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Finite-temperature effective potentials in models with extended Higgs sector

Mikhail Dolgopolov, Evgeniy Golenev, Albina Gurskaya and **Elza Rykova**
Samara State University, Russia

In this report authors discuss features of some topological methods for baryogenesis and phase transition, including models with an extended NMSSM scalar sector at finite temperatures. The classic picture of baryogenesis in grand unification theories has changed significantly with the specification and standard model development and the phase diagram of electroweak interactions with experimental data on Higgs boson physics. Currently (especially after the discovery of a particle candidate for Higgs boson role) the minimal extension of the scalar sector has a less likely to be realized, therefore, an important role is played by researching of the non-minimal extensions. In previous papers authors considered a general scalar Higgs sector, including the violation of CP-invariance and temperature corrections for control parameters. Conditions for effective potential of the model NMSSM that lead to the phase transition of the first order strong required for the generation of the observed baryon asymmetry. Additional chiral field plays here the role of the phase transition stabilizing foam. The feature of the upcoming research is that the violations of symmetries and temperature contributions of the self-potential affect the dark sector is supersymmetric models, which could have consequences for cosmology. That is to significantly change the mass of the cold dark matter particles and intensity of their interaction with other particles and the ability to participate in electroweak decays, including the decay of Higgs bosons. Results for Higgs fields in the case of CP-violating and temperature corrections are used for dark sector physical parameters calculations. Also, the annihilation of neutralinos in the framework of quantum field theory in conjunction with Feynman diagram approach was taking into account with one-loop corrections. Temperature one-loop effective potential for NMSSM is reconstructed, including self-energy corrections (i.e., corrections to the mass parameters of dimension 2 of the Higgs potential). Physical mass condition is determined and the one-loop corrections to the dimensionless parameters of the effective potential are evaluated in the framework of non-minimal supersymmetric model (NMSSM). General case is investigated for calculations of one-loop diagrams with different masses in finite temperature field theory, some representations of infinite series and generalized function of Hurwitz are proposed. Surfaces of the stationary points in space background fields and matrix stability are reconstructed, including difference from SM physical basis in alignment limit. The first and second differential forms are implemented for the effective potential. Scenarios of stationary points are in determination, extreme curves and surfaces based on the definition of Grobner bases will be also considered later.

Recent Publications

1. Kazakov D I (2014) The Higgs boson is found: what is next? Physics-Uspekhi. 57:930–942.

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mvdolgopolov@mail.ru

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