Profiling simulation in Atlas

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Time Gains

In Various Detector Elements

Event	e 100 GeV B		e 100 GeV EC		e 100 GeV FC		π 100 GeV B		π 100 GeV EC		π 100 GeV FC		Z->ee		Higgs	
Pixels	0.009	0.005	0.04	0.04	0.07	0.06	0.008	0.005	0.04	0.04	0.05	0.04	2	2	5	5
Tracker	0.8	0.5	0.6	0.4	0.1	0.1	0.6	0.5	0.5	0.3	0.2	0.12	16	15	49	45
EMB	27	3	1.7	0.6	0.004	0.002	16	3	0.6	0.3	0.04	0.02	21	6	59	18
EMEC	0.03	0.01	51	8	8	4	0.2	0.1	33	6.3	5	2	126	40	284	94
FC	0	0	0.1	0.1	13	6	0	0	0.3	0.3	11	5	147	84	257	185
HB	0.05	0.01	0.04	0.03	0.002	0	3.5	3.2	0.4	0.4	0.1	0.01	4	0.5	13	4
HEC	0	0	0.1	0.1	0.2	0.2	0.015	0.004	3	3	0.7	0.6	8	7	22	21
Muon	0	0	0	0	0.15	0.15	0.08	0.02	0.07	0.01	0.2	0.1	56	55	96	98
Cryostats	0.4	0.2	0.9	0.5	1.3	0.9	0.6	0.3	0.6	0.3	0.8	0.5	28	17	58	35
Presampler	1	0.6	0.4	0.3	0.004	0.002	0.6	0.3	0.2	0.1	0.01	0.01	3	2	9	6
Other	0.6	0.4	1.2	0.9	1.2	1	0.8	0.5	0.87	0.55	0.8	0.6	53	46	113	99
Total	30s	5.1s	56s	11.8s	24.5	11.8	23s	7.9s	40s	11.3s	18s	9.6s	467s	274s	964s	607s

Full Simulation

Parameterized Simulation

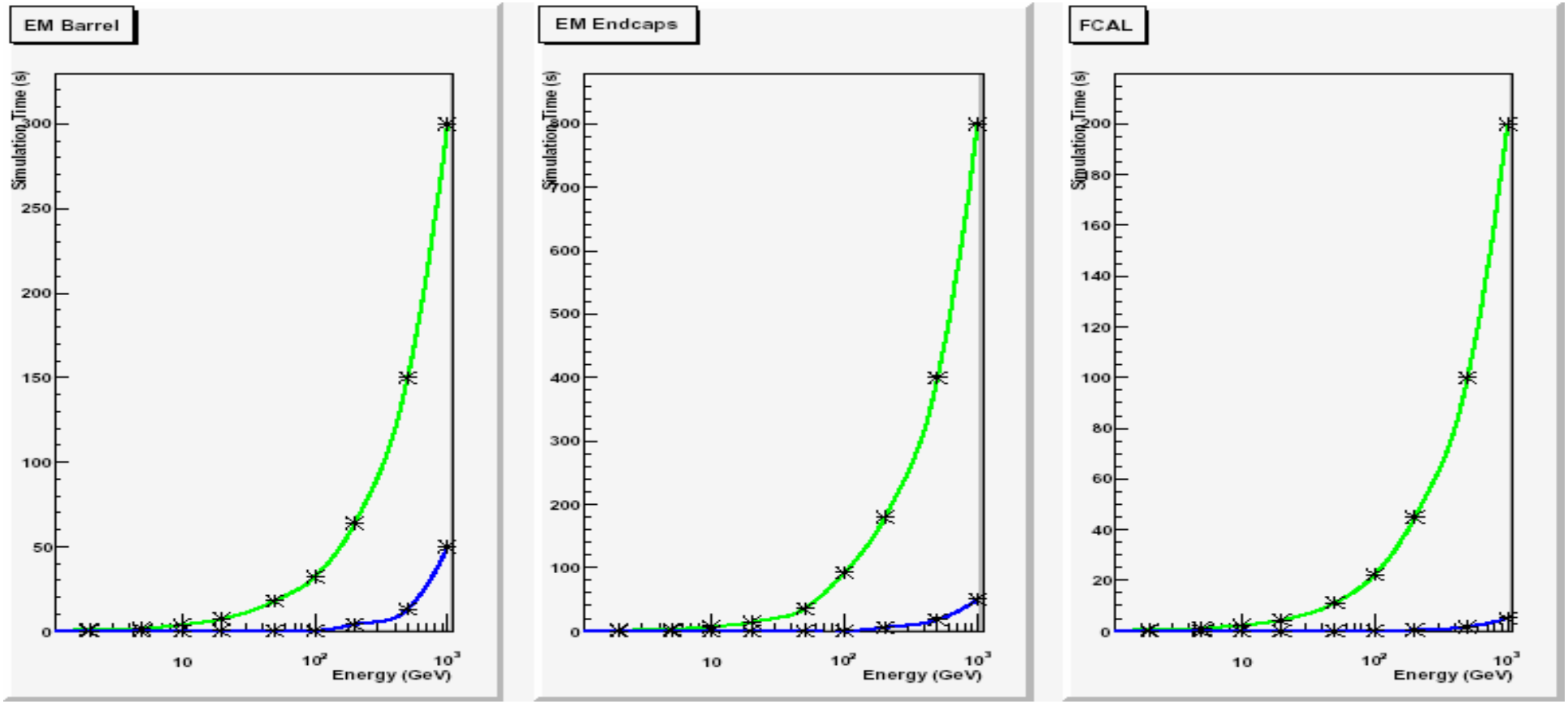
- Numbers for a 2.2 GHz P4, user + system elapsed time
- Long way to go here, but we can start looking for places outside the calorimeters to save time now.

Zach Marshall (CalTech)

Time Gains: Ideal Conditions

A. Waugh (Melbourne), July 2006

e^- beginning in the parameterized region



Other Simulation Accelerators

- Fewer steps per parameterized shower
  - ~few percent reduction in sim time for 10x fewer steps
- Simpler readout geometry for energy spots
  - Parallel navigator
- Removal of neutrinos
  - 4-8% reduction in simulation time
- Cut on particles around after 1 us
  - 10% reduction in full simulation time

Future Acceleration options

- Remove low energy particles in shielding
  - Cryostats
  - Muon shielding
  - Forward regions and shielding

- Change Geant4 default stepper
  - Geant default is 4th order Runge-Kutta
  - Navigation parameters
    - setDeltaIntersection
    - setDeltaOneStep
    - setMaximumEpsilonStep
    - setMinimumEpsilonStep

Timing measurement in detector regions

- To improve the performance, timing measurement for individual detector region is essential.
- ExampleN07 will be enhanced to demonstrate timing measurement for each region.
  - New G4Timer2 class for split time measurement
  - Minor fix in G4TrackingManager to avoid unnecessary hard-coded verbosity