## The 6th international conference on particle physics and astrophysics



Contribution ID : 218

Type : Oral talk

## Sensitivity of DarkSide-50 experiment to double K-capture on Ar-36.

Friday, 2 December 2022 11:15 (15)

The search for neutrinoenter code hereless double  $\beta$ -decay, in particular double K-capture, is of great importance. Confirmation of its existence would mean that the neutrino is Majorana particle. The investigation of this process provides one of the best opportunities to study physics beyond the Standard Model. The double electron capture process  $2\text{EC}2\nu$  was experimentally discovered only once in the XENON1T experiment, and the search for  $2\text{EC}0\nu$  has so far been unsuccessful. These processes are very difficult to register. There are 34 candidate isotopes in which the  $2\text{EC}2\nu$  process is possible; 12 nuclei can experience only two-neutrino 2e-capture. Previously, the search for these processes was carried out on <sup>78</sup>Kr and <sup>124</sup>Xe, since the lower theoretical predictions of their half-lives lie in the experimentally achievable region is ~ 10<sup>22</sup> years, and they are relatively accessible isotopes of inert gases. The purpose of this work is to evaluate the sensitivity of the DarkSide-50 experiment to two-neutrino double electron capture on the <sup>36</sup>Ar isotope. To achieve the goal of the study, the following tasks were performed:

- development of a software module for constructing the energy spectrum of double electron capture (2EC2 $\nu$ ) on  $^{36}$ Ar;
- vapplication of the detector response function due to this effect for the DarkSide-50 detector;
- statistical analysis of data using a model spectrum;
- obtaining a lower limit for the half-life of <sup>36</sup>Ar.

The novelty of this work is in the fact that such processes have not previously been studied on the argon isotope  ${}^{36}$ Ar. The analysis performed in this work will remain relevant in the future.

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Track Classification : Neutrino physics