

Y3 Particle Physics

2012-13
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

Reading List

General particle physics texts

- Introduction to Elementary Particles, David Griffiths (Wiley-VCH, 2008, second edition revised, ISBN 978-3-527-40519-2)
- Particle Physics: An Introduction, John D. Jackson (Wiley, 1999, ISBN 0-471-30936-1)
- Elementary Particle Physics: A Textbook, Christopher G. Tate (Prentice-Hall, 2001, ISBN 0-13-063522-0)
- The New Particle Physics: An Introduction for Scientists, S.D. Drell and J.D. Bjork (Cambridge University Press, ISBN 0-521-85003-1)
- Quarks and Leptons: An Introduction to Modern Particle Physics, F. Halzen and A.D. Martin, Wiley and Sons, ISBN 0-471-88784-2 (1984). Difficult to get hold of and more advanced than required for us
- Elementary Particle Physics, G.E. Burdett, Longman, ISBN 0-582-40521-1 (1982). There is a more recent book by Halzen and Martin which may be useful
- Nuclear and Particle Physics, B.R. Martin, Wiley, ISBN 0-471-02122-8 (2000)
- Particle Physics, B.R. Martin and G. Shaw, Wiley, ISBN 0-471-52239-1 (1992)
- For students who have not attended 'Quarks and Leptons': In reading the particle physics chapters from Quarks, Leptons and the Big Bang, J. Armitage, 2nd edition, ISBN 0750658005

Particle Detectors

- Introduction to Particle Detectors, K. Hancock, Cambridge University Press, ISBN 9512445221 (1988). Note the book has a couple of copies of 1st ed. which will also be useful

Particle Accelerators

- Introduction to Particle Physics and Accelerators, M. Tigner and A. Chao, North-Holland, ISBN 0444432503 (1978) ISBN 0444432503, 1988

Neutrino specific texts

- Neutrino Physics (2nd edition), K. Winter (Ed.), Cambridge University Press, ISBN 9-521-68934-0 (2000)
- The Quark Neutrino, M. Szwed, Scientific American Library, ISBN 0-7147-0060-0 (1987)
- Neutrinos: Neutrinos, C. Barger, Cambridge University Press, ISBN 0-521-32464-4 (1982)
- Physics of Neutrinos and Applications in Astrophysics, B. Raju and T. Vengalil, Springer Verlag, ISBN 3-642-33030-0 (2003)
- Neutrino Oscillations and Applications, M. Mignani and P. Pal, North-Holland, ISBN 0-444-84259-0 (1994)
- Neutrinos, G.M. Lewis, Wileymonographs, ISBN 0-85198-148-7 (1975)
- Fundamental Particles and Introduction to Quarks and Leptons, B.G. Dew, Taylor and Francis Ltd, ISBN 0-4090-320-0 (1986)
- The Neutrino, J.A. Abbas, Prentice-Hall, (1976)

Fast moving!

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

22 December 2011 1:47 (updated at 15:35)
NEWS SCIENCE & ENVIRONMENT
LHC reports discovery of its first new particle
By Jonathan Ames
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 2008.

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

The as-yet-established 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.

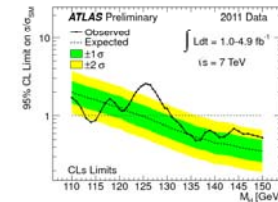
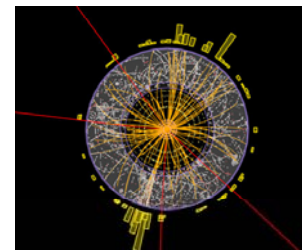
Related Stories
Higgs may have been discovered
GAA: The Higgs boson

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."

Evidence for Higgs-like boson

4 July 2012 Last updated at 08:35

Higgs boson-like particle discovery claimed at LHC

By Paul Rincon

Science editor, BBC News website, Geneva



The moment when Cern director Rolf Heuer confirmed the Higgs discovery

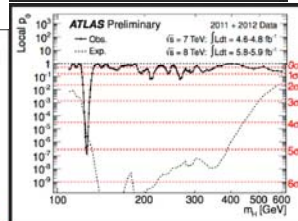
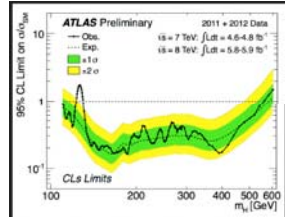
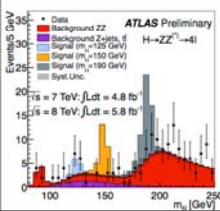
Cern scientists reporting from the Large Hadron Collider have claimed the discovery of a new particle, the Higgs boson.

The particle has been the subject of a 45-year hunt across its mass.

Both of the Higgs boson-hunting experiments at the site, a level of certainty in their data worthy of a "10 sigma".

More work will be needed to be certain that what it is, however.

CMS had comparable results



CERN Summer Studentships

Deadline for applications: 27 January 2013



2011 summer students

- Between 8 and 13 weeks working at CERN
- A living allowance to cover the expenses of a single person in the Geneva area.
- Travel allowance (on a lump sum basis).
- The CERN Housing Service will assist you in finding accommodation on, or near the site of the laboratory.
- 10 June - 27 Sept

https://ert.cern.ch/browse_www/wd_portal.show_page?p_web_site_id=1&p_text_id=12

Outline

- Relativistic Kinematics
 - $(4\text{-momentum})^2$ 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

DESY Summer Studentships

Deadline for applications: 31st January 2013

SUMMER STUDENTS.

DESY International Summer Student Program 2013
July 16 to September 5



DESY is one of the world's leading accelerator centers for fundamental research in particle physics and photon science. Personal development will participate in experiments related to:

- 16 July - 5 September
- Subsistence for single person
- Travel (up to €130)

<http://summerstudents.desy.de/>