Abstract Submitted
for the DAMOP20 Meeting of
The American Physical Society

**Argon dark autoionizing states decay probed with four-wave mixing**[1] COLEMAN CARIKER, Dept. of Physics, University of Central Florida, LUCA ARGENTI, Dept. of Physics and CREOL, University of Central Florida
— Ultrafast pump-probe spectroscopies employing trains of attosecond pulses have emerged as a useful tool for studying electron dynamics in atoms and molecules. In the first implementations of these schemes, pump and probe pulses are collinear and have commensurable frequencies. As a consequence, multiple distinct processes give rise to overlapping signals that are difficult to disentangle. Recent experimental advances have led to the extension of the original schemes to more general non-collinear four-wave mixing spectroscopies with independently tunable probe pulses. These spectroscopies spatially separate signals arising from different excitation pathways. Here, we present an *ab initio* calculation of the four-wave-mixing signal from the argon atom, excited to the $3s^{-1}n\ell$ autoionizing states by an extreme ultraviolet attosecond pulse train, and probed by two independent angled IR pulses. The calculation accounts for the collective emission from the interaction region and are in good agreement with measurements from the group of Arvinder Sandhu. Furthermore, using an essential-states model, we investigate how the resonant four-wave mixing signal depends on the lifetimes of the bright and dark autoionizing states, whose radiative coupling dominate the spectrum.

[1]Work supported by the NSF Grants No. PHY-1607588 and PHY-1912507.

Coleman Cariker
Univ of Central Florida

Date submitted: 31 Jan 2020 Electronic form version 1.4