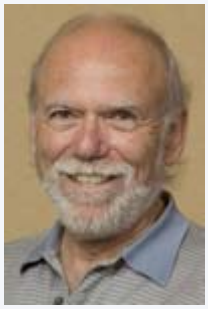
Director's Corner

13 March 2008


Barry Barish

The ILC Technical Design Phase begins at Sendai

Last week the Global Design Effort held a major collaboration meeting at Tohoku University in Sendai, Japan attended by more than 200 participants from both the ILC detector and accelerator efforts. The past couple of months, in reaction to the negative funding actions in the US and UK, we have developed a new plan that maintains the highest-priority items in Technical Design Phase-1, lasting until 2010, while deferring completion of some of the longer-term items to 2012. Tohoku was a crucial time for us, as the meeting represents the first step in our new R&D plan towards the ILC. We focused this workshop on our short term goals with the highest priority in order to kick off the work in these areas as soon as possible. We believe this new highly prioritised programme will enable us to maintain our plan to be ready to propose ILC construction whenever the Large Hadron Collider results justify.

The main part of the GDE meeting was broken into four working groups, where we brainstormed, reported on and discussed the work to be accomplished in these key areas:


Mr. Takeo Kawamura, member of the House of Representatives in the Diet (national legislature) of Japan addressed the Sendai meeting about the importance of basic science projects like the ILC.

Working Group 1 was on **Cost Reduction**. Perhaps our number-one goal in the next phase of the GDE design work is to continue the process of containing and reducing costs relative to figure we published in the *Reference Design Report*. This will require continued vigilance during the coming few years while we develop a technical design.

During the development of the reference design we performed a number of specific trade studies resulting in changes that enabled us to reduce costs by about 25 percent. Some of the key decisions that reduced costs included moving the damping rings to the centre, thereby sharing one tunnel for both positrons and electrons or changing the crossing angle at the interaction point to 14 milliradians, keeping two detectors but having them share one interaction region through a push-pull system.

We also identified a number of issues that could potentially save more money, but that need more study through a process we call value engineering, in order to evaluate and optimise cost to performance. Some targeted areas include making tunnels, caverns, shafts smaller: big enough to accommodate the machine, but with increased cost consciousness to possible savings. Other areas needing study are whether we need two tunnels, whether there could be significant savings in a shallow site, as well as possible efficiencies in the main linac technology, which is the other major cost driver. In order to be successful in obtaining funding for a linear collider project, we will need to be able to convince our governments that the project we propose is as cost effective as possible. Working Group 1 will make sure that the cost reduction process keeps going and is aiming to show first study results at the next meeting.

Working Group 2 focused on the **Superconducting RF R&D** development programme. Our first goal in this programme is to determine and validate the gradient and yield for superconducting cavities. The reference design was based on cavities that operate at 35 megavolts per metre and the yield is assumed to be 90 percent in production, including reprocessing cavities that do not reach the design specifications. This programme involves processing and reprocessing cavities and testing and retesting them in laboratories in Europe, Japan and the US. Our goals for TDP-1 is to establish the gradient and a 50 percent yield and to continue the work in the next phase to establish the final

gradient and yield by 2012. In addition to the crucial task of establishing the ILC cavity gradient, other important parts of the SCRF programme include the design characteristics for plug-compatible cryomodule designs. These crucial short-term goals will define the rules for developing specific designs with some technical differences in the different collaborating institutions. Finally, before we can propose to build the linac we must conduct some ILC-specific systems tests, including one RF unit of three instrumented cryomodules with beam, which is to be completed by 2012 in the second phase of the technical design.

Working Group 3 was dedicated to **Beam Delivery Systems** and interfaces with the detectors. The work to develop a robust design for the beam lines, focusing, dumps and detector interfaces including the interaction region halls and push-pull systems is a crucial area where detailed designs and close collaboration with the detector groups is essential. The sessions at Sendai were mostly joint between the accelerator and detector designers, focusing on what we call machine detector interfaces (MDI). In addition the future work of this group will consider issues related to machine options, like gamma-gamma, as well as collaborative work with the CLIC group on issues related to a higher-energy machine.

Finally, Working Group 4 focused on the **Damping Rings**. As mentioned above, we took a crucial decision in creating the RDR to move the damping rings to the centre to share a single tunnel. This change was based on our ability to mitigate electron cloud effects in the positron ring by grooving and coating the chambers. Although this is justified by the simulation work that we have performed, we have established high-priority goals of studying electron cloud effects in the laboratory at the CESR accelerator at Cornell in a two-year programme primarily funded by the NSF. This work on electron cloud effects should be of great value for high current machines of the future in general.

Many other aspects of the ILC R&D programme were discussed at Sendai, the facilities were very good and the hospitality was outstanding. In addition to the encouraging large attendance at Sendai, the overall spirit and constructiveness at the meeting are good indicators of our resilience and determination to move forward with our plans to build a linear collider.

-- Barry Barish

Traditional "Kagami-wari" ceremony (breaking the barrel of sake) led by Hitoshi Yamamoto, Tohoku University, our host.