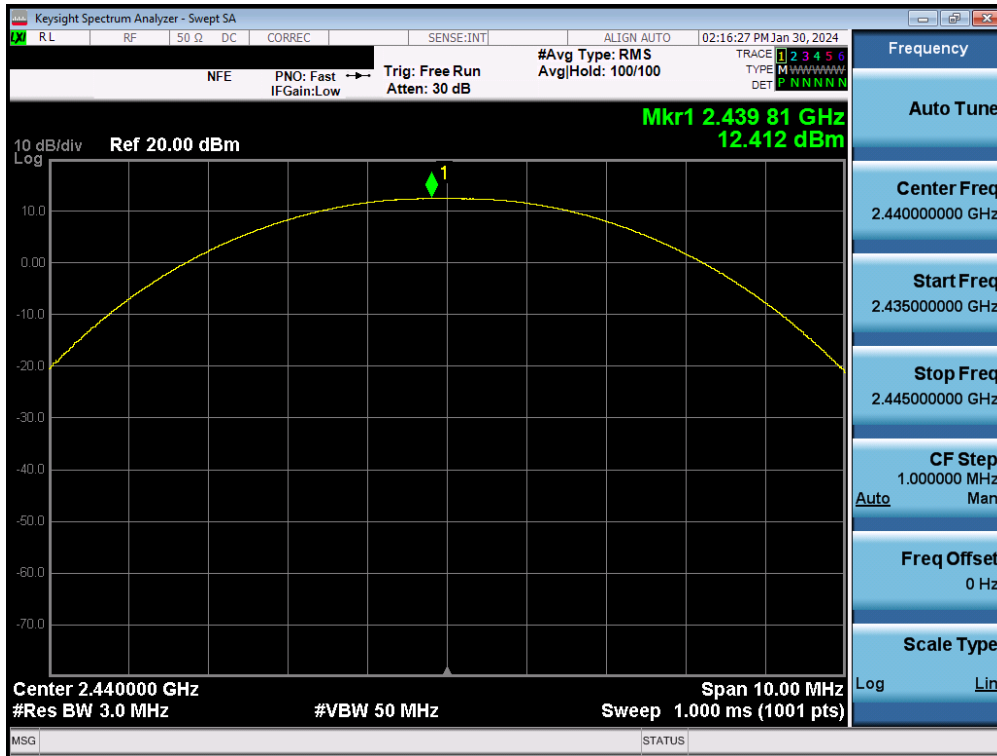
Frequency [MHz]	Data Rate [Mbps]	Channel No.	Bluetooth Mode	Peak Conducted Power		Ant. Gain [dBi]	EIRP	Limit	Margin
				[dBm]	[mW]				
2402	125 kbps	37	LE	11.60	14.448	0.55	12.15	36.02	-23.87
2440	125 kbps	17	LE	12.41	17.430	0.55	12.96	36.02	-23.06
2480	125 kbps	39	LE	11.75	14.969	0.55	12.30	36.02	-23.72
2402	500 kbps	37	LE	11.51	14.148	0.55	12.06	36.02	-23.96
2440	500 kbps	17	LE	12.48	17.693	0.55	13.03	36.02	-22.99
2480	500 kbps	39	LE	11.63	14.555	0.55	12.18	36.02	-23.84
2402	1 Mbps	37	LE	20.57	113.894	0.55	21.12	36.02	-14.91
2440	1 Mbps	17	LE	21.38	137.278	0.55	21.93	36.02	-14.09
2480	1 Mbps	39	LE	20.51	112.409	0.55	21.06	36.02	-14.96
2404	2 Mbps	0	LE	20.67	116.681	0.55	21.22	36.02	-14.80
2440	2 Mbps	17	LE	21.46	139.894	0.55	22.01	36.02	-14.01
2478	2 Mbps	36	LE	20.63	115.718	0.55	21.18	36.02	-14.84

**Table 7-6. Conducted Output Power Measurements (Bluetooth (LE)) – SISO ANT1**

FCC ID: C3K2077 IC: 3048A-2077	<b>MEASUREMENT REPORT (CERTIFICATION)</b>		Approved by: Technical Manager
Test Report S/N: 1M2312040120-16.C3K	Test Dates: 12/14/2023 - 03/05/2024	EUT Type: Portable Computing Device	Page 36 of 120

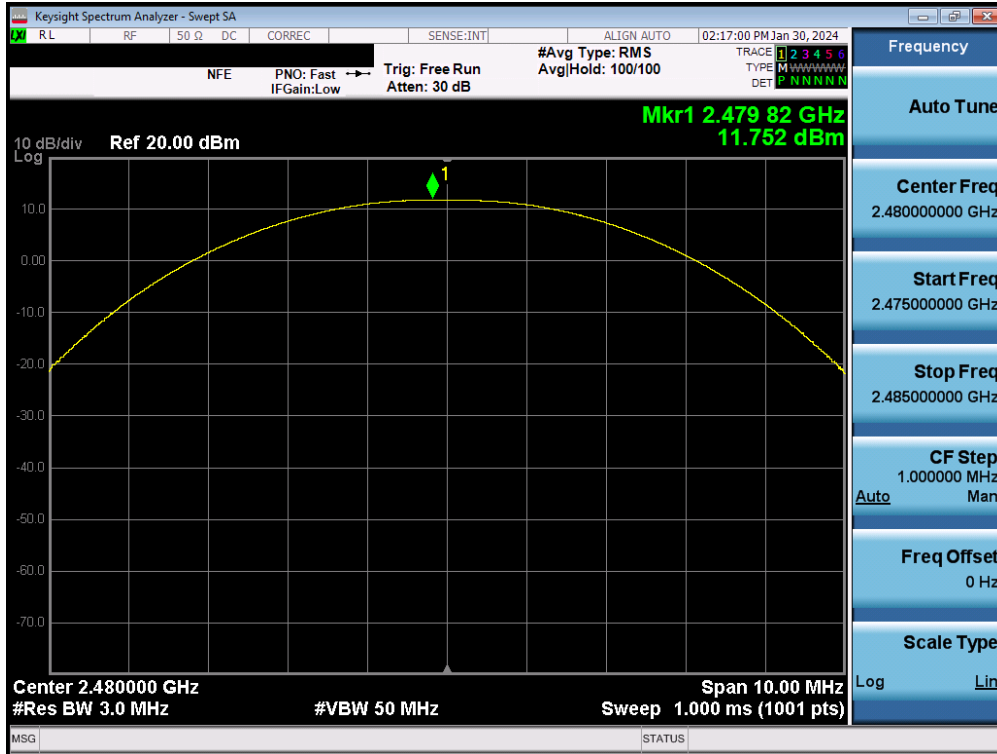


Plot 7-37. Peak Power Plot (Bluetooth (LE), 125kbps – Ch. 37)

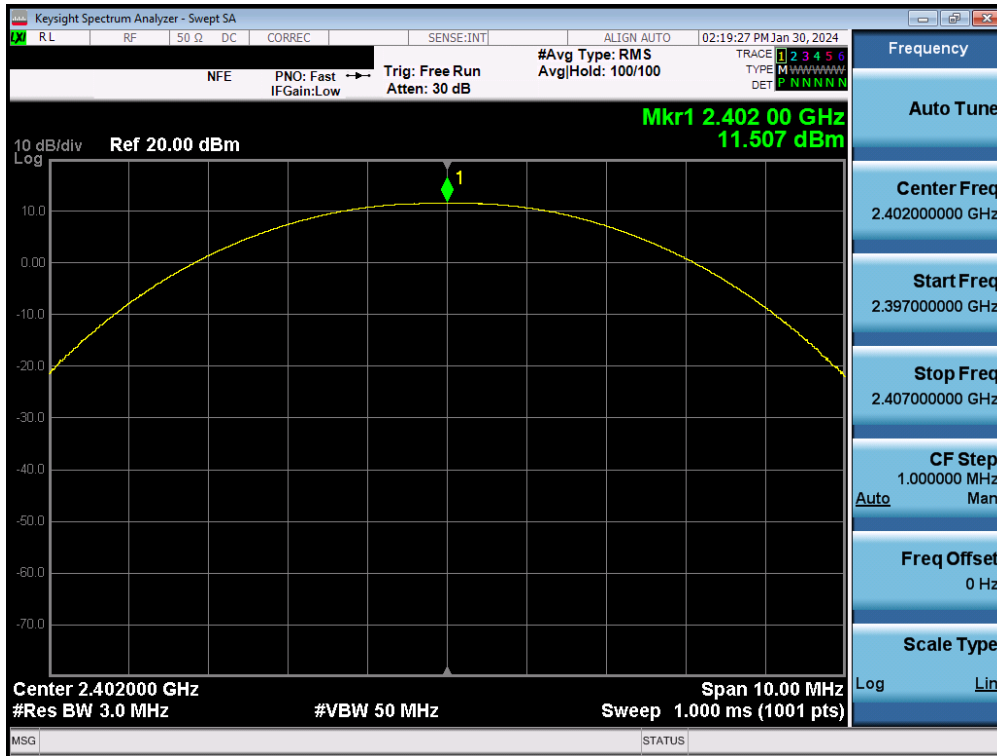


Plot 7-38. Peak Power Plot (Bluetooth (LE), 125kbps – Ch. 17)

FCC ID: C3K2077 IC: 3048A-2077	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2312040120-16.C3K	Test Dates: 12/14/2023 - 03/05/2024	EUT Type: Portable Computing Device	Page 37 of 120

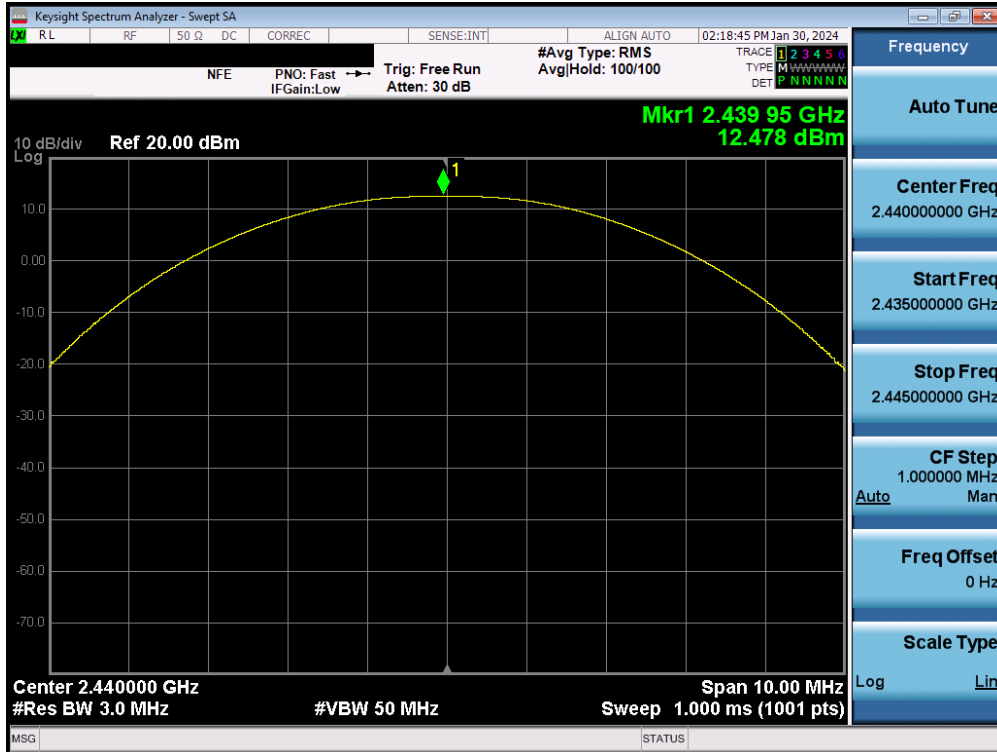


Plot 7-39. Peak Power Plot (Bluetooth (LE), 125kbps – Ch. 39)

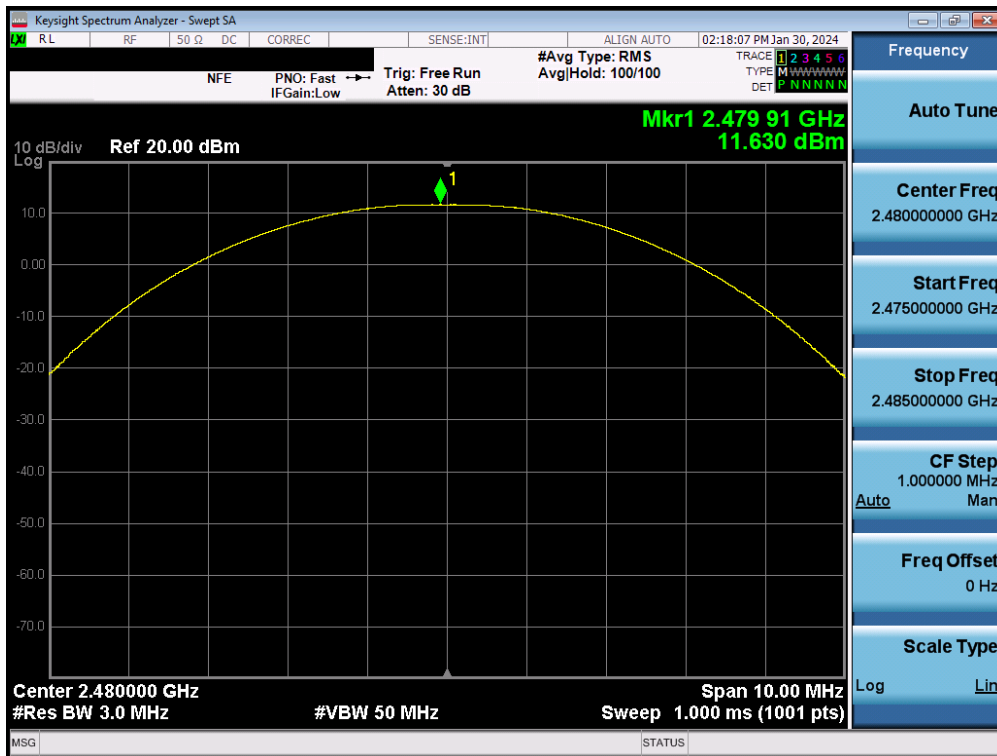


Plot 7-40. Peak Power Plot (Bluetooth (LE), 500kbps – Ch. 37)

FCC ID: C3K2077 IC: 3048A-2077	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2312040120-16.C3K	Test Dates: 12/14/2023 - 03/05/2024	EUT Type: Portable Computing Device	Page 38 of 120

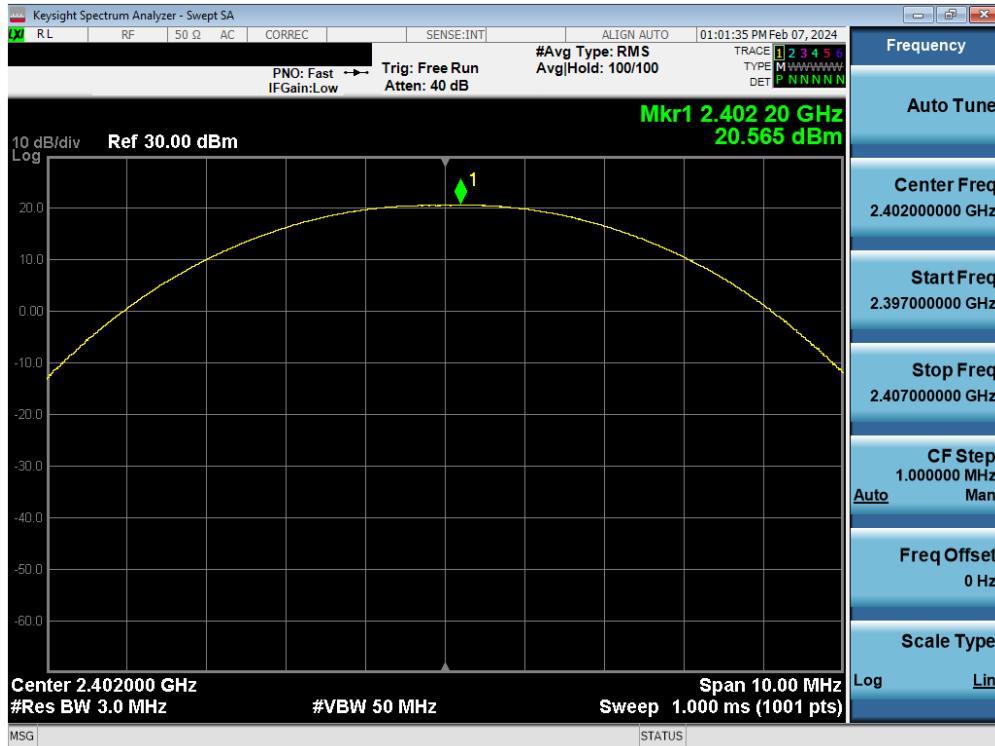


Plot 7-41. Peak Power Plot (Bluetooth (LE), 500kbps – Ch. 17)

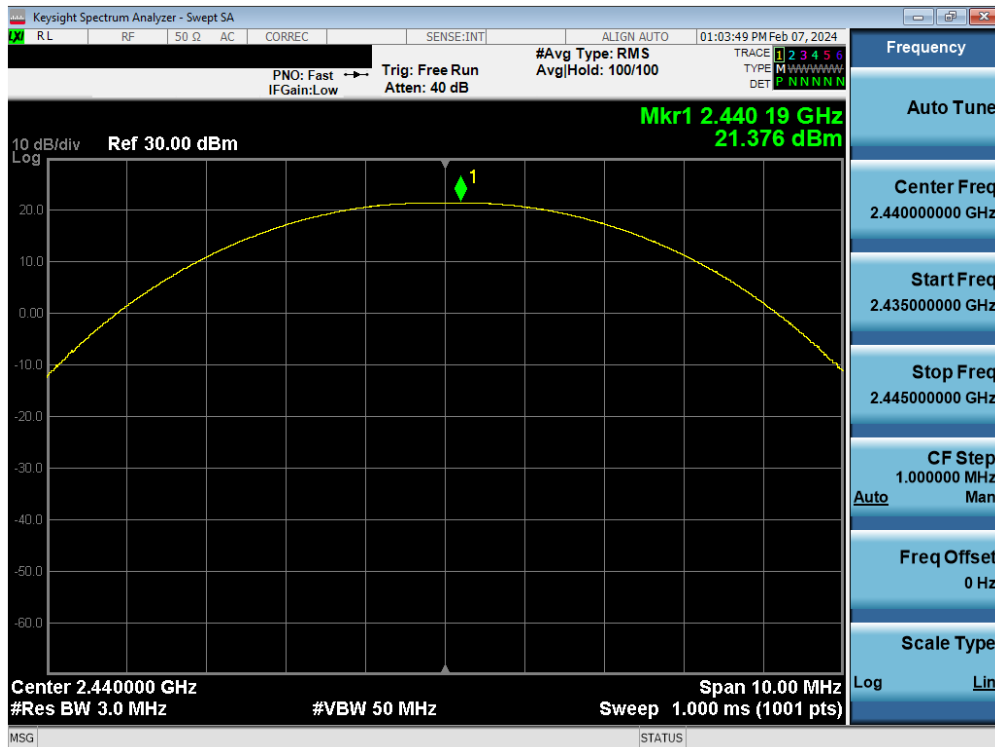


Plot 7-42. Peak Power Plot (Bluetooth (LE), 500kbps – Ch. 39)

FCC ID: C3K2077 IC: 3048A-2077	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2312040120-16.C3K	Test Dates: 12/14/2023 - 03/05/2024	EUT Type: Portable Computing Device	Page 39 of 120



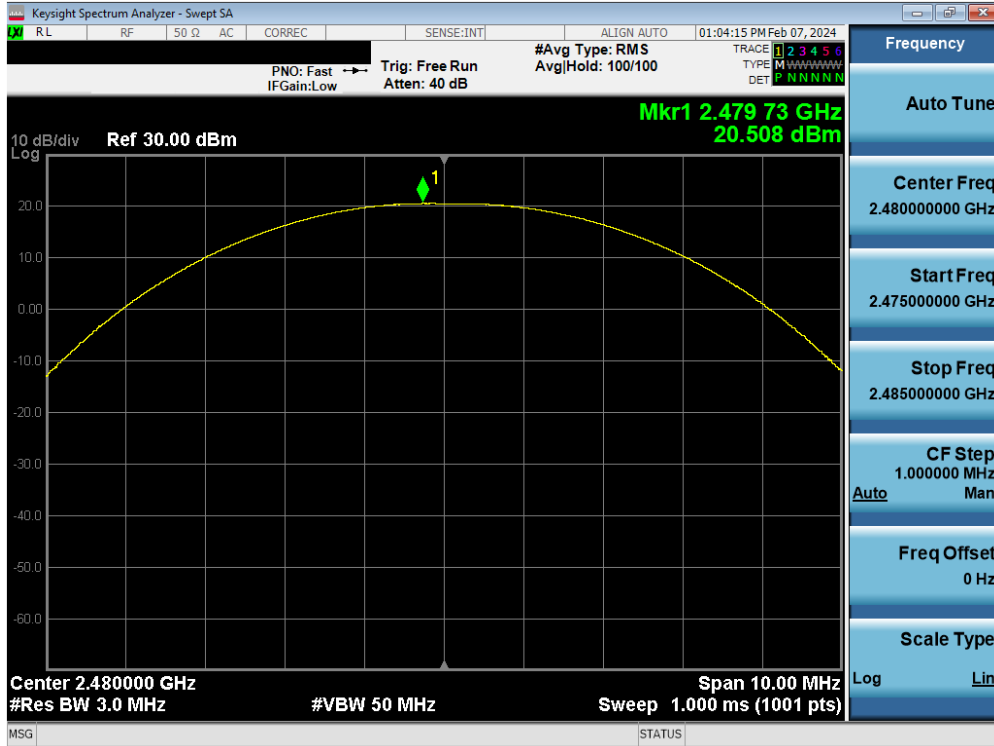
Plot 7-43. Peak Power Plot (Bluetooth (LE), 1Mbps – Ch. 37)



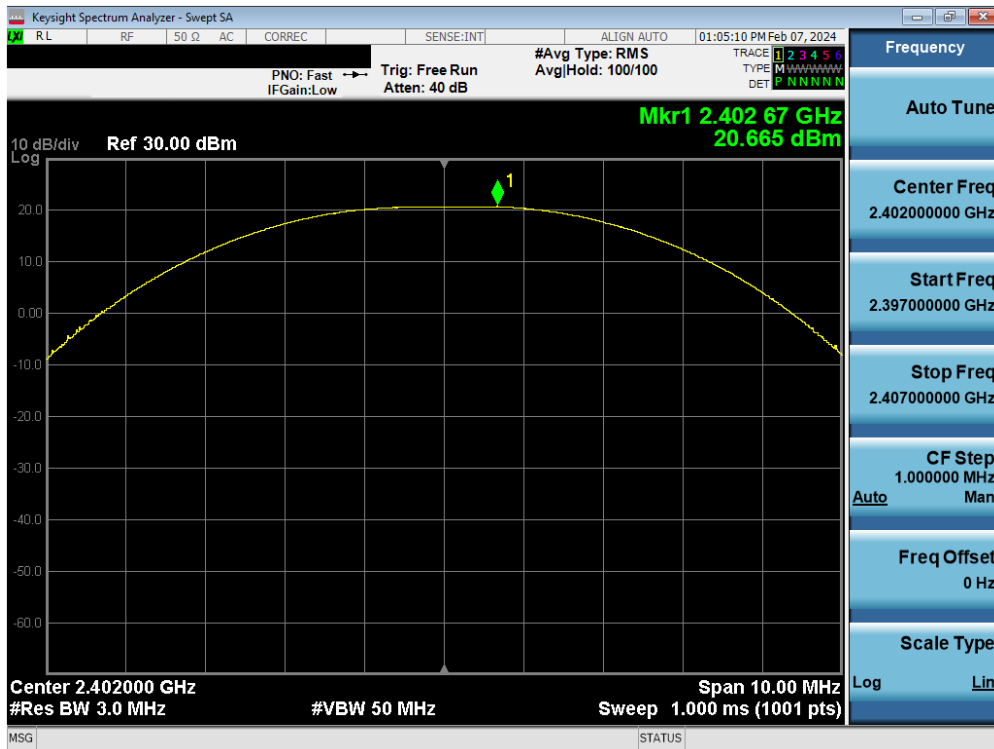
Plot 7-44. Peak Power Plot (Bluetooth (LE), 1Mbps – Ch. 17)

FCC ID: C3K2077 IC: 3048A-2077	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2312040120-16.C3K	Test Dates: 12/14/2023 - 03/05/2024	EUT Type: Portable Computing Device	Page 40 of 120



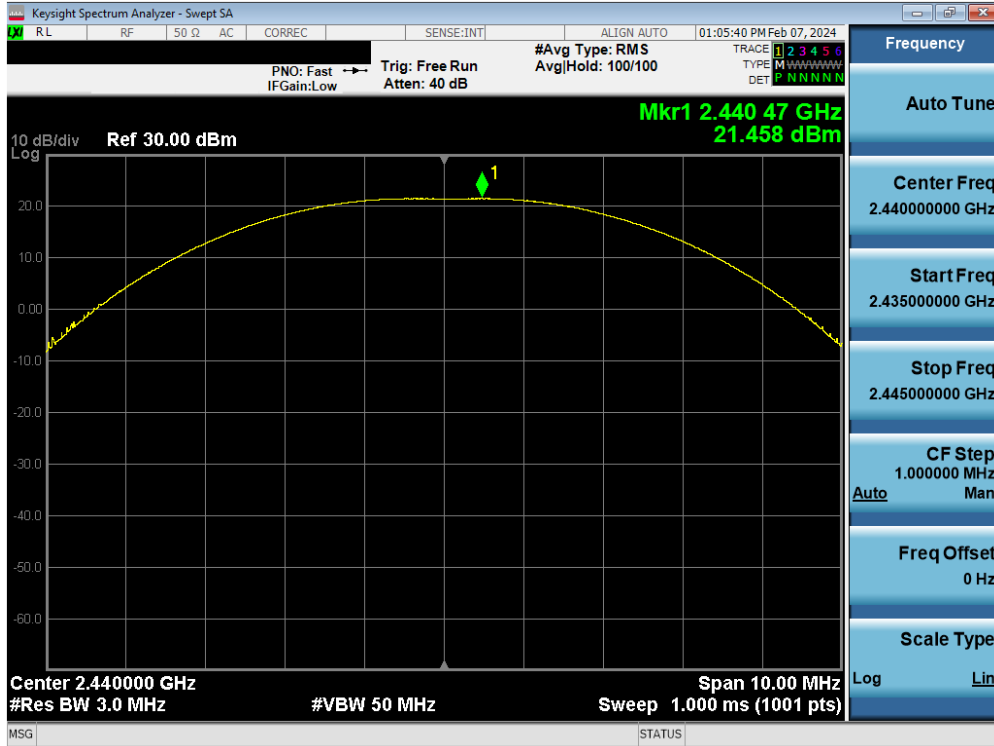


Plot 7-45. Peak Power Plot (Bluetooth (LE), 1Mbps – Ch. 39)

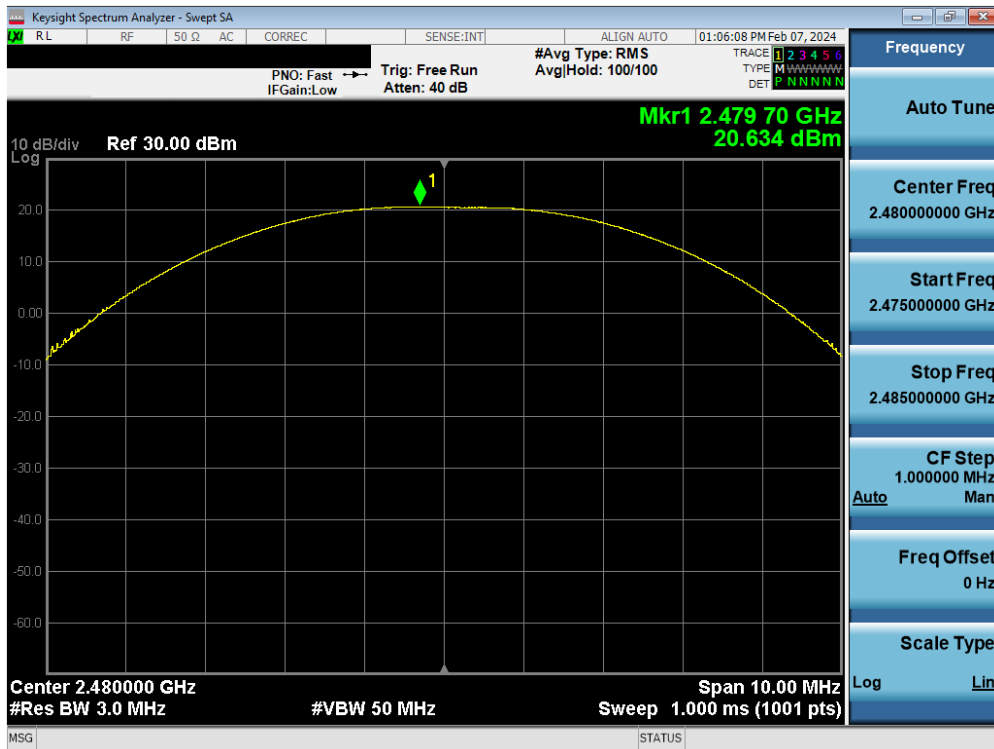


Plot 7-46. Peak Power Plot (Bluetooth (LE), 2Mbps – Ch. 0)

FCC ID: C3K2077 IC: 3048A-2077	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2312040120-16.C3K	Test Dates: 12/14/2023 - 03/05/2024	EUT Type: Portable Computing Device	Page 41 of 120



Plot 7-47. Peak Power Plot (Bluetooth (LE), 2Mbps – Ch. 17)

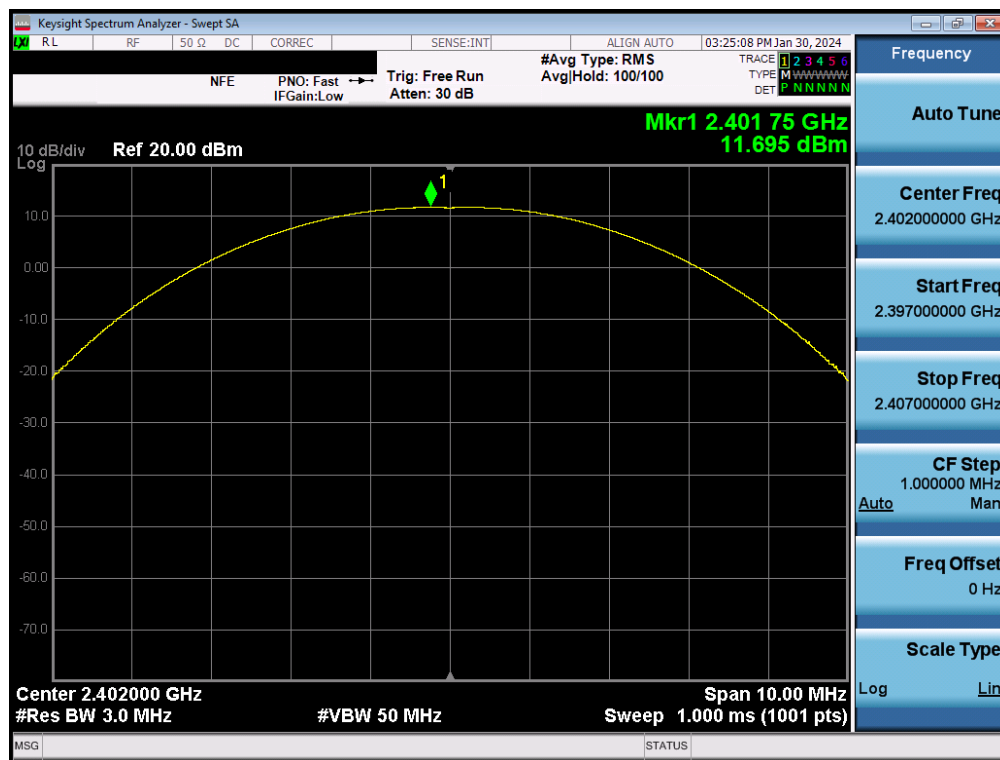


Plot 7-48. Peak Power Plot (Bluetooth (LE), 2Mbps – Ch. 36)

FCC ID: C3K2077 IC: 3048A-2077	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2312040120-16.C3K	Test Dates: 12/14/2023 - 03/05/2024	EUT Type: Portable Computing Device	Page 42 of 120

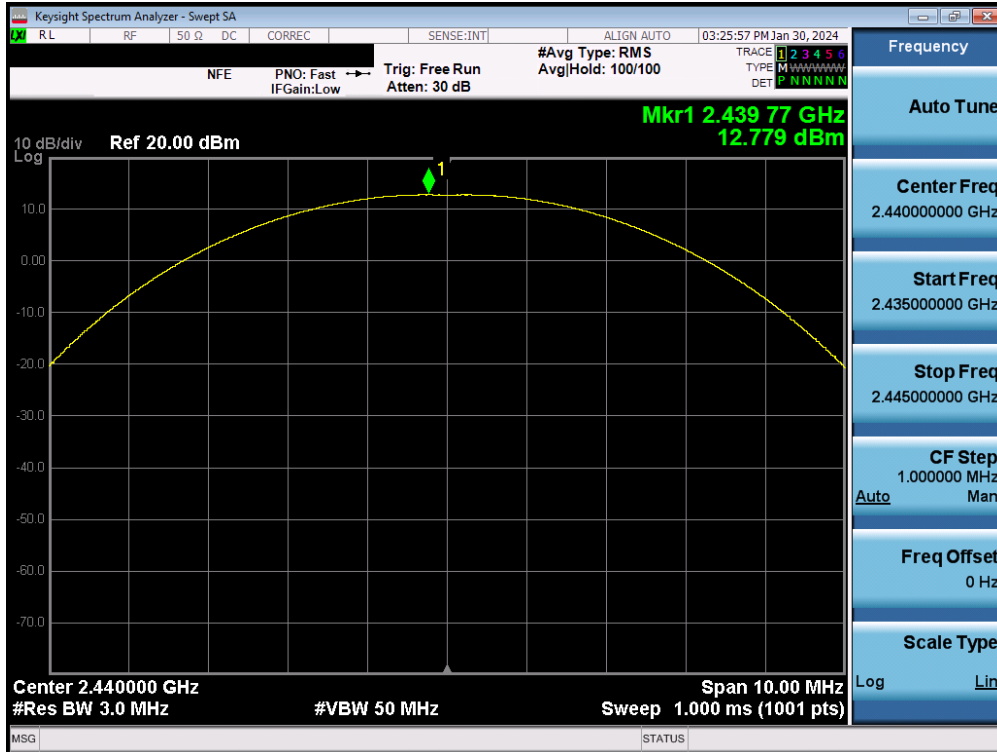
Frequency [MHz]	Data Rate [Mbps]	Channel No.	Bluetooth Mode	Peak Conducted Power		Ant. Gain [dBi]	EIRP	Limit	Margin
				[dBm]	[mW]				
2402	125 kbps	37	LE	11.70	14.774	0.14	11.84	36.02	-24.19
2440	125 kbps	17	LE	12.78	18.963	0.14	12.92	36.02	-23.10
2480	125 kbps	39	LE	11.96	15.711	0.14	12.10	36.02	-23.92
2402	500 kbps	37	LE	11.73	14.880	0.14	11.87	36.02	-24.15
2440	500 kbps	17	LE	12.85	19.262	0.14	12.99	36.02	-23.03
2480	500 kbps	39	LE	12.00	15.849	0.14	12.14	36.02	-23.88
2402	1 Mbps	37	LE	20.28	106.758	0.14	20.42	36.02	-15.60
2440	1 Mbps	17	LE	21.08	128.086	0.14	21.22	36.02	-14.81
2480	1 Mbps	39	LE	20.49	111.892	0.14	20.63	36.02	-15.39
2404	2 Mbps	0	LE	20.10	102.235	0.14	20.24	36.02	-15.78
2440	2 Mbps	17	LE	21.20	131.856	0.14	21.34	36.02	-14.68
2478	2 Mbps	36	LE	20.64	115.958	0.14	20.78	36.02	-15.24

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

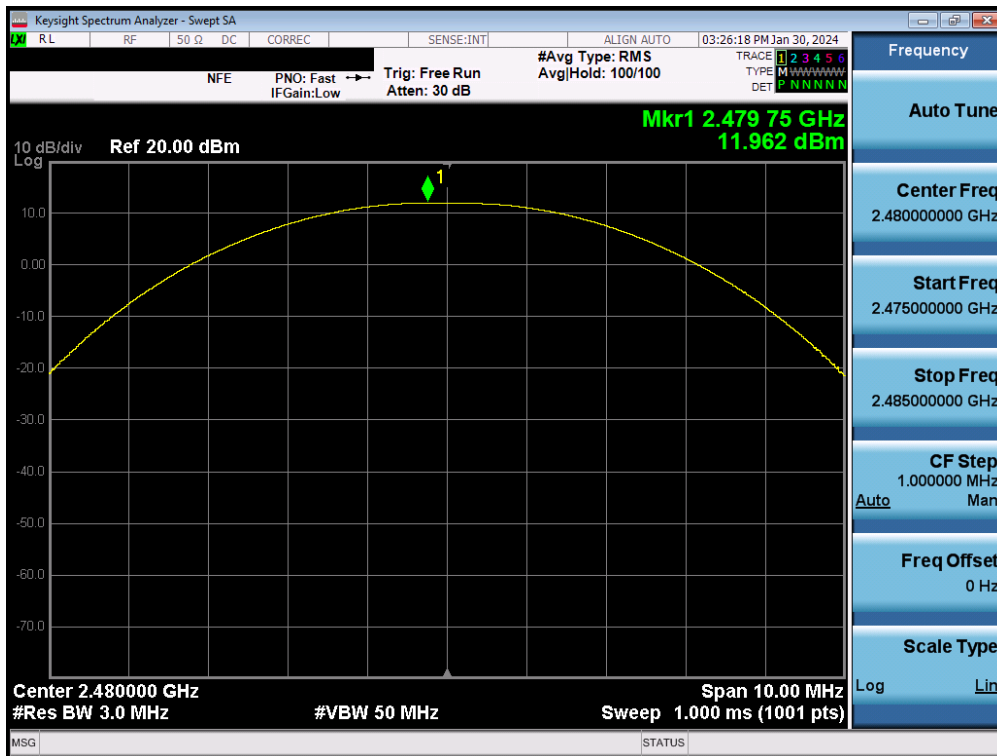


**Plot 7-49. Peak Power Plot (Bluetooth (LE), 125kbps – Ch. 37)**

FCC ID: C3K2077 IC: 3048A-2077	<b>MEASUREMENT REPORT (CERTIFICATION)</b>		Approved by: Technical Manager
Test Report S/N: 1M2312040120-16.C3K	Test Dates: 12/14/2023 - 03/05/2024	EUT Type: Portable Computing Device	Page 43 of 120

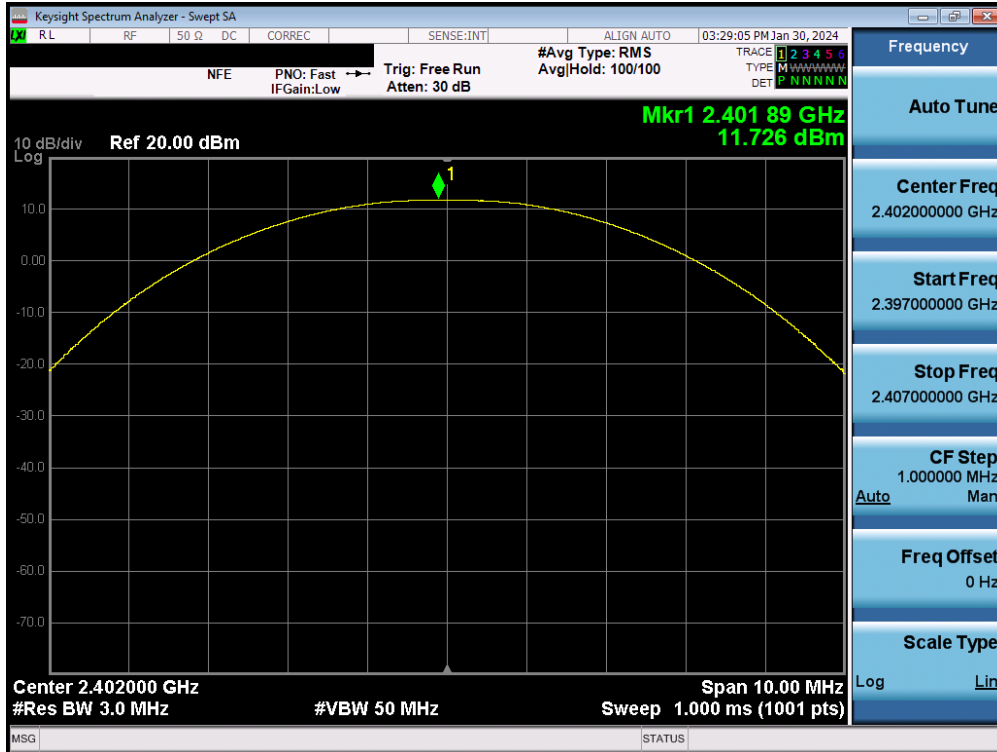


Plot 7-50. Peak Power Plot (Bluetooth (LE), 125kbps – Ch. 17)

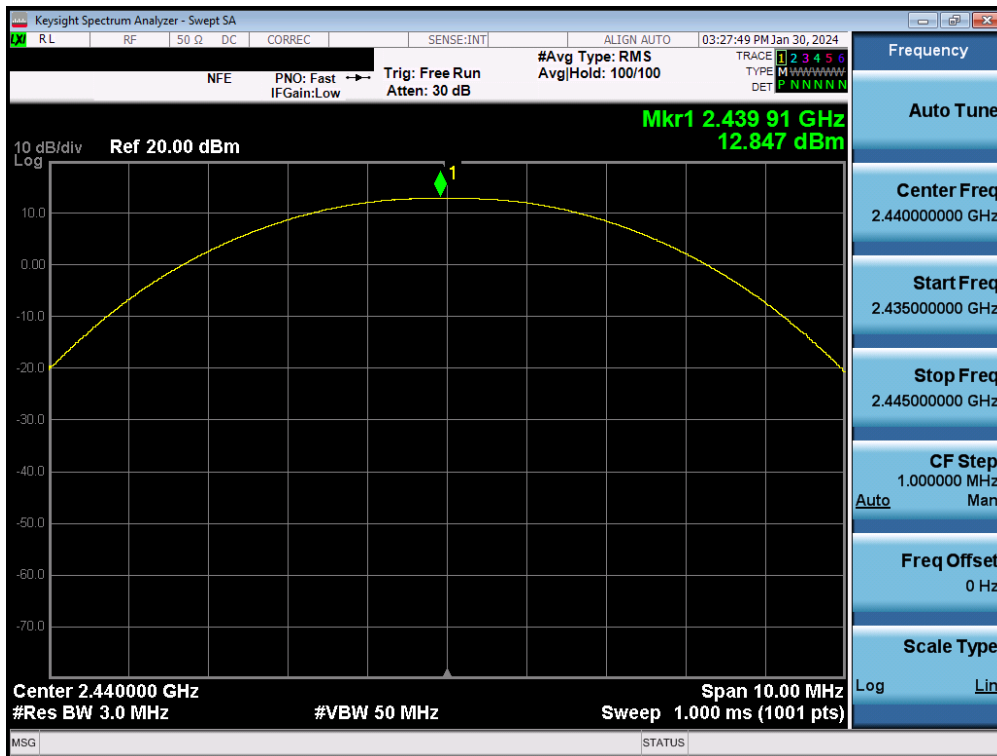


Plot 7-51. Peak Power Plot (Bluetooth (LE), 125kbps – Ch. 39)

FCC ID: C3K2077 IC: 3048A-2077	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2312040120-16.C3K	Test Dates: 12/14/2023 - 03/05/2024	EUT Type: Portable Computing Device	Page 44 of 120

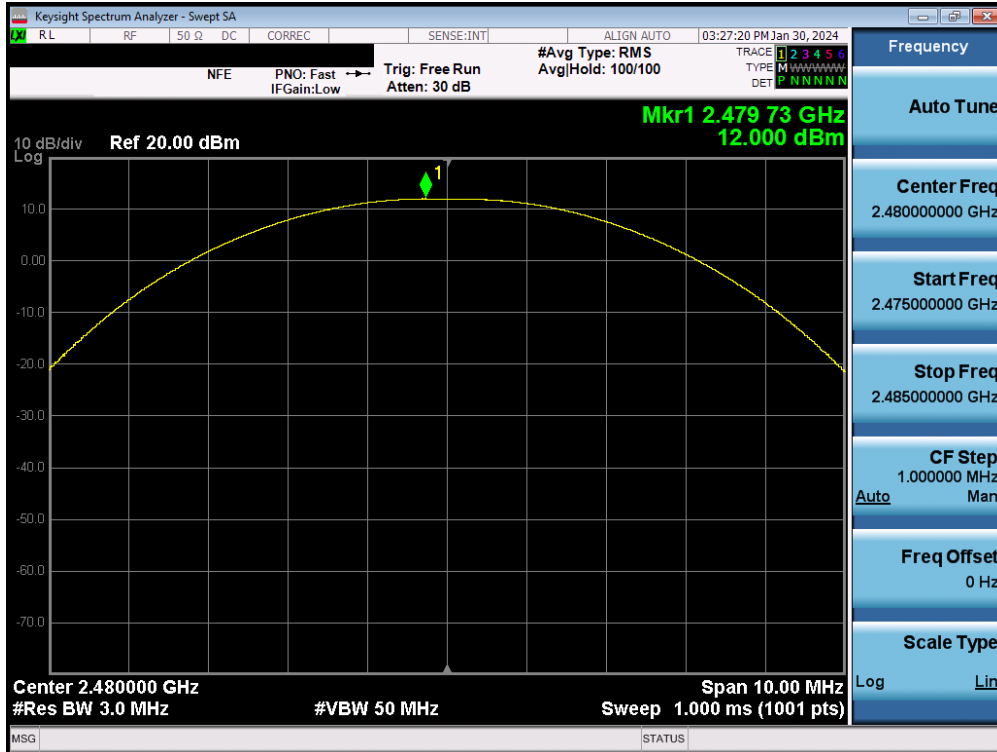


Plot 7-52. Peak Power Plot (Bluetooth (LE), 500kbps – Ch. 37)

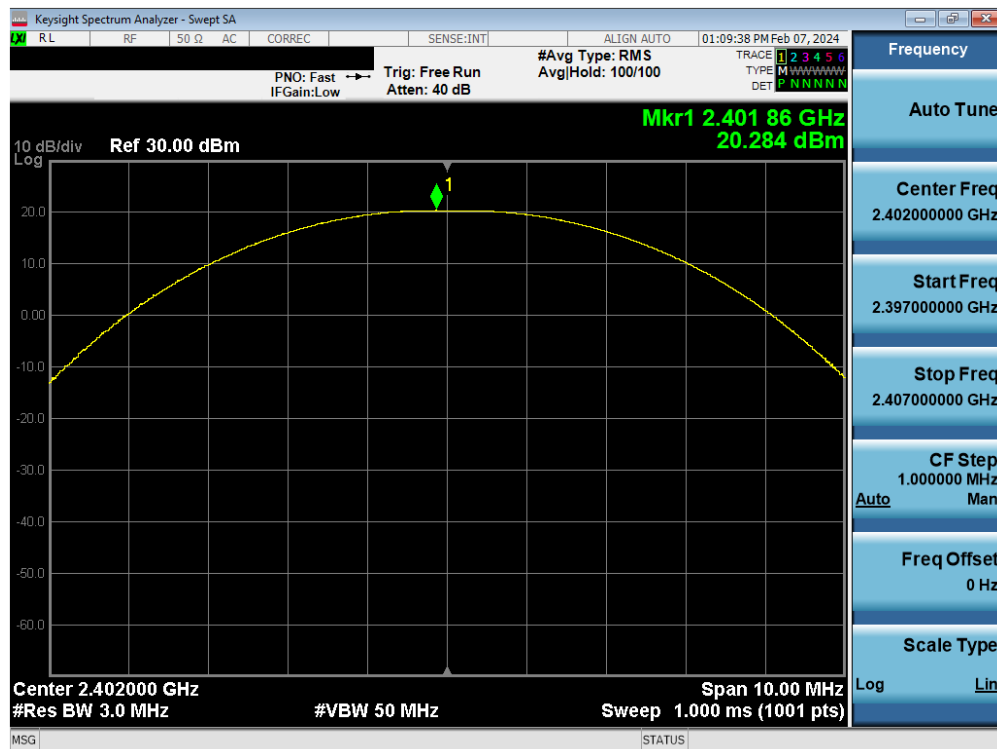


Plot 7-53. Peak Power Plot (Bluetooth (LE), 500kbps – Ch. 17)

FCC ID: C3K2077 IC: 3048A-2077	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2312040120-16.C3K	Test Dates: 12/14/2023 - 03/05/2024	EUT Type: Portable Computing Device	Page 45 of 120

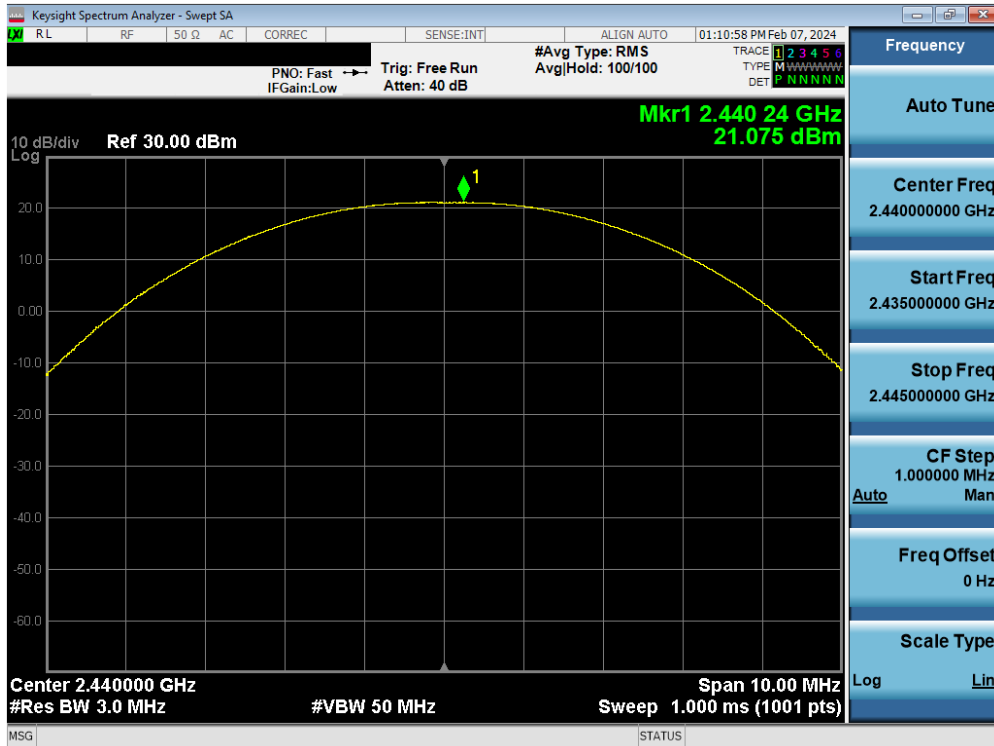


Plot 7-54. Peak Power Plot (Bluetooth (LE), 500kbps – Ch. 39)

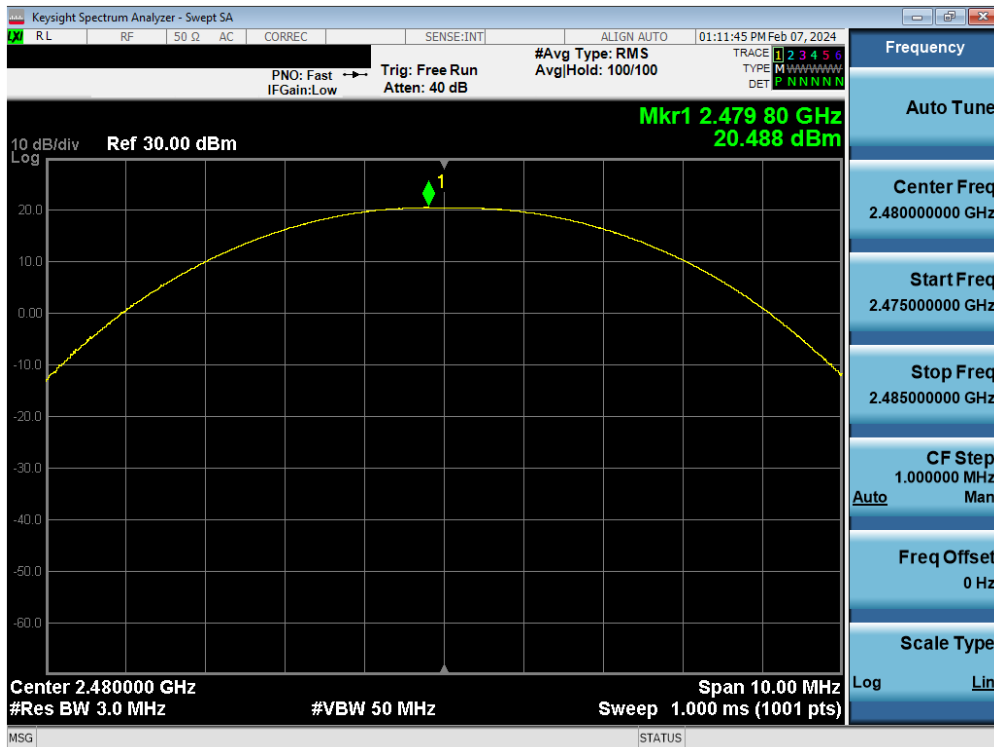


Plot 7-55. Peak Power Plot (Bluetooth (LE), 1Mbps – Ch. 37)

FCC ID: C3K2077 IC: 3048A-2077	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2312040120-16.C3K	Test Dates: 12/14/2023 - 03/05/2024	EUT Type: Portable Computing Device	Page 46 of 120

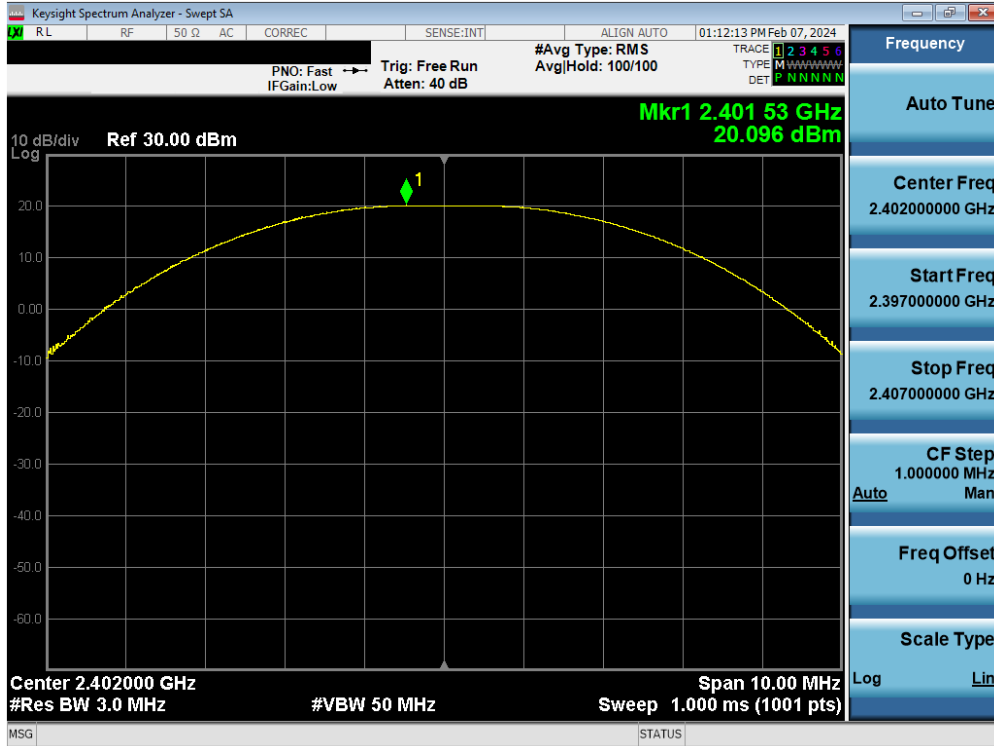


Plot 7-56. Peak Power Plot (Bluetooth (LE), 1Mbps – Ch. 17)

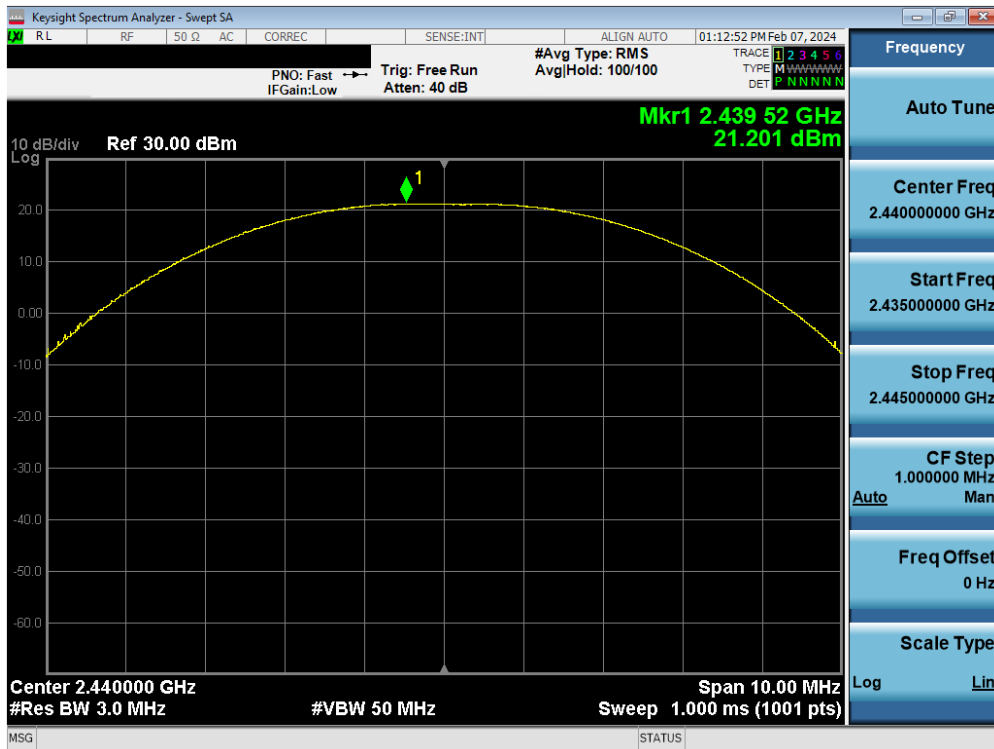


Plot 7-57. Peak Power Plot (Bluetooth (LE), 1Mbps – Ch. 39)

FCC ID: C3K2077 IC: 3048A-2077	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2312040120-16.C3K	Test Dates: 12/14/2023 - 03/05/2024	EUT Type: Portable Computing Device	Page 47 of 120



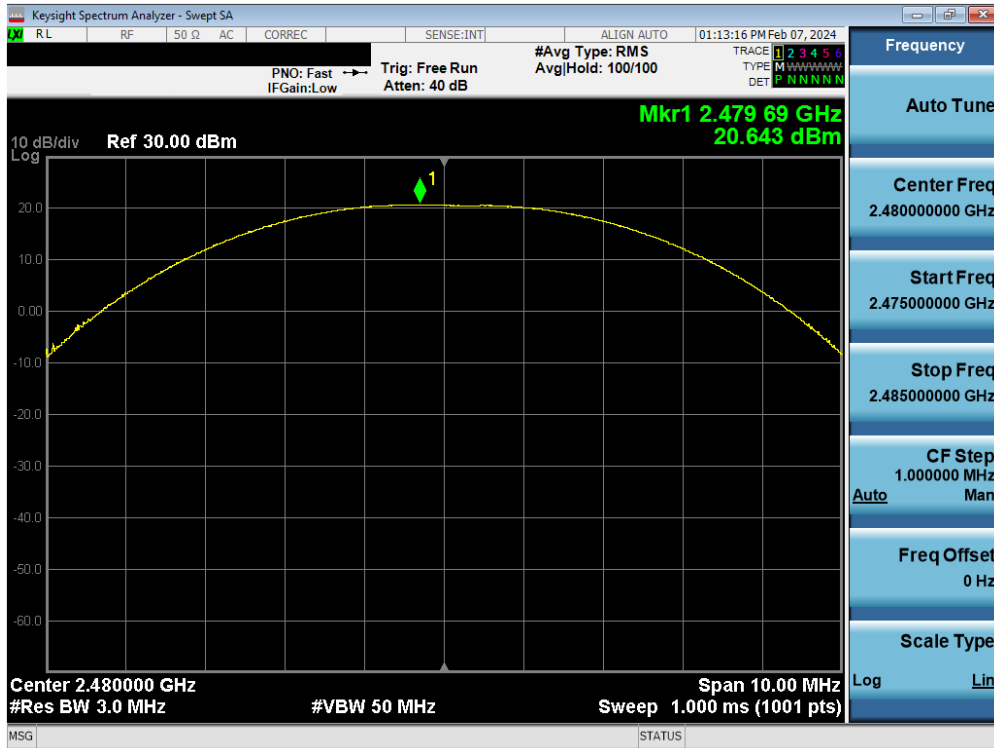
Plot 7-58. Peak Power Plot (Bluetooth (LE), 2Mbps – Ch. 0)



Plot 7-59. Peak Power Plot (Bluetooth (LE), 2Mbps – Ch. 17)

FCC ID: C3K2077 IC: 3048A-2077	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2312040120-16.C3K	Test Dates: 12/14/2023 - 03/05/2024	EUT Type: Portable Computing Device	Page 48 of 120





Plot 7-60. Peak Power Plot (Bluetooth (LE), 2Mbps – Ch. 36)

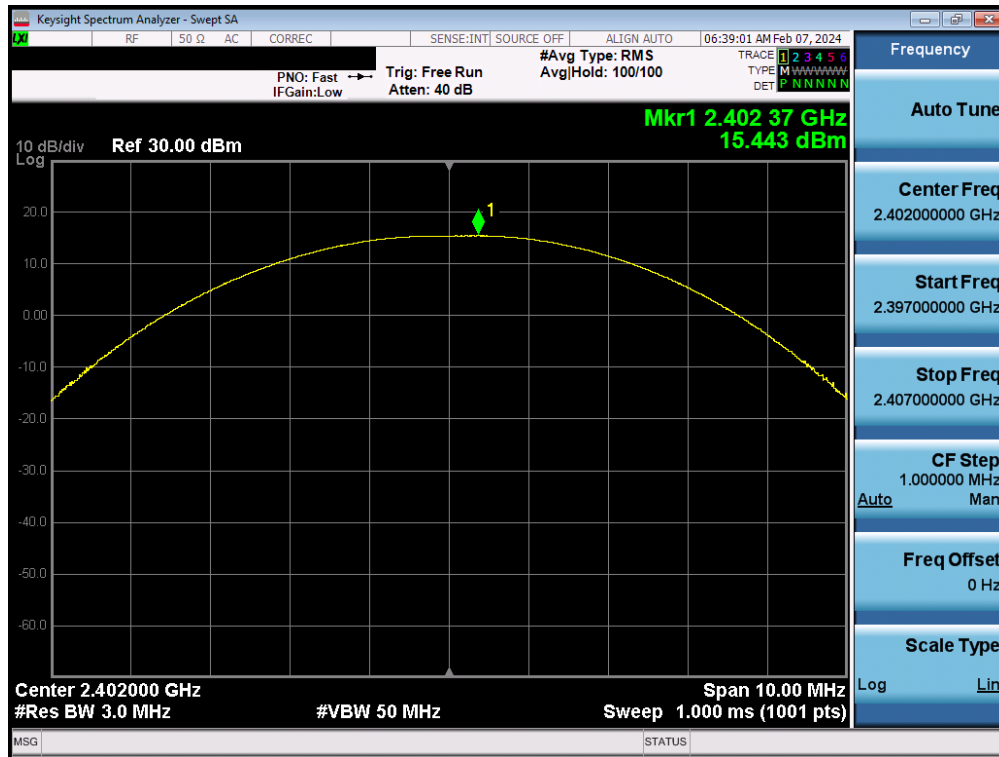
FCC ID: C3K2077 IC: 3048A-2077	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2312040120-16.C3K	Test Dates: 12/14/2023 - 03/05/2024	EUT Type: Portable Computing Device	Page 49 of 120



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	15.44	35.019	14.91	30.946	18.19	36.45	3.36	21.55	36.02	-14.47
2440	1 Mbps	17	LE	16.09	40.682	15.97	39.546	19.04	43.16	3.36	22.40	36.02	-13.62
2480	1 Mbps	39	LE	15.26	33.535	15.23	33.312	18.25	36.44	3.36	21.61	36.02	-14.41
2404	2 Mbps	0	LE	15.58	36.149	15.02	31.761	18.32	37.50	3.36	21.68	36.02	-14.34
2440	2 Mbps	17	LE	16.14	41.124	15.80	38.028	18.98	42.86	3.36	22.34	36.02	-13.68
2478	2 Mbps	36	LE	15.34	34.198	15.31	33.963	18.34	37.09	3.36	21.70	36.02	-14.33

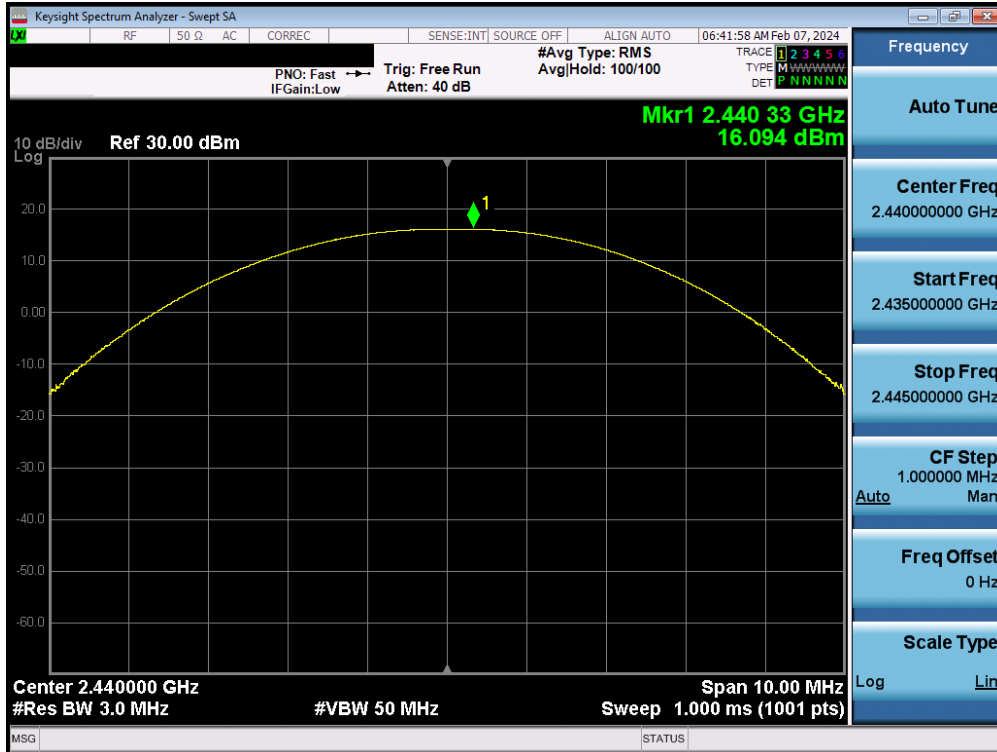
Table 7-8. Conducted Output Power Measurements (Bluetooth (LE)) – DUAL

DUAL ANT1

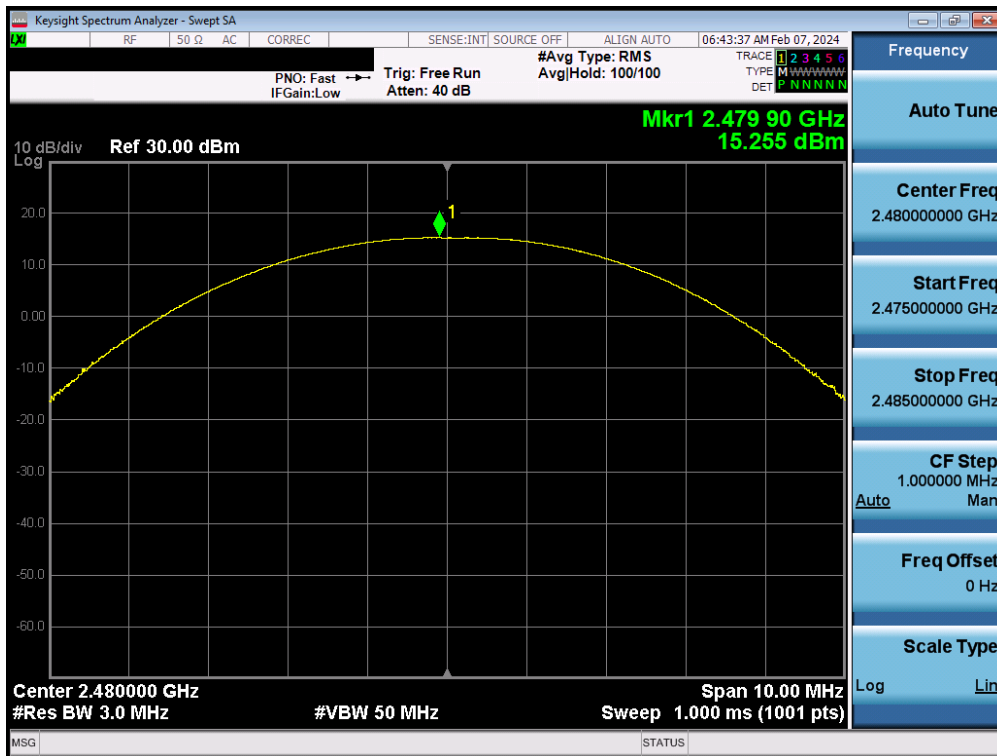


Plot 7-61. Peak Power Plot (Bluetooth (LE), 1Mbps – Ch. 37)

FCC ID: C3K2077 IC: 3048A-2077	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2312040120-16.C3K	Test Dates: 12/14/2023 - 03/05/2024	EUT Type: Portable Computing Device	Page 50 of 120

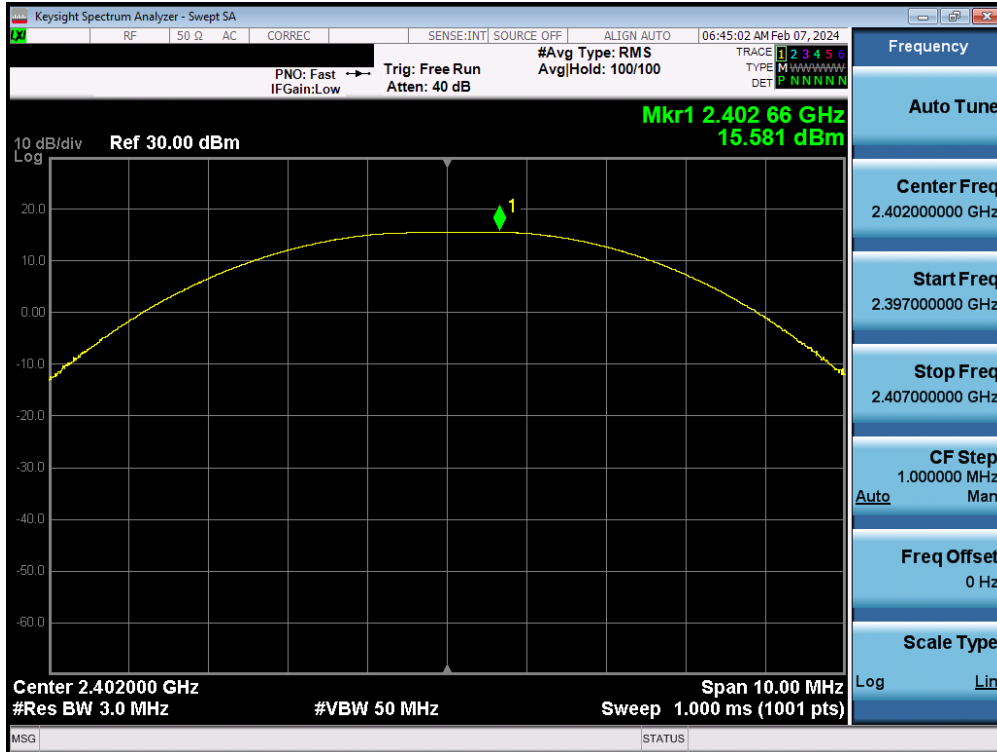


Plot 7-62. Peak Power Plot (Bluetooth (LE), 1Mbps – Ch. 17)

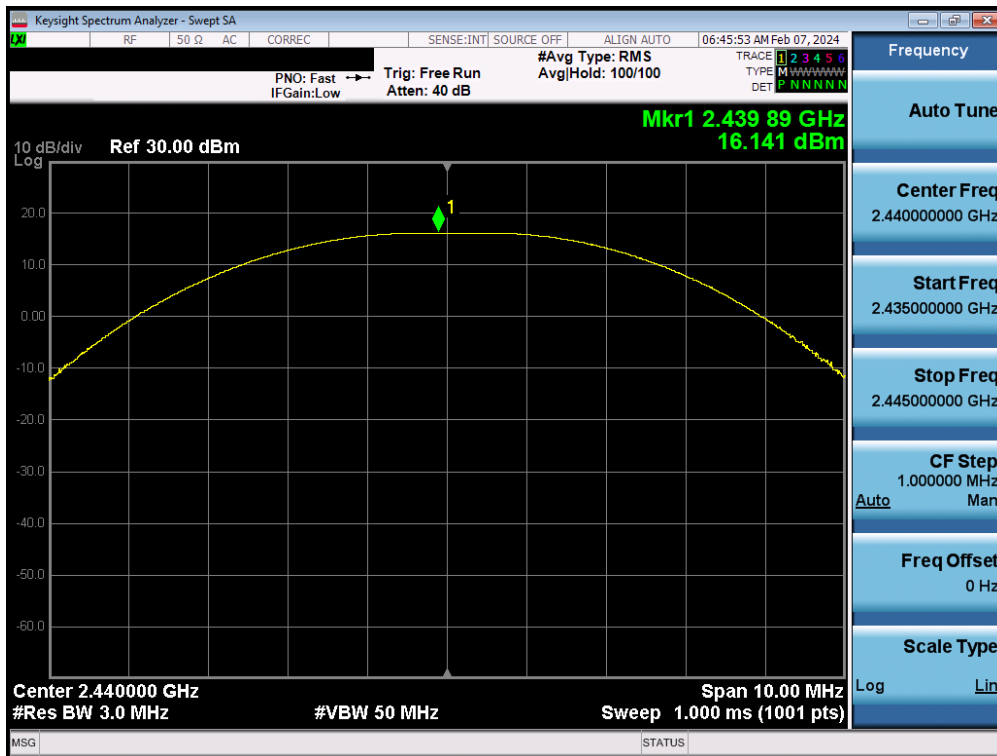


Plot 7-63. Peak Power Plot (Bluetooth (LE), 1Mbps – Ch. 39)

FCC ID: C3K2077 IC: 3048A-2077	<b>MEASUREMENT REPORT (CERTIFICATION)</b>		Approved by: Technical Manager
Test Report S/N: 1M2312040120-16.C3K	Test Dates: 12/14/2023 - 03/05/2024	EUT Type: Portable Computing Device	Page 51 of 120

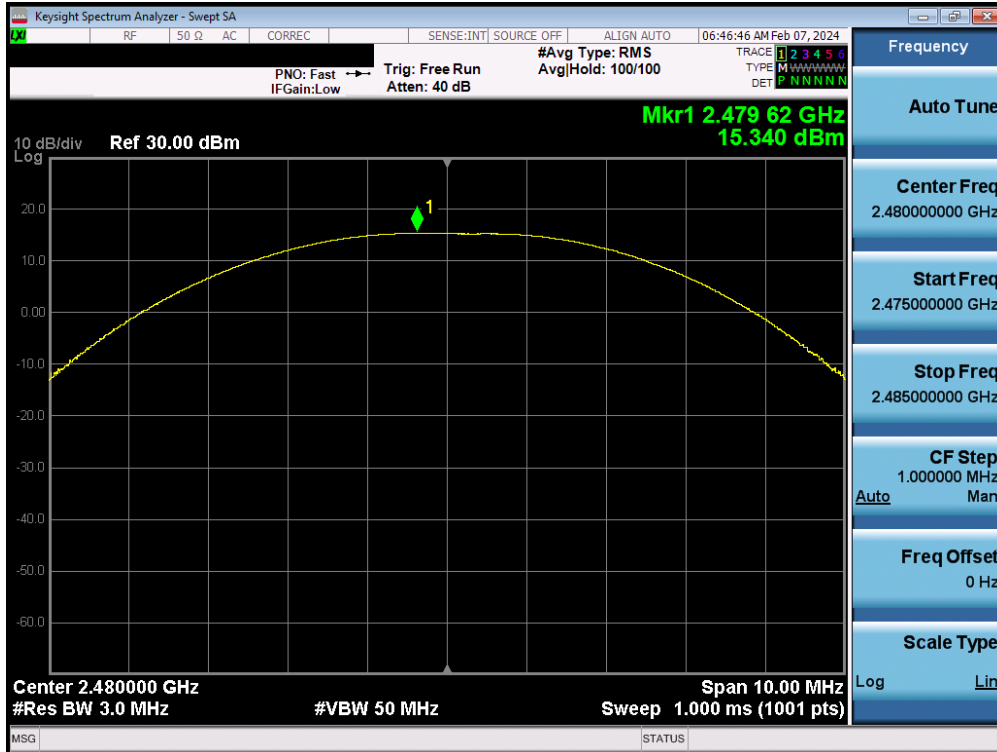


Plot 7-64. Peak Power Plot (Bluetooth (LE), 2Mbps – Ch. 0)



Plot 7-65. Peak Power Plot (Bluetooth (LE), 2Mbps – Ch. 17)

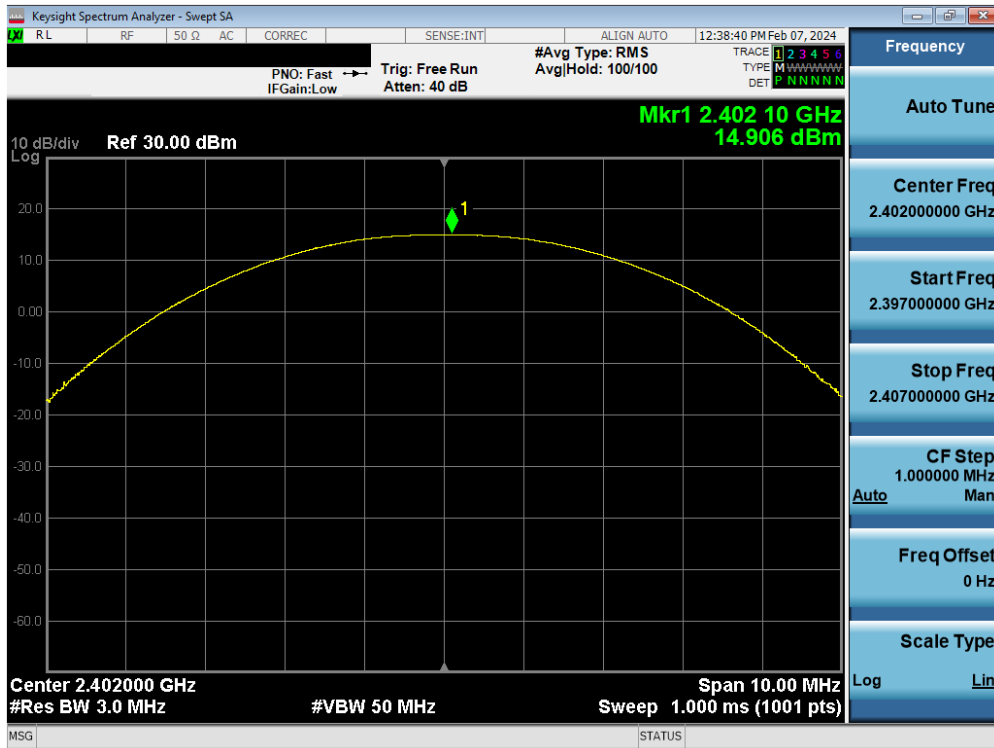
FCC ID: C3K2077 IC: 3048A-2077	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2312040120-16.C3K	Test Dates: 12/14/2023 - 03/05/2024	EUT Type: Portable Computing Device	Page 52 of 120



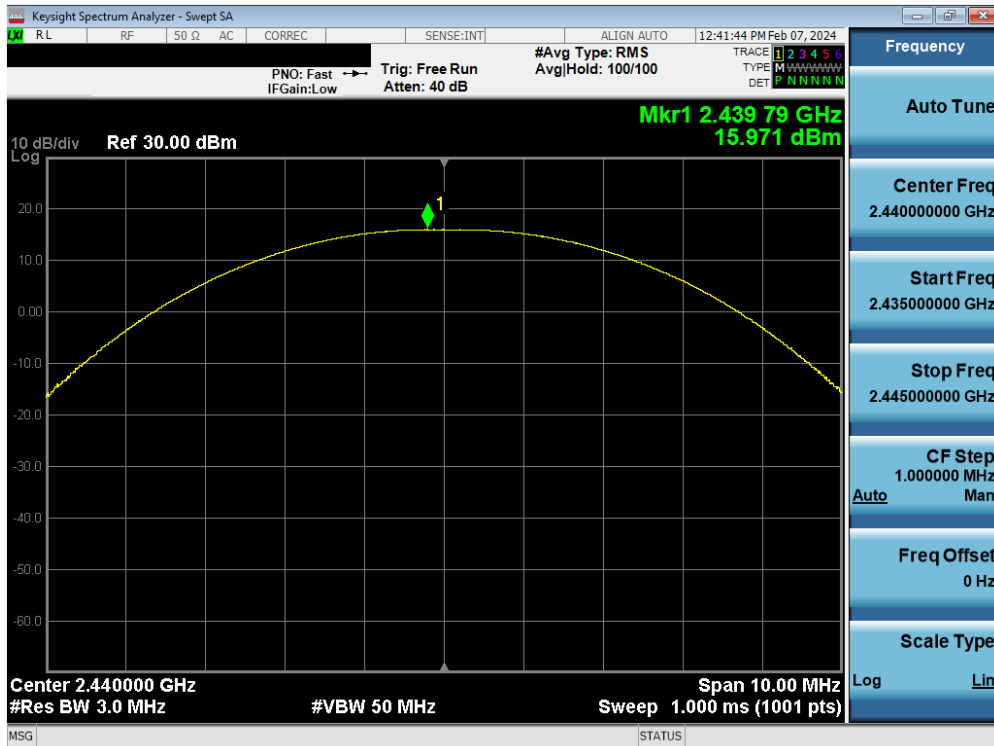
Plot 7-66. Peak Power Plot (Bluetooth (LE), 2Mbps – Ch. 36)

FCC ID: C3K2077 IC: 3048A-2077	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2312040120-16.C3K	Test Dates: 12/14/2023 - 03/05/2024	EUT Type: Portable Computing Device	Page 53 of 120

## DUAL ANT2

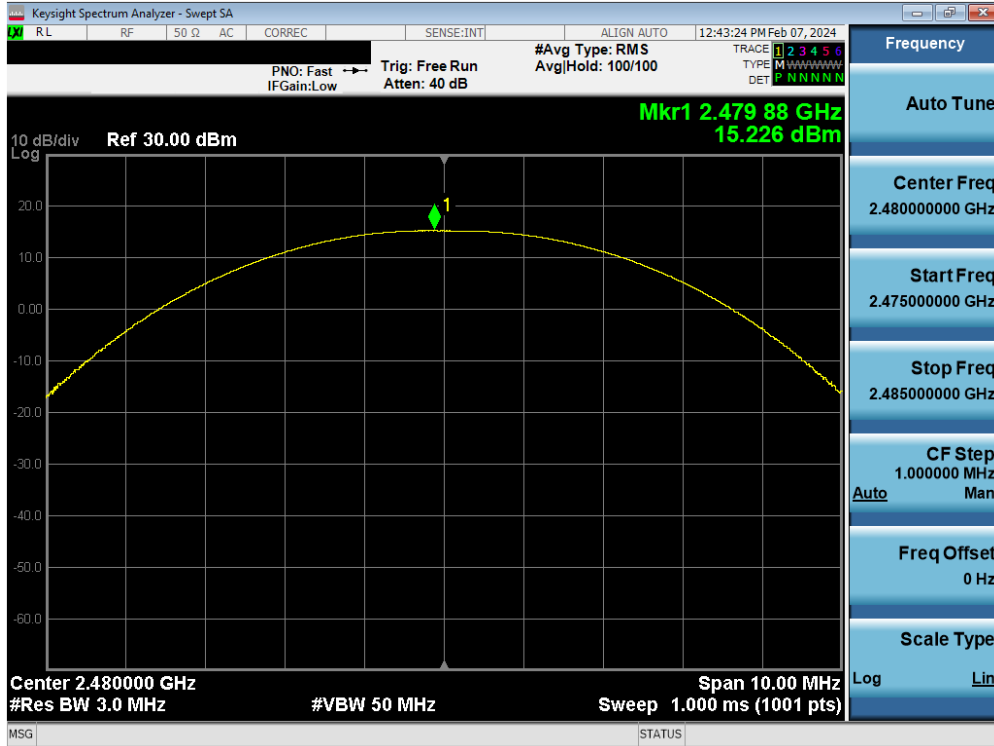


Plot 7-67. Peak Power Plot (Bluetooth (LE), 1Mbps – Ch. 37)

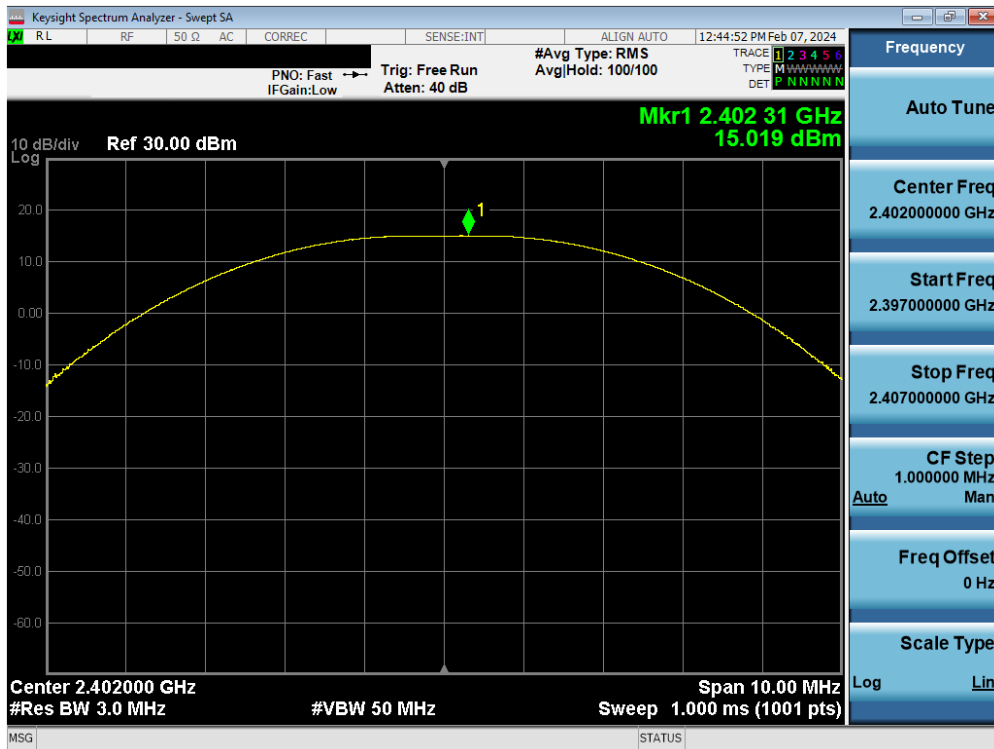


Plot 7-68. Peak Power Plot (Bluetooth (LE), 1Mbps – Ch. 17)

FCC ID: C3K2077 IC: 3048A-2077	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2312040120-16.C3K	Test Dates: 12/14/2023 - 03/05/2024	EUT Type: Portable Computing Device	Page 54 of 120

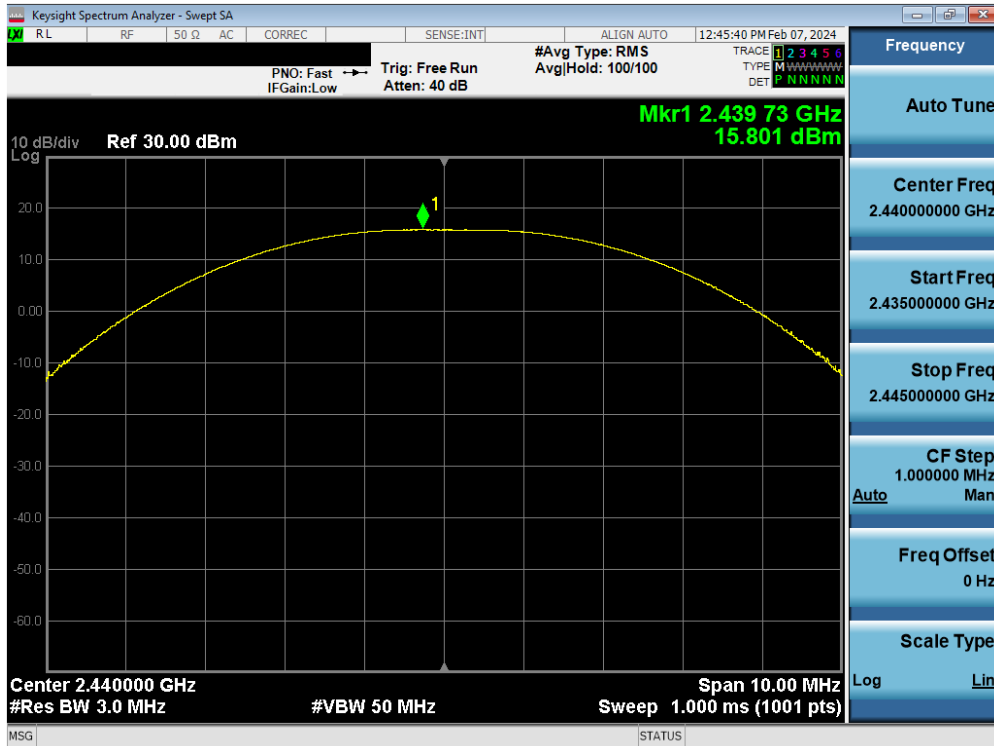


Plot 7-69. Peak Power Plot (Bluetooth (LE), 1Mbps – Ch. 39)

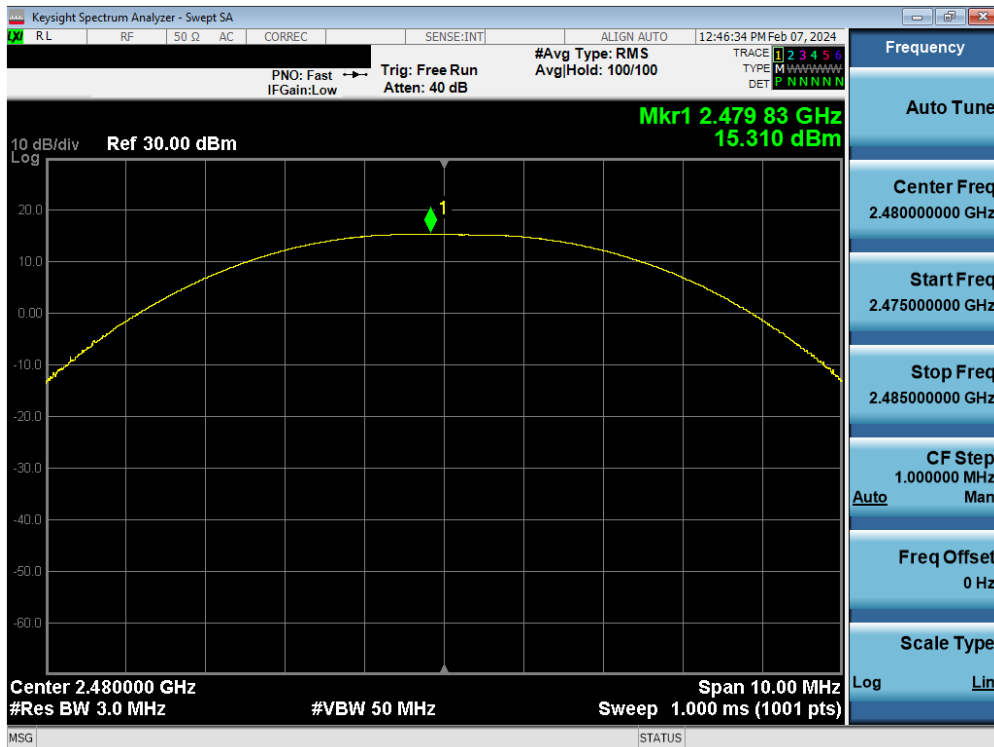


Plot 7-70. Peak Power Plot (Bluetooth (LE), 2Mbps – Ch. 0)

FCC ID: C3K2077 IC: 3048A-2077	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2312040120-16.C3K	Test Dates: 12/14/2023 - 03/05/2024	EUT Type: Portable Computing Device	Page 55 of 120



Plot 7-71. Peak Power Plot (Bluetooth (LE), 2Mbps – Ch. 17)



Plot 7-72. Peak Power Plot (Bluetooth (LE), 2Mbps – Ch. 36)

FCC ID: C3K2077 IC: 3048A-2077	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2312040120-16.C3K	Test Dates: 12/14/2023 - 03/05/2024	EUT Type: Portable Computing Device	Page 56 of 120



## 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

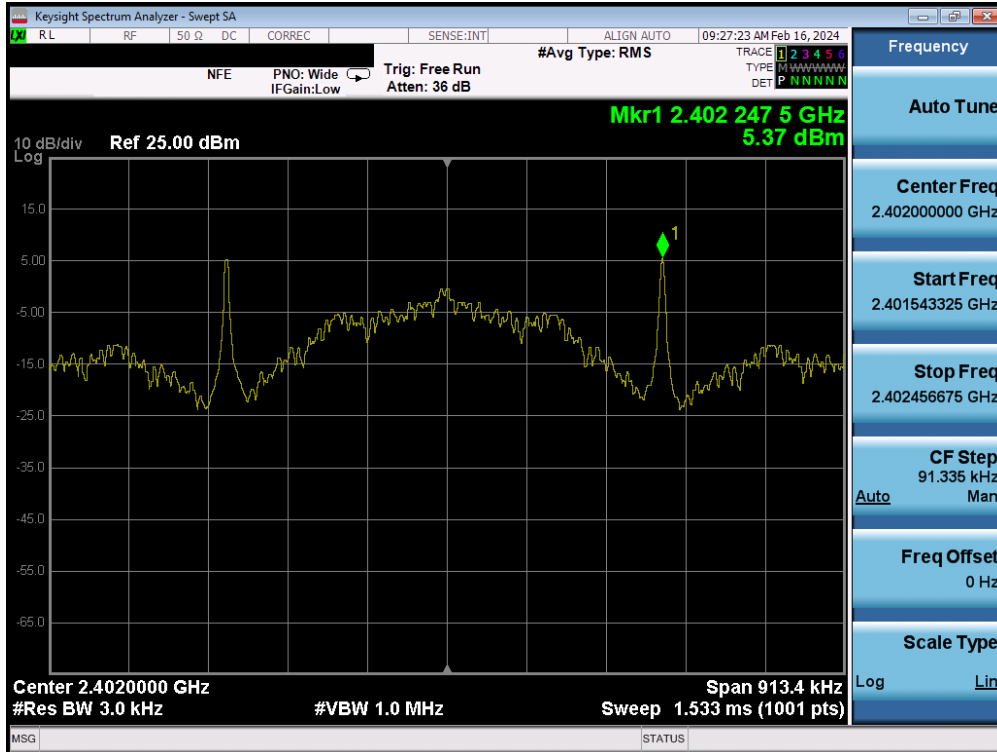
None

FCC ID: C3K2077 IC: 3048A-2077	<b>MEASUREMENT REPORT (CERTIFICATION)</b>		Approved by: Technical Manager
Test Report S/N: 1M2312040120-16.C3K	Test Dates: 12/14/2023 - 03/05/2024	EUT Type: Portable Computing Device	Page 57 of 120

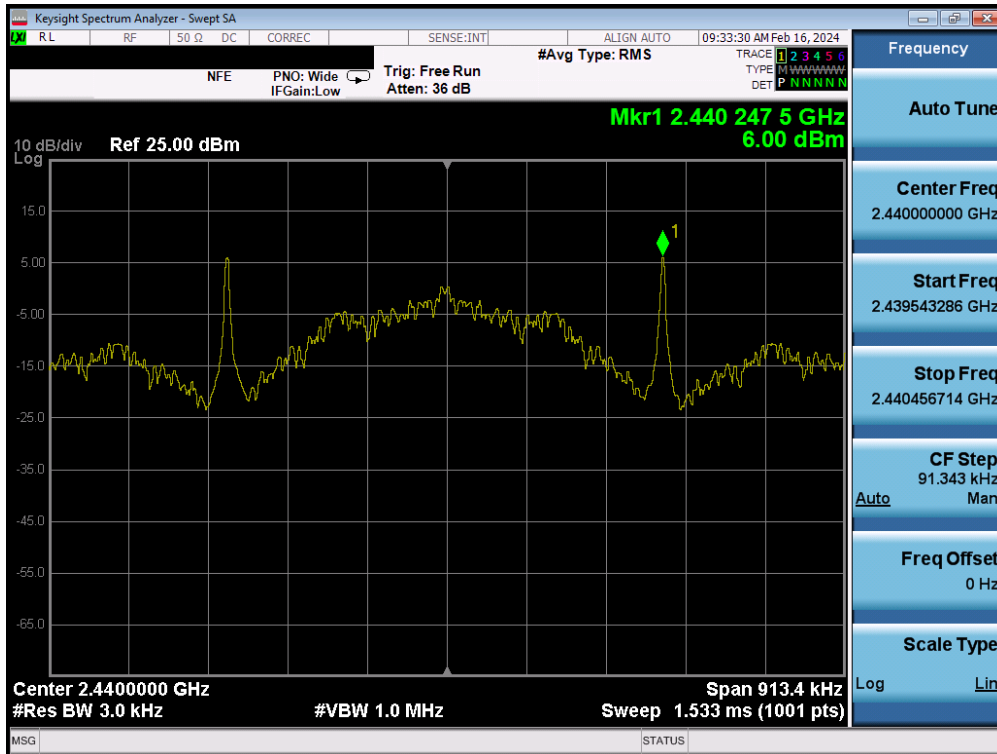
Frequency [MHz]	Data Rate [Mbps]	Channel No.	Bluetooth Mode	Measured Power Spectral Density	Maximum Permissible Power Density	Margin [dB]
2402	125 kbps	37	LE	5.37	8.0	-2.63
2440	125 kbps	17	LE	6.00	8.0	-2.00
2480	125 kbps	39	LE	5.50	8.0	-2.50
2402	500 kbps	37	LE	5.25	8.0	-2.75
2440	500 kbps	17	LE	5.91	8.0	-2.09
2480	500 kbps	39	LE	5.42	8.0	-2.58
2402	1 Mbps	37	LE	4.92	8.0	-3.08
2440	1 Mbps	17	LE	5.88	8.0	-2.12
2480	1 Mbps	39	LE	4.87	8.0	-3.13
2404	2 Mbps	0	LE	2.84	8.0	-5.16
2440	2 Mbps	17	LE	3.54	8.0	-4.47
2478	2 Mbps	36	LE	2.89	8.0	-5.11

**Table 7-9. Conducted Power Density Measurements – SISO ANT1**

<b>FCC ID:</b> C3K2077 <b>IC:</b> 3048A-2077	<b>MEASUREMENT REPORT (CERTIFICATION)</b>		<b>Approved by:</b> Technical Manager
<b>Test Report S/N:</b> 1M2312040120-16.C3K	<b>Test Dates:</b> 12/14/2023 - 03/05/2024	<b>EUT Type:</b> Portable Computing Device	Page 58 of 120



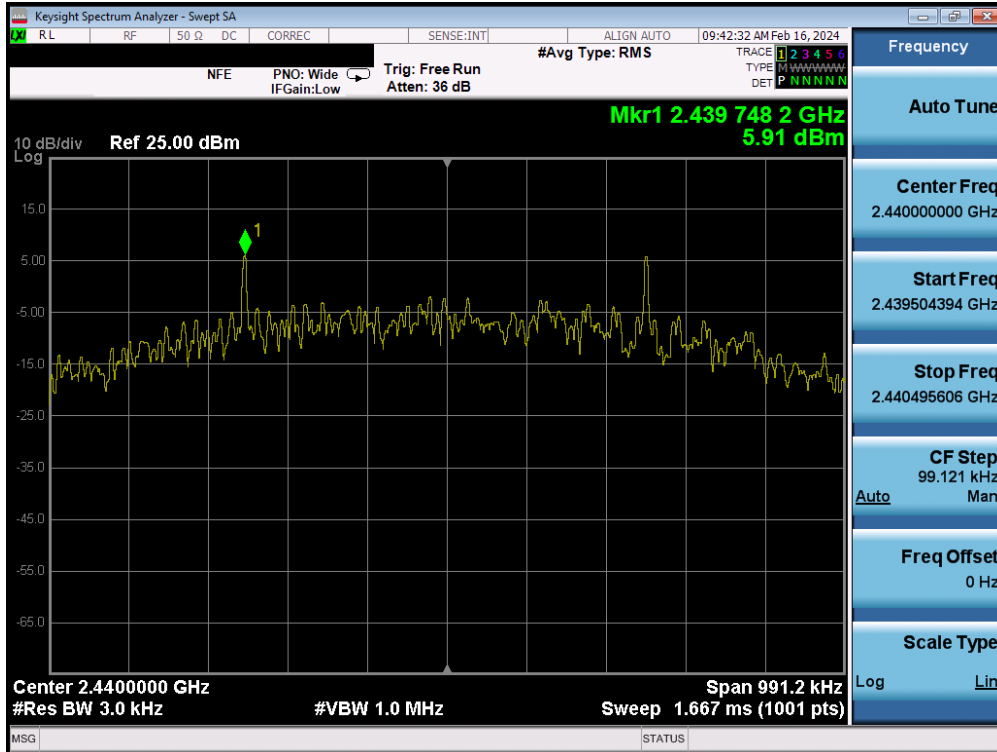
Plot 7-73. Power Spectral Density Plot (Bluetooth (LE), 125kbps – Ch. 37)



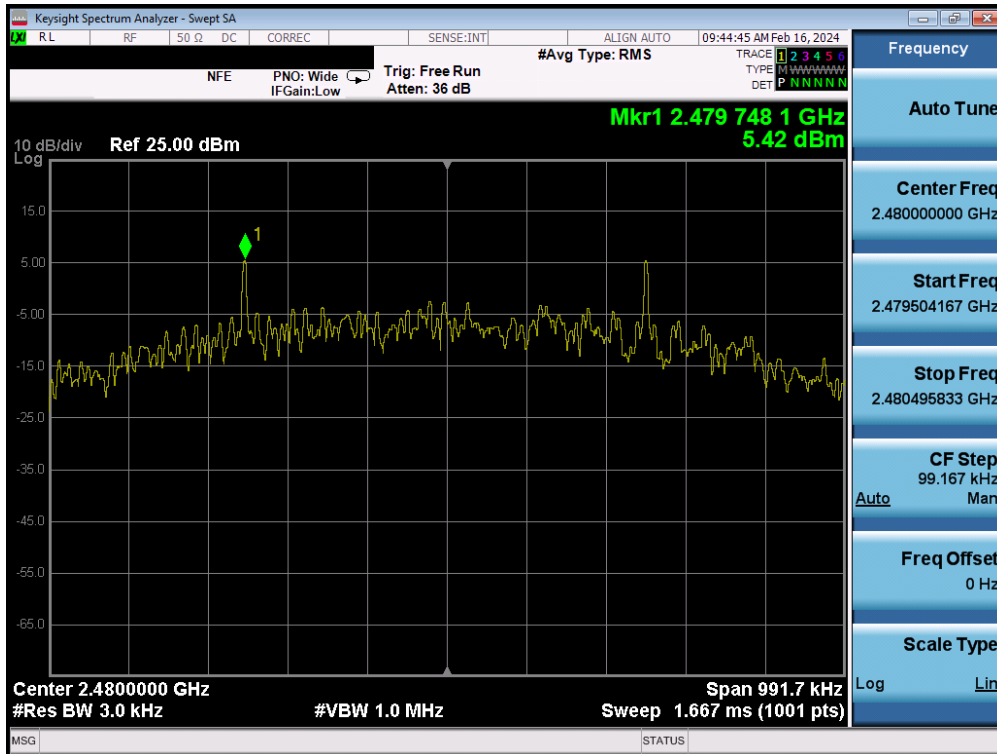
Plot 7-74. Power Spectral Density Plot (Bluetooth (LE), 125kbps – Ch. 17)

FCC ID: C3K2077 IC: 3048A-2077	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2312040120-16.C3K	Test Dates: 12/14/2023 - 03/05/2024	EUT Type: Portable Computing Device	Page 59 of 120





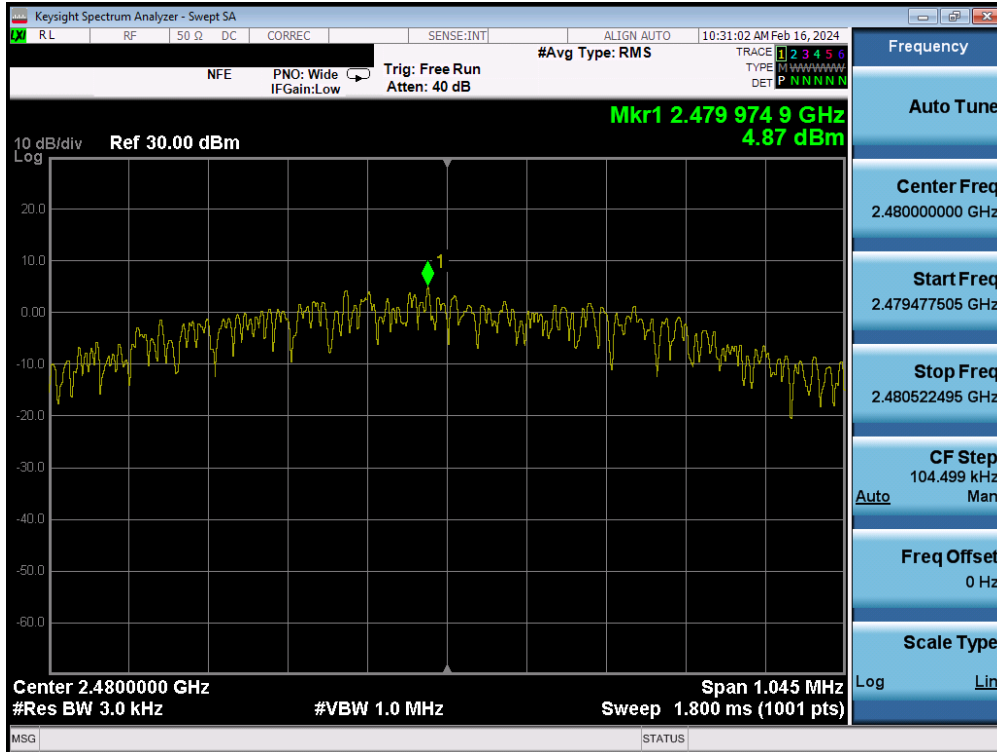
Plot 7-77. Power Spectral Density Plot (Bluetooth (LE), 500kbps – Ch. 17)



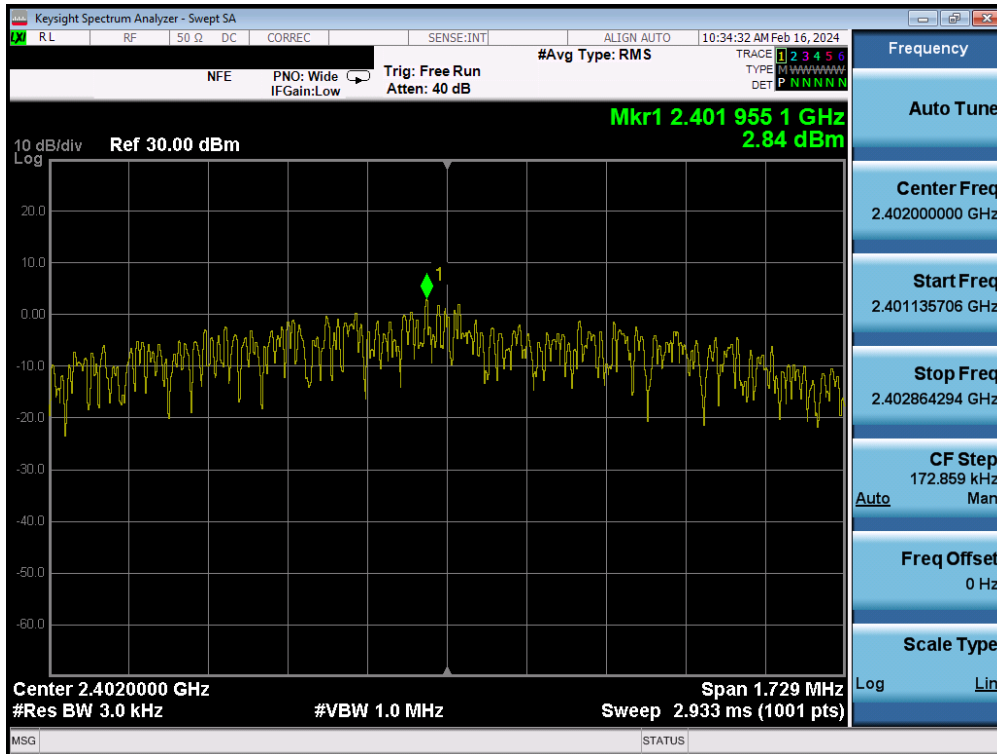
Plot 7-78. Power Spectral Density Plot (Bluetooth (LE), 500kbps – Ch. 39)

FCC ID: C3K2077 IC: 3048A-2077	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2312040120-16.C3K	Test Dates: 12/14/2023 - 03/05/2024	EUT Type: Portable Computing Device	Page 61 of 120





Plot 7-81. Power Spectral Density Plot (Bluetooth (LE), 1Mbps – Ch. 39)



Plot 7-82. Power Spectral Density Plot (Bluetooth (LE), 2Mbps – Ch. 0)

FCC ID: C3K2077 IC: 3048A-2077	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2312040120-16.C3K	Test Dates: 12/14/2023 - 03/05/2024	EUT Type: Portable Computing Device	Page 63 of 120

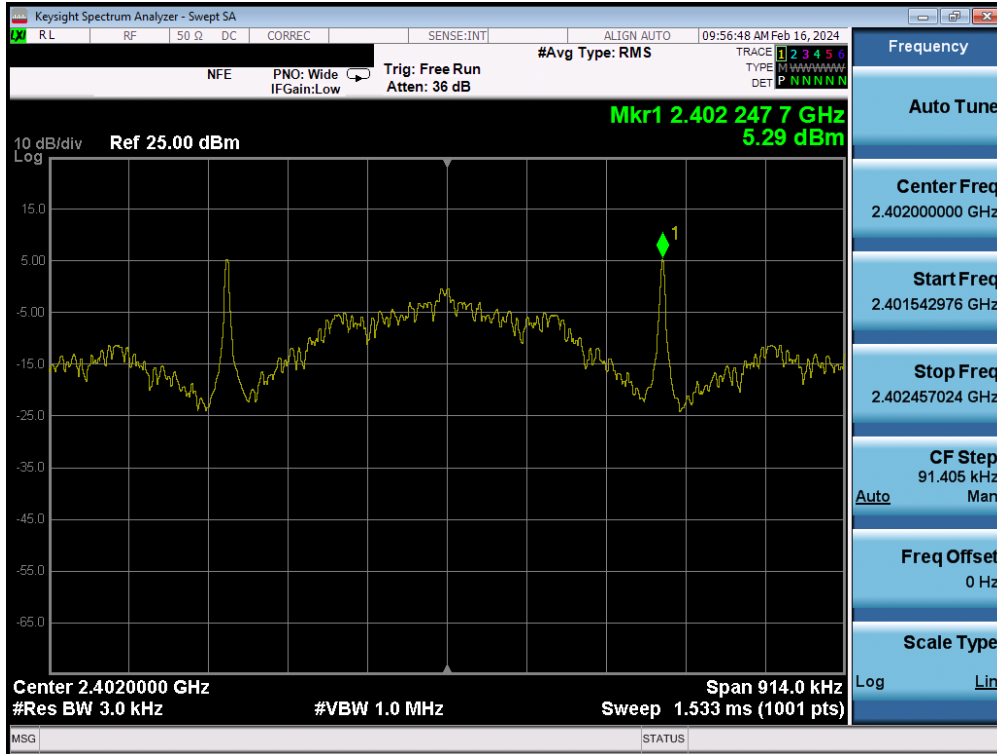




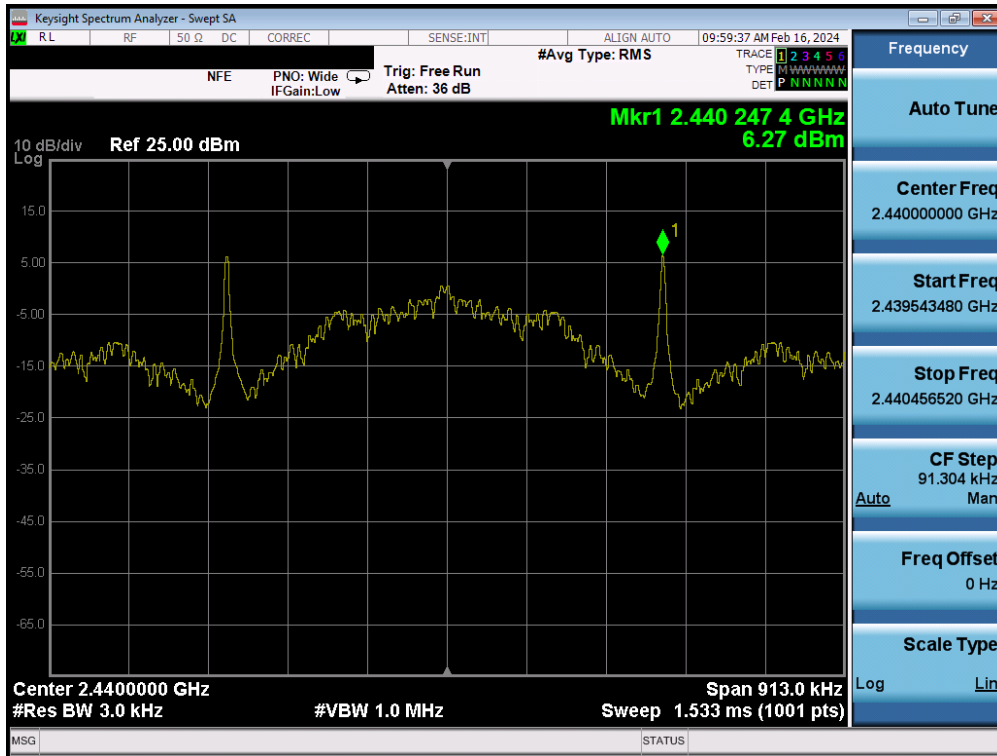
Frequency [MHz]	Data Rate [Mbps]	Channel No.	Bluetooth Mode	Measured Power Spectral Density	Maximum Permissible Power Density	Margin [dB]
2402	125 kbps	37	LE	5.29	8.0	-2.71
2440	125 kbps	17	LE	6.27	8.0	-1.73
2480	125 kbps	39	LE	5.59	8.0	-2.41
2402	500 kbps	37	LE	5.12	8.0	-2.88
2440	500 kbps	17	LE	6.17	8.0	-1.83
2480	500 kbps	39	LE	5.56	8.0	-2.44
2402	1 Mbps	37	LE	4.71	8.0	-3.29
2440	1 Mbps	17	LE	5.61	8.0	-2.39
2480	1 Mbps	39	LE	4.87	8.0	-3.13
2404	2 Mbps	0	LE	2.30	8.0	-5.70
2440	2 Mbps	17	LE	3.35	8.0	-4.65
2478	2 Mbps	36	LE	2.82	8.0	-5.18

**Table 7-10. Conducted Power Density Measurements – SISO ANT2**

FCC ID: C3K2077 IC: 3048A-2077	<b>MEASUREMENT REPORT (CERTIFICATION)</b>		Approved by: Technical Manager
Test Report S/N: 1M2312040120-16.C3K	Test Dates: 12/14/2023 - 03/05/2024	EUT Type: Portable Computing Device	Page 65 of 120

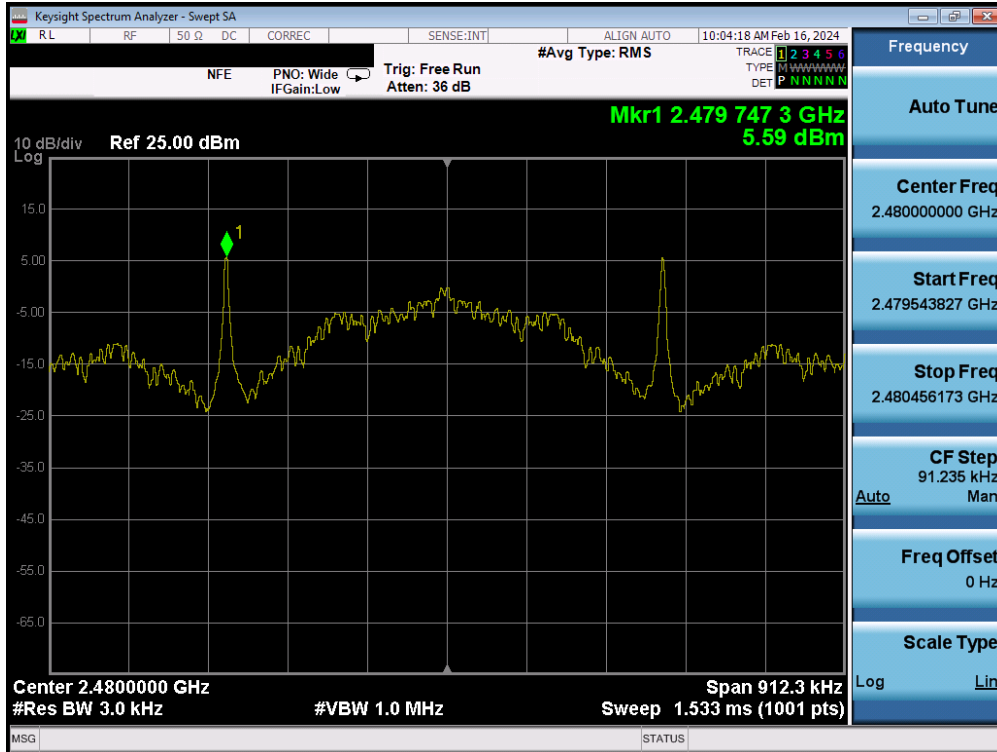


Plot 7-85. Power Spectral Density Plot (Bluetooth (LE), 125kbps – Ch. 37)

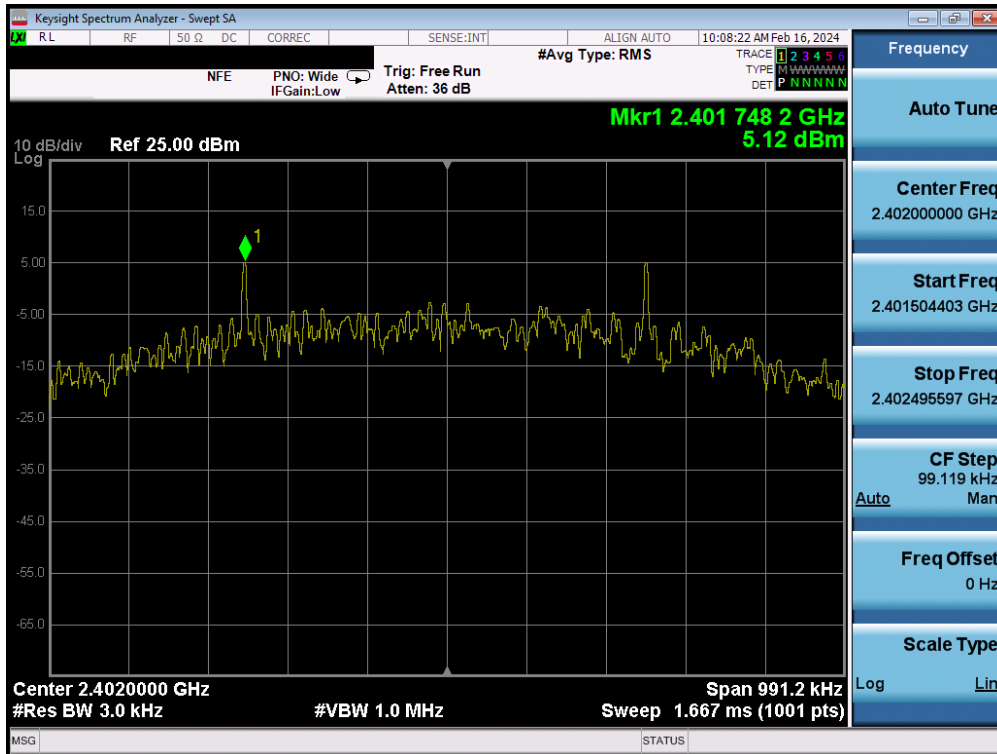


Plot 7-86. Power Spectral Density Plot (Bluetooth (LE), 125kbps – Ch. 17)

FCC ID: C3K2077 IC: 3048A-2077	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2312040120-16.C3K	Test Dates: 12/14/2023 - 03/05/2024	EUT Type: Portable Computing Device	Page 66 of 120

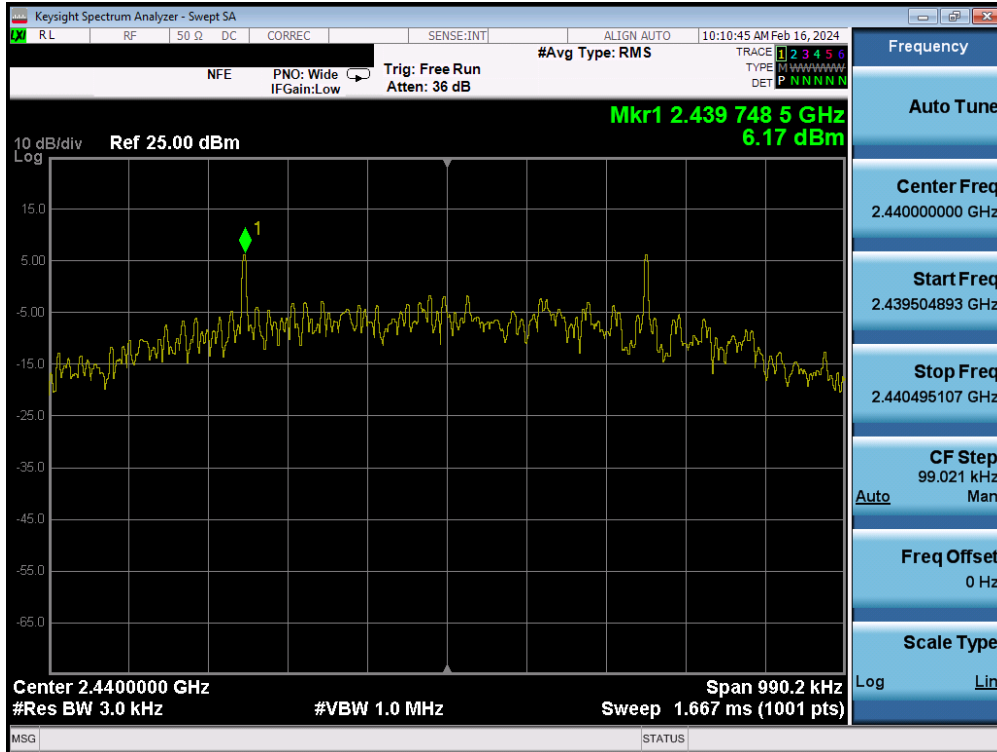


Plot 7-87. Power Spectral Density Plot (Bluetooth (LE), 125kbps – Ch. 39)

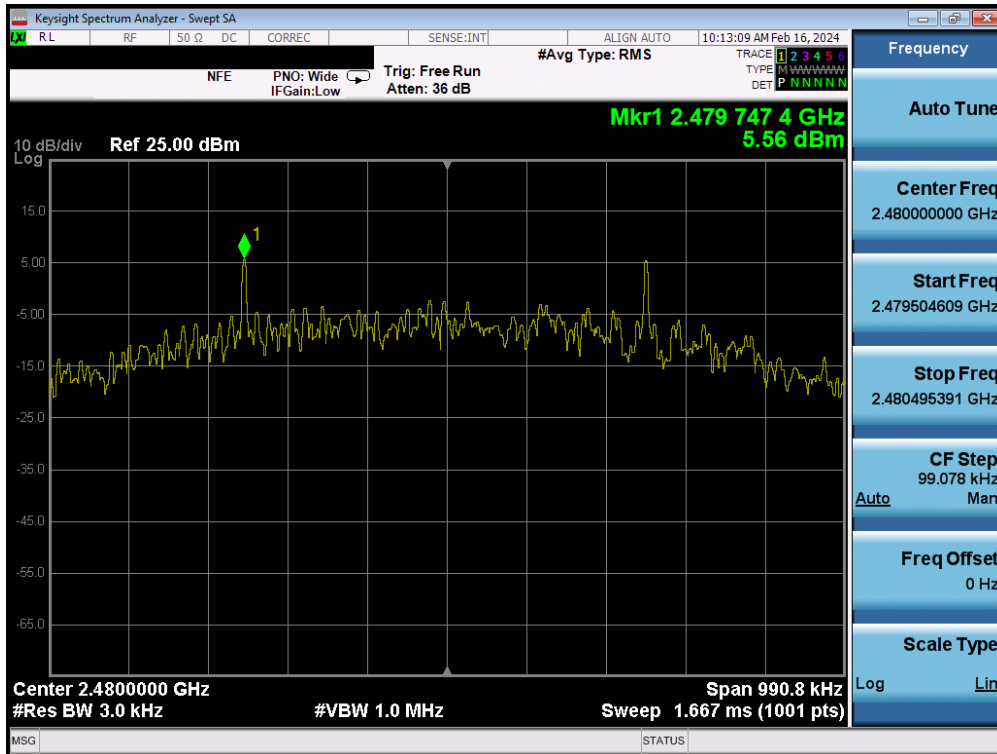


Plot 7-88. Power Spectral Density Plot (Bluetooth (LE), 500kbps – Ch. 37)

FCC ID: C3K2077 IC: 3048A-2077	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2312040120-16.C3K	Test Dates: 12/14/2023 - 03/05/2024	EUT Type: Portable Computing Device	Page 67 of 120



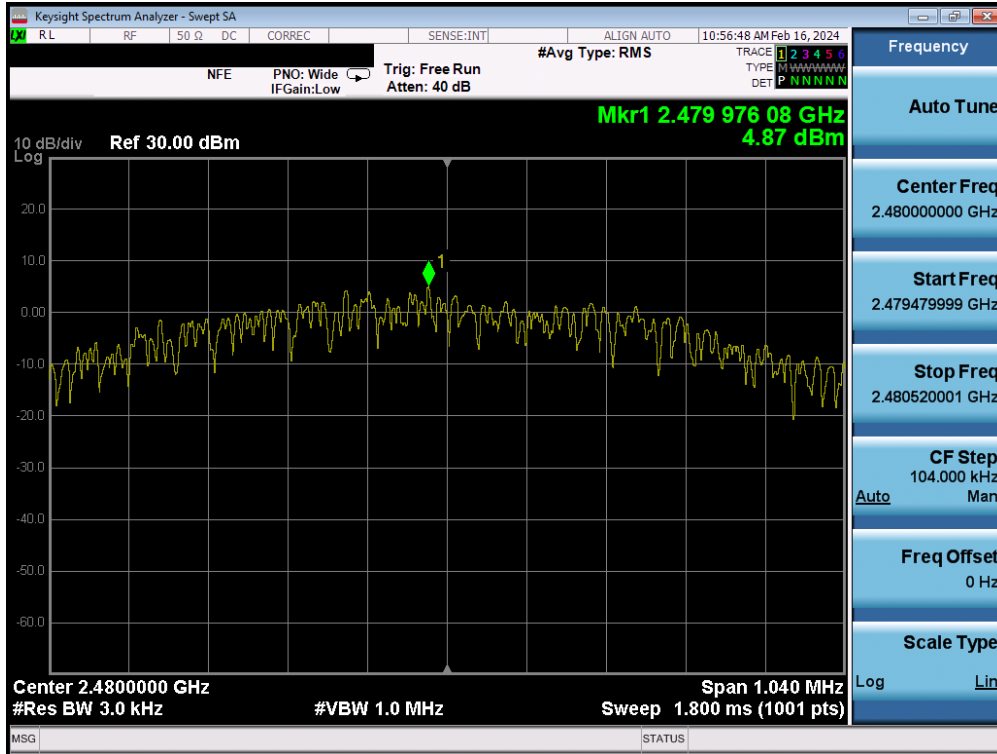
Plot 7-89. Power Spectral Density Plot (Bluetooth (LE), 500kbps – Ch. 17)



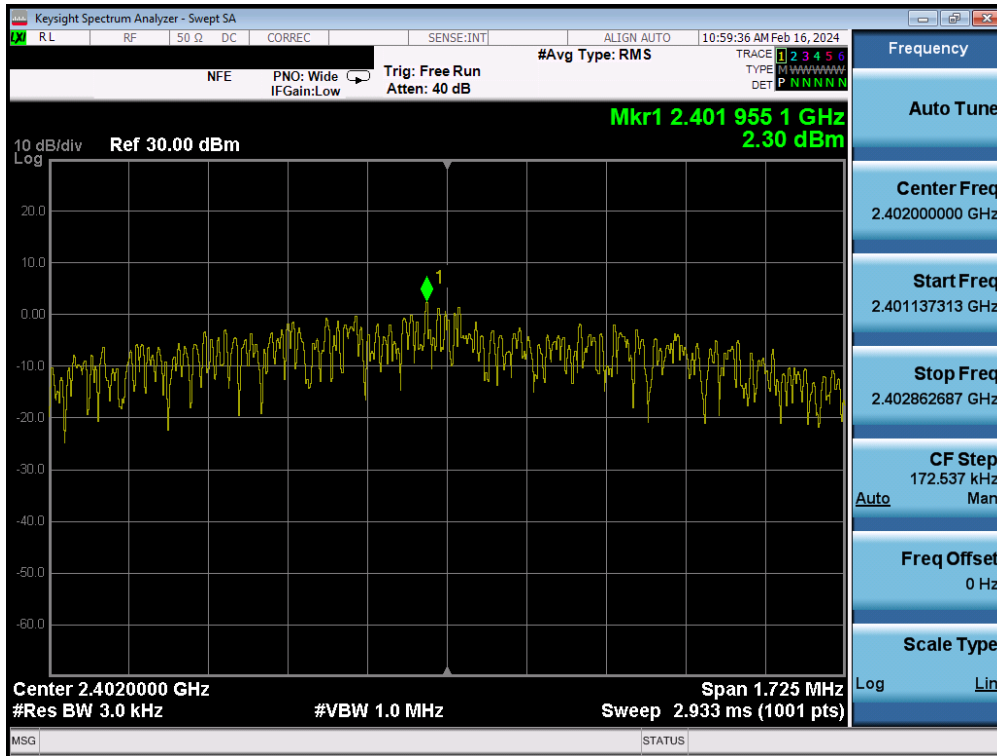
Plot 7-90. Power Spectral Density Plot (Bluetooth (LE), 500kbps – Ch. 39)

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Plot 7-93. Power Spectral Density Plot (Bluetooth (LE), 1Mbps – Ch. 39)



Plot 7-94. Power Spectral Density Plot (Bluetooth (LE), 2Mbps – Ch. 0)

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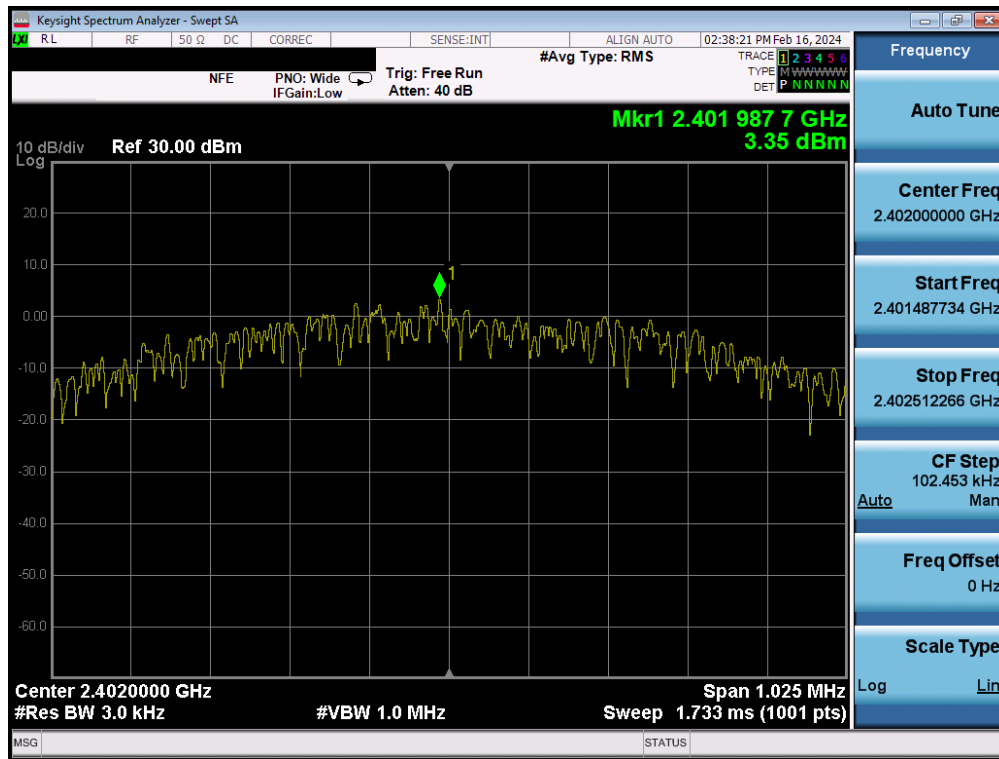




Frequency [MHz]	Data Rate [Mbps]	Channel No.	Bluetooth Mode	ANT 1 Power Spectral Density [dBm]	ANT 2 Power Spectral Density [dBm]	Summed MIMO Power Spectral Density [dBm]	Maximum Permissible Power Density [dBm / 3kHz]	Margin [dB]
2402	1 Mbps	37	LE	3.35	1.39	5.49	8.0	-2.51
2440	1 Mbps	17	LE	2.93	1.68	5.36	8.0	-2.64
2480	1 Mbps	39	LE	1.48	0.44	4.00	8.0	-4.00
2404	2 Mbps	0	LE	0.74	-0.59	3.13	8.0	-4.87
2440	2 Mbps	17	LE	0.79	-0.49	3.21	8.0	-4.79
2478	2 Mbps	36	LE	-0.79	-1.81	1.74	8.0	-6.26

Table 7-11. Conducted Power Density Measurements – DUAL

### DUAL ANT1

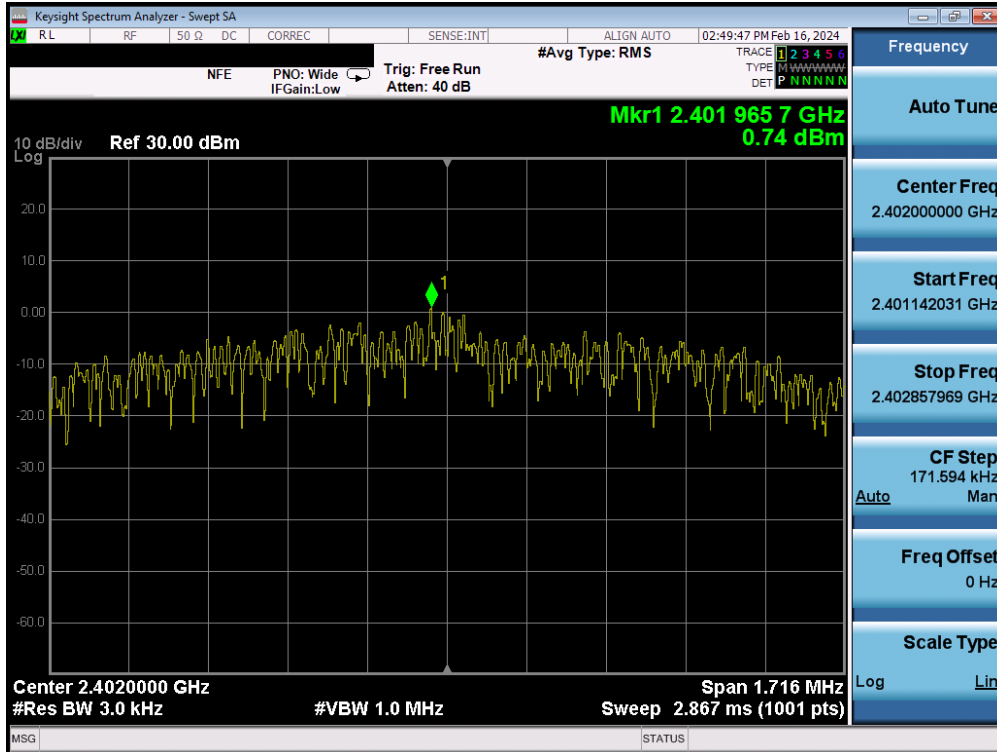


Plot 7-97. Power Spectral Density Plot (Bluetooth (LE), 1Mbps – Ch. 37)

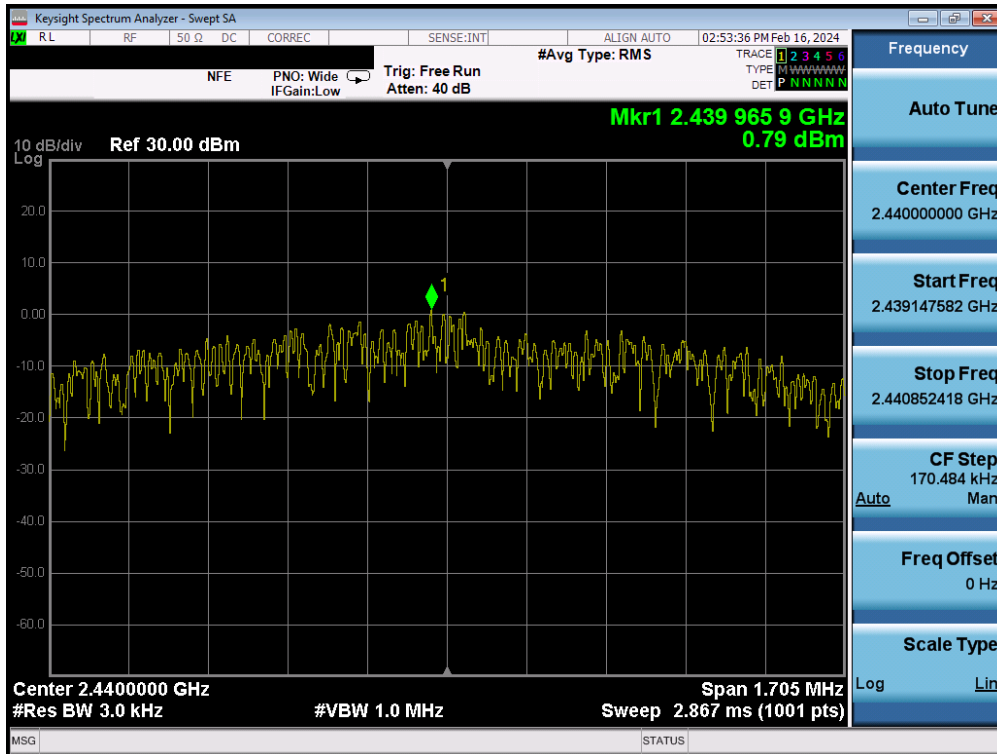
FCC ID: C3K2077 IC: 3048A-2077	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
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Plot 7-100. Power Spectral Density Plot (Bluetooth (LE), 2Mbps – Ch. 0)

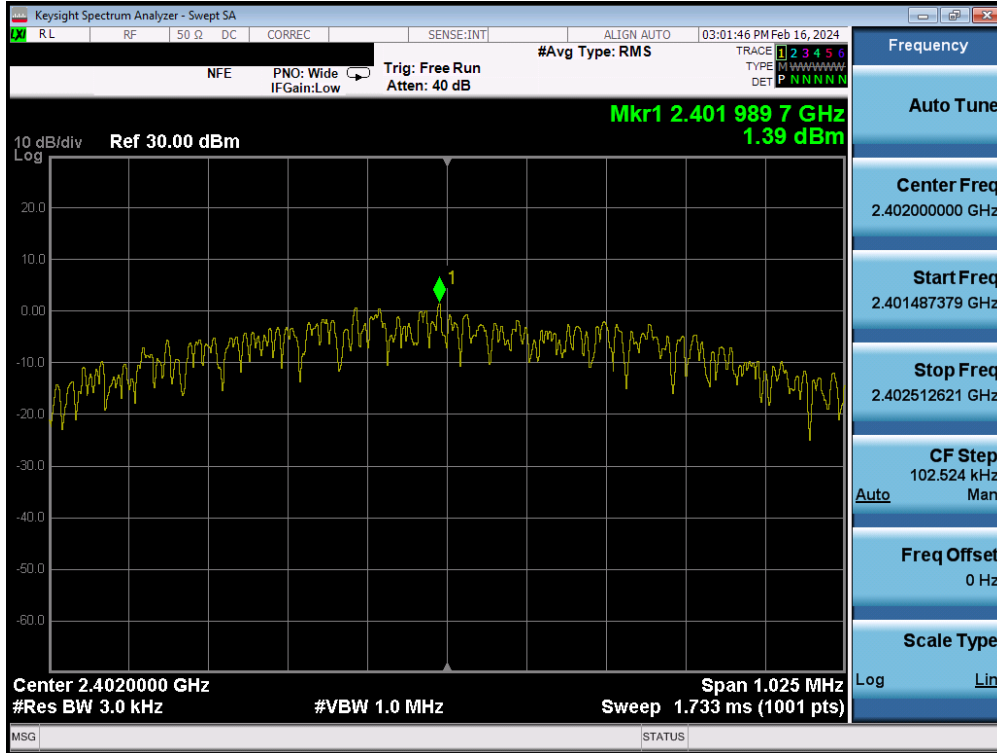


Plot 7-101. Power Spectral Density Plot (Bluetooth (LE), 2Mbps – Ch. 17)

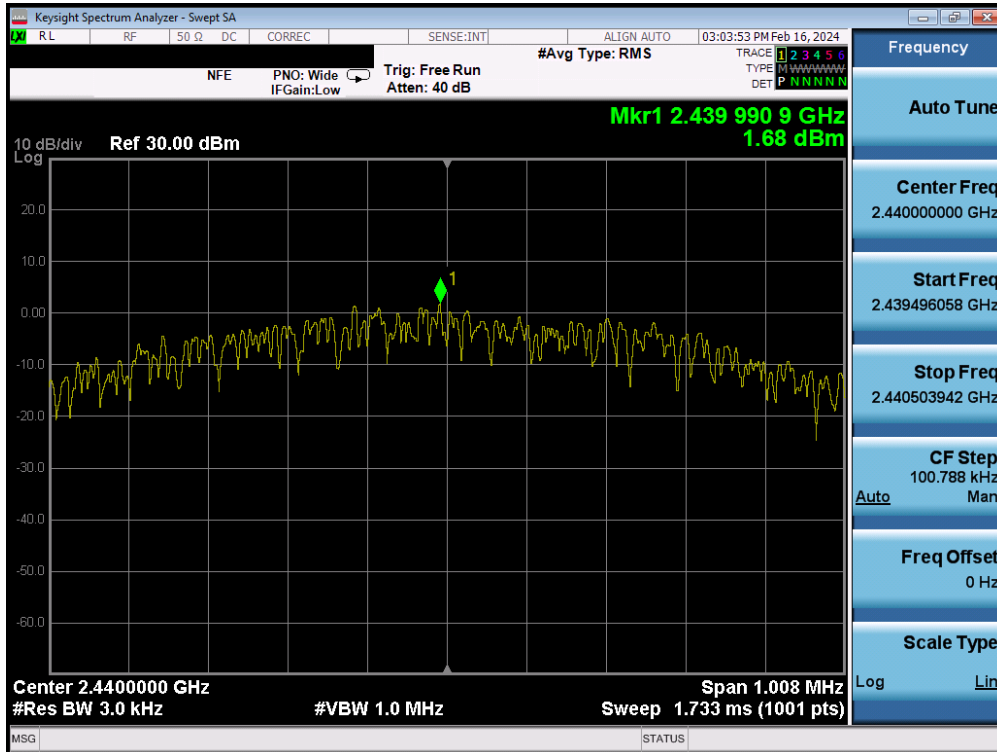
FCC ID: C3K2077 IC: 3048A-2077	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
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## DUAL ANT2

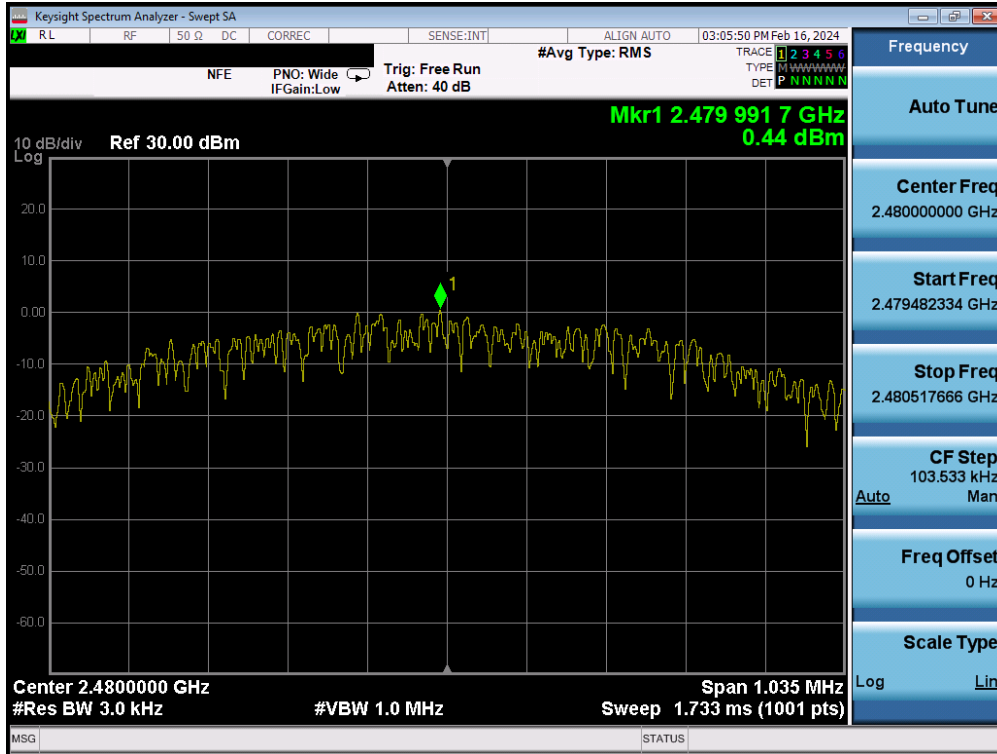


Plot 7-103. Power Spectral Density Plot (Bluetooth (LE), 1Mbps – Ch. 37)

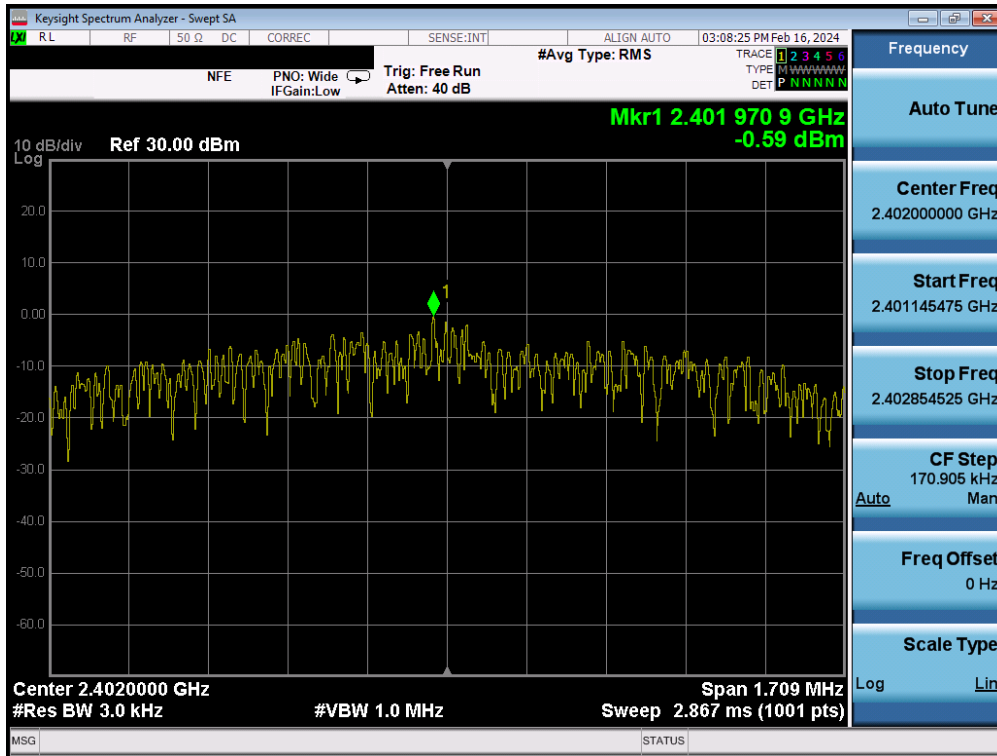


Plot 7-104. Power Spectral Density Plot (Bluetooth (LE), 1Mbps – Ch. 17)

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Plot 7-105. Power Spectral Density Plot (Bluetooth (LE), 1Mbps – Ch. 39)



Plot 7-106. Power Spectral Density Plot (Bluetooth (LE), 2Mbps – Ch. 0)

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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

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