

Drift Chamber dE/dx simulation

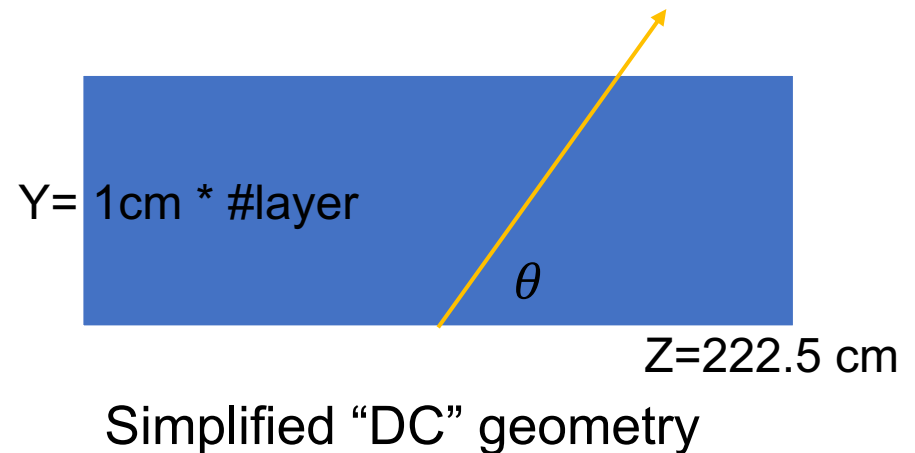
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Introduction

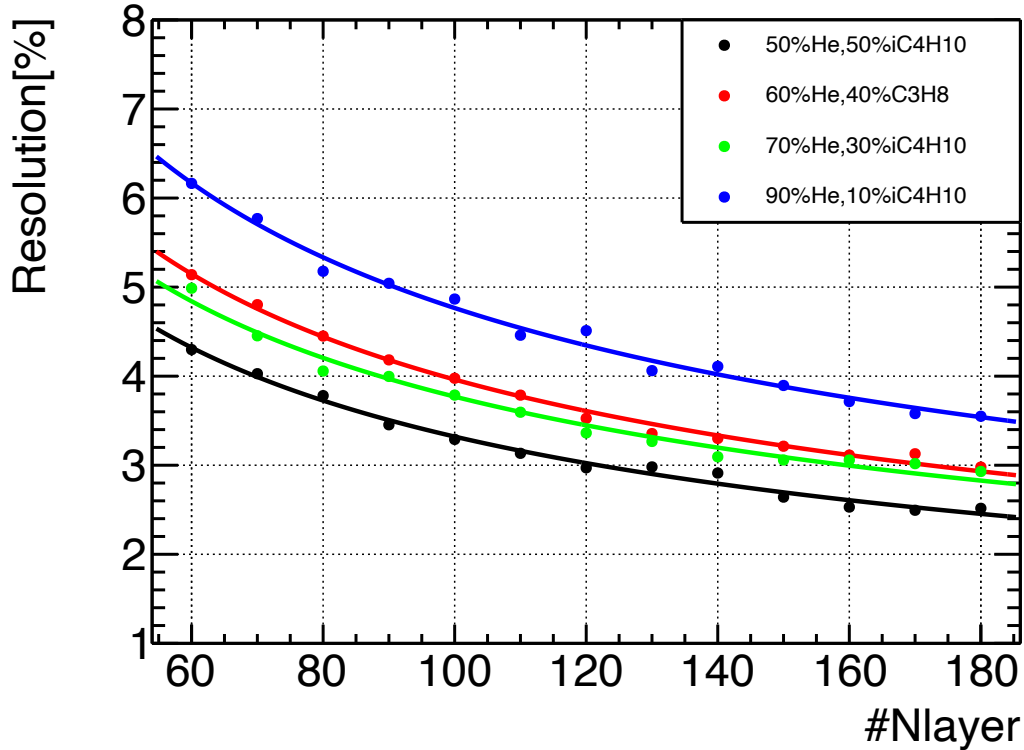
- ❖ CEPC drift chamber aims to provide excellent dE/dx performance
- ❖ Study the dE/dx resolution w.r.t gas component, number of layer using Garfield++
- ❖ Quick scan at primary ionization level.

- ◇ Gas mixture
 - ◇ 50%He,iC4H10
 - ◇ 70%He,iC4H10
 - ◇ 90%He,iC4H10
 - ◇ 60%He,C3H8(BES3 setting)
- ◇ Cell size is fixed to be 1cm



Resolution vs #Layer 20GeV pion

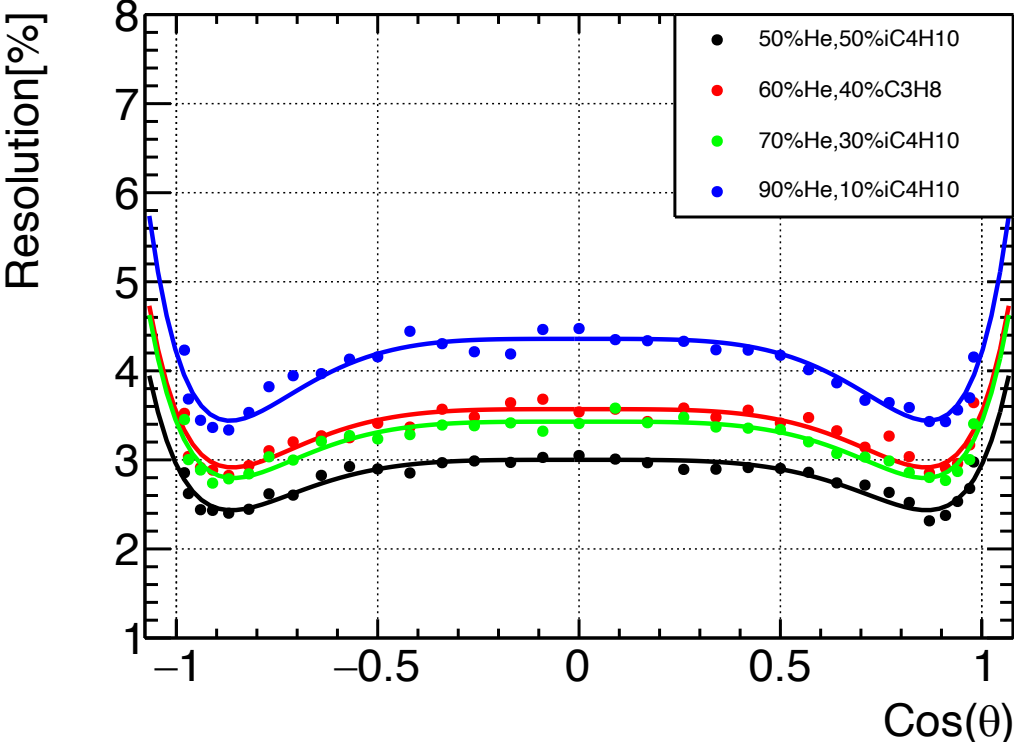
◇ To analyze energy loss distribution, 75% truncated mean is applied.



◇ $\sigma_1 \propto N^{-0.51}$
◇ $\sigma_2 \propto N^{-0.51}$
◇ $\sigma_3 \propto N^{-0.49}$
◇ $\sigma_4 \propto N^{-0.50}$

◇ $\sigma_{90\%} > \sigma_{60\%} > \sigma_{70\%} > \sigma_{50\%}$

20GeV pion

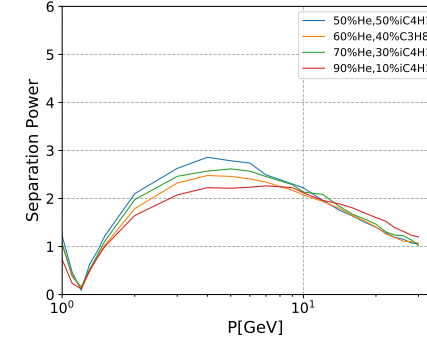
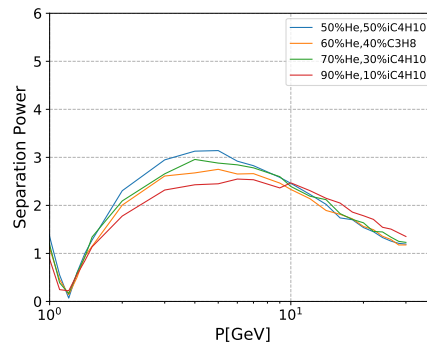
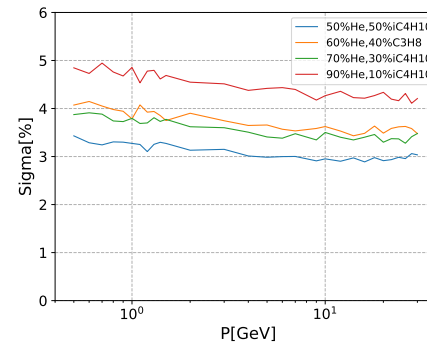
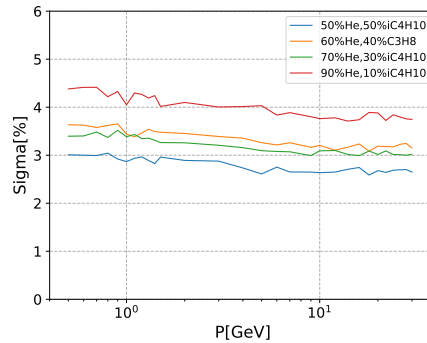


- ◇ $\sigma_1 = 3.00 - 1.69\cos^4 \theta + 1.64 \cos^{10} \theta$
- ◇ $\sigma_2 = 3.56 - 1.98\cos^4 \theta + 1.94 \cos^{10} \theta$
- ◇ $\sigma_3 = 3.42 - 1.94\cos^4 \theta + 1.93 \cos^{10} \theta$
- ◇ $\sigma_4 = 3.00 - 2.71\cos^4 \theta + 2.55 \cos^{10} \theta$

◇ $\sigma_{90\%} > \sigma_{60\%} > \sigma_{70\%} > \sigma_{50\%}$

Pi/K separation

❖ Fixed theta = 90



Nlayer = 150

Nlayer = 120

❖ Smaller fraction of He gives better dE/dx sigma and pi/K separation.

Summary

- ❖ Parameterized dE/dx resolution versus number of layers and incident angle of track.
- ❖ 50%He,50iC4H10 has best performance in the simulation.

Thanks!