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Spatially Resolved Time-of-Flight Ion Mass Spectrometry with Femtosecond Pulses JAMES STROHABER, IGOR MARIYENKO, CHAD PE-TERSEN, CORNELIS UITERWAAL, University of Nebraska - Lincoln — When a focused laser beam is used to study intense, ultrafast ionization processes in a target gas, the interaction region (where the intensity is highest) is usually surrounded by larger regions in which the intensity is different. Collecting ions from all these regions makes the peak intensity ill-defined. To avoid this adverse so-called *volume effect*, we detect ions from a small volume, limited in all three spatial dimensions. We report on our investigations of the focal topology of a 45 femtosecond pulse from an intense Ti:sapphire laser source ($\sim 2.5 \text{ mJ/pulse}$). Experiments and simulations will be presented demonstrating our technique of recording mass-resolved high-resolution spatial images of ion distributions in our laser focus. The technical details and limits of our approach will be discussed. Separate contributions present our plans to use the technique to investigate the effect of orbital angular momentum on rescattering ionization processes.

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