



Struggling with CONTUR

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BSM Models

Additional Higgs sector:

$$S = \frac{1}{\sqrt{2}} (v_s + S + iA)$$

Convert to UFO

```
--- Universal FeynRules Output (UFO) v 1.1 ---
```

```
Starting Feynman rule calculation.
```

```
Expanding the Lagrangian...
```

```
Expanding the indices over 8 cores
```

```
Collecting the different structures that enter the vertex.
```

```
138 possible non-zero vertices have been found -> starting the computation: █████ / 138.
```

```
133 vertices obtained.
```

```
Flavor expansion of the vertices distributed over 8 cores: █████ / 133
```

```
- Saved vertices in InterfaceRun[ 1 ].
```

```
Computing the squared matrix elements relevant for the 1->2 decays:
```

```
█████ / 51
```

```
Squared matrix element compute in 1.3073 seconds.
```

```
█████ / 54
```

```
Decay widths computed in 0.176906 seconds.
```

```
Preparing Python output.
```

```
- Splitting vertices into building blocks.
```

```
Splitting of vertices distributed over 8 kernels.
```

```
- Optimizing: █████ / 185 .
```

```
- Writing files.
```

```
Done!
```

~~Generate Events~~

contur-batch → Out of docker

Lots of scripts → HPCC

Installing Herwig on Ixplus

~~Generate Events~~

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Installing Herwig on Ixplus



Failed... Retry

ERROR... Retry

Failed... Abandon

MadGraph + Pythia?

add output as **hepmc** file to end of autogenerated command file

Illustration by Chris Wormell from "A Man of the Invisible"

```
import cxSM
define p = g u c d s b u~ c~ d~ s~ b~
generate p p > t t~ ~ah ~ah
output tmp0
launch
shower = Pythia8
```

Have to select process?

```
INFO: Running Pythia8 [arXiv:1410.3012]
Follow Pythia8 shower by running the following command (in a separate terminal):
tail -f /home/jozo/MG5_aMC/tmp0/Events/run_02/tag_1_pythia8.log

INFO: Pythia8 shower finished after 14m08s.
INFO: No delphes_card detected, so not run Delphes
=== Results Summary for run: run_02 tag: tag_1 ===

Cross-section : 4.394 +- 0.009599 pb
Nb of events : 10000

INFO: storing files of previous run
INFO: Storing Pythia8 files of previous run
INFO: Done
```

MadGraph + Pythia?

```
rivet --skip-weights -a $CONTUR_RA13TeV /contur_tutorial/MG5_aMC/tmp0/Events/run_02/tag_1_pythia8_events.hepmc.gz
```

```
contur Rivet.yoda --wn "Weight_MERGING=0.000"
```

```
INFO - Run Information
Contur is running in /contur_tutorial/HI-tuto/mine
on analysis objects in ['Rivet.yoda']
Excluding Higgs to WW measurements
Excluding secret b-veto measurements
Excluding ATLAS WZ SM measurement
No correlations being built, using single bins in tests
Building default background model from data, ignoring (optional) theory predictions

Parameter values not known for this run.
INFO - Combined exclusion for these plots is 0.00 %
```

```
Pass pT2          15.0    0%    100%
Pass pT4          10.0    0%    67%
Pass Aplanarity   6.0     0%    60%
Pass MET/m_eff(Nj) 1.0     0%    17%
Pass m_eff(incl)  0.0     0%    0%
```

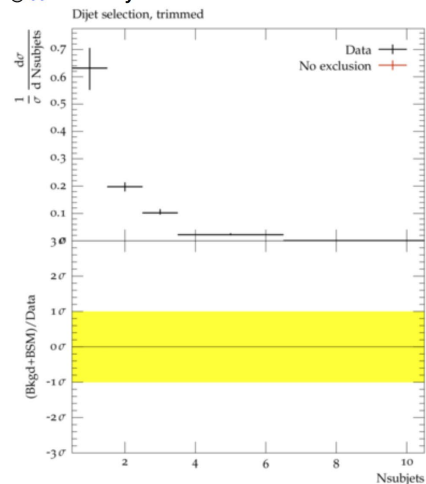
```
6jt cut-flow:
Count  A_cumu  A_incr
10000.0 100%    -
Pass Pre-sel+MET+pT1 105.0    1%    1%
Pass Njet           36.0    0%    34%
Pass Dphi_min(j,MET) 15.0    0%    42%
Pass pT2           15.0    0%    100%
Pass pT4           10.0    0%    67%
Pass Aplanarity     6.0    0%    60%
Pass MET/m_eff(Nj)  2.0    0%    33%
Pass m_eff(incl)    0.0    0%    0%
```

```
Rivet.Analysis.CMS_2019_I1753680:LMODE=EL: WARN Failed to scale histo=/CMS_2019_I1753680:LMODE=EL/d33-x01-y05[DYN_SCALE=1_MUF=0.5_MUR=0.5_PDF=247000_MERGING=0.000] in analysis: CMS_2019_I1753680:LMODE=EL (invalid scale factor = inf)
Rivet.Analysis.CMS_2019_I1753680:LMODE=MU: WARN Failed to scale histo=/CMS_2019_I1753680:LMODE=MU/d33-x01-y02[DYN_SCALE=1_MUF=0.5_MUR=0.5_PDF=247000_MERGING=0.000] in analysis: CMS_2019_I1753680:LMODE=MU (invalid scale factor = inf)
Rivet.Analysis.CMS_2019_I1753680:LMODE=MU: WARN Failed to scale histo=/CMS_2019_I1753680:LMODE=MU/d33-x01-y03[DYN_SCALE=1_MUF=0.5_MUR=0.5_PDF=247000_MERGING=0.000] in analysis: CMS_2019_I1753680:LMODE=MU (invalid scale factor = inf)
Rivet.Analysis.CMS_2019_I1753680:LMODE=MU: WARN Failed to scale histo=/CMS_2019_I1753680:LMODE=MU/d33-x01-y04[DYN_SCALE=1_MUF=0.5_MUR=0.5_PDF=247000_MERGING=0.000] in analysis: CMS_2019_I1753680:LMODE=MU (invalid scale factor = inf)
```

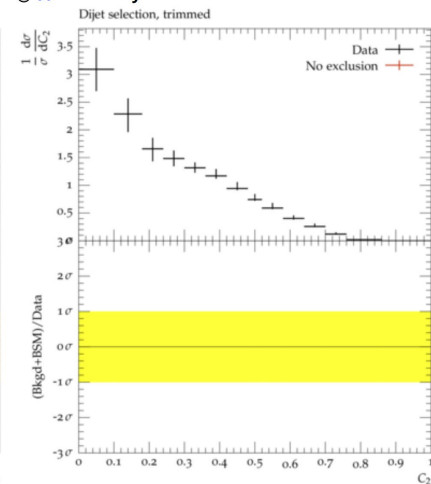
```
Rivet run completed at 2021-07-01 15:03:28, time elapsed = 0:25:54
Histograms written to /contur_tutorial/HI-tuto/mine/Rivet.yoda
```

```
contur-mkhtml Rivet.yoda
```

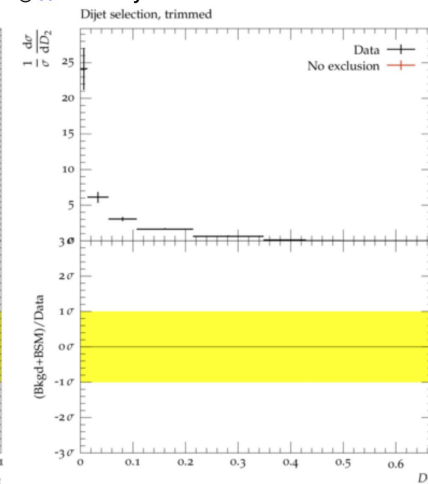
d01-x01-y01:



d02-x01-y01:



d03-x01-y01:



Back to Herwig

Finished installation at 7:51 today  

Create param_file.dat and modify LEP.in

```
[Run]
generator = "/afs/cern.ch/work/c/caiyi/contur/Herwig/bin/activate"
contur = "/afs/cern.ch/work/c/caiyi/contur/contur/setupContur.sh"
[Parameters]
[[a1]]
mode = LIN
start = -550000.0
stop = -350000.0
number = 10
[[x0]]
mode = LIN
start = 20.0
stop = 50.0
number = 6
[[sin]]
mode = CONST
value = -0.4
[[mh1]]
mode = CONST
value = 125
[[mh2]]
mode = LIN
start = 260
stop = 340
number = 4
[[ma]]
mode = CONST
value = 60
```

Installation Guide:

```
source /cvmfs/sft.cern.ch/lcg/views/setupViews.sh
LCG_100 x86_64-centos7-gcc9-opt
source /cvmfs/sft.cern.ch/lcg/releases/LCG_100/ROOT/\
v6.24.00/x86_64-centos7-gcc9-opt/ROOT-env.sh
wget https://herwig.hepforge.org/downloads/herwig-
bootstrap
chmod +x herwig-bootstrap
./herwig-bootstrap --without-hjets ${HERWIGPATH}
```

```
# -*- ThePEG-repository -*-
```

```
read snippets/PPCollider.in
```

```
read FRModel.model
```

```
set /Herwig/FRModel/Particles/H1:NominalMass {mh1}*GeV
```

```
set /Herwig/FRModel/Particles/h2:NominalMass {mh2}*GeV
```

```
set /Herwig/FRModel/Particles/~Ah:NominalMass {ma}*GeV
```

```
set /Herwig/FRModel/FRModel:a1 {a1}
```

```
set /Herwig/FRModel/FRModel:x0 {x0}
```

```
set /Herwig/FRModel/FRModel:SIN {sin}
```

```
set EventGenerator:EventHandler:Luminosity
```

```
set EventGenerator:NumberOfEvents 1000
```

Scan

```
contur-batch -p param_file.dat -b 13TeV -w 2:00 -B condor
```

Running...



Disk Quota Exceeded...

Fine 😊