Contribution ID: **32** Type: **Poster**

Experimental Manifestation of the Neutron - Electron Interaction in Solids via Measurement it Dependence on the Distance between Nucleons

Experimental Manifestation of the Neutron - Electron Interaction in Solids via Measurement it Dependence on the Distance between Nucleons

V.G. Plekhanov

Fonoriton Sci. Lab., Garon Ltd, Estonia
Abstract. Yet, the energy scale associated with new physics (NP) is unknown and therefore the experimental program for physics beyond Standard Model (SM) should be as broad as possible. Colliders are one of the main tools to study elementary particles and the LHC is pushing forward the energy frontier. A complementary and vital role is played by low energy experiments. In broader context atomic and nuclear physics probes have been used for this goal. In this way the isotope shift spectroscopy may probe spin - independent couplings of light bosons fields to electrons and neutrons. The discovery of the neutron by Chadwick in 1932 may be viewed as the birth of the strong nuclear interaction In 1935 Yukawa have tried to develop a theory of nuclear forces. The most important feature Yukawa'forces is they have a small range (~10-15 m). However, up to present time phenomenological Yukawa potential can not be directly verified experimentally. We should remind that the strong nuclear interaction - the heart of Quantum Chromodynamics (QCD) which is the part of the Standard Model (SM). According to SM the nuclear force is a result of the strong force binding quarks to form protons and neutrons. Residual part of it holds protons and neutrons together to form nuclei. There are common place in nuclear and high energy physics that the strong force does not act on leptons. Our report is devoted to study the strong nuclear interaction via measuring the low - temperature (2 K) photoluminescence spectra of LiH (Eg ~ 4.992 eV) (without strong interaction in hydrogen nucleus) and LiD (Eg ~ 5.095 eV) (with strong interaction in deuterium nucleus) single crystals.
The uniqueness of the LiH and LiD compounds is that they differ in only one neutron, i.e. lithium ions, electron and proton are the same for them and, therefore they have the same gravitational, weak and electromagnetic interactions. The additions of a neutron to hydrogen nucleus, generates according to Yukawa, a strong interaction between a prooton and a neutron, the effect on which on electron is manifested in the isotope shift (0.103 eV) of the zero - phonon photoluminescence line of free excitons in LiD crystals (see fig. 4 in Ref. 1). Using the experimentally observed isotopic shift within the framework of the dipole - dipole magnetic interaction, the strong interaction coupling constant was calculated to be 2.4680.

Reference

V.G. Plekhanov, Atomic Energy 131, 121 (2022)

Author: PLEKHANOV, Vladimir G

Presenter: PLEKHANOV, Vladimir G