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Optical Diagnostics on HIT-SI3[1] CHRISTOPHER EVERSON, THOMAS JARBOE, KYLE MORGAN, University of Washington — Interferometry and Thomson Scattering are implemented on the HIT-SI3 (Helicity Injected Torus - Steady Inductive 3) device to provide time resolved measurements of electron density and spatially resolved measurements of electron temperature, respectively. HIT-SI3 is a modification of the original HIT-SI apparatus that uses three injectors instead of two. The scientific aim of HIT-SI3 is to develop a deeper understanding of how injector behavior and interactions influence current drive and spheromak stability. The interferometer system makes use of an intermediate frequency between two parallel 184.3 μm Far-Infrared (FIR) laser cavities which are optically pumped by a CO_2 laser. The phase shift in this beat frequency due to the plasma index of refraction is used to calculate the line-integrated electron density. To measure the electron temperature, Thomson Scattered light from a 20 J (1 GW pulse) Ruby laser off of free electrons in the HIT-SI3 plasma is measured simultaneously at four locations across the spheromak (nominally 23 cm minor radius). Polychromators bin the collected light into 3 spectral bands to detect the relative level of scattering.

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