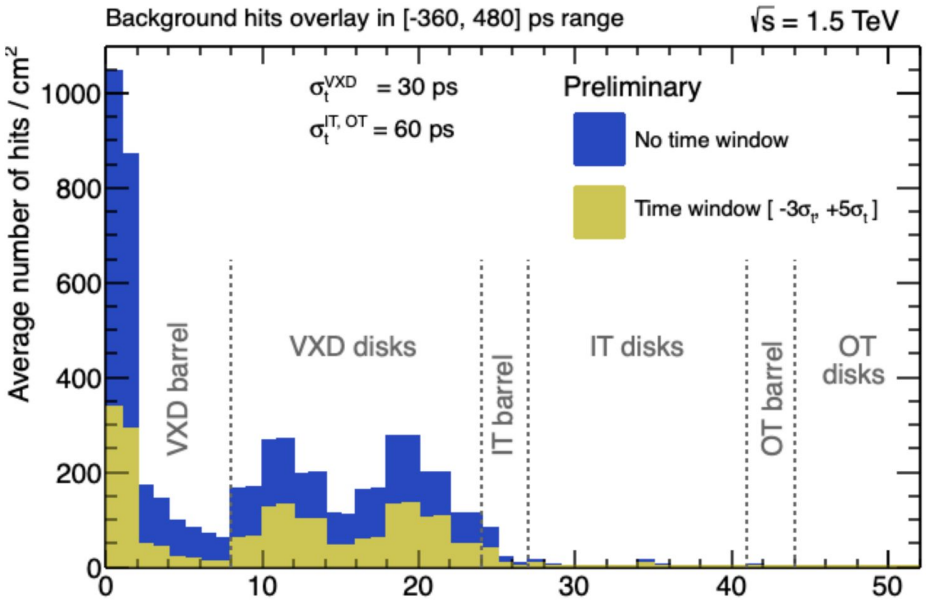
Updated 10 TeV occupancies

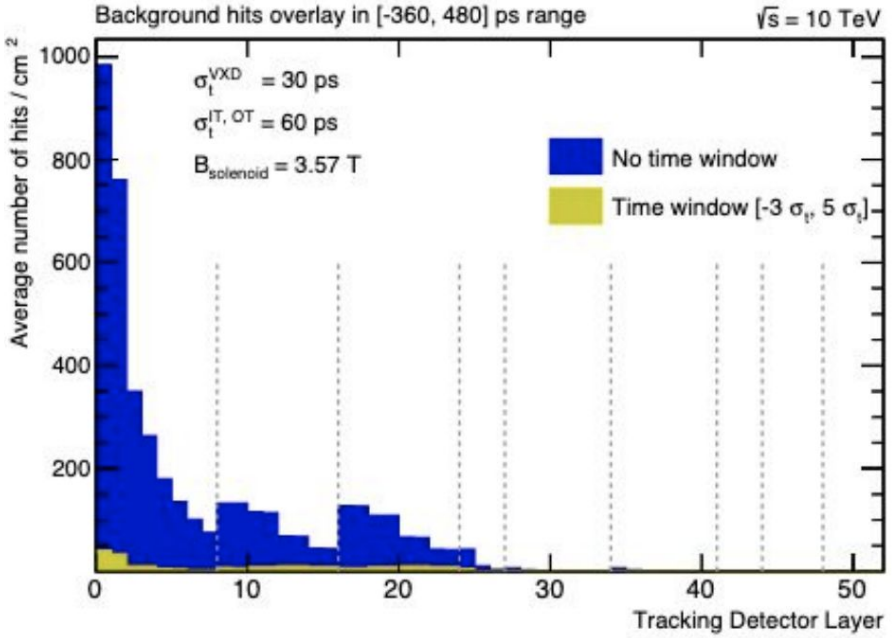
And some bugs squashed in the FLUKA conversion script

Federico Meloni (DESY)

Detector performance and MDI meeting, 24/10/2023

The investigation

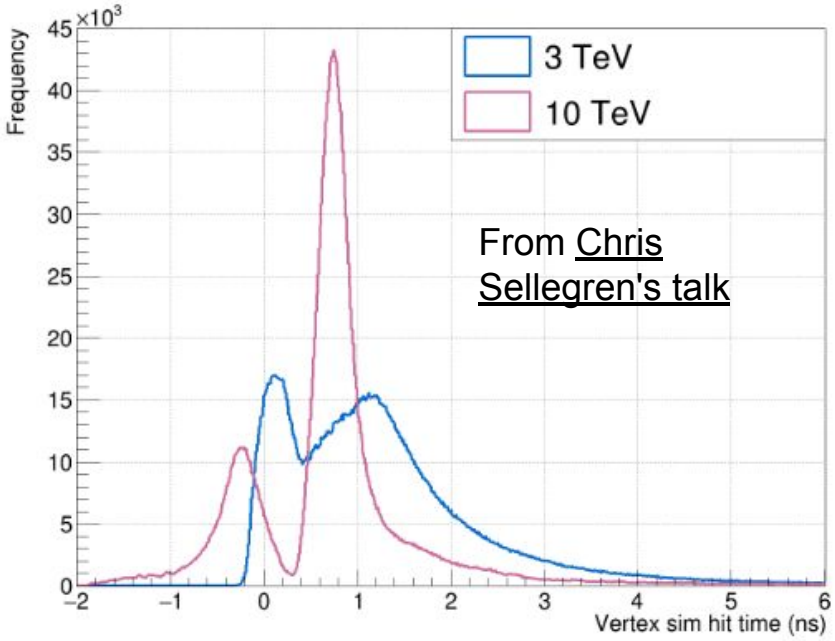




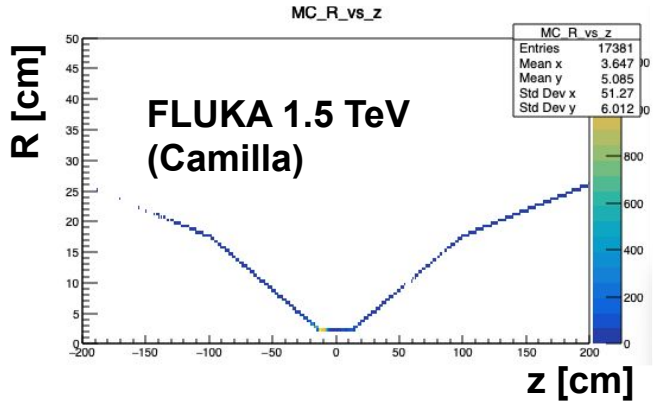
Things to study further:

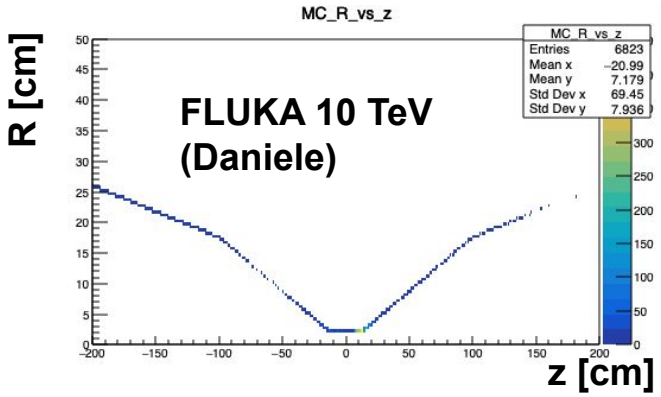
- Different BIB structure in endcaps
- Timing selections seem much more effective than at 3 TeV

Timing distribution in the vertex detector



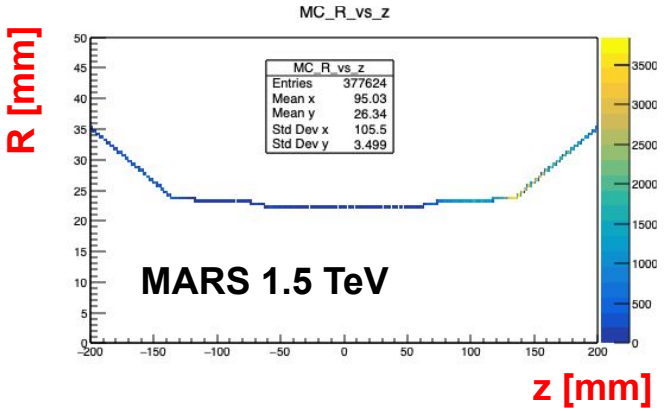
Understood mismatch in timing at Vertex





Re-simulated from truth BIB with consistent detector.
Discovered mismatch in units

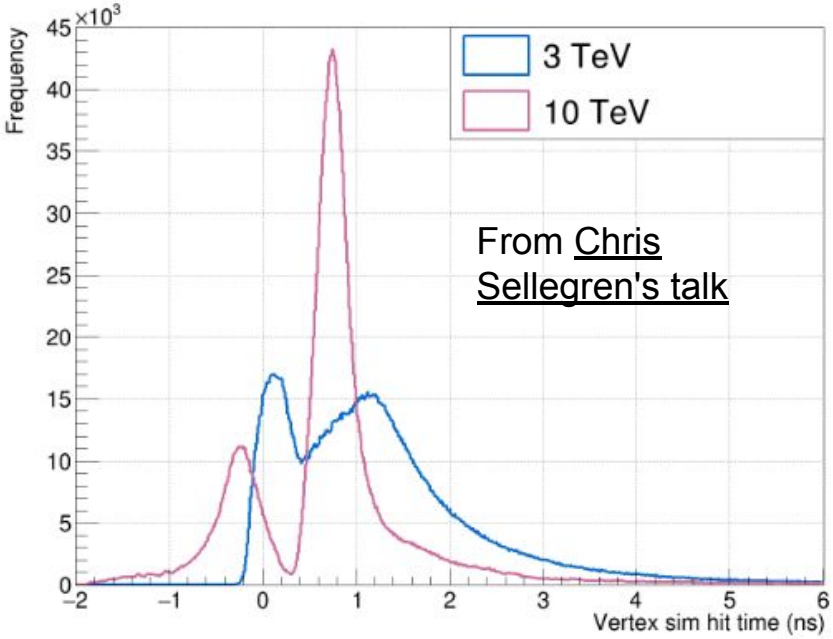
- The fluka to LCIO script didn't take this into account
- Fixed in PR

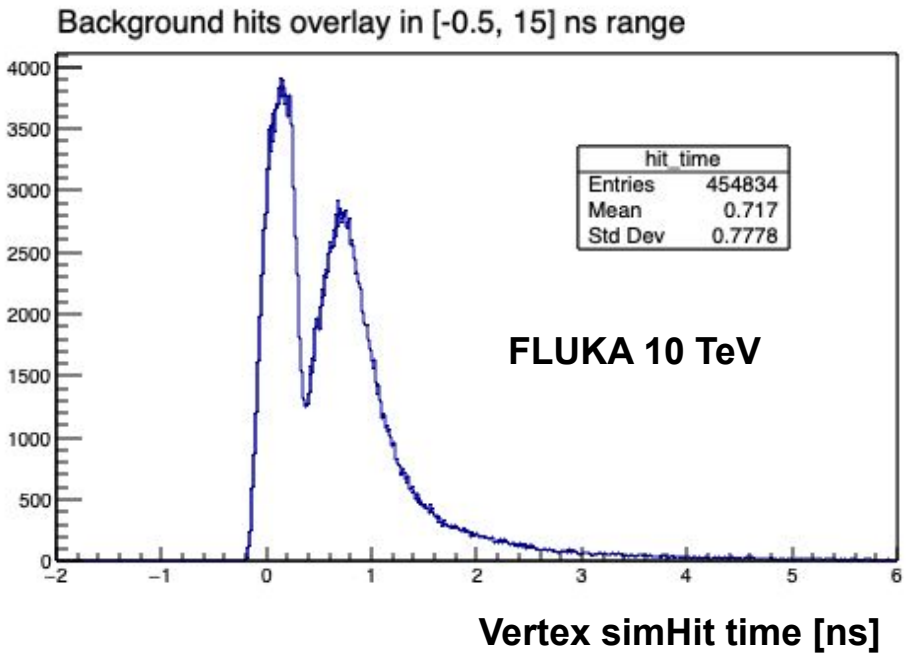


Furthemore: FLUKA reports E_{kin}, not p

- Fixed in PR by Daniele
- Negligible effect on results

Updated timing distribution





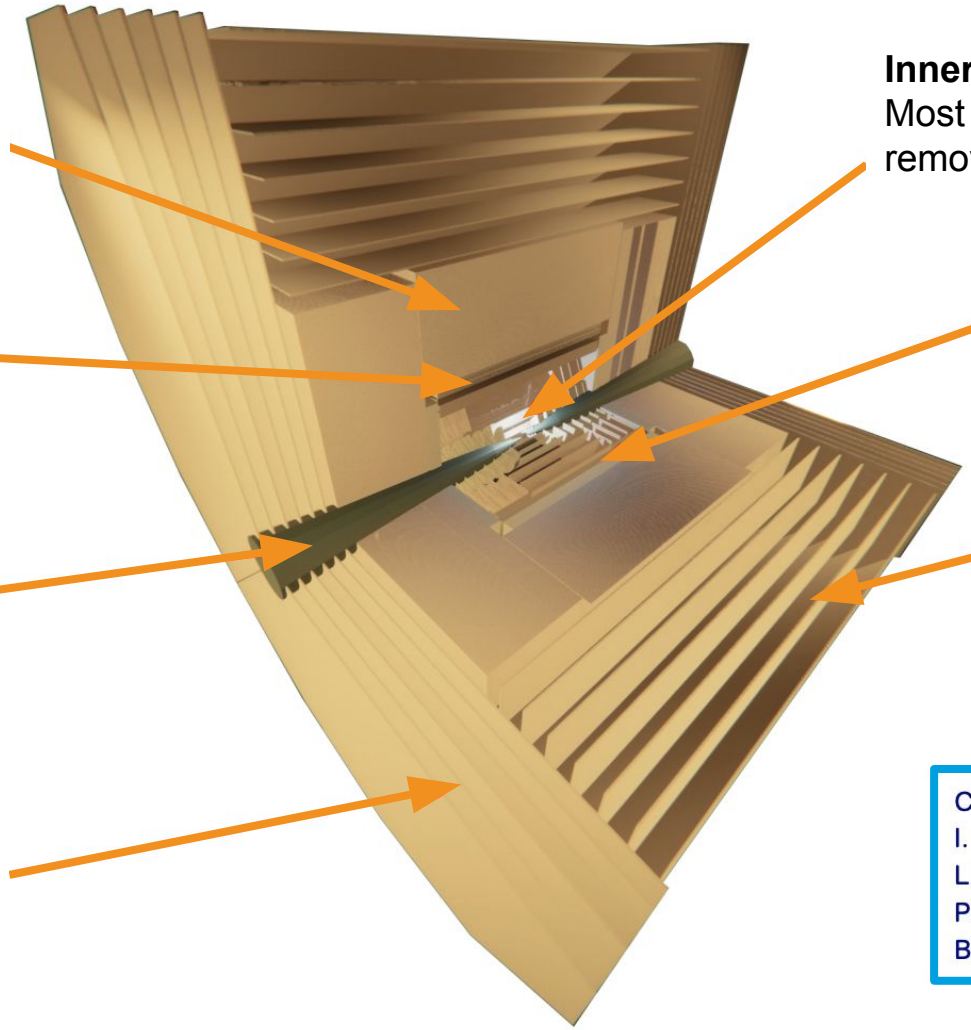
The 10 TeV detector “MuColl_10TeV_v0A”

HCAL
Fe+Scillator
Return B field

ECAL
Si+W

Shielding nozzle
Dimensions to be optimised

In-air muon system
RPC-based



Inner tracker
Most double layers removed

Solenoid
5 T
3m diameter

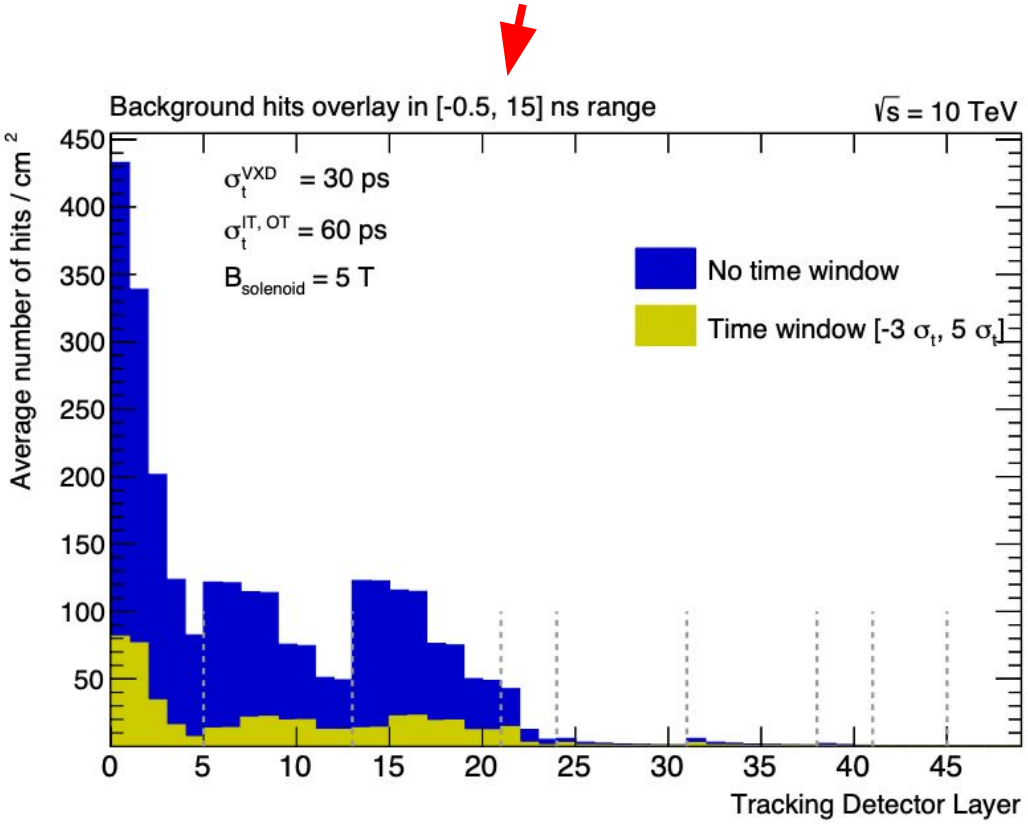
Toroidal field could be added if needed

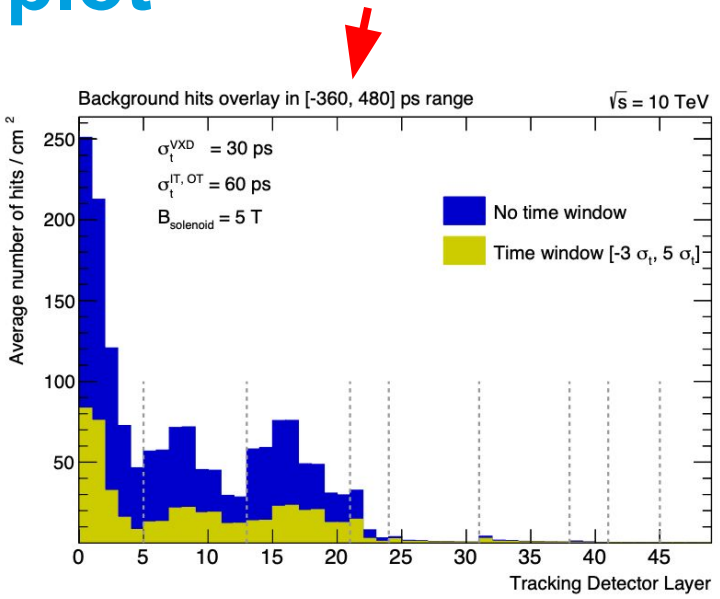
C. Bell, D. Calzolari, K. DiPetrillo, M. Hillman, I. Hirsch, T. Holmes, S. Jindariani, B. Johnson, L. Lee, T. Madlener, F. Meloni, I. Ojalvo, P. Pani, S. Pagan Griso, K. Pedro, R. Powers, B. Rosser, L. Rozanov, A. Vendrasco, J. Zhang

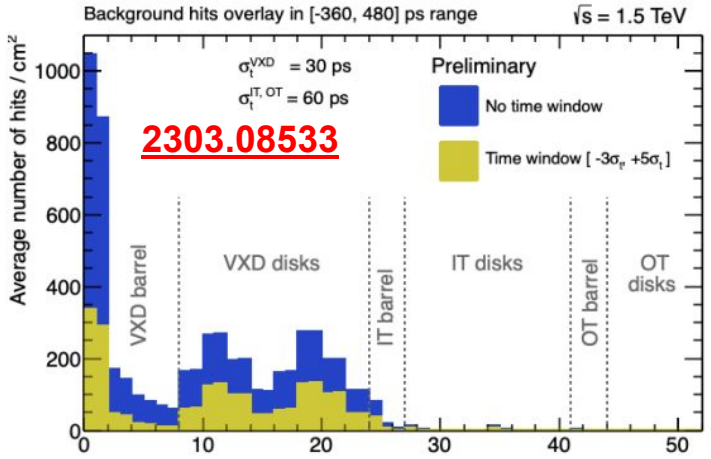
Updated tracker occupancy plot

Results based on simulated 5 TeV μ^+ beam

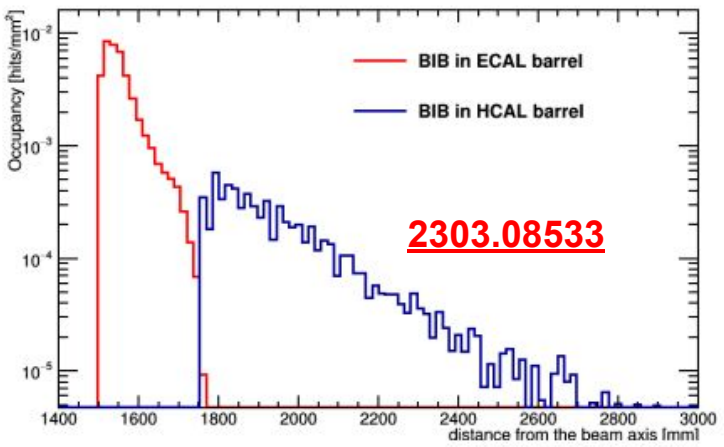
- μ^- beam taken “flipping around z=0”

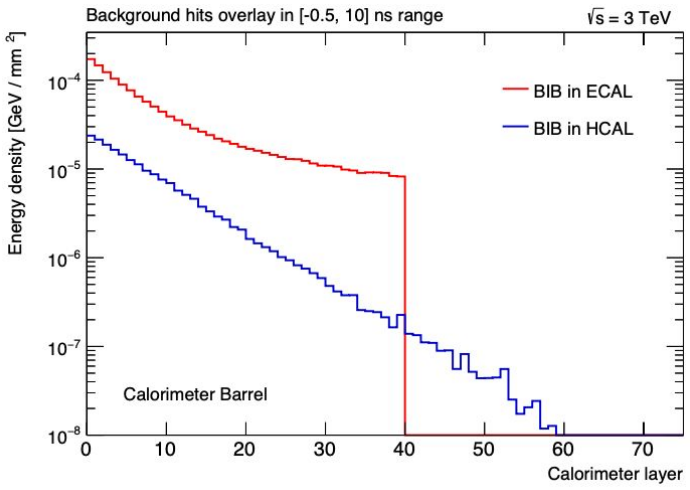


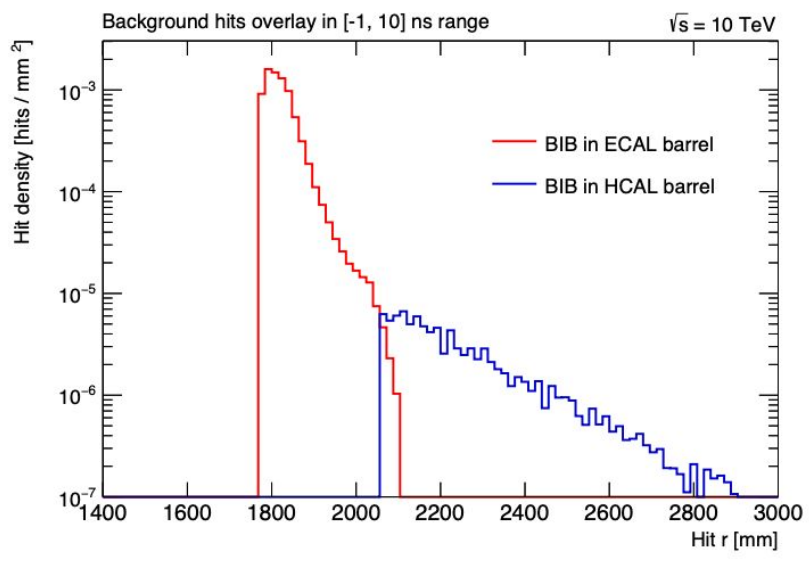


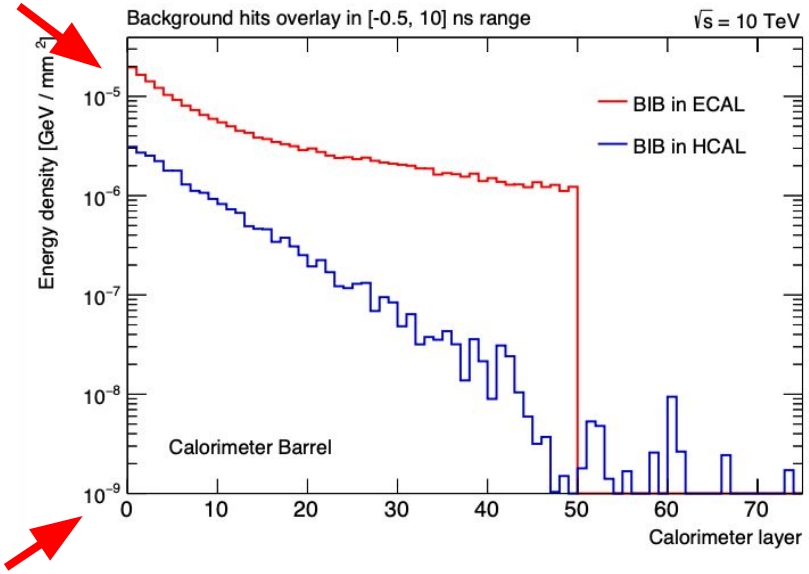


Calorimeter energy density









Summary

Finally understood the difference in time of arrival of BIB to detector

- Corrected bugs in FLUKA conversion scripts

Studied BIB occupancy in tracking detectors

- Found it roughly a factor 4 lower than at 1.5 TeV

Studied BIB occupancy in calorimeter systems

- Proposed new visualisation (vs calorimeter layer instead of radius)
- About 1 order of magnitude less BIB energy per mm^2
- Change driven by different detector design

Thank you!