Photoneutron Cross Sections for Au*

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Photoneutron cross sections for Au are regarded as one of the basic data in nuclear physics cited in the classical literature [1]. The cross section was measured with γ rays produced in positron annihilation in flight (PAIF) at LLNL and Saclay [2-4]. Direct neutron counting was carried out with a neutron detector consisting of BF_3 counters embedded in a paraffin moderator at LLNL[2,4] and with a Ga-doped liquid scintillator at Saclay [3]. While the data show rather good agreement near neutron threshold, they show serious discrepancies above 10 MeV toward the peak of GDR. Photoneutron cross sections near neutron threshold also serve a standard for photoactivation measurements in the study of the p-process nucleosynthesis.[23)] The photoactivation data near threshold [5] is consistent with the direct neutron-counting data. Recently, photoactivation measurements for Au have been extended from the threshold region to the peak energy region of GDR [6]. Photoneutron cross sections for Au were previously measured with laser Compton-scattering (LCS) γ rays [7]. However, a data reduction with the photon difference method has ended up with large uncertainties.

We measured photoneutron cross sections for Au in the entire energy range of the *(γ,n)* channel with the LCS γ rays based on a direct neutron-counting technique with a high-efficiency neutron detector consisting of three rings of 4, 8, and 8 ^{3}He proportional counters embedded in a polyethylene moderator. A least-squares method was employed in data deduction to provide photoneutron cross sections at thirty average energies of the LCS γ-ray beam from 8.08 MeV to 13.13 MeV. Results are compared with the past direct neutron-counting data taken with the PAIF γ rays and the photoactivation data taken with bremsstrahlung.

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