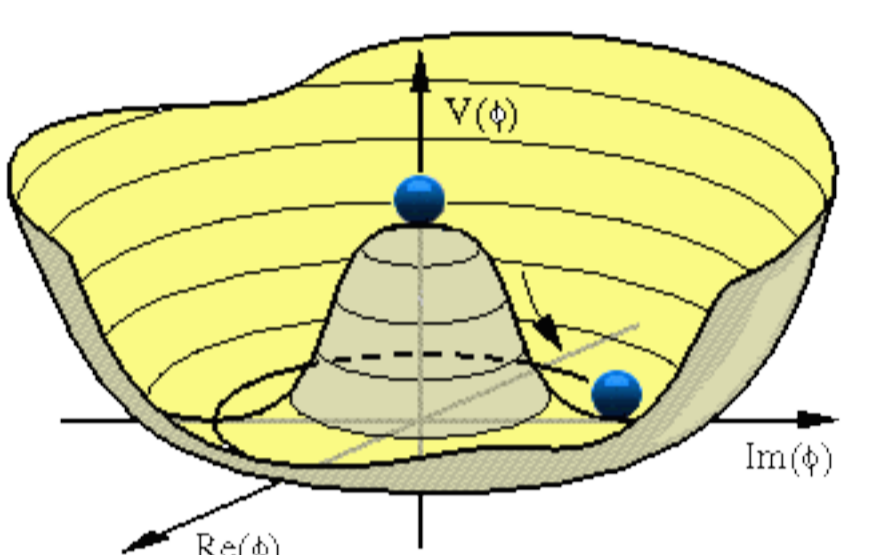


The Higgs search in ATLAS

>Higgs boson

In the Standard Model of elementary particle physics, non-zero particle masses pose a serious technical difficulty. The Higgs mechanism, theorized in 1964 by Peter Higgs, François Englert and Robert Brout, incorporates non-zero particle masses via interactions with a constant, omni-present background field: the Higgs field. This hypothesis fits the Standard Model like a glove. The Higgs background field also predicts the existence of a corresponding particle: the Higgs particle.

The experimental observation of the Higgs particle validates the Higgs hypothesis and thereby clarifies the mystery of non-zero particle masses!



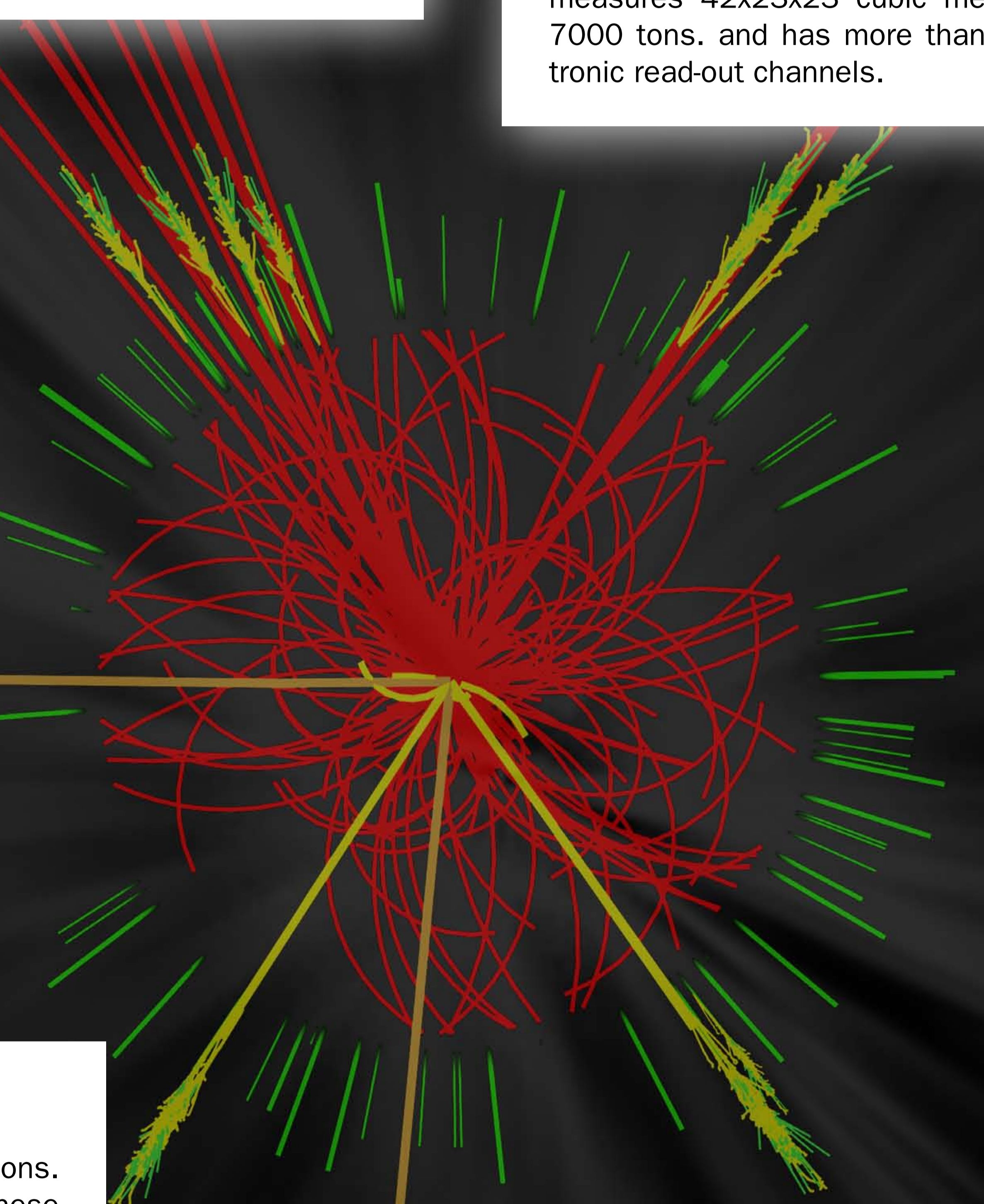
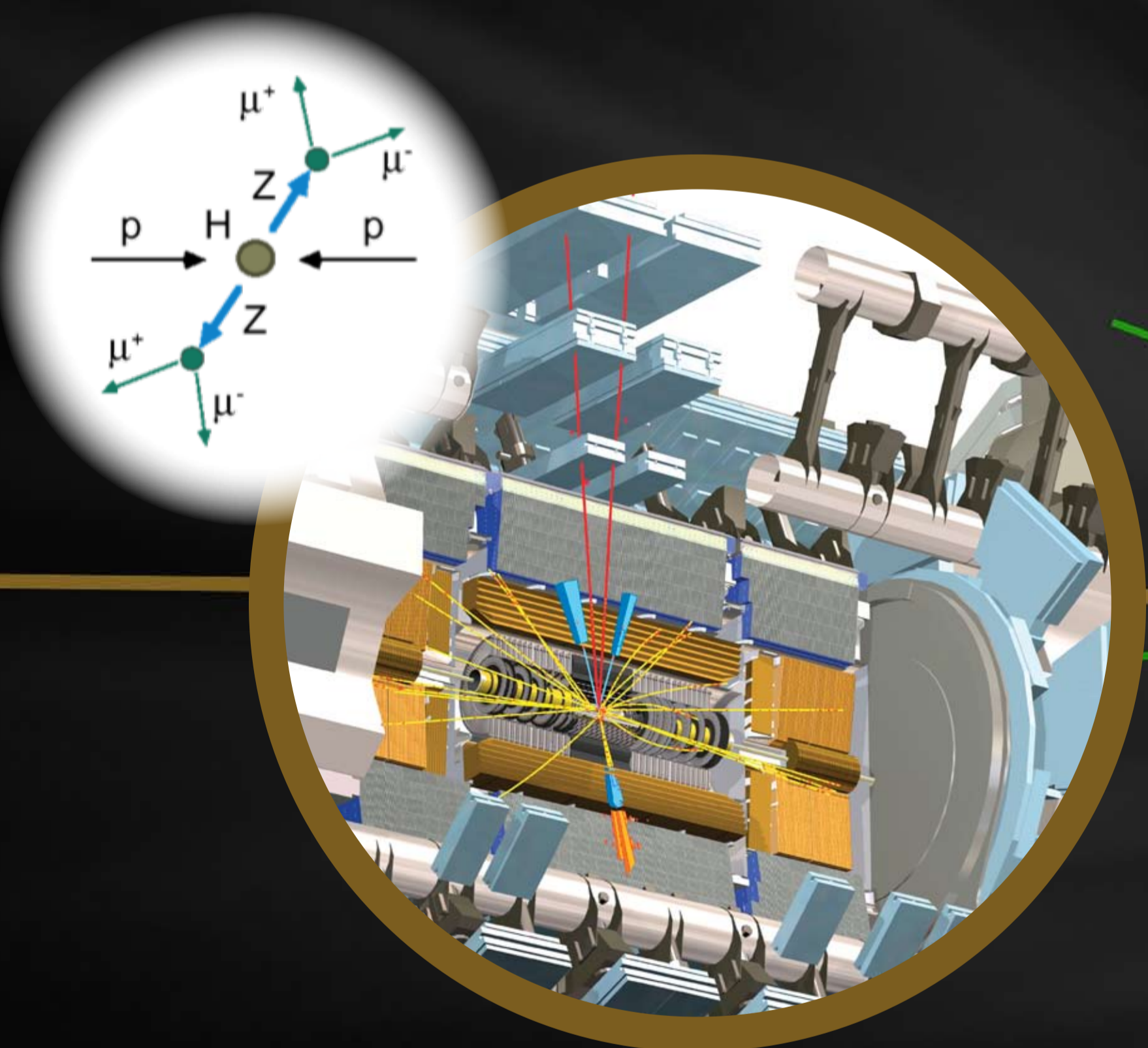
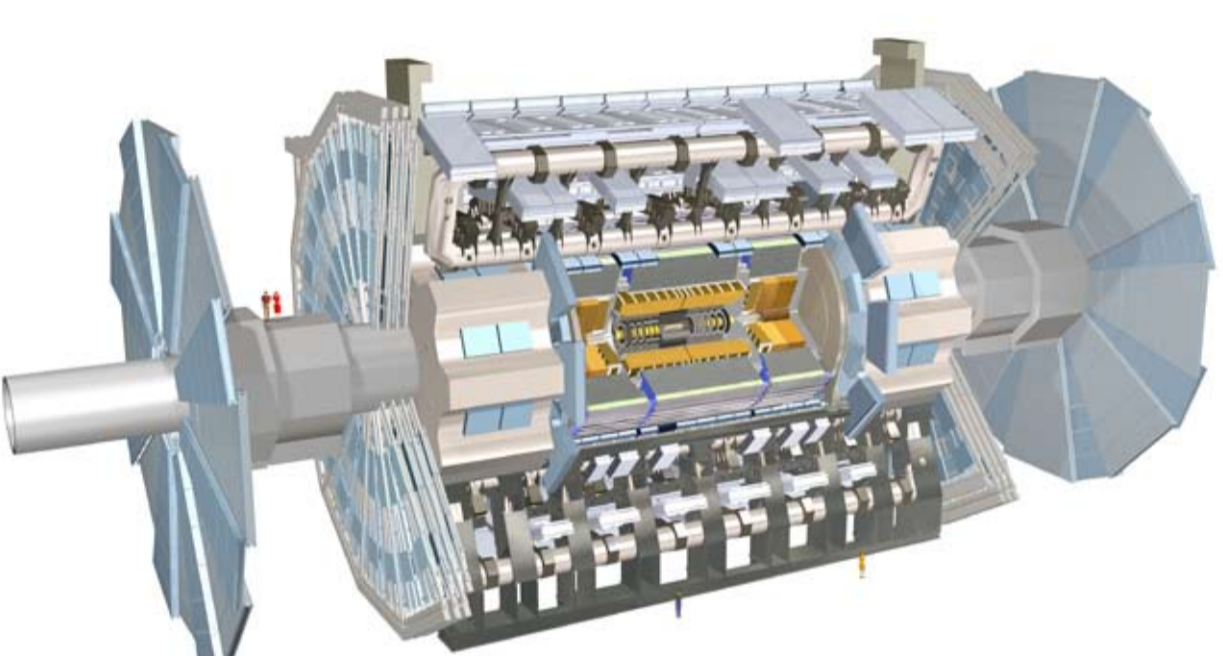
>Large Hadron Collider (LHC)

CERN's LHC near Geneva is a 27 km circumference collider producing proton-proton collisions at a center-of-mass energy of 14,000 GeV or 14 TeV. This energy will open up a completely new energy scale in elementary particle physics: the Tera-scale; allowing the discovery of the Higgs particle.

Protons circulated in the LHC for the first time on September 10th, 2008. Full LHC operation is expected to start in 2009.

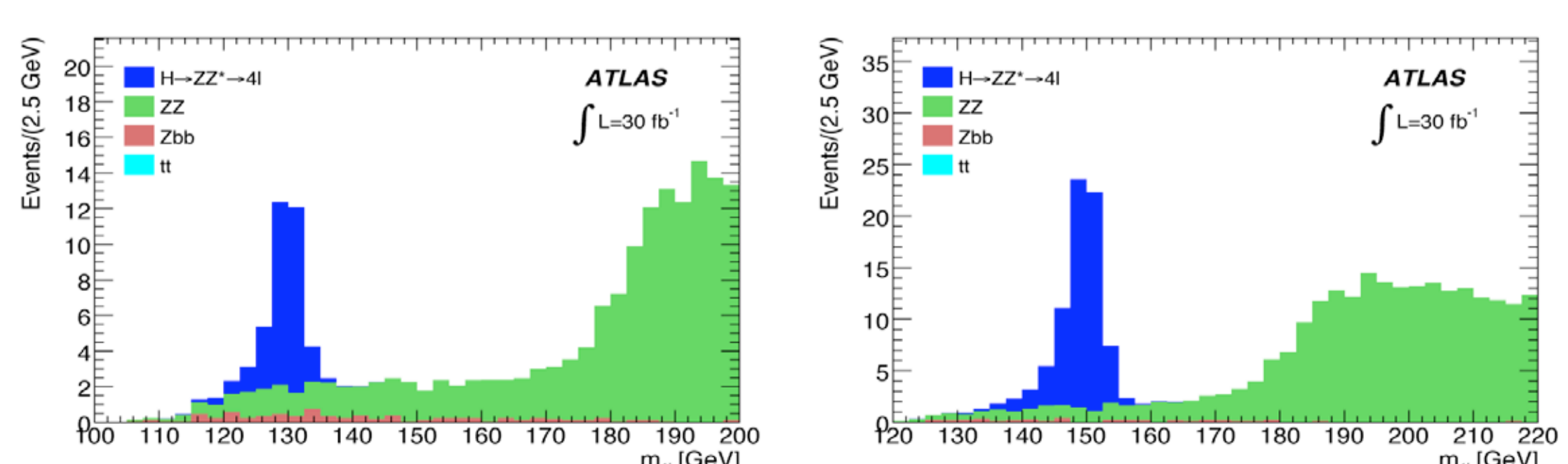
>A Toroidal Apparatus (ATLAS)

The ATLAS detector is designed to reconstruct the products of proton-proton collisions at a rate of 40 million per second. The ATLAS detector measures 42x23x23 cubic meters, weighs over 7000 tons, and has more than 150 million electronic read-out channels.



>Observing the Higgs particle

In the so-called golden channel the Higgs particle decays to four muons. The ATLAS tracking system is perfectly capable of reconstructing these four muons. A peak in the four-muon invariant mass spectrum signals the existence of the Higgs particle as shown in the figures for an assumed Higgs particle mass of 130 and 150 GeV, respectively.



>Prospects for the Higgs particle discovery

Studies have shown that ATLAS will be able to detect the Higgs particle from the today's 114 GeV lower mass limit extracted from earlier measurements to the 1000 GeV upper mass limit based on theoretical prejudice.

