

ILD BeamCal reconstruction.

FCAL software and analysis meeting

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DESY

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The ILD BeamCal

A few characteristics

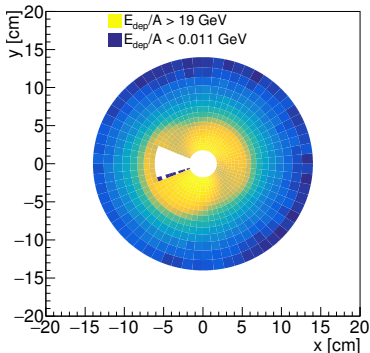
- ECal Si-W sandwich calorimeter
- Main purpose:
 - electron ($\gamma\gamma$) tagging
 - beam diagnostics from the background pattern
- Angular coverage: $\theta \sim [6, 45]$ mrad
- Crossing angle: ~ 14 mrad
- Segmentation:
 - polar grid in ϕ
 - Cell R size: from 2 to 13.7 mm
- 30 layers: total thickness ~ 20 cm

Dedicated reconstruction algorithm

- Overlay beam background (ROOT file)
- Reconstruct showers
- BeamCalClusterReco processor
→ FCALSW/FCalClusterer (mainly CLIC)

More documentation in CLIC note:

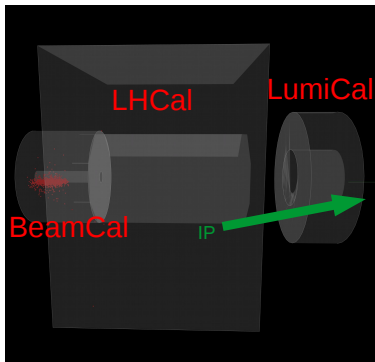
<http://cds.cern.ch/record/2227265/files/BeamCalReco-Note-2016-005.pdf>



BeamCal cluster reconstruction

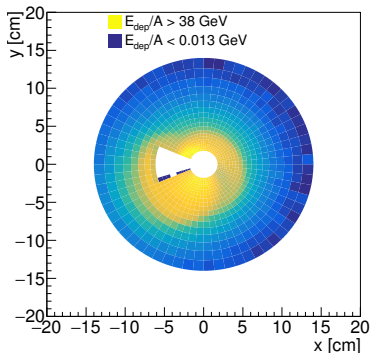
Setup

- Currently not run in ILDConfig
 - re-activating
 - re-investigating reconstruction
- iLCSoft v01-19-05
- ILD_I5_v02
- Use BeamCal background maps from previous study by S. Lukić
 - With nominal Anti DiD
 - Without Anti DiD
 - (See next slide)
- Single particle reconstruction
 - Use ddsim particle gun
 - 30/50/100/200 GeV photons
 - Flat θ distribution
 - Statistics: 10000 events / energy point

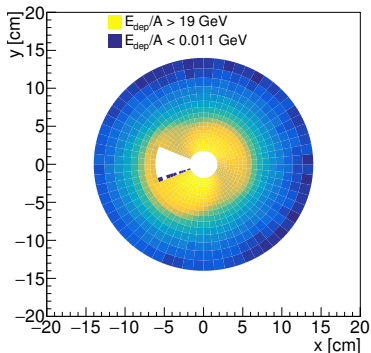


BeamCal cluster reconstruction

Background maps (S. Lukić)



NO Anti DiD



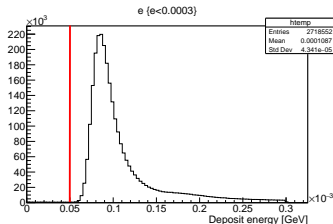
Nominal Anti DiD

Don't pay attention to numbers but to the ratio
→ Factor 2 on background in the central region !

BeamCal cluster reconstruction

BeamCalClusterReco processor parameters

- Original settings from v01-17-11 (M. Habermehl)
 - Study done with old L*
 - Optimized for maximum efficiency
 - Never looked at energy calibration
 - Geometry change:
 - v01-17-11 → Fixed cell size per ring
 - v01-19-05 → Fixed ϕ segmentation

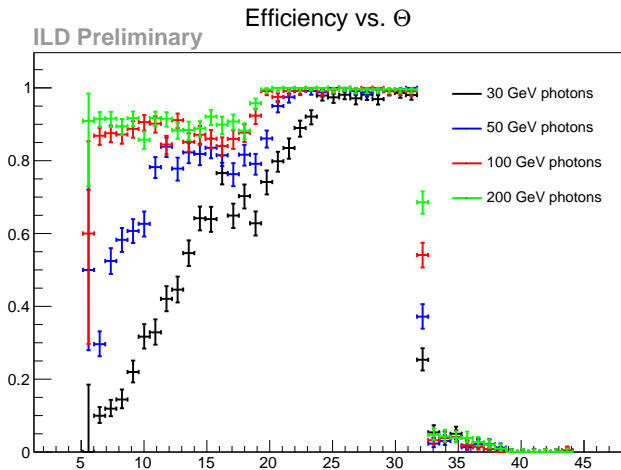


- Re-adjusted a few parameters to fit the current reco
 - ETPad = 5.10^{-5} GeV, from MIP scale
 - ETCluster = 0.06 GeV (non-calibrated), rescaled from v01-17-11
 - LinearCalibrationFactor = 72, same as v01-17-11
 - Shower reconstruction parameters left untouched



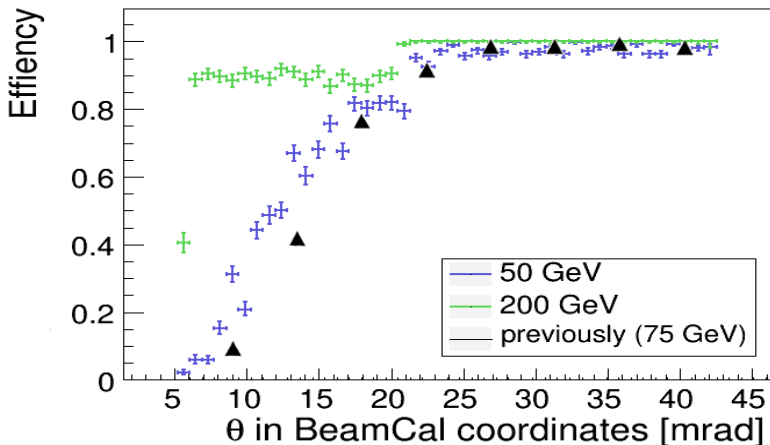
BeamCal cluster reconstruction

Reconstruction efficiency



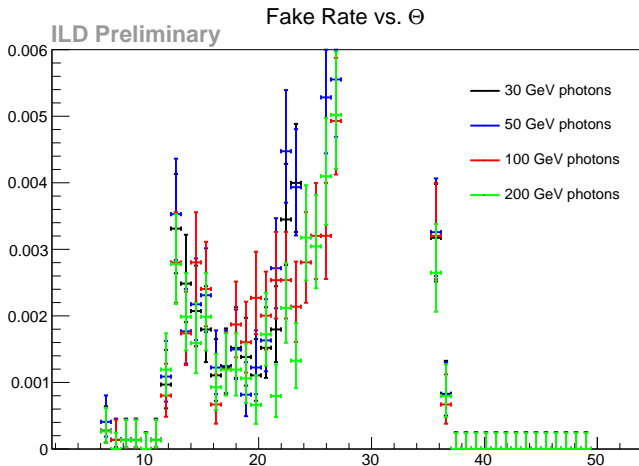
BeamCal cluster reconstruction

Reconstruction efficiency (old L* / Mokka)



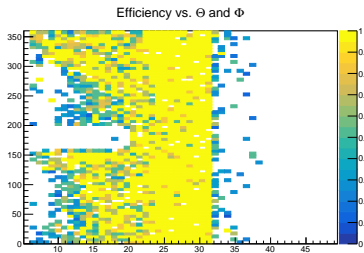
BeamCal cluster reconstruction

Reconstruction fakes

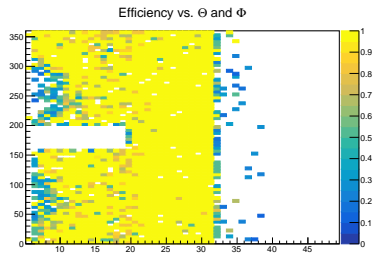


BeamCal cluster reconstruction

Reconstruction efficiency - $\theta VS \phi$



30 GeV photons



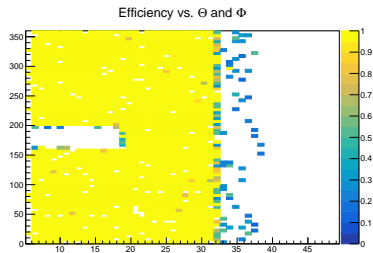
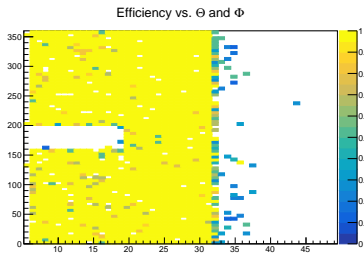
50 GeV photons

ILD Preliminary



BeamCal cluster reconstruction

Reconstruction efficiency - $\theta VS \phi$

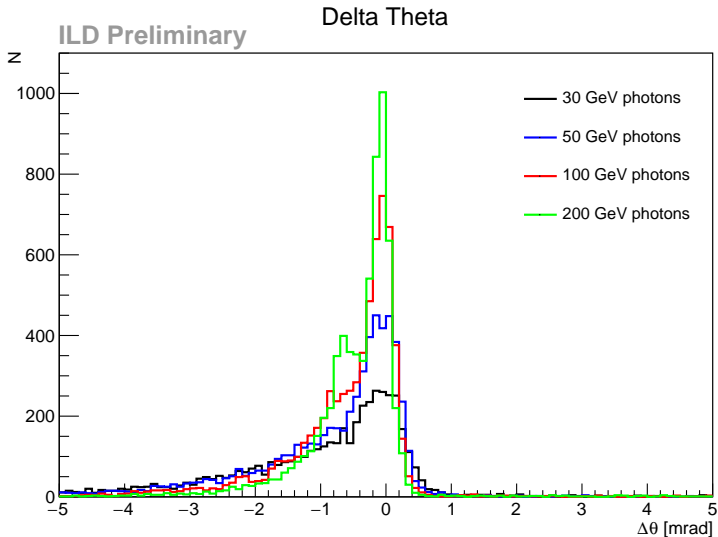


ILD Preliminary



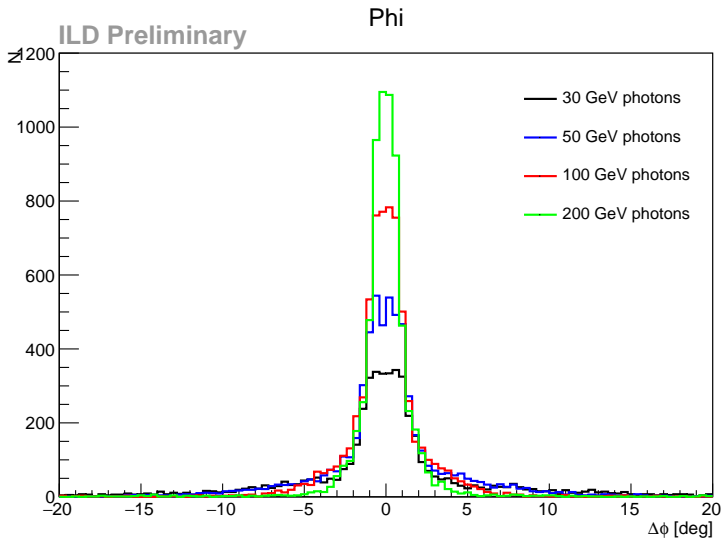
BeamCal cluster reconstruction

MC / Reco θ angle



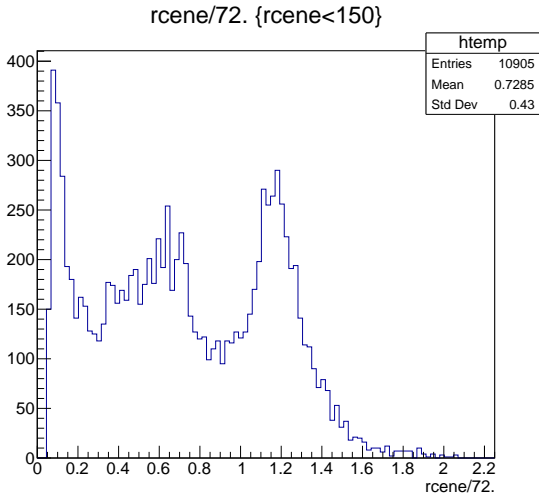
BeamCal cluster reconstruction

MC / Reco ϕ angle



BeamCal cluster reconstruction

First look at energy ...

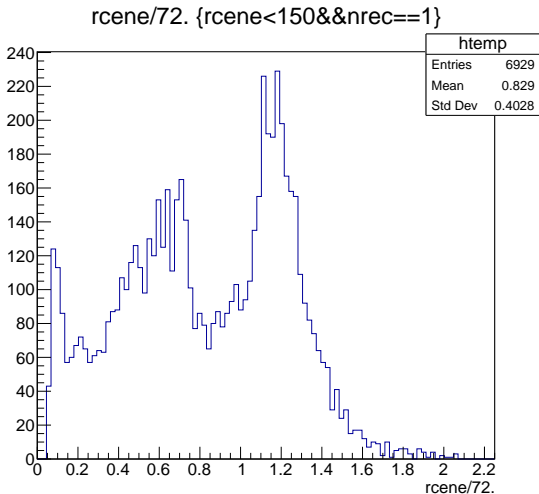


100 GeV photon example - All reco particles



BeamCal cluster reconstruction

First look at energy ...



100 GeV photon example - NRec == 1



BeamCal cluster reconstruction

Conclusion

- ILD BeamCal reconstruction (re-)investigated
- (Re-)Activated a few days ago in ILDConfig
- **Will be run in the central production with the performances as shown today**
- Shown today:
 - Nice reconstruction efficiency (efficiency VS θ)
 - Low fake rate ($< 10^{-3}$)
 - Results comparable to Mokka world
 - Energy distribution not yet understood ...
- Not shown:
 - Results very similar with/without AntiDID
- Not studied yet:
 - Reconstructed energy
 - Need to tune `LinearCalibrationFactor`
 - Need to understand energy distribution first
 - ILD_s5_v02 reconstruction
 - No realistic BField map yet

Any inputs from FCal group ?

