

General Relativity and Quantum Cosmology

Brans-Dicke Cosmology in 4D from scalar-vacuum in 5D

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We show that Brans-Dicke (BD) theory in 5D may explain the present cosmic accelerated expansion without recurring to matter fields in 5D or dark energy in 4D. Without making any assumption on the nature of the extra coordinate or the matter content in 5D, here we demonstrate that the vacuum BD field equations in 5D are equivalent, on every hypersurface orthogonal to the extra dimension, to a BD theory in 4D with a self interacting potential and an effective matter field. The potential is not introduced by hand, instead the reduction procedure provides an expression that determines its shape up to a constant of integration. It also establishes the explicit formulae for the effective matter in 4D. In the context of FRW cosmologies, we show that the reduced BD theory gives rise to models for accelerated expansion of a matter-dominated universe which are consistent with current observations and with a decelerating radiation-dominated epoch.

Comments: A typo in equation (4) is fixed. Accepted for publication in J. Cosmol. Astropart. Phys. (JCAP)

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