Evaluation of Potential Materials for the Construction of the DD Type Fast Neutron Collimator

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Abstract. This paper deals with the development of the new fast neutron imaging facility at the Laboratory of Neutron Applications of STU, especially the evaluation of potential materials which could be used as the collimator of fast neutrons generated from the DD reaction. Neutron beam collimators are essential components in neutron radiography and function by shaping and narrowing the neutron beam, allowing only neutrons to travel along specific paths to pass through, thereby improving image clarity and minimizing background noise. In this study, we investigated recycled Polyethylene and Neutrostop as candidate materials in several geometric configurations by simulation and experiments set up at the STU Mini Labyrinth experiment. The simulations were carried out using the SCALE6 system and experimental measurements were conducted using the PADC detectors in 6 measurement positions. We focused on the comparison of the experiment with the simulation, the properties of the candidate materials and the efficiency of geometries based on the beam shape.