

SiD Calorimeter R&D Collaboration

R&D Report

Summary and Conclusions

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Calorimeter R&D for the SiD detector concept

A multi-year program of hardware and software R&D to develop the optimum calorimeter system for SiD concept:

- **Role of calorimetry** in obtaining the **required physics performance**.
- Understanding the choice and range of values of basic parameters within the SiD compact geometry.
- Identification of possible technologies.
- **Hardware prototype development and testing** (see CALICE talks also) in parallel with simulation/PFA studies.
- Schedule: **path towards CDR then EDR** with technology choices and hardware + (simulated) performance verification.

Electromagnetic Calorimeter

- Initial sensor development completed.
- Next step is order for sensors for full depth module.
- Sensors will be coupled to 1024-channel KPiX chips.
- Readout flex cables are under development.
- Bump bonding trials are underway.
- The medium-term goal is to expose a full depth module to test beams in 2008.
- Longer term, design of a full SiD ECal module will be completed as part of the EDR work.

Readout Electronics

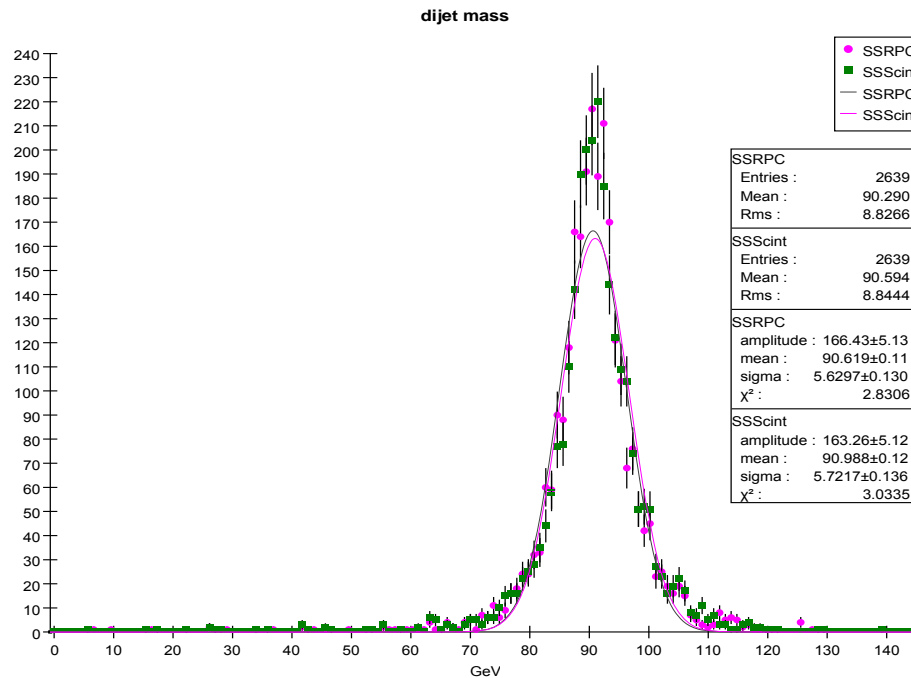
- **KPiX ASIC development** has been the focus.
- High density, high channel count, low power chip needed for ECal, but with applicability to e.g. digital HCal.
- Several iterations of 2 x 32 channel KPiX made and tested with promising results.
- Will be **bonded to ECal sensor next for combined tests.**
- Two GEM chambers, each with 8x8 pad arrays and KPiX readout will go into test beam at Fermilab this summer.
- One further 64-channel iteration is planned before making a 1024-channel submission.

Hadron Calorimeter/TCMT

- **Four potential technologies** proposed (3 gas-based, plus scintillator/SiPM).
- Very active development and testing underway.
- Medium/large-scale prototypes being tested (scintillator) or planned (RPC, GEM).
- Simulations of basic parameter behavior studied - neutral hadron energy resolution effects on jet energy resolution.
- **Five-year plan/schedule defined** for technology R&D and selection: covers CDR and EDR processes.
- TCMT use under study.

Basic simulations

- Many interesting results, comparisons of technologies and materials.



- e.g. Relative insensitivity of dijet mass resolution to intrinsic neutral hadron energy resolution.

SiD - PFAs

Not explicitly presented in SiD talks, but:

- a **comprehensive framework for PFA development** now exists.
- series of physics processes identified as critical tests of detector design and PFA performance.
- approaching a level of understanding PFA performance that will allow **comparison of technology choices for HCal.**

Conclusions

SiD has a very active, coherent, and broad program of calorimeter R&D.

Substantial progress on hardware development and simulations/PFA.

Focusing on major prototype development towards CDR, then EDR.

Rate of progress needs to grow in U.S.: funding/manpower (support has been growing...expect more progress in '08.)

SiD is very open to new collaborators!