

ROOT basics tutorial

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1. Login to your system (Docker ROOT container or LIP remote machine):
 - a. Create a new directory for this exercise (e.g. Tutorial_ROOT_basic).
 - i. For participants using Docker, this directory needs to be created in the `/userhome` directory that you created in the [ROOT setup tutorial](#).
 - b. Download the data file for this exercise ([zjet.root](#)) and save it in this directory.

2. Now we can start the tutorial:
 - a. Confirm that your terminal points to the correct *Tutorial_ROOT_basic* directory with the `pwd` command;
 - b. Open ROOT and load the data file: `root zjet.root`
 - c. Check the content of the file: `.ls`
 - d. Print the content of the tree Tdata: `Tdata->Print()`.
 - i. Check the number of branches and the names of the variables in each branch.
 - e. Check the number of entries in the tree: `Tdata->GetEntries()`
 - f. Draw the px variable: `Tdata->Draw("px")`
 - g. Take a look at the different variables that exist in the tree and draw a couple of them. Try to understand their shape.
 - h. Draw the mass of the particles. Which particles can you identify from this plot?
 - i. Quit ROOT by typing: `.q`

3. Download and save the [RootTutorial1.cc](#) macro to your working directory. Open it with your favorite editor.
 - a. You can execute it in the terminal by typing: `root RootTutorial1.cc`.
 - b. Your task is to modify the macro in order to accomplish the following (you might need to rely on [ROOT's reference guide](#) and google "(something you need) root cern"):
 - i. Draw px, py and pz.
 - ii. Draw a 2D histogram of py versus px.
 - iii. Draw the mass of the particles with `id=0`.
 - iv. Set the title of the histogram, change the line color, rebin it and scale it to unit area.
 - v. Fit the histogram with a Gaussian function and print the results.

4. Download and save the macros [RootTutorial2.cc](#) to the same directory as in the previous exercise. It shows you how to loop over the events of a TTree and fill a histogram.
 - a. Create a TCanvas and divide it in two pads side by side. Use the method `Divide(2)`.
 - b. In the left pad draw the mass of the particles with $id=10$. What objects are responsible for this mass peak?
 - c. In the right pad draw the mass of the Z boson ($id=0$).
 - d. Fit the mass peak of the Z boson with a Gaussian function (as you did in the previous exercise) and the mass of the jet with an exponential function.