

Preliminary Results from Tevatron Collider Model with Assumptions on Recycler Integration

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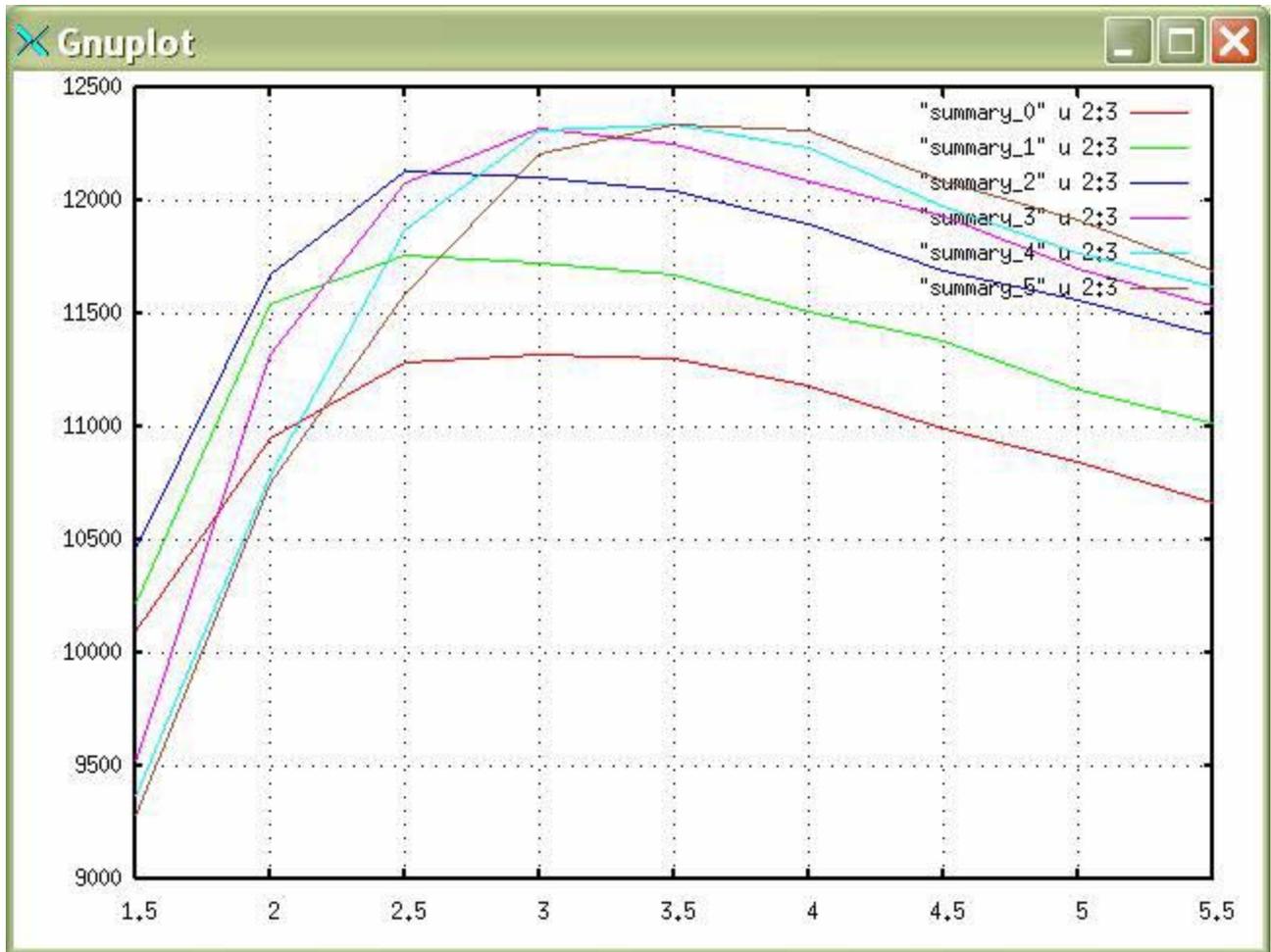
This is an interesting result from my operations model, using the Recycler at the level of capability I think we are at right now.

Assuming:

1. Transfers between the Accumulator and the Recycler take up to, but less than, 1 hour, and
2. The Recycler can stably hold up to $300E10$ pbars, and
3. The Recycler can accept pbars from the accumulator normally (see the next point), up to $250E10$ (then its acceptance efficiency falls off linearly to zero acceptance at $300E10$), and
4. Transfers from the Accumulator are (otherwise) between 90% and 100% efficient, and
5. The beam lifetime in the recycler is about 500 hours, and
6. The luminosity per antiproton from the Recycler is roughly the same as that from the Accumulator, and
7. The probability of losing a stash is about the same as that for the stack, and
8. We use all the pbars we can from the Accumulator and from the Recycler, and
9. We don't use a pbar source for transfers to the Tevatron if it has less than $100E10$ pbars in it, and
10. Everything else behaves the same as it does now;

Then I have the following optimization.

I vary the number of "rapid transfers" that are attempted at the beginning of each store (from 0 (no Recycler) to 5), and make that transfer when the Accumulator reaches $40E10$ pbars. When this number of transfers at the beginning of the store is satisfied, we then continue to stack into the Accumulator. Here is the plot (the different colors represent the different number of "rapid transfers" that are allowed, red is zero, green is one, etc.):



(X-axis: The luminosity potential ratio at which we end the stores, summing the number of pbars in both sources to determine the luminosity potential; Y-axis: the average integrated luminosity per week delivered (2500 weeks of simulation).)

So, doing one transfer to the Recycler each store gives about a 3.5% improvement in the total luminosity delivered per week. Doing two transfers gives a 7% improvement. Doing 3 transfer might help a little bit, but doing 4, 5 or more transfers gives you no further improvement.

Work continues.....

(This was sent as an email message to McGinnis, Morgan, Slaughter and others on May 4, 2004.)