Electron Charge studies progress

Hamed Bakhshian

Moving to CMSSW_3_1

- The code is completely moved and tested in CMSSW_3_1_4
  - Instead of using SusyAnalyzer, PAT Electron is used
- Almost 1 Milion Zee event is downloaded
- The results are in good agreement with previous version.
- An important problem (or conceptual bug!) has been found in previous studies

THE BUG

- The formula used for Probability of charge mis-measurement is :

$$\frac{N_{SS}}{(2\cdot(N_{ss}+N_{os}))}$$

This formula is easy to understand, but the problem is that it doesn't work for error distributed in different bins of a variable

The problem is that in one SS event, we don't which one is badly measured.

In the Tag&Probe method, people solve such problems, but there there is an obvious difference between tag and probe.

Here I try to drive the formula for each bin of a given variable (like Pt or Eta).

$$N_{ss} = e(1-e)N_t$$

$$N_{os} = (1-e)^2 N_t + e^2 N_t$$

Where e is the probability of charge mis-measurement.
Simplifying these equations by ignoring e^2 and eliminating N_t, one can find e versus N_ss and N_os :

$$e = \frac{N_{SS}}{(2 \cdot (N_{ss} + N_{os}))}$$

The important thing here is that, e is the total probability of charge mis-measurement

e vs. different variables

- To calculate that, we need to define a new variable :

N_t^{i,j} = Number of events which have one electron in the ith bin,one electron in the jth bin of a given variable

Then using this new variable, we can introduce two equations for e^i

$$N_{ss}^{ij} = (e^i(1-e^j) + e^j(1-e^i))\, N_T^{ij}$$

$$N_{os}^{ij} = ((1-e^i)(1-e^j) + e^i e^j)\, N_T^{ij}$$

The result

- Solving both of the equations by ignoring the second order of e, one can easily find this relation:

$$e^i + e^j = \frac{N_{SS}^{ij}}{(N_{OS}^{ij} + N_{SS}^{ij})}$$

This formula for i=j reduces to a similar formula to the total error

But the problem is that, the statistic of the events having both legs in the same bin is too low

I didn't use this clear formula in my previous studies and I'm changing it.

I'm trying to solve this equation to find a way to use all of the data in calculating e^i