Particle physics

Tevatron targets three-year extension

Fermilab's Tevatron collider could get a new lease on life following a campaign to keep the facility running beyond the end of 2011, when the rival Large Hadron Collider (LHC) at CERN is scheduled to shut down for 15 months of repairs. One option being debated as *Physics World* went to press would see collisions at the Tevatron continue until 2014 – long enough, say advocates, to search the entire range of likely masses for the Higgs boson, and perhaps even find the first evidence of its existence.

Pressure to keep the US collider running has been building for months thanks to a combination of factors, including the LHC shutdown and a continued stream of results from the Tevatron's two main detector experiments, CDF and DZero. In late July, a group of 38 US physicists unaffiliated with Fermilab sent a letter to Energy Secretary Steve Chu, asking the Department of Energy (DOE) to support an extension. "We feel there's a lot to be gained from running the Tevatron for a few more years," says Harvard University theorist Lisa Randall, one of the letter's signatories. "It is running incredibly well, and from a pure physics standpoint, it would be such a loss to stop now."

Teams working at CDF and DZero have already collected enough data to

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be 95% confident that the Higgs mass does not lie between 158–175 GeV – a range near what CDF co-spokesperson Rob Roser termed the collider's "energy sweet spot". A three-year extension would produce enough data to broaden this search to the rest of the 114–185 GeV mass range that theorists deem most likely to contain the Higgs, and provide at least a 3σ level of confidence in any signal observed. Although not enough to qualify as a "discovery", a 3σ signal would still constitute important "evidence" for the elusive Higgs, Roser says.

Keeping the Tevatron going would not be without costs, however. In addition to the estimated \$60m-per-year

A watchful eye
Physicists in the US are hoping an extension to the Tevatron's run could allow them to spot the Higgs boson.

price of running the collider, an extension would also delay other Fermilab projects. One of the hardest hit would be the NOvA neutrino experiment, which is due to start in 2013. NOvA is designed to study neutrinos produced when protons from Fermilab's main injector ring slam into a graphite target, but continuing operations at the Tevatron would leave fewer protons available for the NOvA beam. According to NOvA co-spokesperson Gary Feldman, the combined effects of reduced beam power and inconvenient shutdown periods would halve the number of data NOvA could collect in its first three years of operations.

One possible compromise would be to extend Tevatron operations for just one year. This would only delay NOvA by six months, thanks to overlapping upgrade and shutdown schedules, says Fermilab deputy director Young-Kee Kim. A year-long extension could also meet with DOE approval relatively quickly, she adds, noting that the Tevatron received a similar one-year reprieve less than a year ago. "The whole community would like to see this extension happen, but we have to consider the impact on other projects," Kim told *Physics World*. "We will make somebody unhappy whatever we decide."

An internal physics advisory committee at Fermilab was scheduled to meet on 27 August to debate the merits and terms of an extension, and then to pass its recommendation on to the DOE.

Margaret Harris

Nuclear weapons

Cash shortage derails nuclear forensics

The ability to detect and analyse the origins of nuclear materials used in terrorism attacks is deteriorating, according to a report by the US National Research Council. Written by a 12-strong committee of nuclear specialists led by former University of California chancellor Albert Carnale, the report warns that human lives could be in danger if funding for the nuclear-forensics programme of the US Department of Homeland Security continues to decline.

Nuclear forensics involves the examination of nuclear materials and post-detonation debris of nuclear

Testing times

Calls are being made in the US to provide better training plus improved equipment and procedures for nuclear forensics.

blasts. It is vital in helping law enforcement and intelligence agencies to evaluate and prevent nuclear incidents such as terrorist attacks. Nuclear forensics was well funded in the US during the Cold War but has since lost financial support and personnel.

The report is an abbreviated version of a full, classified publication completed in January. It calls for a restructuring of the US nuclear programme as well as additional funds to provide better training, maintain the size of the workforce, plus improve equipment and procedures. The panel warns that a lack of nuclear capabilities could

lead to the US becoming a "national security state" – to the detriment of its "justice, general welfare, and blessings of liberty".

Due to the sensitive nature of the study, the authors of the report declined to respond to questions put by *Physics World*. But Klaus Mayer, a nuclear-forensics expert at the European Commission's Joint Research Centre who was not involved in the report, places great significance on nuclear forensics in both the US and Europe. While he admits that nuclear events are unlikely to occur frequently, he maintains that there is an ongoing need to be ready. "The better prepared we are," says Mayer, "the better we can handle a case and – equally importantly – the bigger the deterrent effect."

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