

Test Report

Version
Issued

2026-025

B2
09 Jun 2026

Applicant

Garmin International
1200 E 151st St.
Olathe Kansas USA

Client-supplied information:

Model Identifier

A05147

FCC ID

IPH-05147

ISED ID

1792A-05147

Equipment Type

Portable Digital Transceiver

Types of Radio Tested

Bluetooth Low Energy (BLE), IEEE 802.11b/g/n (WiFi)

Radio Classification

2.4 GHz Digital Transmission System (DTS)

Primary Test Standards

CFR 47, FCC Part 15, Subpart C (15.247 DTS)

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

Project Tracking Identifier

GCL-1030



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

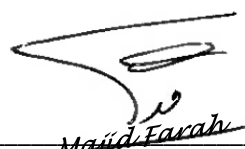
Report History and Approval

Version	Date	Author	Reason for change and/or summary of changes
A	19 May 2026	Andy Heier	Original issuance
B	01 Jun 2026	Andy Heier	Added missing transmit power data for IEEE 802.11g/n starting on page 37 and updated Transmit Power results in the summary table on page 5. Added test ID TR06 to the modifications/changes table on page 8.
B1	02 Jun 2026	Andy Heier	Corrected table and graph labels for test ID RE15 starting on page 72.
B2	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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Senior EMC Engineer



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Report Approval:

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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 IEEE 802.11 (WiFi) and Bluetooth Low Energy (BLE) transceivers. The results are as follows.

FCC	ISED	Requirements	Key Results	Judgment	Data
2.202	RSS-GEN: 6.7	Occupied bandwidth must be reported but there are no limits to apply.	The 99% Occupied bandwidth is 17.82 MHz or less.	Reported	Link RF Port
15.247a2 15.215c	RSS-247: 6.3.1a	The DTS Bandwidth must be at least 500 kHz and must remain within the allowed frequency band.	The 6 dB bandwidth is 777 kHz or greater and remained within the allowed band.	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
15.247b	RSS-247: 6.3.2	Conducted output power presented to the antenna cannot exceed 1 Watt or 30 dBm. The effective radiated power is limited to 4 Watts or 36 dBm EIRP.	The maximum transmit power is 15.08 dBm or 32.21 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.	WiFi: ≥ 98% BLE: ≥ 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.	The margin to the general radiated emission limit was 2.7 dB or greater.	PASS	Link Field: General Link RF Port: Band Edge
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 2 dB or greater. For other restricted bands of operation, the margin to the general radiated emission limit was 2.7 dB or greater.	PASS	Link Field: Band Edge Link Field: General

Table continues on next page

15.247e	RSS-247: 6.3.1b	The power spectral density must be less than 8 dBm in a band of at least 3 kHz.	The power spectral density was -0.85 dBm or less.	PASS	Link RF Port
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 25 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 72 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.)	IEEE 802.11: 20 MHz BLE: 2 MHz	Reported	(None)
(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

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: 26 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. TEST 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	• TR06 Tx Power • TR26 BW6 • TR30 OBW99 • TR61 Band Gap • RE05 Rad. Emissions • RE15 Rad. Emissions • TR47 PSD	Yes
CH2	Reduced power, IEEE 802.11b, Ch 6.	13-Apr-2026	All	To meet radiated emissions requirements for North America	• TR06 Tx Power • TR26 BW6 • TR30 OBW99 • TR61 Band Gap • RE05 Rad. Emissions • RE15 Rad. Emissions • TR47 PSD • TR08 Tx Pwr • TR34 OBW99 • TR32 BW6 • TR48 PSD • RE07 Rad. Emissions • TR66 Band Gap • RE51 Rad. Emissions • RE52 Rad. Emissions	Yes
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	• TR06 Tx Power • TR26 BW6 • TR30 OBW99 • TR61 Band Gap • RE05 Rad. Emissions • RE15 Rad. Emissions • TR47 PSD • TR08 Tx Pwr • TR34 OBW99 • TR32 BW6 • TR48 PSD • RE07 Rad. Emissions • TR66 Band Gap • RE51 Rad. Emissions • RE52 Rad. Emissions • RE61 Rad. Emissions • CE01 Cond. Emissions • CE04 Cond. Emissions • RE60 Rad. Emissions	Yes

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	8WP000266, 8WP000266, 8WP000271, 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, 110-240V, 50-60 Hz at 1.5A
I/O Ports:	USB
Radio Transceivers:	IEEE 802.11 b/g/n, Bluetooth Low Energy
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 BLETx:	Bluetooth Low Energy radio transmitting consistently on a selected channel at 1 Mbps or 2 Mbps.
Mode 7 Wifi2GTx:	The IEEE 802.11 b/g/n radio transmitting consistently on a selected channel, with a specified modulation type, and data rate.

4.4 EUT Arrangement

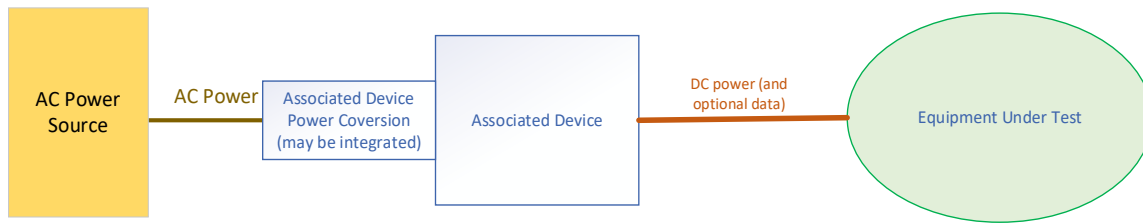
During test, the EUT components and associated support equipment were selected including the following arrangement sets.

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

4.5 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

4.6 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.

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 is an organization within Garmin International distinct from the client. The lab 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 x 10 ⁻⁷	None	1.0 x 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:	41.4% 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.

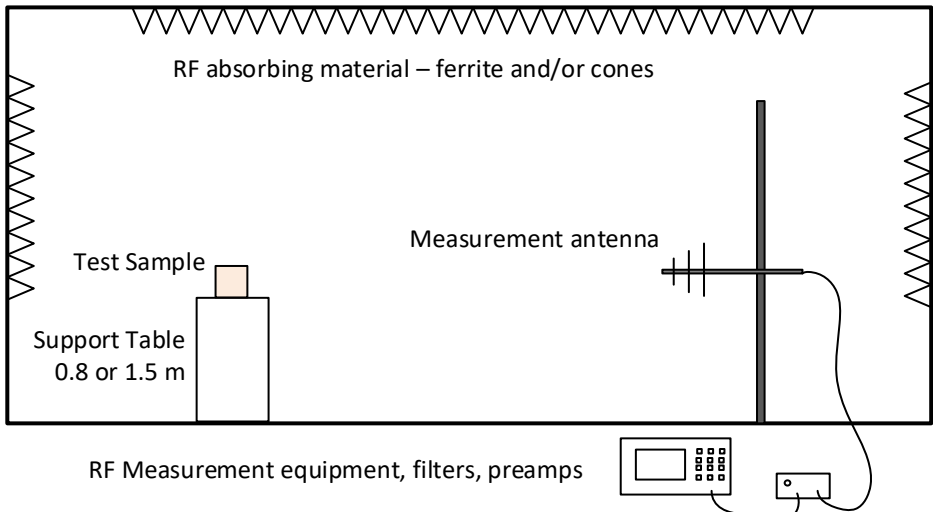


Figure 1: Typical configuration for measurements below 1 GHz

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.

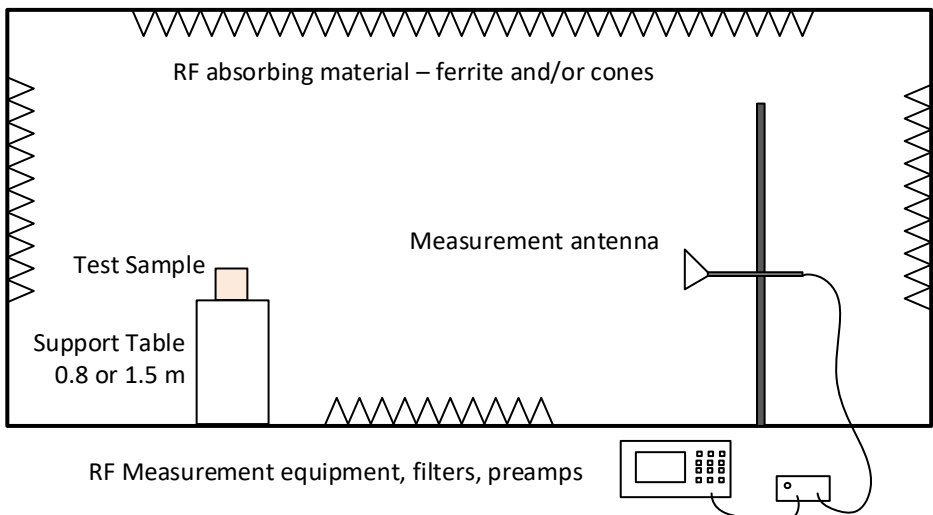


Figure 2: Typical configuration for measurements between 1 GHz and 14 GHz

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.

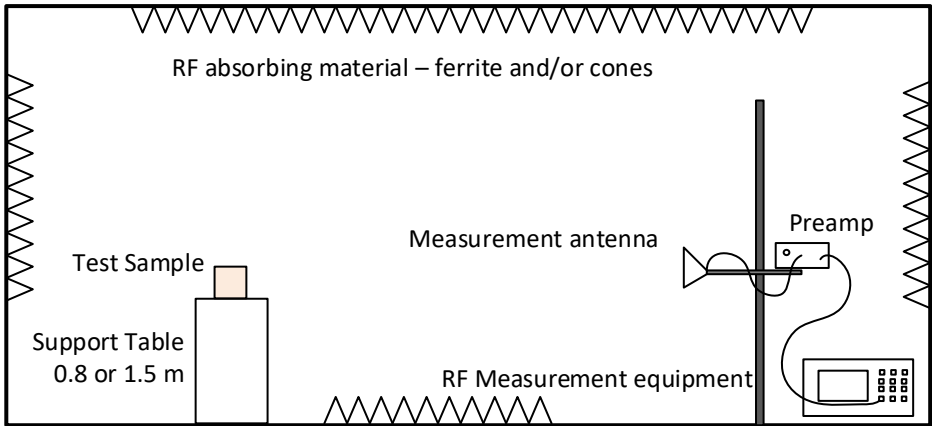


Figure 3: Typical configuration for measurements above 14 GHz

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

Relevant standards include:

CFR47 Part 2.202, 15.215c

RSS-GEN 6.7

ANSI C63.10 section 6.9

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.

Test Record

Transmitter Bandwidth Tests

Test IDs TR30

Project GCL1030

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

Product Model A05147
Serial Number tested 8WP000264

Operating Mode Wifi2GTx
Arrangement A2 (Upwr)
Input Power USB 5

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

Radio Protocol IEEE 802.11 b/g/n (WiFi)
Radio Band 2400 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 TR30.1 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.

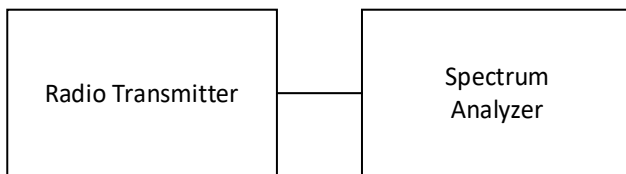


Figure TR30.1: Test setup

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.

	Ch1	Ch6	Ch11	Ch13
B1	14.267	14.934	15.024	14.262
G6	16.375	17.414	16.987	16.162
G12	16.467	17.522	16.861	16.125
NMCS1	17.018	17.823	17.618	16.849
NMCS2	17.082	17.798	17.619	16.818

Table TR30.2: Summary of 99% Occupied Bandwidth Data for IEEE 802.11 WiFi modes

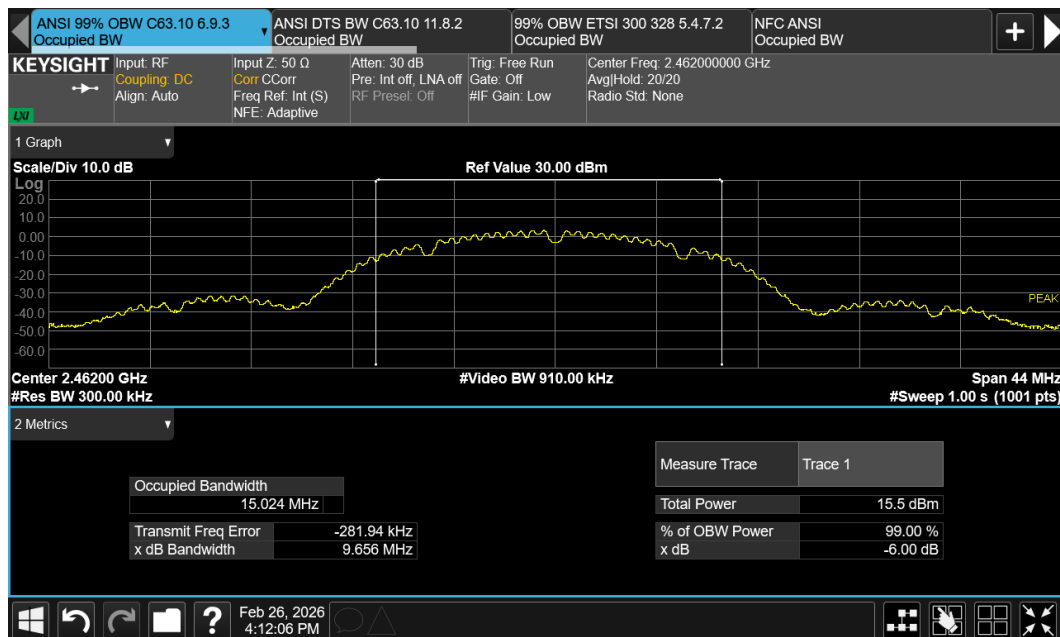


Figure TR30.2: Occupied bandwidth data for 802.11b 1 Mbps at channel 11

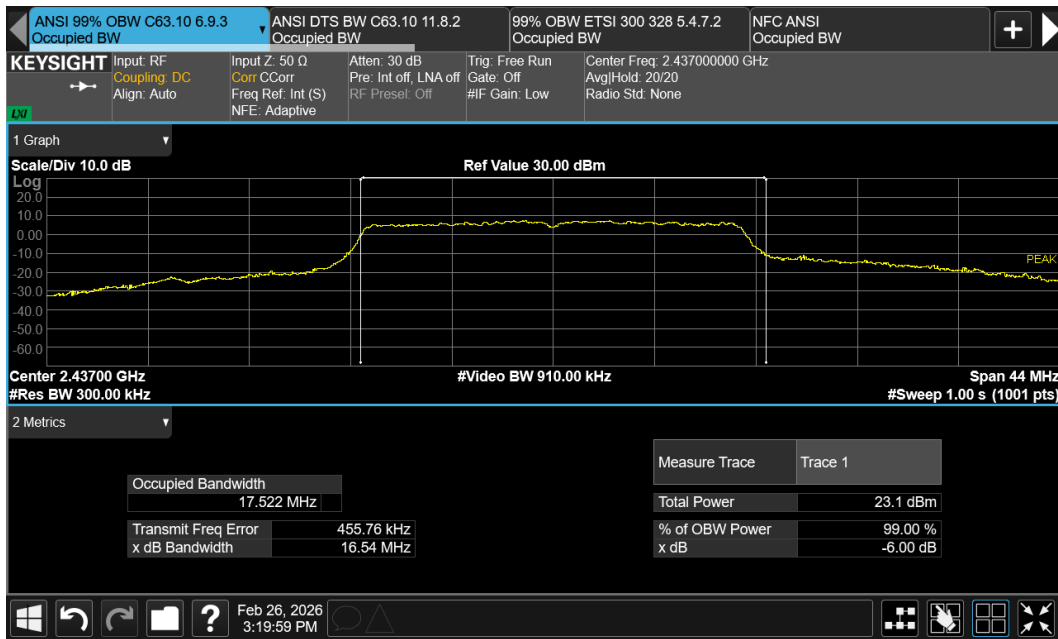


Figure TR30.3: Occupied bandwidth data for 802.11g 12 Mbps at channel 6

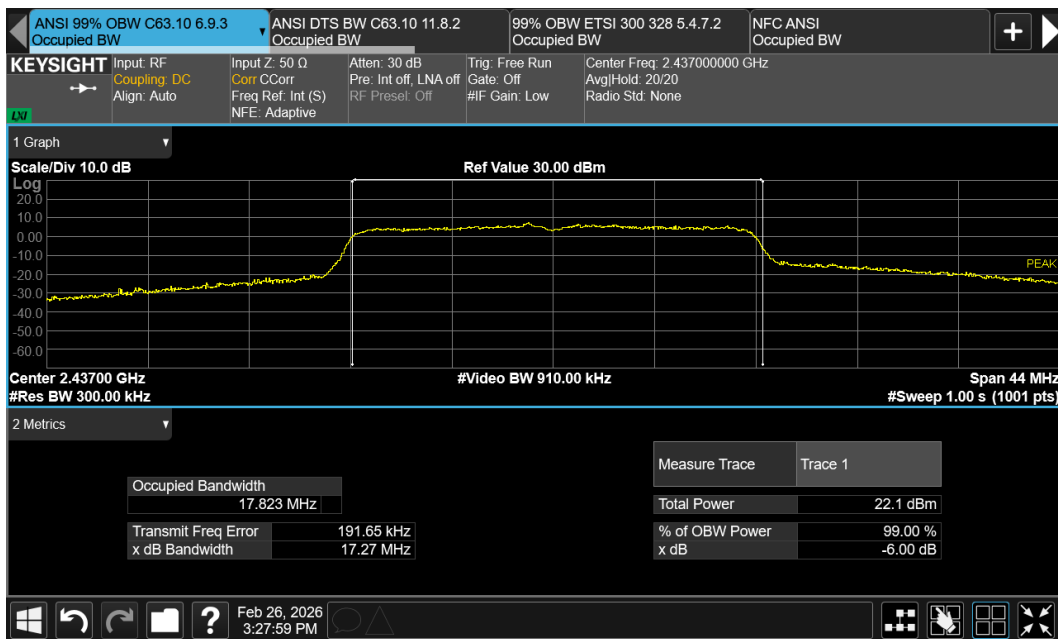


Figure TR30.4: Occupied bandwidth data for 802.11n MCS1 at channel 6

Necessary Bandwidth Calculations

The Necessary Bandwidth 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 NFC, Bluetooth, ANT, and IEEE 802.11b WiFi. However, they differ for IEEE 802.11g and 11n systems because the Canadian TRC-43 standard provides different analysis methods for Orthogonal Frequency Division Multiplexing systems (OFDM). The tables below will show the analysis for most of the radios signals as a combined approach, then separately analyze the results for IEEE 802.11g and n systems. The tables below may include radio protocols that are not part of the product being evaluated.

NFC (Near Field Communication) at 13.56 MHz uses continuous wave telegraphy without tone modulation. The bit rate 'B' in the FCC and TRC equations is split into two parts here. B is the baud rate. C is a coding factor. C=1 for Miller encoding where the transition speed is as high as the bit rate, or C=2 for Manchester encoding where the transition speed is as high as twice the bit rate). K is a factor set to 3 for non-fading circuits under the standards. The Necessary Bandwidth, B_N is then:

$$B_N = BCK$$

Radio Type	B (kbaud)	C	K	B_N (kHz)
NFC A	106	1	3	318.0
NFC B	212	2	3	1272.0
NFC B	424	2	3	2544.0

Table TR30.100: Necessary Bandwidth for NFC

The radio modulation schemes for Ant, for the various Bluetooth protocols, and for IEEE 802.11 b WiFi are a mix of Phase Shift Key (PSK) and Quadrature Amplitude Modulation (QAM) 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 B_N is the Necessary Bandwidth, R is the bit rate, and S is the number of signaling states.

Radio Type	R Mbps	K	S	LogBase2 of (S)	B_N (MHz)
ANT / ANT+	1	1	2	1	2

Table TR30.101: Necessary Bandwidth for ANT and ANT+ Radio Protocols (FCC and TRC-43)

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
BLE	1Mbps	GFSK	1	1	2	1	2
	2Mbps	DQPSK	2	1	4	2	2

Table TR30.102: Necessary Bandwidth for Bluetooth Radio Protocols (FCC and TRC-43)

Radio Type	Sub-type	R Mbps	K	S	LogBase2 of (S)	B_N (MHz)
802.11 b	1	1	1	2	1	2
	2	2	1	4	2	2
	5.5	5.5	1	4	2	5.5
	11	11	1	4	2	11

Table TR30.103: Necessary Bandwidth for IEEE 802.11 b Radio Protocol (FCC and TRC-43)

Radio Type	Sub-type	R Mbps	K	S	LogBase2 of (S)	B _N (MHz)
802.11 a/g	6	6	1	2	1	12
	9	9	1	2	1	18
	12	12	1	4	2	12
	18	18	1	4	2	18
	24	24	1	16	4	12
	36	36	1	16	4	18
	48	48	1	64	6	16
	54	54	1	64	6	18
802.11 n/ac	MCS0	7.2	1	2	1	14.4
	MCS1	14.4	1	4	2	14.4
	MCS2	21.7	1	4	2	21.7
	MCS3	28.9	1	16	4	14.5
	MCS4	43.3	1	16	4	21.7
	MCS5	57.8	1	64	6	19.3
	MCS6	65	1	64	6	21.7
	MCS7	72.2	1	64	6	24.1
	MCS8	86.7	1	256	8	21.7

Table TR30.104: Necessary Bandwidth for IEEE 802.11 a, g, n, and ac 20 MHz Radio Protocols (FCC)

Radio Type	Sub-type	R Mbps	K	S	LogBase2 of (S)	B _N (MHz)
802.11 n/ac	MCS0	15	1	2	1	30.0
	MCS1	30	1	4	2	30.0
	MCS2	45	1	4	2	45.0
	MCS3	60	1	16	4	30.0
	MCS4	90	1	16	4	45.0
	MCS5	120	1	64	6	40.0
	MCS6	135	1	64	6	45.0
	MCS7	150	1	64	6	50.0
	MCS8	180	1	256	8	45.0
	MCS9	200	1	256	8	50.0

Table TR30.105: Necessary Bandwidth for IEEE 802.11 n and ac 40 MHz Radio Protocols (FCC)

As a note, the bit rate for IEEE 802.11 n or ac WiFi is calculated based on the IEEE standard's short guard interval of 400 nsec. If only the long guard interval of 800 nsec were implemented, the bit rates would decrease by a small amount.

The TRC-43 method for OFDM signals simply multiplies the number of subcarriers, K, and the subcarrier spacing, N_s. In both cases, N_s is 312.5 kHz. The count of subcarriers includes nulls. So for example, 802.11 n uses 4 pilot subcarriers, 52 data subcarriers, and one null suppressed subcarrier in the middle for 57 total subcarrier channels.

$$B_N = N_s * K$$

Radio Type	Mode	N _s (MHz)	K	B _N (MHz)
802.11a/g	20 MHz	0.3125	53	16.6
802.11n/ac	20 MHz	0.3125	57	17.8
802.11n/ac	40 MHz	0.3125	117	36.6

Table TR30.106: Necessary Bandwidth for IEEE 802.11 a, g, n, and ac Radio Protocols (TRC-43)

This line is the end of the test record.

Test Record**Transmitter Bandwidth Tests****Test IDs TR34****Project GCL1030**

Test Date(s): 9 April 2026
Test Personnel: Myles Clonch supervised by Majid Farah and Jim Solum

Product Model: A05147
Serial Number tested: 8WP000284

Operating Mode: BLETx
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 Low Energy (BLE)
Radio Band: 2400 to 2483.5 MHz

Pass/Fail Judgment: Reported

Test record created by: Myles Clonch
Date of this record: 12 May 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	22-Apr-2026

Table TR34.1 Equipment Used

Software used: Keysight MXE software A.37.02

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.

For BLE operating at 2 Mbps, the lowest operating frequency was 2404 MHz, and the highest operating frequency was 2478 MHz. For all other Bluetooth, BLE, and ANT radios reported here, the lowest operating frequency was 2402 MHz, and the highest operating frequency was 2480 MHz.

Test Setup

This block diagram shows the test equipment setup.

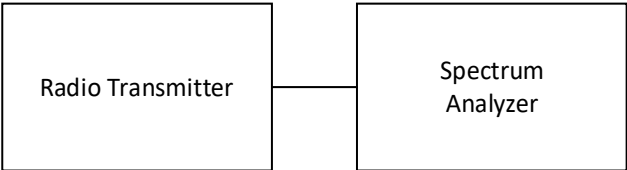


Figure TR34.1: Test setup

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 (04)	2440	2480 (78)
BLE 1 Mbps	1.774	1.264	1.519
BLE 2 Mbps	2.427	2.362	2.442

Table TR34.2: Summary of 99% Occupied Bandwidth Data for BLE modes in MHz

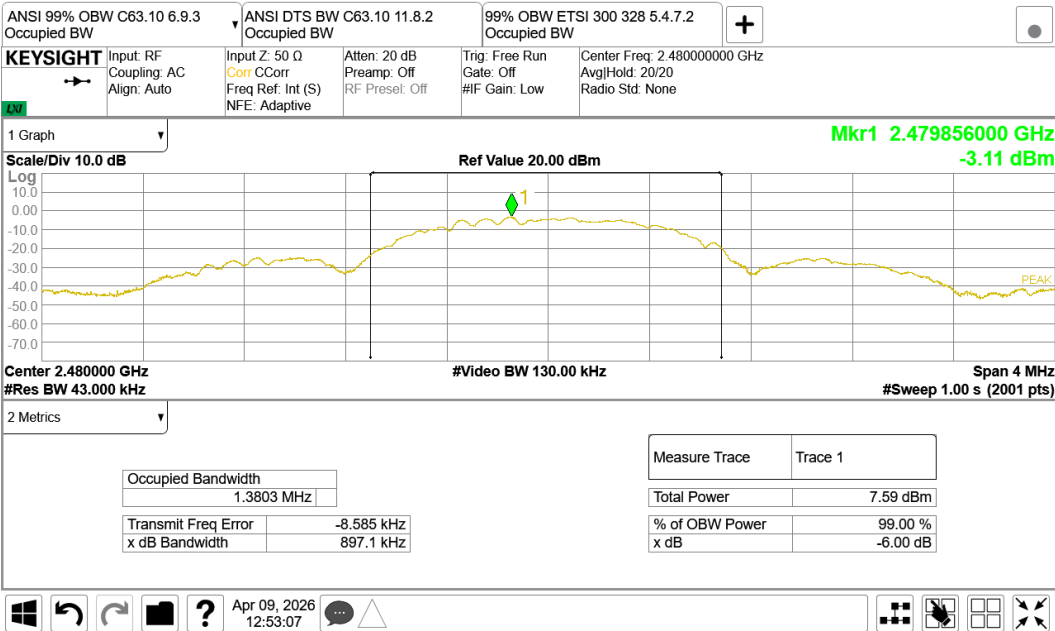


Figure TR34.3: Occupied bandwidth data for BLE 2 Mbps at high channel (2480 MHz)

This line is the end of the test record.

10.1.2 DTS Bandwidth 6 dB Method

Relevant standards include:

CFR47 Parts 15.247(a), 15.215(c)

RSS-247 6.3.1(a)

ANSI C63.10 section 6.9

Test and Data Overview

The standards require that a radio have a 6 dB bandwidth of at least 500 kHz to be certified under the Digital Transmission System (DTS) rules. These bandwidths were measured using the methods at ANSI C63.10 section 6.9. Unlike many other EMC measurements, the worst-case for this test is the radio mode with the smallest 6 dB bandwidth, not the largest.

Test Record

Transmitter Bandwidth Tests

Test IDs TR26

Project GCL-1030

Test Date(s)	26 Feb 2026
Test Personnel	Jim Solum
Product Model	A05147
Serial Number tested	8WP000264
Operating Mode	WiFi2GTx
Arrangement	A2 (UPwr)
Input Power	5Vdc
Test Standards:	FCC Part 15.247, ANSI C63.10, RSS-GEN, RSS-247 (as noted in Section 5 of the report).
Radio Protocol	IEEE 802.11b
Radio Band	2400 to 2483.5 MHz

Pass/Fail Judgment: **PASS**

Test record created by: Jim Solum
Date of this record: 03 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 TR26.1: List of test equipment used

Test Software Used: Keysight PXE firmware A.33.03

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 portion of the total power observed, and also identify parameters such as the edge frequencies for that bandwidth and the center frequency error. The spectrum is scanned many 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.

Test Setup

This block diagram shows the test equipment setup.

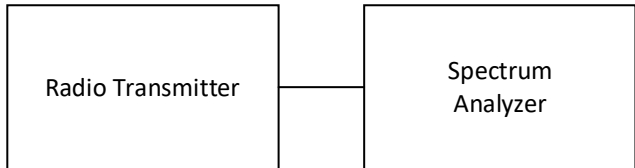


Figure TR26.1: Test setup

Test Data

The data for each test is summarized below, followed by the spectral data for each case highlighted in yellow.

The DTS Bandwidth is measured using a spectrum analyzer operating with a defined resolution bandwidth. The analysis finds the smallest continuous range of frequencies containing all emissions within 6 dB of the highest value. The requirement is that the DTS Bandwidth be greater than 500 kHz. As such the lowest measured bandwidth is worst case. All radios reported here are judged to have met this requirement.

	Ch1	Ch6	Ch11	Ch13
B1	9.212	9.688	9.682	10.110

Table TR26.2: Summary of bandwidth data in MHz for IEEE 802.11 WiFi modes

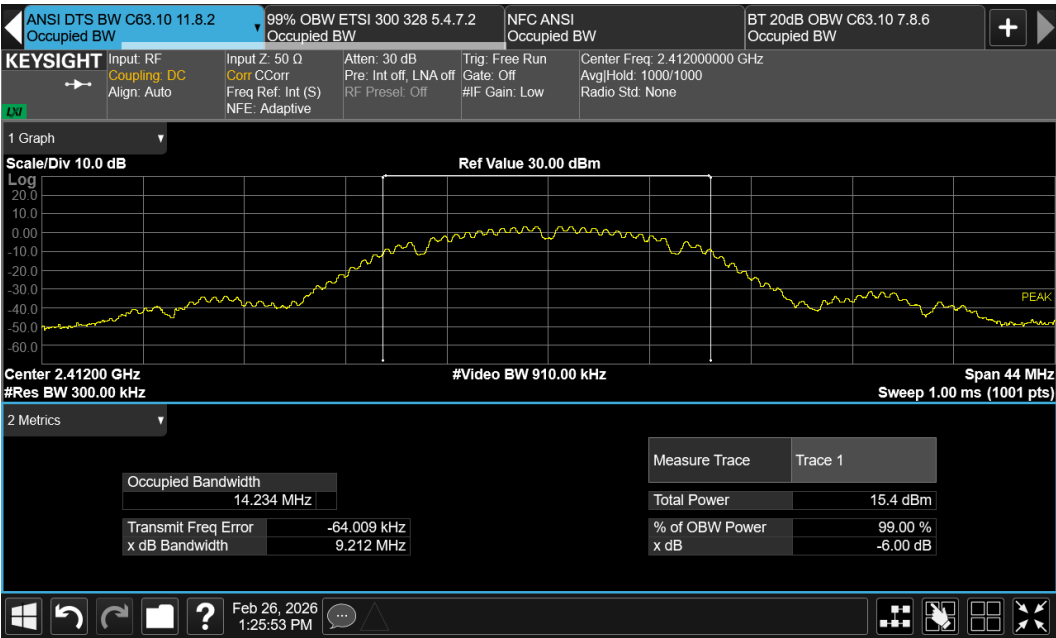


Figure TR26.2: Bandwidth data for 802.11b 1 Mbps at channel 1

This line is the end of the test record.

Test Record**Transmitter Bandwidth Tests****Test IDs TR32****Project GCL1030**

Test Date(s): 9 April 2026
Test Personnel: Myles Clonch supervised by Majid Farah and Jim Solum

Product Model: A05147
Serial Number tested: 8WP000284

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

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

Radio Protocol: Bluetooth Low Energy (BLE)
Radio Band: 2400 to 2483.5 MHz

Pass/Fail Judgment: PASS

Test record created by: Myles Clonch
Date of this record: 14 May 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	22-Apr-2026

Table TR32.1: List of test equipment used

Test Software Used: Keysight MXE firmware A.37.02

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 portion of the total power observed, and also identify parameters such as the edge frequencies for that bandwidth and the center frequency error. The spectrum is scanned many 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.

Test Setup

This block diagram shows the test equipment setup.

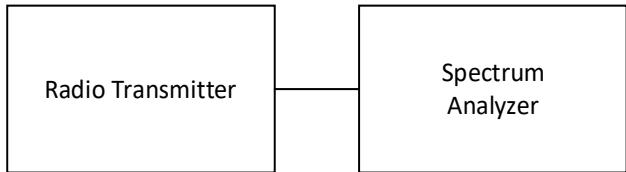


Figure TR32.1: Test setup

Test Data

The data for each test is summarized below, followed by the spectral data for each case highlighted in yellow.

The DTS Bandwidth is measured using a spectrum analyzer operating with a defined resolution bandwidth. The analysis finds the smallest continuous range of frequencies containing all emissions within 6 dB of the highest value. The requirement is that the DTS Bandwidth be greater than 500 kHz. As such the lowest measured bandwidth is worst case. All radios reported here are judged to have met this requirement.

	2402	2440	2480
BLE 1 Mbps	873.9	777.8	922.9

Table TR32.2: Summary of bandwidth data in kHz for BLE 1 Mbps modes

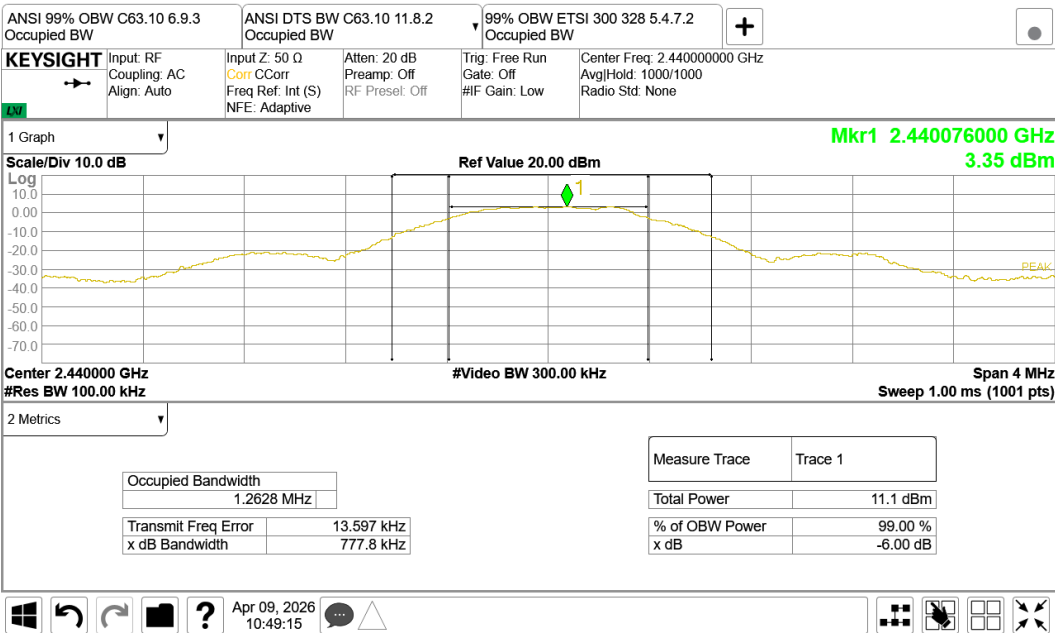


Figure TR32.2: Bandwidth data for BLE 1 Mbps at middle channel (2440 MHz)

This line is the end of the test record.

10.1.3 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, Bn, 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, ANT, and IEEE 802.11b WiFi. However, they differ for IEEE 802.11g and 11n systems because the Canadian TRC-43 standard provides different analysis methods for Orthogonal Frequency Division Multiplexing systems (OFDM). The tables below will show the analysis for most of the radios signals as a combined approach, then separately analyze the results for IEEE 802.11g and n systems.

The radio modulation schemes for ANT, for the various Bluetooth protocols, and for IEEE 802.11 b WiFi are a mix of Phase Shift Key (PSK) and Quadrature Amplitude Modulation (QAM) 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	R Mbps	K	S	LogBase2 of (S)	Bn (MHz)
ANT / ANT+	1	1	2	1	2

Table Bn2: Necessary Bandwidth for ANT and ANT+ Radio Protocols (FCC and TRC-43)

Radio Type	Sub-type	Method	R Mbps	K	S	LogBase2 of (S)	Bn (MHz)
BLE	1Mbps	GFSK	1	1	2	1	2
	2Mbps	DQPSK	2	1	4	2	2

Table Bn4: Necessary Bandwidth for Bluetooth Low Energy Radio Protocols (FCC and TRC-43)

WiFi

Radio Type	Sub-type	R Mbps	K	S	LogBase2 of (S)	Bn (MHz)
802.11 b	1	1	1	2	1	2
	2	2	1	4	2	2
	5.5	5.5	1	4	2	5.5
	11	11	1	4	2	11

Table Bn5: Necessary Bandwidth for IEEE 802.11 b Radio Protocol (FCC and TRC-43)

Radio Type	Sub-type	R Mbps	K	S	LogBase2 of (S)	Bn (MHz)
802.11 a/g	6	6	1	2	1	12
	9	9	1	2	1	18
	12	12	1	4	2	12
	18	18	1	4	2	18
	24	24	1	16	4	12
	36	36	1	16	4	18
	48	48	1	64	6	16
	54	54	1	64	6	18
802.11 n/ac	MCS0	7.2	1	2	1	14.4
	MCS1	14.4	1	4	2	14.4
	MCS2	21.7	1	4	2	21.7
	MCS3	28.9	1	16	4	14.5
	MCS4	43.3	1	16	4	21.7
	MCS5	57.8	1	64	6	19.3
	MCS6	65	1	64	6	21.7
	MCS7	72.2	1	64	6	24.1
	MCS8	86.7	1	256	8	21.7

Table Bn6: Necessary Bandwidth for IEEE 802.11 a, g, n, and ac 20 MHz Radio Protocols (FCC)

Radio Type	Sub-type	R Mbps	K	S	LogBase2 of (S)	Bn (MHz)
802.11 n/ac	MCS0	15	1	2	1	30.0
	MCS1	30	1	4	2	30.0
	MCS2	45	1	4	2	45.0
	MCS3	60	1	16	4	30.0
	MCS4	90	1	16	4	45.0
	MCS5	120	1	64	6	40.0
	MCS6	135	1	64	6	45.0
	MCS7	150	1	64	6	50.0
	MCS8	180	1	256	8	45.0
	MCS9	200	1	256	8	50.0

Table Bn7: Necessary Bandwidth for IEEE 802.11 n and ac 40 MHz Radio Protocols (FCC)

As a note, the bit rate for IEEE 802.11 n or ac WiFi is calculated based on the IEEE standard's short guard interval of 400 nsec. If only the long guard interval of 800 nsec were implemented, the bit rates would decrease by a small amount.

The TRC-43 method for OFDM signals simply multiplies the number of subcarriers, K, and the subcarrier spacing, N_s . In both cases, N_s is 312.5 kHz. The count of subcarriers includes nulls. So for example, 802.11 n uses 4 pilot subcarriers, 52 data subcarriers, and one null suppressed subcarrier in the middle for 57 total subcarrier channels.

$$B_n = N_s * K$$

Radio Type	Mode	N_s (MHz)	K	Bn (MHz)
802.11a/g	20 MHz	0.3125	53	16.6
802.11n/ac	20 MHz	0.3125	57	17.8
802.11n/ac	40 MHz	0.3125	117	36.6

Table Bn8: Necessary Bandwidth for IEEE 802.11 a, g, n, and ac Radio Protocols (TRC-43)

10.1.4 Transmitter Conducted Output Power and Duty Cycle

Relevant standards include:

CFR47 Parts 15.247(b)

RSS-247 6.3.2

ANSI C63.10 sections 11.9.2.3.2, 11.9.2.2

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 is typically the gated power meter approach found in ANSI C63.10 at 11.9.2.3.2 with the time gating provided as a post-processing activity. The Spectrum Analyzer methods at 11.9.2.2 are also valid options.

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 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 client's typical design approach to IEEE 802.11 WiFi radios is that the power control settings are the same for all speed rates within a given channel and mode (b, g, or n). There is one output power setting for b mode channel 3 that is used for the 1, 2, 5.5 and 11 Mbps modulation rates. A different setting is provided for other channels. There is one setting for n mode on channel 10 that is used for all eight MCS options MCS0 through MCS7. A different setting is provided for other channels. A similar approach is used for controlling the power for individual channels for other radios such as BLE and ANT.

Based on this approach, it is typical practice in this lab to select a channel on which to evaluate the effects of modulation on transmitter output power. Once the worst-case b, g, and n modulations are identified there is a check on low, mid, and high channels with those worst-case modulations. 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 TR08****Project GCL1030**

Test Date(s)	8 April 2026
Test Personnel	Myles Clonch Supervised by Jim Solum
Product Model	A05147
Serial Number	8WP000284
Operating Mode	BLETx
Arrangement	A2 (Upwr)
Input Power	USB 5Vdc
Test Standards:	FCC Part 15, ANSI C63.10, RSS-GEN, RSS-247 (as noted in Section 5 of the report).
Antenna Gain	-1.15 dBi, as reported by the client
Radio Protocol	Bluetooth Low Energy

Pass/Fail Judgment: **PASS**

Test record created by: Myles Clonch
Date of this record: 12 May 2026
Original record, Version A.

Test Equipment Used

Description	Make	Model #	Serial #	Last Cal/Ver	Next Due
RF Power Sensor	Rohde&Schwarz	NRP8S	109124	23-Feb-2026	23-Feb-2028

Table TR08.1: List of test equipment used

Software used: Rohde & Schwarz Power Viewer V13.25;
TimePowerAnalysisSpreadsheetv12e.xlsx

Test Method

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

ANSI C63.10: 11.9.2.3.2 (Gated average power with broadband power meter)

Under the ETSI standard, the parameters of duty cycle, transmitter timing, or medium utilization are typically not required for adaptive transceivers or transceivers emitting at 10 dBm EIRP or less, so those results will typically be omitted from the data set. 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. The ETSI 300 328 method looks at the individual transmission bursts within the data record and reports the power level from the burst with the for the highest average power. The ETSI result is presented in dBm EIRP units, and a 20 dBm EIRP limit is applied. The RF exposure analysis asks for the average power observed over the entire data record time, with results in linear power units such as milliwatts. RF exposure limits are not addressed in this test record. Many of 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	2403	2404	2440	2476	2478	2479	2480
BT Low Energy	1 Mbps	1.50	NT	5.20	4.96	5.07	1.83	NT	1.44
BT Low Energy	2 Mbps	NT	NT	5.21	5.24	5.07	1.44	NT	NT

Table TR08.2: Transmit Power, ANSI (Average Power) method, in dBm for BLE 1Mbps, and BLE 2Mbps

Other Power Analyses

Frequency	(MHz)	2402	2403	2404	2440	2476	2478	2479	2480
BT Low Energy	1 Mbps	100.0%	NT	100.0%	100.0%	100.0%	100.0%	NT	100.0%
BT Low Energy	2 Mbps	NT	NT	100.0%	100.0%	100.0%	100.0%	NT	NT

Table TR08.3: Duty cycle for BLE 1Mbps, and BLE 2 Mbps modes

Setup Diagram

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

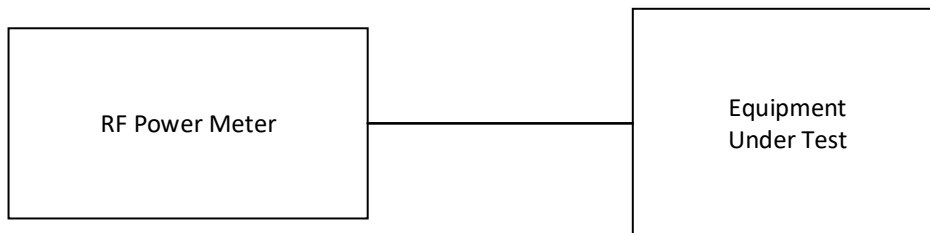


Figure TR08.1: Test equipment setup

This line is the end of the test record.

Test Record

Transmitter Power, Duty Cycle

Test IDs TR10

Project GCL1030

Test Date(s)	22,23 and 24 April 2026
Test Personnel	Myles Clonch supervised by Majid Farah and Jim Solum
Product Model	A05147
Serial Number	8WP000284
Operating Mode	Wifi2GTx
Arrangement	A2 (Upwr)
Input Power	USB 5Vdc
Test Standards:	FCC Part 15.247, ANSI C63.10, RSS-GEN, RSS-247 (as noted in Section 5 of the report).
Antenna Gain	-1.15 dBi, as reported by the client
Radio Protocol	IEEE 802.11b

Pass/Fail Judgment: **PASS**

Test record created by: Myles Clonch
Date of this record: 24 April 2026
Original record, Version A.

Test Equipment Used

Description	Make	Model #	Serial #	Last Cal/Ver	Next Due
RF Power Sensor	Rohde&Schwarz	NRP8S	109124	23-Feb-2026	23-Feb-2028
RF Power Sensor	Keysight	U2021XA	MY64020002	27-Mar-2026	27-Mar-2027

Table TR10.1: List of test equipment used

Software used: Rohde & Schwarz Power Viewer V13.25; Keysight BenchVue V20214.1; TimePowerAnalysisSpreadsheetv12e.xlsx, KeysightPowerAnalysisV3b.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)
ANSI C63.10:	11.9.2.3.2 (Gated average power with broadband power meter)

Under the ETSI standard, the parameters of duty cycle, transmitter timing, or medium utilization are typically not required for adaptive transceivers or transceivers emitting at 10 dBm EIRP or less, so those results will typically be omitted from the data set. 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. The ETSI 300 328 method looks at the individual transmission bursts within the data record and reports the power level from the burst with the for the highest average power. The ETSI result is presented in dBm EIRP units, and a 20 dBm EIRP limit is applied. The RF exposure analysis asks for the average power observed over the entire data record time, with results in linear power units such as milliwatts. RF exposure limits are not addressed in this test record. Many of 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

Mode	Speed	1	2	6	11	12	13
B	1	10.08	NT	9.53	8.63	7.71	7.01
B	2	NT	NT	9.27	NT	NT	NT
B	5.5	NT	NT	9.25	NT	NT	NT
B	11	NT	NT	9.21	NT	NT	NT

Table TR10.2: Transmit Power, ANSI (Average Power) method, in dBm for IEEE 802.11b

Mode	Speed	1	2	6	11	12	13
B	1	NT	NT	11.77	NT	NT	NT

Figure TR10.4: Transmit Power, ANSI (Peak Power) method, in dBm for IEEE 802.11b

Other Power Analyses

Mode	Speed	1	2	6	11	12	13
B	1	100.0%	NT	100.0%	100.0%	100.0%	100.0%
B	2	NT	NT	100.0%	NT	NT	NT
B	5.5	NT	NT	100.0%	NT	NT	NT
B	11	NT	NT	100.0%	NT	NT	NT

Table TR10.6: Duty cycle for IEEE 802.11b

Setup Diagram

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

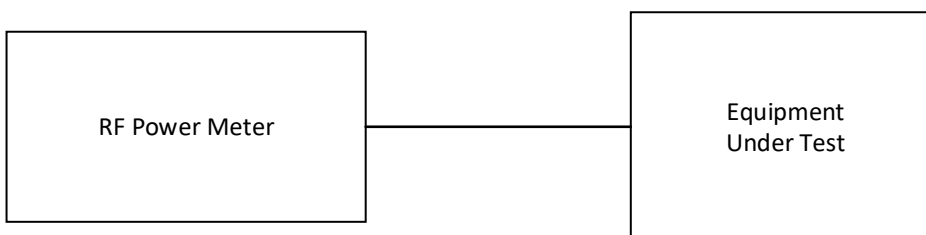


Figure TR10.51: Test equipment setup

This line is the end of the test record.

Test Record

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Garmin		

Transmitter Power, Duty Cycle**Test IDs TR06****Project GCL1030**

Test Date(s)	25 Feb 2026; 09 Mar 2026
Test Personnel	Vladimir Tolstik, Majid Farah
Product Model	05147
Serial Number	8WP000284
Operating Mode	WiFi2GTx
Arrangement	A2 (Upwr)
Input Power	USB 5Vdc
Test Standards:	FCC Part 15.247; RSS-247; RSS-GEN; ANSI C63.10 (as noted in Section 6 of the report).
Antenna Gain	-1.15 dBi, as reported by the client
Radio Protocol	Bluetooth Low Energy, ANT, IEEE 802.11g/n

Pass/Fail Judgment: PASS

Test record created by: Vladimir Tolstik, Myles Clonch
Date of this record: 23 April 2026
Original record, Version A.

Test Equipment Used

Description	Make	Model #	Serial #	Last Cal/Ver	Next Due
RF Power Sensor	Rohde&Schwarz	NRP8S	109927	18-Jul-2024	18-Jul-2026
RF Power Sensor	Keysight	U2021XA	MY65200007	4-Jul-2025	4-Jul-2026

Table TR04.1: List of test equipment used

Software used: Rohde & Schwarz Power Viewer V13.25; Keysight BenchVue V2024;
TimePowerAnalysisSpreadsheetV12e.xlsx

Test Method

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

ANSI C63.10: 11.9.2.3.2 (Gated average power with broadband power meter)
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 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

Mode	Speed	1	2	6	11	12	13
G	6	13.96	14.62	15.08	14.77	13.25	9.30
G	9	NT	NT	14.93	NT	NT	NT
G	12	NT	NT	14.89	NT	NT	NT
G	18	NT	NT	14.38	NT	NT	NT
G	24	NT	NT	13.99	NT	NT	NT
G	36	NT	NT	11.49	NT	NT	NT
G	48	NT	NT	10.52	NT	NT	NT
G	54	NT	NT	10.61	NT	NT	NT
N	MCS0	NT	NT	13.68	NT	NT	NT
N	MCS1	NT	NT	14.21	NT	NT	NT
N	MCS2	12.66	14.10	14.29	13.41	13.00	8.37
N	MCS3	NT	NT	13.39	NT	NT	NT
N	MCS4	NT	NT	11.72	NT	NT	NT
N	MCS5	NT	NT	10.72	NT	NT	NT
N	MCS6	NT	NT	10.75	NT	NT	NT
N	MCS7	NT	NT	9.29	NT	NT	NT

Table TR04.3: Transmit Power, ANSI (Average Power) method, in dBm for IEEE 802.11g/n

Mode	Speed	1	2	6	11	12	13
G	6	NT	NT	20.89	NT	NT	NT
N	MCS2	NT	NT	21.38	NT	NT	NT

Table TR04.4: Transmit Power, ANSI (Peak Power) method, in dBm for IEEE 802.11g/n

Other Power Analyses

Mode	Speed	1	2	6	11	12	13
G	6	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
G	9	NT	NT	100.0%	NT	NT	NT
G	12	NT	NT	100.0%	NT	NT	NT
G	18	NT	NT	100.0%	NT	NT	NT
G	24	NT	NT	100.0%	NT	NT	NT
G	36	NT	NT	100.0%	NT	NT	NT
G	48	NT	NT	100.0%	NT	NT	NT
G	54	NT	NT	100.0%	NT	NT	NT
N	MCS0	NT	NT	100.0%	NT	NT	NT
N	MCS1	NT	NT	100.0%	NT	NT	NT
N	MCS2	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
N	MCS3	NT	NT	100.0%	NT	NT	NT
N	MCS4	NT	NT	100.0%	NT	NT	NT
N	MCS5	NT	NT	100.0%	NT	NT	NT
N	MCS6	NT	NT	100.0%	NT	NT	NT
N	MCS7	NT	NT	100.0%	NT	NT	NT

Table TR04.6: Duty cycle for IEEE 802.11b/g/n

Setup Diagram

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

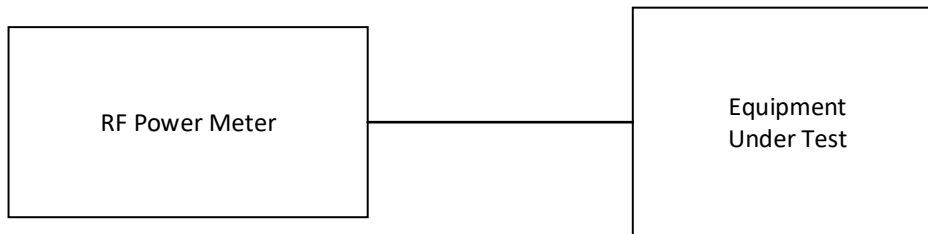


Figure TR04.1: Test equipment setup

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 11.11

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. That is why the unwanted emission requirements were satisfied by a combination of radiated tests and RF port conducted tests.

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 the report section "[Unwanted Emissions Outside the Frequency Bands of Operation, Radiated.](#)"

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 11.11.

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 only 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.

Test Record**Band Edge Conducted Spurious Emission Test****Test IDs TR61****Project GCL1030**

Test Date(s):	05 Mar 2026
Test Personnel:	Jim Solum
Product Model:	A05147
Serial Number tested:	8WP000264
Operating Mode:	Wifi2GTx
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 (IEEE 802.11b/g/n)
Judgment:	PASS
Test record created by:	Myles Clonch
Date of this test record:	14 May 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 TR61.1: 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. Radiated testing in the 2483.5 – 2500 MHz restricted bands demonstrate compliance with the rules at the upper edge of the 2.4 GHz allocated band. This test is only performed 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. 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.

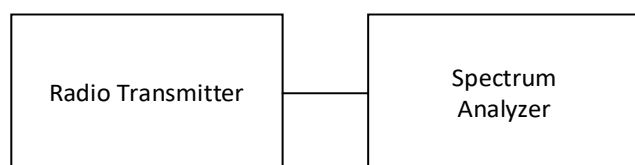


Figure TR61.1: Typical test arrangement

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	Channel	In band to band gap	In band to band gap	Margin to
		required reduction in dB	measurement in dB	limit in dB
IEEE 802.11b 1 Mbps	1	20	-40.90	20.90
IEEE 802.11b 11 Mbps	1	20	-38.83	18.83
IEEE 802.11g 6 Mbps	1	20	-29.50	9.50
IEEE 802.11g 6 Mbps	2	20	-32.59	12.59
IEEE 802.11g 54 Mbps	1	20	-35.62	15.62
IEEE 802.11g 54 Mbps	2	20	-39.35	19.35
IEEE 802.11n NMCS0	1	20	-31.37	11.37
IEEE 802.11n NMCS0	2	20	-34.08	14.08
IEEE 802.11n NMCS7	1	20	-35.20	15.20
IEEE 802.11n NMCS7	2	20	-38.60	18.60

Table TR61.2: 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. In the figures below, the display line should be adjusted to 20 dB below the peak instead of 30 dB. The result summary shows more than 20 dB reduction of in band peak.

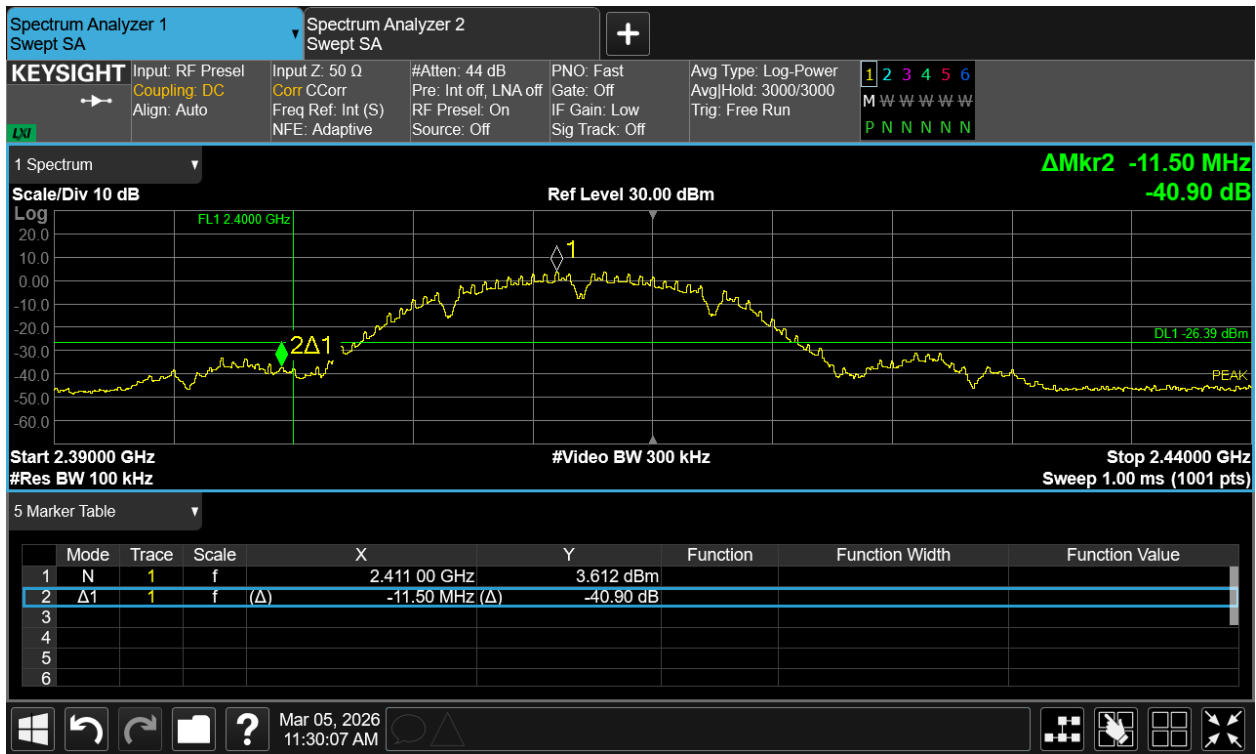


Figure TR61.2: Band edge gap measurement for IEEE 802.11b 1 Mbps, Ch 1

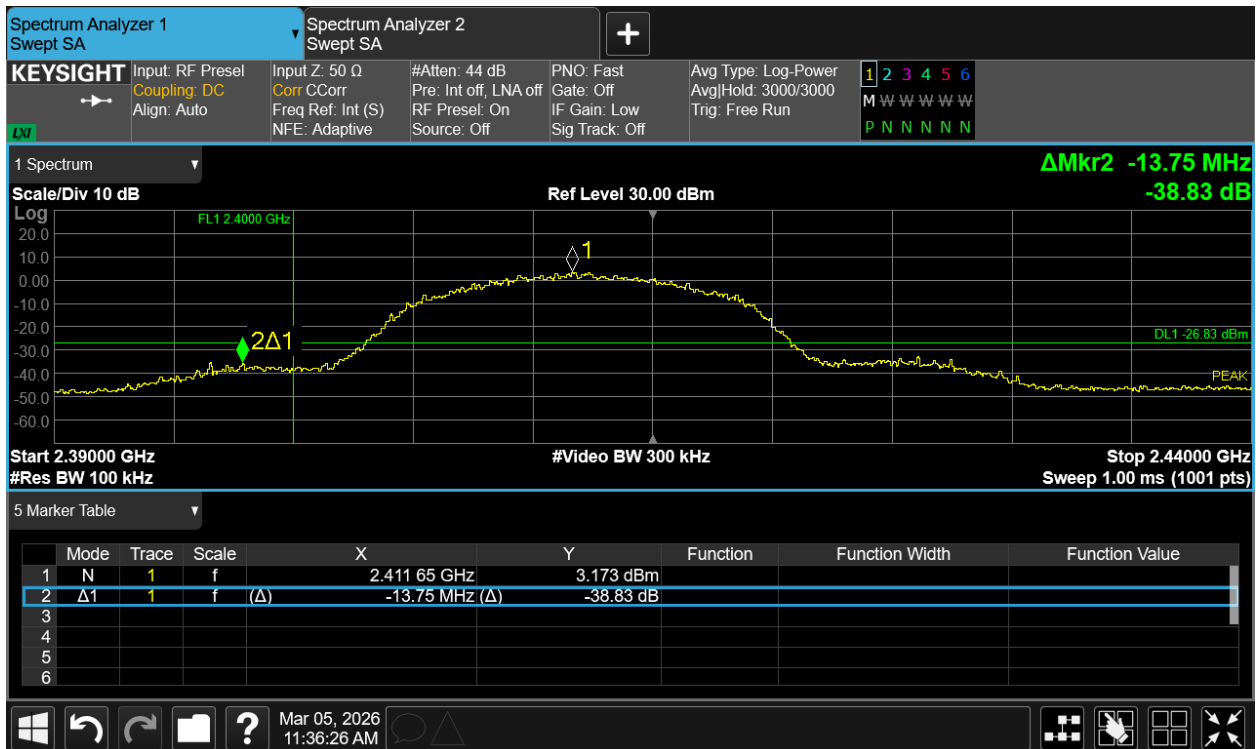


Figure TR61.3: Band edge gap measurement for IEEE 802.11b 11 Mbps, Ch 1

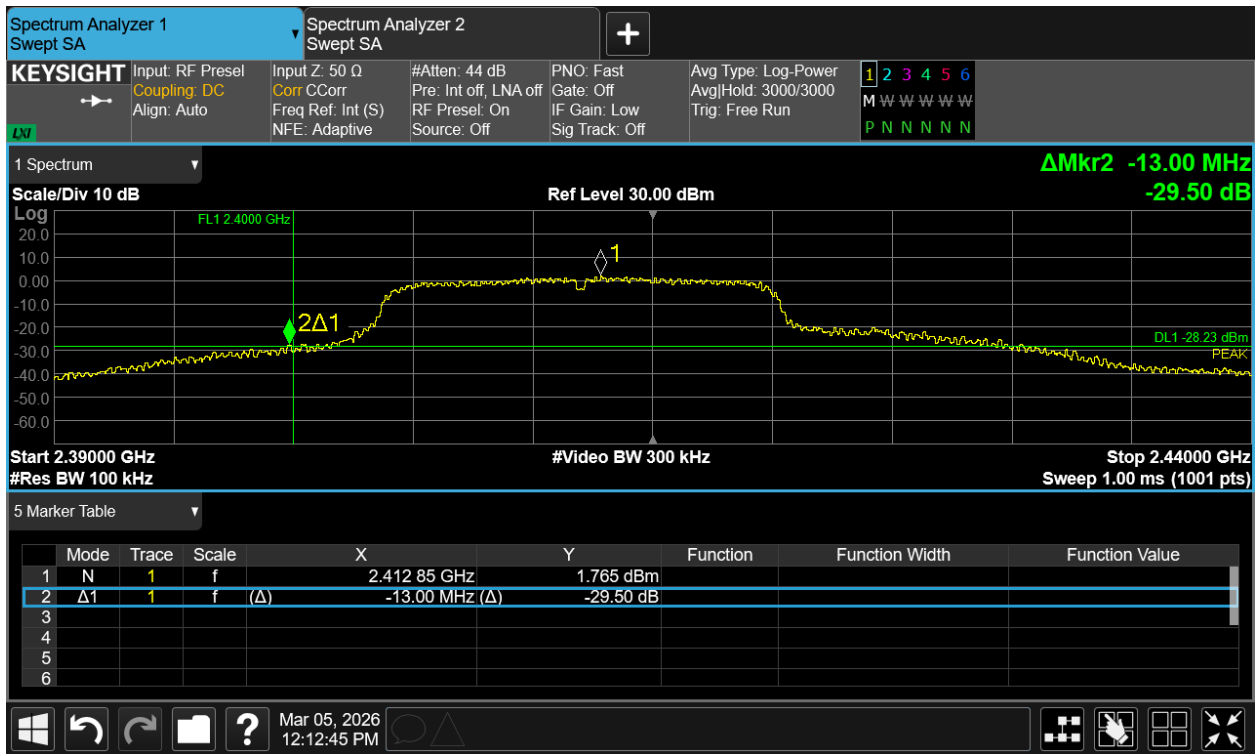


Figure TR61.4: Band edge gap measurement for IEEE 802.11g, 6 Mbps, Ch1

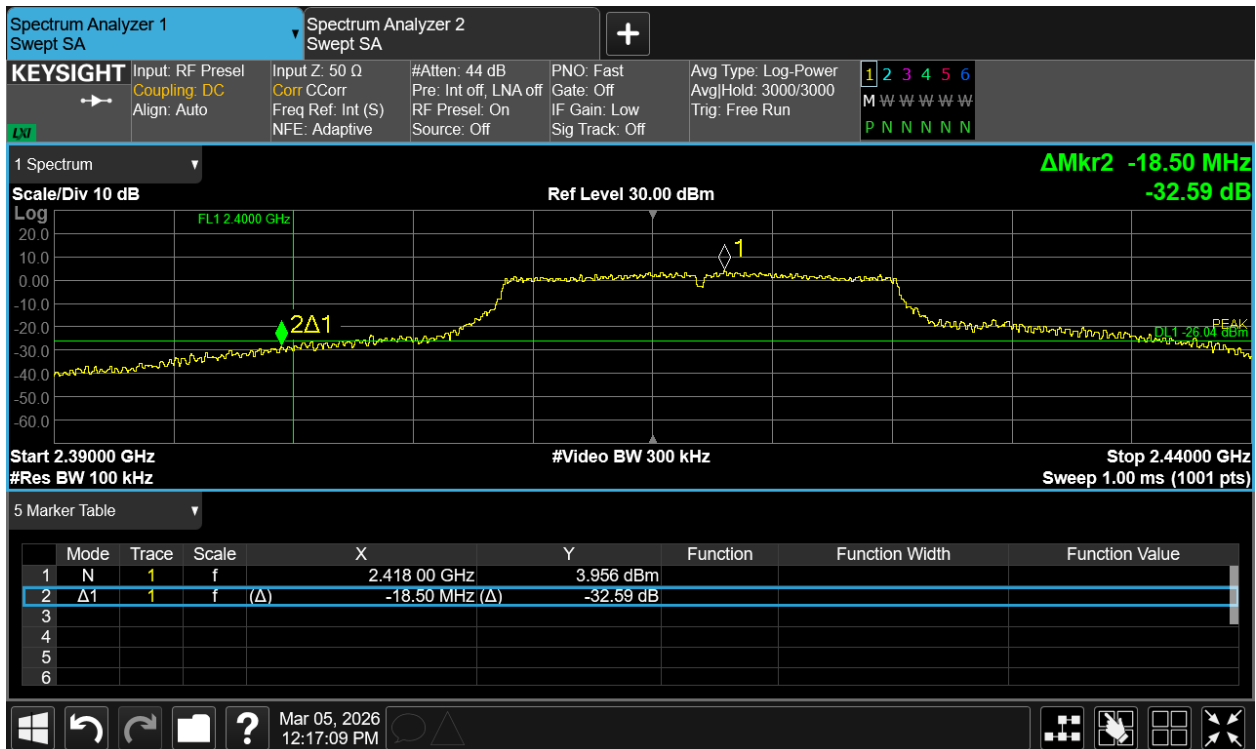


Figure TR61.5: Band edge gap measurement for IEEE 802.11g 6 Mbps, Ch 2

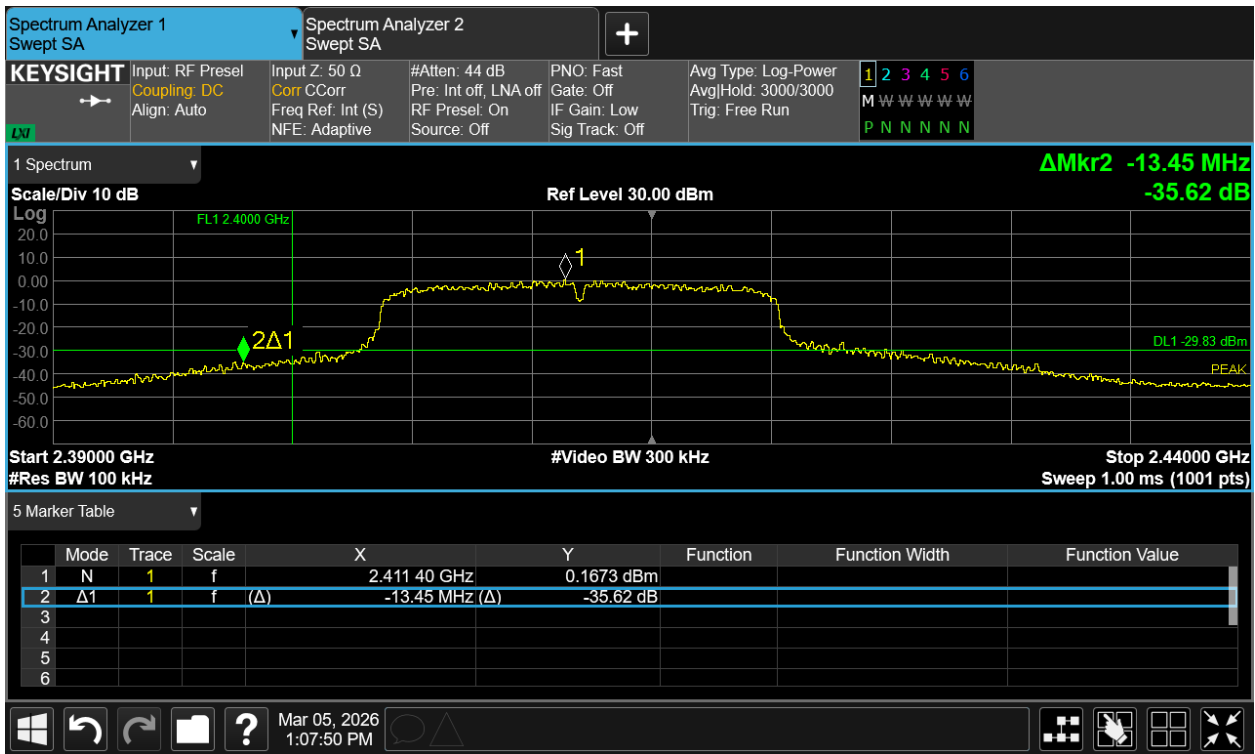


Figure TR61.6: Band edge gap measurement for IEEE 802.11g, 54 Mbps, Ch 1

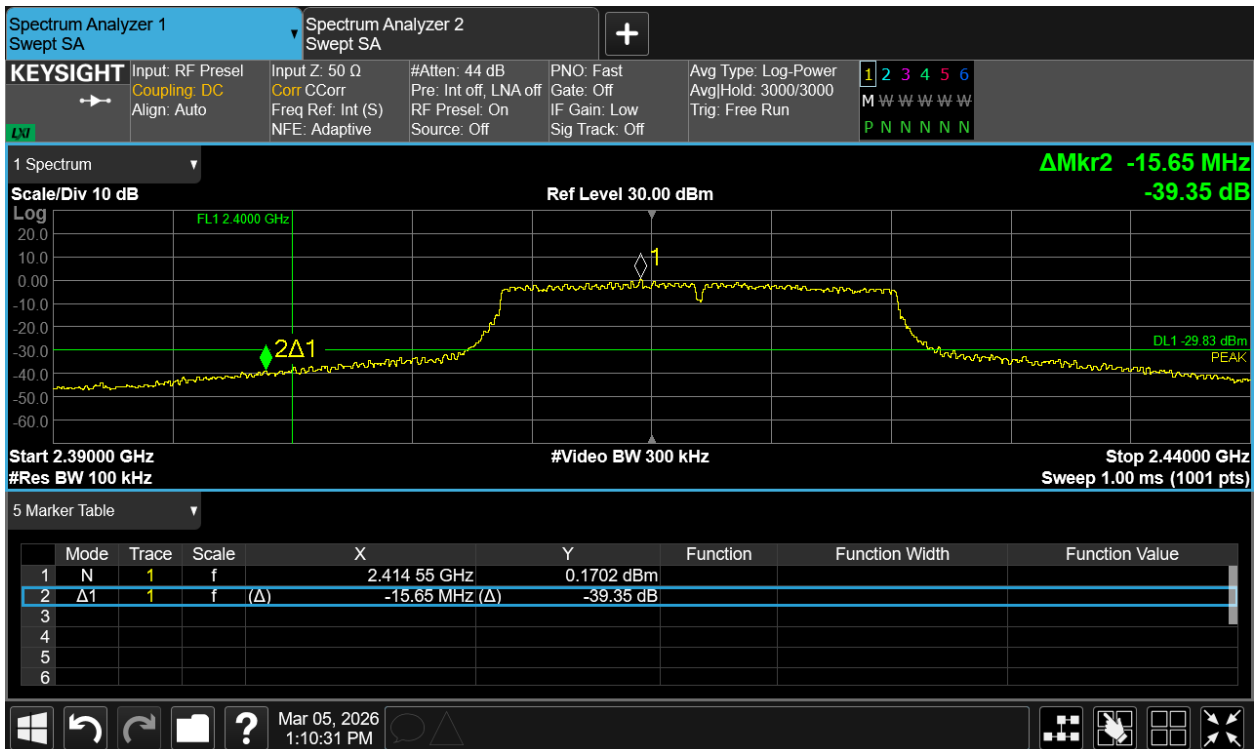


Figure TR61.7: Band edge gap measurement for IEEE 802.11g, 54 Mbps, Ch 2

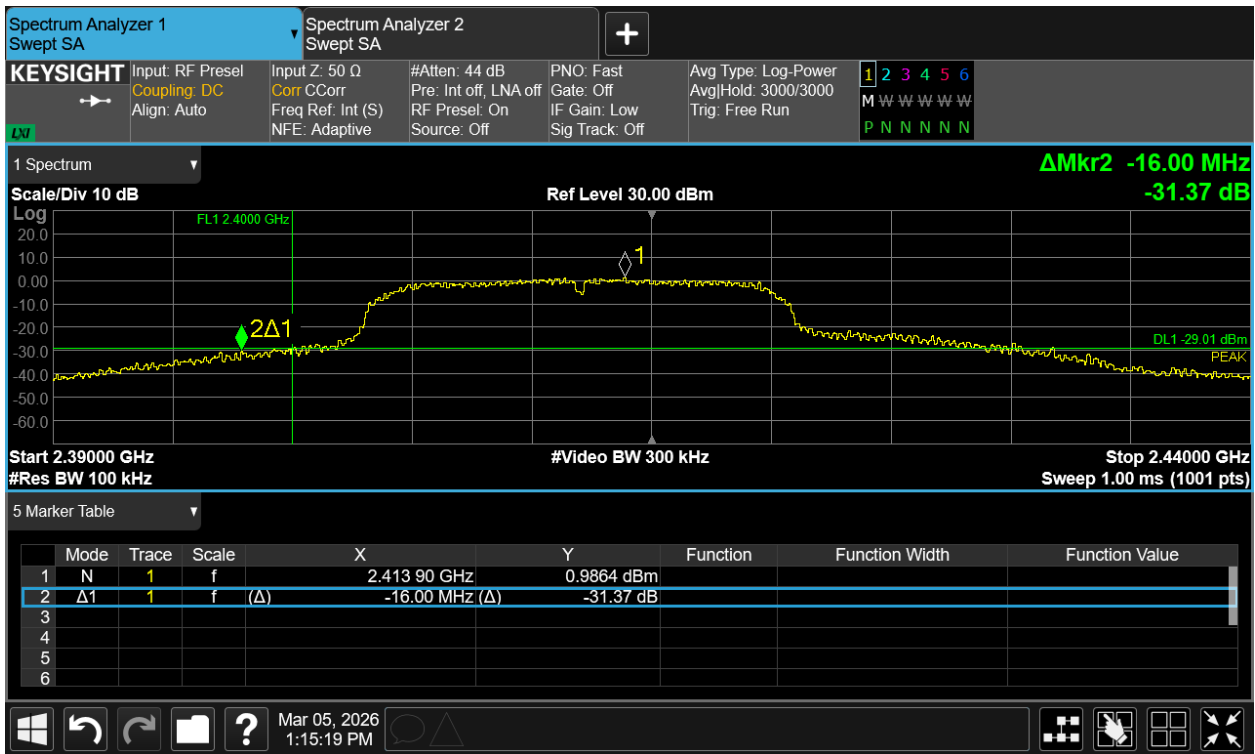


Figure TR61.8: Band edge gap measurement for IEEE 802.11n, NMCS0, Ch 1

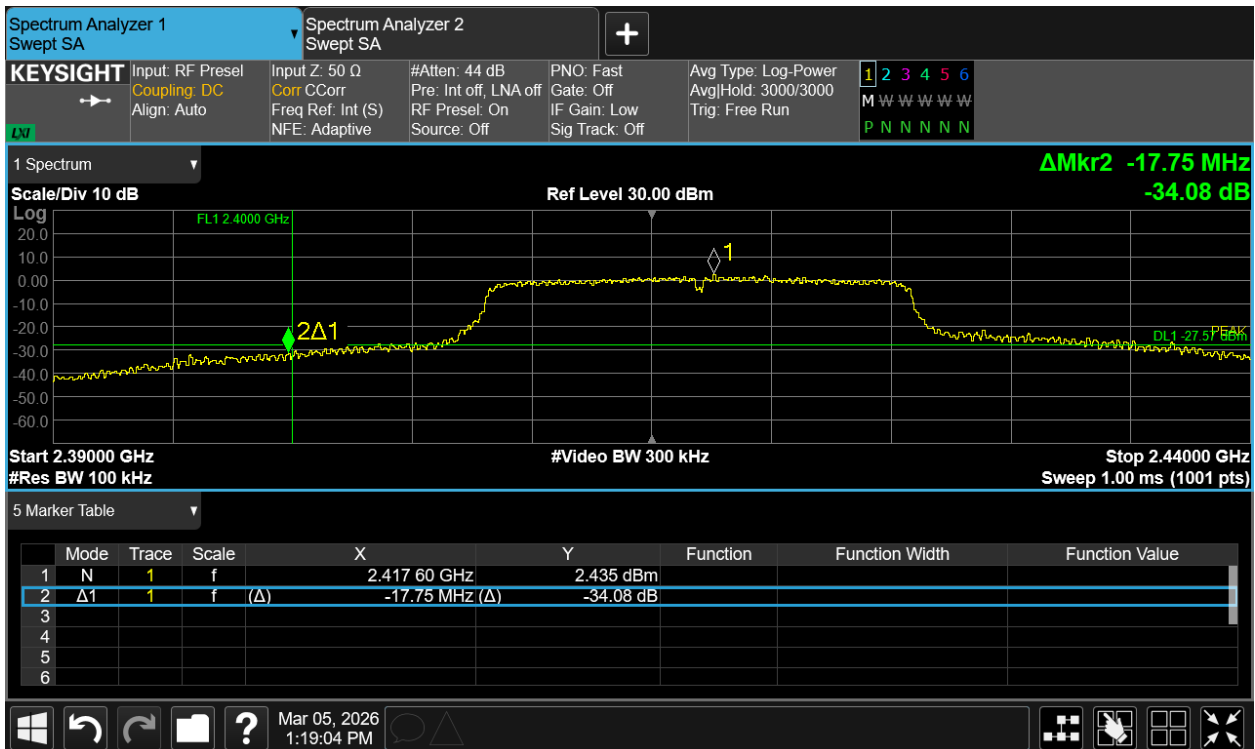


Figure TR61.9: Band edge gap measurement for IEEE 802.11n, MCS0, Ch 2

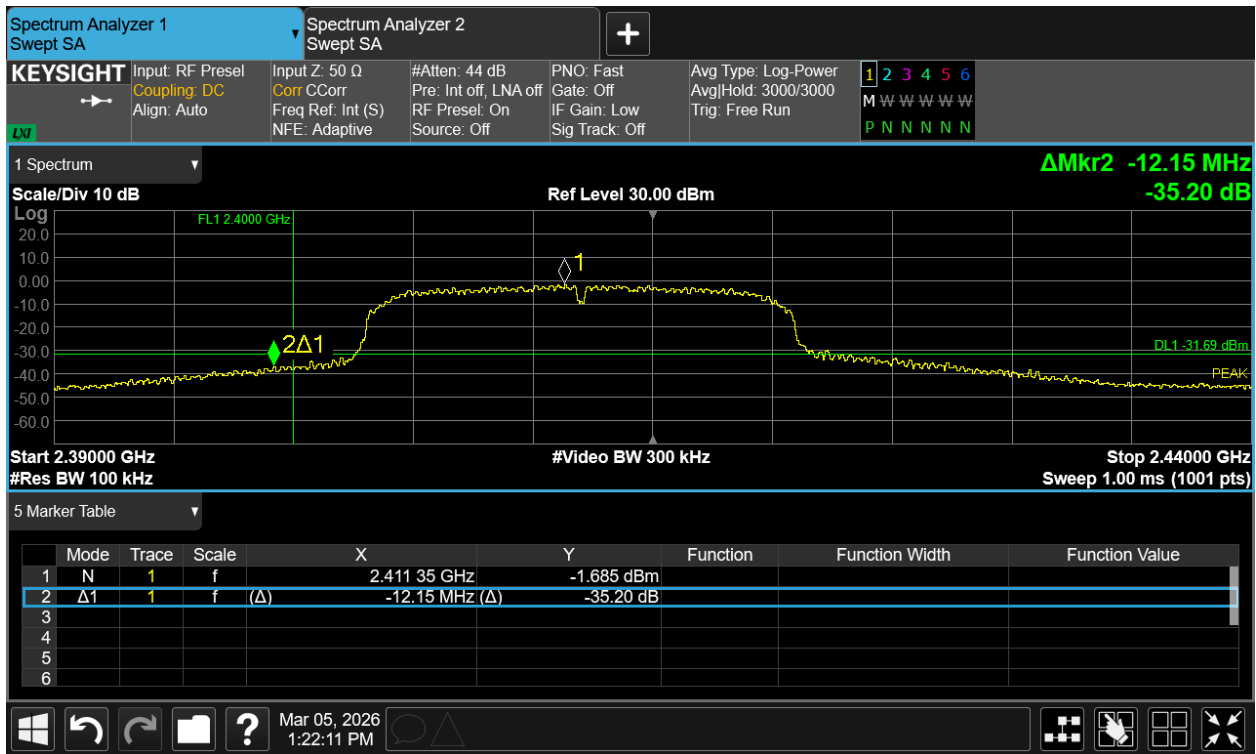


Figure TR61.10: Band edge gap measurement for IEEE 802.11n, MCS7, Ch 1

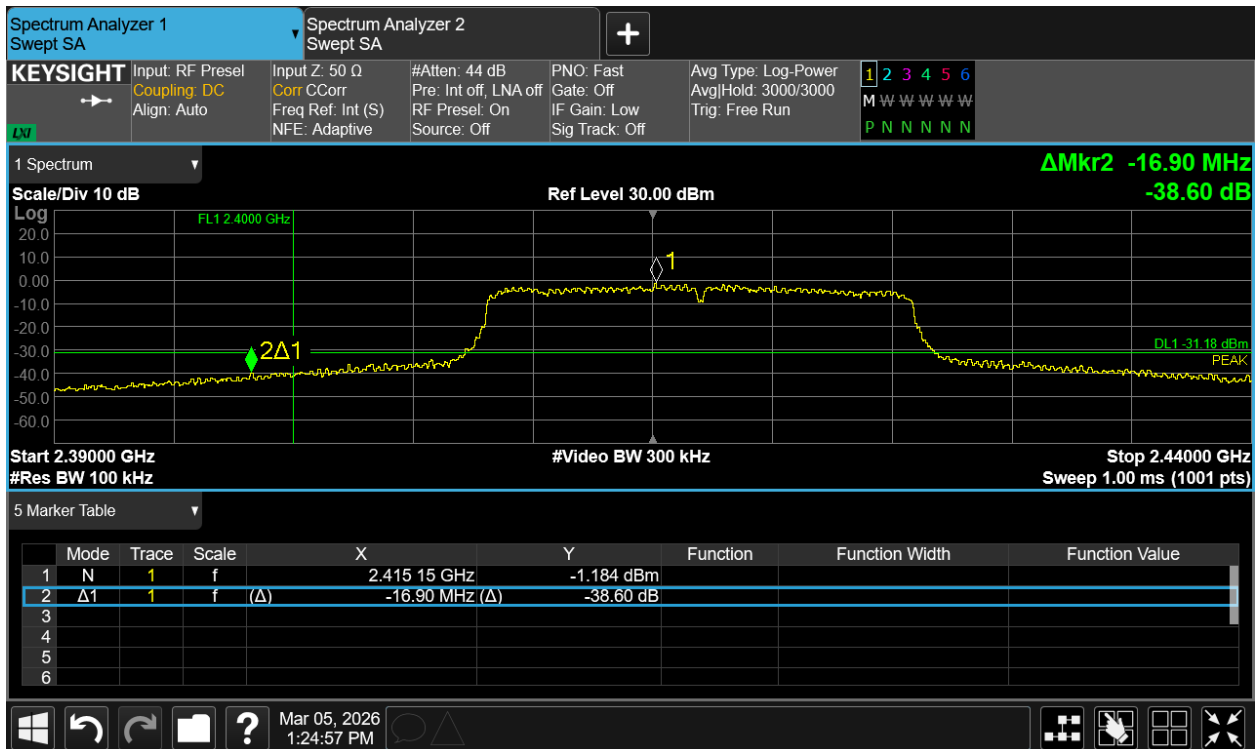


Figure TR61.11: Band edge gap measurement for IEEE 802.11n MCS7, Ch 2

This line is the end of the test record.

Test Record

Band Edge Conducted Spurious Emission Test

Test IDs TR66

Project GCL1030

Test Date(s): 10 April 2026
Test Personnel: Myles Clonch supervised by Majid Farah and Jim Solum

Product Model: A05147
Serial Number tested: 8WP000284

Operating Mode: BLETx
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: 30 dBc for out-of-band reduction relative to in-band levels

Judgment: **PASS**

Test record created by: Myles Clonch
Date of this test record: 12 May 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	22-Apr-2026

Table TR66.1: Test equipment used

Software used: Keysight MXE software A.37.02,

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. Radiated testing in the 2483.5 – 2500 MHz restricted bands demonstrate compliance with the rules at the upper edge of the 2.4 GHz allocated band. This test is only performed 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. 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.

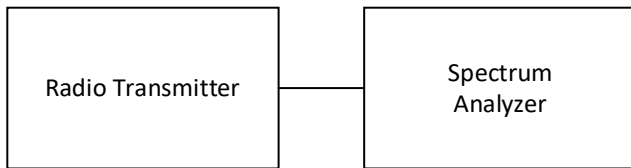


Figure TR66.1: Typical test arrangement

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	Channel	In band to band gap	In band to band gap	Margin to
		required reduction in dB	measurement in dB	limit in dB
BLE 1	2402 MHz	30	-37.35	7.35
BLE 1	2404 MHz	30	-42.82	12.82
BLE 2	2404 MHz	30	-39.79	9.79

Table TR66.2: 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.

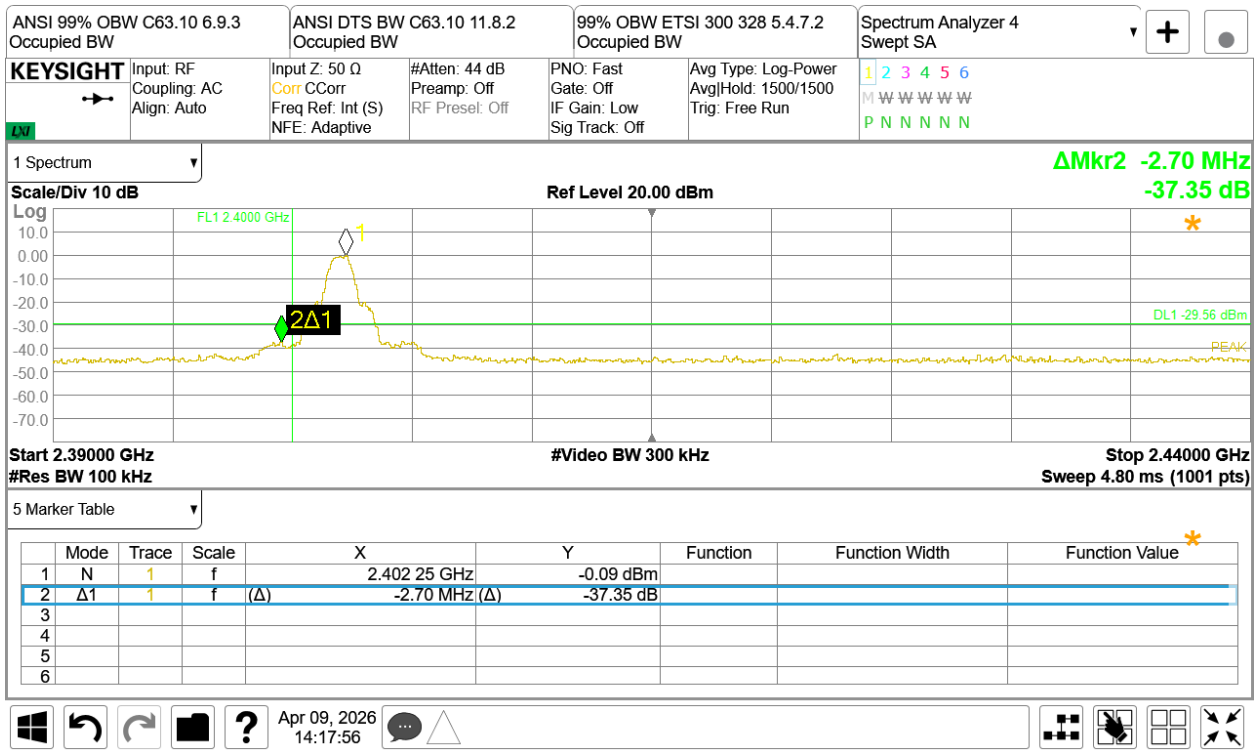


Figure TR66.2: Band edge gap measurement for BLE 1 Mbps, 2402 MHz

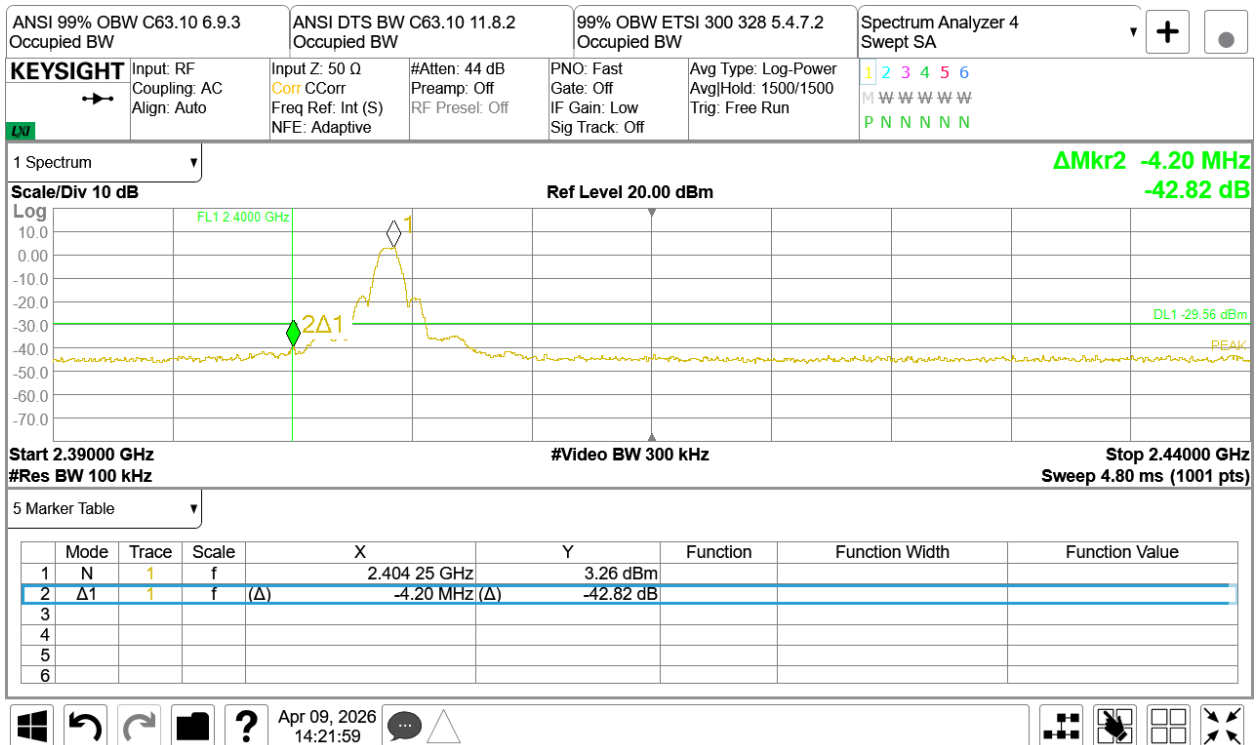
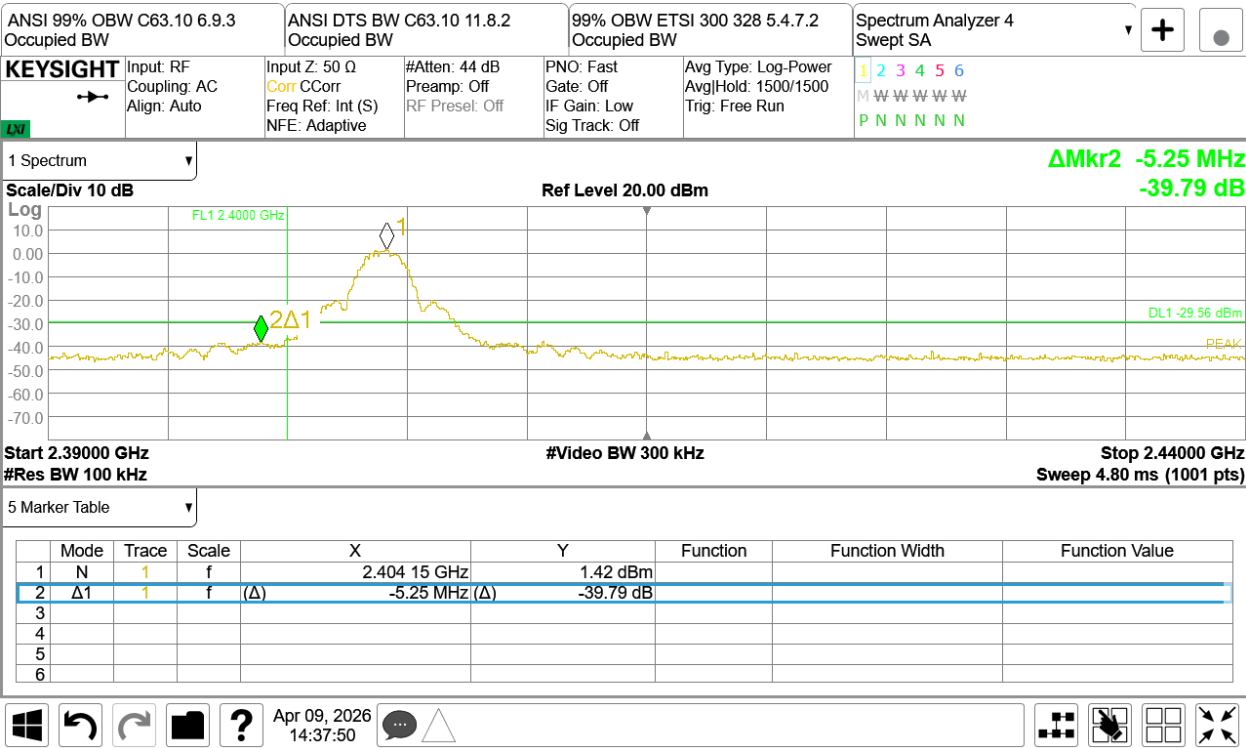


Figure TR66.3: Band edge gap measurement for BLE 1 Mbps, 2404 MHz



10.1.6 Power Spectral Density

Relevant standards include:

CFR47 Parts 15.247(e)

RSS-247 6.3.1(b)

ANSI C63.10 section 11.10

Test and Data Overview

Power spectral density (PSD) is a measure not just of emission power, but of how that power is distributed across a range of frequencies. The rules set a PSD limit of 8 dBm/3 kHz. The measurement can be made with a spectrum analyzer using a resolution bandwidth of 3 kHz or greater. The power measured this way at any frequency in the allocated band of operation cannot be greater than 8 dBm.

The test method was selected from ANSI C63.10 section 11.10. The most general method is the Peak PSD method found at 11.10.2, so that is typically used by default.

Test Record**Transmitter Power Spectral Density****Test IDs TR47****Project GCL-1030**

Test Date(s) 03 Mar 2026
Test Personnel Jim Solum

Product Model A05147
Serial Number tested 8WP000264

Operating Mode Wifi2GTx
Arrangement A2 (Upwr)
Input Power 5Vdc

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

Antenna Gain -1.15 dBi, as reported by the client
Radio Protocol IEEE 802.11 b/g/n (WiFi)

Pass/Fail Judgment: PASS

Test record created by: Myles Clonch
Date of this record: 14 May 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 TR47.1: Test equipment used

Software Used: Keysight PXE software A.33.03

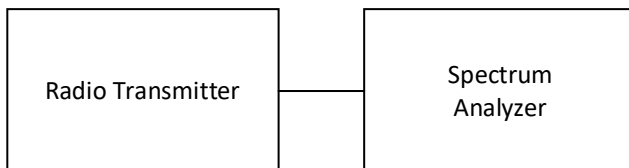
Test Method

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

ANSI C63.10: PKPSD (11.10.2)

Test Setup

This block diagram shows the test equipment setup.

**Figure TR47.1: Test setup**

Test Data

Each measurement is made conducted from the antenna port with the transmitter on a specified channel and in a selected transmission protocol. The results include the effects of any measurement cable losses. Results reported are in units of dBm/Bandwidth and do not include the effect of antenna gain. The standard limit is 8 dBm / 3 kHz, and meeting the limit with a wider resolution bandwidths is permitted. All data met the limit using a 3 kHz resolution bandwidth. The highest PSD levels for each mode are highlighted in yellow, and graphical results are provided for those cases.

	Ch1	Ch6	Ch11	Ch13
B1	-0.85	-1.27	-1.03	-2.65
B2	NT	-5.32	NT	NT
B5.5	NT	-10.51	NT	NT
B11	NT	-10.07	NT	NT
G6	-9.07	-8.25	-8.18	-13.40
G9	NT	-8.63	NT	NT
G12	NT	-9.16	NT	NT
G18	NT	-9.48	NT	NT
G24	NT	-9.73	NT	NT
G36	NT	-13.50	NT	NT
G48	NT	-15.50	NT	NT
G54	NT	-12.91	NT	NT
NMCS0	NT	-10.62	NT	NT
NMCS1	NT	-9.28	NT	NT
NMCS2	NT	-10.10	NT	NT
NMCS3	NT	-11.63	NT	NT
NMCS4	NT	-12.85	NT	NT
NMCS5	NT	-13.56	NT	NT
NMCS6	NT	-13.17	NT	NT
NMCS7	NT	-14.77	NT	NT

Table TR47.2: Summary of results for IEEE 802.11 b/g/n

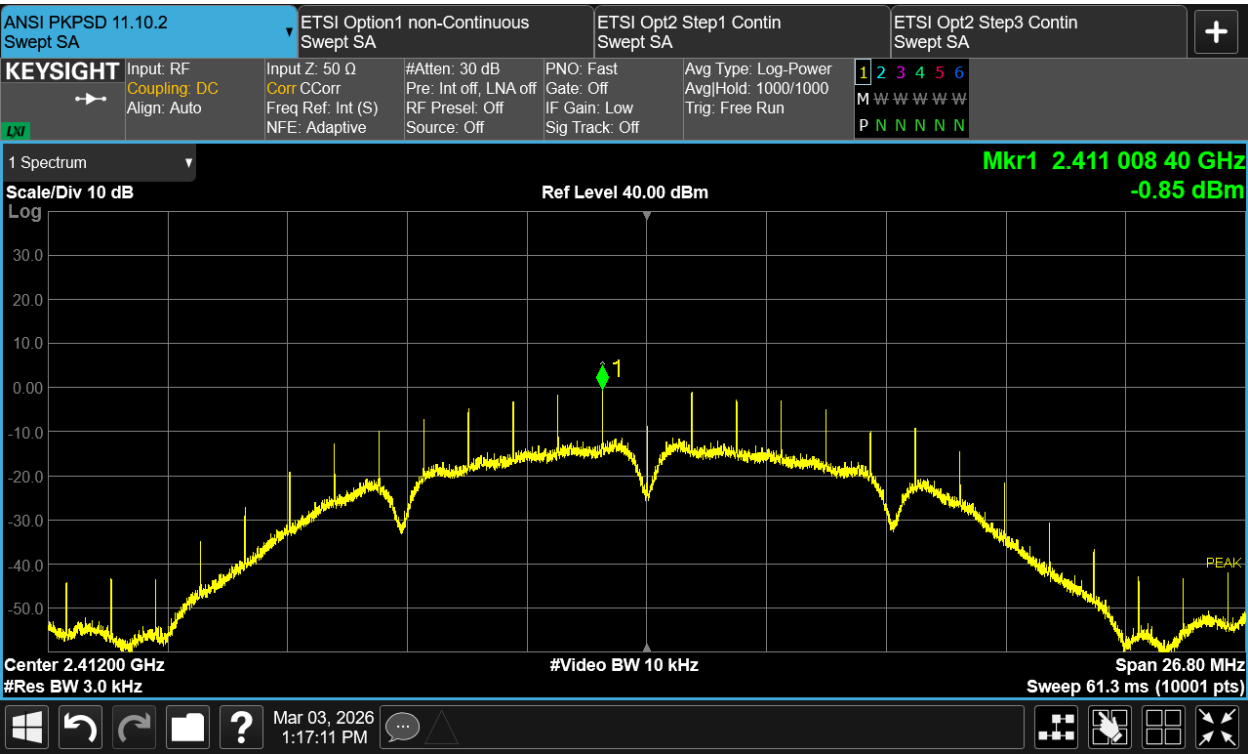


Figure TR47.2: Test data for IEEE 802.11 b 1 on Channel 1

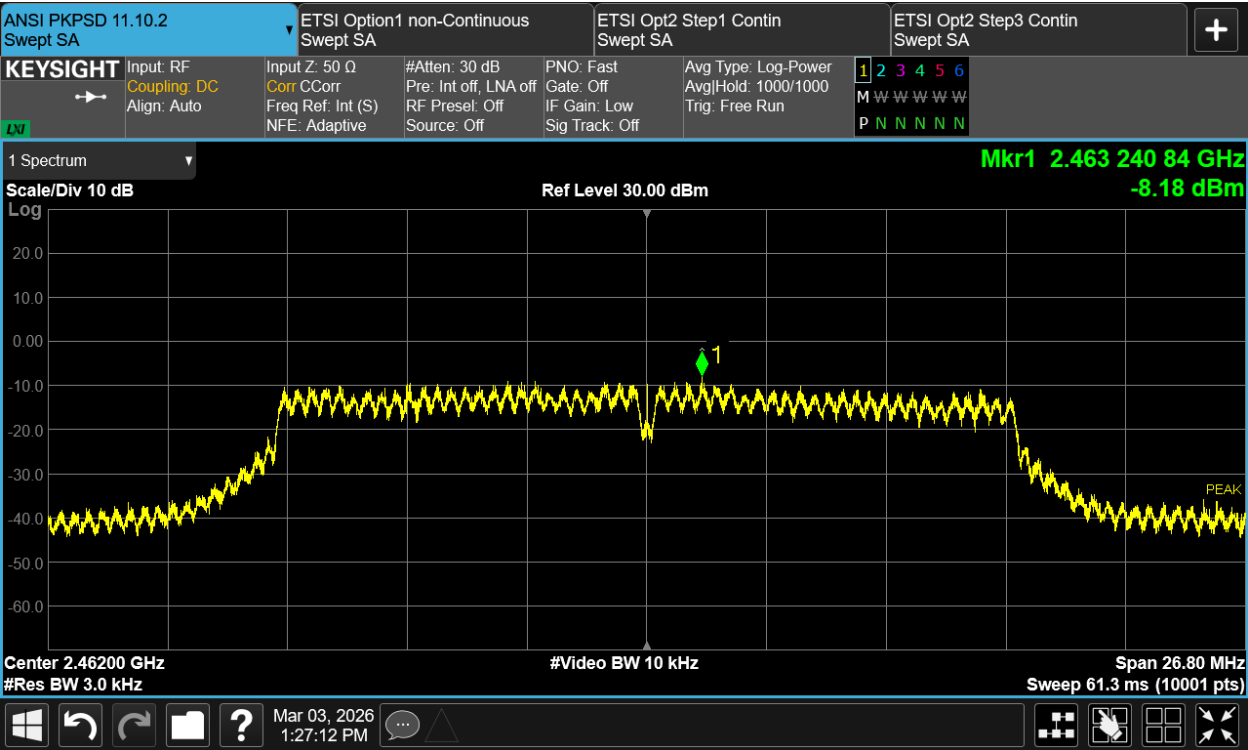


Figure TR47.3: Test data for IEEE 802.11 g 6 on Channel 11

This line is the end of the test record.

Test Record**Transmitter Power Spectral Density****Test IDs TR48****Project GCL-1030**

Test Date(s) 09 Apr 2026
Test Personnel Jim Solum

Product Model A05147
Serial Number tested 8WP000264

Operating Mode BLETx
Arrangement A2 (Upwr)
Input Power 5Vdc

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

Antenna Gain -1.15 dBi, as reported by the client
Radio Protocol Bluetooth Low Energy (BLE)

Pass/Fail Judgment: PASS

Test record created by: Myles Clonch
Date of this record: 14 May 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 TR48.1: Test equipment used

Software Used: Keysight PXE software A.33.03

Test Method

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

ANSI C63.10: PKPSD (11.10.2)

Test Setup

This block diagram shows the test equipment setup.

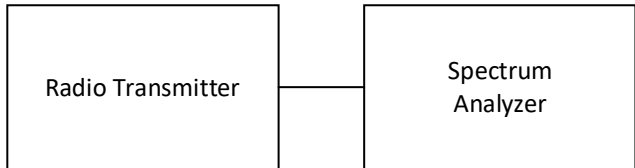


Figure TR48.1: Test setup

Test Data

Each measurement is made conducted from the antenna port with the transmitter on a specified channel and in a selected transmission protocol. The results include the effects of any measurement cable losses. Results reported are in units of dBm/Bandwidth and do not include the effect of antenna gain. The standard limit is 8 dBm / 3 kHz, and meeting the limit with a wider resolution bandwidths is permitted. All data met the limit using a 3 kHz resolution bandwidth. The highest PSD levels for each mode are highlighted in yellow, and graphical results are provided for those cases.

	2402	2440	2480
BLE 1 Mbps	-16.41	-12.65	-15.97

Table TR48.2: Summary of results for BLE 1 Mbps

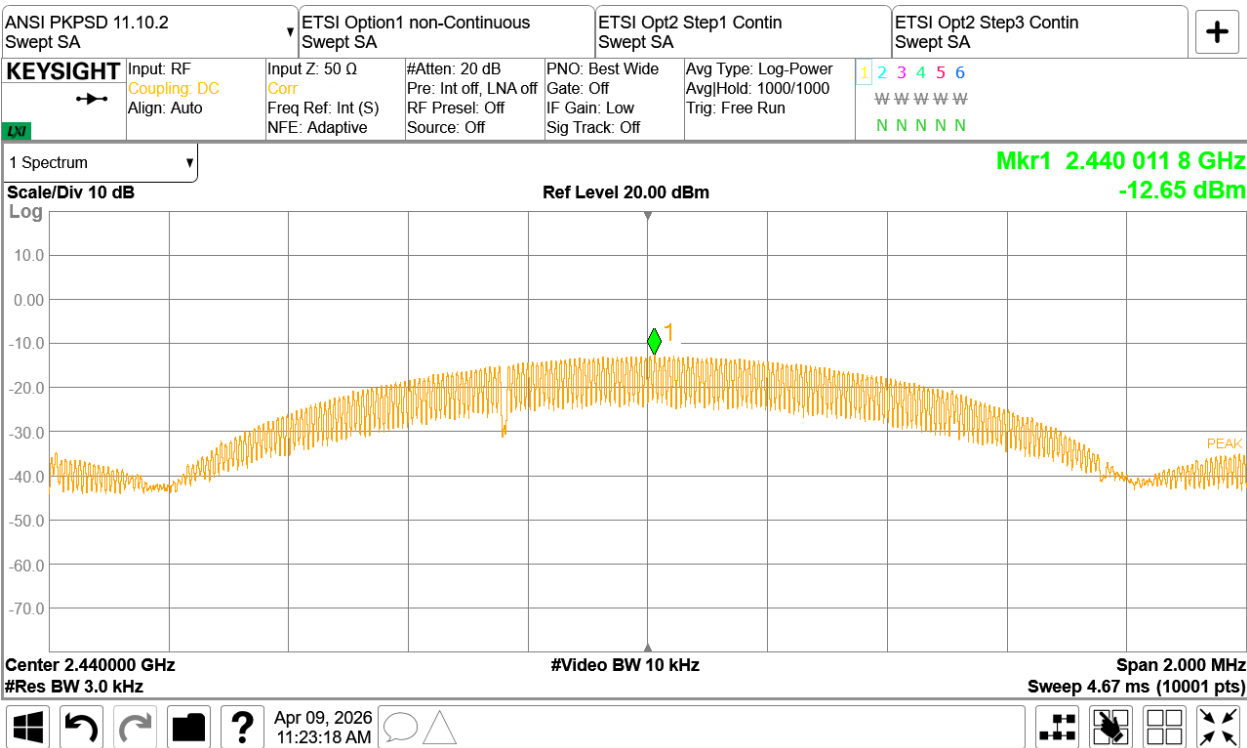


Figure TR48.2: Test data for BLE 1 Mbps at 2440 MHz

This line is the end of the test record.

10.2 Radiated Emission Test Results

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, 6.6, 11.11, 11.12.2.5

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. That is why the unwanted emission measurements are satisfied by a combination of radiated tests and RF port conducted tests.

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](#) and [power spectral density](#) 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. When emissions of significance were identified in restricted bands of operation and an average detector limit applies, an appropriate averaging method from section 11.12.2.5 was applied.

Test Record
Radiated Emission Test
Test ID RE51
Project GCL1030

Test Date(s): 10 Apr 2026
Test Personnel: David Kerr

Product Model: A05147
Serial Number tested: 8WP000276

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

Test Standards: DTS: 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: David A Kerr
Date of this record: 10 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, Horn, 1-18 GHz	ETS Lindgren	3117	227596	11-Nov-2025	11-Nov-2027
Preamplifier, 500 MHz 18 GHz	Com-Power	PAM-118A	18040133	Calibration	Not Required
Wifi Filter	K&L	8NSL26-2437/E8	1	Calibration	Not Required
3 GHz High Pass filter	Anatech Electronics	OKOR2	1	Calibration	Not Required
FSOATS 3m, above 1 GHz	Frankonia	SAC3	F199004	13-Dec-2024	13-Dec-2027
Tape Measure, 1-3/16 in x 33 ft	Crecent Lufkin	L1135CME-02	GMN0013782	Calibration	Not Required

Table RE51.1: 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 BLE 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		
7206.762	V	32.7	42.4	8.1	40.8	50.5	54.0	74.0	13.2	23.5	213.3	333.0
12009.658	V	26.7	38.1	17.1	43.8	55.2	54.0	74.0	10.2	18.8	400.0	350.0
4804.595	H	36.7	46.5	4.7	41.4	51.2	54.0	74.0	12.6	22.8	100.0	0.0

Table RE51.2: Emission summary (BLE, 1 Mbps, 2402 MHz)

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

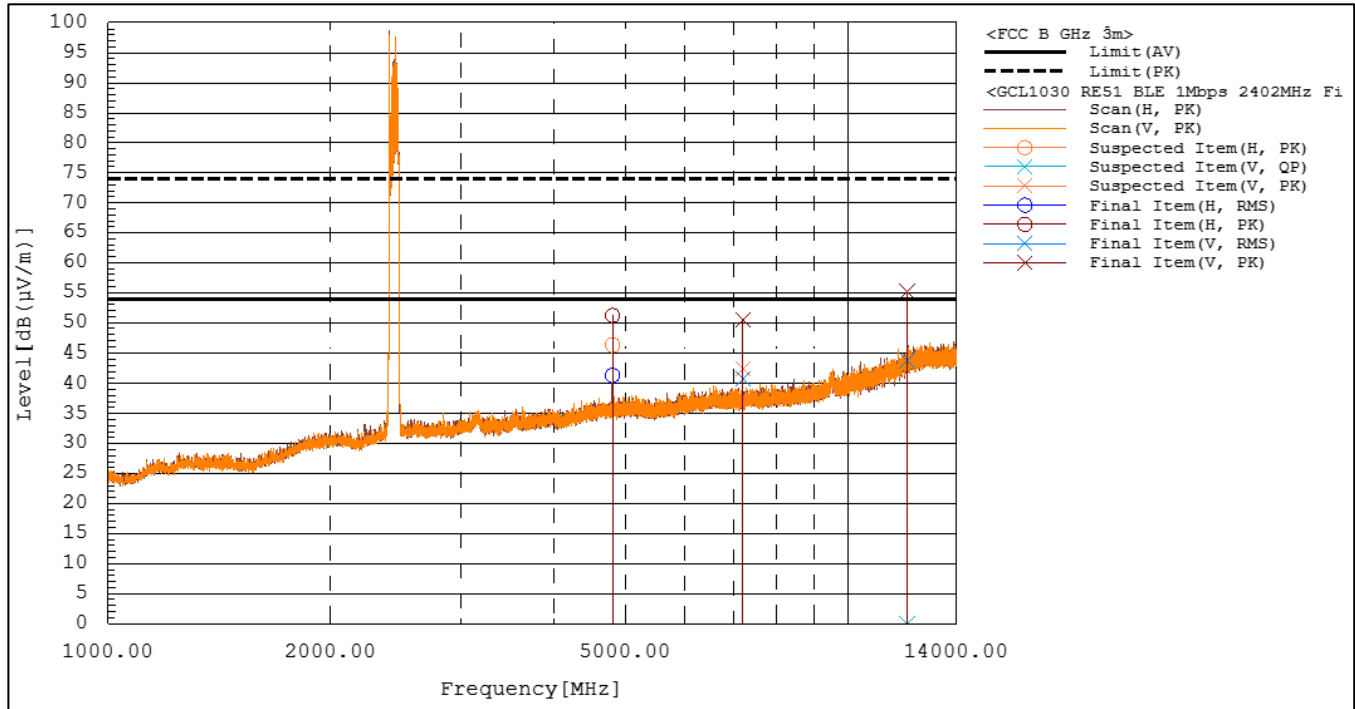


Figure RE51.1: Spectral data (BLE, 1 Mbps, 2402 MHz)

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		
4880.494	H	42.9	50.7	4.8	47.7	55.5	54.0	74.0	6.3	18.5	100.0	36.0
7319.267	H	42.5	48.7	8.8	51.3	57.5	54.0	74.0	2.7	16.5	213.1	25.0
12199.516	H	27.0	38.5	17.8	44.8	56.3	54.0	74.0	9.2	17.7	100.0	0.0

Table RE51.3: Emission summary (BLE 1, Mbps, 2440 MHz)

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

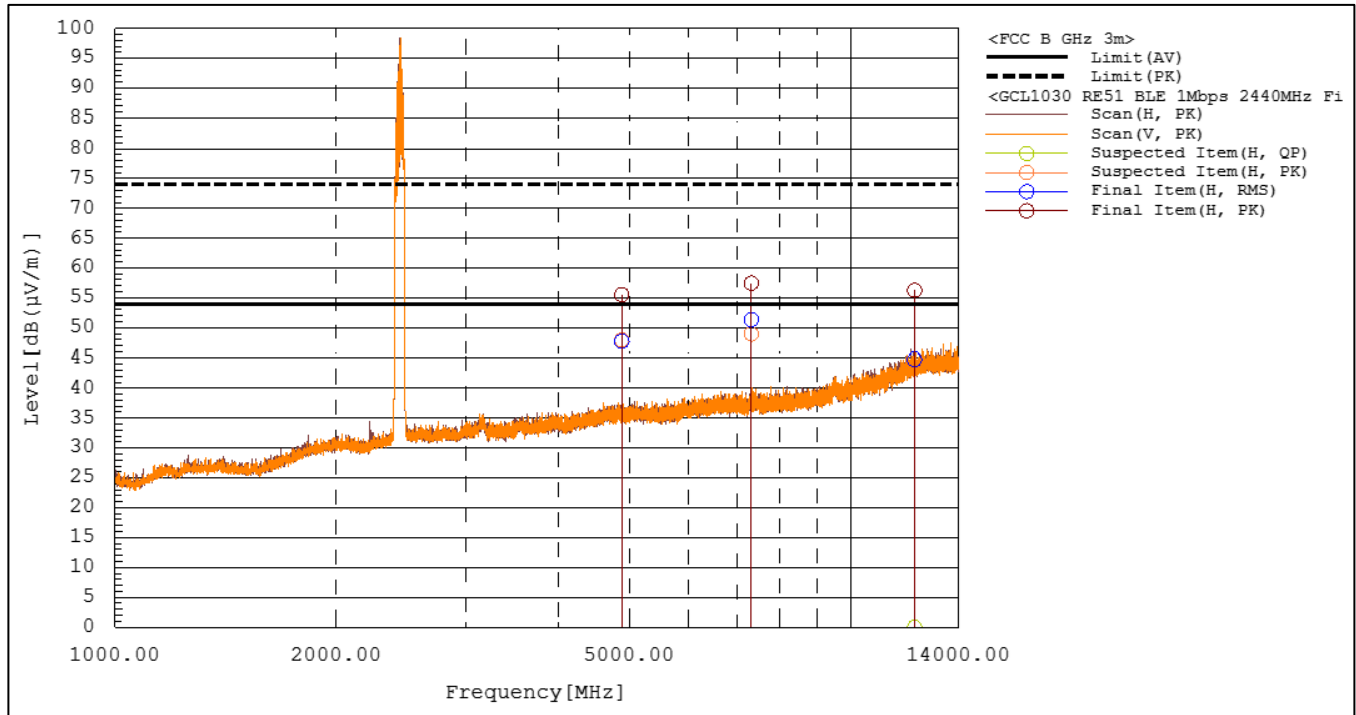


Figure RE51.2: Spectral data (BLE 1, Mbps, 2440 MHz)

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		
4960.432	H	38.6	46.7	4.9	43.5	51.6	54.0	74.0	10.5	22.4	100.0	21.0
7439.520	H	33.4	43.0	8.8	42.2	51.8	54.0	74.0	11.8	22.2	225.1	25.0
12400.176	H	26.4	37.9	17.8	44.2	55.7	54.0	74.0	9.8	18.3	100.0	9.0

Table RE51.4: Emission summary (BLE 1, Mbps, 2480 MHz)

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

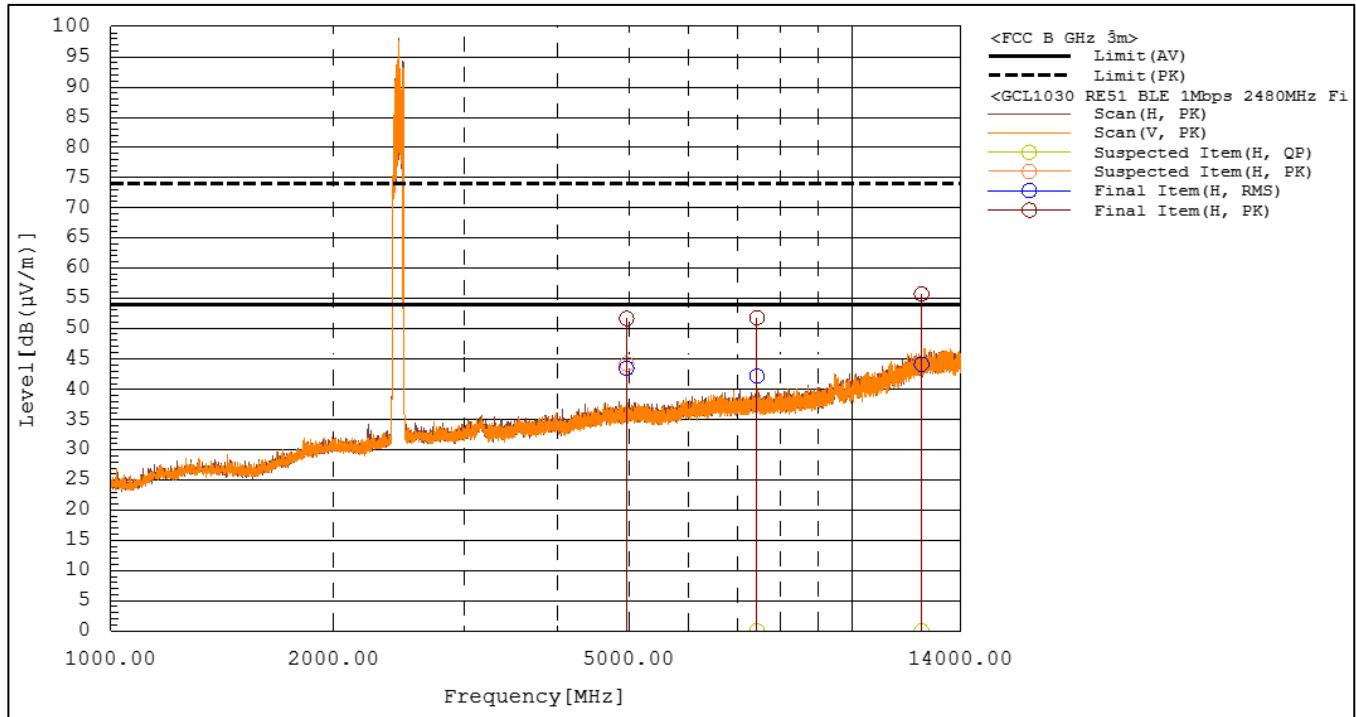


Figure RE51.3: Spectral data (BLE 1, Mbps, 2480 MHz)

Setup Photographs

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



Figure RE51.4: EUT test setup, first view

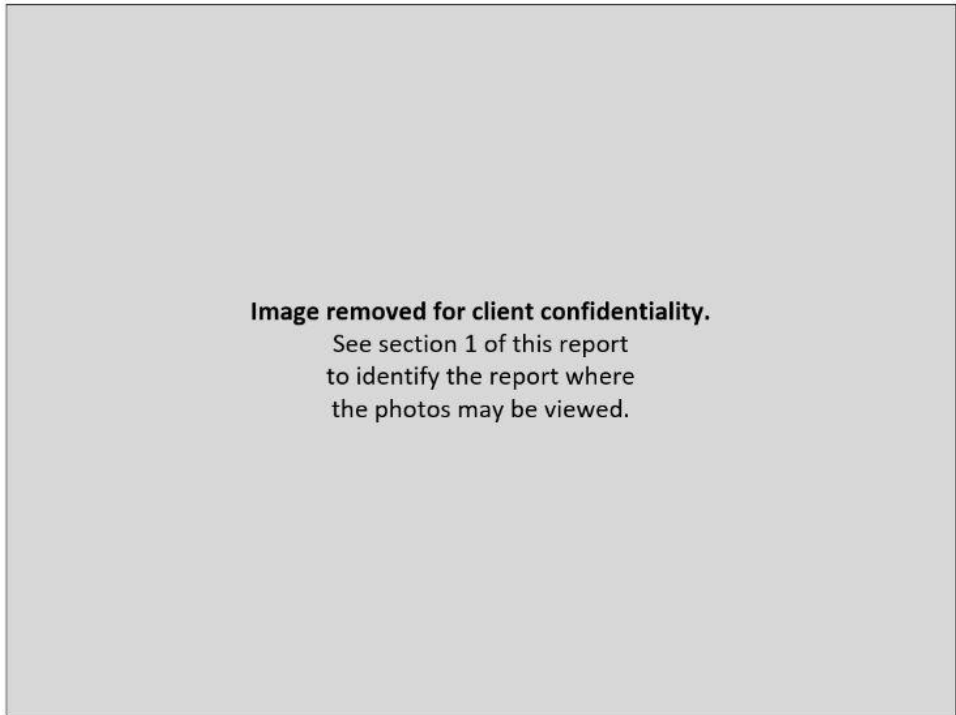


Figure RE51.5: EUT test setup, second view

This line is the end of the test record.

Test Record
Radiated Emission Test
Test ID RE52
Project GCL1030

Test Date(s): 10 Apr 2026
Test Personnel: Vladimir Tolstik

Product Model: A05147
Serial Number tested: 8WP000276

Operating Mode: WiFi2GTx
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: 16 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, Horn, 1-18 GHz	ETS Lindgren	3117	00227596	11-Nov-2025	11-Nov-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	OK0R2	01	Calibration	Not Required
FSOATS 3m, above 1 GHz	Frankonia	SAC3	F199004	13-Dec-2024	13-Dec-2027

Table RE52.1: 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 WiFi 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
		RMS	PK		RMS	PK	AV	PK	RMS	PK		
4824.042	H	46.0	53.0	4.8	50.8	57.8	54.0	74.0	3.2	16.2	223.9	30.0
13507.683	V	25.7	36.5	19.5	45.2	56.0	54.0	74.0	8.8	18.0	392.8	42.0

Table RE52.2: Emission summary (IEEE 802.11b, 1 Mbps, Ch 1)

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

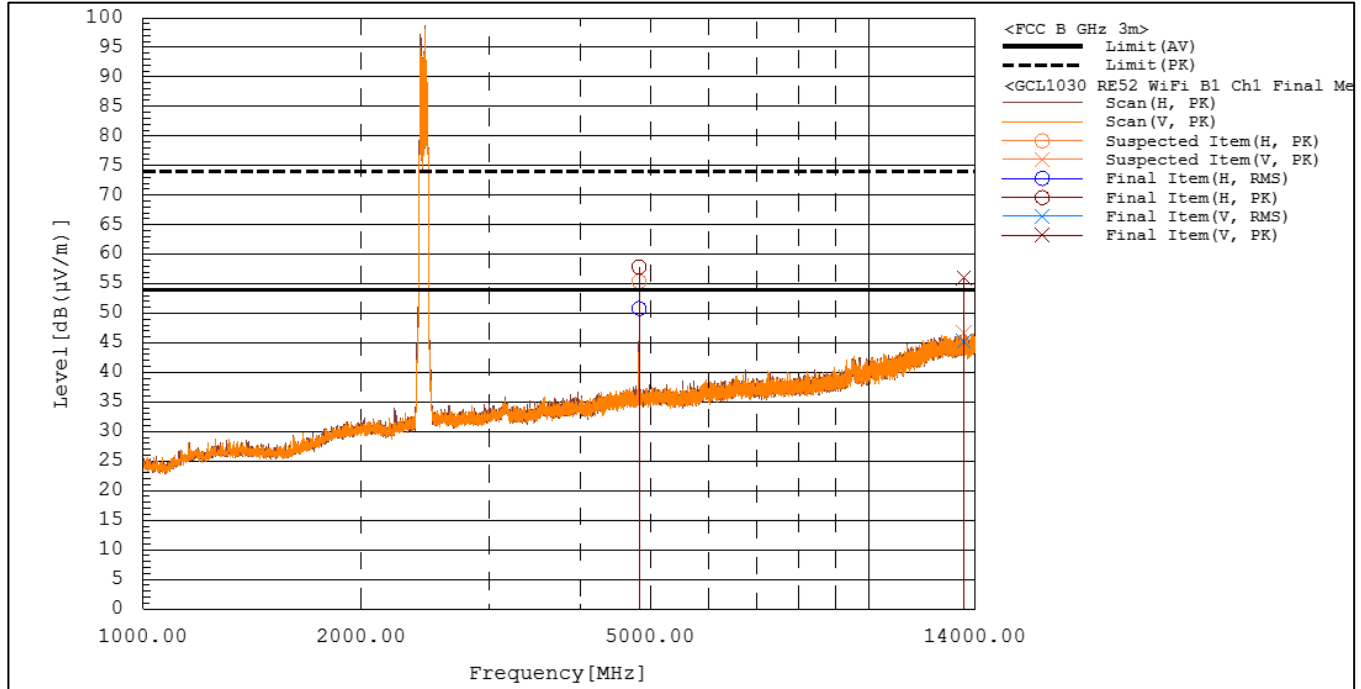


Figure RE52.1: Spectral data (IEEE 802.11b, 1 Mbps, Ch 1)

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		
4874.036	H	46.1	53.2	4.8	50.9	58.0	54.0	74.0	3.1	16.0	104.7	23.0

Table RE52.3: Emission summary (IEEE 802.11b, 1 Mbps, Ch 6)

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

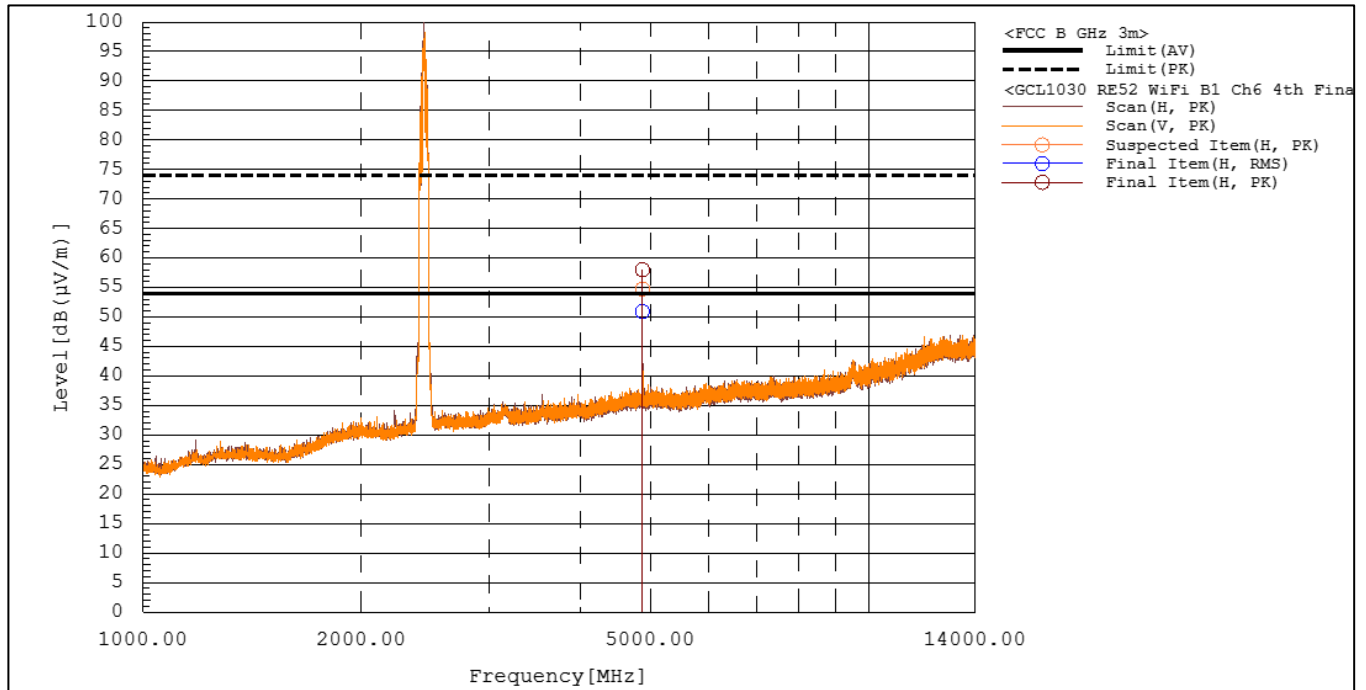


Figure RE52.2: Spectral data (IEEE 802.11b, 1 Mbps, Ch 6)

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		
4923.999	H	43.6	51.0	4.8	48.4	55.8	54.0	74.0	5.6	18.2	100.0	23.0
13644.144	H	26.1	37.2	19.7	45.8	56.9	54.0	74.0	8.2	17.1	369.2	167.0

Table RE52.4: Emission summary (IEEE 802.11b, 1 Mbps, Ch 11)

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

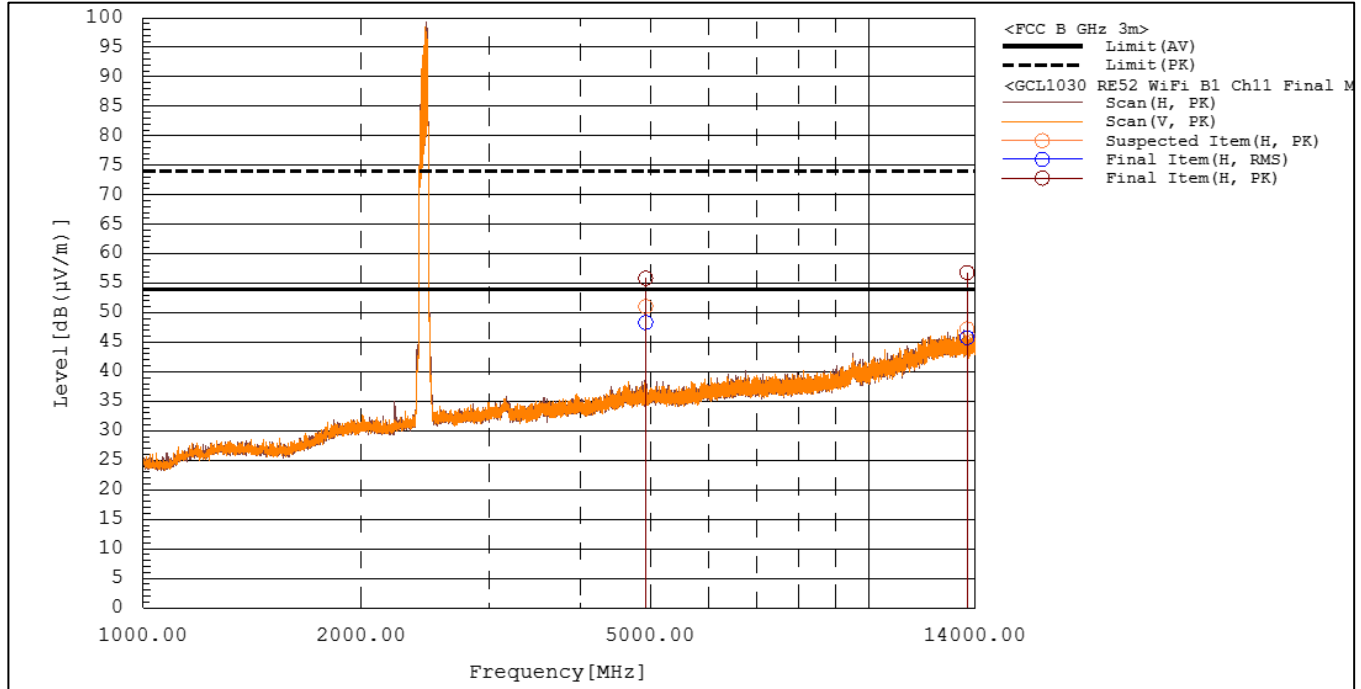


Figure RE52.3: Spectral data (IEEE 802.11b, 1 Mbps, Ch 11)

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		
1720.463	V	32.8	44.2	-4.8	28.0	39.4	54.0	74.0	26.0	34.6	219.3	16.0
4944.035	H	44.4	51.9	4.9	49.3	56.8	54.0	74.0	4.7	17.2	100.0	22.0
13929.116	V	25.4	38.6	20.1	45.5	58.7	54.0	74.0	8.5	15.3	351.7	22.0

Table RE52.5: Emission summary (IEEE 802.11b, 1 Mbps, Ch 13)

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

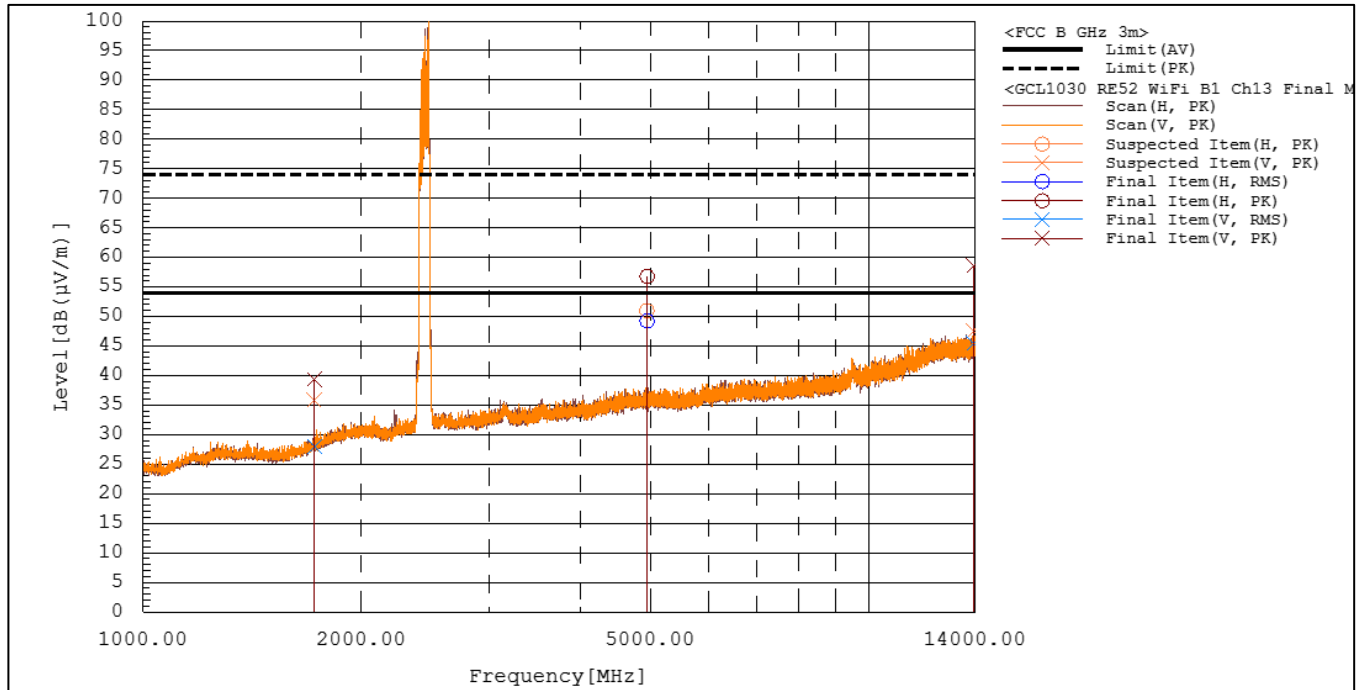


Figure RE52.4: Spectral data (IEEE 802.11b, 1 Mbps, Ch 13)

Setup Photographs

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

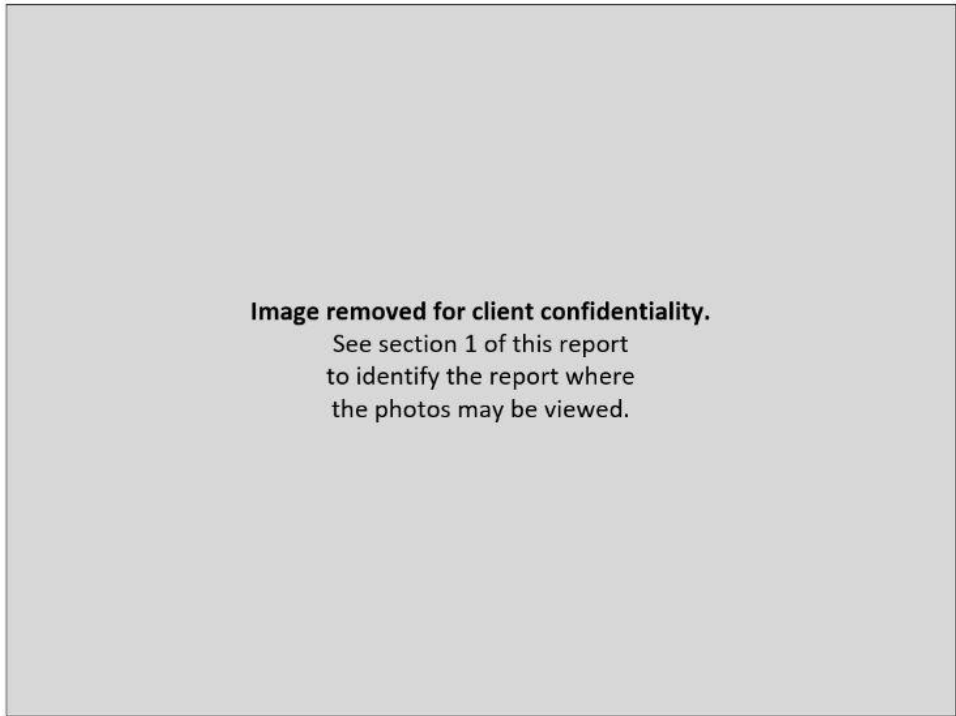


Figure RE52.5: EUT test setup, first view

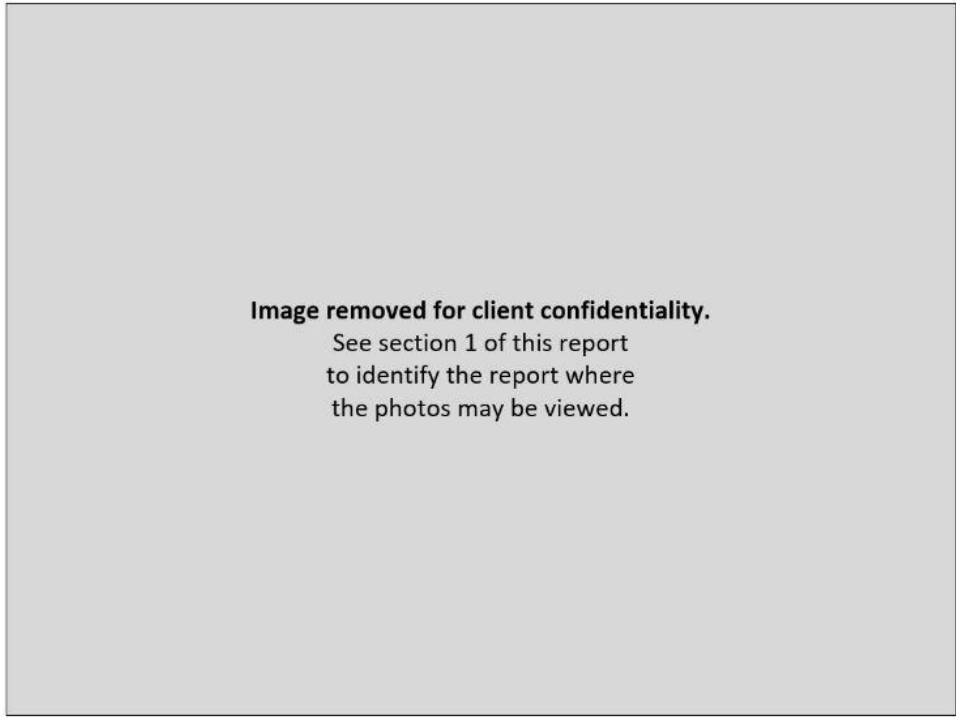


Figure RE52.6: EUT test setup, second view

This line is the end of the test record.

Test Record**Radiated Emission Test RE15****Project GCL1030**

Test Date(s) 17 Mar 2026
Test Personnel David Kerr, Vladimir Tolstik

Product Model A05147
Serial Number tested 8WP000276

Operating Mode Wifi2GTx
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: David A Kerr, Andy Heier
Date of this record: 02 Jun 2026

Original record, Version B.

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	OK0R2	01	Calibration	Not Required

Table RE15.1: 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 WIFI radios 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		
4819.863	H	41.4	57.3	4.9	46.3	62.2	54.0	74.0	7.7	11.8	100.0	15.0
7230.037	H	30.6	42.2	8.3	38.9	50.5	54.0	74.0	15.1	23.5	332.0	291.0
13640.198	H	25.8	37.3	19.5	45.3	56.8	54.0	74.0	8.7	17.2	332.8	29.0

Table RE15.2: Emission summary (IEEE 802.11g, 6 Mbps, Ch 1)

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

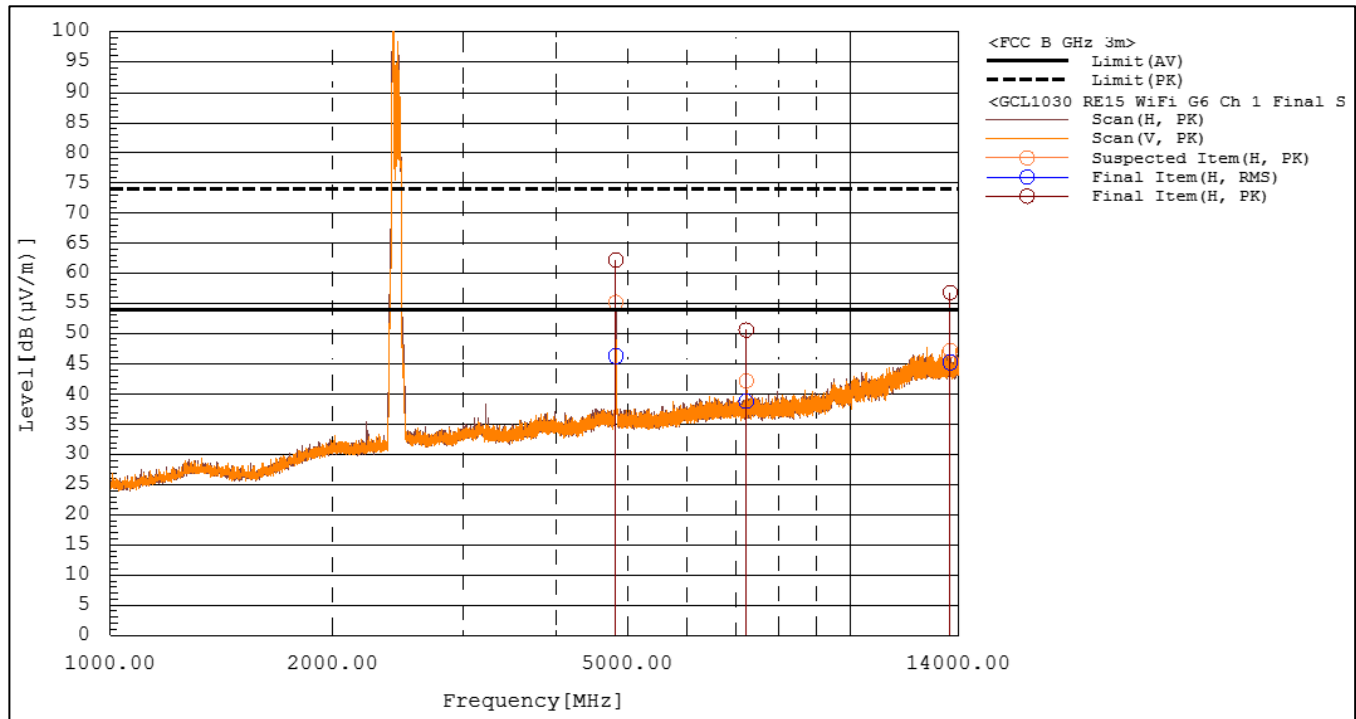


Figure RE15.1: Spectral data (IEEE 802.11g, 6 Mbps, Ch 1)

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		
4872.231	H	38.8	54.2	4.8	43.6	59.0	54.0	74.0	10.4	15.0	247.9	41.0
7314.033	H	31.2	42.1	8.7	39.9	50.8	54.0	74.0	14.1	23.2	353.5	314.0
12712.901	H	26.8	38.4	18.3	45.1	56.7	54.0	74.0	8.9	17.3	346.0	309.0

Table RE15.3: Emission summary (IEEE 802.11g, 6 Mbps, Ch 6)

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

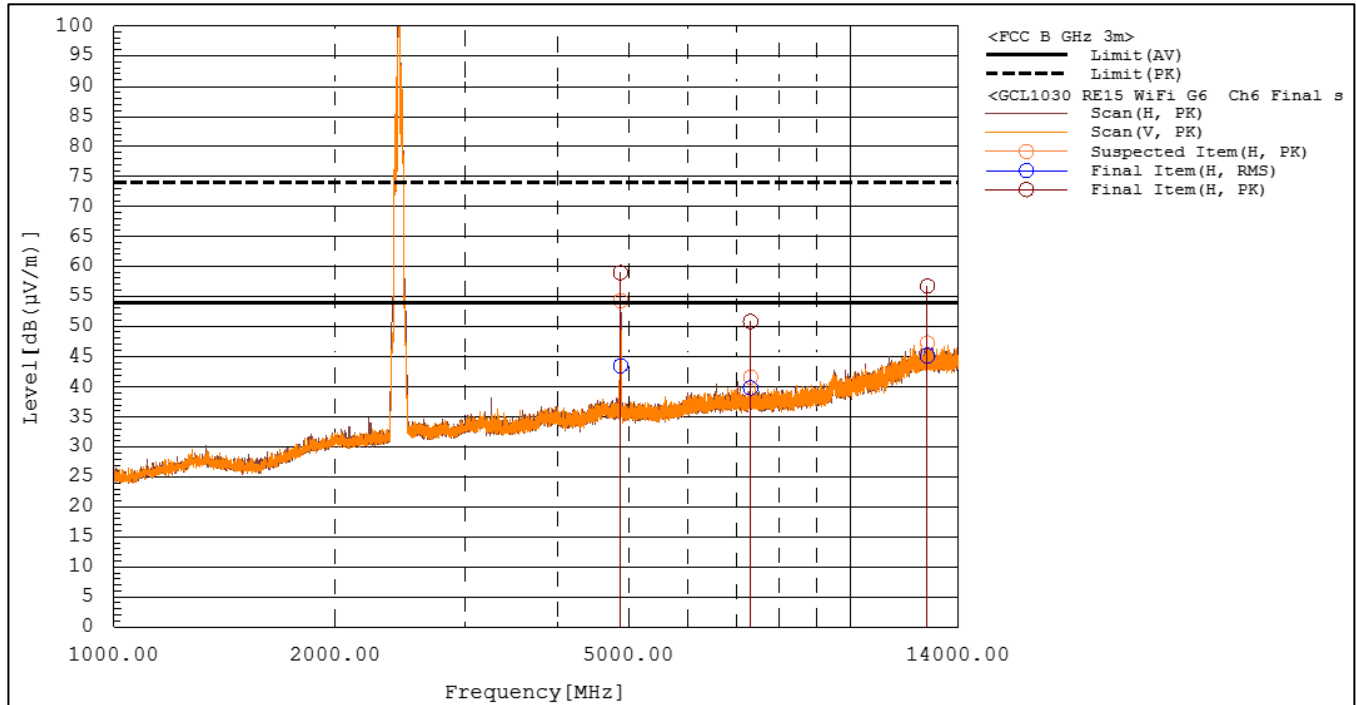


Figure RE15.2: Spectral data (IEEE 802.11g, 6 Mbps, Ch 6)

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		
4917.604	H	39.0	53.5	4.8	43.8	58.3	54.0	74.0	10.2	15.7	106.6	15.0
7386.309	H	30.1	41.3	8.6	38.7	49.9	54.0	74.0	15.3	24.1	221.2	40.0
13270.158	H	26.0	38.1	19.7	45.7	57.8	54.0	74.0	8.3	16.2	390.8	323.0

Table RE15.4: Emission summary (IEEE 802.11g, 6 Mbps, Ch 11)

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

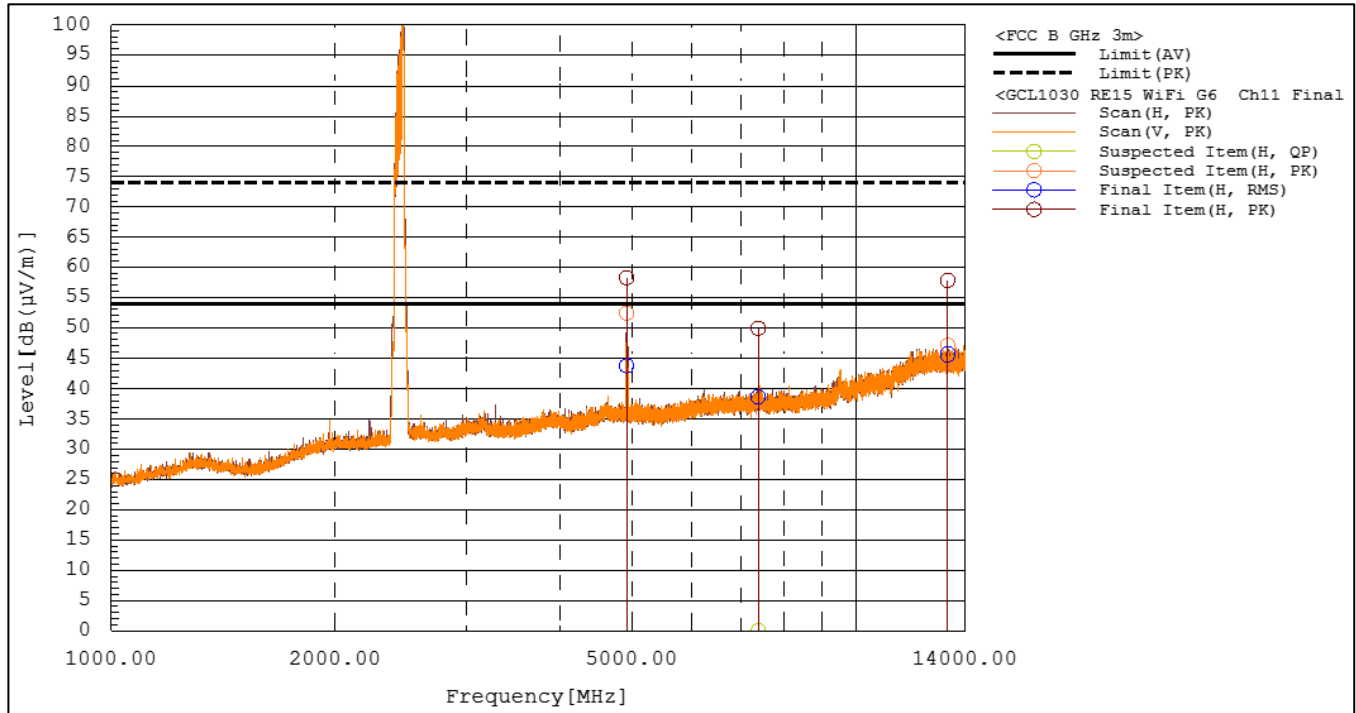


Figure RE15.3: Spectral data (IEEE 802.11g, 6 Mbps, Ch 11)

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		
4945.951	H	34.5	48.8	4.9	39.4	53.7	54.0	74.0	14.6	20.3	106.6	13.0
7416.244	H	29.3	40.5	8.7	38.0	49.2	54.0	74.0	16.0	24.8	234.8	298.0
12687.666	H	26.5	37.1	18.3	44.8	55.4	54.0	74.0	9.2	18.6	373.0	148.0

Table RE15.5: Emission summary (IEEE 802.11g, 6 Mbps, Ch 13)

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

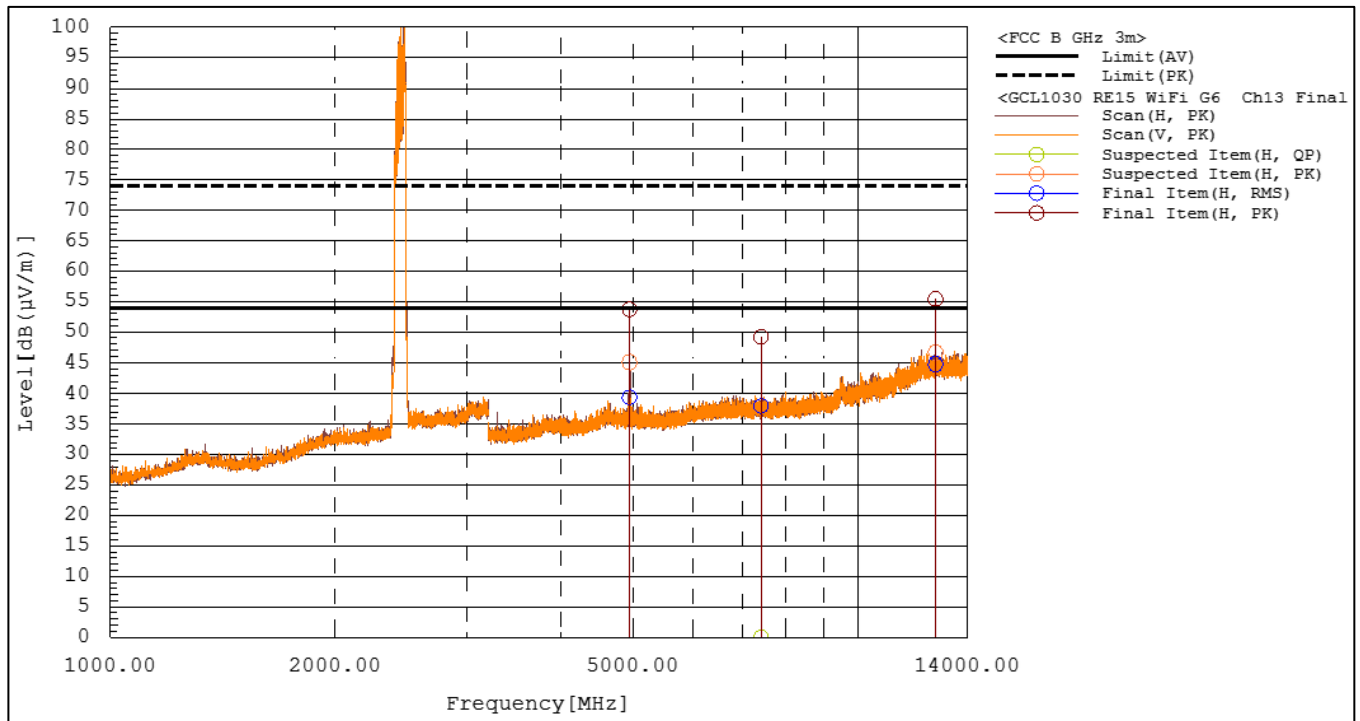


Figure RE15.4: Spectral data (802.11g, 6 Mbps, Ch 13)

Setup Photographs

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

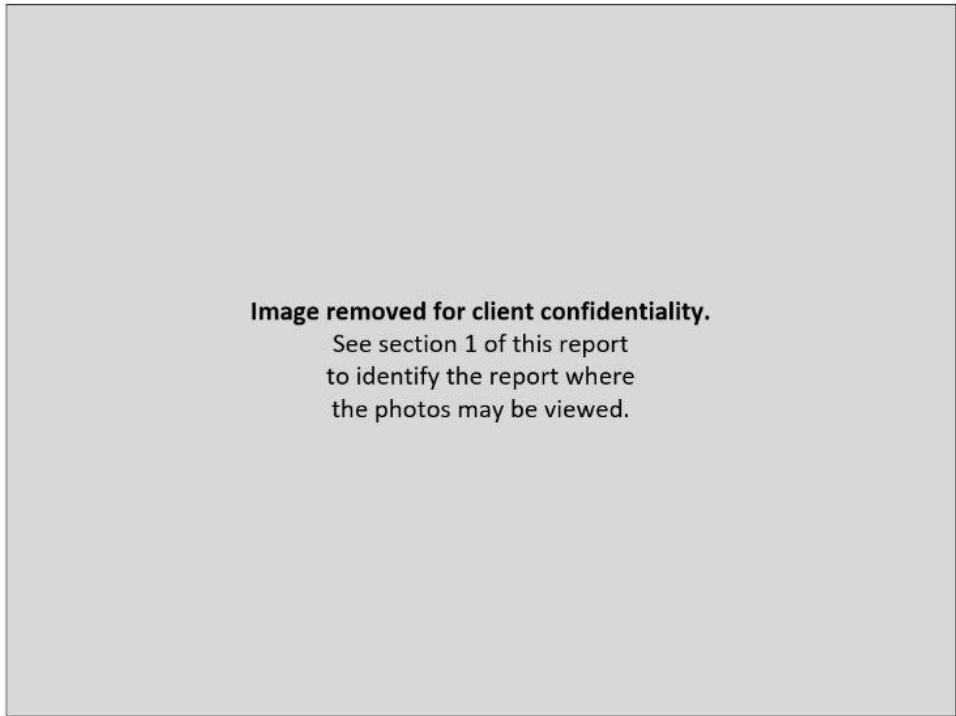


Figure RE15.5: EUT test setup, first view

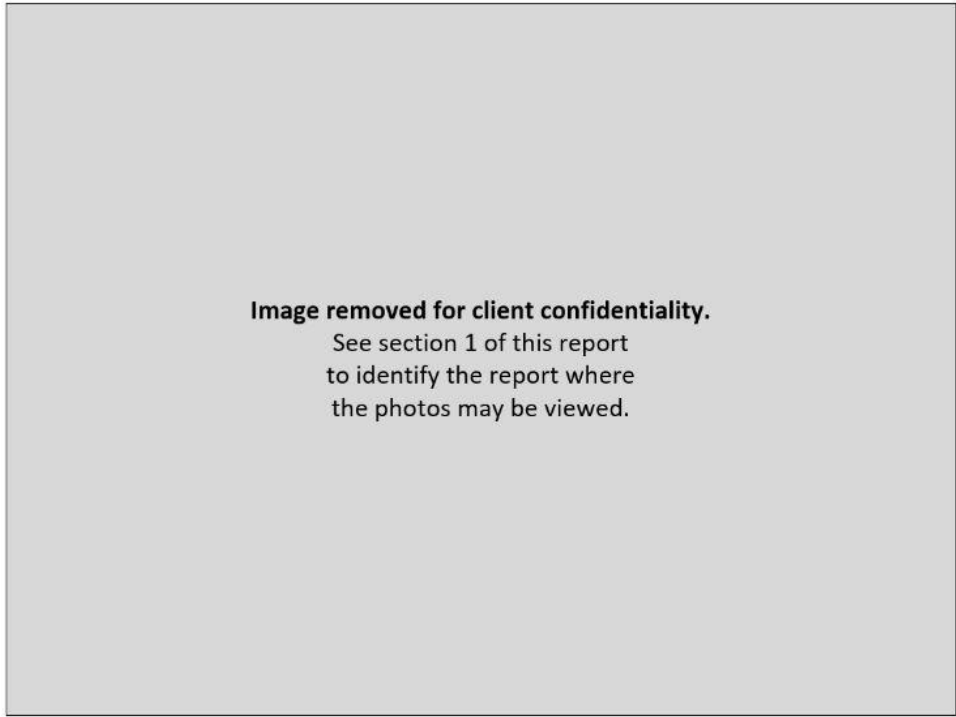


Figure RE15.6: EUT test setup, second view

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, 11.11, 11.12.2.5

Test and Data Overview

See [Section 10.2.1](#).

Test Record
Radiated Emission Test
Test ID RE23
Project GCL1030

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

Product Model: A05147
Serial Number tested: 8WP000276

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

Test Standards: DTS: FCC Part 15.247; RSS-247; RSS-GEN; ANSI C63.10 (as noted in Section 5 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 RE23.1: 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.

In the 14 GHz to 26.5 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 14 GHz 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		
22691.890	V	26.2	33.1	22.0	48.2	55.1	54.0	74.0	5.8	18.9	100.0	0.0

Table RE23.2: Emission summary (BLE, 1 Mbps, 2440 MHz)

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

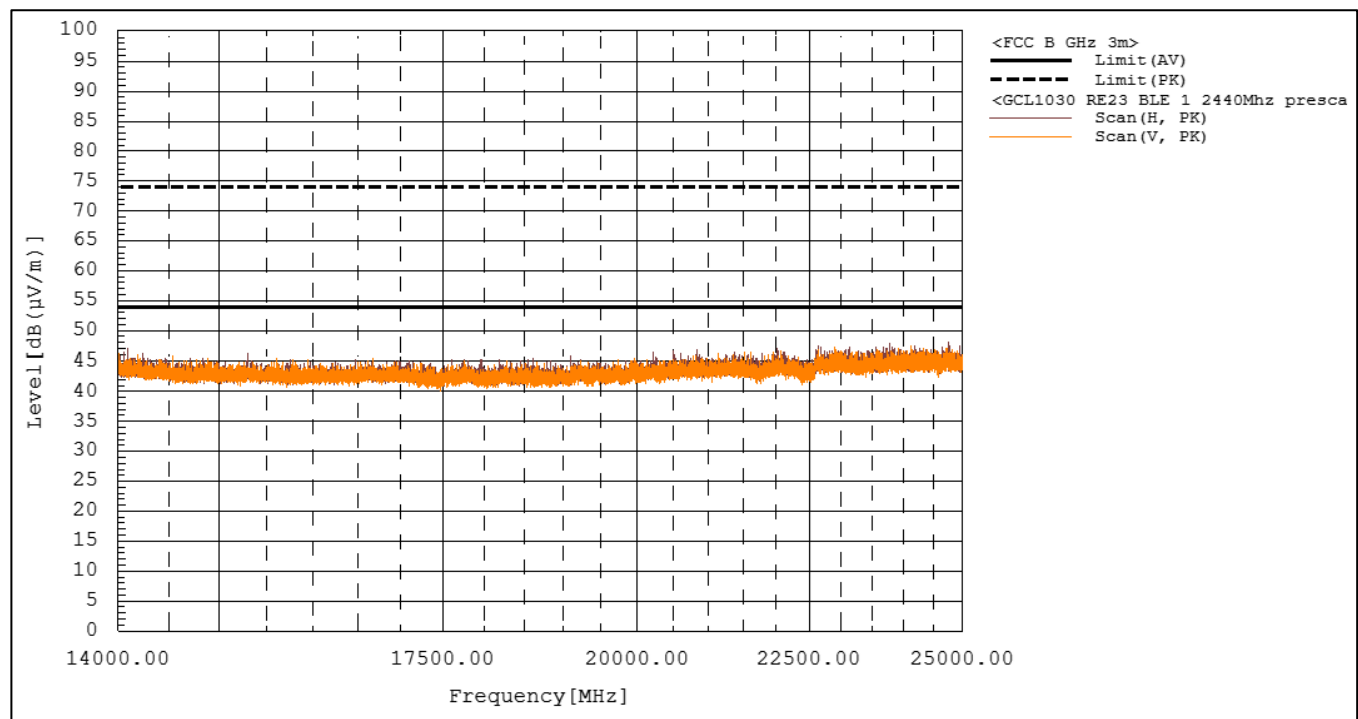


Figure RE23.1: Spectral data at 1 Meter (BLE, 1 Mbps, 2440 MHz)

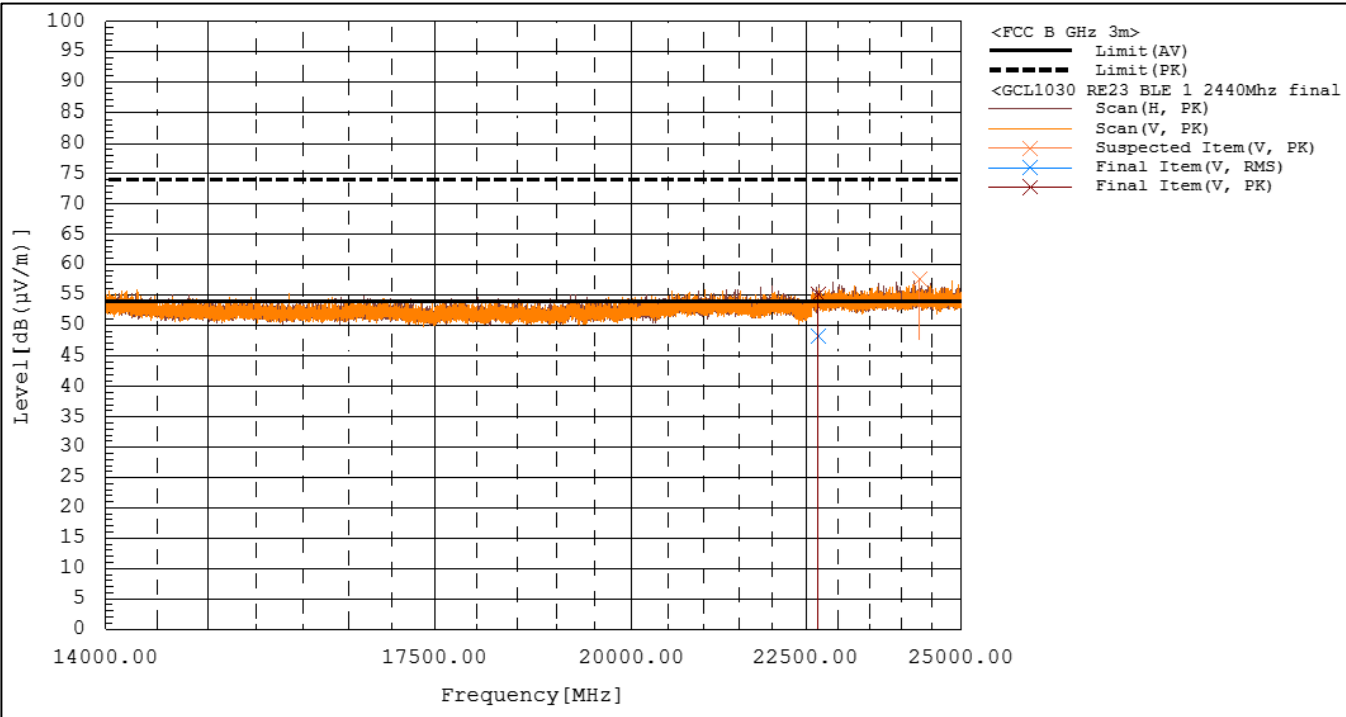


Figure RE23.2: Spectral data at 3 Meters (BLE, 1 Mbps, 2440 MHz)

Setup Photographs

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



Figure RE23.3: EUT test setup, first view (1 Meter)

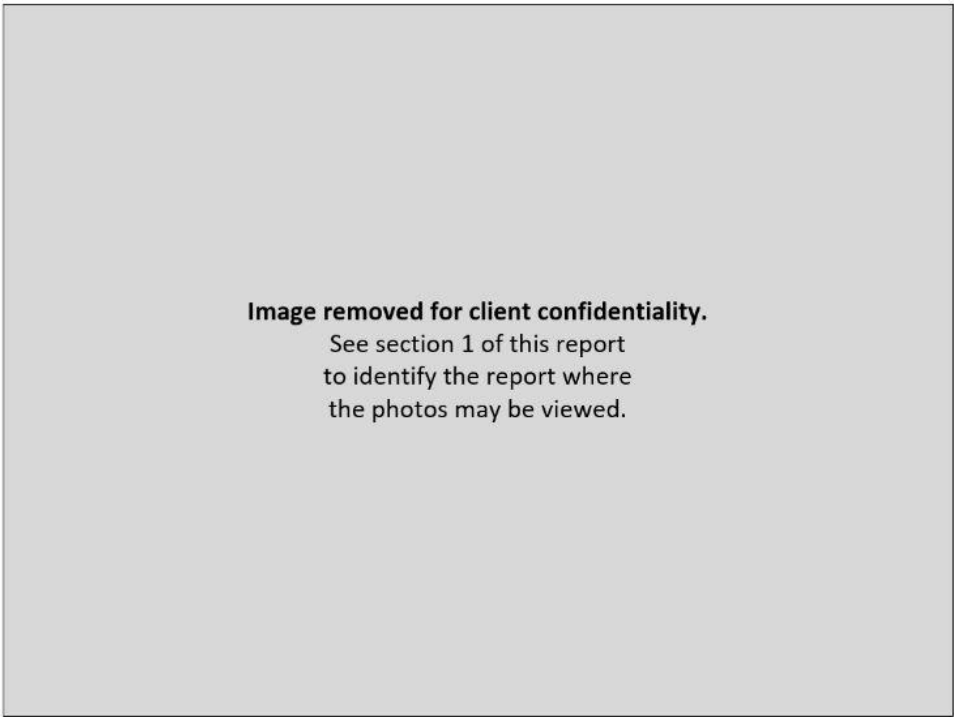


Figure RE23.4: EUT test setup, second view (3 meters)



Figure RE23.5: EUT test setup, second view (3 Meters)

This line is the end of the test record.

Test Record**Radiated Emission Test****Test ID RE24****Project GCL1030**

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

Product Model: A05147
Serial Number tested: 8WP000276

Operating Mode: Wifi2GTx
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: 14 GHz to 25 GHz
Pass/Fail Judgment: PASS

Test record created by: David A Kerr
Date of this record: 28 Apr 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 RE24.1: 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.

In the 14 GHz to 26.5 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 14 GHz 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		
22223.788	V	25.9	31.9	21.7	47.6	53.6	54.0	74.0	6.4	20.4	100.0	0.0

Table RE24.2: Emission summary (IEEE 802.11b, 1 Mbps, Ch 6)

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

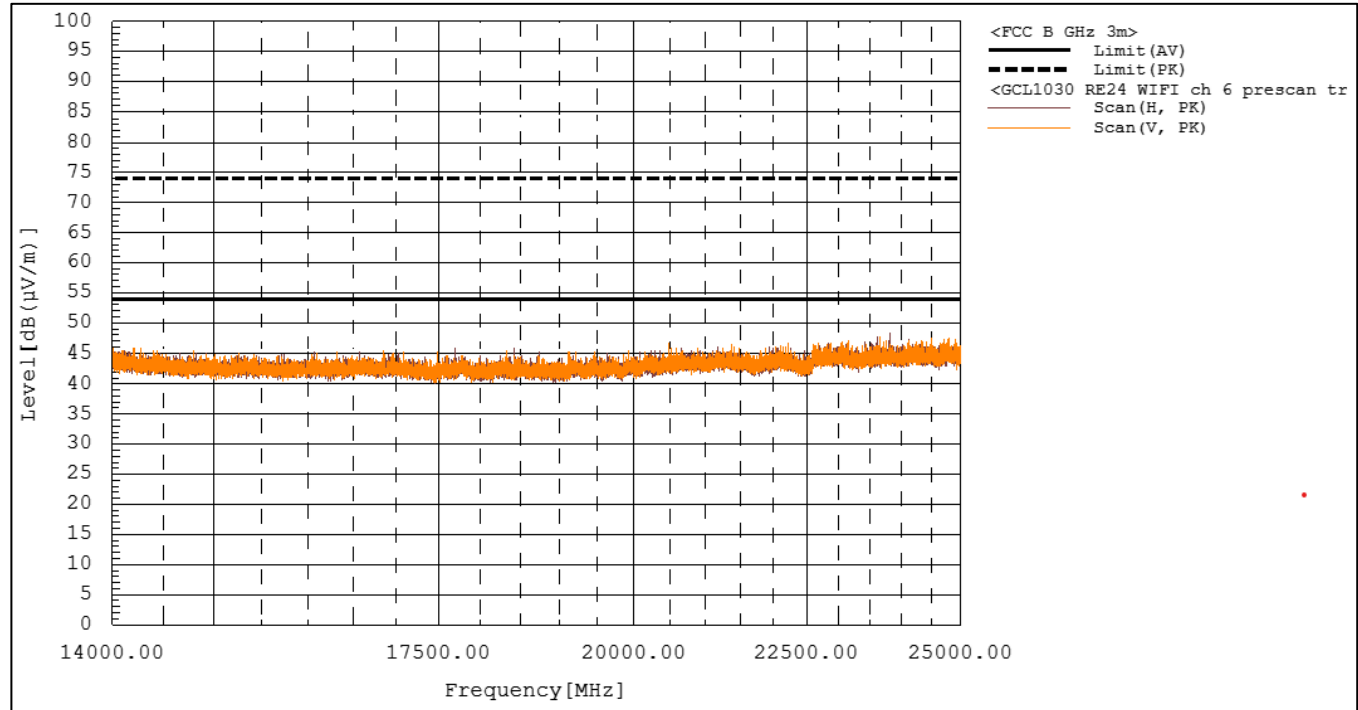


Figure RE24.1: Spectral data at 1 Meter (IEEE 802.11b, 1 Mbps, Ch 6)

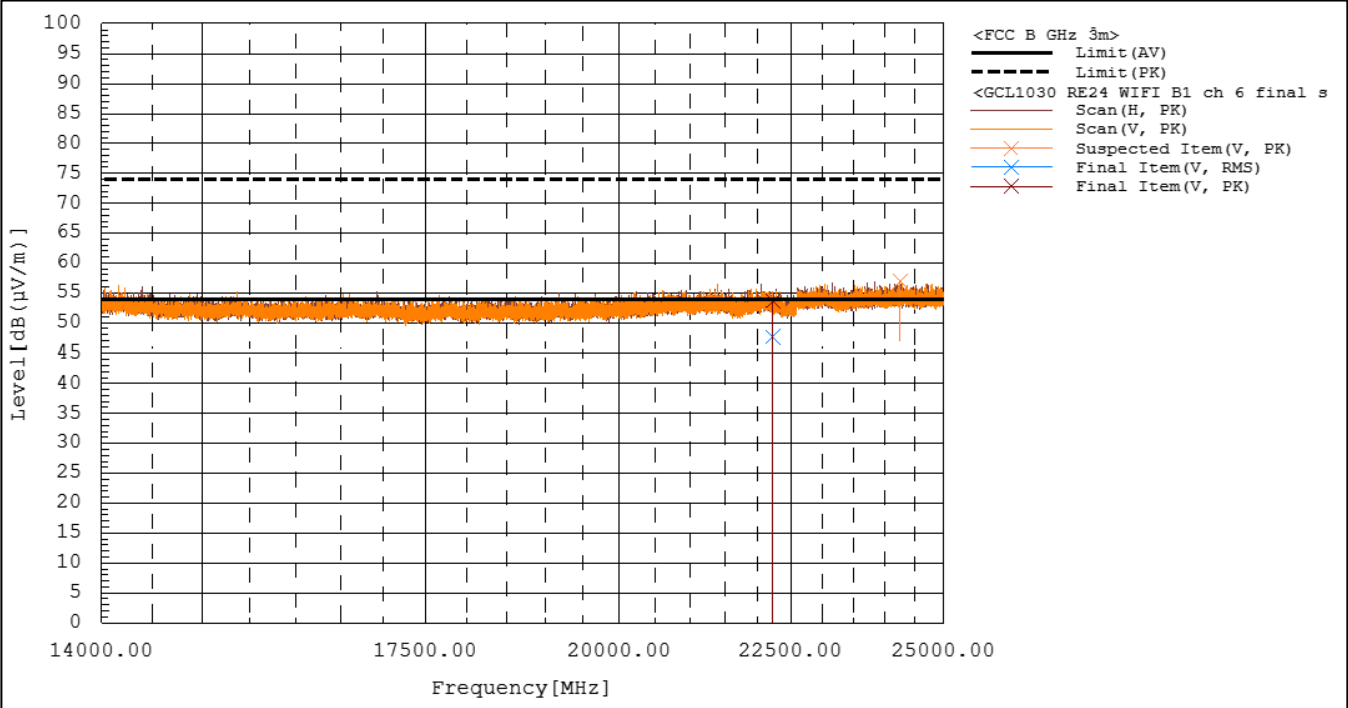


Figure RE24.2: Spectral data at 3 Meters (IEEE 802.11b, 1 Mbps, Ch 6)

Setup Photographs

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

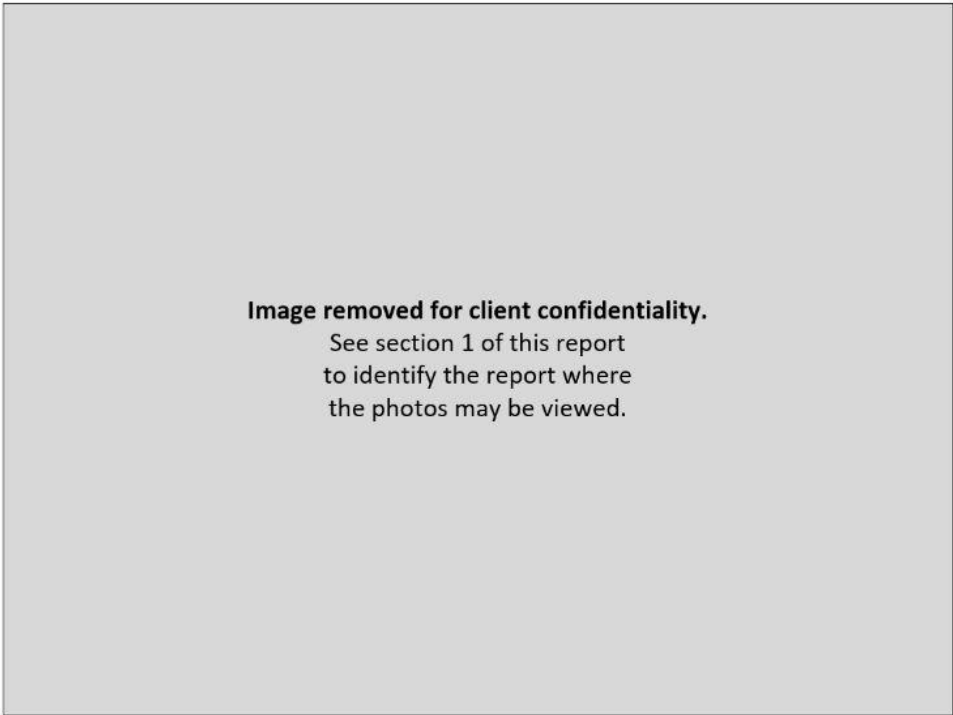


Figure RE24.3: EUT test setup, first view (1 Meter)

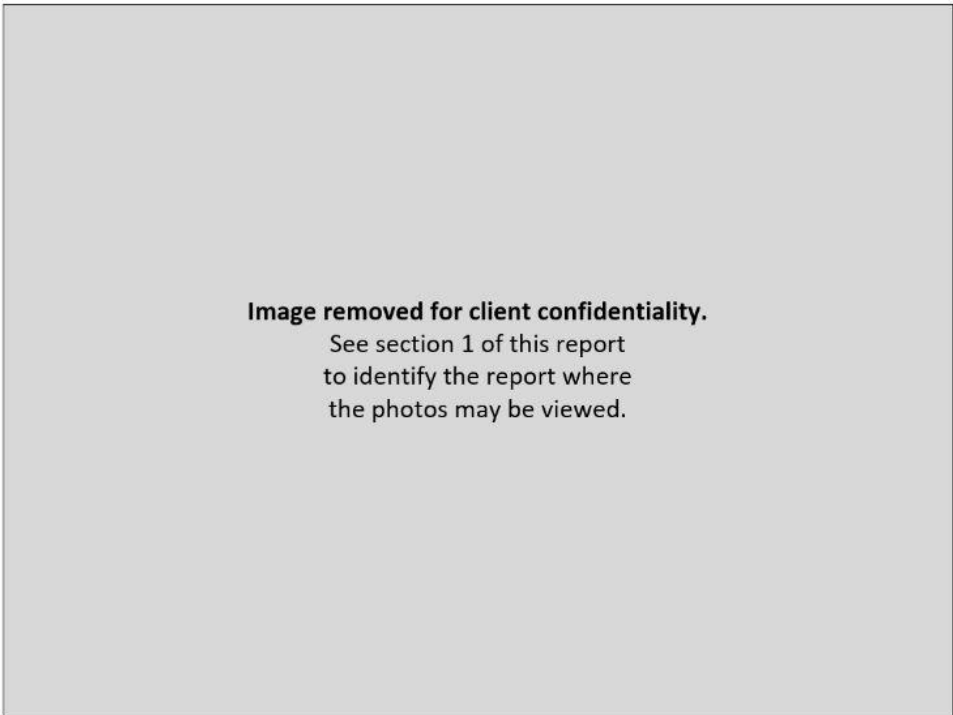


Figure RE24.4: EUT test setup, second view (3 Meters)



Figure RE24.5: EUT test setup, second view (3 Meters)

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, 11.11, 11.12.2.5

Test and Data Overview

See [Section 10.2.1](#).

Test Record**Radiated Emission Test****Test ID RE30****Project GCL1030**

Test Date(s): 24 Apr 2026
Test Personnel: David Kerr

Product Model: A05147
Serial Number tested: 8WP000276

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

Test Standards: DTS: 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: David A Kerr
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, 9k - 30MHz	Schwarzbeck	FMZB 1519B	174	18-Jul-2024	18-Jul-2026
SAC 3m, below 1 GHz	Frankonia	SAC3	F199004	11-Dec-2024	11-Dec-2027

Table RE29.1: 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, 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.

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 mast for tests that involve changes in antenna elevation. At 0° the turntable reference mark is pointed directly at the loop antenna location. 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 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.

The 3 m data is adjusted to an equivalent value at the 30 m or 300 m reference distance. Extrapolation of each data result uses the conservative method of ANSI C63.10 clause 6.4.4.1: 40 dB per decade for the part of the distance within the boundary (wavelength / 2 Pi), and 20 dB per decade for any part of the distance beyond that boundary.

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	36.67	Avg	300	80.00	-43.33	33.76	77.09	44.32	-35.68	53.76	89.44	Z	-154
0.06695	26.51	Avg	300	80.00	-53.49	31.09	84.58	36.83	-43.17	51.09	94.26	Y	-142
0.1277	22.53	Avg	300	80.00	-57.47	25.48	82.95	32.11	-47.89	45.48	93.37	Z	133
1.3065	28.79	QP	30	40.00	-11.21	25.28	36.49	34.58	-5.42	None	None	X	23
1.6845	24.45	QP	30	39.51	-15.06	23.08	38.13	31.94	-7.57	None	None	X	-116

Table RE29.2: Emission summary (BLE, 1 Mbps, 2440)

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

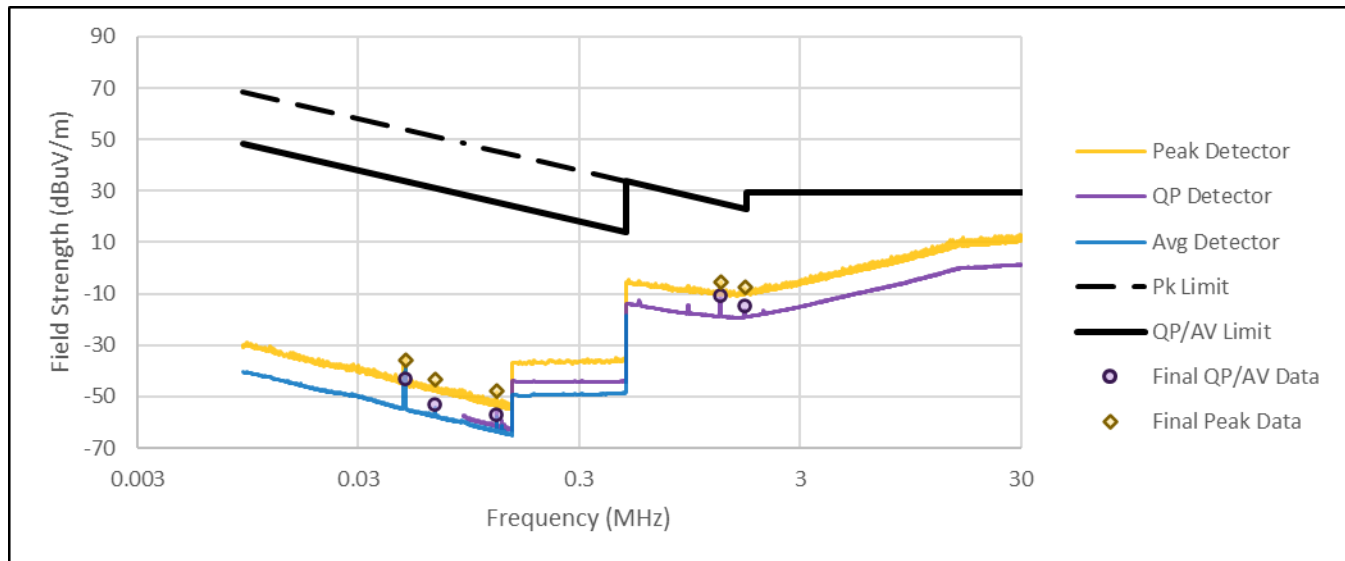


Figure RE29.1: Spectral data (BLE, 1 Mbps, 2440)

Setup Photographs

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



Figure RE29.2: EUT test setup, first view

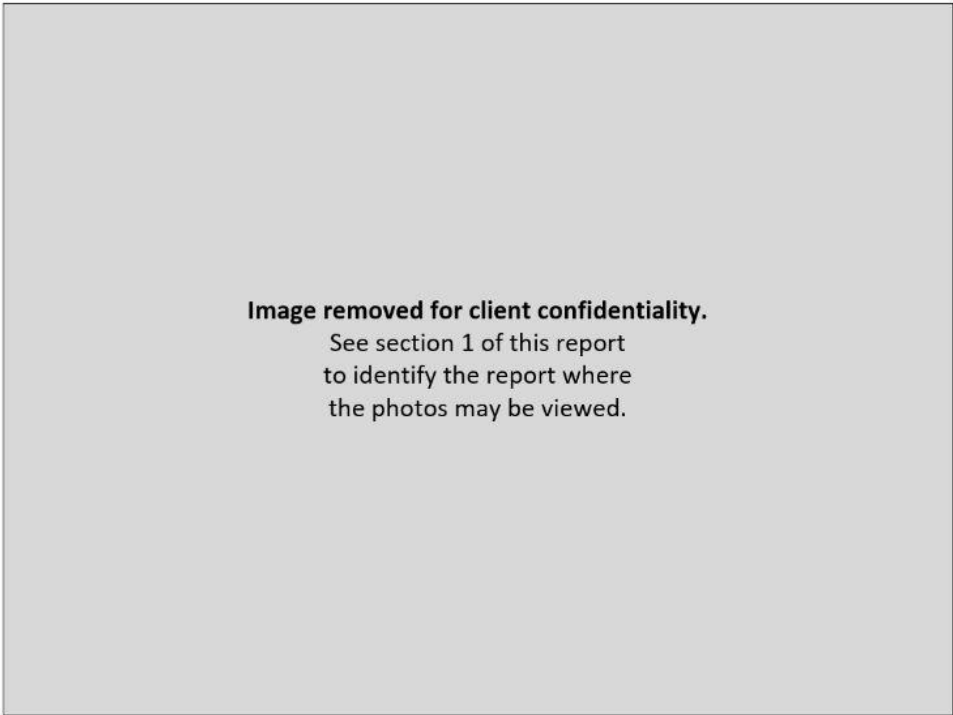


Figure RE29.3: EUT test setup, second view (Z orientation)

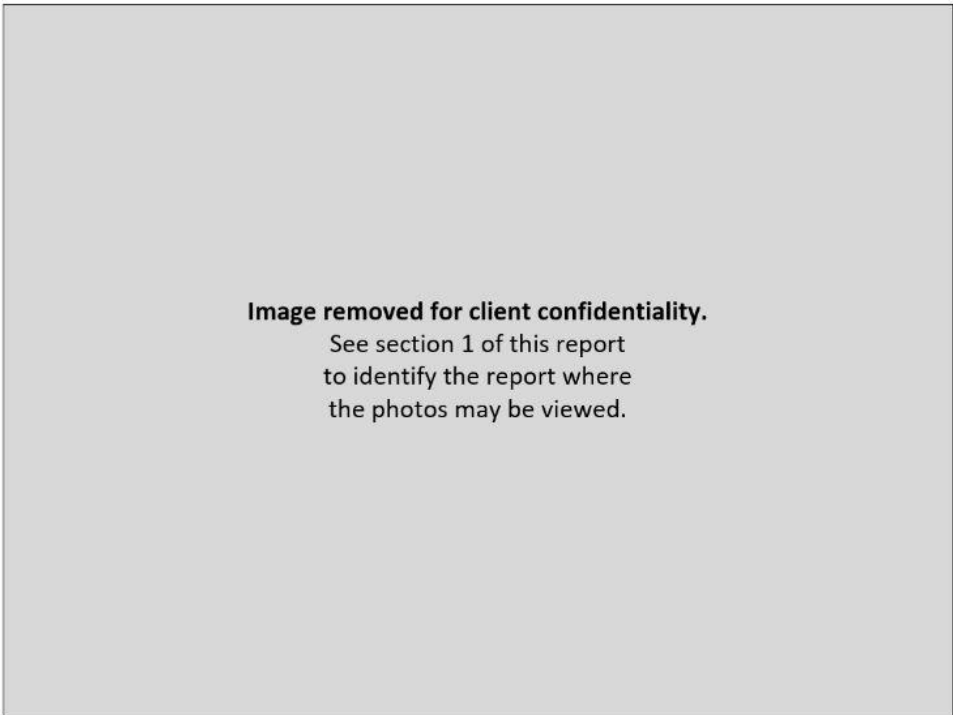


Figure RE29.4: EUT test setup, second view (Y orientation)

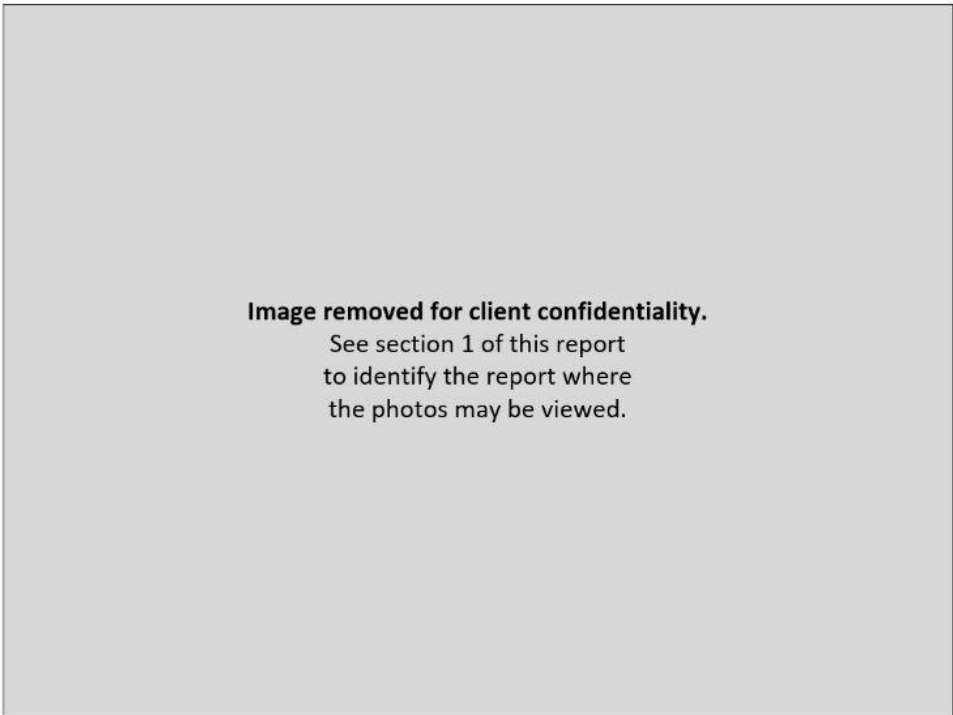


Figure RE29.5: EUT test setup, second view (X orientation)

This line is the end of the test record.

Test Record
Radiated Emission Test
Test ID RE31
Project GCL1030

Test Date(s): 24 Apr 2026
Test Personnel: Vladimir Tolstik

Product Model: A05147
Serial Number tested: 8WP000276

Operating Mode: WiFi2GTx
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: 28 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 RE31.1: 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.

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 mast for tests that involve changes in antenna elevation. At 0° the turntable reference mark is pointed directly at the loop antenna location. 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 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.

The 3 m data is adjusted to an equivalent value at the 30 m or 300 m reference distance. Extrapolation of each data result uses the conservative method of ANSI C63.10 clause 6.4.4.1: 40 dB per decade for the part of the distance within the boundary (wavelength / 2 Pi), and 20 dB per decade for any part of the distance beyond that boundary.

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
0.0493	38.92	Avg	300	80.00	-41.08	33.76	74.84	46.27	-33.73	53.76	87.48	Z	-24
0.0670	26.54	Avg	300	80.00	-53.46	31.08	84.54	35.54	-44.46	51.08	95.54	X	180
0.1277	22.12	Avg	300	80.00	-57.88	25.48	83.36	32.06	-47.94	45.48	93.42	Z	-2
0.1500	16.61	Avg	300	80.00	-63.39	24.08	87.47	26.57	-53.43	44.08	97.52	Z	-181
0.9330	26.37	QP	30	40.00	-13.63	28.21	41.83	33.64	-6.36	None	None	X	-128
1.3043	28.00	QP	30	40.00	-12.00	25.30	37.30	33.84	-6.16	None	None	X	-188
1.3110	28.07	QP	30	40.00	-11.93	25.25	37.18	35.00	-5.00	None	None	X	174
1.6845	24.57	QP	30	39.51	-14.94	23.08	38.02	31.32	-8.19	None	None	X	180

Table RE31.2: Emission summary (IEEE 802.11b, 1 Mbps, Ch 6)

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

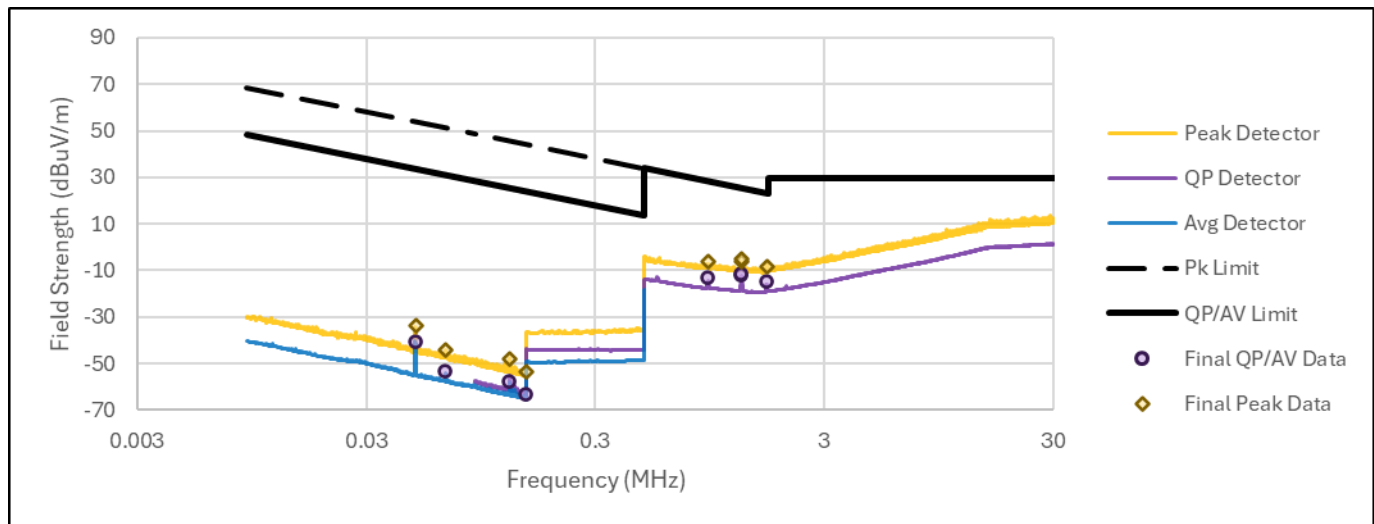


Figure RE31.1: Spectral data (IEEE 802.11b, 1 Mbps, Ch 6)

Setup Photographs

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



Figure RE31.2: EUT test setup, first view

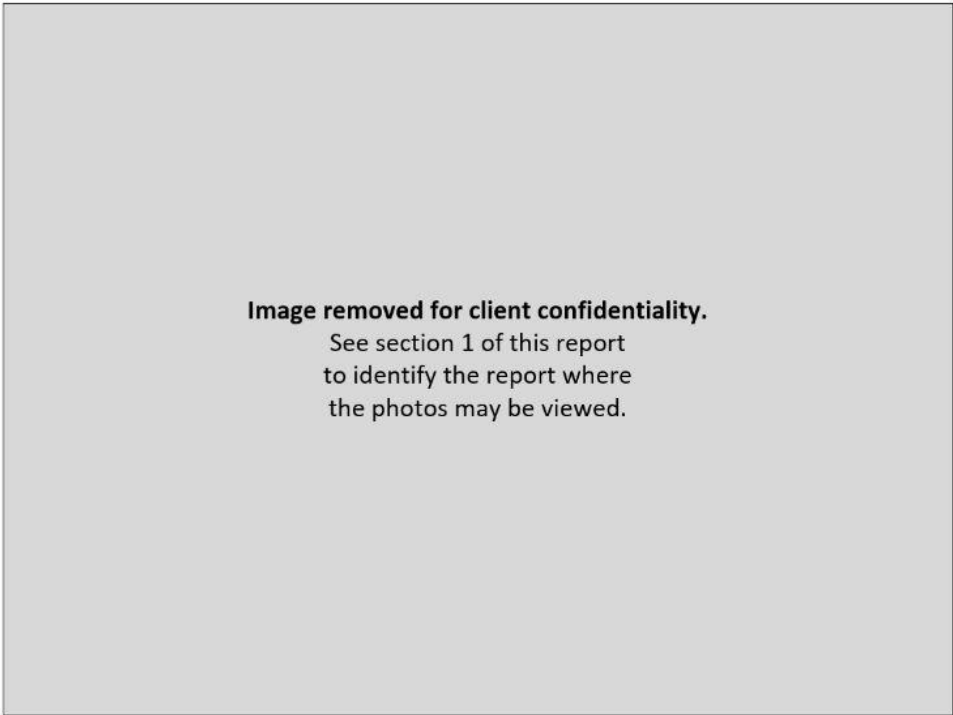


Figure RE31.3: EUT test setup, second view (Antenna, X orientation)

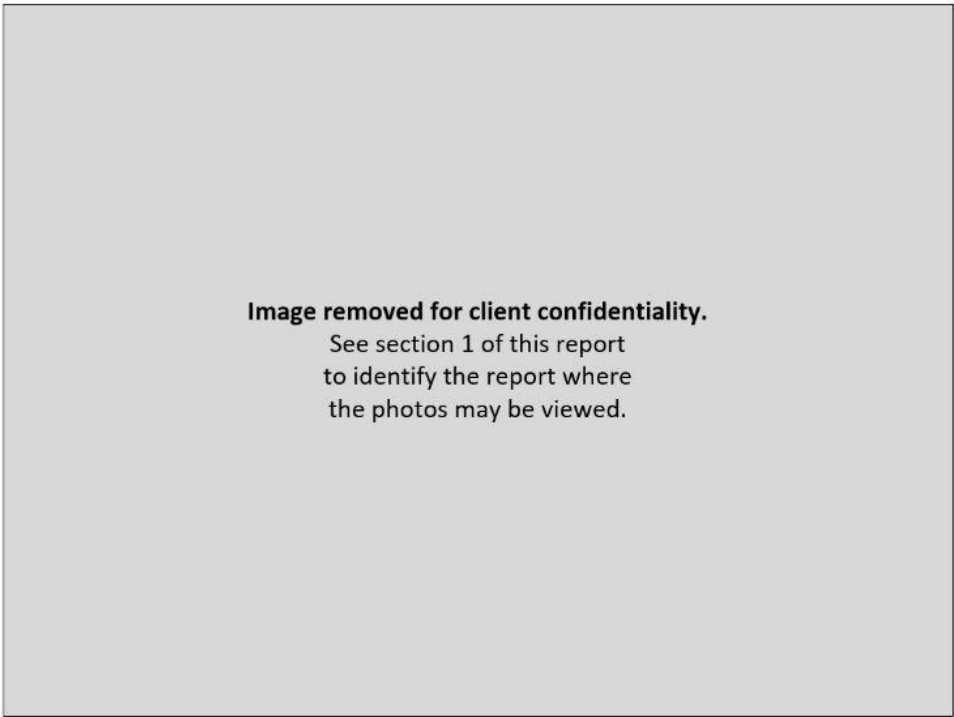


Figure RE31.4: EUT test setup, third view (Antenna, Z orientation)

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, 11.11, 11.12.2.5

Test and Data Overview

See [Section 10.2.1](#).

Test Record
Radiated Emission Test
Test ID RE60
Project GCL1030

Test Date(s): 17 Apr 2026
Test Personnel: Vladimir Tolstik

Product Model: A05147
Serial Number tested: 8WP000266

Operating Mode: BLETx
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: 30 MHz to 1000 MHz
Pass/Fail Judgment: PASS

Test record created by: Vladimir Tolstik
Date of this record: 21 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

Table RE60.1: 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.

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
		QP		QP	QP	QP		
49.110	V	14.5	14.1	28.6	40.0	11.4	100.0	157.0
87.960	V	3.1	14.3	17.4	40.0	22.6	104.4	151.0
206.340	H	3.4	18.8	22.2	43.5	21.3	133.6	60.0
937.710	H	-0.1	35.7	35.6	46.0	10.4	135.9	144.0

Table RE60.2: Emission summary (BLE 1 Mbps, 2440 MHz)

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

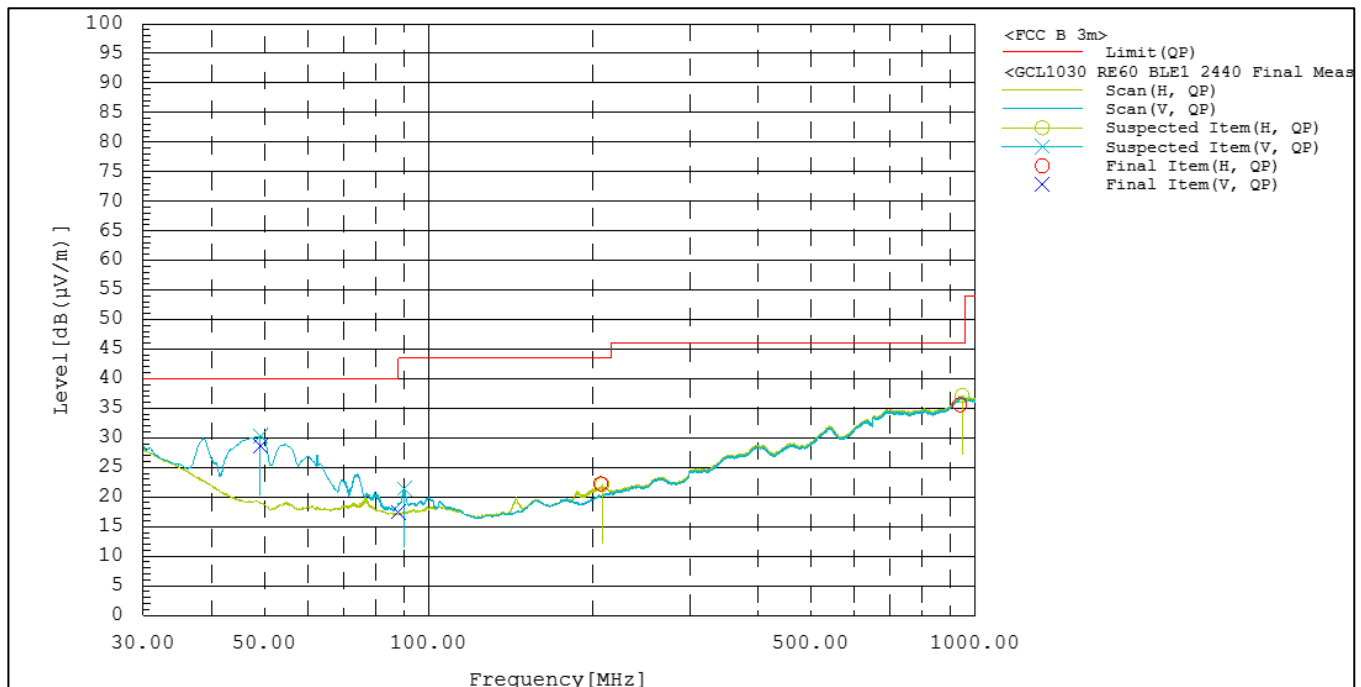


Figure RE60.1: Spectral data (BLE 1 Mbps, 2440 MHz)

Setup Photographs

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

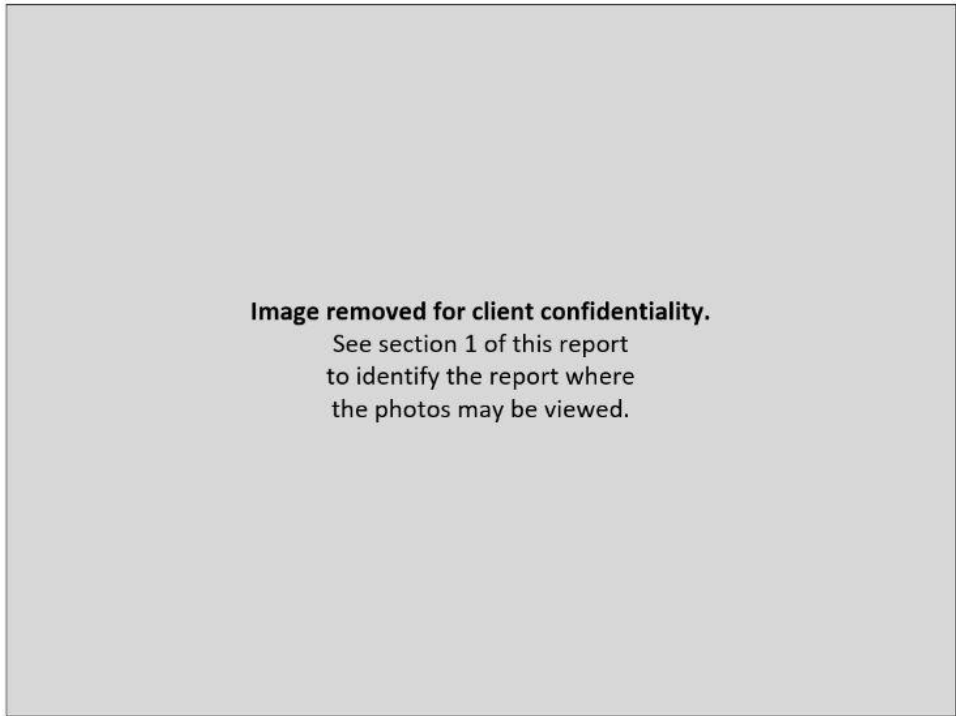


Figure RE60.2: EUT test setup, first view

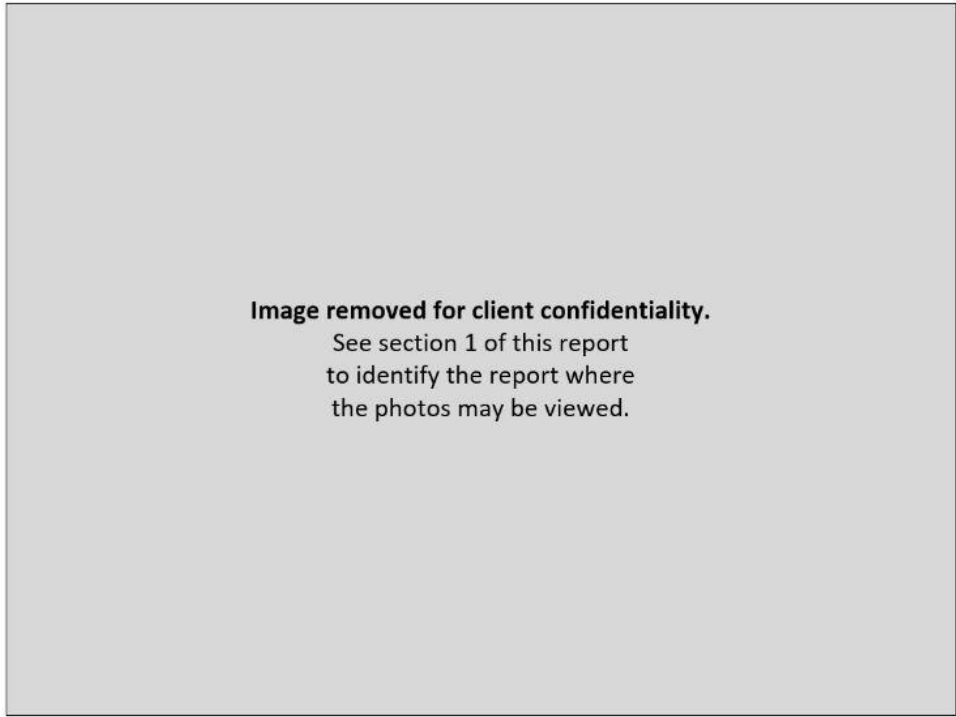


Figure RE60.3: EUT test setup, second view

This line is the end of the test record.

Test Record
Radiated Emission Test
Test ID RE61
Project GCL1030

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

Product Model: A05147
Serial Number tested: 8WP000266

Operating Mode: Wifi2GTx
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: 20 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 RE61.1: 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 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.

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		
30.000	V	5.6	22.8	28.4	40.0	11.6	100.0	0.0
40.740	V	10.1	16.9	27.0	40.0	13.0	100.0	239.0
72.390	V	11.8	14.4	26.2	40.0	13.8	104.5	325.0
90.180	V	6.9	14.6	21.5	43.5	22.0	104.5	234.0
207.900	H	3.6	18.9	22.5	43.5	21.0	116.1	44.0
943.320	V	0.3	35.7	36.0	46.0	10.0	359.3	275.0

Table RE61.2: Emission summary (IEEE 802.11b, 1 Mbps, Ch 6)

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

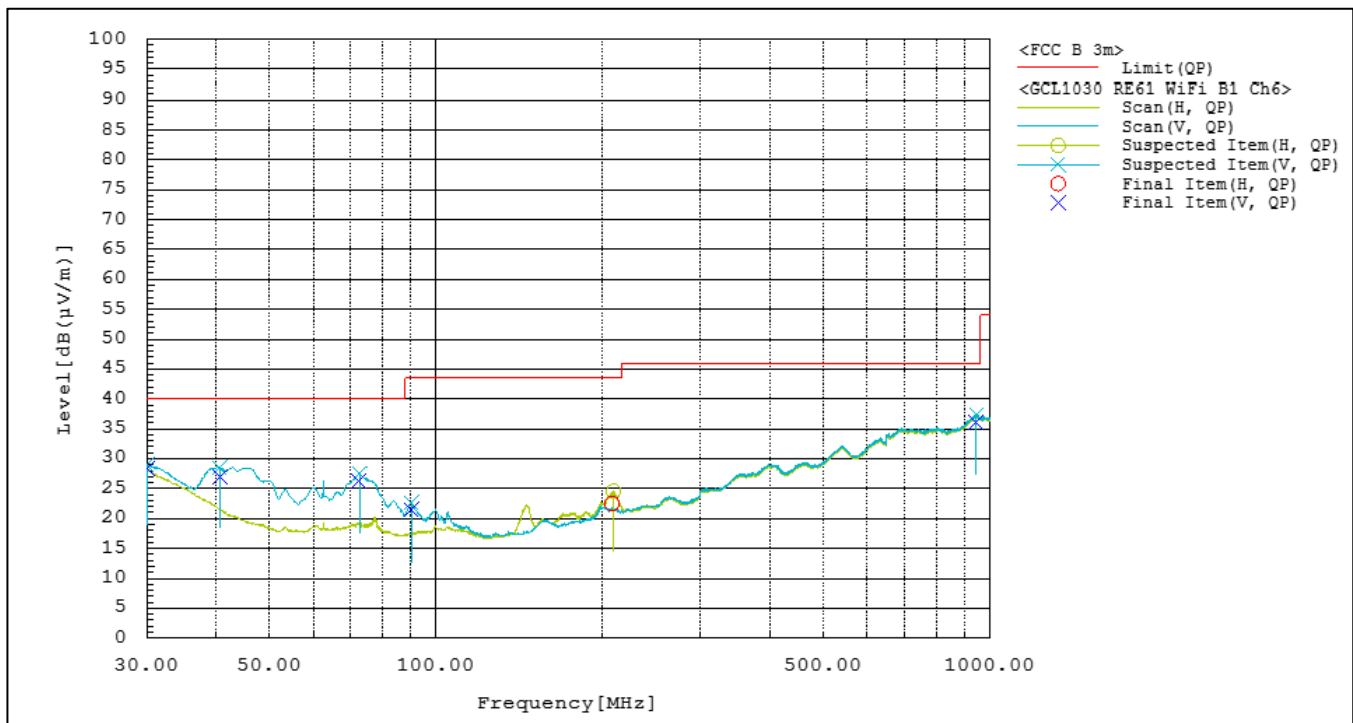


Figure RE61.1: Spectral data (IEEE 802.11b, 1 Mbps, Ch 6)

Setup Photographs

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



Figure RE61.2: EUT test setup, first view

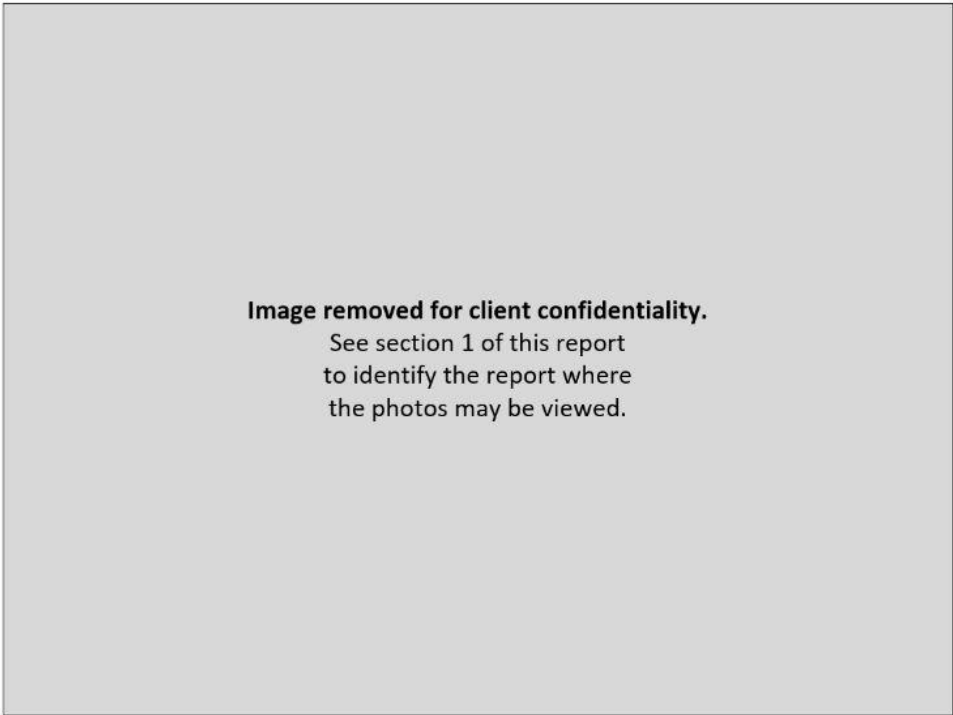


Figure RE61.3: EUT test setup, second view

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, 11.11, 11.12.2.5

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 RE05

Project GCL1030

Test Date(s) 05, 06, 09, 10 Mar 2026
Test Personnel Vladimir Tolstik, Andy Heier supervised by David Kerr

Product Model A05147
Serial Number tested 8WP000276

Operating Mode WiFi2GTx
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: Restricted Bands (2200-2300 MHz, 2310-2390 MHz, 2483.5-2500 MHz)
Pass/Fail Judgment: PASS

Test record created by: Vladimir Tolstik, Andy Heier
Date of this record: 11 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 RE05.1: 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.

This restricted band investigation began with a benchtop setup wherein the emissions in the restricted bands were observed from a modified test sample with an RF output cable replacing the onboard antenna. The actual emission levels within restricted bands in many of the test sample's available transmission modes are too low to be reliably measured in the radiated environment. By applying the required peak and average detectors and bandwidths to the signals direct from the transmitter, lab staff identified the worst-case operational modes. These were then measured using an unmodified unit in the required radiated environment.

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 channels 1, 2 and 3. Measurements in the upper band were made while the transmitter was tuned to channels 9, 10, 11, 12 and 13.

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 WiFi 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	Avg Limit	Pk Limit	Avg Level	Pk Level	Av Margin	Pk Margin	Azimuth	Height	Polarity	Avg Type	DC Adjust
(MHz)	(dBµV/m)	(dBµV/m)	(dBµV/m)	(dBµV/m)	(dB)	(dB)	(degree)	(mm)	---	---	(dB)
2390	54	74	40.73	54.90	13.27	19.10	179	1714	HORZ	RMS	0.00
2390	54	74	40.71	54.29	13.29	19.71	179	1714	HORZ	RMS	0.00

Table RE05.2: FCC restricted bands from 2200 to 2390 MHz (IEEE 802.11b, 1 Mbps, Ch 1)

Frequency	Avg Limit	Pk Limit	Avg Level	Pk Level	Av Margin	Pk Margin	Azimuth	Height	Polarity	Avg Type	DC Adjust
(MHz)	(dBµV/m)	(dBµV/m)	(dBµV/m)	(dBµV/m)	(dB)	(dB)	(degree)	(mm)	---	---	(dB)
2389.3	54	74	39.98	53.54	14.02	20.46	179	1714	HORZ	RMS	0.00
2390	54	74	40.31	53.59	13.69	20.41	179	1714	HORZ	RMS	0.00

Table RE05.3: FCC restricted bands from 2200 to 2390 MHz (IEEE 802.11b, 1 Mbps, Ch 2)

Frequency	Avg Limit	Pk Limit	Avg Level	Pk Level	Av Margin	Pk Margin	Azimuth	Height	Polarity	Avg Type	DC Adjust
(MHz)	(dBµV/m)	(dBµV/m)	(dBµV/m)	(dBµV/m)	(dB)	(dB)	(degree)	(mm)	---	---	(dB)
2388.5	54	74	39.46	53.06	14.55	20.94	179	1714	HORZ	RMS	0.00
2390	54	74	39.90	53.74	14.10	20.26	179	1714	HORZ	RMS	0.00

Table RE05.4: FCC restricted bands from 2200 to 2390 MHz (IEEE 802.11b, 1 Mbps, Ch 3)

Frequency	Avg Limit	Pk Limit	Avg Level	Pk Level	Av Margin	Pk Margin	Azimuth	Height	Polarity	Avg Type	DC Adjust
(MHz)	(dBµV/m)	(dBµV/m)	(dBµV/m)	(dBµV/m)	(dB)	(dB)	(degree)	(mm)	---	---	(dB)
2390	54	74	51.84	69.69	2.16	4.31	179	1714	HORZ	RMS	0.00

Table RE05.5: FCC restricted bands from 2200 to 2390 MHz (IEEE 802.11g, 24 Mbps, Ch 1)

Frequency	Avg Limit	Pk Limit	Avg Level	Pk Level	Av Margin	Pk Margin	Azimuth	Height	Polarity	Avg Type	DC Adjust
(MHz)	(dBµV/m)	(dBµV/m)	(dBµV/m)	(dBµV/m)	(dB)	(dB)	(degree)	(mm)	---	---	(dB)
2390	54	74	51.41	70.32	2.59	3.68	179	1714	HORZ	RMS	0.00

Table RE05.6: FCC restricted bands from 2200 to 2390 MHz (IEEE 802.11n, MCS3, Ch 1)

Frequency	Avg Limit	Pk Limit	Avg Level	Pk Level	Av Margin	Pk Margin	Azimuth	Height	Polarity	Avg Type	DC Adjust
(MHz)	(dBμV/m)	(dBμV/m)	(dBμV/m)	(dBμV/m)	(dB)	(dB)	(degree)	(mm)	---	---	(dB)
2389.8	54	74	50.29	69.30	3.71	4.70	179	1714	HORZ	RMS	0.00
2390	54	74	50.34	69.21	3.66	4.79	179	1714	HORZ	RMS	0.00

Table RE05.7: FCC restricted bands from 2200 to 2390 MHz (IEEE 802.11g, 9 Mbps, Ch 2)

Frequency	Avg Limit	Pk Limit	Avg Level	Pk Level	Av Margin	Pk Margin	Azimuth	Height	Polarity	Avg Type	DC Adjust
(MHz)	(dBμV/m)	(dBμV/m)	(dBμV/m)	(dBμV/m)	(dB)	(dB)	(degree)	(mm)	---	---	(dB)
2390	54	74	47.99	67.71	6.01	6.29	179	1714	HORZ	RMS	0.00
2390	54	74	48.00	67.32	6.00	6.68	179	1714	HORZ	RMS	0.00

Table RE05.8: FCC restricted bands from 2200 to 2390 MHz (IEEE 802.11g, 12 Mbps, Ch 3)

Frequency	Avg Limit	Pk Limit	Avg Level	Pk Level	Av Margin	Pk Margin	Azimuth	Height	Polarity	Avg Type	DC Adjust
(MHz)	(dBμV/m)	(dBμV/m)	(dBμV/m)	(dBμV/m)	(dB)	(dB)	(degree)	(mm)	---	---	(dB)
2483.8	54	74	38.91	52.31	15.09	21.69	178	1650	HORZ	RMS	0.00
2483.5	54	74	39.09	52.82	14.91	21.18	178	1650	HORZ	RMS	0.00

Table RE05.9: FCC restricted band from 2483.5 to 2500 MHz (IEEE 802.11b, 2 Mbps, Ch 9)

Frequency	Avg Limit	Pk Limit	Avg Level	Pk Level	Av Margin	Pk Margin	Azimuth	Height	Polarity	Avg Type	DC Adjust
(MHz)	(dBμV/m)	(dBμV/m)	(dBμV/m)	(dBμV/m)	(dB)	(dB)	(degree)	(mm)	---	---	(dB)
2484	54	74	39.00	52.25	15.00	21.75	178	1650	HORZ	RMS	0.00
2483.5	54	74	39.37	52.68	14.63	21.32	178	1650	HORZ	RMS	0.00

Table RE05.10: FCC restricted band from 2483.5 to 2500 MHz (IEEE 802.11b, 11 Mbps, Ch 10)

Frequency	Avg Limit	Pk Limit	Avg Level	Pk Level	Av Margin	Pk Margin	Azimuth	Height	Polarity	Avg Type	DC Adjust
(MHz)	(dBμV/m)	(dBμV/m)	(dBμV/m)	(dBμV/m)	(dB)	(dB)	(degree)	(mm)	---	---	(dB)
2483.8	54	74	39.79	53.56	14.21	20.45	178	1650	HORZ	RMS	0.00
2483.5	54	74	39.97	53.92	14.03	20.08	178	1650	HORZ	RMS	0.00

Table RE05.11: FCC restricted band from 2483.5 to 2500 MHz (IEEE 802.11b, 1 Mbps, Ch 11)

Frequency	Avg Limit	Pk Limit	Avg Level	Pk Level	Av Margin	Pk Margin	Azimuth	Height	Polarity	Avg Type	DC Adjust
(MHz)	(dBμV/m)	(dBμV/m)	(dBμV/m)	(dBμV/m)	(dB)	(dB)	(degree)	(mm)	---	---	(dB)
2483.8	54	74	44.69	57.05	9.31	16.95	178	1650	HORZ	RMS	0.00
2484.3	54	74	45.26	56.26	8.74	17.74	178	1650	HORZ	RMS	0.00

Table RE05.12: FCC restricted band from 2483.5 to 2500 MHz (IEEE 802.11b, 1 Mbps, Ch 12)

Frequency	Avg Limit	Pk Limit	Avg Level	Pk Level	Av Margin	Pk Margin	Azimuth	Height	Polarity	Avg Type	DC Adjust
(MHz)	(dBμV/m)	(dBμV/m)	(dBμV/m)	(dBμV/m)	(dB)	(dB)	(degree)	(mm)	---	---	(dB)
2483.5	54	74	44.30	60.43	9.70	13.57	178	1650	HORZ	RMS	0.00
2486.3	54	74	50.58	58.58	3.43	15.42	178	1650	HORZ	RMS	0.00

Table RE05.13: FCC restricted band from 2483.5 to 2500 MHz (IEEE 802.11b, 2 Mbps, Ch 13)

Frequency	Avg Limit	Pk Limit	Avg Level	Pk Level	Av Margin	Pk Margin	Azimuth	Height	Polarity	Avg Type	DC Adjust
(MHz)	(dBμV/m)	(dBμV/m)	(dBμV/m)	(dBμV/m)	(dB)	(dB)	(degree)	(mm)	---	---	(dB)
2483.5	54	74	49.28	66.92	4.72	7.08	178	1650	HORZ	RMS	0.00
2483.5	54	74	49.15	66.73	4.85	7.27	178	1650	HORZ	RMS	0.00

Table RE05.14: FCC restricted band from 2483.5 to 2500 MHz (IEEE 802.11g, 12 Mbps, Ch 9)

Frequency	Avg Limit	Pk Limit	Avg Level	Pk Level	Av Margin	Pk Margin	Azimuth	Height	Polarity	Avg Type	DC Adjust
(MHz)	(dBμV/m)	(dBμV/m)	(dBμV/m)	(dBμV/m)	(dB)	(dB)	(degree)	(mm)	---	---	(dB)
2484.3	54	74	49.26	66.47	4.74	7.53	178	1650	HORZ	RMS	0.00
2483.5	54	74	50.04	65.75	3.96	8.26	178	1650	HORZ	RMS	0.00

Table RE05.15: FCC restricted band from 2483.5 to 2500 MHz (IEEE 802.11g, 12 Mbps, Ch 10)

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	51.71	69.58	2.29	4.42	178	1650	HORZ	RMS	0.00

Table RE05.16: FCC restricted band from 2483.5 to 2500 MHz (IEEE 802.11g, 9 Mbps, Ch 11)

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)
2484	54	74	51.68	65.87	2.32	8.13	178	1650	HORZ	RMS	0.00
2483.5	54	74	51.00	64.74	3.00	9.26	178	1650	HORZ	RMS	0.00

Table RE05.17: FCC restricted band from 2483.5 to 2500 MHz (IEEE 802.11g, 6 Mbps, Ch 12)

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	50.24	69.27	3.76	4.73	178	1650	HORZ	RMS	0.00
2483.5	54	74	50.25	69.20	3.76	4.80	178	1650	HORZ	RMS	0.00

Table RE05.18: FCC restricted band from 2483.5 to 2500 MHz (IEEE 802.11n, MCS1, Ch 12)

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	51.65	70.94	2.35	3.06	178	1650	HORZ	RMS	0.00

Table RE05.19: FCC restricted band from 2483.5 to 2500 MHz (IEEE 802.11g, 24 Mbps, Ch 13)

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

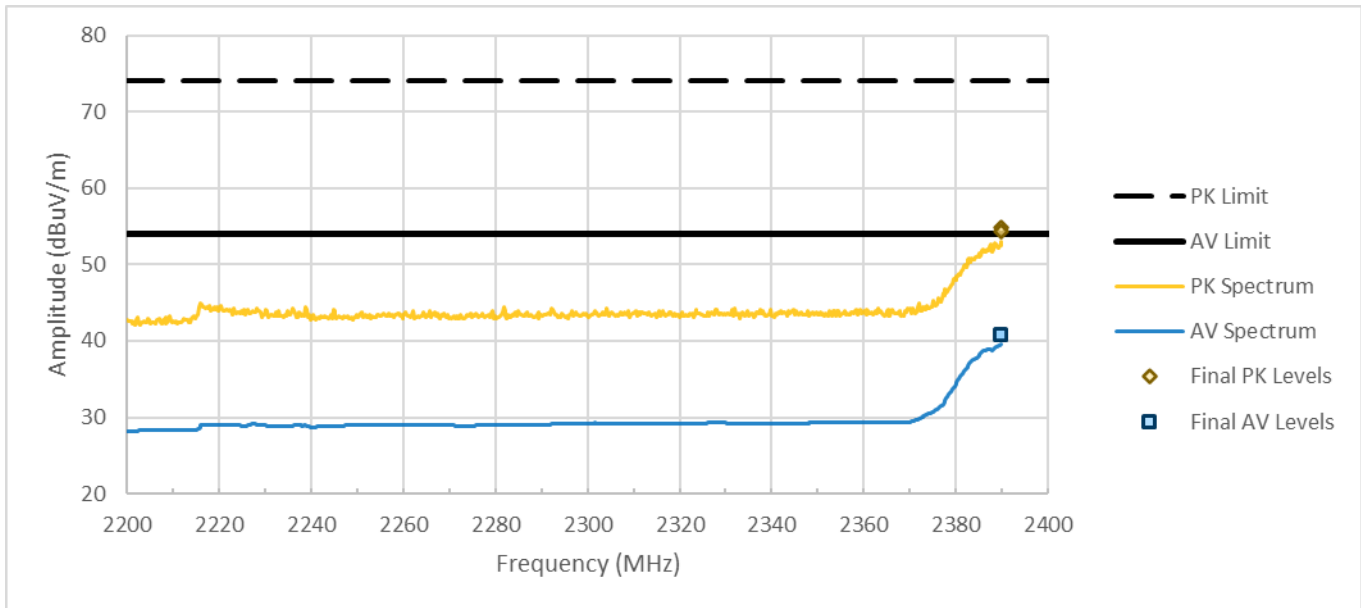


Figure RE05.1: FCC restricted band spectral data from 2200 to 2390 MHz (IEEE 802.11b, 1 Mbps, Ch 1)

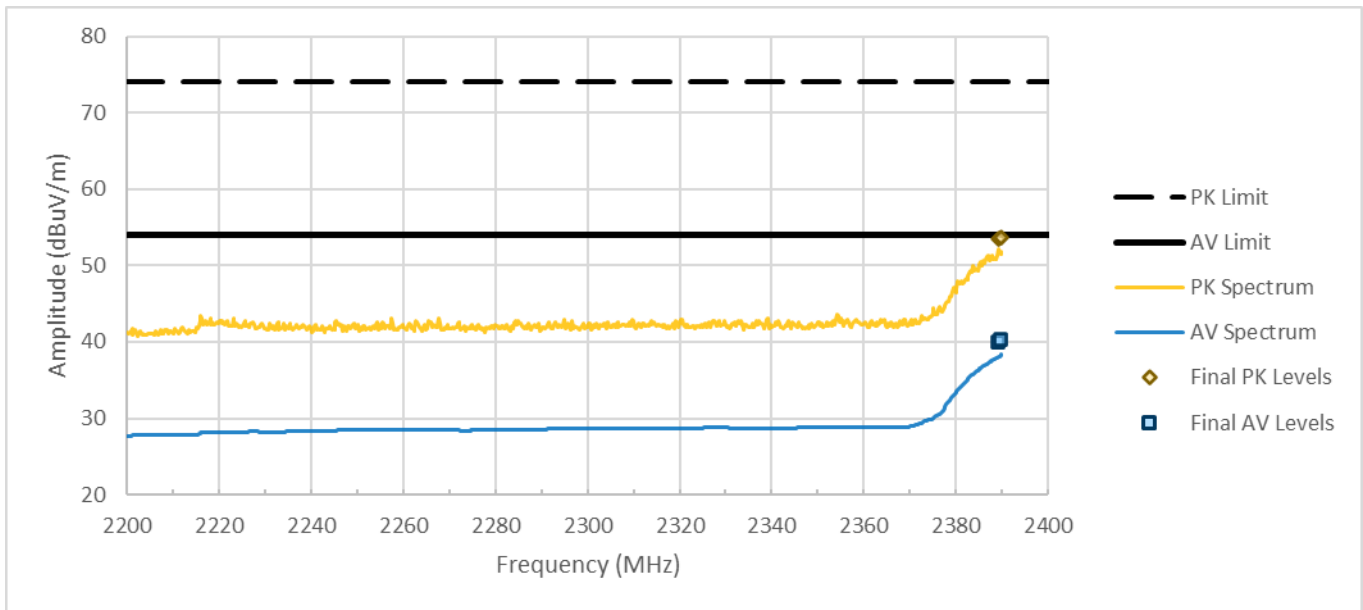


Figure RE05.2: FCC restricted band spectral data from 2200 to 2390 MHz (IEEE 802.11b, 1 Mbps, Ch 2)

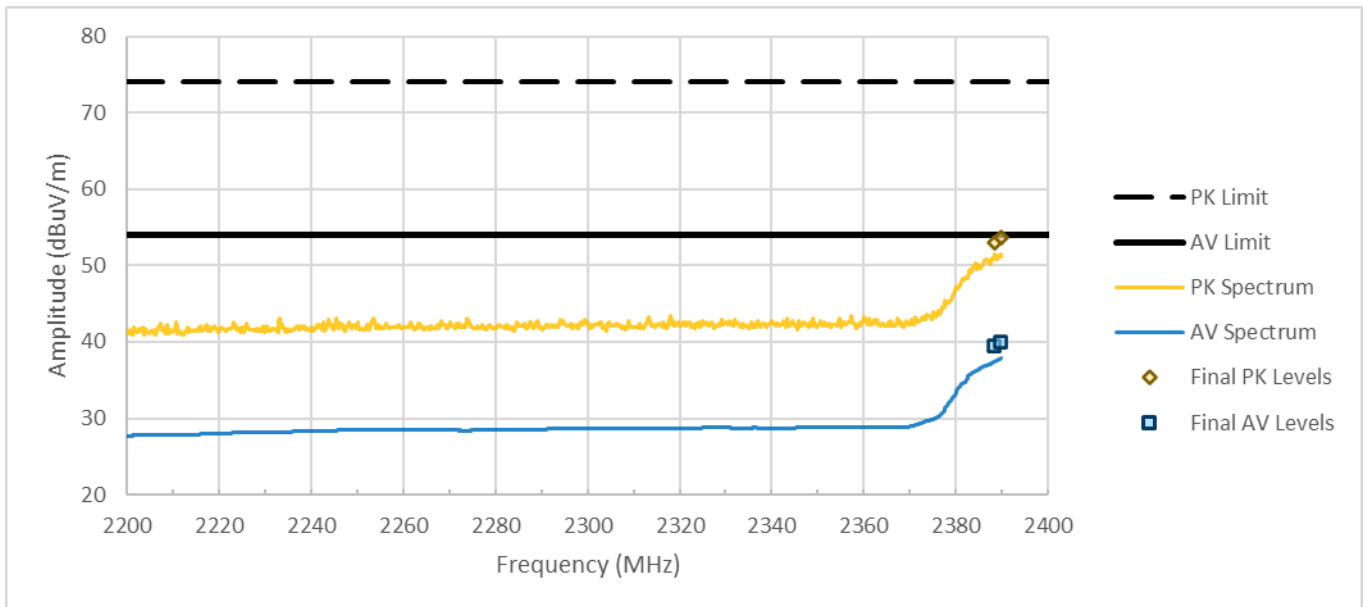


Figure RE05.3: FCC restricted band spectral data from 2200 to 2390 MHz (IEEE 802.11b, 1 Mbps, Ch 3)

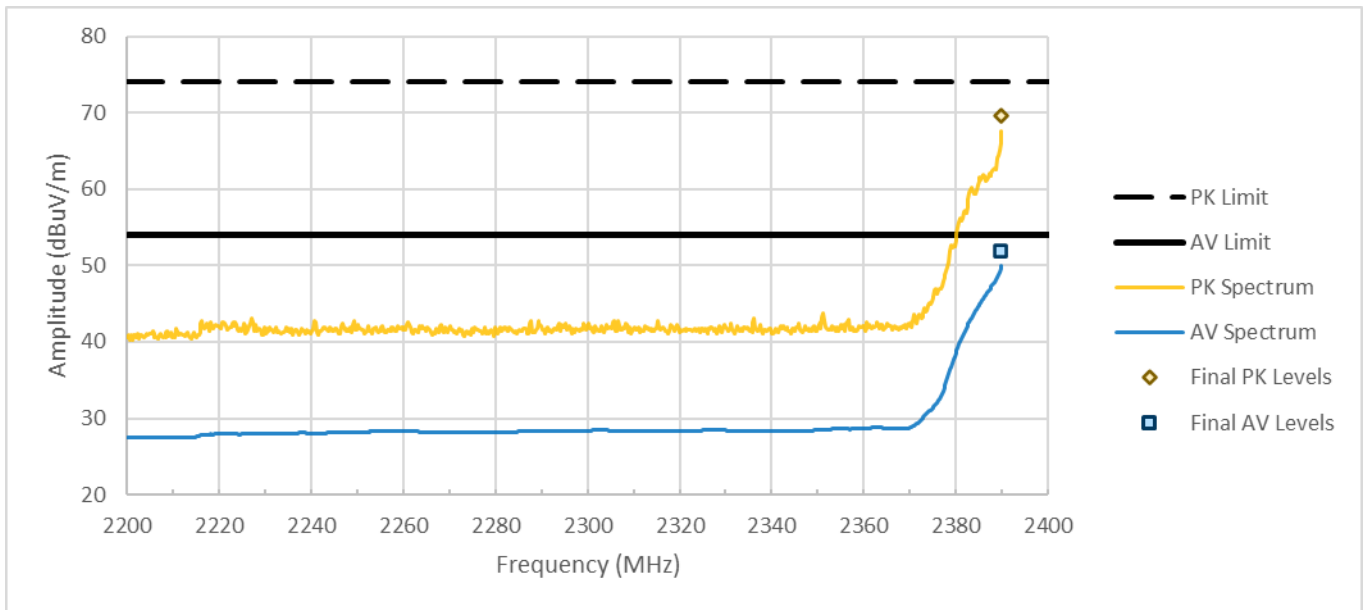


Figure RE05.4: FCC restricted band spectral data from 2200 to 2390 MHz (IEEE 802.11g, 24 Mbps, Ch 1)

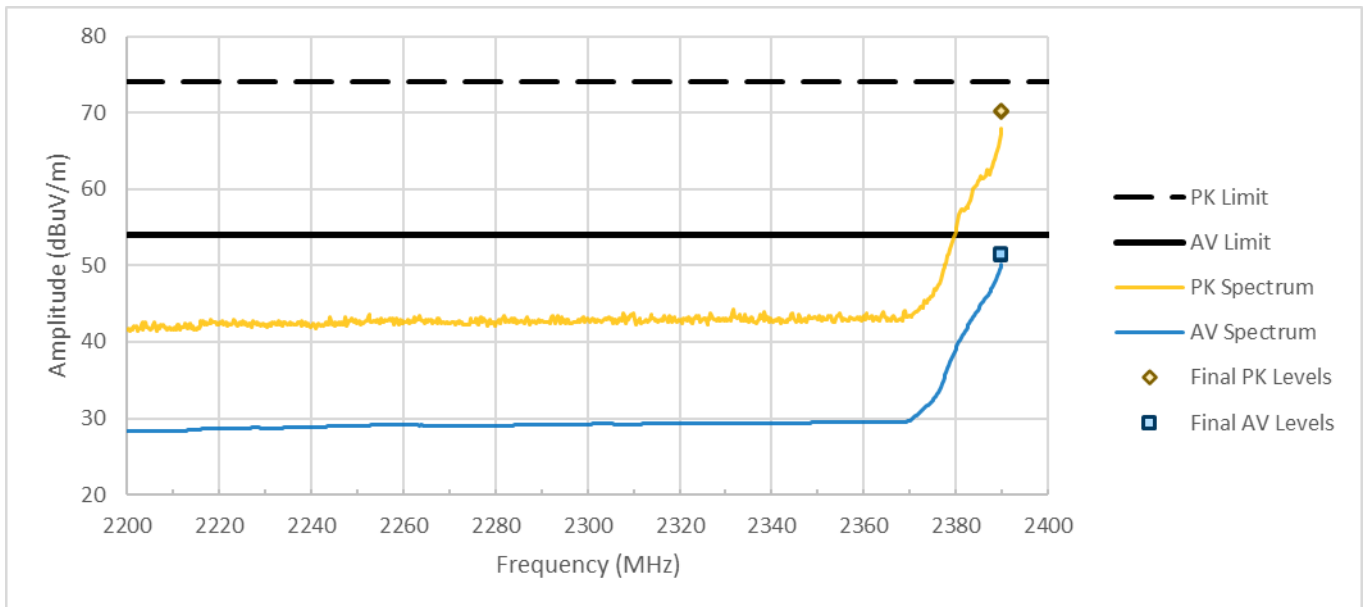


Figure RE05.5: FCC restricted band spectral data from 2200 to 2390 MHz (IEEE 802.11n, MCS3, Ch 1)

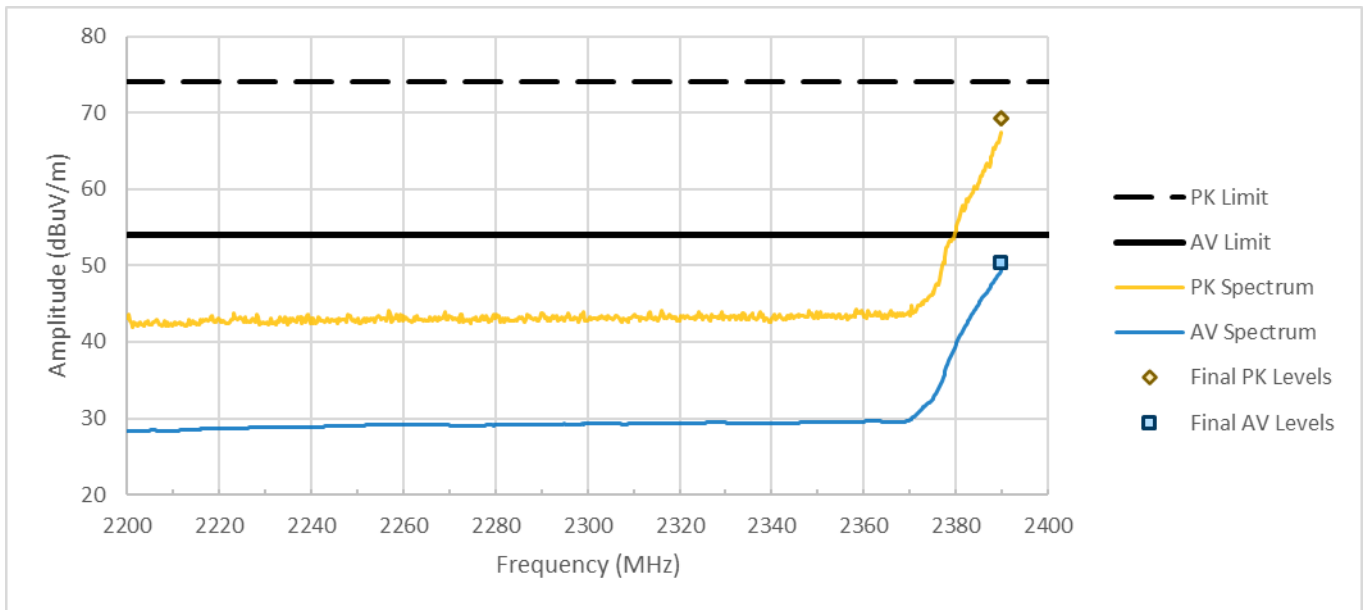


Figure RE05.6: FCC restricted band spectral data from 2200 to 2390 MHz (IEEE 802.11g, 9 Mbps, Ch 2)

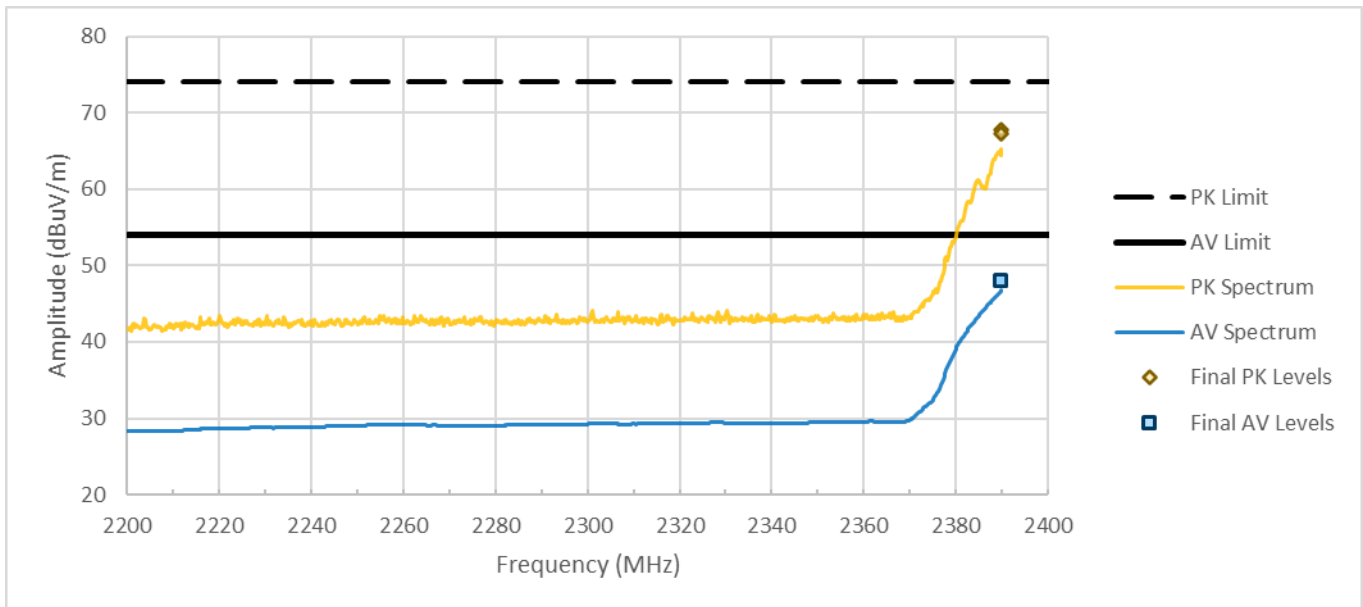


Figure RE05.7: FCC restricted band spectral data from 2200 to 2390 MHz (IEEE 802.11g, 12 Mbps, Ch 3)

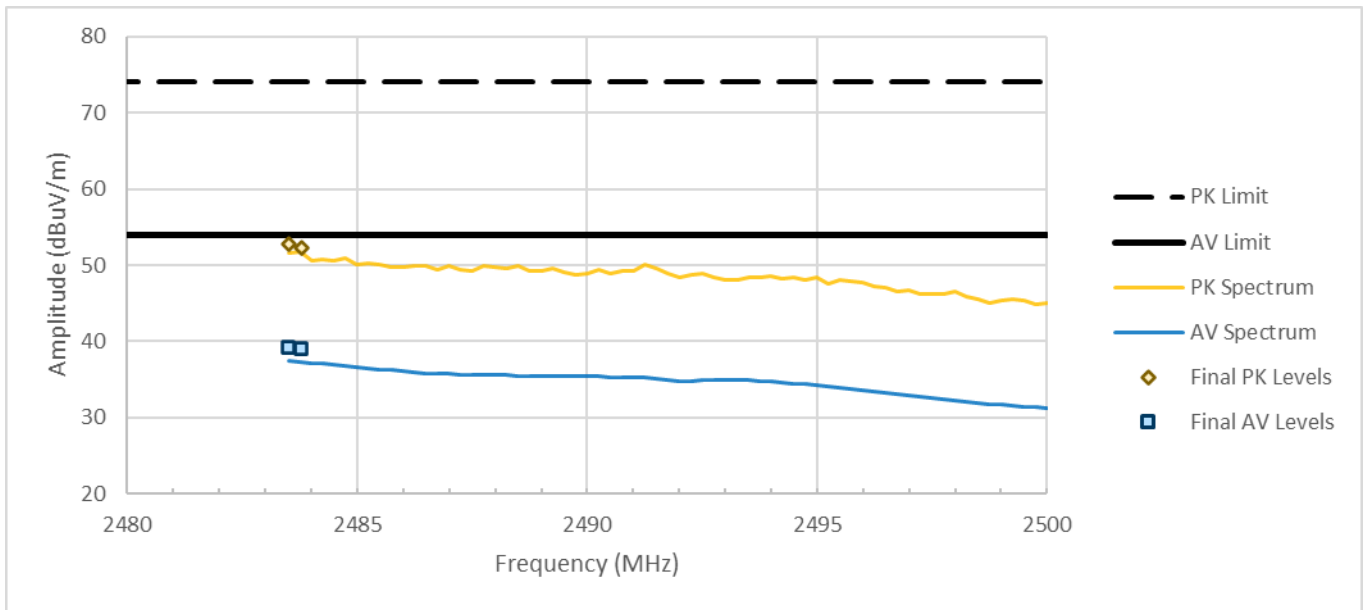


Figure RE05.8: FCC restricted band spectral data from 2483.5 to 2500 MHz (IEEE 802.11b, 2 Mbps, Ch 9)

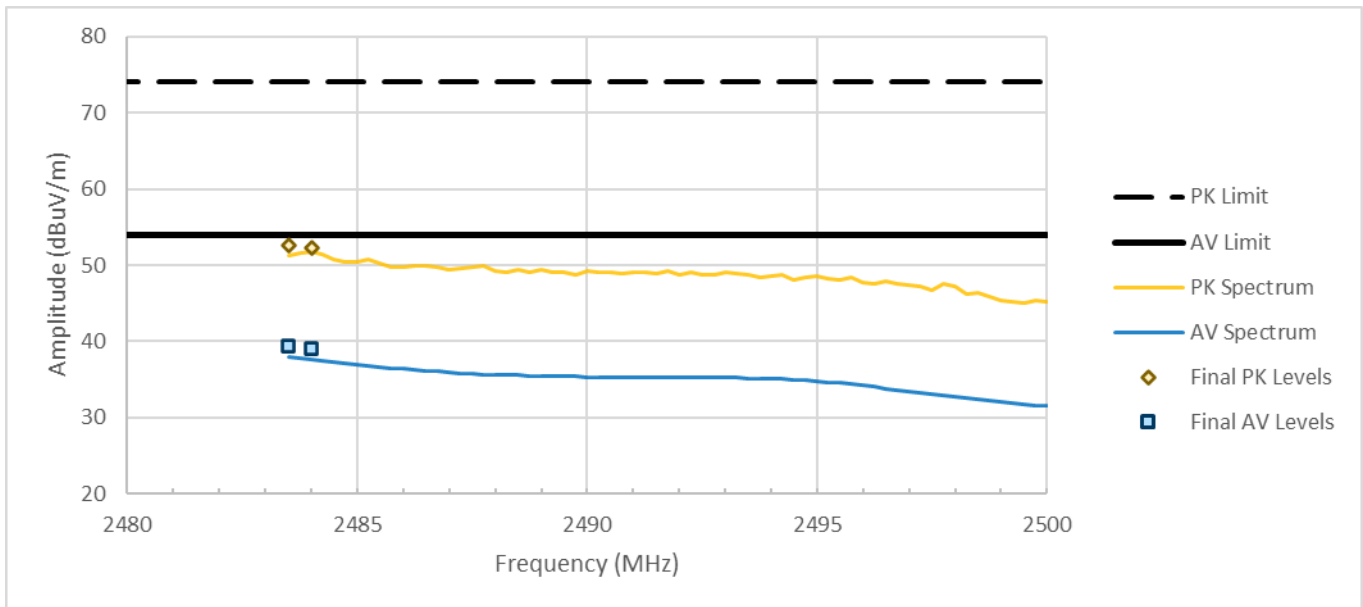


Figure RE05.9: FCC restricted band spectral data from 2483.5 to 2500 MHz (IEEE 802.11b, 11 Mbps, Ch 10)

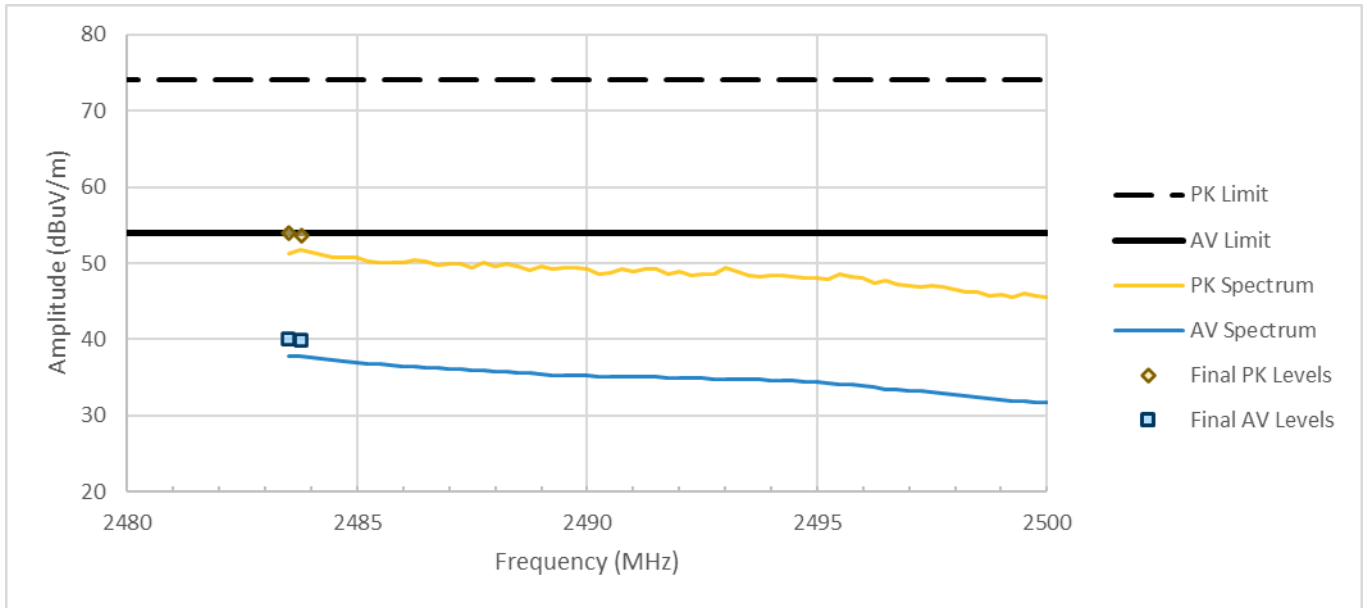


Figure RE05.10: FCC restricted band spectral data from 2483.5 to 2500 MHz (IEEE 802.11b, 1 Mbps, Ch 11)

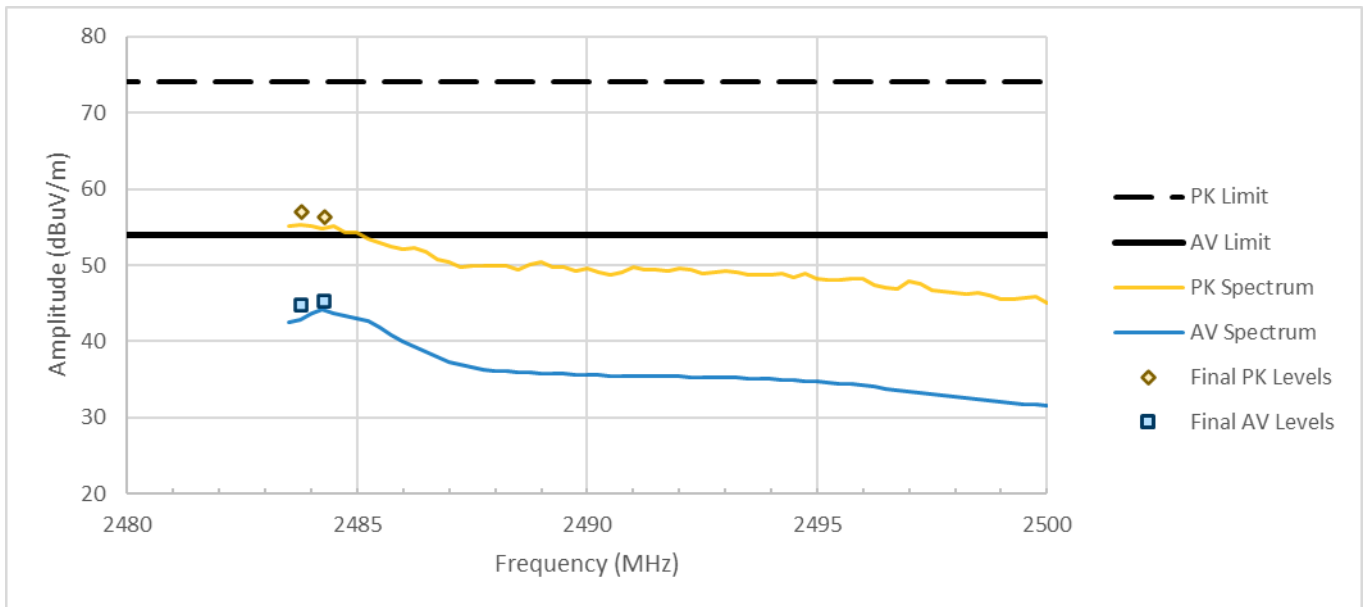


Figure RE05.11: FCC restricted band spectral data from 2483.5 to 2500 MHz (IEEE 802.11b, 1 Mbps, Ch 12)

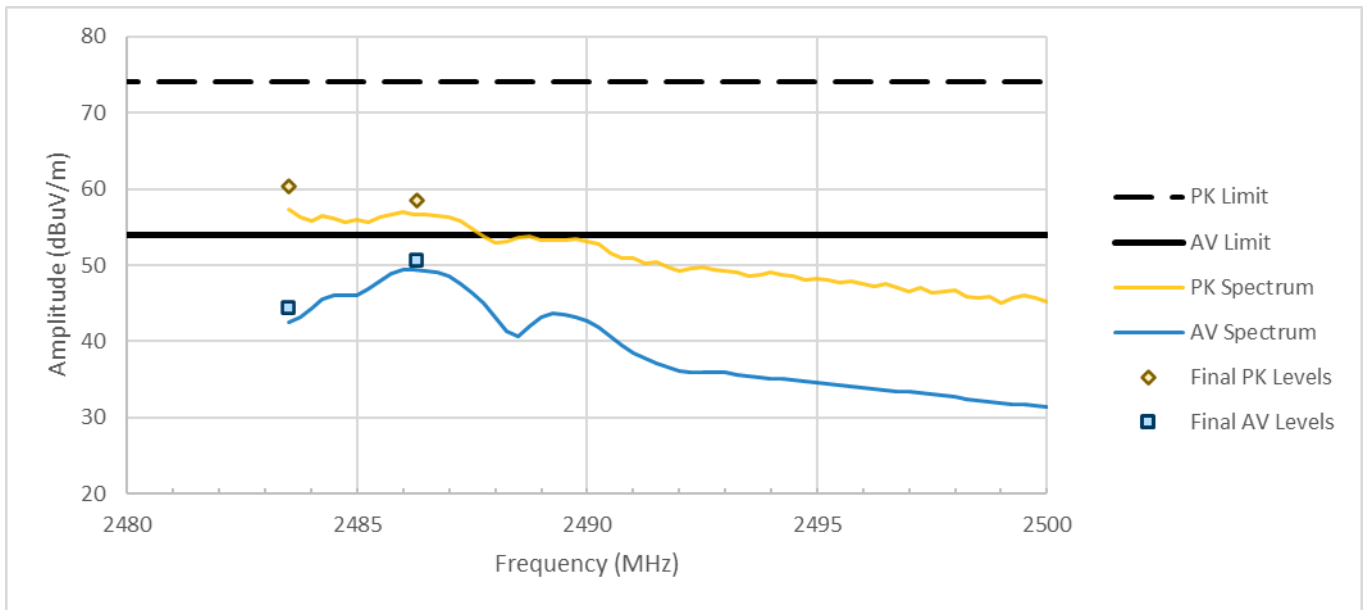


Figure RE05.12: FCC restricted band spectral data from 2483.5 to 2500 MHz (IEEE 802.11b, 2 Mbps, Ch 13)

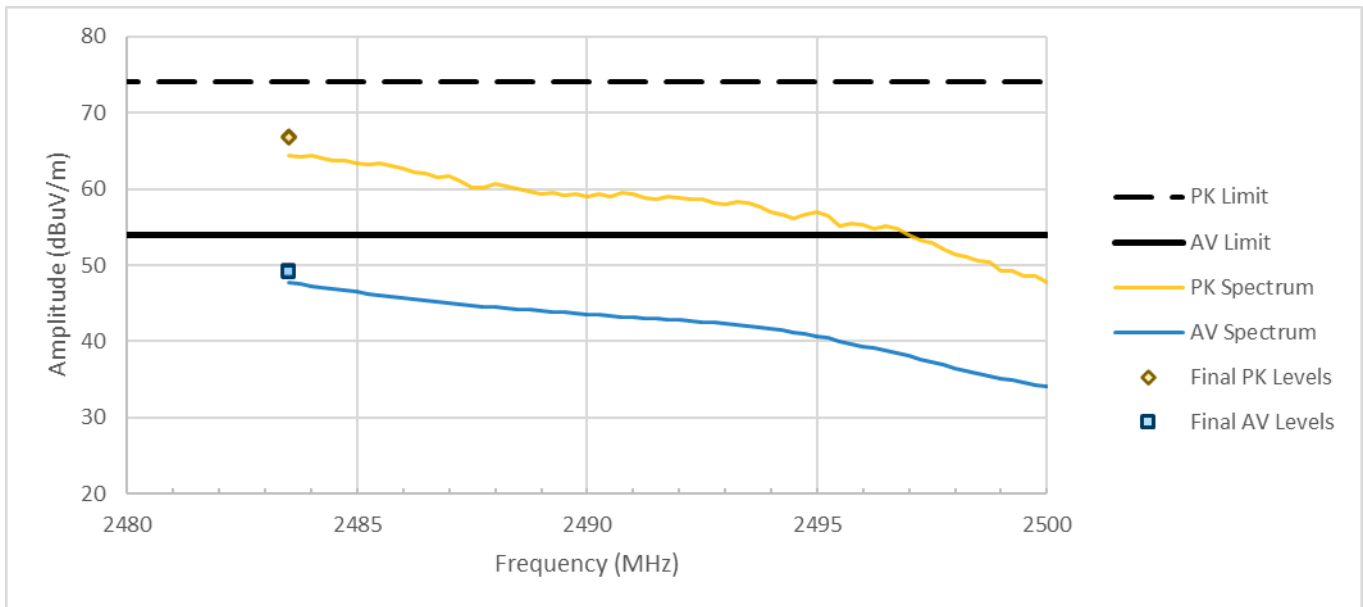


Figure RE05.13: FCC restricted band spectral data from 2483.5 to 2500 MHz (IEEE 802.11g, 12 Mbps, Ch 9)

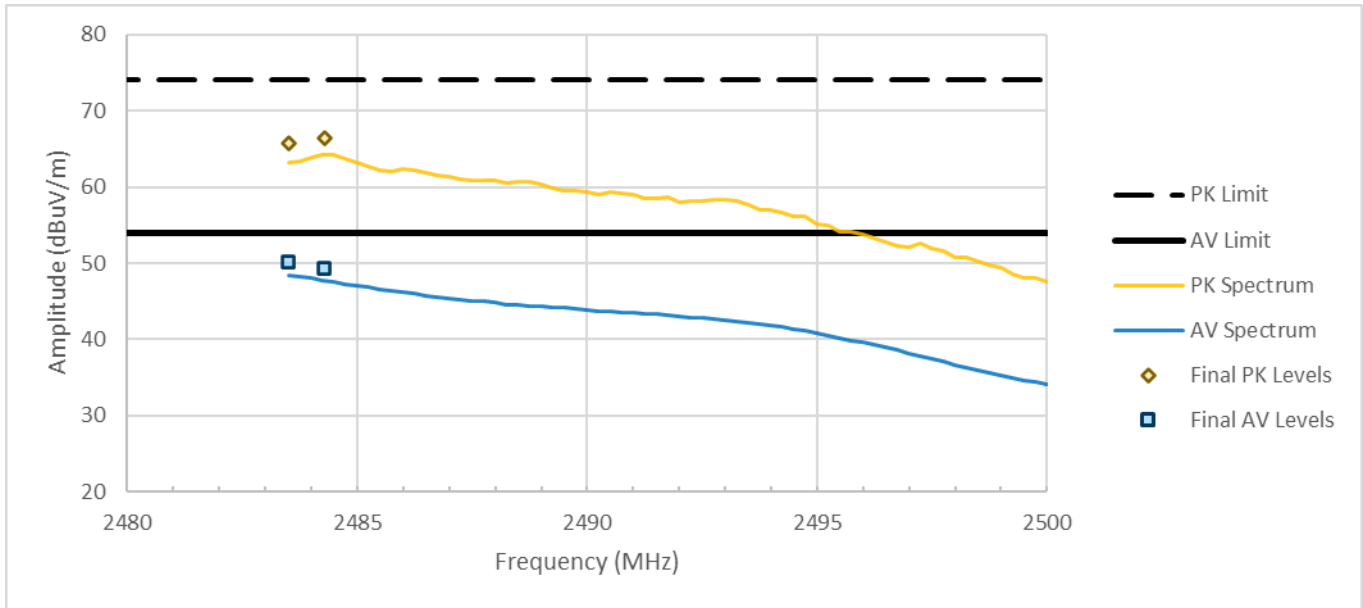


Figure RE05.14: FCC restricted band spectral data from 2483.5 to 2500 MHz (IEEE 802.11g, 12 Mbps, Ch 10)

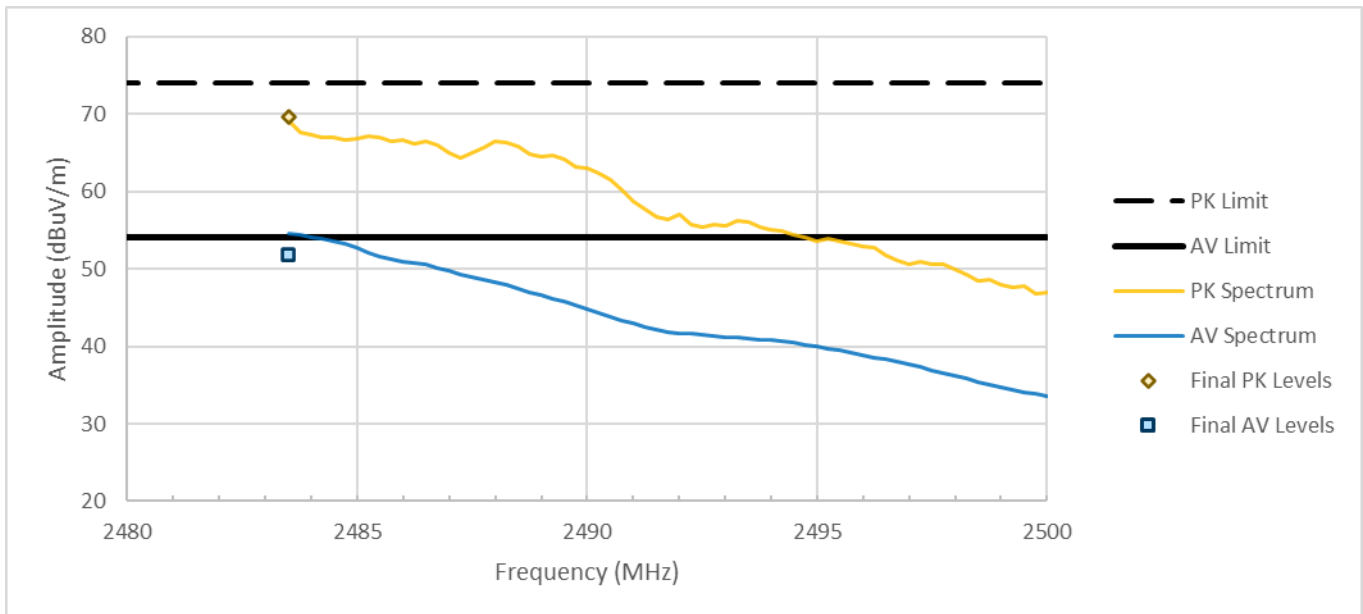


Figure RE05.15: FCC restricted band spectral data from 2483.5 to 2500 MHz (IEEE 802.11g, 9 Mbps, Ch 11)

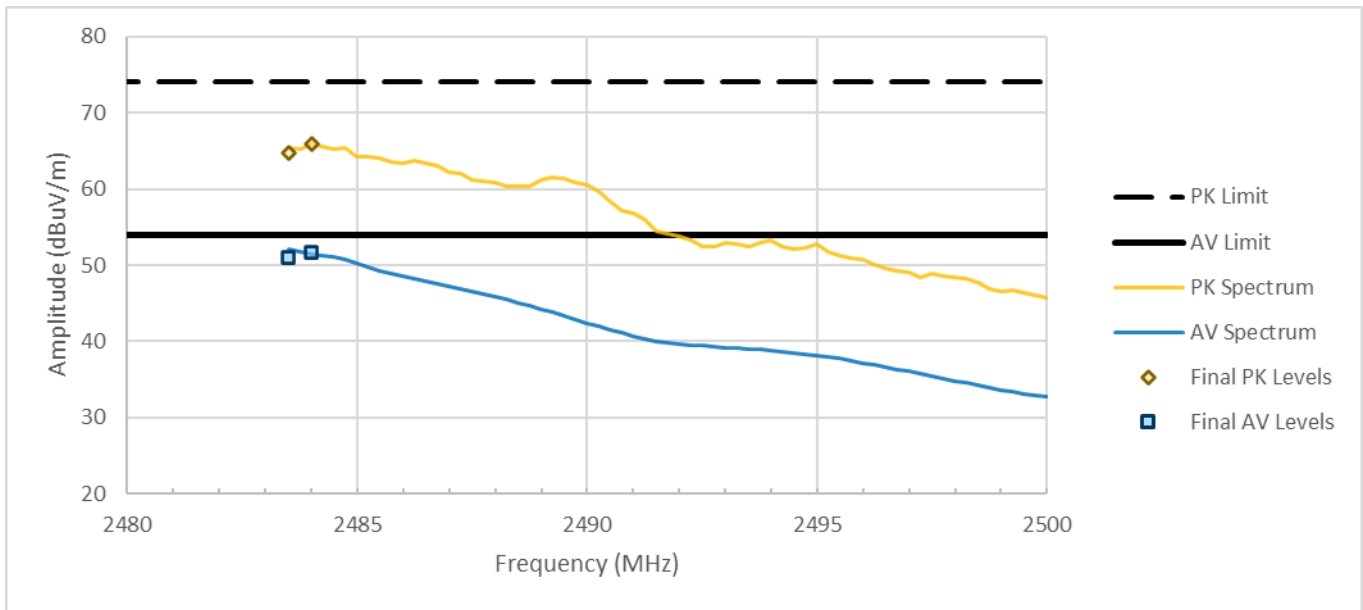


Figure RE05.16: FCC restricted band spectral data from 2483.5 to 2500 MHz (IEEE 802.11g, 6 Mbps, Ch 12)

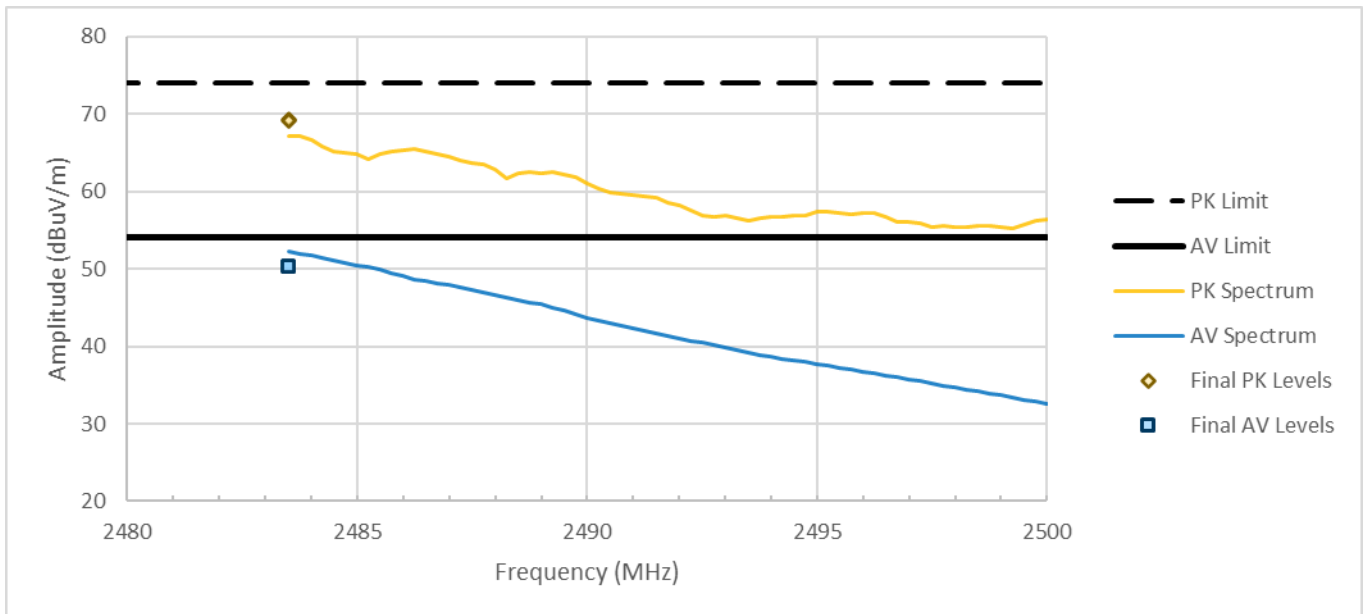


Figure RE05.17: FCC restricted band spectral data from 2483.5 to 2500 MHz (IEEE 802.11n, MCS1, Ch 12)

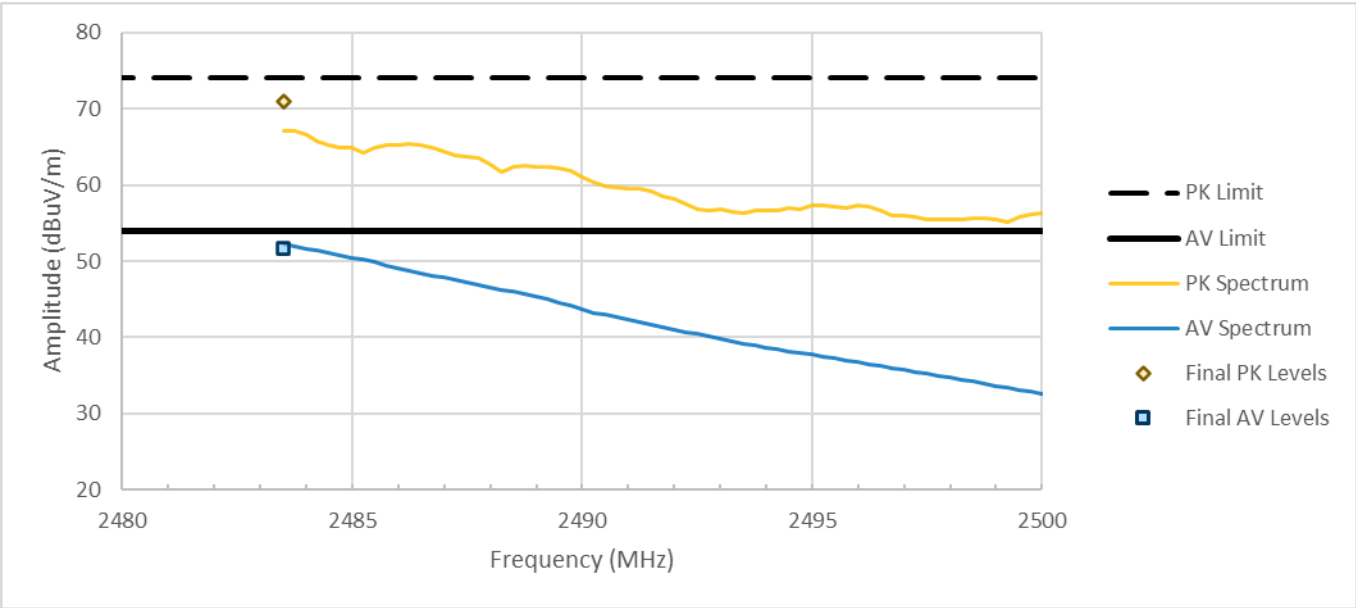


Figure RE05.18: FCC restricted band spectral data from 2483.5 to 2500 MHz (IEEE 802.11g, 24 Mbps, Ch 13)

Setup Photographs

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



Figure RE05.19: EUT test setup, primary view

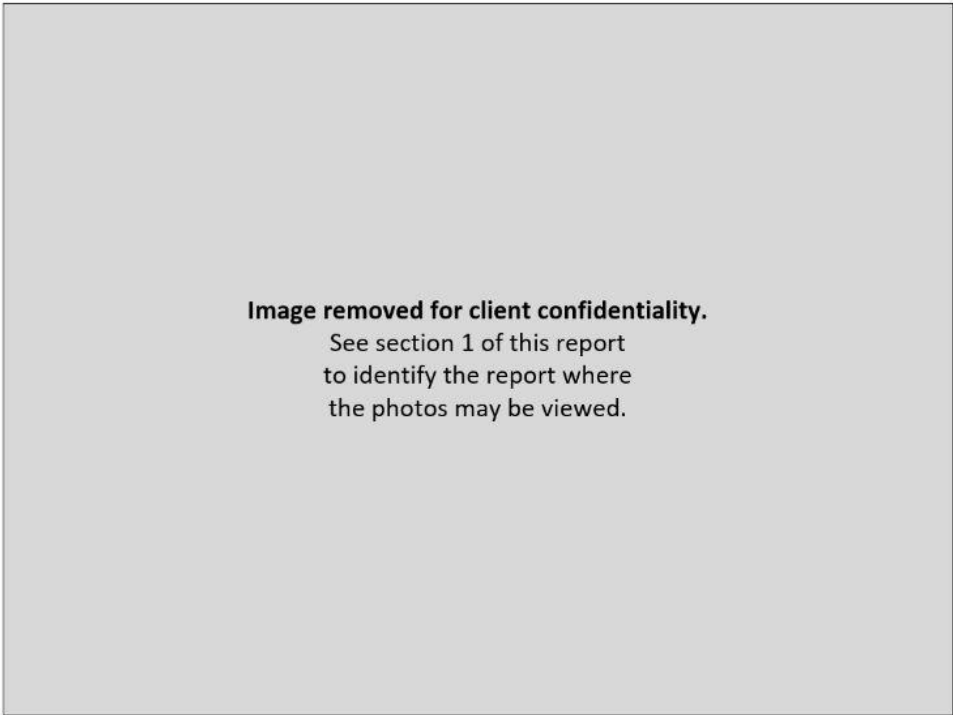


Figure RE05.20: EUT test setup, reverse view

This line is the end of the test record.

Test Record
Radiated Emission Test
Test ID RE07
Project GCL1030

Test Date(s): 09 Apr 2026
Test Personnel: Vladimir Tolstik

Product Model: A05147
Serial Number tested: 8WP000276

Operating Mode: BLETx
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: 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: 13 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, Horn, 1-18 GHz	ETS Lindgren	3117	00227596	11-Nov-2025	11-Nov-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
FSOATS 3m, above 1 GHz	Frankonia	SAC3	F199004	13-Dec-2024	13-Dec-2027

Table RE07.1: 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 frequencies of 2402 MHz, 2404 MHz for the 1 Mbps data rate, and 2404 MHz for the 2 Mbps data rate. Measurements in the upper band were made while the transmitter was tuned to frequencies of 2476 MHz, 2480 MHz for the 1 Mbps data rate, and 2476 MHz, 2478 MHz for the 2 Mbps data rate.

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 BLE 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)
2389.3	54	74	33.92	46.97	20.08	27.03	122	1183	VERT	RMS	0.00
2389	54	74	34.15	47.41	19.85	26.59	122	1183	VERT	RMS	0.00

Table RE07.2: FCC restricted bands from 2200 to 2390 MHz (BLE 1 Mbps, 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)
2383.3	54	74	35.39	47.92	18.61	26.08	122	1183	VERT	RMS	0.00
2383.3	54	74	35.35	47.55	18.65	26.45	122	1183	VERT	RMS	0.00

Table RE07.3: FCC restricted bands from 2200 to 2390 MHz (BLE 1 Mbps, 2404 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	40.00	50.21	14.00	23.80	122	1183	VERT	RMS	0.00
2389	54	74	40.01	50.51	13.99	23.49	122	1183	VERT	RMS	0.00

Table RE07.4: FCC restricted bands from 2200 to 2390 MHz (BLE 2 Mbps, 2404 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)
2484	54	74	43.66	52.58	10.34	21.42	135	1605	HORZ	RMS	0.00
2484	54	74	43.66	52.20	10.35	21.80	135	1605	HORZ	RMS	0.00

Table RE07.5: FCC restricted band from 2483.5 to 2500 MHz (BLE 1 Mbps, 2476 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	40.05	52.71	13.95	21.30	135	1605	HORZ	RMS	0.00
2483.5	54	74	40.04	52.34	13.96	21.66	135	1605	HORZ	RMS	0.00

Table RE07.6: FCC restricted band from 2483.5 to 2500 MHz (BLE 1 Mbps, 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)
2483.8	54	74	41.74	52.87	12.26	21.14	135	1605	HORZ	RMS	0.00
2484	54	74	41.81	51.98	12.19	22.03	135	1605	HORZ	RMS	0.00

Table RE07.7: FCC restricted band from 2483.5 to 2500 MHz (BLE 2 Mbps, 2476 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	43.96	55.69	10.04	18.31	135	1605	HORZ	RMS	0.00
2483.5	54	74	43.97	56.30	10.03	17.70	135	1605	HORZ	RMS	0.00

Table RE07.8: FCC restricted band from 2483.5 to 2500 MHz (BLE 2 Mbps, 2478 MHz)

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

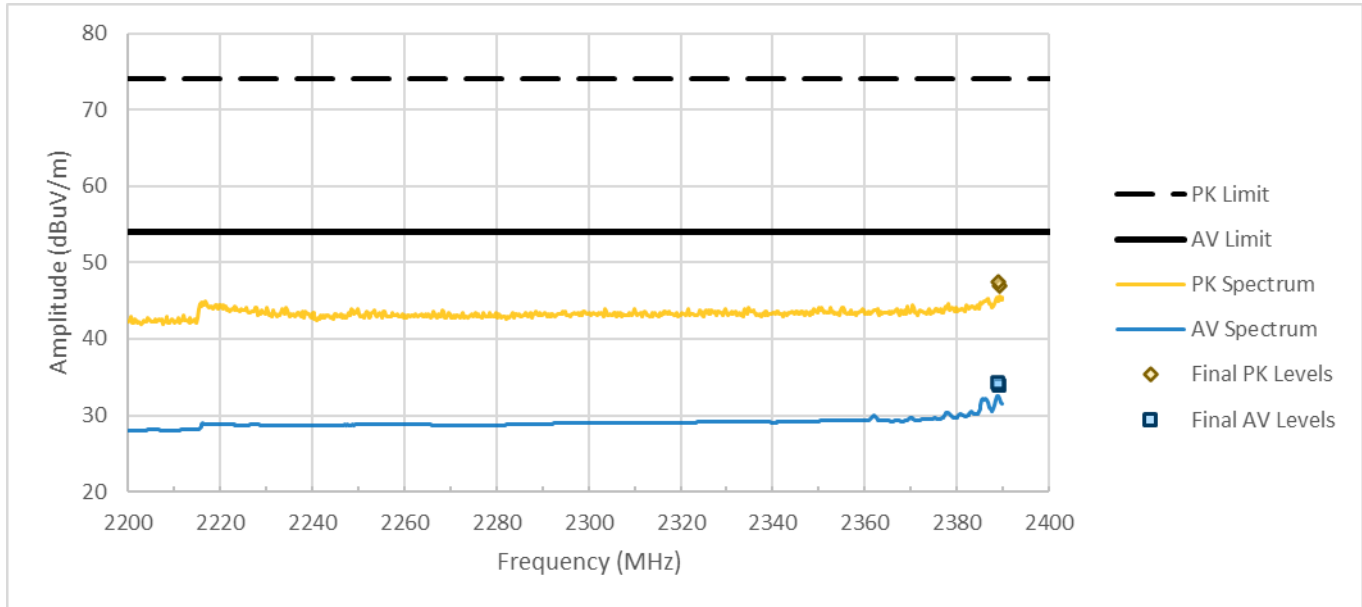


Figure RE07.1: FCC restricted band spectral data from 2200 to 2390 MHz (BLE 1 Mbps, 2402 MHz)

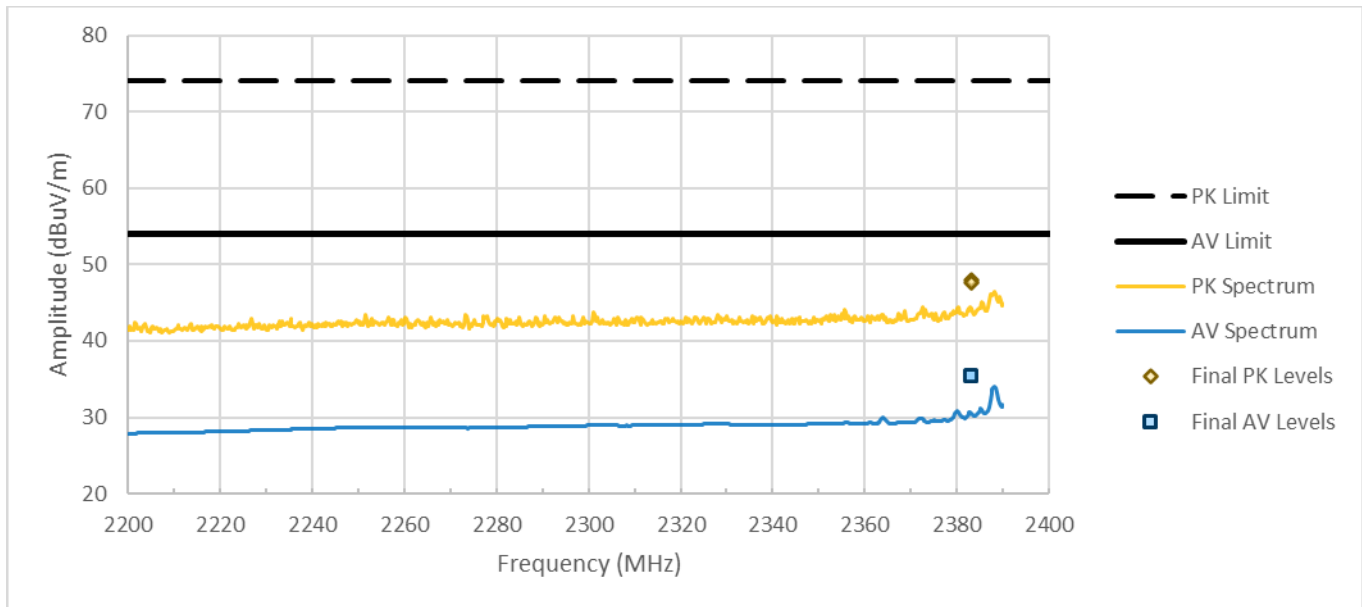


Figure RE07.2: FCC restricted band spectral data from 2200 to 2390 MHz (BLE 1 Mbps, 2404 MHz)

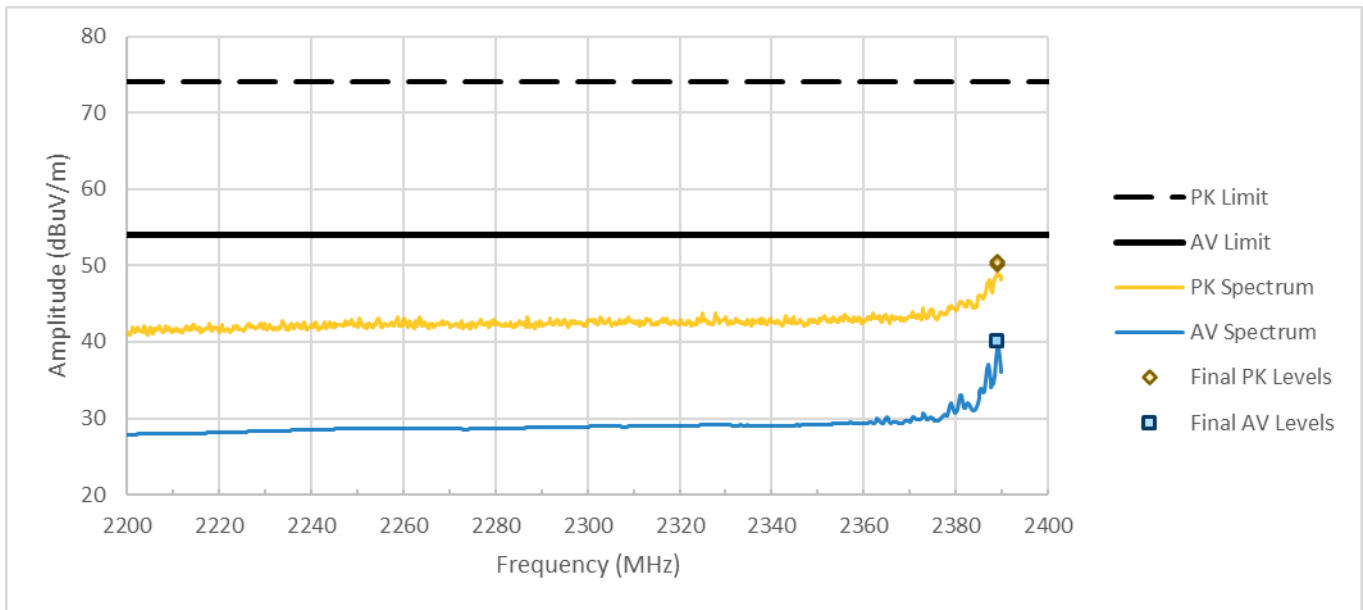


Figure RE07.3: FCC restricted band spectral data from 2200 to 2390 MHz (BLE 2 Mbps, 2404 MHz)

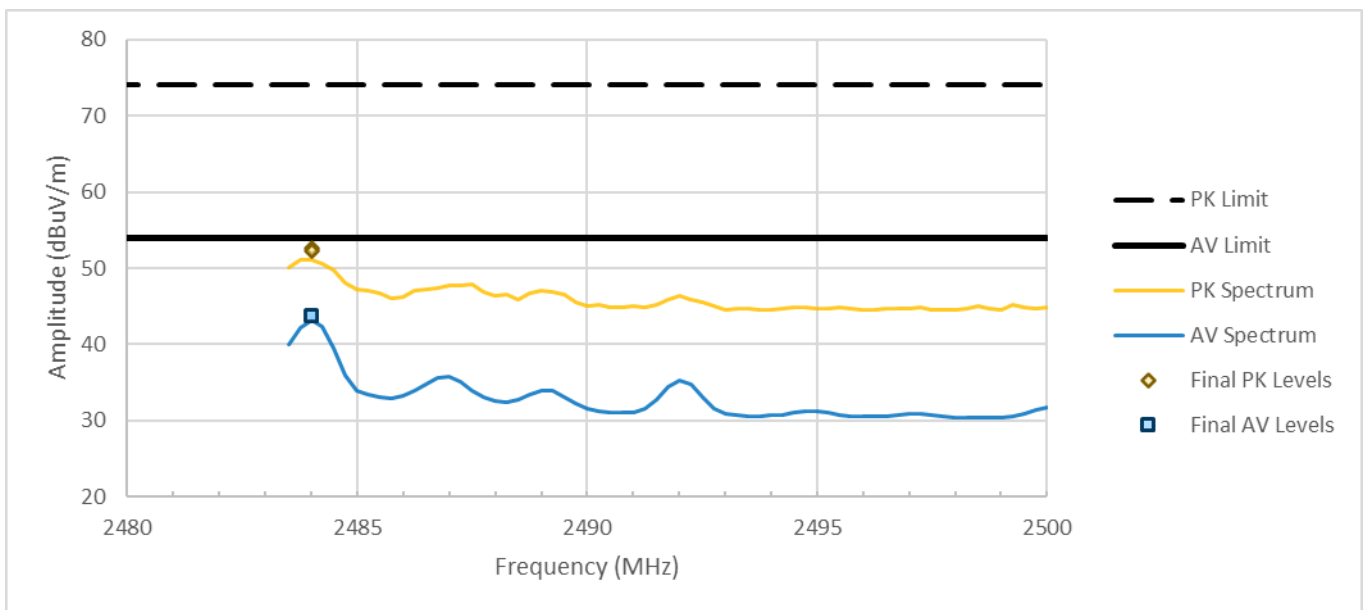


Figure RE07.4: FCC restricted band spectral data from 2483.5 to 2500 MHz (BLE 1 Mbps, 2476 MHz)

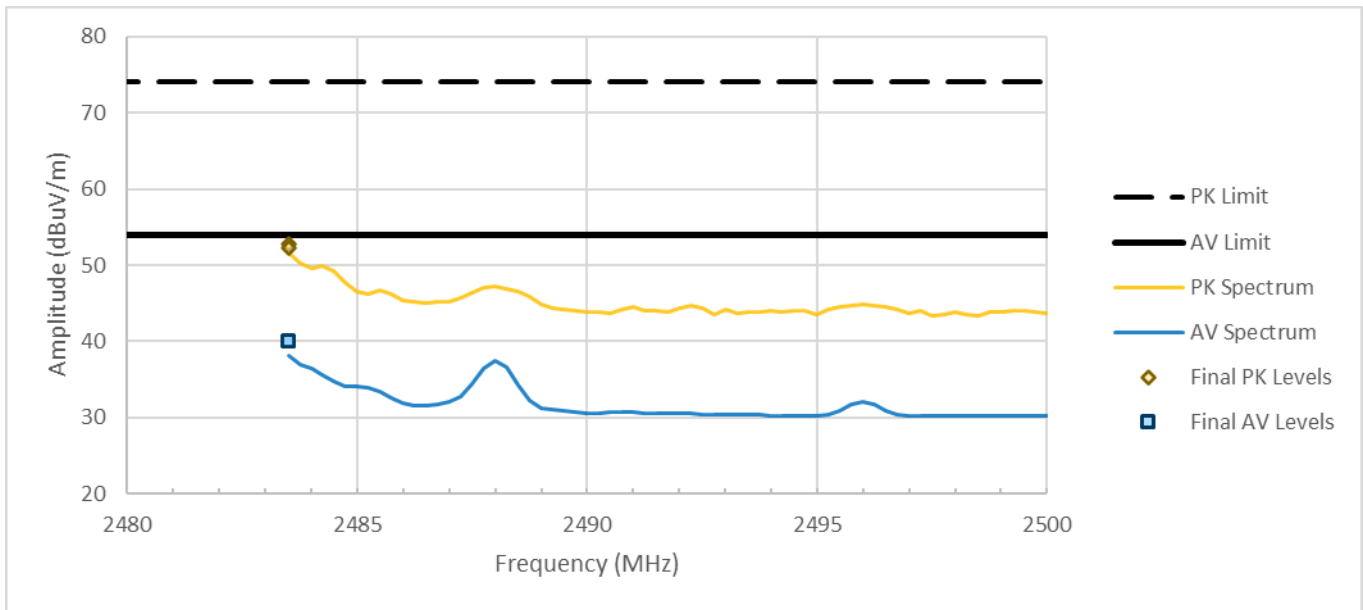


Figure RE07.5: FCC restricted band spectral data from 2483.5 to 2500 MHz (BLE 1 Mbps, 2480 MHz)

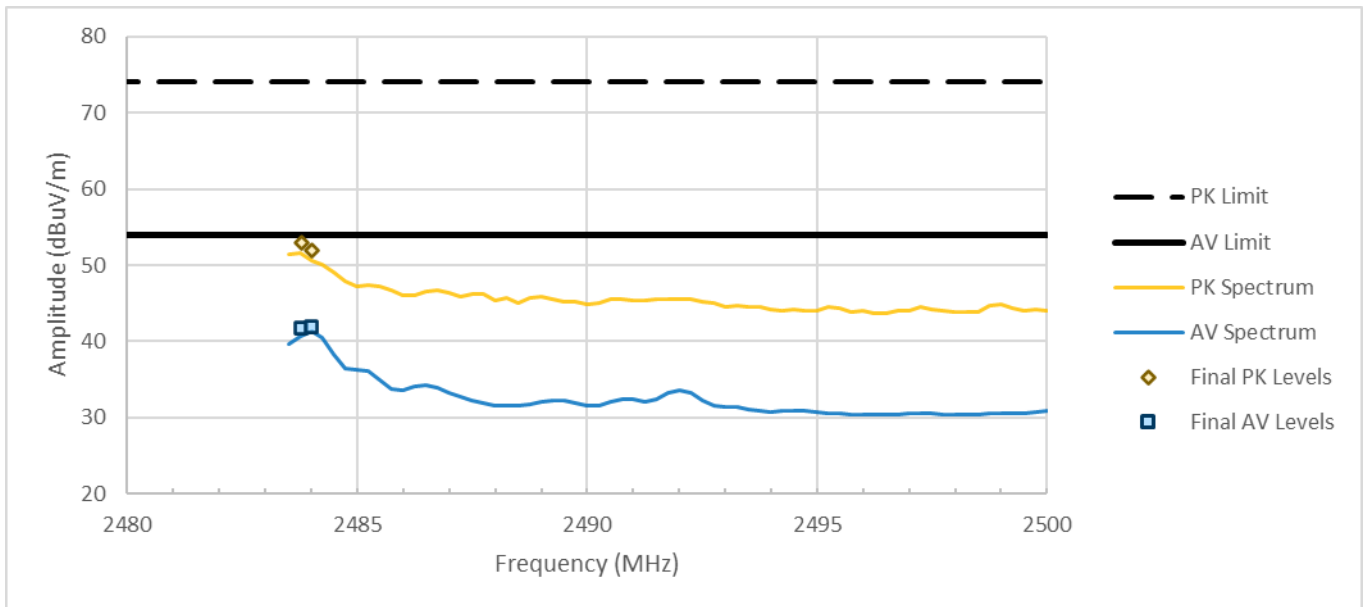


Figure RE07.6: FCC restricted band spectral data from 2483.5 to 2500 MHz (BLE 2 Mbps, 2476 MHz)

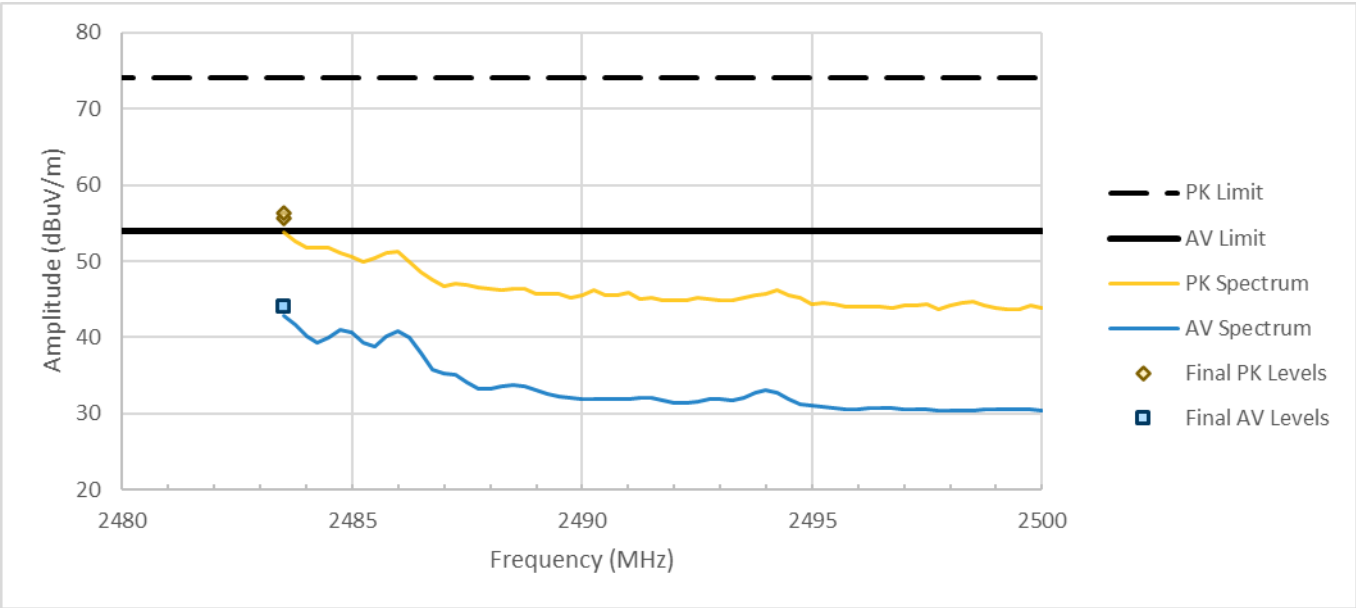


Figure RE07.7: FCC restricted band spectral data from 2483.5 to 2500 MHz (BLE 2 Mbps, 2478 MHz)

Setup Photographs

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



Figure RE07.8: EUT test setup, primary view

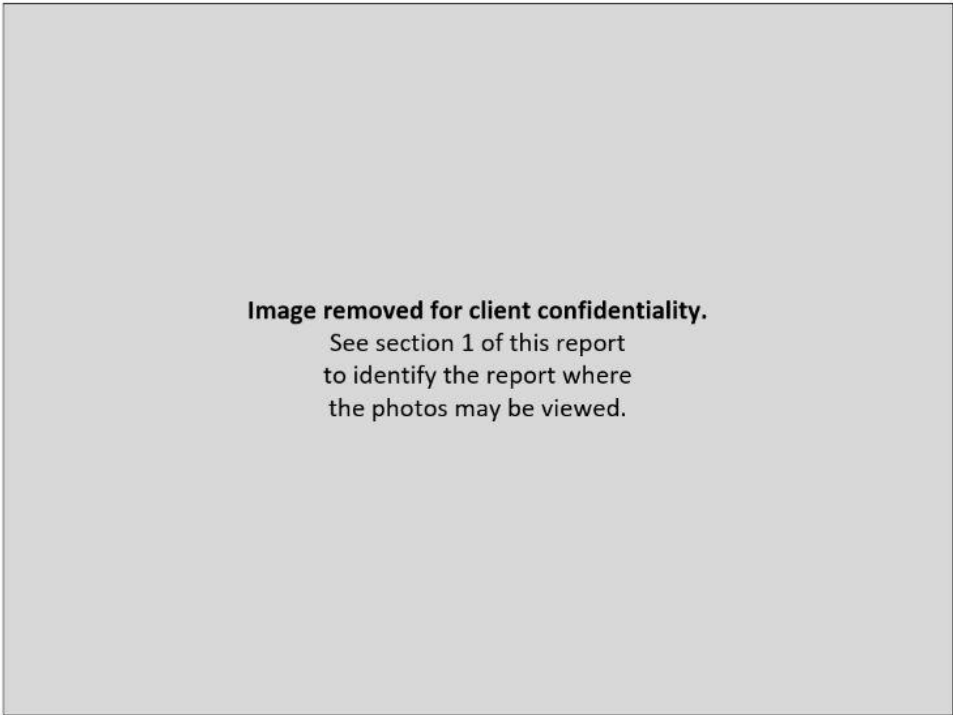


Figure RE07.9: EUT test setup, reverse view

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 CE01****Project GCL1030**

Test Date(s):	16 Apr 2026
Test Personnel:	Aditya Prakash
Product Model:	A05147
Serial Number tested:	8WP000271
Operating Mode:	BLETx
Arrangement:	A4 (Udc)
Input Power:	120 Vac 60 Hz
Test Standards:	FCC Part 15.247, 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 CE01.1: 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.

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	31.16	31.21	21.26	20.94	34.79	34.74
164	65.28	55.28	28.59	28.60	20.81	20.50	36.69	34.47
436	57.14	47.14	23.42	21.77	19.85	16.97	33.73	27.30
438	57.10	47.10	23.29	21.63	19.74	16.82	33.81	27.36
715	56.00	46.00	17.49	17.06	12.64	12.45	38.51	33.36
10001	60.00	50.00	21.81	22.75	18.09	19.22	37.25	30.78

Table CE01.2: Emission summary (BLE, 2 Mbps, 2440 MHz)

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

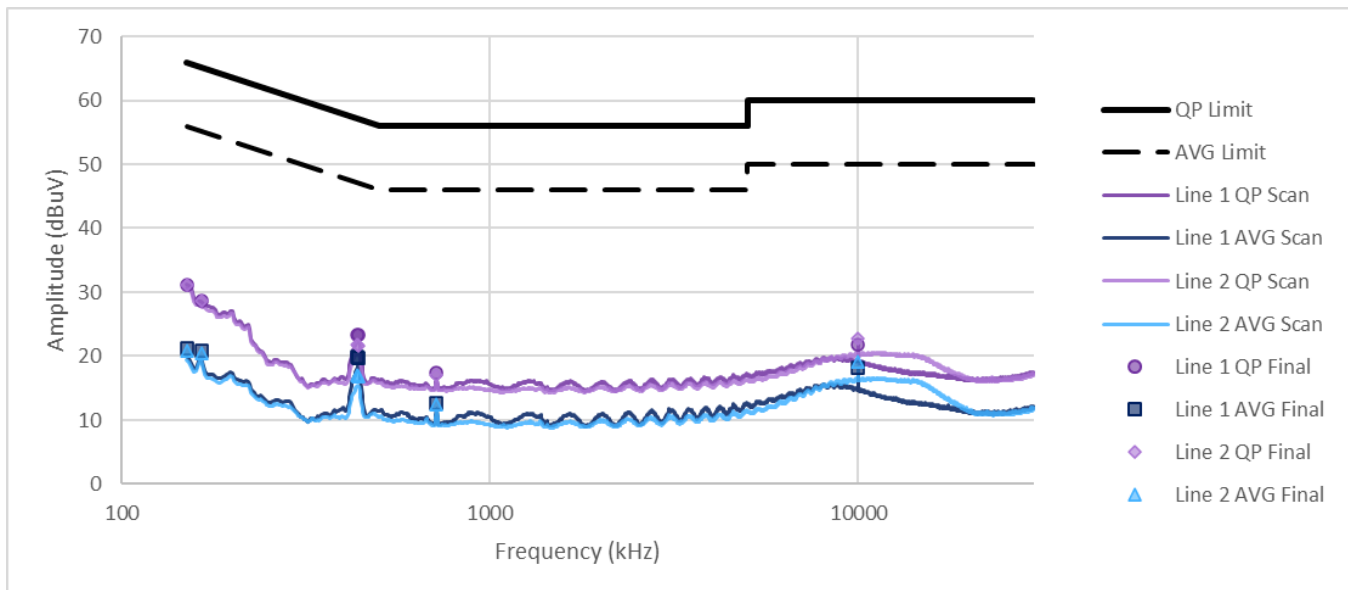


Figure CE01.1: Spectral data (BLE, 1 Mbps, 2440 MHz)

Setup Photographs

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



Figure CE01.2: Test setup, first view

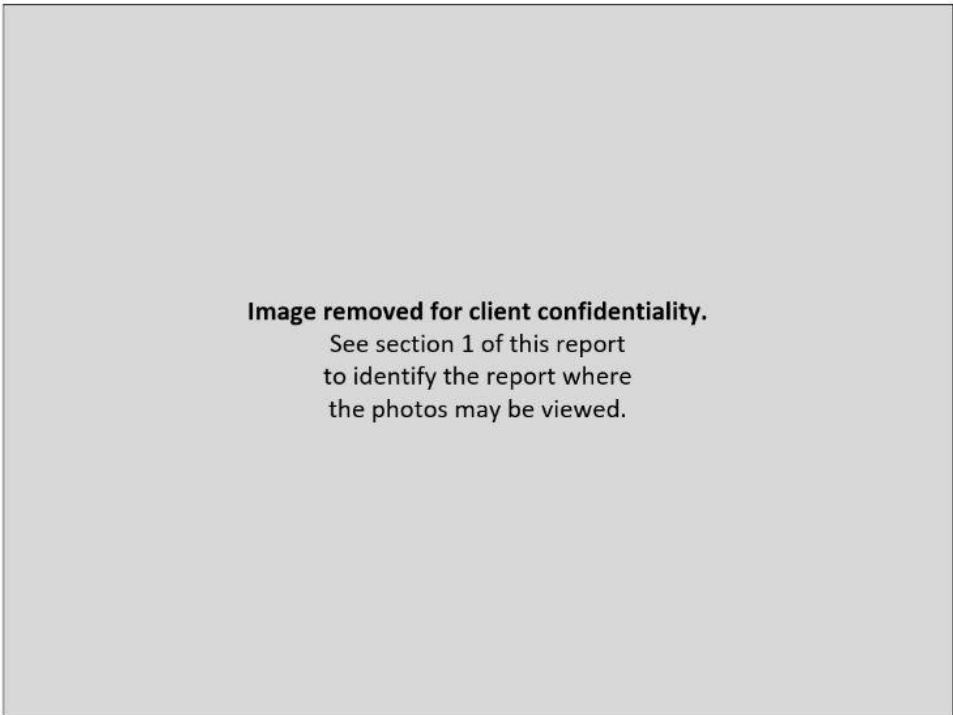


Figure CE01.3: Test setup, second view

This line is the end of the test record.

Test Record**Conducted Emissions Mains Test****Test ID CE04****Project GCL1030**

Test Date(s):	16 Apr 2026
Test Personnel:	Aditya Prakash
Product Model:	A05147
Serial Number tested:	8WP000271
Operating Mode:	Wifi2GTx
Arrangement:	A4 (Udc)
Input Power:	120 Vac 60 Hz
Test Standards:	FCC Part 15.247, 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 CE04.1: 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.

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	26.33	29.13	18.38	20.49	36.87	35.51
164	65.28	55.28	25.74	25.81	19.51	19.33	39.47	35.77
429	57.27	47.27	23.53	21.11	21.25	18.04	33.74	26.02
431	57.23	47.23	23.58	21.04	21.33	17.93	33.65	25.90
436	57.14	47.14	23.00	20.62	20.58	17.17	34.14	26.56
715	56.00	46.00	19.52	18.63	15.09	14.19	36.48	30.91

Table CE04.2: Emission summary (IEEE 802.11g, 6 Mbps, Ch 6)

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

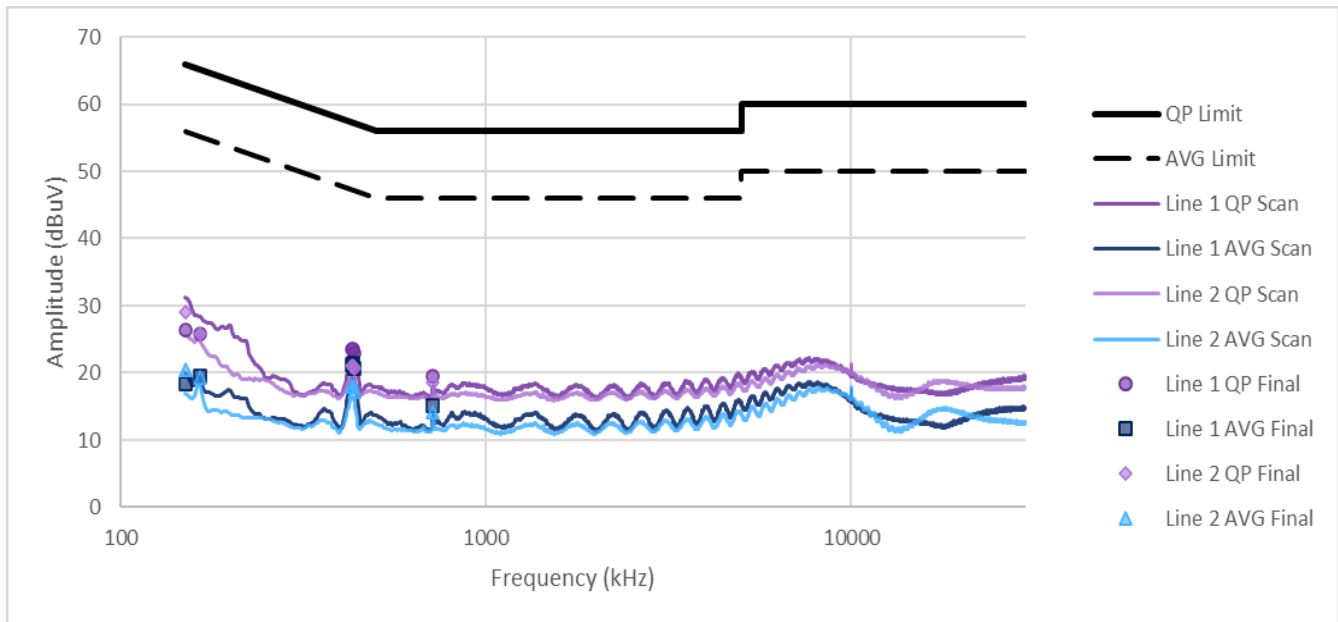


Figure CE04.1: Spectral data (IEEE 802.11g, 6 Mbps, Ch 6)

Setup Photographs

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



Figure CE04.2: Test setup, first view

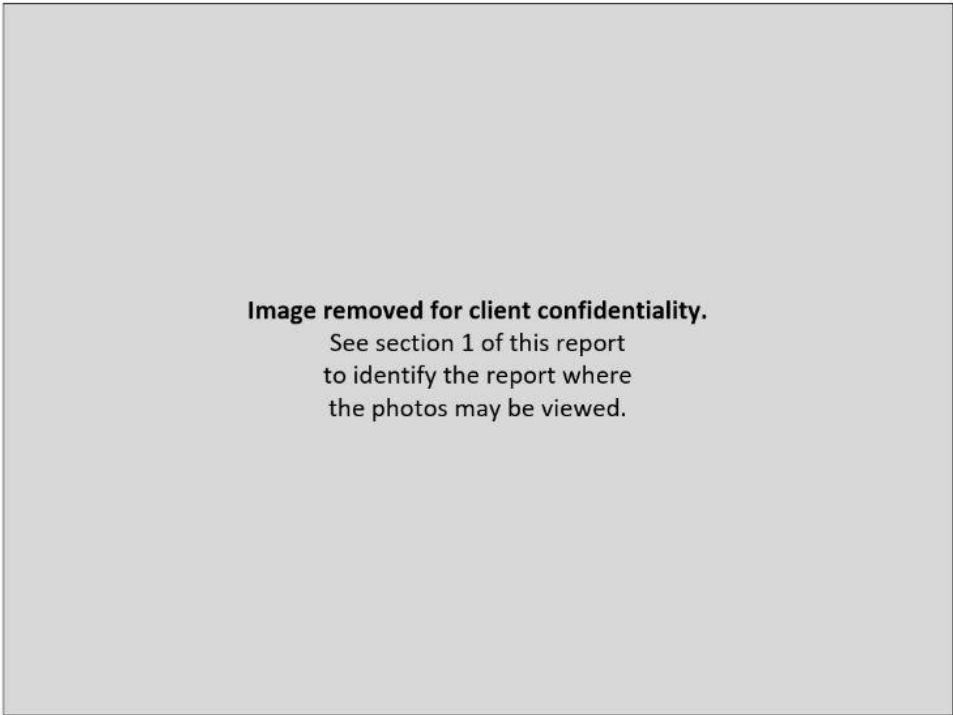


Figure CE04.3: Test setup, second view

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.