POSITRON IMPACT EXCITATION OF 2^1S STATE OF HELIUM ATOM USING A DISTORTED WAVE METHOD

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DECLARATION

This thesis is my original work and has not been presented for a degree in any other university or any other award.

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We confirm that the work reported in this thesis was carried out by the candidate under our supervision.

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ABSTRACT

The study of excitation of helium atom by positron impact has drawn considerable attention since the prediction of existence of the positron by Dirac in 1928.This is due to the fact that the study of atomic collisions forms the basis for understanding of many scientific phenomena in the planetary atmosphere and Astrophysical science. In this study the excitation of helium atom to the 2^1S state by positron impact using the Distorted Wave formula has been done. Previously, studies have been done on the above subject both theoretically and experimentally but the results obtained disagree among themselves. It is on this ground that this research was based. The interaction between the charged projectile and target causes distortion to the projectile's wave functions in the field of target and thus the Distorted Wave Method has been used to calculate the cross sections. A computer program DWBA1 originally written by Madison and Bartschat was modified to perform the numerical calculations for positron-helium scattering and the results obtained for both differential and total cross sections compared with the existing theoretical and experimental data. This was done at incident energies between 30eV to 300eV. The agreement between the present integral cross section results and the experimental results of Sueoka and the differential cross section results obtained using present method and other methods especially at 100eV, 200eV and 300eV was satisfactory. Simple analytic wave functions for both the initial and final states of helium atom were used. In the distorted wave method the initial state static potential of helium atom was used as the initial state distortion potential and a linear combination of initial state static potential and the final state static potential was used as the final state distortion potential.