

9/4/2024

HLI Solutions, Inc.
710 Hesters Crossing
Round Rock, TX 78681
USA

Dear Justin Foster,

Enclosed is the EMC test report for testing of the HLI Solutions, Inc., NXOFM2 tested to the requirements of FCC Part 2.1091 and RSS-102 Issue 6

Thank you for using the services of Eurofins E&E North America. If you have any questions regarding these results or if MET can be of further service to you, please do feel free to contact me.

Sincerely,



Nancy LaBrecque
Documentation Department
Eurofins Electrical and Electronic Testing NA, Inc.

Reference: WIRA132106-MPE_R2



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**RF Exposure Criteria
Test Report
Using Maximum Permissible Exposure (MPE) Calculations**

for the

HLI Solutions, Inc.
NXOFM2

Tested under

FCC Part 2.1091 and RSS-102 Issue 6

Report: WIRA132106-MPE_R2

9/4/2024



Bryan Taylor, Wireless Team Lead
Electromagnetic Compatibility Lab



Nancy LaBrecque
Documentation Department

Engineering Statement: The measurements shown in this report were made in accordance with the procedures indicated, and the emissions from this equipment were found to be within the limits applicable. I assume full responsibility for the accuracy and completeness of these measurements, and for the qualifications of all persons taking them. It is further stated that upon the basis of the measurements made, the equipment tested is capable of operation in accordance with the requirements of the FCC Rules Part 15.247 under normal use and maintenance.



Matthew Hinojosa
EMC Manager, Austin Electromagnetic Compatibility Lab

Report Status Sheet

Revision	Report Date	Reason for Revision
0	6/25/2024	Initial Issue.
1	7/23/2024	Changes requested by the client.
2	9/4/2024	Changes requested by reviewer.

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List of Terms and Abbreviations

AC	Alternating Current
ACF	Antenna Correction Factor
Cal	Calibration
<i>d</i>	Measurement Distance
dB	Decibels
dBμA	Decibels above one microamp
dBμV	Decibels above one microvolt
dBμA/m	Decibels above one microamp per meter
dBμV/m	Decibels above one microvolt per meter
DC	Direct Current
E	Electric Field
DSL	Digital Subscriber Line
ESD	Electrostatic Discharge
EUT	Equipment Under Test
<i>f</i>	Frequency
CISPR	Comite International Special des Perturbations Radioelectriques (International Special Committee on Radio Interference)
GRP	Ground Reference Plane
H	Magnetic Field
HCP	Horizontal Coupling Plane
Hz	Hertz
IEC	International Electrotechnical Commission
kHz	kiloHertz
kPa	kiloPascal
kV	kilovolt
LISN	Line Impedance Stabilization Network
MHz	MegaHertz
μH	microHenry
μF	microFarad
μs	microseconds
PRF	Pulse Repetition Frequency
RF	Radio Frequency
RMS	Root-Mean-Square
V/m	Volts per meter
VCP	Vertical Coupling Plane

1.0
Requirements Summary

Page Number	Test Name	Result
12	RSS-102 Issue 6 MPE Limits (For General Public Exposure)	Compliant
12	FCC Part 2.1091 MPE Limits (For General Public Exposure)	Compliant

Table 1. Summary of Test Results

2.0 Equipment Configuration

2.1 Overview

Eurofins MET Labs was contracted by HLI Solutions, Inc. to perform testing on the NXOFM2, under HLI Solutions, Inc.'s purchase order number 4710448434.

This document describes the test setups, test methods, required test equipment, and the test limit criteria used to perform compliance testing of the HLI Solutions, Inc. NXOFM2.

The results obtained relate only to the item(s) tested.

Product Name:	NXOFM2	
Model(s) Tested:	NXOFM2	
Model(s) Covered:	NXOFM2	
FCCID:	YH9NXOFM2	
ICID:	9044A-NXOFM2	
Serial Number or Sample Number:	Test Sample 1	
EUT Specifications:	Primary Power: 120Vac – 480Vac	
	Type of Modulations:	GFSK
	Equipment Code:	DTS
	Peak RF Output Power:	10.72dBm
	EUT Frequency Ranges:	2402MHz – 2480MHz
	Antenna Gain ¹ :	6dBi (peak gain indicated on the data sheet)
Analysis:	The results obtained relate only to the item(s) tested.	
Environmental Test Conditions:	Temperature: 15-35° C	
	Relative Humidity: 30-60%	
	Barometric Pressure: 860-1060 mbar	
Evaluated by:	Bryan Taylor	
Report Date(s):	5/28/2024 through 6/17/2024	

Table 2. EUT Summary Table

¹ The antenna gain information was provided by HLI Solutions, Inc. and may affect compliance.

2.2 Test Site

All testing was performed at Eurofins E&E North America, Austin, TX. All equipment used in making physical determinations is accurate and bears recent traceability to the National Institute of Standards and Technology.

2.3 References

RSS-102: Issue 6	Radio Frequency (RF) Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands)
FCC Part 2.1091	Radiofrequency radiation exposure evaluation: mobile devices.

Table 3. References

2.4 Description of Test Sample

The NXFM series On-Fixture Module enables a complete control solution for a single luminaire. The On-Fixture Module incorporates a single pole relay for On/Off control as well as industry standard 0 - 10 volt continuous dimming control. An auxiliary input and auxiliary 12 volt power output are available through the 7-pin interface. The input can be programmed to act as any of the NX input types including occupancy and various switch types. On-board power metering circuitry accurately measures current and voltage. The water tight twist lock package contains the control logic, NX Network radio, Bluetooth® radio antennas, and 0 - 10 volt dimming driver. The twist lock form factor allows for easy installation and removal of the module on luminaires equipped with a compatible 7-pin twist lock receptacle. Setup and programming is performed using any Android® or iOS® smart device with an available App that is free for download.

2.5 Mode of Operation

Special radio software was installed on the test sample such that with every power cycle the sample would switch from transmitting on low to mid and then high channels as outlined below at maximum output power.

The EUT has the capability to operate in BLE and Wirepas modes. Wirepas has similar characteristics and power levels as BLE and uses the same physical layer as BLE. Therefore, test data for BLE mode is reported in this report.

Transmit Band	Modulation	Channel Frequencies Tested	Test Tool Power Setting
2400 – 2483.5MHz	BLE (GFSK)	2402MHz / 2440MHz / 2480MHz	NA

Table 4. Test Channels Utilized

2.6 Modifications

2.6.1 Modifications to EUT

No modifications were made to the EUT.

2.6.2 Modifications to Test Standard

No modifications were made to the test standard.

2.7 Disposition of EUT

The test sample including all support equipment submitted to the Electro-Magnetic Compatibility Lab for testing was returned to HLI Solutions, Inc. upon completion of testing.

2.8 RSS-102 RF Exposure Limits

Table 4: RF Field Strength Limits for Devices Used by the General Public (Uncontrolled Environment)				
Frequency Range (MHz)	Electric Field (V/m rms)	Magnetic Field (A/m rms)	Power Density (W/m ²)	Reference Period (minutes)
0.003-10 ²¹	83	90	-	Instantaneous*
0.1-10	-	0.73/ f	-	6**
1.1-10	87/ f ^{0.5}	-	-	6**
10-20	27.46	0.0728	2	6
20-48	58.07/ f ^{0.25}	0.1540/ f ^{0.25}	8.944/ f ^{0.5}	6
48-300	22.06	0.05852	1.291	6
300-6000	3.142 f ^{0.3417}	0.008335 f ^{0.3417}	0.02619 f ^{0.6834}	6
6000-15000	61.4	0.163	10	6
15000-150000	61.4	0.163	10	616000/ f ^{1.2}
150000-300000	0.158 f ^{0.5}	4.21 x 10 ⁻⁴ f ^{0.5}	6.67 x 10 ⁻⁵ f	616000/f ^{1.2}
Note: f is frequency in MHz. * Based on nerve stimulation (NS). ** Based on specific absorption rate (SAR).				

2.9 FCC Exposure Limits

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm ²)	Averaging time (minutes)
(i) 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
(ii) 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
f = frequency in MHz. * = Plane-wave equivalent power density.				

Test Procedure:

An MPE evaluation for was performed in order to show that the device was compliant with the general population exposure limits. The maximum power density was calculated for each transmitter band at a separation distance of 20cm using the maximum declared output power including tune up tolerance.

For each transmitter the maximum RF exposure at a 20 cm distance using the formula:

$$ConductedPower_{mW} = 10^{ConductedPower(dBm)/10}$$

$$PowerDensity = \frac{ConductedPower_{mW} \times Ant.Gain}{4\pi \times (20_{cm})^2}$$

For transmitters that could operate simultaneously, the MPE to limit ratio for each was calculated and then summed. If the sum of the MPE to limit ratios was less than 1, that specific combination of transmitters was deemed to comply.

Test Results:

The NXOFM2 was **compliant** with FCC Part 2.1091 and RSS-102 Issue 6. The calculated maximum power density at 20cm distance was equal to or less than the required limits for general population exposure for FCC Part 2.1091 and RSS-102 Issue 6.

Test Data:

Duty Cycle	100 (%)						
Separation Dist.	20 (cm)						
Operating Mode	Frequency (MHz)	Declared Max Cond. Power (Inc. Tolerance) (dBm)	Duty Cycle Adjusted Cond. Output Power (dBm)	Antenna Gain (dB)	MPE Value (mW/cm ²)	MPE Limit (mW/cm ²)	Margin to Limit (mW/cm ²)
BLE	2402	10.72	10.72	2.7	0.0044	1.0000	0.9956

FCC MPE Data

Duty Cycle	100 (%)						
Separation Dist.	20 (cm)						
Operating Mode	Frequency (MHz)	Declared Max Cond. Power (Inc. Tolerance) (dBm)	Duty Cycle Adjusted Cond. Output Power (dBm)	Antenna Gain (dB)	MPE Value (W/m ²)	MPE Limit (W/m ²)	Margin to Limit (W/m ²)
BLE	2402	10.72	10.72	2.7	0.0437	5.3508	5.3071

ISED MPE Data

Test Engineer(s): Bryan Taylor

Test Date(s): 6/17/2024