Abstract Submitted
for the DPP13 Meeting of
The American Physical Society

**Proton Stopping Power in Warm Dense Hydrogen** DREW HIGGINSON, SOPHIA CHEN, LULI, STEFANO ATZENI, U Roma, MAXENCE GAUTHIER, LULI, FELICIANA MANGIA, U Roma, JEAN-RAPHAËL MARQUÈS, RAPHAËL RIQUIER, JULIEN FUCHS, LULI — Warm dense matter (WDM) research is fundamental to many fields of physics including fusion sciences, and astrophysical phenomena. In the WDM regime, particle stopping-power differs significantly from cold matter and ideal plasma due to free electron contributions, plasma correlation effects and electron degeneracy. The creation of WDM with temporal duration consistent with the particles probes is difficult to achieve experimentally. The short-pulse laser platform allows for the production of WDM along with relatively short bunches of protons compatible of such measurements, however, until recently, the intrinsic broadband proton spectrum was not well suited to investigate the stopping power directly. This difficulty has been overcome using a novel magnetic particle selector ($\Delta$E/E= 10%) to select protons (in the range 100-1000 keV) as demonstrated with the ELFIE laser in LULI, France. These protons bunches probe high-density ($5 \times 10^{20}$ cm$^{-3}$) gases (H, He) heated by a nanosecond laser to reach estimated temperatures above 100 eV. Measurement of the proton energy loss within the heated gas allows the stopping power to be determined quantitatively. The experimental results in cold matter are compared to preexisting models to give credibility to the measurement technique. The results from heated matter show that the stopping power of 450 keV protons is dramatically reduced within heated hydrogen plasma.

Drew Higginson
LULI

Date submitted: 06 Jul 2013 Electronic form version 1.4