

A MeerKAT Atlas of IRAS RBGS Galaxies in the Southern Hemisphere

Abstract

The IRAS Revised Bright Galaxy Sample (RBGS) comprises all 629 sources (individual galaxies or mergers) with $S(60\ \mu\text{m}) \geq 5.24\ \text{Jy}$ in the extragalactic ($|b| > 5\ \text{deg}$) sky. It is the far-infrared (FIR) analog of the radio 3CR catalog or the optical NGC of galaxies, but unique in that most $\lambda = 60\ \mu\text{m}$ emission is powered by young (lifetimes $\tau < 100\ \text{Myr}$) stars in nearby star-forming galaxies (SFGs) rather than by AGNs (3CR) or older stellar populations (NGC). MeerKAT recently imaged 122 southern-hemisphere RBGS galaxies at 1.28 GHz with an unprecedented combination of sensitivity (15–20 $\mu\text{Jy}/\text{beam rms}$) and angular resolution (7.5 arcsec FWHM). This proposal requests 82 hours of MeerKAT time to observe the remaining 176 galaxies and complete a southern atlas of the RBGS. Our main scientific goals are to (1) use the MeerKAT images along with FIR/radio flux ratios and WISE mid-infrared colors to distinguish AGN activity from star formation, (2) improve the local radio luminosity function of starburst galaxies to better constrain the star-formation history of the universe, (3) compare Herschel FIR and MeerKAT 1.28 GHz images to measure the radio blurring caused by cosmic-ray diffusion, and (4) combine MeerKAT with 2MASX 2 μm images to compute spatially resolved specific star-formation rates and trace the evolution of merger-driven starbursts as a function of merger stage. Finally, the MeerKAT RBGS atlas will be a legacy resource for the whole astronomical community for follow-up observations by southern observatories, especially ALMA and eventually the SKA.