PRAMANA
— journal of
physics

Vol. xx, No. x
xxxx xxxx
pp. 1–

The Standard Model Higgs Search at the Large Hadron Collider.

S. Bhattacharya
Department of Physics and Astrophysics, University of Delhi, Bangalore 560012

Abstract. The experiments at the Large Hadron Collider (LHC) will probe for Higgs boson in the mass range between the lower bound on the Higgs mass set by the experiments at the Large Electron Positron Collider (LEP) and the unitarity bound ($\sim$ 1 TeV). Strategies are being developed to look for signatures of Higgs boson and measure its properties. In this paper results from full detector simulation based studies on Higgs discovery from both ATLAS and CMS experiments at the LHC will be presented. Results of simulation studies on Higgs coupling Measurement at LHC will be discussed.

Keywords. higgs, LHC, CMS, ATLAS

PACS Nos 2.0

1. Introduction

Higgs boson, the massive scalar particle responsible for giving mass to Gauge bosons and fermions and for the renormalizability of the Standard Model (SM) of particle physics has remained elusive so far. The Large Electron Positron collider program at CERN, Geneva concluded with no definitive discovery signal of Higgs. The Tevatron data has not revealed any signature of Higgs boson so far. The Large Hadron Collider(LHC), under construction at CERN will collide protons at a center-of-mass energy of 14 TeV. The LHC is expected to start operating in the year 2007. The design startup luminosity is $2 \times 10^{33} cm^{-2}/s$. Search for Higgs boson is the most important Physics goal of the experiments at the LHC. Two experiments at the LHC, CMS and ATLAS will carry out searches for Higgs bosons. Detailed search strategies are being designed to look for signatures of Higgs. Studies have also been done on measurement of Higgs properties such as coupling, spin etc. at the LHC. Higgs bosons. The existing LEP lower limit on SM Higgs mass is 114.4 GeV, at 95% CL[pdg05]. The experiments at the LHC are capable of scanning a Higgs mass range starting from the LEP lower bound upto more than a TeV. It is strogly expected that experiments at the LHC will discover Higgs if it exists. In the following sections we will give an overview of the results obtained from simulation studies done by the CMS and the ATLAS on Higgs search at the LHC.

2. The Troubles

It was a sunny winter afternoon. After having a rather delicious lunch, the king decided to indulge in a long siesta. And he was dreaming of the heaven where all you are supposed to do is to sleep and dream of sleeping and in those sleep of dreams, you again dream of sleeping and these goes on recursively with out ever giving any stacking fault. (*And in heaven you can use recursive subroutines even in fortran!*)

Suddenly the king found the minister shaking him vigorously. Aparently for as small a reason as a battle with the next country, the minister wants him to be present in the meeting of the army chiefs. No amount of protests yielded any results. And worse still, the king could never sleep with out actually going to the bed. And the Air-force chief was sleeping happily in the meeting. Some more text to make it fill up the extra line. And even more text.. even more... even more...

1. first item And here I should describe about what the item is all about! But do I really need to describe that?
2. first item
3. first item

1. This is a test line.
2. This is a test line.

- this is first item
- this is second

2.1 The king does sum

The minister pointed out that the infantry of strength 2000 each needs food which should increase as square of time spent and wrote down some thing on the board which looked like:

$$Food_{total} = \sum_{1}^{2000} \int_{0}^{T} f(t)dt. \tag{1}$$

The minister also said that $f(t)dt$ in equation **??** is amount of food consumed par person at time t from the start of the war in an interval of dt.

Someone had put up a poster which had three lines depicting the food requirement for the air, military and the naval forces. But figure **??** failed to show which is for what and everyone kept nodding their head with out ever asking what the plot actually mean!

There was also a table which actually was:

All these made the king so bored that he decided to leave the kingdom for good.

Figure 1. mass distribution from a Pythia simulated sample of 100 GeV Higgs decaying to two photons(left). A signal(in red)+ background(yellow) mass distribution for a 130 GeV Higgs(center) and background subtracted signal peak (right) are also shown.

Table 1. hey what a nonsense.This is a long line checking if things work properly. may be . may be not . knock woods or keep fingers crossed? How do you type keeping fingers crossed???

class	calory requirement	number of person
army	5000	1247
navy	3895	2435
airforce	3098	8274

3. The long journey

It was a really interesting journey. And the days after the journey ended is even more interesting. We are sorry that because of the restriction of the journal article, we could not tell you more. But you can look up [**?**] for details which are available for Rs. 200 par copy in the book stores and Rs. 23 par dozen in the footpath.

$$2 + 3 = 5 \tag{2}$$

$$2 + 3 = 5 \tag{3(a)}$$

4. Summary

In this paper we discussed the search strategies of a SM Higgs boson in Three broadly divided mass regions. We have discussed some of the dominant discovery modes as examples of MC studies of the MSSM Higgs search at the LHC.

Full detector simulation based studies have been performed in both the CMS And the ATLAS experiments for all major discovery channels in each mass region. Some promising channels, namely $H \to \gamma\gamma, H \to ZZ \to 4leptons(e/\mu)$ in the low mass region, and $H \to$

Table 2. hey what a nonsense.

class	calory requirement	number of person
army	5000	1247
navy	3895	2435
airforce	3098	8274

$WW \rightarrow ll$ (dilepton), H $\rightarrow ZZ \rightarrow lljj$ (dilepton+dijet) channels have been discussed in this paper. It is expected that LHC will be able to discover Higgs with mass between the LEP limit and the perturbative bound within the first year of running at the design luminosity and center of mass energy. In the low mass region Higgs decay to two photons will play a significant role, while in the intermediate-high mass region $H \rightarrow WW$ and $H \rightarrow ZZ$ with W and Z decaying leptonically are the most promising search channels. For a low-intermediate mass Higgs it should be possible to measure the Higgs mass within few hundred MeV from the $H \rightarrow \gamma\gamma, H \rightarrow ZZ \rightarrow 4leptons(e/\mu)$ channels. Higgs properties, such as coupling and CP should be measurable with 100 $fb^{-}1$ of data.

References

[1] this and that author, The story of an unhappy king,3904,230,(98)
[2] This is a long line. This is a long line. This is a long line. This is a long line. This is a long line. This is a long line. This is a long line.
[3] another item
[4] another item
[5] another item
[6] another item
[7] another item
[8] another item
[9] another item
[10] another item
[11] another item
[12] another item