Geneva atom smasher seeks dark matter discoveries

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German Rolf-Dieter Heuer, Director General of CERN, informs journalists about restarting of the LHC (Large Hadron Collider) at CERN, during a press conference at the Geneva Press Club in Geneva, in Geneva, Switzerland, Monday, March 8, 2010. The operators of the world's largest atom smasher hope to provide first discoveries about the elusive nature of dark matter later this year. The director of the European Organization for Nuclear Research, or CERN, said the Large Hadron Collider will be ramped up to half-power in March 2010. That will still be three times more energy than the world record CERN set in 2009. (AP Photo/Keystone, Salvatore Di Nolfi)

(AP) -- The world's largest atom smasher could generate its first scientific breakthrough later this year when operators hope to make discoveries into the elusive nature of dark matter, the director of the European Organization for Nuclear Research said Monday.

Rolf-Dieter Heuer said the Large Hadron Collider would be ramped up

to world record power later this month. At 7 trillion electron volts, that will be three times more energy than the record set in November by Heuer's organization - known by its French acronym CERN.

By crashing high energy beams of protons into each other in a 27-kilometer (17-mile) tunnel under the Swiss-French border at Geneva, CERN's scientists hope to gain key insights into the makeup of matter and the creation of the universe billions of years ago in the moments after the Big Bang.

There have been no discoveries so far with the LHC, Heuer said. But he predicted breakthroughs soon into the mysterious dark matter that scientists believe comprises a quarter of the whole universe.

"We will open a door for new physics at the end of this year," Heuer told reporters. "It took several decades for us to understand the visible universe. This is all nicely explained by the standard model, but the big problem is that this is only 5 percent of the universe."

CERN's experiments represent a massive effort among 7,000 scientists from over 80 countries into better understanding nature and how it works. Like most discoveries in particle physics, the true significance of breakthroughs in dark matter, antimatter or dark energy would only become clear after the revelations are made. Heuer likened the situation to the 1932 discovery of the positron, which has since become a key tool in diagnosing and tracking human cancer.

Dark matter is a particularly tricky subject. Theorized by scientists who couldn't understand missing mass and strangely bent light in faraway galaxies, dark matter has become widely accepted in the physics community without its existence ever being concretely proven.

These invisible substances cannot be seen through telescopes or

advanced instruments. And they are separate from everything we see in the universe - ourselves, objects on this Earth, the planets, the stars and the galaxies - which account for a small fraction of all matter. But dark matter's effect on gravity is significant.

Scientists believe that dark matter makes galaxies spin faster than expected, and that it can affect the light of visible matter in ways we can't understand.

A separate entity called "dark energy" makes up the remaining 70 percent of the universe, and this is understood as associated with the vacuum that is evenly distributed in space and time. It is believed to accelerate the expansion of the universe.

CERN's collider "could be the ideal machine to shed the first light into the dark universe," Heuer said, saying that experiments would soon be able to disprove some theories about dark matter and possibly find elements that are completely new.

The machine recently restarted after a 2 1/2 month winter shutdown during which scientists made improvements and checked out the smasher's ability to collide protons at higher energy levels.

The collider will run at 7 TeV through next year, before being shut down in 2012 to upgrade to full design energy of 14 TeV. It will then restart in 2013, with a long-term goal of revealing the Higgs boson, or "God particle," so named because scientists believe it gives mass to other matter.

"The Higgs particle is not easy to find," Heuer said. "We know everything about the Higgs particle, except if it exists."

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