Abstract Submitted
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Cooper Pair Formation in Acenes[1] TIM HARTMAN, PAVLE JURANIĆ[2], SRC, Univ. of Wisconsin - Madison, KELLY COLLINS, Univ. of Evansville, BETHANY REILLY, Univ. of Wisconsin - Madison, NARAYANA APPATHURAI, SRC, Univ. of Wisconsin - Madison, SCOTT B. WHITFIELD, Dept. of Phys. and Astr., Univ. of Wisconsin - Eau Claire, RALF WEHLITZ, SRC, Univ. of Wisconsin - Madison — We have measured the ratio of doubly to singly charged molecular parent ions of benzene, naphthalene, anthracene, and pyrrole over a wide range of photon energies. About 40 eV above the double-ionization threshold, the first three of the above molecules exhibit a hump of very similar shape and magnitude in the double-to-single photoionization ratio, which we attribute to the formation and emission of an electron Cooper pair from a free molecule. Our results suggest that the de Broglie wave of this highly correlated pair of electrons forms a closed loop in the system of overlapping π bonds with a wavelength that matches the distance between neighboring carbon atoms. Pyrrole with its pentagonal structure does not allow the formation of a closed de Broglie wave and, thus, does not exhibit a hump in the ratio. Photoelectron measurements indicate the break-up of the emitted Cooper pair by two electron peaks sitting on top of the mainly U-shaped double-ionization continuum in support of our interpretation.

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