

Update on diffusion studies

Ajib Paudel

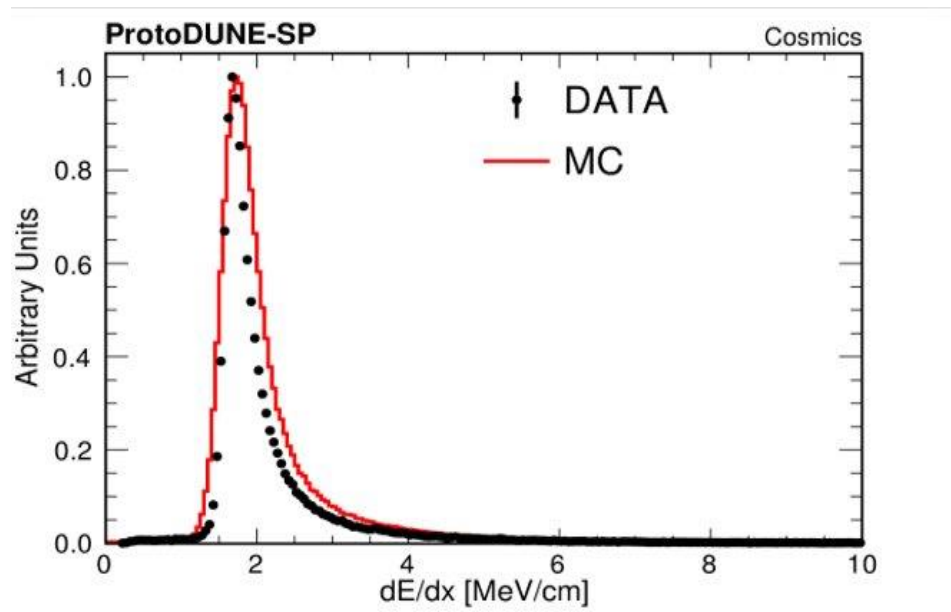
Recap:

<https://indico.fnal.gov/event/22125/contribution/2/material/slides/0.pdf>

We tried to estimate the diffusion constants fitting σ_t^2 vs drift distance(x) for different samples and data:

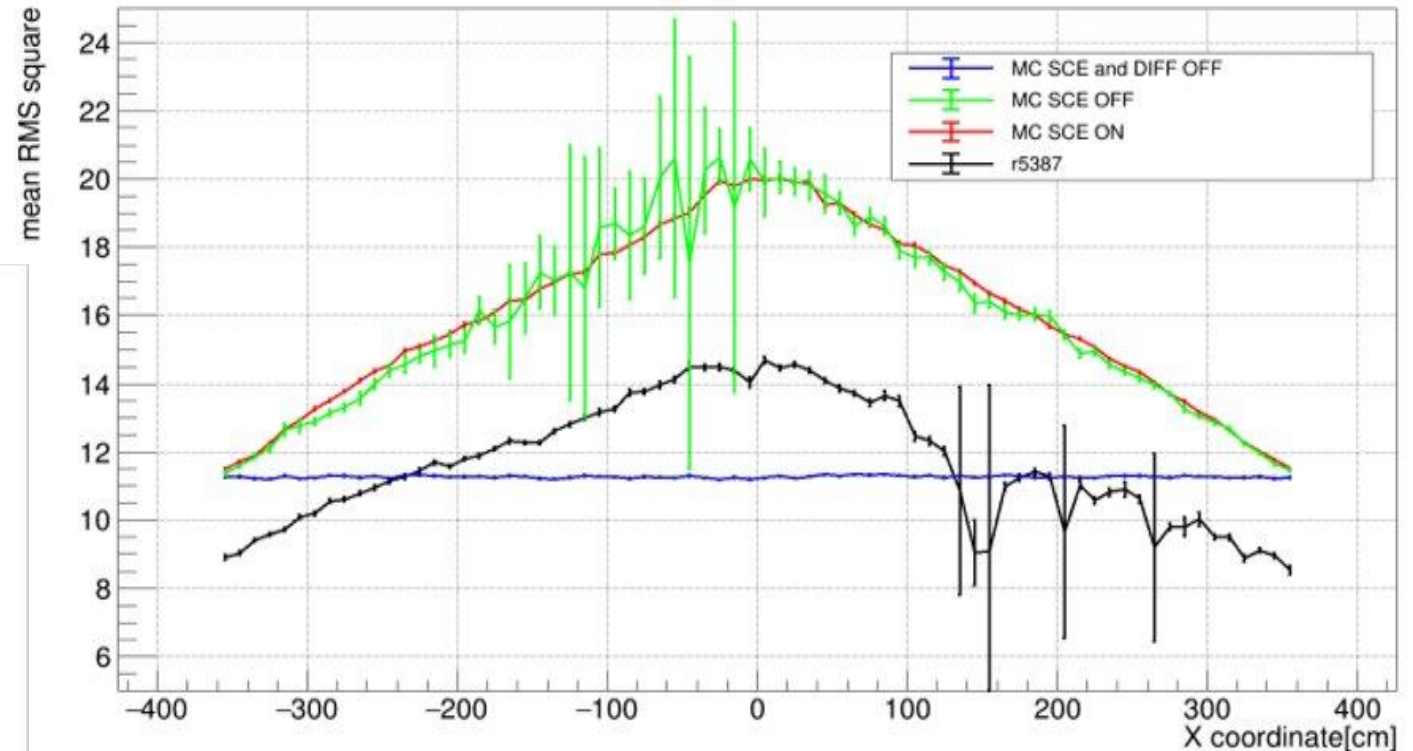
$$\sigma_t^2 = \left(\frac{2DL}{v_d^3} \right) x + \sigma_0^2$$

Labels in the diagram:
- Diffusion coefficient: D
- Drift distance: x
- Drift velocity: v_d
- Total time width of pulse: σ_t^2
- Inherent pulse width: σ_0^2



Width of dE/dx for data and MC doesn't agree

Gaus fit mean RMS square vs X coordinate



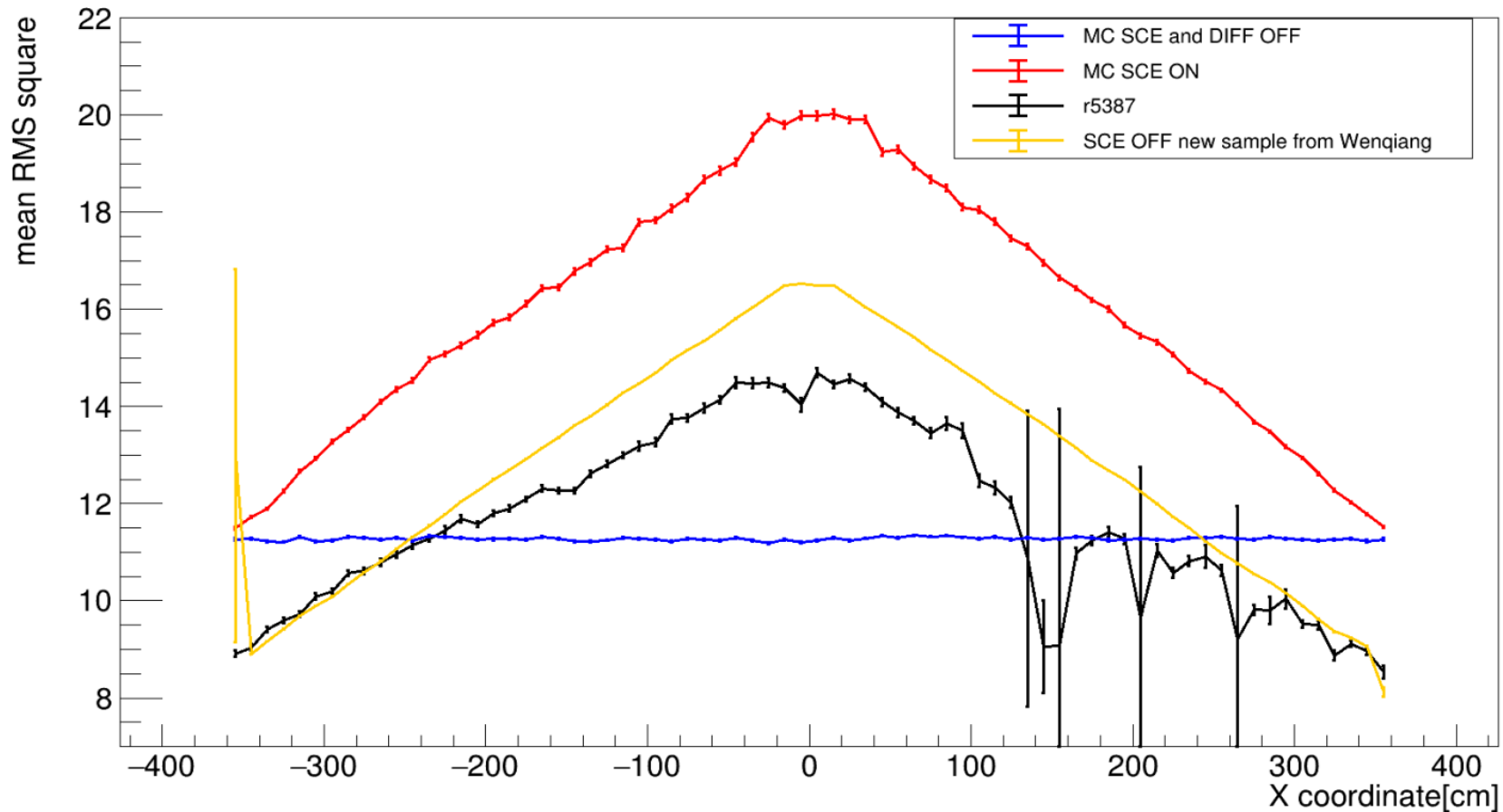
We found the inherent pulse width of data and Monte-Carlo doesn't agree.

Updates:

Wenqiang generated some new Monte-Carlo sample.

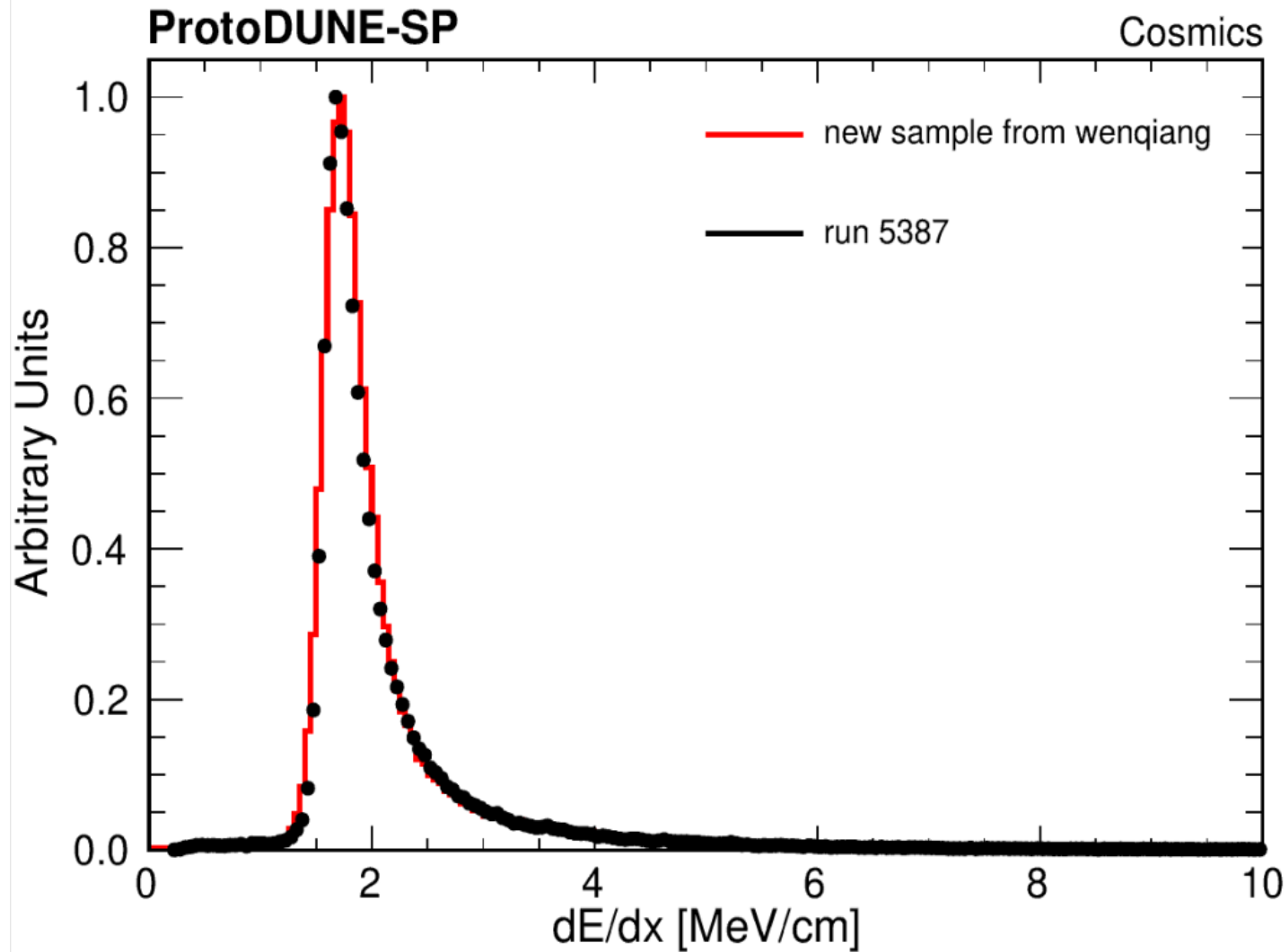
I made a similar sigma_t square vs X coordinate plot for the new sample,

Gaus fit mean RMS square vs X coordinate



We can see the inherent term in the plot for new sample agrees well with data.

I made dE/dx plot for the new MC sample:



The new MC sample dE/dx and data dE/dx width are in close agreement.