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Wigner time delay in photodetachment SOUMYAJIT SAHA, GOPALAN ARAVIND, IIT-Madras, JOBIN JOSE, IIT-Patna, PRANAWA DESHMUKH, IIT-Tirupati, VALERIY DOLMATOV, University of North Alabama, ANATOLI KHEIFETS, Australian National University, STEVEN MANSON, Georgia State University — Using Cl^- as a test case, Wigner time delay [1] in the photodetachment process has been investigated theoretically for the outer $3p$ subshell using the relativistic-random-phase approximation (RRPA). Time delay was probed from threshold to 80 eV to investigate threshold effects, including the shape resonance, along with the Cooper minimum region. This study of the threshold effects is possible for negative ions because the phase of the photodetachment process is not dominated by the Coulomb phase as it is in photoionization. The isoelectronic Ar atom was also studied for comparison and the results show significant differences, both qualitative and quantitative, between the time delays for Cl^- and Ar photoemission at low photoelectron energy, but they are rather similar in the Cooper minimum region, where the Coulomb phase is small. In particular, the Wigner time delay in Cl^- exhibits dramatic energy dependence just above threshold, and a rapidly increasing time delay in the vicinity of the shape resonance. A strong angular dependence of time delay has also been found near the threshold region for Cl^- case, and absent in case of photoionization of Ar. The origin of these phenomenologies is explained and a prospectus for future work is presented. Work partially supported by SERB (India) and the US DOE. [1] E. P. Wigner, Phys. Rev. **98**, 145 (1955).

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