

Z204a ALMA Imaging of CO toward the Microquasar Jet Candidate HESS J1023-575; a Possible Cosmic Ray Accelerator Very Powerful in the Galaxy

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SNRs have been confirmed as an important cosmic ray accelerator in the Galaxy through quantification of the hadronic γ rays (Fukui et al. 2021; 2024), while other sources can contribute to cosmic ray acceleration. We here present new results on the microquasar candidate HESS J1023-575, which is likely a powerful cosmic ray accelerator, possibly comparable to the known young SNRs. HESS J1023-575 is associated with the Jet-Arc CO clouds lined up with the γ ray peak and is a promising microquasar candidate (Fukui et al. 2009; Furukawa et al. 2014). We made ALMA observations of CO emission (Cycle12, PI K.Tsuge), and resolved the CO distribution consisting of many filamentary features of 0.5 pc width of 10–20 pc length, which proves the interaction of the microquasar jet with the ISM. The cosmic ray proton energy here is estimated to be several times 10^{48} erg for the hadronic origin, which is ten times higher than that in the SNRs like RX J1713 and RX J0852. Asahina et al. (2017) modelled the Jet and Arc by MHD simulations and showed that the age of the object can be 1–10 Myr, more than 100 times longer than that in a SNR. This raises a possibility that a microquasar can supply cosmic rays more than 1000 times of that by a SNR. An extensive search for other microquasar candidates by a large scale CO survey is crucial for pursuing further the cosmic ray origin in microquasars.