Impact of B-layer thresholds in the cluster properties using the single b-jet sample

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June 1, 2016

Sample outlook

The following single *b*-jet samples have been produced by Soshi with different pixel thresholds.

- SAMPLE 1 : Threshold = 4.
- SAMPLE 2 : Threshold = 5.
- SAMPLE 3 : Threshold = 6.
- SAMPLE 4 : Threshold = 8.
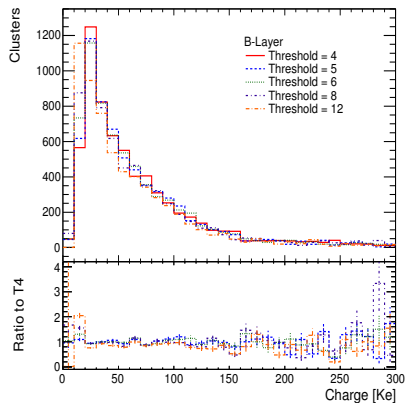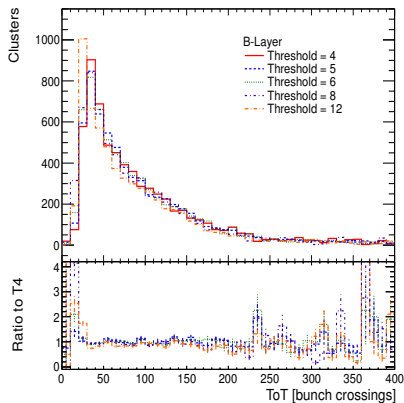- SAMPLE 5 : Threshold = 12.

Clusters inside tracks are selected. Tracks passing loose cuts and $p_T > 500$ MeV are considered.

Split fraction

The fraction of splitted clusters decreases as the threshold is increased
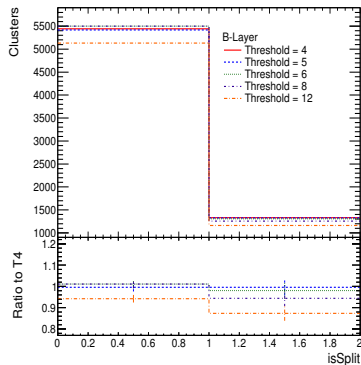
Threshold	Clusters	Split Fraction
4	6153	21.58%
5	6129	21.59%
6	6184	21.07%
8	6147	20.43%
12	5732	20.25%

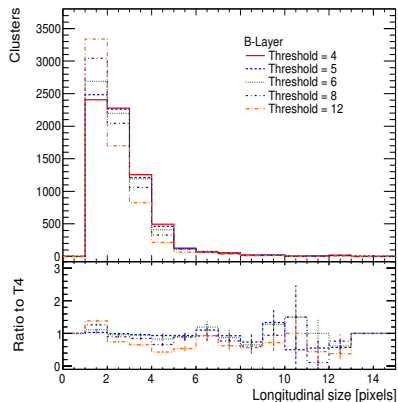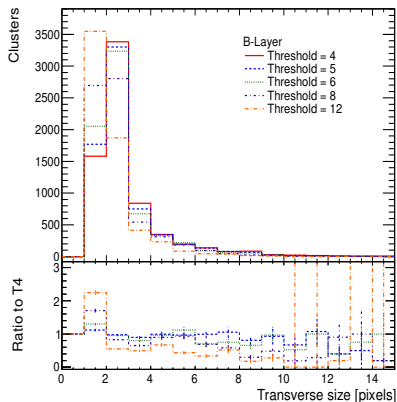Impact on ToT and cluster charge

The peak values for the ToT and the charge are the following

Threshold	ToT value at peak	Charge value at peak
4	35 bunch crossings	25 Ke
5	35 bunch crossings	25 Ke
6	35 bunch crossings	25 Ke
8	35 bunch crossings	25 Ke
12	25 bunch crossings	15 Ke

Impact on cluster transverse and longitudinal sizes.
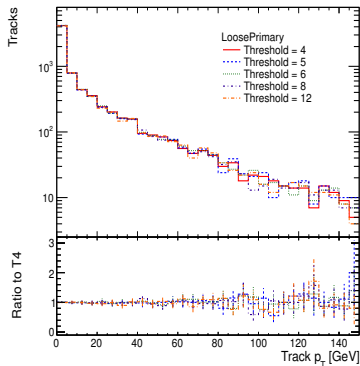
The track reconstruction efficiency for Loose tracks is almost unaffected.
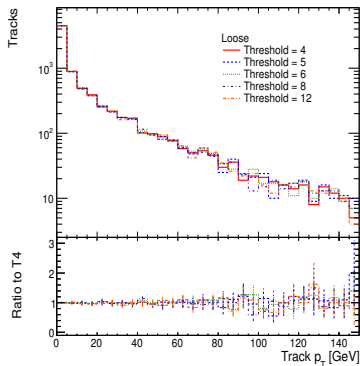
Threshold	Tracks	Ratio to T4
4	8007	100.00 %
5	7976	99.61 %
6	8063	100.70 %
8	8021	100.17 %
12	7957	99.38 %

The track reconstruction efficiency for LoosePrimary tracks is almost
unaffected.

| Threshold	Tracks	Ratio to T4
4	7412	100.00%
5	7394	99.76%
6	7459	100.63%
8	7428	100.22%
12	7370	99.43%

The track reconstruction efficiency for Tight tracks is almost unaffected for thresholds smaller than 8. For $T = 12$, the efficiency shows a drop of a 7% wrt $T = 4$.
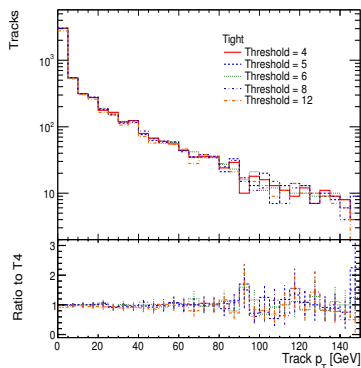
Threshold	Tracks	Ratio to T4
4	5415	100.00%
5	5414	99.98%
6	5421	100.11%
8	5413	99.96%
12	5048	93.22%

Not large effect in the impact parameter significances for both d_0 and z_0.
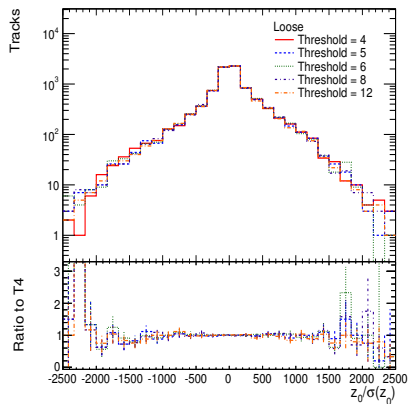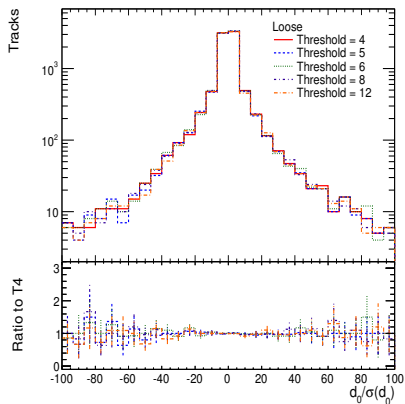
As expected, larger thresholds for the B-layer pixels result in

- Smaller amount of clusters formed.
- Smaller fraction of splitted clusters.
- Smaller cluster size (transverse and longitudinal)
- Lower ToT and charge values for the clusters
- No significant change in track reconstruction is observed.