Design of New Neutron Imaging Facility at Triga Reactor in Morocco

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Abstract

A new neutron imaging facility is about to be built as a part of the TRIGA MARK-II reactor at Maâmora Nuclear Research Centre (CENM). The focus of this facility will be to perform neutron radiography as well as neutron tomography. The beam tube will be mounted at the tangential beam port. For power of 2 MW, the corresponding thermal neutron flux at the inlet of the tangential channel is around $1.01 \times 10^{13} \text{n.cm}^{-2}/\text{s}$. The facility will be based on a conical neutron collimator with a flight tube of 8m and offers three circular diaphragms with diameters of 1cm, 2 cm and 4 cm corresponding to L/D-ratio varying between 200 and 400. The holes will be housed in the primary shutter. These diaphragms’ sizes allow to perform neutron radiography with high resolution (L/D = 400) and high speed (L/D= 200). A multi filter will be installed after the primary collimator shutter, but before the consecutive flight tube. The flight tube will be large enough to contain also additional pin-hole, beam limiter and fast shutter. Finally, the scheme is evaluated and optimized by Monte Carlo calculations (a fully 3D numerical code GEANT4) of the whole beamline.

Keywords: Neutron Imaging Facility; Collimator Design; GEANT4 Monte Carlo simulation; Triga Reactor.