

# 1. RF Exposure Requirements

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## 1.1 General Information

### Client Information

Applicant:	Pro Design, LLC
Address of applicant:	1151 Campus Dr. N/AStowOhioUnited States
Manufacturer:	Pro Design, LLC
Address of manufacturer:	1151 Campus Dr. N/AStowOhioUnited States

### General Description of EUT:

Product Name:	DC Tubular Motor
Trade Name:	/
Model No.:	DM25LEU/S-1.1/16
Adding Model(s):	DM25LEU/S-0.7/16
Rated Voltage:	DC 7.2V
Battery Capacity:	2600mAh
Power Adaptor :	/
FCC ID:	2BMF4DM25LEUS1116Q
Equipment Type:	Portable device

### Technical Characteristics of EUT:

Frequency Range:	433.92MHz
Max. Field Strength:	75.13dBuV/m(3m)
Data Rate:	/
Modulation:	2GFSK
Antenna Type:	line Antenna
Antenna Gain:	0dBi

## 1.2 RF Exposure Exemption

According to §1.1307(b)(3) and KDB 447498 D04 Interim General RF Exposure Guidance v01, system operating under the provisions of this section shall be operating in a manner that the public is not exposed to radio frequency energy level in excess limit for maximum permissible exposure.

**Option A:** FCC Rule Part 1.1307 (b)(3)(i)(A): The available maximum time-averaged power is no more than 1mW, regardless of separation distance.

**Option B:** FCC Rule Part 1.1307 (b)(3)(i)(B): The available maximum time-averaged power or effective radiated power (ERP), whichever is greater, is less than or equal to the threshold  $P_{th}$  (mW) described in the following formula.  $P_{th}$  is given by:

$$P_{th} \text{ (mW)} = \begin{cases} ERP_{20 \text{ cm}} (d/20 \text{ cm})^x & d \leq 20 \text{ cm} \\ ERP_{20 \text{ cm}} & 20 \text{ cm} < d \leq 40 \text{ cm} \end{cases}$$

Where

$$x = -\log_{10} \left( \frac{60}{ERP_{20 \text{ cm}} \sqrt{f}} \right) \text{ and } f \text{ is in GHz;}$$

and

$$ERP_{20 \text{ cm}} \text{ (mW)} = \begin{cases} 2040f & 0.3 \text{ GHz} \leq f < 1.5 \text{ GHz} \\ 3060 & 1.5 \text{ GHz} \leq f \leq 6 \text{ GHz} \end{cases}$$

$d$  = the separation distance (cm);

**Option C:** FCC Rule Part 1.1307 (b)(3)(i)(C): The minimum separation distance (R in meters) from the body of a nearby person for the frequency (f in MHz) at which the source operates, the ERP (watts) is no more than the calculated value prescribed for that frequency. R must be at least  $\lambda/2\pi$ , where  $\lambda$  is the free-space operating wavelength in meters.

Single RF Sources Subject to Routine Environmental Evaluation	
RF Source frequency (MHz)	Threshold ERP (watts)
0.3-1.34	$1,920 R^2$
1.34-30	$3,450 R^2/f^2$
30-300	$3.83 R^2$
300-1,500	$0.0128 R^2 f$
1,500-100,000	$19.2 R^2$

**For Multiple RF sources:** FCC Rule Part 1.1307(b)(3)(ii):

- (A) The available maximum time-averaged power of each source is no more than 1 mW and there is a separation distance of two centimeters between any portion of a radiating structure operating and the nearest portion of any other radiating structure in the same device, except if the sum of multiple sources is less than 1 mW during the time-averaging period, in which case they may be treated as a single source (separation is not required).
- (B) In the case of fixed RF sources operating in the same time-averaging period, or of multiple mobile or portable RF sources within a device operating in the same time averaging period, if the sum of the fractional contributions to the applicable thresholds is less than or equal to 1 as indicated in the following equation.

$$\sum_{i=1}^a \frac{P_i}{P_{th,i}} + \sum_{j=1}^b \frac{ERP_j}{ERP_{th,j}} + \sum_{k=1}^c \frac{Evaluated_k}{Exposure Limit_k} \leq 1$$

### 1.3 Calculated Result

Radio Access Technology	Prediction Frequency (MHz)	Max. Field Strength (dBuV/m)	Antenna Gain (dBi)	Output Power (dBm)	Tune-Up Power (dBm)	ERP (dBm)
SRD	433.92	75.13	0	-20.13	-20.00	-22.15

Frequency (MHz)	Option	Min. Distance (cm)	Max. Power (dBm) (mW)		Exposure Limit (mW)	Ratio	Result Pass/Fail
433.92	B	0.5	-20.00	0.01	23.17	0.01	Pass

Note: 1.  $EIRP = E - 104.8 + 20 \log D$ ; Output Power =  $EIRP - \text{Antenna Gain}$ ;

$ERP = EIRP - 2.15 \text{ dB}$

2. Option A, B and C refers as clause 1.2.

3. For option B, Max (time-averaged power, effective radiated power (ERP)) converts to Max. Power.

For option C, ERP converts to Max. Power;

4. For option B,  $P_{th}$  (mW) converts to Exposure Limit (mW); For option C, ERP (W) converts to Exposure Limit (mW).

5.  $\text{Ratio} = \text{Tune-Up ERP (mW)} / \text{Exposure Limit (mW)}$

**Mode for Simultaneous Multi-band Transmission:**

Radio Access Technology	Ratio 1	Ratio 2	Ratio 3	Simultaneous Ratio	Limit	Result Pass/Fail
/	/	/	/	/	/	/

Result: Pass