Ionisation Amplitudes in Electron-Impact Helium Collisions within the S-Wave Model

Tom Ross supervised by Professor Igor Bray

[ABSTRACT]

Contents

1	Introduction			
2	Theory			
	2.1		rgent Close-Coupling Method	2
		2.1.1	Laguerre Basis	2
		2.1.2	Target-Projectile System	2
		2.1.3	Close-Coupling Equations	2
		2.1.4	Transition Amplitudes	2
		2.1.5	Cross Sections	2
		2.1.6	S-Wave Model	2
	2.2	Electr	on-Impact Hydrogen Scattering	2
		2.2.1	Elastic Scattering	2
		2.2.2	Excitation	2
		2.2.3	Ionisation	2
	2.3	Electr	on-Impact Helium Scattering	2
		2.3.1	Considerations for a Two-Electron Target	2
		2.3.2	Elastic Scattering	3
		2.3.3	Excitation	3
		2.3.4	Ionisation	3
	C	c	E	•
3	Sur	vey or	Experimental Literature	3
4	Survey of Theoretical Literature			
	4.1	Electr	on-Impact Hydrogen Ionisation Calculations	3
		4.1.1	Convergent Close-Coupling Calculations	3
		4.1.2	Exterior-Complex-Scaling Calculations	3
		4.1.3	Ansatz of Zatsarinny and Bartschat	3
	4.2	Electr	on-Impact Helium Ionisation Calculations	3
		4.2.1	Convergent Close-Coupling Calculations	3
		4.2.2	Exterior-Complex-Scaling Calculations	3
		4.2.3	Ansatz of Zatsarinny and Bartschat	3
5	Cor	nclusio	n	3

List of Figures

List of Tables

1 Introduction

Applications of Electron-Impact Hydrogen Scattering

Specific Applications of Electron-Impact Hydrogen Ionisation

Development of Quantum Scattering Theory

2 Theory

- 2.1 Convergent Close-Coupling Method
- 2.1.1 Laguerre Basis
- 2.1.2 Target-Projectile System
- 2.1.3 Close-Coupling Equations
- 2.1.4 Transition Amplitudes
- 2.1.5 Cross Sections

Total Cross Sections

Differential Cross Sections

- 2.1.6 S-Wave Model
- 2.2 Electron-Impact Hydrogen Scattering
- 2.2.1 Elastic Scattering
- 2.2.2 Excitation
- 2.2.3 Ionisation

Singlet Case

Triplet Case

- 2.3 Electron-Impact Helium Scattering
- 2.3.1 Considerations for a Two-Electron Target

Pauli Exclusion Principle

Frozen-Core Model

- 2.3.2 Elastic Scattering
- 2.3.3 Excitation

Auto-Ionisation

- 2.3.4 Ionisation
- 3 Survey of Experimental Literature
- 4 Survey of Theoretical Literature
- 4.1 Electron-Impact Hydrogen Ionisation Calculations
- 4.1.1 Convergent Close-Coupling Calculations
- 4.1.2 Exterior-Complex-Scaling Calculations
- 4.1.3 Ansatz of Zatsarinny and Bartschat
- 4.2 Electron-Impact Helium Ionisation Calculations
- 4.2.1 Convergent Close-Coupling Calculations
- 4.2.2 Exterior-Complex-Scaling Calculations
- 4.2.3 Ansatz of Zatsarinny and Bartschat
- 5 Conclusion

References