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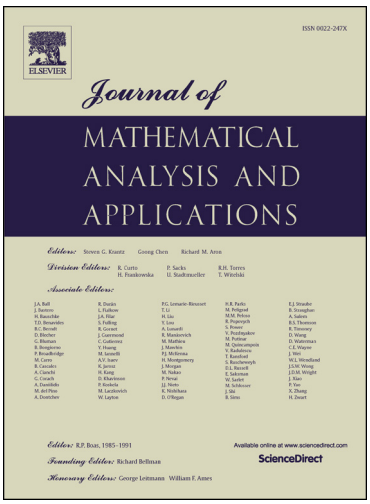

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On The Standing Waves of Quantum Zakharov System

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Abstract

In this work, we study the quantum Zakharov system which describes the nonlinear interaction between high-frequency quantum Langmuir waves and low-frequency quantum ion-acoustic waves. We show the existence and the stability of the standing waves of quantum Zakharov system for the spacial dimensions $d = 1, 2, 3$.

Keywords: quantum Zakharov system, ground states, standing waves, stability
2010 MSC: Primary 35Q55; Secondary 35B35, 35Q40.

1. Introduction

In this work we study the standing waves of the quantum Zakharov system for $d = 1, 2, 3$, which reads as follows

$$\begin{cases} i\partial_t E_{\varepsilon,\lambda} + \Delta E_{\varepsilon,\lambda} - \varepsilon^2\Delta^2 E_{\varepsilon,\lambda} = n_{\varepsilon,\lambda}E_{\varepsilon,\lambda}, \quad (t,x) \in \mathbb{R}\times\mathbb{R}^d; \\ \lambda^{-2}\partial_t^2 n_{\varepsilon,\lambda} - \Delta n_{\varepsilon,\lambda} + \varepsilon^2\Delta^2 n_{\varepsilon,\lambda} = \Delta|E_{\varepsilon,\lambda}|^2; \\ E_{\varepsilon,\lambda}(0) = E_0,\ n_{\varepsilon,\lambda}(0) = n_0,\ \partial_t n_{\varepsilon,\lambda}(0) = n_1, \end{cases} \tag{1}$$

where $\varepsilon \in (0,1]$ and $\lambda \in [1,\infty)$ are constants, $E_{\varepsilon,\lambda} : \mathbb{R}\times\mathbb{R}^d \to \mathbb{C}$ and $n_{\varepsilon,\lambda} : \mathbb{R}\times\mathbb{R}^d \to \mathbb{R}$ are unknown functions, and $E_0 : \mathbb{R}^d \to \mathbb{C}$, $n_0 : \mathbb{R}^d \to \mathbb{R}$ and

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