PHOTODISINTEGRATION OF 9BE THROUGH THE 1/2+ STATE AND PYGMY DIPOLE RESONANCE

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The present research interest in nuclear structure of a borromean system ^{9}Be ($\alpha + \alpha + n$) is threefold: 1) nucleosynthesis of ^{9}Be by the ^{8}Be(n,γ)^{9}Be reaction via the $1/2^{+}$ state near neutron threshold; 2) the nature of the $1/2^{+}$ state; and 3) the nature of pygmy dipole resonance. Photodisintegration of ^{9}Be was measured from the nucleosynthesis point of view in two experiments with laser-Compton scattering γ-ray beams [1,2], which however resulted in a significant discrepancy in peak cross section immediately above the n + ^{8}Be threshold. The nature of the $1/2^{+}$ state is not elucidated experimentally though it can be a virtual state as discussed in the literature [3-5]. Furthermore, low-energy E1 strengths in ^{9}Be referred to as pygmy dipole resonance (PDR) are not well investigated experimentally; the only existing data were obtained with bremsstrahlung [6].

We carried out a new measurement of photodisintegration of ^{9}Be through the $1/2^{+}$ state and PDR at the NewSUBARU facility. Quasi-monochromatic γ-ray beams with 1 – 2% energy spreads in FWHM were produced in laser Compton backscattering (LCS) from relativistic electrons in a range of 954 - 1121 MeV. A grating-fixed CO_2 laser (λ=10.5915μm) was used to produce 1661 - 2232 keV (in maximum energy) γ-ray beams for the study of the $1/2^{+}$ state, while a Nd:YVO_4 laser (λ=1064nm) to produce 5.78 – 16.93 MeV γ-ray beams for PDR. A 99% ^{9}Be rod of 20mm in diameter and 40mm in length was irradiated. It is of essential importance to understand the characteristics of the LCS γ-ray beams used for the present experiment, i.e., the energy distribution, energy calibration, and flux. The characteristics of the γ-ray beam are presented in a poster separately.

We present photoneutron cross sections for the $1/2^{+}$ state with improved accuracy with emphasis on its threshold behavior. It is shown that the peak cross section is rather consistent with the one reported in 2001 [1]. We also present photoneutron cross sections for PDR which follow the cluster dipole sum-rule [7].

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