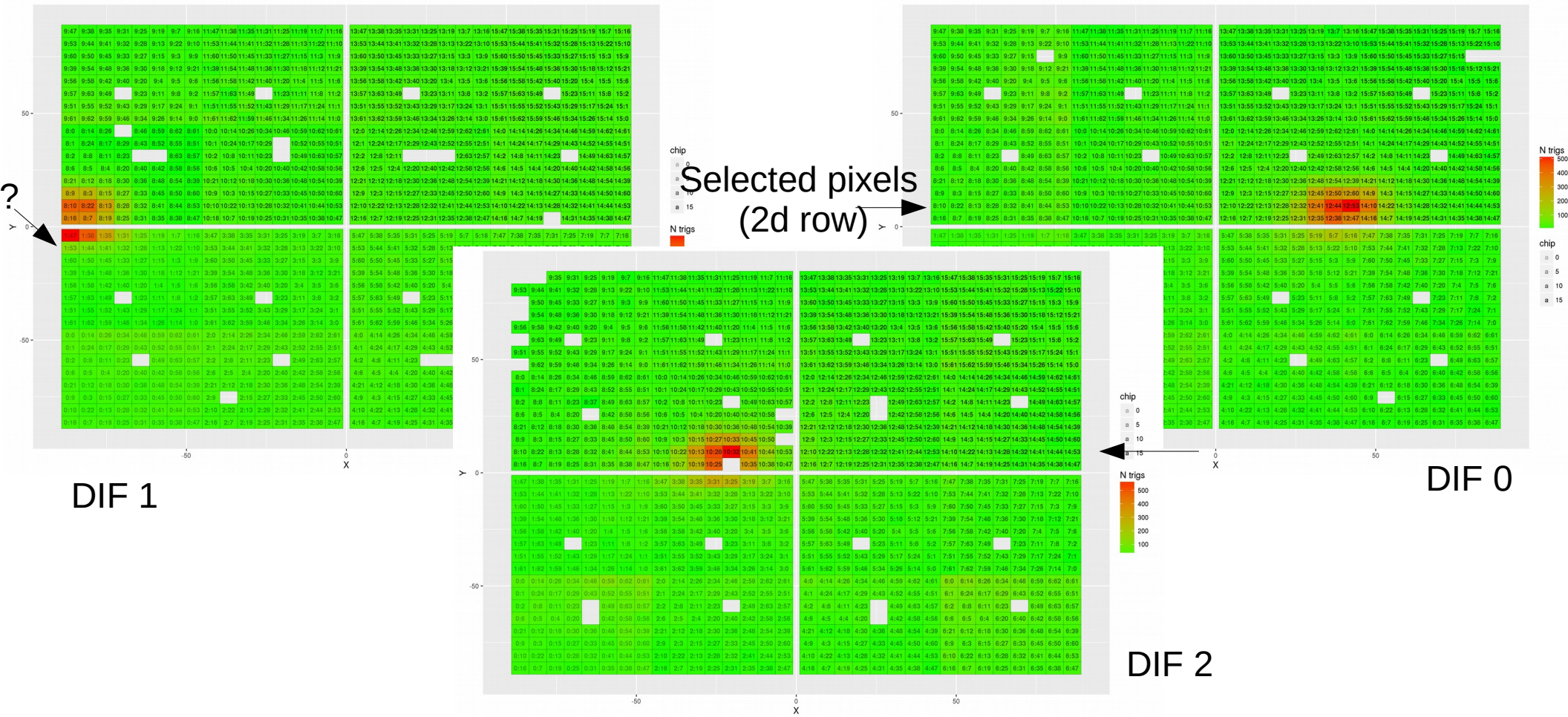


Check of rotation angle

Vladislav Balagura, LLR
7 Apr 2016

Rotation angle was set with the protractor (anglar scale on the table), the angle was supposed to be = 48-49°. One can check it offline using a visible shift between beam spots in DIF 0 and 2 (in DIF 1 the beam is slightly off the layer, not used; big occupancy in top row in low half? - see later). Only MIP-like events are selected to remove broad pion showers and to make beam image narrower: N triggers per layer == 1. In addition, require: ADC-pedestal>30. For x coordinate measurement: select 2nd row with maximal occupancy and no masked pixels.

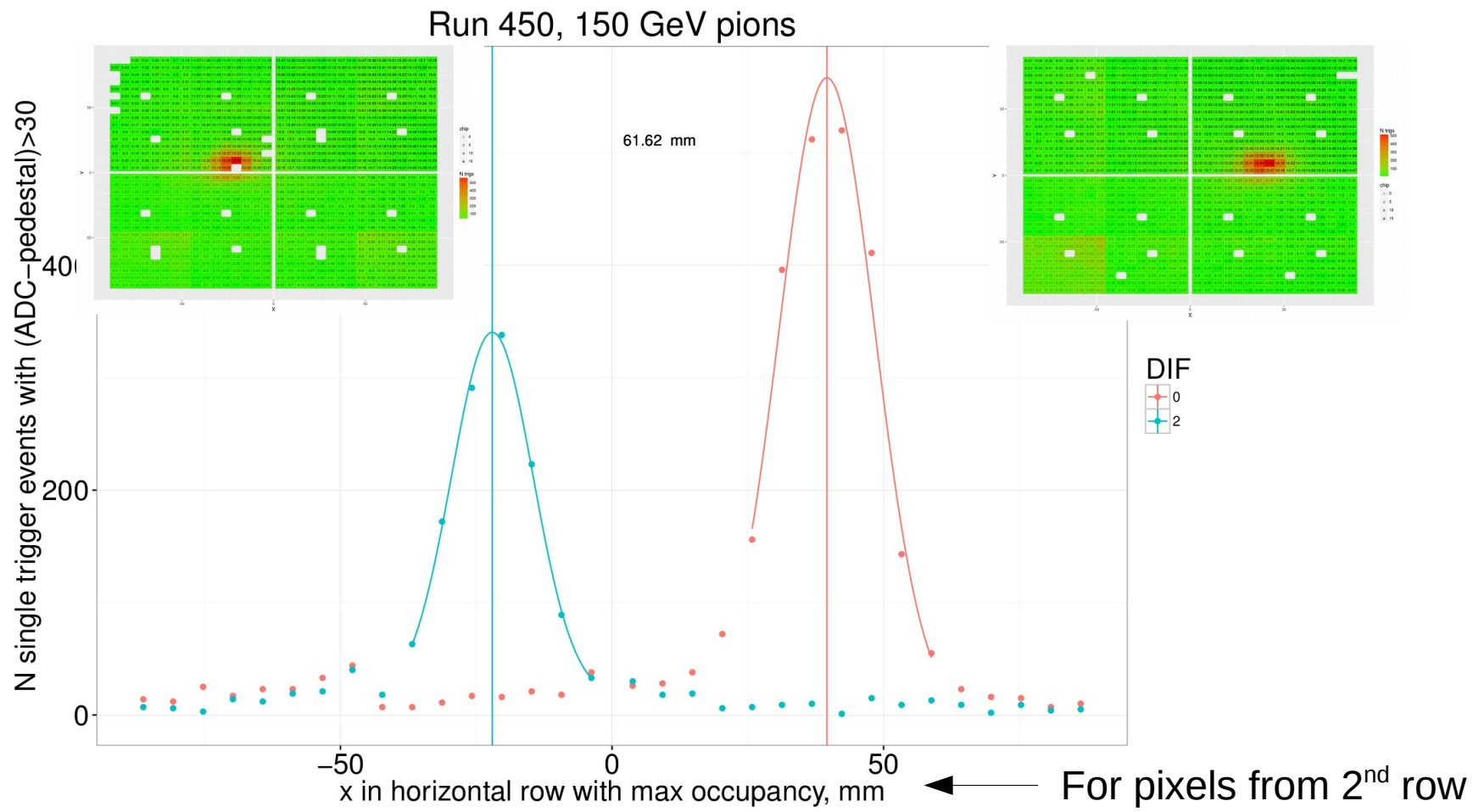


First attempt, no cleaning

Result: shift = 61.6 ± 0.3 mm.

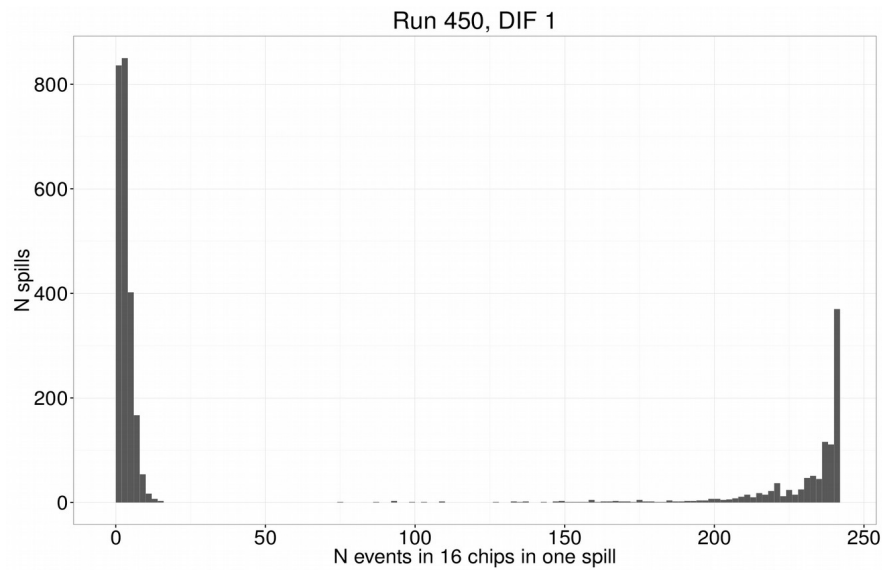
Sigma = 7.5 ± 0.5 and 8.8 ± 0.4 mm (from left to right)

Note different widths and large background.

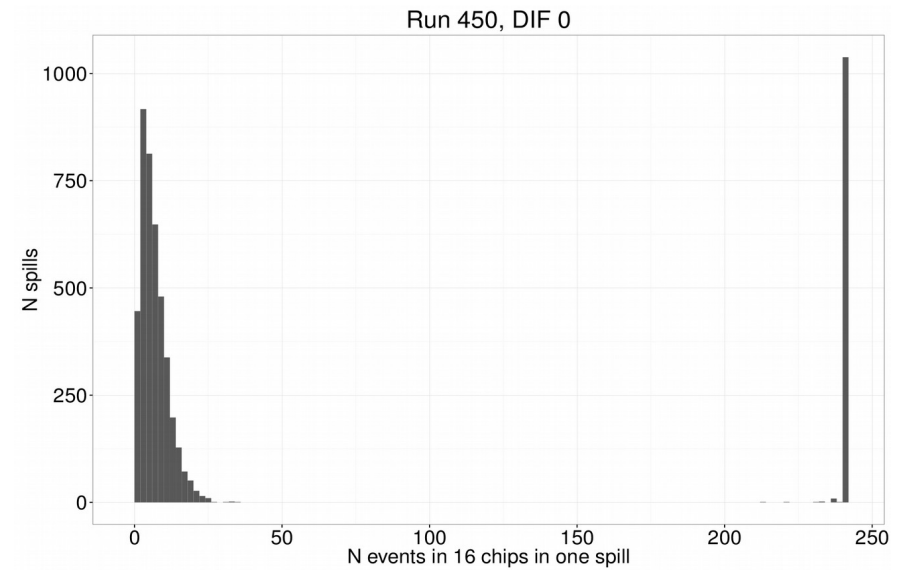


Cleaning

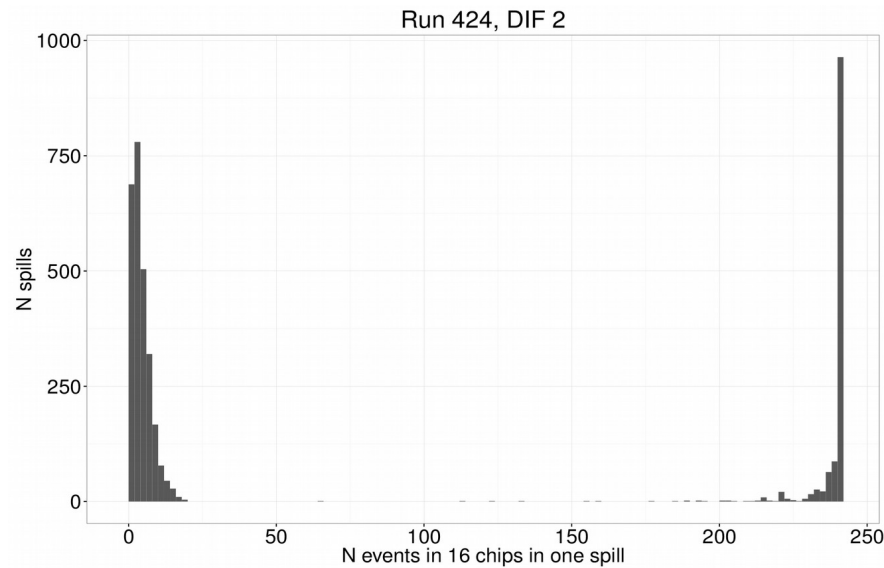
First, remove off SPS spill events. Below: number of triggered events summed over all chips in one spill. Beam events peak at $15 \text{ SCA} \times 16 \text{ chips} = 240$. Cut: $N \text{ events} \geq 200$.



DIF 1



DIF 0

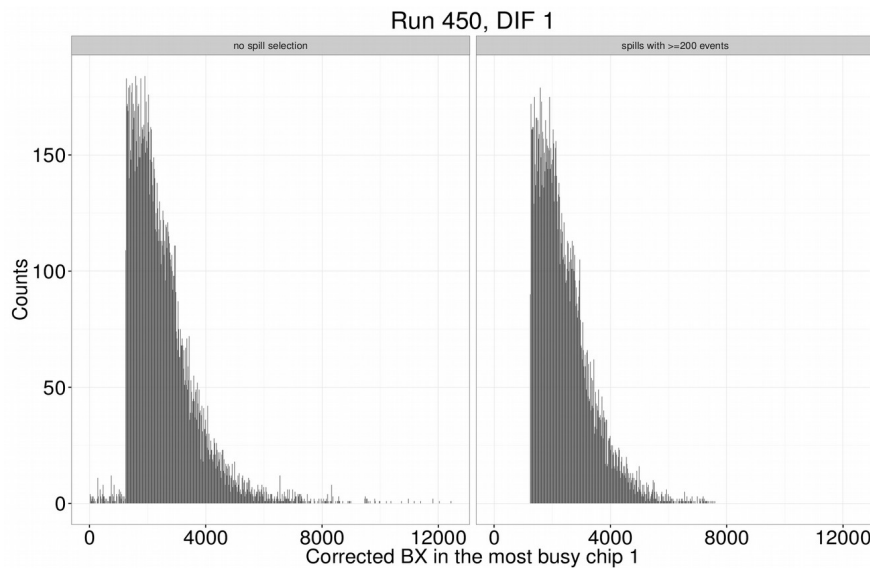


DIF 2

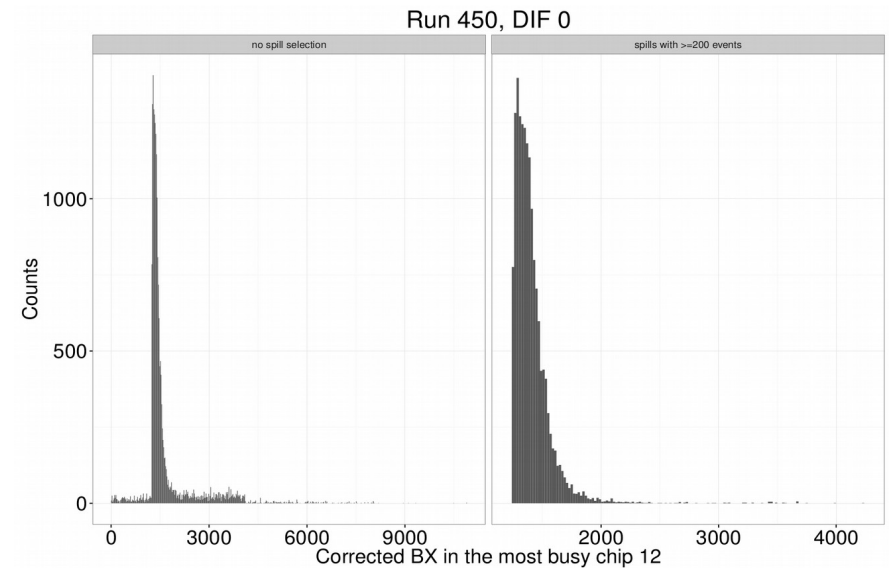
Cleaning

The pion rate was very high, central chip collected 15 SCA events very fast, as can be seen from BX distributions below.

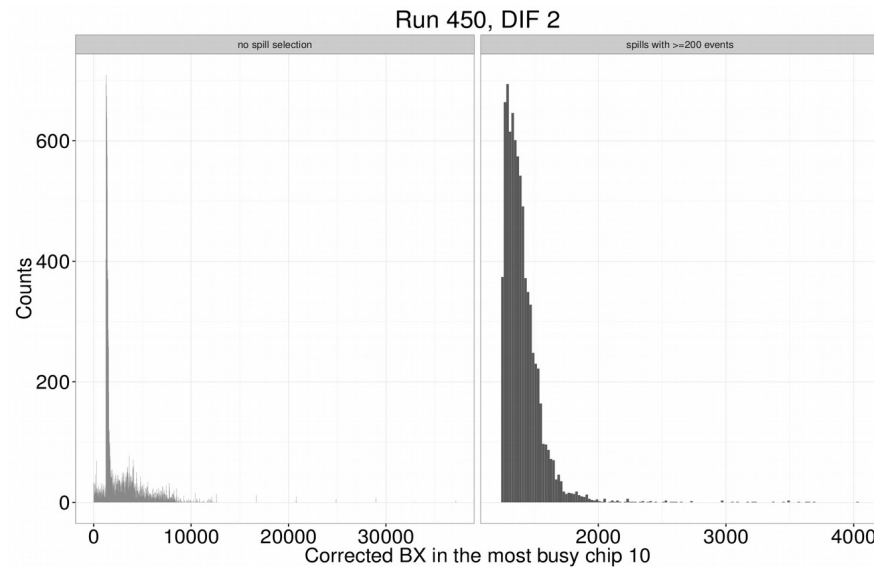
BX can be ≥ 4096 as I use “corrected” BX: if $BX(SCA+1) < BX(SCA)$, there was a recycling $BX=4096 \rightarrow 0$, in this case I add 4096 to BX (partial recovery of non-unique BX coding in 12 bits)



DIF 1



DIF 0

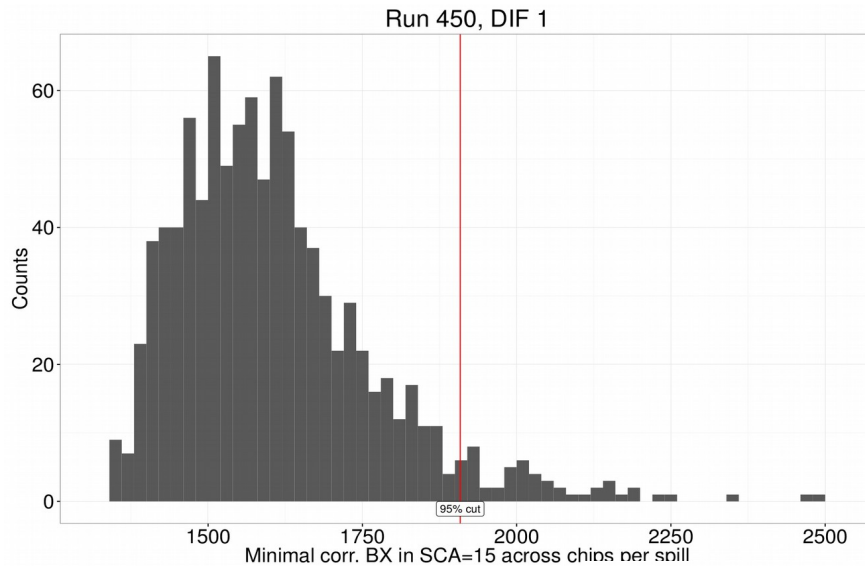


DIF 2

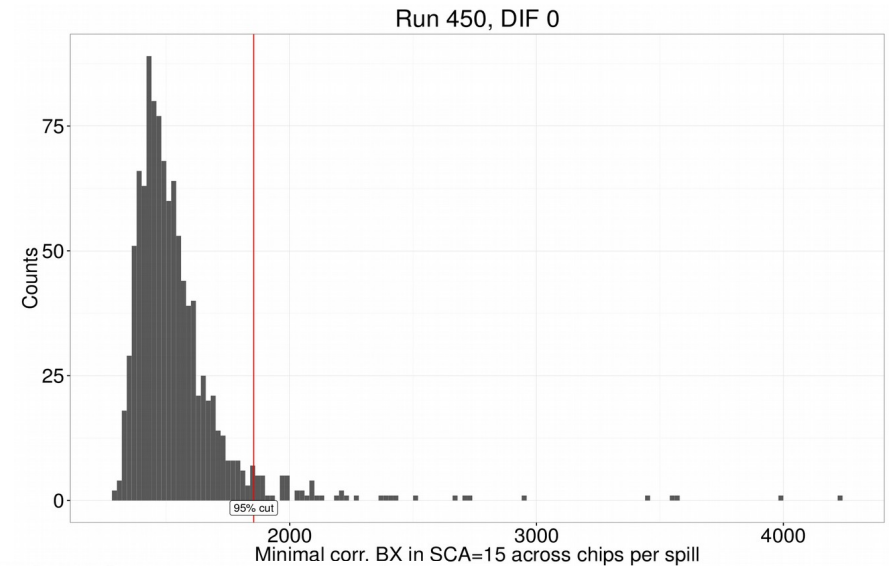
Cleaning

Beam image depends on uniformity of channel responses. Inefficiency can be due to

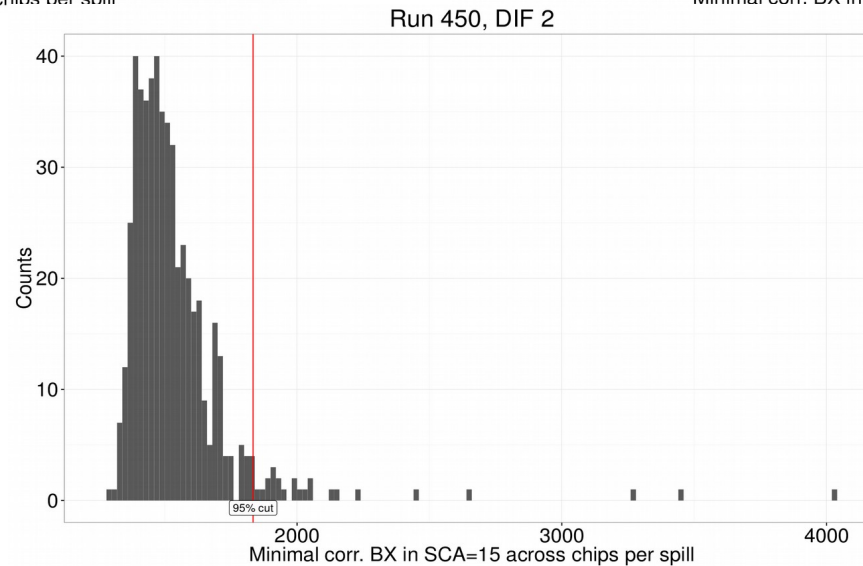
- different gains and trigger threshold cuts
- 15 SCA, ie. limited SKIROC memory. It is uniform within one chip, but not across the chips. Central chip stops very fast, much less efficient compared to peripheral. The latter can slowly collect up to 15 events (comparable with the central chip). Cut: $1249 \leq BX \leq$ minimal BX at SCA=15 calculated across all chips in one spill, in all spills except 5% with the highest minimal BX (shown by red lines). Contribution from peripheral chips might still be slightly enhanced (if after recycling, BX by chance falls in this region), but effect is small.



DIF 1



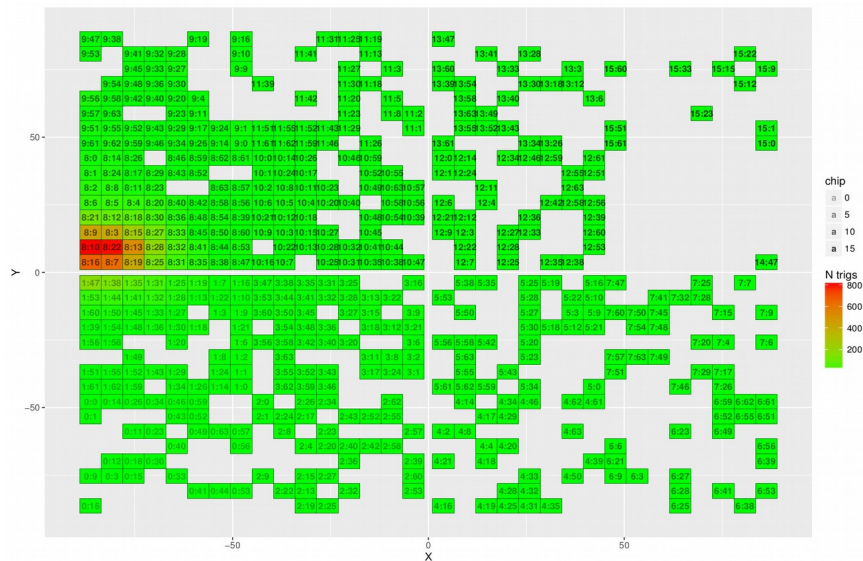
DIF 0



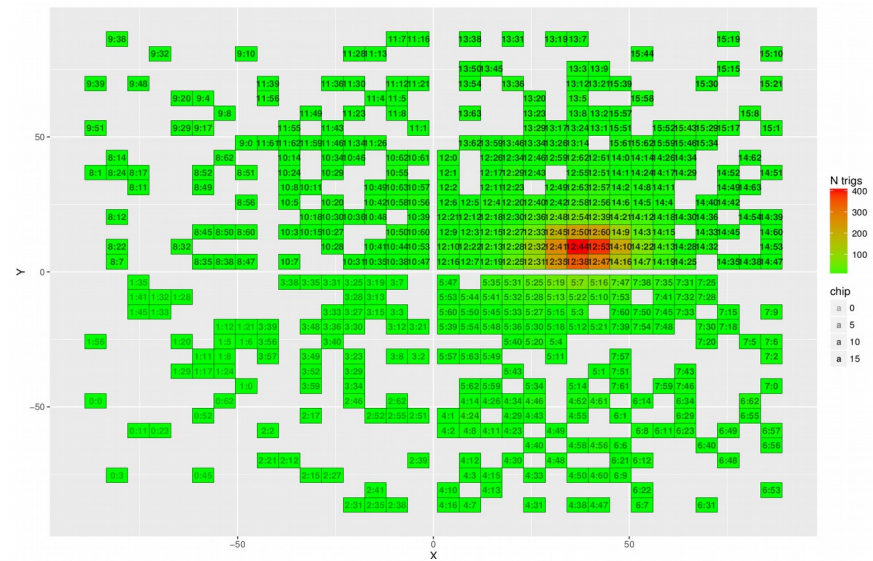
DIF 2

Cleaning

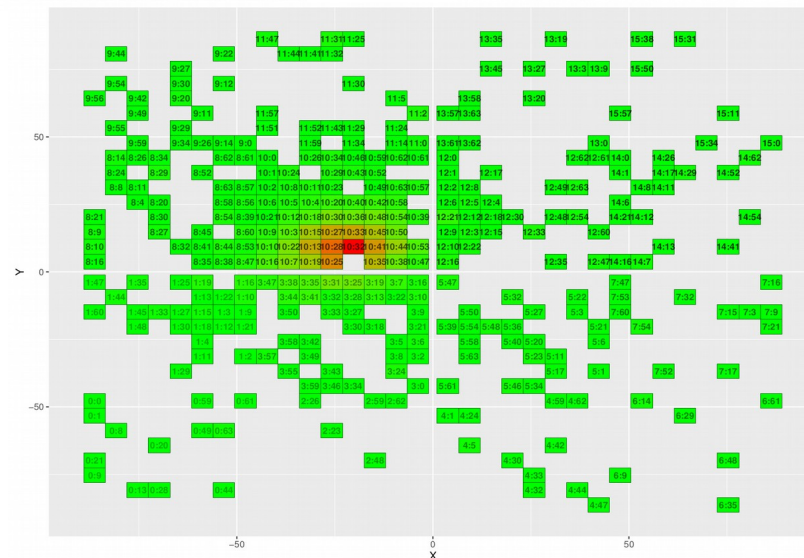
Same plots as on first slide after cleaning, much better. Strange top row in lower half in DIF 1 (marked ? in the first slide) disappeared



DIF 1



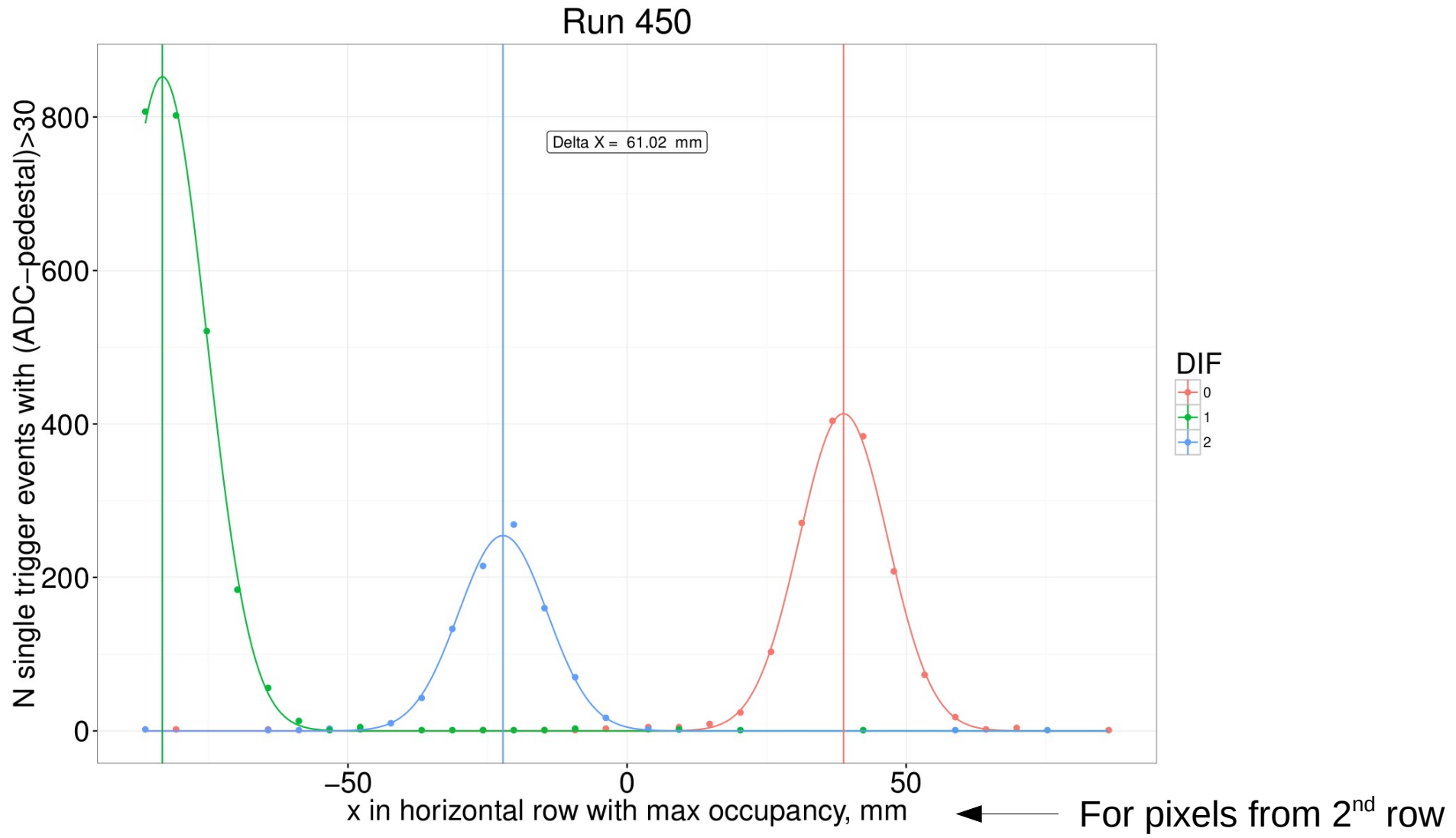
DIF 0



DIF 2

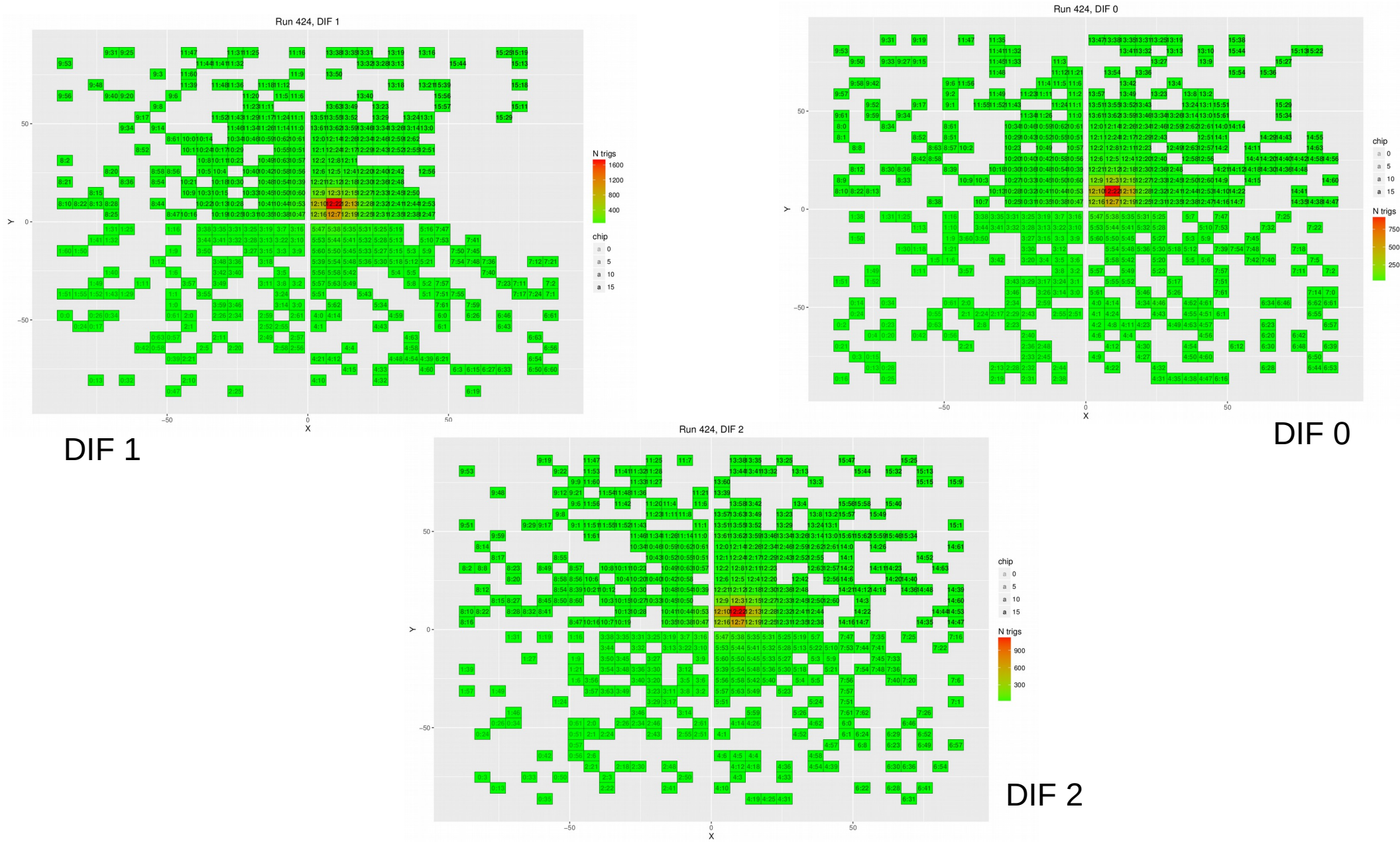
Second attempt, after cleaning

Fit all layers at the same time with equidistant Gaussians with common sigma.
Result: $\Delta X = 61.02 \pm 0.19$ mm, $\sigma = 7.92 \pm 0.12$ mm (errors are statistical)



Normal incidence

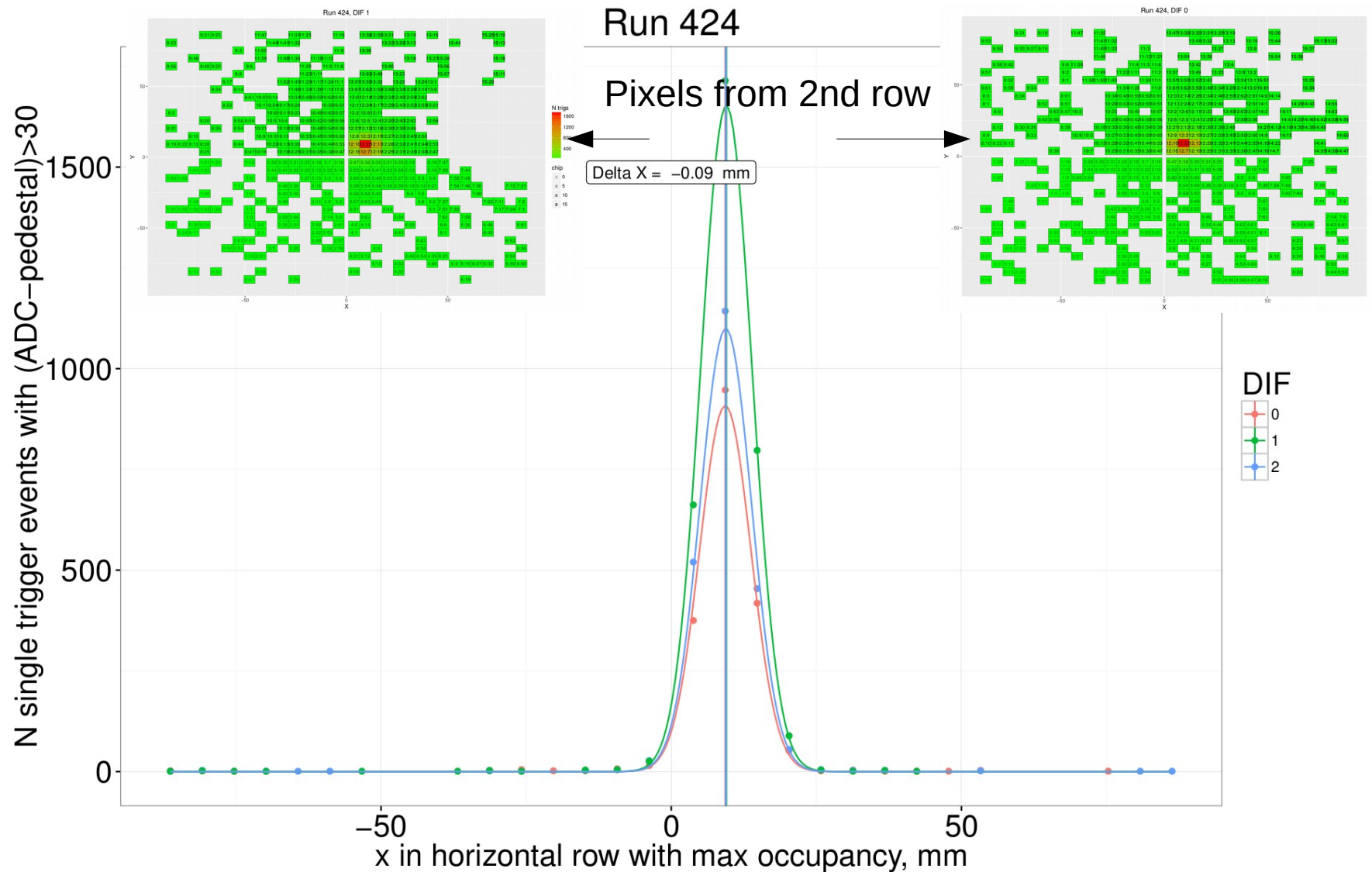
Same before rotation, same configuration, 150 GeV pions.



Check of rotation angle

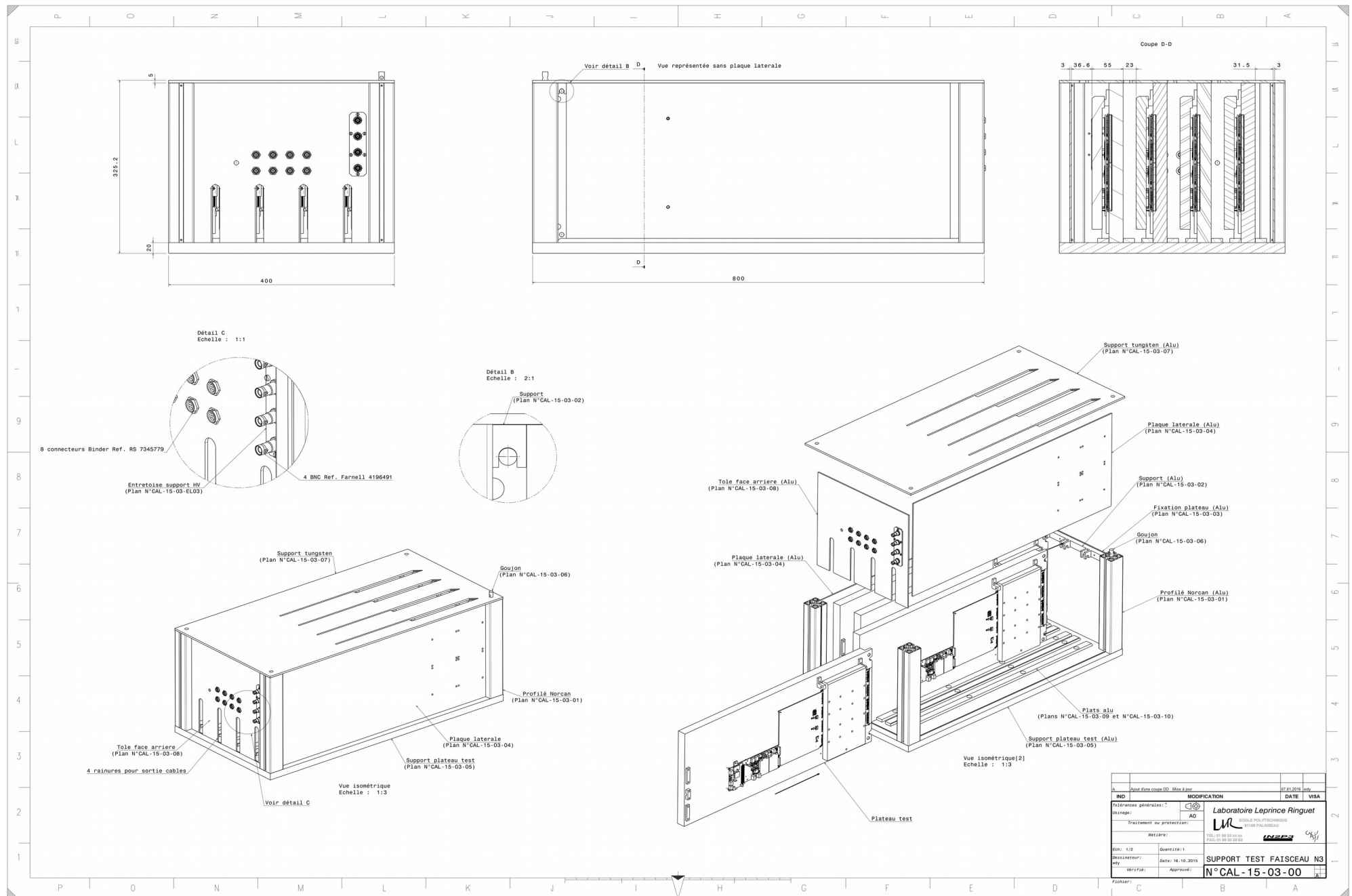
Result:

$\Delta X = -0.09 \pm 0.11$ mm (zero, as it should be for normal incidence), $\sigma = 4.42 \pm 0.07$ mm (errors are statistical)



Check of rotation angle

https://twiki.cern.ch/twiki/pub/Main/Physics_program/ensemble_plateau_test_ind_A.pdf



Check of rotation angle

Pitch between the layers: 78 mm. Angle = $\text{atan}(61.02 / 78) * 180/\pi = 38.0^\circ$ (instead of expected 48-49°). With 48° the shift should be 86.6 mm instead of 60.8 mm (4.5 pixels off!)

