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Stochastic Analysis and Numerical Simulation of Velocity Space Diffusion of Charged Particles by Circularly Polarized Magnetic Waves Transverse to a Uniform Magnetic Field DON LEMONS, Bethel College, KAI-JUN LIU, DAN WINSKE, PETER GARY, Los Alamos National Laboratory — We describe the velocity space diffusion of charged particles in a static magnetic field composed of a uniform field and a sum of transverse circularly polarized magnetic waves. When the wave sum has many terms the auto-correlation time over which particle orbits become effectively randomized is small compared to the time required for the particle distribution to change significantly. In this regime the deterministic equations of motion can be transformed into stochastic differential equations of motion that are valid over the longer time scale. The resulting velocity space diffusion function is consistent with that produced by quasi-linear theory. Numerical solutions of the deterministic equations of motion agree with the theory for all pitch angles, for different wave spectra, and for normalized wave energy densities less one. The theory is applied to the scattering of magnetospheric relativistic electrons from Alfven-cyclotron waves.

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