

On Global Attractors of Nonlinear Hyperbolic PDEs

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We consider Klein-Gordon equations coupled to $U(1)$ -invariant nonlinear oscillators. The solitary waves of the coupled nonlinear system form two-dimensional submanifold in the Hilbert phase space of finite energy solutions. Our main results read as follows:

Theorem

Let all the oscillators be strictly nonlinear. Then any finite energy solution converges, in the long time limit, to the solitary manifold in the local energy seminorms.

The investigation is inspired by Bohr's postulates on transitions to quantum stationary states.

The results are obtained for:

- 1D KGE coupled to one oscillator [1,2,3];
- 1D KGE coupled to finite number of oscillators [4];
- nD KGE coupled to one oscillator via mean field interaction [5].

[1] A.I. Komech, On attractor of a singular nonlinear $U(1)$ -invariant Klein-Gordon equation, p. 599-611 in: Proceedings of the 3rd ISAAC Congress, Berlin, 2003.

[2] A.I. Komech, A.A. Komech, On global attraction to solitary waves for the Klein-Gordon equation coupled to nonlinear oscillator, *C. R., Math., Acad. Sci. Paris* **343**, Issue 2, 15 July 2006, Pages 111-114.

[3] A.I. Komech, A.A. Komech, Global attractor for a nonlinear oscillator coupled to the Klein-Gordon field, *Arch. Rat. Mech. Anal.* **185** (2007), 105-142.

[4] A.I. Komech, A.A. Komech, On global attraction to solitary waves for the Klein-Gordon field coupled to several nonlinear oscillators, accepted in *J. des Mathematiques Pures et App.*, 2009. arXiv:math/0702660

[5] A.I. Komech, A.A. Komech, Global attraction to solitary waves for Klein-Gordon equation with mean field interaction, *Annales de l'IHP-ANL* **26** (2009), no. 3, 855-868. arXiv:math-ph/0711.1131