LCC Physics and Detector Report

1. General remarks
2. Organizational issues
3. Status/plan of concept groups
4. Working groups
   - Detector R&D liaison
   - MDI working group
   - Software/computing
   - ILC parameter working group

Hitoshi Yamamoto
LCB meeting, DESY
February 20, 2014

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General Remarks

LCC Physics&Detectors

- Two goals :
  - Prepare and guide detector groups toward realization of the ILC.
  - Coordinate and promote collaborations between the ILC and CLIC in physics& detector activities (‘synergy’)
    - Keep the community togeher

LCC does not manage CLICdp activities

ILC Timeline (by LCC, LCWS13)

2013 - 2016

- Negotiations among governments
- Accelerator detailed design, R&Ds for cost-effective production, site study, CFS designs etc.
- Prepare for the international lab.

2016 – 2018

- 'Green-sign' for the ILC construction to be given (in early 2016)
- International agreement reached to go ahead with the ILC
- Formation of the ILC lab.
- Preparation for biddings etc.

2018

- Construction start (9 yrs)

2027

- Construction (500 GeV) complete, (and commissioning start)

(250 GeV is slightly shorter)

'Possible' ILC Detector Timeline

2013 - 2016

- Re-optimize the detector design
- Complete the necessary R&Ds
- Prepare to move toward real collaborations

2016 – 2018

- 'Green-sign' for the ILC construction to be given (early 2016)
  (Formation of the ILC lab.)
- Formation of detector collaborations (possibly ne mes)
- Call for detector proposals
- Proposal review, approval of detectors
- Detector TDR completed

2018

- Construction/assembly start (9 yrs)

2027

- Detectors ready for commissioning

LCC Phys&det

ILC lab.

ILC 'strategy' workshops

Many mini workshops worldwide to discuss how to participate in the ILC, how to obtain funds for the ILC.

May 16-17, 2013 : Como, Italy
Sept 2-3, 2013 : United Kingdom
Nov 22, 2013 : Germany
Nov 29, 2013 : Paris, France
Dec 13, 2013 : Seoul, Korea
Feb (1 day of)12-14, 2014 : Spain
…

LCWS13

Nov 11-15, Tokyo. 349 registered (by far the largest in Japan)

CLIC workshop, CERN

Feb 3-7, CERN. 269 registered

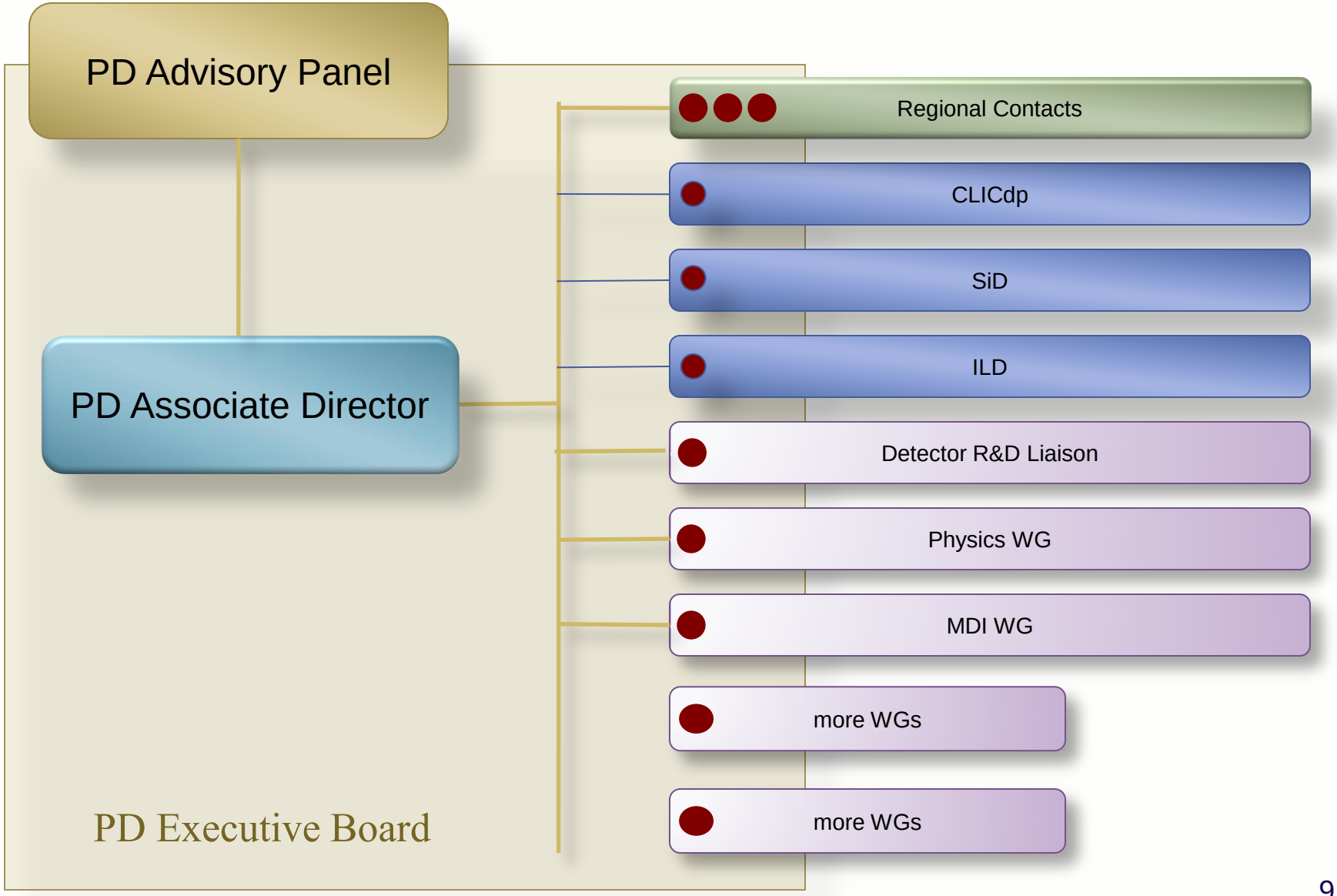
Organizational Issues

Organizational Progresses Since LCB Jun-2013

- LCC P&D EB structure defined and started
  - No regional reps above EB members
  - Key members defined
- Working groups and liaison defined and started
  - Detector R&D liaison
  - MDI working group
  - Software/Computing working group
  - ILC parameter working group
- Physics and Detector Advisory Panel chair selected

- To be done soon
  - Physics and Detector Advisory Panel members to be selected
  - Physics working group to be established

LCC PD Structure



LCC Physics and Detectors

EB members

Concept Groups

- SiD representative : Marcel Stanitzki
- ILD representative : Ties Behnke
- CLICdp representative : Mark Thomson

Regional reps

- European regional contact : Juan Fuster
- North American contact : Dmitri Denisov
- Asian contact : filled in by HY

Plus WG conveners and liaisons

PD Advisory Panel

- Advises the associate director in executing his/her mandate
  - Should be independent of the executive board
  - The advisory panel chair is nominated by the AD, and reports to the AD
  - Its membership is chosen by the advisory panel chair in consultation with the AD

- Reviews progresses of ILC detector concept groups toward real collaborations and the state of synergy between the ILC and CLIC in physics&detectors area

- Chair: Paul Grannis
- Aiming at 1st meeting at AWLC14, Fermilab (May)

Concept Groups

SiD: Status

Milestones in 2013

- DBD has been successfully completed
- SiD has been very active in the US Snowmass process
  - Part of the global Linear Collider Community effort
  - Providing input to P5, which formulates the US strategy for particle physics
- SiD has been doing an reorganization effort, moving towards a more formal organization

SiD : Detector Consortium

- Have been very successful with a light-weight organization until now
- It is clear that with the ILC moving forward we have to move to some more formal Organization
  - Not a collaboration, but a consortium
  - SiD will remain open to all interested people and groups
- Membership in SiD
  - Representation in the Institute Board (IB)
  - Actively take part in decisions
  - Become an Author (once we start having SiD publications)
  - Both individuals and institutes can be members
  - Membership is approved by IB

SiD : Plans for the LCC phase

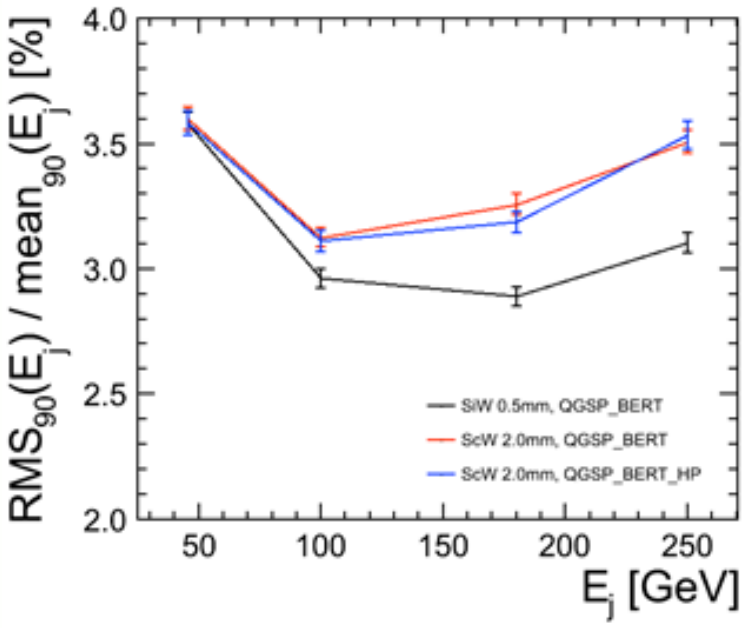
- Goals
  - SiD will be one of the two experiments at the ILC
  - Deliver a full TDR once such a call has been made
- SiD has defined the following priorities for this
  - Site-Specific Studies
  - Detector Optimization studies
  - Strengthen ILC Physics case
  - Common Software Development
  - Detector R&D
  - Detailed Costing Study as preparation for the TDR

ILD: 2014 and beyond

1.) Re-optimization of the ILD detector concept: intensive meetings

Performance – Cost – Realism

2.) Intense and vibrant R&D program in close cooperation with the R&D collaborations



Particle flow performance

- Sophisticated algorithm
- Realistic detector model

Tools and expertise for an in-depth and realistic optimization are available

ILD: R&D

Intense R&D work in many areas.

Focus on

- Demonstrate the system integration aspects
- Demonstrate the scalability of the sub-systems
- Develop an overall subdetector-management concept
  - Cooling
  - Power
  - Mechanical integration
  - Electrical integration

CALICE
FCAL
LC-TPC
PLUME
CMOS
…..

CLICdp

★ Organisation

- CLICdp organised through lightweight collaboration-like structure
  - Spokesperson (Lucie Linssen), Executive team, Institute board
    + working groups
  - Currently 22 institutes have signed MoC
  - Structure provides effective oversight of CLICdp activities

★ Recent focus of work

- Higgs Studies
  - Working towards synoptic paper on Higgs physics at CLIC
  - Assumes 350 GeV, 1.4 TeV and 3 TeV energy stages
  - Will be submitted to EPJ C in late spring/early summer
- Detector Optimisation
  - Current studies use two detector concepts CLIC_ILD and CLIC_SiD
  - New effort to study optimisation of a detector for CLIC
  - Aiming for a single CLIC detector concept by end of year
    – will simplify physics studies

CLICdp

★ Cooperation with ILC

- Maintaining good contacts at all levels
  - Representation in LCC PDeb
  - Good working relations at ground-level
    - e.g. productive collaboration with software
    - Detector R&D
      - CLICdp R&D efforts tied in closely with ILC detector R&D effort: e.g. CALICE, FCAL

★ Other Synergies

- HL-LHC and FCC detectors
  - Investigating possible synergies with HL-LHC activities on high-granularity calorimetry
  - Also looking at links with design of FCC (hadron-collider) detector and physics

Working Groups/Liaison

MDI Working Group

- Charge
  - Coordinates the activities related to the machine-detector interface
    - Design of the detector hall,
    - integration of detectors,
    - Alignment of detectors and beamlines near the interaction point.
  - It liaise with related groups of accelerator activities

- Members
  - Karsten Buesser (convener), Phil Burrrows, Tom Markiewicz, Marco Oriunno, Tomoyuki Sanuki, Toshiaki Tauchi

MDI Working Group

- Immediate tasks
  - For the mountainous (Kitakami) site
    - Detector assembly/installation scheme/schedule/cost
    - Detector hall design
- Coordination with the accelerator side
  - Working with quite a wide range of groups
    - CFS group, ADI group, BDS group

Detector R&D Liaison

- Charge
  - Ensures productive communication between the LCC Physics and communicates relevant information from the Executive Board to detector R&D groups and vice versa.
  - In contact with all detector R&D groups relevant to linear colliders to keep track of the overall detector R&D efforts conducted or planned for linear colliders.
    - Periodically compile summaries of the R&D efforts.

- Does not dictate what each R&D group should or should not do (thus the name ‘liaison’)

Detector R&D Liaison

- Liaison:
  - Maksym Titov, Jan Strube (deputy)

- Immediate task
  - Produce a document describing current detector R&Ds relevant to LC (~30 pages)
    - Would elucidate overlaps and holes – even though it does not explicitly state them
    - Goal: First draft by AWLS14, Fermilab (May 2014)

Software&Computation Working Group

- Charge
  - Coordinates efforts to develop common software tools among the detector concept groups so that duplications are avoided and overall progresses are promoted.
    - Event generators, data formats, and reconstruction programs.
  - When needed, it coordinates large-scale MC productions.
  - Evaluates computing needs from now up to the real experiments (for the laboratory design)

- Members

  Norman Graf (convener), Frank Gaede (deputy), Akiya Miyamoto, Andre Sailer

ILC Parameter Working Group

- Charge
  - Liaises with the relevant accelerator groups to communicate the physics and detector needs regarding the ILC machine parameters
    - Energy, luminosity, crossing angles, pulsing scheme, and bunch patterns etc.
  - Works together as needed with the MDI working group and simulation study efforts in detector concept groups
    - beam backgrounds, achievable accuracies in various physics measurements etc.

- Members

  Jim Brau (convener), Tim Barklow, Keisuke Fujii, Jenny List

ILC Parameter Working Group

- Immediate task
  - Initial running scenarios of the ILC
    - How long to run at what energy in what order?
  - At each energy, what is the minimum energy to produce stated physics result?
    - How much more is needed to lead to significantly meaningful improvement?
  - Drafting a document now (a preliminary draft is ready)

- Close communications with the machine side essential
  - Add a few accelerator members (K. Yokoya. N. Walker) → form a joint working group

ILC PARAMETERS AND PHYSICS GOALS (A PRELIMINARY DISCUSSION)

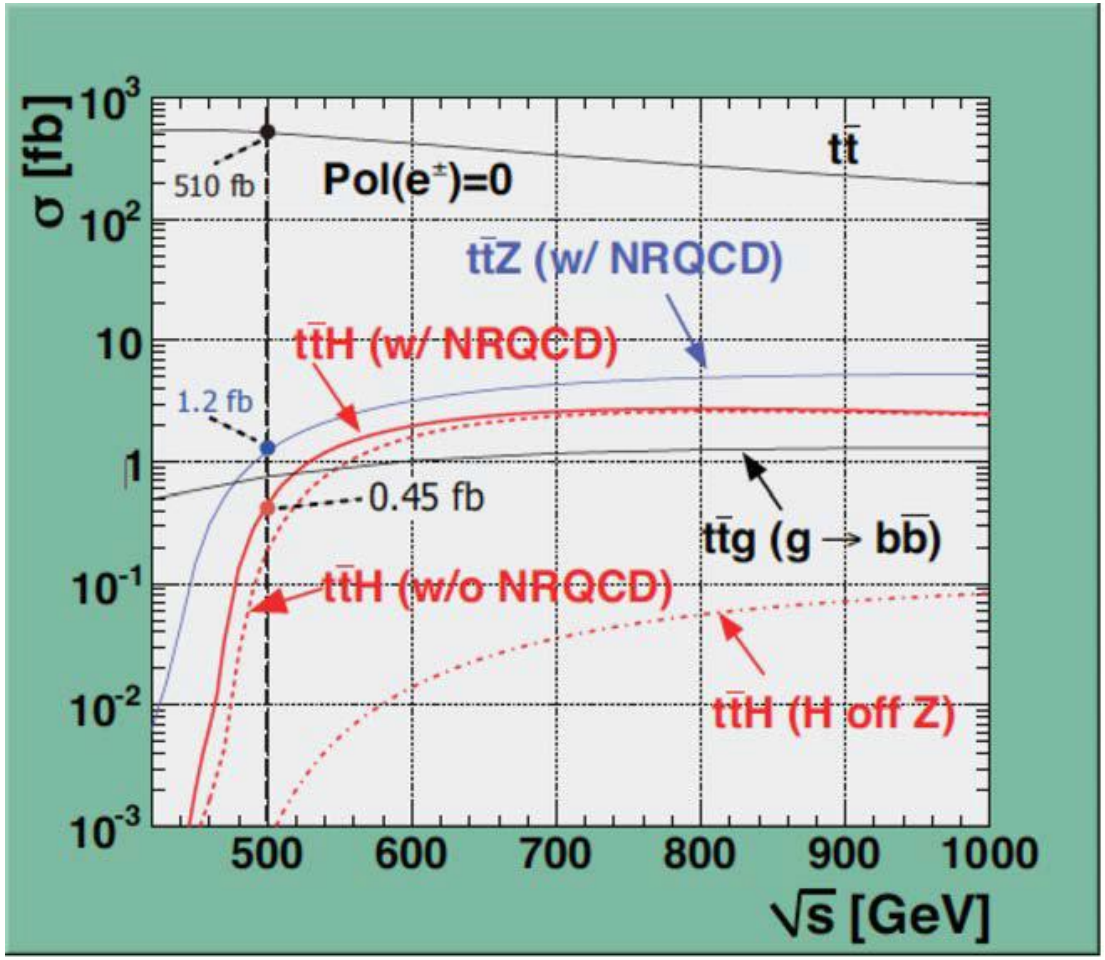
Barklow, Brau, Fujii, List

February 18, 2014

The views expressed here are those of the authors of this note, meant to initiate a discussion of the broader community.

A preliminary 'conclusion':

- An optimal evolution from the physics perspective may be
  - operate at 250 GeV until capability (sufficient number of cryomodules produced) to upgrade to 350 is reached (say 1+2.5 years)
  - pause to upgrade to 350 GeV
  - operate at 350 GeV while capability to upgrade to 550 GeV is fabricated (say 3 years)
  - pause for final upgrade to maximum baseline energy of 550 GeV
  - continue operations at 550 GeV or other energy points
- Set maximum baseline energy reach to 550 GeV
- All three energies are thresholds of important physics channels (ZH, $t\bar{t}$, $t\bar{t}h$),



A slight increase
In energy beyond
500 GeV increases
ttH yield significantly

Summary

- LCC Physics and Detector Organization is starting to function
  - EB has been active for ~ 4 months
  - Most working groups are formed and active
  - PD Advisory Panel is being formed
  - Coordination with accelerator is set up at many levels
- Concept groups are preparing to move toward real collaborations
- Synergy of CLIC and ILC in phys&det is functioning adequately