



Engineering Solutions & Electromagnetic Compatibility Services

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

**L3Harris Corporation
221 Jefferson Ridge Parkway
Lynchburg, VA 24501**

Model: XL-85M VHF Land Mobile Radio

**FCC ID: OWDTR-0176-E
IC: 3636B-0176**

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1 MPE Measurements and Applicable Regulations

This test report presents the results of Maximum Permissible Exposure (MPE) measurements performed on the L3Harris Corporation XL-85M Mobile Radio, which operates in the VHF frequency band (136-174 MHz), which were tested. The tests were performed in accordance with TCB training material and the following FCC Rules and Regulations and Industry 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,"
- 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",
- 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",
- 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, 20177. 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 Justification for Exclusion of Part 15 Wi-Fi Transmitter from Cumulative MPE Calculations

This document does not include all co-located transmitters in the MPE assessment. Specifically, the Part 15 Wi-Fi transmitter is excluded 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 = 205.6 W (53.13 dBm)
- Wi-Fi Transmitter (Part 15.247): Maximum output power = 0.02 W (13 dBm)

The power ratio of the transmitters is as follows:

$$0.02 \text{ W} / 205.6 \text{ W} = 9.73 \times 10^{-5}$$

This demonstrates that the Wi-Fi transmitter operates at a power level over 10,280 times lower than the LMR transmitter. From a radiated energy perspective, the Wi-Fi contribution is functionally irrelevant and falls far below any significance threshold 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 0.01% 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 but 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 additional exposure compliance requirements.

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 Dates

Testing was performed March 15-16, 2025

5 Antenna Information

The following antenna/mounts were tested for the MPE investigation.

Description	Gain (dBi)	Antenna Part #
Antenna, Element, NGP VHF, 2.45 dB	4.55	AN-225002-004
Antenna, Log Periodic, 136-174 MHz, 6 dB	8.15	AN-025137-011

6 Test Equipment, Accessories, and Test Setup

The 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	07/26/2027
901355	JFW Industries	50FH-003-300	300 W Attenuator	N/A	03/23/2027

Table 6-2: EUT and Accessories

Part	Manufacturer	Model/ HVIN	Serial Number	FCC ID	RTL Bar Code
Radio	L3Harris Corporation	XL-85M	A40319000011	OWDTR-0176-E	24465
Microphone	L3Harris Corporation	14050-6010-01 Rev C	AA49059	N/A	24401

Details of the test setup are as follows:

- The EUT was mounted on an 80 cm tall Styrofoam table.
- 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 at maximum RF power 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 VHF 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 ISCED 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
30-300	0.2	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
30-300	1	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	$0.158 f^{0.5}$	$4.21 \times 10^{-4} f^{0.5}$	$6.67 \times 10^{-5} f$	$616000 / f^{1.2}$

Note: f is frequency in MHz.

Table 8-8-4: 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	$0.354 f^{0.5}$	$9.40 \times 10^{-4} f^{0.5}$	$3.33 \times 10^{-4} f$	$616000 / f^{1.2}$

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)
136.0125	0.2	0.1291	1.0	0.753

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:

$$R_{\text{safe}} = \sqrt{\frac{P_{\text{max}} \cdot G_n \cdot \eta}{4\pi \cdot S}}$$

G_n : antenna gain (numeric)

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

S : power density limit (mW/m²) respectively

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

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; for the calculations below, the cable loss is assumed to be zero.

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)
4.55	136.0125	168	265	75	87

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)
8.15	136.0125	255	354	114	131

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 specifies that the ambient temperature and relative humidity must be within the ranges of 10°C to 40°C and 10% to 90%, respectively. Regarding the narrower ranges recommended for the power meter used in the measurements, ambient conditions must align with the power meter's 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. The 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 both controlled and uncontrolled environments.
4. Power density measurements were taken at different heights of the probe above the ground (0.1 to 2 meters) while rotating the antenna azimuthally (from 0° to 360°).
5. The azimuth between the probe and the antenna position corresponding to the highest MPE level was selected as the "worst-case" position for the final measurements.
6. For the final measurements, the distance between the test probe and the tested antenna was adjusted 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 the 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

The Ambient conditions during the MPE investigation were as follows:

- Temperature: 23.2°C
- Relative humidity: 20%

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

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

Antenna Height (cm)	FCC 4.55 dBi Mag Base 136.0125 MHz 123 cm (mW/cm ²)	FCC 4.55 dBi Metal Base 136.0125 MHz 249 cm (mW/cm ²)	FCC 8.15 dBi 136.0125 MHz 179 cm (mW/cm ²)	ISED 4.55 dBi Mag Base 136.0125 MHz 114.2 cm (mW/cm ²)	ISED 4.55 dBi Metal Base 136.0125 MHz 297 cm (mW/cm ²)	ISED 8.15 dBi 136.0125 MHz 210 cm (mW/cm ²)
10	0.055	0.018	0.153	0.102	0.011	0.044
20	0.166	0.026	0.151	0.102	0.016	0.041
30	0.089	0.035	0.150	0.105	0.025	0.044
40	0.089	0.051	0.145	0.115	0.043	0.045
50	0.122	0.074	0.129	0.129	0.058	0.042
60	0.166	0.091	0.123	0.143	0.072	0.039
70	0.181	0.105	0.112	0.152	0.084	0.034
80	0.190	0.128	0.097	0.150	0.094	0.034
90	0.188	0.141	0.088	0.160	0.102	0.034
100	0.191	0.144	0.087	0.164	0.106	0.032
110	0.187	0.155	0.087	0.175	0.108	0.039
120	0.139	0.155	0.091	0.182	0.110	0.043
130	0.196	0.155	0.098	0.186	0.112	0.056
140	0.191	0.163	0.112	0.181	0.113	0.066
150	0.174	0.162	0.132	0.133	0.110	0.083
160	0.139	0.162	0.142	0.183	0.109	0.092
170	0.196	0.166	0.158	0.192	0.111	0.102
180	0.187	0.173	0.166	0.193	0.118	0.109
190	0.175	0.184	0.198	0.199	0.118	0.129
200	0.167	0.199	0.192	0.191	0.129	0.113
Limit	0.2	0.2	0.2	0.2	0.129	0.129

Table 12-2: MPE Data Occupational/Controlled Environment

Antenna Height (cm)	FCC 4.55 dBi Mag Base 136.0125 MHz 69.4 cm (mW/cm ²)	FCC 4.55 dBi Metal Base 136.0125 MHz 51.4 cm (mW/cm ²)	FCC 8.15 dBi 136.0125 MHz 83.9 cm (mW/cm ²)	ISED 4.55 dBi Mag Base 136.0125 MHz 55.5 cm (mW/cm ²)	ISED 4.55 dBi Metal Base 136.0125 MHz 53.5 cm (mW/cm ²)	ISED 8.15 dBi 136.0125 MHz 42.3 cm (mW/cm ²)
10	0.648	0.568	0.029	0.194	0.154	0.033
20	0.680	0.541	0.049	0.204	0.149	0.058
30	0.682	0.541	0.109	0.198	0.139	0.130
40	0.760	0.570	0.217	0.182	0.156	0.220
50	0.780	0.564	0.323	0.189	0.158	0.337
60	0.738	0.570	0.429	0.204	0.182	0.447
70	0.785	0.570	0.526	0.240	0.252	0.548
80	0.798	0.561	0.650	0.296	0.344	0.630
90	0.727	0.671	0.753	0.376	0.454	0.703
100	0.743	0.680	0.839	0.430	0.507	0.731
110	0.741	0.695	0.913	0.466	0.503	0.745
120	0.765	0.697	0.953	0.469	0.487	0.730
130	0.834	0.720	0.997	0.487	0.497	0.716
140	0.750	0.791	0.985	0.517	0.526	0.678
150	0.824	0.875	0.960	0.637	0.595	0.632
160	0.997	0.947	0.919	0.666	0.678	0.574
170	0.998	0.990	0.865	0.732	0.741	0.518
180	0.869	0.999	0.795	0.747	0.745	0.450
190	0.737	0.967	0.723	0.687	0.705	0.394
200	0.711	0.900	0.629	0.608	0.619	0.334
Limit	1.00	1.00	1.00	0.750	0.750	0.750

Table 12-3: MPE for Body Parts – ISED

Part of the Body/ Averaging Points	General Population/ Uncontrolled Environment			Occupational/ Controlled Environmental		
	ISED 4.55 dBi 136.0125 MHz 114.2 cm (mW/cm ²)	ISED 8.15 dBi 136.0125 MHz 297 cm (mW/cm ²)	ISED 4.55 dBi 136.0125 MHz 210 cm (mW/cm ²)	ISED 4.55 dBi 136.0125 MHz 55.5 cm (mW/cm ²)	ISED 8.15 dBi 136.0125 MHz 42.3 cm (mW/cm ²)	ISED 4.55 dBi 136.0125 MHz 53.5 cm (mW/cm ²)
Whole Body (0.1 m to 2.0 m)	0.16	0.09	0.06	0.43	0.48	0.43
Lower Body (0.1 m to 0.9 m)	0.13	0.06	0.04	0.23	0.35	0.22
Upper Body (1.0 m to 2.0 m)	0.18	0.11	0.08	0.59	0.59	0.60

Table 12-4: MPE for Body Parts - FCC

Part of the Body/ Averaging Points	General Population/ Uncontrolled Environment			Occupational/ Controlled Environmental		
	FCC 4.55 dBi 136.0125 MHz 123 cm (mW/cm ²)	FCC 8.15 dBi 136.0125 MHz 249 cm (mW/cm ²)	FCC 4.55 dBi 136.0125 MHz 179 cm (mW/cm ²)	FCC 4.55 dBi 136.0125 MHz 69.4 cm (mW/cm ²)	FCC 8.15 dBi 136.0125 MHz 83.9 cm (mW/cm ²)	FCC 4.55 dBi 136.0125 MHz 51.4 cm (mW/cm ²)
Whole Body (0.1 m to 2.0 m)	0.16	0.12	0.13	0.36	0.29	0.34
Lower Body (0.1 m to 0.9 m)	0.14	0.08	0.12	0.36	0.18	0.29
Upper Body (1.0 m to 2.0 m)	0.18	0.17	0.13	0.36	0.39	0.38

13 Conclusion

1. The MPE measurements for Controlled and Uncontrolled environments shown in this report were conducted in accordance with the applicable FCC/ISED Rules, Regulations, and Guidance. They 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, Log Periodic, 136-174 MHz, 6 dB	8.15	AN-025137-011	VHF	255	354	114	131
Antenna, Element, NGP VHF, 2.45 dB	4.55	AN-225002-004	VHF	168	265	75	87

Photograph 1: MPE Setup Using Log Antenna



Photograph 2: MPE Setup Using NGP Antenna

