



MPE TEST REPORT

for the

FREDERICK ENERGY PRODUCTS, LLC

FCC ID: QUI-SPOT-Z

IC ID: 11625-SPOTZ

WLL REPORT# 19803-03 REV 3

Prepared for:

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Testing Certificate AT-1448



MPE Test Report

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Frederick Energy Products, LLC
SPOT-Z

FCC ID: QUI-SPOT-Z
ISED ID: 11625-SPOTZ

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WLL Report# 19803-03 Rev 3

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Abstract

This report has been prepared on behalf of Frederick Energy Products, LLC to document the findings of the maximum permissible exposure evaluation on the Frederick Energy Products, LLC SPOT-Z. The information provided in this report is only applicable to the device herein documented, as the EUT.

The purpose of this evaluation is to establish a minimum safe distance as per the RF exposure requirements as defined in FCC §1.1307 & §1.1310 and in RSS-102.

This report documents the results of testing to the requirements of:

- CFR Title 47 Volume 1 Practice and Procedure; (1.1307) Environmental Assessments
- RSS-102 Radio Frequency (RF) Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands)

This evaluation was performed by Washington Laboratories, located at: 4840 Winchester Boulevard, Suite 5., Frederick, MD 21703. Site description and site attenuation data have been placed on file with the FCC's Sampling and Measurements Branch at the FCC laboratory in Columbia, MD. Washington Laboratories has been accepted and designated by the FCC under Test Firm Number US3001. Washington Laboratories is approved by the ANSI National Accreditation Board (ANAB), as an independent test laboratory under ISO/IEC 17025:2017. Please refer to Certificate Number AT-1448. The ISED Canada number for Washington Laboratories is 3035A. Washington Laboratories, Ltd. has also been accepted as a Notified Body (NB) and Conformity Assessment Body (CAB) under the United States/European Union Mutual Recognition Agreement.

Revision History	Description of Change	Date
Rev 0	Initial Release	August 25, 2026
Rev 1	ACB Comment Dated: 9/4/2026	September 8, 2026
Rev 2	Section 3.2 of KDB 680106 is addressed	September 14, 2026
Rev 3	20cm extrapolation for final data	September 16, 2026



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1 Introduction

This report has been prepared on behalf of Frederick Energy Products, LLC for the SPOT-Z to show compliance with the RF exposure requirements as defined in FCC §1.1307 & §1.1310 and in RSS-102.

The testing in-support of this evaluation was performed by Washington Laboratories, Ltd. Located at: 4840 Winchester Blvd., Suite #5. Frederick, Maryland 21703.

Washington Laboratories, Ltd. has been accepted as an EMC Conformity Assessment Body (CAB) under the United States/European Union Memorandum of Agreement. Washington Laboratories, Ltd. is accredited with ANAB under Testing Certificate AT-1448.

2 Requirements

2.1 Transmitter Categories

2.1.1 Fixed Installations

A fixed location means that the device, including its antenna, is physically secured at a permanent location and is not able to be easily moved to another location. Additionally, distance to humans from the antenna is maintained to at least 2 meters.

2.1.2 Mobile Devices

A mobile device is defined as a transmitting device designed to be used in other than fixed locations and to be generally used in such a way that a separation distance of at least 20 centimeters is normally maintained between the transmitter's radiating structures and the body of the user or nearby persons. Transmitters designed to be used by consumers or workers that can be easily re-located, such as a wireless modem operating in a laptop computer, are considered mobile devices if they meet the 20-centimeter separation requirement. The FCC rules for evaluating mobile devices for RF compliance are found in 47 CFR §2.1091.

2.1.3 Portable Devices

A portable device is defined as a transmitting device designed to be used so that the radiating structure(s) of the device is/are within 20 centimeters of the body of the user. Portable device requirements are found in Section 2.1093 of the FCC's Rules (47 CFR§2.1093).



2.2 Exposure Categories

The limits for exposure are determined by the type of situation in which the individual is exposed. Table 1 lists the limits for the particular environment.

2.2.1 Occupational/Controlled Exposure

In general, occupational/controlled exposure limits are applicable to situations in which persons are exposed as a consequence of their employment, who have been made fully aware of the potential for exposure and can exercise control over their exposure. This exposure category is also applicable when the exposure is of a transient nature due to incidental passage through a location where the exposure levels may be higher than the general population/uncontrolled limits, but the exposed person is fully aware of the potential for exposure and can exercise control over his or her exposure by leaving the area or by some other appropriate means. Awareness of the potential for RF exposure in a workplace or similar environment can be provided through specific training as part of a RF safety program. If appropriate, warning signs and labels can also be used to establish such awareness by providing prominent information on the risk of potential exposure and instructions on methods to minimize such exposure risks.

2.2.2 General Population/Uncontrolled Exposure

The general population / uncontrolled exposure limits are applicable to situations in which the general public may be exposed or in which persons who are exposed as a consequence of their employment may not be made fully aware of the potential for exposure or cannot exercise control over their exposure. Members of the general-public would come under this category when exposure is not employment-related; for example, in the case of a wireless transmitter that exposes persons in its vicinity. Warning labels placed on low-power consumer devices such as cellular telephones are not considered sufficient to allow the device to be considered under the occupational/controlled category and the general population/uncontrolled exposure limits apply to these devices.



Table 1: MPE Limits (FCC)

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 Exposures				
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	6
300–1500	N/A	N/A	f/300	6
1500–100,000	N/A	N/A	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
300–1500	N/A	N/A	f/1500	30
1500–100,000	N/A	N/A	1	30



Table 2: MPE Limits (ISED)

Frequency Range (MHz)	Electric Field (V/m rms)	Magnetic Field (A/m rms)	Power Density (W/m ²)	Reference Period (minutes)
Limits for General Population/Uncontrolled Exposure				
0.003-10	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	$0.158 f^{0.5}$	$4.21 \times 10^{-4} f^{0.5}$	$6.67 \times 10^{-5} f$	$616000/f^{1.2}$
Note: f is frequency in MHz.				
*Based on nerve stimulation (NS). ** Based on specific absorption rate (SAR).				
Frequency Range(MHz)	Electric Field (V/m rms)	Magnetic Field (A/m rms)	Power Density (W/m ²)	Reference Period (minutes)
Limits for Occupational/Controlled Exposures				
0.003-1023	170	180	-	Instantaneous*
0.1-10	-	$1.6/f$	-	6**
1.29-10	$193/f^{0.5}$	-	-	6**
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.				
*Based on nerve stimulation (NS). ** Based on specific absorption rate (SAR).				



3 Device Summary

The table below summarizes the criteria used to evaluate the EUT.

Table 3: Device Summary, SPOT-Z

Transmitter Category:	Unlicensed
Exposure Category:	General, Uncontrolled
Antenna Gain:	N/A
Total Radiated Power:	91.54 dBuV/m Peak FS
	6.74 dBm (EIRP)
	4.72 mW
Evaluation Distance:	20 cm
Transmitter Frequency	73.0 kHz
FCC Limit:	100 mW/cm ²
ISED Limit:	N/A

The EUT is a pulsed 73kHz transmitter device. The antenna is copper wound ferrite.

The transmitter power is derived from radiated field strength.

The EUT has a peak electric field strength of 91.54 dBuV/m at 10-meters.

$$\text{EIRP}_{\text{dBm}} = 91.54 + 20\text{LOG}(10) - 104.8 = 6.74 \text{ dBm.}$$

6.74 dBm EIRP is the total peak channel power, inclusive of antenna gain.

$$10^{(6.74/20)} = 4.72 \text{ mW}$$



4 Radio Frequency Radiation Exposure Evaluation

The highest RF output power of the unit was measured and recorded. According to §1.1310 of the FCC rules, the power density limit for General Population/Uncontrolled Exposure is 1mW/cm². According to §1.1310 of the FCC rules, the power density limit for Occupational/Controlled Exposure is 5mW/cm².

The MPE shall be calculated at 20cm to show compliance with the power density limit. The following formula was used to calculate the Power Density:

$$S = \frac{PG}{4\pi R^2}$$

where,

S = Power Density

P = Output Power at the Antenna Terminals

G = Gain of Transmit Antenna (linear gain-isotropic)

R = Distance from Transmitting Antenna



Table 4: Transmitter MPE Calculation Summary (FCC)

One Transmitter				
Frequency	0.073	MHz		
Limit	100.0	mW/cm ²		
Distance (cm), R =	20	cm		
Power (dBm), P =	6.74	dBm		
TX Ant Gain (dBi), G =	0	dB		
Power Density:	0.00094	mW/cm ²	Separation<20 cm	
Minimum Distance:	0.061	cm		

Please note for ISSED Canada RSS-102: the EUT is not subject to the MPE requirements due to the frequency of the transmitter. Rather the EUT shall demonstrate compliance with nerve stimulation requirements of RSS-102.SAR.MEAS.

Please see WL Test Report #19803-02 for the nerve stimulation test results.



Additionally, the RF Exposure requirements of KDB Pub. 680106 D01 Wireless Power Transfer v04, and FCC Rule Part 1.1310, as outlined in KDB Pub. 447498 D01 General RF Exposure Guidance v06 are addressed in this section. Consistent with FCC's equipment authorization RF exposure guidance, any device (both portable and mobile) operating at frequencies below 100 kHz is considered compliant for the purpose of equipment authorization when the external (unperturbed) temporal peak field strengths do not exceed the following reference levels:

83 V/m for the electric field strength (E)
and
90 A/m for the magnetic field strength (H)

During the dates of 8/11/2026 to 8/14/2026 The EUT transmitter radiated field strength was measured many times, on all sides of the EUT. For the complete data set, please refer to WL Test Report #19803-02 for the nerve stimulation test results.



Voltage:

The worst-case external (unperturbed) temporal field strength is 77.316 V/m Peak at 8mm.

In this case the Peak measured field strength at 8mm meets the Peak 20cm limit of 83 V/m.

Voltage is complaint at 8mm. Nevertheless, the following data is presented to demonstrate the electric field strength at 20cm.

Logarithmic units: $\text{dBuV/m} = 20\text{LOG}(77.316) + 120 = 157.77 \text{ dBuV/m at 8mm}$

Extrapolation for 20cm via 40dB/dec:

$$0.8\text{cm Value} - 40\text{LOG}(20/0.8) = 20\text{cm Value}$$

where,

$$40\text{LOG}(20/0.8) = 55.9 \text{ dB}$$

therefore,

$$77.316 \text{ V/m} = 157.77 \text{ dBuV/m} - 55.9 \text{ dB} = 101.87 \text{ dBuV/m at 20cm}$$

Convert to Linear

$$\text{V/m} = 10^{\frac{\text{dB}\mu\text{V/m} - 120}{20}}$$

Therefore, $101.87 \text{ dBuV/m at 20cm} = 0.124 \text{ V/m}$

Final Result (Voltage):

- a. the Peak field strength at 8mm is 77.316 V/m
- b. the Peak field strength at 20cm is 0.124 V/m
- c. the 20cm Peak limit is 83 V/m



Current:

The worst-case external (unperturbed) temporal field strength is 81.019 A/m RMS at 8mm.

In this case the RMS measured field strength needs to be extrapolated for Peak levels.

Convert RMS to Peak:

RMS Value * 1.414 = Peak Value

$81.019 \times 1.414 = 114.56$ A/m Peak at 8mm.

Convert to Logarithmic Units

$\text{dBuA/m} = 20\text{LOG}(114.56) + 120 = 161.18$ dBuA/m peak at 8mm

Extrapolation for Distance via 40dB/dec:

$0.8\text{cm Value} - 40\text{LOG}(20/0.8) = 20\text{cm Value}$

where,

$40\text{LOG}(20_{\text{cm}}/0.8_{\text{cm}}) = 55.9$ dB

$40\text{LOG}(1_{\text{cm}}/0.8_{\text{cm}}) = 3.88$ dB

therefore,

$161.18 \text{ dBuA/m} - 55.9\text{dB} = 105.28$ dBuA/m at 20cm

also, $161.18 \text{ dBuA/m} - 3.88\text{dB} = 157.3$ dBuA/m at 1cm

Convert back to Linear

The following conversions are used:

$$\text{A/m} = 10^{\frac{\text{dB}\mu\text{A/m} - 120}{20}}$$

therefore,

$105.28 \text{ dBuA/m at } 20\text{cm} = 0.184$ A/m at 20cm

also, $157.3 \text{ dBuA/m at } 1\text{cm} = 73.28$ A/m at 1cm

Final Result (Current):

- a. the Peak field strength at 20cm is 0.184 A/m
- b. the Peak field strength at 1cm is 73.28 A/m
- c. the 20cm Peak limit is 90A/m