

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

(...وَقُلْ رَبِّيَ زِدْنِي عِلْمًا)

صدق الله العظيم

طه (١١٤)

Dedication

I dedicate this thesis to my parent Al Ata and Ekhllass. I hope that achievement will complete the dream that you had me all those many years ago when you choose to give me the best education you could.

To my lovely husband, my lovely brother, my lovely sisters, all of my family, all my best friends and my colleagues.

Acknowledgements

I would like to Thank ALLAH for given me strength and ability to complete this work .

I also admire the help and guidance of professor Mubarak Dirar who patiently and kindly supervised this research and who generously gave me many valuable references which were a great help .

Thanks extended also to the Department of Physics , college of science and SUST.

Special thanks to BasheirAbd Al- quome , Dr.RawiaAbdElgani and Dr. Amel A. Elfaki (Sudan University Department of physics) and for all people who work in Sudan University Department of physics for assistance to do this research .

My gratitude is sent to my dear family who patiently and kindly aided me very much throughout this work specially my sweet mother who support me and give me the opportunity for education .

Also thanks were sent to all who helped me.

Abstract

In this work improved quantum mechanical model based on harmonic oscillator for frictional medium is obtained.

This quantum model is used to derive radioactive decay law. According to this model radioactivity is predicted to result from nuclear excitation.

A new statistical physical law which accounts for electric, gravity as well as rest mass energy is obtained. This model is found to have capability of describing nuclear interactions.

المستخلص

في هذا العمل تم الحصول على النموذج الكمي المطور الذي يعتمد على الحركة الاهتزازية للوسط المتذبذب، و يستخدم هذا النموذج الكمي لاشتقاق قانون الانحلال الاشعاعي ، وفقا لهذا النموذج النشاط الاشعاعي يتوقع ان ينتج من الاثارة النووية.

تم الحصول على القانون الفيزيائي الاحصائي الجديد الذي يحسب الكهربية والجاذبية كما يحسب طاقة السكون. ووجد ان هذا النموذج لديه القدرة على وصف التفاعلات النووية.

Table of Contents

Content	Page
	I
Dedication	II
Acknowledgment	III
Abstract	IV
Abstract in Arabic	V
Table of content	VI
Chapter One	1
(1.1)Introduction	1
(1.2)The Problem of the Thesis	1
(1.3) Literature Review	2
(1.4)The Aim of the Thesis	2
(1.5)Thesis out Line	2
Chapter Two: Nuclear Reaction	3
(2.1) Introduction	3
(2.2)Composition of Atomic Nucleus - Neutrons and Protons	4
(2.3) Radioactive Decay	4
(2.3.1) Alpha Decays	5
(2.3.2) Beta Decays	5
(2.3.3) Positron Emission	6
(2.3.4) Electron Capture	7
(2.3.5)Gamma Decay	7
(2.3.6)Radioactive Decay Series	8
(2.3.7) Nuclear Transformation or Transmutation	9
(2.4)Radioactive Decay law	10
(2.4.1) Mathematical Consideration of Radioactive Decay	10

(2.4.2)Half -life and the Radioactive Decay Constant	12
(2.5) Radioactivity Dating	15
(2.5.1)The Detection of Radioactivity	15
(2.5.2)Half-Lives of Radioactivity	17
(2.6) Nuclear Binding Energy	18
(2.7) Nuclear Fission Process	20
(2.8)Nuclear Fusion Process	22
(2.9) Problem Associated with Nuclear Power	22
(2.10) Application of Nuclear Physics:	23
(2.10.1)Medical Diagnosis and Treatment	23
(2.10.2) Radioactive Isotopes	23
(2.10.3)Positron Emission Tomography	24
(2.10.4)Cancer Treatment	24
(2.10.5)Environmental Science	25
(2.10.6)Ocean Circulation Studies and Global Warming	25
(2.10.7)Water Resources	26
(2.10.8)Air Quality	27
(2.10.9)Stratospheric Ozone Depletion	27
(2.10.10) ENERGY- Nuclear Power	28
(2.10.11) On-Line Analysis of Coal	29
(2.10.12)Nuclear Fusion	29
(2.10.13)MATERIALS - Ion Implantation	29
(2.10.14)RBS and Channeling	30
(2.11)The Ordinary Schrödinger Equation	30

(2.11.1) The Time-Dependent Schrödinger Equation	30
(2.11.2) The Time-Independent Schrödinger Equation	32
(2.11.3)Probability Current Density	33
(2.12)Quantum Tunneling of Radiation	35
(2.12.1) Nuclear Quantum Tunnelling	36
Chapter three: Literature Review	40
(3.1) Introduction	40
(3.2) Modification of SchrödingerEquation in a Media	40
(3.3) Quantization of Friction for Nun Isolated Systems	41
(3.4) Derivation of Klein-Gordon Equation from Maxwell's Electric Equation	42
(3.5)Interpretation of the change of Intensity and Spectral line width for Bhutan, Neon, Fluorine, and Chlorine by Using Complex Statistical Distribution and Quantum harmonic Oscillator Model	43
(3.5.1)Materials and Methods:	42
(3.5.2.1)Complex Energy Statistical Distribution	50
(3.5.2.2)Quantum Mechanical Approach	54
(3.5.2.3)Semi Classical Harmonic Oscillator Mod	56
(3.5.3)Discussion	60
(3.6)Explanation of Intensity Spectral change of Bhutan, Carbon dioxide , Carbon Monoxide, Oxygen, Nitrogen Gases on the basis of Non Equilibrium Statistical Distribution	61
(3.6.1) Statistical DistributionLaw ofNon- Equilibrium Statistical System	61
(3.6.2) Plasma Statistical Equation in the Presence of Potential Field Only	62
(3.6.3)Variation of Spectral Intensity of Some Gases with Temperature	67
(3.6.4)Theoretical Interpretation	73

(3.6.4.1) Thermal Equilibrium Statistical Interpretation	73
(3.6.4.2)Non- Equilibrium Statistical System	74
(3.6.5)Dissection	78
(3.6.6)Conclusion	79
(3.7)Summary and Critique	79
Chapter 4: Schrödinger Quantum Frictional Equation for Nucleus	80
(4.1)Introduction	80
(4. 2) Relaxation time and Friction	80
(4.3)Schrödinger Equation for Frictional Media	82
(4. 4) The Wave Function of Free Particle in Frictional Medium	84
(4.5)Quantum Radioactive Decay law	85
(4.6)Nuclear Reaction on the Basis of Statistical Distribution Based on Nuclear Potential	87
(4.6.1)Newtonian Statistical Distribution laws for Particles in a field	88
(4.6.2)Massive and Super Massive Astronomical Objects	92
(4.6.3) Statistical Laws Based on Generalized Special Relativity	92
(4. 7) Discussion	94
(4. 8) Conclusion	96
(4. 9) Recommendation	96
References	97