T 65: Gamma Astronomy III

Time: Wednesday 15:50–16:50 Location: POT/0151

T 65.1 Wed 15:50 POT/0151

Towards searching for ultra-high energy photons from galactic PeVatrons — •Chiara Papior, Marcus Niechciol, Markus Risse, and Philip Ruehl — Center for Particle Physics Siegen, Experimentelle Astroteilchenphsik, Universität Siegen

Recently, photons from galactic sources with maximum energies in the PeV range have been discovered. Sources which are able to accelerate particles to these energies are referred to as PeVatrons. They do not only emit photons, but are also candidate sources of galactic cosmic rays. The only firmly identified PeVatron is the Crab nebula. However, through theoretical considerations and directional observations of PeV photon signals, several other potential PeVatron candidates have been proposed, including pulsars, supernova remnants and massive stars. In this contribution, the energy spectra of such source candidates are modelled and extrapolated to even higher energies reaching up to EeV scales. Photons of these energies are referred to as ultra-high-energy (UHE) photons. The results of the extrapolation can then be used to obtain information on the required sensitivity for the measurement of UHE photons from specific source candidates. The work presented in this contribution aims to evaluate the potential at present and future observatories to detect UHE photons from certain sources.
This work is supported by the Deutsche Forschungsgemeinschaft (DFG).

T 65.2 Wed 16:05 POT/0151

Indirect Search for scotogenic WIMP Dark Matter — •Laura Eisenberger — University of Würzburg

Weakly interacting massive particles (WIMPs) are one of the most promising candidates for dark matter. They are predicted for example by scotogenic models which implement an additional Z_2 symmetry under which all Standard Model particles are even while new particles, among them a stable dark matter candidate, are odd.

In our study, we use a scotogenic model (T1-2-A′) which can explain neutrino masses and the muon anomalous magnetic moment while fulfilling the current limits for charged lepton flavour violating processes simultaneously. In addition, it also incorporates a new WIMP dark matter type (m=1.1 TeV) consistent with limits from direct dark matter detection experiments.

We focus on the indirect search for this promising dark matter candidate via the detection of annihilation signals. For this, we predict multiwavelength spectral energy distributions (SEDs) reaching from very-high-energy photons from pion decay to secondary Inverse Compton and synchrotron emission. The results are compared to observational limits.

T 65.3 Wed 16:20 POT/0151

Machine Learning Methods for an Increased Understanding of AGN Flares* — •Yannick Hartych[1,2], Julia Becker Tjus[1,2], Wolfgang Rhode[2,3], and Marcel Schroller[1,2] — [1]Theoretische Physik IV, Ruhr Universität Bochum, Bochum, Germany — [2]RAPP-Center at Ruhr Universität Bochum, Bochum, Germany — [3]Experimentelle Physik 5, Technische Universität Dortmund, Dortmund, Germany

Blazars are some of the brightest known sources in the Universe and are considered possible sources of the highest energy cosmic rays (CRs). Hence they are of high interest to astronomers to understand the processes accelerating those CR. One of those blazars is TXS 0506+056, from which a gamma-ray flare arrived in temporal and spatial coincidence with a high-energy neutrino of high probability to be of astrophysical origin. For this reason, the source was brought into focus for further investigation to understand the underlying processes leading to this observation. It is crucial to physically model blazars thoroughly. In order to find the related parameters responsible for this behaviour, we set up simulations in CRPropa3 and develop theoretical flare templates that can be compared to observational signatures. With those templates, the next step would be to train a machine learner to search the galactic catalogues for other blazars with a high probability of showing behaviour similar to TXS 0506+056. In this talk, we will present first preliminary results of such simulations and evaluate their significance in the context of the parameter study.
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T 65.4 Wed 16:35 POT/0151

Unfolding the Crab Nebula Flux with Gammapy* — •Noah Biederbeck and Maximilian Linhoff — TU Dortmund University, WG Elsässer

In spectral analyses of astrophysical gamma-ray sources, a flux model is typically fitted. Unfolding has the advantage over fitting that it is model independent and correctly includes all known detector effects. Gammapy is a widely used open-source Python package for gamma-ray astronomy, but is lacking unfolding functionality. In this talk, we present the implementation of unfolding in Gammapy and its application to joint flux unfolding of the Crab Nebula using public data of multiple Imaging Atmospheric Cherenkov Telescopes.
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