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Searching for Galactic PeVatrons with the Tibet ASgamma Experiment

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The Tibet Air Shower (AS) array and the underground water-Cherenkov-type muon detector (MD) array have been operating successfully since 2014 at an altitude of 4,300 m in Tibet, China. The surface AS array determines the primary energies and arrival directions, while the MD array enables us to drastically reject background cosmic rays by counting the number of muons in each air shower. Recently, using these AS+MD arrays, we succeeded for the first time in observing sub-PeV gamma rays from the Crab Nebula and sub-PeV diffuse gamma rays from the Galactic disk. On the other hand, it is believed that there are PeVatrons in our Galaxy, which accelerate PeV cosmic rays. PeV cosmic rays accelerated by the source interact with surrounding molecular clouds and emit sub-PeV gamma rays through neutral pion decay. Therefore, sub-PeV gamma-ray observations are crucial for PeVatron searches. In this presentation, we will review sub-PeV gamma-ray observations with the Tibet ASgamma experiment and discuss the most energetic cosmic-ray source “PeVatron” in our Galaxy.

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