

# LCIO Format

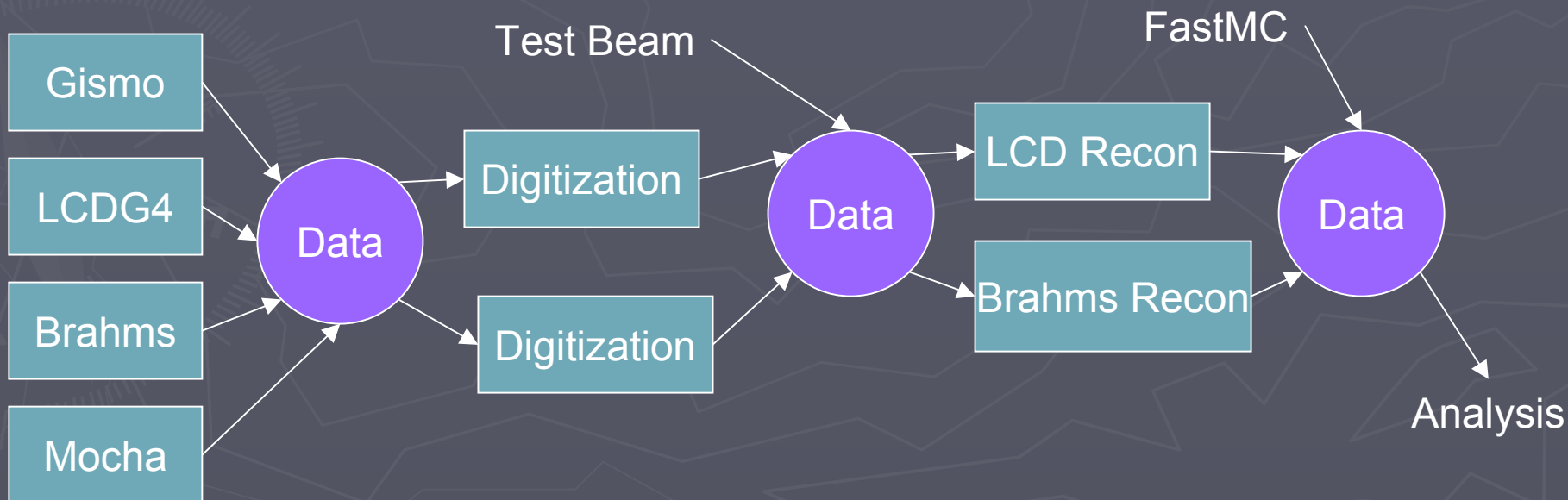
## A global IO format for Linear Collider Physics Studies

UT Arlington Linear Collider Workshop  
January 2003

# Goals

- ▶ Long-term goal to encourage interoperability of worldwide linear collider simulation/reconstruction/analysis programs
- ▶ At NIU calorimeter workshop (November) we began a serious discussion of this
- ▶ Followed up with a mini-workshop at SLAC in December

## First Step – Common IO format



# Common IO

## ▶ Simple IO structure

- We don't need more, and at this stage don't want to limit future options
- Machine independent
- Usable with C, C++, Java, Fortran\*
- Packed (compressed)

## ▶ Conclusions

- Adopt basics of existing SIO format
- Add extra layer of abstraction
  - ▶ hide underlying SIO format
  - ▶ improve support for C++ (and Fortran)
  - ▶ Make it possible to support other formats later
- Agree on common, documented format for blocks
- Add facilities for users to "annotate" existing blocks and for user defined blocks.

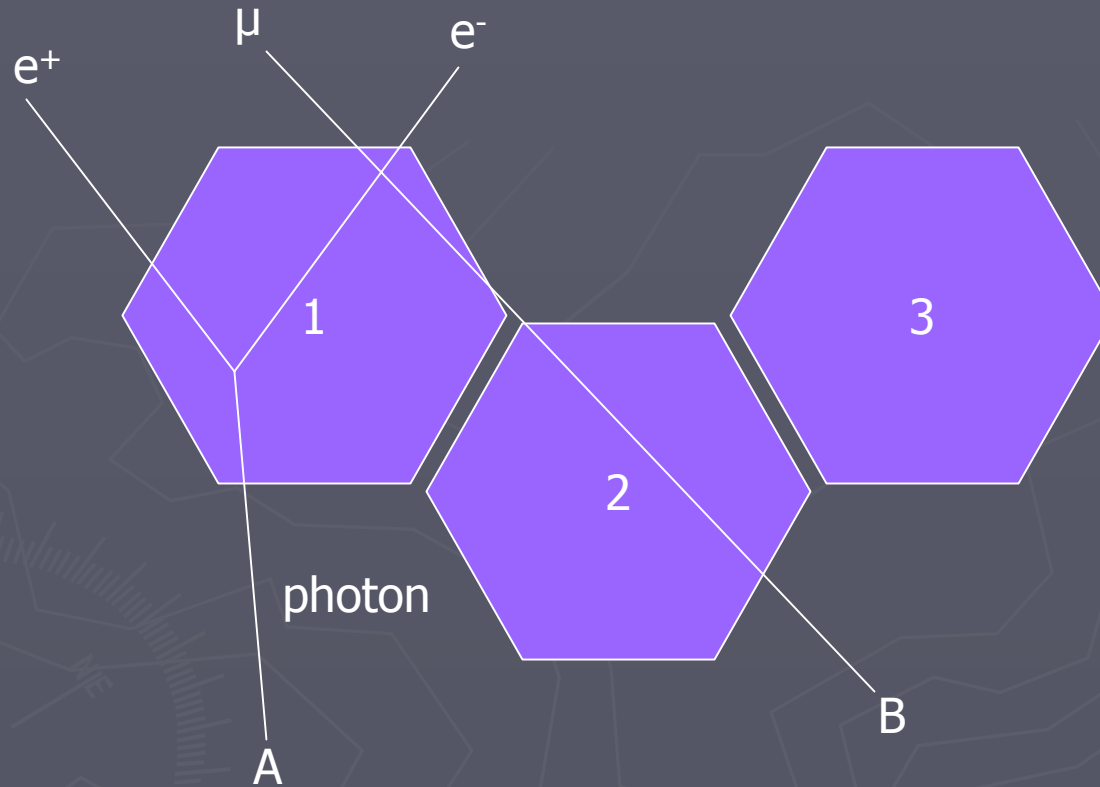


LCIO

# Common IO – Event Record

- ▶ Event Record has 4 types of block
  - EventHeader
    - ▶ Run #, event #, detector Name, timestamp
  - MCParticle – All pre-shower particles
    - ▶ 4-vector, origin, status, parent
  - TrackerHit
    - ▶ Position, MCParticle, dedx, time
  - CalorimeterHit – includes pointer to MCParticles(s)
    - ▶ Exists in two variants
      - Short
        - ▶ stores one entry per cell and per shower which produced this entry, includes "cellID"
      - Long
        - ▶ each cell records each individual particle type which crosses the cell. Both the energy and the MCParticle producing this hit are stored. Includes cell position and "CellID"

# Calorimeter Hits



Short – Cell1

A e1

B e2

Long – Cell1, x,y,z

A - Photon - e1

A -  $e^+$  - e2

A -  $e^-$  - e3

B -  $\mu$  - e4

# Common IO – XML specification

```
<?xml version="1.0" encoding="UTF-8"?>
<!DOCTYPE sio SYSTEM "sio.dtd">

<!--
Document   : lcd.xml
Created on : December 10, 2002, 5:06 PM
Author    : Frank Gaede, Ties Behnke, Norm Graf, Tony Johnson
Description:
  Description of proposed LCIO format.
-->

<sio>
<record name="LCRunHeader">
  <block name="RunHeader" major="1" minor="0">
    <data type="int" name="runNumber"/>
    <data type="string" name="detectorName"/>
    <data type="string" name="description"/>
    <data type="int" name="nActiveSubdetectors"/>
    <repeat count="nActiveSubdetectors">
      <data type="string" name="subdetectorName"/>
    </repeat>
  </block>
</record>
<record name="LCEvent">
  <block name="EventHeader" major="1" minor="0">
    <data type="int" name="runNumber"/>
    <data type="int" name="eventNumber"/>
    <data type="string" name="detectorName"/>
    <data type="long" name="timeStamp">TODO: Format???
```

# Conclusions

## ▶ Who?

- Ties Behnke, Frank Gaede, Norman Graf, Tony Johnson, Paulo Mora de Freitas
- More input/feedback/contributions welcome

## ▶ When?

- This is an incremental step from existing SIO format should be ready very soon (March?)
- Should be easy to use with existing LCD code

## ▶ What next?

- Look next at reconstruction out (e-flow objects)
- This is just a first step, common geometry description is more challenging but also highly desirable
- Hopefully will lead to sharing of code, tools, experience.