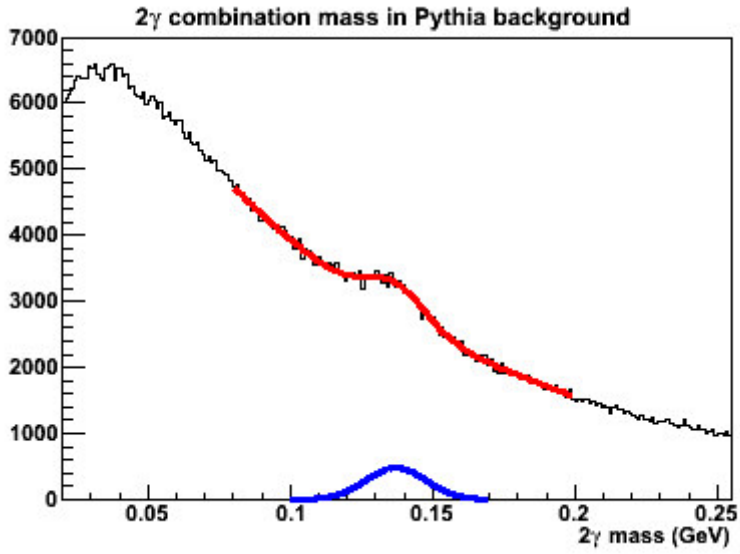


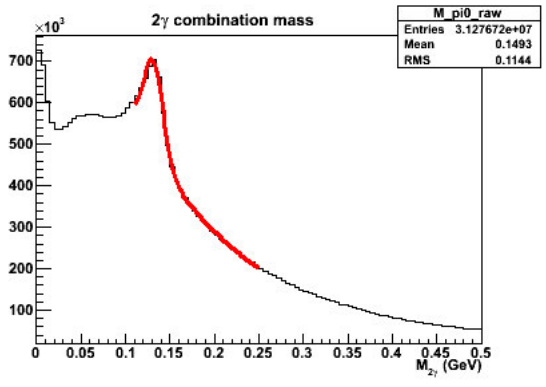
pi0 candidate invariant mass distribution from Pythia (bggen) event set using the KLOE algorithm and current configuration of BCAL noise hits in mcsmear.

Let's examine the selection of b1pi event renditions with attention to the distributions of raw pi0 and ω masses. The new approach is to introduce constraints into the kinematic fit a step at a time, rejecting events with masses far from the mean at every stage.

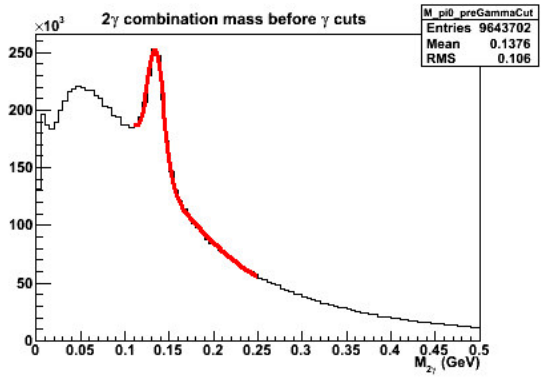
The figure of merit used in the evaluation of pi0 combinatoric background comes from the fit to 2γ mass distribution: $f = f_{bg} + f_{pi0}$ where, $f_{bg} = \exp(p0 + p1*m)$ and $f_{pi0} = p2*\exp(-0.5*((m-p3)/p4)^2)$

FOM = $p2 / f_{bg}(p3)$

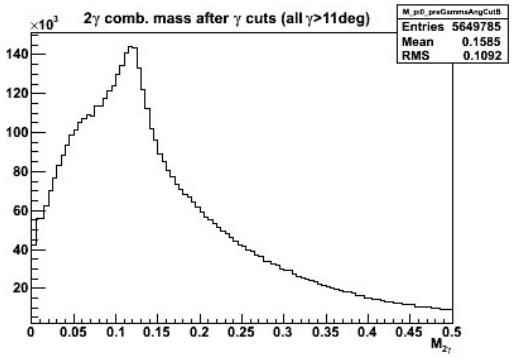
All possible pairs of reconstructed photons are formed
and their invariant mass plotted
signal/background FOM: 0.458



Require at least one photon in FCAL
signal/background FOM: 0.682

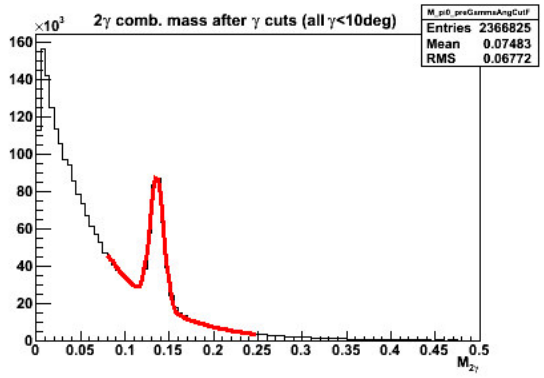


$M_{2\gamma}$ with both γ in **BCAL** (>11deg)



Clearly BCAL is the culprit in the poor signal/bg

$M_{2\gamma}$ with both γ in **FCAL** (<10deg)



signal/background FOM: **3.42**

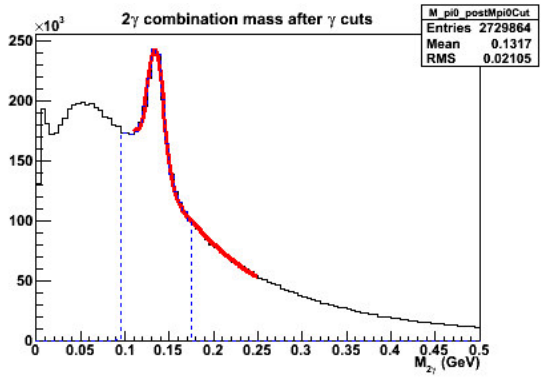
Impose photon CL and E cut:

- CL - *currently disabled* as the photon CL distributions (in both CALs) look far from flat with peak at zero
- E - minimum of 65MeV

signal/background FOM: 0.719

(This FOM reaches 1.9 with CL>0.2 & E>80MeV)

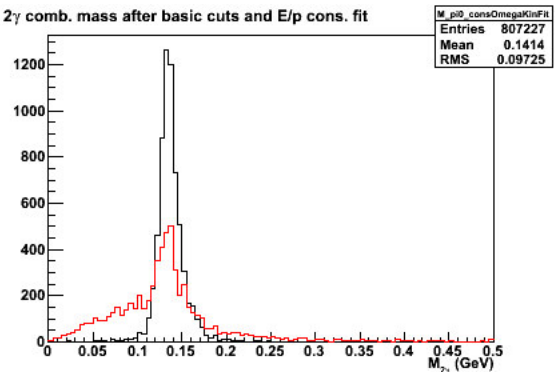
The position of a subsequent pi0 mass cut is shown in dashed blue line



The pi0 hypo. is put into all possible 5pi renditions and kinematically fit with only the energy/momentum conservation constraints (4C). Then the fits are performed again with an omega mass constraint (5C). In both cases the rendition with the best fit is identified and tuned 2γ mass saved:

- black line - 4C
- red line - 5C

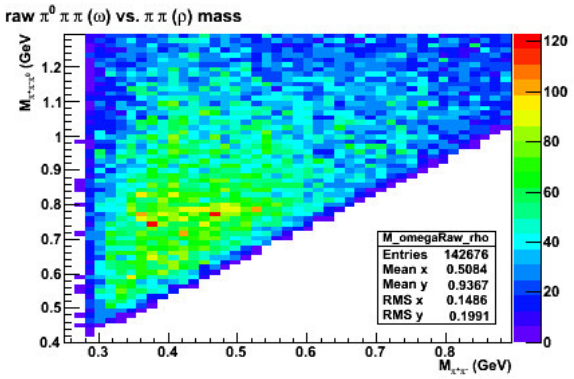
The integrals are the same. What must be happening is that the background underneath the peak is smeared out especially with the tighter constraint.



Surviving pi0 hypotheses are subsequently used in their constrained form (pi0 mass forced) Now:

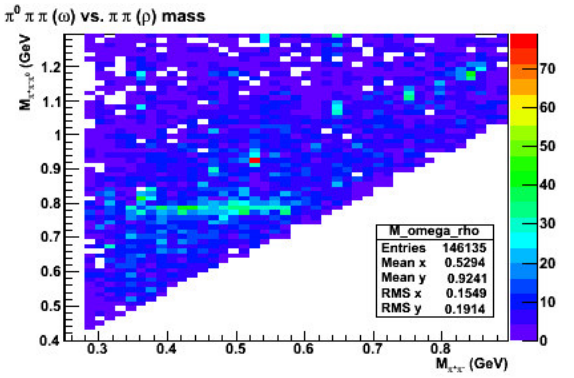
- form all possible $\pi^0\pi^+\pi^-$ candidate ω systems and all combinations of leftover pions for each.
- perform a kinematic fit without an ω constraint
- plot the non-fit-tuned $\pi^+\pi^-\pi^0$ vs $\pi^+\pi^-$ for all renditions of leftovers with fit CL>0.05

A band at the ω mass is clearly visible but with huge combinatoric background



- for each rendition of leftovers, identify the combination with best fit CL (closest compliance to E/p conservation) and plot its tuned $\pi^+\pi^-\pi^0$ vs $\pi^+\pi^-$ for these.

The kinematic fit must be rejecting all those events with more stuff than the 5π: taking a subset of the event breaks the conservation laws. So far no ω constraints have been set.



A y-projection of the above 2D histogram for a sense of the background under the ω. A cut is made 36MeV around the ω mass of this distribution.