Preshower Update

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July 2, 2008
From last time…

• TMVA MLP (neural network) used to separate preshowers from non-preshowlers
  – Train using 9 variables (lat, absZer42, absZer20, secondMomentTP, nCrystals, nHits, fitFailed, s1s9, s9s25)

• Energy loss determined from theta
  \(E_{\text{loss}} \sim 1/\sin \theta\)
  – Use profiles of \(E_{\text{loss}}\) vs theta scatter plot to determine \(E_{\text{loss}}\) for a given theta bin
  – Can use means of profiles or fit to \(1/\sin \theta\) as means of correction
Energy Correction: Theta Correction

- Use MC to determine $E_{\text{loss}} = E_{\text{raw}} - E_{\text{true}}$

- Fit theta profiles with Novosibirsk function

- Difference between MPVs is taken as energy correction, $E_{\text{corr}}$

$E_{\text{corr}} = 0.044$ GeV

48 theta bins

Theta Index 11

Non-Preshower: MVP = -0.008 GeV

Preshower: MVP = -0.052 GeV

$E_{\text{corr}} = 0.044$ GeV

Typical theta bin
Correction: Parameterization vs. Profile Mean

BBbar MC
MC (Truth)

Using $1/\sin\theta$ Parameterization for Correction

BBbar MC

MPV = 132.8 MeV  
$\sigma = 5.932\text{MeV}$

MPV = 133.2 MeV  
$\sigma = 5.794\text{MeV}$

MPV = 127.3 MeV  
$\sigma = 8.201\text{MeV}$

MPV = 133.9 MeV  
$\sigma = 7.322\text{MeV}$

Fit peaks with Novosibirsk function + pol6
MC (Truth)

Using Profile Means for Correction

Fit peaks with Novosibirsk function + pol6
MC (MLP)  
Using 1/sinθ Parameterization for Correction

Fit peaks with Novosibirsk function + pol6
MC (MLP)

Using Profile Means for Correction

Fit peaks with Novosibirsk function + pol6
Data

Using $1/\sin\theta$ Parameterization for Correction

Fit peaks with Novosibirsk function + pol6
Data

Using Profile Means for Correction

Fit peaks with Novosibirsk function + pol6
Working on...

• Improve preshowers/non-preshower separation (for a given efficiency increase purity)
  – Distance from EMC bump centroid to nearest charged track intersection (available in EmcPreshower but does not seem to be working)
  – Addition of DIRC quantities as inputs to TMVA (Cherenkov angle, Cherenkov angle error, number of bkg Cherenkov photons, chiSqr of ring fit)
  – Split sample into 2-5 energy bins for training and testing (number of events at low energies much larger than at higher energies)
Working on...(DIRC Variables)
Working on…

- Would like to correct on an event-by-event basis
  - Try to create a quantity that is (more) correlated with $E_{\text{loss}}$ from variables that are weakly correlated with $E_{\text{loss}}$

\[
Z = \sum_{i} C_i \left( \frac{x_i - x_0}{x_0} \right)
\]

New, more correlated variable

Original variable (lat, absZer20, etc.)

Variable shift (mean, MPV)

Sum over subset of current variables

Coefficient gives correlation