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Experiments Enabled by a New High-Resolution Positron Beam[1]

MIKE NATISIN, JAMES DANIELSON, CLIFF SURKO, Univ of California - San Diego — The ability to make state-resolved measurements of positron interactions with atoms and molecules is limited by difficulties encountered in creating beams with narrow energy spreads. Recent experiments and simulations of buffer gas positron cooling and trap-based beam formation[2] have enabled the design and construction of a cryogenic buffer-gas trap with total beam energy spreads as low as 7 meV FWHM and temporal spreads of sub-microsecond duration.[3] The potential effect of this narrow energy spread on the ability to probe new physics in positron scattering and annihilation experiments will be discussed. For example, beams with such energy spreads are expected to enable the first measurements of state-resolved excitation of molecular rotations by positron impact (i.e., H_2). Further, these narrow spreads and resulting enhanced resolving power are expected to permit the study of new features in annihilation energy spectra, such as possible overtone, combination, and IR-inactive vibrational modes in Feshbach-resonant positron annihilation.

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[2]M. R. Natisin, invited talk at this conference.
[3]M. R. Natisin, *et al.*, Appl. Phys. Lett. **108**, 024102 (2016)

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