



ELEMENT MATERIALS TECHNOLOGY,

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MEASUREMENT REPORT

FCC Part 15.247 / ISED RSS-247 Bluetooth

Applicant Name:

Garmin International Inc
1200 E. 151st. Street
Olathe, Kansas
United States 66062

Date of Testing:

2/19/2026 - 4/21/2026

Test Report Issue Date:

4/23/2026

Test Site/Location:

Element Lab., Columbia, MD, USA

Test Report Serial No.:

1M2602170012-04.IPH

FCC ID:

IPH-05169

IC:

1792A-05169

APPLICANT:

Garmin International Inc

Application Type:

Certification

Model/HVIN:

A05169

EUT Type:

Portable Digital Transceiver

Max. RF Output Power:

29.594 mW (14.71 dBm) Peak Conducted

Frequency Range:

2402 – 2480MHz

Type of Modulation:

GFSK, $\pi/4$ -DQPSK, 8DPSK

FCC Classification:

FCC Part 15 Spread Spectrum Transmitter (DSS)

ISED Specifications:

RSS-247 Issue 4

FCC Test Procedure(s):

ANSI C63.10:2020 + Cor. 1:2023

ISED Test Procedure(s):

ANSI C63.10:2020 + Cor. 1:2023 + C63.10a:2024 + Errata to
C63.10a:2024

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. 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



FCC ID: IPH-05169 IC: 1792A-05169	MEASUREMENT REPORT (CERTIFICATION)	Test Dates: 2/19/2026 - 4/21/2026	EUT Type: Portable Digital Transceiver	Approved by: Technical Manager
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TEST REPORT REVISION HISTORY

Rev. No.	Description	Issue Date	Revised By
-	Initial Release	4/23/2026	WKR0000005883

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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

Measurements were conducted at the Element laboratory(ies) indicated in Section 1.3 below. All measurement facilities are 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 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 test laboratory with the site description on file with ISED (Wireless Test Lab number 2451B) and FCC (Designation Number US1113, Test Lab Registration Number 445776).
- Element Washington DC LLC is a Recognized U.S. Certification Assessment Body (CAB # US0110) for ISED Canada as designated by NIST under the U.S. and Canada Mutual Recognition Agreements (MRAs).

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2.0 PRODUCT INFORMATION

2.1 Equipment Description

The Equipment Under Test (EUT) is the **Garmin Portable Digital Transceiver FCC ID: IPH-05169** and **IC: 1792A-05169**. The test data contained in this report pertains only to the emissions due to the EUT's Bluetooth transmitter.

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

Test Device Serial No.: 3626516786, 3626516775, 3630266096, 3630266079

2.2 Device Capabilities

This device contains the following capabilities:

Multi-band LTE (CAT-M1) / Multi-band NTN / Bluetooth (1x, EDR, LE) / ANT+ / 802.11b/g/n WLAN / NFC

Ch.	Frequency (MHz)
00	2402
:	:
39	2441
:	:
78	2480

Table 2-1. Frequency/ Channel Operations

2.3 Antenna Description

The manufacturer provided the antenna gains which can affect the validity of test results used for determination of compliance. The following antenna gains are used in this device provided by the client.

Frequency [GHz]	Antenna-1 Gain [dBi]
2.4	-2.7

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 C63.10:2020. ANSI C63.10:2020 was also used to reference the appropriate EUT setup for radiated spurious emissions testing and AC line conducted testing. See Sections 3.2 for AC line conducted emissions test setups, 3.3 for radiated emissions test setups, and 7.2, 7.3, 7.4, 7.5, 7.6, 7.7, and 7.8 for antenna port conducted emissions test setups. The worst case radiated emissions data is shown in this report.

The 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. The worst orientation was found to be Y-orientation (landscape).

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

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

EUT was configured to operate at a 100% duty cycle using software provided by the customer. The same software was also used to set the EUT to hopping mode for the relevant test cases.

2.5 Software and Firmware

The test was conducted with software/firmware version 2.20 installed on the EUT.

2.6 EMI Suppression Device(s)/Modifications

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

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3.0 DESCRIPTION OF TESTS

3.1 Evaluation Procedure

The measurement procedure described in the American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices (ANSI C63.10:2020) was used in the measurement of the EUT.

Deviation from measurement procedure.....None

3.2 AC Line Conducted Emissions

The line-conducted facility is located inside a 10'x16'x9' shielded enclosure. The shielded enclosure is manufactured by ETS Lindgren RF Enclosures. The line-conducted facility is located inside a 7m x 3.66m x 2.7m shielded enclosure. The shielded enclosure is manufactured by AP Americas. The shielding effectiveness of the shielded room is in accordance with MIL-Std-285 or NSA 65-5. A 1m x 1.5m wooden table 80cm high is placed 40cm away from the vertical wall and 80cm away from the sidewall of the shielded room. Two 10kHz-30MHz, 50Ω/50μH Line-Impedance Stabilization Networks (LISNs) are bonded to the shielded room floor. Power to the LISNs is filtered by external high-current high-insertion loss power line filters. The external power line filter is an ETS Lindgren Model LPRX-4X30 (100dB Attenuation, 14kHz-18GHz) and the two EMI/RFI filters are ETS Lindgren Model LRW-2030-S1 (100dB Minimum Insertion Loss, 14kHz – 10GHz). These filters attenuate ambient signal noise from entering the measurement lines. These filters are also bonded to the shielded enclosure.

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

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

Line conducted emissions test results are shown in Section 7.12. The EMI Receiver mode of the Agilent MXE was used to perform AC line conducted emissions testing.

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3.3 Radiated Emissions

The radiated test facilities consisted of an indoor 3-meter semi-anechoic chamber used for final measurements and exploratory measurements, when necessary. The measurement area is contained within the semi-anechoic chamber which is shielded from any ambient interference. The test site inside the chamber is a 6m x 5.2m elliptical, obstruction-free area in accordance with Figure 5.7 of Clause 5 in ANSI C63.4:2014. Absorbers are arranged on the floor between the turn table and the antenna mast in such a way so as to maximize the reduction of reflections for measurements above 1GHz. An 80cm tall test table made of Styrodur is placed on top of the turn table. For measurements above 1GHz, an additional Styrodur pedestal is placed on top of the test table to bring the total table height to 1.5m.

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

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

All radiated measurements are performed in a chamber that meets the site requirements per ANSI C63.4:2014. Additionally, radiated emissions below 30MHz are also validated on an Open Area Test Site to assert correlation with the chamber measurements per the requirements of KDB 414788 D01 v01r01.

3.4 Environmental Conditions

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

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4.0 ANTENNA REQUIREMENTS

Excerpt from §15.203 of the FCC Rules/Regulations:

“An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.”

- The antennas of the EUT are **permanently attached**.
- There are no provisions for connection to an external antenna.

Conclusion:

The EUT complies with the requirement of §15.203.

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5.0 MEASUREMENT UNCERTAINTY

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.10:2020. All measurement uncertainty values are shown with a coverage factor of $k = 2$ to indicate a 95% level of confidence. The measurement uncertainty shown below meets or exceeds the U_{CISPR} measurement uncertainty values specified in CISPR 16-4-2 and, thus, can be compared directly to specified limits to determine compliance.

Contribution	Expanded Uncertainty ($\pm$ dB)
Conducted Bench Top Measurements	1.13
Conducted Disturbance	3.09
Radiated Disturbance (<1GHz)	4.98
Radiated Disturbance (>1GHz)	5.07
Radiated Disturbance (>18GHz)	5.09

Table 5-1. Measurement Uncertainty Budget

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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
-	MD 1M 40	EMC Cable and Switch System	2/3/2026	Annual	2/3/2027	MD 1M 40
-	AP2-001	EMC Cable and Switch System	1/30/2026	Annual	1/30/2027	AP2-001
-	AP2-002	EMC Cable and Switch System	1/30/2026	Annual	1/30/2027	AP2-002
-	ETS-001	EMC Cable and Switch System	1/29/2026	Annual	1/29/2027	ETS-001
-	ETS-002	EMC Cable and Switch System	1/29/2026	Annual	1/29/2027	ETS-002
-	WL25-1	Conducted Cable Set (25GHz)	1/30/2026	Annual	1/30/2027	WL25-1
-	WL25-2	Conducted Cable Set (25GHz)	1/30/2026	Annual	1/30/2027	WL25-2
EMCO	3115	Horn Antenna (1-18GHz)	9/6/2024	Biennial	9/6/2026	9704-5182
Keysight Technologies	N9038A	MXE EMI Receiver	11/10/2025	Annual	11/10/2026	MY51210133
Keysight Technologies	N9020A	MXA Signal Analyzer	5/7/2025	Annual	5/7/2026	US46470561
Keysight Technologies	N9030A	PXA Signal Analyzer (44GHz)	6/6/2025	Annual	6/6/2026	MY52350166
Keysight Technologies	N9030A	PXA Signal Analyzer	11/3/2025	Annual	11/3/2026	MY54490576
Pasternack	NMLC-2	Line Conducted Emissions Cable (NM)	1/30/2026	Annual	1/30/2027	NMLC-2
Rohde & Schwarz	ESW44	EMI Test Receiver 2Hz to 44 GHz	3/11/2026	Annual	3/11/2027	101716
Rohde & Schwarz	ESU26	EMI Test Receiver (26.5GHz)	12/19/2025	Annual	12/19/2026	100342
Rohde & Schwarz	ENV216	Two-Line V-Network	2/4/2026	Biennial	2/4/2028	101379
Rohde & Schwarz	180-422-KF	Horn (18 - 40GHz)	10/9/2024	Biennial	10/9/2026	U157403-01
Sunol	JB5	Bi-Log Antenna (30M - 5GHz)	9/11/2024	Biennial	9/11/2026	A051107

Table 6-1. Test Equipment Calibration Table

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.

Component	Serial Number
MegaPhase (CAGE 1GVT4) Cable TM40-K1K1-30	20233002 004
Uniflex Micro Coax UFB 142A-Q-0984-200200	64639 232063 001
R&S TS-PR1840	9037.7670.02

Table 6-2. MD 1M 18-40 EMC Cable and Switch System Components

Component	Serial Number
Flex Cable	P2A-0001
Micro-Coax Utilflex Cable UFB311A-Q-3346-50U50U MFR 64639	231978-003
Chamber Passthrough	CP4/X12
Micro-Coax Utilflex Cable UFB311A-1-0629-50U50U MFR 64639	231986-003
Micro-Coax Utilflex Cable UFB142A-0-0629-5GU200 MFR 6463	232069-001
Rohde & Schwarz TS-PR8 Pre-Amplifier	102335
Rohde & Schwarz OSP130 Open Switch and Control Unit	101181

Table 6-3. AP2-001 EMC Cable and Switch System Components

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Component	Serial Number
MiniCircuits Cable CBL-0.5M-SMNM+	47261
Micro-Coax Utilflex Cable UFB311A-Q-3346-50U50U MFR 64639	231978-001
Micro-Coax Utilflex Cable UFB311A-1-0629-50U50U MFR 64639	231986-002
MegaPhase (CAGE 1GVT4) Cable NC29-N1N1-324	19046401 001
Megaphase (CAGE 1GVT4) Flex Cable 10511-1	15044701-006
Micro-Coax Utilflex Cable UFB311A-Q-3346-50U50U MFR 64639	231978-002
Micro-Coax Utilflex Cable UFB311A-1-0629-50U50U MFR 64639	231986-004
Micro-Coax Utilflex Cable UFB142A-0-0629-5GU200 MFR 64639	232069-001
Rohde & Schwarz SF Unit	102138
Rohde & Schwarz OSP130 Open Switch and Control Unit	101181
Micro-Coax Utilflex Cable UFB311A-Q-3346-50U50U MFR 64639	231978-003
Micro-Coax Utilflex Cable UFB311A-1-0629-50U50U MFR 64639	231986-003
Rohde & Schwarz TS-PR8 Pre-Amplifier	102335

Table 6-4. AP2-002 EMC Cable and Switch System Components

Component	Serial Number
Pasternack Cable RG214/U	111815
MegaPhase (CAGE 1GVT4) Cable GR18-N5N5-24	14042714 001

Table 6-5. ETS-001 EMC Cable and Switch System Components

Component	Serial Number
MegaPhase (CAGE 1GVT4) Cable GR18-N5N5-24	14042714 001
MegaPhase (CAGE 1GVT4) Cable NC29-N1N1-324	20502201 001
Rohde & Schwarz SF Unit	102134
Minicircuits Cable CBL=0.5M-NMNM+	15440

Table 6-6. ETS-002 EMC Cable and Switch System Components

Component	Serial Number
MegaPhase Cable, Model: TM26-S1S1-30	20929201 004
Pasternack 6dB Attenuator, Model: PE7005-6	N/A

Table 6-7. WL25-1 Conducted Cable Set Components

Component	Serial Number
Mini-Circuits Cable, Model: CBL-2FT-SMSM+	77743
MCL 6dB Attenuator, Model: BW-S6W2+	1314

Table 6-8. WL25-2 Conducted Cable Set Components

FCC ID: IPH-05169 IC: 1792A-05169	MEASUREMENT REPORT (CERTIFICATION)	Test Dates: 2/19/2026 - 4/21/2026	EUT Type: Portable Digital Transceiver	Approved by: Technical Manager
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7.0 TEST RESULTS

7.1 Summary

Company Name: Garmin International Inc
 FCC ID: IPH-05169
 IC: 1792A-05169
 Method/System: Frequency Hopping Spread Spectrum (FHSS)
 Number of Channels: 79

FCC Part Section(s)	RSS Section(s)	Test Description	Test Limit	Test Condition	Test Result	Reference
15.247(a)(1)(iii)	RSS-247 [6.2.1(a)]	20dB Bandwidth	N/A	CONDUCTED	PASS	Section 7.2
15.247(b)(1)	RSS-247 [6.2.3.2(a)]	Peak Transmitter Output Power	< 1 Watt if ≥ 75 non-overlapping channels used		PASS	Section 7.3
15.247(a)(1)	RSS-247 [6.2.3.1(a)]	Channel Separation	> 2/3 of 20 dB BW for systems with Output Power < 125mW		PASS	Section 7.5
15.247(a)(1)(iii)	RSS-247 [6.2.3.1(b)]	Number of Channels	> 15 Channels		PASS	Section 7.7
15.247(a)(1)(iii)	RSS-247 [6.2.3.1(b)]	Time of Occupancy	< 0.4 sec in 31.6 sec period		PASS	Section 7.6
15.247(d)	RSS-247 [6.6]	Band Edge / Out-of-Band Emissions	Conducted > 20dBc		PASS	Section 7.4, Section 7.8
15.205 15.209	RSS-Gen [8.9]	General Field Strength Limits (Restricted Bands and Radiated Emission Limits)	Emissions in restricted bands must meet the radiated limits detailed in 15.209 (RSS-247 limits)	RADIATED	PASS	Section 7.9, Section 7.10, Section 7.11
15.207	RSS-Gen [8.8]	AC Conducted Emissions 150kHz – 30MHz	< FCC 15.207 limits (RSS-Gen [8.8] limits)	LINE CONDUCTED	PASS	Section 7.12

Table 7-1. Summary of Test Results

Notes:

- 1) All modes of operation and data rates were investigated. The test results shown in the following sections represent the worst case emissions.
- 2) The analyzer plots shown in this section were all taken with a correction table loaded into the analyzer. The correction table was used to account for the losses of the cables, directional couplers, and attenuators used as part of the system to maintain a link between the call box and the EUT at all frequencies of interest.
- 3) All antenna port conducted emissions testing was performed on a test bench with the antenna port of the EUT connected to the spectrum analyzer through calibrated cables, attenuators, and couplers.
- 4) For conducted spurious emissions, automated test software was used to measure emissions and capture the corresponding plots necessary to show compliance. The measurement software utilized is Element "BT Auto," Version 3.5.
- 5) For radiated band edge, automated test software was used to measure emissions and capture the corresponding plots necessary to show compliance. The measurement software utilized is Element "Chamber Automation," Version 1.7.1.

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7.2 20dB Bandwidth Measurement

Test Overview and Limit

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

Test Procedure Used

ANSI C63.10:2020 – Section 6.9.2

Test Settings

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

Test Setup

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



Figure 7-1. Test Instrument & Measurement Setup

Test Notes

None

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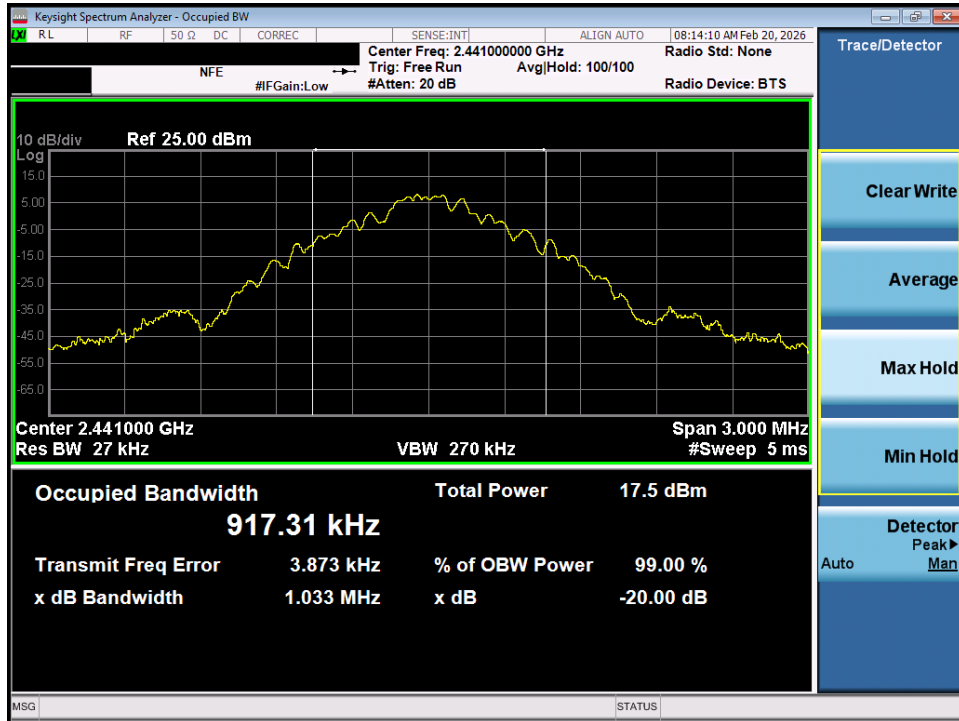
Frequency [MHz]	Data Rate [Mbps]	Channel No.	20dB Bandwidth Test Results [kHz]
2402	1.0	0	1034.00
2441	1.0	39	1033.00
2480	1.0	78	1033.00
2402	2.0	0	1341.00
2441	2.0	39	1333.00
2480	2.0	78	1336.00
2402	3.0	0	1366.00
2441	3.0	39	1359.00
2480	3.0	78	1361.00

Table 7-2. Conducted 20dB Bandwidth Measurements



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

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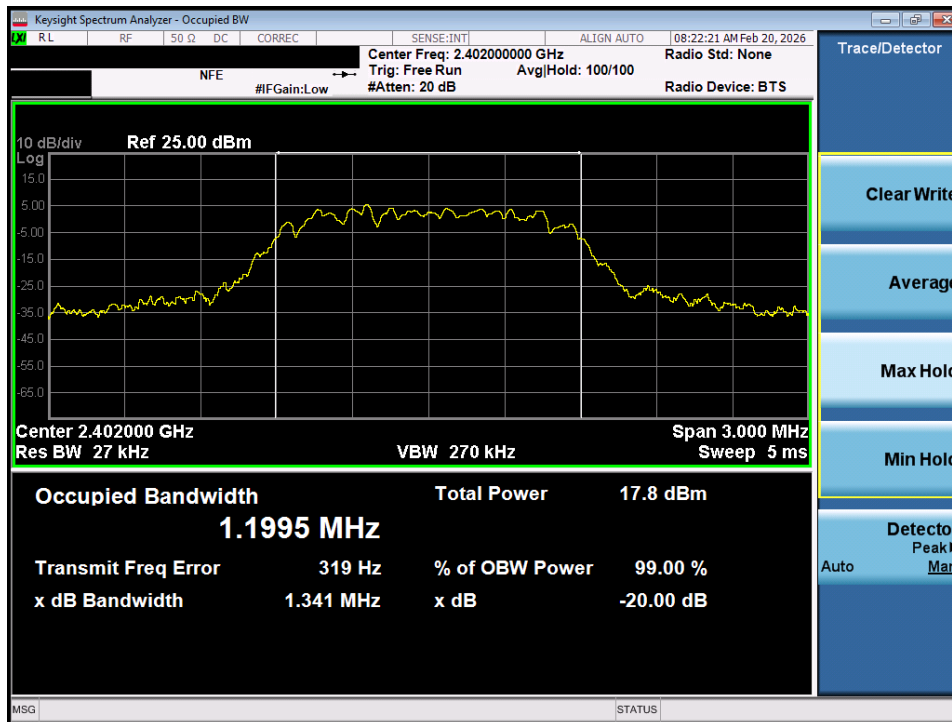


Plot 7-2. 20dB Bandwidth Plot (Bluetooth, 1Mbps – Ch. 39)

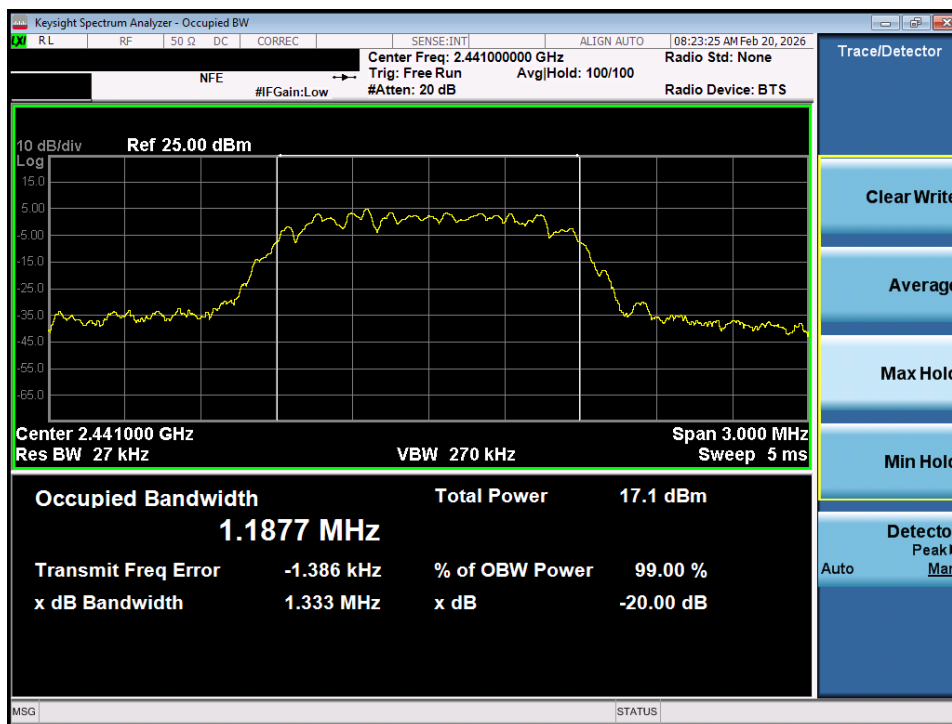


Plot 7-3. 20dB Bandwidth Plot (Bluetooth, 1Mbps – Ch. 78)

FCC ID: IPH-05169 IC: 1792A-05169	MEASUREMENT REPORT (CERTIFICATION)	Test Dates: 2/19/2026 - 4/21/2026	EUT Type: Portable Digital Transceiver	Approved by: Technical Manager
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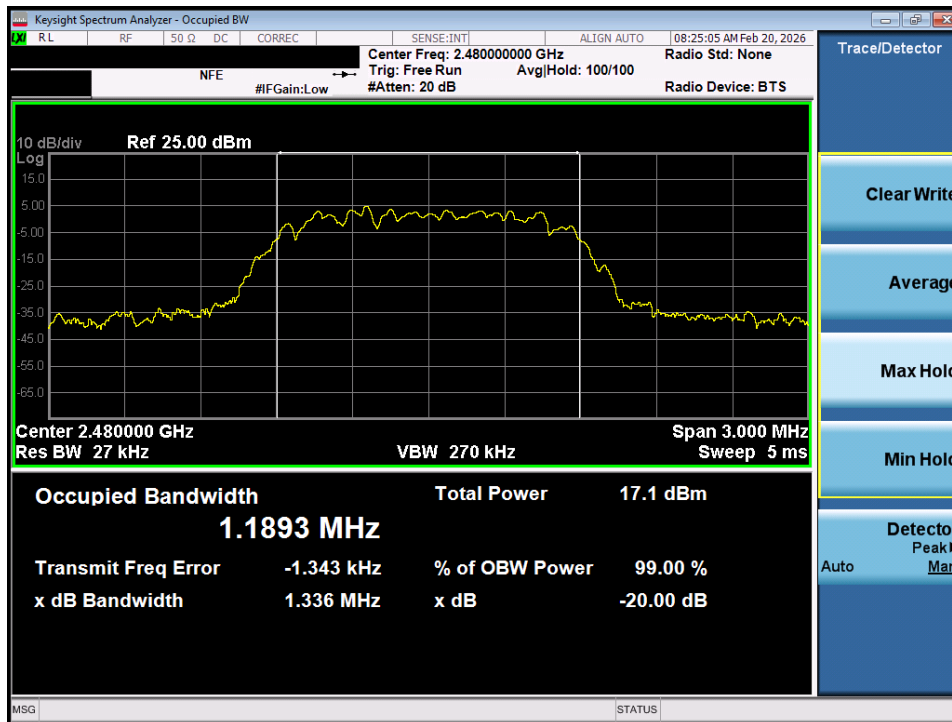


Plot 7-4. 20dB Bandwidth Plot (Bluetooth, 2Mbps – Ch. 0)

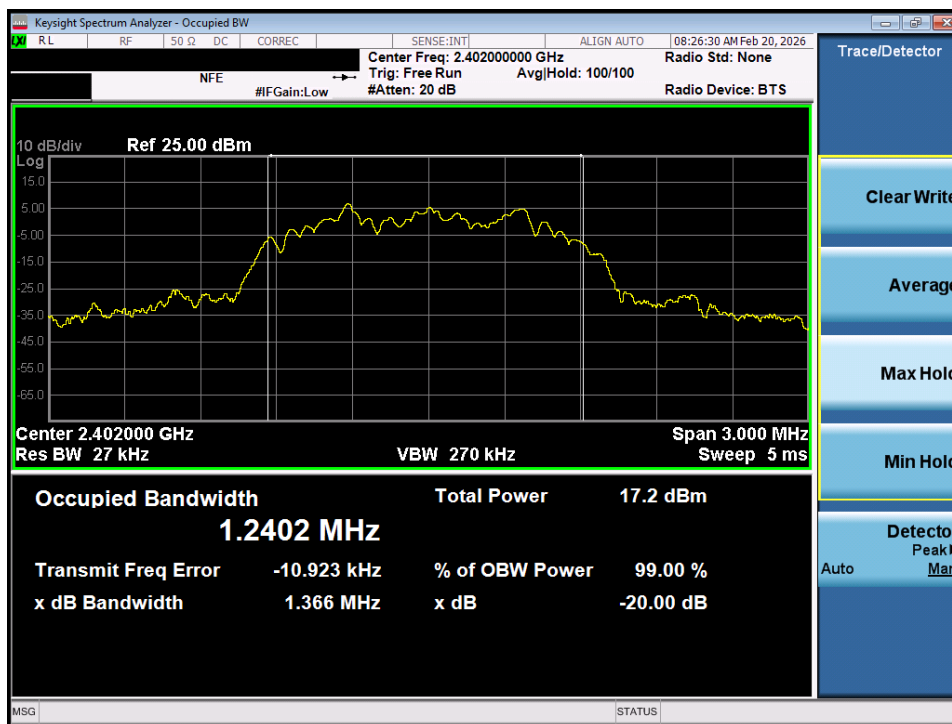


Plot 7-5. 20dB Bandwidth Plot (Bluetooth, 2Mbps – Ch. 39)

FCC ID: IPH-05169 IC: 1792A-05169	MEASUREMENT REPORT (CERTIFICATION)	Test Dates: 2/19/2026 - 4/21/2026	EUT Type: Portable Digital Transceiver	Approved by: Technical Manager
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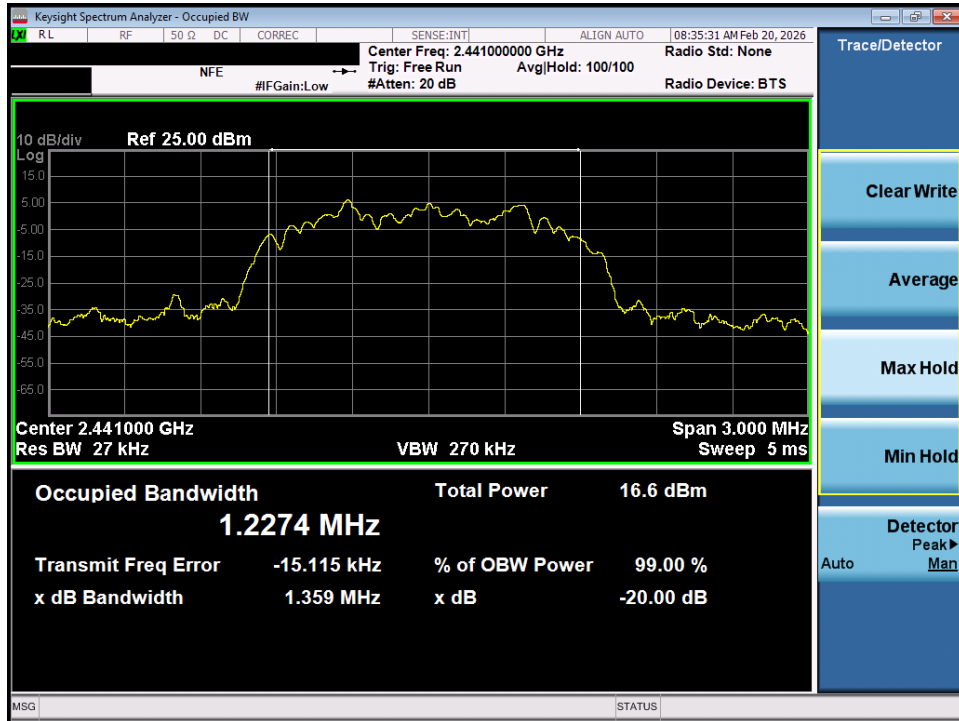


Plot 7-6. 20dB Bandwidth Plot (Bluetooth, 2Mbps – Ch. 78)

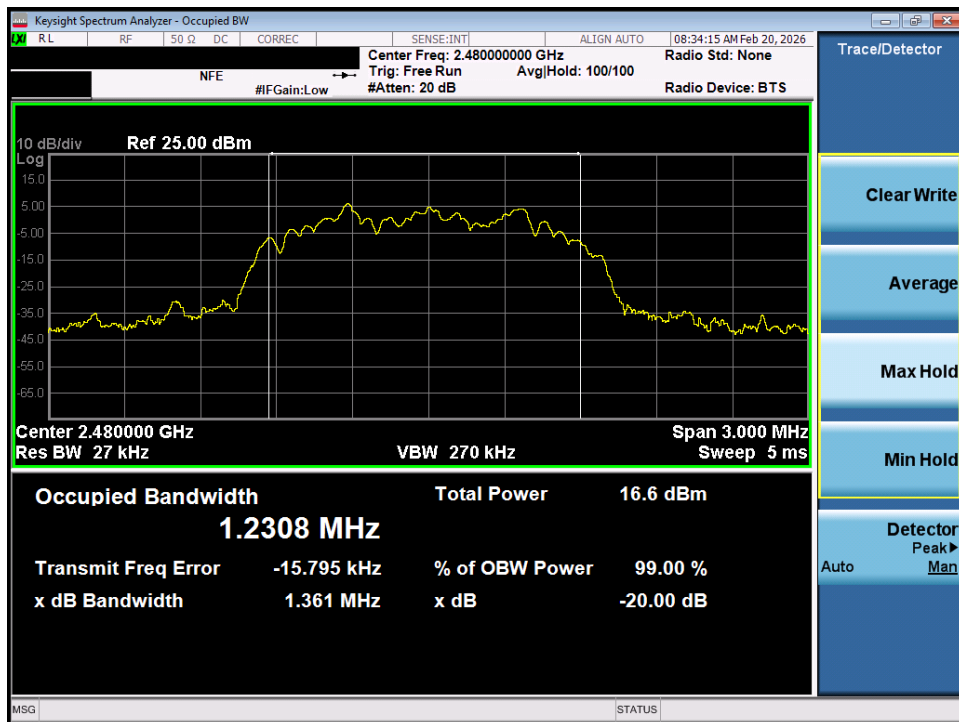


Plot 7-7. 20dB Bandwidth Plot (Bluetooth, 3Mbps – Ch. 0)

FCC ID: IPH-05169 IC: 1792A-05169	MEASUREMENT REPORT (CERTIFICATION)	Test Dates: 2/19/2026 - 4/21/2026	EUT Type: Portable Digital Transceiver	Approved by: Technical Manager
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Plot 7-8. 20dB Bandwidth Plot (Bluetooth, 3Mbps – Ch. 39)



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

FCC ID: IPH-05169 IC: 1792A-05169	MEASUREMENT REPORT (CERTIFICATION)	Test Dates: 2/19/2026 - 4/21/2026	EUT Type: Portable Digital Transceiver	Approved by: Technical Manager
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7.3 Output Power Measurement

Test Overview and Limits

Measurement is made while the EUT is operating in non-hopping transmission mode. The powers shown below were measured using a spectrum analyzer. Average power measurements are performed using the analyzer's "burst power" function with RBW = 3MHz. The burst power function triggers on a single set burst set to maximum power and measures the maximum average power on the on-time.

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

Test Procedure Used

ANSI C63.10:2020 – Section 7.8.5

Test Settings

Peak Power Measurement

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

Test Setup

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

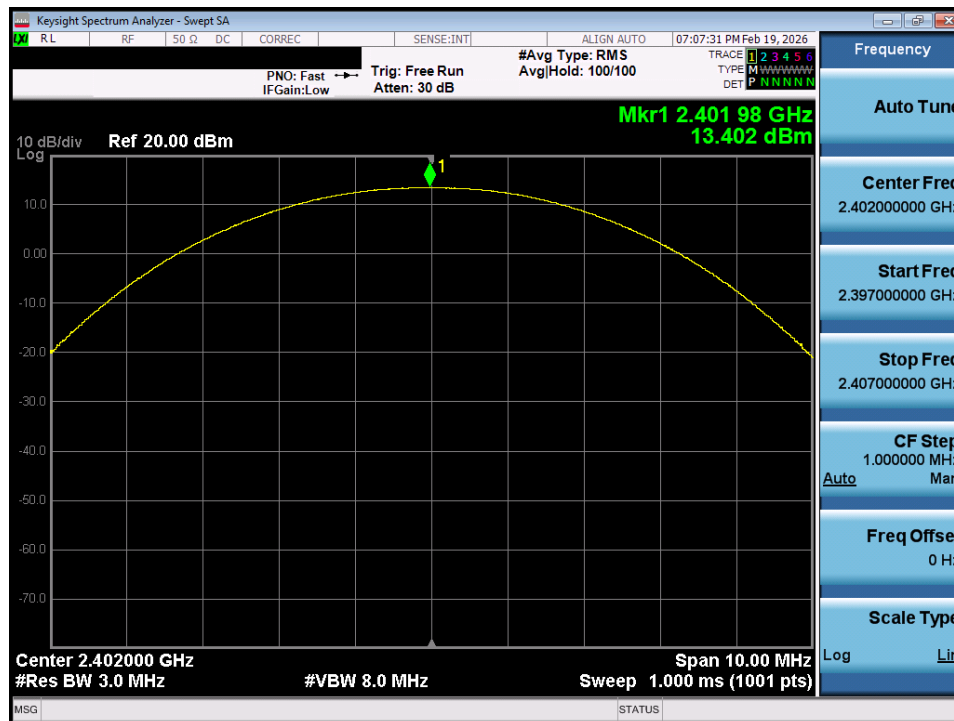


Figure 7-2. Test Instrument & Measurement Setup

FCC ID: IPH-05169 IC: 1792A-05169	MEASUREMENT REPORT (CERTIFICATION)	Test Dates: 2/19/2026 - 4/21/2026	EUT Type: Portable Digital Transceiver	Approved by: Technical Manager
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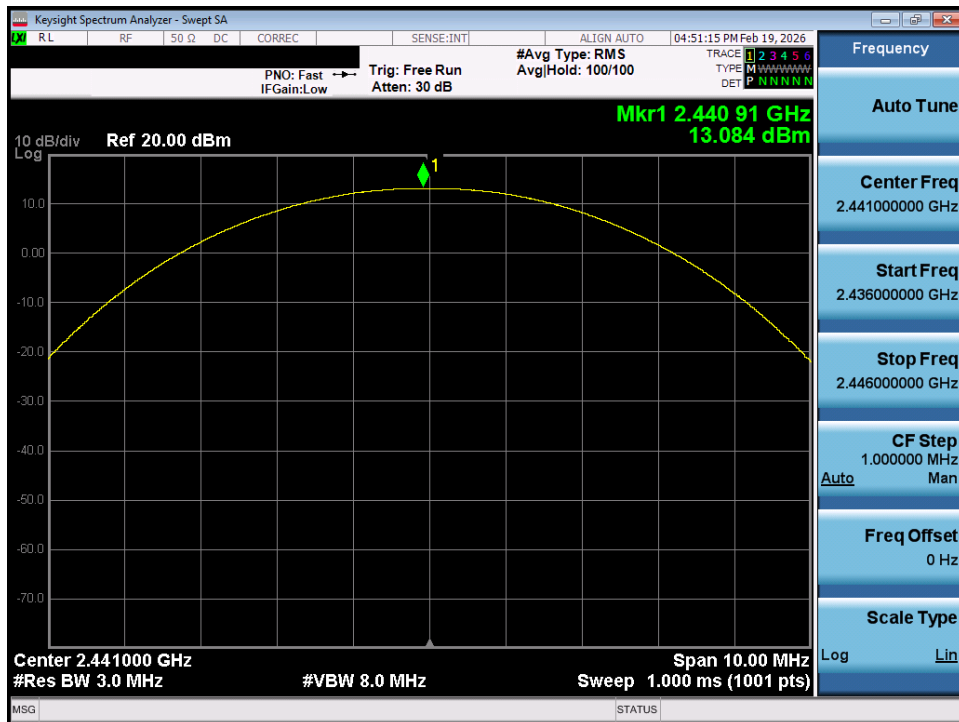
Frequency [MHz]	Data Rate [Mbps]	Channel No.	Peak Conducted Power		Avg Conducted Power		Ant. Gain [dBi]	EIRP [dBm]	Limit [dBm]	Margin [dB]
			[dBm]	[mW]	[dBm]	[mW]				
2402	1.0	0	13.40	21.888	13.33	21.548	-2.70	10.70	36.02	-25.32
2441	1.0	39	13.08	20.342	12.95	19.706	-2.70	10.38	36.02	-25.64
2480	1.0	78	13.13	20.559	13.01	19.979	-2.70	10.43	36.02	-25.59
2402	2.0	0	14.71	29.594	12.68	18.543	-2.70	12.01	36.02	-24.01
2441	2.0	39	14.56	28.602	12.33	17.092	-2.70	11.86	36.02	-24.16
2480	2.0	78	14.15	25.984	12.37	17.274	-2.70	11.45	36.02	-24.57
2402	3.0	0	14.68	29.356	12.43	17.505	-2.70	11.98	36.02	-24.04
2441	3.0	39	14.57	28.648	12.12	16.277	-2.70	11.87	36.02	-24.15
2480	3.0	78	14.48	28.061	12.20	16.591	-2.70	11.78	36.02	-24.24

Table 7-3. Conducted Output Power Measurements

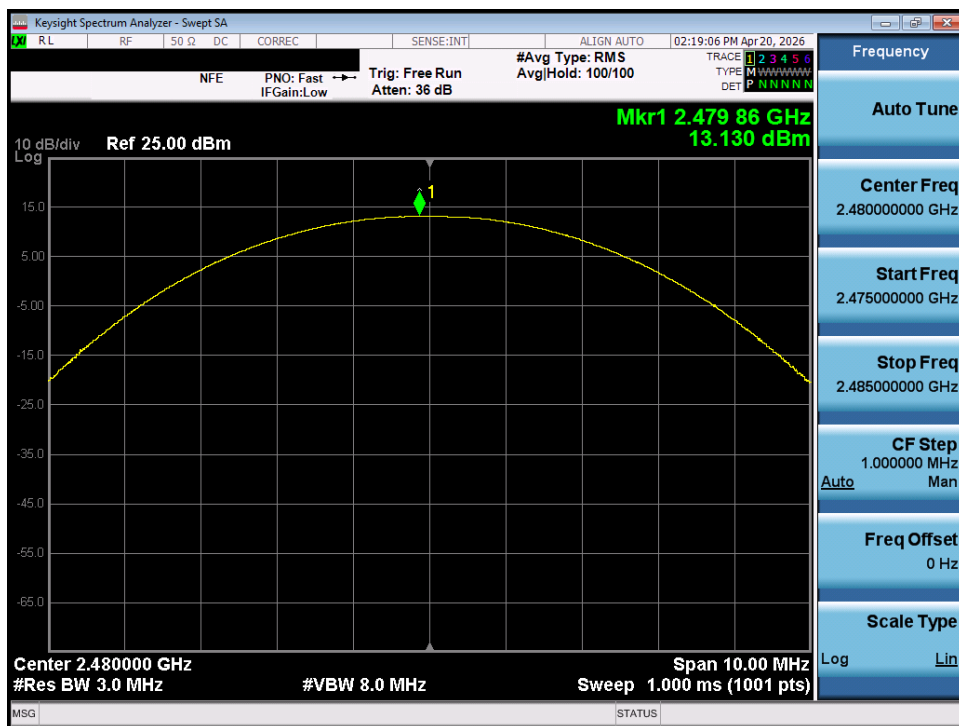


Plot 7-10. Peak Conducted Power (1Mbps – Ch. 0)

FCC ID: IPH-05169 IC: 1792A-05169	MEASUREMENT REPORT (CERTIFICATION)	Test Dates: 2/19/2026 - 4/21/2026	EUT Type: Portable Digital Transceiver	Approved by: Technical Manager
Test Report S/N: 1M2602170012-04.IPH		This report is Blockchain Verified. To verify the report authenticity, please visit HTTPS://WWW.BLOCKCHAIN-VERIFIED.COM or by clicking on the Blockchain logo.		Page 21 of 62

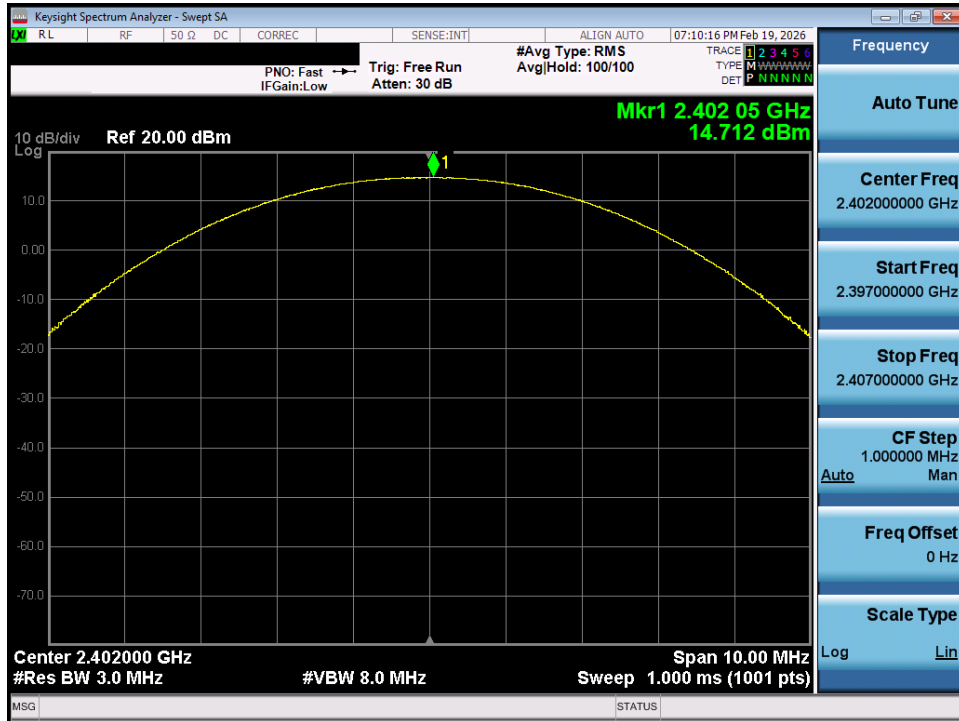


Plot 7-11. Peak Conducted Power (1Mbps – Ch. 39)

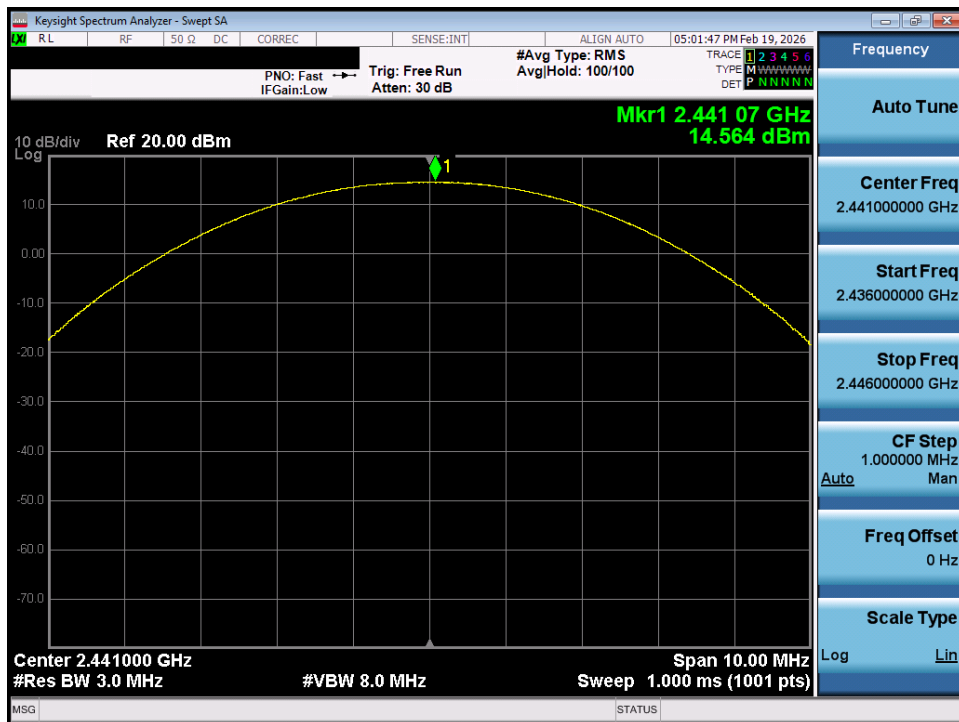


Plot 7-12. Peak Conducted Power (1Mbps – Ch. 78)

FCC ID: IPH-05169 IC: 1792A-05169	MEASUREMENT REPORT (CERTIFICATION)	Test Dates: 2/19/2026 - 4/21/2026	EUT Type: Portable Digital Transceiver	Approved by: Technical Manager
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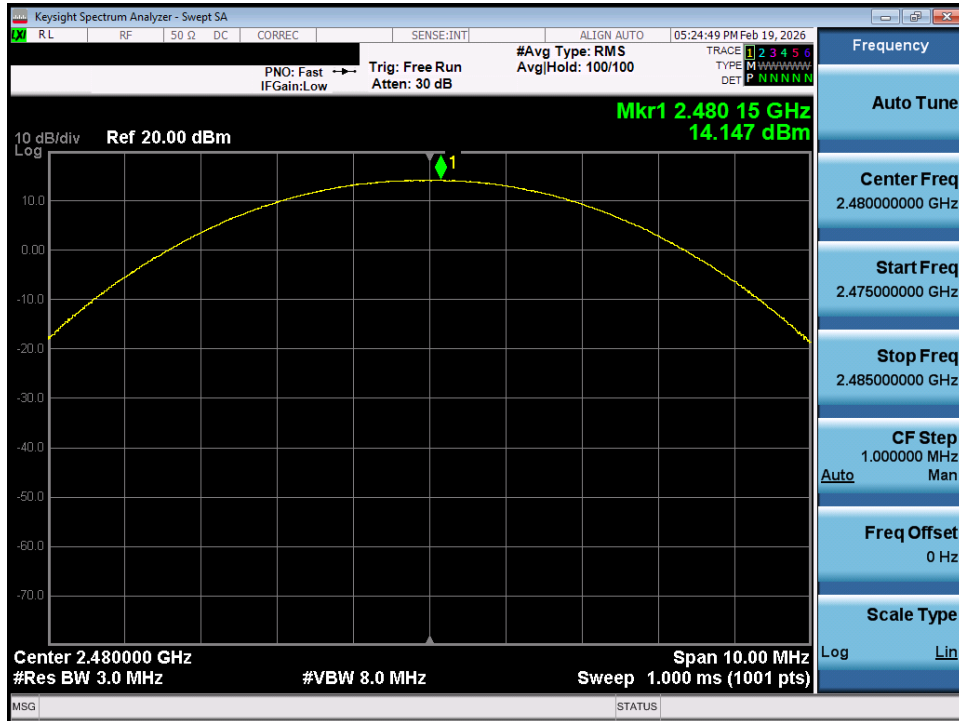


Plot 7-13. Peak Conducted Power (2Mbps – Ch. 0)

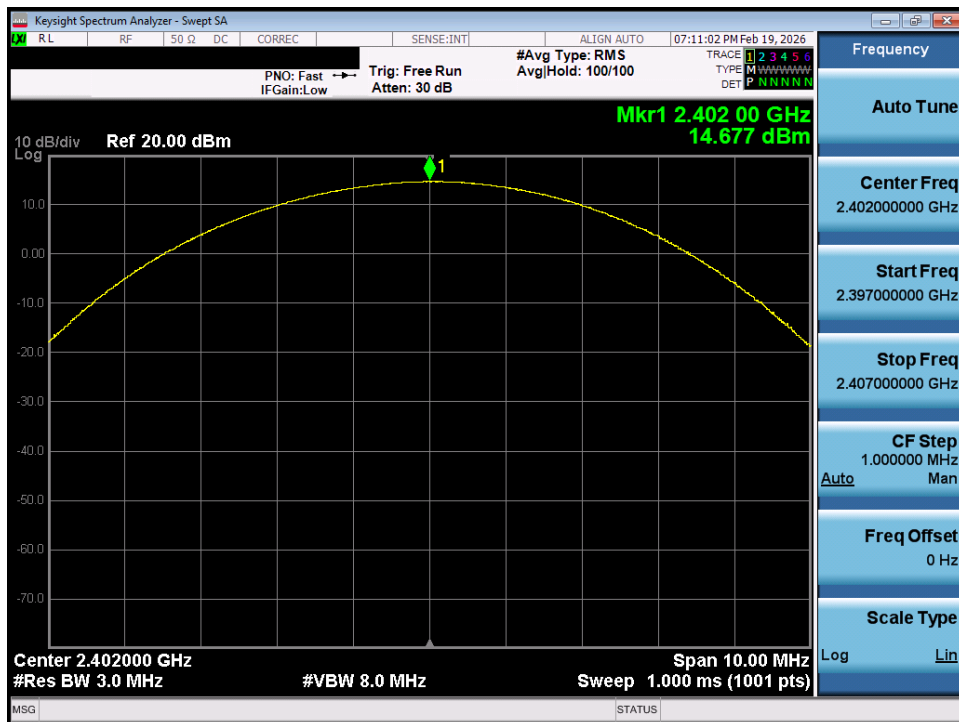


Plot 7-14. Peak Conducted Power (2Mbps – Ch. 39)

FCC ID: IPH-05169 IC: 1792A-05169	MEASUREMENT REPORT (CERTIFICATION)	Test Dates: 2/19/2026 - 4/21/2026	EUT Type: Portable Digital Transceiver	Approved by: Technical Manager
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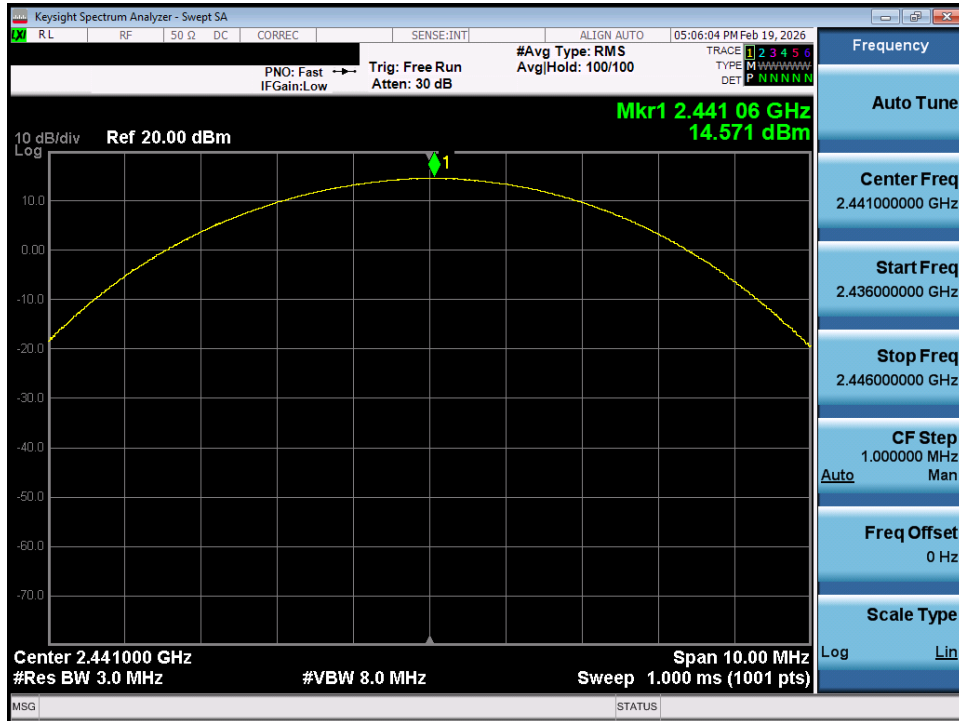


Plot 7-15. Peak Conducted Power (2Mbps – Ch. 78)

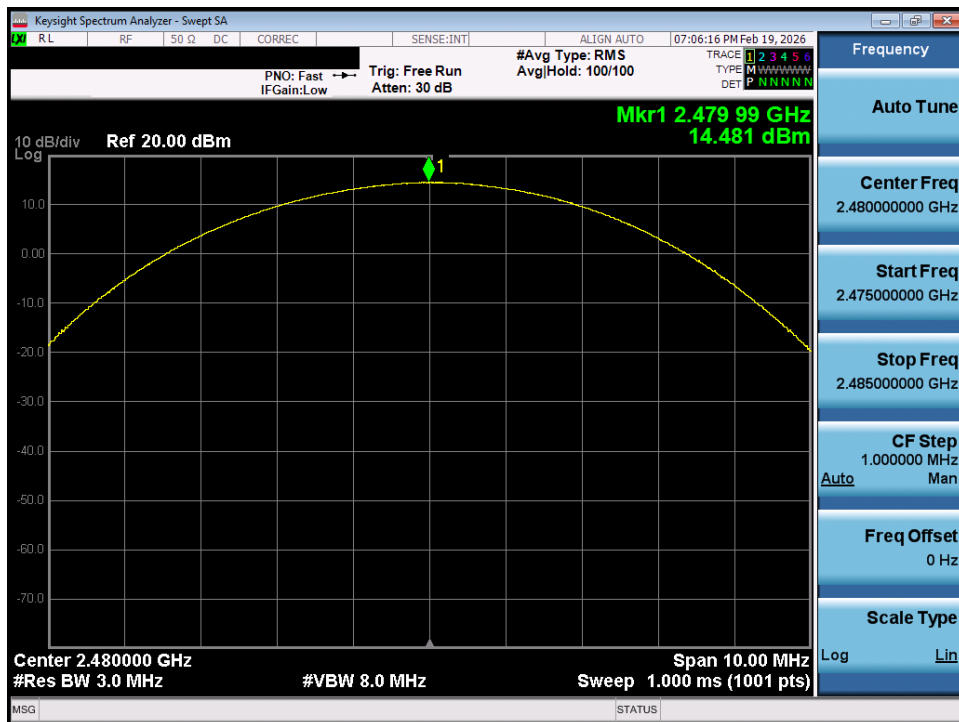


Plot 7-16. Peak Conducted Power (3Mbps – Ch. 0)

FCC ID: IPH-05169 IC: 1792A-05169	MEASUREMENT REPORT (CERTIFICATION)	Test Dates: 2/19/2026 - 4/21/2026	EUT Type: Portable Digital Transceiver	Approved by: Technical Manager
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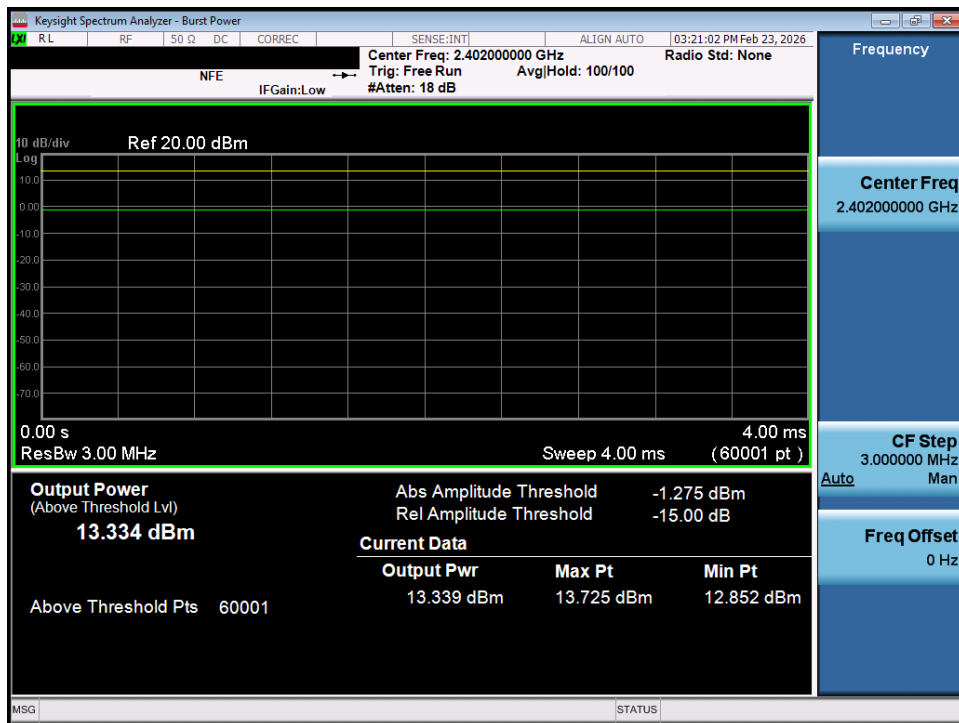


Plot 7-17. Peak Conducted Power (3Mbps – Ch. 39)

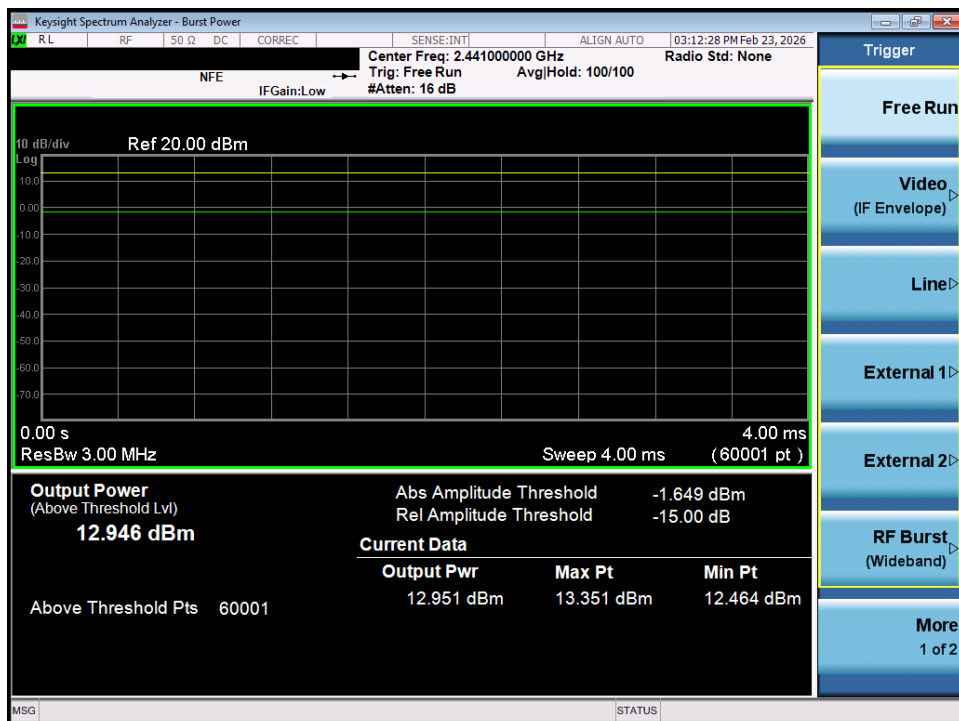


Plot 7-18. Peak Conducted Power (3Mbps – Ch. 78)

FCC ID: IPH-05169 IC: 1792A-05169	MEASUREMENT REPORT (CERTIFICATION)	Test Dates: 2/19/2026 - 4/21/2026	EUT Type: Portable Digital Transceiver	Approved by: Technical Manager
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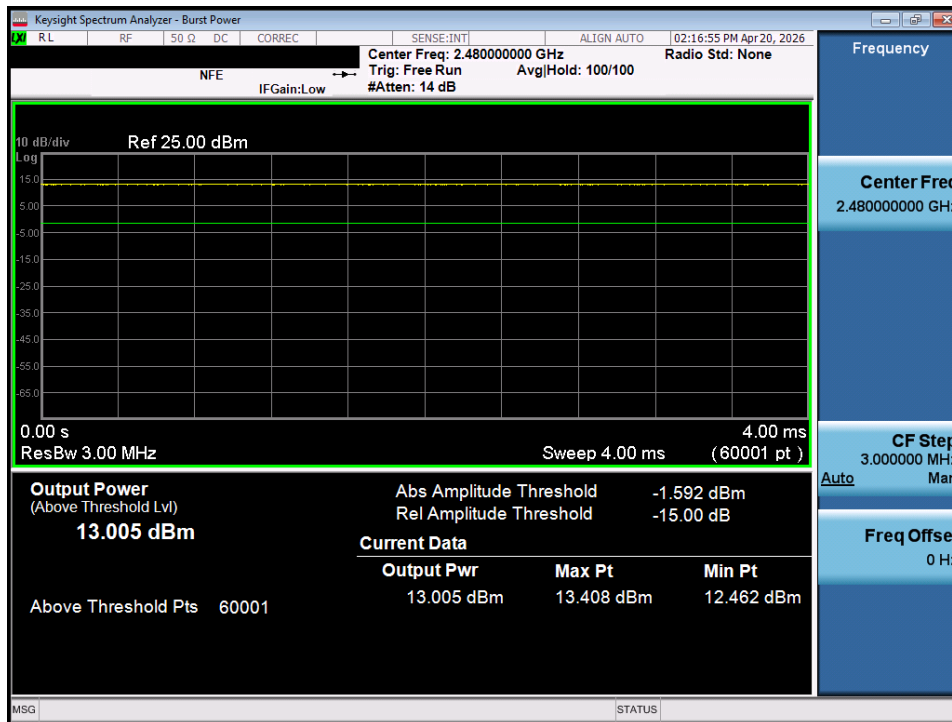


Plot 7-19. Average Conducted Power (1Mbps – Ch. 0)

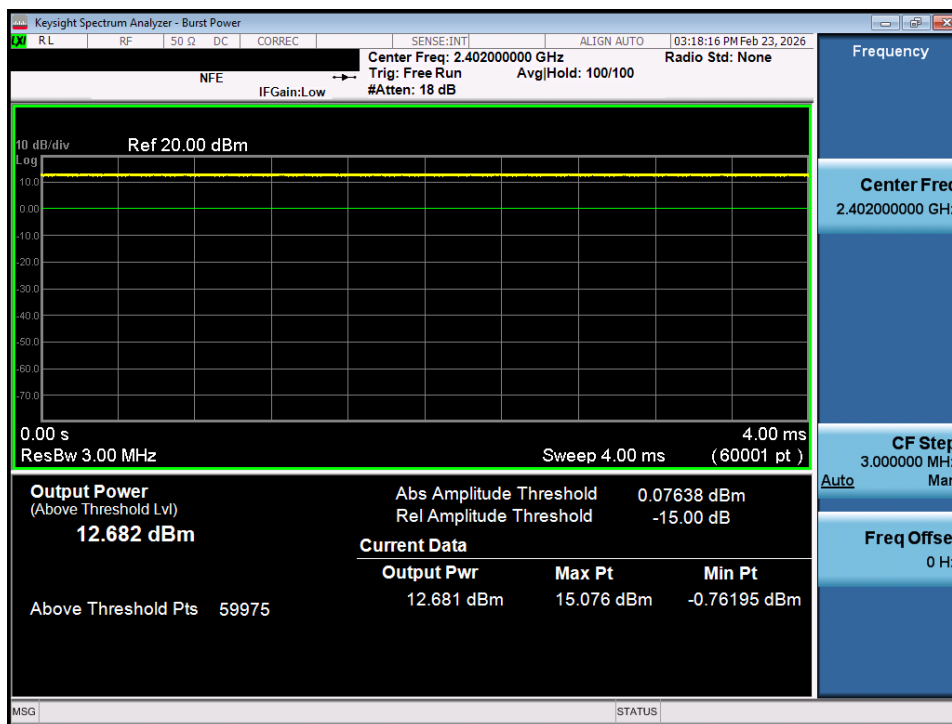


Plot 7-20. Average Conducted Power (1Mbps – Ch. 39)

FCC ID: IPH-05169 IC: 1792A-05169	MEASUREMENT REPORT (CERTIFICATION)	Test Dates: 2/19/2026 - 4/21/2026	EUT Type: Portable Digital Transceiver	Approved by: Technical Manager
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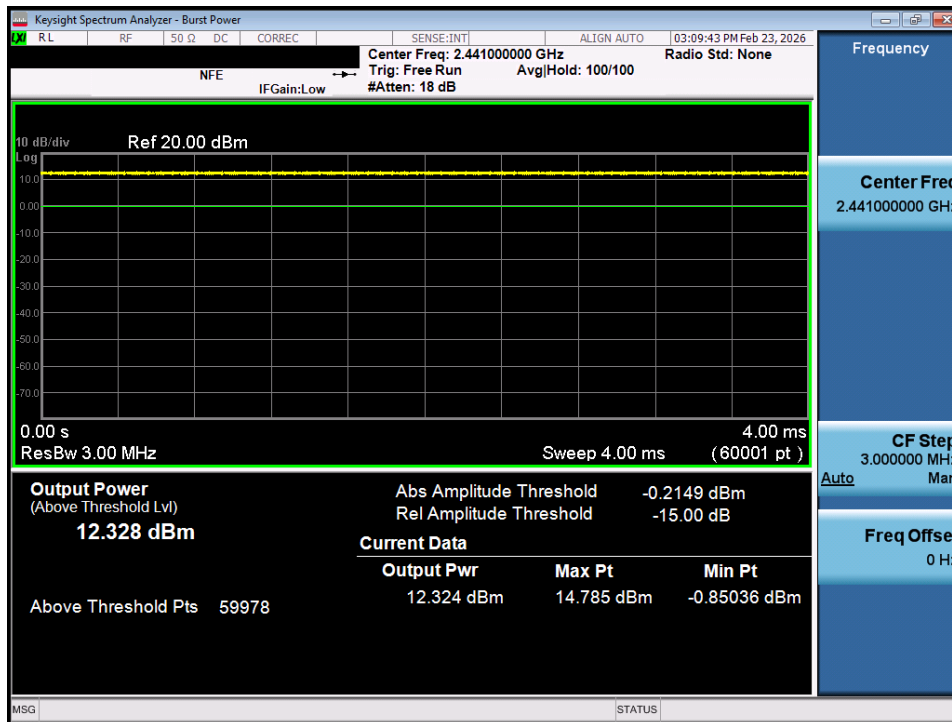


Plot 7-21. Average Conducted Power (1Mbps – Ch. 78)

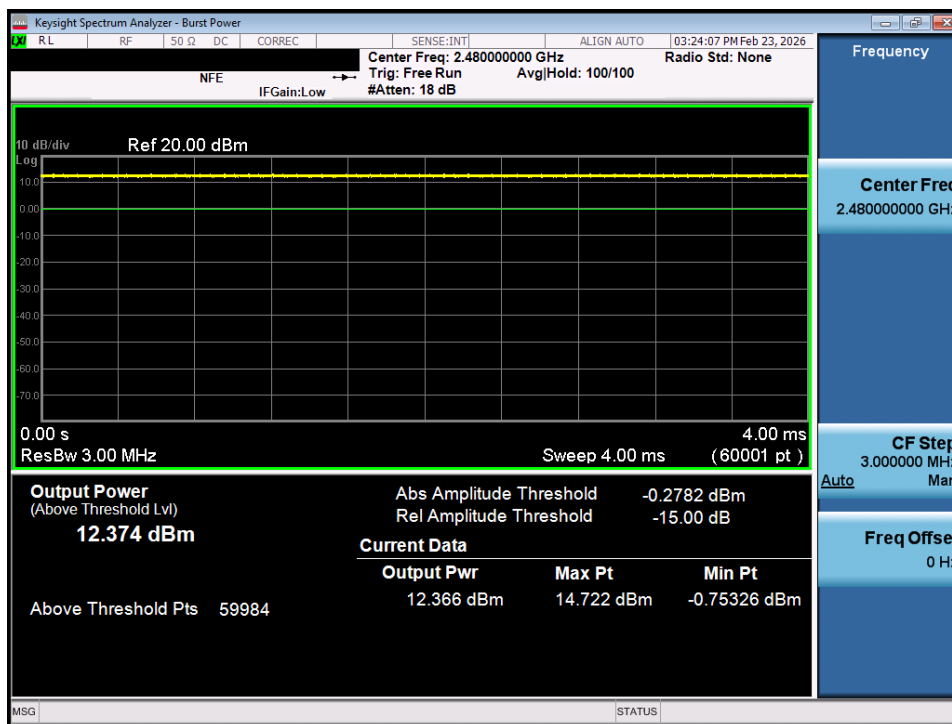


Plot 7-22. Average Conducted Power (2Mbps – Ch. 0)

FCC ID: IPH-05169 IC: 1792A-05169	MEASUREMENT REPORT (CERTIFICATION)	Test Dates: 2/19/2026 - 4/21/2026	EUT Type: Portable Digital Transceiver	Approved by: Technical Manager
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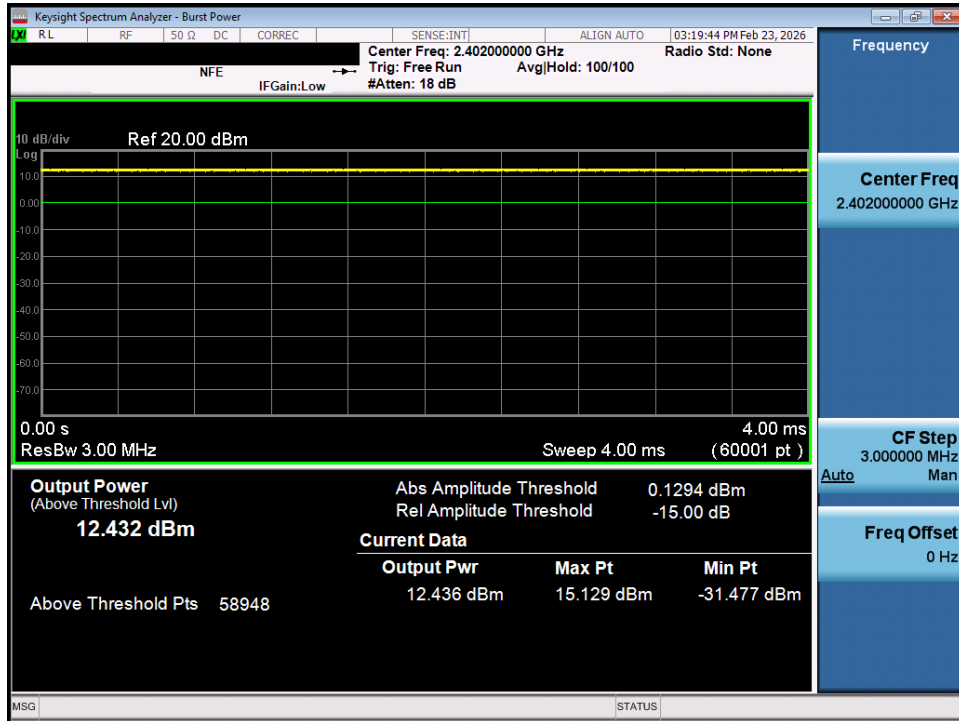


Plot 7-23. Average Conducted Power (2Mbps – Ch. 39)

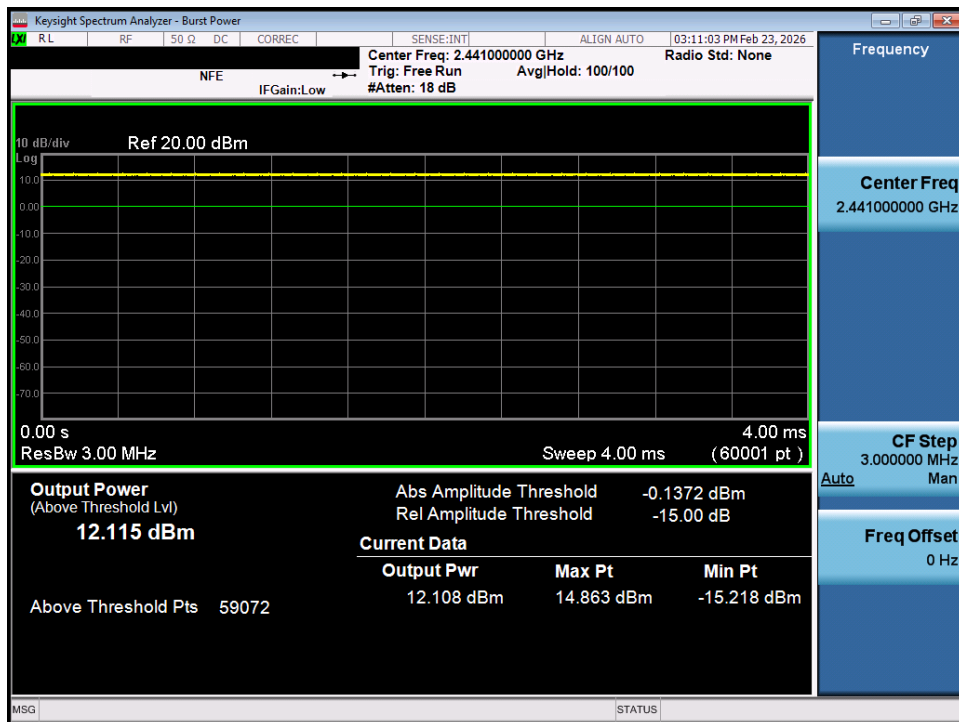


Plot 7-24. Average Conducted Power (2Mbps – Ch. 78)

FCC ID: IPH-05169 IC: 1792A-05169	MEASUREMENT REPORT (CERTIFICATION)	Test Dates: 2/19/2026 - 4/21/2026	EUT Type: Portable Digital Transceiver	Approved by: Technical Manager
Test Report S/N: 1M2602170012-04.IPH	 This report is Blockchain Verified. To verify the report authenticity, please visit HTTPS://WWW.BLOCKCHAIN-VERIFIED.COM or by clicking on the Blockchain logo.			Page 28 of 62

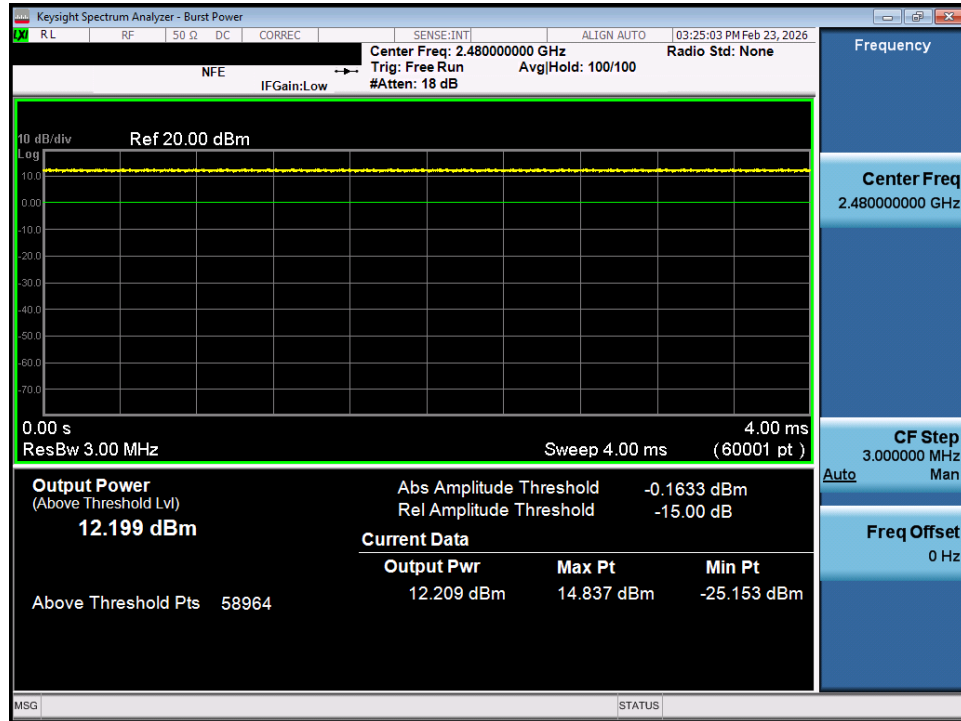


Plot 7-25. Average Conducted Power (3Mbps – Ch. 0)



Plot 7-26. Average Conducted Power (3Mbps – Ch. 39)

FCC ID: IPH-05169 IC: 1792A-05169	MEASUREMENT REPORT (CERTIFICATION)	Test Dates: 2/19/2026 - 4/21/2026	EUT Type: Portable Digital Transceiver	Approved by: Technical Manager
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Plot 7-27. Average Conducted Power (3Mbps – Ch. 78)

FCC ID: IPH-05169 IC: 1792A-05169	MEASUREMENT REPORT (CERTIFICATION)	Test Dates: 2/19/2026 - 4/21/2026	EUT Type: Portable Digital Transceiver	Approved by: Technical Manager
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7.4 Band Edge Compliance

Test Overview and Limits

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

Test Procedure Used

ANSI C63.10:2020 – Section 6.10.4

Test Settings

1. Start and stop frequency were set such that the band edge would be placed in the center of the plot
2. Span was set large enough so as to capture all out of band emissions near the band edge
3. RBW = 100kHz
4. VBW = 300kHz
5. Detector = Peak
6. Number of sweep points $\geq 2 \times \text{Span/RBW}$
7. Trace mode = max hold
8. Sweep time = auto couple
9. The trace was allowed to stabilize

Test Setup

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

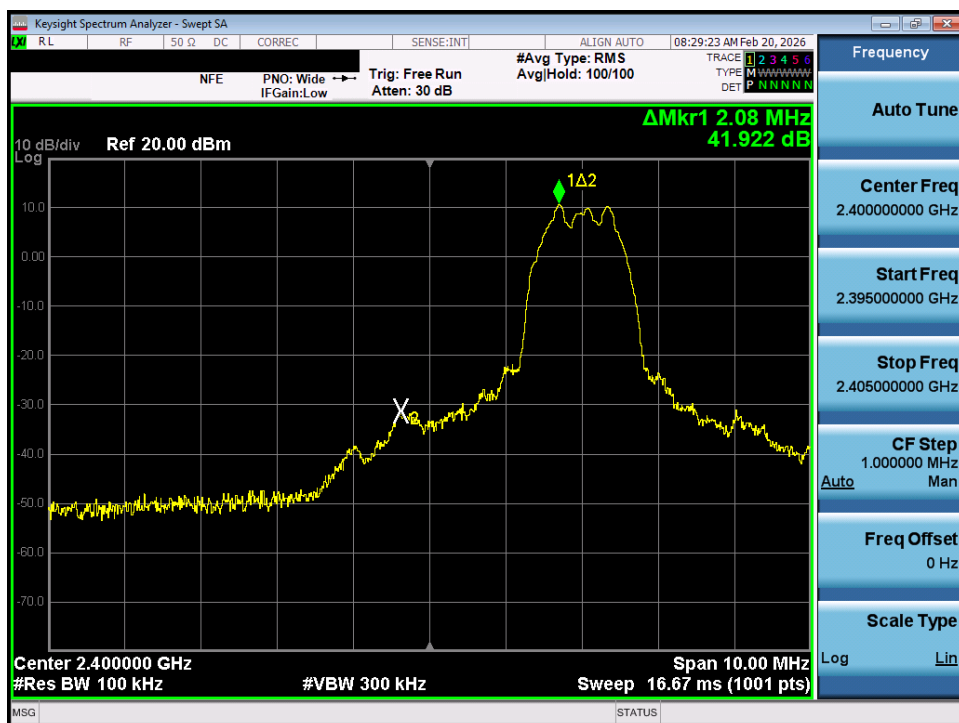


Figure 7-3. Test Instrument & Measurement Setup

Test Notes

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

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Plot 7-28. Band Edge Plot (Bluetooth with Hopping Disabled, 3 Mbps – Ch. 0)

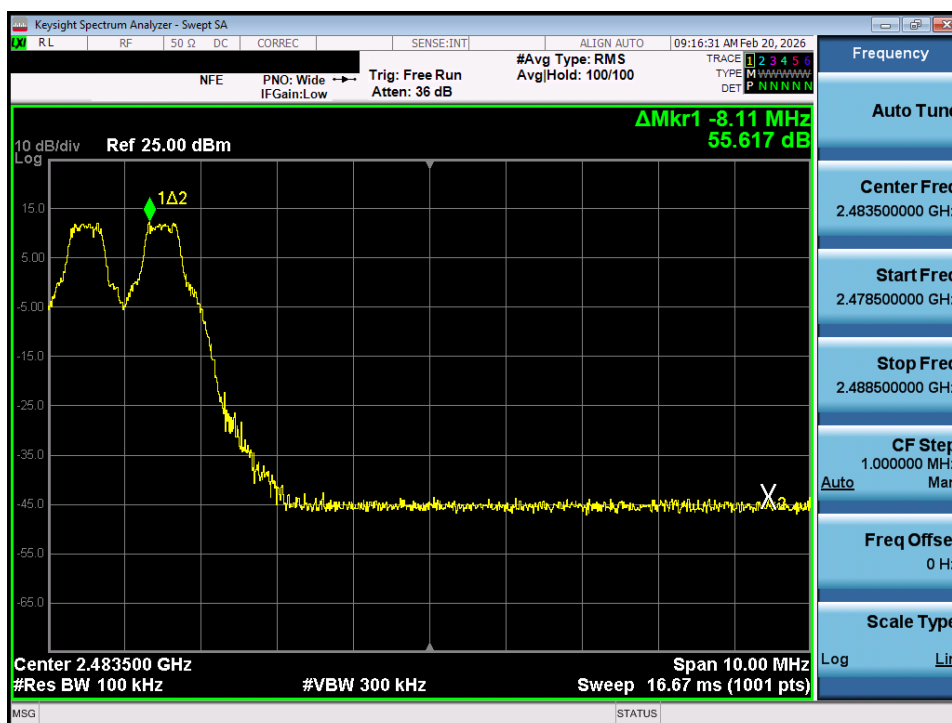


Plot 7-29. Band Edge Plot (Bluetooth with Hopping Disabled, 3 Mbps – Ch. 78)

FCC ID: IPH-05169 IC: 1792A-05169	MEASUREMENT REPORT (CERTIFICATION)	Test Dates: 2/19/2026 - 4/21/2026	EUT Type: Portable Digital Transceiver	Approved by: Technical Manager
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Plot 7-30. Band Edge Plot (Bluetooth with Hopping Enabled, 3 Mbps)



Plot 7-31. Band Edge Plot (Bluetooth with Hopping Enabled, 3 Mbps)

FCC ID: IPH-05169 IC: 1792A-05169	MEASUREMENT REPORT (CERTIFICATION)	Test Dates: 2/19/2026 - 4/21/2026	EUT Type: Portable Digital Transceiver	Approved by: Technical Manager
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7.5 Carrier Frequency Separation

Test Overview and Limit

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

Test Procedure Used

ANSI C63.10:2020 – Section 7.8.2

Test Settings

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

Test Setup

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



Figure 7-4. Test Instrument & Measurement Setup

Test Notes

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

FCC ID: IPH-05169 IC: 1792A-05169	MEASUREMENT REPORT (CERTIFICATION)	Test Dates: 2/19/2026 - 4/21/2026	EUT Type: Portable Digital Transceiver	Approved by: Technical Manager
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Frequency [MHz]	Data Rate [Mbps]	Channel No.	Min. Channel Separation [MHz]
2402	1.0	0	0.689
2441	1.0	39	0.689
2480	1.0	78	0.689
2402	2.0	0	0.894
2441	2.0	39	0.889
2480	2.0	78	0.891
2402	3.0	0	0.911
2441	3.0	39	0.906
2480	3.0	78	0.907

Table 7-4. Minimum Channel Separation



Plot 7-32. Channel Spacing Plot (Bluetooth)

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7.6 Time of Occupancy

Test Overview and Limit

Measurement is made while EUT is operating in hopping mode with the spectrum analyzer set to zero span. ***The maximum permissible time of occupancy is 400 ms within a period of 400ms multiplied by the number of hopping channels employed.***

Test Procedure Used

ANSI C63.10:2020 – Section 7.8.4

Test Settings

1. Span = zero span, centered on a hopping channel
2. RBW $\leq$ channel spacing and $\gg 1/T$, where T is expected dwell time per channel
3. Sweep = as necessary to capture entire dwell time. Second plot may be required to demonstrate two successive hops on a channel
4. Trigger is set with appropriate trigger delay to place pulse near the center of the plot
5. Detector = peak
6. Trace mode = Clear Write
7. Marker-delta function used to determine transmit time per hop

Test Setup

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

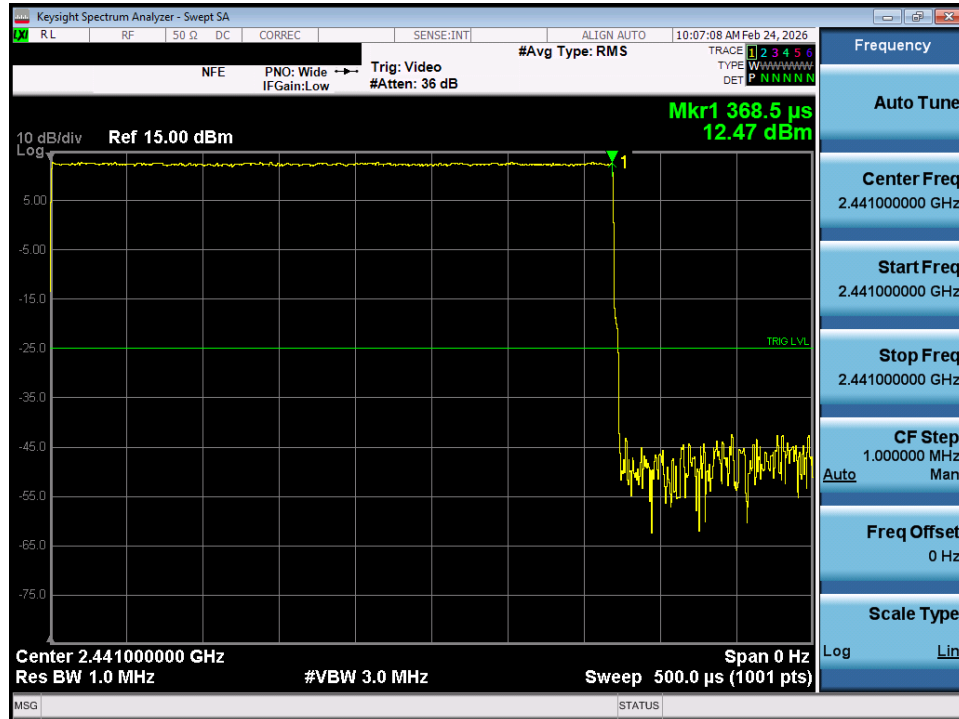


Figure 7-5. Test Instrument & Measurement Setup

Test Notes

None

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Plot 7-33. Time of Occupancy Plot (Bluetooth)

Bluetooth Time of Occupancy Calculation

Typically, Bluetooth 1x/EDR mode has a channel hopping rate of 1600 hops/s. Since 1x/EDR modes use 5 transmit and 1 receive slot, for a total of 6 slots, the Bluetooth transmitter is actually hopping at a rate of $1600 / 6 = 266.67$ hops/s/slot

- $400\text{ms} \times 79$ hopping channels = 31.6 sec (Time of Occupancy Limit)
- Worst case BT has 266.67 hops/second (for 1x/EDR modes with DH5 operation)
- $266.67 \text{ hops/second} / 79 \text{ channels} = 3.38 \text{ hops/second}$ (# of hops/second on one channel)
- $3.38 \text{ hops/second/channel} \times 31.6 \text{ seconds} = 106.67 \text{ hops}$ (# hops over a 31.6 second period)
- $106.67 \text{ hops} \times 0.3685 \text{ ms/channel} = 39.307 \text{ ms}$ (worst case dwell time for one channel in 1x/EDR modes)

With AFH, the number of channels is reduced to a minimum of 20 channels and the channel hopping rate is reduced by 50% to 800 hops/s. AFH mode also uses 6 total slots so the Bluetooth transmitter hops at a rate of $800 / 6 = 133.3$ hops/s/slot

- $400\text{ms} \times 20$ hopping channels = 8 sec (Time of Occupancy Limit)
- Worst case BT has 133.3 hops/second/slot (for AFH mode with DH5 operation)
- $133.3 \text{ hops/s} / 20 \text{ channels} = 6.67 \text{ hops/second}$ (# of hops/second on one channel)
- $6.67 \text{ hops/s} / \text{channel} \times 8 \text{ seconds} = 53.34 \text{ hops}$ (# hops over a 8 second period)
- $53.34 \text{ hops} \times 0.3685 \text{ ms/channel} = 19.653 \text{ ms}$ (worst case dwell time for one channel in AFH mode)

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7.7 Number of Hopping Channels

Test Overview and Limit

Measurement is made while EUT is operating in hopping mode. ***This frequency hopping system must employ a minimum of 15 hopping channels.***

Test Procedure Used

ANSI C63.10:2020 – Section 7.8.3

Test Settings

1. Span = frequency of band of operation (divided into two plots)
2. RBW < 30% of channel spacing or 20dB bandwidth, whichever is smaller
3. VBW ≥ RBW
4. Sweep = auto
5. Detector = peak
6. Trace mode = max hold
7. Trace was allowed to stabilize

Test Setup

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

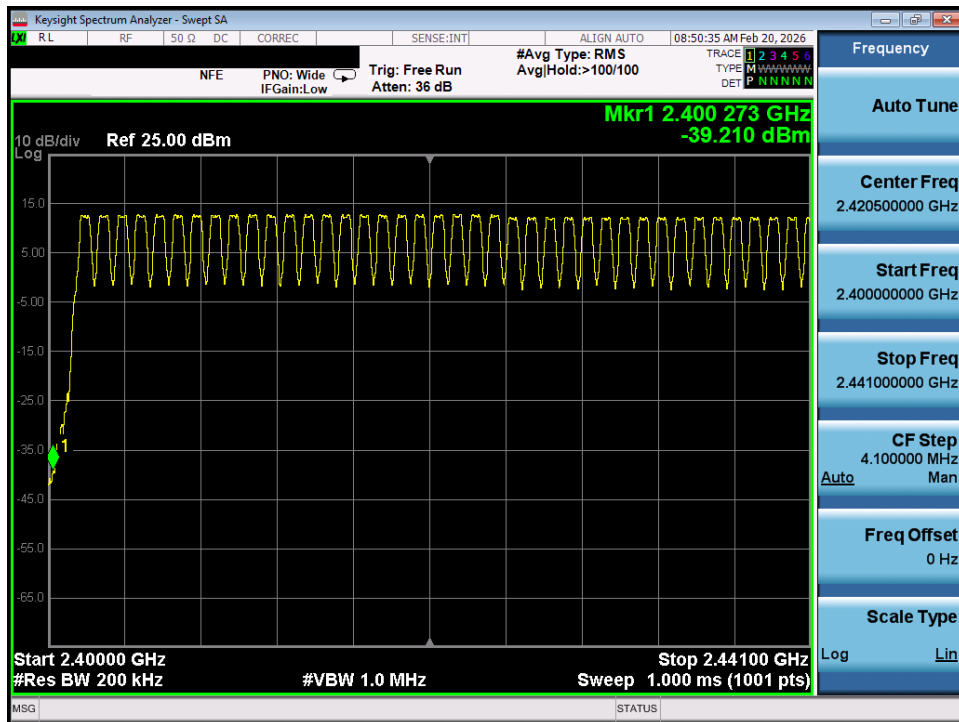


Figure 7-6. Test Instrument & Measurement Setup

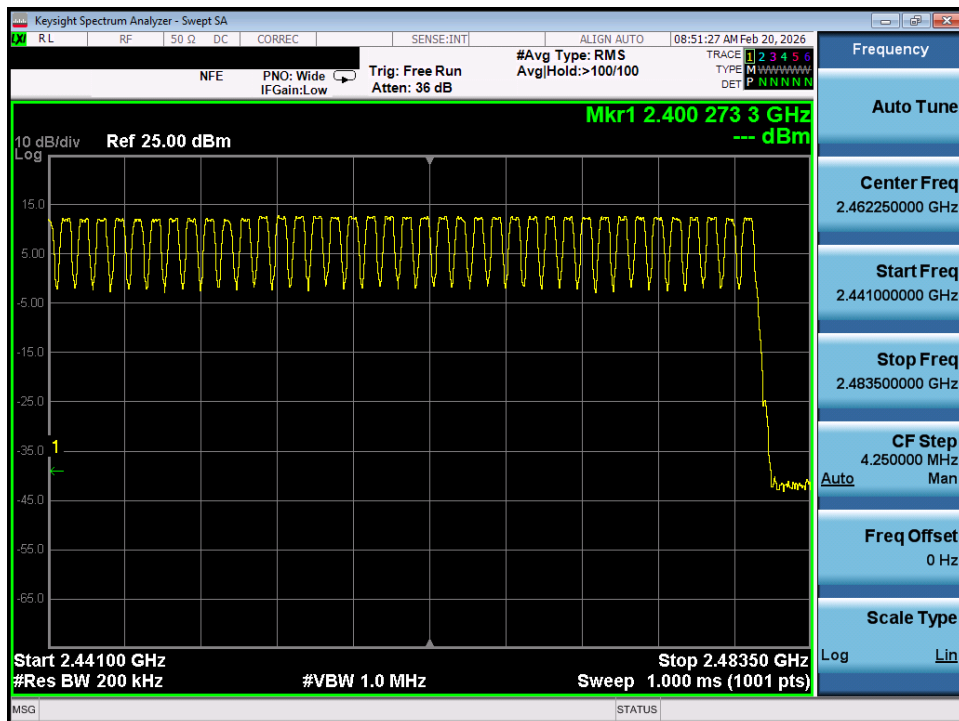
Test Notes

The frequency spectrum was broken up into two sub-ranges to clearly show all the hopping frequencies. In AFH mode, this device operates using 20 channels so the requirement for minimum number of hopping channels is satisfied.

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Plot 7-34. Low End Spectrum Channel Hopping Plot (Bluetooth)



Plot 7-35. High End Spectrum Channel Hopping Plot (Bluetooth)

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7.8 Conducted Spurious Emissions

Test Overview and Limit

Conducted out-of-band spurious emissions were investigated from 30MHz up to 25GHz to include the 10th harmonic of the fundamental transmit frequency. **The maximum permissible out-of-band emission level is 20 dBc.**

Test Procedure Used

ANSI C63.10:2020 – Section 7.8.7

Test Settings

1. Start frequency was set to 30MHz and stop frequency was set to 25GHz (separated into two plots per channel)
2. RBW = 1MHz* (See note below)
3. VBW = 3MHz
4. Detector = Peak
5. Trace mode = max hold
6. Sweep time = 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.

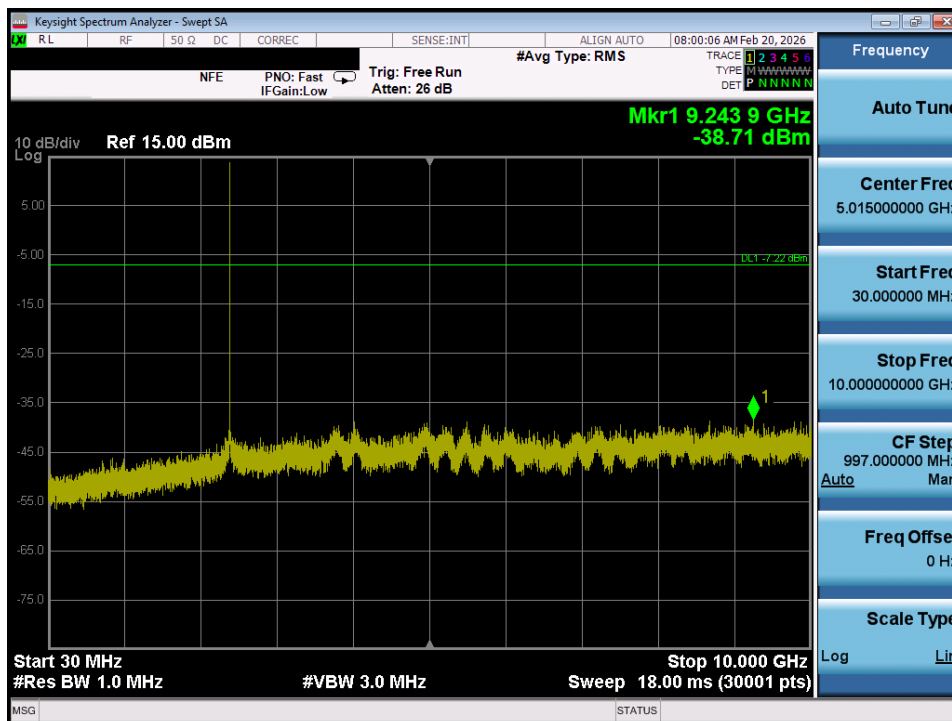


Figure 7-7. Test Instrument & Measurement Setup

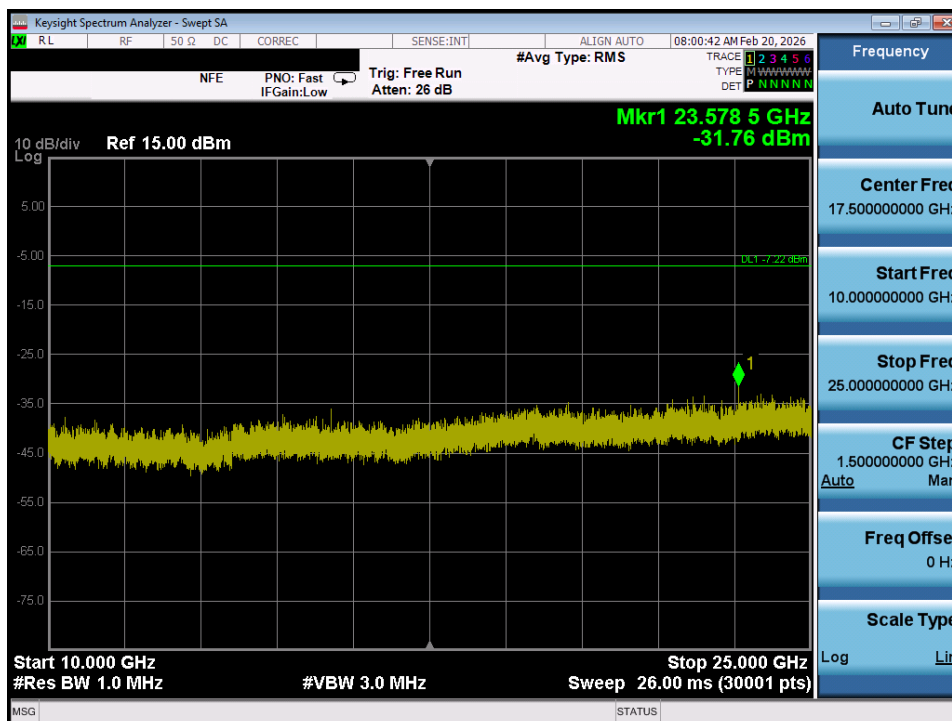
Test Notes

Out-of-band conducted spurious emissions were investigated for all data rates and the worst-case emissions were found with the EUT transmitting at 1Mbps. The display line shown in the following plots is the limit at 20dB below the fundamental emission level measured in a 100kHz bandwidth. However, the traces in the following plots are measured with a 1MHz RBW to reduce test time, so the display line may not necessarily appear to be 20dB below the level of the fundamental in a 1MHz bandwidth.

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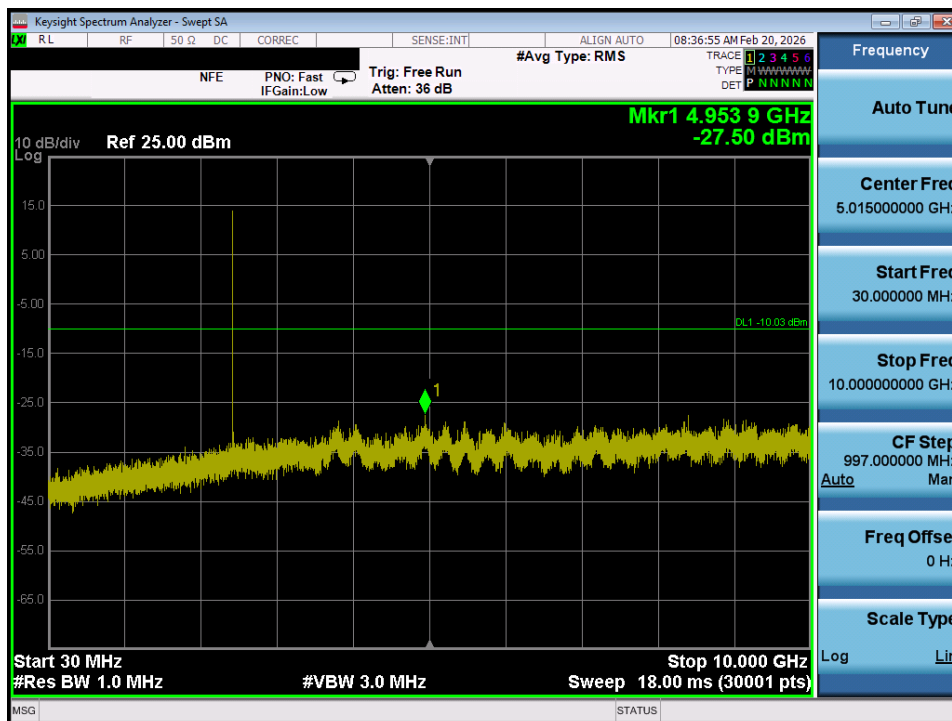


Plot 7-36. Conducted Spurious Plot (Bluetooth, 1Mbps – Ch. 0)

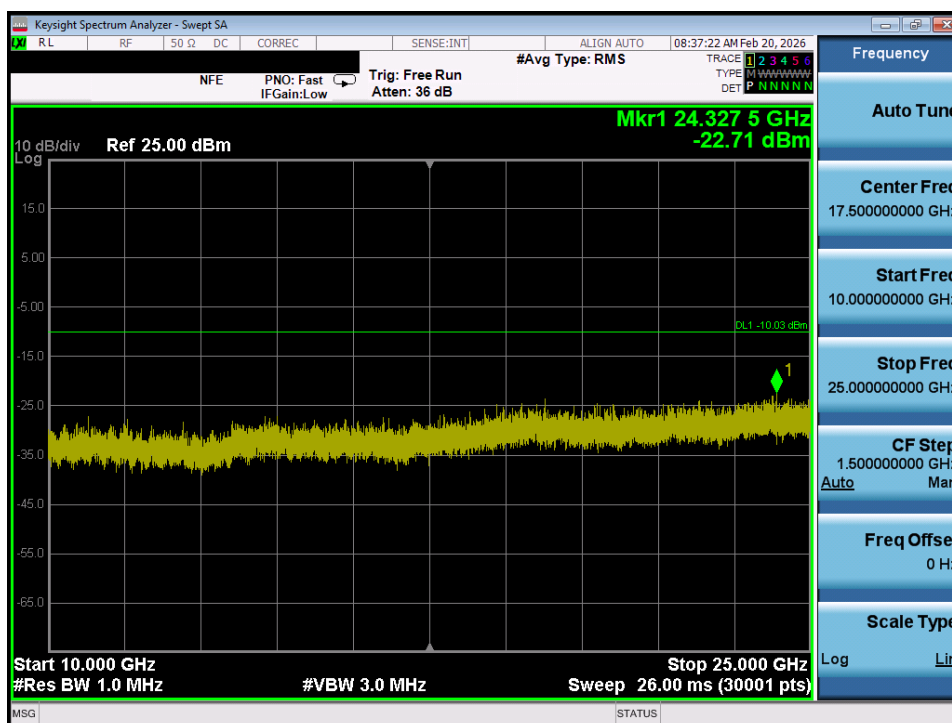


Plot 7-37. Conducted Spurious Plot (Bluetooth, 1Mbps – Ch. 0)

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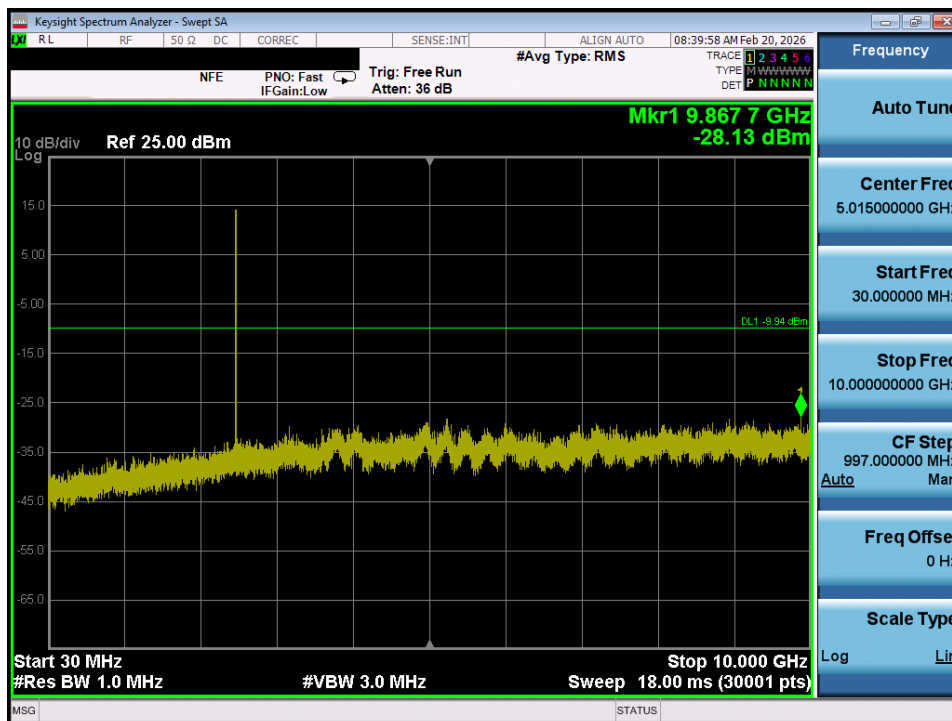


Plot 7-38. Conducted Spurious Plot (Bluetooth, 1Mbps – Ch. 39)

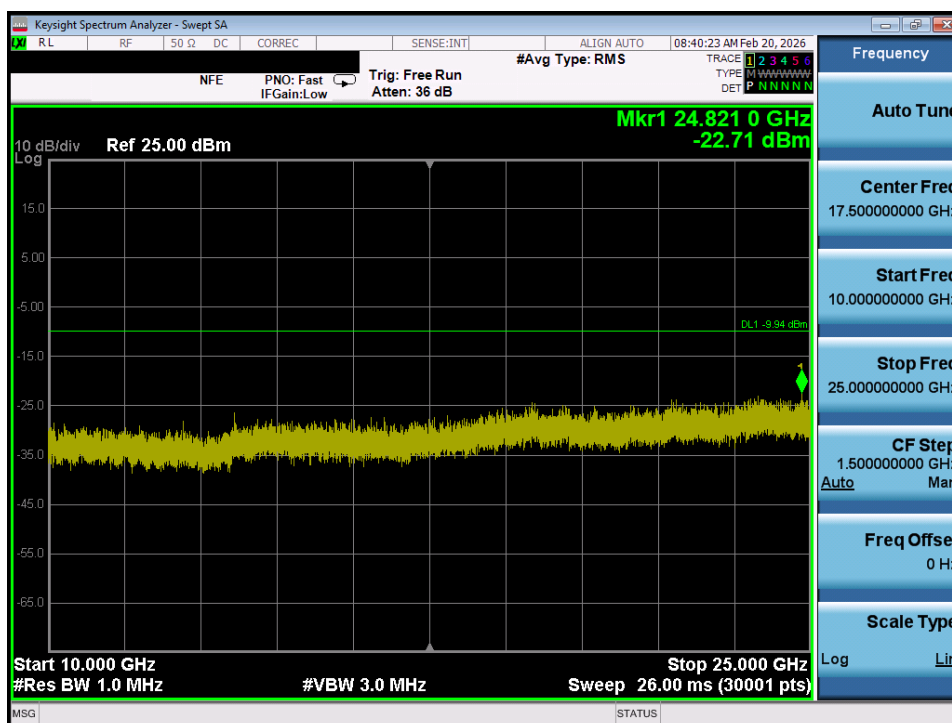


Plot 7-39. Conducted Spurious Plot (Bluetooth, 1Mbps – Ch. 39)

FCC ID: IPH-05169 IC: 1792A-05169	MEASUREMENT REPORT (CERTIFICATION)	Test Dates: 2/19/2026 - 4/21/2026	EUT Type: Portable Digital Transceiver	Approved by: Technical Manager
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Plot 7-40. Conducted Spurious Plot (Bluetooth, 1Mbps – Ch. 78)



Plot 7-41. Conducted Spurious Plot (Bluetooth, 1Mbps – Ch. 78)

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7.9 Radiated Spurious Emission Measurements – Above 1GHz

Test Overview and Limit

All out of band radiated spurious emissions are measured with a spectrum analyzer connected to a receive antenna while the EUT is operating at maximum power and at the appropriate frequencies. Only the radiated emissions of the configuration that produced the worst-case emissions are reported in this section.

All out of band emissions appearing in a restricted band as specified in Section 15.205 of the Title 47 CFR and Table 6 of RSS-Gen (8.10) must not exceed the limits shown below per Section 15.209 and RSS-Gen (8.9).

Frequency	Field Strength [$\mu\text{V/m}$]	Measured Distance [Meters]
Above 960.0 MHz	500	3

Table 7-5. Radiated Limits

Test Procedure Used

ANSI C63.10:2020 – Section 6.6.4.3

Test Settings

Average Field Strength Measurements per Section 4.1.5.2.3 of ANSI C63.10:2020

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 1MHz
3. VBW = 1kHz $\geq 1/\tau$ Hz, where τ = pulse width in seconds
4. Averaging type was set to RMS to ensure that video filtering was applied in the power domain
5. Detector = peak
6. Sweep time = auto
7. Trace mode = max hold
8. Trace was allowed to stabilize

Peak Field Strength Measurements per Section 4.1.5.2.2 of ANSI C63.10:2020

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW is set depending on measurement frequency, as specified in Table 7-6 below
3. VBW = 3MHz
4. Detector = peak
5. Sweep time = auto couple
6. Trace mode = max hold
7. Trace was allowed to stabilize

Frequency		RBW	
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9 – 150kHz	200 – 300Hz
0.15 – 30MHz	9 – 10kHz
30 – 1000MHz	100 – 120kHz
> 1000MHz	1MHz

Table 7-6. RBW as a Function of Frequency

Test Setup

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

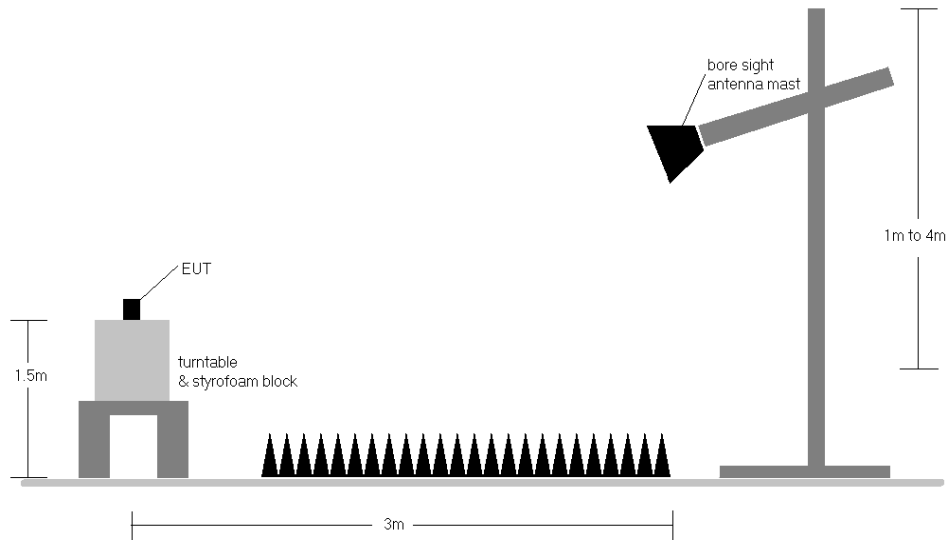


Figure 7-8. Radiated Test Setup >1GHz

Test Notes

1. All emissions lying in restricted bands specified in §15.205 and Section 8.10 of RSS-Gen are below the limit shown in §15.209.
2. No significant radiated emissions were found in the 2310 - 2390MHz restricted band.
3. The antenna is manipulated through typical positions, polarity, and length during the tests. The EUT is manipulated through three orthogonal planes.
4. This unit was tested with its standard battery.
5. The spectrum is measured from 9kHz to the 10th harmonic and the worst-case emissions are reported.
6. The duty cycle correction factor was not applied to noise floor measurements.
7. The wide spectrum spurious emissions plots shown on the following pages are used only for the purpose of emission identification. Any emissions found to be within 20dB of the limit are fully investigated and the results are shown in this section.
8. The "-" shown in the following RSE tables is used to denote a noise floor measurement.
9. Emissions below 18GHz were measured at a 3-meter test distance while emissions above 18GHz were measured at a 1-meter test distance with the application of a distance correction factor.

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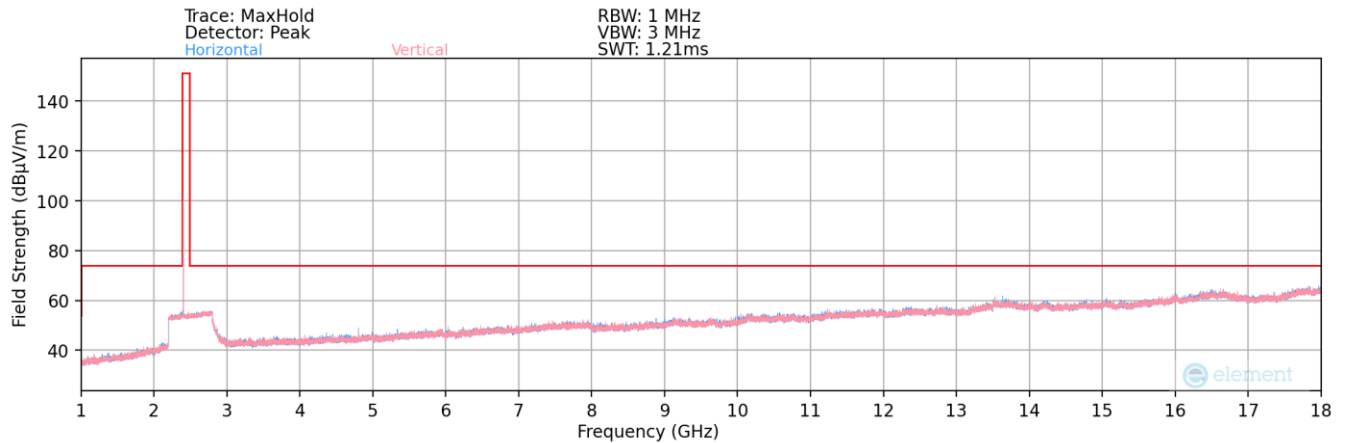
Sample Calculation

- Field Strength Level $_{\text{dB}\mu\text{V/m}}$ = Analyzer Level $_{\text{dBm}}$ + 107 + AFCL $_{\text{dB/m}}$ + Duty Cycle Correction $_{\text{dB}}$
- AFCL $_{\text{dB/m}}$ = Antenna Factor $_{\text{dB/m}}$ + Cable Loss $_{\text{dB}}$
- Margin $_{\text{dB}}$ = Field Strength Level $_{\text{dB}\mu\text{V/m}}$ – Limit $_{\text{dB}\mu\text{V/m}}$

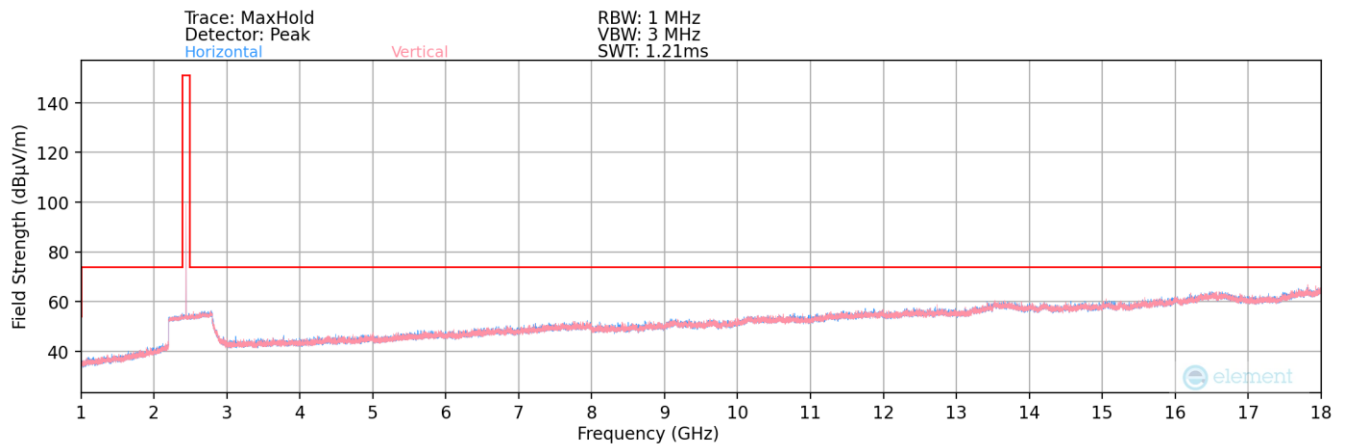
FCC ID: IPH-05169 IC: 1792A-05169	MEASUREMENT REPORT (CERTIFICATION)	Test Dates: 2/19/2026 - 4/21/2026	EUT Type: Portable Digital Transceiver	Approved by: Technical Manager
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Radiated Spurious Emission Measurements

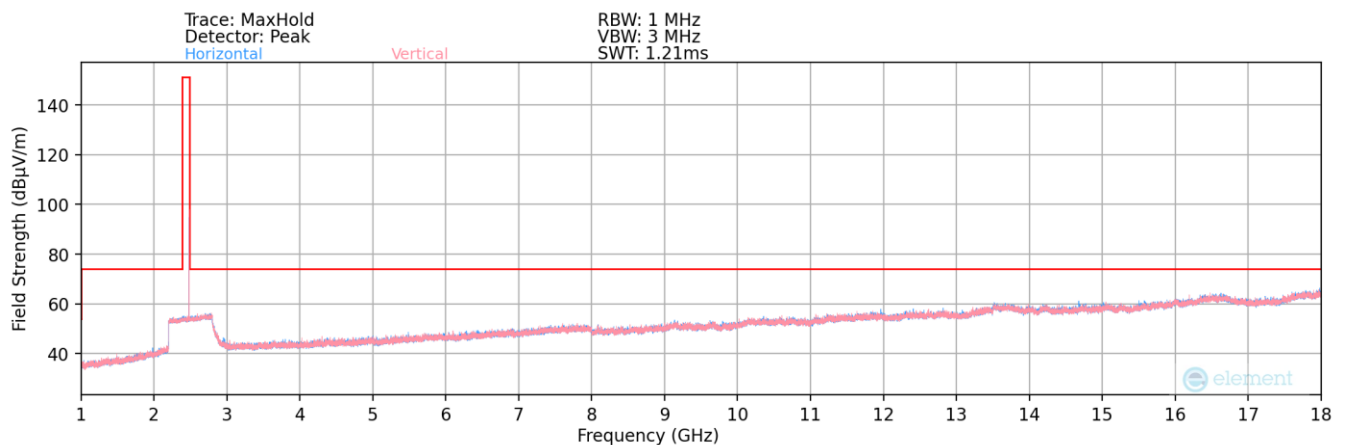
§15.205 §15.209 §15.247 (d); RSS-Gen [8.9]



Plot 7-42. Radiated Spurious Plot above 1GHz (BT - Ch. 0) - Ant 1



Plot 7-43. Radiated Spurious Plot above 1GHz (BT - Ch. 39) - Ant 1

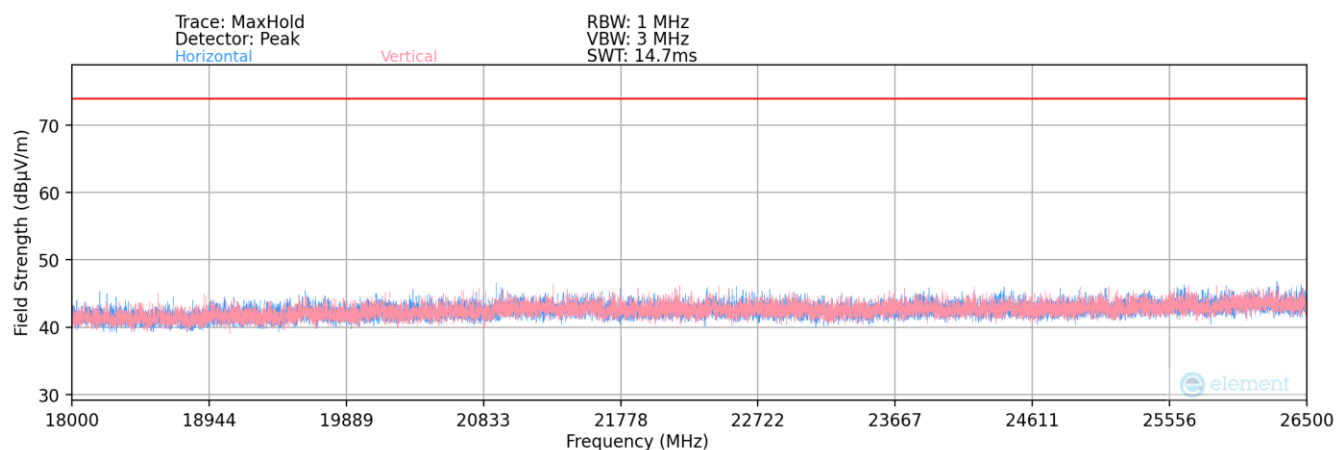


Plot 7-44. Radiated Spurious Plot above 1GHz (BT - Ch. 78) - Ant 1

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Radiated Spurious Emissions Measurements (Above 18GHz)

§15.209; RSS-Gen [8.9]



Plot 7-45. Radiated Spurious Plot above 18GHz – Ant 1

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Radiated Spurious Emission Measurements

Worst Case Mode: Bluetooth
Worst Case Data Rate: 1 Mbps
Measurement Distance: 3 Meters
Operating Frequency: 2402MHz
Channel: 0

Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBμV/m]	Limit [dBμV/m]	Margin [dB]
4804.00	Avg	V	336	11	-76.68	9.20	39.52	53.98	-14.46
4804.00	Peak	V	336	11	-68.60	9.20	47.60	73.98	-26.38
12010.00	Avg	V	-	-	-83.54	21.55	45.01	53.98	-8.97
12010.00	Peak	V	-	-	-72.54	21.55	56.01	73.98	-17.97

Table 7-7. Radiated Measurements – Ant 1

Worst Case Mode: Bluetooth
Worst Case Data Rate: 1 Mbps
Measurement Distance: 3 Meters
Operating Frequency: 2441MHz
Channel: 39

Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBμV/m]	Limit [dBμV/m]	Margin [dB]
4882.00	Avg	V	110	203	-78.15	9.51	38.36	53.98	-15.62
4882.00	Peak	V	110	203	-68.81	9.51	47.70	73.98	-26.28
7323.00	Avg	V	-	-	-81.81	14.89	40.08	53.98	-13.90
7323.00	Peak	V	-	-	-70.60	14.89	51.29	73.98	-22.69
12205.00	Avg	V	-	-	-84.15	22.04	44.89	53.98	-9.09
12205.00	Peak	V	-	-	-72.71	22.04	56.33	73.98	-17.65

Table 7-8. Radiated Measurements– Ant 1

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Worst Case Mode: Bluetooth
 Worst Case Data Rate: 1 Mbps
 Measurement Distance: 3 Meters
 Operating Frequency: 2480MHz
 Channel: 78

Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBμV/m]	Limit [dBμV/m]	Margin [dB]
4960.00	Avg	V	397	41	-80.20	9.49	36.29	53.98	-17.69
4960.00	Peak	V	397	41	-68.80	9.49	47.69	73.98	-26.29
7440.00	Avg	V	105	320	-79.50	15.23	42.73	53.98	-11.25
7440.00	Peak	V	105	320	-67.21	15.23	55.02	73.98	-18.96
12400.00	Avg	V	-	-	-83.36	22.37	46.01	53.98	-7.97
12400.00	Peak	V	-	-	-71.22	22.37	58.15	73.98	-15.83

Table 7-9. Radiated Measurements – Ant 1

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7.10 Radiated Restricted Band Edge Measurements

§15.205 §15.209 §15.247 (d); RSS-Gen [8.9]

Test Overview and Limit

All out of band radiated emissions at the band edge are measured with a spectrum analyzer connected to a receive antenna while the EUT is operating at maximum power, at the appropriate frequencies, and with hopping disabled. Only the radiated emissions of the configuration that produced the worst-case emissions are reported in this section.

All out of band emissions appearing in a restricted band as specified in Section 15.205 of the Title 47 CFR and Table 6 of RSS-Gen (8.10) must not exceed the limits shown below per Section 15.209 and RSS-Gen (8.9).

Frequency	Field Strength [$\mu\text{V/m}$]	Measured Distance [Meters]
Above 960.0 MHz	500	3

Table 7-10. Radiated Limits

Test Procedure Used

ANSI C63.10:2020 – Section 6.10.5.2

Test Settings

1. Span is set large enough to capture the peak level of the emission operating on the channel closest to the band edge
2. Reference level offset is set with the appropriate corrections for the frequencies shown in the plots
3. Reference level is set to provide the appropriate amount of “head room” above the signal as specified in ANSI C63.10:2020 Section 4.1.6.2
4. Attenuation is set to a low enough level to maintain enough dynamic range between the noise floor and the radiated limit
5. Sweep time = Auto coupled
6. RBW = 1MHz
7. VBW = 3 x RBW for peak measurements and 1kHz for RMS measurements
8. Detector = RMS and peak
9. Trace = Max Hold
10. Trace was allowed to stabilize

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Test Setup

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

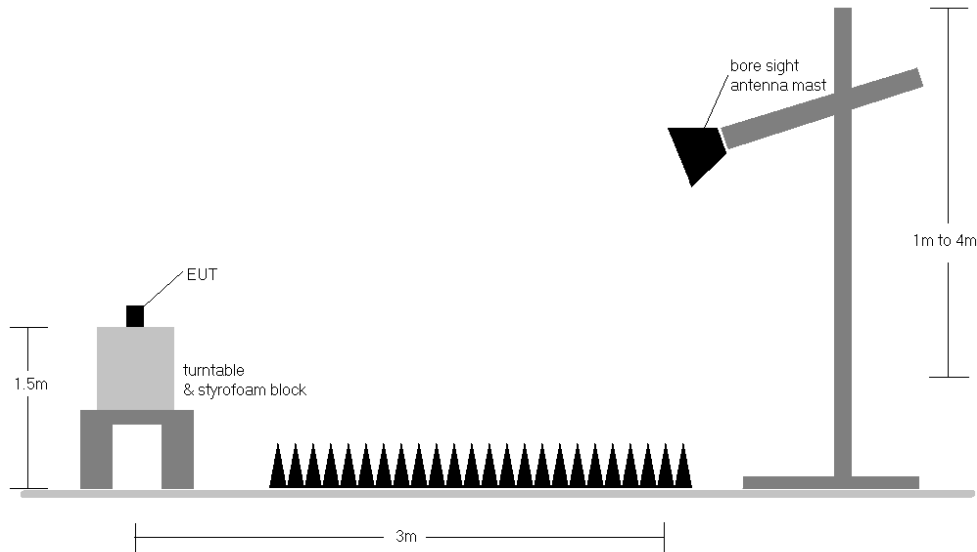


Figure 7-9. Radiated Test Setup >1GHz

Test Notes

1. All emissions lying in restricted bands specified in §15.205 and Section 8.10 of RSS-Gen are below the limits shown in §15.209.
2. No significant radiated emissions were found in the 2310 - 2390MHz restricted band.
3. The antenna is manipulated through typical positions, polarity, and length during the tests. The EUT is manipulated through three orthogonal planes.
4. This unit was tested with its standard battery.
5. The spectrum is measured from 9kHz to the 10th harmonic and the worst-case emissions are reported.
6. Two different amplitude offsets were used depending on whether peak or average measurements were measured. The average measurements use a duty cycle correction factor (DCCF).

The amplitude offset shown in the following plots for average measurements was calculated using the formula:

$$\text{Offset (dB)} = (\text{Antenna Factor} + \text{Cable Loss} + \text{Attenuator}) - \text{Preamplifier Gain} + \text{DCCF}$$

7. The "-" shown in the following RSE tables is used to denote a noise floor measurement.

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Duty Cycle Correction Factor Calculation

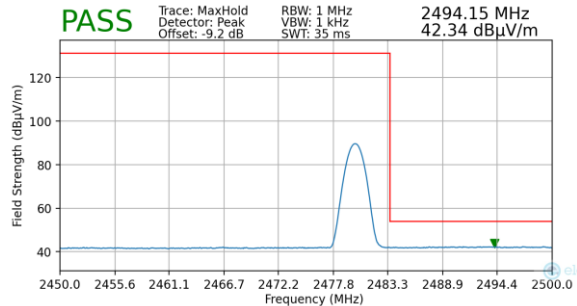
- Channel hop rate = 800 hops/second (AFHMode)
- Adjusted channel hop rate for DH5 mode = 133.33 hops/second
- Time per channel hop = $1 / 133.33 \text{ hops/second} = 7.50 \text{ ms}$
- Time to cycle through all channels = $7.50 \times 20 \text{ channels} = 150 \text{ ms}$
- Number of times transmitter hits on one channel = $100 \text{ ms} / 150 \text{ ms} = 1 \text{ time(s)}$
- Worst case dwell time = 7.5 ms
- Duty cycle correction factor = $20\log_{10}(7.5\text{ms}/100\text{ms}) = -22.5 \text{ dB}$

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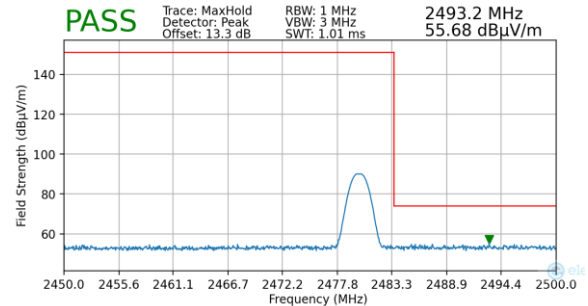
Radiated Restricted Band Edge Measurements – Ant 1

§15.205 §15.209 §15.247 (d); RSS-Gen [8.9]

Worst Case Mode:	Bluetooth
Worst Case Data Rate:	3 Mbps
Measurement Distance:	3 Meters
Operating Frequency:	2480MHz
Channel:	78



Plot 7-46. Radiated Restricted Upper Band Edge Measurement (Average)



Plot 7-47. Radiated Restricted Upper Band Edge Measurement (Peak)

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7.11 Radiated Spurious Emissions Measurements – Below 1GHz

§15.209; RSS-Gen [8.9]

Test Overview and Limit

All out of band radiated spurious emissions are measured with a spectrum analyzer connected to a receive antenna while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies. All data rates and modes were investigated for radiated spurious emissions. Only the radiated emissions of the configuration that produced the worst case emissions are reported in this section.

All out of band emissions must not exceed the limits shown below per Section 15.209 and RSS-Gen (8.9).

Frequency	Field Strength [$\mu\text{V/m}$]	Measured Distance [Meters]
0.009 – 0.490 MHz	2400/F (kHz)	300
0.490 – 1.705 MHz	24000/F (kHz)	30
1.705 – 30.00 MHz	30	30
30.00 – 88.00 MHz	100	3
88.00 – 216.0 MHz	150	3
216.0 – 960.0 MHz	200	3
Above 960.0 MHz	500	3

Table 7-11. Radiated Limits

Test Procedures Used

ANSI C63.10:2020

Test Settings

Quasi-Peak Field Strength Measurements

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 120kHz (for emissions from 30MHz – 1GHz)
3. Detector = quasi-peak
4. Sweep time = auto couple
5. Trace mode = max hold
6. Trace was allowed to stabilize

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Test Setup

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

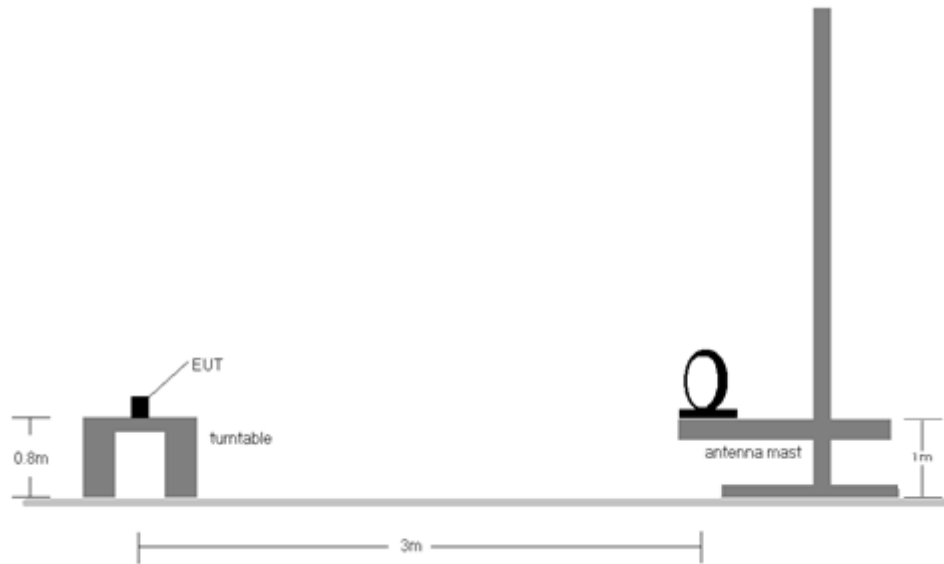


Figure 7-10. Radiated Test Setup < 30Mhz

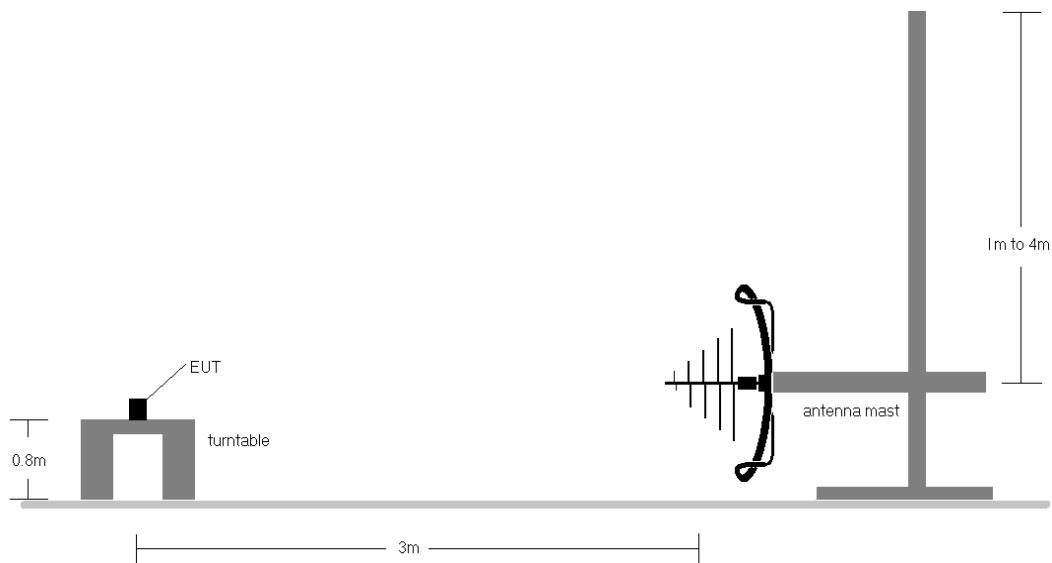


Figure 7-11. Radiated Test Setup < 1GHz

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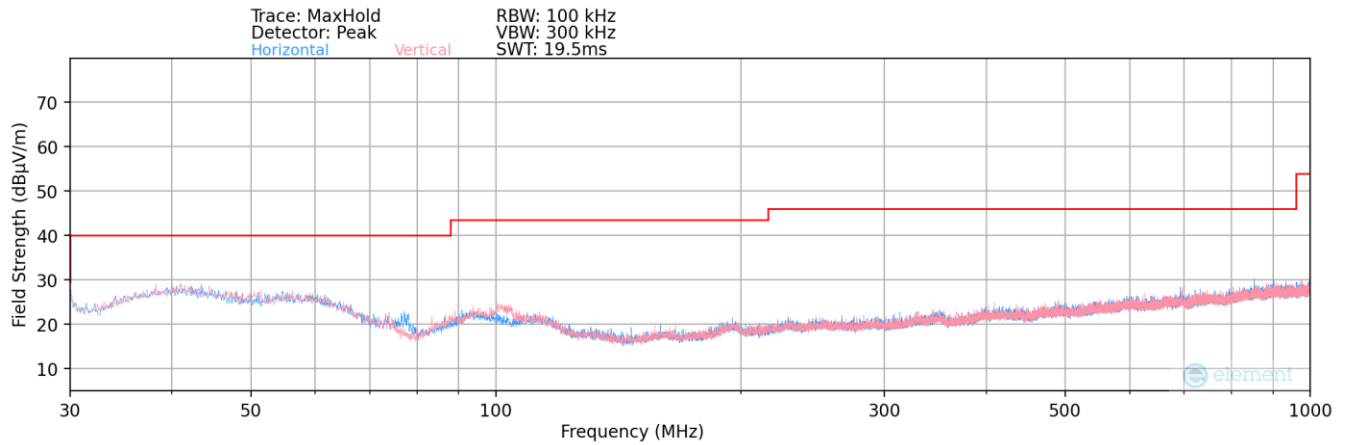
Test Notes

1. All emissions lying in restricted bands specified in §15.205 and RSS-Gen (8.10) are below the limits shown in §15.209.
2. The broadband receive antenna is manipulated through vertical and horizontal polarizations during the tests. The EUT is manipulated through three orthogonal planes.
3. This unit was tested with its standard battery.
4. The spectrum is investigated using a peak detector and final measurements are recorded using CISPR quasi peak detector. The worst-case emissions are reported however emissions whose levels were not within 20dB of the respective limits were not reported.
5. Emissions were measured at a 3 meter test distance.
6. Emissions are investigated while operating on the center channel of the mode, band, and modulation that produced the worst case results during the transmitter spurious emissions testing.
7. No spurious emissions were detected within 20dB of the limit below 30MHz.
8. The results recorded using the broadband antenna is known to correlate with the results obtained by using a tuned dipole with an acceptable degree of accuracy. The VSWR for the measurement antenna was found to be less than 2:1.
9. The wide spectrum spurious emissions plots shown on the following pages are used only for the purpose of emission identification. There were no emissions detected in the 30MHz – 1GHz frequency range, as shown in the subsequent plots.

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Radiated Spurious Emissions Measurements (Below 1GHz)

§15.209; RSS-Gen [8.9]



Plot 7-48. Radiated Spurious Plot below 1GHz – Ant 1

Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
77.19	Quasi-Peak	H	243	148	-73.29	-18.89	14.82	40.00	-25.18
102.48	Quasi-Peak	V	-	-	-78.40	-13.99	14.61	43.52	-28.92
491.59	Quasi-Peak	V	-	-	-85.36	-7.35	14.29	46.02	-31.74
792.00	Quasi-Peak	V	-	-	-86.95	-2.80	17.25	46.02	-28.77

Table 7-12. Radiated Spurious Emissions Below 1GHz – Ant 1

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7.12 Line Conducted Measurement Data

§15.207; RSS-Gen [8.8]

Test Overview and Limit

All AC line conducted spurious emissions are measured with a receiver connected to a grounded LISN while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies. All data rates and modes were investigated for conducted spurious emissions. Only the conducted emissions of the configuration that produced the worst case emissions are reported in this section.

All conducted emissions must not exceed the limits shown in the table below per Section 15.207 and RSS-Gen (8.8).

Frequency of emission (MHz)	Conducted Limit (dBμV)	
	Quasi-peak	Average
0.15 – 0.5	66 to 56*	56 to 46*
0.5 – 5	56	46
5 – 30	60	50

Table 7-13. Conducted Limits

*Decreases with the logarithm of the frequency.

Test Procedures Used

ANSI C63.10:2020, Section 6.2

Test Settings

Quasi-Peak Field Strength Measurements

1. Analyzer center frequency was set to the frequency of the spurious emission of interest
2. RBW = 9kHz (for emissions from 150kHz – 30MHz)
3. Detector = quasi-peak
4. Sweep time = auto couple
5. Trace mode = max hold
6. Trace was allowed to stabilize

Average Field Strength Measurements

1. Analyzer center frequency was set to the frequency of the spurious emission of interest
2. RBW = 9kHz (for emissions from 150kHz – 30MHz)
3. Detector = RMS
4. Sweep time = auto couple
5. Trace mode = max hold
6. Trace was allowed to stabilize

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Test Setup

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

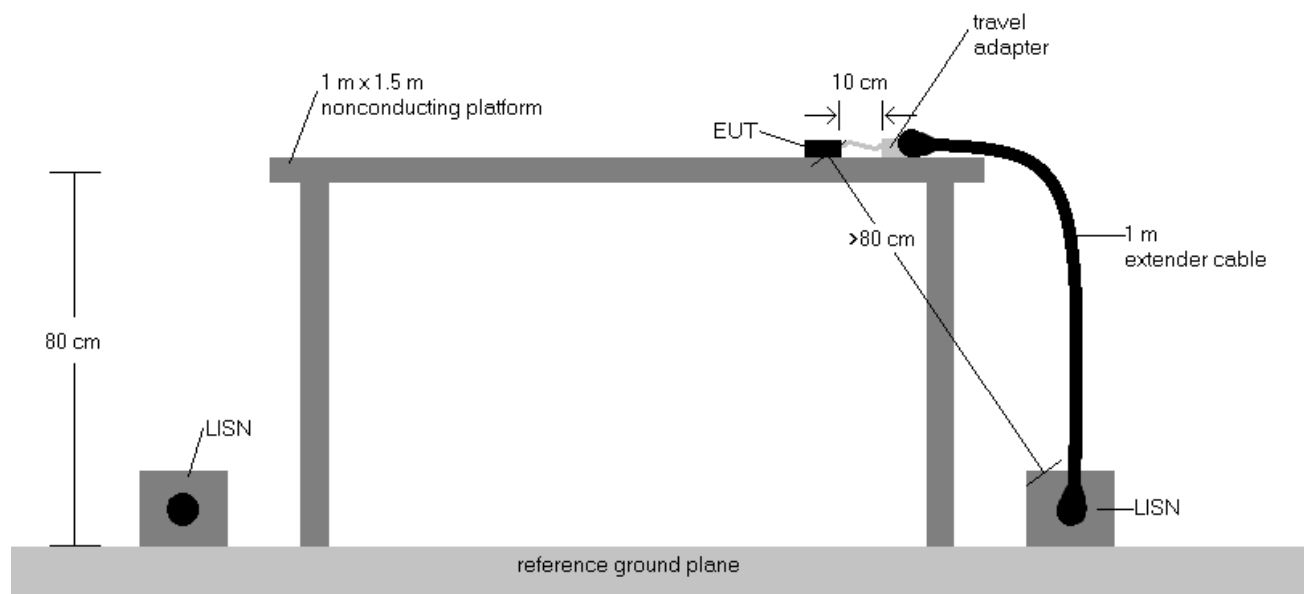
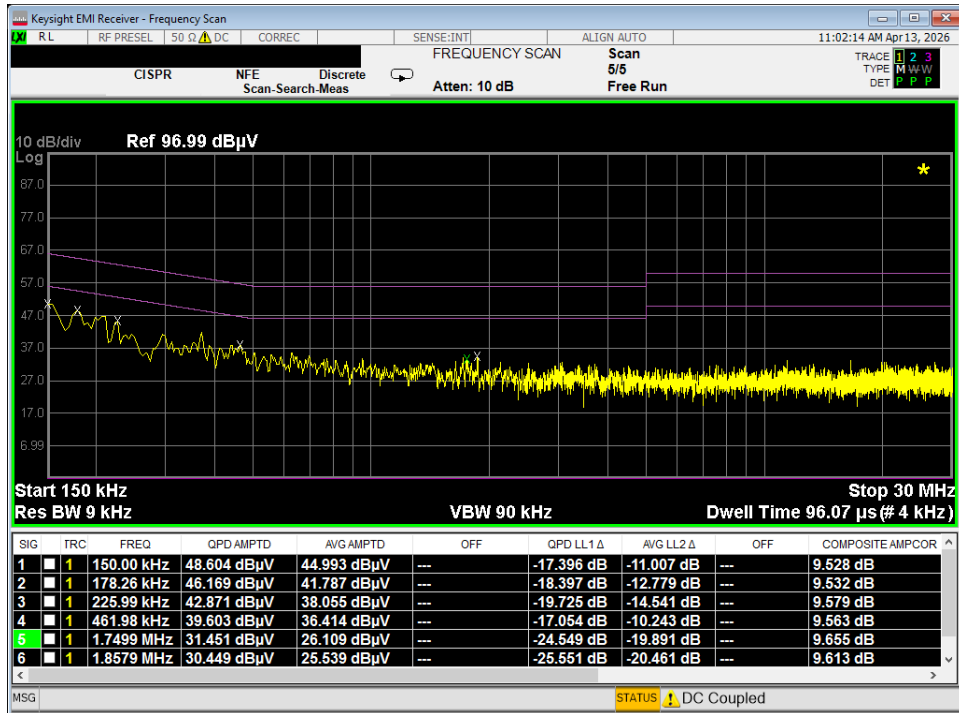


Figure 7-12. Test Instrument & Measurement Setup

Test Notes

1. All modes of operation were investigated, and the worst-case emissions are reported using mid channel. The emissions found were not affected by the choice of channel used during testing.
2. The limit for an intentional radiator from 150kHz to 30MHz are specified in 15.207 and RSS-Gen (8.8).
3. $\text{Corr. (dB)} = \text{Cable loss (dB)} + \text{LISN insertion factor (dB)}$
4. $\text{QP/AV Level (dB}\mu\text{V)} = \text{QP/AV Analyzer/Receiver Level (dB}\mu\text{V)} + \text{Corr. (dB)}$
5. $\text{Margin (dB)} = \text{QP/AV Limit (dB}\mu\text{V)} - \text{QP/AV Level (dB}\mu\text{V)}$
6. Traces shown in plot are made using a peak detector.
7. Deviations to the Specifications: None.

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Plot 7-49. Line-Conducted Test Plot (L1)

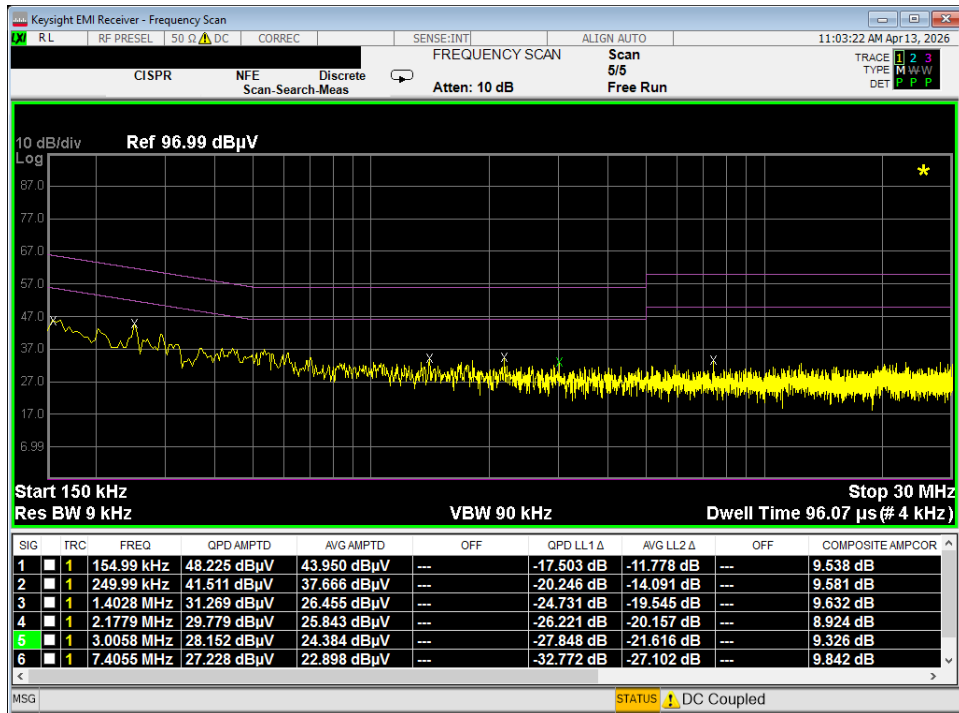


Table 7-14. Line-Conducted Test Data (N)

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8.0 CONCLUSION

The data collected relate only to the item(s) tested and show that the **Garmin Portable Digital Transceiver FCC ID: IPH-05169** and **IC: 1792A-05169** is in compliance with Part 15 Subpart C (15.247) of the FCC Rules and RSS-247 of the ISED Rules.

- END OF TEST REPORT -

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