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Benchmarking and Optimizing Techniques for Inverting Images of DIII-D Soft X-Ray Emissions[1] E. CHANDLER, Carnegie Mellon University, E.A. UNTERBERG, M.W. SHAFER, A. WINGEN, Oak Ridge National Laboratory — A tangential 2-D soft x-ray (SXR) imaging system is installed on DIII-D to directly measure the 3-D magnetic topology at the plasma edge. This diagnostic allows the study of the plasma SXR emissivity at time resolutions ≥ 10 ms and spatial resolutions ~ 1 cm. Extracting 3-D structure from the 2-D image requires the inversion of large ill-posed matrices − a ubiquitous problem in mathematics. The goal of this work is to reduce the memory usage and computational time of the inversion to a point where image inversions can be processed between shots. We implement the Phillips-Tikohnov and Maximum Entropy regularization techniques on a parallel GPU processor. To optimize the memory demands of computing these matrixes, effects of reducing the inversion grid size and binning images are analyzed and benchmarked. Further benchmarking includes a characterization of the final image quality (with respect to numerical and instrumentation noise).

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