11th International Conference "Distributed Computing and Grid Technologies in Science and Education" (GRID'2025)



Contribution ID: 500

Type: Sectional talk

TSVD-based neutron spectra unfolding by Bonner multi-sphere spectrometer readings with iteration procedure

Thursday 10 July 2025 17:00 (15 minutes)

At present, Bonner multi-sphere spectrometers are considered reliable devices for assessing radiation conditions at high-energy physics facilities. However, the unfolding of the neutron spectral density function from the results of such measurements, from a mathematical point of view, belongs to the class of ill-posed inverse problems requiring various regularization methods. As such a method, we propose to use truncated singular value decomposition (TSVD), which allows not only the regularization procedure to be carried out, but also makes it possible to determine the optimal set of spectrometer moderator spheres for performing correct measurements. To unfold the neutron spectrum, we use its representation as a superposition of shifted Legendre polynomials, the number of which is determined by the degree of accuracy of the unfolding. Moreover, in order to match the accuracy of the unfolded neutron spectrum with the required measurement errors, we also use an iteration procedure, which allows us to improve the accuracy of unfolding. To illustrate our approach to unfolding neutron spectra and selecting sets of spectrometer moderator spheres, we use experimental data obtained at the JINR facilities - Phasotron and IREN.

Author: CHIZHOV, Alexei (Joint Institute for Nuclear Research, LRB)

Co-author: CHIZHOV, Konstantin (MLIT)

Presenter: CHIZHOV, Alexei (Joint Institute for Nuclear Research, LRB)

Session Classification: Methods and Technologies for Experimental Data Processing