# RECENT ADVANCES IN THE SPECTROSCOPY OF NEUTRON RICH $^{20}O^{*}$

M. Wiedeking, S. L. Tabor, J. Pavan, I. J. Calderin, D. B. Campbell, W. T. Cluff, E. Diffenderfer, J. Fridmann, K. W. Kemper, B. T. Roeder, C. Teal, and I. Wiedenhöver
*Florida State University, Tallahassee, FL 32306, USA*

The difficulty in understanding the limited stability of the neutron-rich, semi-magic oxygen isotopes compared to those of fluorine suggests the need for further study of these nuclei. Surprisingly, the structure of even $^{20}O$ is not well known, so we have begun an investigation using long-lived radioactive beams and targets.

Excited states in $^{20}O$ were populated through the $^{10}Be(^{14}C,\nabla)$ reaction at $E_{Lab}$ = 21.4 MeV. Prompt γ radiation was detected with the Compton suppressed HPGe detector array at Florida State University made up of 3 four-crystal Clover detectors and 6 single crystal detectors. The evaporated charged particles were detected in an E-ΔE silicon particle telescope near 0° consisting of 4 annularly segmented silicon surface barrier detectors.

The current work extends the level scheme significantly to a total of 24 γ rays and 19 states in contrast to previous works [1,2] with only 7 known γ rays and also fewer states. Figure 1 shows the preliminary level scheme of $^{20}O$. Angular distribution measurements were also performed. In most cases the spin assignment of previously known states was confirmed. However, the spin of the state at 5611 keV which was frequently disputed over the last 25 years has been measured to agree with a $2^{+}$ rather than a $3^{-}$ assignment.

The limited agreement between the experimental data and theoretical s-d shell model calculations emphasizes the importance of expanding the experimental investigation. Therefore, mean lifetimes are currently being measured using the Doppler-shift attenuation method, since none are known above the 1674 keV state.

*This work is supported in part by the U.S. National Science Foundation.

[1] D. R. Tilley *et al.*, Nucl. Phys. A **636**, 249 (1998).

[2] M. Stanoiu *et al.*, Phys. Rev. C **69**, 034312 (2004).

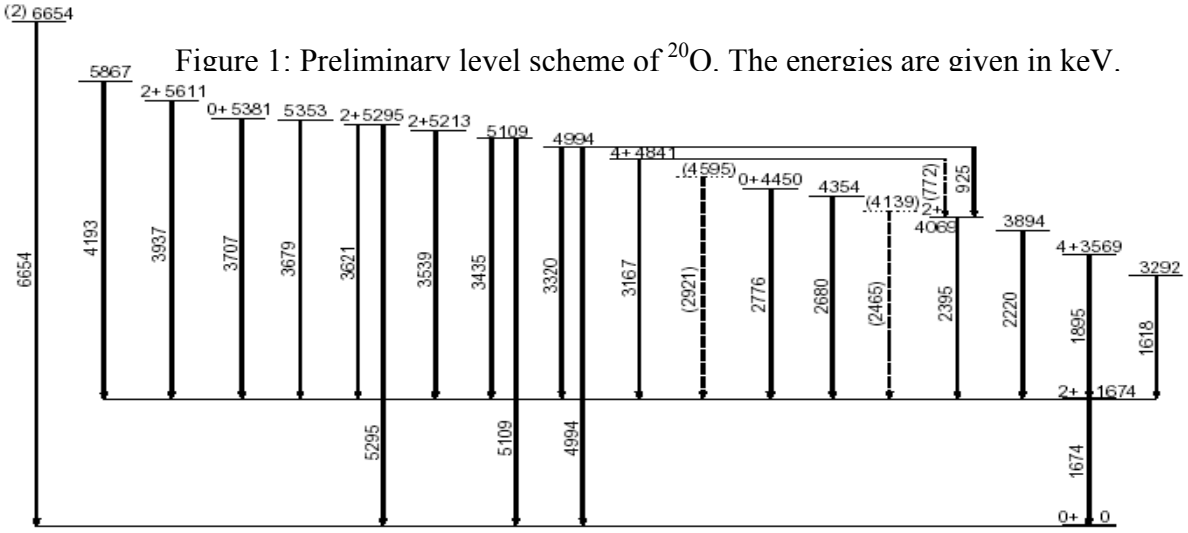


Figure 1: Preliminary level scheme of $^{20}O$. The energies are given in keV.