COMMENTS

Comments are short papers which criticize or correct papers of other authors previously published in the **Physical Review.** *Each Comment should state clearly to which paper it refers and must be accompanied by a brief abstract. The same publication schedule as for regular articles is followed, and page proofs are sent to authors.*

Comment on ''Prolate-oblate band mixing and new bands in ^{182}Hg''

J. Wauters, N. Bijnens, and M. Huyse
LISOL, KU Leuven, Celestijnenlaan 200 D, B-3001 Leuven, Belgium

P. Van Duppen
CERN, CH-1211 Genève 23, Switzerland

(Received 6 April 1995)

We comment on a recent paper by Bindra *et al.* [Phys. Rev. C **51**, 401 (1995)]. [S0556-2813(96)04405-6]

PACS number(s): 27.70.+q, 29.30.Kv, 23.20.Lv

Bindra *et al.* [1] have recently reported on in-beam γ-ray spectroscopic studies of ^{182}Hg and on the observation of different band structures in this nucleus. In particular, they discuss the position of the well-known prolate band relative to the oblate ground-state band. They identified the 2^+ member of the prolate band and developed on this basis a discussion of the minimum in the prolate-oblate energy difference as a function of neutron number. They point out that when the 0^+ and 2^+ members of the oblate and prolate band interact, the prolate band member energies will alter significantly from the values calculated by using the rotational formula and high-spin members of the band. They state that ''Any conclusion about the prolate-oblate energy difference based on the high-spin members may be questioned.'' Indeed, extrapolation of the prolate band using the rotational formula and the high-spin members results in the unperturbed excitation energy of the prolate 0^+ bandhead *relative* to the experimental 0^+ ground state and not to the unperturbed oblate 0^+ bandhead. The unperturbed excitation energy equals the energy difference between the unperturbed oblate and prolate bandhead ($\Delta E_{P\text{-}O}$) plus the energy shift (Δ_0) due to mixing $E_{\text{unpert}}(0_2^+)=\Delta E_{P\text{-}O}+\Delta_0$. A crucial test is then to compare the unperturbed energy with the experimental position on the 0_2^+. Here the authors are not taking into account our measurement of the 0_2^+ bandhead position through the observation of fine structure in the α decay of ^{186}Pb [2].

In Fig. 1 all the information is brought together on the oblate ground-state band (up to spin 4) and the prolate band (up to spin 8) for $^{180-190}$Hg. Also given is the position of the 0^+, 2^+ and 4^+ prolate band members extrapolated from the high-spin members (6^+–12^+) with the rotational formula $[E_0+AI(I+1)+BI^2(I+1)^2]$. A nice agreement with the experimental values is obtained for the 0^+ and 4^+ states. Only the 2_2^+ states in ^{182}Hg and ^{184}Hg are significantly deviating. This means that the 0^+ bandhead of the prolate band is essentially not mixing with the oblate ground state when reaching its minimum at $N=102$. From α-decay studies of ^{186,188}Pb it has been shown that the high hindrance of the α decay towards the excited 0^+ state can be understood only if one assumes very weak mixing between the 0^+ excited and ground state in ^{182,184}Hg [2,3]. The extrapolations in Fig. 1 are in fairly good agreement with similar calculations by Dracoulis [4]. With an interaction matrix element of 90 keV, it is possible to extract now both the unperturbed oblate and prolate 2^+ states [5]. Such a calculation reproduces the constancy of the unperturbed excitation energy of the oblate 2^+ state as a function of neutron number, as observed in the heavier even Hg isotopes. Furthermore, the unperturbed 2^+ prolate band member follows now the same parabolic behav-

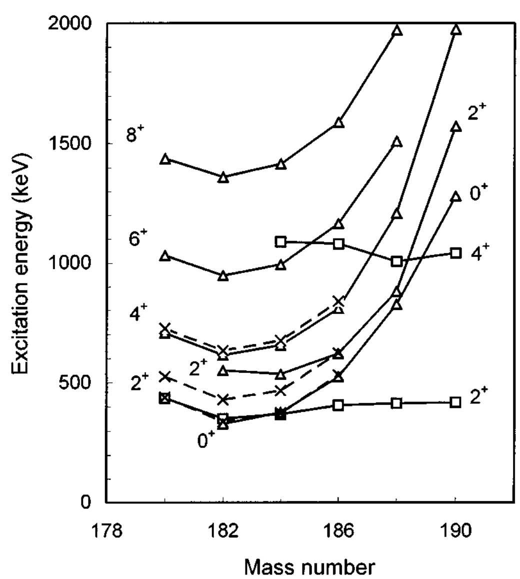

FIG. 1. Low-level energy systematics of the even-even $^{180-190}$Hg isotopes showing the experimental prolate band (△), 2^+ and 4^+ oblate band members (□), together with the calculated unperturbed prolate 0^+, 2^+, and 4^+ band members from extrapolation of the high-spin members (×). References to the experimental data can be found in [1–3].

ior as a function of neutron number as the other band members. With decreasing neutron number, the prolate band decreases and when the 2^+ band members of both bands come closer, they start to interact: Their mixing varies from a few percent in ^{188}Hg to 35% for ^{182,184}Hg. Extrapolation of the high-spin members of the prolate band in ^{180}Hg to low spins gives an unperturbed excitation energy for the 2^+ prolate band of 525 keV and 438 keV for the 0^+ bandhead. As can be seen from Fig. 1, the first excited 2^+ state in ^{180}Hg has been restored to its near-constant value from the heavier isotopes ($A>186$), indicating essentially no mixing between the 2^+ members in ^{180}Hg.

In conclusion, given the experimental excitation energies for $^{182-190}$Hg, one can indeed draw reliable conclusions concerning this prolate-oblate energy difference and its degree of mixing. Taking into account this mixing, the energy position of all band members indicate that the prolate-oblate energy difference is minimal for $N=102$, in agreement with the earlier results of Dracoulis [4]. Finally, we wonder whether the experimental data of Bindra *et al.* [1] contain an indication for the 2_2^+-0_2^+ γ transition at 220(12) keV.

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