Upgrade of LHC underway paving way for new discoveries

April 4 2013, by Bob Yirka

(Phys.org) —The Large Hadron Collider (LHC) has been shut down so that it can be upgraded, a process that is expected to take at least two years. Researchers on the project hope the upgrade will allow the facility to reach its full potential which was reduced following an accident that occurred shortly after the collider begin operating back in 2008.

The LHC was constructed over the years 1998 to 2008 with the hope of allowing scientists a means of proving many of the theories related to the Standard Model. One of those, the discovery of what appears to be the Higgs Boson, occurred just last year. But scientists want to know more about the tiny particles that are thought to make up all matter, including the kind that can't be see—so-called dark matter which currently is still a theory because no one has been able to devise a way to make it show

itself. Researchers are hoping this new upgrade to the largest collider in the world will not only help prove that dark matter exists, but offer a way for physicists to create some for themselves.

The upgrade, which is projected to cost U.S. $105 million, will involve replacing approximately 10,000 connections between sections of the collider and adding 5,000 insulation systems. Part of the upgrade will also include tests of the system—over 10,000 to ensure there are no leaks, and another 18,000 to prove the correctness of the electrical system. All of the magnets in the system will also be tested and if necessary, they will be replaced. The upgrade is expected to double the power of the LHC, allowing for collisions that were supposed to take place at the facility nearly five years ago. Shortly after turning the system on an electrical fault occurred that resulted in liquid helium rushing into the underground tunnels where the collider resides—it left the system damaged and unable to operate at full capacity.

Scientists are hoping once the upgrade is complete and the system turned back on that they will be able to prove that theories regarding supersymmetry are correct. Part of that process will involve looking for other particles, perhaps even other types of Higgs Bosons.

More information: lhc.web.cern.ch/lhc/