

The POWHEG-BOX-HJ 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/HJ
```

```
$ 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/HJ
```

```
$ make main-PYTHIA-lhef
```

```
$ cd test
```

```
$ ../main-PYTHIA-lhef
```

Input parameters

Parameters in `powheg.input` that are specific to HJ:

```
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 Higgs transverse momentum in the
                  ! underlying Born kinematics
bwcutoff 15        ! Higgs Breit-Wigner is probed between hmass +/- 15*hwidth
higgsfixedwidth 1  ! (default 0), If 1 uses standard, fixed width Breit-Wigner
                  ! formula, if 0 it uses the running width Breit-Wigner
#bornktmin 5       ! (default 0), generation cut: minimum transverse momentum
                  ! of the Higgs at the underlying Born level.
#bornsuppfact 1    ! (default 1), If 1 the Born suppression factor is included.
                  ! Weighted events are generated. If 0 no suppression
                  ! factor is included, and events are unweighted. A
                  ! generation cut bornktmin>0 must be supplied in this case
#ckkwscalup 1     ! (default 1), If 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; If 1 include negative weighted events
```

For the use of the `bornktmin` and of the `bornsuppfact`, consult the general POWHEG BOX manual in the `POWHEG-BOX/Docs` directory. By default, the program uses a Born suppression factor and no generation cuts, and it thus produces weighted (possibly signed) events. By setting `bornsuppfact` to 0 and `bornktmin` to a value larger than zero, unweighted events are generated, but one should make sure that the results are insensitive to a decrease of `bornktmin`.

The Born suppression factor can be modified by editing the `born_suppression` routine in the `Born_phsf.f` file. At the moment it is given by $p_T^2/(p_T^2 + p_{\min}^2)$, with $p_{\min} = 20$ GeV.

Bibliography

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