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14.19 Calibration of Proton Dispersion for the NIF Electron Positron Proton Spectrometer (NEPPS) for short-pulse laser experiments on the NIF ARC

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Experiments using the Advanced Radiographic Capability (ARC) laser at the National Ignition Facility (NIF) with recently commissioned capabilities aim to characterize proton beams accelerated via the TNSA mechanism² for use as both probes and drivers for High-Energy Density Physics experiments. The first measurements of ARC-driven TNSA proton beam characteristics, such as energy spectrum and conversion efficiency, relies on the recently commissioned NEPPS (NIF Electron Positron Proton Spectrometer) diagnostic. The NEPPS diagnostic is a version of the an existing spectrometer³ which has been primarily used for detecting MeV electron and positron spectra via permanent magnetic field dispersion, but has not been calibrated for protons. Small variations in the field uniformity can affect the proton dispersion due to the relatively small resolving power (E/dE) for this diagnostic. A broadband, TNSA proton source was produced at the Titan laser to experimentally calibrate the EPPS. Discussion of NEPPS as a TNSA proton diagnostic on the NIF will also be presented. This work was performed under the auspices of the U.S. Department of Energy (DOE) by Lawrence Livermore National Laboratory under Contract DE-AC52-07NA27344 and funded by the LLNL LDRD program under tracking code 17-ERD-039.

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