Abstract Submitted
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Primary Pressure Standard with Cold Atoms[1] PINRUI SHEN, KAIS JOOYA, Department of Physics and Astronomy, University of British Columbia, Vancouver, BC, V6T 1Z1, Canada., JAMES BOOTH, Physics Department, British Columbia Institute of Technology, Burnaby, BC, V5G 3H2, Canada., KIRK MADISON, Department of Physics and Astronomy, University of British Columbia, Vancouver, BC, V6T 1Z1, Canada. — We developed a method of using an ultra-cold ensemble of atoms confined in a trap as an atomic primary pressure standard. This primary standard uses a 3D MOT to trap ^{87} Rb and then transfers them into a quadrupole magnetic trap where atoms could collide with background gas atoms in a shallower trap, resulting in loss of the atoms. The measured loss rate is proportional to the density of the background gas particles and to a velocity-averaged collision cross-section. The advantages of this cold atom standard (CAS) are that it is based on immutable atomic properties, can be used to measure the pressure of any species - in contrast with existing pressure standards which only measures either Argon or Nitrogen, and it transduces loss rate into pressure. The CAS is currently being tested against a NIST-calibrated ionization gauge using both Argon and Nitrogen over the pressure range (10^{-6} - 10^{-9}) Torr. The gauge factor for Argon is found to be 1.25 and the Nitrogen measurements have allowed the long-range Vanderwals coefficient for N_2 - Ar elastic collisions to be determined, which allows us for it to be used as a standard. We also studied the Majorana losses in this quadrupole magnetic trap and reduced its effect to improve the accuracy of the CAS.

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