

KWKD FM-1 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 99 watts.

The antenna system consists of a Jampro JCPD antenna. The antenna has a power gain of 5.25 at 102.3 MHz. Therefore, an antenna input power of 18.8 watts is required to achieve 99 watts.

The transmission line used to get from the multi-station combiner to the antenna input is Andrew HJ12-50 (2 1/4 inch) air dielectric heliax. With 22.8 meters of length, the transmission line attenuation is 0.16 dB yielding an efficiency of 96.38%. Therefore, a power of 19.5 watts is required at the output of the multi-station combiner, which is the transmission line input, to achieve the authorized effective radiated power.

A Jampro RCCC-29A-0.8 Balanced Combiner is utilized in the transmission system in order to combine KWKD FM-1 with KEGA FM-6 and KUDD FM-4. This combiner has an insertion loss of 0.5926 dB at 102.3 MHz yielding an efficiency of 87.12%. It is therefore necessary to have 22 watts at the input to the combiner to achieve the authorized effective radiated power.

Finally, the transmission line used to get from the transmitter to the multi-station combiner is Andrew LDF4.5-50 (5/8 inch) low density foam dielectric heliax. With 7.6 meters of length, the transmission line attenuation is 0.15 dB yielding an efficiency of 96.57%. Therefore, a transmitter power output of 23 watts is required at the output of the multi-station combiner, which is the transmission line input, 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.

Andrew HJ12-50 (22.8 meters)
Insertion Loss = .16 (at 102.3 MHz)

Jampro RCC-29A-0.8 Balanced Combiner
Insertion Loss = 0.5926 db (at 102.3 MHz)

Andrew LDF4.5-50 Heliax (7.6 meters)
Insertion Loss = 0.15 dB (at 102.3 MHz)

Total Insertion Loss: .9026 dB

Feed System Efficiency: 81.3%

Antenna Gain:

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

Jampro JCPD 4H/3V-1s
Power Gain = 5.25

TPO Calculations:

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

$$\frac{99 \text{ w}}{(5.25 * 81.3\%)} = \underline{\underline{.023 \text{ kW TPO}}}$$