Abstract Submitted
for the DPP16 Meeting of
The American Physical Society

Extracting the Electron-Ion Temperature Relaxation Rate from Ion Stopping Experiments[1] PAUL E. GRABOWSKI, Lawrence Livermore National Laboratory, Livermore, California 94550, USA, JOHAN A. FRENJE, Plasma Science and Fusion Center, Massachusetts Institute of Technology, Cambridge, Massachusetts 02139, USA, LORIN X. BENEDICT, Lawrence Livermore National Laboratory, Livermore, California 94550, USA — Direct measurement of i-e equilibration rates at ICF-relevant conditions is a big challenge, as it is difficult to differentiate from other sinks and sources of energy, such as heat conduction and pdV work. Another method is to use information from ion stopping experiments. Such experiments [Frenje et al, PRL **115**, 205001 (2015)] at the OMEGA laser have made precision energy loss measurements of fusion products at these conditions. Combined with the multimonochromatic x-ray imager technique [Nagayama et al, J. Appl. Phys. **109**, 093303 (2011); Phys. Plasmas **19**, 082705 (2012); **21**, 050702 (2014)], which gives temporally and spatially resolved electron temperature and density, we have a robust stopping experiment. We propose to use such stopping measurements to assess the i-e temperature relaxation rate, since both processes involve energy exchange between electrons and ions. We require that the fusion products are 1) much faster than the thermal ions so that i-i collisions are negligible compared to i-e collisions and 2) slower than the thermal electrons so that the stopping obeys a linear friction law. Then the Coulomb logarithms associated with ion stopping and i-e temperature relaxation rate are identical and a measurement of the former provides the latter.

[1]Prepared by LLNL under Contract DE-AC52-07NA27344.

Paul Grabowski
Lawrence Livermore National Laboratory, Livermore, California 94550, USA

Date submitted: 13 Jul 2016 Electronic form version 1.4