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Performance study of a position sensitive SiPM detector for Cherenkov applications

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Silicon photomultipliers (SiPMs) are multi-pixel APDs operated in Geiger mode. This photon detection technology is characterized by a high photon detection efficiency, low costs and an insensitivity to magnetic fields. These attributes make them suitable for detectors in many research fields, such as particle physics, nuclear physics or medical imaging.

A prototype of a position sensitive Cherenkov detector was built, consisting of an array of 8 x 8 SiPMs with a light concentrator on top. The SiPMs have an active area of 3 x 3 mm2 with a pixel size of 100 x 100 μm2. With an entrance surface of 7 x 7 mm2 and an exit surface of 3 x 3 mm2, the light guide increases the detection area of the module, while providing sufficient position resolution for example for the barrel DIRC detector of the PANDA experiment at FAIR in Darmstadt

The detector was tested under laboratory conditions by scanning the array in two dimensions, using a pulsed light-beam and two step motors. The light source is an LED with a wavelength range of 465-475 nm. The beam diameter was about the size of a SiPM pixel and the step size to move the beam was 100 μm.

To define the collection efficiency of the light concentrator, measurements were done with and without light concentrator respectively and in dependence of the incident beam angle. The results will be compared with previous simulations and will be presented during the conference.

quote your primary experiment

SiPM, Array, Efficiency

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