



University of Pisa

DEPARTMENT OF NATURAL, MATHEMATICAL AND PHYSICAL SCIENCES
Master's degree in Physics

Optimization of the trigger system and data acquisition of the FOOT experiment at CNAO

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Abstract

[illegible]

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Chapter 1

Charge Particle Therapy

Prova del capitolo 1.

$$F = ma \tag{1.1}$$

$$F = ma \tag{1.2}$$

$$F = ma \tag{1.3}$$

$$F = ma \tag{1.4}$$

1.1 Physics of Charged Particle Therapy

Qui ci scrivo qualcosa.

1.1.1 Electron magnetic energy loss of heavy charged particles

Scrivo qualcosa[Pan95].

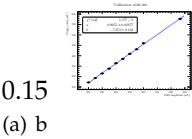


Figure 1.1: $y = x$

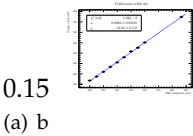


Figure 1.2: $y = 3\sin x$

1.1.2 Multiple Coulomb Scattering

Scrivo qualcosa[Pan95].

1.1.3 Nuclear interaction

Scrivo qualcosa[Pan95].

1.1.4 Range

Scrivo qualcosa[Pan95].

1.2 Radiobiology in CPT

Qui ci scrivo qualcosa.

1.2.1 Dose deposition

Scrivo qualcosa[Pan95].

1.2.2 DNA damage

Scrivo qualcosa[Pan95].

1.2.3 Linear Energy Transfer

Scrivo qualcosa[Pan95].

1.2.4 Cells survival models

Scrivo qualcosa[Pan95].

1.2.5 Relative Biological Effectiveness

Scrivo qualcosa[Pan95].

1.3 Thesis objectives

Qui ci scrivo qualcosa.

Chapter 2

The FOOT experiment

Prova del capitolo 1.

$$F = ma \quad (2.1)$$

$$F = ma \quad (2.2)$$

$$F = ma \quad (2.3)$$

$$F = ma \quad (2.4)$$

2.1 Measurements and strategies

Qui ci scrivo qualcosa.

2.2 Experimentla setup

Qui ci scrivo qualcosa.

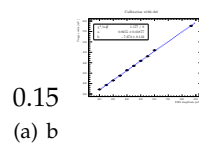


Figure 2.1: $y = x$

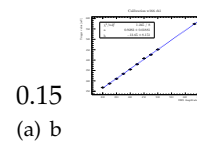


Figure 2.2: $y = 3\sin x$

2.2.1 Upstream region

Scrivo qualcosa[Pan95].

2.2.2 Tracking system

Scrivo qualcosa[Pan95].

2.2.3 Downstream region

Scrivo qualcosa[Pan95].

2.3 Current status and research program

Qui ci scrivo qualcosa.

Chapter 3

Methods and materials

Prova del capitolo 1.

$$F = ma \quad (3.1)$$

$$F = ma \quad (3.2)$$

$$F = ma \quad (3.3)$$

$$F = ma \quad (3.4)$$

3.1 Overview

Qui ci scrivo qualcosa.

3.2 Detection system

Qui ci scrivo qualcosa.

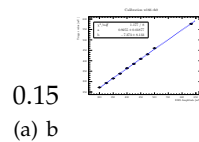


Figure 3.1: $y = x$

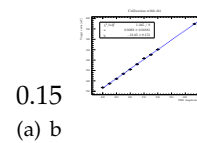


Figure 3.2: $y = 3\sin x$

3.2.1 Start Counter

Scrivo qualcosa[Pan95].

3.2.2 TOF-Wall detector

Scrivo qualcosa[Pan95].

3.2.3 The WaveDAQ system

Scrivo qualcosa[Pan95].

3.3 Trigger update

Qui ci scrivo qualcosa.

3.3.1 WaveDREAM channels calibration

Scrivo qualcosa[Pan95].

3.4 Data taking

Qui ci scrivo qualcosa.

3.5 Data precessing

Qui ci scrivo qualcosa.

3.5.1 Start Counter waveforms analysis

Scrivo qualcosa[Pan95].

3.5.2 TOF-Wall waveforms analysis

Scrivo qualcosa[Pan95].

3.5.3 Clock analysis

Scrivo qualcosa[Pan95].

3.5.4 Time resolution

Scrivo qualcosa[Pan95].

3.5.5 Time of flight evaluation

Scrivo qualcosa[Pan95].

3.5.6 Charge evaluation

Scrivo qualcosa[Pan95].

3.5.7 Energy evaluation

Scrivo qualcosa[Pan95].

Chapter 4

Results and discussion

Prova del capitolo 1.

$$F = ma \quad (4.1)$$

$$F = ma \quad (4.2)$$

$$F = ma \quad (4.3)$$

$$F = ma \quad (4.4)$$

4.1 Trigger efficiency

Qui ci scrivo qualcosa.

4.2 Charge reconstruction

Qui ci scrivo qualcosa.

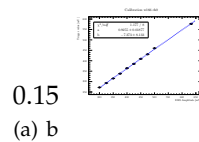


Figure 4.1: $y = x$

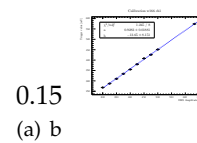


Figure 4.2: $y = 3\sin x$

Appendix A

Capitolo 1

Prova del capitolo 1.

$$F = ma \quad (A.1)$$

$$F = ma \quad (A.2)$$

$$F = ma \quad (A.3)$$

$$F = ma \quad (A.4)$$

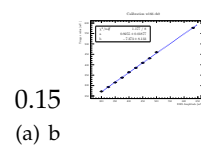


Figure A.1: $y = x$

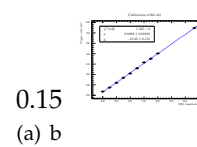


Figure A.2: $y = 3\sin x$

Bibliography

- [Pan95] D. Pan. A tutorial on mpeg/audio compression. *IEEE Multimedia*, 2:60–74, Summer 1995.