But the MRC Council, meeting 26 July, decided that an international group of experts should study the matter and issue a recommendation by October. "The MRC has a duty to safeguard the well-being of the women who have volunteered for the WISDOM study," MRC chief George Radda said in a statement. "We must be absolutely satisfied that it is right to press ahead ... with the study."

"It sounds like a very reasonable approach to me," says Stanford University's Marcia Stefanick, principal investigator of WHI. Unlike the WISDOM leaders, Stefanick says she has no doubts about the WHI results, although she notes that researchers differ in what they regard as convincing. But WISDOM steering committee chair Rory Collins worries that recruitment in the trial, already behind schedule, will suffer, even if it resumes after October: "Once you stop a tanker, it's quite difficult to get it going again." —MARTIN ENSERINK

HIGH-ENERGY PHYSICS

Tevatron Sees Light at End of Tunnel?

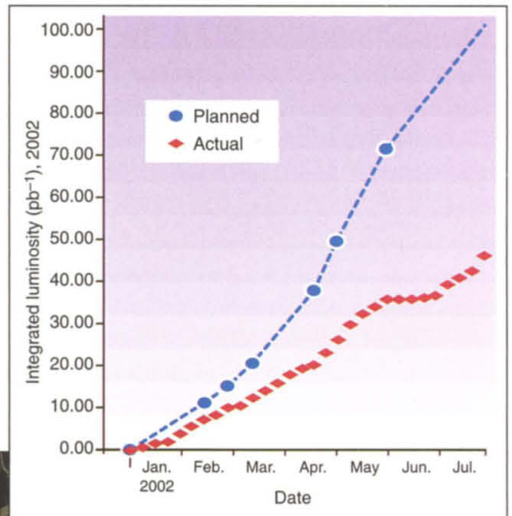
Six months ago, the Tevatron accelerator was in trouble, plagued by technical woes that threatened to cripple the device's research program. Now scientists working on the project say things are looking up—mostly. Scientific results from the accelerator are beginning to trickle out, and a 2-week shutdown in June might have marked a turning point in the battle against the machine's problems. But the accelerator's particle beams still fall far short of their target brightness levels, and scientists still await the Tevatron's reemergence as a flagship accelerator.

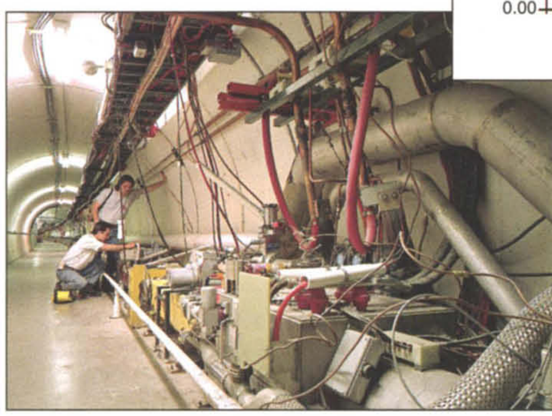
A year and a half ago, the Tevatron, which smashes protons and antiprotons together at enormous energies, began operating again after a $260 million refit. Despite months of tinkering, however, scientists and engineers couldn't boost the beam's luminosity—its "brightness"—high enough to begin the bulk of the accelerator's research program. By January, Tevatron scientists had devised a plan for attacking the accelerator's problems and had set performance benchmarks for the rest of the year (*Science*, 8 February, p. 942). Six months later, the accelerator has missed every single luminosity benchmark. "We're still a factor of 2 short," says Stephen Holmes, head of the beams division at Fermi National Accelerator Laboratory (Fermilab) in Batavia, Illinois.

A major problem with the accelerator lies in the system that accumulates, accelerates, and stores antiprotons—which, unlike protons, are hard to produce. Fully 80% of the antiprotons were supposed to survive the trip from the accumulator system to the collider, but in January, a mere 30% made the journey intact. "Really, until April, we had no idea what the physical cause" of this problem was, says Holmes. So, despite Fermilab's best efforts, "we topped out at about 40%. We were pretty much stuck."

In April, however, scientists at Fermilab figured out that the antiproton problem was caused by intrabeam scattering. "When the antiprotons are going around and around in the antiproton accumulator, they are confined to a very small space, and they are bouncing off each other," says Holmes. "This tends to heat the beam, making it get bigger. It wants to blow up." Scientists had anticipated problems, but this effect was worse than expected.

Now a 2-week shutdown in June might have solved the antiproton problem, Holmes says. While the accelerator was turned off, engineers improved the beam cooling system and refocused the magnetic optics that keeps the beam tight. Now about 50% to 60% of the antiprotons survive the trip to the accelerator, and the number is rising. With that roadblock removed, last week the Tevatron's luminosity surged to a record-setting 2.64×10^{31} inverse square





Hard climb. Fermilab's Tevatron accelerator (*above*) is still struggling to hit its luminosity targets.

centimeters per second—still far short of the benchmarks but a vast improvement. "The problem seems like it's moving downstream, out of the antiproton facility," says Holmes.

Physicists now have enough data to start doing real science with the Tevatron, says John Womersley, spokesperson for the D0 experiment on the Tevatron. "There are a lot of interesting things we can do with a small data set," he says. Teams have already used Tevatron data to measure properties of the W and Z bosons, carriers of the weak nuclear force, at an energy at which these properties had not been measured before. The amount of data already collected should roughly double the number of top-quark sightings, Womersley says. "We're beginning to do physics," he says, "but this doesn't mean we're happy to run like this for years."

Tevatron engineers still have several other problems to solve. One particularly sticky one arises from the unwanted mutual influence of the proton and antiproton beams, which travel close to each other in the accelerator. This beam-beam interaction is more severe than expected at low energies, and engineers are going to tear out a bottleneck in the accelerator where the beams get too close together.

That makes physicists at CERN, the European laboratory for particle physics near Geneva, nervous, as their next big machine, the Large Hadron Collider (LHC), also has two high-luminosity beams in close proximity. "For the LHC, we are pretty confident that [beam-beam interactions] are not going to be a problem, but anything can happen," says Steve Myers, Holmes's counterpart at CERN. Partly for that reason, CERN is flying a handful of its scientists to Fermilab to assist their American colleagues. "The main effort is to help them out, and in so doing, we get hands-on experience dealing with problems that might affect us," says Myers. "In repayment, when we start running the LHC, they will help us. This is the deal of the collaboration."

According to Mike Harrison, head of the superconducting magnets division at Brookhaven National Laboratory in Upton, New York, the Tevatron's fundamentals are sound: The performance at top energy is good, and the antiproton production system works—it's just a matter of getting all the parts to work together, usually a struggle when getting an accelerator up and running.

If Tevatron scientists manage to bring their accelerator's performance up to its design expectations, they will be ready for the next big challenge: adding a system to recycle used antiprotons. With luck, the Tevatron's greatest difficulties lie behind it rather than ahead of it. —CHARLES SEIFE

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