

Bhabha Tracking Efficiencies

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Motivation

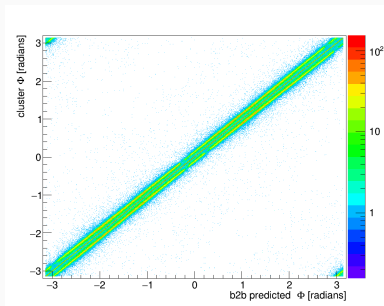
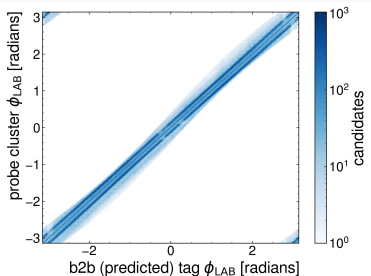
- I would like to estimate the tracking efficiency Bhabha events
- One possible way to do it is to select the electrons using only information coming from the ECL (they are therefore labeled and treated as gammas)
- Once selected a pure electron sample, one can then look at the Tracks related to ECLClusters
- 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)

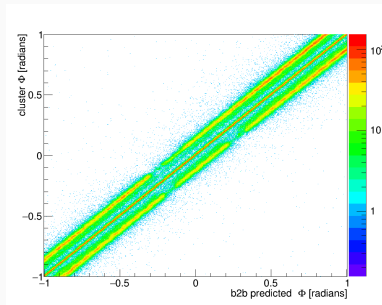
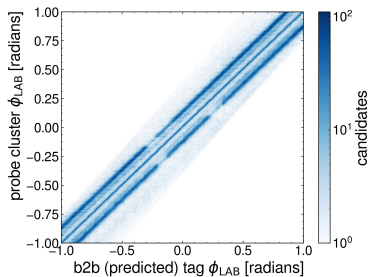
Reproducing Plots

- 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 $ee \rightarrow ee$



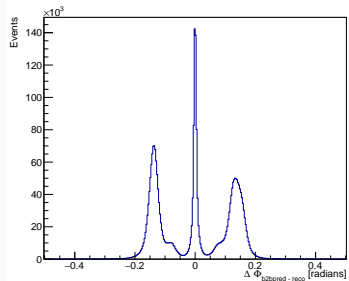
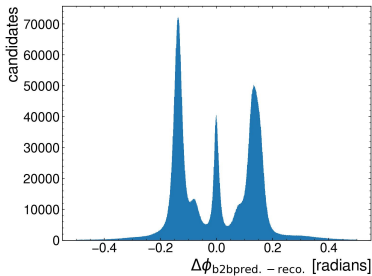
Reproducing Plots

Same plots but zoomed in:



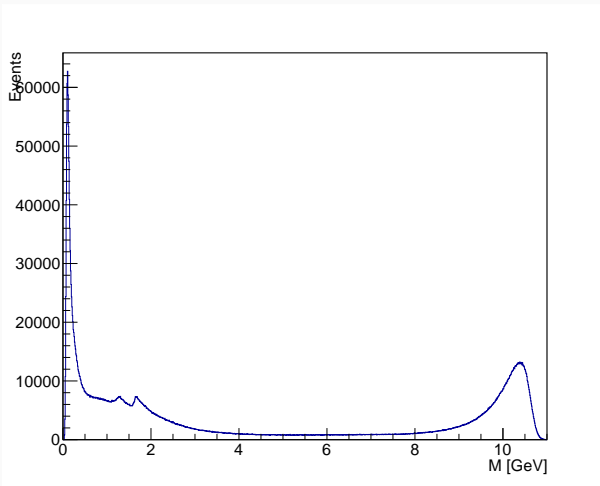
Reproducing Plots

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



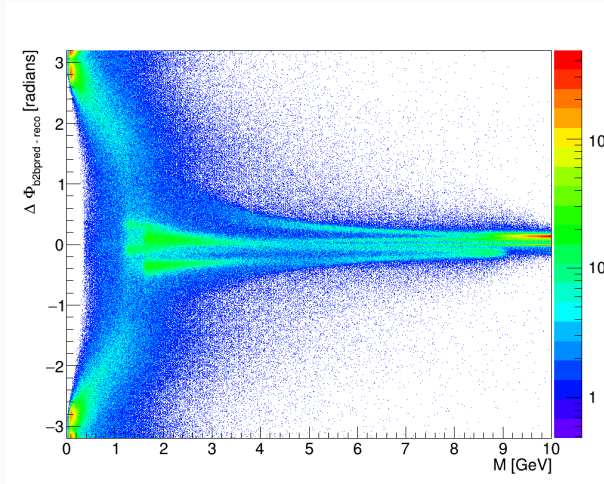
Some more plots

Here the invariant mass of the virtual photon (γ^*) is plotted



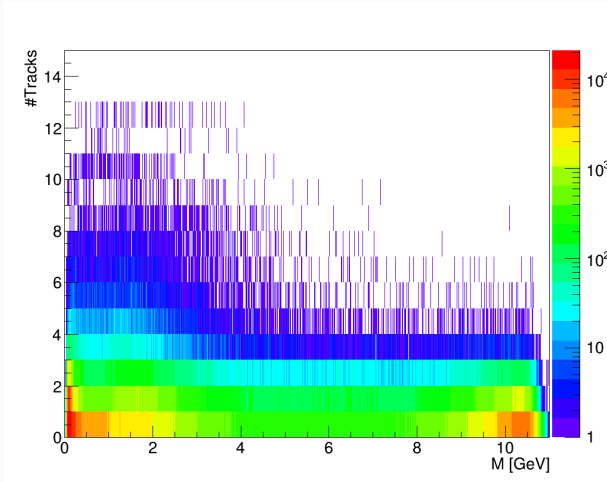
Some more plots

Here the invariant mass of the virtual photon is plotted against the difference between the b2bpredicted and the reconstructed Φ 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 $ee \rightarrow ee$ 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)