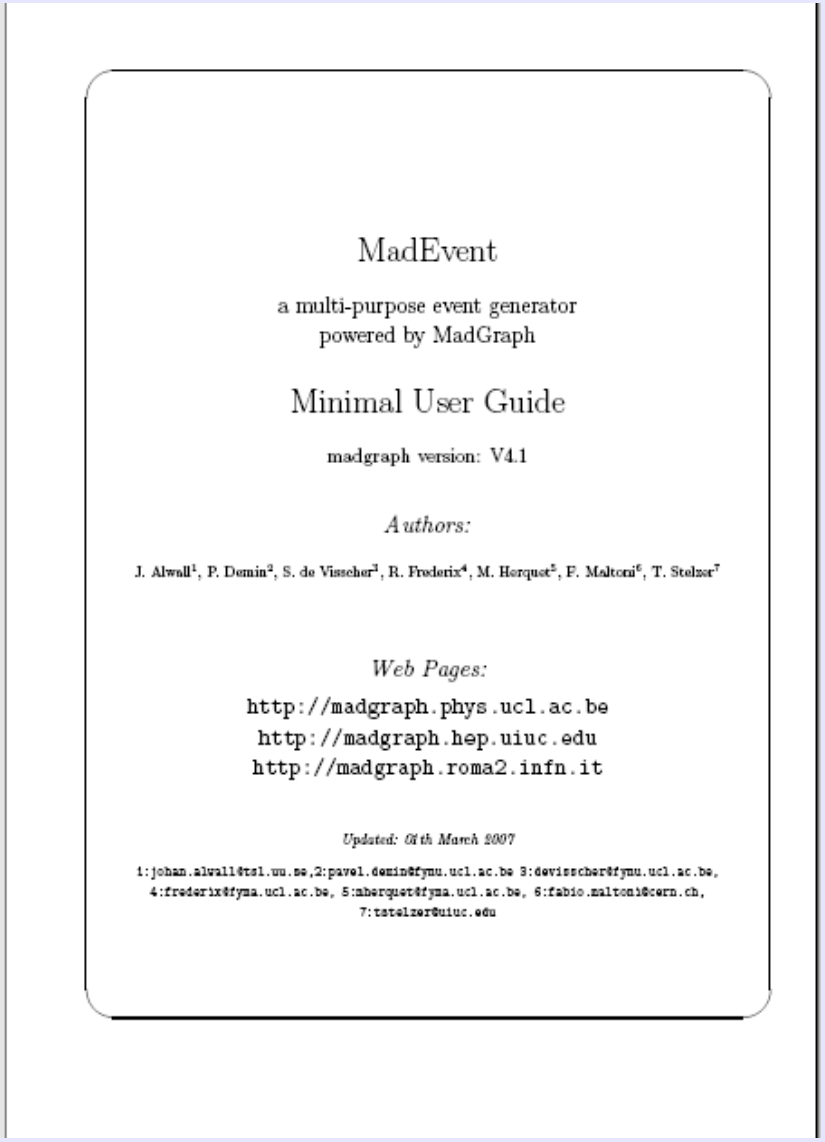
THE MADGRAPH HOMEPAGES:

http://madgraph.hep.uiuc.edu/
http://madgraph.phys.ucl.ac.be/
http://madgraph.roma2.infn.it/

I have been using the first one, but right now their server is down. We try today with the one in Belgium:
http://madgraph.phys.ucl.ac.be/

You need to register, you will get a password delivered fairly right away to your mailbox.

Then we go.....



MadEvent

a multi-purpose event generator
powered by MadGraph

Minimal User Guide

madgraph version: V4.1

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Web Pages:

http://madgraph.phys.ucl.ac.be
http://madgraph.hep.uiuc.edu
http://madgraph.roma2.infn.it

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MadGraph

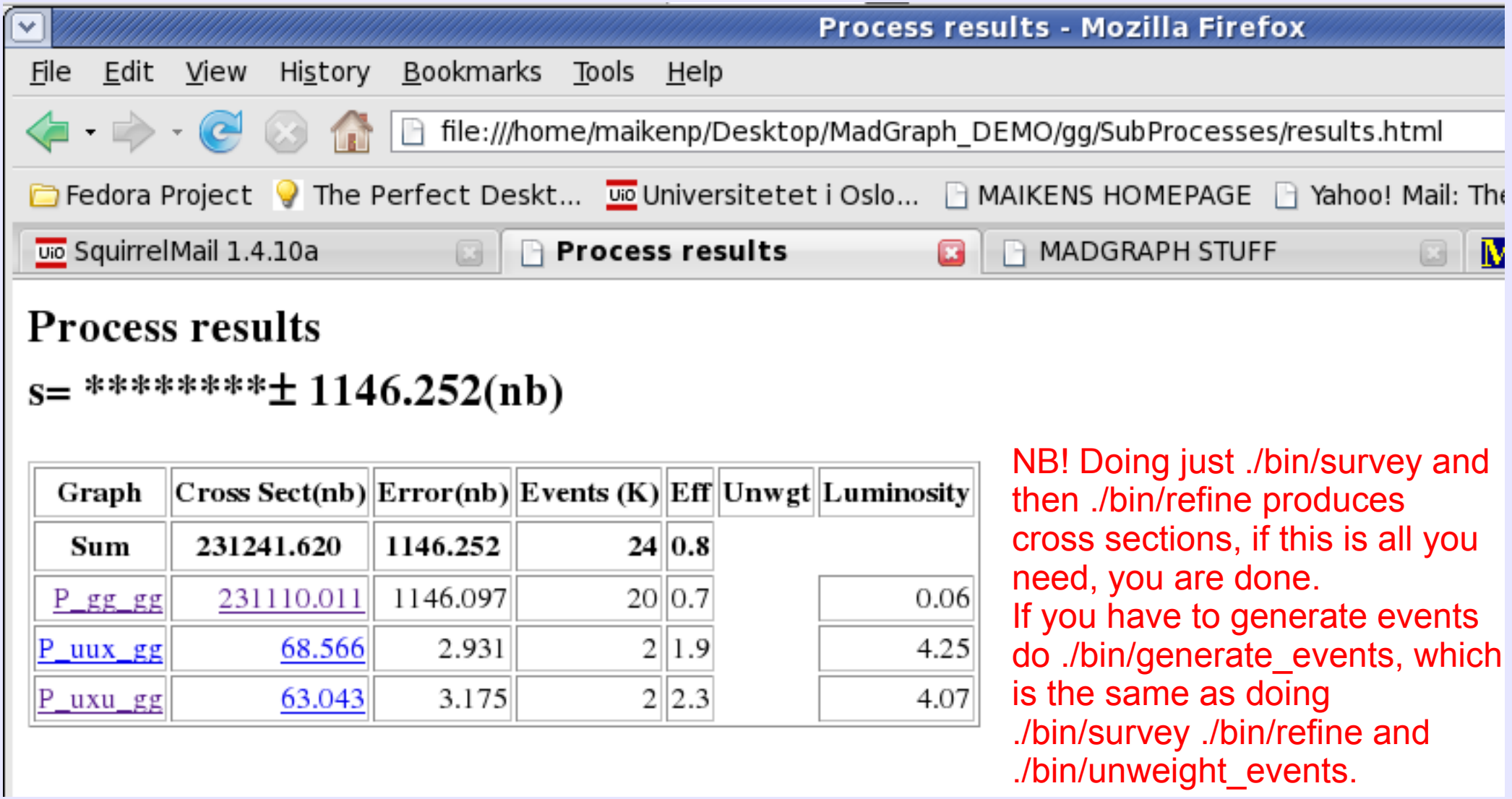
Get going with the manual right away! It can save you an awful lot of time... for example save you plotting 500 possible combinations of processes by hand!

A first example

- Create a SM process. Let two protons collide, and see what kind of combinations are possible for production of two gluons
  - Click **Generate Process**
  - pp>gg
- When the processing is finished click on **Process information** and look at the nice Feynman Diagrams!

- This is all you've got so far.
- Now you need to download the code to do your crossection calculations. This you do on your local machine
  - Click on **Download Code** and save the tar file in an unused directory, f.ex gluongluon
  - tar -zxvf madevent.tar.gz
- For calculating cross sections do in your gluongluon directory:
  - **./bin/survey**
  - **./bin/refine**
- All you need to have is a Fortran compiler, then it should work right out of the box :)

- For generating actual events do:
  - **./bin/generate_events**
- Look at the results in a browser ctrl+o (open file) go to your gluongluon/SubProsesses open the file results.html



Process results

s= ******± 1146.252(nb)**

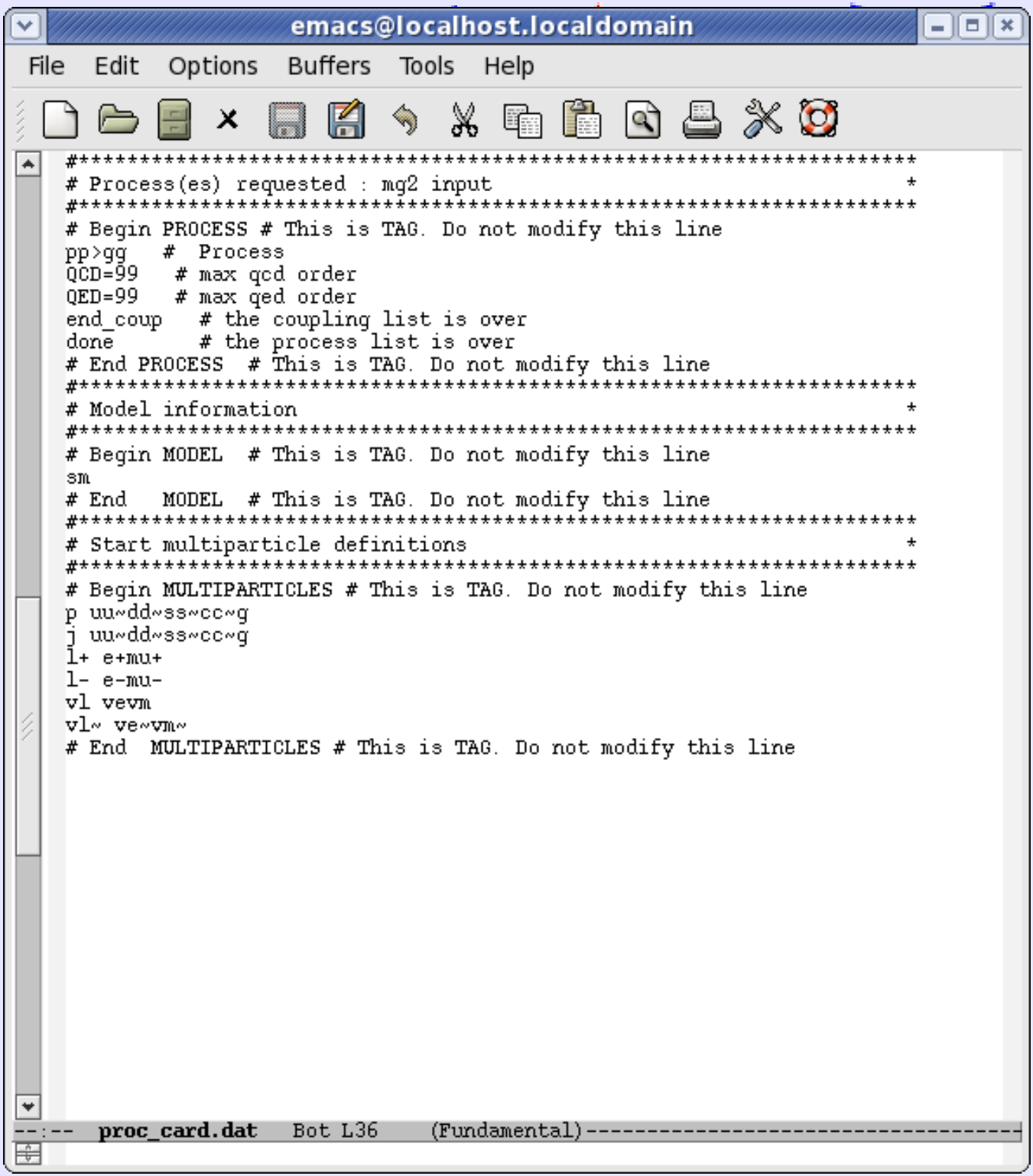
Graph	Cross Sect(nb)	Error(nb)	Events (K)	Eff	Unwgt	Luminosity
Sum	231241.620	1146.252	24	0.8		
P_gg_gg	231110.011	1146.097	20	0.7		0.06
P_uux_gg	68.566	2.931	2	1.9		4.25
P_uxu_gg	63.043	3.175	2	2.3		4.07

NB! Doing just ./bin/survey and then ./bin/refine produces cross sections, if this is all you need, you are done.
If you have to generate events do ./bin/generate_events, which is the same as doing ./bin/survey ./bin/refine and ./bin/unweight_events.

- Exclude intermediate particles by /w+
  - uu~>dd~/w+
- Require intermediate particle by >w+>
  - pp>w+>l+vl+jj
- You can do things like:
  - gg>t~t>b~be+e-ve~ve

Using Cards

- The Cards folder contains files that control the run, the physics model you want to use, and also the processes you want to calculate.
  - run_card.dat
  - proc_card.dat
  - param_card.dat
- You can modify the two first cards as you want, but the last should be generated through a calculator.



Create your own model dependent parameter card

- Use MadGraphs parameter calculator:
  - Click on **Tools** on the main MadGraph home page
  - Choose **Calculators**, and click on the relevant model, here: SUSY!
  - Click on **spectrum generator** (if you don't want to use one of the SPS points already available)
  - Input the parameter values you want
  - Download the produced files
  - Input one of these in the MadEvent parameter card calculator (MadEvent needs to derive its own card from the files that are produced by the spectrum generators, the Les Houches files)
  - **Send**

- Now you have a param_card.dat file that MadEvent uses to calculate crossections for exactly your model f.ex. mSUGRA bulk region point.
- Copy this into the Cards folder and call it param_card.dat
- Generate events by ./bin/generate_events or
- Make your own process card also.....------>

See a complete example of a process card at http://folk.uio.no/maikenp/MadGraph/madgraph.html


```
pp > S1S2 @6 # Process
QCD=2 # max qcd order
QED=0 # max qed order
end_coup # the coupling list is over
done # the process list is over
```

Extract of a process card that produces squark-gluino pairs in all kinds of combinations...

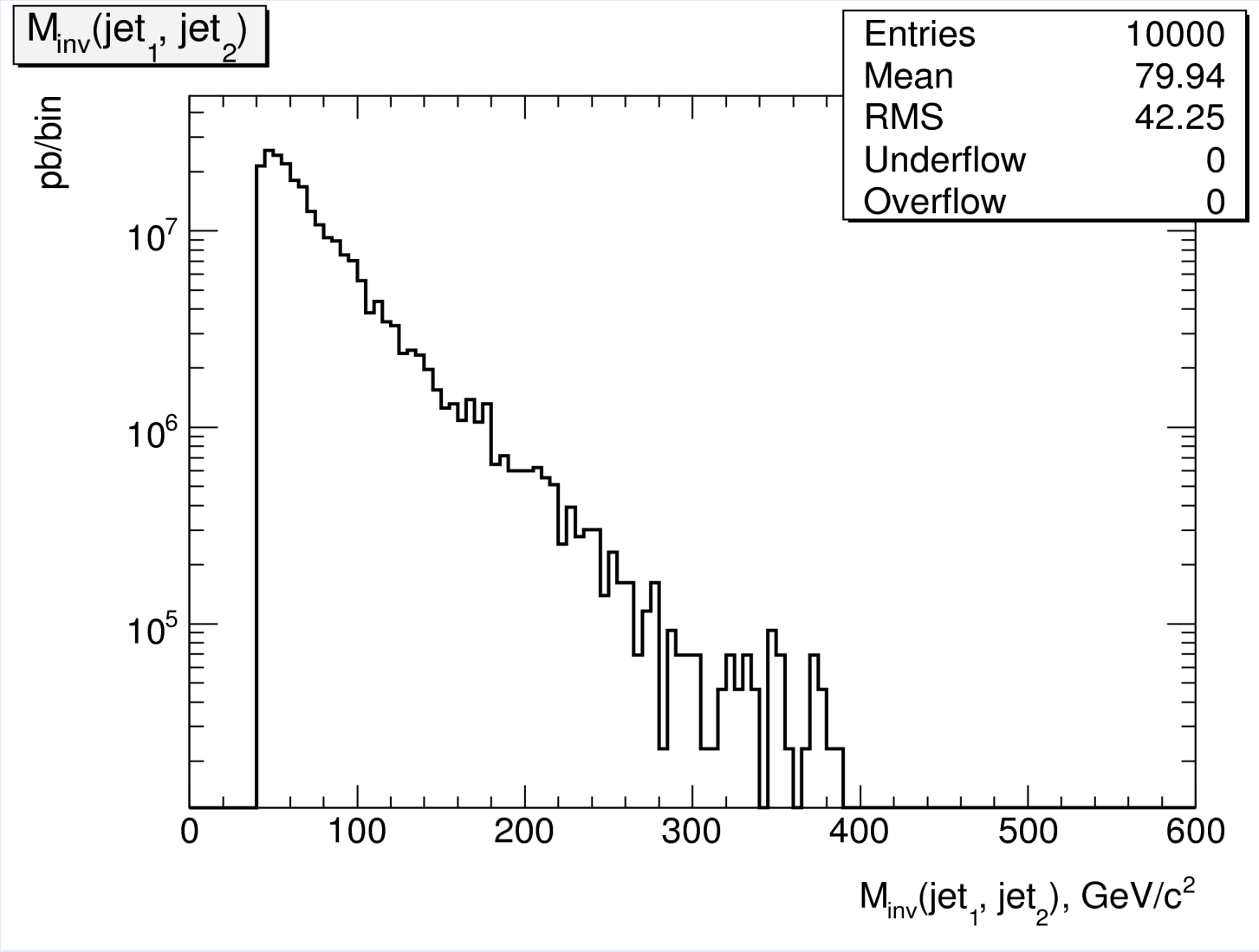
```
# End PROCESS # This is TAG. Do not modify this line
# Begin MODEL # This is TAG. Do not modify this line
mssm
# End MODEL # This is TAG. Do not modify this line
# Begin MULTIPARTICLES # This is TAG. Do not modify this line
p uu~dd~ss~cc~bb~g
S1 ulul~urur~dldl~drdr~slsl~srsr~clcl~crcr~
S2 b1b1~b2b2~t1t1~t2t2~

# End MULTIPARTICLES # This is TAG. Do not modify this line
```

- Generate events using your own process cards!
- Choose possibility

  II. Upload the proc_card.dat
- **Send**
- **Download the result**
- **Generate events** (also using your own param_card.dat)

Plotting in MadGraph

- You can create root files through MadGraph. For this you have to generate events i.e. process the events with ./bin/generate_events
- Click **Tools**
- Choose **Plotting Interface (ExRootAnalysis)**
- In your Cards folder you will find a file
  - plot_card.dat
- In Events you find a lhc file
  - 1_unweighted_events.lhe.gz
- Upload these 2 files and submit/Plot


$M_{inv}(jet_1, jet_2)$
Entries 10000
Mean 79.94
RMS 42.25
Underflow 0
Overflow 0
pb/bin
10^7
10^6
10^5
0
100
200
300
400
500
600
$M_{inv}(jet_1, jet_2)$, GeV/c^2

- Many more possibilities....
- Explore.....