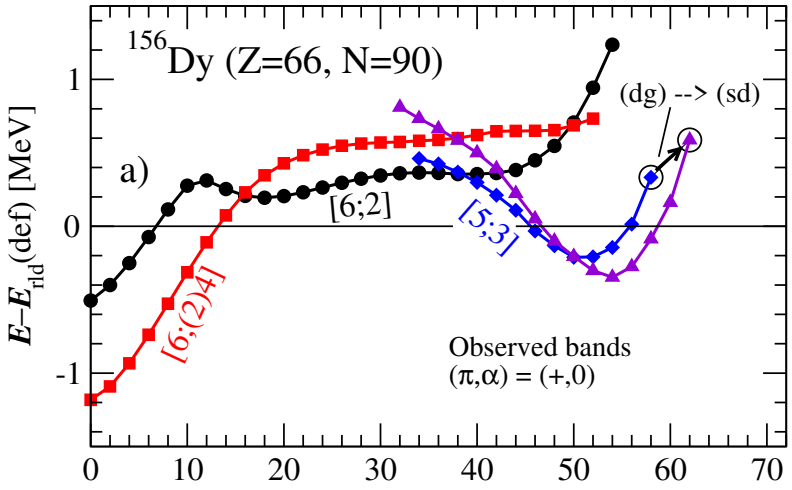
The high-spin level scheme of ^{156}Dy.

Ingemar Ragnarsson
Division of Mathematical Physics, LTH, Lund University, P.O. Box 118,
SE-221 00 Lund, Sweden

The level scheme of ^{156}Dy is observed [1] in the $I = 60$ region, corresponding to the highest spin observed at normal deformation in any nucleus. The experimental bands are well understood in terms of their occupation of the j-shells [2]. Thus, comparing with Cranked Nilsson Strutinsky (CNS) calculations [2,3], configurations can be assigned to the different bands. In this assignment, it is important to be able to put labels on the orbitals, which are valid at all relevant deformations. For example, in the $N = 4$ shell, not only the high-j $g_{9/2}$ orbitals can be labelled but in many cases, it is also possible to make a distinction between orbitals having their dominating amplitudes within either the $d_{5/2}g_{7/2}$ (dg) shells or the $s_{1/2}d_{3/2}$ (sd) shells.



Four positive-parity even-spin bands have been observed over an extended spin range. These bands come close and interact around $I = 40$. We have fitted these observed bands by two pairs of smooth bands which interact with a constant strength. The resulting smooth bands, which appear to preserve their configurations in the full spin range, are shown in the figure. Configurations are assigned to the bands in terms of the number of high-j particles; $h_{11/2}$ protons and $i_{13/2}$ neutrons with $h_{11/2}$ neutron holes in parentheses. They are specified relative to a ^{146}Gd ($Z = 64, N = 82$) core. Thus, for example, the [6;2] configuration can be written in full as $\pi(dg)^{-4}(h_{11/2})^6\nu(fh)^6(i_{13/2})^2$, where fh refers to the $f_{7/2}h_{9/2}$ shells. The two bands which are lowest in energy for $I \approx 50$ show the typical features of smooth band termination [4]. These bands are observed to their terminating states (encircled), which is $I_{max} = 58$ for the [5;3] configuration, with four additional spin units from the $(dg) \rightarrow (sd)$ excitation. The highest spin state, $I = 62$, is formed from 14 particles + 4 holes 'rotating in the same direction' around the oblate quantization axis. The two bands at low spin are understood as two coexisting configurations where the $\nu(h_{11/2})^{-2}(i_{13/2})^2$ excitation should lead to an increased deformation for [6;(2)4] relative to [6;2], which is, however, not presently confirmed from measured transitional quadrupole moments, Q_t. I will discuss the properties of these bands and also make comparisons with similar bands in neighbouring nuclei.

[1] F.G. Kondev *et al.*, Phys. Lett. B 437, 35 (1998).
[2] I. Ragnarsson, A. Kardan, B.G. Carlsson, E.S. Paul, C.M. Petrache, M.A. Riley, J.F. Sharpey-Schafer and J. Simpson, to be publ.
[3] B.G. Carlsson and I. Ragnarsson, Phys. Rev. C 74, 011302(R) (2006).
[4] A.V. Afanasjev, D.B. Fossan, G.J. Lane and I. Ragnarsson, Phys. Rep. 322 (1999) 1-124.