

Follow this tutorial only if you do not have access to the LIP machines and are using Docker and the ROOT container in your own computer

1. Download the data file for this exercise ([zjet.root](#)) and save it inside the Docker shared folder on your system. It's probably a good idea to create a new directory for this exercise inside that shared folder (e.g. `Tutorial_ROOT_basic`)
2. Open a new terminal and start the ROOT docker container (you should have already followed the instructions [here](#) to set-up Docker and start the ROOT container)
 - a. Go to the shared folder inside the container: `cd /shared`
 - b. Go into the directory you created in step 1: `cd Tutorial_ROOT_basic`
 - c. Open ROOT and load the data file: `root zjet.root`
 - d. Check the content of the file: `.ls`
 - e. Print the content of the tree Tdata: `Tdata->Print()`. Check the number of branches and the names of the variables in each branch.
 - f. Check the number of entries in the tree: `Tdata->GetEntries()`
 - g. Draw the px variable: `Tdata->Draw("px")`
 - h. Take a look at the different variables that exist in the tree and draw a couple of them. Try to understand their shape.
 - i. Draw the mass of the particles. Which particles can you identify from this plot?
 - j. Quit ROOT by typing: `.q`
3. There are two macros available depending on whether you want to use C++ ([RootTutorial1.cc](#)) or Python ([RootTutorial1.py](#)). Choose the one you want to use and save it to the directory you are working in. Open it with your favourite editor. You can run these macros in the terminal by typing: `root RootTutorial1.cc` or `python3 RootTutorial1.py`.
 - a. Draw px, py and pz.
 - b. Draw a 2D histogram of py versus px.
 - c. Draw the mass of the particles with id=0.
 - d. Set the title of the histogram, change the line color, rebin it and scale it to unit area.
 - e. Fit the histogram with a Gaussian function.
4. Download and save the macros [RootTutorial2.cc](#) (written in C++) or [RootTutorial2.py](#) (written in python) 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.
 - 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.