

## Shell model approach to proton-neutron alignment in N~Z Ge-As nuclei

T. Mizusaki\*, M. Hasegawa and K. Kaneko

\*Institute of Natural Sciences, Senshu University / Center for Nuclear Study, University of Tokyo

Detailed experiments, including high spin non-yrast states, were, recently, performed for N~Z medium-heavy nuclei, for instance,  $^{66}\text{Ge}$  [1],  $^{68}\text{Ge}$  [2] and  $^{69}\text{As}$ [3]. On the other hand, recently the spherical shell model has become capable of calculating A=60-70 nuclei in the  $pf_{5/2}g_{9/2}$  shell. As residual interaction, isospin invariant extended P+QQ interaction, which has been proposed by Hasegawa and Kaneko, has also become successful in pf shell and  $pf_{5/2}g_{9/2}$  shell. Indeed, our shell model calculations reproduce observed energy levels up to high spins in these nuclei and successfully explain shape changes from  $^{64}\text{Ge}$  to  $^{68}\text{Se}$  along the even-even N = Z line.

In this abstract, we would like to report that various type of particle alignments like two-neutron alignment, one-proton-one-neutron alignment, two-proton-and-two-neutron alignment and so on, become significant, especially for  $^{66}\text{Ge}$ ,  $^{68}\text{Ge}$  and  $^{69}\text{As}$  [4]. The figure shows the experimental and theoretical level schemes of  $^{69}\text{As}$ , for instance. By evaluating occupation number, partial isospin and partial angular momentum of the  $g_{9/2}$  orbit, the alignment mechanism is clearly shown in our shell model framework.

[1] E.A. Stefanova et al., Phys. Rev. C 67, 054319 (2003).

[2] D. Ward et al., Phys. Rev. C 63, 014301 (2001).

[3] I. Stefanescu, et al. Phys. Rev. C 70, 044304 (2004).

[4] M. Hasegawa, K. Kakeko, T. Mizusaki, Phys. Rev. C70 (2004) 031301. Phys. Rev. C72 (2005) 064320, Phys. Rev. C71 (2005) 044301

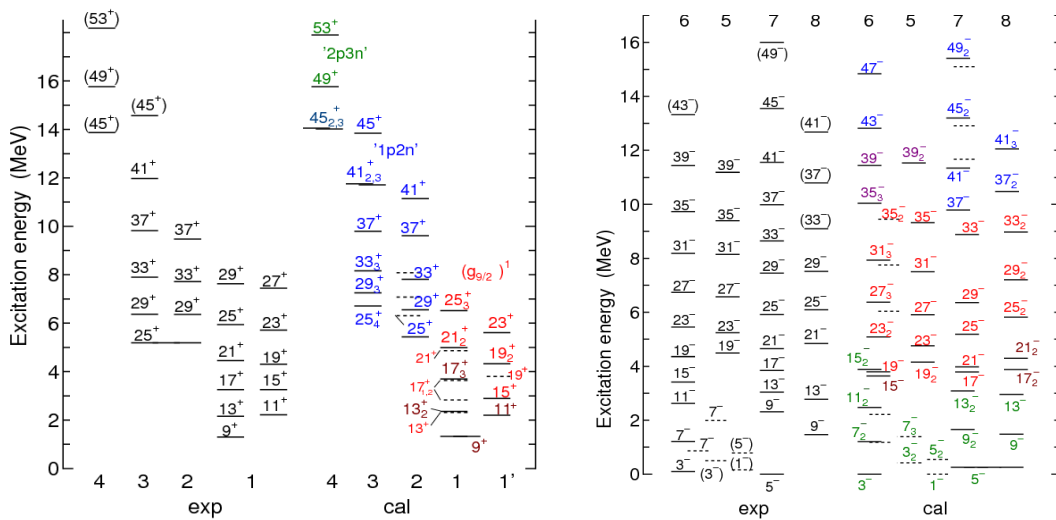


Figure: FIG. 1: Experimental and theoretical energy levels with positive (left) and negative (right) parities for  $^{69}\text{As}$ . Details are shown in Ref.[4].