



Monitoring Tools for the CMS Upgraded Outer Tracker Detector

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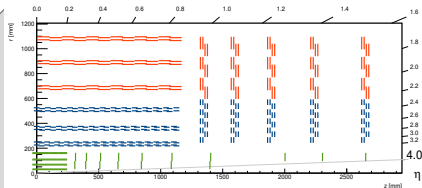
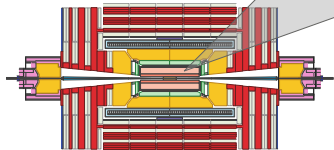
on behalf of the CMS Tracker Collaboration

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Lake Louise Winter Institute 2015

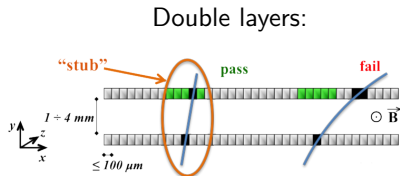
The CMS Upgraded Outer Tracker

- ▶ high luminosity LHC
⇒ high pile-up
 - ▶ maintain/improve performance
⇒ upgrade CMS detector
- new Tracker



- ▶ New Outer Tracker Detector:
 - ▶ barrel-endcap geometry
 - ▶ double layers (a few mm spacing)
 - ▶ pixel and strip sensors

Hits, Clusters, Stubs ...



charged particle passes through
Outer Tracker



hit pixels/strips

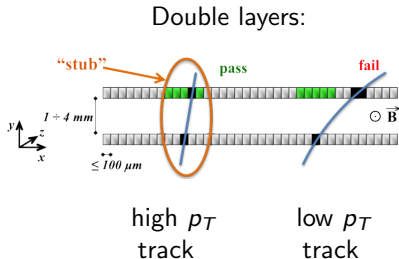


grouped into clusters



clusters in inner and outer sensor
layers form stubs

The TrackTrigger



TrackTrigger:

reject low- p_T stubs ($< 2 \text{ GeV}$)



relation track p_T and curvature



cut on stub displacement
(= displacement of outer cluster
w.r.t. inner cluster)



allowed **window** (per layer)

Monitoring

- ▶ Check quality of data and simulations
- ▶ Monitored properties:

Cluster/Stub

- position
- η distribution
- width/
displacement
- rate

'Truth' information

- p_T distribution
- η distribution
- φ distribution
- vertex position
- particle ID

Stub vs. 'truth'

- p_T distribution
- η distribution
- φ distribution
- stub displacement vs.
simulation truth p_T

Monitoring

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'Truth' information

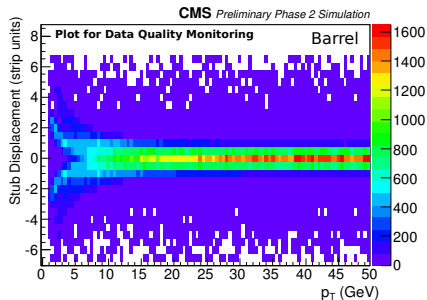
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Stub vs. 'truth'

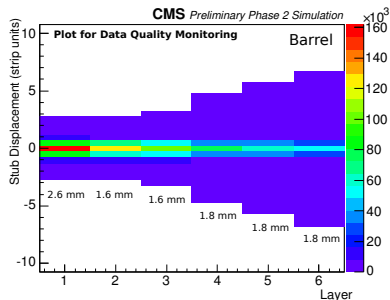
- p_T distribution
- η distribution
- φ distribution
- stub displacement vs.
simulation truth p_T

Important for TrackTrigger

Stub Displacement



- ▶ small displacement at high p_T
- ▶ larger displacement at low p_T



- ▶ allowed windows
- ▶ mostly small displacements
⇒ mostly large p_T in this sample