HIGH RESOLUTION UV EMISSION CROSS SECTIONS FOR
ANALYSIS OF SATELLITE OBSERVATIONS OF AURORA
AND DAYGLOW OF PLANETARY ATMOSPHERES

J.M. Ajello (Jet Propulsion Laboratory, California Institute of
Technology, Pasadena, CA 91109; 818 354-2457; e-mail:
jajello@jpluv.s.jpl.nasa.gov)
1. Kanik, G. James, X. Liu, C. Noren, M. Alvarez (All at: Jet
Propulsion Laboratory, California Institute of Technology, Pasadena,
CA 91109) D. Shemansky (University of Southern California, Los
Angeles, CA 90089)

A new generation of high resolution UV imaging spacecraft (Polar,
Galileo, HST) are studying the airglow and aurora of the Earth and the
Jovian planets. To keep pace with these technological improvements we
have developed a laboratory program to provide electron collision cross
sections of the major molecular planetary gases (H, O, N, C02,
S02, O2, H20 and CO). Molecular spectra under optically thin
conditions have been measured with a high resolution (A/\Delta \lambda = 50000)
UV spectrometer in tandem with an electron impact collision chamber.
Synthetic spectral intensities and rotational line positions for H2 based
on the J-dependent transition probabilities are in good agreement with
experimental intensities. A new high resolution UV model is being
developed for modeling laboratory data. The model includes an
accurate remeasurement of the Lyman band and Werner band cross
sections. The kinetic energy distribution of H(2p) atoms resulting from
electron impact dissociation of H2 has been measured. Electron impact
dissociation of H2 is one of the major mechanisms leading to the
observed wide profile of H L\alpha from Jupiter aurora by HST. Analysis of the
deconvolved line profile of H L\alpha reveals the existence of a narrow
line peak (40 m\AA FWHM) and a broad pedestal base (240 m\AA FWHM).
Follow-on studies of dissociative excitation of S11 1259\AA, 01 1304\AA
emission from S0, and of Nii1200\AA, Nii1085\AA from N2 also indicate
substantial kinetic energy release (1-10eV). We report a quantitative
measurement of the predissociation fraction in the N2 c'4\Sigma^+ \rightarrow X^1\Sigma^-
(0,0) band to model N, EUV emission from Titan, Triton and the Earth.
The most recent studies of the excitation cross section of the N2 (a'IIg)
state will be discussed. We report the first study of J L\alpha from atomic
H in the extended energy range (1 0-2000 eV) where cross sections can
be related to optical oscillator strengths. A small (~5%) change in the
cross section of the most abundant species at low energy (~50eV) is
fundamental to all electron energy loss codes.