



COURS ENIGMASS 2014

Proposal for three lectures of 1h30' + 30' discussion
Location: Annecy-le-Vieux

Organizers

Marie-Hélène Genest, Fabienne Ledroit, Benjamin Trocmé from LPSC in Grenoble.
Marco Delmastro, Lucia Di Ciaccio and Isabelle Wingerter-Seez from LAPP in Annecy.

The aim is to highlight and detail two topics, naturalness and EWSB, in the context of preparing the Run II of LHC.

The target audience is advanced staff physicists, PhD students and post-docs.

1. Naturalness

1.1. We would like first to understand better the concept of naturalness, its links with the hierarchy problem(s) and whether we do actually have a hierarchy problem or not. In other words, could it be that the Standard Model is the ultimate theory?

1.2. Since the answer to the above question is not obviously "yes", we would then like to understand the different ways to solve the problem: what are the classes of theories/models, how do they fix the issue, what are their possible drawbacks, etc.... These points should be addressed in a pedagogical way.

1.3. Finally, can we already draw some conclusions from the Run I limits? What would be the best concept or approach to be able to conclude on some scenarios with run II data ?

2. EWSB

2.1. We would like to understand which are the possible scenarios of EWSB after the discovery of the 125 GeV Higgs and the present measurements of its parameters.

2.2. How can we study these possible scenarios of EWSB in Run II (and beyond)? We would then like to know what we can learn in Run II from:

2.2.1. the Higgs analyses,

2.2.2. the study of final states with at least two gauge bosons,

2.2.3. the precision measurements (and in this case, which ones are the most relevant: m_W , m_{top} ?)

2.3. Which are the constraints derived from the present measurements of the Higgs properties (quantum numbers, couplings and masses) on New Physics Model? What does a 125 GeV Higgs imply for SUSY, etc..?