

# Bhabha Tracking Efficiencies

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# Motivation

- I would like to estimate the tracking efficiency
- I use Bhabha events because if one track is reconstructed then the other particle should also produce a track

$$\epsilon = \frac{\text{Number of Bhabha events with exactly 2 tracks}}{\text{Number of Bhabha events with one or more tracks}}$$

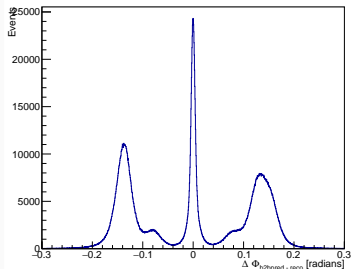
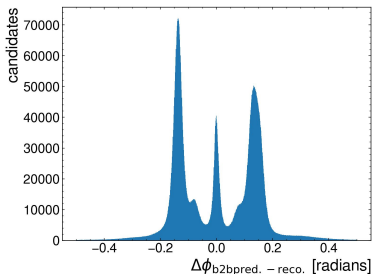
- This idea comes from some plots presented by Sam in previous [tracking and ECL](#) meetings.

# Getting Started

- Cuts Sam used:
  - gamma:probe '(E > 0.1)'
  - gamma:tag '(clusterE > 3.0)'
  - vpho:cand 'reconstructed from gamma:probe and gamma:tag'
  - $0.296706 < \theta < 2.61799 \rightarrow$  It has to hit the ECL
  - nCleanedTracks[abs(dz) < 2.0 and abs(dr) < 0.5 and nCDCHits > 0 and pt > 0.15] < 1  $\rightarrow$  bad quality hits
  - $M(\text{vpho}) > 8.0 \text{ GeV} \rightarrow$  To cut away background (not from his email but surely he is using something like that)
- Cuts I use:
  - $M(\text{vpho}) > 8.0 \text{ GeV} \rightarrow$  For the vpho to have a mass of at least 8 GeV, gamma:tag and gamma:probe must have at least an energy of more than 3 GeV

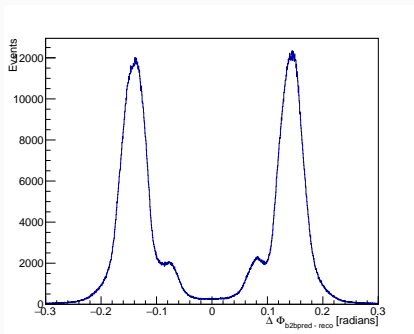
# Reproducing Plots

- The plots in the following slides are produced using prod6 (this is because as a starting point I tried to reproduce Sam's plots)
- Sam used all Prod6 data. I am only using the following:  
/hsm/belle2/bdata/Data/release-02-01-00/DB00000438  
/prod00000006/e0003/4S/r02\*/all/mdst.sub00/\*.root
- Sam's plot is on the left.



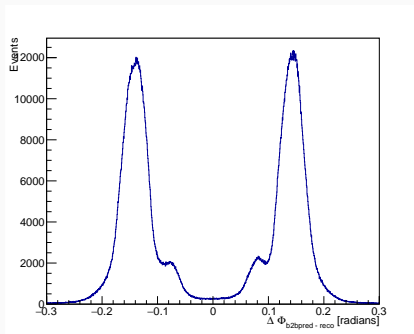
# Running on MC

- At first I ran over MC11  $ee \rightarrow ee$  samples with the same steering file but I almost had no events in the gamma list
- 1st problem: ECL hits are written in the gamma list only if they have no track associated. Not every ECL hit is written in the gamma list
- 2nd problem: I also have to look at events with only one charge particle tracked  $\rightarrow$  I have to *reconstruct*:  $\nu_{pho} \rightarrow \gamma e$  and  $\nu_{pho} \rightarrow ee$



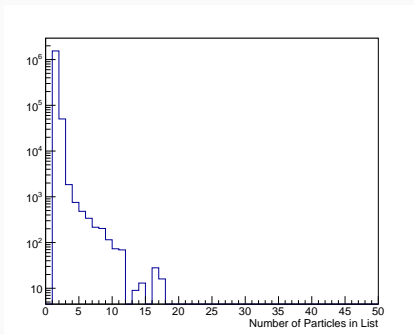
# More problems

- Double peak structure has to be understood



# More problems

- Double peak structure has to be understood
- Sometimes more than one vpho per event is reconstructed



## Next steps

- Select best  $v_{pho}$
- Cut on  $\Delta\Phi_{b2b_{pred} - reco}$  peak and calculate a first efficiency