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Recent Results of sub-PeV Gamma Ray Observation 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 primary energy and arrival direction are determined by the surface AS array, while the MD array enables us to drastically reject background cosmic rays by counting the number of muons in an air shower. In 2019, using these Tibet AS+MD arrays, we succeeded for the first time in observing gamma rays above 100 TeV (sub-PeV) from the Crab Nebula [Amenomori et al. PRL, 123, 051101 (2019)]. 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 recent sub-PeV gamma-ray observations with the Tibet ASgamma experiment and discuss the most powerful cosmic-ray source, the "PeVatron," in our Galaxy.

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