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Improved Technique for Parallel Temperature Measurement of Cryogenic Non-neutral Plasmas LEN EVANS, ERIC HUNTER, University of California, Berkeley, ALEX POVILUS, Lawrence Livermore Natl Lab, NICOLE LEWIS, CHUKMAN SO, ANDREW CHARMAN, JOEL FAJANS, University of California, Berkeley — New hardware and software methods to optimize the parallel temperature diagnostic for nonneutral plasmas are reported. Plasmas are extracted onto an MCP-phosphor screen assembly in the UC Berkeley Cold electron research apparatus (CERES). Incident charges on the MCP are amplified and converted into light. Rather than measuring the charge directly on a Faraday cup, the light collected by photodetectors is used to measure the time of arrival of charges as they arrive at the MCP. Efficient light collection, using Fresnel lenses and nonimaging optics, are combined with enhanced light detection, with conventional and silicon photomultipliers, to act as an amplifier chain with effective single-electron resolution. Data from this detector is analyzed to obtain a parallel temperature using a suite of newly developed, GPU-accelerated software. Plasma temperature can be obtained in real-time without human input, reducing potential biases in these measurements. This research was supported by the Department of Energy, Grant DE-FG02-06ER54904.

Alexander Povilus
Lawrence Livermore Natl Lab

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