Shadow of the microsectors
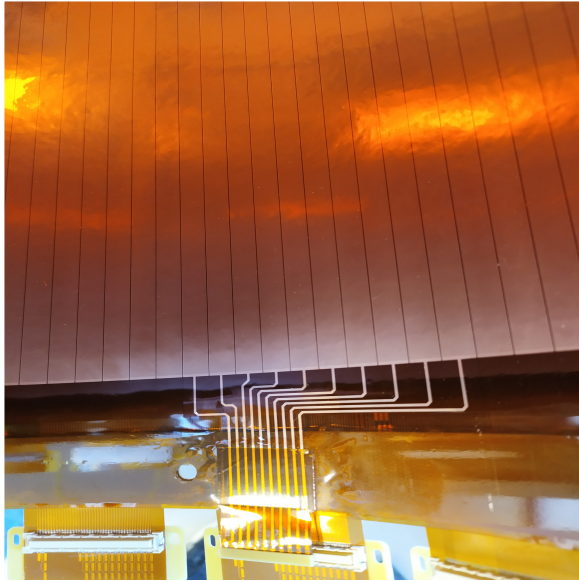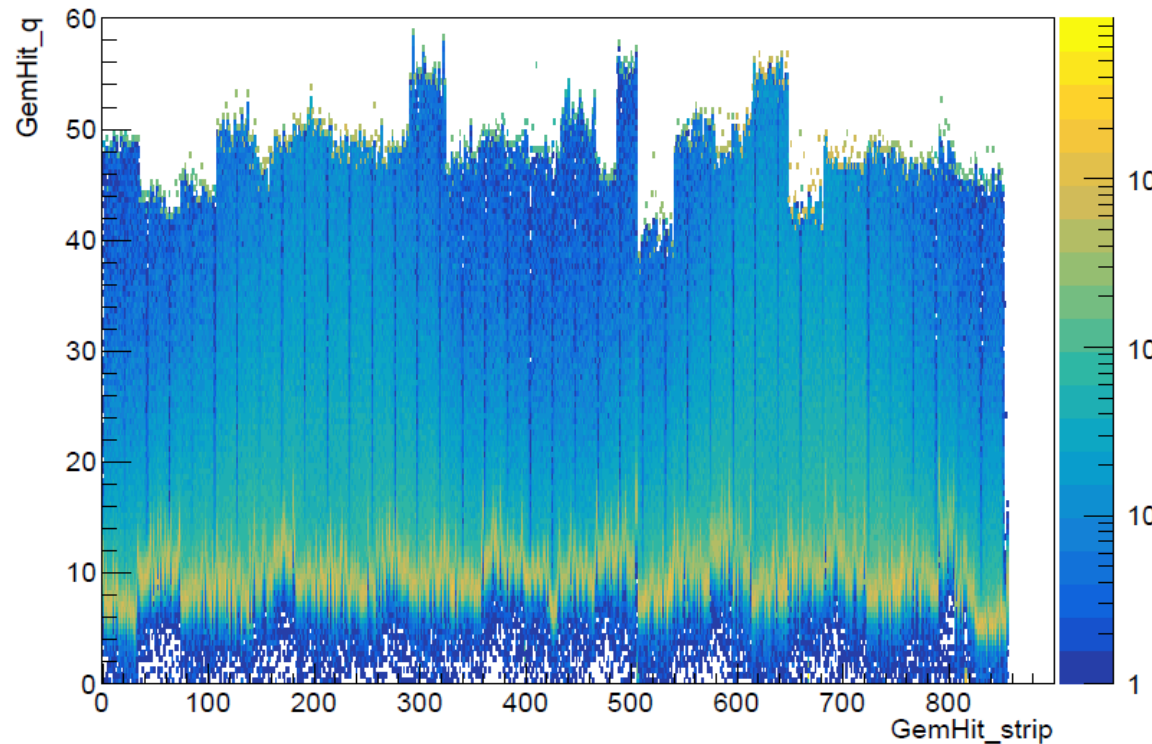
2020-02-24

Outlook

- The HV is delivered on the GEM copper layers via microsectors

  .

- Each foil has 40 microsectors:
  - → 1 microsector is about 20 strips on L1
  - → 1 microsector is about 15 strips on L2

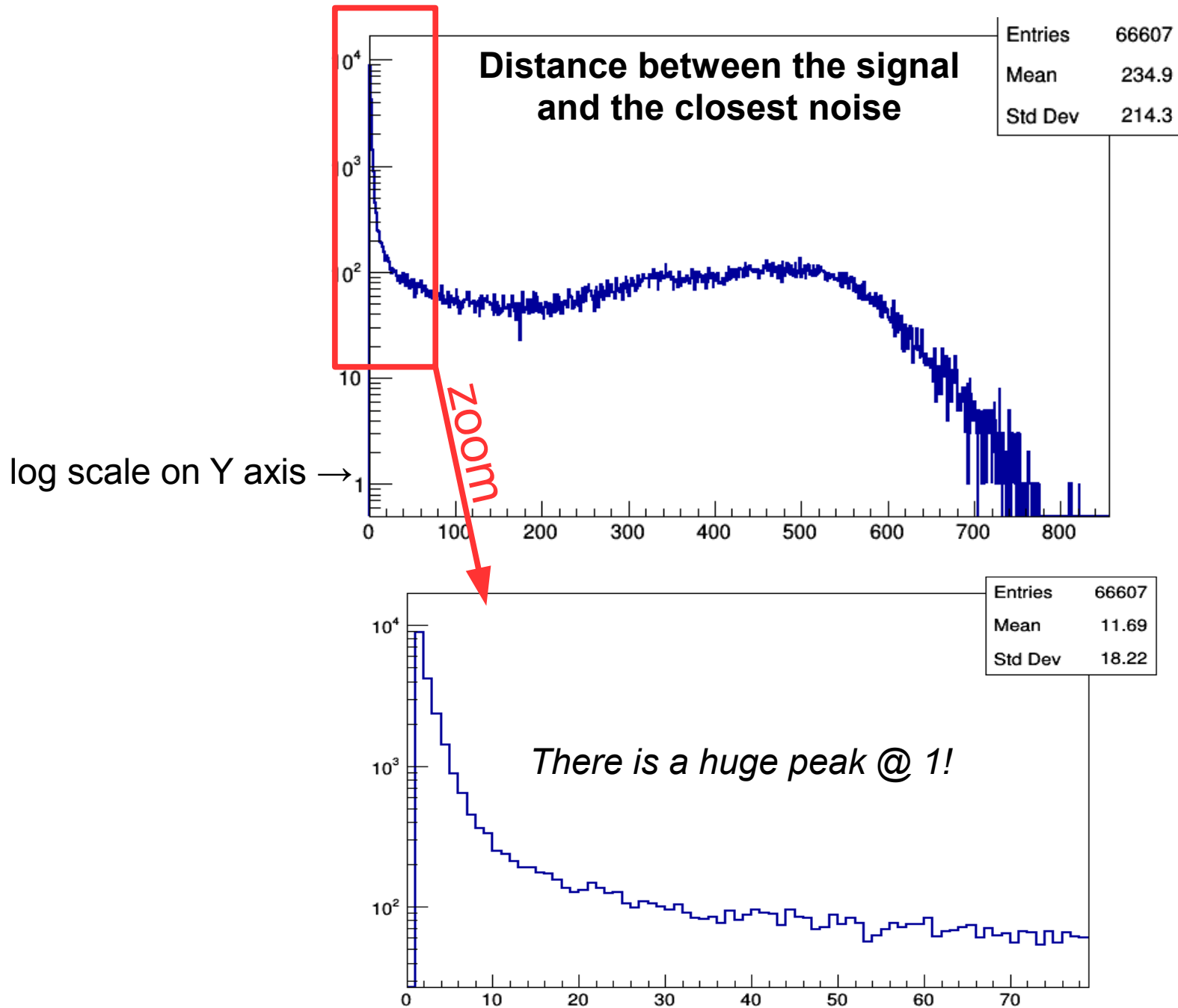GemHit_q:GemHit_strip {GemHit_view==2&&GemHit_plane==0}

- The position of the microsectors is evident in the **charge *vs* stripID** plot (x view)

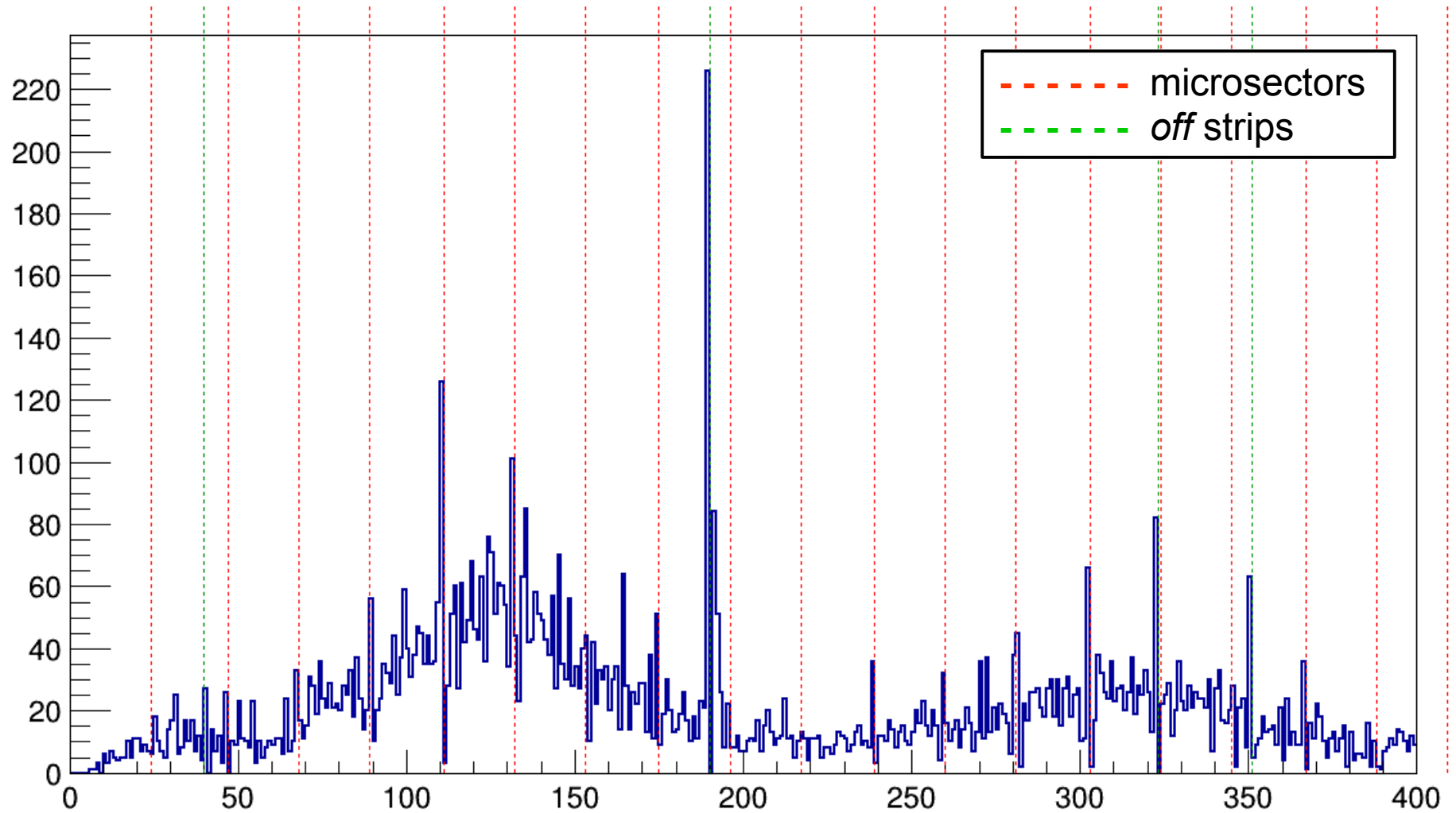- We need to check possible effects on reconstruction

Procedure

- Select the clusters 2D and consider only the **axial strip** component

- Request $\chi^2_{TOT} = \chi^2_{XY} + \chi^2_{RZ} < 20$ (**large** cut)

- Compute the **distance in terms of number of strips** between the *signal* cluster (closest to the fit on the test plane) and the *closest noise* cluster

- If this distance is **one strip only**, then plot also the stripID of the missing strip to check if it coincides with the microsectors

- Used all runs from **10 to 17** included

LAYER 1 - BOTTOM

Distance between the signal and the closest noise

Entries	66607
Mean	234.9
Std Dev	214.3

log scale on Y axis →

zoom

Entries	66607
Mean	11.69
Std Dev	18.22

There is a huge peak @ 1!

LAYER 1 - BOTTOM

Missing strip (when only one) strip ID

LAYER 1 - BOTTOM

Charge vs the first (last) strip of the cluster

hcharge_vs_stripid1

hcharge_vs_stripid2
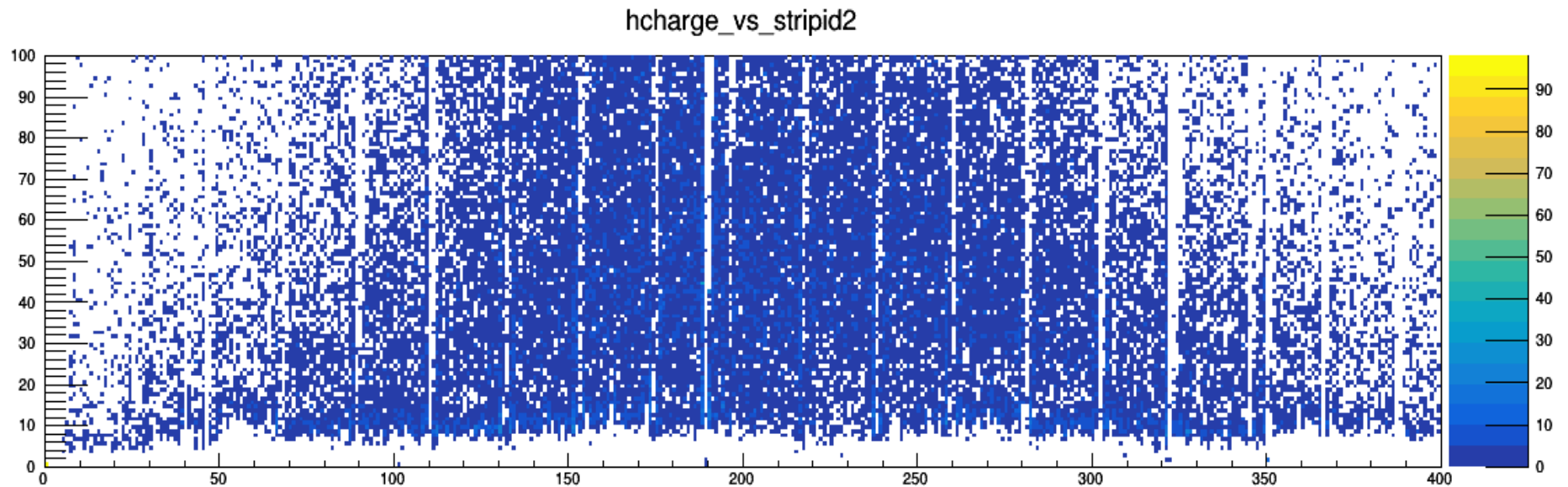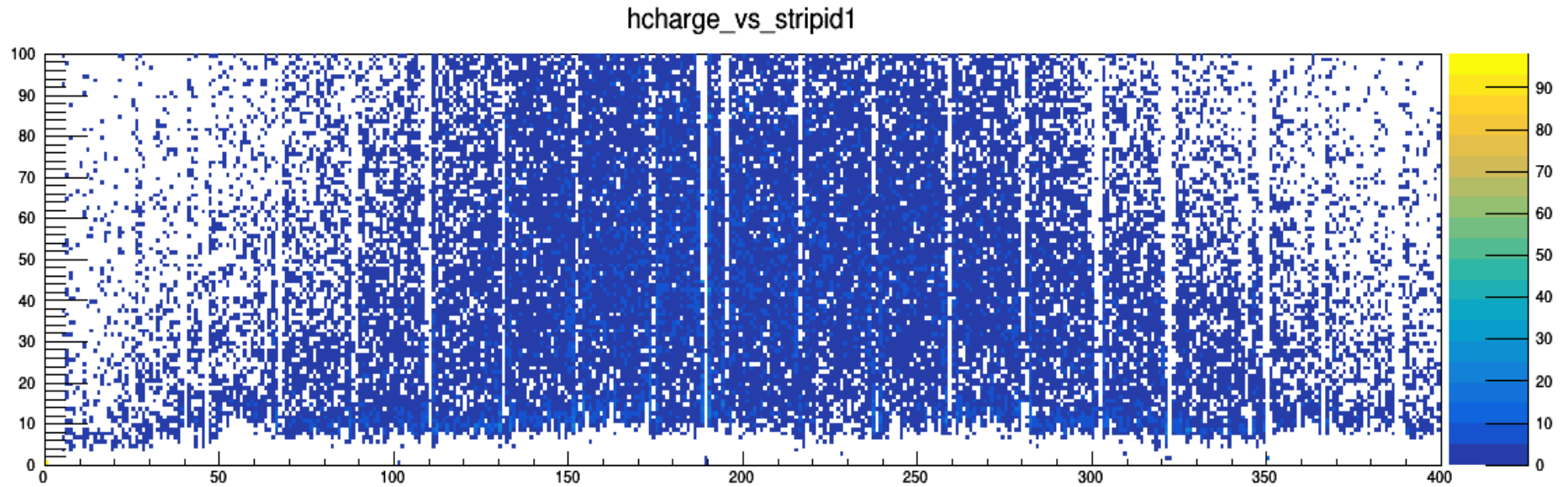
The white vertical lines are the shadow of the microsectors

LAYER 1 - BOTTOM

Cluster size vs the first (last) strip of the cluster
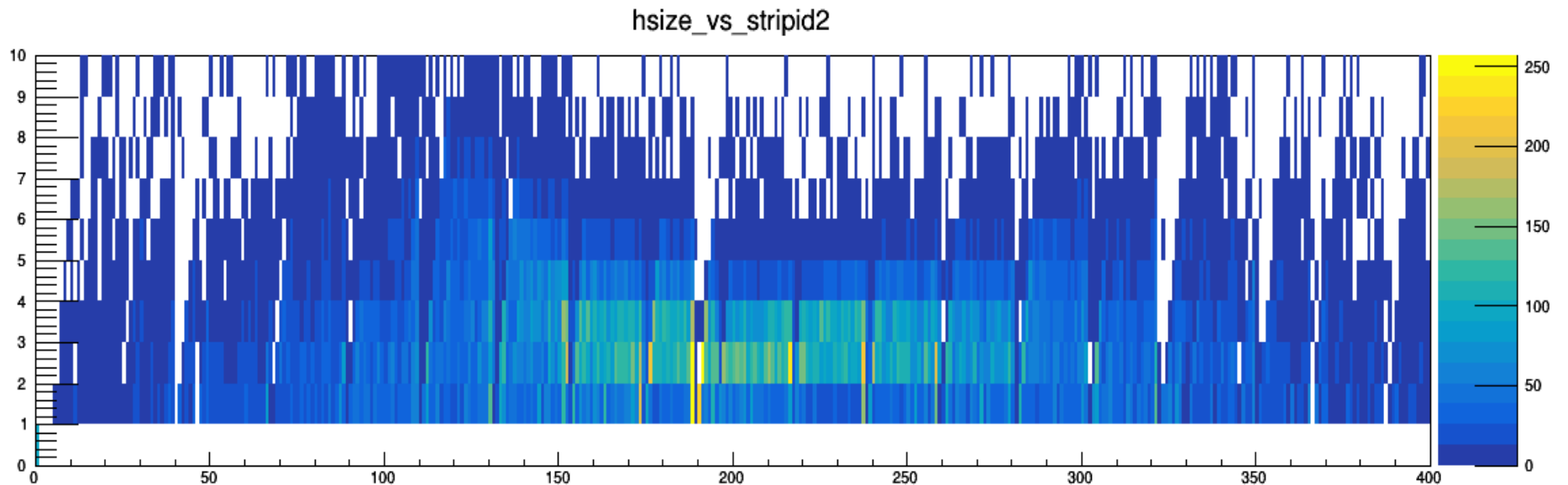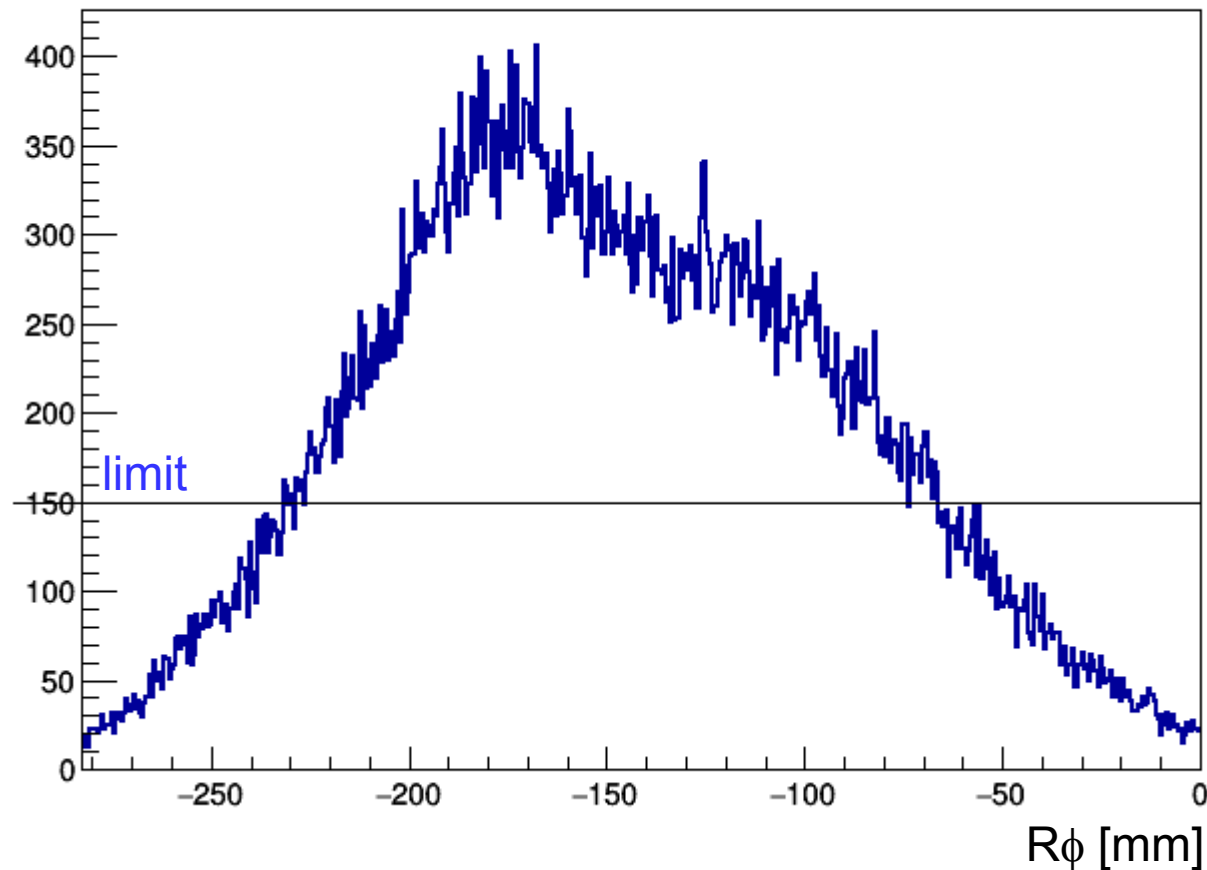

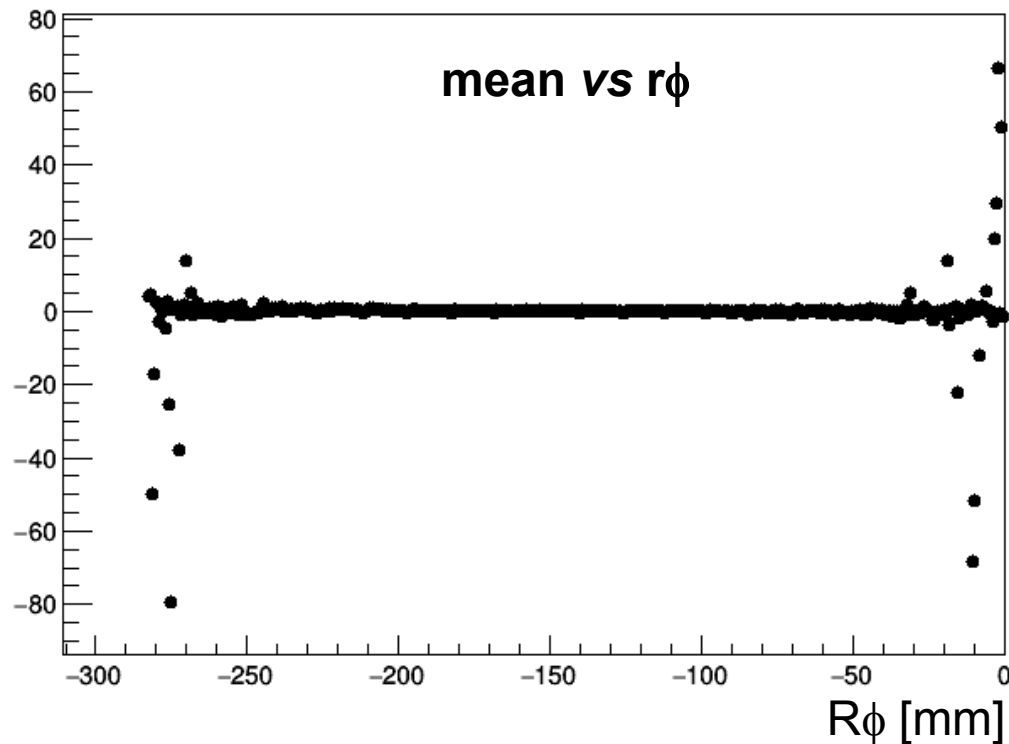**microsectors are less evident, but visible**
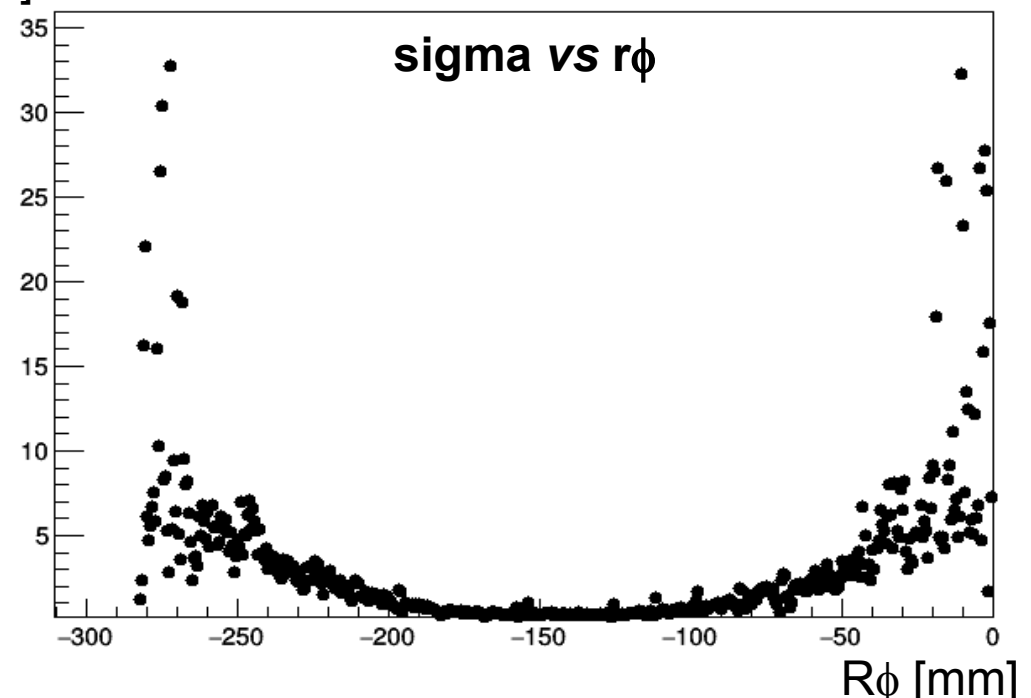
Efficiency & Resolution

LAYER 1 - BOTTOM

Procedure

- divide R*ϕ in 500 slices, each one is 565.487 micron wide
- need to fit the residual distribution in each slice → need enough entries
- limit > 150 entries → range from -225 to -70 mm arc length
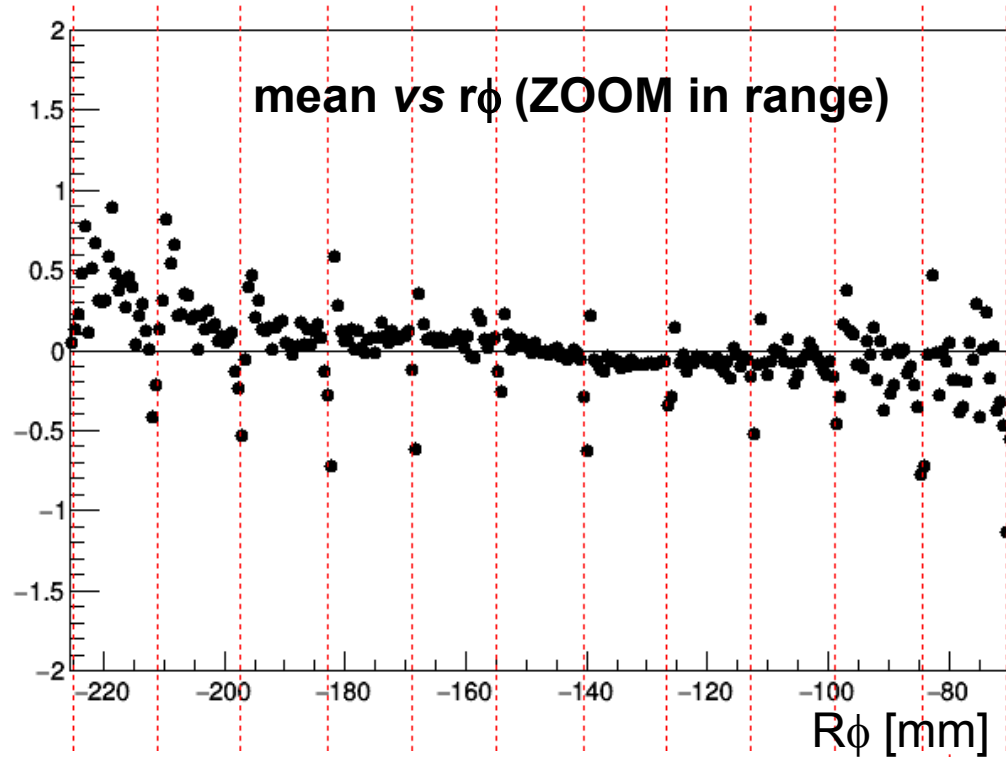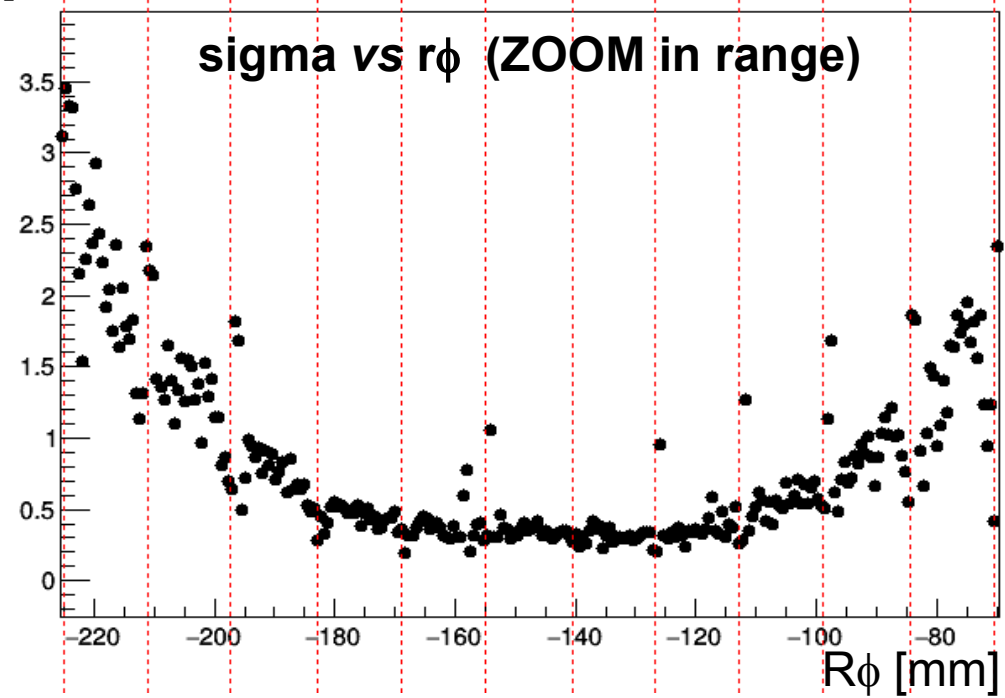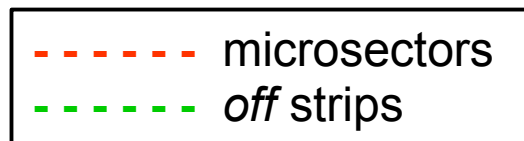- For each slice, fit the residual R*ϕ and the residual z
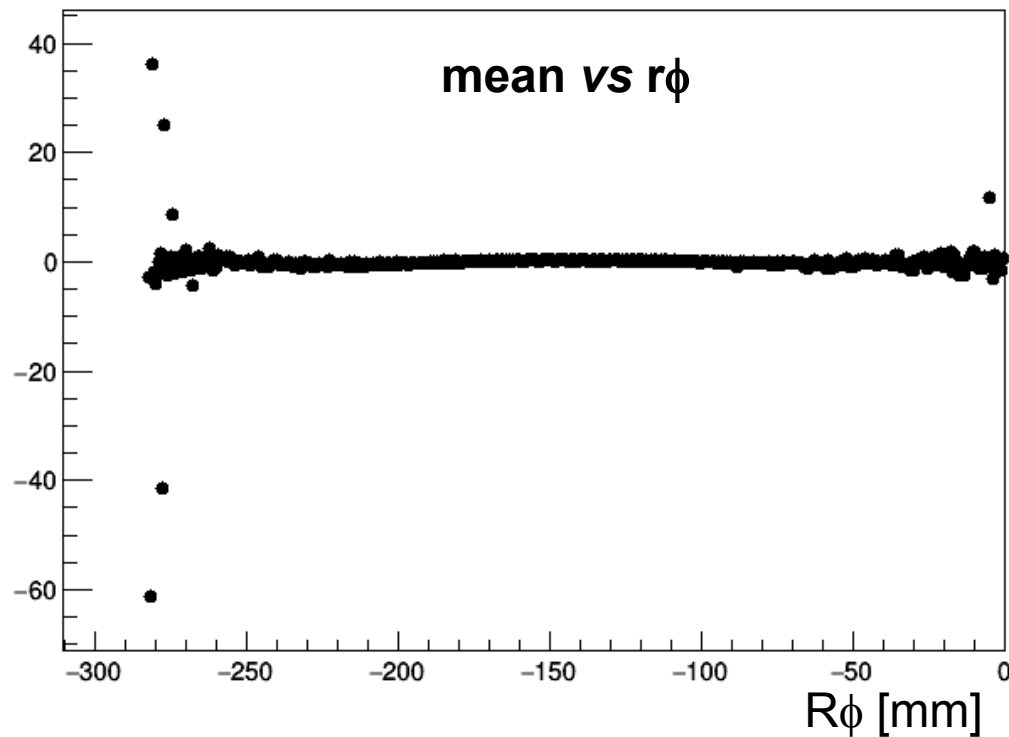
LAYER 1 - BOTTOM

**Rϕ RESIDUAL
all sample**

LAYER 1 - BOTTOM

mean *vs* rφ (ZOOM in range)

R φ [mm]

Rφ RESIDUAL
sample above limit

- - - - - microsectors
- - - - - *off* strips

sigma *vs* rφ (ZOOM in range)

Rφ [mm]

LAYER 1 - BOTTOM

mean *vs* rϕ

**z RESIDUAL
all sample**

sigma *vs* rϕ

LAYER 1 - BOTTOM

z RESIDUAL
sample above limit

mean *vs* rϕ (ZOOM in range)

Rϕ [mm]

- - - - - microsectors
- - - - - *off* strips

sigma *vs* rϕ (ZOOM in range)

Rϕ [mm]
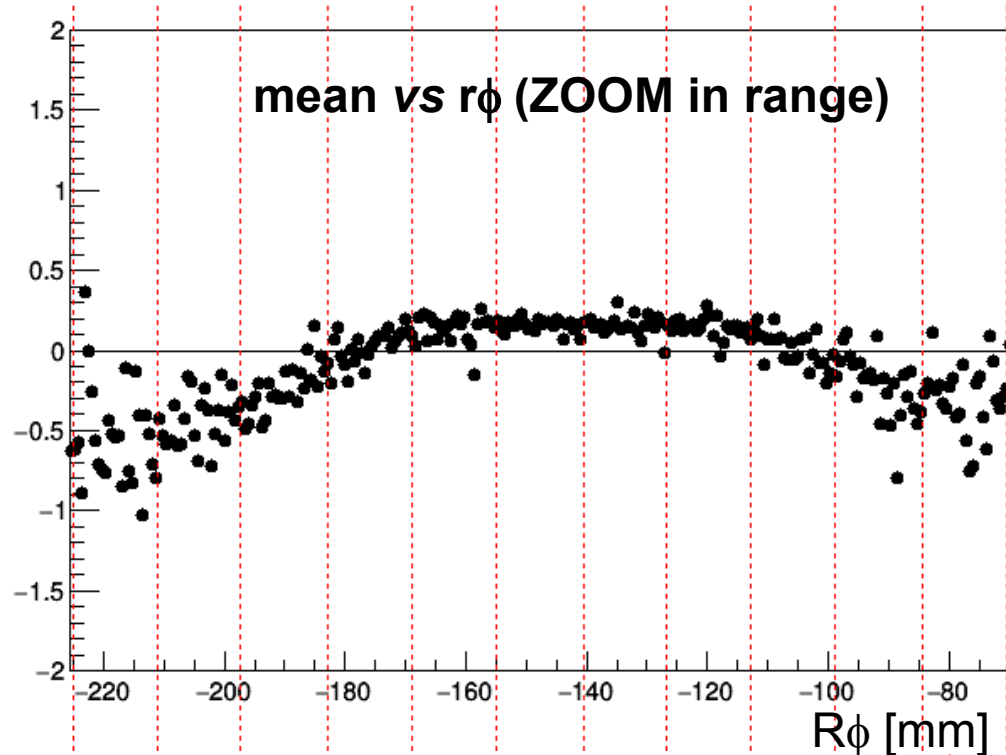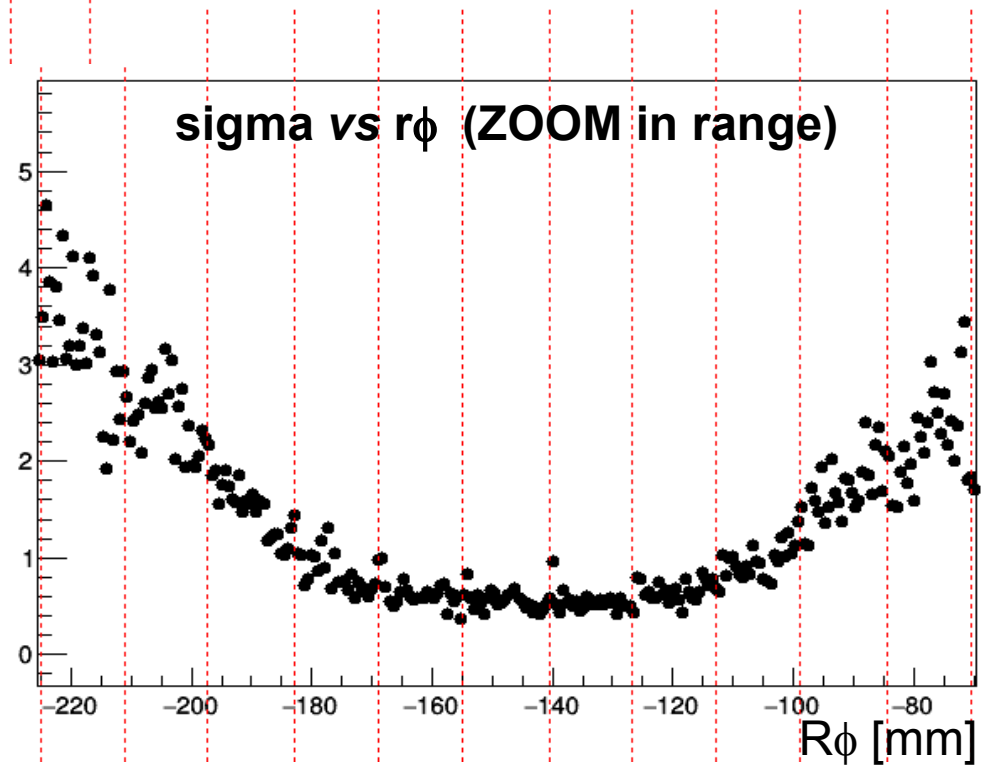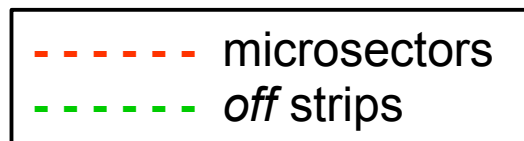
LAYER 1 - BOTTOM

EFFICIENCY

- Request $\chi^2_{TOT} = \chi^2_{XY} + \chi^2_{RZ} < 0.01$
- At least 150 entries to evaluate it
- Nof entries within 5sigma in the residuals in Rϕ and z
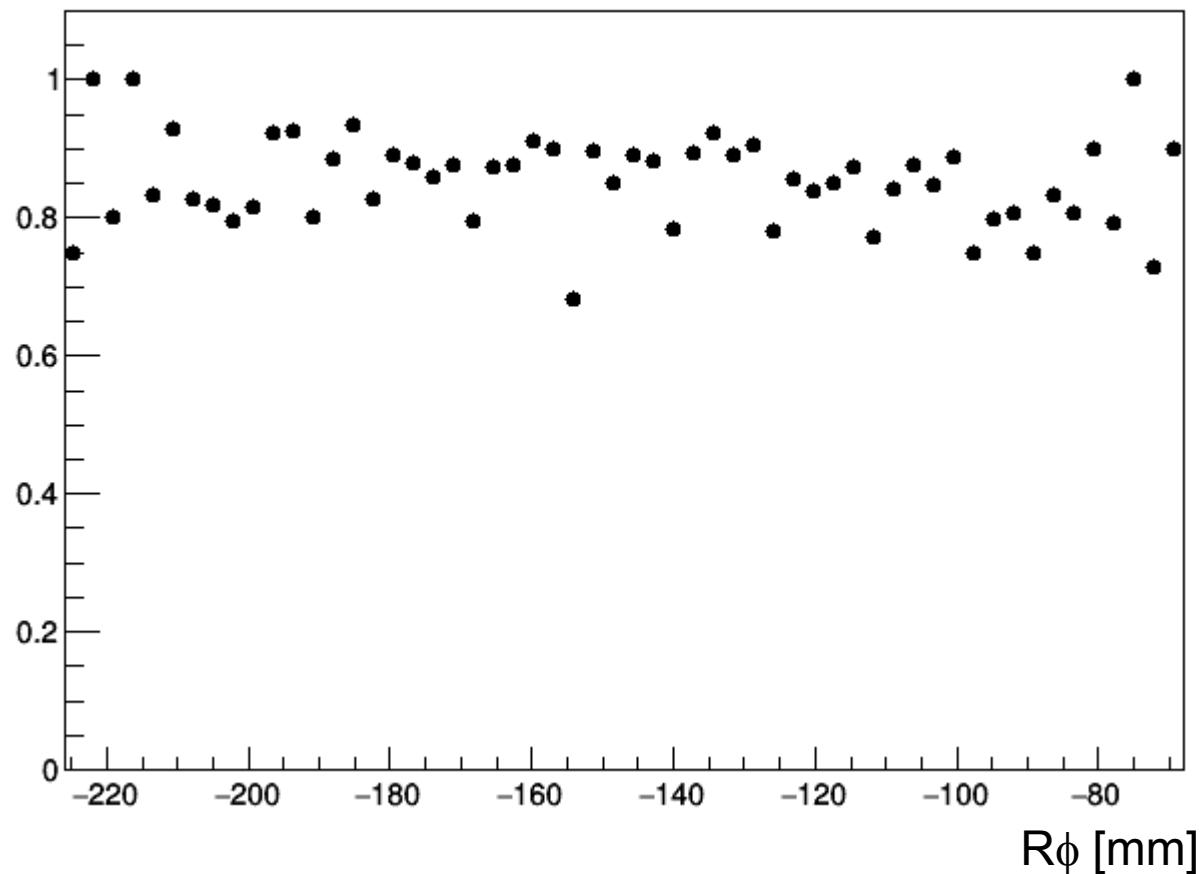
Conclusions

- The presented results are on LAYER1-BOTTOM, but I studied also the other planes and are the same

- It is evident a modification in
    - charge
    - cluster size
    - efficiency
    - resolution
  in coincidence of the microsector positions
- For this reason it is important to implement the **clusterization-with-holes** in CgemBoss
    - I tried but for now I don't see an improvement
    - probably we must limit this clusterization to the clusters crossing the microsectors

- **It is evident also a misalignment:**
    - It is **necessary** to perform the alignment with millipede
    - The statistics is enough to **select good events** and apply the alignment on these events