Minutes, 4/07/05 Tevatron BPM Upgrade Meeting
Stephen Wolbers

This set of minutes, and all future minutes, are or will be
deposited in the Beams Document Database as document number
792.

The agenda as announced consisted of:

  Status of TBT/TCLK problems
  Antiproton cancellation strategy - Rob Kutschke
  AOB

1. Status of TBT/TCLK problems

   - Rob, Jim, Luciano, and others reported on the status of various
problems reported during the morning (Thursday) shot. Some of the
problems are simply not taking into account hex vs decimal reporting of
information. So those are not a worry, presumably. However, the 6000
turn problem is still around and investigations continue on the
teststand and in the accelerator to debug the problem(s).

2. Proposal for pbar measurement

   - Rob discussed a proposal that he sent around in email on Tuesday
April 5 to everyone. For convenience I repeat that email at the bottom
of these notes. In fact, most of the relevant information is in this
message and I will not be repeating it here.

   - After some discussion we decided that some further investigation
would be needed to decide how to get the data into the USER PROFILE,
including what new TCLKs, etc would have to be defined and implemented.

  - Rob will talk to Jean about getting data into SDA.

  - The goals for now are:

   - April 7-April 14 or 15, get the data into a form to analyze
   - Process data in SDA, push to front-ends.
   - Eventually have the front-end compute the proton cancellation
     coefficients.
   - Investigate the possibility of a proton-only, separators off
     store to learn more about the cancellation.

   - We agreed that the sooner that we collect data and analyze it the
better to understand how well we can measure pbar postions, how stable

those measurements are (and how often we will have to calibrate), what
and how many BPMs have the unfortunate feature of having the helix open
in the plane orthogonal to the measurement plane, etc.

Rob Kutschke's email of April 5, 2005:

Hi All,

 The message below is my proposal for how we can
determine, on a shot by shot basis, the coefficients
to subtract the proton contamination from the pbar signals.

 Comments and suggestions are welcome and I suggest
that we schedule a meeting to discuss this proposal.

 The front end computers currently have a "user frame buffer"
which is designed like the profile frame buffer but is not
currently used. I propose that we can use this buffer
to hold the necessary data. An alternative is to create
another similar buffer dedicated to this purpose, leaving
the user frame buffer free for unforseen studies.

 I propose that we take a single closed orbit measurement
at the following times and record the result in the user
frame buffer.

 1) After each proton injection.
 2) Just before the helix opens.
 3) Just after the helix opens.
 4) Just after each pbar-injection.

On a normal shot this would give 26+1+1+9 = 37 measurements.

For each measurement, for each BPM we need to record the (I,Q)
values for all channels.   It is OK to take the latest value
from the fast abort buffer, as is done for the profile frame.

Strictly speaking, only measurements 2) and 3) are needed to
determine the coefficients but at least some of the other measurements
are needed for quality control. We can discuss a shorter list
if necessary.

I propose that we record this information using SDA so that it
is available for offline analysis.

In the short term we can perform the analysis offline and push
the new values of the cancelation coefficients to the front ends.
This has the bad side effect that the pbar sum and position information
will be unreliable until the updated coefficients are pushed down.

As we get experience, we can consider having the front ends compute
the coefficients themselves. This would allow the front ends to
give reliable pbar positions starting with the first pbar injection.
If we decide to do this we will need to discuss how to keep
the audit trail up to date.

Some questions:

 1) What Beam sync and TCLK events do we need to listen to
    to trigger?   Do we need to define new ones?

 2) It is important that the closed orbit measurements be done
    after the injection bumps have recovered. This is a few
    seconds after the bunch is injected. How do we arrange this?

 3) I don't know the right words for this but I will try.
    Sometimes the Tevatron "misses" an injection. For example
    the injection bump occurs but no new beam is injected.
    After one or a few misses, injection continues normally,
    for a total of 36 proton bunches. How do we deal with this
    situation?

 4) Do we need to do anything special with tuneup shots.

 5) When to record the result to SDA - after all is over or
    in stages throughout the process?

And a final thought. Maybe we might want to create an ACNET
device which can return the RMS of the proton and pbar positions,
computed from the most recent N values from the fast abort buffer.
This is something which we could record to lumberjack or SDA
a few minutes after HEP running commences each shot.