Problems with reconstruction of daily scans

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14-12-2023

Looking at all calibration runs of RUN 2 and RUN 3 (from Feb to Oct 2023)

I did all plots of all clusters that remains after applying the following cuts:

```
cut_source = (tree.sc_integral[isc] > 1e3
      and tree.sc_length[isc] < 500
      and tree.sc_integral[isc] / tree.sc_nhits[isc] < 100
      and tree.sc_integral[isc] < 6e4
      and 0.6 < tree.sc_width[isc] / tree.sc_length[isc] < 1
      and ROOT.TMath.Hypot(tree.sc_xmean[isc] - 2304 / 2, tree.sc_ymean[isc] - 2304 / 2) < 1500
```

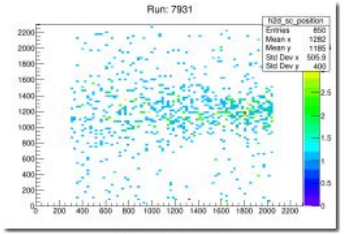
Note, I put here only RUN 3 and RUN 2 calibration runs that satisfies the conditions:

- before the "collimator" was removed (calibrations before October 11).
- if in the logbook, in a given day there are more than 5 steps (let's say twice step 2), then I use the always last one, since probably the shifter did something wrong in the first one.

NOTE: we know that in the following dates, the pedestal was inverted (“code issue”): 12, 17, 18, 19 July
Those dates correspond to runs: from run 21048 to run 22514

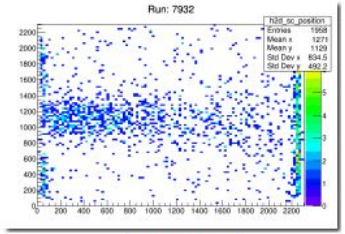
RUN 2

Step 1



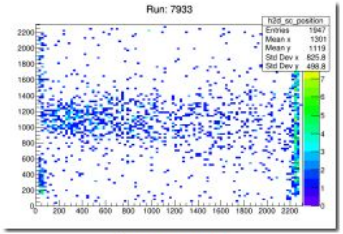
plot_7931.png

Step 2



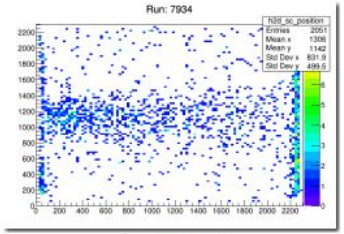
plot_7932.png

Step 3



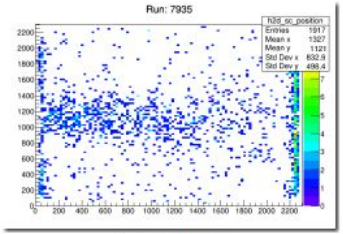
plot_7933.png

Step 4



plot_7934.png

Step 5



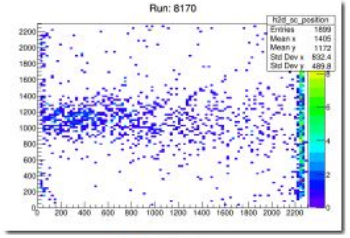
plot_7935.png

Date of creation of reco files

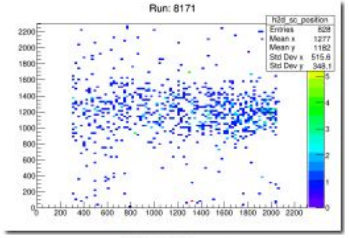
```
Feb 17  2023 Winter23/reco_run07931_3D.root
Feb 17  2023 Winter23/reco_run07932_3D.root
Feb 24  2023 Winter23/reco_run07933_3D.root
Feb 17  2023 Winter23/reco_run07934_3D.root
Feb 17  2023 Winter23/reco_run07935_3D.root
```

This step was reconstructed differently from other steps (source inverted + noise bands)

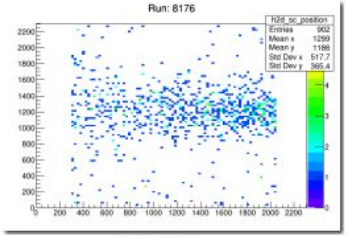
RUN 2



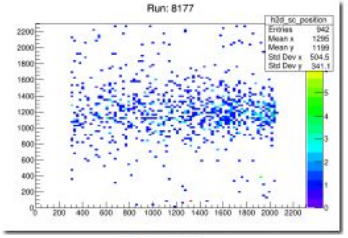
plot_8170.png



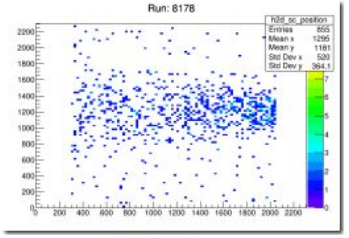
plot_8171.png



plot_8176.png



plot_8177.png



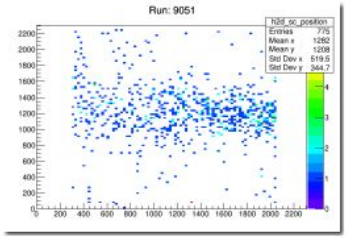
plot_8178.png

Date of creation of reco files

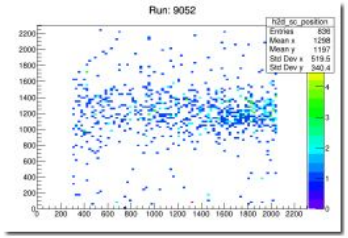
```
Feb 17  2023 Winter23/reco_run08170_3D.root
Feb 17  2023 Winter23/reco_run08171_3D.root
Feb 17  2023 Winter23/reco_run08176_3D.root
Feb 17  2023 Winter23/reco_run08177_3D.root
Feb 17  2023 Winter23/reco_run08178_3D.root
```

This step was reconstructed differently from other steps (source inverted + noise bands)

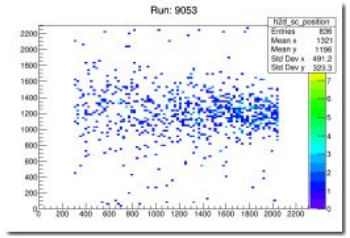
RUN 2



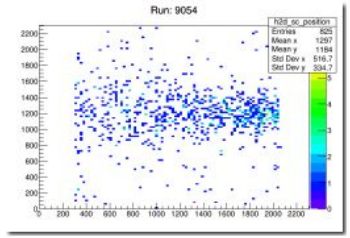
plot_9051.png



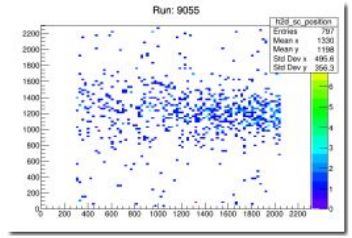
plot_9052.png



plot_9053.png

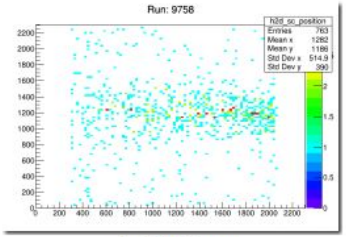


plot_9054.png

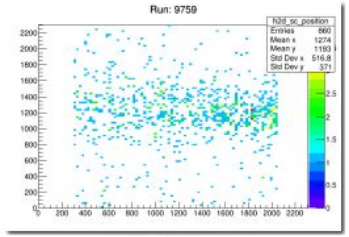


plot_9055.png

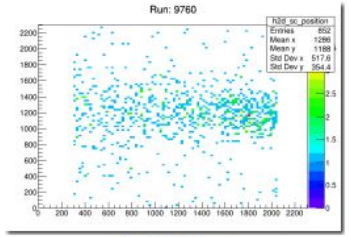
RUN 2



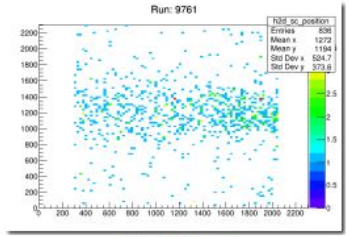
plot_9758.png



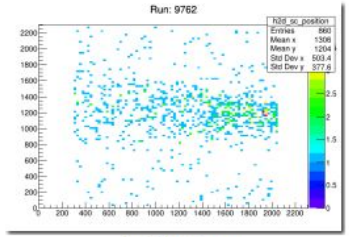
plot_9759.png



plot_9760.png

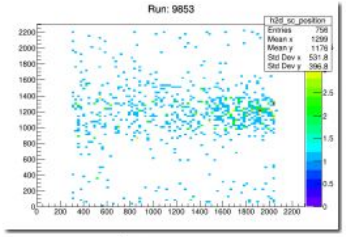


plot_9761.png

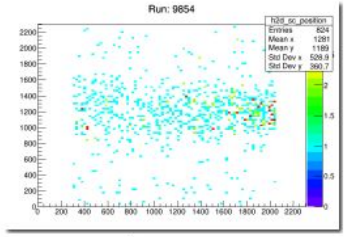


plot_9762.png

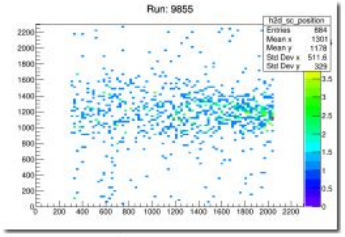
RUN 2



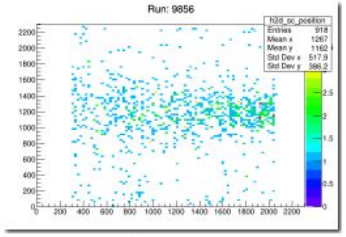
plot_9853.png



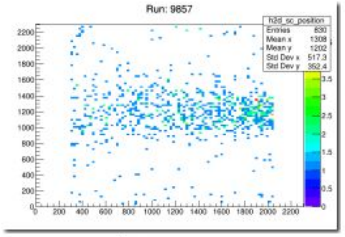
plot_9854.png



plot_9855.png

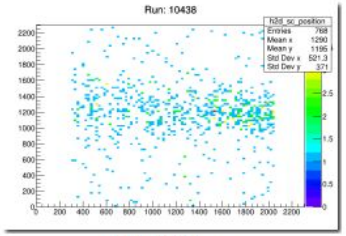


plot_9856.png

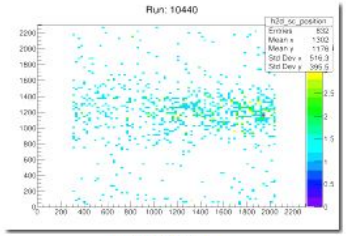


plot_9857.png

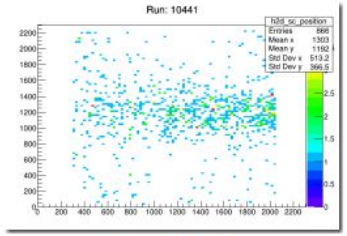
RUN 2



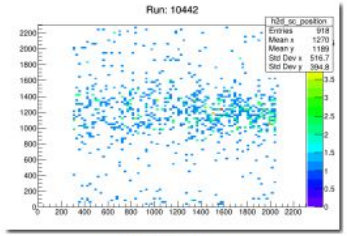
plot_10438.png



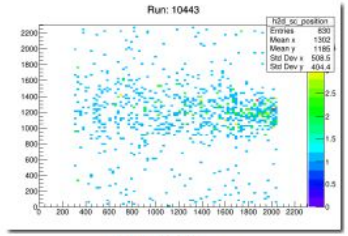
plot_10440.png



plot_10441.png

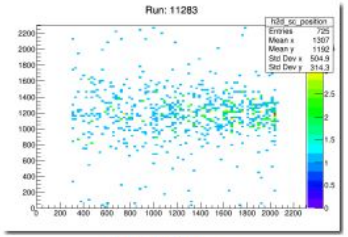


plot_10442.png

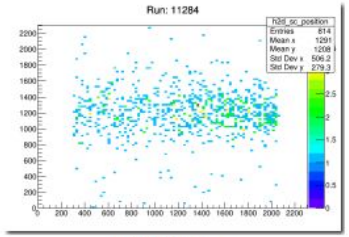


plot_10443.png

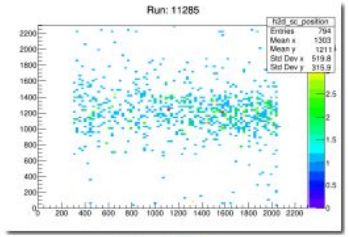
RUN 2



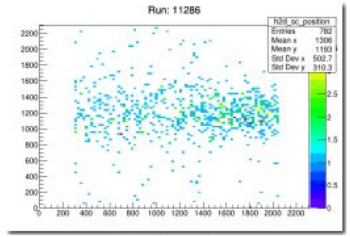
plot_11283.png



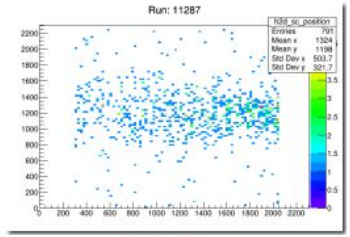
plot_11284.png



plot_11285.png

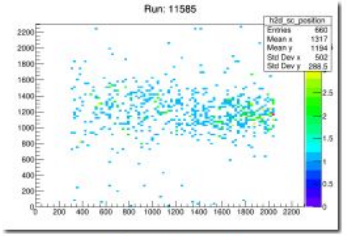


plot_11286.png

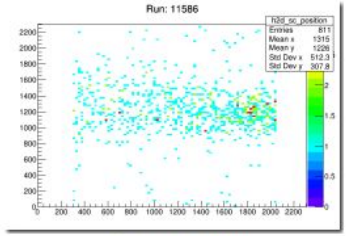


plot_11287.png

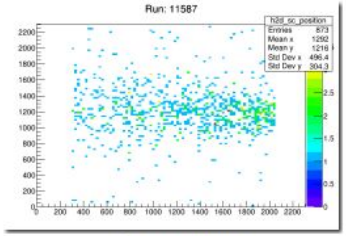
RUN 2



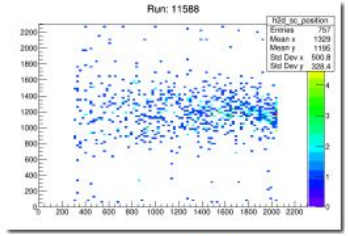
plot_11585.png



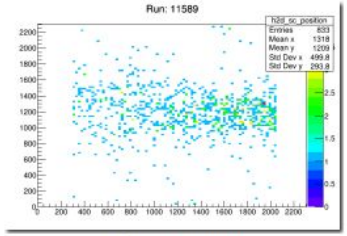
plot_11586.png



plot_11587.png

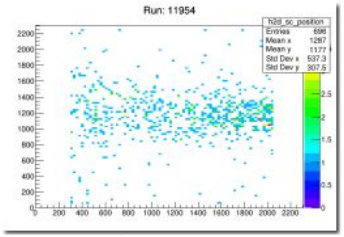


plot_11588.png

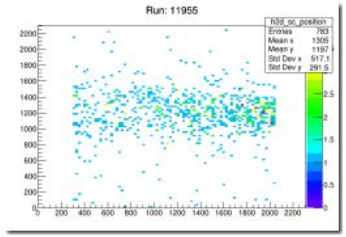


plot_11589.png

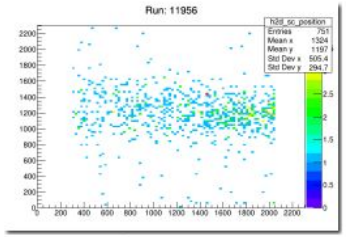
RUN 2



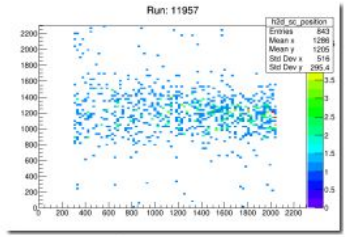
plot_11954.png



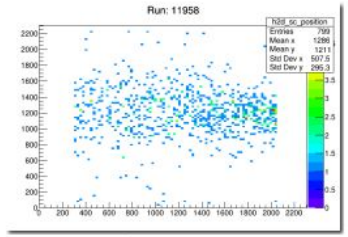
plot_11955.png



plot_11956.png



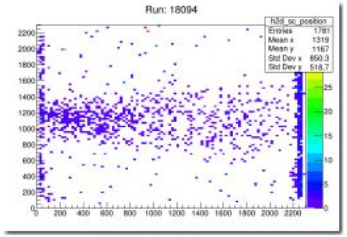
plot_11957.png



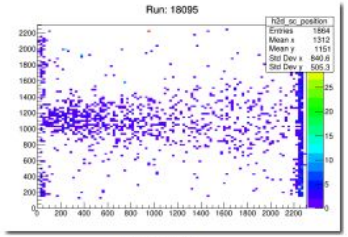
plot_11958.png

Last calibration run of RUN 2

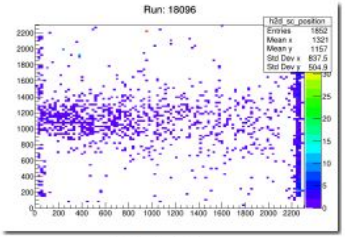
RUN 3



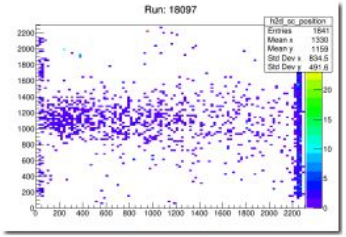
plot_18094.png



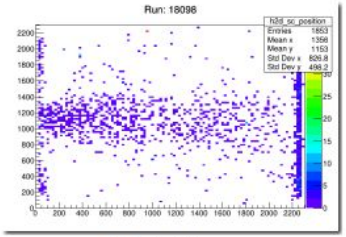
plot_18095.png



plot_18096.png



plot_18097.png

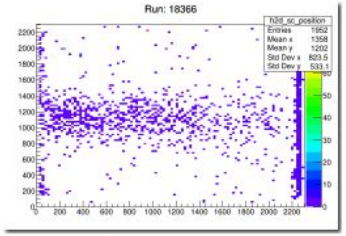


plot_18098.png

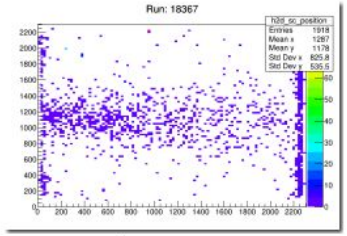
Source appears to be inverted

And noise bands appear up and down -> peaks in background spectra by Flaminia

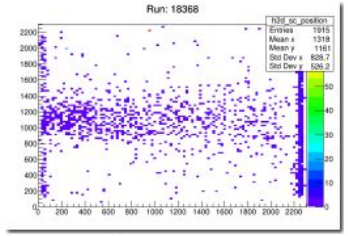
RUN 3



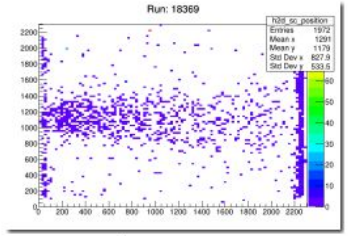
plot_18366.png



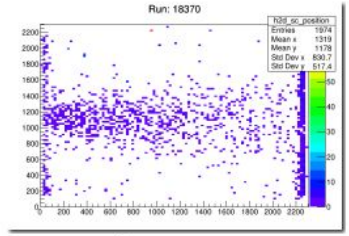
plot_18367.png



plot_18368.png

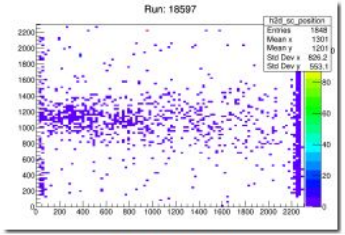


plot_18369.png

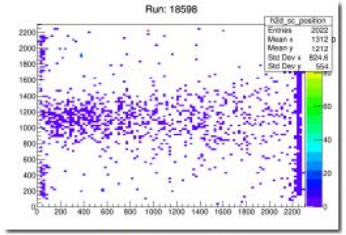


plot_18370.png

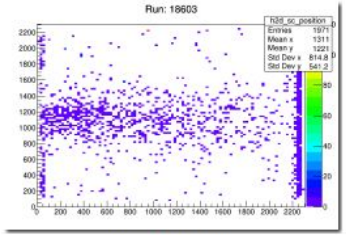
RUN 3



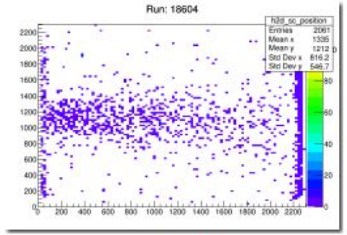
plot_18597.png



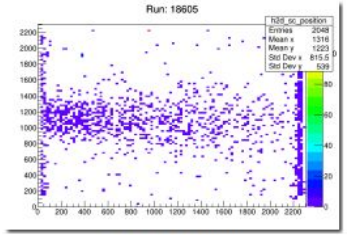
plot_18598.png



plot_18603.png

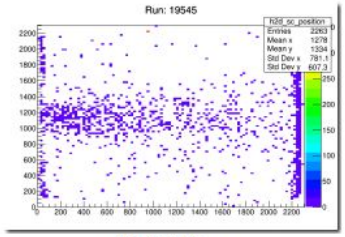


plot_18604.png

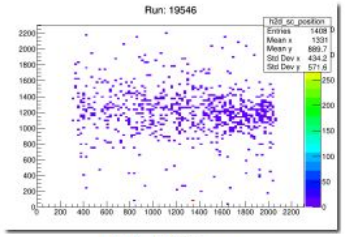


plot_18605.png

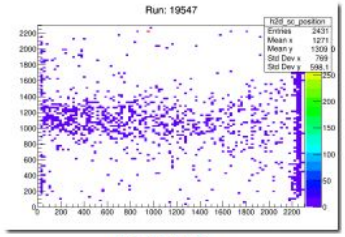
RUN 3



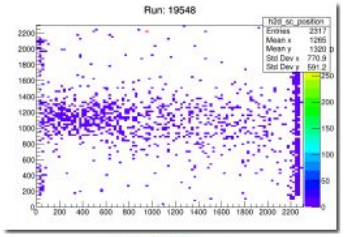
plot_19545.png



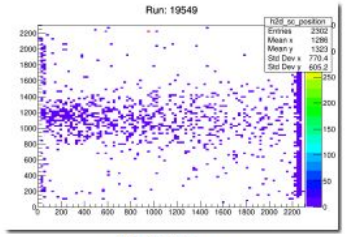
plot_19546.png



plot_19547.png



plot_19548.png



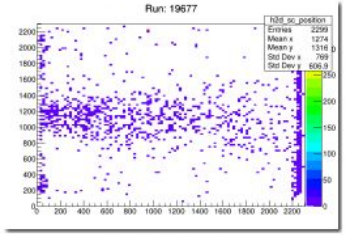
plot_19549.png

Date of creation of reco files

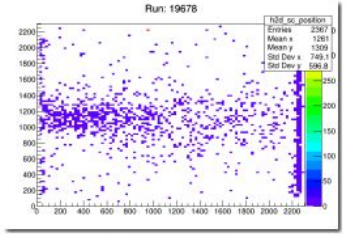
```
Jun 28 03:56 Winter23/reco_run19545_3D.root
May 15  2023 Winter23/reco_run19546_3D.root
Jun 29 17:34 Winter23/reco_run19547_3D.root
Jun 28 23:53 Winter23/reco_run19548_3D.root
Jun 29 17:33 Winter23/reco_run19549_3D.root
```

This step was reconstructed differently from other steps
(reco file has indeed different creation date)

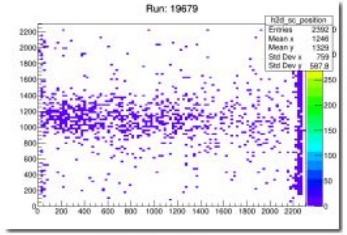
RUN 3



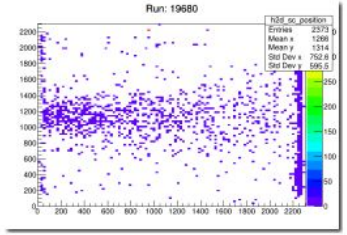
plot_19677.png



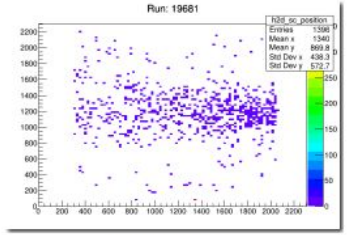
plot_19678.png



plot_19679.png



plot_19680.png



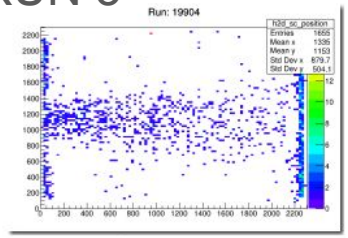
plot_19681.png

Date of creation of reco files

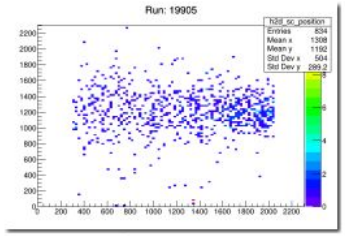
```
Jun 29 20:02 Winter23/reco_run19677_3D.root
Jun 28 05:15 Winter23/reco_run19678_3D.root
Jun 29 20:10 Winter23/reco_run19679_3D.root
Jun 29 21:36 Winter23/reco_run19680_3D.root
May 16  2023 Winter23/reco_run19681_3D.root
```

This step was reconstructed differently from other steps
(reco file has indeed different creation date)

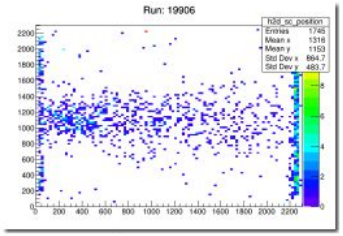
RUN 3



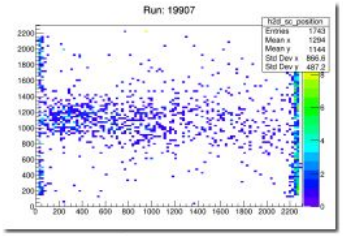
plot_19904.png



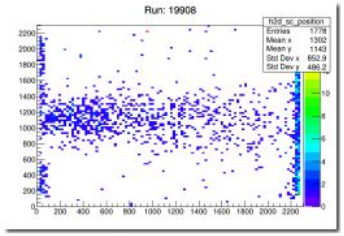
plot_19905.png



plot_19906.png



plot_19907.png



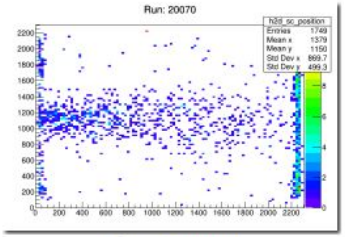
plot_19908.png

Date of creation of reco files

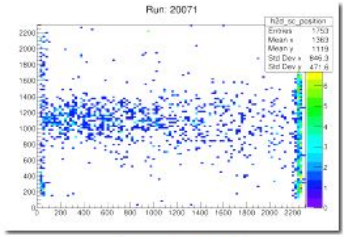
```
Jun 27 20:22 Winter23/reco_run19904_3D.root
May 22  2023 Winter23/reco_run19905_3D.root
Jun 27 20:23 Winter23/reco_run19906_3D.root
Jun 27 20:38 Winter23/reco_run19907_3D.root
Jun 27 20:25 Winter23/reco_run19908_3D.root
```

This step was reconstructed differently from other steps
(reco file has indeed different creation date)

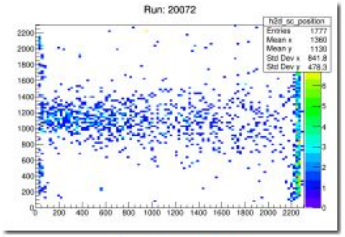
RUN 3



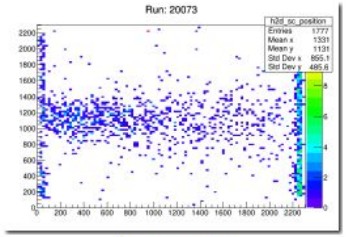
plot_20070.png



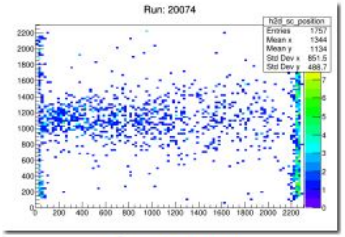
plot_20071.png



plot_20072.png

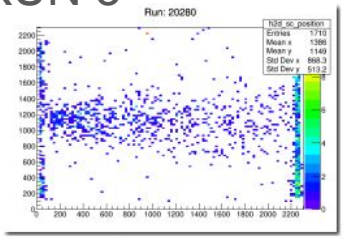


plot_20073.png

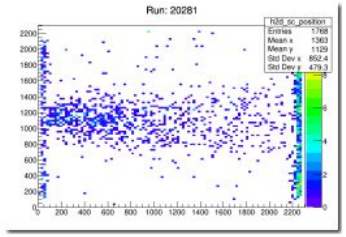


plot_20074.png

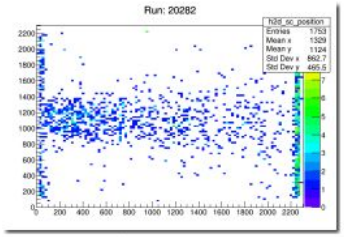
RUN 3



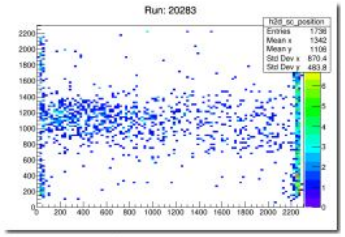
plot_20280.png



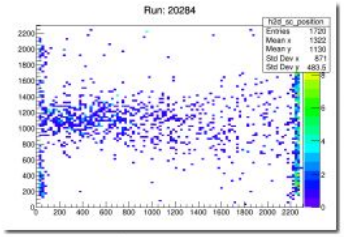
plot_20281.png



plot_20282.png



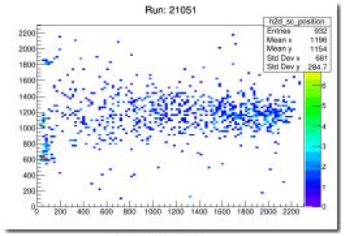
plot_20283.png



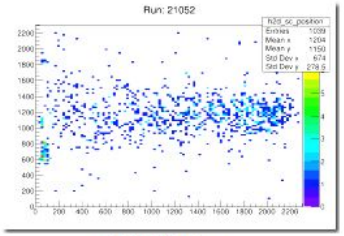
plot_20284.png

Last calibration of May. From now, the source is flipped and the bands disappear.

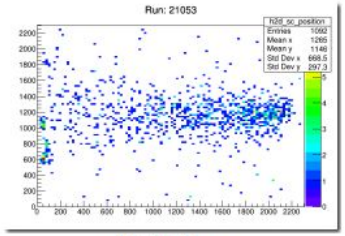
RUN 3



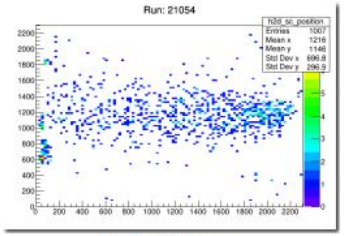
plot_21051.png



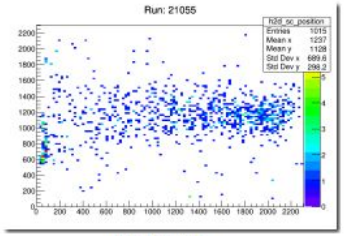
plot_21052.png



plot_21053.png



plot_21054.png

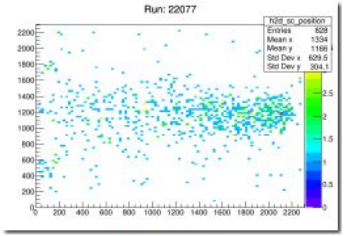


plot_21055.png

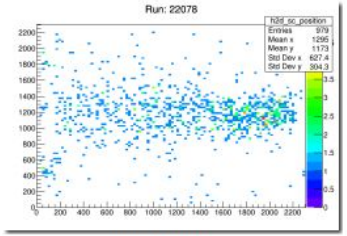
July 12-> source seems to be inverted (known issue)

BUT also note the noise bands disappear (is this the right way to reconstruct?)

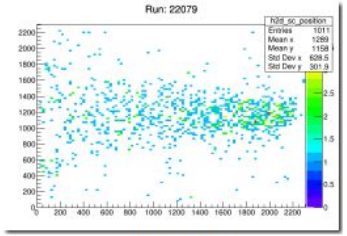
RUN 3



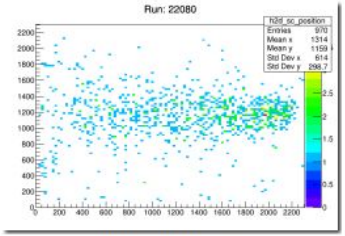
plot_22077.png



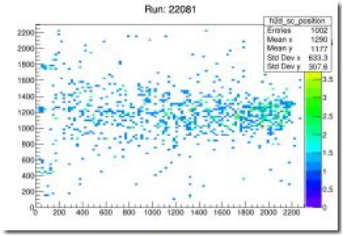
plot_22078.png



plot_22079.png



plot_22080.png

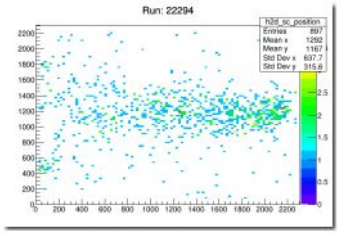


plot_22081.png

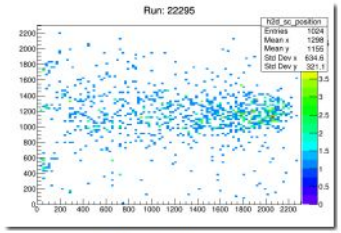
July 17-> source seems to be inverted (known issue)

BUT also note the noise bands disappear (is this the right way to reconstruct?)

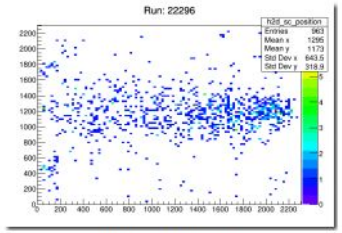
RUN 3



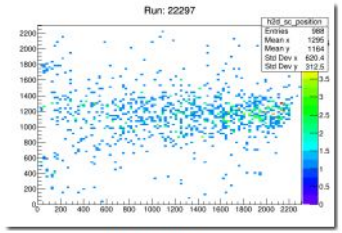
plot_22294.png



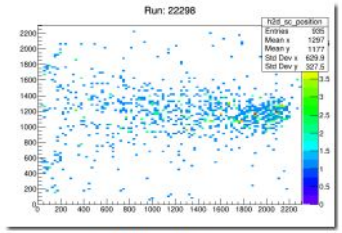
plot_22295.png



plot_22296.png



plot_22297.png

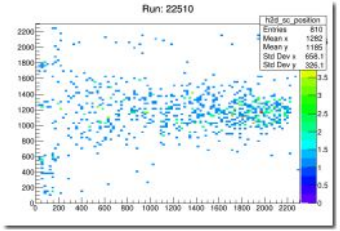


plot_22298.png

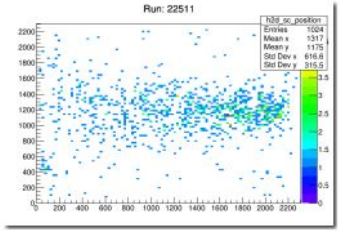
July 18-> source seems to be inverted (known issue)

BUT also note the noise bands disappear (is this the right way to reconstruct?)

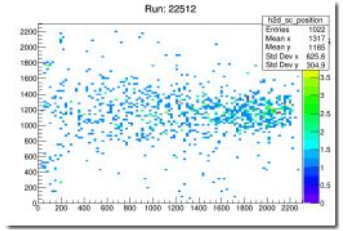
RUN 3



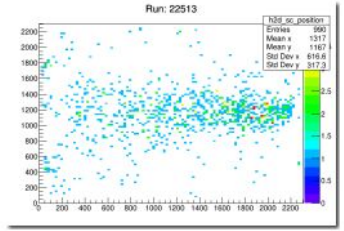
plot_22510.png



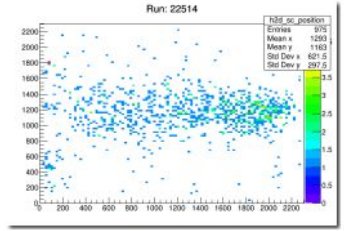
plot_22511.png



plot_22512.png



plot_22513.png

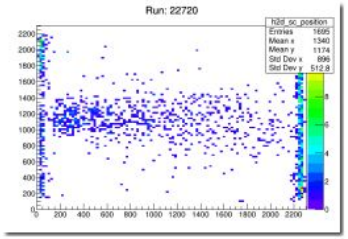


plot_22514.png

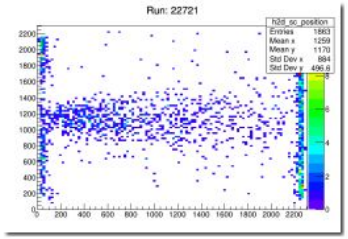
July 19-> source seems to be inverted (known issue)

BUT also note the noise bands disappear (is this the right way to reconstruct?)

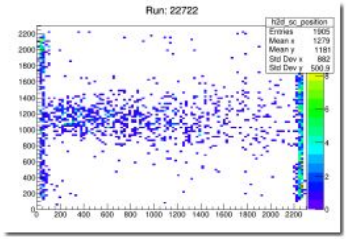
RUN 3



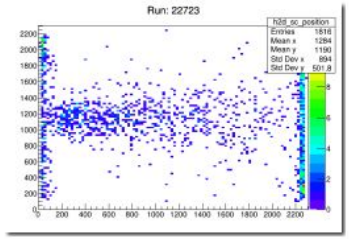
plot_22720.png



plot_22721.png



plot_22722.png



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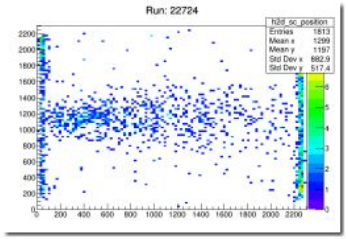
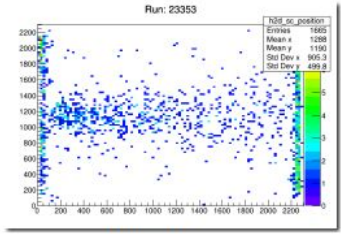


plot_22724.png

Last days of July: we return to source position as in May (and again noisy bands)

RUN 3



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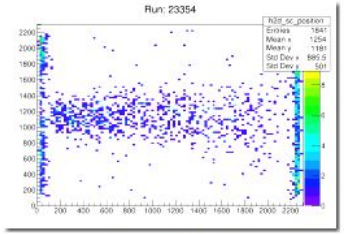

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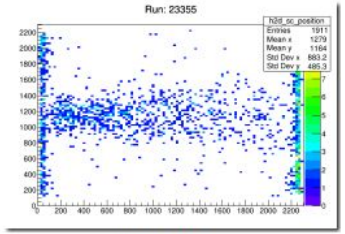

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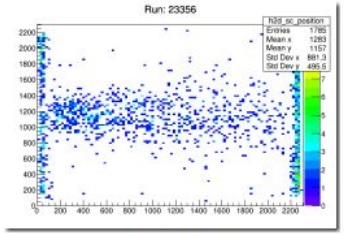

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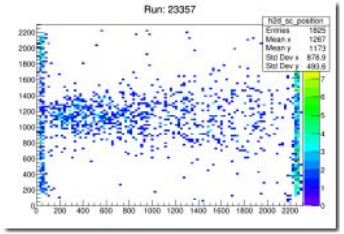
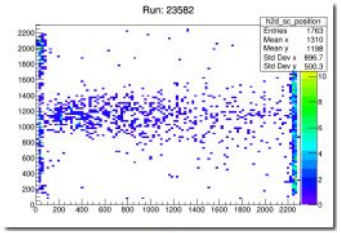


plot_23357.png

RUN 3



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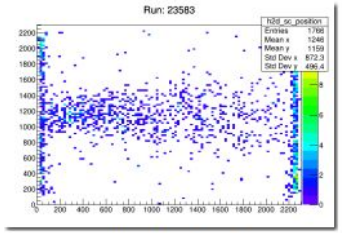

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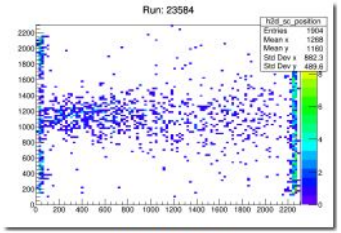

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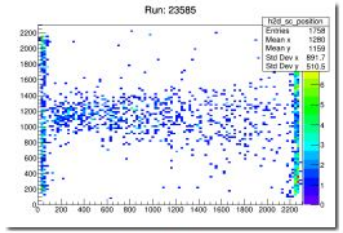

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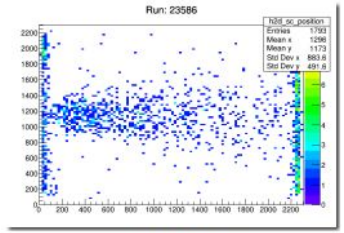

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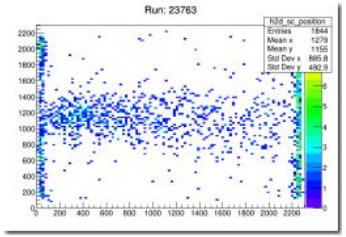
RUN 3



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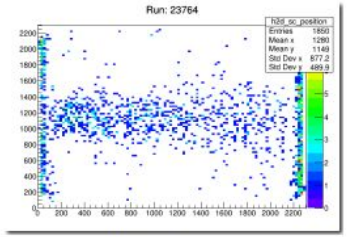

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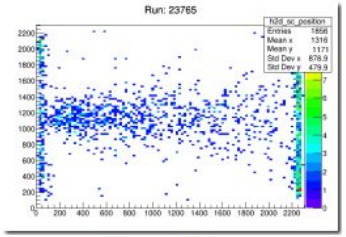

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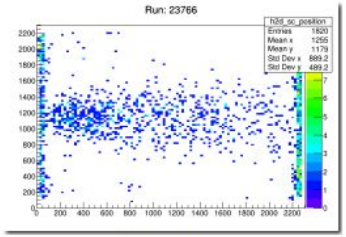

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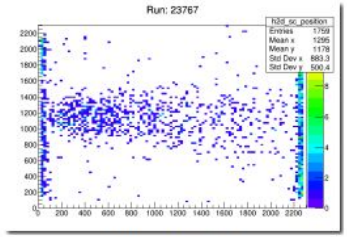

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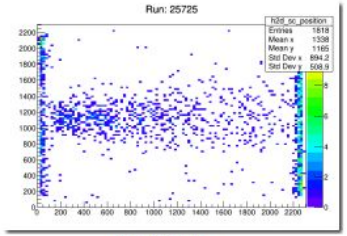
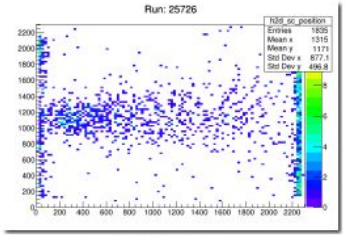
RUN 3



plot_25725.png



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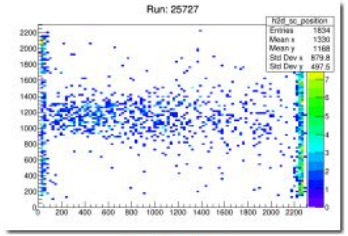

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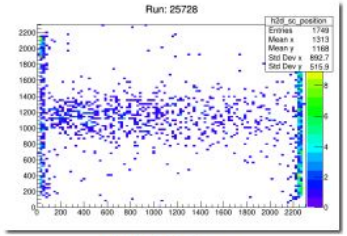

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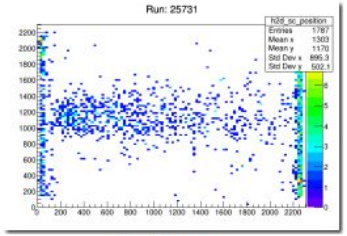
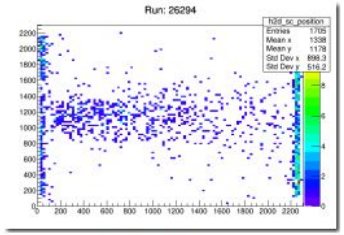
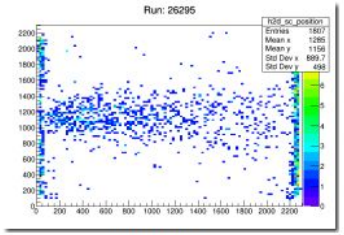


plot_25731.png

RUN 3



plot_26294.png



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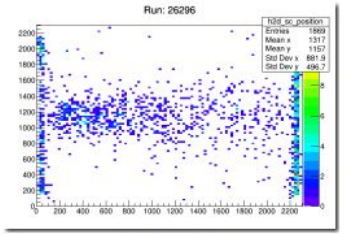

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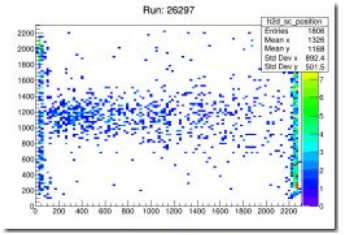

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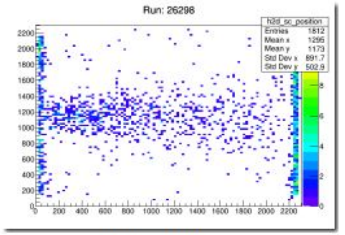

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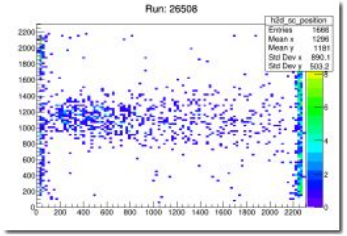
RUN 3



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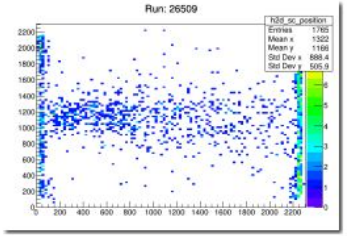

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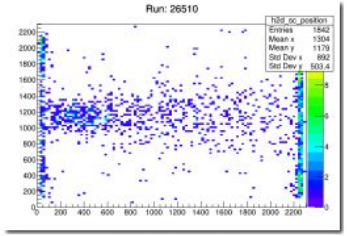

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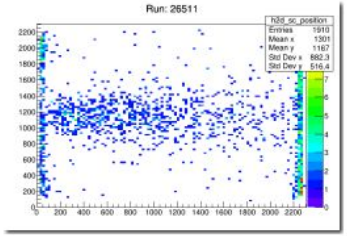

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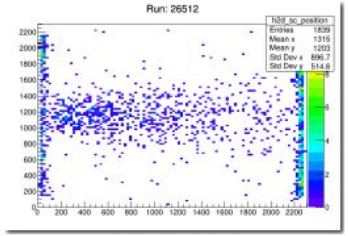

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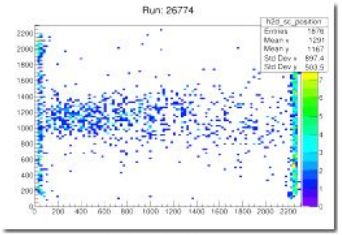
RUN 3



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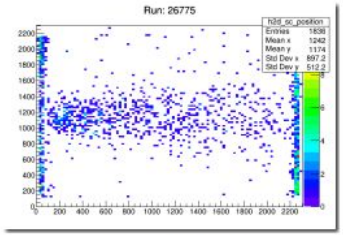

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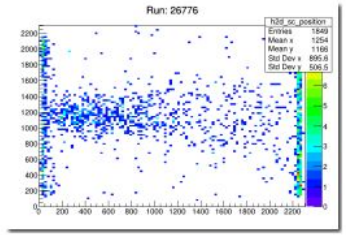

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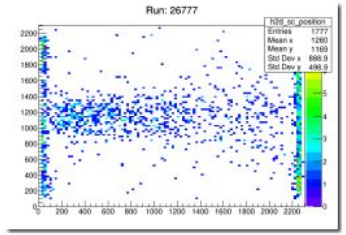

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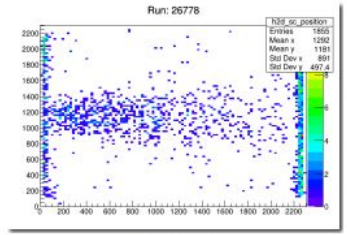

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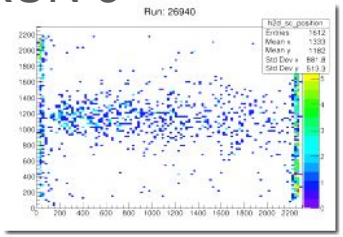

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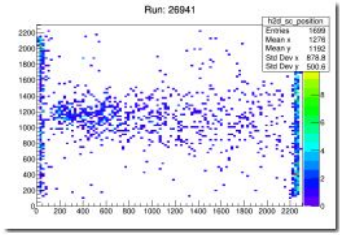

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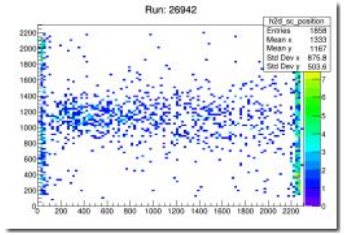

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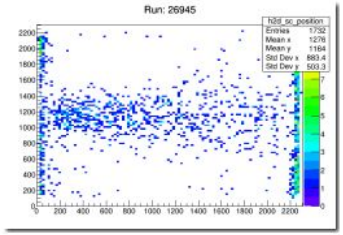

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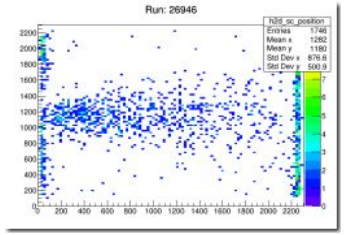

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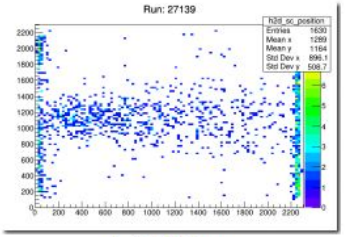
RUN 3



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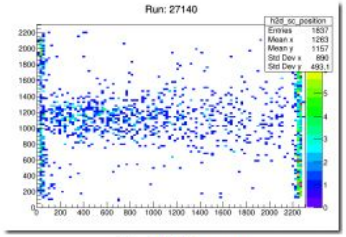

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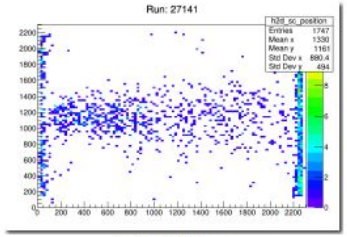

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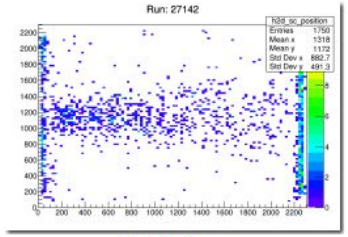

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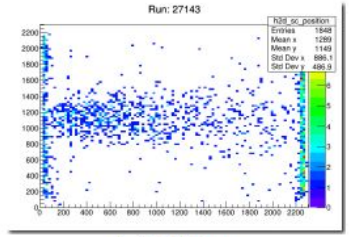
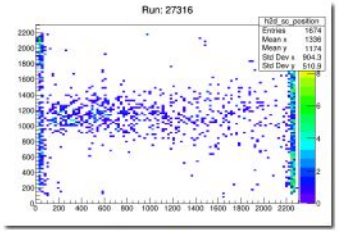
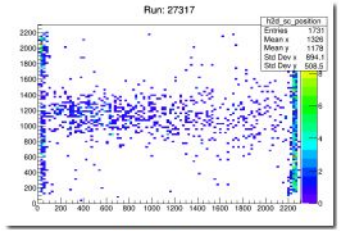


plot_27143.png

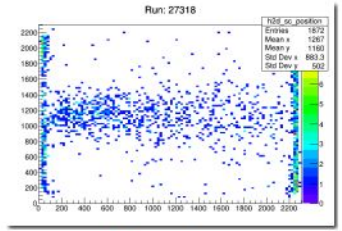
RUN 3



plot_27316.png



plot_27317.png



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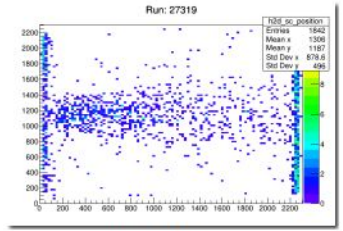
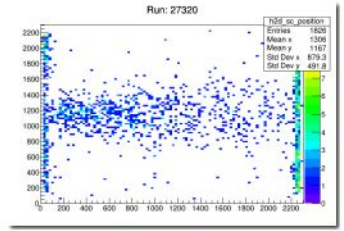
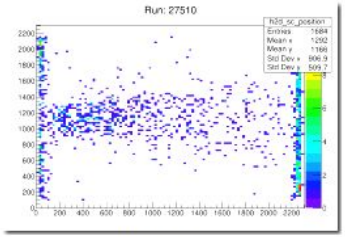


plot_27319.png

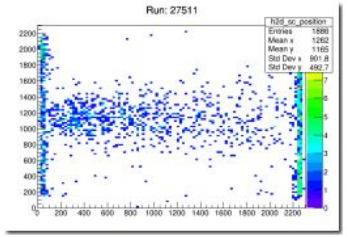


plot_27320.png

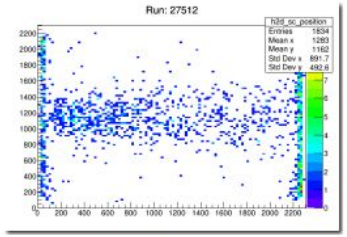
RUN 3



plot_27510.png



plot_27511.png



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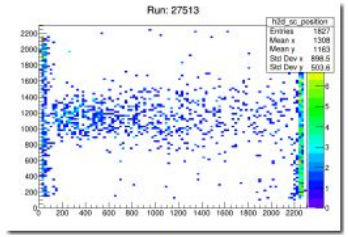
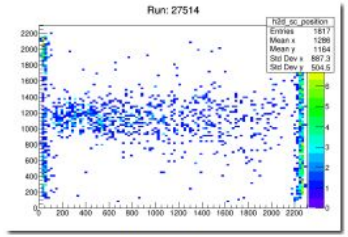
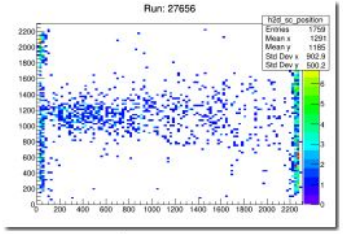


plot_27513.png

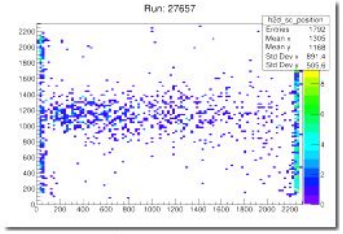


plot_27514.png

RUN 3



plot_27656.png



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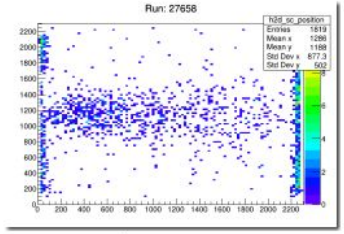

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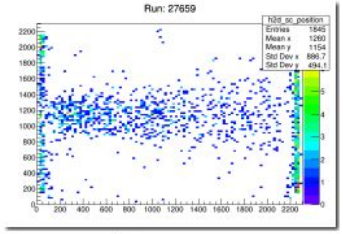

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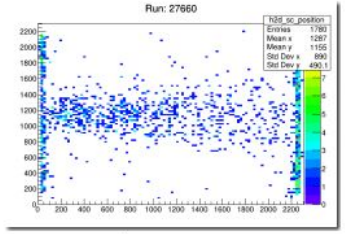
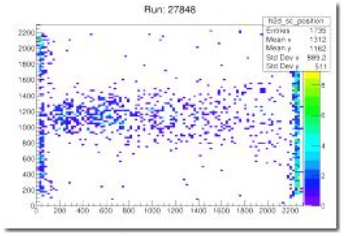
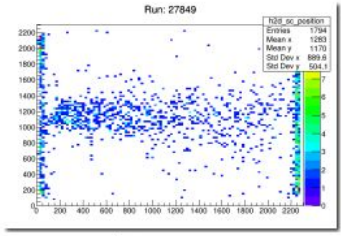


plot_27660.png

RUN 3



plot_27848.png



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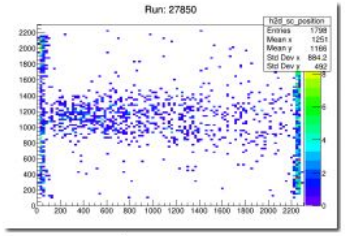
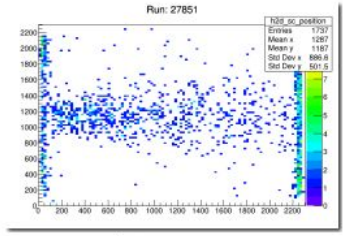
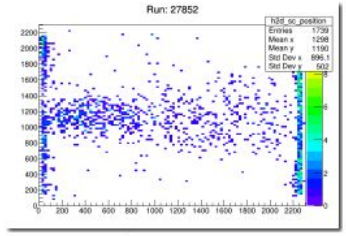


plot_27850.png



plot_27851.png



plot_27852.png

Conclusions

- Once in a while, **one step in the calibration is reconstructed in a different way**. But this is likely due to manual reconstruction of some runs that the online-reco failed to reconstruct.
- Since this happened in RUN 2 and in RUN 3 **there might be similar issues also in RUN 1** and not only in calibration runs. **Should we reconstruct also RUN 1 and RUN 2?**
- It seems that there are two versions of the code that were used between February and October (and likely in November and December (now) too):
    1. One code makes the source appear on one side and also **makes the noise bands appear** (**used from May to June and from August to October**)
    2. The other code makes the source appear on the other side and **does NOT make the noise bands appear** (used in **most of RUN 2 runs and in runs of July 12 ,17 ,18 ,19**)

I believe that **the correct version of the code is this second one**, because in the other version the noise bands appear. This would also explain how **it is not the camera becomes noisier on the borders** in some periods of time, but it is the reconstruction code that is messing things.