News & Analysis

Beleaguered LHC gears up for restart

The Large Hadron Collider (LHC) at CERN is finally set to restart in mid-November following last year's accident. Initially it will collide protons at an energy of only 3.5 TeV per beam, and staff at CERN will have to wait until late next year before trying to run the collider at its maximum energy. Collisions of 14 TeV (7 TeV per beam) will therefore not take place until 2011 at the earliest.

CERN has spent the last year repairing the damage to the LHC that occurred in September last year when an electrical connection between two of the accelerator's superconducting magnets disintegrated as engineers were ramping up energies to 5 TeV per beam. The incident, which happened just nine days after protons had been successfully guided in both directions around the 27 km long ring, generated an electrical arc that ripped through the cooling system and allowed six tonnes of liquid helium to spill into the tunnel.

The Geneva lab has so far spent €40m (£35m) repairing the collider, restocking spare parts, and installing a network of cables to detect tiny increases in resistance as well as extra helium-relief valves to prevent similar accidents occurring in future. Earlier this year, CERN settled on a schedule to inject protons back into the LHC at the end of September. In that plan, collisions would begin at 7 TeV (3.5 TeV per beam) and rise to

10 TeV by Christmas, providing the first sizeable data set for researchers to begin searching for physics beyond the Standard Model.

But a few localized problems, such as helium leaks into the vacuum enclosure, have forced CERN to put back the restart until mid-November. "Paraphrasing Eisenhower, plans are useless but planning is everything," explains CERN spokesman James Gillies. "So we have a schedule but it changes all the time."

However, it now seems that reaching the originally proposed collisions at 14 TeV will be less than straightforward. Repeated setbacks have allowed many of the LHC's magnets to lose their calibration or "training" – a process that can take months and

Powering up

CERN's Large Hadron Collider will initially begin colliding beams of protons with an energy of 3.5 TeV, but collisions at its maximum energy are not expected until 2011.

involves cooling the magnets to 1.9 K and subjecting them to a series of quenches while measuring the current through the superconducting coils. Moreover, engineers have discovered that some copper stabilizers surrounding the superconducting cables, which bear electrical current in the event that the superconducting cables fail, have too high a resistance. This could also scupper plans for 14 TeV collisions but will only be readdressed during the next shutdown at the end of 2010.

Teething problems like these might be expected. At Fermilab in the US, the Tevatron, which currently holds the record for beam collision energy at 2 TeV, took two years after its second run in 2001 to reach design intensity and efficiency. "Spirits in the lab are very high at the moment, because we see the light at the end of the tunnel," says Steve Myers, CERN's director of accelerators and technology.

Mark Lancaster, a particle physicist at University College London who works on the Tevatron, notes that the LHC was built to probe the electro-weak scale and that it can do this even with 7 TeV collisions. "It will take longer at lower beam energies to accumulate the data and some phenomena may be beyond reach. But I don't think it will severely impact the great physics that the LHC will undoubtedly produce," he says.

Jon Cartwright

Space

Europe unveils plans for UK space base

The European Space Agency (ESA) has announced plans to build its first centre in the UK. Based in Harwell, Oxfordshire, the centre is expected to focus on areas such as climate-change monitoring and novel energy sources for spacecraft. The ESA centre will join a group of existing research facilities at Harwell, including the Rutherford Appleton Laboratory and the Diamond synchrotron light source. Work on industry-oriented projects is scheduled to start later this year.

The as-yet-unnamed centre currently has only one employee, project manager Martin Ditter, but ESA has budgeted

The Harwell centre will eventually employ about 75 staff

£1.5m for its first year. The centre will eventually employ about 75 staff, with numbers increasing gradually over several years as a new building is constructed. Initially, the centre will function as a contract-managing offshoot of ESA's much larger European Space Research and Technology Centre in Noordwijk, the Netherlands. However, it will probably expand to include its own research facilities within a few years, according to Richard Peckham, business development director of space firm EADS Astrium and chair of the trade association UKspace.

The UK government has hailed the ESA

centre as a key element in its plans to develop a base for space research, known as the International Space Innovation Centre, at Harwell. Speaking at the ESA centre's formal launch in late July, science and innovation minister Lord Drayson called for a "space renaissance" in the UK, which has the world's second-largest space sector (the US is first) supporting 68 000 jobs and contributing £6.5bn annually to the economy.

Both the ISIC and the ESA centre will aim to draw on these strengths, but the ISIC's support will come from the Science and Technology Facilities Council. "Funding is the elephant in the room," says Alan Smith, director of the Mullard Space Science Laboratory at University College, London. Margaret Harris