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Particle ID: Cherenkov Imaging Counters in Nuclear and Particle Physics

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The basic principles of Particle Identification (PID) are introduced with emphasis on the role of the Cherenkov counters.

The Cherenkov effect, with reference to those properties which are at the base of the Cherenkov counter concept, is recalled.

The different Cherenkov counter types (threshold, differential, imaging) are illustrated.

The main components of the Cherenkov counters, namely the radiator materials, the photon detectors and the focusing optical systems are discussed in detail.

The three main RICH (Ring Imaging Cherenkov Counter) families, namely RICHes with focalization, proximity focusing RICHes and DIRCs (Detection of Internally Reflected Cherenkov (Light)) are illustrated by outstanding examples, including double-radiator RICHes, RICHes for space-born experiments and the heavy ion identification by RICH techniques.

Recent novel approaches to the Cherenkov imaging technique as the TOP (Time Of Propagation) concept, the focusing DIRC and the use of aerogel radiators with multiple refractive index are illustrated. A comparison of PID performance offered by Cherenkov imaging approaches and time of flight techniques making use of detectors with time resolution below 100 ps is presented.

The conclusive remarks relate PID opportunities by RICHes with physics programmes in nuclear and subnuclear physics.

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