

Abstract Submitted
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**SPECTRUM OF THE RASHBA SPIN-ORBIT COUPLED
HAMILTONIAN WITH SPIN-DEPENDENT CONTACT INTERAC-
TION IN DIMENSION THREE** RYTIS JURSENAS, Vilnius University, Insti-

tute of Theoretical Physics and Astronomy — The presentation provides functional analytic interpretation for the spectrum of the Rashba spin-orbit coupled Hamiltonian considered in the presence of the out-of-plane magnetic field. The impurity scattering is treated by means of a spin-dependent contact interaction. The research was inspired by a recently proposed technique [1, 2, 3] for producing the Rashba-type spin-orbit coupling for a three-dimensional ultracold atom. The analysis of the resolvent formula shows that, for nonzero spin-orbit coupling, the eigenvalues solve the transcendental equation. For small spin-orbit-coupling strength α , the eigenvalues are derived analytically with the accuracy up to $O(\alpha^4)$. It is shown that there are no eigenvalues above the threshold no matter the form of a nonzero coupling parameter of contact interaction. When the lower branch of dispersion relation attains two minima, the eigenvalues are situated only below the threshold or above the minimum of the upper branch of dispersion relation; the upper bound of discrete states is also obtained. [1] B. M. Anderson et al, Phys. Rev. Lett. 111 (2013), 125301. [2] D. L. Campbell et al, Phys. Rev. A 84 (2011), 025602. [3] F. Jendrzejewski et al, Nature Physics 8 (2012), 398.

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