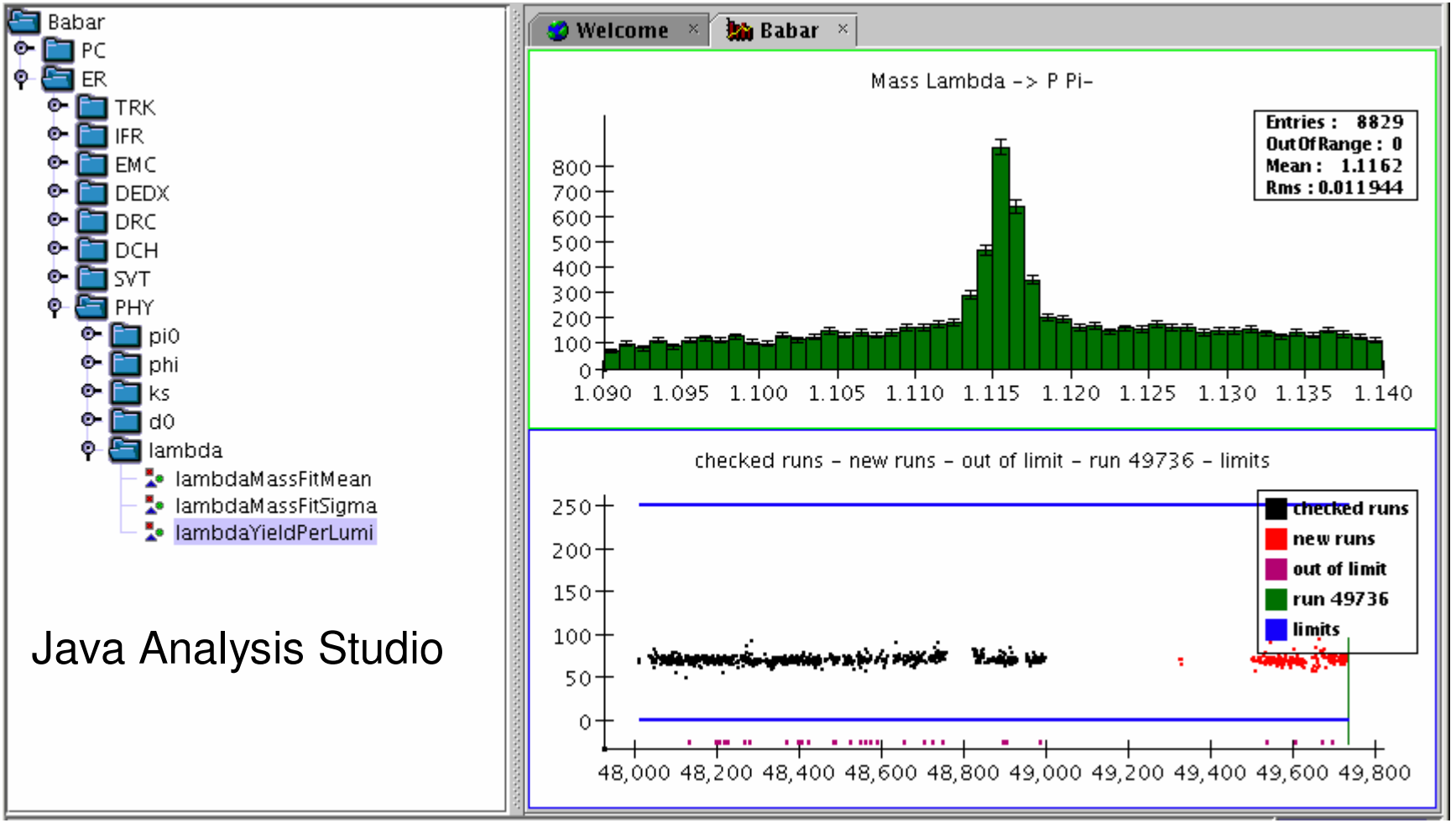
Data Quality Group checks for Monte Carlo

- Currently there are no formal checks of MC datasets
- It is assumed that MC does not suffer from the same faults possible in the real data: sub-detector failures etc.
- However MC can be incorrect due to:
  - Using the wrong detector conditions (change each month)
  - Using the wrong “background frames” to match the PEPII backgrounds (change each month)
  - Using the wrong signal decay files
  - Bugs in the reconstruction software
  - etc.

Catching MC errors

- Suggested methods of catching these failings:
  - Use same tools as for checking data



- New tools suggested:
- Below is a preliminary list of the physics processes to monitor in one fb^{-1} that might be sensitive to various changes:
  - Tracking mass resolution & abs. scale
    - high mass($ee \to \mu\mu$),
    - med. mass D($k\pi$),
    - low mass ($\phi \to KK$)
    - low momentum tracks ($D^* \to \pi$ D0)
    - high momentum tracks ($ee \to \mu\mu$)
  - Tracking efficiencies
    - $ee \to \tau$ 3-prong vs τ 1-prong
    - $D^* \to \pi D^0(K\pi)$ yield
    - #hits/track versus angle

    (check if condition DB is correct for SP)
  - EMC resolution & abs. scale
    - π^0 mass
    - η mass
    - low momentum γ; $ee \to \gamma\mu\mu$
    - high momentum γ?
  - Neutral efficiency
    - π^0 & η rates
  - PEP beam energies
    - BRECO rates and M_{es} peak position
  - Particle ID efficiency
    - rejection rates using PID control samples
  - Background monitoring
    - bkgd under π^0 peak?
    - extra bkgd hits in clean exclusive modes ($ee \to \gamma\mu\mu$)?
  - K_s lifetime ($\gamma\beta c\tau$)
    - efficiency vs dec. length
  - Tracking angular acceptance
    - Ks helicity angle dist.?
    - is $\cos(\theta_\pi)$ flat?
  - Photon angular acceptance
    - π^0 helicity angle dist.?
    - is $\cos(\theta_\gamma)$ flat?
  - Checks of charged/neutral track pulls of exclusive modes

David Hutchcroft

How to implement these checks

- Need help to write the code to make the histograms
  - Should be fairly clean samples which can measure more than one of the required cases
  - Probably very loose analysis cuts are required
  - People are those doing similar analyses should suggest sensible values
- Need help to run the code to make the histograms could make part of normal production and integrate as required
- Need help to check the histograms!
  - Every month of MC production for B^0B^0(bar), B^+B^-, cc and $\tau^+\tau^-$ should be checked
  - Every new release should be checked
  - Any new production at a new site should be checked
  - Every signal mode should be checked

What should the histograms look like?

- Again analysis groups should confirm that their MC looks like the appropriate data
- Automated checks are obviously preferred: fits to peaks, yields per fb^{-1} etc.
- Need people with experience of the data to set the limits on the MC shapes
- Same checks will be performed on the data
  - Same code so no peaking at the truth!
- This is a better check and avoids the problem where the MC is calibrated differently to the data

Process

- Each MC and data reconstruction job will output a histogram file for the processes to check
- When required a script will gather the histogram files from several hundred runs and sum the content of the histograms
- Fits to the histograms will be performed and the results compared to a “normal” band
- The accumulated histograms and fits should be available for humans to look at too