General Physics Seminar
Rijnhuizen Seminar Room

22 August, 15:00

Charge driven fragmentation of fullerenes, van-der-Waals clusters, and small biomolecules

Thomas Schlathölter

KVI Atomic Physics
Zernikelaan 25
9747-AA Groningen
The Netherlands

Removal of one or several electrons from a microscopic system such as a cluster or a small molecule can lead to extensive fragmentation. Typically photons, electrons or ions can be used to induce the ionization in the first place.
Multiply charged ions with keV energies are a particularly interesting tool for studies of such processes. Because of the extremely short interaction time (of the order of a few fs), the ionization process is decoupled in time from the response of the ionized system. Furthermore, by variation of the three parameters ion charge state q, ion velocity v and ion atomic number Z, the excitation can be tuned over a wide range.
For the extraordinarily stable fullerenes for instance low v lead predominantly to vibrational excitation whereas high v induces electronic excitation. Very high ion charge states lead to a strongly bimodal mass-distribution of the collision products: Either internally cold multiply charged fullerene ions are formed or fragmentation into very small fragments is observed.
Fundamentally different are weakly bound van-der-Waals clusters. In contrast to the fullerene case, we observed strong charge localization amongst the interaction products.
Interactions of multiply charged ions with biomolecules are interesting for two reasons: Biomolecules are strongly heterogeneous systems. Furthermore, the interaction of keV ions with biomolecules is of fundamental interest for the field of biological radiation damage.