

Test Report

2026-026

Version
Issued

A1
09 Jun 2026

Applicant

Garmin International
1200 E 151st St.
Olathe Kansas USA

Client-supplied information:

Model Identifier
FCC ID
ISED ID
Equipment Type

A05147
IPH-05147
1792A-05147
Portable Digital Transceiver

Types of Radio Tested
Radio Classification

Bluetooth Classic
2.4 GHz Frequency Hopping Spread Spectrum (FHSS)

Primary Test Standards

CFR 47, FCC Part 15, Subpart C (15.247 FHSS)
RSS-GEN Issue 5 Amd 2
RSS-247 Issue 4
ANSI C63.10: 2020 and ANSI C63.10: 2020 +Cor 1: 2023

Test Lab

Garmin Compliance Lab
1200 E 151st St.
Olathe Kansas 66062 USA
GCL-1030

Project Tracking Identifier



See [section 5.5](#) of this report regarding the presence or absence of accreditation logos or marks on this cover page.

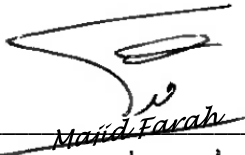
Report History and Approval

Version	Date	Author	Reason for change and/or summary of changes
A	21 May 2026	Andy Heier	Original issuance
A1	09 Jun 2026	Andy Heier	Removed extra space from FCC & ISSED IDs on the report cover page. Corrected RSS-247 Issue 3 to Issue 4 on report cover page and section 5.1 on page 11.

Table 0.1: Revision history

Report Technical Review:

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GCL only

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TABLE OF CONTENTS

1.	Test Result Summary.....	5
2.	Test Background.....	7
2.1	The Test Lab	7
2.2	The Applicant	7
2.3	Other Information	7
3.	Test Sample Modifications and Special Conditions.....	7
4.	Description of the Equipment Tested	9
4.1	Unique Identification	9
4.2	Key Parameters	9
4.3	Operating modes	9
4.4	EUT Arrangement	9
4.1	Associated Equipment (AE) used	10
4.2	Cables used	10
5.	Test Standards and Accreditation.....	11
5.1	Accredited Standards	11
5.2	Non-accredited Standards	11
5.3	Sampling and Decision Rule	11
5.4	Variances.....	11
5.5	Laboratory Accreditation	12
6.	Measurement Instrumentation Uncertainty	13
7.	Selected Example Calculations	14
8.	Environmental Conditions During Test	14
9.	3m RF Chamber Block Diagrams	15
10.	Test Results	17
10.1	RF Port Test Results.....	17
10.1.1	Occupied Bandwidth 99% Power and 20 dB Methods	17
10.1.2	Necessary Bandwidth	20
10.1.3	Hopping Channel Parameters: Number, Spacing, Occupancy.....	20
10.1.4	Transmitter Conducted Output Power and Duty Cycle.....	29
10.1.5	Unwanted Emissions Outside the Frequency Bands of Operation, RF Port Conducted	32
10.2	Radiated Emission Test Results	39
10.2.1	Unwanted Emissions Outside the Frequency Bands of Operation, Radiated 1 – 14 GHz	39
10.2.2	Unwanted Emissions Outside the Frequency Bands of Operation, Radiated 14-25 GHz	47
10.2.3	Unwanted Emissions Outside the Frequency Bands of Operation, Radiated 0.009-30 MHz	54
10.2.4	Unwanted Emissions Outside the Frequency Bands of Operation, Radiated 30-1000 MHz	60
10.2.5	Unwanted Emissions in the Restricted Bands adjacent to the Frequency Bands of Operation	65
10.3	Other Test Results	72

10.3.1 AC powerline conducted emissions 72

11. Concluding Notes 77

1. TEST RESULT SUMMARY

The equipment or product described in section 5 of this report was tested at the Garmin Compliance Lab according to standards listed in section 6. This report focuses on the 2.4 GHz Bluetooth transceiver. The results are as follows.

FCC	ISED	Requirements	Key Results	Judgment	Data
2.202 15.215c	RSS-GEN: 6.7	Occupied bandwidth on a 99% basis must be reported but there are no limits to apply. The 20 dB occupied bandwidth must remain within the frequency band of operation.	The 99% Occupied bandwidth is 1.235 MHz or less. The 20 dB bandwidth was within the frequency band of operation.	PASS	Link RF Port
2.202	RSS-GEN: 9	Necessary bandwidth is a property of radio protocols.	The necessary bandwidth is calculated.	Reported	Link Other
15.247a1	RSS-247 6.2.1 6.2.3.1	The radio manages its use of channels appropriately. Requirements include the number of channels employed, their spacing, and the occupancy time on each channel.	The system uses 79 hopping channels separated by at least 2/3 of the 20 dB Bandwidth. Channel occupancy was 0.342 seconds or less.	PASS	Link RF Port
15.247g-h	RSS-247: 6.1 6.2	Frequency hopping systems have additional functional requirements.	These functional requirements are design parameters, but not testable requirements.	NT	(None)
15.247b1	RSS-247: 6.2.3.2	Conducted output power presented to the antenna cannot exceed 125 mW or 21 dBm. The effective radiated power is limited to 4 Watts or 36 dBm EIRP.	The maximum transmit power is 10.69 dBm or 11.72 mW. Based on antenna gain data below, the effective power limit is satisfied.	PASS	Link RF Port
(None)	(None)	Duty cycle is the fraction of time that the transmitter is keyed in the test mode.	Bluetooth: ≥ 98%	Reported	Link RF Port
15.247 b4 and c	(None)	The antenna gain must be below 6 dBi or special rules apply.	NT. The client stated that the antenna gain value was -1.15 dBi and will document antenna gain separately.	NT	(None)
15.247d, 15.209	RSS-247: 6.6 RSS-GEN: 8.9	Unwanted emissions outside the frequency band must be reduced to the general radiated emission limit or at least 20 dB below the in-band levels.	The margin to the general radiated emission limit was 2.4 dB or greater.	PASS	Link Field: General Link RF Port: Band Edge

Table continues on next page

15.247d, 15.205	RSS-GEN: 8.9 and 8.10	Restricted band emissions must be below the general radiated emission limit.	In the restricted bands adjacent to the allocated frequency band, the margin to the general radiated emission limit was 13 dB or greater. For other restricted bands of operation, the margin to the general radiated emission limit was 2.4 dB or greater.	PASS	Link Field: Band Edge Link Field: General
15.215c	RSS-247: 6.11	Transmitter frequency stability looks at carrier drift over a range of temperatures and supply voltages.	NT. The client stated that the radios reported here are exempt.	NT	(None)
15.207	RSS-GEN: 8.8	AC powerline conducted emissions must be below the limits provided in these sections of the regulations.	The measured emissions had at least 26 dB of margin to the limits.	PASS	Link Other
(None)	RSS Gen Annex A item 10a	Rated transmitter power (as stated by client)	20 dBm	Reported	(None)
(None)	RSS Gen Annex A item 10b	Modulation characteristics (as stated by client)	Digitally modulated spread spectrum at rates as high as 3 Mbps.	Reported	(None)
(None)	RSS Gen Annex A item 10c	Frequency bands of operation	2400 – 2483.5 MHz	Reported	(None)
(None)	RSS Gen Annex A item 10d	Channel Bandwidths (Emission designators were not provided by the client and will be stated separately.)	See the 20 dB bandwidth at the start of this table.	Reported	Link RF Port
(None)	RSS Gen Annex A item 10g	Antenna characteristics (as stated by client)	A model-unique antenna is embedded in the product by design and cannot be changed by the user. Type: Inverted F SMP Gain: -1.15 dBi Impedance: 50 Ω	Reported	(None)
(None)	RSS Gen Annex A item 14b	Identification of the test sample firmware version	Version 22.25	Reported	(None)

NT (Not Tested) means the requirement may or may not be applicable, but the relevant measurement or test was not performed as part of this test project.

N/A (Not Applicable) means the lab judged that the test sample is exempt from the requirement.

RF Port in the Data column means testing was performed on a benchtop measuring radio performance characteristics at a coaxial cable port that replaced the antenna.

Field in the Data column means testing was performed in a validated radiated emission test site.

Other in the Data column means testing was performed in a different way than RF Port or Radiated.

Table 1.1: Summary of results

Page 6 of 77	GCL Test Report 2026-026	Version A1
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2. TEST BACKGROUND

2.1 The Test Lab

The testing reported here was performed at the Garmin Compliance Lab, an organization within Garmin International but distinct from the applicant/client, located at 1200 E 151st St, Olathe Kansas, USA. The contact telephone number is +1.913.397.8200. Lab accreditation and recognition are discussed at [section 5.5](#) of this report.

2.2 The Applicant

The testing was performed on behalf of the Garmin design group, a separate organization located at 1200 E 151st St, Olathe Kansas, USA. Witnesses from the business group included: None.

2.3 Other Information

Test Sample received: 11 Feb 2026
Test Start Date: 23 Feb 2026
Test End Date: 28 Apr 2026

The data in this test report apply only to the specific samples tested.

Upon receipt all test samples were believed to be properly assembled and ready for testing.

Due to confidentiality, certain material (such as test setup photographs) has been removed from this report and placed in GCL Test Report 2026-028. That report is treated as a part of this document by way of this reference.

3. EST SAMPLE MODIFICATIONS AND SPECIAL CONDITIONS

The following special conditions or usage attributes were judged during test to be necessary to achieve compliance with one or more of the standards listed in section 6 of this report:

ID	Description of the special conditions or usage attributes	Tests most likely to be affected
None	None	None

Table 3.1: List of special conditions or usage attributes

The following modifications to the test sample(s) were made, and are judged necessary to achieve compliance with one or more of the standards listed in section 6 of this report:

ID	Detailed description of the change	Date Applied	Samples Modified	Reason for the change	List of tests performed without using the change *	Relevant to these stds?
CH1	Updated firmware from ver. 22.08 to 22.20. Changed BLE/ANT RF output filter.	08-Apr-2026	All	To meet radiated emissions requirements for North America	• TR02 Tx Power • TR27 OBW99 • TR57 Band Edge Gap • RE01 2.4G Restricted • TR58 Band Edge Gap • RE11 Rad. Emissions • TR93 Chan Sep • TR94 # of Channels • TR96 Occup. & Dwell • TR23 OBW20 • TR95 # of Channels	No
CH2	Reduced power, IEEE 802.11b, Ch 6.	13-Apr-2026	All	To meet radiated emissions requirements for North America	• TR02 Tx Power • TR27 OBW99 • TR57 Band Edge Gap • RE01 2.4G Restricted • TR58 Band Edge Gap • RE11 Rad. Emissions • TR93 Chan Sep • TR94 # of Channels • TR96 Occup. & Dwell • TR23 OBW20 • TR95 # of Channels • RE58 Rad. Emissions • CE02 Cond. Emissions	No
CH3	Updated firmware from ver. 22.20 to 22.25. Reduced power, IEEE 802.11b, All channels.	22-Apr-2026	All	To meet radiated emissions requirements for North America	• TR02 Tx Power • TR27 OBW99 • TR57 Band Edge Gap • RE01 2.4G Restricted • TR58 Band Edge Gap • RE11 Rad. Emissions • TR93 Chan Sep • TR94 # of Channels • TR96 Occup. & Dwell • TR23 OBW20 • TR95 # of Channels • RE58 Rad. Emissions • CE02 Cond. Emissions	No

Table 3.2: List of changes made to the test sample(s)

* Any tests listed in this right-most column were performed without this modification being present, and the presence or absence of the modification is judged by the lab and client to have no significant effect on these specific tests.

Identifiers (ID) are provided for each special condition / usage attribute (SC#) or modification / change (CH#) for ease in referencing these details elsewhere in the test report.

4. DESCRIPTION OF THE EQUIPMENT TESTED

4.1 Unique Identification

Product Model	A05147
Serial Numbers Tested	8WP000264, 8WP000276, 8WP000284

This product tested is a mobile device for collecting and sharing data with the user and nearby electronic devices.

The client affirmed that the test samples will be representative of production in all relevant aspects.

4.2 Key Parameters

EUT Input Power:	5 Vdc
I/O Ports:	USB
Radio Transceivers:	Bluetooth Classic
Radio Receivers:	Global Navigation Satellite Systems
Typical use:	Portable in multiple orientations
Highest internal frequency:	2.484 GHz
Highest digital frequency:	240 MHz
Number of Tx chains:	1

4.3 Operating modes

During test, the EUT was operated in one or more of the following modes.

Mode 1 BTCTx:	The sample transmits in Bluetooth classic on a fixed channel (not hopping).
Mode 2 BTCHop:	The sample transmits in Bluetooth classic - hopping mode.
Mode 3 BTCLink:	The sample is linked to a companion device using Bluetooth classic.

4.4 EUT Arrangement

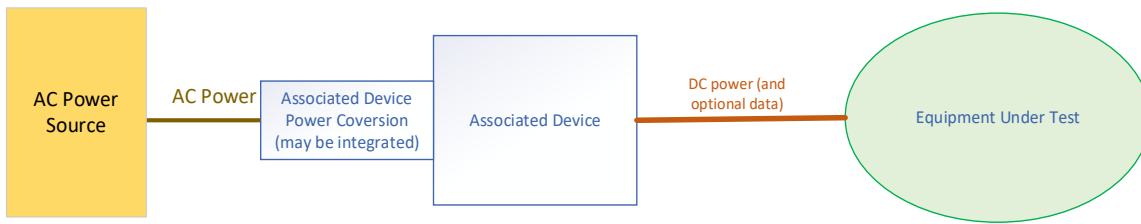
During test, the EUT components and associated support equipment were selected including the following arrangement sets.

Arrangement 1: A1 (Solo). The test sample operates from its battery and no external physical connections. No block diagram is needed for this arrangement.

Arrangement 2: A2 (Upwr). The test sample is connected to a Mains-powered device that provides dc power to the sample over a cable but no user data. See the block diagram in Figure 1.

Arrangement 3: A3 (Udata). The test sample is connected to a Mains-powered device that provides dc power to the sample and user data over a cable. See the block diagram in Figure 1.

Arrangement 4: A4 (Udc). The test sample is connected to a Mains-powered device that provides dc power to the sample and may or may not provide user data. This arrangement is specified in the test plan to provide staff flexibility when the presence or absence of data on the cable is not pertinent. See the block diagram in Figure 1.



*This interconnect drawing is not to scale.
It does not indicate the placement of devices.*

Figure 1: Block diagram of equipment arrangements A2, A3, A4

4.1 Associated Equipment (AE) used

Description	Manufacturer	Model	Serial Number
USB C power adaptor	Phihong (Garmin)	AQ27A-59CFA	362-00118-00
Laptop	Dell	Precision 5540	3JYG33
Power Supply	Dell	HA130PM130	CN-0V363H-CH200-78G-0DC1-A01

Table 4.5.1: List of associated equipment that may have been used during test

4.2 Cables used

Description	From	To	Length	EMC Treatment
USB-C Charging/Data	Laptop/Wall Charger	EUT	0.5m	none

Table 4.6.1: List of cables that may have been used during test

5. TEST STANDARDS AND ACCREDITATION

5.1 Accredited Standards

The following test or measurement standards were applied and are within the scope of the lab's accreditation. All results in this report that cite these standards are presented as Accredited results consistent with ISO/IEC 17025.

CFR 47, FCC Part 15, Subpart C

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

RSS-GEN Issue 5 Amd 2

RSS-247 Issue 4

5.2 Non-accredited Standards

The following test or measurement standards were applied and are either outside the scope of the lab's accreditation, or were performed in such a way that results are not presented as being fully accredited.

FCC Part 2.202

TRC-43 Issue 3

5.3 Sampling and Decision Rule

The client typically provides two forms of test sample: modified to have an RF-cabled output instead of an antenna, and unmodified. The form of sample is matched to each kind of test based on whether the individual test method is done best with a modified or unmodified sample. When multiple samples of either form are provided, the sample to use is selected randomly from the eligible samples. Any diversions from this general rule will be identified in this section of the report or in the relevant test data records.

The baseline pass/fail decision rule used in GCL is that uncertainty is not used in determining the test result: the measurand is compared directly to the limit to judge whether the test has a passing or failing result. Some EMC or radio test standards require an alternate decision rule. Their alternate rule is that any MIU (uncertainty) above the benchmark uncertainty must be added to (or subtracted from, as appropriate) the measurand before comparison to the relevant limit. Except for Radio Signal Frequency Accuracy under some conditions and standards, all GCL uncertainties are below the benchmark level. Thus it is rare that this alternate decision rule would need to be applied at GCL. If the alternate rule must be applied as a requirement under one or more standards, that case will be plainly identified in this section or in the relevant test data records.

5.4 Variances

The following variances were applied to standards cited in this section.

Where different test standards cover the same test parameter or phenomenon, and the standards have compatible differences, the stricter of the requirements is typically applied. For example, a consolidated limit may be applied to emission tests selecting the strictest of the limits at each frequency. Likewise, if one standard requires a vertical antenna sweep with boresighting and another does not, swept motion with boresighting will typically be used as it is the more stringent requirement.

Some standards that apply an Average detector provide a variety of methods to handle time-averaging, especially where the transmission is not continuous and the Duty Cycle (DC) is below a value such as 98%. The basic GCL process is to begin by applying an Average detector to the emission with the receiver in Max-Hold data mode. This Max Average method is worst-case compared to any of the methods of time-averaging provided. If the Max Average result complies with the limit, that result is provided in the test record and the emission judged to be compliant without additional detail. If the Max Average result is near or above the limit at one or more emission frequencies, then one of the appropriate time-averaging methods is applied to determine final compliance. When time-averaging is used, the test record will indicate which method of time-averaging was used.

Some standards ask for measurements made with a 'Time Domain Power' function, but that function is not defined in the standards. GCL addresses this process gap as follows. Staff capture a zero-span Average detector data record of emission power, with a timespan covering a transmission burst. When the maximum power in the data record is clearly below the limit, this value will be reported. When the maximum power in the data record is near or above the limit, then the average of the power (in linear units) during a transmission burst is calculated and reported.

DISCLAIMER: In some test activities, the operation of a test or the result of a test depends on data provided by the client. The Garmin Compliance Lab disclaims responsibility for any error in the processes, results, or judgments in this report arising from incorrect client-provided data.

5.5 Laboratory Accreditation

FCC Designation Number	US1311
FCC Test Firm Registration Number	273575
ISED CAB Identifier	US0233
ISED Company Number	1792A
A2LA Accreditation Certificate	6162.01

The Garmin Compliance Lab, an organization within Garmin International distinct from the applicant, is registered with the US Federal Communication Commission and recognized by the Canada Department of Innovation, Science, and Economic Development (ISED). The lab is accredited by A2LA, the American Association for Laboratory Accreditation. The presence of the A2LA logo on the cover of this report indicates this is an accredited ISO/IEC 17025 test report. If the logo is absent, this report is not issued as an accredited report. Other marks and symbols adjacent to the A2LA logo are accreditation co-operations of which A2LA is a member under a mutual recognition agreement, and to which the Garmin Compliance Lab has been sublicensed.

6. MEASUREMENT INSTRUMENTATION UNCERTAINTY

The lab has analyzed the sources of measurement instrumentation uncertainty (MIU). The analysis concludes that the actual measurement values cited in this report are accurate within the U_{LAB} intervals shown below. MIU is based on two standard deviations which is approximately 95% statistical confidence for an upper- and lower-bounded limit. MIU is one component of over-all measurement uncertainty, and other uncertainty components are not considered as part of this analysis.

The primary benchmark for MIU in an electromagnetic compatibility (EMC) test lab is the set of U_{CISPR} values published in CISPR 16-4-2. In all cases where a U_{CISPR} value is published by CISPR, the analysis shows that U_{LAB} – this lab’s estimated MIU – is better than the U_{CISPR} benchmark.

The secondary benchmark for MIU in a lab performing radio transceiver tests is a set of uncertainty limit values published in various ETSI standards. In this report, U_{ETSI} is the most restrictive of the values found in the ETSI EN standards in this lab’s scope of accreditation. The analysis principles are described in the ETSI TR documents listed there. In most cases U_{LAB} is better than the U_{ETSI} benchmark. Where U_{LAB} exceeds the U_{ETSI} benchmark cited here, that entry is preceded by an asterisk. In an individual test report, staff may re-evaluate that excess uncertainty based on the uncertainty of the method used and the uncertainty limits of the actual ETSI EN standard being applied, and the revised uncertainty values will be shown in the test report.

Some measurement uncertainties analyzed and reported here are not addressed in CISPR 16-4-2 or the ETSI standards, as indicated by the entry ‘None.’

Test Type	U_{LAB}	U_{CISPR}	U_{ETSI}
Conducted DC voltage	0.09% + 2 x LSDPV	None	1%
Conducted AC voltage below 500 Hz	1.0% + 3 x LSDPV	None	2%
Conducted Emissions, Mains Voltage	0.10% + 10 mV	None	None
Conducted Emissions, Mains Current	0.10% + 3 mA	None	None
Conducted Emissions, Mains Power	0.15% + 100 mW	None	None
Conducted Emissions, Power Mains, 9 kHz to 150 kHz	1.70 dB	3.8 dB	None
Conducted Emissions, Power Mains, 150 kHz to 30 MHz	1.48 dB	3.4 dB	None
Conducted Emissions, Cat 6 LCL, 150 kHz to 30 MHz	1.57 dB	5 dB	None
Conducted Emissions, Cat 5 LCL, 150 kHz to 30 MHz	3.06 dB	5 dB	None
Conducted Emissions, Cat 3 LCL, 150 kHz to 30 MHz	4.27 dB	5 dB	None
Radiated Emissions, below 30 MHz	0.88 dB	None	6 dB
Radiated Emissions, 30 MHz to 1000 MHz	2.79 dB	6.3 dB	6 dB
Radiated Emissions, 1 GHz to 18 GHz	2.54 dB	5.2 & 5.5 dB	6 dB
Radiated Emissions, 18 GHz to 26.5 GHz	2.68 dB	None	6 dB
Radiated Emissions, 26.5 GHz to 40 GHz	3.17 dB	None	6 dB
*Radio Signal Frequency Accuracy	$*1.55 \times 10^{-7}$	None	1.0×10^{-7}
Radio Signal Occupied Bandwidth	0.95%	None	5%
Radio Power or Power Spectral Density	0.98 dB	None	1 dB
Temperature	0.38 °C	None	1 °C
Barometric Pressure	0.38 kPa	None	None
Relative Humidity	2.85% RH	None	±5% RH
Signal Timing	The greater of these three...	None	None
	0.63 µsec		
	0.01% of value		
	0.5 x LSDPV		

Table 6.1: Measurement Instrumentation Uncertainty

Note: LSDPV stands for the Least Significant Digit Place Value reported. In the value 1470 msec, the least significant digit is the 7. It has a 10 msec place value. The LSDPV is thus 10 msec and the maximum error due to roundoff would be 5 msec. If the time value were reported as 1470 msec, the underscore indicates that the 0 is a significant figure and the error due to roundoff would be 0.5 msec. All digits provided to the right of a decimal point radix are significant.

7. SELECTED EXAMPLE CALCULATIONS

Certain regulators require samples of the calculations that lead from the raw measurement to the final result for AC Mains conducted and unintended radiated emissions. The assumption is that the lab performs raw measurements, then adds, subtracts, multiplies, or divides based on transducer factors, amplifier gains, and losses in the signal transmission path. In this lab, our CISPR 16 Receiver does not work that way. The calibration factors and losses and gains are provided to the receiver as detailed data files. These factors are applied in the RF measurement path prior to the detector. But the math is the same.

The transmission loss is measured including the combined losses and gains of preamplifiers, cables, and any band-selective filters. In many cases above 1 GHz it is a negative value, indicating that the preamplifier gain is greater than these other losses.

Here are examples of these calculations. The data in these examples was not taken as part of this project:

AC Mains conducted emissions at 22 MHz

(Raw measurement) + (AMN factor) + (transmission loss) = Result
 (7.145 dBμV) + (9.812 dB) + (0.216 dB) = 17.173 dBμV

Radiated Emissions at 630 MHz

(Raw measurement) + (Antenna factor) + (transmission loss) = Result
 (2.25 dBμV) + (27.80 dB/m) + (2.89 dB) = 32.94 dBμV/m

Radiated Emissions at 2.7 GHz

(Raw measurement) + (Antenna factor) + (transmission loss) = Result
 (43.72 dBμV) + (32.22 dB/m) + (-36.09 dB) = 39.85 dBμV/m

8. ENVIRONMENTAL CONDITIONS DURING TEST

Environmental conditions in the test lab were monitored during the test period. Temperature and humidity are controlled by an air handling system. As information to the reader, the conditions were observed at the values or within the ranges noted below. For any tests where environmental conditions are critical to test results and require further constraints or details, the test records in the annex may provide more specific information.

Temperature:	20.9 to 22.5 °C
Relative Humidity:	41.3% to 56.4% (non-condensing)
Barometric Pressure	95.3 to 99.8 kPa

Description	Make	Model #	Serial #	Last Cal/Ver	Next Due
Barometer	Traceable	6453	240300703	9-Apr-2024	9-Apr-2027

Table 8.1: Environmental monitoring device

9. 3M RF CHAMBER BLOCK DIAGRAMS

The 3m chamber has three basic configurations which are shown in the figures below. These figures are not to scale.

Figure 1 shows a semi anechoic setup which is typically used for frequencies below 1 GHz. In this example, the antenna is mounted on a mast capable of 1-4 m elevation changes. If a preamplifier or RF filter is used, they are located at or just below floor level. The receiver is outside the chamber, typically in an adjacent separate shielded room.

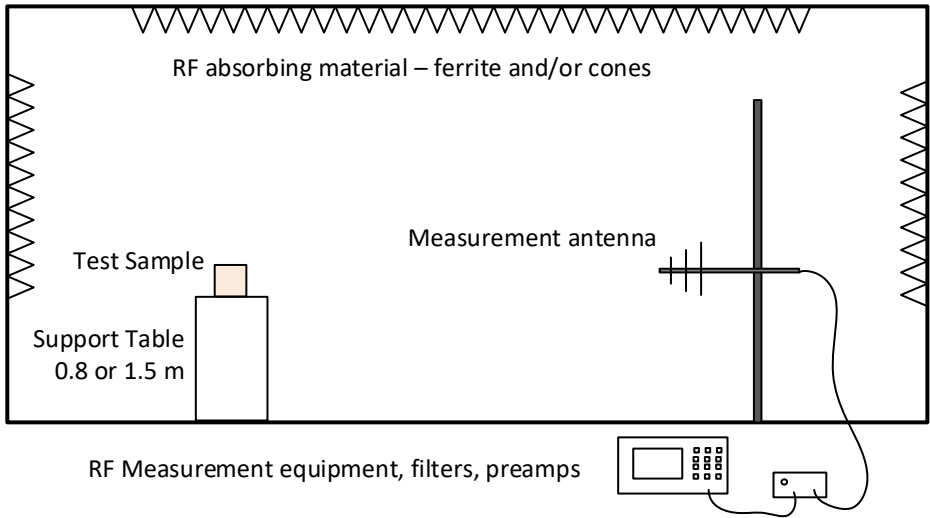


Figure 1: Typical configuration for measurements below 1 GHz

Figure 2 shows an FSOATS setup which is typically used for frequencies above 1 GHz but below an upper limit such as 14 or 18 GHz. In this example, the antenna is mounted on a mast capable of 1-4 m elevation changes and bore sighting. If a preamplifier or RF filter is used, they are located at or just below floor level. The receiver is outside the chamber, typically in an adjacent separate shielded room.

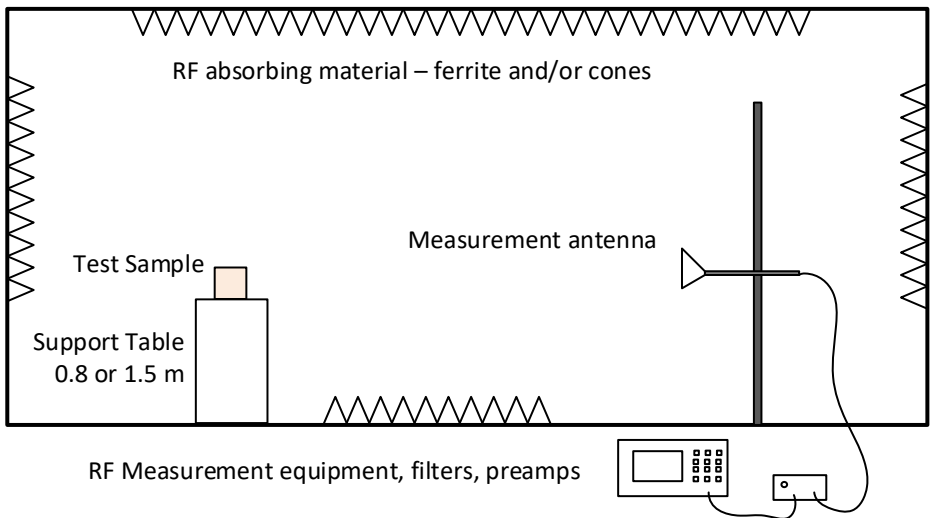


Figure 2: Typical configuration for measurements between 1 GHz and 14 GHz

Figure 3 shows an alternate FSOATS setup which is typically used for frequencies above 14 GHz. In this example, the antenna is mounted on a mast capable of 1-4 m elevation changes and bore sighting. A preamplifier is located on the mast just behind the antenna. The receiver is located in the chamber near floor level but outside the antenna beam. The receiver may be operated manually by an operator in the chamber and or remotely via an Ethernet connection.

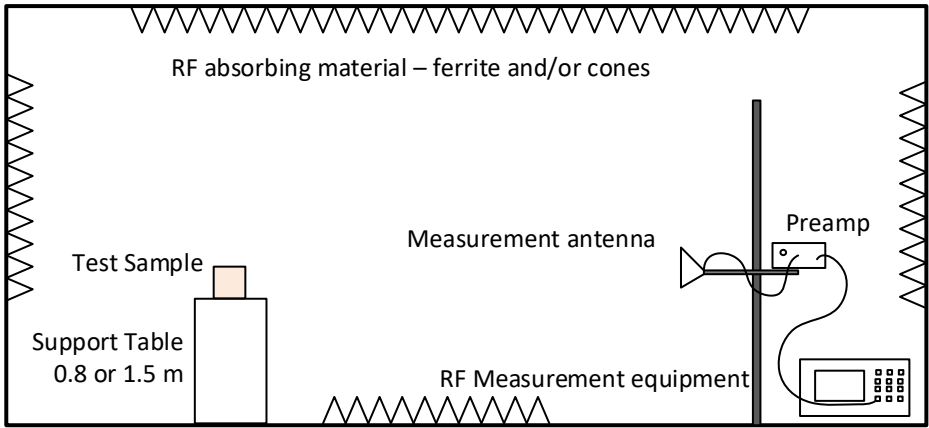


Figure 3: Typical configuration for measurements above 14 GHz

10. TEST RESULTS

This section of the report contains the detailed test data. The test data are organized as follows:

RF Port Data. This testing was performed on a benchtop measuring radio performance characteristics at a coaxial cable port that replaced the antenna. In many cases, the test sample only has embedded antennas, so it does not ship into the market with coaxial antenna port. In such cases, the sample was modified by the client to provide that port instead of the antenna. The modification was made at a point where the client designed the RF system to have a 50 Ω RF impedance.

Radiated Emission Data. This testing was performed in a validated radiated emission test site. It generally uses unmodified test samples so that intended and unintended emissions from antennas embedded within the system, and stray emissions from various circuits (including circuits feeding those antennas), will be representative of the units to be sold into the market.

Other Data. This section includes testing performed in a different way than the RF Port or Radiated Emission data described above. The most common example here is AC mains conducted emission data which was measured in a defined site configuration using a Line Impedance Stabilization Network.

10.1 RF Port Test Results

10.1.1 Occupied Bandwidth 99% Power and 20 dB Methods

Relevant standards include:

CFR47 Part 2.202, 15.215c

RSS-GEN 6.7

ANSI C63.10 sections 6.9.2, 6.9.3, 7.8.6

Test and Data Overview

These bandwidths were measured using the methods at ANSI C63.10 section 6.9. The 99% bandwidth is reported but has no limits or requirements on the result. The 20 dB bandwidth was measured to ensure that the end points of the occupied band were within the allocated frequency bands of operation. The 20 dB bandwidth is also used later relative to channel spacing requirements.

Test Record

Transmitter Bandwidth Tests

Test IDs TR27

Project GCL1030

Test Date(s) 26 Feb 2026
Test Personnel Jim Solum

Product Model A05147
Serial Number tested 8WP000264

Operating Mode BTCTx
Arrangement A2 (Upwr)
Input Power USB 5 Vdc

Test Standards: FCC Part 2.202, ANSI C63.10, TRC-43, RSS-GEN (as noted in Section 5 of the report).

Radio Protocol Bluetooth Classic (Including EDR2 and EDR3)
Radio Band 2480 to 2483.5 MHz

Pass/Fail Judgment: Reported

Test record created by: Jim Solum
Date of this record: 02 Mar 2026

Original record, Version A.

Test Equipment Used

Description	Make	Model #	Serial #	Last Cal/Ver	Next Due
PXE Receiver 44 GHz	Keysight	N9048B	MY62220139	4-Sep-2025	4-Sep-2026

Table TR27.1 Equipment Used

Software used: Keysight PXE software A.33.03,

Background

There are regulatory requirements to present two additional types of bandwidth analyses: 99% Occupied Bandwidth and Necessary Bandwidth. There are no limits or functional requirements around these data, beyond a reporting requirement. The contents of this test record are for information, and do not affect compliance of the devices that are the subject of this report.

Test Setup

This block diagram shows the test equipment setup.

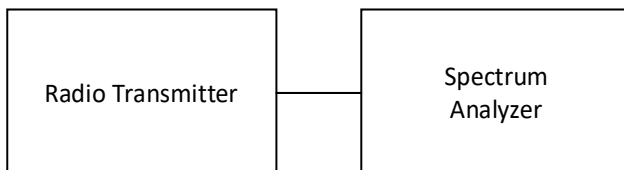


Figure TR27.1: Test setup

Occupied Bandwidth, 99% Test Method

During this test the transmitter output is fed directly, or through RF attenuators, to the spectrum analyzer. The analyzer has a built-in capability to identify the minimum bandwidth that contains a specified percentage of the total power observed. The spectrum is scanned hundreds of times so that the varied effects of modulation are appropriately assessed. Since the focus is on the relative distribution of energy across a range of frequencies, the absolute amplitudes recorded during this test are not relevant and may not include cable losses or attenuation factors.

Occupied Bandwidth, 99% Test Data

The data for each type of bandwidth is summarized below, followed by the spectral data for the cases highlighted in yellow. The analysis threshold for this test was the bandwidth containing 99% of the observed power using the ANSI C63.10 method. The standards require testing a frequency near the bottom, middle, and top of the band. The measured bandwidth data are in bold font and have MHz as their units of measure.

	2402	2440	2480
Bluetooth BR	0.937	0.916	0.918
Bluetooth EDR2	1.195	1.196	1.198
Bluetooth EDR3	1.235	1.233	1.234

Table TR27.2: Summary of 99% Occupied Bandwidth Data (DH5) for Bluetooth modes

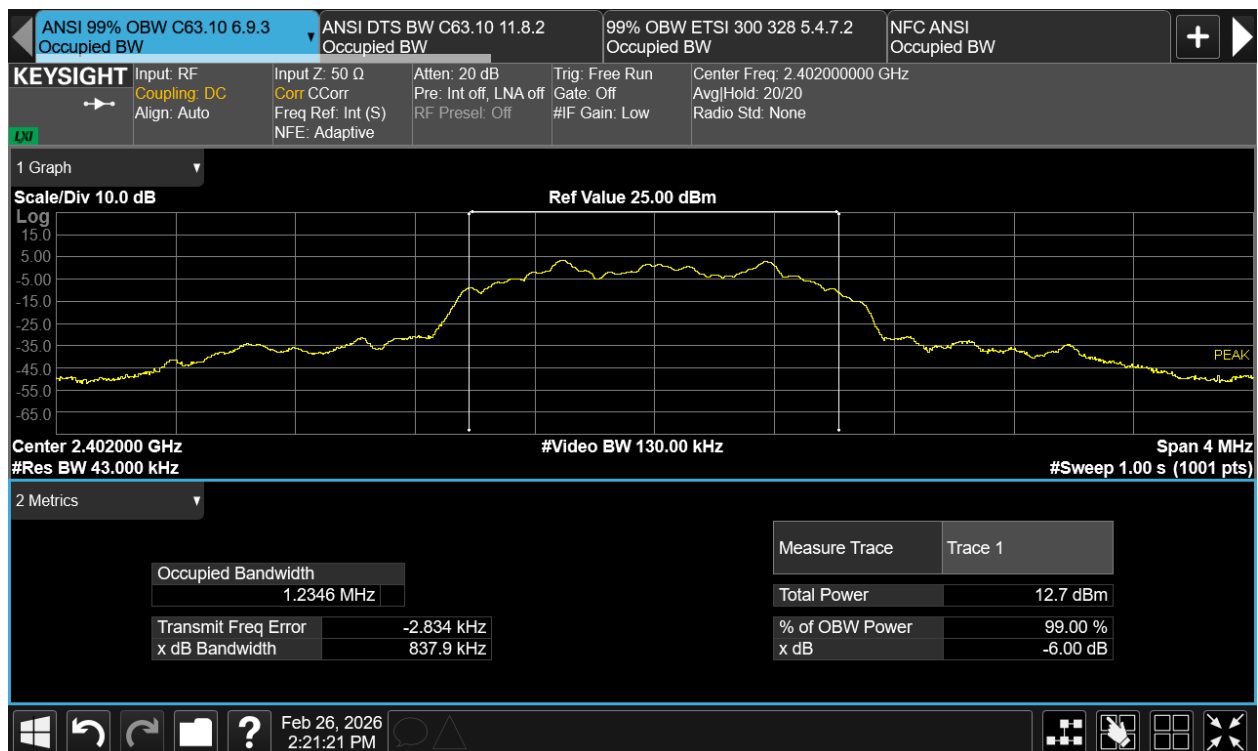


Figure TR27.2: Occupied bandwidth data for Bluetooth EDR3 (3_DH5) at low channel (2402 MHz)

This line is the end of the test record.

10.1.2 Necessary Bandwidth

Relevant standards include:

FCC Part 2.202

RSS-GEN at 9

TRC-43 section 9

The standards require the calculation of the necessary bandwidth for use in device classification. This is a requirement to calculate and report, but no limits apply. The bandwidths are calculated below for radios that could be supported by the standards called out in this test report. This text may include data for, and information about, radio protocols that are not included in the test sample. The calculation is generic to the radio protocols cited and is not specific to the product or test samples that are the subject of this report.

The Necessary Bandwidth, B_n , is a theoretical value based on the specifications for a communication protocol, rather than the hardware implementation and a subsequent lab measurement. The analysis methods in FCC Part 2.202 and TRC-43 are the same for Bluetooth protocols.

The radio modulation schemes for the various Bluetooth protocols are based on Phase Shift Key (PSK) techniques. The Necessary Bandwidth calculations use the equations from 47CFR Part 2.202(g) table section 6. We have set the variable $K=1$, which leaves the equation for both PSK and QAM as:

$$B_n = 2R / \log_2(S)$$

where R is the bit rate, and S is the number of signaling states.

Radio Type	Sub-type	Method	R Mbps	K	S	LogBase2 of (S)	B_n (MHz)
Bluetooth	BR	GFSK	1	1	2	1	2
	EDR2	Pi/4 DPSK	2	1	4	2	2
	EDR3	8DPSK	3	1	8	3	2

Table Bn3: Necessary Bandwidth for Bluetooth Classic Radio Protocols (FCC and TRC-43)

10.1.3 Hopping Channel Parameters: Number, Spacing, Occupancy

Relevant standards include:

CFR47 Parts 15.247(a)(1), (a)(1)(iii)

RSS-247 6.2.1, 6.2.3.1

ANSI C63.10 sections 7.8.2, 7.8.3

Test and Data Overview

The standards require that the number of radio channels be identified, and that their spacing meet certain rules. The channel spacing must be at least 2/3 of the 20 dB bandwidth. If the channel spacing is less than the full 20 dB bandwidth, or if fewer than 75 channels are used, the transmission power limits are reduced from 1 W (30 dBm) to 125 mW (21 dBm).

The system must employ at least 15 hopping channels, including times when some channels are avoided or suppressed – for example, to avoid interference with other spectrum users. All of the channels in use must be used with similar selection rates so that no channel is used more than 0.4 seconds in a monitoring time of 0.4 seconds multiplied by the number of hopping channels employed.

Test Record

FHSS ANSI Tests: 20 dB bandwidth, Carrier frequency separation, Number of hopping frequencies, Time of channel occupancy

FHSS ANSI Tests TR23, TR93, TR94, TR96

Project GCL1030

Test Date(s) 16,17 Mar 2026

Test Personnel Jim Solum

Product Model A05147

Serial Numbers tested 8WP000264, 8WP000284

Operating Mode BTCTx, BTCHop

Arrangement A2 (Upwr)

Input Power USB 5V dc

RF Output Is Not greater than 125 mW (21 dBm) conducted to the antenna

Test Standards: FCC Part 15.247, ANSI C63.10, AS/NZS 4268, RSS-GEN, RSS-247 (as noted in Section 6 of the report).

Pass/Fail Judgment: PASS

Test record created by: Jim Solum

Date of this test record: 8 Mar 2026

Original record, Version A.

Test Equipment Used

Description	Make	Model #	Serial #	Last Cal/Ver	Next Due
PXE Receiver 44 GHz	Keysight	N9048B	MY62220139	4-Sep-2025	4-Sep-2026
MXE Receiver 8.4 GHz	Keysight	N9038B	MY63460112	17-Mar-2025	22-Apr-2026

Table TR93.1: Test equipment used

Test software used: Keysight PXE software A.33.03, Keysight MXE software A.37.02

Test Data

This test looks at details specific to frequency hopping systems in the referenced standards: the number of hopping channels; the relationship between 20 dB Occupied bandwidth and channel separation; and channel occupancy time.

This measurement requires that a coaxial feed line from the transmitter is available as a connector exterior to the test sample. This feed line and connector may be a part of the shipping product, or it may be a special modification to the product for testing purposes. The connector is attached via laboratory cables to the measurement instrument. Since the absolute signal amplitude is not relevant to these tests, the results may not have been adjusted to account for the losses in the laboratory cables.

Test Data: Hopping Channels

The test sample was placed in a test mode where it transmits on its various frequency channels while hopping. The spectrum analyzer scanned a frequency range that included these frequencies in Max Hold condition. The resulting spectra are attached, showing that the sample uses each of the 79 hopping frequencies from 2402 MHz to 2480 MHz, also confirming a channel separation of 1.05 MHz.

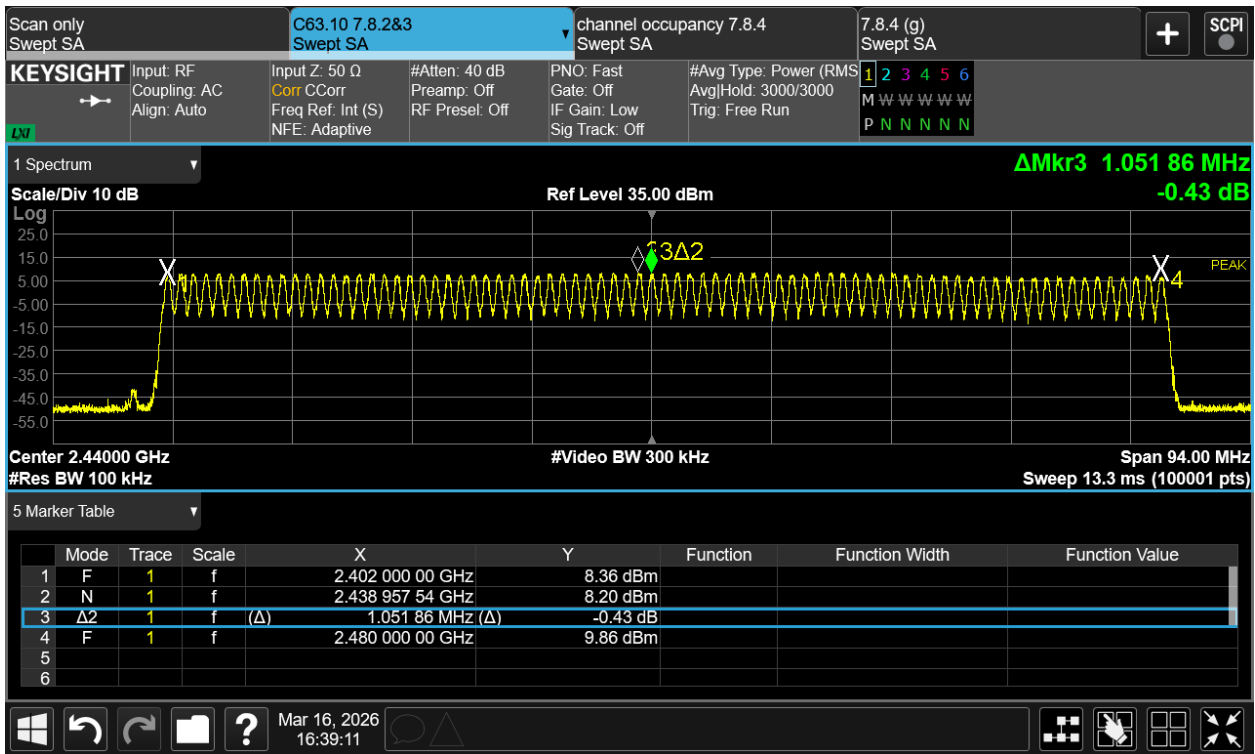


Figure TR93.1: Spectral data, 79 transmissions, showing channels used and channel separation for Bluetooth basic rate

Test Data: Bandwidth and Channel Separation

The 20 dB Occupied bandwidth (OBW20) was measured for each modulation type, with the transmission fixed on low, middle, and high channels. The maximum bandwidth observed is highlighted in yellow, and the spectrum image for that case is also provided.

The standards require that the hopping channel separation is no less than OBW20 if the transmitted power is above 125 mW. For lower power transmissions, the hopping channel separation must be no less than two-thirds of OBW20. This second case can also be expressed as limiting OBW20 to 1.5 times the channel separation. Based on the 1.05 MHz separation between hopping channel, and the output power of the transmitter, the 20 dB occupied bandwidth must be no greater than 1.58 MHz. The data below shows compliance with this limit.

	2402	2440	2480
Bluetooth BR	1.039	1.038	1.037
Bluetooth EDR2	1.336	1.332	1.331
Bluetooth EDR3	1.356	1.349	1.329

Table TR93.2: Summary of 20 dB Occupied Bandwidth results

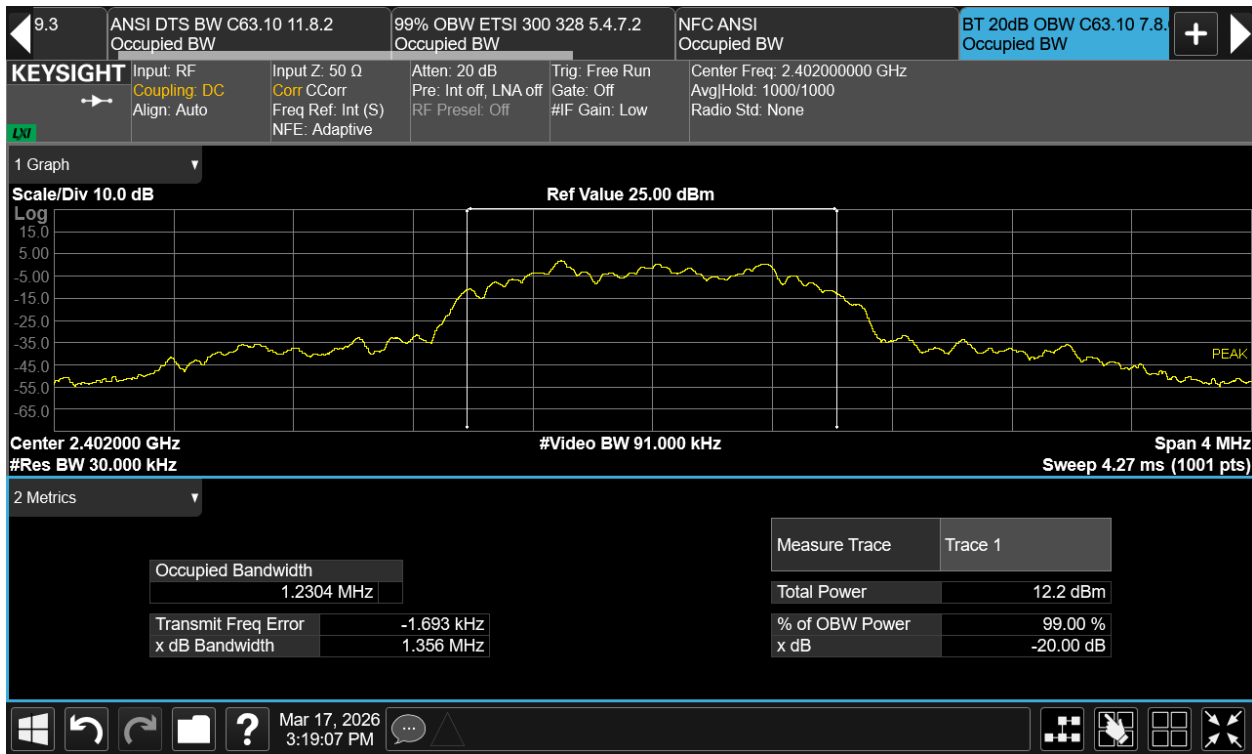


Figure TR93:2 Spectral data for EDR3 modulation at 2402 MHz

Test Data: Channel Occupancy

The channel occupancy requirement ensures that the transmissions are distributed consistently across the hopping channels. The measurement is made on each of the three randomly selected channels for a period of 0.4 seconds multiplied by the number of hopping channels. For this product, that is a measurement period of 31.6 seconds. During that time, the sum of the transmission times on the selected channel cannot exceed the limit of 0.4 seconds.

This testing is performed at three test channel frequencies, randomly selected within a range. The first range is 2402 to 2427 MHz. The second test frequency range is 2428 to 2454 MHz. The final range is 2455 to 2480 MHz.

The test sample was placed in a test mode where it transmits on its various frequency channels while hopping. The transmissions were measured while the test equipment was tuned to each one of the three test channels using a detector more narrow than the OBW20 value. This provides a record of transmissions only on the selected channel over time. A spreadsheet analyzed the data to determine channel occupancy -- the total sum of time that the transmitter was on the selected channel. The maximum channel occupancy values is highlighted in yellow, and a zero-span time plot image for that case is also provided.

Radio Type	Frequency MHz	Dwell Time per hop in milliseconds	Number of hops in observation period (31.6 sec. sweep)	Channel Occupancy in seconds
Bluetooth BR-DH5	2402	2.871	117	0.336
Bluetooth BR-DH5	2440	2.871	112	0.322
Bluetooth BR-DH5	2480	2.871	119	0.342
Bluetooth 2-DH5	2402	2.871	97	0.278
Bluetooth 2-DH5	2440	2.871	113	0.324
Bluetooth 2-DH5	2480	2.871	108	0.310

Table TR93.3: Summary of Channel Occupancy results

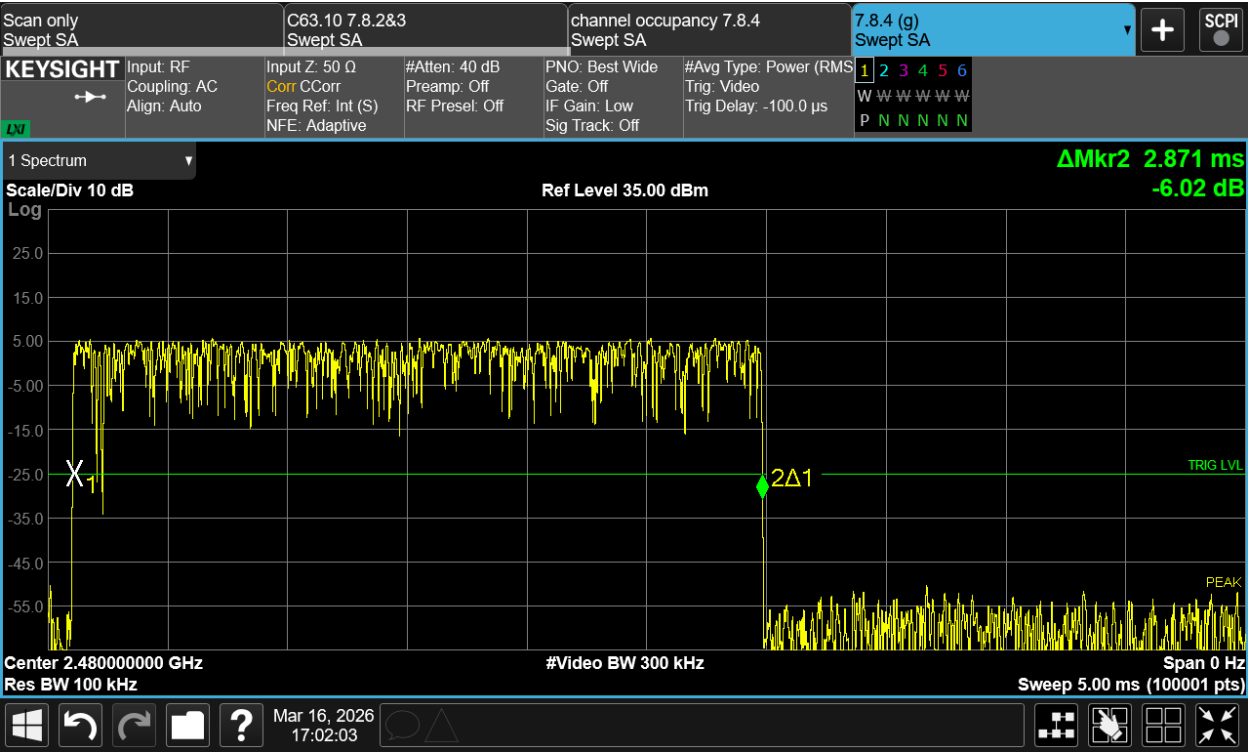


Figure TR93.3: Dwell time per hop, Bluetooth BR-DH5 transmission at 2480 MHz

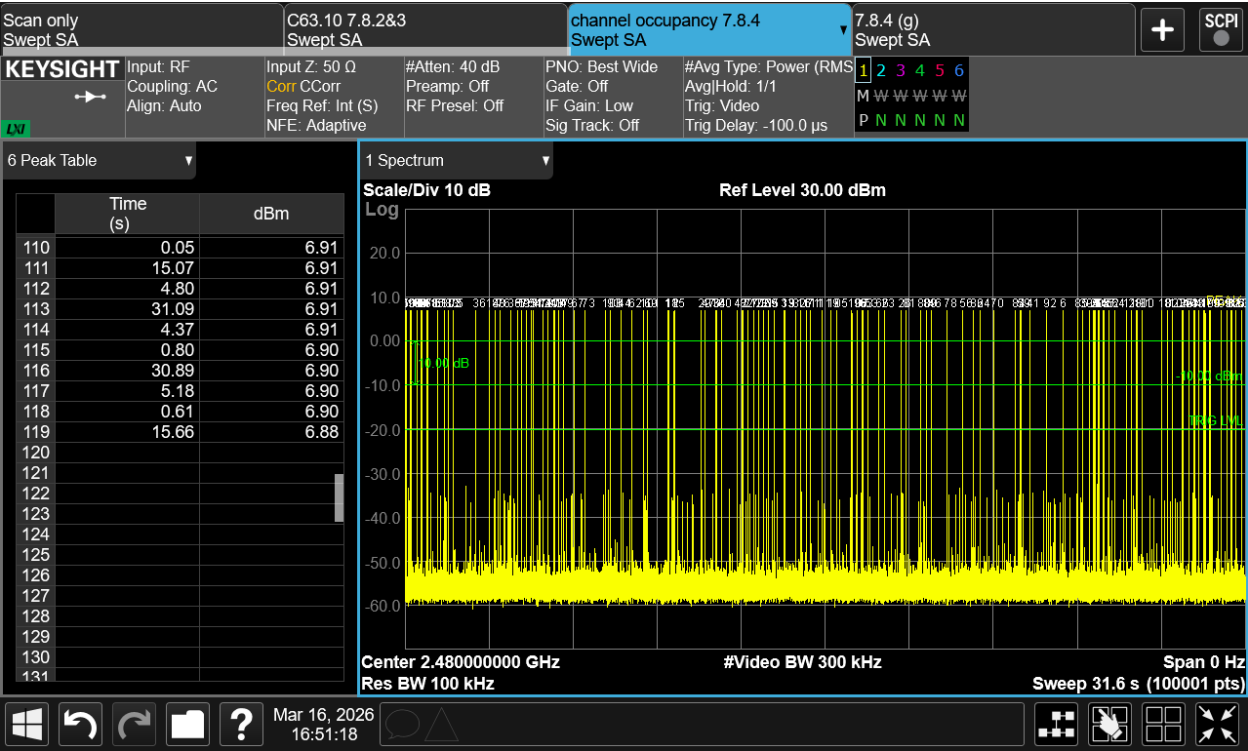


Figure TR93.4: Number of hops in the regulatory observation period, Bluetooth BR-DH5 transmission at 2480 MHz

This line is the end of the test record.

Test Record**FHSS Minimum Channels Used TR95****Project GCL1030**

Test Date(s)	17 Mar 2026
Test Personnel	Majid Farah
Product Model	A05147
Serial Number tested	8WP000284
Operating Mode	BTCLink
Arrangement	A2 (Upwr)
Input Power	USB 5V dc
RF Output Power	Is Not greater than 125 mW (21 dBm) conducted to the antenna
Client-declared Min Chans.	20
Test Standards:	FCC Part 15.247, ANSI C63.10, AS/NZS 4268, RSS-GEN, RSS-247 (as noted in Section 5 of the report).
Pass/Fail Judgment:	PASS
Test record created by:	Majid Farah
Date of this test record:	17 Mar 2026

Original record, Version A.

Test Equipment Used

Description	Make	Model #	Serial #	Last Cal/Ver	Next Due
MXE Receiver 8.4 GHz	Keysight	N9038B	MY63460112	17-Mar-2025	17-Mar-2026
Vector Signal Generator	Rohde&Schwarz	SMBV100B	101011	9-Oct-2025	9-Oct-2027
Wideband Radio Communication Tester	Rohde&Schwarz	CMW 500	1201.0002K50-168630-bg	Calibration	Not Required

Table TR95.1: Test equipment used

Test software used: Keysight MXE software A.37.02, Vector signal generator software 5.10.035.34, Wideband Radio communication receiver software 4.0.250.19.

Requirement

This test looks at details specific to frequency hopping systems in the referenced standards. It specifically evaluates the minimum number of channels used. 15.247(a)(iii) states, "Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used." The text at (b)(1) raises the limit to a minimum of 75 hopping channels if the Tx power delivered to the antenna is greater than 21 dBm. The same requirements are found in RSS-247 at 6.2.3.1(b) and 6.2.3.2(b).

This measurement requires that a coaxial feed line from the transmitter is available as a connector exterior to the test sample. This feed line and connector may be a part of the shipping product, or it may be a special modification to the product for testing purposes. The connector is attached via laboratory cables to the measurement instrumentation. Since the absolute signal amplitude is not relevant to these tests, the results may not have been adjusted to account for the losses in the measurement system.

Test Data: Hopping Channels

The test sample was connected through attenuators to a companion device, as well as the spectrum analyzer and a vector signal generator capable of creating Gaussian noise more than 80 MHz wide. The sample was linked to the companion and operated in a mode where it transmits on its various frequency channels while hopping. The Gaussian noise was introduced so that it created interference on the upper channels, and it was slowly shifted downward in frequency to observe how channels were removed from the hopping list. The objective was to detect how few hopping channels the test sample would use before it stopped transmissions altogether.

The spectrum analyzer scanned a frequency range that included these frequencies. Trace 1 (yellow) is in Max Hold condition to show the channels on which the test sample radio hopped. The cyan trace is clear-write, showing the interfering noise spectrum. Marker 1 is set 13 channels higher than lowest channel (2402 MHz) at 2415 MHz. In a compliant result, frequency hopping system shall stop transmission while less than 15 channels are available.

The resulting spectra are attached, showing that in the presence of broadband noise with partially blocked spectrum the radio did not suppress transmissions in an impermissible way. If broadband noise blocks the entire band so that fewer than 15 hopping channels available, the radio will stop transmissions.

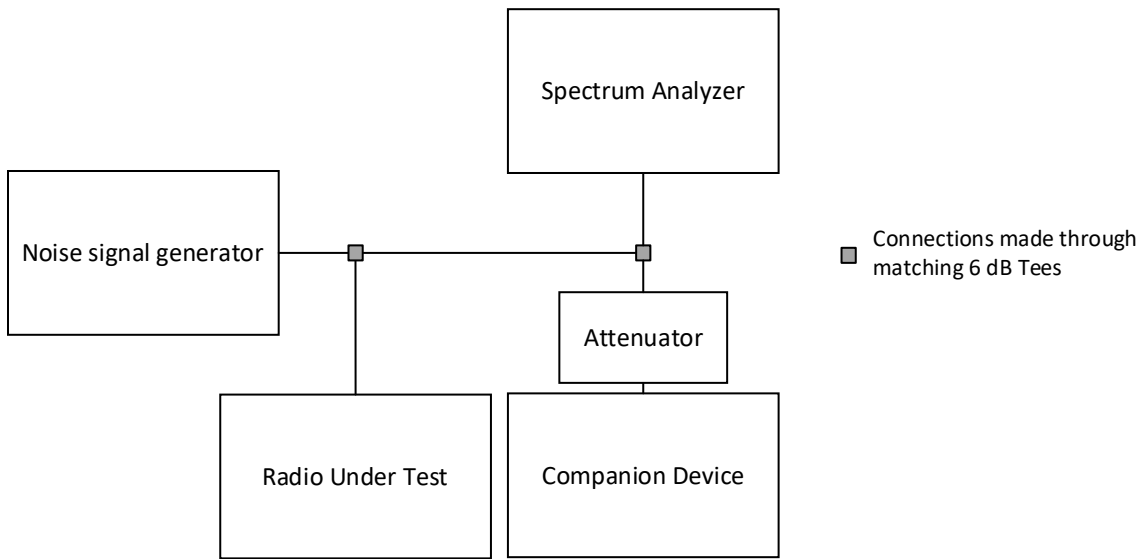


Figure TR95.1: Equipment setup

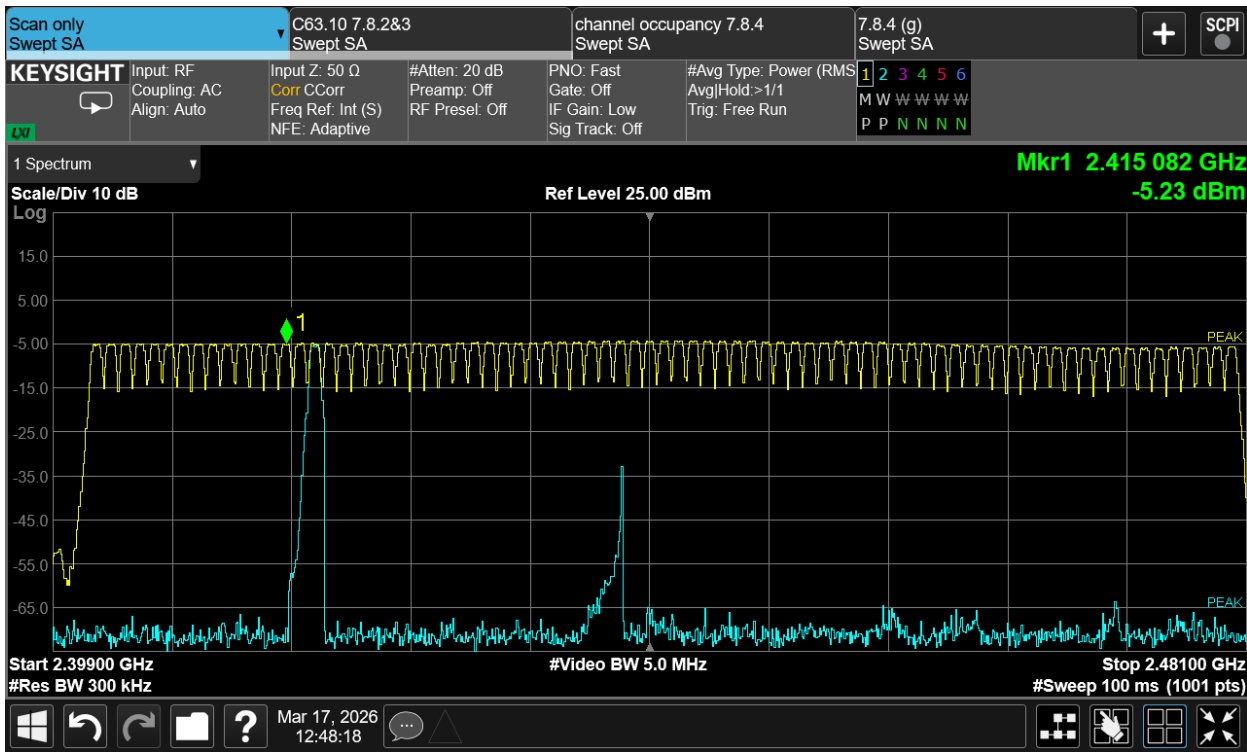


Figure TR95.2: Spectral data, Bluetooth transmission, showing channels used with no presence of noise source

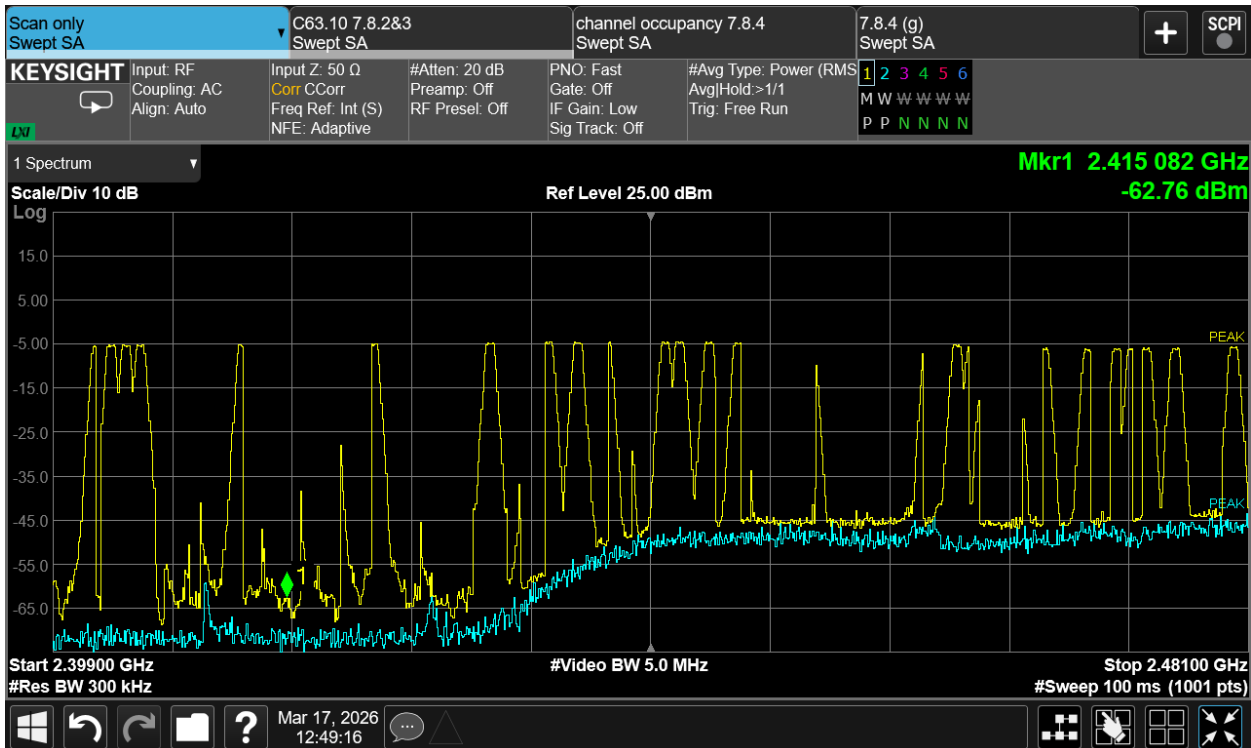


Figure TR95.3: Spectral data, Bluetooth transmission, showing channels used in the presence of broadband noise with partially blocked spectrum with more than 15 channels in use

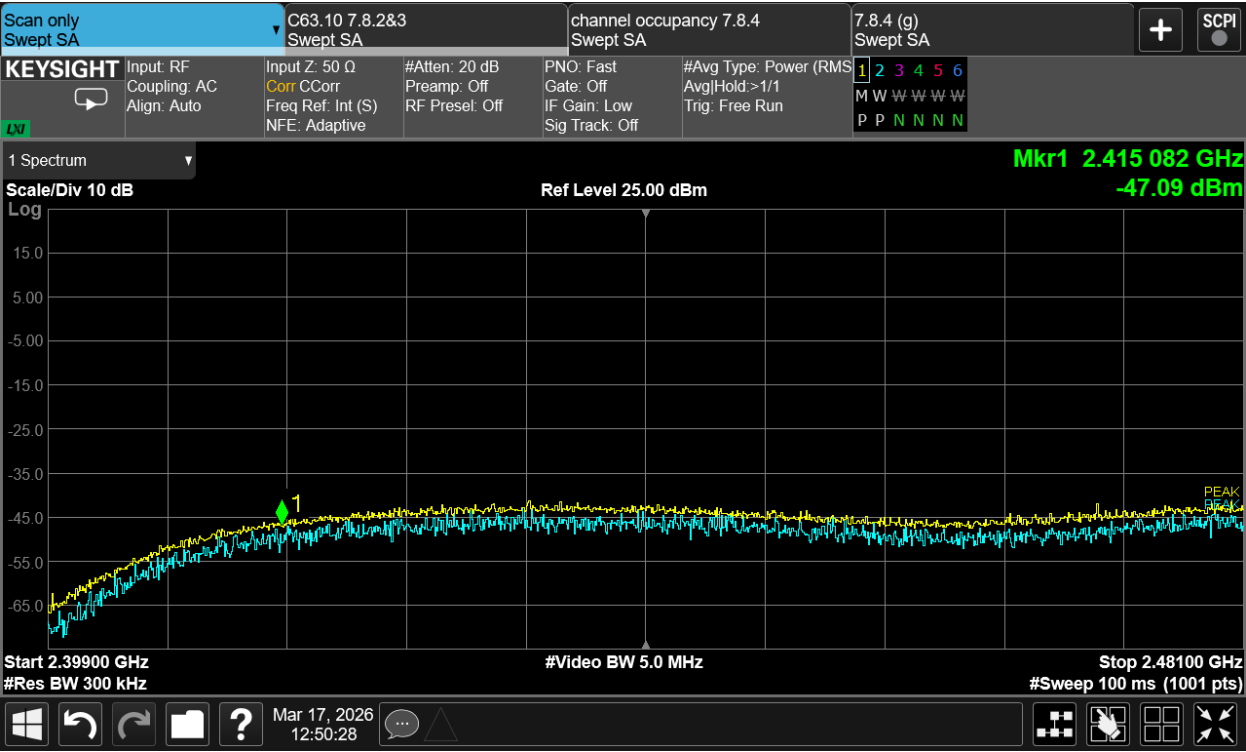


Figure TR95.3: Spectral data, Bluetooth transmission, showing no channels used in the presence of broadband noise blocked the spectrum while less than 15 channels are available

This line is the end of the test record.

10.1.4 Transmitter Conducted Output Power and Duty Cycle

Relevant standards include:

CFR47 Parts 15.247(a)(1), (b)(1)

RSS-247 6.3.2

ANSI C63.10 section 7.8.5

Test and Data Overview

This test measured the strength of the intentional signals created by a radio transmitter. It measured the power provided at the antenna feed point. The measurement method states that the transmitter is to be on a fixed channel, not actively hopping. This lab tends to use the power meter approach found in ANSI C63.10 at 7.8.5. The Spectrum Analyzer method at 7.8.5 is also a valid option. These are peak detection measurements.

The US standard applies a requirement that the antenna gain be no greater than 6 dBi or else additional rules and restrictions must be applied. Canada has a similar requirement. Canada applies a limit on transmitter power and a limit on effective radiated power that is at least 6 dB higher. So long as a radio uses an antenna with no more than 6 dBi of gain, demonstrating compliance with the limits for power delivered to the antenna also demonstrates compliance with Canada's effective radiated power rule.

The rules require measurements on the top and bottom channels, as well as a mid-band channel. It is common for the test operator to measure the output power on additional inward channels if the edge channel power levels have been reduced more than 1 dB from the mid-band channel. This data about how the power may have been reduced on edge channels was used as a guide during other tests, such as tests of the radiated emissions in the nearby restricted bands or at the band edges.

Duty cycle is also evaluated, typically as part of the transmitter output power analysis. Duty cycle is the ratio of Tx On time to repeated cycle time which is usually much shorter than one second. It describes how the transmitter functions during the lab test mode and may not reflect typical user operating modes. The regulations do not apply a limit to the duty cycle. But this important result may affect how other tests are performed or how test data is analyzed. There are three general categories: Continuous transmission (at least 98%); discontinuous and stable (less than 98% and varying 2% or less); discontinuous and unstable (less than 98% and varying more than 2%).

Test Record**Transmitter Power, Duty Cycle****Test IDs TR02****Project GCL1030**

Test Date(s) 24 Feb 2026
Test Personnel Vladimir Tolstik

Product Model A05147
Serial Number 8WP000284

Operating Mode BTCTx
Arrangement A2 (Upwr)
Input Power USB 5Vdc

Test Standards: FCC Part 15.247; RSS-247; RSS-GEN; ANSI C63.10 (as noted in Section 5 of the report).

Antenna Gain -1.15 dBi, as reported by the client
Radio Protocol Bluetooth

Pass/Fail Judgment: PASS

Test record created by: Vladimir Tolstik
Date of this record: 26 Feb 2026
Original record, Version A.

Test Equipment Used

Description	Make	Model #	Serial #	Last Cal/Ver	Next Due
RF Power Sensor	Keysight	U2063XA	MY65340001	29-Oct-2025	29-Oct-2026

Table TR02.1: List of test equipment used

Software used: Keysight BenchVue V2024; KeysightPowerAnalysisV2b.xlsx

Test Method

The basic test standards provide options for the time evaluation test method. The following test methods were applied.

ANSI C63.10: 11.9.1.2 (Peak power with broadband power meter)

Duty Cycle data will be included if it is relevant to test methods used for other standards such as Average Detector methods in the ANSI standards that apply duty cycle correction or certain kinds of analysis under the RF exposure standards.

Transmit Power and Timing Data

Each measurement is made conducted from the antenna port with the transmitter on a specified channel and in a selected transmission protocol. Where standards cited here apply harmonized test methods and different limits, the more strict limit has applied.

This test record will show results based on one or more of the following methods of analyzing the same set of raw power data vs. time. The ANSI peak power method looks for the highest power in the data record, with results in dBm units. The ANSI gated average power method determines the average power in the data record but only during times when the transmitter is keyed on, with results in dBm units. Under the US and Canadian rules a limit of 30 dBm is applied independent of which ANSI method is used. RF exposure limits are not addressed in this test record. Many of the these standards also care about duty cycle, the portion of the time when the transmitter was actually transmitting. That is presented as a percentage, and no limit applies. All of these results are drawn from the same trace of Tx power data. The results are shown below.

ANSI Power

Frequency	(MHz)	2402	2440	2462	2463	2464	2465	2466	2480
Bluetooth	Basic	8.16	8.69	7.82	7.66	7.52	NT	NT	7.10
Bluetooth	EDR2	10.16	10.69	9.90	9.76	9.96	9.70	9.55	9.19
Bluetooth	EDR3	9.71	10.21	9.40	9.24	9.13	NT	NT	8.82

Table TR02.2: Transmit Power, ANSI method, in dBm for Bluetooth

Other Power Analyses

Frequency	(MHz)	2402	2440	2462	2463	2464	2465	2466	2480
Bluetooth	Basic	100.0%	100.0%	100.0%	100.0%	100.0%	NT	NT	100.0%
Bluetooth	EDR2	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Bluetooth	EDR3	100.0%	100.0%	100.0%	100.0%	100.0%	NT	NT	100.0%

Table TR02.3: Duty cycle for Bluetooth mode

Setup Diagram

The following block diagrams show how the EUT and test equipment is arranged for test.

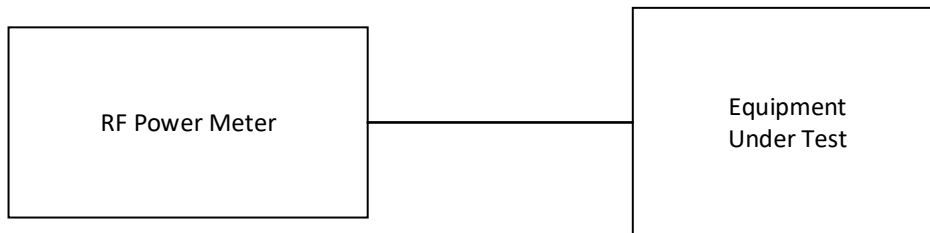


Figure TR02.1: Test equipment setup

This line is the end of the test record.

10.1.5 Unwanted Emissions Outside the Frequency Bands of Operation, RF Port Conducted

Relevant standards include:

CFR47 Parts 15.247(d), 15.209

RSS-247 6.6

ANSI C63.10 section 7.8.7

Test and Data Overview

The US and Canadian standards provide relaxed limits for emissions within the frequency band allocated for radio operation. One must demonstrate compliance for unwanted signals that arise outside this allocated band. There are two ways this compliance is demonstrated. The unwanted emission requirements are satisfied by a combination of radiated tests and RF port conducted tests. Under the FHSS rules, compliance must be shown both hopping and while tuned to the lowest and highest channels.

One way to do this is to show that the emission is below the general limits found in FCC Part 15.209 and in RSS-GEN tables 5 and 6 (which are essentially an extension of the Class B limits in FCC Part 15.109 and ICES-003 tables 2 and 3). This radiated emission test is evidence of compliance for any emission, whether inside or outside the restricted bands of operation. Data taken for this approach is found in report section for [radiated spurious emissions](#).

The other way to do this applies only outside the restricted bands. It is to show that the emission level is sufficiently reduced from the level of the in-band emissions. This can generally be shown as a radiated test or as an RF port conducted test, using ANSI C63.10 section 7.8.7.

The 2.4 GHz radio band extends from 2400 MHz to 2483.5 MHz. The upper edge of this band is also the edge of a restricted band from 2483.5 to 2500 MHz so the radiated emission test is the primary path to compliance at the upper band edge. There is a gap between lower edge of the allocated band and the edge of the 2310 – 2390 MHz restricted band. Compliance for this ‘gap’ frequency range of 2390 to 2400 MHz is most easily and plainly shown with an RF port conducted test. RF port conducted tests may also be shown in this section if other emissions are found to be above the general emission limit and outside the restricted bands.

For an FHSS radio, the tests described above are performed with hopping disabled. The rules also require a check in hopping mode to ensure that the tuning circuits have stabilized before the transmitter is keyed on. This check applies the conducted band edge test method in both the 2390-2400 MHz range and the 2483.5 – 2493.5 MHz range.

Test Record

Band Edge Conducted Spurious Emission Test

Test IDs TR57 – TR58

Project GCL1030

Test Date(s): 04,05 Mar 2026
Test Personnel: Jim Solum

Product Model: A05147
Serial Number tested: 8WP000264

Operating Mode: BTCTx, BTCHop
Arrangement: A2 (Upwr)
Input Power: USB 5 Vdc

Test Standards: FCC Part 15, ANSI C63.10, RSS-GEN, RSS-247 (as noted in Section 5 of the report).

Required reduction: 20 dBc for out-of-band reduction relative to in-band levels

Judgment: PASS

Test record created by: Jim Solum
Date of this test record: 06 Mar2026
Original record, Version A.

Test Equipment Used

Description	Make	Model #	Serial #	Last Cal/Ver	Next Due
PXE Receiver 44 GHz	Keysight	N9048B	MY62220139	4-Sep-2025	4-Sep-2026

Table TR57.1: Test equipment used

Software used: Keysight PXE software A.33.03

Test Data

This conducted spurious emission test measures the strength of radio signals conducted from the transmitter to the antenna in the range between the 2390 MHz upper edge of a restricted band and the 2400 MHz lower edge of the allocated band for a 2.4 GHz transceiver. This test addresses spurious emission requirements at the lower end of the 2.4 GHz band because there is a 10 MHz gap between the restricted band and the allocated band. Radiated testing in the 2483.5 – 2500 MHz restricted bands demonstrate compliance with the spurious emission rules at the upper edge of the 2.4 GHz allocated band. But ANSI C63.10 requires testing in the 10 MHz range above and below the band both while the FHSS radio is hopping and again while the radio is tuned to its highest and lowest channel frequencies. This test follows the ANSI methods for non-restricted bands.

This is a relative measurement. The measurement captures the energy both inside and outside the allocated band using a 100 kHz resolution bandwidth. All emissions outside the allocated band must be reduced relative to the highest emission inside the allocated band. The amount of the reduction is either 20 dB or 30 dB as indicated above, depending on how transmitter power was measured (using a peak or average detector).

This measurement requires that a coaxial feed line from the transmitter is available as a connector exterior to the test sample. This feed line and connector may be a part of the shipping product, or it may be a special modification to the product for testing purposes. The connector is attached via laboratory cables to the measurement instrument. The results may not have been adjusted to account for the losses in the laboratory cables or feed lines since it is a relative measurement across a small frequency span.

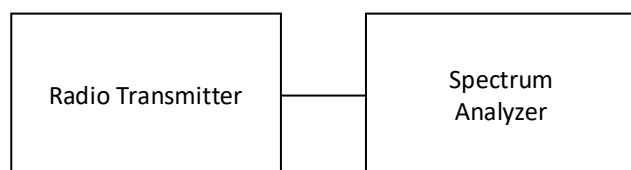


Figure TR57.1: Typical test arrangement

Testing meets the ANSI C63.10 requirements at 11.11 for DTS transmitters, 7.8.7 for FHSS transmitters, and 6.10.4 for other transmitters. Data is collected using the required peak detector function, in Max-Hold operation, across the frequency range. The instrument uses a 100 kHz bandwidth detector typically at half-bandwidth intervals to ensure overlapping measurements. ANSI C63.10 may recommend making two distinct measurements, one focused on the in-band signal and the other looking a broad span of frequencies. The ANSI method is intended for use across a wide frequency span, such as 30 MHz to 25 GHz, where identification of in-band signal levels could be more difficult. The measurement reported here happens across a span of 50 MHz, so the separated measurement approach is not pertinent.

Measurement to find the highest emission across the full 2400-2483.5 allocated band is not usually necessary. If some part of the emission spectrum extends above 2440 MHz (as is typical with frequency hopping transmitters) and the out of band data is reduced the necessary amount from the signal levels below 2440 MHz, then the transmitter would also be compliant when considering the possibility of higher in-band emissions above 2440 MHz.

Radio Type	Frequency	In band to band gap	In band to band gap	Margin to
	MHz	required reduction in dB	measurement in dB	limit in dB
Bluetooth 1-DH5	2402	20	-48.04	28.04
Bluetooth 1-DH5	2480	20	-51.88	31.88
Bluetooth 2-DH5	2402	20	-45.72	25.72
Bluetooth 2-DH5	2480	20	-49.64	29.64
Bluetooth 1-DH5	Hop (low)	20	-53.17	33.17
Bluetooth 1-DH5	Hop (high)	20	-55.13	35.13
Bluetooth 2-DH5	Hop (low)	20	-51.83	31.83
Bluetooth 2-DH5	Hop (high)	20	-54.85	34.85

Table TR57.2: Results Summary

The graphs below show the spectral data as continuous curves. Marker 1 is the highest power level found inside the allocated band. Marker 2 is the highest power level found between 2390 and 2400 MHz. It is configured as a delta marker relative to Marker 1. A vertical green reference line at 2400 MHz shows the edge of the allocated band. A horizontal green reference line shows the allowed level and is set 20 or 30 dB below Marker 1. Marker 2 is the highest signal peak found outside the allocated band. The table at the bottom shows the Y offset between Marker 1 and Marker 2.

Compliance is demonstrated when the Y offset shown for delta Marker 2 is larger than the required amplitude reduction (20 or 30 dB), or when there is no signal that is above and to the left of where the green lines cross.

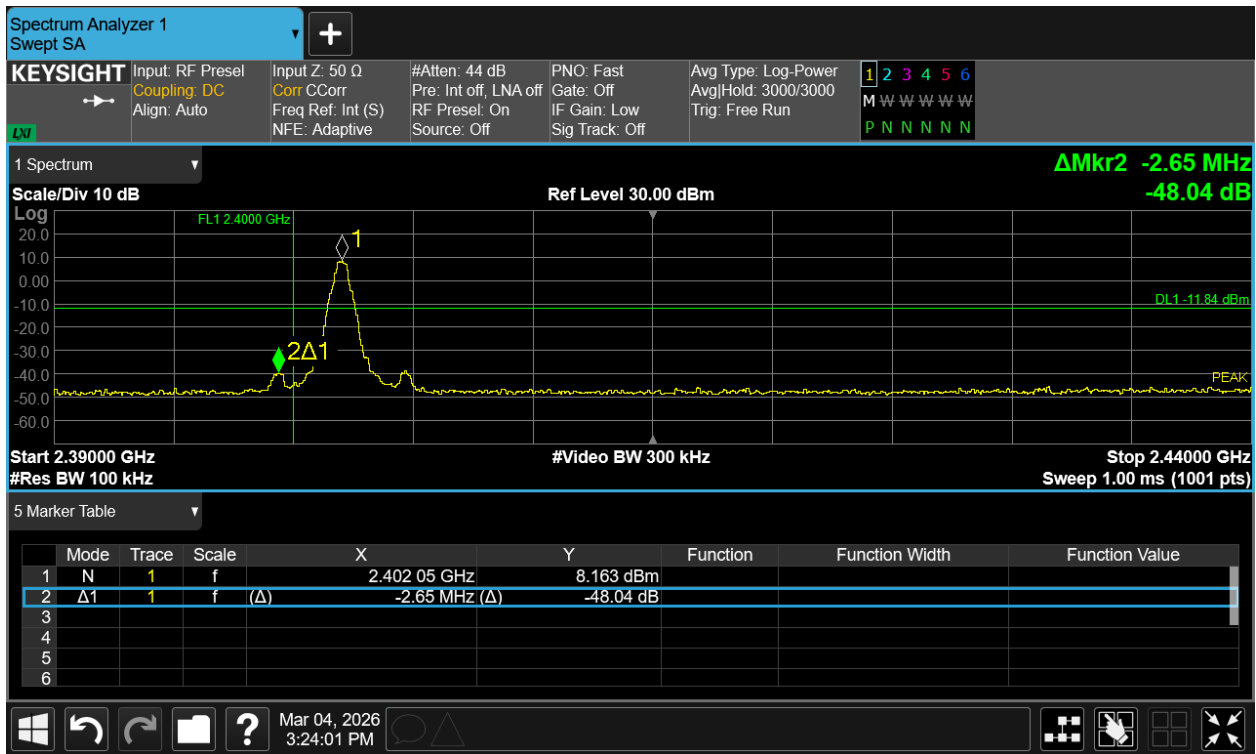


Figure TR57.1: Band edge gap measurement for Bluetooth 1-DH5, 2402 MHz

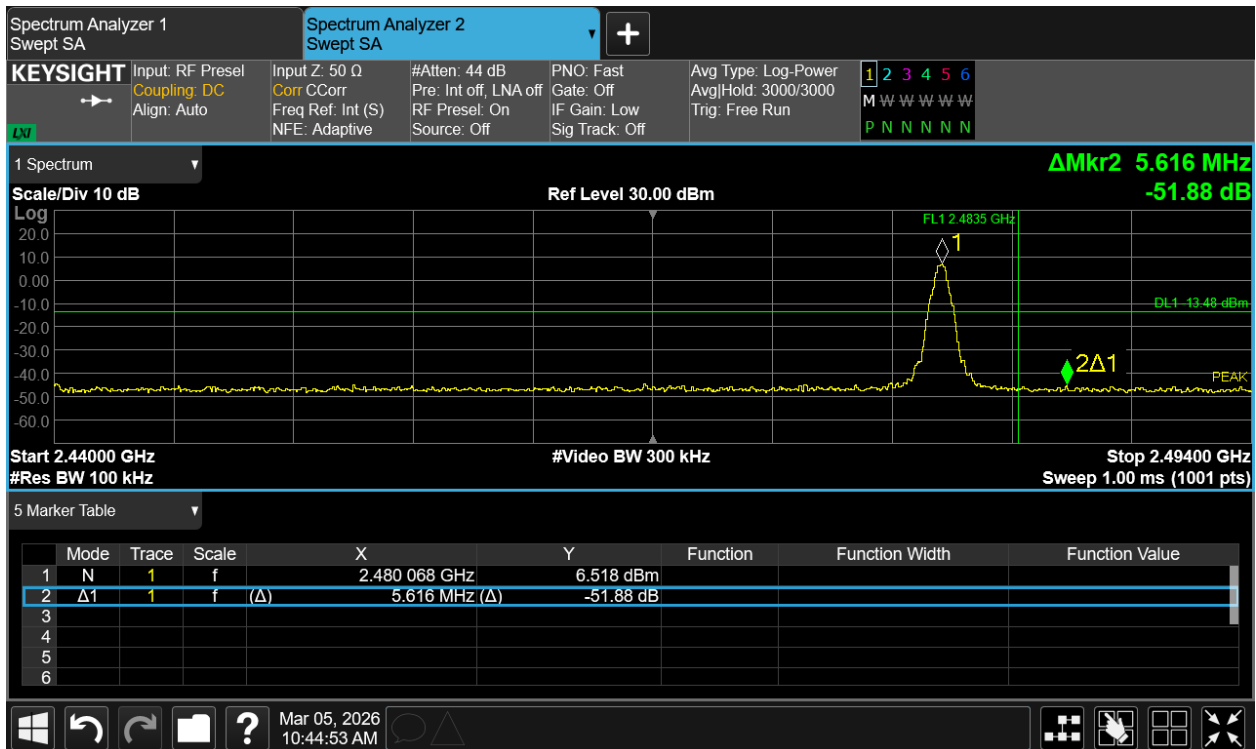


Figure TR57.2: Band edge gap measurement for Bluetooth 1-DH5, 2480 MHz

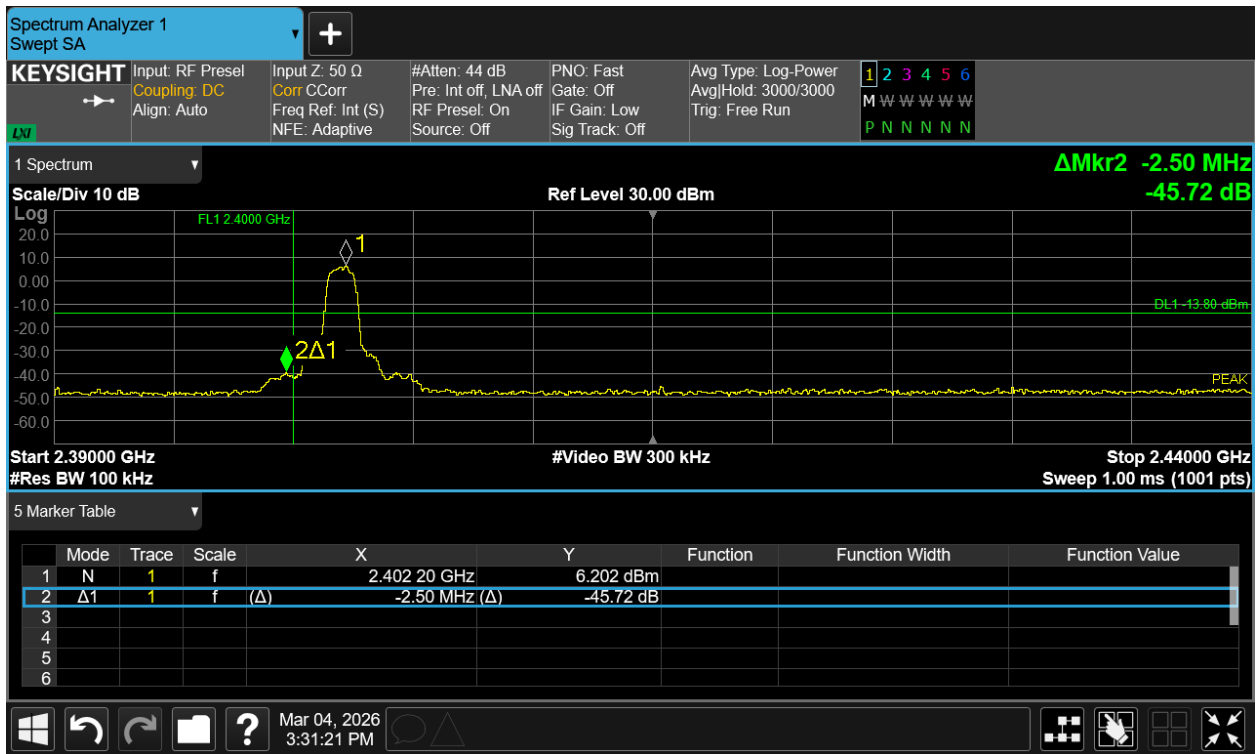


Figure TR57.3: Band edge gap measurement for Bluetooth 2-DH5, 2402 MHz

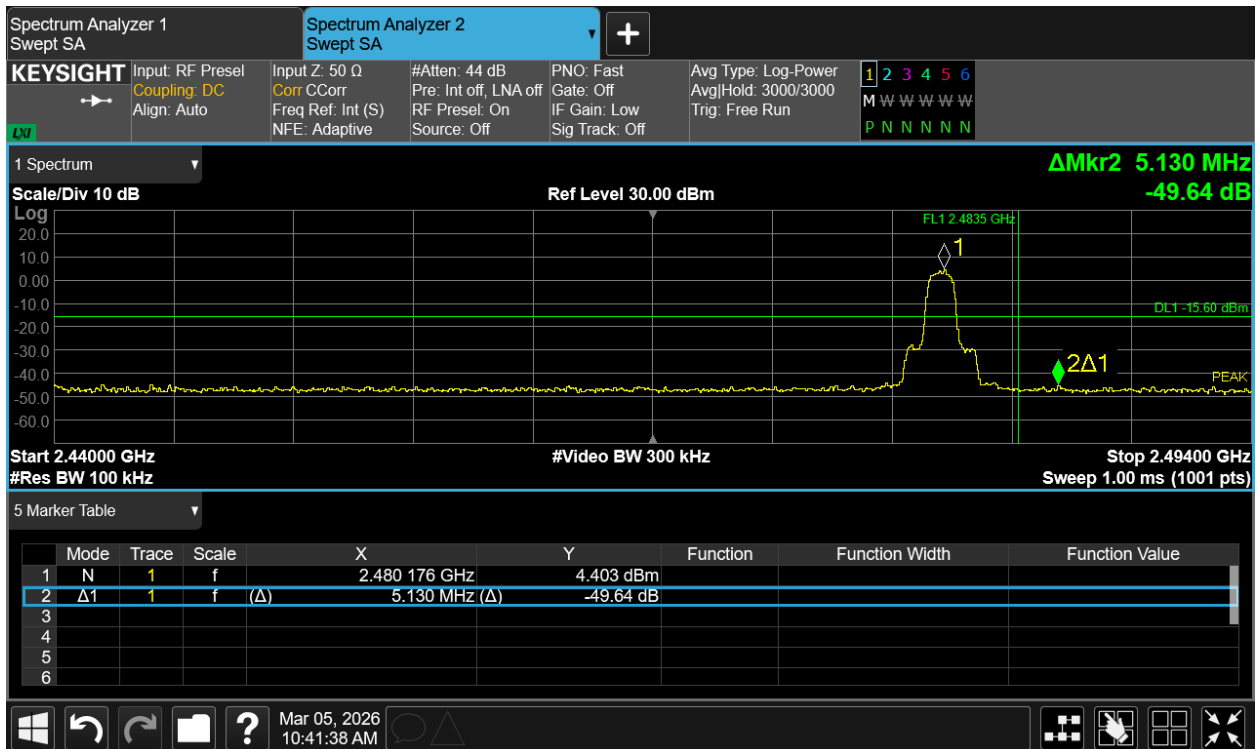


Figure TR57.4: Band edge gap measurement for Bluetooth 2-DH5, 2480 MHz

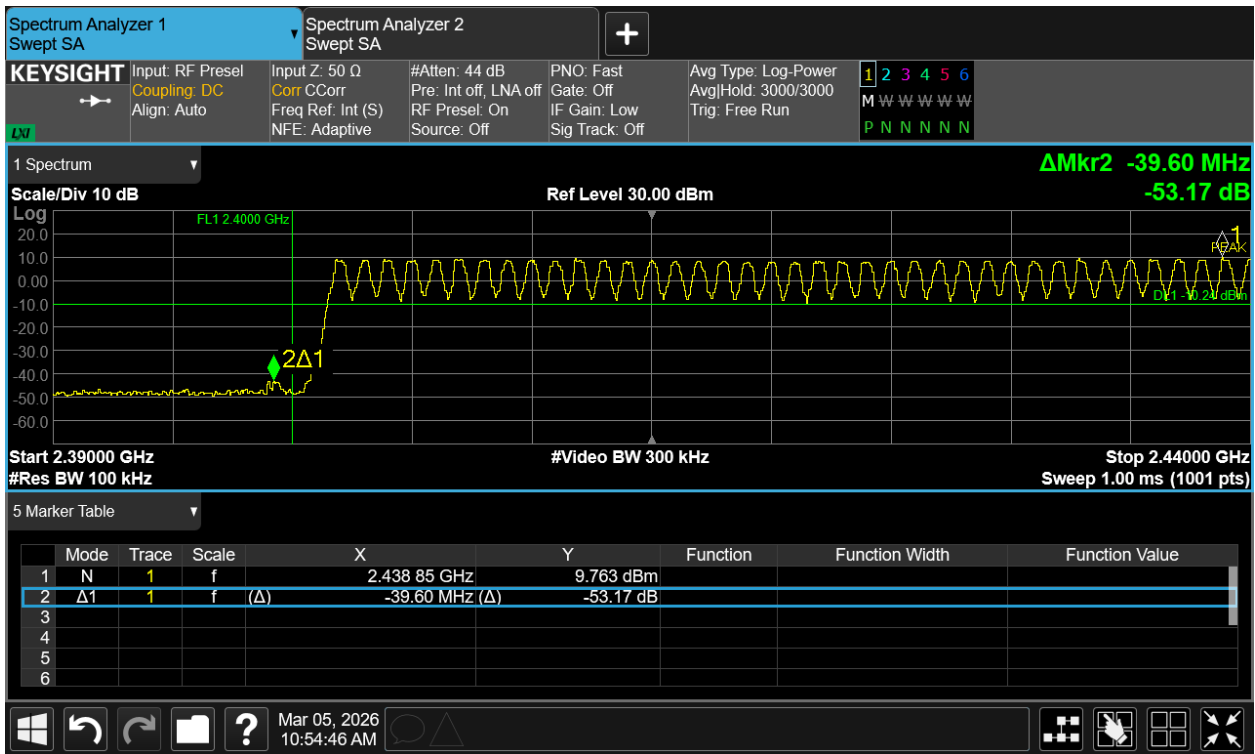


Figure TR57.5: Band edge gap measurement for Bluetooth 1-DH5, Hopping (low side)

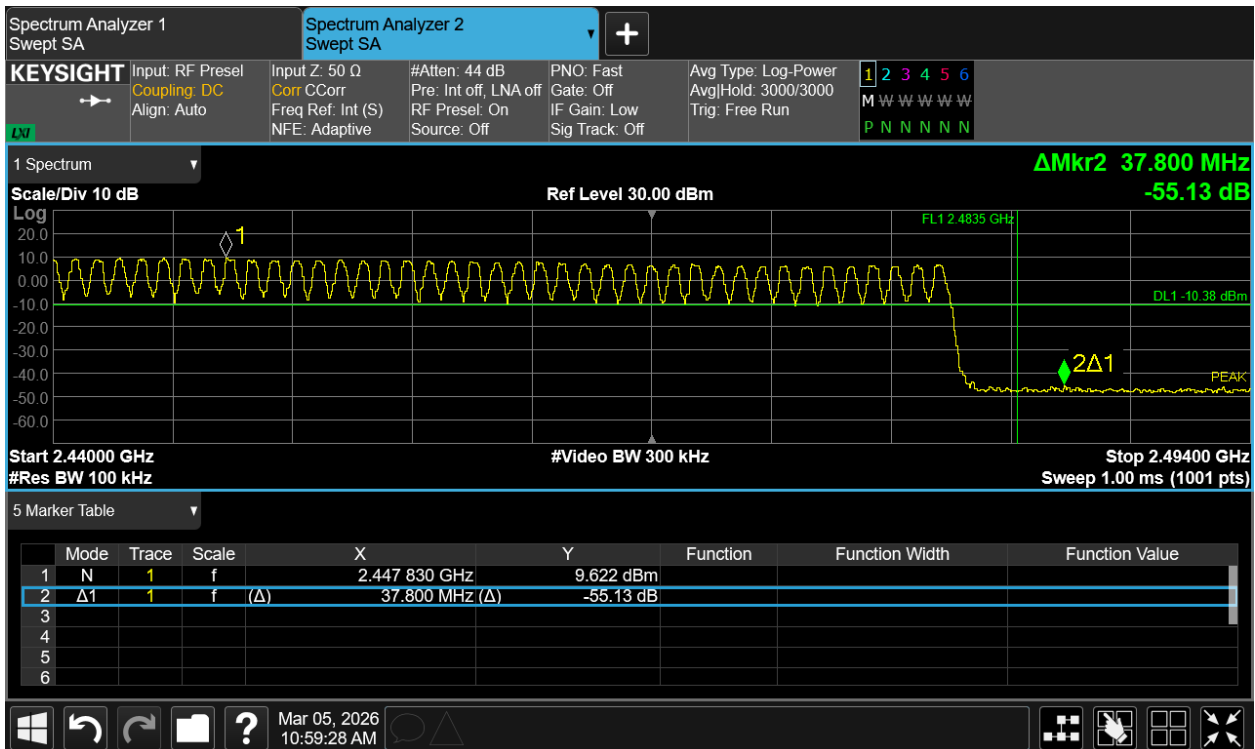


Figure TR57.6: Band edge gap measurement for Bluetooth 1-DH5, Hopping (high side)

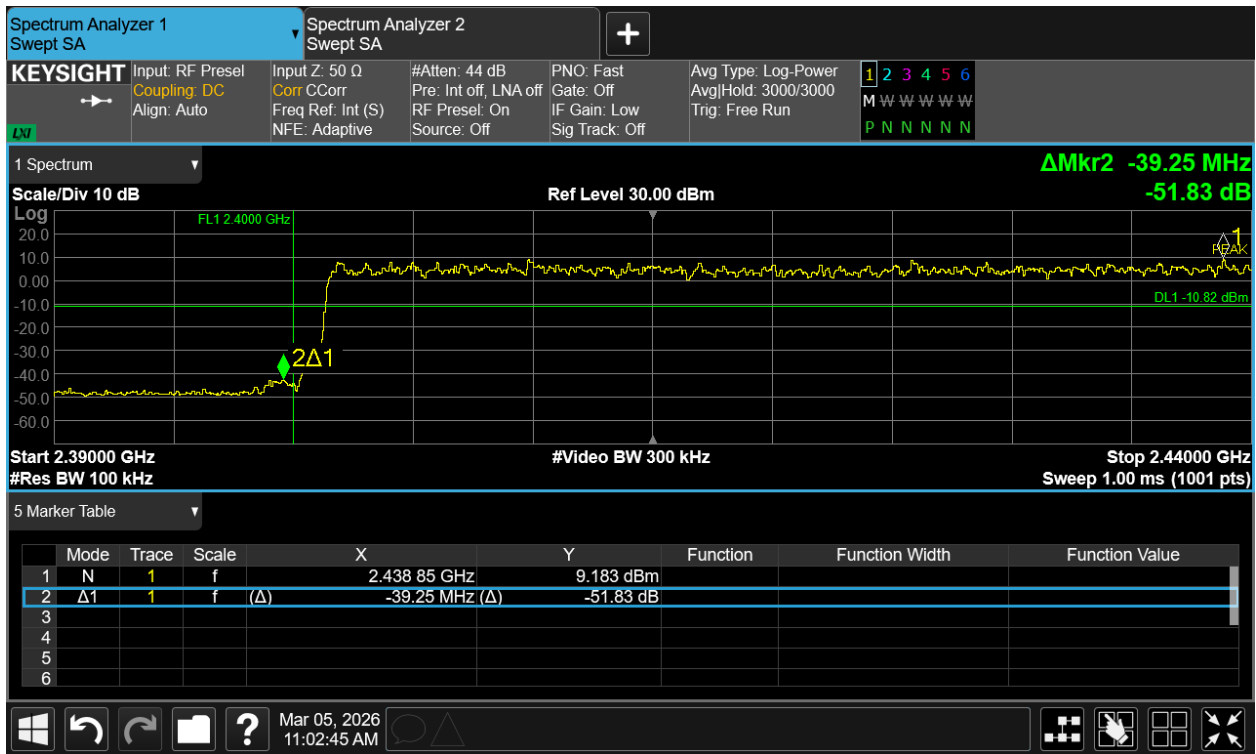


Figure TR57.7: Band edge gap measurement for Bluetooth 2-DH5, Hopping (low side)

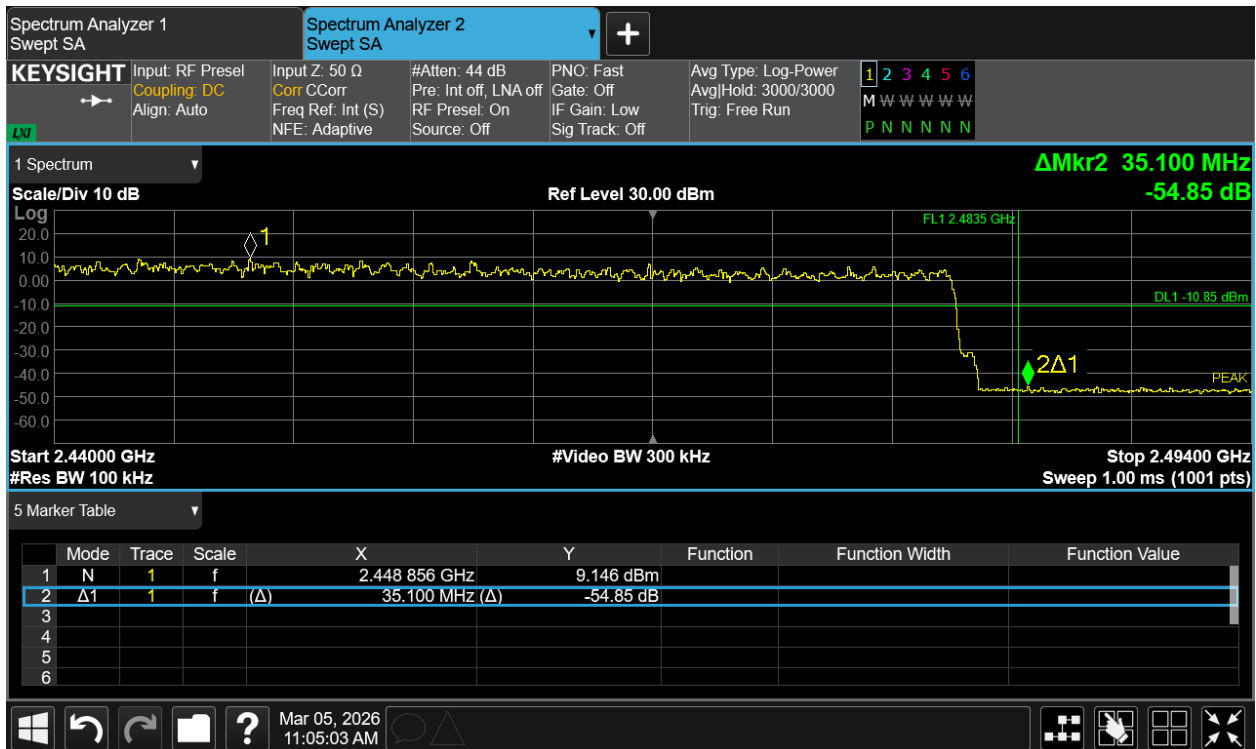


Figure TR57.8: Band edge gap measurement for Bluetooth 2-DH5, Hopping (high side)

This line is the end of the test record.

10.2 Radiated Emission Test Results

ANSI C63.10 permits the average power in an emission to be determined by reducing the measured level by a decibel offset calculated based on the maximum transmission dwell time in a 100 msec time window. This option for converting peak detector data to average for any duty cycle, or as an adjustment to average detector data when the test mode has a continuous duty cycle. The option is usually not exercised at the Garmin Compliance Lab. If this option is exercised, the relevant test record will indicate accordingly.

When used, the offset is determined based on T_D , the maximum dwell time reported [previously](#). With reference to C63.10 section 7.8.8.2, the Channel Separation and Overlapping Channel corrections are both 1 for Bluetooth. Dwell Time is reported for a time period of 0.4 seconds multiplied by N, the number of active channels, rather than 100 msec. Setting N to the lowest number of channels that are used (typically 15), the minimum correction C_{FHSS} for adjusting a measured Average detector value is

$$C_{FHSS} = 10 * \log(5 * T_D / N)$$

Twice C_{FHSS} will be used when determining Average levels based on a Peak detector measurement. The smallest value of C_{FHSS} will occur when N is 15 channels and T_D is at the regulatory limit of 0.4 seconds. That value is 8.75 dB.

10.2.1 Unwanted Emissions Outside the Frequency Bands of Operation, Radiated 1 – 14 GHz

Relevant standards include:

CFR47 Parts 15.247(d), 15.209

RSS-247 6.6

RSS-GEN 8.9, 8.10

ANSI C63.10 sections 6.3, 7.8.8

Test and Data Overview

The US and Canadian standards provide relaxed limits for emissions within the frequency band allocated for radio operation. One must demonstrate compliance for unwanted signals that arise outside this allocated band. There are two ways this compliance is demonstrated. The unwanted emission requirements are satisfied by a combination of radiated tests and RF port conducted tests. Under the FHSS rules, compliance must be shown both hopping and while tuned to the lowest and highest channels.

One way to do this is to show that the emission is below the general limits found in FCC Part 15.209 and RSS-GEN table 5 and 6 (which are essentially an extension of the Class B limits in FCC Part 15.109 and ICES-003 tables 2 and 3). This radiated emission test is evidence of compliance for any emission, whether inside or outside the restricted bands of operation.

The RF port method is described in the report section "[Unwanted Emissions Outside the Frequency Bands of Operation, RF Port Conducted](#)" and relevant data also appears there.

In this section, radiated emission data is provided for multiple channels and modes from 1 GHz to 14 GHz. (A [later section](#) of this report provides a special focus on the restricted bands just above and below the operating band.) The channels and modes selected for the remaining frequency bands were chosen with an awareness of the 1 to 14 GHz data, as well as the [transmitter output power](#) test results.

The test method generally followed ANSI C63.10 section 6.3. Section 6.4, 6.5, or 6.6 was also applied depending on the frequency range.

Test Record**Radiated Emission Test RE11****Project GCL1030**

Test Date(s) 11, 12, 13 Mar 2026
Test Personnel Vladimir Tolstik

Product Model A05147
Serial Number tested 8WP000276

Operating Mode BTCTx
Arrangement A4 (Udc)
Input Power USB 5 Vdc

Test Standards: FCC Part 15.247; RSS-247; RSS-GEN; ANSI C63.10 (as noted in Section 5 of the report).

Frequency Range: 1 GHz to 14 GHz
Pass/Fail Judgment: PASS

Test record created by: Vladimir Tolstik
Date of this record: 24 Mar 2026

Original record, Version A.

Test Equipment

Description	Make	Model #	Serial #	Last Cal/Ver	Next Due
PXE Receiver 26 GHz	Keysight	N9048B	MY59290135	9-Dec-2025	9-Dec-2026
Antenna, Horn, 1-18 GHz	ETS Lindgren	3117	00227596	11-Nov-2025	11-Nov-2027
FSOATS 3m, above 1 GHz	Frankonia	SAC3	F199004	13-Dec-2024	13-Dec-2027
Preamplifier, 500 MHz 18 GHz	Com-Power	PAM-118A	18040133	Calibration	Not Required
Wifi Filter	K&L	8NSL26-2437/E82.2-0/0	1	Calibration	Not Required
3 GHz High Pass filter	Anatech Electronics	OKOR2	01	Calibration	Not Required

Table RE11.1: Test Equipment Used

Software Used: Keysight PXE software A.32.06, EPX test software Version 2025.01.000

Test Data

For test standards that require reorienting the test sample, preliminary scans were taken in those alternate orientations to find the orientation that produced that largest field at the receive antenna. With intentional radiators, that highest field is usually found at the carrier frequency. The alternate orientations are typically described as X, Y, and Z and explained with a photograph. Subsequent testing was done using on the orientation identified in this way.

The radiated emission test process continued with a preliminary scan at multiple turntable angles, antenna heights, and both antenna polarizations. Where the test standard requires cable manipulation, this was done at one of more likely worst case frequencies selected by the test personnel while observing the receiver display. At each of the frequencies selected for final measurements, the turntable angle, antenna height, and antenna polarization were explored to find the worst-case settings. Final field strength measurements were taken in that set of positions. Full maximization was not performed at frequencies that are noise floor measurements included per the test standard requirements.

In the 1 GHz to 3.2 GHz frequency range, a Chebyshev ‘Wifi’ notch filter covering the 2.4 GHz ISM band was placed in series just before the preamplifier to ensure it operated in its linear range. This filter is accounted for in the system loss, so it appears in the prescan plots as high noise floor levels from 2400 – 2483 MHz. These are not failing emissions. A 3 GHz high pass filter was applied during testing between 3.2 GHz and 14 GHz to similarly protect the preamplifier.

In the 1 GHz to 14 GHz frequency range, pre-scan spectral data was taken at 1 meter and extrapolated to a 3 meter distance. Final measurements were made at 3 meters.

At azimuth angle 180° the ‘front’ reference mark of the turntable is pointed Southward. At 270° the reference mark points West. At 90° it points East. At 173° the turntable reference mark is pointed directly at the antenna. The designation of the X, Y, and Z orientations of the test sample are sample dependent, so these are reported by use of photographs.

The table shows the selected final measurement data between 1 GHz and 14 GHz. It includes at least the six strongest emissions observed relative to the test limit, along with other data points of interest. Where a data point is highlighted is yellow, this is an aid to indicate the data point(s) with the least margin to the test limit. A positive margin value indicates that the emission was below the test limit. The test limit is the FCC Class B Limit at 3m. Any unintentional radio emission limits are not applied to intentional radio signals.

Emissions within the restricted bands were measured with an averaging process described in the ANSI C63.10 methods noted in this paragraph. (See also section 6.3 of this test report.) The duty cycle for the BT radio had a duty cycle of 98% or greater and so the trace-averaging method of clause 11.12.2.5.1 was applied.

In this test, fewer than six emissions were observed within 20 dB of the limit. The relevant emissions were measured, including one or more noise floor signals as judged appropriate to the spectrum.

Frequency	Pol.	Reading		Factor	Level		Limit		Margin		Height	Angle
MHz		dB(μ V)		dB(1/m)	dB(μ V/m)		dB(μ V/m)		dB		cm	deg
		RMS	PK		RMS	PK	AV	PK	RMS	PK		
2216.216	H	34.2	46.6	-2.3	31.9	44.3	54.0	74.0	22.1	29.7	302.1	313.0
3202.754	H	38.1	46.5	0.7	38.8	47.2	54.0	74.0	15.2	26.8	110.5	316.0
4803.965	H	46.7	55.4	4.9	51.6	60.3	54.0	74.0	2.4	13.7	100.0	15.0
13281.659	H	26.6	39.0	19.5	46.1	58.5	54.0	74.0	7.9	15.5	100.0	352.0

Table RE11.2: Emission summary (Bluetooth, BR, 2402 MHz)

Frequency	Pol.	Reading		Factor	Level		Limit		Margin		Height	Angle
MHz		dB(μV)		dB(1/m)	dB(μV/m)		dB(μV/m)		dB		cm	deg
		RMS	PK		RMS	PK	AV	PK	RMS	PK		
2219.631	H	33.6	45.5	-2.2	31.4	43.3	54.0	74.0	22.6	30.7	302.1	308.0
3253.391	H	36.2	45.4	0.4	36.6	45.8	54.0	74.0	17.4	28.2	270.0	303.0
4880.128	H	44.2	53.1	4.8	48.9	57.9	54.0	74.0	5.1	16.1	202.9	22.0
13265.074	H	26.4	38.9	19.8	46.2	58.7	54.0	74.0	7.8	15.3	394.7	6.0

Table RE11.3: Emission summary (Bluetooth, BR, 2440 MHz)

Frequency	Pol.	Reading		Factor	Level		Limit		Margin		Height	Angle
MHz		dB(μ V)		dB(1/m)	dB(μ V/m)		dB(μ V/m)		dB		cm	deg
		RMS	PK		RMS	PK	AV	PK	RMS	PK		
3306.597	H	36.6	46.2	0.4	37.0	46.6	54.0	74.0	17.0	27.4	100.0	21.0
4960.126	H	43.5	52.7	4.9	48.4	57.6	54.0	74.0	5.6	16.4	100.0	13.0
12659.924	H	27.3	39.6	18.1	45.4	57.7	54.0	74.0	8.6	16.3	359.3	0.0

Table RE11.4: Emission summary (Bluetooth, BR, 2480 MHz)

Frequency	Pol.	Reading		Factor	Level		Limit		Margin		Height	Angle
MHz		dB(μ V)		dB(1/m)	dB(μ V/m)		dB(μ V/m)		dB		cm	deg
		RMS	PK		RMS	PK	AV	PK	RMS	PK		
4803.735	H	45.4	57.2	4.9	50.3	62.1	54.0	74.0	3.7	11.9	100.0	15.0
9495.773	V	26.8	39.1	15.1	41.9	54.2	54.0	74.0	12.1	19.8	383.1	0.0
13990.050	H	26.5	40.5	19.7	46.2	60.2	54.0	74.0	7.8	13.8	181.6	0.0

Table RE11.5: Emission summary (Bluetooth, EDR2, 2402 MHz)

Frequency	Pol.	Reading		Factor	Level		Limit		Margin		Height	Angle
MHz		dB(μ V)		dB(1/m)	dB(μ V/m)		dB(μ V/m)		dB		cm	deg
		RMS	PK		RMS	PK	AV	PK	RMS	PK		
1853.755	H	33.0	44.4	-2.9	30.1	41.5	54.0	74.0	23.9	32.5	400.0	347.0
4879.992	H	45.0	57.2	4.8	49.8	62.0	54.0	74.0	4.2	12.0	100.0	15.0
13924.708	V	26.7	40.0	20.0	46.7	60.0	54.0	74.0	7.3	14.0	108.6	343.0

Table RE11.6: Emission summary (Bluetooth, EDR2, 2440 MHz)

Frequency	Pol.	Reading		Factor	Level		Limit		Margin		Height	Angle
MHz		dB(μ V)		dB(1/m)	dB(μ V/m)		dB(μ V/m)		dB		cm	deg
		RMS	PK		RMS	PK	AV	PK	RMS	PK		
4959.966	H	42.1	54.3	4.9	47.0	59.2	54.0	74.0	7.0	14.8	100.0	13.0
9521.730	V	27.2	39.7	14.6	41.8	54.3	54.0	74.0	12.2	19.7	154.0	0.0
13939.838	V	26.5	39.4	19.8	46.3	59.2	54.0	74.0	7.7	14.8	124.5	236.0

Table RE11.7: Emission summary (Bluetooth, EDR2, 2480 MHz)

The graph below shows the background spectrum observed during pre-scan, as well as the final data points from the table above.

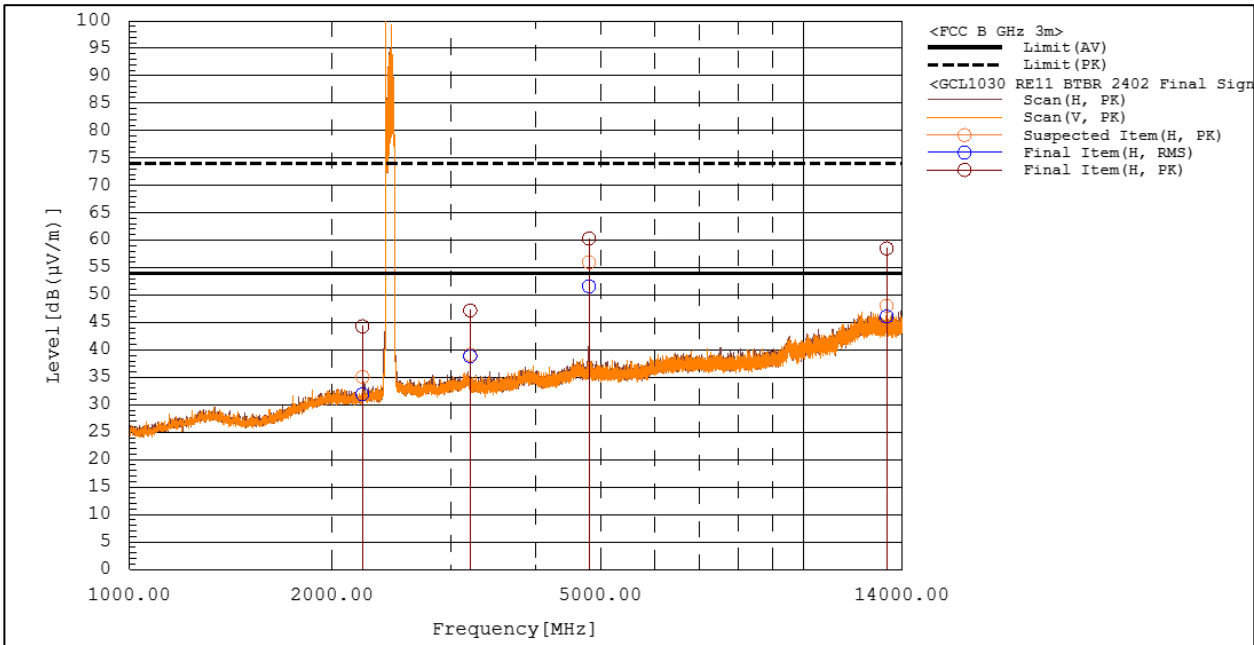


Figure RE11.1: Spectral data (Bluetooth, BR, 2402 MHz)

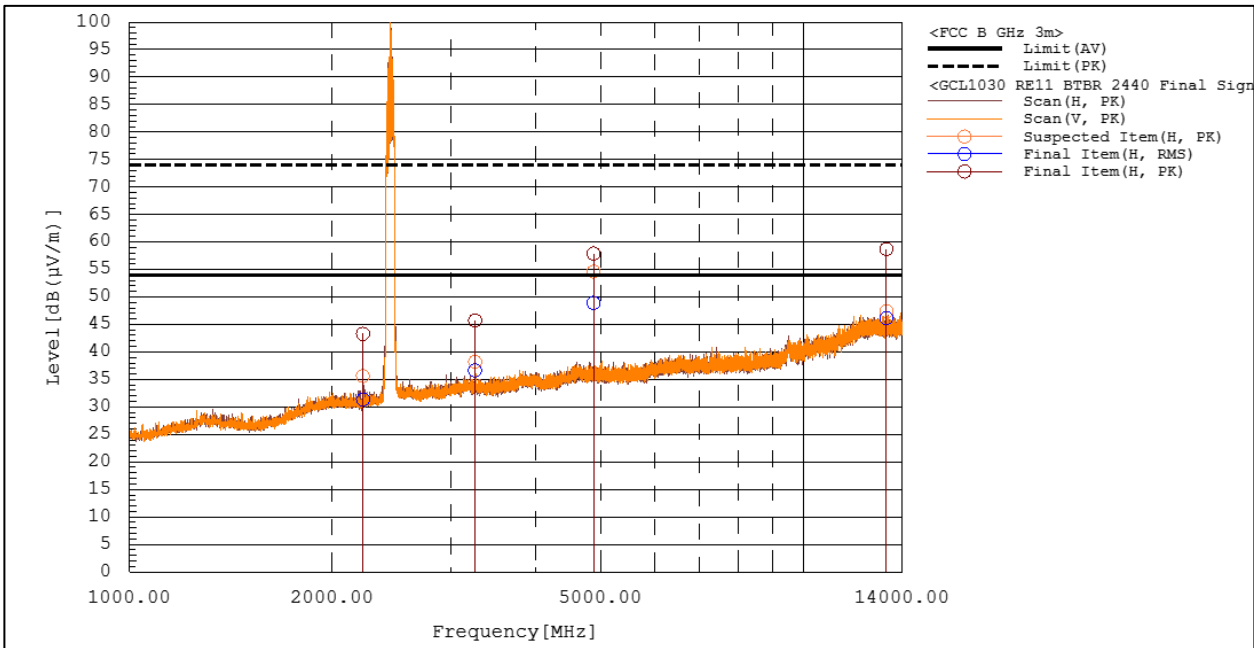


Figure RE11.2: Spectral data (Bluetooth, BR, 2440 MHz)

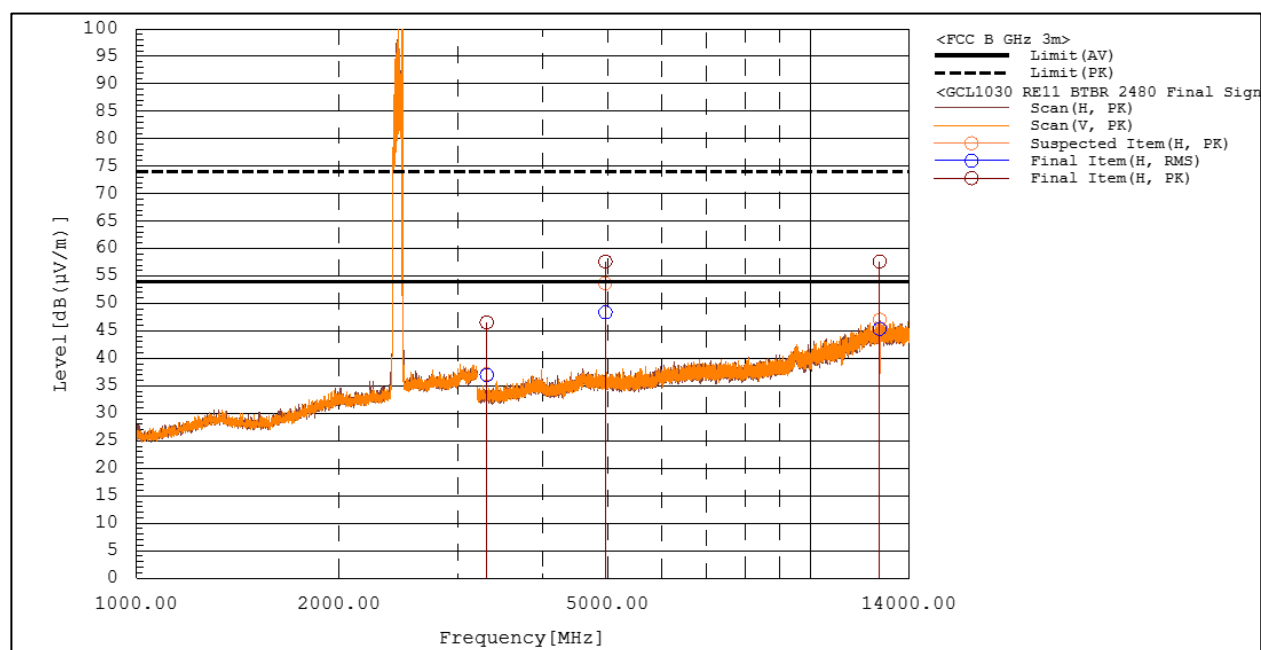


Figure RE11.3: Spectral data (Bluetooth, BR, 2480 MHz)

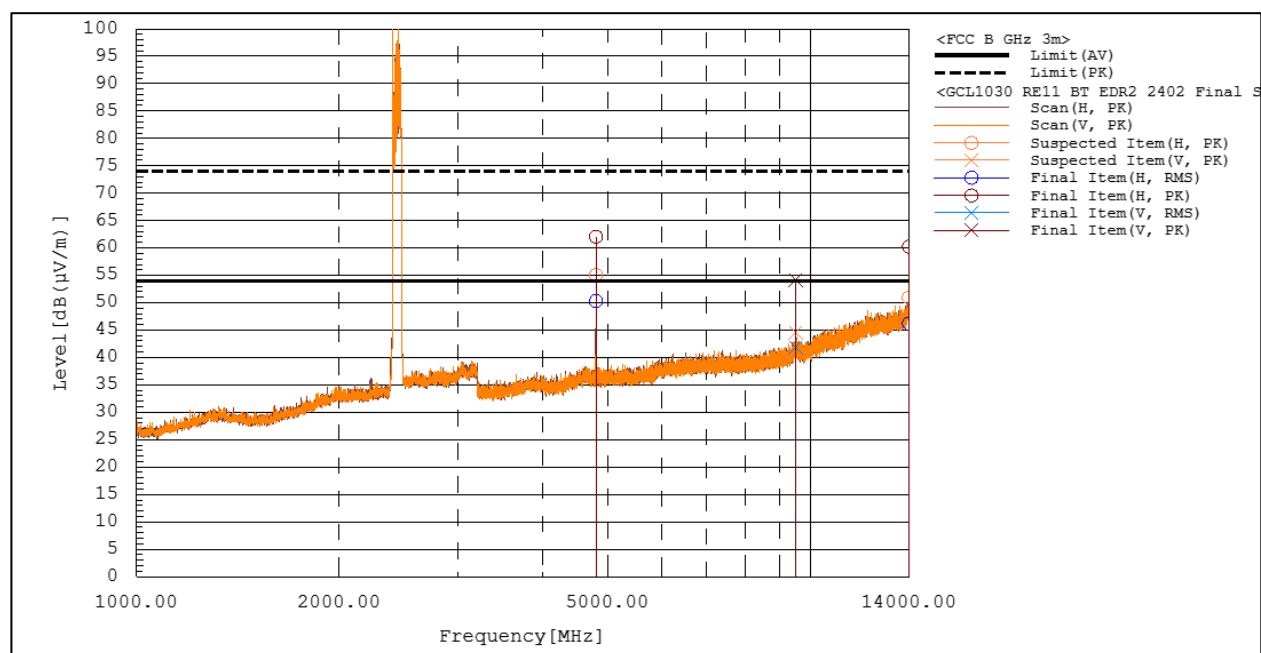


Figure RE11.4: Spectral data (Bluetooth, EDR2, 2402 MHz)

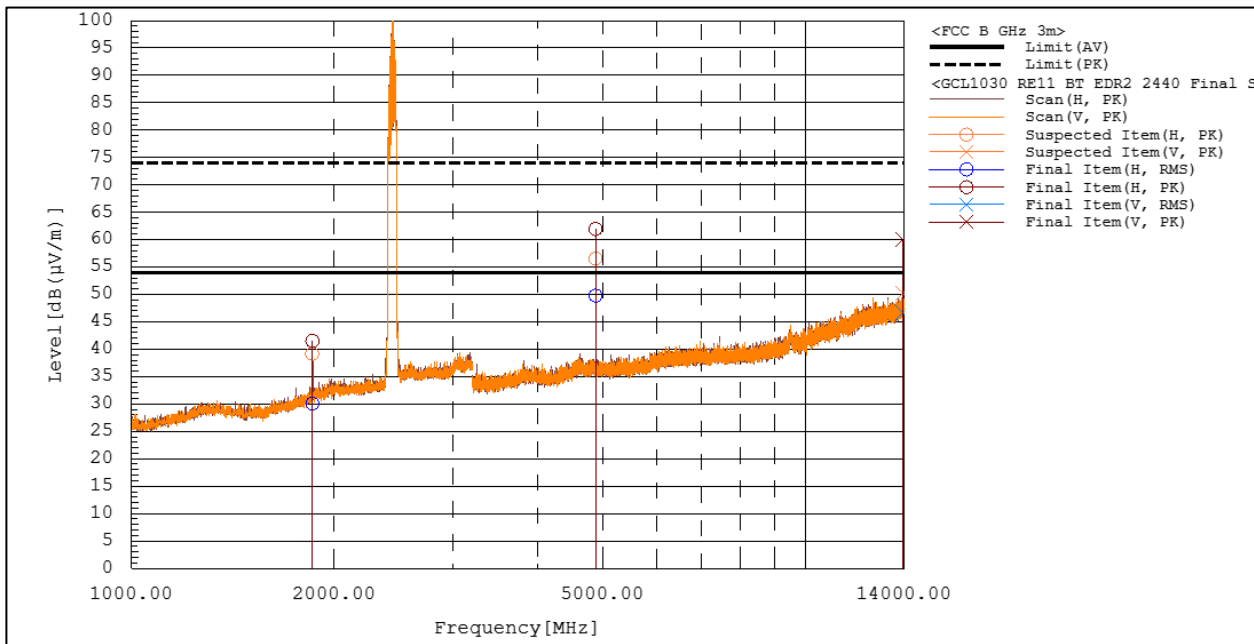


Figure RE11.5: Spectral data (Bluetooth, EDR2, 2440 MHz)

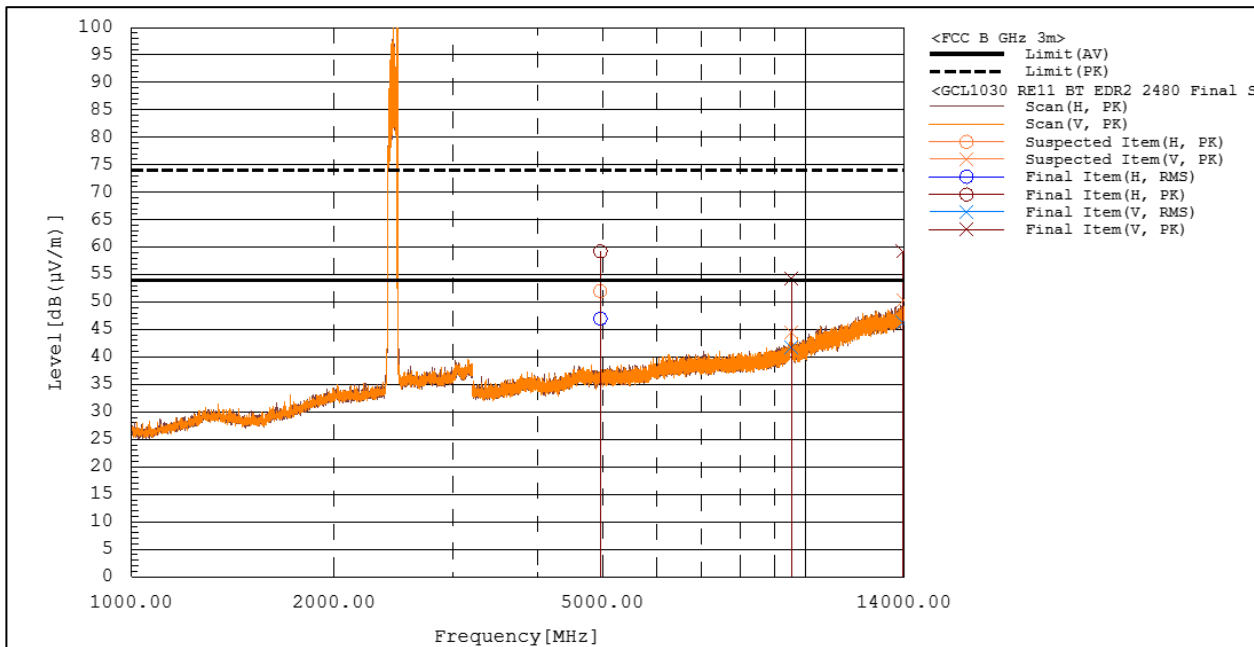


Figure RE11.6: Spectral data (Bluetooth, EDR2, 2480 MHz)

Setup Photographs

The following photographs show the EUT configured and arranged in the manner in which it was measured.

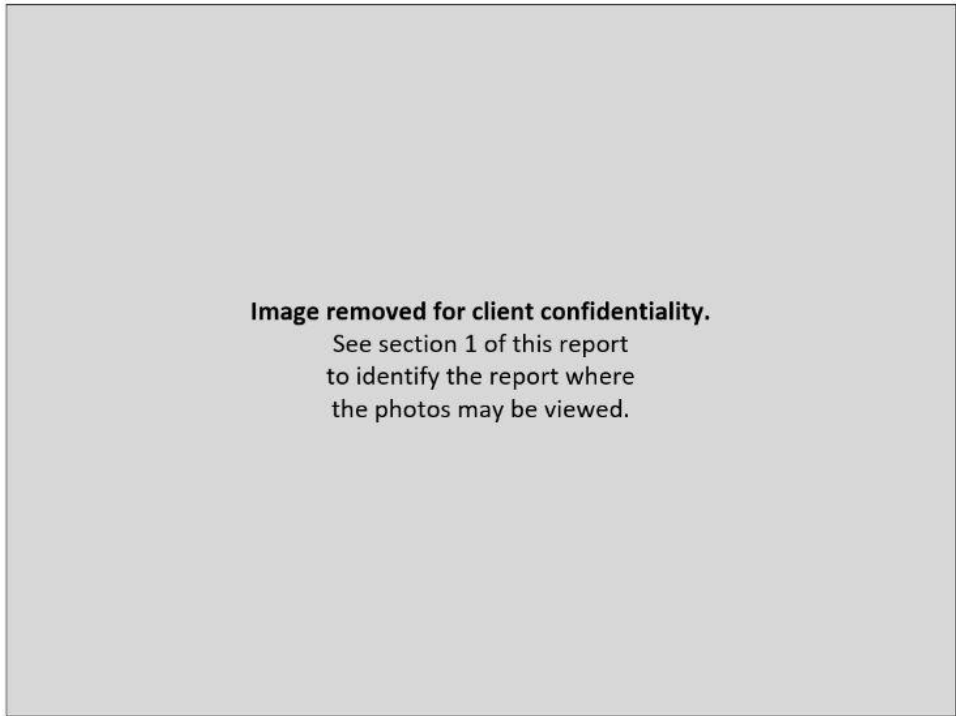


Figure RE11.7: EUT test setup, first view

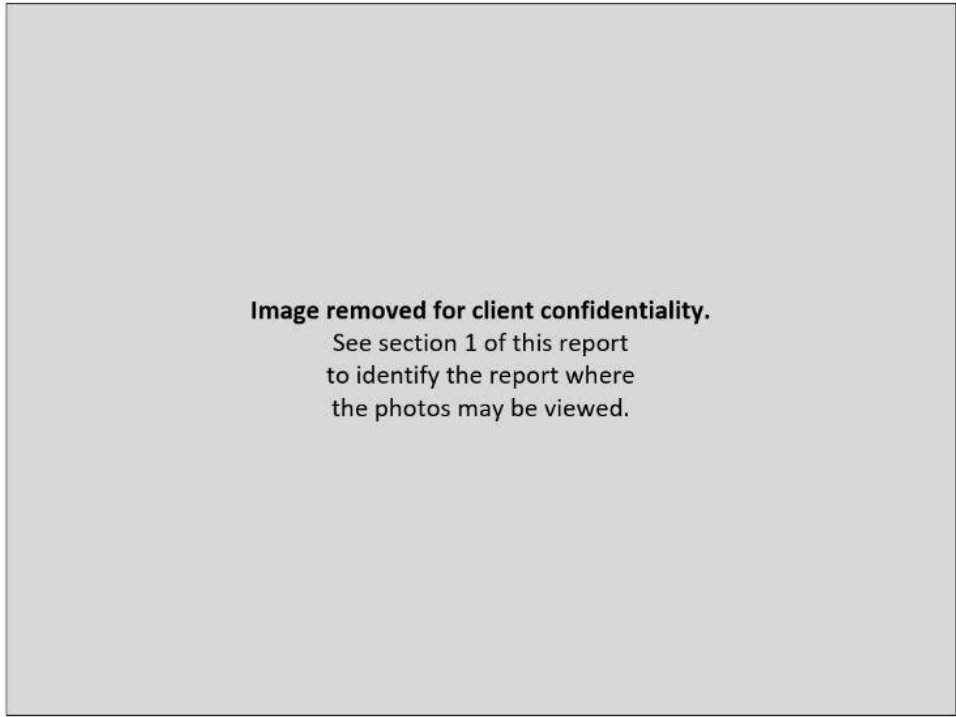


Figure RE11.8: EUT test setup, second view

This line is the end of the test record.

10.2.2 Unwanted Emissions Outside the Frequency Bands of Operation, Radiated 14-25 GHz

Relevant standards include:

CFR47 Parts 15.247(d), 15.209

RSS-247 6.6

RSS-GEN 8.9, 8.10

ANSI C63.10 sections 6.3, 6.6, 7.8.8

Test and Data Overview

See [Section 10.2.1](#).

Test Record
Radiated Emission Test
Test ID RE20
Project GCL1030

Test Date(s): 28 Apr 2026
Test Personnel: David Kerr

Product Model: A05147
Serial Number tested: 8WP000276

Operating Mode: BTCTx
Arrangement: A4 (Udc)
Input Power: USB 5 Vdc

Test Standards: FHSS: FCC Part 15.247; RSS-247; RSS-GEN; ANSI C63.10 (as noted in Section 6 of the report).

Frequency Range: 14 GHz to 25 GHz
Pass/Fail Judgment: PASS

Test record created by: David A Kerr
Date of this record: 5 May 2026

Original record, Version A.

Test Equipment

Description	Make	Model #	Serial #	Last Cal/Ver	Next Due
PXE Receiver 44 GHz	Keysight	N9048B	MY62220139	4-Sep-2025	4-Sep-2026
Antenna, Horn, 10-40 GHz	ETS Lindgren	3116C	227673	11-Nov-2025	11-Nov-2027
Preamplifier, 14 GHz to 40 GHz	Com-Power	PAM-840A	461364	Calibration	Not Required
FSOATS 3m, above 1 GHz	Frankonia	SAC3	F199004	13-Dec-2024	13-Dec-2027

Table RE20.1: Test Equipment Used

Software Used: Keysight PXE software A.32.06, RE Signal Maximization Tool v2021Feb25.xlsx, EPX test software Version 2025.01.000

Test Data

For test standards that require reorienting the test sample, preliminary scans were taken in those alternate orientations to find the orientation that produced that largest field at the receive antenna. With intentional radiators, that highest field is usually found at the carrier frequency. The alternate orientations are typically described as X, Y, and Z and explained with a photograph. Subsequent testing was done using on the orientation identified in this way.

The radiated emission test process continued with a preliminary scan at multiple turntable angles, antenna heights, and both antenna polarizations. Where the test standard requires cable manipulation, this was done at one of more likely worst case frequencies selected by the test personnel while observing the receiver display. At each of the frequencies selected for final measurements, the turntable angle, antenna height, and antenna polarization were explored to find the worst-case settings. Final field strength measurements were taken in that set of positions. Full maximization was not performed at frequencies that are noise floor measurements included per the test standard requirements.

At azimuth angle 180° the 'front' reference mark of the turntable is pointed Southward. At 270° the reference mark points West. At 90° it points East. At 173° the turntable reference mark is pointed directly at the antenna. The designation of the X, Y, and Z orientations of the test sample are sample dependent, so these are reported by use of photographs.

The table shows the selected final measurement data between 14 MHz and 25 GHz. It includes at least the six strongest emissions observed relative to the test limit, along with other data points of interest. Where a data point is highlighted is yellow, this is an aid to indicate the data point(s) with the least margin to the test limit. A positive margin value indicates that the emission was below the test limit. The test limit is the FCC Class B Limit at 3m. Any unintentional radio emission limits are not applied to intentional radio signals.

In this test, fewer than six emissions were observed within 20 dB of the limit. The relevant emissions were measured, including one or more noise floor signals as judged appropriate to the spectrum.

Frequency	Pol.	Reading		Factor	Level		Limit		Margin		Height	Angle
MHz		dB(μ V)		dB(1/m)	dB(μ V/m)		dB(μ V/m)		dB		cm	deg
		RMS	PK		RMS	PK	AV	PK	RMS	PK		
24513.585	H	24.8	36.5	22.9	47.7	59.4	54.0	74.0	6.3	14.6	400.0	73.0

Table RE20.2: Emission summary (Bluetooth, Basic Rate, 2402 MHz)

Frequency	Pol.	Reading		Factor	Level		Limit		Margin		Height	Angle
MHz		dB(μ V)		dB(1/m)	dB(μ V/m)		dB(μ V/m)		dB		cm	deg
		RMS	PK		RMS	PK	AV	PK	RMS	PK		
24295.167	H	24.6	36.5	22.9	47.5	59.4	54.0	74.0	6.5	14.6	373.5	244.0

Table RE20.3: Emission summary (Bluetooth, EDR2, 2440 MHz)

The graph below shows the background spectrum observed during pre-scan, as well as the final data points from the table above.

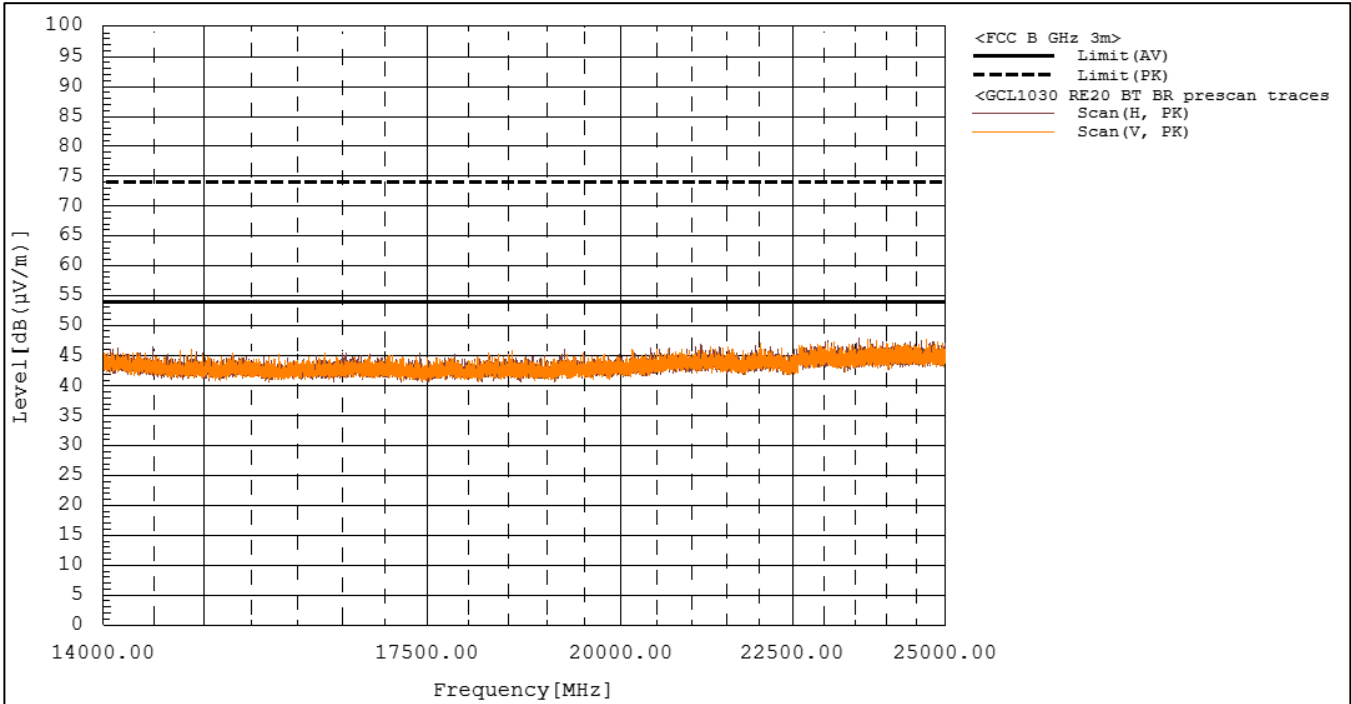


Figure RE20.1: Spectral data (Bluetooth, BR, 1 meter, 2402 MHz)

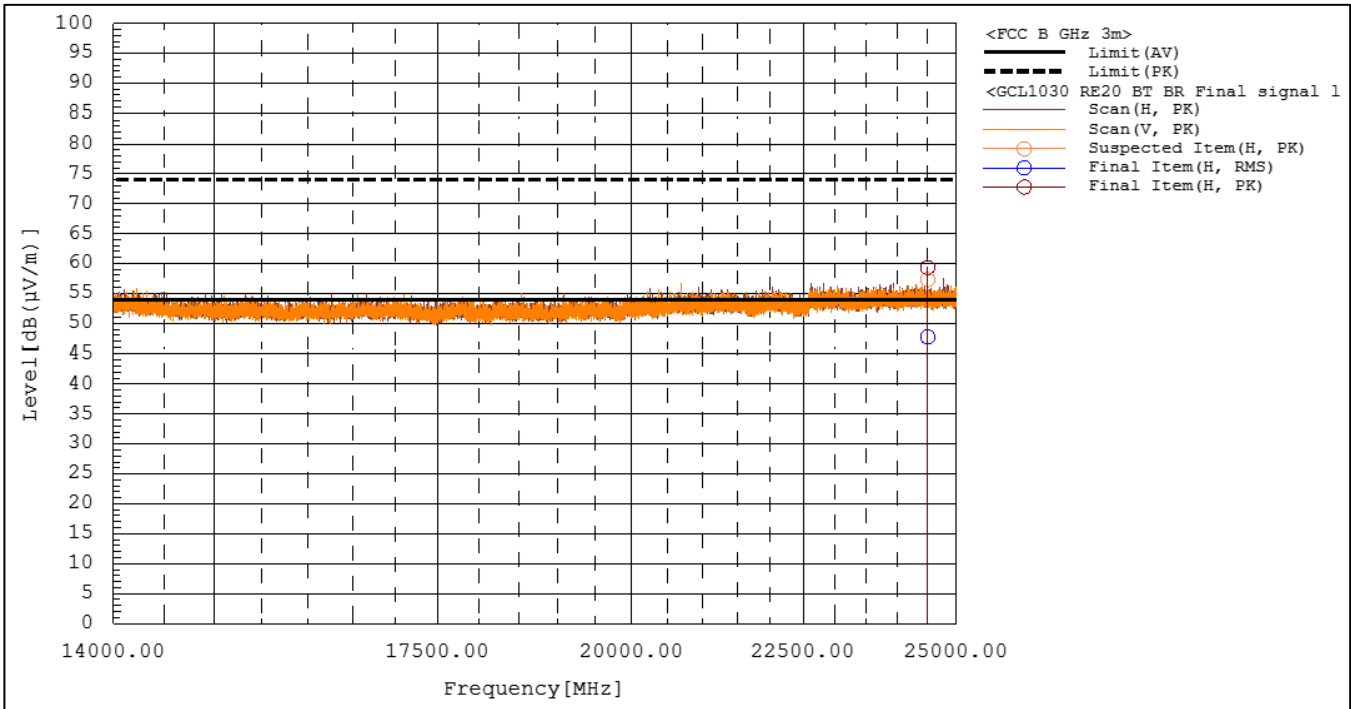


Figure RE20.2: Spectral data (Bluetooth, BR, 3 meter, 2402 MHz)

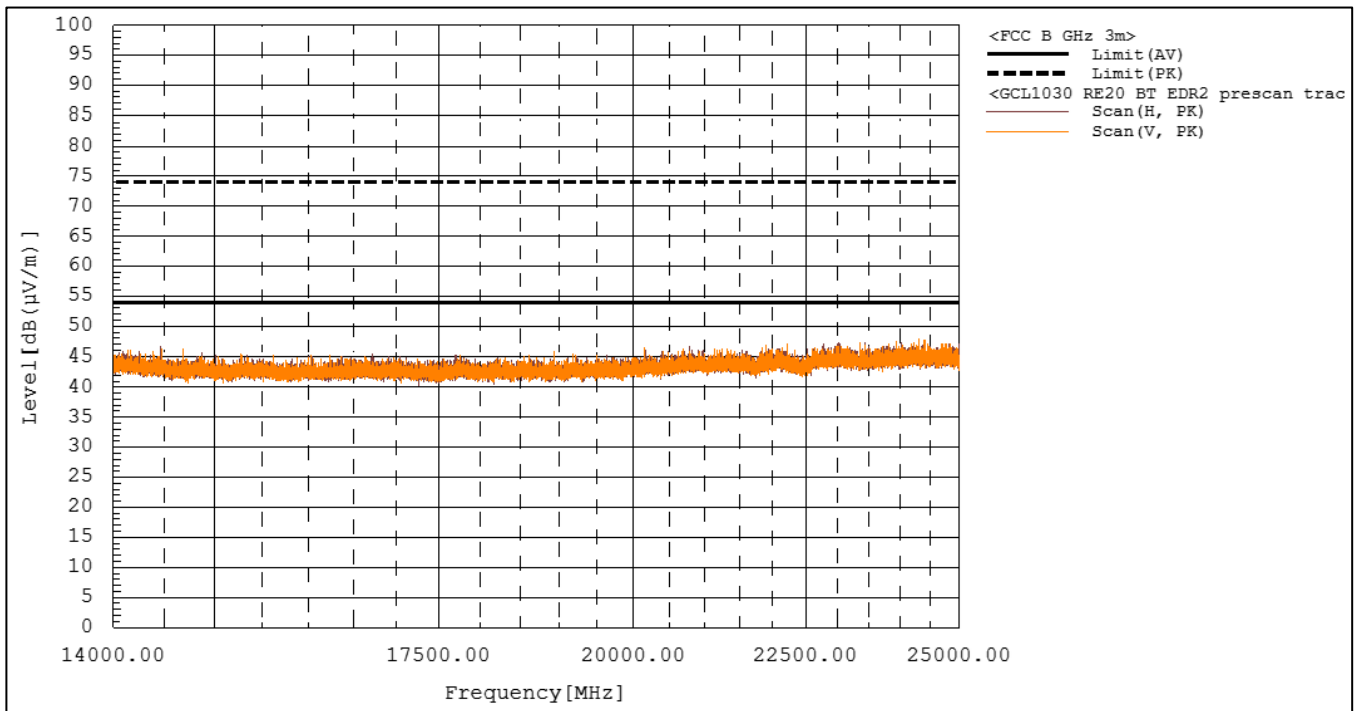


Figure RE20.3: Spectral data (Bluetooth, EDR2, 1 meter, 2440MHz)

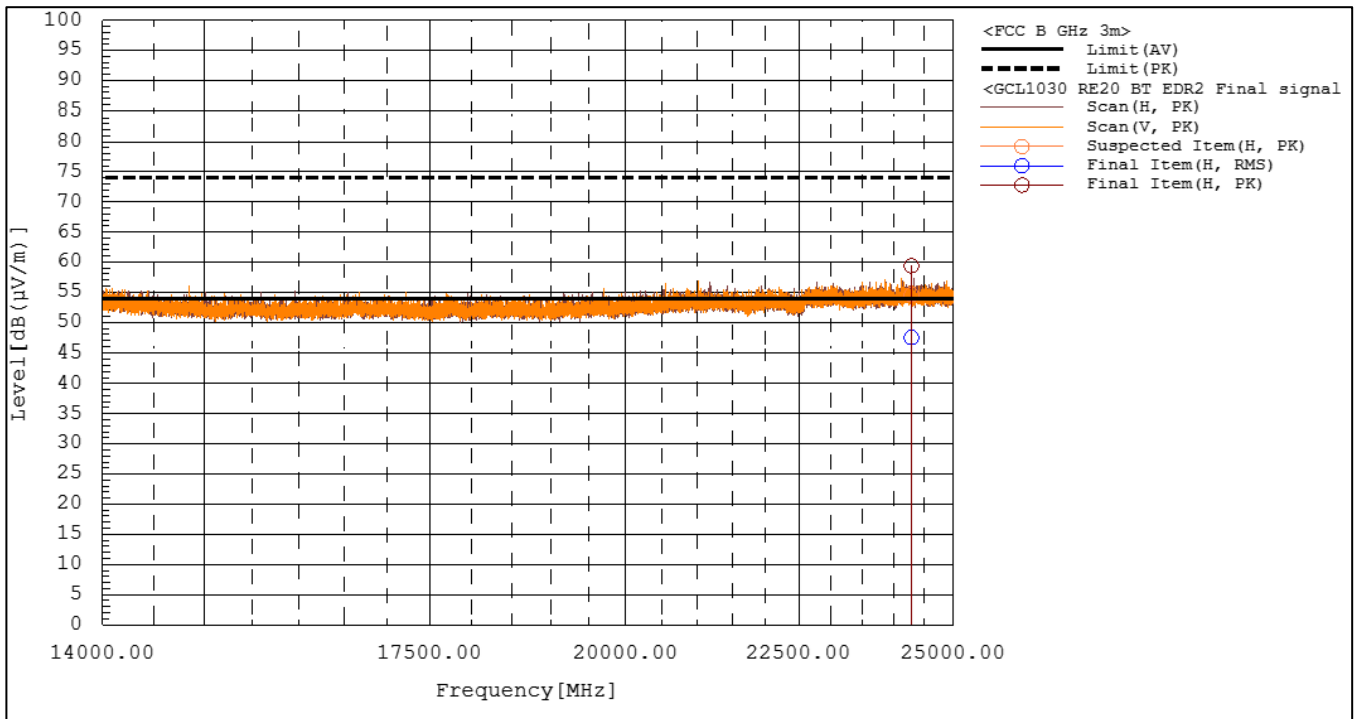


Figure RE20.4: Spectral data (Bluetooth, EDR2, 3 meter, 2440 MHz)

Setup Photographs

The following photographs show the EUT configured and arranged in the manner in which it was measured.



Figure RE20.5: EUT test setup, first view (1 meter)



Figure RE20.6: EUT test setup, second view

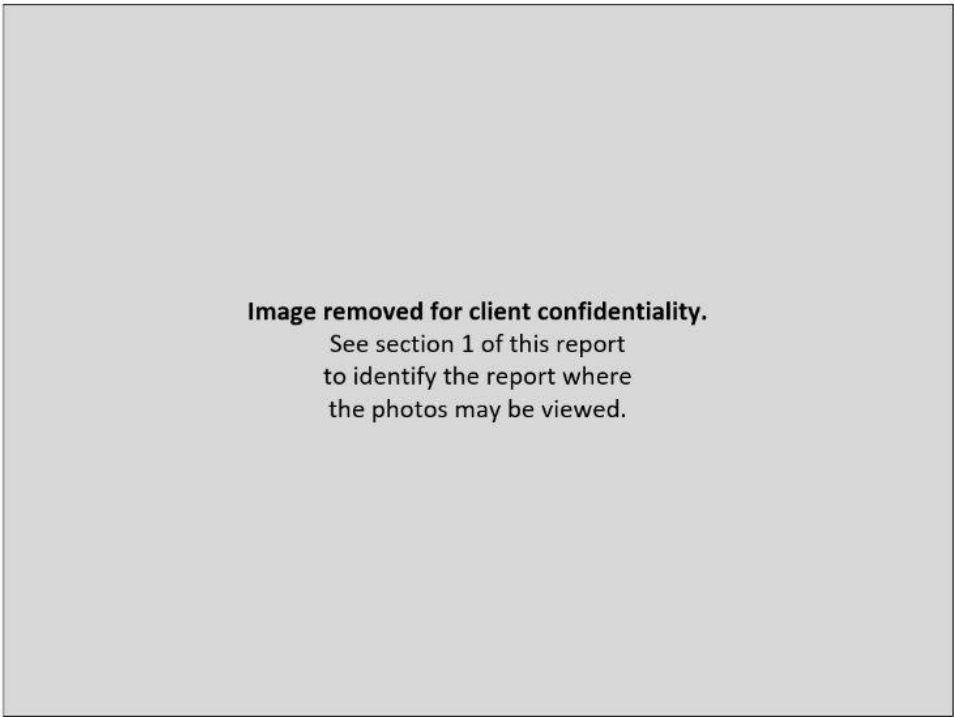


Figure RE20.7: EUT test setup, second view

This line is the end of the test record.

10.2.3 Unwanted Emissions Outside the Frequency Bands of Operation, Radiated 0.009-30 MHz

Relevant standards include:

CFR47 Parts 15.247(d), 15.209

RSS-247 6.6

RSS-GEN 8.9, 8.10

ANSI C63.10 sections 6.3, 6.4, 7.8.8

Test and Data Overview

See [Section 10.2.1](#).

Test Record**Radiated Emission Test****Test ID RE28****Project GCL1030**

Test Date(s): 23, 24 Apr 2026
Test Personnel: David Kerr, Vladimir Tolstik

Product Model: A05147
Serial Number tested: 8WP000276

Operating Mode: BTCTx
Arrangement: A4 (Udc)
Input Power: USB 5 Vdc

Test Standards: FCC Part 15.247; RSS-247; RSS-GEN; ANSI C63.10 (as noted in Section 5 of the report).

Frequency Range: 9 KHz to 30 MHz
Pass/Fail Judgment: PASS

Test record created by: Vladimir Tolstik
Date of this record: 24 Apr 2026

Original record, Version A.

Test Equipment

Description	Make	Model #	Serial #	Last Cal/Ver	Next Due
PXE Receiver 26 GHz	Keysight	N9048B	MY59290135	9-Dec-2025	9-Dec-2026
Antenna, Loop w/amp, 8k - 30 MHz	Schwarzbeck	FMZB 1519C	00071	11-Nov-2025	11-Nov-2027
SAC 3m, below 1 GHz	Frankonia	SAC3	F199004	11-Dec-2024	11-Dec-2027

Table RE28.1: Test Equipment Used

Software Used: Keysight PXE software A.32.06, RE 150k to 30M Signal Maximization Tool V1 2021Mar17.xlsx, RE 9k30m FccCanada Analysis5 NS.xlsx

Test Data

For test standards that require reorienting the test sample, preliminary scans were taken in those alternate orientations to find the orientation that produced that largest field at the receive antenna. With intentional radiators, that highest field is usually found at the carrier frequency. The alternate orientations are typically described as X, Y, and Z and explained with a photograph. Subsequent testing was done using on the orientation identified in this way.

The radiated emission test process continued with a preliminary scan at multiple turntable angles, and in the three loop antenna polarizations. The loop antenna was positioned at a 1.5 m height. Where the test standard requires cable manipulation, this was done at one of more likely worst case frequencies selected by the test personnel while observing the receiver display. At each of the frequencies selected for final measurements, the loop was set to the worst case orientation for that frequency and the turntable angle was explored to find the worst-case settings. Final field strength measurements were taken in that set of positions. Full maximization was not performed at frequencies that are noise floor measurements included per the test standard requirements.

The table shows the selected final measurement data between 9 KHz and 30 MHz. It includes at least the six strongest emissions observed relative to the test limit, along with other data points of interest. Where a data point is highlighted in yellow, this is an aid to indicate the data point(s) with the least margin to the test limit. A positive margin value indicates that the emission was below the test limit. The test limit is the FCC Class B Limit at 3m. Any unintentional radio emission limits are not applied to intentional radio signals.

Test limits for electric fields above 30 MHz that are stated for a distance other than 3 m are adjusted to 3 m with a factor of 20 dB per decade of distance. Test limits for electric or magnetic fields below 30 MHz that are stated for a distance other than 3 m are adjusted to 3 m by one of two methods. For ETSI testing, the extrapolation uses the curve of ETSI EN 300 330 Annex H figure H.2. For FCC and ISSED testing, the conservative method of ANSI C63.10 clause 6.4.4.1 is applied: 40 dB per decade for distances within the boundary ($\text{wavelength} / 2 \text{ Pi}$), 20 dB per decade beyond that distance boundary.

In this test, fewer than six emissions were observed within 20 dB of the limit. The relevant emissions were measured, including one or more noise floor signals as judged appropriate to the spectrum.

Freq.	3 m Level	Detector	Distance	Dist Adj	Final Level	Limit	Margin	Peak 3 m	Peak Final	Pk Limit	Pk Margin	Antenna	Table
MHz	dBuV/m	Type	m	dB	dBuV/m	dBuV/m	dB	dBuV/m	dBuV/m	dBuV/m	dB	Orientation	Azimuth, deg
0.0488	26.35	Avg	300	80.00	-53.65	33.84	87.49	36.64	-43.36	53.84	97.20	Z	67
0.0492	38.19	Avg	300	80.00	-41.81	33.77	75.59	45.87	-34.13	53.77	87.91	X	-130
0.1277	22.59	Avg	300	80.00	-57.41	25.48	82.89	32.12	-47.88	45.48	93.36	Z	-172
1.311	28.49	QP	30	40.00	-11.51	25.25	36.77	34.41	-5.59	None	None	X	117
6.092	20.82	QP	30	28.34	-7.52	29.54	37.06	28.69	0.35	None	None	Z	158

Table RE28.2: Emission summary (Bluetooth, BR, 2402 MHz)

The graph below shows the background spectrum observed during pre-scan, as well as the final data points from the table above.

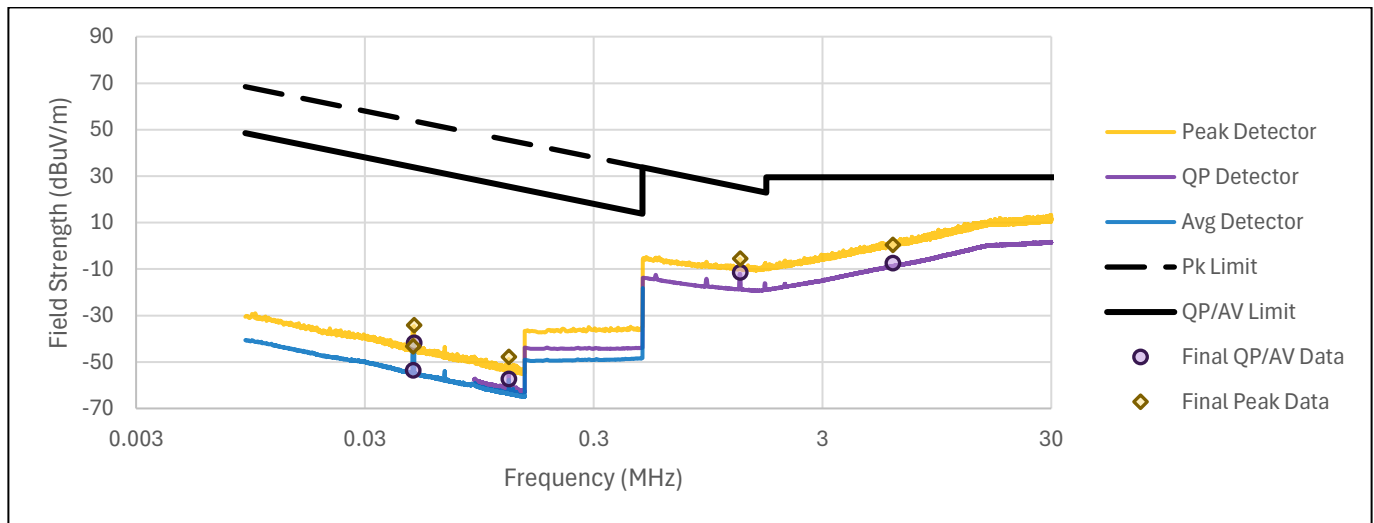


Figure RE28.1: Spectral data (Bluetooth, BR, 2402 MHz)

Freq.	3 m Level	Detector	Distance	Dist Adj	Final Level	Limit	Margin	Peak 3 m	Peak Final	Pk Limit	Pk Margin	Antenna	Table
MHz	dBuV/m	Type	m	dB	dBuV/m	dBuV/m	dB	dBuV/m	dBuV/m	dBuV/m	dB	Orientation	Azimuth, deg
0.04925	36.29	Avg	300	80.00	-43.71	33.76	77.47	42.62	-37.38	53.76	91.14	X	172
0.067	26.73	Avg	300	80.00	-53.27	31.08	84.35	35.88	-44.12	51.08	95.20	Y	-129
0.12765	22.59	Avg	300	80.00	-57.41	25.48	82.89	32.75	-47.25	45.48	92.73	Z	104
0.5595	28.63	QP	30	40.00	-11.37	32.65	44.02	36.36	-3.64	None	None	X	3
0.93525	26.96	QP	30	40.00	-13.04	28.19	41.23	33.77	-6.23	None	None	X	-187
1.3088	29.17	QP	30	40.00	-10.83	25.27	36.10	35.33	-4.67	None	None	X	85

Table RE28.3: Emission summary (Bluetooth, EDR2, 2440 MHz)

The graph below shows the background spectrum observed during pre-scan, as well as the final data points from the table above.

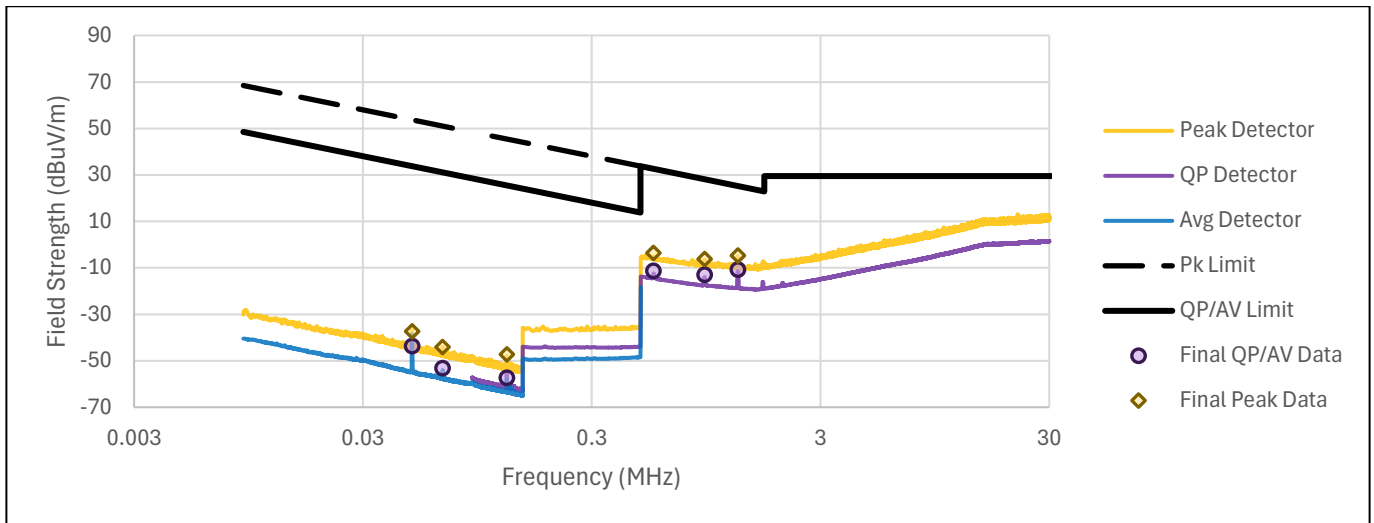


Figure RE28.2: Spectral data (Bluetooth, EDR2, 2440 MHz)

Setup Photographs

The following photographs show the EUT configured and arranged in the manner in which it was measured.

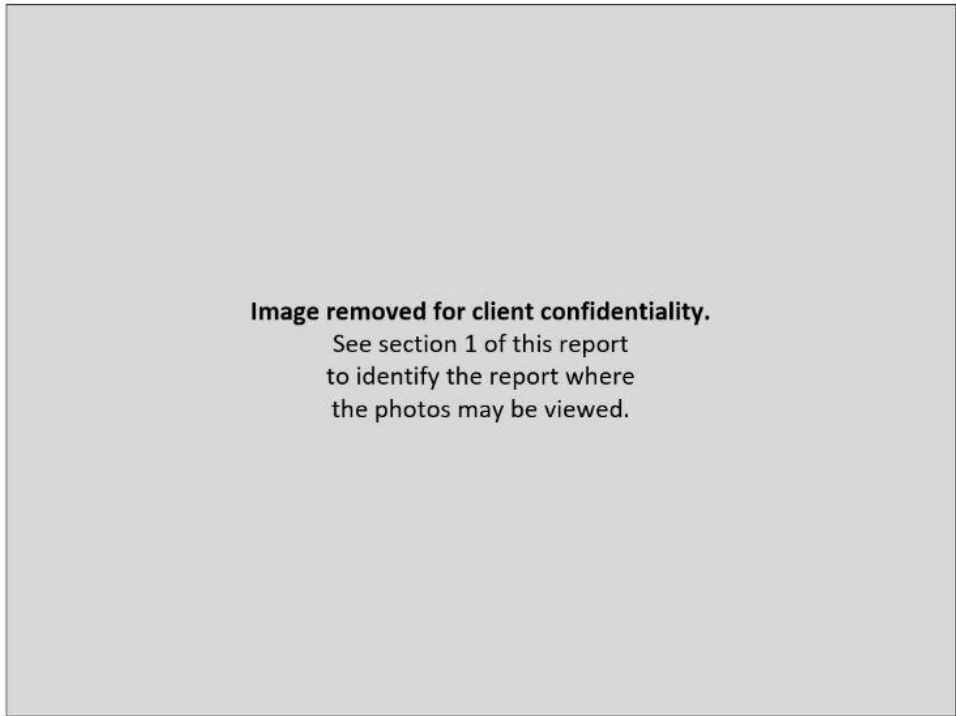


Figure RE28.3: EUT test setup, first view

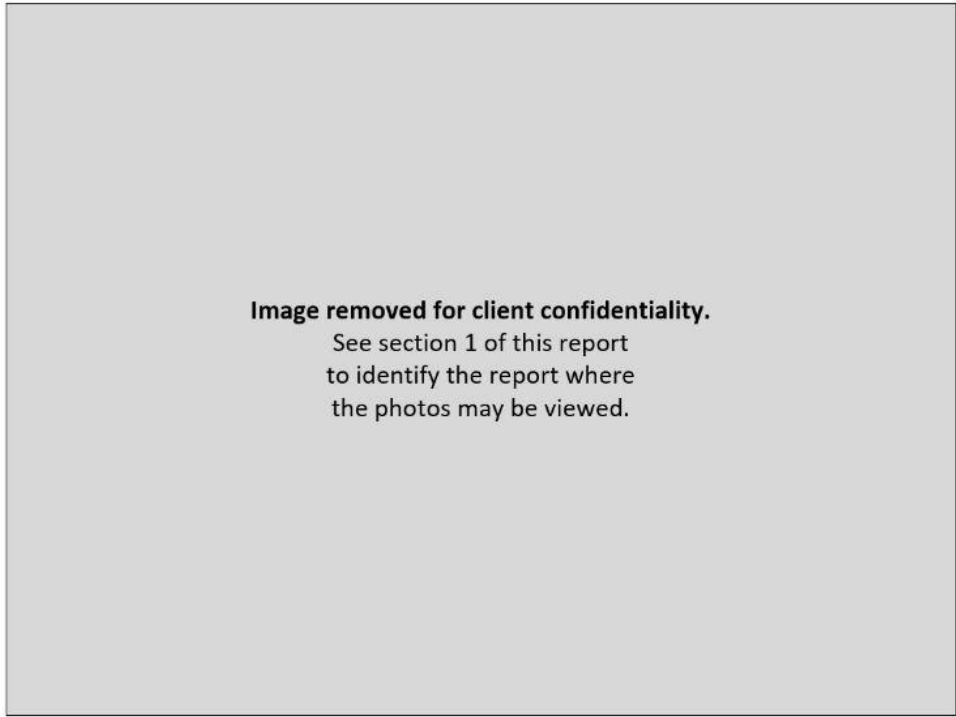


Figure RE28.4: EUT test setup, second view (Antenna, X orientation)

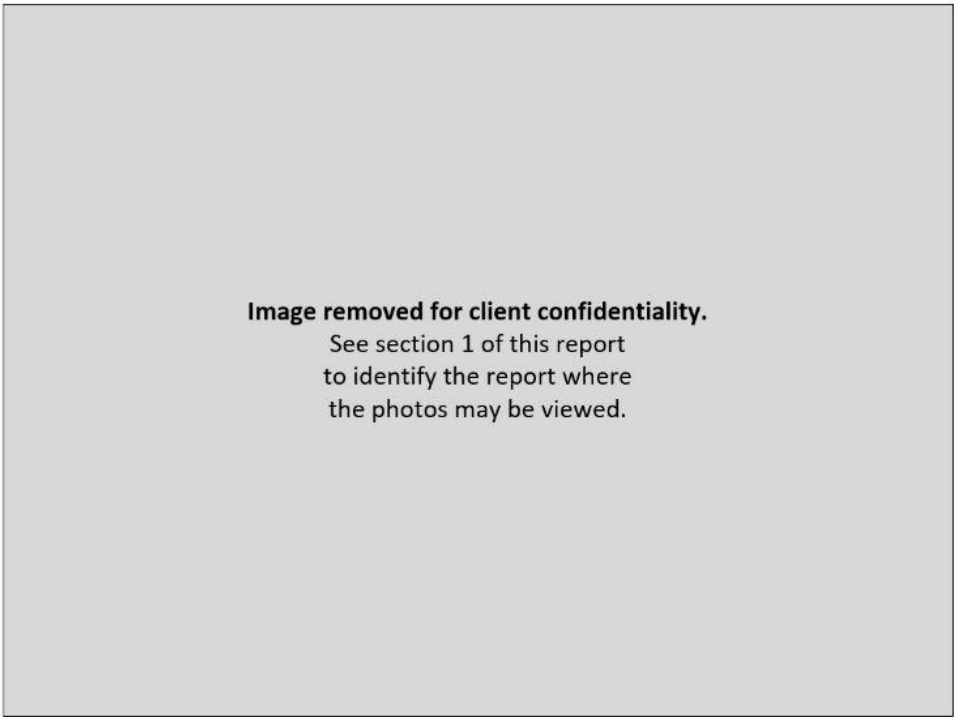


Figure RE28.5: EUT test setup, third view (Antenna, Y orientation)



Figure RE28.6: EUT test setup, forth view (Antenna, Z orientation)

This line is the end of the test record.

10.2.4 Unwanted Emissions Outside the Frequency Bands of Operation, Radiated 30-1000 MHz

Relevant standards include:

CFR47 Parts 15.247(d), 15.209

RSS-247 6.6

RSS-GEN 8.9, 8.10

ANSI C63.10 sections 6.3, 6.5, 7.8.8

Test and Data Overview

See [Section 10.2.1](#).

Test Record
Radiated Emission Test
Test ID RE58
Project GCL1030

Test Date(s): 16 Apr 2026
Test Personnel: Andy Heier

Product Model: A05147
Serial Number tested: 8WP000266

Operating Mode: BTCTx
Arrangement: A4 (Udc)
Input Power: USB 5 Vdc

Test Standards: FCC Part 15.247, RSS-247, RSS-GEN, ANSI 63.10 (as noted in Section 5 of the report).

Frequency Range: 30 MHz to 1000 MHz
Pass/Fail Judgment: PASS

Test record created by: Andy Heier
Date of this record: 17 Apr 2026

Original record, Version A.

Test Equipment

Description	Make	Model #	Serial #	Last Cal/Ver	Next Due
PXE Receiver 26 GHz	Keysight	N9048B	MY59290135	9-Dec-2025	9-Dec-2026
Antenna, Biconilog, 30M-6 GHz	ETS Lindgren	3142E	00233204	11-Nov-2025	11-Nov-2027
SAC 3m, below 1 GHz	Frankonia	SAC3	F199004	11-Dec-2024	11-Dec-2027
Tape Measure, 1-3/16 in x 33 ft	Crecent Lufkin	L1135CME-02	GMN0013783	Calibration	Not Required

Table RE58.1: Test Equipment Used

Software Used: Keysight PXE software A.32.06, EPX test software Version 2025.01.000

Test Data

For test standards that require reorienting the test sample, preliminary scans were taken in those alternate orientations to find the orientation that produced that largest field at the receive antenna. With intentional radiators, that highest field is usually found at the carrier frequency. The alternate orientations are typically described as X, Y, and Z and explained with a photograph. Subsequent testing was done using on the orientation identified in this way.

The radiated emission test process continued with a preliminary scan at multiple turntable angles, antenna heights, and both antenna polarizations. Where the test standard requires cable manipulation, this was done at one of more likely worst case frequencies selected by the test personnel while observing the receiver display. At each of the frequencies selected for final measurements, the turntable angle, antenna height, and antenna polarization were explored to find the worst-case settings. Final field strength measurements were taken in that set of positions. Full maximization was not performed at frequencies that are noise floor measurements included per the test standard requirements.

At azimuth angle 180° the 'front' reference mark of the turntable is pointed Southward. At 270° the reference mark points West. At 90° it points East. At 173° the turntable reference mark is pointed directly at the antenna. The designation of the X, Y, and Z orientations of the test sample are sample dependent, so these are reported by use of photographs.

The table shows the selected final measurement data between 30 MHz and 1 GHz. It includes at least the six strongest emissions observed relative to the test limit, along with other data points of interest. Where a data point is highlighted is yellow, this is an aid to indicate the data point(s) with the least margin to the test limit. A positive margin value indicates that the emission was below the test limit. The test limit is the FCC Class B Limit at 3m. Any unintentional radio emission limits are not applied to intentional radio signals.

Emissions within the restricted bands were measured with an averaging process described in the ANSI C63.10 methods noted in this paragraph. (See also section 6.3 of this test report.) The duty cycle for the BTC radio had a duty cycle of 98% or greater and so the trace-averaging method of clause 11.12.2.5.1 was applied.

In this test, fewer than six emissions were observed within 20 dB of the limit. The relevant emissions were measured, including one or more noise floor signals as judged appropriate to the spectrum.

Frequency	Pol.	Reading	Factor	Level	Limit	Margin	Height	Angle
MHz		dB(μV)	dB(1/m)	dB(μV/m)	dB(μV/m)	dB	cm	deg
		QP		QP	QP	QP		
40.290	V	12.6	17.2	29.8	40.0	10.2	100.0	358.0
90.180	V	5.3	14.6	19.9	43.5	23.6	100.0	76.0
946.350	V	0.5	35.7	36.2	46.0	9.8	331.8	358.0

Table RE58.2: Emission summary (BTC BR, 2402 MHz)

The graph below shows the background spectrum observed during pre-scan, as well as the final data points from the table above.

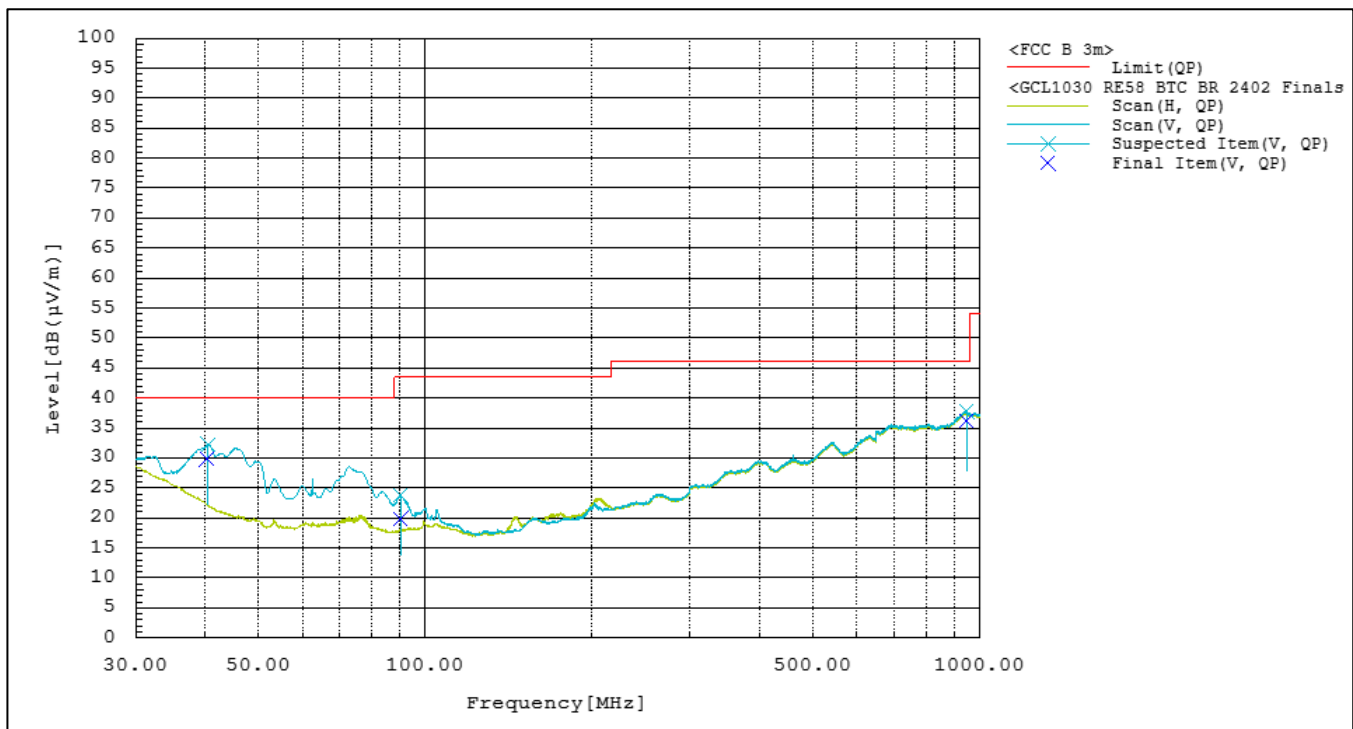


Figure RE58.1: Spectral data (BTC BR, 2402 MHz)

Frequency	Pol.	Reading	Factor	Level	Limit	Margin	Height	Angle
MHz		dB(μV)	dB(1/m)	dB(μV/m)	dB(μV/m)	dB	cm	deg
		QP		QP	QP	QP		
207.810	H	3.1	18.9	22.0	43.5	21.5	129.2	242.0
945.750	H	0.1	35.7	35.8	46.0	10.2	176.4	304.0
45.330	V	15.3	15.1	30.4	40.0	9.6	100.0	162.0

Table RE58.3: Emission summary (BTC EDR 2, 2440 MHz)

The graph below shows the background spectrum observed during pre-scan, as well as the final data points from the table above.

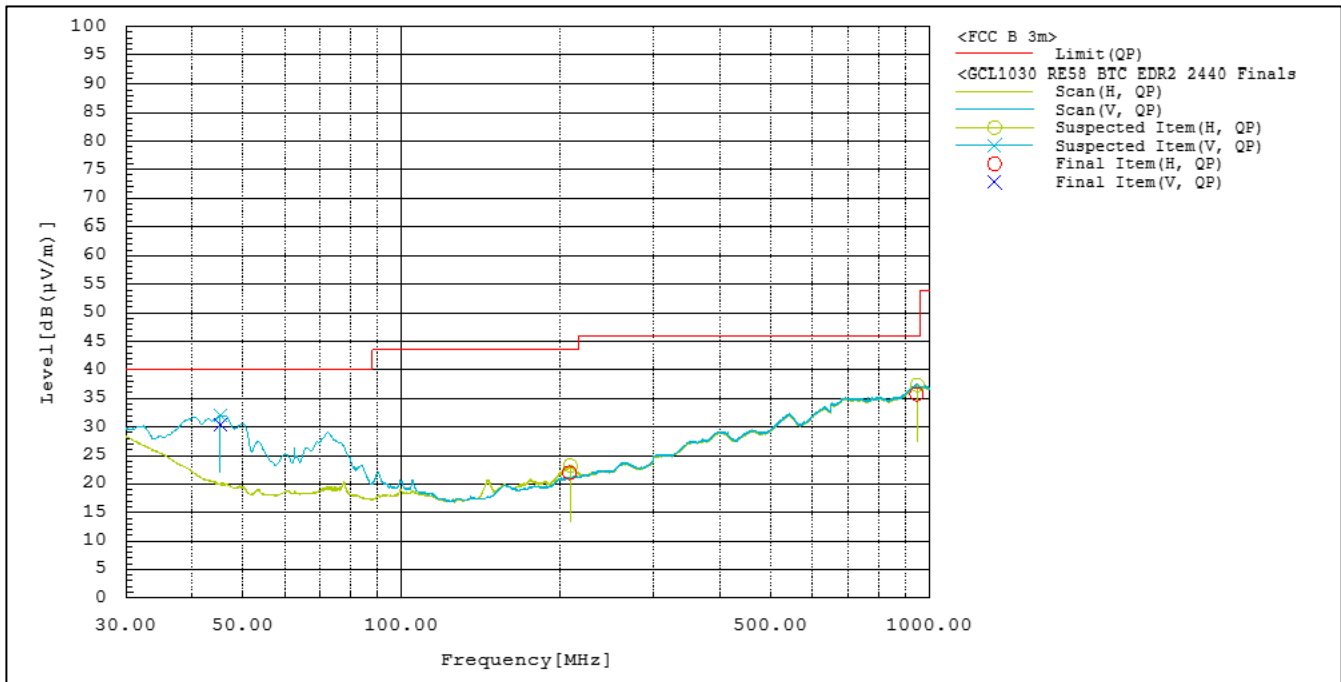


Figure RE58.2: Spectral data (BTC EDR 2, 2440 MHz)

Setup Photographs

The following photographs show the EUT configured and arranged in the manner in which it was measured.



Figure RE58.2: EUT test setup, first view



Figure RE58.3: EUT test setup, second view

This line is the end of the test record.

10.2.5 Unwanted Emissions in the Restricted Bands adjacent to the Frequency Bands of Operation

Relevant standards include:

CFR47 Parts 15.247(d), 15.205

RSS-247 6.6

RSS-GEN 8.9, 8.10

ANSI C63.10 sections 6.3, 6.6, 7.8.8

Test and Data Overview

This section presents data that is a special case of the measurement of [radiated emissions outside the frequency bands of operation](#). This section looks specifically at emissions appearing in three restricted bands that are very close to the bands allocated for the operation of these radios. There are two lower bands (2200 to 2300 MHz and 2310 to 2490 MHz), and one upper band (2483.5 to 2500 MHz). In these bands the radiated emission limits at the 3 m measuring distance are 54 dB μ V/m with an average detector, and 74 dB μ V/m with a peak detector. The test method followed the general instructions at ANSI C63.10 sections 6.3 and 6.6. The average detection was implemented using an appropriate method from section 11.12.2.5.

For IEEE 802.11 (WiFi) radios, preliminary testing was performed on a sample with an RF port. The plan for that preliminary test used the channels of interest for each radio type. A channel is of interest when the [transmitter output power](#) on the channel was observed to be lower relative to the center channels. The data was taken in dBm units as generally described at ANSI C63.10 section 11.12.2.2 step a, with no attempt to convert to field values. The purpose was to find, for each channel of interest, the data rate with the highest results and likely least margin to the limit. Radiated testing was performed using likely worst-case modulation identified on each of these channels for b mode, and for g or n mode.

A similar process of preliminary testing may have been applied to other 2.4 GHz radios. The channels to be tested were selected with an understanding of the transmitter output power data, and any output power reductions on upper or lower channels.

For each basic modulation type, data are presented in this report section for the lowest and highest channels as well as any inward channels selected for investigation.

Test Record**Radiated Emission Test RE01****Project GCL1030**

Test Date(s) 04, 05 Mar 2026
Test Personnel Vladimir Tolstik

Product Model A05147
Serial Number tested 8WP000276

Operating Mode BTCTx
Arrangement A4 (Udc)
Input Power USB 5 Vdc

Test Standards: FCC Part 15; RSS-247; RSS-GEN; ANSI C63.10 (as noted in Section 5 of the report)

Frequency Range: Restricted Bands (2200-2300 MHz, 2310-2390 MHz, 2483.5-2500 MHz)
Pass/Fail Judgment: PASS

Test record created by: Vladimir Tolstik
Date of this record: 09 Mar 2026

Original record, Version A.

Test Equipment

Description	Make	Model #	Serial #	Last Cal/Ver	Next Due
PXE Receiver 26 GHz	Keysight	N9048B	MY59290135	9-Dec-2025	9-Dec-2026
Antenna, Horn, 1-18 GHz	ETS Lindgren	3117	00227596	11-Nov-2025	11-Nov-2027
FSOATS 3m, above 1 GHz	Frankonia	SAC3	F199004	13-Dec-2024	13-Dec-2027
Preamplifier, 500 MHz 18 GHz	Com-Power	PAM-118A	18040133	Calibration	Not Required
Wifi Filter	K&L	8NSL26-2437/E82.2-0/0	1	Calibration	Not Required

Table RE01.1: Test Equipment Used**Software Used**

Keysight PXE receiver software A.32.06, RE Signal Maximization Tool v2025May27.xlsx,
FCC Restricted Band 2p4GHz Data Analysis Template v3a NS.xlsx

Test Data

US and Canadian laws contain dozens of bands where radio operation is restricted. Compliance with most of those band restrictions is typically demonstrated by a series of spurious emission tests covering a very wide span of frequencies from kilohertz to Gigahertz. This test record focuses on restricted bands that are immediately adjacent to the authorized band in which the test sample radio operate. It shows whether the modulation products are sufficiently suppressed to meet the restricted band requirements.

The radiated emission test began with a preliminary scan in each restricted band at multiple turntable angles, antenna heights, and both antenna polarizations. For test standards that require reorienting the test sample, further preliminary scans were taken in those alternate orientations typically described as X, Y, and Z. Subsequent testing was done using on the orientation(s) producing the highest result relative to the test limit. Final field strength measurements were taken in that set of positions.

Restricted band measurements in the lower band were made while the transmitter was tuned to its lowest frequency of 2402 MHz. Measurements in the upper band were made while the transmitter was tuned to frequencies of 2464 MHz, 2466 MHz and 2480 MHz.

At azimuth angle 0° the 'front' reference mark of the turntable is pointed Southward. At 90° the reference mark points West. At -90° it points East. At -7° the turntable reference mark is pointed directly at the antenna. The designation of the X, Y, and Z orientations of the test sample are sample dependent, so these are reported by use of photographs.

The tables show the selected final measurement data between the FCC restricted bands. It includes a the strongest emissions observed relative to the test limit, along with other data points of interest. Where a data point is highlighted is yellow, this is an aid to indicate the data point(s) with the least margin to the test limit. A positive margin value indicates that the emission was below the test limit. The test limit is the FCC restricted band 'Class B' Limit at 3 m listed at 15.209 and RSS-Gen clause 8.9.

Emissions within the restricted bands were measured with an averaging process described in the ANSI C63.10 methods noted in this paragraph. (See also section 6.3 of this test report.) The duty cycle for the Bluetooth Classic radio had a duty cycle of 98% or greater and so the trace-averaging method of clause 11.12.2.5.1 was applied.

Frequency (MHz)	Avg Limit (dBµV/m)	Pk Limit (dBµV/m)	Avg Level (dBµV/m)	Pk Level (dBµV/m)	Av Margin (dB)	Pk Margin (dB)	Azimuth (degree)	Height (mm)	Polarity ---	Avg Type ---	DC Adjust (dB)
2390	54	74	35.61	49.19	18.39	24.81	178	1717	HORZ	RMS	0.00
2390	54	74	35.62	49.33	18.38	24.67	178	1717	HORZ	RMS	0.00

Table RE01.2: FCC restricted bands from 2200 to 2390 MHz (Bluetooth, BR, 2402 MHz)

Frequency (MHz)	Avg Limit (dBµV/m)	Pk Limit (dBµV/m)	Avg Level (dBµV/m)	Pk Level (dBµV/m)	Av Margin (dB)	Pk Margin (dB)	Azimuth (degree)	Height (mm)	Polarity ---	Avg Type ---	DC Adjust (dB)
2389	54	74	34.99	48.85	19.01	25.16	178	1717	HORZ	RMS	0.00
2390	54	74	35.36	49.04	18.64	24.96	178	1717	HORZ	RMS	0.00

Table RE01.3: FCC restricted bands from 2200 to 2390 MHz (Bluetooth, EDR2, 2402 MHz)

Frequency (MHz)	Avg Limit (dBµV/m)	Pk Limit (dBµV/m)	Avg Level (dBµV/m)	Pk Level (dBµV/m)	Av Margin (dB)	Pk Margin (dB)	Azimuth (degree)	Height (mm)	Polarity ---	Avg Type ---	DC Adjust (dB)
2483.5	54	74	34.31	47.71	19.69	26.29	177	1664	HORZ	RMS	0.00
2483.5	54	74	34.31	47.99	19.69	26.01	177	1664	HORZ	RMS	0.00

Table RE01.4: FCC restricted band from 2483.5 to 2500 MHz (Bluetooth, BR, 2464 MHz)

Frequency (MHz)	Avg Limit (dBµV/m)	Pk Limit (dBµV/m)	Avg Level (dBµV/m)	Pk Level (dBµV/m)	Av Margin (dB)	Pk Margin (dB)	Azimuth (degree)	Height (mm)	Polarity ---	Avg Type ---	DC Adjust (dB)
2483.5	54	74	39.54	53.11	14.46	20.89	177	1664	HORZ	RMS	0.00
2483.5	54	74	39.54	53.98	14.46	20.02	177	1664	HORZ	RMS	0.00

Table RE01.5: FCC restricted band from 2483.5 to 2500 MHz (Bluetooth, BR, 2480 MHz)

Frequency (MHz)	Avg Limit (dBµV/m)	Pk Limit (dBµV/m)	Avg Level (dBµV/m)	Pk Level (dBµV/m)	Av Margin (dB)	Pk Margin (dB)	Azimuth (degree)	Height (mm)	Polarity ---	Avg Type ---	DC Adjust (dB)
2483.5	54	74	34.33	48.04	19.67	25.96	177	1664	HORZ	RMS	0.00
2483.5	54	74	34.32	48.44	19.68	25.56	177	1664	HORZ	RMS	0.00

Table RE01.6: FCC restricted band from 2483.5 to 2500 MHz (Bluetooth, EDR2, 2466 MHz)

Frequency (MHz)	Avg Limit (dBµV/m)	Pk Limit (dBµV/m)	Avg Level (dBµV/m)	Pk Level (dBµV/m)	Av Margin (dB)	Pk Margin (dB)	Azimuth (degree)	Height (mm)	Polarity ---	Avg Type ---	DC Adjust (dB)
2483.5	54	74	40.08	55.51	13.92	18.49	177	1664	HORZ	RMS	0.00
2483.5	54	74	40.06	55.23	13.95	18.77	177	1664	HORZ	RMS	0.00

Table RE01.7: FCC restricted band from 2483.5 to 2500 MHz (Bluetooth, EDR2, 2480 MHz)

The graphs below show the background spectrum observed during pre-scan, as well as the final data points from the table above.

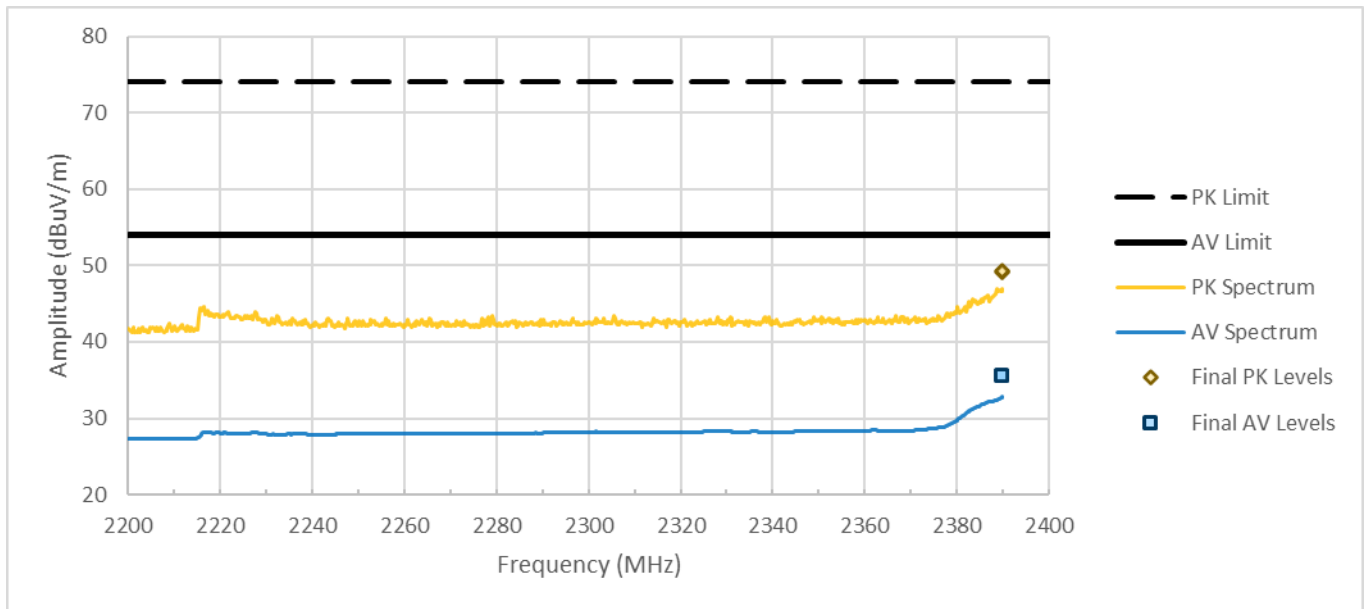


Figure RE01.1: FCC restricted band spectral data from 2200 to 2390 MHz (Bluetooth, BR, 2402 MHz)

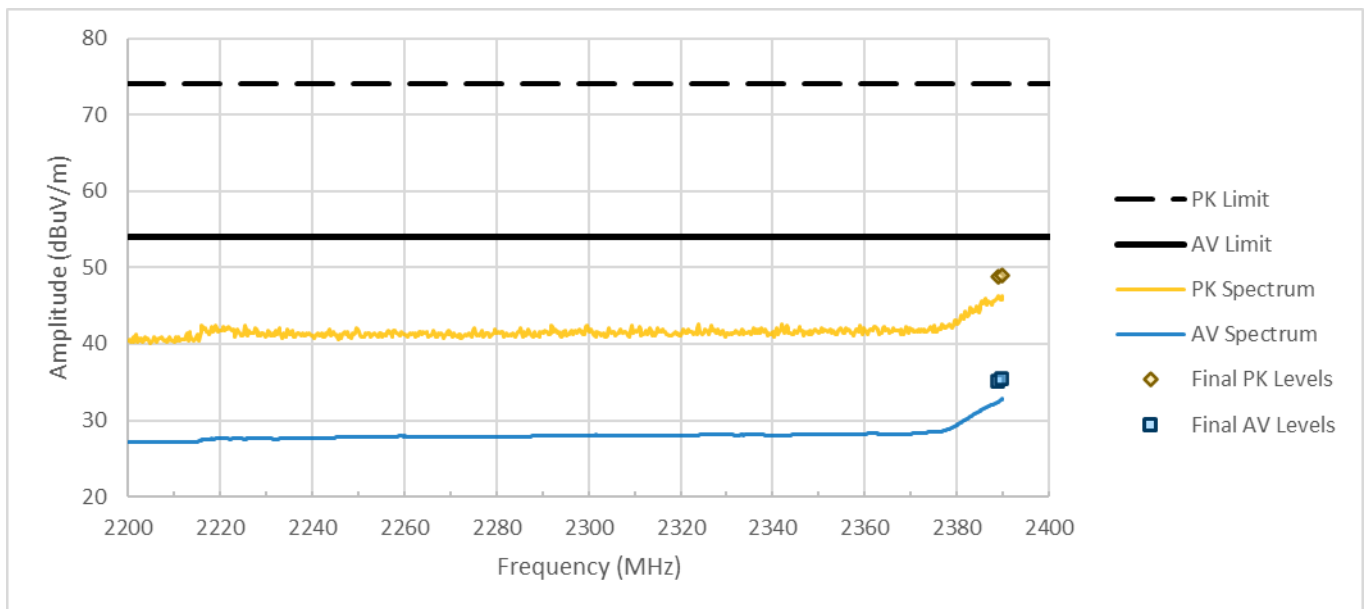


Figure RE01.2: FCC restricted band spectral data from 2200 to 2390 MHz (Bluetooth, EDR2, 2402 MHz)

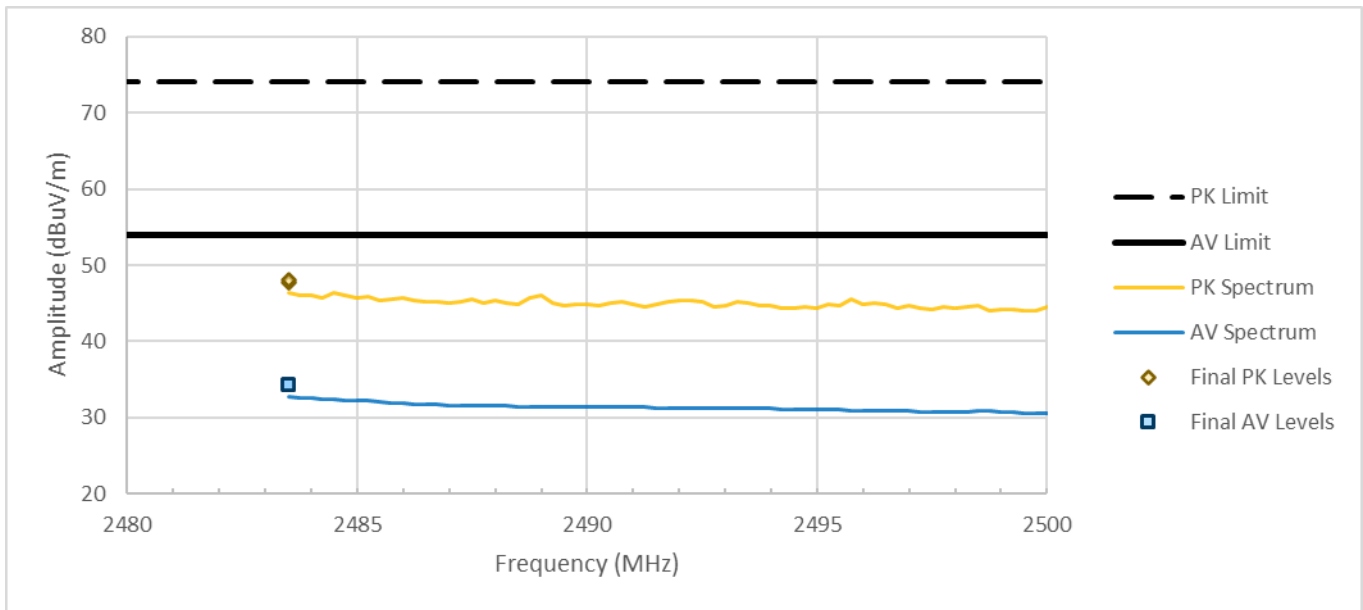


Figure RE01.3: FCC restricted band spectral data from 2483.5 to 2500 MHz (Bluetooth, BR, 2464 MHz)

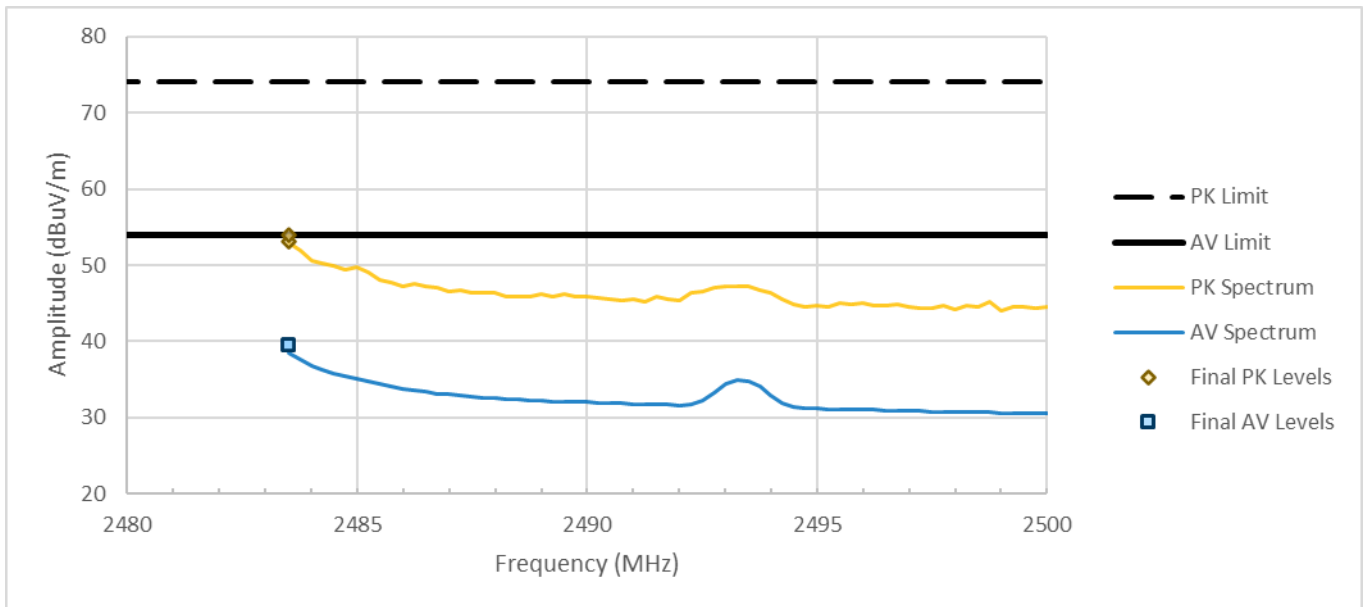


Figure RE01.4: FCC restricted band spectral data from 2200 to 2390 MHz (Bluetooth, BR, 2480 MHz)

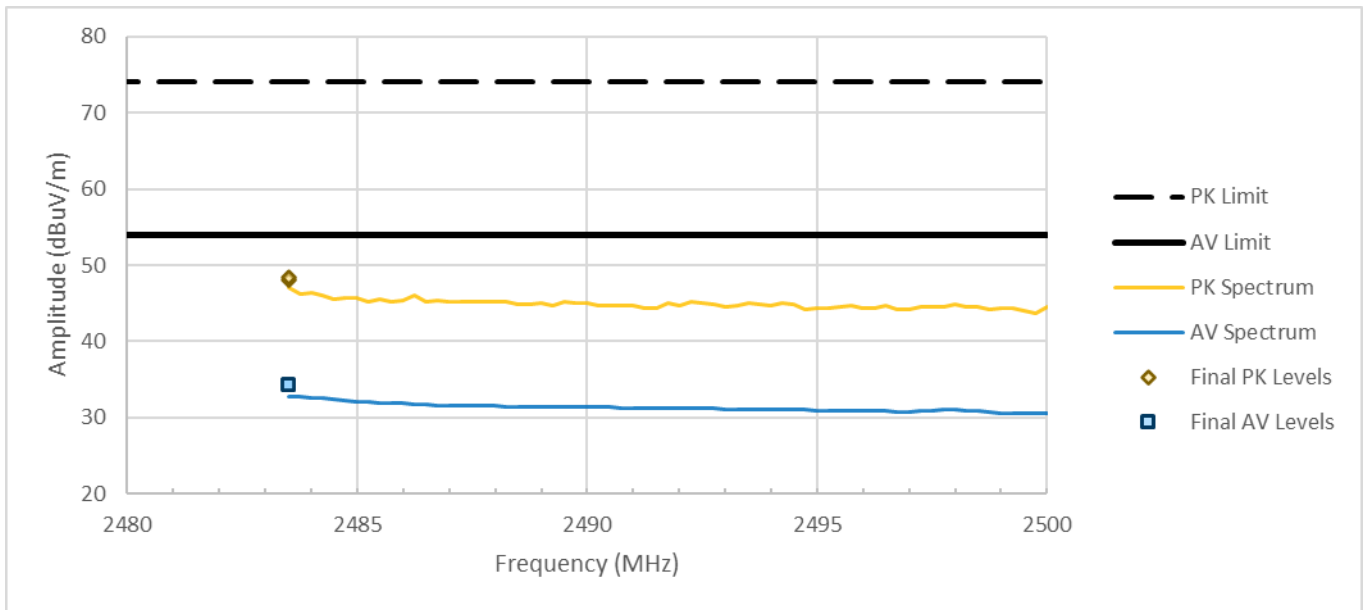


Figure RE01.5: FCC restricted band spectral data from 2483.5 to 2500 MHz (Bluetooth, EDR2, 2466 MHz)

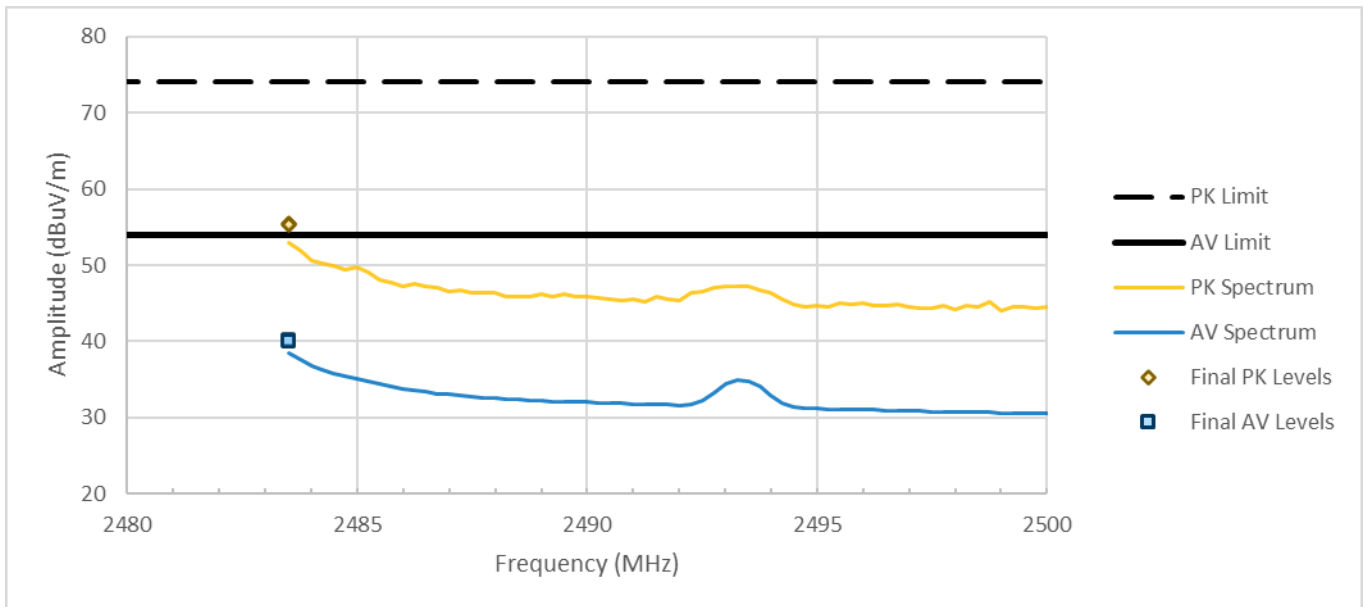


Figure RE01.6: FCC restricted band spectral data from 2200 to 2390 MHz (Bluetooth, EDR2, 2480 MHz)

Setup Photographs

The following photographs show the EUT configured and arranged in the manner in which it was measured.



Figure RE01.7: EUT test setup, primary view



Figure RE01.8: EUT test setup, reverse view

This line is the end of the test record.

10.3 Other Test Results

10.3.1 AC powerline conducted emissions

Relevant standards include:

CFR47 Parts 15.207

RSS-GEN 8.8

ANSI C63.10 section 6.2

Test and Data Overview

The standards limit the RF emission currents that can be conducted onto the line and neutral AC mains power conductors, which could then act as transmitting antennas for these RF currents. This requirement applies if the transmitter can be active while receiving mains-sourced electrical power. It applies whether the product has its own AC mains connection or is powered from the AC mains by an intermediary device like an AC/DC power converter.

The limits are found in FCC Part 15.207 and RSS-GEN table 4 (which are the same as the Class B limits in FCC Part 15.107 and ICES-003 tables 1). The test method is found in ANSI C63.10 section 6.2.

The operating modes used during this test were selected with an awareness of the [output power](#) of the transmitter for different channels and data rates, as well as the [radiated spurious emission](#) data.

Test Record**Conducted Emissions Mains Test****Test ID CE02****Project GCL1030**

Test Date(s):	16 Apr 2026
Test Personnel:	Aditya Prakash
Product Model:	A05147
Serial Number tested:	8WP000271
Operating Mode:	BTCTx
Arrangement:	A4 (Udc)
Input Power:	120 Vac 60 Hz
Test Standards:	FCC Part 15, ANSI C63.10, RSS-247, RSS-GEN (as noted in Section 5 of the report).
Frequency Range:	150 kHz to 30 MHz
Pass/Fail Judgment:	PASS
Test record created by:	Aditya Prakash
Date of this record:	17 Apr 2026

Original record, Version A.

Test Equipment Used

Description	Make	Model #	Serial #	Last Cal/Ver	Next Due
PXE Receiver 44 GHz	Keysight	N9048B	MY62220139	4-Sep-2025	4-Sep-2026
Tape Measure, 1-3/16 in x 33 ft	Crecent Lufkin	L1135CME-02	GMN0013782	Calibration	Not Required
LISN multiline; 15A to 9kHz	Com-Power	LI-215A	192027	19-Feb-2024	15-Feb-2027
Coaxial Power Cable	Garmin	RG214/U	20240123-01	19-Feb-2024	15-Feb-2027

Table CE02.1: Test Equipment Used

Software Used: Keysight PXE software A.33.03; CE Mains 150k to 30M Data Analysis V4b NS.xlsx

Test Data

The conducted emission test process began with a set of preliminary scans on both power conductors using both Quasi-Peak and Average detectors across the frequency range. Where the test standard requires cable manipulation, one or more likely worst case frequencies selected by the test personnel. Cables were manipulated to find the maximal signal strength while observing the receiver levels at those selected frequencies. At each of the frequencies selected for final measurements, Quasi-peak and Average detector readings were taken on each conductor.

The table shows the selected final measurement data. It includes at least the six strongest emissions observed relative to the limit lines, along with other data points of interest. The yellow highlight indicate the data points with the least margin to the quasi-peak detector limit and the average detector limit. A positive margin value indicates that the emission was below the test limit. The test limit is the Composite FCC/CISPR Class B Limit.

In this test, fewer than six emissions were observed within 20 dB of the limit. The relevant emissions were measured, including one or more noise floor signals as judged appropriate to the spectrum.

Frequency	QP Limit	AV Limit	L1 QP	L2 QP	L1 AV	L2 AV	QP Margin	AV Margin
(kHz)	(dBμV)	(dBμV)	(dBμV)	(dBμV)	(dBμV)	(dBμV)	(dB)	(dB)
150	66.00	56.00	30.94	30.87	21.12	20.68	35.06	34.88
164	65.28	55.28	28.30	28.20	20.53	20.30	36.98	34.76
436	57.14	47.14	25.63	21.65	20.88	16.85	31.51	26.26
715	56.00	46.00	24.62	17.07	19.17	12.30	31.38	26.83
10001	60.00	50.00	25.98	24.72	21.18	20.03	34.02	28.82

Table CE02.2: Emission summary (BTC, BR, 2402 MHz)

The graph below shows preliminary scan data as continuous curves. Superimposed are the final measurement data points reported in the table above.

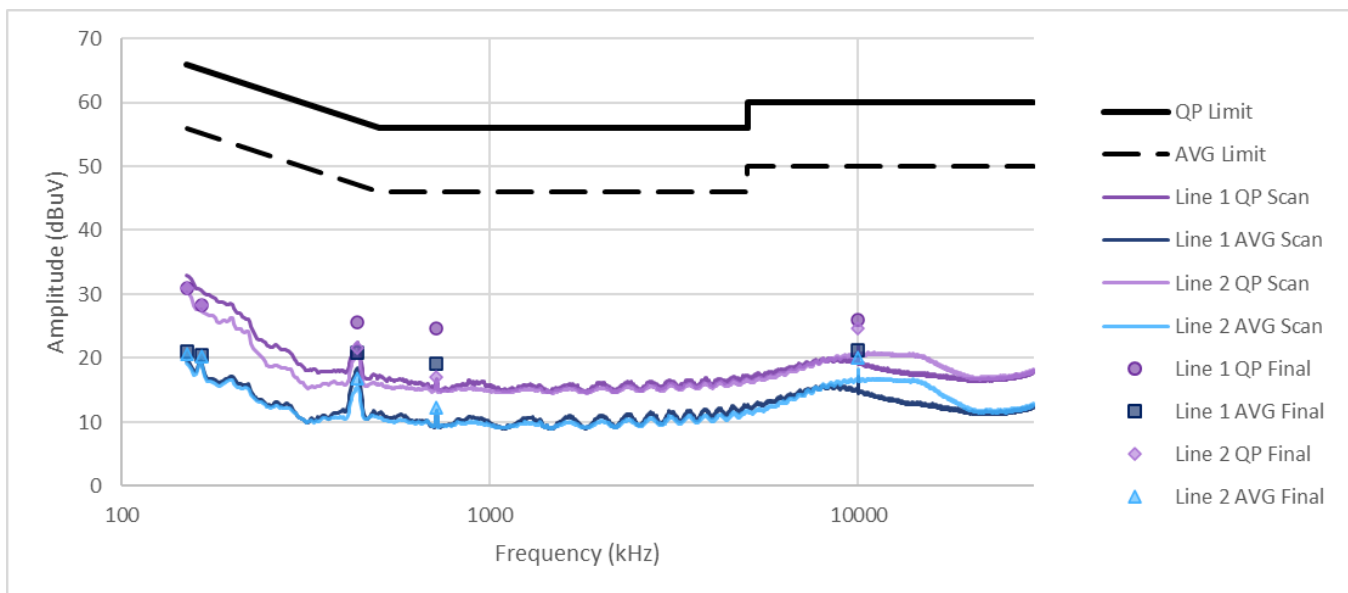


Figure CE02.1: Spectral data (BTC, BR, 2402 MHz)

Frequency	QP Limit	AV Limit	L1 QP	L2 QP	L1 AV	L2 AV	QP Margin	AV Margin
(kHz)	(dB μ V)	(dB μ V)	(dB μ V)	(dB μ V)	(dB μ V)	(dB μ V)	(dB)	(dB)
150	66.00	56.00	23.22	30.64	17.68	20.45	35.36	35.55
164	65.28	55.28	23.80	27.96	19.26	19.91	37.32	35.37
197	63.73	53.73	26.58	21.20	18.17	15.92	37.15	35.56
436	57.14	47.14	23.29	23.02	19.71	18.19	33.85	27.44
715	56.00	46.00	16.95	22.25	11.98	16.93	33.75	29.07
10001	60.00	50.00	21.71	22.77	17.89	19.17	37.23	30.83

Table CE02.3: Emission summary (BTC, EDR 2, 2440 MHz)

The graph below shows preliminary scan data as continuous curves. Superimposed are the final measurement data points reported in the table above.

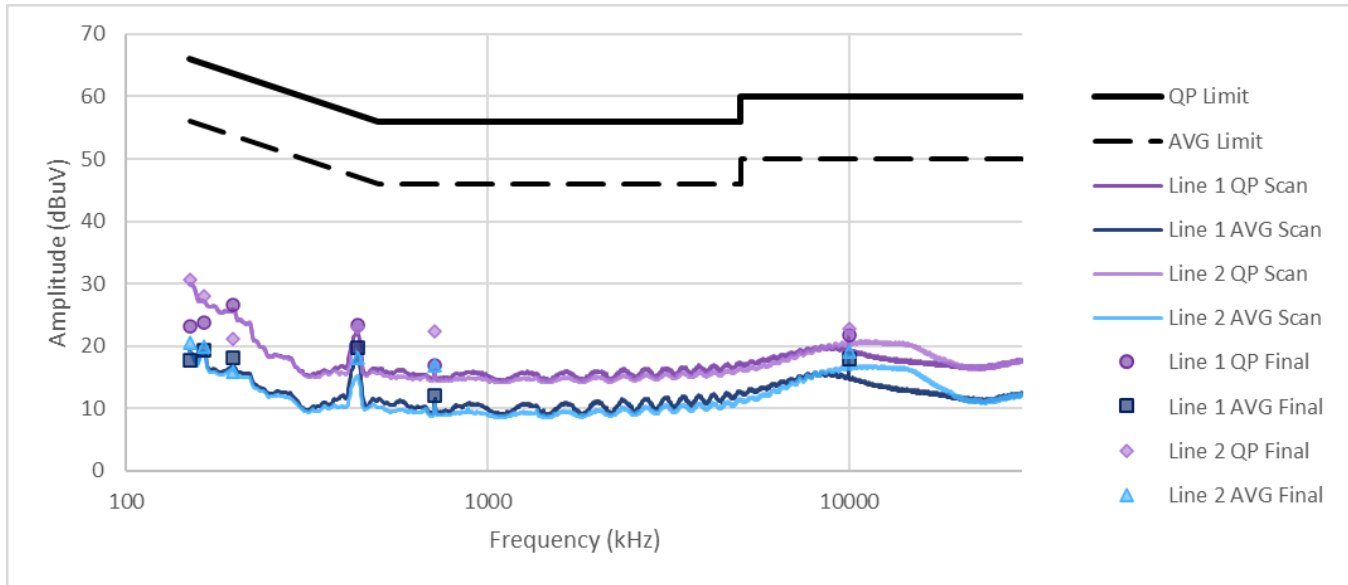


Figure CE02.2: Spectral data (BTC, EDR 2, 2440 MHz)

Setup Photographs

The following photographs show the EUT configured and arranged in the manner in which it was measured.



Figure CE02.4: Test setup, first view

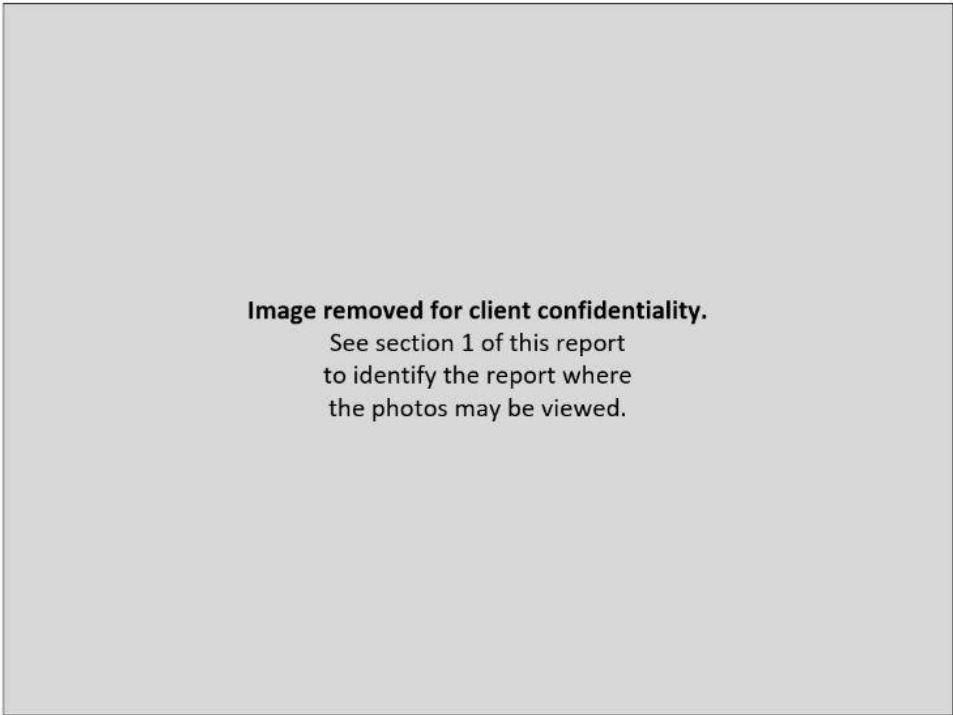


Figure CE02.5: Test setup, second view

This line is the end of the test record.

11. CONCLUDING NOTES

This report stands as an integrated record of the tests performed and must be copied or distributed in its complete form. The reproduction of selected pages or sections separate from the complete report would require specific approval from the manager of the Garmin Compliance Lab.

This is the final page of the report.