ERP Calculation

In this calculation, we report ERP relative to a theoretical half-wave dipole. We intend to use approximately 50 ft of Andrew LDF4-50A Heliax (`http://www.rfparts.com/heliax_LDF450A.html`) cable which attenuates 0.463 dB per 100 ft at 50 MHz. The system gains and losses are as follows:

- maximum antenna gain: 6.4 dBd
- cable loss: $0.00463 \text{ dB}/\text{ft} \cdot 50 \text{ ft} = 0.232 \text{ dB}$
- connector loss: 0.03 dB [1]

From the standard definition of decibel

$$\Gamma \text{ dB} = 10 \text{ dB } \log_{10}\left(\frac{P_{ERP}}{P_{TPO}}\right), \tag{1}$$

we obtain the formula[2] to calculate ERP

$$P_{ERP} = P_{TPO}\ 10^{\Gamma/10}. \tag{2}$$

The net gain is $\Gamma = 6.4 - 0.232 - 0.03 = 6.14$ dB. With $P_{TPO} = 500, 700$ W the ERP is 2050 W and 2880 W, respectively. In the proposal we mentioned the TPO would be 500-700 W, therefore the final ERP will be in the range 2050-2880 W.

[1] We conservatively estimate 0.03 dB for our system. Various amateur radio forums and tutorials discuss RF connector losses ranging from 0.01 dB to 0.09 dB.

[2] P_{ERP} and P_{TPO} are Effective Radiated Power and Transmitter Power Output, respectively.