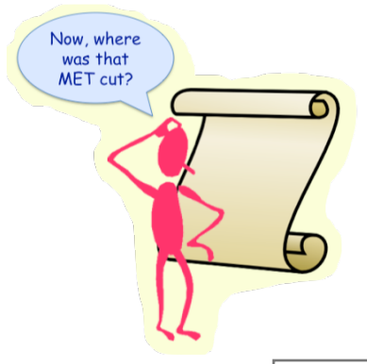
Searches for new physics: recommendations for the presentation of LHC results

chaired by Michelangelo Mangano (CERN), Sabine Kraml (Centre National de la Recherche Scientifique (FR))
Monday, 13 February 2012 from **09:00** to **19:00** (Europe/Zurich)
at **CERN (TH Theory Conference Room)**

Discussion of Recommendations



1. Analysis description

1a) Provide a clear, explicit description of the analysis in publications.
In particular, the most crucial information such as basic object definitions and event selection should be clearly displayed in the publications, preferably in tabular form, and kinematic variables utilised should be unambiguously defined. Further information necessary to reproduce the analysis should be provided on a suitable common platform.

1b) Provide a common analysis database where all the experimental results are stored together with all necessary information about the analyses, including well-encapsulated functions, such as multivariate analysis (MVA) functions if they are needed.

Phenomenologists' approach towards 1b: (Sezen et al.)
common platform of analysis codes by users of experimental results

2. Detector modeling

2a) Provide histograms or functional forms of efficiency maps wherever possible in the auxiliary information, along with precise definitions of the efficiencies, and preferably provide them in standard electronic forms that can easily be interfaced with simulation or analysis software.

2b) Provide and maintain a public simulator developed by the collaboration, or provide official support of an existing one. The public simulator would provide the mapping from the pre-detector data to the post-reconstruction data.

Both ATLAS and CMS object to 2b) and we surely respect this position.
Nevertheless, this document lists recommendations which, the authors believe, will help to improve the scientific output of the LHC results. Whether an experiment agrees with a recommendation or not should not change the fact that the recommendation is useful and should exist.

3. Analysis dissemination

3a) Provide all crucial numbers

An important complication to address is how to account for systematic uncertainties. For the single-bin analysis, numbers should be reported with and without the inclusion of systematic uncertainties. The same holds for theoretical uncertainties of various types: it would be useful if the experiments also provided results obtained without the inclusion of the theoretical uncertainties for well-specified theoretical inputs.

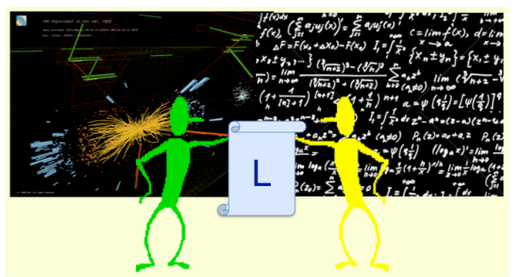
Addendum: For multi-bin results, provide an ensemble of sets of the numbers B, delta B, L, delta L, Q, k, etc in the auxiliary information.
These would be created by sampling from the various experiment-specific systematic effects, such as the jet energy scale, jet energy resolution, etc.
Systematic uncertainties external to the experiment, such as PDF uncertainties, need not be included because they induce correlations across measurements.

3. Analysis dissemination

3a) Provide all crucial numbers

3b) Provide a mathematical description of the final likelihood function in which experimental data and parameters are clearly distinguished, either in the publication or the auxiliary information.

3c) Provide a digitized implementation of the likelihood that is consistent with the mathematical description (e.g. in RooStats).

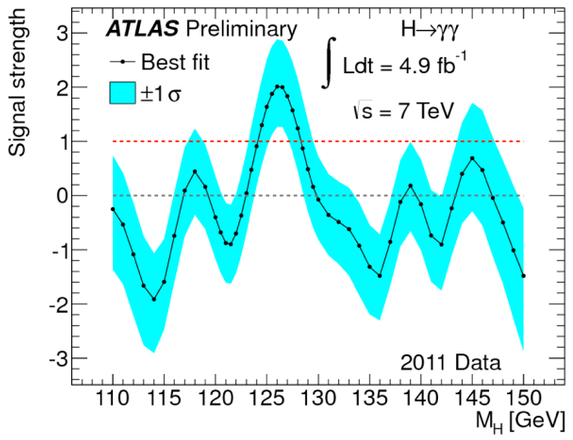


Interpretation of results

- So far our recommendations concern generally the presentation of experimental results, irrespective of whether they report a signal or are used to set limits. We also make some recommendations regarding the interpretation of these results, the presentation of confidence intervals, parameter inference and limit setting.

4) In the interpretation of experimental results, preferably provide the final likelihood function (following 3b or 3c), or provide a grid of confidence levels over the parameter space.
The expected constraints should be given in addition to the observed ones, and whatever sensitivity measure is applied must be be precisely defined. Modeling of the acceptance needs to be precisely described.

5) For Higgs searches, provide all relevant information on a channel-by-channel basis.



Analysis design

6) When relevant, design analyses and signal regions that are based on disjoint sets of events.