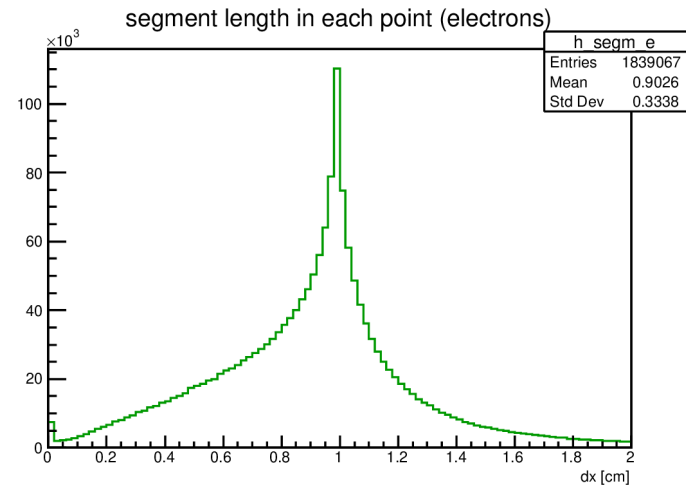
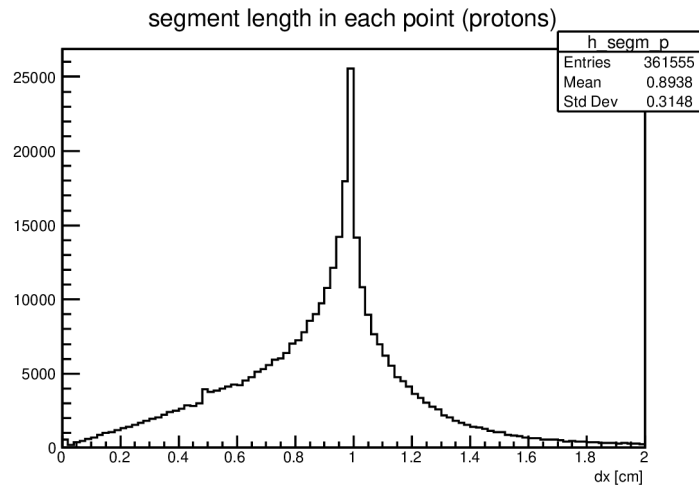
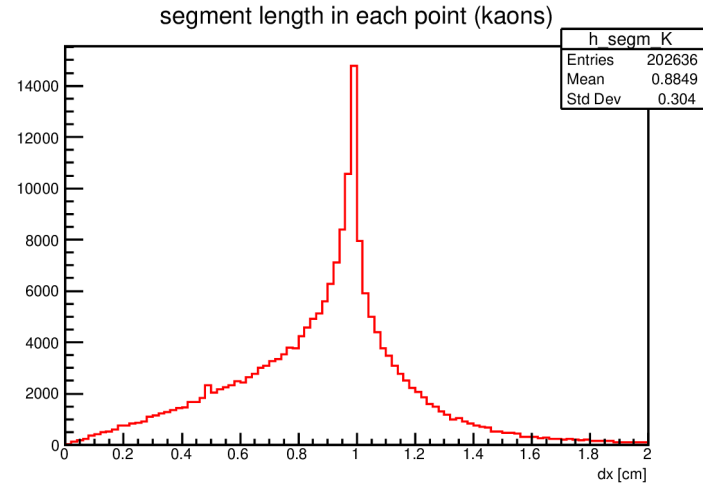
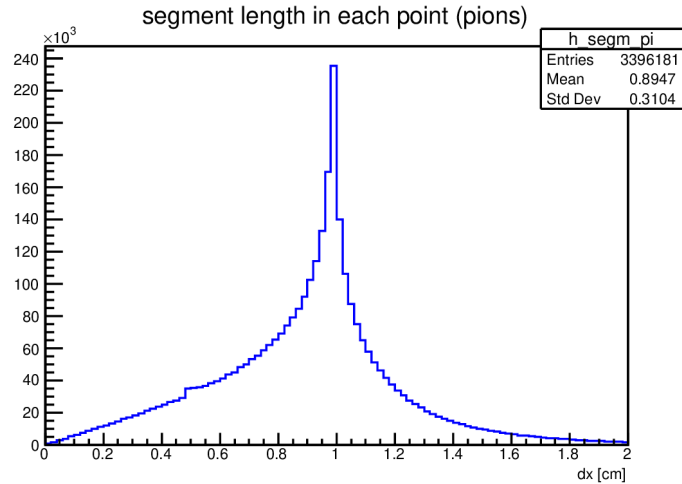


Studies of dE/dx in Straw Tracker of SPD

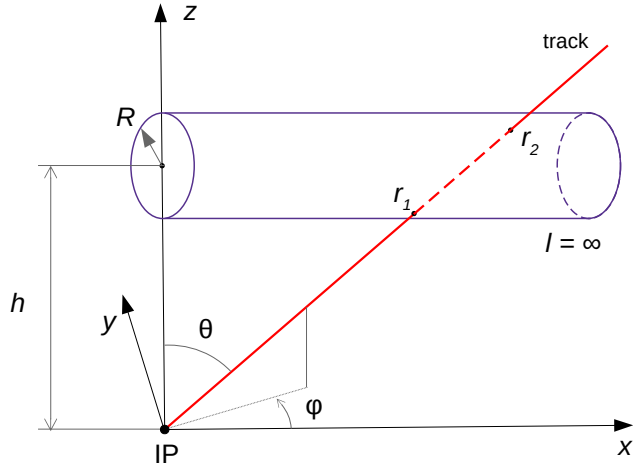
Ruslan Akhunzyanov
JINR

SPD S&C meeting, Sep 14, 2021

Distributions of segment lengths (dx)



Simple geometrical model



Line
(track):

$$\begin{aligned} x &= r \sin \theta \cos \phi \\ y &= r \sin \theta \sin \phi \\ z &= r \cos \theta \end{aligned}$$

Cylinder
(tube):

$$(z-h)^2 + y^2 = R^2$$

$$r_{2,1} = \frac{h \cos \theta \pm \sqrt{R^2 \cos^2 \theta - (h^2 - R^2) \sin^2 \theta \sin^2 \phi}}{\cos^2 \theta + \sin^2 \theta \sin^2 \phi}$$

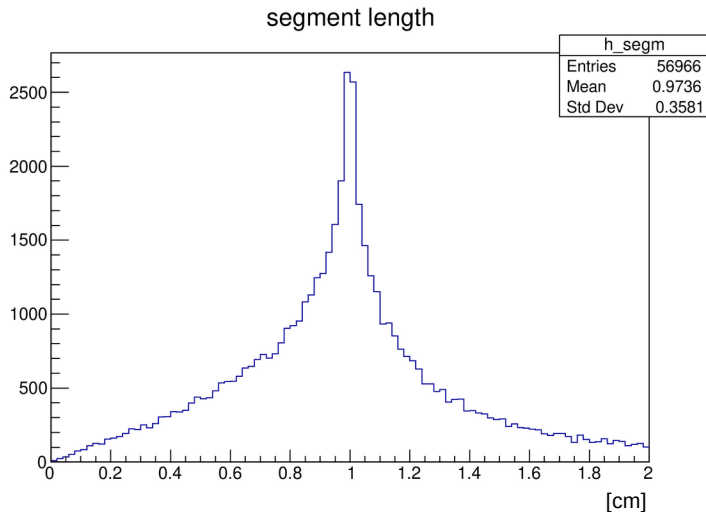
Segment length:

$$s = r_2 - r_1 = \frac{2\sqrt{R^2 \cos^2 \theta - (h^2 - R^2) \sin^2 \theta \sin^2 \phi}}{\cos^2 \theta + \sin^2 \theta \sin^2 \phi}$$

$$d\Omega = d\phi d(\cos \theta)$$

ϕ uniformly distributed in $[0; 2\pi]$

$\cos \theta$ uniformly distributed in $[0; 1]$

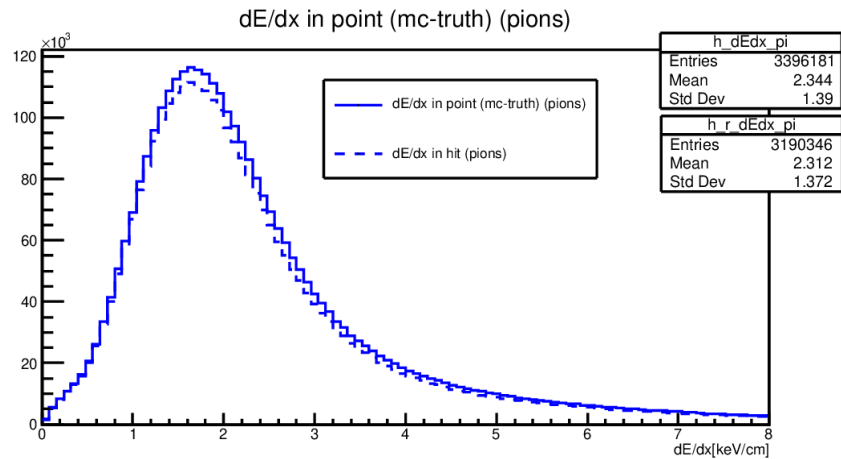
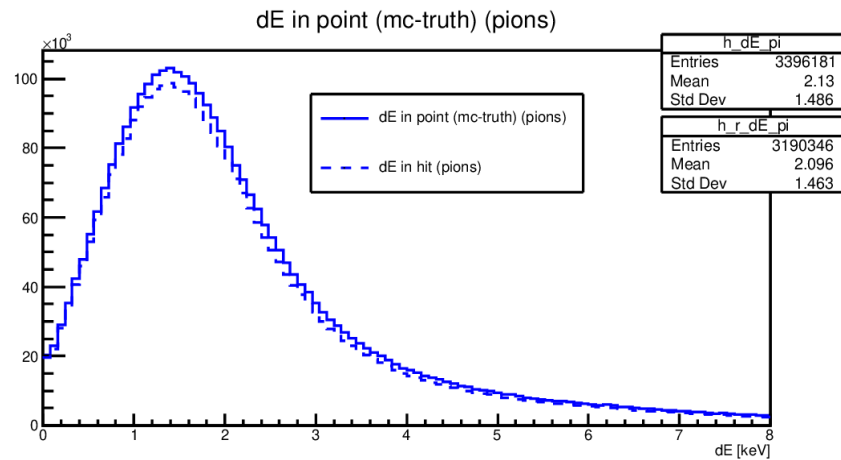
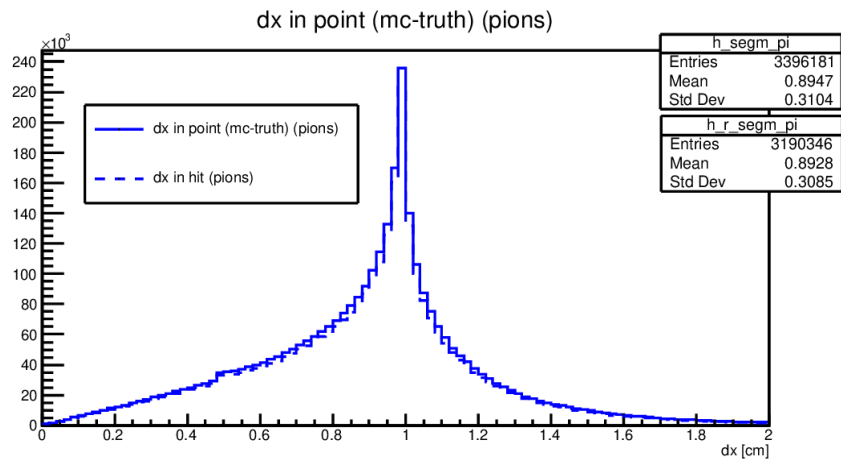


$(R=0.5 \text{ cm}; h=56 \text{ cm})$

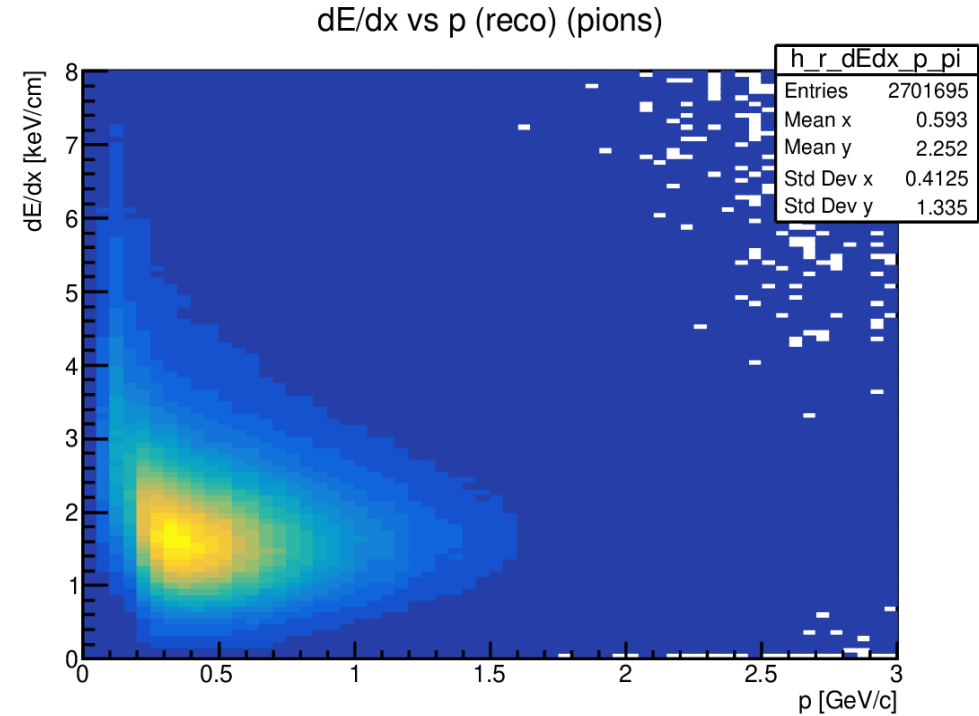
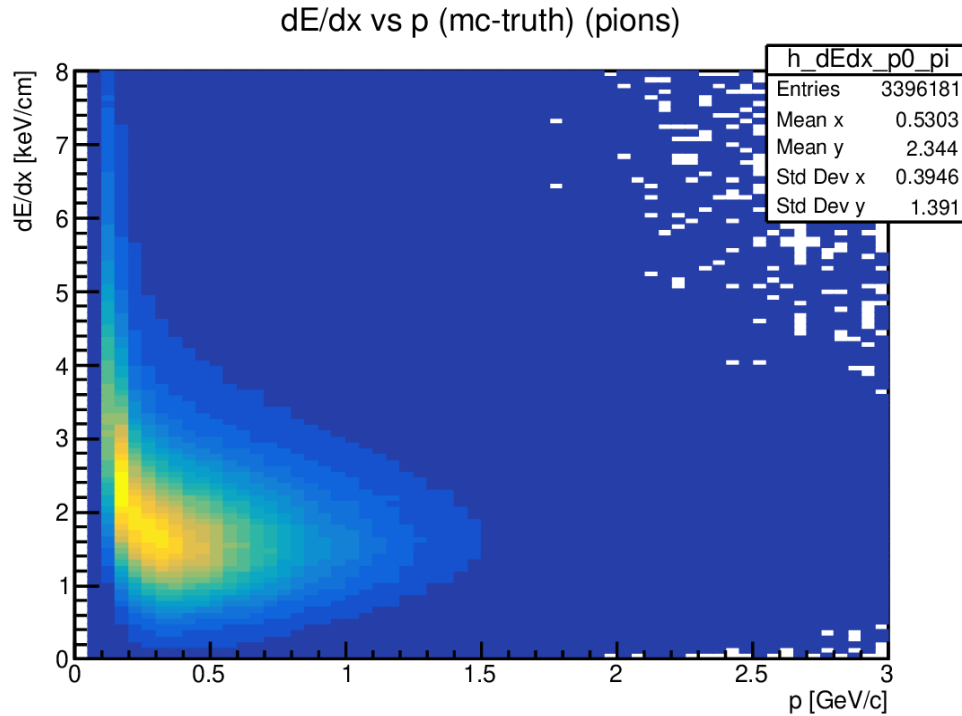
Analysis

	MC-truth		Reco
	SpdTstBPoint		SpdTrackMC SpdMCStrawHit1D (hit->GetModId()==2)
dE	point->GetEnergyLoss()	=	hit->GetResp()
dx	point->GetSegmentLength()	=	hit->GetSegLen()
p	mctruth_track->GetP()		track->GetFitPars() ->GetFinalState() ->GetMomentum()

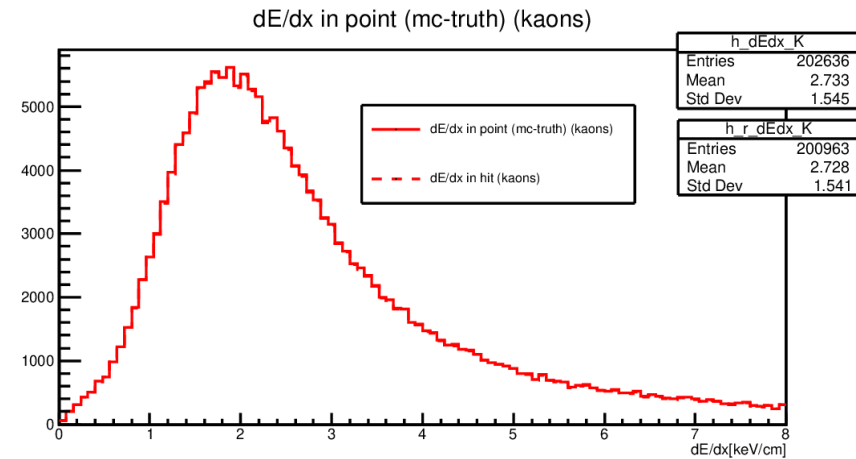
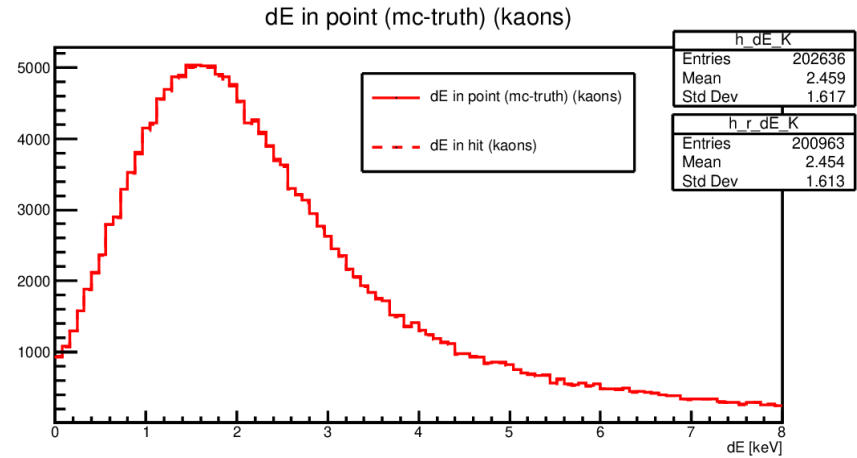
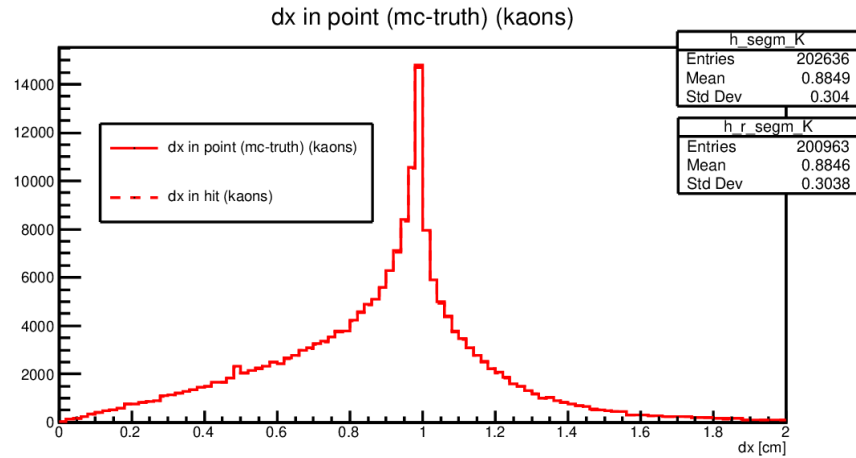
mc-truth vs. reco: pions



mc-truth vs. reco: pions

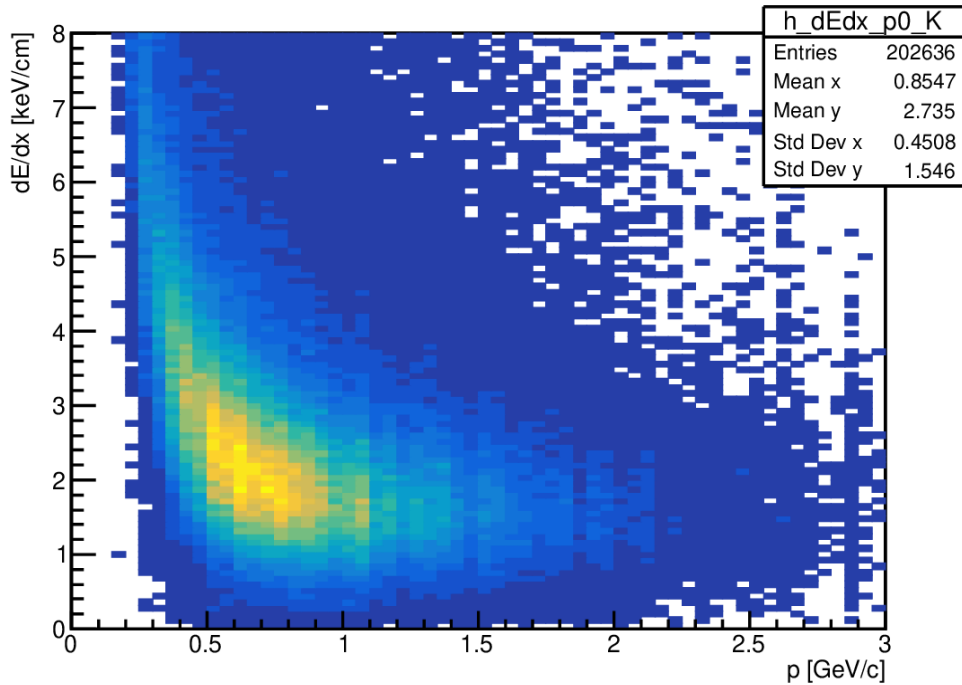


mc-truth vs. reco: kaons

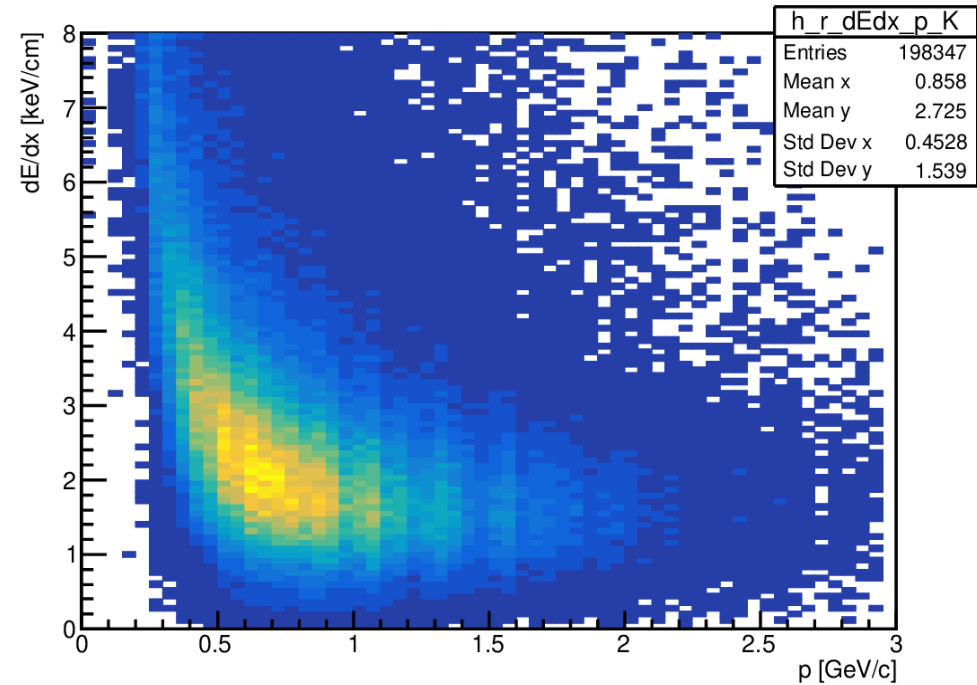


mc-truth vs. reco: kaons

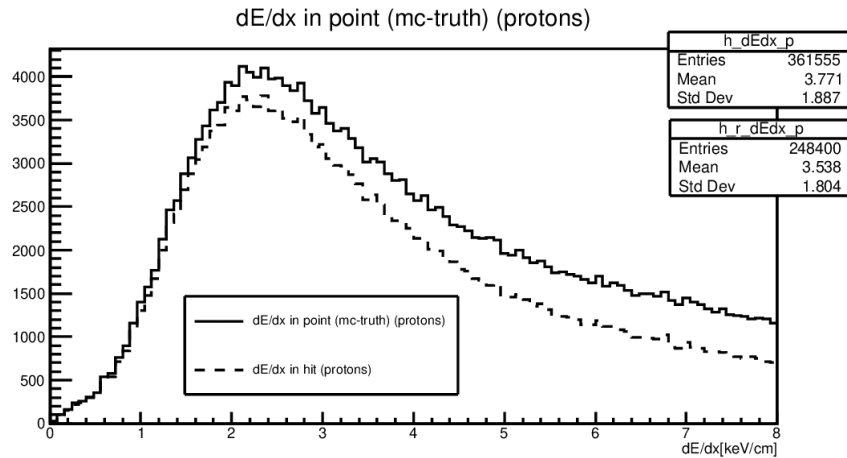
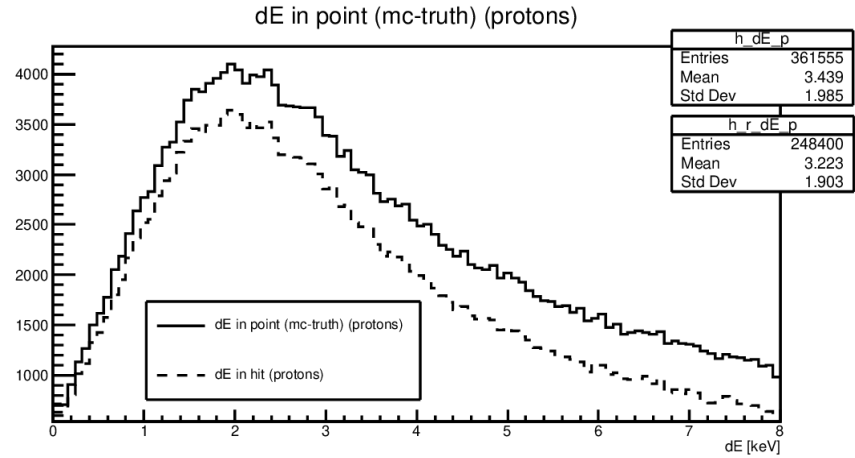
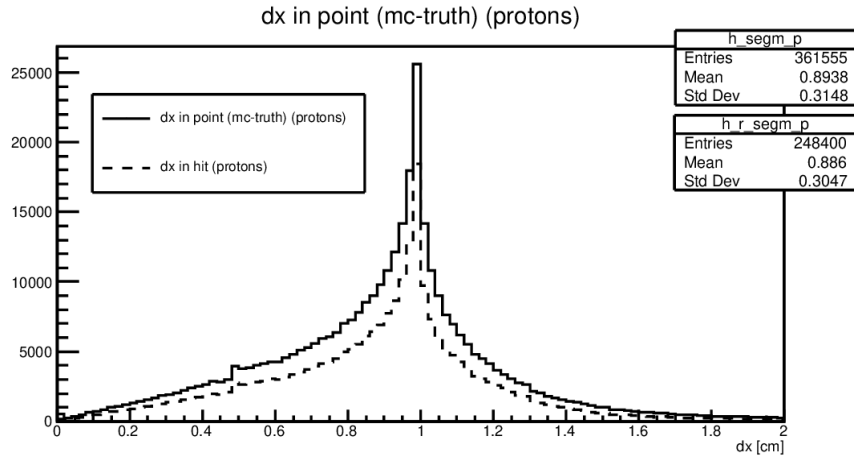
dE/dx vs p (mc-truth) (kaons)



dE/dx vs p (reco) (kaons)

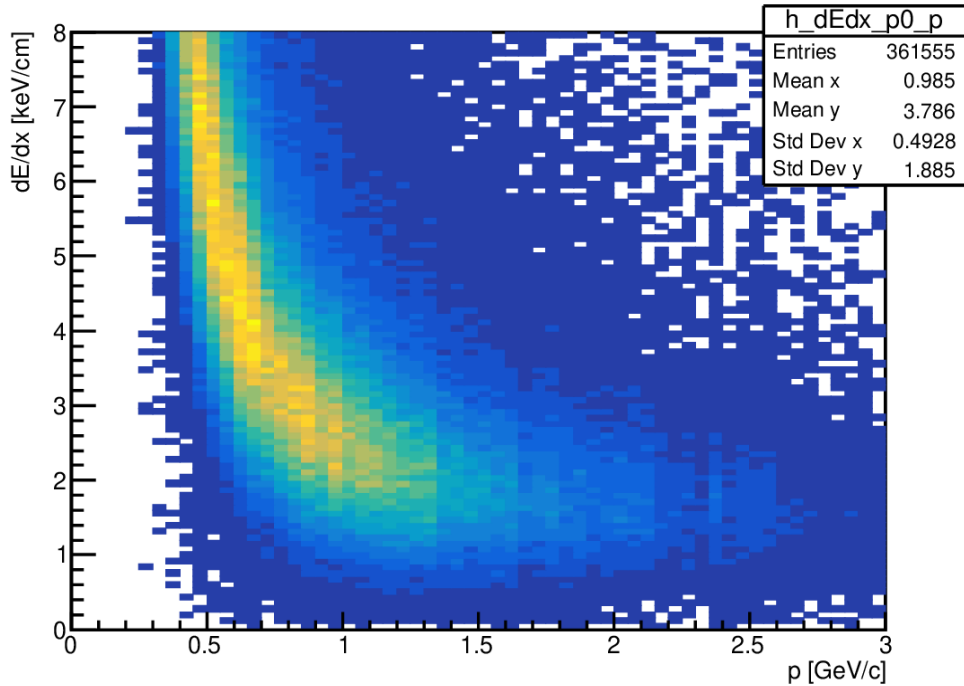


mc-truth vs. reco: protons

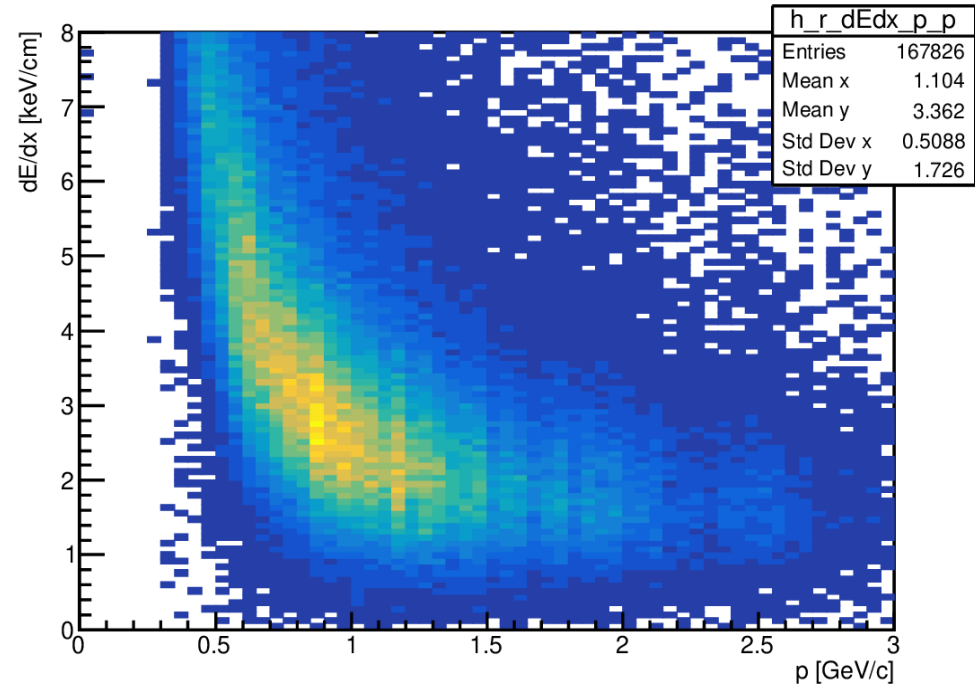


mc-truth vs. reco: protons

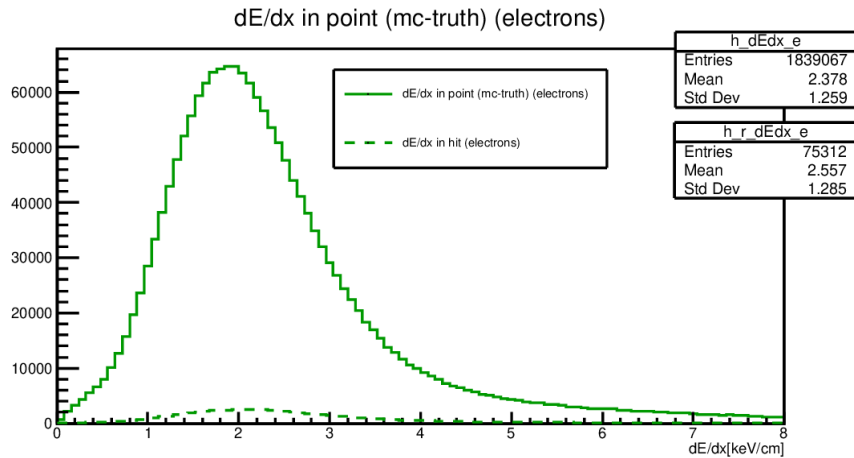
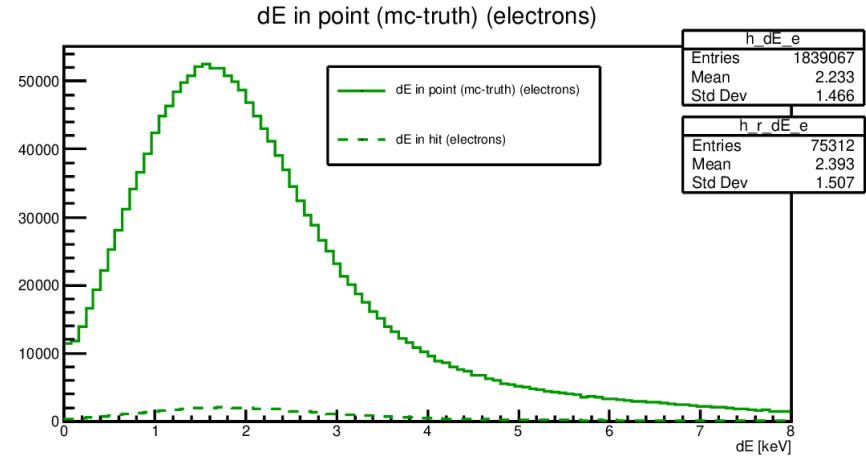
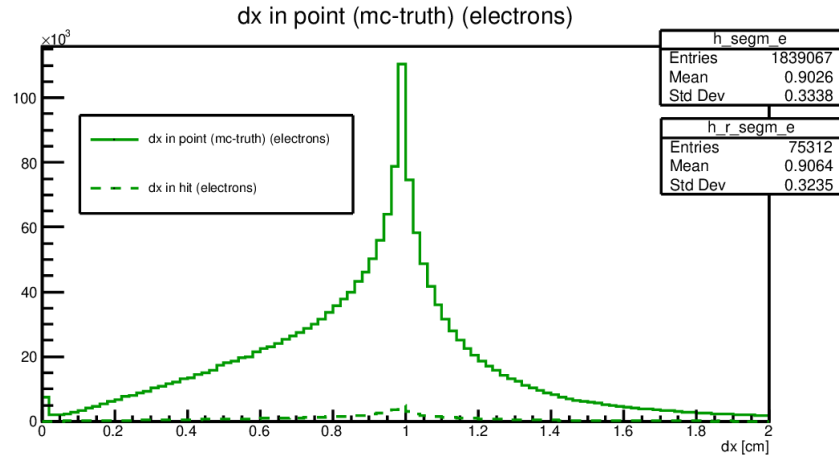
dE/dx vs p (mc-truth) (protons)



dE/dx vs p (reco) (protons)

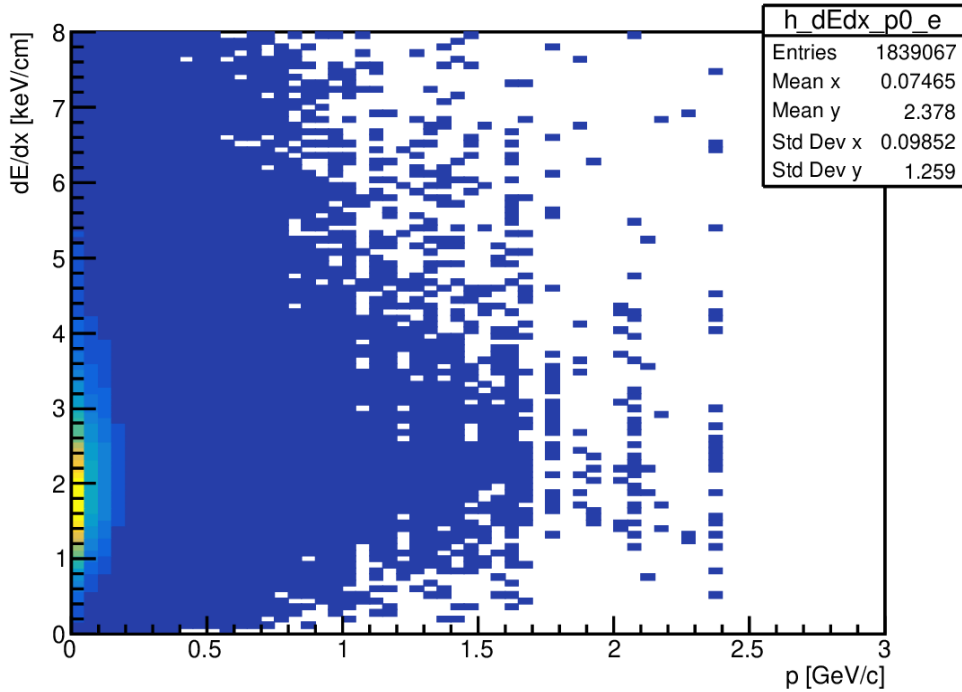


mc-truth vs. reco: electrons

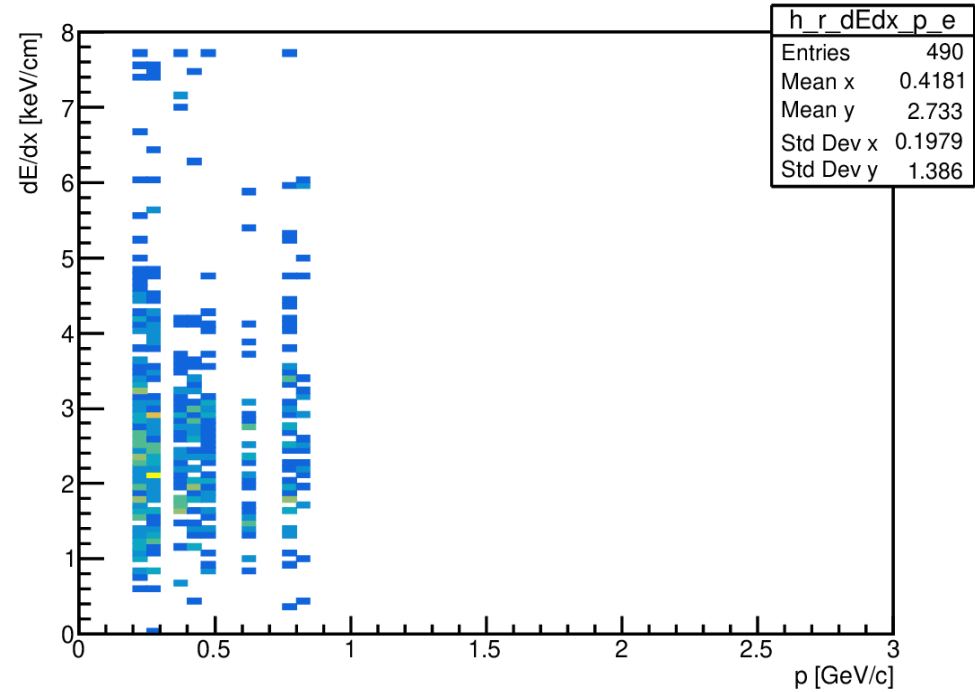


mc-truth vs. reco: electrons

dE/dx vs p (mc-truth) (electrons)



dE/dx vs p (reco) (electrons)

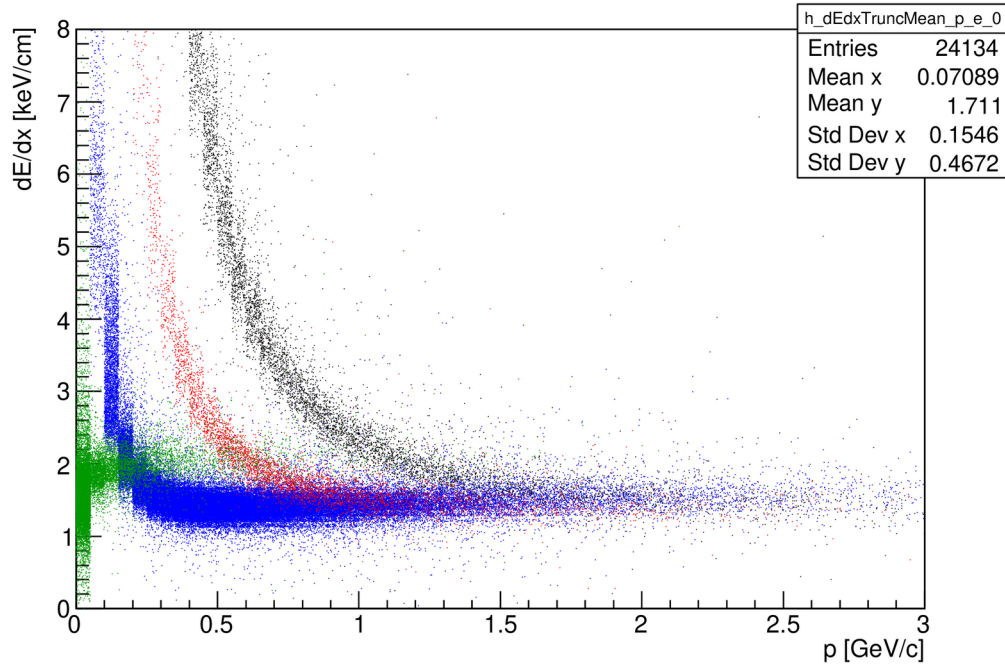


Summary

	fraction of hits associated with tracks	fraction of hits assoc. with tracks having momentum
pions	0,94	0,80
kaons	0,99	0,98
protons	0,69	0,46
electrons	0,04	~ 0

mc-truth vs. reco: dE/dx, truncated mean

dE/dx (trunc. mean 35%)



dE/dx (trunc. mean 35%) (reco)

