Abstract Submitted
for the DPP13 Meeting of
The American Physical Society

Geometric theory of wave kinetics and the ray-tracing controversy[1] I.Y. DODIN, N.J. FISCH, PPPL — An invariant, geometric formulation of linear wave kinetics is proposed that allows casting *any* wave equation (WE) in a quantumlike form. The wave amplitude is described by the Schrödinger equation, which, absent dissipation, has a Lagrangian form. Any approximations made to the Lagrangian preserve the conservative form of WE, automatically preventing standard errors (e.g., at guessing a WE from a dispersion relation or at approximating the dielectric tensor with its local value). The wave action is naturally introduced as a Hermitian operator (density matrix). The associated kinetic equation (KE) accounts for both diffraction and mode coupling and conserves wave quanta. Contrary to a popular misconception, taking the geometrical-optics limit does *not* necessarily lead to what is known as the "wave kinetic equation." This undermines the applicability of ray tracing for common practical applications; e.g., the correct KE manifestly prohibits stochasticity at $t \to \infty$.

[1]The work was supported by the U.S. DOE through Contract No. DE-AC02-09CH11466, by the NNSA SSAA Program through DOE Research Grant No. DE274-FG52-08NA28553, and by the U.S. DTRA through Research Grant No. HDTRA1-11-1-0037.

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Date submitted: 05 Jul 2013 Electronic form version 1.4