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Wavelength selection of bidirectional laser transmission based on Monte Carlo method

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Abstract

The laser detection technology in uncertain and dynamic environments is of utmost importance in many fields. A model of transient radiative transfer of bidirectional path laser based on Monte Carlo method is developed to investigate the optimum wavelength of active detector at complex atmospheric conditions. The radiative parameters of atmosphere are calculated by HITRAN database and Mie theory at several typical atmospheric conditions including the standard atmosphere, urban aerosol, and radiation fog. Transmission characteristics for five spectral bands at the above atmospheric conditions are calculated by this model. The optimal transmission ability occurred in bands 0.2–0.5, 1.4–1.6, and 0.75–1.25 μm on the condition of standard atmosphere, urban aerosol, and radiation fog, respectively. All results provide effective reference and basic support for choosing the optimal spectral band for active detection.

Keywords: Transient radiative transfer; Active laser detection; Imaging simulation; Atmospheric scattering

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