SiD – The Next Steps

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for the SiD Concept

Where we are:

- The DBD is complete (and almost printed!)

  This was a heroic effort by Marcel and others with much of the load falling on DESY – thank you!!

- The DBD is a strong statement for our concept and its ability to address the ILC physics program

Where we are:

EU strategy for Particle Physics

There is a strong scientific case for an electron-positron collider, complementary to the LHC, that can study the properties of the Higgs boson and other particles with unprecedented precision and whose energy can be upgraded. The Technical Design Report of the International Linear Collider (ILC) has been completed, with large European participation. The initiative from the Japanese particle physics community to host the ILC in Japan is most welcome, and European groups are eager to participate. *Europe looks forward to a proposal from Japan to discuss a possible participation.*

…the European particle physics community, should:

- Exploit its current world-leading facility for particle physics, the LHC, to its full potential over a period of many years, with a series of planned upgrades;
- Continue to develop novel techniques leading to ambitious future accelerator projects on a global scale;
- Be open to engagement in a range of unique basic physics research projects alongside the LHC;
- Be open to collaboration in particle physics projects beyond the European region;
- Maintain a healthy base in fundamental physics research, with universities and national laboratories contributing to a strong European focus through CERN;
- Continue to invest substantial effort in communication, education and outreach to engage global publics with science.

Where we are:

- The HEPAP Facilities Panel gave ILC the highest grade.

Major High Energy Physics Facilities
2014-2024

The discovery of the Higgs boson reinforces the strong scientific case for the International Linear Collider (ILC). The ILC research program will be complementary to the research program of the LHC (and HL-LHC), in that it can deliver measurements that are complementary, as well as enable searches for new physics that are complementary to those performed at the LHC. For instance, the ILC enables high precision measurements of Higgs boson properties in a program complementary to the LHC. Beginning at energy above the threshold for production of pairs of

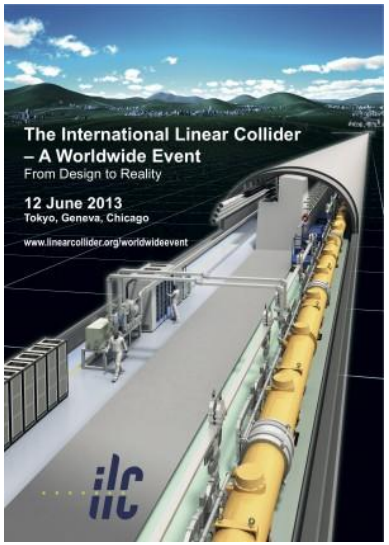
sions at high mass scales. The ILC accelerator and detectors enable a research program that will address questions of very great scientific importance, and both the accelerator and the detectors are *absolutely central*. The initiative from the Japanese particle physics community to host the

ership roles. A technical design report for the accelerator facility was recently completed; the ILC accelerator is technically *ready to initiate construction* once agreements are reached in Japan and internationally. Detailed baseline designs for the detectors have been completed; however, engineering remains before the ILC detectors are ready to initiate construction, and for this reason the readiness classification *significant scientific/engineering challenges to resolve before initiating construction* is assigned.

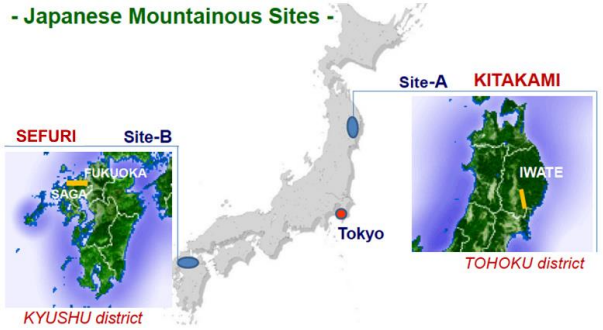
Where we are:

- Our Japanese colleagues made a high-level important visit to Washington DC.

- We have a "world-wide" ILC launch event on June 12



- A site decision will be made in Japan in July



So finally, this year, there is some sense of forward momentum

But - after 10+ years of effort, this is only the beginning!

What's next?

Technical aspects

- We have a design concept with the components at various stages of development and testing
- Further design optimization is needed
- Another R&D phase is needed to get from prototypes to engineering modules
- We need a process for final sub-detector technology decisions.
- We need to develop a plan for a full TDR

Engineering – Detector Subsystems

- Beamline:
  - Adequate conceptual design.
  - Impedance issues that can generate wakefields and heating have been checked.
  - Synchrotron radiation issues seem ok.
  - Vacuum design seems ok.
- Vertex Detector:
  - Minimal conceptual design for modeling.
  - Little ongoing work on support structures, power and cooling, which may make the modeling of multiple scattering and dead regions somewhat optimistic.
- Tracker:
  - Adequate conceptual design for modeling.
  - Conceptual design for support mechanics.
  - Need to understand Lorentz force issues from pulsed power and cable design.
- EMCal:
  - Adequate conceptual design for modeling. (But may not be optimized; CLIC work suggests 20 layers adequate for PFA)
  - Mechanical prototyping of structure using relatively small tungsten sheets has stalled.
  - First trials indicate some problems bump bonding KPiX. (Work active for beam test)
  - Need work on assembly strategy. Current estimate is extremely labor intensive. Robotics?

Engineering – Detector Subsystems

- HCal:
  - No settled conceptual design.
  - Active efforts in PFA work.
  - Critically need outer dimensions of barrel and endcap for solenoid and iron engineering.
  - Radial cracks between modules are apparently accepted, documentation may be weak.
  - The actual detector choice is secondary to the mechanical engineering issues as long as it fits in the allocated space.
  - Cost may well be an issue.
- Solenoid:
  - In principle CMS approach is ok.
  - Might be significant cost improvements with advanced conductor R&D.
- Muon System:
  - SiD has changed baseline to scintillator.
  - Conceptual design probably stalled waiting iron segmentation design.
  - Need conceptual design for SiPM readout.
- BeamCal:
  - Minor mechanical engineering issues.
  - Needs sensor development!

What's next?

Resource aspects

- We need a significant increase in resources of people and M&S to carry out the next R&D phase
- This could come from:
  - Expansion of institutional support (Lab, University) (e.g. in U.S. - DoE Detector Development program)
  - Direct support from e.g. U.S.- Japan program
  - Attracting new SiD members with resources

- To prepare for the next phase, we need to draft a plan of essential resources – > use as a basis for requesting support, showing potential collaborators where they could contribute etc.
- Develop resource needs for TDR

What's next?

Collaboration aspects

➔ Develop a "collaboration light" approach that strikes a balance between the present situation and a full-blown collaboration – have this in place this Fall.

➔ Start with a light/informal structure that allows integration of new collaborators with agreed tasks.

➔ Work with the new LCO to develop the role of an eventual SiD Collaboration within the organization

➔ Actively recruit new members of SiD (initiatives in Europe, Asia…)

What's next?

"Collaboration light"

- Minimal set of "rules"
- Form letter
- Request for expression of areas of interest
- List of people
- Timescale for involvement
- Resources

- Process: draft above for consideration by SiD Exec, discussion with existing collaborators, use as basis for integrating new groups.
- Form an Institutional Board with agreed level of Lab, University representation.
- Agree procedure for electing Spokespersons, Exec committee
- Have maintained Web pages!

What's next?

➔Must have the correct balance – we must have a list of areas where new collaborators can contribute:

- continuation of existing R&D topics
- new/alternative ideas
- detector optimization
- improved simulation
- …

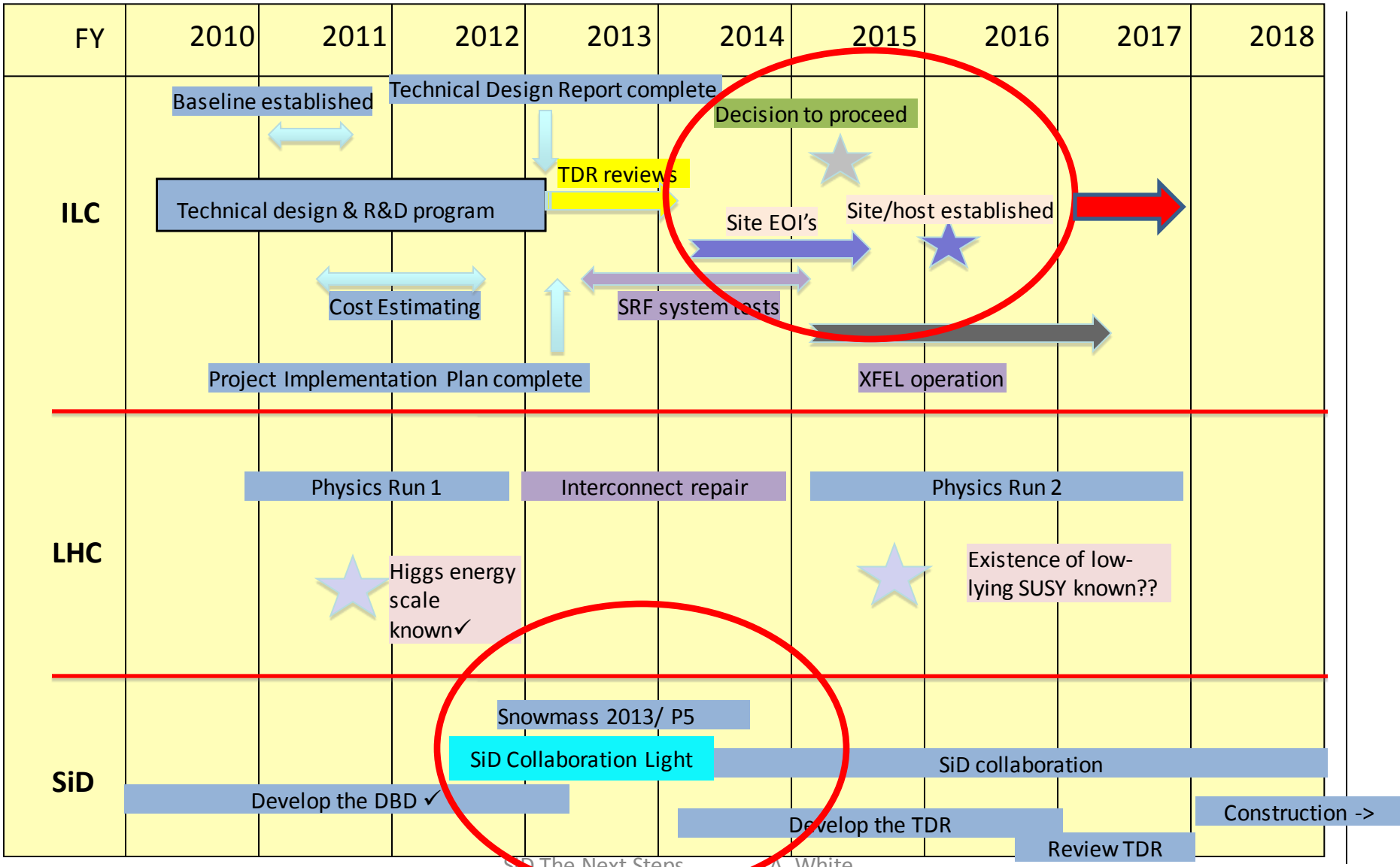
➔ If we move too fast, too soon we risk frustration if there is no support, but, if we do not have a sufficiently large number of collaborators when we (hopefully) get the green light, we risk a lack of credibility in our ability to realize SiD.

What's next - timescales

Marty – at last SiD meeting (AW updates):

- Japan commits to linear collider 2013/14?
- Optimize SiD (Only crude optimization for LOI; ~0 for DBD!) Can we lower costs and preserve performance?
- Prepare serious TDR with technical prototypes and serious cost estimate. 3 years: 2016/17
- Requires a fully reviewed TDR. Assume the review process, with minor iterations, takes 1 year. 2018
- Procurement, fabrication, and assembly: 6-7 years 2024/5
- Begin Commissioning

ILC possible timeline



What to do:

- Get involved with the Snowmass exercise

- Plan on attending the Seattle Energy Frontier meeting and the "Snowmass on the Mississippi" workshop and give talk(s)!

- Suggest potential new SiD collaborators

- Think about nominating(?) SiD/ILC people for the next P5 (U.S.)

- Give talks about ILC/SiD

- Express your opinions/ideas about SiD moving forward.

Possible Timeline (by A. Suzuki)