Status of GEANT3 TRT Full Detector Simulation

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October 12, 2001

October TRT Week Software Session

Recent Changes to the Code (since April)

- Two serious bugs in the GEANT3 TR generation routines have been found.
  - Elisabetta found the first bug that caused TR model parameters for a random part of the TRT to be used during TR generation.
    - This problem was the result of an improperly initialized variable.
    - The result was somewhat decreased TR production in the barrel and type A & C wheels and increased TR production in the type B wheels.
  - I found the second bug that caused the TR absorption routine to treat the straw walls as a denser material then Kapton (carbon?).
    - This problem was the result of changing the name of straw material from Kapton to straw.
    - This problem resulted in a substantial over-absorption of the generated TR X-Rays before they reached the sensitive gas.

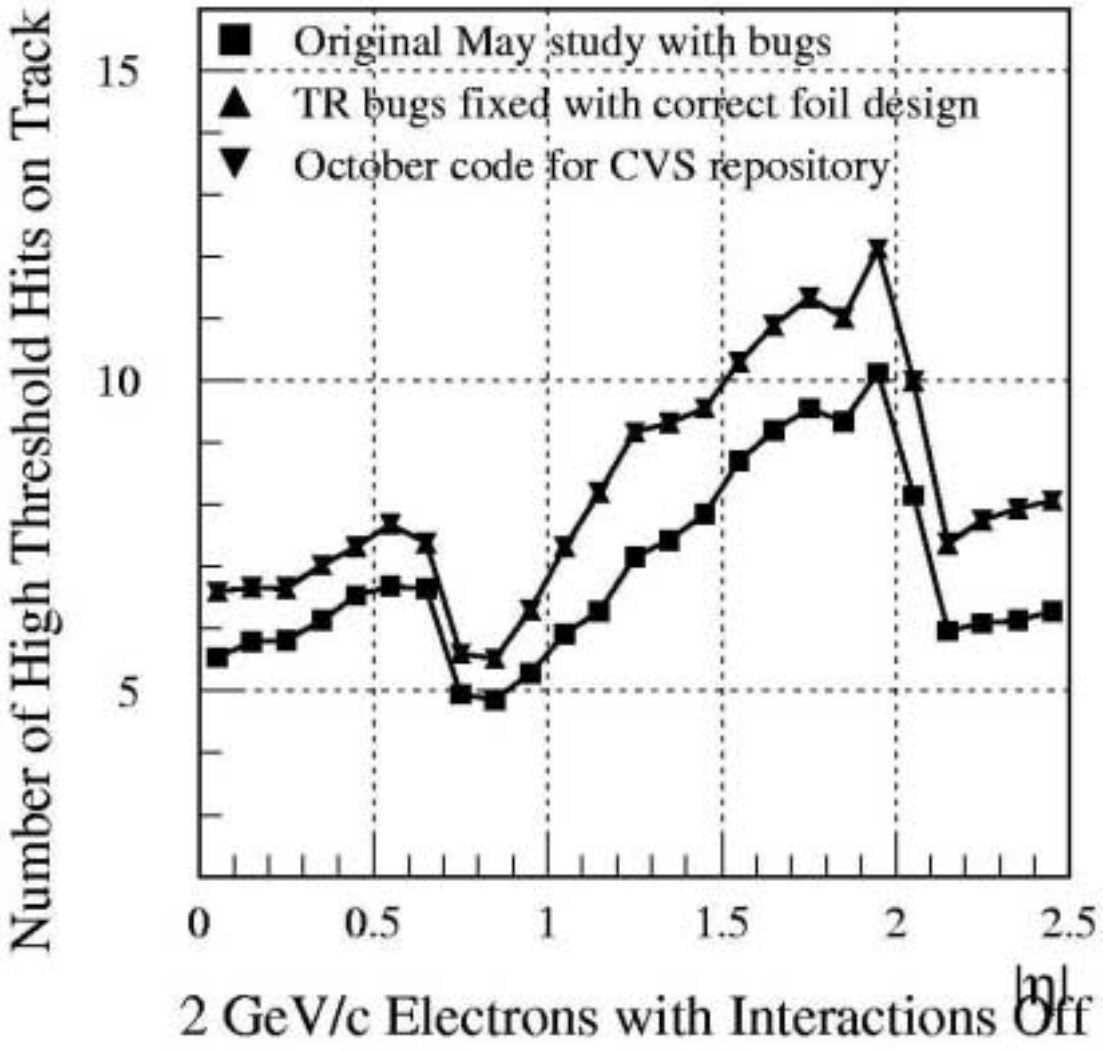
More About the TR Bugs

- These bugs caused the results in the TR section of the Physics TDR to be pessimistically wrong.
- Neither bug affected the test beam simulation and the previous comparisons showing good agreement between GEANT3, GEANT4, and data are correct.
- I made these bugs when I changed the code to have:
  - The foil volumes between the end-cap straw layers instead of the previous arrangement where the radiator filled the entire wheel volume not occupied by the straws.
  - The actual thickness of the end-cap foils and gap widths. (These parameters were later tuned to different values to match the testbeam results.) For the record the parameters used by the ID TDR version of the TR generation were:
    - 19 micron thick foils with ~600 micron gaps (end-cap).
    - 13 micron thick foils with 195 micron gaps (barrel).

Recent Changes to the Code (continued)

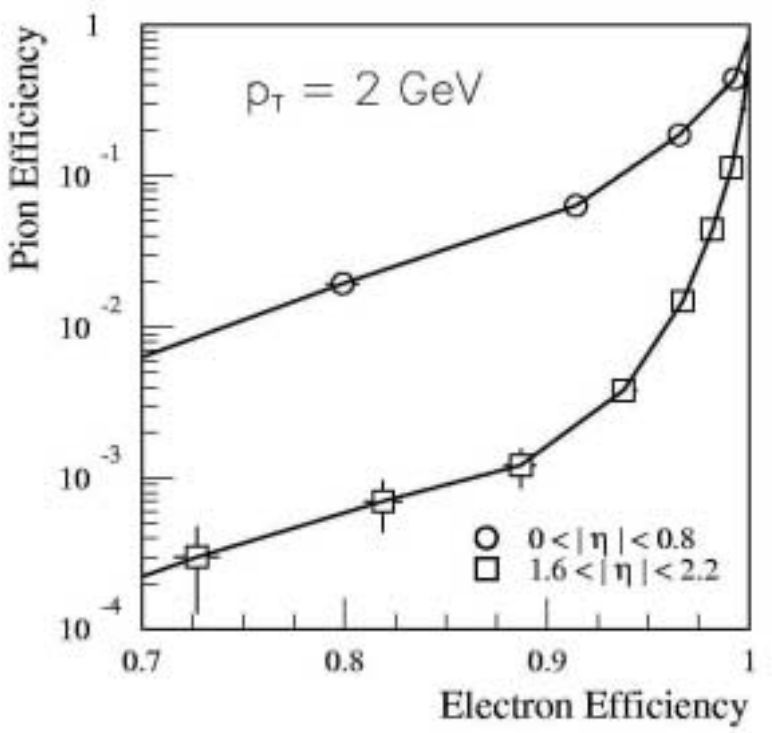
- Elisabetta has introduced two changes to the TR model:
  - In the end-cap foils the dimensions now match the physical dimensions of the end-cap stacks. This results a longer average integrated path length in radiator stacks within the end-cap.
  - The gaps and foil thickness have been tuned to produce results that match recent data.
- In the process of tuning the TR model the density of end-cap foils may have been reduced below their physical values so the simulated weight of the end-cap wheel is probably less than their actual weight.

Number of High Threshold Hits

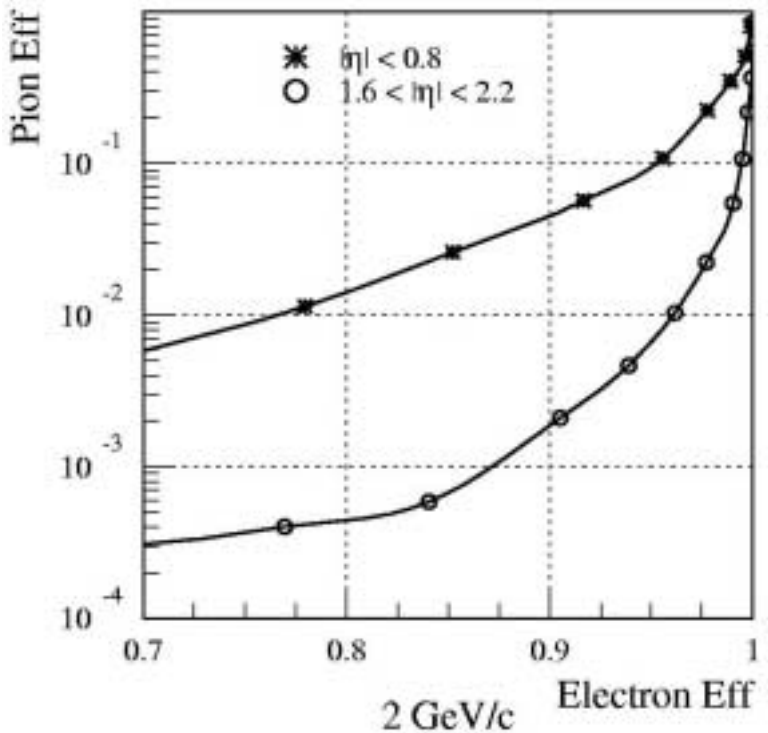


Elisabetta's TR tuned code is the line labeled "TR bugs fixed"

Pion Efficiency at 2 GeV/c

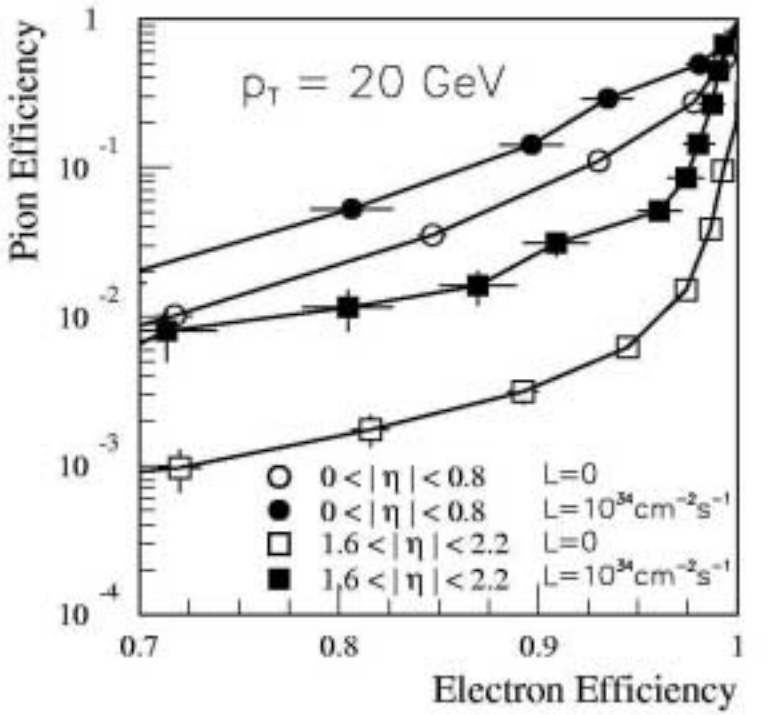


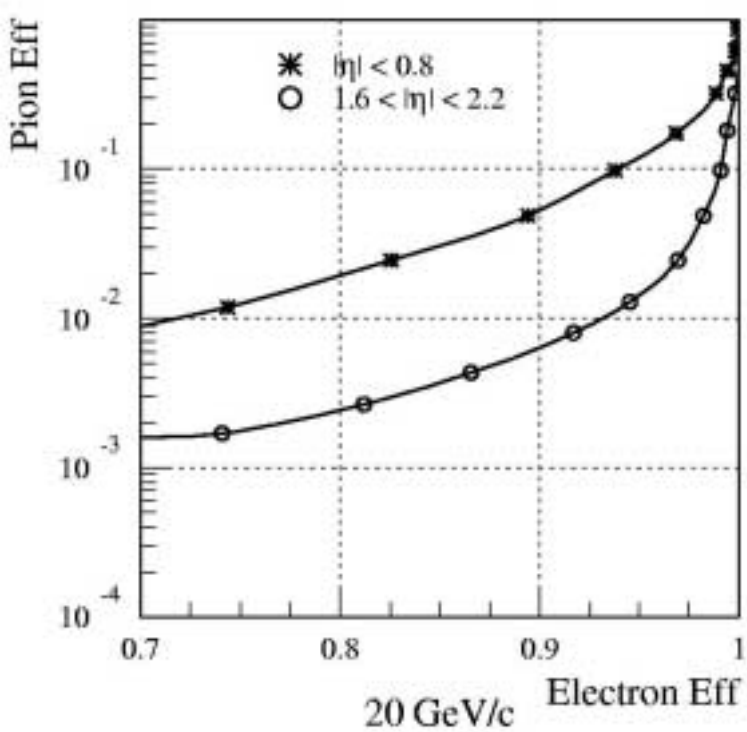
ID TDR Result 1997



Current Tuned Code

Pion Rejection at 20 GeV/c





ID TDR Result 1997

Current Tuned Code

Recent Changes to the Code (continued)

- The 1.1 TR tuning coefficient was removed from the TR model where it had inadvertently been left during the code changes of last November.
- The April Z positions and dimensions of the end-cap wheels were put into the simulation.
- Since the width of the gap between the TRT barrel and end-cap is not final, I added a parameter that moves the type A & B wheels as a fixed length unit in Z. The barrel and type C wheels remain at fixed positions which mean if the barrel to end-cap gap width increases, the gap between the type B and C wheels decreases and vice versa.

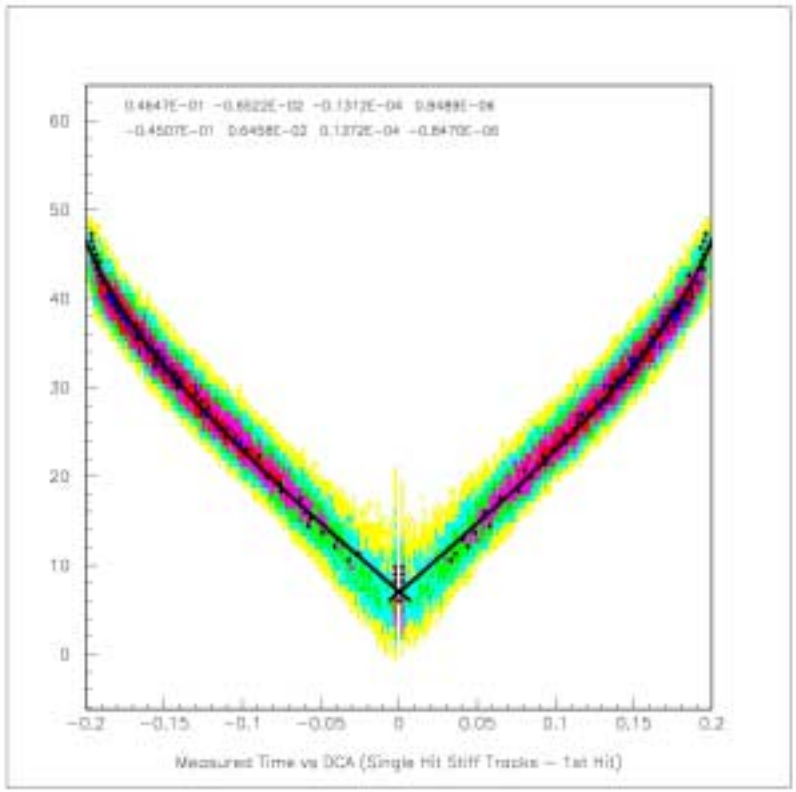
Recent Changes to TRT Code (continued)

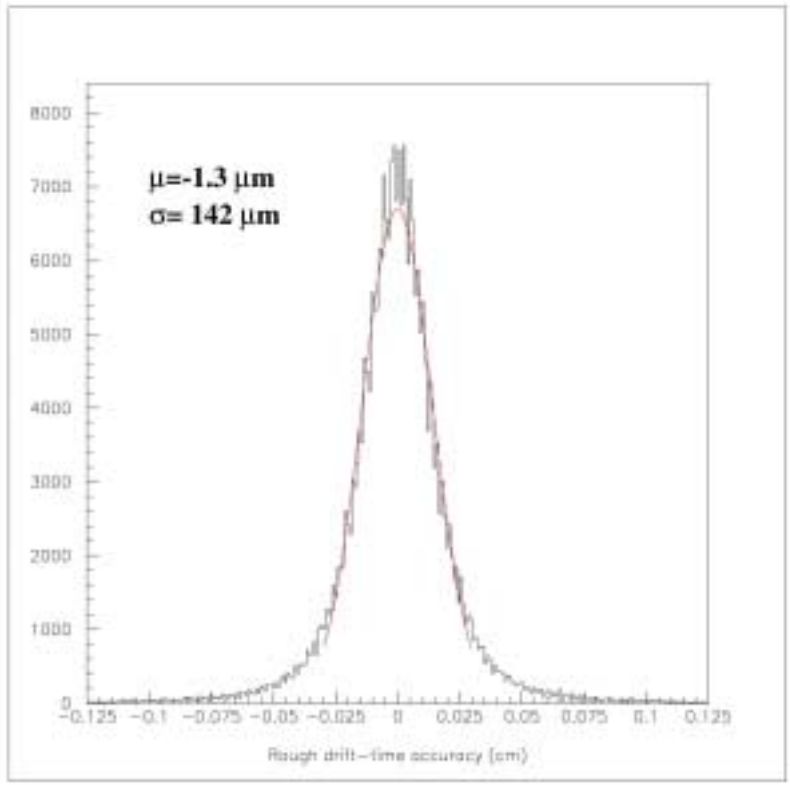
- Several more minor changes were made:
  - The number of straws in the end-cap layers was wrong by four in a couple of minor code releases. This is now corrected.
  - A couple of references to variables that are no longer used were removed to prevent future problems if the end-cap geometry is changed.
- All changes were included in the software used in to make the previously shown plots of the release code performance.

rt Relationship Work for xKalman

- The revised TRT code required changing the drift time to drift distance relationship in the xKalman TRT digitizations unpacking routine. Pauline has modified the unpacking so:
  - The routine checks whether the digits were made using the previous TRT version (ID and Physics TDR) and adjusts the rt relationship accordingly.
  - The routine adjusts automatically for whether time of flight is in use.
  - The routine uses the result of Serge Sm's cubic fit instead of a linear rt relationship.

Most Recent V-Plots





Release of Latest Fixes

- The fixed code is essentially ready to be committed and tagged for release.
- A few minor issues remain before the code can be released:
  - When the foil stack dimensions were changed, the content of the data structure TRTB was altered in a non-backwards compatible way.
  - Release of the new unpacking routine for the TRT digitizations in xKalman has to be coordinated with the reconstruction release because a critical common block is extended.

Release Details

- The release will certainly be in time for the next build of the ATLAS software (2.4.0 on approximately October 23).
- The current code will be tagged TRT-04-03-00 (superceding TRT-04-02-17). Pavel is aware of the impending release.
- Since this March there have been 8 TRT code releases so please use the code in the official ATLAS CVS repository. Please contact me if you need help doing this.