

TRT SW Status and Plans

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Inner Tracker Software Meeting

TRT Offline Status

- The last few months have been busy for the CTB code but pretty quiet for the offline TRT code.
- The main news items are:
 - Thomas Kittelmann has become the contact for TRT_GeoModel, TRT_PAI_Process, and TRT_TR_Process.
 - Thomas will do the day to day maintenance on the PAI and TR packages but any substantial changes to the TR code will require help from Mogens.
 - Mogens will most likely be assuming a major role in coordinating the TRT software during the Atlas commissioning period.

TRT Geometry

- In the simulation, the TRT barrel was rotated by 180° about the Y axis.
 - Thomas has put code to correct this into the TRT detector description.
 - By default the correction is not activated and we must turn it on before we start the production for Rome.
- Thomas also modified the TRT detector description so that the parameters could be read from Oracle instead of Nova.

TRT Material

- We are going to have to redo all of the material estimates for the TRT services in both the barrel and the end-cap.
 - Portions of my spreadsheet are out of date.
 - It will take substantial effort from the engineers and electronics groups to get together the necessary information.
 - I estimate several weeks of effort are required.

TRT Digitization (I)

- The main changes by Andrei and Yura Zalite:
 - The possibility to scale the r-t relationship linearly has been implemented to allow compensation for field on/off and for new/old gas mixture.
 - the default is a scale of 1 - i.e. no scaling and corresponds to $B = 0$ T.
 - Linear scaling is not really appropriate as Peter C's studies show that the function has a somewhat different shape with the field on and off.
 - The r-t relationships for the new and old mixtures supplied by Peter C. were put in.
 - Need to check that these relationships go into the release used for the Rome production.
 - The HV used in the model still needs to be corrected from 1830 V to 1530 V.

TRT Digitization (II)

- The main changes by Andrei and Yura continued:
 - The possibility to do multiple bunch (TOF) pile-up,
 - Previously only one bunch crossing was possible.
 - A small shift to avoid negative drift times was introduced.
 - The TR photons can be tagged with the particle ID -22 to distinguish them from other soft photons.
 - The -22 code is only visible privately within the TRT code and not visible to users of the public code interface.
- Thomas also made contributions:
 - Thomas' translation of Pavel's PAI code is now available in the TRT digitization by setting a switch.
 - The default remains the GEANT4 PAI model.
 - Using the this code would break the dependence on GEANT4.
 - Thomas also made an attempt to introduce the affect of diffusion in smearing the r-t relationship but it's not in use.

TRT Conditions Database

- Rasmus Mackeprang and Peter Hansen worked out a way to store TRT drift time information and alignment data in the conditions database.
 - Rasmus wrote the package TRT_DriftCircleOnTrackTool to facilitate this work.
 - Further work remains to finish this.

SW Work During Commissioning

- There are many jobs requiring new software during the installation and early running with cosmic rays:
 - r-t calibration constants need to be calculated and stored.
 - Alignment constants need to be calculated and stored.
 - DCS needs to control and monitor the HV system, gas system, temperatures, etc.
 - The DAQ code to readout the TRT and form the ByteStream data needs to be written.
 - Monitoring code needs to be written and interface to Athena.
 - Need to debug the reconstruction of tracking finding and fitting.
 - The Atlas Event Display will probably need code to display the TRT correctly.

A Few Results From TRT TB

- The follow slides were shown yesterday at the TRT testbeam meeting.

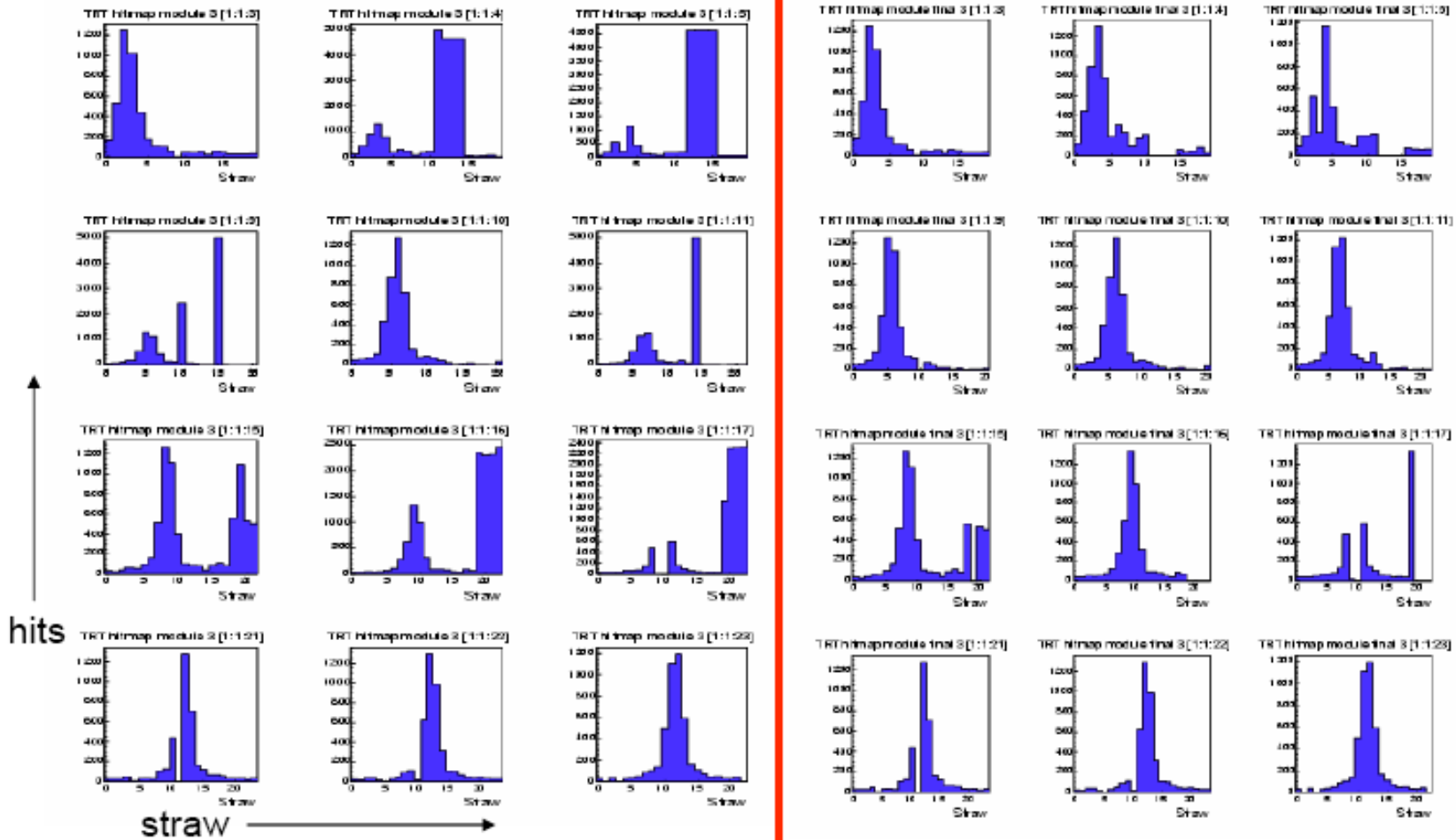
Noisy/dead channels investigation

- Noisy straws are characterized as;
 - Having a low threshold hit while track is not passing through it
 - Distance from track > 4 mm (i.e should not be neighbour to hit straw (??))
 - Noise occupancy > 4 X mean noise occupancy of all noisy straws in a straw layer
 - The output of analysis is a text file containing identifiers and straw status
 - A straw is bad if it is noisy/dead(2/3)
 - Analysed all good runs
 - registration in the CondDB is in progress

Noisy channels as vertical columns are removed (still not 100% efficient)

With noisy channels

Masking noisy channels



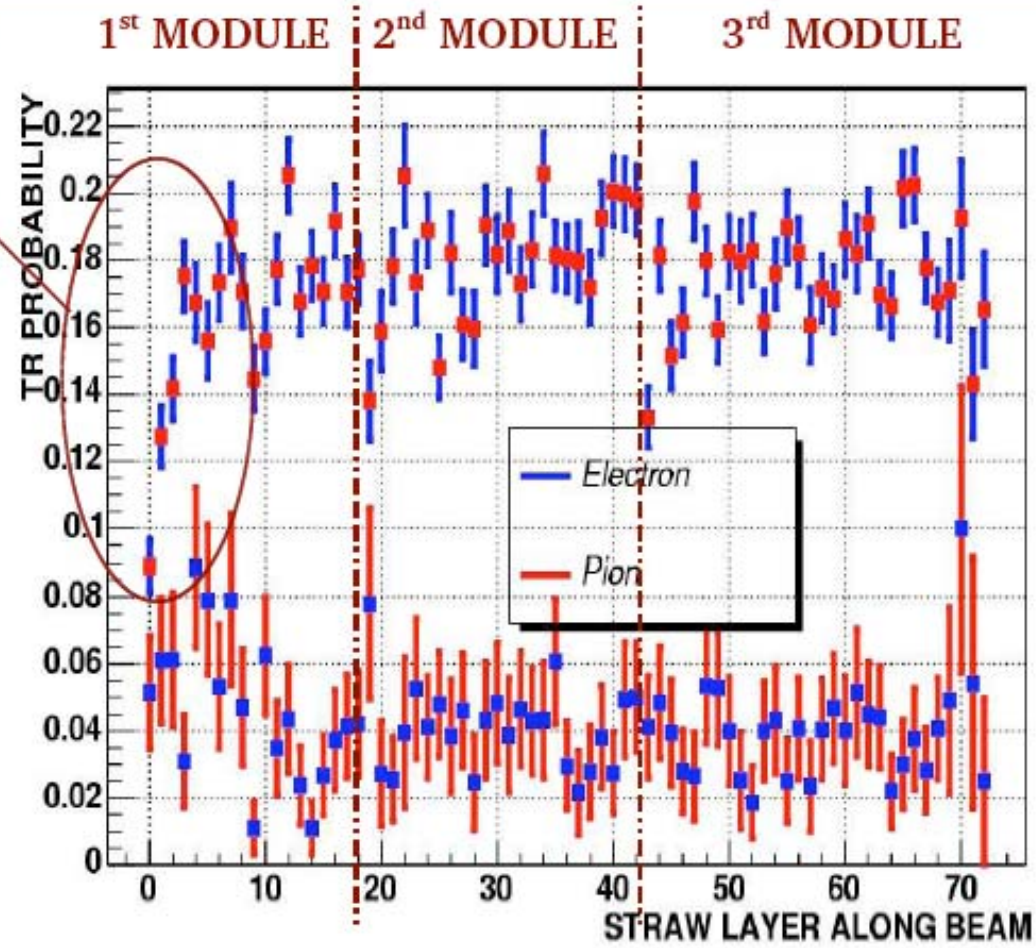
TR hit probability along beam axis

- Mixed beam at 2 GeV

TR accumulation effect over first radiator layers

TR probability drops at module boundaries

Similar behaviour observed for different beam energies

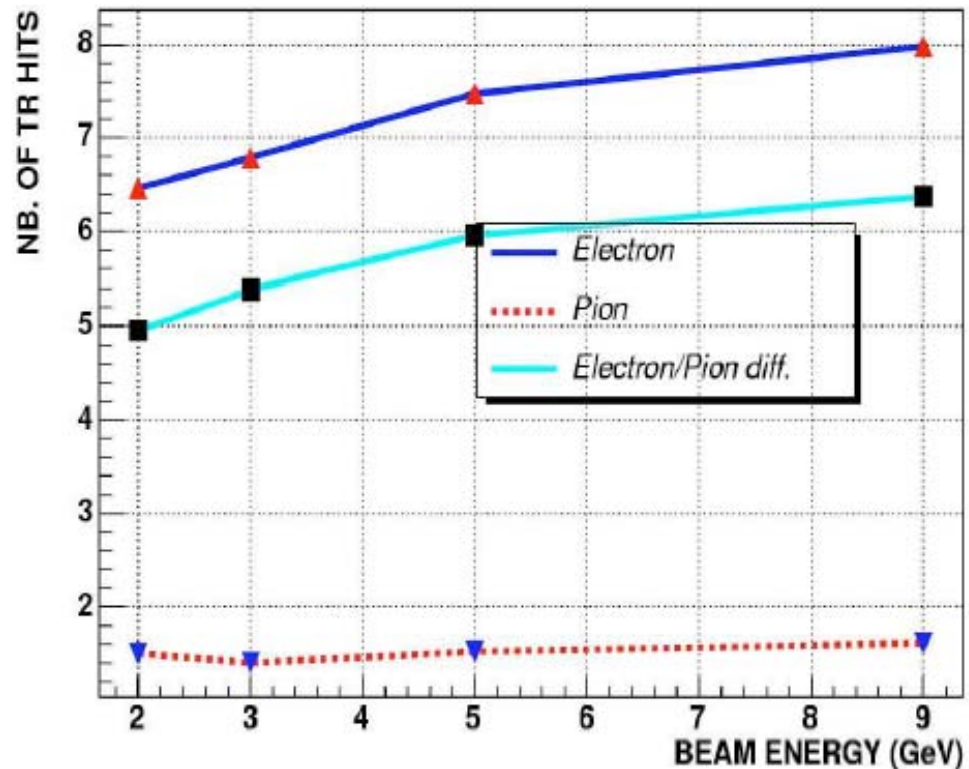


Number of TR hits as function of beam energy

- Number of hits is stable for pions and increases by ~ 1.5 for electrons

- Naively, we expect the electron TR curve to reach the saturation level quickly, i.e. below ~ 3 GeV

- One more thing to be investigated further



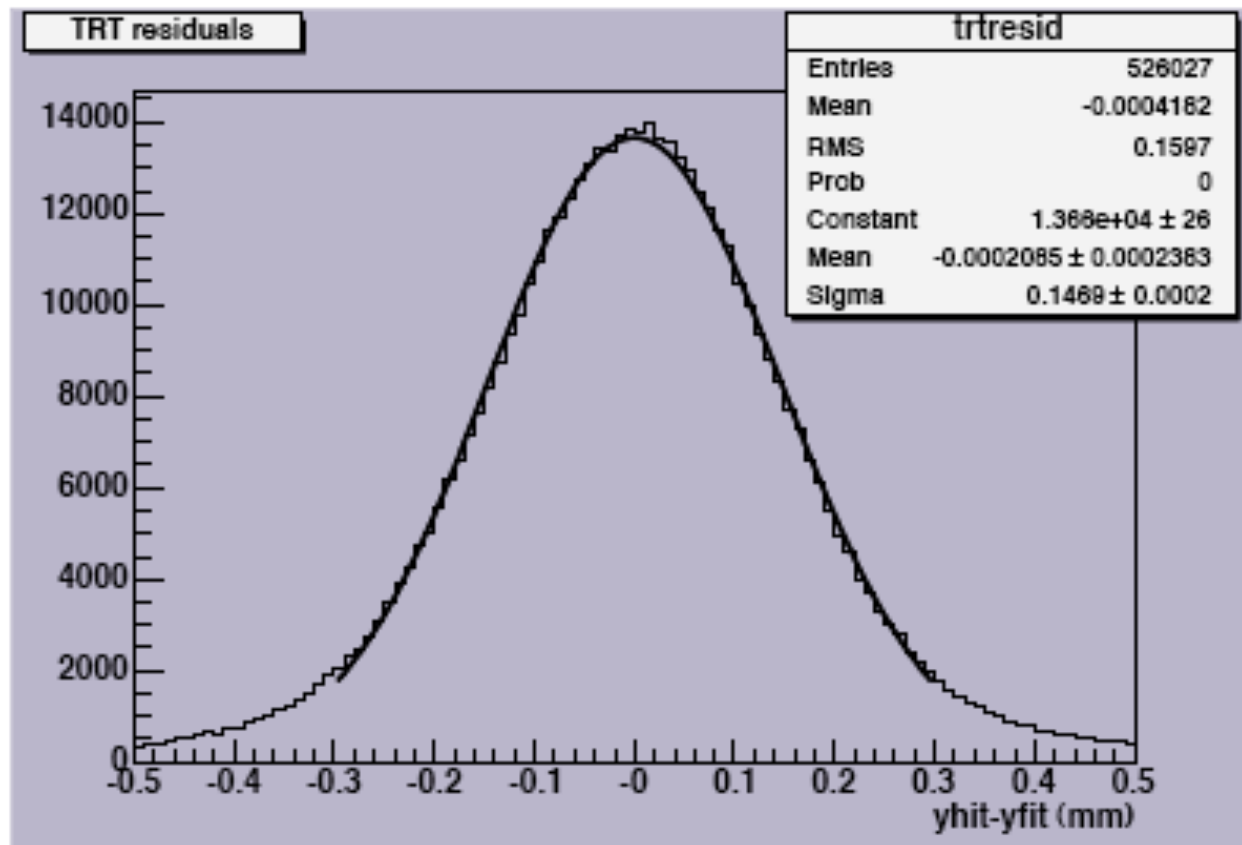
General method used at test beam

- So-called **V-plots** have the **drift-time** plotted against an estimator of the **true particle position**. The estimator is a fitted track intercept.
- At each position bin, **5-7 time-bins are averaged** and fitted to a **"V"**. This yields the **wire $r\phi$** and the **T_0** .
- The **$r\phi$'s are averaged on each side** and their difference is fitted to a third degree **$R(t)$** polynomial.
- In testbeam, the TRT straws are **aligned internally** and calibrated using **TRT-only tracks**.
- The **orientation of a TRT phi-sector** is fixed by **tracks extrapolated from the silicon tracker**.

From Peter Hanson's talk on TRT calibration and alignment.

What calibration can do for you

The resolution went from 0.5mm to 0.147mm after calibration in this particular run with 180 GeV pions:



From Peter Hanson's talk on TRT calibration and alignment.

TRT SW Plans

- Continue to work on the testbeam data.
- Plan a new organization for the TRT software effort.
 - New students and postdocs will join the the institutes that have built the TRT as the onset of Atlas data taking approaches. We are working on a plan to use these new people efficiently.
 - Need to allocate personnel for SW needed for detector commissioning.
 - Need to provided effort for the SCT & TRT cosmic ray run this autumn.
 - The TRT steering group will discuss this tomorrow.