The next generation of high resolution UV imaging spacecraft are being prepared for studying astrophysical objects. To keep pace with these technological improvements we have developed a laboratory program to provide electron impact collision cross sections of the major molecular astrophysical diatomic molecular gases (H₂, HD, N₂, CO₂, O₂ and CO). Spectra under optically thin conditions have been measured with a high resolution (λ/Δλ = 50000) UV spectrometer in tandem with electron impact collision chamber. High resolution spectra of the Lyman and Werner band systems of H₂ have been obtained and modeled. Synthetic spectral intensities based on the J-dependent transition probabilities that include ro-vibronic perturbations are in very good agreement with experimental intensities. Electron impact dissociation of H₂ is believed to be one of the major mechanisms leading to the observed wide profile of H Lyman-α(H Lα) from high resolution spectra of Jupiter’s aurora by the Hubble Space Telescope. The kinetic energy distribution of H(2p) atoms resulting from electron impact dissociation of H₂ has been measured. The distribution is based on the first measurement of the H Lyman-α (1 la) emission line Doppler profile. Analysis of the deconvolved line profile reveals the existence of a narrow line peak (40 mÅFWIM) and a broad pedestal base (240 mÅFWIM). The band strengths of the electron excited N₂(C₃Πᵤ - B₃Πₑ) second positive system have been measured in the middle ultraviolet. The relative band intensities were used to get an improved transition probability matrix. The energy dependence of the (0,0) cross section is reported with analytic shape function for use in model calculations. At low energies (1-15 eV), the excitation function showed threshold effects from resonances. We report a quantitative measurement of the predissociation fraction 0.15 ± 0.045 at 300 K in the N₂C₄⁺Σ⁺ᵤ − x 'Σ⁺ₐ (0,0) band, with an experimental determination of rotational line strengths. The coupling of the rotational branches is complicated by heterogeneous perturbations by the c₃ ¹Πᵥ and b ¹Πᵥ states, forcing strong departures from Hone-
London factors and distorting the P, R branches of the rotational envelope, obtained at medium resolution.

REFERENCES: