

# Status of crystal E/M calorimetry studies

- Motivation
- Simulation studies
- Lab tests
- Manpower

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# Why are we interested?

- **Very good energy resolution**
  - e.g. BABAR's CsI(Tl) ECAL gets
$$\sigma_E/E = 1\%/ \sqrt{E} (+) 1.2\%$$
  - For  $\text{PbWO}_4$ ,  $X_0 \sim 9\text{mm}$ ,  $\lambda \sim 18\text{ cm}$
  - Light yield of “new”  $\text{PbWO}_4$  is  $\sim 10\text{x}$  greater than that used in CMS.
- **Decent spatial resolution**
  - $R_m \sim 2.2\text{ cm}$  for  $\text{PbWO}_4$
- **Inexpensive**

# Other considerations

- **Depth and distance from IP of crystal ECAL**
  - Consequences for HCAL?
- **Optimization of transverse segmentation**
- **Particle flow algorithm**
  - Effects of longitudinal segmentation?

# Plan

- **To find out, need:**
  - **A serious simulation study**
  - **Intensive lab tests with various samples of crystals towards crystal development**
    - **Beam tests later**

# Simulation

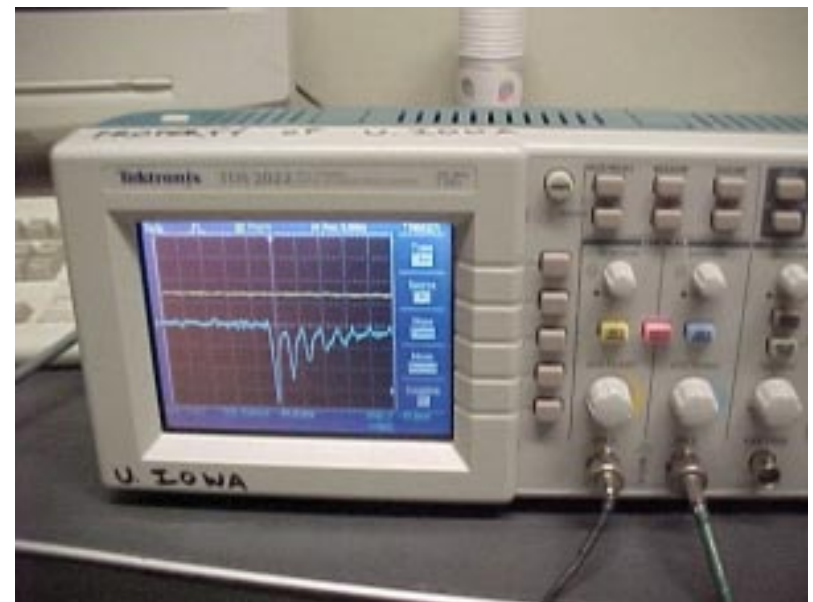
- **Goal is a realistic particle-flow study of a detector.**
  - **Crystal detector geometry: LD? SD-like with crystal?**
  - **Fair comparison with Si/W ECAL needed**
- **So far, Iowa group has been getting up to speed on the LC simulation environment:**
  - **SLAC workshop on LC simulation**
  - **Useful discussions with the SLAC group, NICADD, Ties Behnke**
  - **Some tests with Gizmo and JAS 2, 3**

# Simulation

- **It's clear that:**
  - **Doing crystal ECAL simulation and particle flow properly will require a lot of work and understanding**
  - **We will also need to study the Si/W ECAL design to understand the differences**
- **... so we are joining the particle flow effort**
  - **Starting with the Si/W (SD)**
  - **More on manpower shortly**

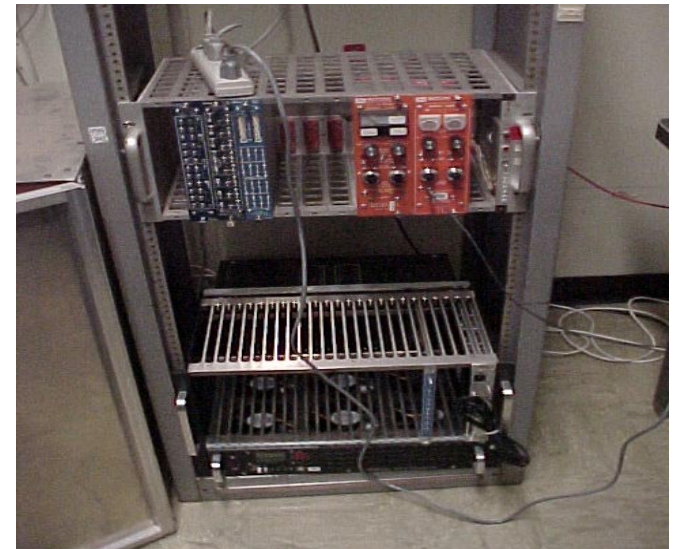
# Lab tests: Current setup

- Sample  $\text{PbWO}_4$  crystals obtained from Ren-Yuan Zhu (CalTech)
- Lab set up at SLAC (bldg 40, room 223)
- Testing the setup...



# Lab tests: Next steps

- **Install drivers for Jorway CAMAC controller on Linux system for direct readout**
- **Radioactive source(s)**
- **Begin real measurements**
  - **Light yield**
  - **Uniformity**
  - **Linearity**
  - **Consistency between crystals**





# Manpower

- **Usha Mallik**
- **Two post-docs (part-time)**
  - **Mat Charles: simulation, lab tests**
  - **Wolfgang Mader (from September): simulation?**
- **One student (full-time)**
  - **Arriving at SLAC on July 13**
  - **Will work on the lab tests**
  - **A second student may work on the simulation**
- **Collaborating institutions: SLAC, CalTech, U. of Austin**

# Conclusions

- **Many things to do:**
  - **Lab tests of crystals**
  - **Establish particle flow algorithm (with Si/W)**
  - **Geometry and particle flow studies with a crystal ECAL**