Contribution ID: **100** Type: **Parallel Talk**

Warped Gravitons at the LHC and Beyond

Thursday 26 July 2007 14:40 (20 minutes)

We study the production and decay of Kaluza-Klein (KK) gravitons at the Large Hadron Collider (LHC), in the framework of a warped extra dimension in which the Standard Model (SM) fields propagate. Such a scenario can provide solutions to both the Planck-weak hierarchy problem and the flavor puzzle of the SM. In this scenario, the production via $q\bar{q}$ annihilation and decays to the conventional photon and lepton channels are highly suppressed. However, we show that graviton production via gluon fusion followed by decay to longitudinal Z/W can be significant; vector boson fusion is found to be a sub-dominant production mode. In particular, the "golden" ZZ decay mode offers a distinctive 4-lepton signal that could lead to the observation at the LHC of a KK graviton with a mass up to ~ 2 TeV for the ratio of the AdS_5 curvature to Planck scale modestly above unity. We argue that (contrary to the lore) such a size of the curvature scale can still be within the regime of validity of the framework. Upgrades beyond the LHC design are required to discover gravitons heavier than ~ 4 TeV, as favored by the electroweak and flavor precision tests.

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Session Classification: Alternatives 1

Track Classification: Alternatives