

# Overall TRT Software Status

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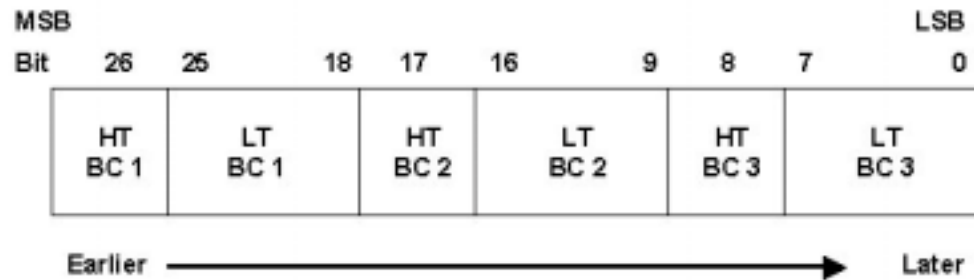
# Code Version to Use

- The last changes to the code were in July and were released in version 3.2.1.
  - Please use the code in version 3.2.1 because it contains an important bug fix to the TRT digitization.
    - Version 3.2.1 was used for the event generation for DC1, phase 1.
    - All more recent versions (4.0.1, 4.2.0, 4.3.0, etc.) have the fixes.
- The TRT code can be found in the official repository.
  - For version 3.2.1 the top directory is:  
`/afs/cern.ch/atlas/software/dist/3.2.1/`
  - The TRT code is in two subdirectories:
    - `...dice/dice-03-21-55-64/trt/` (code)
    - `...dice/dice-03-21-03-21-55-64/include/dice/trt` (commons & structures)
  - To view the code changes for each version use the web:  
`http://atlas-sw.cern.ch/cgi-bin/cvsweb.cgi/offline/dice/trt/`  
`http://atlas-sw.cern.ch/cgi-bin/cvsweb.cgi/offline/dice/include/dice/trt/`
- The most recent ATLAS software version is 4.3.0.

# Changes to the TRT Code for DC1/1

- For DC1 phase 1 the TRT code was changed so:
  - The DC1 events are run with flight time digitization.
    - DC1 also uses the modular barrel.
  - The full encoding is included in the digits because it will be needed for the High Level Trigger TDR.
    - The full encoding simulates the DTMROC output for each channel.
    - Limitations in atlsim/zebra forced the full encoding to be split into three 9 bit digits.
    - The TRT digits reflecting the high luminosity TRT ROD output and dead channels remain the same to prevent breaking the reconstruction code.

DTMROC output:



# Changes to the TRT Code for DC1/1

- Additional minor changes to the TRT code for DC1 phase 1:
  - Some minor bugs in calculating the TRT digit that represents the high luminosity ROD output were fixed.
    - No DC1 events were produced with the old code.
  - Minor changes to the routines that unpack the TRT digits in the reconstruction were required.

# Future TRT GEANT3 Changes

- These changes need to the material be implemented:
  - Update (i.e. increase) the amount of material in the representation of the service material.
  - Add volumes for the AI heat exchangers in the end-cap.
  - Inafgeo needs to be changed because there has been a substantial savings in the weight of the squirrel cage.
- The service volumes (e.g. cables, pipes, supports, electronics) in the GEANT3 simulation are modeled as carbon with an altered density. This leads to the wrong mass and interaction length for these volumes.
  - It is desirable to replace these carbon volumes with ones reflecting the true elemental composition of the services.

# GEANT4 Work

- Andrei and Yura have been working hard on simulating the TRT using GEANT4. I will now show some slides they wrote describing what they did.

# TRT Byte Stream and GEANT3

- The studies for the HLT TDR need simulated output data that has the same format as is actually written by the ATLAS readout.
  - This output is known as the byte stream.
- Andrei and Yura have an implementation of the byte stream in the GEANT4 simulation.
- Thanks to Andrei and Yura, it is possible to produce the byte stream from the TRT GEANT3 simulation running within atlsim.
  - The GEANT3 byte stream is produced using the C++ routines developed for the GEANT4 simulation.

# TR Model for GEANT4

- Mogens Dam and Jakob Nielsen of NBI have agreed to study how to generate transition radiation hits in the GEANT4 simulation. Several paths are possible:
  - Wrapping the existing GEANT3 TR generation code.
  - Using a new TR models that are now part of the official GEANT4 code. Vladimir Grichine wrote this code.
  - Writing our own C++ TR generation code for GEANT4 based on the existing GEANT3 code written within the TRT group.
- Mogens and Jakob are studying what would be the best. Mogens has already spoken with Andrei and Yura. Mogens will try to speak with Vaso, Vladimir Grichine, and John Apostolakis soon.

# Material Calculation Status

- The barrel material is unchanged since the Hampton.
- A detailed calculation of the services in the end-cap outer ring region is nearly complete. Now included:
  - The electronics cooling system.
  - The manifolds.
  - The CO<sub>2</sub> ventilation system.
- Key remaining issues:
  - The barrel electronics and electronics cooling – lack of a final design is a problem. By far most important issue.
  - Adhesives in the end-cap.
  - Certain structural elements at the outer part of the end-cap wheels are still under design and not included.
  - Services at outside the end-cap wheels need to be checked again. Does new squirrel cage need to be calculated?

# End-Cap Material

- With help from Fido and Neil, the material on the inner part of the end-cap has been revised and checked carefully but the results are essentially unchanged:
  - Currently 2.89% X0 A, 2.19% X0 B, and 2.91% X0 C.
- The active region has not been changed.
  - Currently 4.94% X0 A, 4.58% X0 B, and 6.17% X0 C.
- Thanks to help from Mar and Neil, most of the mass of the ventilation gas heat exchangers has been included in the spreadsheet (but not the simulation).
- The covers at the front and back of each set of wheels that seal in the ventilation gas are not designed and not included anywhere.

# End-Cap Material (continued)

- The detailed calculation of the outer ring region is 90% done for the end-cap:
  - Currently 16.53% X0 A, 15.78% X0 B, and 14.88% X0 C.
  - Previously (1999) 11.78% X0 type A, 9.76% X0 type B, and 10.80% X0 type C.
- Still checking on:
  - Adhesive amounts.
  - Electronics and Front End Boards.
  - Structural spacers between 4 and 8 plane assemblies.

# Summary

- The GEANT3 simulation has been unchanged since the start of DC1.
- The GEANT4 simulation is working in FADS/Goofy.
- The C++ digitization has been well tested and has comparable features to the GEANT3 digitization.
- Work continues on byte-stream, EDM, raw data objects, MySQL .
- The TRT material calculation is nearly complete except where the design of the TRT is not finished.
  - Certain services running outside of the end–cap wheels need to be rechecked.
- Revised material amounts need to be put into the GEANT3 simulation.
- Mogens /Jakob will study simulating TR in GEANT4.