

Study of the neutron irradiation effect on SiPM based 10-channel prototype of scintillation detector module produced at JINR.

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The detectors based on solid-state photomultipliers (SiPM) are proposed for forthcoming experiments planned with relativistic heavy ions at FAIR (CBM) and at NICA (MPD). The main radiation damage of the detectors located along the beam axis is caused by neutrons. The forward calorimeter PSD@CBM is equipped with SiPM. The fluence up to 10^{13} n/cm² during first months of the CBM experiment at position of SiPM is expected. Therefore we have investigated SiPM based 10-channel prototype of scintillation detector module produced at JINR by irradiating it with quasi-monoenergetic neutrons of peak energy 32 MeV and fluence $\sim 3 \cdot 10^8$ n/cm². Secondary neutron beam was produced in the ${}^7\text{Li}(p,n){}^7\text{Be}$ neutron generator at the NPI cyclotron (Rez, Czech Republic).

It is shown that the module electronics remains operational, but the noise of SiPM increased. We applied new method to monitor changes in the breakdown voltage without measurement of SiPMs I-V characteristics. The method is based on measurement of the dependence of V_{pp} and V_{rms} voltage on the bias voltage. The proposed method can be applied for monitoring of changes in the breakdown voltage during the detector operation and does not require the usage of the additional equipment.

Primary author(s) : REZNIKOV, Sergey (JINR)

Presenter(s) : REZNIKOV, Sergey (JINR)

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