Photoionization of the N$^+$, NH$^+$ and NH$_2^+$ ions in the region of the K-threshold$^1$ B. M MCLAUGHLIN, Queen’s U. Belfast, J.-P. MOSNIER, E. T. KENNEDY, Dublin City University, E. SOKELL, University College Dublin, J.-M. BIZAU, D. CUBAYNES, S. GUILBAUD, Université Paris-Saclay and Synchrotron Soleil, S. CARNIATO, Sorbonne-Universités — The MAIA photon-ion merged-beam apparatus at the SOLEIL synchrotron in France was used to measure single and double photoionization cross-sections in the photon region straddling the nitrogen K-edge (~450 eV), for the atomic N$^+$ and molecular NH$^+$ and NH$_2^+$ species. This extends prior work on N$^+$ into the Rydberg region ($1s \rightarrow np$, $n > 2$ excitations), manifesting as sharp structures between 420 and 435 eV, up to and over the K-ionization threshold. Photoionization of the NH$^+$ and NH$_2^+$ molecular ions were measured for the first time. The main fragmentation routes following $1s$ excitation in NH$^+$ and NH$_2^+$ produced mostly the N$^2+$ species. The spectral patterns are similar to N$^+$: Strong discrete structures near 400 eV ($1s \rightarrow 2p$ excitations), followed by a Rydberg structure in the 410 - 430 eV regions. Significant broadening effects are apparent, testimony to the influence of the molecular vibrational degrees of freedom on the inner-shell photoionization process. The N$^+$ experimental spectra are compared with results of ab-initio RMPS and MCDF calculations, and the molecular spectra with the configuration-interaction single (CIS) method.

$^1$CNRS

Brendan McLaughlin
Queen’s U. Belfast

Date submitted: 01 Feb 2019

Electronic form version 1.4