

Rogers Labs, a division of The Compatibility Center LLC

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FCC / ISED RF Exposure Evaluation Report

Model: HALOW1
HaLow Module
CARGT Inc.

9825 Widmer Road
Lenexa, KS 66215

FCC ID: 2AQ2Q-HALOW1
IC ID: 27013-HALOW1

Test Report Number: 250514

Test Date: May14, 2025 – January 13, 2026

Authorized Signatory: 

Patrick Powell

Rogers Labs, a division of The Compatibility Center LLC

FCC Designation: US5305

ISED Registration: 3041A

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Revisions

Revision 1 February 24, 2026 – Initial Release

Executive Summary

The purpose of this report is to evaluate the EUT's transmitter for exemption from routine SAR testing. This module is a mobile device and is used in Public / Uncontrolled environments.

Regulatory Requirements:

FCC:

47CFR 1.1307

Per 47CFR §1.1310 and §2.091 RF Exposure is calculated.

This is a mobile device so MPE is required.

Limits for Maximum Permissive Exposure (MPE):

FCC radio frequency radiation exposure limits per 1.1310		
Frequency (MHz)	Occupational Limit W/m ²	Public Limit W/m ²
300-1,500	$f/30$	$f/150$
1,500-100,000	50	10

Industry Canada:

RSS-102 Issue 6

Limits for Maximum Permissive Exposure (MPE):

IC radio frequency radiation exposure limits per RSS-102, Issue 6 Field Reference Level FRL Limit (W/m ²)			
Frequency (MHz)	Uncontrolled	Frequency (MHz)	Controlled
10-20	2.0	10-20	10.0
20-48	$8.944/f^{0.5}$	20-48	$44.72/f^{0.5}$
48-300	1.291	48-100	6.455
300-6,000	$0.02619*f^{0.6834}$	100-6,000	$0.6455*f^{0.5}$
6,000-15,000	10.0	6,000-15,000	50.0
15,000-150,000	10.0	15,000-150,000	50.0
150,000-300,000	$6.67*(10^{-5})*f$	150,000-300,000	$3.33*(10^{-4})*f$

Applicant:

Name of Applicant: CARGT Inc.
 9825 Widmer Road
 Lenexa, KS 66215

EUT details:

Names and IDs:

HVIN: HALOW1
 PMN/Model: HALOW1
 FCC ID: 2AQ2Q-HALOW1
 Industry Canada: 27013-HALOW1
 Operating Frequency Range: 903.5 – 926.5 MHz

Transmitter Modes:

Mode	Transmitter Operation
1	802.11ah – 1MHz
2	802.11ah – 2MHz
3	802.11ah – 4MHz
4	802.11ah – 8MHz

Equipment & Accessory List

Model: HALOW1

CARGT Inc.

9825 Widmer Road

Lenexa, KS 66215

<u>Equipment</u>	<u>Model / PN</u>	<u>Serial Number</u>
EUT #2 Antenna Port Conducted	HALOW1	N/A
Carrier Board	012-00326-00	N/A
Host Adapter (M.2)	012-00375-00	N/A
A/C Adapter	Model: 1230	N/A
USB to RJ45 adapter	UE306	Y238014005865
Ethernet cable	N/A	N/A

Test results in this report relate only to the items tested. Worst-case configuration data recorded in this report.

All antennas operate within the same frequency band(s) and are connected to the only RF transmitter chain.

Software (FVIN): rel_1_14_1_2024_Dec_05 or newer

Antenna Configuration Summary

The module supports four antenna options as shown below:

Antenna #	Type	Peak Gain (dBi)	Location	Connector
1	Flexible Printed Circuit (FPC)	-0.90	External	u.FL
2	Dipole	1.2	External	SMA
3	Omni	3	External	NMO
4	Flexible Printed Circuit (FPC)	3.6	External	u.FL

The device employs a single transmitter architecture.

All antennas operate within the same frequency band(s) and are connected to the same RF transmitter chain.

Only one antenna is active at a time.

The module is approved for use only with the antennas listed in this filing or antennas with equal or lower gain.

The maximum permitted antenna gain is 3.6 dBi.

Use of antennas exceeding this gain requires a Class II permissive change or new FCC certification.

Equipment Function

The EUT device is a solder down module containing a WiFi Halow (802.11ah) transmitter that is connected by soldered pads to a carrier PCB designed by the host manufacturer that integrates this module.

The antennas listed above are the only ones approved for use with the module. The antenna port for this module is in the solder balls that are provided for connection to the host's PCB. It is therefore unique. The host manufacturer is responsible for and bound to following the integration guide provided by the device's module certification holder.

For testing purposes, the EUT was placed on a test fixture with a u.FL connector. All antennas on the approved list were tested by connecting to it.

Test Site Locations

Conducted EMI AC line conducted emissions testing performed in a shielded screen room located at Rogers Labs, a division of The Compatibility Center LLC, 7915 Nieman Rd., Lenexa, KS.

Antenna port Antenna port conducted emissions testing was performed in a shielded screen room located at Rogers Labs, a division of The Compatibility Center LLC, 7915 Nieman Rd., Lenexa, KS.

Radiated EMI The radiated emissions tests were performed at the 3 meters Semi-Anechoic Chamber (SAC) located at Rogers Labs, a division of The Compatibility Center LLC, 7915 Nieman Rd., Lenexa, KS.

Registered Site information: FCC Site: US5305, ISED: 3041A, CAB Identifier: US0096

NVLAP Accreditation Lab code 200087-0

Test Method

The purpose of this report is to evaluate the EUT's transmitter for exemption from routine SAR testing.

Test Limits

The exemption to SAR evaluation limits are shown below for both FCC and Industry Canada.

FCC radio frequency radiation exposure limits per 1.1310		
Frequency (MHz)	Occupational Limit W/m ²	Public Limit W/m ²
300-1,500	$f/30$	$f/150$
1,500-100,000	50	10
908.0	30.26666667	6.053333333

IC radio frequency radiation exposure limits per RSS-102, Issue 6 Field Reference Level FRL Limit (W/m ²)					
Frequency (MHz)	Uncontrolled		Frequency (MHz)	Controlled	
10-20	2.0	2.0	10-20	10.0	10.0
20-48	$8.944/f^{0.5}$	0.3	20-48	$44.72/f^{0.5}$	1.5
48-300	1.291	1.291	48-100	6.455	6.455
300-6,000	$0.02619*f^{0.6834}$	2.8	100-6,000	$0.6455*f^{0.5}$	19.5
6,000-15,000	10.0	10.0	6,000-15,000	50.0	50.0
15,000-150,000	10.0	10.0	15,000-150,000	50.0	50.0
150,000-300,000	$6.67*(10^{-5})*f$	0.1	150,000-300,000	$3.33*(10^{-4})*f$	0.3

Calculations

				Antenna Gain (dBi)	3.6			
				dBd + 2.17 = dBi	2.2			
Tx Frequency (MHz)	908	Peak Power (Watts)	0.5129	Antenna Gain (dBi)	1.43			
		Peak Power (mW)	512.9	Antenna Gain (numeric)	2.3			
Cable Loss (dB)	0.0	(dBm)	27.1	Antenna minus cable (dBi)	3.60			
		Duty Cycle (%)	100.0%					
		Adjusted Power (mW)	512.9					
		Adjusted Power (dBm)	27.1					
	Calculated ERP (mw)	712.907		EIRP = Po(dBm) + Gain (dB)				
	Calculated EIRP (mw)	1174.986		Radiated (EIRP) dBm	30.700			
				ERP = EIRP - 2.17 dB				
				Radiated (ERP) dBm	28.530			
Power density (S) EIRP ----- = mW/cm² 4 π r² r (cm) EIRP (mW)		FCC radio frequency radiation exposure limits per 1.1310						
		Frequency (MHz)	Occupational Limit W/m ²	Public Limit W/m ²				
		300-1,500	f/30	f/150				
		1,500-100,000	50	10				
		908.0	30.26666667	6.05				
IC radio frequency radiation exposure limits per RSS-102, Issue 6 Field Reference Level FRL Limit (W/m ²)								
Frequency (MHz)	Uncontrolled		Frequency (MHz)	Controlled				
10-20	2.0	2.0	10-20	10.0	10.0			
20-48	8.944/f ^{0.5}	0.3	20-48	44.72/f ^{0.5}	1.5			
48-300	1.291	1.291	48-100	6.455	6.455			
300-6,000	0.02619*f ^{0.6834}	2.8	100-6,000	0.6455*f ^{0.5}	19.5			
6,000-15,000	10.0	10.0	6,000-15,000	50.0	50.0			
15,000-150,000	10.0	10.0	15,000-150,000	50.0	50.0			
150,000-300,000	6.67*(10 ⁻⁵)*f	0.1	150,000-300,000	3.33*(10 ⁻⁴)*f	0.3			
f = Transmit Frequency (MHz)			f (MHz) =	FCC	908.0	ISED	908.0 MHz	
P _T = Power Input to Antenna (mW)			P _T (mW) =		512.9		512.9 mW	
Duty cycle (percentage of operation)			% =		100.0%		100.0% %	
P _A = Adjusted Power due to Duty cycle or Cable Loss (mW)			P _A (mW) =		512.90		512.90 mW	
G _N = Numeric Gain of the Antenna			G _N (numeric) =		2.29		2.29 numeric	
S ₂₀ = Power Density of device at 20cm (mW/m ²)		S ₂₀ =(P _A G _N)/(4πR ₂₀) ²	S ₂₀ (mW/m ²) =		0.23		0.23 mW/m ²	
S ₂₀ = Power Density of device at 20cm (W/m ²)		S ₂₀ =(P _A G _N)/(4πR ₂₀) ²	S ₂₀ (W/m ²) =		2.34		2.34 W/m ²	
S _L = Power Density Limit (W/m ²)			S _L (W/m ²) =		6.05		2.75 W/m ²	
R _C = Minimum distance to the Radiating Element for Compliance (cm)		R _C =√(P _A G _N /4πS _L)	R _C (cm) =		12.4		18.4 cm	
S _C = Power Density of the device at the Compliance Distance R _C (W/m ²)		S _C =(P _A G _N)/(4πR _C) ²	S _C (W/m ²) =		6.05		2.75 W/m ²	
R ₂₀ = 20cm			R ₂₀ =		20		20 cm	
Summary: Standalone MPE Calculations and Summary								
Radio	Tx Duty Cycle (%)	Tx Frequency (MHz)	Power Total (mW)	Gain (numeric)	S _L (W/m ²)	S ₂₀ (W/m ²)	R _C (cm)	S _C (cm)
HaLow (FCC)	100.0%	908.0	512.9	2.3	6.05	2.34	12.4	6.0533
HaLow (ISED)	100.0%	908.0	512.9	2.3	2.75	2.34	18.4	2.7523

Results

The EUT complies with requirements in the cited standards. The mode (Mode 4, 802.11ah 8MHz) and channel (12) with highest power output was chosen for analysis.

FCC:

Power Density at 20cm:	2.34 W/m ²
Limit at 20cm:	6.05 W/m ²
Results:	PASSES

ISED:

Power Density at 20cm:	2.34 W/m ²
Limit at 20cm:	2.75 W/m ²
Results:	PASSES

Please note:

- Usage case for this product is as a Mobile device in Public/Uncontrolled environments.
- The integration instructions for this module will stipulate that a 20cm distance from the user be maintained.
- Peak gain used for these calculations was obtained from the worst case (highest gain) antenna in the module's approved antenna list.
- Host users who implement this module into their device must reevaluate the RF Exposure compliance when combining with other transmitters.

Annex

- Annex A Measurement Uncertainty Calculations
- Annex B Test Equipment
- Annex C Laboratory Certificate of Accreditation

Annex A Measurement Uncertainty Calculations

The measurement uncertainty was calculated for all measurements listed in this test report according To CISPR 16–4. Result of measurement uncertainty calculations are recorded below. Component and process variability of production devices similar to those tested may result in additional deviations. The manufacturer has the sole responsibility of continued compliance.

Measurement	Expanded Measurement Uncertainty $U_{(lab)}$
3 Meter Horizontal 0.009-1000 MHz Measurements	4.16
3 Meter Vertical 0.009-1000 MHz Measurements	4.33
3 Meter Measurements 1-18 GHz	5.46
3 Meter Measurements 18-40 GHz	5.16
10 Meter Horizontal Measurements 0.009-1000 MHz	4.15
10 Meter Vertical Measurements 0.009-1000 MHz	4.32
AC Line Conducted	1.75
Antenna Port Conducted power	1.17
Frequency Stability	1.00E-11
Temperature	1.6°C
Humidity	3%

Annex B Test Equipment

Equipment	Manufacturer	Model (SN)	Band	Cal Date(m/d/y)	Due
☐ LISN	FCC	FCC-LISN-50-25-10(1PA) (160611)	.15-30MHz	3/20/2025	3/20/2026
☐ Cable	Huber & Suhner Inc.	Sucoflex102ea(L10M)(303073)	9kHz-40 GHz	9/9/2025	9/9/2026
☐ Cable	Huber & Suhner Inc.	Sucoflex102ea(1.5M)(303069)	9kHz-40 GHz	9/9/2025	9/9/2026
☐ Cable	Belden	RG-58 (L1-CAT3-11509)	9kHz-30 MHz	9/9/2025	9/9/2026
☐ Antenna	Com Power	AL-130 (121055)	.001-30 MHz	9/2/2025	9/2/2026
☐ Antenna:	EMCO	6509	.001-30 MHz	9/16/2024	9/16/2026
☐ Antenna	ARA	BCD-235-B (169)	20-350MHz	9/2/2025	9/2/2026
☐ Antenna	Sunol	JB-6 (A100709)	30-1000 MHz	9/2/2025	9/2/2026
☐ Antenna	ETS-Lindgren	3147 (40582)	200-1000MHz	9/16/2024	9/16/2026
☐ Antenna	ETS-Lindgren	3117 (200389)	1-18 GHz	3/17/2025	3/17/2027
☐ Antenna	Com Power	AH-118 (10110)	1-18 GHz	9/16/2024	9/16/2026
☐ Antenna	Com Power	AH-1840 (101046)	18-40 GHz	3/17/2025	3/17/2027
☒ Analyzer	Rohde & Schwarz	ESU40 (100108)	20Hz-40GHz	7/9/2025	7/9/2026
☐ Analyzer	Rohde & Schwarz	ESW44 (101534)	20Hz-44GHz	1/21/2025	1/21/2026
☐ Analyzer	Rohde & Schwarz	FS-Z60, 90, 140, and 220	40GHz-220GHz	12/22/2017	12/22/2027
☐ Amplifier	Com-Power	PA-010 (171003)	100Hz-30MHz	9/9/2025	9/9/2026
☐ Amplifier	Com-Power	CPPA-102 (01254)	1-1000 MHz	9/9/2025	9/9/2026
☐ Amplifier	Com-Power	PAM-118A (551014)	0.5-18 GHz	9/9/2025	9/9/2026
☐ Amplifier	Com-Power	PAM-840A (461328)	18-40 GHz	9/9/2025	9/9/2026
☒ Pwr Sensor	Rohde & Schwarz	NRP33T	0.05-33 GHz	9/9/2025	9/9/2026
☐ Generator	Rohde & Schwarz	SMBV100A6 (260771)	20Hz-6 GHz	3/19/2025	3/19/2026
☐ RF Filter	Micro-Tronics	BRC50722 (009).9G notch	30-18000 MHz	3/21/2025	3/21/2026
☐ RF Filter	Micro-Tronics	HPM50117 (063) 3G HPF	30-18000 MHz	3/21/2025	3/21/2026
☐ RF Filter	Micro-Tronics	BRM50702 (172) 2G notch	30-18000 MHz	3/21/2025	3/21/2026
☐ RF Filter	Micro-Tronics	BRC50703 (G102) 5G notch	30-18000 MHz	3/21/2025	3/21/2026
☐ RF Filter	Micro-Tronics	BRC50705 (024) 5G notch	30-18000 MHz	3/21/2025	3/21/2026
☐ Attenuator	Fairview	SA6NFN100W-40 (1625)	30-18000 MHz	3/21/2025	3/21/2026
☒ Attenuator	Mini-Circuits	VAT-3W2+ (1445)	30-6000 MHz	3/21/2025	3/21/2026
☐ Attenuator	Mini-Circuits	VAT-3W2+ (1735)	30-6000 MHz	3/21/2025	3/21/2026
☐ Attenuator	Mini-Circuits	VAT-6W2+ (1438)	30-6000 MHz	3/21/2025	3/21/2026
☒ Weather station	Davis	6152 (A70927D44N)		1/23/2026	1/23/2027

<u>Equipment</u>	<u>Manufacturer</u>	<u>Model (SN)</u>	<u>Band</u>	<u>Cal Date(m/d/y)</u>	<u>Due</u>
☐ Frequency Counter: Leader		LDC-825 (8060153)		3/19/2025	3/19/2026
☐ ISN	Com-Power	Model ISN T-8 (600111)		3/19/2025	3/19/2026
☐ LISN:	Com-Power	Model LI-220A		9/16/2024	9/16/2026
☐ LISN:	Com-Power	Model LI-550C		9/16/2024	9/16/2026
☐ Cable	Huber & Suhner Inc.	Sucoflex102ea(1.5M)(303072)	9kHz-40 GHz	9/9/2025	9/9/2026
☒ Cable	Huber & Suhner Inc.	Sucoflex102ea(L1M)(281183)	9kHz-40 GHz	9/9/2025	9/9/2026
☐ Cable	Huber & Suhner Inc.	Sucoflex102ea(4M)(281184)	9kHz-40 GHz	9/9/2025	9/9/2026
☐ Cable	Huber & Suhner Inc.	Sucoflex102ea(L10M)(317546)	9kHz-40 GHz	9/9/2025	9/9/2026
☐ Cable	Time Microwave	4M-750HF290-750 (L4M)	9kHz-24 GHz	9/9/2025	9/9/2026
☐ Cable	Mini-Circuits	KBL-2M-LOW+ (23090329)	9kHz-40 GHz	3/22/2025	3/22/2026
☐ Analyzer	HP	8562A (3051A05950)	9kHz-125GHz	3/20/2025	3/20/2026
☐ Antenna:	Solar	9229-1 & 9230-1		2/5/2025	2/5/2026
☐ CDN:	Com-Power	Model CDN M325E		9/16/2024	9/16/2026
☐ Oscilloscope Scope: Tektronix		MDO 4104		2/5/2025	2/5/2026
☐ EMC Transient Generator HVT		TR 3000		2/5/2025	2/5/2026
☐ AC Power Source (Ametech, California Instruments)				2/5/2025	2/5/2026
☐ Field Intensity Meter: EFM-018				2/5/2025	2/5/2026
☐ ESD Simulator: MZ-15				2/5/2025	2/5/2026
☐ Injection Clamp Luthi Model EM101				not required	
☐ R.F. Power Amp ACS 230-50W				not required	
☐ R.F. Power Amp EIN Model: A301				not required	
☐ R.F. Power Amp A.R. Model: 10W 1010M7				not required	
☐ R.F. Power Amp A.R. Model: 50U1000				not required	
☐ Temperature Chamber				not required	
☒ Shielded Room				not required	

Annex C Laboratory Certificate of Accreditation

United States Department of Commerce
National Institute of Standards and Technology



Certificate of Accreditation to ISO/IEC 17025:2017

NVLAP LAB CODE: 200087-0

Rogers Labs, a division of The Compatibility Center LLC
Lenexa, KS

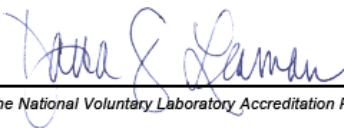
*is accredited by the National Voluntary Laboratory Accreditation Program for specific services,
listed on the Scope of Accreditation, for:*

Electromagnetic Compatibility & Telecommunications

*This laboratory is 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 joint ISO-ILAC-IAF Communiqué on ISO/IEC 17025).*

2025-03-11 through 2026-03-31
Effective Dates




For the National Voluntary Laboratory Accreditation Program