



شبكة المعلومات الجامعية
التوثيق الإلكتروني والميكرو فيلم

بسم الله الرحمن الرحيم



MONA MAGHRABY



شبكة المعلومات الجامعية
التوثيق الإلكتروني والميكروفيلم



شبكة المعلومات الجامعية التوثيق الإلكتروني والميكروفيلم



MONA MAGHRABY



شبكة المعلومات الجامعية
التوثيق الإلكتروني والميكروفيلم

جامعة عين شمس

التوثيق الإلكتروني والميكروفيلم

قسم

نقسم بالله العظيم أن المادة التي تم توثيقها وتسجيلها
علي هذه الأقراص المدمجة قد أعدت دون أية تغيرات



يجب أن

تحفظ هذه الأقراص المدمجة بعيدا عن الغبار



MONA MAGHRABY



Faculty of Science

Department of Mathematics

Three-quark forces effect in proton - proton elastic scattering at high energies

A THESIS

Submitted to Faculty of Science - Ain Shams University as a partial fulfilment for requirements of the Master of Science
(Applied Mathematics)

By

Assem Abdel-Naby El-samman Hefny

B. Sc. (2012), Department of Mathematics, Faculty of Science,
Ain Shams University

SUPERVISORS

Prof. Dr. Mohamed Ahmed Mohamed Hassan

Professor Emeritus of Applied Mathematics
Department of Mathematics, Faculty of Science, Ain Shams University

Prof. Dr. Hassan Hassan Hassan Ramadan

Professor Emeritus of theoretical physics
Department of Basic Science, Faculty of Computer and Information Science,
Ain Shams University

Dr. Tarek Nasr El- Din Salama

Assistant professor of Applied Mathematics
Department of Mathematics, Faculty of Science, Ain Shams University

2020

CONTENTS

Contents

ACKNOWLEDGEMENT	I
SUMMARY	II
LIST OF FIGURES.....	V
LIST OF TABLES	VIII
LIST OF ABBREVIATIONS	VIII
CHAPTER I	
PROTON-PROTON ELASTIC SCATTERING AT VERY HIGH ENERGY: REVIEW	1
1.1. INTRODUCTION	1
1.2. PROTON STRUCTURE MODELS	1
1.2.1. <i>Quark model</i>	1
1.2.2. <i>Quark-diquark model</i>	2
1.2.3. <i>Islam models</i>	3
1.3. MODELS OF COLLISION	4
1.3.1. <i>Regge pole theory</i>	4
1.3.2. <i>Hybrid quark-hadron model</i>	5
1.3.3. <i>Pomeron exchange theory</i>	6
1.3.4. <i>Phenomenological models</i>	6
1.4. THE MULTIPLE SCATTERING THEORY OF GLAUBER	7
1.4.1. <i>General view</i>	7
1.4.2. <i>Real part and the slope parameter</i>	11
1.4.3. <i>Formalism of proton-proton scattering in quark model</i>	12
1.4.4. <i>Geometrical scaling property</i>	15
1.5. THE OPTICAL LIMIT APPROXIMATION	16
1.6. THE THESIS GOAL	18
CHAPTER II	
PROTON-PROTON ELASTIC SCATTERING AT ISR ENERGY: DIFFERENTIAL CROSS SECTION	20
2.1. INTRODUCTION	20
2.2. PROTON-PROTON ELASTIC SCATTERING FORMALISM	21
2.3. RESULTS AND DISCUSSION	34
2.3.1. <i>The differential cross section</i>	34
2.3.2. <i>Quark-quark interaction radius -Gluon energy</i>	36
CHAPTER III	
PROTON-PROTON TOTAL CROSS SECTIONS AT CERN-ISR ENERGY	51
3.1. TOTAL CROSS SECTION	51

3.2. THE RATIO ρ	55
3.3. ELASTIC AND INELASTIC SCATTERING TOTAL CROSS SECTIONS	55
3.4 RESULTS AND DISCUSSION	57
3.4.1. <i>Total cross section and ratio</i>	57
3.4.2. <i>The elastic and inelastic total cross sections</i>	59
3.5. CONCLUSION	60
CHAPTER IV.....	
PROTON-PROTON ELASTIC SCATTERING DIFFERENTIAL CROSS SECTION AT LHC ENERGY	61
4.1. INTRODUCTION	61
4.2. THE MODEL	62
4.3. DIFFERENTIAL CROSS SECTION RESULTS AND DISCUSSION	75
4.4. BIALAS AND BZDAK MODEL.....	85
CHAPTER V.....	
PROTON-PROTON TOTAL CROSS SECTIONS AND RATIO AT LHC ENERGY	88
5.1. TOTAL CROSS SECTION AND THE RATIO ρ	88
5.2 TOTAL ELASTIC AND INELASTIC CROSS SECTIONS	89
5.3. TWO- AND THREE-QUARK FORCE RADII	90
5.4. THE FIELD PARTICLE OF PROTON.....	92
5.5. CONCLUSION	93
5.6. FINAL CONCLUSION AND FUTURE OUT LOOK.....	95
REFERENCES.....	93
ARABIC SUMMARY	

ACKNOWLEDG EMENT

Acknowledgement

I would like to express my deepest gratitude to my supervisor Prof. Dr. Mohammed A. Hassan, Mathematics Department, Faculty of Science, Ain Shams University, for suggesting this line of research, kind supervision, systematic guidance and valuable help in a myriad ways from the beginning of this thesis. With his generous and fruitful discussions this work has been completed.

I would like to express my sincere thanks to Prof. Dr. Hassan Ramadan, Department of Basic Science, Faculty of Computer and information Science, Ain Shams University, for his great help and valuable advices.

I would like to express my gratitude to Dr. Tarek Nasr El-Din, Department of Mathematics, Faculty of Science, Ain Shams University, for his great help and discussions he offered during preparation of thesis, his great efforts to explain and his cooperation for follow-up through this work.

Finally, I must express my very profound gratitude to my parents and to my brothers, sisters and friends for providing me with unfailing support and continuous encouragement throughout my years of study and through the process of researching and writing this thesis. This accomplishment would not have been possible without them.

A special thanks to my father who I wish you would be with me.

Thank you.

SUMMARY

