Test beam data reconstruction and analysis

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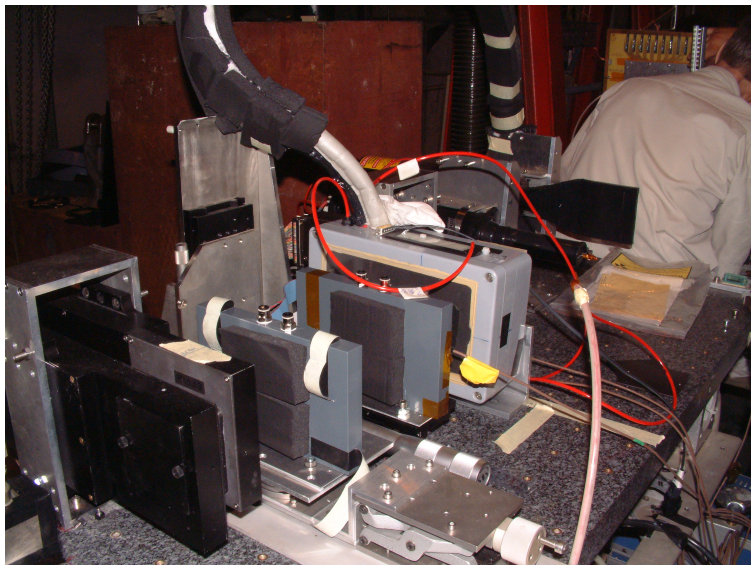
Outline

- 2008 test beam
- Available data
- Tracking an alignment
- Preliminary analysis
- Outlook

Test beam

Setup:

- Trigger: Two scintillators in coincidence, one anti-coincidence
- Bonn telescope, three modules
- Cooling box(Manchester)



Participants:
Ole Røhne, Erlend Bolle, Bart Butler, Cinzia Da Via, Heinz Pernegger, Salvatore Fazio, Håvard Gjersdal, Alessandro La Rosa, Vladimir Linhart, David Miller, Kyrre Ness Sjøbæk, Tomas Slavicek, Michal Tomasek, Stephen Watts, Charlie Young.

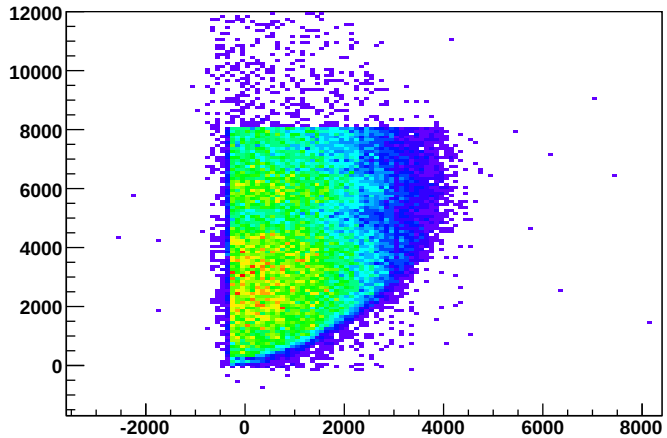
Available data

Approximately 1100 runs(run 9000 - 172)

- Mainly short runs(5k triggers)
- Two devices in the beam at the time
- HPTDC information from run 9243→

4E-C, 3E-G, 3E-S(Irrad):

- Edge effects
- Testing irradiated chip
- Bias scans



http://mpnoatlas01/~atlas3dsi/tb2008/tbdata/runs2008.txt
http://mpnoatlas01/~atlas3dsi/tb2008/tbdata/3E-S.txt
http://mpnoatlas01/~atlas3dsi/tb2008/tbdata/3E-G.txt
http://mpnoatlas01/~atlas3dsi/tb2008/tbdata/4E-C.txt

Tracking and alignment with the Bonn telescope

Main challenges:

- Lost sync in BAT, one event in the raw data contain information from several events
- Loss of alignment, BAT modules, DUTs

Reconstruction code:

- BAT clustering, η corrections
- Check sync by finding correlation of cluster positions in the BAT modules
- Events with one cluster in each BAT layer are kept
- Check alignment using biased residuals in BAT, unbiased in DUT
  - BAT: Biased residuals, position of cluster - position of track at surface
  - DUT: Unbiased residuals, center of pixel - position of track

Realignment

BAT:
Starts out assuming the surveyed position of the modules. Only good tracks are used, χ^2-cut.
Realignment done in steps, progressively adding degrees of freedom and at each step minimizing χ^2 until it converges:

- Release translations in x and y
- Release rotations around z-axis
- Release changes in scale in x and y for one plane

Works well, but:

- Points of lost alignment identified manually. Short runs/low statistics, means these points may be identified too late
- Editing code and breaking at χ^2 convergence for each step, making the process slow

Realignment

DUT alignment:

- Done manually
- Translations in x and y, rotations around z-axis
- Not perfect, will probably need to be adjusted in analysis

Information from tracking and DUT dumped to tbtrack#.root files

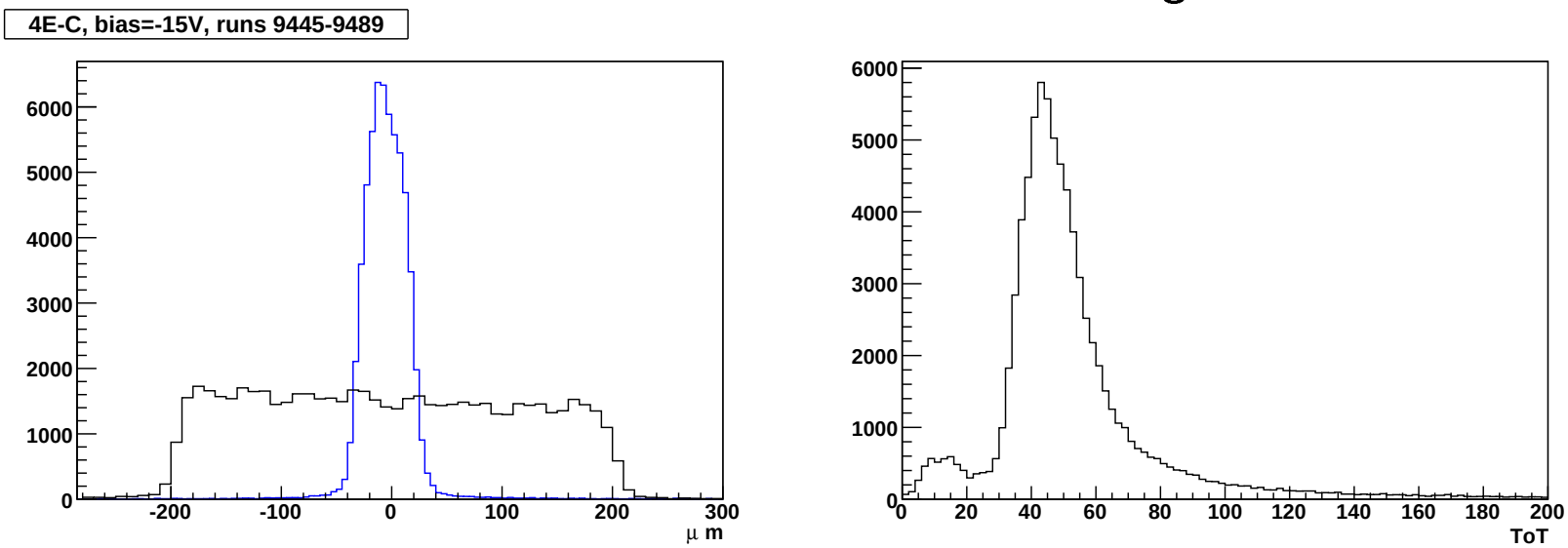
Available at **http://mpnoatlas01/~atlas3dsi/tb2008/tbtrack/**

So far all runs up to 9520 are realigned and available as root files

Feedback on alignment **hgjersdal@gmail.com** and **ole.rohne@gmail.com**

Preliminary analysis on tbtrack files

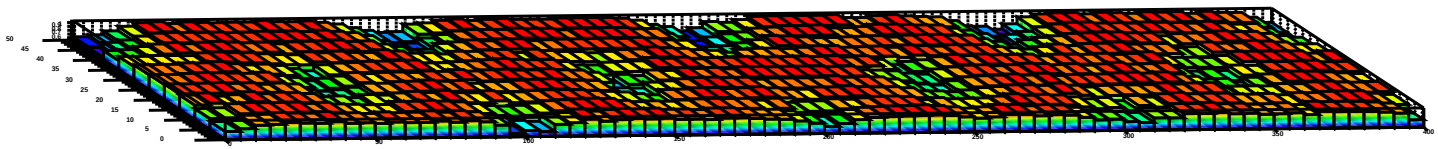
4E-C, -15V, runs 9445-9489, no access, constant alignment



Analysis on tbtrack files

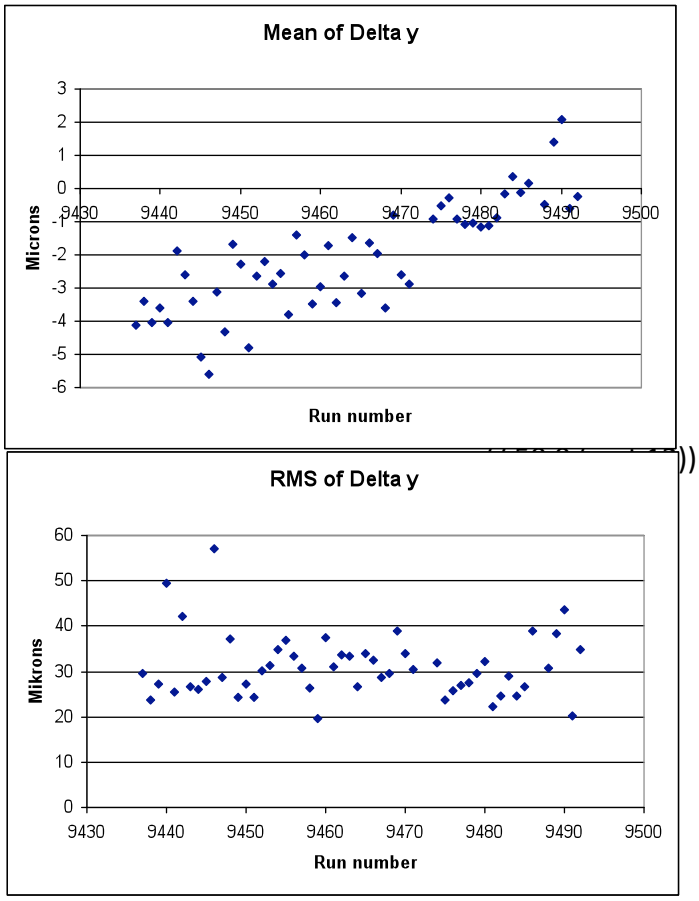
Super positioning all pixels: Position of track relative to the single pixel it passes through

For each bin: Tracks passing through with a hit somewhere in DUT divided by all tracks passing through



- Track resolution good enough to find holes
- Alignment of DUT not perfect

- Plots by Bjarne Stugu and Ahmed Mohamed Abdelsalam from the University of Bergen
- Top plot: Mean of y-residuals between track and center of pixel for different runs
- Bottom plot: RMS of residuals



Outlook

All runs hopefully processed the next couple of weeks

For next test beam:

- Make code faster and easier to run
  - Fully automate alignment of BAT and pixels
- Hopefully possible to reconstruct tracks in paralell with data taking, making it possible to test data quality on the fly

Continuing work on pixel alignment and analysis in Oslo and Bergen