TECHNOLOGY

Improved Method for Laser Energy Focusing

OVERVIEW

Background
Optical beams propagating through the atmosphere acquire phase distortions from turbulent fluctuations in the refractive index. These distortions are usually deleterious to propagation and result in spreading, wander, and scintillation of the beam, reducing the accuracy and efficiency of applications requiring long range propagation, such as free space optical communications and directed energy laser applications. Fortunately, not all phenomena associated with propagation through atmospheric turbulence are detrimental. When an optical beam propagates through turbulence to a target, reflects off the target, and propagates back through the same turbulence, it undergoes a local recovery of spatial coherence and intensity enhancement referred to as enhanced backscatter (EBS). EBS is observed as a high intensity sub-diffraction limited spot in the detector or receiver plane, and thus has the potential to facilitate applications such as optical tracking or beam phase control.

Innovative Technology
Researchers at the University of Maryland have invented an improved technique of focusing a laser beam on a target through atmospheric turbulence referred to as the tilt-shift method (TSM). It relies upon a well-known phenomenon called enhanced backscatter (EBS) and the principle of reciprocity. TSM is a novel algorithm for detecting EBS in a monostatic channel from a single instance of turbulence. The TSM replaces an average over paths in statistically independent channels for an average over paths through the same channel and allows detection of EBS in static turbulence. This makes EBS more appealing for applications involving long distance propagation of beams through the atmosphere.

APPLICATIONS

Long distance propagation of laser beams through the atmosphere

Systems for improved laser aiming through atmosphere for directed energy and communications

ADVANTAGES

Improved focusing of a laser beam on a target through atmospheric turbulence
No delays in detecting the EBS signal
Detects EBS from a single instance of turbulence
The EBS signal represents the current state of the turbulent channel

CONTACT INFO

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Additional Information

INSTITUTION

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PATENT STATUS

Pending

EXTERNAL RESOURCES

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