

# Global Existence of Solutions to Scalar Equations on Spatially Flat Universe as a Background with Non-minimal Coupling.

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We prove the wellposedness of scalar wave equations on spatially flat universe as a background with nonminimal coupling with the scalar potential turned on by introducing the  $k$ -order linear energy and the corresponding energy norm. In the local case, we show that both the  $k$ -order linear energy and the energy norm are bounded for finite time with initial data in  $H^{k+1} \times H^k$ . Whereas in the global case, we have to add three assumptions related to the nonminimal coupling constant, the scale factor of spacetimes, and the form of the scalar that has to be a polynomial with a small positive parameter. Then, we show that the solution does globally exist with a particular decay estimate that depends on the scale factor of the spacetimes. Finally, we provide some physical models that support our general setup.