



SEMINAR

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CFEL – Building 99, seminar room IV (first floor)

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Double-arm three-dimensional ion imaging apparatus for the study of ion pair channels in resonance enhanced multiphoton ionization

It will be presented an experimental method for the full quantitative characterization of the multichannel resonance enhanced multiphoton ionization (REMPI) of small molecules in cases when the ion-pair dissociation channel is important. For this purpose, a double-arm time-of-flight mass spectrometer with three-dimensional (3D) ion imaging detectors at both arms is constructed. The REMPI of HCl molecules is used to examine the constructed setup. The apparatus allows one to perform simultaneous measurements of the 3D velocity vector distributions of positive (H^+ , HCl^+ , and Cl^+) and negative (Cl^-) photoions. The characterization consists of the determination of “two-photon absorption cross sections” for the process $HCl(X)+2h\nu \rightarrow HCl^*$ and one-photon absorption cross sections for subsequent processes $HCl^* + h\nu \rightarrow HCl^{**}$. All these data should be obtained from the analysis of the dependencies of the number of produced ions on the laser energy. The full characterization of the laser beam and the knowledge of the ion detection probability are necessary parts of the analysis. Detailed knowledge of losses of produced ions in the mass spectrometer before detection requires understanding and characterization of such processes like electron emission from metallic grids under ion bombardment.