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Universality in the Equilibration of Quenched Yukawa One Component Plasmas[1] THOMAS LANGIN, PATRICK MCQUILLEN, TREVOR STRICKLER, Rice University, NIKOLA MAKSIMOVIC, University of Colorado, Boulder, THOMAS POHL, Max Planck Institute for the Physics of Complex Systems, THOMAS KILLIAN, Rice University — We study the equilibration of a Yukawa One Component Plasma (OCP) after a rapid change in the screening parameter from $\kappa_0 = \infty$ to $\kappa_f(n, T_e)$, which is realized by photoionizing a laser cooled ($T \sim 10\,\mathrm{mK}$), uncorrelated gas of ^{88}Sr atoms with density n between $10^{14}\,\mathrm{m}^{-3}$ and $3 \times 10^{16}\,\mathrm{m}^{-3}$ using a two photon process in which the energy of one of the photons is adjustable. The excess photon energy above the ionization threshold sets the electron temperature, T_e, and thus gives us control of κ_f. The resultant plasma is a classical plasma with strongly coupled ions, and is therefore described by the Yukawa OCP model with the electrons treated as a screening background. After photoionization, the ions develop spatial correlations to minimize their interaction energy, thus heating the ions. Since the dynamics of a Yukawa OCP depend solely on κ, we expect the heating process to be uniquely determined by κ_f. We verify this behavior by measuring the ion heating curve and comparing it to molecular dynamics simulations. We also report on how this behavior can be used to accurately measure n given a measured equilibration curve at a known T_e.

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