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ExHuME: An Exclusive Monte Carlo

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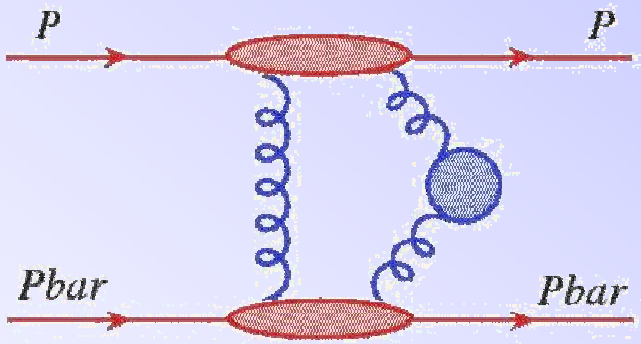
What ExHuME Simulates:

- ExHuME is a Monte Carlo generator that implements the KMR Durham model for exclusive diffraction (hep-ph 0111078)



Unintegrated gluon

$$L = \left(\frac{\pi}{8b} \int \frac{dQ_t^2}{Q_t^4} f_g\left(x_1, x_1', Q_t, \mu^2\right) f_g\left(x_2, x_2', Q_t, \mu^2\right) \right)^2$$

Survival factor

t dependence

Hard Scale

How it Works

- Calculates the differential luminosity and central cross section separately.
- Card file passed as argument.
- C++ nature of ExHuME makes it #easy# for the user to add any new processes.
- Simply create a class that inherits from the general cross section class, which calculates the luminosity
- If you can calculate glu glu ->small pink hedgehogs then you can add it to ExHuME
- Uses Hdecay for Higgs width and Pythia for hadronisation

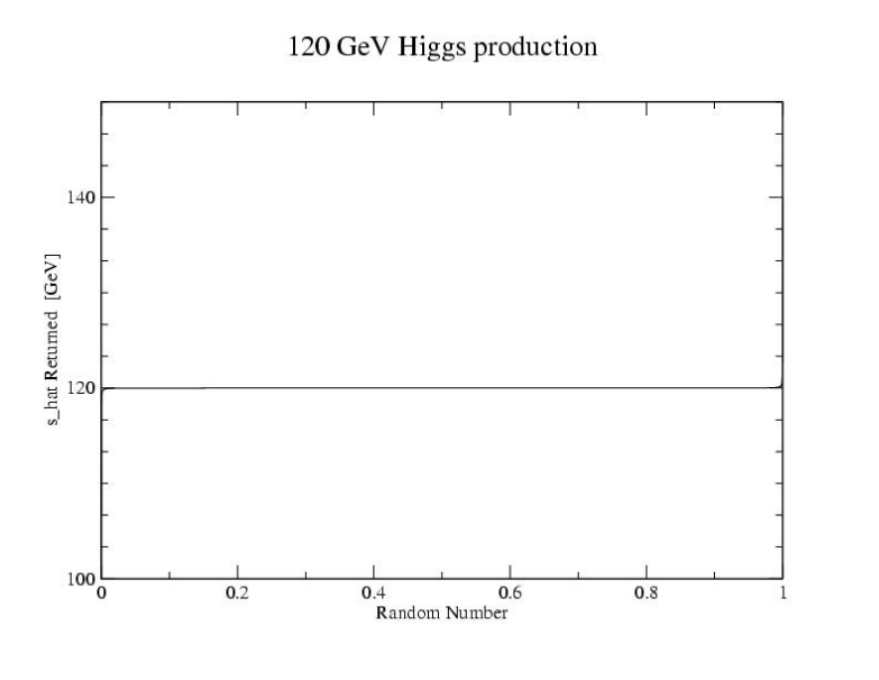
ExHuME weights its events…

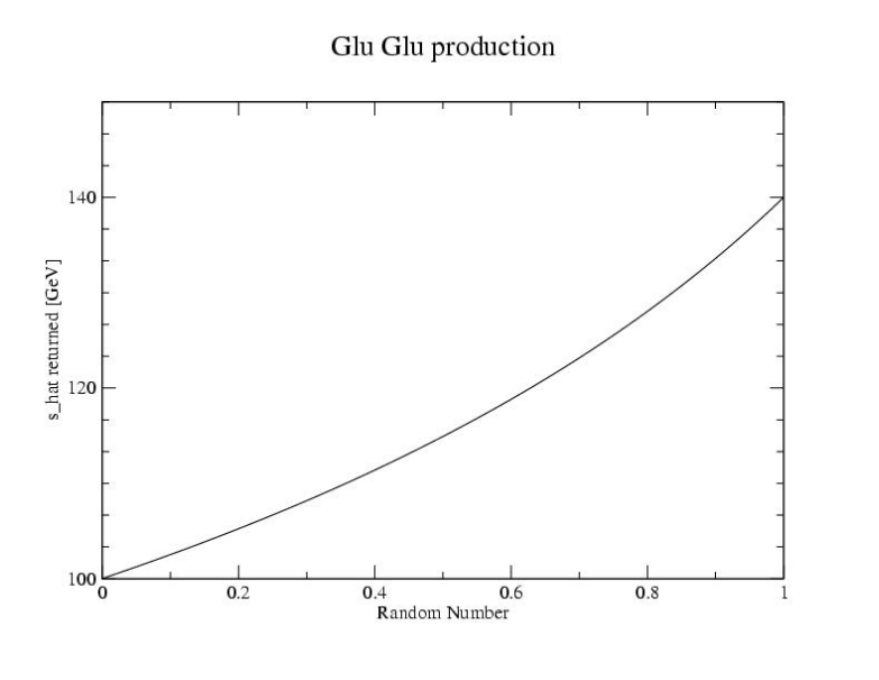
- Before generating any events ExHuME samples points and makes a linear fit to the differential cross section.
- Integrates over this and puts the results in a map.
- Makes several iterations (3) so that the points it samples are themselves weighted.
- Ends up with a C++ map mapping the range {0,1} to some kinematic variable (usually mass, could be anything).
- Updates itself as needed during event generation.
- Because of this can only calculate cross section once event generation has ended (instead of averaging as we go along)
- General method to weight events - very nice and efficient

For example have obtained >60 % efficiency in Higgs production (Pomwig 2% ??)

If generalised it to 2D hope to approach 100% efficiency!

Event Weighting

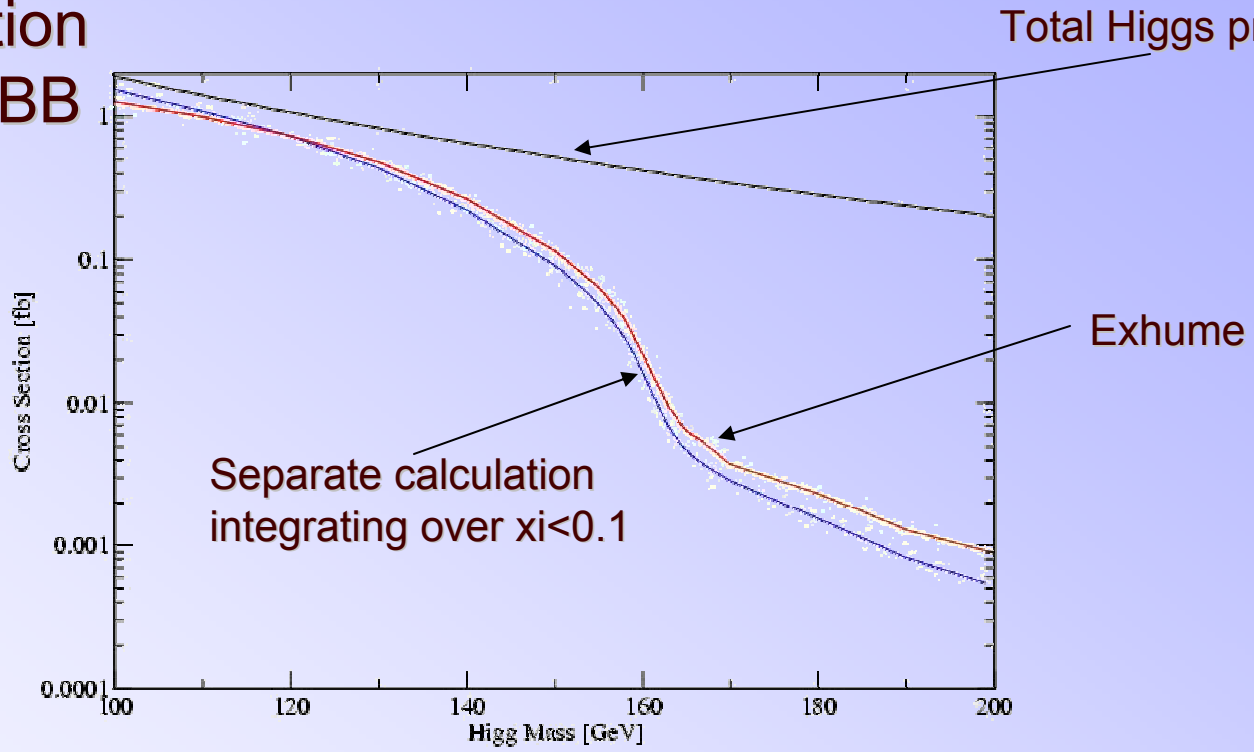




Uses the same numerical function to weight both types of event automatically

The Monte Carlo Matches Theory.

Higgs Production and Decay to BB



Differences due to branching ratio calculation and kinematic ranges

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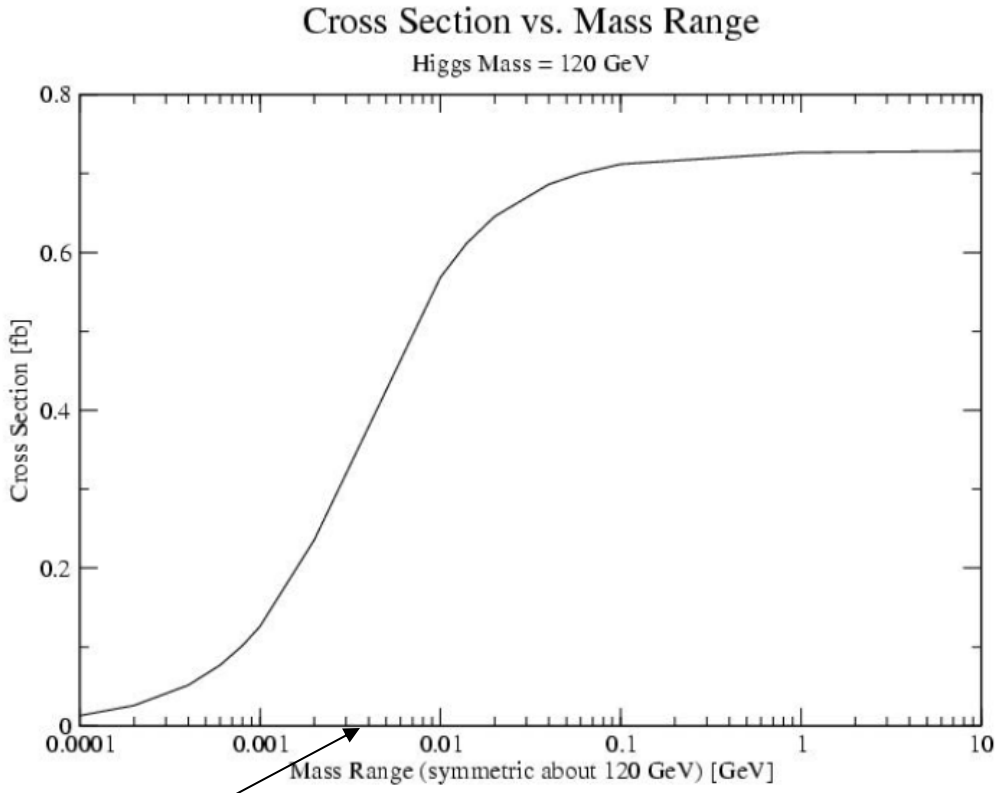
Falls Off correctly with Mass Range:



S.M. Higgs width = 0.0036 GeV

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Work in Progress:

- Currently uses CERN libraries. Want to update to use LHAPDF.
- Allows the user to set an Et range and a mass range. They are not independent and the user could do something stupid. For this reason we have not released GluGlu and qq yet
- We have a version that is 10x faster. Still working on this.
- Higgs decay to WW
- Supercemmetry Higgs

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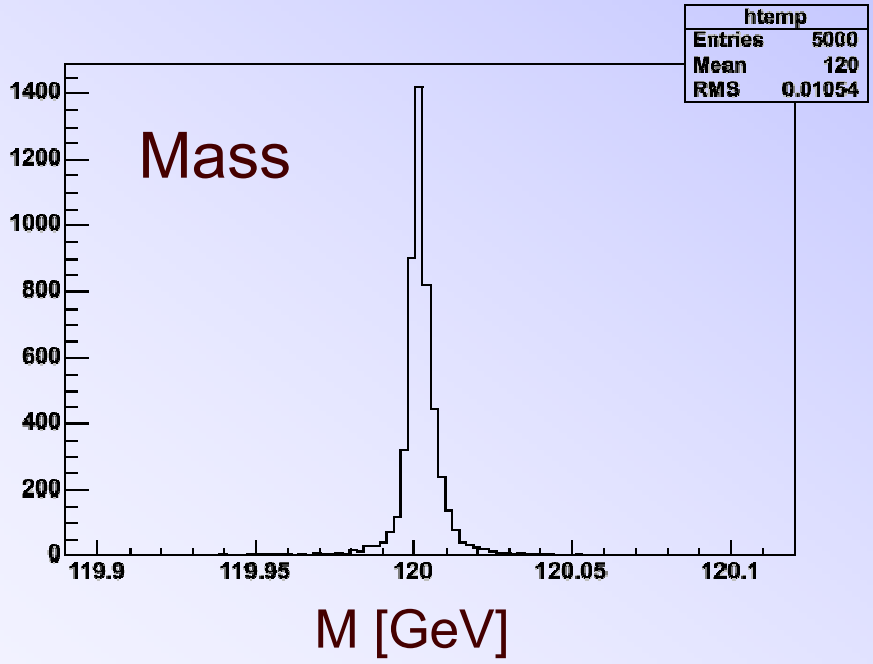
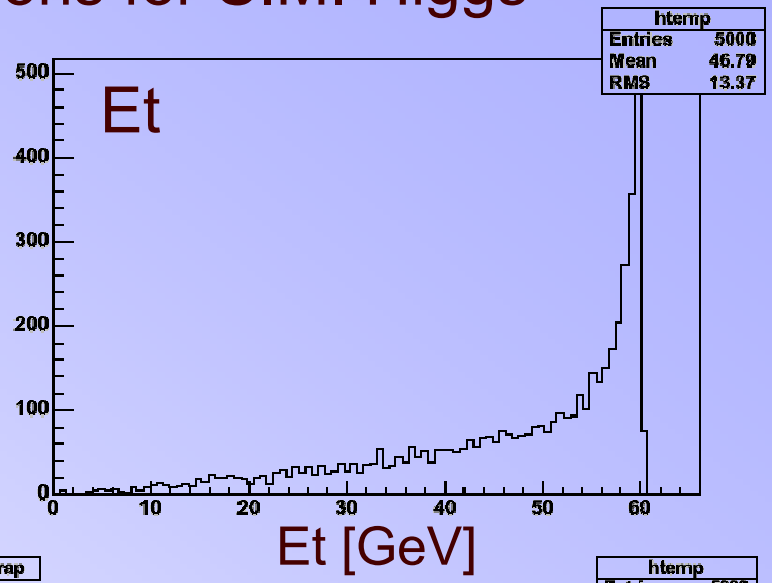
Distributions

Mass and Rapidty Distributions for S.M. Higgs





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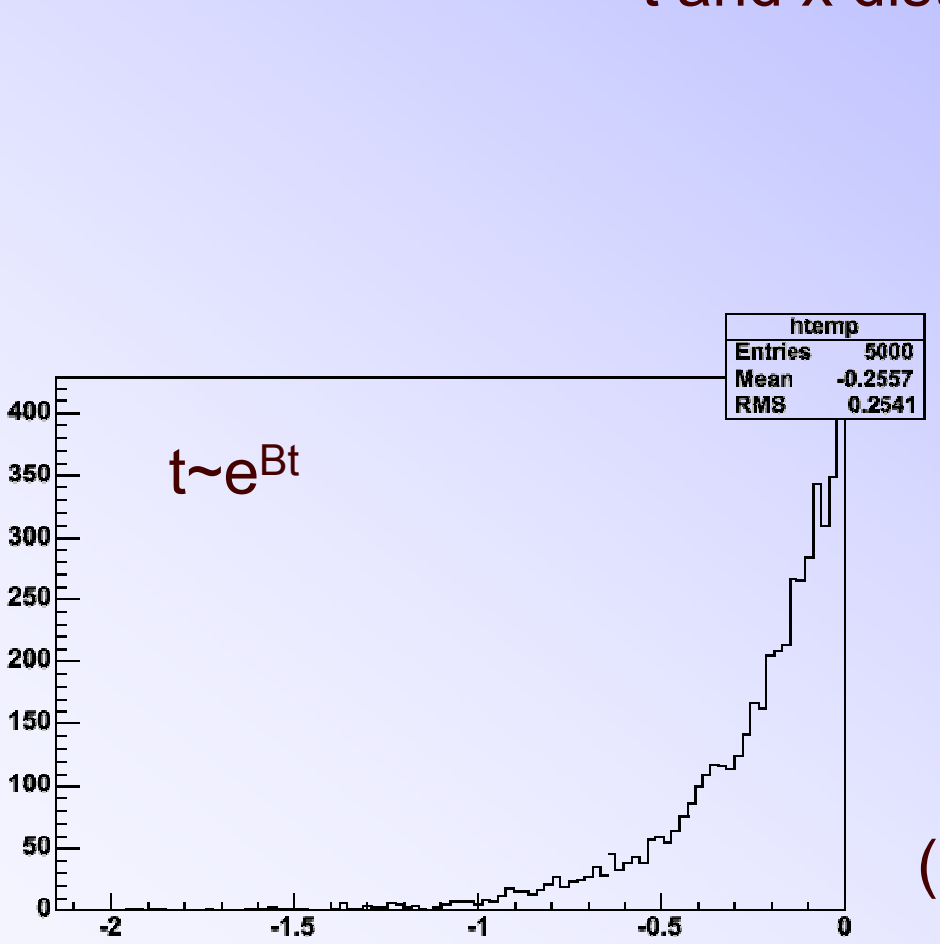
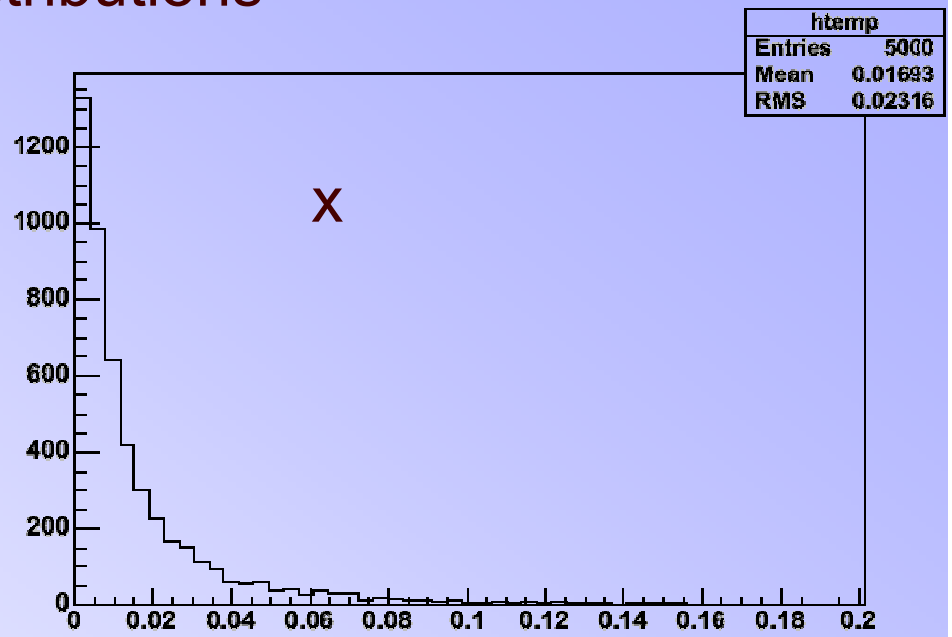
t and x distributions





(B = 4 GeV^2)

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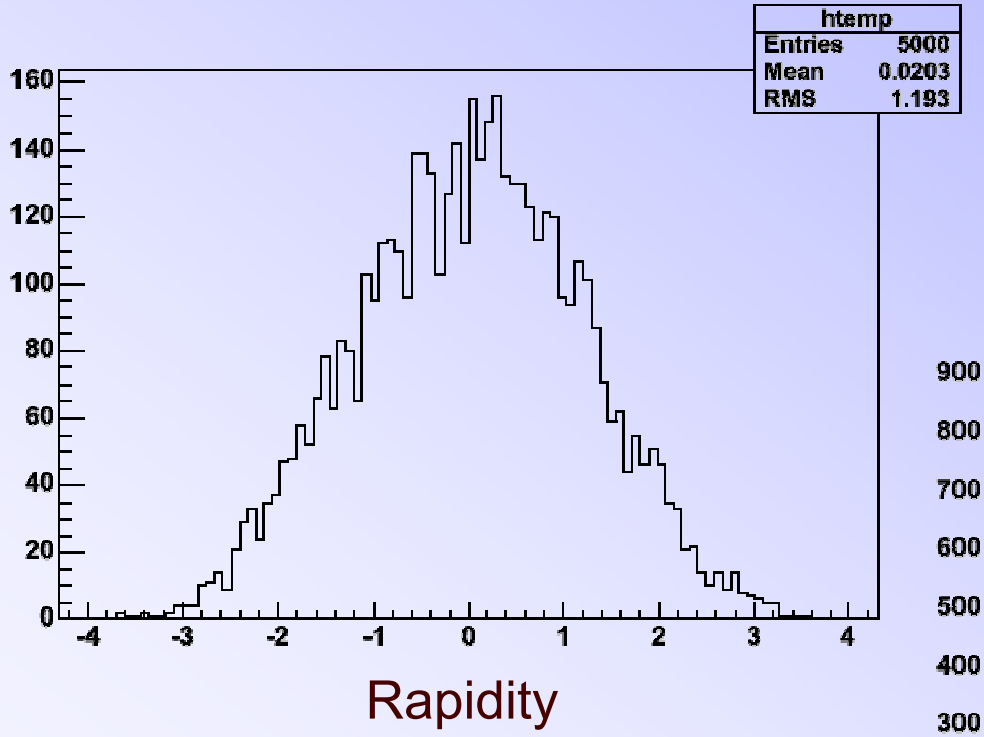
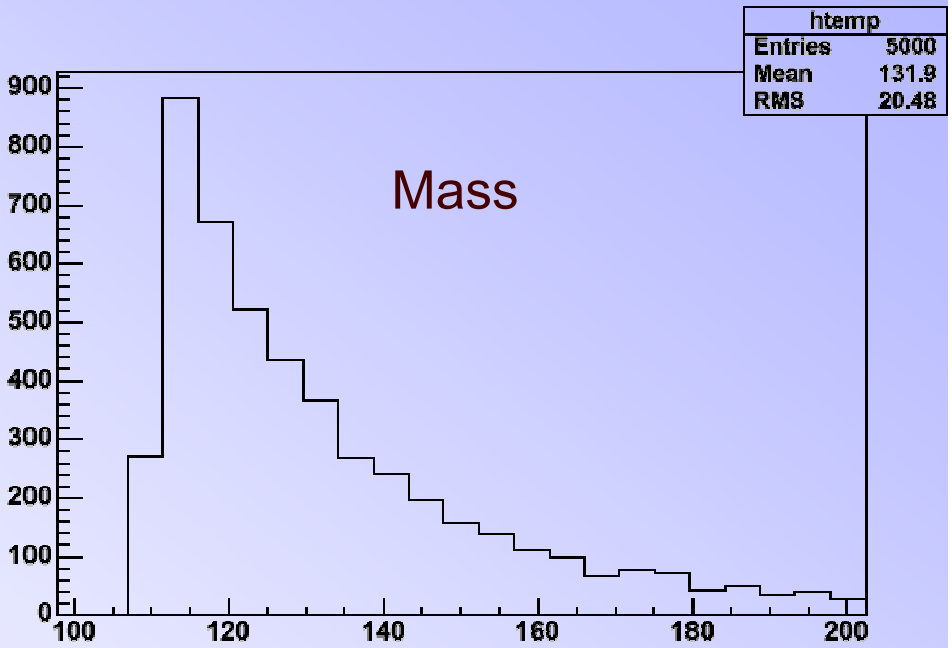
BB Background



Rapidity



Mass

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Post Mortem

- ExHuME is the only Monte Carlo implementation of the Durham model
- ExHuME will be available today at

  www.exhume-me.com
- Have only made Higgs signal available. Backgrounds exist and will be available next week.
- Still adding lots of new and exciting things - check the web page often.
- The Monte Carlo agrees with separate calculation of the cross section
- Documentation to come.