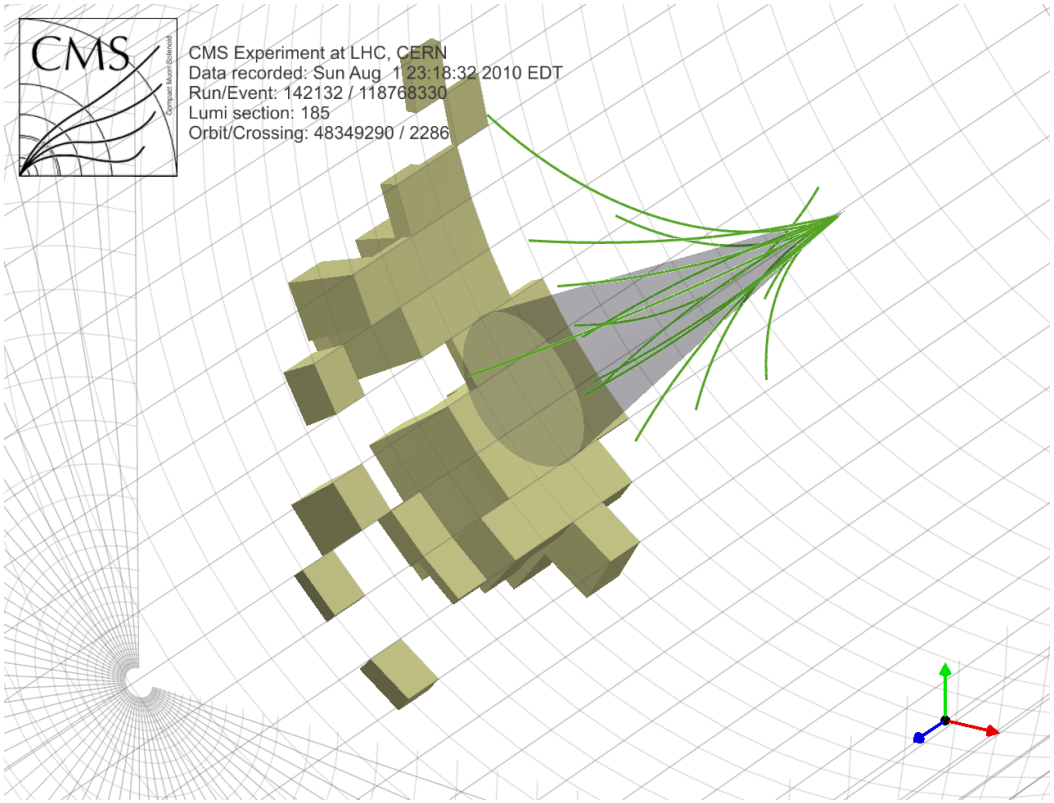
Tutorial category: Normal mode

MadAnalysis 5 + FastJet



Version 1.0

Date 24/07/2016

Official MadAnalysis 5 website : https://launchpad.net/madanalysis5/

Goals of this tutorial

- Installing the FastJet package in MadAnalysis 5
- Applying a jet-clustering algorithm on the top of the events before analysis them.
- Saving the processed events into a file
- Producing the ME/PS merging validation plots.

Requirements

- MadAnalysis 5 is installed on your system and has been launched successfully at least one time. The collection of example samples is installed too.

- Knowledge of the MadAnalysis 5 main concepts (see tutorials for beginners).


Let's start!

Part 1

Applying a jet-clustering algorithm

Installation of FastJet

It could be installed in a easy way by using the MadAnalysis console:

```
ma5> install fastjet
```

The last release of FastJetContrib will be also installed.

Launching MadAnalysis in reconstruction-level mode

For using FastJet, you should launch MadAnalysis with the –R argument.

```
bash> ./bin/ma5 -R
```

Setting the jet-clustering algorithm

- Large selection of jet algorithms

```
ma5>  set  main.clustering.algorithm  =
         antikt              cdfjetclu           genkt     kt
         cambridge           cdfmidpoint         gridjet    siscone
```

- Adopting a jet algorithm → new options appear corresponding to algorithm & object-identification parameters

```
ma5>  set  main.clustering.algorithm  =  antikt
ma5>  set  main.clustering.ptmin   =  5
ma5>  set  main.clustering.radius  =  1
ma5>  set  main.clustering.bjet.efficiency  =  0.5
```

- Possibility to save the clustered events in to a "simplified" LHE

```
ma5>  set  main.outputfile = mysample.lhe.gz
```

Part 2

ME/PS merging validation plots

ME/PS merging validation plots

Matrix elements
hard partons

2 complementary approaches

Need to merge them
but avoid double counting.

Parton showers
soft partons

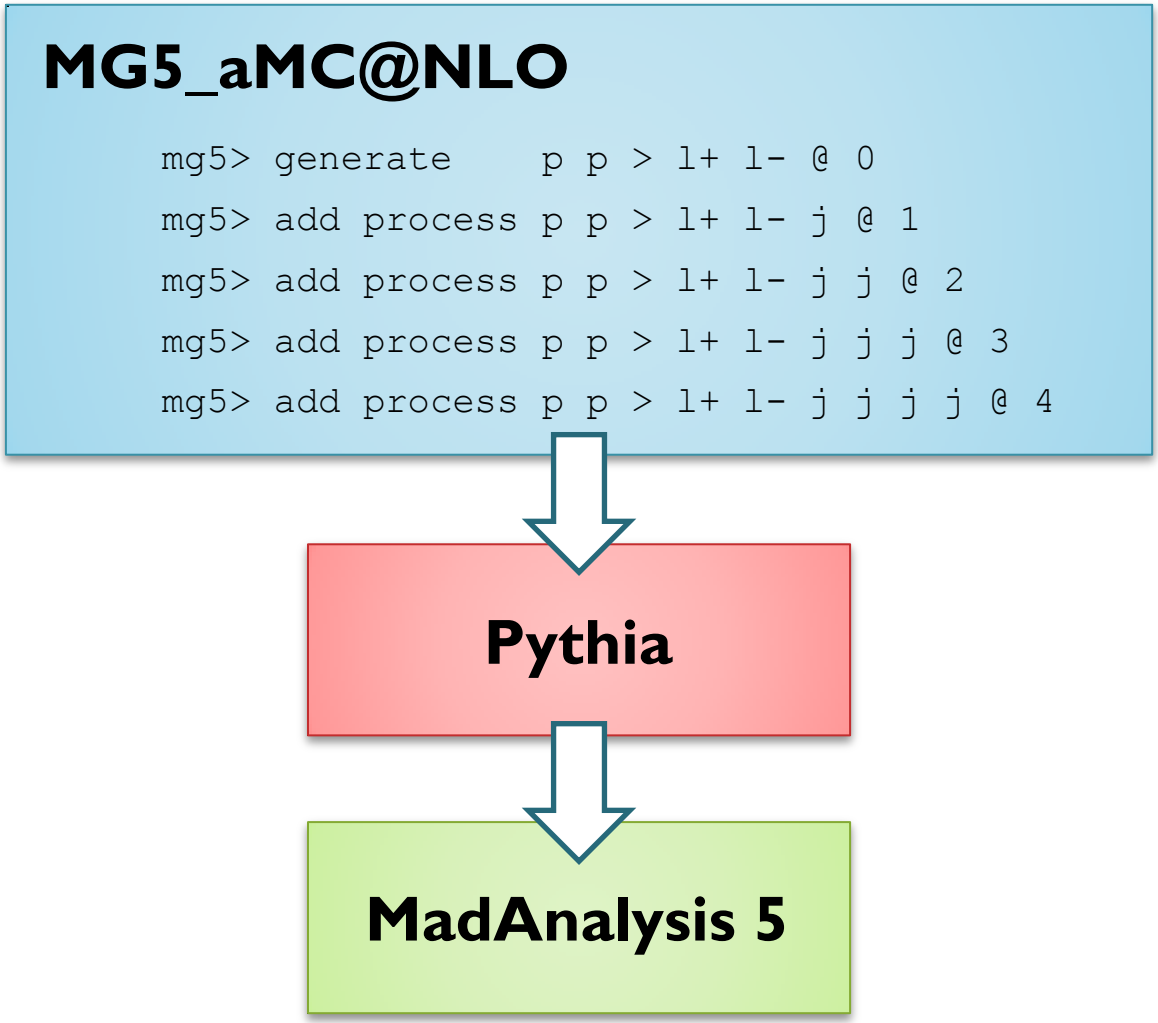
- **Merging matrix-elements with 0, 1, 2, 3, …. extra jets**
  - Study of the smoothness of the differential jet rate (DJR) distributions.
    - The scale for which an event goes from a N → N+1 jet configuration.
    - Extremely sensible to the merging procedure.
  - This validates the choices for the merging parameters.

- **Running MadAnalysis 5 in reconstruction-level mode: bin/ma5 -R**

```
ma5> set  main.merging.check  =  true
ma5> set  main.merging.njets  =  4
```

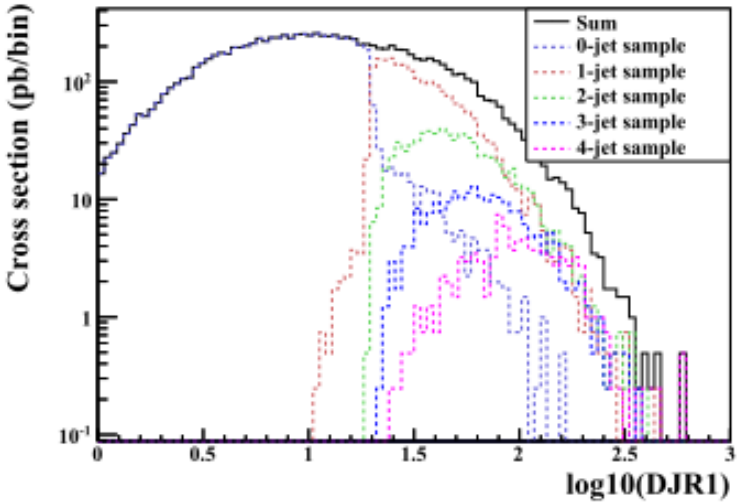
ME/PS merging validation plots

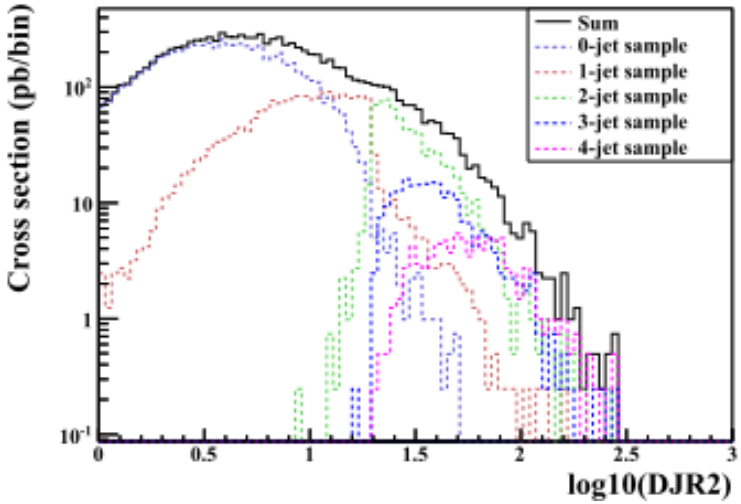
Example: drell-yan production with MG5_aMC@NLO

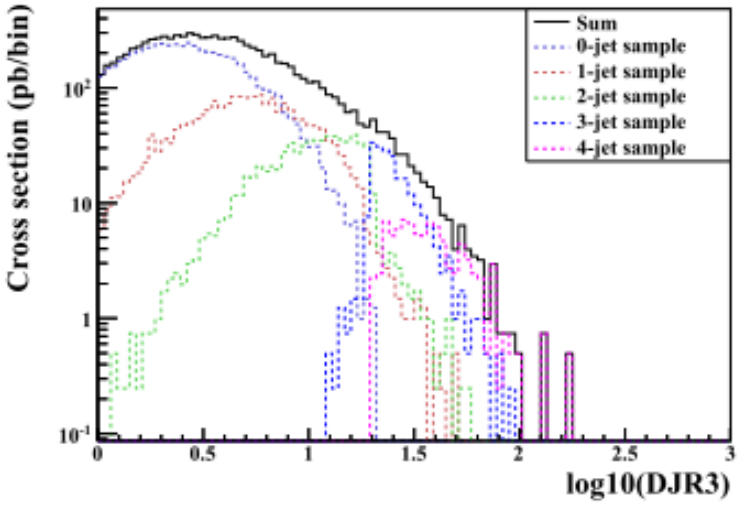


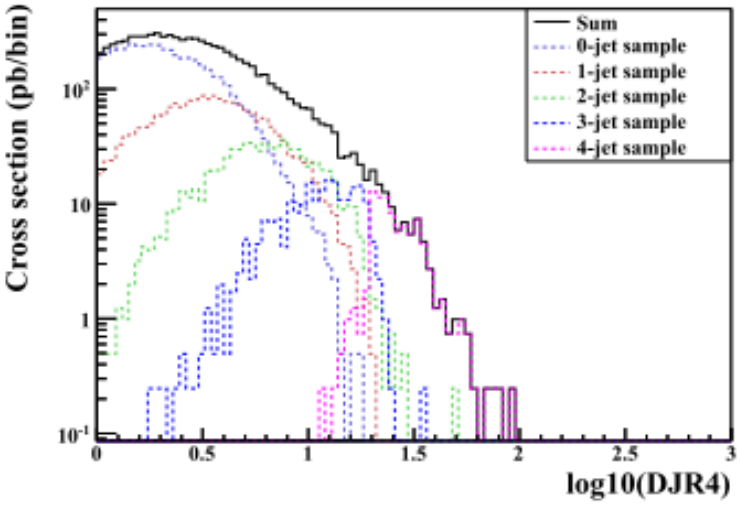
ME/PS merging validation plots

Drell-yan production with 0, 1, 2, 3, 4 extra jets










GREAT!
JOB!

About this document

- The present document is a part of the tutorial collection of the package MadAnalysis 5 (MA5 in abbreviated form). It has to be conceived to explain in a practical and graphical way the functionalities and the various options available in the last public release of MA5.

- The up-to-date version of this document, also the complete collection of tutorials, can be found on the MadAnalysis 5 website :

  https://madanalysis.irmp.ucl.ac.be/wiki/tutorials

- Your feedback interests ourselves (bug reports, questions, comments, suggestions). You can contact the MadAnalysis 5 team by the email address : ma5team@iphc.cnrs.fr

Change log

Version	Date	Update
1.0	23/07/2016	First release