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# NMSSM spectrum calculators

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This is a list of NMSSM spectrum calculators that are currently under investigation, with a small summary of their main features:

## (C++)

full 2-loop RGEs; full 1-loop corrections to all SUSY masses; 2-loop Higgs corrections  $O(\alpha_s \alpha_t + \alpha_s \alpha_b + \alpha_{\tau}^2 + \alpha_t^2 + \alpha_t \alpha_b + \alpha_b^2)$ ; Z3-invariant and Z3-violating NMSSM; boundary conditions and EWSB output can be customized via a model file

## NMSSMCALC (Fortran)

Real and complex NMSSM: Higgs boson masses up to  $O(\alpha_t \alpha_s)$ , branching ratios including the state-of-the-art HO (QCD, SUSY-QCD&EW -  $\Delta_b$ ?,  $\Delta_s \Delta_{\tau}$ ; , SUSY-QCD to  $\sim q$  decays) corrections and off-shell decays.

## NMSSMTools (Fortran77)

2-loop RGEs; computation of the Higgs (up to  $O((\alpha_b + \alpha_t)\alpha_s)$ ) and sparticle masses and decay ratios, and the dark matter relic density via MicrOmegas. Possible variants are the general NMSSM, the Z3-invariant NMSSM, constraints at the GUT scale and GMSB. Present experimental constraints are implemented.

## (C++)

full 2-loop RGEs; full 1-loop corrections to all SUSY masses; 2-loop Higgs corrections  $O(\alpha_s \alpha_t + \alpha_s \alpha_b + \alpha_{\tau}^2 + \alpha_t^2 + \alpha_t \alpha_b + \alpha_b^2)$ ; Z3-invariant and Z3-violating NMSSM; a number of boundary conditions (mSUGRA, non-universal trilinears, general, ...)

## SPheno (Fortran 90)

2-loop RGEs with flavour and CP effects; 1-loop corrections to all SUSY masses; 2-loop Higgs corrections beyond  $O(\alpha_s(\alpha_b + \alpha_t))$ ; independent calculation of decays as well as flavour and precision observables.

Definition:  $\alpha_{t,b} = h_{t,b}^2 / (4\pi)$ , with  $h_{t,b}$  being the superpotential top and bottom couplings. The one-loop  $O(\alpha_t)$  corrections are in fact corrections proportional to  $h_t^2 m_t^2$ , i.e.  $h_t^4 v^2$ .

-- EricFeng - 2018-02-28

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