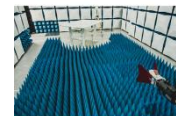




ELEMENT MATERIALS TECHNOLOGY

(formerly PCTEST)
18855 Adams Court, Morgan Hill, CA 95037 USA
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<http://www.element.com>



MEASUREMENT REPORT

FCC PART 15.247 / ISED RSS-247 Bluetooth (Low Energy)

Applicant Name:

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

Date of Testing:

05/12/2025 - 07/19/2025

Test Report Issue Date:

9/2/2025

Test Site/Location:

Element Materials Technology, Morgan Hill, CA, USA

Test Report Serial No.:

1C2504170039-17-R1.BCG

FCC ID:

BCGA3358

IC:

579C-A3358

APPLICANT:

Apple Inc.

Application Type:

Certification

Model/HVIN:

A3358, A3359

EUT Type:

Tablet Device

Max. RF Output Power:

125.89 mW (21.00 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 C63.10-2020, KDB 558074 D01 v05r02

This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in ANSI C63.10-2020 and KDB 558074 D01 v05r02. Test results reported herein relate only to the item(s) tested.

This revised Test Report (S/N: 1C2504170039-17-R1.BCG) supersedes and replaces the previously issued test report on the same subject device for the same type of testing as indicated. Please discard or destroy the previously issued test report(s) and dispose accordingly.

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

RJ Ortanez

Executive Vice President



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1 INTRODUCTION

1.1 Scope

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

1.2 Element Materials Technology Test Location

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

1.3 Test Facility / Accreditations

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

- Element Materials Technology is an ISO 17025-2017 accredited test facility under the American Association for Laboratory Accreditation (A2LA) with Certificate number 2041.02 for Specific Absorption Rate (SAR), Hearing Aid Compatibility (HAC) testing, where applicable, and Electromagnetic Compatibility (EMC) testing for FCC and Innovation, Science, and Economic Development Canada rules.
- Element Washington DC LLC TCB is a Telecommunication Certification Body (TCB) accredited to ISO/IEC 17065-2012 by A2LA (Certificate number 2041.03) in all scopes of FCC Rules and ISED Standards (RSS).
- Element Materials Technology facility is a registered (22831) test laboratory with the site description on file with ISED.
- Element Washington DC LLC is a Recognized U.S. Certification Assessment Body (CAB # US0110) for ISED Canada as designated by NIST under the U.S. and Canada Mutual Recognition Agreements (MRAs).

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2 PRODUCT INFORMATION

2.1 Equipment Description

The Equipment Under Test (EUT) is the **Apple Tablet Device FCC ID: BCGA3358 and IC: 579C-A3358**. 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.: YY73H7C7LJ, X6YW4WNPM9, H9HHEN0003H0000X4E, H9HHEL0009D0000X4D

2.2 Device Capabilities

This device contains the following capabilities:

850/1700/1900 WCDMA/HSPA, Multi-band LTE, 5G NR (FR1), 802.11b/g/n/ax/be WLAN, 802.11a/n/ac/ax/be UNII (5GHz and 6GHz), 802.15.4, Bluetooth (1x, EDR, LE, HDR, HDT), Narrowband (NB) UNII (5GHz and 6GHz), WPT.

This device supports BT Beamforming

This device supports channel puncturing and channel bandwidth reduction.

BLE-150k		BLE-500k		BLE-1M		BLE-2M	
Ch.	Frequency (MHz)	Ch.	Frequency (MHz)	Ch.	Frequency (MHz)	Ch.	Frequency (MHz)
00	2402	00	2402	00	2402	01	2404
:	:	:	:	:	:	:	:
19	2440	19	2440	19	2440	19	2440
:	:	:	:	:	:	:	:
39	2480	39	2480	39	2480	38	2478

Table 2-1. Bluetooth LE Frequency / Channel Operations

Note: This device is capable of operating in hopping and non-hopping mode. The EUT can hop between 40 different channels in the 2400 – 2483.5MHz band.

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

BLE Mode		Antenna 4a		Antenna 2a		TxBF	
		Duty Cycle [%]	DCCF [dB]	Duty Cycle [%]	DCCF [dB]	Duty Cycle [%]	DCCF [dB]
125k	ePA	96.872	0.138	97.320	0.118	97.342	0.117
	iPA	96.872	0.138	97.320	0.118	97.342	0.117
500k	ePA	90.490	0.434	90.490	0.434	90.490	0.434
	iPA	90.490	0.434	90.490	0.434	90.490	0.434
1M	ePA	84.840	0.714	84.859	0.713	84.801	0.716
	iPA	84.840	0.714	84.859	0.713	84.801	0.716
2M	ePA	56.872	2.451	56.872	2.451	56.794	2.457
	iPA	56.872	2.451	56.872	2.451	56.794	2.457

Table 2-2. Measured Duty Cycles

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

Antenna	Simultaneous Tx Config	Bluetooth 2.4GHz	Thread	WLAN	NB UNII	WIFI 5GHz	WIFI 6GHz	LTE / FR1 NR		
		BDR, EDR, LE HDR, HDT	802.15.4	802.11 b/g/n/ax/be	BDR, EDR, LE HDR, HDT	802.11 a/n/ac/ax/be	802.11 a/ax/be	LB	MB/HB	UHB
Ant 4a	Config 1	✓	✗	✗	✗	✓	✗	✗	✗	✗
Ant 4a	Config 2	✓	✗	✗	✗	✗	✓	✗	✗	✗
Ant 4a	Config 3	✗	✓	✗	✗	✓	✗	✗	✗	✗
Ant 4a	Config 4	✗	✓	✗	✗	✗	✓	✗	✗	✗
Ant 4a	Config 5	✗	✗	✓	✓	✗	✗	✗	✗	✗
Ant 4a	Config 6	✗	✗	✓	✗	✓	✗	✗	✗	✗
Ant 4a	Config 7	✗	✗	✓	✗	✗	✓	✗	✗	✗
Ant 2a	Config 8	✓	✗	✗	✗	✓	✗	✗	✗	✗
Ant 2a	Config 9	✓	✗	✗	✗	✗	✓	✗	✗	✗
Ant 2a	Config 10	✗	✓	✗	✗	✓	✗	✗	✗	✗
Ant 2a	Config 11	✗	✓	✗	✗	✗	✓	✗	✗	✗
Ant 2a	Config 12	✗	✗	✓	✓	✗	✗	✗	✗	✗
Ant 2a	Config 13	✗	✗	✓	✗	✓	✗	✗	✗	✗
Ant 2a	Config 14	✗	✗	✓	✗	✗	✓	✗	✗	✗

Table 2-3. Simultaneous Transmission Configurations

✓ = Support; ✗ = Not Support

Note:

All the above simultaneous transmission configurations have been tested and the worst-case configuration was found to be Config 1 and reported in RF Bluetooth and RF UNII 5GHz OFDM test reports.

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2.3 Antenna Description

Following antennas gains provided by manufacturer were used for testing.

Frequency [GHz]	Antenna Gain (dBi)	
	Antenna 4a	Antenna 2a
2.4	2.4	1.7

Table 2-4. Highest Antenna Gain

2.4 Test Support Equipment

1	Apple MacBook Pro	Model:	A2141	S/N:	C02H604EQ05D
	w/AC/DC Adapter	Model:	A2166	S/N:	C4H042705ZNPM0WA6
2	Apple USB-C Cable	Model:	Spartan	S/N:	GXK1336018XKTR024
3	USB-C Cable	Model:	A2795	S/N:	DWH80115BK826GV19
	w/ AC Adapter	Model:	A2305	S/N:	C4H95160004PF4F4V
4	Apple Pencil	Model:	A2538	S/N:	KJ26TCFXJW
5	DC Power Supply	Model:	KPS3010D	S/N:	N/A

Table 2-5. Test Support Equipment List

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2.5 Test Configuration

The EUT was tested per the guidance of ANSI C63.10-2020 and KDB 558074 D01 v05r02. ANSI C63.10-2020 was used to reference the appropriate EUT setup for radiated spurious emissions testing and AC line conducted testing. See Sections 3.2 for AC line conducted emissions test setups, 3.3 for radiated emissions test setups, and 7.2, 0, 7.4, 7.5, and 7.6 for antenna port conducted emissions test setups.

There are two vendors of the WiFi/Bluetooth radio modules, variant 1 and variant 2. Both radio modules have the same mechanical outline, same on-board antenna matching circuit, identical antenna structure, and are built and tested to conform to the same specifications and to operate within the same tolerances. The worst case configuration was found between the two variants. The EUT was also investigated with and without charger.

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

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

For AC line conducted and radiated test below 1GHz, following configuration were investigated and the worst case was reported.

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

2.6 Software and Firmware

The test was conducted with firmware version 23A256 installed on the EUT.

2.7 EMI Suppression Device(s)/Modifications

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

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3 DESCRIPTION OF TESTS

3.1 Evaluation Procedure

The measurement procedures described in the American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices (ANSI C63.10-2020) and the guidance provided in KDB 558074 D01 v05r02 were used in the measurement of the EUT.

Deviation from measurement procedure.....None

3.2 AC Line Conducted Emissions

The line-conducted facility is located inside a 7m x 3.66m x 2.7m shielded enclosure. The shielded enclosure is manufactured by AP Americas. The shielding effectiveness of the shielded room is in accordance with MIL-Std-285 or NSA 65-6. A 1m x 1.5m wooden table 80cm high is placed 40cm away from the vertical wall and 80cm away from the sidewall of the shielded room. Two 10kHz-30MHz, 50Ω/50μH Line-Impedance Stabilization Networks (LISNs) are bonded to the shielded room floor. Power to the LISNs is filtered by external high-current high-insertion loss power line filters. The external power line filter is EPCOS 2X60A Power Line Filter (100dB Attenuation, 14kHz-18GHz) and the two EPCOs 2X48A filters (100dB Minimum Insertion Loss, 14kHz - 10GHz). These filters attenuate ambient signal noise from entering the measurement lines. These filters are also bonded to the shielded enclosure.

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

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

Line conducted emissions test results are shown in Section 7.9. Automated test software was used to perform the AC line conducted emissions testing. Automated measurement software utilized is Rohde & Schwarz EMC32, Version 10.50.40.

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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.

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

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

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

3.4 Environmental Conditions

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

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4 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 MEASUREMENT UNCERTAINTY

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.23-2012. All measurement uncertainty values are shown with a coverage factor of $k = 2$ to indicate a 95% level of confidence. The measurement uncertainty shown below meets or exceeds the U_{CISPR} measurement uncertainty values specified in CISPR 16-4-2 and, thus, can be compared directly to specified limits to determine compliance.

Contribution	Expanded Uncertainty ($\pm$ dB)
Conducted Bench Top Measurements	2.07
Line Conducted Disturbance	1.91
Radiated Disturbance (<30MHz)	4.12
Radiated Disturbance (30MHz - 1GHz)	4.85
Radiated Disturbance (1 - 18GHz)	5.08
Radiated Disturbance (>18GHz)	5.22

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6 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 with the requirements of ANSI C63.5-2017.

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
Anritsu	ML2496A	Power Meter	2/10/2025	Annual	2/10/2026	1306009
Anritsu	MA2411B	Pulse Power Sensor	2/10/2025	Annual	2/10/2026	1315051
Anritsu	MA2411B	Pulse Power Sensor	2/10/2025	Annual	2/10/2026	1339027
ATM	180-442-KF	20dB Nominal Gain Horn Antenna	3/24/2025	Annual	3/24/2026	T058601-02
ETS-Lindgren	3117	Double Ridged Guide Antenna (1-18 GHz)	9/25/2024	Annual	9/25/2025	00240109
Fairview Microwave/MCL	FMCA1975-36/BW-K10-2W44+	30MHz-40GHz RF Cable/Attenuator *	6/10/2025	Annual	6/10/2026	-
Keysight Technology	N9040B	UXA Signal Analyzer	9/5/2024	Annual	9/5/2025	MY61320121
Keysight Technology	N9030A	PXA Signal Analyzer	10/16/2024	Annual	10/16/2025	MY49430494
Rohde & Schwarz	TS-PR18	Pre-Amplifier (1GHz - 18GHz)	8/14/2024	Annual	8/14/2025	101648
Rohde & Schwarz	FSW43	Spectrum Analyzer 2Hz to 43GHz	11/21/2024	Annual	11/21/2025	104093
Rohde & Schwarz	ESW44	EMI Test Receiver	10/17/2024	Annual	10/17/2025	101668
Rohde & Schwarz	TS-PR8	Pre-Amplifier (30MHz - 8GHz)	9/20/2024	Annual	9/20/2025	102327
Rohde & Schwarz	TS-PR1840	Pre-Amplifier (18GHz - 40GHz)	6/3/2025	Annual	6/3/2026	100052
Rohde & Schwarz	HFH2-Z2	Loop Antenna	5/12/2025	Annual	5/12/2026	100546
Rohde & Schwarz	ENV216	Two-Line V-Network	7/12/2024	Annual	7/12/2025	101363
Schwarzbeck	VULB 9162	Bilog Antenna (30MHz - 6GHz)	9/18/2024	Annual	9/18/2025	00358

Table 6-1. Test Equipment List

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

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7 TEST RESULTS

7.1 Summary

Company Name: Apple Inc.
 FCC ID: BCGA3358
 IC: 579C-A3358
 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
2.1049	RSS-Gen [6.7]	Occupied Bandwidth	N/A		N/A	Section 7.2
15.247(b)(3)	RSS-247 [5.4(d)]	Transmitter Output Power	< 1 Watt		PASS	Section 0
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	Section 7.5, 7.6
15.205 15.209	RSS-Gen [8.9]	General Field Strength Limits (Restricted Bands and Radiated Emission Limits)	Emissions in restricted bands must meet the radiated limits detailed in 15.209 (RSS-Gen [8.9])	RADIATED	PASS	Section 7.7, 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 "Conducted Automation," Version 1.4.0.
- For radiated testing, automated test software was used to measure emissions and capture the corresponding plots necessary to show compliance. The measurement software utilized is Element "Chamber Automation," Version 3.4.2.

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7.2 Bandwidth Measurement

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

Test Overview and Limit

The bandwidth at 6dB down from the highest in-band spectral density is measured with a spectrum analyzer connected to the transmitter antenna terminal of the EUT while the EUT is operating at 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 occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission shall be measured. All modes of operation were investigated and the worst case configuration results are reported in this section.

The minimum permissible 6dB bandwidth is 500 kHz.

Test Procedure Used

ANSI C63.10-2020 – Subclause 11.8.2 Option 2

KDB 558074 D01 v05r02 – Section 8.2

RSS-Gen [6.7]

Test Settings

1. The signal analyzers' automatic bandwidth measurement capability of the spectrum analyzer was used to perform the 99% occupied bandwidth and the 6dB bandwidth measurement. The "X" dB bandwidth parameter was set to $X = 6$. The bandwidth measurement was not influenced by any intermediate power nulls in the fundamental emission.
2. RBW = 100kHz
3. VBW $\geq 3 \times$ RBW
4. Detector = Peak
5. Trace mode = max hold
6. Sweep = auto couple
7. The trace was allowed to stabilize
8. If necessary, steps 2 – 7 were repeated after changing the RBW such that it would be within 1 – 5% of the 99% occupied bandwidth observed in Step 7

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Test Setup

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



Figure 7-1. Test Instrument & Measurement Setup

Test Notes

All supported modulation, antenna (including TxBF mode) and power schemes have been tested on the unit and only worst case configuration is reported.

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7.2.1 Antenna 4a

Frequency [MHz]	Data Rate [Mbps]	Power Scheme	Channel	Measured 99% Occupied Bandwidth [MHz]	Measured 6dB Bandwidth [MHz]	Minimum 6dB Bandwidth [MHz]	Pass/Fail
2402	0.125	ePA	0	1.049	0.677	0.50	Pass
2440	0.125	ePA	19	1.050	0.683	0.50	Pass
2480	0.125	ePA	39	1.050	0.682	0.50	Pass
2402	0.500	ePA	0	1.039	0.663	0.50	Pass
2440	0.500	ePA	19	1.040	0.660	0.50	Pass
2480	0.500	ePA	39	1.039	0.661	0.50	Pass
2402	1.0	ePA	0	1.033	0.665	0.50	Pass
2440	1.0	ePA	19	1.034	0.664	0.50	Pass
2480	1.0	ePA	39	1.033	0.667	0.50	Pass
2404	2.0	ePA	1	2.043	1.179	0.50	Pass
2440	2.0	ePA	19	2.045	1.183	0.50	Pass
2478	2.0	ePA	38	2.044	1.182	0.50	Pass

Table 7-2. 6dB BW & 99% OBW Measurements Antenna 4a

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Plot 7-1. 6dB BW & 99% OBW Plot Antenna 4a (Bluetooth (LE), 125kbps, ePA – Ch. 0)



Plot 7-2. 6dB BW & 99% OBW Plot Antenna 4a (Bluetooth (LE), 125kbps, ePA – Ch. 19)

FCC ID: BCGA3358 IC: 579C-A3358	 MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
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Plot 7-3. 6dB BW & 99% OBW Plot Antenna 4a (Bluetooth (LE), 125kbps, ePA – Ch. 39)



Plot 7-4. 6dB BW & 99% OBW Plot Antenna 4a (Bluetooth (LE), 500kbps, ePA – Ch. 0)

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Plot 7-5.6dB BW & 99% OBW Plot Antenna 4a (Bluetooth (LE), 500kbps, ePA – Ch. 19)



Plot 7-6. 6dB BW & 99% OBW Plot Antenna 4a (Bluetooth (LE), 500kbps, ePA – Ch. 39)

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Plot 7-7. 6dB BW & 99% OBW Plot Antenna 4a (Bluetooth (LE), 1Mbps, ePA – Ch. 0)



Plot 7-8. 6dB BW & 99% OBW Plot Antenna 4a (Bluetooth (LE), 1Mbps, ePA – Ch. 19)

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7.2.2 Antenna 2a

Frequency [MHz]	Data Rate [Mbps]	Power Scheme	Channel	Measured 99% Occupied Bandwidth [MHz]	Measured 6dB Bandwidth [MHz]	Minimum 6dB Bandwidth [MHz]	Pass/Fail
2402	0.125	ePA	0	1.049	0.684	0.50	Pass
2440	0.125	ePA	19	1.049	0.679	0.50	Pass
2480	0.125	ePA	39	1.048	0.683	0.50	Pass
2402	0.500	ePA	0	1.040	0.663	0.50	Pass
2440	0.500	ePA	19	1.041	0.660	0.50	Pass
2480	0.500	ePA	39	1.039	0.662	0.50	Pass
2402	1.0	ePA	0	1.032	0.667	0.50	Pass
2440	1.0	ePA	19	1.034	0.664	0.50	Pass
2480	1.0	ePA	39	1.031	0.667	0.50	Pass
2404	2.0	ePA	1	2.042	1.179	0.50	Pass
2440	2.0	ePA	19	2.043	1.180	0.50	Pass
2478	2.0	ePA	38	2.042	1.180	0.50	Pass

Table 7-3. 6dB BW & 99% OBW Measurements Antenna 2a

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Plot 7-15. 6dB BW & 99% OBW Plot Antenna 2a (Bluetooth (LE), 125kbps, ePA – Ch. 39)

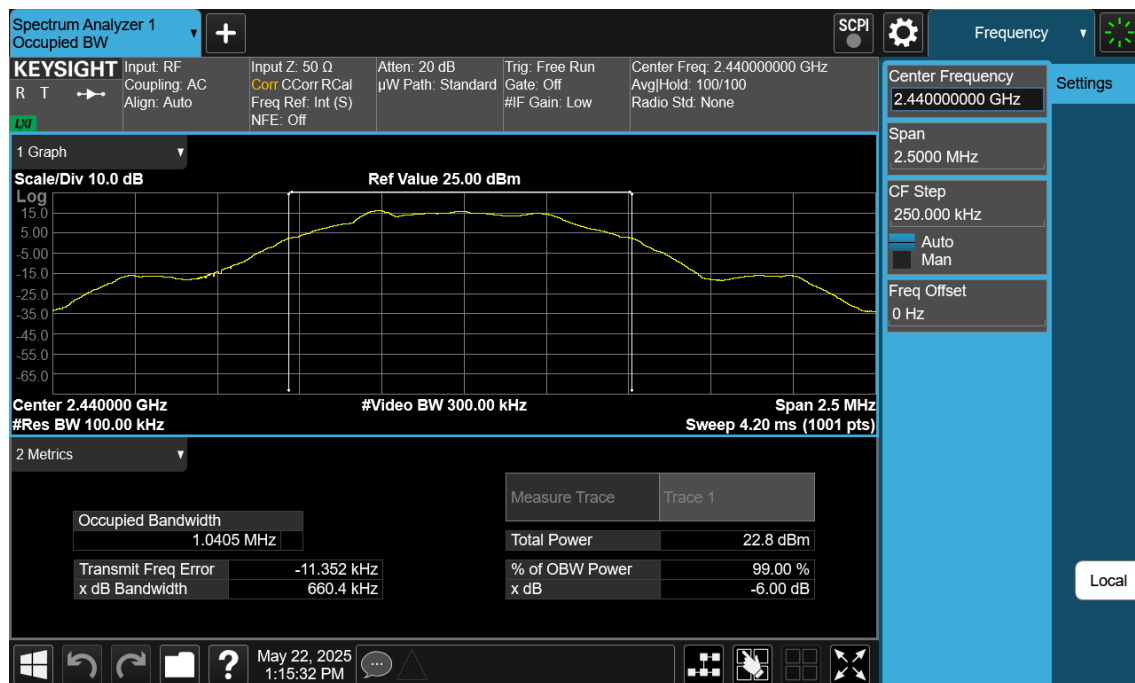


Plot 7-16. 6dB BW & 99% OBW Plot Antenna 2a (Bluetooth (LE), 500kbps, ePA – Ch. 0)

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Plot 7-19. 6dB BW & 99% OBW Plot Antenna 2a (Bluetooth (LE), 1Mbps, ePA – Ch. 0)



Plot 7-20. 6dB BW & 99% OBW Plot Antenna 2a (Bluetooth (LE), 1Mbps, ePA – Ch. 19)

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Plot 7-21. 6dB BW & 99% OBW Plot Antenna 2a (Bluetooth (LE), 1Mbps, ePA – Ch. 39)



Plot 7-22. 6dB BW & 99% OBW Plot Antenna 2a (Bluetooth (LE), 2Mbps, ePA – Ch. 1)

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7.3 Output Power Measurement

§15.247(b)(3); RSS-247 [5.4(d)]

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

The conducted output power limit on paragraph above is based on the use of antennas with directional gains that do not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

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

Test Procedure Used

ANSI C63.10-2020 – Subclause 11.9.1.2 PKPM1 Peak Power Method
 KDB 558074 D01 v05r02 – Section 8.3.1.3 PKPM1 Peak-reading Power Meter Method
 ANSI C63.10-2020 – Subclause 11.9.2.3.2 Method AVGPM-G
 KDB 558074 D01 v05r02 – Section 8.3.2.3 Measurement using a Power Meter (PM)
 ANSI C63.10-2020 – Subclause 14.4 Measure-and-Sum Technique
 KDB 662911 D01 v02r01 – Section E)1) Measure-and-Sum Technique

Test Settings

Method PKPM1 (Peak Power Measurement)

The maximum peak conducted output power may be measured using a broadband peak RF power meter. The power meter shall have a video bandwidth that is greater than or equal to the DTS bandwidth and shall utilize a fast-responding diode detector.

Method AVGPM-G (Average Power Measurement)

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

Test Setup

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



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

Test Notes

None

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7.3.1 Peak Output Power Measurement – Bluetooth (LE)

Frequency [MHz]	Data Rate [Mbps]	Power Scheme	Channel No.	Peak Conducted Power		Conducted Power Limit [dBm]	Conducted Power Margin [dB]	Ant. Gain [dBi]	EIRP [dBm]	EIRP Limit [dBm]	EIRP Margin [dB]
				[dBm]	[mW]						
2402	0.125	ePA	0	12.61	18.222	30.00	-17.39	2.40	15.01	36.02	-21.01
2440	0.125	ePA	19	12.47	17.652	30.00	-17.53	2.40	14.87	36.02	-21.15
2480	0.125	ePA	39	12.54	17.964	30.00	-17.46	2.40	14.94	36.02	-21.08
2402	0.125	iPA	0	8.38	6.882	30.00	-21.62	2.40	10.78	36.02	-25.24
2440	0.125	iPA	19	8.15	6.524	30.00	-21.86	2.40	10.55	36.02	-25.48
2480	0.125	iPA	39	8.31	6.781	30.00	-21.69	2.40	10.71	36.02	-25.31
2402	0.500	ePA	0	12.72	18.724	30.00	-17.28	2.40	15.12	36.02	-20.90
2440	0.500	ePA	19	12.94	19.670	30.00	-17.06	2.40	15.34	36.02	-20.68
2480	0.500	ePA	39	12.66	18.429	30.00	-17.35	2.40	15.06	36.02	-20.97
2402	0.500	iPA	0	8.41	6.928	30.00	-21.59	2.40	10.81	36.02	-25.21
2440	0.500	iPA	19	8.64	7.311	30.00	-21.36	2.40	11.04	36.02	-24.98
2480	0.500	iPA	39	8.38	6.891	30.00	-21.62	2.40	10.78	36.02	-25.24
2402	1.0	ePA	0	17.47	55.847	30.00	-12.53	2.40	19.87	36.02	-16.15
2440	1.0	ePA	19	17.58	57.332	30.00	-12.42	2.40	19.98	36.02	-16.04
2480	1.0	ePA	39	17.74	59.416	30.00	-12.26	2.40	20.14	36.02	-15.88
2402	1.0	iPA	0	8.37	6.868	30.00	-21.63	2.40	10.77	36.02	-25.25
2440	1.0	iPA	19	8.15	6.537	30.00	-21.85	2.40	10.55	36.02	-25.47
2480	1.0	iPA	39	8.32	6.784	30.00	-21.69	2.40	10.72	36.02	-25.31
2404	2.0	ePA	1	18.02	63.372	30.00	-11.98	2.40	20.42	36.02	-15.60
2440	2.0	ePA	19	17.05	50.734	30.00	-12.95	2.40	19.45	36.02	-16.57
2478	2.0	ePA	38	16.73	47.065	30.00	-13.27	2.40	19.13	36.02	-16.89
2404	2.0	iPA	1	8.40	6.925	30.00	-21.60	2.40	10.80	36.02	-25.22
2440	2.0	iPA	19	8.20	6.601	30.00	-21.80	2.40	10.60	36.02	-25.42
2478	2.0	iPA	38	7.90	6.162	30.00	-22.10	2.40	10.30	36.02	-25.72

Table 7-4. Peak Conducted Output Power Measurements Antenna 4a (Bluetooth LE)

Frequency [MHz]	Data Rate [Mbps]	Power Scheme	Channel No.	Peak Conducted Power		Conducted Power Limit [dBm]	Conducted Power Margin [dB]	Ant. Gain [dBi]	EIRP [dBm]	EIRP Limit [dBm]	EIRP Margin [dB]
				[dBm]	[mW]						
2402	0.125	ePA	0	12.51	17.807	30.00	-17.49	1.70	14.21	36.02	-21.81
2440	0.125	ePA	19	12.60	18.205	30.00	-17.40	1.70	14.30	36.02	-21.72
2480	0.125	ePA	39	12.74	18.806	30.00	-17.26	1.70	14.44	36.02	-21.58
2402	0.125	iPA	0	7.52	5.643	30.00	-22.49	1.70	9.22	36.02	-26.81
2440	0.125	iPA	19	7.57	5.719	30.00	-22.43	1.70	9.27	36.02	-26.75
2480	0.125	iPA	39	7.65	5.821	30.00	-22.35	1.70	9.35	36.02	-26.67
2402	0.500	ePA	0	12.57	18.068	30.00	-17.43	1.70	14.27	36.02	-21.75
2440	0.500	ePA	19	12.68	18.552	30.00	-17.32	1.70	14.38	36.02	-21.64
2480	0.500	ePA	39	12.78	18.971	30.00	-17.22	1.70	14.48	36.02	-21.54
2402	0.500	iPA	0	7.14	5.181	30.00	-22.86	1.70	8.84	36.02	-27.18
2440	0.500	iPA	19	7.62	5.781	30.00	-22.38	1.70	9.32	36.02	-26.70
2480	0.500	iPA	39	7.31	5.386	30.00	-22.69	1.70	9.01	36.02	-27.01
2402	1.0	ePA	0	18.01	63.285	30.00	-11.99	1.70	19.71	36.02	-16.31
2440	1.0	ePA	19	17.91	61.773	30.00	-12.09	1.70	19.61	36.02	-16.41
2480	1.0	ePA	39	17.81	60.325	30.00	-12.20	1.70	19.51	36.02	-16.52
2402	1.0	iPA	0	7.52	5.652	30.00	-22.48	1.70	9.22	36.02	-26.80
2440	1.0	iPA	19	7.62	5.780	30.00	-22.38	1.70	9.32	36.02	-26.70
2480	1.0	iPA	39	7.68	5.860	30.00	-22.32	1.70	9.38	36.02	-26.64
2404	2.0	ePA	1	17.84	60.799	30.00	-12.16	1.70	19.54	36.02	-16.48
2440	2.0	ePA	19	17.91	61.731	30.00	-12.10	1.70	19.61	36.02	-16.42
2478	2.0	ePA	38	18.01	63.168	30.00	-12.00	1.70	19.71	36.02	-16.32
2404	2.0	iPA	1	7.16	5.194	30.00	-22.85	1.70	8.86	36.02	-27.17
2440	2.0	iPA	19	7.63	5.797	30.00	-22.37	1.70	9.33	36.02	-26.69
2478	2.0	iPA	38	7.35	5.435	30.00	-22.65	1.70	9.05	36.02	-26.97

Table 7-5. Peak Conducted Output Power Measurements Antenna 2a (Bluetooth LE)

FCC ID: BCGA3358 IC: 579C-A3358	 MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1C2504170039-17-R1.BCG	Test Dates: 05/12/2025 - 07/19/2025	EUT Type: Tablet Device	Page 31 of 132

Frequency [MHz]	Data Rate [Mbps]	Power Scheme	Channel No.	Peak Conducted Power						Conducted Power Limit [dBm]	Conducted Power Margin [dB]	Directional Ant. Gain [dBi]	EIRP [dBm]	EIRP Limit [dBm]	EIRP Margin [dB]
				Antenna 4a		Antenna 2a		Summed							
				[dBm]	[mW]	[dBm]	[mW]	[dBm]	[mW]						
2402	0.125	ePA	0	9.57	9.064	9.57	9.051	12.58	18.113	30.00	-17.42	5.07	17.65	36.02	-18.37
2440	0.125	ePA	19	9.96	9.915	9.70	9.330	12.84	19.231	30.00	-17.16	5.07	17.91	36.02	-18.11
2480	0.125	ePA	39	9.54	8.991	9.75	9.432	12.65	18.408	30.00	-17.35	5.07	17.72	36.02	-18.30
2402	0.125	iPA	0	8.79	7.563	7.48	5.601	11.19	13.152	30.00	-18.81	5.07	16.26	36.02	-19.76
2440	0.125	iPA	19	8.53	7.130	7.52	5.644	11.06	12.764	30.00	-18.94	5.07	16.13	36.02	-19.89
2480	0.125	iPA	39	8.23	6.653	7.62	5.781	10.95	12.445	30.00	-19.05	5.07	16.02	36.02	-20.00
2402	0.500	ePA	0	9.70	9.337	9.57	9.051	12.65	18.408	30.00	-17.35	5.07	17.72	36.02	-18.30
2440	0.500	ePA	19	9.50	8.921	9.71	9.352	12.62	18.281	30.00	-17.38	5.07	17.69	36.02	-18.33
2480	0.500	ePA	39	9.60	9.129	9.81	9.576	12.72	18.707	30.00	-17.28	5.07	17.79	36.02	-18.23
2402	0.500	iPA	0	8.35	6.836	7.12	5.149	10.79	11.995	30.00	-19.21	5.07	15.86	36.02	-20.16
2440	0.500	iPA	19	8.56	7.180	7.56	5.704	11.10	12.882	30.00	-18.90	5.07	16.17	36.02	-19.85
2480	0.500	iPA	39	8.31	6.775	7.27	5.333	10.83	12.106	30.00	-19.17	5.07	15.90	36.02	-20.12
2402	1.0	ePA	0	17.45	55.526	17.97	62.633	20.72	118.032	30.00	-9.28	5.07	25.79	36.02	-10.23
2440	1.0	ePA	19	17.55	56.833	17.83	60.716	20.70	117.490	30.00	-9.30	5.07	25.77	36.02	-10.25
2480	1.0	ePA	39	17.12	51.570	17.74	59.429	20.45	110.917	30.00	-9.55	5.07	25.52	36.02	-10.50
2402	1.0	iPA	0	8.31	6.781	7.49	5.605	10.93	12.388	30.00	-19.07	5.07	16.00	36.02	-20.02
2440	1.0	iPA	19	8.07	6.405	7.57	5.716	10.84	12.134	30.00	-19.16	5.07	15.91	36.02	-20.11
2480	1.0	iPA	39	8.25	6.680	7.22	5.270	10.77	11.940	30.00	-19.23	5.07	15.84	36.02	-20.18
2404	2.0	ePA	1	17.40	54.916	17.81	60.353	20.62	115.345	30.00	-9.38	5.07	25.69	36.02	-10.33
2440	2.0	ePA	19	18.12	64.893	17.86	61.024	21.00	125.893	30.00	-9.00	5.07	26.07	36.02	-9.95
2478	2.0	ePA	38	17.56	57.069	17.96	62.575	20.78	119.674	30.00	-9.22	5.07	25.85	36.02	-10.17
2404	2.0	iPA	1	8.33	6.805	7.13	5.169	10.78	11.967	30.00	-19.22	5.07	15.85	36.02	-20.17
2440	2.0	iPA	19	8.10	6.460	7.60	5.758	10.87	12.218	30.00	-19.13	5.07	15.94	36.02	-20.08
2478	2.0	iPA	38	8.34	6.819	7.32	5.398	10.87	12.218	30.00	-19.13	5.07	15.94	36.02	-20.08

Table 7-6. Peak Conducted Output Power Measurements TxBF (Bluetooth LE)

FCC ID: BCGA3358 IC: 579C-A3358	 MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
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7.3.2 Average Output Power Measurement – Bluetooth (LE)

Frequency [MHz]	Data Rate [Mbps]	Power Scheme	Channel No.	Average Conducted Power		Conducted Power Limit [dBm]	Conducted Power Margin [dB]	Ant. Gain [dBi]	EIRP [dBm]	EIRP Limit [dBm]	EIRP Margin [dB]
				[dBm]	[mW]						
2402	0.125	ePA	0	12.15	16.410	30.00	-17.85	2.40	14.55	36.02	-21.47
2440	0.125	ePA	19	12.46	17.608	30.00	-17.54	2.40	14.86	36.02	-21.16
2480	0.125	ePA	39	12.53	17.906	30.00	-17.47	2.40	14.93	36.02	-21.09
2402	0.125	iPA	0	8.35	6.841	30.00	-21.65	2.40	10.75	36.02	-25.27
2440	0.125	iPA	19	8.11	6.471	30.00	-21.89	2.40	10.51	36.02	-25.51
2480	0.125	iPA	39	8.31	6.775	30.00	-21.69	2.40	10.71	36.02	-25.31
2402	0.500	ePA	0	12.51	17.807	30.00	-17.49	2.40	14.91	36.02	-21.11
2440	0.500	ePA	19	12.73	18.746	30.00	-17.27	2.40	15.13	36.02	-20.89
2480	0.500	ePA	39	12.41	17.398	30.00	-17.60	2.40	14.81	36.02	-21.22
2402	0.500	iPA	0	8.23	6.656	30.00	-21.77	2.40	10.63	36.02	-25.39
2440	0.500	iPA	19	8.46	7.016	30.00	-21.54	2.40	10.86	36.02	-25.16
2480	0.500	iPA	39	8.49	7.066	30.00	-21.51	2.40	10.89	36.02	-25.13
2402	1.0	ePA	0	17.29	53.617	30.00	-12.71	2.40	19.69	36.02	-16.33
2440	1.0	ePA	19	17.35	54.375	30.00	-12.65	2.40	19.75	36.02	-16.27
2480	1.0	ePA	39	17.50	56.221	30.00	-12.50	2.40	19.90	36.02	-16.12
2402	1.0	iPA	0	8.34	6.819	30.00	-21.66	2.40	10.74	36.02	-25.28
2440	1.0	iPA	19	7.91	6.184	30.00	-22.09	2.40	10.31	36.02	-25.71
2480	1.0	iPA	39	8.32	6.797	30.00	-21.68	2.40	10.72	36.02	-25.30
2404	2.0	ePA	1	17.06	50.793	30.00	-12.94	2.40	19.46	36.02	-16.56
2440	2.0	ePA	19	16.79	47.742	30.00	-13.21	2.40	19.19	36.02	-16.83
2478	2.0	ePA	38	16.64	46.142	30.00	-13.36	2.40	19.04	36.02	-16.98
2404	2.0	iPA	1	8.36	6.852	30.00	-21.64	2.40	10.76	36.02	-25.26
2440	2.0	iPA	19	7.67	5.844	30.00	-22.33	2.40	10.07	36.02	-25.95
2478	2.0	iPA	38	7.61	5.768	30.00	-22.39	2.40	10.01	36.02	-26.01

Table 7-7. Average Conducted Output Power Measurements Antenna 4a (Bluetooth LE)

Frequency [MHz]	Data Rate [Mbps]	Power Scheme	Channel No.	Average Conducted Power		Conducted Power Limit [dBm]	Conducted Power Margin [dB]	Ant. Gain [dBi]	EIRP [dBm]	EIRP Limit [dBm]	EIRP Margin [dB]
				[dBm]	[mW]						
2402	0.125	ePA	0	12.49	17.734	30.00	-17.51	1.70	14.19	36.02	-21.83
2440	0.125	ePA	19	12.59	18.151	30.00	-17.41	1.70	14.29	36.02	-21.73
2480	0.125	ePA	39	12.72	18.694	30.00	-17.28	1.70	14.42	36.02	-21.60
2402	0.125	iPA	0	7.35	5.431	30.00	-22.65	1.70	9.05	36.02	-26.97
2440	0.125	iPA	19	7.38	5.465	30.00	-22.62	1.70	9.08	36.02	-26.94
2480	0.125	iPA	39	7.47	5.589	30.00	-22.53	1.70	9.17	36.02	-26.85
2402	0.500	ePA	0	12.34	17.147	30.00	-17.66	1.70	14.04	36.02	-21.98
2440	0.500	ePA	19	12.46	17.628	30.00	-17.54	1.70	14.16	36.02	-21.86
2480	0.500	ePA	39	12.57	18.072	30.00	-17.43	1.70	14.27	36.02	-21.75
2402	0.500	iPA	0	6.96	4.964	30.00	-23.04	1.70	8.66	36.02	-27.36
2440	0.500	iPA	19	7.42	5.521	30.00	-22.58	1.70	9.12	36.02	-26.90
2480	0.500	iPA	39	7.12	5.155	30.00	-22.88	1.70	8.82	36.02	-27.20
2402	1.0	ePA	0	17.82	60.590	30.00	-12.18	1.70	19.52	36.02	-16.50
2440	1.0	ePA	19	17.73	59.224	30.00	-12.28	1.70	19.43	36.02	-16.60
2480	1.0	ePA	39	17.63	57.890	30.00	-12.37	1.70	19.33	36.02	-16.69
2402	1.0	iPA	0	7.30	5.372	30.00	-22.70	1.70	9.00	36.02	-27.02
2440	1.0	iPA	19	7.43	5.530	30.00	-22.57	1.70	9.13	36.02	-26.89
2480	1.0	iPA	39	7.48	5.592	30.00	-22.52	1.70	9.18	36.02	-26.84
2404	2.0	ePA	1	17.51	56.312	30.00	-12.49	1.70	19.21	36.02	-16.81
2440	2.0	ePA	19	17.72	59.183	30.00	-12.28	1.70	19.42	36.02	-16.60
2478	2.0	ePA	38	17.62	57.810	30.00	-12.38	1.70	19.32	36.02	-16.70
2404	2.0	iPA	1	7.04	5.059	30.00	-22.96	1.70	8.74	36.02	-27.28
2440	2.0	iPA	19	7.37	5.463	30.00	-22.63	1.70	9.07	36.02	-26.95
2478	2.0	iPA	38	7.11	5.137	30.00	-22.89	1.70	8.81	36.02	-27.21

Table 7-8. Average Conducted Output Power Measurements Antenna 2a (Bluetooth LE)

FCC ID: BCGA3358 IC: 579C-A3358	 MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
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Frequency [MHz]	Data Rate [Mbps]	Power Scheme	Channel No.	Average Conducted Power						Conducted Power Limit [dBm]	Conducted Power Margin [dB]	Directional Ant. Gain [dBi]	EIRP [dBm]	EIRP Limit [dBm]	EIRP Margin [dB]
				Antenna 4a		Antenna 2a		Summed							
				[dBm]	[mW]	[dBm]	[mW]	[dBm]	[mW]						
2402	0.125	ePA	0	9.54	8.991	9.08	8.095	12.33	17.100	30.00	-17.67	5.07	17.40	36.02	-18.62
2440	0.125	ePA	19	9.47	8.845	9.66	9.238	12.57	18.072	30.00	-17.43	5.07	17.64	36.02	-18.38
2480	0.125	ePA	39	9.46	8.833	9.72	9.365	12.60	18.197	30.00	-17.40	5.07	17.67	36.02	-18.35
2402	0.125	iPA	0	8.31	6.772	7.31	5.388	10.85	12.162	30.00	-19.15	5.07	15.92	36.02	-20.10
2440	0.125	iPA	19	8.04	6.364	7.35	5.433	10.72	11.803	30.00	-19.28	5.07	15.79	36.02	-20.23
2480	0.125	iPA	39	8.21	6.619	7.35	5.429	10.81	12.050	30.00	-19.19	5.07	15.88	36.02	-20.14
2402	0.500	ePA	0	9.48	8.867	9.49	8.890	12.49	17.742	30.00	-17.51	5.07	17.56	36.02	-18.46
2440	0.500	ePA	19	9.29	8.490	9.50	8.904	12.40	17.378	30.00	-17.60	5.07	17.47	36.02	-18.55
2480	0.500	ePA	39	9.36	8.624	9.59	9.103	12.49	17.742	30.00	-17.51	5.07	17.56	36.02	-18.46
2402	0.500	iPA	0	8.18	6.578	6.94	4.941	10.61	11.508	30.00	-19.39	5.07	15.68	36.02	-20.34
2440	0.500	iPA	19	8.38	6.882	7.37	5.459	10.91	12.331	30.00	-19.09	5.07	15.98	36.02	-20.04
2480	0.500	iPA	39	8.14	6.513	7.10	5.133	10.66	11.641	30.00	-19.34	5.07	15.73	36.02	-20.29
2402	1.0	ePA	0	17.33	54.063	17.82	60.534	20.59	114.551	30.00	-9.41	5.07	25.66	36.02	-10.36
2440	1.0	ePA	19	17.48	56.002	17.67	58.533	20.59	114.551	30.00	-9.41	5.07	25.66	36.02	-10.36
2480	1.0	ePA	39	16.89	48.809	17.56	57.043	20.25	105.925	30.00	-9.75	5.07	25.32	36.02	-10.70
2402	1.0	iPA	0	8.11	6.467	7.33	5.405	10.75	11.885	30.00	-19.25	5.07	15.82	36.02	-20.20
2440	1.0	iPA	19	8.16	6.539	7.34	5.419	10.78	11.967	30.00	-19.22	5.07	15.85	36.02	-20.17
2480	1.0	iPA	39	8.05	6.375	7.03	5.044	10.58	11.429	30.00	-19.42	5.07	15.65	36.02	-20.37
2404	2.0	ePA	1	17.18	52.276	17.76	59.717	20.49	111.944	30.00	-9.51	5.07	25.56	36.02	-10.46
2440	2.0	ePA	19	17.36	54.500	17.76	59.649	20.57	114.025	30.00	-9.43	5.07	25.64	36.02	-10.38
2478	2.0	ePA	38	17.30	53.703	17.59	57.372	20.46	111.173	30.00	-9.54	5.07	25.53	36.02	-10.49
2404	2.0	iPA	1	8.19	6.586	6.92	4.917	10.61	11.508	30.00	-19.39	5.07	15.68	36.02	-20.34
2440	2.0	iPA	19	8.29	6.739	7.36	5.448	10.86	12.190	30.00	-19.14	5.07	15.93	36.02	-20.09
2478	2.0	iPA	38	8.49	7.066	7.12	5.155	10.87	12.218	30.00	-19.13	5.07	15.94	36.02	-20.08

Table 7-9. Average Conducted Output Power Measurements TxBF (Bluetooth LE)

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Note:

Per ANSI C63.10-2020 and KDB 662911 D01 v02r01 Section E)1), the conducted powers at Antenna 4a and Antenna 2a were first measured separately during TxBF transmission as shown in the section above. The measured values were then summed in linear power units then converted back to dBm.

Per ANSI C63.10-2020 Section 14.6.3, the directional gain is calculated using the following formula, where G_N is the gain of the nth antenna and N_{ANT} , the total number of antennas used.

$$\text{Directional gain} = 10 \log[(10^{G_1/20} + 10^{G_2/20} + \dots + 10^{G_N/20})^2 / N_{ANT}] \text{ dBi}$$

Sample TxBF Calculation:

At 2402MHz the average conducted output power was measured to be 9.54 dBm for Antenna 4a and 9.08 dBm for Antenna 2a.

$$\text{Antenna 4a} + \text{Antenna 2a} = \text{TxBF}$$

$$(9.54 \text{ dBm} + 9.08 \text{ dBm}) = (8.991 \text{ mW} + 8.095 \text{ mW}) = 17.100 \text{ mW} = 12.33 \text{ dBm}$$

Sample e.i.r.p. Calculation:

At 2402MHz, the average conducted output power was calculated to be 12.33 dBm with directional gain of 5.07 dBi.

$$\text{e.i.r.p. (dBm)} = \text{Conducted Power (dBm)} + \text{Ant gain (dBi)}$$

$$12.33 \text{ dBm} + 5.07 \text{ dBi} = 17.40 \text{ dBm}$$

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7.4 Power Spectral Density

§15.247(e); RSS-247 [5.2]

Test Overview and Limit

The peak power density is measured with a spectrum analyzer connected to the antenna terminal of the EUT while the EUT is operating at 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 C63.10-2020 – Subclause 11.10.2 Method PKPSD

KDB 558074 D01 v05r02 – Section 8.4 DTS Maximum Power Spectral Density level in the fundamental emission

ANSI C63.10-2020 – Subclause 14.5.2.2 Measure-and-Sum Technique

KDB 662911 D01 v02r01 – Section E)2) Measure-and-Sum Technique

Test Settings

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

Test Setup

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

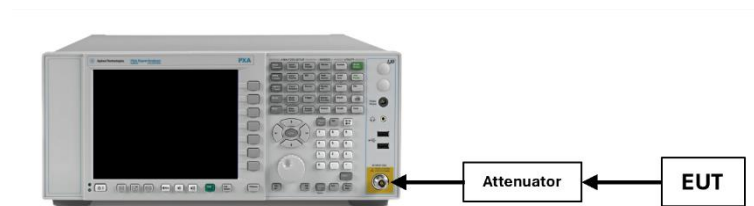


Figure 7-3. Test Instrument & Measurement Setup

Test Notes

None

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7.4.1 Antenna 4a

Frequency [MHz]	Data Rate [Mbps]	Power Scheme	Channel No.	Measured Power Density [dBm/3kHz]	Max Power Density [dBm/3kHz]	Margin [dB]
2402	0.125	ePA	0	6.50	8.0	-1.50
2440	0.125	ePA	19	6.06	8.0	-1.94
2480	0.125	ePA	39	6.21	8.0	-1.79
2402	0.125	iPA	0	1.93	8.0	-6.07
2440	0.125	iPA	19	2.10	8.0	-5.90
2480	0.125	iPA	39	2.05	8.0	-5.95
2402	0.500	ePA	0	6.27	8.0	-1.73
2440	0.500	ePA	19	6.39	8.0	-1.62
2480	0.500	ePA	39	6.02	8.0	-1.98
2402	0.500	iPA	0	1.67	8.0	-6.33
2440	0.500	iPA	19	2.41	8.0	-5.59
2480	0.500	iPA	39	1.41	8.0	-6.59
2402	1.0	ePA	0	1.16	8.0	-6.84
2440	1.0	ePA	19	2.33	8.0	-5.67
2480	1.0	ePA	39	1.36	8.0	-6.65
2402	1.0	iPA	0	-8.07	8.0	-16.07
2440	1.0	iPA	19	-7.20	8.0	-15.20
2480	1.0	iPA	39	-7.75	8.0	-15.75
2404	2.0	ePA	1	-1.08	8.0	-9.08
2440	2.0	ePA	19	-1.49	8.0	-9.49
2478	2.0	ePA	38	-2.24	8.0	-10.24
2404	2.0	iPA	1	-10.58	8.0	-18.58
2440	2.0	iPA	19	-10.49	8.0	-18.49
2478	2.0	iPA	38	-10.99	8.0	-18.99

Table 7-10. Conducted Power Density Measurements Antenna 4a

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Plot 7-25. Power Spectral Density Plot Antenna 4a (Bluetooth (LE), 125kbps, ePA – Ch. 0)



Plot 7-26. Power Spectral Density Plot Antenna 4a (Bluetooth (LE), 125kbps, ePA – Ch. 19)

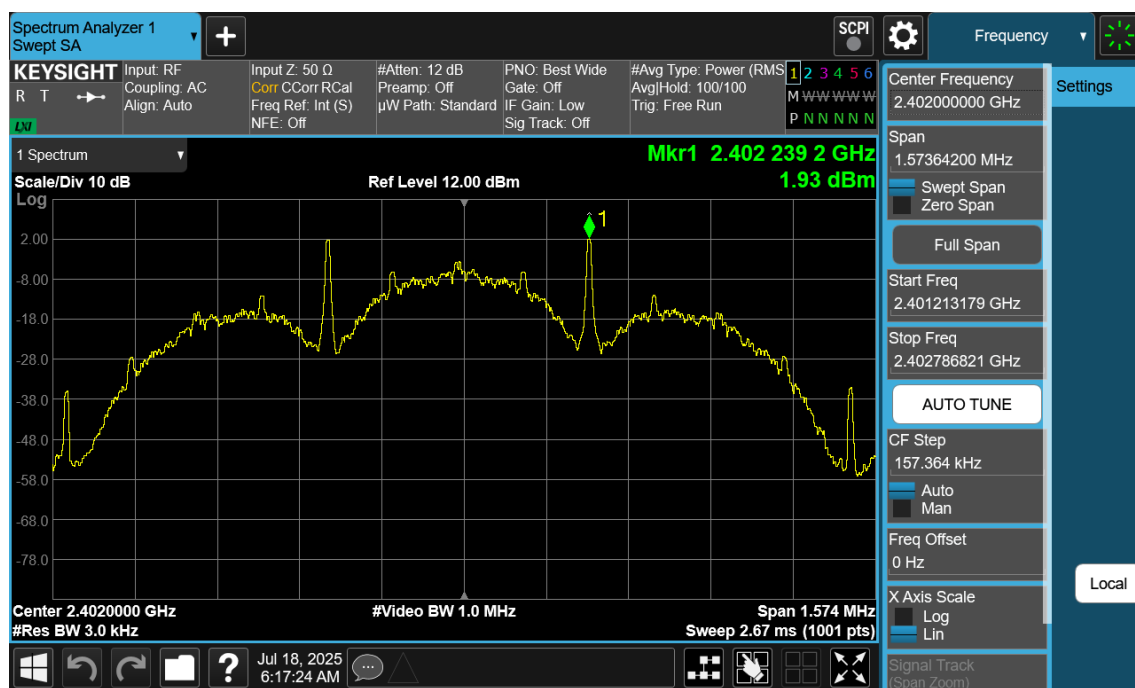
FCC ID: BCGA3358 IC: 579C-A3358		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
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Plot 7-27. Power Spectral Density Plot Antenna 4a (Bluetooth (LE), 125kbps, ePA – Ch. 39)



Plot 7-28. Power Spectral Density Plot Antenna 4a (Bluetooth (LE), 125kbps, iPA – Ch. 0)

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Plot 7-29. Power Spectral Density Plot Antenna 4a (Bluetooth (LE), 125kbps, iPA – Ch. 19)

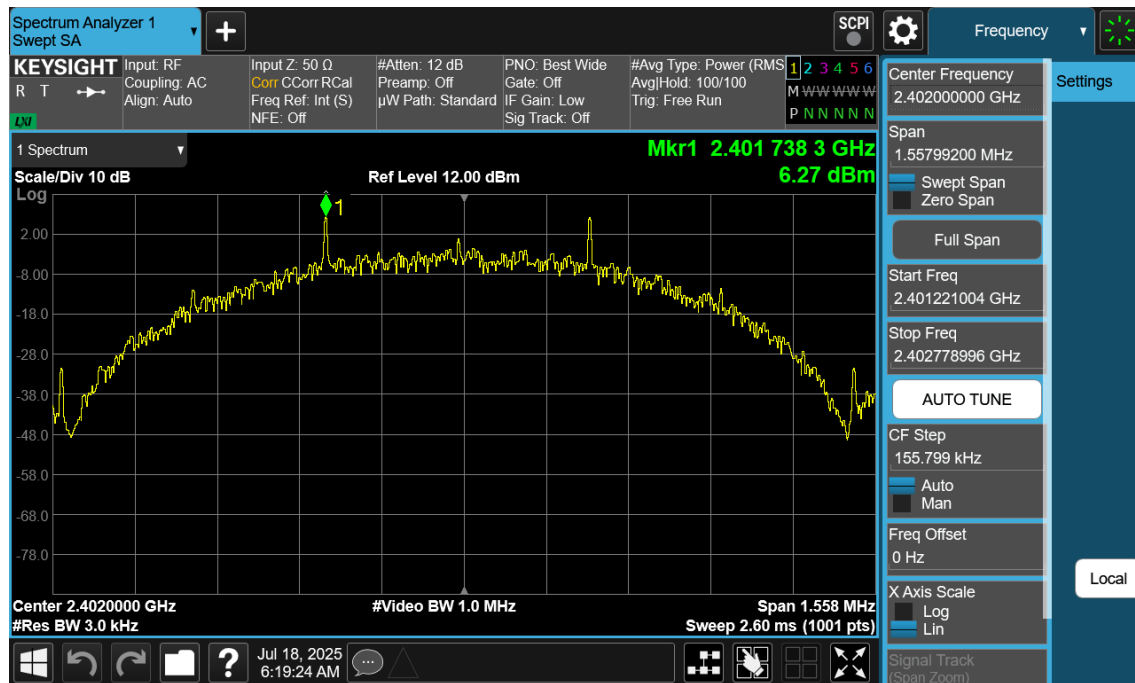


Plot 7-30. Power Spectral Density Plot Antenna 4a (Bluetooth (LE), 125kbps, iPA – Ch. 39)

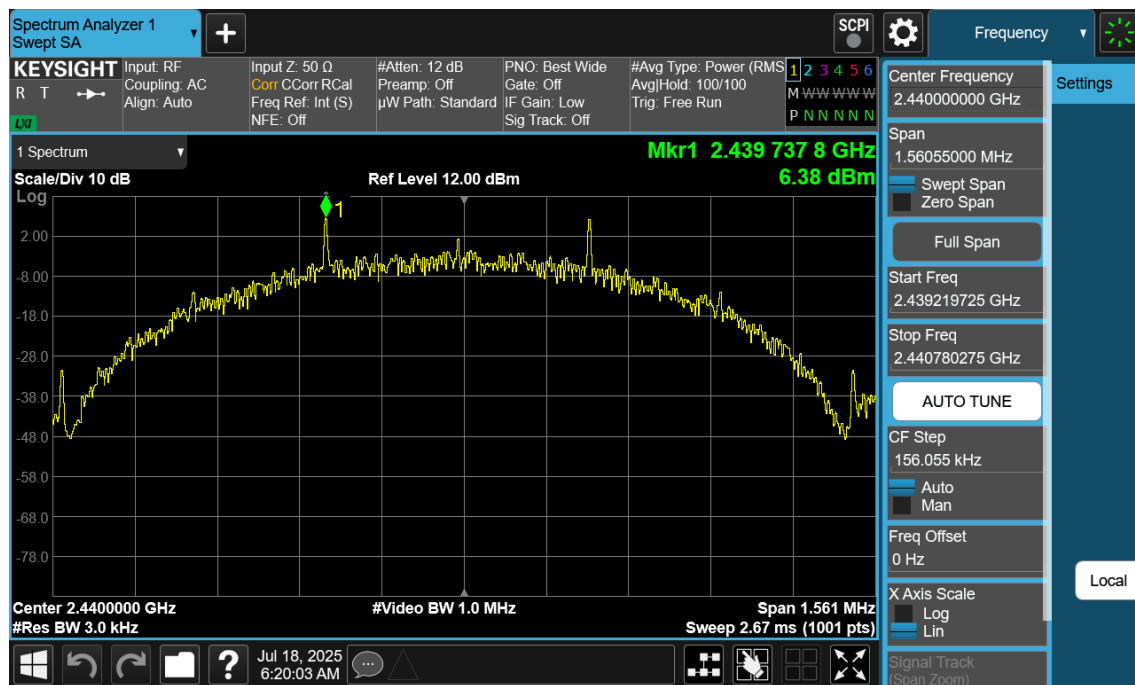
FCC ID: BCGA3358 IC: 579C-A3358		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
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Plot 7-31. Power Spectral Density Plot Antenna 4a (Bluetooth (LE), 500kbps, ePA – Ch. 0)

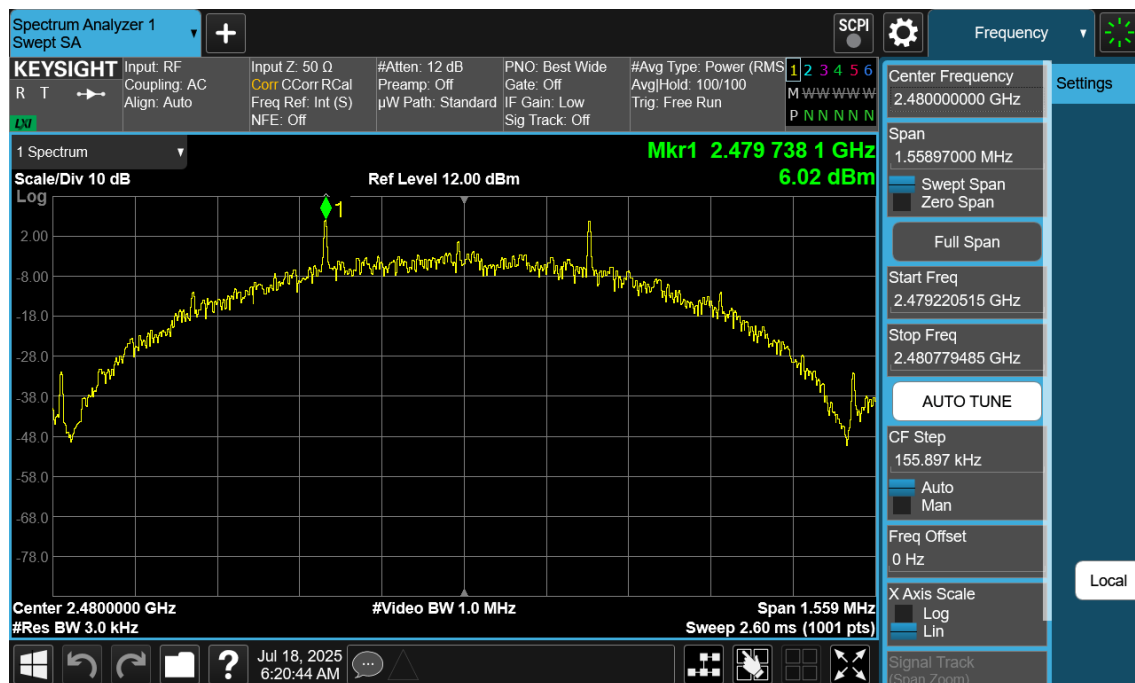


Plot 7-32. Power Spectral Density Plot Antenna 4a (Bluetooth (LE), 500kbps, ePA – Ch. 19)

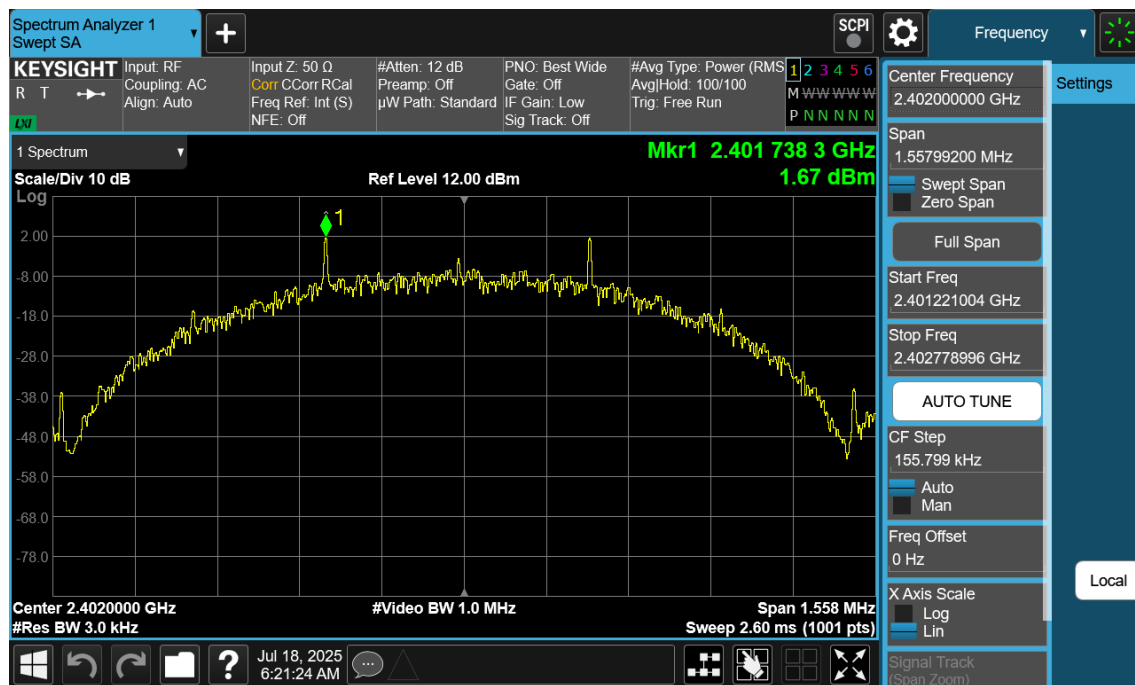
FCC ID: BCGA3358 IC: 579C-A3358		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
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Plot 7-33. Power Spectral Density Plot Antenna 4a (Bluetooth (LE), 500kbps, ePA – Ch. 39)

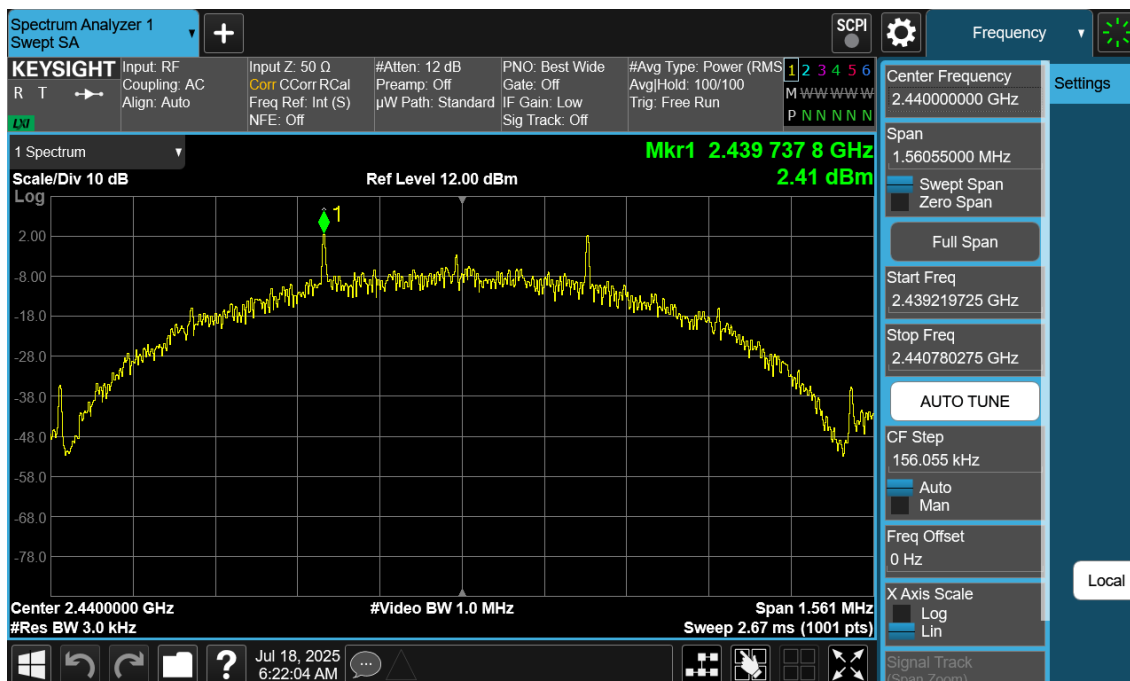


Plot 7-34. Power Spectral Density Plot Antenna 4a (Bluetooth (LE), 500kbps, iPA – Ch. 0)

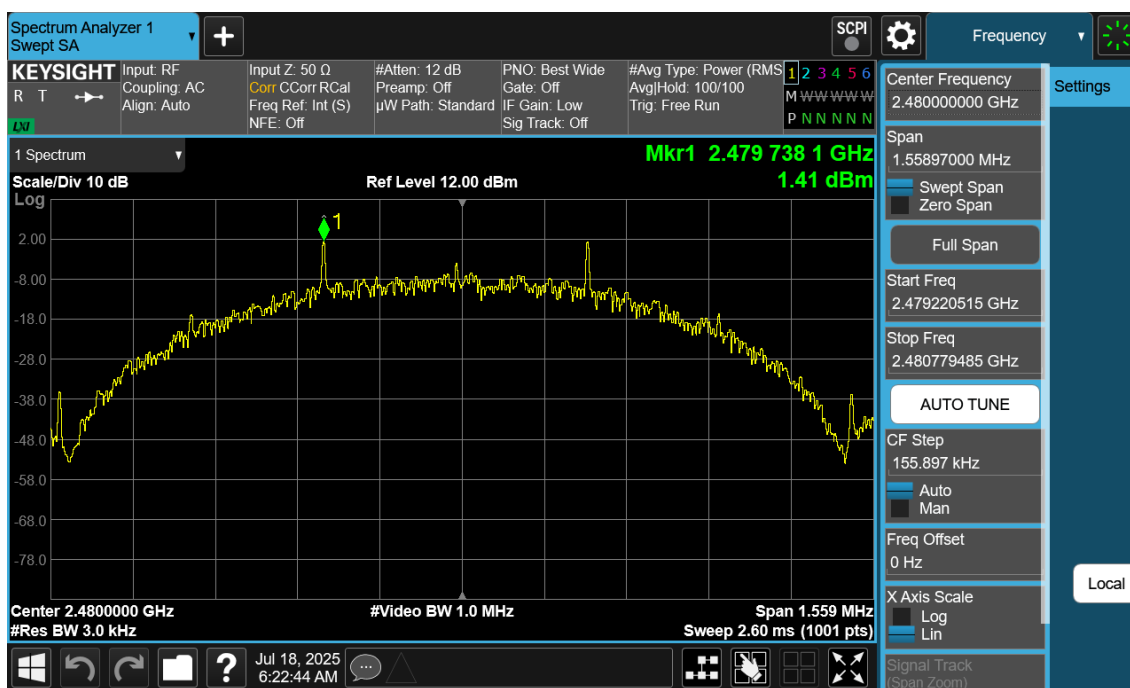
FCC ID: BCGA3358 IC: 579C-A3358		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
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Plot 7-35. Power Spectral Density Plot Antenna 4a (Bluetooth (LE), 500kbps, iPA – Ch. 19)



Plot 7-36. Power Spectral Density Plot Antenna 4a (Bluetooth (LE), 500kbps, iPA – Ch. 39)

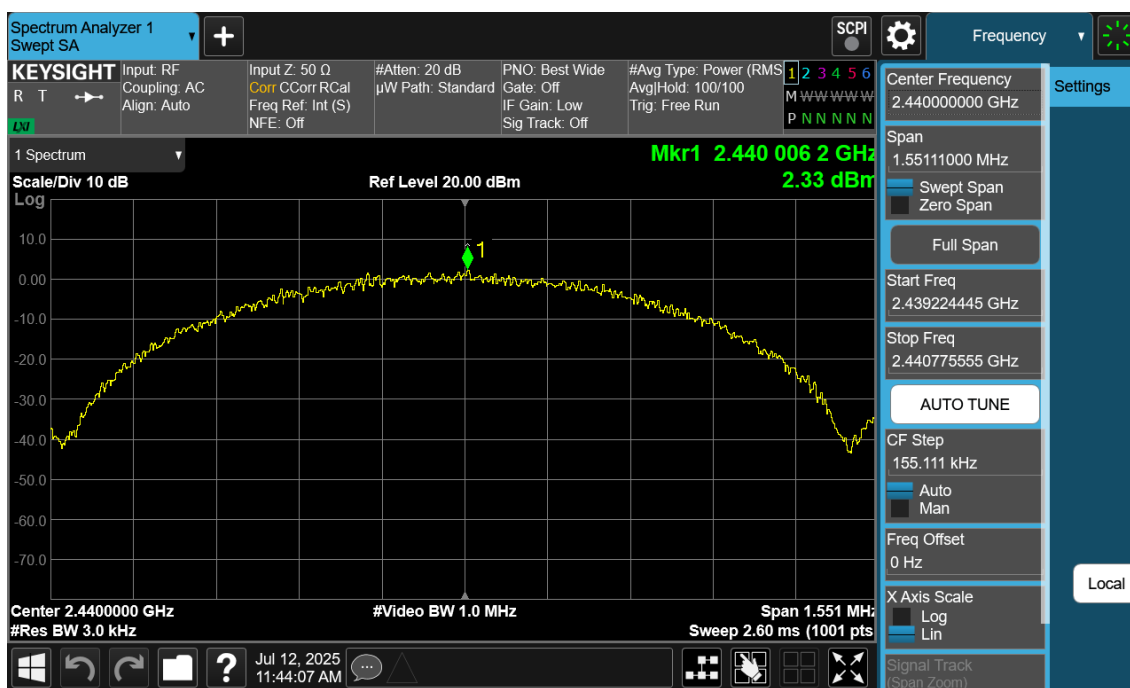
FCC ID: BCGA3358 IC: 579C-A3358		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
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Plot 7-37. Power Spectral Density Plot Antenna 4a (Bluetooth (LE), 1Mbps, ePA – Ch. 0)

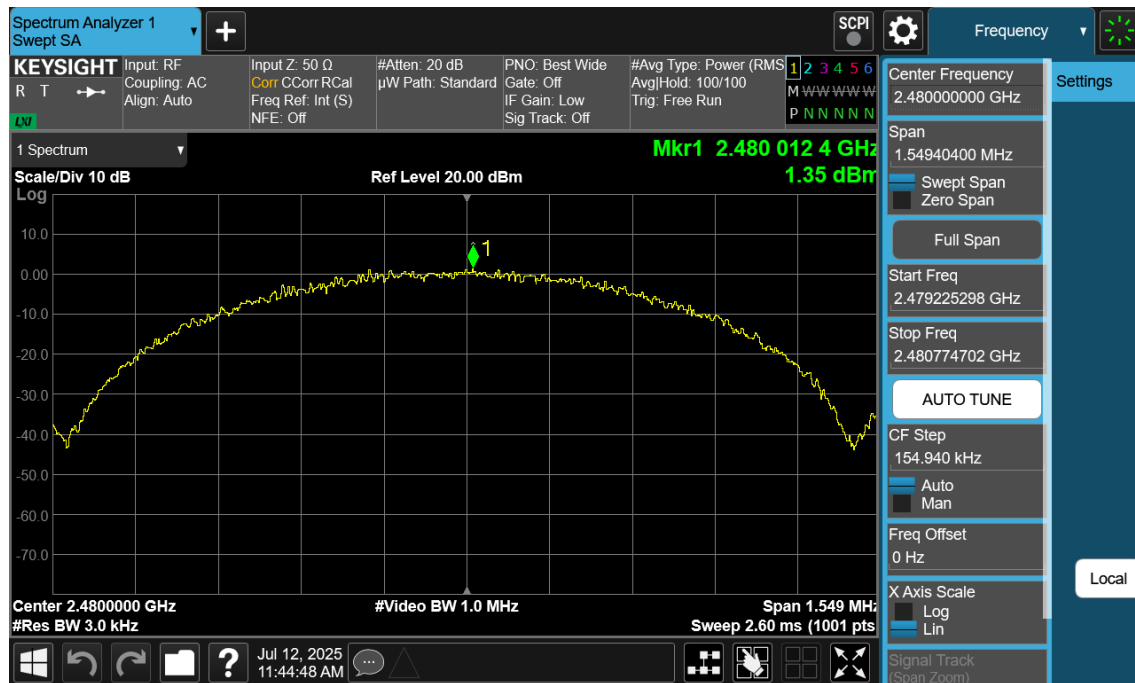


Plot 7-38. Power Spectral Density Plot Antenna 4a (Bluetooth (LE), 1Mbps, ePA – Ch. 19)

FCC ID: BCGA3358 IC: 579C-A3358		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
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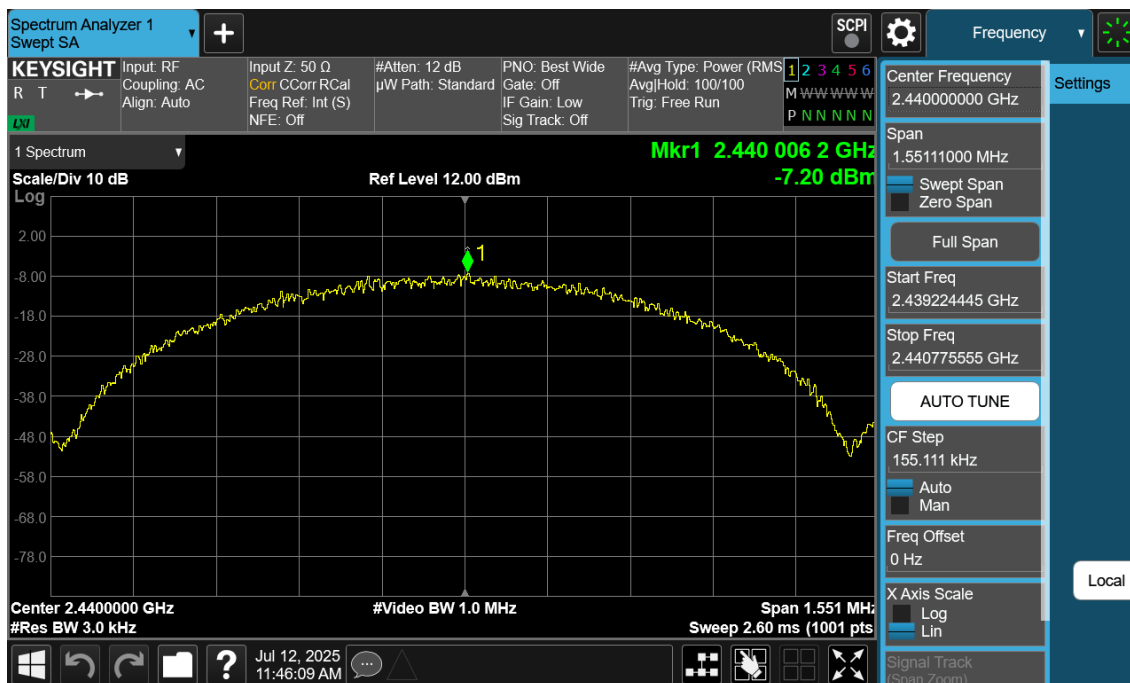
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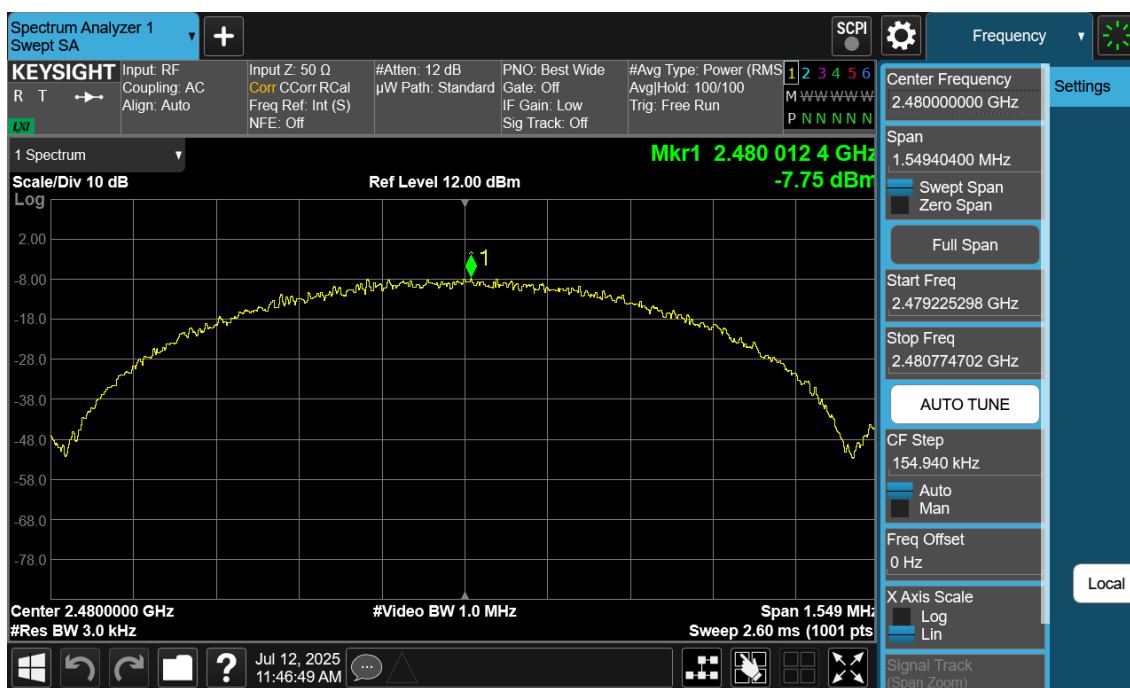
FCC ID: BCGA3358 IC: 579C-A3358	 MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
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Plot 7-41. Power Spectral Density Plot Antenna 4a (Bluetooth (LE), 1Mbps, iPA – Ch. 19)

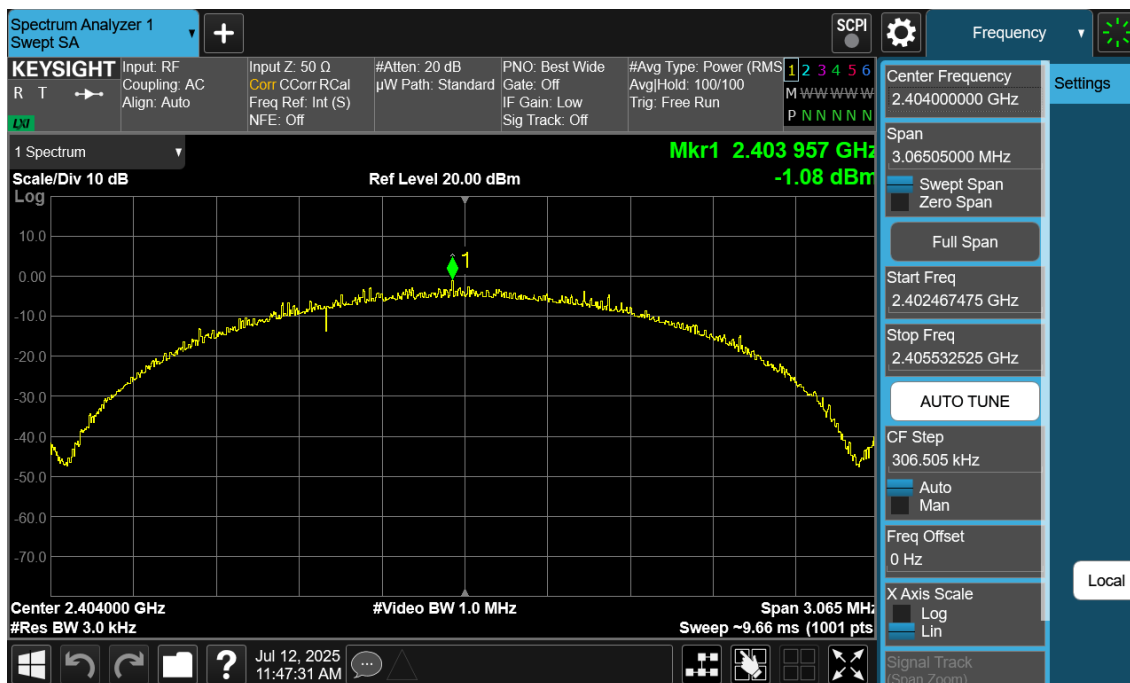


Plot 7-42. Power Spectral Density Plot Antenna 4a (Bluetooth (LE), 1Mbps, iPA – Ch. 39)

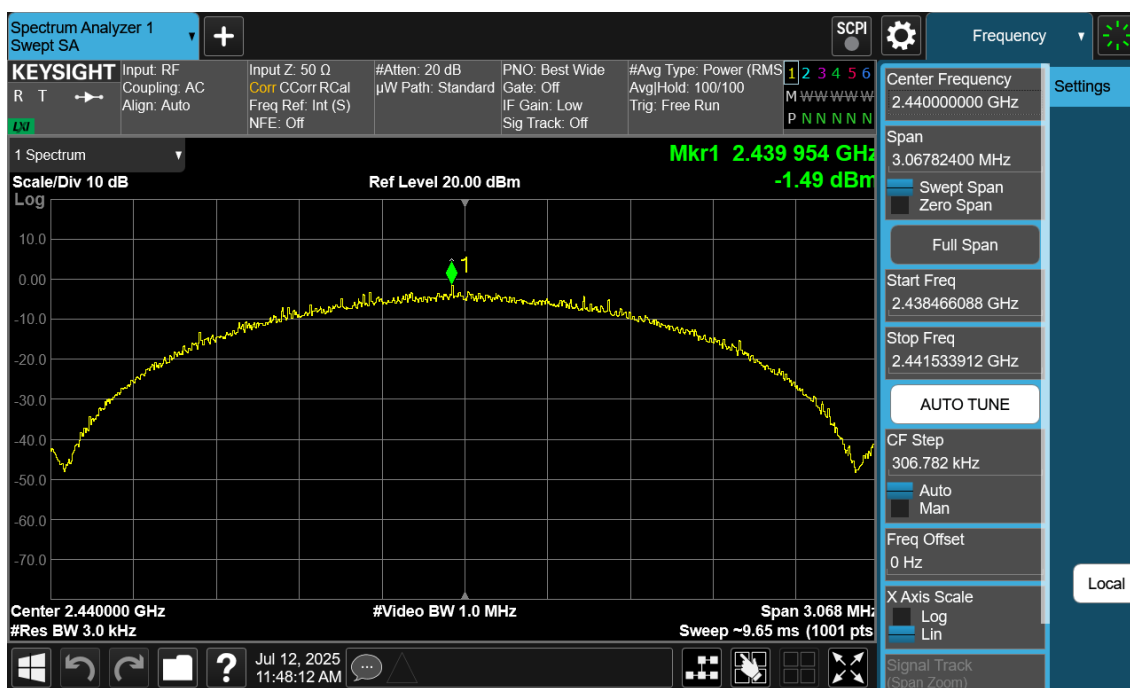
FCC ID: BCGA3358 IC: 579C-A3358		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
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Plot 7-43. Power Spectral Density Plot Antenna 4a (Bluetooth (LE), 2Mbps, ePA – Ch. 1)

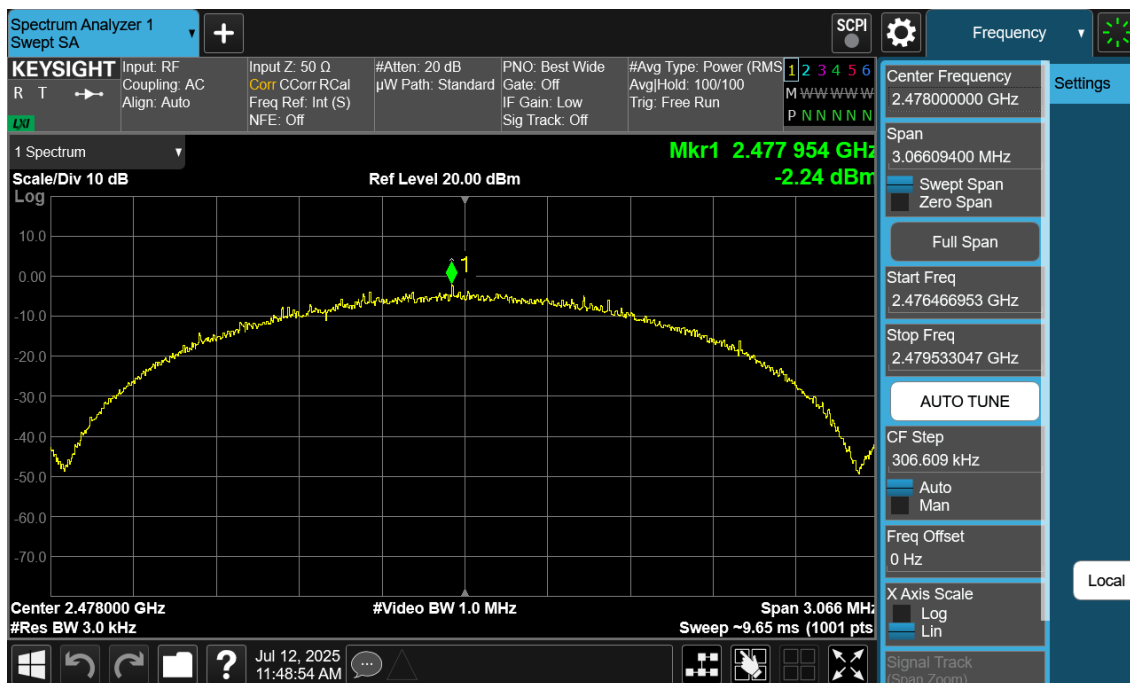


Plot 7-44. Power Spectral Density Plot Antenna 4a (Bluetooth (LE), 2Mbps, ePA – Ch. 19)

FCC ID: BCGA3358 IC: 579C-A3358	 MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
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Plot 7-45. Power Spectral Density Plot Antenna 4a (Bluetooth (LE), 2Mbps, ePA – Ch. 38)

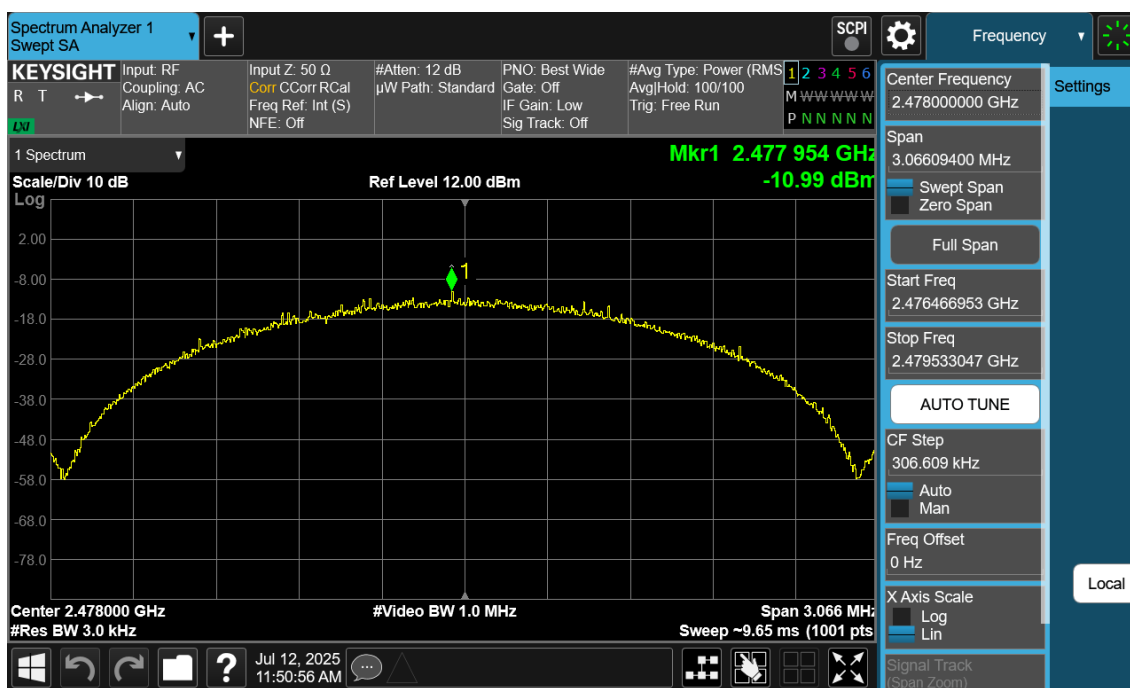
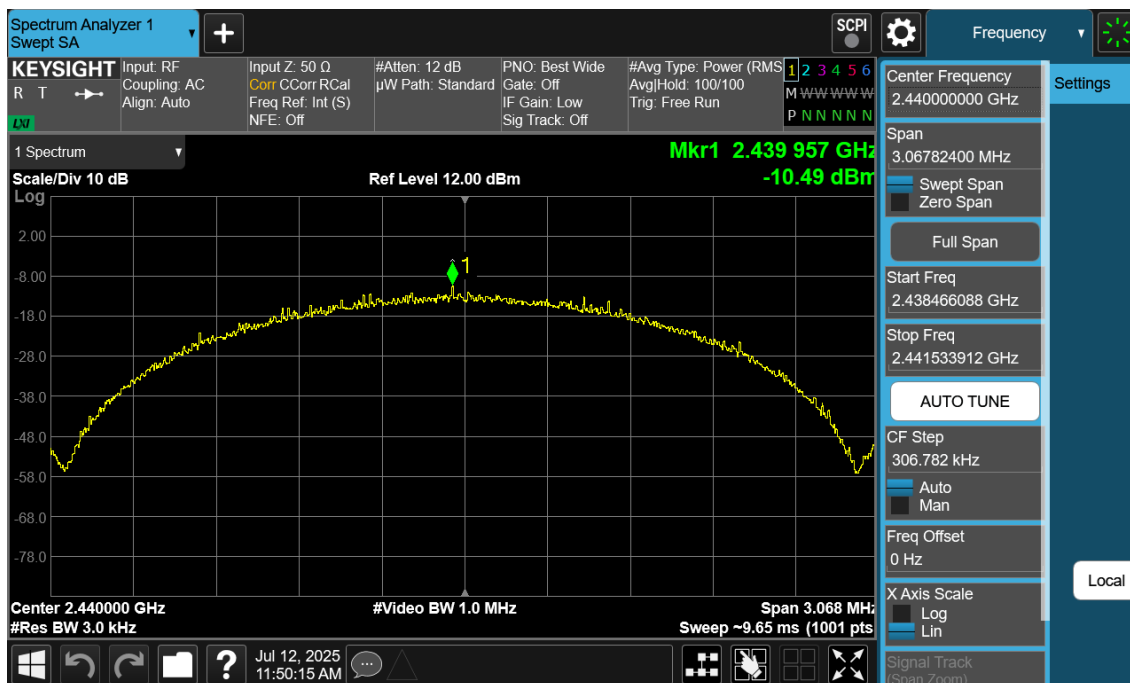


Plot 7-46. Power Spectral Density Plot Antenna 4a (Bluetooth (LE), 2Mbps, iPA – Ch. 1)

FCC ID: BCGA3358 IC: 579C-A3358		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
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7.4.2 Antenna 2a

Frequency [MHz]	Data Rate [Mbps]	Power Scheme	Channel No.	Measured Power Density [dBm/3kHz]	Max Power Density [dBm/3kHz]	Margin [dB]
2402	0.125	ePA	0	6.22	8.0	-1.78
2440	0.125	ePA	19	6.31	8.0	-1.69
2480	0.125	ePA	39	6.37	8.0	-1.63
2402	0.125	iPA	0	0.14	8.0	-7.86
2440	0.125	iPA	19	2.60	8.0	-5.40
2480	0.125	iPA	39	-0.35	8.0	-8.35
2402	0.500	ePA	0	6.03	8.0	-1.97
2440	0.500	ePA	19	6.14	8.0	-1.86
2480	0.500	ePA	39	6.21	8.0	-1.79
2402	0.500	iPA	0	0.77	8.0	-7.23
2440	0.500	iPA	19	2.47	8.0	-5.53
2480	0.500	iPA	39	-0.47	8.0	-8.47
2402	1.0	ePA	0	0.97	8.0	-7.03
2440	1.0	ePA	19	-0.02	8.0	-8.02
2480	1.0	ePA	39	1.17	8.0	-6.83
2402	1.0	iPA	0	-10.08	8.0	-18.08
2440	1.0	iPA	19	-7.04	8.0	-15.04
2480	1.0	iPA	39	-10.61	8.0	-18.61
2404	2.0	ePA	1	-2.26	8.0	-10.26
2440	2.0	ePA	19	-3.21	8.0	-11.21
2478	2.0	ePA	38	-1.97	8.0	-9.97
2404	2.0	iPA	1	-11.83	8.0	-19.83
2440	2.0	iPA	19	-10.32	8.0	-18.32
2478	2.0	iPA	38	-13.08	8.0	-21.08

Table 7-11. Conducted Power Density Measurements Antenna 2a

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Plot 7-51. Power Spectral Density Plot Antenna 2a (Bluetooth (LE), 125kbps, ePA – Ch. 39)



Plot 7-52. Power Spectral Density Plot Antenna 2a (Bluetooth (LE), 125kbps, iPA – Ch. 0)

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