Beyond the 3SM generation at the LHC era Workshop

Thursday 4 September 2008 - Friday 5 September 2008

CERN

Scientific Programme

This is a 2 day workshop on the additional SM generations.

day-1: Theoretical Motivations + Precision physics &Rare decays + Astrophysics&Cosmology

day-2: Collider aspects (LHC and beyond) + Conclusions

Workshop "Beyond the 3rd SM generation at the LHC era"

A possible fourth SM generation offers an exciting opportunity in the LHC era. Such new heavy particles with masses larger than 100 GeV are compatible with measurements from LEP and the B factories. On the connection with CP violation, a fourth generation can link to, hence affect, all FCNC processes of interest.

For example, a recent Belle paper in Nature highlighted the possibility that the direct CP violation difference between B+ -> K+pi0 and B0 -> K+pi- could be due to New Physics in the electroweak penguin amplitude. If true, then very likely it could be due to the 4th generation up-type quark in the loop. Assuming this, then large and negative sin2Phi_Bs, i.e. CPV phase in Bs-Bs(bar) mixing amplitude, is predicted. Interestingly, this Winter, both CDF and DO announced measurements, four in total, all of which give large and negative sin2Phi_Bs.

The fourth sequential family is quite accessible at the LHC. For example, LHC can cover the full range of search for an extra quark generation.
Fourth family may be the simplest example of new flavor physics that will change our perspective on the flavor and the mass problem of the Standard Model. Models involving a fourth family are often concerned with the origin of the fermion mass spectrum. When the fourth family is massive enough then it also implies that the Goldstone bosons of electroweak symmetry breaking are strongly coupled. This implies that a light Higgs boson is absent, and new physics must play the role of Yukawa couplings. Thus a fourth family can unite the issues of electroweak symmetry breaking and the origin of flavor and mass.

With or without motivation from hints at the B factories, the search for additional generations will be conducted, and one should be prepared. Discovery would change our

view towards TeV scale physics.

We plan a small thematic workshop on the physics of the SM with N fermion generations with N>3, "Beyond the 3rd SM generation at the LHC era" on the 4th and 5th of September at CERN. Theory, precision data from B and charm factories, astroparticle/cosmology and collider aspects are to be reviewed in this 2 day meeting.
The aim is also to bring together theorists and experimentalists working on the phenomenology of the additional families and to stimulate discussions on the subject. The imminent LHC start up date imposes an emphasis on the collider and flavour physics, especially on the LHC data exploitation preparation.