

About critical exponents in semi-linear de Sitter models

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In this paper we consider the Cauchy problem for semi-linear de Sitter models. The model of interest is

$$\begin{aligned}\phi_{tt} - e^{-2t} \Delta \phi + n\phi_t + m^2\phi &= F_p(\phi), \\ (\phi(0, x), \phi_t(0, x)) &= (f(x), g(x)),\end{aligned}$$

where n is the dimension, m^2 is a non-negative constant and p is a positive parameter. Our main goal is to verify that, in general, one can not observe a critical exponent $p_{crit} = p_{crit}(n)$ in the family of non-linearities $\{F_p(\phi)\}_{p>1} = \{|\phi|^p\}_{p>1}$. Moreover, we like to propose parameter-dependent families $\{F_p(\phi)\}_{p>0}$ of non-linear right-hand sides where the correct choice of the parameter p might provide a threshold between global (in time) existence of small data solutions (stability of the zero solution) and blow-up behavior even of small data solutions.