



Report from the event supported by RadioNet

TITLE *POLARISED EMISSION FROM ASTROPHYSICAL JETS*

DATE: *12-16 JUNE 2017*

LOCATION: *IERAPETRA, GREECE*

MEETING WEBPAGE: *http://www3.mpifr-bonn.mpg.de/old_mpifr/jetpol/jetpol/Home.html*

HOST INSTITUTE: *MAX-PLANCK-INSTITUT FÜR RADIOASTRONOMIE, METROPOLE OF IERAETRA AND SITIA*

RADIONET BENEFICIARY / NO: *MPG/ 1*

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Report:

1. SCIENTIFIC SUMMARY

The conference POLARISED EMISSION FROM ASTROPHYSICAL JETS (12-16 June 2017, Irapetra/GR) aimed at a comprehensive coverage of the **theoretical** and **observational** aspects related to **linearly** and **circularly** polarized emission observed from **extragalactic** (AGN, GRBs) as well as **galactic** (e.g. XRBs) astrophysical jets, and its potential to reveal the physical conditions and emission processes governing these sources.

The ambition was to focus on current polarimetric monitoring programs, as well as high angular resolution interferometric observations, and prospects for new facilities (i.e., ALMA, SKA, EHT, XIPE, e-ASTROGAM). The topics that were invited, included: theories for linear and circular polarization emission; propagation of polarized emission and Faraday effects; magnetic field structure and its role in the jet dynamics; jet formation and composition; polarization variability; polarimetric monitoring programs; high angular resolution polarimetric observations; prospects for high energy (X-ray, gamma-ray) polarimetry.

The scientific program, which was finally shaped by the contributed presentations, covered all the wished subject and even more. A great deal of time was spent on the theory and simulations of jets and disks. Specifically, Polarized emission from 3-D GRMHD simulations of black hole jets and other similar topics were thoroughly covered and bred a extensive discussion and ideas for further developments. The specific case of the Sag A* was also presented from a number different aspects like observational, multi-frequency, high angular resolution as well as theoretically. The connection between black holes, disks and jets was similarly covered from different standpoints and especially through simulations that attempt a realistic reproduction of the observables. On this general subject, a number of studies dealt with the magnetic fields at different contexts and from different systems. The role of the shocks in the production of polarised emission and particle acceleration was also exhausted. Several studies were presented to be dealing with the basic configurations of jets and their composition. As an example, Internal shocks in relativistic transverse stratified jets and synthetic radiation maps from relativistic MHD jet simulations, were discussed. Recollimation, reconnection and flares in relativistic jets with helical magnetic fields with Simulations was yet another noteworthy topic that was discussed combined with studies that rely on multi-wavelength polarization signatures to probe the blazar jet physics. In the observational part, the micro-arcsecond imaging occupied a noticeable fraction of the scientific program. Beyond studies that aim at imaging the magnetic fields at the event horizon, also investigations of the innermost regions of AGN jets and their magnetic fields were discussed. The Faraday effects were discussed not only in terms of rotation but also in terms of converting linear to circular polarisation. The observed gradients of rotation measure were presented as probes of the jet magnetic fields and constituted a large fraction of the observational part of the program. Furthermore, interesting studies on the dynamics of the RM were also discussed in the context of different study cases. In this context several many studies focused on the RM environment such as probing the magnetised medium of AGN with polarimetry, high rotation measures etc. The subject of circular polarisation was very prominent. Its potential in probing the composition of the jets and the magnetic fields was among the many different discussed subjects. The smooth rotations of the EVPA also bred a lot of discussion along with the many different and multi-band monitoring programs as a great focus was put on their relation to the high energy emission. Different mechanisms were presented to have the potential to produce such events as well as variability of the polarised emission in general. Considerable was dedicated to the monitoring programs sampling the polarised emission in different bands. In radio, with single dish or VLBI, optical, mm or sub-mm wavelengths. Individual source studies were yet another well-covered topic as was the blazar emission and variability models. Beyond extragalactic systems also GRNSB, micro-quasars and even proto-stellar systems were presented to be emitting polarised emission. Finally, mostly high energy instrumentation for detecting polarised emission were presented in radio as well as gamma and x rays.

A comprehensive summary of the conference was prepared and delivered as a main part of the conference scientific program and can be found at:

http://www3.mpifr-bonn.mpg.de/old_mpifr/jetpol/downloads/talks/summary.pdf

Impact of the event for the RadioNet community.

This conference comprises the only recent attempt to understand the polarized emission from astrophysical jets in a systematic way. That is, in different possible contexts in the parameters space as well as systems. Its scientific program constitutes a compilation all major topics that are relevant and will serve as reference for the near future. Especially, the anticipated proceedings will provide an excellent review of all major subjects that are of importance currently and in the immediate future.

In this sense the impact on the radionet community and given the areas of research that it focuses, will be immense. Should it be for just a session in yet another AGN conference would not have a noticeable effect. But the production of proceedings and the coherent coverage of such a broad spectrum of topics will definitely have an impact. In summary, the impact on the community in question will primarily be through:

- a) the discussed topics which are of immediate relevance to their research interests,
- b) the attention payed in the importance of the relevant facilities (radio telescopes and interferometers)
- c) the expertise deposited in radionet activities for the subject that were discussed, and
- d) the new topics that arose providing a think tank for the next generation project in all of which the radionet community can have a great impact.

http://www3.mpifr-bonn.mpg.de/old_mpifr/jetpol/jetpol/Home.html



2. AGENDA OF THE EVENT

Monday, June 12

Chair: T. Savolainen

09:00 - 09:25: Moscibrodzka (invited): Polarized emission from 3-D GRMHD simulations of black hole jets

09:25 - 09:40: Millas: Synthetic radiation maps from relativistic MHD jet simulations

09:40 - 09:55: Kylafis: The energy distribution of electrons in radio jets

09:55 - 10:10: Contopoulos: Electric currents along astrophysical jets

10:10 - 10:25: Nishikawa: Recollimation, Reconnection and Associated Flares in Global Relativistic Jets Containing Helical Magnetic Fields with PIC Simulations

10:25 - 11:00: coffee

Chair: I. Contopoulos

11:00 - 11:25: Johnson (invited): Imaging Magnetic Fields at the Event Horizon of a Black Hole

11:25 - 11:40: Gómez: Probing the innermost regions of AGN jets and their magnetic fields with RadioAstron

11:40 - 11:55: Kovalev: Ultra-compact regions with very high polarization are found in quasars

11:55 - 12:10: Jimenez-Rosales: Impact of Faraday effects on event horizon scale GRMHD images of Sgr A*

12:10 - 12:25: Janssen: High-resolution polarimetric study of Sgr A* with the GMVA

12:25 - 12:40: Casadio: 3mm GMVA observations of total and polarised emission from blazar and radiogalaxy core regions

12:40 - 15:00: lunch

Chair: J. L. Gomez

15:00 - 15:25: Asada (invited): ALMA and SMA polarimetric observation towards M87

15:25 - 15:40: Lu: The polarimetric structure of M87 with 3mm-VLBI

15:40 - 15:55: Savolainen: Multifrequency polarization structure of the (sub-)parsec scale jet of 3C273 at mm-wavelengths

15:55 - 16:10: Hovatta: Probing the magnetic fields in 3C273 through Faraday rotation observations

16:10 - 16:25: Nagai: Accretion Flow Property of 3C 84: A View Through Faraday Rotation

16:25 - 18:00: Posters Session, Reception

18:00 - 19:30: Dr. J. A. MacGillivray (British School at Athens): The Minoans in Space and time

20:00: star-gazing (public) by "Cretan Friends of Astronomy"

Tuesday, June 13

Chair: S. Jorstad

09:00 - 09:25: Marscher (invited): Modeling the Time-Dependent Polarization of Blazars

09:25 - 09:40: MacDonald: Faraday Conversion in Turbulent Blazar Jets

09:40 - 09:55: Nalewajko: A model of polarization angle swings in blazars based on kink instability of magnetized jets

09:55 - 10:10: Garrigoux: Modeling polarization from relativistic outflows

10:10 - 10:25: Anantua: Towards multi-wavelength observations of relativistic jets from general relativistic magnetohydrodynamic simulations

10:25 - 11:00: coffee

Chair: A. Marscher

11:00 - 11:25: Zhang (invited): High-energy polarization of blazars: current status and model predictions

11:25 - 11:40: Meliani: Internal shocks in relativistic transverse stratified jets

11:40 - 11:55: Fuentes: Total and linearly polarized synchrotron emission from overpressured magnetized relativistic jets

11:55 - 12:10: Fromm: Radiative signature of large scale magnetized jets

12:10 - 12:25: Angelakis: Full-Stokes, multi-frequency radio polarimetry: monitoring and modeling

12:25 - 12:40: Boettcher: SALT spectropolarimetry and self-consistent SED and spectropolarimetry modeling of blazars

12:40 - 15:00: lunch

Chair: M. Aller

15:00 - 15:25: Jorstad (invited): The VLBA-BU-BLAZAR program: Comparison of linear polarization in parsec scale jets with optical polarization of gamma-ray blazars

15:25 - 15:40: Larionov: The blazar CTA 102 behaviour during two giant outbursts

15:40 - 16:05: Pavlidou (invited): The RoboPol optopolarimetric blazar monitoring program

16:05 - 16:20: Blinov: Connection between optical polarization plane rotations and gamma-ray flares in blazars

16:20 - 16:50: coffee

Chair: E. Angelakis

16:50 - 17:05: Kiehlmann: Testing a stochastic variability model of optical EVPA rotations in blazars with RoboPol data

17:05 - 17:20: Liodakis: Coherent changes in the polarization angle and broadband SED: the case of 3C454.3

17:20 - 17:45: Itoh (invited): Polarimetric monitoring of jets with Kanata Telescope

Wednesday, June 14

Chair: M. Moscibrodzka

09:00 - 09:25: Mundell (invited): Probing magnetic fields in relativistic jets with real-time polarimetry

09:25 - 09:40: Carrasco-Gonzalez: These guys can accelerate particles: synchrotron emission from protostellar jets

09:40 - 09:55: Baglio: Neutron star low mass X-ray binaries jets: a polarimetric view

09:55 - 10:10: Buckley: Polarimetric evidence of the first white dwarf pulsar

10:10 - 10:25: S. Potter: The extraordinary polarimetric nature of the white dwarf pulsar ARSCo

10:25 - 11:00: coffee

Chair: Buckley

11:00 - 11:25: Markoff (invited): Unravelling the complexities of the disk/corona/jet relationship

11:25 - 11:40: Trushkin: The jets of microquasars during giant radio flares and quiet state

11:40 - 11:55: Johnston: A search for polarised emission in jets from high-mass protostars

11:55 - 12:10: Shazamanian: Polarized near-infrared emission from the Galactic center

12:10 - 12:25: Adebahr: Polarised structures in the restarted radio galaxy B2 0258+35 - Magnetic field compression or magnetic draping?

12:25 - 12:40: Partridge: Can CMB Surveys Help the AGN Community?

12:40 - 15:00: lunch

Chair: S. Markoff

15:00 - 15:25: Miller-Jones (invited): Polarised radio emission from X-ray binary jets

15:25 - 15:40: Lee: Detection of short-term flux density variability and intraday variability in polarized emission at millimeter-wavelength from S5 0716+714

15:40 - 15:55: Anderson: Beyond rotation measures: Leveraging broadband polarimetry and all-sky radio surveys to probe spatially-unresolved magneto-ionic structure in AGN jets

15:55 - 16:20: Russell (invited): Optical/infrared polarised emission in X-ray binaries

16:10 - 18:30: Guided Excursion to "Gournia" Minoan site by Prof. Y. Papadatos (University of Athens) and INSTAP by Thomas M. Brogan

21:00: Conference Dinner

Thursday, June 15

Chair: K. Nalewajko

09:30 - 09:55: Wardle (invited): Understanding jet launching through polarisation observations

09:55 - 10:10: Gabuzda: Determining the Jet Longitudinal Magnetic Field Directions and Black-Hole Rotation Directions in AGNs

- 10:10 - 10:25: Knuettel: Evidence for toroidal B-field components in AGN jets on kiloparsec scales
10:25 - 10:40: Beuchert: VLBA polarimetry monitoring of 3C 111 as a tool to probe AGN jet physics on parsec scales
10:40 - 10:55: Lico: On the time variable rotation measure in the core region of Markarian 421

10:55 - 11:30: coffee

Chair: M. Böttcher

- 11:30 - 11:55: Homan (invited): Constraints on Particles and Fields from Full Stokes Observations of AGN
11:55 - 12:10: Pasetto: Exploring the environment of high Rotation Measure Active Galactic Nuclei with wideband radio spectropolarimetry observations
12:10 - 12:25: Pushkarev: Linear Polarization Properties of Parsec-Scale AGN Jets
12:25 - 12:40: Kravchenko: Multi-frequency polarimetric analysis of the quasar 0850+581
12:40 - 12:55: Ma: Radio Polarisation Study of High Rotation Measure AGNs — How to Distinguish Intrinsic from External Sources of Rotation Measure?
12:55 - 13:10: Molina: Magnetic field studies in BL Lacertae through Faraday rotation and a novel astrometric technique

13:10 - 15:30: lunch

Chair: T. Hovatta

- 15:30 - 15:55: Aller (invited): Centimeter-Band All-Stokes Observations of Blazar Variability
15:55 - 16:10: Barres de Almeida: Time-Evolving SED of MKN421: a long-term multi-band view and polarimetric signatures.
16:10 - 16:25: Goyal: Multiwavelength variability study of the BL Lac objects PKS 0735+178 and OJ 287 on timescales ranging from decades to minutes
16:25 - 16:50: Agudo (invited): Linear and Circular Polarization Variability Properties of AGN Jets at Short Millimeter Wavelengths

16:50 - 17:20: coffee

Chair: K. Asada

- 17:20 - 17:35: Cohen (remotely): Double Rotations in EVPA in OJ287
17:35 - 17:50: Myserlis: Multi-frequency, radio circular and linear polarization monitoring of OJ 287
17:50 - 18:05: Biggs: Polarization monitoring of the lens system JVAS B0218+357
18:05 - 18:30: Kobayashi (invited): Polarised Emission from Gamma-Ray Burst Jets

Friday, June 16

Chair: D. Gabuzda

- 09:00 - 09:25: Martí-Vidal (invited): AGN polarization at the highest radio-frequencies and resolutions
09:25 - 09:40: Damas Segovia: Rotation measure asymmetry reveals a precession of the AGN outflow in a Seyfert galaxy
09:40 - 09:55: Cantwell: Low frequency Polarization observations of NGC 6251
09:55 - 10:10: Johnston-Hollitt: Evidence for Helical or Toroidal Magnetic Fields on in a Jet on kpc-scales
10:10 - 10:25: Kierdorf: Probing the Magnetized Medium of AGNs using Wideband Polarimetry

10:25 - 11:00: coffee

Chair: S. Potter

- 11:00 - 11:15: W. Potter: Modelling blazar flaring using a time-dependent fluid jet emission model - an explanation for orphan flares and radio lags
11:15 - 11:30: Beaklini: Optical polarimetry and radio observations of PKS1510-089 between 2009 and 2013
11:30 - 11:45: Readhead (T. Hovatta): SPRITE: the Stokes Polarimetric Radio Interferometer for Time-domain Experiments
11:45 - 12:00: Marshall: The Imaging X-ray Polarization Explorer (IXPE)
12:00 - 12:15: Briggs: LEAP – A Large Area burst Polarimeter for the ISS

12:15 - 14:30: lunch

Chair: H. Marshall

- 14:30 - 14:45: Moody: Automated Polarimetry with Smaller Aperture Telescopes: The ROVOR Observatory

14:45 - 15:00: Bernard: Linear Polarimetry with gamma -> e+e- conversions

15:00 - 15:15: Spencer: An Old Fogey's History of Jets

15:15 - 15:50: Stawarz (invited): Conference Summary

20:00: Closing ceremony, astrophotography contest, Public talk

POSTERS

Gamma-ray astronomy with magnetic-field-free active targets: Optimal measurement of charged particle momentum from multiple scattering with a Bayesian analysis of filtering innovations - Denis BERNARD (LLR, CNRS/IN2P3), Mikael Frosini

High angular-resolution high sensitivity gamma-ray astronomy and linear polarimetry with low density (gas) detectors in the MeV-GeV energy range - Denis BERNARD (CNRS / IN2P3)

Resolving Quasar 3C 334 with e-MERLIN and the Jansky VLA- Katie HESTERLY (The University of Manchester)

Hydrodynamical Jet Simulations with Passive Magnetic Fields - Christopher KAYE (University of Central Lancashire)

The Jet Collimation Profile of 3C273 - Colin LONSDALE (MIT Haystack Observatory), Kazunori Akiyama, Vincent Fish (MIT Haystack Observatory), Keiichi Asada, Masa Nakamura (ASIAA), Hi-roshi Nagai, Kazuhiro Hada (NAOJ)

From Supernovae, to Hypernovae to Binary Driven Hypernovae - Remo RUFFINI (ICRANET)

The giant flares of the microquasar Cygnus X-3: X-rays states and jets - Sergei TRUSHKIN (Special Astrophysical Observatory RAS), M. McCollough, N. Nizhelskij, P. Tsybulev

Polarisation and spectral energy distribution in OJ 287 during the 2016 outbursts - Staszek ZOLA (Astronomical Observatory, Jagiellonian University), A. M. Valtonen, S. Zola, S. Ciprini, H. Jermak, A. Gopakumar, L. Dey amp; Monitoring Team

OGLE Blazars behind the Large and Small Magellanic Clouds - Natalia ZYWUCKA-HEJZNER (Astronomical Observatory of Jagiellonian University), Arti Goyal, Marek Jamroz, Lukasz Stawarz, Michal Ostrowski, Szymon Kozlowski, Andrzej Udalski

3. PARTICIPANTS

The conference program was “frozen” at 104 registered scientists and was operated with 89 ones after the last minute cancellation (the fee was not pre-paid). The venue had only 90 seats so that was anyhow wished to happen this way. The participants originated from 25 different countries for around the globe. Of those some 18 were in the course of a PhD degree and 15 in professorships. Around 25 participants were at an early research career stage (Postdoc). Also 25 were the female participants of the conference. Finally 19 were invited speakers and 10 of them received radionet support.

Attendance list:

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4. RADIONET FINANCIAL CONTRIBUTION

The RadioNet support was used for the support of the following invited speakers:

- Margo Aller (University of Michigan/USA) – expert on radio polarimetry and the signatures of shocks in both polarisation and total power;
- Ryosuke Itoh (Tokyo Institute of Technology Astrophysics Research Institute/JP) – expert on radio high angular resolution polarimetry.
- Shiho Kobayashi (Liverpool John Moores University/UK) – expert on theory of polarised emission from Gamma-ray bursts. Particularly important for cross-disciplinary science.
- Sera Markoff (API, University of Amsterdam/NL) – expert on jet formation in galactic systems, particularly important for exchange of expertise.
- Haochen Zhang (University of New Mexico/USA) – expert on the theory of polarisation and polarisation variability. His work produces testable results at different energy bands and allows understanding of the role and characteristics of the magnetic field in such systems.
- Ivan Marti Vidal (Onsala Space Observatory/SE) – expert on high-frequency radio polarimetry and disk-jet magnetic fields.
- Monika Moscibordzka (Radboud University/NL) – expert on the theory of jets. Developing GRMHD to understand the formation of such structures in all systems galactic and extragalactic.
- Lukasz Stawarz (Jagiellonian University/PL) – expert on the theory of jets and the multi-band approach. Also involved in HE polarisation instrumentation. Will deliver a concise and synthetic view of the future of jet polarimetry.
- John Wardle (Brandeis University/USA) – expert on the theory of polarisation from relativistic jets. One of the pioneers of using polarimetry to understand the micro-physics of jets.
- Alan Marcher (Boston University/USA) – expert in the theory of extragalactic jets, the variability and emission mechanisms and polarisation.

5. PUBLICATIONS

The conference proceedings will be published in a special issue of MDPI Galaxies

http://www.mdpi.com/journal/galaxies/special_issues/astrophysical_jets

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