Contribution ID: **39** Type: **not specified**

# Developing and Optimizing Signals Processing Techniques for the Tangra Project Experimental Setups

*Tuesday, 27 May 2025 14:20 (15 minutes)*

In the scope of the "TANGRA" (TAgged Neutrons and Gamma RAys) project established at the Frank Laboratory of Neutron Physics (JINR, Dubna), several experimental setups of different configurations [1] were devised and employed to study the inelastic scattering of neutrons with an energy of 14 MeV on atomic nuclei using the tagged neutron method [2].

One of "TANGRA" setups utilizes two high-purity germanium (HPGe) semiconductor detectors [3] to measure gamma-radiation resulting from the neutron-induced reactions. The selection of HPGe was made on the basis of its smaller band gap and the lowest energy for formation electron-hole pairs in comparison to other semiconductors.

In the "TANGRA" experiments, customized digitizers are employed, with the resulting signals subsequently fed into the "Romana" software, which was developed as a part of the project. The software is used for recording and processing of signals from the detectors, and it utilizes a specialized approach for acquiring spectrometric information.

Nevertheless, it has been observed that the energy resolution significantly deteriorates as the detector load increases. One potential solution to mitigate this loss of resolution is to expand the processing area of signals. However, this approach may cause the processing system to be unable to maintain the required data processing rate, potentially leading to data loss.

Consequently, alternative digital signal processing techniques were developed, and optimal parameters were identified to achieve the best energy resolution.

The purpose of this report is to present the findings from the latest studies on optimizing parameters for various methods used to process digitized signals from HPGe detectors.

Acknowledgment

This research was supported by the Russian Science Foundation under grant No. 23-12-00239.

References

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**Primary authors:** KHARLAMOV, Petr (JINR); Dr FEDOROV, Nikita (JINR); Dr GROZDANOV, Dimitar (JINR); Dr KOPATCH, Yuri (JINR); Dr PRUSACHENKO, Pavel (JINR); HRAMCO, Constantin (JINR); RUSKOV, Ivan (JINR); Dr TRETYAKOVA, Tatyana (JINR); Dr SKOY, Vadim (JINR); ANDREEV, Aleksandr (JINR); FILONCHIK, Polina (JINR); PAMPUSHIK, Grigorii (JINR)

**Presenter:** KHARLAMOV, Petr (JINR)

**Session Classification:** Parallel Session 2: Nuclear data for applied and scientific purposes/Neutron detection & Methodical aspects

**Track Classification:** Parallel session: Parallel session 2