

# ABSOLUTE PHOTO-DOUBLE DETACHMENT CROSS-SECTION MEASUREMENTS FOR F<sup>-</sup> AND Cl<sup>-</sup>

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Loosely bound systems such as negative ions are particularly well suited to study the effects of electron correlation on atomic structure and dynamics. Photo-double detachment is a highly correlated process in which two electrons are simultaneously ejected from a negative ion following the absorption of a single photon. There have been several previous investigations of photo-double detachment. Most of these studies have focused on threshold behavior or resonance structure. Only a few experiments included absolute measurements of the cross section. The first measurement of a cross section over an extended energy range was recently made for Li<sup>-</sup> [1].

Absolute measurements of the total cross section for photo-double detachment of the halogen negative ions, F<sup>-</sup> and Cl<sup>-</sup> have been obtained from 20-60 eV and 18-42 eV respectively. The experiments were performed using the ion-photon-beam (IPB) endstation [2] installed on undulator beamline 10.0.1 at the Advanced Light Source.

Figure 1 shows the data accumulated for the F<sup>-</sup> ion in the double detachment continuum, extending from the threshold at the F<sup>+</sup> (2p<sup>4</sup> <sup>3</sup>P) limit to the F<sup>2+</sup> (2p<sup>3</sup> <sup>4</sup>S<sup>o</sup>) limit. A corresponding energy range was covered in the Cl<sup>-</sup> measurements. Since the detection of the F<sup>+</sup> and Cl<sup>+</sup> ions was not state selective, these measurements represent the sum of the partial cross sections for detachment into the different continua asso-

ciated with the ground and excited states of the F<sup>+</sup> and Cl<sup>+</sup> ions. A careful search was made for resonance structure in the cross section using high energy resolution and small energy steps. No resonances were apparent in either the F<sup>-</sup> or the Cl<sup>-</sup> cross section.

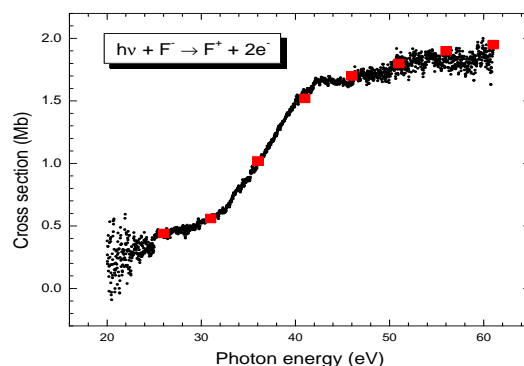


Fig. 1. Measurements of the total cross section for photo-double detachment of F<sup>-</sup>. The red squares indicate absolute measurements made at selected photon energies.

## References

- [1] H. Kjeldsen et al. *J. Phys. B* **34**, L353 (2001).
- [2] A. M. Covington et al. *Phys. Rev. A* **66**, 062710 (2002).