CHAPTER 1

Introduction

A galaxy is a group of several billion stars, planets, gas, dust and dark matter bound under the gravitational potential due to their masses, including a super-massive black hole at the center. There are about a trillion of galaxies in the universe. Most of them are located in galaxy groups and clusters. For example, the Milky Way is part of a galaxy group called "Local Group".

This study is going to focus on the general characteristics of the sample galaxies using photometric imaging data observed with B, V, R_C, Red-continuum and [SII] filters to determine the isophotal diameter and the morphological type of the galaxies. Due to the hydrogen alpha (Hα) emission line corresponding to the star formation of the host galaxies, the amount of Hα line can be used to represent the star formation rate in galaxies.

The equivalence width of hydrogen alpha (EW(Hα)) is one of the important parameters in determining the amount of star formation within the galaxy sample. Therefore, this study used the method of EW(Hα) estimation on the photometry imaging data. The first study of EW(Hα) appeared in Kennicutt and Kent [1983] report. Kennicutt and Kent [1983] studied the Hα measurement in the photometric and spectroscopic data of the sample galaxies in the Virgo cluster and in 200 field galaxies. The results showed that the emission line of spiral galaxies depends on HII region. Hence, the integrated Balmer line flux of the galaxies can be used to be an indicator as well as the Hα emission line to estimate the star formation rate of the massive OB star in the host galaxy. Furthermore, the integrated Balmer line flux is related to Hubble type and color which is consistent with the previous research of Cohen [1967] who found the strong correlation between B-V color and the Hα emission line. In addition, Cohen [1967] found that the bluer galaxies emit higher Hα emission line. This is a direct result from the HII region in the galaxies itself. The emission line depends on the temperature, i.e., the higher temperature, the higher

Hα emission line.

Mouhcine et al. [2011] studied a sample of galaxies in the nearby cluster, Abell 1367, using the optical and near-infrared imaging data. The sample was selected from the center to a half of radius of the cluster. After classification along Hubble type, they compared the optical and near-infrared colors into the grid model to measure the stellar ages and metallicity of the sample galaxies. The study showed that spiral galaxies vary in terms of stellar metallicity for the same range of stellar age, while lenticular galaxies are scattered in a wide range of age and metallicity, and the low-mass galaxies tend to be younger than the more massive galaxies. The sample galaxies with a sign of disturbance and high star formation rates showed lower metallicity than the others for the same mass. Mouhcine et al. [2011] argues that this incident may be the result of the tidal force driven by the interstellar medium which has low metallicity in the star formation region, thus diluting the high metallicity medium, and making the measurement of the metallicity less than the value that should be at the same ages. The study also found that metallicity and ages do not depend on the radius of the cluster.

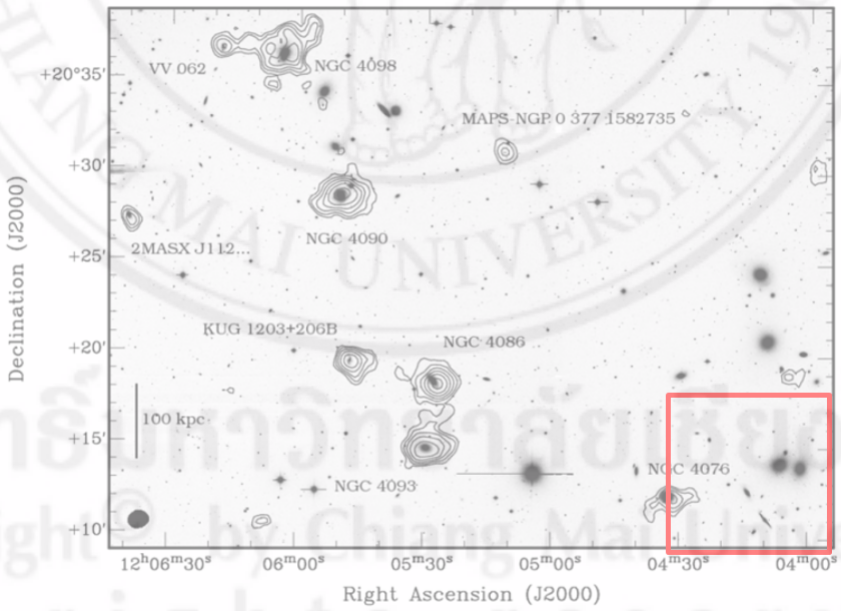

Figure 1.1: The total intensity of HI emission overlaid with optical R image [Freeland et al., 2009]. The red square is shown an area of the NGC 4065 group.

To determine the interaction of the group galaxies in this work, the background

element of the samples must be determined. In particular, HI region has to be considered. The HI region is a hydrogen-abundant region which is used in star formation. Freeland et al. [2009] have observed the HI region in the sky area as shown in Figure 1.1. From the figure, the target galaxy in this study group is located on the bottom-right corner, where the lowest x-ray intensity is equal to 5.9×10^{19} cm^{-2} and is increasing by $\sqrt{2}$ on every contour.

1.1 Research Objectives

1) To observe galaxies in NGC 4065 group by Red-continuum and [SII] filter then determine $EW(\mathrm{H}\alpha)$ using photometric method

2) To estimate stellar age and metallicity of the galaxies in the the NGC 4065 group by broadband imaging data

3) To study the correlation between the parameters, such as magnitude, color index, type, $EW(\mathrm{H}\alpha)$, age and metallicity of the galaxies in the NGC 4065 group

4) To study the interaction that occurs on the galaxies in the NGC 4065 group using the photometric method

1.2 Usefulness of the Research

1) Obtain the $EW(\mathrm{H}\alpha)$ and the star formation of the galaxies in the NGC 4065 group

2) Obtain the stellar age and metallicity of the sample galaxies by using photometric imaging data

3) Explain the correlation between the physical parameters of the galaxies in the NGC 4065 group

4) Understand the interaction and evolution of the galaxies in the NGC 4065 group using photometric imaging data