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Photo detachment of negative ions at ISOLDE: Towards measurement of the Electron Affinities of Radioactive Elements

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Negatively charged ions are mainly stabilized through the electron correlation effect. A measure for their stability is the binding energy which is termed electron affinity (EA). The energy required to form a positively charged ion by releasing an electron from the neutral atom is referred to as ionization potential (IP). These two energies are fundamental characteristics, defining the chemical properties of the atom in compounds.

In previous campaigns at ISOLDE we have performed precision measurements of the IP of astatine and polonium by observing series of Rydberg resonances using laser spectroscopy. The logical next step is to also measure the electron affinity of these elements. The method of measuring the photo detachment threshold is widely used for precisely determining this quantity.

We will present results from our first experimental campaign at ISOLDE, based on an approved Letter-of-intent. We will explain the method and the experimental setup, introducing the newly commissioned Gothenburg ANion Detector for Affinity measurements by Laser PHotodetachment (GANDALPH) and show the first data obtained using negative iodine beams extracted from ISOLDE. We will conclude with an outlook and also present a concept that could be applied for purification of negative ion beams extracted from ISOLDE.

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