Dynamics of Continuous, Discrete and Impulsive Systems
Series **A:** *Mathematical Analysis* **24 (2017)** 303-315
 http://www.watam.org

RANDOM ATTRACTORS FOR THE STOCHASTIC DISCRETE COMPLEX GINZBURG-LANDAU EQUATIONS

Jia Zhang[1] , Chun Huang[2] and Ji Shu[3]

[1]Ideological and Political Department
Sichuan TOP Vocational Institude, Chengdu 611743, P. R. China

[2]Department of Applied Mathematics and Economy
Sichuan Vocational and Technical College, Suining 629000, P. R. China
[3]College of Mathematics and Software Science
Sichuan Normal University, Chengdu 610066, P. R. China

Corresponding author: Ji Shu, *E-mail address*: shuji2008@hotmail.com

Abstract. In this paper, we study the asymptotic behavior of the stochastic discrete complex Ginzburg-Landau equations with multiplicative noise. Due to the lack of smoothness on the infinite lattice, we prove asymptotic compactness by using uniform a priori estimates for the tail of solutions and obtain the existence of a compact random attractor.

Keywords. Random dynamical system; Random attractor; Stochastic discrete complex Ginzburg-Landau equation; Multiplicative noise

AMS (MOS) subject classification: 37L55, 60H15, 35Q56

1 Introduction

In this paper, we consider the following stochastic discrete complex Ginzburg-Landau equation with multiplicative noise

$$du_n = [-\lambda u_n + (\gamma_1 + i\gamma_2)(u_{n-1} - 2u_n + u_{n+1}) - (\beta_1 + i\beta_2)|u_n|^2 u_n]dt + u_n dW,$$

$$n \in \mathbf{Z}, t > 0, \tag{1}$$

with the initial value

$$u_n(0) = u_0, n \in \mathbf{Z}, \tag{2}$$

where u_n is a complexed-valued function, $\mathbf{Z}$ denotes the integer set, $\lambda, \gamma_1, \gamma_2$, β_1, β_2 are positive constants, $W(t)$ will be specified later.

The complex Ginzburg-Landau equation is an important mathematics model in nonlinear science. It has important applications in many different branches of physics, such as nonlinear optics, superconductor, superfluid and Bose-Elinstein condensation phenomenon. The deterministic system of (1)