

Z222r Theoretical Models for Galactic PeVatrons

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Recent observations of ultrahigh-energy gamma-rays above 100 TeV revealed that PeVatrons exist in our Galaxy. Detection of TeV-PeV neutrinos from Galactic plane also supports existence of Galactic PeVatrons. Although LHAASO detection of ultrahigh-energy gamma-rays from several source classes, including stellar cluster and microquasars, suggest these source classes as promising PeVatron candidate, the dominant source of PeV cosmic rays observed on Earth is still unknown.

In this talk, I will overview theoretical possibilities of Galactic PeVatrons and discuss multi-messenger prospects to probe the current PeVatron candidates using near-future facilities. First, I will talk about microquasars as PeVatrons. We propose that shear acceleration in extended jets is a viable mechanism to reproduce super-Knee cosmic-ray data. Then, I will introduce isolated black holes wandering in molecular clouds as potential PeVatrons, which can be tested by future observations to LHAASO unidentified sources. Finally, I will discuss interaction-powered supernovae as PeV cosmic-ray accelerators, focusing on energetics and multi-messenger prospects from nearby extragalactic interaction-powered supernovae.