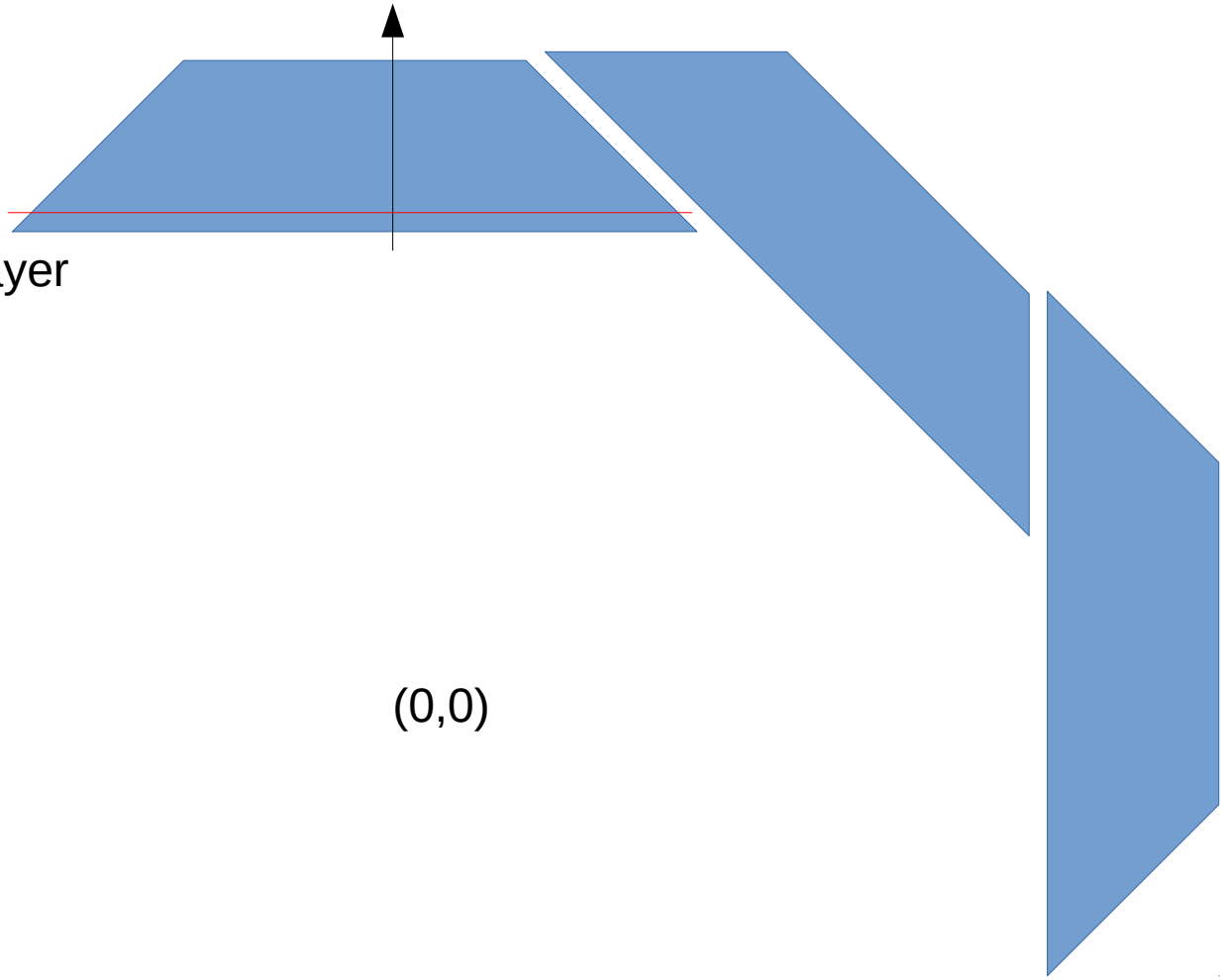
update: photon direction bias

Daniel, 17 Apr 2020

geometry check: are hits in the correct position?

shoot 10 GeV directly upwards from just in front of the ECAL barrel
compare MC muon vertex with the hit position in the first layer



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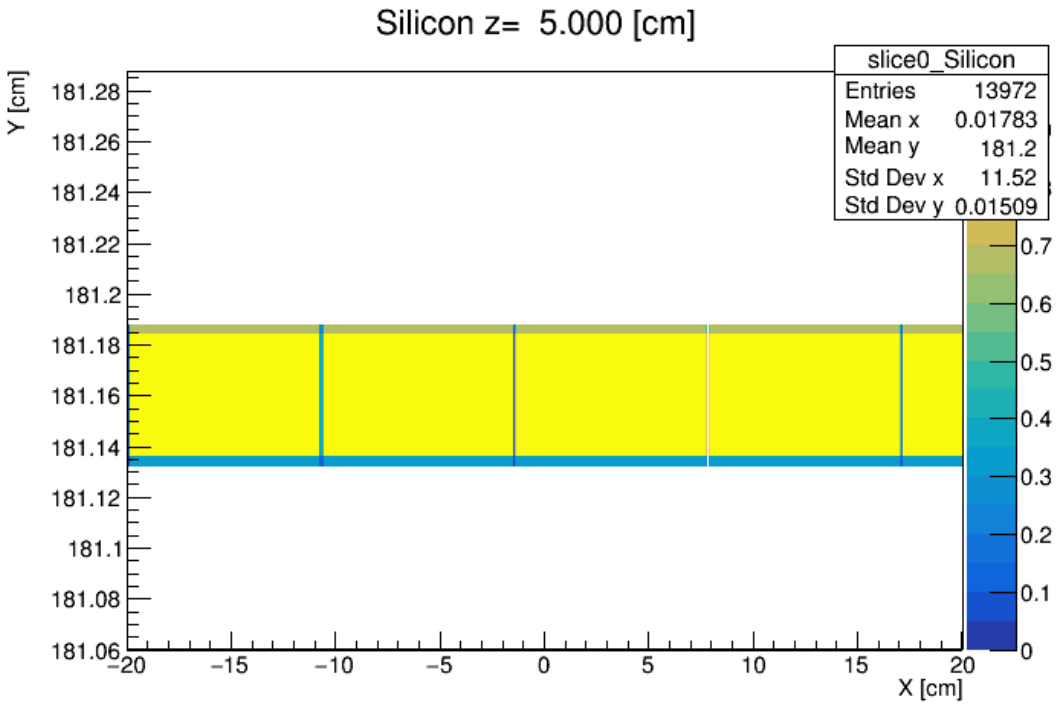
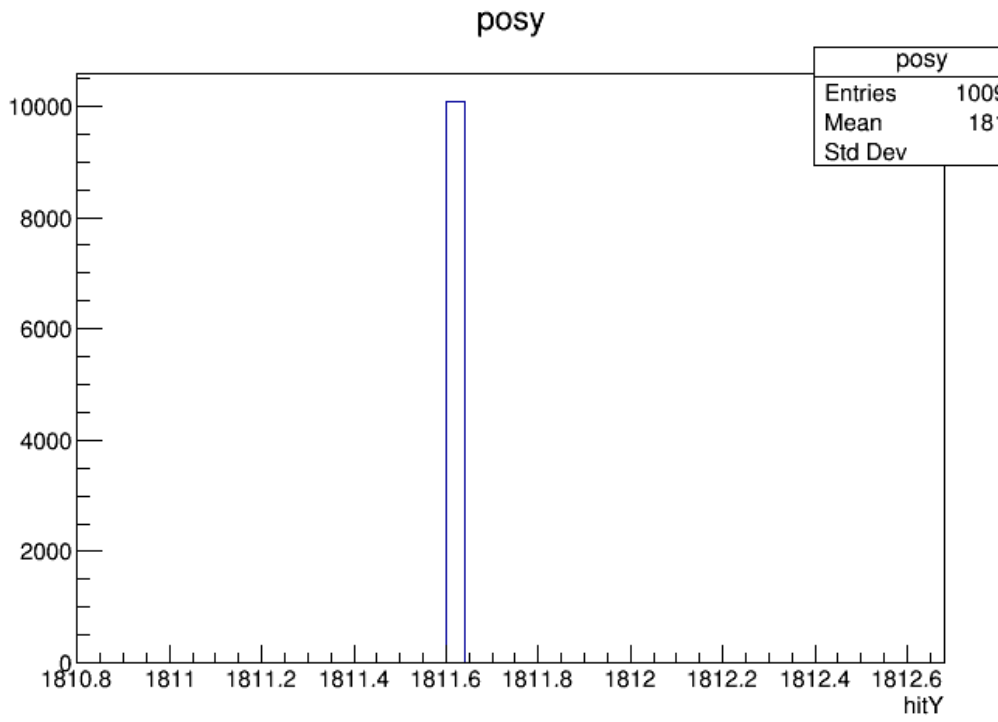


position of silicon layer in lcgeo/dd4hep detector description

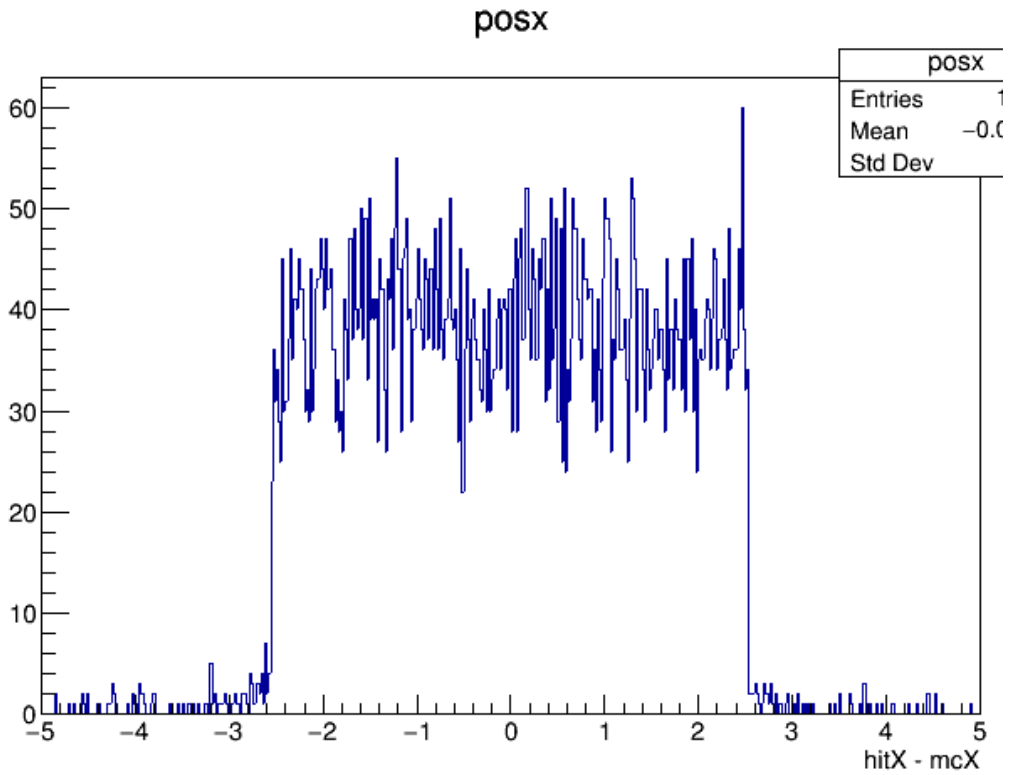


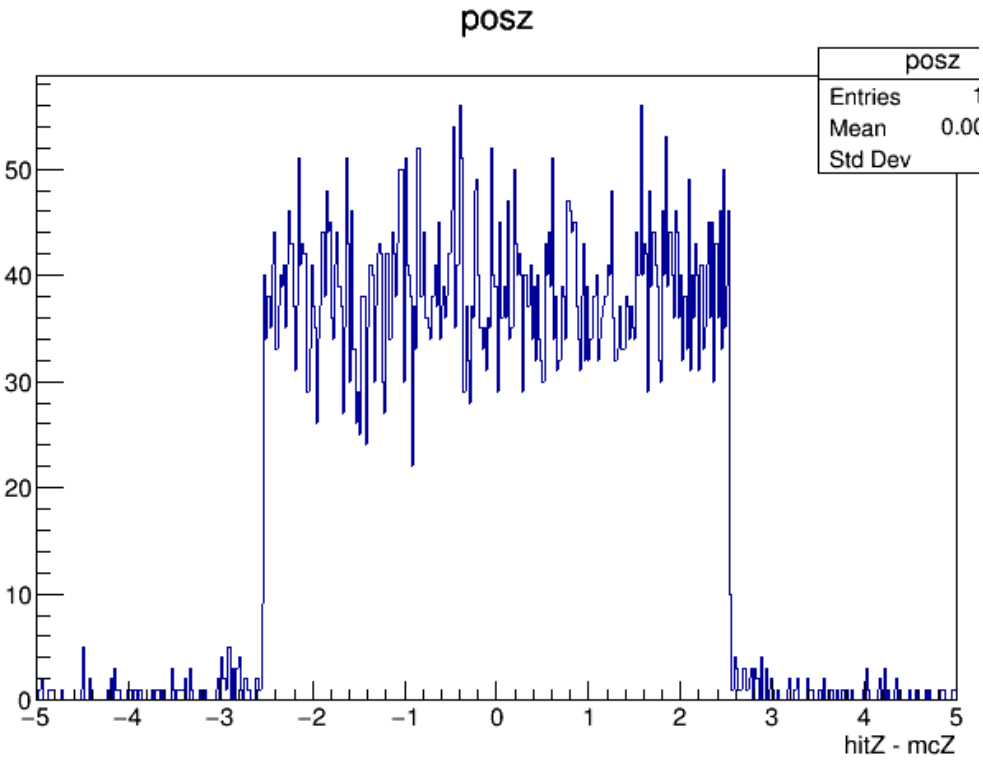
position of silicon hits (L0)

consistent with centre of silicon layer, as expected

geometry check: are hits in the correct position?

shoot 10 GeV directly upwards from just in front of the ECAL
compare MC muon vertex with the hit position in the first layer



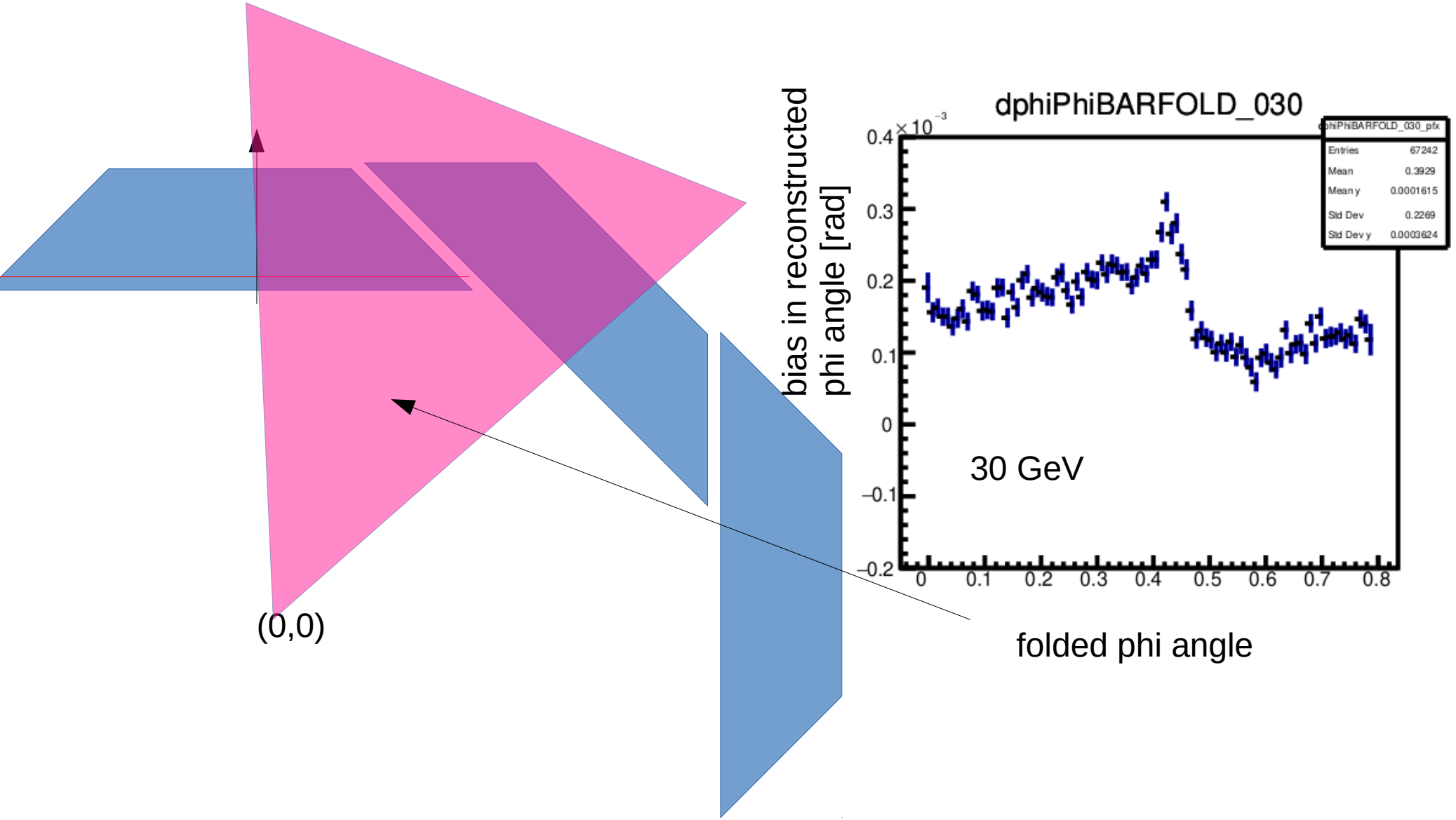


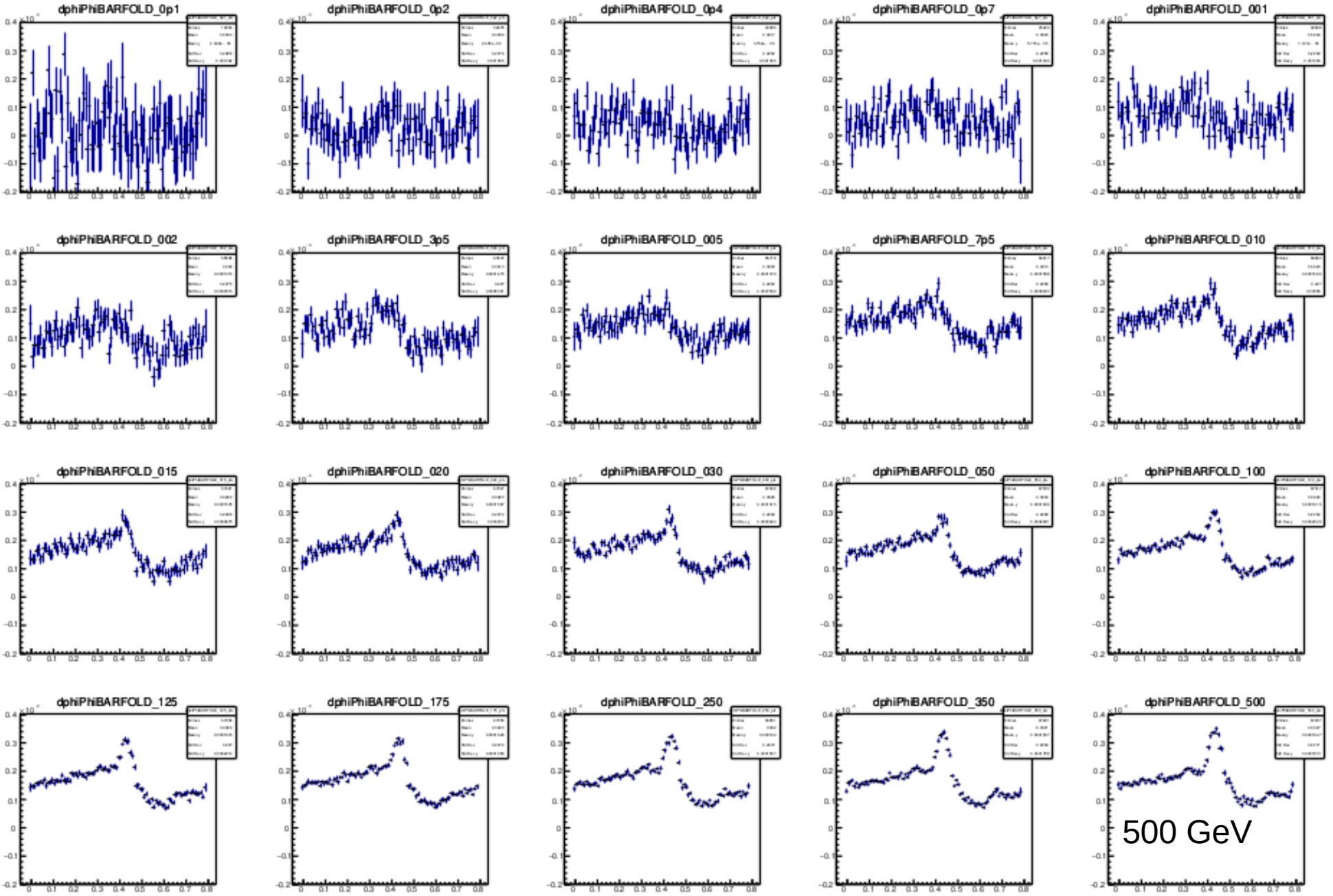
difference between hit position (= centre of ~5mm ECAL readout cell)
and the MC particle vertex, in both X and Z

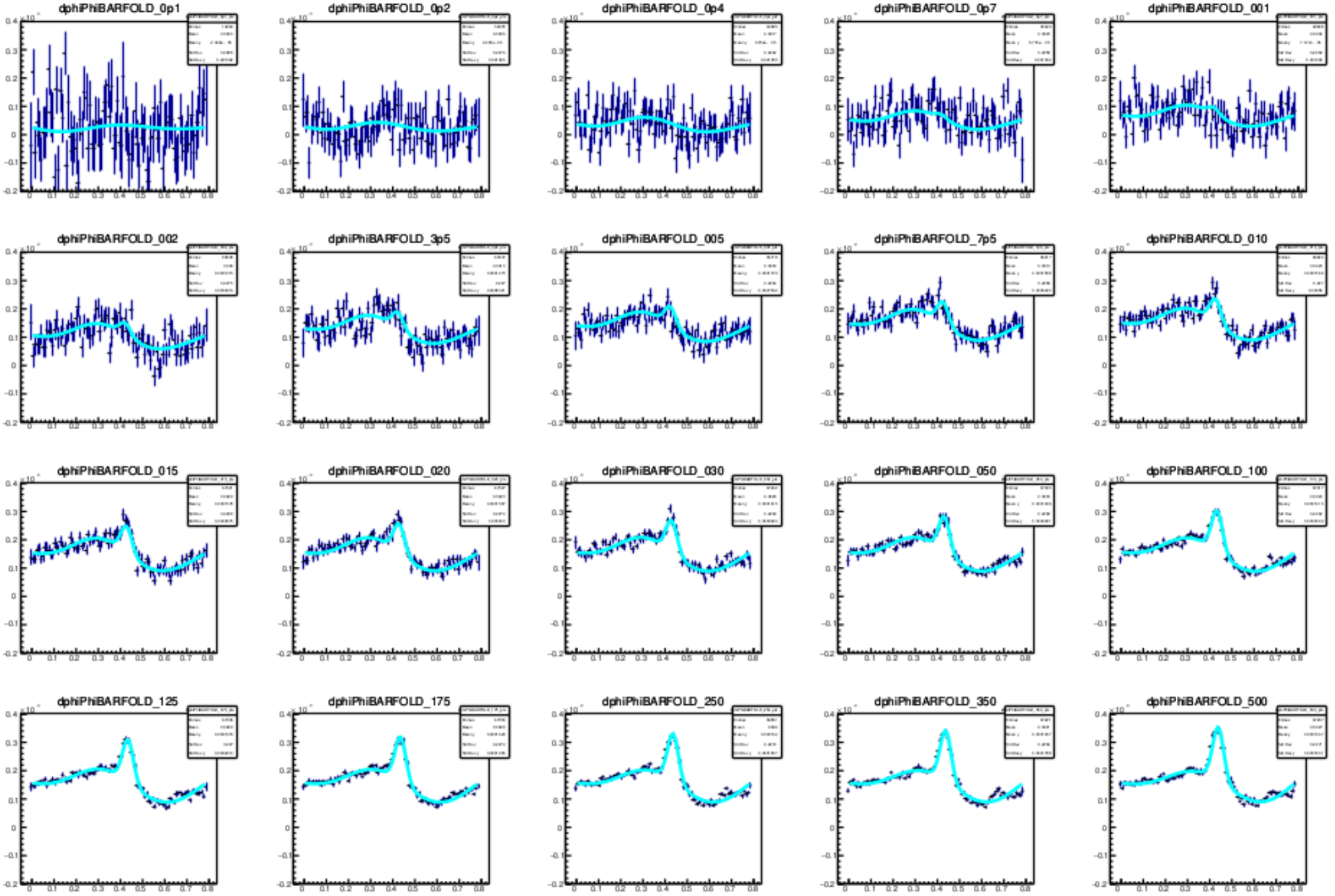
looks centred on 0, as expected

→ ECAL geometry & hit positions look consistent

1. phi bias in barrel

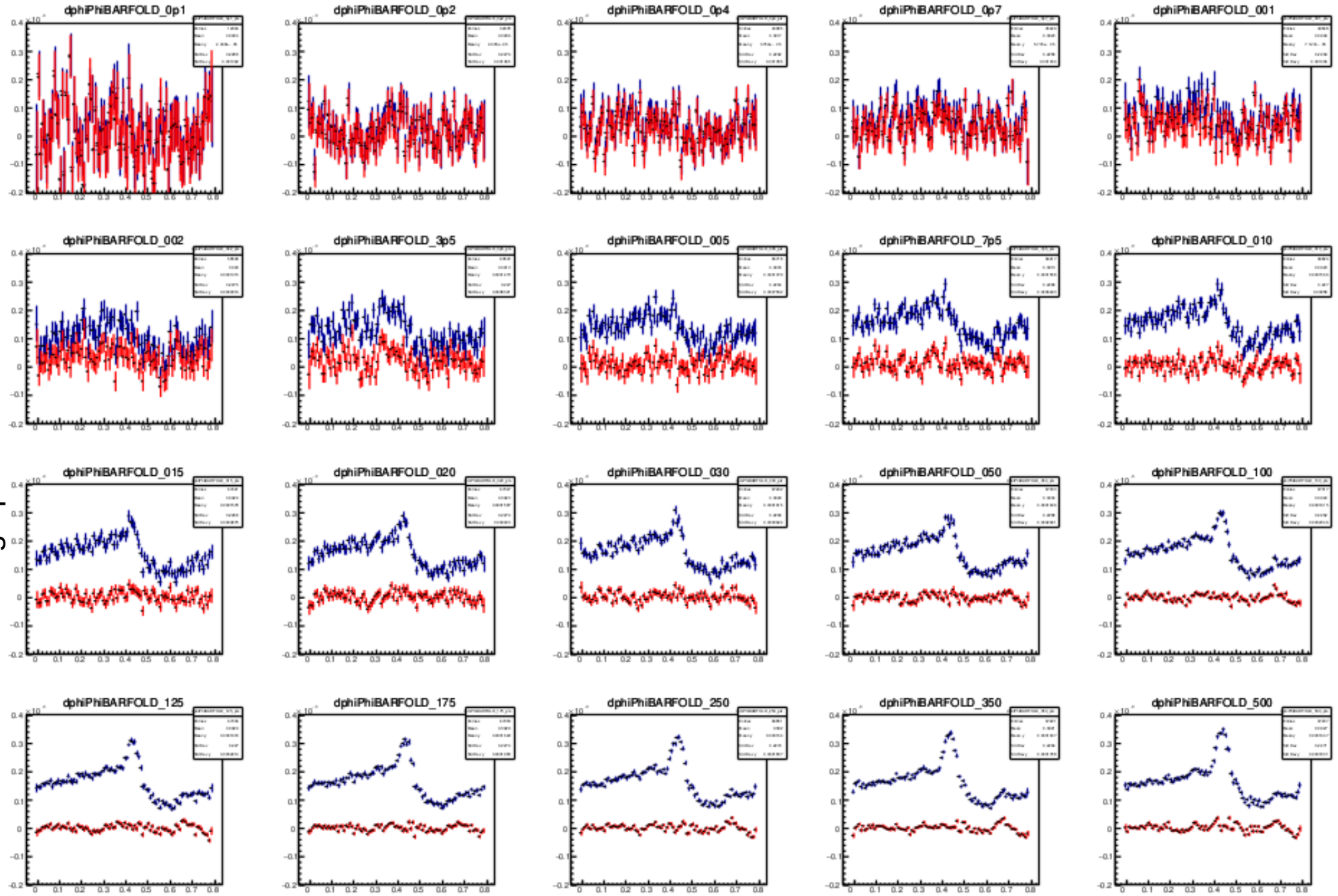



100 MeV
1 GeV
dphiPhiBARFOLD_0p1
dphiPhiBARFOLD_0p2
dphiPhiBARFOLD_0p4
dphiPhiBARFOLD_0p7
dphiPhiBARFOLD_001
dphiPhiBARFOLD_002
dphiPhiBARFOLD_3p5
dphiPhiBARFOLD_005
dphiPhiBARFOLD_7p5
dphiPhiBARFOLD_010
dphiPhiBARFOLD_015
dphiPhiBARFOLD_020
dphiPhiBARFOLD_030
dphiPhiBARFOLD_050
dphiPhiBARFOLD_100
dphiPhiBARFOLD_125
dphiPhiBARFOLD_175
dphiPhiBARFOLD_250
dphiPhiBARFOLD_350
dphiPhiBARFOLD_500
500 GeV
average phi bias
folded azimuthal angle



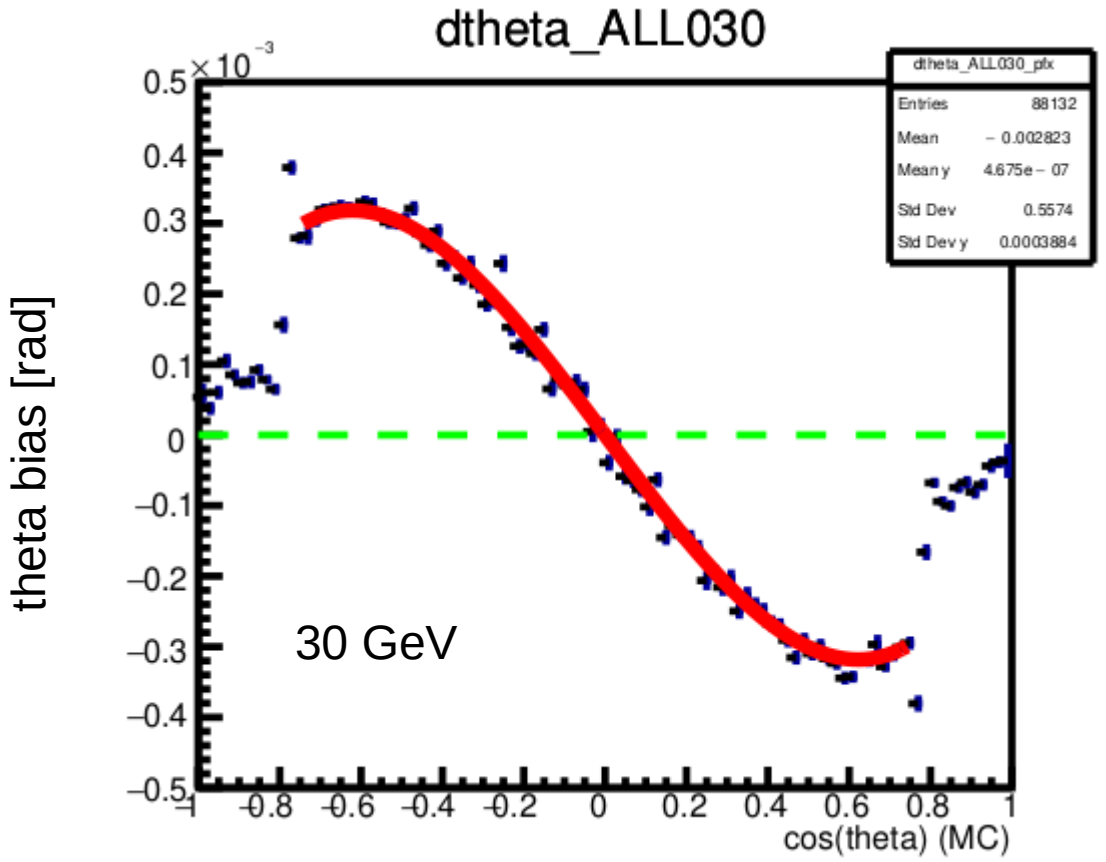
fit as gaus (p0, p1, p2) + p3*sin(4*phi) + p4*sin(8*phi) + p5*sin(12*phi) + p6*sin(16*phi)

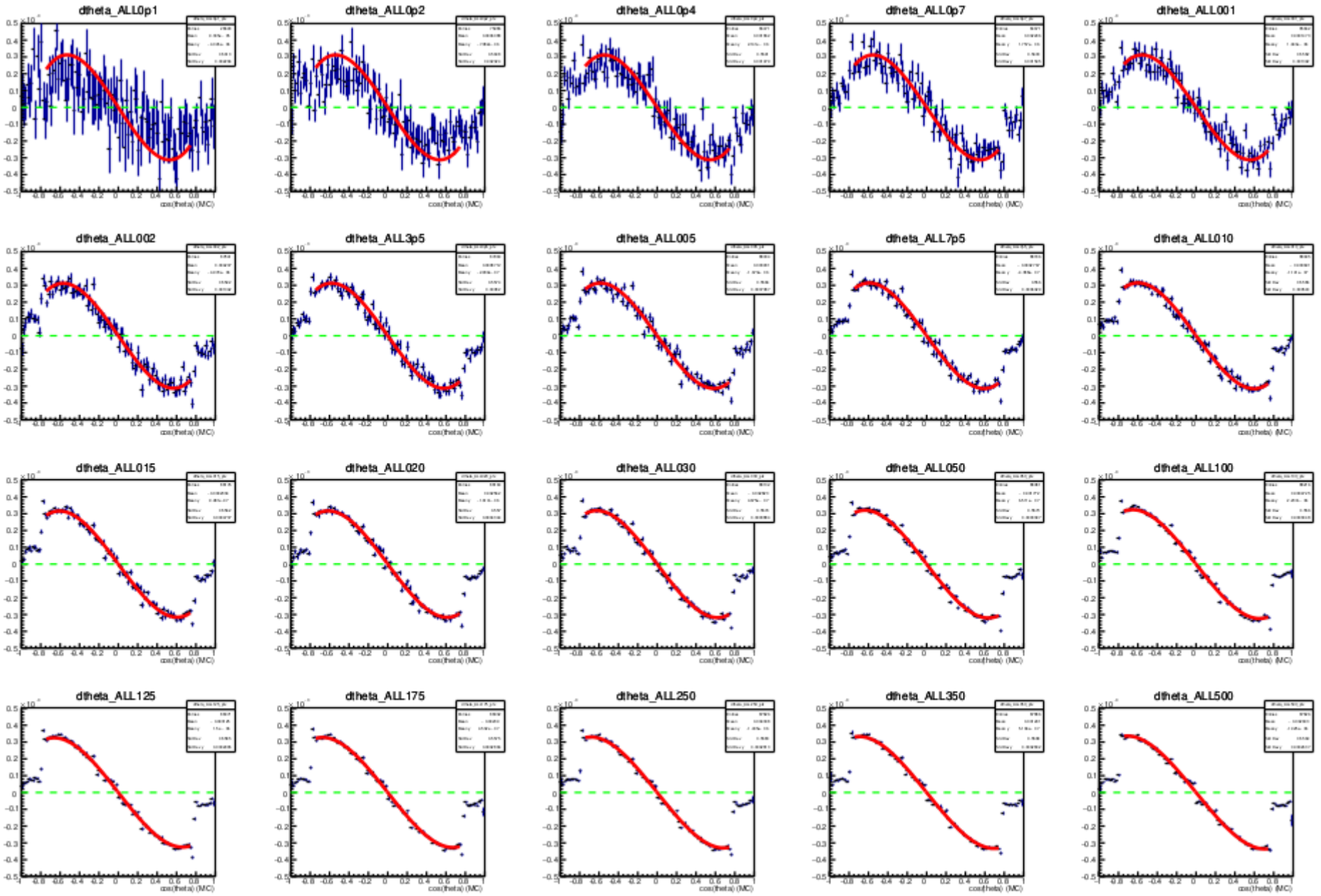
parameters p0...6 are more-or-less simple functions of log(E)



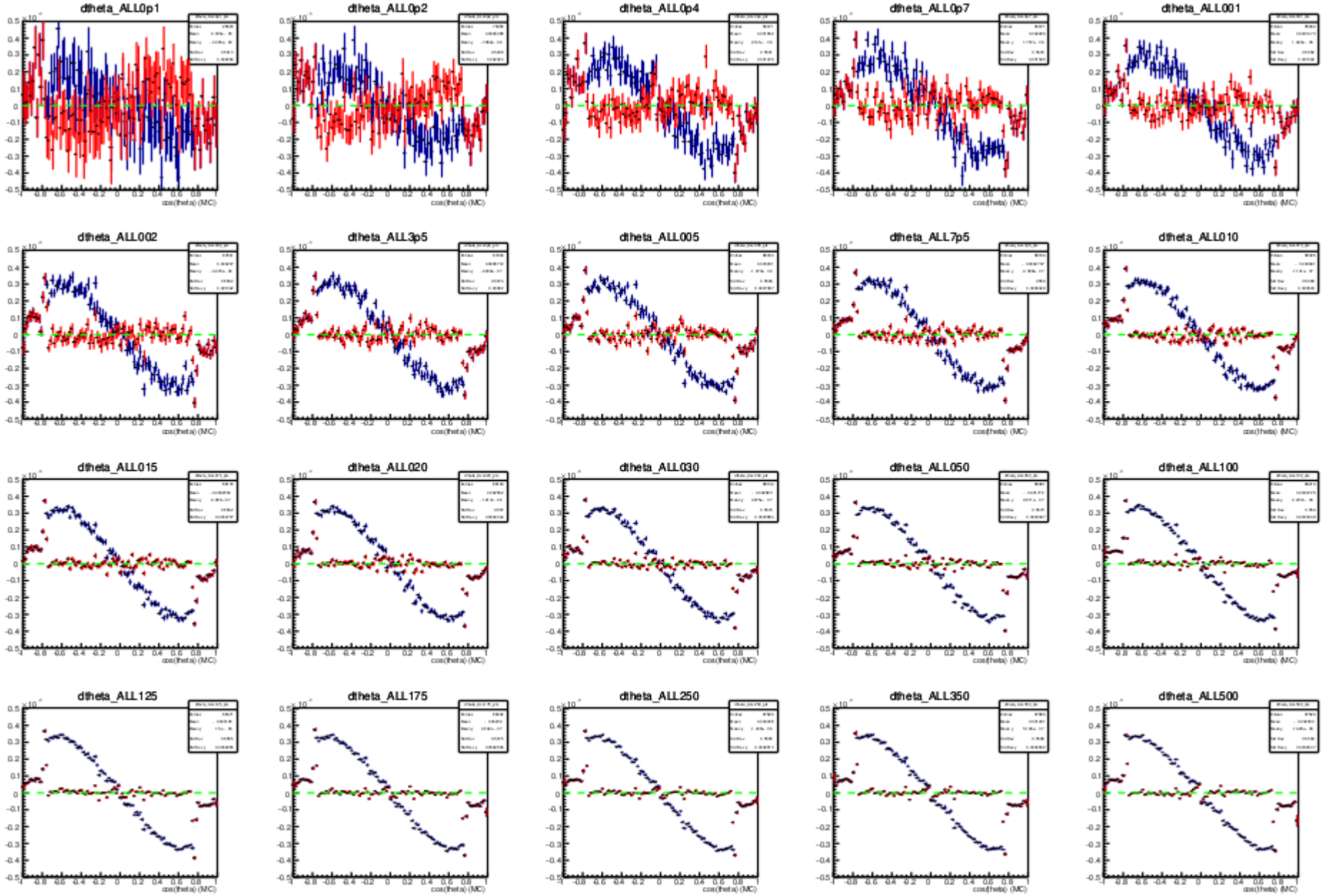
phi bias after correction: much improved

2. theta bias


dtheta_ALL030
dtheta_ALL030_pfx
Entries 88132
Mean −0.002823
Mean y 4.675e−07
Std Dev 0.5574
Std Dev y 0.0003884
×10⁻³
0.5
0.4
0.3
0.2
0.1
0
−0.1
−0.2
−0.3
−0.4
−0.5
−1 −0.8 −0.6 −0.4 −0.2 0 0.2 0.4 0.6 0.8 1
cos(theta) (MC)
theta bias [rad]
30 GeV
cos(theta)



in barrel, fit as p0*cos(theta) + p1*cos^3(theta)



correction works pretty well in barrel; still need to look in endcaps