Preliminary results with the Alibava Telescope

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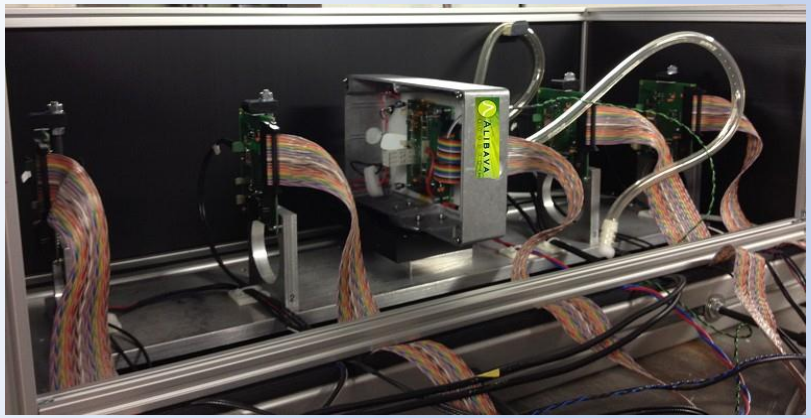
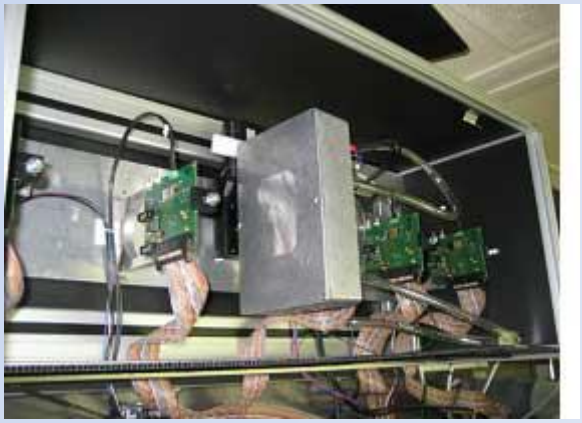
The Alibava Telescope (AT)

The Alibava based test beam telescope is a system with four 2D semiconductor detectors which measures track parameters with elevated precision and determines the position of the beam particle interactions with a device under test (DUT). Characteristics of detectors before and after irradiation, as a function of bias voltage or other variables (temperature, influence of magnetic field, etc.) can be studied in real operation conditions. Usually, the set-up of a test beam is laborious and time consuming. Our telescope has been conceived to be easy handling and portable, to minimize the set-up time, provide high resolution and high rate tracking with early feedback from analysis of the recorded data. Preliminary results of the telescope operation at the DESY beam-line are presented.

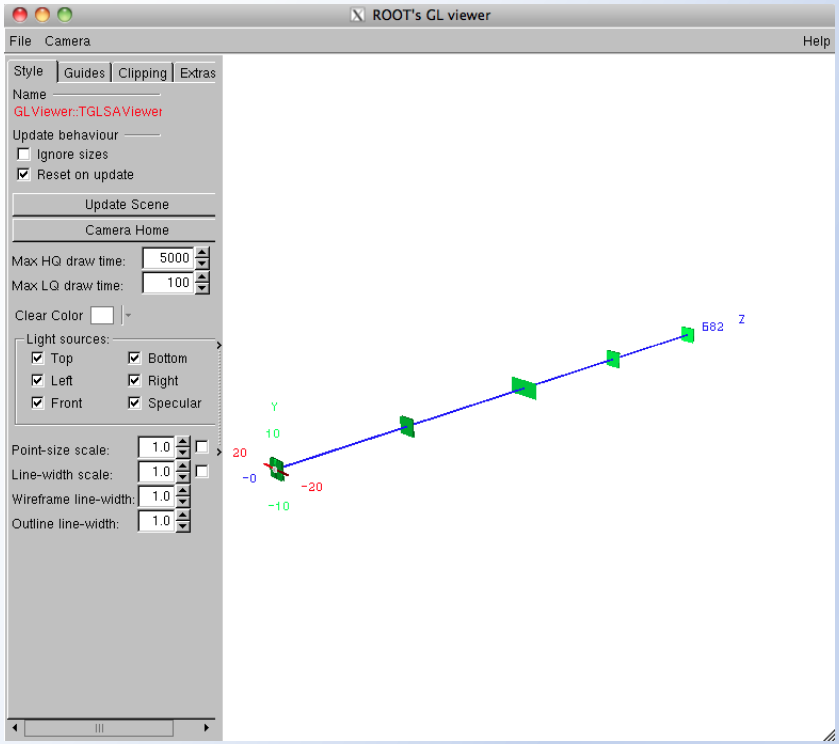




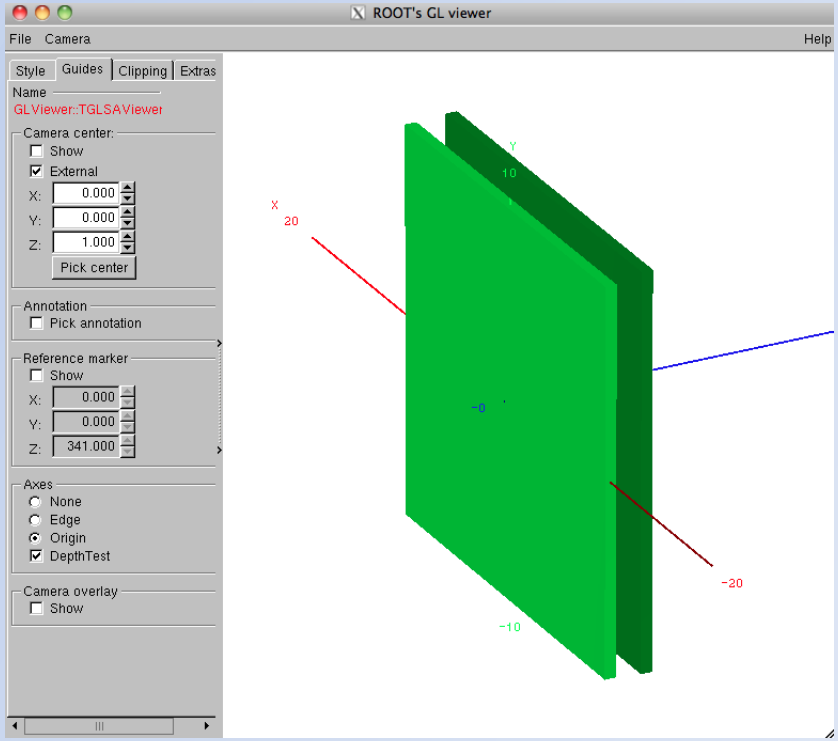
The Alibava Telescope (AT)

Improving geometry package (this will provide visual track information):

4 tracking planes and 1 DUT (central)



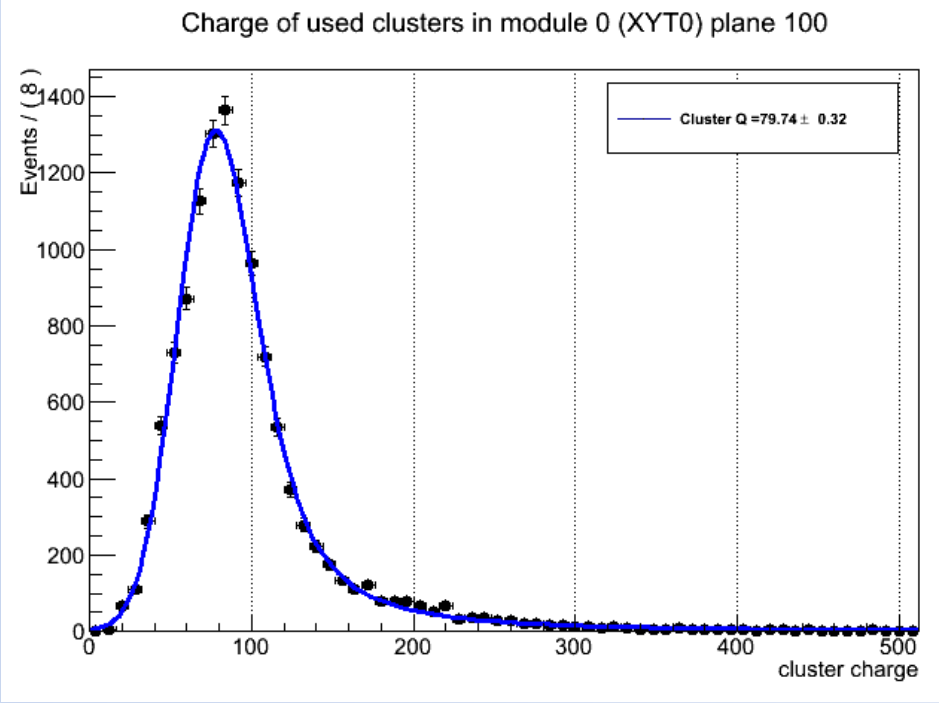
Closer view of a XYT station (2 planes)



Preliminary results:

Test beam in Desy 3 days in April, 3 days in May:
Participant : I. Tsurin, J. Rodriguez.
Beam energy: 4 GeV electrons.
Thanks to AIDA for access and to the local DESY support (N. Meyners, I. Gregor)

Sanity check:
Cluster charge in tracker modules:

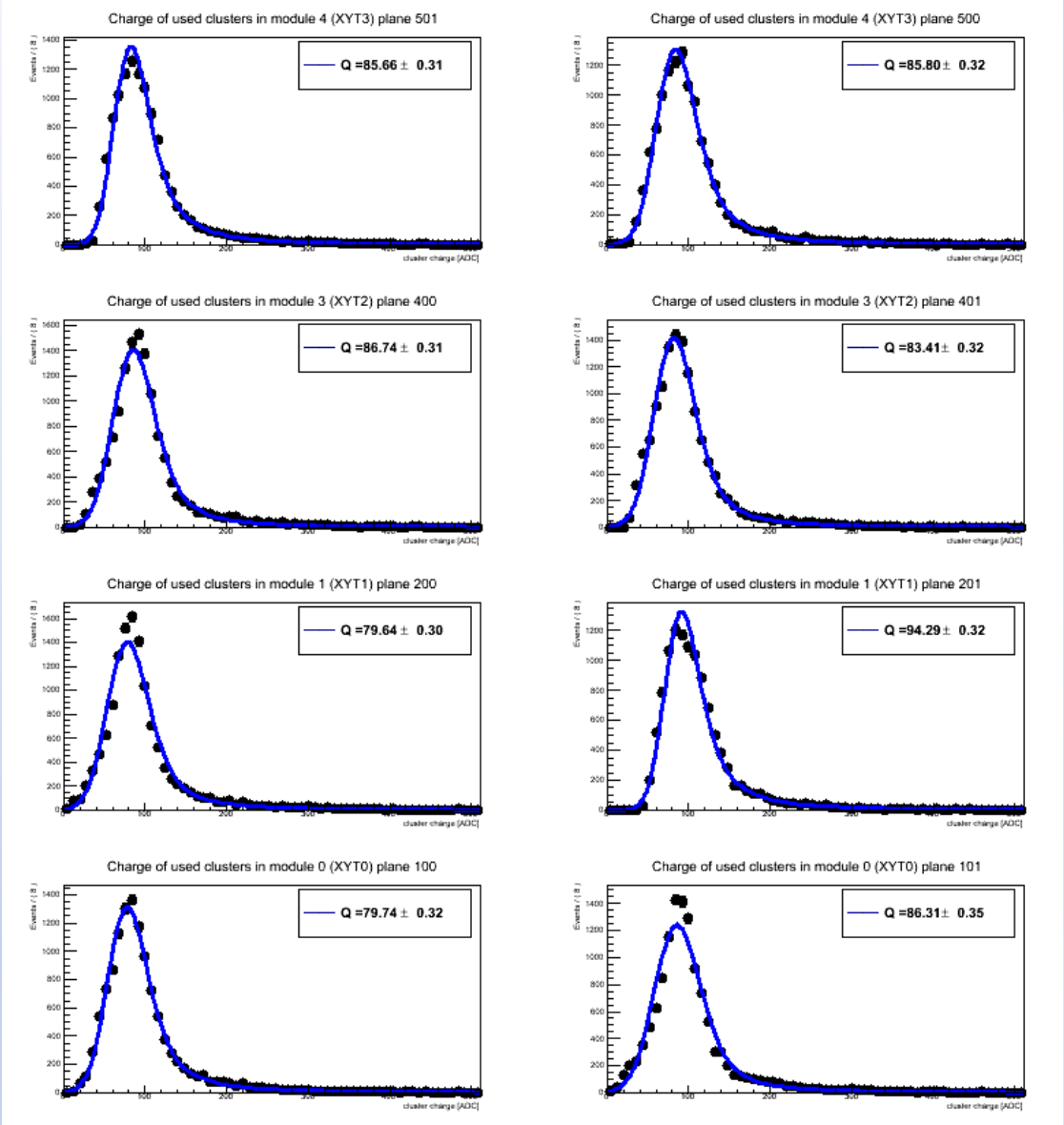


- Tracking performed using the XYT stations.
-Iterative Chi2 track fitting. Associate up to 1 per plane.
- Unused hits available for other tracks. Possibility of more than 1 track per event
- No B field -> straight track model
- No Multiple Coulomb scattering included yet (working on it)
- Track-hit residuals allowed to perform an initial alignment

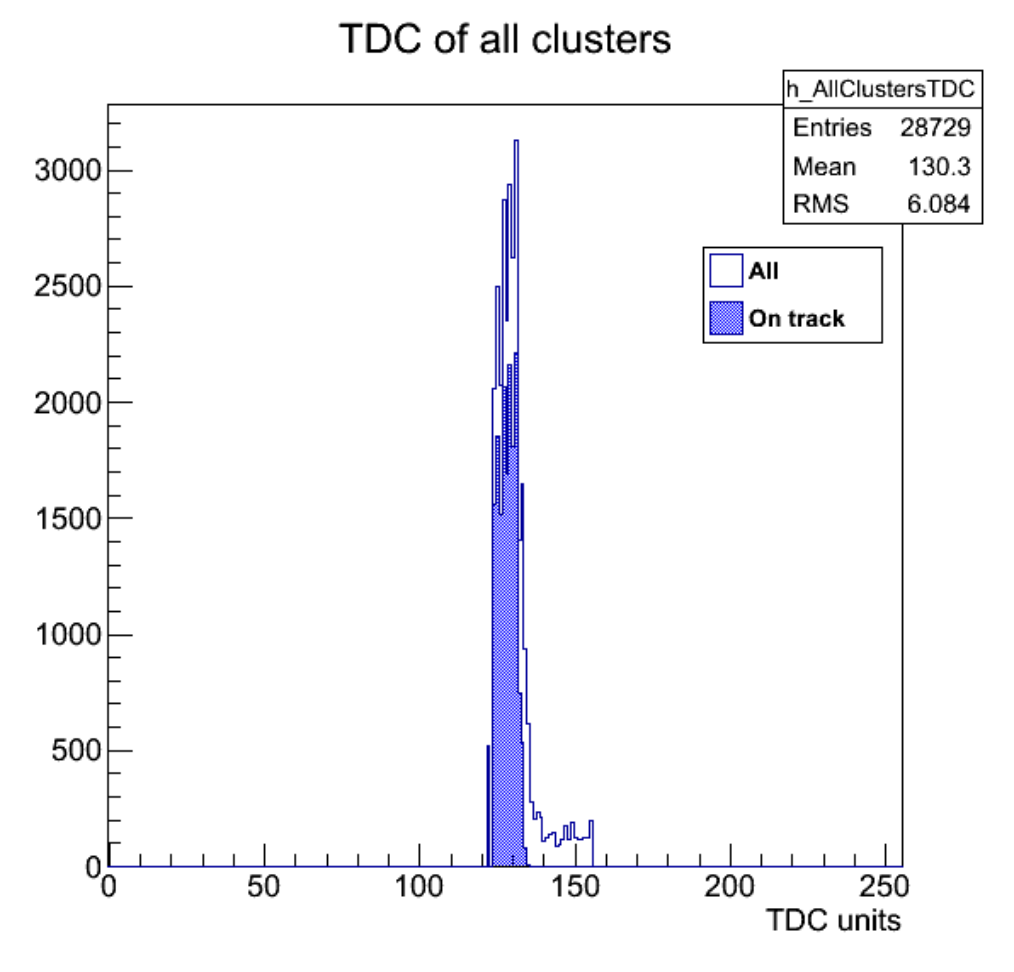
Preliminary results:

April results:
Cluster charge after ped subtraction.

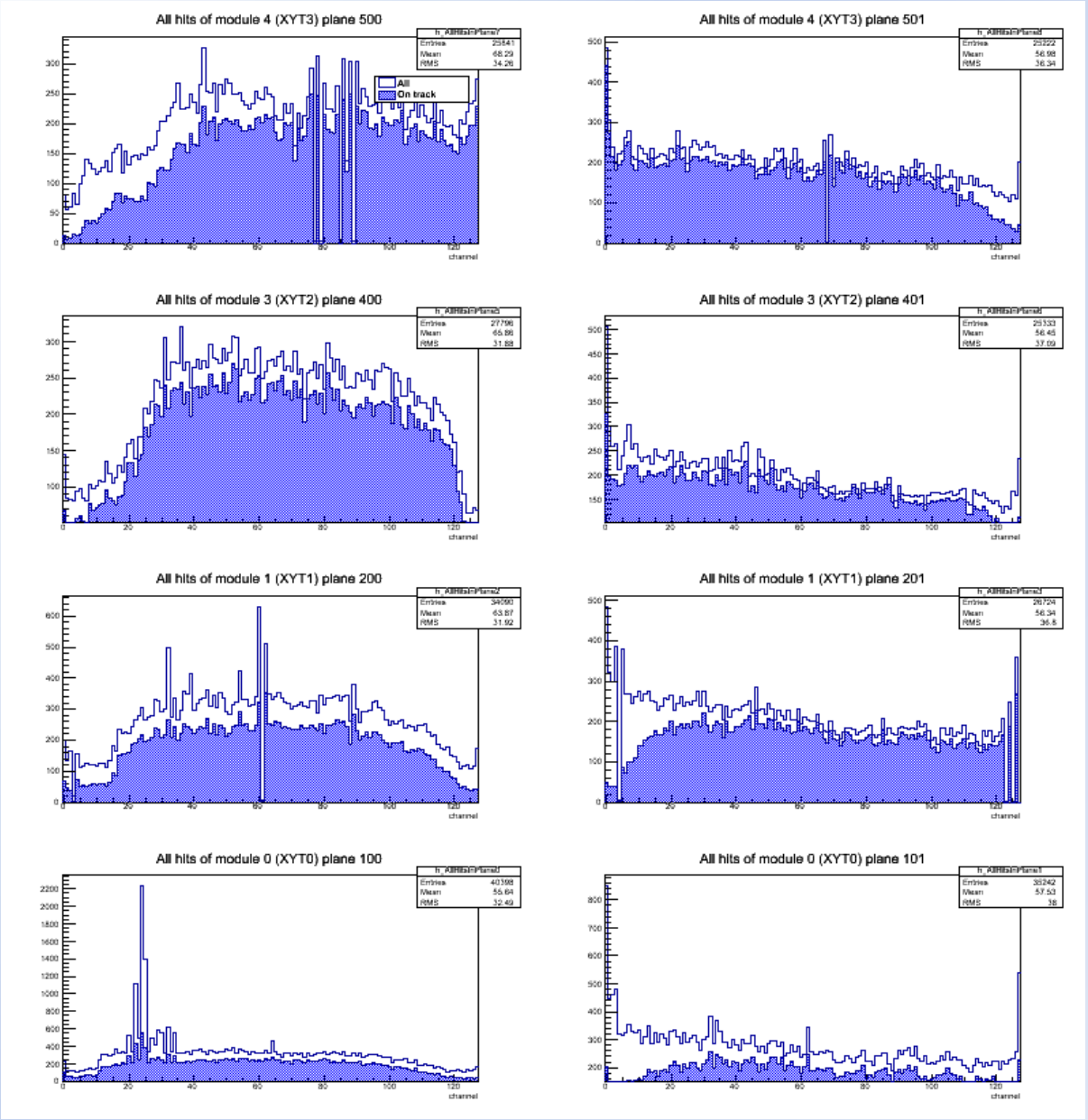
Distributions fitted to Landau convoluted with Gaussian.
The highlighted value is the Landau mean (in ADC units).

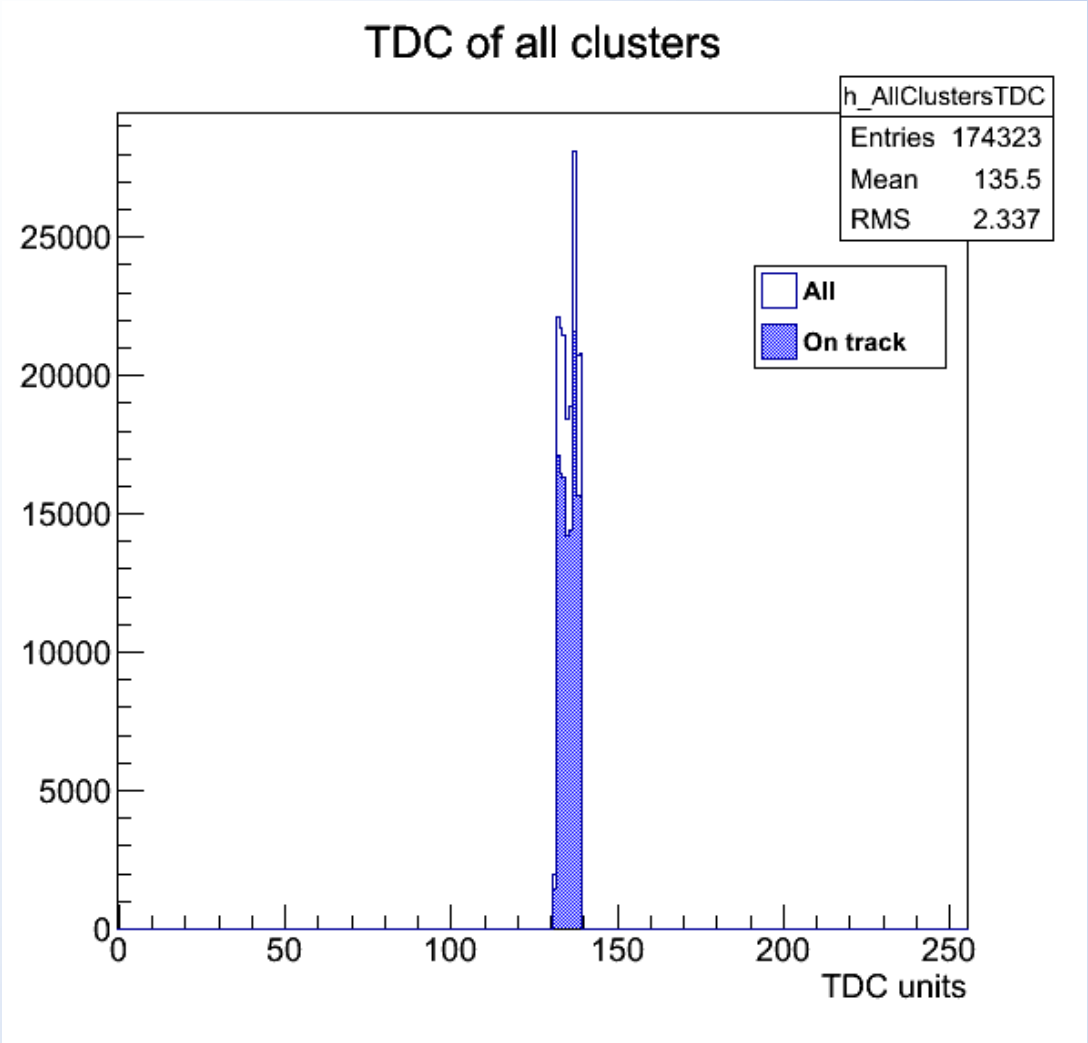


TDC measurement (all modules). Tail of the TDC possibly due to noisy hits. They are not accepted in the track reconstruction.



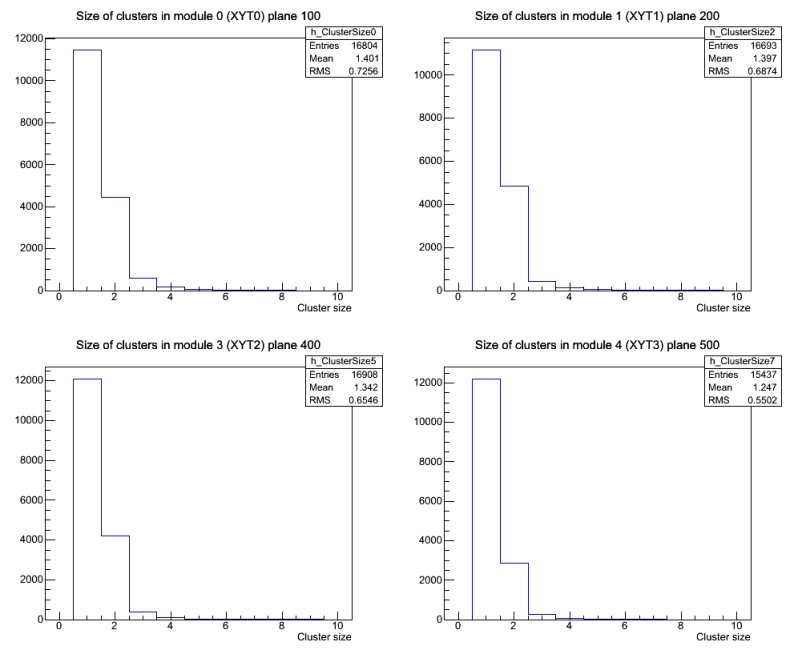
May results:
After alignment



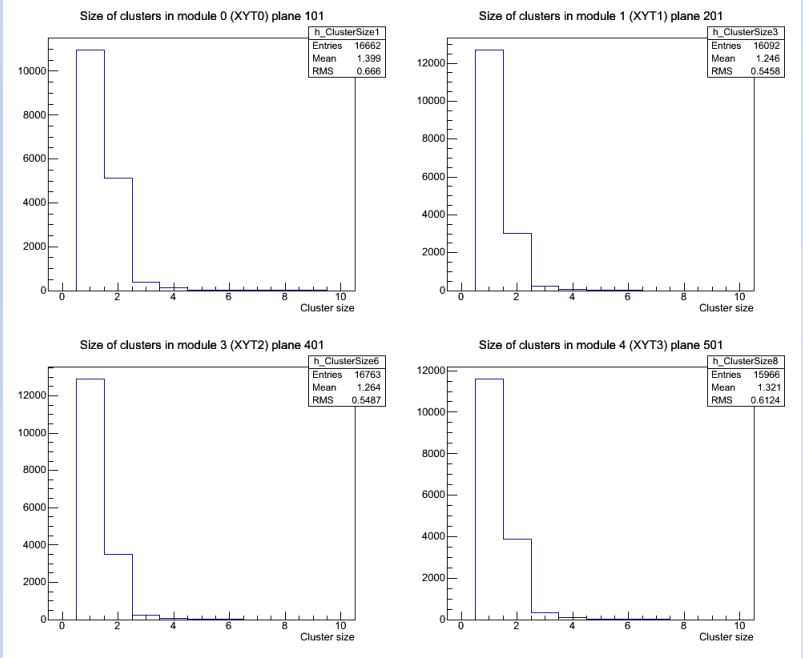

TDC of all clusters
h_AllClustersTDC
Entries 174323
Mean 135.5
RMS 2.337
All
On track
25000
20000
15000
10000
5000
0
0
50
100
150
200
250
TDC units

Cluster size compatible with expectations.

Cluster size, x-planes

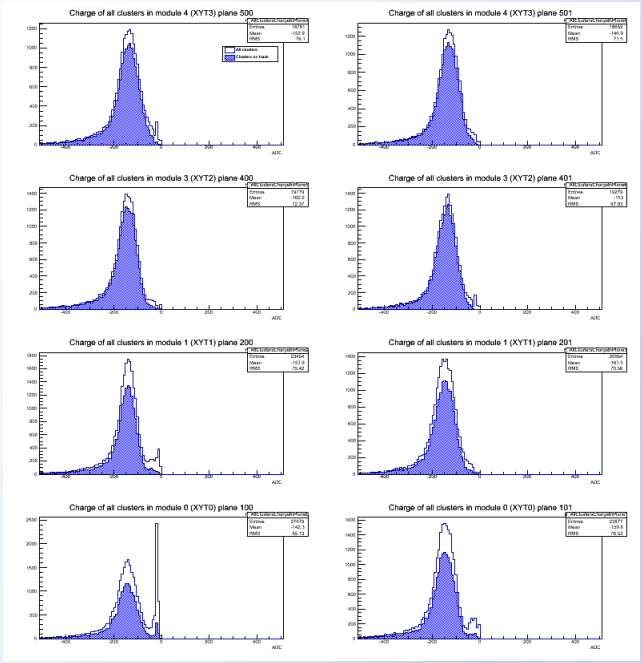


Cluster size, y-planes

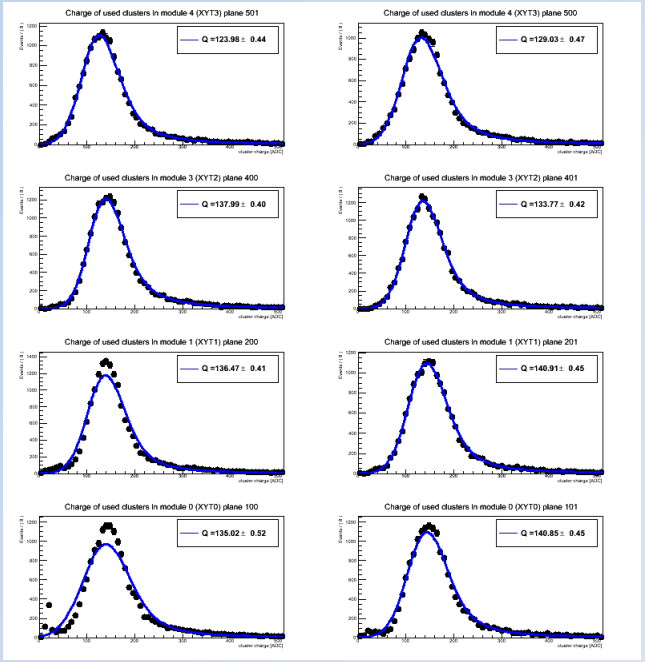


Energy spectra

Charge of all clusters (white) and of those clusters used in the track reconstruction (blue).

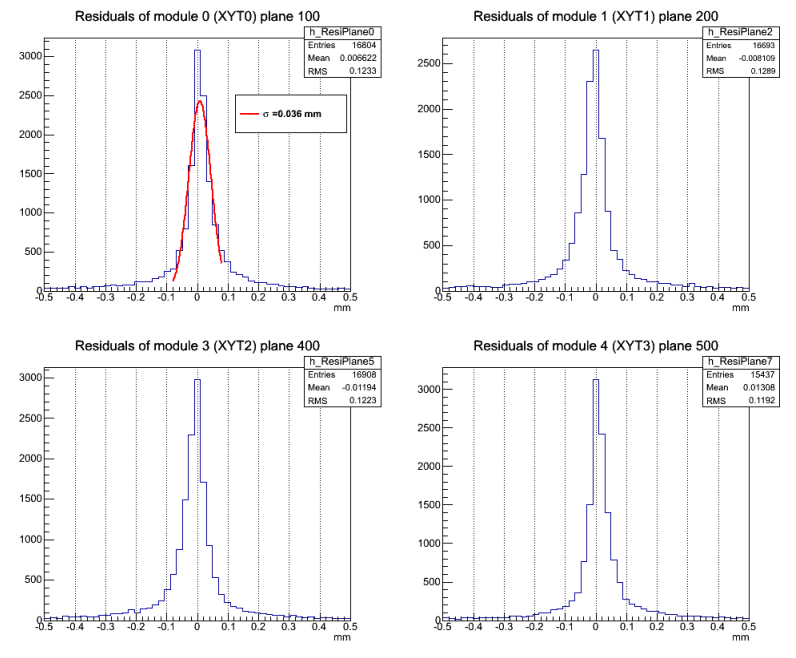


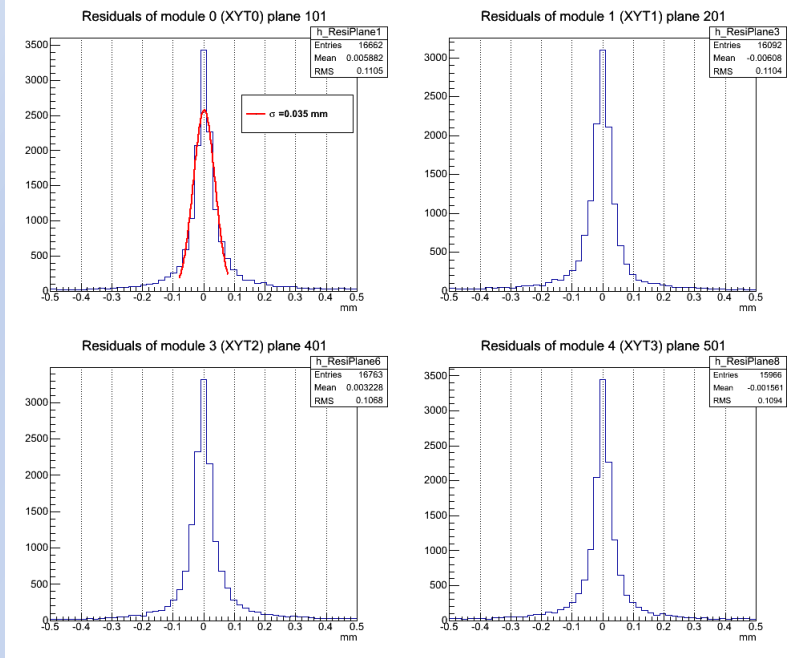
Fit to the blue distribution (absolute value).



Fit to residuals

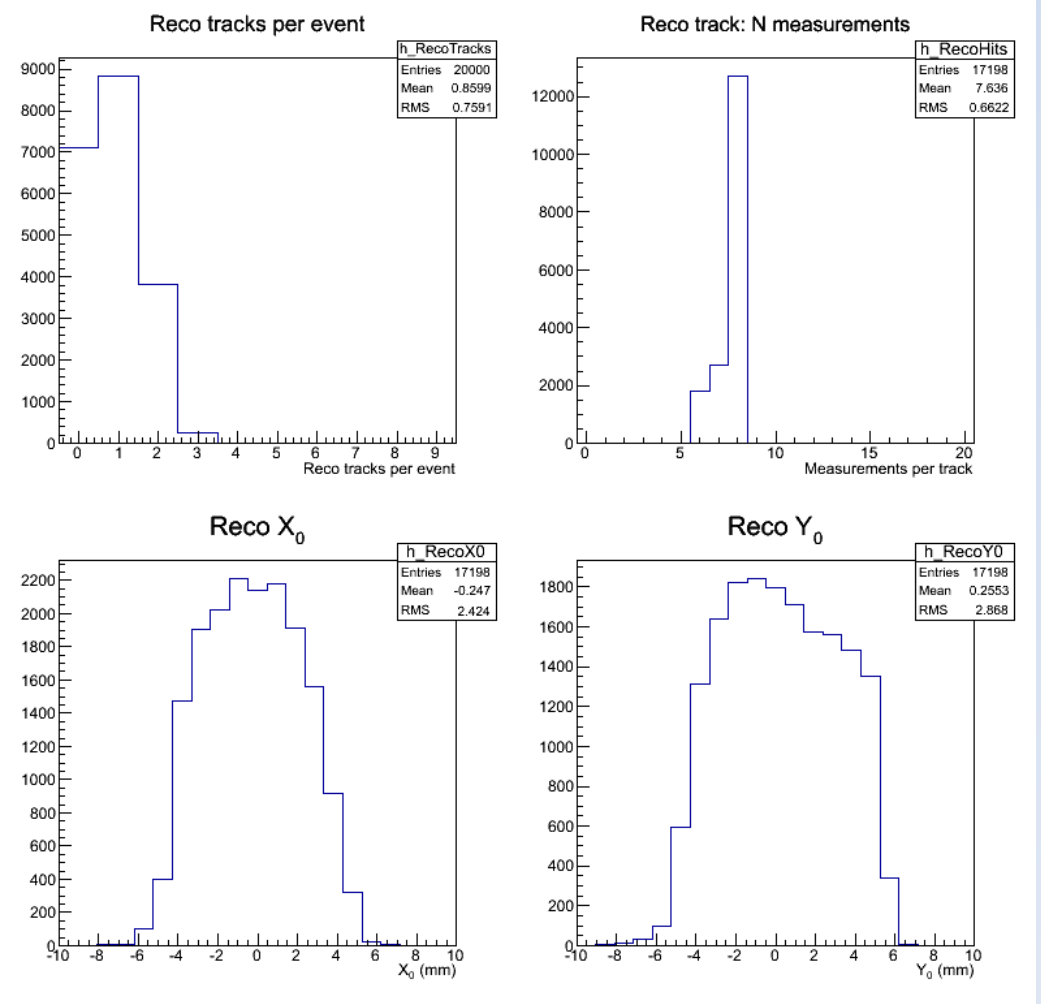
Very preliminary: coarse aligned has been performed, no multiple scattering, improvement to the geometry description to be implemented .....





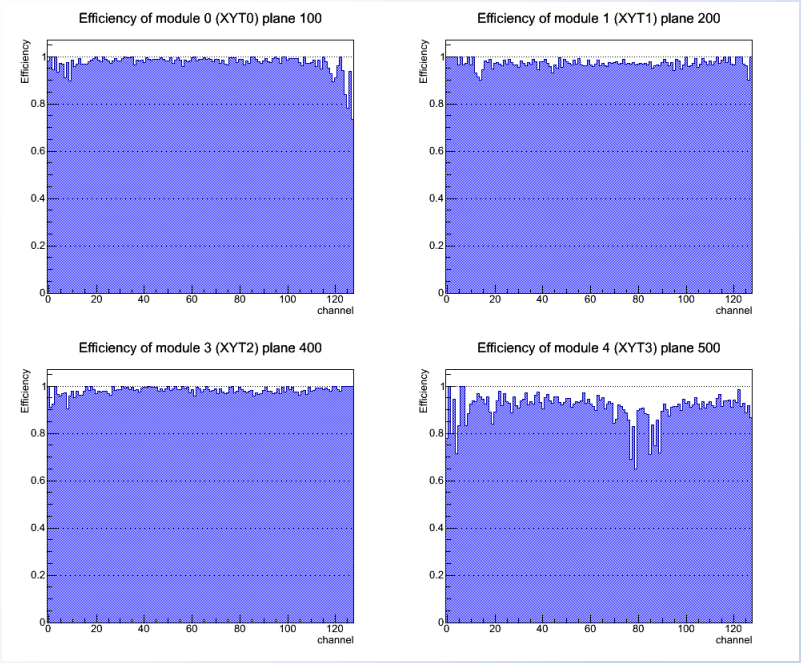
Track reconstruction

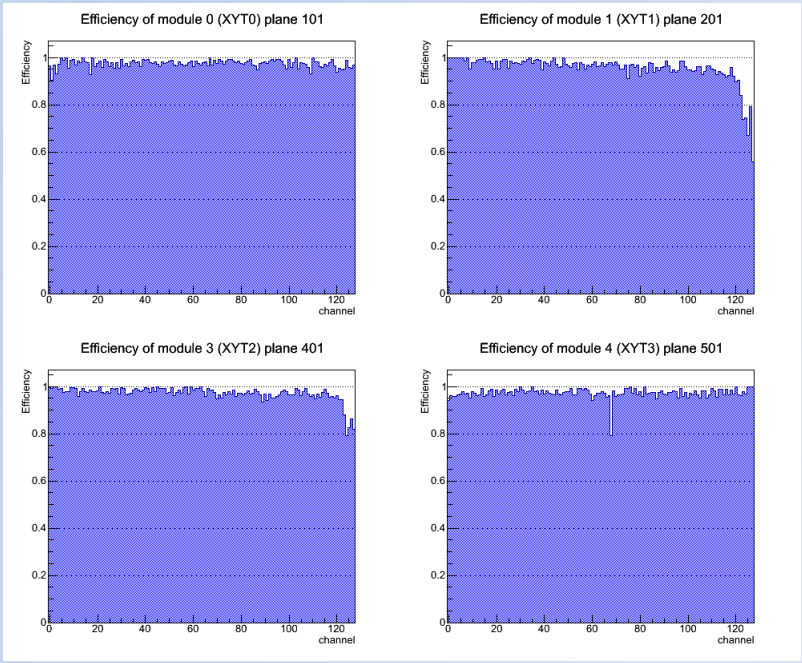
Particles reconstructed per events (few events with 3).
Up to 8 hits (4 stations x 2 planes).
Less than 6 hits--> track not fitted.



Efficiency

Hit_eff = tracks_seen_by_strip_or_its_neighbours / expected_hits_in_this_strip
This picture will improve with final alignment.





CONCLUSIONS

Telescope working well. Hardware in place, DUT temperature down to -20^{o}C without any particular arrangement. Software well advance (basic tracking software is working, event display almost ready), adjustments needed but the structure of the analysis written and operational. Trigger rate being improved, target >= 1kHz.

Possible to study angle tracks, magnetic field effects ...

System conceived for allowing easy replacement of the tracking sensors (e.g. for improved resolution or increase of the acceptance area).

Confident to reduce the set-up time (1st day).