Abstract Submitted
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Novel Positron-beam Systems for Atomic Physics[1] M.R. NATISIN, J.R. DANIELSON, C.M. SURKO, University of California, San Diego — Trapped positron plasmas are now routinely used to generate high resolution positron beams for a range of atomic physics experiments. Described here are the designs of two new positron beam systems intended for study of the nature and mechanisms of positron attachment to ordinary matter. Positrons attach to molecules in two-body collisions via the excitation of vibrational modes, resulting in huge enhancements in the annihilation rate. While this technique provides a way to measure binding energies,[2] improved energy resolution is critical to further progress. The design of a new system using a cryogenically cooled buffer gas is described that is intended to meet this need (i.e., resolution ≤ 10 meV, FWHM, a factor of 4 improvement). The analogous process of positron attachment to atoms has not yet been studied experimentally. Also described here is the design of a tailored beam system, combined with a pulsed laser, intended to do this via photo-induced recombination.[3] The example of positron binding to zinc (predicted binding energy ~ 0.1 eV) is discussed.

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[2]Gribakin, Young, and Surko, *Rev. Mod. Phys.* **82**, 2557 (2010).
[3]Surko, Danielson, Gribakin, and Continetti, *NJP* **14**, 065004 (2012).

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