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Innovative analysis technique of neutron time-of-flight spectra, validation, and first results in (α, n) reaction studies

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An innovative methodology has been developed for the procurement of neutron energy distributions from neutron time-of-flight (TOF) measurements with neutron spectrometers. The methodology is based on the accurate determination of the response of the neutron spectrometer via Monte Carlo simulation and an iterative Bayesian unfolding technique for the analysis of the TOF data. The methodology has been validated first with the analysis of a virtual experiment and second with experimental data coming from the ^{85}As β-delayed neutron measurement performed at the IGISOL facility of JYFL-ACCLAB with the MOdular Neutron time-of-flight SpectromeTER (MONSTER).

Several modules of MONSTER were shipped in 2023 to the Centro Nacional de Aceleradores (CNA) in Seville, Spain, and used in a test measurement of the ^{27}Al$(\alpha, n)^{30}$P reaction. The results from the analysis of the data will be presented and plans of future measurements will be discussed.

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