Title: Dynamical symmetry breaking in models with strong Yukawa interactions

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Abstract: The primary aim of the thesis is to explore the possibility of spontaneous symmetry breaking by strong Yukawa dynamics. Technically, the symmetry is assumed to be broken by formation of symmetry-breaking parts of both the scalar and the fermion propagators, rather than by the scalar vacuum expectation values. The idea is first introduced on an example of a toy model with the underlying symmetry being an Abelian one and later applied to a realistic model of electroweak interaction. In addition, the thesis also deals with some more general, model-independent issues, applicable not only to the discussed model of strong Yukawa dynamics, but to a wider class of models with dynamical mass generation. First of these issues is the problem of fermion flavor mixing in the presence of fermion self-energies with a general momentum dependence. It is in particular shown how to define the CKM matrix in such models and argued that it can come out in principle non-unitary. Second issue is the problem of calculating the gauge boson masses when the symmetry is broken by fermion self-energies. On top of deriving the formula for the gauge boson mass matrix we also find corrections to the related Pagels–Stokar formula.

Keywords: Dynamical electroweak symmetry breaking