

# New Transitions Found in $^{27}\text{Na}$ Using a $^{14}\text{C}$ Beam on a $^{14}\text{C}$ Target \*

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Until recently it has been difficult to study nuclei that do not lie near the line of stability. Due to the recent developments in radioactive beams, it has become increasingly important to study the structure of nuclei in  $s$ - $d$  shell region. At present, very little is known about the structure of the neutron rich  $s$ - $d$  shell nuclei. The study of nuclei in this region would prove invaluable in comparing microscopic and macroscopic nuclear models.

Previous studies of the  $s$ - $d$  shell nuclei have resulted in observation of several transitions in  $^{25}\text{Na}$  [1], but very little in the other Na nuclei further from the line of stability. However, advances in radioactive beams and detectors make it important to re-examine the nuclear structure of these Na nuclei and other nearby nuclei, which may also help in the study of more neutron rich nuclei.

Several new transitions in  $^{27}\text{Na}$  were found using the  $^{14}\text{C}(^{14}\text{C},p)$  reaction at  $E_{\text{lab}} = 22$  MeV. The  $^{14}\text{C}$  target was  $0.28$  mg/cm<sup>2</sup> thick and the beam was stopped in a  $33.8$  mg/cm<sup>2</sup> Au foil.  $\gamma$ - $\gamma$ , particle- $\gamma$ , and particle- $\gamma$ - $\gamma$  coincidences were measured using 2 four-crystal Eurogam type “clover” detectors, 7 Compton suppressed HPGe detectors, and a particle E- $\Delta$ E telescope at  $0^\circ$ . The 67, 1660, 1756, 1823, and 2219 keV transitions, which are in coincidence with the high energy protons, have been identified as transitions in  $^{27}\text{Na}$ , as shown in Fig. 1.

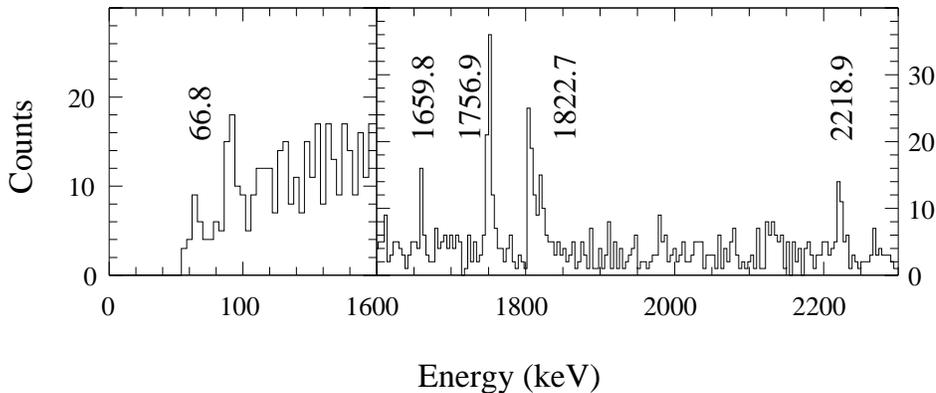


FIG. 1.  $\gamma$  spectrum in coincidence with high energy protons (x-axis in keV).

[1] P.M. Endt and C. Van der Leun, Nucl. Phys. **A521**, 1 (1990).

[2] L.K. Fifield *et al.*, Nucl. Phys. **A437**, 141 (1985).

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