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Tune-out Wavelength of ^{4}He for the 1s2s ^{3}S - 1s3p ^{3}P Transition[1]
JACOB MANALO, GORDON DRAKE, University of Windsor — Tune-out wavelengths are those where the dynamic polarizability of an atom is zero. Several applications include laser cooling, atomic clocks and quantum information, all for the Group II atoms [1]. Of the Group II's, helium is a useful subject as it is the simplest atom of two electrons. According to Mitroy and Tang, the tune-out wavelength closest to the $1s2s\ ^3S$ - $1s3p\ ^3P$ transition for metastable helium can serve as a useful low energy probe of atomic structure [2]. Our calculation of this wavelength, employing a full Hylleraas basis set as well as mass polarization for ^{4}He, is 0.11030082982551(1) in reduced mass atomic units. In order to measure this tune-out wavelength, an interferometer is needed [2]. Methods of using laser beams as waveguides for matter waves have been explored, and such techniques can be applied to interferometry as stated by Baldwin et al. [3]. Our future calculations will include relativistic and QED corrections.

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[3] R. G. Dall, S. S. Hodgman, M. T. Johnsson, K. G. H. Baldwin, and A. G. Truscott, Phys. Rev. A **81**, 011602(R) (2010).

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