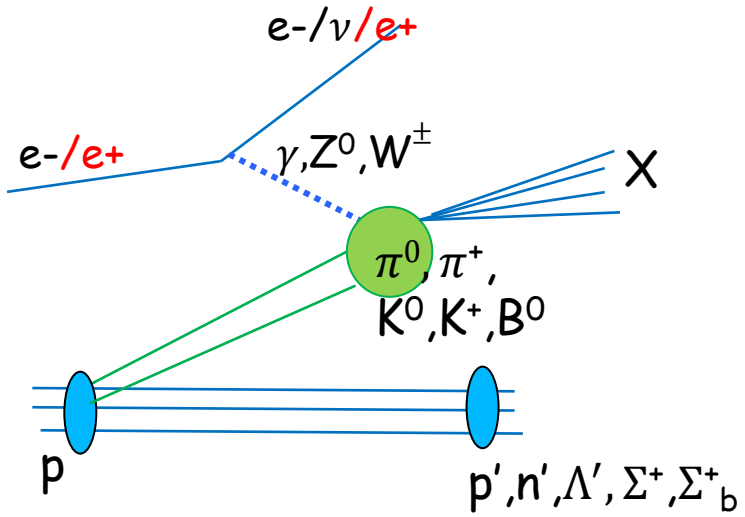
First look on Lambdas in FF region

Julia Furletova in collaboration with Meson Structure group.

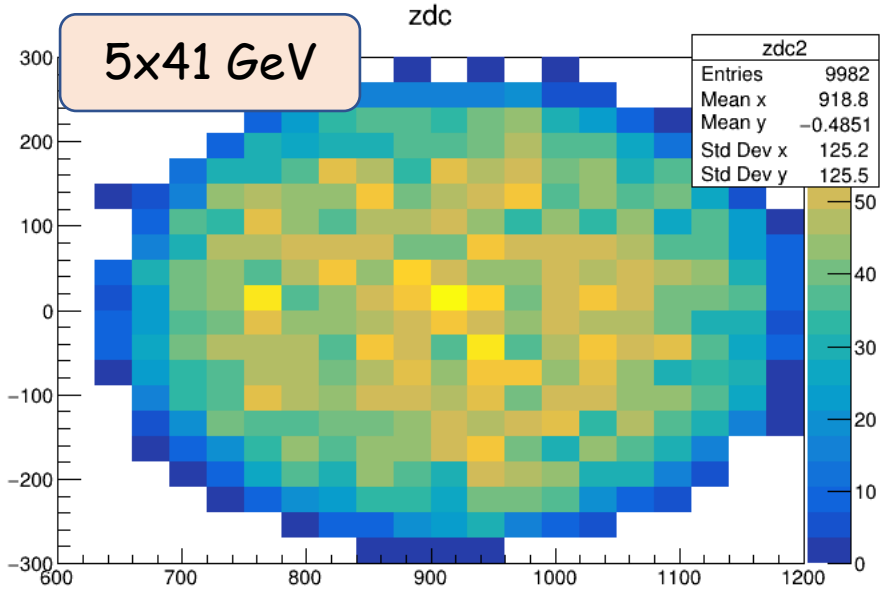
Pion/Kaon structure functions and further progress towards
flavor decomposition



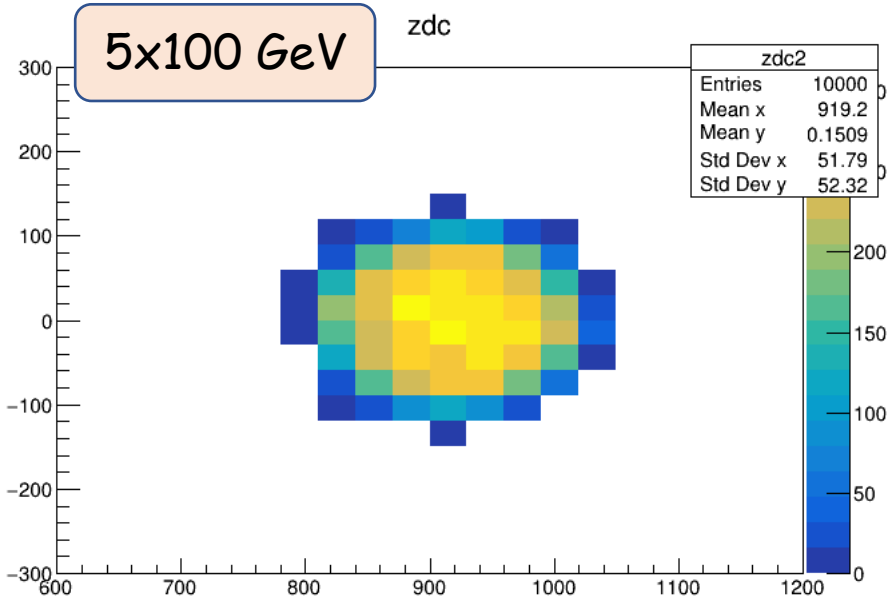
e p -> (pi) -> e' + X + n

Neutron sample

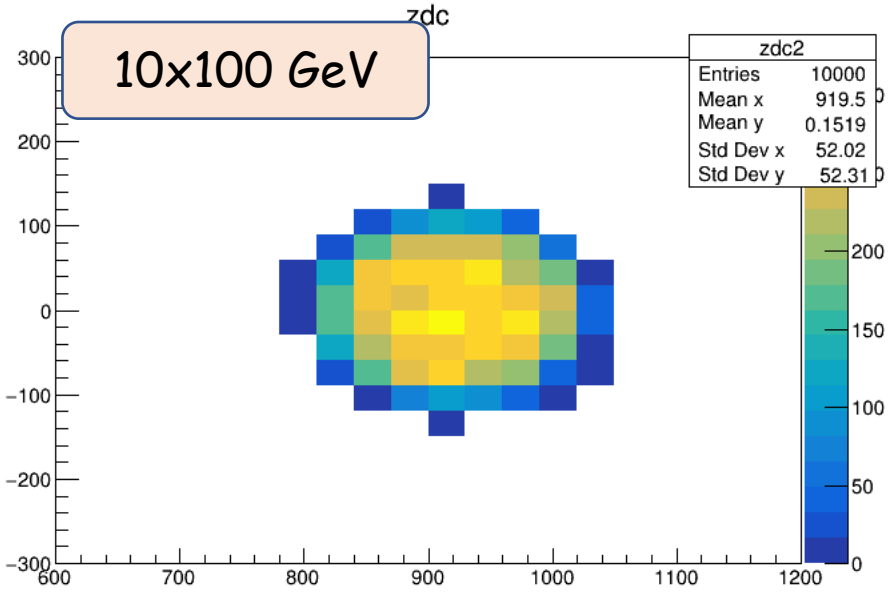
5x41 GeV



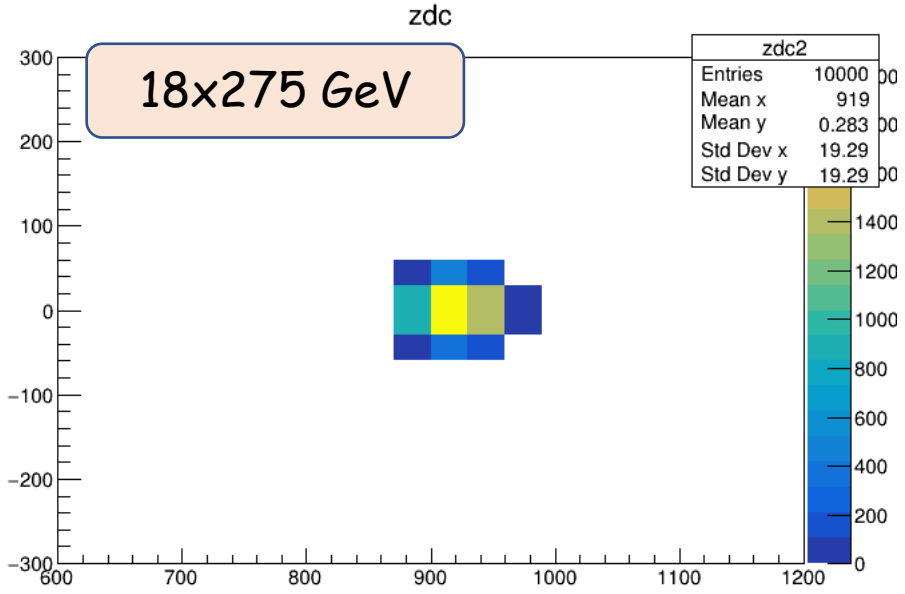
5x100 GeV



10x100 GeV



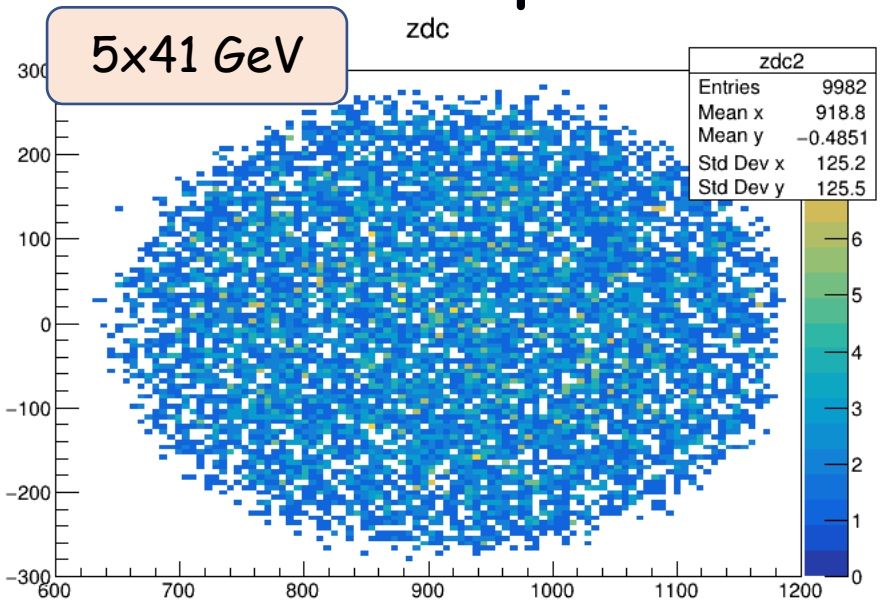
18x275 GeV



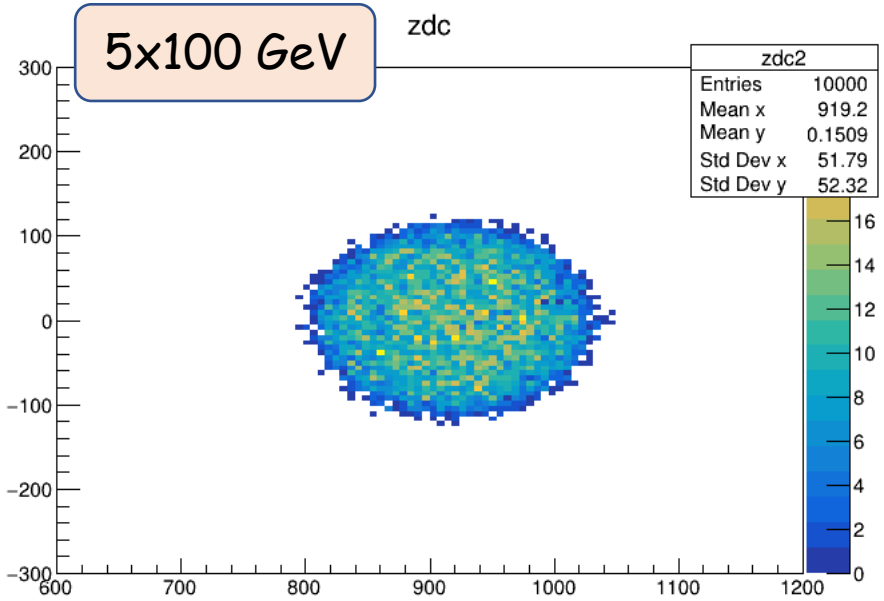
ZDC
60x60 cm
20bins => 3cm towers

Neutron sample

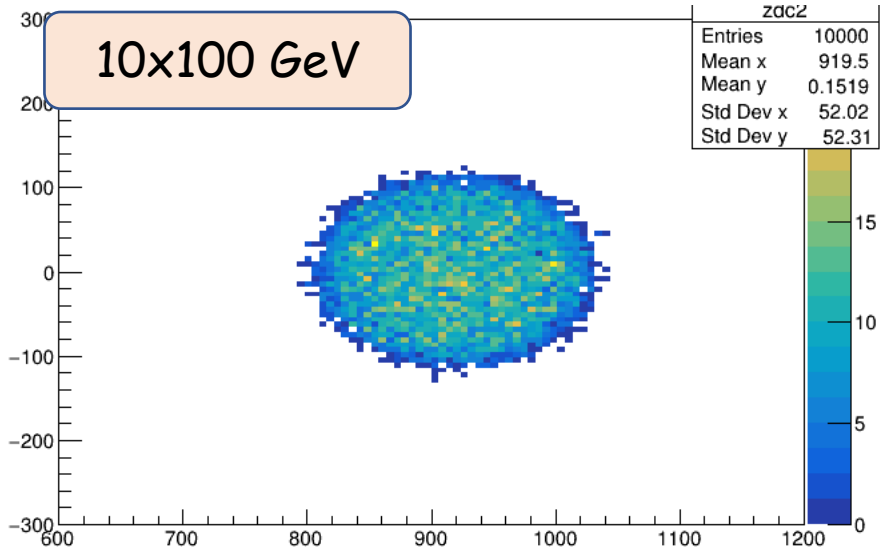
5x41 GeV



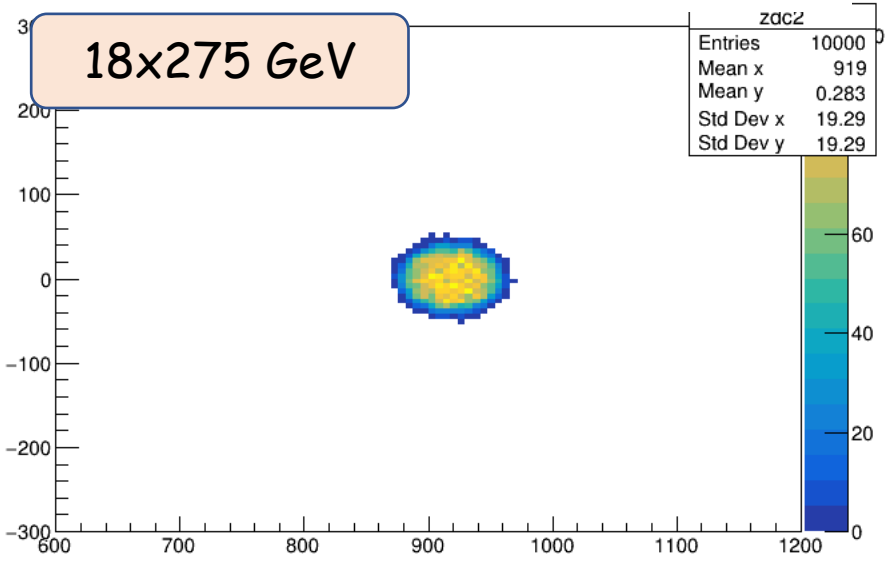
5x100 GeV



10x100 GeV

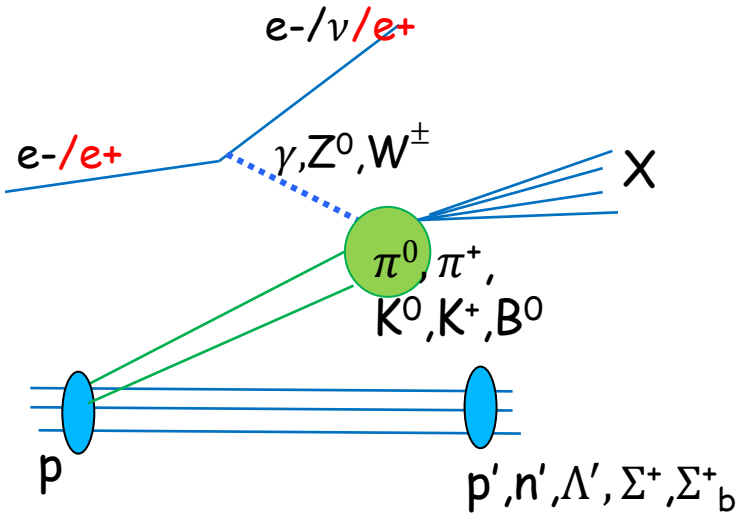


18x275 GeV



ZDC
60x60 cm
100bins =>
0.6cm towers

Pion/Kaon structure functions and further progress towards
flavor decomposition



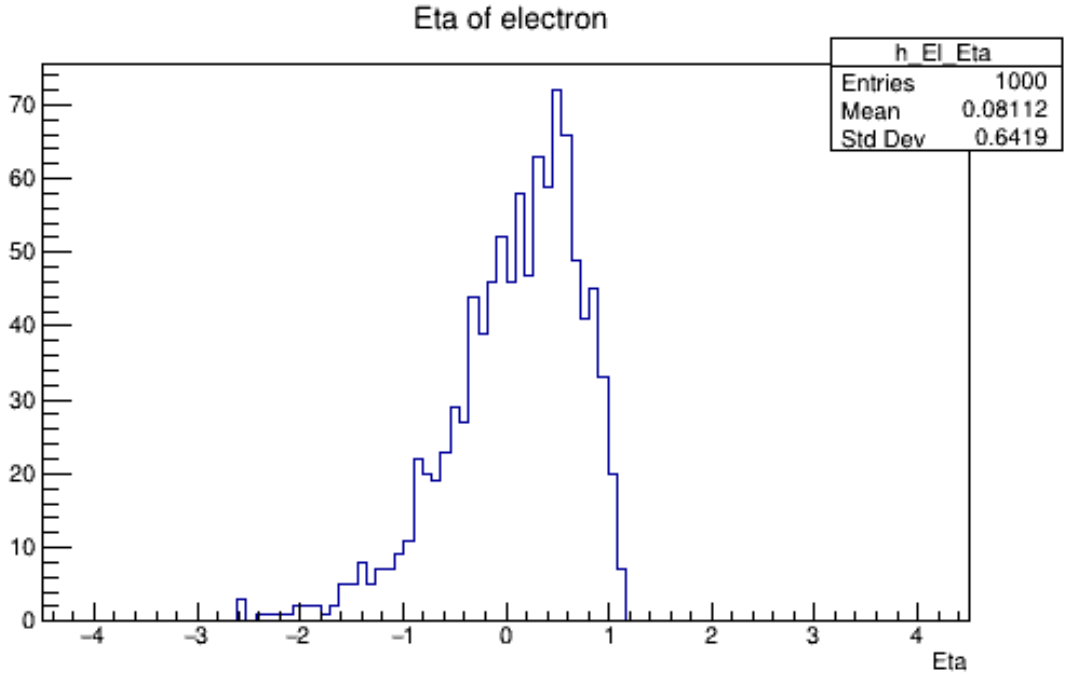
e p -> (K) -> e' + X + Λ

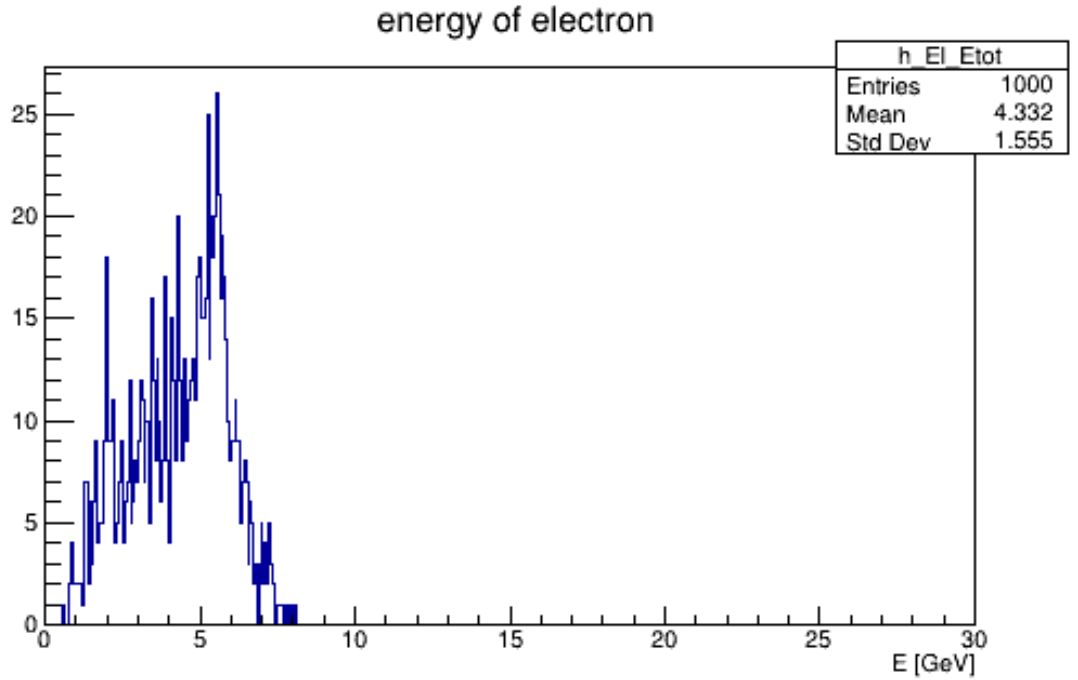
$\Lambda \rightarrow p + \pi^-$

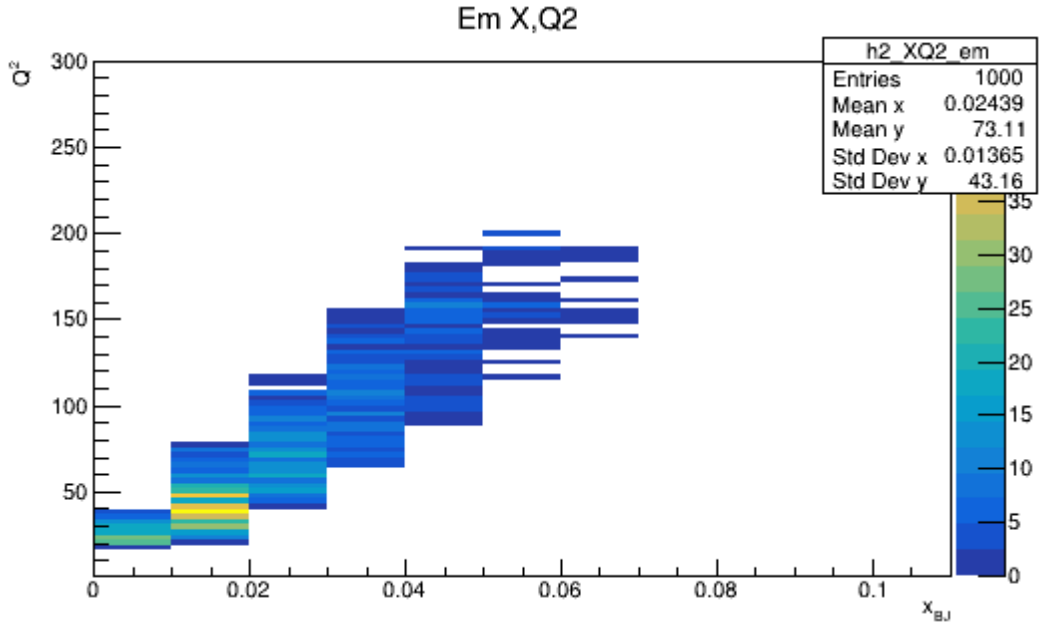
$\Lambda \rightarrow n + \pi^0$

mode[0] = new G4PhaseSpaceDecayChannel("lambda",0.639,2,"proton","pi-");
G4PhaseSpaceDecayChannel("lambda",0.358,2,"neutron","pi0");

Electron (5x41)







Electron in the central detector area

Lambdas (275 GeV)

$\Lambda \rightarrow p + \pi^-$

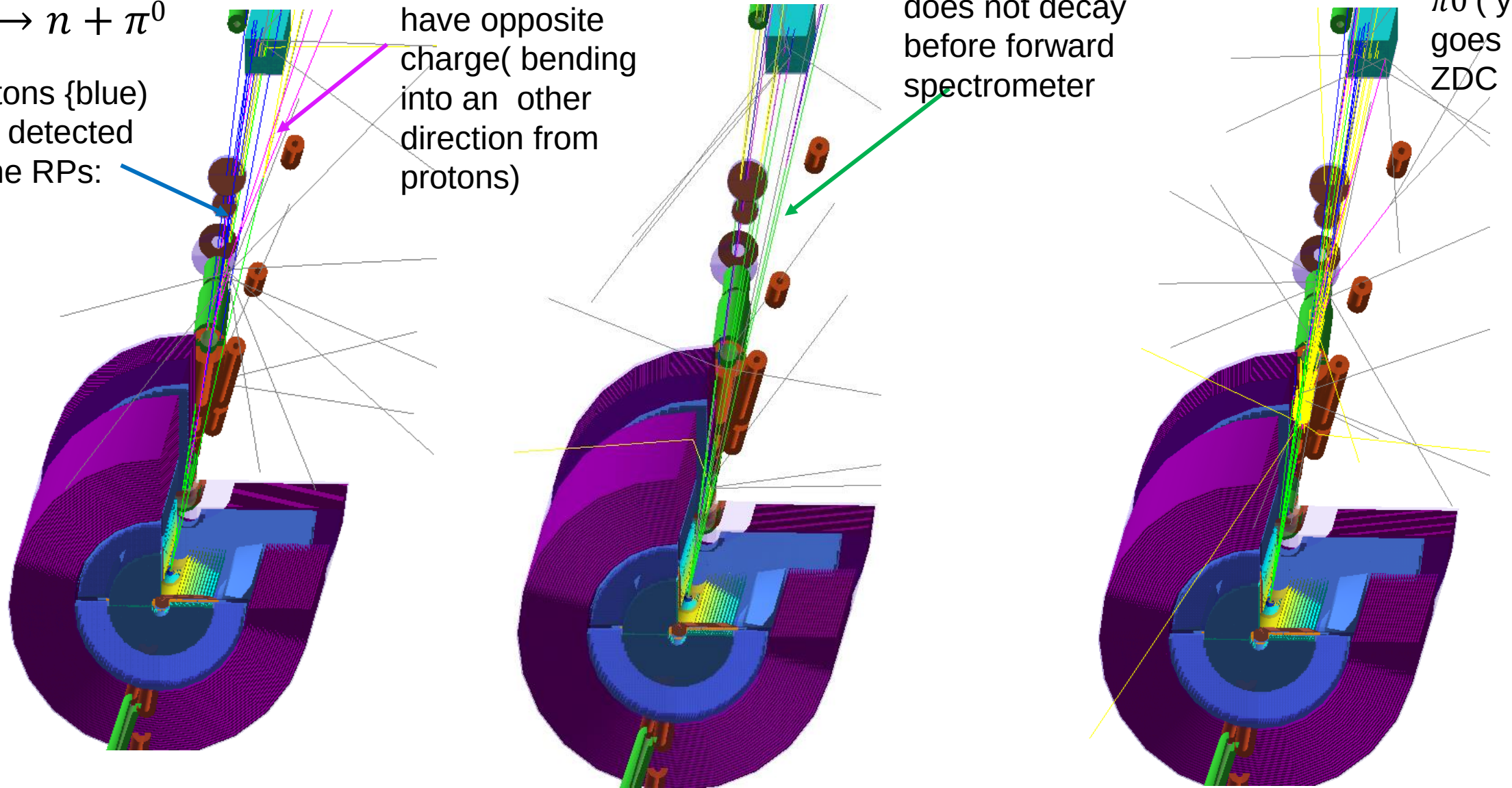
$\Lambda \rightarrow n + \pi^0$

Protons {blue) are detected in the RPs:

π^- {magenta) have opposite charge(bending into an other direction from protons)

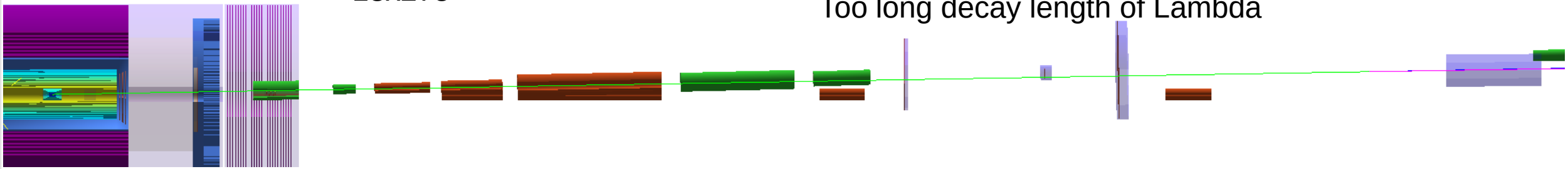
Ca 30% of Lambdas (green) at high energy does not decay before forward spectrometer

Neutrons {gray) and fraction of $\pi 0$ (yellow) goes into ZDC

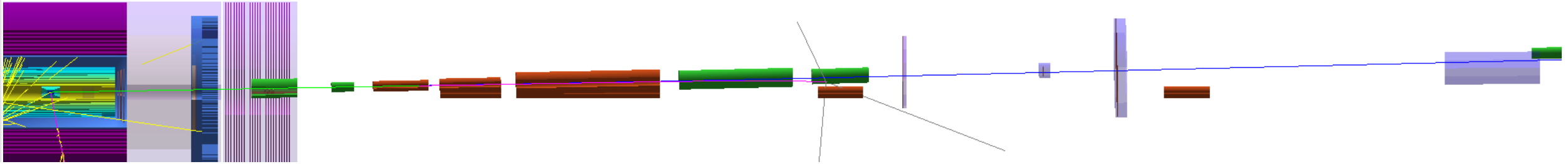


18x275

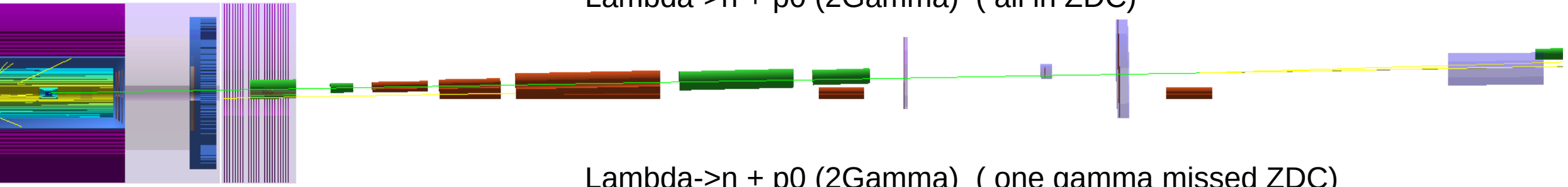
Too long decay length of Lambda



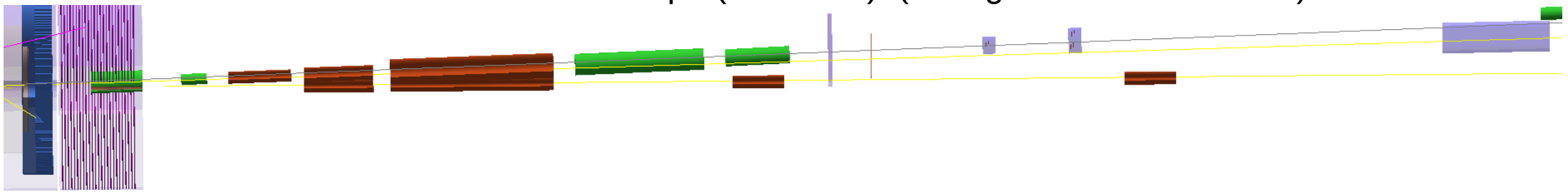
Lambda->p+pi- (pion was lost in Dipole)



Lambda->n + p0 (2Gamma) (all in ZDC)

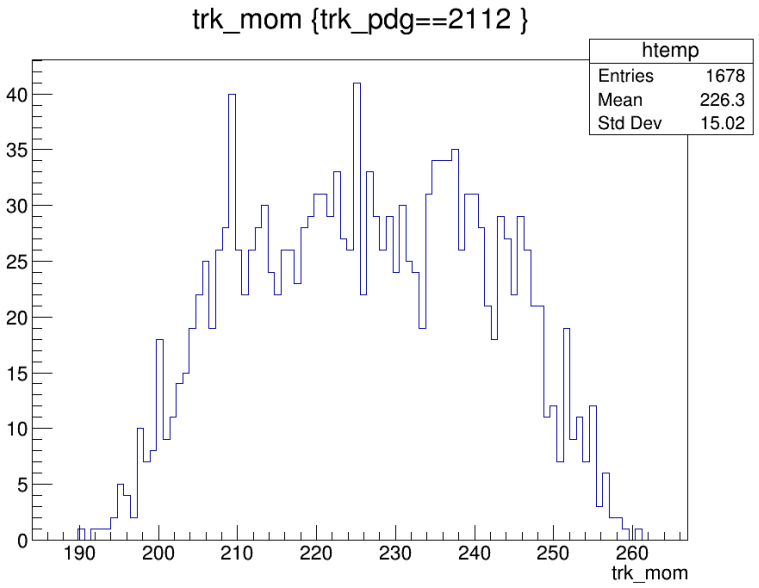


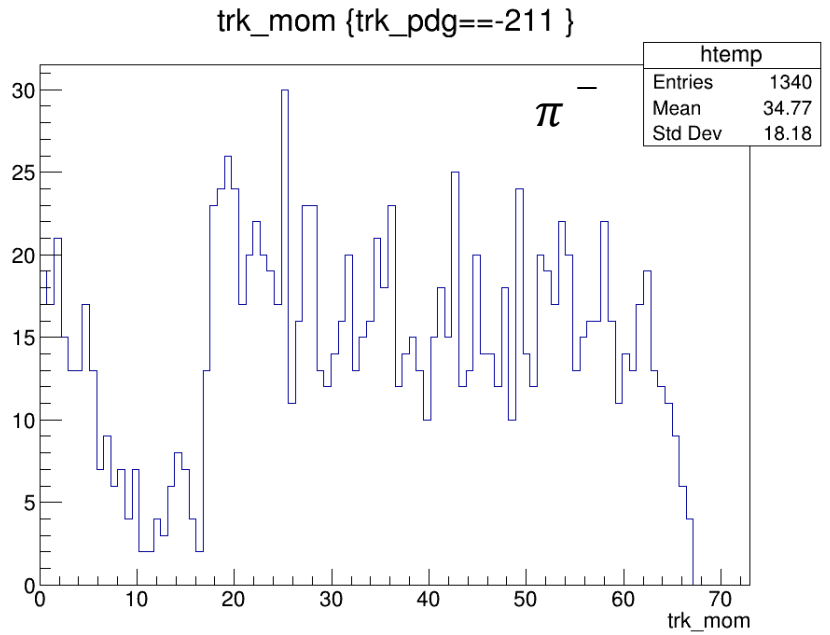
Lambda->n + p0 (2Gamma) (one gamma missed ZDC)

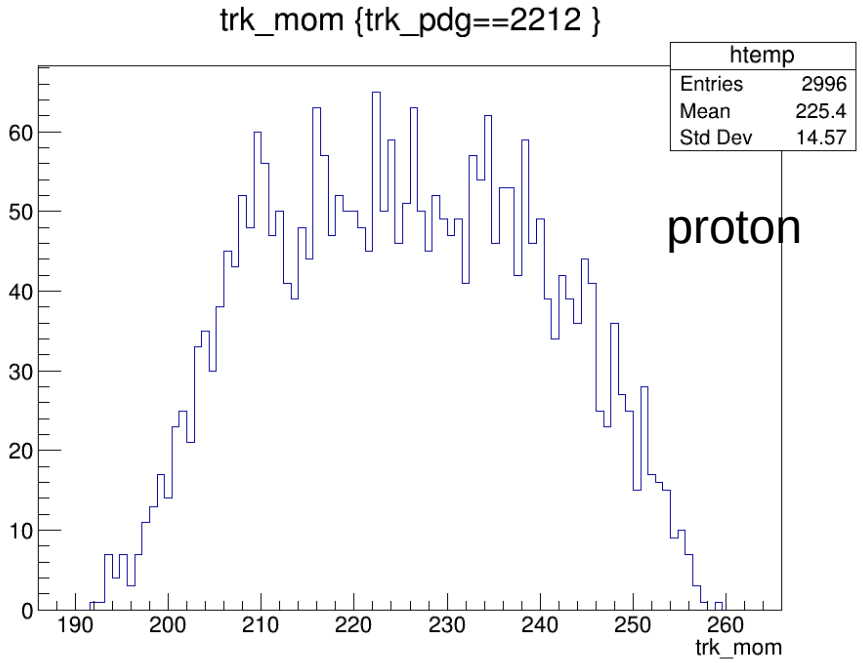


Protons and neutron (18x275)

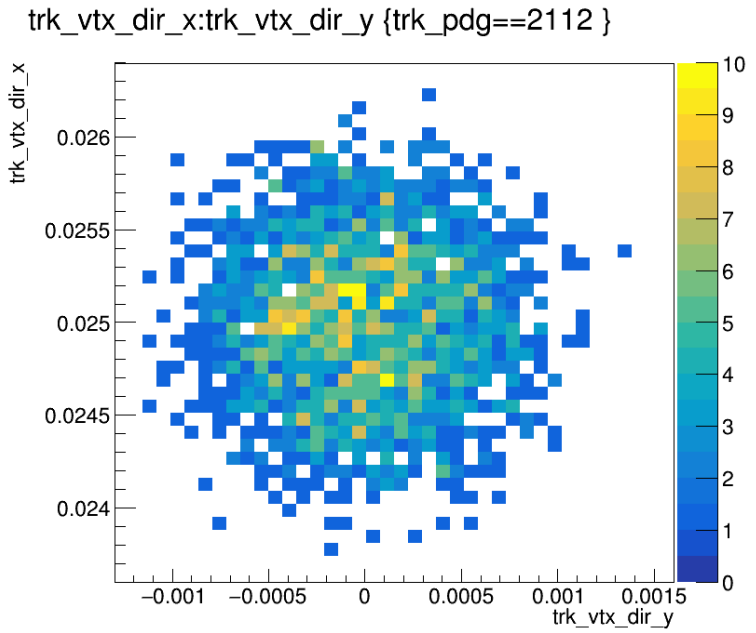
$$\Lambda \rightarrow p + \pi^-$$
$$\Lambda \rightarrow n + \pi^0$$

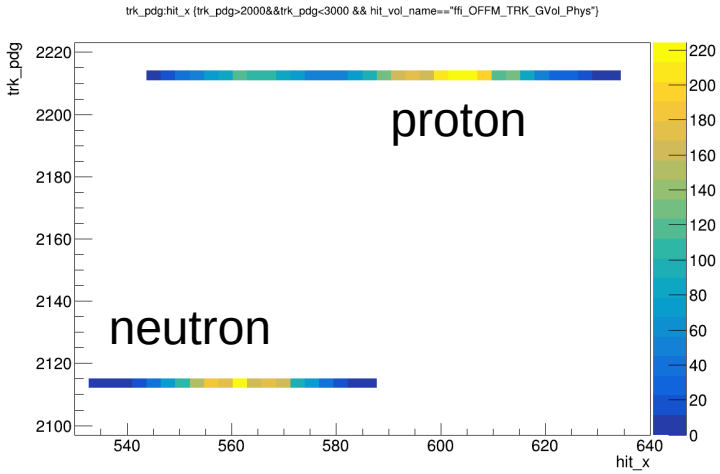






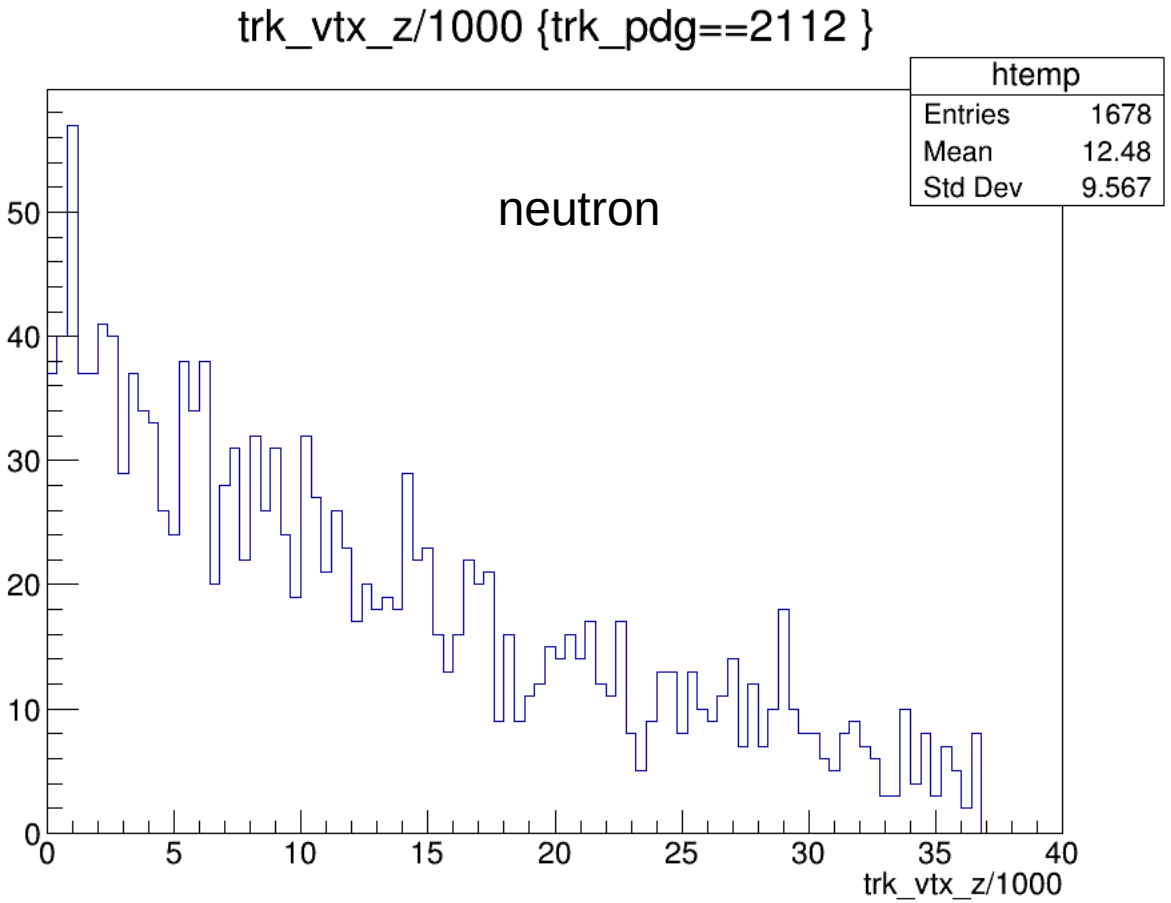
Angular distr for proton

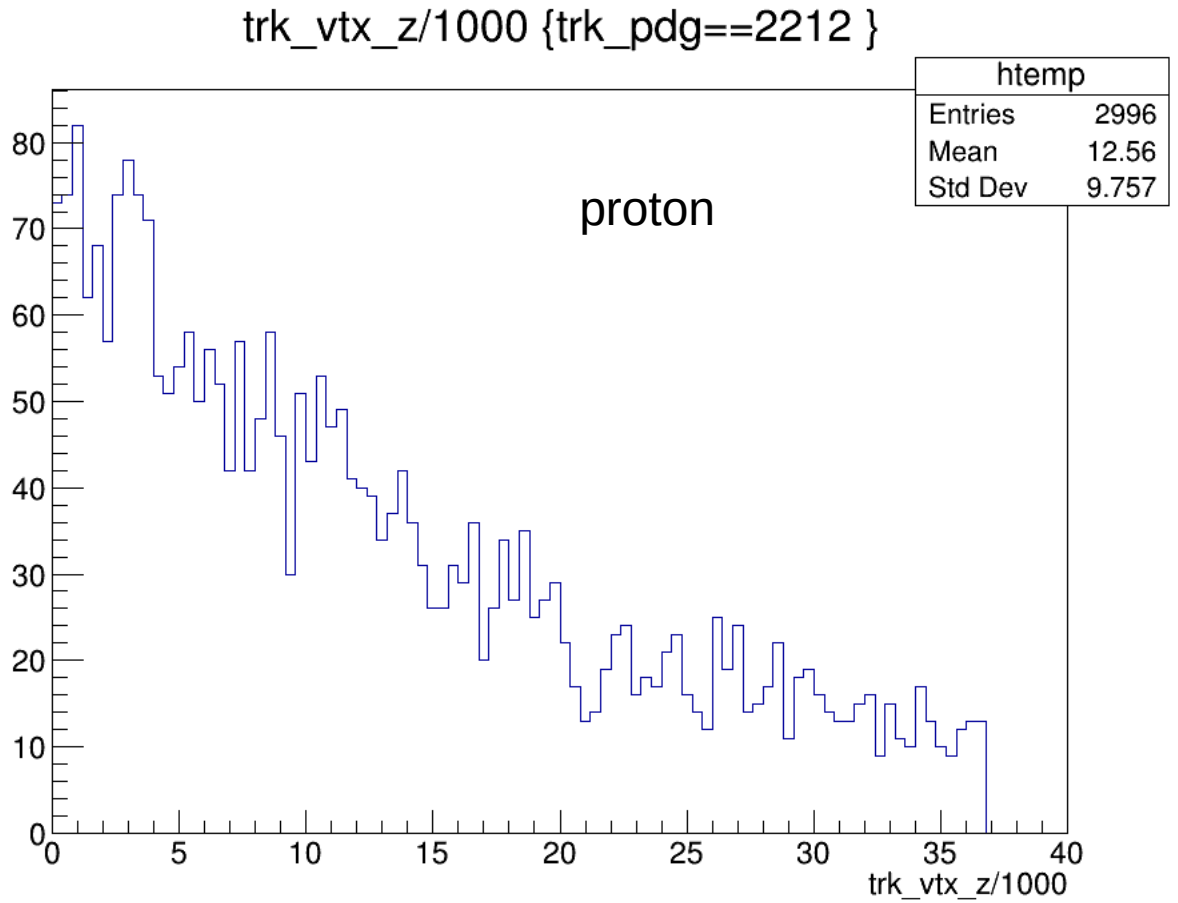




Decay Length (p/n vertex) (18x275)

mode[0] = new G4PhaseSpaceDecayChannel("lambda",0.639,2,"proton","pi-");
G4PhaseSpaceDecayChannel("lambda",0.358,2,"neutron","pi0");

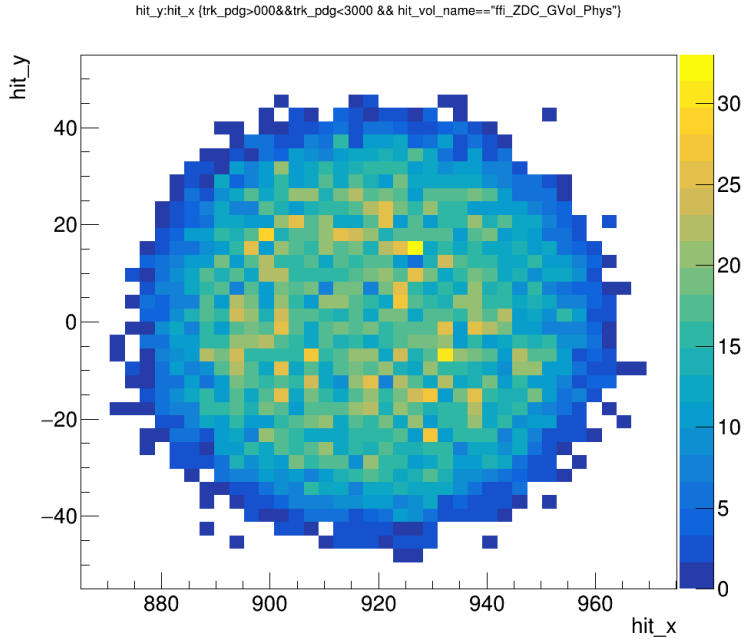


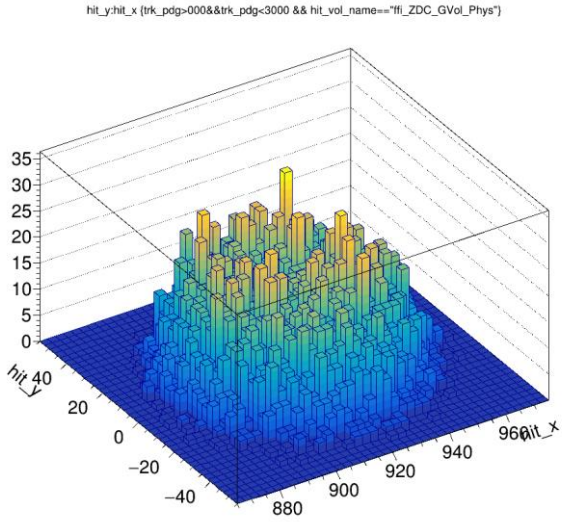


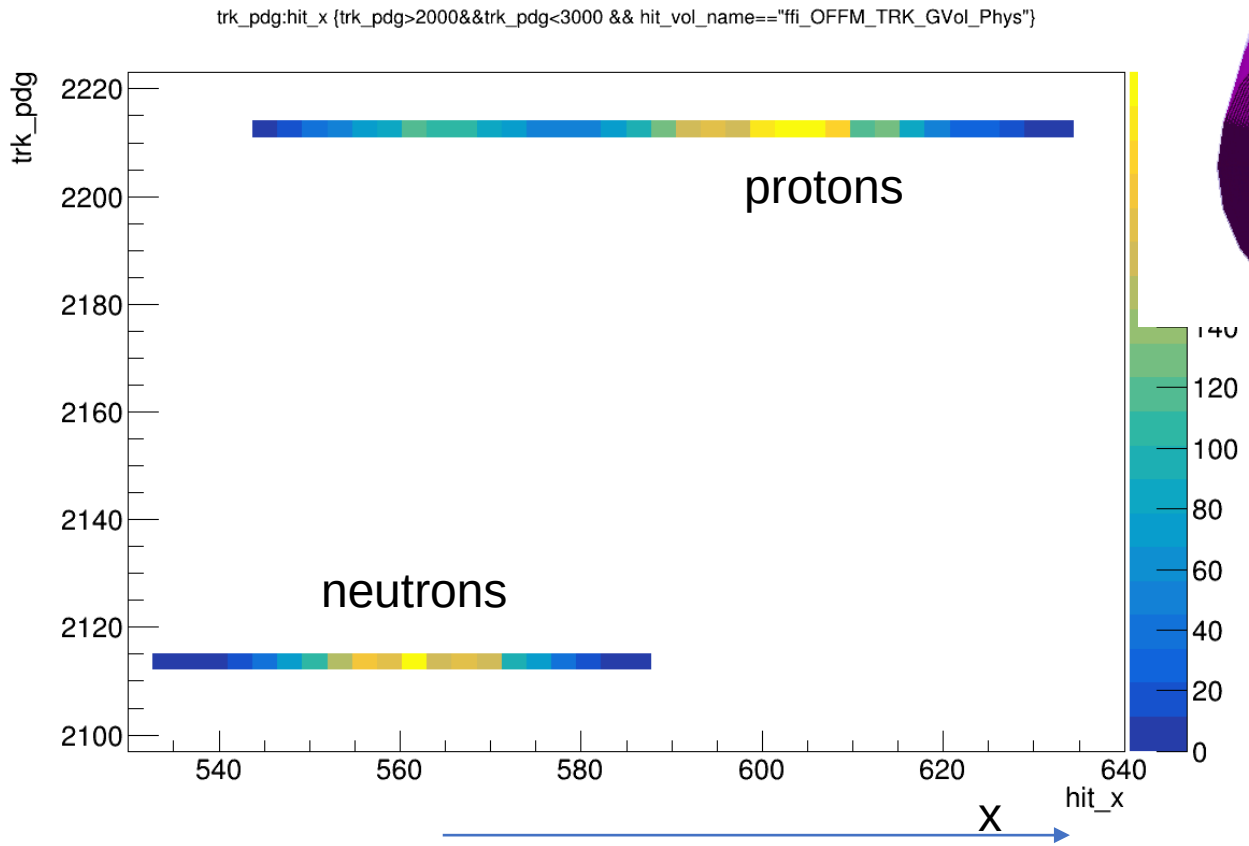
10k events total => 3580 neutrons => ~ 47%
Need to add pi0 efficiency

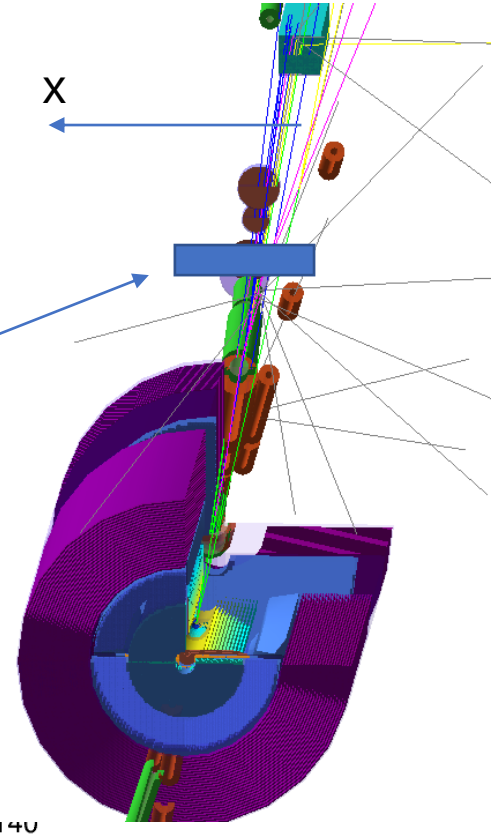
10k events total => 6390 protons => ~ 47%
Need to add pi- efficiency

Occupancy in different sub-detectors



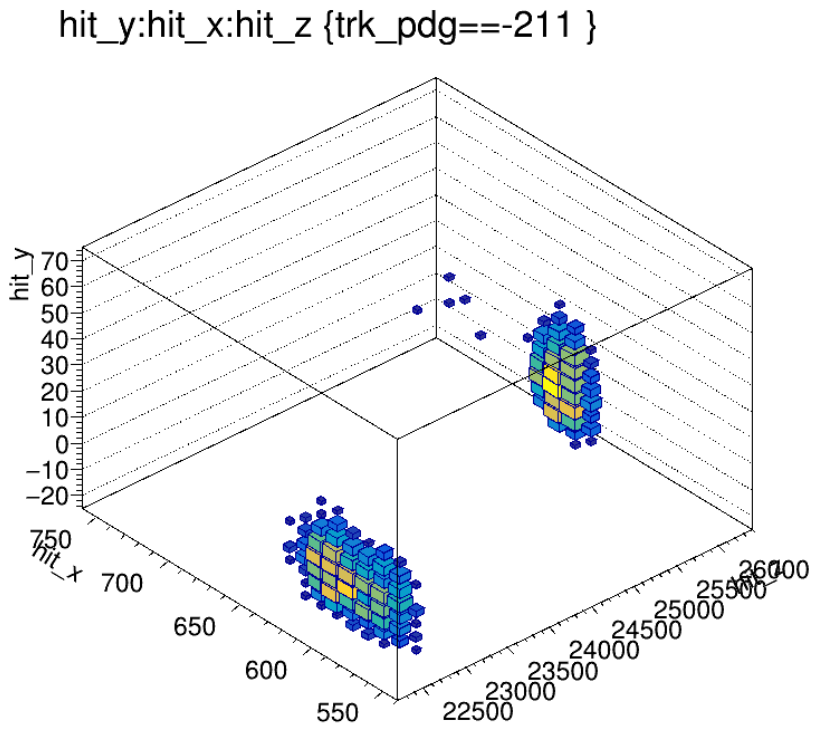


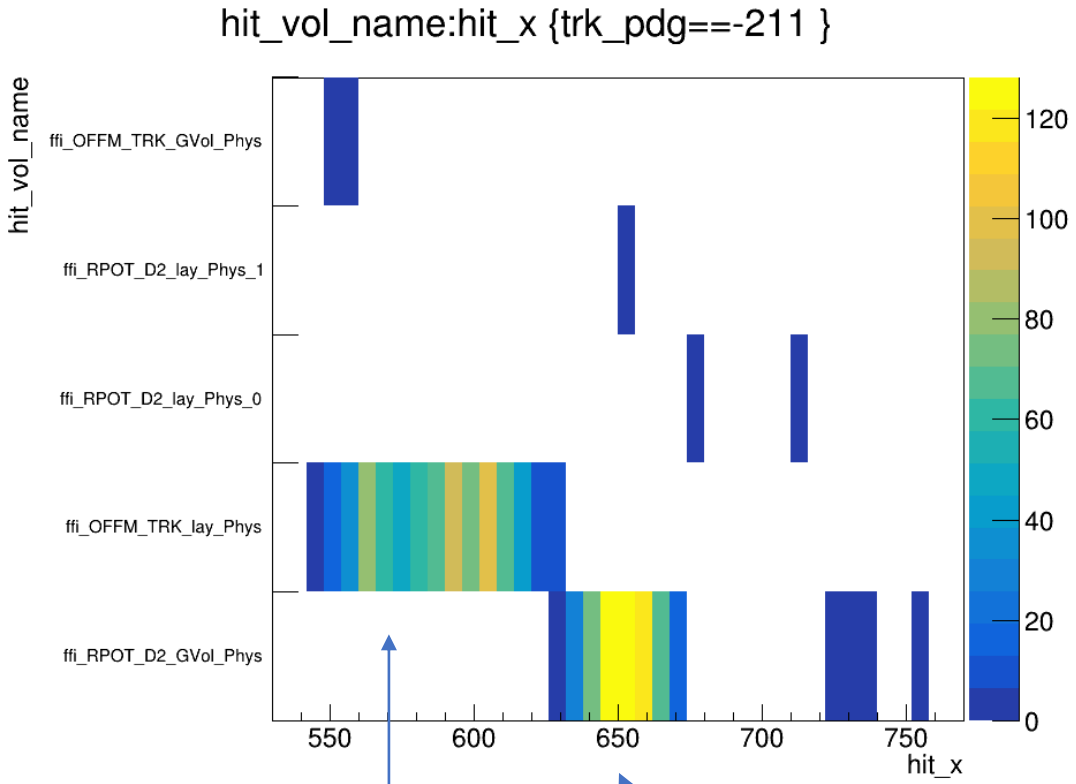


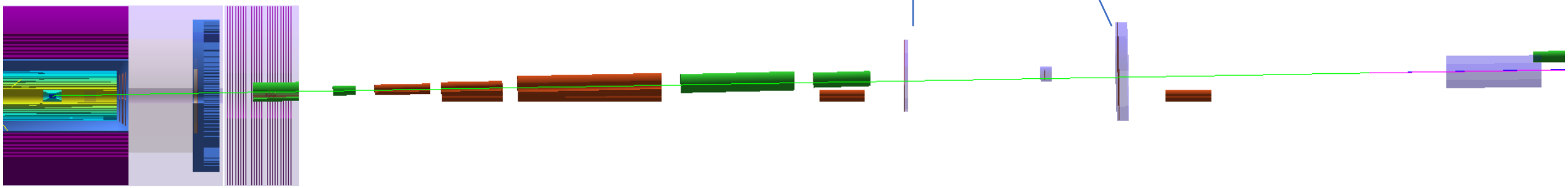


Virtual plane after B1

At the virtual planes







Conclusions and plans

$\Lambda \to p + \pi^-$
$\Lambda \to n + \pi^0$

- Very challenging!
- For $\Lambda \to p + \pi^-$ protons could be detected efficiently, but we need trackers in opposite direction (charge) => on the path to ZDC
- $\Lambda \to n + \pi^0$ neutrons could be detected efficiently, but need to check π^0 -> $\gamma\gamma$ (gamma energy and momentum spread)
- Switch from virtual planes to the real size detector and check detection efficiency
- Check for different energy configurations.