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Measurement of the $^{197}\text{Au}(\gamma, n)^{196}\text{Au}$ cross-section with the activation method

The $^{197}\text{Au}(\gamma, n)^{196}\text{Au}$ reaction is commonly used as a reference process to measure the gamma beam intensity in photonuclear reaction experiments. However, at energies higher than 14.7 MeV, the cross-section values of the $^{197}\text{Au}(\gamma, n)^{196}\text{Au}$ reaction available in the literature (both from experiments and theory) exhibit conflicting values. Thus, we performed a new measurement of the $^{197}\text{Au}(\gamma, n)^{196}\text{Au}$ reaction cross section at the HI γ S facility using the activation method. A beam of nearly-monochromatic photons at various energies (10 MeV-20 MeV) was used to activate several gold foils. After irradiation, the number of gamma decays of ^{196}Au (at energies of 333 keV and 356 keV) was measured for each gold foil using a HPGe detector. The intensity of the beam was measured using a dual fission chamber and a thin plastic scintillator. The combined use of these beam diagnostic systems and the measure of the disintegrations of ^{196}Au , provided a new measurements of the $^{197}\text{Au}(\gamma, n)^{196}\text{Au}$ cross-section reducing the experimental errors with respect to the previous experiments. This result is important to improve the measurement of the gamma-beam intensity for the study of (γ, α) and (γ, p) reactions of interest for the astrophysics.

In this presentation experimental procedure and preliminary results will be shown.

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