

Y3 Particle Physics

2011-12

Dr. N.K. Watson

"Office Hours"

Monday and Thursdays, in the hour following lectures

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Course Material

Updated lecture by lecture on

<https://www.ep.ph.bham.ac.uk/twiki/bin/view/General/Y3Pp>

WebCT for course has two links: one to above, and one to previous course material

Outline

- Relativistic Kinematics
 - ▶ (4-momentum)² invariance, invariant mass
 - ▶ Hypothesis testing, production thresholds
 - ▶ Cross sections, flux and luminosity
 - ▶ Particle lifetime, decay length, width
- Classification of particles
 - ▶ Fermions and bosons
 - ▶ Leptons, hadrons, quarks
 - ▶ Mesons, baryons
- Quark Model
 - ▶ Meson and baryon multiplets
 - ▶ Isospin, strangeness, c, b, t quarks
- Particle Interactions
 - ▶ Virtual particles and range of forces
 - ▶ Strong and weak decays, conservation rules
 - ▶ Parity, charge conjugation, CP
 - ▶ Weak decays of quarks
 - ▶ Colour charge, QCD, gluons
 - ▶ Charmonium and upsilon systems
- Electroweak Interactions
 - ▶ Charged and neutral currents
 - ▶ W, Z, LEP experiments
 - ▶ Higgs and the future
- LHC Experiments
- Future - introduction to accelerator physics

Fast moving!

22 Dec.2011 Chi_b(3P) – 1st observation

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22 December 2011 Last updated at 10:59

LHC reports discovery of its first new particle

By Jonathan Amos
Science correspondent, BBC News

The Large Hadron Collider (LHC) on the Franco-Swiss border has made its first clear observation of a new particle since opening in 2009.

It is called Chi_b (3P) and will help scientists understand better the forces that hold matter together.

The as-yet unpublished discovery is **reported on the Arxiv pre-print server.**

The LHC is exploring some of the fundamental questions in "big physics" by colliding proton particles together in a huge underground facility.

Detail in the sub-atomic wreckage from these impacts is expected to yield new information about the way the Universe is constructed.



The LHC has been built to investigate the fundamental building blocks of nature

Related Stories

Higgs 'may have been identified'

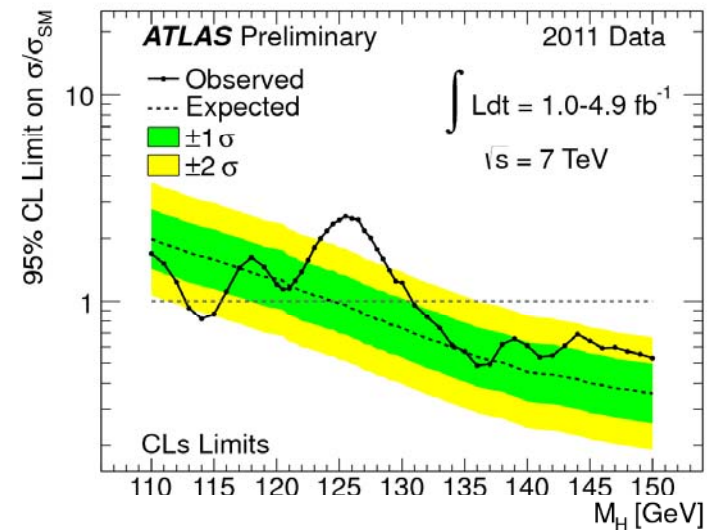
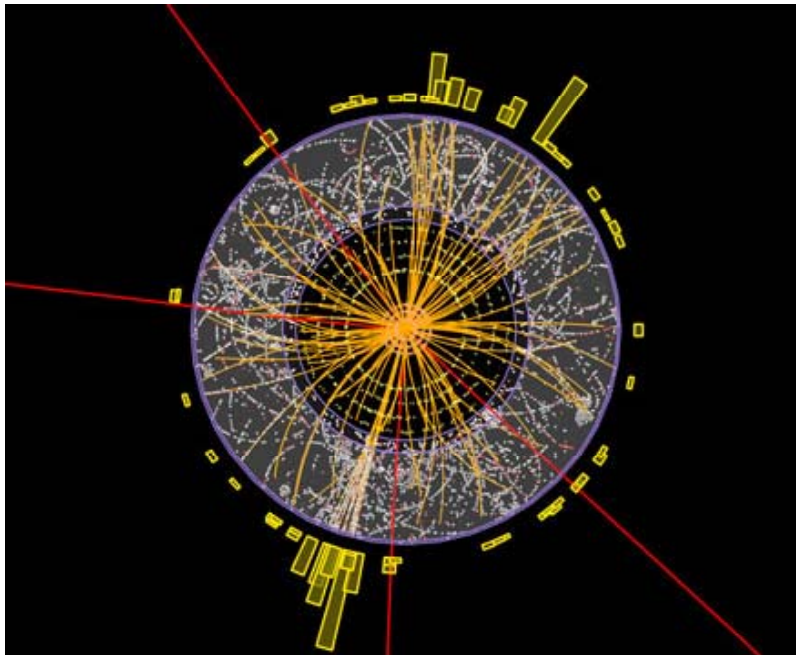
Q&A: The Higgs boson

Andy Chisholm, a PhD student from Birmingham who worked on the analysis, said: "Analysing the billions of particle collisions at the LHC is fascinating. There are potentially all kinds of interesting things buried in the data, and we were lucky to look in the right place at the right time."

15 months after starting his PhD in Birmingham - only 3 years ahead of y3

Fast moving!

Status reports from ATLAS and CMS, 13 Dec. 2011
ATLAS interesting event and summary



"We have restricted the most likely mass region for the Higgs boson to 115-130 GeV, and over the last few weeks we have started to see an intriguing excess of events in the mass range around 125 GeV," explained ATLAS experiment spokesperson Fabiola Gianotti. "This excess may be due to a fluctuation, but it could also be something more interesting. We cannot conclude anything at this stage. We need more study and more data. Given the outstanding performance of the LHC this year, we will not need to wait long for enough data and can look forward to resolving this puzzle in 2012."

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- 11 June - 28 Sept

https://ert.cern.ch/browse_www/wd_portal.show_job?p_web_site_id=1&p_web_page_id=9868

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