

dE/dx Studies

Yet another update

Ulrich Einhaus
LCTPC Meeting
26.04.2018 KEK

- Track::dEdxError should reflect the width of the dE/dx distribution
- Formula for dE/dx error was questioned
- Two independent quantities go in:
 - Track length
 - Number of hits / readout granularity
- Consistent with former observation from experiments, summary e. g. in Blum, Rolandi: Particle detection with drift chambers, 1993



dE/dx error formula

- Current formula:
$$\Delta \frac{dE}{dx} = \frac{dE}{dx} \cdot 4.7\% \cdot \left(\frac{L}{1\text{ m}}\right)^{-0.34} \cdot N_{trunc}^{-0.45}$$

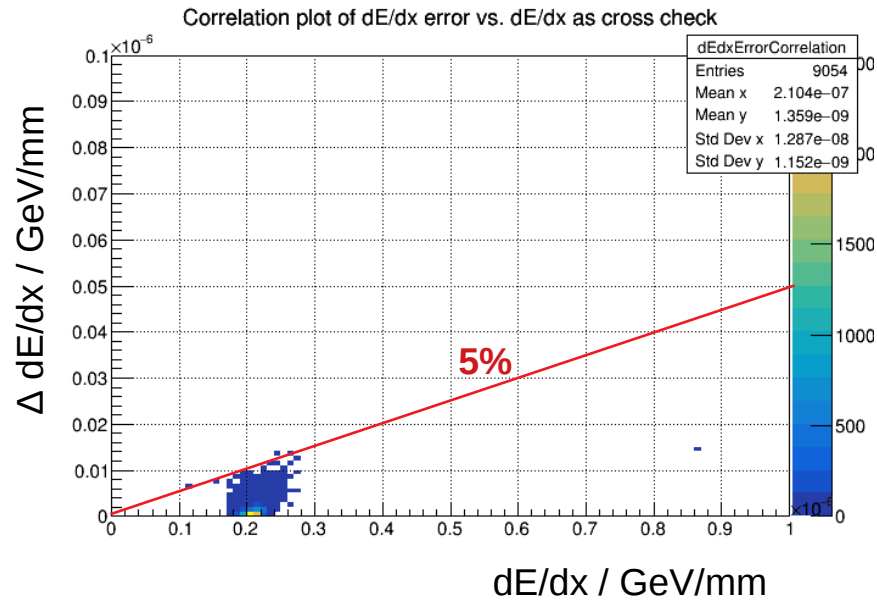
- Proposed formula:
$$\Delta \frac{dE}{dx} = \frac{dE}{dx} \cdot 4.7\% \cdot \left(\frac{L}{N_{Hit} \cdot 6\text{ mm}}\right)^{-0.34} \cdot \left(\frac{N_{Hit}}{220}\right)^{-0.45}$$

- Exponents should be checked!
Does the errors match our observed dE/dx distribution width?

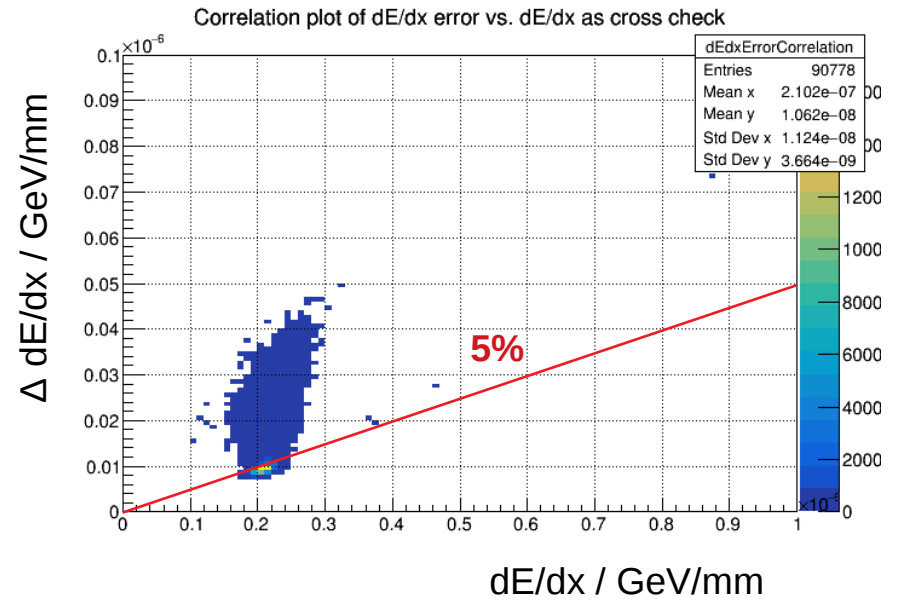


Overall scale

Current:



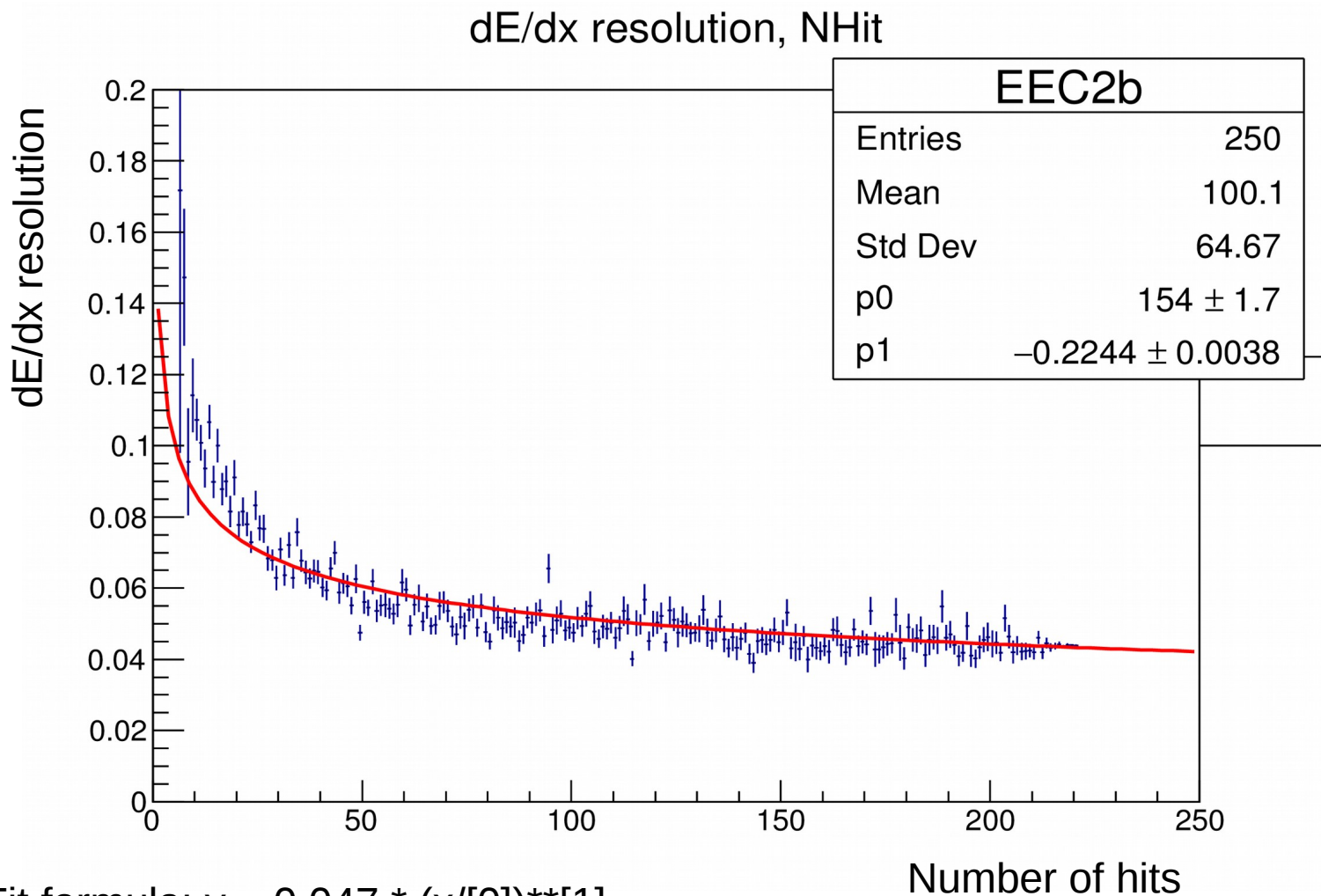
Proposed:



- Overall scale issue is separately corrected for later in the PID tools



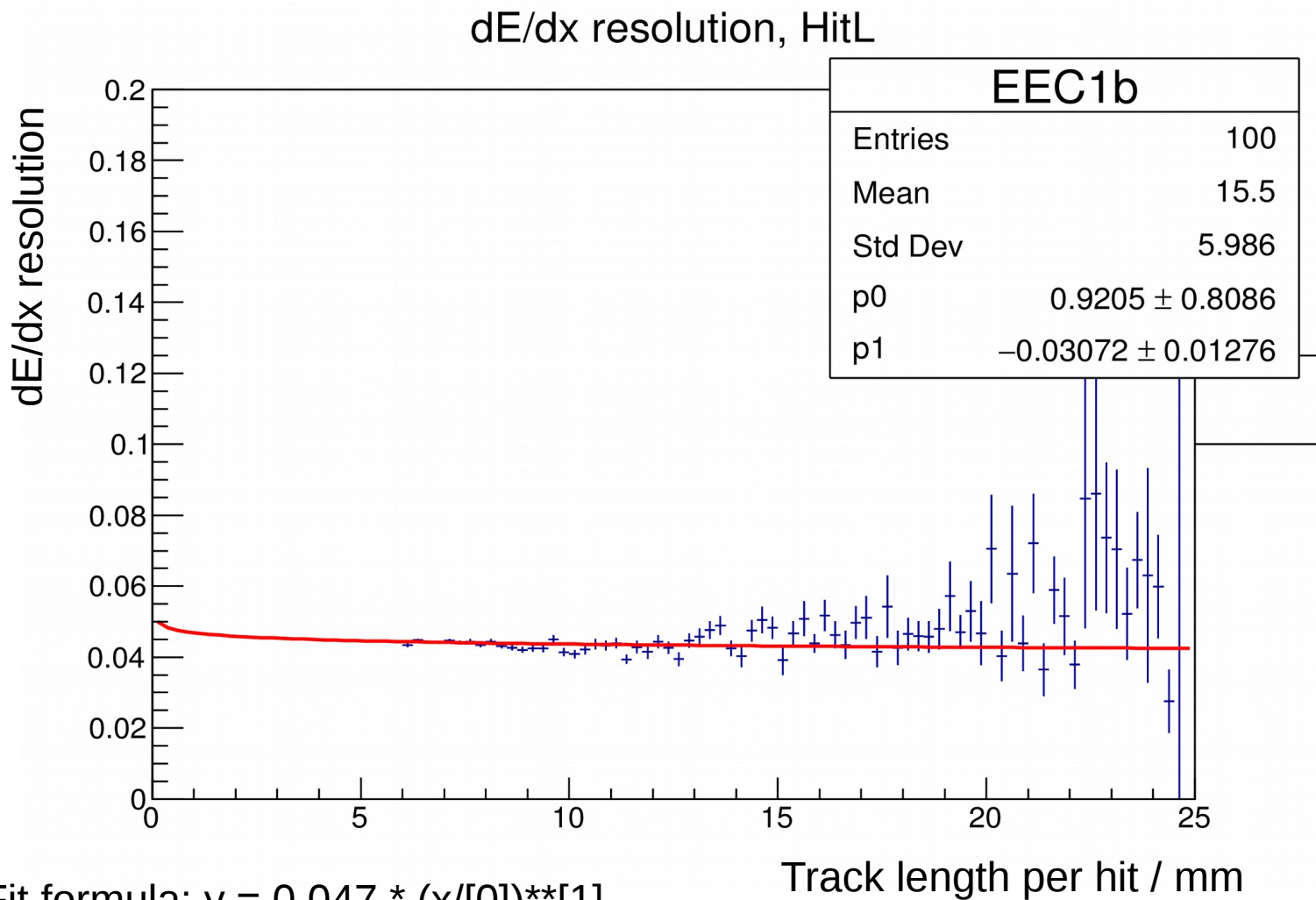
Dependence on number of hits



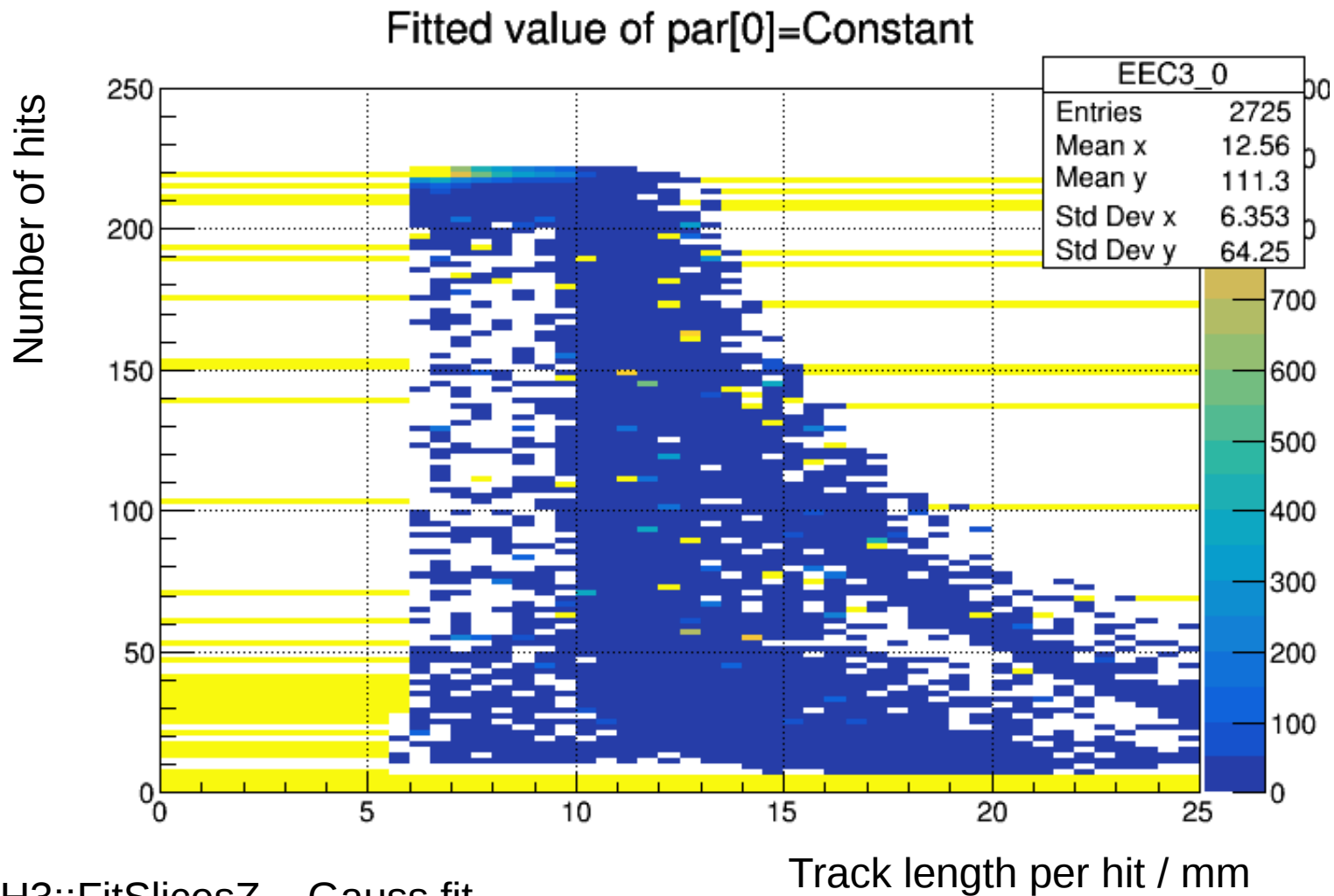
Fit formula: $y = 0.047 * (x/[0])**[1]$



Dependence on track length



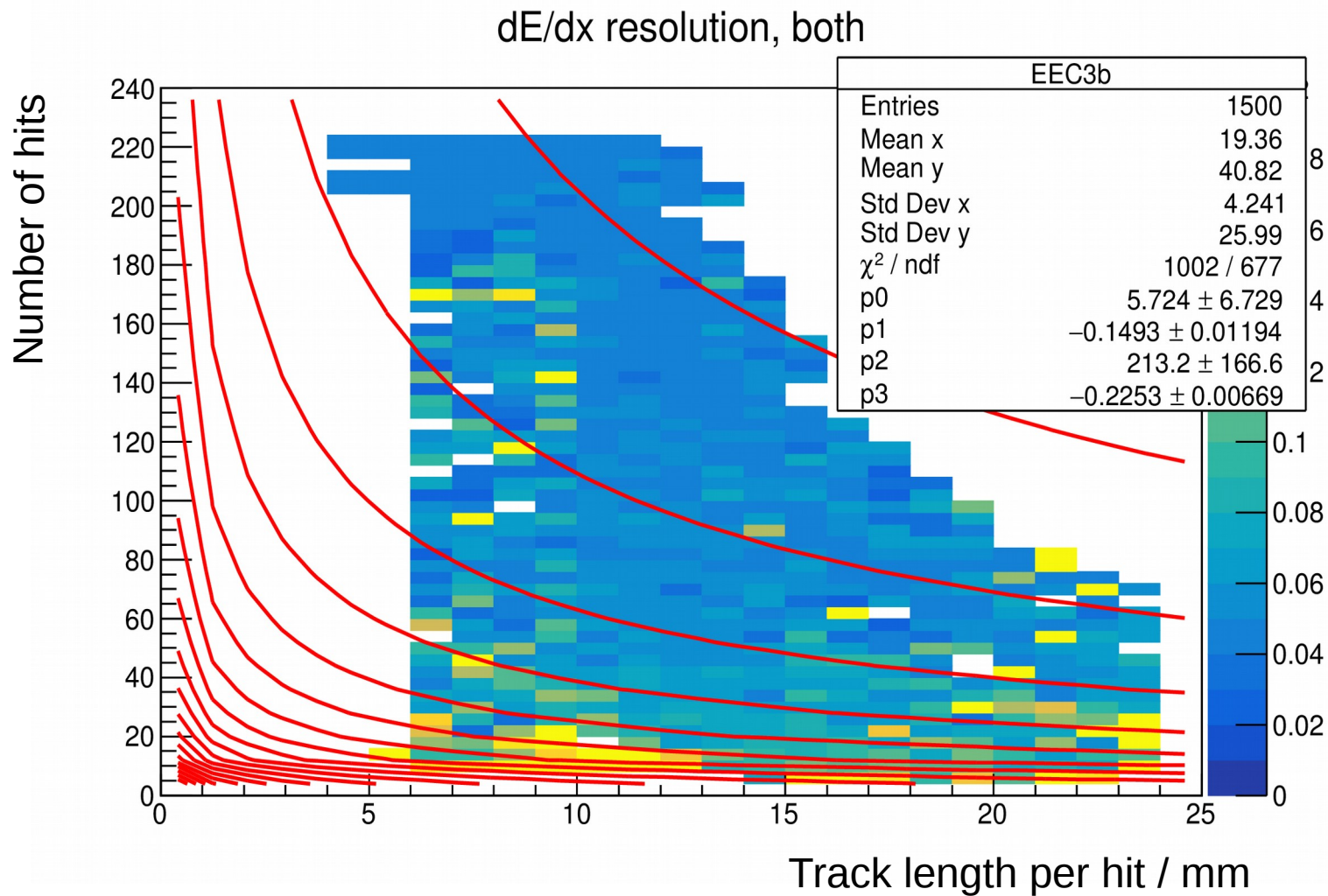
Dependence on both at once



TH3::FitSlicesZ – Gauss fit
Here: amplitude (constant)



Dependence on both at once



Fit formula: $y = 0.047 * (x/[0])**[1] * (y/[2])**[3]$

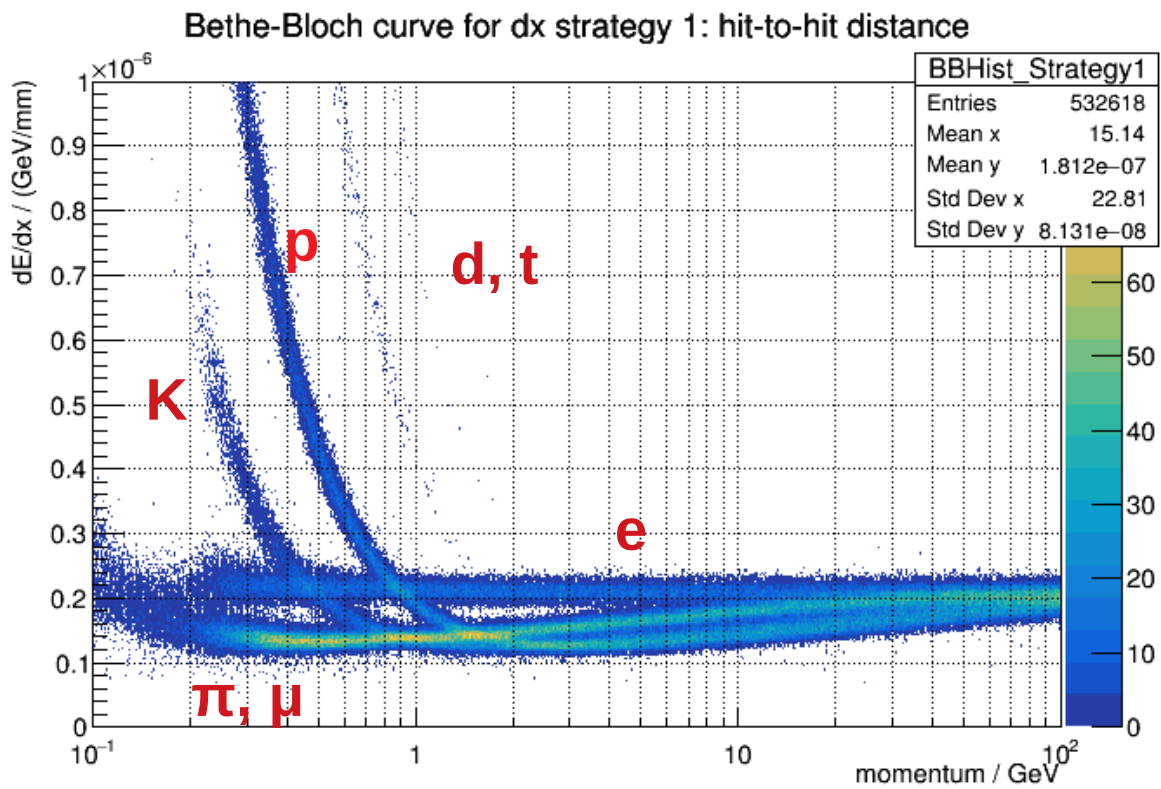


- Overall scale is corrected by the proposed formula
- Expected dependencies are not sufficiently reflected in observed dE/dx distribution width - neither for proposed, nor for current formula!
- More correlation on momentum, drift, etc. could cause this
- A dedicated study may be necessary
- Decision by software conveners: keep current formula
- Consequences unknown & current performance sufficient



- ILCsoft v02-00 is out and the production has started
- Run the dE/dx analysis again when the new single-particle samples have been produced
- Asked to give a dE/dx presentation at ALCW Fukuoka (remotely)





Thanks!



Backup

