



Universität Zürich



TT efficiency studies

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Studies done with **magnet on** collision data and Monte-Carlo

In both cases reconstruction redone in Brunel (no TT hits added to long tracks)

Collision

Used DSTs from Juan (~300k events)

DDDBtag "head-20100119"

CondDBtag "head-20100119"

Alignment VeloOTTxTyModulesTxITTxTyRzLaddersTxRzTTModulesTxRz20100122.db

Monte-Carlo

All of the latest 450GeV MC (~200k events)

DDDBtag "head-20091120"

CondDBtag "sim-20100119-vc15mm-md100"

General idea



Loop over Long tracks (no TT hits added)

{

Extrapolate track through TT and find point of intersection with each layer

Check if intersection is in an active region

Count number of expected TT hits

Count number of reconstructed TT hits within 5mm of track

For each expected TT hit

{

For each reconstructed TT hit in the same sector

{

calculate 3D residual to track

}

Fill tuple with info about track and expected and reconstructed TT hits

}

}

To calculate efficiency

For each expected hit check if there is a cluster with a residual smaller than some window size. Loop over all tracks and count the number of expected and found hits in a given detector element then,

Efficiency = totalFound / totalExpected (ensure no double counting!)

Track selection



Basic requirements

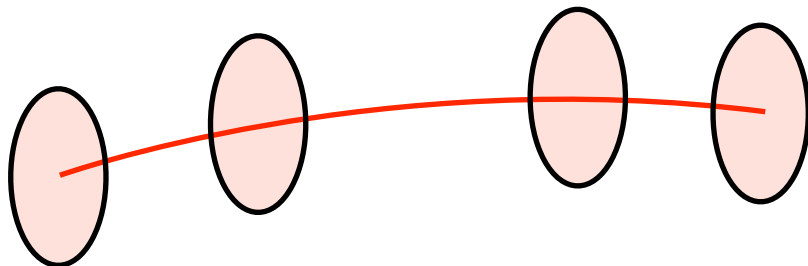
$P > 6 \text{ GeV}$

$\text{Chi}^2/\text{nDof} < 7$

$\#\text{expectedHits} > 2$

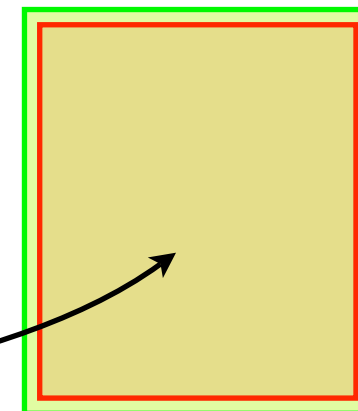
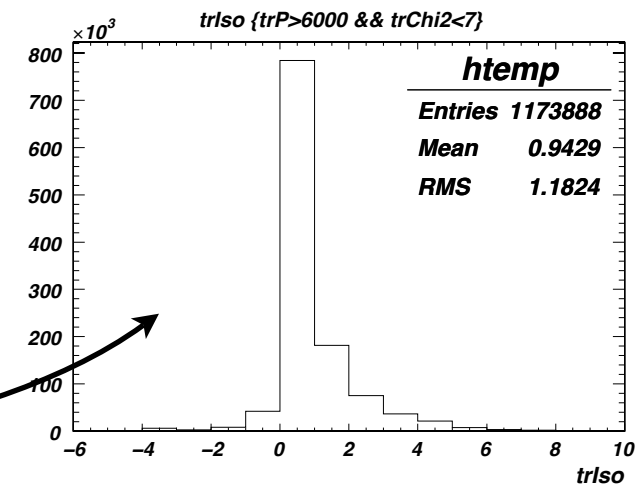
Use isolated tracks

Reject track if there are more than $(\#\text{expected} + 1)$ clusters within 5mm of track

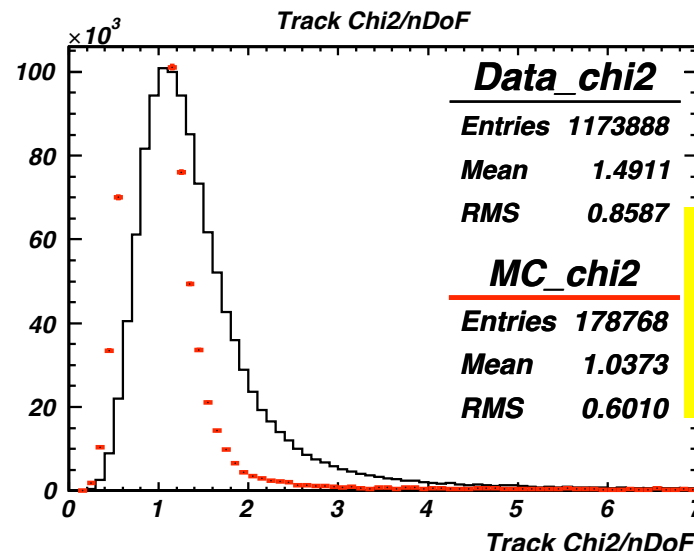
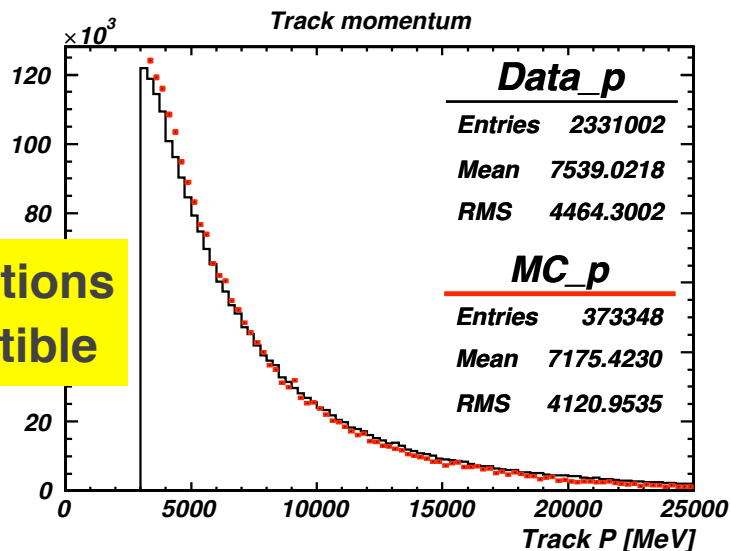


Guard against remaining mis-alignments

I only consider expected hits that are not near edge of sensor (2mm)

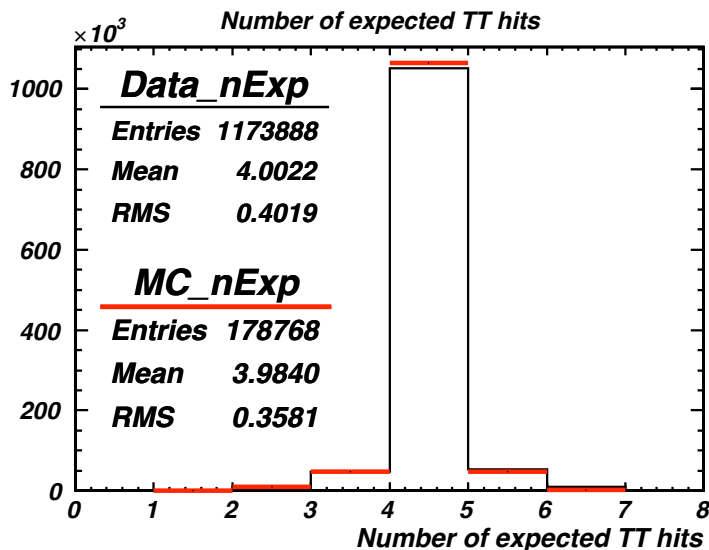


Track selection (Collision Vs MC)

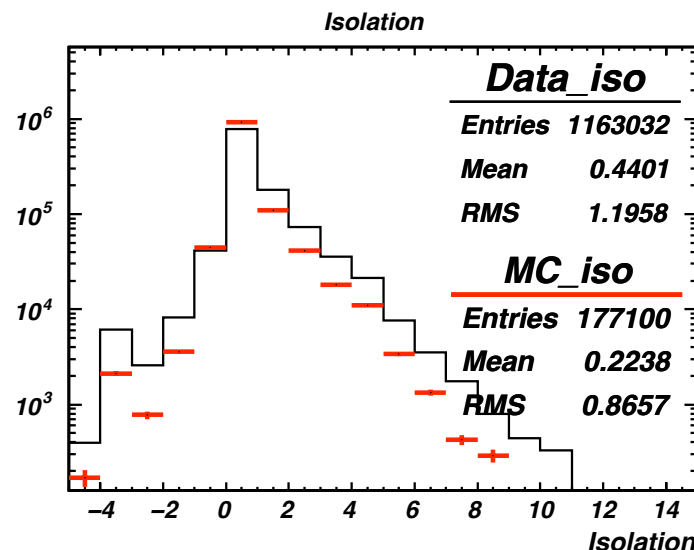


Real data has worse Chi2 (I cut at 7)

Distributions Compatible



Distributions Compatible

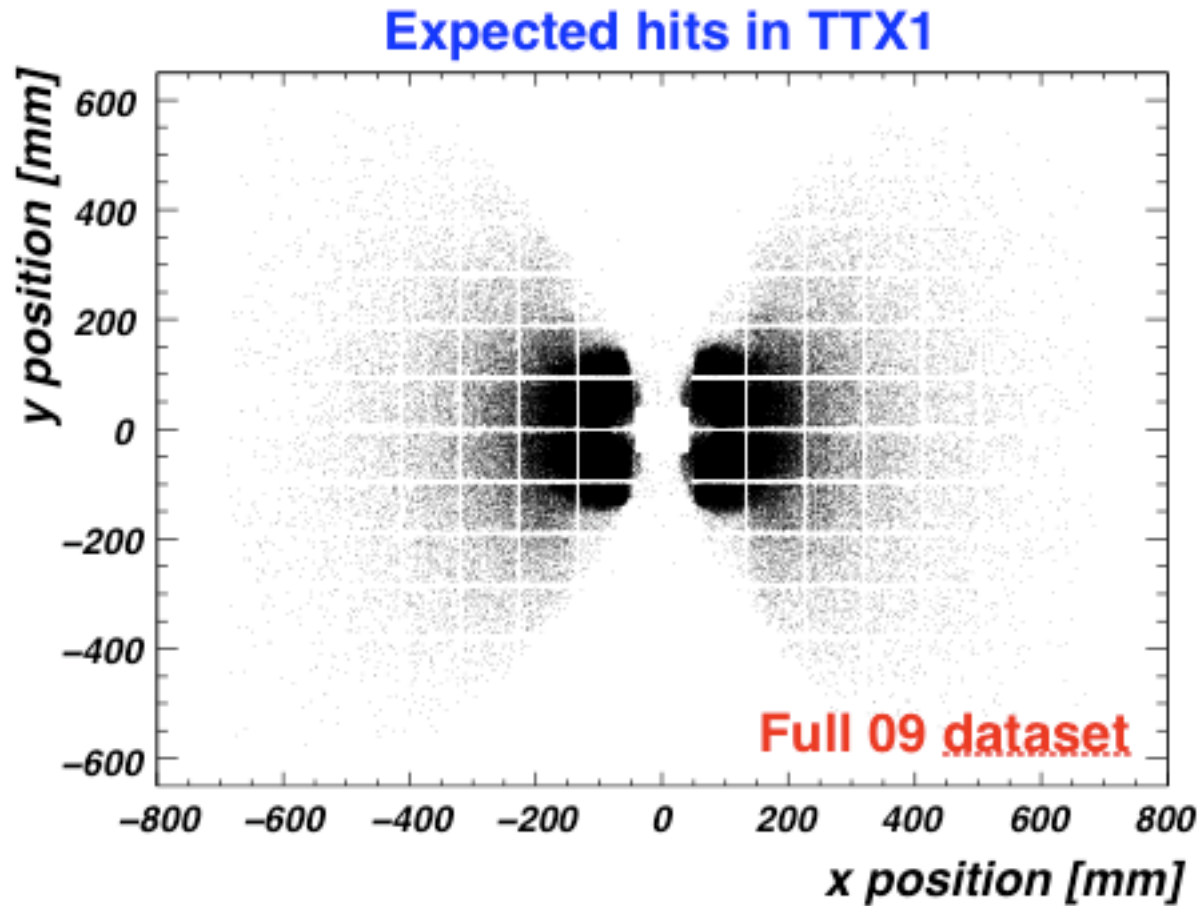


Occupancy higher than expected

Can we determine efficiencies by sector?

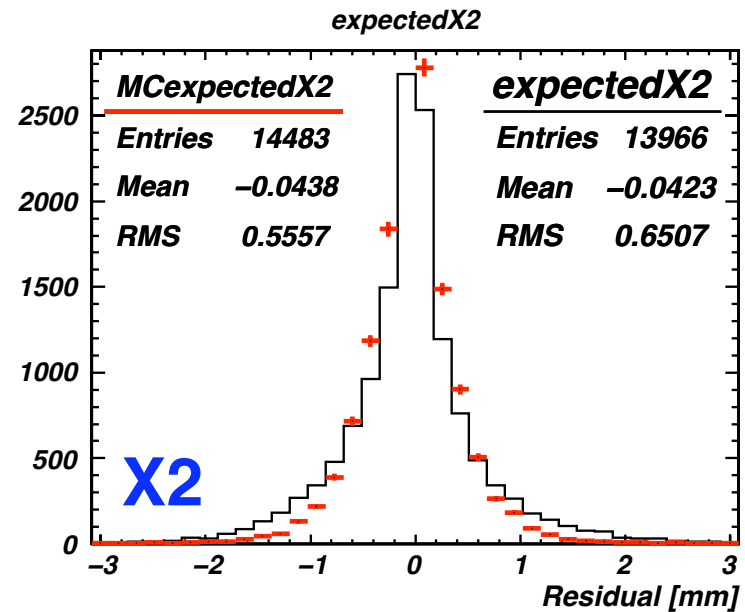
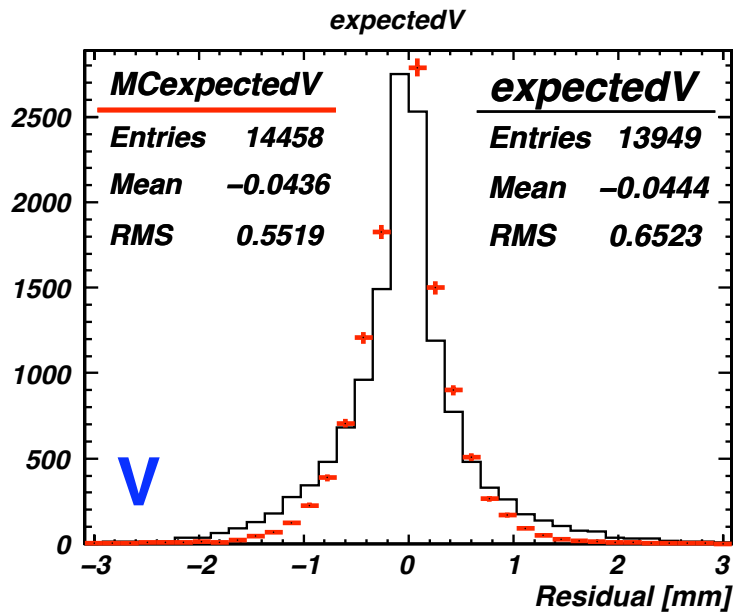
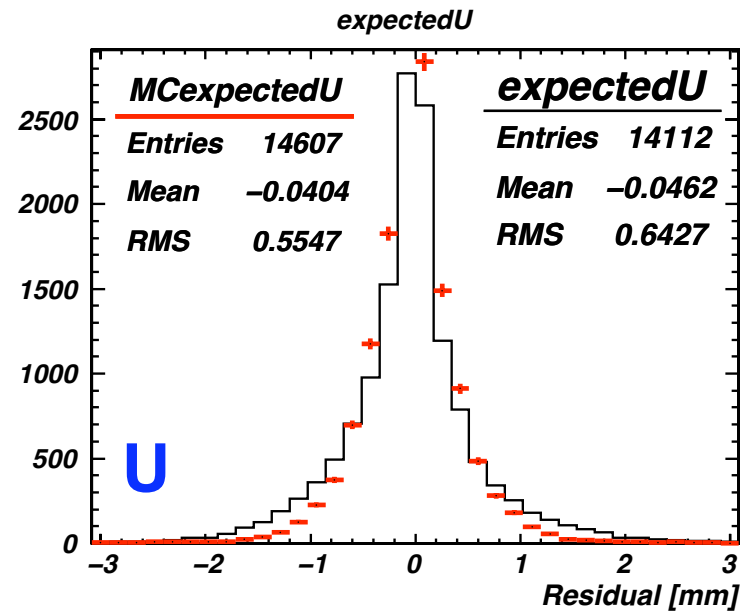
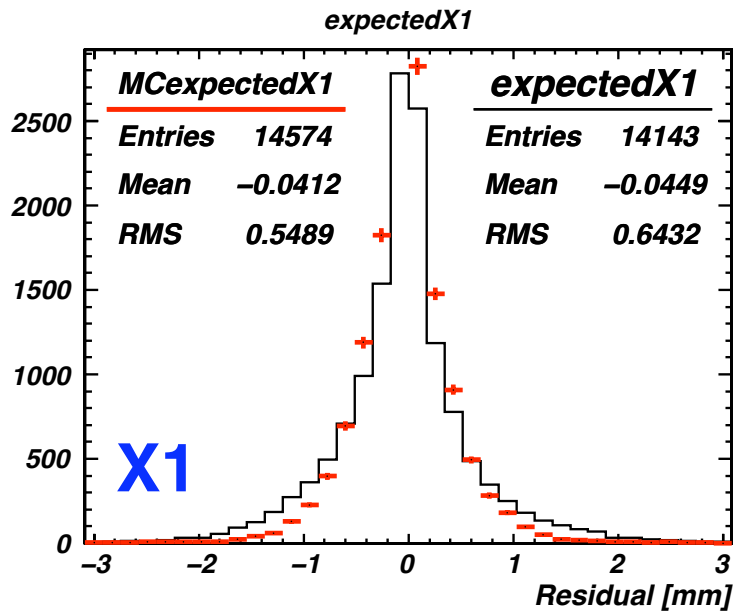


No, central region well covered but not enough stats at edges and above and below the beam pipe (Velo open)

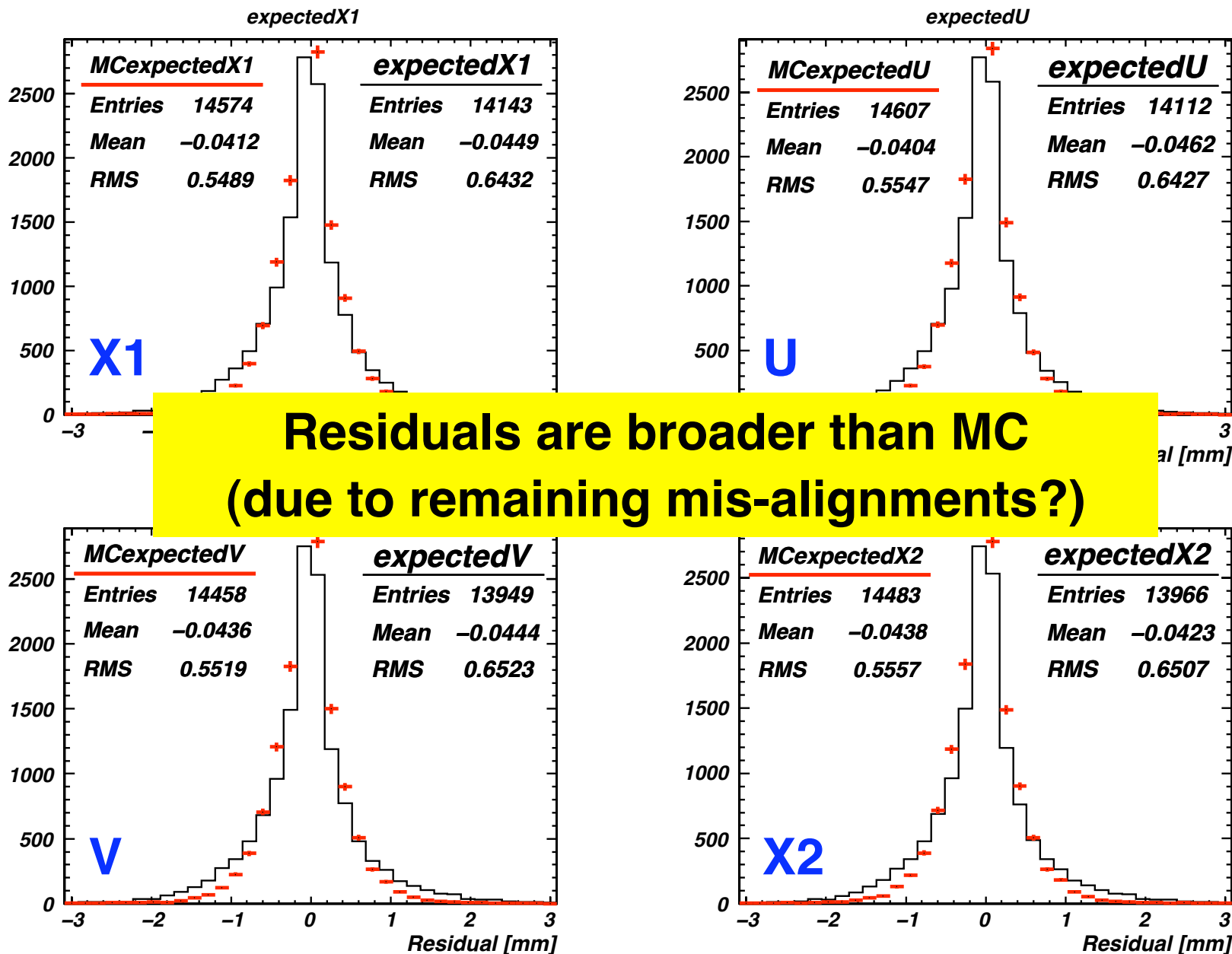


I will only show efficiencies by layer...

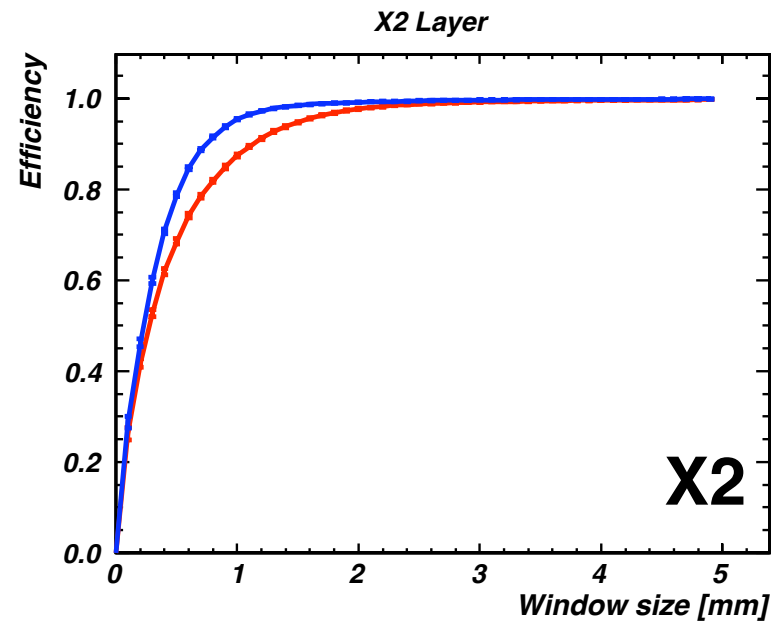
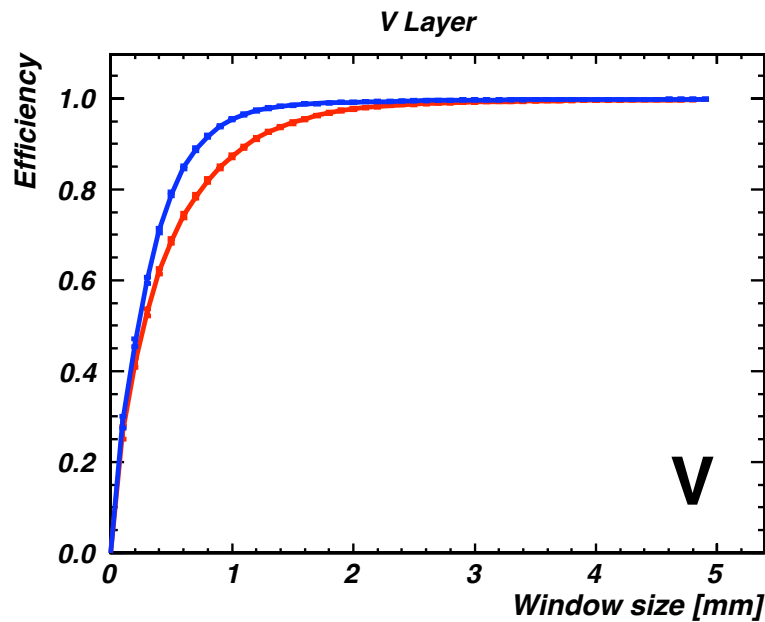
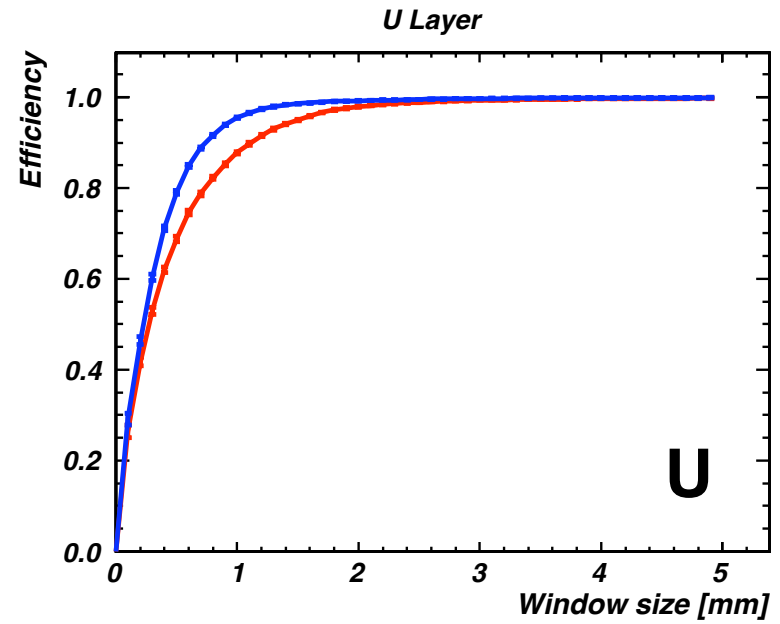
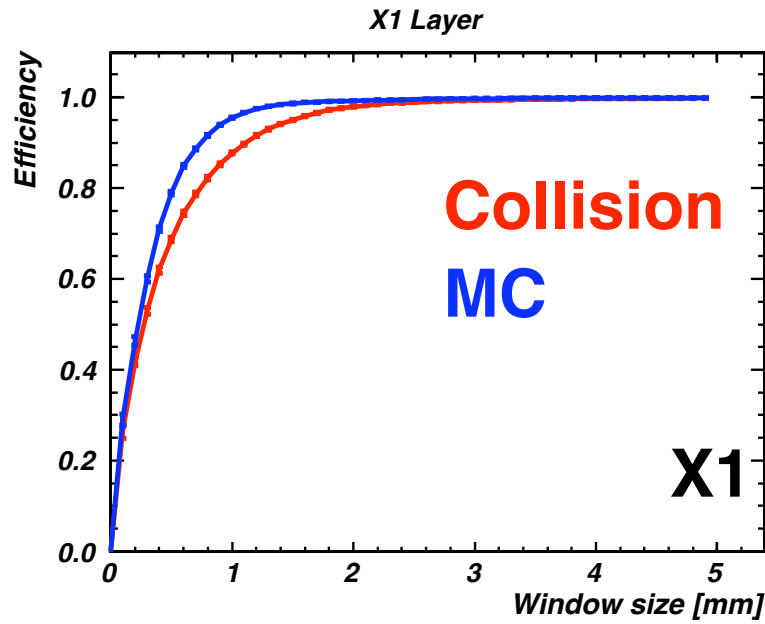
3D residuals (by layer)



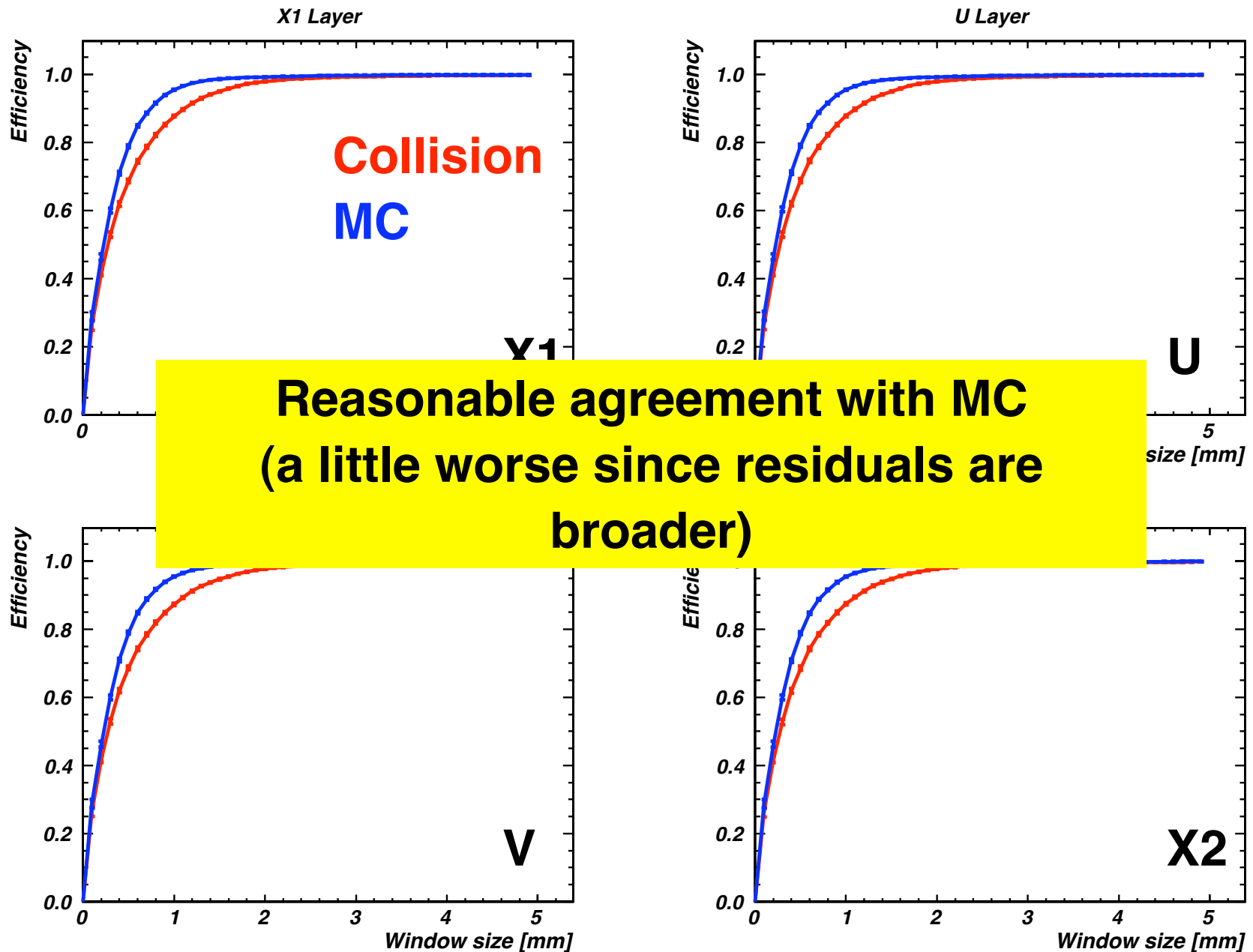
3D residuals (by layer)



Efficiency Vs window size



Efficiency Vs window size



Thresholds



The efficiency depends on the clustering thresholds

Current TT thresholds

Inclusion threshold per strip $S/N = 2.5$

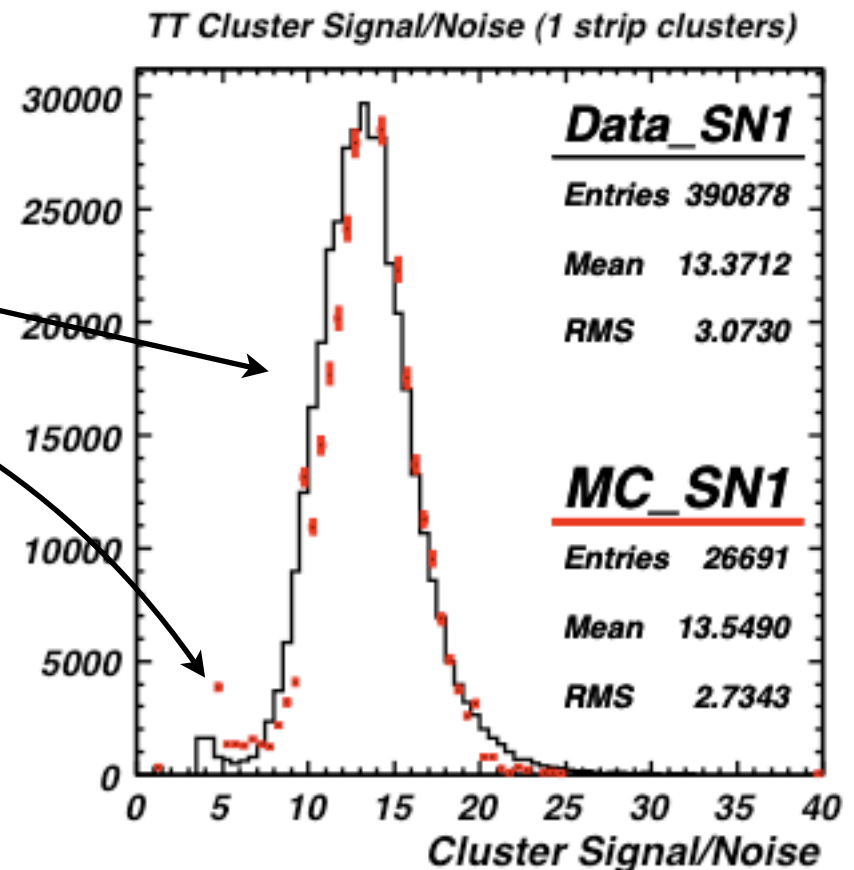
Confirmation threshold $S/N = 4$

Agreement between collision data and MC

Noise tail visible

Increasing confirmation threshold to 7 will remove remaining noise

Would lead to a drop in efficiency according to our definition (e.g. 0.96 \rightarrow 0.953)



Thresholds



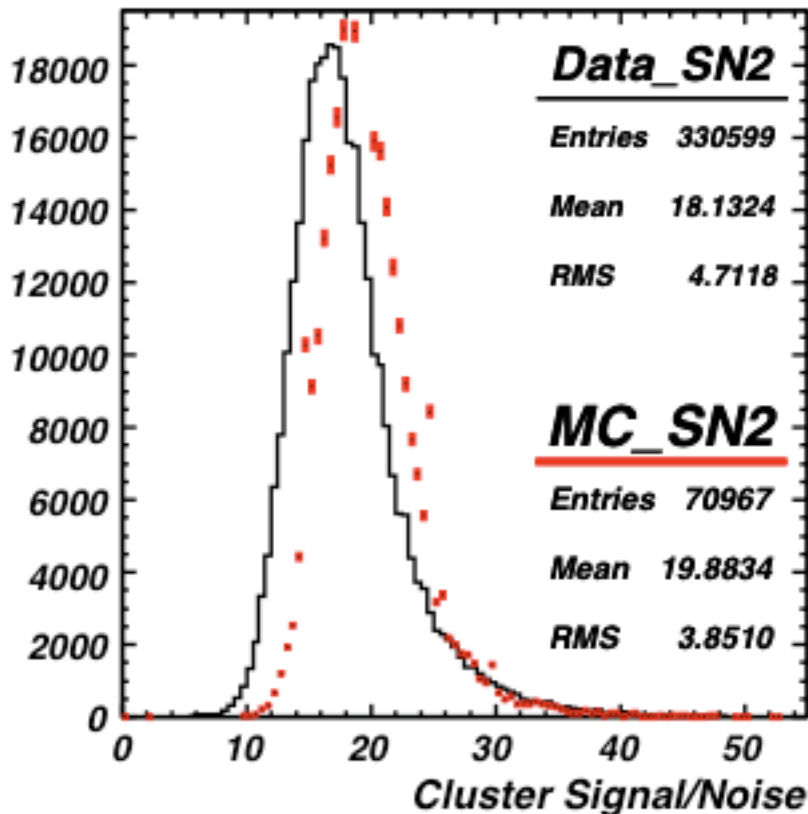
The efficiency depends on the clustering thresholds

Current TT thresholds

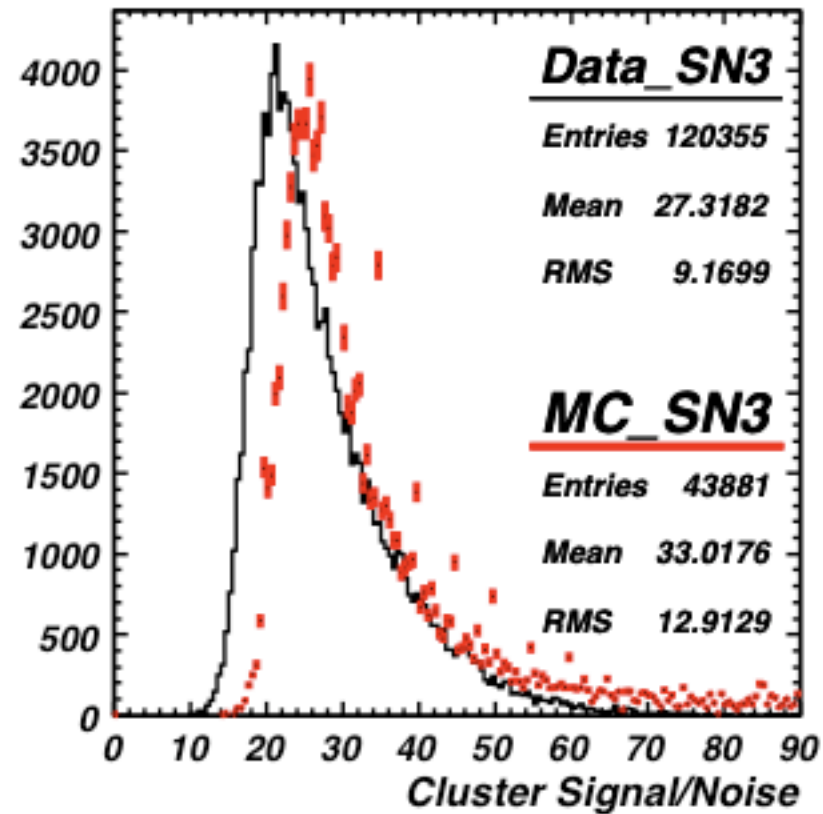
Inclusion
Confirmation

**Aside: poorer agreement for multi-strip
(worse charge sharing?)**

TT Cluster Signal/Noise (2 strip clusters)



TT Cluster Signal/Noise (3 strip clusters)



Thresholds

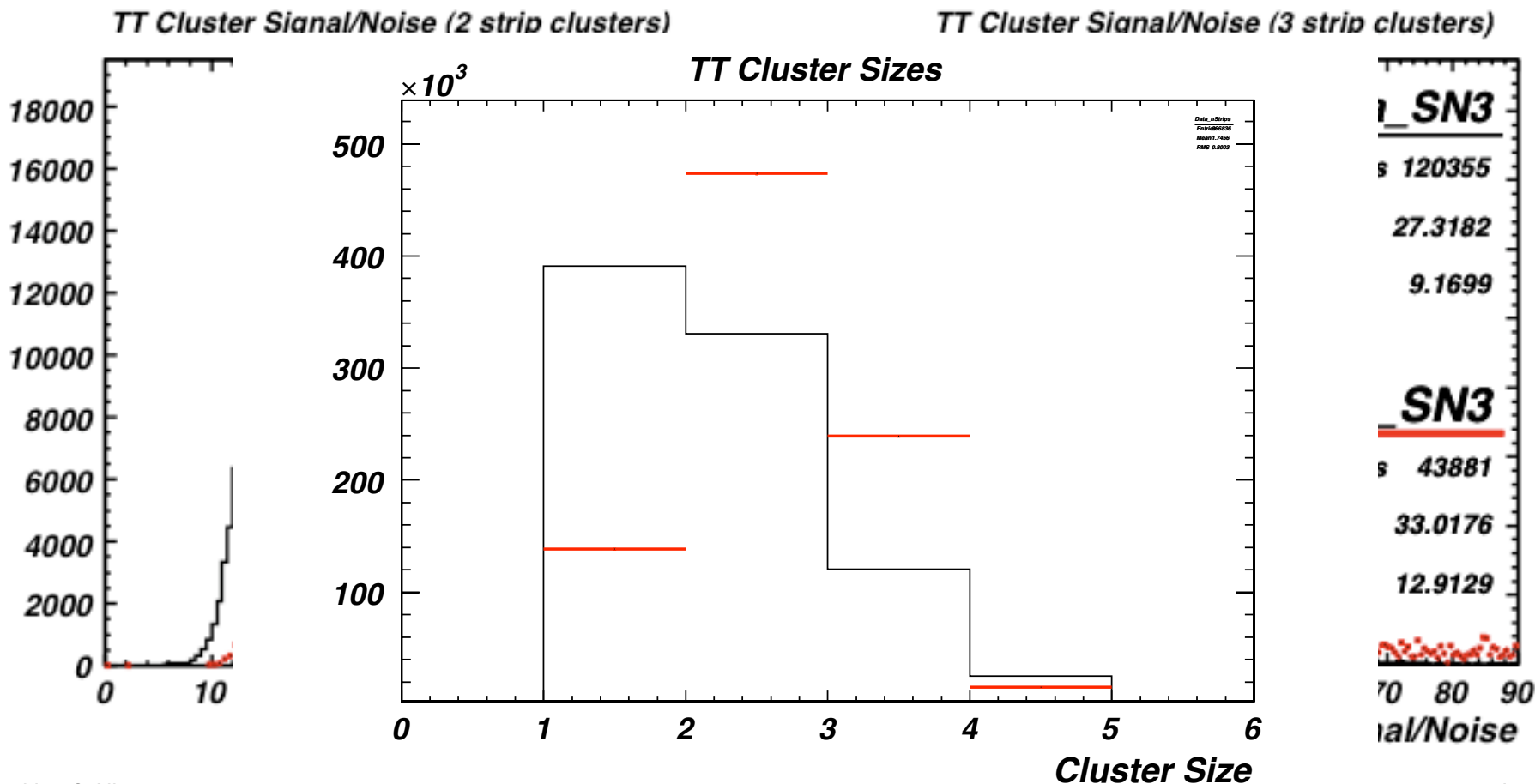


The efficiency depends on the clustering thresholds

Current TT thresholds

Inclusion
Confirmation

**Aside: poorer agreement for multi-strip
(worse charge sharing?)**



Conclusions



Efficiencies have been investigated at the layer level

- **Much more data required for detailed sector by sector study**

TT efficiencies from collision data and Monte-Carlo agree

- **Difference is probably due to remaining mis-alignments**