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2.19 A Stretched $(g_{9/2}d_{5/2}^{-1})_{6^+}$ State in ^{28}Si Studied through m = 0 Substate Population

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It is one of the current interests to study high spin states of stretched configuration in nuclei. Excitation of these states provides a crucial test for effective interactions and also for model wave functions. Although there have been many works on stretched states of $(f_{7/2}d_{5/2}^{-1})_{6^-}$ T = 0 and 1 in ^{28}Si[1], there is no clear evidence reported on $g_{9/2}$ component yet in sd-shell nuclei. We have chosen a specific experimental geometry to excite only m = 0 substate of the high spin state, which gives a unique spin-parity assignment[2].

We report here a direct evidence of the g-shell component obtained in sd-shell nuclei from the α_0 and p_0 decay measurement from the m = 0 substate of the 12.80 MeV state in ^{28}Si populated through the ^{12}C(^{20}Ne,α)^{28}Si reaction at 0° at 52 MeV. Fig. 1 shows the angular correlation function for the 12.80-MeV state, indicating 6^+ for the state. Since this state decays simultaneously by a proton emission, it is assigned to have a proton configuration of $(g_{9/2}d_{5/2}^{-1})_{6^+}$ of about 30 %. A DWBA calculation assuming a $g_{9/2}$ proton transfer also explains well the ^{27}Al(α,t)^{28}Si reaction at 64.5 MeV[3] for the same state, as shown in Fig. 2, giving a consistent spectroscopic factor $S^2(g_{9/2}) = 0.2$.

References

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2) K. Morita, S. Kubono, et al., Phys. Rev. Lett. 55, 185 (1985).
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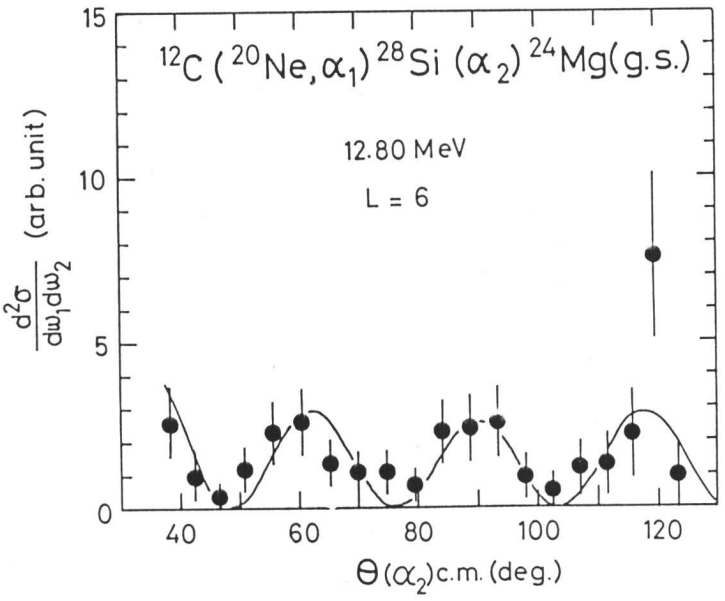

Fig. 1 An α-α angular correlation function obtained for the 12.80-MeV state. The solid line is the best fit curve with $|P_{L=6}(\cos\theta)|^2$.

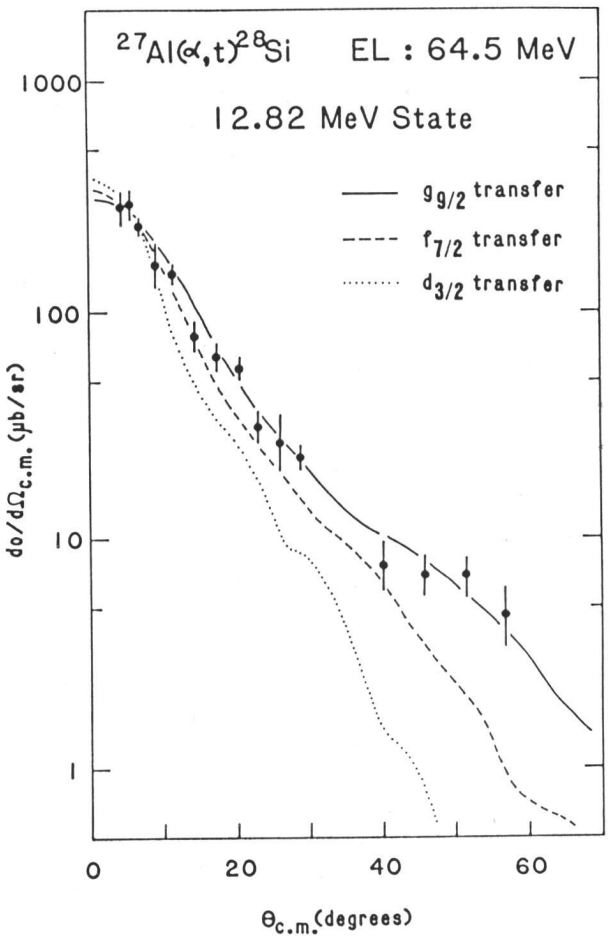

Fig. 2 Angular distribution of tritons from the $^{27}Al(\alpha,t)^{28}Si$ reaction leading to the 12.82 MeV state at 64.5 MeV. The solid line is the DWBA result assuming $g_{9/2}$ proton transfer, the dashed line is for $f_{7/2}$ transfer, and the dotted line is for the $d_{3/2}$ transfer.