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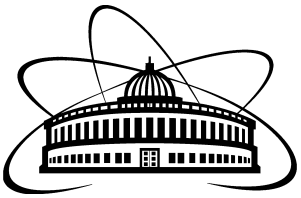

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BOOK OF ABSTRACTS

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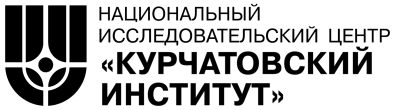

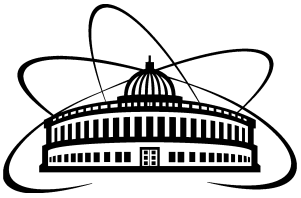

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NUCLEAR RADII SYSTEMATICS BASED ON AN ARTIFICIAL NEURAL NETWORK WITH FUZZY LOGIC

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This paper develops the first experience of using a fuzzy hybrid network model for the systematics of nuclear radii [1]. The root-mean-square charge radii of atomic nuclei measured by different methods are collected in the NuRa database [2]. A good result for the radii of all nuclei is given by the parametrization (the smooth curve in Fig.1).)
$R = (r_0 + r_1 A^{1/3}) \cdot A^{1/3}$, if $r_0 = 1.07$ fm, $r_1 = -0.0236$ fm.
In the hybrid model, all nuclei were divided into four groups: light (Z≤17), medium (18≤Z≤31), medium-heavy (32≤Z≤51), and heavy nuclei (Z≥52). Parameters of the hybrid network were separately defined in each group of nuclei. After combining, they created a single model for describing the radii of all nuclei, which was the basis for systematics.
Figure 1 shows how the hybrid model (polyline) describes the experimental data (black circles) in the group of light nuclei. The model reproduces jumps and characteristic fractures in the mass dependence of radii in isotopic chains. When the domain of definition is expanded by A and Z, the model errors increase dramatically [1]. Further development of the model is associated with the attraction of additional information about the nuclear binding energy and deformation.

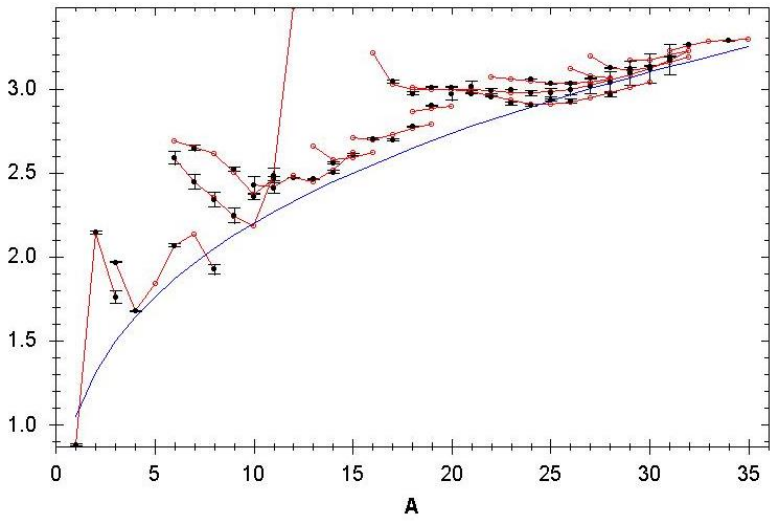

Figure 1: The root-mean-square charge radii of light nuclei with Z≤17.

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2. I.A. Mitropolsky, L.P. Kabina, S.S. Lisin. The certificate 2018621327 of state registration of the database, Rospatent, 2018.