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Matrix scintillation detector with high time resolution based on silicon photomultipliers with epitaxial quenching resistors.

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A prototype of a matrix pixel detector based on LYSO scintillators with EQR15-3030 type silicon photomultipliers [1] has been developed, and studies of its characteristics have been carried out. The dimensions of the detector's scintillation elements are $3 \times 3 \times 20$ mm; the time resolution is 150 ps, and the energy resolution is about 15% for gamma ray photon energy of 511 keV. The coordinate coding scheme is based on the "active matrix" principle, which improves the signal-to-noise ratio during reading and significantly increases the slew rate of the output signal from the matrix, thereby improving the detector's temporal resolution. Time parameters are measured using a multichannel TDC based on an FPGA [2]. The report will present a description of the detector, its electronics, and the results of characteristic measurements. References 1. Measurement of Time Resolution of Scintillation Detectors with EQR-15 Silicon Photodetectors for the Time-of-Flight Neutron Detector of the BM@N Experiment / F. Guber et al. // Instrum.Exp.Tech. 67 (2024) 3, 443-446 DOI: 10.1134/S0020441224700696 2. Development of a 100 ps TDC based on a Kintex 7 FPGA for the high granular neutron time-of-flight detector for the BM@N experiment / D. Finogeev et al. // Nucl.Instrum.Meth. A 1059 (2024) 168952 DOI: 10.1016/j.nima.2023.168952

Primary author(s) : KOZHUKHOV, Alexandr; SUKHANOV , Mikhail; SEREBRYAKOV, Dmitriy; KAR-
AVICHEV, Tatiana

Presenter(s) : KOZHUKHOV, Alexandr

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