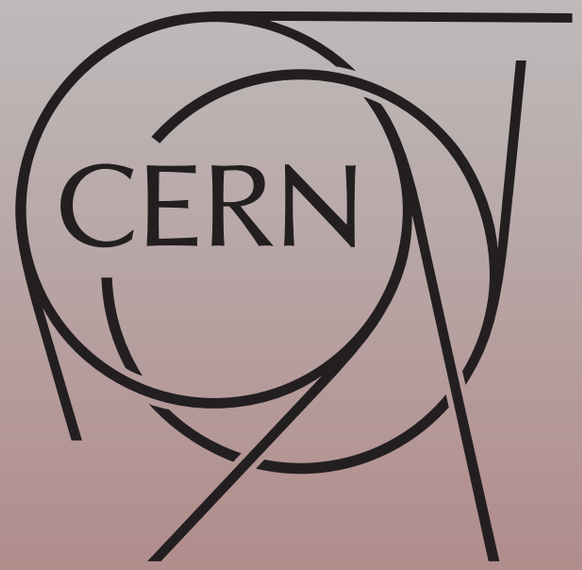

Employing an extended LHE 2.0 format in MadGraph5_aMC@NLO

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for MadGraph5_aMC@NLO & MadAnalysis5

CERN theory group (and IPHC Strasbourg)

Next steps in LHEF, LPCC CERN, October 25th 2013

Current status

- All based and compliant with LHEF v2.0
- Developed together with POWHEG
- Already implemented in MadGraph5_aMC@NLO since Jan 2013
- Automatic plotting (including e.g. scale uncertainty bands) with MadAnalysis5 on its way

HEADER

```
<header>
 ...

 <initrwgt>
  <weight id='1'> This is the original event weight </weight>
  <weightgroup type='scale_variation' combine='envelope'>
     <weight id='2'> muR=2.0 </weight>
     <weight id='3'> muR=0.5 </weight>
  </weightgroup>
   <weightgroup type="mrst2008e40" combine="hessian">
     <weight id='4'> set01 </weight>
     <weight id='5'> set02 </weight>
     ...
   </weightgroup>
  <weightgroup type='Qmatch_variation' combine='envelope'>
     <weight id='44'> Qmatch=20 </weight>
     <weight id='45'> Qmatch=40 </weight>
  </weightgroup>
  <weight id='46'> BSM benchmark point number 42B, see arXiv XXXX.XXXX </weight>
 </initrwgt>
...
</header>
```

Each event

```
<event id='evtid'>
7 100  0.10000000E+01  0.20000000E+00  0.00000000E+00  0.00000000E+00
 -2 -1  0  0 0 0  0.12699952E+01  0.55429630E+01  0.57634577E+02  0.57914435E+02  0.000(
  2 -1  0  0 0 0 -0.91353745E+00  0.13160013E+01 -0.34965448E+02  0.35002128E+02  0.000(
 23  2  1  1 0 0  0.35645919E+00  0.68589662E+01  0.22669189E+02  0.92916566E+02  0.898(
-13  2  3  3 0 0  0.51612833E+01  0.21143065E+02  0.53960893E+02  0.58184682E+02  0.105(
 13  2  3  3 0 0 -0.48048241E+01 -0.14284099E+02 -0.31291705E+02  0.34731884E+02  0.105(
 <rwgt>
  <wgt id='1'> 1.001e+00 </wgt>
  <wgt id='2'> 0.204e+00 </wgt>
  <wgt id='3'> 1.564e+00 </wgt>
  <wgt id='4'> 2.248e+00 </wgt>
  <wgt id='5'> 1.486e+00 </wgt>
  ...
  <wgt id='46'> -0.899e+00 </wgt>
 </rwgt>
</event>
```

POSITIVE POINTS

- Human readable
- Flexible (no ordering, XML-like)
- Weightgroups (including information on combinations)
- Reasonable file size when g'zipped
- Format is suitable for BSM and parameter scans

Negative points

- Maybe not so well suited for HepMC
  - but simple solution to concatenate the names of the weights, e.g., with '&&' tags between weightgroup, weightID etc.

LHEF v3

- Previous was all compliant with LHEF v2.0
- Possible improvements for LHEF v3 that would be useful are:
  - Separate starting scale setting for each leg/dipole (SCALUP should become an array)
  - ...