# Status of Geant4 Physics Validation

**Atlas Software Week**

**10 May, 2000 @LBL**

**Katsuya Amako**
**(KEK)**

# Introduction

- **Two related activities**
  - Collaboration project with the Geant4 team
  - Internal activities in Atlas

# Collaboration with the G4 team - 1

## Request from the Geant4 team

- We received from G4 a call for 'expression of intent' of collaboration on *24th February, 2000*.
- Major points in the call:
  - They want to establish 'comparison projects' with experiment groups.
  - These projects will be the G4's most important goal in 2000.
  - They want Atlas to prepare a 'letter' stating the intent and broad outline of the collaboration.
- Constraints G4 put to collaborations:
  - Joint projects will be expected to last 6 months at most.
  - There will be only a few active at a time (about 3) .
  - Significant duplication must be avoided.
  - To attempt to address all (or as many as possible) of the major types of detector or setups used in experiments.

# Collaboration with the G4 team - 2

## Atlas' Expression of Intent ( Draft Proposal 28March2000 )

### Outline of the project

We are interested in comparing test beam data with the following three detectors:

1) EM barrel calorimeter.
2) Hadronic endcap with forward calorimeter,
3) Hadronic barrel calorimeter

We already have test beam data for these detectors, therefore, we can start comparisons immediately. Actually we have already started comparison by ourselves on some detectors.

### Type of physics to be tested

Electromagnetic and hadronic shower processes

### Manpower from our group

| | |
|---|---|
| EM barrel calorimeter: | 4.5 FTE |
| Hadronic endcap with forward calorimeter: | 0.6 - 1.0 FTE (Canadian team) |
| Hadronic barrel calorimeter: | ? FTE (at least 2 persons will commit) |

***(Note)***

***Please take the above manpower counts as VERY VERY preliminary!***

# Collaboration with the G4 team - 4

- **A letter to John Apostolakis (G4 Spokesperson) on 11th April, 2000**

Dear John,

Further to our recent discussions about ATLAS/G4 'detector milestones', we have now discussed this with our colleagues on the ATLAS Computing Steering Group. *The ATLAS position is that we are happy to participate in these milestones, but with the clear understanding that the effort devoted to these milestones must NOT prejudice effort from the G4 collaboration in sorting out other areas in which G4 does not reproduce the ATLAS detector response.*

*In particular, we would like to reserve the right to 'suspend' an ATLAS/G4 milestone if, in our opinion, extremely urgent problems arise.*

Please be assured that the above does not imply any unwillingness to co-operate with the G4 collaboration, but rather reflects the enormous importance we attach to validating G4 for the ATLAS detector.

With best regards
Katsuya
Norman

# Collaboration with the G4 team - 3

## Expression of Intent by other groups

- **ESA**

  Comparison of low energy proton scattering with TRIM and real data.

  *(TRIM*: programs to calculate the energy loss of ions in solids, liquids and gases.)

- **BaBar**

  Use Dimuon data from drift chambers and the Silicon Vertex Tracker to study delta rays distribution, dE/dX in thin materials.

- **CMS**

  Comparison with data taken in the Hadron Calorimeter test beam setup.

  ← Recently they changed the subject to study the tracking detector.

# Collaboration with the G4 team - 5

- **We haven't received yet an official response from the Geant4 team about our letter of intent.**
- **Issues we need to discuss with the Geant4 team:**
  - How to share responsibilities among the G4 team and us?
  - How to share works of studying physics processes among experiment groups?
  - When the G4 team starts the projects?
  - How to kick off collaboration - to have a kick off meeting?
  - How to proceed the collaboration?
    - To have regular meetings?
    - To organize a joint workshop?
  - …..

# Internal activities in Atlas - 1

- **Triggered by Andrea Dell'Acqua's G4 tutorial courses, subsystem detector people started their own studies on G4 comparisons and validations since last year.**
- **Problems in Geant4 found by these studies have been informed to the Geant4 team either through**
  - G4 problem tracking system,
  - direct contact with experts in G4.
    - ← *These are Atlas' important contributions to improve Geant4.*
- **Issues in Atlas internal activities.**
  - Each activity is independent to other so far.
    - ← *Information exchange inside Atlas is desired.*
  - No systematic studies on Atlas related physics processes.
    - ← *Organisation of studies is necessary.*

# Internal activities in Atlas - 2

- **Proposal by Fabiola Gianotti and Katsuya Amako on 5th April to Simulation and Software Coordinators:**
  - Call for G4 Physics meeting
  - The idea is to review the work which has been already done,

    and to get organized for the future.
  - Topics to be discussed in the 1st meeting are
    - status of the geometry of their sub-detectors in G4 (ATLAS detector, module zeros, prototypes, whatever ...)
    - results (even if very preliminary, of course !) of the G4 comparisons with G3 and test beam data, and general tests of the G4 physics done so far.
    - which test beam data exist (and with which layout), which could be used for the G4 validation.
    - anything else that you consider a useful input to the discussion

# Internal activities in Atlas - 3

- **The 1st Atlas G4 Physics Meeting**

  **Date:** Thursday 18th May

  **Time:** 9:00 am (CERN time)

  **Place:** 40-4-C01

# Summary

- **We are about to start comprehensive studies of physics processes in Geant4.**

- **Intensive interactions among subsystem simulation people and the Geant4 team is necessary.**

  ← To ensure this is one of major responsibilities of the simulation coordinator.