

Photon reconstruction

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ILD benchmarking days @ UTA Oct '18

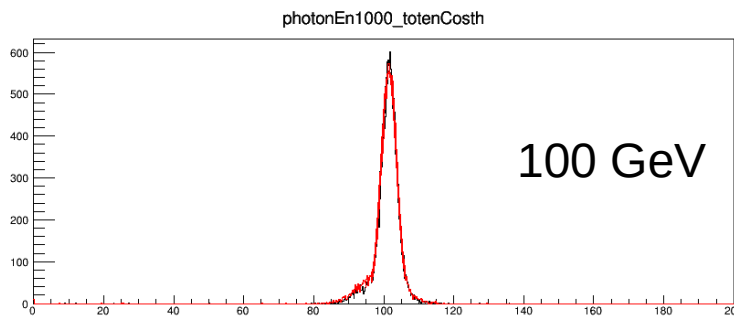
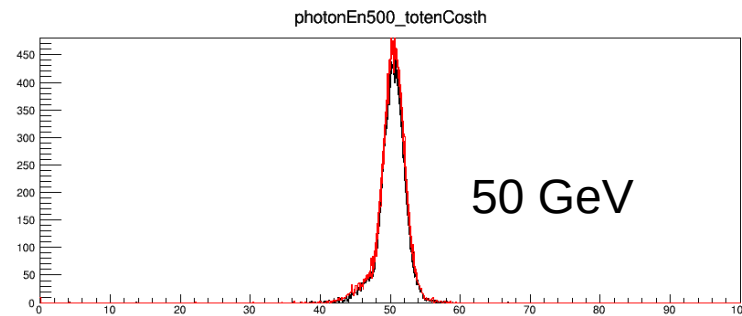
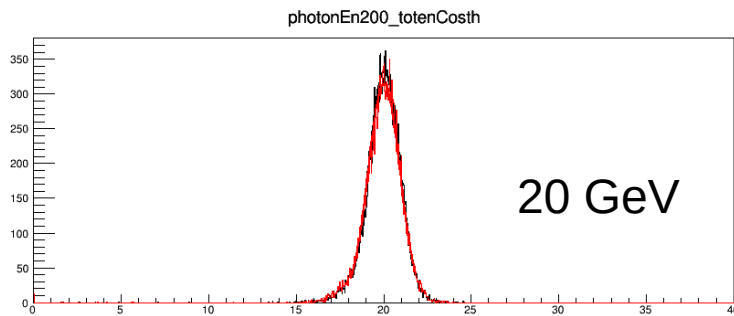
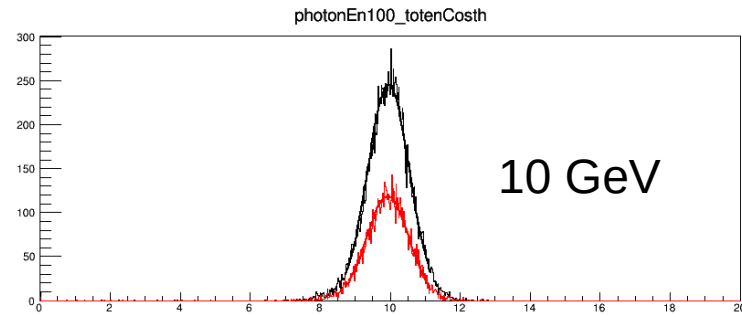
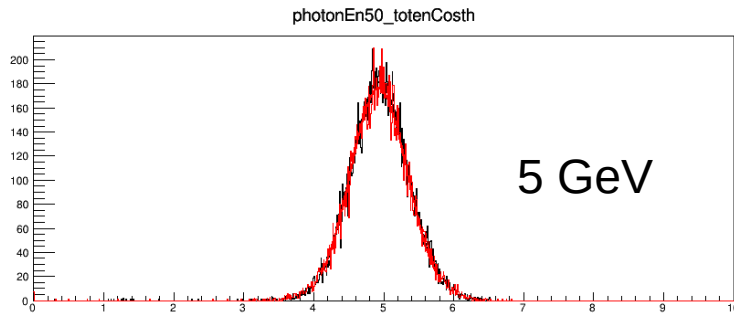
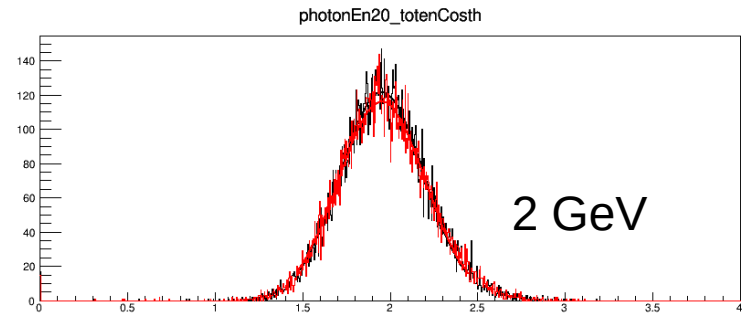
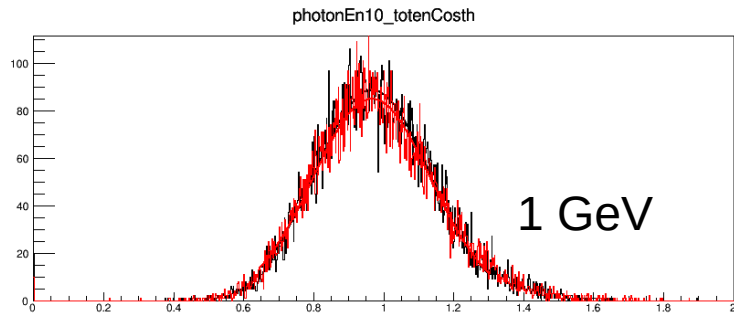
Photon clustering & ID done by PandoraPFA

I have a few plots from ilcsoft v01-19-05-p01,

single photon events, flat in $\cos(\theta)$, no conversions

Sum of PFO energies

LARGE SMALL

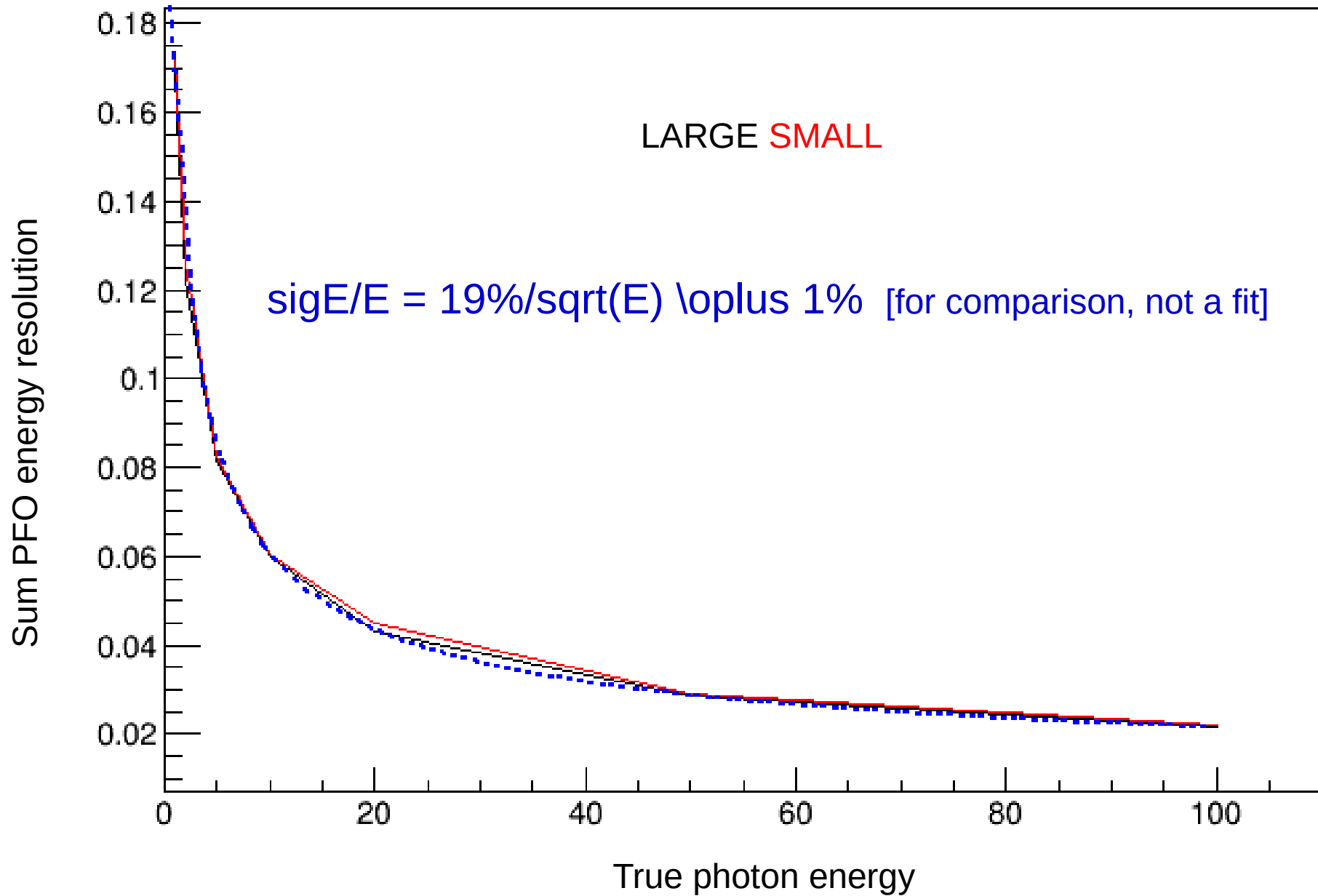


Sum (pfo energies) [GeV]

Fit in ± 2 sigma range

→ estimate energy resolution

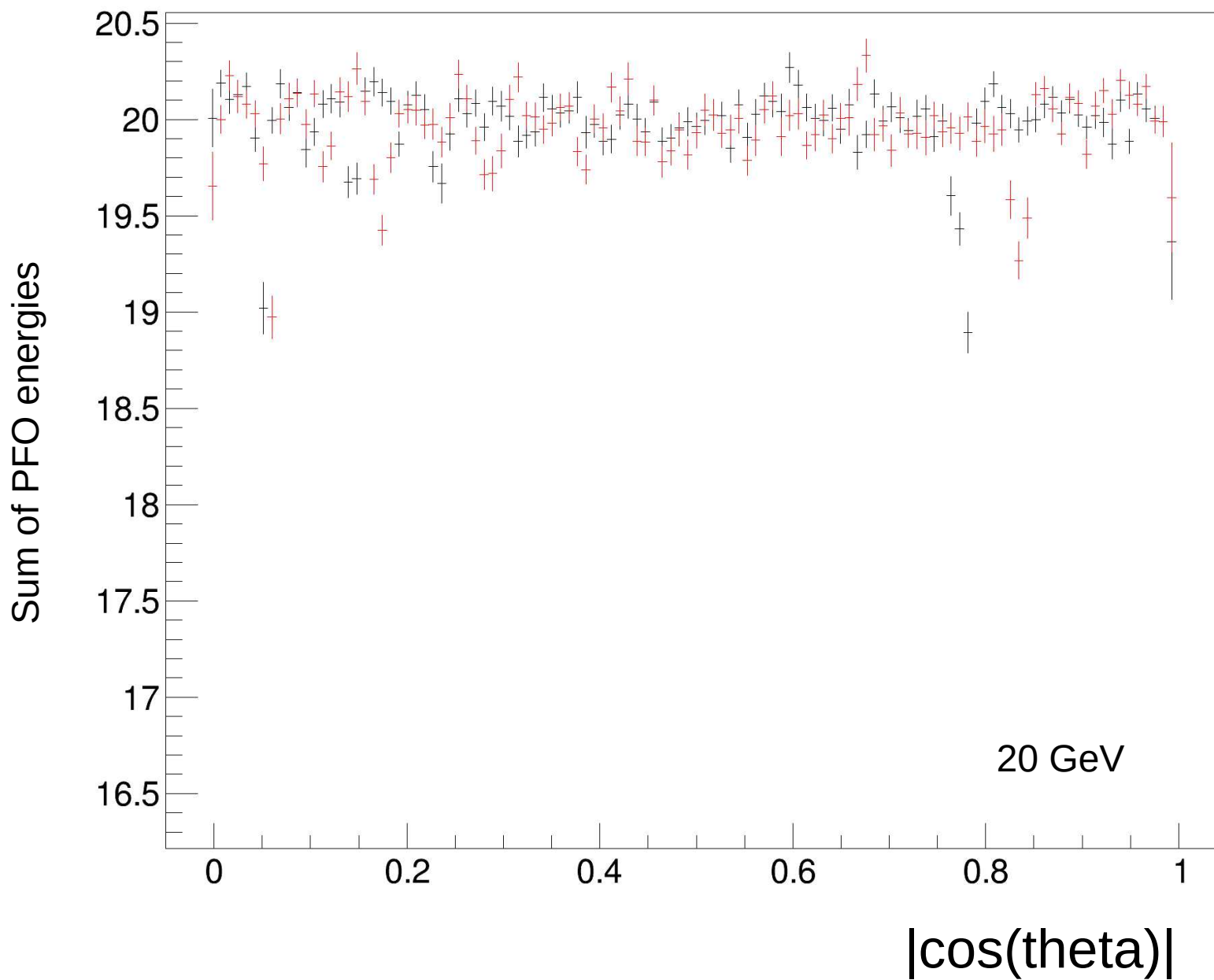
Relative energy resolution, all angles



Sum pfo energies vs MC photon |cos(theta)|

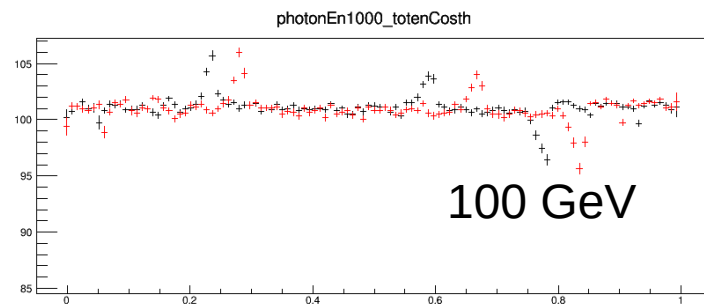
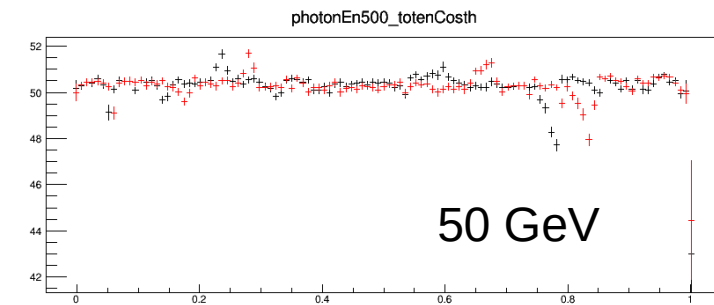
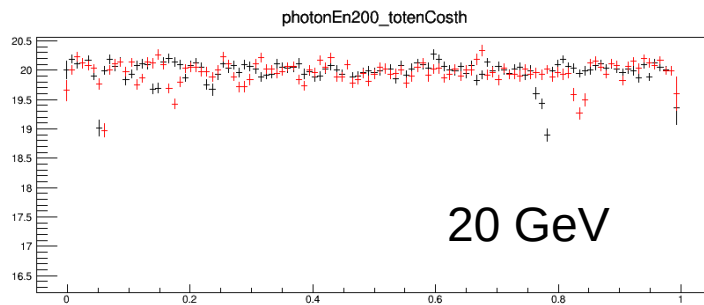
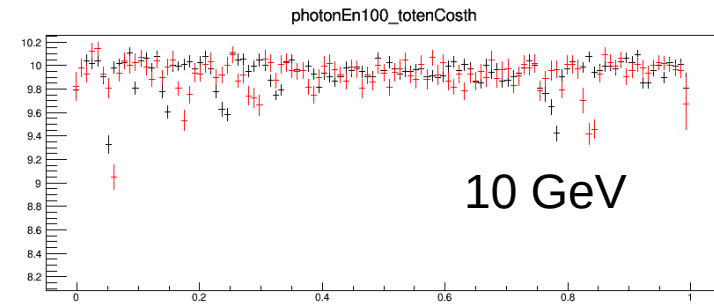
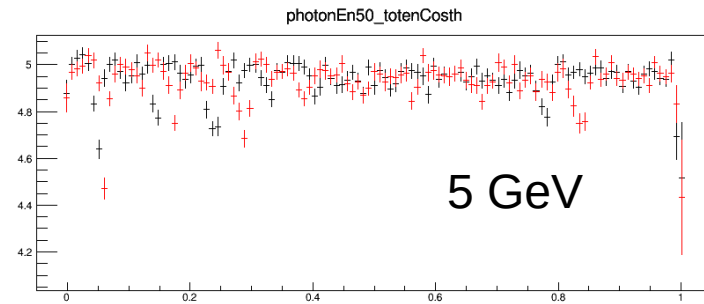
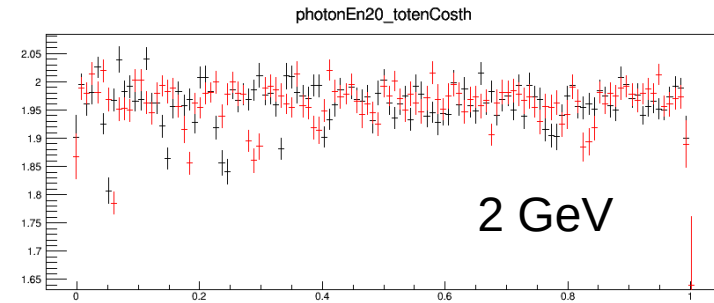
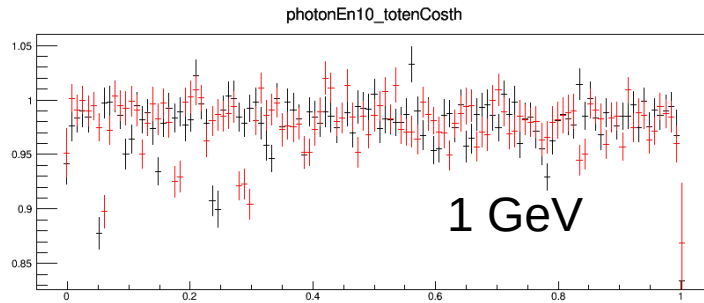
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photonEn200_totenCosth



Sum pfo energies vs MC photon $|\cos(\theta)|$

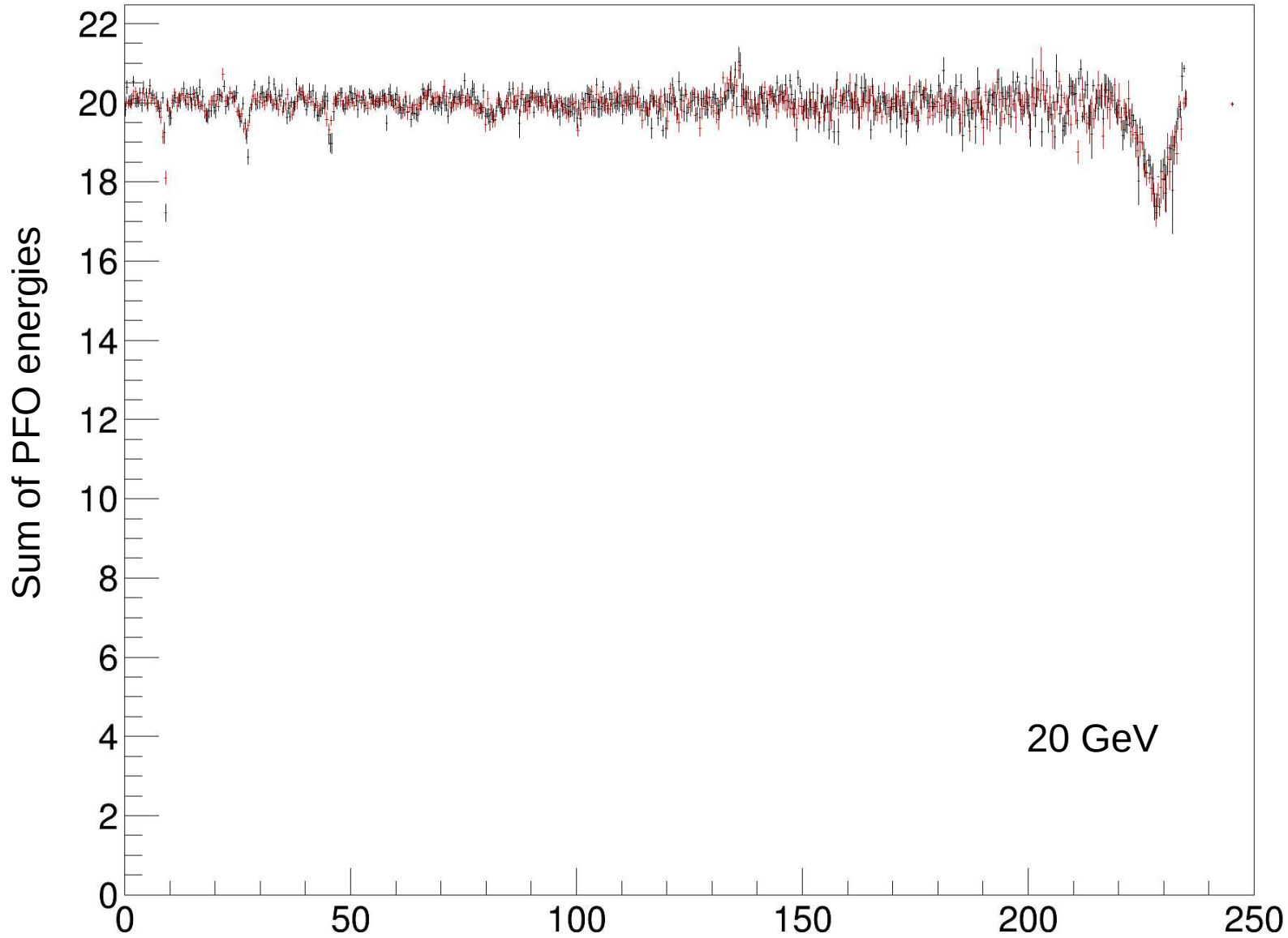
LARGE SMALL



Clear effect of gaps and their imperfect correction

Position of gaps changes L/S
→ different aspect ratios

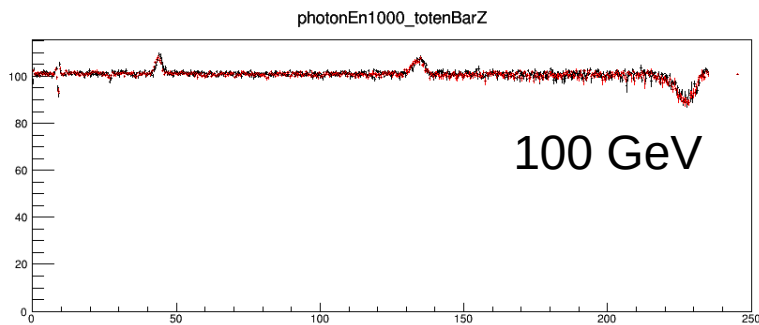
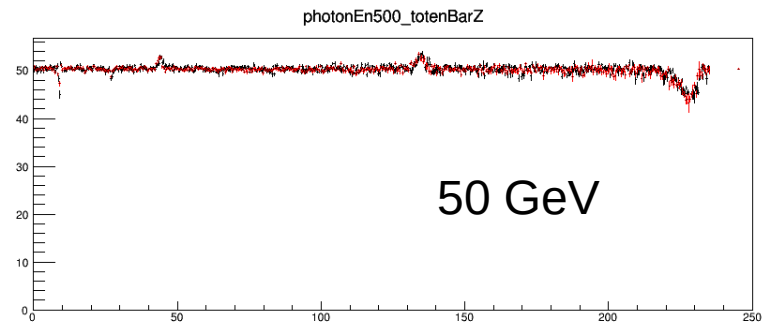
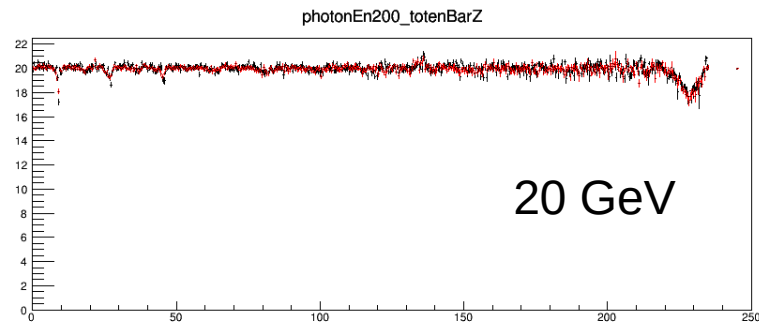
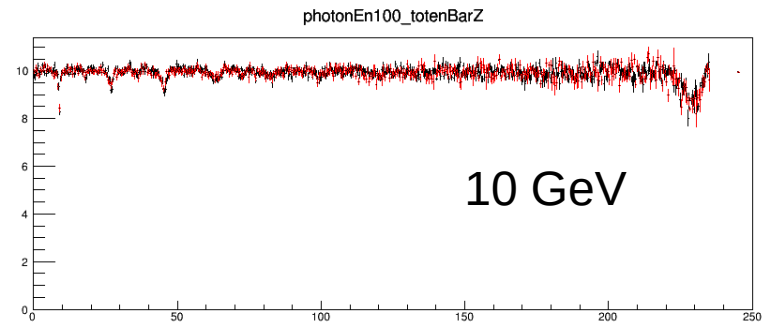
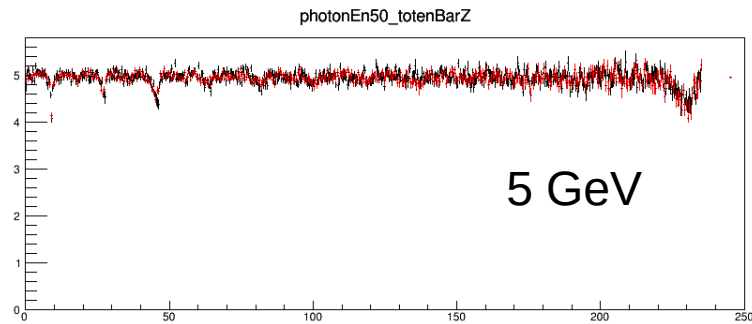
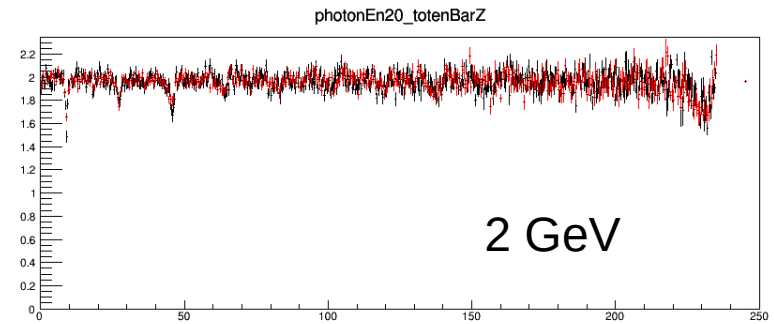
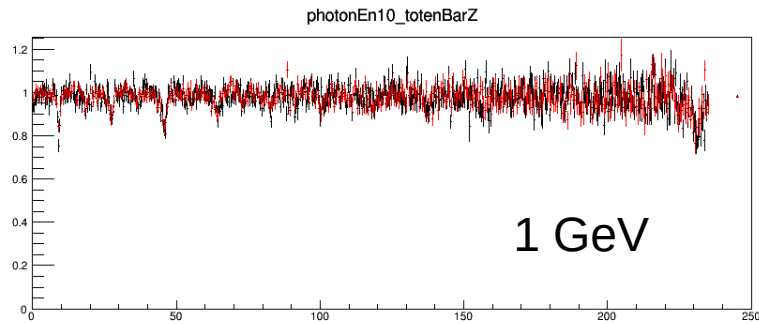
photonEn200_totenBarZ



MC photon |z| @ ECAL [cm]

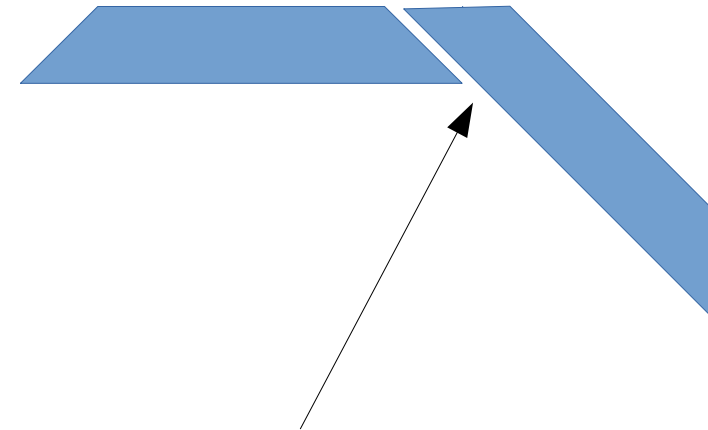
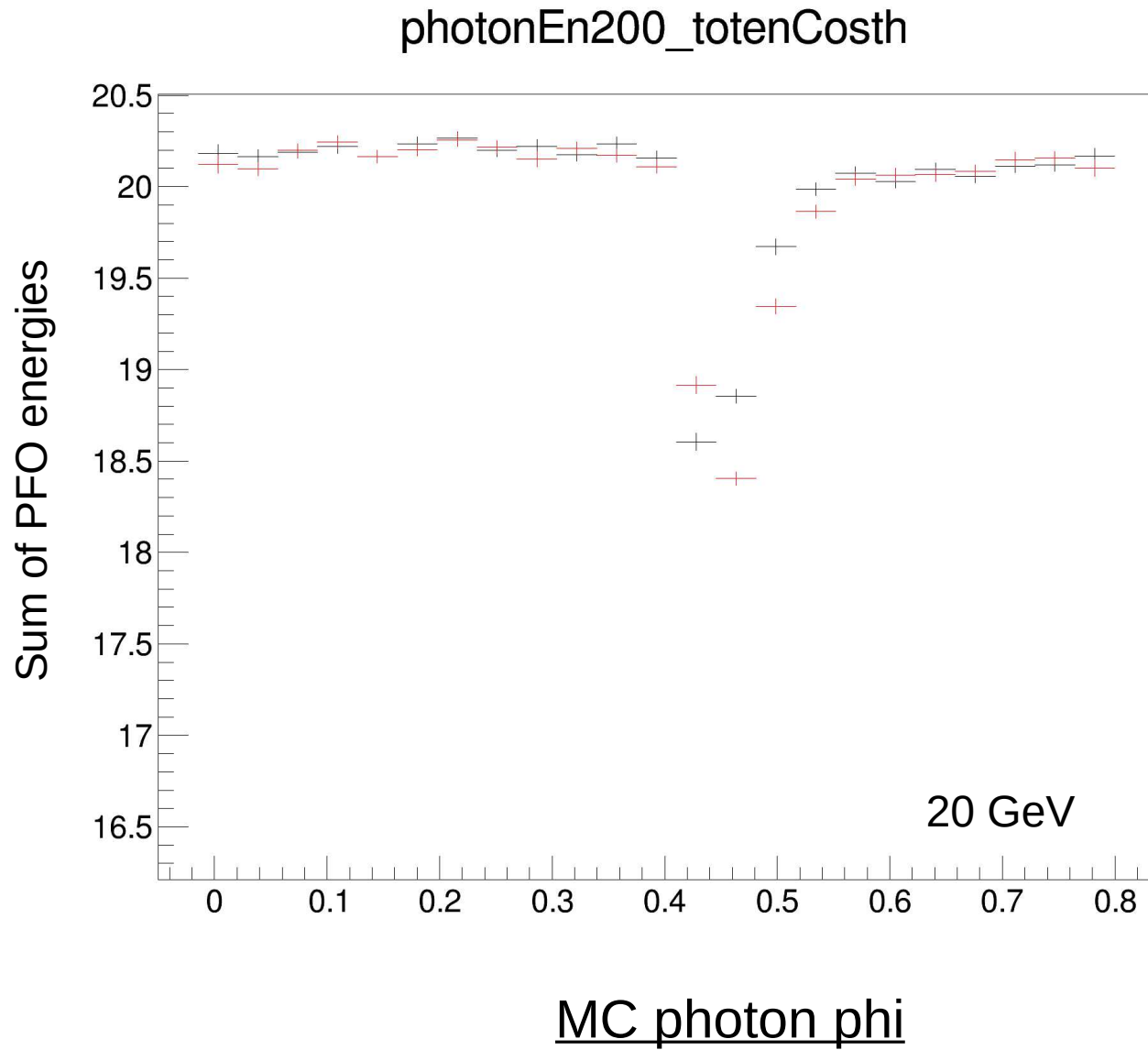
Sum pfo energies vs MC photon $|z|$ @ ECAL (Barrel only)

LARGE SMALL

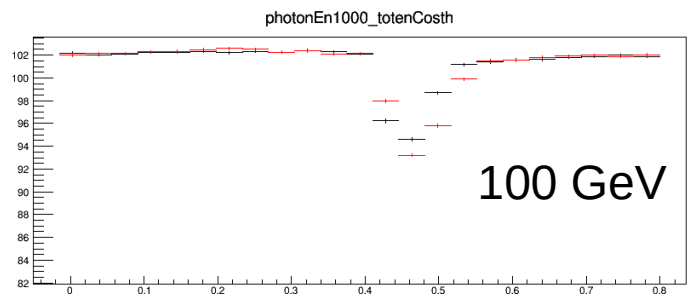
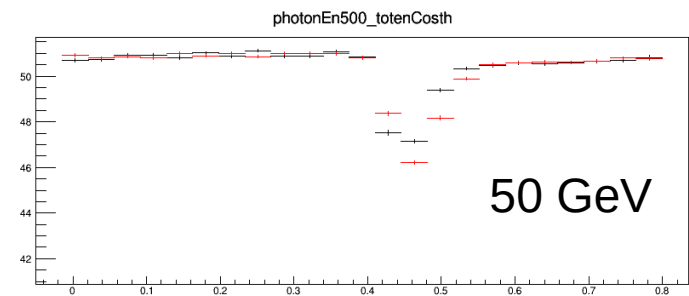
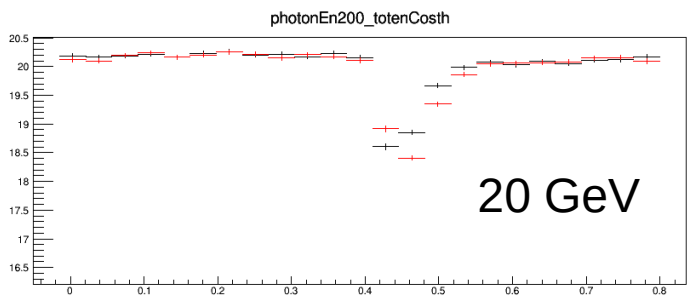
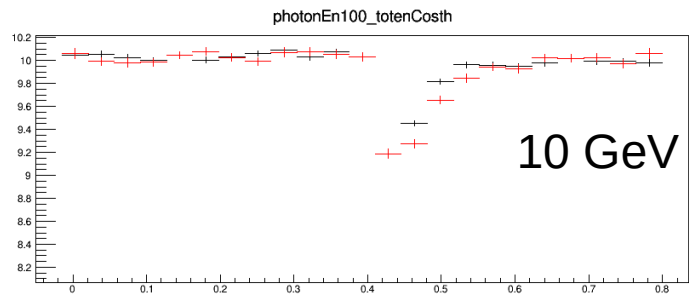
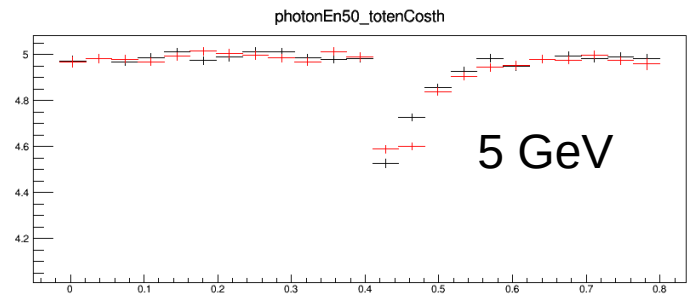
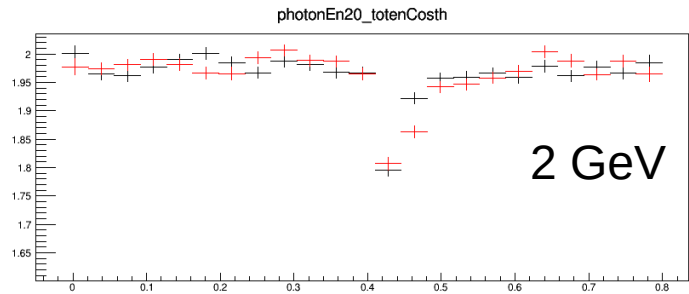
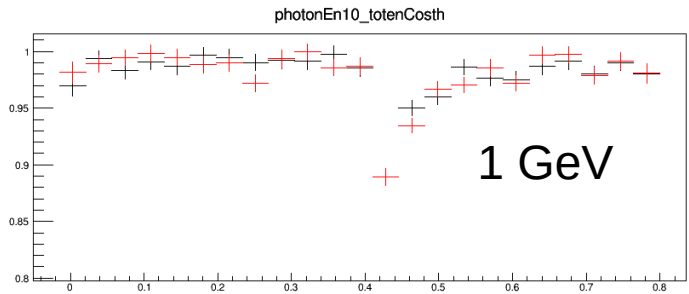


Gaps line up nicely when plotted against z

Sum pfo energies vs MC photon phi (barrel only, folded 8-ways) LARGE SMALL



Sum pfo energies vs MC photon phi (barrel only, folded 8-ways) LARGE SMALL

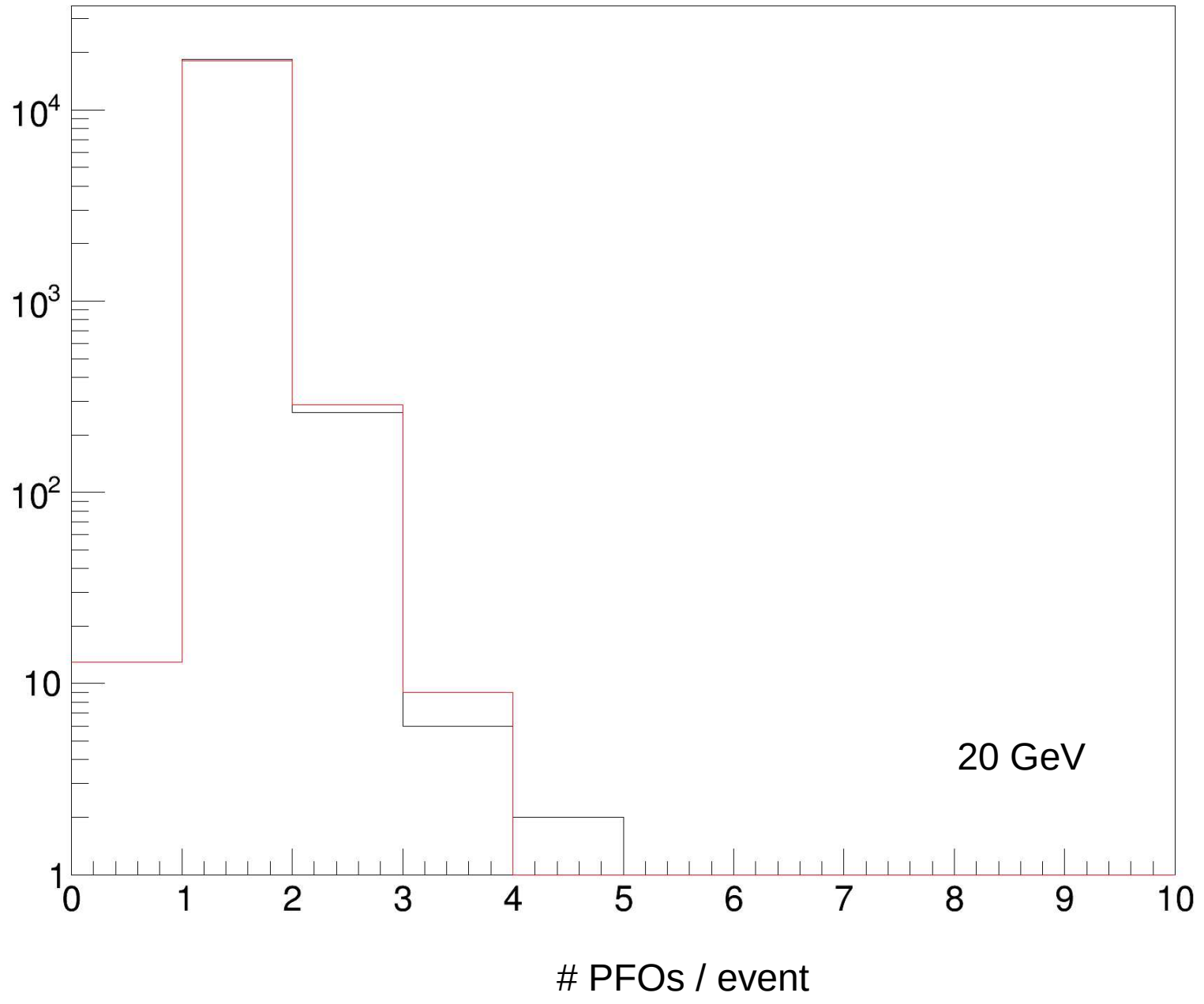


Clear effect of phi overlap sectors

PFOs per single gamma event

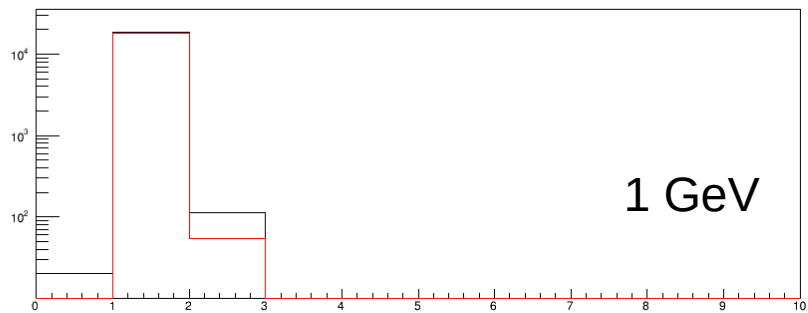
LARGE SMALL

photonEn200_nPFO

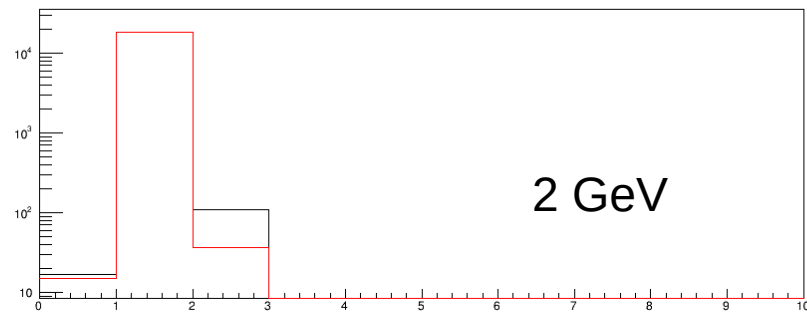


20 GeV

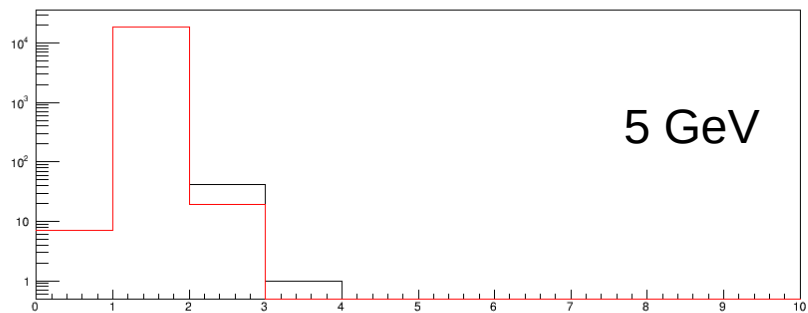
photonEn10_nPFO



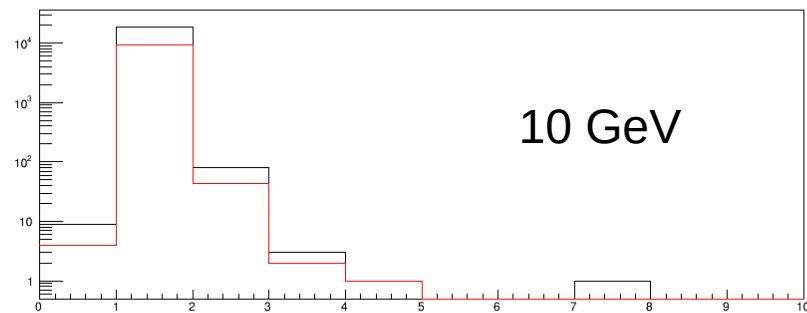
photonEn20_nPFO



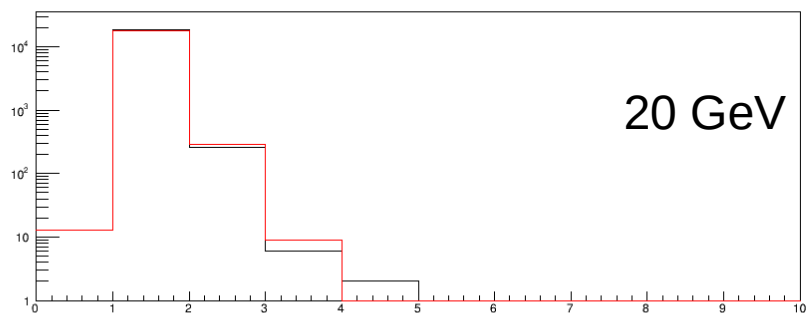
photonEn50_nPFO



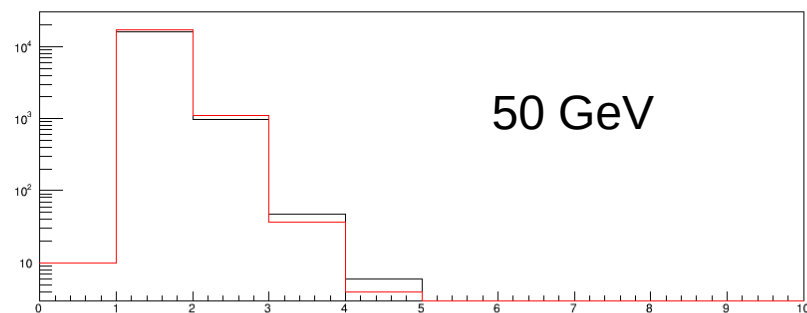
photonEn100_nPFO



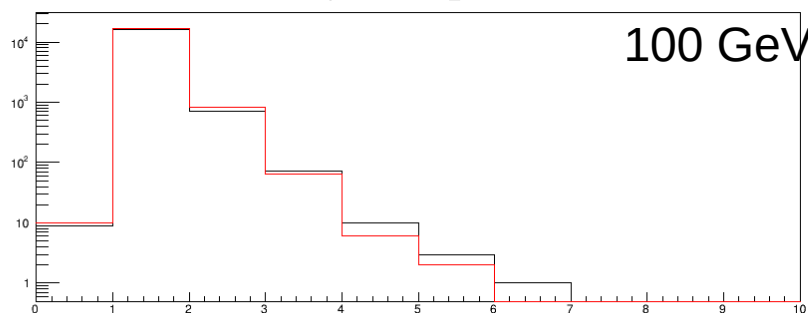
photonEn200_nPFO



photonEn500_nPFO



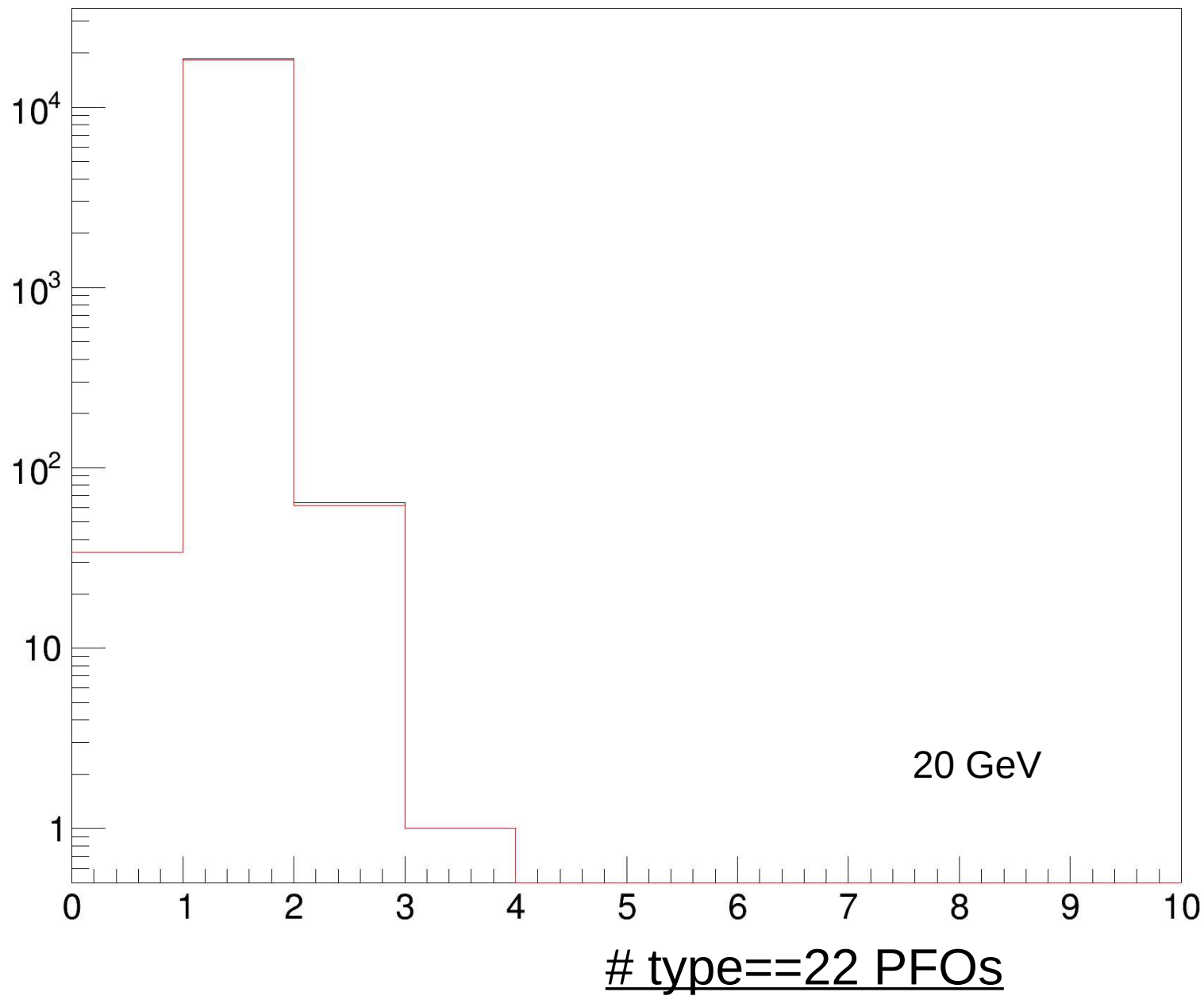
photonEn1000_nPFO



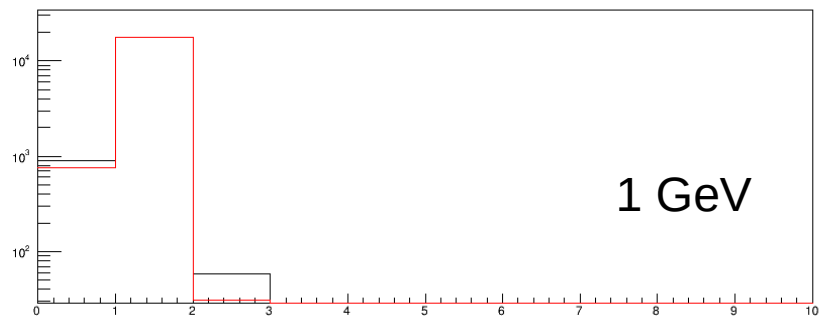
PFOs per single gamma event

type==22 PFOs per single gamma event

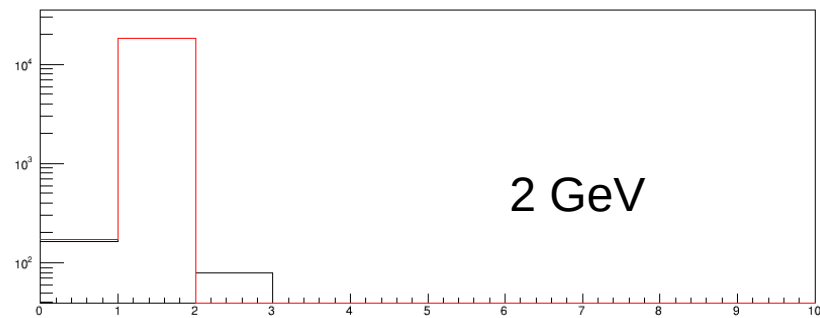
photonEn200_nPFO22



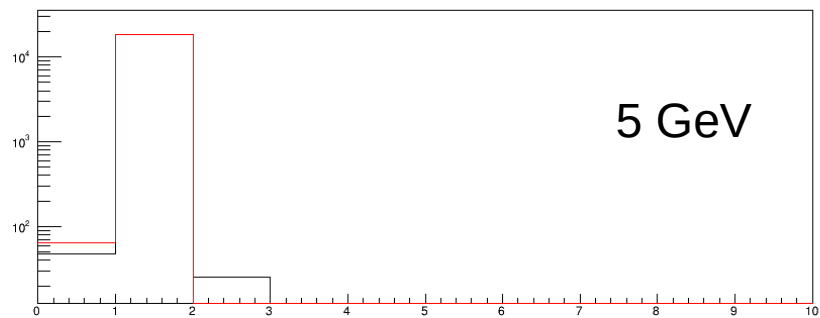
photonEn10_nPFO22



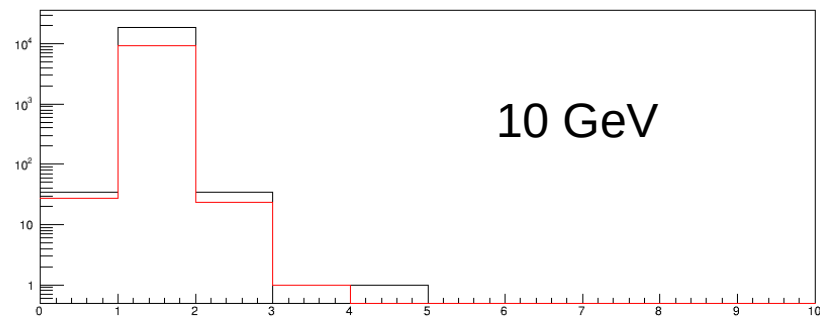
photonEn20_nPFO22



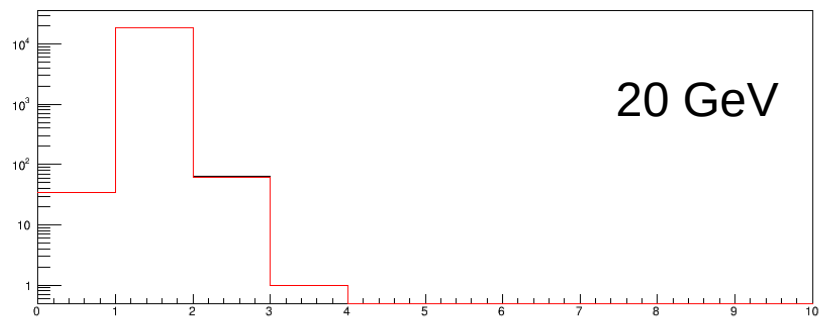
photonEn50_nPFO22



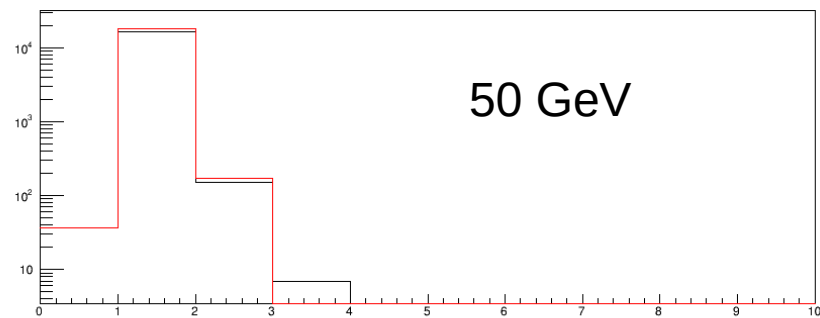
photonEn100_nPFO22



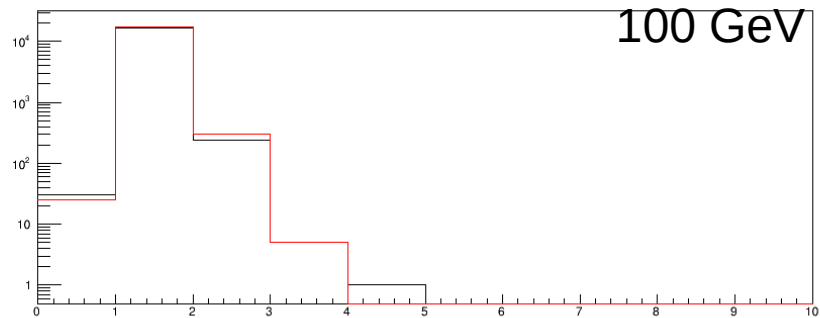
photonEn200_nPFO22



photonEn500_nPFO22



photonEn1000_nPFO22



type==22 PFOs
per single gamma event

Summary:

Several known issues with photon reconstruction,
mostly connected to gaps in detector

I believe situation is similar in latest samples
but must be re-done

No significant differences between
large and small
at single photon level (as expected)

Not addressed here, but important and should be investigated:
position resolution
pointing resolution
Moliere radius
converted photons