STATUS OF G4MICE

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Muon Collaboration Weekly Meeting
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Short History

- Had first workshop Aug 02 to form a team and start design, held 4 more since (last Nov 04)
- Tracking and detector modeling based on GEANT4 toolkit; also use ROOT for analysis
- Started with some code for FSII (cooling lattice) and MuScat (SciFi detector)
- Built up and improved model of experiment as design of MICE evolved: 25 releases so far
- Collected user requirements from the collaboration to drive future work (early 04)
- Central code repository under version control 47500 lines of C++ code in 358 files/10 packages
- All the available documentation is on the web http://mice.iit.edu/software
G4MICE team

- MICE simulation team collaborates through bi-weekly phone meetings, workshops, email list and the occasional personal visit
- Many people participated in workshops and contributed code but average effort ~2FTE
- Have the infrastructure to support many more
- New developers and users welcome!
MICE simulation challenge

- We have to handle beamline (quadrupole) and cooling channel (absorber, magnet, rf cavity) components and detectors within the same framework
- Sub-% level precision isn’t easy — have to model and test important parts in great detail
- We need to carefully tailor pieces of the simulation to get precise tracking through the cooling channel as well as all the necessary physics for different detectors
What’s in G4MICE?

- Cooling channel components: magnet coils, rf cavities, LH2 absorbers
- Tracking and PID detectors and the beamline section that contains them
What’s in G4MICE?

- Geometry/materials for all components
- Tracking in electromagnetic field of magnets and cavities
- Hit generation for all detectors
  (tracking $\rightarrow$ energy deposition in detector volumes)
- Digitization for all detectors
  (simulated energy deposition $\rightarrow$ raw data)
- Reconstruction for SciFi tracker
- Beam interface to ICOOL, G4Beamline, TURTLE
- Detailed model for rf-induced background
- Analysis tools for manipulating track distributions (emittance, cooling ..)
Cooling Channel
Rf Background

- R. Sandstrom
Downstream muon distributions

- H. Wilson
Emittance

- M. Ellis
What’s incomplete in G4MICE?

- Some engineering detail for components
  - Work to verify geometry/materials in progress
- Detailed unit tests for every subpackage
  - In progress
- Detailed up-to-date documentation
  - In progress
- Event model and interface to DAQ
  - Will implement when defined
- Tools to drive large scale data processing (storage and use of calibration data, analysis hooks, ...)
  - Will evolve with the rest of the experiment
Outlook

- G4MICE still severely understaffed but finally catching up to the latest design of the experiment
- Expect several (G4)MICE-Notes by year-end
  - Rf background simulation (R. Sandstrom)
  - Tracking/cooling analysis (C. Rogers)
  - Track distributions at detectors (H. Wilson)
- Have essentially complete model of the experiment; now moving to
  - Verification of engineering and physics details
  - Detector optimization and physics analysis
  - Long term maintainability of our software
  - Data storage and processing
- Next workshop possibly around the same time as Muon Collaboration mtg at Berkeley