



Updates on Fwd Endcap ECAL Studies

EVO Meeting

17/11/2009

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*Work supported by


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SLAC meeting conclusions and steps forward



At the October SLAC meeting some preliminary results have been presented:

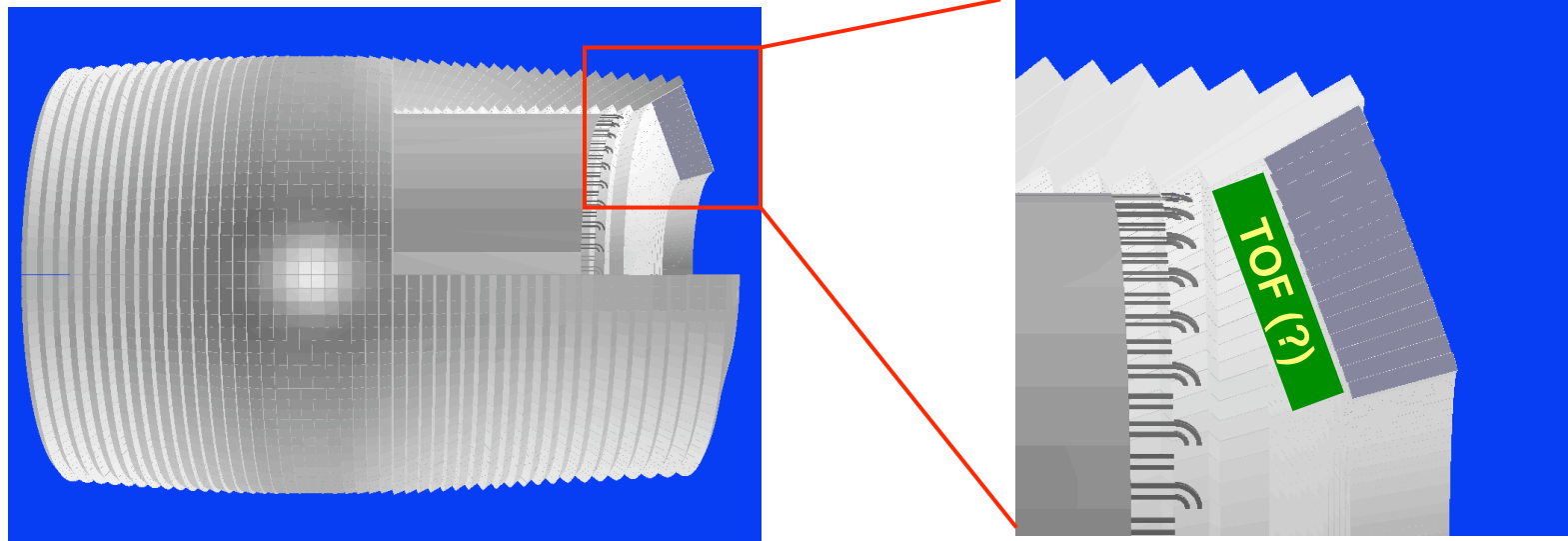
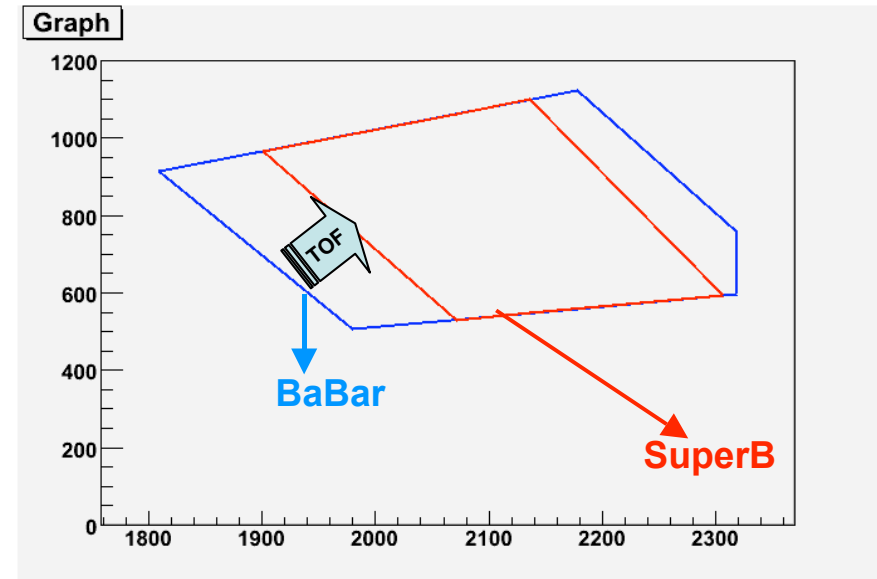
- Energy resolution
 - Investigate Barrel-Fwd transition region
 - Preliminary conclusion: No effect
 - Effect of Fwd PID material on energy resolution
 - Preliminary conclusion : no effect up to $\sim 0.3 X_0$
 - Possible additional study: effect of distance between fwd PID and ECAL
 - Not covered here
 - Needed improvements:
 - Clustering algorithm
 - New, more tail sensitive, function or parameter to describe the reconstructed energy resolution
 - To be understood:
 - Difference of intrinsic energy resolution for back and front aligned Fwd Endcap



Fwd ECAL Geometry Envelop



- Fill the same BaBar angular region but
 - leave space for TOF: $\Delta Z = (100 \text{ mm}) \cdot \cos(22.7)$
 - Xtals material : LSO (LYSO)
 - Xtal depth = 200 mm ($\sim 17.5 X_0$)
- Barrel-Endcap Transition region modeled according to M. Lebeau suggestion
 - 5 mm no-go zone (air)
 - 10 mm CF

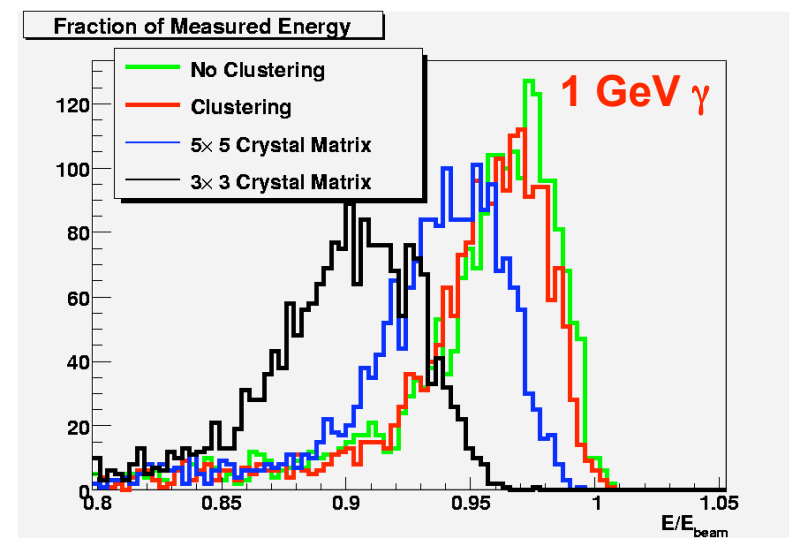
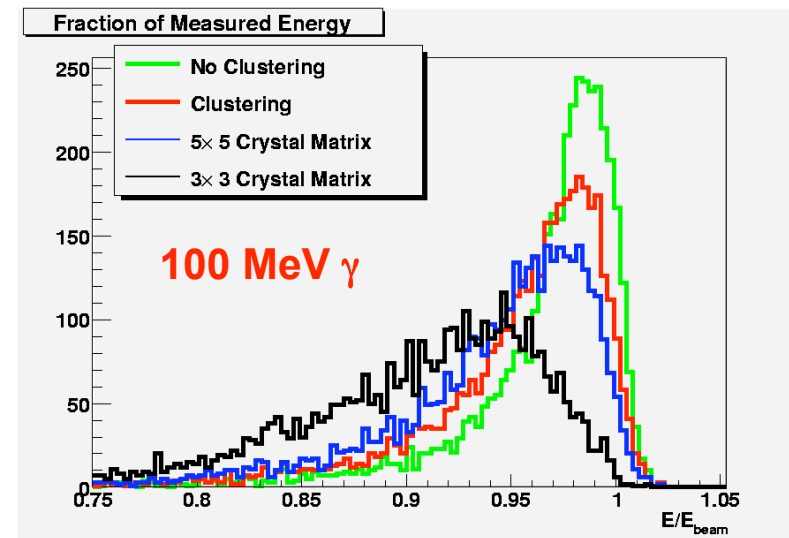




Clustering



- No Clustering:
 - $E_{\text{crystal}} > 1 \text{ MeV}$
 - Same as slac meeting
- Clustering :
 - Clustering algorithm as (supposed to be) in BaBar
 - Adapted for LSO
 - Not yet tuned or optimized
- 5 x 5 - 3 x 3 Matrix
 - Take maximum energy crystal and a matrix of crystal around it



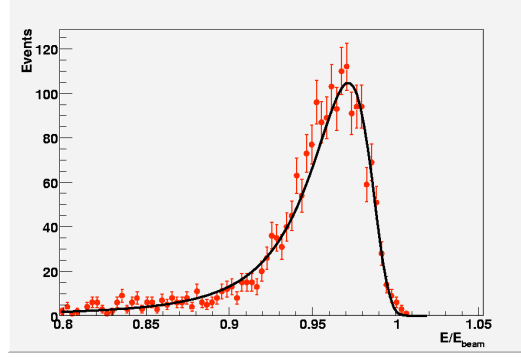
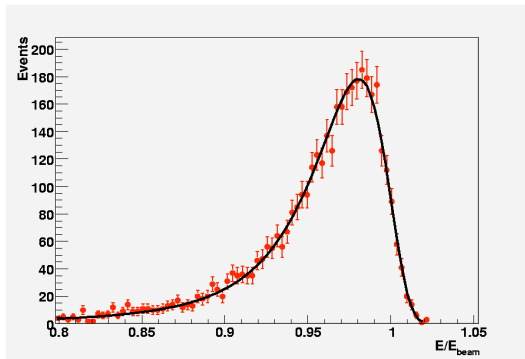


Fit Functions

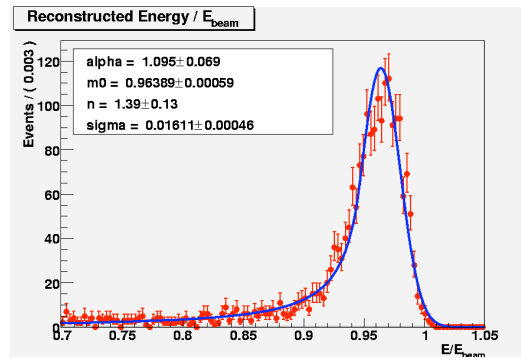
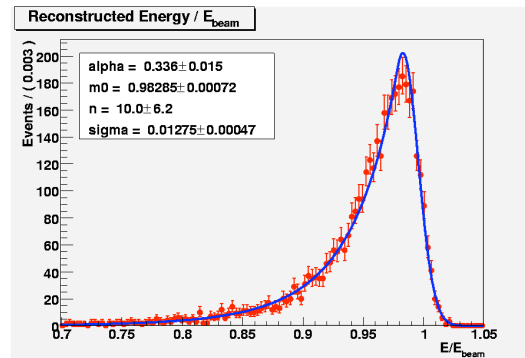


100 MeV γ

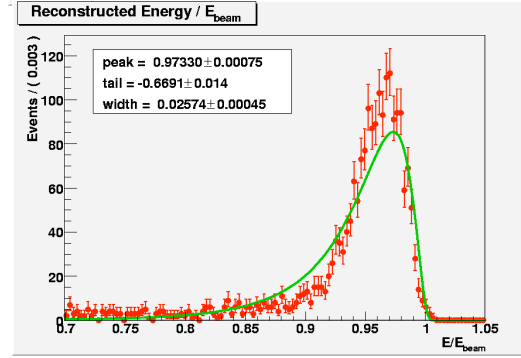
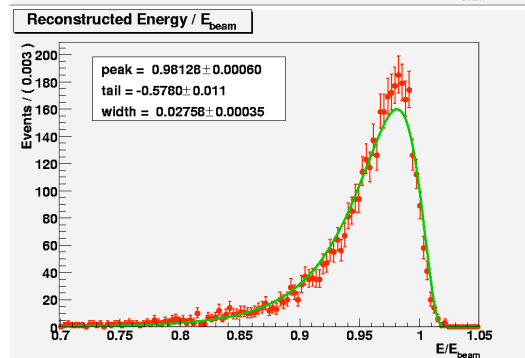
1 GeV γ



Asymmetric Gauss Function



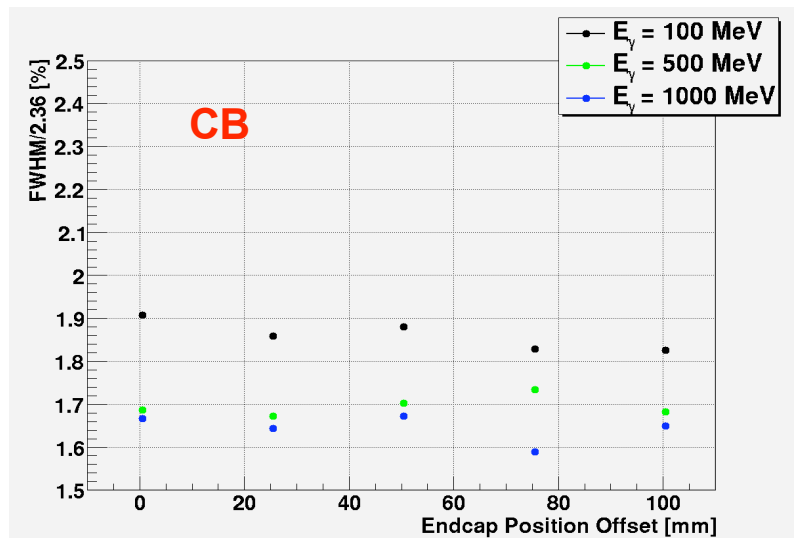
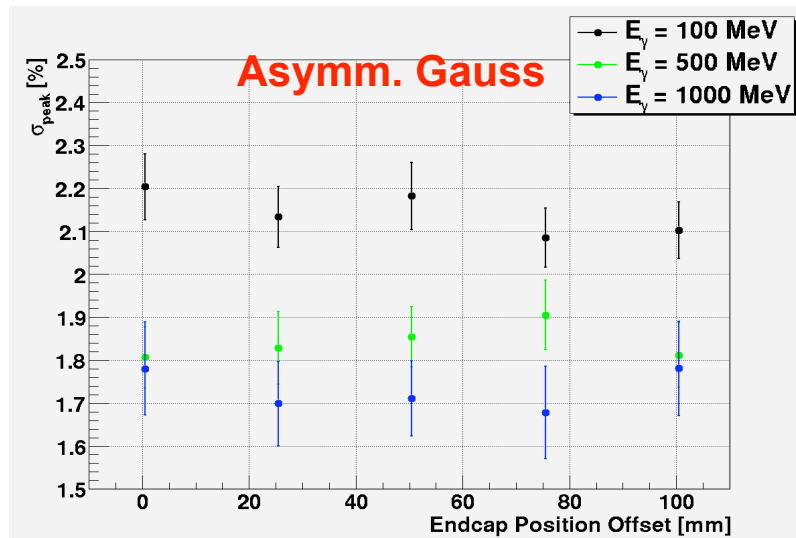
Crystal Ball Function



Novosibirsk Function

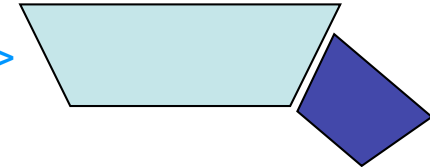


Energy Resolution vs Fwd Endcap Position

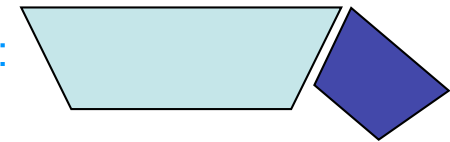


- Scan Energy resolution as a function of Forward Endcap position with respect to the Barrel

– 0 mm Offset ->



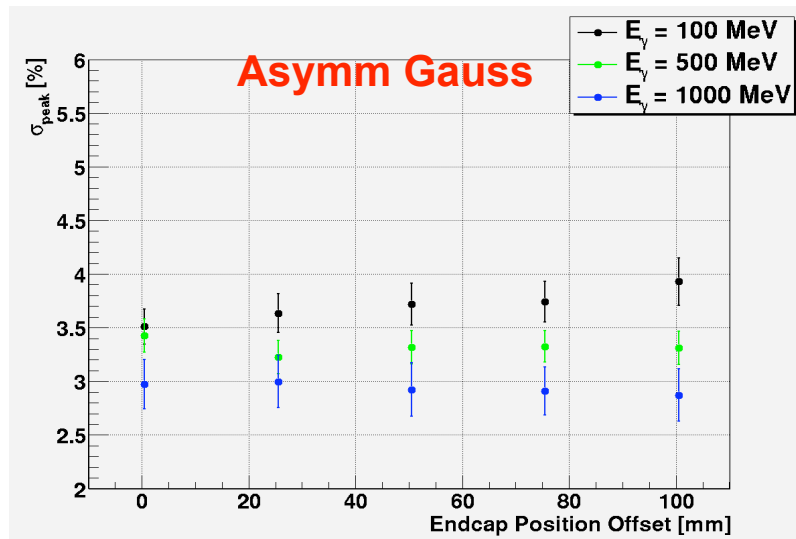
– 100 mm Offset:



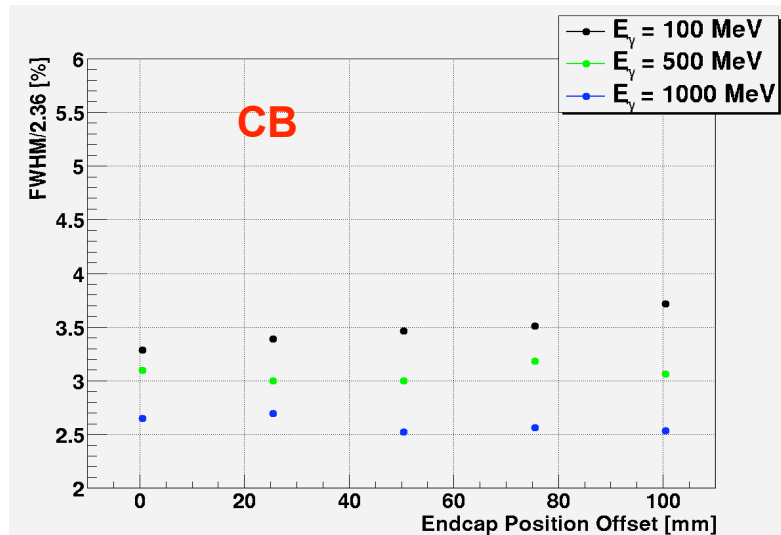
- No really clear trend after
 - Some hints at low energies



E Res. vs Fwd Position at Transition ($28 < \theta < 29$)

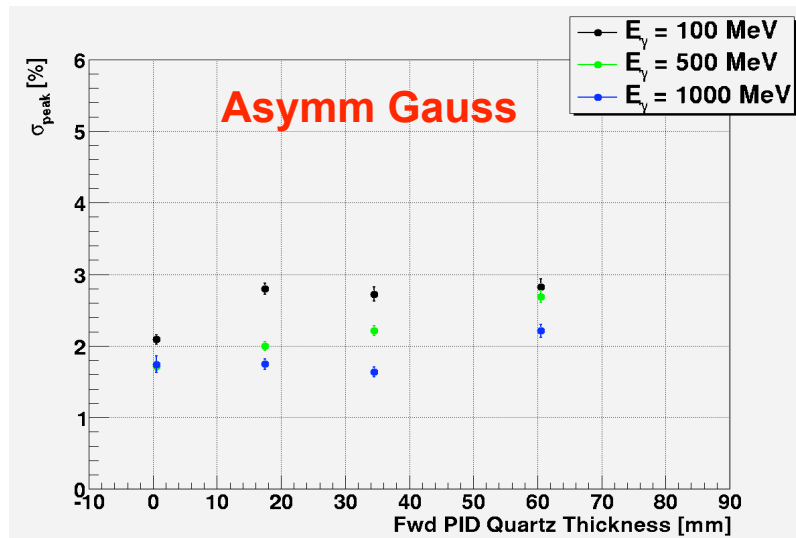


- With the clustering at low energy the transition region seems to have an effect on the energy resolution

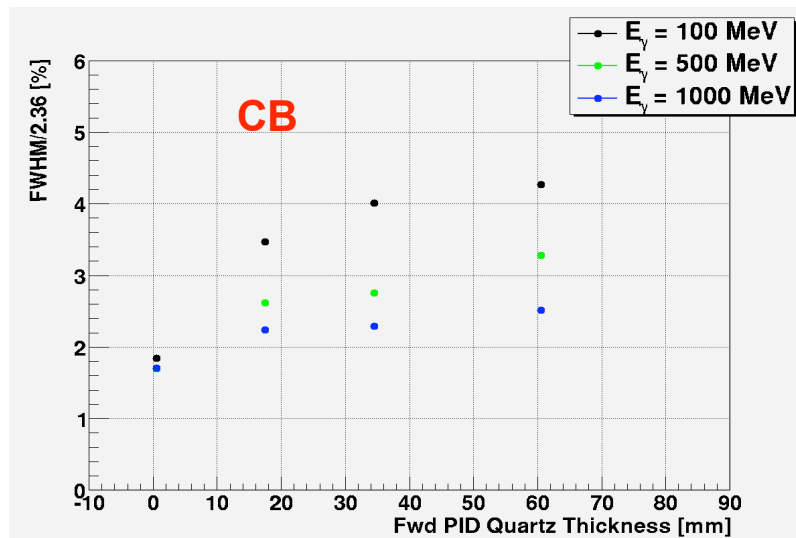




Eres vs Fwd PID thickness



- Adding the clustering algorithm the effect of the Forward PID material it is not negligible
- Larger impact on low energy resolution





Conclusions



- Adding the clustering algorithm:
 - The position of the endcap wrt the barrel has some impact in the transition region
 - Algorithm optimization may improve things
 - The PID material seems to have a non negligible effect on the energy resolution
- Next steps:
 - Algorithm optimization for single and double (π^0) photons
- Final remarks:
 - The addition of the clustering algorithm affected the results in a significant way
 - Changing the clustering algorithm performance is likely to have some impact
 - Final conclusions only after a real clustering algorithm optimization