PandoraPFA track selector

Matthias Weber (CERN)

Track Selector Parameters

Change PandoraPFA track selector parameter, particularly constraints on first hit closest to interaction point in DDMarlinPandora, namely

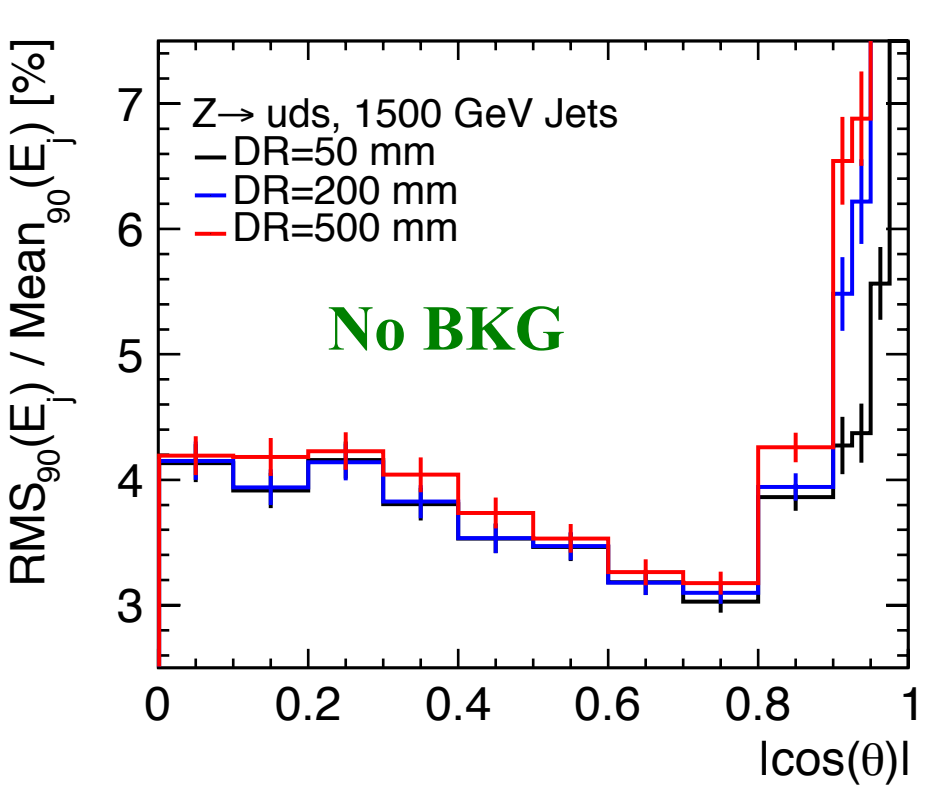
--MyDDMarlinPandora.D0TrackCut
--MyDDMarlinPandora.Z0TrackCut
--MyDDMarlinPandora.MaxBarrelTrackerInnerRDistance

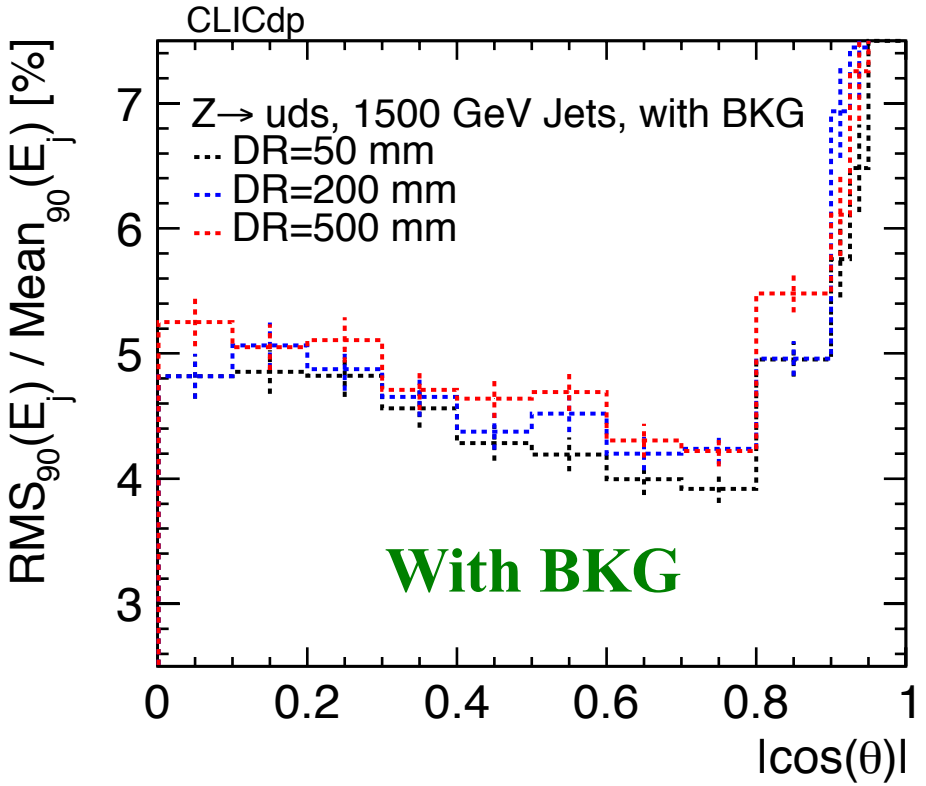
Default: 50 mm → check 200 and 500 mm

→checked in Simulation that at 200 mm is sufficient for b and c decays, tails don't reach more than 500 mm

→ Check effects on Z→uds for datasets light flavor and a bbbar sample at 3 TeV for heavy flavour jets, with and without background (assuming 3 TeV background levels)

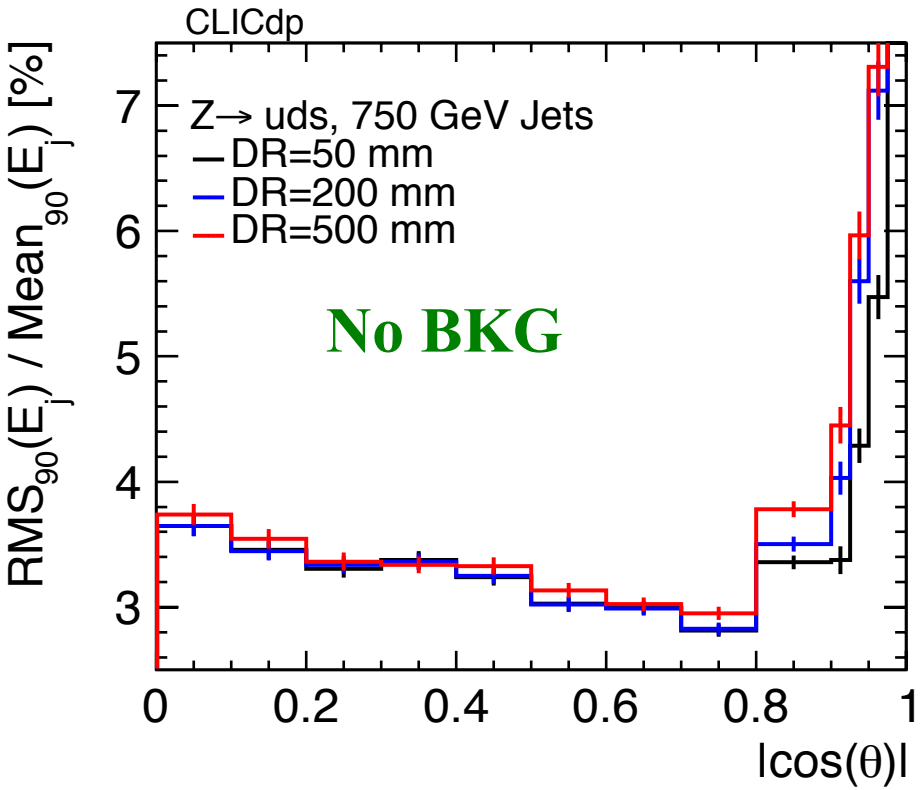
Z→uds at 3 TeV: 1500 GeV light flavour jets

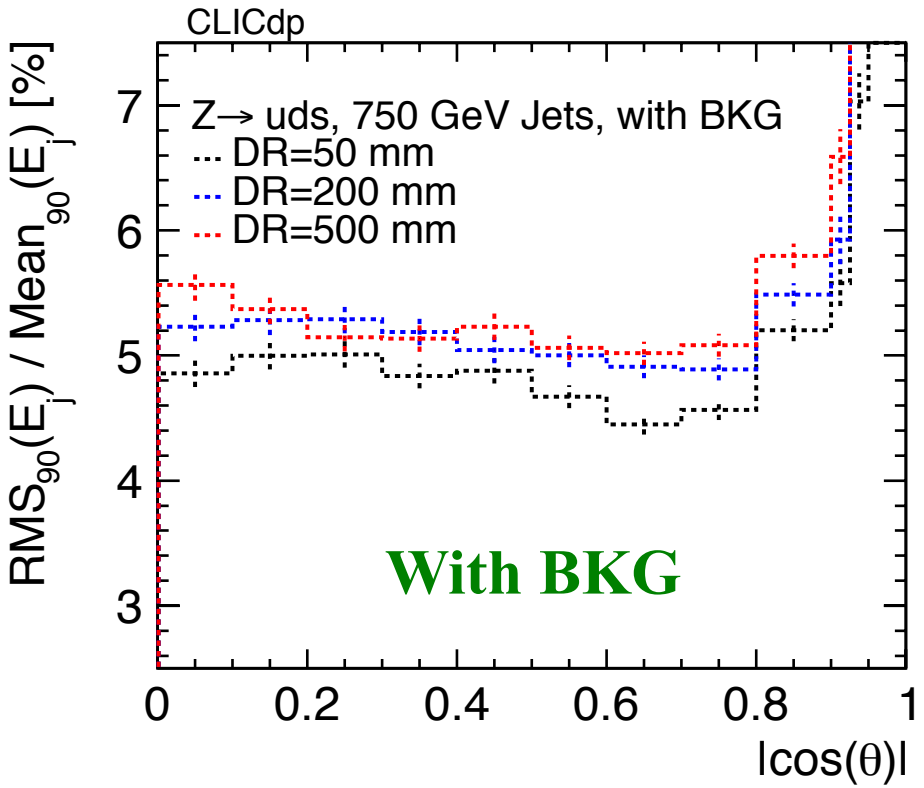




Hardly any difference between 200 mm and 50 mm settings, larger impact for 500 mm settings, particularly when adding γγ→hadrons

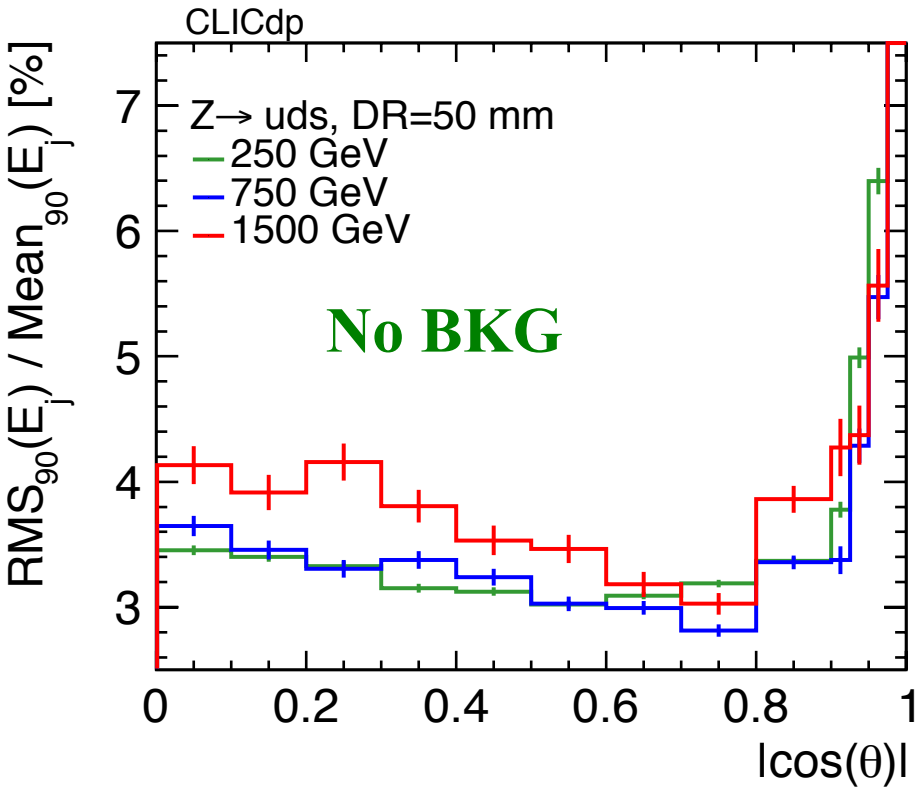
Z→uds at 1.5 TeV: 750 GeV light flavour jets

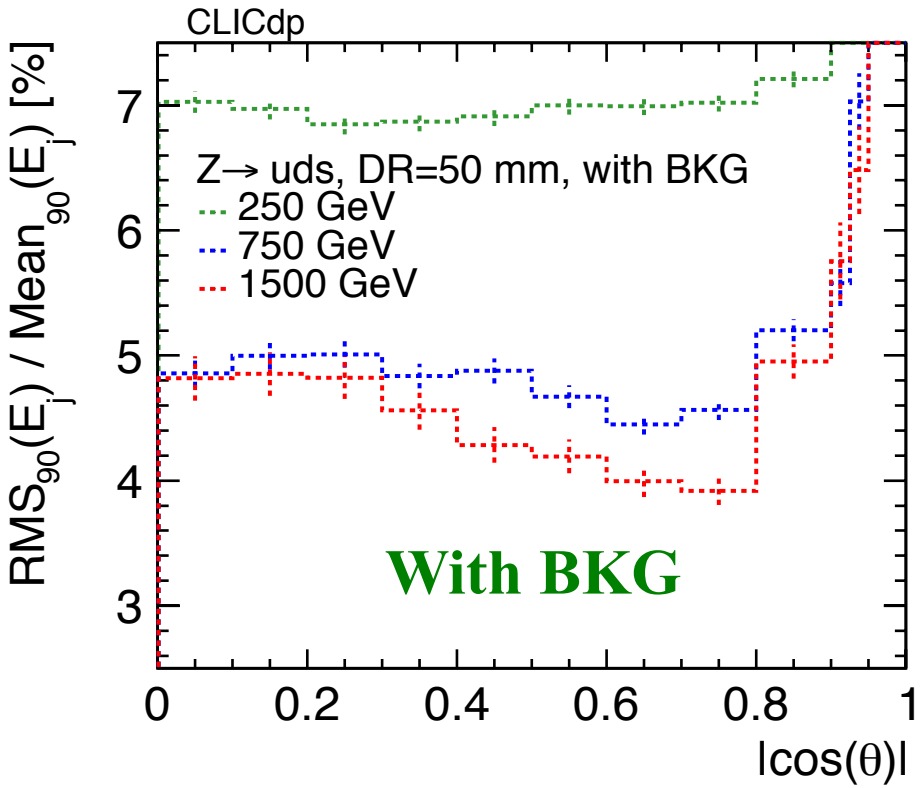




Hardly any difference between 200 mm and 50 mm settings, larger impact for 500 mm settings, particularly when adding γγ→hadrons

Z→uds: JER vs Energy, with and without BKG

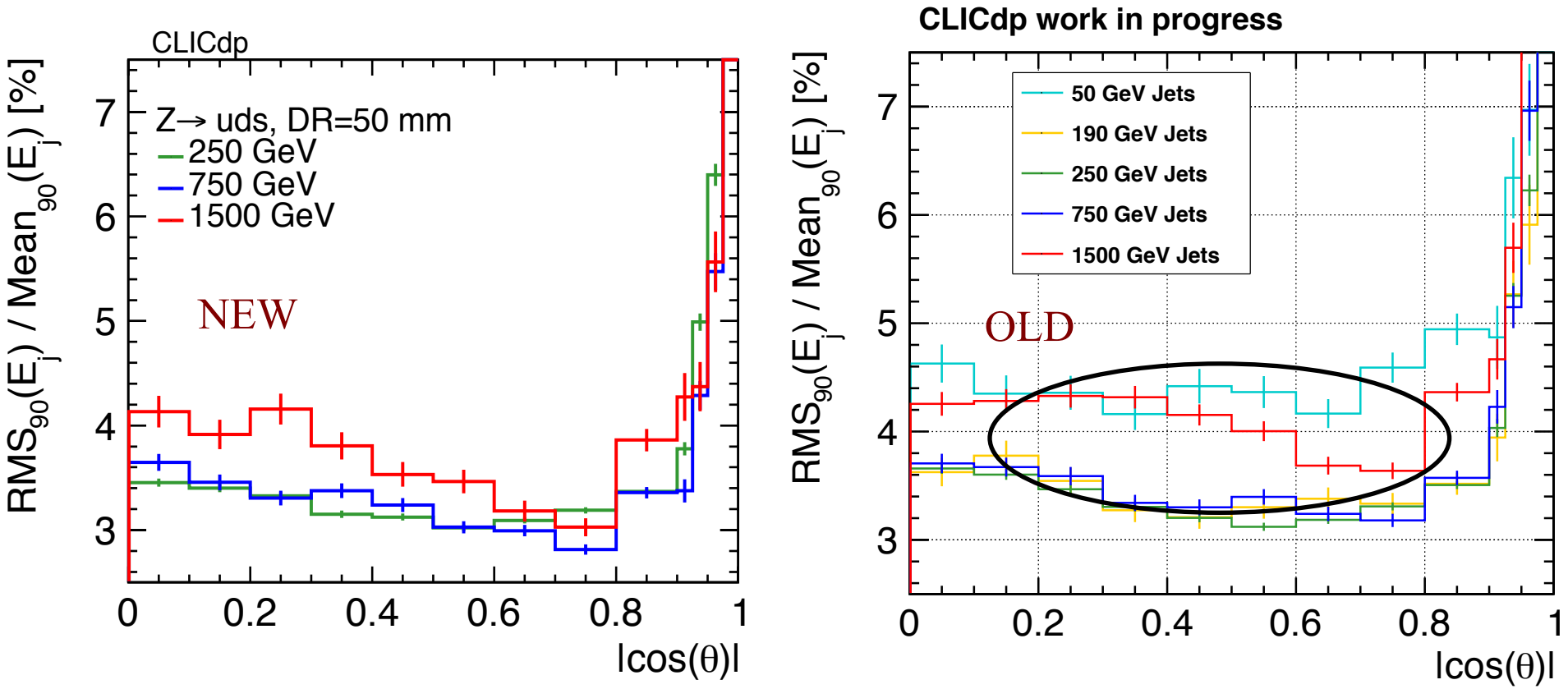




Larger impact of background on resolution of 250 GeV jets (considering our way of checking the resolution using the full energy) compared to the other energies

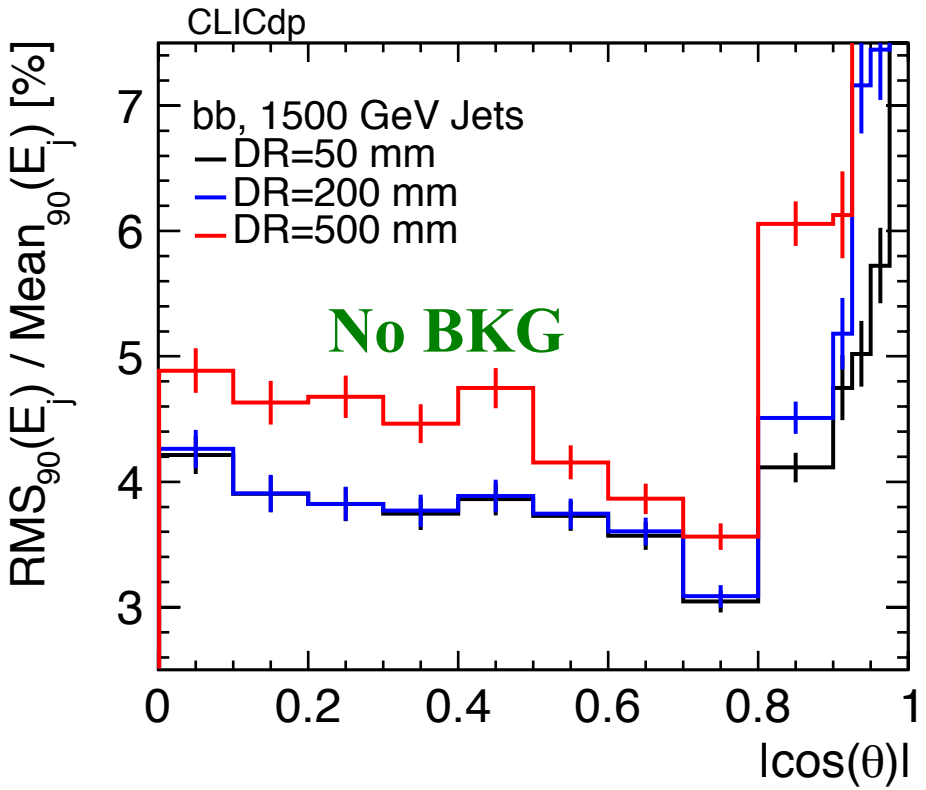
Jet energy resolution at CLIC

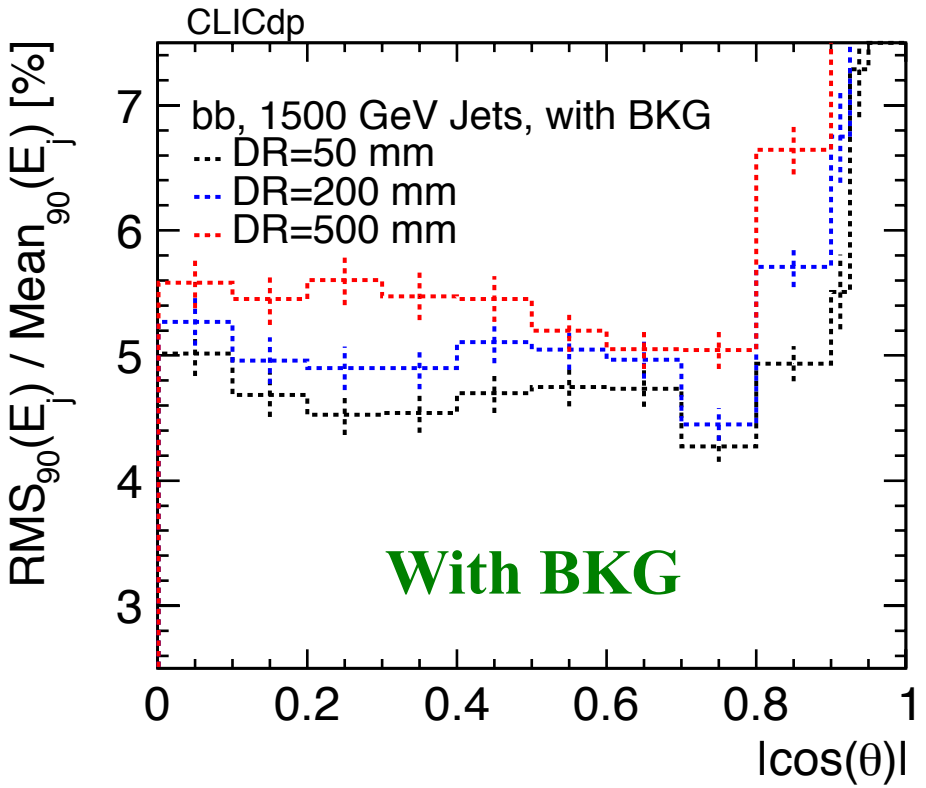
Check new tweaking of conformal tracking algorithm



Seems we made progress in conformal tracking → i.e. considerably lower jet energy resolution values for the 3 TeV dataset (1500 GeV jets)

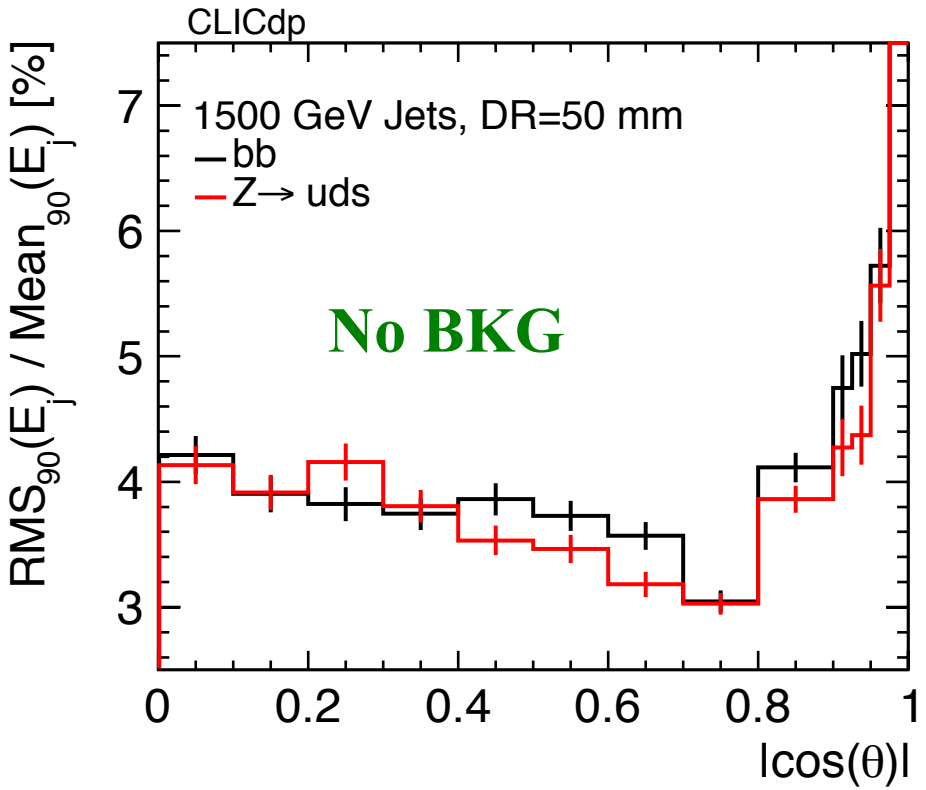
bbar at 3 TeV: JER vs Energy, with and without BKG

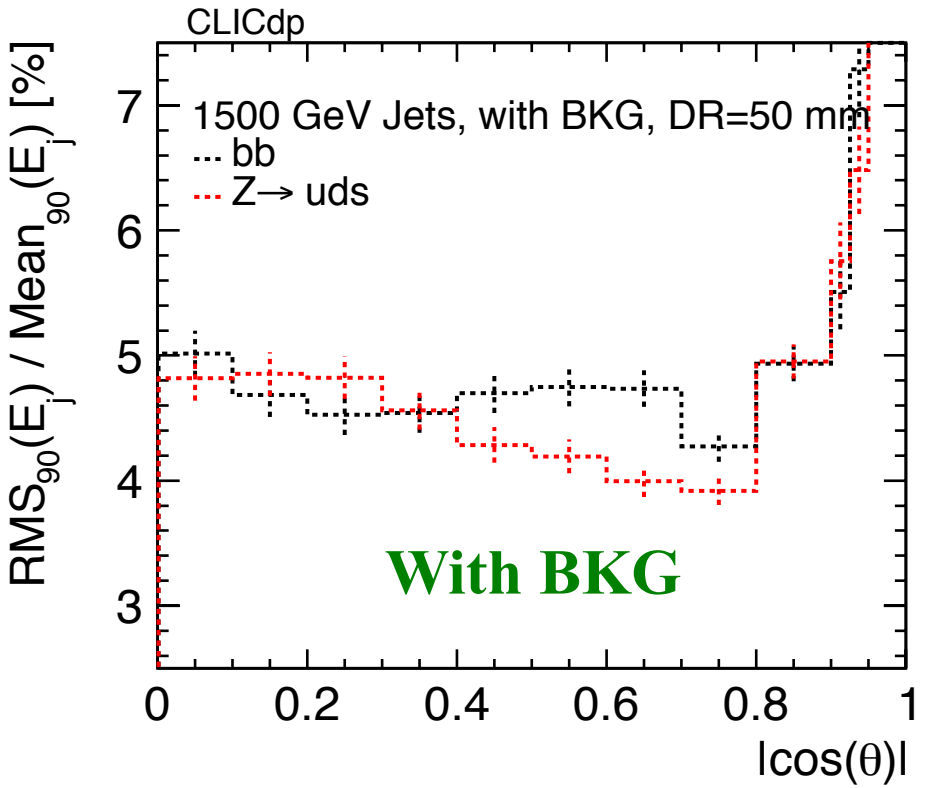




Between DR=50 mm and DR=200 mm settings moderate changes, DR=500 mm setting seems to be too agressive

bbar vs Z→uds (heavy vs light flavour jets) at 3 TeV





In the inner barrel no large differences observed, for outer barrel jets, resolution in heavy flavour events is worse

Electron dressing

Matthias Weber (CERN)

Electron dressing

Use single electron particle gun events at 10, 100 and 1000 GeV

→ starting point: reconstructed electron in the event

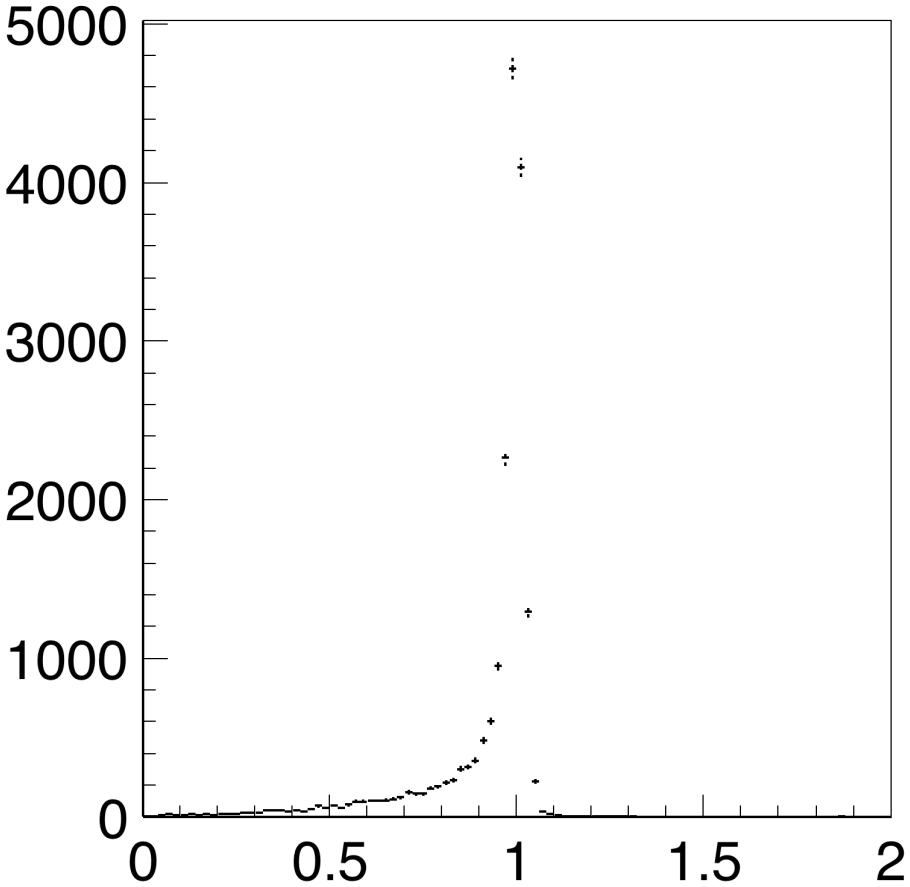
Dressing: add photon energy to the reconstructed electron candidate, if closeby

→ Spatial matching A: angular distance less than 5 degrees (checked also 10 degrees)

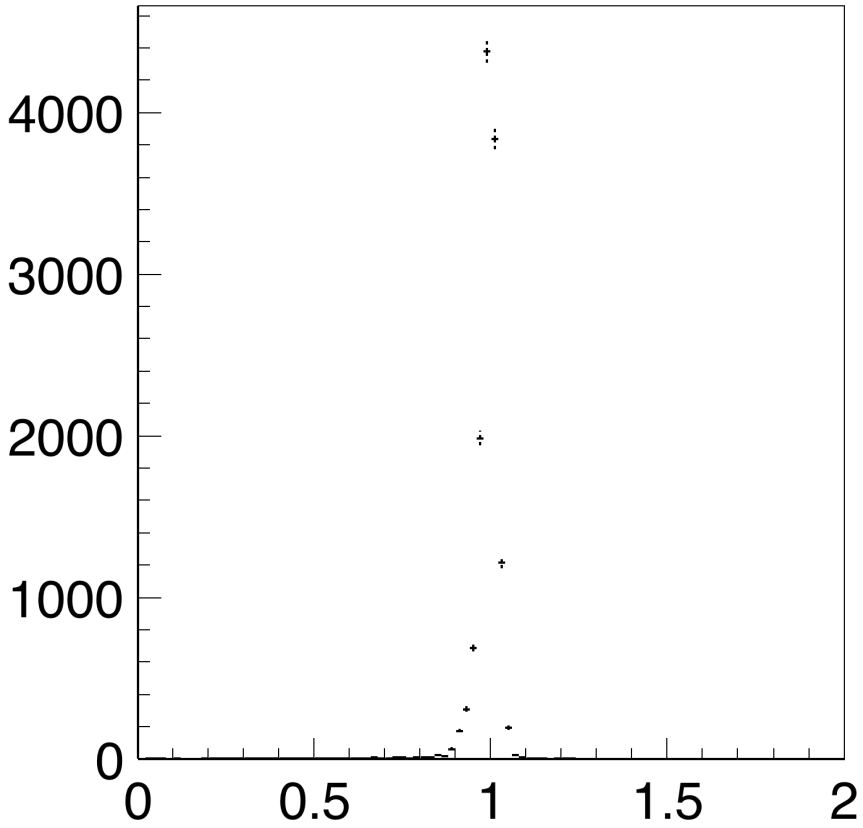
→ Spatial matching B: since Bremsstrahlung photons have very similar theta wrt electron, but differ in phi → impose a tougher cut on theta, DeltaPhi within 5 and 10 degrees to be merged

→ For the following plots we use method A for the spatial matching, dressing performed using reconstructed photons in a 5 degree angle

1 TeV Electron: Energy without any dressing

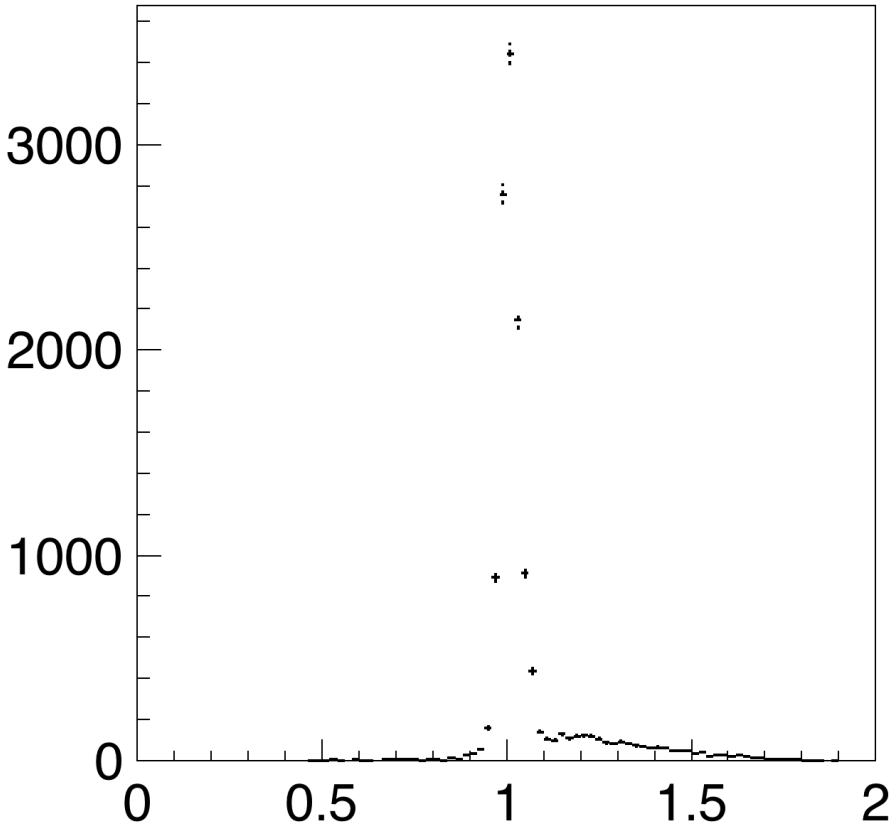


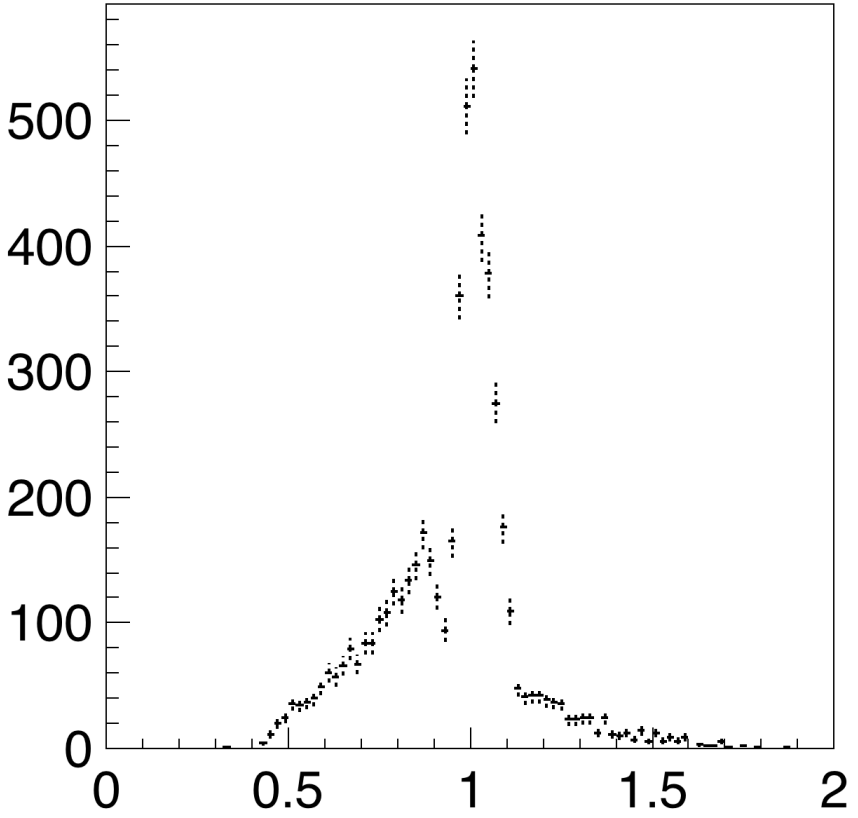
All electrons,
Lower energy tail due to
Bremsstrahlung



Reduced selection:
Sum of bremsstrahlung photon energies
lower than 10 % of original energy
→ Tail is gone

1 TeV: dress electron, light/strong brem





Low brem (ph-E-sum< 10 % true energy):
→considerable tail to larger energies

Large brem (sum of ph-E > 10 % of true energy)
→ Tail to lower energies not recovered

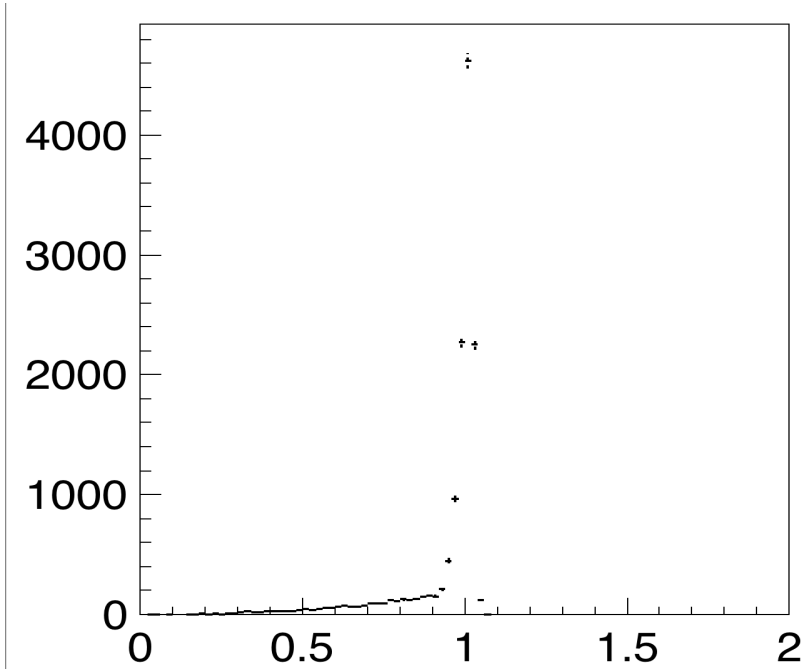
No change if we dress in addition with neutrons or electrons

Electron: track-p or cluster-E

PandoraPFA uses the track as measure for charged particle momentum

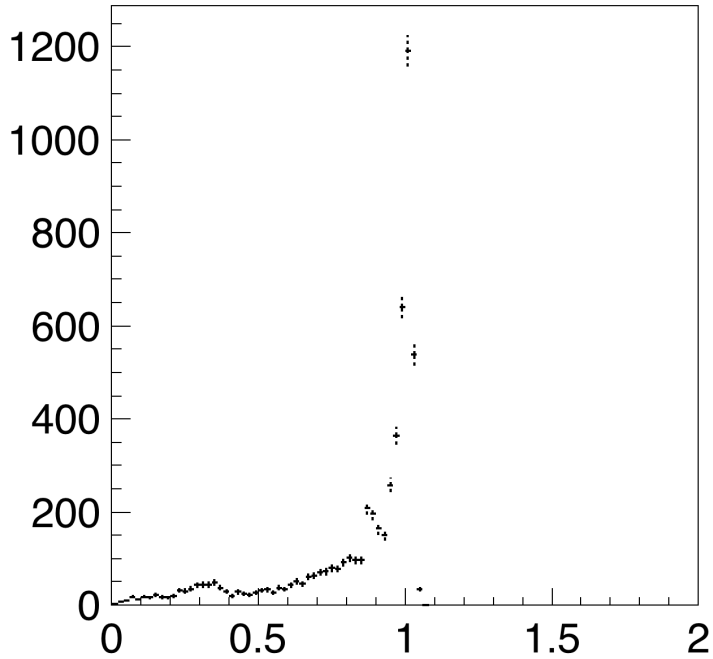
→ Check if at large energies situation improves when using the ECAL cluster as measure for the electron energy

Consider first electron cluster energy **BEFORE** dressing



Low brem (ph-E-sum< 10 % true energy):

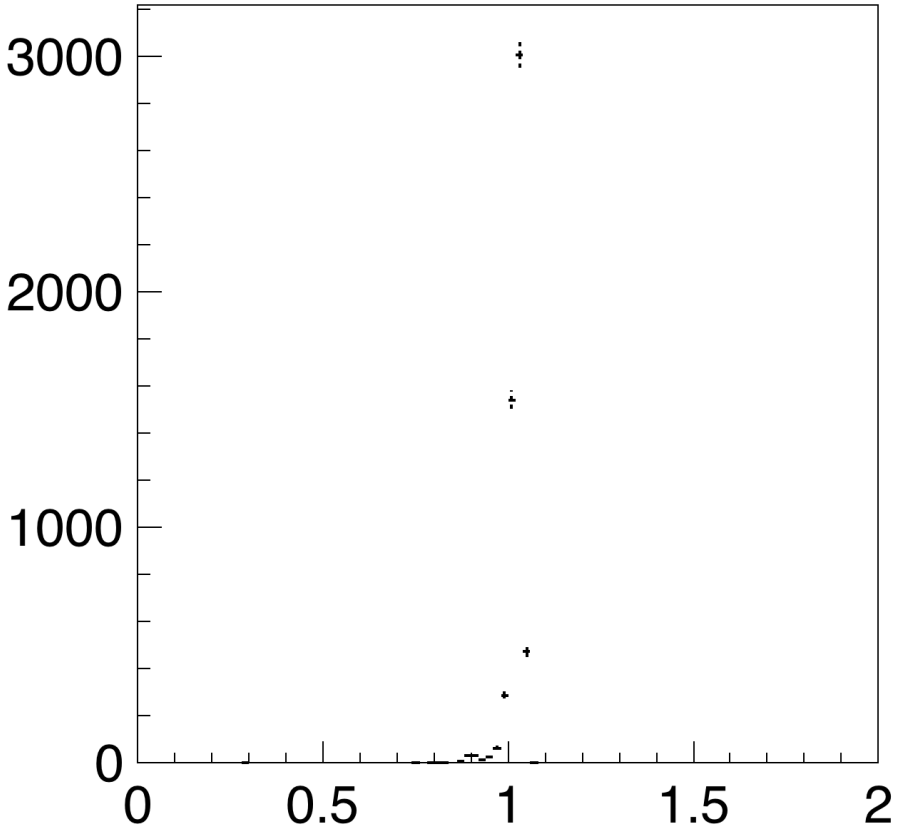
→tail to lower energies, larger than for track based energy reconstruction

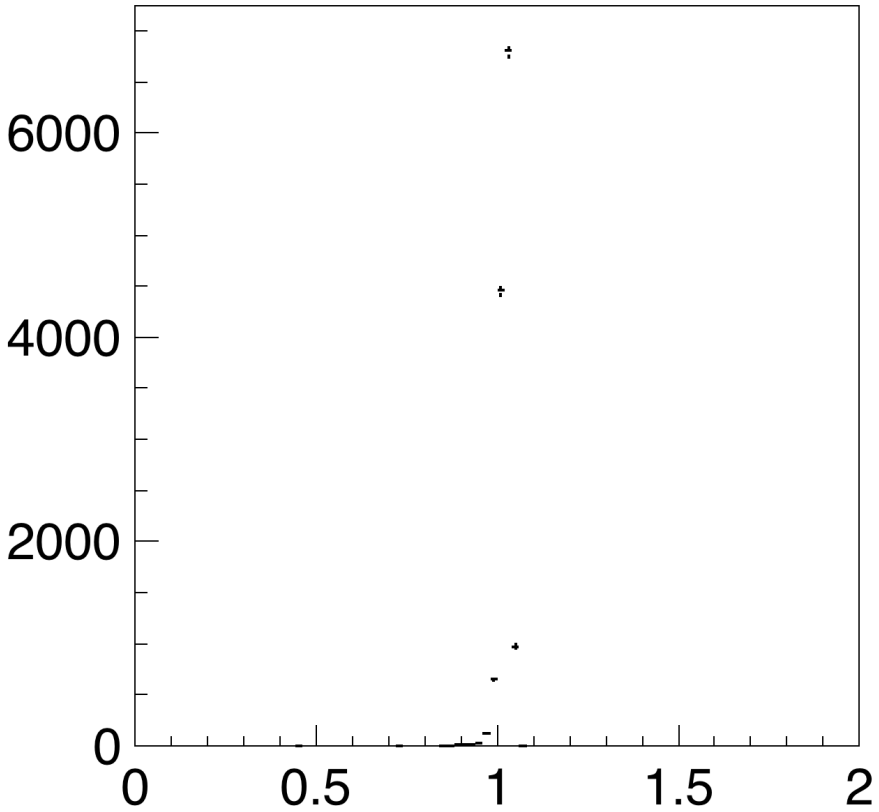


High brem (ph-E-sum> 10 % true energy):

→considerable tail to larger energies

1 TeV: dress cluster-electron, light/strong brem



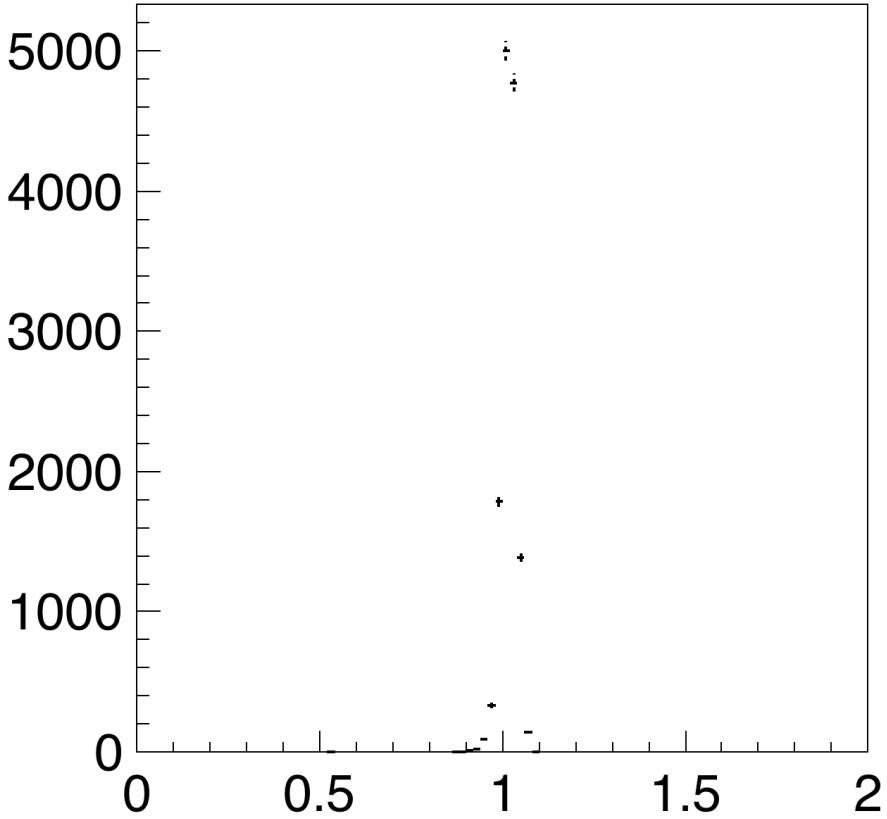


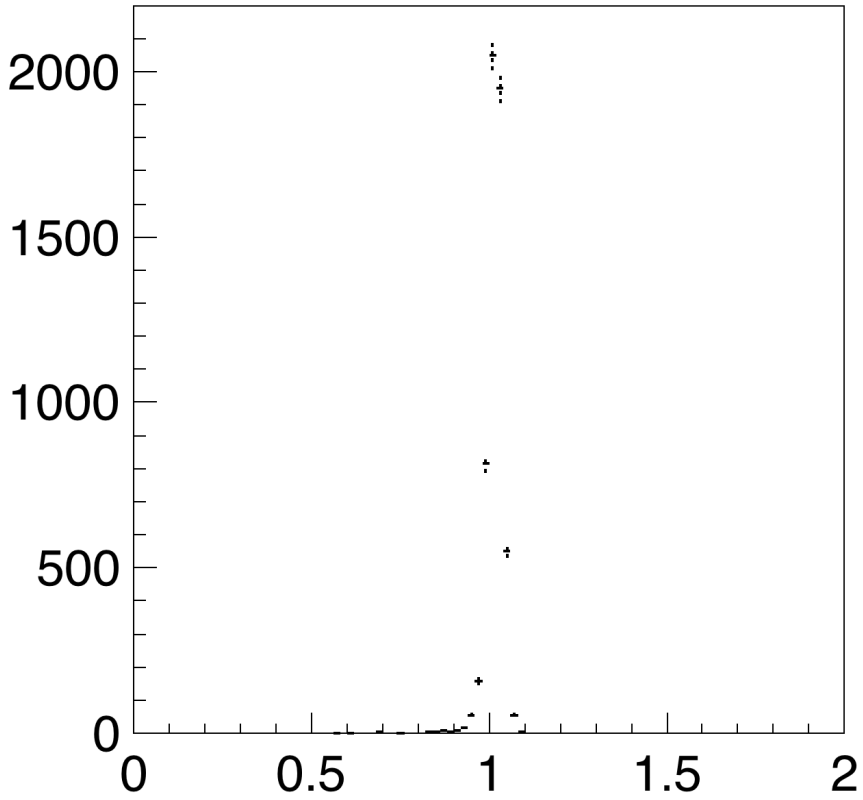
Low brem (ph-E-sum< 10 % true energy):
→tail largely gone

Large brem (sum of ph-E > 10 % of true energy)
→ Tail to lower energies is gone

Here: replace reconstructed Electron energy by cluster energy

100 GeV: dress cluster-electron, light/strong brem





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→tail largely gone

Large brem (sum of ph-E > 10 % of true energy)
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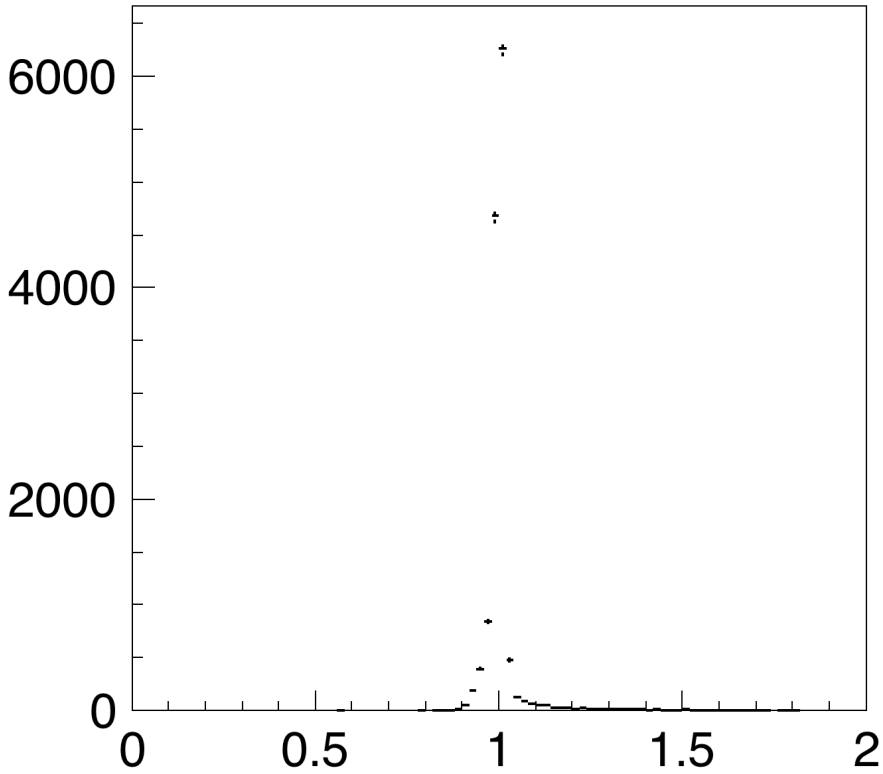
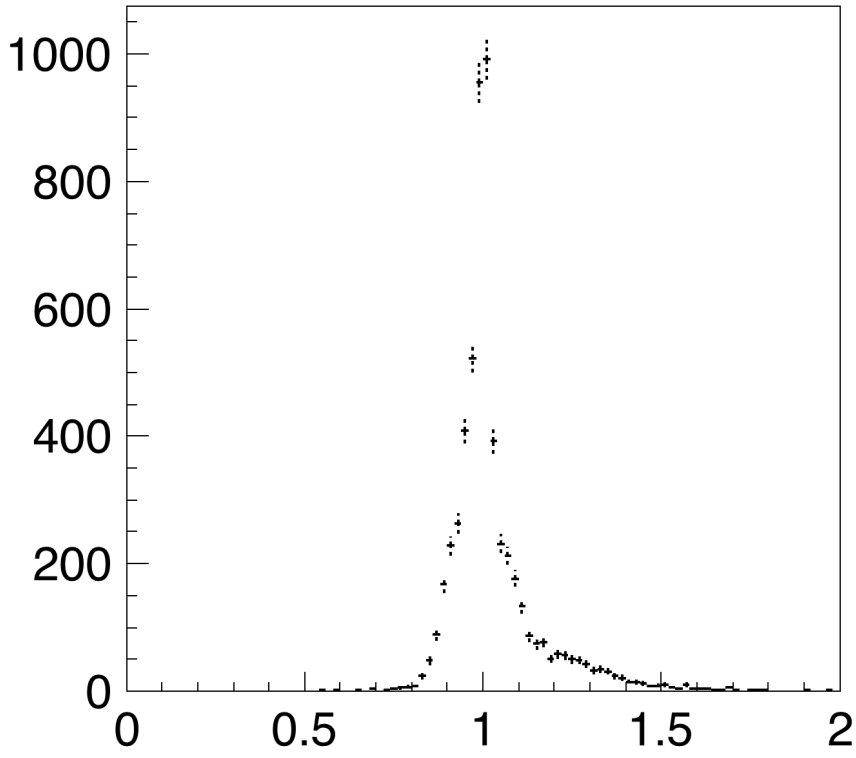
Here: replace reconstructed Electron energy by cluster energy

100 GeV: dress track-electron, light/strong brem



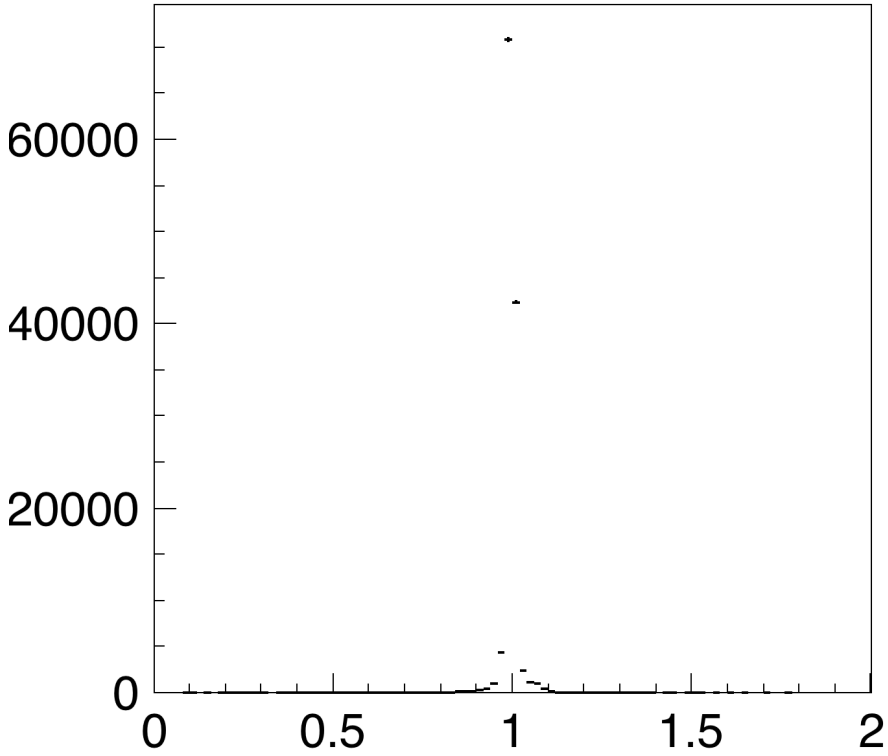


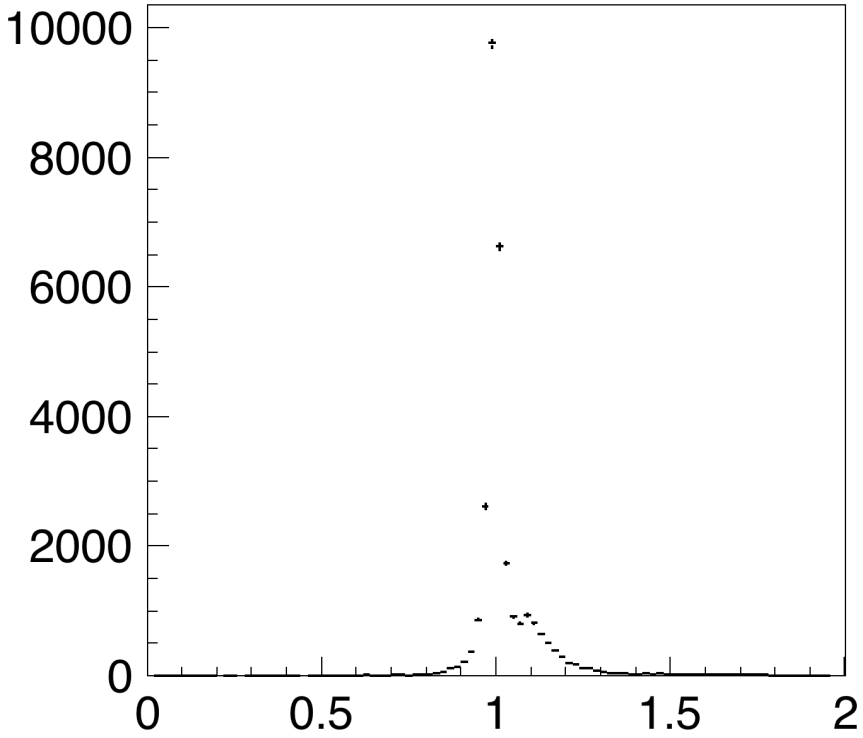
Low brem (ph-E-sum< 10 % true energy):
Very slight tail to higher energies

Large brem (sum of ph-E > 10 % of true energy)
→over correction by dressing

Here: use pandora default energy, track based

10 GeV: dress track-electron, light/strong brem



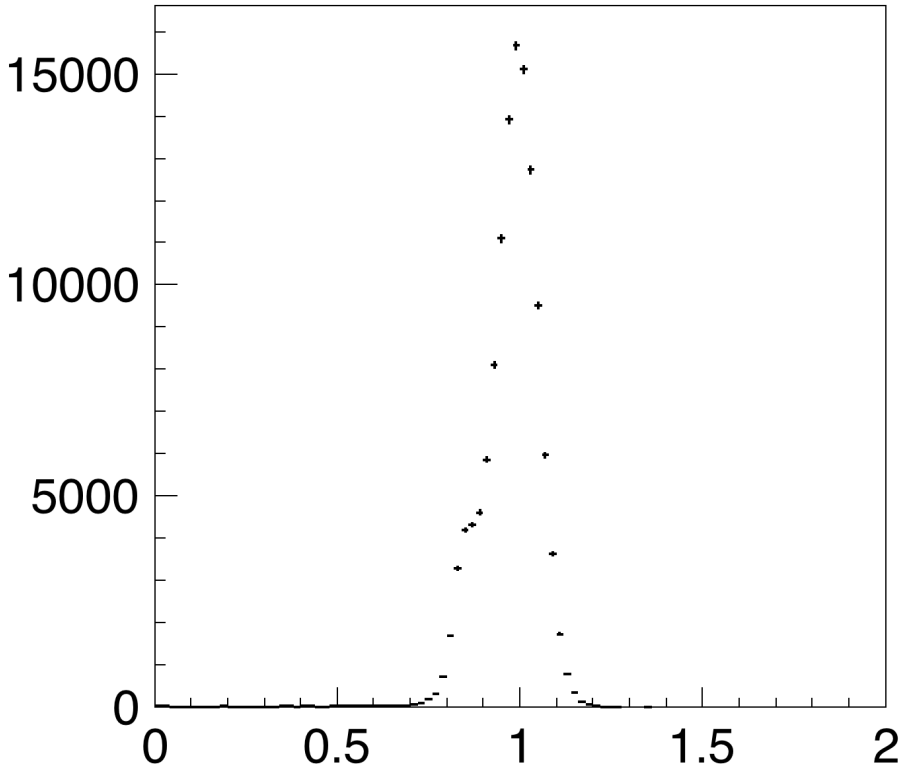


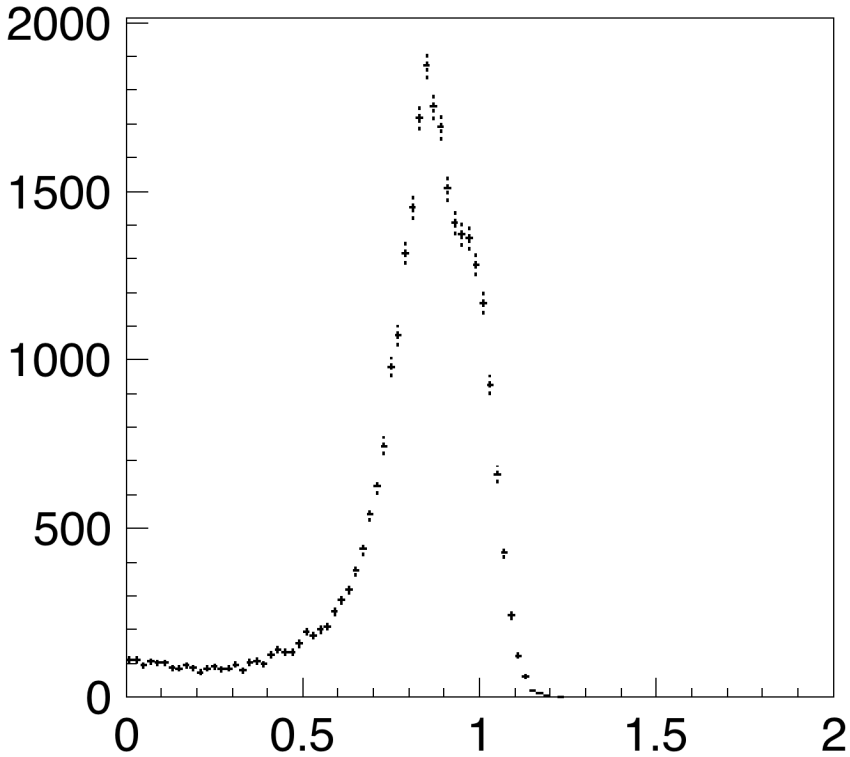
Low brem (ph-E-sum< 10 % true energy):
Very slight tail to higher energies

Large brem (sum of ph-E > 10 % of true energy)
→over correction by dressing

Here: use pandora default energy, track based

10 GeV: raw cluster-electron, light/strong brem



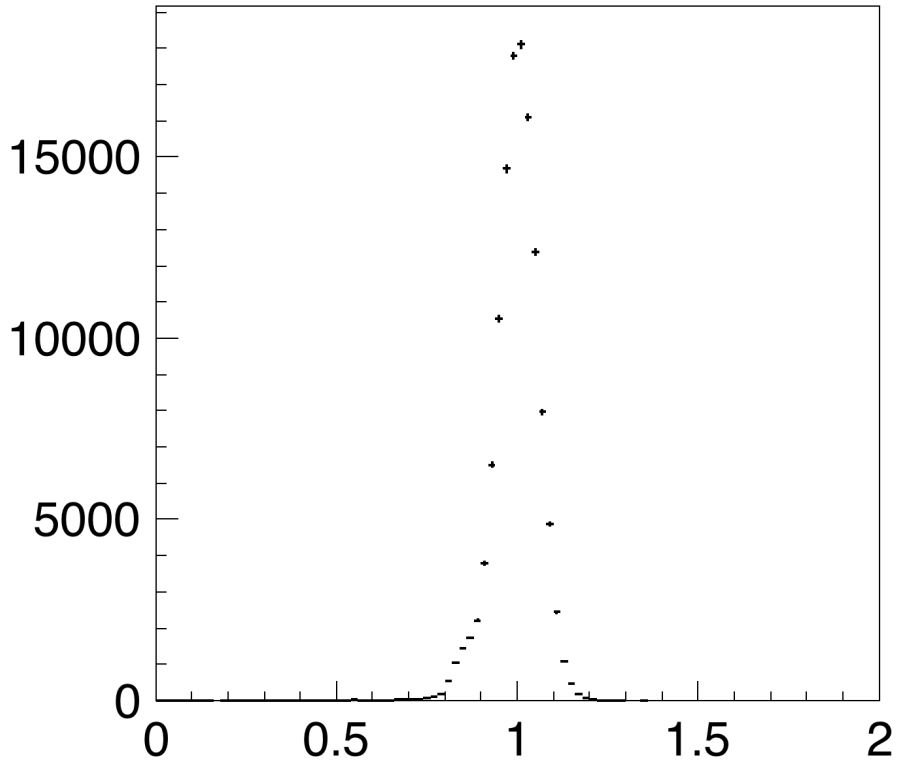


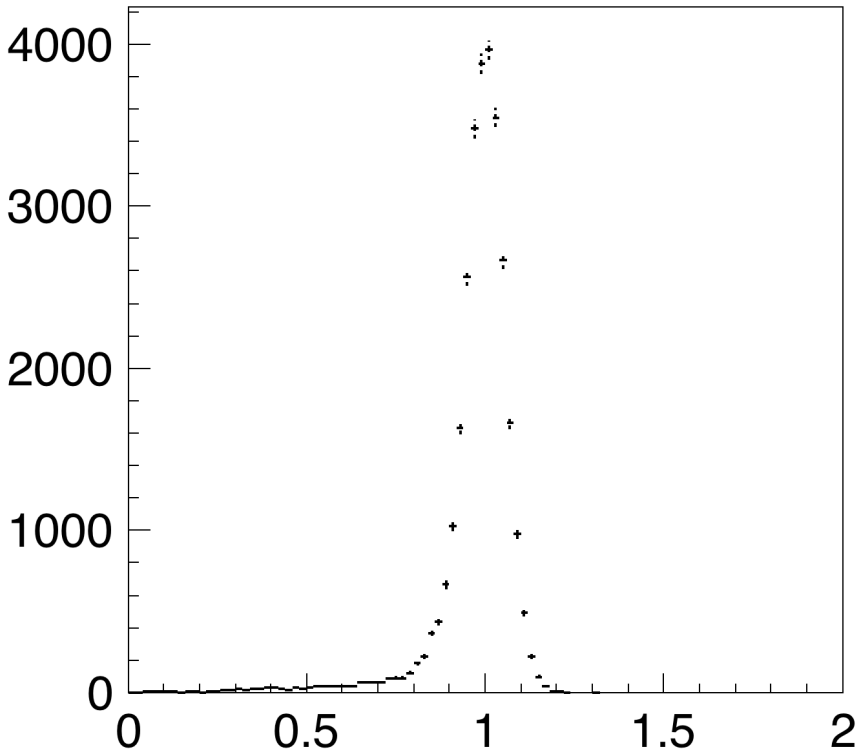
Low brem (ph-E-sum< 10 % true energy):
→resolution of ECAL worse than resolution of tracker

Large brem (sum of ph-E > 10 % of true energy)
→ Broad peak, considerable tail to low energies

Here: cluster energey of reconstructed Electron

10 GeV: dress cluster-electron, light/strong brem





Low brem (ph-E-sum< 10 % true energy):
→resolution of ECAL worse than resolution of tracker

Large brem (sum of ph-E > 10 % of true energy)
→ Tail to lower energies is not gone

Here: replace reconstructed Electron energy by cluster energy