

POSITIVE SEMICLASSICAL STATES FOR A FRACTIONAL SCHRÖDINGER-POISSON SYSTEM

EDWIN G. MURCIA AND GAETANO SICILIANO
 Instituto de Matemática e Estatística
 Universidade de São Paulo
 Rua do Matão 1010, 05508-090 São Paulo, SP, Brazil

(Submitted by: Jean Mawhin)

Abstract. We consider a fractional Schrödinger-Poisson system in the whole space \mathbb{R}^N in presence of a positive potential and depending on a small positive parameter ε . We show that, for suitably small ε (i.e. in the “semiclassical limit”) the number of positive solutions is estimated below by the Ljusternick-Schnirelmann category of the set of minima of the potential.

1. INTRODUCTION

In the last decades, a great attention has been given to the following Schrödinger-Poisson type system

$$\begin{cases} -\Delta u + V(x)u + \phi u = |u|^{p-2}u \\ -\Delta \phi = u^2, \end{cases}$$

which arises in non relativistic Quantum Mechanics. Such a system is obtained by looking for standing waves solutions in the purely electrostatic case to the Schrödinger-Maxwell system. For a deduction of this system, see e.g. [12]. Here, the unknowns are u , the modulus of the wave function, and ϕ which represents the electrostatic potential. V is a given external potential and $p \geq 2$ a suitable given number.

The system has been studied by many authors, both in bounded and unbounded domains, with different assumptions on the data involved: boundary conditions, potentials, nonlinearities; many different type of solutions have been encountered (minimal energy, sign changing, radial, nonradial...), the behavior of the solutions (e.g. concentration phenomena) has been studied as well as multiplicity results have been obtained. It is really difficult to

AMS Subject Classifications: 35A15, 35S05, 74G35 .

Accepted for publication: August 2016.