J. Astrophys. Astr. (2011) **32,** 465–466

GMRT Low Radio Frequency Study of the Wolf Rayet Galaxy NGC 4214 and Detection of a Distant Galaxy

Shweta Srivastava[1,*], N. G. Kantharia[2] & D. C. Srivastava[1]
[1]*DDU Gorakhpur University, Gorakhpur 273 009, India.*
[2]*National Centre for Radio Astrophysics, Pune 411 007, India.*
[*]*e-mail: srivashweta@gmail.com*

Abstract. In this paper, we present the first low frequency (< 1.4 GHz) radio continuum study of a Wolf Rayet galaxy NGC 4214 using the Giant Meterwave Radio Telescope (GMRT). We detect diffuse extended emission from the galaxy disk at 325 MHz and find that the radio emission closely follows the ultraviolet emission mapped by GALEX. The galaxy is undergoing continuous star formation which can explain the diffuse emission. We suggest that the diffuse radio continuum emission and X-ray emission detected in the northern part of NGC 4214 is associated with a background galaxy, 2MASX J12153795+3622218.

Key words. Galaxy: radio continuum—galaxy: Wolf Rayet—individual: NGC 4214.

1. Introduction

Galaxies containing the signatures of Wolf Rayet stars such as broad He II 4686 Å emission feature in their optical spectra are known as Wolf Rayet (WR) galaxies. NGC 4214 has been described as a barred, S-shaped magellanic irregular galaxy in the CVn group of galaxies at a distance of about 4 Mpc. The central region of NGC 4214 is rich in WR stars and shows wide $H\alpha$ emission in its spectrum (Sargent & Fillipenko 1991). This galaxy has been extensively studied in several wave bands ranging from X-rays to radio continuum emission at frequencies > 1 GHz. Two large HII complexes located in the central parts of NGC 4214 have been detected in the high resolution data.

2. Results

We have selected the galaxy from Beck *et al.* (2000) where high-frequency radio continuum study of this galaxy is available. The final images generated from GMRT observations in 2008 and 2009 have rms noise ∼90 μJy and 0.34 mJy at 610 and 325 MHz respectively. The data analysis was done following standard procedure for GMRT data analysis in AIPS.

Figure 1(a) shows the diffuse emission detected from the entire galaxy at 325 MHz which follows the NUV morphology from GALEX data. Diffuse radio emission at

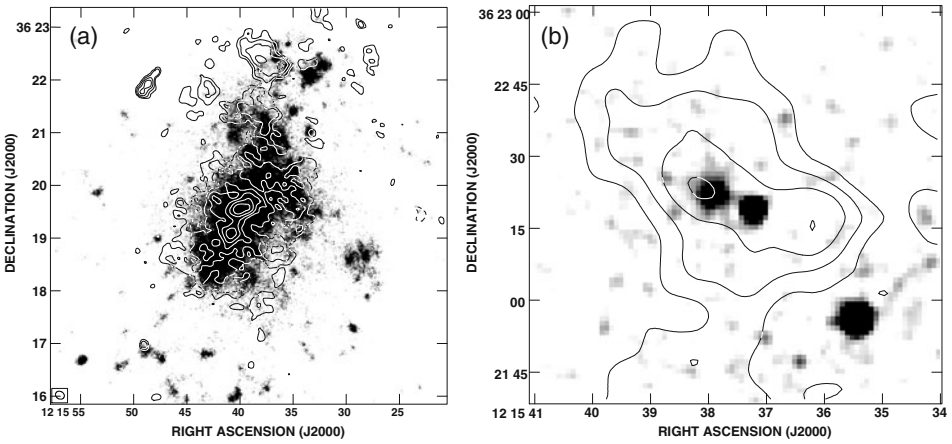

Figure 1. **(a)** Contours at 325 MHz (10.4 × 8.6, PA = 61.27) superposed on the NUV map from GALEX. The 325 MHz image detects diffuse emission from the entire galaxy in addition to the bright central parts and an extension to the north and follows the NUV morphology. **(b)** Zoom-in of the northern part where we believe the radio continuum emission is associated with a background galaxy seen in the 2MASS grey scale.

325 MHz is similar to the halo emission seen in edge-on normal disk galaxies including a steeper spectrum compared to the central HII regions. Our 610 MHz data traces only the central HII regions and the overall morphology of the high resolution emission at 610 MHz is fairly similar to the images obtained at higher frequencies (Beck *et al.* 2000). In Fig. 1(b), we show a zoomed-in image of the region north of NGC 4214 where we detect radio emission associated with a background galaxy 2MASX J12153795+3622218. X-ray emission has also been detected from this region (Ott *et al.* 2005). Several galaxies are recognizable in the vicinity of this galaxy in the SDSS image.

Acknowledgement

We thank the staff of GMRT who made these observations possible.

References

Beck, S. C., Turner, J. L., Kovo, O. 2000, *Astrophys. J.*, **120**, 244.
Ott, J., Walter, F., Brinks, E. 2005, *Mon. Not R. Astron. Soc.*, **358** 1423.
Sargent, W. L. W., Filippenko, A. V. 1991, *Astrophys. J.*, **102** 107.