

GEANT4 Hit Definitions GEANT3 TRT Code Release

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- 1. New Inner Tracker Hit Definitions for GEANT4**
- 2. Status of GEANT3 TRT Code Release**
- 3. Software Task List and Who Will Do the Work**

TRT Hit Definitions

Comparison of Hits GEANT3 and GEANT4 Hits for Each Step in an Active Volume (Sizes Measured in Bits)

Geant3 Hit	Size	Geant4 Hit	Original	Reduced
TDR / Y - Distance of Closest App	7	Step Starting Position (X, Y, Z)	3x32 = 96	3x8 = 24
CZ - Cos(Θ)	6	Step Ending Position (X, Y, Z)	3x32 = 96	3x8 = 24
STP - Step Length	8	Track Energy Loss in Step	32	16
TOF - Flight Time	12	Flight Time to Middle of Step	32	16
LGAM / GG -log(γ -1)	8	Track Number or Pointer to Track	32	32
ELOSS /DE - Ion. or TR En. Dep.	8	Track E or γ (not in definition)	32	16
USR - Flag Word	4	Flag Bits (not in definition)	8	8
Z - Hit position along straw	9 or 10	Number of Clusters	32	8
ETOT - Track Energy (Redundent)	10	List of Cluster Energies	16/cluster	8/cluster
Track Number	16			
Total (ignoring shaded fields)	79	Total (ignoring shaded fields)	328	140

I assume that the additional storage needed for identify which straw was hit is in is approximately the same in GEANT3 and GEANT4 and do not show it.

TRT GEANT3 Code Status

The revised TRT code is now in the official repository. Problems in the code related to the way I made comments in the data structure have been fixed by Maya.

The new code includes:

1. The current TRT geometry.

- Shorter active lengths in the end-cap wheels.
- Service gap locations and widths match engineering design from March 2000.
- NB: Must set GEOM=2 to select modular barrel geometry.

2. A revised digitization model that is tuned with testbeam data.

- Lowered low energy cut for range over which dN/dx is calculated.
- Use of the exponential cluster smearing algorithm.
- Removed hardheaded GEANT cuts applied to TRT radiators, straw, and gas and added a check of the GEANT δ -ray cut to avoid double counting energy deposition.
- Introduce Pavel's correction for energy deposited by low energy δ -rays created in the gas.
- Changed default signal shape to be fixed and not depend on energy deposited in straw.

CODE STATUS (continued)

There are some items that the code is missing or have not yet been decided.

1. Revised TRT service material amounts. The simulation has about 7.5 %X₀ at the end of the barrel while I calculate about 11.25 %X₀ for the electronics and space frame and 1.0% X₀ for the manifolds. I also need to create a spread sheet of the material on the outside of the end-cap and then adjust the simulation to match.
2. The drift time to drift distance relationship is not decided (most of the rest of the session is on this).
3. The number ionization clusters for very low energy tracks may not be correct. Currently the number of clusters rises linearly in with decreasing $\log(\gamma-1)$ which is proportional to $\log(1/\beta^2)$. The particle data book suggests the proportion should be closer to $\log(1/\beta^{5/3})$.
4. The digitizations are the old format that does not match the current read-out scheme. The old format only includes a single leading edge and does not encode a trailing edge time or the time over threshold.
5. Minor changes to include electronic noise, threshold variation, crosstalk etc. I promised to put these effects in and just did not get to it.

Personnel and Tasks

We are short of experienced people. Here is a list of what tasks various people are working on or at least giving advice on.

GEANT3 Full Detector Simulation: Myself.

GEANT3 Digitization: Elisabetta, Myself, Serge Mo., Pavel (advisor)

GEANT4 Full Detector Geometry: Andrei and Yuri Zalite.

GEANT4 Digitization and PAI: Ketevi (will leave July 1).

GEANT4 TR: Vaso (will graduate this year?).

Read-out Simulation: Mogens, Philippe (advisor)

TestBeam Analysis / MC Software: Engin, Elisabetta, Serkant, Serge Mo., Mariuz, Serge Sm., Volodia. Andrea has graduated and left.

We have one new person that I know of: Pauline.