Generators Working Group Summary

M. Antonelli
LNF-INFN

Generators for $\gamma\gamma$

Montpellier: call for $\gamma\gamma$ generators

partially addressed

Durham: Joint session with $\gamma\gamma$ and SUSY group

2 NEW generators for 4-fermions

2 lepton 2 quark production in $\gamma\gamma$ collisions W. Da Silva

Lowest order prediction for $\gamma\gamma$-> 4f(γ) M. Roth

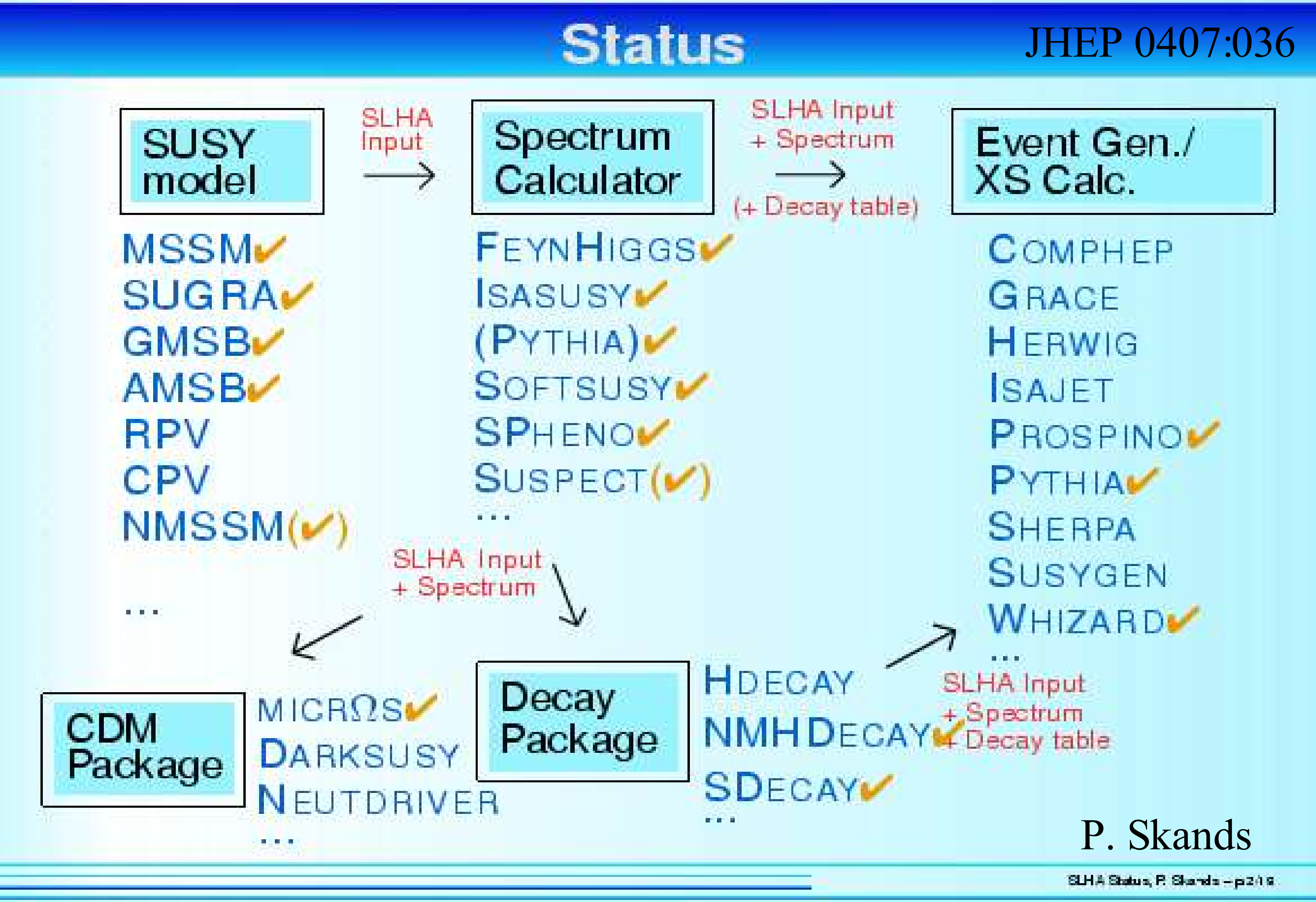
next:

comparison a la 6-fermions (and more) at e+e-

(LC-tool-2004-018

LCWS-04 talk)

SUSY Les Houches Accord(SLHA)



JHEP 0407:036

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Starting Point

SLHA — Considerations:

- **Consistency**
  Define parameters consistently and unambiguously → specific conventions adopted (described in detail in writeup).
- **Flexible/Extendable**
  Structure should be general enough to *eventually* handle *any* model → files built of modular "data blocks".
- **Usable**
  Easy to implement and to use → keep basic structure simple.

SLHA status

(Examples)

```
# SUSY Les Houches Accord 1.0
# Example input file - Snowmass point 1a
Block MODSEL    # Model selection
     1      1      # SUGRA model
Block SMINPUTS # SM parameters
     5      4.25   # mb(mb)
     6    174.3    # t pole mass
Block MINPAR    # Model Parameters
     1    100.     # m0
     2    250.     # m12
     3     10.     # tanbeta
     4      1.     # sgnmu
     5   -100.     # A0
```

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SLHA status

(Examples)

```
# SUSY Les Houches Accord 1.0
# Example spectrum file - Snowmass point 1a
Block SPINFO          # Program information
     1    SOFTSUSY     # spectrum calculator
     2    1.8.4        # version number
Block MODSEL   # Select model
     1    1   # sugra
Block MINPAR   # Input parameters
     1    1.000000000e+02   # m0
     2    2.500000000e+02   # m12
     3    1.000000000e+01   # tanb
     4    1.000000000e+00   # sign(mu)
     5   -1.000000000e+02   # A0
Block SMINPUTS # SM parameters
     1    1.279340000e+02   # 1/alpha(MZ)[MSbar]
     2    1.166370000e-05   # Gmu [GeV**-2]
     3    1.172000000e-01   # alphas(MZ)[MSbar]
     4    9.118760000e+01   # Z pole mass
     5    4.250000000e+00   # mb(mb)[MSbar]
     6    1.743000000e+02   # t pole mass
     7    1.777000000e+00   # tau pole mas
Block MASS  # Mass spectrum (pole masses)
          24       8.024639840e+01    # W
          25       1.106358320e+02    # h0
          35       4.008746040e+02    # H0
          36       4.005062720e+02    # A0
          37       4.087847760e+02    # H+
     1000001       5.537379281e+02    # sd(L)
     1000002       5.480648005e+02    # su(L)
     1000003       5.536689385e+02    # ss(L)
     1000004       5.479950083e+02    # sc(L)
     1000005       4.990864878e+02    # sb(1)
     1000006       3.866811125e+02    # st(1)
     1000011       2.005077001e+02    # se(L)
     1000012       1.844822029e+02    # snue(L)
     1000013       2.005050044e+02    # smu(L)
     1000014       1.844792730e+02    # snumu(L)
     1000015       1.339969762e+02    # stau(1)
     1000016       1.836242253e+02    # snu(tau(L))
     1000021       5.934756712e+02    # gluino
     1000022       9.701573617e+01    # neutralino(1)
     1000023       1.788864799e+02    # neutralino(2)
     1000024       1.782549095e+02    # chargino(1)
     1000025      -3.536102287e+02    # neutralino(3)
     1000035       3.733417082e+02    # neutralino(4)
     1000037       3.736128390e+02    # chargino(2)
     2000001       5.269575664e+02    # sd(R)
     2000002       5.311251030e+02    # su(R)
     2000003       5.269552151e+02    # ss(R)
     2000004       5.309795680e+02    # sc(R)
     2000005       5.257115262e+02    # sb(2)
     2000006       5.704560875e+02    # st(2)
     2000011       1.430886701e+02    # se(R)
     2000013       1.430810123e+02    # smu(R)
     2000015       2.043832731e+02    # stau(2)
Block alpha  # Effective Higgs mixing angle alph
         -1.146864127e-01    # alpha
Block hmix Q= 4.520624648e+02   # DRbar Higgs mixi
     1     3.439934743e+02    # mu
Block stopmix   # stop mixing matrix
  1  1     5.443784304e-01    # O(1,1)
  1  2     8.388397490e-01    # O(1,2)
  2  1     8.388397490e-01    # O(2,1)
  2  2    -5.443784304e-01    # O(2,2)
Block sbotmix   # sbottom mixing matrix
  1  1     9.355024721e-01    # O(1,1)
  1  2     3.533201449e-01    # O(1,2)
  2  1    -3.533201449e-01    # O(2,1)
  2  2     9.355024721e-01    # O(2,2)
Block staumix   # stau mixing matrix
  1  1     2.810947184e-01    # O(1,1)
  1  2     9.596800297e-01    # O(1,2)
  2  1     9.596800297e-01    # O(2,1)
  2  2    -2.810947184e-01    # O(2,2)
# Gaugino-higgsino mixing
Block nmix   # neutralino mixing matrix
  1  1     9.849417415e-01    # N(1,1)
  1  2    -5.795970738e-02    # N(1,2)
  1  3     1.526931274e-01    # N(1,3)
  1  4    -5.670314904e-02    # N(1,4)
  2  1     1.090115410e-01    # N(2,1)
  2  2     9.374300545e-01    # N(2,2)
  2  3    -2.852021039e-01    # N(2,
  2  4     1.673354023e-01    # N(
...
```

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(Examples)

```
# SUSY Les Houches Accord 1.0
# Example decay file - Gluino decays
Block DCINFO        # Program information
      1     SDECAY     # Decay package
      2     1.0        # version number
#           PDG              Width
DECAY     1000021     1.01752300e+00   # gluino decays
#           BR              NDA       ID1          ID2
      4.18313300E-02     2        1000001          -1     # BR(sg -> sd(L) dbar)
      1.55587600E-02     2        2000001          -1     # BR(sg -> sd(R) dbar)
      3.91391000E-02     2        1000002          -2     # BR(sg -> su(L) ubar)
      1.74358200E-02     2        2000002          -2     # BR(sg -> su(R) ubar)
      4.18313300E-02     2        1000003          -3     # BR(sg -> ss(L) sbar)
      1.55587600E-02     2        2000003          -3     # BR(sg -> ss(R) sbar)
      3.91391000E-02     2        1000004          -4     # BR(sg -> sc(L) cbar)
      1.74358200E-02     2        2000004          -4     # BR(sg -> sc(R) cbar)
      1.13021900E-01     2        1000005          -5     # BR(sg -> sb(1) bbar)
      6.30339800E-02     2        2000005          -5     # BR(sg -> sb(2) bbar)
      9.60140900E-02     2        1000006          -6     # BR(sg -> st(1) tbar)
      0.00000000E+00     2        2000006          -6     # BR(sg -> st(2) tbar)
      4.18313300E-02     2       -1000001           1     # BR(sg -> sdbar(L) d)
      1.55587600E-02     2       -2000001           1     # BR(sg -> sdbar(R) d)
      3.91391000E-02     2       -1000002           2     # BR(sg -> subar(L) u)
      1.74358200E-02     2       -2000002           2     # BR(sg -> subar(R) u)
      4.18313300E-02     2       -1000003           3     # BR(sg -> ssbar(L) s)
      1.55587600E-02     2       -2000003           3     # BR(sg -> ssbar(R) s)
      3.91391000E-02     2       -1000004           4     # BR(sg -> scbar(L) c)
      1.74358200E-02     2       -2000004           4     # BR(sg -> scbar(R) c)
      1.13021900E-01     2       -1000005           5     # BR(sg -> sbbar(1) b)
      6.30339800E-02     2       -2000005           5     # BR(sg -> sbbar(2) b)
      9.60140900E-02     2       -1000006           6     # BR(sg -> stbar(1) t)
      0.00000000E+00     2       -2000006           6     # BR(sg -> stbar(2) t)
```

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News

- NMHDecay: [U. Ellwanger et al., hep-ph/0406215]
  - NMSSM Higgs sector: masses + couplings.
  - NMSSM Higgs decays.
- CPSuperH: [J. Lee et al., CPC 156(2004)283, hep-ph/0307377]
  - CPV MSSM Higgs sector: masses + mixings
  - CPV MSSM Higgs decays.
- SDecay: [M. Mühlleitner et al., hep-ph/0311167]
  - 3-body sbottom decays.
  - QCD corrections for gaugino $\rightarrow \tilde{q}q'$ and $\tilde{q} \rightarrow \tilde{q}'V$.
  - SLHA spectrum read-in. (SLHA output already there.)

News

- Sfitter: [R. Lafaye et al., hep-ph/0404282]
  - MSSM fitting.
- Fittino [P. Bechtle et al.]
  - MSSM fitting.
- SLHAlib-1.0 [T. Hahn, hep-ph/0408283]
  - F77 SLHA Read-Write libraries.

Discussion: extension towards

Flexibility to include new models:

CP Violating MSSM
NMSSM
Flavor violation
....

Theory errors?

important for SPA project (determination of fundamental SUSY parameters)

check consistency among programs

Discussion: extension towards

SuSy Les Houches Accord

We have agreed to: Conserve colour, charge, and spin!

- $\rightarrow$ add (optional) new LARGE mixing blocks which in principle can deal with all possible consequences of CPV, RPV, etc. (normally will be block-diagonal to a large extent)
- Include (option for) giving either effective (loop-improved) mixing matrices OR mixing in $\overline{\text{DR}}$ scheme at a given scale.
- Include imaginary parts in new mixing structure.
- Conventions for NMSSM adopted, for CPV underway.
- Theory errors: highly non-trivial issue. Sub-group organised by K. Desch & W. Porod to investigate solutions.
- Cross sections: even more thorny issue. No general concensus yet — but strong interest from SPA project for e^+e^- case.

Monte Carlo production organization

it's time for a common MC production for SM processes:

consistency across physics WG
more efficient checks of generators
ease exchange info between TH-EX
integrated with other studies (6-f sample production from T. Barklow)
interesting production test

When & how:

storage, accessibility (and CPU ?) at DESY
management (to be discussed),
integrated with GRID (?), ...

meeting before the end of the year between
generators authors and physics WG
conveners on behalf of users