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Particle Acceleration in Relativistic Jets: Results from VERITAS

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Relativistic jets are extremely powerful outflows of collimated plasma that may be seen in active galactic nuclei (AGN), gamma-ray bursts, and X-ray binaries. AGN are believed to be powered by the accretion of matter onto a super-massive black hole (SMBH). The observed similarities (in morphology and spectrum) of jets from black holes of different masses suggests that they share a common physical origin. Very-high-energy (VHE; E > 100 GeV) gamma-ray emission has been measured for more than 50 active galactic nuclei out to distances of at least 7.4 billion light-years (red shifts > 0.6035). Observations of astrophysical objects in the TeV band are sensitive probes of highly energetic processes occurring in these sources. The detection of > 10 TeV gamma-rays from AGN demonstrates that they accelerate particles up to extreme energies, which makes them natural candidates to explain the origin of ultra-high-energy cosmic rays (E > 10^18 eV). The majority of the active galaxies detected at TeV energies are blazars, sources where the jet is viewed nearly along its axis. Outstanding questions in TeV astrophysics of blazars include the nature of the jet structure, formation, acceleration and collimation, as well as the particle content of jets. Blazars are also the best probes of the extragalactic background light via the pair production of TeV photons traveling cosmological distances, and blazar observations may also be used to constrain intergalactic magnetic fields. In this talk we will summarize recent results from the VERITAS imaging atmospheric Cherenkov telescope on observations of VHE emission in the 100 GeV-20 TeV band from blazars and X-ray binaries, and discuss the results in the context of particle acceleration in jets.

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