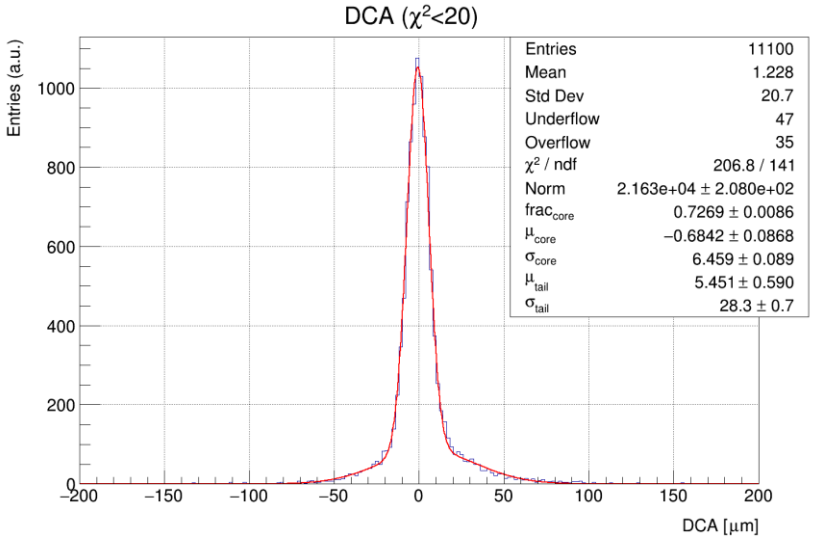
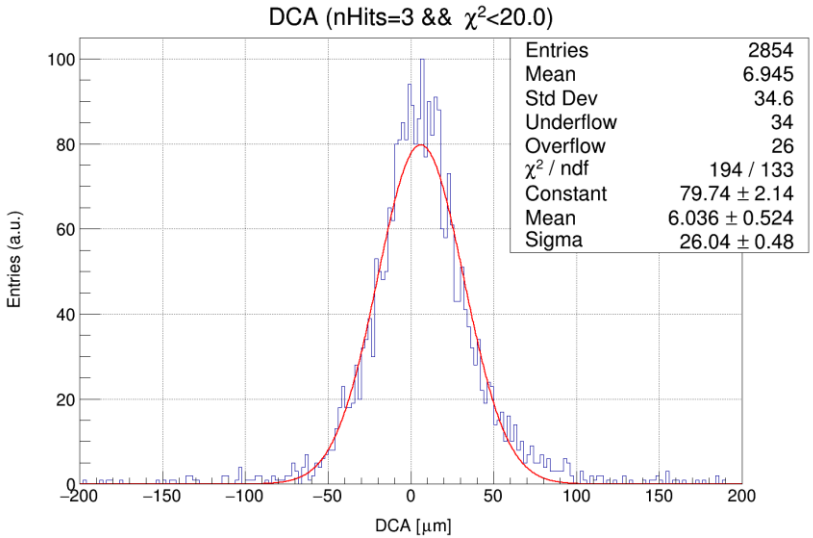
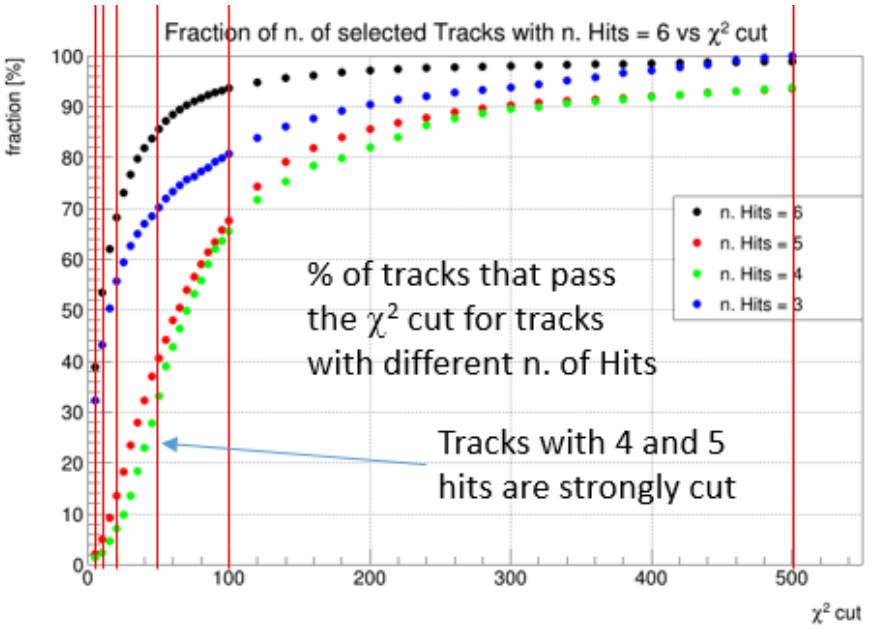
Update on ITS3 test beam analysis

Remainder and Status

- Open questions:
  - why the DCA of tracks with 3 hits is significantly shifted?
  - why the quality (χ^2/p-val) of the tracks with 4 and 5 hits is worst?



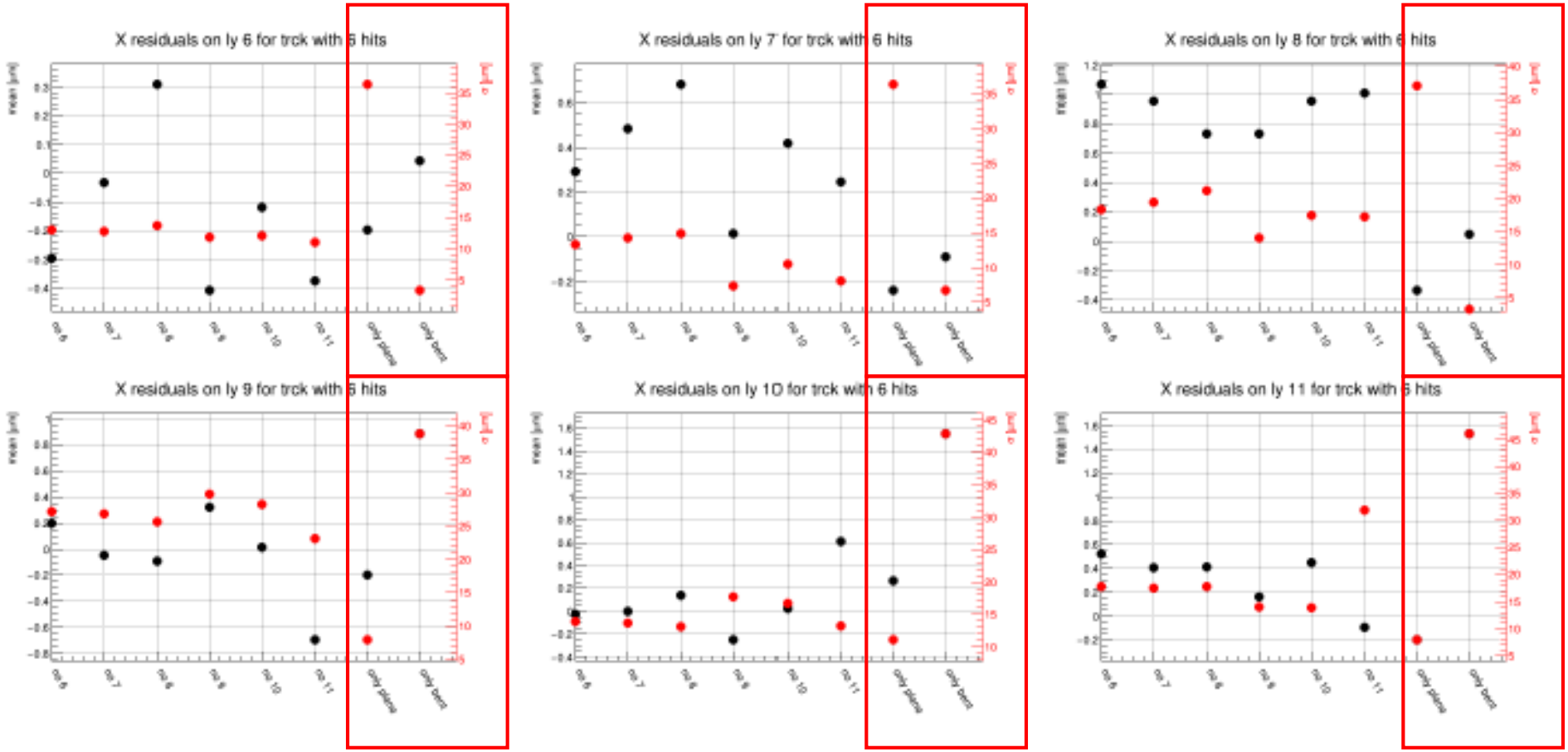




Remainder and Status

- It seems that there is a residual misalignment, especially between bent and plane layers.

X Residuals distributions per layers for Tracks with p-val>0 and nHit=6

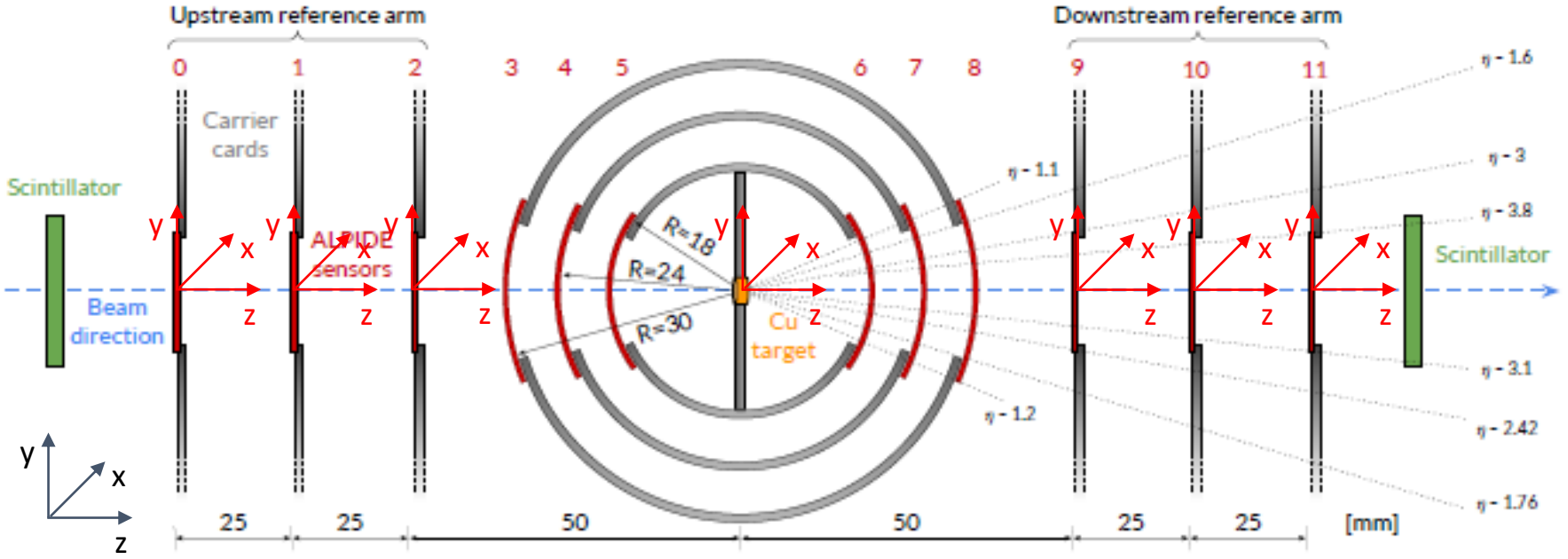


New additional alignment method

- We decided to introduce a new alignment procedure to try to refine the reached alignment.
- The method works outside of Corryvreckan as ROOT macro:
  1. Take the reconstructed tracks (eventually applying some quality cuts)
  2. One or more layers can be excluded from the track fitting
  3. One or more layers can be selected to be aligned
  4. The tracks are fitted with the selected layers
  5. The geometrical properties of the layers that have to be aligned are updated
  6. The tracks are re-fitted
  7. The global χ^2 of the tracks or a global probability is evaluated
  8. Step 4-7 are repeated iteratively up to a minimum/maximum of the χ^2/probability is reached
     (χ^2 or ML method can be used)

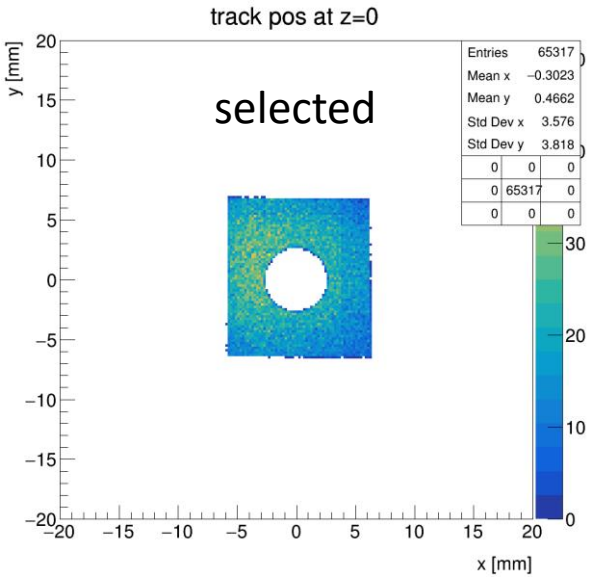
New additional alignment method

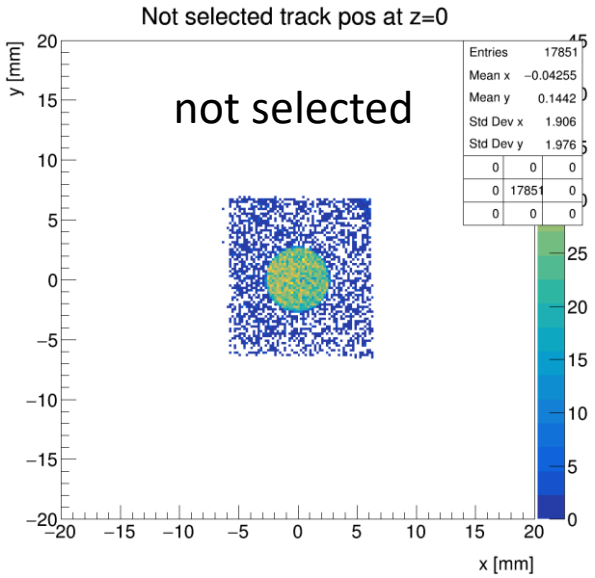
- Layer geometrical properties:
  - sensors “general” positioning is assume to be already resolved, the movements are applied starting from their nominal positions
  - For bent layer their radius can be modified
  - Layers can rotate respect to their nominal center around X, Y and Z axes
  - Layers centers offsets (X,Y,Z) can be added



Re-alignment of the alignment data set

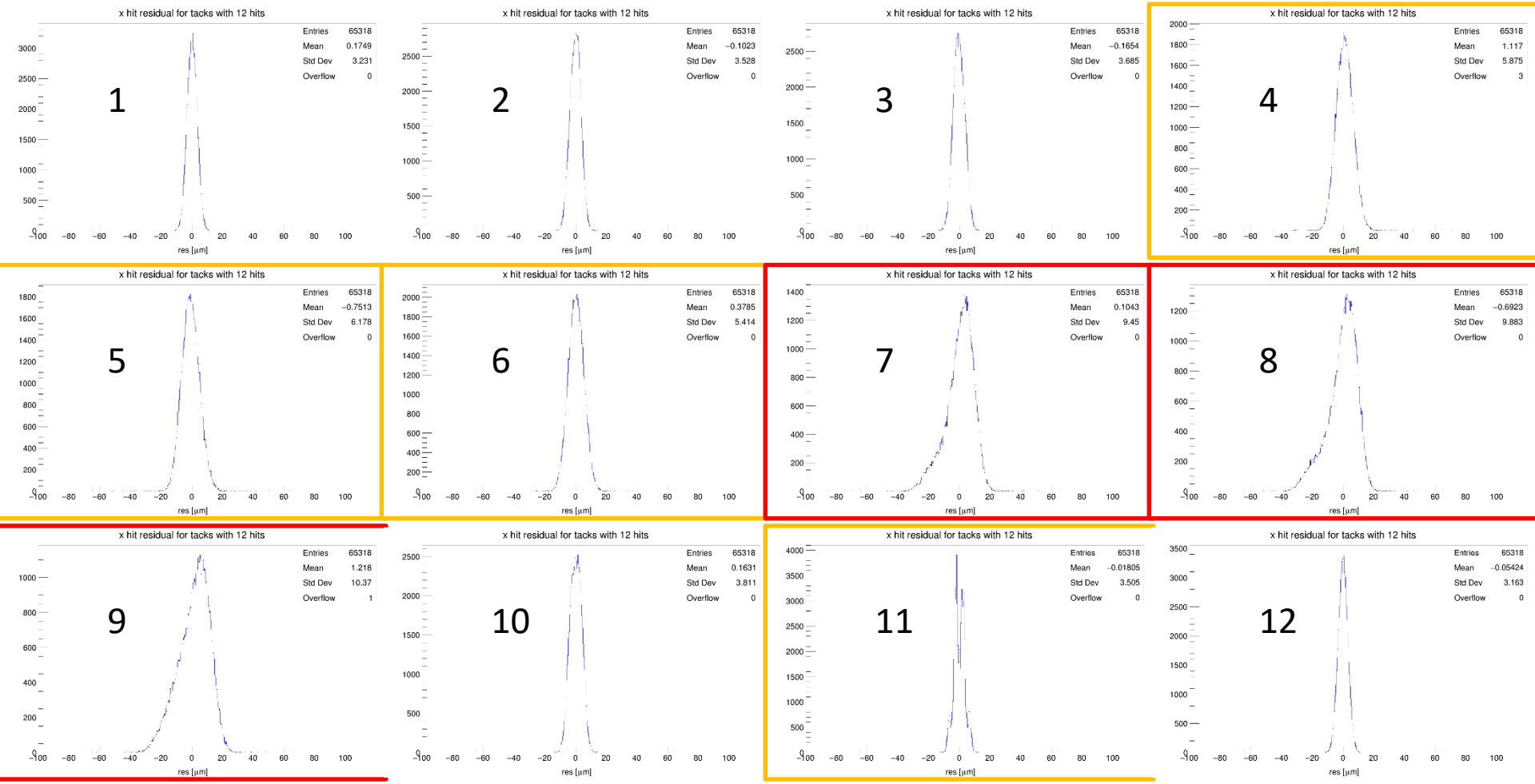
- To align the system a set of about 92200 single track events were used
- Check of the current alignment status:
  - to don't bais the residual, the tracks are fitted by using only the flat layers and the following selection criteria are used:
    - p-val > 5%
    - $\eta > 8$
    - d(z=0) > 2.7 mm (to avoid the target)





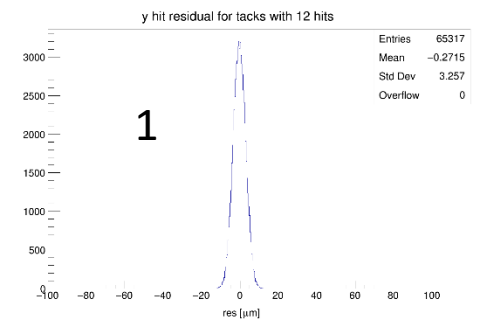
Re-alignment of the alignment data set: check

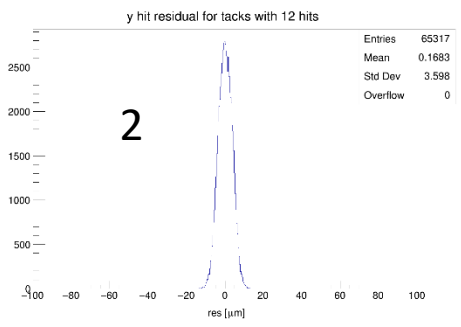
Residuals on X

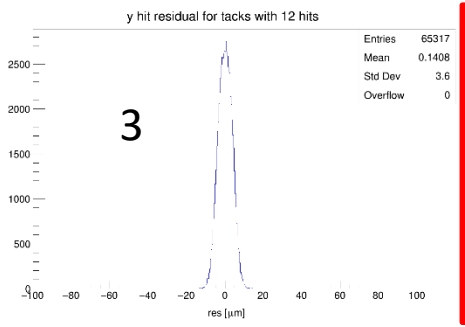


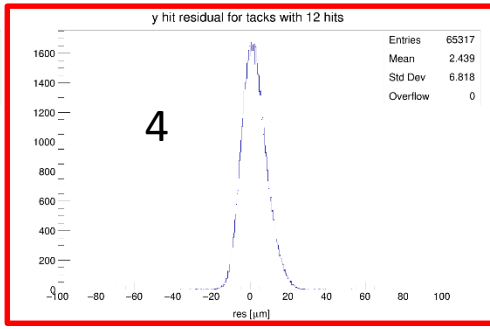
Re-alignment of the alignment data set: check

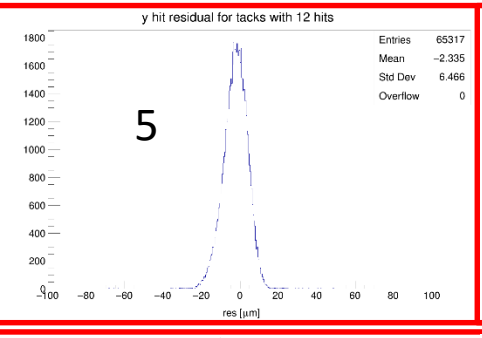
Residuals on Y

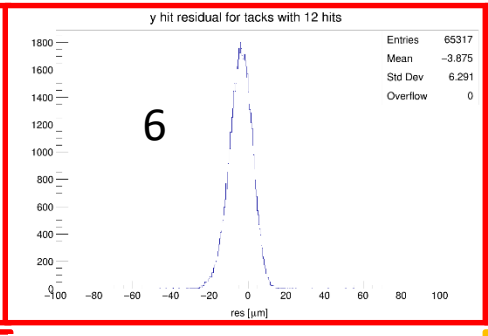


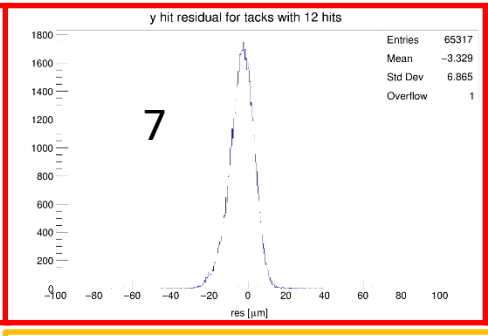


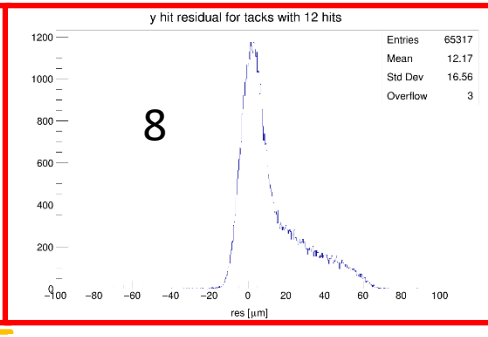


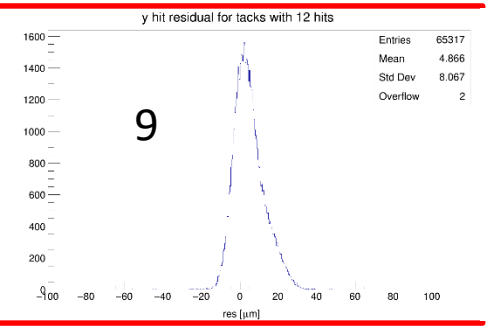


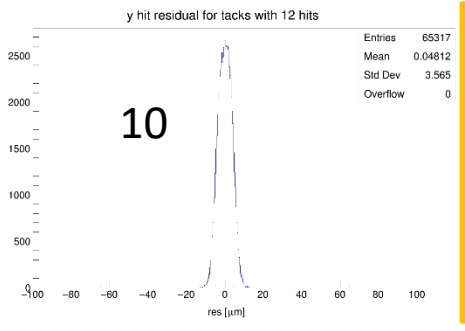


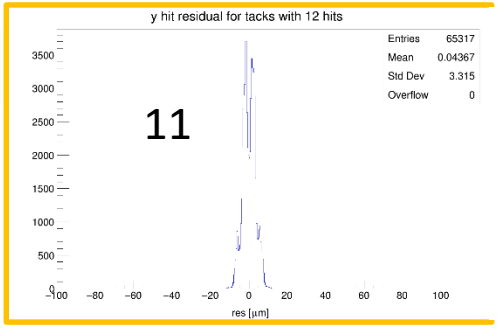


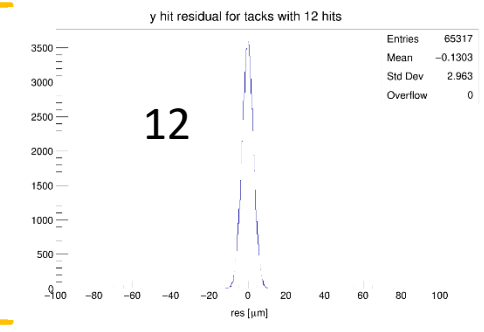






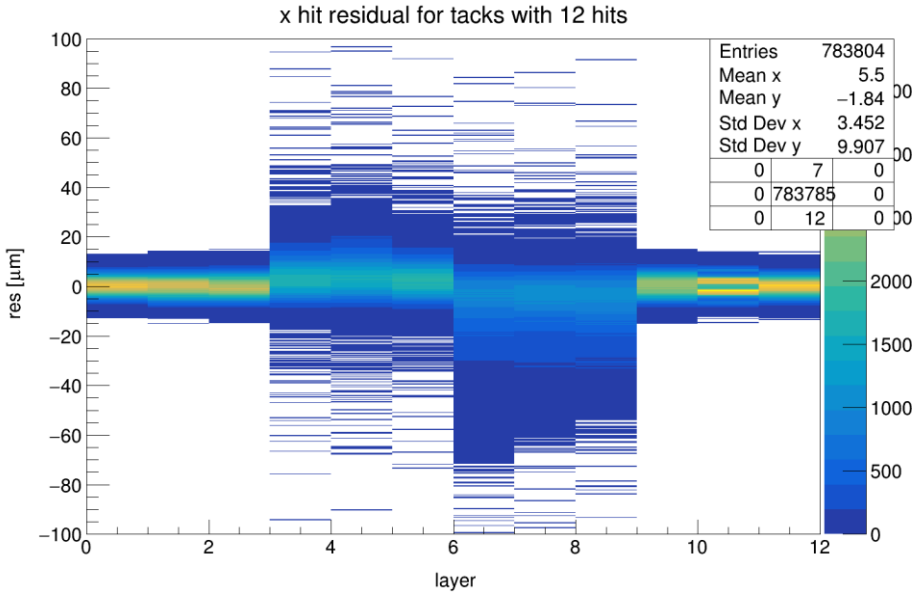


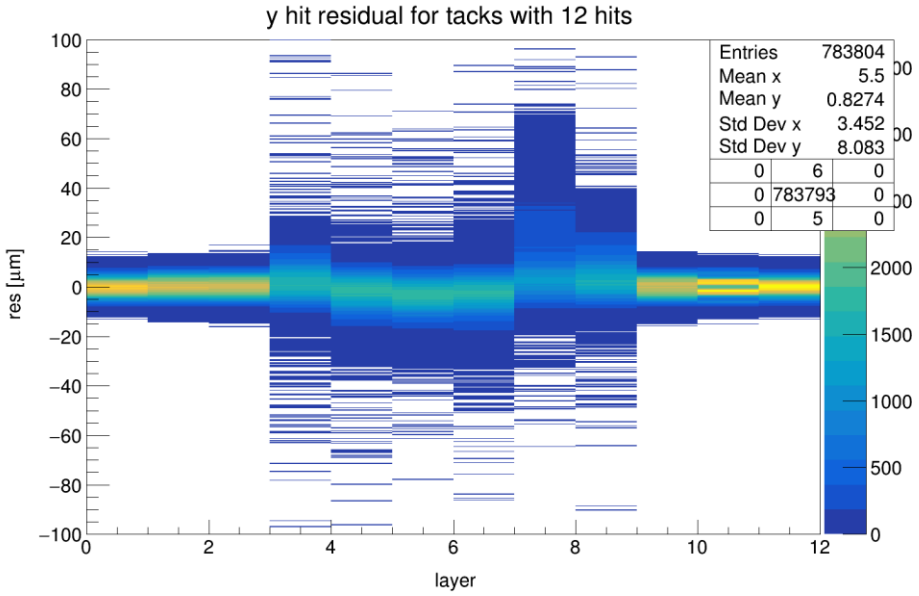




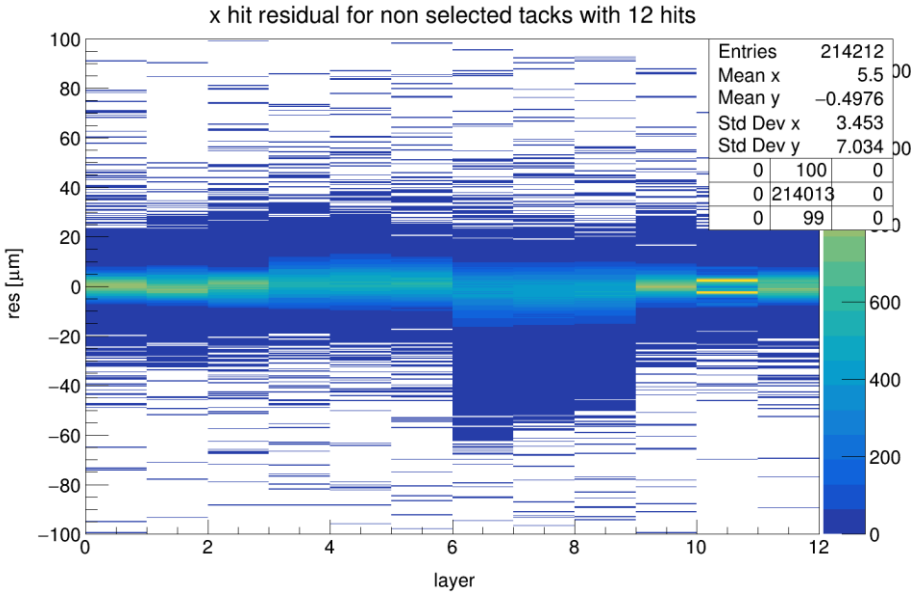
Re-alignment of the alignment data set: check

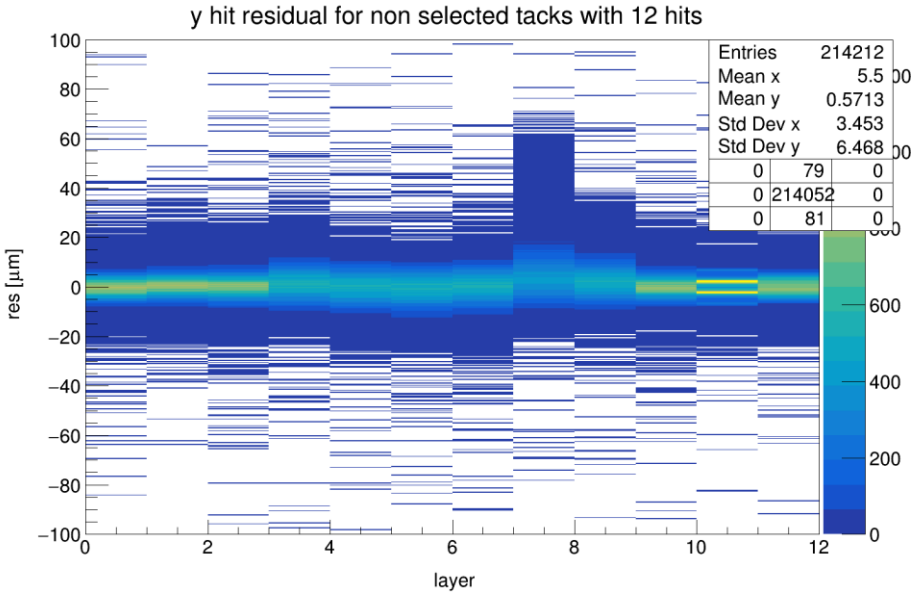
selected





not selected





Re-alignment of the alignment data set: check

- To proceed with the second alignment the first alignment data are needed to be able to transform the hits in their sensor local frame

[ALPIDE_0]
orientation = -0.096658deg,0.0261269deg,0.482201deg
position = 9.331um,6.744um,-100mm
[ALPIDE_1]
orientation = 0.0147823deg,-0.00435448deg,-0.145245deg
position = -952.535um,-93.781um,-75mm
[ALPIDE_2]
orientation = 0.00802141deg,0.00429718deg,-0.294443deg
position = -814.475um,106.285um,-50mm
[ALPIDE_3]
orientation = 0.0148396deg,-0.00836518deg,90.0387deg
position = 910.03um,1.55357mm,-30mm
[ALPIDE_4]
orientation = 0.027903deg,1.48104deg,89.9099deg
position = 1.1072mm,385.58um,-24mm
[ALPIDE_5]
orientation = -0.974659deg,2.48566deg,89.9272deg
position = 826.939um,470.953um,-18mm

[ALPIDE_6]
orientation = 0.0591292deg,180.104deg,90.9439deg
position = -355.875um,1.23141mm,18mm
[ALPIDE_7]
orientation = -0.0609054deg,180.097deg,90.762deg
position = -648.574um,2.26835mm,24mm
[ALPIDE_8]
orientation = -0.00332316deg,180deg,90.0485deg
position = -104.285um,1.83396mm,30mm
[ALPIDE_9]
orientation = -0.0662339deg,0.111841deg,-0.5674deg
position = -2.48536mm,313.481um,50mm
[ALPIDE_10]
orientation = -0.0642286deg,0.120378deg,-0.55617deg
position = -2.89125mm,462.662um,75mm
[ALPIDE_11]
orientation = -0.0636556deg,0.132296deg,-0.510906deg
position = -3.55659mm,202.39um,100mm

The highlight rotations are needed to define the nominal poition of the sensors, we don’t need it for the second alignment step

Re-alignment of the alignment data set: check

- To proceed with the second alignment the first alignment data are needed to be able to transform the hits in their sensor local frame

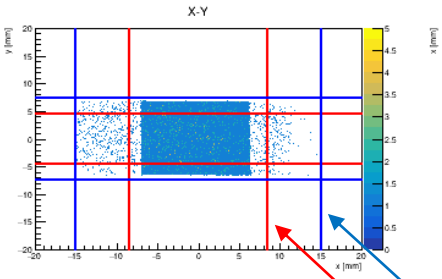
A new custom data format has been adopted, it should be equivalent to the previous data positioning apart from the rotation for the nominal positioning.
Note:

- 1e30 default value to flag the flat layers
- position step of 1um
- Rotation step of 1°/1000

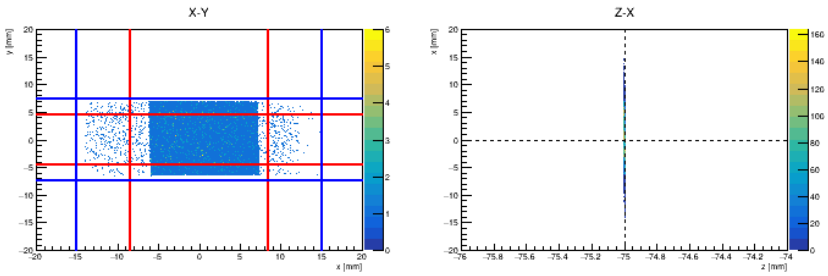
#Id	Radi[mm]	Cx[mm]	Cy[mm]	Cz[mm]	Rx[deg]	Ry[deg]	Rz[deg]
0	1e30	0.009	0.007	-100.000	-0.097	0.026	0.482
1	1e30	-0.952	-0.094	-75.000	0.015	-0.004	-0.145
2	1e30	-0.814	0.106	-50.000	0.008	0.004	-0.294
3	-30.0	0.910	1.554	0.000	0.015	-0.008	0.039
4	-24.0	1.107	0.386	0.000	0.028	1.481	-0.090
5	-18.0	0.827	0.471	0.000	-0.975	2.486	-0.073
6	18.0	-0.356	1.231	0.000	0.059	0.104	0.944
7	24.0	-0.649	2.268	0.000	-0.061	0.097	0.762
8	30.0	-0.104	1.834	0.000	-0.003	0.000	0.048
9	1e30	-2.485	0.313	50.000	-0.066	0.112	-0.567
10	1e30	-2.891	0.463	75.000	-0.064	0.120	-0.556
11	1e30	-3.557	0.202	100.000	-0.064	0.132	-0.511

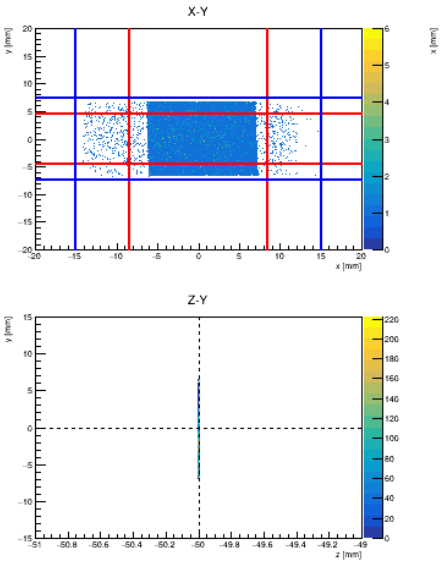
Re-alignment of the alignment data set: check

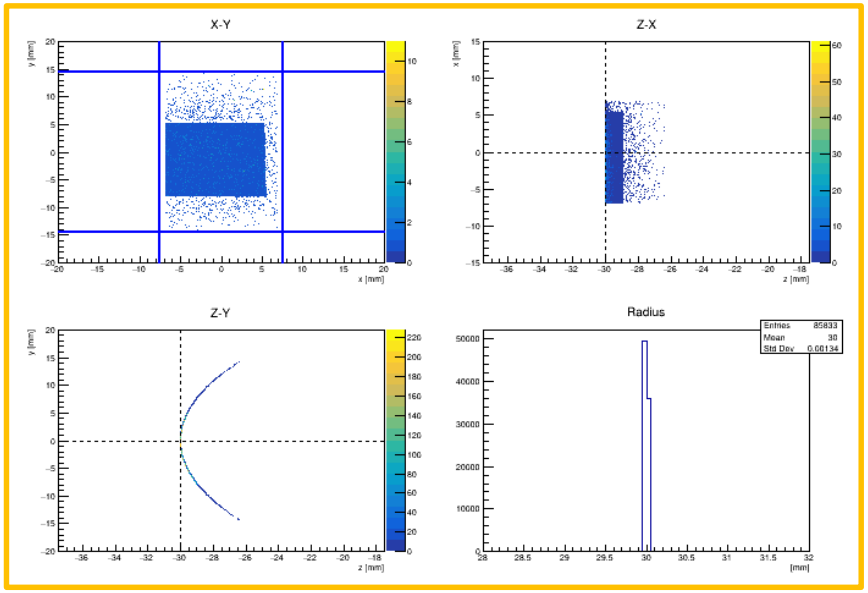
Check of the invers transformation



Blue: chip nominal limits
Red: flat layers jigs limits

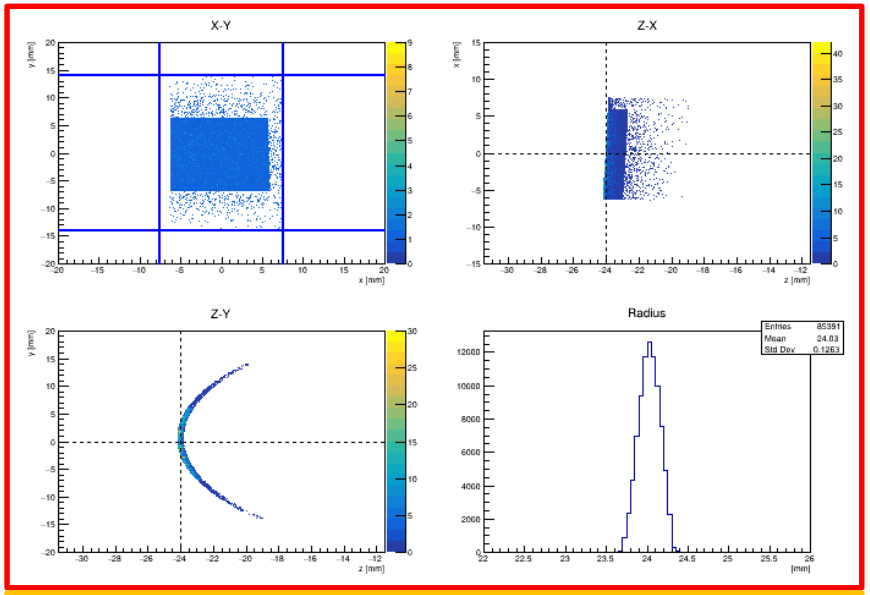


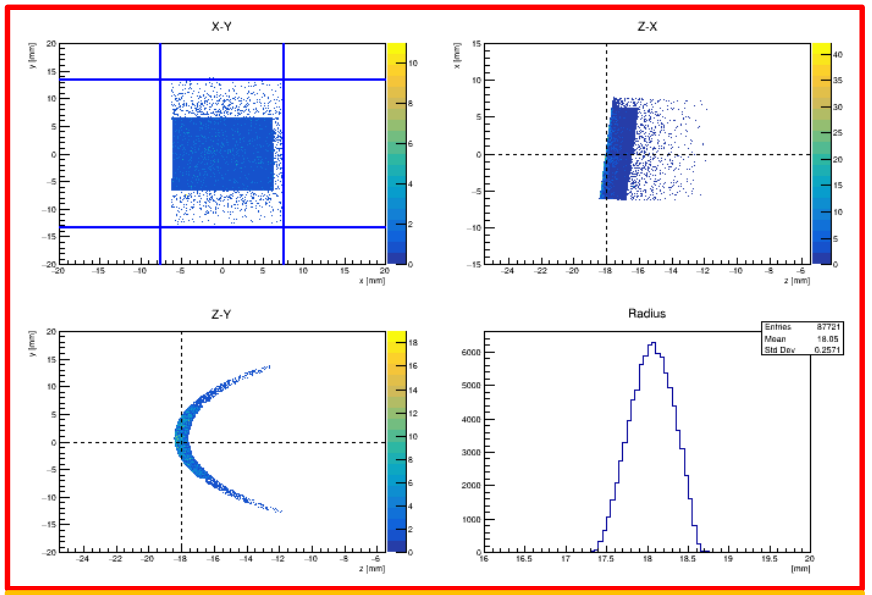


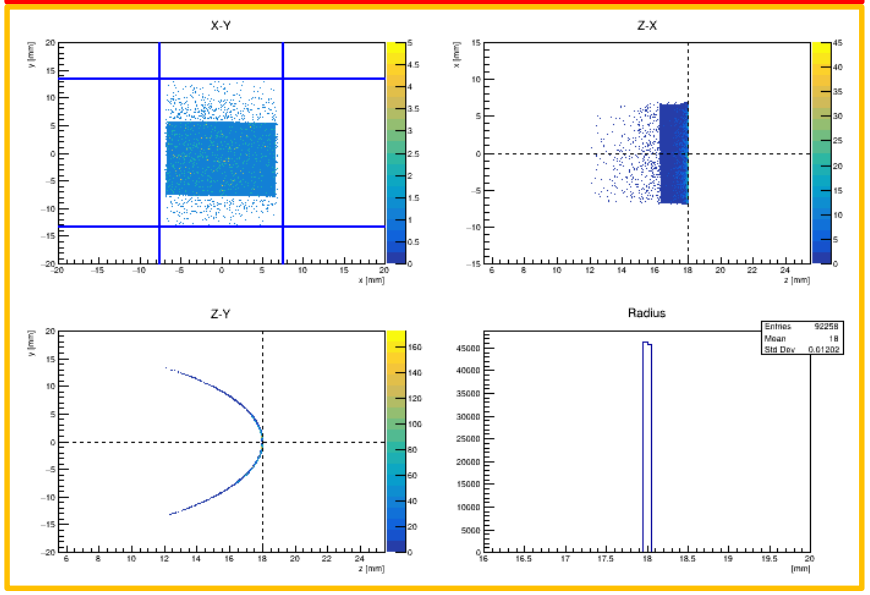


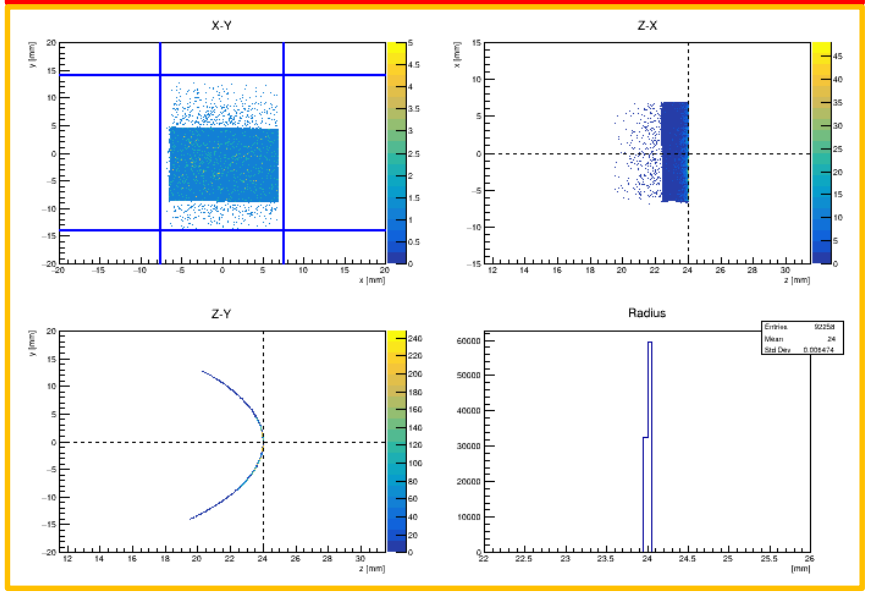
Re-alignment of the alignment data set: check

Check of the invers transformation



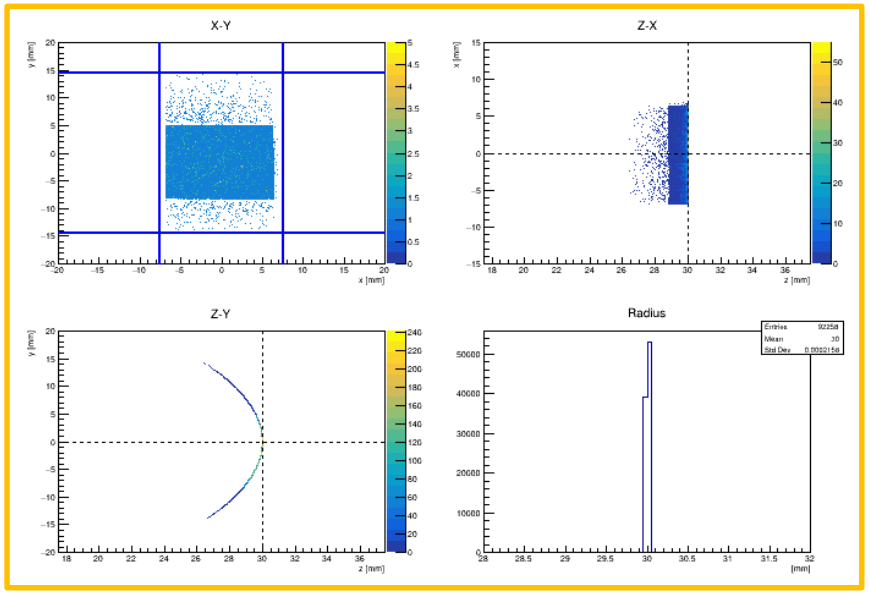


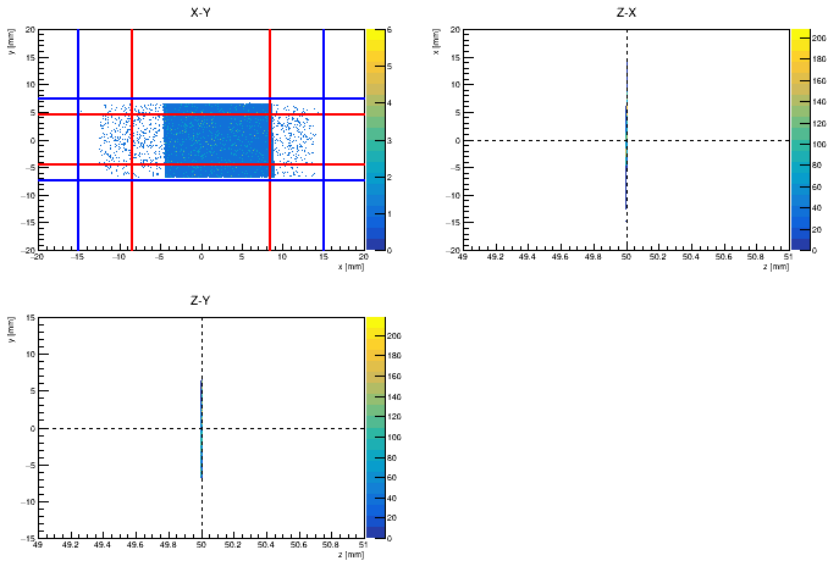


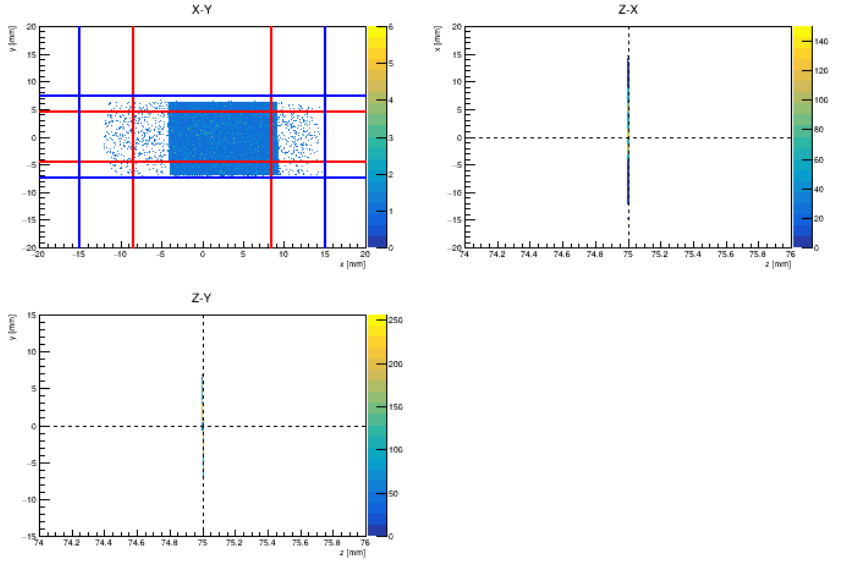


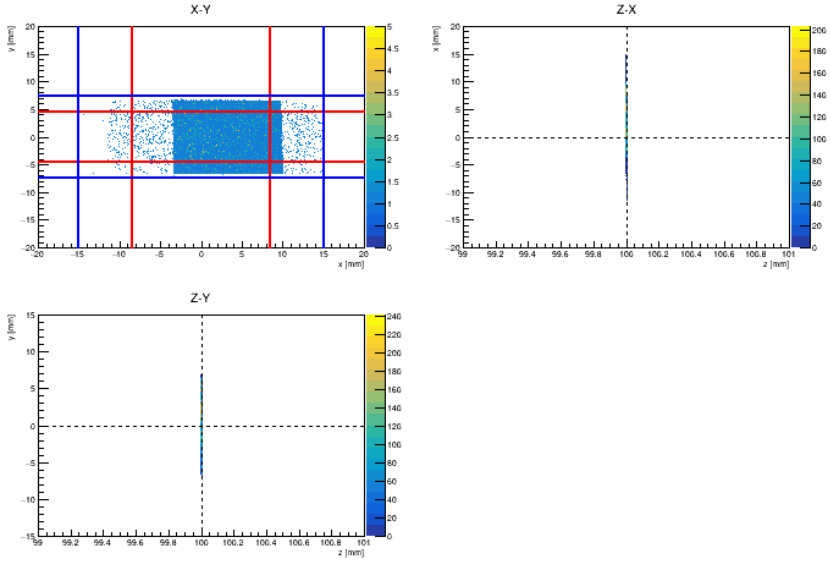
Re-alignment of the alignment data set: check

Check of the invers transformation









Re-alignment of the alignment data set: check

It seems that the inverse transformations are not very well
(why? Have the all bent layers been included in the alignment from beginning?):

- Some of the bent layer have a residual rotations
- Almost all the bent layers have some shift
- There are even some problems with the flat layers

The problems with the bent layers have to fixes because the applying rotations starting form a not well centered configuration cause wrong positioning that can be solved by the alignment procedure (The hit radius is calculated by their positon when they are in the sensor frame).

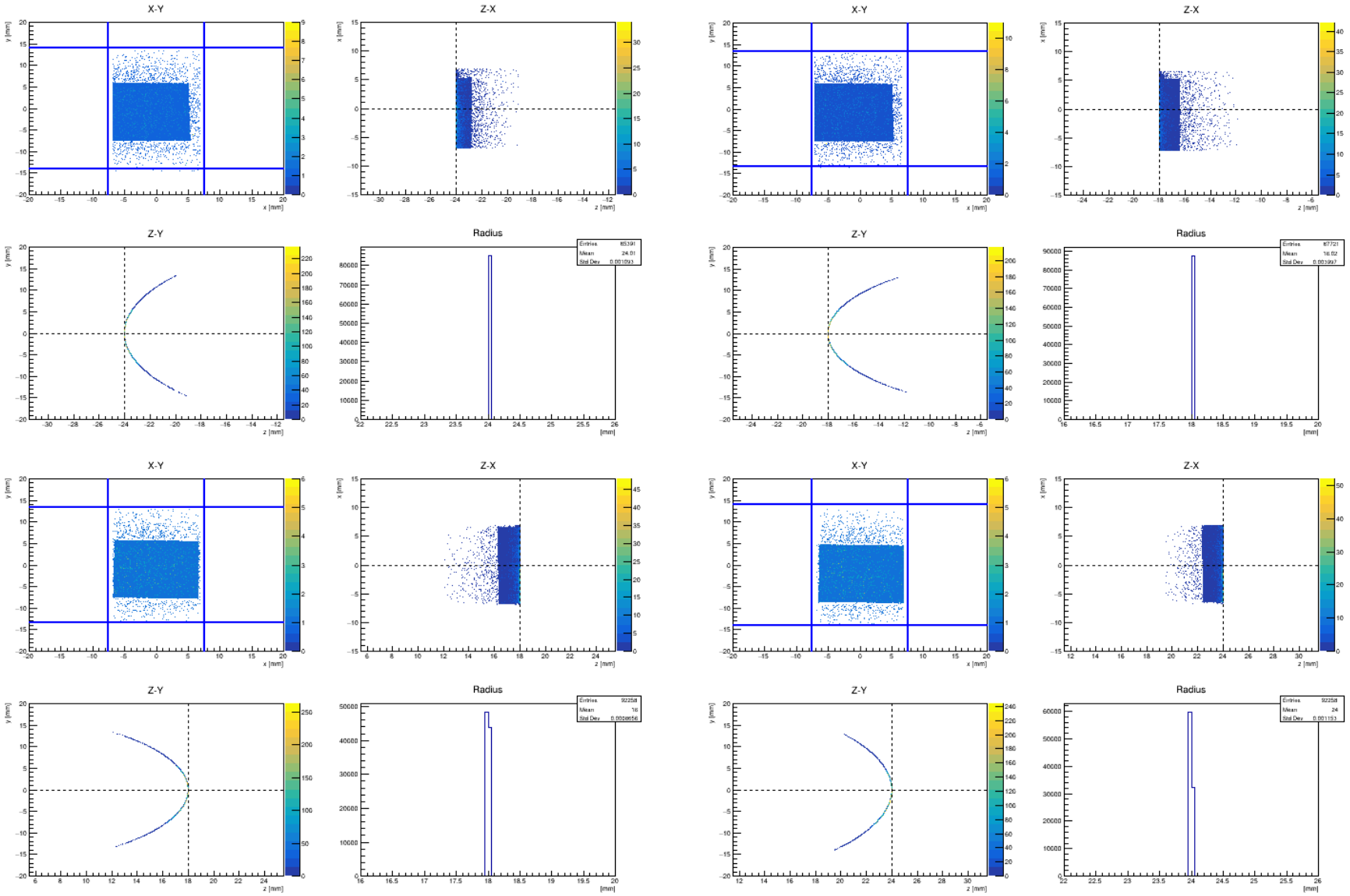
The problems with fat layers can be neglected because they not sensible to the same issue and the alignment can find a solution.

A fixing on the starting transformation is needed:

- The fix was done by hand, by correcting the rotation and the position and by checking the hits distributions, e.g. for some bent layers:

Re-alignment of the alignment data set: check

Check of the invers transformation (layers 5-8 after corrections)



Re-alignment of the alignment data set: check

Form Cory:

#Id	Radi[mm]	Cx[mm]	Cy[mm]	Cz[mm]	Rx[deg]	Ry[deg]	Rz[deg]
0	1e30	0.009	0.007	-100.000	-0.097	0.026	0.482
1	1e30	-0.952	-0.094	-75.000	0.015	-0.004	-0.145
2	1e30	-0.814	0.106	-50.000	0.008	0.004	-0.294
3	-30.0	0.910	1.554	0.000	0.015	-0.008	0.039
4	-24.0	1.107	0.386	0.000	0.028	1.481	-0.090
5	-18.0	0.827	0.471	0.000	-0.975	2.486	-0.073
6	18.0	-0.356	1.231	0.000	0.059	0.104	0.944
7	24.0	-0.649	2.268	0.000	-0.061	0.097	0.762
8	30.0	-0.104	1.834	0.000	-0.003	0.000	0.048
9	1e30	-2.485	0.313	50.000	-0.066	0.112	-0.567
10	1e30	-2.891	0.463	75.000	-0.064	0.120	-0.556
11	1e30	-3.557	0.202	100.000	-0.064	0.132	-0.511

Cory Fixed:

#Id	Radi[mm]	Cx[mm]	Cy[mm]	Cz[mm]	Rx[deg]	Ry[deg]	Rz[deg]
0	1e30	0.009	0.007	-100.000	-0.097	0.026	0.482
1	1e30	-0.952	-0.094	-75.000	0.015	-0.004	-0.145
2	1e30	-0.814	0.106	-50.000	0.008	0.004	-0.294
3	-30.0	0.910	1.554	0.000	0.015	0.015	0.039
4	-24.0	1.107	1.000	0.000	0.028	0.020	-0.090
5	-18.0	0.827	1.271	0.000	-0.975	-0.970	-0.073
6	18.0	-0.356	1.200	0.000	0.059	-0.045	0.944
7	24.0	-0.649	2.220	0.000	-0.061	0.061	0.762
8	30.0	-0.104	1.834	0.000	-0.003	0.002	0.048
9	1e30	-2.485	0.313	50.000	-0.066	0.112	-0.567
10	1e30	-2.891	0.463	75.000	-0.064	0.120	-0.556
11	1e30	-3.557	0.202	100.000	-0.064	0.132	-0.511

Re-alignment of the alignment data set

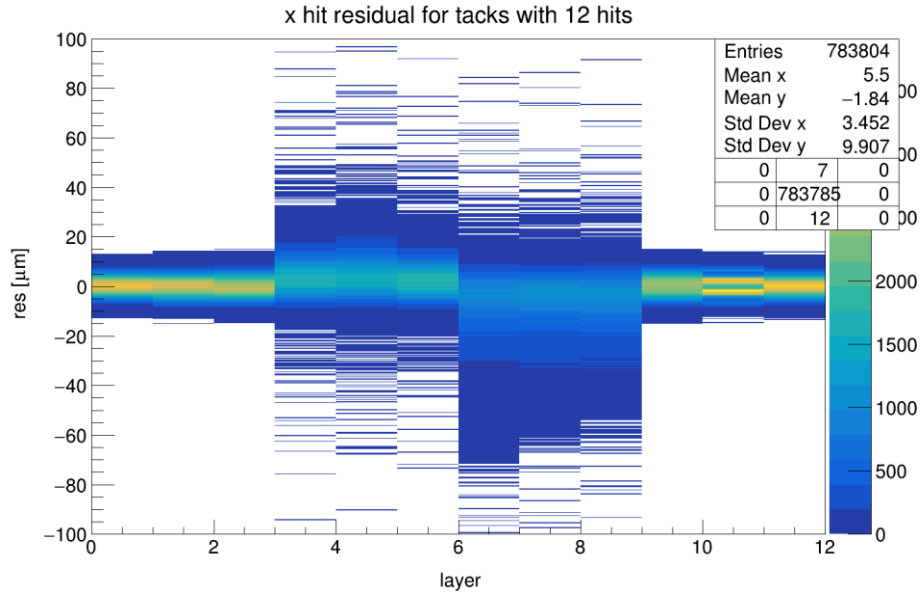
The new alignment was performed in steps:

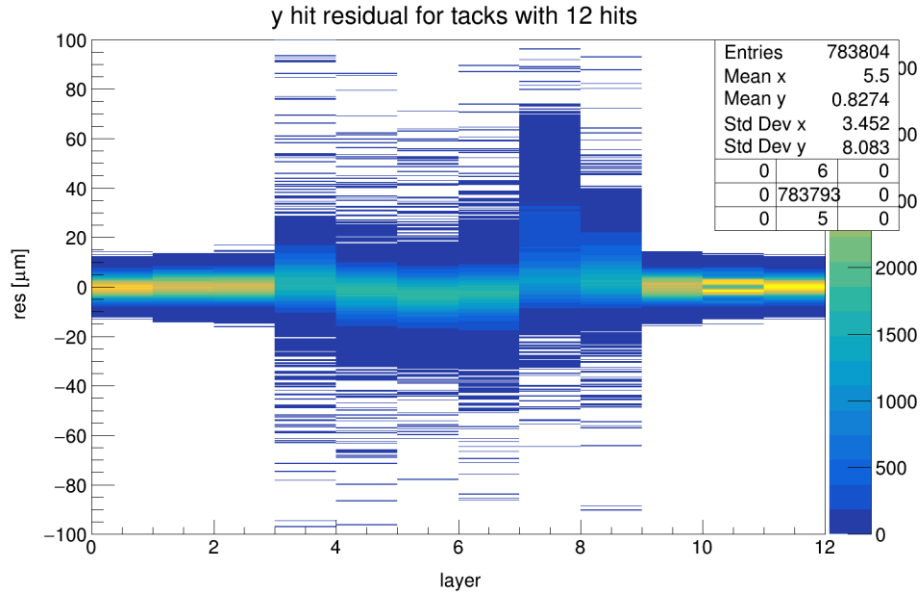
- The flat layers are well aligned so they are used as references in the first steps;
- The alignment is performed to fit layers rotations and C_x and C_y;

1. Using only the first 5000 events, each single bent layer are aligned one by one respect to the flat layers. After all the bent layers are aligned all together;
2. A second iteration of the alignment of the bent layers (as before) is repeated using the second 5000 events starting from the configuration found in step 1;
3. A third iteration of the alignment of all the layers, one by one, and after all together, are aligned using the second 10000 events starting from the configuration found in step 2.
4. A final refinement of the layers offsets is performed by hand (not strictly needed)
5. The residuals are evaluated even respect to the tracks fitted with all the layers after the alignment.

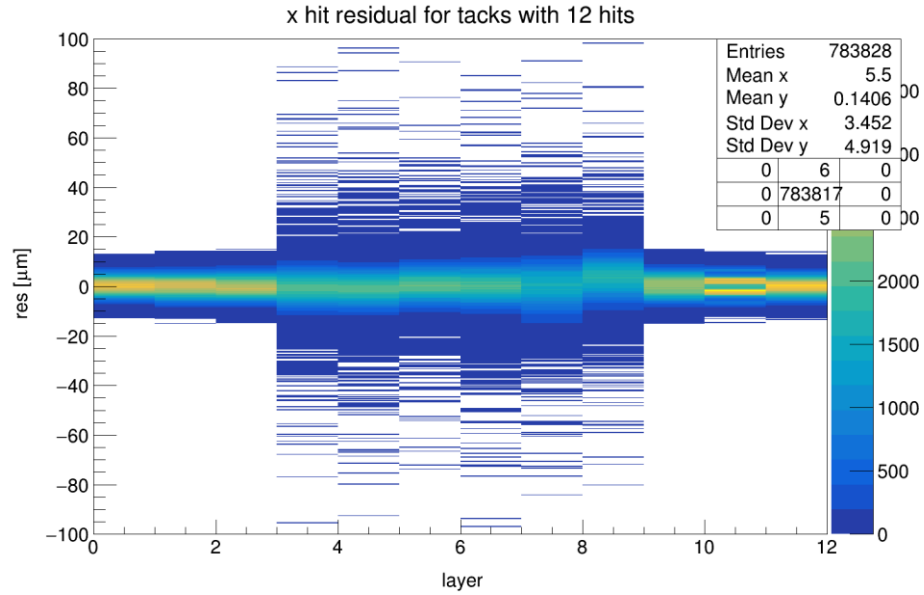
Re-alignment of the alignment data set

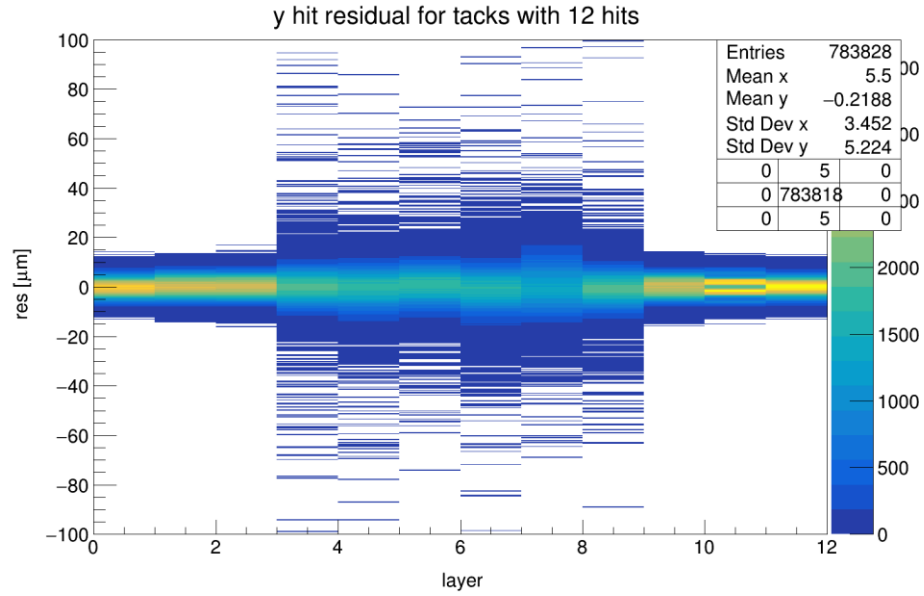
Cory





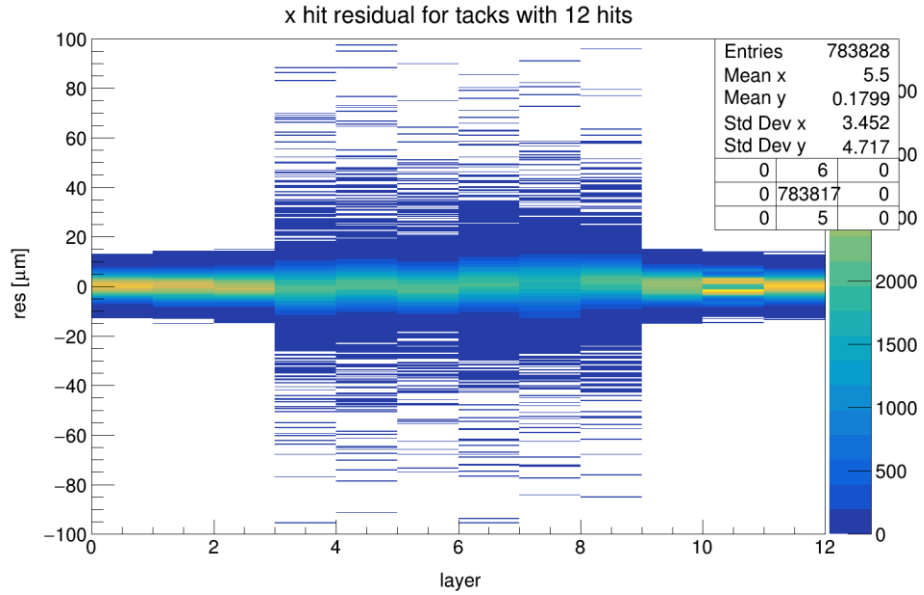
Step 1

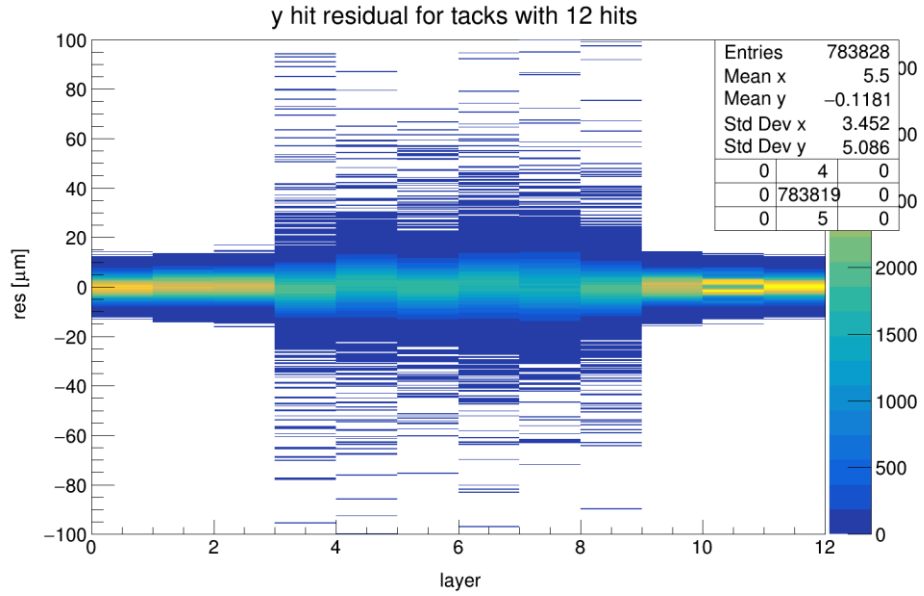




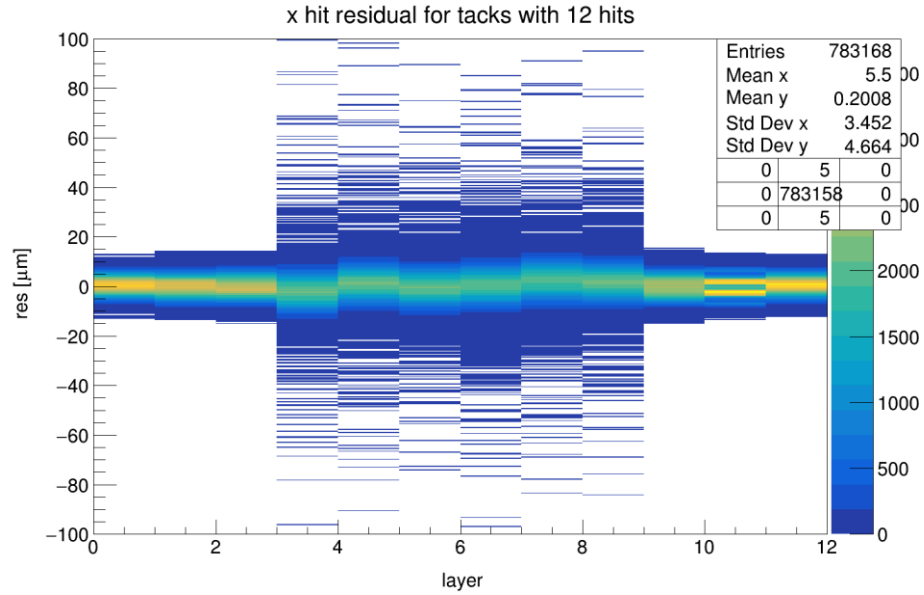
Re-alignment of the alignment data set

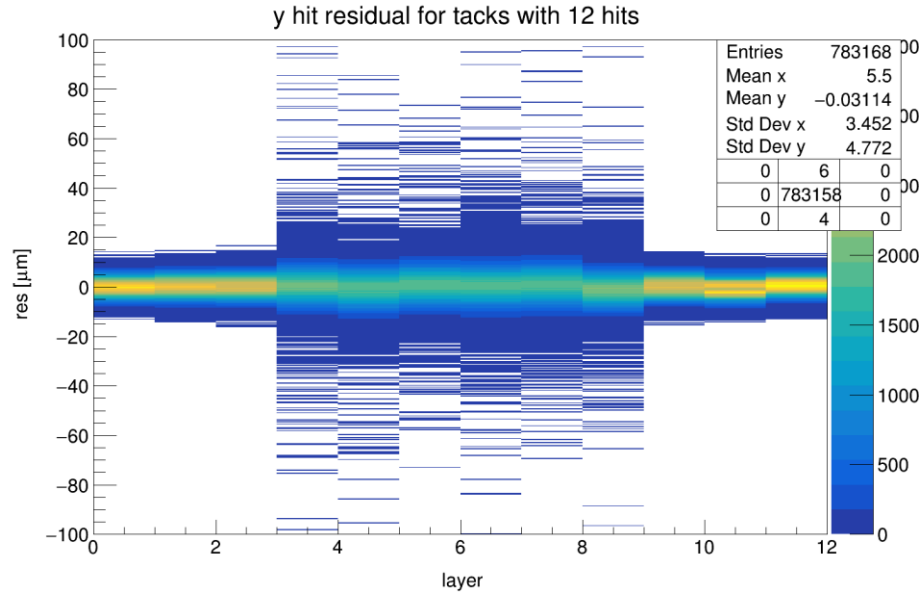
Step 2





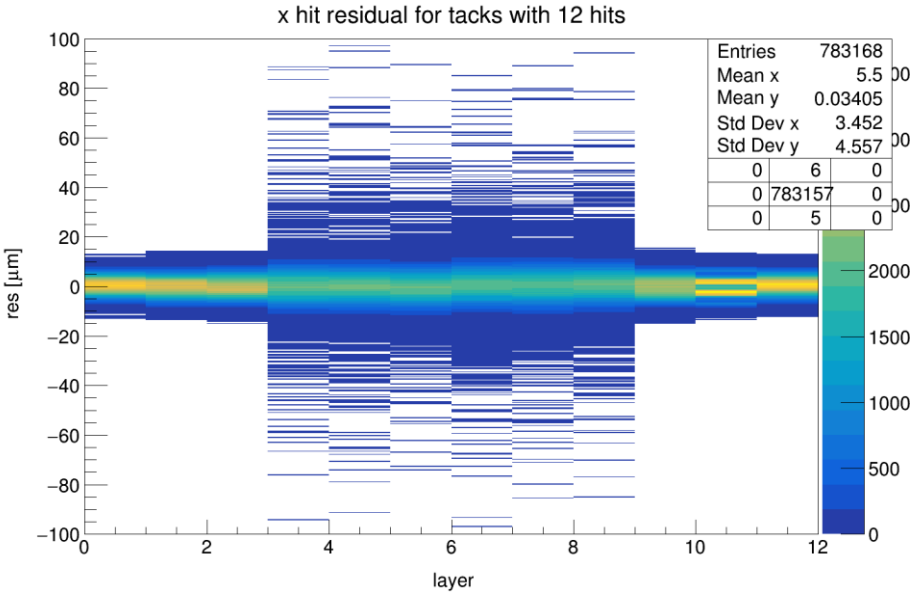
Step 3

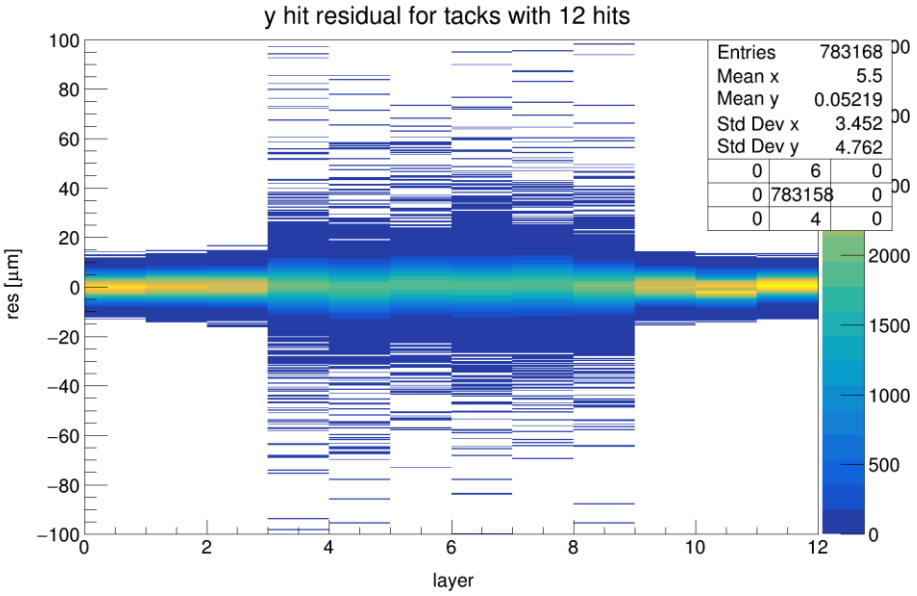




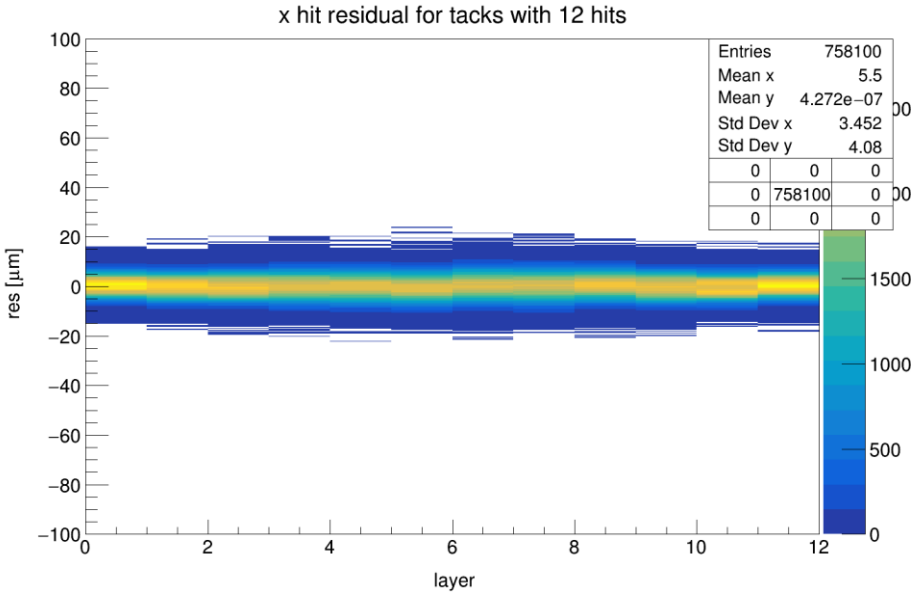
Re-alignment of the alignment data set

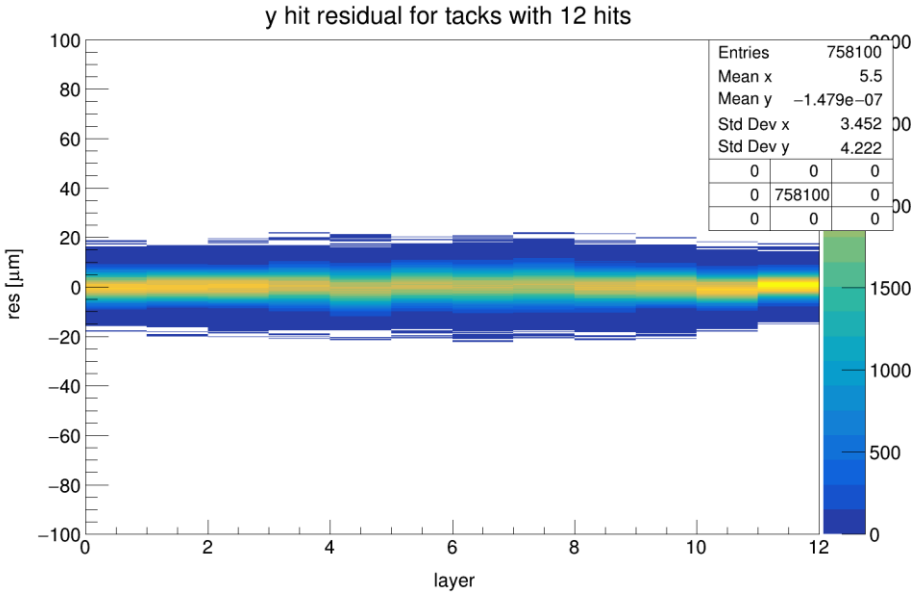
Step 4





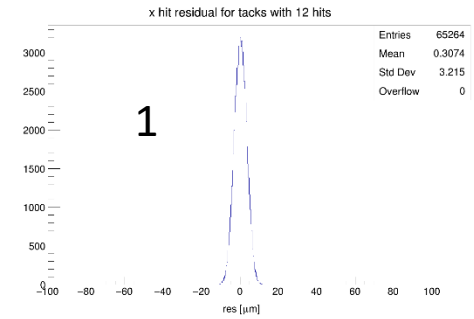
Step 5

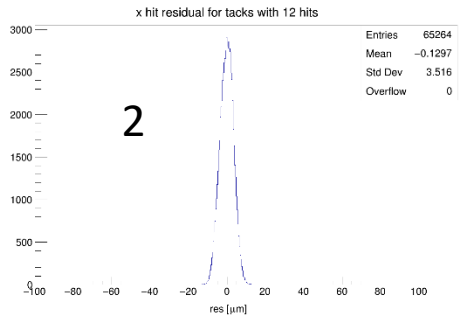


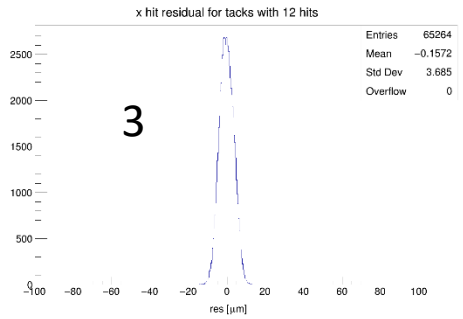


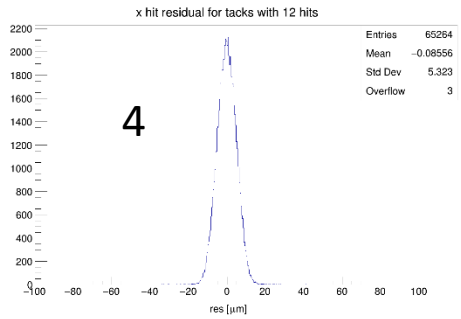
Re-alignment of the alignment data set (Step 4)

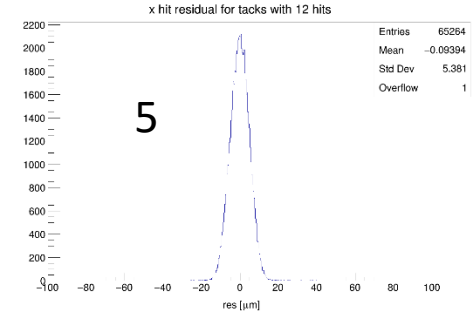
Residuals on X

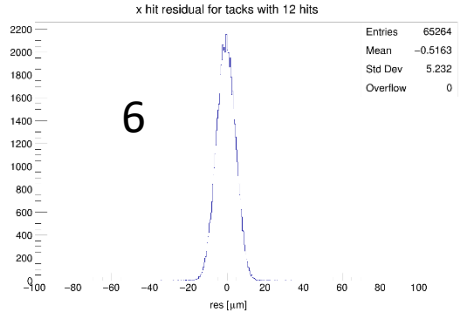


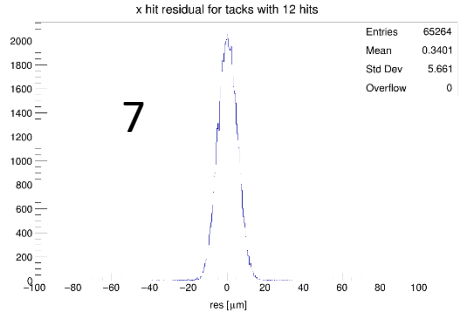


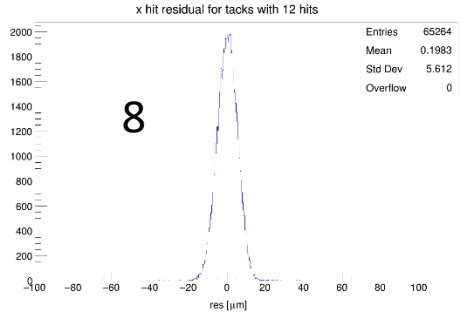


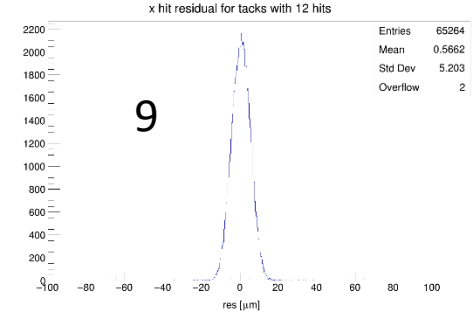


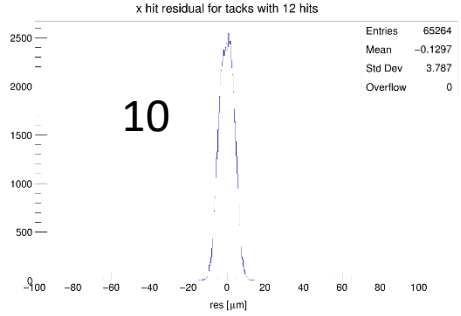


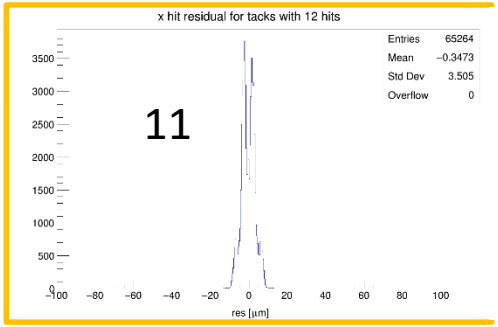


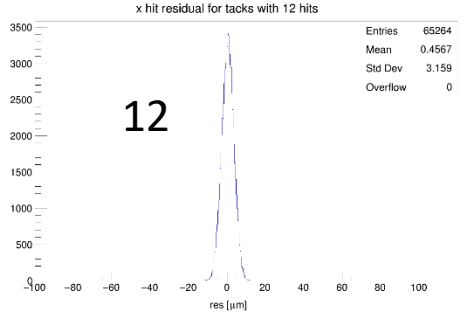






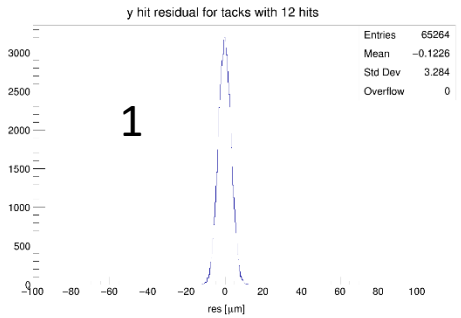


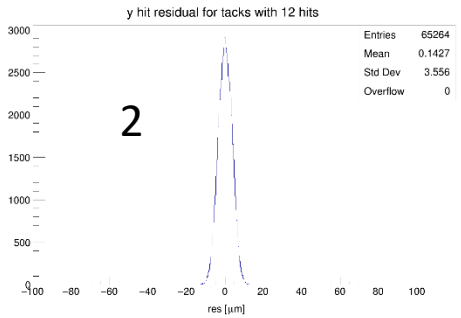


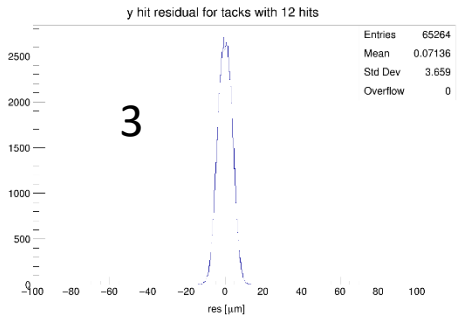


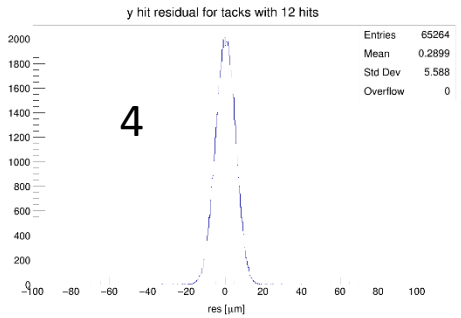
Re-alignment of the alignment data set (Step 4)

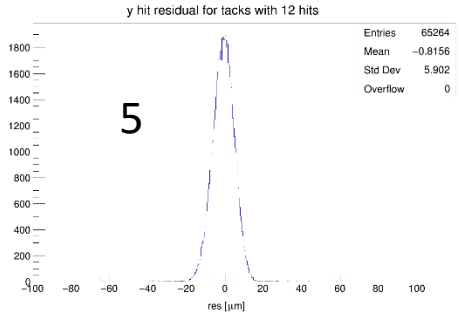
Residuals on Y

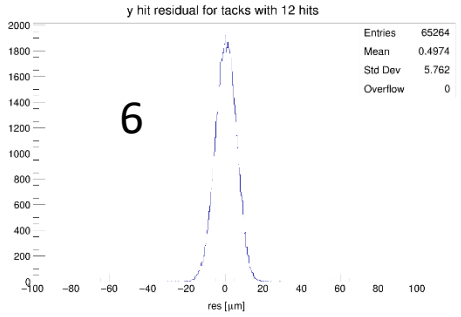


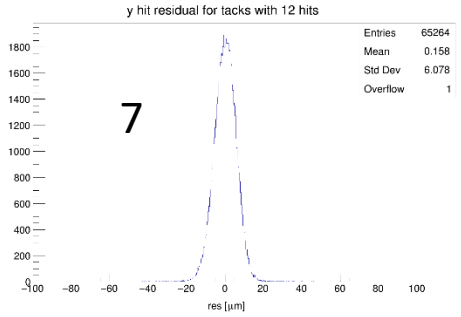


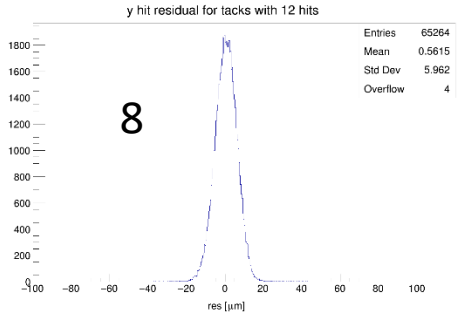


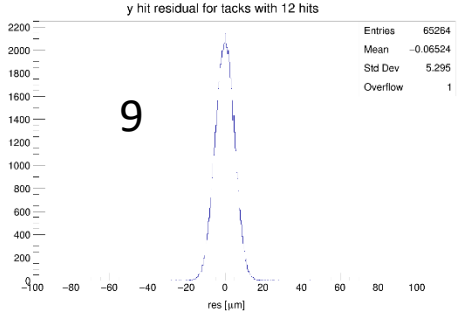


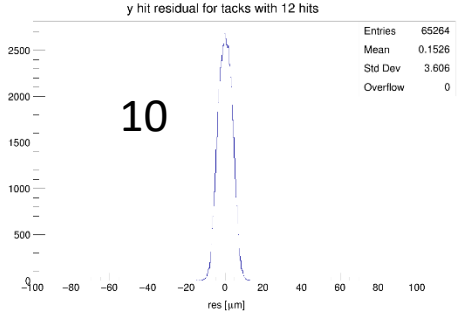


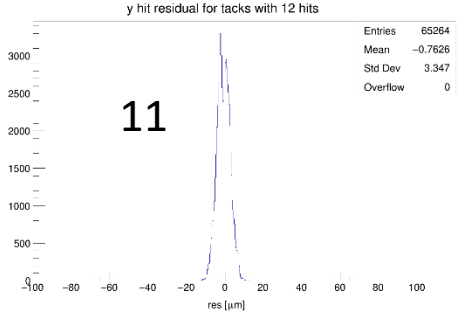


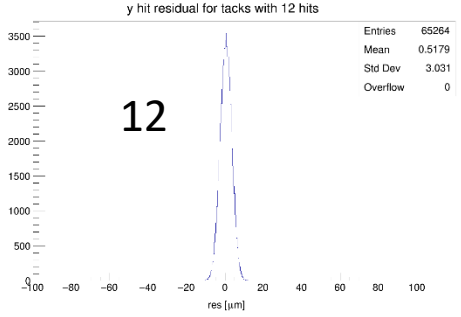












Re-alignment of the alignment data set

Cory Fixed:

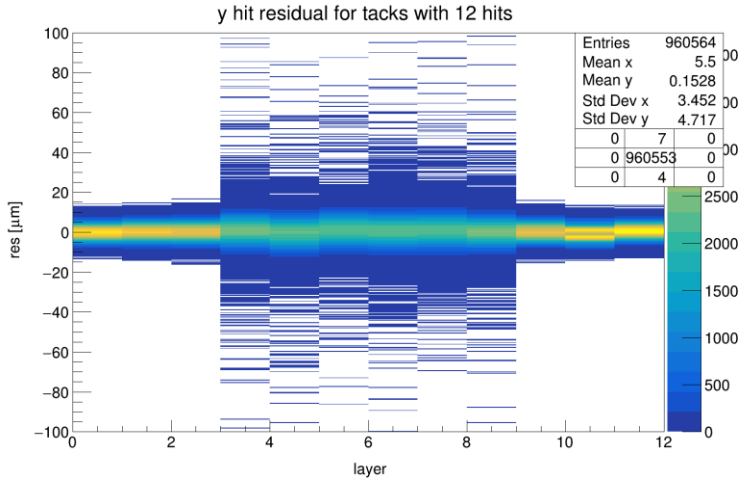
#Id	Radi[mm]	Cx[mm]	Cy[mm]	Cz[mm]	Rx[deg]	Ry[deg]	Rz[deg]
0	1e30	0.009	0.007	-100.000	-0.097	0.026	0.482
1	1e30	-0.952	-0.094	-75.000	0.015	-0.004	-0.145
2	1e30	-0.814	0.106	-50.000	0.008	0.004	-0.294
3	-30.0	0.910	1.554	0.000	0.015	0.015	0.039
4	-24.0	1.107	1.000	0.000	0.028	0.020	-0.090
5	-18.0	0.827	1.271	0.000	-0.975	-0.970	-0.073
6	18.0	-0.356	1.200	0.000	0.059	-0.045	0.944
7	24.0	-0.649	2.220	0.000	-0.061	0.061	0.762
8	30.0	-0.104	1.834	0.000	-0.003	0.002	0.048
9	1e30	-2.485	0.313	50.000	-0.066	0.112	-0.567
10	1e30	-2.891	0.463	75.000	-0.064	0.120	-0.556
11	1e30	-3.557	0.202	100.000	-0.064	0.132	-0.511

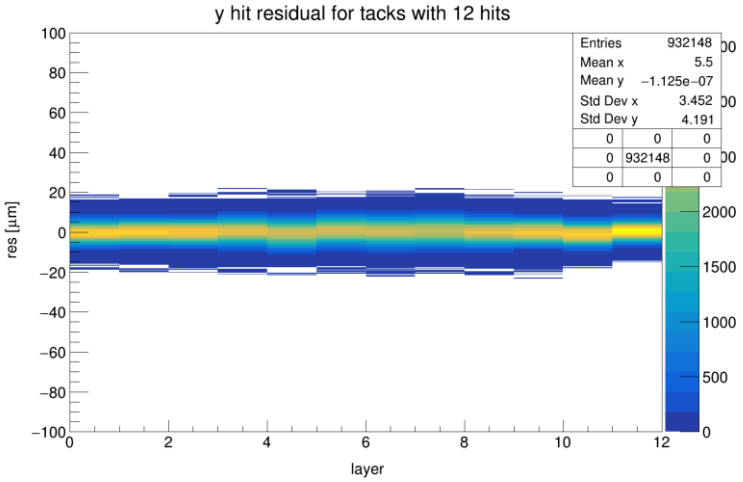
Step 4:

#Id	Radi[mm]	Cx[mm]	Cy[mm]	Cz[mm]	Rx[deg]	Ry[deg]	Rz[deg]
0	1e+30	0.009	0.007	-100.000	-0.097	0.029	0.481
1	1e+30	-0.952	-0.094	-75.000	0.760	-0.766	-0.150
2	1e+30	-0.814	0.106	-50.000	1.476	0.158	-0.288
3	-30.00	0.520	1.123	0.000	0.841	-0.730	0.020
4	-24.00	0.771	1.068	0.000	-0.131	-0.783	-0.112
5	-18.00	0.717	1.363	0.000	-1.262	-1.320	-0.083
6	18.00	0.215	1.322	0.000	0.414	-1.873	0.967
7	24.00	0.036	1.333	0.000	-2.206	-1.542	0.802
8	30.00	1.093	1.242	0.000	-1.143	-2.288	0.070
9	1e+30	-2.485	0.313	50.000	-1.786	-0.789	-0.556
10	1e+30	-2.891	0.462	75.000	-1.885	-0.661	-0.544
11	1e+30	-3.556	0.202	100.000	-2.442	-0.824	-0.489

Re-alignment of the alignment data set

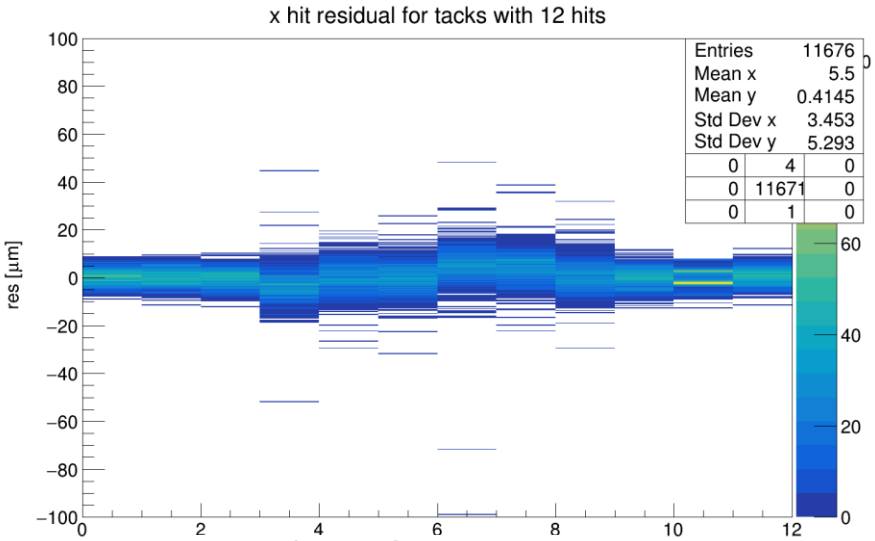
- 20000 events over 92200 were used to perform the new alignment;
- The residuals of all the layers are all good Gaussian distributions;
- The resolutions of the bent layer respect to the tracks defined only with the flat layers is about 5 um;
- The resolutions of all the layers respect to the tracks defined with the all layers is about 3 um;
- (can we use the 72200 events to measure the single hit resolution?)
- the results even in the target region are compatible

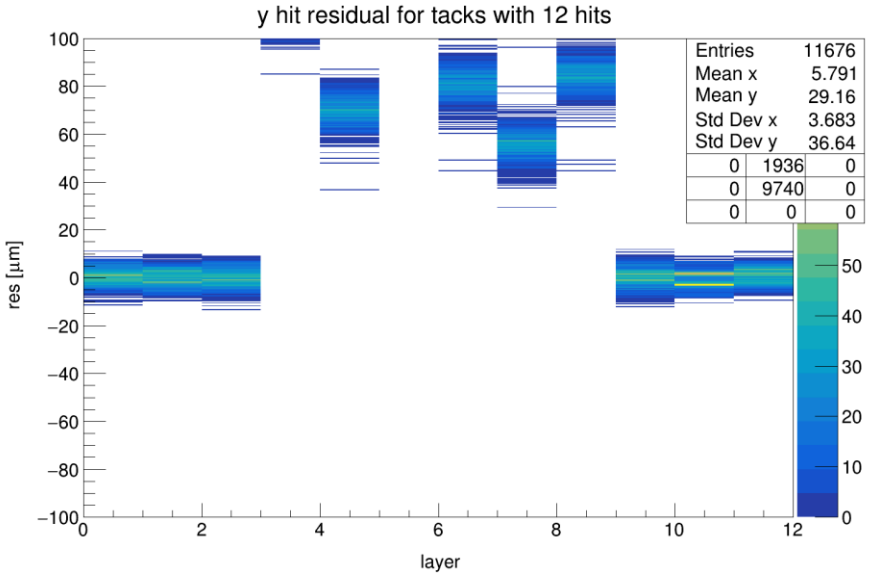


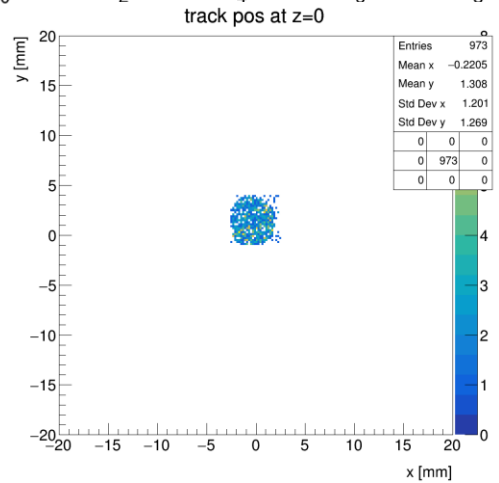


New alignment with “interaction” data set

- The new alignment is applied to the “interaction” data set
- In the “interaction” data set there are events with remnant beam, by tracking the full track (across the 12 layers) it is possible to check the alignment:



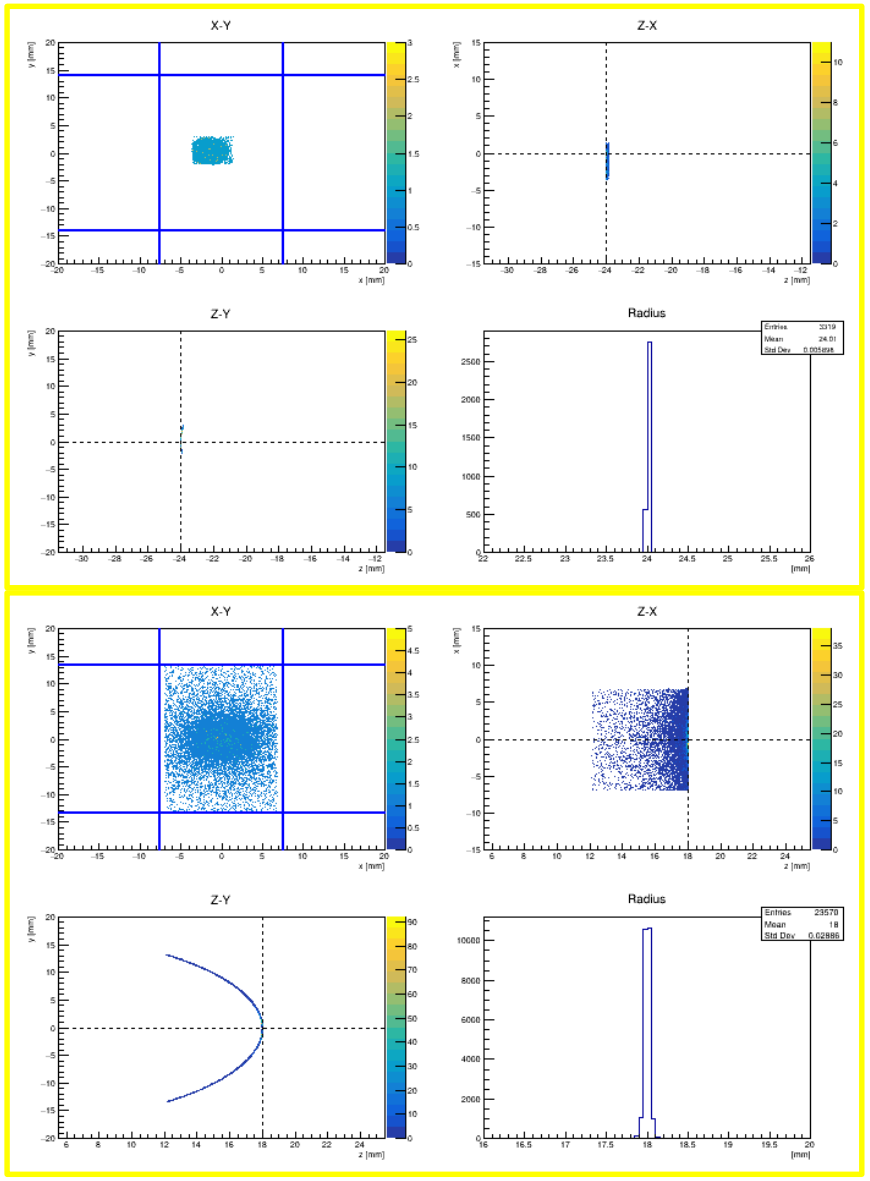




X seems quite good, but which is the problem with Y?

New alignment with “interaction” data set: check

Check of the invers transformation (e.g. layers 5-8)



New alignment with “interaction” data set: check

It is quite good but a little refinement can be done

Cory Fixed:

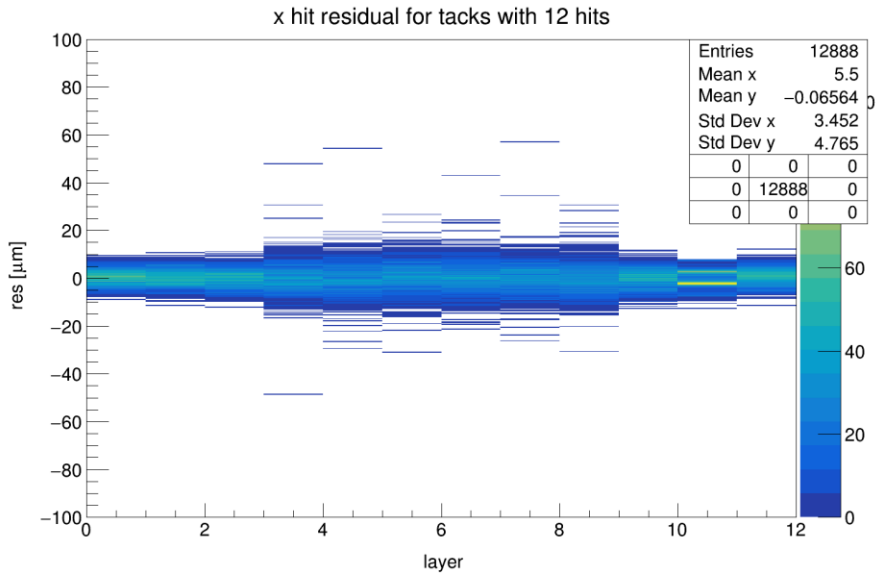
#Id	Radi[mm]	Cx[mm]	Cy[mm]	Cz[mm]	Rx[deg]	Ry[deg]	Rz[deg]
0	1e30	0.009	0.007	-100.000	-0.097	0.026	0.482
1	1e30	-0.952	-0.094	-75.000	0.015	-0.004	-0.145
2	1e30	-0.814	0.106	-50.000	0.008	0.004	-0.294
3	-30.0	0.910	1.554	0.000	0.015	0.015	0.039
4	-24.0	1.107	1.000	0.000	0.028	0.020	-0.090
5	-18.0	0.827	1.271	0.000	-0.975	-0.970	-0.073
6	18.0	-0.356	1.200	0.000	0.059	-0.045	0.944
7	24.0	-0.649	2.220	0.000	-0.061	0.061	0.762
8	30.0	-0.104	1.834	0.000	-0.003	0.002	0.048
9	1e30	-2.485	0.313	50.000	-0.066	0.112	-0.567
10	1e30	-2.891	0.463	75.000	-0.064	0.120	-0.556
11	1e30	-3.557	0.202	100.000	-0.064	0.132	-0.511

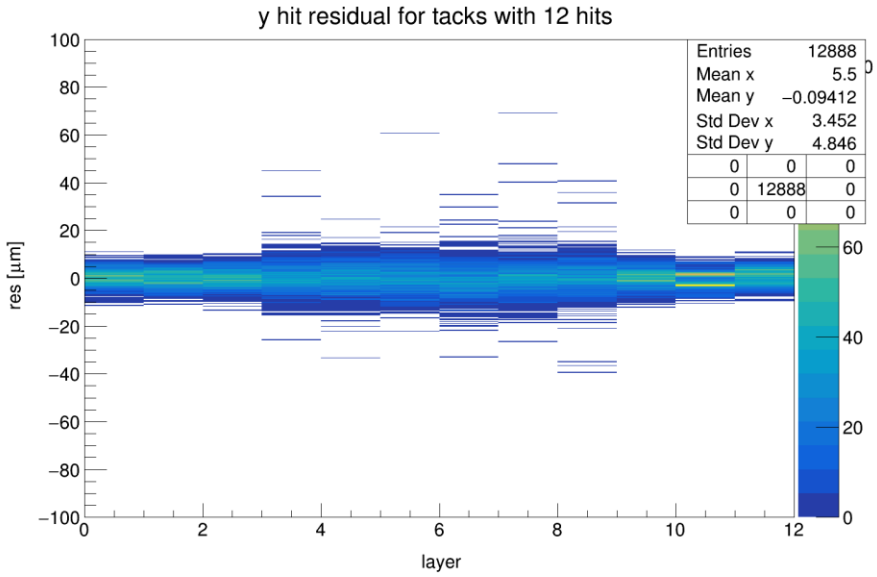
Cory Fixed_1:

#Id	Radi[mm]	Cx[mm]	Cy[mm]	Cz[mm]	Rx[deg]	Ry[deg]	Rz[deg]
0	1e30	0.009	0.007	-100.000	-0.097	0.026	0.482
1	1e30	-0.952	-0.094	-75.000	0.015	-0.004	-0.145
2	1e30	-0.814	0.106	-50.000	0.008	0.004	-0.294
3	-30.0	0.910	1.444	0.000	0.015	0.013	0.039
4	-24.0	1.107	0.930	0.000	0.028	0.020	-0.090
5	-18.0	0.827	1.136	0.000	-0.975	-0.970	-0.073
6	18.0	-0.356	1.120	0.000	0.059	-0.061	0.944
7	24.0	-0.649	2.165	0.000	-0.061	0.060	0.762
8	30.0	-0.104	1.750	0.000	-0.003	0.001	0.048
9	1e30	-2.485	0.313	50.000	-0.066	0.113	-0.567
10	1e30	-2.891	0.463	75.000	-0.064	0.120	-0.556
11	1e30	-3.557	0.202	100.000	-0.064	0.132	-0.511

New alignment with “interaction” data set

- The refinement of the Starting Configuration helps a bit but non enough;
- By assuming that the rotations for each layers between the alignment and the «interaction» data sets a new alignment procedure is run over the remnant beam to fit only the Cx and Cy positions of the bent layers:





Re-alignment of the alignment data set

Step 4:

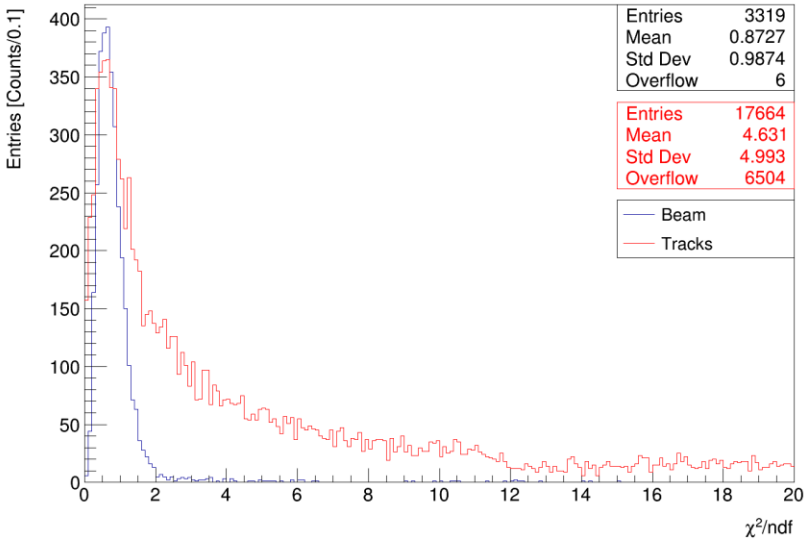
#Id	Radi[mm]	Cx[mm]	Cy[mm]	Cz[mm]	Rx[deg]	Ry[deg]	Rz[deg]
0	1e+30	0.009	0.007	-100.000	-0.097	0.029	0.481
1	1e+30	-0.952	-0.094	-75.000	0.760	-0.766	-0.150
2	1e+30	-0.814	0.106	-50.000	1.476	0.158	-0.288
3	-30.00	0.520	1.123	0.000	0.841	-0.730	0.020
4	-24.00	0.771	1.068	0.000	-0.131	-0.783	-0.112
5	-18.00	0.717	1.363	0.000	-1.262	-1.320	-0.083
6	18.00	0.215	1.322	0.000	0.414	-1.873	0.967
7	24.00	0.036	1.333	0.000	-2.206	-1.542	0.802
8	30.00	1.093	1.242	0.000	-1.143	-2.288	0.070
9	1e+30	-2.485	0.313	50.000	-1.786	-0.789	-0.556
10	1e+30	-2.891	0.462	75.000	-1.885	-0.661	-0.544
11	1e+30	-3.556	0.202	100.000	-2.442	-0.824	-0.489

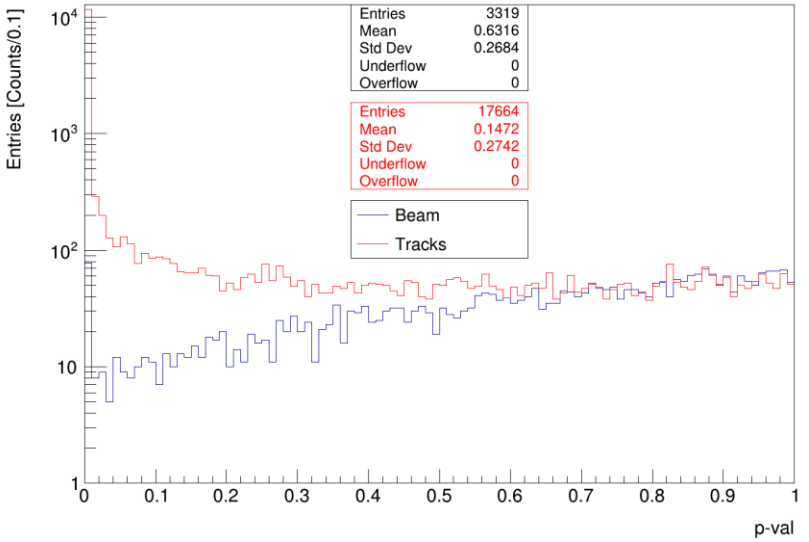
Final for interaction data set:

#Id	Radi[mm]	Cx[mm]	Cy[mm]	Cz[mm]	Rx[deg]	Ry[deg]	Rz[deg]
0	1e+30	0.009	0.007	-100.000	-0.097	0.029	0.481
1	1e+30	-0.952	-0.094	-75.000	0.762	-0.768	-0.149
2	1e+30	-0.814	0.106	-50.000	1.478	0.160	-0.286
3	-30.00	0.523	1.012	0.000	0.842	-0.728	0.017
4	-24.00	0.771	0.998	0.000	-0.132	-0.785	-0.115
5	-18.00	0.718	1.226	0.000	-1.261	-1.318	-0.080
6	18.00	0.210	1.240	0.000	0.413	-1.874	0.968
7	24.00	0.032	1.277	0.000	-2.206	-1.541	0.802
8	30.00	1.092	1.158	0.000	-1.140	-2.286	0.069
9	1e+30	-2.485	0.313	50.000	-1.788	-0.791	-0.556
10	1e+30	-2.891	0.462	75.000	-1.885	-0.659	-0.544
11	1e+30	-3.556	0.202	100.000	-2.441	-0.825	-0.487

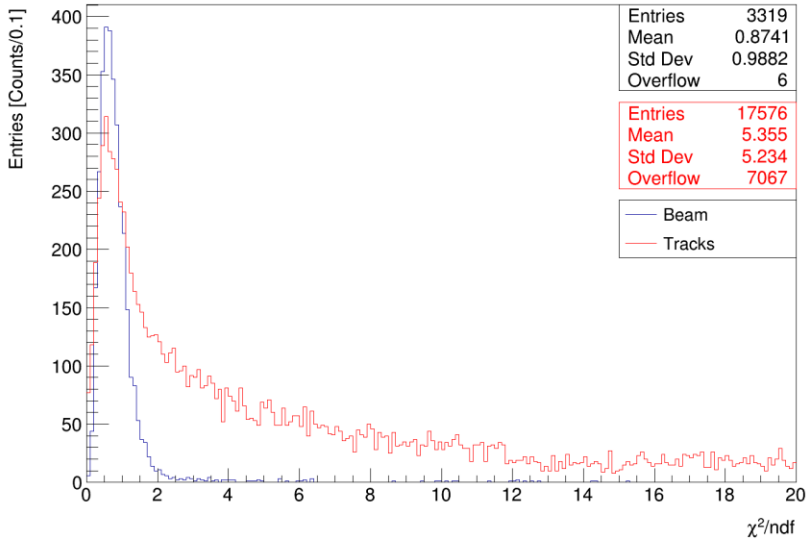
Impact of the new alignment on the analysis

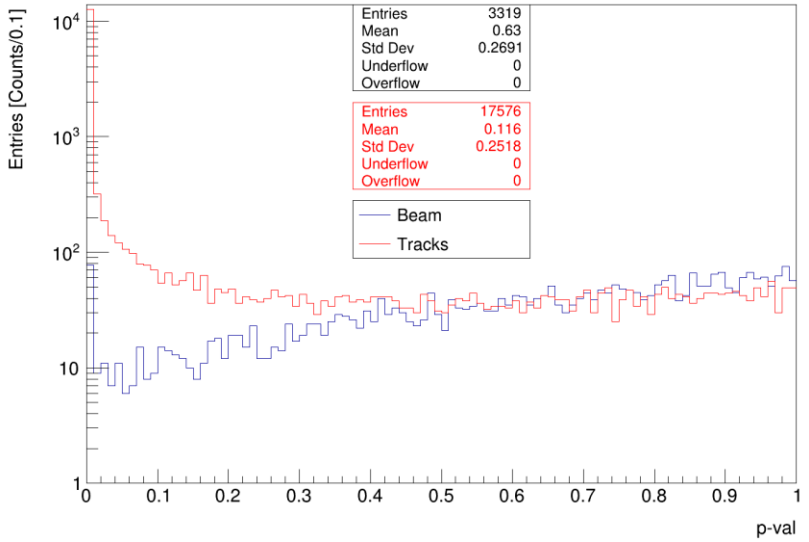
New Alignment





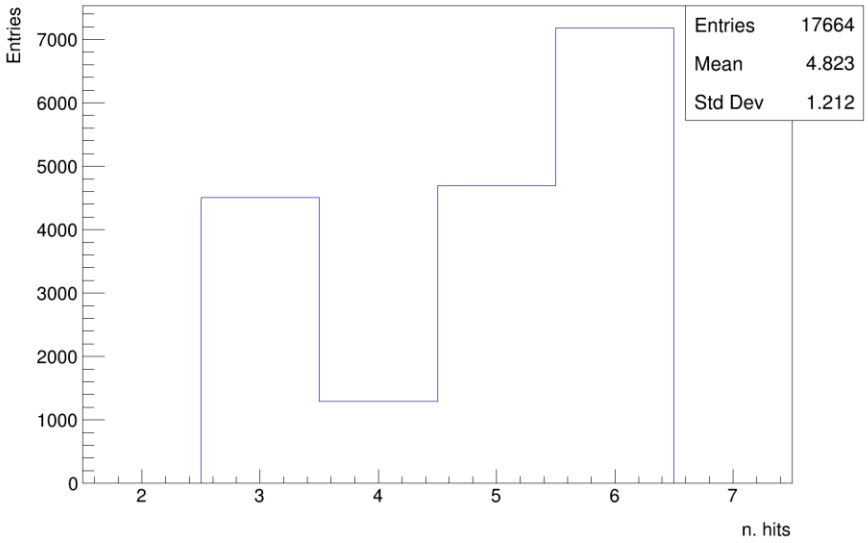
Original Alignment



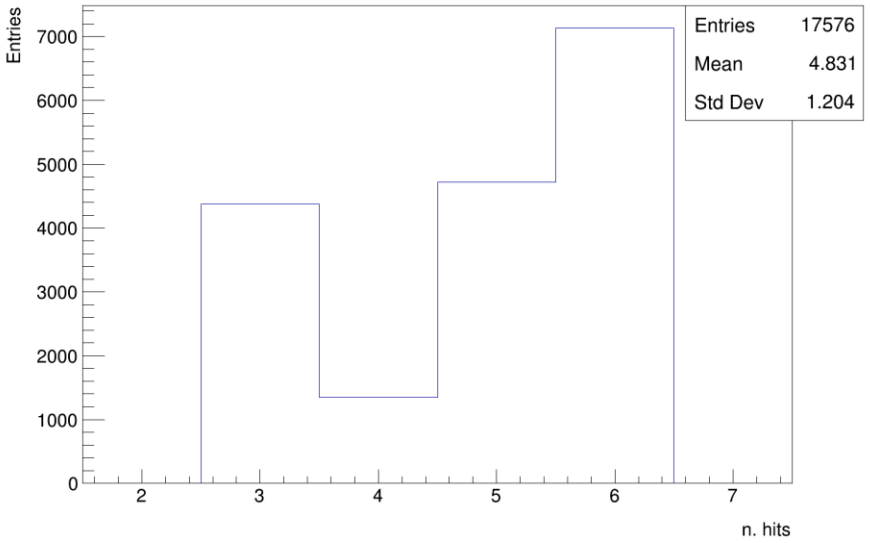


Impact of the new alignment on the analysis

New Alignment



Original Alignment

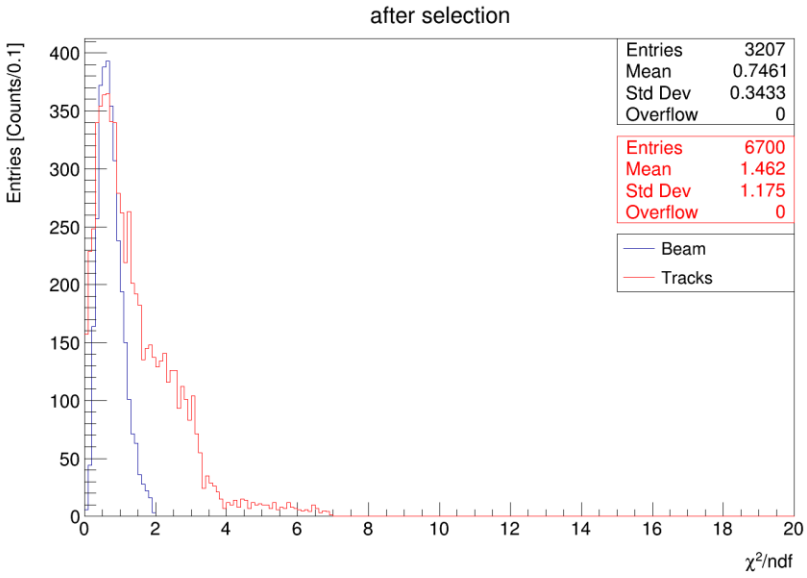


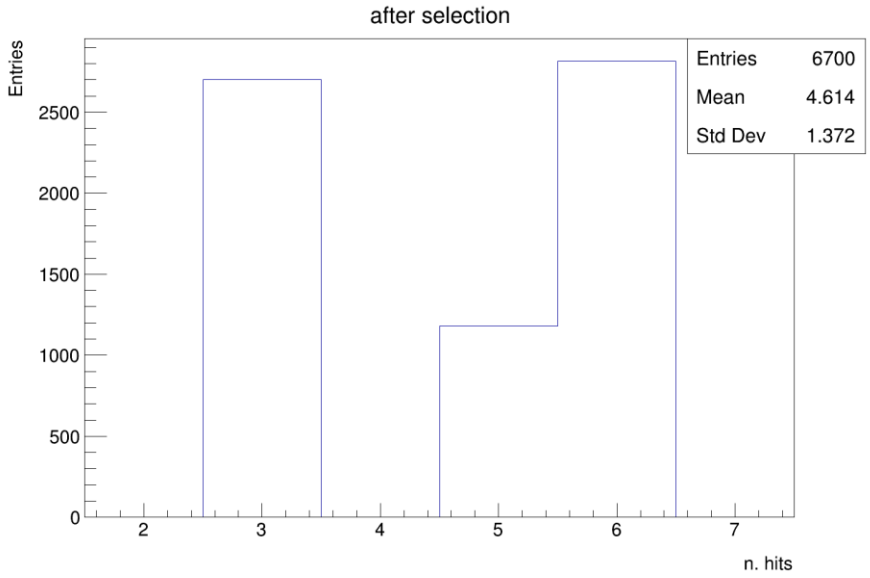
Selection criteria (after preselection in PR: d0<50 mm, tracks selected by p-val):

- P-val > 0.001 (0.1%)
- $\eta < 7.5$
- Beam-Track DCA < 500 μm

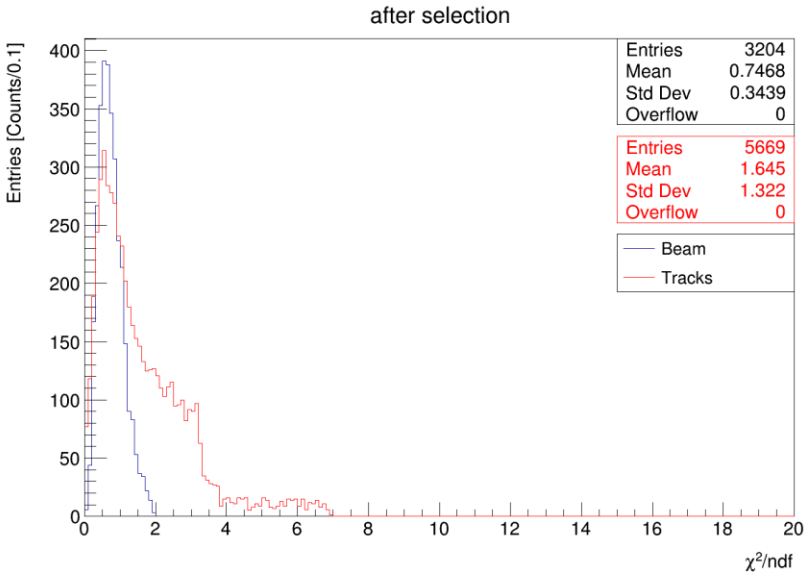
Impact of the new alignment on the analysis

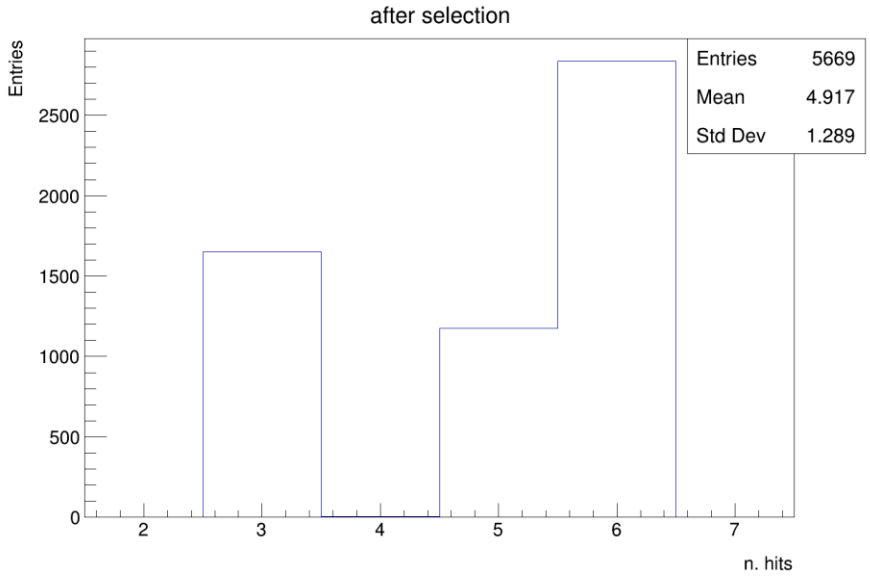
New Alignment





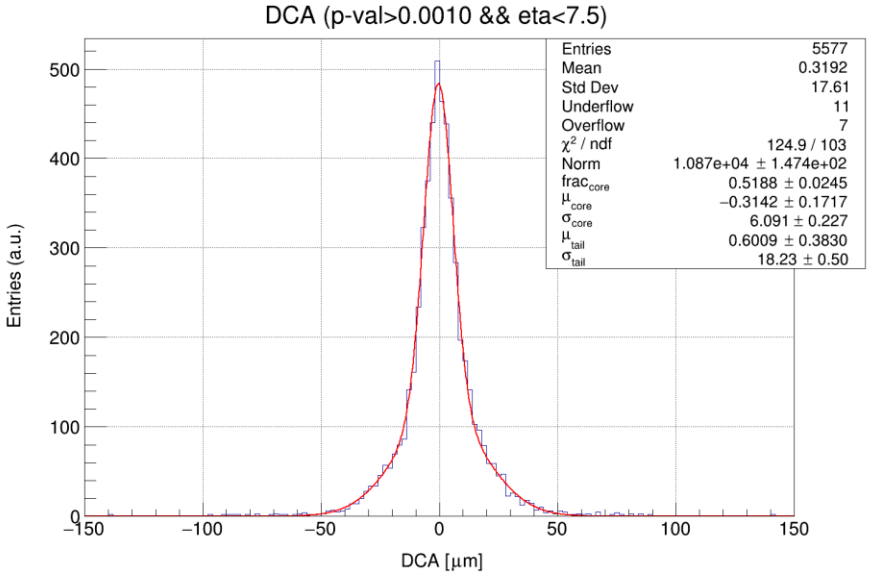
Original Alignment

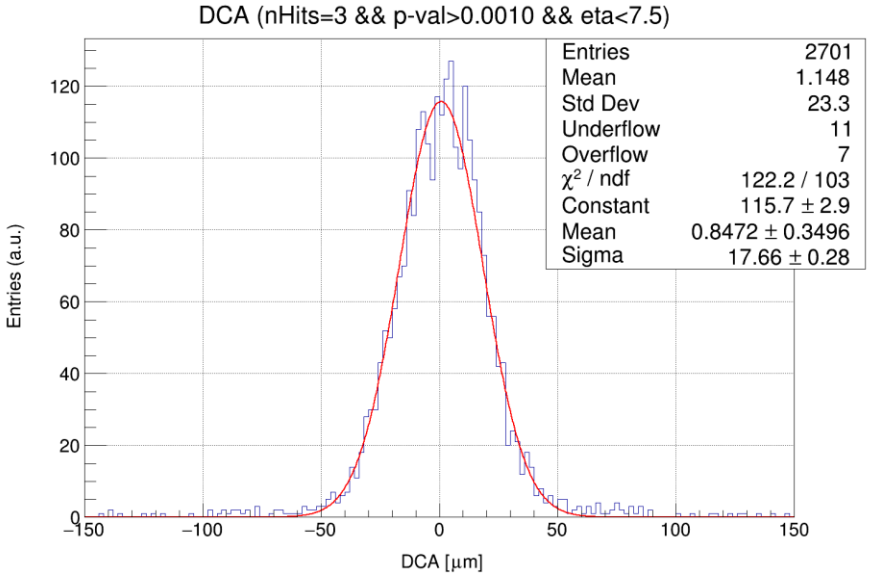




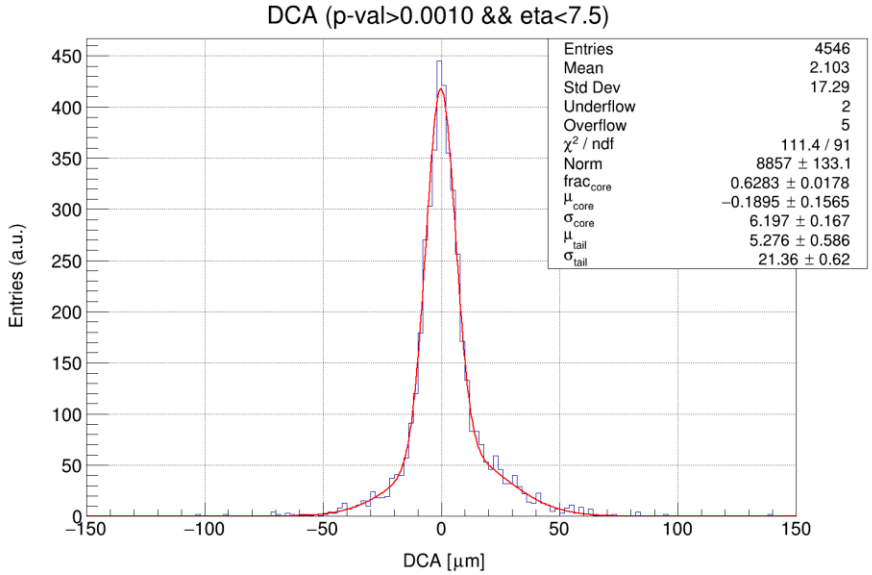
Impact of the new alignment on the analysis

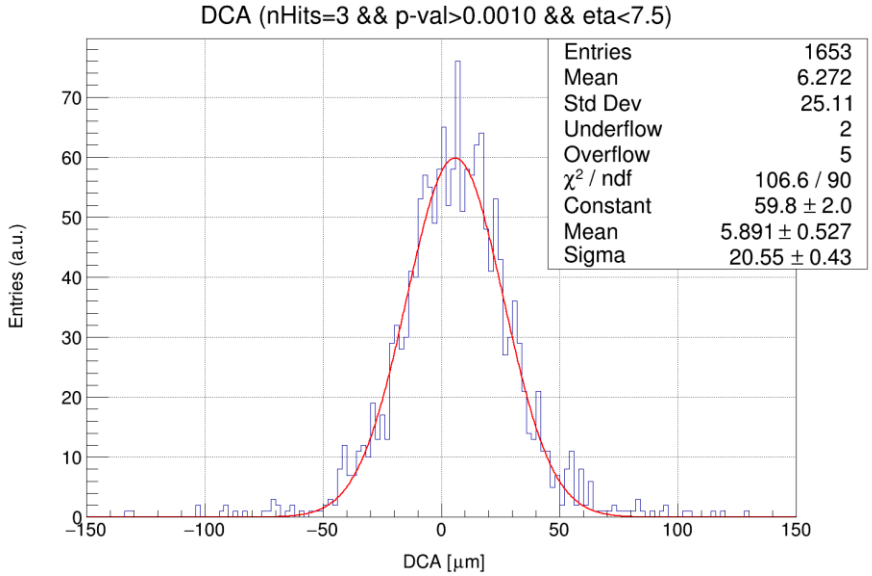
New Alignment





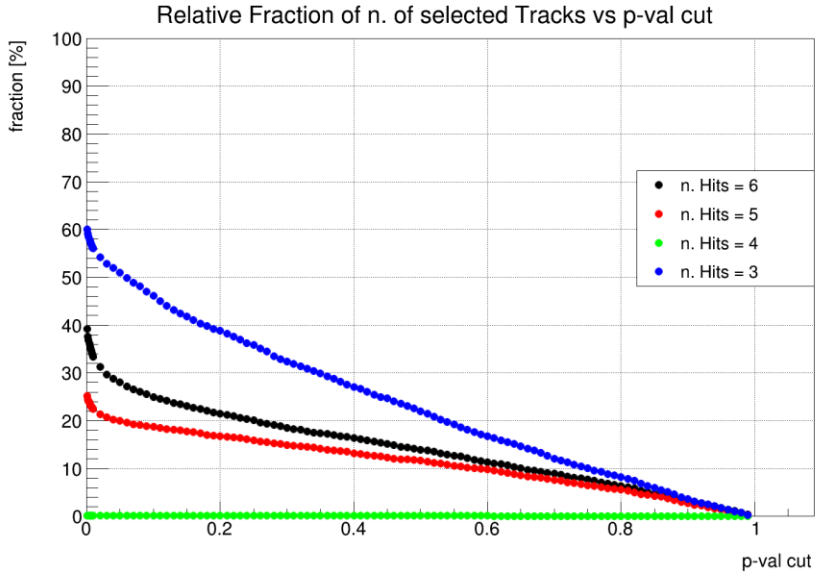
Original Alignment

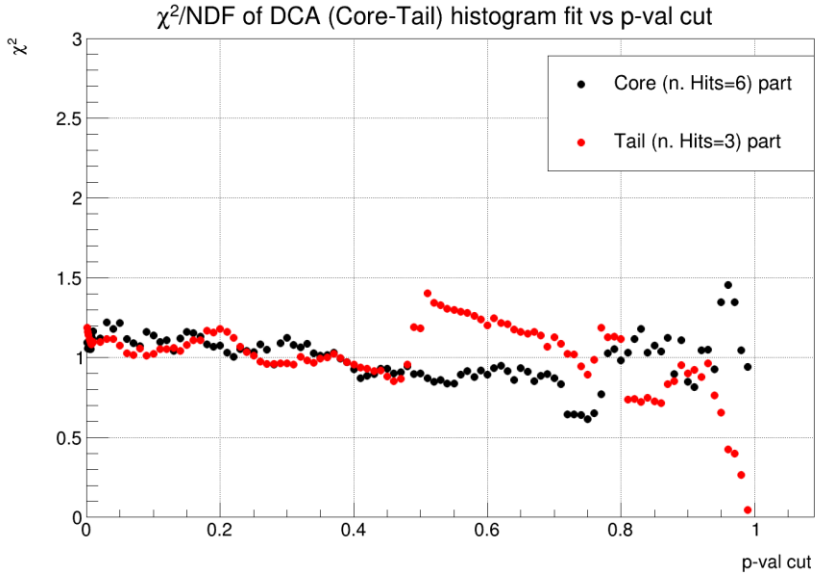




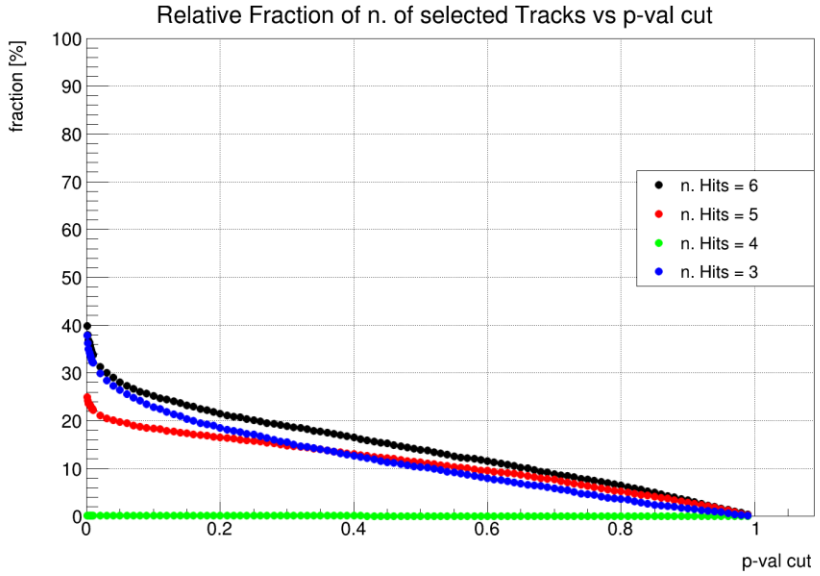
Impact of the new alignment on the analysis

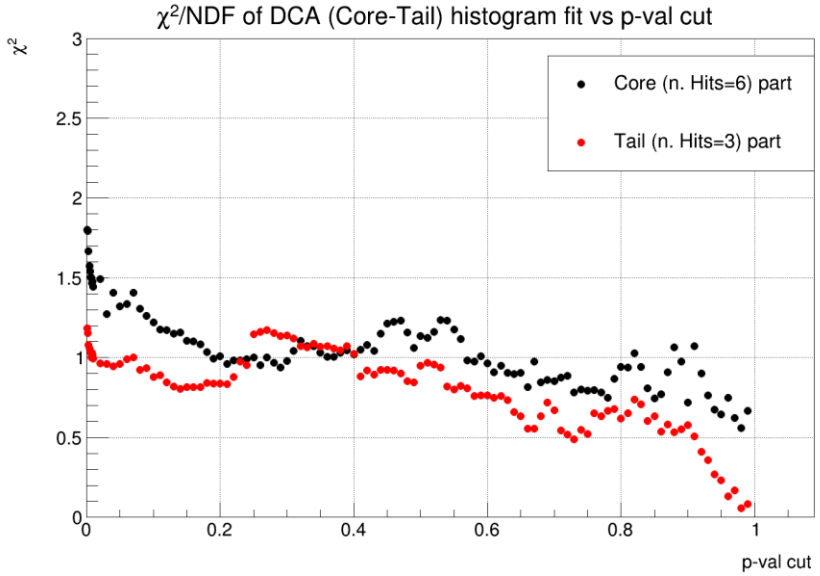
New Alignment





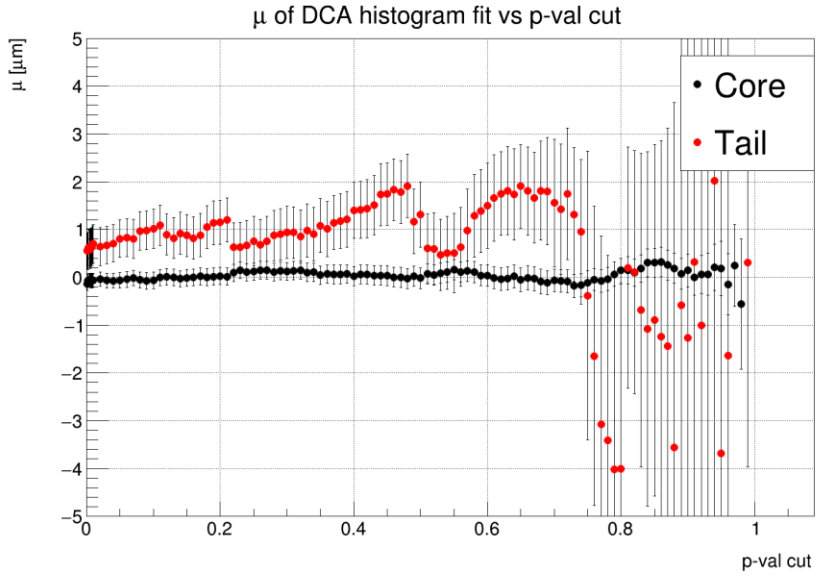
Original Alignment

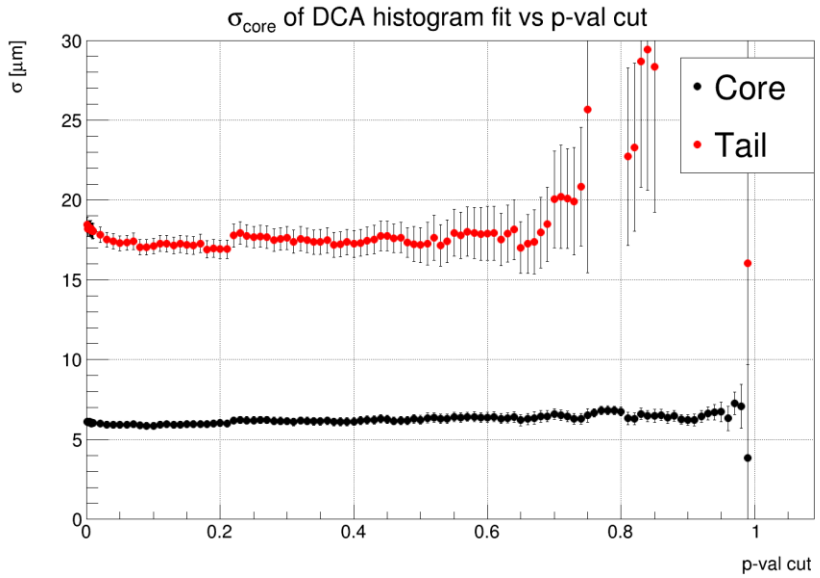




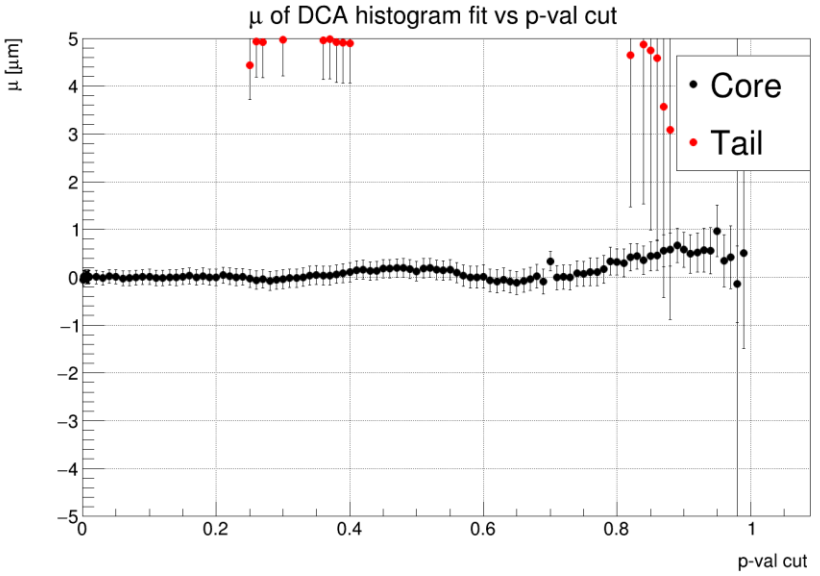
Impact of the new alignment on the analysis

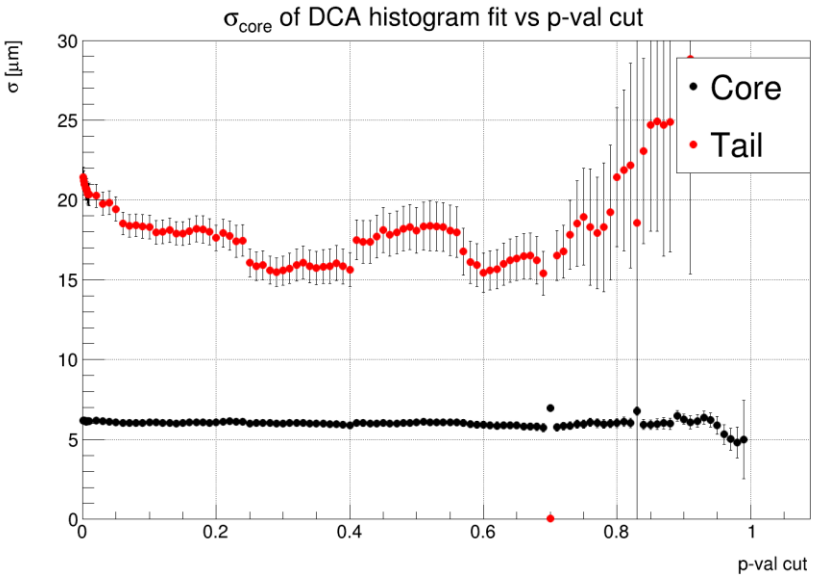
New Alignment





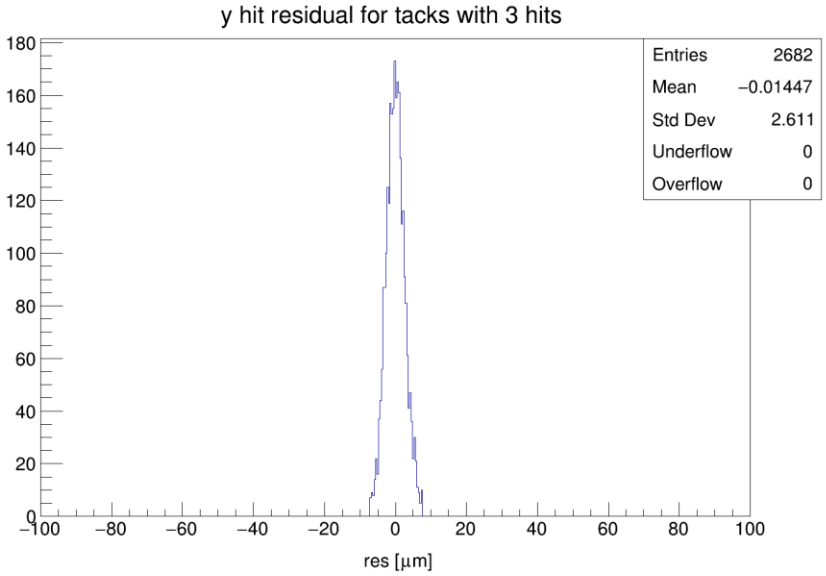
Original Alignment

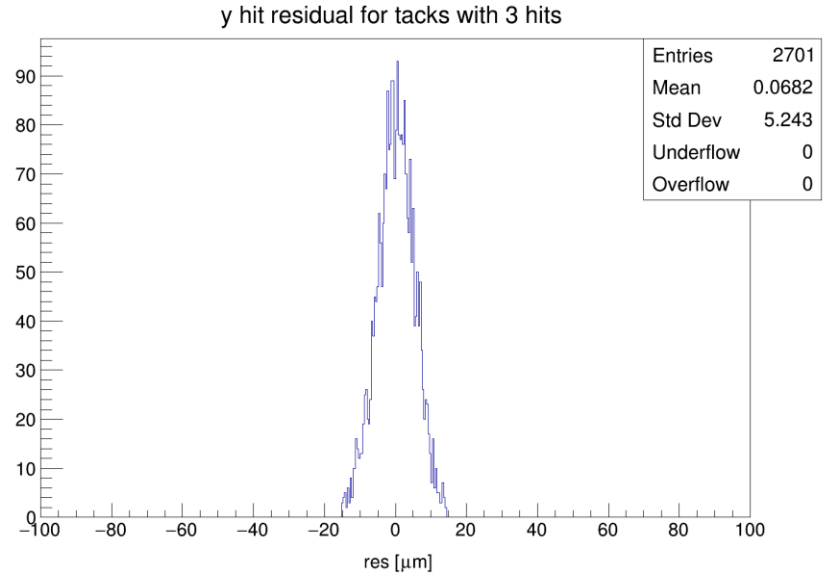




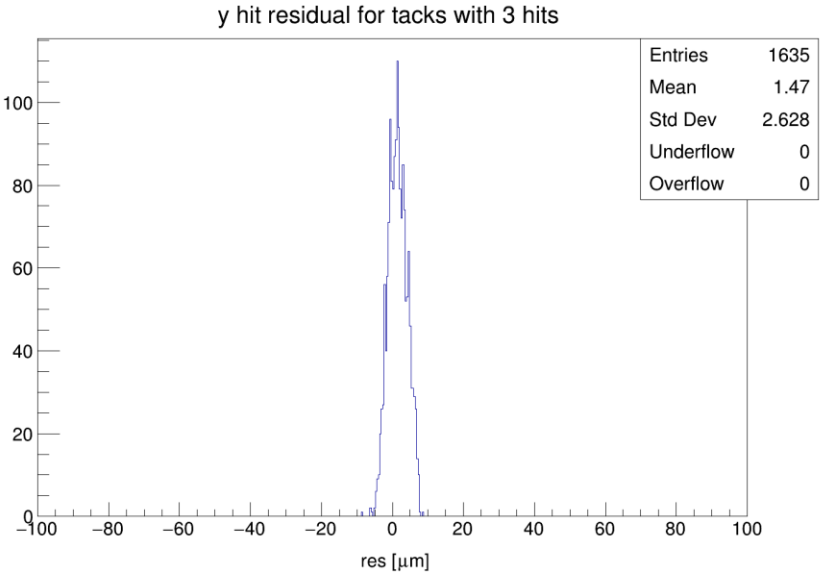
Impact of the new alignment on the analysis

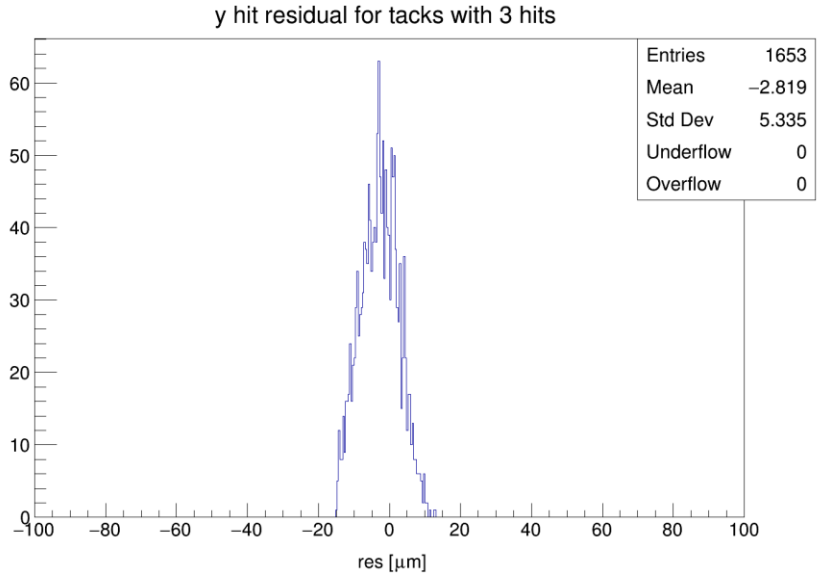
New Alignment





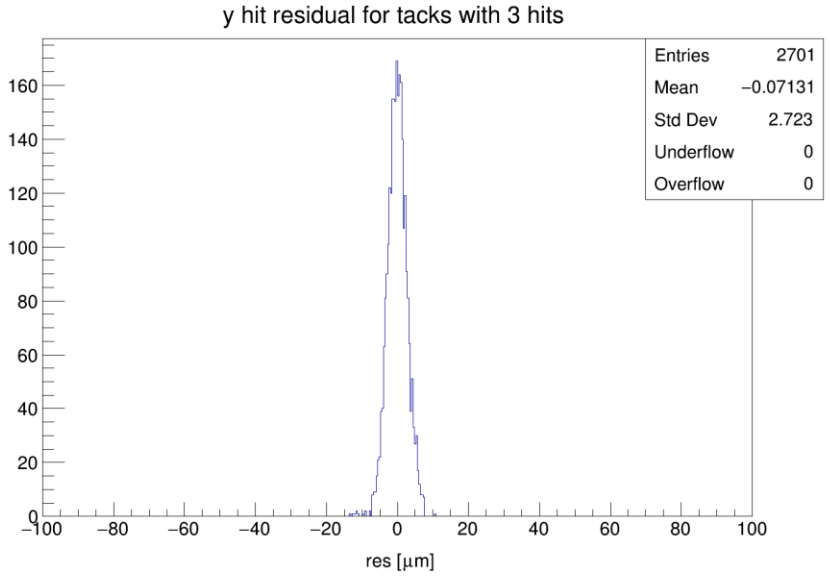
Original Alignment

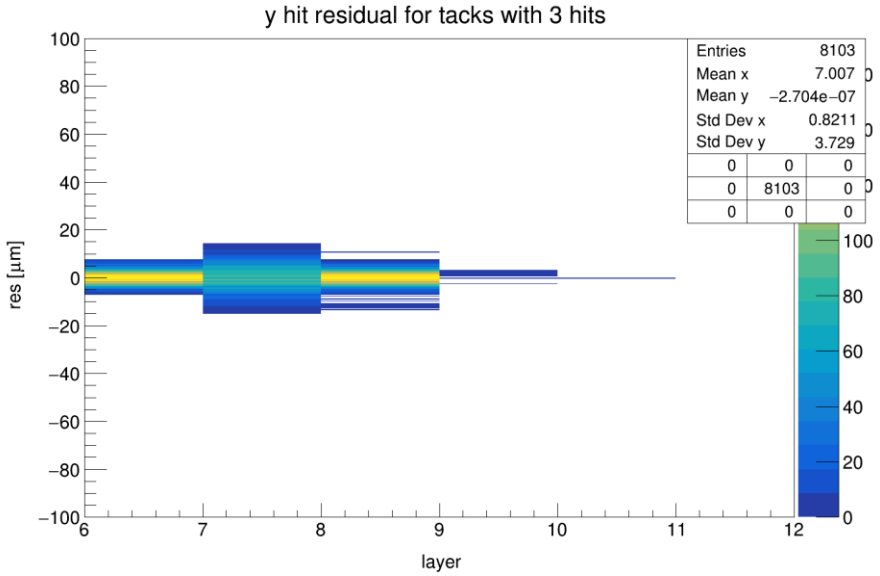




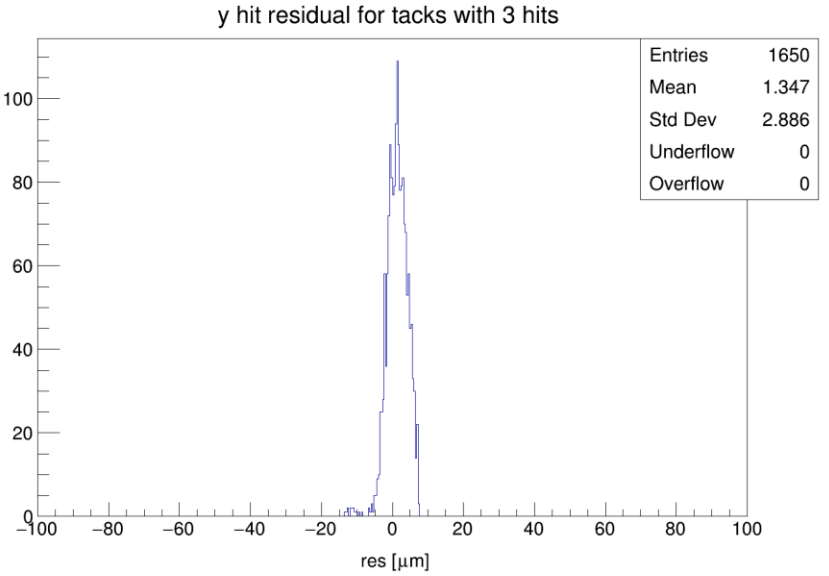
Impact of the new alignment on the analysis

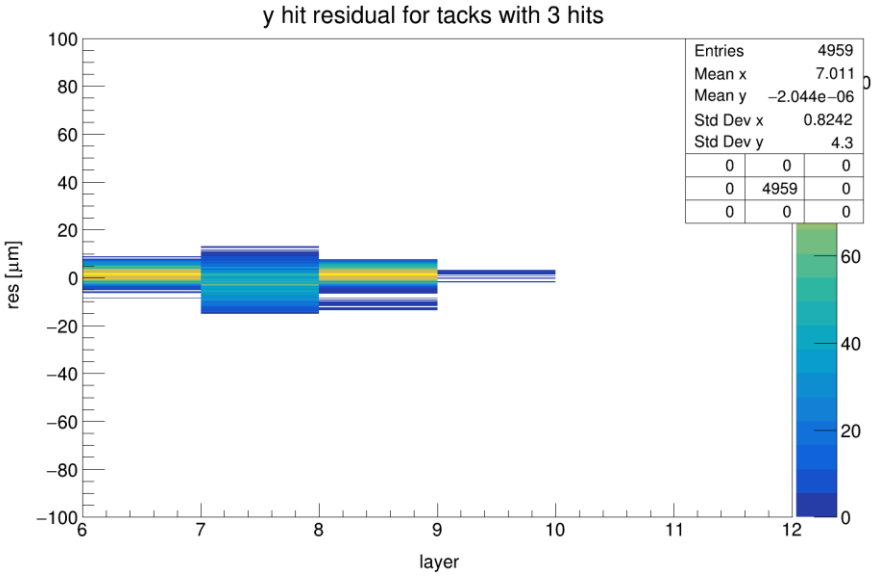
New Alignment





Original Alignment





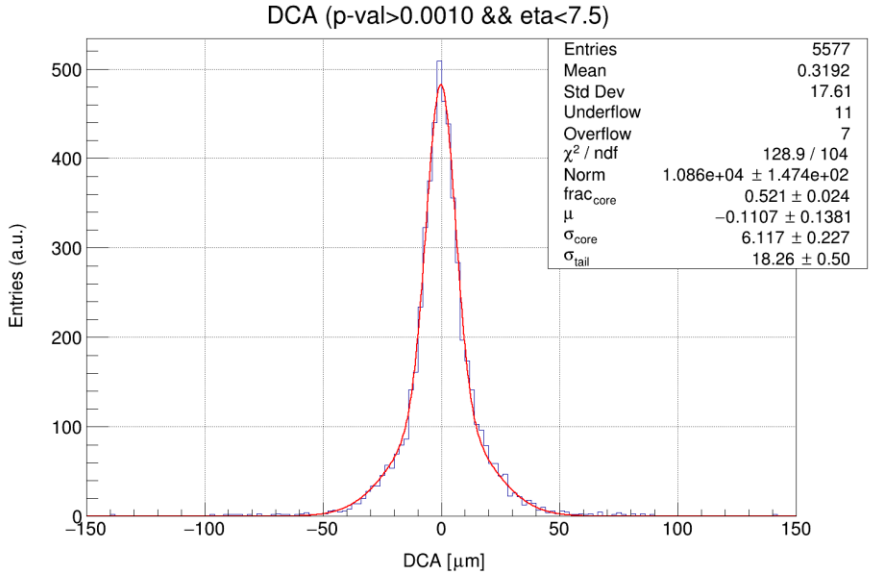
Impact of the new alignment on the analysis

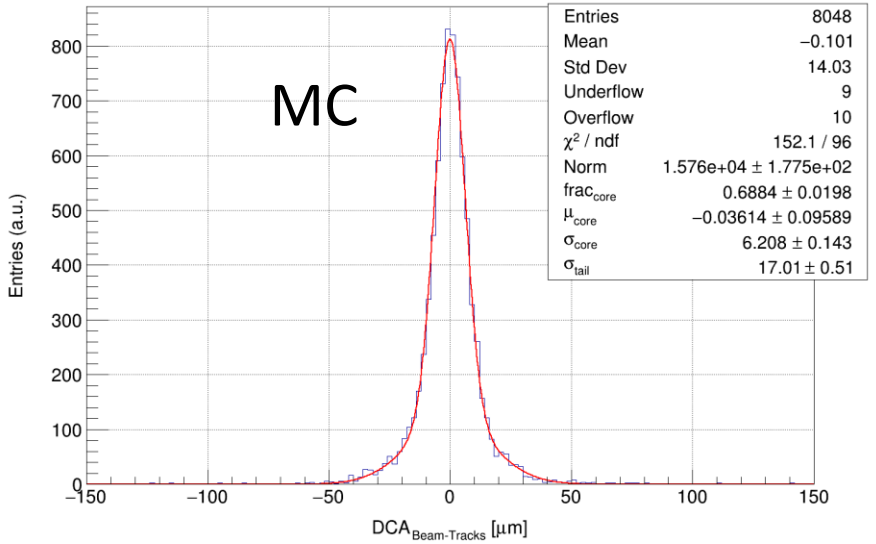
The new alignment (with some luck) works on the «interaction» data set too:

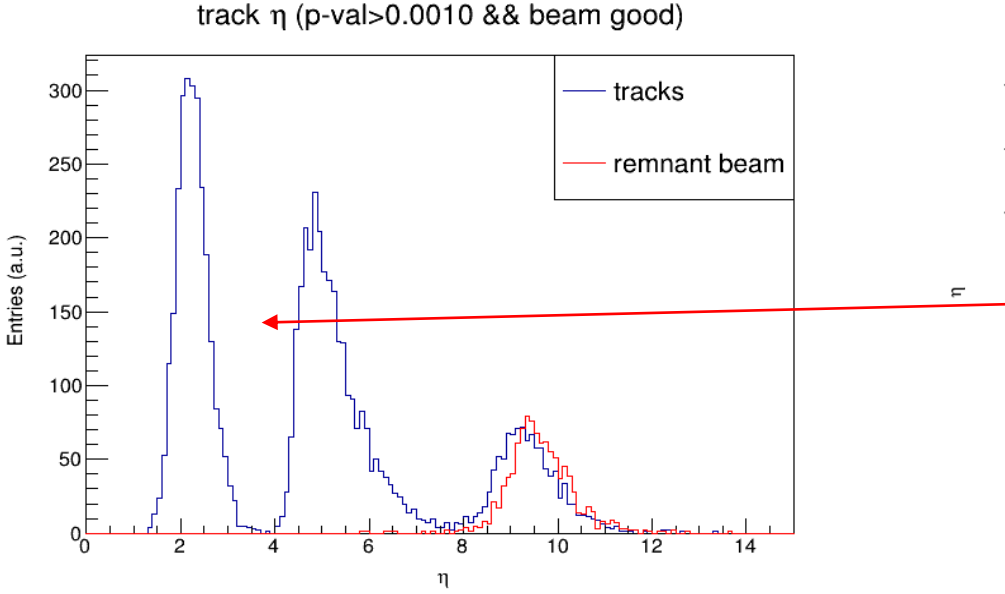
- More tracks are well reconstructed
- More tracks with 3 hits pass the quality cuts
- The DCA distribution is well centered and there is no more shift of the tails and it is in agreement with simulation
- The Y residuals for the 3 hits tracks now are well centered

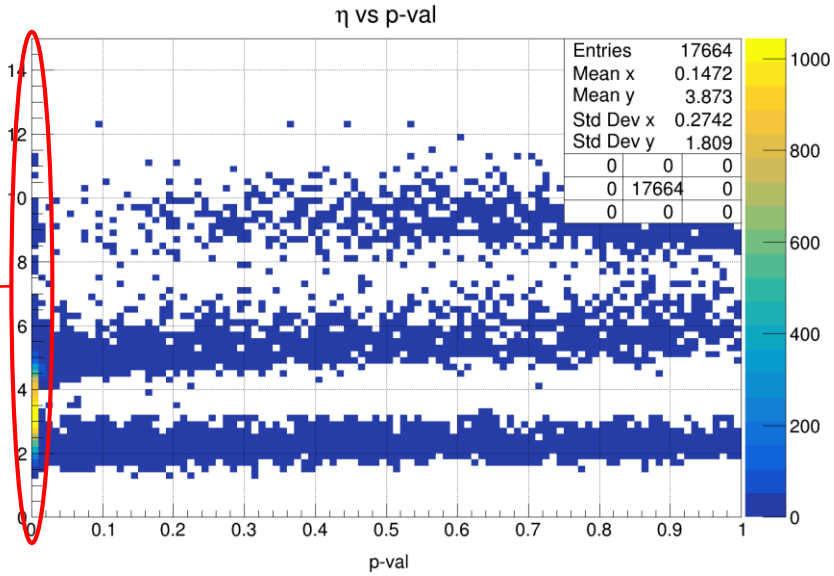
Open question: why are the bent layers shifted (almost along Y) respect to the alignment data set? The system was touched?

More on the analysis

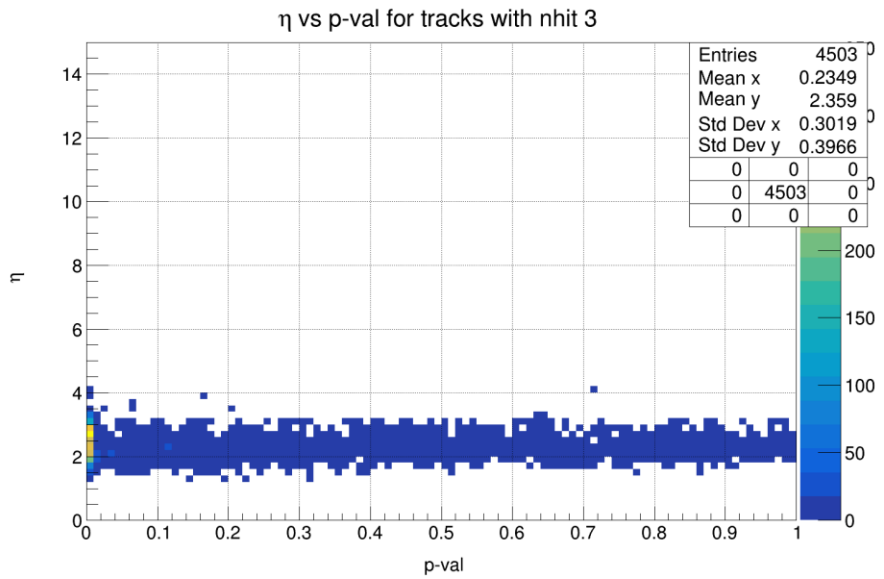


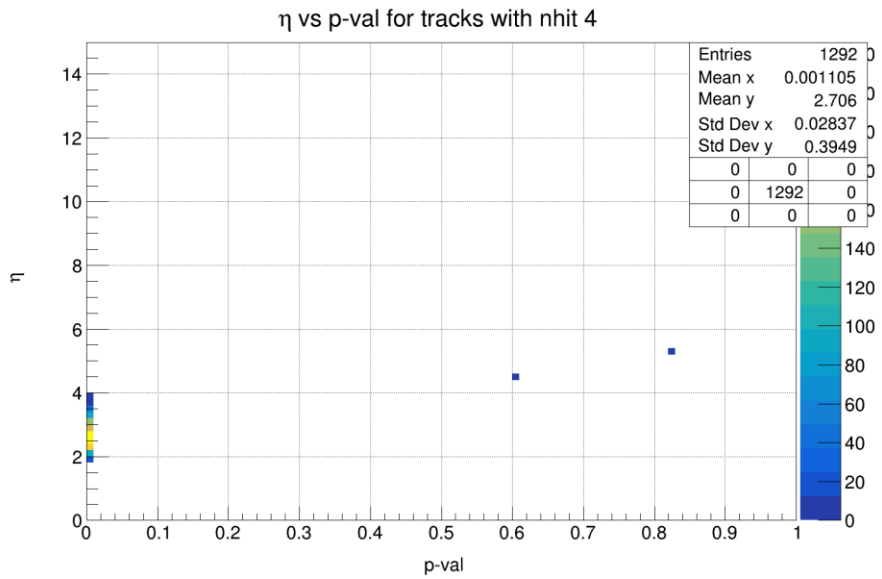


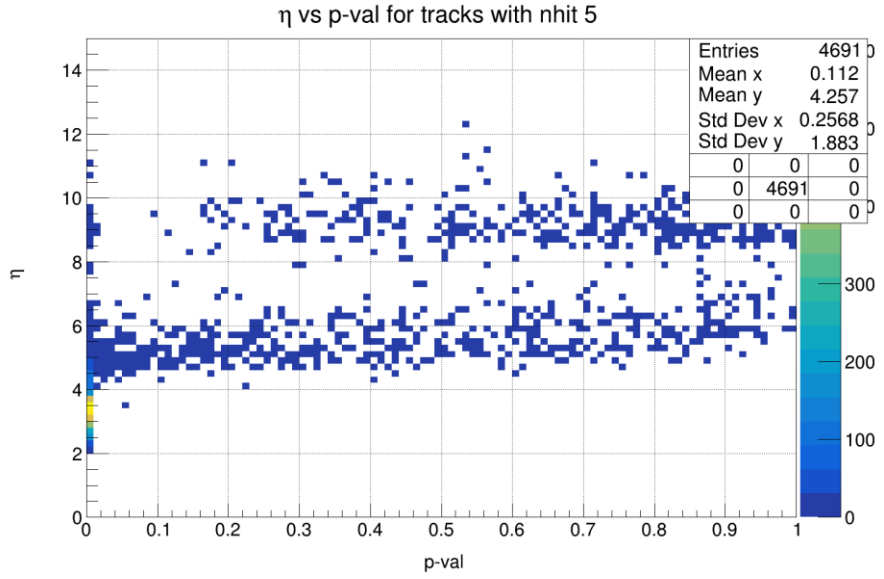


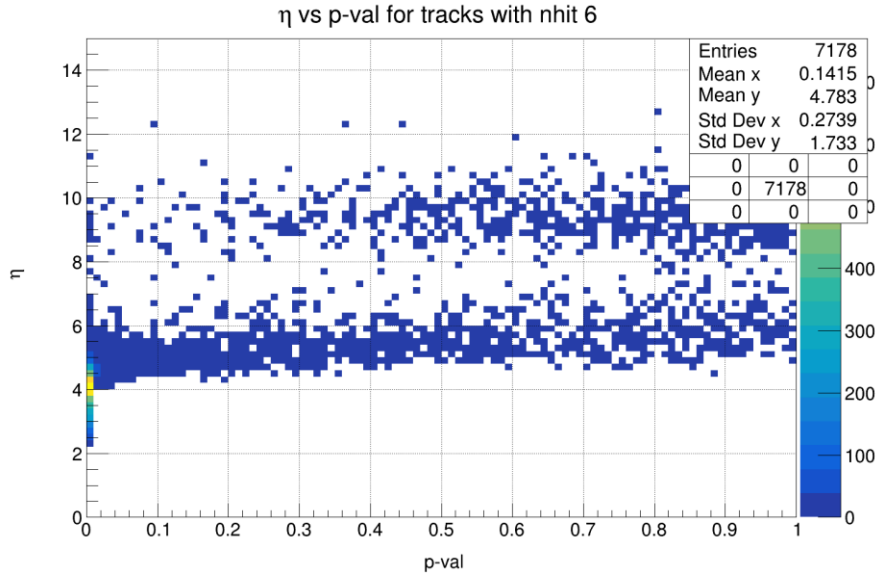


More on the analysis



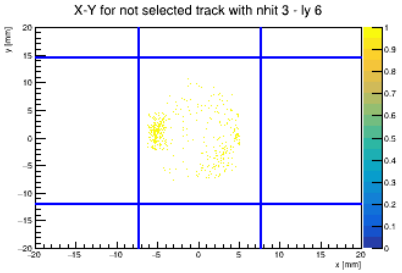


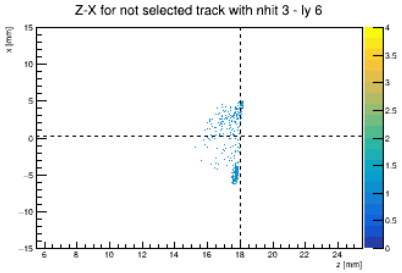


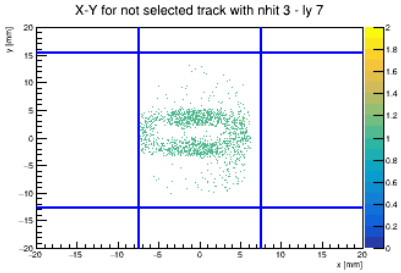


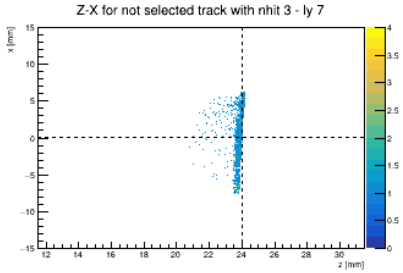
More on the analysis

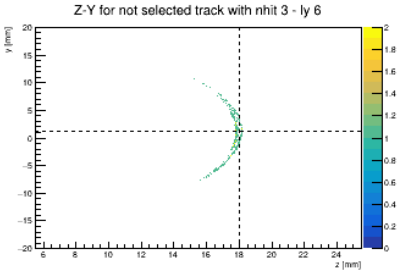
Hit distributions over each layer for track with 3 hits that are rejected

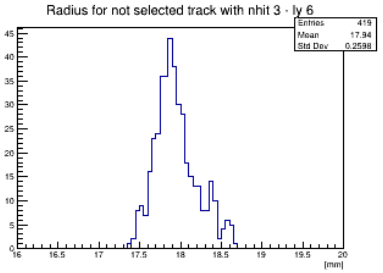


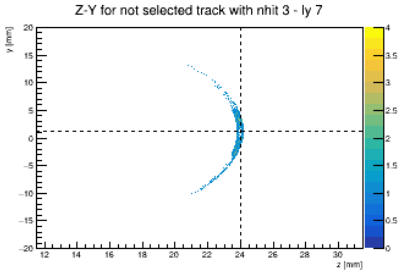


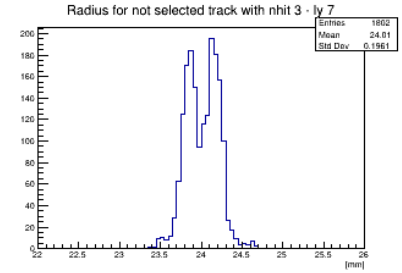


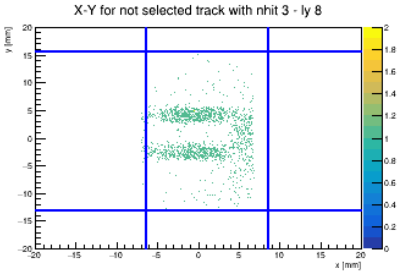


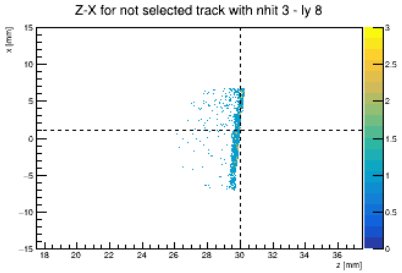


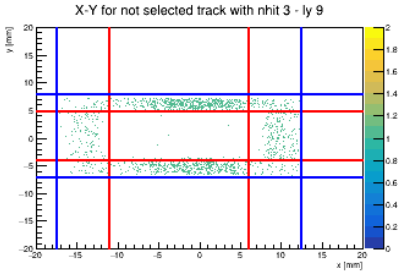


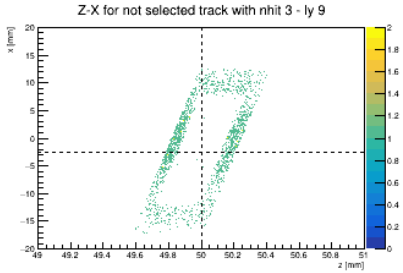


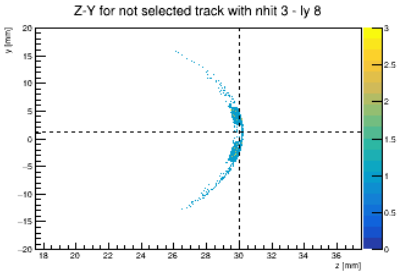


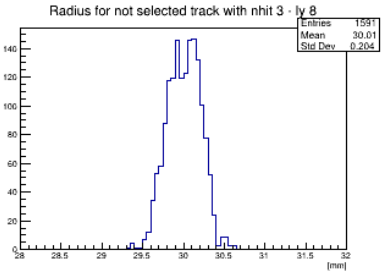


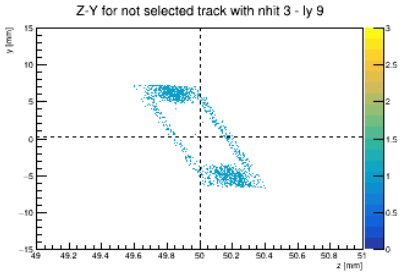






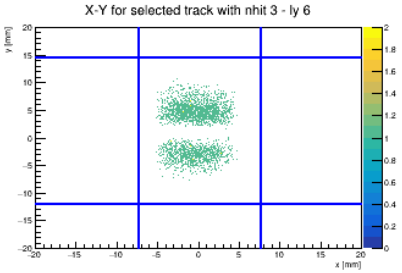


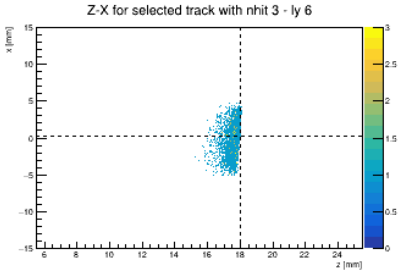


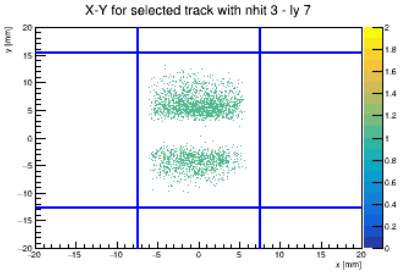


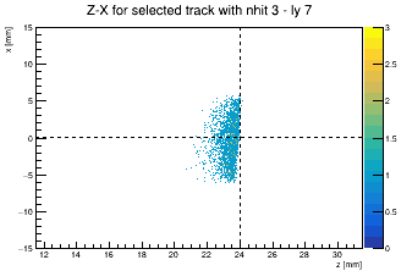
More on the analysis

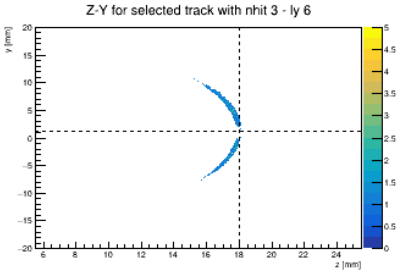
Hit distributions over each layer for track with 3 hits that are selected

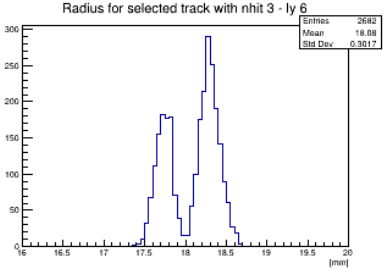


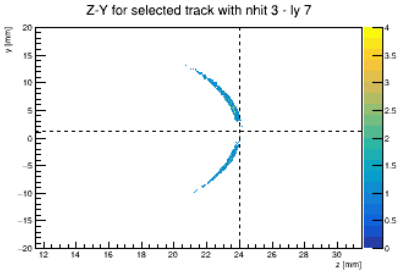


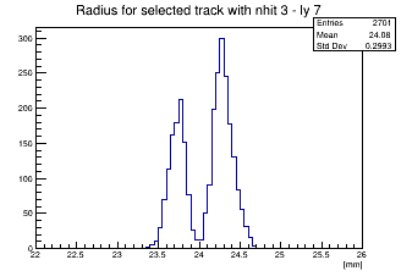


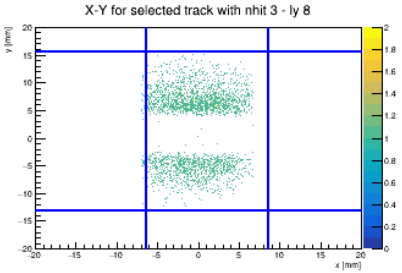


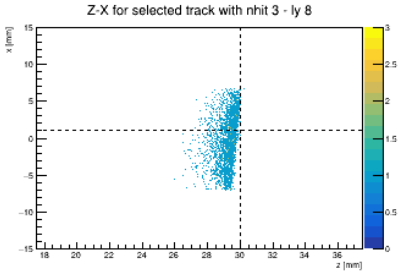


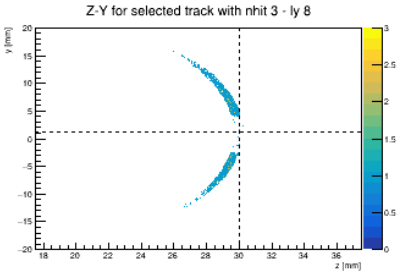


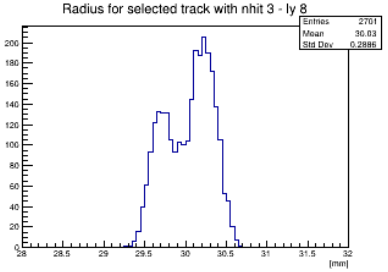






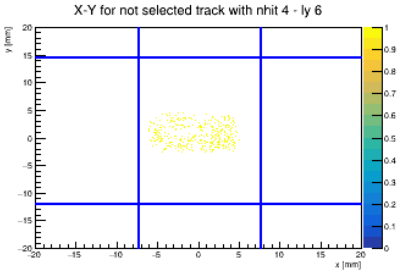


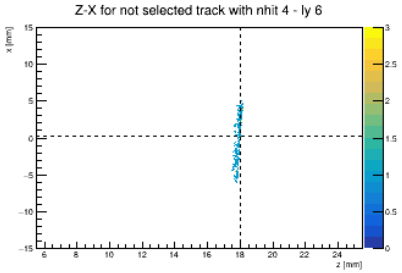


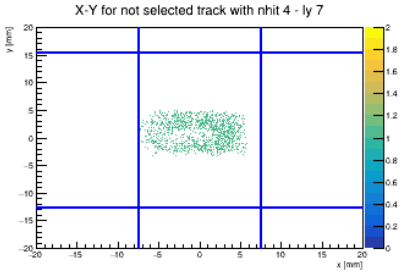


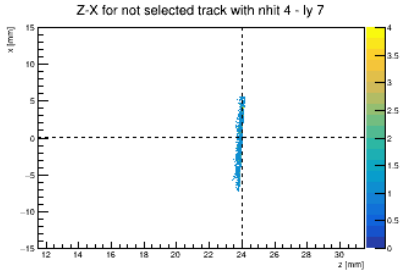
More on the analysis

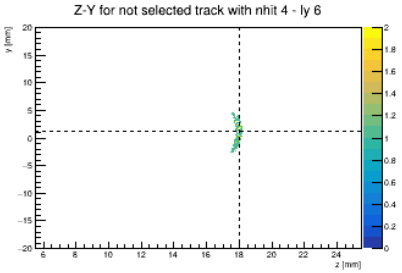
Hit distributions over each layer for track with 4 hits that are rejected

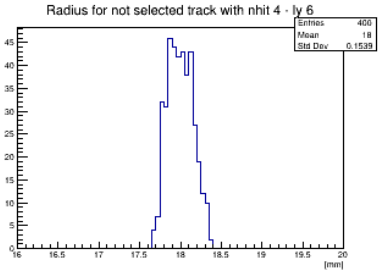


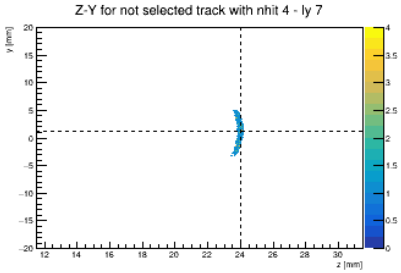


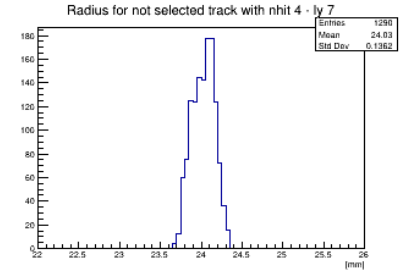


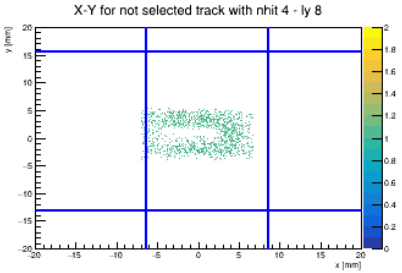


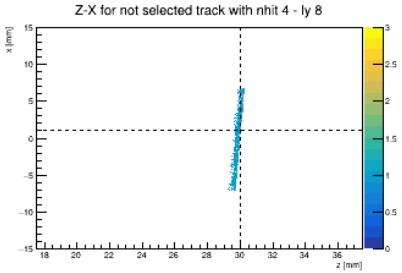


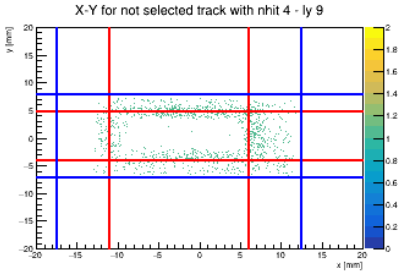


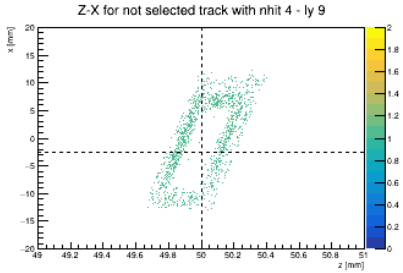


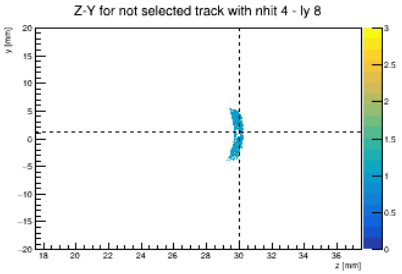


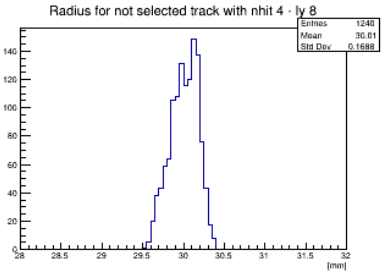


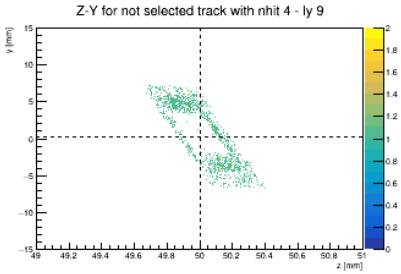






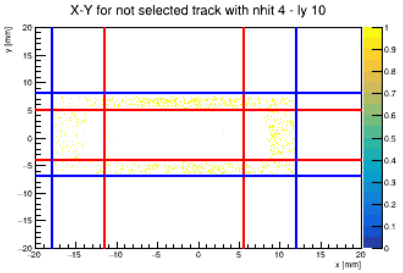


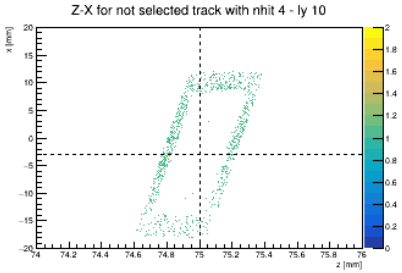


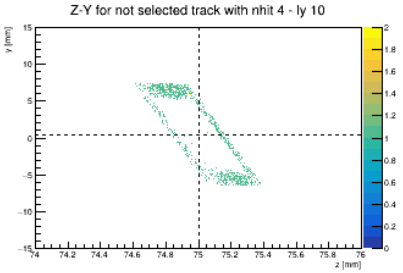


More on the analysis

Hit distributions over each layer for track with 4 hits that are rejected

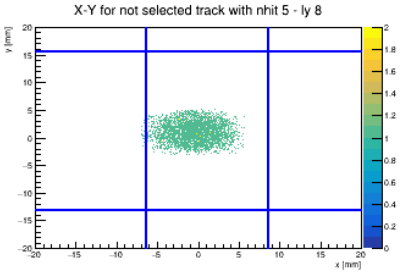


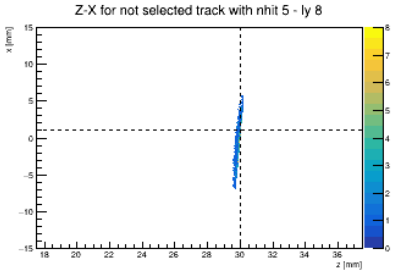


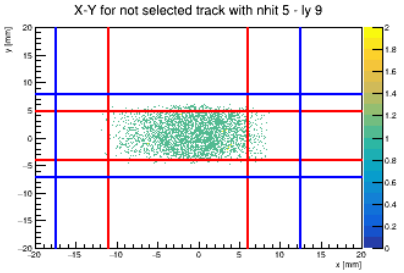


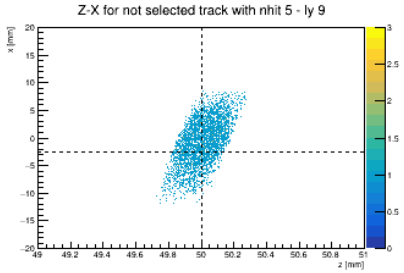
More on the analysis

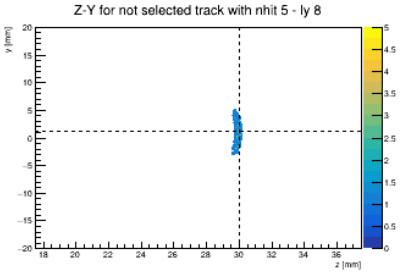
Hit distributions over last layer for track with 5 hits that are rejected

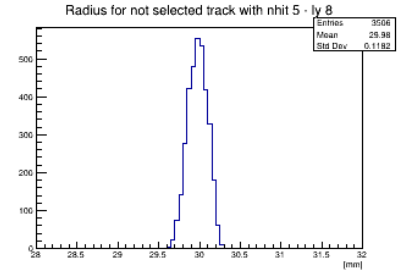


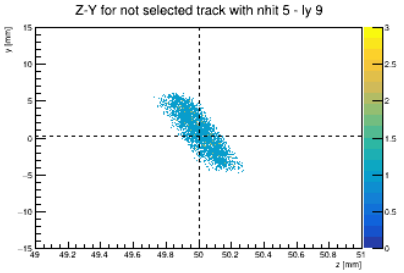


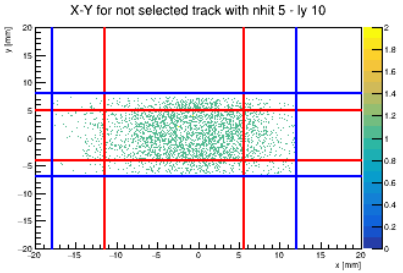


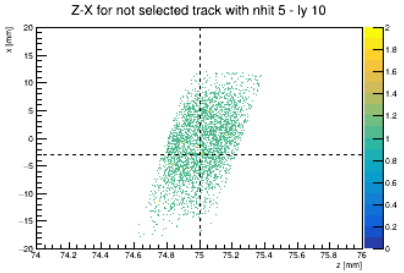


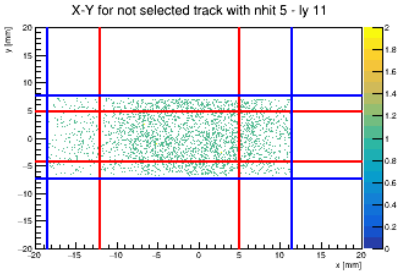


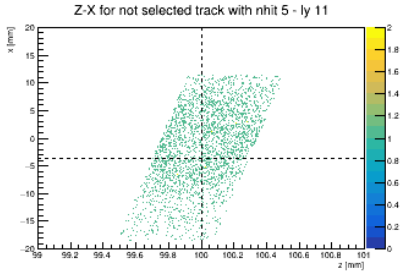


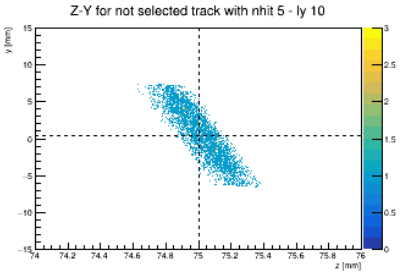


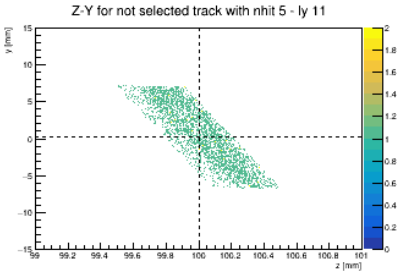






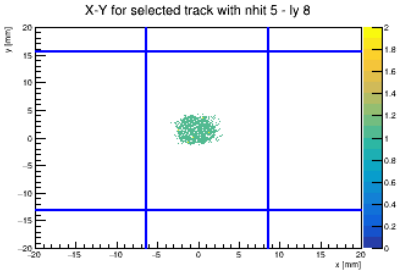


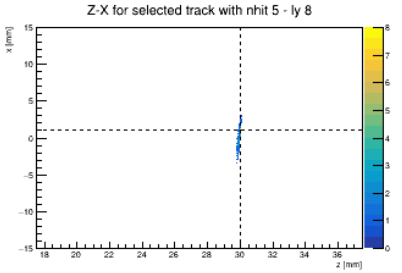


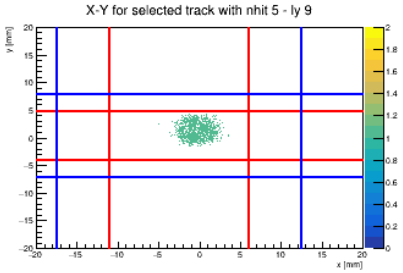


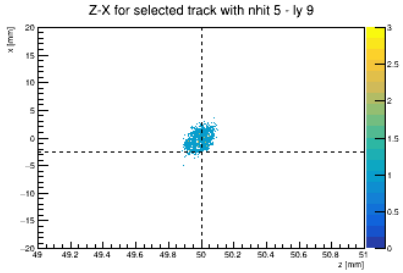
More on the analysis

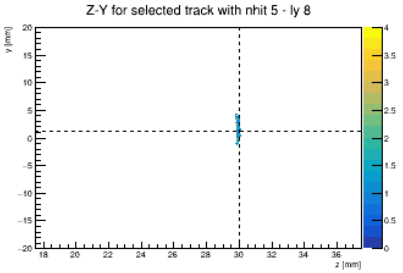
Hit distributions over last layer for track with 5 hits that are selected

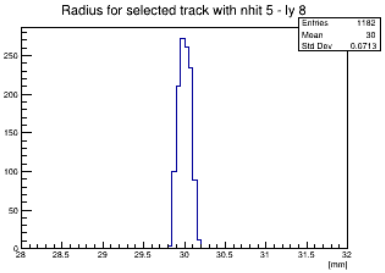


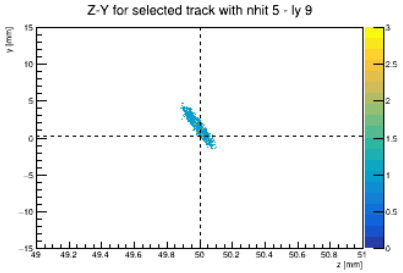


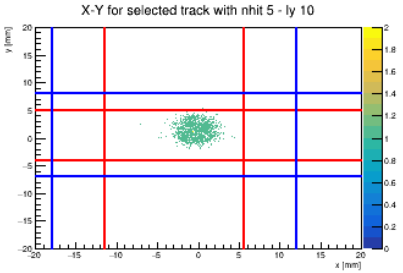


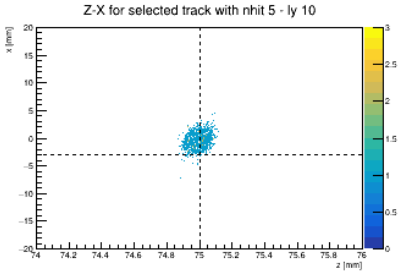


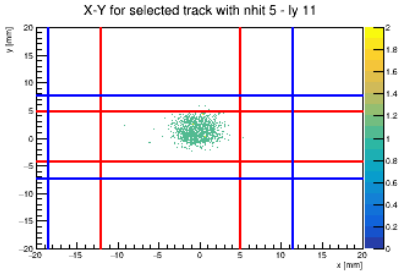


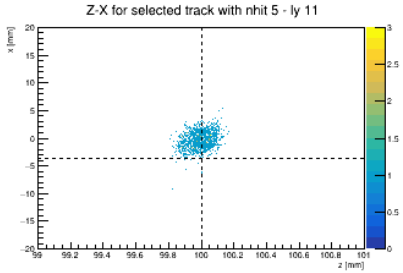


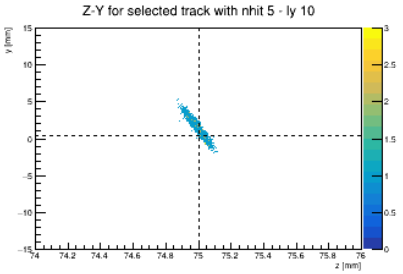


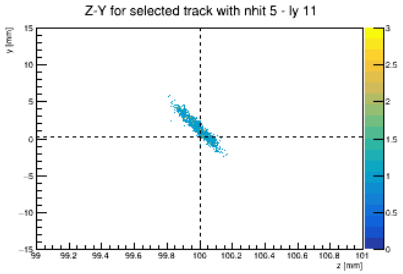






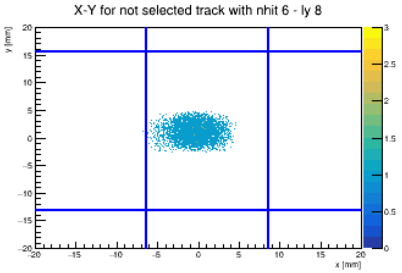


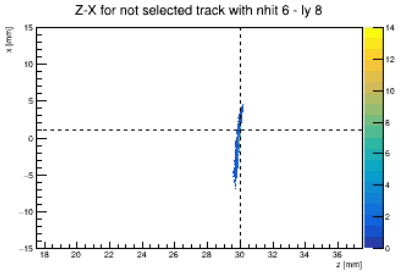


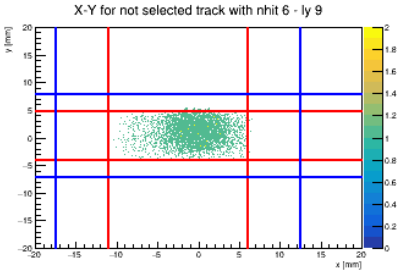


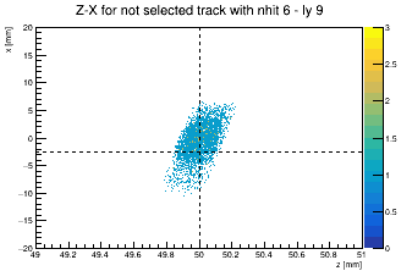
More on the analysis

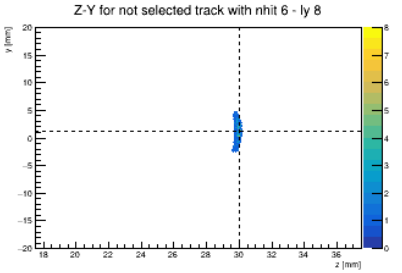
Hit distributions over last layer for track with 6 hits that are rejected

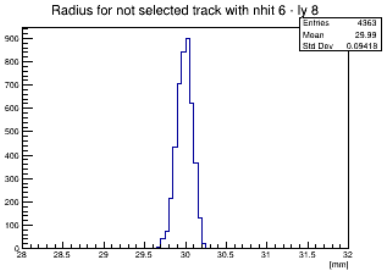


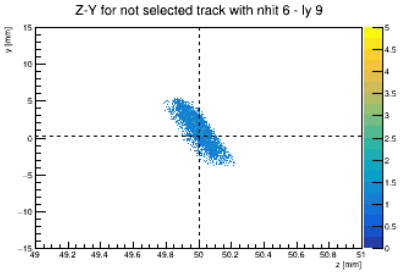


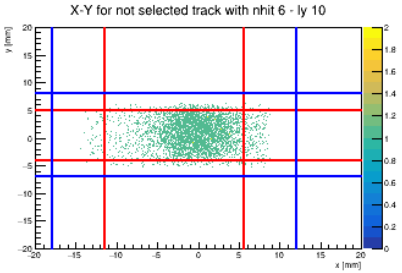


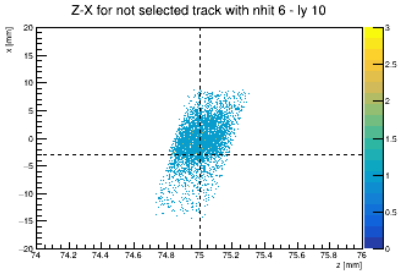


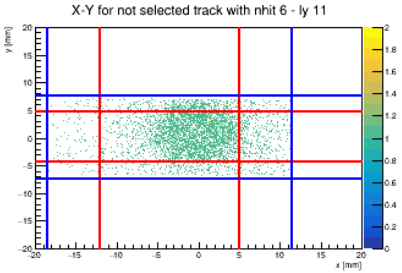


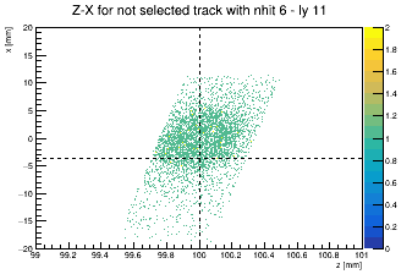


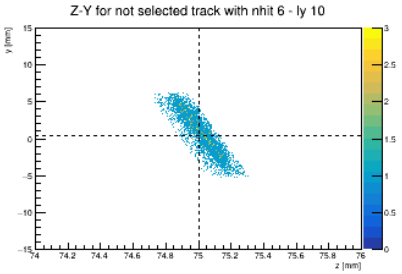


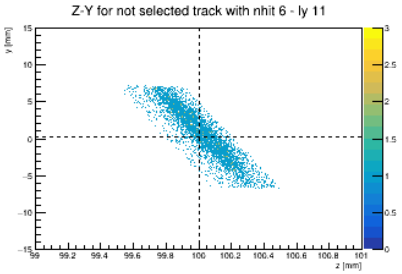






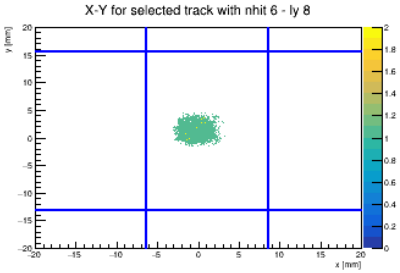


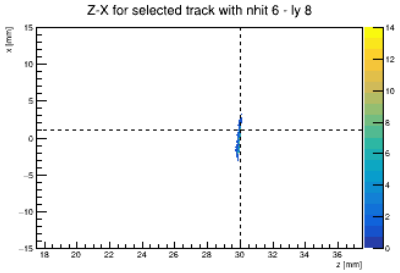


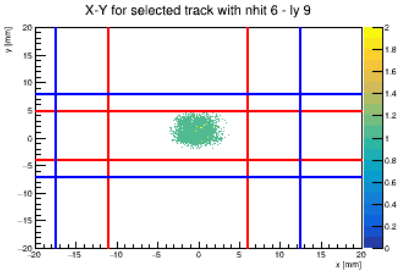


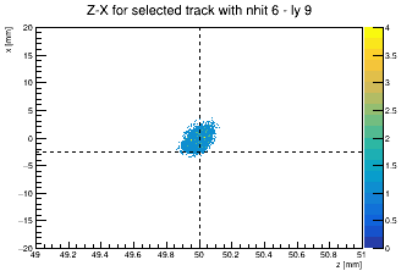
More on the analysis

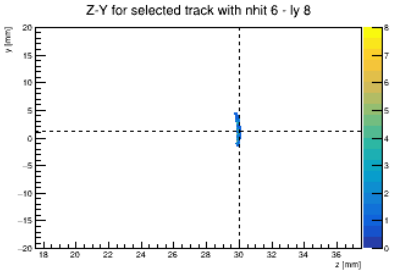
Hit distributions over last layer for track with 6 hits that are selected

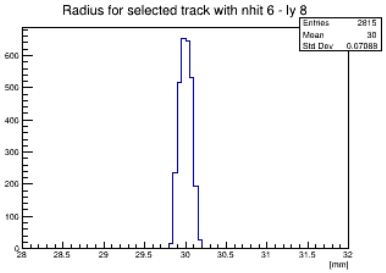


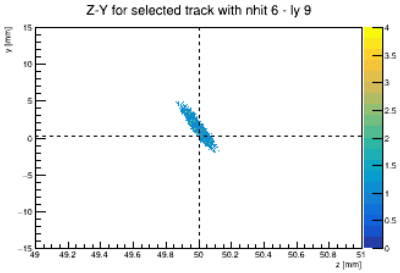


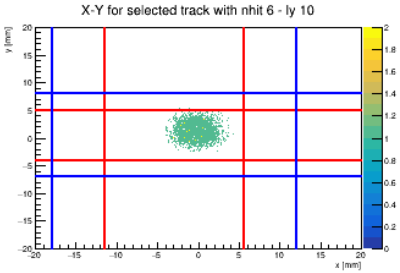


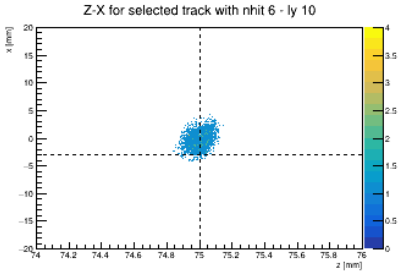


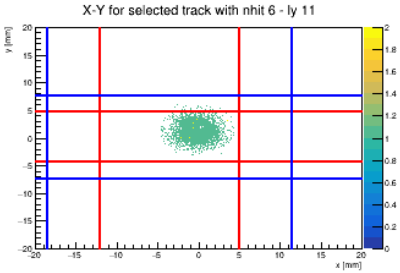


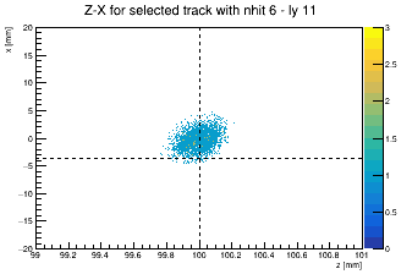


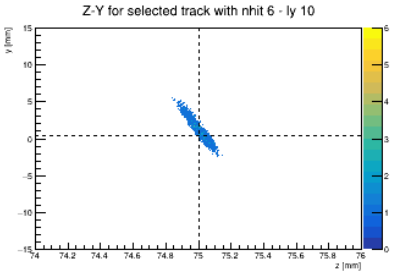


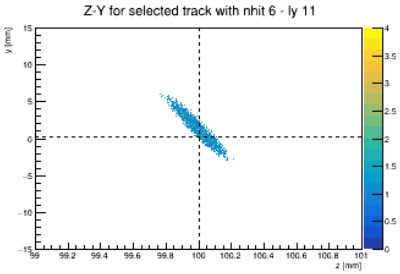






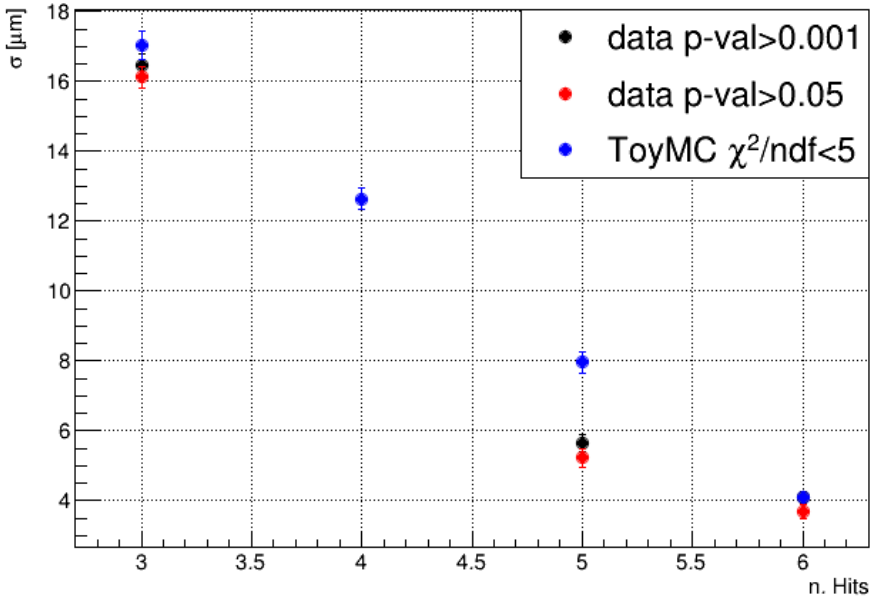


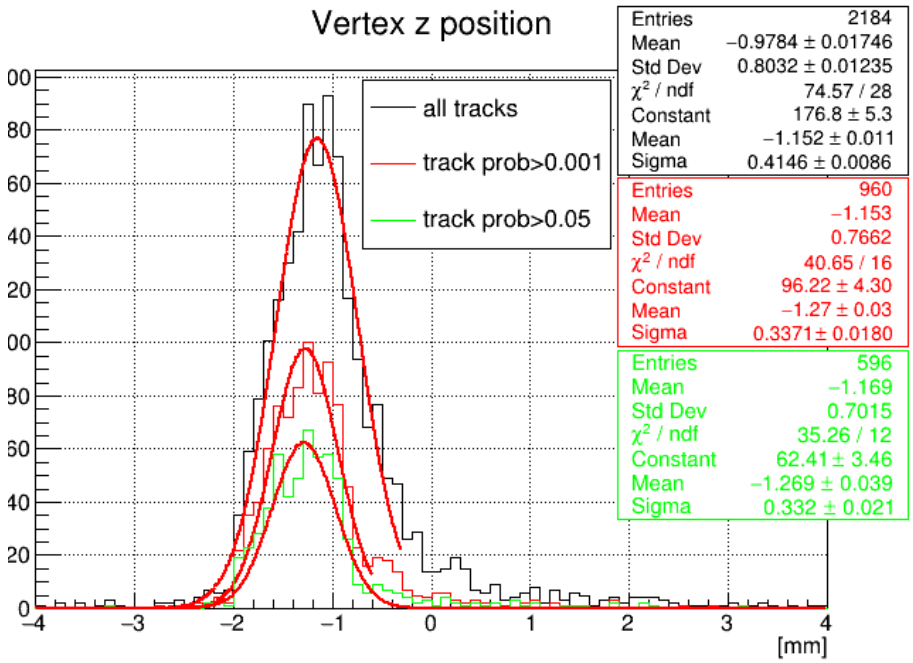




More on the analysis

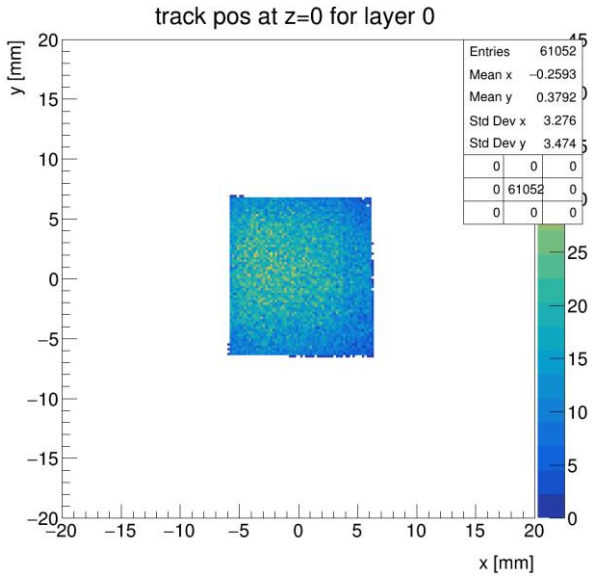
- The hole in the h distribution around 3-4 is due to a strong dependency of the track quality with the track h for each track kinds (with 3, 4, 5 and 6 hits). It is due to tracks that are hitting the jigs of the flat layers.
- The Vertex z positions has «negligible» tail:



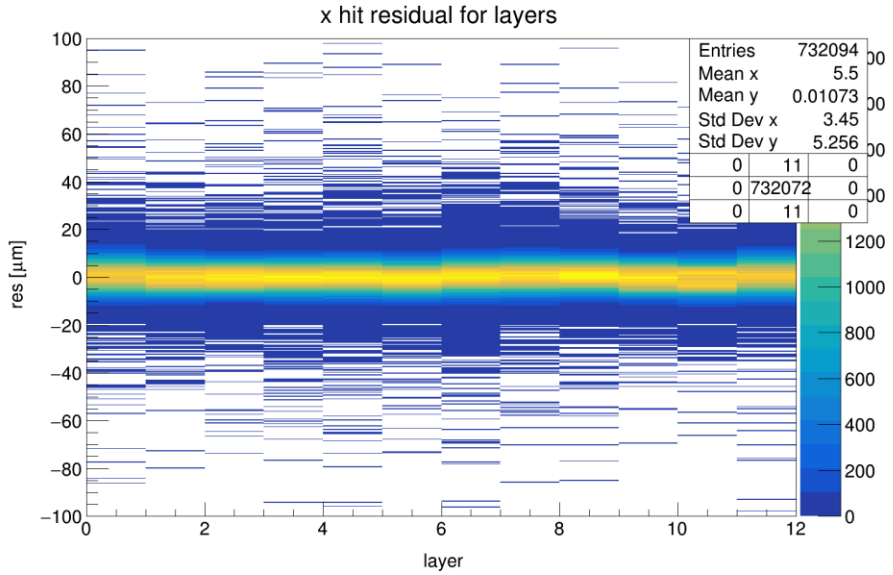


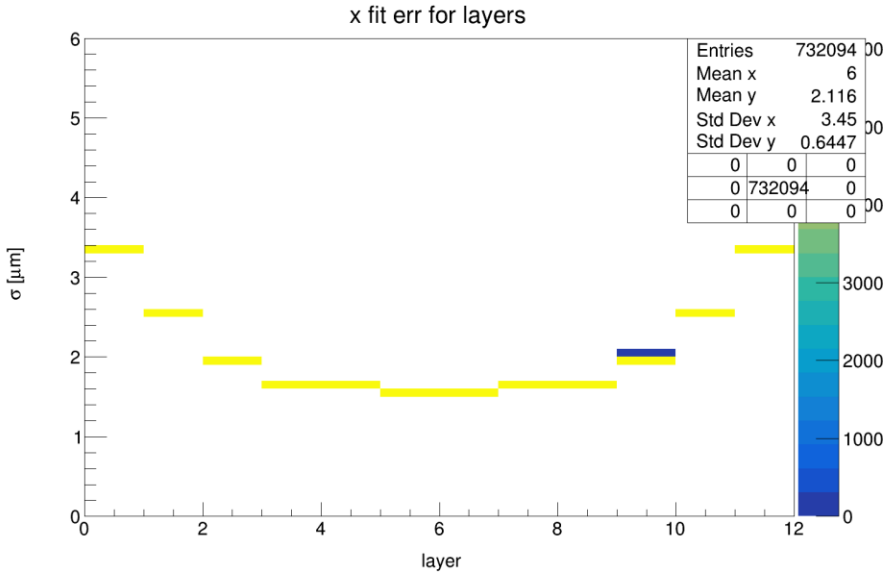
Single Hit resolution (from alignment data set)

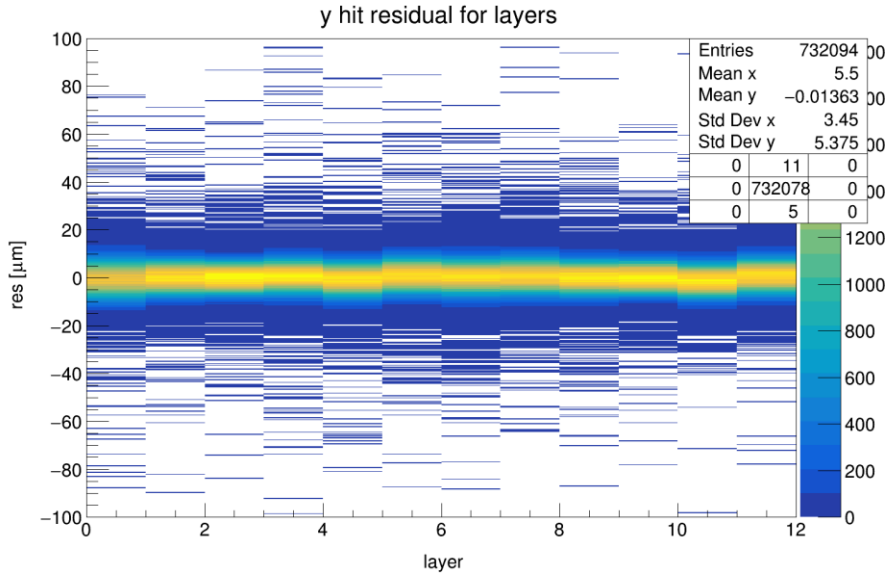
- Used the last about 72200 events
- Tracks selection criteria:
  - $\eta > 8$
  - p-val > 0.05
- The residuals on a layer are evaluated by fitting the tracks excluding the considered layer
- The resolutions on a layer are evaluated by subtracting the extrapolation errors to the residuals

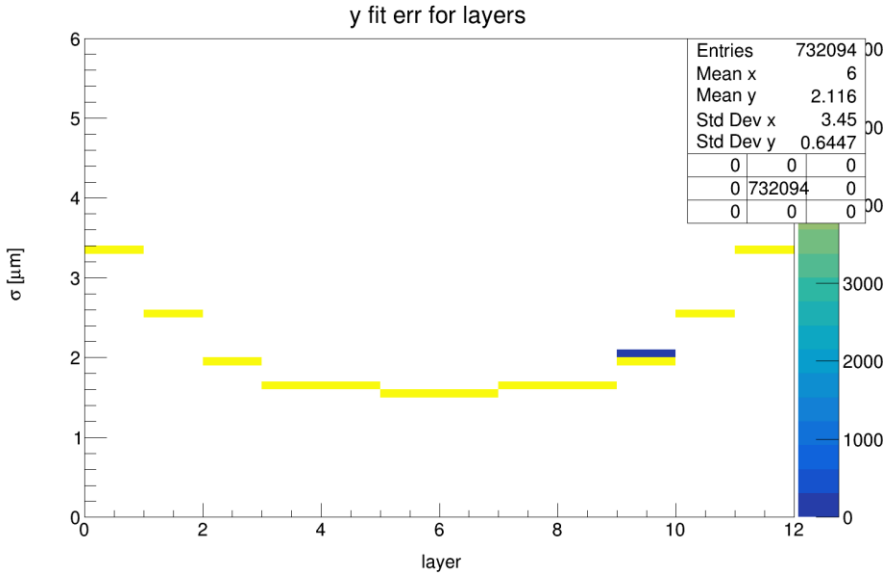


Single Hit resolution (from alignment data set)



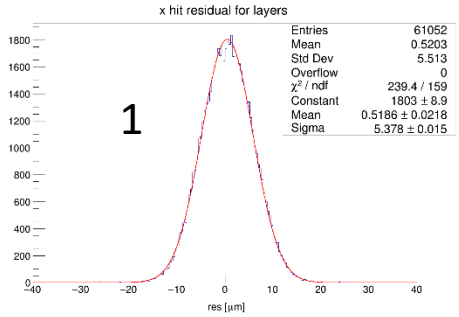


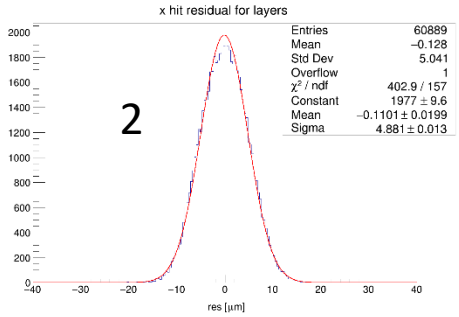


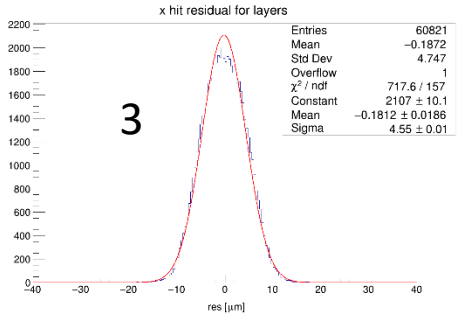


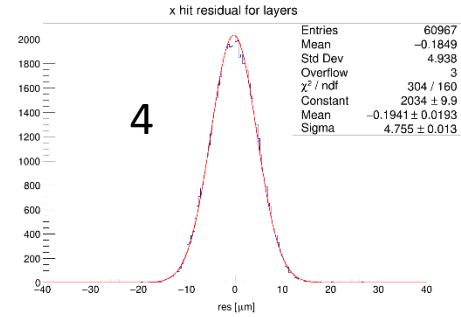
Single Hit resolution (from alignment data set)

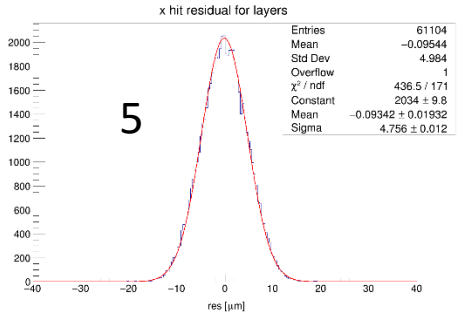
Residuals on X

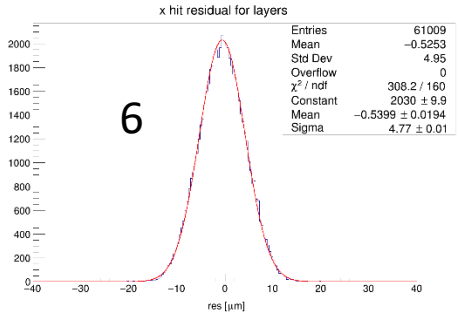


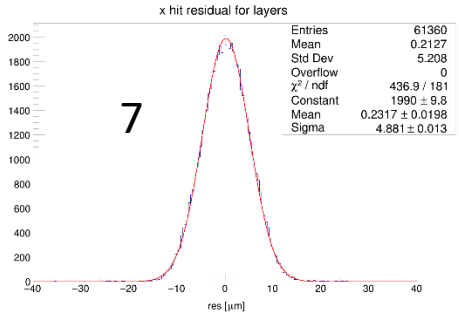


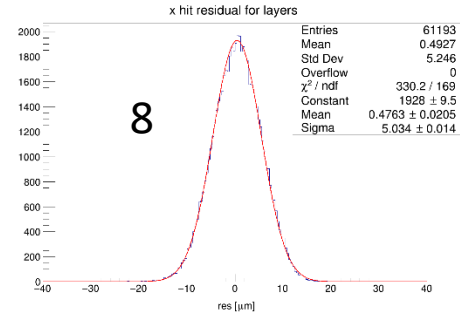


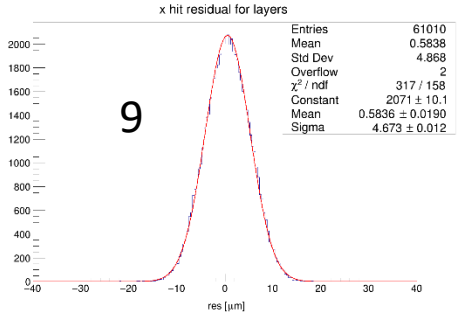


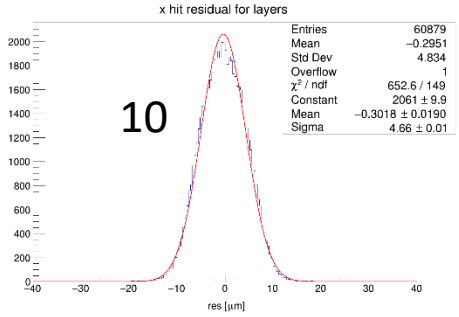


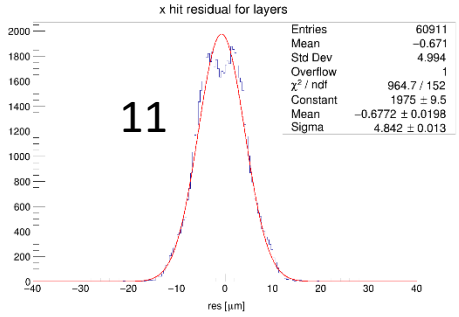


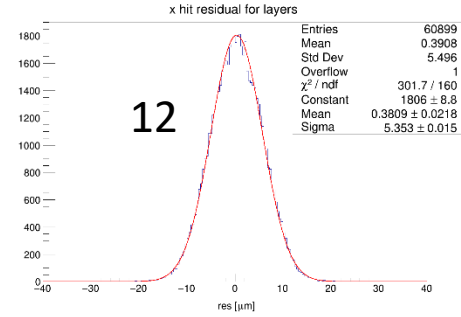




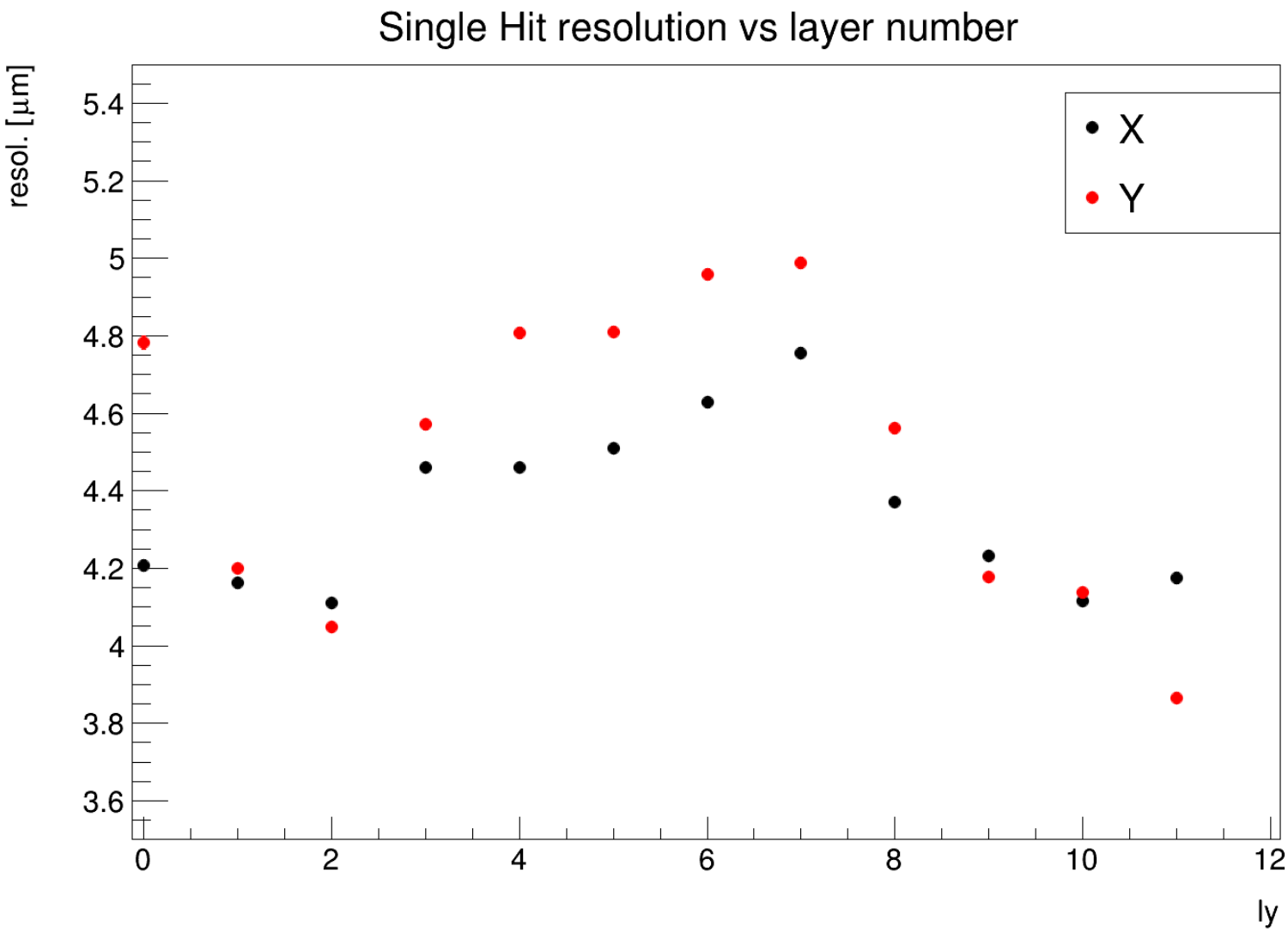








Single Hit resolution (from alignment data set)



Single Hit resolution (from alignment data set)

Residuals on Y