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9.3 Multi-Objective data analysis using Bayesian Parameter Estimation for the Interpretation of Magnetized Liner Inertial Fusion experiments

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The Magnetized Liner Inertial Fusion (MagLIF) concept has recently demonstrated Gbar pressures, confinement of charged fusion products, and substantial fusion yield. We have developed a new analysis methodology that allows for the self-consistent integration of multiple diagnostics including nuclear, x-ray imaging, and x-ray power measurements to determine important stagnation parameters. The analysis uses a simplified model of the hotspot in conjunction with a Bayesian inference network to determine the most probable configuration that describes the experimental observations. The analysis is also used to reveal correlations in the data and model parameters as well as to assess the value of the diagnostics. We present the details of the model used as well as the results of validation tests. We demonstrate the method on experimental data and show how new diagnostics can be added or existing ones optimized to reduce uncertainties. *Sandia National Laboratories is a multimission laboratory managed and operated by National Technology and Engineering Solutions of Sandia, LLC., a wholly owned subsidiary of Honeywell International, Inc., for the U.S. Department of Energy's National Nuclear Security Administration under contract DE-NA-0003525.

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