Effect of the neutron energy cut on the angular asymmetry of prompt neutrons simulated via G4

draft

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Abstract

In this paper we'll describe how the energy cut on the prompt neutrons affects the asymmtry.

Contents

1 Procedure

The asymmetry was calculated as $A = \frac{N(0^0)-N(90^0)}{N(0^0)+N(90^0)}$. Two cases were considered: (i) 238U inside the target and vacuum outside the target; (ii) 238U inside the target and air outside the target. In the case when the material surrounding the target was air, the secondaries produced by the neutrons and by the other particles going out of the 238U target were killed in order to speed up the calculation. Two detectors with 100% efficiency were placed

with their centers at $\phi = 90^0$ at a distance of about 197 cm away from the target. The thickness of each of the detectors was 5.1 cm, the width 7.3 cm, and the hight 7.3 cm. The dimensions of the detectors were exactly the same as the dimensions of the scintillation crystalls attached to PMTs used in the previous neutron detection experiments.

2 Geant4 simulation of the effect of energy cut on the angular distribution of prompt neutrons in the case $P_\gamma = 0.25$ and $(K = 0, J = 1^-)$ channel and 238U target.

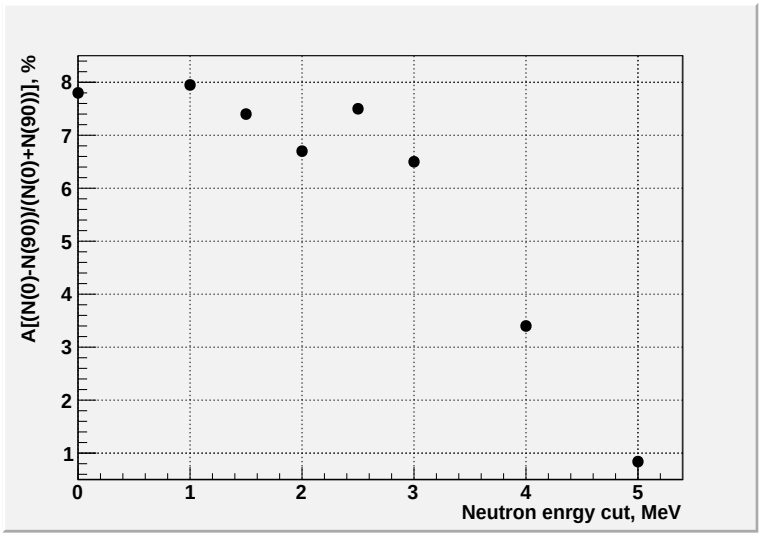

Figure 1: Asymmetry vs. energy cut. 238U inside the target and vacuum is a surrounding material. Initially 10^8 neutrons were sampled.

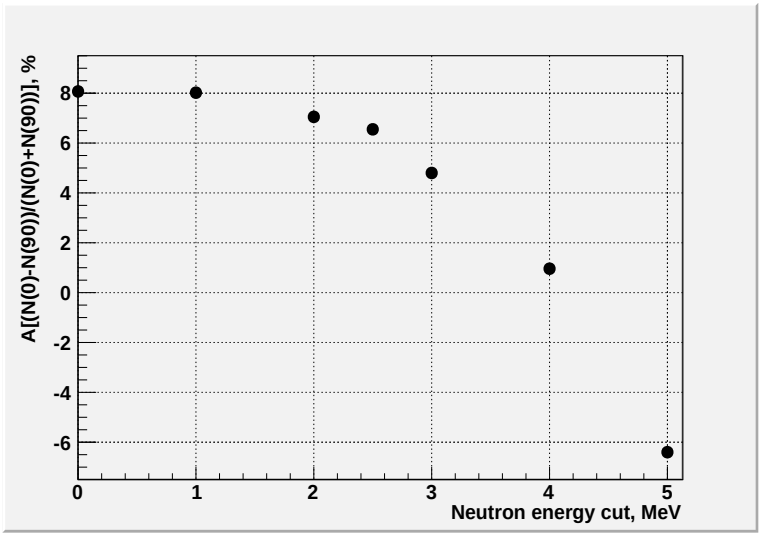

Figure 2: Asymmetry vs. energy cut. 238U inside the target and air is a surrounding material. Initially 10^8 neutrons were sampled.

3 Summary

I guess we should observe the asymmetry rise with the energy threshold increase. I obtained completely different trend. Why is that?