THE NEWLY SET-UP SPECTROSCOPIC MOLECULAR BEAM APPARATUS : CONCEPTIONAL AND TECHNICAL OVERVIEW

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Molecular chirality is an established phenomenon and a extensive field of modern interdisciplinary research. In particular, the usage of light for the identification and control of chirality on a molecular level constitutes fundamental challenges and represent the main research goal of the SFB 1319 ELCH (Extreme light for sensing and driving molecular chirality). Aspects of these challenges are the distinction between enantiomers, enantiomer switching, and enantio-selective state preparation, which demand the development of precision spectroscopic tools and techniques. We aim to employ a combination of microwave and infrared radiation to achieve chirality sensing.

Here, we present our new spectrometer capable of production and cooling of chiral species adiabatically in a molecular beam and subsequent manipulation and detection via resonance-enhanced multi-photon ionization (REMPI). A conceptual and technical overview of the experimental setup and its various components is presented. For the production and cooling of chiral molecules an Even-Lavie valve is utilized. REMPI-schemes are employed with optical radiation for state selective ionization and mass selective detection of the species by ion time-of-flight spectrometry. Manipulation and state preparation techniques are outlined, and technical specifications as well as performance data of the nozzle (pulse shape, temperature profile) and of the employed optical lasers (spectral line widths) are presented.