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info@ComplianceTesting.com

Test Report

Prepared for: Telonics

Model: MK-29 module

Description: MURs Animal Tracking Collar

Serial Number: NA

Test Result: PASS

To

FCC Part 95J

Date of Issue: January 3rd 2025

On the behalf of the applicant:	**Telonics** **932 E. Impala Avenue** **Mesa AZ 85204**
Attention of:	**James Carter** **Ph: (480)892-4444** **E-Mail: Jim@telonics.com**

Prepared By
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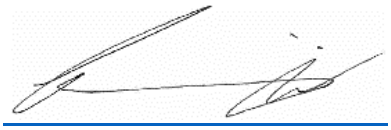
Project No: p24c0006

Reviewed / Authorized By:



John Michalowicz

Test Engineer

Test Results Summary

Specification	Test Name	Pass, Fail, N/A	Comments
2.1046 95.2767	Transmitter Power	Pass	
95.2773	Authorized Bandwidth	Pass	
2.1053	Field Strength of Spurious Radiation	Pass	
95.2765 2.1055	Frequency Stability (Temperature Variation)	Pass	
95.2765 2.1055	Frequency Stability (Voltage Variation)	Pass	
95.2779 2.1051	Unwanted Emissions	Pass	

Statements of conformity are reported as:

- Pass - the measured value is below the acceptance limit, *acceptance limit = test limit*.
- Fail - the measured value is above the acceptance limit, *acceptance limit = test limit*.

Test Report Revision History

Revision	Date	Revised By	Reason for Revision
1.0	January 3rd 2024	John Michalowicz	Original Document
2.0	June 3rd, 2025	John Michalowicz	Updated OCBW measurements. Included Emission Type Updated conducted spurious results with 7 dBi antenna gain

Current revision of the test report replaces any prior versions. Only the current version of the test report is valid.

Table of Contents

The Applicant has been cautioned as to the following:

15.21: **Information to the User**

The user's manual or instruction manual for an intentional radiator shall caution the user that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

15.27(a): **Special Accessories**

Equipment marketed to a consumer must be capable of complying with the necessary regulations in the configuration in which the equipment is marketed. Where special accessories, such as shielded cables and/or special connectors are required to enable an unintentional or intentional radiator to comply with the emission limits in this part, the equipment must be marketed with, i.e. shipped and sold with, those special accessories. However, in lieu of shipping or packaging the special accessories with the unintentional or intentional radiator, the responsible party may employ other methods of ensuring that the special accessories are provided to the consumer, without an additional charge.

Information detailing any alternative method used to supply the special accessories for a grant of equipment authorization or retained in the verification records, as appropriate. The party responsible for the equipment, as detailed in § 2.909 of this chapter, shall ensure that these special accessories are provided with the equipment. The instruction manual for such devices shall include appropriate instructions on the first page of text concerned with the installation of the device that these special accessories must be used with the device. It is the responsibility of the user to use the needed special accessories supplied with the equipment.

ANAB

Compliance Testing, LLC, has been accredited in accordance with the recognized International Standard ISO/IEC 17025:2017. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to the joint ISO-ILAC-IAF Communiqué dated January 2009).

The tests results contained within this test report all fall within our scope of accreditation, unless noted below.

Please refer to http://www.compliancetesting.com/labscope.html for current scope of accreditation.

FCC Site Reg. #349717

IC Site Reg. #2044A-2

Test and Measurement Data

All tests and measurement data shown were performed in accordance with FCC Rules and Regulations, Volume II, Part 2, Subpart J, Sections 2.947, 2.1033(c), 2.1041, 2.1046, 2.1047, 2.1049, 2.1051, 2.1053, 2.1055, 2.1057, and the individual FCC Part 90.

Standard Test Conditions and Engineering Practices

Prior to testing, the EUT was tuned up in accordance with the manufacturer's alignment procedures. All external gain controls were maintained at the position of maximum and/or optimum gain throughout the testing.

Measurement results, unless otherwise noted, are worst case measurement.

In accordance with ANSI/TIA 603C, and unless otherwise indicated in the specific measurement results, the ambient temperature of the actual EUT was maintained within the range of 10° to 40°C (50° to 104°F) unless the particular equipment requirements specified testing over a different temperature range. Also, unless otherwise indicated, the humidity levels were in the range of 10% to 90% relative humidity.

Environmental Conditions		
Temp (ºC)	**Humidity (%)**	**Pressure (mbar)**
20.1 – 24.2	23.4 – 25.7	973.6 - 979

EUT Description
Model: MK-29 module
Description: MURs Animal Tracking Collar
Firmware: MK-29 2024.12.10 10:10:34
Software: NA
Emission Type: F1D
Serial Number: NA
Additional Information: The EUT is a module intended to be used on wild animal tracking collars.
The device operates on the 151 MHz channels with up to 2.4 ksps and the 154 MHz channels with up to 6.4 ksps.
The modulation is 4-GFSK

EUT Operation during Tests
The EUT was powered via an external DC power supply with 3.6 volts. It was controlled over a serial connection and a manufacturer's created GUI. The antennas that will be utilized with the device are expected to be low gain antennas.7dBi is referenced in this test report.

Accessories:

Qty	Description	Manufacturer	Model	S/N
1	USB to BNC serial converter	Telonics	TSC-9A	NA

Cables: N/A

Modifications: N/A

Transmitter Power

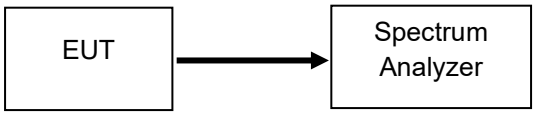
Engineer: John Michalowicz

Test Date: 12/17/24

Test Procedure

The Method of Measurement was C63.26 5.2.3.3. The EUT was measured in a conducted configuration.

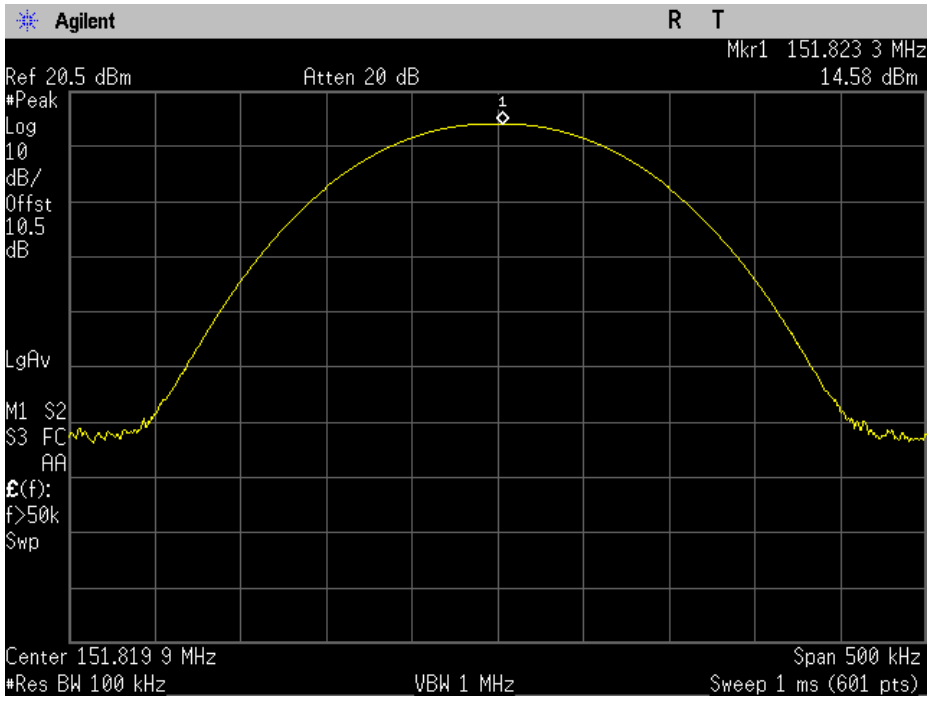
Test Setup



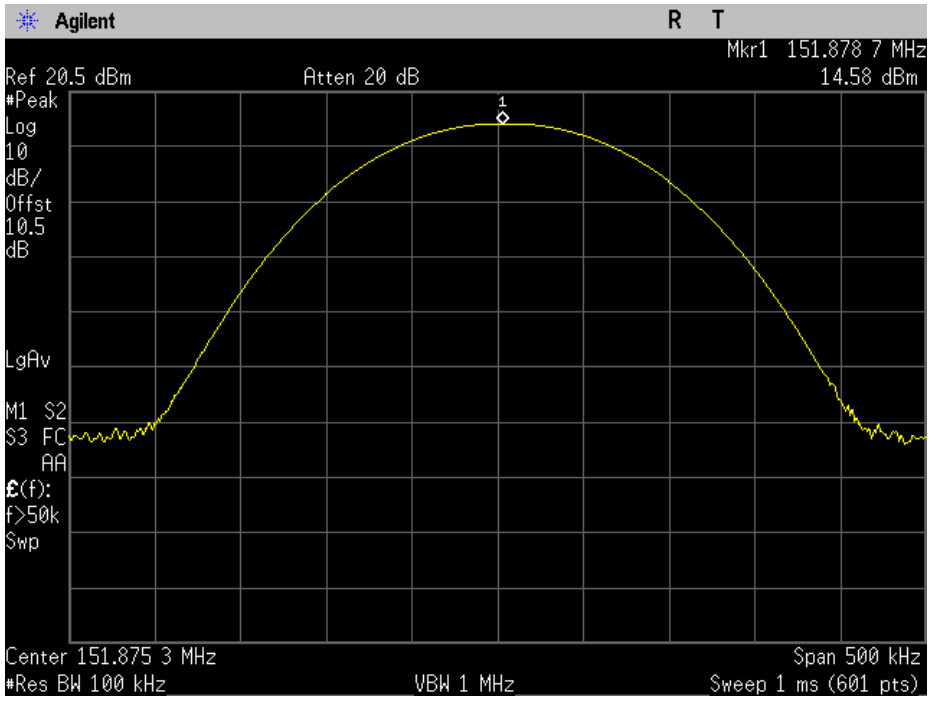
Test Results

Frequency (MHz)	Measured Power (dBm)	Maximum antenna gain (dBi)	EIRP to ERP	ERP	ERP (mW)	Limit (mW)	Margin (mW)
151.82	14.58	7	-2.15	19.43	87.70	2000	-1912.3
151.88	14.58	7	-2.15	19.43	87.70	2000	-1912.3
151.94	14.59	7	-2.15	19.44	87.90	2000	-1912.1
154.57	14.50	7	-2.15	19.35	86.10	2000	-1913.9
154.60	14.52	7	-2.15	19.37	86.50	2000	-1913.5

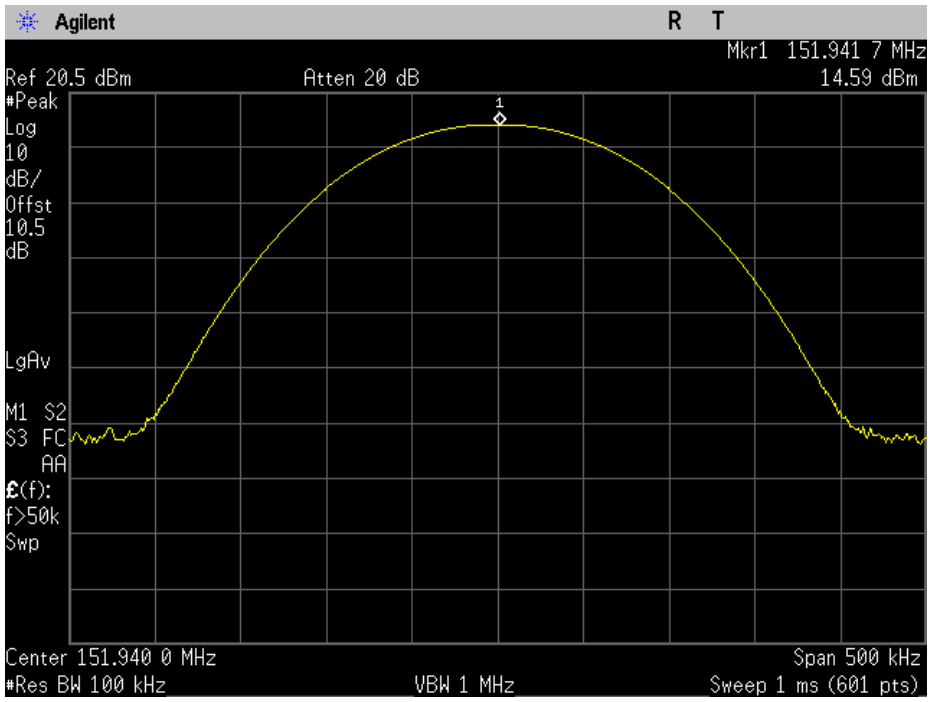
ERP is calculated with the maximum possible antenna gain stated by the manufacturer.
ERP=conducted power+gain-2.15



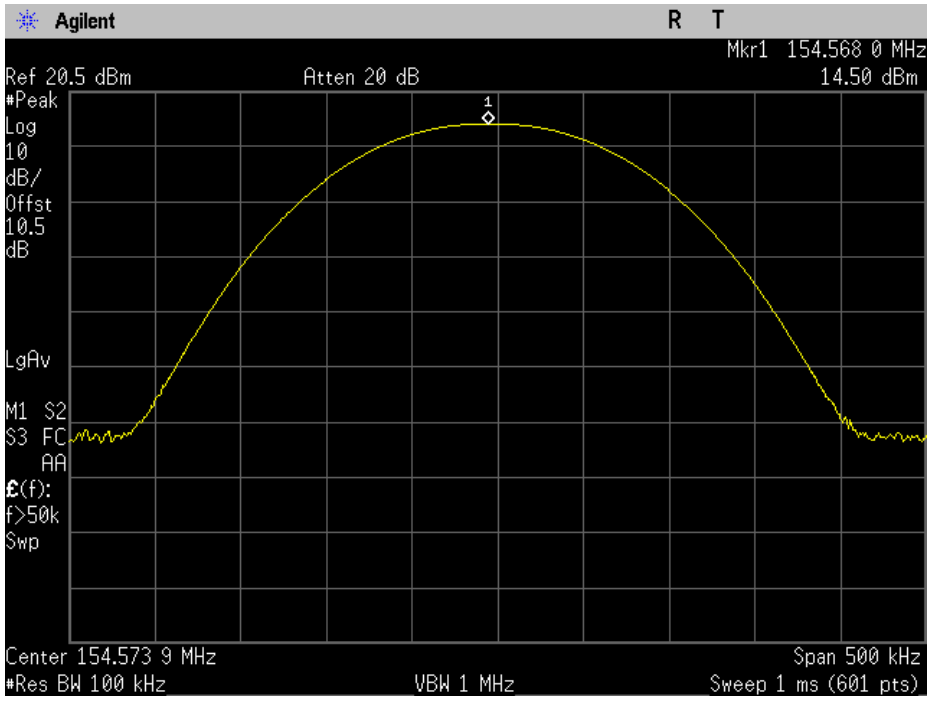
151.82 MHz Peak Power



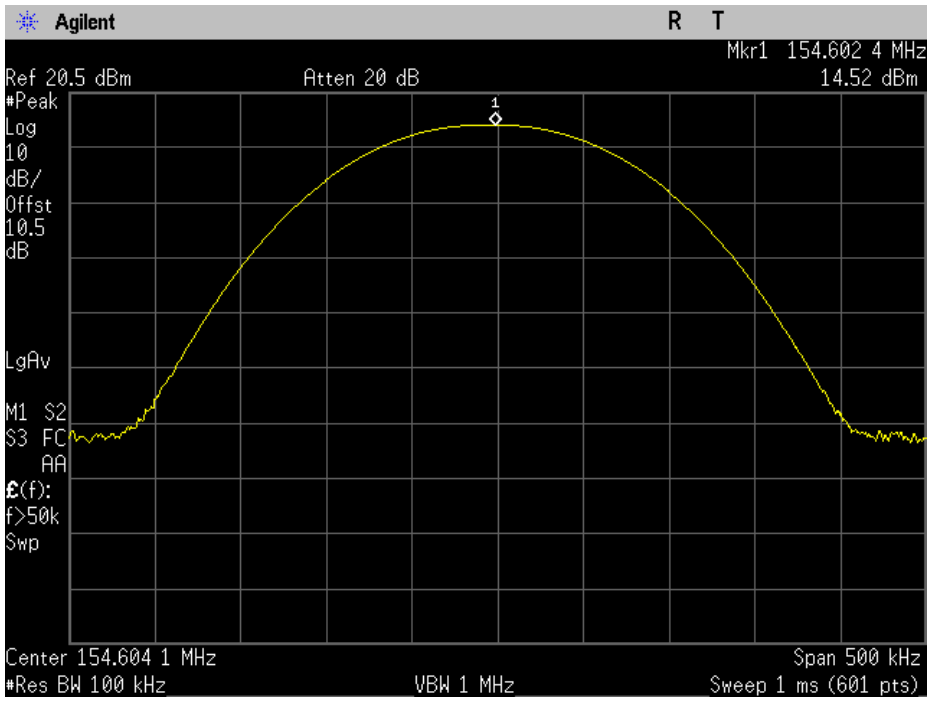
151.88 MHz Peak Power



151.94 MHz Peak Power



154.57 MHz Peak Power



154.60 MHz Peak Power

Authorized Bandwidth

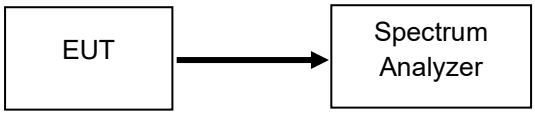
Engineer: John Michalowicz

Test Date: 12/17/24

Test Procedure

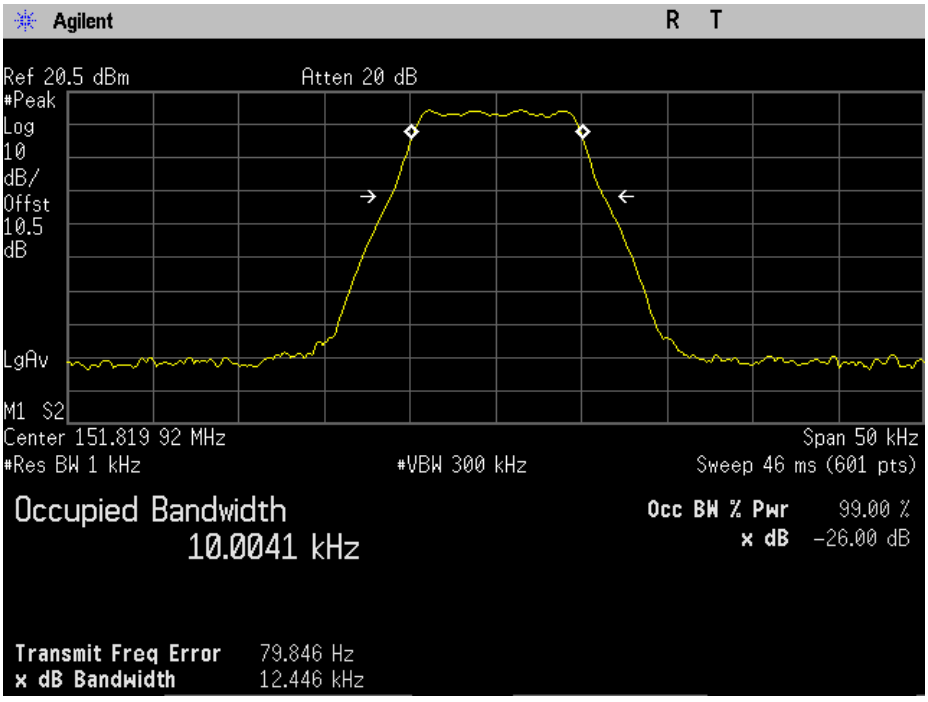
The Method of Measurement was C63.26 5.4.3, with no deviations. The EUT was modulated to produce maximum deviation.

Test Setup

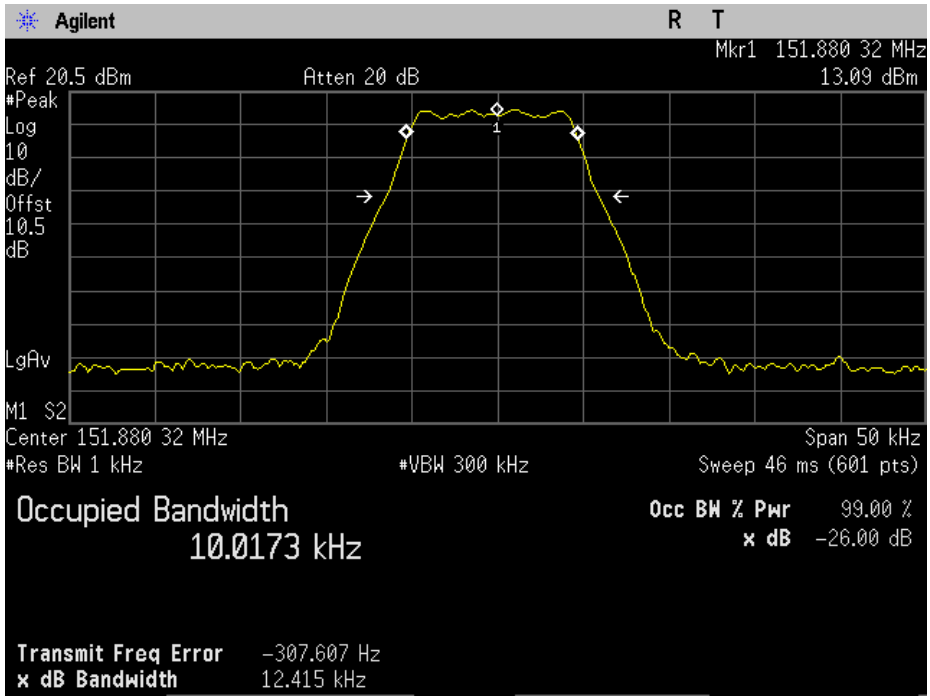


Test Results

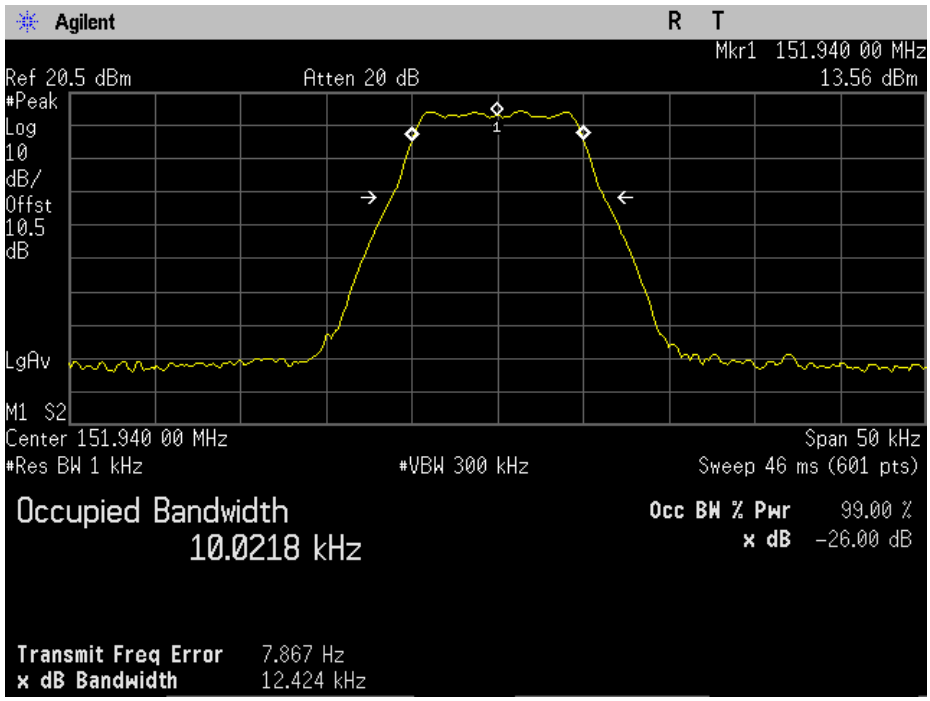
Frequency (MHz)	26dB Bandwidth (kHz)	Limit (kHz)	Pass/Fail
151.82	10.004	11.25	Pass
151.88	10.017	11.25	Pass
151.94	10.022	11.25	Pass
154.57	16.258	20	Pass
154.60	16.254	20	Pass



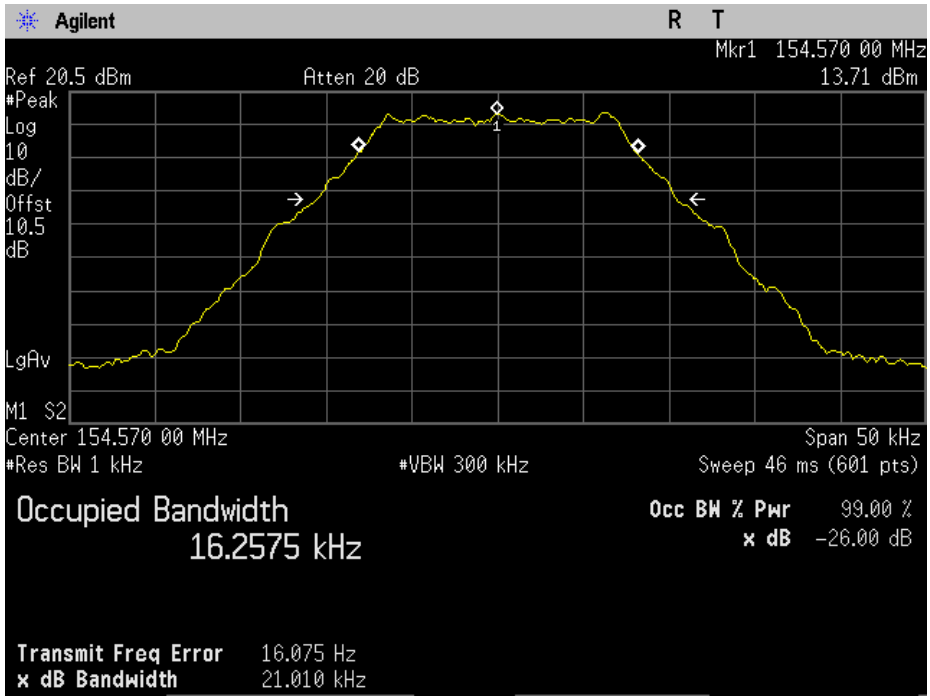
151.82 OCBW



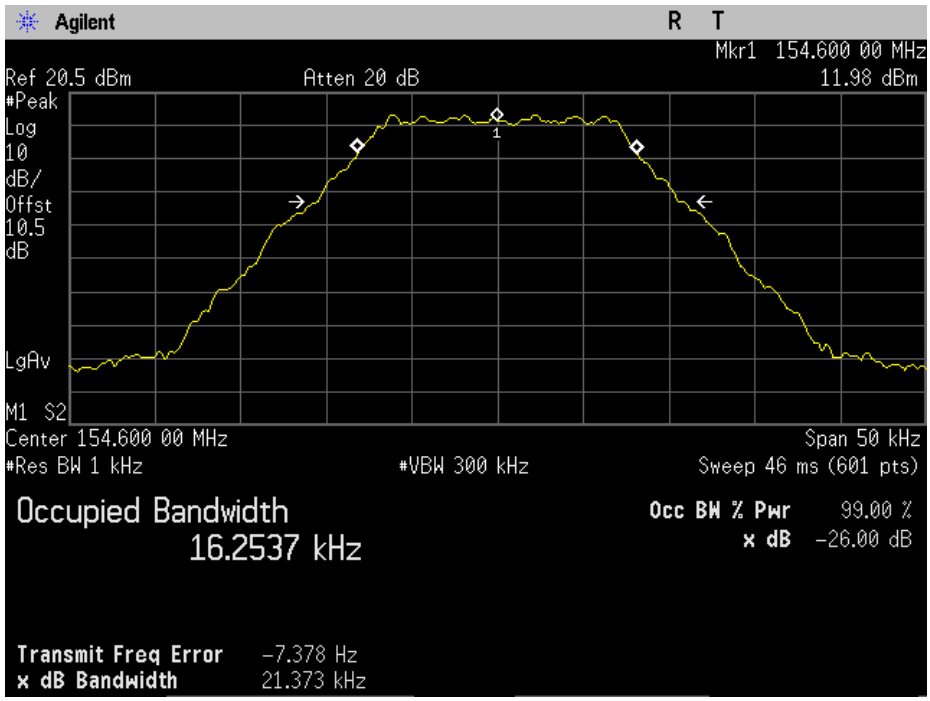
151.88 OCBW



151.94 OCBW



154.57 OCBW



154.60 OCBW

Unwanted Emissions – In-Band Mask

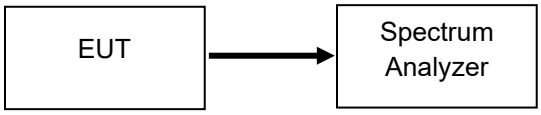
Engineer: John Michalowicz

Test Date: 12/17/24

Test Procedure

The Method of Measurement was C63.26 5.7, with no deviations. The EUT was modulated to produce maximum deviation. Emission masks were based on Transmitter Output Power data presented previously in this report.

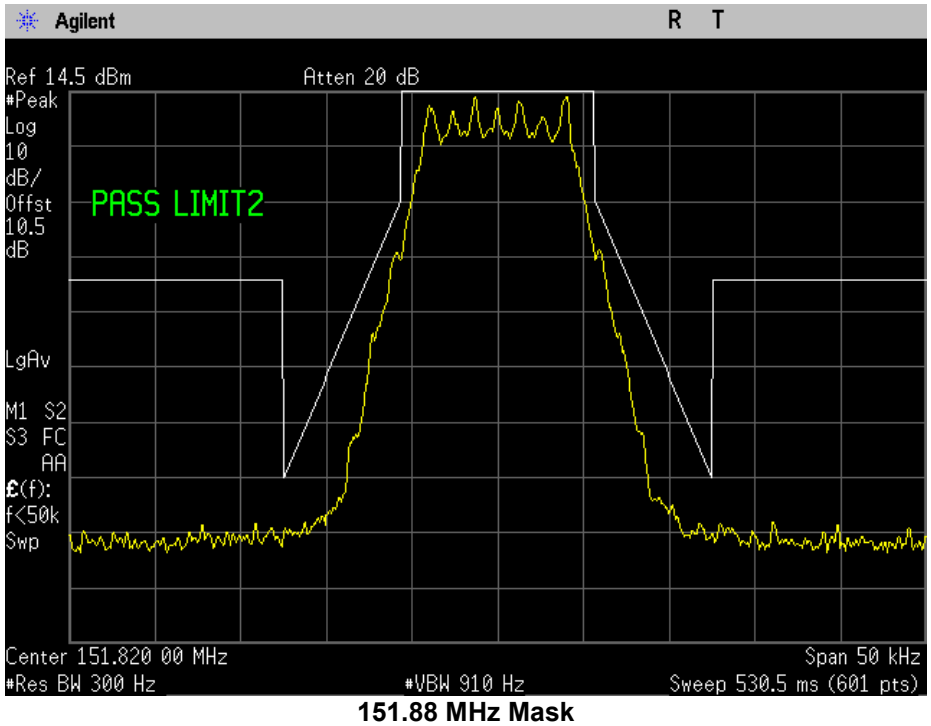
Test Setup



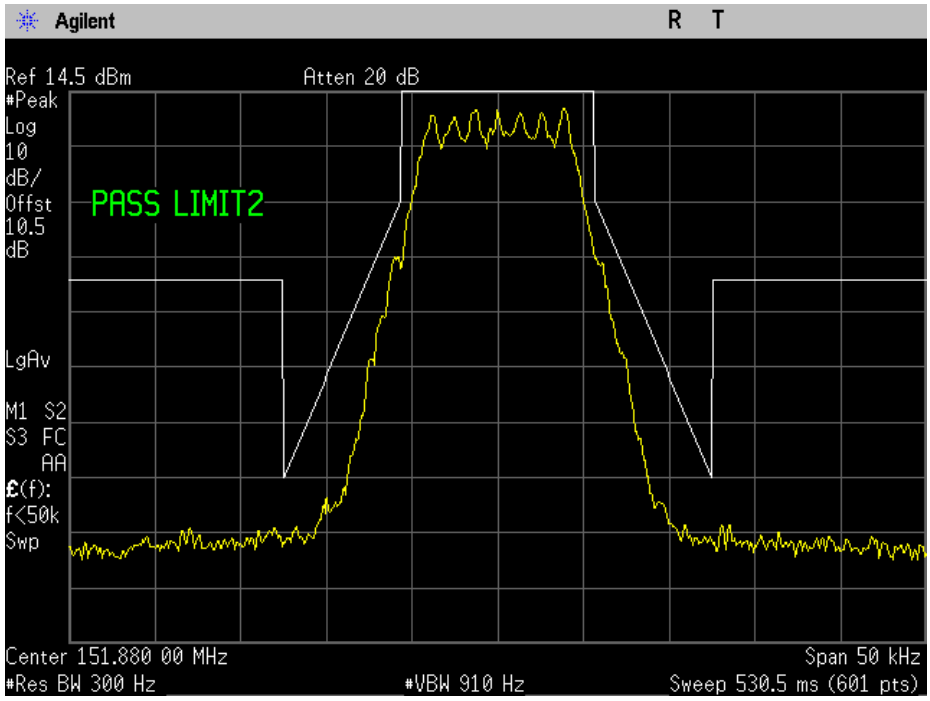
Limits

Band of Operation (MHz)	Limit Reference
151.82 – 151.94	47 CFR 95.2773(a)
154.57 – 154.6	47 CFR 95.2773(b)

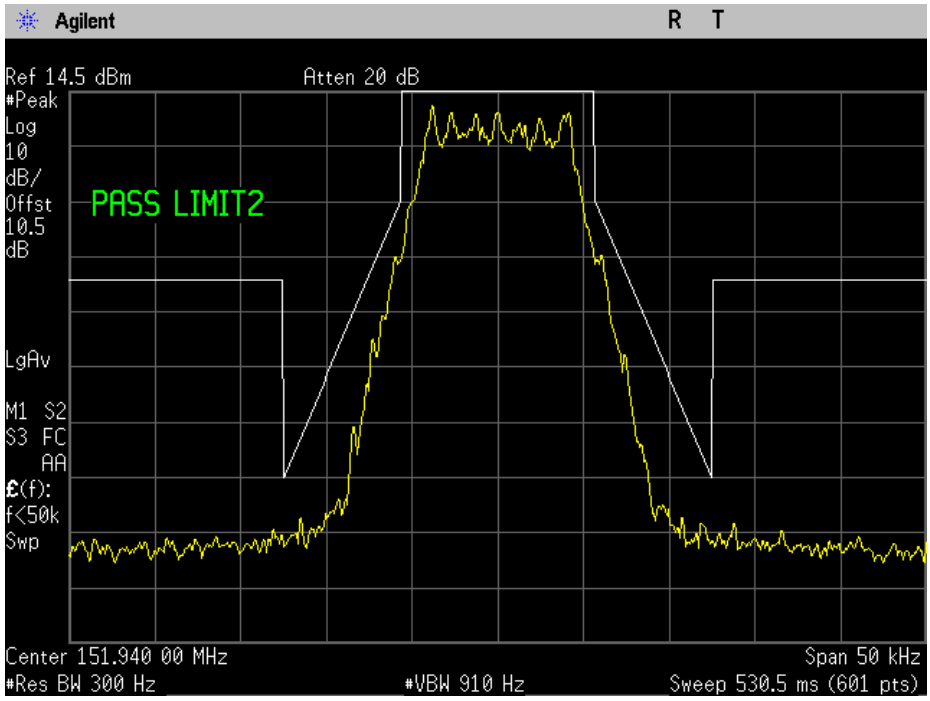
Test Results



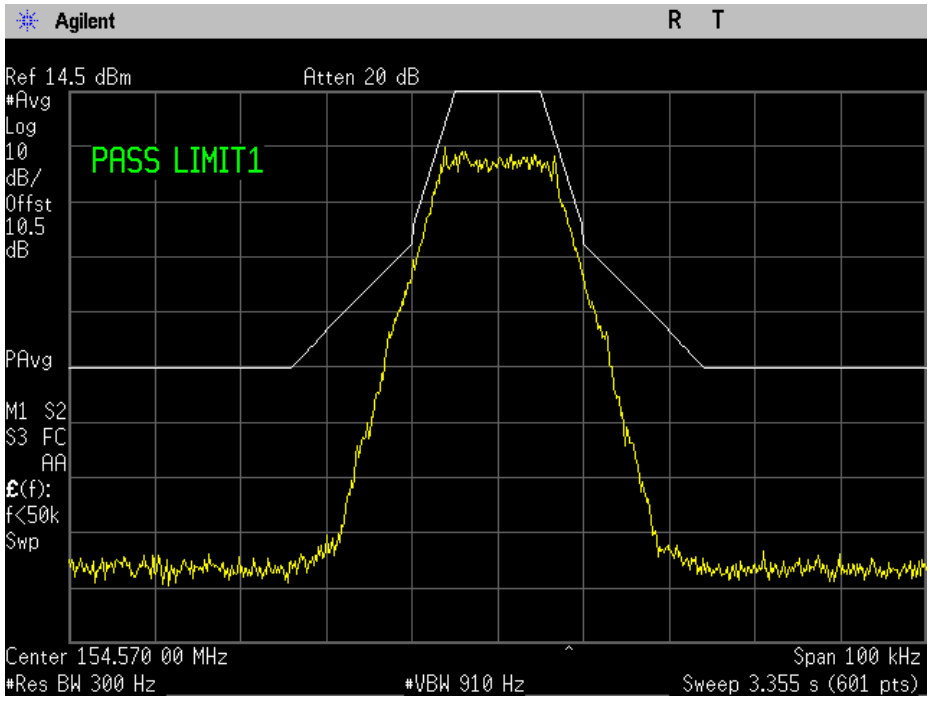
151.88 MHz Mask



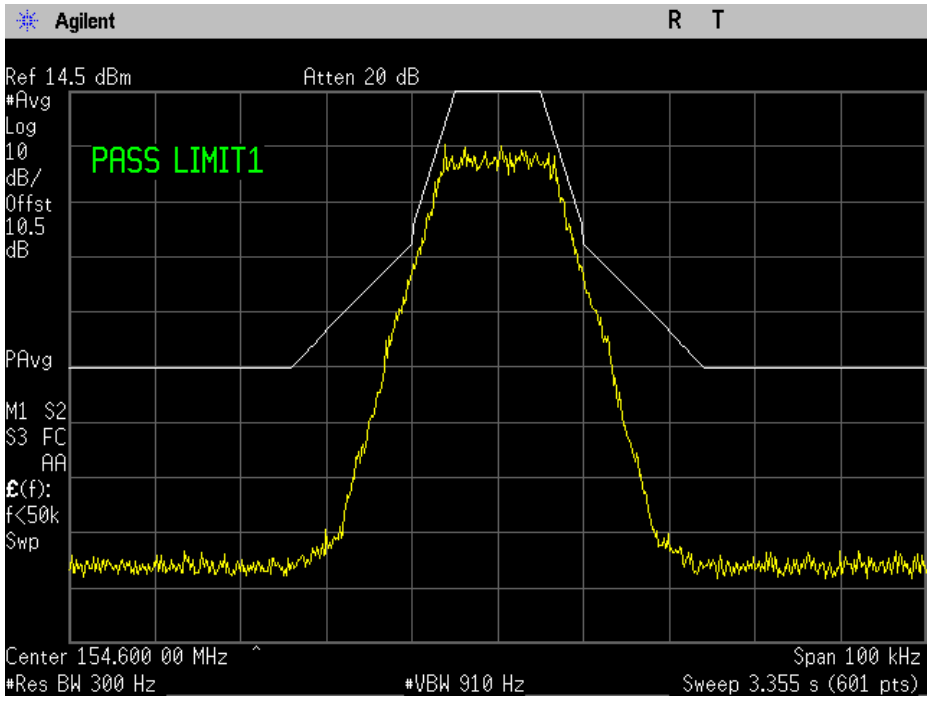
151.88 MHz Mask



151.94 MHz Mask



154.57 MHz Mask



154.60 MHz Mask

Unwanted Emissions – Out of Band Spurious

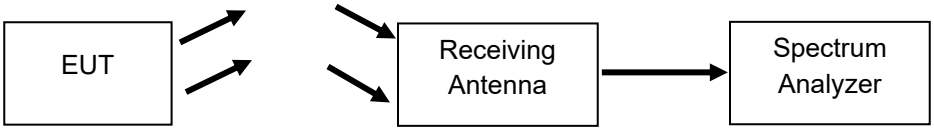
Engineer: John Michalowicz

Test Date: 12/19/24

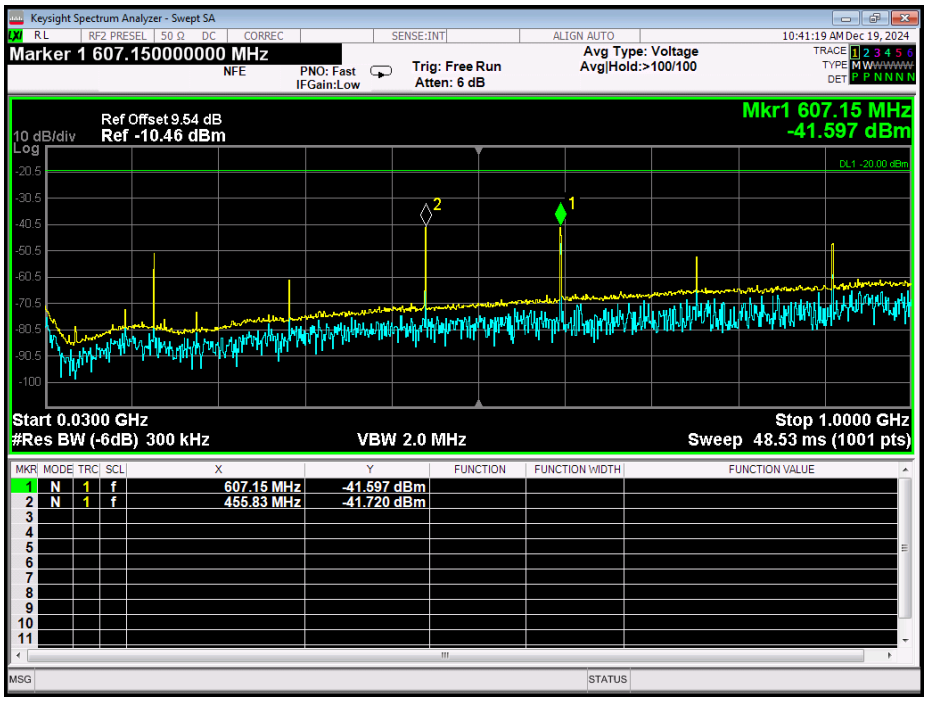
Test Procedure

The Method of Measurement was C63.26 5.5.4, with no deviations. The EUT was modulated to produce maximum deviation. The EUT was terminated into a 50 ohm antenna

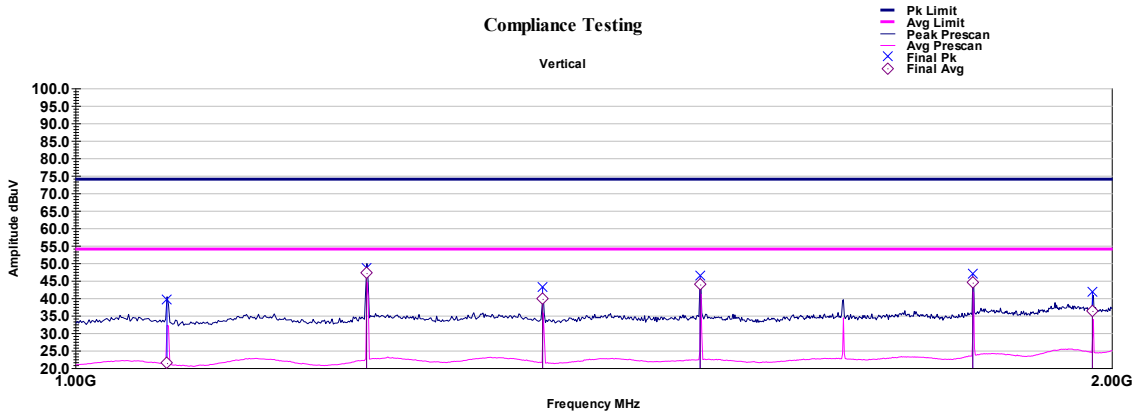
Test Setup



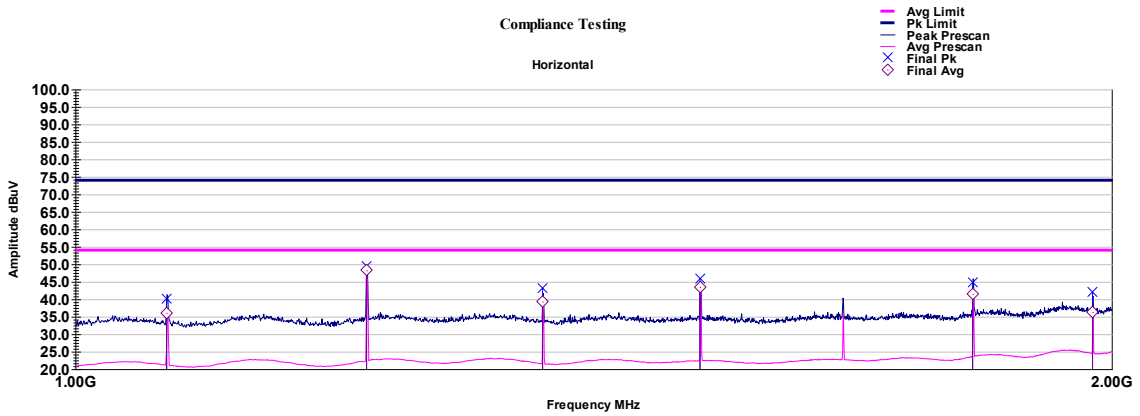
Test Results



1 - 2 GHz_



Frequency	Azimuth	Height	Raw Pk	Raw Avg	Correction	Final Pk	Pk Limit	Pk Margin	Final Avg	Avg Limit	Avg Margin
MHz	deg	cm	dBuV	dBuV	dB	dBuV/m	dBuV/m	dB	dBuV/m	dBuV/m	dB
1063251000	61.00	315.00	54.83	36.58	-15.18	39.65	74.00	-34.35	21.40	54	-32.60
1215066000	126.00	113.00	63.27	61.81	-14.66	48.61	74.00	-25.39	47.15	54	-6.86
1366861000	186.00	117.00	57.10	53.78	-14.01	43.09	74.00	-30.91	39.76	54	-14.24
1518817000	359.00	105.00	59.58	57.10	-13.23	46.35	74.00	-27.65	43.87	54	-10.13
1822541000	113.00	100.00	58.44	55.97	-11.59	46.86	74.00	-27.15	44.38	54	-9.62
1974326000	108.00	100.00	51.32	45.78	-9.47	41.85	74.00	-32.16	36.31	54	-17.69
Final = Raw + Path Loss											
Margin = Final - Limit											



Frequency	Azimuth	Height	Raw Pk	Raw Avg	Correction	Final Pk	Pk Limit	Pk Margin	Final Avg	Avg Limit	Avg Margin
MHz	deg	cm	dBuV	dBuV	dB	dBuV/m	dBuV/m	dB	dBuV/m	dBuV/m	dB
1063055000	50.00	325.00	55.41	51.25	-15.18	40.23	74.00	-33.77	36.07	54	-17.93
1215036000	24.00	381.00	64.25	62.91	-14.66	49.59	74.00	-24.41	48.25	54	-5.75
1366940000	62.00	105.00	57.12	53.35	-14.01	43.11	74.00	-30.89	39.33	54	-14.67
1518652000	6.00	100.00	59.14	56.75	-13.23	45.91	74.00	-28.09	43.52	54	-10.48
1822436000	205.00	315.00	56.25	53.06	-11.59	44.66	74.00	-29.34	41.47	54	-12.53
1974449000	15.00	400.00	51.40	45.79	-9.47	41.93	74.00	-32.07	36.32	54	-17.68
Final = Raw + Path Loss											
Margin = Final - Limit											

The emissions pass the 15.209 restricted band limits which are more stringent than the -20 dBm eirp limit

Unwanted Emissions – Out of Band Spurious - Conducted

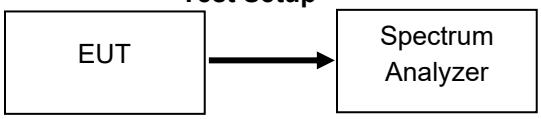
Engineer: John Michalowicz

Test Date: 12/19/24

Test Procedure

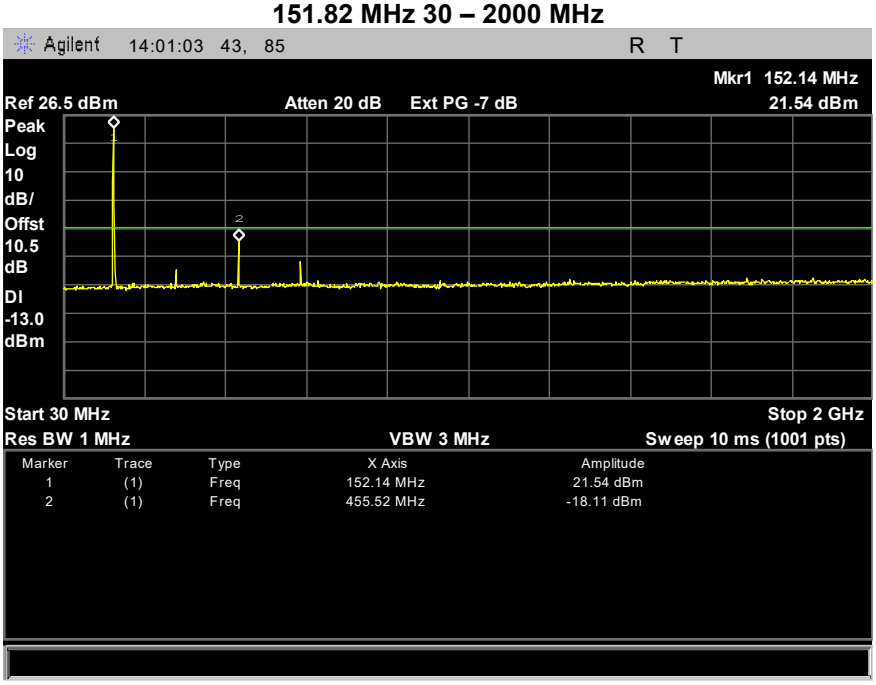
The Method of Measurement was C63.26 5.5.4, with no deviations. The EUT was modulated to produce maximum deviation.

Test Setup

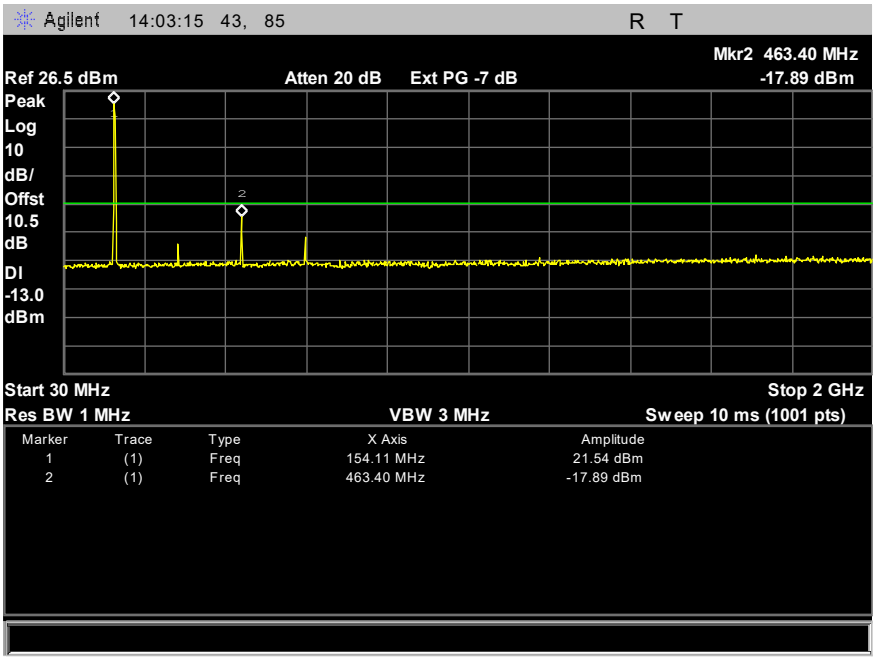


Test Results

151.82 MHz 30 – 2000 MHz



154.60 MHz 30 – 2000 MHz



Frequency Accuracy

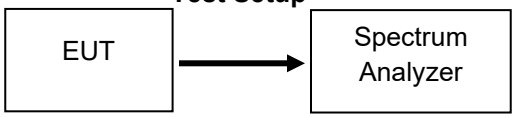
Engineer: John Michalowicz

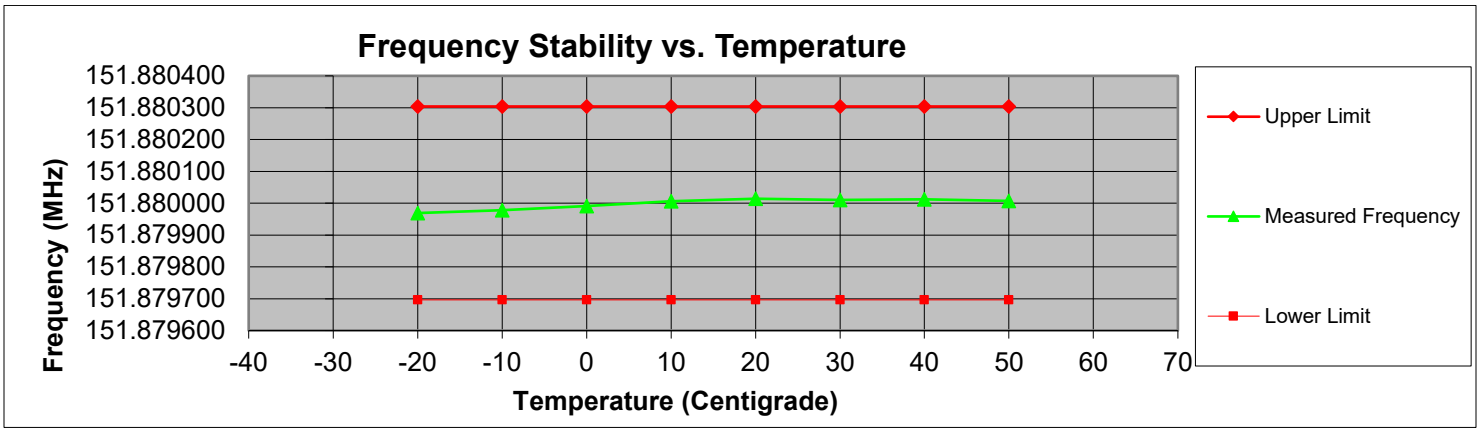
Test Date: 12/18/24

Test Procedure

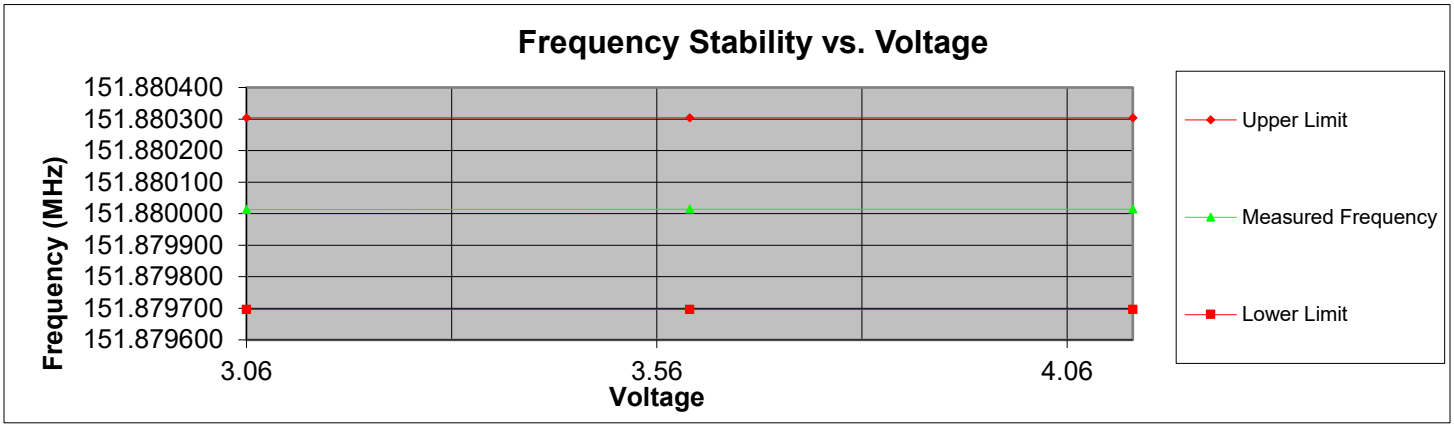
The Method of Measurement was C63.26 5.6, with no deviations. The EUT passes with 2ppm deviation.

Test Setup





Temperature centigrade	Measured Frequency (MHz)	Upper Margin (MHz)	Lower Margin (MHz)
-20	151.879969	-0.000335	0.000273
-10	151.879978	-0.000326	0.000282
0	151.879991	-0.000313	0.000295
10	151.880006	-0.000298	0.000310
20	151.880014	-0.000290	0.000318
30	151.880010	-0.000294	0.000314
40	151.880012	-0.000292	0.000316
50	151.880007	-0.000297	0.000311



Test Equipment Utilized

Description	Manufacturer	Model #	CT Asset #	Last Cal Date	Cal Due Date
Horn Antenna	ARA	DRG-118/A	i00271	8/09/24	8/09/26
Bi-Log Antenna	Schaffner	CBL 6111D	i00349	2/7/23	2/7/25
3 Meter Semi-Anechoic Chamber	Panashield	3 Meter Semi-Anechoic Chamber	i00428	7/13/23	7/13/26
MXE EMI receiver	Keysight	N9038A	i00552	3/1/24	3/1/25
Temp./humidity/pressure monitor (rad. immunity)	Omega Engineering	iBTHX-W-5	i00629	1/25/24	1/25/25
Spectrum Analyzer	Keysight	E4448A	i00688	10/26/24	10/26/25

In addition to the above listed equipment standard RF connectors and cables were utilized in the testing of the described equipment. Prior to testing these components were tested to verify proper operation.

Measurement Uncertainty

Measurement Uncertainty (U_{lab}) for Compliance Testing is listed in the table below.

Measurement	U_{lab}
Radio Frequency	± 3.3 x 10^{-8}
RF Power, conducted	± 1.5 dB
RF Power Density, conducted	± 1.0 dB
Conducted Emissions	± 1.8 dB
Radiated Emissions	± 4.5 dB
Temperature	± 1.5 deg C
Humidity	± 4.3 %
DC voltage	± 0.20 VDC
AC Voltage	± 1.2 VAC

The reported expanded uncertainty +/- U_{lab}(dB) has been estimated at a 95% confidence level (k=2)

U_{lab} is less than or equal to U_{ETSI} therefore

- Compliance is deemed to occur if no measured disturbance exceeds the disturbance limit
- Non-Compliance is deemed to occur if any measured disturbance exceeds the disturbance limit

END OF TEST REPORT