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Ultrafast XUV Pulses at High Repetition Rate for Time Resolved Photoelectron Spectroscopy of Surface Dynamics[1] CHRISTOPHER CORDER, PENG ZHAO, XINLONG LI, AMANDA R. MURACA, MATTHEW D. KERSHIS, MICHAEL G. WHITE, THOMAS K. ALLISON, Stony Brook University — Ultrafast photoelectron studies of surface dynamics are often limited by low repetition rates. At Stony Brook we have built a cavity-enhanced high-harmonic generation XUV source that delivers ultrafast pulses to a surface science apparatus for photoelectron spectroscopy. We begin with a Ytterbium fiber laser at a repetition rate of 78 MHz and up to 90 W of average power. After compression the pulses have μJ's of energy with < 180 fs pulse width. We then use an enhancement cavity with a finesse of a few hundred to build up to the peak intensity required for high harmonic generation. The enhancement cavity is a six mirror double folded bow-tie geometry with a focus of 15 μm at a Krypton gas jet, followed by a Sapphire crystal at Brewster's angle for the fundamental to allow outcoupling of the harmonics. A single harmonic is selected using a time-preserving monochromator to maintain the short pulses, and is sent to an ultra high vacuum chamber with sample preparation and diagnostic tools as well as an electron energy spectrometer. This allows us to study the electronic dynamics of semiconductor surfaces and their interfaces with adsorbed molecules which enable various charge transfer effects.

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