Abstract Submitted
for the DPP16 Meeting of
The American Physical Society

X-ray Emission Line Anisotropy Effects on the Isoelectronic Temperature Measurement Method DUANE LIEDAHL, MARIA BARRIOS, GREG BROWN, MARK FOORD, WILLIAM GRAY, Lawrence Livermore National Laboratory, STEPHANIE HANSEN, Sandia National Laboratory, ROBERT HEETER, LEONARD JARROTT, CHRISTOPHER MAUCHE, JOHN MOODY, MARILYN SCHNEIDER, KLAUS WIDMANN, Lawrence Livermore National Laboratory — Measurements of the ratio of analogous emission lines from isoelectronic ions of two elements form the basis of the isoelectronic method of inferring electron temperatures in laser-produced plasmas, with the expectation that atomic modeling errors cancel to first order. Helium-like ions are a common choice in many experiments. Obtaining sufficiently bright signals often requires sample sizes with non-trivial line optical depths. For lines with small destruction probabilities per scatter, such as the 1s2p–1s2 He-like resonance line, repeated scattering can cause a marked angular dependence in the escaping radiation. Isoelectronic lines from near-Z equimolar dopants have similar optical depths and similar angular variations, which leads to a near angular-invariance for their line ratios. Using Monte Carlo simulations, we show that possible ambiguities associated with anisotropy in deriving electron temperatures from X-ray line ratios are minimized by exploiting this isoelectronic invariance.

Duane Liedahl
Lawrence Livermore National Laboratory

Date submitted: 20 Jul 2016 Electronic form version 1.4