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The New Data Acquisition System MPD-32 for the High-Resolution Fourier Diffractometer at the IBR-2 Pulsed Reactor

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In the Laboratory of Neutron Physics a new high-performance data acquisition system (DAQ) is being developed in the framework of the project on creation of a high-aperture backscattering detector (BSD) for the high-resolution Fourier diffractometer HRFD.

The designed increase in the BSD aperture of 12.5 times together with an increase in the neutron flux on the sample by a factor of 2-3 due to employment of the new neutron guide demand for raising the neutron registration rate to $\sim 3 \cdot 10^7$ n/s [1]. In addition to signals from the multielement scintillation detector BSD, time encoders also digitize pick-up signals from the chopper as well as of reactor startups that are transmitted to the computer in the list mode to be recorded on the disk for further processing. This has required development of new electronics and programs as the MPD-240-based DAQ system used today has the neutron registration limit on the level of $\sim 10^6$ n / s.

Earlier, in order to increase the transmission capacity of the data acquisition systems with a USB-2 interface for the IBR-2 spectrometers, the FLINK USB 3.0 was developed [2] to provide links between the modules having an optical interface with a computer according to the USB 3.0 protocol. This has solved the problem of increasing the performance of the DAQ systems for all the spectrometers except those for the HRFD that has undergone modernization.

This work presents the results of development of a high-performance data acquisition system on the basis of MPD-32 blocks integrated into a common system of a high-speed interblock interface and a USB 3.0 computer interface with an optical fiber extender.

References

- [1] A. Balagurov et al. «High-resolution neutron Fourier diffractometer at the IBR-2 pulsed reactor: A new concept». Nuclear Inst. and Methods in Physics Research B 436 (2018) 263–271.
- [2] V.V. Shvetsov, V.A. Drozdov. "Increasing Bandwidth of Data Acquisition Systems on IBR-2 Reactor Spectrometers in FLNP". Proceedings of the XXVII International Symposium on Nuclear Electronics & Computing (NEC'2017) Becici, Budva, Montenegro, September 25 - 29, 2017, European repository of the CEUR Workshop Proceedings Vol-2023, pp. 293-298.

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