

TEST REPORT

Prepared for: **Garmin International, Inc.**

Address: **1200 E. 151st Street**
Olathe, Kansas, 66062, USA

Product: **A04556**

Test Report No: **R20210922-20-E1B**

Approved By: 
Nic S. Johnson, NCE
Technical Manager
iNARTE certified EMC Engineer EMC-003337-NE

DATE: **21 January 2022**

Total Pages: **33**

The Nebraska Center for Excellence in Electronics (NCEE) authorizes the above-named company to reproduce this report provided it is reproduced in its entirety for use by the company's employees only. Any use that a third party makes of this report, or any reliance on or decisions made based on it, are the responsibility of such third parties. NCEE accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report. This report applies only to the items tested.

	Report Number:	R20210922-20-E1A	Rev	B
	Prepared for:	Garmin		

REVISION PAGE

Rev. No.	Date	Description
0	8 December 2021	Original – KVepuri Prepared by KVepuri/FLane
A	14 January 2022	Corrected frequency stability limit Changed listed testing method for output power -NJ
B	21 January 2022	Clarified method used in Section 4.2.

	Report Number:	R20210922-20-E1A	Rev	B
	Prepared for:	Garmin		

CONTENTS

Revision Page.....	2
1.0 Summary of test results.....	4
2.0 EUT Description	5
2.1 Equipment under test.....	5
2.2 Description of test modes.....	6
2.3 Description of support units	6
3.0 Laboratory description	7
3.1 Laboratory description	7
3.2 Test Personnel	7
3.3 Test equipment	8
4.0 Detailed results	9
4.1 Radiated Spurious Emissions	9
4.2 Output Power	13
4.3 Bandwidth and emissions mask	17
4.4 Frequency Stability measurements	25
4.5 Conducted AC Mains Emissions.....	27
Appendix A: Sample Calculation	30
Appendix B – Measurement Uncertainty	32
REPORT END.....	33

	Report Number:	R20210922-20-E1A	Rev	B
	Prepared for:	Garmin		

1.0 SUMMARY OF TEST RESULTS

The worst-case measurements were reported in this report. The EUT has been tested according to the following specifications:

APPLIED STANDARDS AND REGULATIONS		
Standard Section	Test Type	Result
FCC Part 2.1046 FCC Part 95.2767	Output Power	PASS
FCC Part 2.1053 FCC Part 95.2779	Radiated Spurious Emissions	PASS
FCC Part 2.1049 FCC Part 95.2773, 95.2779	Emissions Masks/ Occupied Bandwidth	PASS
FCC Part 2.1055 (a)(1), (b) FCC Part 95.2765	Frequency Stability Under Voltage and Temp Variation	PASS
FCC Part 15.209	Receiver Spurious Emissions	PASS

See Section 4 for details on the test methods used for each test.

	Report Number:	R20210922-20-E1A	Rev	B
	Prepared for:	Garmin		

2.0 EUT DESCRIPTION

2.1 EQUIPMENT UNDER TEST

The Equipment Under Test (EUT) was a portable transceiver from Garmin.

Model	A04556
EUT Received	26 October 2021
EUT Tested	26 October 2021- 3 November 2021
Serial No.	3391975621, 3392525130
Operating Band	151.820 MHz – 154.600 MHz
Device Type	VHF
Power Supply	Internal Battery/ Charger: Garmin (Phi Hong) MN: LAC046 (worst case power supply, all the measurements presented in this report); Garmin MN: PSM10R-050; Garmin MN: PSAF10R-050Q; Garmin car charger MN:320-00239-56

NOTE: For more detailed features description, please refer to the manufacturer's specifications or user's manual.

	Report Number:	R20210922-20-E1A	Rev	B
	Prepared for:	Garmin		

2.2 DESCRIPTION OF TEST MODES

The EUT operates on, and was tested at the frequencies below:

Channel	Frequency (MHz)
Channel 1	151.820
Channel 2	151.880
Channel 3	151.940
Channel 4	154.570
Channel 5	154.600

These channels are described in FCC Part 95.2763 "MURS Channels"

This EUT was set to transmit in a worse-case scenario with modulation on.

2.3 DESCRIPTION OF SUPPORT UNITS

NA

	Report Number:	R20210922-20-E1A	Rev	B
	Prepared for:	Garmin		

3.0 LABORATORY DESCRIPTION

3.1 LABORATORY DESCRIPTION

All testing was performed at the following Facility:

The Nebraska Center for Excellence in Electronics (NCEE Labs)
 4740 Discovery Drive
 Lincoln, NE 68521

A2LA Certificate Number:	1953.01
FCC Accredited Test Site Designation No:	US1060
Industry Canada Test Site Registration No:	4294A-1
NCC CAB Identification No:	US0177

Environmental conditions varied slightly throughout the tests:

Relative humidity of $35 \pm 4\%$
 Temperature of $22 \pm 3^\circ$ Celsius

3.2 TEST PERSONNEL

All testing was performed by Karthik Vepuri and Fox Lane of NCEE Labs. The results were reviewed by Karthik Vepuri.

	Report Number:	R20210922-20-E1A	Rev	B
	Prepared for:	Garmin		

3.3 TEST EQUIPMENT

DESCRIPTION AND MANUFACTURER	MODEL NO.	SERIAL NO.	LAST CALIBRATION DATE	CALIBRATION DUE DATE
Keysight MXE Signal Analyzer (44GHz)	N9038A	MY59050109	July 21, 2021	July 21, 2023
Keysight MXE Signal Analyzer (26.5GHz)	N9038A	MY56400083	May 5, 2020	May 5, 2022
Keysight EXA Signal Analyzer	N9010A	MY56070862	July 20, 2021	July 20, 2023
SunAR RF Motion	JB1	A091418	July 27, 2021	July 27, 2022
EMCO Horn Antenna	3115	6415	March 16, 2020	March 16, 2022
Com-Power LISN 50 μ H / 250 μ H - 50 Ω	LI-220C	20070017	September 22, 2020	September 22, 2022
8447F POT H64 Preampfier*	8447F POT H64	3113AD4667	February 1, 2021	February 1, 2022
Rohde & Schwarz Preampfier*	TS-PR18	3545700803	April 14, 2020	April 14, 2022
Trilithic High Pass Filter*	6HC330	23042	April 14, 2020	April 14, 2022
ETS – Lindgren- VSWR on 10m Chamber	10m Semi-anechoic chamber-VSWR	4740 Discovery Drive	July 30, 2020	July 30, 2023
NCEE Labs-NSA on 10m Chamber	10m Semi-anechoic chamber-NSA	NCEE-001	October 25, 2019	October 25, 2022
TDK Emissions Lab Software	V11.25	700307	NA	NA
RF Cable (preampfier to antenna)*	MFR-57500	01-07-002	April 14, 2020	April 14, 2022
RF Cable (antenna to 10m chamber bulkhead)*	FSCM 64639	01E3872	September 24, 2021	September 24, 2023
RF Cable (10m chamber bulkhead to control room bulkhead)*	FSCM 64639	01E3864	September 24, 2021	September 24, 2023
RF Cable (control room bulkhead to test receiver)*	FSCM 64639	01F1206	September 24, 2021	September 24, 2023
N connector bulkhead (10m chamber)**	PE9128	NCEEBH1	September 24, 2021	September 24, 2023
N connector bulkhead (control room)**	PE9128	NCEEBH2	September 24, 2021	September 24, 2023

*Internal Characterization

	Report Number:	R20210922-20-E1A	Rev	B
	Prepared for:	Garmin		

4.0 DETAILED RESULTS

4.1 RADIATED SPURIOUS EMISSIONS

Test Method: ANSI C63.26:2015:

1. Section 5.5, "Radiated Emissions Testing"

Limits for radiated emissions measurements:

Emissions radiated outside of the specified bands shall be applied to the limits in 95.2779 as followed:

Transmitting Frequency (MHz)	Frequency Band	Limit (dB)
151.820 151.880 151.940	≥12.5kHz removed from center frequency	50 + 10log(P)
154.570 154.600	≥50kHz removed from center frequency	43 + 10log(P)

Where P is equal to the output power of the transmitter in Watts.

Rated output power of transmitter is 2 W thus making the worst-case emissions attenuation 53.01 dB for 151.82 MHz and 46.01 dB for 154.6 MHz.

Test procedures:

- a. The EUT was placed on the top of a rotating table above the ground plane in a 10-meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation. The table was 0.8m high for measurements from 30MHz-1GHz and the EUT was placed on a 1.5m pedestal for measurements from 1GHz to 2 GHz
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The antenna was a broadband antenna, and its height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are used to make the measurement.
- d. For each suspected emission, the EUT was arranged to maximize its emissions and then the antenna height was varied from 1 meter to 4 meters and the rotating table was turned from 0 degrees to 360 degrees to find the maximum emission reading.

	Report Number:	R20210922-20-E1A	Rev	B
	Prepared for:	Garmin		

e. The test-receiver system was set to use a peak detector with a specified resolution bandwidth. For spectrum analyzer measurements, the composite maximum of several analyzer sweeps was used for final measurements.

f. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10 dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

NOTE:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Peak detection (PK) and Quasi-peak detection (QP) at frequencies below 1GHz.
2. The resolution bandwidth 1 MHz for all measurements and at frequencies above 1GHz, A peak detector was used for all measurements above 1GHz. Measurements were made with an EMI Receiver.

Deviations from test standard:

No deviation.

Test setup:

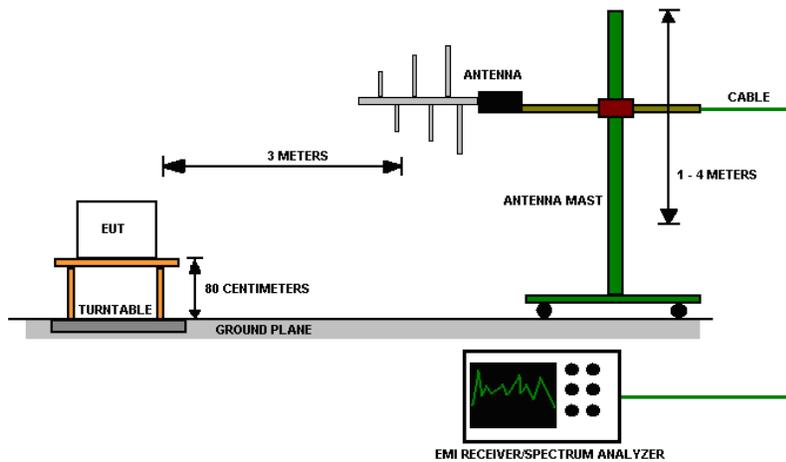


Figure 1 - Radiated Emissions Test Setup

EUT operating conditions

EUT was powered by 5V power supply. Device was set to transmit in the Lowest, Mid and Highest frequencies in its operating range.

	Report Number:	R20210922-20-E1A	Rev	B
	Prepared for:	Garmin		

Test results:

Radiated Emissions Data				
Frequency	Level	Limit	Margin	Operating Channel
MHz	dB μ V/m	dB μ V/m	dB	
303.64272	44.54	75.23	30.69	151.82
455.45688	35.60	75.23	39.63	151.82
759.10200	49.22	75.23	26.01	151.82
826.46328	33.30	75.23	41.93	151.82
151.82424	70.86	NA	NA	151.82
476.31120	37.35	75.23	37.88	151.82
910.92096	53.65	75.23	21.58	151.82
303.87840	45.61	75.23	29.62	151.94
455.83680	37.32	75.23	37.91	151.94
759.72024	46.89	75.23	28.34	151.94
905.72064	33.77	75.23	41.46	151.94
911.66088	52.34	75.23	22.89	151.94
151.93536	74.02	NA	NA	151.94
476.32848	34.82	75.23	40.41	151.94
907.05432	33.82	75.23	41.41	151.94
309.19128	47.68	82.23	34.55	154.60
463.76520	36.54	82.23	45.69	154.60
476.28696	32.33	82.23	49.90	154.60
772.99248	49.23	82.23	33.00	154.60
927.62880	53.29	82.23	28.94	154.60
89.30928	27.63	82.23	54.60	154.60
154.60032	73.33	NA	NA	154.60

*Frequencies with N/A's in their limit and margin columns are transmission frequencies and thus not evaluated.

**All other emissions were found to be at least 20 dB below the limit.

	Report Number:	R20210922-20-E1A	Rev	B
	Prepared for:	Garmin		

Conducted Spurious Emissions:

No measurements were found within 20 dB of the limit per ANSI C63.26 Part 5.1.1(c).

Receiver Spurious Emissions:

No emissions were found within 10dB of the limit.

REMARKS:

1. Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB)
2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB)
3. The other emission levels were very low against the limit.
4. Margin value = Limit value - Emission level
5. EUT was investigated for intermodulation. No intermodulation was found above system's noise floor

	Report Number:	R20210922-20-E1A	Rev	B
	Prepared for:	Garmin		

4.2 OUTPUT POWER

Test Method: ANSI C63.26:

Section(s) 5.2.4.3.1 “General procedure for measuring average power of a narrowband signal with a spectrum/signal analyzer or EMI receiver”

FCC Part 95.2767 MURS transmitting power limit:

Each MURS transmitter type must be designed such that the transmitter power output does not exceed 2 Watts under normal operating conditions.

Per requirement in 5.2.4.1 a) duty cycle in test firmware was >98%, so the method from a)2)i) and 5.2.4.3.1 were used.

Since the duty cycle was >98%, sweep triggering was not required.

Test procedures:

- a) Set the RBW \geq OBW.
- b) Set VBW \geq 3 \times RBW.
- c) Set span \geq 2 \times OBW.
- d) The sweep time was set to auto-couple
- e) Detector = Average.
- f) Trace mode = Trace Average (Avg|Hold = 100).
- g) Allow trace to fully stabilize.
- h) Use the peak marker function to determine the amplitude level.

Deviations from test standard:

No deviation.

Test setup:

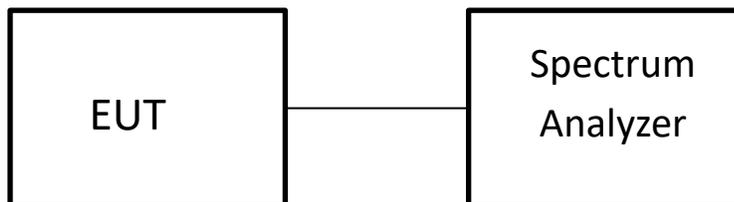


Figure 2 – Peak Output Power Measurements Test Setup

EUT operating conditions:

EUT was connected to a laptop via USB cable. Device was set to transmit in low, mid and high of its allocated frequencies.

	Report Number:	R20210922-20-E1A	Rev	B
	Prepared for:	Garmin		

Test results:

Limit = 33 dBm (2000 mW)

Output Power

CHANNEL FREQUENCY (MHz)	OUTPUT POWER (dBm)	OUTPUT POWER (mW)	Method	RESULT
151.820	31.837	1526.511	Conducted	PASS
151.940	32.474	1767.665	Conducted	PASS
154.600	32.128	1632.300	Conducted	PASS

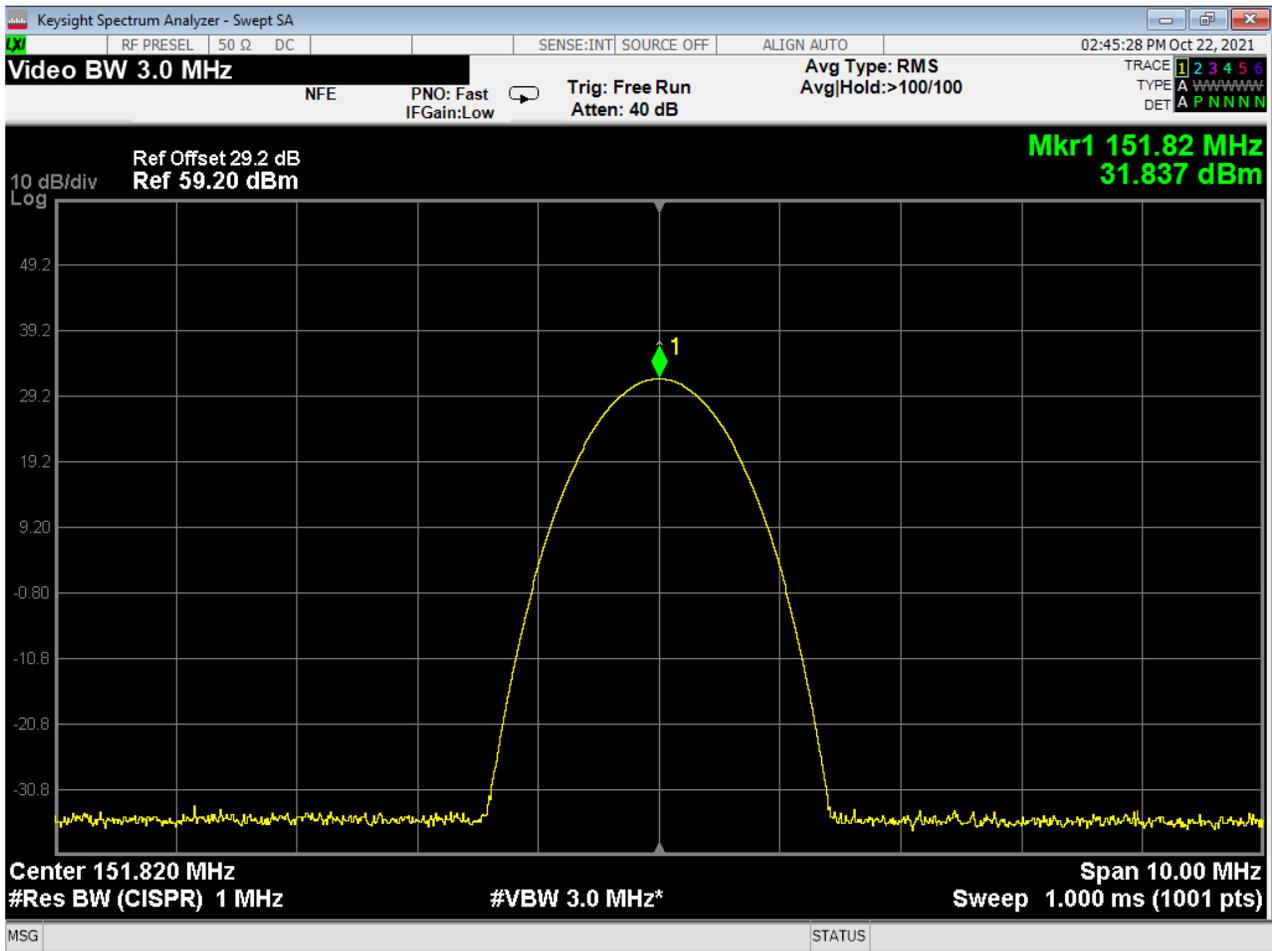


Figure 3 –Output Power, 151.820 MHz

	Report Number:	R20210922-20-E1A	Rev	B
	Prepared for:	Garmin		

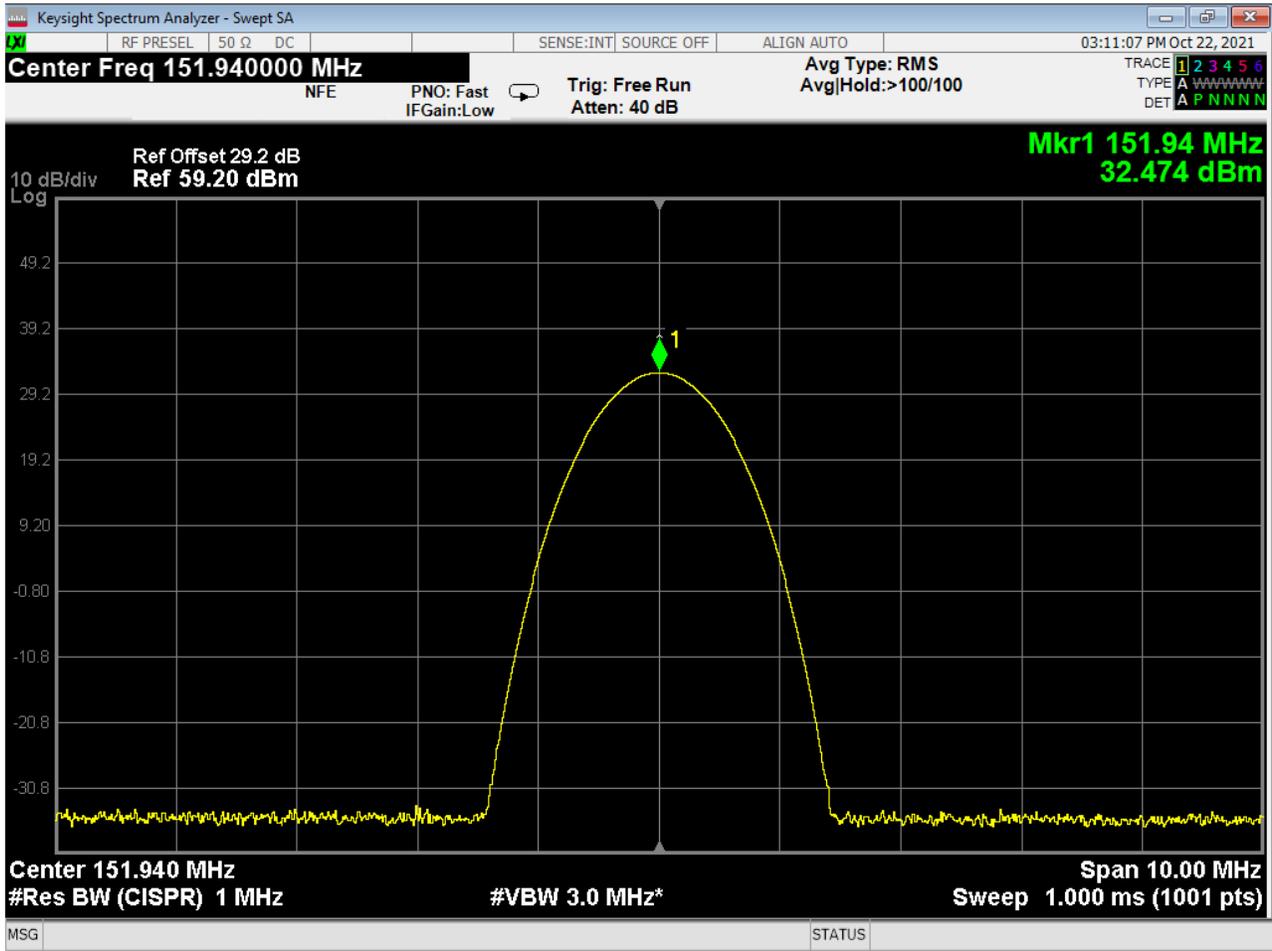


Figure 4 –Output Power, 151.940 MHz

	Report Number: R20210922-20-E1A	Rev	B
	Prepared for: Garmin		

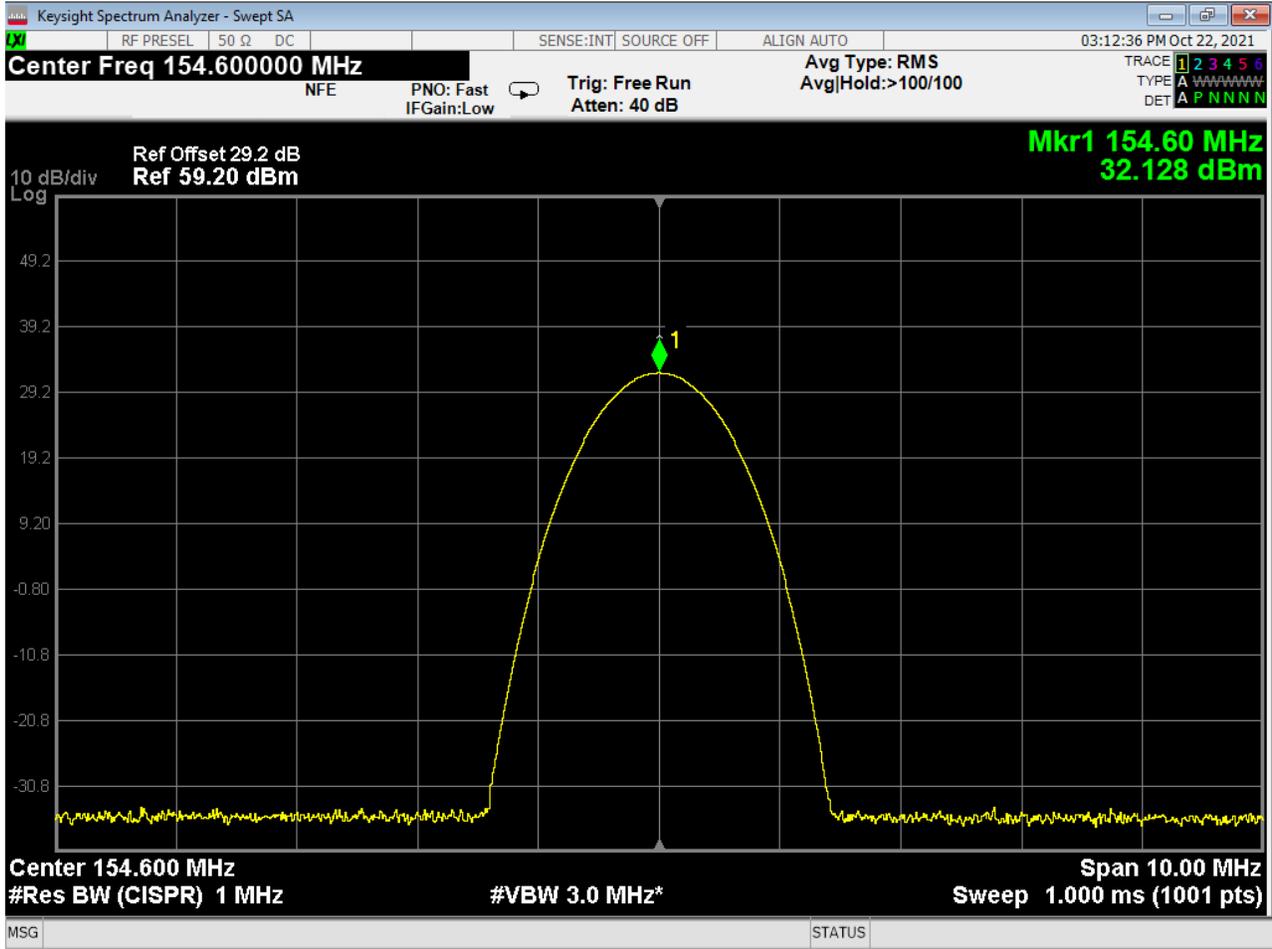


Figure 5 –Output Power, 154.600 MHz

	Report Number:	R20210922-20-E1A	Rev	B
	Prepared for:	Garmin		

4.3 BANDWIDTH AND EMISSIONS MASK

Test Method: ANSI C63.26,
1. Section(s) 5.4.3, 5.4.4

Limits:

FCC Part 95.2773 MURS authorized bandwidths:

Each MURS transmitter type must be designed to meet the emission bandwidth limitations in this section.

(a) The occupied bandwidth of emissions transmitted on the center frequencies 151.820 MHz, 151.880 MHz, and 151.940 MHz must not exceed 11.25 kHz.

(b) The occupied bandwidth of emissions transmitted on the center frequencies 154.570 MHz and 154.600 MHz must not exceed 20.0 kHz.

FCC Part 95.2773 MURS authorized bandwidths:

Channel Center Frequencies	Paragraphs
151.820, 151.880 and 151.940	(1), (2)
154.570 & 154.600, without audio filter	(5), (6), (7)

(1) 7.27($f_d - 2.88$ kHz) dB on any frequency removed from the channel center frequency by a displacement frequency (f_d in kHz) that is more than 5.625 kHz, but not more than 12.5 kHz. RBW = 300 Hz

(2) 50 + 10 log (P) dB or 70 dB, whichever is the lesser attenuation, on any frequency removed from the channel center frequency by more than 12.5 kHz. RBW = 30 kHz

(3) 25 dB on any frequency removed from the channel center frequency by more than 10 kHz, but not more than 20 kHz. RBW = 300 Hz

(4) 35 dB on any frequency removed from the channel center frequency by more than 20 kHz, but not more than 50 kHz. RBW = 300 Hz

(5) 83 log ($f_d \div 5$) dB on any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) that is more than 5 kHz, but not more than 10 kHz. RBW = 300 Hz

(6) 29 log ($f_d \div 11$) dB or 50 dB, whichever is the lesser attenuation on any frequency removed from the channel center frequency by a displacement frequency (f_d in kHz) that is more than 10 kHz, but not more than 50 kHz. RBW = 300 Hz

(7) 43 + 10 log(P) dB on any frequency removed from the channel center frequency by more than 50 kHz. RBW = 30 kHz

	Report Number:	R20210922-20-E1A	Rev	B
	Prepared for:	Garmin		

Test procedures:

The EUT was connected to the spectrum analyzer directly with a low-loss shielded coaxial cable. The bandwidth of the fundamental frequency was measured by spectrum analyzer with 300 Hz RBW and 910 Hz VBW. The bandwidth measurements were done using the automatic bandwidth measurement.

(c) Measurement bandwidths. The power of unwanted emissions in the frequency bands specified in paragraphs (b)(1) and (3) through (6) of this section is measured with a reference bandwidth of 300 Hz. The power of unwanted emissions in the frequency ranges specified in paragraphs (b)(2) and (7) of this section is measured with a reference bandwidth of at least 30 kHz.

Start Freq	Stop Freq	Integ BW
5.625 kHz	12.50 kHz	300.0 Hz
12.50 kHz	100.0 kHz	300.0 Hz
24.14 kHz	50.00 kHz	300.0 Hz
50.00 kHz	100.0 kHz	30.00 kHz
8.000 MHz	12.50 MHz	1.000 MHz
12.50 MHz	15.00 MHz	1.000 MHz
12.50 MHz	15.00 MHz	1.000 MHz

Deviations from test standard:

No deviation

Test setup:

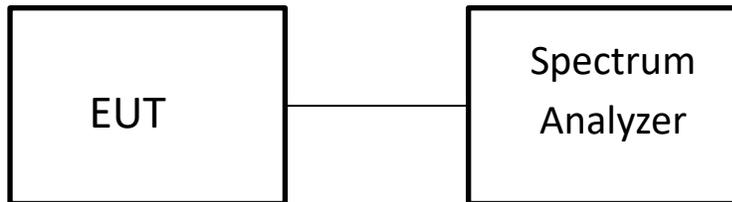


Figure 6 –Measurements Test Setup

EUT operating conditions:

EUT was connected to a laptop via USB cable. Device was set to transmit in the Lowest, Mid and Highest frequencies in its operating range.

	Report Number:	R20210922-20-E1A	Rev	B
	Prepared for:	Garmin		

Test results:

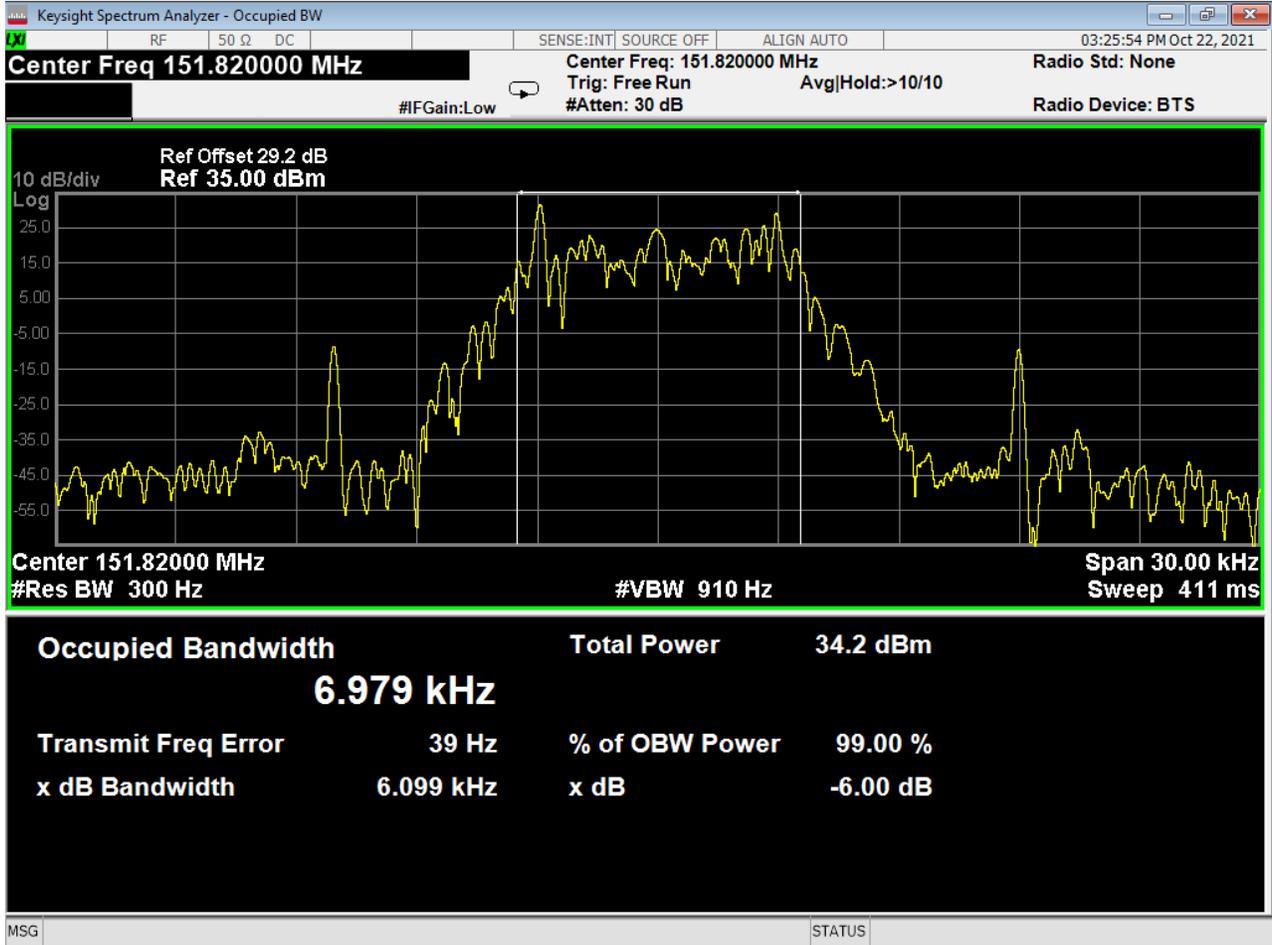


Figure 7 - Bandwidth, 151.820 MHz

	Report Number:	R20210922-20-E1A	Rev	B
	Prepared for:	Garmin		

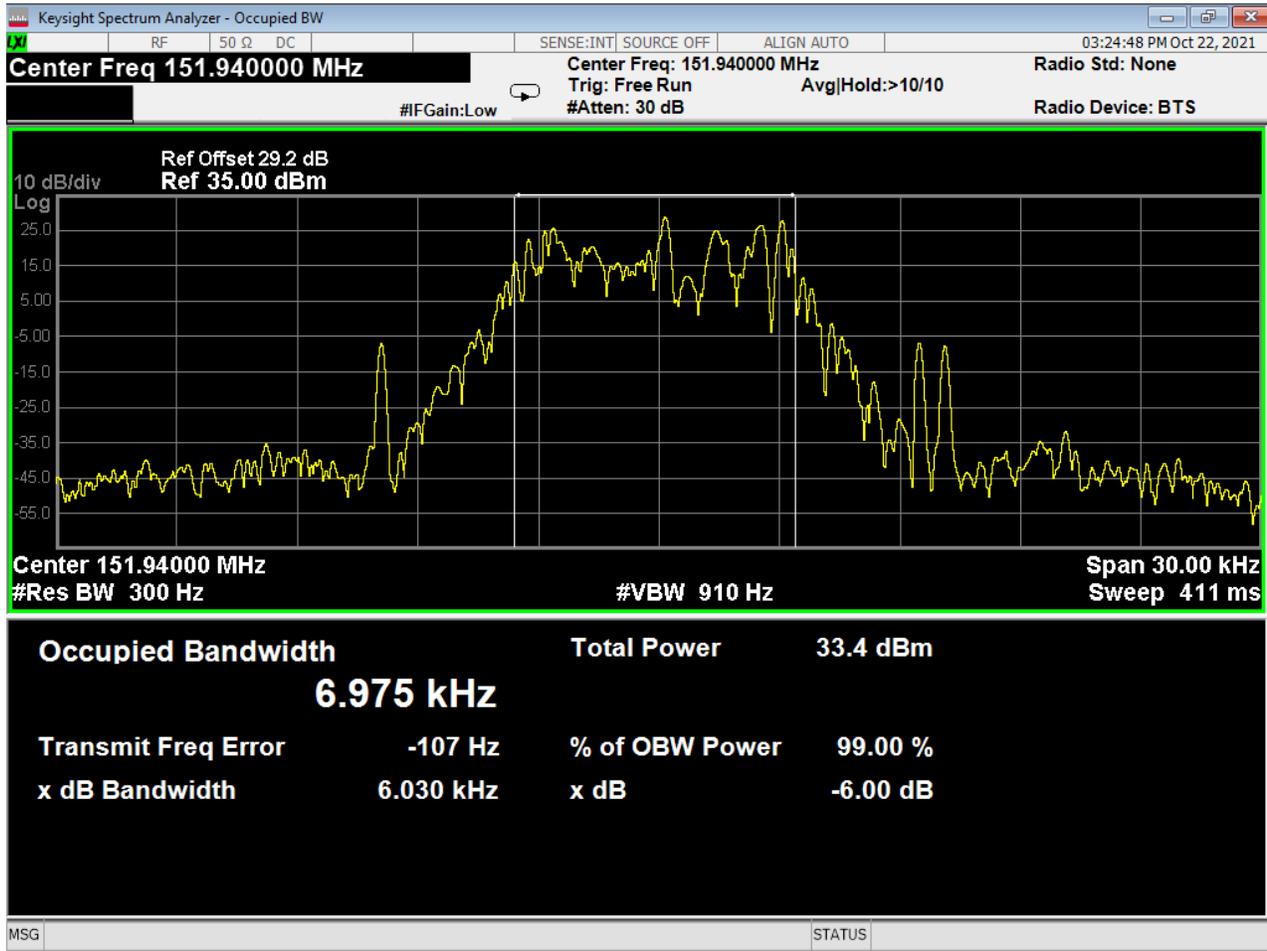


Figure 8 - Bandwidth, 151.940 MHz

	Report Number:	R20210922-20-E1A	Rev	B
	Prepared for:	Garmin		

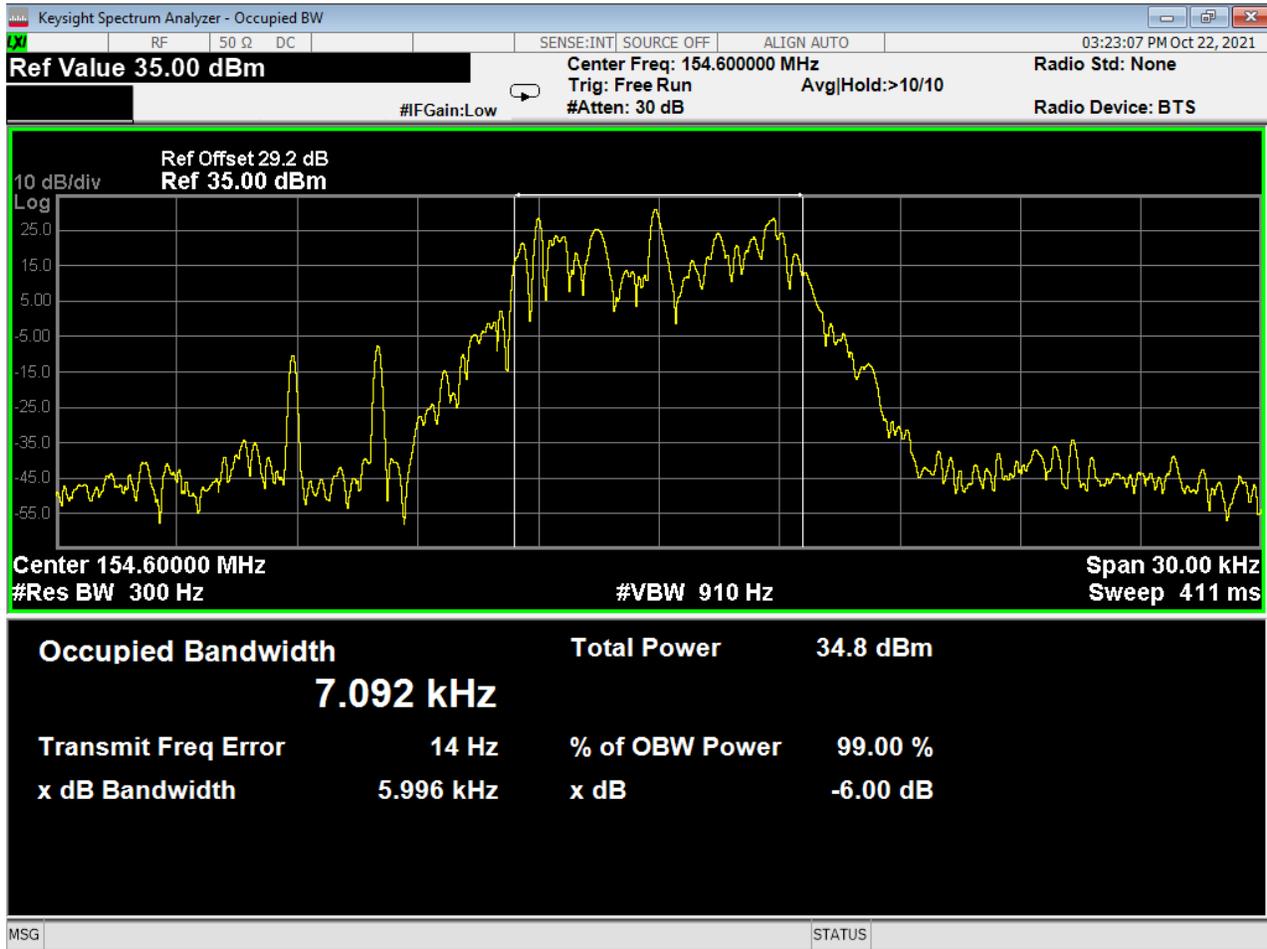


Figure 9 - Bandwidth, 154.600 MHz

	Report Number:	R20210922-20-E1A	Rev	B
	Prepared for:	Garmin		

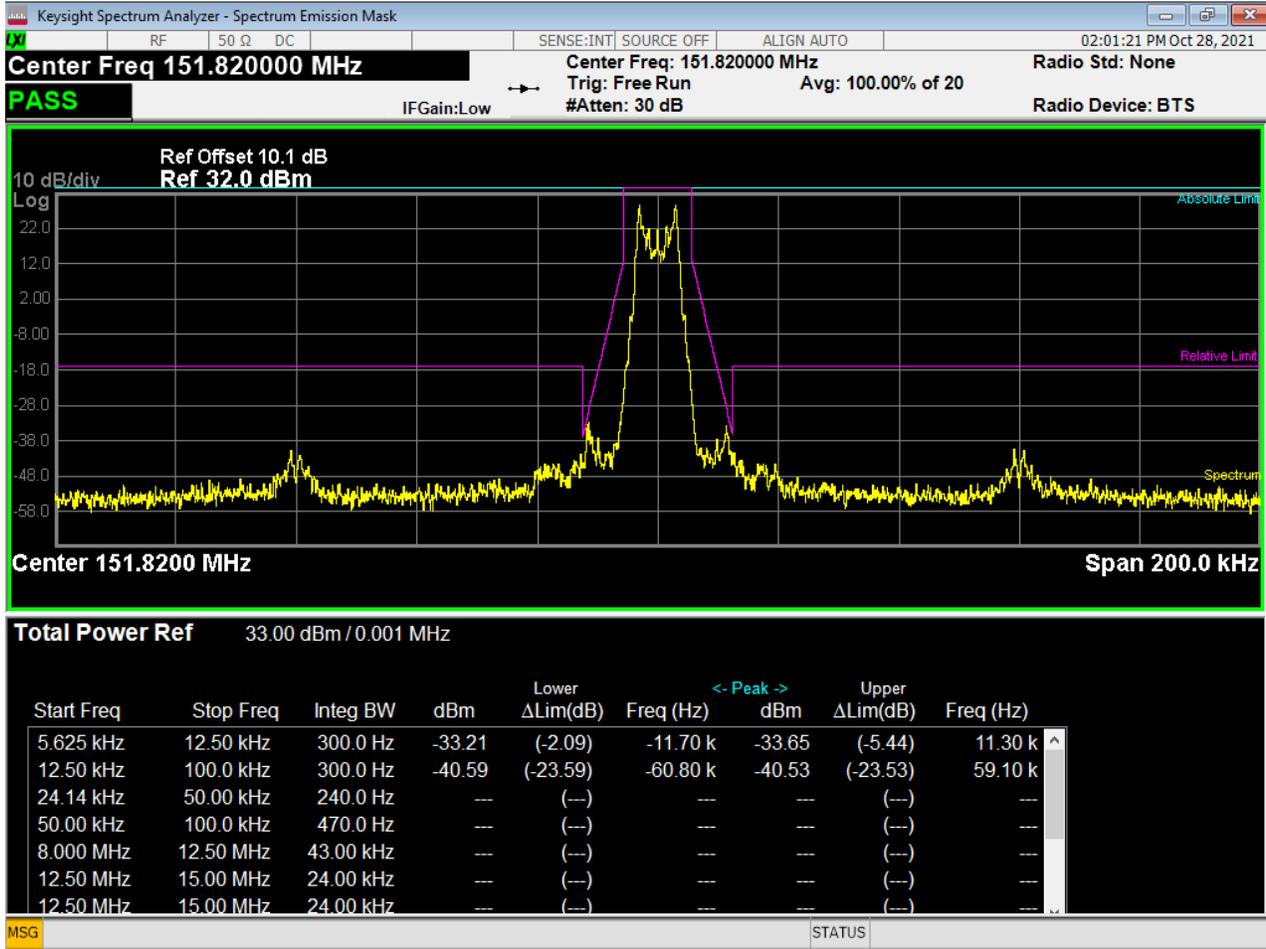


Figure 10 – Emissions Mask, 151.820 MHz

	Report Number:	R20210922-20-E1A	Rev	B
	Prepared for:	Garmin		

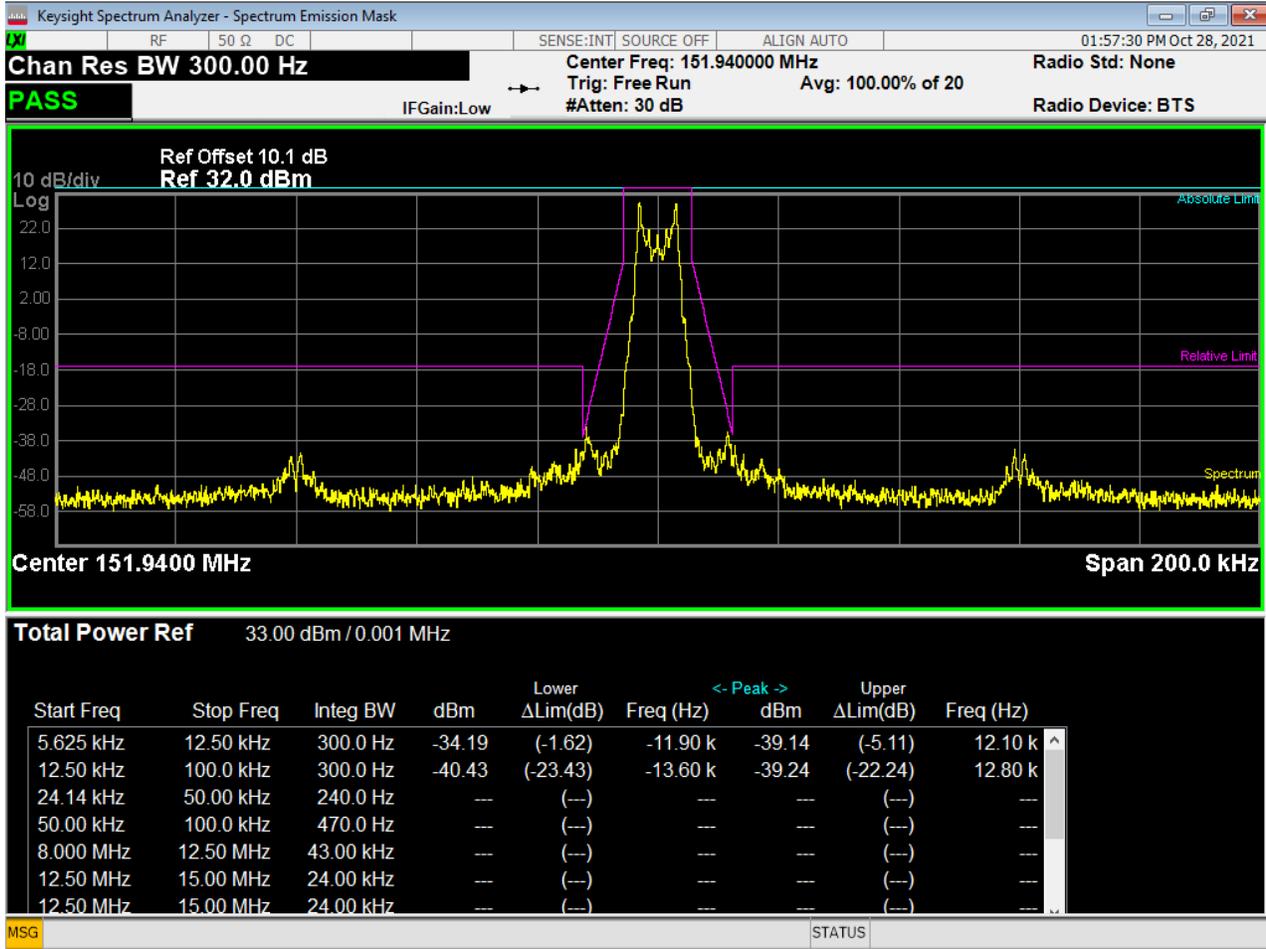


Figure 11 - Emissions Mask, 151.940 MHz

	Report Number: R20210922-20-E1A	Rev	B
	Prepared for: Garmin		

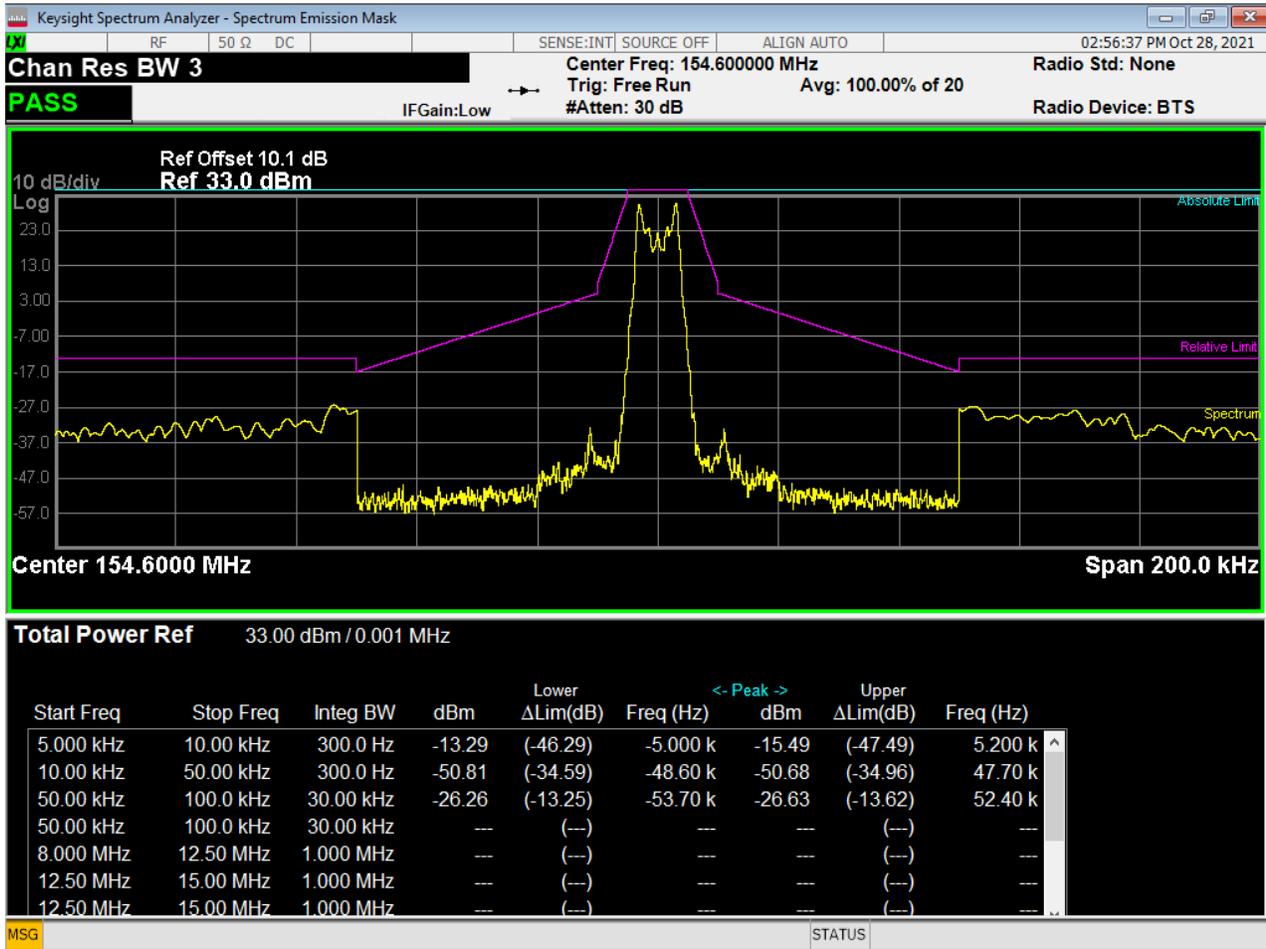


Figure 12 - Emissions Mask, 154.600 MHz

	Report Number:	R20210922-20-E1A	Rev	B
	Prepared for:	Garmin		

4.4 FREQUENCY STABILITY MEASUREMENTS

Test Method: ANSI C63.26,

1. Section(s) 5.6.3 "Procedure for frequency stability testing"

Limits:

FCC Part 95.2765 MURS frequency accuracy:

Each MURS transmitter type must be designed to meet the applicable frequency tolerance and stability requirements of this section.

(a) MURS transmitters that operate with an emission bandwidth of 6.25 kHz or less must be designed such that the carrier frequencies remain within ± 2.0 parts-per-million (ppm) of the channel center frequencies specified in §95.2763 during normal operating conditions.

Test procedures:

Radiated power was measured on a spectrum analyzer with resolution bandwidth and video bandwidth set to 500 Hz and 1 kHz respectively. The frequency error functionality on the receiver was used. The temperature was varied from -30°C to $+50^{\circ}\text{C}$.

Deviations from test standard:

No deviation

Test setup:

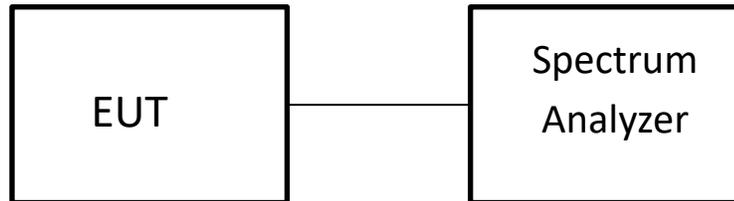


Figure 13 –Measurements Test Setup

EUT operating conditions:

EUT was connected to a laptop via USB cable. Device was set to transmit in the Lowest, Mid and Highest frequencies in its operating range.

	Report Number:	R20210922-20-E1A	Rev	B
	Prepared for:	Garmin		

Test results:

Frequency Stability, Temperature Variation

Temp in C°	-30	-20	-10	0	10	20	30	40	50			
Freq (MHz)	Deviation (Hz)									limit (Hz)	limit (ppm)	Result
151.8200	14	59	31	72	79	80	65	75	78	759.100	5	Pass
151.9400	19	36	23	65	75	79	75	72	77	759.700	5	Pass
154.6000	24	44	45	68	75	77	64	74	60	773.000	5	Pass

	Report Number:	R20210922-20-E1A	Rev	B
	Prepared for:	Garmin		

4.5 CONDUCTED AC MAINS EMISSIONS

Test Method: ANSI C63.10-2013, Section(s) 6.2

Limits for conducted emissions measurements:

FREQUENCY OF EMISSION (MHz)	CONDUCTED LIMIT (dB μ V)	
	Quasi-peak	Average
0.15-0.5	66 to 56	56 to 46
0.5-5	56	46
5-30	60	50

Notes:

1. The lower limit shall apply at the transition frequencies.
2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50 MHz
3. All emanations from a class A/B digital device or system, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strengths specified above.

Test Procedures:

- a. The EUT was placed 0.8m above a ground reference plane and 0.4 meters from the conducting wall of a shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). The LISN provides 50 ohm/ 50uH of coupling impedance for the measuring instrument.
- b. Both lines of the power mains connected to the EUT were checked for maximum conducted interference as well as the ground.
- c. The frequency range from 150 kHz to 30 MHz was searched. Emission levels over 10dB under the prescribed limits are not reported.
- d. Results were compared to the 15.207 limits.

Deviation from the test standard:

No deviation

EUT operating conditions:

Details can be found in section 2.1 of this report.

	Report Number:	R20210922-20-E1A	Rev	B
	Prepared for:	Garmin		

Test Results:

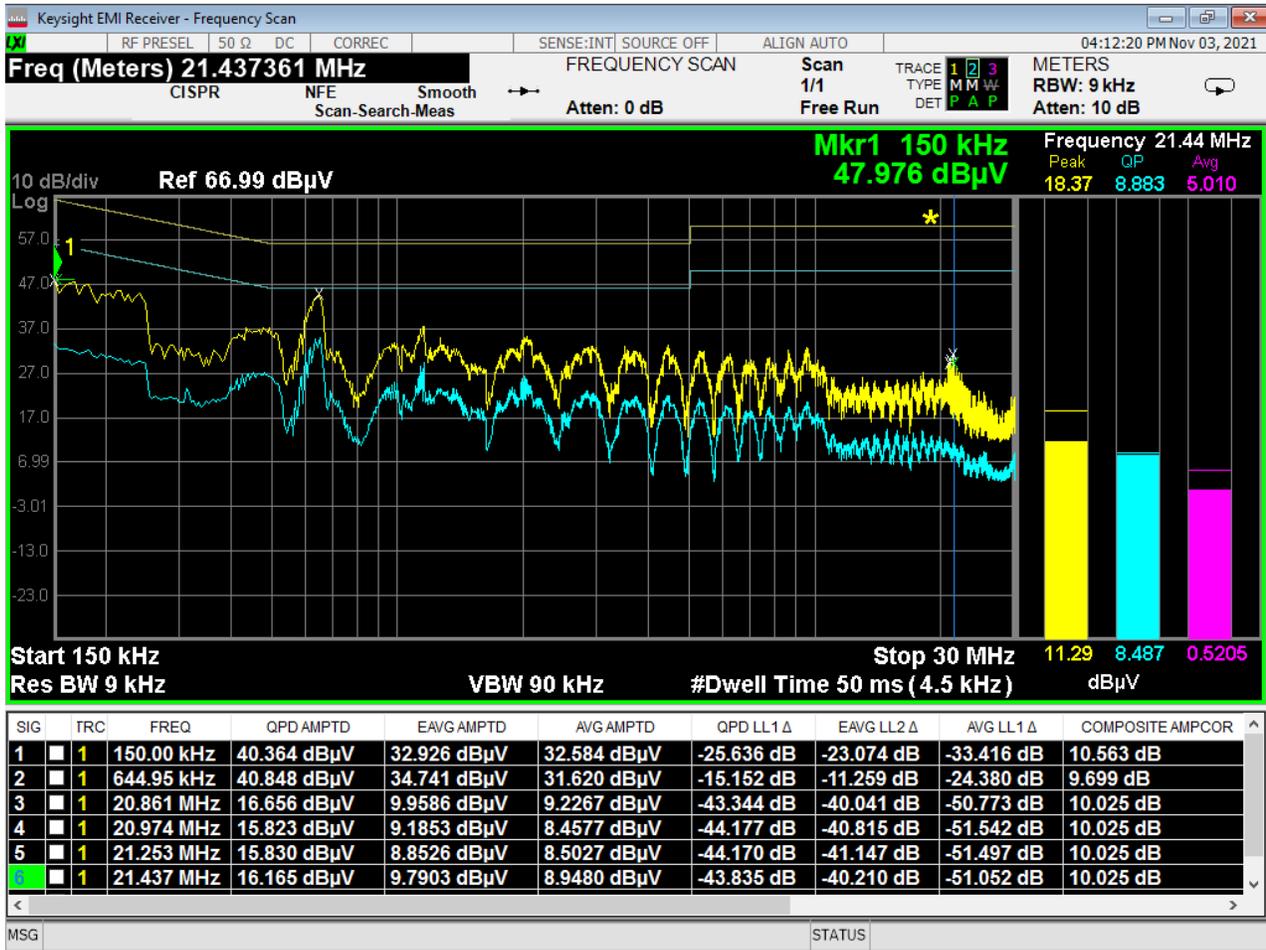


Figure 14 - Conducted Emissions Plot, Line

	Report Number: R20210922-20-E1A	Rev	B
	Prepared for: Garmin		

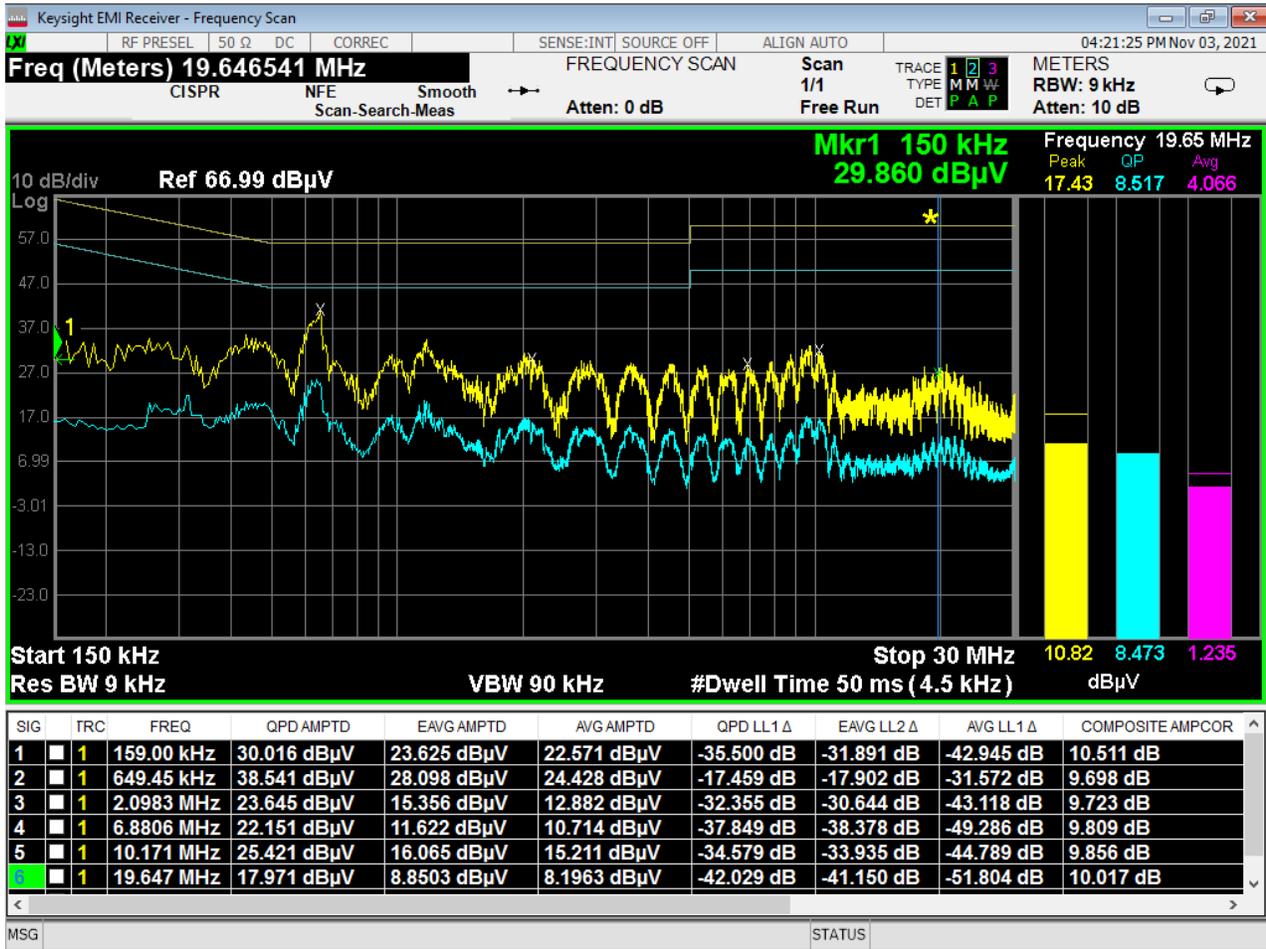


Figure 15 - Conducted Emissions Plot, Neutral

	Report Number:	R20210922-20-E1A	Rev	B
	Prepared for:	Garmin		

APPENDIX A: SAMPLE CALCULATION

Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as follows:

$$FS = RA + AF - (-CF + AG) + AV$$

where FS = Field Strength

RA = Receiver Amplitude

AF = Antenna Factor

CF = Cable Attenuation Factor

AG = Amplifier Gain

AV = Averaging Factor (if applicable)

Assume a receiver reading of 55 dB μ V is obtained. The Antenna Factor of 12 and a Cable Factor of 1.1 is added. The Amplifier Gain of 20 dB is subtracted, giving a field strength of 48.1 dB μ V/m.

$$FS = 55 + 12 - (-1.1 + 20) + 0 = 48.1 \text{ dB}\mu\text{V/m}$$

The 48.1 dB μ V/m value can be mathematically converted to its corresponding level in μ V/m.

$$\text{Level in } \mu\text{V/m} = \text{Common Antilogarithm} [(48.1 \text{ dB}\mu\text{V/m})/20] = 254.1 \mu\text{V/m}$$

AV is calculated by the taking the $20 \cdot \log(T_{\text{on}}/100)$ where T_{on} is the maximum transmission time in any 100ms window.

	Report Number:	R20210922-20-E1A	Rev	B
	Prepared for:	Garmin		

EIRP Calculations

In cases where direct antenna port measurement is not possible or would be inaccurate, output power is measured in EIRP. The maximum field strength is measured at a specified distance and the EIRP is calculated using the following equation;

$$EIRP (Watts) = [Field Strength (V/m) \times antenna distance (m)]^2 / 30$$

$$Power (watts) = 10^{[Power (dBm)/10]} / 1000$$

$$Voltage (dB\mu V) = Power (dBm) + 107 \text{ (for } 50\Omega \text{ measurement systems)}$$

$$Field Strength (V/m) = 10^{[Field Strength (dB\mu V/m) / 20]} / 10^6$$

$$Gain = 1 \text{ (numeric gain for isotropic radiator)}$$

Conversion from 3m field strength to EIRP (d=3):

$$EIRP = [FS(V/m) \times d^2]/30 = FS [0.3] \quad \text{for } d = 3$$

$$EIRP(dBm) = FS(dB\mu V/m) - 10(\log 10^9) + 10\log[0.3] = FS(dB\mu V/m) - 95.23$$

10log(10^9) is the conversion from micro to milli

	Report Number:	R20210922-20-E1A	Rev	B
	Prepared for:	Garmin		

APPENDIX B – MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been for tests performed in this test report:

Test	Frequency Range	Uncertainty Value (dB)
Radiated Emissions, 3m	30MHz - 1GHz	±3.82 dB
Radiated Emissions, 3m	1GHz - 18GHz	±4.44 dB
Emissions limits, conducted	30MHz – 18GHz	±3.30 dB
Antenna port conducted	9 kHz – 25 GHz	±0.50 dB

Values were calculated per CISPR 16-4-2:2011

Expanded uncertainty values are calculated to a confidence level of 95%.

	Report Number:	R20210922-20-E1A	Rev	B
	Prepared for:	Garmin		

REPORT END