Abstract Submitted
for the DPP19 Meeting of
The American Physical Society

Measurements of Arbitrary Distribution Functions Using Angularly Resolved Thomson Scattering[1] A.L. MILDER, J. KATZ, R. BONI, J.P. PALASTRO, D.H. FROULA, Laboratory for Laser Energetics, U. of Rochester —
The basis of many phenomena in laser-produced plasmas is contingent upon the understanding of the underlying electron distribution function. The sensitivity of Thomson scattering to electron distribution function has been shown numerically 1 and has been used experimentally to identify non-Maxwellian electron distribution functions driven by thermal transport, 2 inverse bremsstrahlung heating, and ionization. 3 A new angularly resolved Thomson-scattering diagnostic has been invented to measure electron distribution functions with arbitrary shape. The relationship between scattering angle and the resonant thermal plasma wave probed by Thomson scattering results in scattering features that vary with angle in correspondence to the shape of the electron distribution over several orders of magnitude. A numerical forward fit to the complete angularly resolved Thomson-scattered spectra provides a measurement of the electron distribution function without predicting which physical processes will contribute to its shape.
[1] A. L. Milder et al., Phys. Plasmas 26, 022711 (2019).
[2] R. J. Henchen et al., Phys. Rev. Lett. 121, 125001 (2018).
[3] A. L. Milder et al., Evolution of the electron distribution function in the presence of inverse bremsstrahlung heating and collisional ionization to be submitted to Physical Review Letters.

[1]This material is based upon work supported by the Department of Energy National Nuclear Security Administration under Award Number DE-NA0003856.

Ruth Teferi
APS

Date submitted: 09 Jul 2019 Electronic form version 1.4