T 80: Invited Topical Talks 6

Time: Thursday 14:00–15:30 Location: Geb. 30.22: Gaede-HS

Invited Topical Talk T 80.1 Thu 14:00 Geb. 30.22: Gaede-HS

The advent of TeV gamma-ray astronomy with gamma-ray bursts — •Alessio Berti — Max Planck Institute for Physics, Garching, Germany

Gamma-ray bursts (GRBs) are the prototypical transient sources and the most energetic ones in the electromagnetic domain. After their first discovery more than 50 years ago, they have been the subject of searches across all wavelengths. Since then, the understanding of these enigmatic sources has greatly improved, especially in the recent years in the context of multi-messenger astrophysics. One of the most intriguing bands is the very-high-energy range (VHE, $E \gtrsim 100$ GeV), through which one can probe the presence of new emission components and better understand the properties of particle acceleration and energy dissipation within GRBs. At these energies and above, Cherenkov telescopes and extensive air shower arrays have been hunting for GRBs for decades. All previous VHE observations did not result in any detection. This changed suddenly in 2019, when the MAGIC and H.E.S.S. collaborations announced the detection of VHE emission from two distinct GRBs, followed by two additional events within the following two years. More recently, in October 2022 the LHAASO collaboration announced the detection of another event. These detections provide unique datasets to improve our understanding of GRB physics, but they can be used also for fundamental physics studies. In this contribution I will present the journey which has led to these discoveries, what the GRB community has learned from them and what are the perspectives for future searches.

Invited Topical Talk T 80.2 Thu 14:30 Geb. 30.22: Gaede-HS

Multi-messenger models of active galaxies: achievements and future directions — •Xavier Rodrigues — European Southern Observatory, Garching bei München

The IceCube neutrino experiment has now accumulated over a decade of observations, and a suite of next-generation experiments is on the horizon. Theorists try to keep pace by developing increasingly refined astrophysical neutrino source models. In this talk I give an overview of some of the most recent advancements in these models, with emphasis on active black holes. I discuss the state of the art of numerical cosmic-ray simulation methods, the predicted multi-wavelength signatures of neutrino production, and the most promising source classes. I illustrate the significance of utilizing public multi-wavelength catalogs and open-source simulation software in developing the next generation of multi-messenger models.

Invited Topical Talk T 80.3 Thu 15:00 Geb. 30.22: Gaede-HS

Acceleration and transport of relativistic electrons in the parsec-scale jets of the microquasar SS 433 — •Laura Olivera-Nieto — Max-Planck-Institut für Kernphysik, Heidelberg, Germany

The microquasar SS 433 provides a unique opportunity to study relativistic collimated jets. In contrast to the precessing inner jets, the larger-scale jet dynamics remain poorly understood. Here I will present results from the High Energy Stereoscopic System (H.E.S.S.), which reveal an energy-dependent shift in the position of the gamma-ray emission of the outer SS 433 jets. These observations, which trace the energetic electron population, confirm an inverse-Compton origin of the gamma rays. Our analysis of the energy-dependent gamma-ray morphology establishes the location of particle acceleration and requires an abrupt deceleration of the jet flow. We find strong evidence for the presence of shocks 25-30 pc either side of the binary system. That the self-collimation of the precessing jets forms such efficiently accelerating shocks strengthens claims that a similar process takes place in other sources hosting powerful relativistic jets.