Poster Contributions

Participant: Abraham, Zulema
Affiliation: University of São Paulo
Title: Millimeter Multiwavelength Observations of Blazars with the LLAMA Radiotelescope.
Abstract:
Simultaneous multiwavelength observations are fundamental for the understanding of the emission mechanism of blazars. Millimeter and submillimeter emission can be observed with few radiotelescopes around the world, and campaigns of simultaneous observations are generally not long enough to guarantee useful correlation between the different frequencies. In this context, I will describe the LLAMA radiotelescope, to be installed in the Argentinian Andes, at 4800m altitude and 150 km from the ALMA site. With a 12m Cassegrain dish and two Nasmyth cabins, it will operate within six of the ALMA bands, from 30 to 700 GHz. Three receivers will be installed in each of two cryostats, allowing rapid changes between frequencies and in the future, even simultaneous observations at several frequencies. This configuration will allow almost simultaneous observations of blazars, when used as single dish. The radiotelescope will also have VLBI capability, and its privileged position will allow its participation in the EHT, as well as in other mm wave VLBI experiments.

Participant: Acosta Pulido, Jose A.
Affiliation: Instituto de Astrofisica de Canarias
Title: A new statistical approach to the optical spectral variability in a sample of Gamma-Bright Blazars.
Abstract:
We present a statistical study based on optical spectroscopic observations of a list of gamma-ray bright blazars. We have used the observations obtained as part of the ground-based observational support program to the Fermi mission conducted at Steward Observatory (Univ. of Arizona). Spectra of about 35 targets have been obtained with an almost weekly cadence. We retrieved observations from the end of 2008 to beginning of 2016, i.e. about 7.5 years. We have obtained synthetic photometry and produced colour-magnitude diagrams which show different trends associated to the object classes: generally BL-Lacs tend to become bluer when brighter, FSRQs redder when brighter, although several objects exhibit different trends depending on the brightness. We have also applied a pattern recognition algorithm to obtain the minimum number of physical components which can explain the variability of the optical spectrum. We have used NMF (Non-Negative Matrix Factorization) instead of PCA (Principal Component Analysis) to avoid un-realistic negative components. For most targets we found that two meta-components are enough to explain the observed spectral variability. The spectral shape of these components will be presented and their association to plausible physical emission mechanisms (synchrotron, accretion disk, inverse-Compton, stellar population, etc) will be discussed. The relative contribution of each component is also studied in relation to colour changes and variability observed in other frequency ranges.

Participant: Agarwal, Aditi
Affiliation: Aryabhatta Research Institute of Observational Sciences
Title: FREQUENCY-DEPENDENT CORE SHIFTS AND PARAMETER ESTIMATION IN BLAZARS
Abstract:
We study the core shift effect in the parsec-scale jet of blazars using the 4.8-36.8 GHz radio light curves obtained from four decades of continuous monitoring. From a piecewise Gaussian fit to each flare, time lags between the observation frequencies and spectral indices (α) based on peak amplitudes (A) are determined. Index k is calculated and found to be ∼ 1, indicating equipartition between the magnetic field energy density and the particle energy density. A mean

magnetic field strength at 1 pc (B1) and at the core (Bcore) are inferred which are found to be consistent with previous estimates. The measure of core position offset is also performed by averaging over all frequency pairs. Based on the statistical trend shown by the measured core radius as a function of frequency, we infer that the synchrotron opacity model may not be valid for all cases. A Fourier periodogram analysis yields power-law slopes in the range 1.6 to 3.5 describing the power spectral density shape and gives bend timescales. This result, and both positive and negative spectral indices, indicate that the flares originate from multiple shocks in a small region. Important objectives met in our study include: the demonstration of the computational efficiency and statistical basis of the piecewise Gaussian fit; consistency with previously reported results; evidence for the core shift dependence on observation frequency and its utility in jet diagnostics in the region close to the resolving limit of very long baseline interferometry observations.

Participant: An, Hongjun
Affiliation: Stanford University
Title: SEDs of three high-redshift BL Lac objects and EBL constraints
Abstract:
We present results of data analyses and SED modeling of three high-redshift BL Lac objects 3FGL J0022.1-1855 (z=0.689), 3FGL J0630.9-2406 (z>1.239), and 3FGL J0811.2-7529 (z=0.774). We have a set of nearly contemporaneous optical to X-ray observations (GROND, XMM-Newton, NuSTAR) and further improved the SED's sampling with archival infrared observations, optical spectra, and historical Fermi-LAT data integrated over 6.5-yr. The well-sampled broadband SEDs of these sources allow sensitive modeling with the one-zone synchro-Compton model of Boettcher et al. (1997). The results are interesting in that the highest-z source can be used for constraining EBL absorption models and in that emission properties of unusual, high-power BL Lacs can be inferred. We discuss possible implications for the BL Lac population and the blazar sequence.

Participant: Bachev, Rumen
Affiliation: Institute of Astronomy, Sofia
Title: The extremes in intra-night blazar variability: the S4 0954+65 case
Abstract:
We present results of optical observations of an extremely violently variable blazar S4 0954+65 on intra-night time scales. The object showed flux changes of up to 100% within a few hours. Possible time delays between optical bands are searched for and the results are discussed in terms of existing models of blazar variability.

Participant: Banasiński, Piotr
Affiliation: University of Lodz
Title: Dynamical Inhomogeneous Model for High Energy Emission from blazars
Abstract:
Based on gamma-ray emission from blazars, two states can be identified - quiescent state and active state. However, the blazar emission in long lasting quiescent state and violent outburst is difficult to explain with a single process. In our work, we present dynamical emission model of blazar jet in which radiation in the low emission state comes from the extended jet and the outbursts are produced by the magnetic reconnection process in the vicinity of jet base. The results of numerical calculations are compared with observations of the nearby blazars, in both, the quiescent and the active states.

Participant: Becerra Gonzalez, Josefa
Affiliation: NASA Goddard Space Flight Center
Title: Physical implications of the most extreme X-ray flaring activity of the high-peaked BL Lac Mrk 501 from a detailed multi-wavelength study

Abstract:
The high-frequency-peaked BL Lac object Markarian 501 is a very high energy (VHE, E>100 GeV) emitter located in our extragalactic neighborhood (z=0.034). The source can be detected in the VHE band during low state, what makes this target an ideal source for long-term multi-wavelength studies covering the entire electromagnetic spectrum. During a multi-wavelength campaign in 2014, the source showed the highest X-ray activity observed by Swift-XRT during the last decade. The source displayed very hard spectra at X-rays and gamma-ray energies with variability on day timescales. The temporal evolution of the broadband SED, studied during 2 weeks on a day-by-day basis, suggests the existence of ultra-energetic electron energy distributions contributing to the broadband emission of Mrk501. In the conference I will report about this unprecedented flaring event and its physical implications in the multi-wavelength context.

Participant: Bednarek, Wlodek
Affiliation: University of Lodz
Title: Gamma-rays from collisions of compact objects with intermediate scale jets in AGNs
Abstract:
Massive blakc holes are immersed in galactic bulges and nuclear stellar clusters which are also surrounded by spherical halos composed of globular clusters. These compact objects should collide from time to time with the jet disturbing its plasma flow. We calculate the synchrotron and the IC gamma-ray spectra produced by elelctrons accelerated in such collision regions within the jet. The model is applied to the non-thermal emission from the jet in the nearby radio galaxy Cen A from which steady emission with a complex spectrum has been recently reported.

Participant: Beuchert, Tobias
Affiliation: Dr. Remeis Observatory & ECAP
Title: Probing the parsec-scale jet of the radio galaxy 3C111 with radio polarimetry using Effelsberg and MOJAVE
Abstract:
We present a dedicated polarimetry study of the radio galaxy 3C 111 based on five years of radio single-dish observations with the Effelsberg 100-m telescope at 10 GHz as part of the F-GAMMA programme and MOJAVE VLBI observations at 15 GHz between early 2007 and mid 2012. The imaging data reveal a number of separate significantly polarized regions that we relate with shocks propagating down the jet, which locally compress an underlying, tangled magnetic field increasing its uniformity. These regions show not only rapid changes in polarized flux but also a complex and variable pattern of electric vectors displaying an EVPA swing of more than 180 degrees in about 4 years. The smooth evolution of the EVPAs, their transversely resolved structure as well as a study of the brightness temperature evolution allow us to interpret them as indications for a shock-shock interaction with a conical re-collimation shock. We additionally use quasi-simultaneous Effelsberg data at 10 GHz to probe the hidden complex pc-scale jet dynamics with single-dish studies.

Participant: Borisov, Sergei
Affiliation: P.N. Lebedev Physical Institute, Russian Academy of Science
Title: Observations of TeV gamma-rays from BL Lacs and its connection with activity at low energies
Abstract:
The long term SHALON observations yielded data on extragalactic sources of different type at energy range of 800GeV - 100 TeV. During the period 1992 - 2016, SHALON has been used for observations of several AGNs of the “blazar” class. We present results of observations of known BL Lac objects Mkn 421, Mkn 501, Mkn 180 as well as Radio galaxy 3c 382. Also, the observation data on BL Lac type object OJ 287 (detected by SHALON) including the high level flux period of 2010 y. are summarized in this presentation. The observation results are presented with integral spectra, images and spectral energy distributions for each of sources at energies above 800 GeV. All

data from SHALON observations are compared with ones from experiments at high and very high energies. A number of variability periods in different wavelengths including VHE gamma-rays were found. For example, the last flaring state of Mkn 501 at the very high energies was detected in the SHALON observational period between March and June 2009. This increase is correlated with the flaring activity at lower energy range in observations of Fermi LAT and Whipple, VERITAS, MAGIC.

Participant: Bruni, Gabriele
Affiliation: MPIfR
Title: Imaging AGN at record angular resolution: space-VLBI in the RadioAstron hera
Abstract:
RadioAstron is the first observatory in history of astronomy able to provide space-baselines up to 25 Earth-diameters, and in full polarization. A new version of the DiFX software correlator has been developed to handle a spaceborne antenna, and is nowadays in use at the MPIfR correlator in Bonn. I will review the technological challenges and progresses that marked the steps towards the highest angular resolution image ever, obtained in the framework of the RadioAstron AGN-polarization KSP.

Participant: C S, Stalin
Affiliation: Indian Institute of Astrophysics
Title: Narrow Line Seyfert 1 galaxies: A new class of gamma-ray emitting AGN
Abstract:
Prior to the year 2008, only two classes of gamma-ray emitting AGN are known, namely blazars and radio-galaxies. The launch of the Fermi Gamma-ray Space Telescope in late 2008, has led to the discovery of gamma-ray emission from a new class of objects, namely, the Narrow Line Seyfert 1 (NLSy1) galaxies. As of now, less than a dozen gamma-ray emitting NLSy1 galaxies are detected with high significance by Fermi. This clearly demonstrates that relativistic jets are present in these sources. However, it is generally thought that NLSy1 galaxies are hosted by spiral galaxies and as gamma-ray ray emission is detected in them, it is clear now, spiral galaxies can also host relativistic jets which is against the “Elliptical – Jet paradigm”. We have carried out a systematic study of these gamma-ray NLSy1 galaxies using data in the optical from the Himalayan Chandra Telescope, UV from Swift UVOT, X-rays from Swift-XRT, Swift-BAT and gamma-rays from Fermi. It is found that these sources have properties similar to the Flat Spectrum Radio Quasar (FSRQ) class of AGN. For, one gamma-ray emitting NLSy1 galaxy 1H 0323+342, we find that it shows both the properties of a radio-quiet Seyfert galaxy and a FSRQ. Further details of these results will be presented.

Participant: Carnerero Martin, Maria Isabel
Affiliation: INAF-Osservatorio Astrofisico di Torino
Title: Investigating the puzzling synchrotron behaviour of Mkn 421
Abstract:
We present the preliminary results of a huge observing effort spent on the BL Lac object Mkn 421 by the Whole Earth Blazar Telescope (WEBT; http://www.oato.inaf.it/blazars/webt/). The multiwavelength analysis covers the period 2007-2015, including the 2012-2013 outburst detected at optical and X-ray frequencies. The WEBT continuous monitoring was performed with 35 optical and near-infrared telescopes, collecting more than 6000 data points, while UV and X-ray data were acquired by the Swift satellite during 709 pointings at the source. Optical polarimetry was provided by the Calar Alto, Liverpool, Steward, and St. Petersburg observatories. We investigate the synchrotron emission from the Mkn 421 jet with the main goal of understanding the different behaviour of the optical and X-ray radiations, which are expected to come from the same emission mechanism. Moreover, we study the relationship between the flux and polarization variability, focussing on episodes characterized by wide rotations of the electric vector polarization angle.

Participant: Castro-Tirado, Alberto J.
Affiliation: IAA-CSIC
Title: The powerfulness of BOOTES Network of Robotic Telescopes for AGN monitoring
Abstract:
The BOOTES network of robotic telescopes has deployed in late 2015 its last observing station (BOOTES-5) in Mexico, thus completing the Northern Hemisphere Network. We will show the capabilities of the BOOTES instruments for long-term AGN monitoring campaigns.

Participant: Dai, Yan
Affiliation: Beijing Normal University
Title: Optical Behavior of S5 0716+714 from 2012 to 2014
Abstract:
We monitored Blazar S5 0716+714 in the optical B, V, R, and I bands with 2.16m, 60cm, 80cm, and 85cm telescopes of NAOC at Xinglong Observation. Especially in 2014, we used three telescopes with four different bands to observe the target that improve time resolution substantially. We studied its optical flux and spectral variations and searched for the inter-band time lags. A strong bluer-when-brighter chromatism was found on the intra-night timescale.

Participant: Einecke, Sabrina
Affiliation: TU Dortmund
Title: Search for high-confidence blazar candidates and their MWL counterparts in the Fermi-LAT catalog using machine learning
Abstract:
The Large Area Telescope (LAT) on board the Fermi satellite conducted the deepest all-sky survey in gamma-rays so far. Despite outstanding achievements in assigning source types, 1010 sources in the Third Fermi-LAT Source Catalog (3FGL) remain without plausible associations, and 573 sources are associated to active galaxies of uncertain type. Assigning blazar classes to unassociated and uncertain sources, and linking counterparts to the unassociated ones, will refine tremendously our knowledge of the population of gamma-ray emitting objects. The application of machine learning algorithms has become an integral part of exploring astrophysical data. Previous machine learning strategies to assign source types were based solely on properties extracted from gamma-ray observations. The extension to multiwavelength information, especially the relation between properties extracted from different parts of the energy spectrum, provides additional source type-specific characteristics for better classification. At the same time, it offers the possibility to determine the most likely corresponding counterpart. The source localization accuracy of Fermi measurements, given by the 95% confidence region, is in the order of several arcminutes. Typically several hundred possible counterparts are located within this region, making the association ambiguous. To figure out the most likely counterpart, the associated sample is used to train machine learning classification algorithms. For any particular 3FGL source, all possible combinations with measurements of one additional energy range are considered, e.g. from the Wide-Field Infrared Survey Explorer (WISE) source catalog, the Sydney University Molongo Sky Survey (SUMSS) radio catalog, or the Swift X-ray Point Source (1SXPS) catalog. By merging the most probable candidates of each of those studies, the power of multiwavelength strategies is exploited and conclusions with even higher confidence concerning blazar counterpart candidates are drawn. In this talk, the statistical model and its validation to estimate the performance is described. Finally, results of the application of this novel wavelength-dependent approach are presented.

Participant: Fan, Junhui
Affiliation: Guangzhou University
Title: Optical Variability of Blazars
Abstract:
Title 2: Beaming Effects for Fermi Blazars

Abstract 2:
We present the spectral energy distributions (SEDs) for about 1400 Fermi blazars. Their synchrotron peak frequencies, peak luminosities, bolometric luminosities, and effective spectral indexes are calculated from the available observations. Some statistical analyses for the whole sample and the subclasses of blazars are investigated using beaming effect.

Participant: Frey, Sándor
Affiliation: FÖMI Satellite Geodetic Observatory
Title: Precessing jet in the high-redshift blazar J0017+8135
Abstract:
The prominent flat-spectrum radio quasar J0017+8135 (S5 0014+81) at z=3.366 is one of the most luminous active galactic nuclei (AGN) known. Its milliarcsecond-scale radio jet structure has been studied with very long baseline interferometry (VLBI) since the 1980's. The quasar was selected as one of the original defining objects of the International Celestial Reference Frame (ICRF), but left out from its current second realization (ICRF2) because of systematic long-term positional variations. Here we analyse archival X- and S-band VLBI imaging data collected at nearly 100 different epochs during more than 20 years, to obtain information about the kinematics of jet components. Because of the cosmological time dilation, extensive VLBI monitoring data are essential to reveal changes in the jet structure of high-redshift AGN. These changes appear a factor of (1+z) slower than in the rest frame of the source. In the case of J0017+8135, the data can be described with a simple kinematic model of jet precession with a 12-year periodicity in the observer's frame.

Participant: Garrigoux, Tania
Affiliation: North West University
Title: Modeling polarized emission from relativistic outflows
Abstract:
The X-ray and gamma-ray emissions from highly energetic astrophysical sources such as Gamma-Ray Bursts and Active Galactic Nuclei, are believed to be produced primarily by two mechanisms: synchrotron radiation (SR) and inverse Compton scattering (ICS). The study of the polarization of the emissions is an important tool in the analysis of these mechanisms. We investigate the polarization of photons produced by ICS of relativistic electrons on various target photon fields, including the CMB. We present polarization results over the whole energy spectrum, including the trans-relativistic regime, considering initially unpolarized photons and electrons in any spectral distribution.

Participant: Gaur, Haritma
Affiliation: Shanghai Astronomical Observatory, Shanghai
Title: Variability and Polarization Studies of BL Lacertae
Abstract:
We present the results of photometric (V band) and polarimetric observations of the blazar BL Lac during 2008–2010 using TRISPEC attached to the KANATA 1.5 m telescope in Japan. The V band flux strongly anticorrelates with the degree of polarization during the first of two observing seasons but not during the second. The direction of the electric vector, however, remained roughly constant during all of our observations. We computed models involving helical jet structures and single transverse shocks in jets and show that they might be able to agree with the anticorrelations between flux and fractional polarization. Also, we extensively observed this source in optical and radio bands during an active phase in the period 2010–2013 when the source showed several prominent outbursts. We will present results of the possible correlations and time lags between the optical and radio band flux variations using multi-frequency data to learn about the mechanisms producing variability.

Participant: Glawion, Dorit
Affiliation: ITPA Wuerzburg
Title: Multi-wavelength observations of IC 310 following an extreme gamma-ray outburst
Abstract:
IC 310, a one-sided radio galaxy in the Perseus Cluster, has repeatedly shown large-amplitude and short-time-scale variability at TeV photon energies. The observed variability and hard spectrum of the minute-scale flare in November 2012 cannot be explained by shock acceleration in the jet, but instead by highly anisotropic particle beams at the base of the jet. The particle beams fire electromagnetic cascades, loading the jet with electrons and positrons. After passing through shocks further down the jet, the injected particles should lead to flux enhancements at radio frequencies. In search of this afterglow, we carried out multi-wavelength follow-up observations, including the European VLBI Network and MOJAVE. Here, we report the first results of this campaign.

Participant: Goyal, Arti
Affiliation: Astronomical Observatory of the Jagiellonian University
Title: Flux variability of classical BL Lac object PKS 0735+178
Abstract:
The power spectral density (PSD) spectra of flux variability of blazars, $P(f) = A f^{-\beta}$, where A is the normalization and β is the slope, indicate that the variability is generated by the underlying {\it stochastic} processes (i.e., $\beta \simeq 1-3$, characteristic of flicker/red noise). Study of power-law slopes, normalization or characteristic timescales (if any), in the PSD is important for constraining the physics of emission and energy dissipation processes in the blazar jets. In this talk, I will present the results of PSD analysis of lightcurves at GeV (using {\it Fermi}-LAT), optical (R-band) and radio (GHz band from UMRAO and OVRO programmes), covering time periods ranging from few decades to sub-hours, for the BL Lac object PKS 0735+178. The novelty of this study is that at optical frequenices, by combining long-term and densely sampled intra-night lightcurves, we constructed the PSD for time periods ranging from 23 years down to sub-hour timescales. The main results from our analysis are : (1) nature of processes generating flux variability at optical/radio frequencies is different from those at GeV freqeuncies ($\beta \sim $ 2 and 1, respectively); this could imply, that $\gamma-$ray variability, unlike the Synchrotron (radio-to-optical) one, is generated by a superposition of two stochastic processes with different relaxation timescales, (2) the main driver behind the optical variability is same on years, months, days, and hours timescales ($\beta \sim 2$), which argues against the scenario where different drivers behind the long-term flux changes and intra-night flux changes are considered, such as internal shocks due to the jet bulk velocity fluctuation (long-term flux changes) versus small-scale magnetic reconnection events taking place at the jet base (intra-night flux changes). Implications of these results are discussed in the context of blazar emission models.

Participant: Hervet, Olivier
Affiliation: SCIPP - University of California at Santa Cruz
Title: The relevance of a blazar kinematical classification
Abstract:
The blazar jet kinematics observed at very hight resolution in radio VLBI is surprising. The wide majority of these jets show several radio surdensities (knots) but behave in various ways. Some of them show quasi-stationary knots, some of them present relativistic velocities, and others show an hybridization between these two cases. The idea tested here is to classify a large sample of blazar following their VLBI kinematic features in order to understand what could be the origin of these differences. A notable result is that the VLBI kinematical behaviour is linked to the blazar spetral properties, classified as HBLs, IBLs, LBLs and FSRQs; but also linked to the large scale radio jet luminosities. It will be shown how a scenario of multiple recollimation shocks in structured jets is fully appropriated to describe the characteristics of these kinematic classes.

Participant: HU, Shao Ming
Affiliation: Shandong University, Weihai
Title: Statistical Analysis on Temporal Properties of BL Lacertae
Abstract:
A comprehensive temporal analysis has been performed on optical light curves of BL Lacertae in B, V, R and I bands. The light curves were denoised by Gaussian smoothing and decomposed into individual flares using an exponential profile. Symmetry, duration time, peak flux and energy output of flares were measured and the distributions are presented. Most optical flares on short-term scales are highly symmetric. The distributions of flare durations, peak fluxes are not random but consistent with a gamma distribution or lognormal distribution. A positive correlation is detected between flare durations and peak fluxes. Results presented here can serve as constraints on physical models attempting to interpreting blazar variations.

Participant: Järvelä, Emilia
Affiliation: Aalto University Metsähovi Radio Observatory and Dept. of Radio Science and Engineering
Title: Narrow-line Seyfert 1 galaxies: the perplexing jetted spirals.
Abstract:
Our understanding of active galactic nuclei (AGN) and the related jet phenomena was challenged when Fermi detected gamma-rays from a handful of narrow-line Seyfert 1 galaxies (NLS1s), thus confirming the presence of fully developed relativistic jets in them. The differences between NLS1s and other gamma-ray emitting AGN are pronounced; NLS1s have lower mass black holes, higher accretion rates, preferably compact radio morphology, they reside mostly in spiral galaxies, and were thought to be radio-quiet. It is now necessary to revise the AGN unification schemes to fit in NLS1s. Fermi's discovery also provokes questions about what triggers and maintains the AGN activity, and what are the evolutionary lines of the different populations. NLS1s complicate the whole AGN scenario, but also offer a new perspective on the jet phenomena. Despite their importance, NLS1s are poorly studied and observations of them are scarce; we need more observations and extensive studies of them as a class. For example, some NLS1s seem to be totally radio-silent, but a considerable fraction are radio-loud and thus probably host jets. This, along with other observational evidence, implies that they do not form a homogeneous class. However, it remains unclear what is triggering the radio loudness in some of them, but, for example, the properties of the host galaxy and the large-scale environment might play a role. We used various statistical methods, for example, multivariable correlations and principal component analysis to study a large sample of NLS1 sources. We will present the results and discuss the interplay between their properties, such as emission properties, black hole masses, large-scale environments, and their effect on radio loudness. We will also introduce the Metsähovi Radio Observatory NLS1 galaxy observing programme, which is the first survey dedicated to systematical observations of NLS1s at high radio frequencies, and show some results for individual sources.

Participant: Jermak, Helen
Affiliation: Astrophysics Research Institute, Liverpool John Moores University, UK.
Title: Observations of Possible Jet Formation
Abstract:
In November- December 2015 the secondary supermassive black hole of the OJ287 binary system interacted with the accretion disk of the primary source causing a predicted flare in optical wavelengths, attributed to disruption in the accretion disk (see Valtonen et al. 2016). Shortly after the first, a second flare occurred which was joined by a simultaneous optical degree of polarisation flare- the highest on record- reaching ~40% polarisation. This second flare, with its polarised emission, could be the result of the formation of a relativistic jet from the secondary supermassive black hole after its gravitational influence has accreted matter from the primary accretion disk. It could also be non-jetted emission associated with accretion disk collision or emission from the

primary's jet. I present intensive optical photometric and polarimetric monitoring of this second flaring event, along with Fermi gamma-ray data.
Title 2: The RINGO2 and DIPOL Optical Polarisation Catalogue of Blazars
Abstract 2:
We present ∼2000 polarimetric and ∼3000 photometric observations of 15 γ-ray bright blazars over a period of 936 days (11/10/2008 - 26/10/2012) using data from the Tuorla blazar monitoring program (KVA DIPOL) and Liverpool Telescope (LT) RINGO2 polarimeters (supplemented with data from SkyCamZ (LT) and Fermi-LAT γ-ray data). In 11 out of 15 sources we identify a total of 19 electric vector position angle (EVPA) rotations and 95 flaring episodes. We group the sources into subclasses based on their broadband spectral characteristics and compare their observed optical and γ-ray properties. We find that (1) the optical magnitude and γ-ray flux are positively correlated, (2) EVPA rotations can occur in any blazar subclass, 4 sources show rotations that go in one direction and immediately rotate back, (3) we see no difference in the γ-ray flaring rates in the sample; flares can occur during and outside of rotations with no preference for this behaviour, (4) the average degree of polarisation (DoP), optical magnitude and γ-ray flux are lower during an EVPA rotation compared with during non-rotation and the distribution of the DoP during EVPA rotations is not drawn from the same parent sample as the distribution outside rotations, (5) the number of observed flaring events and optical polarisation rotations are correlated, however we find no strong evidence for a temporal association between individual flares and rotations and (6) the maximum observed DoP increases from ∼10% to ∼30% to ∼40% for subclasses with synchrotron peaks at low, intermediate and high frequencies respectively.
Title 3: The World’s Largest Robotic Telescope
Abstract 3: I will highlight the design and progress of the new Liverpool Telescope 2; a new, fully robotic optical/infrared telescope planned to be located at the Observatorio del Roque de los Muchachos (ORM) on the Canary island of La Palma. The new, larger (4 metre-segmented mirror) telescope will build on the success of the Liverpool Telescope (LT) in transient astronomy and its study of the variable sky. The LT is the world’s largest fully autonomous robotic observatory and houses 3 spectrographs, 1 polarimeter, 2 optical imaging cameras, 1 infrared imaging camera and three piggy-back optical cameras and is located on ORM. The new robotic telescope will have a faster slew time (allowing an even more rapid response to transients, particular those electromagnetic counterparts to gravitational wave events) and a larger aperture allowing for deeper exploration. The new robotic telescope will act as a key spectroscopic follow-up facility for the large-scale facilities such as LSST and CTA.

Participant: Karamanavis, Vassilis
Affiliation: Max-Planck-Institut für Radioastronomie
Title: Nuclear opacity, magnetic fields, and the location of γ rays in the blazar PKS 1502+106
Abstract:
The origin of blazar variability is still a heavily debated matter and broadband flares offer a unique testbed towards a better understanding of these extreme objects. An energetic outburst, from gamma rays down to radio wavelengths, was observed from the blazar PKS 1502+106 in 2008. The radio flare is studied through single-dish flux density measurements at 12 frequencies in the range 2.64 to 226.5 GHz. To quantify it, we employ both a Gaussian process regression and a discrete cross-correlation function analysis. Through the delay between flare maxima at different radio frequencies, we study the frequency-dependent position of the core and infer its absolute position with respect to the jet base. This nuclear opacity profile enables the magnetic field tomography of the jet. We also localize the gamma-ray emission region and explore the mechanism producing the flare. We find that the light curve parameters (flare amplitude and cross-band delays) show a power-law dependence on frequency. Delays decrease with frequency, and the flare amplitudes increase up to about 43 GHz and then decay. This behavior is consistent with a shock propagating downstream the jet. The self-absorbed radio cores are located between about 10 and 4 pc from the jet base and their

magnetic field strengths range between 14 and 176 mG, at the frequencies 2.64 to 86.24 GHz. Finally, the gamma-ray active region is located at (1.9 +/- 1.1) pc away from the jet base.

Participant: Keck, Mason
Affiliation: Boston University
Title: Probing Blazar Jets Closer to the Black Hole via Faraday Rotation Measurements
Abstract:
We present Very Long Baseline Array total and polarized intensity images of ten blazars obtained simultaneously at 22, 43, and 86 GHz in 2014 May. We aim to study the Faraday rotation measure and degree of polarization at the location of the 86 GHz VLBI core, closer to the black hole than previous analyses done at lower frequencies. The goal of the project is to probe the nature of the Faraday rotation screen and structure of the magnetic field geometry in the inner parsec-scale jet. Alignment of the total intensity maps at different frequencies will allow us to analyze the shape of the jet closer to its base.

Participant: Kravchenko, Evgeniya
Affiliation: Astro Space Center of Lebedev Physical Institute
Title: Radio and gamma-ray study of the quasar S4 1030+611 during its activity in 2009-2014
Abstract:
We present a study of the parsec-scale multi-frequency polarization properties of the quasar S4 1030+61 during a prolonged radio and gamma-ray activity. Observations were performed by the Fermi Gamma-ray Space Telescope, VLBA and OVRO 40-m telescope covering five years starting from 2009. The quasar has stable, straight jet well described by standard conical jet theories. Observations cover a strong gamma-ray flare in the source accompanied by a high radio activity and observed emergence of a new parsec-scale jet component. Radio flaring activity of the quasar results from an injection of relativistic particles and energy losses at the jet base, where gamma-ray emission originates.

Participant: Kutkin, Alexander
Affiliation: Astro Space Center of Lebedev Physical Institute
Title: A new method to estimate jet kinematics at parsec scales
Abstract:
Apparent speed of jets in quasars strongly varies for different features as measured by VLBI and might even not reflect the bulk motion speed. We suggest and implement a different indirect method to study kinematical properties of blazars on the innermost scales. It is based on multi-frequency measurements of apparent core shifts and single-dish variability time lags. First results of implementing this approach are presented for the blazars 0716+714, 0851+202, 1633+382, and 1730-130 on the basis of VLBA, UMRAO, Metsahovi, and OVRO data. We find a systematic difference between results of the direct (VLBI) and this indirect method which should be understood.

Participant: Liodakis, Ioannis
Affiliation: University of Crete
Title: F-GAMMA: Multiwavelength Variability Doppler factors
Abstract:
Understanding the relativistic effects holds the key to uncovering the true nature of blazars and their jets. To that end, several methods have been proposed in order to estimate the Doppler factor (ie the amount of the relativistic boosting). Using population models were recently able to show that the variability Doppler factors is the only method that can adequately describe both the BL Lac object (BL Lacs) and Flat Spectrum Radio Quasar (FSRQ) populations with on average 30% error on each estimate. We built on this method by using sophisticated and specially designed algorithms and multi-wavelength radio lightcurves (from 2.64 to 142.33 GHz) in order to estimate the Doppler factor for 58 sources of the F-GAMMA program. Our novel and innovative approach allows us to

effectively constrain the variability brightness temperature, overcome the limitations of previous attempts, and produce the most accurate Doppler factor estimates yet with 15% error on average. We will then use these estimates to clear the fog of the relativistic effects and look straight in the heart of the blazar central engines.

Participant: Liu, Xiang
Affiliation: Xinjiang Astronomical Observatory, CAS
Title: Correlation analysis of jet power, accretion rate and black hole spin
Abstract:
TBD

Participant: Liu, Yi
Affiliation: Center for Astrophysics, Guangzhou Univerisity
Title: Multifractal Simulation of Fermi Blazar Light Curves
Abstract:
In this work, we'll present the multifractal simulation of Fermi Blazar light curves.

Participant: Lyutikov, Maxim
Affiliation: Purdue University
Title: On the Linear Stability of Sheared Magnetized Jets
Abstract:
We consider MHD stability of sheared magnetized jets. We find that a special type of magnetic field structure - with the return current confined within a jet are particularly stable. Also, shear has a strongly stabilizing effect on various modes of jet instability.

Participant: Malmrose, Michael
Affiliation: Boston University
Title: Dertermining the Relative Contribution of Different Emission Components to the Optical-UV Spectrum of Gamma-Ray Bright Blazars
Abstract:
In the small fraction of active galactic nuclei (AGN) classified as blazars, one may occasionally observe relatively unprocessed radiation from the accretion disk. In the spectral energy distribution (SED) this produces a feature in the optical-UV portion of the spectrum known as the big blue bump (BBB). In Blazars, however, the relative strength of emission from synchrotron radiation is still significant in this region of the electromagnetic spectrum, complicating direct measurements of the BBB luminosity. Decoupling the portion of the SED produced by synchrotron radiation from that produced by the accretion disk can be accomplished through the use of spectropolarimetric observations. The spectral index, α_{s}, of the synchrotron emission is revealed from observations of the polarized flux spectrum of a blazar spanning from $\lambda = $ 4000-7000 $\aa$ in the observer's frame. The BBB emission is then obtained by fitting a two component model of the form $F_{\nu} = A nu^{- \alpha_{s}} + B nu^{-\alpha_{BBB}}$ to the full spectrum and fixing α_{BBB}, the spectral index of the BBB, to -1/3. By deconstructing the spectra this way for γ-ray bright blazars insight can be gained into the stability of the BBB over the course of several years as well as provide clues to any wavelength dependence of the polarized emission.

Participant: Manganaro, Marina
Affiliation: IAC (Instituto de Astrofisica de Canarias)
Title: The blazar S5 0716+714 MWL picture during its brightest outburst
Abstract:
S5 0716+714 is a well known BL-Lac object, located at a redshift of z~0.31. The discovery in the Very High Energy band (VHE, E> 100 GeV) by MAGIC happened in 2008. In January 2015 the

source went through the brightest optical state ever observed, triggering MAGIC follow-up and a VHE detection with ~13 sigma significance (ATel #6999). The data, combined with simultaneous Fermi-LAT observations in the High Energy (HE, 100 MeV <HE<100 GeV) allows us to constrain the Inverse Compton peak of the spectrum. Rich multiwavelength coverage of the flare allowed us to construct broad-band spectral energy distribution of S50716+714 during its brightest outburst. In this work we will present the preliminary analysis of MAGIC and Fermi-LAT data of the flaring activity in January and February 2015 for the HE and VHE band, together with radio (Metsahovi, OVRO, VLBA, Effelsberg), sub-millimeter(SMA), optical (Tuorla, Perkins, Steward, AZT-8+ST7, LX-200, Kanata), X-ray and UV (Swift-XRT and UVOT), in the same time-window and discuss the time variability of the MWL light curves during this impressive outburst. A preliminary study on the Extragalactic Background Light absorption will also be shown, with implications on current EBL models.
Title 2: Blazar PKS1441+25 at the Cosmic Gamma-ray Horizon: MWL description of a recent MAGIC discovery
Abstract 2:
We will report on the discovery of the z~1 blazar PKS1441+25 in the very-high-energy range (VHE, >100GeV) by MAGIC, a system of two 17 m of diameter Imaging Atmospheric Cherenkov Telescopes (IACTs) located in the Canary island of La Palma. For IACTs like MAGIC, such a redshift is very challenging due to the strong absorption of the extragalactic background light (EBL). The record for the farthest source ever detected in the VHE range is held by MAGIC, with the gravitationally lensed blazar B0218+357 detected in July 2014, at a redshift of z=0.944, and later on, the detection in April 2015, of the Flat Spectrum Radio Quasar PKS1441+25 at redshift z=0.939. In this contribution we will report on the discovery of the blazar PKS1441+25, and we will discuss how the exploration of the higher redshift Universe in VHE is helping in constraining the EBL evolution. We will show results on MAGIC analysis of PKS1441+25, including lightcurves, spectral energy distributions and EBL absorption studies, in a multi-wavelength context. The simultaneous multi-wavelength dataset collected (Fermi-LAT, NuSTAR, Swift XRT and UVOT, KVA, Hans-Haffner, CANICA, Metsähovi) allows us to test accurately for the first time the present generation of EBL models at such distances.

Participant: Meng, Nankun
Affiliation: Beijing Normal University
Title: Intra-night Optical Variability of BL Lacertae
Abstract:
We monitored BL Lacertae simultaneously in the optical B, V, R, I bands for 13 nights during the period 2012-2016. We studied its optical flux and spectral variations, and searched for inter-band time lags. The source was active on all 13 nights and showed significant intraday variability especially on one night in the B and I bands. A strong bluer-when-brighter chromatism was found on the intra-night timescale. The spectral changes are not sensitive to the host galaxy contribution. Cross correlation analysis revealed possible time delays of about 10 mins between variations in the V and R bands.

Participant: Molina, Sol Natalia
Affiliation: Instituto de Astrofísica de Andalucía - CSIC
Title: Internal rotation and toroidal magnetic field in the inner jet of NRAO150.
Abstract:
NRAO 150 is a very prominent millimeter to radio emitting quasar at redshift z = 1.52. In previous studies (Agudo et al. 2007) this source has revealed a fast counterclockwise rotation of the innermost regions of the jet. Since this process is observed in the innermost regions of relativistics jets and must therefore be closely related to the properties of the regions where the jet is formed, collimated, and accelerated, the understanding of this process could be a very useful tool to study the physical process in the innermost part of jets. Despite this the physical origin of this process is

still far from being well understood. With the aim to contribute to the understanding of this process we have developed a multi-frequency study at 8,15,22,43 and 86 GHz, analyzing in particular the polarization and the cinematic behavior.

Participant: Morozova, Daria
Affiliation: St.Petersburg University
Title: Optical Outburst of the blazar S4 0954+658 in early 2015
Abstract:
We analyze behaviour of the BLLac object S4 0954+658 during an unprecedented bright optical flare in early 2015. Optical flare was accompanied with powerfull gamma-ray flare and detection of the VHE-emission (ATel #7080). We analyzed total and polarized intensity images obtained with the VLBA at 43 GHz and discovered new bright polarized superluminal knot which passed through the VLBI-core during the maximum of the flare. Such close connection between the events in different wavebands supports the conclusion that optical and gamma-ray emission are produced in a region located in the vicinity of the mm-wave core of the jet.

Participant: Motter, Juliana Cristina
Affiliation: University of Sao Paulo
Title: 18-22 cm VLBA observational results for six AGN Jets
Abstract:
The formation of relativistic jets in Active Galactic Nuclei (AGNs) is related to accretion onto their central supermassive black holes, and magnetic fields are believed to play a central role in launching, collimating and accelerating the jet streams from very compact regions out to kiloparsec or megaparsec scales. The radio emission of AGN jets is synchrotron radiation, which can be linearly polarized up to about 75%. We have analyzed Very Long Baseline Array (VLBA) total intensity, linear polarization, fractional polarization and Faraday rotation maps based on VLBA data obtained at four wavelengths in the 18–22 cm range for six AGNs in the MOJAVE–I sample. These observations typically probe projected distances out to tens of parsecs from the observed core, and are well suited for Faraday rotation studies due to the relatively long wavelengths used and the similarity of the structures measured at the different wavelengths. The linear polarization images show interesting structure along and across the jets in a number of cases. We have also identified statistically significant, monotonic transverse Faraday rotation gradients across the jets of some of these sources, indicating the presence of a toroidal magnetic field, which may be one component of helical magnetic fields associated with these AGN jets.

Participant: Myserlis, Ioannis
Affiliation: Max Planck Institute for Radio Astronomy
Title: Physical conditions and variability processes in AGN jets through multi-frequency linear and circular radio polarization monitoring
Abstract:
The radio frequency emission of AGN jets is polarized due to the incoherent synchrotron mechanism. The polarization parameters carry information for the physical conditions and variability processes in the jet regions where the radiation is emitted and propagated through, e.g. the magnetic field properties or the plasma composition. However, the detection of their polarized components, especially the circular one, is challenging due to their low levels and possible depolarization effects. We present the multi-wavelength linear and circular polarization properties of 87 AGNs measured by the F-GAMMA program. The dataset spans from 2010 to 2015 and includes 10 radio frequencies between 2.6 and 142.3 GHz with a mean cadence of 1.3 months. We recovered the linear polarization properties at 4 frequencies between 2.6 and 10.5 GHz and the circular polarization at 4.9 and 8.4 GHz. Our analysis eliminates a number of systematics bringing the uncertainty to levels as low as 0.1%, essential for the inherently low circular polarization degree. Furthermore, we implement a polarized radiative transfer code that attributes the variability to

evolving internal shocks, to investigate the conditions and processes needed to reproduce the observed polarization behavior. This model was successfully applied for the blazar 3C454.3. Here, we present population studies based on the radio polarization data of the observed sources and the results of the model application for 3C454.3.

Participant: Nakahara, Satomi
Affiliation: SOKENDAI (The Graduate University for Advanced Studies)/ JAXA
Title: Conical stream line of approaching and counter jet in NGC 4261 over the range of 10^6 Rs
Abstract:
We report the profile of jet width on both side at the radial distance ranging of ~10^3 - 10^9 Schwarzschild radii from the central engine of nearby(~30 Mpc) AGN NGC 4261. We investigated jet structures using Very Large Array(VLA) and Very Long Baseline Array(VLBA). The jets maintain a conical structure in both sides over the range of 10^6 Schwarzschild radius without any structural change ("jet break") like the approaching jet of M87. Our result on NGC 4261 may request an additional consideration to theoretical models of jet structure.

Participant: Pasetto, Alice
Affiliation: Max Planck Institute for Radio Astronomy (MPIfR-Bonn)
Title: Exploring the environment of high Rotation Measure Active Galactic Nuclei with wideband radio spectropolarimetry observations.
Abstract:
We present new high sensitivity wide-band full polarization observations of a sample of Active Galactic Nuclei observed with the JVLA. This sample contains objects with very high Rotation Measure (RM) values, sign of extreme environment of the AGN. We study their radio spectral energy distributions and their polarization properties in the well-sampled frequency range between 4 and 12 GHz. We found that the polarization properties show a complex behaviour with the polarization angle and the fractional polarization that dramatically change within the wide-band.
The strong depolarization experienced by the sources, have been studied through a complex modelling of the Stokes parameters Q and U together with the fractional polarization and the polarisation angle with wavelength by applying combinations of the simplest existing depolarisation models. This study suggest the presence of several Faraday layers within or in front of the observed emitting region each of them with extreme polarized conditions. This points the complexity of these objects; they not only could have dense clumpy regions surrounding the central engine but also could be characterised by a dense wind that envelops the relativistic jet.

Participant: Piner, Glenn
Affiliation: Whittier College
Title: Parsec-Scale Structure and Kinematics of Faint TeV HBLs
Abstract:
We present new multi-epoch Very Long Baseline Array (VLBA) observations of a set of TeV blazars drawn from our VLBA program to monitor all TeV-detected high-frequency peaked BL Lac objects (HBLs) at parsec scales. Most of these sources are faint in the radio (with flux densities of order 10 millijanskys), so they have not been well observed with VLBI by other surveys. Our previous measurements of apparent jet speeds in of order a dozen TeV HBLs showed apparent jet speeds that were subluminal or barely superluminal; suggesting jets with velocity structures at the parsec-scale. Here we present apparent jet speed measurements for eight new TeV HBLs, which for the first time show a superluminal tail to the apparent speed distribution for the TeV HBLs.

Participant: Pursimo, Tapio
Affiliation: Nordic Optical Telescope
Title: Optical Spectroscopic Characterization of Unidentified Gamma-ray Sources
Abstract:

In the last gamma-ray catalogue from the {\it Fermi}-LAT, 3FGL, the number of established GeV-gamma-ray sources increased by 60\% (from 1873 to 3055 objects). The great majority of these sources (56\%) are blazars (AGNs whose relativistic jets point towards the Earth). About 20\% of these sources have an unclassified optical counterpart (classified as unidentified AGNs or AGU) due to the lack of optical spectroscopic information. This lack of spectroscopy prevents the full exploitation of the data, since the spectral classification and the distance of the source (redshift) are crucial to infer their intrinsic emission. We present preliminary results from our on-going programme for spectroscopic classification of AGUs. These include low resolution spectra for 16 sources, all of which have featureless spectrum. The results and the implications for the full sample are discussed.

Participant: Rajput, Bhoomika
Affiliation: Indian Institute of Astrophysics
Title: The connection between optical and GeV flux variations in blazars
Abstract:
The extragalactic gamma-ray sky is dominated by the blazar class of active galactic nuclei (AGN). These sources with their relativistic jets pointed close to be observer show flux variations over the entire accessible electromagnetic spectrum. By studying flux variations over multiple wavelengths one can probe the multi-wavelength emission sites in blazar jets. According to the leptonic model, the flux variations in the optical and GeV bands of blazars need to the correlated. Alternatively, in the hadronic scenario of emission from blazar jets, a correlation between flux variations in the optical and GeV bands is not expected. To probe the possible connection between optical and GeV emission mechanism in blazar jets (leptonic v/s hadronic scenario), we are carrying out a systematic study on the opitcal and GeV flux variations on a large sample of blazars detected by the Fermi Gamma-ray Space Telescope. Our preliminary results indicate that blazars show a wide range of variability patterns such as (a) correlated optical and GeV flux variations with/without time lag, (b) optical flares with no GeV counterparts and (c) GeV flares with no optical counterparts. Details of the results will be presented.

Participant: Ramakrishnan, Venkatessh
Affiliation: Aalto University Metsähovi Radio Observatory
Title: Spectral and time variability of the correlated and uncorrelated flares in blazars
Abstract:
To understand the physics of the correlated and uncorrelated flares we analyse the gamma-ray spectra and time variability of radio and gamma-ray light curves of 55 sources from the Ramakrishnan et al. (2015). Quasi-simultaneous events at both the radio and gamma rays are constrained using the multivariate Bayesian block analysis. For these time intervals, we obtain the gamma-ray spectrum with an adaptive procedure that incorporates the Bayesian blocks and therefore provides a finer resolution to the spectrum. The spectrum is then modelled using the variants of power-law and compared against the results from variability analyses. I will present some of the results from this study that also shows the level of exacerbation from binning.

Participant: Saikia, Payaswini
Affiliation: Dept. of Astrophysics, Radboud University, Nijmegen
Title: Using the Black hole Fundamental Plane to constrain Blazar Jet physics
Abstract:
Black hole accretion disc and its associated jets form a coupled system, which is thought to scale globally across the entire black hole mass range - from the stellar mass X-ray Binaries to the supermassive Active Galactic Nuclei. One of the main findings supporting scale invariance of accretion and jet physics is the Fundamental Plane of Black Hole activity, which is an empirical relation between radio luminosity, X-ray luminosity and black hole mass for low-accretion rate black holes. Using a sample of 39 AGN selected from the Palomar Spectroscopic Survey, 4 stellar

mass X-ray binaries in the low/hard state and 82 blazars from the VLBA Imaging and Polarimetry Survey, we report the discovery of the fundamental plane in the optical band with the luminosity of nuclear [OIII] emission line as a tracer of accretion rate. This plane can be obtained with the supermassive black hole sample alone and can be used to study the radio-loudness of different AGN types. We show that after accounting for the non-linearity in the radio-[OIII] luminosity correlation and by including a mass-scaling factor, we see no clear radio-dichotomy in the different types of AGN in our sample. Finally, we use this plane to provide insights on the underlying distributions of important blazar parameters (eg. opening angles, Lorentz factor distribution) and use them to put constraints on black hole jet physics.

Participant: Sasada, Mahito
Affiliation: Boston University
Title: Stochastic study of microvariability in Kepler blazar W2R 1926+42
Abstract:
One of the remarkable features in blazars is violent variability over a wide wavelength range. The variation mechanism is still under debate, since the behavior of the variability is very complex. The timescales of variability range from less than a day to decades, with variations on timescales less than a day known as microvariability. Such short-term variations can provide insights regarding the origin of variability after they are distinguished from longer-term variation components. We select about 200 microvariability events from the high-time-resolution and continuous light curve of the blazar W2R 1926+42 obtained by the Kepler spacecraft, and estimate the timescale and amplitude of each event. The rise and decay timescales of the events change both randomly and systematically with time. This result indicates that the events are associated with each other, not independently.

Participant: Shastri, Prajval
Affiliation: Indian Institute of Astrophysics
Title: Synchrotron Jets, their Parsec-scale Environments and the Blazar Divide
Abstract:
Current data at gamma-ray (Fermi), radio (MOJAVE, VLA) and other frequencies suggest that the parsec-scale environment of synchrotron jets leaves imprints on the relativistically beamed emission from the jets. We use these trends to test the hypothesis that the blazar divide constitutes a dichotomy. Obtaining a handle on the Doppler factor can play a key role in building a consistent picture of the jets and their relationship with the central supermassive black hole accretion system, especially in the framework of unification schemes. We will present our results from such an investigation.

Participant: Shukla, Amit
Affiliation: Institute for Theoretical Physics and Astrophysics, University of Würzburg, Würzburg 97074 ,
Title: Detection of very hard gamma-ray spectrum from nearby blazar Mrk 501
Abstract:
The emission from active galactic nuclei ranges from radio to TeV energies and shows high variability. The origin of the very high energy (VHE) emission is highly debated. The observed emission could be due to a complex superposition of emission from multiple zones. New evidence of the detection of very hard intrinsic gamma-ray spectra obtained from Fermi-LAT observations have challenged the theories about origin of VHE gamma-rays. We used 7 years of Fermi-LAT data to search for time intervals with unusually hard spectra from the nearby TeV blazar Mrk 501. In the presentation, we discuss a few possible explanations for the origin of these hard spectra within a leptonic scenario.

Participant: Sinitsyna, Vera Georgievna
Affiliation: P.N. Lebedev Physical Institute, Russian Academy of Science

Title: Long-term studies of NGC 1275 at very high energies: the structure and emission origin
Abstract:
We present the results of fifteen-year-long observations of the AGN NGC 1275 at energies 800 GeV - 40 TeV discovered by the SHALON telescope in 1996. Having analyzed the SHALON data, we have determined such characteristics of NGC 1275 as the spectral energy distributions and images at energies > 800 GeV for the first time. The emission regions of very high energy gamma-rays observed by SHALON from NGC 1275 well correlates with the photon emission regions viewed in X-rays by Chandra. Thus, the TeV gamma-ray emission recorded by SHALON has an extended structure with a distinct core centered at the source's position. To analyze the emission related to this core, we additionally identified the emission component corresponding to the central region of NGC 1275, and got spectral energy distribution of this component as a result. Also, the variations of TeV gamma-ray flux were found. The data obtained at very high energies, namely the images of the galaxy and its surroundings, and the flux variability indicate that the TeV gamma-ray emission is generated by a number of processes: in particular, part of this emission is generated by relativistic jets in the nucleus of NGC 1275 itself. Whereas, the presence of an extended structure around NGC 1275 is evidence of the interaction of cosmic rays and magnetic fields generated in the jets at the galactic center with the gas of the Perseus cluster.

Participant: Sinitsyna, Vera Yurievna
Affiliation: P.N. Lebedev Physical Institute, Russian Academy of Science
Title: Probing of distant FSRQ jet activity at very high energies
Abstract:
The radio-loud active galactic nuclei having the radio emission arising from a core region rather than from lobes are often referred to as "blazars" and include Flat Spectrum Radio Quasars (FSRQ) and BL Lacertae (BL Lac) objects. The SHALON observations yielded data on extragalactic sources of different type at energy range of 800 GeV - 100 TeV. During the period 1992 - 2016, SHALON has been used for observations of the FSRQ type: 4c+31.63 (z=0.295), 3c454.3 (z=0.859), 4c+55.17 (z=0.896), PKS1441+25 (z=0.939), 1739+522 (z=1.375). We present results of long term observations of FSRQ: among them are known object 3c454.3, high-red shifted quasar 1739+522 (4c+51.37) and 4c+31.63, 4c+55.17. The observation results are presented with integral spectra, images and spectral energy distributions for each of sources at energies above 800 GeV. The data from SHALON observations are compared with ones from experiments at high and very high energies. A number of variability periods in different wavelengths including VHE gamma rays were found. For example 3c454.3 shows the significant flux variability in the different energy ranges including high and very high energies. The last significant flaring state of 3c454.3 at TeV energies was detected in the SHALON observational period of Nov. - Dec. 2010.This increase is correlated with the flares at lower energy range in observations of Fermi LAT. Also, the observations of high-redshift (z>2) sources have been started in autumn-winter period of 2014 year. The results on B2 0242+43 (z = 2.243) and B2 0743+25 (z = 2.979) quasars from first and second Fermi LAT AGN catalogue are presented.

Participant: Sitarek, Julian
Affiliation: University of Lodz
Title: Gamma-ray variability induced by microlensing on intermediate size structures in lensed blazars.
Abstract:
Strong gravitational lensing results in an appearance of multiple, differently magnified images of a lensed source. As shown by the detection of very-high-energy gamma ray emission from a lensed blazar QSO B0218+357, this effect is opening new possibilities in studying the emission proprieties of such blazars. Moreover, the magnifications of individual images can be modified by microlensing on smaller mass scales within the lens. Recently, measurements of the changes in the magnification ratio of the individual images have been proposed as a powerful tool for estimation of

the size and velocity of the emission region in the lensed source. The changes of the magnification ratios in blazars PKS1830-211 and QSO B0218+357, if interpreted as caused by a microlensing on individual stars, put strong constraints on those two variables. These constraints are difficult to accommodate with the current models of gamma-ray emission in blazars. We study whether similar changes in the magnification ratio can be caused by the microlensing on the intermediate size structures in the lensing galaxy, namely stellar clusters and giant molecular clouds. Our numerical simulations show that changes in the magnification ratio of two images, with similar time scales as seen in QSO B0218+357, can be obtained for relativistically moving emission regions with sizes up to 0.01 pc in the case of microlensing on clumps in giant molecular clouds.
Title 2: Broad band observations of gravitationally lensed blazar B0218+357 during a gamma-ray outburst.
Abstract 2:
B0218+357 is a blazar located at a cosmological redshift of z=0.944. The source is gravitationally lensed by a spiral galaxy located at the redshift of z=0.68. Strong gravitational lensing splits the signals emitted by the source into two components separated by 10-12 days, as observed in radio and gamma-ray bands. In July 2014 a GeV flare was observed by Fermi-LAT, triggering follow-up observations with the MAGIC telescopes at energies above 100 GeV. The expected time delay between the components allowed us to plan broad band MWL observations before, during and after the trailing component of the emission. The MAGIC observations at the expected time of arrival of the trailing component resulted in the first detection of B0218+35 in very-high-energy (>100 GeV) gamma rays. It is both the farthest known VHE object and one of only a few Flat Spectrum Radio Quasars detected in this energy range. We report here the observed multiwavelength spectral and temporal properties of the emission during the 2014 flare. We will present also broad band spectral modeling in the external Compton scenario.

Participant: Sohn, Bong Won
Affiliation: Korea Astronomy and Spcae Science Institute
Title: Recent results of KaVA AGN WG
Abstract:
KaVA stands for KVN and VERA Array. KaVA AGN WG recently launched Large Program (LP) and other programs. I will briefly review recent KaVA AGN WG results. (if possible as contribution talk)

Participant: Strigachev, Anton
Affiliation: Institute of Astronomy, Sofia
Title: The extremes in intra-night blazar variability: the S4 0954+65 case
Abstract:
We present results of optical observations of an extremely violently variable blazar S4 0954+65 on intra-night time scales. The object showed flux changes of up to 100% within a few hours. Possible time delays between optical bands are searched for and the results are discussed in terms of existing models of blazar variability.

Participant: Temme, Fabian
Affiliation: TU Dortmund
Title: Long-term Monitoring of Bright Blazars in the multi-GeV to TeV Range with FACT
Abstract:
Blazars like Markarian 421 or Markarian 501 are active galactic nuclei (AGN), with their jets orientated towards the observer. They are among the brightest objects in the very high energy gamma ray regime (VHE, > 100 GeV). Their emitted gamma ray fluxes are extremely variable, with changing activity levels on timescales between minutes, months and even years. Several questions are part of the actual research, such as the question of the emission regions or the engine of the AGN and the particle acceleration. To investigate the properties of blazars in detail, a dedicated longterm moni-

toring program is necessary. A densely sampled and unbiased light curve allows for a detailed modelling of the spectral energy distributions and the combination with multi-wavelength observation could contribute to the solution of several questions mentioned above. The First G-APD Cherenkov Telescope (FACT) is an ideal device for such a longterm monitoring program. FACT is the first operational telescope using silicon photomultipliers (SiPMs) as photon detectors instead of conventional photomultiplier tubes (PMTs). Since more than four years, the FACT collaboration has successfully been showing the application and reliability of SiPMs for earth-bound gamma-ray astronomy. SiPMs allow the operation even during full moon without any filter, leading to a maximal duty cycle of the telescope, limited only by bad weather conditions. The combination of the large duty cycle and the excellent performance of the photo sensors, qualifies FACT as an ideal device for longterm monitoring of bright blazars. A small set of sources, e. g. Markarian 421 and Markarian 501, is currently being monitored. In this contribution, the FACT telescope and the concept of longterm monitoring of bright blazars will be introduced. The results of the monitoring program will be illustrated, and the physical implication of densely sampled and unbiased light curves will be discussed.

Participant: Troitskaya, Yulia
Affiliation: St.Petersburg University
Title: The multiwavelength monitoring of the gamma-bright blazar Mkn 421.
Abstract:
We present the results of photo-polarimetric and spectral monitoring observation of the blazar Mkn 421 carried out at different telescopes (the 0.4 m telescope of SPbSU, the 0.7 m telescope of the Crimean Astrophysical Observatory , the 2.3 m and 1.54 m telescopes of Steward Observatory) during 2008-2015. We also analyze gamma-ray light curves obtained with the Fermi Large Area Telescope. The multiwavelength flux and polarization variations and the optical spectral behaviour are discussed.

Participant: Troitskiy, Ivan
Affiliation: St.Petersburg University
Title: Multifrequency monitoring of the flat spectrum radio quasar PKS 1222+216
Abstract:
We analyze broadband activity of the flat radio spectrum quasar PKS 1222+216 from 2008 to 2015 using multifrequency monitoring which involves gamma-ray data from the FERMI Large Area Telescope, total intensity and linear polarization observations from different optical telescopes in R band, and imaging of the inner jet structure with the VLBA at 43 GHz. During the observations the source has several dramatic flares at gamma rays and optical bands, with the rising branch of a gamma-ray flare accompanied by a rapid rotation of the polarization position angle (EVPA), a fast increase of the degree of polarization in the optical band, brightening of the VLBI core, and appearance of a new superluminal component in the parsec-scale jet. We find a statistically significant correlation between gamma-rays, optical R band, and 43 GHz variability on a long-term scale and a good general alignment between EVPAs in R band and at 43 GHz, while the correlation between short-term variations is not apparent. Synchronous activity across the bands supports the idea that the emission regions responsible for the flares in gamma-rays and optical band are co-spacial and located in the vicinity of the mm-wave core of the parsec-scale jet. The rapid variability of the optical linear polarization points to strong turbulence in the jet plasma.

Participant: Uemura, Makoto
Affiliation: Hiroshima University
Title: TimeTubes: Visualization of polarization variations in blazars.
Abstract:
Optical polarization provides important clues to the magnetic field in blazar jets. It is easy to find intriguing features in the time-series data of the polarization degree (PD) and position angle (PA).

On the other hand, the trajectory of the object on the Stokes QU plane becomes essential when the object has multiple components of polarization. In this case, ironically, the more data we have, the more difficult it is to gain any knowledge from it. Here, we introduce TimeTubes, a new visualization scheme to explore the time-series data of polarization observed in blazars. In TimeTubes, the data is represented by tubes in 3D (Q, U, and time) space. The measurement errors of (Q,U), color and total flux of objects can be expressed as the size, color and brightness of the tubes. Then, TimeTubes allow us to see variations of six variables in one view. We used TimeTubes for our data taken by the Kanata telescope between 2008 and 2014. We found that this tool facilitates the recognition of the patterns in blazar variations; for example, i) favored PA of flares (ex. PKS 1502+106, PKS 1749+096, and QSO B0133+47), ii) PA rotations associated with a series of flares (3C 454.3), and iii) off-center PA rotation superposed on long-term trends (PKS 2155-304), as well as standard PA rotations (3C 454.3 and PKS 1749+096). We show some demonstrations of TimeTubes in my presentation.

Participant: Villacaña Pedraza, Ilhuiyolitzin
Affiliation: Universidad Autonoma de Madrid
Title: Multifrequency study of 3C454.3
Abstract:
In this work I presented a multifrequency syudy of 3C454.3, the study included spectroscopy and photometry observed in optical and IR(OAGH 2m telescope), FERMI telescope and VLA array.

Participant: Wehrle, Ann
Affiliation: Space Science Institute
Title: Optical observations of OJ 287 and other blazars with the K2 mission
Abstract:
We present optical observations of OJ 287 and several other gamma ray blazars carried out with the K2 mission (formerly Kepler) in 2015. The observations were continuously sampled at 30-minute intervals for approximately 75 days. In addition to these highly variable blazars, we have observed several hundred radio-loud and radio-quiet AGN with the K2 mission in order to characterize the amplitude and duty cycle of their optical variations.

Participant: Williamson, Karen
Affiliation: Boston University
Title: Comprehensive Monitoring of Gamma-Ray Bright Blazars. II. Time Series Analysis of Delays Between Variations in Gamma-Ray, X-Ray, and Optical Light Curves
Abstract:
The BU team has been performing multi-wavelength monitoring of a sample of gamma-ray blazars since the launch of the Fermi Large Area Telescope in the Summer 2008. We present gamma-ray, X-ray, and optical light curves for several quasars and BL Lac objects from the sample to demonstrate different patterns of the variability. We investigate possible correlations between γ-ray and X-Ray, γ-ray and R-band, and X-ray and R-band light curves to study delays between variations at different wavelengths, if a statistically significant correlation is found. To perform the correlation, we use the Z-transformed Discrete Correlation Function algorithm (ZDCF), and to test the significance of ZDCF, we simulate artificial light curves using actual observational data. The location of the emitting regions in AGN jets and the origin of the high-energy photons are questions that may be answered by a better understanding of the time delays between different wavebands. We will present preliminary results of the analysis. In spite of 8 years of active monitoring, our correlation analysis remains plagued with uncertainties due to sparsity of the data.

Participant: Wu, Jianghua
Affiliation: Department of Astronomy, Beijing Normal University
Title: Inter-band time lag of optical variabilities of blazar S5 0716+714

Abstract:
Time lags among the radio, optical, X-ray, and gamma-ray variabilities of blazars are sometimes been reported in the literature, but very few such lags were claimed between the variabilities at different optical wavelengths. We carried out multi-band optical monitoring of blazar S5 0716+714 with high temporal resolutions at several epochs. Inter-band time lags were detected in the optical variability of this object with high confidence level. This can be taken as a support for the shock model of blazars.

Participant: Yuhai, Yuan
Affiliation: Guangzhou University
Title: Short-term optical variability of blazars
Abstract:
In this work, we present the VRI photometric observations of 1ES1959+650 obtained by using the 1.56m telescope at Shanghai Observatory (ShAO), China, during the period from Jun. 11, 2006 to Jul. 31, 2014. Our observations show that the maximum variabilities at three bands are $\Delta m_{V}=1.74\pm0.02$ mag, $\Delta m_{R}=0.97\pm0.02$ mag and $\Delta m_{I}=1.15\pm0.03$ mag. We obtained two intra-day variabilities on Sep. 2, 2009 (JD 2455077) and Sep. 3, 2009 (JD 2455078). On Sep. 2, 2009, the optical variabilities are $\Delta m_V = 0.36\pm0.08$ mag within 1.56 hours, $\Delta m_R = 0.21\pm0.04$ mag within 23 minutes; $\Delta m_I = 0.53\pm0.03$ mag within 45 minutes. On Sep. 3, 2009, the intra-day variabilities are $\Delta m_V = 0.40\pm0.10$ mag within 27 minutes, $\Delta m_R = 0.48\pm0.04$ mag within 3.24 hours; $\Delta m_I = 0.68\pm0.06$ mag within 3.72 hours. We use the Power spectrum, the DCF method and the Jurkevich method to analyze the lightcurve and obtain three quasi-periodicities, $P_1=1.4\pm0.2$yr, $P_2=2.9\pm0.6$yr and $P_3=5.5\pm0.9$yr.

Participant: Zacharias, Michael
Affiliation: LSW Heidelberg
Title: Implications of time-dependent injection in relativistic jets
Abstract:
Time-dependent injection can cause non-linear cooling effects, which lead to a faster energy loss of the electrons in jets. The most obvious result is the appearance of unique breaks in the SED, which would normally be attributed to a complicated electron distribution. The knowledge of the observation time and duration is important to interpret the observed spectra, because of the non-trivial evolution of the SED. Intrinsic gamma-gamma absorption processes in the emission region are only of minor importance.
Title 2: On the unusual SED of AP Librae and the origin of the TeV gamma-rays
Abstract 2:
The LBL AP Librae has been detected in the TeV gamma-ray range, which is unexpected for this kind of blazar. In combination with other features of the SED, this rules out the one-zone model to account for the TeV domain. Furthermore, an extended jet on arcsec scales has been detected both in radio and X-ray frequencies. The spectral index of the X-ray band indicates an inverse Compton origin. Using an IC/CMB model, the TeV emission can be successfully modeled as originating in the extended jet. Several arguments in favor of this model as well as observational tests to check the model will be presented. If true, acceleration of particles to very high energies is still efficient at large distances to the core.

Participant: Zhang, Xiaoyuan
Affiliation: Beijing Normal University
Title: Intra-day Simultaneous Optical Monitoring of S5 0716+714
Abstract:
We present the result of simultaneous optical multi-color observation of BL Lac object 0716+714 in November 2014 and February 2016. The intra-day variability varies from 0.04 to 0.3 mag. Both

achromatic and bluer-when-brighter color behaviours were detected. A probable quasi-periodic oscillation overlapping on a significant flare was also observed. We used the interpolated cross-correlation function to calculate time lags between light curves in different bands. Variations in B and R lagging behind that in I band was found, which correspond with anti-clockwise loops on the color-magnitude diagrams. Such an optical time delay can be interpreted by acceleration and cooling process of electrons in jet of the blazar.

Participant: Zola, Staszek
Affiliation: Astronomical Observatory, Jagiellonian University
Title: Preliminary results from 2015/26 observing campaign of the OJ287 blazar
Abstract:
To be filled in later