Exercise 10: Cut based analysis: Resonance search

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Please send your solutions to nberger@physi.uni-heidelberg.de until 7. 1. 2013, 12:00. Put your answers in an email (subject line *SMIPP:Exercise10*).

1. **Bump hunting** On the course website, you find two root files, named `tree_ex10A.root` and `tree_ex10B.root`. They contain made-up analysis *N-tuples*, i.e. a series of numbers for each measured event. Measured was a three particle final state. For each pair of particles, the invariant mass is given (*mass ij* variables) and for every particle, the energy loss per unit distance (dE/dx), a relative time of flight (*tof*) and the fraction of the particle energy deposited in the electromagnetic calorimeter (*efrac*) is given.

   The two particle masses were generated equidistributed between 1 and 3 MeV/c^2. In addition, some relatively narrow resonances in two particle combinations with Breit-Wigner shapes were added. Through applying suitable cuts, find where the resonance(s) are hiding and what their masses are (not necessarily the same in both files). Produce mass spectrum plots of your findings.
   (Attach a list of your cuts (including the file), and produce suitable plots)

2. **Bump hunting II** What can you do to avoid biases when searching for bumps in your data?