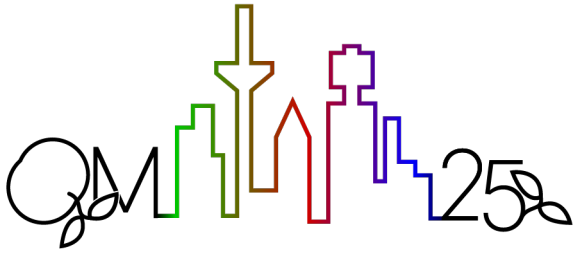

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Performance evaluation of p-type silicon sensors for the ALICE FoCal-E in irradiation tests

Much has been learned about the quark gluon plasma (QGP) produced in relativistic heavy-ion collisions, but one of the most challenging issues that still needs to be addressed is that it reaches thermal equilibrium much earlier than theoretically expected. Color glass condensation (CGC) is a strong candidate for the mechanism by which this occurs, but experimental verification has not yet been successful. In the ALICE experiment, with the aim of experimentally confirming CGC, we are developing Forward Calorimeter (FoCal), which consists of an electromagnetic calorimeter and a hadron calorimeter, to precisely measure the position and energy of direct photons and photons from π^0 decay, which can be the signals of CGC, in the forward region with small x. The FoCal electromagnetic calorimeter consists of low-granularity pad types and high-granularity pixel types, and we are developing a pad type electromagnetic calorimeter (FoCal-E pad). Since FoCal will be installed at forward region of the beam axis where many neutrons will be irradiated, a p-type silicon sensor which has high neutron tolerance is used. To evaluate the performance of the sensor, a neutron irradiation test was conducted at RIKEN-RANS and a beam test experiment was conducted at TOHOKU-ELPH with positrons of various energies injected. In the ALICE experiment, a maximum neutron irradiation amount of about $10^{14} n_{eq}/cm^2$ is expected at the location where FoCal will be installed. In the RANS test, the dose to the silicon sensor was estimated by analyzing the indium foil dose, which has high sensitivity to neutron irradiation, placing around the silicon sensor. The results of the estimation indicate that the neutron dose to the sensor was about $6 \times 10^{13} n_{eq}/cm$. The MIP (Minimum Ionizing Particle) signal of neutron-irradiated and of non-irradiated sensors were detected in the beam test data to evaluate the performance change of the sensors. In this poster, we will report on the development status of FoCal-E and discuss the results of the performance evaluation of the silicon sensor using these tests.

Category

Experiment

Collaboration (if applicable)

ALICE Collaboration

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