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Rotating Brane Worlds and the Global Rotation of the Universe

ALI NAYERI, Institute for Fundamental Theory, University of Florida, ALAN GUTH, Center for Theoretical Physics, Massachusetts Institute of Technology — We introduce a class of brane-world models in which a single brane is embedded in an anti-de Sitter spacetime containing a rotating (Kerr) black hole. In this Letter we consider the case of slow rotation, calculating the metric and dynamics of the brane world to first order in the angular momentum of the black hole. To this order we find that the cosmic fluid on the brane rotates rigidly relative to a Robertson-Walker frame of reference, which in turn rotates rigidly relative to the original Kerr-anti-de Sitter coordinate frame. Corrections to the Friedmann equations and the shape of the brane occur only at higher order. We construct models for which the geometry on the brane is either closed or open, but the open models are described only for small distances from the rotation axis, and may very likely develop pathologies at larger distances. Finally we discuss the effect of rotation as a dark energy when we look at the Friedmann equations beyond the first order in the angular momentum of the bulk black hole.

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