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THE REPULSIVE CASIMIR FORCE

Abstract

The article is devoted to the history of the development of ideas about the Casimir effect

In 1948, the Dutch physicist Hendrik Casimir (Hendrik Casimir, 1909-2000) made a prediction about the attractive force arising between conductive uncharged plates under the action of quantum fluctuations in a vacuum in which virtual particles and antiparticles are constantly born and disappear.

In the article in the historical-physical context, various manifestations of the repulsive force of Casimir are considered depending on the geometry of the analyzed objects. The analysis was subjected to various models, boundary conditions and configurations for which Casimir's repulsive force is intrinsic.

Energy values are considered for such simple configurations as a rectangle, a cylinder, a Mobius sheet, a cube. Attention is paid to the establishment in the last decade of the geometry of objects with good metallic conductivity and a vacuum gap between them, contributing to the emergence of the repulsive force of Casimir.

The role of Casimir additives in the development of modern cosmological concepts is considered. Attention is drawn to the fact that at the present time Kazimir's additives have become an indispensable element when considering inflationary models of the universe.

The uniqueness of the Casimir effect lies in the fact that the structure of the vacuum of quantum fields manifests itself on a macroscopic level, and in that it does not depend on the constant coupling of the system (neither on mass, nor on charges, etc.). The Casimir energy is due mainly to the boundary conditions of the geometry / topology of the system under consideration. The change in the boundary conditions leads to a change in the spectrum of the vacuum oscillations and to the appearance of Casimir forces acting on the boundaries. Therefore, this effect is applied in various fields of physics. Thanks to modern experiments, we can demonstrate and evaluate the core of the Casimir effect. Undoubtedly, in the near future it will be the Casimir effect that will become a verification for predictions of fundamental theories.

A conclusion is drawn that although the Casimir effect was discovered relatively recently, its role in constructing cosmological models increases.

Keywords

Casimir effect, configuration, boundary conditions, the quantum fluctuations.

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