Card File Testing for CSA07

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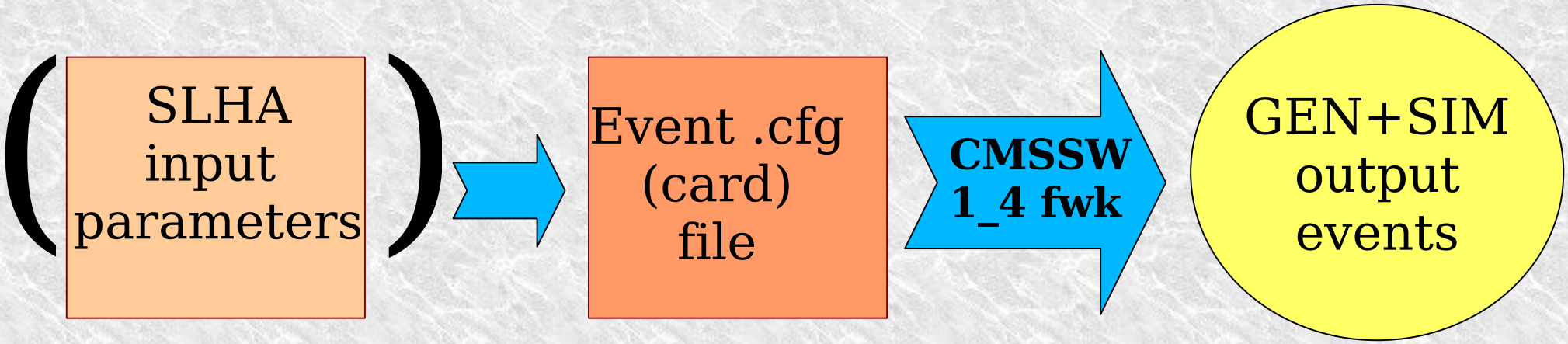
CSA07 Goals

- Generate 100M “soup” standard model events
- Also generate signal events for user-defined processes
- Maryland responsible for checking generation of all SUSY/BSM processes
  - mSUGRA, GMSB, R-S graviton, ...
- Files tested by Dinko Ferencek, Ellie Lockner, Malina Kirn, and Jeff Temple

Generating SUSYBSM Events



Testing SLHA files

- Searching through SUSY decay tables
- Checks performed by graduate student Dinko Ferencek
- Found bug in charged lepton ID in susyhit package!

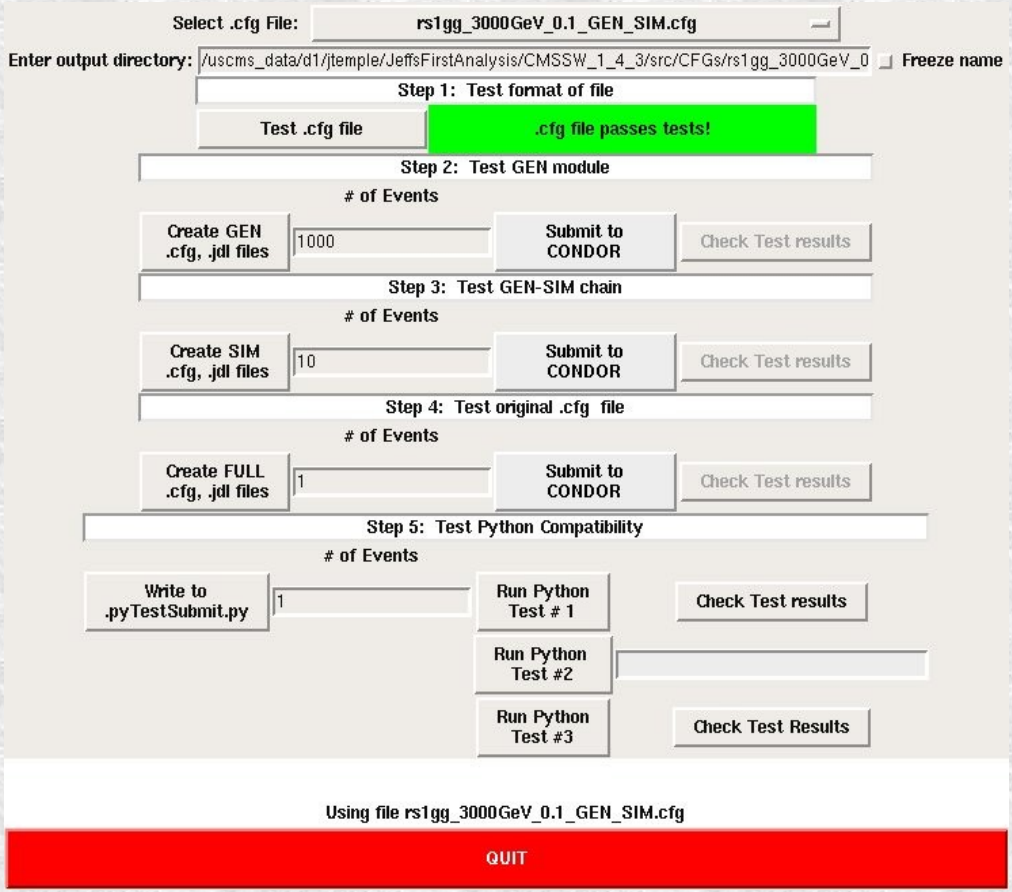
```
     1.75155980E-03    2     1000025   1000035   # BR(H -> ~chi_20 ~chi_40)
     2.54261735E-08    2     1000025   1000035   # BR(H -> ~chi_30 ~chi_40)
#
#         PDG            Width
DECAY        36     2.90448015E+01   # A decays
#          BR         NDA      ID1       ID2
     1.07381583E-01    2          5        -5   # BR(A -> b       bb     )
     1.95613712E-02    2        -15        15   # BR(A -> tau+    tau-   )
     6.91564534E-05    2        -13        13   # BR(A -> mu+     mu-    )
     8.49466842E-05    2          3        -3   # BR(A -> s       sb     )
     4.58960071E-07    2          4        -4   # BR(A -> c       cb     )
     4.57708598E-02    2          6        -6   # BR(A -> t       tb     )
     4.52889032E-05    2         21        21   # BR(A -> g       g      )
     4.29315002E-07    2         22        22   # BR(A -> gam     gam    )
     5.87140103E-08    2         23        22   # BR(A -> Z       gam    )
     2.03185620E-05    2         23        25   # BR(A -> Z       h      )
     3.06167504E-01    2    1000024  -1000024   # BR(A -> ~chi_1+ ~chi_1-)
     2.04922931E-01    2    1000037  -1000037   # BR(A -> ~chi_2+ ~chi_2-)
     1.52323165E-01    2    1000024  -1000037   # BR(A -> ~chi_1+ ~chi_2-)
     1.52323165E-01    2    1000037  -1000024   # BR(A -> ~chi_2+ ~chi_1-)
     7.65850286E-03    2    1000022   1000022   # BR(A -> ~chi_10 ~chi_10)
     2.58699088E-04    2    1000023   1000023   # BR(A -> ~chi_20 ~chi_20)
     2.90041995E-07    2    1000025   1000025   # BR(A -> ~chi_30 ~chi_30)
     5.42797242E-07    2    1000035   1000035   # BR(A -> ~chi_40 ~chi_40)
     2.94770354E-03    2    1000022   1000023   # BR(A -> ~chi_10 ~chi_20)
     1.51318054E-04    2    1000022   1000025   # BR(A -> ~chi_10 ~chi_30)
     2.62878685E-04    2    1000022   1000035   # BR(A -> ~chi_10 ~chi_40)
     2.11389221E-05    2    1000023   1000025   # BR(A -> ~chi_20 ~chi_30)
     2.75634307E-05    2    1000023   1000035   # BR(A -> ~chi_20 ~chi_40)
     1.25538561E-07    2    1000025   1000035   # BR(A -> ~chi_30 ~chi_40)
#
#         PDG            Width
DECAY        37     8.84618608E+00   # H+ decays
#          BR         NDA      ID1       ID2
     5.60450274E-04    2          4        -5   # BR(H+ -> c       bb     )
     6.42557665E-02    2        -15        16   # BR(H+ -> tau+    nu_tau )
     2.27167148E-04    2        -13        14   # BR(H+ -> mu+     nu_mu  )
     3.58686283E-06    2          2        -5   # BR(H+ -> u       bb     )
     1.33467107E-05    2          2        -3   # BR(H+ -> u       sb     )
     2.75954765E-04    2          4        -3   # BR(H+ -> c       sb     )
     4.97461205E-01    2          6        -5   # BR(H+ -> t       bb     )
     6.68466024E-05    2         24        25   # BR(H+ -> W+      h      )
     7.57484959E-13    2         24        36   # BR(H+ -> W+      A      )
     3.63638310E-01    2    1000024   1000022   # BR(H+ -> ~chi_1+ ~chi_10)
     4.00890522E-03    2    1000024   1000023   # BR(H+ -> ~chi_1+ ~chi_20)
     3.15052510E-03    2    1000024   1000025   # BR(H+ -> ~chi_1+ ~chi_30)
     2.24735119E-02    2    1000024   1000035   # BR(H+ -> ~chi_1+ ~chi_40)
     2.77883292E-02    2    1000037   1000022   # BR(H+ -> ~chi_2+ ~chi_10)
     1.46293265E-02    2    1000037   1000023   # BR(H+ -> ~chi_2+ ~chi_20)
     3.87696373E-04    2    1000037   1000025   # BR(H+ -> ~chi_2+ ~chi_30)
     1.05907165E-03    2    1000037   1000035   # BR(H+ -> ~chi_2+ ~chi_40)
```

Testing Card Files

- Card files must work within CSA07 framework
- Tested files for:
  - Basic syntax/typos
  - Event Generation
  - Full Simulation
  - Python interface compatibility
  - ROOT event output

Card Testing GUI

- Works with batch queue to check multiple card files simultaneously
- Checks each stage of event generation, from basic file syntax to simulated ROOT output vertex position



Card Testing Statistics

- 24 different SLHA files
- 164 different card files
- Multiple requesters
- All good files checked into CVS by July 17, in anticipation of August 1 deadline
  - New files received on July 16
  - GUI allows testing of new files within a few hours of receipt

To Do List

- GMSB
  - Bug in gravitinos in susyhit package not fixed until last week
  - Awaiting new card files from requesters
- Black hole production
  - Black hole simulator doesn't exist in CSA07 software release
- Various requesters have not yet produced card files

Summary

- Maryland group had all available files tested and ready for CSA07 use well in advance of stated deadline
- Uncovered bugs in SUSY generation
- Testing procedures allow for quick check of new card files as they become available.