SEARCH FOR HIGH SPIN PARTICLE-HOLE STATES IN ^{20}Ne

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The identification of "stretched" 6^- states in ^{28}Si and ^{24}Mg was one of the early results to come from inelastic proton scattering studies at IUCF[1]. Stretched states are particle-hole states with the particle and hole both in "stretched" orbits ($j_p = \ell_p + 1/2$; $j_h = \ell_h + 1/2$) coupled to the highest possible total spin ($J = j_p + j_h$). Consequently, the relative purity of configuration of the 6^- states of ^{28}Si (T=0 state at 11.58 MeV excitation and T=1 state at 14.35 MeV) has been used to test various forms of the nucleon-nucleon interaction[2]. These particular states stood out in the spectra of inelastically scattered protons from ^{28}Si and ^{24}Mg.

In previous work[3] no definite identification of either expected 6^- state was possible, due mainly to the poor (160 keV) resolution obtained. The main purpose of this experiment was to continue the search for the 6^- particle-hole states of ^{20}Ne using the K600 spectrometer to improve the resolution.

A gas cell designed to be used in the K600 scattering chamber contained the target gas (>99.5% ^{20}Ne). This gas cell can be placed in a normal target position on the target ladder without interfering with other targets on the ladder. The ^{20}Ne gas pressure used was 95 psi. This pressure gave a good compromise between resolution and count rate. The energy resolution obtained was 85 keV at the center of the K600 focal plane and about 140 keV at the edges of the focal plane due to known spectrometer aberrations. The resolution can be improved by offline software corrections of these aberrations. Measurements were made over an angular range of 15° to 60°.

Due to the gas cell having extended depth it is not possible to dispersion match the beam to the spectrometer. Thus resolution on target is governed by the momentum width of the proton beam. To improve resolution the momentum width of the beam was reduced using the object slits 3 and 7 of the analysing magnet in beam line 3. This reduced the beam from about 100 nA maximum to 10 nA.

Figure 1 shows a sample spectra of one momentum bite of the K600 spectrometer. Analysis of the data is in progress.

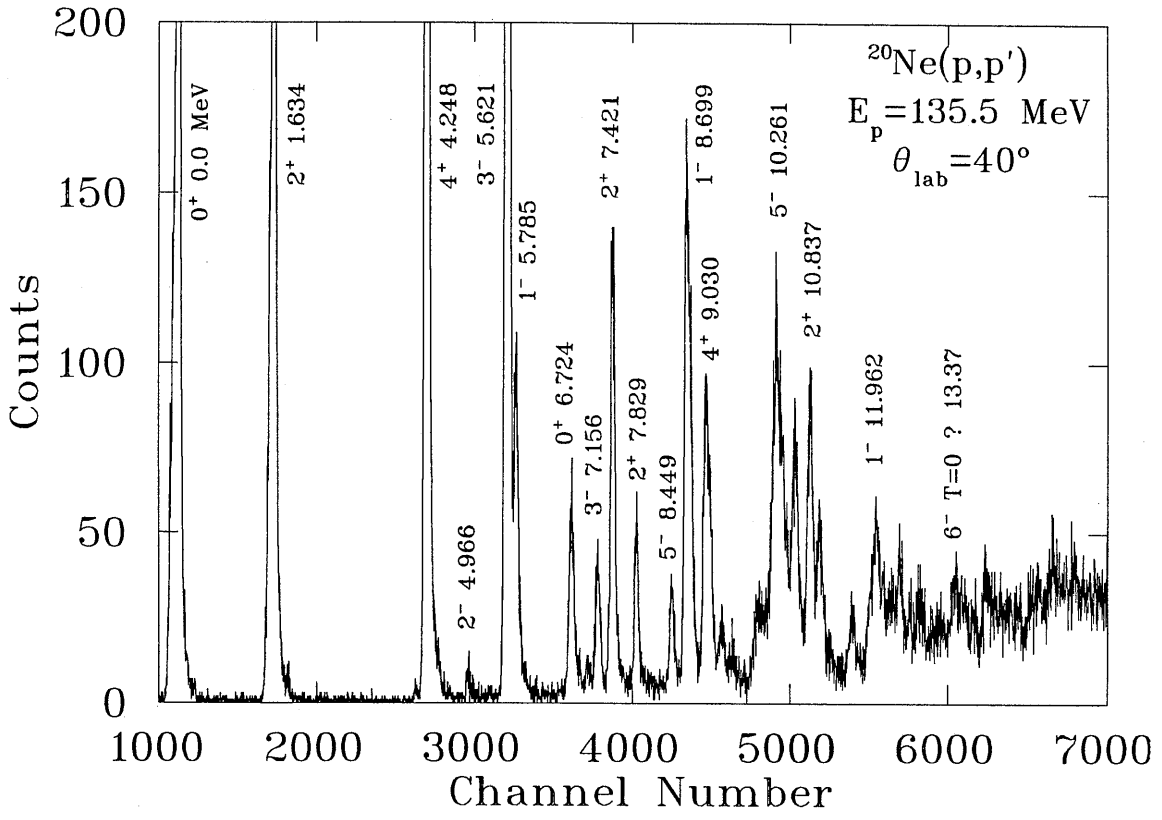

Figure 1. Proton spectrum for ^{20}Ne(p,p'), θ_{lab} =40°, E$_p$=135.5 MeV.

1. G.S. Adams, A.D. Bacher, G.T. Emery, W.P. Jones, R.T. Kouzes, D.W. Miller, A. Picklesimer, and G.E. Walker, Phys. Rev. Lett. **38**, 1387 (1977).
2. C. Olmer, A.D. Bacher, G.T. Emery, W.P. Jones, D.W. Miller, H. Nann, P. Schwandt, S. Yen, T.E. Drake, and R.J Sobie, Phys. Rev. **C29**, 361 (1984).
3. M.C. Munro, G.G. Shute, B.M. Spicer, V.C. Officer, A.D. Bacher, C.C. Foster and W.E. Dollhopf, IUCF Scientific and Technical Report 1985, p. 1.