



Closeout Report

on the

*Department of Energy
Review Committee*

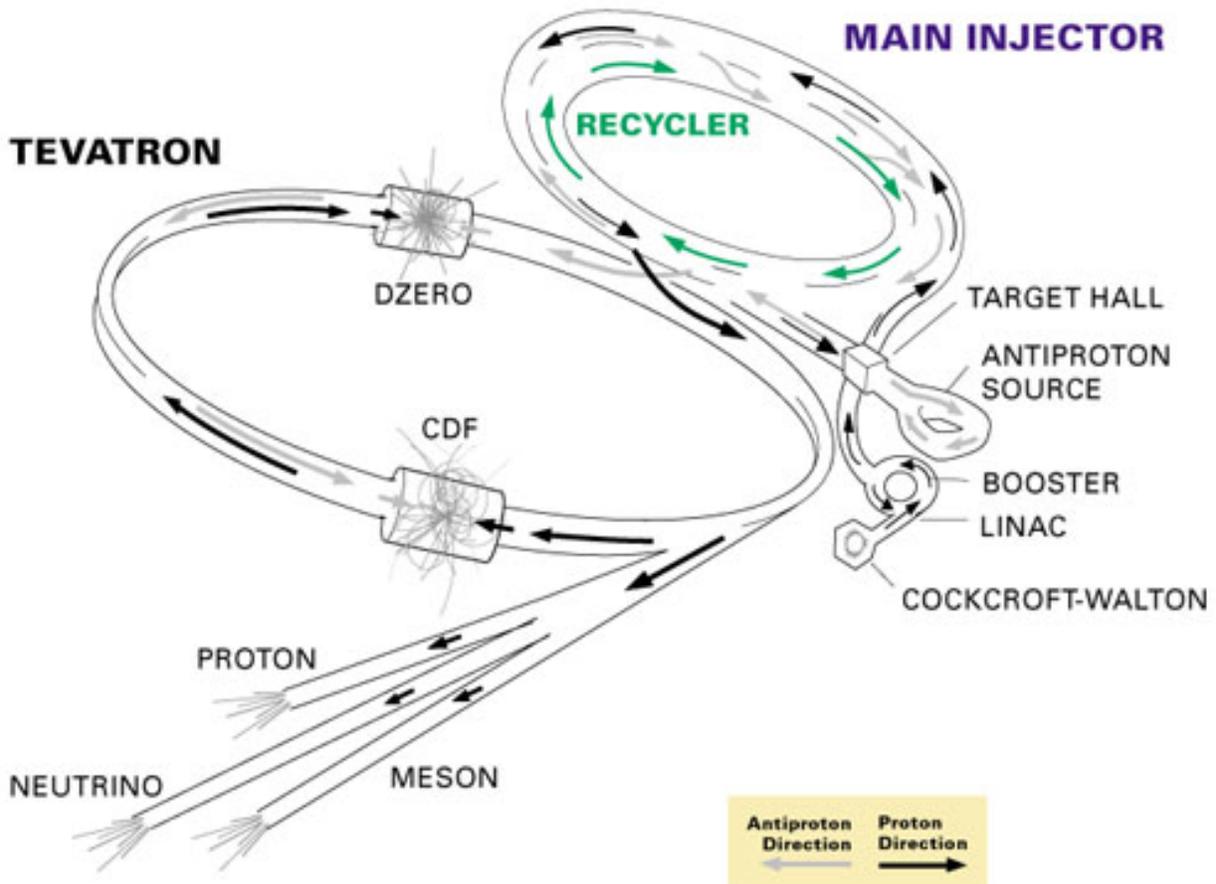
on the Assessment of the

RUN II LUMINOSITY PLAN at the FERMILAB TEVATRON

July 23, 2003

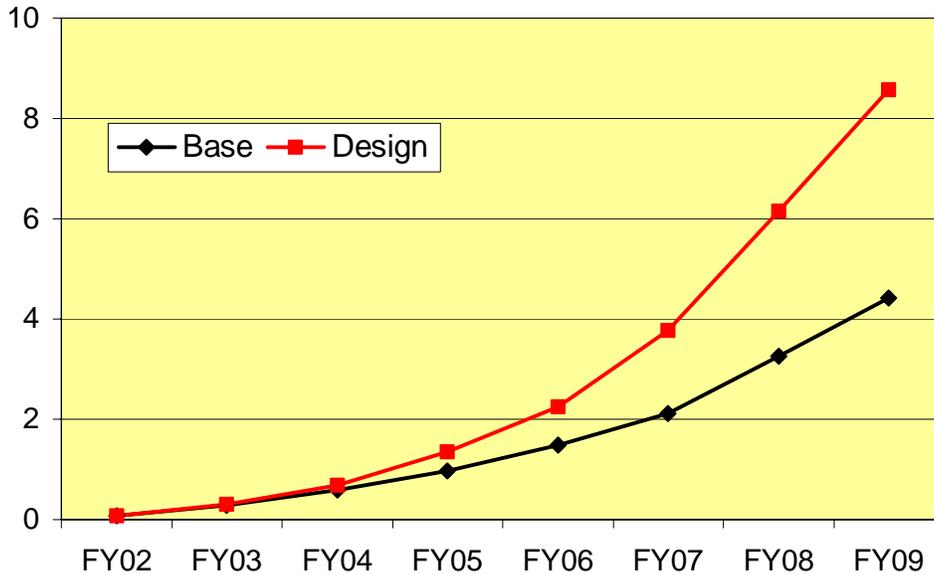


Fermilab's ACCELERATOR CHAIN





Luminosity Projections



Integrated Luminosity (fb ⁻¹)				
	Design Projection		Base Projection	
	per year	Accumulated	per year	Accumulated
FY03	0.22	0.30	0.20	0.28
FY04	0.38	0.68	0.31	0.59
FY05	0.67	1.36	0.39	0.98
FY06	0.89	2.24	0.50	1.48
FY07	1.53	3.78	0.63	2.11
FY08	2.37	6.15	1.14	3.25
FY09	2.42	8.57	1.16	4.41



Charge to the Committee

DATE:

REPLY TO
ATTN OF: April 18, 2003

SUBJECT: SC-22

TO: Request to Conduct a Review of the Tevatron Run II Luminosity Upgrades

Mr. Daniel Lehman, Director, Construction Management Support Division, SC-81

I would like to request that you lead a status review of the Tevatron Run II Luminosity Upgrades at Fermi National Accelerator Laboratory on July 21-23, 2003. The purpose of this review is to assess the performance of the Tevatron in FY 2003 and Fermilab's plan to increase the luminosity of the Tevatron collider during fiscal years 2004-2006.

As a result of the action items developed at the October DOE 2002 review, Fermilab is formulating a detailed resource-loaded plan to carry out the luminosity upgrades. Fermilab plans to replace or augment equipment in the Tevatron complex and modify their procedures for running the complex in order to increase the luminosity from its current average initial value of $3.0 \times 10^{31} \text{ cm}^{-2} \text{ s}^{-1}$ to at least $2.0 \times 10^{32} \text{ cm}^{-2} \text{ s}^{-1}$ with possible integrated luminosities reaching a minimum base goal of 6.5 pb^{-1} and possibly achieving a stretch goal of 11 fb^{-1} by the end of FY 2008.

In performance of a general assessment of the current status, the future plan and the identification of potential issues, the committee should address the following specific items:



1. Is the Laboratory plan reasonable to achieve the stated luminosity improvements?
2. Have adequate resources (i.e. manpower, funding, etc.) been identified and allocated to carry out the plan?
3. Is the proposed resource-loaded schedule credible and appropriate in light of the technical tasks required?
4. Have the major technical, schedule and cost risks been adequately identified and assessed in the plan?
5. Have the issues of reliability of all elements of the Tevatron complex and the site infrastructure been adequately addressed?
6. Is the management structure adequate and appropriate for implementing the proposed plan to a successful completion?
7. The committee is also asked to assess the laboratory's response to the comments and recommendations from the October 2002 review.

Michael Procaro is the program manager for Fermilab in this office and will serve as the DHEP contact person for the review.

We appreciate your assistance in this matter. As you know, these reviews play an important role in our program. I look forward to receiving your Committee's formal report within 60 days of the review.

[signed]

Robin Staffin
Acting Director
Division of High Energy Physics

cc:

R. Orbach, SC-1
J. Decker, SC-2
P. Rosen, SC-20

L. Dever, SC-80
M. Procaro, SC-221
A. Byon-Wagner, SC-223

M. Witherell, Fermilab
J. Monhart, FAO



Review Committee

Department of Energy Review of the Tevatron Run II Luminosity Upgrades July 21-23, 2003

Daniel R. Lehman, Chairman (DOE)

SC-1

Accelerator Physics

- * Steve Peggs, BNL
- Rick Baartman, TRIUMF
- Francesco Ruggerio, CERN

SC-2

Proton Source

- * Thomas Roser, BNL
- Uli Weinands, SLAC
- Karlheinz Schindl, CERN

SC-3

Anti-Proton Source

- * Gerry Dugan, Cornell
- Flemming Pedersen, CERN
- Fritz Caspers, CERN

SC-4

Tevatron

- * Norbert Holtkamp, ORNL
- Georg Hoffstaetter, Cornell
- Ferdi Willeke, DESY

SC-5

Instrumentation

- * Bob Siemann, SLAC
- Massimo Placidi, LBNL

SC-6

Management Systems Integration

- * Jay Marx, LBNL
- Klaus Berkner, Consultant
- Marty Breidenbach, SLAC
- Stephen Meador, DOE/SC

Observers

- Aesook Byon-Wagner, SC-22
- Michael Procario, SC-22

LEGEND

- SC Subcommittee
- * Chairperson
- [] Part-time Subcom. Member

Count: 19 (excluding observers)



Writing Assignments

Executive Summary Meador

1. Introduction Procario

2. Technical

 2.1 Accelerator Physics..... Peggs/SC-1*

 2.1.1 Findings

 2.1.2 Comments

 2.1.3 Recommendations

 2.2 Proton Source..... Roser/SC-2*

 2.3 Anti-Proton Source Dugan/SC-3*

 2.4 TevatronHoltkamp/SC-4*

 2.5 InstrumentationSiemann/SC-5*

3. Cost Estimate..... Meador/SC-6*

4. Schedule and Funding..... Meador/SC-6*

5. Management Marx/SC-6*

Appendices

- A. Charge Memorandum
- B. Review Participants
- C. Review Agenda
- D. Luminosity Projections
- E. Cost Table
- F. Schedule Chart
- G. Funding Table
- H. Action Items

SC-Subcommittee

* All subcommittees need to respond to each of the charge questions.



ACTION ITEMS

**Resulting from the July 21-23, 2003
Department of Energy Assessment of the
Run II Luminosity Plan at the Fermilab Tevatron**

<u>Action</u>	<u>Responsibility</u>	<u>Due Date</u>
1. Conduct mini-review	DOE/Fermilab	October 8, 2003
2. Deliver the updated Run II Luminosity Upgrade Plan to DOE	Fermilab	January 30, 2004
2. Conduct review of updated Run II Luminosity Upgrade Plan	DOE/Fermilab	February 24-26, 2004

R. Dixon
Beams Division Head
Fermilab

D. Lehman
Review Chairman
Department of Energy

S. Holmes
Associate Director for Accelerators
Fermilab

M. Procaro
Program Manager
Department of Energy

M. Witherell
Director
Fermilab

J. Monhart
Fermi Area Office Manager
Department of Energy

2.1 Accelerator Physics

S. Peggs (BNL), R. Baartman (TRIUMF), F. Ruggiero (CERN)

Findings

Excellent progress continues to be made by the Beam Physics department in support of Run II luminosity goals!

Remarkable results have already been obtained from the accelerator modeling effort.

Beam Physics has contributed to significant breakthroughs at the **Booster** (aperture limitations caused by dog-leg dipoles) and at the **Tevatron** (linear coupling)

The Beam Physics department has recently been renamed the **Accelerator Integration** department, and its mission has **begun** to be re-defined.

Their main task is to operate in a vital **"horizontal"** role across **"vertical"** machine groups, taking a global perspective.

Comments

We encourage **continued modeling** work in **particular** areas, such as space charge and transition crossing in the Booster, and beam-beam effects in the Tevatron.

We also anticipate the development of a **comprehensive model** of the collider **complex, from source to collisions.**

The upgrade plan too heavily emphasizes **machine-specific goals.**

We **suggest** consideration of the following Accelerator Integration initiatives:

- a) Identify a "Beam Study Coordinator"
- b) Set-up a Task Force for "Emittance Preservation"
- c) Set-up a Task Force for "Machine Impedance" (aka "Impedance Police")
- d) Set-up a "Machine-to-Experiments Interface Working Group", to ensure a direct exchange of **technical** information

We **suggest** that the AI group and others:

- a) Give maximum priority to **minimize the antiproton emittance** at injection into the Tevatron, and to **maximize** proton and antiproton beam **lifetimes**.
- b) Actively **pursue helix optimization**, and clarify the dependence of long range beam-beam effects from relative versus absolute beam separation.
- c) Establish a simplified/optimized procedure for shot set-up, and to **enable more operators and physicists to master the machine complex**.
- d) Support the assessment and review of **high level controls improvements and upgrades**.

Recommendations

- 1 **Clarify and expand the "horizontal" role of the Accelerator Integration department**, in support of the individual machine groups. Consider the establishment of task forces or working groups for emittance preservation, machine impedances, and for the machine-experiment interface.
- 2 **Create, maintain, and exploit an integrated depository of basic configuration data for each accelerator and beam line.** This should include optics information, survey and alignment data, magnetic imperfections, and apertures. It should also include simulation software available to a broad public of users.

- 3 **Target a doubling of the number of expert Operators and Physicists** who are fully qualified to operate the Tevatron complex, capable of being on-call, and of preparing, performing and analyzing beam studies.

- 4 **Develop a comprehensive model of the Collider complex**, to analyze baseline and fall-back luminosity scenarios under various conditions, and to help establishing evolving target performance for each accelerator and relative priorities for beam studies or new equipment.

- 5 **Explore a scenario with a reduced number of bunches** (say 18 instead of 36) for a given total antiproton intensity.

2.2 Proton Source (SLAC)

Thomas Roser (BNL), Karlheinz Schindl (CERN), Uli Wienands

Findings

- Responded to recommendations of the October 2002 review in a positive manner.
- Excellent availability (better than 90%) delivering the required beam intensity.
- Potentially serious supply crisis of 7835 rf power tubes for the five Linac drift tube tanks. Averted by borrowing spare tubes from Argonne and Brookhaven. Plan to build up the spare tube budget and pursue alternative options.
- 8 GeV Booster: workhorse of the complex, intensity per pulse of up to 5×10^{12} . Beams for the fixed target experiment MiniBoone. Larger throughput than for collider operation. Loss monitor system switches off the beam when losses exceed 400 W.
- Four magnet dogleg to by-pass the extraction septum magnet causes strong edge focusing. Reduces the horizontal acceptance from 16 to 8 π mm mrad. New dogleg system may potentially lead to a significant increase of the intensity per pulse. The Committee congratulates the team for this great success.

2.2 Proton Source (SLAC)

Thomas Roser (BNL), Karlheinz Schindl (CERN), Uli Wienands

Findings

- MI captures and coalesces protons with $\sim 85\%$ efficiency, mostly independent of the intensity
Can provide adequate bunch intensity for the Tevatron (300×10^9 protons per bunch).
Longitudinal emittance for 7-bunch coalescing exceeds the desired value (~ 3 eVs).
- Vertical emittance blowup traced to saturation effects in the beam profile monitor.
Actual emittance growth during acceleration about 2π mm mrad.
Observed enlarged emittance in Tevatron due to growth during transfer from MI to Tevatron.
- “slip-stacking”: increase proton intensity for p-bar production by up to a factor of two.
Recently successfully tested at a stacked intensity of 4.5×10^{12} .
- Installation of longitudinal dampers planned for the Fall shutdown is expected to control longitudinal instability in MI. This will allow reducing the longitudinal emittance of the Tevatron proton bunches.

2.2 Proton Source (SLAC)

Thomas Roser (BNL), Karlheinz Schindl (CERN), Uli Wienands

Comments

- Resources for the proton source upgrade in the Run II plan seem reasonable and adequate.
- Maintain number of spare 7835 tubes at a level that allows operation for two to three years. Leaves adequate time to develop an alternative option in case Burle Industries is not able to supply any more new or rebuilt rf power tubes.
- Throughput will gradually increase from at present 4×10^{16} particle per hour to 1.8×10^{17} . This fourfold increase is a formidable challenge. The beam physics work, which has so successfully started, has to be continued vigorously in order to continue to progress towards this goal.
- The effort to improving the beam intensity/emittance ratio should be continued, which has been shown to have direct benefit for the Tevatron performance.
- The MI is able to capture and accelerate the beam intensities required at present and as anticipated in the Run II plan. Required upgrades for slip-stacking, beam-loading compensation and feedback systems are ready to be installed in August/September. At present, support of this system appears to be adequate.

2.2 Proton Source (SLAC)

Thomas Roser (BNL), Karlheinz Schindl (CERN), Uli Wienands

Comments

- Slip-stacking results are very encouraging; the team should be proud of this achievement. Commissioning of slip-stacking and beam-loading compensation should continue at high priority.
- Installation and commissioning of the longitudinal feedback system should proceed with high speed. We fully endorse the chosen architecture using common hardware and state-of-the-art digital technology for a number of these systems.
- We encourage the team to continue looking for ways to reduce the beam emittances. Smaller longitudinal emittance ($< 2\text{eVs}$) can benefit for injection and acceleration efficiency of the Tevatron. Likewise, shortening the bunch length for pbar production may significantly enhance the pbar yield..
- We encourage the MI and Booster groups to work closely together to solve problems arising at the beam transfer from Booster to MI. The same applies to beam transfer from MI and to the Tevatron and p-bar source.
The presented emittance budget should be completed by including Linac and Booster emittances in order to better assess machine performance.

2.2 Proton Source (SLAC)

Thomas Roser (BNL), Karlheinz Schindl (CERN), Uli Wienands

2.2.3 Recommendations

1. Test operation of pbar production using slip stacking including cogging necessary for multi-batch transfers and beam-loading compensation before the upcoming shutdown.
2. Reexamine the operating parameters of the whole collider facility to fully exploit the potential capabilities of the proton source by the next review.
3. Continue to aggressively improve the bunch intensity and emittances, especially longitudinal, of the proton beam for the Tevatron and the pbar production target.
4. Continue the successful work on quantitative understanding of the beam dynamics and losses in the Booster.
5. Continue to adhere to the present policy of limiting machine activation to allow hands-on maintenance of the Booster.
6. Consider increasing the plan for spare 7835 tubes to a two-year supply.

2.3 Antiproton Source and Recycler

Committee members:

Fritz Caspers, CERN.

G. Dugan, Cornell;

Flemming Pedersen, CERN;

Charge items 1,4, 5: Reasonableness of the plan, technical risks, reliability issues:

• **Targeting, lithium lens upgrades:**

- Good work in identification of improved target materials, better understanding of optimum target spot size
- Lithium lens improvements look promising: good chance of lifetime and/or gradient improvements

Antiproton Source and Recycler

• Debuncher, AP-2 aperture improvements:

- Detailed planning underway, but solid experimental procedures to identify aperture restrictions have yet to be developed.
- There have been repeated efforts in the past to improve the aperture of these systems, with limited success. Given this context, the Committee considers the goal of 35x35 mm-mrad to have significant technical challenge.

• Debuncher longitudinal cooling:

- The energy spread of the beam injected into the Accumulator is a key performance parameter for the stacking rate.
- The Committee recommends that additional efforts be made to reduce the bunch length of the proton beam, and that the possibility of modulation of the η function in the Debuncher be considered.

Antiproton Source and Recycler

- **Accumulator stack tail cooling upgrade:**
 - The Committee concurs with the overall philosophy adopted for the stack tail improvements, i.e., effectively trading storage capability for flux capability, when the storage requirements can be shifted to the Recycler.
 - The Committee recommends continuing strong efforts to better understand and suppress effects which currently limit stacktail cooling performance.
- **Rapid antiproton transfers:**
 - The Committee did not identify any major issues here, and generally felt that there was a good chance that this effort would be largely successful.

Antiproton Source and Recycler

• Recycler storage ring and electron cooling

- Design and performance features of the Recycler vacuum system remain a point of concern.
 - Effects of Main Injector stray fields on the stored beam in the Recycler continues to be a serious issue.
 - Progress in development of the high-energy electron cooling system continues to be very good, and the installation and commissioning efforts seem to have been well-thought-through.
 - Electron cooling system at this high energy is a novelty, and surprises should be expected.
 - Operational scenarios for electron cooling in the Recycler are still being worked out.
- *Given the known problems, and potential unknowns in both the Recycler and the electron cooling systems, the Committee considers this aspect of the Run II Upgrade to have substantial technical risk at this time, and it is difficult to assess the likelihood of timely success.*

Antiproton Source and Recycler

Charge items 2,3: Are there adequate resources, is schedule credible and appropriate?

- The Committee's review of the resource-loaded costs and schedule did not reveal any major issues, other than with the AP2-Debuncher aperture increase. The scope of this work is not well defined at this point and there may be surprises.
- The Committee is concerned about the level of scientific manpower resources applied to the Recycler commissioning, and to electron cooling. These technically critical and challenging areas should receive a great deal of *immediate* attention.
- The Committee recommends a timely and thorough review of the scientific staffing needs in these areas, and encourages particularly efforts to engage experienced accelerator physicists in these challenging projects.
- Beam study time needed for the Recycler commissioning has been budgeted as a 25% "pbar tax". This study time is essential.



2.4 TEVATRON

Georg Hoffstaedter

Ferdinand Willeke

Norbert Holtkamp

• Findings

- Peak Luminosity and integrated luminosity increased significantly; Run II is now $\sim 300 \text{ pb}^{-1}$, which is more than a factor of two over the total luminosity integrated in Run I. Tevatron will most likely deliver the base goal integrated luminosity for FY 03
- Increased emphasize on accelerator physics across the board which has impacted the performance and the Run II plan in a very positive way in many areas
- The alignment issue has been addressed, investigated, understood and a plan to fix it is in place
- Largely automated measurements of beam parameters do exist and are available in the control room. There is better and more diagnostics.
- A plan to provide sufficient spares is in place. There is sufficient emphasize on this subject.
- A reference magnet as a tool for magnetic field control has been thoroughly investigated.
- First results with the operation of the TEL were shown.

• **Comments**

- Integrated Luminosity is not as good as projected last October but on track for this years goal.
- There was a big payoff in the proton intensity without the C0 lambertson. Full use of the increased aperture could not be made due to present dynamic aperture restriction.
- AP effort needs a more coherent approach with simulation tools that are benchmarked and a common input database under configuration control.
- The committee agrees with the presented approach on the realignment of the Tevatron. AP support is needed here very soon and data should be made available for on/offline analysis. The required resources seem sufficient and should be fully dedicated.
- Presently measured emittances at injection are larger then presented in the RUN II plan and can only be reduced due to beam scraping. With the realignment smaller emittances should be available and the parametric model needs to reevaluate this important aspect as soon as possible
- The luminosity loss due to unavailable expertise in the control room is not acceptable. Experts should constantly tune maximum performance or specifically train operators to be able to do so.
- Reliability and downtime is addressed but more involvement of the Tevatron department in analysis and planning of maintenance will be beneficial
- Abandoning the expensive reference magnet system is the right choice. We concur with presented approach of doing offline analysis
- In general resources and schedule that was presented is consistent with the goals of the RUN II plan. More details are necessary to ensure that the required resources to make the ambitious plan successful are available and not overcommitted.

- Recommendations:

- Develop a more coherent approach to modeling of the Tevatron and set up an input database that is put under configuration control by the next review.
- Start immediately to specify and develop control tools for automated measurement that can be integrated into operations.
- Involve the accelerator physicists in routine operations to benefit the medium and long term accelerator tuning of performance.
- Provide written instruction for complicated procedures in the control-room and provide Tevatron specific operator training.
- Install and commission the planned diagnostics upgrades in the A1 transfer line as soon as possible.
- Commission the transverse feedback systems as soon as possible.

- Implement the alignment plan and give all necessary priority to finish this task up in the next shut down.
- The Tevatron department head should take an aggressive role in monitoring down times and other sources of inefficiency, in discussing possible cures and priorities with the technical support groups.
- Pursue the reduced reference magnet system plan and develop a firm schedule within the next 3 month.
- Perform experiments with the largest possible proton bunch currents to analyze the necessity of active beam beam compensation. Quantify the Luminosity improvements that can be achieved by integrating Beam Beam compensation (either the Tevatron Electron Lens or the Wire compensation) into operations by the next review. (2nd time)
- Finish the resource loading of the RUN II upgrade plan to ensure that there is no over-commitments of specific individuals.
- Expedite the construction and installation of the Tevatron BPM electronics as much as possible.
- Make use of the existing expertise in the lab as much as possible

2.5 Instrumentation and Diagnostics

Bob Siemann (SLAC) and Massimo Placidi (LBNL)

2.5.1 Findings

.....

2.5.2 Comments

- There has been a substantial increase in emphasis on instrumentation since the October 2002 review. Needed resources were made available in FY2003 and/or are included in the luminosity upgrade plan. Communication has improved between the Instrumentation Dept. and the Systems Departments, and other divisions are contributing significantly to the instrumentation.
- The beam position monitors in the Recycler, Main Injector, Tevatron and anti-proton source are either completed or included in the luminosity upgrade.
 1. The Tevatron system should have the capability of measuring anti-proton orbits during routine operation. (..... technical details)
 2. The beam position monitor systems would benefit from common technical approaches to the extent possible.

2.5.2 Comments

- The luminosity upgrade plan has identified and allocated needed funding when contingency is taken into account. The manpower called for in the plan is reasonable, but specific individuals are yet to be identified. Therefore, it is unclear that people with the required skills will be available when called for in the schedule.
- The schedule for instrumentation is credible provided people are available when needed. Of course, there would be performance benefits if some of the instrumentation upgrades were completed earlier.
- The instrumentation projects will improve reliability and maintainability by replacing old, outdated electronics, connectors, etc.

2.5.2 Comments

- The Assistant Division Head for Controls and Instrumentation, who is part of the management team, does not have responsibility for the Accelerator Controls and Instrumentation Departments.
- Instrumentation and diagnostics will be critical for success of the Tevatron, and there will be a continuing need for new instrumentation after the present plans are completed.

2.5.3 Recommendations

- Develop specifications and requirements for measuring anti-proton orbits during routine Tevatron operation and include the capability to make such measurements in the Tevatron beam position monitoring system. The specifications and requirements should be complete by September 1, 2003.
- The Assistant Division Head for Instrumentation and Controls should have line responsibility for the Accelerator Controls and Instrumentation Departments.

3.0 & 4.0 Cost and Schedule

(S.Meador)

- Cost estimates developed by task managers using a standard template and guidelines
- Costs can be rolled up using a WBS
- A WBS Dictionary and Basis of Estimate has been developed
- The bases of estimates includes: historical costs, expert opinion, and vendor quotes
- Scope not yet defined has been highlighted and in these cases “representative” estimates included

Cost and Schedule

- The Run II schedule has been developed in MS Project and includes over 600 activities
- Many of the activities are parallel and a critical path analysis has not been done
- Estimates of activity durations are documented in the Basis of Estimate
- Over 50 milestones define physical progress evaluation points, major scope decision points and planned internal technical reviews

Cost and Schedule

- Generally, the Committee finds the cost and schedule estimates to be complete, but preliminary - not baseline quality
- The timing, nature, number and sequence of milestones seem appropriate.
- The Committee endorses the establishment of a dedicated “project controls” team to assist the task managers and to track status for the Management Team

Recommendations

- Present a detailed progress update of the internal cost and schedule estimate review at the Mini-Review scheduled in October 2003
- Establish, by December 2003, cost and schedule estimates that can serve as “baseline” for measuring progress against plan and tracking variances

Management Overview (5)

Jay Marx, LBNL (chair)
Marty Breidenbach, SLAC
Klaus Berkner, LBNL, ret.
Steve Meador, DOE
Jim Yeck, DOE

Management Concerns

In the past there have been serious management concerns—

-the lack of focus on run II

-the level of involvement of top laboratory management

-the morale of the staff and trust in management

-attrition of technical staff

-insufficient communications at all levels

**-the effectiveness of the management, e.g. the level and reality of planning,
the effective utilization of planning processes)**

- the ease for new people, within and outside of Fermilab to become involved

The New Management Team

Since the October 2002 review the Laboratory management has recognized these concerns and has begun to take steps to address them.

A new head of the Beams Division was appointed, and shortly before this review, a number of significant changes to the management team were made.

The roles and responsibilities of the Associate and assistant Beams Division Heads are not sufficiently defined. Some positions appear to be closer to staff than line.

Some of the new Beams Division management team have limited accelerator experience.

The Beams Division Head has also appointed a very experienced and respected accelerator physicist as Assistant Division Head, Scientific Advisor but her role and level of involvement is not yet well defined.

This team may well have the mix of knowledge and experience needed to succeed, but there is as yet no significant track record. The next six months will be critical.

To bring the technical strength of the team to the required level, the committee believes that it is essential to add more accelerator expertise.

Laboratory management and stakeholders must evaluate rapidly if the new Beams Division management team will succeed. The laboratory management must define management milestones for the next year to judge the performance of the new team.

Management Risks

Laboratory and Beams Division management must aggressively establish effective and open communication at and between all levels. Priorities and decisions and the basis of decisions must be understood at all levels, and ideas from all levels in the staff should be given due consideration.

Success depends critically on the staff at all levels buying-in to the new plan; the plan must be perceived as being realistic; and a shared belief in the sustained commitment of the laboratory to reach the goals.

Success also requires a high degree of discipline and teamwork across the whole Beams Division as well as encouragement of people from outside the Division (from inside and outside of the Laboratory) to contribute.

Translation: Run II needs effective leadership to succeed.

Signs of Change

Since the last review there have been positive management-based changes:

New emphasis on diagnostic instrumentation by the Beams Division management

Horizontal task forces (e.g. integration task force, Tevatron task force, etc) set up to address specific cross cutting issues

More modeling is guiding the upgrade strategy

Interactions with rest of lab are improving; but processes for hand-off of work, e.g. for setting requirements and specs and managing the tasks need development.

Interactions with other institutions are receiving more emphasis.

The Role of the Laboratory Director

The Laboratory Director is clearly focused on the success of Run II. He recognizes the need to be directly involved in the setting of priorities, in the making of the difficult decisions, and being cognizant of technical progress and issues.

The daily commissioning monitoring meeting and the Run II task force that he chairs are steps in the right direction. They can and should play a critical role in improving communications and directing the strategy of Run II.

Expectation Management

There has been a serious problem of expectation management --luminosity projections have been changing with time in the downward direction.

The stakeholders must be given performance expectations that they can count on with a high degree of confidence. The credibility of the Laboratory and of the whole field hangs in the balance.

Manpower

There is a critical need for additional accelerator physics and engineering manpower in a number of key areas (e.g. the recycler, modeling, applications software...)

The users should be encouraged to collaborate and contribute to the accelerator upgrade efforts.

Use the plan as a tool to determine whether key people are over committed.

Utilize the Plan to bring on needed manpower (who, when, how) as basis to monitor progress

Recommendations:

- 1. The Laboratory should scrub the existing plan by the end of the calendar year. By February 2004, it should incorporate the recycler to produce a complete and comprehensive plan for Run II.**
- 2. The DOE should review the status and the comprehensive plan for Run II soon after plan has been completed.**
- 3. The Laboratory, by September 1, 2003, should define clear management milestones for the next year that can be used to determine the effectiveness of the new team.**
- 4. The Beams Division Head should clarify the roles and responsibilities of the Associate and Assistant Division Heads by September 1, 2003.**

Review Summary

The Laboratory has a high quality staff working extremely hard on the commissioning, maintenance and upgrading of the Tevatron complex. There is a high probability that the FY03 luminosity goal will be reached.

Achieving the scientific potential of the Tevatron complex will be a great challenge for the whole laboratory. It will require active, well-integrated involvement from all Divisions.

Success requires the new management team to effectively lead and manage the many technically complex activities that make up Run II. The next 6 months will be critical.

Luminosity Projections

The Laboratory has presented two projections of the luminosity through FY09, a “design projection” of 8.6 fb⁻¹ and a “base projection” of 4.4 fb⁻¹.

Both projections assume successful integration of the electron cooling in the recycler. This represents a very significant uncertainty.

The committee views a projection of ~4 fb⁻¹ by the end of FY09 as having a reasonable probability of being met

Meeting the design projection of 8.6 fb⁻¹ by the end of FY09 is very challenging

The Plan

The Laboratory has developed an ambitious bottoms-up plan to support new integrated luminosity projections

The plan has not been completed and the recycler commissioning and operations plan still needs to be completed and then incorporated into the plan.

Nor has enough time passed to judge whether this ambitious plan is realistic.

By the time of the next review it should be possible to better determine whether the plan is on track and whether the Laboratory is evolving in the way needed to successfully execute the plan.

So what's the bottom line?

We're watching and waiting to see if the new management can lead the team to success and solve organizational and technical issues as they arise

We are looking for performance that shows that the ambitious plan is achievable

We look forward to the Tevatron complex being reliable, and well-characterized to serve as a platform for the cutting edge upgrades.

We look forward to the recycler commissioning and operating plan and from that, a clearer picture of the expected contribution of electron cooling

We (and the lab) recognize that there are many challenges and uncertainties ahead.

The next 6 months are critical