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Low frequency study of Luminous Infra-Red Galaxies (LIRGs)

A. Goyal[1]*, N. G. Kantharia[2], S. K. Sirothia[2],
C. H. Ishwara-Chandra[2] and Gopal-Krishna[3]

[1]*Astronomical observatory, Jagiellonian university, Orla 171, 30-244 Krakow, Poland*
[2]*National Centre for Radio Astrophysics-Tata Institute of Fundamental Research, Ganeshkhind, 411007 Pune, India*
[3]*IUCAA, Post Bag 4, Pune University Campus, Ganeshkhind, Pune 411007, India*

Abstract. We present the results of low frequency continuum imaging of a sample of 11 luminous infra-red galaxies (LIRGs) detected in the TIFR GMRT Sky Survey (TGSS) data release 4 (DR4). With the availability of TGSS data, the radio spectra have been constrained down to 150 MHz. Our results indicate that the median spectral index between 150 and 325 MHz is slightly flatter ($\alpha_{150}^{325} = -0.34$) than the median spectral indices between 325 and 610 MHz ($\alpha_{325}^{610} = -0.59$) and between 610 and 1400 MHz ($\alpha_{610}^{1400} = -0.64$), the latter being close to optically thin synchrotron emission.

Keywords : Galaxies: infra-red – galaxies – radio imaging

1. Introduction

The low frequency radio spectra of luminous infra-red galaxies (LIRGs) appear to be distinct from normal galaxies which is a power law with typical, α = -0.75 ($S_\nu = \nu^\alpha$, see, Gioia et al. 1982). The radio spectra of LIRGs arise from an interplay between the starburst activity and a possible AGN (Clemens et al. 2010; Condon et al. 1992), hence, they can be used as a tool to search for buried AGN.

*email: arti@oa.uj.edu.pl

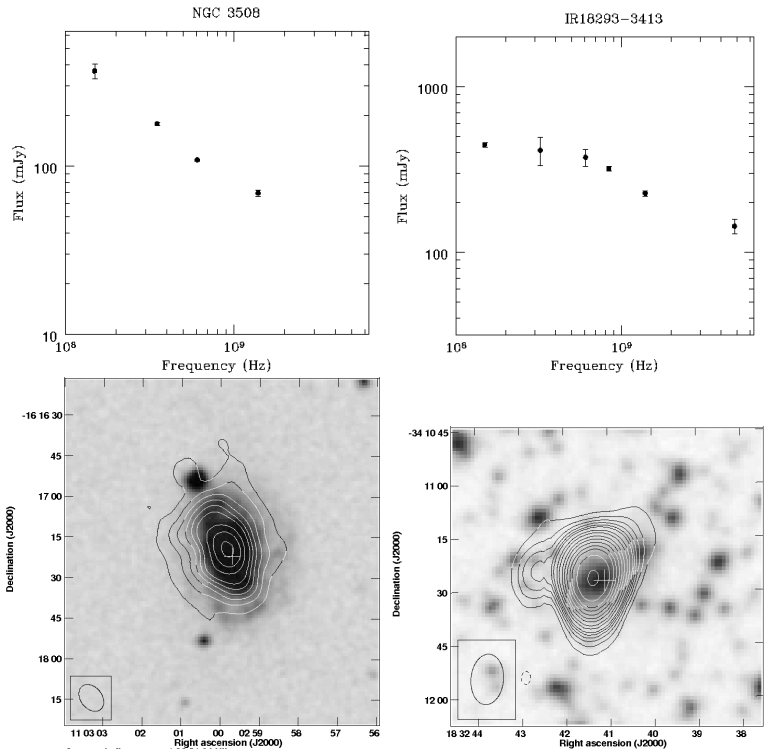

Figure 1. The top row shows the integrated radio spectra of NGC 3508 [*left panel]*, IR 18293-3413 [*right panel*] while the bottom row shows the 325 MHz contours overlaid on DSS-R band image for the same galaxies. The 325 MHz contours are drawn from 2.5 mJy/beam for NGC 3508 and 5.0 mJy/beam for IR 18293-3413.

2. Sample selection, observation, data analysis and preliminary results

Our sample consists of 11 LIRGs with the selection criterion of $log(L_{IR}) > 10.75 L_{\odot}$ (where $L_{\odot} = 3.83 \times 10^{26} W$ is the bolometric Solar luminosity; Helou et al. 1988), derived from the list of Condon et al. (1996) whose counterpart exist in the TGSS DR4. Each LIRG was imaged at 325 MHz and 610 MHz frequencies using the GMRT and data were analyzed using NRAO AIPS. Based on our observations, we conclude the following

(1) The low frequency radio spectra show variety of shapes. The median spectral indices are : α_{150}^{325} = -0.34, α_{325}^{610} = -0.59, α_{610}^{1400} = -0.64. 4 out of the 11 LIRGs show a power-law spectrum down to 150 MHz while another 4 show a flat radio spectrum ($\alpha > -0.5$) below 325 MHz, with the spectrum becoming flatter

at the lower frequencies. This flattening at lower frequencies could be due to (a) missing flux at 150 MHz frequencies, or, (b) galaxy spectrum turning over due to central AGN or free-free absorption

(2) The spectral index maps between 150 MHz and 610 MHz show a variatio, between 0 to -1.5 with a flatter spectrum occurring in the central parts of the disks for most of the galaxies.

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