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On Possibility of Fizeau Interferometry In Plasma* D.L. BROWER, W.X. DING, University of California, Los Angeles, V.V. MIRNOV, University of Wisconsin - Madison — The phase velocity of electromagnetic waves propagating through a substance depends on whether they propagate in a moving or stationary medium (Fizeau effect). In the case of a high frequency electromagnetic wave, the plasma dielectric response is dominated by the electrons so that the velocity of the medium is associated with the electron flow velocity. The Fizeau measurement of this characteristic can be linked to the electron current in plasma [1]. In the case of cold unmagnetized electrons, the plasma refraction index $N^2=1-\omega_{pe}^2/\omega^2$. Due to specific ω^{-2} scaling, the phase velocity turns out to be insensitive to the electron flow velocity. Any deviation from this scaling may result in wave vector dependence on the electron flow velocity that can make the Fizeau effect measurable. We evaluate the phase difference caused by the Fizeau effect and relate it to the experimental high-resolution, vertically viewing far-infrared polarimeter-interferometer system currently used on the Madison symmetric torus (MST) reversed field pinch (RFP). The calculations include the effect of motion of the plasma-vacuum interface, corrections caused by electron gyrorotation, and the influence of the finite electron temperature on the wave dispersion. [1] D. L. Brower, W. X. Ding, B. H. Deng, M. A. Mahdavi, V. V. Mirnov, S. C. Prager, Rev. of Sci. Inst. **75** (10) 3399 (2004).
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