ABSTRACT

Galaxies interact with their environment, which includes neighboring galaxies and hot gases. Galaxy interactions cause the gas in the disk to lose its angular momentum and fall into the inner region of the galaxy's dics. The accumulated gas can increase nuclear activity and star formation. The hot stars amplify the Hα emission line in the galaxy's spectrum. In addition to Hα lines, forbidden lines also appear, which are lines produced by electron transitions that are in a metastable state, for example [N II]. The Hα emission line coexists with the [N II] emission line.

The study of intergalactic interactions in this thesis examines the equivalent width of Hα+[N II] and SFR which are then related to the projected spatial separation (r_p), line-of-sight velocity separation (ΔV), and luminosity contrast (Δm_r). The equivalent width (EW) of Hα+[N II] and SFR were obtained from galaxy spectra obtained from SDSS DR17 and processed using Python. The galaxy pairs were selected based on the criteria of projected spatial separation (r_p) $\leq$ 50 kpc (Patton et al., 2013) and line-of-sight velocity separation (ΔV) $\leq$ 400 km/s (Donzelli and Pastoriza, 1997) and are starburst galaxies. The starburst galaxies and AGN were selected using BPT diagrams. From the BPT diagrams, 1118 starburst galaxies and 32 AGN were obtained. Based on these criteria, 1118 galaxies (677 galaxy pairs) were obtained. The results show that some relations are weakly correlated: EW and r_p relation is inversely correlated with Spearman correlation value ($C_{SR} = -0.11$), EW and ΔV relation is inversely correlated ($C_{SR} = -0.087$), SFR and r_p relation is inversely correlated ($C_{SR} = -0.099$), SFR and ΔV relation is directly correlated ($C_{SR} = 0.102$). SFR and Δm_r are inversely proportional ($C_{SR} = -0.146$). Galaxy pairs with $\Delta m_r < 2$ (major merger) have greater EW and SFR values than galaxies with $\Delta m_r \geq 2$ (minor merger).

The relation between the equivalent width of [N II] and the equivalent width of Hα for the starburst is $C_{SR} = 0.464$ while the relation between the flux of [N II] and the flux of Hα is $C_{SR} = 0.818$. This shows that there is a strong relationship between Hα flux and [N II] flux. This is expected because the Hα flux is an indicator of SFR and when SFR is high, the forbidden line in this case [N II] is also larger.

As for AGN, the correlation value of [N II] equivalent width to Hα equivalent width is 0.925 while the correlation value of [N II] flux to Hα flux is

0.808. It can be seen that the equivalent widths of Hα and [N II] and the flux of Hα and the flux of [N II] are strongly correlated. This is because AGN such as LINER, despite having low luminosity, have strong emission lines for low ionization such as the [O I] and [N II] forbidden lines.

Key words: interacting galaxies, equivalent width, SFR, emission line.