Abstract Submitted
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Investigating Stationary Phase Violations in Kinetic RF Simulation of Real Plasmas[1] D.L. GREEN, L.A. BERRY, Oak Ridge National Laboratory, E.F. JAEGER, XCEL Engineering, RF-SCIDAC TEAM — The standard approach to linear, kinetic RF simulation in the ion-cyclotron and lower-hybrid frequency regimes in fusion plasmas utilizes the Fourier spectral method to capture the non-local plasma response [e.g., 1]. This response, i.e., the plasma current $\mathbf{j_p}$, is related to the wave electric field through a dielectric tensor $\bar{\sigma}$ for each Fourier mode $\mathbf{j_p}(\mathbf{k}) = \bar{\sigma}(\mathbf{k}) \cdot \mathbf{E}(\mathbf{k})$. $\bar{\sigma}$ is typically derived by solving the linearized Vlasov equation via the method of characteristics assuming stationary phase, constant amplitude electric field modes along those characteristics (i.e., a single $\mathbf{k}$ along unperturbed particle trajectories). This assumption is violated in real device magnetic field configurations. Here we examine the impact of variations in $\mathbf{k}$ along characteristics due to the poloidal magnetic field in Tokamak devices using the Kinetic-j code [2]. We calculate $\mathbf{j_p}$ accounting for the variations in $\mathbf{k}$, compare with the analytic result, and discuss possible implications for present kinetic spectral RF codes.

[1] Jaeger E.F. et al., Phys. Rev. Lett. 90, 195001 (2003)
[2] Green D. L., http://meetings.aps.org/link/BAPS.2012.DPP.TP8.66

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