Abstract Submitted
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Relativistic Plasma Polarizer: Impact of Temperature Anisotropy on Relativistic Transparency[1] R.D. HAZELTINE, DAVID J. STARK, CHINMOY BHATTACHARJEE, ALEXEY V. AREFIEV, Institute for Fusion Studies, The University of Texas at Austin, Texas 78712, USA, TOMA TONCIAN, Center for High Energy Density Science, The University of Texas at Austin, Texas 78712, USA, S.M. MAHAJAN, Institute for Fusion Studies, The University of Texas at Austin, Texas 78712, USA — 3D particle-in-cell simulations demonstrate that the enhanced transparency of a relativistically hot plasma is sensitive to how the energy is partitioned between different degrees of freedom. We consider here the simplest problem: the propagation of a low amplitude pulse through a preformed relativistically hot anisotropic electron plasma to explore its intrinsic dielectric properties. We find that: 1) the critical density for propagation depends strongly on the pulse polarization, 2) two plasmas with the same density and average energy per electron can exhibit profoundly different responses to electromagnetic pulses, 3) the anisotropy-driven Weibel instability develops as expected; the timescales of the growth and back reaction (on anisotropy), however, are long enough that sufficient anisotropy persists for the entire duration of the simulation. This plasma can then function as a polarizer or a wave plate to dramatically alter the pulse polarization [1].

[1] D.J. Stark, C. Bhattacharjee, A.V. Arefiev, T. Toncian, R.D. Hazeltine, and S.M. Mahajan. Phys. Rev. Lett. 115, 025002 (2015).

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