

Minutes of the UEC Meeting: 16 October 2004

Present: Alton, Artuso, Bertram, Bloom, Finley, Gottschalk, Hagopian, Nguyen, Tanaka, Trischuk
By Video: Hughes
Apologies: Messier, Rolli

GSA representative: Clark

The meeting was called to order at 9:00 AM by Chair Trischuk.

Trischuk reported on the September 2004 HEPAP Meeting:

Trischuk reviewed the role of HEPAP (the High Energy Physics Advisory Panel) and its various subpanels. HEPAP has advised the Department of Energy since 1967, considering balance between the various disciplines, as well as the geography. In addition, since October, 2000, it also reports to the NSF Mathematical and Physical Sciences Directorate.

The agenda of the meeting was as follows:

Status of LHC:

The main news from the LHC was that the transfer line between the SPS and LHC is complete and is ready for testing when SPS operations stop in November. Delivery of superconducting cables is 75-80% complete while dipole cold masses are 45-50% complete. Unfortunately, problems with the cryogenics, where thermal expansion platforms were built with the wrong alloy, are preventing installation of dipoles. The CERN staff is now working to replace the pipes. Thanks to the geographic extent of the tunnel, CERN will be able to double or triple work crews to catch up on the installation. As a result, CERN is confident of delivering collisions in 2007. Following a review, a final schedule will be put together.

Fermilab/SLAC Operations Review: Reported by Lehman

The Lehman Operations review is a new kind of review which evaluates the operations and business performance of the two major US high-energy physics laboratories. The operations review of the laboratories last spring was considered a key step in that it will provide the benchmark for all future

reviews. The recent effort to maximize luminosity in the main accelerators at the two laboratories was described as "heroic." The laboratories expressed concerns about their changing staff demographics under increasingly stringent budgets.

SAGENAP (Scientific Assessment Group for Experiments in Non-Accelerator Physics): reported by R. Ong

SAGENAP is reviewing twenty-six projects in four broad research categories:

1. Dark Energy/Cosmic Microwave Background
2. Dark Matter
3. Very High Energy astrophysics
4. Neutrinos

Ong argued that the projects needed to be put into a broader context to build a stronger case (a "roadmap"). He considered this to be too much for the current allotted time of the study (four months); a comprehensive review would require more time and more panels and perhaps should evolve into a rolling yearly exercise.

There is a 63 page report summarizing the study that is now available for comment from the community at:

<http://astro.ucla.edu/sagenap>

BTeV:

After reconsidering the physics impact of the experiment with the new construction and staging schedule, P5 (the Particle Physics Planning and Prioritization Panel) reaffirmed the competitiveness of the BTeV physics program. P5 admonished, however, if completion moves beyond 2010, the competitiveness of the experiment may be compromised.

Linear Collider; reported by Barish and Tigner

Barish reviewed the methodology and rationale of the decision in favor

of cold technology. The next steps are to find a new director for the International Linear Collider (ILC), which now supersedes all existing linear

collider efforts (NLC, TESLA, JLC) and choose a site for the Global Design

Effort, which has 9 bids. The first ILC collaboration meeting will occur in

November at KEK to sign Memorandums of Understanding (MOUs) with the various

laboratories (Fermilab Director Witherell will attend). There will be a meeting at SLAC preceding the collaboration meeting to consolidate the North

American effort. Other news: the Department of Energy has lifted the cap on R&D funding for linear collider effort.

APS Multi-Divisional Neutrino Report : reported by B. Kayser

The American Physical Society (APS) brought together four divisions (Particles & Fields/Nuclear/Astrophysics/Beams) to put together a coherent picture for the next steps in neutrino physics. Seven different working groups met through the year, culminating in a general meeting at Snowmass during the summer, where all the groups agreed to produce a report summarizing the findings of the study.

The report is expected in mid-October at:

<http://www.interactions.org/neutrino study>

News from the DOE/NSF: reported by R. Staffin and M. Turner:

Staffin and Turner emphasized the importance of making LHC a major success. The two funding agencies have agreed to maintain a 1:3 (NSF/DOE) funding parity to support operations and maintenance and increase funding from the current \$24 million dollars to \$65-70 million/year.

This year's budget for DOE: The House has passed a 2% increase, but the Senate has not, making a continuing resolution likely until after the election. Highlights include finishing NuMI and GLAST. Unfortunately, the start of new projects will be difficult until the budget is passed. The budget also has a significant burden for current operations, with finished projects having relatively small impact on the budget. The transition to the LHC will make things more difficult, which means that even small projects will need to be planned in advance to ensure funding.

National Academy of Sciences study: reported by S. Dawson

The National Academy of Sciences sponsors studies in all fields of science every decade. The study for particle physics will differ from other studies (the Quantum Universe, DOE New Facilities Report, etc.) in that at least half of the people will not be particle physicists. The study will be unique in that the excitement of the field and its future will be conveyed by influential people who are not specialists.

The members will meet in December in Washington, D.C., followed by visits to SLAC and Fermilab, followed by another meeting next summer in Washington, with the goal of producing a report by December 2005.

The list of committee members and the charge can be found at:
<http://www7.nationalacademies.org/bpa/EPP2010.html>

HEP Human Resources: reported by C. Brock

A study is in place to evaluate the human resource available to high energy physics experiment in the near future. With a large movement of people occurring, (e.g. large number of graduate students finishing at BaBar), planning needs to start now to ensure the necessary human resources for future HEP projects.

A first pass assessment was reported last spring to the UEC. More precise studies, involving Excel templates being sent to 234 Principal Investigators, involved in 33 experiments (13 at Fermilab) is now in progress.

Education and Outreach: reported by E. Simmons

Simmons reported on a education and outreach workshop held in Aspen this summer. The effectiveness of resources such as Quarknet, websites as well as pitfalls in the education and outreach process were discussed.

Trischuk summarized by stating that the meeting was an intense overview of the US HEP program. The next HEPAP meeting will be on Feb 14/15, where it would be good to have another UEC representative present.

Bruce Chrisman: Visa and Fermilab Security Issues

The Department of Energy held a meeting in September at SLAC focussing on new orders for facilities visits. There were 70 attendees from various laboratories with many interesting talks. An OSTP representative provided statistics on border crossings and visas:

1. There are 550 million border crossing/year
2. 330 million are by non-US citizens
3. There are 8 million visa applications/year
4. 1 million are students, 0.5 million are scientists, 30000 connected to DOE.

Concerns regarding visa lag times have reached high levels of the Executive Office. A new visa type for scientists to deal with the extended visits required for effective scientific collaboration is being worked on.

The head of the Washington Visa office (representative of the State Department) reported that there are new websites to find out the wait time for visa interview appointments at US embassies in various countries. Wait times

vary from days to months, with staffing issues part of the problem. However, limitations in physical space in selected embassies and consulates limit the ability to increase staff where needed.

There were general discussions regarding the new fingerprinting/photo system, as well as the extension of the J Visa category to five years.

The Stanford Provost gave a talk on the importance of international collaboration.

Chrisman reported that there is a reduction of time for visas going through Fermilab, with typical times of 30-45 days compared to the 18 months seen in the past.

Chrisman then discussed how the new DOE order will affect Fermilab site access. No significant changes are expected for users and associated visitors. The restrictions on visitors from T7 countries (the State Department's list of state sponsors of terrorism) remain, with a moratorium on new badges. Vendors may be affected by the requirement that non-US citizens (that are not users or associated with a user) will need to be escorted on site. The Laboratory is working to rework access so that controlled access is needed only in designated areas, following a model established by SLAC, allowing a return to a more open site. The UEC expressed strong support for this effort.

Meeting with Fermilab Director Michael Witherell:

Q: Could you update us on news from the linear collider funding agency meeting and HEPAP meeting where this was discussed?

A: At the ILC funding agencies meeting in Geneva (at CERN), representatives of the major funding agencies (DOE + NSF by Staffin and Turner, European agencies, MEXT (Japan)) were present. Barish presented the technology decision and I represented the laboratories. I said that the laboratories strongly support the joint design effort behind the superconducting technology. The existing linear collider collaborations (NLC, TESLA, JLC) will be incorporated into the ILC at the initial collaboration meeting at KEK meeting (13-15th November). With CERN focussed on the LHC, strong support from other laboratories and

university groups for the efforts at the primary HEP laboratories is needed to advance the research effort.

The laboratories expressed their appreciation for the support to date, with the need to establish a forum for continued dialogue with the funding agencies.

These meetings are currently scheduled to be held twice yearly. The funding agencies signed on to a statement supporting the clear choice and stating that making the technology choice was a critical step forward. The agencies will set up a group to represent them in interacting with the ILC so that efforts are in step with the expectations of each funding agency.

At the HEPAP meeting, the ILC technology choice was reported. The report was mainly informational, in that HEPAP did not have any action to take on the linear collider. Robin Staffin announced that the linear collider funding cap has been removed.

At Fermilab, warm and cold efforts are to be consolidated, effectively doubling the LC effort to something like \$5 million in FY05. Currently, work on Superconducting RF, the A0 photoinjector and the CKM beamline effort, perhaps \$2.5 million taken together, are not considered part of the LC effort, while LC R&D separately has \$2.5 million. These will be combined and will need at least to double to \$10 million in FY06. FY06 represents the first opportunity for a significant change in LC funding. While there is pressure to reduce discretionary spending, there is lot of positive discussion in Washington following the technology choice. Witherell is hopeful for FY06, though the situation is unstable at least through the election.

Q: What steps are being taken to re-furbish the meson area to develop and Superconducting Module Test Facility (SMTF)?

A: There has been discussion on various layouts for the SMTF and what various phases will look like. The laboratory will need to officially decide where it is and work on a schedule for developing the infrastructure. Eighteen months are needed to clear out the area and move things to new areas and install the cryogenic infrastructure. Currently, SMTF will serve both the linear collider

and proton driver efforts, represented by S. Mishra and B. Foster, respectively. S. Holmes will guide from the Directorate, with P. Limon serving as manager. H. Edwards is effectively in the role of chief scientist.

Q: Is there progress defining the role of the Lab vis-a-vis other US labs who are moving forward in this area (ANL and RIA, JLab, SLAC)?

A: The Expression of Interest for the SMTF will be submitted in a few weeks, with fifteen institutions (including Argonne, SLAC, Cornell, etc.). The SMTF is complementary to the individual efforts at each of the laboratories. For example, Argonne is developing RIA (Rare Isotope Accelerator) based on superconducting RF, but the testing will occur at SMTF. In this model, SMTF will provide cryogenics, RF sources and beam (via the photoinjector). There will be a briefing with the DOE in November to coordinate across various boundaries (HEP/nuclear, DOE/NSF). We will need to divide the budget between the basic infrastructure, Linear Collider/Proton Driver, RIA and recirculating linac, so that the various parts are funded separately. The same model of cooperation across several laboratories was used for the SNS at ORNL.

Q: Can you explain to us how the meeting being held at SLAC this week and at KEK, early next month fit into the process?

A: The general goals of the KEK meeting are to maintain the momentum from the technology decision and bridge the gap until the GDI (Global Design Initiative) is in place in a few months. It will bring the principals together to identify the R&D that needs to be done by reviewing existing designs. For example, there are significant differences between the US SC design and TESLA on whether to have one or two tunnels and the design of the positron source and damping rings. The workshop will sort out which things are more or less set, and which need R&D, and who will do it. The US will have a major contribution in each system. The SLAC meeting is an American meeting to decide the US position on each of these decision and coordinate the US view. The high-level performance parameters are set. A site-independent design will be set first, and with a transition to a site-dependent design in 2-3 years.

Q: Any news on the Design Effort or the prospects of Fermilab hosting the Design group?

A: The GDI (Global Design Initiative) is mostly at existing laboratories, with the CDT (Central Design Team) acting as a coordinating center. There is active discussion on how large a role this should be. There are concerns that with visa issues, the US sites cannot effectively compete. As a result, the visa issues will need to be dealt with by the time siting is discussed. There are also sentiments that the site of the CDT should not be the ILC site. Fermilab is bidding to host the CDT, but is much more interested in being the site of the ILC. People should not be concerned if the CDT is not sited at Fermilab.

Q: Can you update us on the outcome of the Proton Driver workshop that was held last week?

A: The Proton Driver workshop is an initial workshop, and should be regarded as the start of a process. Though some of the discussion were around well-known issues (e.g. neutrino physics), it included how proton driver physics will fit into the global HEP program. Some new ideas included a low energy muon program for both fundamental and applied research, and the problem of achieving the long spill beams needed for kaon physics. Currently, achieving regular slow spills from the Main Injector while controlling activation remains an issue. One idea is to use the Tevatron instead. Although the present nine month effort will result in a report by the end of the year, the physics workshops are expected to continue.

Q: How is the Shutdown Proceeding?:

A: The shutdown is going well. At the Friday morning meeting, the laboratory is still on or near the 13 week schedule with the Tevatron starting operations on the 22nd of November. The planning has been good. Installation of the electron cooling apparatus is probably the critical path item in the schedule.

Tevatron Status and Plans: Vladimir Shiltsev

FY2004 was a great year for the Tevatron:

1. Peak luminosity of 1.07×10^{32} cm⁻²/sec
2. Weekly average of 18.6 pb⁻¹
3. Integrated 343 pb⁻¹
4. Achieved Run IIa design luminosity (without recycler) of 86×10^{30}

Other highlights:

- Weekly average is 8 times Run I (2 pb⁻¹/week)
- DOE goals achieved for second year in a row.

Shiltsev reviewed the parameters governing luminosity integral, in particular the store lifetime, and then key elements of how luminosity was improved in

FY04:

1. Beta* reduction following identification of focussing errors. In mid-May, a solution was found that made the beams even smaller. The reduction of Beta* at the IP was confirmed by D0, with CDF measurements on the way. These improvements lead to 26% increase in the luminosity with the same number of p/pbar.

2. Reshimming: Support cold masses were compressed by pressure, resulting in the coils moving with respect to the magnet iron. This causes a distortion in the focussing properties (acquiring a skew-quadrupole moment) and increasing the beam size. The 108 most important magnets were identified, resulting factor two reduction in emittance growth between the Main Injector and the Tevatron. Another 424 magnets are being fixed, but the effect is not expected to be as big.

3. Alignment in the Tevatron: Identified that pbar kickers were 14 mm off, resulting in loss of horizontal aperture. At D0, a girder was misplaced by 1/4". This was fixed at the last shutdown, increasing the pbar transfer efficiency from 90% to 96-98%.

4. Machine Uptime: The Tevatron ran 38 weeks in FY04 versus 44 in FY03, but store times are still up by 4% due to better reliability and reduction of

beam study time (32->12 hours). Studies are typically performed after failures to diagnose them. In FY03, 77 out of 234 store terminations were unintentional, as opposed to the 43 out of 162 in FY04: with fewer failures, there are fewer opportunities for studies.

Summary of Luminosity Improvements (Approx)

Beta*: 26% for instantaneous, 14% for integrated (lower lifetime)
AA+RR shots: 18%
Longer Stores: 13% for instantaneous, 4% for integrated (larger stack->larger emittance and lower efficiency)
Emittance: 11%
AA->MI transfer 7%
work
Feedback and 5%
Beam Loading Compensation

The result is a factor 2.2 in instantaneous luminosity, 1.9 in weekly integrated luminosity, and 1.5 for the year.

Plans for FY05:

1. 470 pb⁻¹ integrated luminosity.
2. Break 20-year ISR record of 140x10^{30}.

How it will be done:

1. Improve transfer efficiencies (10-12% gain)
2. Reduce beam size at IP: (10-12% gain)
By reducing beta* and commissioning injection dampers.
3. Improve lifetime (7-9% gain)
Drop chromaticity with a new helix at low beat (separate the beams further). Autotune up at low beta, change RF spacing and reduce longitudinal emittance growth.
4. Improve uptime (7-9% gain)
Upgrade beam loss and position monitors.
Place PMTs around CDF to obtain beam propagation information.

With the plan and people in place, study times will be needed to realize the goal

of 30-40% increase in integrated luminosity. The Tevatron will need 10 hours a week of studies for 17 projects, with 3-4.7% reduction in integrated

luminosity. This is currently still under discussion.

Make up by increasing the stacking rate, reduce longitudinal emittance and

using the recycler. The latter may result in 10% integral gain if 2-3 mixed

source shots are used per week.

FY05 is a unique year in that luminosity gains will come mainly from Tevatron

upgrades, which means more study time. In FY06, the recycler will kick in. The payoff for the study time is a 100 pb⁻¹ gain in FY2005 and every year thereafter.

Subcommittee Reports:

User's Meeting: Ken Bloom

Proposed date is Wednesday/Thursday June 8-9. This is one week after a CDF

meeting, one week before D0 and CMS meetings. A draft outline for the meeting

was presented, with highlights on the change of Directorship, NuMI start up,

MiniBooNE and new initiatives (Proton Driver and Linear Collider).

Washington, DC Trip: Gottschalk

Gottschalk reviewed the logistics of planning the trip, including the joint

SLAC/SLUO meeting, which will be held at Fermilab this year.

Quality of Life: Andrew Alton

Alton proposed a unified UEC survey, covering visa issues as well as quality

of life to query the user community.

GSA Report: David Clark

Clark announced that there are 5 new GSA members following the election:

David Clark

Katherine Copic

Yannis Katsanos

Jennifer Pursley

Sinjini Sengupta

Clark also raised concerns following the recent thefts at CDF and D0 (at least

eight instances in the past few weeks), in particular the response of the site

security personnel to the thefts. Possible improvements in response, including

an email from the security to announce thefts and other crime when they occur

and better communication from shift-to-shift were discussed.

Next UEC Meeting: 13 November, 2004