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Spectral energy distribution modeling of infrared bright galaxies

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We present the detailed analysis of (U)LIRGs from ultraviolet through far-infrared to radio (∼70\, MHz to ∼15\,GHz) bands. We derive the astrophysical properties through spectral energy distribution (SED) modeling using the Code Investigating GALaxy Emission (CIGALE) and UltraNest codes. The radio SEDs include our new observations at 325 and 610\,MHz from the GMRT and the measurements from public archives. Our main results are (1) radio SEDs show turnovers and bends, (2) the synchrotron spectral index of the fitted radio spectra ranges between -0.5 and -1.7, and (3) the infrared luminosity, dust mass, dust temperature, stellar mass, star-formation rates (SFRs) and AGN fraction obtained from CIGALE falls in
the range exhibited by galaxies of the same class. The ratio of 60μm infrared and 1.4\,GHz radio luminosity, the 1.4\,GHz thermal fraction, and emission measure range between 2.1 and 2.9, 0.1\% and 10\%, 0.02 and 269.5×10^{6}\,cm^{-6}\,pc, respectively. We conclude that the turnovers seen in the radio SEDs are due to free-free absorption; this is supported by the low AGN fraction derived from the CIGALE analysis. The decomposed 1.4\,GHz thermal and nonthermal radio luminosities allowed us to compute the star formation rate (SFR) using scaling relations.
A positive correlation is observed between the SFR$_{IR}$ obtained 10\,Myr ago (compared to 100\,Myr ago) and 1.4\,GHz radio (total and nonthermal) because similar synchrotron lifetimes are expected for typical magnetic field strengths observed in these galaxies ($\approx$50μG).

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