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Responses to Recommendations and Progress Since  
October Review

Bob Webber  
Run II Luminosity Upgrade Review  
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# October Recommendations and Score Card Responses

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- Expand the role of the Shot Data Analysis team effort led by Beam Physics Department and Beams Division Headquarters staff, with the goal of enhancing broad "source-to-collisions" and "short-to-long-timescale" analyses of Run II performance.
  - Shot Data Analysis (SDA) is now incorporated into the Accelerator Integration Department [that includes the Beam Physics Department].
- Install the Tevatron feedback dampers as planned. Assure, as soon as possible, that the dampers can indeed damp the higher-order head-tail instability. Investigate whether octupoles effectively cure higher-order head-tail instability without affecting the single particle lifetime.
  - The feedback dampers are installed and commissioned at 150 GeV. Chromaticity thresholds are lowered as a result, and have led to improved lifetime. Octupoles have been demonstrated to mitigate the instability but the appropriate feeddown systems do not yet exist to allow them to be utilized with protons and pbars in the machine simultaneously. [Tevatron Department has plan to fix this.]

# October Recommendations and Score Card Responses

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- Install Tevatron injection dampers and test the optics tuning as planned. Implement the necessary beam tuning tools and diagnostics as a high priority.
  - Power amplifiers were delayed: first due to low priority relative to military orders; second, one of the two amplifiers was damaged in shipment and is back at the vendor. It is not expected to be returned to us before the August shutdown.
- There must be significantly increased emphasis and resources devoted to instrumentation.
  - Additional help from within the Laboratory has been brought to bear on this problem and additional effort is being added to the Instrumentation Department. In addition, Joel Butler has become an Assistant Division Head for Beams with responsibility for bringing more collaborative effort to both Instrumentation and Controls.

# October Recommendations and Score Card Responses

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- Improve the communication between the Diagnostics Group and the rest of the Beams Division.
  - Splitting the previously combined RF and Instrumentation Depts. has improved the visibility and stature of the Instrumentation organization. It is clear to all that the Instrumentation Dept. management has the charge of interacting with Systems Depts. on a peer-to-peer level. The Instrumentation Dept. is now regularly invited to and represented at weekly Systems Dept. meetings; this is particularly the case for Tevatron Dept. meetings, where beam Instrumentation presentations are now common. On the level of projects, communications have been beneficially formalized with the utilization of written requirements documents and Division HQ sponsored requirements reviews. The process that has led to a successful and now nearly completed major overhaul of the Recycler Ring Beam Position Monitoring system is an excellent example. Similar processes are underway for both Tevatron and Main Injector BPM system upgrades.

[[Beams-doc-471-v1, Main Injector Bpm System Upgrade + Numi Beamline Bpm Requirements](#); [Beams-doc-401-v1, RR BPM Functional Specification](#); [Beams-doc-554-v2, TeV BPM Upgrade Requirements](#)]

## Findings, Comments, and Recommendations in October Review Committee Report

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- “Firstly, significantly greater attention must be paid to the maintenance and upgrading of the instrumentation needed to measure machine performance.”
- “A particular area that requires significantly increased emphasis in the period is diagnostic instrumentation.”
  - Instrumentation tasks included in this Run II Upgrade Plan and described in the talks in this breakout session will convince you that the attention received by instrumentation has risen considerably.

# Findings, Comments, and Recommendations in October Review Committee Report

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- “Good diagnostics will be important in reaching this [Booster beam pulse intensity] goal, recent progress in this regard (tune meter) is encouraging.”
  - Eric Prebys will describe the improved utilization and status of beam instrumentation in the Proton Source.
- “The Shot Data Analysis system stores and provides easy access to diagnostics and other information recorded during physics production and machine studies runs.”
  - SDA has provided an important focal point for beam instrumentation data collection and utilization. It serves as an excellent catalyst for instrumentation improvements. Jean Slaughter will provide SDA update in this breakout.

## Findings, Comments, and Recommendations in October Review Committee Report

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- “The Synchrotron Light Monitor is an instrument that allows non-invasive measurements of beam centroids and sizes at the Tevatron collision energy of 980 GeV. ... The optical arrangement is relatively rudimentary, and there are unresolved calibration issues. Despite this it is providing valuable information.”
  - Continues to provide “valuable information”; now making preliminary abort gap measurements; improvements included in Upgrade Plan (WBS 1.3.4.6.1).
- “The flying wire systems provide clean transverse profiles, ... Tevatron flying wires produce unacceptable backgrounds during collisions.”
  - An Ionization Profile Monitor is included in Upgrade Plan (WBS 1.3.4.6.5) to address flying wire (bandwidth) and synch light (beam energy) shortcomings.

# Findings, Comments, and Recommendations in October Review Committee Report

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- “The Beam Line Tuners (BLT) ... provide essential measurements of injection steering and can measure tunes, chromaticity, and coupling..”
  - BLTs are now fully stable, operational systems in daily use.
- “Beam position monitors in the Recycler, Main Injector and Tevatron need substantial improvement..”
  - Breakout talks will be presented on each of these.
- “It is essential that the beam position monitor systems be properly funded instead of being targeted for cuts.”
  - Recycler BPM system funds have been provided and expended.
  - TeV and MI systems are included in Upgrade Plan (WBS 1.3.4.6.4 and 1.3.1.3.2 respectively).
  - BPMs included in Plan for AP2 beamline (WBS 1.3.2.2.3.1.1) and Debuncher Ring (WBS 1.3.2.2.3.2.1) to support improved Pbar Acceptance and for Accumulator to Recycler transfer lines (WBS 1.3.3.6.5.1) to support automated pbar rapid transfers.

## Findings, Comments, and Recommendations in October Review Committee Report

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- “We left the breakout sessions with the strong impression that the physicists and engineers working on instrumentation did not feel themselves well-integrated into the team improving the Run II performance. ... There will be a reorganization of the management and responsibilities for instrumentation starting November 1. Team building should be an early part of the activities.”
- “There must be significantly increased emphasis and resources devoted to instrumentation.”
  - Witness Scorecard answers on earlier slides.
  - Witness breakout talk on Recycler BPM system progress.
  - Witness Roger Dixon’s talk on collaborations and contributions of other Laboratory Divisions in this area.

## Technical Highlights Since October

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- Beam Line Tuners are now fully stable, operational systems in daily use.
- Recycler Ring BPM system is in final stages of installation and beginning commissioning.
- 1.7 GHz Schottky's installed in TeV and Recycler, showing useful signals, and in Plan for integration.
- Flying Wire signals have been cleaned up and are better understood.
- Sampled Bunch Display bunch intensity calibration has been understood and improved.
- Instrumentation Dept has completed Lambertson and separator impedance measurements.
- Better understanding/utilization of capabilities of present Tevatron BPM system.