HK 13: Instrumentation IV

Time: Tuesday 17:00–18:15 Location: SCH/A251

HK 13.1 Tue 17:00 SCH/A251

SiPM-characteristics after proton irradiation — •Vincent Verhoeven[1], Dieter Grzonka[3], and James Ritman[1,2,3] — [1]GSI Helmholtzzentrum für Schwerionenforschung GmbH, 64291 Darmstadt, Germany — [2]Ruhr-Universität Bochum, Institut für Experimentalphysik I, 44801 Bochum, Germany — [3]Institut für Kernphysik, Forschungszentrum Jülich, 52428 Jülich, Germany

Silicon photomultipliers (SiPM) are frequently used for the photon read out of scintillation detectors as an alternative to a conventional photomultiplier. SiPMs exhibit a high photon detection efficiency in the order of 40%, achieve internal amplifications of 10^6 to 10^7, require rather low operating voltages, are insensitive to magnetic fields and, due to the small size, simplify the mechanical construction of detector components. A drawback is the sensitivity of SiPMs to irradiation resulting in a remarkable change of the behavior already at a rather low radiation dose.

In order to determine the effect of irradiation for the SiPM operation as photon sensors, the characteristics of SiPMs after irradiation with a 35 MeV proton beam have been studied. In addition to the basic properties, the performance as a photon detector at various photon numbers was investigated. With a bake-out at temperatures of up to 150 $°C$ a regeneration to a certain degree was achieved.

The characteristics of SiPMs as a function of radiation dose and its possible regeneration at high temperatures will be presented.

HK 13.2 Tue 17:15 SCH/A251

Systematic Studies of Radiation Damage and Stimulated Recovery of PWO — •Pavel Orsich, Valery Dormenev, Hans-Georg Zaunick, Markus W. H. Moritz, Rainer W. Novotny, and Kai-Thomas Brinkmann — II. Physikalisches Institut, Justus-Liebig-Universität, Gießen

Degradation of the optical transmittance of lead tungstate (PWO) scintillation crystals in the luminescence spectrum under ionizing radiation leads to loss of the light output, which results in the deterioration of the energy resolution. Stimulated recovery allows to restore the optical transmittance losses and is achieved by inducing photons of different wavelengths via external light sources (laser diode, LED). Here we report on new results of studies on the stimulated recovery and the radiation damage under gamma irradiation cooled down and at room temperature of lead tungstate crystals. It includes light output and transmittance degradation of PWO, correlations between variations of transmittance at 420 nm and the radiation induced absorption coefficient. Moreover, we present the first lab experiment results of in-situ recovery of the PWO optical transmittance during radiation period[3]. We also propose the model of the radiation damage and the stimulated recovery of damaged PWO after gamma irradiation as well as spontaneous recovery.
This work is supported by BMBF, GSI and HFHF.

HK 13.3 Tue 17:30 SCH/A251

Pre production tests of the PANDA BARREL EMC Slice* — •Thorsten Erlen — II. Physikalisches Institut, JLU Gießen, Deutschland

The Electromagnetic Calorimeter (EMC) of the future PANDA-Experiment at the FAIR complex in Darmstadt will use lead tungsten scintillator crystals (PWO II) to convert energy into an according amount of light and in most parts two Large Area Avalanche Photo Diodes (LAAPD) per crystal are used to measure the amount of light created. Main characteristics of both the scintillator and the photosensors are temperature dependent. With decreasing temperature the light yield (photons per MeV) of the scintillators increases and the noise of the photosensors is reduced, while their gain-factor at a fixed voltage increases. The nominal operating temperature for the EMC is -25 degree celsius to meet the desired properties and allow the EMC to perform according to the needs of the experiment. Energy resolution and threshold depend on a system that is capable of achieving and maintaining stable crystal and photosensor temperatures. Topic of this talk will be the results of test measurments with the first in kind slice (one of sixteen) for the barrel part of the calorimeter, using the latest (pre)production versions of the cooling, monitoring and front end electronic systems. Cooling and monitoring system design solutions will be presented in more detail.
*gefördert durch das BMBF, GSI und HIC for FAIR.

HK 13.4 Tue 17:45 SCH/A251

Calibration of Detector Modules for the PANDA FAIR Phase-0 Calorimeter — Nicolo Baldicchi[1], Luigi Capozza[1], •Samet Katilmis[1], Dong Liu[1], Frank Maas[1,2,3], Julian Moik[1], Oliver Noll[1,2], David Rodriguez Piñeiro[1], Paul Schöner[1], Christoph Rosner[1], and Sahra Wolff[1] — [1]Helmholtz-Institut Mainz, Mainz, Germany — [2]Institute of Nuclear Physics, Mainz, Germany — [3]PRISMA+ Cluster of Excellence, Mainz, Germany

The PANDA FAIR Phase-0 Calorimiter consists of 48 submodules. Each submodule houses detector components, such as high voltage distribution boards, charge sensitive preamplifiers, avalanche photo diodes (APDs) and temperature sensors. The characteristics of these components must be determined to run the calorimeter in an optimal operating mode. Following parameters were determined and optimised. The APD gain as a function of the bias voltage at -25 °C, the entrance area of the PANDA charge sensitive preamplifier and the characteristic curves of both the HV boards and the platinum temperature sensors. Furthermore a first energy calibration of the submodules by utilising atmospheric muons was performed. The talk points out both technical developments and results.

HK 13.5 Tue 18:00 SCH/A251

Series calibration of the slow-control of the barrel part of the PANDA EMC front-end electronics* — •Christopher Hahn — Justus Liebig Universität, Giessen, Deutschland

The Electromagnetic Calorimeter (EMC) inside a 2T solenoid will be the main component of the upcoming PANDA experiment at the future FAIR complex in Darmstadt. Due to the targeted energy resolution, timing and spatial constraints, the individual high-voltage adjustments for the Large Area Avalanche Photodiodes (LAAPDs) demands innovative and customized electronics, such as, for example, the individual bias voltage adjustments for the Photodiodes with an accuracy of 0.1V or better. In the same time, no space can be occupied in the inner detector volume for individual cable routing and connections for the LAAPD bias voltage. The key elements of the high-voltage adjustment concept and the frontend electronics as well as environmental dependencies will be described. The first results of the calibration of the high-voltage distribution and the resulting calibration algorithm will be presented. *supported by BMBF, GSI und HFHF.