ON THE SPECTRUM OF THREE-BODY STATES IN THE ONE-DIMENSIONAL HARMONIC TRAP

Kartavtsev O.I.[1], <u>Malykh A.V.[1]</u>, Zhang P.[2]

[1] Joint Institute for Nuclear Research, Dubna, 141980, Russia; [2] Institute of Modern Physics, Lanzhou 730000, China

E-mail: maw@theor.jinr.ru

The system of three identical particles with contact two-body interactions in the one-dimensional harmonic trap is considered. One of possible applications is an optional study of non-stationary problems, in particular, to elucidate the quasi-integrability of the experiments in the quantum Newton's cradle set-up [1].

Up to 30 energy levels of even-parity totally symmetric states are calculated as a function of the interaction strength λ. The calculations show that energy levels form a number of bunches, in which they becomes degenerate for two limiting values $\lambda=0$ and $\lambda \rightarrow \infty$, where the system is integrable. The wave-function structure is demonstrated by plotting the nodal lines for different levels and interaction strength. The critical values λc are found, for which topological properties of nodal lines change thus indicating the different wave-function structure if λ crosses these values.

The highly excited states are calculated via quasi-classical approach. The properties of the full spectrum is analysed.

1. T.Kinoshita, Tr.Wenger, D.S.Weiss, A quantum Newton's cradle // Nature. 2006. V.440. P.900.