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Three-body recombination in ultracold plasmas: small energy transfer with large consequences D. VRINCEANU, Texas Southern University, T. POHL, Max Plank Institute, Dresden, Germany, H.R. SADEGHPOUR, Harvard-Smithsonian Center for Astrophysics — Extensive Monte Carlo calculations of electron-impact induced transitions rates between highly excited Rydberg states, and ionization rate, and particle-in-cell simulation of ultracold neutral plasma evolution and cooling, are presented. While for large energy transfer, our calculations confirm the well known Mansbach and Keck's rate formulae (P. Mansbach and J. Keck, Phys. Rev. 181, 275(1969)), significant deviations for small energy transfer are found. Comparison of plasma expansion velocity in an strontium Ultracold Neutral Plasma experiment and Rydberg atom recombination in a xenon Ultracold Neutral Plasma are made, illustrating the applicability of such differences. The effects of the corrections introduced to the Mansbach and Keck rates are more pronounced for short time dynamics and almost insignificant for steady state and equilibrium quantities.

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