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#07-151 Tests of various scintillator detectors in selected monoenergetic neutron beams

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The neutron detection using organic scintillators is a perspective technique for online neutron detection independent of the use of 3He detectors. This is an important issue due to the increas-ing need of neutron detection in homeland security, nuclear energy and also in nuclear nonpro-liferation applications. One of the important parameters in organic scintillation spectroscopy is the energy resolution of a scintillation detector, which for example in homeland security can distinguish between fission neutron source and radioisotope source. The measurement of pro-ton recoil spectra in monoenergetic neutron fields can be used for both validations of neutron response function and also for the determination of resolution of new neutron scintillation ma-terials. These responses were compared with the stilbene response. The stilbene was used for comparison because it is the best scintillation material for fast neutron spectral flux measure-ments in neutron gamma mixed fields. A set of monoenergetic neutron sources in the range of 1.5 –19 MeV in PTB Braunschweig were used in the testing of detectors. Hamamatsu R329-02 photomultiplier was used to collect the scintillation light. It is connected to the preamplifier that uses different amplification to increase the dynamic range. This also allows us to check on the linearity of the output using calibration sources Co-60 and Cs-137. A verified measurement apparatus NGA-01 was used for the evaluation of the signal of the photomultiplier. This sys-tem can work with a high impulse count per second (>10^5) without any dead time. NGA-01 contains integrated PSD circuits based on the integration method. The measurements show that the best resolution was reached with stilbene, a satisfactory resolution with p-terphenyl, why in the case of the EJ299-33A scintillator the resolution is not very good. On the other hand, due to the low price of plastic scintillator EJ299-33A, the resolution is good enough for large area de-tectors applicable in homeland security applications.

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