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A Non-Invasive Method to Measure Magnetic Field from Emission Diagnostics in WIRX[1] J. TANNOUS, D. CRAIG, C. ADAMS, S. MCKAY, M. MCMILLAN, M. RAK, Wheaton College — The Wheaton Impulsive Reconnection Experiment (WIRX) is a laboratory experiment for the study of magnetized plasma arcades. We present a method for deriving the global magnetic field from light emission diagnostics. An ICCD camera provides 2D images with good spatial resolution (1 mm) but at only two points in time. Meanwhile, a custom 1D photodiode camera provides emission data with coarse spatial resolution (10 mm) but good temporal resolution (1 μs). Combining the two diagnostics allows us to characterize the emission as a function of both space and time. We postulate that the current density J and emissivity E are related by $J \propto E^{\alpha}$. The direction of the current density vector at each point is set by constraining the current to flow along a volume-filling set of circular arcs that intersect the two electrodes. Since the diagnostics integrate the emission along the line of sight, an inversion algorithm is applied to extract the emissivity on each circular arc. The magnetic field is calculated from the current density using the Biot-Savart Law. The validity of this emission-based model and the best choice of exponent α are examined by comparing the magnetic field predicted by the model with actual magnetic probe data at select locations.

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