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Fast neutron measurements with dueterated liquid organic scintillator NE230

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Abstract content
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Neutron measurements such as response functions and efficiency of the detector are of importance in detector development for fast neutrons. A number of detectors such as proportional counters and plastic, liquid, and crystal organic scintillators have been developed for such measurements, however liquid organic scintillators have been favoured owing to their excellent pulse shape discrimination, relative cheapness and that they can be suitably manufactured. Widely used liquid scintillators such as NE123 are based on proton recoil, however the challenge presented by such recoil spectrometers is that protons have a long range, thus some protons tend to escape the detector without depositing all their energies, this distort the response function and in turn affect the measured efficiency of the scintillator. Additionally for in phantom measurements such as in water, the detector cannot discriminate between protons from water and those arising from the detector. In light of the above mentioned reasons organic scintillators such as NE230 have been suggested as an alternative since they are based on deuteron recoil which has shorter range compared to protons and can be used for in phantom measurements since it offers a way to discriminate against the protons. Experiments were carried out at the neutron beam facility at iThemba LABS in Cape Town. Neutron beams of energies up to ˜64MEV were produced by bombarding either Li (1.0mm), Be (10.0mm), or C (10.0mm) targets with 66MeV protons from the separated sector cyclotron. Measurements were carried out with NE230 detector using time of flight method (ToF). Data was used to obtain the detector efficiency of NE230 and results obtained will be compared to theoretically calculated detector efficiency.

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MSc

Main supervisor (name and email)
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