**Femtosecond Mass Spectroscopy with Aqueous Samples**

The current project investigates the effect of the substrate in laser desorption ionization of aqueous samples. The PHAROS laser system in operation has a pulse duration of and a repetition rate of up to . We presently employ wavelengths of (fundamental) and (second-harmonic generation). A wavelength of has also been achieved through third-harmonic generation and will be applied on future samples once optimized. A maximum power output of has been measured for λ1 = 1026 nm. The experiments are conducted with a linear time-of-flight mass spectrometer which has a mass resolution of . It utilizes dual-stage extraction (and a lens. The setup allows for front- and back-illumination, with the former currently in use. The samples are proteins or peptides prepared as thin water films. A solution of bradykinin () is the standard sample, which has single-shot sensitivity and a limit of detection of A sample of ubiquitin () has been determined to be the upper mass limit of the system. The sample is placed on one of the following substrates: indium tin oxide (ITO), phosphorus doped n-type silicon (Si\*), borosilicate glass, chalcogenide glass, or copper. For all substrates, background noise is generally observed until Sample imaging is possible with a step size of in the x, y-directions with maximum dimensions of. Data has been collected for bradykinin on all substrates with wavelengths and