



Contribution ID: 13

Type: not specified

Ground-based gamma-ray astronomy: Investigating the sky at photon energies between ~ 20 GeV and 100 TeV

Wednesday, 16 September 2015 11:00 (40 minutes)

Since about a decade, ground-based gamma-ray telescopes are key instruments to investigate the high-energy universe at photon energies above ~ 100 GeV. Mainly devoted to searching for and characterizing cosmic particle acceleration and transport, the instruments HESS, MAGIC, VERITAS and HAWC have so far discovered more than 100 Galactic and extragalactic sources of very-high-energy (VHE) gamma rays. The observations complement measurements performed with the Fermi-LAT instrument at lower energies, and in many cases provide good energy overlap with the latter, especially after recent upgrades of the ground-based instruments which in some cases enable observations down to energies of a few tens of GeV.

Meanwhile, gamma-ray astronomy is a matured branch of science which starts to enter an era of precision measurements on the high-energy emission of objects such as supernova remnants, pulsars and their nebulae, binary systems, stellar clusters and active galactic nuclei. With HESS, a deep-exposure survey of the Milky Way has been finished recently, resulting in the first systematic catalog of Galactic VHE gamma-ray sources. Furthermore, the large number of VHE gamma-ray sources enables population studies to investigate the properties of source classes such as VHE-emitting supernova remnants and pulsar wind nebulae. Besides that, questions of fundamental physics are addressed by e.g. searching for dark matter, placing constraints on the star formation rate in the early universe, or testing for an energy dependence of light speed.

The talk will review the recent progress in VHE gamma-ray observations with HESS, MAGIC, VERITAS, and HAWC.

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Session Classification: Plenary session 5