Università di Pisa

DIPARTIMENTO DI FISICA "ENRICO FERMI"
Corso di Laurea in Fisica

Tesi di laurea

Commissioning and first data analysis of the Mainz radius experiment.

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Contents

Abstract

short introduction

Chapter 1

Introduction

- explain neutron skin thickness.
- connection to neutron stars radious, and neutron stars description.
- Equation of state (EoS) for high density nuclear matter.
- Parity-violating scattering experiment for extracting neutron skin thickness.
- mention the weak form factor.
- Transverse asymmetry as background for Parity-violating experiment.
- Mention the other experiment, like PREX, that measure zero A_n for Lead.

Chapter 2

Transverse Asymmetry

- Physics behind the A_n asymmetry, dependence on Q^2, the formula $\frac{\sigma_\uparrow - \sigma_\downarrow}{\sigma_\uparrow + \sigma_\downarrow}$
- state of the art of the Exp. (?already a description of the experiment at A1?)
- Model description: so scattering amplitude, theoretical prediction
- Expected error δA_t
- open question: problems with lead, dependence of E_{beam}, dependence from Z, Z/A

Chapter 3

Experimental setup

- description of MAMI, how the beam is produced, how the electrons are polarized.
- description of A1.
- description of beam stabilization, how the monitors measure the beam parameters.
- Electronics description, DAQ system, VFC monitors.
- Detectors A and B.

Chapter 4

Test and beam time analysis

1. development of the analysis program (description of the Levenberg-Marquardt-Algorithmus.
2. testing the analysis program with montecarlo data.
3. Test of the detectors in the Lab.
4. Beam line description.
5. Data Analysis
   (a) Rates on Pb^{208}.
   (b) Stabilization Monitors.
   (c) C^{12} Asymmetry.

Chapter 5

Conclusion and outlook

- result of the Analysis

Appendices

Appendix A

Some Appendix

The contents...