Abstract Submitted
for the DAMOP12 Meeting of
The American Physical Society

Integral Cross Sections for Electron Impact Excitation of Rydberg and Valence States of Molecular Nitrogen C.P. MALONE, P.V. JOHNSON, I. KANIK, Jet Propulsion Laboratory, X. LIU, Space Environment Technologies, B. AJDARI, M.A. KHAKOO, California State University, Fullerton — We present integral cross sections (ICSs) for electron impact excitation of N_2 out of the ground state $X(v{=}0)$, to the b, c_3, o_3, b', c_4', G, and F electronic states at incident energies ranging between 17.5 eV and 100 eV. The ICSs were derived from the differential cross sections (DCSs) of Khakoo *et al.* [Phys. Rev. A **77**, 012704 (2008)], which were obtained by unfolding energy loss spectra in the ∼12-13.82 eV range. Recently, Heays *et al.* [Phys. Rev. A **85**, 012705 (2012)] measured comparable higher resolution energy loss spectra, with a significantly different apparatus configuration, but in agreement with the Khakoo *et al.* (2008) spectra. This latter additional effort provided further confidence in the accuracy of the DCSs upon which the present ICS results are based. Of the higher-lying states studied, five are singlet states that radiate to the ground state via dipole allowed transitions. These include the b and b' valence states and the c_4' Rydberg state that give rise to the Birge-Hopfield I, II, and Carroll-Yoshino bands, respectively, all of which are observed in the atmospheres of Earth, Titan, and Triton. The c_3 and o_3 Rydberg states give rise to the Worley-Jenkins and Worley series of Rydberg bands, respectively. However, these emissions are not readily observed since predissociation for the c_3 and o_3 states approaches 100%. As such, direct electron excitation measurements, such as those presented here are superior to standard (spontaneous) emission based measurements in this case.

Paul Johnson
Jet Propulsion Laboratory

Date submitted: 26 Jan 2012 Electronic form version 1.4