Abstract

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Irradiance scintillation index on slant atmospheric turbulence: a simple approach

Turbulence plays an important role in investigating the irradiance scintillation index (SI) for a freespace optical wave propagating through atmospheric turbulence. The Hufnagel–Valley model is used in most studies, where the SI of the slant path is obtained using numerical analysis. A polynomial is proposed for the refractive index structure parameter, on which a closed form is derived for the irradiance SI of a spherical optical wave propagating through a slant atmospheric turbulence. This is used to study signal-to-noise ratio and bit error rate for system performance evaluation. The obtained results demonstrate the simplicity of using the derived closed form of SI compared to statistical methods. The derived expression takes less computational time for SI, which reflects positively on the system performance, which is an essential issue in vehicular mobile applications, in particular.