

Asymptotic dynamics of certain solutions for an extended nonlinear Gross-Pitaevskii equation with critical nonlinear damping in \mathbb{R}^3

Brahim ALOUINI

University of Monastir

brahimalouini@protonmail.com

Recent experiments have revealed the formation of stable droplets in a dipolar Bose-Einstein condensate (**BEC**). This surprising result has been explained, experimentally, by the stabilization given by the three body loss process appearing in the form of a critical damping term in an extended Gross-Pitaevskii equation (**eGPE**) modelling the formation of these dipolar quantum droplets. The purpose of the current paper is to study the dynamics of solutions to this equation (**eGPE**). In the first part, we present a new mathematical study that validates this prediction by proving that the nonlinear damping prevents the collapse and ensures the existence of global-in-time solutions. The asymptotic dynamics of these solutions will be discussed as well, especially when the system is free (without potential). We show that all global solutions behave as free waves asymptotically in time.