Effects of Symmetry on Intense-field Ionization of Heterocyclic Organic Molecules\textsuperscript{1} TIMOTHY SCARBOROUGH, DAVID FOOTE, CORNELIS UITERWAAL, University of Nebraska - Lincoln — We report on the ultrafast photoionization of pyridine, pyridazine, pyrimidine and pyrazine. These four molecules represent a systematic series of perturbations into the structure of a benzene ring which explores the substitution of a C-H entity with a nitrogen atom, creating a heterocyclic structure which remains isoelectronic with benzene. Other than pyridine, each molecule has the same molecular formula, with the only difference being the placement of the perturbing nitrogen atoms (ortho-, meta- or para-substitutions). Differences in the intense-field behavior of these molecules are caused by the symmetry of the perturbation to the benzene system, primarily influenced through the interactions of lone-pair states surrounding the nitrogen atoms. Data is recorded under intense-field, single-molecule conditions. 50 fs, 800 nm pulses are focused into the molecular vapor, and ion mass spectra are recorded for intensities of $\sim 10^{13}$ W/cm$^2$ to $\sim 10^{15}$ W/cm$^2$. We measure ion yields in the absence of the focal volume effect without the need for deconvolution of the data. For all targets, stable singly- and doubly-charged parent ions ($C_{6-n}H_{6-n}N_{n}^{+}(++)$) are observed with features suggesting resonance enhancement (REMPI).

\textsuperscript{1}This material is based upon work supported by the National Science Foundation under Grant Nos. PHY-0855675 and PHY-1005071.

Timothy Scarborough  
University of Nebraska - Lincoln

Date submitted: 10 Nov 2011  
Electronic form version 1.4