MONTI-1: Thermal and epithermal neutron fields from an electron medical-type LINAC for BNCT studies and detector test

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Based on an Elekta Precise SL 18 MV medical LINAC, a thermal and an epithermal neutron sources have been developed at the Physics Department of Turin University in Italy, where a dedicated accelerator has been installed. The facility, developed within the E_LiBANS INFN project, aims at offering two neutron irradiation fields for BNCT preclinical studies on cells or tissues and for the detectors development and test.

Both the thermal and the epithermal neutron field are obtained by photo-conversion. The LINAC head is coupled with a specifically designed photoconverter-moderator system which deploys the (γ,n) photonuclear reaction on a thick lead target to convert the bremsstrahlung photons of the LINAC beam into a neutron field. Suitable materials and geometries have been selected to optimize the neutron energy distributions and to reduce the gamma contamination. The useful field is obtained in a closed cavity. Energy distributions are shown in figure 1.

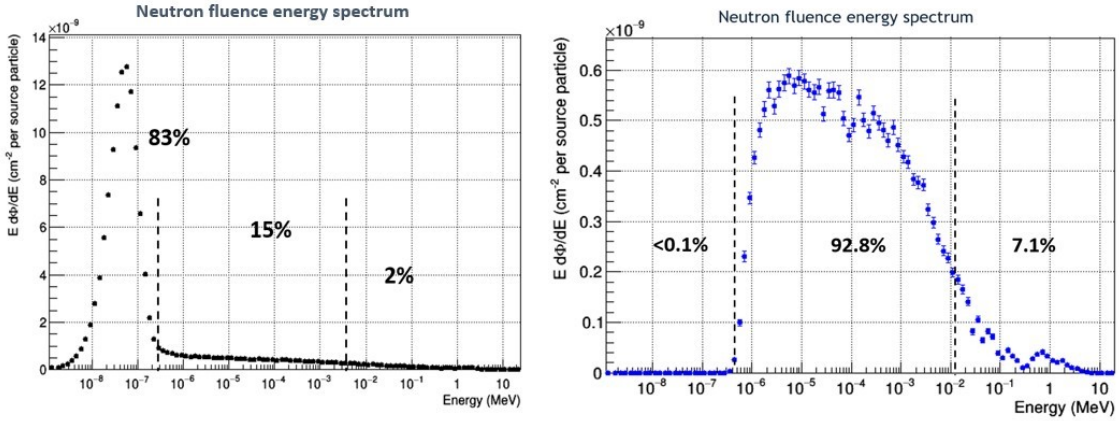

Figure 1: Energy distribution of the thermal(left) and epithermal (right) neutron field

The thermal neutron sources can reach an average fluence rate of 2 10^6 cm^{-2} s^{-1} while the epithermal one can reach some 10^5 cm^{-2} s^{-1}. A pulsed beam is obtained with the characteristic to be tunable in intensity.

This communication demonstrates the feasibility of neutron sources based on medical type LINACS and illustrates the possibility to offer to the BNCT community “easy to access” neutron fields for irradiation tests, showing the advantageous characteristics of these facilities.