

Figure 1. Analyzing power for (p,p') reaction to 15.11 MeV state in ^{12}C at 120 MeV. The curve is a theoretical prediction based on the procedures of Ref. 1.

found for the 15.11 MeV transition, which is dominated by one-pion exchange. Analyzing power data are compared with the predictions of the same interaction in Fig. 1. The predicted shape agrees well with the data over the same range of angles for which good agreement is found for the cross sections, but the magnitude of the oscillations is too small.

Data acquisition for ^{12}C was completed in January, 1980 and the data are being analyzed. Additional measurements are planned for the 2.31 MeV transition in ^{14}N (1^+ , $T=0 \rightarrow 0^+$, $T=1$) which is dominated by the tensor interaction.

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INELASTIC PROTON SCATTERING FROM ^{12}C : A SEARCH FOR NUCLEAR PRECRITICAL OPALESCENCE

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Following the suggestions of Toki and Weise,¹ Delorme et al.,² and Ericson,³ an attempt is being made to observe an indication of nuclear precritical phenomena near pion-condensation thresholds. In particular, precritical phenomena, sometimes referred to as precritical opalescence, might be expected to show up as a cross-section enhancement at high momentum transfer, $q \sim (2-3)m_\pi c$, of inelastic nucleon scattering to states that carry the quantum numbers of the pion, i.e. $T=1$, unnatural parity.

Proton inelastic scattering to the 15.11 MeV state in ^{12}C is thought to be a favorable reaction for observing this effect, particularly since the transition appears to be well described as a spin-flip,

isospin-slip transition that carries a large part of the M1 strength.

A run was taken at a bombarding energy of 155 MeV. Angular distributions for the 15.11 MeV state (1^+ , $T=1$), as well as the 12.71 MeV (1^+ , $T=0$) and 16.11 MeV (2^+ , $T=1$) states are shown in Fig. 1. It can be seen that a peak in the right region is seen for the 15.11 MeV state. A similar enhancement of the transverse form factor $|F_T|^2$ for the 15.11 MeV state has been observed in inelastic electron scattering.⁴ These results to some degree confirm earlier work of Buenard⁵ who, with poorer quality data at fewer angles, reported a stronger peak in the same region.

Of course, one angular distribution does not

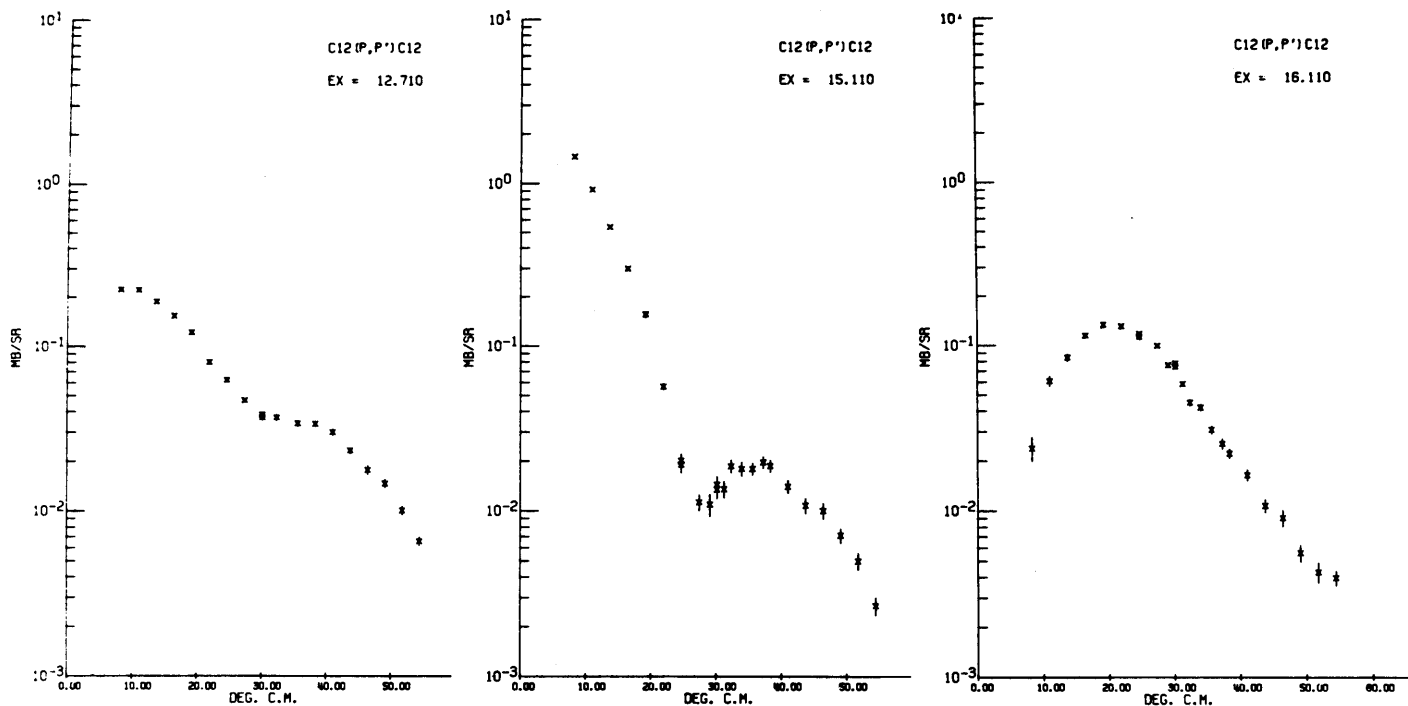


Figure 1. Angular distributions of proton inelastic scattering from ^{12}C at 155 MeV bombarding energy.

establish nuclear opalescence. In fact, it has been shown that plausible modifications to the wave functions that are usually used can lead to a fitting of the electron scattering data.^{4,6} Conversely, it is certainly possible to simulate the effects of nuclear opalescence by altering some of the many parameters that go into nuclear reaction calculations. What are needed, then, are systematic investigations, both theoretical and experimental. To this end, it is next planned to investigate the dependence of the angular distributions on bombarding energy. Data for another experiment⁷ have already been taken at 122 MeV. Here the effect in the 15.11 MeV angular distribution is

less apparent. A run at 200 MeV is presently planned.

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- 4) J.B. Flanz, R.S. Hicho, R.A. Lingren, G.A. Peterson, J. Dubach, and W.C. Haxton, Phys. Rev. Lett. 43, 1922 (1979).
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- 6) J. Dubach and W.C. Haxton, Phys. Rev. Lett. 41, 1453 (1978).
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