



# Washington Laboratories, Ltd.

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Applicant: Frederick Energy Products, LLC

Exempt RF Device: FCC ID: QUI-DDAC-PAD-WC // ISED ID: 11625A-DDACPADWC

**Result Summary:** The DDAC-PAD-WC is categorically excluded from SAR testing.

## **Time-Averaged Exclusion Threshold for FCC:**

Reference: KDB 447498 DO1 General RF Exposure Guidance v06. -- SAR evaluation for general population exposure conditions, by measurement or simulation, is not required when the corresponding SAR Test Exclusion Threshold condition(s), listed below, are satisfied. These test exclusion conditions are based on source-based time-averaged maximum conducted output power of the RF channel requiring evaluation, adjusted for tune-up tolerance, and the minimum test separation distance required for the exposure conditions.

In accordance with Section 4.3.1, of the referenced document, the following formula may be used to calculate the exclusion of SAR Testing:

$$[(\text{max. power of channel, including tune-up tolerance, mW}) / (\text{min. test separation distance, mm})] \cdot [\sqrt{f_{(\text{GHz})}}] \leq 3.0 \text{ for 1-g SAR, and } \leq 7.5 \text{ for 10-g extremity SAR}$$

where,

- a)  $f_{(\text{GHz})}$  is the RF channel transmit frequency in GHz
- b) power and distance shall be rounded to the nearest mW and mm before calculation
- c) the result is rounded to the nearest mW and mm before calculation
- d) when the minimum test separation distance is < 5mm, a distance of 5mm is used
- e) the values of 3.0 and 7.5 are the final numerical thresholds, these values are unitless



## Time-Averaged Exclusion Threshold for ISED Canada:

Reference: RSS-102, Issue 6 (12/2023) Radio Frequency (RF) Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands). -- SAR evaluation is required if the separation distance between the user and/or bystander and the antenna and/or radiating element of the device is less than or equal to 20 cm, except when the device operates at or below the applicable output power level (adjusted for tune-up tolerance) for the specified separation distance defined in RSS-102. These limits are provided below.

Frequency (MHz)	≤ 5 mm (mW)	10 mm (mW)	15 mm (mW)	20 mm (mW)	25 mm (mW)	30 mm (mW)	35 mm (mW)	40 mm (mW)	45 mm (mW)	> 50 mm (mW)
≤ 300	45	116	139	163	189	216	246	280	319	362
450	32	71	87	104	124	147	175	208	248	296
835	21	32	41	54	72	96	129	172	228	298
1900	6	10	18	33	57	92	138	194	257	323
2450	3	7	16	32	56	89	128	170	209	245
3500	2	6	15	29	50	72	94	114	134	158
5800	1	5	13	23	32	41	54	74	102	128

The limits of Table 1, as provided in RSS-102, Issue 5 are based on RF port conducted power, or EIRP, whichever is higher. The EUT transmitter has a frequency of 916.48 MHz.

The following equation shall be employed to interpolate the proper exclusion threshold:

$$y = y_1 + (x - x_1) \frac{(y_2 - y_1)}{(x_2 - x_1)}$$

therefore,

$$\begin{aligned} y &= 21 + (916.48 - 835) * ((6 - 21) \div (1900 - 835)) \\ y &= 19.85 \text{ mW} \end{aligned}$$

19.85 mW is the final exclusion limit

19.85 mW = 12.98 dBm from 10LOG(mW)



## **EUT Transmitter and Antenna Details:**

The EUT has a Peak radiated field strength that measures 81283.1 uV/m at 3-meters.

$$\begin{aligned} \text{dBuV/m} &= 20\text{LOG}(\text{uV/m}) \\ &= 20\text{LOG}(81283.1) = 98.2 \text{ dBuV/m} \end{aligned}$$

The manufacturer has declared a tune-up tolerance of  $\pm 1.0$  dB.

$$98.2 + 1.0 = 99.2 \text{ dBuV/m Peak radiated FS at 3-meters (adjusted for tune-up tolerance).}$$

$$\begin{aligned} \text{EIRP}_{\text{dBm}} &= \text{FS}_{\text{dBuV/m}} + 20\text{LOG}(\text{D}_m) - 104.8 \\ &= 99.2 + 20\text{LOG}(3) - 104.8 \end{aligned}$$

$$\text{EIRP} = 3.94 \text{ dBm Peak (not time averaged)}$$

$$\begin{aligned} \text{mW} &= 10^{(\text{dBm} \div 10)} \\ &= 10^{(3.94 \div 10)} \end{aligned}$$

$$\text{mW} = 2.48 \text{ (total radiated power, peak)} = 3.94 \text{ dBm}$$

The EUT employs a JJB series omni-directional antenna from TE Connectivity/Linx. The antenna is connected to the EUT PCB via a soldered through-hole.

The model number of the antenna is ANT-916-JBB-RA.

The peak gain of the antenna is -0.5 dBi.

$$\begin{aligned} \text{Conducted Output Power} &= \text{EIRP}_{\text{dBm}} - \text{Gain}_{\text{dBi}} \\ &= 3.94 - (-0.5) = 4.44 \end{aligned}$$

$$\begin{aligned} \text{Conducted Output Power} &= 4.44 \text{ dBm (peak)} \\ &= 2.78 \text{ mW (peak conducted output power)} \end{aligned}$$

In this case, the conducted power is greater than the radiated power.

Therefore, both the FCC and ISED calculations shall use the conducted level.

2.78mW shall be rounded to 3mW for both markets.



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### **Exclusion Results for FCC:**

The earlier noted compliance formula, referenced to KDB 447498 DO1, shall be employed:

$$[(\text{max. power of channel, including tune-up tolerance, mW}) / (\text{min. test separation distance, mm})] \cdot [\sqrt{f_{\text{GHz}}}] \leq 3.0 \text{ for 1-g SAR, and } \leq 7.5 \text{ for 10-g extremity SAR}$$

as such,

$$(3\text{mW} \div 5\text{mm}) \cdot (\sqrt{0.91648\text{GHz}}) = 0.574 \text{ (unitless)}$$

Because 0.574 is less than 3.0, the EUT is categorically excluded from SAR testing under the FCC rules.

### **Exclusion Results for ISED Canada:**

The EUT transmitter has a peak output power of 4.44 dBm, which is equal to 2.78 mW.

2.78 mW shall be rounded to 3mW.

The ISED Canada limitation for SAR exclusion is: 19.85 mW.

Because 3 mW is less than 19.85 mW, the EUT is categorically excluded from SAR testing under the ISED Canada rules.



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### **Conclusion:**

The FCC time-averaged SAR Exclusion limit is 3.0 (numerical)

The EUT has a calculated numerical value of 0.574

The ISED Canada time-averaged SAR Exclusion limit is 19.85 mW.

The EUT has a peak power of 3 mW.

In both cases, the EUT meets the exclusion limit.

Prepared By:

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