

## ERP Calculation

In this calculation, we report ERP relative to a theoretical half-wave dipole. We intend to use approximately 400 ft of Andrew HJ9-50BC Heliax<sup>1</sup> cable which attenuates 0.055 dB per 100 ft at 50 MHz. A power divider splits the signal into an eight bay phased Yagi array. Each Yagi antenna is fed by Andrew HJ5-50 Heliax<sup>2</sup> The system gains and losses are as follows:

- maximum antenna gain (main lobe):  $20.10 \text{ dBi} \Rightarrow 20.10 \text{ dBi} + 2.15 \text{ dBi} = 22.25 \text{ dBd}$
- cable loss, primary feed line:  $0.00055 \text{ dB/ft} \cdot 400 \text{ ft} = 0.22 \text{ dB}$
- connector loss:  $2 \cdot 0.03 \text{ dB} = 0.06 \text{ dB}$
- power divider:  $0.05 \text{ dB}$
- cable loss, single antenna line:  $0.0034 \text{ dB/ft} \cdot 40 \text{ ft} = 0.14 \text{ dB}$

From the standard definition of decibel

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

we obtain the formula<sup>3</sup> to calculate ERP

$$P_{\text{ERP}} = P_{\text{TPO}} 10^{\Gamma/10}. \quad (2)$$

The net gain is  $\Gamma = 22.25 - 0.22 - 0.06 - 0.05 - 0.14 = 21.78 \text{ dB}$ . With  $P_{\text{TPO}} = 40 \text{ kW}$  the ERP is 6.03 MW.

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<sup>1</sup>[http://awapps.commscope.com/catalog/andrew/product\\_details.aspx?id=1465](http://awapps.commscope.com/catalog/andrew/product_details.aspx?id=1465)

<sup>2</sup><http://antennasystems.com/product/cable-andrew-hj-series-heliax/HJ5-50.html>

<sup>3</sup> $P_{\text{ERP}}$  and  $P_{\text{TPO}}$  are Effective Radiated Power and Transmitter Power Output, respectively.