

# Continuum Simulation of the Incoherent Scatter Radar Spectrum

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**Abstract:** Incoherent Scatter Radar (ISR) is a ground-based remote-sensing technique for studying ionospheric plasmas. The objective of this work is to perform a one-dimensional simulation of ISR spectra using Gkeyll package, which implements discontinuous Galerkin (DG) finite element algorithm for spatial discretization and a third order strong-stability preserving Runge-Kutta method for temporal discretization. First, a small, unmagnetized, region plasma volume in thermodynamic equilibrium is simulated, then these initial assumptions are relaxed. Unlike traditional and widely used particle-based methods, such as the particle-in-cell (PIC) method for plasmas, DG uses a continuous scheme in which the 6D phase-space is discretized using discontinuous basis functions.. A continuum scheme has the advantage that the counting noise inherent in PIC methods is eliminated, however, at higher computational complexity. Also, DG algorithms are well suited to run efficiently on highly parallel computer architectures.

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