

General Relativity and Quantum Cosmology

Pre-big bang collapsing universe from modern Kaluza-Klein theory of gravity

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We study the collapse of the universe described by a scalar field spherically symmetric collapse of a system described by a massless scalar field from a 5D Riemann-flat canonical metric, on which we make a dynamical foliation on the extra space-like dimension. The asymptotic universe (absent of singularities) results to be finite in size and energy density, with an vacuum dominated equation of state. The important result here obtained is that the asymptotic back-reaction effects are given by a negative constant: $\frac{1}{2} \left[\frac{1}{1 + \dot{\psi}^2} + \frac{1}{\dot{\psi}^2} \right] \langle \dot{\Delta} \bar{\phi} \rangle^2 + \frac{1}{2a^2} \langle \nabla \Delta \phi \rangle^2 \Big|_{t \rightarrow \infty} = -\frac{8 \Lambda_0}{3 \pi G}$.

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