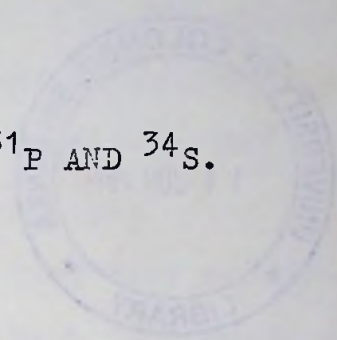


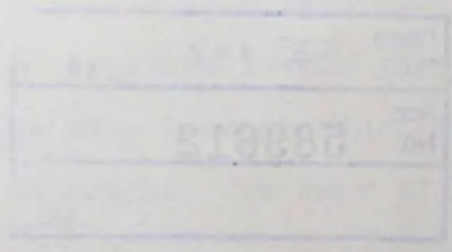
NUCLEAR STRUCTURE STUDIES IN  $^{31}\text{P}$  AND  $^{34}\text{S}$ .



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### ABSTRACT

A multi-crystal array has been used to measure the angular correlations of gamma rays from states of  $^{31}\text{P}$ . The states were excited in the reaction  $^{28}\text{Si}(^4\text{He}, \text{P})^{31}\text{P}$  and identified by means of the associated proton groups detected at  $180^\circ$  to the beam direction in an annular counter telescope.

The gamma ray linear polarizations have been measured with a triple Ge(Li) Compton polarimeter at three bombarding energies using the reaction  $^{28}\text{Si}(^4\text{He}, \text{P})^{31}\text{P}$ . The  $^{28}\text{Si}(^4\text{He}, \text{P})^{31}\text{P}$  reaction has been used with an escape suppressed and pair escape spectrometer to measure lifetimes of fifteen states and to place lifetime limits on a further twelve states in  $^{31}\text{P}$  by the Doppler shift attenuation method.

In  $^{31}\text{P}$  spin parity assignments have been made for levels at 4634 keV  $7/2^+$ , 5344 keV  $9/2^+$ , 5773 keV  $7/2^+$ , 5892 keV  $9/2^+$ , 6078 keV  $9/2^+$ , 6452 keV  $11/2^+$ , 6503 keV  $9/2^-$ , 6792 keV  $9/2^-$ , 6828 keV  $11/2^-$ , 7118 keV  $9/2^+$ , 7441 keV  $11/2^+$ , 7678 keV  $7/2$ , 8343 keV  $11/2^-(7/2^-)$ , 8707 keV  $13/2^-(9/2^-)$ , 9123 keV  $13/2^+(9/2^+)$ , 9287 keV  $7/2$ , and 9752 keV  $11/2^+$ . The spin parity assignments of several other levels have been confirmed and spin restrictions have been placed on other levels populated in the reaction. Branching ratios have been obtained for many of the levels and mixing ratios determined for many of the observed electromagnetic transitions.

The levels of  $^{34}\text{S}$  from 5.4 MeV to 7.4 MeV excitation energy have been studied by particle-gamma ray angular correlation experiments using the reaction  $^{31}\text{P}(^4\text{He}, \text{P})^{34}\text{S}$ . A five Ge(Li) crystal array was used to obtain angular correlations for the decays of the close lying 5.680 and 5.689 MeV levels. Spin assignments of  $5^-(3^-)$ ,  $4^+$ ,  $1, 4^+(2)$ ,  $2^+$  and  $4^-(3)$  have been made to the levels at 5.689, 6.250, 6.480, 6.864, 6.950 and 7.388 MeV respectively. Spin restrictions have been

placed on other levels and some previous spin assignments have been confirmed. Branching ratios have been determined for many of the observed decay modes and multipole mixing ratios obtained for several transitions.

The theories of the experiments, the experimental apparatus and the methods of data collection and reduction are described in detail. Finally the experimental results are discussed in relation to various model calculations which have been carried out for each nucleus.