ARCHITECTURE AND FEATURES OF THE DATA ACQUISITION SYSTEM BASED ON THE DT5560 DIGITIZER FROM CAEN FOR THE DETECTOR SYSTEM OF THE FOURIER STRESS DIFFRACTOMETER FSD

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The report describes the architecture and characteristics of a newly developed data acquisition system for the upgraded detector system of the Fourier stress diffractometer operating on the beam 11a of the IBR-2 neutron reactor [1]. The upgraded FSD detector system includes a backscatter detector assembled from 16 ^{6}Li scintillation elements and two ASTRA detectors, each containing 7 ZnS(Ag) scintillation elements, designed according to the principles of combined electronic and geometric focusing proposed in [2]. New data acquisition system (DAQ) is based on CAEN's 32-channel DT5560 digitizer, part of the Open FPGA family [3], whose distinguishing feature is the ability for the developer to quickly create custom firmware designed and compiled from an extensive list of ready-made firmware components. The digitizer-based DAQ system operates successfully on the beam 11a, replacing the previous MPD240-based system in the fall of 2025. A description of developed firmware and software of the DAQ system is presented.

[1] Bokuchava, G. (2018) “Neutron RTOF Stress Diffractometer FSD at the IBR-2 Pulsed Reactor,” Crystals, 8(8). Available at: https://doi.org/10.3390/cryst8080318.
[2] Kudryashev, V.A., Trounov, V.A. and Mouratov, V.G. (1997) “Improvement of Fourier method and Fourier diffractometer for internal residual strain measurements,” Physica B: Condensed Matter, 234–236, pp. 1138–1140. Available at: https://doi.org/https://doi.org/10.1016/S0921-4526(97)89271-X.
[3] https://www.caen.it/families/open-fpga-digitizers/