

Higgs boson mass as input to Suspect3

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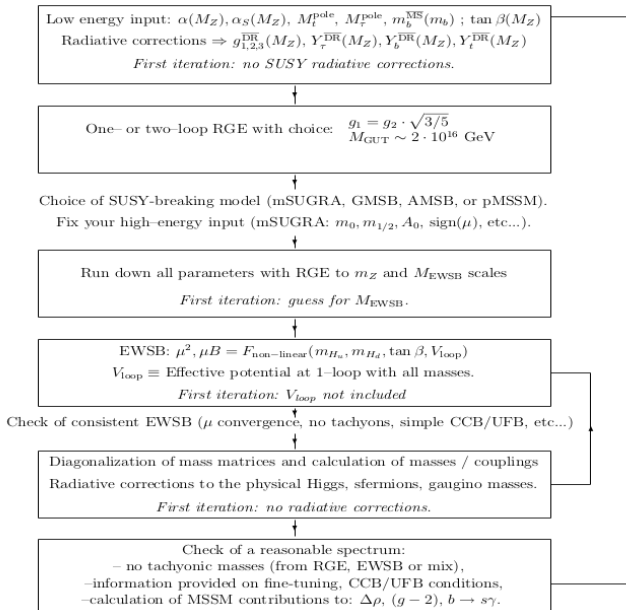
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March 16, 2016

Suspect3

- Suspect3 C++ is a **SUSY spectrum calculator** developed in Montpellier.
- It computes the **MSSM** spectrum and couplings for the SUSY breaking models i.e.: **mSUGRA**, **AMSB** and **GMSB**.
- It implements the radiative corrections at one loop for the masses and the dominant **two loops for the Higgs**.
- It takes as input an SLHA file containing the SM inputs (M_Z , M_{top}^{pole} , $\alpha(M_Z)$, $\alpha_s(M_Z)$, ...) and the boundary conditions depending on the SUSY breaking model chosen.

Scheme of the Suspect code



Overview

- We're studying the MSSM that we've after the discovery of the Higgs boson @ LHC.
- We're adding the 125 GeV Higgs boson mass as input to Suspect3, while in the present version it is an output.
- **Task:** For a given Higgs boson mass of 125 GeV, check if **the number of free parameters in the Higgs and top sectors (i.e.: μ , A_t) can be reduced.**

- To proceed with the Higgs inversion, we first consider a simple approximation for the Higgs mass radiative corrections:

$$m_h^2 = m_h^{2,tree} + \frac{3g_2^2 m_t^4}{8\pi^2 m_W^2} \left[\ln\left(\frac{m_{\tilde{t}_1} m_{\tilde{t}_2}}{m_{t_1}^2}\right) + \frac{X_t^2}{M_s^2} - \frac{X_t^4}{12M_s^4} \right]$$

where $X_t = A_t - \mu \cot \beta$

$$M_s^2 = \sqrt{m_Q^2 m_{t_R}^2 + m_t^2 (m_Q^2 + m_{t_R}^2) + m_t^4}$$

$$m_{\tilde{t}_1} m_{\tilde{t}_2} = \sqrt{M_s^4 - 4m_t^2 X_t^2}$$

- For our actual project, we'll not use this simple equation but a more elaborated one as included in Suspect3.

Thank you for your attention