Q18a Investigating Jet–ISM Interaction Signatures Around the Gamma–Ray Binary LMC P3

G. R. Bhuvana, K. Tsuge, H. Sano, R. Z. E. Alsaberi (Gifu Univ.), Y. Fukui (Nagoya Univ.)

The interaction between relativistic jets from compact objects and hydrogen gas in the interstellar medium (ISM) has been proposed as a potential mechanism for molecular cloud formation, though the underlying astrophysical processes remain poorly understood. In this work, we investigate such phenomena in the gamma-ray binary system LMC P3, containing an unidentified compact object within the supernova remnant DEM L241 located in Large Magellanic cloud. Notably, ALMA CO observation near the compact object has revealed a jet-like molecular cloud emerging in the northern direction. Meanwhile, the host SNR exhibits diffuse, extended X-ray emission, possibly indicating a common origin for both features. We examine the X-ray spectral properties of this extended emission using *XMM-Newton* observations which is found to be thermal with temperature ~ 0.8 keV. The NuSTAR spectrum of compact object is found to be non-thermal powerlaw ($\Gamma = 1.3$–1.5), consistent with a neutron star/pulsar, further supported by ASKAP and MeerKAT radio continuum observation that shows a steep spectral index ($\Gamma = -0.81 \pm 0.05$). With the neutron-star identified as the likely engine, we examine the detailed physical properties of the jet-like molecular cloud (its mass, density, and kinetic temperature) and search for shock signatures using ALMA ^{12}CO($J = 3$–2) and ^{13}CO($J = 3$–2) observations. Combining X-ray and radio results, we aim to construct a coherent view of the jet-like molecular cloud in LMC P3, and its association with the high-energy emission from this gamma-ray binary system.