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EJ-276 based neutron spectrometer with neutron-gamma pulse shape discrimination maximum load experimental estimation

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The work is devoted to the EJ-276 plastic scintillator based neutron spectrometer with pulse shape discrimination (PSD) capability experimental development [1]. A DT neutron generator was used as a radiation source. The PSD method is carried out using a CAEN DT5730B digitizer.
An experiment was carried The maximum neutron flux density at which the spectrometric channel is capable to separate neutron and gamma radiation was measured. The experiment consisted of response spectra at different neutron fluxes measurements sets, while the distance from the neutron generator target to detector R was 10 ± 1 cm.
PSD value parameter characterizes a neutron-gamma discrimination. The PSD quality is characterized by the FoM parameter. FoM ≥ 1.27 is the criterion for positive PSD result [2].
Thus, the neutron flux density φ in the detector, at which PSD separation is carried out, is not less than 1*10E6 n*s-1 *cm-2. At higher flux densities, the neutron radiation component is suppressed, which is associated with a large number of overlaps of pulses arriving at the data processing unit.The scintillator segmentation and more accurate processing of overlays can be used to increase the flux density processed by the spectrometer. This result allows identifying the scope of developed device practical application, in particular, in the field of medical physics, accelerator and reactor technology, in the field of radiation resistance.

References:
[1] E.V. Ryabeva et. al. Calibration of EJ-276 plastic scintillator for neutron–gamma pulse shape discrimination experiments. Nucl. Instrum. Methods A 1010 (2021), 165495
[2] N. Zaitseva, et.al. Plastic scintillators with efficient neutron/gamma pulse shape discrimination. Nucl. Instrum. Methods A 668 (2012), 88–93

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