Measurement of Particle Fluxes in Space
Space Physics 2006

Daniel Schick
Umeå University

October 12, 2006
Overview

1 Introduction

2 Cosmic Rays

3 Measurement Methods
   - Indirect Methods
   - Direct Methods
     - Method 1
     - Method 2

4 Summary
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What are Cosmic Rays?

Cosmic rays are charged particles!

- 2% electrons
- 98% atomic nuclei
  - 87% protons
  - 12% Helium nuclei
  - 1% heavy atomic nuclei

Until today all natural nuclei from hydrogen to actinides were detected.
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We divide cosmic rays according to their origin!
**Origin**

- **our** sun is the source for **solar** cosmic rays
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- most likely cosmic particles are produced and accelerated during supernova explosions
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[Image of a cosmic nebula]
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**Lorentz Force:**

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Method 2

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**Cherenkov Detector**

**Cherenkov Effect:**

- A charged particle in a transparent medium with higher velocity than the velocity of light in this medium will produce a light cone.
- The aperture angle $\theta$ of that cone can be measured.

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- fast, charged particle’s trajectory will bend in a magnetic field because to the Lorentz force

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![Diagram of charged particle in silicon microstrip detectors](Image)
Overview

Cherenkov detector
upper time of flight detector
array of silicon microstrip detectors
lower time of flight detector
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Thank you for your attention!