Molecular oxygen and its positive ions plays a fundamental role in the physics and chemistry of earth’s atmosphere. A detailed information about collisions between low-energy electrons and positive ions of oxygen molecule is required in studies of the physics of planetary atmosphere, gaseous discharges, and both astrophysical and laboratory plasmas.

The ion $O_2^+$ is an open-shell system that has ground state ($X^2 \Pi_g$) configuration $1\sigma_g^2 \cdot 3\sigma_g^2 \cdot 1\pi_u^2 \cdot 2\sigma_u^2 \cdot 1\pi_u^4 \cdot 1\pi_g^1$ in the $D_{\infty h}$ point group which is reduced to the $D_2h$ point group when the symmetry is lowered. The Multi-state close-coupling calculations are performed, using the UK molecular R-matrix method [1, 2], to compute the excitation cross sections. The target states are represented by including correlation via a configuration interaction technique, and results are compared with previous work [3, 4]. The CI calculations yields the ground state energy of $-149.20544$ Hartree and rotational constant $1.6901$ cm$^{-1}$ (Expt. Value $B_e = 1.6913$ cm$^{-1}$ [5]) at the equilibrium bond length of $2.1$ a$_0$. We obtain the effective collision strength for electron temperature range $100 - 10000$ K assuming Maxwellian distribution of incident electron. Detailed results will be presented in the conference.

References: