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Feasibility study of neutron spectra calculations for irradiation of materials using MCNPX in the NEAR station at CERN/n_TOF facility

One of the few neutron spallation facilities in the world capable of delivering neutron spectra is the neutron time-of-flight facility (n_TOF). These spectra are primarily employed in conducting precise neutron-induced cross-section measurements using the time of flight technique. Since its operation began in 2001, the facility has continuously contributed to a diverse array of scientific pursuits, encompassing astrophysics, nuclear technologies, and medical applications. n_TOF produces neutrons through a 20 GeV pulsed proton beam, which is extracted from the proton synchrotron, impinging a pure lead target cooled down with nitrogen gas.

In 2021 the third irradiation area, the other two are n_TOF EAR1 and n_TOF EAR2, was constructed close to the n_TOF target, the NEAR station. The station is divided into two study locations. One of the locations is inside the shielding of the n_TOF target, which aim is to study irradiation damage of high dose (in the order of MGy) in materials. The other location, outside the shielding, which uses a collimator to convey the high-intensity neutrons to the outside area, has been incorporated to study irradiation of electronics.

In this work we introduce the capability of incorporation Monte Carlo N-particle (MCNPX) code to simulate the irradiation of materials in the NEAR station. Three locations were chosen to be irradiated in the NEAR station and neutron spectra were estimated for several moderator material compositions, which will be used during neutron capture cross section measurements by the activation method at the n_TOF NEAR Station in the upcoming years.

Type of contribution

Poster

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