RHEIN TECH LABORATORIES, INC.

Engineering Solutions & Electromagnetic Compatibility Services

RF Maximum Permissible Exposure (MPE) Report
for
Controlled and Uncontrolled Environments

L3Harris Technologies, Inc.
221 Jefferson Ridge Parkway
Lynchburg, VA 24501

Model: XL-85M UHF-L Land Mobile Radio
FCC ID: OWDTR-0177-E
IC: 3636B-0177

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These test(s) are accredited under Rhein Tech Laboratories, Inc. ISO/IEC 17025 accreditation issued by ANAB. Refer to certificate and scope of accreditation AT-1445.

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1 MPE Measurements and Applicable Regulations

The Federal Communications Commission (FCC) regulates Maximum Permissible Exposure (MPE) under Subpart I, Part 1 of 47 CFR FCC Rules and Regulations, Edition 2-15-24: "Procedures Implementing the National Environmental Policy Act of 1969." Specifically, Paragraph 1.1310: "Radiofrequency Radiation Exposure Limits", which establishes limits for human exposure to radiofrequency (RF) electromagnetic fields. These limits are frequency-dependent and vary based on occupational and general public exposure categories. For compliance purposes, the regulation below applies to mobile device classification:

- Subpart J, Part 2 of 47 CFR FCC Rules and Regulations, Edition 2-15-24: "Equipment Authorization Procedures." Specifically, Subpart J, Part 2 of 47 CFR FCC Rules and Regulations, Edition 2-15-24: "Equipment Authorization Procedures." Specifically, Paragraph 2.1091: "Radiofrequency Radiation Exposure Evaluation: Mobile Devices".

These rules ensure that RF-emitting devices comply with established safety thresholds, protecting human health from excessive electromagnetic exposure.

This test report presents the results of Maximum Permissible Exposure (MPE) measurements performed on the L3Harris Technologies XL-85M Mobile Radio, which operates in the UHF-L frequency band (for FCC 378-470 MHz; for ISED 406.1-430 and 450-470 MHz). The device was tested to assess compliance with the applicable FCC MPE limits and ensure its safe operation within regulatory guidelines. Additionally, the tests were performed in accordance with TCB training material and the following FCC Rules and Regulations and ISED Canada Radio Standard Specifications:

- IEEE Std C95.1: 2019: "IEEE Standard for Safety Levels with Respect to Human Exposure to Electric, Magnetic, and Electromagnetic Fields, 0 Hz – 300 GHz".
- IEEE Std C95.3: 2021: "IEEE Recommended Practice for Measurements and Computations of Electric, Magnetic, and Electromagnetic Fields with Respect to Human Exposure to Such Fields, 0 Hz – 300 GHz".
- FCC OET Bulletin 65, Edition 97-01: "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields".
- FCC Supplement C to OET Bulletin 65, Edition 01-01: "Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emission."
- RSS-102, Issue 6: Radio Frequency (RF) Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands).

2 Modifications

No modifications were made to the EUT during testing.

3 Test Laboratory

Testing was performed by RTL personnel at the Rhein Tech Laboratories (RTL) test facility located at 360 Herndon Parkway, Suite 1400, Herndon, VA, 20170. Various regulatory bodies, including the FCC and ISED Canada, approved this facility for conducting tests and measurements on a contractual basis.

CAB ID: US0079

3.1 Technical Justification for Exclusion of Part 15 Wi-Fi Transmitter from Cumulative MPE Calculations

This document addresses not including all co-located transmitters in the MPE assessment. Specifically, the exclusion of the Part 15 Wi-Fi transmitter from the cumulative MPE evaluation based on overwhelming technical evidence and established FCC guidance.

3.1.1 Extreme Disparity in Transmitter Power

The EUT integrates Wi-Fi transmitters and an LMR transmitter and the highest power from the Wi-Fi transmitters is 0.02 W:

- LMR Transmitter (Part 90): Maximum output power = 1032 W (60.14 dBm)
- Wi-Fi Transmitter (Part 15.247): Maximum output power = 0.02 W (13 dBm)

The power ratio of the transmitters is as follows:

$$0.02\ \text{W}/1032\ \text{W} = 1.94\times10^{-5}$$

This demonstrates that the Wi-Fi transmitter operates at a power level that is over 51,000 times lower than the LMR transmitter. From a radiated energy perspective, the Wi-Fi contribution is functionally irrelevant and falls far below any threshold of significance in the context of MPE evaluation.

3.1.2 Negligible contribution to MPE Compliance

Even under the most conservative assumptions, the Wi-Fi transmitter's power level is so low that it would contribute less than 0.002% to the total MPE. This is orders of magnitude below the variability introduced by environmental conditions or test setup tolerances and would have no measurable impact on the overall exposure level. Including such a minute contribution is not only unnecessary, it is technically unjustifiable.

3.1.3 Physical Separation of Antennas

The antennas for the LMR and Wi-Fi transmitters are separated by **more than 20 cm**, satisfying the FCC's definition of a "mobile" configuration and qualifying for **independent evaluation** per §1.1310. This spatial separation ensures the fields are **non-overlapping at any compliance boundary**, further reinforcing that there is no compound exposure risk.

3.1.4 FCC Guidance on SAR Exemption for Wi-Fi

The Wi-Fi transmitter independently qualifies for SAR exemption under KDB 447498, based on:

- Low power (0.02 W)
- 20 cm separation
- Operation in the 2.4 GHz band with duty cycle considerations

Thus, even if evaluated independently, this transmitter would not trigger any additional exposure compliance requirement.

3.1.5 Technical Exclusion Justification—Conclusion

The inclusion of the Wi-Fi transmitter in cumulative MPE calculations is technically unwarranted and unsupported by FCC policy. The transmitter operates at a trivial power level, has no material impact on total exposure, and is fully isolated both electrically and spatially from the high-power LMR transmitter. Therefore, the LMR-only MPE evaluation is comprehensively sufficient to demonstrate compliance for all transmitters in this product configuration. We respectfully assert that no update is necessary to include the Wi-Fi transmitter in the MPE analysis, and the current MPE report already ensures full compliance with FCC exposure limits.

4 Test Date

The testing was conducted on February 2, 2025.

5 Antenna Information

Table 5-1: Antennas/Mounts Tested

The following antenna/mounts were tested for the MPE investigation and represent the worst case gains:

Description	Gain (dBi)	Antenna Part #
Antenna, Whip 378-430, 0dB	2.15	AN-225003-001
Antenna, Yagi, 375-403 MHz,10dB	12.15	AN-025137-003

6 Test Equipment, Accessories and Test Setup

Test equipment used for the measurements is shown in Table 6-1.

Table 6-1: Test Equipment

RTL Asset	Manufacturer	Model	Equipment Type	Serial Number	Calibration Due Date
901676	ETS Lindgren	HI-6053	Electric Field Probe	00200468	07/26/2025
901355	JFW Industries	50FH-003-300	300 W Attenuator	N/A	03/23/2025

Table 6-2: EUT and Accessories

Part	Manufacturer	Model/ HVIN	Serial Number	FCC ID	RTL Bar Code
Radio	L3Harris Technologies	XL-85M/ XLM-85M-UHF-L	Unit #1	OWDTR-0177-E	24456
Microphone	L3Harris Technologies	14050-6010-01 Rev C	F2P22143	N/A	24462

Details of the test setup are as follows:

- The EUT was mounted on a Styrofoam table 80 cm tall.
- The antenna was mounted on a metal plate (roof mount only) with azimuth indicators and placed in the middle of a separate table.
- The control unit and power supply were located at a distance of at least 1.5 meters from the EUT's antenna to minimize interference.
- The test probe was solidly connected to the radiation meter and then attached to the plastic mast in front of the EUT's antenna.
- During the MPE measurements, the EUT was set to transmit RF power at maximum with a 50% duty cycle.

7 Justification of Transmitting Mode and Frequency

The EUT can transmit with a non-modulated carrier and with various types of modulations at a maximum rated power of 50 W in the UHF-L band. Power was adjusted by 50% as a PTT radio, then increased by 20% per FCC Part 90.205(s) to allow for manufacturing tolerances. Analog modulation was chosen to represent the worst case for the MPE measurements.

8 MPE Limits for the EUT

The FCC and ISED MPE limits for uncontrolled and controlled environments are shown in the following tables. The limits are based on the recommended MPE Guidelines published by the National Council on Radiation Protection and Measurements in "Biological Effects and Exposure Criteria for Radiofrequency Electromagnetic Fields".

Table 8-1: FCC MPE Limit and Averaging Time in an Uncontrolled Environment

Frequency Range, MHz	Power Density (S), mW/cm^2	Averaging Time, min
300-1500	f/1500, where "f" is the frequency in MHz	30

Table 8-2: FCC MPE Limit and Averaging Time in a Controlled Environment

Frequency Range, MHz	Power Density (S), mW/cm^2	Averaging Time, min
300-1500	f/300, where "f" is the frequency in MHz	6

Table 8-3: ISED MPE Limit and Averaging Time in an Uncontrolled Environment

Frequency range (MHz)	Electric field (V_{RMS}/m)	Magnetic field (A_{RMS}/m)	Power density (W/m^2)	Reference period (minutes)
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	$0.158\, f^{0.5}$	$4.21\times10^{-4}\ f^{0.5}$	$6.67\times10^{-5}\ f$	$616000/ f^{1.2}$

Note: f is frequency in MHz.

Table 8-4: ISED MPE Limit and Averaging Time in a Controlled Environment

Frequency range (MHz)	Electric field (V_{RMS}/m)	Magnetic field (A_{RMS}/m)	Power density (W/m^2)	Reference period (minutes)
10-20	61.4	0.163	10	6
20-48	$129.8 / f^{0.25}$	$0.3444 / f^{0.25}$	$44.72 / f^{0.5}$	6
48-100	49.33	0.1309	6.455	6
100-6000	$15.60\, f^{0.25}$	$0.04138\, f^{0.25}$	$0.6455\, f^{0.5}$	6
6000-15000	137	0.364	50	6
15000-150000	137	0.364	50	$616000 / f^{1.2}$
150000-300000	$0.354\, f^{0.5}$	$9.40\times10^{-4}\, f^{0.5}$	$3.33\times10^{-4}\, f$	$616000 / f^{1.2}$

Note: f is frequency in MHz.

The MPE limits for the EUT are shown in Table 8-5.

Table 8-5: MPE Limits for the Investigated Frequencies

Transmit Frequencies (MHz)	Uncontrolled Exposure		Controlled Exposure	
	FCC Limit (mW/cm^2)	ISED Limit (mW/cm^2)	FCC Limit (mW/cm^2)	ISED Limit (mW/cm^2)
378.0125	0.25	0.15	1.3	1.3

9 Calculating the Safe Distance from the EUT's Antenna

Before starting MPE measurements, we calculated the safe distance, R_{safe} using the following formula:

$$\mathrm{Rsafe} = \sqrt{\frac{P\max \cdot Gn \cdot \eta}{4\pi \cdot S}}$$

G_n: antenna gain (numeric)

P_{max}: maximum power input to the antenna (mW)

S: power density limit (mW/m^2) respectively

η: duty cycle (decimal number), for these measurements η = 0.5

The cable loss of the RF cable connecting the EUT and the antenna under test decreases the RF power delivered to the antenna and influences the value of the safe distance.

Based on the specification for the cable supplied with these antennas, the cable loss in the frequency range of interest is approximately 0.5 dB; the cable loss is assumed to be zero in the calculations below.

The calculated safe distances serve as a starting point for the MPE measurements, though it is acknowledged that the measured safe distances will be smaller.

Tables 9-1 and 9-2 present the results of **R_{safe}** calculations:

Table 9-1: Calculated R_{safe}

Calculated Minimum Safe Distance from LMR Antenna (Based on Maximum Gain of Non-Yagi/Non-Log Periodic Antennas)

Antenna Gain (dBi)	Transmit Frequencies (MHz)	Uncontrolled Exposure		Controlled Exposure	
		United States (cm)	Canada (cm)	United States (cm)	Canada (cm)
2.15	378.0125	114	168	51	51

Table 9-2: Calculated R_{safe}

Calculated Minimum Safe Distance from LMR Antenna (Based on the Maximum Gain of Yagi/Log Periodic Antennas) Mobile Command Center Applications

Antenna Gain (dBi)	Transmit Frequencies (MHz)	Uncontrolled Exposure		Controlled Exposure	
		United States (cm)	Canada (cm)	United States (cm)	Canada (cm)
12.15	378.0125	360	400	161	161

10 Standard Test Conditions and Engineering Practices

Except as noted herein, the following conditions and procedures were fulfilled during the testing:

1. ANSI C63.4 requires the ambient temperature and relative humidity to be within the ranges of 10°C to 40°C and 10% to 90%, respectively. Concerning the narrower ranges recommended for the power meter used for the measurements, ambient conditions shall align with the power meter ranges. Actual ambient temperature and relative humidity values are shown in Section 12 of this test report.
2. Unless otherwise noted, Measurement results presented in Section 13, Test Results show the highest measured level of MPE.

11 Measurement Procedure

1. The test setup was as described in Section 7 of this test report.
2. Polarization of the EUT's antenna was vertical, which is its polarization in actual use.
3. The EUT was set to transmit at the chosen frequency at maximum RF power and at 50% duty cycle (50% duty cycle is simulated either by lowering the radio's power by 3 dB or by using a 3 dB pad on the output of the radio) and *X 1.20 (per Part 90.205(s)).* During preliminary measurements, we set the distance between the power density probe and the investigated EUT's antenna equal to the average calculated R_{safe} (Table 10-1) applicable for controlled or uncontrolled environments.
4. Power density measurements were taken at different heights of the probe from the ground (0.1 to 2 meters) while rotating the antenna versus azimuth (from 0° to 360°).
5. The azimuth between the probe and the antenna position corresponding to the highest MPE level was chosen as the "worst case" position for the final measurements.
6. For the final measurements, the distance was adjusted between the test probe and the tested antenna to the Real safe distance, R_{real}, such that the measured highest power density in the "worst case" position was the same or slightly less than the test limit.
7. The measurement results of final measurements conducted at the chosen azimuth and different heights of the probe above the ground are shown in Section 12.
8. Average values of power density were calculated for the imaginary whole human body (0.1–2.0 m), for the lower part of the body (0.1–0.9 m), and for the upper part of the body (1.0–2.0 m). The results of the calculations are shown in Section 12.

12 Test Results

Ambient conditions during the MPE investigation were as follows:

- Temperature: 24.1°C
- Relative humidity: 18%

The MPE measurement procedure was performed per the description in Section 11. The test results are provided in Tables 12-1 through 12-4.

Table 12-1: MPE Data - General Population/Uncontrolled Environment

Measuring Antenna Height (cm)	FCC 2.15 dBi 378.0125 MHz 114 cm mW/cm^2)	FCC 12.15 dBi 378.0125 MHz 444 cm (mW/cm^2)	ISED 2.15 dBi 378.0125 MHz 114 cm (mW/cm^2)	ISED 12.15 dBi 378.0125 MHz 444 cm (mW/cm^2)
10	0.036	0.006	0.036	0.006
20	0.037	0.010	0.037	0.010
30	0.041	0.018	0.041	0.018
40	0.076	0.025	0.076	0.025
50	0.098	0.053	0.098	0.053
60	0.020	0.069	0.020	0.069
70	0.119	0.094	0.119	0.094
80	0.106	0.115	0.106	0.115
90	0.090	0.123	0.090	0.123
100	0.081	0.086	0.081	0.086
110	0.135	0.099	0.135	0.099
120	0.155	0.098	0.155	0.098
130	0.198	0.105	0.198	0.105
140	**0.244**	0.111	**0.244**	0.111
150	0.194	**0.130**	0.194	**0.130**
160	0.178	0.103	0.178	0.103
170	0.161	0.092	0.161	0.092
180	0.123	0.081	0.123	0.081
190	0.118	0.052	0.118	0.052
200	0.100	0.042	0.100	0.042
Limit	**0.25**	**0.15**	**0.25**	**0.15**

Table 12-2: MPE Data Occupational/Controlled Environment

Measuring Antenna Height (cm)	FCC 2.15 dBi 378.0125 MHz 46 cm (mW/cm^2)	FCC 12.15 dBi 378.0125 MHz 42 cm (mW/cm^2)	ISED 2.15 dBi 378.0125 MHz 46 cm (mW/cm^2)	ISED 12.15 dBi 378.0125 MHz 42 cm (mW/cm^2)
10	0.142	0.239	0.142	0.239
20	0.161	0.357	0.161	0.357
30	0.161	0.512	0.161	0.512
40	0.097	0.506	0.097	0.506
50	0.193	0.712	0.193	0.712
60	0.236	0.728	0.236	0.728
70	0.413	0.941	0.413	0.941
80	0.877	1.100	0.877	1.100
90	**1.290**	**1.230**	**1.290**	**1.230**
100	1.000	0.976	1.000	0.976
110	0.998	0.789	0.998	0.789
120	0.872	0.539	0.872	0.539
130	0.686	0.403	0.686	0.403
140	0.576	0.285	0.576	0.285
150	0.334	0.197	0.334	0.197
160	0.253	0.080	0.253	0.080
170	0.166	0.065	0.166	0.065
180	0.092	0.031	0.092	0.031
190	0.055	0.016	0.055	0.016
200	0.035	0.004	0.035	0.004
Limit	**1.3**	**1.3**	**1.3**	**1.3**

Table 12-3: MPE for Body Parts - FCC

Part of the Body/ Averaging Points	General Population/ Uncontrolled Environment		Occupational/ Controlled Environmental	
	FCC 2.15 dBi 378.0125 MHz 114 cm (mW/cm^2)	FCC 12.15 dBi 378.0125 MHz 444 cm (mW/cm^2)	FCC 2.15 dBi 378.0125 MHz 46 cm (mW/cm^2)	FCC 12.15 dBi 378.0125 MHz 42 cm (mW/cm^2)
Whole Body (0.1 m to 2.0 m)	0.12	0.08	0.43	0.49
Lower Body (0.1 m to 0.9 m)	0.07	0.06	0.46	0.73
Upper Body (1.0 m to 2.0 m)	0.15	0.09	0.46	0.31

Table 12-4: MPE for Body Parts – ISED

Part of the Body/ Averaging Points	General Population/ Uncontrolled Environment		Occupational/ Controlled Environmental	
	ISED 2.15 dBi 378.0125 MHz 114 cm (mW/cm^2)	ISED 12.15 dBi 378.0125 MHz 444 cm (mW/cm^2)	ISED 2.15 dBi 378.0125 MHz 46 cm (mW/cm^2)	ISED 12.15 dBi 378.0125 MHz 42 cm (mW/cm^2)
Whole Body (0.1 m to 2.0 m)	0.12	0.08	0.43	0.49
Lower Body (0.1 m to 0.9 m)	0.07	0.06	0.40	0.70
Upper Body (1.0 m to 2.0 m)	0.15	0.09	0.46	0.31

13 Conclusion

1. The MPE measurements for Controlled and Uncontrolled Environments shown in this report were conducted per the applicable FCC/ISED Rules, Regulations, and Guidance and determined the minimum safe distances between a user and the EUT antennas with different gains.
2. As shown in Section 12, the measured MPE is below the maximum allowed limits.
3. The User Manual shall include RF radiation safety warnings and statements with the minimum separation distance between the user and the antennas per the following table:

Antenna	Gain (dBi)	Part #	Band (MHz)	Uncontrolled Exposure		Controlled Exposure	
				United States (cm)	Canada (cm)	United States (cm)	Canada (cm)
Antenna, Whip 378-430, 0dB	2.15	AN-225003-001	UHF-L	114	168	51	51
Antenna, Yagi, 375-403 MHz,10dB	12.15	AN-025137-003	UHF-L	360	400	161	161