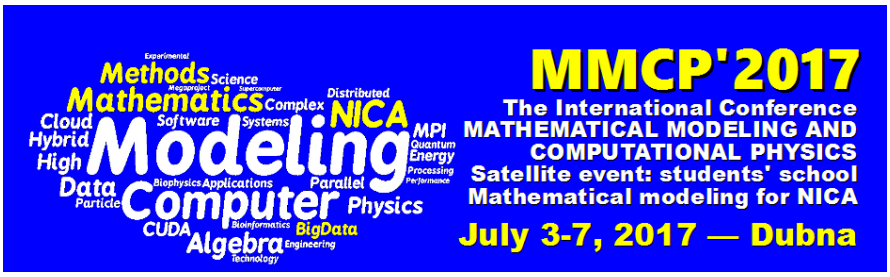

Contribution ID: **43** Type: **not specified**

ON A METHOD OF INVESTIGATION NONLINEAR SELF-CONSISTENT EIGENVALUE PROBLEM WITH THE GROWING POTENTIALS

Monday, 3 July 2017 17:00 (30 minutes)

Success in solving multiparticle problems is in many cases connected with the choice of an adequate model. As a simple example, we can cite the concept of a polaron as a problem of an autolocalized electron in an ionic crystal. At present, there are a large number of physical examples [1-3], the theory of polarons, bipolarons, a strong-coupling binucleon model, a generalized polaron model, etc. The effect of autolocalization in liquids leads to the formation of solvated electrons in them, which play an important role in many chemical processes [4, 5]. Similar problems arise in the nonrelativistic potential model at the description of the spectrum of heavy quarkonia [6]. To study such problems, one can involve methods of self-consistent description of multiparticle systems.

A method is proposed for investigating the properties of solutions of a nonlinear self-consistent boundary value problem with increasing potentials of even and odd powers. A comparative analysis of the solutions of the linear boundary value problem for a quadratic growing potential with a nonlinear self-consistent boundary value problem for this potential is carried out. Formulas are obtained which allow us to calculate the shift of the eigenvalues. If the distances between the levels of a linear problem are equidistant, then in a self-consistent problem this property is also satisfied. In addition, when investigating problems with potentials above the quadratic one, new growing potentials appear to a lesser degree in the self-consistent problem than the original potential.

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The work was carried out at the financial support of the RFBR grant, No. 17-01-00661a.

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Session Classification: Poster Session