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# Determination of reaction activities on Au and Tm targets using the quasi-monoenergetic neutron beams at approximately 90 MeV

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Determination of reaction activities on Au and Tm targets using the quasi-monoenergetic neutron beams at approximately 90 MeV
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The International Atomic Energy Agency (IAEA) has highlighted the challenge of managing highly radioactive waste from nuclear reactions, and one potential solution being considered is the use of accelerator-driven sub-critical systems (ADS) [1]. However, constructing such reactors requires experimental neutron cross-section libraries for (n, xn) reactions in various materials at energies above 20 MeV, which currently are scarce or have large uncertainties [2]. To address this gap, this study aims to perform preliminary measurements on the reaction product activities of 197Au and 169Tm target materials using quasi-monoenergetic neutron beams of approximately 90 MeV. The study utilized the iThemba LABS neutron beam facility to produce quasi-monoenergetic neutron beams. Neutron detectors were used on the 0° and 16° beam paths to obtain spectra, which were then compared to determine the neutron flux. Stacked target materials including 197Au and 169Tm were irradiated and also placed along the 0° and 16° beam path. Neutron detectors and target materials were placed at least 5 m from the Li target, the neutron production point.

After irradiations, the samples were counted on a gamma-ray counting system to identify the reaction products and calculate the activities of the identified nuclei. The experimental procedure used to determine energy and efficiency calibrations with the gamma-ray spectrometry method will be discussed during the presentation. The results of this study are expected to contribute to the improvement of the International Reactor Dosimetry and Fusion File (IRDFF) library [3] and provide a benchmark for validating nuclear models and improving nuclear data libraries.

[1] Bielewicz et al., The New Collaboration of the JINR and the iThemba LABS for Cross-Section (n,xn) Reactions Measurements (2019).
[2] Pomp et al., Radiat. Prot. Dosimetry 161 (1-4), 62−66 (2014).
[3] Trkov et al., Special issue of Nucl. Data Sheets, 163, 1-108 (2020).

## Apply to be considered for a student ; award (Yes / No)?

Yes

## Level for award;(Hons, MSc, PhD, N/A)?

MSc

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