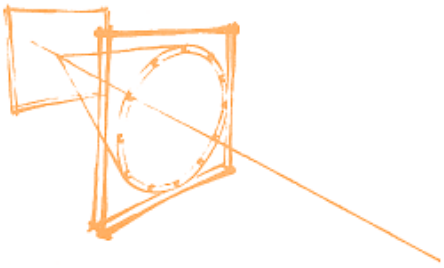

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The influence of gas refractive index to the RICH detector accuracy

jeudi 6 mai 2010 10:00 (1 minute)

The radiator gas C4F10 at Compass RICH has two important characteristics of refractive index –absolute value at specific wavelength and material dispersion of this index. The influence of both characteristics, possibility of their measurement and compensation of it are presented.
The refractive index of radiator gas varies with temperature, atmospheric pressure and gas purity. It is important to compensate effective refractive index changes in the process of particle identification. The modified Jamin interferometer was proposed, constructed and tested for on-line refractive index measurement. This interferometer will be connected in parallel to the Compass RICH vessel. It has 30 cm active length. It is very stable and very well vibration resistant instrument. It uses He-Ne laser so it measures refractive index at 633 nm with accuracy better than 10-6. The results can be applied to the all wavelengths of Cherenkov spectra.
Only one value of effective refractive index of gas is used in general for gas characterization. But the dispersion must be taken into account. The simulation of Cerenkov angle distributions due refractive index dispersion of C4F10 for both PMT and CsI detectors was made. The spectrum of emitted Cherenkov photons depends on particle momentum especially in the case of momentum lower than 20 GeV/c. The photons of different wavelength have a different probability to be detected. There are two tendencies –photons from VIS range can fall to narrow angle and the number of detected photons is not so big. Photons from UV create wider rings and the number of detected UV photons is higher. We calculated angle distribution of detected photons, position and width of Cherenkov rings for both PMT and CsI detectors. Calculations were made for various values of particle momentum taken as parameters. It results that effective index is depending on particle momentum. This can be can be used at particle identification algorithm.

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plenary

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