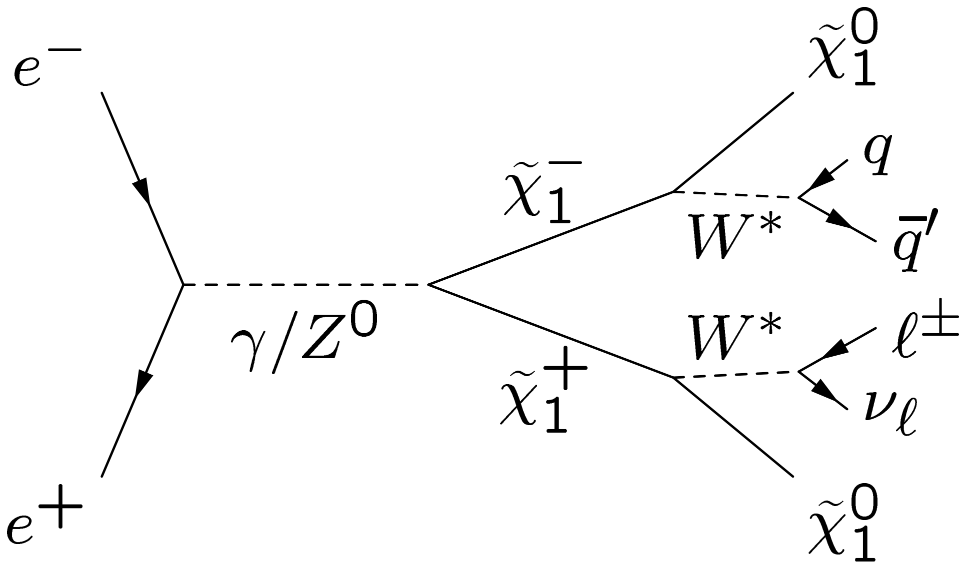
Point 4 $\tilde{\chi}_1^+ \ \tilde{\chi}_1^-$ Signal



Parameters for Generation of Events

Energy ($\sqrt{s}$)	500 GeV
Polarization	80% Left
Integrated Luminosity	50 fb^{-1}

Overview of Studies

- Cuts to eliminate SUSY background and to allow analysis of hadronization of single $\tilde{\chi}_1^{\pm}$
- Attempt to calculate sparticle masses using remaining data
- Determination of sources of bias in mass calculations

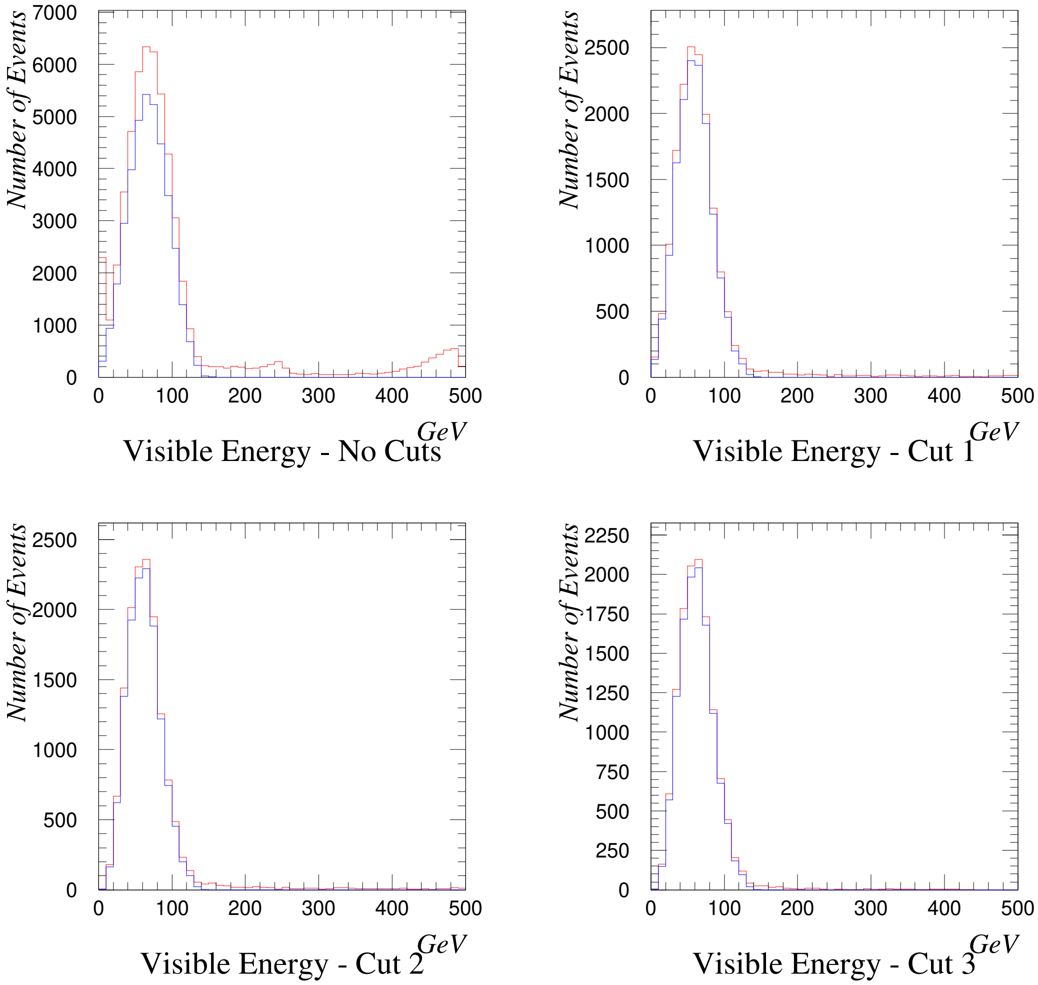
The Cuts

- Cut 1: Keep only events containing exactly one “isolated” lepton.
- Cut 2: Remove all events containing more than one visible lepton.
- Cut 3: Remove events with a combined mass less than tau mass.

Result of Cuts

Visible energy after cuts 1, 2, and 3:

Red - all SUSY data; Blue - chargino signal.



Mass Calculations

- Standard "Endpoint Method" does not work, as combined mass of visible particles is variable.
- A simple modification broadens this method to allow for variable combined mass.

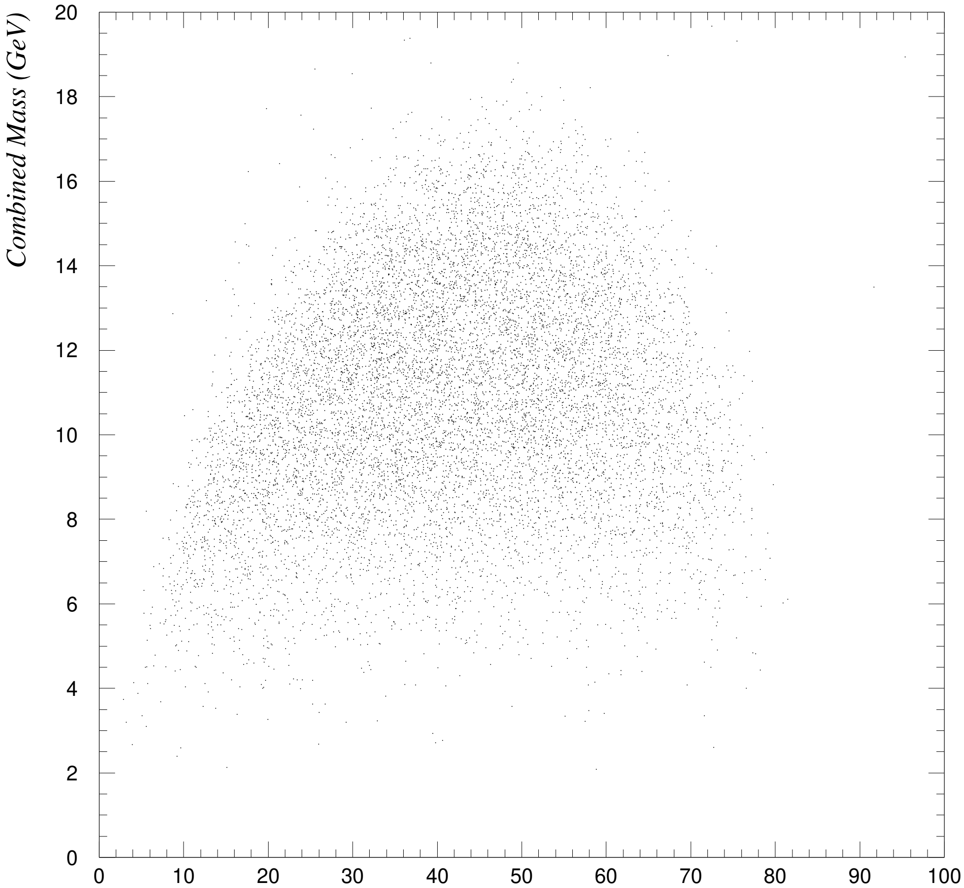
Two Dimensional Fit

- A calculation of the probability of any given energy and combined mass allows a fit to all data.

- The primary advatage is that no data is discarded in this fit.

- A secondary advantage is that no analysis is needed to determine the relative confidence in several box fits.

The Data Being Fit

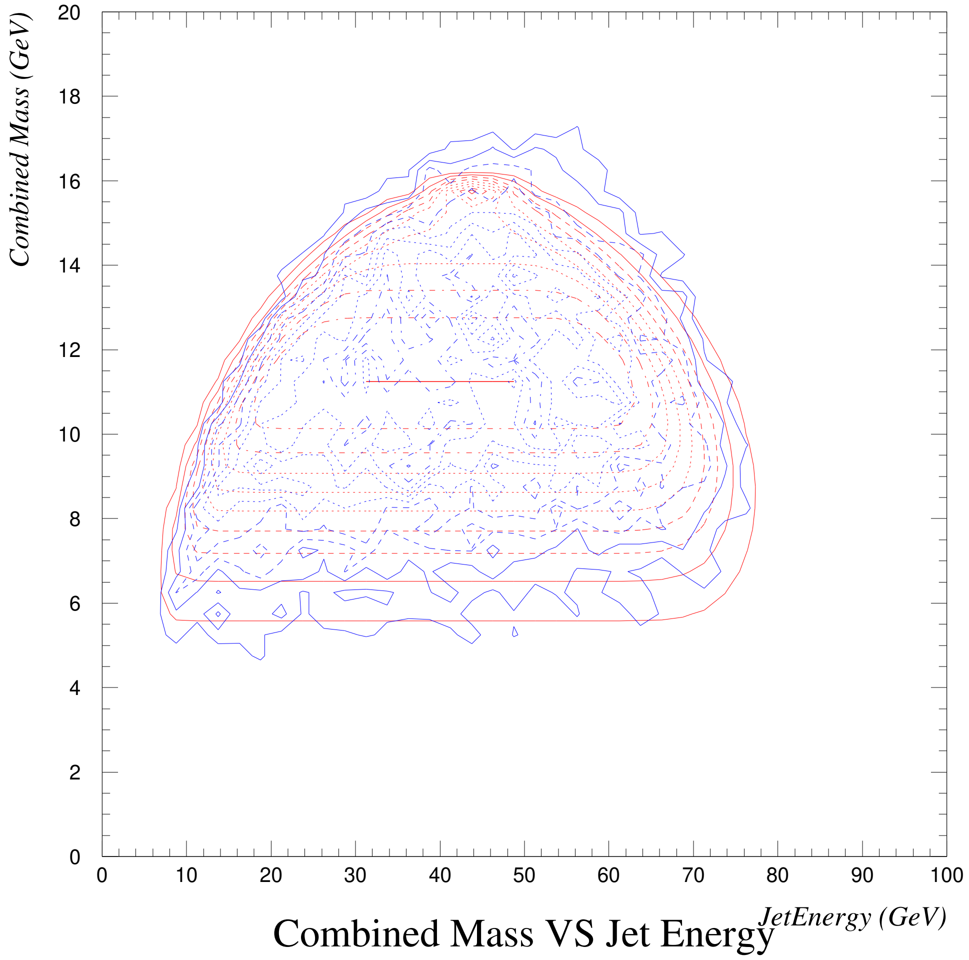


Combined Mass VS Jet Energy

Combined Mass VS Energy

Result of Fit

Blue = Data; Red = Fit.



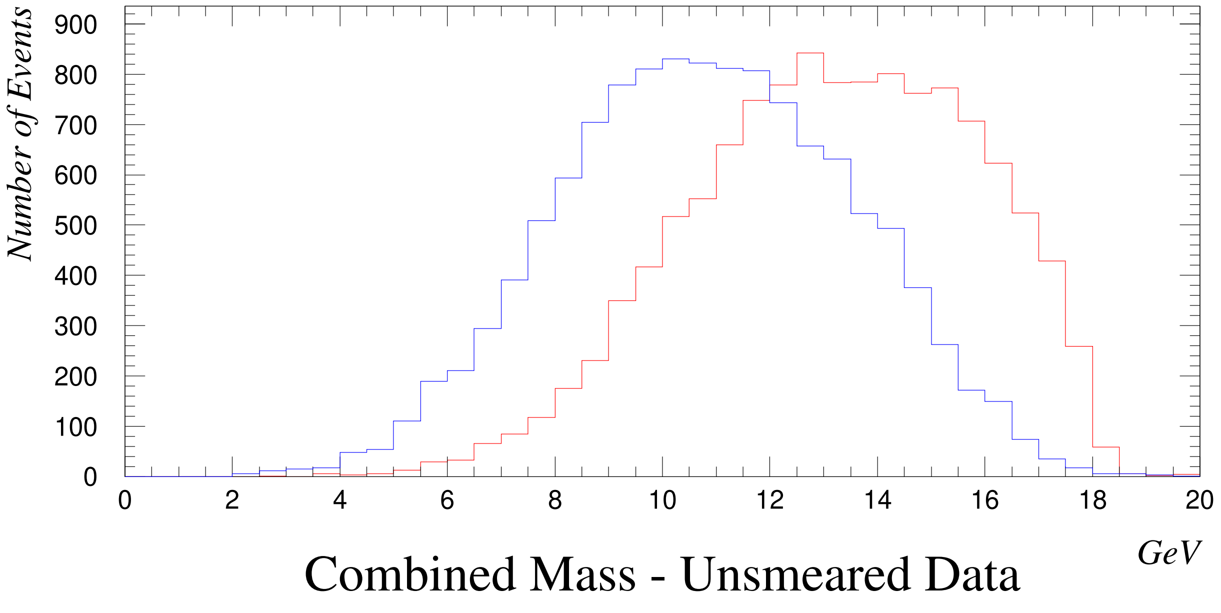
Combined Mass VS Energy

Results

Particle	Generated Mass	Calculated Mass	Discrepancy
$\tilde{\chi}_1^{\pm}$	96.1	89.5	-6.8%
$\tilde{\chi}_1^{0}$	77.8	73.7	-5.3%

Source of Discrepancy

Red - Smeared Data; Blue - Unsmeared Data.



Sources of Bias

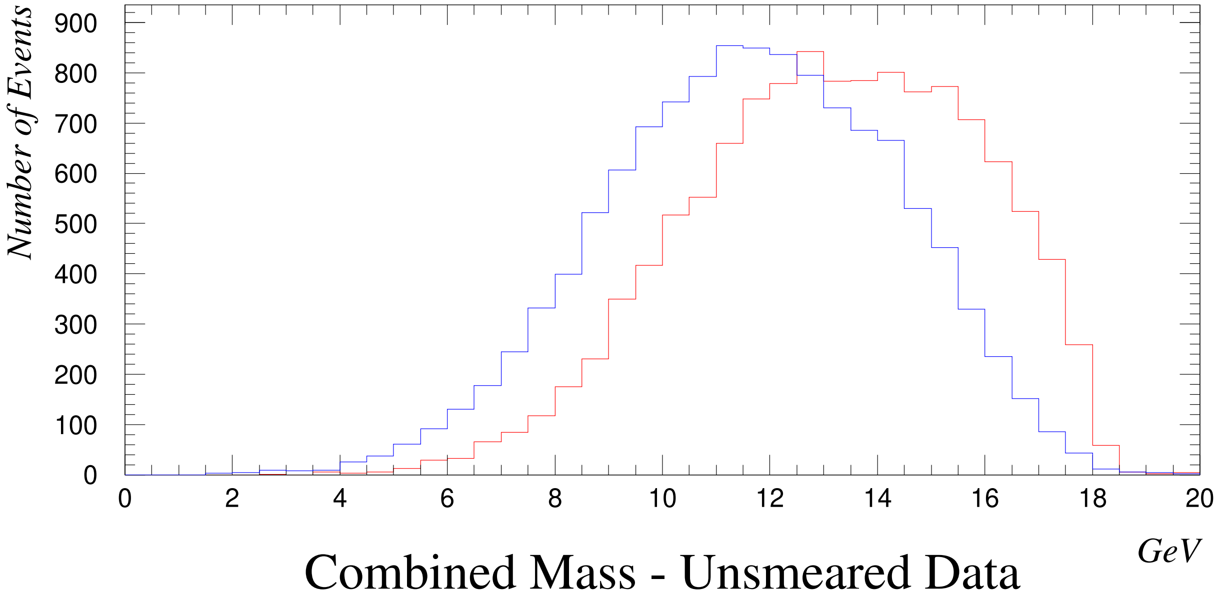
Three sources of bias in combined mass measurement:

- Bad particle identification:
  $p^{\pm}$, $K^{\pm}$ treated as $\pi^{\pm}$;
  n^0 treated as K^0.

- Strong B-field causes many $\pi^{\pm}$ (and some $p^{\pm}$, $K^{\pm}$) with low transverse momentum to "curl up" in detector.

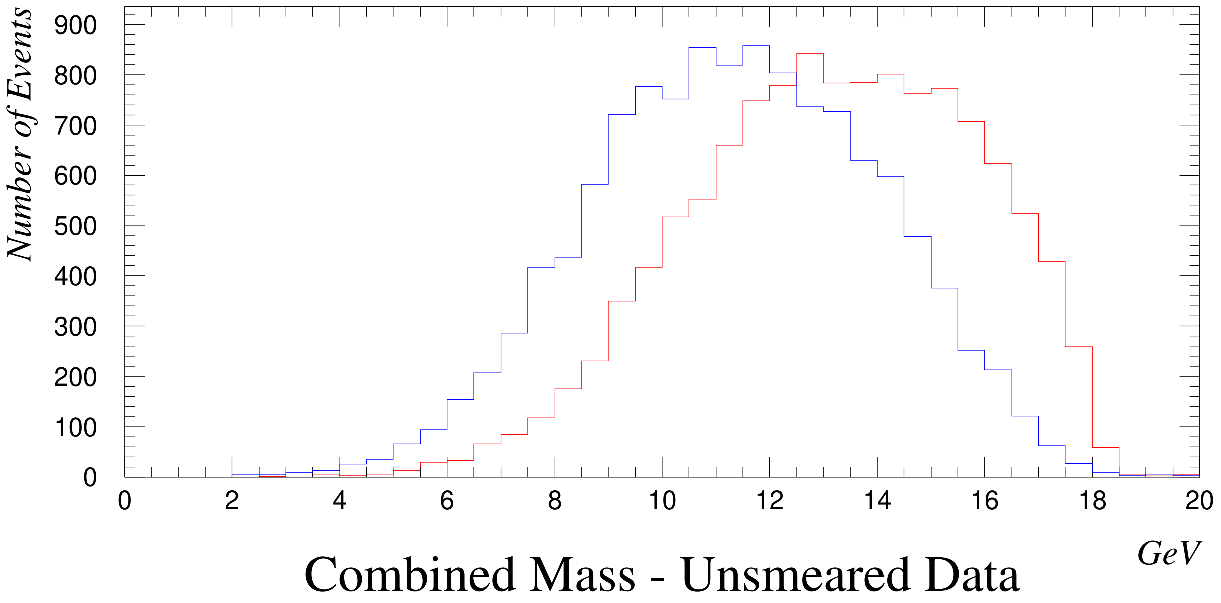
- Very many γ's ($E < 500 MeV$) lost to detector noise in EM calorimeter.

Particle Misidentification



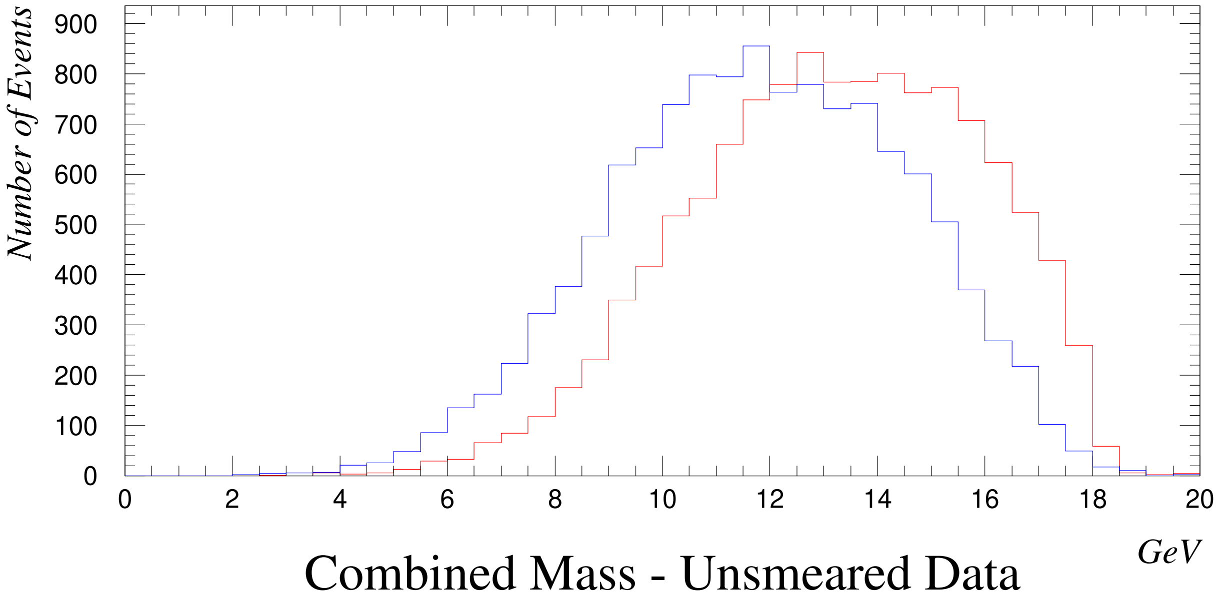
Particle misidentification has a significant effect on the calculated combined mass.

Missing Pions



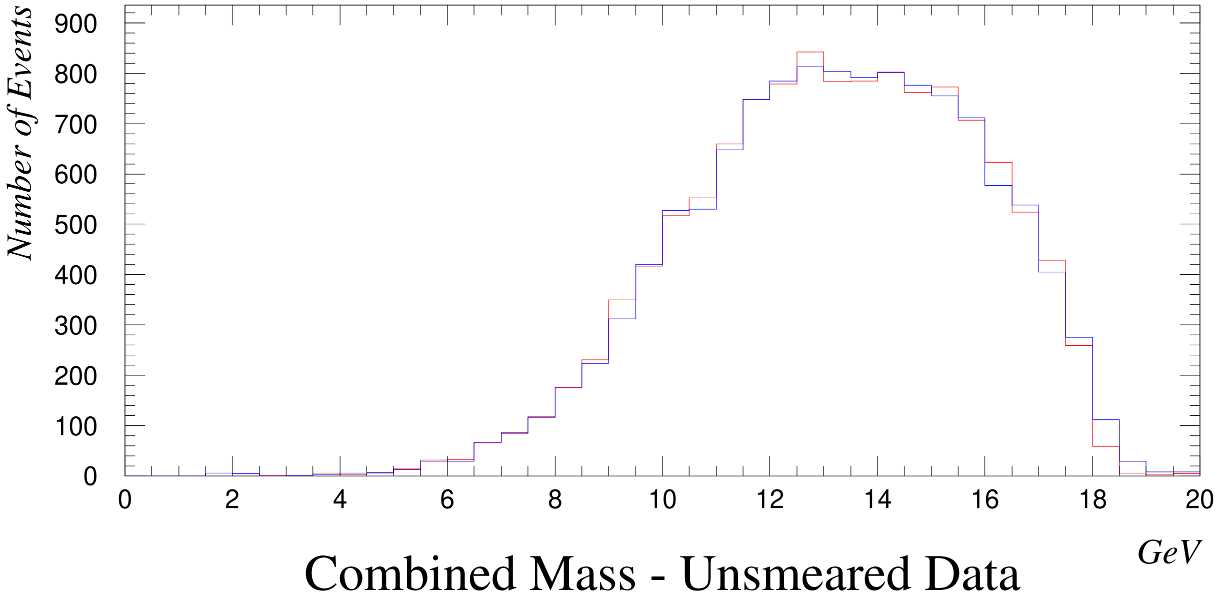
Losing pions has a similar effect on the combined mass than does particle misidentification.

Missing Photons



Missing photons account for slightly more of the bias in the combined mass calculation than any other factor.

All Corrections



After incorporating all corrections, the resulting smeared data agrees quite well with the unsmeared data.