



Delphes Simulation Studies on Higgs Pair Production in Muon Collider

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- Signal: $\mu^+ + \mu^- \rightarrow \nu_\mu + \bar{\nu}_\mu + H + H$
- Background:
 - $\mu^+ + \mu^- \rightarrow \nu_\mu + \bar{\nu}_\mu + b + \bar{b} + Z$
 - $\mu^+ + \mu^- \rightarrow \nu_\mu + \bar{\nu}_\mu + b + \bar{b} + H$
 - $\mu^+ + \mu^- \rightarrow \nu_\mu + \bar{\nu}_\mu + b + \bar{b} + b + \bar{b}$



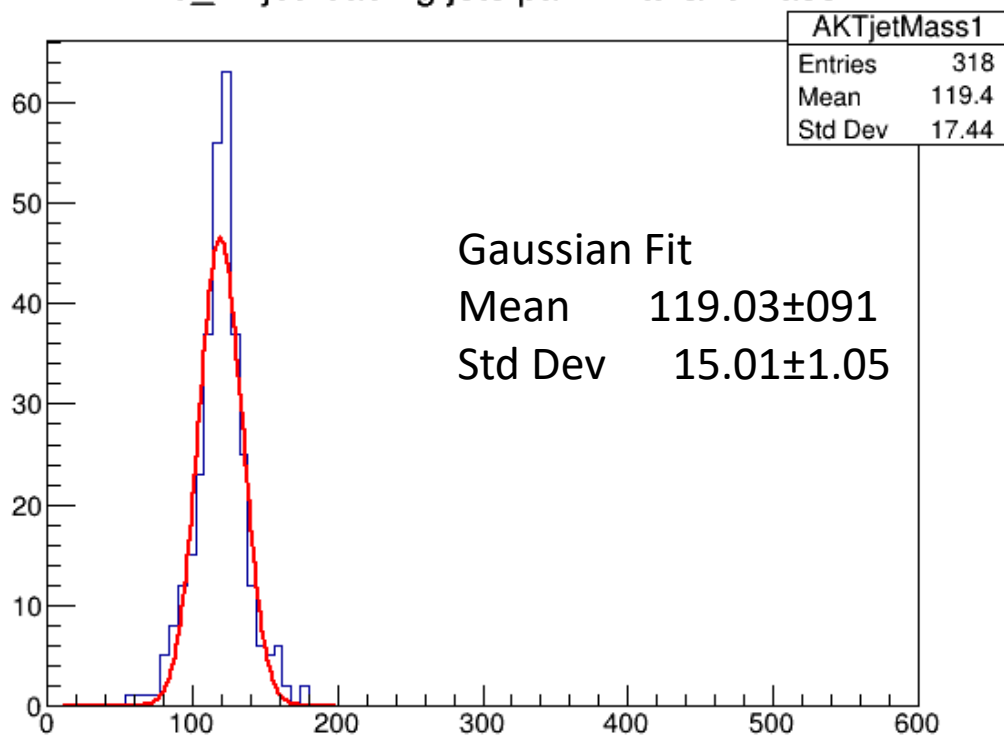
Reconstructing two Higgs bosons

- Anti- k_t Jets:
 - Only studied the events with at least 4 jets (or exactly 4), ordering the leading and sub-leading jets pair by distance to 125GeV. Then truth matching with GenJet ($|\eta| < 2.25$).
 - 32.4% pass check (nJets \geq 4)
 - 26.4% pass check (nJets = 4)
 - Invariant mass of sub-leading jets pair
 - 79.33GeV (nJets \geq 4)
 - 85.80GeV (nJets = 4)
 - Gaussian fit with an exponential background

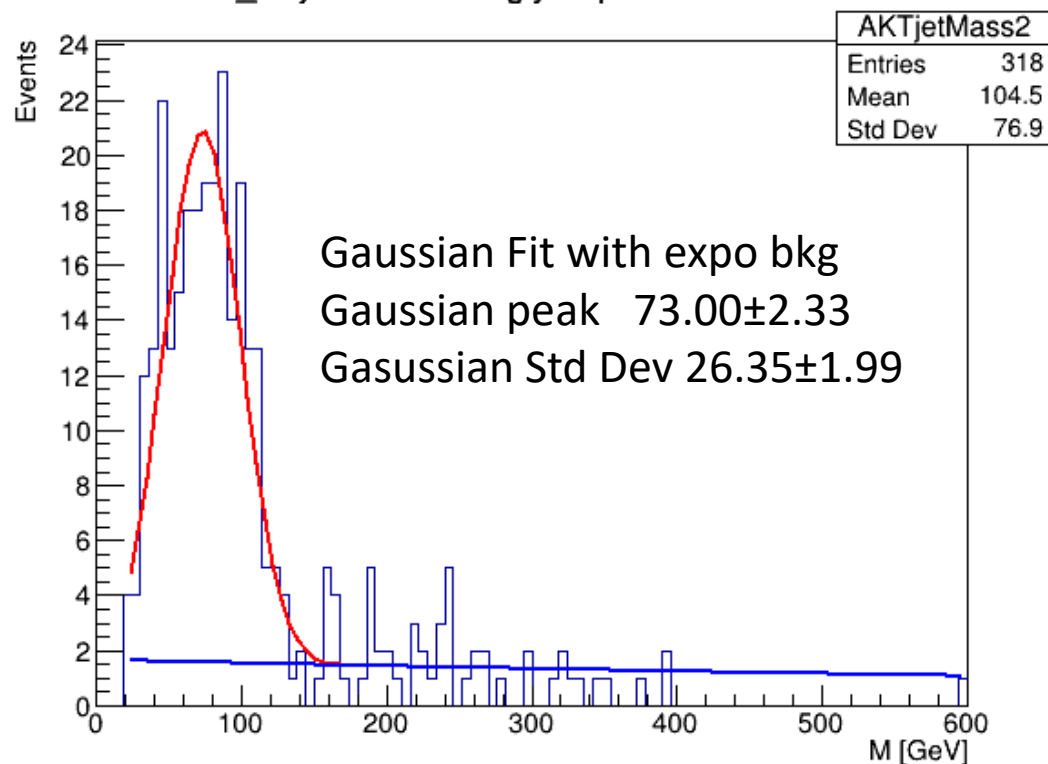


Anti- k_t jet for 1k events

Anti_KTjet leading jets pair invariant mass



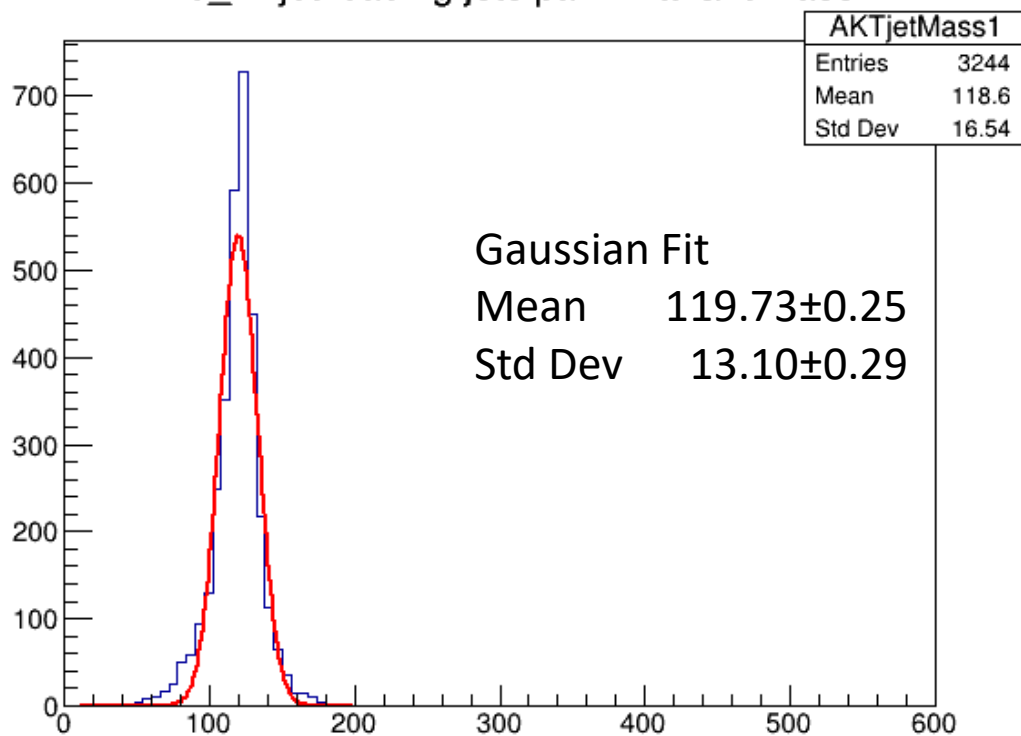
Anti_KTjet sub-leading jets pair invariant mass



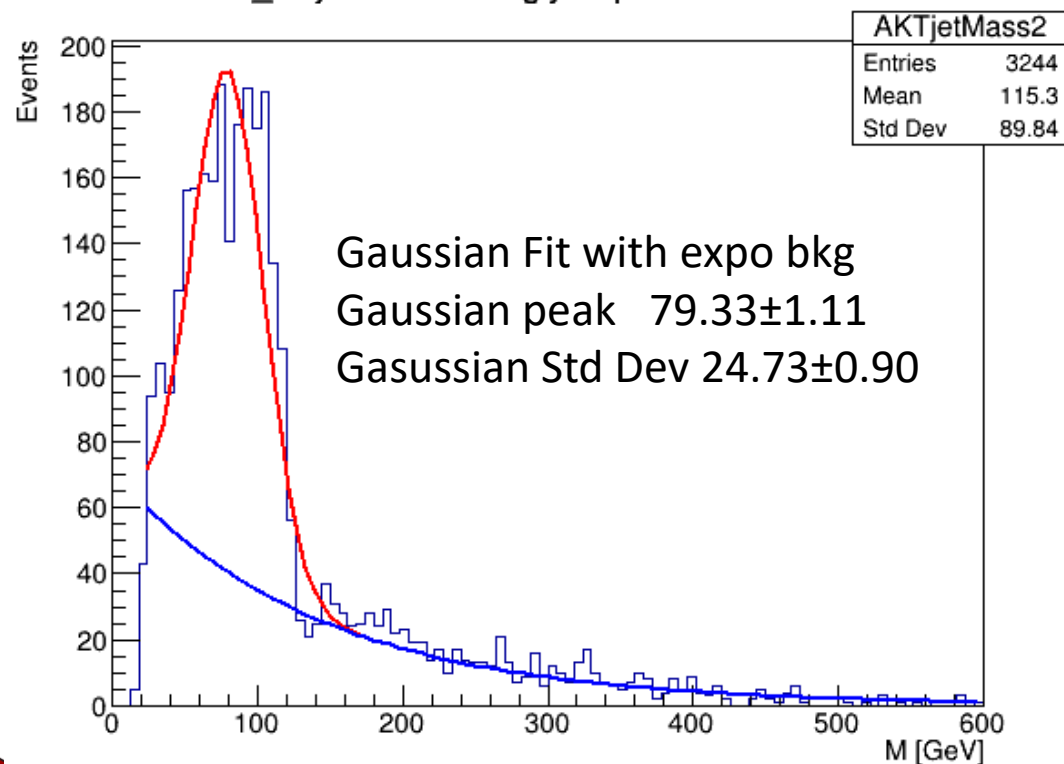


Anti- k_t jet for 10k events ($n_{\text{Jets}} \geq 4$)

Anti_KTjet leading jets pair invariant mass



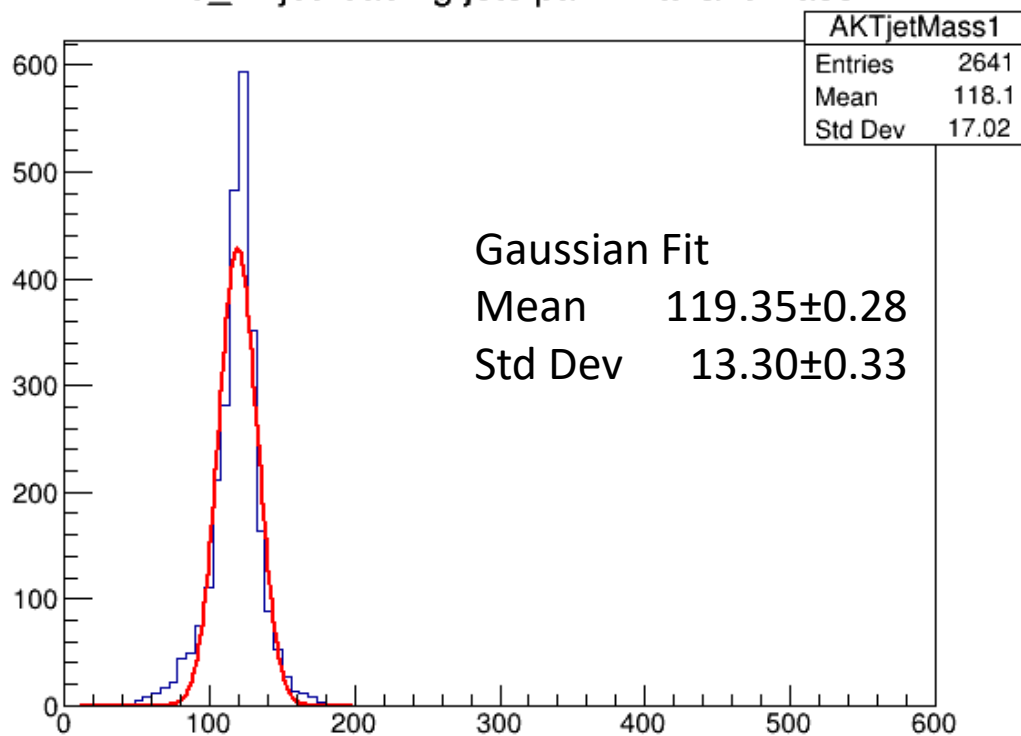
Anti_KTjet sub-leading jets pair invariant mass



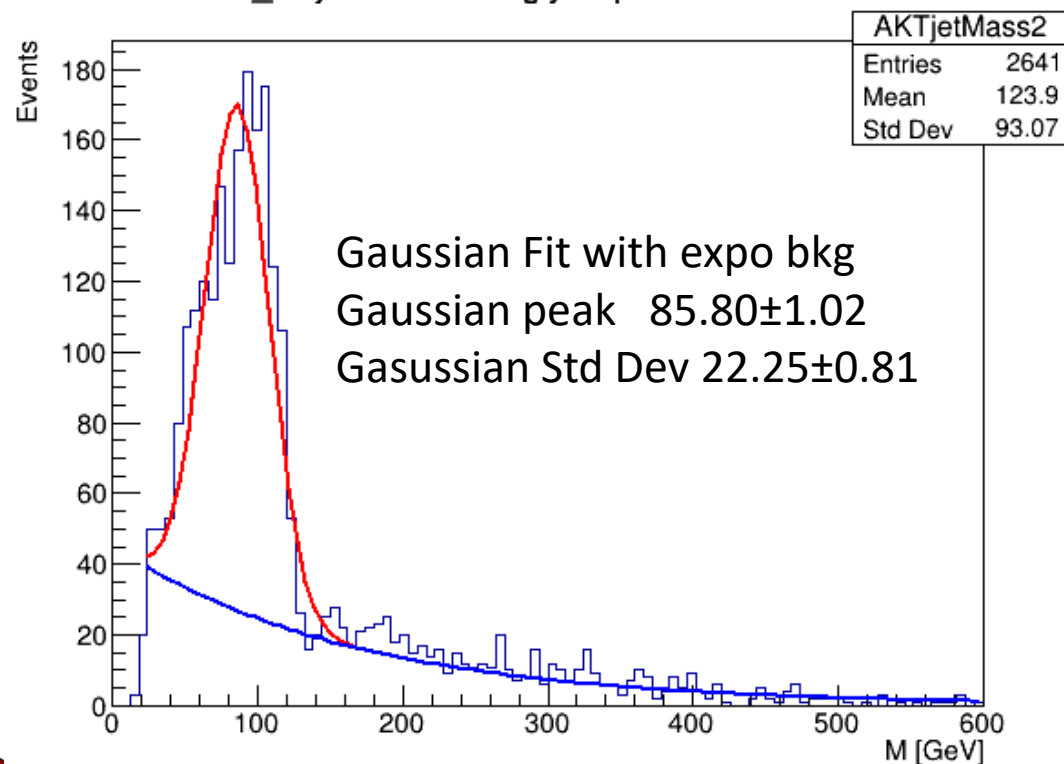


Anti- k_t jet for 10k events (nJets = 4)

Anti_KTjet leading jets pair invariant mass



Anti_KTjet sub-leading jets pair invariant mass





Appendix: data card for run anti- k_t jet algo

```
1633 #####
1634 # Jet finder AKT
1635 #####
1636
1637 module FastJetFinder FastJetFinderAKT {
1638     # set InputArray Calorimeter/towers
1639     set InputArray EFlowMerger/eflow
1640
1641     set OutputArray AKTjets
1642
1643     # algorithm: 1 CDFJetClu, 2 MidPoint, 3 SIScone, 4 kt, 5 Cambridge/Aachen, 6 antikt.
1644     set JetAlgorithm 6
1645     set ParameterR 0.5
1646
1647     set JetPTMin 20.0
1648 }
```