Top mass: challenges in definition and determination

Report of Contributions

https://agenda.infn.it/e/9202

Contribution ID: **0** Type: **not specified**

Top mass at CMS and World Averages

Thursday, 7 May 2015 14:30 (30 minutes)

A precise measurement of the top mass is one of the key aspects for testing the Standard Model. A short review of the experimental methodologies used at CMS will be given, including both direct and indirect reconstruction methods. Results will be presented and discussed, with emphasis to the systematic
errors, now dominating the total uncertainty.
The last part of the talk will be devoted to explain how the combination of the measurements, at the LHC and with the Tevatron experiments, is performed.

Primary author: CHIERICI, Roberto (CMS/IPNL Lyon)

Presenter: CHIERICI, Roberto (CMS/IPNL Lyon)

Contribution ID: **1** Type: **not specified**

Stability condition of the EW vacuum and top mass measurements

Friday, 8 May 2015 10:00 (1 hour)

According to the standard analysis, the stability condition of the EW vacuum mainly depends on the values of the Higgs and top masses, MH and Mt. For this reason, it has been believed and strongly stressed in the last years that a precision measurement of Mt will provide an answer to the crucial question of whether our universe is in a stable or metastable vacuum, or at the edge of stability. Needless to say, the top quark mass is one of the fundamental parameters of the Standard Model: the top cross sections, the size of quantum corrections to different processes, the value of the top Yukawa coupling, just to mention few examples, all crucially depend on Mt. Obviously, a precision measurement of Mt is of the greatest importance. However, it will not be able to tell us anything on the "fate of our universe" (contrary to what is often stated).
The reason is that new physics interactions, even if they show up only at very high scales (Planck scale), can strongly affect the stability condition of the EW vacuum. In the past, it was argued that new physics at very high energies cannot have impact on the vacuum stability properties, and this led to the believe that a precision measurement of Mt could "solve" the crucial stability problem.

Presenter: BRANCHINA, Vincenzo (Catania U. & INFN)

Contribution ID: **2** Type: **not specified**

The Higgs Mass, the Top Mass and the Scale of New Physics

Friday, 8 May 2015 11:00 (1 hour)

In view of the measured Higgs mass of 125 GeV, the perturbative renormalization group evolution of the Standard Model suggests that our Higgs vacuum might not be stable. I will present recent work where we connected the usual perturbative approach and the functional renormalization group which allows for a straightforward inclusion of higher-dimensional operators in the presence of an ultraviolet cutoff. In the latter framework vacuum stability can be studied in the presence of higher-dimensional operators. Their presence can have a sizable influence on the maximum ultraviolet scale of the Standard Model and the existence of instabilities. Further, I explain how such operators can be generated in specific models. Finally, I discuss the role of the top Yukawa coupling within this scenario.

Presenter: SCHERER, Michael (Inst. fur Theoretische Physik, Heidelberg)

Contribution ID: **3** Type: **not specified**

What is mt ?

Wednesday, 6 May 2015 10:00 (1 hour)

An introductory discussion of the main basic issues regarding determinations of the top quark mass is given. After a reminder of how to extract a fundamental parameter in a quantum field theory from observables, I will concentrate on two issues. First, which observables are particulary well suited for a determination of the top mass. Second, are some mass definitions better than others?

Presenter: SIGNER, Adrian (PSI, Villigen)

Contribution ID: **5** Type: **not specified**

The Top Mass: Interpretation and Theoretical Uncertainties

Wednesday, 6 May 2015 11:00 (1 hour)

I will talk about ways to better understand the concepts behind the Monte Carlo (MC) top mass parameter and about theoretical thoughts of how it may be related to renormalized field theory mass definitions.
The only possible way I can currently see to clarify the question in a more concrete way is by comparing hadron-level QCD calculations for observables which are highly top mass sensitive to corresponding hadron-level MC output. I might show first results for such an analysis based on event-shape distributions.

Presenter: HOANG, Andre (Vienna U.)

Contribution ID: **6** Type: **not specified**

Top quark mass at the LHC: kinematics and beyond

Thursday, 7 May 2015 15:00 (1 hour)

I will review some recent strategies for the top quark mass measurement, stressing in particular the foundation of each method on features of the kinematics of top quark production and decay at the Large Hadron Collider. Some of the advantages and drawbacks are discussed; in particular, I will present issues connected with the present status of the event simulations and theoretical calculations needed to carry out these measurements.

Presenter: Dr FRANCESCHINI, Roberto (CERN)

Contribution ID: **7** Type: **not specified**

Measurements of the top quark mass at the Tevatron

Thursday, 7 May 2015 11:00 (30 minutes)

I will show a summary of the top quark mass measurements at the Tevatron.
In particular, I will concentrate on the evolution of the “template” method
from its first application to the most recent results in the dilepton,
lepton plus jets and all hadronic top pair decay channels

Presenter: LEONE, Sandra (INFN Pisa)

Contribution ID: **8** Type: **not specified**

Top mass reconstruction techniques in ATLAS

Thursday, 7 May 2015 11:30 (30 minutes)

The top quark is a fundamental constituent of the Standard Model. Its properties are accurately predicted by the theory, except for its mass, which remains a fundamental parameter of the SM. Since the start of the Large Hadron Collider many million of top-antitop quark pairs are available for study. With such a statistics, the physics of the top quark has entered the precision era.
The main techniques used by the ATLAS experiment to reconstruct the top mass are discussed.

Presenter: COBAL, Marina (Udine U. & INFN)

Contribution ID: **9** Type: **not specified**

Measuring the top-quark running mass

Wednesday, 6 May 2015 15:00 (1 hour)

The top-quark mass is a fundamental parameter of the Standard Model. We will motivate, why precision determinations of the top-quark mass are important in the upcoming high-energy run of the LHC and discuss the prerequisites in theory for the extraction of a well-defined mass parameter in a given renormalization scheme.
We show that the top-quark's running mass in the MSbar scheme can be extracted with good precision at next-to-next-to-leading order in QCD and discuss a number of suitable observables.

Presenter: MOCH, Sven-Olaf (DESY)

Contribution ID: **10** Type: **not specified**

The search for new physics in top-quark interactions

Friday, 8 May 2015 15:00 (1 hour)

I would like to discuss how we could systematically look for new physics in top quark interactions at the LHC by using an EFT approach.

Presenter: MALTONI, Fabio

Contribution ID: **12** Type: **not specified**

Effects of color reconnection on the top mass

Thursday, 7 May 2015 10:00 (1 hour)

Color reconnection constitutes one of the main limiting factors for the high-precision top-mass measurements at hadron colliders.
This talk will describe what color reconnection is, how it is modeled in event generators and how it affects the reconstruction of top final states, with a particular emphasis on the top mass.
A series of new color reconnection models implemented in Pythia 8 will be presented, focusing on their implications for the existing top mass measurements and demonstrating ways in which future measurements could be used to constrain them.

Presenter: ARGYROPOULOS, Spyridon (DESY, Hamburg)