# T 78: Gamma Astronomy II

Time: Thursday 16:15–18:15 Location: VG 2.103

T 78.1 Thu 16:15 VG 2.103

**Constraining the intergalactic Magnetic field with Fermi-LAT observations** — •Yosef Abed, Dieter Horns, and Matías Sotomayor — Institut für Experimentalphysik, Universität Hamburg

The intergalactic magnetic field (IGMF) represents a weak and omnipresent magnetic field permeating the intergalactic medium. Its origins are unclear and a detection of the IGMF has yet to be achieved. The most sensitive method to search indirectly for evidence of the existence of the IGMF are based upon $\gamma$-ray observations.This talk presents a conservative lower limit for the IGMF, calculated from *Fermi*-LAT data and ELMAG simulations. Extended source templates for several blazars were generated using ELMAG simulations with varying magnetic field strengths of the IGMF, where its coherence length was taken into account. In the *Fermi* binned likelihood analysis of these blazars, the extended templates were added as diffuse sources and from the loglikelihood profile, the normalization with 95% confidence level was calculated for each template. Then the spectral energy distributions of the normalized fitted template and the non-fitted simulation template were compared, from which the conservative lower limit for the IGMF was estimated.

T 78.2 Thu 16:30 VG 2.103

**Adaptive Sampling in Simulations for the Cherenkov Telescope Array Observatory** — •Tristan Gradetzke and Luca Di Bella — TU Dortmund University

Monte Carlo simulations of particle induced extensive air showers are of crucial importance to the analysis chain of data taken by Imaging Air Cherenkov Telescopes (IACTs). Besides for the training of particle classifiers and energy estimators, they are needed to compute a mathematical description of the measurement process required for the scientific analysis, the Instrument Response Functions (IRFs). There usage however, comes at the extensive cost of computational resources. Therefore much effort has been made to this day, to make these simulations more efficient. This work aims at investigating, among others, adaptive sampling based methods to sample only phase-space regions improving event statistics and to a limited extent uncertainties in e.g. IRFs. Thus reducing the extent of Monte Carlo productions. Phase space in this context refers to, among others, detector field of view and primary particle energy . The main challenges arise from the definition of a metric, that is optimized by any given algorithm. Here, the simple case of an event-per-bin based metric is presented and an outlook is given.

T 78.3 Thu 16:45 VG 2.103

**Investigating the Effects of Symmetry Assumptions in the Instrument Response of the Cherenkov Telescope Array Observatory** — •Luca Davide Di Bella and Tristan Franziskus Gradetzke — TU Dortmund University, Dortmund, Germany

The Cherenkov Telescope Array Observatory is the next generation of Imaging Air Cherenkov Telescope observatories, designed to operate in an energy range between 20 GeV to 300 TeV and achieve higher sensitivities and lower systematic uncertainties than previous experiments. An important data analysis step to achieving the systematic uncertainty targets is accurate modeling of the instrument response. This is done in discrete intervals of the relevant quantities using Monte Carlo simulated events to ensure accuracy.

In order to reduce the necessary amount of simulations, the Instrument Response Functions (IRFs) are assumed to be radially symmetric over the field of view of the telescopes. Due to for example atmospheric effects, this simplification is not necessarily accurate, especially at higher zenith distances. It is thus necessary to implement computation of non-radially symmetric Instrument Response Functions and evaluate their impact on the measurement.

More complex implementations, which allow asymmetry of the IRFs, have been implemented and will be compared against the existing radially symmetric implementations using simulated data sets.

T 78.4 Thu 17:00 VG 2.103

**FlashCam development and verification** — •Anne Timmermans for the FlashCam-Collaboration — Max-Planck-Institut für Kernphysik, Heidelberg, Germany

FlashCam is a high-performance camera design for ground-based, imaging atmospheric Cherenkov telescopes. An advanced prototype has been installed in CT5 of the H.E.S.S. experiment, and has been successfully running since December 2019.

The next generation observatory for very high energy gamma-ray astronomy will be the Cherenkov Telescope Array Observatory (CTAO). The FlashCam team, is preparing another FlashCam camera for the MST pathfinder telescope on the Southern CTAO site. Before installation in Chile, the camera will be fully characterized in the lab. This talk will give an overview of the current status and presents results on the performance measurements.

T 78.5 Thu 17:15 VG 2.103

**SWGO Array Trigger Performance Evaluation** — •Johannes Bennemann — Max-Planck-Institut für Kernphysik, Heidelberg, Germany

The Southern Wide-field Gamma-ray Observatory (SWGO) is a future gamma-ray instrument to be built in Chile. It will consist of more than 6000 water tanks with an almost 100% duty cycle. The amount of data produced by SWGO will be more than what can be handled by the available computing infrastructure. This makes a sophisticated trigger strategy necessary for the detector array. While data reduction is the key motivation for an array trigger, the scientific quality of the data is equally important. In this talk, the criteria for trigger performance studies will be presented. Additionally, the quality of different trigger strategies will be discussed.

T 78.6 Thu 17:30 VG 2.103

**Modeling of dark matter prompt and secondary signatures in dwarf galaxies** — •Athithya Aravinthan[1,2], Julia Becker Tjus[1,2,3], and Lukas Merten[1,2] — [1]Theoretische Physik IV, Ruhr-Universität Bochum, Bochum, Germany — [2]RAPP Center, Ruhr-Universität Bochum, Bochum, Germany — [3]Department of Space, Earth and Environment, Chalmers University of Technology, 412 96 Gothenburg, Sweden

Dwarf galaxies are a convenient testing ground in the indirect search for Dark Matter (DM), due to their low astrophysical background in radio and gamma ray frequencies. In addition to the much explored prompt emission of DM in dwarf galaxies, one must also consider the secondary multimessenger signatures of charged DM annihilation products via synchrotron radiation and inverse Compton scattering. The consistent modeling of this secondary emission with the astrophysical background is necessary for placing stringent constraints on the nature of DM.

In this work, the multi-wavelength secondary spectrum of DM annihilation for dwarf spheroidal galaxies is calculated using the open-source code CRPropa 3.2., which allows for the self-consistent treatment of the astrophysical background and secondary emissions. The code can also be extended to treat DM particles, which is currently not available in the public version. *Supported by DFG (SFB 1491).

T 78.7 Thu 17:45 VG 2.103

**Analysis of the IC 443 Supernova Remnant with H.E.S.S. Data** — •Lukas Grosspietsch, Alison Mitchell, and Tina Wach for the H.E.S.S.-Collaboration — Friedrich-Alexander-Universität Erlangen-Nürnberg

The Jellyfish Nebula or IC 443 is one of the few observed supernova remnants (SNRs) interacting with a molecular cloud. In this contribution, we present a first spectral and spatial analysis of gamma-ray emission from IC 443 observed with the H.E.S.S. telescope array using the open source analysis package gammapy. The data show some significant emission best modeled by an extended source. Further- more, we combine our analysis with some multi-wavelength data which can best be modeled by a parent proton population producing gamma rays via neutral pion decay, indicated by the characteristic pion-bump. This analysis of the IC 443 gamma-ray emission observed by the H.E.S.S. telescope therefore again highlights IC 443 as a probe for cosmic ray acceleration in SNRs.

T 78.8 Thu 18:00 VG 2.103

**Spatially coherent 3D distributions of HI and CO in the Milky Way** — •Laurin Söding[1], Gordian Edenhofer[2,3], Torsten A. Ensslin[2,3,6], Philipp Frank[2], Ralf Kissmann[4], Vo Hong Minh

Phan[5], Andrés Ramírez[4], Hanieh Zandinejad[2,3], and Philipp Mertsch[1] — [1]RWTH Aachen University, Aachen, Germany — [2]Max Planck Institute for Astrophysics, Garching, Germany — [3]Ludwig Maximilian University of Munich, Munich, Germany — [4]Universität Innsbruck, Innsbruck, Austria — [5]Sorbonne Université, Paris, France — [6]Excellence cluster ORIGINS, Garching, Germany

The spatial distribution of the gaseous components of the Milky Way is of great importance for a number of different fields, for example, Galactic structure, star formation, cosmic rays, and diffuse emission. We used three-dimensional (3D) Gaussian processes to model correlations in the interstellar medium, including correlations between different lines of sight, and enforce a spatially coherent structure in the prior. We inferred the spatial distributions of atomic hydrogen (HI), carbon monoxide (CO), their emission line widths, and the Galactic velocity field in a joint Bayesian inference from multiple datasets, mainly Doppler-shifted line emission. Our main result consists of a set of samples that implicitly contain statistical uncertainties. We confirm previous findings regarding the warping and flaring of the Galactic disc. A comparison with 3D dust maps reveals a good agreement on scales larger than approximately 400 pc. While our results are not free of artefacts, they present a big step forward in obtaining high-quality 3D maps of the interstellar medium.