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The Mini Orange Spectrometer (MOS) for Stellar and Big-Bang Nucleosynthesis studies at OMEGA and the National Ignition Facility
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— A compact and highly efficient Mini Orange Spectrometer (MOS) is being designed for measurements of energy spectra of protons and alphas in the range of 1-12 MeV in experiments at the OMEGA laser facility and the National Ignition Facility (NIF). The MOS will extend charged-particle spectrometry at these laser facilities to lower energies (<5 MeV) and lower yields ($<5 \times 10^8$) than current instrumentation allows. This new spectrometer will enable studies of low-probability stellar nucleosynthesis reactions, including the ${}^3\text{He}+{}^3\text{He}$ reaction that is part of the solar proton-proton chain. Its unique capabilities will also be exploited in other basic science experiments, including studies of stopping power in ICF-relevant plasmas, astrophysical shocks and kinetic physics. The MOS design achieves high efficiency by maximizing the solid angle of particle acceptance. The optimization of the MOS design uses simulated magnetic fields and particle tracing. Performance requirements of the MOS system, including desired detection efficiencies and energy resolution, are discussed. This work was supported in part by the U.S. DoE, LLNL, and LLE.

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