

THE (p, π^-) REACTION IN THE sd SHELL

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IUCF Studies of the (p, π^-) reaction in the sd-shell have been reported previously.¹⁻³ The target nuclei included in these earlier studies were ^{18}O and ^{26}Mg (spectra and angular distributions of the differential cross sections and analyzing powers at $T_p=201$ MeV),^{1,2} and $^{24,25,26}\text{Mg}$ and $^{28,29,30}\text{Si}$ (spectra at $T_p=190$ MeV and $\theta_{\pi}(\text{lab})=30^\circ$).³

During 1984 (p, π^-) spectra from several other targets in the lower half of the sd-shell were obtained, in order to discover the extent to which strong enhancement of transitions to stretched $2p-1h$ states⁴ prevails in the sd shell.

Spectra for the reactions $^{19}\text{F}(p, \pi^-)^{20}\text{Na}$, $^{23}\text{Na}(p, \pi^-)^{24}\text{Al}$, and $^{27}\text{Al}(p, \pi^-)^{28}\text{P}$ are shown in Fig. 1. These spectra were all taken without changing the QQSP magnetic field to facilitate accurate cross energy calibrations.

Angular distributions of the differential cross sections and analyzing powers for several of the strongest transitions are shown in Figs. 2 and 3.

These results will be compared with the systematics of the (p, π^-) reaction in other mass regions and interpreted within the framework of existing reaction mechanism and nuclear structure models.

- 1) J.J. Kehayias et al., IUCF Scientific and Technical Report, 1982, p. 85.
- 2) J.J. Kehayias et al., IUCF Scientific and Technical Report, 1983, p. 80.
- 3) R.D. Bent et al., IUCF Scientific and Technical Report, 1983, p. 78.
- 4) S.E. Vigdor et al., Phys. Rev. Lett 49, 1314 (1982) and Nucl. Phys. A396, 61c (1983).

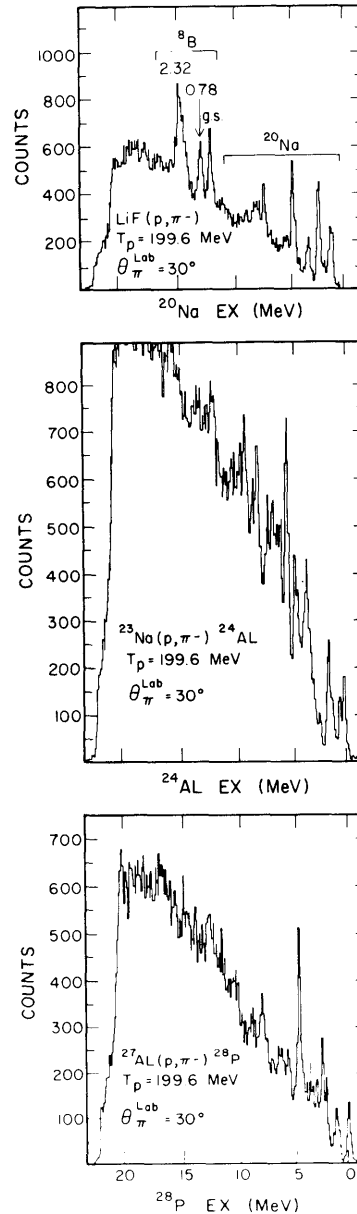


Figure 1. Pion Spectra from the reactions $^{7}\text{Li}(p, \pi^-)^8\text{B}$, $^{19}\text{F}(p, \pi^-)^{20}\text{Na}$, $^{23}\text{Na}(p, \pi^-)^{24}\text{Al}$ and $^{27}\text{Al}(p, \pi^-)^{28}\text{P}$ at $T_p=199.6$ MeV and $\theta_{\pi}(\text{lab})=30^\circ$.

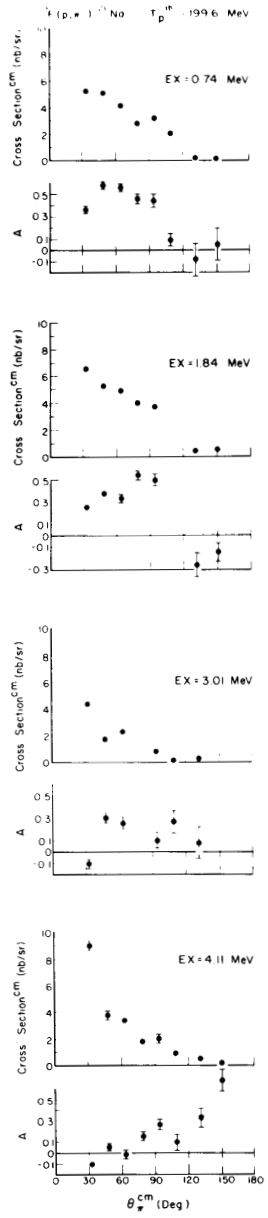


Figure 2. Angular distributions of the differential cross sections and analyzing powers for the reaction $^{19}\text{F}(p, \pi^-)^{20}\text{Na}$ leading to strongly excited states in ^{20}Na at excitation energies of 0.74, 1.84, 3.01, and 4.11 MeV.

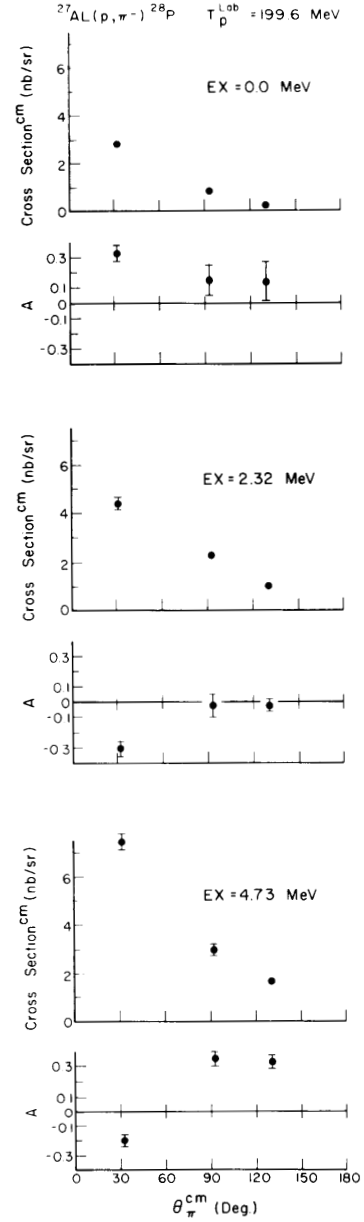


Figure 3. Angular distributions of the differential cross sections and analyzing powers for the reaction $^{27}\text{Al}(p, \pi^-)^{28}\text{P}$ leading to the strongly excited states at excitation energies of 0.0, 2.32, and 4.73 MeV.