

# Bhabha Tracking Efficiencies

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# Motivation

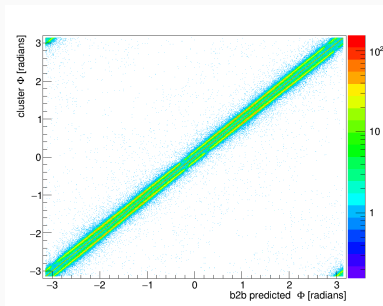
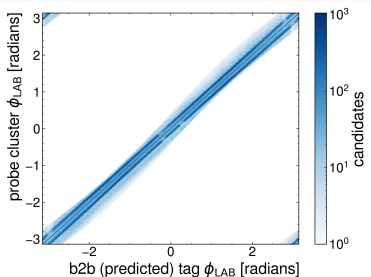
- I would like to estimate the tracking efficiency Bhabha events
- One possible way to do it is to select the electrons using only information coming from the ECL (they are therefore labeled and treated as gammas)
- Once selected a pure electron sample, one can then look to the Tracks related to ECLClusters
- The ratio between the ECLClusters with a Track associated and all the ECLClusters will provide an estimation of tracking efficiency
- This idea comes from some plots presented by Sam in previous tracking and ECL meetings.

# Getting Started

- All cuts were taken from Sam's studies:
  - 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(vpho) > 8.0 GeV  $\rightarrow$  To cut away background (not from his email but surely he is using something like that)

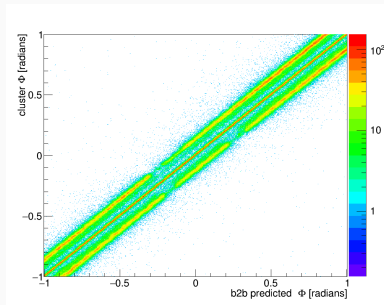
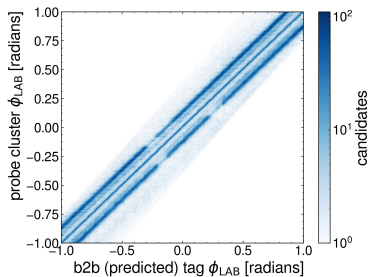
# Reproducing Plots

- 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  
/prod000000006/e0003/4S/r02\*/all/mdst.sub00/\*.root
- Sam's plots are on the left.
- Three lines. The middle one is  $ee \rightarrow \gamma\gamma$  the two others are  $ee \rightarrow \gamma\gamma$



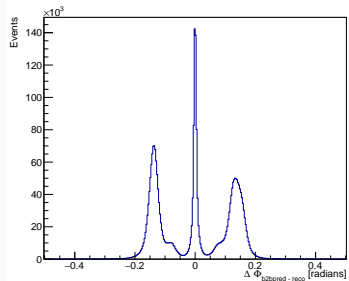
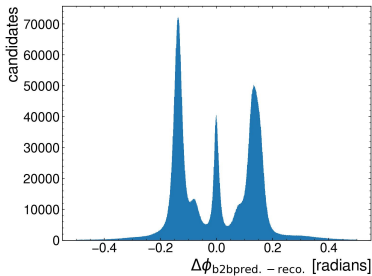
# Reproducing Plots

Same plots but zoomed in:



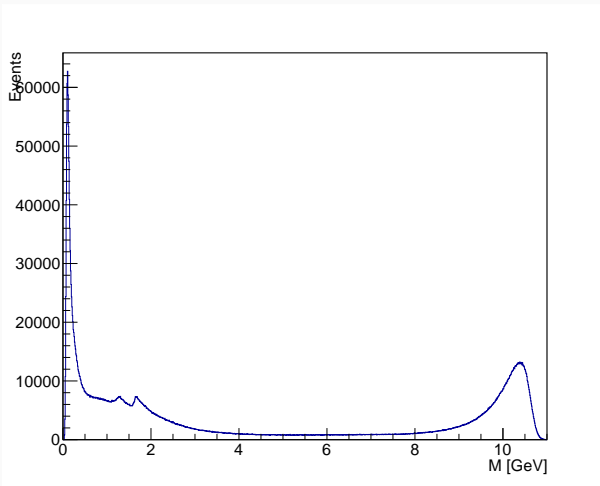
# Reproducing Plots

- The middle peak is  $ee \rightarrow \gamma\gamma$ , the two other peaks are  $ee \rightarrow \gamma\gamma$
- My  $ee \rightarrow \gamma\gamma$  peak is way higher (Maybe there are some cuts that I am not considering?)



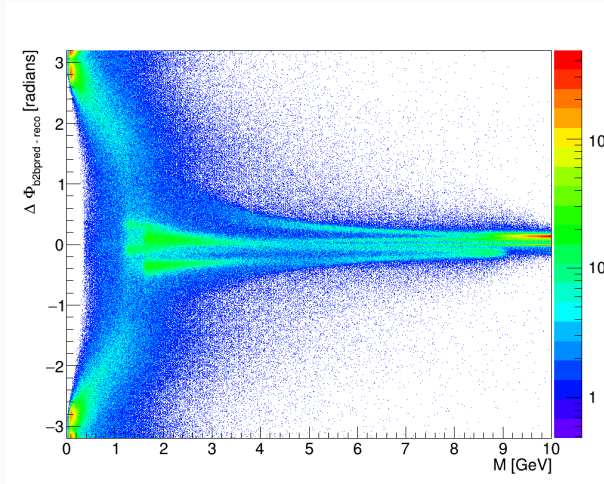
## Some more plots

Here the invariant mass of the virtual photon ( $\gamma^*$ ) is plotted



## Some more plots

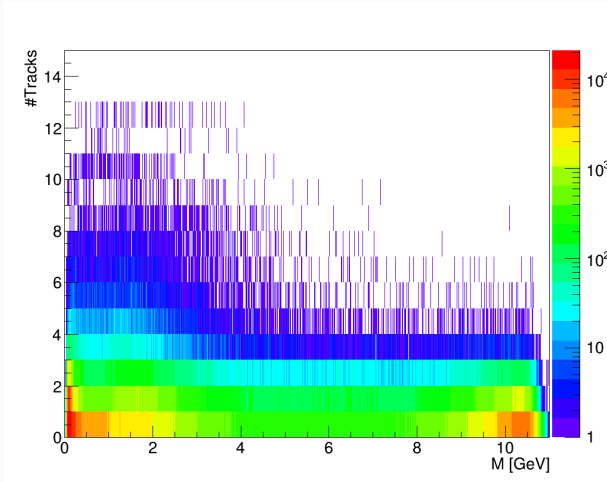
Here the invariant mass of the virtual photon is plotted against the difference between b2bpredicted and reconstructed  $\Phi$  angel





## Some more plots

Here the invariant mass of the virtual photon is plotted against the number of reconstructed Tracks.



# The next Steps

- Investigate the best cuts for our purposes and apply them
- Select only the  $ee$  candidates and study the tracking efficiency using that sample
- Produce the same plots shown here using MC sample (from a preliminary study using MC10 it looks like very few events survive applying the described selection)