In-Beam Spectroscopy of ^{231}Pa ◇

M. Würkner, J. de Boer, M. Loewe, H. Steffens, E. Maier, J. Srebrny [a], P. J. Napiorkowski [b], J. Iwanicki [b], A. Kordyasz [a], M. Kisieliński [b], M. Kowalczyk [b], J. Choinski [b], T. Czosnyka [b], A. I. Levon [c], J. Kvasil [d], C. Günther [e], and G. Sletten [f]

[a] Nuclear Physics Dept., Institute of Experimental Physics, University of Warsaw, Poland
[b] Heavy-Ion Laboratory, University of Warsaw, Poland
[c] Institute for Nuclear Research, Kiev, Ukraine [d] Charles University, Prague, Czech Republic
[e] Institute for Radiation and Nuclear Physics, University of Bonn
[f] Niels Bohr Institute Tandem-Accelerator-Laboratory, Roskilde, Denmark

A 105 μg/cm^2 ^{231}Pa oxide target on a 15 μg/cm^2 carbon backing was Coulomb-excited by 148 MeV and 260 MeV ^{58}Ni projectiles. The 20 Compton-suppressed germanium detectors of NORDBALL were read out in coincidence with 55 PIN-diodes for the backscattered projectiles [1]. Evaluating p-γ-γ coincidences the g.s. band of ^{231}Pa could be followed at least up to 35/2- (see Fig. 1) and side-band-transitions are observed feeding the g.s. band.

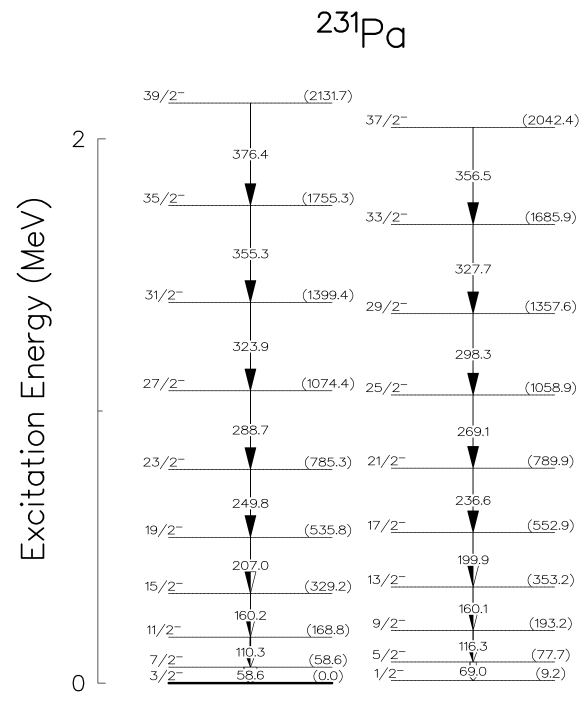

Fig. 1: Proposed levels of the ground state band in ^{231}Pa

A detailed investigation of the data is in progress using the Radware computer code [2] to determine the structure of the side-bands and the K mixing responsible for their excitation.
A fit to the rotational model [3] using equations (1) to (3)

$$E_{rot} = A\{I(I+1) + (-)^{I+1/2}(I+1/2)a(I)\} \qquad (1)$$

with a spin-dependent decoupling parameter due to Coriolis interaction given by

$$a(I) = a[1 - \epsilon^2(I-1/2)(I+3/2)] \qquad (2)$$

and a spin-dependent moment of inertia

$$J = J_0(1 - k \cdot I^2) \qquad (3)$$

gives a parameter set:

$$A = 6.28(1)\,\mathrm{keV}, a = -1.39(1), \epsilon^2 = 0.0021(2), k = 0.0004(1)$$

Further experiments using of the new particle detector system [1] at the Munich Tandem-Accelerator and at the Warsaw cyclotron are envisaged. A new hotlab at the University of Munich may produce new and better ^{231}Pa targets.

References

[1] M. Würkner *et al.*, Jahresbericht 1995, p. 115
[2] D. C. Radford, Proceedings of the International Seminar on the Frontier of Nuclear Spectroscopy, ed. Y. Yoshizawa, H. Kusakari and T. Otsuka, World Scientific (1993) 229
[3] A.I. Levon *et al.*, Nuc. Phys. **A598** (1996) 11-46

◇ This work was jointly funded by the following agencies: the Munich and the Niels Bohr Institute Tandem-Accelerator-Laboratories; the Polish State Committee for Scientific Research; DFG, grant Bo 1109/1; Volkswagen-Stiftung, grant I/70 407