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Towards a fast calculator for atomic emission processes of photons and electrons from relativistic heavy-ion-atom collisions

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The study of heavy-ion systems at the GSI Helmholtz-center for Heavy-Ion Research in Darmstadt has proven to provide a deep insight into atomic structures and interactions processes in the presence of extreme field-strengths [1]. The FAIR project which is currently being built at the site of the GSI and especially its High-Energy Storage Ring (HESR) give raise to new opportunities for heavy-ion experiments with the full range of charge-states and energies reaching up to the GeV/u regime [2]. The planning of future heavy-ion-atom collision experiments at relativistic energies at the HESR's internal gas-target may profit from the availability of a fast calculator for the emission characteristics of the occurring interactions. In particular, those processes are of great importance, which give rise to the emission of high energy photons and electrons that may contribute to the background of a broad range of planned experiments.

As a starting point for such a universal calculator, we recently begun to assemble results of theoretic physics concerning relativistic heavy-ion-atom interactions [3-5] into a set of tools that was used to create a database: Precise results on Radiative Electron Recombination, Bremsstrahlung and Binary Encounter processes in a vast parameter range can be found within seconds using the resulting database. The results were used in first simulations on possible day-zero-experiments at the HESR.

References

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Collaboration

Helmholtz-Institut Jena, 07743 Jena, Germany

Primary author: HERDRICH, Marc Oliver (GSI, Darmstadt)

Co-author: WEBER, Günter (GSI, Darmstadt)

Presenter: HERDRICH, Marc Oliver (GSI, Darmstadt)

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