Performance studies for HGTD

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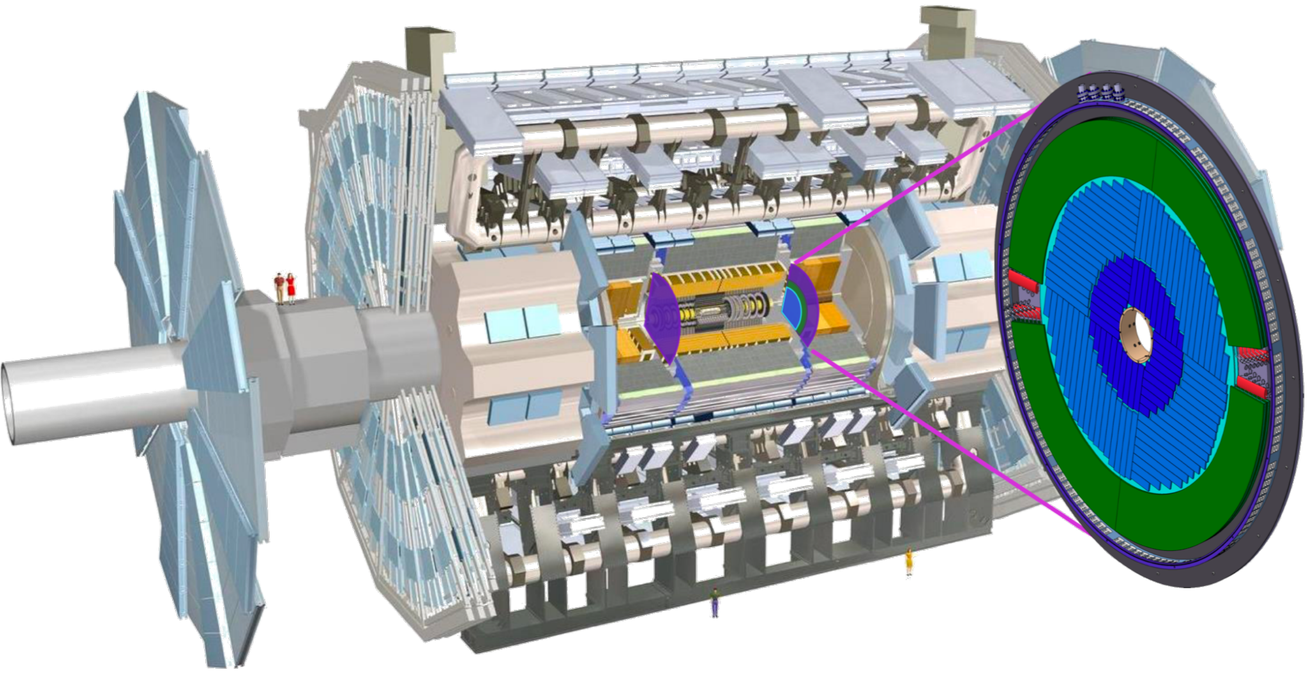
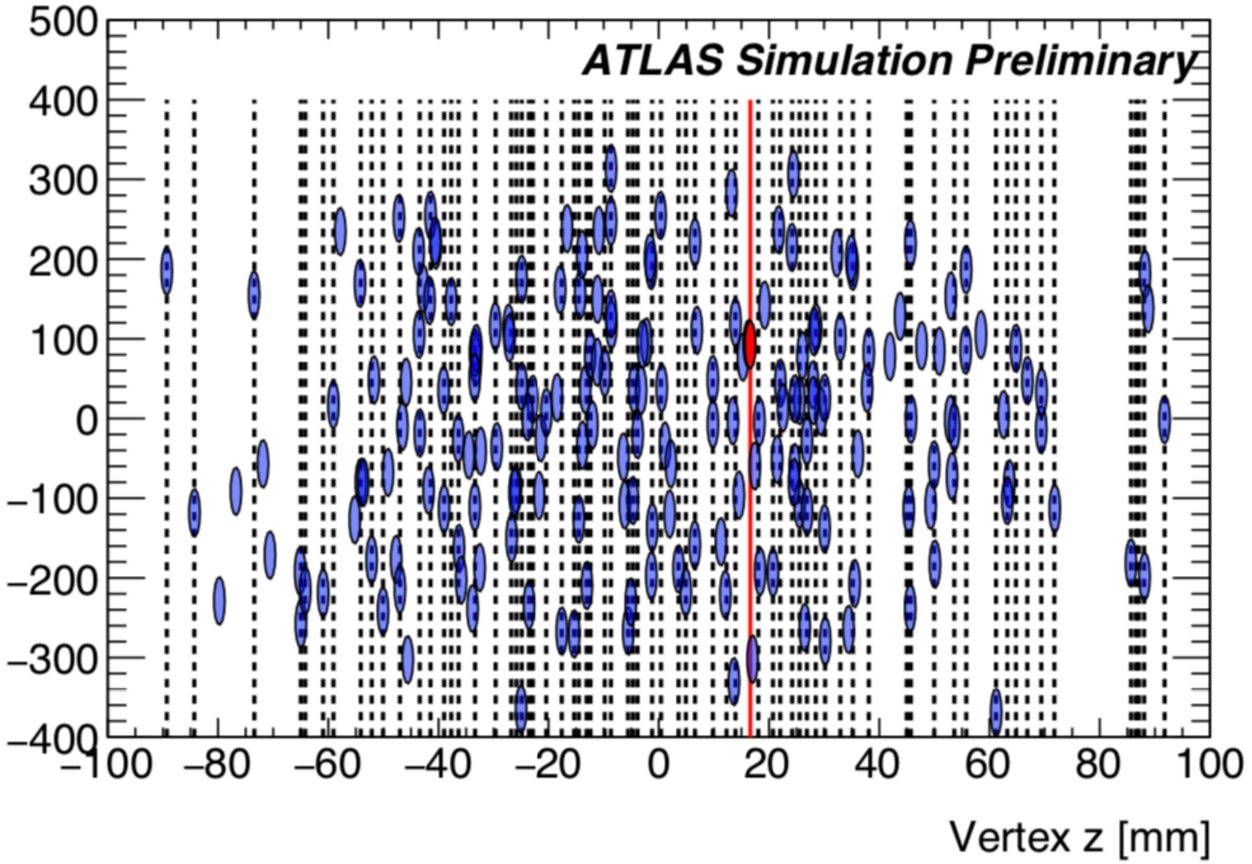
ATLAS EXPERIMENT

Timing with HGTD

- ATLAS upgrade detector for the HL-LHC
- uses LGAD sensors to measure time with σ_t~30ps
- covers range $2.4 \leq |\eta| \leq 4.0$





Basic idea:

- Tag particle tracks with a time
- Assign a time to the HS interaction
- Remove tracks that are out of time with regard to this reference to reduce pile-up

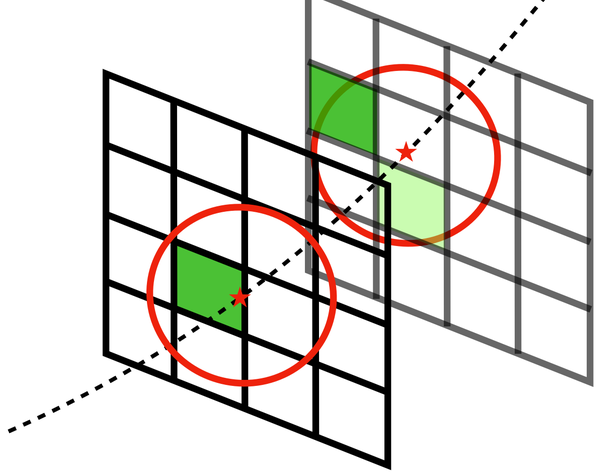
Track timing

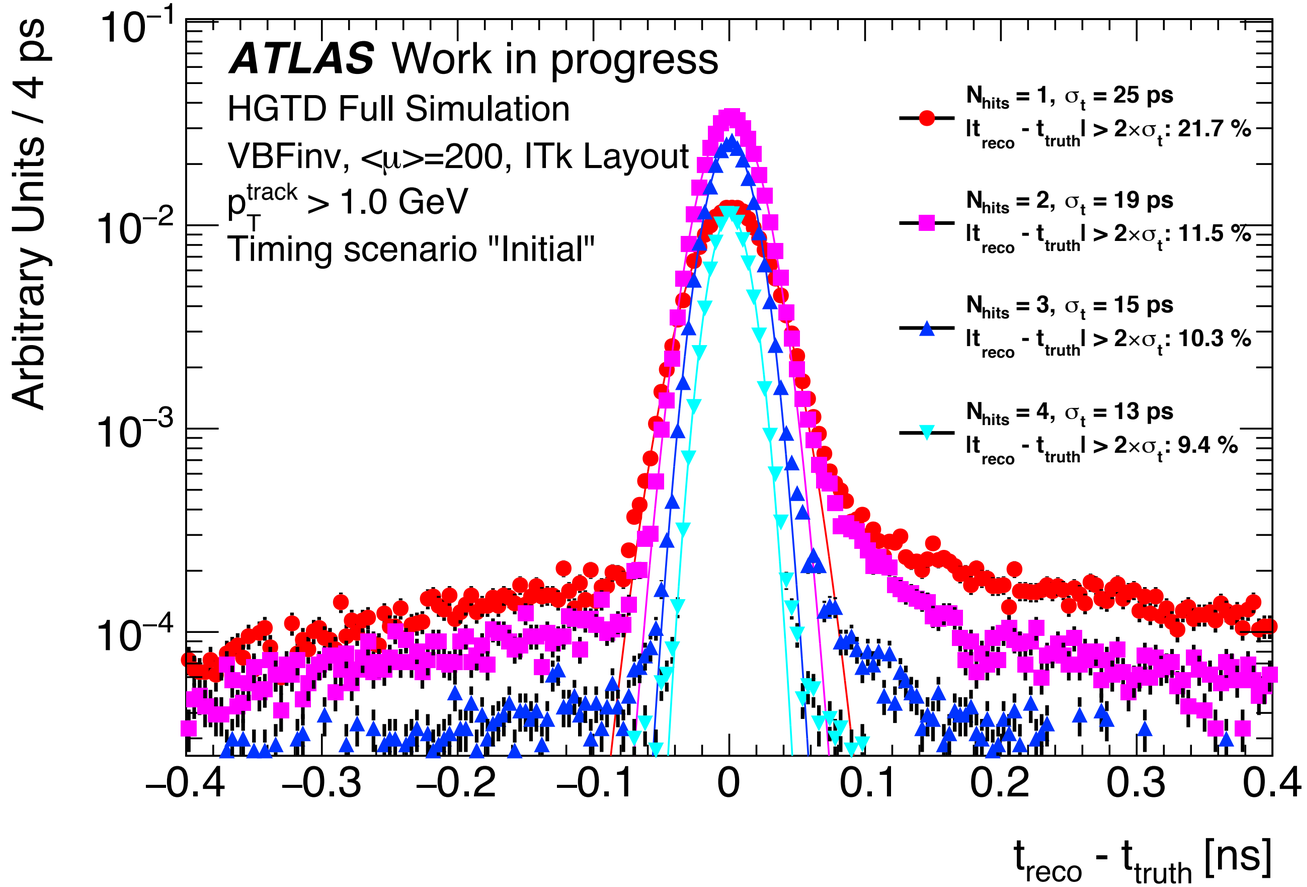
Matching of HGTD hits to tracks by extrapolating the tracks reconstructed in ITk to the surfaces of HGTD

Due to showering in the material between the IP and HGTD (ITk, PP1), have to deal with mismatching of tracks and hits

Checking for time inter-compatibility of different hits around the extrapolation point helps cure impurities

ε~70%, purity ~90%





HS vertex timing

We want to assign a time to the hard-scatter vertex

Due to the limited resolution of ITk in the forward region, selecting tracks that can be associated to the primary vertex gives large number of PU tracks

Used approach:

- select the (sub-)leading jet *if* in HGTD acceptance
- cluster the times of the tracks that can be associated to that jet
- choose the biggest cluster

ε(VBFinv)~40%, purity ~95%