

DATA ACQUISITION SYSTEM BASED ON THE R5560 DIGITIZER WITH OPEN FPGA FOR THE WIDE-APERTURE DETECTOR OF THE HIGH-RESOLUTION NEUTRON FOURIER DIFFRACTOMETER HRFD

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During the commissioning of a large-scale scintillation detector with a total sensitive elements area of approximately 13 m² at the HRFD diffractometer of the IBR-2 reactor in 2025 [1], three variants of data acquisition systems were tested. Better results in terms of performance and reliability were demonstrated by the new data acquisition system based on a 128-channel R5560SE digitizer from CAEN, which allows the user to write his own pulse processing algorithm on an open FPGA. Unlike the other two acquisition systems [2], the digitizer-based system includes a pulse shape discrimination algorithm, which is crucial for neutron-gamma separation and is optimized for the timing characteristics of ZnS(Ag)/⁶LiF scintillator signals. The article presents the digitizer-based system, signal processing algorithms implemented as the digitizer's firmware, as well as the software of the data acquisition system and some results of the analysis of the measured data.

- [1] Sumnikov, S. V. et al. (2026) “High-resolution neutron Fourier diffractometer with wide-aperture detector,” *Journal of Applied Crystallography*, 59(2), pp. 426–439. Available at: <https://doi.org/10.1107/S1600576726001986>.
- [2] Bogdzel, A. A., et al. (2019) “The New Data Acquisition System MPD-32 for the High-Resolution Fourier Diffractometer at the IBR-2 Pulsed Reactor”, *Proceedings of the 27th International Symposium on Nuclear Electronics and Computing*, pp. 142–146. Available at: <https://ceur-ws.org/Vol-2507/142-146-paper-24.pdf>.