Minutes, 4/11/05 Tevatron BPM Upgrade Meeting
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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
Safe mode discussion - Bob Webber
AOB

1. Status of TBT/TCLK problems

- The problem(s) are not yet solved. We had a long discussion of what it is we know from how the system responds on the teststand and in the accelerator. Many ideas were kicked around about how the 6000 turn problem could occur -- early trigger, incorrect memory map, memory over-writing, pointers messed up, etc. People are thinking of how to look at the memory to try to sort this out -- maybe generating patterns, dumping more or less than 8K, etc. It is true that the problem was not seen before March 25, the day we fixed the outlier TBT problem. The missing TCLK problem is seen consistently in C2.

2. AOB

- We will turn off one of the old BPM systems reasonably soon to be sure that it does not adversely affect any other systems. The multibus/BLM systems must be kept on.

- Two houses will be installed during the day on Monday. That gets us to 11 fully installed, 8 installed but not yet connected, and 8 more to install.

- Jim would like to use the diagnostics during the Monday between stores period.

3. Safe Mode (Asynchronous Injection First Turn)

- Bob described the "Safe Mode" required of the new TeV BPM system. This is required to find the beam when the timing is not close enough to use to rely on the normal TBT modes that exist and rely on precise timing. This situation only occurs after coming up from a long shutdown or if there is some other really big change in the system.

- Bob's description of what is needed can be found in his email of March 30, 2005, repeated for convenience at the end of these notes.

- After going through each of the items we basically agreed to everything that Bob wrote down. A few things need to be tested to ensure that this mode will work:

- We need to test the Echotek with long burst counts.

- If we get one point every 200 ns or so in this mode we will need on order 8K points to get enough turns to ensure that the beam is not missed. We could use a larger number of points but it depends on how much the timing might be wrong.

- We should understand how low to set the threshold (for the sum signal) to sort out the real beam from the noise.

- We should understand whether we need only the sum signal, the I's and Q's, the positions, etc. as the output from this measurement.

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Bob Webber's email of 3/30/05:

I write this as a "strawman" description of what has been termed the "safe mode" of operation for the TeV BPMs so that people will start thinking about it. The mode needs to be clearly thought out and specified so that work can begin on implementation.

All comments and feedback are solicited, however I feel this should be the topic of one of our meetings in the near future. We should not try to define the mode in a flurry of email.

OBJECTIVE: to provide a means of producing credible and reliable first turn (minimum one turn) or first turns turn-by-turn (multiple turns preferable) positions and intensities in a mode that is robust even if BPM timing (or beam or Beam sync clock) is incorrect at the level of ~many tens of microseconds.

OPERATION: User manually selects "safe mode" to supercede normal first turn mode. Requirement to begin normal closed orbit as soon as possible after injection is relaxed to allow CPUs time to run "find the beam

algorithms". This mode is intended to be used primarily when beam won't circulate and timing conditions might be uncertain. Manual user selection is required to return to normal "non-safe mode" BPM operation.

HOW IT WORKS: Echotek boards are set up in normal turn-by-turn configuration except the "burst count" is set to a very large number. For example, data rate out of Greychip in TBT operation is one point per 800 nanoseconds? [I might be wrong by factor of two]. With burst count of 8K, data is acquired for an interval of 6.4 milliseconds or about 300 turns. There is only one trigger to the EchoTeks to acquire all this data and that trigger is set to occur one or a few hundred microseconds prior to expected injection. Once the data is acquired in the EchoTek memory, the VME CPU reads it all out and runs an algorthim searches the data starting at the earliest value looking for a sum signal above a TBD threshold. When this is found the program then searches for a sum signal peak in the near (few points) vicinity and identifies this as the time of the first turn and computes intensity and position from that data. Knowing the number of data points corresponding to one turn, the algorthim then searches for successive turns etc. The resulting array of positions and intensities should then be stored in the regular first turn/injection buffers and applications don't know the difference whether the data came from normal mode or safe mode. As a validity check the algorithm might make sure that it finds the first turn (if any) at very close to the same time for each BPM in the house. One can dream up lots of cool and complicated algorithmic things to do, but simple and robust should be the goal.