The Global Minimum in Higgs Potentials

O. Nachtmann, M. Maniatis

Seminar Heidelberg, 2012

Motivation for SUSY

- Use `itemize` a lot.
- Use very short sentences or short phrases.

Naturalness Problem

- Quantum corrections to the Higgs-boson mass.
- A fermion loop with Lagrangian $\mathcal{L} = -\lambda_f H \bar{f} f$

$$\Delta m_H^2 = \frac{|\lambda_f|^2}{16\pi^2} \left[-2\Lambda_{UV}^2 + 6m_f^2 \ln(\Lambda_{UV}/m_f) + \dots \right]$$

Introduction SUSY

- Possible forms of such symmetries restricted by Haag-Lopuszanski-Sohnius extension of Coleman-Mandula theorem.

  Coleman, Mandula, 1967; Haag, Lopuszanski, Sohnius, 1975

$$\{Q, Q^\dagger\} = P^\mu$$
$$\{Q, Q\} = \{Q^\dagger, Q^\dagger\} = 0$$
$$[P^\mu, Q] = [P^\mu, Q^\dagger] = 0$$