HIGH-SPIN STATES AND SPIN-COUPLED QUADRUPOLE VIBRATIONAL STATES IN NUCLEI EXCITED VIA (p,n) REACTIONS

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We have obtained neutron spectra at several angles from 0 to 24° from the (p,n) reaction on targets of ^{12}C, ^{16}O, ^{24}Mg, ^{28}Si, and ^{40}Ca at 61.9 and 135 MeV incident proton energies. Also we have data over the same angular range for ^{12}C at 119.8 MeV and ^{12}C and ^{16}O at 160 MeV. Neutron energy spectra at four angles from the $^{12}C(p,n)^{12}N$ reaction at 135 MeV are presented in Fig. 1. The state at about 5.5 MeV of excitation in ^{12}N remains strongly excited at 24° and is identified as a high-spin state complex of the type predicted by Moffa and Walker.[1] The identification of this state is in excellent agreement with the identification by Donnelly et al.[2] of the analog state at 19.5 MeV of excitation in ^{12}C by inelastic scattering. Also we identified high-spin state complexes in the $^{16}O(p,n)^{16}F$ [3] and the $^{28}Si(p,n)^{28}P$ reactions. At the largest angle available (viz, 24°), the calculations of Moffa and Walker[1] predict that these complexes still contain contributions from lower-spin states. Now we plan to extend these measurements out to about 60° with the beam-swinger facility in order to minimize the low-spin state contributions to the complexes.

Our preliminary results reveal a broad bump at about 12 MeV of excitation in ^{12}N which may be the spin-flip component of the giant dipole resonance. These measurement, limited to forward angles, did not have large enough momentum transfers to most

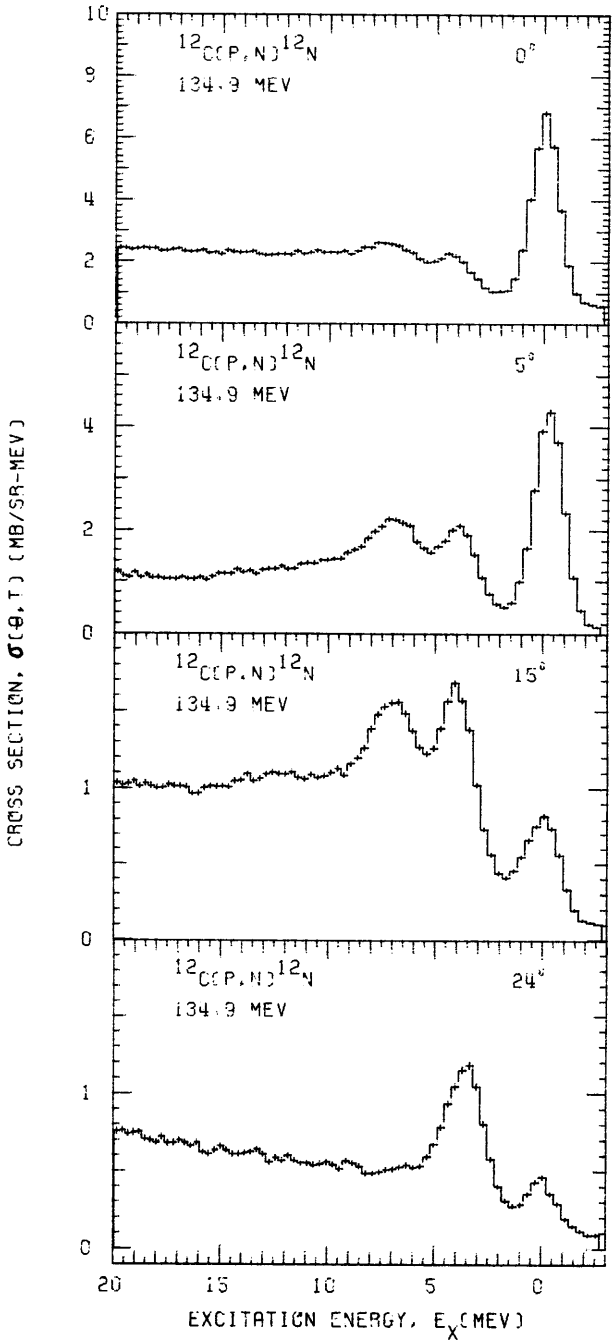

Figure 1

strongly excite spin-coupled quadrupole vibrational states. We will be better able to search for this strength with the larger momentum transfer measurements possible with the beam-swinger facility.

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1) P.J. Moffa and G.E. Walker, Nucl. Phys. A222, 140 (1974).

2) T.W. Donnally, et al., Phys. Rev. Letters 21, 1196, (1968).

3) this report, p. 112.