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A new model for p +9Be reaction as BNCT neutron source

The production of a neutron beam with suitable energy and angular distributions is fundamental for different scientific applications and particularly for Boron Neutron Capture Therapy (BNCT). Nowadays, two accelerator based nuclear reactions are studied and used worldwide as BNCT neutron sources: ^{7}Li(p,n) and ^{9}Be(p,xn).

The former is commercially available but is affected by important limitations, as the low melting point of lithium and the formation of ^{7}Be, a radioactive nuclide that requires adequate precautions in hospitals. The latter allows to overcome these limits, but is more complex to be described due to the presence of more open reaction channels: they are not always all considered in state-of-art codes and it is important to estimate their contribution to the total neutron yield.

We have developed a new model for the calculation of the double differential neutron yield of the ^{9}Be(p,xn) reaction at low energies (E≤5 MeV), based on the existing data and on previous analyses for the total cross sections. We present the new results of our work that show a significant improvement with respect to the currently available models and also allow to estimate neutron yields at higher energies.

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