**Synthetic X-ray Phase Contrast Images using the GREENER Code**

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The National Ignition Facility's landmark results over the last two years were in part made possible by effective diagnostics supporting improvements in experimental design. Improved diagnostics and diagnostic modeling capabilities could result in further improvements in understanding, which could lead to higher gain experiments. This talk will discuss one potential diagnostic improvement: X-ray Phase Contrast Imaging (XPCI); and the GREENER code which can model this diagnostic.

Inertial Fusion experiments generate plasmas with material interfaces and strong shocks. Understanding interfaces and the growth of instabilities like Rayleigh Taylor instability, as well as how laser imprint seeds mixing and instabilities could help reduce ablator mix into the core. Better diagnostics showing shocks could improve hydrodynamic simulations and test new experimental designs. XPCI is particularly sensitive to shocks and interfaces, so is well suited to this task, and has benefits over purely absorption based x-ray imaging. XPCI has already been used to image static cold objects, and some objects undergoing shock compression.

The GREENER code, based on extensions to the Geant4 Monte Carlo particle tracking code, can be used to aid the analysis of these experiments, and to design new experiments. This code can generate synthetic absorption and refractive images of the output from hydrodynamic simulations, and is moving towards generating synthetic images of hot plasmas through including bremsstrahlung emission.

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