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CPU benchmarks for Magnetic Field

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Pure tracking benchmark

Honeycomb calorimeter benchmark in <u>source/geometry/benchmarks</u>

It consists of transporting 10,000 geantinos, along predefined directions, in a honeycomb calorimeter made of two modules, each 26 x 50 tubes

Release		Ratios	
5.2.p02	2.57s	0.84	
6.2.p02	3.05s	1.00	<--- ***G4Navigator*** becomes
7.0.p01	3.00s	0.98	
7.1.p01a	**3.06s**	**1.00**	
8.0.p01	3.07s	1.00	
8.1.p02	3.02s	0.99	
8.2.p01	3.14s	1.03	<--- ***in G4Navigator***
8.3	3.15s	1.03	***LocateGlobalPointAndSetup() metod***
8.3.p01	3.13s	1.02	becomes
9.0	3.15s	1.03	
9.0.p01	3.14s	1.03	

These changes in ***G4Navigator*** have been done to accommodate the Tgeo/VMC interface (ALICE requirement)

Tracking in Magnetic Field: only transportation process.

BaBar Tracker in geometry/magneticfield/tests/NTST

It consists of simulating the BaBar silicon tracker and 40 layers drift chamber, in a 1.5 T constant magnetic field.

Only transportation, no physics. **100** B-Bbar events simulated.

Locally build with static libraries .

With afs version big time variations were measured (5% or more)

Release		Ratios	
7.1.p01a	**2. 05**	**1.00**	
8.0.p01	2.04	1.01	
8.1.p02	2.14	1.04	<--- ***G4FieldTrack::LoadFromArray***
8.2	2.31	1.12	<--- ***G4Navigator::LocateGlobalPointAndSetup*** become **virtual**
8.2.p01	2.31	1.12	
8.3	2.3	1.12	
8.3.p01	2.31	1.12	
9.0	2.26	1.10	<--- ***G4PropagatorInField***
9.0.p01	2.26	1.10	**(better initialization of G4FieldTrack array)**

The number of steps and calls to fields are almost the same in all cases.

Observations / Conclusions

- Main advantages : complex geometry
  B-Bbar events
- Needs to read B-Bbar events from file (12 Mb)
  (Can be replace by charged geantino, if needed
  It has his own Gun generator)

- Macro can be run for 100 or 1000 B-Bbar events (about 200 or 2000 sec)
- In output :
  - -time per event
  - -number of calls to Field
  - -number of calls to ChordFinder
  - -number of steps

Tracking in Magnetic Field: QGSP_EMV Physics List

BaBar Tracker in geometry/magneticfield/tests/NTST

Same Geant4 example as in the previous slide, but this time with the QGSP_EMV Physics List. 100 B-Bbar events simulated.

Local build with static libraries.

Release		Ratios	
7.1.p01a	**3.04**	**1.00**	**(QGSP_GN)**
8.0.p01	3.78	1.24	*
8.1.p02	3.85	1.27	*
8.2	3.72	1.22	*
8.2.p01	3.84	1.26	*
8.3	3.91	1.29	*
8.3.p01	3.89	1.28	
9.0	3.57	1.17	<--- *Code review of* ***Electomagnetic***
9.0.p01	3.62	1.19	*physics module*

* The variations are due to tuning and adding safety checks to Urban Multiple Scattering model.

Details on NTST test

- NTST test has different options :

  -looperCut Kill looping particle below this cut

  -minEcut Minimum Energy Cut

  -maxEcut Maximum Energy Cut

- Corresponding macros:

  Run2xa.mac looperCut= 200 MeV, minEcut=1 MeV

  Run2xb.mac minEcut=1 MeV

  Run2xc.mac default

- NTST test is run with QGSP_EMV

Do we run all macros for testing ?

Do we use different Physics Lists ? QGSP?

Observations / Conclusions

- afs version has to big fluctuations (5% or more)

- local installation with static libraries can also give 3-4 % of difference
  if rerun benchmarks after few months

- would be very useful make benchmarking more automatic
  run benchmarks, grep for information, compare with previous results
  give the results of comparison

- Add to benchmarking tests more complex test with more complex geometry
  (CMS full detector) and non uniform field