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Developments in detector and beam technologies at INP BSU

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Fast physical phenomena of radiation interaction with matter that allowed capturing ionization process in scintillators with the definition about 10 ps were researched. It is shown that in e.g. lead tungstate (PWO) scintillation crystal it is possible to distinguish start of scintillation and start of electromagnetic shower by the measurements of non-linear optical absorption of femtosecond laser pulses.

Classes of non-organic materials, including scintillating, that have minor damage of their properties by protons with energies higher than 1 GeV and fluxes up to 5×1014 cm-2 are specified. These materials are prospective for application in detectors intended for installation in proximity to the beam interaction points.

INP BSU manages and takes part in design and production of 1.3 GHz superconductive niobium resonators for future accelerators. Three prototypes of the resonators have been tested in liquid He cryostat and demonstrated superconducting operation and quality factor Q ˜ 2.8⊠109 at the top boundary of the measurement region. At present the resonators are suppressed by additional polishing and the measurement technique is being refined to reach the best possible results.

INP BSU has solid expertise for development of custom integrated circuits (IC) for many years. Two custom monolithic 8-channel ICs transimpedance amplifiers Ampl-8.3 and fast comparators DEisc-8.3 have been developed and produced for 50 thousand channels of the Forward Muon System of the Dzero experiment (Fermilab), 8 thousand channels for Muon System of the COMPASS (CERN), one thousand channels in the PiBeta (PSI), and 3200 channels with straw-tubes of SVD-2 (IHEP, Protvino). Now we engineer 8-channel custom low-impedance amplifier for the muon system of the PANDA project (GSI) and 9-channel amplifier for electromagnetic calorimeters of the NICA experiment setups.

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