

The search for the God Particle's heavier siblings

The aspiration to understand the universe has existed for as long as mankind has walked the earth. Humanity has come up with a plethora of explanations for how things work, including explanations such as religious forces or the combination of the four elements. As time has moved on, we've begun to realize which theories actually predict reality and which fall short, and this is a process that is essential to science even today.

One theory that is central to the understanding of the universe is called the Standard Model. It has been developed and refined since the mid-1900s and it describes the fundamental particles and forces of our universe. It can be seen as a recipe book with the basic ingredients out of which the universe is made of. The Standard Model accurately predicts and describes a majority of the universe and its interaction, but completely misses in a few areas. For example, it can't describe the existence of gravity, or why the universe seems to be entirely made of matter rather than both matter and anti-matter. For this reason, scientists build massive experiments in order to reveal the underlying structure of the universe, allowing them to improve the models.

The Large Hadron Collider (LHC) at CERN in Geneva is one such experiment. It accelerates protons in a giant circular accelerator close to the speed of light in order to collide them with each other. Because of their high speed, the colliding protons explode like tiny piñatas, producing massive amounts of particles of different types. These emerging particles can be studied using massive detectors, allowing physicists to compare real events with predictions from current theories. If a prediction from a theory matches the measured data very well, the Standard Model might be tuned to include that theory, resulting in an improved model.

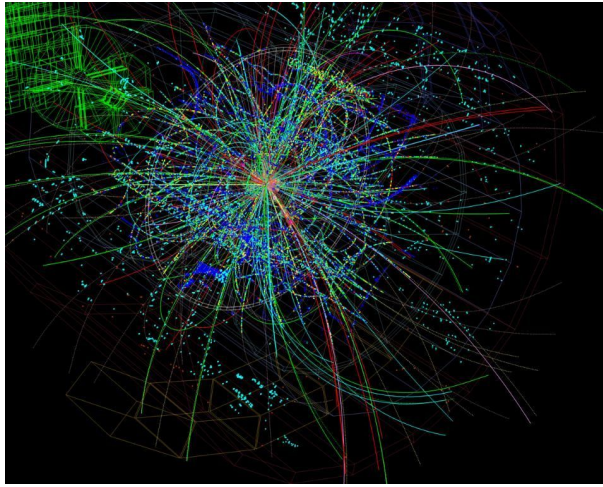


Figure 1: Recreation of tracks from particles emerging from a collision inside a detector. (From home.cern)

The discovery of the "God particle", or rather the Higgs boson in 2012 was a huge confirmation of the accuracy of the Standard Model. The theory had for a long time predicted its existence, but it took many years for the technology to catch up. Nowadays we're in sort of a reversed situation where strange effects can be found in the data that isn't explainable by the Standard Model in its current state. Theorists therefore have suggested (among many other theories) that the Higgs particle has some as yet undiscovered siblings. These particles would behave a lot like the Higgs particle, but would have different mass and different ways of decaying. Recent studies indicate that this is plausible, but so far no one has been able to confirm their existence. This might change in the near future as the LHC improves, and so it might just be a matter of time before we get the chance to meet the siblings of the God Particle.