

KOTB Transmission System

Transmitter Power Output Calculations

This exhibit has been included to explain the basis for the transmitter power output utilized to achieve the authorized effective radiated power of 89 kW.

The antenna system consists of a horizontally polarized Shively 6016H-10/4 antenna. The antenna has a power gain of 12.900 at 106.1 MHz in the Horizontal Polarization. Therefore, an antenna input power of 6899 watts is required to achieve 89 kW.

The transmission line used to get from the multi-station combiner to the antenna input is Andrew HJ9-50 (5 inch) air dielectric heliax. With 42 meters of length, the transmission line attenuation is 0.14 dB (96.76% efficient). Therefore, a power of 7130 watts is required at the output of the multi-station combiner, which is the transmission line input, to achieve the authorized effective radiated power.

Finally, a Shively 2540 Balanced Combiner is utilized in the transmission system in order to combine KOTB (FM) with KEGA (FM), KDUT (FM), and KPEB (FM). This combiner has an insertion loss of 0.316 dB at 106.1 MHz. It is therefore necessary to have a transmitter power output of 7656 watts at the input to the combiner to achieve the authorized effective radiated power.

Feed System Efficiency:

In calculating the Feed System Efficiency, the following values were used based on the insertion loss data provided by each manufacturer.

Shively 2540 Balanced Combiner
Insertion Loss = 0.316 db (at 106.1 MHz)

Andrew HJ9-50 Heliax (42 meters)
Insertion Loss = 0.14 dB (at 106.1 MHz)

Total Insertion Loss: .456 dB

Feed System Efficiency: 90.12%

Antenna Gain:

In calculating the Antenna Gain, the following value was used based on data provided by the manufacturer:

Shively 6016H-10/4

Power Gain = 0.0 (Vertical)

Power Gain = 12.900 (Horizontal)

TPO Calculations:

$$\frac{\text{Effective Radiated Power}}{\text{(Antenna Power Gain * Feed System Efficiency)}} = \text{TPO}$$

$$\frac{89 \text{ kW}}{(12.900 * 90.12\%)} = 7.656 \text{ kW TPO}$$

7.656 kW rounds to **7.7 kW TPO**