Special LHC run for Magnet Stations

M. Bettler[1], J. Bhom[2] , P. Billoir[3], M. Chrzaszcz[4], C. Da Silva[5], M.Durham[5], R.Greim[6], W.Karpinskig[6], T.Kiring[6], M. Martinelli[4], M. Pikies[2]

[1] Cambridge, [2] IFJ PAN, [3] LPNHE, [4] CERN, [5] LANL, [6] Aachen

OPG, CERN, September 13, 2018

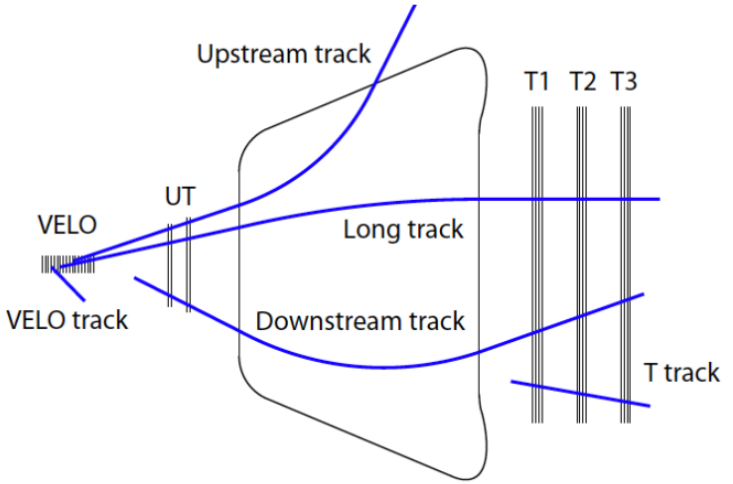
Where our tracks are?

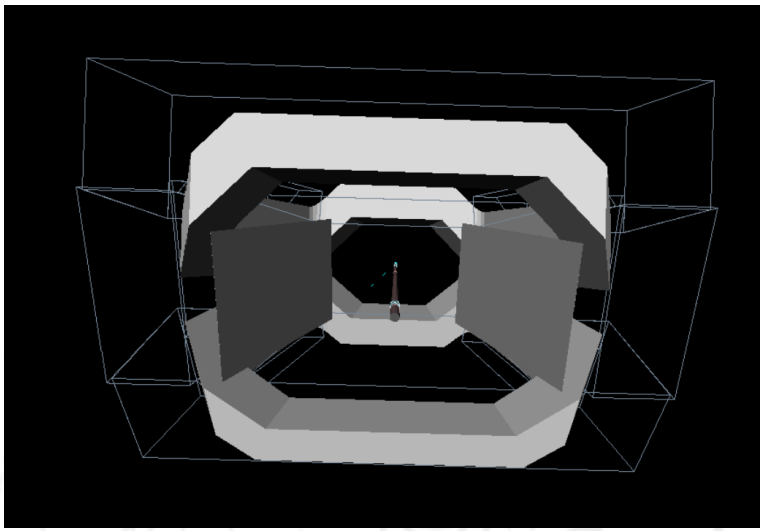
⇛ The upstream tracks have rather poor momentum resolution: $\frac{\Delta p}{p} \sim 15\%$.

⇛ The particles die after short and sad (for physics) life in the magnet yoke.

⇛ If one put chambers in the magnet stations, one could record the particles before they death.

⇛ This will not increase the material budget of the rest of the detector.





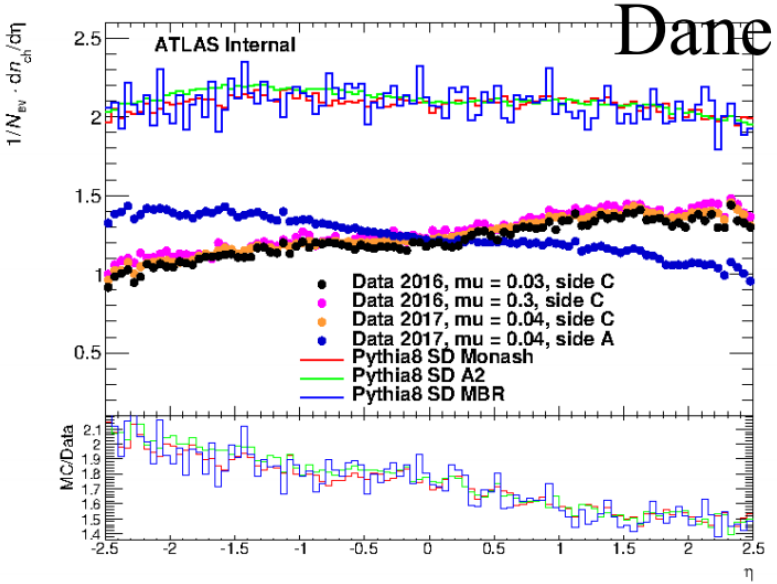
Studies done so far

⇛ We have performed studies:

- Radiation: Dosimeters have been put in the magnet region to measure the radiation dose.
- For sensitivity studies the MC was used.

⇛ These of course are important studies but having a data driven method is the best.

⇛ Often our MC prediction are wrong ;)



The proposal

$\Rightarrow$ We would like to propose of obtaining a sample of lower p_T tracks from data.

$\Rightarrow$ There are essentially two possibilities: (many thanks to Niels for discussion and guidance):

- Make a run with a $50\ \%$ of magnetic field.
  - Direct access to particles that would be swapped by magnet.
  - Not much work on our side
  - Needs additional 10-12h for machine to understand our magnetic field.
- Run with nominal magnet and open the OT.
  - No work for the LHC people.
  - Needs some extrapolation on our side.
  - Needs 1-2h access to open the OT.

The golden question

How much to open the OT, how much coverage/gain you get?

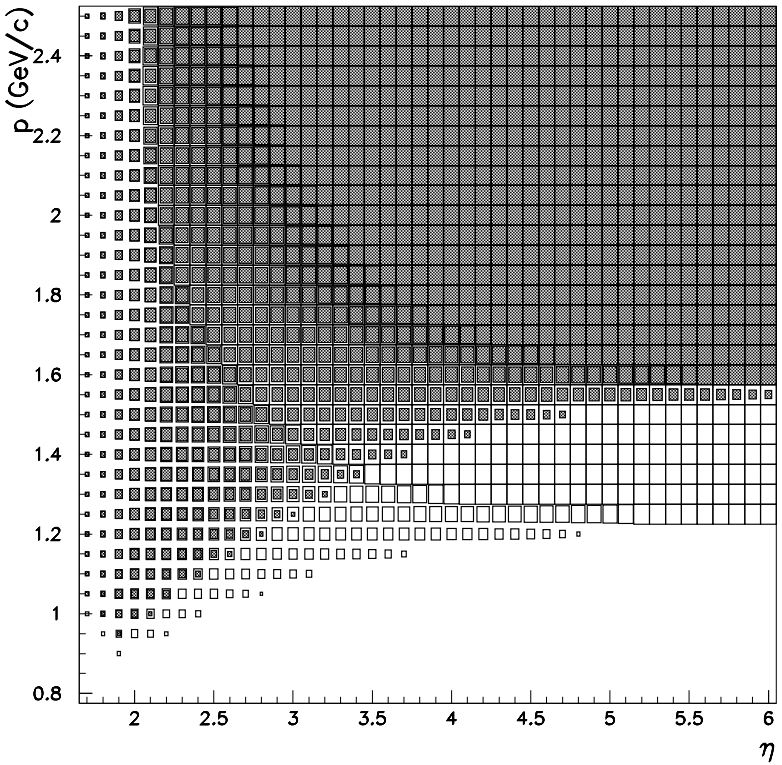
⇛ This is a hard one ;) and took a bit of time to answer.

⇛ We made two types of simulation:

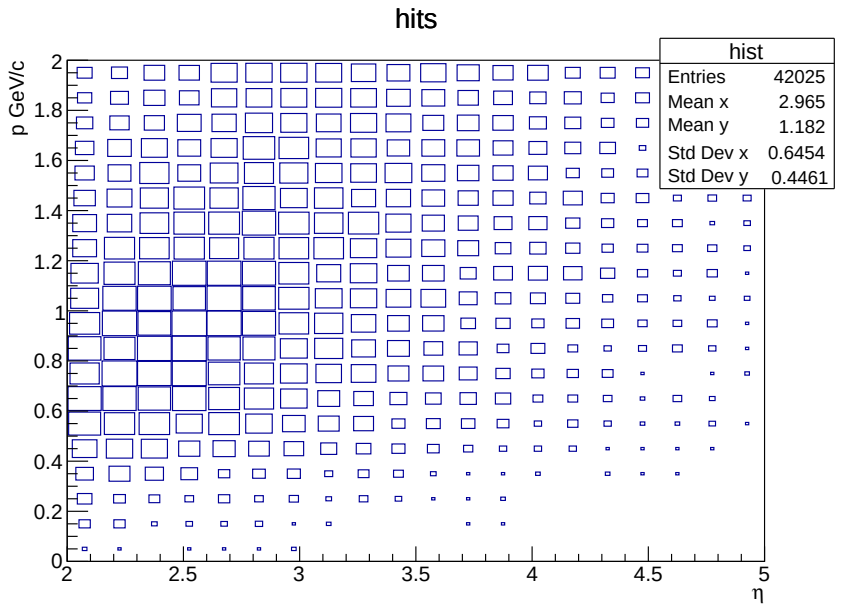
1. Open the OT fully.
2. Make a half magnetic field

Opened OT

⇛ Efficiency gain:

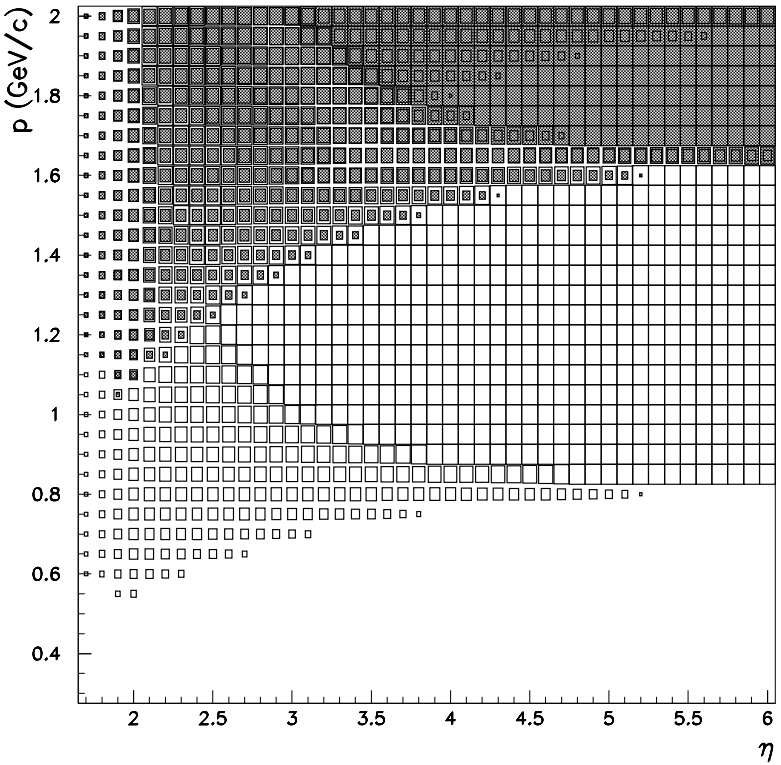


⇛ Slow pions from D^*:

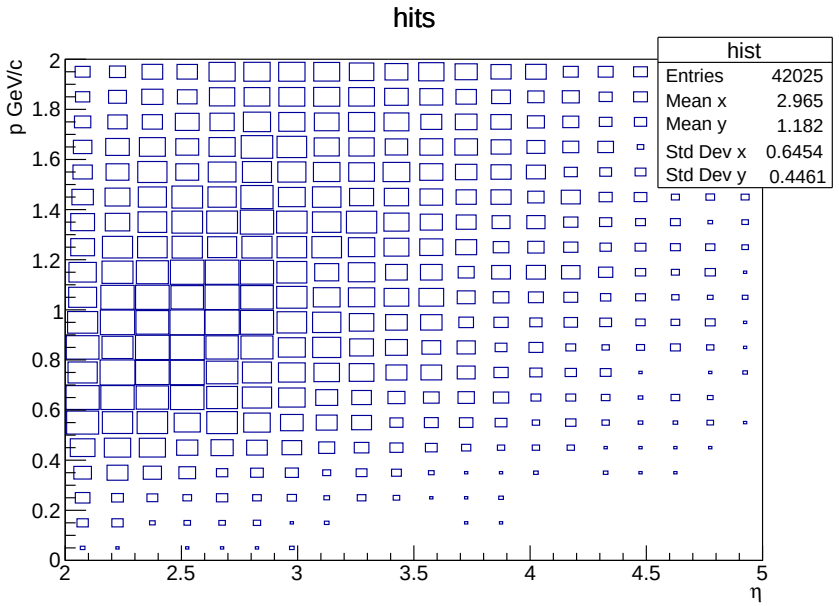


Half magnetic field, closed OT

⇛ Efficiency gain:



⇛ Slow pions from D^*:



Conclusions

$\Rightarrow$ The half magnetic field is more expensive but buys us more phase space.

$\Rightarrow$ The open OT is ”cheaper” but doesn’t dig in the most sensitive region.

Backup