T 54: Gammaastronomie II

Zeit: Mittwoch 16:30–18:25 Raum: Philo-HS7

Gruppenbericht T 54.1 Mi 16:30 Philo-HS7

FACT - Results from Six Years of Monitoring at TeV Energies — •Daniela Dorner for the FACT-Collaboration — Universität Würzburg, Germany

The First G-APD Cherenkov Telescope, located on the Canary Island La Palma, is operational since more than six years. Thanks to the stable performance of its SiPM camera, it is ideally suited for long-term monitoring. With robotic operation, the data taking efficiency was maximized reaching up to 2400 h of physics data in 12 months. Monitoring a small sample of bright TeV sources, in total about 10000 hours of physics data have been collected. The bright blazars Mrk 421 and Mrk 501 have been observed for about 2000 hours each. In 2012 and 2014, extreme outbursts have been observed from Mrk 501, and Mrk 421 showed a bright flare in 2013. Another blazar, 1ES 1959+650 showed an exceptional outburst in summer 2016 after having shown no enhanced activity for 14 years. Thanks to an automatic quick look analysis, FACT alerts the community about such events with low latency triggering valuable multi-wavelength observations. Since March 2014, more than 50 alerts and five astronomer's telegrams have been issued. Following an open data policy, the FACT Collaboration not only publishes the results of the quick look analysis online, but also provides a sample of high quality raw data to the community.

The presentation summarizes results from six years of blazar monitoring with FACT and coordinated multi-wavelength studies.

T 54.2 Mi 16:50 Philo-HS7

MAGIC as a Neutrino Alert Follow-up Instrument — •Alicia Fattorini for the MAGIC-Collaboration — TU Dortmund

Despite the detection of a diffuse cosmic neutrino flux by the IceCube neutrino observatory in 2013, no neutrino point source has been detected yet. A promising approach for the first detection are the ongoing multi-messenger campaigns.

When a potential astrophysical neutrino is detected by IceCube, an alert with the reconstructed coordinates is sent among others to MAGIC, where follow-up observations are performed in search of a correlated gamma-ray flux. As the MAGIC telescopes are designed to observe sources with well-known coordinates, the analysis for discovering sources in a given region has to be modified. Different statistical methods for identifying point sources as possible neutrino sources are studied. This talk presents an overview of different techniques of deriving sky maps for point source searches.

T 54.3 Mi 17:05 Philo-HS7

FACT - Sub-Threshold Data for Correlation Studies in AMON — •Daniela Dorner[1] and Azadeh Keivani[2] for the FACT-Collaboration — [1]Universität Würzburg, Germany — [2]Pennsylvania State University, USA

In more than six years, the First G-APD Cherenkov Telescope (FACT) has collected an unprecedented data sample by continuously monitoring a small sample of blazars. Thanks to the stable performance of the system, the data taking efficiency could be maximized achieving up to 2400 hours of physics data per year. Blazars like Mrk 421, Mrk 501 and 1ES 1959+650 have been showing exceptional flaring activities. A fast quick look analysis enables the collaboration to alert the community within minutes in case of an interesting event.

To enhance the combined sensitivity of collaborating observatories to astrophysical transients, the Astrophysical Multimessenger Observatory Network (AMON) is searching for significant coincidences in sub-threshold data provided by the individual observatories. FACT joined AMON both as triggering and follow-up observatory.

Trigger criteria for the FACT sub-threshold events have been defined, and the data are sent to AMON in real-time. These alerts will be analyzed in coincidence with sub-threshold triggers of other AMON partner observatories. In case a significant coincidence is found, an AMON alert will be issued, enabling rapid multi-wavelength follow-up observations. Such multi-messenger searches will enable us to address many important questions in high energy astrophysics, including the emission and acceleration mechanisms in high energy sources.

T 54.4 Mi 17:20 Philo-HS7

Classification of unassociated 3FGL sources with Machine Learning — •Simone Mender, Kai Brügge, Maximilian Nöthe, and Kevin Schmidt — TU Dortmund, Lehrstuhl für Experimentelle Physik Vb, Otto-Hahn-Straße 4a, 44227 Dortmund

Active Galactic Nuclei (AGN) are astrophysical objects, whose emission range covers the entire electromagnetic spectrum. The AGN unification model includes numerous subclasses. The most powerful of them are the blazars, which are subdivided into BL Lac and Flat Spectrum Radio Quasars. To explore their phenomenology and their cosmological evolution it is interesting to look at average spectral energy distributions for the different classes.

The aim is to classify as many objects as possible so that they can be included in the calculation of average spectral energy distributions. To perform this classification Machine Learning can be used. In this talk, ongoing work based on the Fermi 3FGL catalog will be presented. It will be shown how unassociated sources and blazar candidates of uncertain type can be classified. For this purpose, methods of supervised and unsupervised learning are compared.

Gruppenbericht T 54.5 Mi 17:35 Philo-HS7

M@TE - Extending the Coverage of TeV Monitoring — •Daniela Dorner[1] and Thomas Bretz[2] for the MATE-Collaboration — [1]Universität Würzburg, Germany — [2]RWTH Aachen, Germany

Monitoring at TeV Energies (M@TE) is a joint project of German and Mexican universities which aims at extending the blazar monitoring to so far unexplored time ranges.

Emitting radiation across the electromagnetic spectrum, blazars are highly variable objects. At TeV energies variability on time scales from minutes to years have been measured. To study typical variability time scales of few hours to one day, continuous observations are crucial.

Long-term monitoring at TeV energies is carried out by the FACT project sucessfully since more than six years. Being limited to one site, gaps due to the rotation of the Earth remain in the measured light curves. To allow for systematic studies using continuous observations covering up to 12 hours, a second telescope is being installed in Mexico.

A mount from a previous experiment is being refurbished and will be equipped with a new SiPM camera. Providing an excellent and stable performance, these silicon based photo sensors are ideal for long-term monitoring. The mount, a new drive system and new mirrors are already available and with the observatory of San Pedro Martir, an excellent site has been chosen.

In the presentation, the overview of the project will be given and its status discussed.

T 54.6 Mi 17:55 Philo-HS7

Transient simulations for ground-based detection — •Jana Moschner, Lena Linhoff, and Kai Brügge — TU Dortmund

Gamma-ray bursts (GRBs) are high energy transient phenomena in the gamma-ray band which show incomparable brightness for very short time scales. Despite many detections and follow-up observations in different wavelengths, there remain unsolved questions on GRBs. With their unprecedented sensitivity, fast slewing capacity and wide field of view, the next generation of ground-based Cherenkov telescopes like CTA will be able to detect and follow-up transients like GRBs. To analyze these short transient, we are currently working on a tool which detects transients during the regular data taking. A wavelet transform makes it possible to find transient events in the field of view of a steady source. Therefore a steady source, the cosmic background and a transient are simulated by using toy models. Instead of that, we now need realistic models to develop and evaluate the methods for transient detection. Due to the low number of ground-based transient observations, there is a need for physically wise simulations of spectra and lightcurves of short transients in the energy range of Cherenkov telescopes. This talk will give an introduction to different simulation models for transients like GRBs based on data from the Fermi and Swift satellites.

T 54.7 Mi 18:10 Philo-HS7

Wavelet Denoising for Transient Search — •Lena Linhoff, Kai Brügge, and Jana Moschner — TU Dortmund

Astrophysical transient events are phenomena where a huge amount of high energy radiation is emitted over short timescales (a few minutes) such as gamma ray bursts, supernovae or transits. Cherenkov

telescopes like CTA in its final setup will be able to see such short flares in the gamma ray regime on unknown positions. Since transients appear in an unpredictable manner, it necessary to detect these short events during the regular data taking. Due to very limited observation time the data taken from transient events is very noisy and dominated by background events and steady sources in the field of view. A wavelet transform is an application known from digital image processing to denoise images and is used in this context to find transient events in the field of view of Chrerenkov telescopes.