Beijing Tracking Review Preparations

- Extensive charge drafted by Chris
  - Posted on agenda server
  - Charge was far too ambitious given the current state of R&D
  - "Kitchen Sink" scope made charge not terribly helpful (IMHO)
- SiD drafted an R&D report that included sections on all efforts that chose to affiliate with SiD
  - Brown, Colorado, Fermilab, Kansas State, Michigan, Oregon, Purdue, Santa Cruz, and SLAC submitted material (in one form or another…)
  - Lots of editing by Marcel to make this into a coherent document
  - Note that Santa Cruz chose to affiliate with both SiD and SiLC
- Report is posted on the SiD home page (see "Tracking Review" under papers)

Review Committee

- Bill Willis willis@nevis.columbia.edu
- Bing Zhou bzhou@umich.edu
- Chen Yuanbo chenyb@ihep.ac.cn
- Chris Damerell c.damerell@rl.ac.uk
- Dean Karlen karlen@uvic.ca
- Fabio Sauli fabio.sauli@cern.ch
- Harry Weerts weerts@hep.anl.gov
- Hartmut Sadrozinski hartmut@scipp.ucsc.edu
- Helmuth Spieler hgspieler@lbl.gov
- Hideki Hamagaki hamagaki@cns.s.u-tokyo.ac.jp
- Hwanbae Park sunshine@knu.ac.kr
- Ioanis Giomataris ioanis.giomataris@cern.ch
- Jim Brau jimbrau@faraday.uoregon.edu
- Junji Haba junji.haba@kek.jp
- Mike Tyndel M.Tyndel@rl.ac.uk
- Ouyang Qun ouyq@ihep.ac.cn
- Peter Braun-Munzinger p.braun-munzinger@gsi.de
- Wolfgang Lohmann wlo@ifh.de
- Yoshinobu Unno unno@post.kek.jp

Agenda – Day 1

- **8:30 Committee Executive Session** (1h00')
- 9:30 Welcome (10')
- 9:40-10:00 Overview of the LCTPC Effort (20') Ron Settles (*Max-Planck)*
- 10:00-10:25 Results from Prototypes-I and Software Status (25') Dan Peterson
- 10:25:10:50 Results from Prototypes-II and Electronics Developments (25') Madhu Dixit
- 11:10-11:25 Progress in the CMOS Pixel TPC Concept (15') Jan Timmermans (*NIKHEF*)
- 11:25:11:45 Plans for Future R&D Measurements (20') Takeshi Matsuda
- 11:45 Discussion (45')
- 13:30:13:55 Cluster Counting Drift Chamber for ILC (a viable alternative to TPC?) (25')
- 13:55-14:25 Discussion (30')
- 14:25-14:35 Motivations for Using Si Tracking and Main R&D Objectives (10') Aurore
- 14:35-14:50 R&D on Mechanics: main issues (15') Marcel Vos
- 14:50-15:15R&D on Sensors (25') Manuel Lozano, Hongjoo Kim
- 15:35-16:15 R&D on Electronics and Elementary Modules (40') Bruce & Aurore
- 16:15-16:30 Simulations (15') Valeri Saveliev
- 16:30-16:45 Test benches and test beams (15') Aurore Savoy-Navarro
- 16:45 Discussion (45')
- **19:00 Tracking Review Dinner**

Agenda – Day 2

- 8:30-8:45 Strategy for SiD (15')
  Marcel Demarteau *(FNAL)*
- 8:45-9:25 Mechanical Design and R&D (40')
  William Cooper (*FNAL)*
- 9:25-10:05 Sensor and Module Design and R&D (40')
  Timothy Nelson
- 10:05-10:25 SiD-related University R&D (20')
  Richard Partridge
- 10:25 Discussion (45')
- **Closed Session (11:30 ->13:00)**
- 12:00 LCTPC (1h00')
- 14:30 4th (30')
- 15:50 SiLC (1h00')
- 17:20 SiD (1h00')

Open Session Summary

- The open session talks were organized by the four groups
  - Talks are posted on the agenda server
  - http://ilcagenda.linearcollider.org/conferenceDisplay.py?confId=1319
- Chris tried to keep things moving, but some speakers did not budget well for the allotted time
  - Most groups ran through the discussion time with their scheduled talks
  - In these cases, there was little/no discussion after the last talk
  - SiD was the exception, finishing with a few minutes left for discussion
- SiD Presentation:
  - In my opinion, SiD was much better organized that the other groups
    - Talks were of appropriate length / level of detail, did pretty well at keeping to schedule
  - Only a few questions during talks by Marcel (motivation / goals) and Bill (mechanical design)
  - Quite a few questions during Tim's talk on the module design
    - Many questions about double metal / bump bonding approach
  - Some questions for RP, but I don't remember them…

Closed Session Summary

- We originally thought this was going to be about funding, but specific funding issues never came up during the review
  - There were some general comments about not duplicating effort, etc.
- This session was aimed at asking us further questions about our design, and providing a list of questions they would like answered
- We were given a list of "questions" during the closed session
  - See next slide for list
  - These questions were given to all four groups
  - There were later specific questions from Sauli (gaseous tracking only) and Karlen (all groups)
- Response to questions in preparation, expect to send out tonight

General Questions

- List of 10 most pressing issues/ risks? Overall plan of issues, their impact and mitigation program including schedule, identify show stoppers
- Major technical decisions needed and time scale
- What corrections have to be applied to the data to get the desired resolution
- How much data and analysis overhead
- How much computer time needed to analyze an event? On-line, offline?
- What is worse resolution you need for science, how close are you?
- How well is BC time measured
- How many BC are integrated over? Can it be reduced?
- What is noise/background, show efficiency vs. resolution including backgrounds (noise and machine backgrounds)
- Largest uncertainty in material budget
- Largest uncertainty in performance
- Pulsed power needed: issues
- Temperature uniformity required/achieved
- B-field dependence in performance/ operations
- Electronic issues
- Cost drivers
- Schedule drivers
- Distinction to other similar efforts
- Collaborative tasks with other projects
- Simulations required at what time schedule

Karlen Questions

- **CLUCOU**
- performance of the cluster counting technique in multijet events at ILC including expected background needs to be simulated.
- What is occupancy? LCTPC has 10^9 voxels, speaks of operating with 1% occupancy which is 10^7/200 BX = 5x10^4 voxels/BX. This detector has only 3x10^4 voxels - so occupancy could be 100%.
- need to demonstrate that cluster counting is actually required - the time between first and last pulse may contain most of the additional information, and can be measured with simpler electronics
- very sensitive to fliers - muons travel along wire direction, and gas gain is VERY high.
- **SILC**
- list of priorities needed
- concerted effort on forward tracking needed - including system concerns (mechanics, cabling, cooling, power pulsing, material budget)
- **SID**
- clear demonstration of benefits of the challenging electronics design, including bump bonding
- demonstration of the rigidity of tracking module - maintains its shape under temperature variation of 10 C.

Closeout

- Here is what I remember…
- Closeout focused on establishing a Tracking R&D task force
- Lots of discussion about "benchmarks"
  - Concern expressed by SiD that we are trying to optimize tracking as part of an integrated detector, stand alone tracking hard to compare
- Discussion of encouraging collaboration, minimizing duplication of effort
- Discussion of test beam needs, and need to pool resources for common infrastructure
- Discussion of split-field solenoid for tracking studies to be used by TPC and silicon efforts

Possible review outcomes (2)

- **Could imagine a Tracking Task Force in which work on common elements such as infrastructure could be planned and implemented, including**
  - Test beam facility with ILC-specific features eg bunch timing – a significant investment
  - Appropriate high field magnet for testing large-scale prototypes, specially regarding complex issues such as mechanical disturbances due to pulsed power
  - Agreed test procedures for evaluating prototypes, with a view to providing experiment collaborations with objective data for decision-making
  - Even the true material budgets associated with different options may not be trivial to establish
- **[The ILC vertexing community, encouraged by the WWS-OC, has recently decided to form a Vertexing Infrastructure Task Force, with similar aims]**
- ***This review provides an opportunity for the committee and collaborations to think about whether this, or some other link between the R&D collaborations, might be useful***

*** From talk by Chris at first closed session (and posted on the agenda server) ***

Summary

- Significant effort in putting together report, talks, responses to questions
  - Did receive some positive feedback from the review committee with respect to our effort/focus/organization
  - Probably won points for presenting a coherent R&D plan
- Many good technical questions, and some useful feedback during the review
  - Very high degree of technical expertise on the committee
- Committee was very set on establishing a "Tracking Task Force"
- We hope to get our response to questions out today
- Expect to get draft report back at end of the week
- Open question: will this exercise help advance the case for SiD R&D funding