Various Windows to Understand Extra Dimensions

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In this talk I will explore various observational and theoretical windows to understand the presence of extra dimensions. In particular, I will demonstrate the following results:

- I will explicitly demonstrate that a possible resolution to the stabilization of an extra spatial dimension (radion) can be obtained *solely in the context of gravitational dynamics* itself without the necessity of introducing any external stabilizing field. In this scenario the stabilized value of the radion field gets determined in terms of the parameters appearing in the higher curvature gravitational action. Furthermore, the mass of the radion field and its coupling to the standard model fields are found to be in the weak scale implying possible signatures in the TeV scale colliders. Some resulting implications will also be discussed [1, 2].

- Strong cosmic censorship conjecture has been one of the most important leap of faith in the context of general relativity, providing assurance in the deterministic nature of the associated field equations. Though it holds well for asymptotically flat spacetimes, a potential failure of the strong cosmic censorship conjecture might arise for spacetimes inheriting Cauchy horizon along with a positive cosmological constant. I will argue that violation of the censorship conjecture holds true in the presence of a Maxwell field even when higher spacetime dimensions are invoked. In particular, for a higher dimensional Reissner-Nordström-de Sitter black hole, for certain parameter space, the violation of cosmic censorship conjecture is at a larger scale compared to the four dimensional one. On the other hand, for a brane world black hole, the effect of extra dimension is to make the violation of cosmic censorship conjecture weaker. For rotating black holes, intriguingly, the cosmic censorship conjecture is always respected even in presence of higher dimensions. A similar scenario is also observed for a rotating black hole on the brane [3, 4].

These results explicitly demonstrate that the presence of higher dimensions can affect various physical results, providing interesting playground to understand physics beyond general relativity.

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