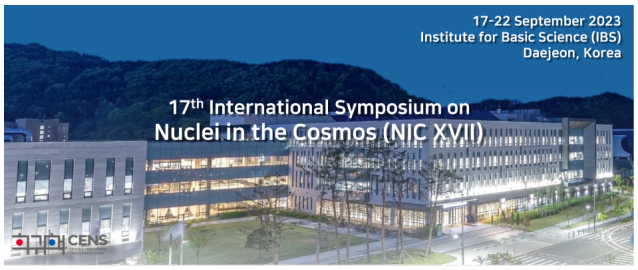

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An exact solution of the higher-order gravity in standard radiation-dominated era

Tuesday, 19 September 2023 17:05 (5 minutes)

We report that the standard evolution of radiation-dominated era (RDE) universe $a \propto t^{1/2}$ is a sufficient condition for solving a sixth order gravitational field equation derived from the Lagrangian containing $BR^{ab}R_{ab} + CRR^{;c}{}_{c}$ as well as a polynomial $f(R)$ for a spatially flat radiation FLRW universe. By virtue of the similarity between $R^{ab}R_{ab}$ and R^2 models up to the background order and of the vanishing property of $R^{;c}{}_{c}$ for $H = 1/(2t)$, the analytical solution can be obtained from a special case to general one. This proves that the standard cosmic evolution is valid even within modified gravitational theory involving higher-order terms. An application of this background solution to the tensor-type perturbation reduces the complicated equation to the standard second order equation of gravitational wave. We discuss the possible ways to discriminate the modified gravity model on the observations such as the gravitational wave from the disturbed universe and primordial abundances.

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