We have obtained neutron spectra at several angles from 0 to 240° from the \((p,n)\) reaction on targets of \(^{12}\text{C}\), \(^{16}\text{O}\), \(^{24}\text{Mg}\), \(^{28}\text{Si}\), and \(^{40}\text{Ca}\) at 61.9 and 135 MeV incident proton energies. Also we have data over the same angular range for \(^{12}\text{C}\) at 119.8 MeV and \(^{12}\text{C}\) and \(^{16}\text{O}\) at 160 MeV. Neutron energy spectra at four angles from the \(^{12}\text{C}\,(p,n)^{12}\text{N}\) reaction at 135 MeV are presented in Fig. 1. The state at about 5.5 MeV of excitation in \(^{12}\text{N}\) remains strongly excited at 240° 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 \(^{12}\text{C}\) by inelastic scattering. Also we identified high-spin state complexes in the \(^{16}\text{O}(p,n)^{16}\text{F}\)\(^3\) and the \(^{28}\text{Si}(p,n)^{28}\text{p}\) reactions. At the largest angle available (viz, 240°), 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 \(^{12}\text{N}\) which may be the spin-flip component of the giant dipole resonance. These measurements, limited to forward angles, did not have large enough momentum transfers to most
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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3) this report, p. 112.