# Transfer ionization in collisions of bare nuclei with light atoms

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In a collision between an ion (projectile) and an atom with two or more electrons (target) one of atomic electrons can be captured into a bound state of the ion while another electron be emitted. Such a process is called transfer ionization.

There are few basic mechanisms contributing to transfer ionization in fast collisions. Depending on whether the electron-electron interaction (correlation) is crucial or not these mechanisms can be subdivided into correlated and uncorrelated ones. The uncorrelated mechanisms include so called independent capture–ionization and capture–shake-off whereas the correlated ones are electron-electron Thomas [1] and electron-electron Auger [2-5].

A non-relativistic theory of transfer ionization in fast collisions (including both correlated and uncorrelated channels) was presented in [2-4]. This theory can be applied when the typical velocities of the electrons in their initial and final bound states are much less than the collision velocity.

We present calculation of the double-differential cross section of the correlated transfer ionization in relativistic collisions between bare nuclei and light atoms [5]. Nuclei with the nuclear charge $30 \leq Z \leq 92$ are considered. The calculation is performed within the relativistic QED theory.

This process is profoundly influenced by the generalized Breit interaction already at modest relativistic impact energies. This interaction qualitatively changes the shape of the emission pattern and strongly increases the emission. These effects can be verified experimentally by detecting high-energy electrons emitted in the laboratory frame under large angles ($\sim 120^\circ - 180^\circ$) with respect to the motion of the highly charged ion.

**References**

[1] L. H. Thomas Proc. R. Soc. **14**, 561-576 (1927)
[2] A. B. Voitkiv J. Phys. B **41**, 195201 (2008)
[3] A. B. Voitkiv, B. Najjari, and J. Ullrich Phys. Rev. Lett. **101**, 223201 (2008)
[4] A. B. Voitkiv, X. Ma Phys. Rev. A **86**, 012709 (2012)
[5] O. Yu. Andreev, E. A. Mistonova, and A. B. Voitkiv Phys. Rev. Lett. **112**, 103202 (2014)