Searches for New Physics:

Les Houches Recommendations for the Presentation of LHC Results

CERN, Feb 13, 2012

Motivation

- LHC is the high energy frontier machine to explore the TeV scale and provide answers to many key questions in particle physics.

- Experimental program is running extremely well, with a plethora of analyses for Higgs and new physics searches being performed.

- The complexity of the analyses together with the complexity of the possible new physics models requires active collaboration of experimentalists and theorists —the whole HEP community— to fully exploit the LHC potential.

- Common agreement that LHC results should be made available in the best possible way.

- Besides our own (physics) interest in making the most out of the LHC data, we may soon be seriously mandated by the funding agencies to work much more openly towards this aim ...

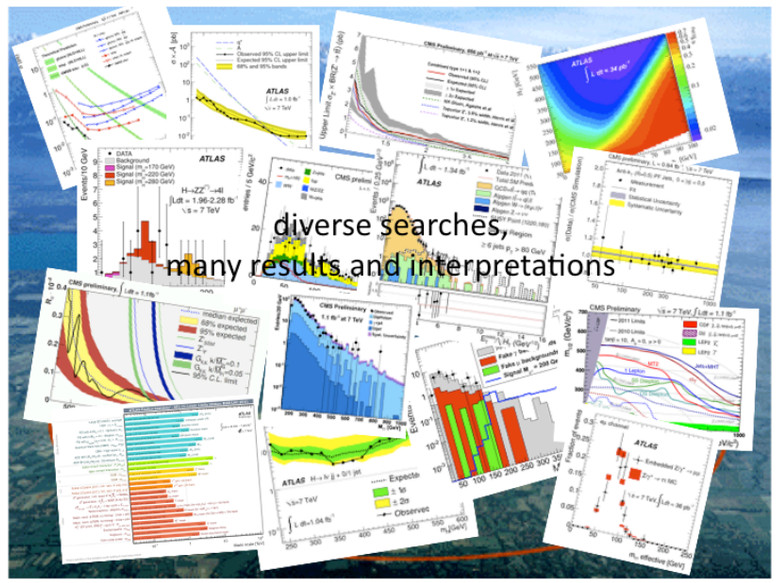


Illustration curtesy S. Sekmen

Les Houches Recommendations

- At PhysTev2011 workshop, we started to discuss a set of recommendations for presenting the LHC results in a form that would be most useful to the community at large, and that would help to maximize the scientific return of the LHC.

- Initial set of recommendations contributed to Les Houches proceedings; 28 authors from 28 institutes, (17 th / 11 exp)

- Intended as guidelines to the experimental collaborations to maximize the use of the published results. Now need further discussion and refinement.

Searches for New Physics: Les Houches Recommendations for the Presentation of LHC Results

Coordinators: *S. Kraml*[1], *S. Sekmen*[2,3];

B.C. Allanach[4], *P. Bechtle*[5], *G. Belanger*[6], *K. Benslama*[7], *C. Balazs*[8], *A. Belyaev*[9,10], *M. Dolan*[11], *B. Fuks*[12], *M. Campanelli*[13], *K. Cranmer*[14], *J. Ellis*[3,15], *M. Felcini*[16], *D. Guadagnoli*[17], *J.F. Gunion*[18], *S. Heinemeyer*[16], *M. Kadastik*[19], *M. Krämer*[20], *J. Lykken*[21] *F. Mahmoudi*[3,22], *M. Mangano*[3], *S.P. Martin*[23,24,25], *H. Prosper*[2], *T. Rizzo*[26], *T. Robens*[27], *M. Tytgat*[28], *A. Weiler*[5]

underlined: editors

Abstract

We present a draft set of recommendations for the presentation of LHC results on searches for new physics, which are aimed at providing a more efficient flow of scientific information between the experimental collaborations and the rest of the high energy physics community, and facilitating the interpretation of the results in a wide class of models. Implementing these recommendations would aid the full exploitation of the physics potential of the LHC.

Contributed to Les Houches PhysTeV 2011 proceedings
January 17, 2011

LH Recommendations - some remarks

- In the Recommendations, we think it useful to clearly distinguish between
  - experimental result — whatever is actually observed, i.e. the outcome of an analysis, such as event count or the measurement of a physical observable,
  - and interpretation — the comparison of the experimental results to particular theoretical models

- Many of the experimental publications already implement several of the basic recommendations ⇨ work towards an agreement on a common standard.

- The sum of our recommendations goes substantially beyond current practice.

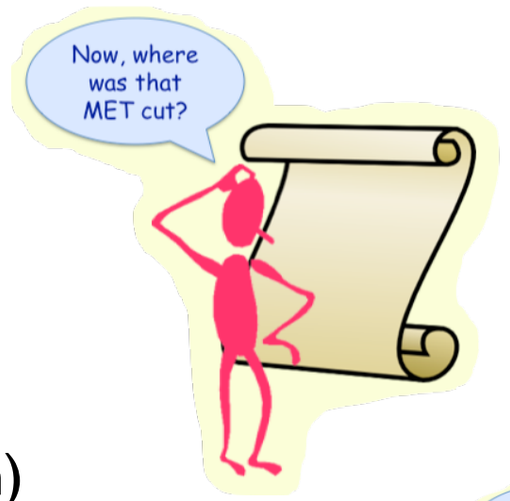
- Useful not only for non-collaboration groups or individuals performing (re-)interpretation studies; a common standard will also greatly facilitate the comparison and combination of analyses within and across the LHC collaborations, and help long-term data preservation efforts.

- Recommendations focus on what information should be provided, not how this should be done!

Nature and categories

a. "mandatory"
b. "desirable"

- Analysis description
  a. Clear, explicit & complete description of the analysis
  b. Common analysis database (analysis codes)
- Detector modeling
  a. Efficiency maps
  b. Public fast detector simulator
- Analysis dissemination
  a. Crucial numbers of results
  b. Full likelihood function (analytic and/or numerical form)



- Interpretation of experimental results confidence levels, etc ....
- Higgs searches channel-by-channel information
- Analysis design disjoint sets of events

curtesy S. Sekmen

Charge of this workshop

- The present document presents an initial set of recommendations, intended to serve as a basis for further discussion and refinement

- .... such that the recommendations might be adopted by the experimental collaborations for the presentation of their new physics and Higgs search results.

➤ Aim of this workshop

NB: The added value for the experiments, and the whole HEP community, in providing "open-access" information on the experimental results consist in a faster and more precise feedback on implications of these results for a broad range of theoretical scenarios that, in turn, will serve as crucial input in the choice of the best research directions in the near future, at the LHC, and in the longer term.

The tools needed to provide extended experimental information will require some dedicated efforts in terms of resources and manpower, to be supported by both the experimental and the theory communities. Practical solutions on the implementation of these tools also need to be discussed.

Feedback/concerns from collaborations

"... we feel we should be careful not to be too prescriptive, or to go too far down the road of providing raw, undigested information that would allow unreliable conclusions to be too easily drawn."

Feedback from ATLAS physics coordinators

Feedback/concerns from collaborations

"... we feel we should be careful not to be too prescriptive, or to go too far down the road of providing raw, undigested information that would allow unreliable conclusions to be too easily drawn."

Feedback from ATLAS physics coordinators

no intention to ask for this

Feedback/concerns from collaborations

"... we feel we should be careful not to be too prescriptive, or to go too far down the road of providing raw, undigested information that would allow unreliable conclusions to be too easily drawn."

Feedback from ATLAS physics coordinators