

# ILC Detector R&D Panel

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# ILC Detector R&D Panel and charge

- ❑ **9 members appointed shortly before LCWS 2005 by WWS-OC, 3 from each region:**
  - Jean-Claude Brient (Ecole Polytechnique, France)
  - Chris Damerell (RAL, UK) chair
  - Ray Frey (U Oregon, USA)
  - HongJoo Kim (Kyonpook National U, Korea)
  - Wolfgang Lohmann (DESY-Zeuthen, Germany)
  - Dan Peterson (Cornell U, USA)
  - Yasuhiro Sugimoto (KEK, Japan)
  - Tohru Takeshita (Shinsu U, Japan)
  - Harry Weerts (Michigan State U, USA)
  
- ❑ **All are or were at Snowmass**
  
- ❑ **Our website:**  
<https://wiki.lepp.cornell.edu/wws/bin/view/Projects/WebHome>

## Charge for WWS LC Detector R&D Panel 1/13/05

1. Create and maintain a register of ongoing R&D programs relevant for LC experiments, which should include R&D goals and schedules, names of participating institutions and their responsibilities, relevant publications, level of support, and web-links to current work. The R&D programs should include not only those required for the proposed detector concepts, but also those needed for measurements of luminosity, energy, and polarization (LEP) and those associated with the masking system, possible beam EMI, and other areas which may overlap with MDI. The registration of such MDI projects should be performed jointly with the MDI panel. Maintain a central web repository for this information, and update it regularly.

2. **Survey the R&D relevant for LC experiments.** This survey should review the R&D needs of all candidate detector concepts, LEP measurements, and relevant MDI issues as discussed above. It should strive to identify the critical R&D items which affect the viability of each concept and uncover any needed R&D which is not being pursued. In addition, it should encompass the existing R&D efforts, assess the relevance of these efforts to the various detector concepts and LEP or MDI needs, and flag areas needing more attention. Document this survey before August, 2005.

3. **Critically review the Status of R&D Relevant for LC experiments.** An important input for this review will be the **Spring 2006 Detector Outlines**, which will be requested from each of the current design studies by the World Wide Study Organizing Committee. Each outline will include an introduction to the detector concept, a description of the detector, its expected performance, subsystem technology selections or options, status of ongoing studies, and a list of R&D needed. Additional input will come from reassessing the ongoing R&D efforts with respect to relevance and importance, current level of effort, scheduled project completion times, duplication of effort, and additional resources required. Document this review by Summer, 2006.

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4. Register the regional review processes for LC detector R&D. In consultation with the ILCSC and the GDE, facilitate review for R&D proposals which are not easily incorporated into these existing review structures.

5. Continue these activities, and whatever further activities are judged important to prepare needed R&D for LC detectors, until a global lab assumes these responsibilities

# Input from detector groups

- ❑ Dan Peterson and colleagues at Cornell U have set up, maintained and continue tuning a very good website for the R&D reports
- ❑ Due to understandable sensitivities, funding information is restricted to panel members
- ❑ Since LCWS2005, our Panel has worked via e-mail, phone calls and personal contacts, to establish one contact person per collaboration (or per group, if strongly preferred by the groups), and to help that person fill in the register
- ❑ Response rate has been slow, presumably because we have 'no carrots and no sticks'
- ❑ One or both may be on the way ...

# Input from Concept Groups

- ❑ **Groups were requested to deliver reports describing their R&D activities and future needs, in order to turn their studies into proposals based on established detector technologies**
- ❑ **The SiD group has provided a detailed document including a spreadsheet covering all their detector subsystems. Thanks to Andy White for this**
- ❑ **We have outlines, but are awaiting the detailed reports (specially the financial estimates) from the other concept groups**
- ❑ **There is obviously a large overlap between these routes for gathering information. For example, it may be that the LDC and GLD tracker R&D will be covered by the funding information from the world-wide TPC detector collaboration, when we receive it.**

# Interpretation

- ❑ We are still in the information-gathering phase
- ❑ Careful interpretation will be needed, to avoid double-counting or omitting topics
- ❑ We do need to hear from people who represent missing R&D activities. PID based on advanced DIRC could be important, given the developments in possibilities for heavy quark sign-selection, and spectacular recent progress regarding Si-PMTs operating in the Geiger mode).

# Output for end 2005

- ❑ We will write a document, based on YOUR input, indicating R&D areas that have a high and urgent need for additional funding
- ❑ This will be particularly timely, given the sense of optimism regarding an increase in funding for ILC R&D (machine and detector) in the USA
- ❑ Other regions have been less starved of funds, but a document setting out priorities could also help there
- ❑ There are NO areas of current detector R&D for ILC that don't deserve ongoing support (*my opinion*) so people should not worry that their current work will be cut, **unless our document is misinterpreted by unfriendly forces within funding systems. We will have to be careful**
- ❑ Please note that this report will discuss only priorities regarding topics, not individual proposals, so we won't yet be at the stage of Barry Barish's 'proposal driven' R&D support, except (of course) with our own funding agencies

## Longer term plans – preliminary discussion with GDE

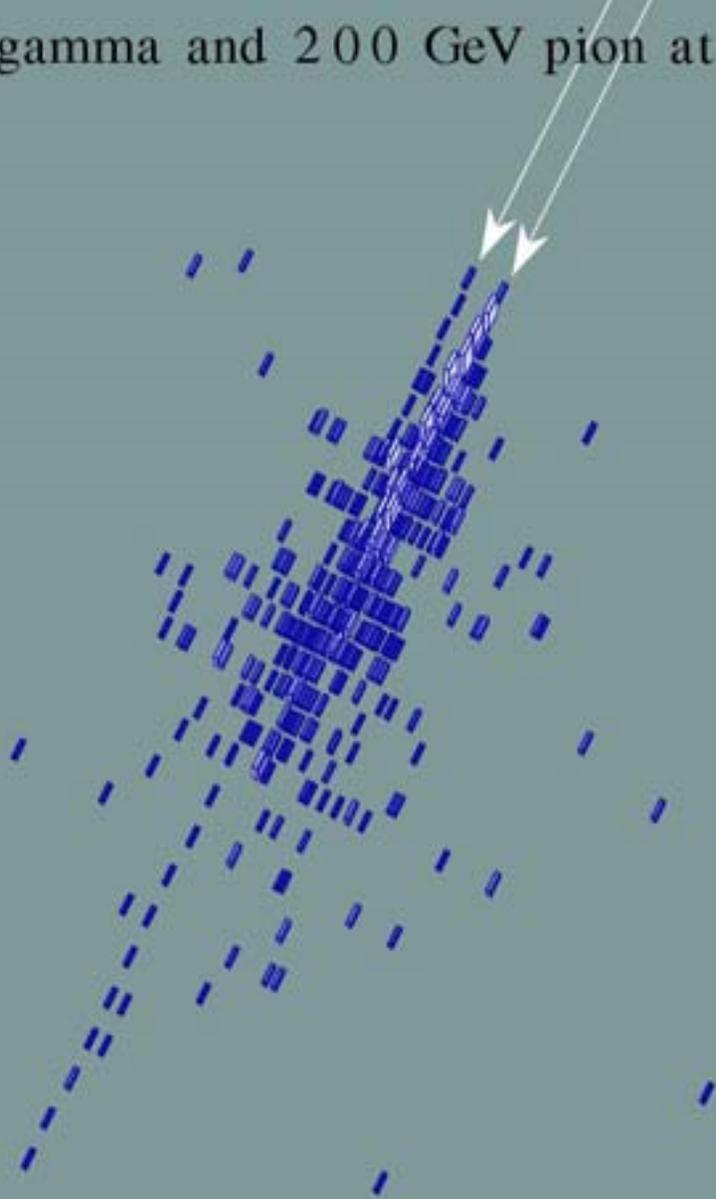
- ❑ Very preliminary discussions between R&D Panel members, WWS-OC directors and Barry Barish for GDE took place on Aug 18th
- ❑ Suggestion is being considered of evolving to a second phase, where our panel would be replaced by a committee under the GDE
- ❑ This committee would undertake serious evaluation of individual proposals, appoint referees, hold open session presentations, require progress reports, etc.
- ❑ The GDE could provide important links to funding agencies by publishing its evaluation of these proposals, via FALC, etc
- ❑ Current composition of Detector R&D Panel would not be appropriate – we are all ILC ‘insiders’ with potential conflicts of interest

## Some personal observations

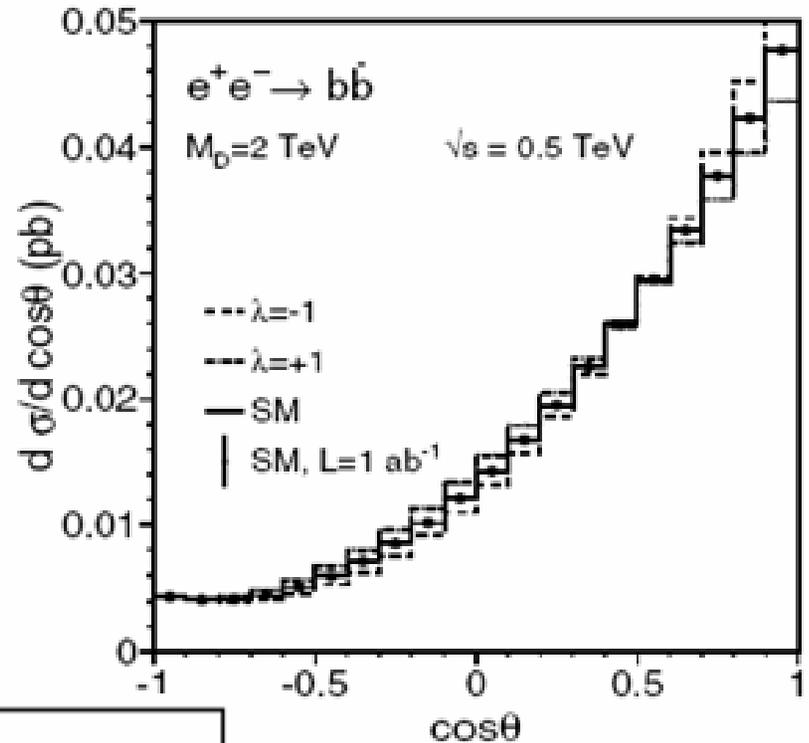
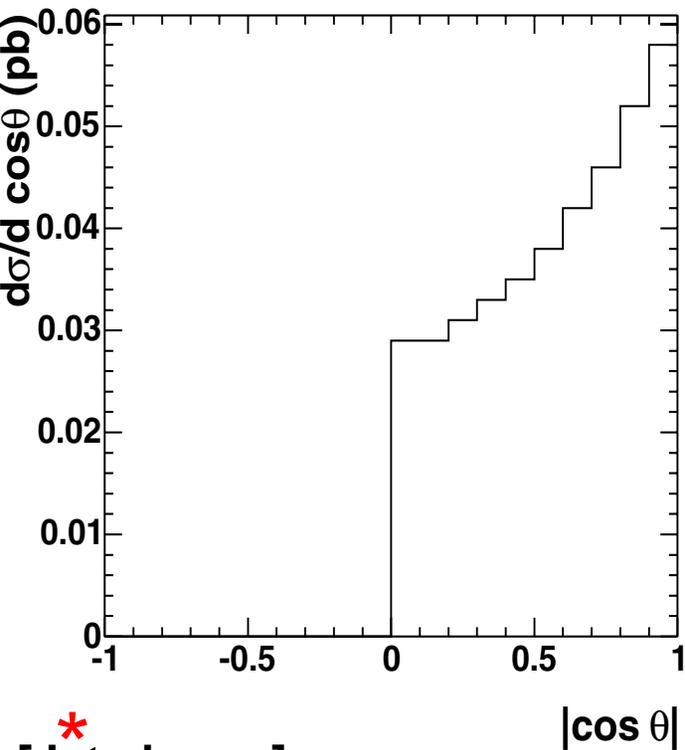
- ❑ Our community has been involved in ILC detector R&D (simulations only at the beginning) since LCWS 1991 or earlier (roots in SLD and LEP)
- ❑ In Europe, the ECFA/DESY workshops have provided a framework respected by funding agencies. For the past 5 years, several funding agencies have supported ILC-specific detector development
- ❑ However, we in Europe are at a disadvantage compared to astronomers, who have multiple 'fully approved' ESA and NASA 'cornerstone missions' extending to 2025 and beyond. **We are often asked precisely what is the ILC schedule. The fact that they are aware of the LHC off-ramp does not help ...**
- ❑ In Japan, modest support has been obtained from various routes, but, as I understand it, formal proposals for ILC detector R&D cannot be made till this becomes an approved project
- ❑ In the USA, the funding available has been ***totally inadequate*** to permit any significant detector development, though there are many groups with post-docs doing excellent simulation studies

- **Two highlights from this conference, illustrating the very preliminary state of our understanding:**
  - **PFA has been studied since 1991, but only now have we been educated by Henri Videau's beautiful simulations for the ECAL, indicating that **readout granularity** could to some extent overcome the generally accepted limitations from Moliere radius**
  - **Some in our community have pushed for a high performance vertex detector since 1991, but only now do we have Sonja Hillert's important results on **heavy quark sign selection** by vertex charge. At last, we have established the physics imperative of an adventurous vertex detector surrounding a small radius beampipe**
  
- **Given more adequate funding, we should have been able to answer such fundamental questions years ago**
  
- **We really need a rapid escalation in R&D funding (specially in the USA and Asia) if we are to build the detectors we need, on the timescale of around 2015**

10 GeV gamma and 200 GeV pion at 7mm  
02 05



Henri Videau  
Pb-Si sandwich  
Moliere radius 2.1 cm



\*  
[Jet charge]

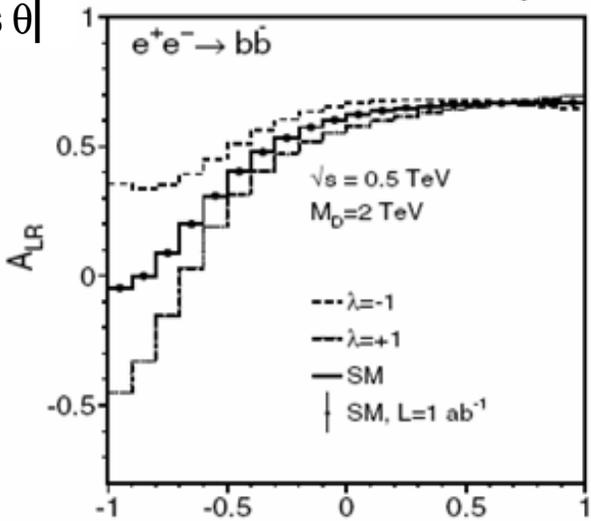
Vertex charge (S Hillert)

Charge dipole

SV/TV + lepton

SV/TV + kaon

Charge of tertiary D



S Riemann

LC-Th-2001-007

Places highest performance requirements on vertex detector, and need  $R_{bp} \sim 12-15$  mm.  
Such measurements of differential cross-sections and angular correlations in multi-jet processes are entirely inaccessible at LHC

# Conclusions

- ❑ Several important developments reported at Snowmass have illustrated the provisional nature of many of our studies, despite much hard work since LCWS 1991
- ❑ Current studies are generally well focused – though there are some areas which could become more cost effective by pooling resources. *R&D Panel will encourage such developments*
- ❑ Funding will continue to be supplied by national proposal-driven peer review
- ❑ Eventual evolution to an additional layer global peer review will strengthen the case for the enhanced support that everyone in the detector community knows to be urgently needed
- ❑ Warmest thanks to the organisers for a wonderful Snowmass – every day has been exciting, and the momentum associated with this project is terrific!