

# Positron-Impact Excitation of the Lowest Autoionizing State in Rubidium Atom using Distorted Wave Method

Alex Magembe Marucha

May 2014

## ABSTRACT

Many calculations on atomic collisions and scattering processes have been performed on electron impact excitation of the lowest autoionizing state of rubidium, but not much attempt has been made with positron impact which is of equally fundamental importance and is receiving attention nowadays with the availability of improved positron beam experiments. So, in this study, total cross-sections, differential cross-sections, lambda parameter, R parameter and the alignment parameter for positron impact excitation of the lowest autoionizing state of rubidium have been calculated using Distorted Wave method. The wave functions used are the Roothan Hatree Fock double zeta and multi zeta wave functions due to Clementi and Roetti. Variations in distortion potential have been made such that the static potential of the initial state of rubidium atom is used as the initial channel distortion potential and a linear combination of static potentials of the initial and final states as the final channel distortion potential to check its effect on crosssections. Numerical calculations have been done using a modified DWBA1 FORTRAN computer program which was originally made for hydrogen atom. The results for positron impact excitation of the lowest autoionizing state of rubidium have been analyzed and compared with experimental and theoretical results for positron and electron impact excitation of the same state available in literature. From the comparison of the results, it is seen that in general the electron impact excitation cross section results are higher than the positron impact excitation cross section especially near excitation threshold energy. This can be attributed to the exchange process which takes place in the case of electron impact and not in the case of positron impact and also due to larger interaction between the projectile and the target in case of electron impact than in case of positron impact. It is also found from the alignment parameter results that the integral cross section results for  $m=0$  level are larger compared to  $m=1$  level for impact energies up to about 500 eV beyond which integral cross-sections for the magnetic sublevel  $m=1$  become greater. The lambda parameter indicates that more particles are scattered towards  $m=0$  for electron impact compared to positron impact excitation near threshold energy. R parameter results have been calculated to account for phases of scattered amplitudes in the collision process.

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