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January 9, 2009

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Dear Dennis and Tony:

I am writing to summarize the meeting of the High Energy Physics Advisory Panel (HEPAP) held in Washington on November 13-14, 2008. At the start of the meeting, I noted with great pleasure this year's Nobel Prizes in physics which were awarded to three elementary particle physicists: Yoichiro Nambu for his work on spontaneous broken symmetry which was essential to the development of the Standard Model, and to Makoto Kobayashi and Toshihide Maskawa for their six-quark model that naturally explained the observed CP violation within the Standard Model.

We first heard from Dennis Kovar who discussed the budgetary situation of the past year – the largest funding reduction in recent years followed by a crucial supplemental funding bill. The current fiscal year is uncertain due to the continuing resolution extending into 2009. The Tevatron has been able to run and there has been flat funding in support of the LHC experiments, but other projects have had to be delayed. Enacting an FY2009 appropriations bill by early spring will be critical; a year-long continuing resolution would have dire consequences. On the positive side, FY2010 plans are being developed, a transition document has been prepared, the DOE will participate in the phase-I LHC accelerator upgrade, and a JDEM agreement with NASA has been signed.

HEPAP is very concerned with the budgetary deadlock and the serious damage that would occur to the high-energy physics program if a funding bill is not passed by March. The Panel hopes that an FY2009 funding bill will be well on its way to passage by the next meeting. HEPAP congratulated Dennis on being named a DOE Presidential Rank Distinguished Executive.

Joe Dehmer described the situation within the National Science Foundation. There is no new budget information, so they are planning for the full range of possibilities, from a year-long continuing resolution to the full FY2009 budgetary increase. Regarding new projects, Joe noted that half of the IceCube detector strings are installed, with the remainder going in over the next

few years; the collaboration is starting to look at the data. The Advanced LIGO project is starting construction. DUSEL is making progress on a number of fronts: a project engineer has been added to the NSF DUSEL team, a memorandum of understanding was drafted for the physics Joint Operating Group, the lifecycle funding plan was to be submitted by the Physics Division a few days after the HEPAP meeting, technical designs for proposed experiments are due in early January, and a full NSF review of the baseline facility plan will be carried out late in January.

Hesheng Chen, Director of the Institute of High Energy Physics in Beijing, described the high-energy physics program in China. The latest upgrades of the Beijing Electron Positron Collider and its detector are now complete and the complex is operating. The Daya Bay reactor neutrino oscillation experiment is under construction, with data taking expected to commence late in 2010. China is participating in both the LHC and ILC R&D. Their particle astrophysics projects include the China-Japan Air Shower Array in Tibet, participation in the Alpha Magnetic Spectrometer, and the Hard X-ray Modulation Telescope on the ChangEr-1 spacecraft. HEPAP is very impressed with the broad and rapidly expanding Chinese science program and their plans for the future.

Gary Feldman presented an update on the NOvA neutrino oscillation experiment. With its totally active detector at an off-axis angle relative to the upgraded Fermilab neutrino beam, the experiment will be the first to have sensitivity to the neutrino mass ordering. The current plan calls for a 14 kiloton detector, but it could be increased to 18 kilotons if they can preserve half of their contingency. Construction could begin soon since CD-3a was granted and funding was provided in the supplemental budget bill. If those funds appear by March, the first 2.5 kiloton far detector could be online in 2012, with the full detector complete by the beginning of 2014. In response to questions from HEPAP, Gary noted that a detailed analysis of the module construction model is needed to see whether a funding-dependent speed-up in construction is possible.

Steve Holmes reported on plans for the Fermilab multi-megawatt proton source which would produce a high-intensity neutrino source in the mid-term, with the possibility of being the front-end of a neutrino factory or muon collider in the future. R&D to be carried out will be synergistic with that needed for the ILC. They are aiming at CD-0 in FY2009 and CD-2/3a reviews in 2012 so that construction could begin in 2013. The current estimate is approximately $100M to get through CD-2. A multi-institutional collaboration is being established for the R&D phase; they hope to sign the memoranda of understanding at the next collaboration meeting. In the discussion with HEPAP members, it was suggested that a close collaboration with the XFEL project at DESY could help the Fermilab project.

Helen Quinn spoke on the status of the demography committee which has been working for almost ten years to understand the flow of young people into and out of the field. The database has been significantly improved, but even with time-consuming hand-checks, the uncertainties in the data remain too large to answer the demography questions of real interest. The committee suggested that adding individual identifiers would help, but the LBL representative stated this would require additional resources. It would also be very useful to know not only how many people left the field, but also what they are currently doing. In the ensuing discussion, it was agreed to have a phone meeting between the agencies and the committee to decide on a plan for the future.

Barry Barish reported on the work of the ILC Global Design Effort. They have moved from the Reference Design Report, which was a conceptual design, to the technical design phase which involves completion of the crucial R&D, optimizing the design, world wide industrialization, and planning for international governance. Although 30-40% of the total effort was in the U.S. and the U.K. at the time of the budget crises in both countries in December, 2007, the global program has been able to move forward because the work is focused at the large R&D facilities. In June, the plan for the technical design phase was released; it will be updated every six months. Cavity gradient has reached or exceeded 35 MV/m in some cavities, but the cavity-to-cavity spread is too large. R&D to understand this continues, especially regarding material defects near electron beam welds. A Fermilab test facility will be needed to carry out a system string test with beam loading. Other important work being carried out in the U.S. includes fast kicker studies at SLAC and electron cloud effect R&D at Cornell. Issues common to the ILC and CLIC will be addressed by the recently established joint working groups. The ILC effort in the U.S. has now restarted, but a long range plan for the work must be developed.

Hasan Padamsee spoke about R&D on superconducting RF, which has become a core technology for high energy physics, nuclear physics, nuclear astrophysics, and basic energy sciences. The research is being carried out in a worldwide collaboration. The industrial base is quite strong in Europe and Asia, but is growing very slowly in the U.S. Outstanding questions being addressed include the role of the grain structure of the niobium used in the cavities, the cavity yield at the needed gradient, increasing cavity Q for continuous wave applications, optimal use of gradient spread for high intensity applications, and theoretical research into niobium-tin as a superconductor for higher gradients. In response to a question, Hasan remarked that the coordinated international program is largely organized around specific projects such as the ILC.

Dennis Kovar gave a presentation on the Joint Dark Energy Mission process. Michael Salamon from NASA and John Henry Scott from OSTP were present to respond to questions. Kathy Turner from DOE was on the telephone. NASA, as the agency responsible for space flight, will lead the mission; the two agencies will work together on the scientific project. The DOE contribution will be approximately $200M in FY2008 dollars for construction and operation. An MOU has been signed. The overall project office is at the Goddard Space Flight Center; the DOE project office is at LBNL. The Science Working Group developed an improved figure of merit for comparing proposed experiments which is being used by the Science Coordination Group to modify the Reference Mission pre-conceptual design to maximize the science. A NASA Community Announcement of Future Solicitation went out on November 3. The community was given three weeks to comment on the details of this Announcement of Opportunity (AO), which will solicit proposals for various dark energy studies as well as other scientific investigations. Questions from HEPAP members produced a lively discussion on many important issues including instrument design, international participation, how the science will be done by the various teams, how the availability of ground-based data would be considered in the AO process, and the relationship between the detector builders and the science teams.

Lyn Evans reported on the commissioning of CERN's Large Hadron Collider. Turn-on, which occurred on September 10, was available for viewing on television by approximately one billion people. The initial machine studies were very successful, including multi-turn transport of both

beams and RF capture. Nine days later, a major failure occurred at a splice in a superconducting bus bar. Twenty-two magnets will be replaced with spares, with an equal number refurbished and reinserted into the ring. They are developing a method to detect any such problem in the future. A schedule for repairs is being prepared so that the experimenters will know when to expect accelerator turn-on. Lyn then described the two-stage plan for increasing the collider's luminosity by an order of magnitude beyond the design of 10^{34} $cm^{-2}sec^{-1}$. The first factor of two or three will occur after a shutdown in 2013. A major upgrade of the accelerator injector system is being considered for 2017 to complete the luminosity upgrade.

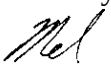
We then heard status reports on the ATLAS and CMS detectors from Mike Tuts and Joel Butler, respectively. They reviewed detector commissioning, computing status, physics readiness, and the activities to be carried out during the shutdown. Particularly impressive is the work that was done to understand the detectors, their timing and alignment using cosmic rays and single accelerator beams. They also discussed plans for the phase-I upgrades. U.S. ATLAS is concerned that funding will not be available as early as it is needed.

The final presentation was given by Gary Bernstein on the JDEM Science Working Group. It is charged with updating the figure of merit for assessing proposals that will be submitted in response to the AO. The major question is whether the constant in the dark energy equation of state differed from -1 at any time in the history of the universe. They are developing quantitative measures, considering the effect of systematic uncertainties, and also allowing for the violation of general relativity. The most difficult issue is agreeing on what the state of knowledge will be in 2016, when JDEM is expected to start collecting data.

Discussion of new subpanel charges was on the agenda but was postponed to the following meeting.

The next HEPAP meeting will be held on February 24-25. The panel hopes by then the FY2009 and FY2010 funding situation will have been clarified.

Sincerely yours,



Melvyn J. Shochet
Chair, HEPAP