MVD contribution to global PID

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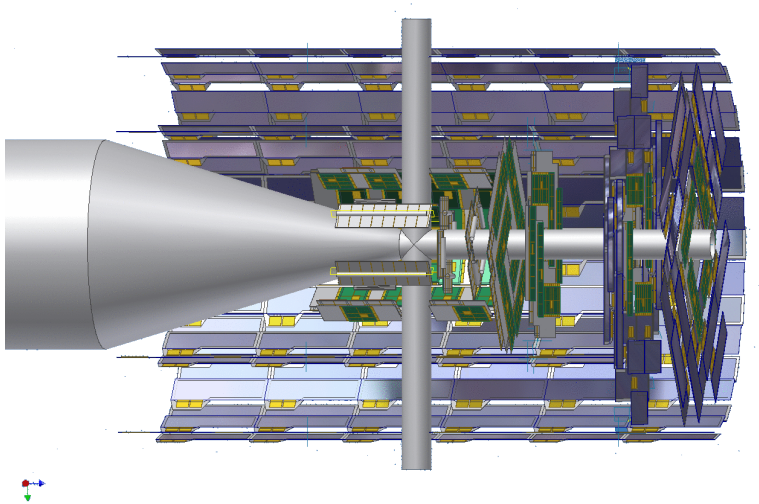
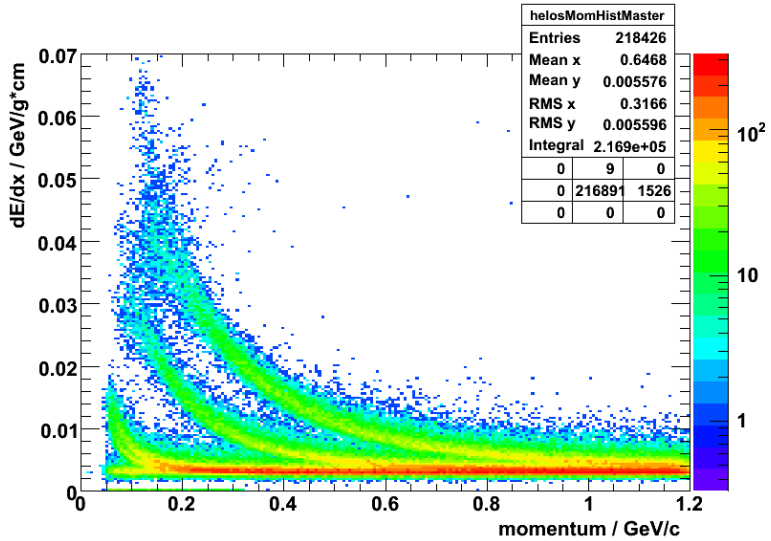
- MVD frontend measures collected charge in sensor
- position/direction information from track reconstruction $\rightarrow$ dE/dx
- limited number of hits per track; 4 (barrel) - 6 (forward)



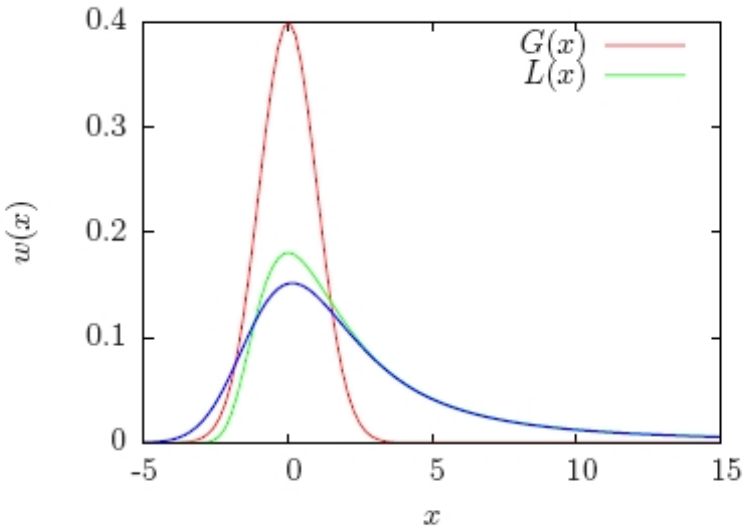


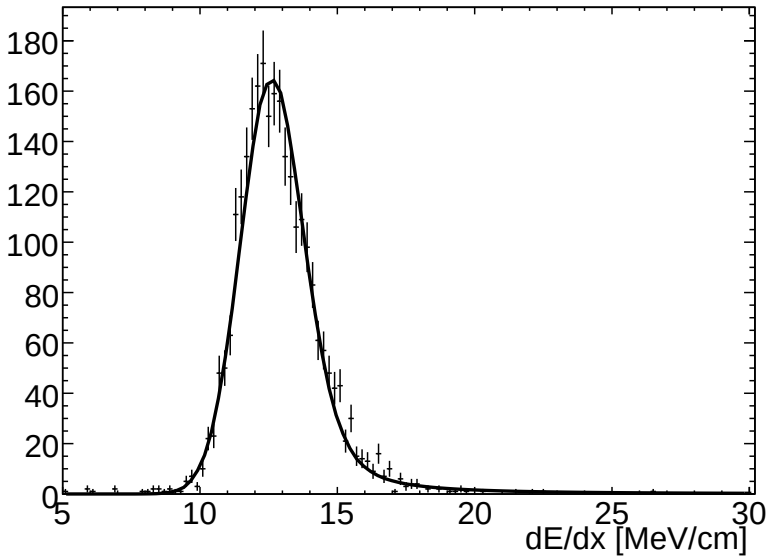
Signal parametrization

$$w(s) = \int L(x)\, G(s-x)dx$$

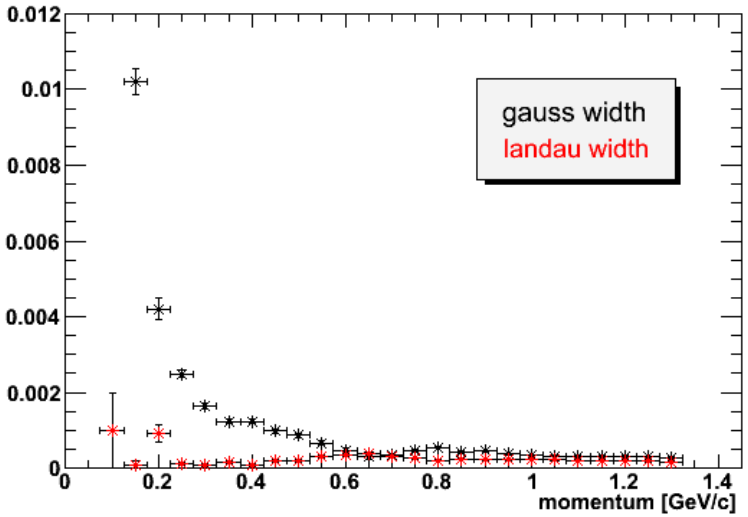
$$G_\sigma(x) = \frac{1}{\sqrt{2\pi}\sigma} e^{-x^2/\sigma^2}$$

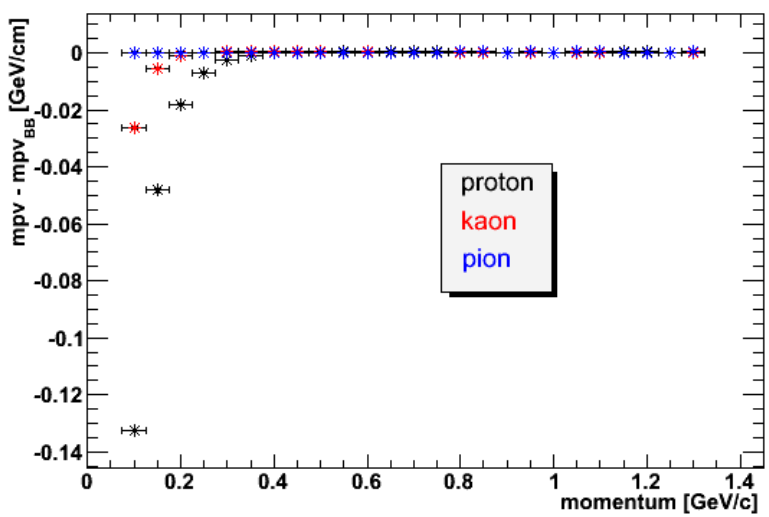
$$L_\tau(x) = \frac{1}{\pi\tau} \int_0^\infty e^{-t(\ln t - x/\tau)} \sin(\pi t)dt$$

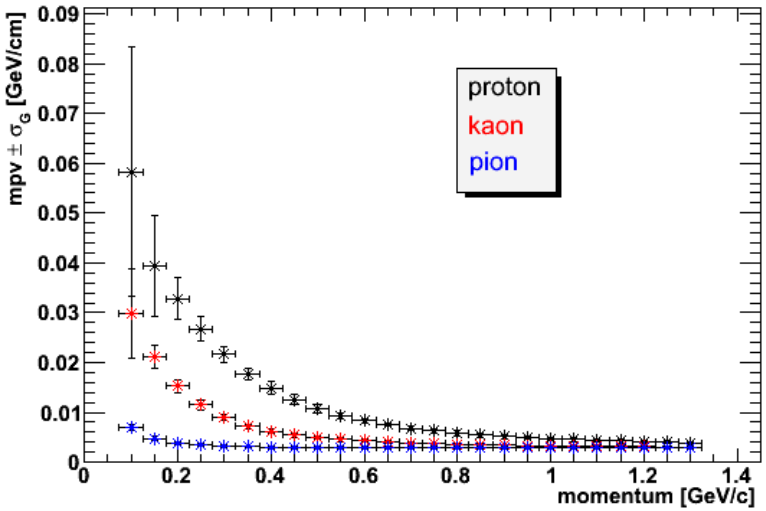


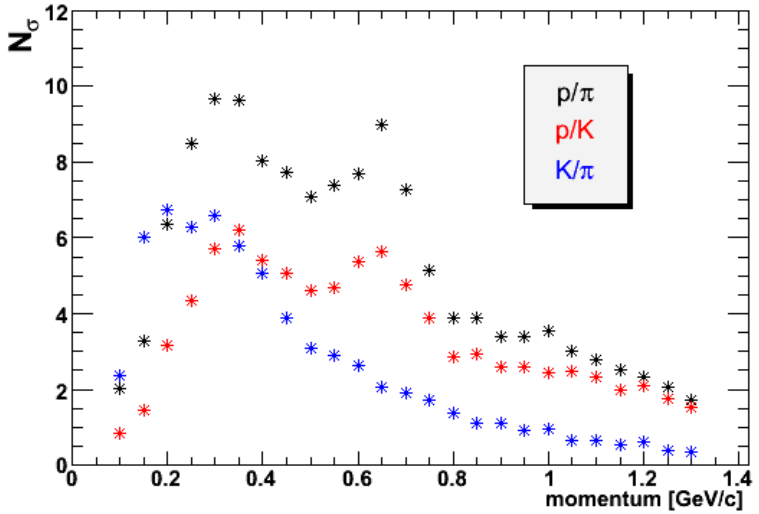


- e.g. proton band: for low momenta gauss width dominates (additional smearing)
- in region ($p > 500$ MeV/c) the landau width is in same order would dominate signal!
- deviation from the Bethe-Bloch expectation to low momenta









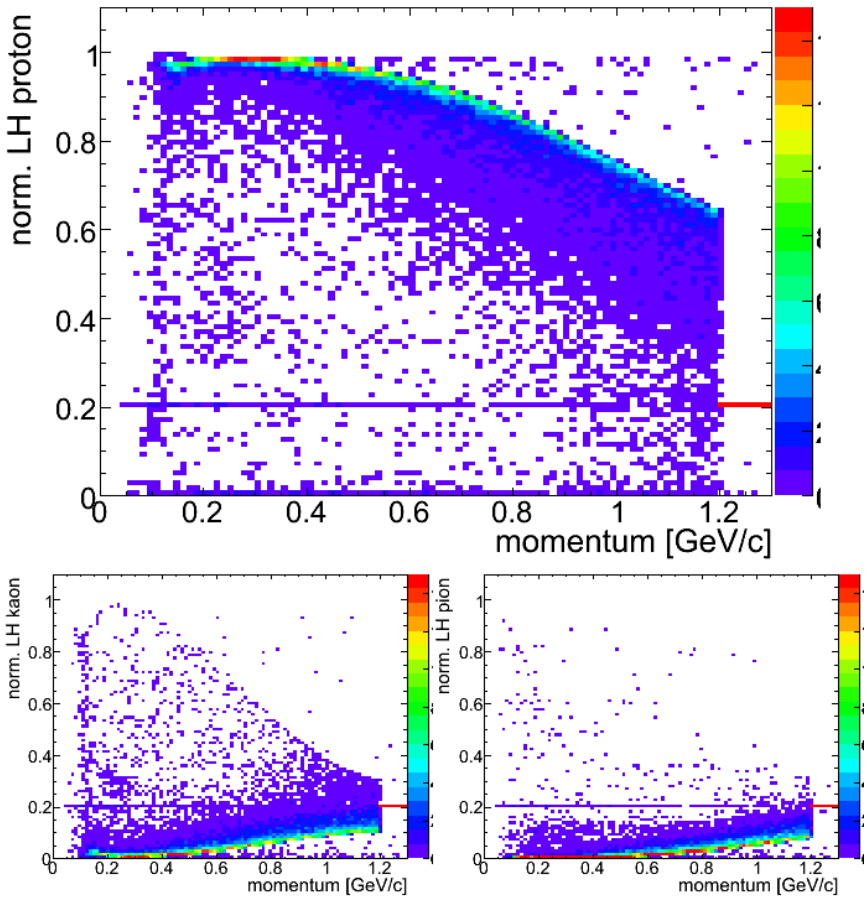
- calculate separation power
- based only on gauss width ($\times 2$, to compensate landau smearing)

$$N_\sigma = \frac{|\mu_1 - \mu_2|}{\sigma_1/2 + \sigma_2/2}$$

$\rightarrow$ still to optimistic, other error sources not encountered

more realistic description

- momentum dependent evolution of dE/dx for all species known
- calculate probability based on realistic distributions
- all probabilities (p, K, π, μ, e) normalized to unity
- maximum follows expectation, but smearing from landau tail
- e.g. proton events (and its misidentification)



Additional error sources

- study was done without additional electronics smearing
- dE resolution might be ok ($\approx 5\%$), relevant for larger momentum (> 500 MeV/c)
- frontend gain not clear (only up to few MeV?)
- largest uncertainty coming from track trajectory (reconstructed)
- no uncertainty from position determination (no Δdx), precision of sensor calibration not clear
  $\rightarrow$ probably most important