

The first order expansion of a ground state energy of the φ^4 model with cutoffs

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Abstract In this talk, we consider the d -dimensional φ^4 model with cutoffs. The Hilbert space for the system is defined by a boson Fock space. The total Hamiltonian is given by

$$H_\kappa = H_0 + \kappa \int_{\mathbb{R}^d} \chi_I(\mathbf{x}) \phi(\mathbf{x})^4 d\mathbf{x}. \quad (1)$$

Here, H_0 is the free Hamiltonian with the dispersion relation of $\omega(\mathbf{k}) = \sqrt{\mathbf{k}^2 + m^2}$, $m \geq 0$, $\phi(\mathbf{x})$ is the field operator with a momentum cutoff, and $\kappa \in \mathbb{R}$ is a coupling constant. Applying Arai's new perturbation theory [1], we derive the first order expansion of a ground state energy of the total Hamiltonian [2].

[Reference]

[1] A. Arai, A new asymptotic perturbation theory with applications to models of massless quantum fields, *Ann. H. Poincaré* **15** (2014), 1145-1170.

[2] T. Takaesu, The first order expansion of a ground state energy of the φ^4 model with cutoffs (preprint).