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ACCEPTED MANUSCRIPT

On a periodic Schrödinger equation involving periodic and nonperiodic nonlinearities in \mathbb{R}^2

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Abstract

We study the existence of solutions for the nonlinear Schrödinger equation

 $-\Delta u + V(x)u = f(x, u) \quad \text{in} \quad \mathbb{R}^2,$

where the potential V is 1-periodic, 0 lies in a spectral gap from the spectrum of the Schrödinger operator $S = -\Delta + V$ and the nonlinearity f(x,t) has exponential growth in the sense of Trudinger-Moser. The main feature here is that f(x,t) is allowed to be both periodic and nonperiodic in the x variable. Our proofs rely on a linking theorem and the Lions concentration compactness principle.

Keywords and phrases: Schrödinger Operator, Periodic Potential, Spectral Theory, Linking Theorem, Trudinger-Moser Inequality. AMS Subject Classification: 35J60, 35J20, 35J10.

1 Introduction

In this paper we are concerned with the existence of nontrivial solutions for the nonlinear Schrödinger equation

$$-\Delta u + V(x)u = f(x, u) \quad \text{in} \quad \mathbb{R}^2, \tag{P}$$

where the potential V is 1-periodic and the nonlinearity f(x,t) has exponential growth in the sense of Trudinger-Moser. Equation (\mathcal{P}) arises in various branches of mathematical physics and has been

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