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Ultracold plasma expansion rate dependence on non-neutrality[1]
CRAIG WITTE, JACOB ROBERTS, Colorado State University — Ultracold plasmas are formed by photoionizing a collection of laser cooled atoms. Once formed, these plasmas expand. This expansion is driven by both the thermal energy of the plasma electrons, as well as electrostatic energy owing to non-neutrality. Both the parameters can be experimentally controlled with a significant degree of independence. Combining previous work,[2,3] we have developed a theoretical model designed to investigate the dependence of ultracold plasma expansion on the degree of non-neutrality of these plasmas in a parameter range relevant to experiments. We find that variations of the plasma neutrality produce non-negligible changes in predicted electron temperature evolution and plasma expansion rate. Such behavior needs to be taken into account for an accurate interpretation of ultracold plasma parameters relevant to experimental measurements.

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[3]D Vrinceanu, G S Balaraman, and L A Collins, The King model for electrons in a finite-size ultracold plasma, J. Phys. A: Math. Theor.**41** 425501 (2008).

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