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## Problematic aspects of extra dimensions

The following recent results concerning multidimensional Kaluza-Klein (KK) models with different types of compactification of extra spatial dimensions (ESDs) are discussed in detail. First, in the case of toroidal compactification, dust-like gravitational field sources are incompatible with relativistic tests in the Solar system. Such non-dust-like sources as latent solitons (particularly, black strings and black branes), characterized by tension in the internal space, satisfy these tests, but they must be uniformly smeared over the ESDs, that contradicts quantum mechanics and statistical physics predicting KK modes. Second, in the case of spherical compactification, dust-like sources satisfy the relativistic tests, however, because of the background matter perturbation they acquire the effective relativistic pressure in the external space, which is incompatible with thermodynamics. Again, tension in the ESDs can save the situation, but then the sources must be uniformly smeared. The necessity of smearing also holds true for Ricci-flat (in particular, Calabi-Yau) internal spaces. More general Einstein compactification does not obviate this grave difficulty.

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