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PANDA detector R&D study

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PANDA is an experiment designed for the future FAIR facility at GSI to challenge our understanding of the strong interact ion and of hadronic matter. Exploiting the high luminosity and good quality of the cooled antiproton beam, PANDA will search for new forms of matter, namely for precise measurements of possible exotic states, such as glueballs, hybrids, pentaquarks etc. in the quark confinement area.

One of the major detector components for the study of electromagnetic probes is compact and fast electromagnetic barrel calorimeter constructed out of high quality lead tungstate (PWO) crystals. The most forward region will be covered by a fine-segmented small cell sampling electromagnetic calorimeter as another key detector at PANDA. We report on the R&D study of both PANDA calorimeters including the achieved performance of both PWO and Shashlik calorimeter prototypes. The report includes studies of long-term radiation hardness of PWO crystals at low temperature using infrared-light or temperature for recovery.

The PANDA physics program requires the construction of a Silicon Micro Vertex detector with utmost capability to reconstruct primary vertex and secondary vertices from D meson decays. Inhomogeneous distribution of the radiation damage with a strong peak in the forward direction imposes innovative solutions and asymmetric layout. Besides limited material budget and triggerless system, capable to handle large amounts of data in real-time, are requested. For the inner layers of the detector, thinned epitaxial silicon hybrid pixels are under study with custom readout chips, called ToPix. For the outer layers a double-sided silicon strip detector is under development.

R&D study of other PANDA detectors is also presented.

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