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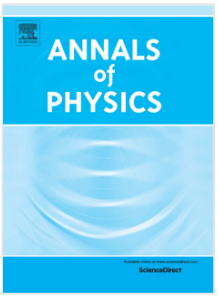


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# Quantum dissipative Higgs model

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**Abstract**

By using a continuum of oscillators as a reservoir, we present a classical and a quantum-mechanical treatment for the Higgs model in the presence of dissipation. In this base, a fully canonical approach is used to quantize the damped particle on a spherical surface under the action of a conservative central force, the conjugate momentum is defined and the Hamiltonian is derived. The equations of motion for the canonical variables and in turn the Langevin equation are obtained. It is shown that the dynamics of the dissipative Higgs model is not only determined by a projected susceptibility tensor that obeys the Kramers-Kronig relations and a noise operator but also the curvature of the spherical space. Due to the gnomonic projection from the spherical space to the tangent plane, the projected susceptibility displays anisotropic character in the tangent plane. To illuminate the effect of dissipation on the Higgs model, the transition rate between energy levels of the particle on the sphere is calculated. It is seen that appreciable probabilities for transition are possible only if the transition and reservoir's oscillators frequencies to be nearly on resonance.

*Keywords:* Higgs model, Dissipation, Langevin equation, Susceptibly tensor.
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