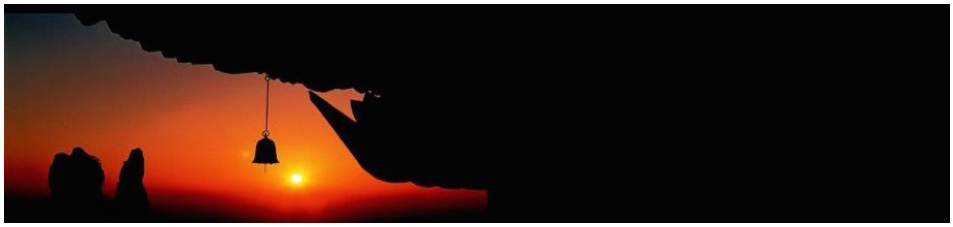

Contribution ID: **4** Type: **not specified**

The Coannihilation Codex

Monday, 14 December 2015 14:00 (1 hour)

We present a general classification of simplified models that lead to dark matter (DM) coannihilation processes of the form DM + X $\rightarrow$ SM_1 + SM_2, where X is a coannihilation partner for the DM particle and SM_1, SM_2 are Standard Model fields. Our classification also encompasses regular DM pair annihilation scenarios if DM and X are identical. Each coannhilation scenario motivates the introduction of a mediating particle M that can either belong to the Standard Model or be a new field, whereby the resulting interactions between the dark sector and the Standard Model are realized as tree-level and dimension-four couplings. We construct a basis of coannihilation models, classified by the $SU(3)_C \times SU(2)_L \times U(1)_Y$ quantum numbers of DM, X and M. Our main assumptions are that dark matter is an electrically neutral color singlet and that all new particles are either scalars, Dirac or Majorana fermions, or vectors. We illustrate how new scenarios arising from electroweak symmetry breaking effects can be connected to our electroweak symmetric simplified models. We offer a comprehensive discussion of the phenomenological features of our models, encompassing the physics of thermal freeze-out, direct and indirect detection constraints, and in particular searches at the Large Hadron Collider (LHC). Many novel signatures that are not covered in current LHC searches are emphasized, and new and improved LHC analyses tackling these signatures are proposed. We discuss how the coannihilation simplified models can be used to connect results from all classes of experiments in a straightforward and transparent way. This point is illustrated with a detailed discussion of the phenomenology of a particular simplified model featuring leptoquark-mediated dark matter coannihilation.

Presenter: Dr YU, Felix

Session Classification: Plenary Session