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Electron-photon coincidence studies on electron impact excitation of lighter neutral atoms

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Abstract. Recently we applied non-relativistic distorted wave approximation theory to study electron impact excitations in lighter atoms (viz. hydrogen, helium and some alkalis). Excitations from the ground and (or) initially excited metastable S states to next upper excited P and D states have been considered. Results for the differential cross-sections and electron-photon coincidence parameters are obtained. Here the theory and the calculation of various scattering parameters are described briefly and some selected results are presented and discussed.

Keywords. Excitation; electrons; distorted-wave; atoms.

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1. Introduction

Electron-atom scattering has been one of the most studied subject in the atomic and molecular collision physics having many important applications. It is still currently a very rapidly expanding field both theoretically and experimentally. The reason is partly due to the development of highly sophisticated experimental technology with which one can study in a realistic manner the very complex nature of the collision dynamics involved and partly the easy access to fast speed computers with which one can perform cumbersome calculations in a short time. For example, the coincidence detection of a decay photon from an excited atomic state and the exciting scattered electron after excitation is now a well established technique in the study of electron impact excitation of atoms. In fact, the electron-photon coincidence experiments have played a major role in the understanding of an excitation process in a complete sense as well as in the refinement and development of theories for atomic excitations even since the pioneering experiments of Eminyan *et al* [1]. Although various excitation processes in the number of atoms have now been studied using this electron-photon coincidence technique most previous studies have been carried out for 2^2P in hydrogen, $2^{1,3}P$ states of helium and also for excitations in sodium and some inert gases. The field has been extensively reviewed by Andersen *et al* [2], Slevin and Chwirot [3] and Becker *et al* [4].

In the present talk I take up some of the work we recently carried out through our number of theoretical studies on the electron and positron impact excitation of the lighter atoms where relativistic effects are not important and can be neglected. In general our basic emphasis has been to study various excitations in different atoms where theoretical studies are required to supplement and explain the experimental results or to report