

S-wave model in electron-atom collisions

A Thesis presented for the Degree of Doctor of Philosophy by

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Declaration

I declare that the work presented in this thesis, except where otherwise stated, is my own account of my research. It covers work which has not been previously submitted for a degree in this or any other university.

Christopher M. Plottke

Abstract

This thesis discusses the theory and presents the numerical solution of the S-wave models of electron-hydrogen and electron-helium scattering. The Convergent Close-Coupling (CCC) method is used to obtain the numerical results. The focus within the electron-hydrogen S-wave model is to investigate cross section results for scattering from excited states; in particular, the elastic free-free transitions. These contain a divergent potential matrix element as the first term. The investigation of the electron-helium S-wave model is split into two sections, firstly applying the Frozen-Core approximation and then relaxing this approximation. This includes the first accurate *ab initio* calculation of double-excitation of helium.

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“Truly great madness cannot be achieved without significant intelligence.”