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Prospects for the development of a liquid organic scintillation detector based on neodymium perovskite quantum dots designed to detect particles

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The study considers the possibility of creating and using a new type of scintillation detectors - a liquid scintillator doped with neodymium-containing perovskite quantum dots, in order to increase the efficiency of recording rare nuclear reactions. Rare-earth Nd3+ ions were doped into perovskite CsPbBr3 quantum dots by solution processing at room temperature. The luminescence spectra of the obtained quantum dot samples were measured. The data obtained made it possible to estimate the efficiency of energy transfer from the base material to the doping neodymium ions and to determine the potential for using the synthesized structures as an effective scintillation material. The results obtained are of great practical importance for the development of new technologies in the field of low-energy radiation detection, applicable in fundamental research in nuclear physics and cosmology. The creation of efficient scintillation detectors based on quantum dots opens up prospects for solving a number of scientific problems related to the study of neutrino properties and the search for manifestations of lepton number symmetry violations. Special attention is paid to the discussion of methods for synthesizing quantum dots, the features of the luminescent characteristics of the obtained material, and calculations of the expected detection efficiency. The prospects for further improvement of the proposed concept are considered to expand the possibilities of experimental search for the most important effects that determine the properties of particles and the nature of our Universe.
The study is performed within the ARIADNA Collaboration.

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