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Early time dynamics of strongly coupled ultracold neutral Ca^+ and Ca^{2+} plasmas[1] MARY LYON, SCOTT BERGESON, Brigham Young University — Ultracold neutral plasmas are generated by photoionizing laser-cooled atoms. Due to their extremely low temperatures, ultracold plasmas fall into the "strongly coupled" regime, where strong coupling is characterized by the parameter Γ. This dimensionless parameter, given by the ratio of the Coulomb potential energy to the average kinetic energy of the ions, describes the complete thermodynamic state of a strongly coupled system. This makes it possible to study the fundamental behavior of strongly coupled systems as manifested in high energy-density plasmas using low energy table-top experiments. We report progress on an experiment in laser-cooled calcium designed to increase the strong coupling of an ultracold neutral plasma by promoting the plasma ions to the second ionization state. Measurements of the effect that the Ca^{2+} ions have on the temperature of the Ca^+ ions as a function of the second ionization fraction are discussed.

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