

Electron Identification
Again...
Final?

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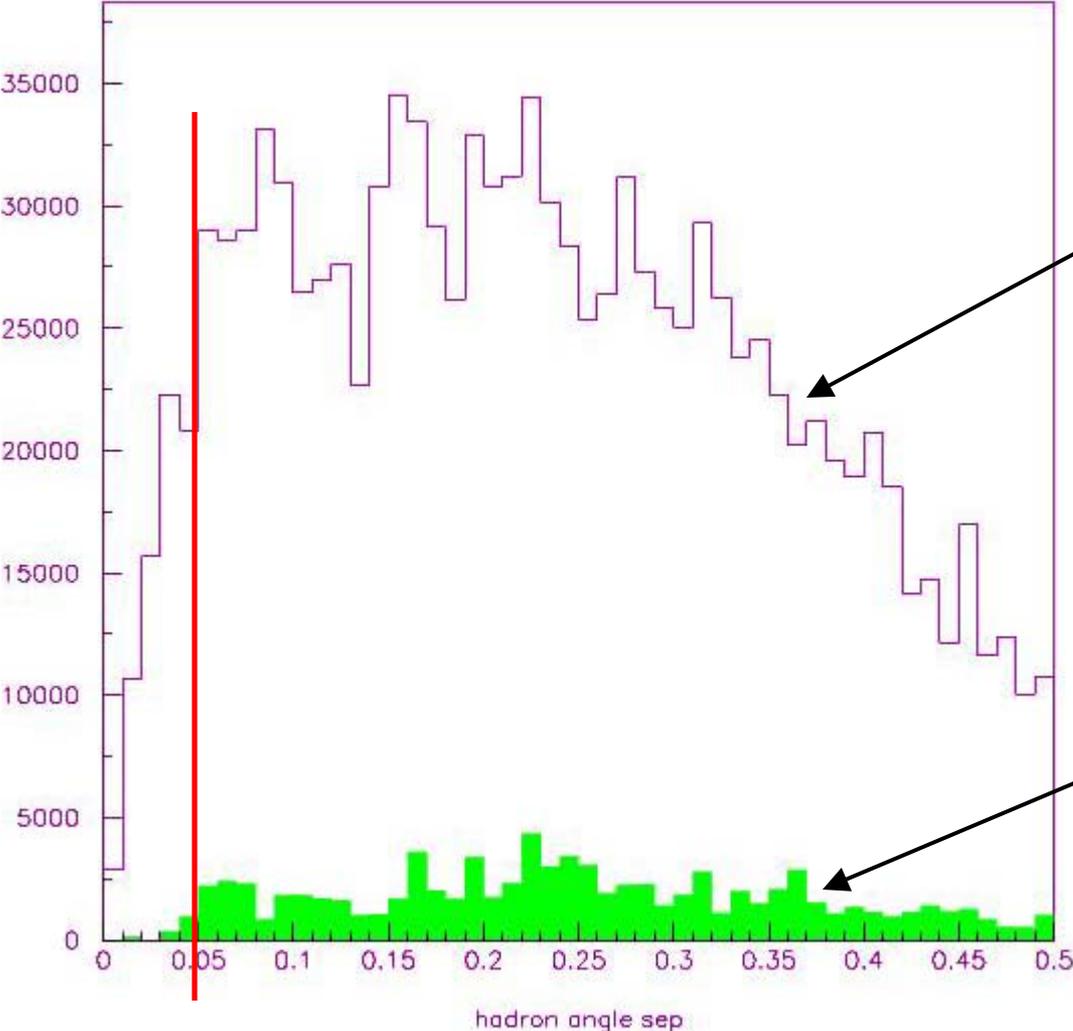
New Scheme

- Compare the SFT pulse height distribution in U,V,X in each plane with the expected distribution for various electron energies and track assignments
 - Expect better discrimination using longitudinal and transverse shower development information
 - Expect better discrimination at the edges of the SFT
- Use E872MC generated electron showers to define the “expected distribution”
 - “Histo scheme”

Eidanal version 2

- Stuff SFT hit pulse height into 44 histograms w 1 cm bins (remove spikes)
- Track angle separation cut (next slide)
 - Allow no more than 2 tracks within 50 mrad
- Calculate $\chi^2 = 0.5 * (\chi^2_{SF} + \chi^2_{EMCal})$ for $15 < E < 115$ GeV for each track
 - χ^2_{SF} = compare actual and expected PH shape in each plane
 - χ^2_{SF} = compare cluster energy sum with expected + compare center of energy in cluster sum window

Standard MC events

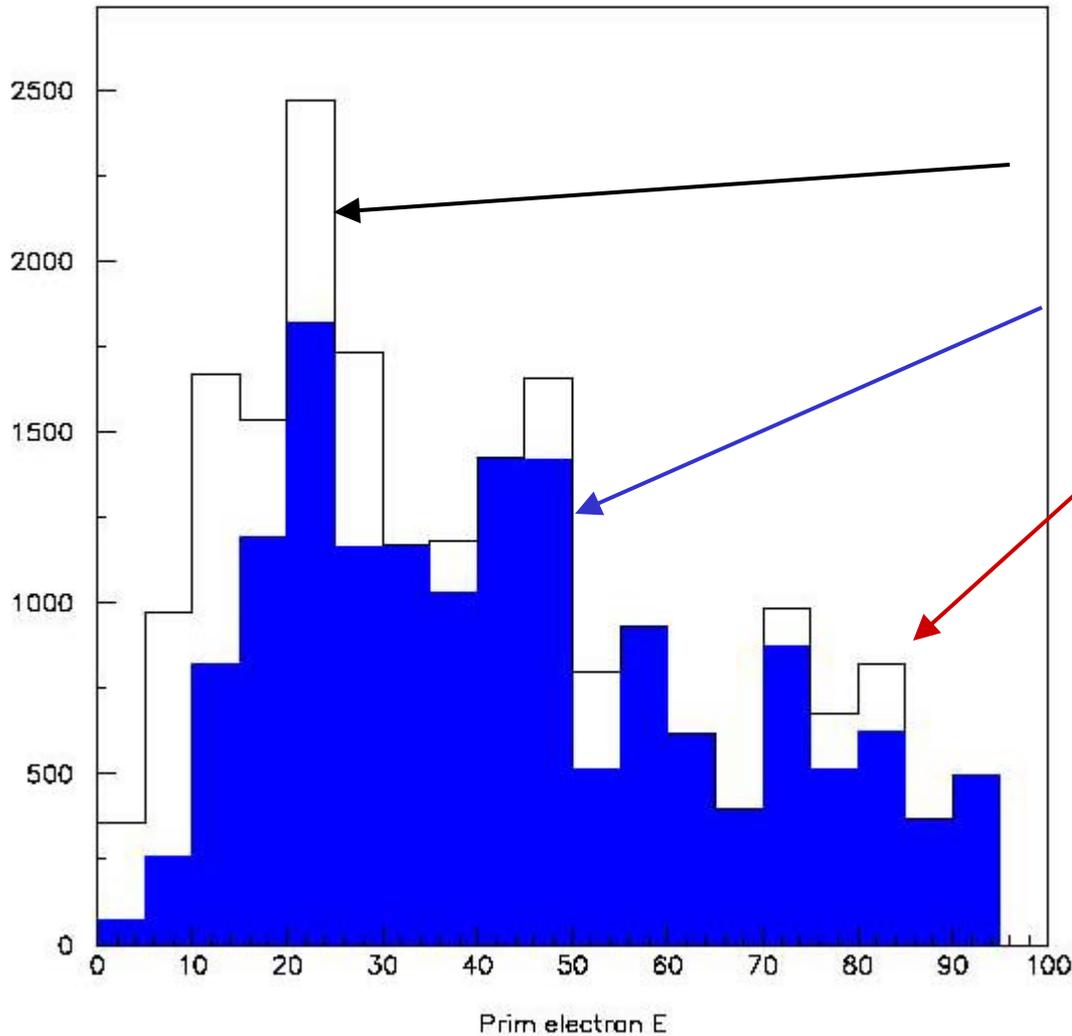


$d\theta$ between each hadron and all other tracks

$d\theta$ between primary electron and all other tracks

Eidanal version 2 (cont)

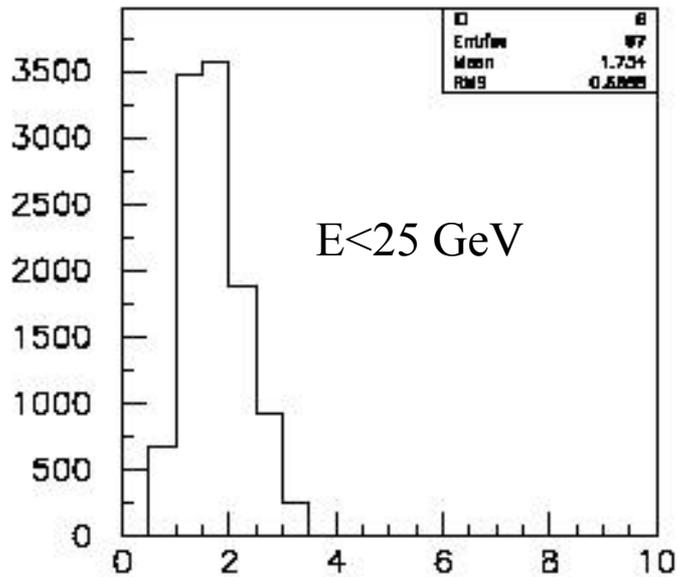
- Find energy (E_{\min}) at χ^2_{\min} for each track
 - Require $\chi^2_{\min} < 5$ and $E_{\min} > 13$ GeV
- Tag the electron as the track with the highest weight
 - Weight = E_{\min} / χ^2_{\min}
 - Allow a maximum of 1 electron/event
- Evaluate code with 1k standard MC



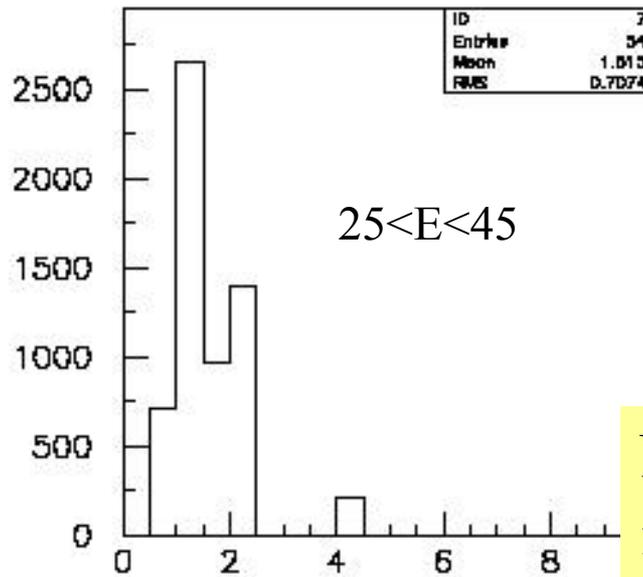
Electron true energy - All
 Electron true energy - Tag

Some "obvious" failures

Electron tag eff 88% for
 $E > 20 \text{ GeV}, X_{0,\text{SFT}} > 2$
 Hadron tag eff 97%

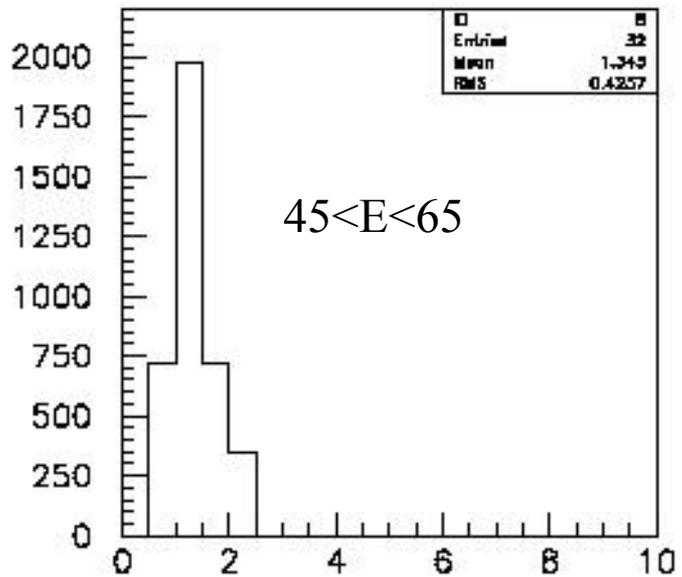


chisq bin 1

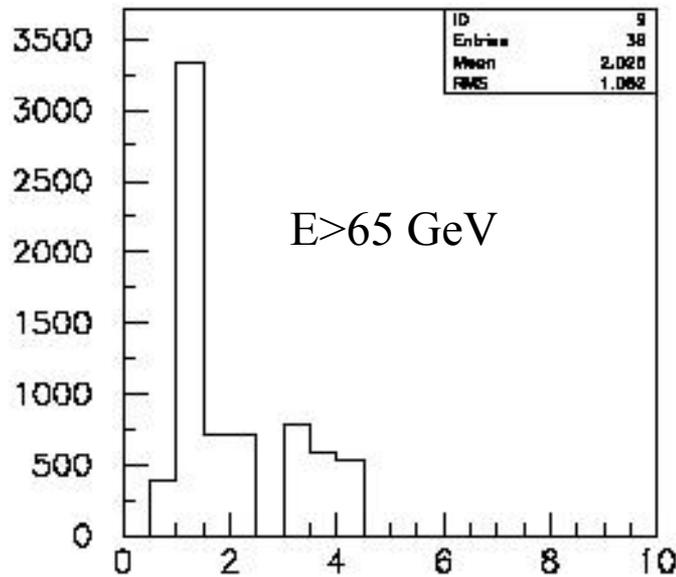


chisq bin 2

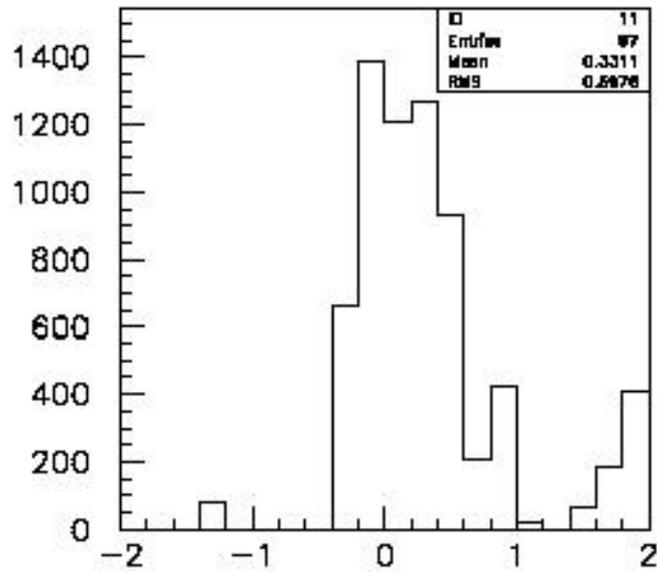
No extreme changes in χ^2 over the energy range



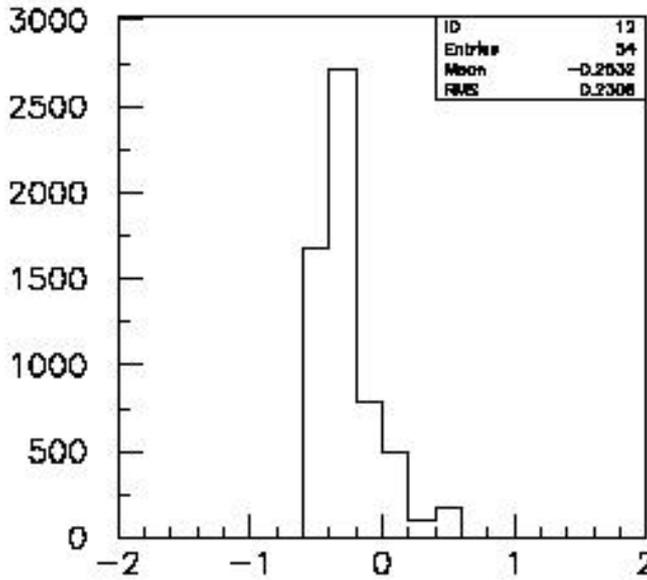
chisq bin 3



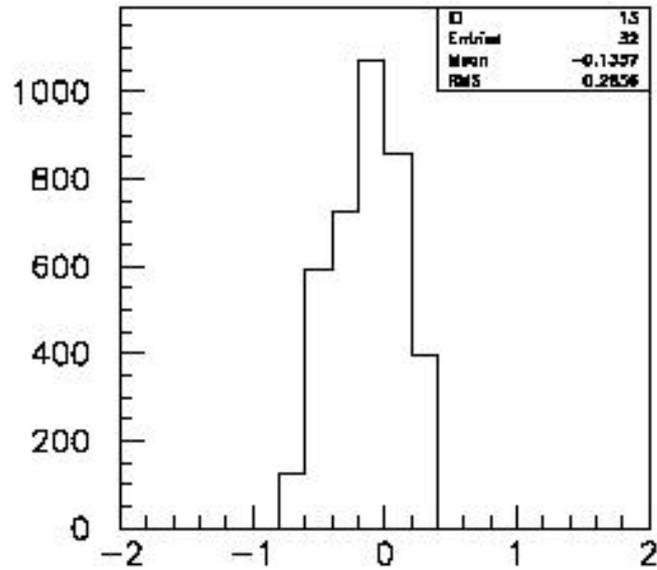
chisq bin 4



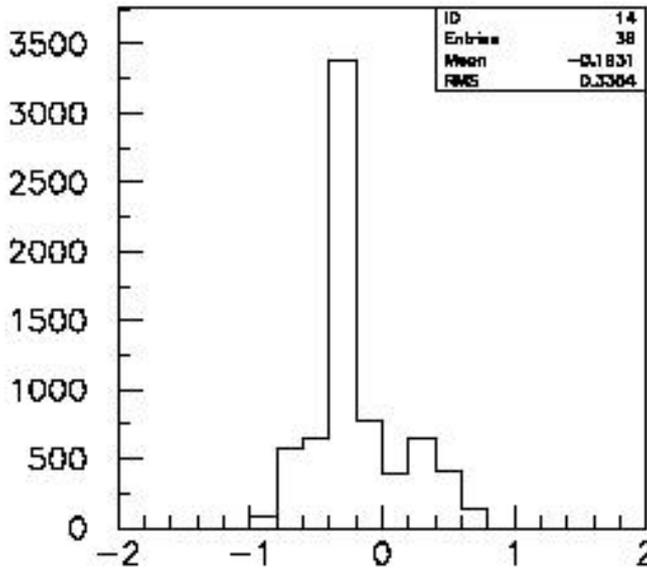
dE/Etru bin 1



dE/Etru bin 2



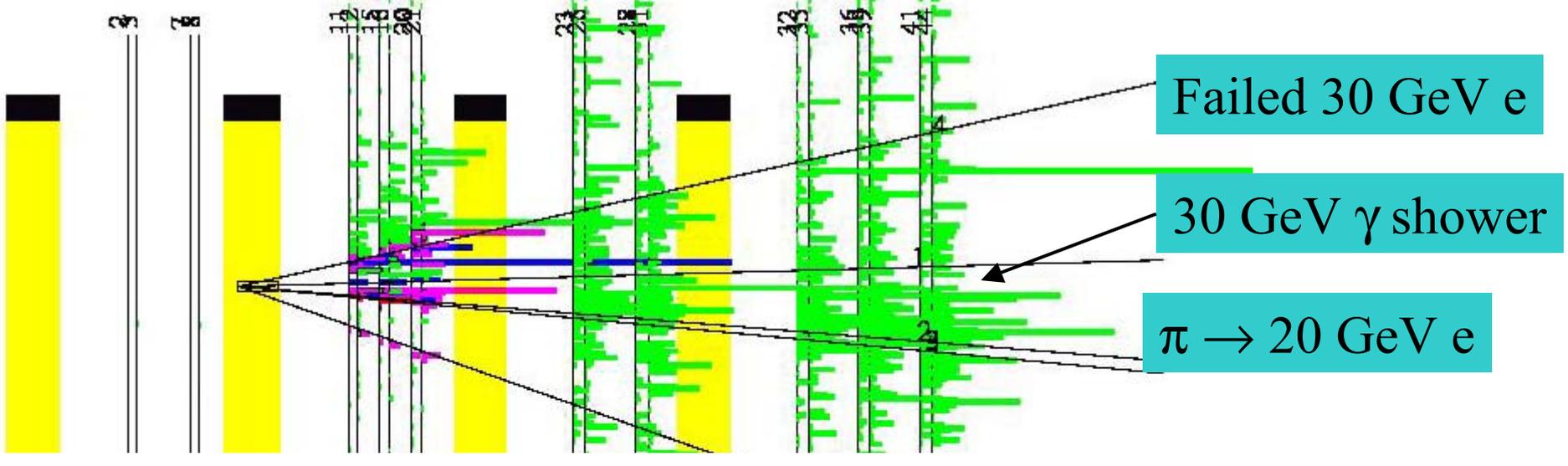
dE/Etru bin 3



dE/Etru bin 4

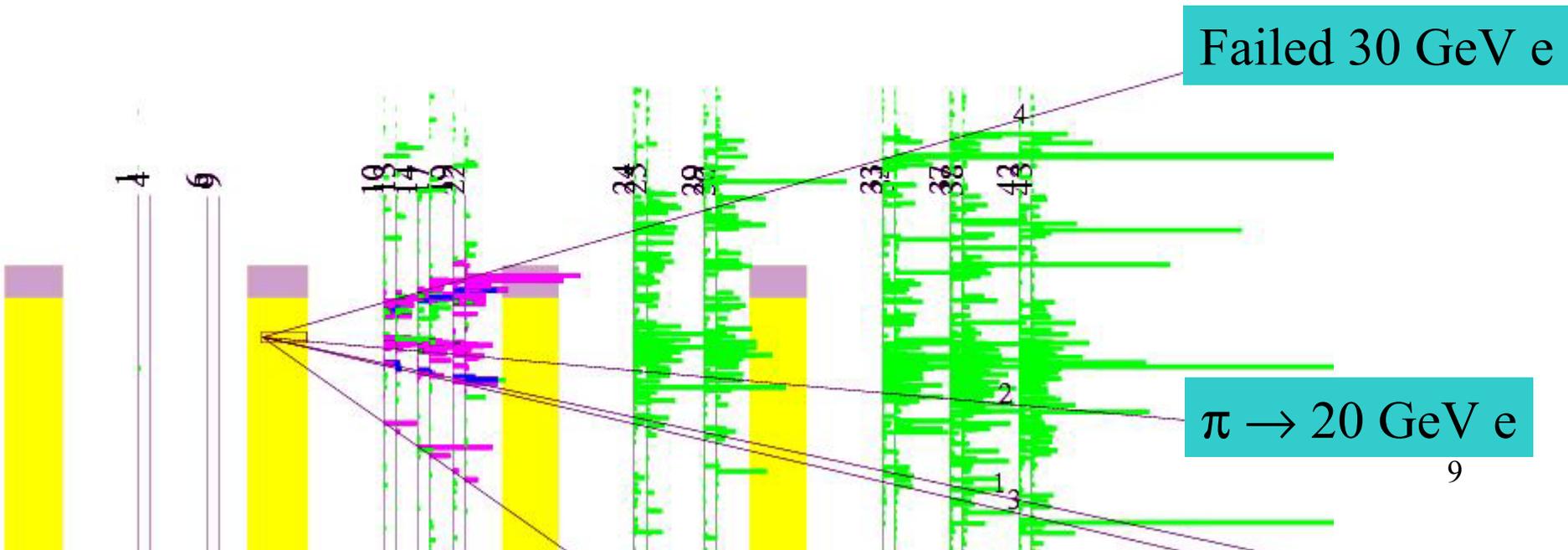
Energy is ~OK
Errors ~30%

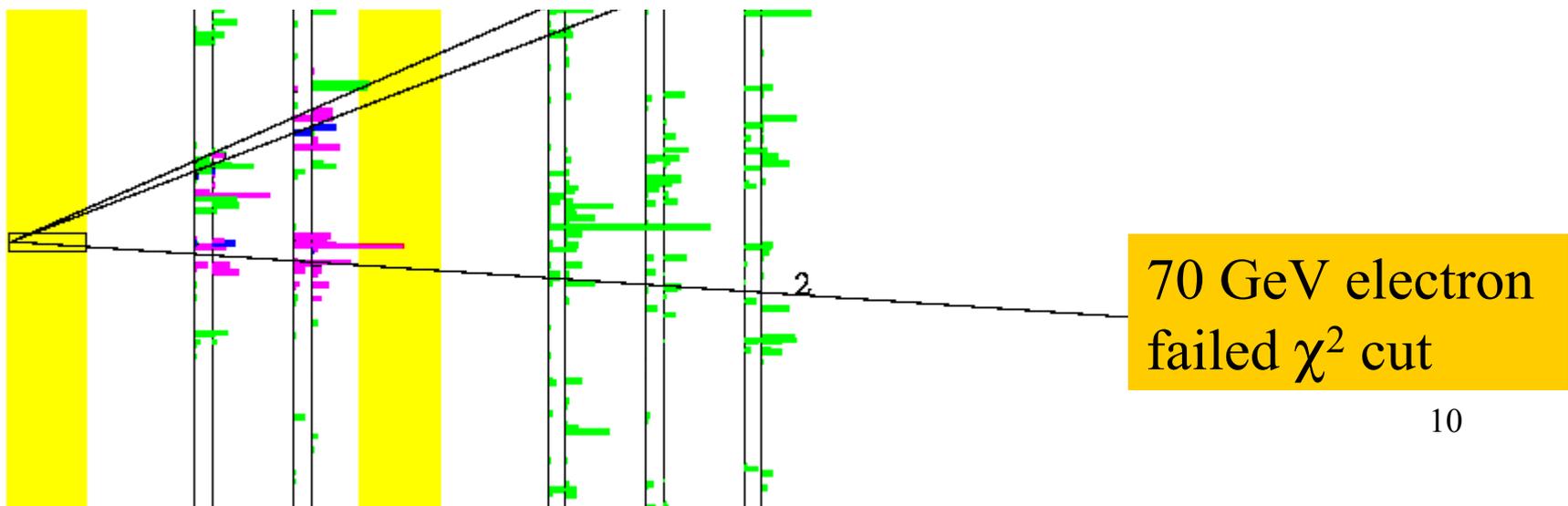
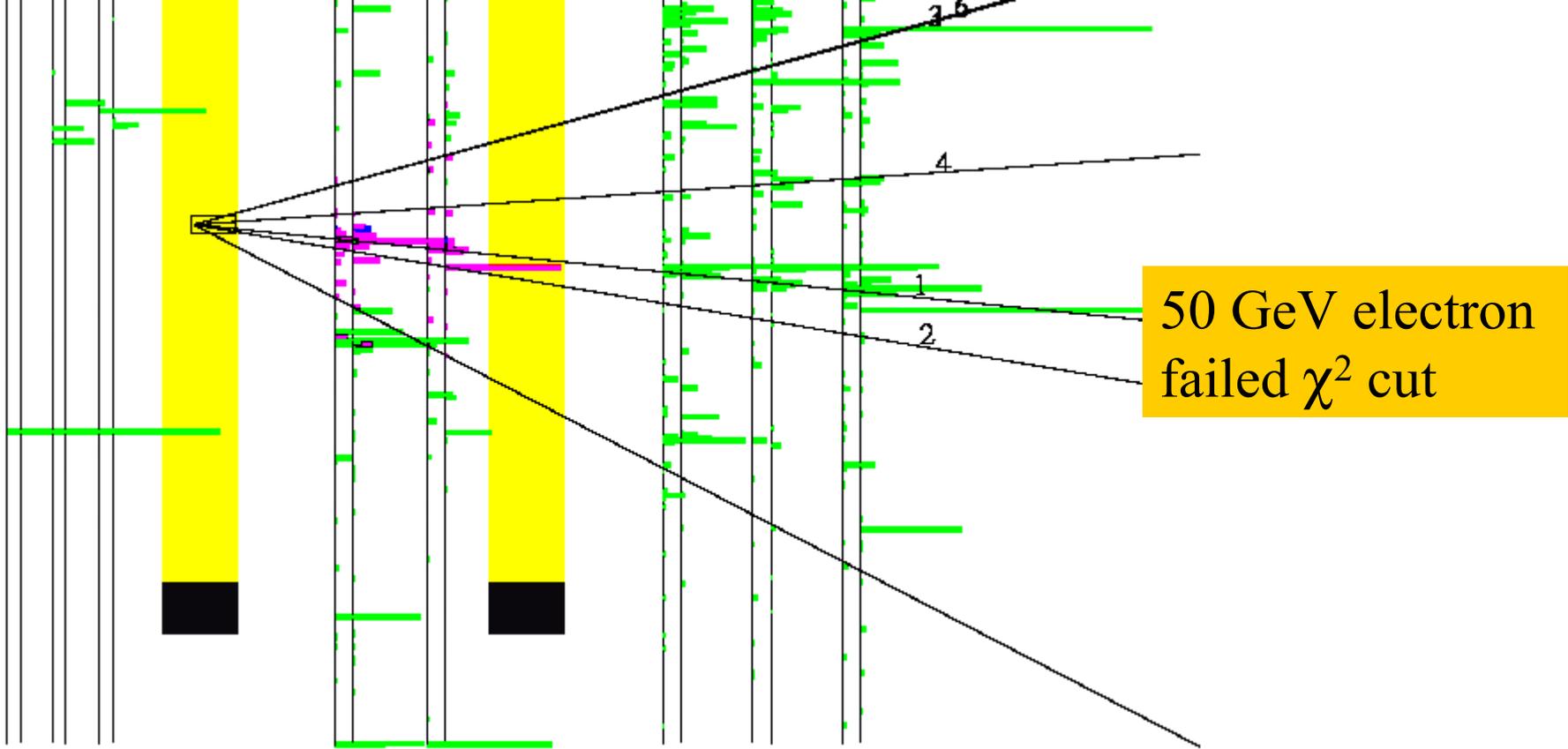
Energy resolution
error ~20% for isolated
electrons using
pulseheight χ^2 instead
of shape χ^2

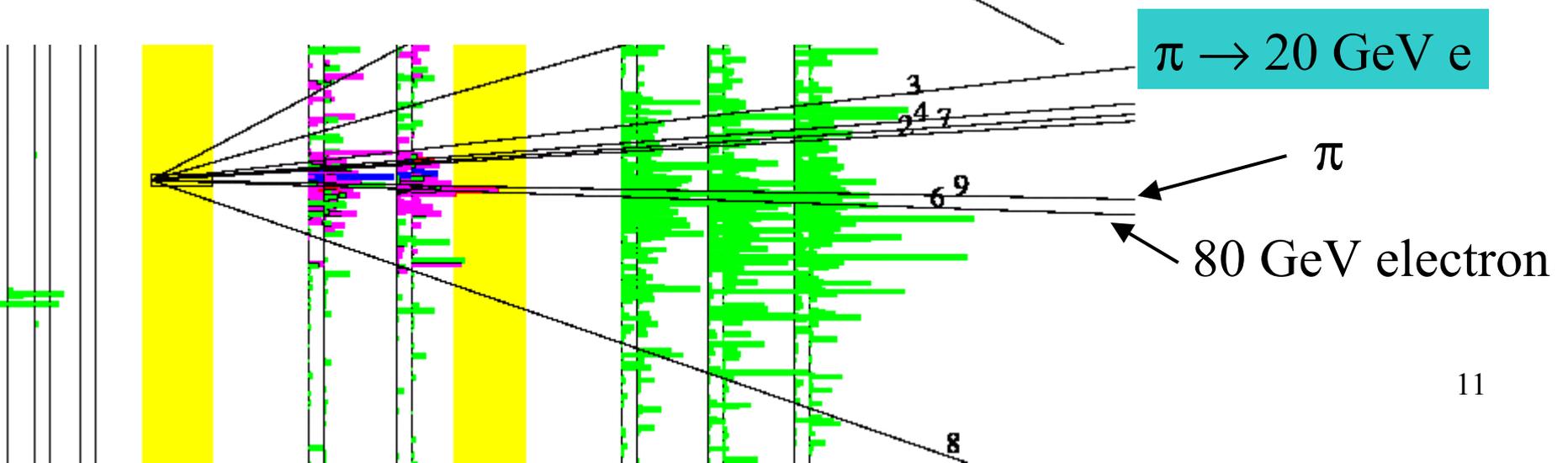
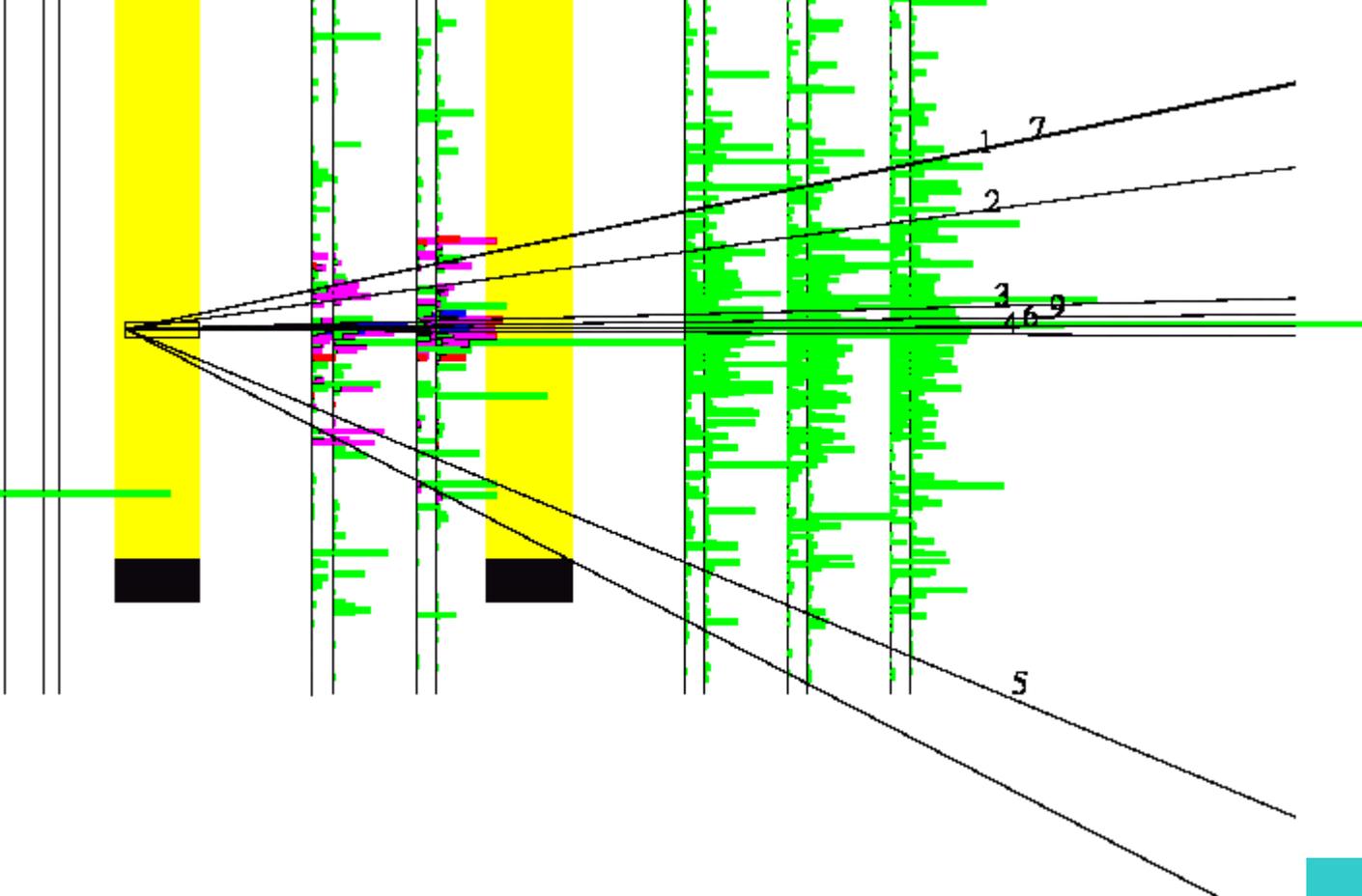


E872 Run= 3300 Event= 176 Wght= 177.0

V View







Failure modes

- Failed electron tags in std 1k MC (12%)
 - o $E_{\min} < 20$ GeV (7 evts)
 - o Close tracks (5 evts)
 - o Edge of SFT acceptance (5 evts)
 - o Lower weight than mis-tagged hadron (2 evts)
 - o Large SFT shower fluctuation from expected (2 evts)
 - o Electron masked by π_0 conversions (1 evts)
- Failed hadron tags (3%)
 - Most due to π_0 overlap (50 evts)
 - Identify $\sim 75\%$ as electrons “by eye”

Possible Next Steps

- Try to improve the algorithm
 - Use DC hits
 - Identify EMCal “broomstick” pattern for events with $\sim 2 < t < \sim 6$ radiation lengths
 - Cut on χ^2 in each SFT view
 - Cut on χ^2 in tail and core of shower
- Allow user directed electron ID
 - Already done

Summary

- New & old code electron efficiency = 88%
 - For $E > 20$ GeV, rad len in station 4 $>$ 2
- Hadron tag efficiency is much better
 - 91% old code
 - 97% new code