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Quantifying x-ray diagnostics accuracy when imaging ICF capsule implosions using Monte Carlo simulations[1] SAM IAQUINTA, CLEMENT TROSSEILLE, SHAHAB KHAN, SABRINA NAGEL, Lawrence Livermore Natl Lab — Cutting edge research on Inertial Confinement Fusion (ICF) is undertaken at the National Ignition Facility (NIF) to achieve fusion ignition. Accurately measuring the temporal and spatial evolution of ICF capsules during implosion is crucial to analyze each experiment. Multiple x-ray diagnostics have thus been developed at the NIF to monitor the implosions. Each instrument uses different technologies to record the experiment, and they therefore each have their own advantages and weaknesses. We compare the performance and limitations of different diagnostics used at NIF, such as micro-channel plate (MCP) detectors or drift-tube-based detectors. This is achieved by performing Monte Carlo simulations of the different diagnostics and comparing how the latter record different images of the same source. This task involves a very large amount of data to be processed in parallel. Therefore, the simulations are performed using both the CPU and the GPU through the use of the Open Computing Language (OpenCL), which allows for much faster and more accurate simulations. These simulations are then used to quantify the detectors accuracy to measure asymmetries in the shape of implosions, and therefore assign a confidence level to the measurement provided by each diagnostic.

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