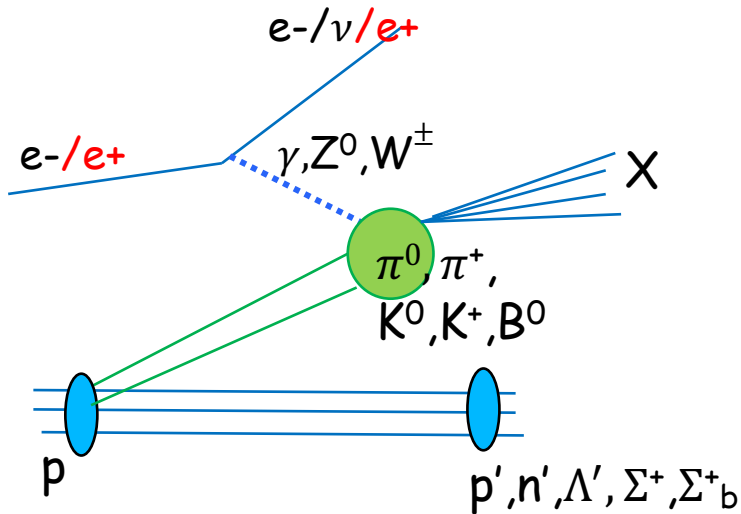# First look on Lambdas in FF region

Julia Furletova in collaboration with Meson Structure group.

Pion/Kaon structure functions and further progress towards flavor decomposition
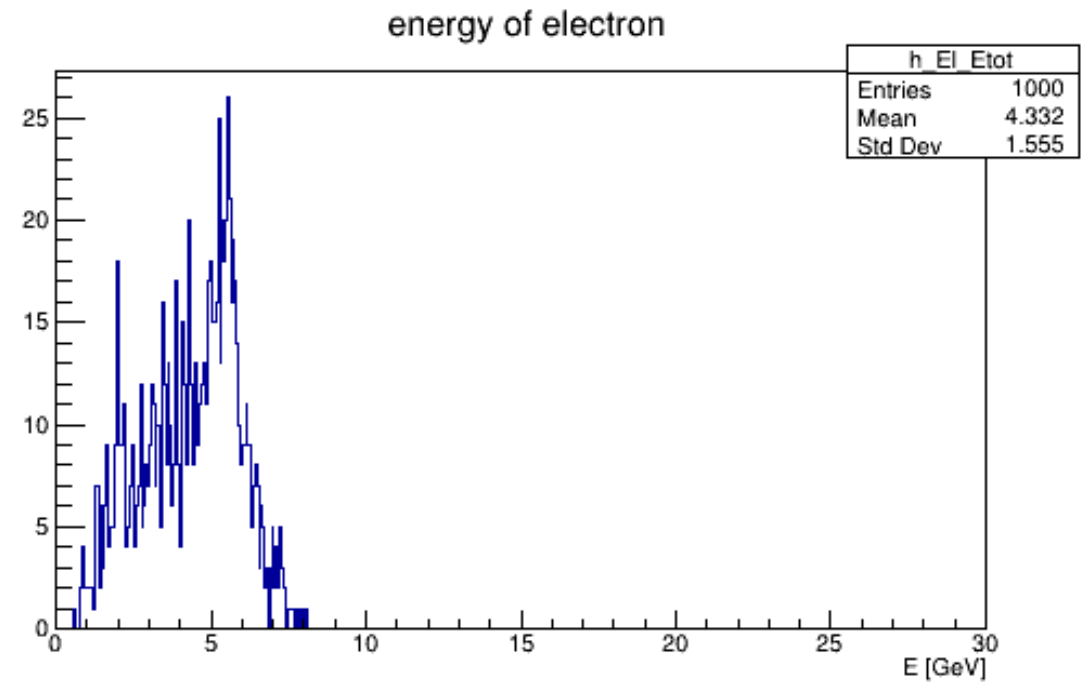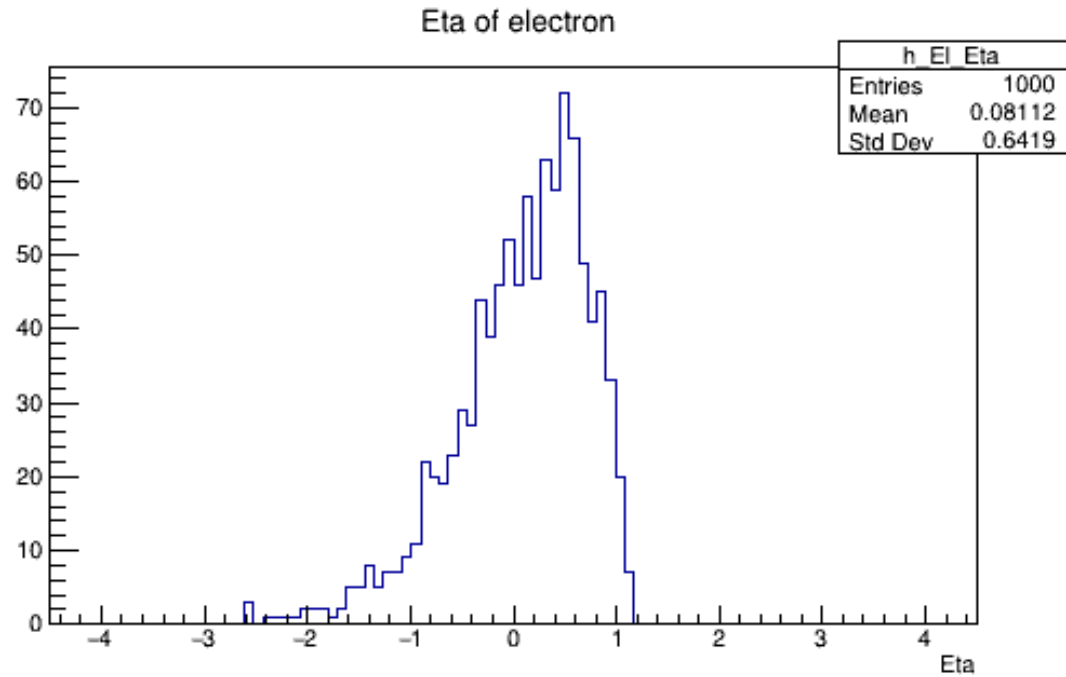

$$e\ p \rightarrow\ (K) \rightarrow\ e' + X + \Lambda$$
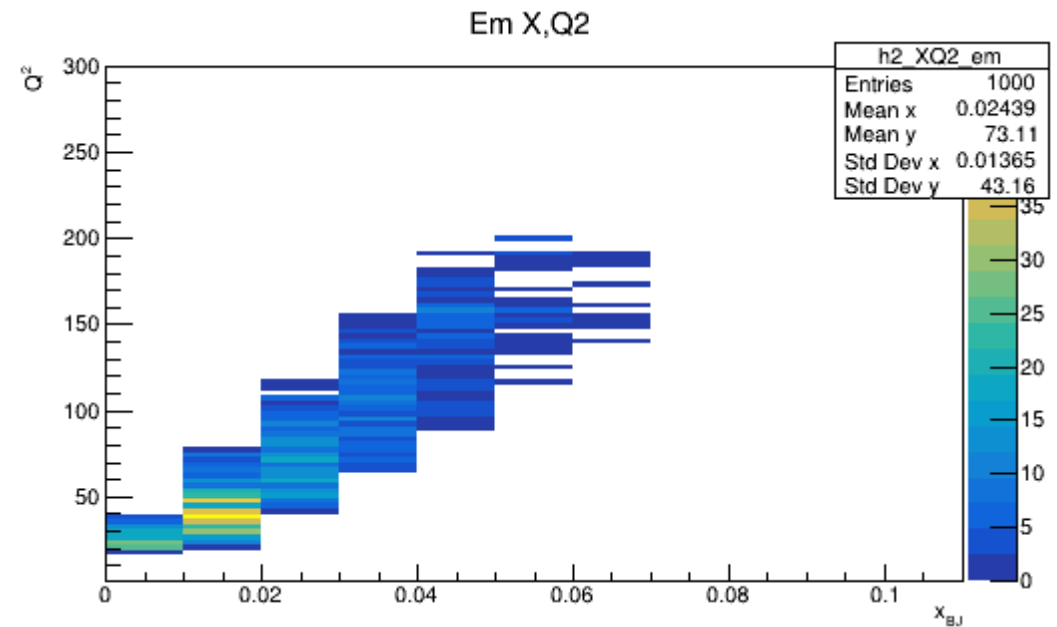
$$\Lambda \rightarrow p + \pi^{-}$$

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

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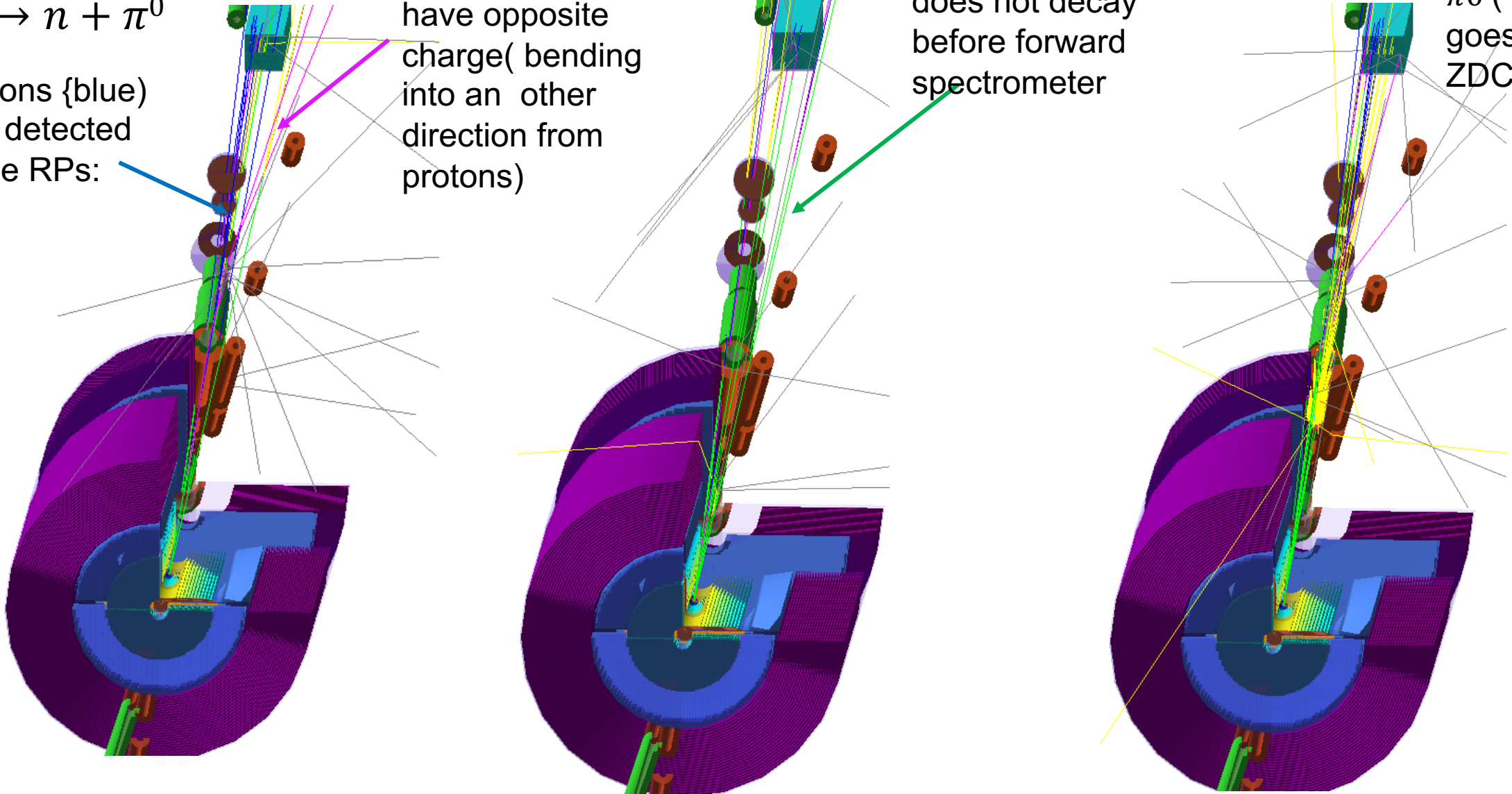
$$\Lambda \rightarrow p + \pi^-$$
$$\Lambda \rightarrow n + \pi^0$$

Protons {blue} are detected in the RPs:

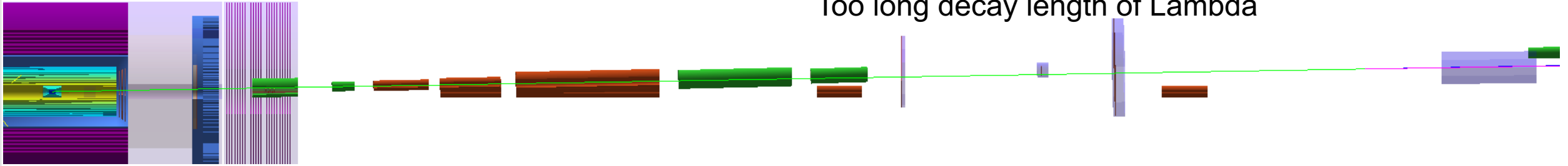π^- {magenta) have opposite charge(bending into an other direction from protons)

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

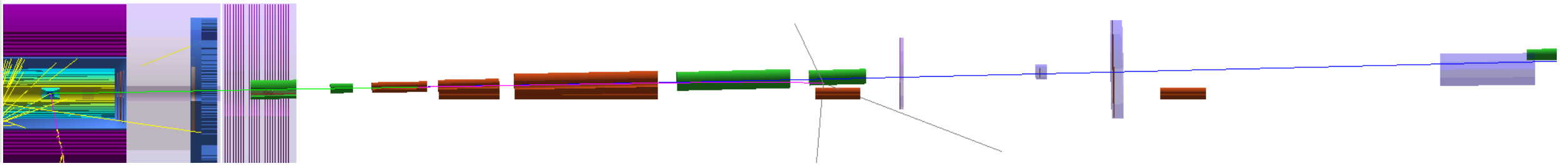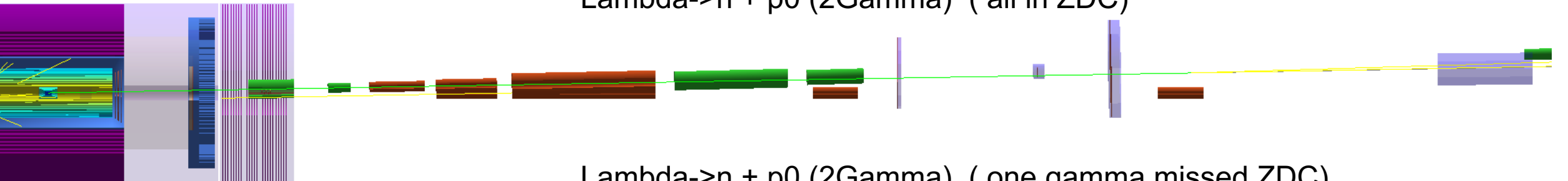Neutrons {gray) and fraction of $\pi0$ (yellow) goes into ZDC
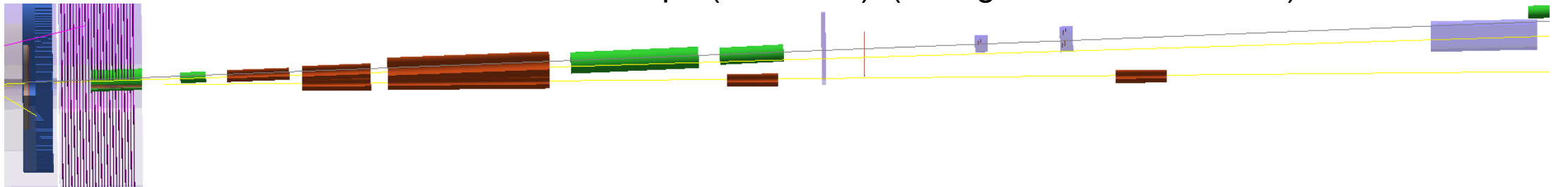
18x275

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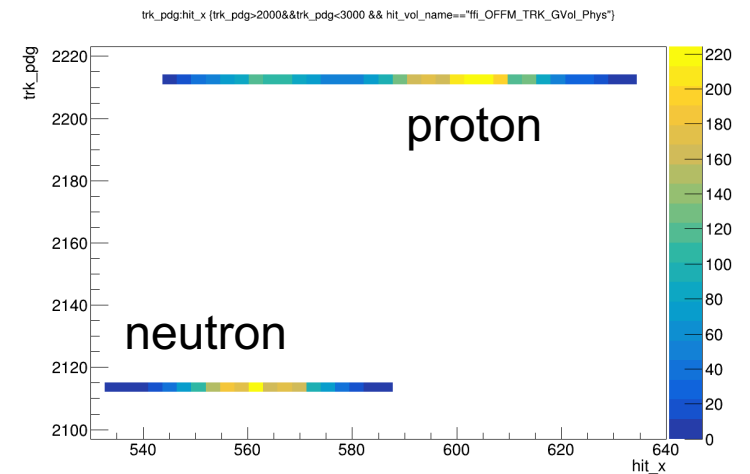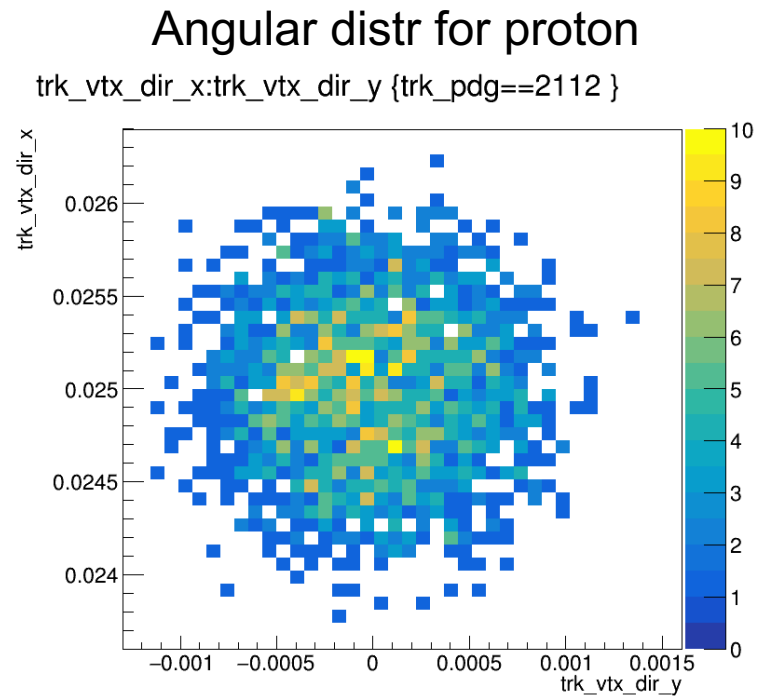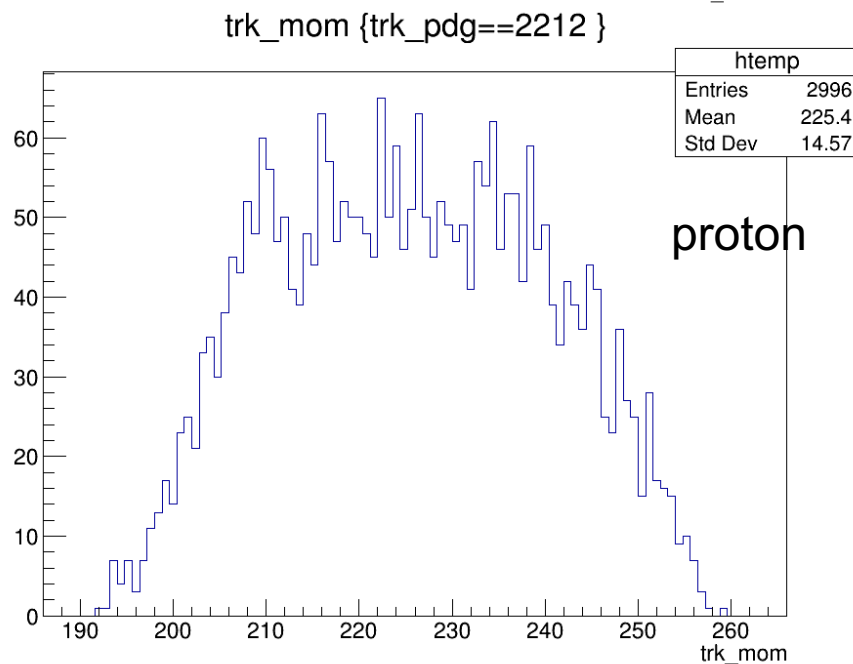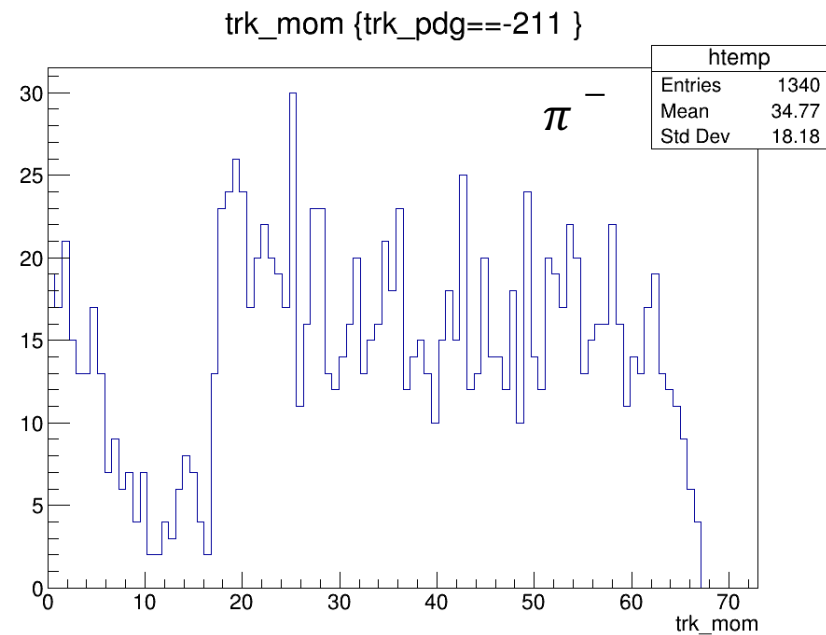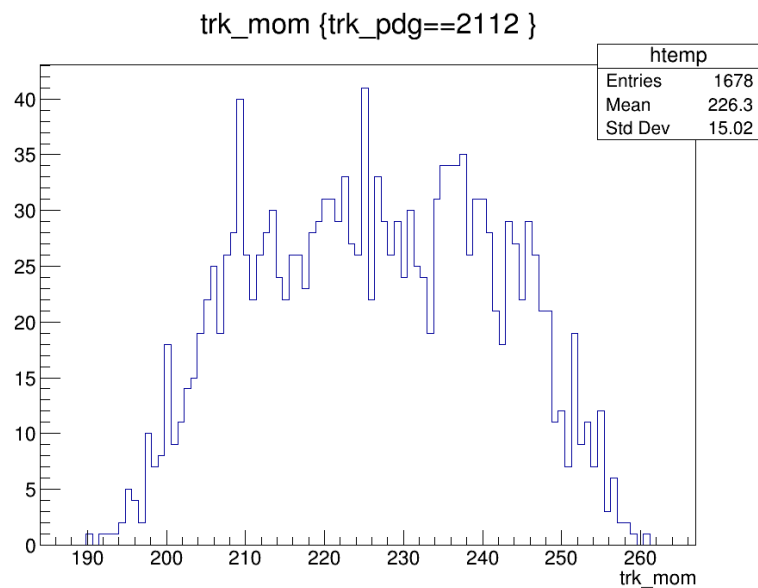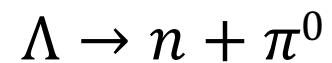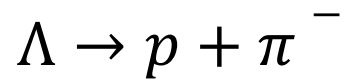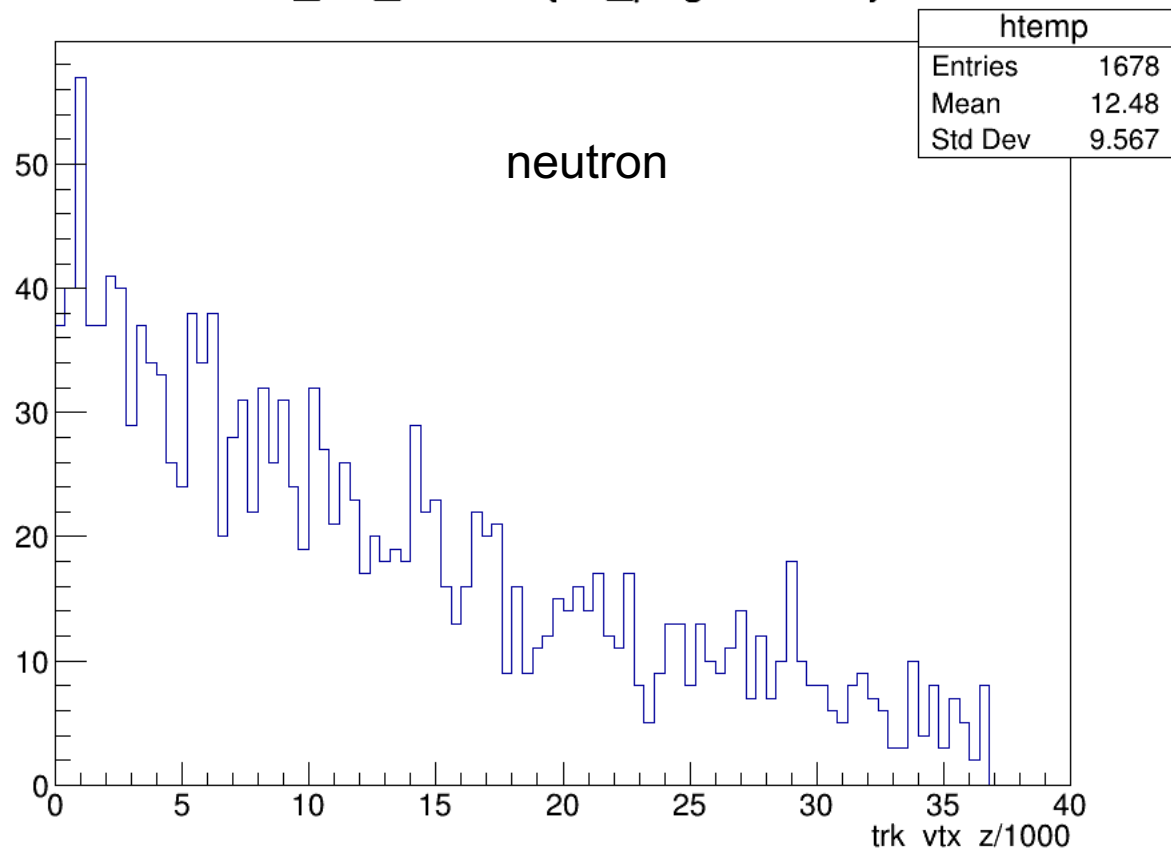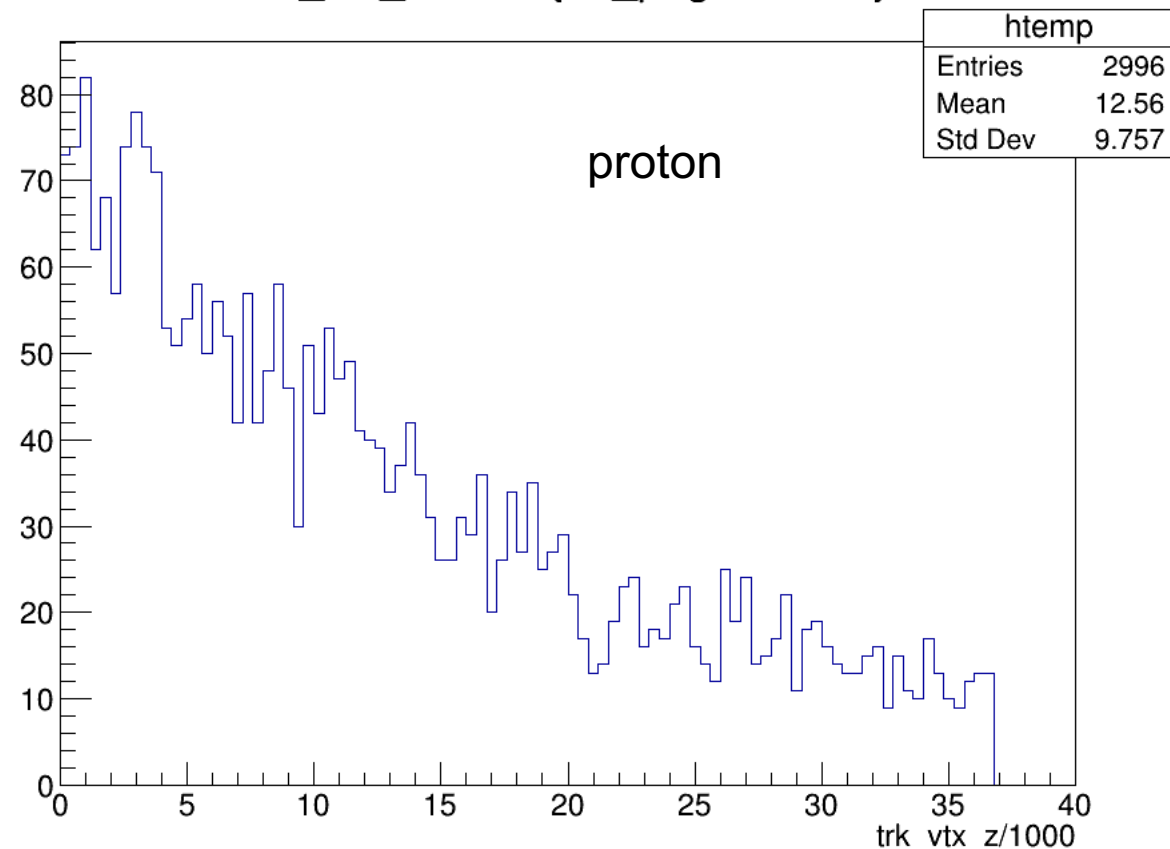
Decay Length (p/n vertex) (18x275)

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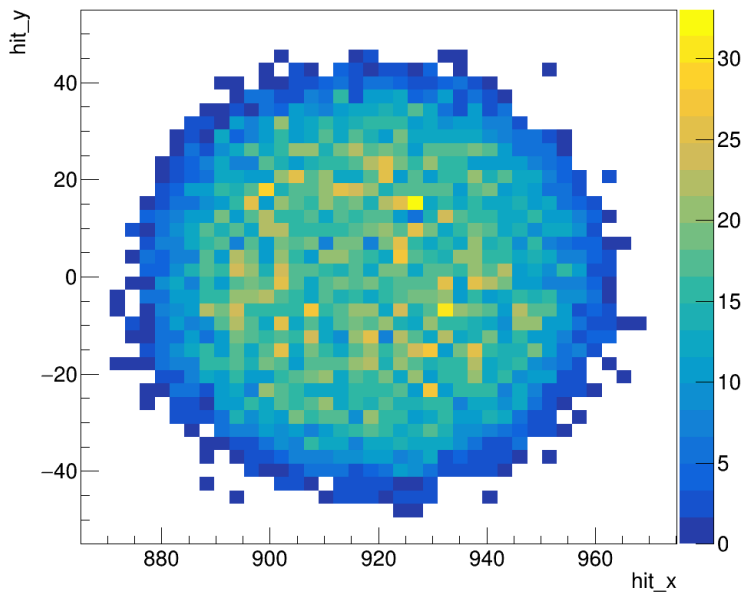

10k events total => 3580 neutrons => ~ 47%
Need to add pi0 efficiency
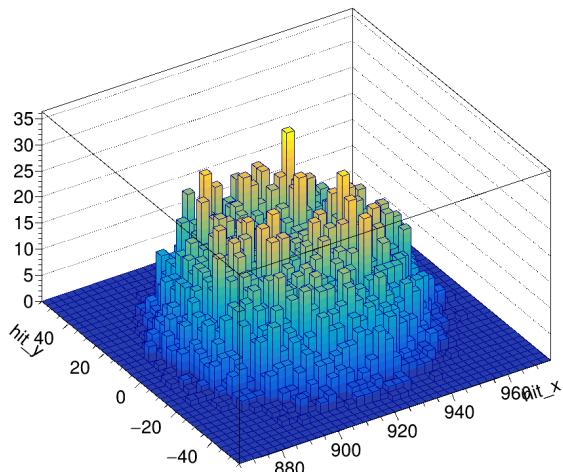
10k events total => 6390 protons => ~ 47%
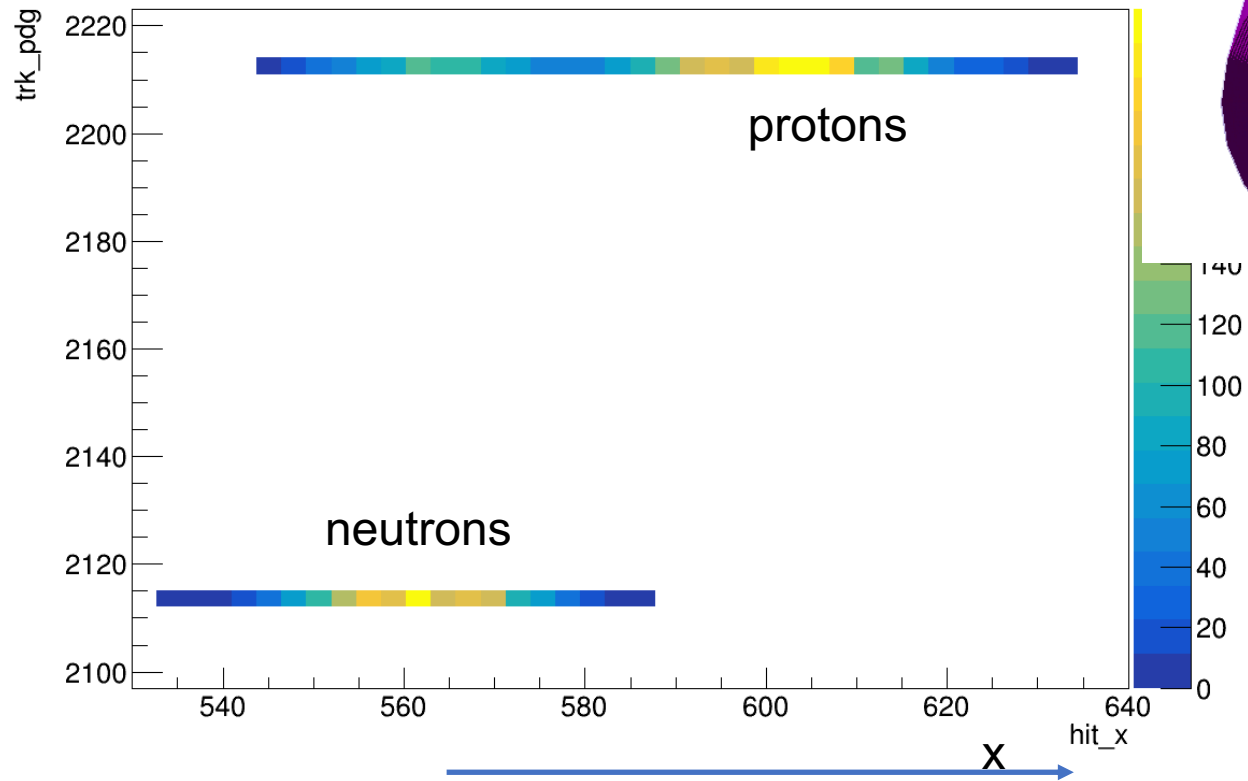Need to add pi- efficiency

Occupancy in different sub-detectors

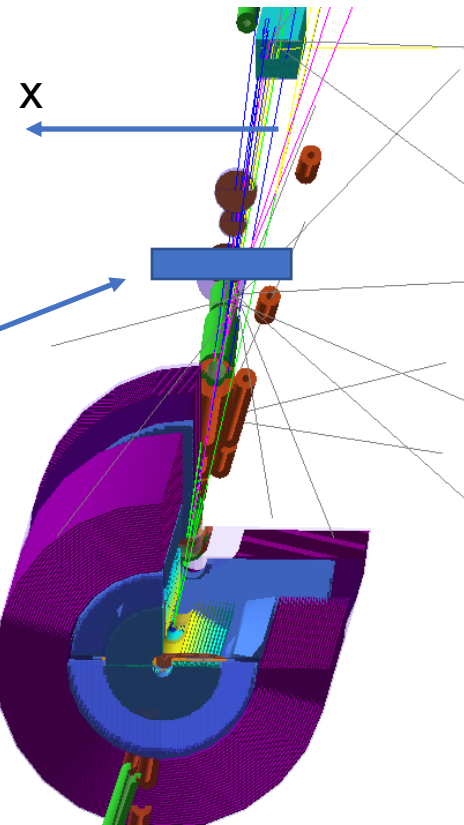hit_y:hit_x {trk_pdg>000&&trk_pdg<3000 && hit_vol_name=="ffi_ZDC_GVol_Phys"}

Virtual plane after B1

trk_pdg:hit_x {trk_pdg>2000&&trk_pdg<3000 && hit_vol_name=="ffi_OFFM_TRK_GVol_Phys"}

protons

neutrons

hit_y:hit_x {trk_pdg>000&&trk_pdg<3000 && hit_vol_name=="ffi_ZDC_GVol_Phys"}

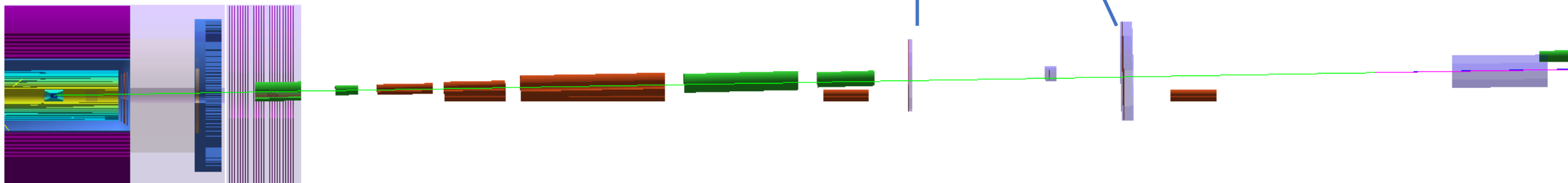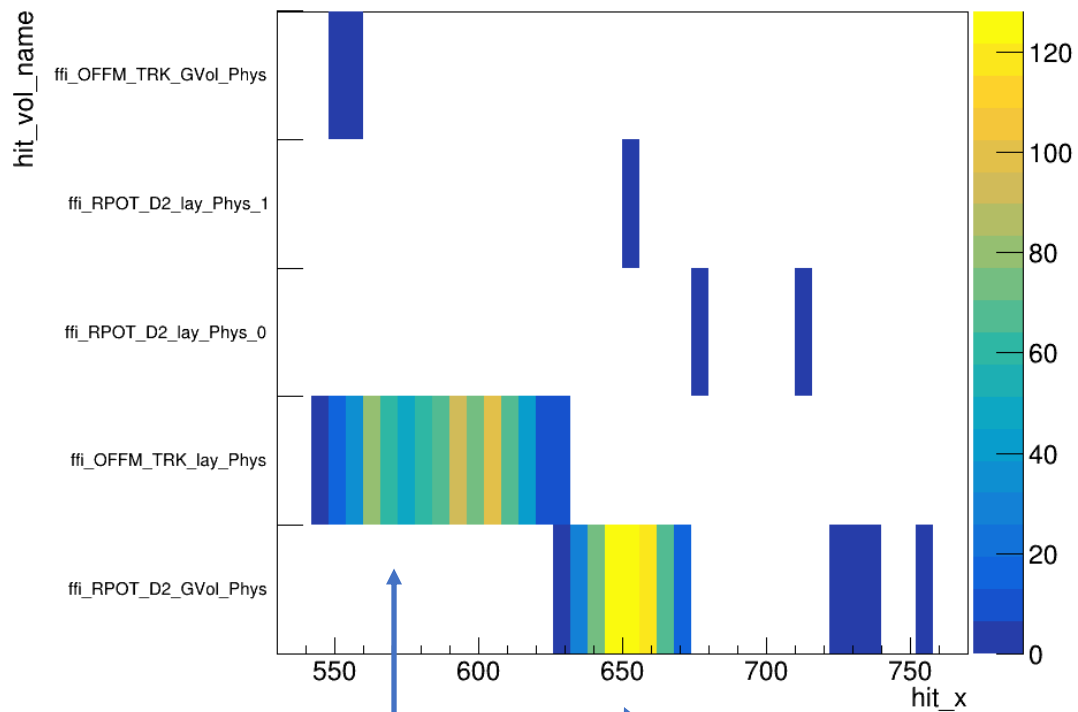# At the virtual planes
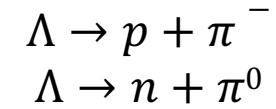
hit_y:hit_x:hit_z {trk_pdg==-211 }
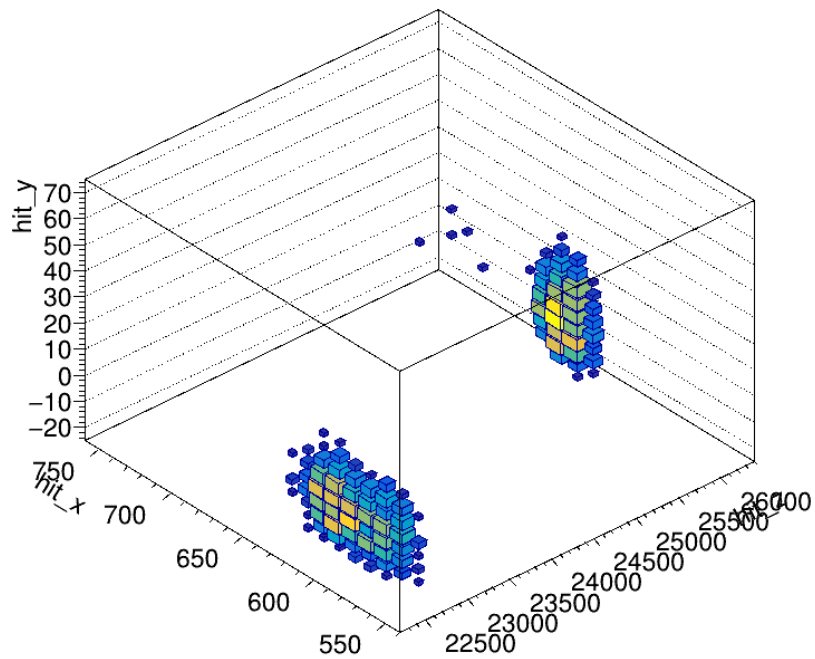
hit_vol_name:hit_x {trk_pdg==-211 }

Conclusions and plans

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

- Very challenging!

- For $\Lambda \rightarrow p + \pi^-$ protons could be detected efficiently, but we need trackers in opposite direction (charge) => on the path to ZDC

- $\Lambda \rightarrow n + \pi^0$ neutrons could be detected efficiently, but need to check $\pi^0 \rightarrow \gamma\gamma$ (gamma energy and momentum spread)

- Switch from virtual planes to the real size detector and check detection efficiency

- Check for different energy configurations.