

Status of the BaBar Simulation

BaBar Simulation Workshop
12 July 2004

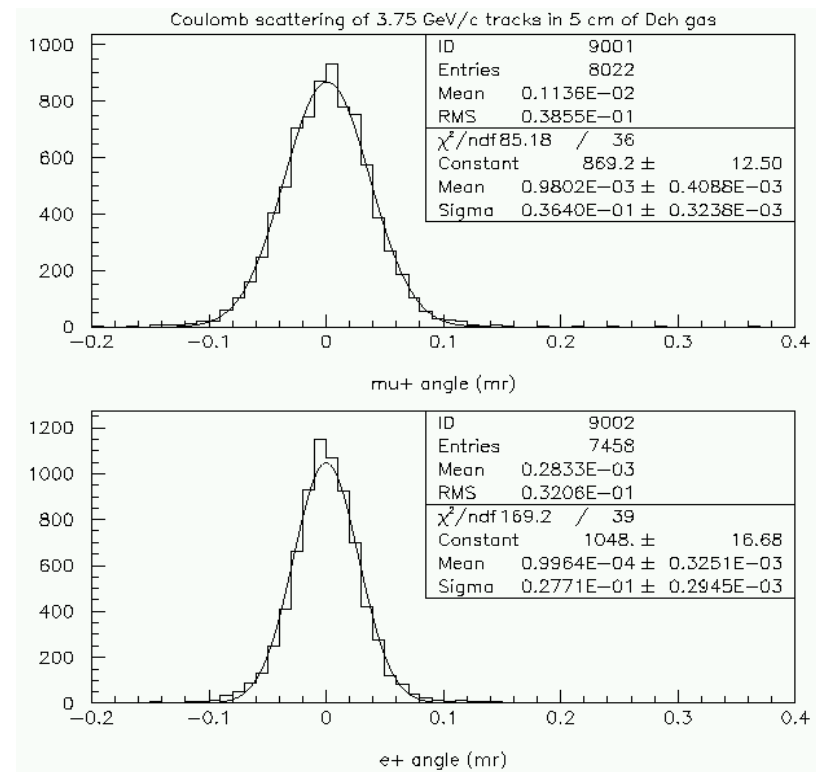
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Outline

- Core issues
 - Geant4
 - Fast Monte Carlo
- Hardware-driven upgrades
 - Pep extension
 - LSTs
 - Trigger
- Things to do

Geant4 and SP6

- Using Geant4 5.2 (better ms, hadronic models)
- However, new hadronic models not robust enough, continue using old ones
- Bug in multiple scattering code
 - Too little ms of e+ in DCH
 - Problem understood
 - Fix available, but ...
 - Wait until SP7



Geant4 and SP7

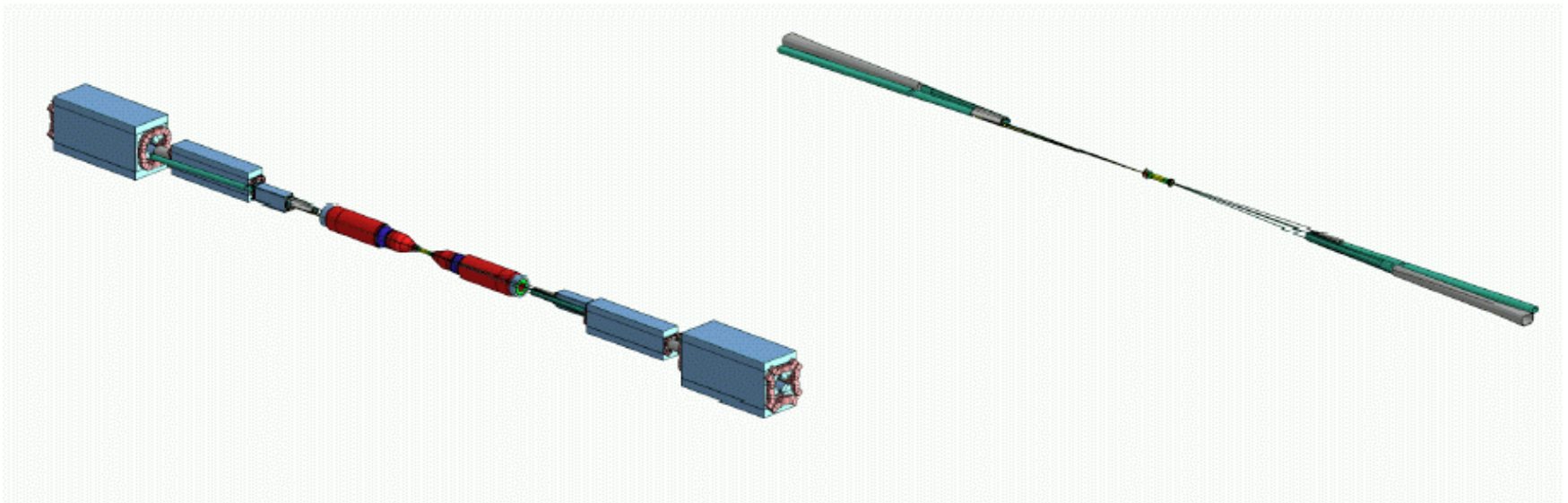
- Move to Geant4 6.1 (since 15.0.0)
- Electron multiple scattering bug fixed (confirmed by Gerry Lynch)
- Hadronic models more robust – use them this time
 - Bertini cascade model replaces Low Energy Parameterized Model for p, n, π only
 - Two new processes added, mainly for beam background studies but still useful in EMC
 - electro-nuclear
 - gamma-nuclear
 - Improved proton inelastic cross sections available

Fast Monte Carlo

- Until December 2003, development done by Dominique Mangeol
- Goal: produce Beta candidates at rate 100 – 1000 X faster than fully detailed Bogus
 - Factor 100 achieved for SVT+DCH+EMC
 - Parameterized showers from CEPack used (Geant4 too slow)
 - Nicely documented at
~BFROOT/www/Computing/Offline/Simulation/web/simcodes/fastsim/fastsim_main.html
- What now?
 - Fast enough?
 - Need a new developer

Hardware-driven Improvements – Pep

- Dealing with increases in beam-related background requires a decision on IR-2 design
- Bogus will be used to do a detailed study of sources
 - Can accept Turtle rays
 - Pep geometry extended beyond septum (M.B., G.C.)
 - magnetic fields added (G.B., W.L.)



Hardware-driven Improvements – LSTs

- In August, most RPCs in top and bottom sectors of IFR barrel will be replaced by LSTs. Some replaced by brass absorbers.
- IFR geometry, digitization modified by Matteo Negrini last year
 - Each tube is simulated
 - Code is switchable and largely ready to go
 - Tested with muons
 - Persistence being tested

Hardware-driven Improvements -Trigger

- L1 DCT is adding z-vertex information to p_T discriminator
 - PTD -> ZPD
- L1 DCT simulation being re-written from scratch
 - trgDC will finally be replaced
- Improvements:
 - simulation configured just like the electronics
 - better validation at the board-level
 - should lead to better understanding of data/MC differences

Things To Do

- PEP
 - Completion of extended geometry, aperatures
 - Comparison of central orbits: Bogus, Magbends, Turtle
 - Event generation using Turtle rays
 - Decide which Bhabha generator should be used
 - Test electro- and gamma-nuclear hadronic processes
 - See Bill Lockman's talk for detailed list

Things To Do

- SVT
 - Detailed modeling of matching cards and cables
 - Intrinsic resolution should be re-examined and modeling improved
 - Improve response to dE/dx : look at time-over-threshold to dE/dx conversion (there may be a student to work on this)

Things To Do

- DCH
 - As soon as Turtle-generated events are available, look at effects on background.
 - Re-visit digi-mixing: want to overlay Turtle events with Bhabha events and real no-beam BKG events
 - Simulate neutron backgrounds
 - Complete crosstalk simulation (Jeff Wilson)

Things To Do

- DRC
 - Simulate neutron backgrounds (student of J. Vavra working on this)
 - More recoil nuclei showing up in DRC – how should they be handled?
 - Re-visit PID tables? Will disabling them help to spot simulation deficiencies?

Things To Do

- EMC
 - Characterize beam BKG as a function of luminosity and current (new student to work on this)
 - Simulate neutron backgrounds
 - Repeat MC/data comparisons (Roger Barlow is assembling a team)
 - A repeat of A. Lyon's shower shape comparisons in the 15-series would be very helpful

Things To Do

- IFR
 - Switch on LST code for SP7
 - Data/MC comparisons with LSTs installed
 - Comparisons in SP5 show significant discrepancies
 - #strips hit
 - Last layer hit
 - Cluster fits
 - Track match chi-square
 - Muon ID efficiency
 - No comparisons done yet for SP6

Things To Do

- Core
 - Test Bertini cascade in 15-series
 - Add improved proton inelastic cross sections
 - Complete extension of Bertini cascade to kaons
 - Continue CLHEP migration
 - Determine if trigger upgrades will affect other areas of simulation -> trigger validation tests
 - Validation
 - Need input from AWGs
 - Do we need another comprehensive test production?