

Abstract Submitted
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Spheromak Plasma Density Measurement Using a Quadrature Phase Interferometer¹ DEEPAK KUMAR, PAUL BELLAN, California Institute of Technology — A quadrature phase homodyne interferometer has been developed in double-pass Michelson geometry to measure the density of plasma produced in the Caltech spheromak experiment. The design is specially suited for large vacuum chambers ($\sim 1.5\text{m}$ in diameter) and for experiments with time scales ($\sim 10\ \mu\text{s}$) much less than the time scale of acoustic vibrations. Quadrature phase information is generated by the interference of a linearly polarized scene beam and a circularly polarized reference beam. Path length difference between the two beams is approximately 3m . To compensate for this large difference, we utilize a non-fundamental longitudinal mode of the HeNe laser. This ensures a greatly simplified optical alignment procedure. The interferometer detected very high densities ($\sim 10^{22}/\text{m}^3$) of the central plasma jet column. The high densities have been corroborated by Stark broadening measurements.² Motivated by the results of the homodyne interferometer, a prototype heterodyne interferometer is also being developed. It is expected to have much better signal to noise ratio.

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²S. You, G. Yun, P. M. Bellan, Phys. Rev. Lett. (In print)

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