Abstract Submitted
for the GEC20 Meeting of
The American Physical Society

Estimating electron density, electron temperature, and signal-to-noise ratio from laser-collision induced fluorescence data by treating the measurement as a stochastic process BRIAN Z. BENTZ, Sandia National Laboratories, ZACHARY WHITE, RYAN GOTT, KUNNING XU, University of Alabama in Huntsville, EDWARD V. BARNAT, Sandia National Laboratories — This communication presents a parameter estimation framework and its application to the laser-collision induced fluorescence (LCIF) diagnostic problem. An advantage of the approach is a capability to determine plasma parameters that may have a complicated or nonlinear relationship to the expected value of the measurement. Furthermore, by modeling the measurement as a stochastic process with additive Gaussian noise the experimental signal-to-noise ratio (SNR) can be quantified and the detection limits understood. We present estimation of the electron density and electron temperature in 2-D from camera measurements of LCIF from He within the plasma expansion region of a cathodic arc (50 mTorr) and the positive column of a DC discharge (1 Torr). Additionally, the SNR as defined by the measurement noise model is determined in 2-D or for each camera pixel by estimating the signal variance. Sandia National Laboratories is managed and operated by NTESS under DOE NNSA contract DE-NA0003525.

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Date submitted: 17 Jun 2020 Electronic form version 1.4