

Electron Collision Excitation of O II, O IV, and Fe XIV

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Electron collision excitation cross sections for infrared, optical, and ultraviolet lines arising from transitions between the 47 levels of O II, 54 levels of O IV, and 135 levels of Fe XIV have been calculated using the Breit-Pauli R-matrix approach [1]. Configuration-interaction wave functions have been used for an accurate representation of target levels. There is a strong term dependence of valence orbitals in O II. The non-orthogonal orbitals in the multiconfiguration Hartree-Fock approach have been used to account for term-dependence of O II wave functions and to describe important correlation corrections and relaxation effects. These wave functions yield excitation energies which are in close agreement with experiment. Oscillator strengths and transition probabilities for various transitions also compare very well with previous calculations and measurements. The B-spline R-matrix approach [2,3] has been used to calculate electron excitation collision strengths and rates in O II. The calculated excitation cross sections show very good agreement with the available measured absolute excitation cross sections for all three ions. Several line intensity ratios involving O II, O IV, and Fe XIV lines are density and/or temperature sensitive and can be used for diagnosing the physical conditions of planetary nebulae, seyfert galaxies, symbiotic stars, and solar transition region and corona. This research work is supported by NASA Grant NAG06GD39G from the Astronomy and Physics Research Analysis program.

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