Director's Corner
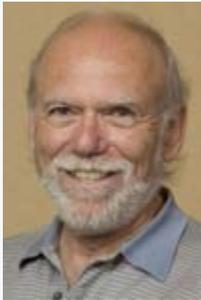
19 August 2010

Barry Barish

ICHEP addresses the future of high-energy physics

I gave a few highlights last week from the 35th International Conference on High Energy Physics (ICHEP2010) held in Paris last month. In addition to the LHC focus, the meeting had several parallel sessions and plenary talks dedicated to the future of particle physics, with special emphasis on future accelerators. This orientation was highlighted in the final session of the conference with a talk by Tor Raubenheimer on "New accelerator techniques," Jean-Pierre Delahaye on "New accelerator projects," a discussion on "the future of High Energy Physics," and a comprehensive closing talk by Michel Spiro, again with a future orientation.

Tor Raubenheimer, SLAC, began his talk by stating the problem. In his words, "*Accelerators have been the primary tool to advance HEP frontiers, but accelerators have continued to increase in size and cost and appear to be approaching the limit that can be supported.*" However, rather than stop here, he used that as the motivation for us to develop "new technologies that are aimed at cost effective solutions," and he emphasised that "*accelerator research is very broad from materials to rf to nonlinear dynamics, and advances come from both fundamental research and directed R&D aimed at applications.*" Tor then proceeded to discuss both the advances and primary challenges in accelerator research: beam energy, beam power and beam brightness for a large number of applications, beginning with a linear collider like the ILC and to future developments like plasma accelerators, where he noted accelerating gradients of 50 GV/meter have already been achieved.

A child's vision of future machines (from Michel Spiro's closing talk)
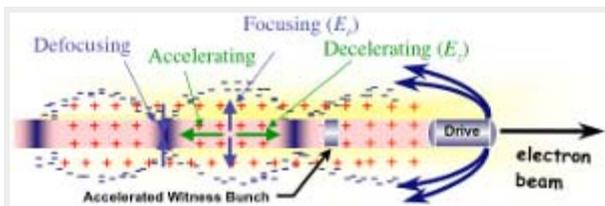
Plasma acceleration concept (beam or plasma driven) from talk by Tor Raubenheimer

Pierre Delahaye's summary of potential high energy physics projects, their schedules and likely decision points.

Tor's talk was followed by Jean-Pierre Delahaye, who reviewed the many possible future high energy physics projects. Clearly, they cannot all be built, but the long list of possible projects illustrates the vitality of our field. Tough and wise choices will be necessary! Jean-Pierre made the bold attempt to put all of the major potential future projects into one common chart. This is very difficult, because the steps from an idea to implementing a project differ depend on many factors and are different from project to project. He obtained the information directly from the proponents of each project, but of course they also have different degrees of optimism. Nevertheless, it is interesting to see how things might unfold as LHC and other results emerge and where there will be decision points.

The concluding talk of the conference was given by Michel Spiro, who reviewed all of particle physics in 107 slides that he presented in about 40 minutes. Michel's comprehensive talk reviewed the entire field from the LHC energy frontier to astroparticle physics and cosmology.

The ILC was well represented at ICHEP. In the parallel sessions, I gave a talk on our progress and plans, where I showed some of the R&D achievements since the Reference Design Report, and Brian Foster gave an interim report on our Governance studies for the ILC. Our impressive progress in achieving our gradient goals was reported by both Tor Raubenheimer and Jean-Pier Delahaye.

Finally, Michel Spiro gave a "vision for the next (big) machine," which he said could be the ILC, or possibly CLIC, or perhaps a doubling of the energy of LHC, a newly revised idea. He also cited from a recent CERN study that there may be a possibility of creating a high-energy electron-proton collider by colliding an ILC-type energy recovery linac with the LHC, providing luminosities of up to 10^{33} cm^2sec^{-1}. Whatever new large projects will be in our future, we are building a strategy and timing for decisions, where the scientific results and imperatives can determine our choices.

Michel Spiro giving the concluding talk at ICHEP

-- Barry Barish