

Download FlexibleSUSY

```
$ wget https://www.hepforge.org/archive/flexiblesusy/FlexibleSUSY-1.0.1.tar.gz
$ tar xzf FlexibleSUSY-1.0.1.tar.gz
$ cd FlexibleSUSY-1.0.1
```

Generate spectrum generators

```
./createmodel --name=MSSM
./createmodel --name=NMSSM
./configure --with-models=MSSM,NMSSM
make
```

Run them

```
cd models/MSSM # or s/MSSM/NMSSM/g
./run_MSSM.x --slha-input-file=LesHouches.in.MSSM # ditto
```

```
Block MASS
1000021 1.15236966E+03 # Glu
1000024 3.85774334E+02 # Cha_1
1000037 6.50460073E+02 # Cha_2
25 1.14766149E+02 # hh_1
35 7.06792640E+02 # hh_2
37 7.11388516E+02 # Hpm_2
36 7.06523105E+02 # Ah_2
...
```

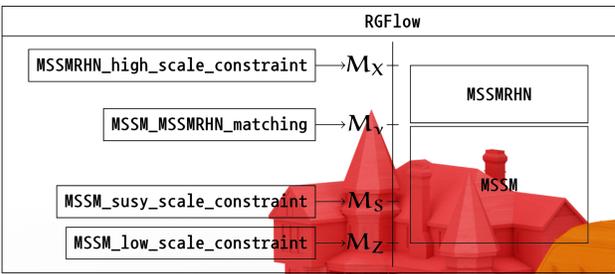
Bundled models

CMSSM, NUHMSSM, NMSSM, UMSSM, NUHM E₆SSM, MSSMRHN, MRSSM, ...

Prerequisites

C++ & FORTRAN compiler, Mathematica, SARAH, Eigen, LAPACK, Boost, GSL

Tower of EFTs



For reliability

- Nightly build tests & numerical comparison against (NM)Softsusy
- Comparison against cE6SSM_SpecGen
- Analytic scrutiny by hand

FlexibleSUSY model file for NUHMSSM

```
FModelName = "@CLASSNAME@";

MINPAR = {{1, m0}, {2, m12}, {3, TanBeta}, {4, Sign[\[Mu]]}, {5, Azero}};
EXTPAR = {{1, mHd2In}, {2, mHu2In}};

EWSBOutputParameters = { B[\[Mu]], \[Mu] };

HighScale = g1 == g2;
HighScaleFirstGuess = 2.0*^16;
HighScaleInput = {
  {T\[Ye], Azero*Ye}, {T\[Yd], Azero*Yd}, {T\[Yu], Azero*Yu},
  {mHd2, mHd2In}, {mHu2, mHu2In},
  {mq2, UNITMATRIX[3] m0^2}, {m12, UNITMATRIX[3] m0^2}, {md2, UNITMATRIX[3] m0^2},
  {mu2, UNITMATRIX[3] m0^2}, {me2, UNITMATRIX[3] m0^2},
  {MassB, m12}, {MassWB, m12}, {MassG, m12}};

SUSYScale = Sqrt[M[Su[1]]*M[Su[6]]];
SUSYScaleFirstGuess = Sqrt[m0^2 + 4 m12^2];

LowScale = SM[MZ];
LowScaleFirstGuess = SM[MZ];
LowScaleInput = {
  {Yu, Automatic}, {Yd, Automatic}, {Ye, Automatic},
  {vd, 2 MZDRbar / Sqrt[GUTNormalization[g1]^2 g1^2 + g2^2] Cos[ArcTan[TanBeta]]},
  {vu, 2 MZDRbar / Sqrt[GUTNormalization[g1]^2 g1^2 + g2^2] Sin[ArcTan[TanBeta]]}};

InitialGuessAtLowScale = {
  {vd, SM[vev] Cos[ArcTan[TanBeta]]}, {vu, SM[vev] Sin[ArcTan[TanBeta]]},
  {Yu, Automatic}, {Yd, Automatic}, {Ye, Automatic}};
InitialGuessAtHighScale = {{\[Mu], 1.0}, {B[\[Mu]], 0.0}};

UseHiggs2LoopMSSM = True;
EffectiveMu = \[Mu];

PotentialLSPParticles = { Chi, Cha, Glu, Sv, Su, Sd, Se };
DefaultPoleMassPrecision = MediumPrecision;
```



original image from www.3dheights.com

FlexibleSUSY

Peter Athron
Jae-hyeon Park
Dominik Stöckinger
Alexander Voigt

U Adelaide
U València
TU Dresden
TU Dresden

a **meta** spectrum generator for supersymmetric models
born to be **reliable**, **modular**, easy to **hack**, **fast**, capable of **EFT towers**, open to alternative **BVP solving methods**
flexiblesusy.hepforge.org, arXiv:1406.2319

37th International Conference on High Energy Physics, 2–9 Jul 2014, València

image from Ghost, a 1990 Paramount Pictures film

An MSSM spectrum generator does:

- Constrain $m_H^2, m_A^2, M_a, A \rightarrow M_X$ (energy scale, RGE)
- Impose EWSB condition, Calculate pole masses $\rightarrow M_S$ (RGE)
- Constrain $g_a, y_f \rightarrow M_Z$ (RGE)

Existing spectrum generators

MSSM	ISASUSY, Softsusy, SPheno, SuSeFlav, SuSpect
NMSSM	NMSPEC, Softsusy, SPheno
CE ₆ SSM	cE6SSM_SpecGen
user-defined models	SARAH, FlexibleSUSY

CMSSM running-time (ms)