

Indian jacks support world's biggest accelerator at CERN

The Large Hadron Collider (LHC), the world's biggest atom smasher commissioned Wednesday in Geneva, has the strong 'support' of India - literally.

The 88,000 tonne 27 km underground magnetic ring through which the protons race at lightning speed are propped up by 7,080 jacks supplied by the Indian Department of Atomic Energy (DAE).

Along the racetrack are 1,232 liquid helium cooled magnets each weighing 32 tonnes. They must be jacked up and aligned so precisely that the speeding protons do not deviate from the tube axis as they zoom through the pipe 10,000 times a second.

The jacks designed and developed by the Centre for Advanced Technology (CAT) in Indore can do just that.

India was one of the five non-European countries invited to participate in the construction of LHC, the others being Canada, Japan, Russia and the US.

If the protons in LHC keep on course, the credit should also go to Indian companies that supplied a total of nearly 1,800 superconducting 'dipoles' and 'quadrupoles' corrector magnets - half of the total in LHC. European firms supplied the other half.

Dipoles bend the charged particle beams in a circular path through the ring and the quadrupoles focus them tightly without letting them spread out. They are the principal magnets of the LHC and if any of them fails the concentrated proton beam may hit and damage the detectors.

The magnets were designed and developed by CAT and then manufactured at Kirloskar Electric Company Ltd in [Bangalore](#) and Crompton Greaves Ltd in Bhopal.

The 'protection system' of the accelerator also employs several items from India: 5,500 quench heater power supplies, 1,435 local protection units, 70 circuit breakers and quench detection electronics. India has also supplied LHC machine control software, 50,000-litre liquid nitrogen tanks, and facility for testing superconducting magnets at liquid helium temperature.

More important, India provided 125 man-years of skilled manpower support for magnetic tests subsystem evaluation and commissioning, according to DAE officials.

The \$50 million worth hardware, software, and manpower was provided by India under a protocol signed in 1996 with CERN, the European Organisation for Nuclear Research.

Half the value of this 'in kind' contribution was treated as India's input to LHC and the other half is credited to an 'Indian Fund' which was created to cover expenses of Indian scientists visiting CERN.

Under another protocol signed in 2002, DAE has been helping CERN build software for LHC data analysis - an effort worth \$10 million. The agreement has been extended till December 2010.

The success of the DAE-CERN partnership in LHC has led to a two way collaboration under which DAE has been invited to participate in CERN's upcoming projects: the Compact Linear Collider Test

Facility and the Superconducting Proton Linac at CERN.

The LHC cost \$4.1 billion and took 14 years to build. The CERN experiments could reveal more about "dark matter", and possibly hidden dimensions of space and time.

When the high-energy protons collide inside the LHC, data on the nuclear debris will flow through the huge computer grid to computers around the world including DAE labs in India.

The rules of the universe may have to be rewritten if LHC data shows evidence of the Higgs boson, the hypothetical particle that is believed to give mass to all other particles.

But as CERN theorist John Ellis told the Nature journal, 'we will have a whole bunch of other things more interesting even if the Higgs particle not found'.

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