In-Beam Spectroscopy of ^{231}Pa ◇

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The investigation of ^{231}Pa located near the boundary of octupole correlations was continued. Particle-$\gamma\gamma$-coincidences following Coulomb-excitation by ^{32}S(148MeV) and ^{58}Ni(255,260,261MeV) projectiles backscattering from a 105 μg/cm^2 ^{231}Pa oxide target on a 15 μg/cm^2 carbon backing into either a PSD-silicon detector [1] or a multi-PIN-diode detector array [2] and the readout of 20 Compton-suppressed germanium detectors of NORDBALL were evaluated [3]. With the help of a computer code [4] the level scheme was constructed. The 3/2− 1/2[530] ground state rotational band can be followed up to 39/2− (see fig. 1). A striking observation is the regular band-structure observed in the 5/2+ 3/2[651] band for levels above 9/2+, fed by strong transitions from the ground-state band, determined to be E1 by angular distributions. The structure of the lower part known from conversion-electron measurements [5] is strongly influenced by Coriolis coupling [6] changing the order of the squeezed levels, although the $E(I+1) - E(I-1)$ differences are roughly proportional to the spin for the two signatures leading to the regular structure in the upper part of the band. This can be reproduced in quasiparticle-phonon model calculations [5,7].

Another interesting feature known [8] in this band is the long lifetime of about 45ns for the lowest state 5/2+. The rapid change in E1 matrix elements seems to be a cancellation effect which is very sensitive to the wave function's admixtures included in the calculations.

The Coulomb-excitation data can also be used to obtain a complete set of electromagnetic matrix elements. The computer code GASPAN [9] gives energy and efficiency calibrated fits passed on to the computer code GOSIA [10] for a simultanious fit of the matrix elements for all transitions to all experimentally measured intensities. Exploiting relations given by the tensor algebra these fits can be checked for consistency to avoid falling into false minima. Problems with the fit are the large set of matrix elements and transitions. Although simple starting approximations from a known or estimated set of parameters can be done, the influence of numerous weaker side-band transitions can give rise to drastic changes in the scenario. The work on these fits will be continued.

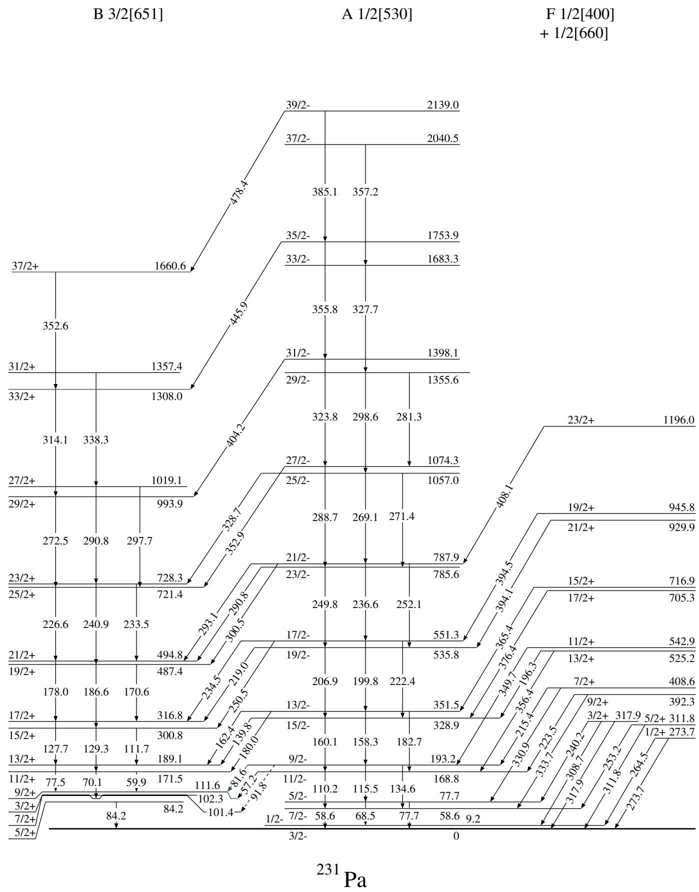

Fig. 1: Dominant transitions and proposed levels of ^{231}Pa

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