T 115: Gamma Astronomy V

Time: Thursday 15:50–17:20 Location: POT/0151

T 115.1 Thu 15:50 POT/0151

Quasi-periodic behavior of J1048+7143* — •Armin Ghorbanietemad[1], Ilja Jaroschewski[1], Emma Kun[1,2,3], and Julia Becker Tjus[1] — [1]Theoretical Physics IV, Ruhr University Bochum — [2]CSFK, MTA Centre of Excellence, Hungary — [3]Konkoly Observatory, ELKH, Hungary

Most blazars show short- and long-term variability in their electromagnetic emissions. Some of these have a gamma-ray light curve with a periodic pattern with a declining periodicity called quasi-periodic behavior, which is evident in observations using Fermi-LAT. Jet precession is a possible explanation for such a behavior. Supermassive binary back holes (SMBBHs) are characterized by the change in jet direction accompanied by jet precession close to an imminent merger, which makes them interesting candidates as the origin of quasi-periodic emission. A recent study on the multi-messenger behavior of the blazar J1048+7143 indicates a quasi-periodic behavior in the gamma-ray emissions from 2009 until now. The detected gamma-ray light curve is composed of three double-peak structures, each different in shape and symmetry, which makes conventional ways of signal assessment unsuitable.

In this talk, we analyze the gamma-ray light curve of J1048+7143 and use the centroid approach to find its characterizations, meaning duration and period. Furthermore, we apply our developed jet precession model on this blazar. Our findings show that its gamma-ray flares are compatible with an SMBBH at its center. Then, we use this model to predict its next gamma-ray flares and the time of merger based on its mass ratio. *Supported by DFG (SFB 1491)

T 115.2 Thu 16:05 POT/0151

Potential for detection of M31-like gamma-ray halos with CTA and Fermi-LAT — •Mario Engelmann, Alison Mitchell, and Katrin Streil — Erlangen Centre for Astroparticle Physics Nikolaus-Fiebiger-Str. 2 D-91058 Erlangen Germany

Recent evidence from the Fermi LAT satellite suggests that a gamma-ray halo exits around the Andromeda Galaxy. One explanation for the gamma-ray emission is, that in the inner region of the galaxy, buoyant bubbles of gas are created. These bubbles are pushed outwards and create a cosmic ray Halo around the galaxy. Consequently, the gamma rays are produced via proton-proton interaction of cosmic rays or inverse Compton scattering of cosmic ray electrons with the microwave background photons.

The sensitivity of the Fermi LAT satellite isn't sufficient to observe the whole spectrum in the GeV range. For this reason, observations with CTA can be used to search for emission at higher energies. With this information, the parameters for the spectrum can be fine-tuned. After this, potential candidate galaxies for similar halos will be chosen from the nearby galactic catalogue (maximum distance at 25 Mpc). In this contribution I will compare the sensitivity of CTA and Fermi-LAT to the gamma-ray emission from galaxies similar to the Andromeda galaxy.

T 115.3 Thu 16:20 POT/0151

Satellite trails in H.E.S.S. data — •Thomas Lang, Alison Mitchell, and Samuel Spencer for the H.E.S.S.-Collaboration — Erlangen Centre for Astroparticle Physics

The commercialization of space by private companies such as SpaceX and OneWeb has caused the number of satellites launched in low earth orbit to almost triple to over 4000 in the last three years. 17 constellations with over 400,000 total satellites are planned/proposed, which causes major concerns for ground based astronomy. The impact on Imaging Air Cherenkov Telescopes (IACTs) has been assumed to be low and apart from the brightest trails has not been considered as a significant problem.

This work aims to find and quantify satellite trails in data taken by the High Energy Stereoscopic System (H.E.S.S.), determine which observation times and directions are affected the most, giving a prediction for these effects depending on the satellite numbers and determine whether trails have an impact on the Hillas parameters used to reconstruct high energy particle events.

Trails are found in night sky background (NSB) maps of FlashCam data, the latest camera of the largest telescope (CT5) with a 0.1 s NSB mapping rate, and from this inferred for the other smaller telescopes (CT1-4). Comparisons of the distributions of Hillas parameters will be made of during and around satellite trail passing times.

T 115.4 Thu 16:35 POT/0151

Simultaneous TeV and X-Ray Observations of Markarian 421 in 2020 — •Bernd Schleicher for the MAGIC-Collaboration — University of Würzburg, Institute for Theoretical Physics and Astrophysics, Germany

The blazar Mrk 421 is one of the brightest and most studied sources in very-high-energy (VHE) gamma rays. As the underlying processes of the production of these gamma rays are still under debate and different models predict correlations between X-rays and gamma rays and some hadronic models for example predict specific features in the hard X-ray regime. Therefore, regular multi-wavelength (MWL) campaigns have been carried out since 2009. In late 2020, simultaneous observations were performed with the X-ray satellites XMM-Newton, the International Gamma-Ray Astrophysics Laboratory (INTEGRAL), and the Major Atmospheric Gamma Imaging Cherenkov Telescopes (MAGIC) to check if these hadronic signatures can be found. Two INTEGRAL observations with an long exposure of 165 ks were performed during the time range of 21. November to 24. November and the time range of 12. December to 15. December and data were taken simultaneously with XMM-Newton and MAGIC. The results of this MWL campaign will be presented.

T 115.5 Thu 16:50 POT/0151

Evidence of hadronic origin of the gamma-ray emission from the nova RS Oph by the MAGIC telescopes — •David Green[1], Vandad Fallah Ramazani[2], Francesco Leone[3], Rubén López-Coto[4], Alicia López-Oramas[5], and Julian Sitarek[6] for the MAGIC-Collaboration — [1]Max Planck Institute for Physics, Munich, Germany — [2]Astronomisches Institut (AIRUB) Ruhr-Universität Bochum, Bochum, Germany — [3]National Institute for Astrophysics, Rome, Italy — [4]IAA-CSIC, Granada, Spain — [5]Instituto de Astrofísica de Canarias, Tenerife, Spain — [6]University of Lodz, Faculty of Physics and Applied Informatics, Department of Astrophysics, Lodz, Poland

RS Ophiuchi (RS Oph) is a symbiotic recurrent nova that shows eruptive events roughly every 15 years. On August 8th, 2021, RS Oph erupted with its latest outburst. This event was detected by a wide range of multi-wavelength (MWL) instruments from radio up to very-high-energy (VHE) gamma rays. The MAGIC telescopes followed up on optical and high-energy triggers and initiated an observation campaign from August 9th till September 1st. RS Oph is the first nova detected in the VHE gamma-ray energy range. We report on the detection of VHE gamma rays at a significant level of 13.2σ during the first 4 days of RS Oph with the MAGIC telescopes. We combine the VHE emission detected by MAGIC with optical and high-energy observations and conclude RS Oph accelerated hadrons during its eruption. We will present the MWL modeling revealing this hadronic emission, and its further implications for Galactic cosmic-rays.

T 115.6 Thu 17:05 POT/0151

Performance of joint observations with LST-1 and MAGIC — •Alessio Berti[1], Yoshiki Ohtani[2], Julian Sitarek[3], Federico Di Pierro[4], Yusuke Suda[5], and Elli Jobst[1] for the MAGIC-Collaboration — [1]Max Planck Institute for Physics, Munich, Germany — [2]Institute for Cosmic Ray Research, Tokyo, Japan — [3]University of Lodz, Lodz, Poland — [4]INFN Torino, Torino, Italy — [5]Hiroshima University, Hiroshima, Japan

The next generation ground-based instrument for very high energy gamma rays observations will be the Cherenkov Telescope Array (CTA). In one of the two planned sites, La Palma (Canary Islands, Spain), the first prototype of a Large Sized Telescope, LST-1, is already operational and is currently under commissioning. The proximity of the two MAGIC telescopes offers a unique opportunity to perform joint observations with LST-1. This three-telescope system provides a better reconstruction of the events, both in angular and energy resolution, and discrimination between showers initiated by gamma rays and cosmic rays, which turns into an improvement in sensitivity with respect to LST-1 or the two MAGIC telescopes separately. In this contribution, we will report on results from Crab Nebula data with a pipeline developed for the analysis of joint LST-1 and MAGIC observations, and show the performance estimated both from real and simulated data.