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Title
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Neutron Beam Filtering Assembly for the LBNL BNCT Facility*


In preparation for future clinical BNCT trials, neutron production via the $^7\text{Li}(p,\gamma)$ reaction as well as subsequent moderation to produce epithermal neutrons have been studied. Proper design of a moderator and filter assembly is crucial in producing an optimal epithermal neutron spectrum for brain tumor treatments. Based on in-phantom figures-of-merit, desirable assemblies have been identified. Experiments were performed at LBNL's 88" cyclotron to characterize epithermal neutron beams created using several microamperes of 2.5 MeV protons on a lithium target. The neutron moderating assembly consisted of Al/AlF$_3$ and Teflon, with a lead reflector to produce an epithermal spectrum strongly peaked at 10-20 keV. The thermal neutron fluence was measured as a function of depth in a cubic lucite head phantom by neutron activation in gold foils and portions of the neutron spectrum were measured by in-air activation of six cadmium-covered materials (Au, Mn, In, Cu, Co, W) with high epithermal neutron absorption resonances. The results were compared to those obtained in Monte Carlo computational models.

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