

Electron-impact excitation of the heaviest helium-like ion (U90+) in relativistic collisions

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Here we propose to measure the fundamental atomic process of electron-impact excitation (EIE) for the heaviest helium-like ion (U90+) at the gas-jet target of the ESR. Thereby we plan to extend the previous successful study where the EIE process has been identified for the first time for such a system, but only relative cross sections could be extracted and compared to theory. In the proposed study, we plan to obtain absolute EIE cross sections by using the process of Radiative Electron Capture (REC) occurring in the same collisions for normalization. Relying on the accurate knowledge of the REC cross sections, we aim to obtain the absolute EIE cross sections with an accuracy of few percent. This will allow to distinguish between the EIE calculations using the Breit Interaction or the Generalized Breit interaction for the first time, and thereby provide a benchmark test for the electron-electron interaction in the regime of extreme fields. In addition, we plan to measure the linear polarization of the characteristic Lyman radiation by using a novel Compton polarimeter and thus provide a more stringent test of the state-of-the-art theory.

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