

## Ultrafast Photoelectron Spectroscopy of N<sub>2</sub> Rydberg Wavepackets

Mizuho Fushitani<sup>1</sup>, Yuto Toida<sup>1</sup>, François Légaré<sup>2</sup>, Akiyoshi Hishikawa<sup>1</sup>

<sup>1</sup>*Nagoya University, Nagoya, 464-8601, Japan*

<sup>2</sup>*INRS-EMT, Quebec, Canada*

Recent developments of laser high-order harmonics generation have enabled us to employ ultrashort laser pulse as a probe for accessing atomic/molecular Rydberg states lying in EUV. In this work, we investigated Rydberg wavepackets dynamics of N<sub>2</sub> using single-order harmonics at 80 nm and ultrashort laser pulse at 800 nm. Three extra peaks ( $v = 2 - 4$ ) are identified in the photoelectron spectra in addition to the other two peaks ( $v = 0, 1$ ) observed in the conventional He I photoelectron spectrum. Each peak exhibits ultrafast decay characterized by double exponential function with  $\sim 0.3$  and  $\sim 3$  ps lifetime components. At a short time delay, periodic oscillation ( $\sim 280$  fs) was identified for  $v = 0$ , which is attributed to the motion of electron wavepackets in the Rydberg levels.