MadGraph school 2013
SHERPA Tutorial: h+jets

1 Running the example set-up

This is an example for a merged sample for Higgs production in association with up to 2 jets, where 0 and 1 jets are simulated at NLO accuracy and the second jet is simulated at LO. The loop matrix element for $pp \to h + X$ and $pp \to h + j + X$ are included in SHERPA.

SHERPA has been installed in the tutorial directory on your virtual machine. Please execute the following shell command to set the relevant environment variables

```
. /home/sluser/Sherpa/env.sh
```

The change to the tutorial directory

```
cd /home/sluser/Sherpa/tutorials/mepsatnlo/
```

In the first run, Sherpa will generate process-specific source code necessary for the computation of the tree-level matrix elements and for the NLO subtraction terms. This is done one multiplicity at a time, hence you will execute the following commands

```
Sherpa
./makelibs
Sherpa
./makelibs
...
```

The last step (run Sherpa and makelibs) has to be repeated for every jet multiplicity (in this case 2) at NLO and for each process (in this case just one: $pp \to h + X$ and $pp \to h + j + X$).
Once the process-specific libraries exist, the individual cross sections can be computed and event generation can be started. This is done by simply running Sherpa again:

```
Sherpa -e100k
```

In this example the events are analysed with Sherpa's internal analysis package. Using the commandline option `-e100k` we require 100000 events. If more events are needed just run the above command with an increased number. The cross-sections have been stored and do not need to be recomputed, such that event generation begins right away.
We generate plots from the analysis output using a gnuplot script

```
./plot_results.sh
gv plots.ps
```

2 Proposals for variations

Now you can either run one of the other example set-ups, or try some variations of this one. As the integration for higher multiplicity processes takes rather long, it is advisable to try only variations that do not require recomputation of cross sections for the moment. Here are a few suggestions:

- Vary the number of jets that are computed at NLO by varying the `LJET` tag in the run card. `LJET=0` corresponds to MePs@Lo, `LJET=1` to MeNloPs.
- Vary the number of jets that are computed at LO by varying the `NJET` tag in the runcard. Depending on the setting of `LJET`, `NJET=0` will either produce an Mc@Nlo or a parton-shower result.
- Vary the scales (when generating weighted events this does not require recomputation of the cross sections).
- Switch on hadronization and/or underlying event.