Faddeev calculations for $^7\Lambda$He and $^9\Lambda$Be: bound states and low-lying resonances

IGOR FILIKHIN, VLADIMIR SUSLOV, BRANISLAV VLAHOVIC,
North Carolina Central University, Durham NC, 27707 — $^7\Lambda$He and $^9\Lambda$Be hypernuclei are considered in the three-body cluster models $^5\Lambda$He+n+n [1] and $\alpha + \alpha + \Lambda$ [2], respectively. Configuration space Faddeev calculations are performed for the hyperon binding energy. For $^7\Lambda$He we obtained the binding energy 5.35 MeV which is in agreement with previous theoretical predictions and preliminary experimental value (5.4 MeV) [3]. We have found that the binding energy of $^9\Lambda$Be depends strongly on the $\alpha\Lambda$ potential used. A variant of the method of analytical continuation in coupling constant [4] is applied to calculate the energies of low-lying levels of the $^7\Lambda$He and $^9\Lambda$Be. The second bound state of $^7\Lambda$He with total angular momentum $J=3/2^+$ (5/2$^+$) is found. The bound states of $^7\Lambda$He can be classified as an analog of the $^6$He ground band. For $^9\Lambda$Be concluded that the ground band of this nucleus cannot be explained by similar classification related to the core nucleus $^8$Be. We have obtained a new $2^+_2$ resonance state that is close to the $\alpha + \alpha + \Lambda$ threshold. Overall, calculated resonance energies differ from previous theoretical predictions. This work is supported by the DoD W911NF-05-1-0502 and NASA NAG3-804 grants. 1. I. Filikhin, et al. J. Phys. G31 389 2005 2. I. Filikhin, et al. J. Phys. G30 513 2004 3. O. Hashimoto, HYP2006 Mainz, October 11-14, 2006 4. V. I. Kukulin, et al. Theory of Resonances (Kluwer Academic, Dordrecht, 1989)