Abstract Submitted
for the DAMOP13 Meeting of
The American Physical Society

Photoemission of Cooper Pairs from Aromatic Hydrocarbons[1]
TIM HARTMAN, PAVLE JURANIĆ[2], SRC, UW-Madison, KELLY COLLINS, Purdue Univ., BETHANY REILLY, UW-Madison, EMILY MAKOUTZ, Michigan Tech. Univ., SCOTT B. WHITFIELD, UW-Eau Claire, NARAYAN APPATHURAI, RALF WEHLITZ, SRC, UW-Madison — We have measured the ratio of doubly to singly charged molecular parent ions of benzene, naphthalene, anthracene, coronene, pyrrole, and furan over a wide range of photon energies. About 40 eV above the double-ionization threshold, the first four 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.[3] 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. Interestingly, coronene also exhibits a hump that corresponds to a de Broglie wavelength of twice the C–C distance. Pyrrole and furan, on the other hand, do not show any hump in the ratio probably due to their pentagonal structure. Photoelectron measurements indicate the break-up of the emitted Cooper pair in support of our interpretation.

[1]The SRC is mainly supported by the University of Wisconsin-Madison
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[3]R. Wehlitz *et al.* Phys. Rev. Lett. **109**, 193001 (2012)

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Date submitted: 24 Jan 2013 Electronic form version 1.4