

FCC / ISED & Test Report

For:

Garmin International

Brand:

Garmin

Marketing Name:

M/N A04674

Model Number:

A04674

Product Description:

Portable device with BLE, ANT, and LTE

FCC ID: IPH-04674 contains FCC ID: HSW-TY1SC **IC:** 1792A-04674 contains IC: 4492A-TY1SC

Applied Rules and Standards:

47 CFR Parts 24 and 27 RSS: 130 Issue 2, 133 Issue 6, 139 Issue 4

REPORT #: EMC_GARMI_117_24001_FCC_24_27_Rev1 DATE: 6/3/2024



A2LA Accredited

IC recognized # 3462B

CETECOM Inc.

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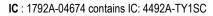




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Test Report #:

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1 **Assessment**

The following device as further described in section 3 of this report was evaluated against the applicable criteria specified in the Code of Federal Regulations Title 47 parts 24, 27 and Industry Canada Standards RSS-GEN issue 5, RSS-130 issue 2, RSS-133 issue 6, RSS-139 issue 4

No deficiencies were ascertained.

Company	Description	Model #	
Garmin International	Portable device with BLE, ANT, and LTE	A04674	

Responsible for the Report:

Art Thammanavarat

2024-06-03	Compliance	(Senior EMC Engineer)	
Date	Section	Name	Signature

The test results of this test report relate exclusively to the test item specified in Section3.

CETECOM Inc. USA does not assume responsibility for any conclusions and generalizations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by the test item. The test report may only be reproduced or published in full. Reproduction or publication of extracts from the report requires the prior written approval of CETECOM Inc. USA.

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2 Administrative Data

2.1 Identification of the Testing Laboratory Issuing the EMC Test Report

Company Name:	CETECOM Inc.
Department:	Compliance
Street Address:	411 Dixon Landing Road
City/Zip Code	Milpitas, CA 95035
Country	USA
Telephone:	+1 (408) 586 6200
Fax:	+1 (408) 586 6299
EMC Lab Manager:	Issa Ghama
Responsible Project Leader:	Sangeetha Sivaraman

2.2 Identification of the Client

Client Firm/Name:	Garmin International Inc	
Street Address:	1200 E. 151st. Street	
City/Zip Code	Olathe, KS 66062	
Country	USA	

2.3 Identification of the Manufacturer

Manufacturer's Name:	Garmin Corporation	
Manufacturers Address:	No.68, Zhangshu 2nd Rd., Xizhi Dist.	
City/Zip Code	New Taipei City 221	
Country	Taiwan, R.O.C.	

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3 **Equipment Under Test (EUT)**

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EUT Specifications 3.1

Model No	A04674			
HW Version	1			
SW Version	2.09			
FCC-ID:	IPH-04674 contains FCC ID: HSW-TY1SC			
IC:	1792A-04674 contains IC: 4492A-TY1SC			
HVIN:	A04674			
PMN:	M/N A04674			
Product Description	Portable device with BLE, ANT, and LTE			
Transceiver Technology / Type(s) of Modulation	Cellular Modules Model Name: Murata Model Number: LBAD0XX1SC FCC_: HSW-TY1SC Wireless Technologies LTE FDD/TDD Band: 2, 4,12			
Frequency Range	LTE Band 2: 1850 – 1910 MHz LTE Band 4: 1710 – 1755 MHz LTE Band 12: 699 – 716 MHz			
Max. declared antenna gain	Antenna type: Laser Direct Structuring (LDS) Antenna brand: Garmin Corp. Antenna model: 700-00195-01 Antenna gain: - LTE Band 2: 2.0 dBi - LTE Band 4: 0.4 dBi - LTE Band 12: -2.6 dBi Antenna impedance: 50 ohms			
Other Radios included in the device:	BTLE; ANT			
Power Supply/ Rated Operating Voltage Range	4.5 – 5.5 Vdc Rechargeable Lithium-Ion, Garmin PN: 361-00160-00.			
Operating Temperature Range	From -20° to 60°C (from -4° to 140°F)			
Sample Revision	☑Production ☐ Pre-Production			
Note: The information of the EUT	Note: The information of the EUT specifications in the table above is provided by the client.			

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3.2 **EUT Sample details**

E	EUT#	IMEI Number	Model Number	HW Version	SW Version	Comments
	1	351521107855074	A04674	1	2.09	

3.3 Accessory Equipment (AE) details

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AE#	Туре	Model	Manufacturer	Serial Number	Comments
1	Laptop	P135G	Dell	12243628947	Support laptop provided by Cetecom to exercise device.

Test Sample Configuration

Set-up #	EUT / AE used for set-up	Comments
1	EUT#1	Radiated RF measurements were performed with EUT configured via customer provided GUE and instructions.

3.5 Mode of Operation details

Mode of Operation	Description of Operating modes	Additional Information
		Cellular was tested on Mid Channels at maximum power in a cotransmission mode
Op. 1	Cellular and BT Co-Transmission	BT was configured to Mid channel using special commands through command window provided by the client that will not be available to the end user

Justification for Worst Case Mode of Operation 3.6

During the testing process the EUT was tested with transmitter sets on mid channels at the maximum power simultaneous transmission with BT Mid channel, which is the worst case of the radios supported, based on the maximum average conducted output power from the reports.

For radiated measurements, all data in this report shows the worst case between horizontal and vertical antenna polarizations and for all orientations of the EUT.

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4 Subject of Investigation

The objective of the measurements done by CETECOM Inc. was to evaluate the compliance of the EUT against the relevant requirements specified in the Code of Federal Regulations Title 47 parts 24, 27 and ISED Standards RSS-130 issue 2, RSS-133 issue 6, RSS-139 issue 4.

4.1 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus, with 95% confidence interval (in dB delta to result), based on a coverage factor k=2.

Radiated measurement

Measurement System		EMC 1	EMC 2
Conducted emissions (mains por	t)	1.12	N/A
Radiated emissions	(< 30 MHz)	3.28	2.98
	(30 MHz – 1 GHz)	3.16	2.81
	(1 – 3 GHz)	4.71	4.51
	(3 – 18 GHz)	4.23	4.16
	(18 – 40 GHz)	2.42	2.42

RF conducted measurement

 $\pm 0.5 dB$

According to TR 102 273 a multiplicative propagation of error is assumed for RF measurement systems. For this reason the RMS method is applied to dB values and not to linear values as appropriate for additive propagation of error. Also used: http://physics.nist.gov/cuu/Uncertainty/typeb.html. The above calculated uncertainties apply to direct application of the Substitution method. The Substitution method is always used when the EUT comes closer than 3dB to the limit.

4.2 Environmental Conditions During Testing:

The following environmental conditions were maintained during the course of testing:

- Ambient Temperature: 20-25°C
- Relative humidity: 40-60%

4.3 Dates of Testing:

2024-03-14 - 2024-03-21

4.4 Decision Rule:

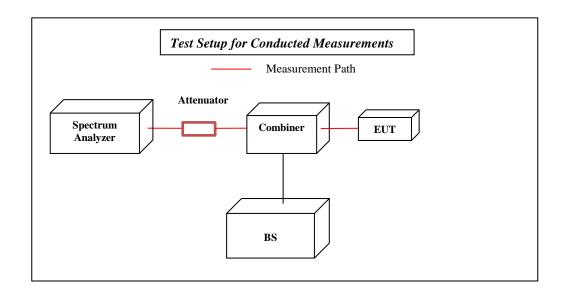
Cetecom advanced follows ILAC G8:2019 chapter 4.2.1 (Simple Acceptance Rule).

Only the measured values related to their corresponding limits will be used to decide whether the equipment under test meets the requirements of the test standards listed in chapter 3. The measurement uncertainty is mentioned in this test report, See chapter 9, but is not taken into account – neither to the limits nor to the measurement results. Measurement results with a smaller margin to the corresponding limits than the measurement uncertainty have a potential risk of more than 5% that the decision might be wrong.



5 **Measurement Procedures**

Testing is performed according to the guidelines provided in FCC publication (KDB) 971168 D01 v03r01 -"Measurement Guidance for Certification of Licensed Digital Transmitters" and according to relevant parts of ANSI/TIA-603-D-2010 as detailed below.



5.1 Radiated Measurement

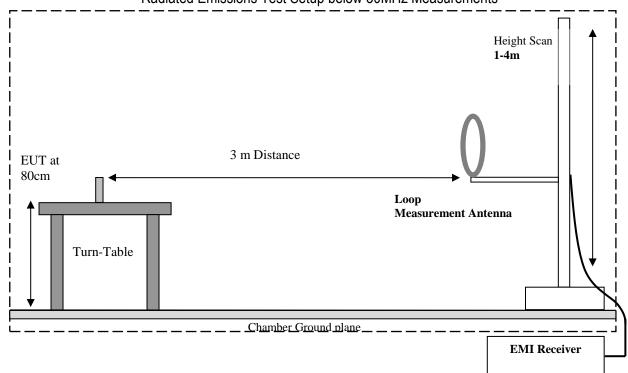
- The exploratory measurement is accomplished by running a matrix of 16 sweeps over the required frequency range with R&S Test-SW EMC32 for 4 positions of the turntable, two orthogonal positions of the EUT and both antenna polarizations. This procedure exceeds the requirement of the above standards to cover the 3 orthogonal axis of the EUT. A max peak detector is utilized during the exploratory measurement. The Test-SW creates an overall maximum trace for all 12 sweeps and saves the settings for each point of this trace. The maximum trace is part of the test report.
- The 10 highest emissions are selected with an automatic algorithm of EMC32 searching for peaks in the noise floor and ensuring that broadband signals are not selected multiple times.
- The maxima are then put through the final measurement and again maximized in a 90deg range of the turntable, fine search in frequency domain and height scan between 1m and 4m.
- The above procedure is repeated for all possible ways of power supply to EUT and for all supported modulations.
- In case there are no emissions above noise floor level only the maximum trace is reported as described
- The results are split up into up to 4 frequency ranges due to antenna bandwidth restrictions. A magnetic loop is used from 9 kHz to 30 MHz, a Biconilog antenna is used from 30 MHz to 1 GHz, and two different horn antennas are used to cover frequencies up to 40 GHz.

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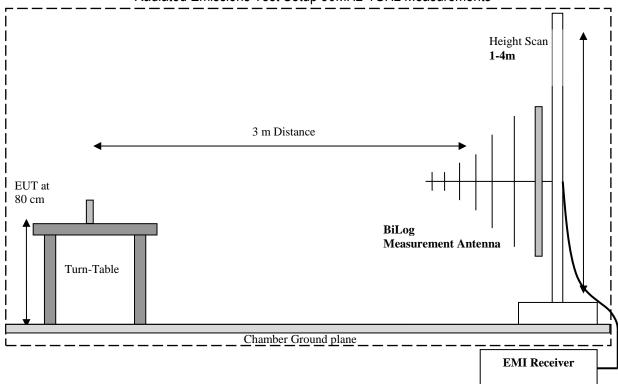
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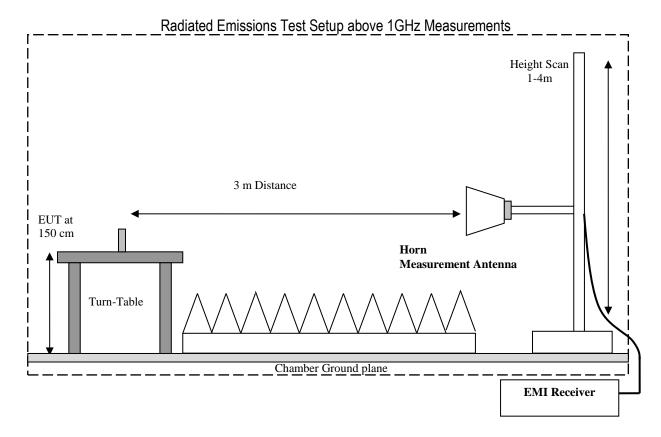
Radiated Emissions Test Setup below 30MHz Measurements



Radiated Emissions Test Setup 30MHz-1GHz Measurements







5.2 Sample Calculations for Field Strength Measurements

Field Strength is calculated from the Spectrum Analyzer/ Receiver readings, taking into account the following parameters:

- Measured reading in dBµV
- Cable Loss between the receiving antenna and SA in dB and
- Antenna Factor in dB/m

All radiated measurement plots in this report are taken from a test SW that calculates the Field Strength based on the following equation:

FS ($dB\mu V/m$) = Measured Value on SA ($dB\mu V$)+ Cable Loss (dB)+ Antenna Factor (dB/m)

Example:

Frequency	Measured SA	Cable Loss	Antenna Factor Correction (dB)	Field Strength Result
(MHz)	(dBµV)	(dB)		(dBµV/m)
1000	80.5	3.5	14	98.0

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Measurement Results Summary 6

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6.1 Part 24 / RSS-133

Test Specification	Test Case	Temperature and Voltage Conditions	Mode	Pass	Fail	NA	NP	Result
§2.1046; §24.232 (a) RSS-133 Clause 6.4	RF Output Power	Nominal	-					Complies Note 1 Note 2
§2.1047, RSS-133 Clause 6.2	Modulation Characteristics	Nominal	-					Complies Note 1 Note 2
§2.1055; §24.235 RSS-133 Clause 6.3	Frequency Stability	Extreme Temperature and Voltage	-					Complies Note 1 Note 2
§2.1049; §24.238 RSS-133 Clause 2.3	Occupied Bandwidth	Nominal	-					Complies Note 1 Note 2
§2.1051; §24.238 RSS-133 Clause 6.5	Band Edge Compliance	Nominal	-					Complies Note 1 Note 2
§2.1051; §24.238 RSS-133 Clause 6.5	Conducted Spurious Emissions	Nominal	-					Complies Note 1 Note 2
§2.1053; §24.238 RSS-133 Clause 6.6	Radiated Spurious Emissions	Nominal	Op. 1					Complies

Note 1: NA= Not Applicable; NP= Not Performed.

Note 2: Power Conducted (dBm) leveraged from test report "103652106LEX-007" prepared by Intertek of cellular module Murata Electronics / Model # LBAD0XX1SC

6.2 FCC 27 / RSS-130/ RSS-139

Test Specification	Test Case	Temperature and Voltage Conditions	Mode	Pass	Fail	NA	NP	Result
§2.1046; §27.50 / RSS- Clause 6.5	RF Output Power	Nominal	-				•	Complies Note 1 Note 2
§2.1047; §27.50/ RSS-Clause 6.2	Modulation Characteristics	Nominal	-				•	Complies Note 1 Note 2
§2.1055; §27.54 /RSS-Clause 6.4	Frequency Stability	Extreme Temperature and Voltage	-				•	Complies Note 1 Note 2
§2.1049; §27.53 /RSS-Clause 6.7	Occupied Bandwidth	Nominal	-					Complies Note 1 Note 2
§2.1051; §27.53 / RSS-Clause 6.6	Band Edge Compliance	Nominal	-					Complies Note 1 Note 2

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§2.1051; §27.53 / RSS-Clause 6.6	Conducted Spurious Emissions	Nominal	-			Complies Note 1 Note 2
§2.1053; §27.53 / RSS-Clause 6.6	Radiated Spurious Emissions	Nominal	Op. 1			Complies

Note 1: NA= Not Applicable; NP= Not Performed.

Note 2: Power Conducted (dBm) leveraged from test report "103652106LEX-007" prepared by Intertek of cellular module Murata Electronics / Model # LBAD0XX1SC

Test Report #:

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Test Result Data

7.1 **ERP/EIRP**

FCC Rule Parts	Band	Frequency Range	Power Conducted Note 1	Power Conducted	Gain	EIRP Note 2	ERP Note 2	Limit EIRP (W)	Limit ERP (W)	
i aito	(MHz		(dBm)	(W)	(dBi)	(W)	(W)			
24E	LTE 2	1850 – 1910	22.8	0.191	2.00	0.302	-	2	-	
27	LTE 4	1710 – 1755	22.97	0.198	0.40	0.217	-	1	-	
27	LTE 12	699 – 716	20.85	0.122	-2.60	-	0.041	-	3	

Note 1: Power Conducted (dBm) leveraged from test report "103652106LEX-007" prepared by Intertek of cellular module Murata Electronics / Model # LBADOXX1SC

Note 2: ERP/EIRP are based on calculations from Power Conducted by adding the declared maximum gain of the utilized cellular antenna per operational description.

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7.2 Radiated Spurious Emissions

7.2.1 Measurement utilizing KDB 971168 D01 Power Meas License Digital Systems v03r01, and according to ANSI/TIA-603-D-2010

Spectrum Analyzer Settings for FCC 22

poor and poor of an appearance process and poor										
Frequency Range	30MHz – 1 GHz	1 – 1.58 GHz	1.58 – 9 GHz							
Resolution Bandwidth	100 kHz	1 MHz	1 MHz							
Video Bandwidth	100 kHz	1 MHz	1 MHz							
Detector	Peak	Peak	Peak							
Trace Mode	Max Hold	Max Hold	Max Hold							
Sweep Time	Auto	Auto	Auto							

Spectrum Analyzer Settings for FCC 24 and 27

Frequency Range	30MHz – 1 GHz	1 – 2.7 GHz	2.7 – 18 GHz	18 – 19.1 GHz								
Resolution Bandwidth	100 kHz	1 MHz	1 MHz	1 MHz								
Video Bandwidth	100 kHz	1 MHz	1 MHz	1 MHz								
Detector	Peak	Peak	Peak	Peak								
Trace Mode	Max Hold	Max Hold	Max Hold	Max Hold								
Sweep Time	Auto	Auto	Auto	Auto								

7.2.2 Limits:

7.2.2.1 FCC Part 24.238 (a); FCC Part 27.53 (h)

Out of band emissions. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.

7.2.2.2 RSS-133 Part 6.5; RSS-139 Part 5.6; Transmitter Unwanted Emissions

Mobile and base station equipment shall comply with the limits in (i) and (ii) below.

i.In the first 1.0 MHz band immediately outside and adjacent to each of the sub-bands specified in Section 5.1, the power of emissions per any 1% of the occupied bandwidth shall be attenuated (in dB) below the transmitter output power P (dBW) by at least 43 + 10 log10p (watts).

ii. After the first 1.0 MHz immediately outside and adjacent to each of the sub-bands, the power of emissions in any 100 kHz bandwidth shall be attenuated (in dB) below the transmitter output power P (dBW) by at least 43 + 10 log10 p (watts). If the measurement is performed using 1% of the occupied bandwidth, power integration over 100 kHz is required.

Note: The limit calculation result is a constant of -13 dBm.

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7.2.3 Test conditions and setup:

Ambient Temperature (°C)	EUT Set-Up #	EUT operating mode	Power Input
23.0	1	1	5Vdc

7.2.4 **Measurement result:**

Plot #	Channel	EUT operating mode	Scan Frequency	Lowest margin emission (dBm)	Limit (dBm)	Result
1-4	Mid	LTE Band 2	30 MHz – 22 GHz	-26.89	-13	Pass
5-7	Mid	LTE Band 4	30 MHz – 18 GHz	-27.59	-13	Pass
8-10	Mid	LTE Band 12	30 MHz – 18 GHz	-26.83	-13	Pass

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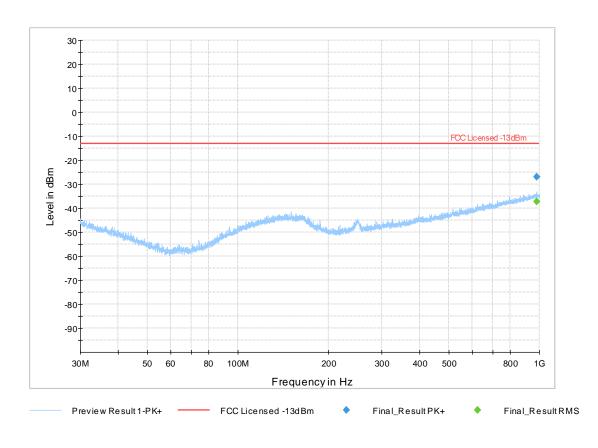


7.2.5 **Measurement Plots:**

Plot # 1 Radiated Emissions: 30 MHz - 1GHz

Channel: Mid

	Frequency (MHz)	MaxPeak (dBm)	RMS (dBm)	Limit (dBm)	Margin (dB)	Meas. Time	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Sig Path	Preamp (dB)	Trd Corr.	Raw Rec
-	977.781		-			500.0	120.000	400.0	Н	112.0	-62.7	2.7	0.0	-65.5	25.4
	977.781	-26.885		-13.00	13.88	500.0	120.000	400.0	Η	112.0	-62.7	2.7	0.0	-65.5	35.9



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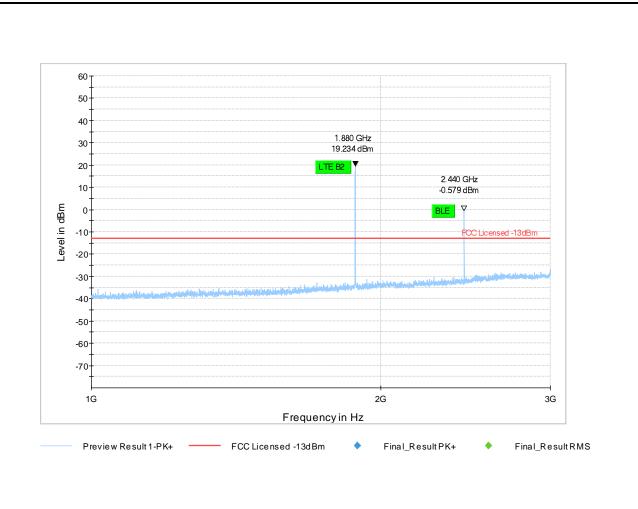
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Channel: Mid



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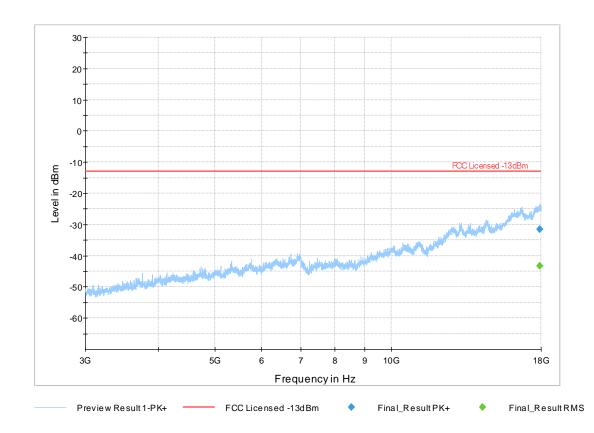
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Plot # 3 Radiated Emissions: 3 GHz - 18 GHz

Channel: Mid

	Frequency (MHz)	MaxPeak (dBm)	RMS (dBm)	Limit (dBm)	Margin (dB)	Meas. Time	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Sig Path	Preamp (dB)	Trd Corr.	Raw Rec
Ī	17891.250		-			500.0	1000.000	164.0	٧	67.0	-79.8	16.2	-42.4	-53.6	36.5
	17891.250	-31.483	-	-13.00	18.48	500.0	1000.000	164.0	٧	67.0	-79.8	16.2	-42.4	-53.6	48.3



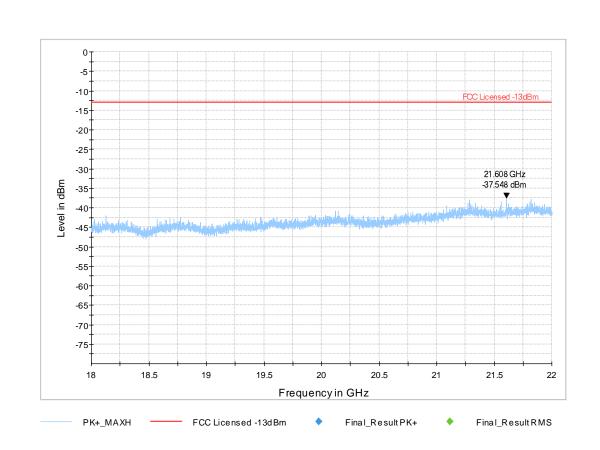
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Plot # 4 Radiated Emissions: 18 GHz - 22 GHz

Channel: Mid



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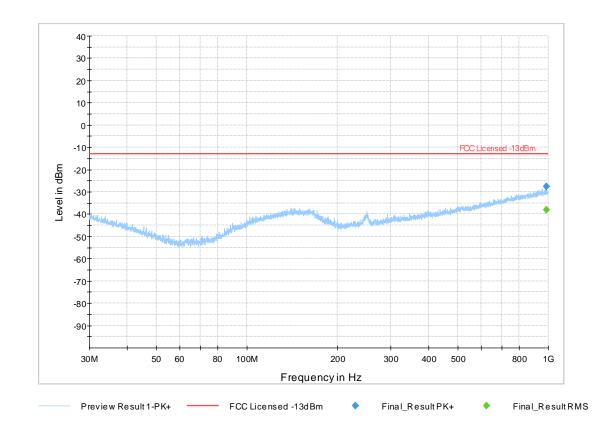
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Plot # 5 Radiated Emissions: 30 MHz - 1GHz

Channel: Mid

Frequency (MHz)	MaxPeak (dBm)	RMS (dBm)	Limit (dBm)	Margin (dB)	Meas. Time	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Sig Path	Preamp (dB)	Trd Corr.	Raw Rec
985.844		-	-13.00	25.18	500.0	100.000	377.0	Н	230.0	-62.7	2.7	0.0	-65.4	24.5
985.844	-27.594		-13.00	14.59	500.0	100.000	377.0	Н	230.0	-62.7	2.7	0.0	-65.4	35.1



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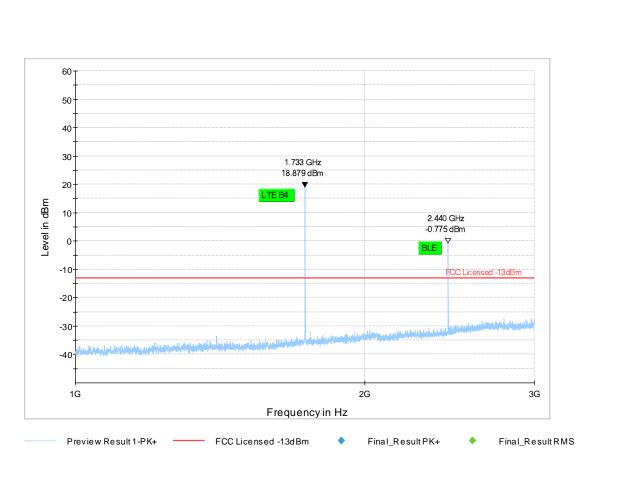
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Plot # 6 Radiated Emissions: 1 GHz - 3 GHz

Channel: Mid



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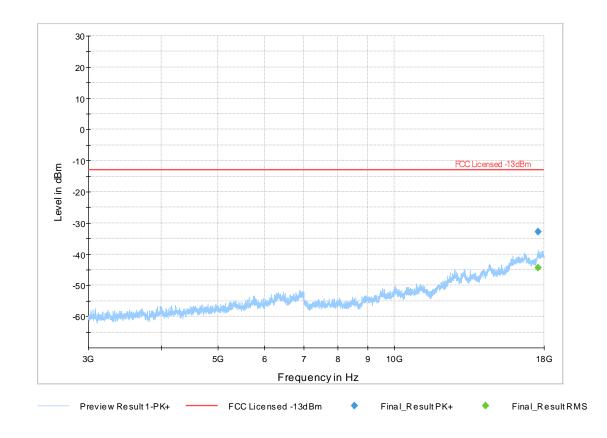
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Plot # 7 Radiated Emissions: 3 GHz - 18 GHz

Channel: Mid

Frequence (MHz)	y MaxPeak (dBm)	RMS (dBm)	Limit (dBm)	Margin (dB)	Meas. Time	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Sig Path	Preamp (dB)	Trd Corr.	Raw Rec
17597.8	3	-	-13.00	31.41	500.0	1000.000	319.0	٧	-37.0	-80.2	16.5	-42.8	-53.9	35.7
17597.8	3 -32.719		-13.00	19.72	500.0	1000.000	319.0	٧	-37.0	-80.2	16.5	-42.8	-53.9	47.4



 ${\tt EMC_GARMI_117_24001_FCC_22_24_27_Rev1} \quad \textbf{FCC ID} : {\tt IPH-04674} \ \ contains \ \ {\tt FCC \ ID} : {\tt HSW-TY1SC}$

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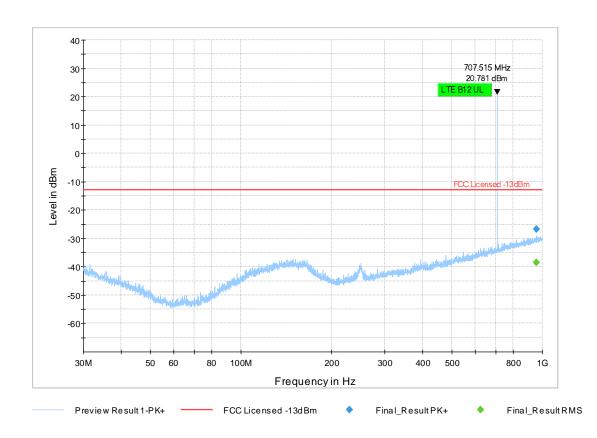
IC: 1792A-04674 contains IC: 4492A-TY1SC



Plot # 8 Radiated Emissions: 30 MHz - 1GHz

Channel: Mid

Frequency (MHz)	MaxPeak (dBm)	RMS (dBm)	Limit (dBm)	Margin (dB)	Meas. Time	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Sig Path	Preamp (dB)	Trd Corr.	Raw Rec
956.805		-	-13.00	25.43	500.0	100.000	301.0	٧	217.0	-63.2	2.6	0.0	-65.8	24.7
956.805	-26.826		-13.00	13.83	500.0	100.000	301.0	٧	217.0	-63.2	2.6	0.0	-65.8	36.3



 ${\sf EMC_GARMI_117_24001_FCC_22_24_27_Rev1} \quad \textbf{FCC ID} : \mathsf{IPH-04674} \ \, \mathsf{contains} \ \, \mathsf{FCC} \ \, \mathsf{ID} : \mathsf{HSW-TY1SC}$ Page 24 of 27

IC: 1792A-04674 contains IC: 4492A-TY1SC



Plot # 9 Radiated Emissions: 1 GHz - 3 GHz **Channel: Mid** 60-50 40 30 20 2.440 GHz 10 -1.046 dBm -10 -20 -30 -40 -50 -60 1G 3G Frequency in Hz Preview Result 1-PK+ FCC Licensed -13dBm Final_ResultPK+ Final_ResultRMS

 ${\sf EMC_GARMI_117_24001_FCC_22_24_27_Rev1} \quad \textbf{FCC ID} : \mathsf{IPH-04674} \ \, \mathsf{contains} \ \, \mathsf{FCC} \ \, \mathsf{ID} : \mathsf{HSW-TY1SC}$

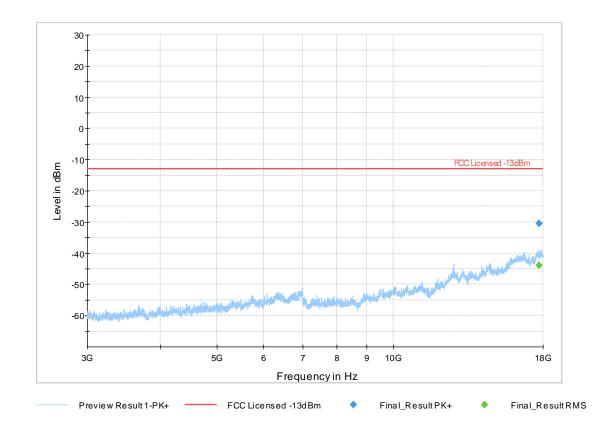
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Plot # 10 Radiated Emissions: 3 GHz - 18 GHz

Channel: Mid

Frequency (MHz)	MaxPeak (dBm)	RMS (dBm)	Limit (dBm)	Margin (dB)	Meas. Time	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Sig Path	Preamp (dB)	Trd Corr.	Raw Rec
17697.656		-	-13.00	30.91	500.0	1000.000	165.0	٧	53.0	-80.2	16.4	-42.7	-53.8	36.3
17697.656	-30.474	-	-13.00	17.47	500.0	1000.000	165.0	٧	53.0	-80.2	16.4	-42.7	-53.8	49.7



Test Report #:

 ${\sf EMC_GARMI_117_24001_FCC_22_24_27_Rev1} \quad \textbf{FCC ID}: \mathsf{IPH-04674} \ \, \mathsf{contains} \ \, \mathsf{FCC} \ \, \mathsf{ID}: \mathsf{HSW-TY1SC}$

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8 Test setup photos

Setup photos are included in supporting file name: "EMC_GARMI_117_24001_FCC_Setup_photos.pdf"

Test Equipment And Ancillaries Used For Testing 9

Equipment Type	Manufacturer	Model	Serial #	Calibration Cycle	Last Calibration Date
BILOG ANTENNA	A.H. SYSTEMS	BiLA2G	569	3 YEARS	10/30/2023
HORN ANTENNA	EMCO	3115	00035111	3 YEARS	10/26/2023
HORN ANTENNA	ETS LINDGREN	3117-PA	00167061	3 YEARS	9/25/2023
HORN ANTENNA	ETS LINDGREN	3116C-PA	00166821	3 YEARS	10/26/2023
ESW.EMI TEST RECEIVER	ROHDE & SCHWARZ	ESW44	101715	3 YEARS	10/24/2023
DIGITAL THRMOMETER	Control Company	4410,90080-03	230712972	3 YEARS	10/18/2023
Software	EMC32	Version 10.50.40	-	-	-

Note: Equipment used meets the measurement uncertainty requirements as required per applicable standards for 95% confidence levels. Calibration due dates, unless defined specifically, falls on the last day of the month. Items indicated "N/A" for cal status either do not specifically require calibration or is internally characterized before use.

Test Report #:

 ${\sf EMC_GARMI_117_24001_FCC_22_24_27_Rev1} \quad \textbf{FCC ID} : \mathsf{IPH-04674} \ \, \mathsf{contains} \ \, \mathsf{FCC} \ \, \mathsf{ID} : \mathsf{HSW-TY1SC}$



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IC: 1792A-04674 contains IC: 4492A-TY1SC

10 Revision History

Date	Template Revision	Changes to report	Prepared by
5/20/2024	EMC_GARMI_117_24001_FCC_22_24_27	Initial Version	Art Thammanavarat
6/3/2024	EMC_GARMI_117_24001_FCC_22_24_27_Rev1	Report revised base on TCB's feedback. Section 7.1: Corrected Typo.	Art Thammanavarat

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