Modeling Beyond Standard Model physics

13 April 2017

Coffee and tea from 9.30am

10.00 Welcome

10.05–10.25 Tiziano Camporesi (CMS, CERN)

Standard Model of Nature: the unfinished job
With the discovery of the Higgs boson in 2012 at CERN LHC accelerator, the keystone of the Standard Model of nature's fundamental particles and forces has been laid. Paradoxically, this discovery highlights the limitation of the model and of our knowledge of fundamental phenomena as it leaves a number of fundamental questions unanswered. In this talk I will try to highlight what accelerator-based physics can contribute to address the questions related to the nature of Dark Matter, the asymmetry between matter and anti-matter in our universe, and in general the shortcomings of our present model on how Nature works.

10.25–10.45 Monica D'Onofrio (ATLAS, CERN ad Physics at Liverpool)

Searching for SUSY particles in an ocean of top quarks
At the Large Hadron Collider, searching for new particles predicted by SUSY
implies identifying their extremely tiny "signals" in an ocean of
uninteresting events, the so-called "background". Often, such background is constituted
by top quarks, discovered at the Tevatron only in 1995. The top quark is
special: the heaviest subatomic particle ever observed, its mass is about as
heavy as an entire atom of gold. Copiously produced at the LHC, top quarks can
mimic the signature of SUSY particles and physicists have to develop very sophisticated
strategies to recognize and reject these events. Physicists' knowledge about the top quark
is key to explore new physics Beyond the Standard model. I will give a brief

overview of the challenges facing the hunt for SUSY at LHC, and
some of the ingenious solutions.

10.45–11.05 Jon Butterworth (ATLAS, CERN and Physics at UCL)

Minimising model-dependence in LHC measurements
I will discuss how model dependence of measurements at colliders, especially the LHC, can be minimised by careful definition of the observables. I will show some of the practical benefits of this, in terms of the shelf-life of measured data and the impact on physics beyond the Standard Model.

11.05–11.25 Alan Barr (ATLAS, CERN and Physics at Oxford)

What the Large Hadron Collider can tell us about dark matter
The make-up of dark matter is one of the outstanding problems of physics today. The world's highest-energy collisions at the LHC have the potential to produce dark-matter in the laboratory for the first time. I describe how we are searching for dark matter candidates at the LHC, and discuss how our measurements are starting to constrain dark matter theories.

11.25–11.45 Michela Massimi (Philosophy at Edinburgh and PI of the ERC project *Perspectival realism*)

Modeling what might be the case
The methodological challenges facing the search for Beyond Standard Model physics at LHC highlight the peculiar nature of modeling practices in contemporary high-energy physics. Looking at specific experimental practices at LHC, I argue for the need to re-think what scientific models are for; and, how they can be used to explore new physics Beyond the Standard Model.

11.45– 12.15 Q&A for the whole panel