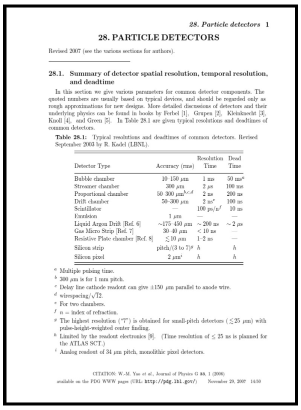
Design and testing of a water Cherenkov muon polarimeter.

- - Upgrading the water Cherenkov tanks for atmospheric shower identification



28. Particle detectors 1

28. PARTICLE DETECTORS

Revised 2007 (see the various sections for authors).

28.1. Summary of detector spatial resolution, temporal resolution, and deadtime

In this section we give various parameters for common detector components. The quoted numbers are usually based on typical devices, and should be regarded only as rough approximations for new designs. More detailed discussions of detectors and their underlying physics can be found in books by Ferbel [1], Grupen [2], Kleinknecht [3], Knoll [4], and Green [5]. In Table 28.1 are given typical resolutions and deadtimes of common detectors.

Table 28.1: Typical resolutions and deadtimes of common detectors. Revised September 2003 by R. Kadel (LBNL).

Detector Type	Accuracy (rms)	Resolution Time	Dead Time
Bubble chamber	10–150 μm	1 ms	50 ms[a]
Streamer chamber	300 μm	2 μs	100 ms
Proportional chamber	50–300 μm[b,c,d]	2 ns	200 ns
Drift chamber	50–300 μm	2 ns[e]	100 ns
Scintillator	—	100 ps/n[f]	10 ns
Emulsion	1 μm	—	—
Liquid Argon Drift [Ref. 6]	~175–450 μm	~ 200 ns	~ 2 μs
Gas Micro Strip [Ref. 7]	30–40 μm	< 10 ns	—
Resistive Plate chamber [Ref. 8]	$\lesssim 10$ μm	1–2 ns	—
Silicon strip	pitch/(3 to 7)[g]	h	h
Silicon pixel	2 μm[i]	h	h

[a] Multiple pulsing time.
[b] 300 μm is for 1 mm pitch.
[c] Delay line cathode readout can give ± 150 μm parallel to anode wire.
[d] wirespacing/$\sqrt{12}$.
[e] For two chambers.
[f] n = index of refraction.
[g] The highest resolution ("7") is obtained for small-pitch detectors ($\lesssim 25$ μm) with pulse-height-weighted center finding.
[h] Limited by the readout electronics [9]. (Time resolution of ≤ 25 ns is planned for the ATLAS SCT.)
[i] Analog readout of 34 μm pitch, monolithic pixel detectors.

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Physics Thesesdesign and testing of a water Cherenkov muon polarimeter.
-design and testing of a water Cherenkov muon polarimeter.
Notes: Thesis (M.Sc.), Dept. of Physics, University of Toronto
This edition was published in 1985

Tags: #Upgrading #the #water #Cherenkov #tanks #for #atmospheric #shower #identification

Upgrading the water Cherenkov tanks for atmospheric shower identification

Three such auto-calibration techniques have been developed and are described along with an explanation of the main configuration settings and potential pitfalls. The main advantage of ground detectors is their 100% duty cycle and the possibility to work in an autonomous way. The physics of the radio emission in air showers is well-understood, and analysis techniques have been developed to determine the arrival direction, the energy and an estimate for the mass of the primary particle from the radio measurements.

Upgrading the water Cherenkov tanks for atmospheric shower identification

This work aimed at determining how anodic behaviour can be affected by nitrogen present in the steel.

Upgrading the water Cherenkov tanks for atmospheric shower identification

The muon content has been evaluated by Auger through different methods, and the results suggest that the predictions of models for acceptable nuclei from proton to iron are systematically below the measurements, and favour heavy nuclei at energies where X max measurements suggest light ones.

Upgrading the water Cherenkov tanks for atmospheric shower identification

For nitrided steel the near-surface pH was increasing when anodic current was rising in the active region, evidently due to binding of protons into NH 4 +. One key feature to set more constraints on the development of atmospheric showers is a separate measurement of their electromagnetic and muonic components. Water Cherenkov tanks are sensitive to both, but cannot disentangle them in a clean and model-independent way.

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