Tevatron BPM Instrumentation Upgrade Technical Review

- Tuesday, December 16, 2003
- Goal: To review the proposed BPM upgrade technology choice and project plan.

- **Review Committee:**

  Marvin Johnson (Chair)
  Al Baumbaugh
  Alan Hahn
  Jim Patrick
  Tom Shea (SNS/ORNL) ←
  Om Singh (ANL) ←
  Mike Syphers

http://www-bd.fnal.gov/run2upgrade/reviews

The Tevatron BPM System Upgrade

- The upgrade involves replacing the existing signal processing electronics for all 232 BPMs (928 total channels) and developing the associated software.
- The goal is to provide significantly better performance and expanded functionality over the present system, in a timely fashion.
- The measurement requirements were reviewed and endorsed in September, 2003.

Charge

1. Is the technology choice appropriate and adequate to meet the approved requirements/needs of Run II?
2. Is the technology choice the most cost/time effective solution for the required performance? Consideration should be given in particular to the development time involved, the schedule and long-term maintenance of the system. The goal for the project is to complete the BPM upgrade by October 1, 2004.
3. The highlights of the requirements include (a) supporting an order of magnitude improvement in position resolution and (b) making signals from both protons and anti-protons available. Please comment specifically on the capabilities of the chosen technology with regards to these requirements.
4. Review the key specification parameters for the hardware choice and the technical plan for the project.
5. Comment on the cost and schedule and allocated resources - do the estimates appear reasonable?

Agenda

- 8:40- 9 AM Committee Executive Session
- 9 AM - noon Presentations

Introduction & Charge -- Pushpa Bhat

Overview of the Project -- Steve Wolbers 20 mins

Key Requirements -- Mike Martens 30 mins

Specifications for Hardware Architecture Choices
-- Jim Steimel 40 mins

p/pbar separation measurements
-- Rob Kutschke 10 mins

Hardware options and Technology choice
-- Vince Pavlicek 20 mins

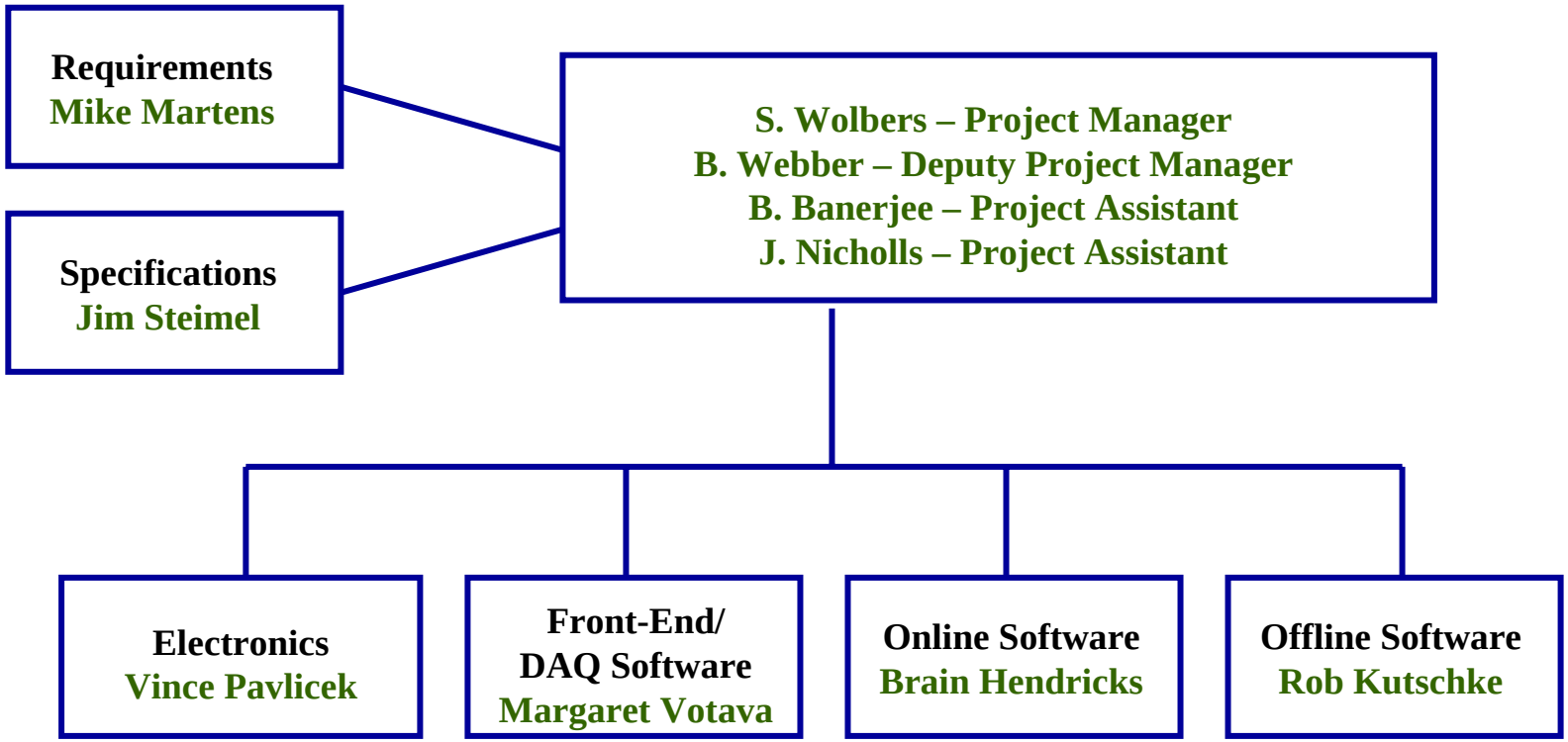
Summary -- Bob Webber 10 mins

Q & A

2 PM - 3 PM Committee Executive Session

3 PM - 4 PM Closeout

Tev BPM Upgrade Project Organization



Closeout Report

Findings:

- Except for the simultaneous measurement of closed orbits for p's and p bars, we believe that the proposed system using the Echotek boards will work adequately.
- The Echotek board appears to be the only feasible path to delivering a working system by October 1, 2004.
- No commissioning plan was presented.

Closeout Report (contd.)

- Concerns:
  - The presentations did not demonstrate that the pbars could be measured in the presence of the proton signal. This will be a problem for the p signal when the p bar intensity reaches 50% of the proton signal.
  - There are a number of associated system (timing for single turn measurements, calibrations systems and so on) that have no designs and no one assigned to the design. These are likely to be technically demanding projects so manpower should be assigned as soon as possible.
  - The physical sensors (mechanical accuracy and inherent non linearity of the BPM pickups) affects the system accuracy. This should be reflected in the requirements document.

Closeout Report (contd.)

Recommendations:

- The BPM group should move as quickly as possible to install a single complete BPM system using the existing Echotek boards. This system should be running before the next DOE review in February. Release of the purchase order for the Echotek boards should be contingent on the successful demonstration of this system.
- Allow the option for a second signal path so that some subset of the BPMs could make additional time domain measurements of the closed orbit positions.
- There should be a person designated as a system integrator. This person should not have any other major responsibilities.

Back-up Slides

List of Requirements

Measurement Purpose	Beam Structure	Data Acquisition Type	Position accuracy and resolution
Proton closed orbit during a store.	36x36.	Manual. Buffered on TCLK. ACNET variable. FTP variable.	Position resolution of 0.007 mm.
Proton single turn for injection tune up.	Prot uncoal.	Single turn, triggered on TCLK.	Position resolution of 0.05 mm.
Pbar closed orbit during a store.	36x36.	Manual. Buffered on TCLK. ACNET variable. FTP variable.	Position resolution of 0.05 mm.
Proton closed orbit during ramp and LB squeeze	36x36. Prot coal. Prot uncoal.	Buffered on TCLK. ACNET variable. FTP variable.	Position resolution of 0.05 mm.

List of Requirements

Measurement Purpose	Beam Structure	Data Acquisition Type	Position accuracy and resolution
Proton single turn for injection commissioning.	Prot uncoal.	Single turn, triggered on TCLK.	Position resolution of 0.1 mm.
Proton closed orbit for injection commissioning.	Prot uncoal.	Buffered on TCLK	Position resolution of 0.05 mm.
Proton single turn for injection tune up.	Prot uncoal.	Single turn, triggered on TCLK.	Position resolution of 0.05 mm.
Proton closed orbit for injection tune up.	Prot uncoal.	Buffered on TCLK.	Position resolution of 0.02 mm.

Martens

List of Requirements

Measurement Purpose	Beam Structure	Data Acquisition Type	Position accuracy and resolution
Closed orbit circular buffer.	36x36. Prot coal. Prot uncoal. Pbar coal.	Circular buffer halted on Tevatron Abort.	Position resolution of 0.007 mm.
Aperture scans	Prot coal. Prot uncoal.	Manual. Buffered on TCLK. ACNET variable. FTP variable.	Position resolution of 0.007 mm.
Lattice measurements	Prot uncoal. Prot coal.	Manual. Buffered on TCLK. ACNET variable. FTP variable.	Position resolution of 0.007 mm.
Lattice and coupling measurements	Prot coal. Prot uncoal.	TBT buffer.	Position resolution of 0.007 mm. ??

Martens