

## Measuring 4th generation CKM parameters at the LHC

CPV measurement in  $B_s \rightarrow J/\psi \phi$  at the Tevatron,  $\sin 2\Phi_{B_s}$ , hint at new physics, with the 4th generation the simplest explanation. At the same time, great progress is made already at the LHC for the direct search of 4th generation quarks. We show that a precise measurement of  $\sin 2\Phi_{B_s}$  by LHCb, together with a measurement (combining LHCb, ATLAS and CMS) of  $B_s \rightarrow \mu^+\mu^-$  at slightly above the SM level, normalized with  $B_s$ -mixing, can pin down the strength and phase of  $V_{t's}^* V_{t'b}$  for given  $mt'$ . *This could be achieved as early as 2012. Such a measurement is akin to the measurement of  $\sin 2\phi_1/\beta$  by Belle and BaBar in 2001, i.e. completing a CKM triangle, but the strength of CPV, unlike the 3 generation case, could be linked to the baryon asymmetry of the Universe. A complementary measurement would be to measure  $V_{t'b}$ , by measuring the branching ratio (BR) of the kinematic suppressed, but CKM allowed,  $t' \rightarrow b' W^+$  decay. The knowledge that  $|mt' - mb'| < MW$  implies that the W here is virtual. Precisely when  $V_{t'b}$  is small, the BR for  $t' \rightarrow b' W^{*+}$  can be amplified, making it a sensitive probe of small values of  $V_{t'b}$ .*

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