Top Physics Tutorial

Marcel Vos
Miguel Villaplana

At this point you should have calculated W helicity fractions in the theory part of tutorial.

Here we want you to generate a sample of simulated ttbar events and draw the distribution of cos(theta*)

(Solution at https://www.dropbox.com/sh/e4gbtzkt0fjqxh2/CmBRTQPuFS)

1) Generate events with MadGraph
   - http://madgraph.phys.ucl.ac.be/
   - You can use the web interface or download the source and run it at you computer.
   - Generate p p > t t~ QED=0,(t > W+ b, W+ > j j),(t~ > w- b~, W- > l- vl~)
   - Use Pythia for shower and hadronisation

2) Look into the data! (We will use ROOT to do that)
   - http://root.cern.ch/drupal/
   - We have divided this part in three steps: (You'll find 3 directories called STEP0, 1, and 2 in Solution)
        - STEP0: We provide an empty framework to analise the data.
          At this point we want you to focus on the method called test::generator_level()
          Here you have to select the objects from the ttbar pair decay.

     - STEP1: We provide a framework with the solution to STEP0 implemented. Here we want you to fill in the
          methode called test::helicity()

          The helicity angle theta* is dened as the angle between the W-boson momentum in the top-quark
          rest frame and the momentum of the down-type decay fermion in the rest frame of the W boson.

-STEP2: Here we want you to see what happens to the cos(theta*) distribution when some real-life effects are added.

- We apply some selection cuts to the lepton
- We make it so that the wrong b-jet is used in the reconstruction

PD: This is to much for you to do in just 1h. We will guide you through the solution during the tutorial but we expect you to try it on your own and ask us during the week.