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Rydberg atom formation rate versus the three-body recombination rate in ultracold plasmas[1] JOHN GUTHRIE, WEI-TING CHEN, JACOB ROBERTS, Colorado State University — One of the main limitations to the lowest achievable electron temperatures in ultracold plasmas is the formation of Rydberg atoms through three-body recombination collisions. Such recombination collisions are predicted to obey a well-known electron temperature (T) scaling of $T^{-\frac{9}{2}}$ in plasmas. Such a predicted scaling, however, is true only given a careful definition of what a recombination rate is versus the what the overall Rydberg atom formation rate is. We present such considerations that are relevant for low-density ultracold plasmas and compare theory predictions to experimental measurements. The $T^{-\frac{9}{2}}$ scaling is not observed, but this is in line with expectations. While we have good agreement between theory and experiment for what should be steady-state populations of Rydberg atoms in ultracold plasmas, the predicted dynamics at earlier times are not in agreement between theory and experiment.

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