



Contribution ID: 772

Type: **Parallel Session Talk**

## A brief (p)review on a possible fourth generation world to come

*Saturday 24 July 2010 17:00 (13 minutes)*

From a thread in the “Direct CPV difference” in charged vs neutral  $B \rightarrow K \pi$  decays observed at the B factories, a possible large and negative mixing-dependent CPV in  $B_s \rightarrow J/\psi \phi$  is predicted, if the former arises at least partially from 4th generation  $t'$  effect in the Z-penguin. Surprisingly, there is some standing hint at the Tevatron. Whether or not these flavor and CPV effects bear up, a 4th generation would help us soar to the heavens: there seems to be enough CPV for the baryon asymmetry of the Universe. A separate thread is the ever increasing bounds on  $t'$  and  $b'$  at the Tevatron, implying large Yukawa coupling. Direct search can only be settled at the LHC, and the partial wave unitarity bound is only a glass ceiling. What is intriguing is the possibility of EW symmetry breaking due to the NJL-type condensation of very heavy 4th generation quarks, where we outline two scenarios that can be pursued on the lattice: Higgs-Yukawa Lagrangian, and the electroweak theory as we know it, without ever mentioning the Higgs boson. If the pursuit of 4th generation quark search at the LHC bears fruit, we may simultaneously touch upon two of the greatest problems in particle physics, and even cosmology: source of EW symmetry breaking (raison d'être for LHC); and source of CPV for BAU (raison d'être for ourselves). Implications for flavor and other physics would be further discussed.

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