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Dark Matter and High-Energy Gamma Rays

JAMES BUCKLEY, Washington University

Future ground-based gamma-ray instruments consisting of large arrays of imaging atmospheric Cherenkov detectors have the potential to provide a unique tool in determining the nature of dark matter and its role in structure formation in the universe. These measurements are complimentary to other methods, probing parameter space inaccessible to direct detection (if the nuclear recoil cross section is too small) or above the energy reach of the LHC. If a candidate particle is detected in the lab, these measurements would allow us to identify this particle as the dark matter and to measure the dark matter distribution in the halo of our galaxy and other galaxies. The spectrum of gamma-rays would be imprinted with the mass of the dark matter particle and sensitive to the branching ratios for different annihilation channels providing key data needed to identify the properties of the dark matter particles. I will summarize results of current experiments (Fermi, HESS, MAGIC and VERITAS) and will describe the sensitivity of future experiments (such as the planned CTA array) for detection of emission from dark matter annihilation in the Galactic Center region or nearby Dwarf spheroidal galaxies.