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Nuclear Physics A 591 (1995) 117-144

NUCLEAR PHYSICS A

# Probing the limits of complete spectroscopy in $^{164}$Yb

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Received 31 August 1994; revised 9 March 1995

**Abstract**

High spin states of $^{164}$Yb have been populated using the $^{152}$Sm($^{16}$O,4n) reaction. Analysis has been made using $\gamma\gamma$ coincidences and, for the first time in a large detector array, angular correlations. The experimental level scheme has been extended to include a total of 15 decay cascades, for some of which the spins have been measured. Extensive cranked shell model calculations have been performed to map the quasiparticle rotational bands in a window, reaching up to 1 MeV above the yrast line, in the spin–energy plane. The experimental data are compared with the calculated bands, and most of the experimental bands are interpreted in terms of quasiparticle excitations. It is also found that the number of experimentally detected bands is in good agreement with the calculated number of bands in the observed spin–energy region.

*Keywords:* NUCLEAR REACTIONS $^{152}$Sm($^{16}$O,4n), $E$ = 83.2 MeV;measured $E_\gamma$, $I_\gamma$, $\gamma\gamma$-coin, $\gamma\gamma(\theta)$. $^{164}$Yb deduced levels, $J$, configurations, routhians, alignments, cranked shell model calculations. Array of Compton-suppressed Ge-detectors.

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*SSDI* 0375-9474(95)00124-7