

The minimal renormalizable  $SO(10)$  Higgs model with the unified gauge symmetry broken down by the adjoint representation  $45_S$  is known to suffer from tachyonic instabilities along all potentially realistic symmetry breaking chains. Few years ago, this issue has been identified as a mere relic of the tree-level calculations and the radiative corrections to the masses of the pair of the "most dangerous" pseudo-Goldstone scalars transforming as  $(8, 1, 0)$  and  $(1, 3, 0)$  with respect to the  $SU(3)_c \times SU(2)_L \times U(1)_Y$  Standard model gauge group were computed. Remarkably enough, it turns out that in the minimal potentially realistic renormalizable realization of the model – consisting of  $45_S \oplus 126_S$  scalar and  $45_G$  gauge fields – there is third pseudo-Goldstone scalar, a full singlet with respect to the Standard model gauge group that, until recently, happened to escape the community's attention. In this thesis we computed the one-loop corrections to its mass employing two different methods within the effective potential approach. In both cases we reduced the complexity of our calculations by decomposition into the Standard model irreducible representations. In the end, we cross-checked the resulting formulae in four distinct symmetry breaking limits in which the pseudo-Goldstone mass was degenerated with those of the multiplets  $(8, 1, 0)$  and/or  $(1, 3, 0)$ .