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Monoenergetic Proton Radiography of Electromagnetic Fields and Areal Density in Implosions and in Laser-Plasma-Interaction Experiments[*,†]

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An isotropic monoenergetic proton backlighter source with matched detector has been utilized on the OMEGA laser system to accurately and sensitively study the following: First, MG fields generated by laser plasma interactions [1,2], both in the growth and decay phase, the latter associated with the development of instabilities that break 2-D symmetry; Second, the reconnection of MG fields in interacting, laser-generated magnetic bubbles [3]; Third, the fields and areal density evolution for cone-in-shell implosions[4]; and Fourth, the fields and areal density evolution of spherical implosions [5,6]. Complex field structures are observed during the implosions. Because of the precise energy of the 14.7 (3.0) MeV P backlighter, a result of the fusion reaction of D and ^{3}He (and DD) in an exploding pusher, a quantitative relationship exists between particle energy loss and areal density, and between particle deflections and field strength. Results of these experiments, as well as those currently being planned, such as accurate stopping power measurements in warm dense matter, will be presented.

[1] C. K. Li *et al.*, PRL 97 2006 ;
[2] C. K. Li *et al.*, PRL 99 2007;
[3] C. K. Li *et al.* (to be published in PRL);
[4] J. R. Rygg *et al.*, this conference;
[5] F. H. Seguin *et al.*, this conference;
[6] C. K. Li *et al.*, this conference.

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