

## LEAK-OUT SPECTROSCOPY: A UNIVERSAL METHOD OF ACTION SPECTROSCOPY IN COLD ION TRAPS

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So far, action spectroscopy in cold ion traps has been relying on a change of the ion mass by fragmentation upon photon absorption, pre-dissociation of tagged ions or via laser induced chemical reactions. Despite the advances of these techniques they could not be applied to many important ions. Here, a new method of action spectroscopy in cold ion traps, termed leak-out spectroscopy (LOS <sup>a</sup>) is presented. LOS is based on transfer of internal energy to translational energy upon collision of the excited ion with a neutral collision partner. By detecting these accelerated ions leaving the ion trap, their spectrum is recorded. <sup>b</sup> This method is background free and may be applied to any ion (cation/anion). Ro-vibrational spectra are recorded in high-resolution. IR-MMW double resonance is used to record rotational spectra. The method also works using pulsed lasers. Recent examples will be highlighted. Moreover, due to the trapping of a finite ensemble, all ions addressed by the excitation can be kicked out. Therefore, the content of the trap can be analyzed for isomers or other isobaric but spectroscopically distinct species. This analysis can also be used for an isomer specific preparation prior to subsequent experiments.

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<sup>a</sup>Patent pending: DE 10 2021 127 556.3 (Universität zu Köln), 22.10.2021

<sup>b</sup>P. C. Schmid, O. Asvany, T. Salomon, S. Thorwirth, and S. Schlemmer, "Leak-Out Spectroscopy, A Universal Method of Action Spectroscopy in Cold Ion Traps", *J. Phys. Chem. A*, 126, 8111-8117 (2022)