the magnetic field created by such a cylinder and compare it with the field of a cylinder without a defect, which is of interest for problems of determining the location of hidden defects of the discontinuity type.

Dirac – Kaehler particle in an external magnetic field, cylindrical tetrad and Fedorov – Gronskiy method

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16-component system of equations describing the Dirac -Kaehler particle in presence of the external uniform magnetic field has been studied. This equation describes a multi-spin boson field equivalent to the scalar, pseudoscalar, vector, pseudovector, and anti-symmetric tensor. On the searched solutions, we diagonalize operators of the energy, third projection of the total angular momentum, and the third projection of the linear momentum. After separating the variable, we derive the system of sixteen first order differential equations in the polar coordinate. To resolve this system, we apply the method by Fedorov – Gronskiy based on projective operator constructed from generator J^{12} for the field under consideration.

According to this approach, we decompose the complete wave function into three 16-dimensional projective constituents, each expressed trough only one functions of the polar coordinate. In the present system, these five basic function are constructed in terms of the confluent hypergeometric functions, at this a quantization rule follows from the polynomial requirements. The 16-dimensional matrix structure of projective constituents is determined by the arising linear algebraic system of equations. So, we have found five independent solutions for the Dirac–Kaehler particle in the magnetic field, $\Psi_{\epsilon km\sigma}(t,r,\phi,z)$. The number 5 for independent solutions correlates with 5 different tensor entering the complete wave function for Dirac – Kaehler particle.

Effect of Active Brownian Motion on Dust-Acoustic Instability in a DC Glow Discharge

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Active Brownian particles are particles capable of converting environmental energy into their own motion energy. Active particles can move both independently and exhibit a collective character. The mean kinetic energy of active particles can significantly exceed the mean kinetic energy (temperature) of the environment, which indicates a significant nonequilibrium of the process. Examples of active particles are many bacteria, mobile cells, micro- and nanorobots, dust particles in discharge plasma and superfluid helium.

The influence of active Brownian motion induced by laser impact of different intensity on dust-acoustic instability developing in a plasma-dust cloud consisting of Janus particles is experimentally investigated. The experiment is carried out in a DC glow discharge. In the initial condition, dust-acoustic instability developed in the cloud and reached a strongly nonlinear stage. Illumination with a low-power laser is used to record the wave process. With increasing laser intensity, a change in the dynamics of dust particles, deformation of the cloud, and suppression of the dust-acoustic wave are observed. The wave attenuation is accompanied by a decrease in the longitudinal component of the kinetic energy. Thus, in the considered case, “laser cooling” of the plasma-dust structure isrealized. The analysis of the trajectories of dust particles revealed their characteristic features corresponding to different intensities of laser radiation.

Influence of the geometry of the pole piece on the performance characteristics of a stationary magnetic fluid seal

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A numerical simulation of the diffusion of magnetic nanoparticles in a motionless magnetic fluid seal (MFS) has been carried out in this work. Two geometries of magnetic fiekd concentrator are considered: triangular and rectangular.