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Modeling of Fiber Laser Beam Propagation through a Homogeneous Atmosphere[1] FIDELE TWAGIRAYEZU, Department of Physics, Texas State University, ERIK BOCHOVE, Air Force Research Laboratory, Kirtland AFB — High-brightness (power per unit area per unit solid angle) laser beams have many demanding applications especially for directed energy weapons. Reaching higher power levels was not possible without the birth of the fiber-laser technology because as the power increases the beam becomes distorted due to thermo-optic effects, but the waveguide nature of a fiber overcomes those effects and the large ratio of surface area to volume of a fiber is conductive to efficient cooling. However some applications require greater power than a single fiber can generate and the current solution is by combining $N >> 1$ fiber laser elements in an array. The Gaussian Optics Approximation was used to compute the properties of a coherent hexagonal N- element array of Gaussian fields. The array elements are assumed to be aligned and identical except for their field amplitudes and phases. The output beam of each is collimated by a small lens and the transmitted beams are focused on a distant target as modeled by a single large lens representing a compound system of equivalent focal length. We evaluated the effectiveness of large (N-7 to >200) hexagonal coherent laser arrays to propagate through focusing optics and a homogeneous atmosphere to project concentrated power on distant targets (10 to >100 km).

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