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Thesis Title	*Tunneling effect of Higgs field in a black-hole background*
Supervisor	N. Tetradis, Professor
Summary	The subject of this diploma thesis is related to vacuum decay, namely the transition from false vacuum to true. Initially, there is an introduction in quantum tunneling of particles through the method of path integrals in Euclidean spacetime, as well as an analysis of the same phenomenon for scalar fields in flat and curved spacetime. Then, the effective potential of the Higgs field is calculated in the context of Quantum Field Theory through the contributions of the Standard Model particles. In the following section, there is an introduction to black hole thermodynamics. The Gibbons-Hawking surface term is analyzed, the Hawking temperature in Schwarzschild background is extracted and the relation between Euclidean action and free energy is proven. In the last chapter, the decay of the Higgs field in the presence of a black hole is analyzed and its probability is calculated as a function of the energy of the bounce contribution and the number of primordial black holes during the radiation-dominated era of the early Universe.
Key words	Instantons, Vacuum Decay, Higgs Field , Black holes
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