Abstract Submitted
for the DPP09 Meeting of
The American Physical Society

Thermal simulations of the NDCX-I target experiments[1] E. HENESTROZA, F.M. BIENIOSKE, P.A. NI, R.M. MORE, J.J. BARNARD, Lawrence Berkeley National Laboratory — Experiments on ion-beam target heating use a 0.3 MeV K+ beam from the Neutralized Drift Compression Experiment (NDCX-I) accelerator at LBNL. The NDCX-I delivers a long pulse beam (several microseconds) with a power density of 500 kW/cm^2 over a sampled spot size on the target of several hundred micrometers. With the addition of an imposed velocity tilt from an induction core, the NDCX-I can compress a portion of the long pulse to reach a power density of 25 MW/cm^2 over 2 nanoseconds. Under these conditions, the free-standing thin foil targets used in the experiments go through the melting and vaporization phases to reach temperatures up to 4000 K. Since the targets are thin foils of fractions of a micron in thickness we can model the target thermal dynamics using the equation of heat conduction for the temperature T(x,t) as function of time and the spatial dimension along the beam direction; we also include cooling processes from energy flux from the surface of the foil due to evaporation, radiation, and thermionic (Richardson) emission.

[1]This work was supported by the Director, Office of Science, Office of Fusion Energy Sciences, of the U.S. Department of Energy under Contract No. DE-AC02-05CH11231 and Contract DE-AC52-07NA27344.

E. Henestroza
Lawrence Berkeley National Laboratory

Date submitted: 20 Jul 2009

Electronic form version 1.4