

## Noise suppression in the signal spectral induced by atmospheric turbulence on the fso (free-space optical) communications

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### Abstrak

Beam wander and spatial noise that are modulated on optical propagation produce noise modulation in the signal spectral before being received by a Photodetector (PD). In order to suppress noise modulation in the signal spectral, we present an Optical Spatial Filter (OSF) method that is composed of the cone reflector and a pinhole as a detection method. A cone reflector is designed to suppress beam wander in order to minimize temporal noise that fluctuates randomly and governs reflection of the deflected focus spot into the narrow region of pinhole. The pinhole governs the Fresnel diffraction in order to suppress spatial noise in the center of focus spot that undergoes fluctuation and random frequencies as well. Through simultaneous suppression in temporal noise caused by beam wander and spatial noise using the OSF method, noise modulation in the signal spectral can be minimized optimally. We compared the OSF with the Direct-Detection (DD) method by experimentation. The results of the experiment show significant improvements for noise suppression in the signal spectral. The average values of the Signal-to-Noise Ratio (SNR) increase, namely, 37.5 dB, 38.5 dB, 38.7 dB and 39.2 dB for pinhole diameters of 50  $\mu\text{m}$ , 40  $\mu\text{m}$ , 30  $\mu\text{m}$ , and 20  $\mu\text{m}$ , respectively.