Curtin University PHYS4001 - Thesis

Total Ionisation-with-Excitation Cross-Sections for Electron-Impact Helium Collisions within the S-Wave Model

Tom Ross, supervised by Professor Igor Bray

ABSTRACT

PHYS4001 - Thesis Tom Ross

Contents

1	Intr	oduction	2
2	The	ory	2
	2.1		2
			2
			2
			2
			2
	2.2		2
			2
			2
	2.3		2
			2
		2.3.2 Auto-Ionising Target States	2
3	Res	ults	2
	3.1	Computational Hindrances	2
		1	2
		· · · · · · · · · · · · · · · · · · ·	2
			2
	3.2		$\frac{1}{2}$
4	Cor	clusion	2

List of Figures

PHYS4001 - Thesis Tom Ross

1 Introduction

2 Theory

- 2.1 Convergent Close-Coupling Method for an Atomic Target
- 2.1.1 Laguerre Basis
- 2.1.2 Target States
- 2.1.3 Total Wavefunction
- 2.1.4 Convergent Close-Coupling Equations
- 2.2 Scattering Statistics
- 2.2.1 Scattering Amplitudes
- 2.2.2 Ionisation Cross-Sections
- 2.3 Considerations for a Helium Target
- 2.3.1 Partially Frozen-Core Model
- 2.3.2 Auto-Ionising Target States

3 Results

- 3.1 Computational Hindrances
- 3.1.1 Attaining Multi-Parameter Convergence
- 3.1.2 Target State Fidelity
- 3.1.3 Handling Interference from Auto-Ionising Target States
- 3.2 Total Ionisation-with-Excitation Cross-Sections

4 Conclusion