Higgs boson FAQ

What is the Higgs boson?

The Higgs boson (named for Scottish physicist Peter Higgs) is an unusual kind of subatomic particle. To explain *how* unusual, let's back up a bit.

In our current theory of particle physics, fundamental particles do not have mass on their own. They get their mass by interacting with the the Higgs *field*. The *field* is a concept like a magnetic or gravitational field: it's present everywhere. (Unlike a magnetic or gravitational field, though, the size of the Higgs field doesn't change much from place to place.) Higgs *bosons* are ripples of the Higgs field. By finding the Higgs bosons, we have evidence that the field itself exists - like seeing water waves and concluding there must be an ocean beneath.

The Higgs field is extremely important in particle physics. It's no exaggeration to say that it makes your existence possible. Without it, atoms would not exist; electrons would zip away from nuclei at the speed of light. The value of the Higgs field determines what kinds of nuclei are stable and some of the differences between matter and antimatter. Almost all particles we know of are affected in some way by the Higgs field.

What have we discovered?

We have found a new particle which, on the whole, appears to have the properties expected for the simplest Higgs boson model. This new particle has a mass about that of an atom of cesium. We can only make general statements now because we just have enough data to claim that we see something, but not enough data to know precisely how it behaves.

This point is important because there are many theories which would modify these properties from the simplest model. Our discovery has already ruled out many ideas that would have predicted that we would see nothing at all, that it would be at a different mass, or that it would decay wildly differently.

Ok, you found it, are you done now?

Not by any means. We have found *something*, but have only been able to get a brief glimpse of it. The exact properties of this particle will be able to give us huge insight into what additional particles and forces there might be. We are planning to study this particle in great detail to accumulate as much information about it as we can.

How is UT involved?

UT physicists form part of the ATLAS collaboration, which built and operates a particle physics experiment at the Large Hadron Collider at CERN, the European particle physics laboratory. This facility is the only place in the world where Higgs bosons can be produced and studied.

Check out our poster from the Oct 2012 Physics Department Open House here.