Contribution ID: **704** Type: **not specified**

A Study of Large $\sin 2\Phi_{B_s}$ with High Mass Fourth Generation t'

Thursday 16 July 2009 15:50 (15 minutes)

The Standard Model predicts the CP violation phase $\Phi_{B_s}^{\rm SM} = \arg M_{12} \simeq \arg(V_{ts}^* V_{tb})$ in B_s–$\bar{B}_s$ mixing is very small, of $calO(\lambda^2\eta) \simeq -0.02$, any finite value of Φ_{B_s} measured at the Tevatron would mean New Physics. Recent hints for finite $\sin 2\Phi_{B_s}$ have appeared from CDF and DO experiments at the Tevatron Run II. We consider the possibility to account for it with the 4th generation t' quark. Considering recent direct search bounds, we set the mass to be near the unitarity bound of 600 GeV. Combining the measurement values of Δm_{B_s} with $calB(B_d \to X_s \ell^+ \ell^-)$, together with typical f_{B_s} values, we find a sizable $\sin 2\Phi_{B_s}^{\rm SM4} \sim -0.3$. Using a typical value of $m_{b'} = 580$ GeV, we get a narrow range of values, $0.089 < |V_{t'b}| < 0.100$, from the constraints $\Gamma(Z \to b\bar{b})/\Gamma(Z \to \text{hadrons})$, $calB(K^+ \to \pi^+ \nu\bar{\nu})$ and Δm_{D^0}. Finally, we use the ZFITTER code to check the global fit deviation.

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Session Classification: II. Flavour Physics

Track Classification: Flavour Physics