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LHCb Upstream Tracker

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On behalf of the LHCb collaboration

for the UT Group

The LHCb upgrade requires replacing the silicon strip tracker between the vertex locator (VELO) and the magnet. A new design has been developed and tested based on the "stave" concept planned for the ATLAS upgrade.

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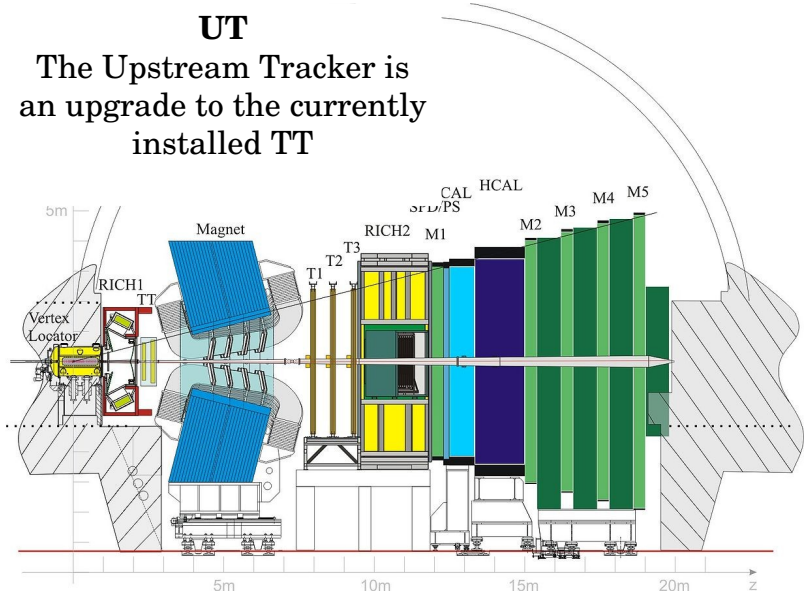
Purpose

LHCb is a single-arm forward detector covering an acceptance of $2<\eta<5$
Upgraded detector → Same geometry with improved sub-detectors

UT
The Upstream Tracker is an upgrade to the currently installed TT

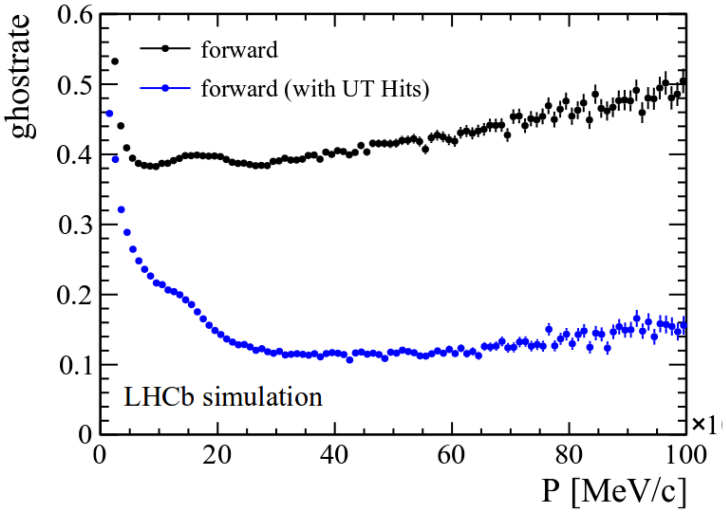


By removing gaps in the acceptance currently found in the TT, there is significant improvement to track reconstruction efficiency

Adding UT hits to tracks reconstructed by the downstream tracker improves track momentum resolution - finer granularity of the UT vs the TT

Requiring tracks to have hits in the UT hugely reduces the amount of "ghost tracks" in the upgrade geometry.

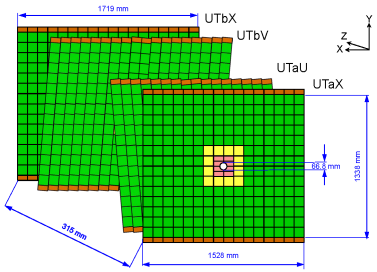
High efficiency for tracks in the acceptance and bending of tracks due to B field between VELO & UT will be used to select only high pt tracks for the trigger, speeding up the algorithm by a factor of 3



Details

So please come to see my poster if you would like to know more about:

GEOMETRY

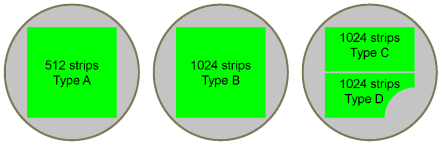


Four planes of silicon sensors

Finer segmentation and larger coverage than the TT

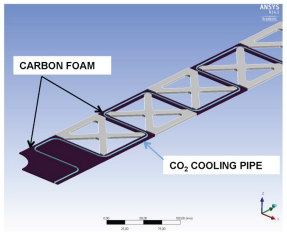
Stave design staggered in z

SENSORS



Four types of sensor geometries in UT.
The majority consists of 10cm^2
p-in-n sensors: 512 readout strips
n-in-p sensors: 1024 readout strips with 95 um

COOLING



Evaporative CO_2 is used for cooling

Titanium “snake” pipe embedded in carbon fiber stave

Solution validated with extensive thermal simulations

And lots more...