



Test Report - FCC PART 1.1310 / MPE

Applicant: Navico Inc.

Approved for Release By:

Signature: Bruno Clavier

Name & Title: Bruno Clavier, General Manager

Date of Signature 3/30/2022

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Timco Engineering, Inc., an IIA Company
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1. Customer Information

Applicant: Navico Inc.
Address: 4500 S. 129th East Avenue
Suite 200
Tulsa Oklahoma, 74134-5885, United States

2. Location of Testing

2.1 Test Laboratory

Timco Engineering Inc. is a subsidiary of Industrial Inspection & Analysis, Inc. ("IIA"). Testing was performed at Timco's permanent laboratory located at 849 NW State Road 45, Newberry, Florida 32669

FCC test firm # 578780
FCC Designation # US1070
FCC site registration is under A2LA certificate # 0955.01
ISED Canada test site registration # 2056A
EU Notified Body # 1177
For all designations see A2LA scope # 0955.01



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2.2 Testing was performed, reviewed by

Dates of Testing: 10/29/2021 – 11/18/2021

Signature:

Sr. EMC Engineer
EMC-003838-NE



Name & Title:

Tim Royer, EMC Engineer

Date of Signature

3/30/2022

Signature:

Name & Title:

Terri Allen, Technical Assistant

Date of Signature

3/30/2022



3. Test Sample(s) (EUT/DUT)

The test sample was received: 10/29/2021

3.1 Description of the EUT

A description as well as unambiguous identification of the EUT(s) tested. Where more than one sample is required for technical reasons (such as the use of connected units for the purpose of conducted output power testing where the product units will have integral antennas), each specific test shall identify which unit was tested.

Identification	
FCC ID:	RAYHALO3000
Brief Description	SIMRAD HALO 3000 SERIES Pulse Compression Radar
Model(s) #	HALO 3000 SERIES
Firmware version	n/a
Software version	8.1.99.91
Serial Number	2106951005

Technical Characteristics	
Technology	Pulse Compression Radar
Frequency Range	9.3 GHz – 9.5 GHz
RF O/P Power (Max.)	130 W
Modulation	Pulse/ FM Chirp
Bandwidth & Emission Class	PON
Duty Cycle	8.0 %
Antenna Connector	WR90
Voltage Rating (AC or Batt.)	12V DC

Antenna Characteristics		
Frequency Range	Mode / BW	Antenna Gain
9.3 GHz – 9.5 GHz	n/a	29 dBi



4. Test methods & Applicable Regulatory Limits

4.1 Test methods/Standards/Guidance:

The following guidance FCC KDB 447498 D01 General RF Exposure Guidance v06 was used for RF exposure evaluation as per FCC Part 1.1310 and FCC Part 2.1091 and part 2.1093. Full test results are available in this report.

4.1.1 FCC Limits for Maximum Permissible Exposure (MPE)

Frequency Range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm ²)	Averaging Time (minutes)
A Limits for Occupational/Controlled Exposure				
0.3-3.0	614	1.63	*(100)	≤6
3.0-30	1842/f	4.89/f	*(900/f ²)	<6
30-300	61.4	0.163	1.0	<6
300-1,500			f/300	<6
1,500-100,000			5	<6
B Limits for General Population/Uncontrolled Exposure				
0.3-1.34	614	1.63	*(100)	<30
1.34-30	824/f	2.19/f	*(180/f ²)	<30
30-300	27.5	0.073	0.2	<30
300-1,500			f/1500	<30
1,500-100,000			1.0	<30



4.2 Equations

POWER DENSITY

$$E(V/m) = \text{SQRT} (30 * P * G) / d$$

$$Pd(W/m^2) = E^2 / 377$$

$$S = \text{EIRP} / (4 * \text{Pi} * D^2)$$

Where:

S = Power density, in mW/cm²

EIRP = Equivalent Isotropic Radiated Power, in mW

D = Separation distance in cm

Power density is converted from units of mW/cm² to units of W/m² by multiplying by 10.

DISTANCE

$$D = \text{SQRT} (\text{EIRP} / (4 * \text{Pi} * S))$$

Where:

D = Separation distance in cm

EIRP = Equivalent Isotropic Radiated Power, in mW

S = Power density in mW/cm²

SOURCE-BASED DUTY CYCLE (When applicable (for example, multi-slot mobile phone applications) A duty cycle factor may be applied.)

$$\text{Source-based time-average EIRP} = (\text{DC} / 100) * \text{EIRP}$$

Where:

DC = Duty Cycle in % as applicable.

EIRP = Equivalent Isotropic radiated Power, in mW



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5. RF Exposure Results

MPE

Frequency Band	Evaluation Distance (cm)	Max Power + Tolerance (dBm)	Antenna Gain (dBi)	Duty Cycle (%)	EIRP (W)	Power Density	Limit for Uncontrolled Exposure	Limit for Controlled Exposure	Distance Required to meet Uncontrolled Exposure Limit (cm)
9300-9500 MHz	20	69.57	29.00	8%	9059.20	1802.271 mW/cm ²	1 mW/cm ²	5 mW/cm ²	849.06

RESULT: Pass at DISTANCE 849.06 cm



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6. History of Test Report Changes

Test Report #	Revision #	Description	Date of Issue
TR_5474-21_FCC PT 1.1310/ MPE_	1	Initial release	2/01/2022
	2	Updated Pages 5, 8	3/18/2022



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END OF TEST REPORT
