Multi-parametric Nonlinear Generalization of Klein-Gordon: Real and Complex Fields

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We construct a nonlinear multiparametric Klein-Gordon for complex and real fields with mass dimension depending on a real parameter α as $\delta = 2/(1+\alpha)$ where δ is the mass dimension of the fields. We show that there are three classes of generalized models, one class for complex fields and two different classes for real fields. All models of the complex class and models of only one class of the two real classes recover the standard Klein-Gordon model. We also build the Lagrangian and the Hamiltonian for the three classes of models. The fields in the models of these three classes could in principle have the mass dimension varying from zero to one and this can allow us to construct interaction terms, other than $\lambda \Phi^4$, with coupling constants with positive or zero mass dimensions.

Furthermore, we also show that there is a subclass of equations in the complex class which has a Lorentzian soliton solution.