Nonlinear Cosmological Predictability Time[1] KEITH ANDREW,
JOHN WILSON, Western Kentucky University — We examine time scales for phase
space orbits in a FRW cosmological model coupled to a scalar field. The cosmological
model from the Einstein field equations are coupled to the Klein-Gordon equation
for a spin zero scalar field with an interaction potential $V(\phi)$. The resulting cos-
mological equations are nonlinear in the scale cosmic parameter and scalar field.
The equations can be linearized in the neighborhood of equilibrium points and then
diagonalized to yield a classification of solutions. Some of the solutions exhibit a
sensitive dependence on initial conditions and an exponential deviation or orbits in
phase space. Such deviations can be characterized by a predictability time beyond
which all information about the initial state of the system is lost. We calculate the
predictability time in terms of the scalar field potential function for this system and
compare it to the cosmic spacetime big rip time scale for a scalar field source term.

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