

October 15, 2007  
DRAFT

Physics Advisory Committee  
November 1-3, 2007

**Charge**

**Introduction/Process**

Over the course of the past several months the Laboratory has commissioned a Steering Group which considered future directions for accelerator-based particle physics in the U.S. that could be considered should the decisions pertinent to the ILC be delayed. That process led to a report finalized in September 2007. It discusses various configurations of accelerators at Fermilab, including the construction of a linear accelerator capable of accelerating protons to 8 GeV. This energy is the same as that of the current Booster accelerator, the Recycler ring, the anti-proton Accumulator, and the Debuncher. Such an accelerator could form the basis of programs of physics based on these 8 GeV protons, on 120 GeV protons, or even allow the use of the Tevatron to work at 800 GeV. Ideas have been floated to use the Debuncher and/or Tevatron to condition the beams for particular experimental needs.

A start on defining the physics program for this accelerator system is currently embodied in a number of documents of varying length submitted to the Steering Group. Many of these ideas, and others that may arise, will be discussed in a workshop November 16-17 at Fermilab and at a follow-up workshop in January, both of which are being jointly organized by the Laboratory and the Users Executive Committee.

At the fall PAC meeting, presentations of the overall conclusions of the Steering Group, the accelerator plans, and the potential physics program will be presented by leaders of the Steering Group. Meanwhile, some of the ideas have been translated into Expressions of Interest, Letters of Intent, and Proposals to the Laboratory. Where appropriate, presentations to the PAC have been requested. However, it is not anticipated that any decisions can be made at this stage, especially where significant resources are required.

More generally, the ensemble of information available will be used to inform the Laboratory about the resources needed for preparatory work.

**Charge to the Physics Advisory Committee**

*Steering Group Report and Project X Physics*

At this meeting, the PAC will hear about the Fermilab Steering Group Report, its recommended Project X accelerator, and the physics program made possible if Project X were built. The PAC should focus on the Steering Group Report and the physics made possible by such a facility. In particular, comment on the physics program afforded by Project X; is the

outline of that program complete, coherent, and potentially compelling? Are there elements of the program which should be emphasized, further developed, or are missing? Does the Committee see potential for a collaborative approach to planning and implementation at the national scale or at the international scale?

*Computational Astrophysics (Dodelson)*

A program of computational astrophysics was seeded in FY2007 at Fermilab. Funding was received from the University of Chicago under the FRA umbrella and from the Kavli Institute for Cosmological Physics (KICP) at UC; and resources were contributed by the Fermilab's Theoretical Astrophysics Group and Computing Division. The PAC will hear a report from a task force which was charged with developing the case for an ongoing program in this area and the potential business model. The PAC should comment on this beginning, compare it to related efforts elsewhere, and make a recommendation with respect to continuation of support for this initiative and its potential for development into a major national program.

*CMS Upgrade (Butler, Bortoletto)*

The US CMS Collaboration has submitted to the CERN LHCC, and delivered to the DOE, a document outlining its interest in participating in the upgrade of the CMS detector for the anticipated higher luminosity at the LHC. The PAC will hear a presentation and elaboration of this initial plan from the US CMS point of view. The PAC should comment on how the effort fits the expected needs of the CMS experiment. In particular, are the chosen emphases appropriate? The Laboratory would also like to hear whether the perceived impacts, positive or negative (if any), match the importance of this program for Fermilab.

*E-944 MiniBooNE Extension (Brice/Van de Water)*

The MiniBooNE collaboration has submitted a proposal to extend the current experiment to collect an additional  $3 \times 10^{20}$  protons on target for anti-neutrino beam production. The PAC should consider this proposal, the physics reach which would be afforded, the impact on the rest of the program, and the physics priority which such a commitment of beam should receive; and make a recommendation.

*P-974 MicroBooNE (Fleming/Willis)*

The MicroBooNE collaboration has submitted a proposal to install a liquid argon detector upstream of MiniBooNE. The PAC should consider the physics goals of the proposal, the physics reach and interest of a successful implementation of such an experiment, and any ancillary contribution to the development of liquid-argon detector technology. The PAC should prepare written comments and questions as necessary to guide the Laboratory and the collaboration in the consideration of this proposal.

*P-975 NuSOnG (Conrad/Fisher)*

The NuSOnG Collaboration has expressed the intent to make a proposal to build a new experiment using a beam of neutrinos generated by the Tevatron. The PAC should consider the physics goals of such a proposal, what would be required to implement such a proposal, and the physics reach and interest of a successful implementation of such an experiment. Comments made at this stage would inform the Laboratory and might help the experimenters as they prepare a proposal.

*P-973 Mu2e (Miller/Prebys)*

The Mu2e collaboration has expressed the intent to make a proposal to extend the search for evidence of muon to electron conversion in a new experiment at Fermilab. The PAC should consider the physics goals of such a proposal, what would be required to implement such a proposal, and the physics reach and interest of a successful implementation of such an experiment. Comments made at this stage would inform the Laboratory and might help the experimenters as they prepare a proposal.

Additional comments on the R&D necessary to make a full proposal and/or develop the experiment may be appropriate.

*Tevatron Collider Program*

At the recent P5 Meeting, the Laboratory and the experiments, CDF and D0, made presentations in support of operation of the Tevatron Collider during 2010. As of now, there is no written report from P5. Nevertheless, the Laboratory is given to understand that the eventual decision will depend heavily on the Laboratory Director. The advice that such a decision be taken in spring/summer 2008 was received.

The P5 material is made available to the PAC and there will be short summary presentations from the two experiments. The PAC is asked to come up to speed with these issues. Any comments they may have concerning this decision would be welcome.