The `POWHEG-BOX-HJJ` manual

1 Introduction

The `POWHEG-BOX-HJ` program generates Higgs plus jet production in hadronic collisions, and is described in ref. [1]. Here we document its usage.

2 Generation of events

Do
```
$ cd POWHEG-BOX/HJJ
$ make pwhg_main
```
Then do (for example)
```
$ cd testrun-lhc
$ ../pwhg_main
```
At the end of the run, the file `pwgevents.lhe` will contain events for $H + \text{jet}$ production in the Les Houches format. In order to shower them with `PYTHIA`:
```
$ cd POWHEG-BOX/HJJ
$ make main-PYTHIA-lhef
$ cd test
$ ../main-PYTHIA-lhef
```

Input parameters

Parameters in `powheg.input` that are specific to `HJJ`:
```
hmass 120           !  Higgs mass in GeV
hwidth 5.753e-3     !  Higgs width in GeV
runningscales 0     !  (default 0), if 0 use hmass as central
                    !  factorization and renormalization scale;
                    !  if 1 use the hat Ht scale (see eq.  (5.1) in
                    !  ref.  [1])
bwcutoff    15      !  Higgs Breit-Wigner is probed between hmass +- 15*hwidth
higgsfixedwidth 1   !  (default 0), If 1 uses standard, fixed width Breith-Wigner
                    !  formula, if 0 it uses the running width Breit-Wigner
#ckkwscalup 1       !  (default 1), compute the scalup scale for subsequent
                    !  shower using the smallest kt in the final state;
                    !  If 0, use the standard POWHEG BOX scalup (see section 5.3
                    !  of ref [1] for details)
withnegweights 1    !  Default 0; include negative weighted events
```

In this program, at variance with the `HJ` generator, there is no option for the generation of unweighted events. One must therefore use a Born suppression factor. Generation cuts may be introduced by suitably modifying the suppression factor. We may introduce this possibility in the future depending upon user's requests.

The Born suppression factor can be modified by editing the `born_suppression` routine in the `Born_phsp.f` file. Its default form is given in formula (4.6) of ref. [1].

In the directory `POWHEG-BOX/HJJ/testparallel-lhc` a simple setup for a parallel run of the generator can be found. On a many-cpu machine, one can execute the parallel runs by executing the shell script `run`. This scripted can be adapted for more complex batch machines.

Bibliography

[1] J. Campbell, R. K. Ellis, R. Frederix, P. Nason, C. Oleari, and C. Williams.