Test Report 2025-020

Version B
Issued 4 Feb 2026

Project GCL-0630
Model Identifier: GMN-01410-02
Frequency Range: 118-136.992 MHz

Primary Test Standard(s):
FCC Part 87 D
RSS-141 Issue 2: 2010

Garmin Compliance Lab
Garmin International
1200 E 151st Street
Olathe Kansas 66062 USA

Client-supplied Information

FCC ID: IPH-0271501
IC ID: 1792A-0271501

ACCREDITED
CERTIFICATE #6162.01

See section 6 of this report regarding the presence or absence of accreditation logos or marks on this cover page.

1. 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 VHF transceiver(s). The results are as follows.

Parameter	Description	Key Performance Values	Result	Data starts at page
Radio Modulation	Summary of the kinds of communication this radio can achieve, as stated by the client. [RSS-GEN at Annex A item 10b]	A3E Analog voice with amplitude modulation.	Reported	N/A
Transmit Power	The peak transmit power presented to the antenna is no greater that 55 Watts.[FCC 87.131, RSS-141 at 5.1]	The maximum transmit power is 42.81 dBm or 19.11 Watts.	PASS	16
Frequency Stability	The radio tuning must be robust over a range of temperature and supply voltage conditions. [FCC 87.133, RSS-141 at 5.1]	Radio emissions remained within the allowed radio band under all environmental conditions tested.	PASS	18
Occupied Bandwidths	Regulatory agencies also require the reporting 99% of power bandwidths. [FCC 87.135(a)]	The maximum 99% occupied bandwidth observed is 5.159 kHz.	Reported	20
Unwanted Emissions (Conducted Spurious)	The radio should not provide too much radio energy to the antenna at frequencies beyond its intended frequency band. [RSS 141 5.2.2, FCC 87.139(a)]	Emissions outside the band must be reduced from in-band levels according to a mask. The measured reduction was at least 5.83 dB below the mask levels.	PASS	23
Over Modulation	Modulation Index for A3E and A9W Emissions shall not exceed 100% [FCC 87.141, RSS-141 at 5.1]	The maximum modulation index observed was 90%.	PASS	27
Radiated Emissions	The radiated emissions from the device should be under the limits. [FCC 2.1053, FCC 87.139]	Frequency range tested: 30 MHz-2 GHz. maximum emission margin from class B limit: 57.4 dB	PASS	30

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.

Table 1: Summary of results

Report Organization

For convenience of the reader, this report is organized as follows:

1. Summary
2. Test Background
3. Report History and Approval
4. Test Sample Modifications and Special Conditions
5. Description of Equipment Tested
6. Test Standards Applied
7. Measurement Instrumentation Uncertainty
8. Selected Examples of Calculations
9. Environmental Conditions During Test
10. Immunity Performance Criteria
11. 3m RF Chamber Block Diagrams

Annex: Test records are provided for each type of test, following the order and page numbering stated in the summary table. Concluding notes appear on the final page of this report.

Due to confidentiality, certain material (such as test setup photographs) has been removed from this report and placed in GCL Test Report 2025-021. That report is treated as a part of this document by way of this reference.

2. Test Background

2.1 The Test Lab

The testing reported here was performed at the Garmin Compliance Lab, an organization within Garmin International, located at 1200 E 151st St, Olathe Kansas, USA. The contact telephone number is +1.913.397.8200.

2.2 The Client

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: 18 Mar 2025
Test Start Date: 21 Mar 2025
Test End Date: 03 Apr 2025

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.

3. Report History and Approval

Version B of this report has an update on section 6.4. Version B was written by Majid Farah on 04 Feb 2026. This report was written initially by Majid Farah and issued on 5 May 2025 as Version A.

Report Technical Review:

David Arnett
Technical Lead EMC Engineer

Report Approval:

Shruti Kohli
Senior Manager Operations

4. 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:
None.

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:
None.

5. Description of the Equipment Tested

5.1 Unique Identification

Product Model	GMN-01410-02
Serial Numbers Tested	89S000100

The product is an aeronautical communications transceiver which also incorporates navigational receivers. The authorized transmitter operational frequency band is 118.000 to 136.975 MHz (25 kHz mode). The design includes an Aviation-Band VHF Transceiver with channel operational capability for 25 kHz or 8.33 kHz Channel Spacing. The device is marketed as Aircraft Remote Mounted Integrated Avionics Unit. In addition to the authorized frequency band and operational modes, the design provides for VHF operation in other frequency bands and services. This report documents operation for this application and authorization only as provided for in 47CFR 87.173. The additional operational capability to transmit in the 138-144 MHz, 148-149.9 MHz, or 150.5-150.8 MHz bands are presented in 47CFR 87.147(f).

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

5.2 Key Parameters

EUT Input Power:	14 (13.75) Vdc or 28 (27.5) Vdc
I/O Ports:	RS-232 DB9
Radio Transceivers:	VHF
Radio Receivers:	VHF, GPS L1
Primary Functions:	transmitting or receiving in different VHF bands, receiving navigation and GPS signals
Typical use:	Table top
Highest transmit frequency:	136.992 MHz
Highest digital frequency:	4991.2 MHz
Firmware Revision:	COM System Software version: 2.50f; NAV System Software version: 2.50a

5.3 Operating modes

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

Mode 15: M15 (Tx). VHF transceiver is transmitting with/without modulation, output power set to 10 or 16 watts. When used for Radiated Emission testing, a function generator keyed the transmitter on for 1 second every 5 seconds to maintain a maximum 20% duty cycle as directed by the client. Measurement dwell times were lengthened accordingly.

Mode 16: M16 (Rx). VHF transceiver is in receive (standby) mode, transmitter output power set to 16 watts.

5.4 EUT Arrangement

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

Arrangement 1: A1(RE) VOR/Localizer antenna port, Glideslope antenna port and GPS antenna port are terminated with 50 ohms load. EUT is tuned to a frequency in VHF band and is transmitting.

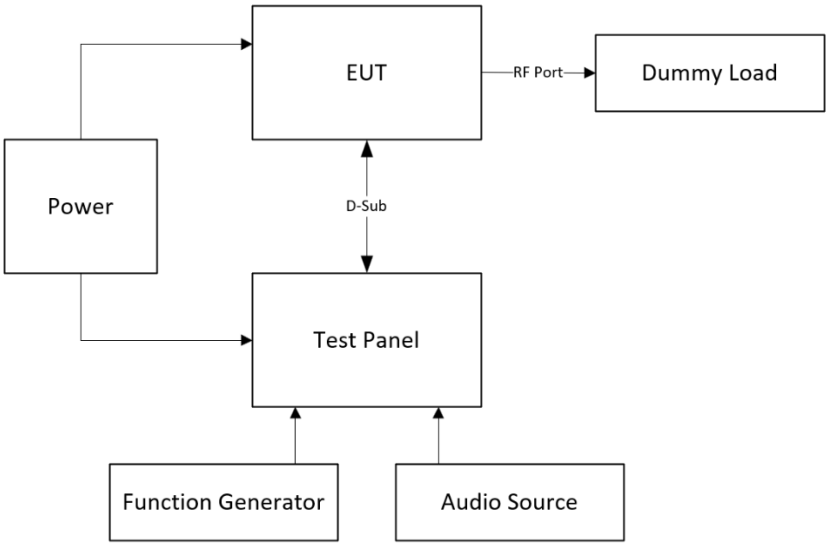

Figure 1: Block diagram of equipment arrangement A1

Arrangement 2: A2(NAV) Test sample was in arrangement 1 but audio source and function generator were not used. EUT is tuned to a frequency in VHF band but it is not transmitting.

Arrangement 3: A3(COM) VOR/Localizer antenna port, Glideslope antenna port and GPS antenna port are terminated with 50 ohms load. EUT is tuned to different frequency in VHF bands and is transmitting.

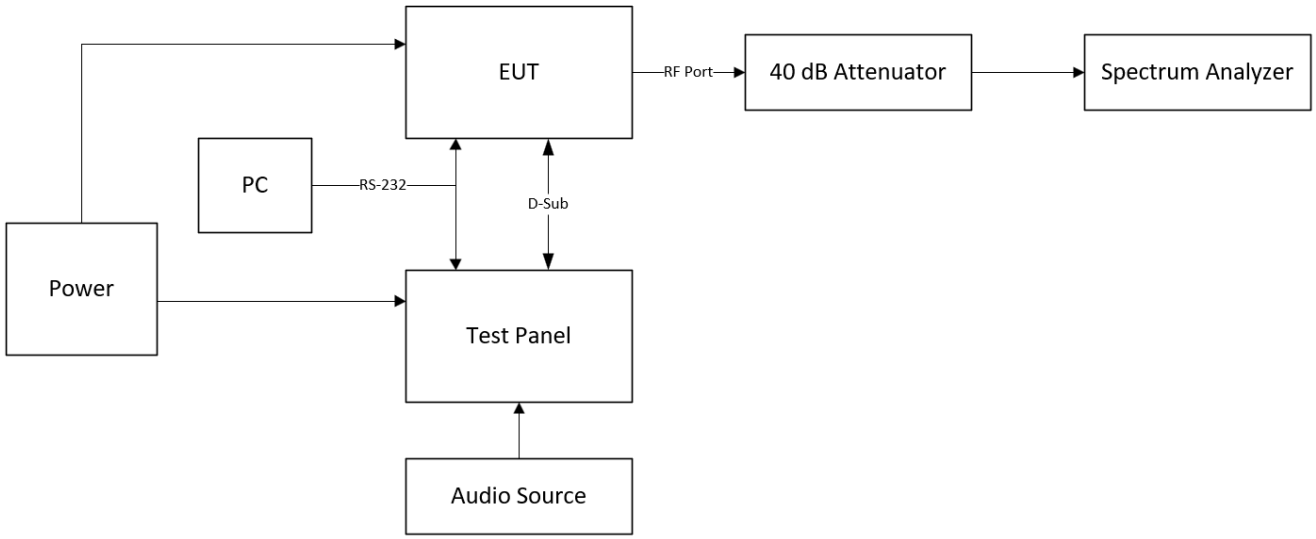

Figure 2: Block diagram of equipment arrangement A3

5.5 Associated Equipment (AE) used

Description	Manufacturer	Model	Serial Number
COM Test Panel	Garmin	N/A-client provided	N/A-client provided
Test rack with wiring harness	Garmin	N/A-client provided	N/A-client provided
RS232 DB9 to USB adaptor	startech.com	ICUSB232SM3	N/A
Laptop	Dell	Latitude 5410	5VSPFB3
Power Supply	Dell	HA65NM191	CN-0H374X-CH200-0BD-7TC0-A02

Table 2: List of associated equipment that may have been used during test

5.6 Cables used

Description	From	To	Length	EMC Treatment
Audio	Audio Source	Test Panel	0.5 m	None
Control	Function generator	Test Panel	6 m	None
RF	EUT	Load/attenuator	0.5 m	None

Table 3: List of cables that may have been used during test

5.7 Additional EUT Information Provided by the Requestor

Application for Certification

(1) The full name and mailing address of the manufacturer of the device and the applicant for certification.

Garmin International, Inc. 1200 East 151st Street Olathe, KS 66062

(2) FCC identifier.

FCC I.D.: IPH-0271501 IC: 1792A-0271501

(3) A copy of the installation and operating instructions to be furnished the user. A draft copy of the instructions may be submitted if the actual document is not available. The actual document shall be furnished to the FCC when it becomes available.

Refer to exhibit for Instruction Manual.

(4) Type or types of emission.

6k00A3E (25 kHz), (5K60A3E for 8.33 kHz operation)

(5) Frequency range.

118-136.975 MHz (25 kHz channel operation), (118-136.992 MHz, 8.33 kHz channels)

(6) Range of operating power values or specific operating power levels, and description of any means provided for variation of operating power.

10 W nominal, 41 dBm for 14-volt installation / operation
16 W nominal, 43 dBm for 28-volt installation / operation

(7) Maximum power rating as defined in the applicable part(s) of the rules.

Maximum allowable power output of 55 Watts as defined per CFR47 paragraph 87.131 and RSS-141 paragraph 5.1.

(8) The dc voltages applied to and dc currents into the several elements of the final radio frequency amplifying device for normal operation over the power range.

Power delivered into final amplifier 14-volt, 14.9 volts @ 1.6 amps (23.8 watts)
Power delivered into final amplifier 28-volt, 14.9 volts @ 1.6 amps (23.8 watts) for 10 Watt operation, or 18.4 volts @ 2.0 amps (36.8 watts) for 16 Watt operation

(9) Tune-up procedure over the power range, or at specific operating power levels.

Refer to Exhibit for Transceiver Alignment Procedure.

(10) A schematic diagram and a description of all circuitry and devices provided for determining and stabilizing frequency, for suppression of spurious radiation, for limiting modulation, and for limiting power.

Refer to Exhibit for Circuit information and theory of operation.

(11) A photograph or drawing of the equipment identification plate or label showing the information to be placed thereon.

Refer to Exhibit for Photograph or Drawing.

(12) Photographs (8″ × 10″) of the equipment of sufficient clarity to reveal equipment construction and layout, including meters, if any, and labels for controls and meters and sufficient views of the internal construction to define

component placement and chassis assembly. Insofar as these requirements are met by photographs or drawings contained in instruction manuals supplied with the certification request, additional photographs are necessary only to complete the required showing.

Refer to Exhibit for Drawings of Components Layout and Chassis Drawings.

(13) For equipment employing digital modulation techniques, a detailed description of the modulation system to be used, including the response characteristics (frequency, phase and amplitude) of any filters provided, and a description of the modulating wave train, shall be submitted for the maximum rated conditions under which the equipment will be operated.

Not applicable

(14) The data required by §2.1046 through 2.1057, inclusive, measured in accordance with the procedures set out in §2.1041.

Data is contained in this application

(15) The application for certification of an external radio frequency power amplifier under part 97 of this chapter need not be accompanied by the data required by paragraph (b)(14) of this section. In lieu thereof, measurements shall be submitted to show compliance with the technical specifications in subpart C of part 97 of this chapter and such information as required by §2.1060 of this part.

Does not apply to this device or application.

(16) An application for certification of an AM broadcast stereophonic exciter-generator intended for interfacing with existing certified, or formerly type accepted or notified transmitters must include measurements made on a complete stereophonic transmitter. The instruction book must include complete specifications and circuit requirements for interconnecting with existing transmitters. The instruction book must also provide a full description of the equipment and measurement procedures to monitor modulation and to verify that the combination of stereo exciter-generator and transmitter meet the emission limitations of §73.44.

Does not apply to this device or application.

(17) Applications for certification required by §25.129 of this chapter shall include any additional equipment test data required by that section.

Does not apply to this device or application.

(18) An application for certification of a software defined radio must include the information required by §2.944.

Does not apply to this device or application.

(19) Applications for certification of equipment operating under part 27 of this chapter, that a manufacturer is seeking to certify for operation in the:

(i) 1755-1780 MHz, 2155-2180 MHz, or both bands shall include a statement indicating compliance with the pairing of 1710-1780 and 2110-2180 MHz specified in §§27.5(h) and 27.75 of this chapter.

(ii) 1695-1710 MHz, 1755-1780 MHz, or both bands shall include a statement indicating compliance with §27.77 of this chapter.

(iii) 600 MHz band shall include a statement indicating compliance with §27.75 of this chapter.

Does not apply to this device or application.

(20) Before equipment operating under part 90 of this chapter and capable of operating on the 700 MHz interoperability channels (See §90.531(b)(1) of this chapter) may be marketed or sold, the manufacturer thereof shall have a Compliance Assessment Program Supplier's Declaration of Conformity and Summary Test Report or, alternatively, a document detailing how the manufacturer determined that its equipment complies with §90.548 of this chapter and that the equipment is interoperable across vendors. Submission of a 700 MHz narrowband radio for certification will constitute a representation by the manufacturer that the radio will be shown, by testing, to be interoperable across vendors before it is marketed or sold.

Does not apply to this device or application.

(21) Contain at least one drawing or photograph showing the test set-up for each of the required types of tests applicable to the device for which certification is requested. These drawings or photographs must show enough detail to confirm other information contained in the test report. Any photographs used must be focused originals without glare or dark spots and must clearly show the test configuration used.

Data is contained in this application or application exhibits.

6. Test Standards Applied

6.1. 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.

FCC Part 87 D
RSS-141 Issue 2: 2010
ANSI C63.26: 2015

6.2 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.

None.

6.3 Variances

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

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

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

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

6.4 Laboratory Accreditation

The Garmin Compliance Lab, an organization within Garmin International, is registered with the US Federal Communication Commission (FCC) as:

Lab Registration Number: 273575
FCC Designation Number: US1311

The Garmin Compliance Lab, an organization within Garmin International, is recognized by the Canada Department of Innovation, Science, and Economic Development (ISED) under:

Company Number: 1792A
CAB Identifier: US0233

The Garmin Compliance Lab, an organization within Garmin International, is accredited by A2LA, Certificate No. 6162.01. 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.

7. Measurement Instrumentation Uncertainty

The lab has analyzed the sources of measurement instrumentation uncertainty. The analysis concludes that the actual measurement values cited in this report are accurate within the U_{LAB} intervals shown below with approximately 95% statistical confidence. Where the report shows a judgment that a test sample passes a test against a published limit based on these measured values, that judgment has a statistical confidence of 97.5% or greater. Measurement Instrumentation Uncertainty is one component of over-all measurement uncertainty, and other uncertainty components are not considered as part of this analysis.

The primary benchmark for measurement instrumentation uncertainty (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 an EMC 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 listed in section 5 of this report. 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. When required by the ETSI EN standards, excess uncertainty will be added to the measurand before comparison to a limit. 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...	0.63 µsec 0.01% of value 0.5 x LSDPV	None	None

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 147<u>0</u> 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.*

8. 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 as a step in the lab measurement process, staff frequently verify that these factors are applied correctly. They make a measurement with the factors applied inside the receiver, then they disable the factors and remeasure the result manually adding in the various relevant factors.

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:

8.1 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

8.2 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

8.3 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

9. 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:	21.5 to 22.4 °C
Relative Humidity:	42.5% to 52% (non-condensing)
Barometric Pressure	95.2 to 98.7 kPa

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

Table 4: Environmental monitoring device

10. Immunity Performance Criteria

If this report includes immunity tests then results have been categorized as Performance Criteria A, B, C, or D. The standards that the lab applied will define the details for A, B, and C, as well as which criterion is required for each type of test. They will also define the electrical stresses that were applied during each test. In a very general sense the observed criteria noted in this report are as follows:

Criterion A. The stress applied did not alter product operation. This criterion is generally used for 'continuous' stresses that can be present for a long time in the places the product will be used, or that can appear often, even though they may come and go over time.

Criterion B. The stress applied altered product operation, but the product self-recovered so that the user would not have to try to figure out how to restore it to full operation. This criterion is generally used for 'transient' stresses that appear briefly and occasionally, but are usually not present in the places the product will be used.

Criterion C. The stress applied altered product operation, but the user could restore it to full operation, for example by power cycling the product. This criterion is generally used for 'transient' stresses that appear briefly and only rarely in the places the product will be used.

Criterion D. This is not an official criterion in the standards, because it would be a failure of the requirements. This indication in a test record means the product was affected in a way that the user might not be able to correct. The effect could include some degree of hardware damage, or it could include loss of program files or data files necessary for operation.

Repeatability is an issue in all EMC immunity work. When the product operation changes unexpectedly during a test, and the change would fail the requirements of the standard, this is an anomaly. The test operator needs to determine whether the anomaly was a result of the applied electrical stress. The investigation is done by repeating the section of the test where the anomaly occurred three times. If the same or a similar anomaly occurs in any of the three repeat trials, it is confirmed as a response to the stress. If not, the anomaly is judged unreproducible and is not considered when judging the A, B, or C observed performance. Since there is usually no ability to confirm a Criterion D anomaly, these are usually treated as Criterion D upon a single occurrence.

Tests that require Criterion B performance will be judged to Pass if criteria A or B is observed. Similarly, tests that require Criterion C performance will be judged to Pass if criteria A, B, or C is observed.

11. 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.

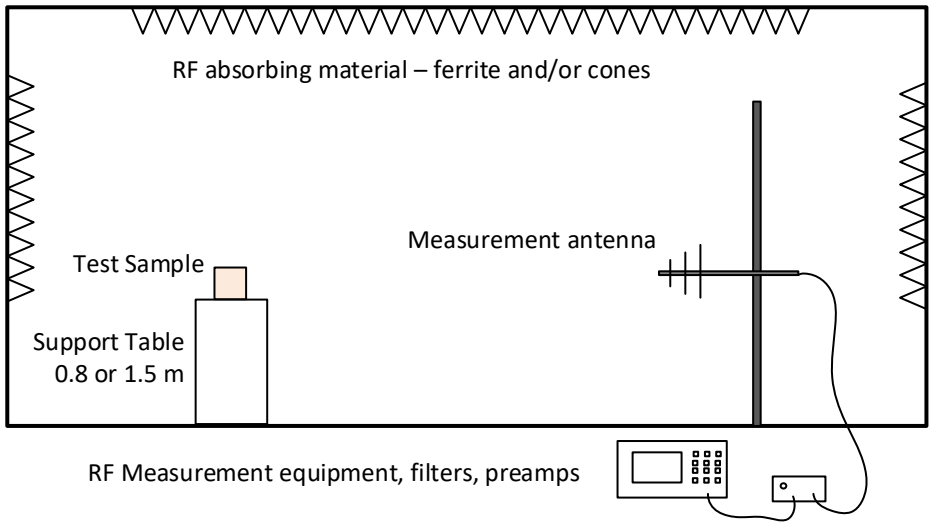

Figure 1: Typical configuration for measurements below 1 GHz

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.

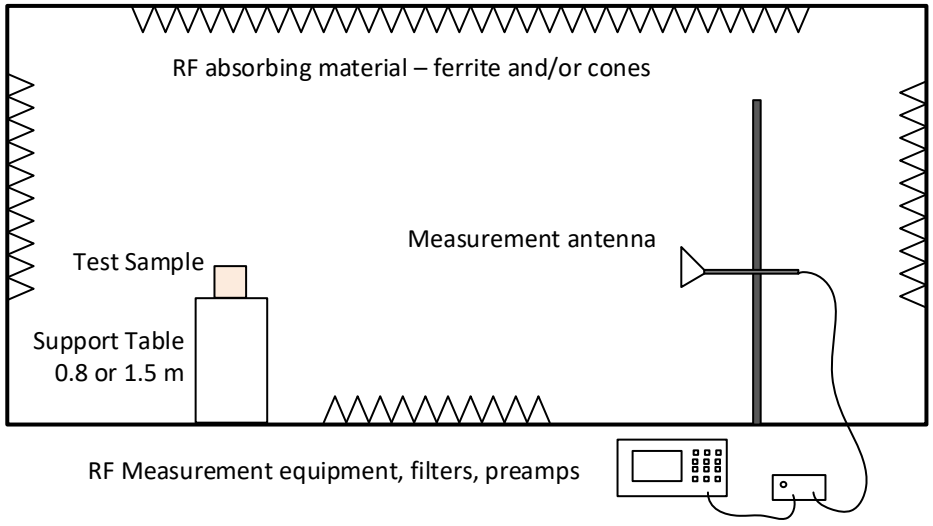

Figure 2: Typical configuration for measurements between 1 GHz and 14 GHz

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.

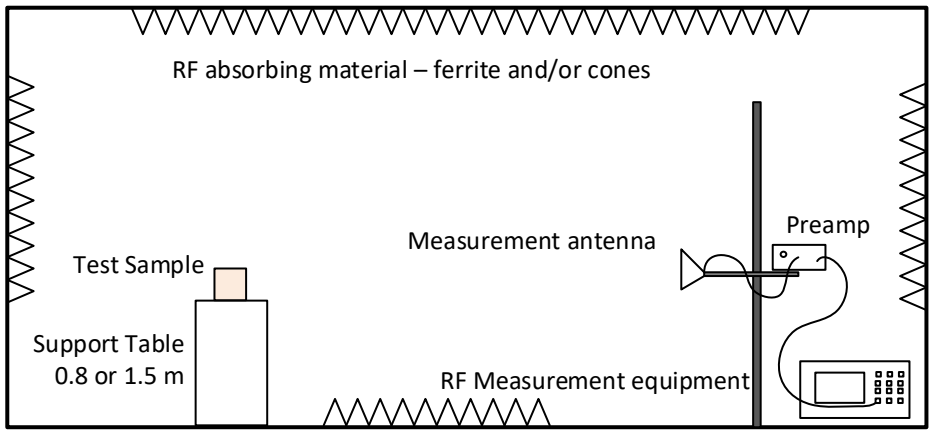

Figure 3: Typical configuration for measurements above 14 GHz

ANNEX

The remainder of this report is an Annex containing individual test data records. These records are the basis for the judgments summarized in section 1 of this report. The Annex ends with a set of concluding notes regarding use of the report.

Test Record
Transmitter Power
Test IDs TR01a
Project GCL0630

Test Date(s)	21, 22 Mar 2025
Test Personnel	Jim Solum
Product Model	GMN-01410-02
Serial Number tested	89S000100
Operating Mode	M15 (Tx)
Arrangement	A3 (COM)
Input Power	14 or 28 Vdc
Test Standards:	FCC part 87D, RSS-141, ANSI C63.26 (as noted in Section 6 of the report)
Antenna Gain	2.2 dBi, as reported by the client
Radio Protocol	VHF Transceiver, AM DSB (6K00A3E and 5K60A3E)
Radio Band(s)	118 to 137 MHz
Pass/Fail Judgment:	**PASS**
Test record created by:	**Majid Farah**
Date of this record:	**30 Apr 2025**

Original record, Version A.

Test Equipment Used

Description	Make	Model #	Serial #	Last Cal/Ver	Next Due
RF Power Sensor	Rohde&Schwarz	NRP8S	109124	18-Jul-2023	15-Jul-2025
Programmable DC power source	Keithley	2260B-30-72 720 W	1411917	27-Jun-2024	27-Jun-2026

Table TR01a.1: List of test equipment used

Software used: Rohde & Schwarz Power Viewer V11.3, TimePowerAnalysisSpreadsheetV12d.xlsx

Test Method

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

ANSI C63.26: 2015 5.2.3.2

The peak output power was measured at the Antenna port of the transceiver using a broadband peak RF Power Sensor with no modulation. The transmit power limit is 55 Watts.

Test 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 is applied. The results are shown below and the highest cases separately highlighted for 10 watts or 16 watts.

Input dc Voltage	Tx Power Setting	Tx Frequency	Channel Spacing	Measured Tx power	
(V)	(W)	(MHz)	(kHz)	(W)	dBm
14	10	118.000	8.33	12.23	40.88
14	10	127.000	8.33	11.77	40.71
14	10	136.992	8.33	11.54	40.62
14	10	118.000	25	12.22	40.87
14	10	127.000	25	11.78	40.71
14	10	136.975	25	11.53	40.62
28	10	118.000	8.33	12.07	40.82
28	10	127.000	8.33	11.61	40.65
28	10	136.992	8.33	11.50	40.61
28	10	118.000	25	12.02	40.80
28	10	127.000	25	11.57	40.63
28	10	136.975	25	11.37	40.56

Table TR01a.2: Transmit Power measurements within 10 W output setting

Input dc Voltage	Tx Power Setting	Tx Frequency	Channel Spacing	Measured Tx power	
(V)	(W)	(MHz)	(kHz)	(W)	dBm
28	16	118.000	8.33	19.08	42.81
28	16	127.000	8.33	18.58	42.69
28	16	136.992	8.33	18.22	42.61
28	16	118.000	25	19.11	42.81
28	16	127.000	25	18.52	42.68
28	16	136.975	25	18.20	42.60

Table TR01a.3: Transmit Power measurements within 16 W output setting

Setup Diagram

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

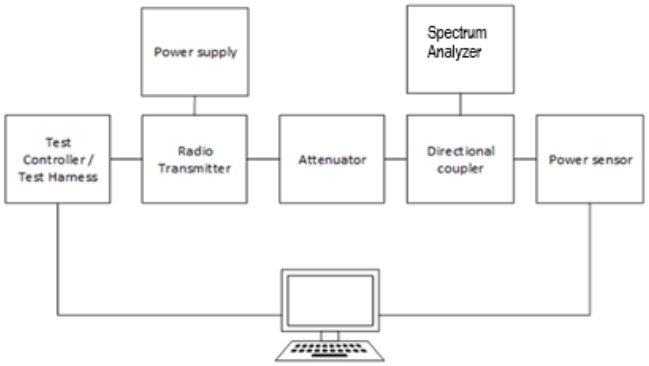

Figure TR01a.1: Test equipment setup

This line is the end of the test record.

Test Record
Transmitter Stability in Extreme Conditions
Test IDs TR05
Project GCL0630

Test Date(s)	28 Mar 2025
Test Personnel	Majid Farah, Jim Solum
Product Model	GMN-01410-02
Serial Number tested	89S000100
Operating Mode	M15 (Tx)
Arrangement	A3 (COM)
Nominal Input Power	13.75 Vdc or 27.5 Vdc
Test Standards	FCC part 87D, RSS-141, ANSI C63.26 (as noted in Section 6 of the report)
Antenna Gain	2.2 dBi, as reported by the client
Radio Protocol	VHF Transceiver, AM DSB (6K00A3E and 5K60A3E)
Radio Band(s)	118 to 137 MHz
Pass/Fail Judgment:	**PASS**
Test record created by:	**Jim Solum**
Date this record:	**31 Mar 2025**

Test Equipment Used

Description	Make	Model #	Serial #	Last Cal/Ver	Next Due
PXE Receiver 44 GHz	Keysight	N9048B	MY62220139	21-Oct-2024	21-Oct-2025
Programmable DC power source	Keithley	2260B-30-72 720 W	1411917	27-Jun-2024	27-Jun-2026
Regulated DC power supply	TRIPLETT	PS305	C233005744	Calibration	Not Required
Thermometer	Thermco	ACCD370P	210607316	21-Sep-2023	15-Sep-2025
Thermal Chamber	Tenney	T2RC	32774-02	Calibration	Not Required
DMM Multimeter	Fluke	87V	63490051	2-Jan-2025	2-Jan-2028

Table TR05.1: List of test equipment used

Test Software Used: Keysight PXE firmware A.33.03

Test Method

The standards cited require observation of the stability for transmission frequency and/or power at certain environmental extremes. The reference is performance on nominal input voltage and a temperature of 20 °C. Where the standards cited here impose different limits or conditions, the most stringent limits and conditions have been applied. The standards cited allow 30 ppm maximum carrier frequency drift for Aircraft stations.

The EUT accepts 13.75 Vdc and 27.5 Vdc as nominal input voltage. For the voltage variation test, the extreme conditions applied were 11.6 Vdc (85% of 13.75 Vdc) and 31.7 Vdc (115% of 27.5 Vdc).

The PXE receiver was used to measure the carrier frequency of the VHF transmitter.

Test Data

The test sample was set for maximum output power (10 W) with an unmodulated 118.000 MHz carrier frequency. Observed data is presented in the table below and the highest value highlighted.

Temperature	Input voltage	Measured Frequency	Difference	Limit
°C	Volt	MHz	±ppm	±ppm
50	13.75	118.000032	0.07	30
40	13.75	118.000030	0.05	30
30	13.75	118.000032	0.07	30
20	13.75	118.000024	0.00	30
10	13.75	118.000020	-0.03	30
0	13.75	117.999990	-0.29	30
-10	13.75	117.999979	-0.38	30
-20	13.75	117.999971	-0.45	30
-30	13.75	117.999973	-0.43	30
85% of Nominal voltage	11.6	118.000024	0.00	30
115% of Nominal voltage	31.7	118.000024	0.00	30

Table TR05.2: Carrier frequency changes under extreme conditions

Setup Block Diagram

The following block diagram shows the EUT configured and arranged in the manner in which it was measured.

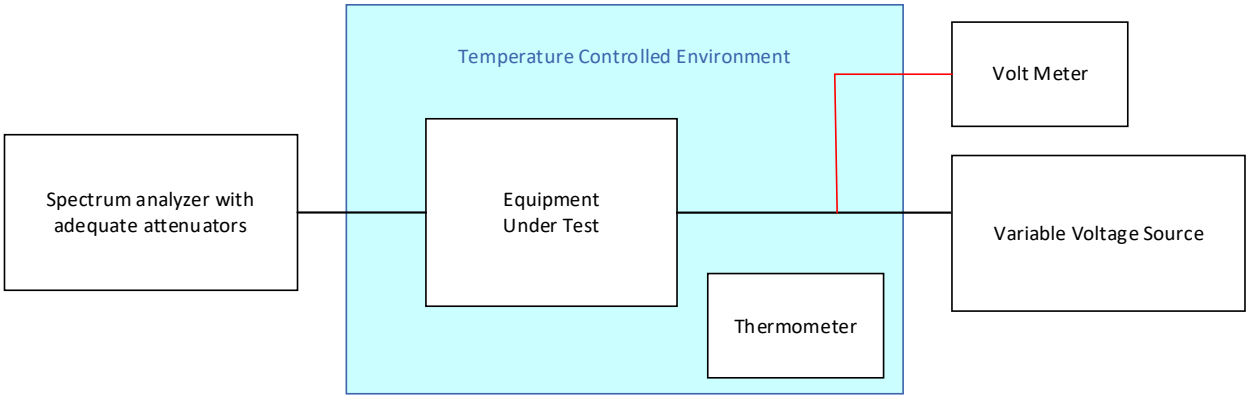

Figure TR05.1: Test setup

This line is the end of the test record.

Test Record
Transmitter Occupied Bandwidth Tests
Test IDs TR02a
Project GCL0630

Test Date(s)	24-25 Mar 2025
Test Personnel	Jim Solum
Product Model	GMN-01410-02
Serial Number tested	89S000100
Operating Mode	M15 (Tx)
Arrangement	A3 (COM)
Input Power	14 or 28 Vdc
Test Standards:	FCC Part 87 D, RSS-141, ANSI C63.26 (as noted in Section 6 of the report)
Antenna Gain	2.2 dBi, as reported by the client
Radio Protocol	VHF Transceiver, AM DSB (6K00A3E and 5K60A3E)
Radio Band(s)	118 to 137 MHz
Pass/Fail Judgment:	**PASS**
Test record created by:	**Majid Farah**
Date of this record:	**30 Apr 2025**

Original record, Version A.

Test Equipment Used

Description	Make	Model #	Serial #	Last Cal/Ver	Next Due
PXE Receiver 44 GHz	Keysight	N9048B	MY62220139	21-Oct-2024	21-Oct-2025
DMM Multimeter	Fluke	87V	63490051	2-Jan-2025	2-Jan-2028
Programmable DC power source	Keithley	2260B-30-72 720 W	1411917	27-Jun-2024	27-Jun-2026
Arbitrary Waveform Generator	Agilent	33220A	MY44062720	Calibration	Not Required

Table TR02a.1: List of test equipment used

Test Software Used: Keysight PXE firmware A.33.03

Test Method

The following test methods was applied.
ANSI C63.26: 2015 5.4.4

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 Data

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

The analysis threshold for the Occupied Bandwidth test was the bandwidth containing 99% of the observed power. The standards cited the Occupied Bandwidth (OBW) shall be measured for all operating modes that will result in

transmission in a different OBW. In such cases different channel spacing and different power level tested when modulating a 2500 Hz audio signal at maximum available modulation level.

Input dc Voltage	Tx Power Setting	Tx Frequency	Channel Spacing	OBW %99
(V)	(W)	(MHz)	(kHz)	(Hz)
14	10	118.000	8.33	5132
14	10	127.000	8.33	5135
14	10	136.992	8.33	5133
14	10	118.000	25	5154
14	10	127.000	25	5159
14	10	136.975	25	5156
28	10	118.000	8.33	5132
28	10	127.000	8.33	5135
28	10	136.992	8.33	5133
28	10	118.000	25	5154
28	10	127.000	25	5157
28	10	136.975	25	5155
28	16	118.000	8.33	5129
28	16	127.000	8.33	5131
28	16	136.992	8.33	5130
28	16	118.000	25	5149
28	16	127.000	25	5152
28	16	136.975	25	5152

Table TR02a.2: Summary of 99% occupied bandwidth data

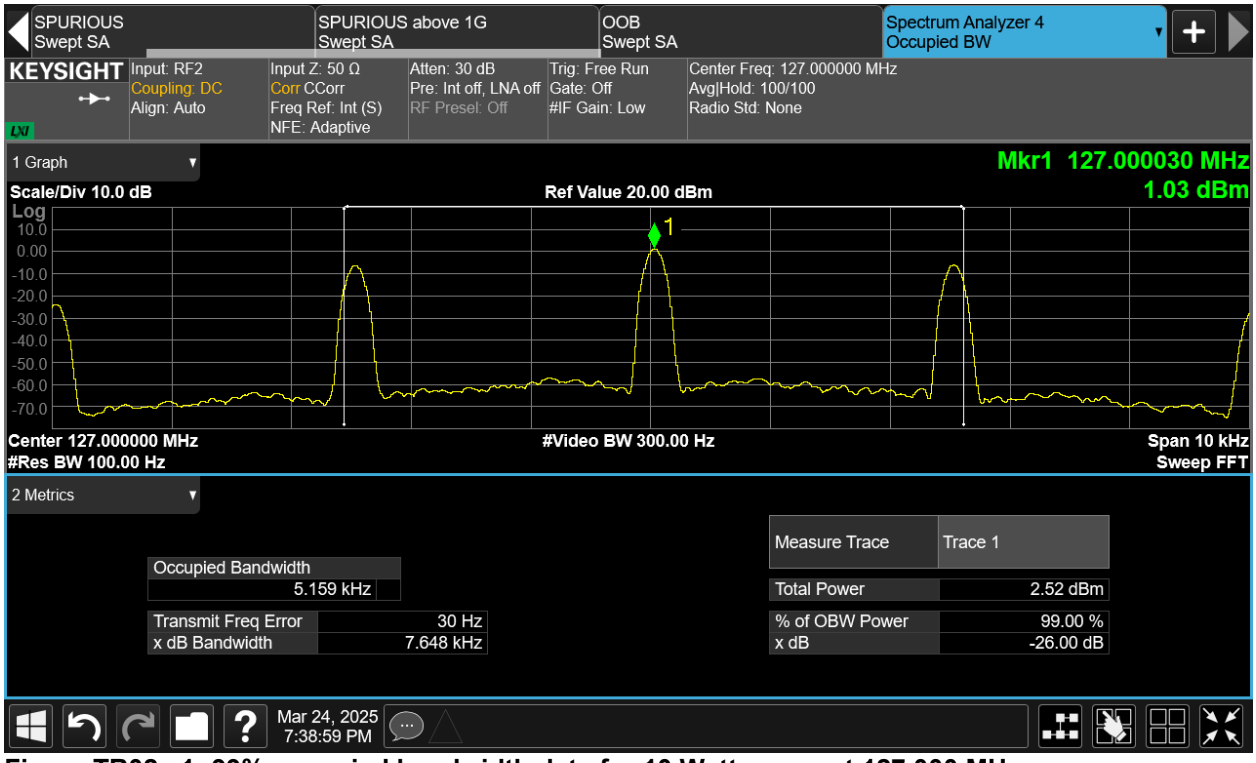

Figure TR02a.1: 99% occupied bandwidth data for 10 Watt power at 127.000 MHz

Test Setup

This block diagram shows the test equipment setup.

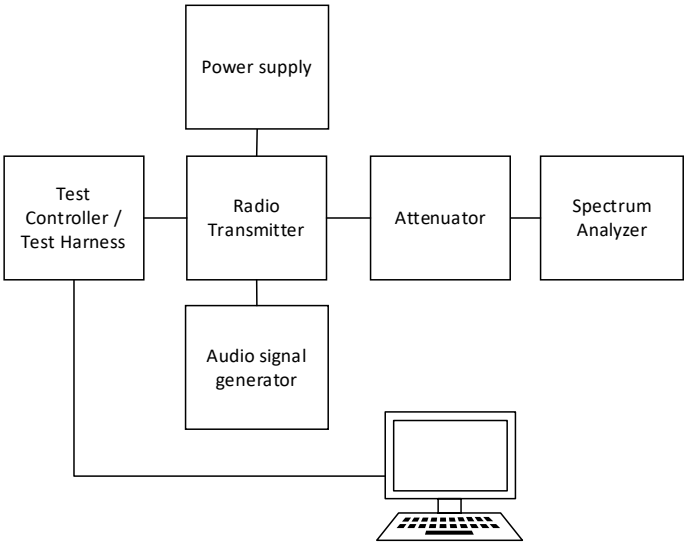

Figure TR02a.2: Test setup

This line is the end of the test record.

Test Record
Transmitter Channel Edge and Spurious Emission Tests
Test IDs TR03a and TR04a
Project GCL0630

Test Date(s)	25, 26 Mar 2025
Test Personnel	Majid Farah, Jim Solum
Product Model	GMN-01410-02
Serial Number tested	89S000100
Operating Mode	M15 (Tx)
Arrangement	A3 (COM)
Input Power	14 or 28 Vdc
Test Standards:	FCC Part 87D, RSS-141, ANSI C63.26 (as noted in Section 6 of the report).
Radio Protocol	VHF Transceiver, AM DSB (6K00A3E and 5K60A3E)
Radio Band(s)	118 to 137 MHz
Pass/Fail Judgment:	**PASS**
Test record created by:	**Majid Farah**
Date of this record:	**30 Apr 2025**

Original record, Version A.

Test Equipment Used

Description	Make	Model #	Serial #	Last Cal/Ver	Next Due
PXE Receiver 44 GHz	Keysight	N9048B	MY62220139	21-Oct-2024	21-Oct-2025
DMM Multimeter	Fluke	87V	63490051	2-Jan-2025	2-Jan-2028
Programmable DC power source	Keithley	2260B-30-72 720 W	1411917	27-Jun-2024	27-Jun-2026
PSG Analog Signal Generator	Keysight	E8257D	SG59140055	23-Jul-2024	23-Jul-2026

Table TR03a.1: Test equipment used

Test Software Used: Keysight PXE firmware A.33.03; LimitCalculatorB-1.xlsx

Test Method

Each measurement is made conducted from the antenna port with the transmitter on a specified channel or hopping (for FHSS devices) and in a selected transmission protocol. Measurements are power spectral density values over a specific measurement bandwidth. The results include the effects of any measurement cable losses as well as antenna gain. Resulting values are compared against a limit. Where the test standards listed have different limit definitions, a composite limit is typically applied that is the most stringent of the defined masks in all regulated respects. Compliance with this composite limit therefore demonstrates compliance with the limits in each listed standard.

All data in this test record was performed with continuous transmission. The carrier was modulated using a 2.5 kHz sinusoidal tone from a signal generator. The tone level from the generator was set at a level 16 dB above the tone level that produced a 50% AM modulation. The amplitude and frequency of the tone were verified using a calibrated multimeter.

Channel Edge Test Data

The standards allow a certain amount of power to be emitted in an Out-of-Channel region just beyond the tuned radio frequency. The limit for this test is a mask, which defines specific amplitude limits over specific frequency ranges. For these standards, the generation of the mask is based on maximum carrier level as reference 0 dBc. The mask calculated based on the worst-case between FCC 87.137 and RSS-141 Table 1.

The data below include a table summarizing the test results with highlighted observed maximum emission and a graph of the measured energy showing of the applied mask for the carrier and out of channel emissions. Markers were set for the carrier and actual offset to the strongest out of band emissions.

Input voltage	Tx Power	Carrier	Ch. Spacing	Mask limits	Margin to mask
(V)	(W)	(MHz)	(kHz)	Pass/fail	(dBc)
14	10	118.000	8.33	Pass	>6
14	10	127.000	8.33	Pass	5.38
14	10	136.992	8.33	Pass	>6
28	16	118.000	8.33	Pass	>8
28	16	127.000	8.33	Pass	>8
28	16	136.992	8.33	Pass	>9

Table TR03a.2: Channel edge data summary

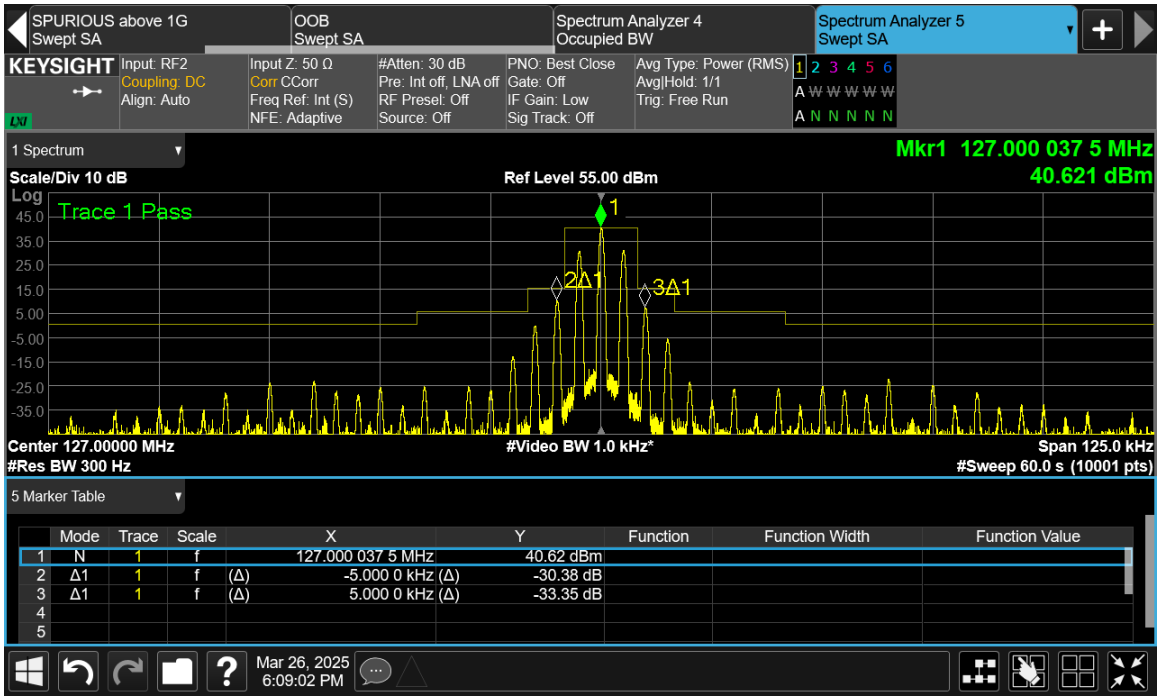

Figure TR03a.1: Channel edge data for 14 V input,10W transmit power at 127 MHz (Maximum out of band emission case)

Conducted Spurious Emission Test Data

The spurious emission limits apply to emissions that are generated but are not required for radio communication. The standards require spectra for the lowest and highest transmit frequencies. Two upper end transmit frequencies are represented based on whether the transmit frequencies are selected on 25 kHz centers or 8.33 kHz centers. All emissions beyond the channel edge spectrum mask discussed above must be reduced at least 40 dB below the carrier level. Note that this test method uses a wider resolution bandwidth than the channel edge data above, so the measured carrier level is affected. The table below shows the strongest emission observed that is subject to the -40 dBc limit with highlighted maximum emission as worst case. The graphical data shows the highlighted case in table below as the strongest spurious emission with its relative frequency. the strongest emission among different radio bands has been considered as the worst-case and subject to spurious radiated emission testing. (refer to radiated emission test record)

Input voltage	Tx Power	Carrier	Ch. Spacing	Spurious Freq	Max Spurious	Limit
(V)	(W)	(MHz)	(kHz)	Δ to Carrier (MHz)	(dBc)	(dBc)
14	10	118.000	8.33	236.001	-79.99	-40
14	10	127.000	8.33	254.043	-81.39	-40
14	10	136.992	8.33	274.025	-82.04	-40
28	16	118.000	8.33	236.001	-77.41	-40
28	16	127.000	8.33	254.043	-78.05	-40
28	16	136.992	8.33	274.025	-79.95	-40

Table TR03a.3: Spurious emission data summary

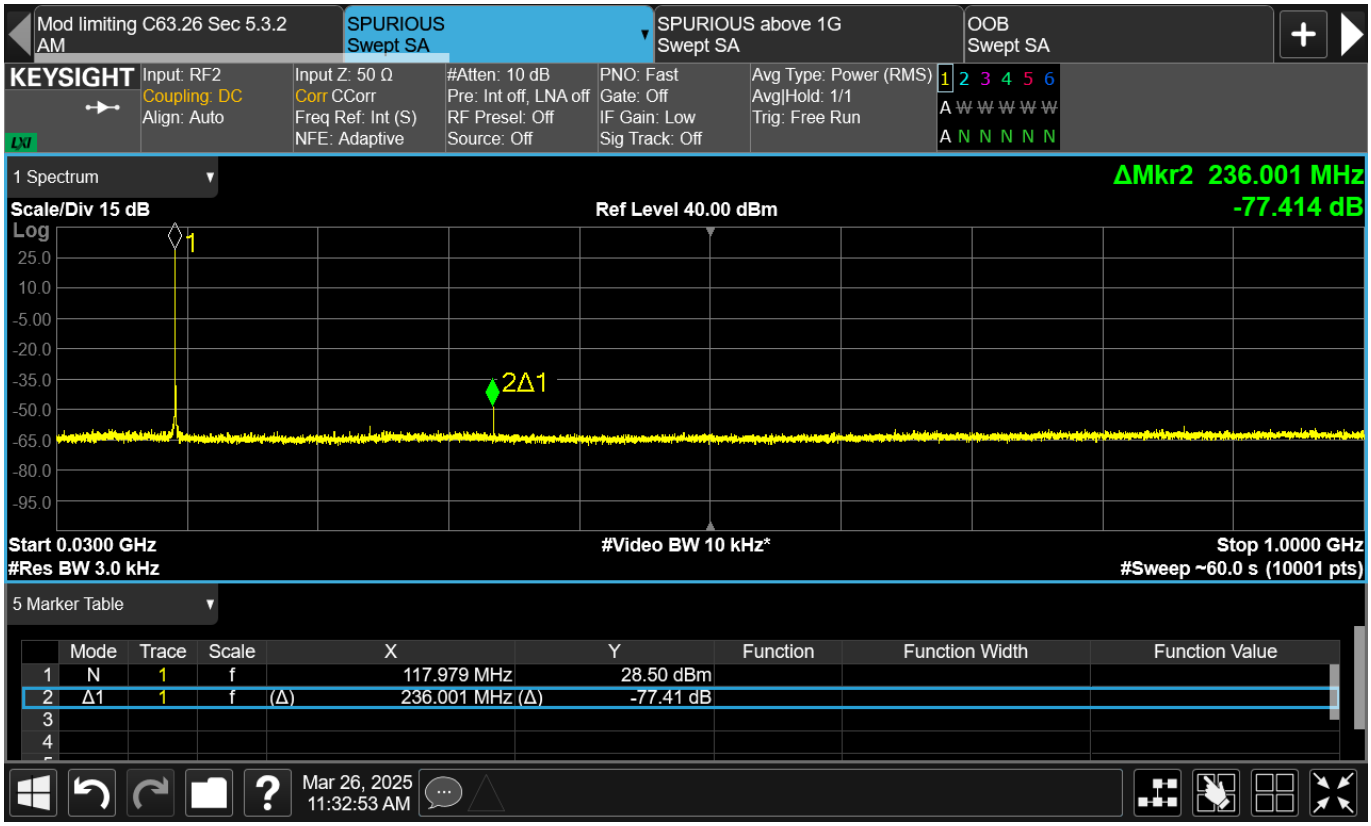

Figure TR03a.4: Spurious emission graphical data for 28 V input,16W transmit power at 118 MHz (Maximum spurious emission case)

Test Setup

This block diagram shows the test equipment setup.

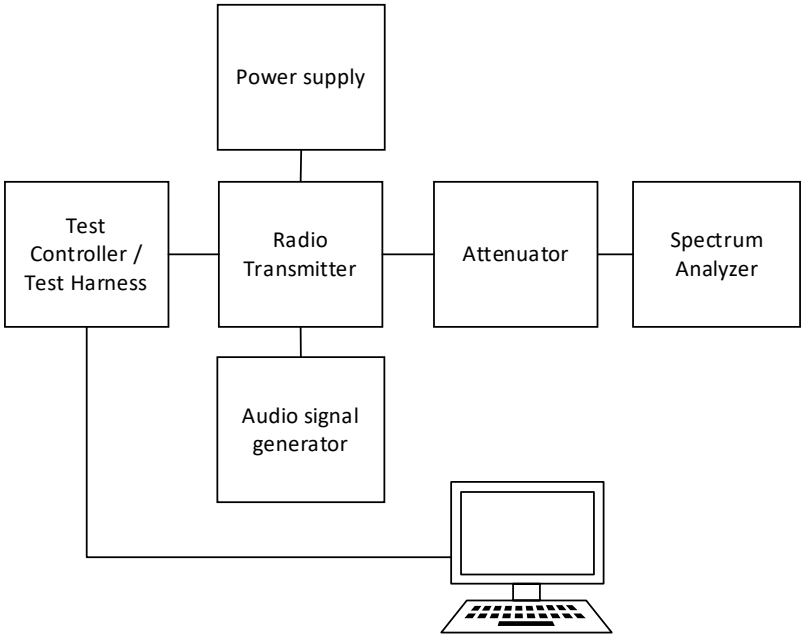

Figure TR03a.5: Test setup

This line is the end of the test record.

Test Record
Modulation Characteristics Tests
Test IDs TR06
Project GCL0630

Test Date(s)	27 Mar 2025
Test Personnel	Majid Farah, Jim Solum
Product Model	GMN-01410-02
Serial Number tested	89S000100
Operating Mode	M15 (Tx)
Arrangement	A3 (COM)
Input Power	28 Vdc
Test Standards:	FCC Part 87D, FCC Part 2.1047, RSS-141, ANSI C63.26 (as noted in Section 6 of the report)
Antenna Gain	2.2 dBi, as reported by the client
Radio Protocol	VHF Transceiver, AM DSB (6K00A3E and 5K60A3E)
Radio Band(s)	118 to 137 MHz
Pass/Fail Judgment:	**PASS**
Test record created by:	**Jim Solum**
Date of this record:	**02 April 2025**

Original record, Version A.

Test Equipment Used

Description	Make	Model #	Serial #	Last Cal/Ver	Next Due
PXE Receiver 44 GHz	Keysight	N9048B	MY62220139	21-Oct-2024	21-Oct-2025
DMM Multimeter	Fluke	87V	63490051	2-Jan-2025	2-Jan-2028
Programmable DC power source	Keithley	2260B-30-72 720 W	1411917	27-Jun-2024	27-Jun-2026
Arbitrary Waveform Generator	Agilent	33220A	MY44062720	Calibration	Not Required

Table TR06.1: List of test equipment used

Test Software Used: Keysight PXE firmware A.33.03

Test Method

The basic test standards provide options for the time evaluation test method. The following test methods were applied. ANSI C63.26: 2015 5.3.2 and 5.3.3

During these tests the transmitter output was fed directly, or through RF attenuators, to the PXE spectrum analyzer. The analyzer has a built-in capability to characterize AM modulation and provide details such as modulation depth for positive/negative peaks and demodulated signal frequency. The analyzer was tuned to the carrier frequency. The Arbitrary Waveform signal generator provided various sinusoidal input tones at controlled amplitudes and frequencies to the audio input of the transmitter. The amplitude and the frequency accuracy of input tones verified by a calibrated multimeter.

Modulation limiting response
This test ensures that the EUT will not provide overmodulation of the AM carrier for an input tone of 300 Hz, 1 kHz, 2.5 kHz, or 3 kHz. For each tone frequency, the signal generator output level was adjusted to obtain 60% modulation depth. This signal drive level was the ‘0 dB’ reference level for that tone frequency. The modulating

signal level was increased in 5 dB steps to 20 dB above the reference level. The modulation depth was recorded at each step. This process was repeated at each tone frequency. The limit is no more than 100% AM modulation.

Audio frequency response
This test looks at frequency response across a set of tone frequencies from 100 Hz to 5 kHz. The analysis compares the drive strength levels from the signal generator that resulted in 20% modulation. The drive strength for the 1 kHz tone is taken as the '0 dB' reference level. This data is required but there is no pass/fail limit.

Test Data

For both tests the VHF transmitter was set to 28 V input,16 Watts output power transmitting at 127.000 MHz with 25 kHz channel spacing. The data for each test are shown in below.

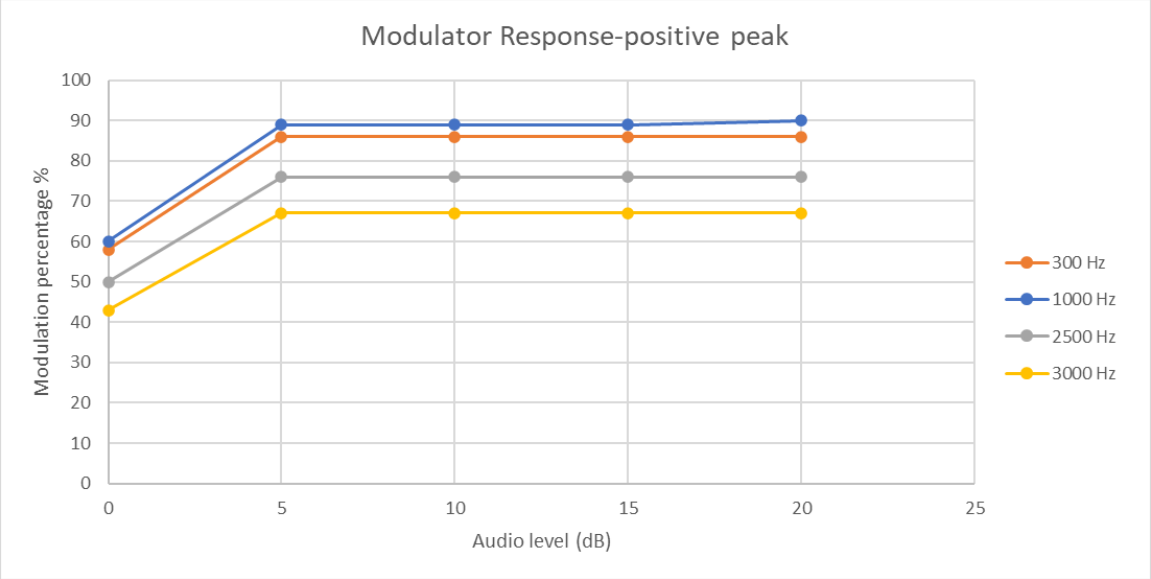

Figure TR06.1: Positive peak modulation limiting response

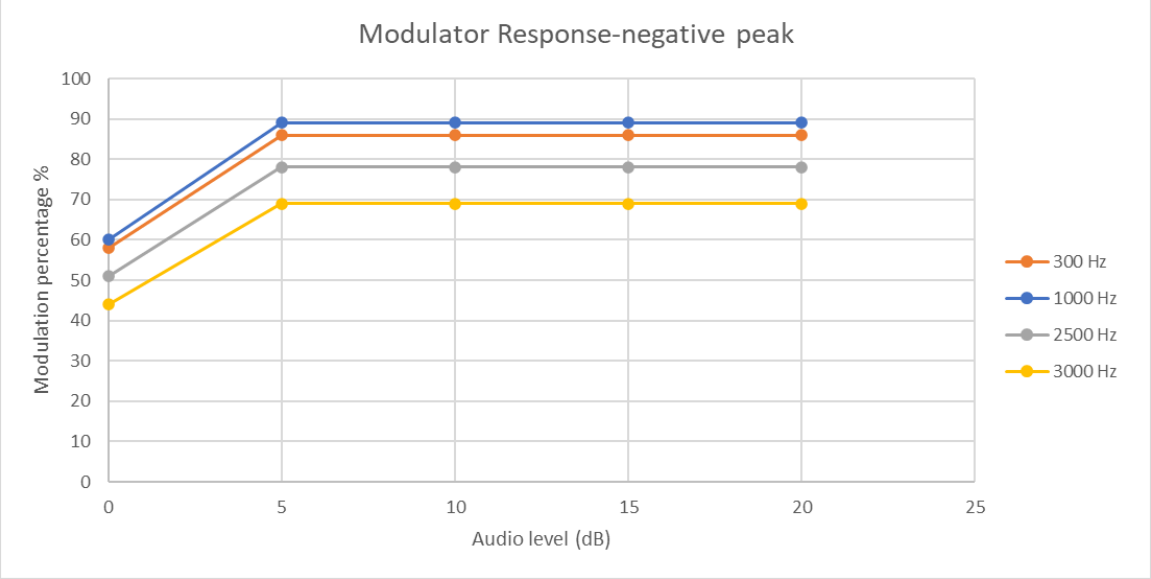

Figure TR06.2: Negative peak modulation limiting response

Audio frequency response data from 100 Hz to 5 kHz is shown in the picture below.

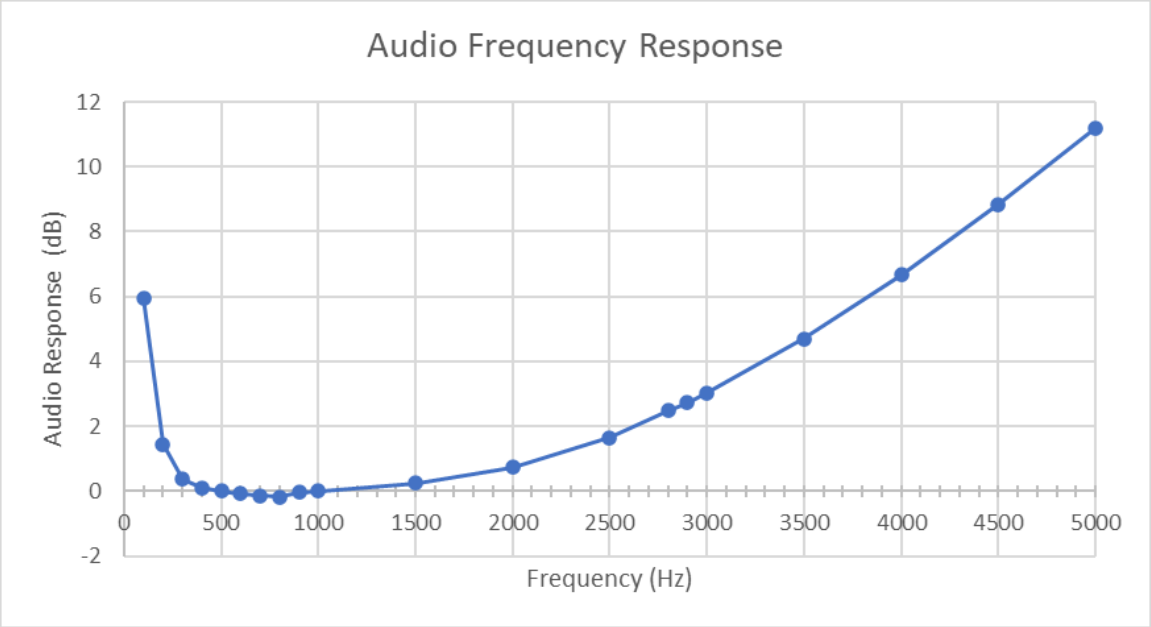

Figure TR06.2: Audio frequency response

Test Setup

This block diagram shows the test equipment setup.

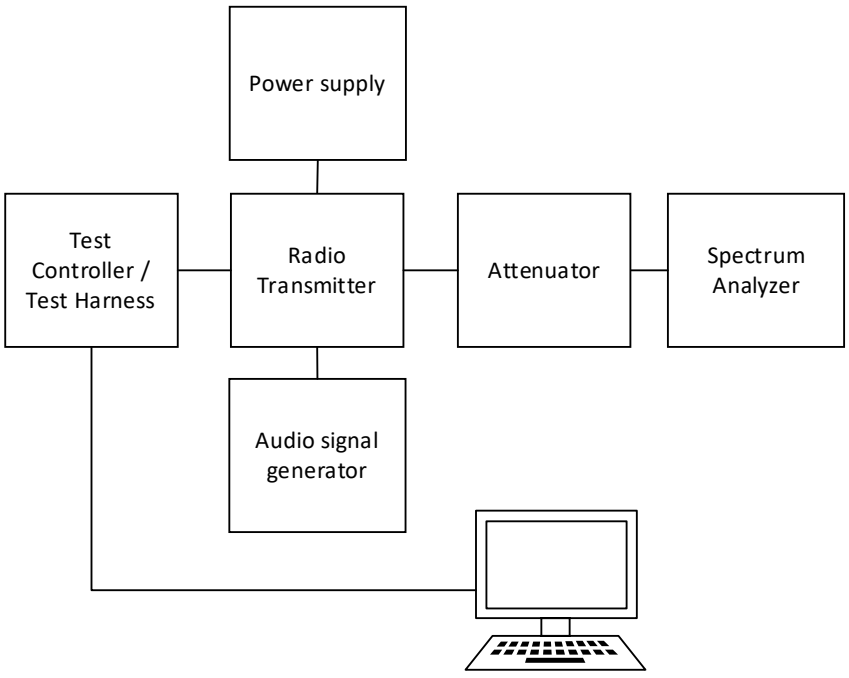

Figure TR06.3: Test setup

This line is the end of the test record.

Author's Note

The EUT has dual input voltages, dual output power levels and different channel spacing. This configuration results in a large number of potential combinations or test modes for radiated spurious emissions. To optimize testing time and resources while ensuring compliance with FCC 87D (C63.26), the client agreed to focus on a subset of these combinations, selecting only the "worst-case" scenarios based on the conducted emissions testing. (Refer to around page 22 of this report "TR03a, TR04a Spurious Emission Test record")

Section 5.1.2.2 of C63.26 permits the use of a method to reduce the number of test modes by identifying and testing only the worst-case scenarios to demonstrate compliance.

During the conducted spurious emission testing, GCL staff identified the worst-case scenario out of many possible combinations, highlighted in yellow in table TR03.3a located at or near page 24 of this report. This worst case represent the combinations of input voltage, output power, frequency band, and channel spacing that resulted in the highest observed spurious emissions. Although the observed variances were small and the spurious emissions were more than 35 dB below the limit, this approach was adopted by GCL to focus radiated testing on the worst-case scenario.

Radiated emissions from the EUT were measured from 30 MHz to 2 GHz for the worst-case identified: 28 Volt input power; 16 Watt transmit power setting; 118.000 MHz carrier with 8.33 kHz channel spacing.

Test Record
Radiated Emission Test RE01
Project GCL0630

Test Date(s)	02 Apr 2025
Test Personnel	David Kerr
Product Model	GMN-01410-02
Serial Number tested	89S000100
Operating Mode	M15 (Tx)
Arrangement	A1 (RE)
Input Power	27.5 V DC
Output Power	16 Watt
Test Standards:	FCC Part 87D, RSS-141, ANSI C63.26 (as noted in Section 6 of the report).
Frequency Range:	30 MHz to 1000 MHz
Transmitter Frequency :	118 MHz, 8.33 kHz channel spacing
Pass/Fail Judgment:	**PASS**
Test record created by:	David A Kerr
Date of this record:	03 Apr 2025

Original record, Version A.

Test Equipment

Description	Make	Model #	Serial #	Last Cal/Ver	Next Due
PXE Receiver 26 GHz	Keysight	N9048B	MY59290135	24-Oct-2024	24-Oct-2025
Antenna, Biconilog, 30M-6 GHz	ETS Lindgren	3142E	233201	18-Jul-2024	18-Jul-2026
SAC 3m, below 1 GHz	Frankonia	SAC3	F199004	25-Jan-2023	25-Jan-2026
Tape Measure, 1-3/16 in x 33 ft	Crecent Lufkin	L1135CME-02	GMN0013783	26-Jun-2024	26-Jun-2027
DMM Multimeter	Fluke	87V	63490051	2-Jan-2025	2-Jan-2028
Programmable DC power source	Keithley	2260B-30-72 720 W	1411917	27-Jun-2024	27-Jun-2026

Table RE01.1: Test Equipment Used

Software Used: Keysight PXE software A.32.06,EPX test software Version 2025.01.000, RE 87D Table Processing v1.xlsx

Test Data

For products that may be used in multiple orientations, preliminary scans were taken in alternate orientations to find the orientation that produced that largest field at the receive antenna. With intentional radiators, that highest field search is only performed below 1 GHz on one of the transmitter operating modes. 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 began 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.

The field was measured at a 3 m distance in accordance with ANSI C63.26. During test, the operator was presented a limit line based on converting the -13 dBm effective (isotropic or dipole) radiated power limit to a field limit. This reference line appears in the spectrum graph as a visual reference. In the data table below, the field values measured are converted to power limits using ANSI C63.26 section 5.2.7 equation d. For frequencies below 1 GHz, this conversion included the 2.15 dB EIRP gain of a dipole as an offset to convert form EIRP to ERP.

The limit in the standard includes an envelope shape allowing emission levels higher than -13 dBm within a few radio transmitter bandwidths of the carrier. Those limits were applied and evaluated separately in an RF port conducted test. During this radiated test, the RF port that would normally connect to an antenna was terminated in a resistive load. Any emissions appearing in the radiated spectrum that fall within that envelope area around the carrier were ignored if they exceeded the -13 dBm level.

Consistent with the general rules of Canada and the US agencies, where an average detector limit of -13 dBm EIRP is applied, a peak limit is also applied 20 dB higher at 7 dBm EIRP.

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 the strongest emissions observed relative to the test limit, along with other data points of interest. Emissions with more than 20 dB of margin to the limit were not subjected to final measurement. 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.

Frequency MHz	Pol	Reading dB(µV)	Factor dB(1/m)	Level(QP) dB(µV/m)	Level dBm ERP	Limit dBm ERP	Margin dB	Height cm	Angle deg
110.010	V	6.4	15.6	22.0	-75.4	-13	62.4	100	0

Table RE01.2: Emission summary

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

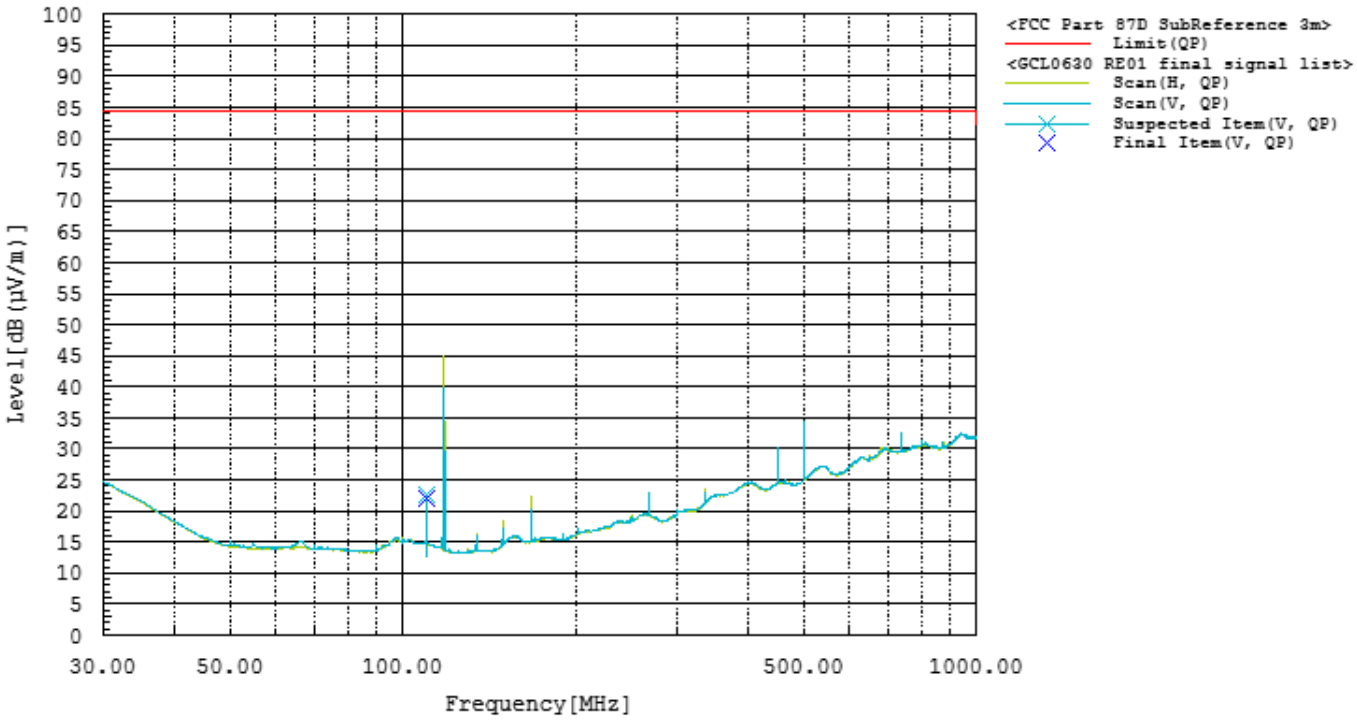

Figure RE01.1: Spectral data

Setup Photographs

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

Image removed for client confidentiality.
See section 1 of this report
to identify the report where
the photos may be viewed.

Figure RE01.2: EUT test setup, first view

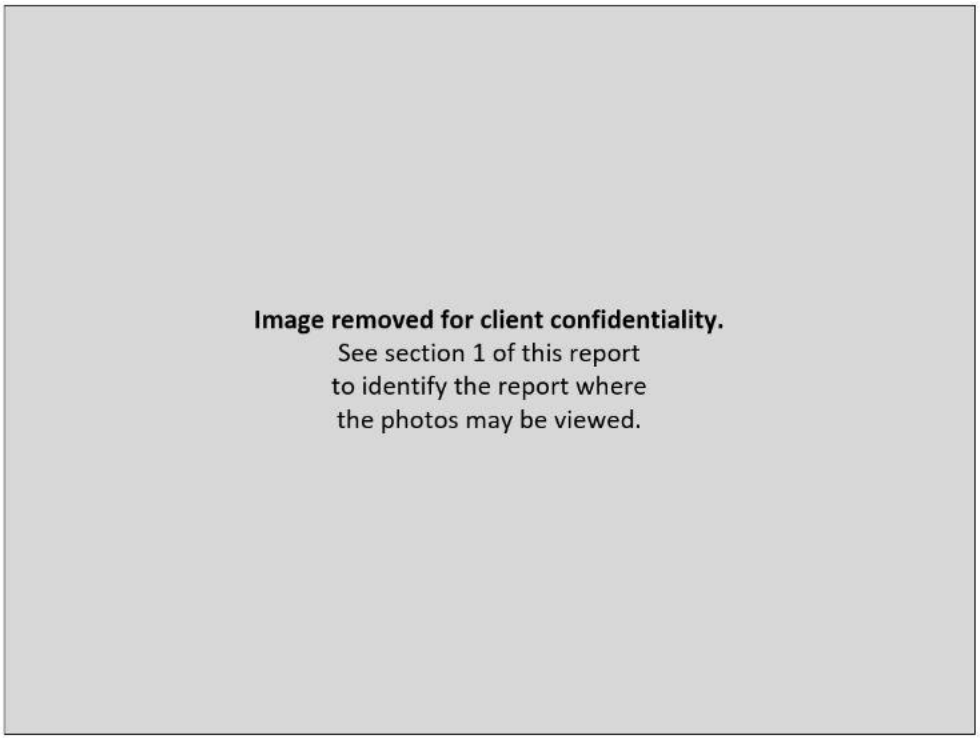

Figure RE01.3: EUT test setup, second view

This line is the end of the test record.

Test Record
Radiated Emission Test RE02
Project GCL0630

Test Date(s)	02 Apr 2025
Test Personnel	Vladimir Tolstik supervised by Jim Solum
Product Model	GMN-01410-02
Serial Number tested	89S000100
Operating Mode	M15 (Tx)
Arrangement	A1 (RE)
Input Power	28 Vdc
Output Power	16 Watts
Test Standards:	FCC Part 87D, RSS-141, ANSI C63.26 (as noted in Section 6 of the report).
Frequency Range:	1 GHz to 2 GHz
Transmitter Frequency	118.0 MHz, 8.33 kHz channel spacing
Pass/Fail Judgment:	**PASS**
Test record created by:	Vladimir Tolstik
Date of this record:	03 Apr 2025

Original record, Version A.

Test Equipment

Description	Make	Model #	Serial #	Last Cal/Ver	Next Due
PXE Receiver 26 GHz	Keysight	N9048B	MY59290135	24-Oct-2024	24-Oct-2025
Antenna, Biconilog, 30M-6 GHz	ETS Lindgren	3142E	00233201	18-Jul-2024	18-Jul-2026
FSOATS 3m, above 1 GHz	Frankonia	SAC3	F199004	7-Mar-2023	7-Mar-2026
Tape Measure, 1-3/16 in x 33 ft	Crecent Lufkin	L1135CME-02	GMN0013784	26-Jun-2024	26-Jun-2027
DMM Multimeter	Fluke	87V	63490051	2-Jan-2025	2-Jan-2028
Programmable DC power source	Keithley	2260B-30-72 720 W	1411917	27-Jun-2024	27-Jun-2026

Table RE02.1: Test Equipment Used

Software Used: Keysight PXE software A.32.06, EPX test software Version 2025.01.000, RE 87D Table Processing v1.xlsx

Test Data

For products that may be used in multiple orientations, preliminary scans were taken in alternate orientations to find the orientation that produced that largest field at the receive antenna. With intentional radiators, that highest field search is only performed below 1 GHz on one of the transmitter operating modes. 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 began 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.

The field was measured at a 3 m distance in accordance with ANSI C63.26. During test, the operator was presented a limit line based on converting the -13 dBm effective (isotropic or dipole) radiated power limit to a field limit. This reference line appears in the spectrum graph as a visual reference. In the data table below, the field values measured are converted to power limits using ANSI C63.26 section 5.2.7 equation d. For frequencies below 1 GHz, this conversion included the 2.15 dB EIRP gain of a dipole as an offset to convert form EIRP to ERP.

The limit in the standard includes an envelope shape allowing emission levels higher than -13 dBm within a few radio transmitter bandwidths of the carrier. Those limits were applied and evaluated separately in an RF port conducted test. During this radiated test, the RF port that would normally connect to an antenna was terminated in a resistive load. Any emissions appearing in the radiated spectrum that fall within that envelope area around the carrier were ignored if they exceeded the -13 dBm level.

Consistent with the general rules of Canada and the US agencies, where an average detector limit of -13 dBm EIRP is applied, a peak limit is also applied 20 dB higher at 7 dBm EIRP.

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 2 GHz. It includes the strongest emissions observed relative to the test limit, along with other data points of interest. Emissions with more than 20 dB of margin to the limit were not subjected to final measurement. 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.

Frequency	Pol	Reading dB(µV)		Factor	Level dB(µV/m)		Level dBm EIRP		Limit dBm EIRP		Margin dB		Height	Angle
MHz		CAV	PK	dB(1/m)	CAV	PK	CAV	PK	CAV	PK	CAV	PK	cm	deg
1748.467	H	32.1	45.7	-7.2	24.9	38.5	-70.4	-56.8	-13	7	57.4	63.8	156.6	24

Table RE02.2: Emission summary

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

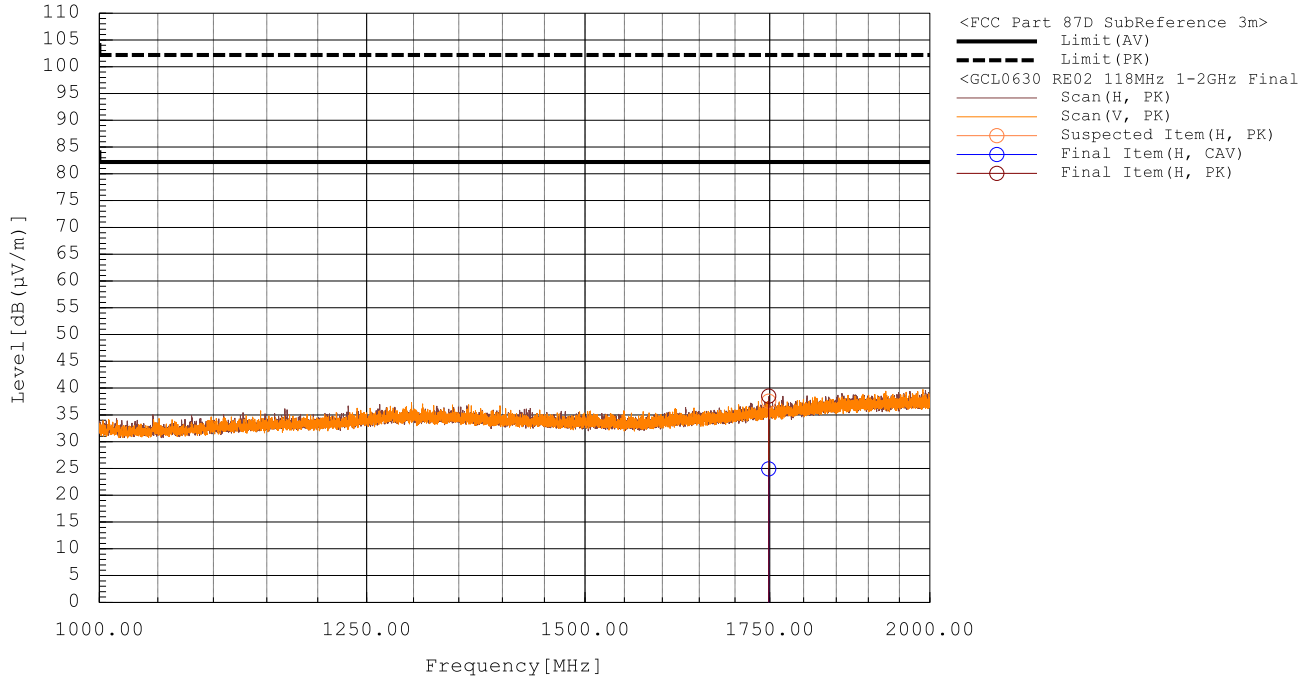

Figure RE02.1: Spectral data

Setup Photographs

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

Figure RE02.2: EUT test setup, first view

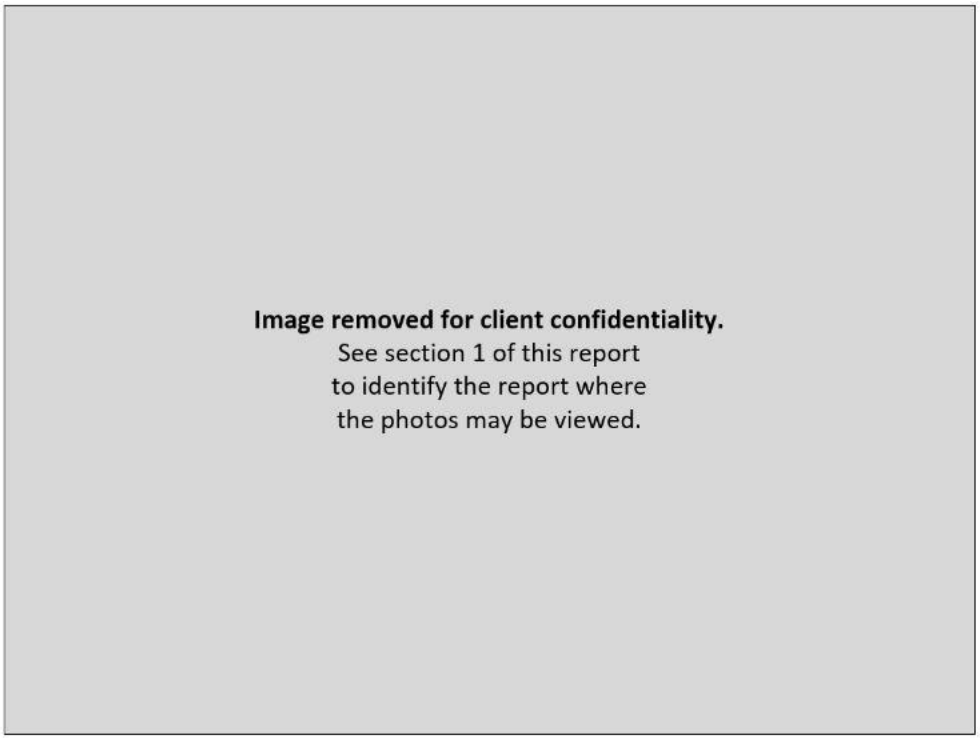

Figure RE02.3: EUT test setup, second view

This line is the end of the test record.

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.