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Beam test of FARICH prototype with dSiPM

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FARICH is a modern RICH detector based on variable refractive index 'focusing' aerogel. Silicon photomultipliers (SiPM) can be successfully employed in large RICH detectors due to their potentially low costs, compactness and immunity to magnetic field. Recently Philips has developed a digital silicon photomultiplier (dSiPM) by integrating readout electronics on the same chip as the array of avalanche diodes using conventional CMOS process technology. dSiPM is a very promising candidate for modern high-energy physics detectors because it cardinally solves the problem of front-end electronics integration for high channel density and the solution is easily scalable. Moreover, dSiPM enables a significant reduction of dark count rates by switching off noisy SPADs.
In June 2012 we tested a FARICH detector prototype based on dSiPM from Philips at the CERN PS T10 beam channel. The prototype consists of a 20x20 cm photon detector using 2304 dSiPM pixels of 4x4 mm size each. In order to reduce dark count rates the detector was cooled to -40C in addition to disabling individual SPADs. Two aerogel samples produced in Novosibirsk were studied. One is a four-layer 'focusing' aerogel and the other is a homogeneous aerogel. We have observed rings with 0.8 mm ring radius resolution and 14 photoelectrons for 6 GeV/c pions in the 'focusing' aerogel. Particle separation capability of FARICH along with several other results will be presented and compared to MC simulations.

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