# SHELL MODEL DESCRIPTION OF THE N=82 NUCLEUS $^{141}$Pr

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In a recent in-beam investigation we have studied excited states of $^{141}$Pr using the reactions $^{139}$La($\alpha$,2n)$^{141}$Pr and $^{140}$Ce(d,n)$^{141}$Pr /1/. Our experimental results are compared with shell model predictions. In the shell model calculations we adopted the approach of Wildenthal /2/. Two different configuration spaces were used to calculate the energy levels. In both cases an inert core with Z=50 protons and N=82 neutrons was assumed. The nine remaining protons are distributed over the $1g_{7/2}$, $2d_{5/2}$, $2d_{3/2}$ and $3s_{1/2}$ orbits. All configurations of the types $(1g_{7/2},2d_{5/2})^9$ or $(1g_{7/2},2d_{5/2})^8$, $(2d_{3/2},3s_{1/2})^1$ are taken into account in the larger configuration space, whereas the smaller space consists of the $(1g_{7/2},2d_{5/2})^9$ configurations.

The calculated and experimental energy spectra for positive-parity states agree very well. The percentage contributions of the configurations to the wave functions of selected positive-parity states in the case of the larger configuration space are given in the table. The reliability of these predictions is strongly supported by a good agreement of our calculated spectroscopic factors and electromagnetic quantities (transition probabilities, branching and mixing ratios, g-factors and quadrupole moments) with the experiment. Shell model calculations of odd-parity states in $^{141}$Pr are in progress.

## Literature

1. H. Prade, H.U. Jaeger, L. Kaeubler, H.J. Keller and F. Stary ZfK-404 (1979) 76 (Abstr. Int. Conf. on Extreme States in Nucl. Systems, Dresden 1980).
2. B.H. Wildenthal, Phys. Rev. Letters 22 (1969) 1118.

| configuration [a] | | | | contribution (%) to the state $J_i^\pi$ | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $1g_{7/2}$ | $2d_{5/2}$ | $2d_{3/2}$ | $3s_{1/2}$ | $5/2_1^+$ | $7/2_1^+$ | $3/2_1^+$ | $1/2_1^+$ | $9/2_1^+$ | $11/2_1^+$ | $9/2_2^+$ | $13/2_1^+$ | $15/2_1^+$ | $13/2_2^+$ | $17/2_1^+$ | $15/2_2^+$ | $19/2_1^+$ |
| 5 | 3 | 1 | | .3 | .6 | 6.0 | 2.4 | 1.8 | 1.7 | 4.7 | 3.7 | 2.0 | 3.7 | 3.3 | 3.3 | 2.8 |
| 4 | 4 | 1 | | .6 | .9 | 1.3 | 1.1 | 2.2 | 2.0 | 1.8 | .6 | .7 | 1.3 | .5 | 2.0 | 1.8 |
| 5 | 3 | | 1 | .1 | .6 | .3 | .2 | 4.0 | 3.8 | 1.0 | 1.5 | 2.5 | 2.1 | .3 | .5 | 2.0 |
| 4 | 4 | | 1 | .6 | .2 | 1.9 | 20.6 | .1 | .3 | 1.7 | .8 | .2 | 1.2 | 1.3 | 1.0 | 1.1 |
| 6 | 2 | 1 | | .8 | 1.4 | 1.9 | 1.0 | 3.4 | 3.8 | 3.5 | 1.6 | 1.7 | 1.1 | .8 | 2.7 | 5.4 |
| 3 | 5 | 1 | | – | .1 | .9 | .5 | .3 | .2 | .8 | .3 | .2 | .4 | .4 | .2 | .2 |
| 5 | 4 | | | .1 | 43.8 | 4.8 | 3.6 | 30.4 | 37.0 | 6.3 | 26.0 | 33.8 | 2.4 | .8 | 15.8 | 17.4 |
| 6 | 2 | | 1 | .8 | .4 | 7.7 | 41.8 | .3 | .5 | 1.9 | .9 | .4 | 1.2 | 1.3 | 1.4 | 1.0 |
| 3 | 5 | | 1 | – | .1 | – | – | .2 | .7 | .2 | .3 | .2 | .3 | – | .1 | .2 |
| 6 | 3 | | | 57.9 | .2 | 64.7 | 10.2 | 8.2 | 1.8 | 67.1 | 9.4 | .9 | 68.2 | 73.2 | 61.7 | 68.1 |
| 4 | 5 | | | 16.0 | .1 | 4.5 | 2.3 | 2.5 | .3 | 6.0 | 2.2 | .3 | 14.5 | 18.1 | 9.0 | – |
| 7 | 1 | 1 | | .1 | .2 | 2.0 | .8 | 1.0 | .5 | 1.0 | 1.8 | .1 | 1.1 | – | .6 | – |
| 7 | 2 | | | .1 | 45.9 | 2.8 | 3.8 | 42.4 | 45.3 | 3.9 | 50.8 | 57.0 | 2.4 | – | .1 | – |
| 2 | 6 | 1 | | – | – | .1 | – | .1 | .1 | .1 | – | – | – | – | – | – |
| 3 | 6 | | | – | 5.1 | – | – | .1 | .9 | – | – | .2 | – | – | 1.7 | – |
| 7 | 1 | | 1 | – | .2 | .1 | – | 2.9 | 1.2 | .1 | .1 | – | – | – | – | – |
| 2 | 6 | | 1 | – | – | – | 1.5 | – | – | – | .1 | – | .1 | – | – | – |
| 8 | 1 | | | 22.6 | – | – | – | – | – | – | – | – | – | – | – | – |
| 8 | | 1 | | – | – | .9 | – | – | – | – | – | – | – | – | – | – |
| 8 | | | 1 | – | – | – | 10.4 | – | – | – | – | – | – | – | – | – |

[a]) Number of protons on the shell-model orbit Nlj.