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Electron strong coupling in low-density ultracold plasmas[1] WEITING CHEN, CRAIG WITTE, JACOB ROBERTS, Colorado State University — Three-body recombination is one of the main heating mechanisms that prevents electrons in ultracold plasmas (UCPs) from reaching higher degrees of strong coupling. Such heating has been predicted to limit the degree of electron strong coupling in a UCP to strong coupling parameter $\Gamma \sim 0.2$ [F. Robicheaux and James D. Hanson, Phys. Rev. Lett. **88**, 055002 (2003)]. The recombination rate scales as $\Gamma^{\frac{9}{2}}$ and linearly with plasma frequency. On the other hand, the UCP formation time does not scale linearly with plasma frequency. These two different scaling behaviors with respect to the plasma frequency suggest that by operating at low density, there is a period of time right after formation that the three-body recombination effect is insignificant such that Γ can exceed the 0.2 limit temporarily. To experimentally verify this, we measured the temperature and density of low-density UCPs so as to extract Γ. This was accomplished by measuring an electron oscillation frequency and damping rate. For low-temperature conditions in our system, $\Gamma \sim 0.35$ was measured.

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