



A Scintillation Model for Dual Auroral Power Spectra

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The subject of radio-wave propagation in various media has for more than a century preoccupied astronomers, space plasma physicists, scientists and engineers interested in the problem of wave scattering by turbulent media.

We are particularly interested in the propagation of radio waves in the polar cap and auroral ionosphere and their wave-scintillation signatures as observed by ground-based Global Positioning Systems (GPS). We will briefly review the universal approach to radio-wave propagation in a turbulent plasma and show how to identify refractive and diffractive effects within the linear approximation. We will show how invariants of the wave equation derived [1] impose power spectra for the amplitude and phase of the GPS signals recorded. We will also review the use of conventional scintillation indices, like S_4 and ROTI, and show how the model developed allows us to self-consistently construct scintillation indices by calculating structure functions.

1. A. M. Hamza, K. Song, K. Meziane and P. T. Jayachandran, “Two-component phase scintillation spectra in the auroral region: Observations and Model,” *Journal of Geophysical Research – Space Physics*, **29**, 1, <https://doi.org/10.1029/2023JA031998>