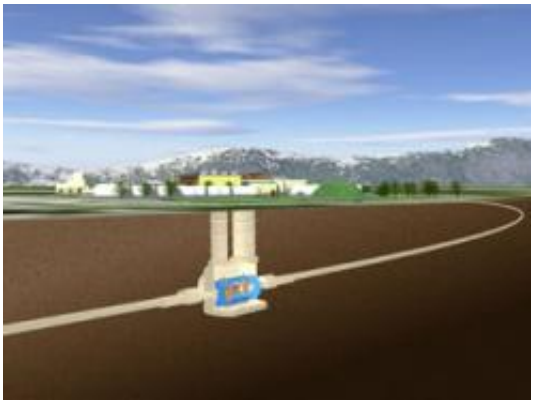
CERN teams post Higgs Boson papers - one ups its sigma level of certainty

August 2 2012, by Bob Yirka



This artist's graphic shows the underground ATLAS detector along the 17-mile subsurface tunnel, the Large Hadron Collider at the Swiss-Franco border. Protons will smash into each other with unprecedented impact speeds.

(Phys.org) -- The two teams working (and causing headlines around the world) at the CERN Large Hadron Collider CMS and ATLAS, have both uploaded papers describing their work in searching for evidence of the particle that is believed to explain why matter sticks together, the elusive Higgs Boson, to the preprint server *arXiv*. In their paper, ATLAS has bumped up its sigma level of certainty from 5.0 to 5.9 while CMS has kept its level at the 4.9 to 5 range.

The sigma levels are indicators physicists use to gauge how sure they are of their results. 5.0, for example indicates the researchers believe there is

a five in ten million chance that the signals they've seen are due to something other than what they believe it to be; in this case, evidence of a Higgs boson. 5.9 would bump up the likelihood to two in a billion.

It's important to note that both teams are still calling what they've found to be something "Higgs like" rather than boasting of the discovery of the actual boson. This is because neither team has actually seen the boson, instead, they rely on measurements of particles that are thought to come into existence as a Higgs decays; according to theory, it's only supposed to last for the tiniest fraction of a second, too little time to actually see or record it. It's also important to note that the sigma numbers aren't measurements of how certain the researchers are that what they've found is the Higgs, instead they are numbers that represent how certain the teams are of what they've measured. This means it's possible that all their measurements and numbers are right, but whatever caused them to come about isn't an actual Higgs, but something else that is both close to a Higgs and un-described in the Standard Model. There is no statistical number to demonstrate how sure they are of that.

What this all means is that both teams, and most physicists who study such things, are pretty sure that the work at CERN has proven that the Higgs boson does indeed exist and that further study will one day allow for the removal of the Higgs-like tag. On the other hand, if it turns out that what the teams have been measuring is due to something else, well, that will mean having to edit the Standard Model, which is a description physicists have come up with to describe all of the ingredients at their most basic level, that make up everything that exists.

More information:
ATLAS preprint: arxiv.org/abs/1207.7214
CMS preprint: arxiv.org/abs/1207.7235