Measurement of Vibrational Feshbach Resonances Mediated by Nondipole Positron-Molecule Interactions.\textsuperscript{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,\textsuperscript{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.\textsuperscript{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.

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