M1 and E1 Cross Sections near Threshold in Photodisintegration of Deuteron

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Photodisintegration of deuteron is one of the most fundamental reactions to investigate nuclear interactions. In addition, an accurate determination of the photodisintegration cross section near breakup threshold is desired from the viewpoint of big-bang nucleosynthesis of deuterium. Further, M1 strength in $^2H(\gamma,n)p$ is related to the Gerasimov-Drell-Hearn sum rule, which is a fundamental low that governs the nucleon spin.

Total photodisintegration cross sections were measured by Hara *et al*. with Laser-Compton scattering (LCS) γ rays [1]. The photon analyzing power was measured by Ahmed *et al*. [2] with LCS γ rays from a free-electron laser to determine the cross section ratio, $\sigma(M1)/\sigma(E1)$. Further, M1 cross sections were deduced by Ryezayeva *et al*. in the (e,e') reaction at 180° [3].

We measured M1 and E1 cross sections in photodisintegration of deuteron, $^2H(\gamma,n)p$, with linearly-polarized LCS γ rays at four energies near photodisintegration threshold. Figure 1 shows results of the measurement in comparison with total and partial cross sections previously reported for deuteron as a function of γ-ray energy.

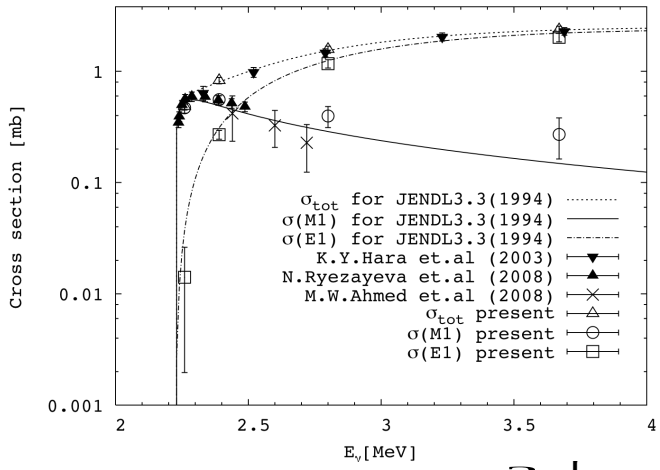

Figure 1: Present M1 and E1 cross sections determined in the $^2H(\gamma,n)p$ reaction; σ_{M1} (open circles), σ_{E1} (open squares), and sum cross sections σ_{total} (open triangles).

[1] K. Y. Hara *et al*., Phys. Rev. D 68, 072001 (2003).
[2] W. Tornow *et al*., Phys. Lett. B574, 8 (2003)
M.W. Ahmed *et al*., Phys. Rev. C 77, 044005 (2008).,
[3] N. Ryezayeva *et al*., Phys. Rev. Lett. 100, 172501 (2008).