Abstract Submitted
for the DAMOP18 Meeting of
The American Physical Society

Measurement of Vibrational Feshbach Resonances Mediated by Nondipole Positron-Molecule Interactions.[1] J. R. DANIELSON, M. R. NATISIN, C. M. SURKO, University of California, San Diego, A. R. SWANN, G. F. GRIBAKIN, Queen's University Belfast — Experiments have shown that low-energy (sub eV) annihilation spectra of positrons on molecules are typically dominated by relatively sharp features that have been identified as vibrational Feshbach resonances (VFR) involving fundamental modes. A theory by Gribakin and Lee,[2] is successful in describing quantitatively annihilation spectra for several small molecules, where they are dominated by *dipole-active* fundamental modes. Presented here are measurements of positron-molecule annihilation using a recently developed cryogenic positron beam with significantly improved energy resolution.[3] Data for 1,2-trans-dichloroethylene and tetrachloroethylene show clear signatures of a resonance at the location of *nondipole-active* C-C stretch modes. The magnitudes of these resonances are consistent with a simple model that predicts resonances due to *quadrupole* coupling. This work provides evidence that positron-molecule bound states can be populated by *non-dipole* interactions. Further implications of this work will be discussed.

[1]Work supported by NSF grant PHY-1702230.
[2]Gribakin and Lee, Phys. Rev. Lett. **97**, 193201 (2006).
[3]Natisin, et. al., Phys. Rev. Lett. **119**, 113402 (2017).

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Date submitted: 24 Jan 2018 Electronic form version 1.4