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11.2 Spatially Resolved Spectral and Magnetic Field Measurements on High Power Diodes

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Measurements of magnetic field profiles on the self-magnetic pinch (SMP) diode are critical to understanding the electron beam pinch dynamics throughout the current pulse. In the SMP diode, the planar anode, consisting of a high Z material, converts the beam energy into bremsstrahlung x-rays, resulting in dense plasma formation, on the anode surface. A fiber array images along the anode surface of the SMP diode. This array is coupled to a high-resolution, time gated spectrometer, which results in spectral measurements at several radii. Zeeman split C IV line emission is used to determine local magnetic fields, and a novel analysis technique utilizes the cylindrical symmetry of the electron beam to place an upper bound on the current density profile. Additionally, measurements of several Stark broadened spectral lines of differing charge states are used to determine electron density profiles. And finally, spectral line ratios are used to estimate electron temperatures.

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