Active Galaxies Newsletter	*An electronic publication dedicated to the observation and theory of active galaxies*
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Accepted Abstracts - Submitted Abstracts - Thesis Abstracts
Jobs Adverts - Meetings Adverts - Special Announcements

From the Editor

Welcome to all the new subscribers, and thanks to everyone who contributed to this issue of the Active Galaxies Newsletter.

This newsletter is intended to disseminate paper abstracts, meeting announcements, job adverts and other information which may be of interest to the active galaxies community. It is produced monthly and, whilst the deadline for contributions is the last day of the month, contributions may be submitted at any time.

The Latex macros for submitting abstracts and dissertation abstracts are appended to each issue of the newsletter and are also available on the web page. Please note that the editor may reject submissions which do not use the template. As always, any suggestions or feedback regarding the newsletter are welcome.

Thanks for your continued subscription.

Megan Argo

Abstracts of recently accepted papers

Investigating the dusty torus of Seyfert galaxies using SOFIA/FORCAST photometry

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We present 31.5 μm imaging photometry of 11 nearby Seyfert galaxies observed from the Stratospheric Observatory For Infrared Astronomy (SOFIA) using the Faint Object infraRed CAmera for the SOFIA Telescope (FORCAST). We tentatively detect extended 31 μm emission for the first time in our sample. In combination with this new data set, subarcsecond resolution $1-18$ μm imaging and $7.5-13$ μm spectroscopic observations were used to compute the nuclear spectral energy distribution (SED) of each galaxy. We found that the turnover of the torus emission does not occur at wavelengths $\leq$31.5 μm, which we interpret as a lower-limit for the wavelength of peak emission. We used Clumpy torus models to fit the nuclear infrared (IR) SED and infer trends in the physical parameters of the AGN torus for the galaxies in the sample. Including the 31.5 μm nuclear flux in the SED 1) reduces the number of clumpy torus models compatible with the data, and 2) modifies the model output for the outer radial extent of the torus for 10 of the 11 objects. Specifically, six (60%) objects show a decrease in radial extent while four (40%) show an increase. We find torus outer radii ranging from <1pc to 8.4 pc.

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Preprint available at https://arxiv.org/abs/1607.07918

The faint radio sky: radio astronomy becomes mainstream

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Radio astronomy has changed. For years it studied relatively rare sources, which emit mostly non-thermal radiation across the entire electromagnetic spectrum, i.e. radio quasars and radio galaxies. Now it is reaching such faint flux densities that it detects mainly star-forming galaxies and the more common radio-quiet active galactic nuclei. These sources make up the bulk of the extragalactic sky, which has been studied for decades in the infrared, optical, and X-ray bands. I follow the transformation of radio astronomy by reviewing the main components of the radio sky at the bright and faint ends, the issue of their proper classification, their number counts, luminosity functions, and evolution. The overall "big picture" astrophysical implications of these results, and their relevance for a number of hot topics in extragalactic astronomy, are also discussed. The future prospects of the faint radio sky are very bright, as we will soon be flooded with survey data. This review should be useful to all extragalactic astronomers, irrespective of their favourite electromagnetic band(s), and even stellar astronomers might find it somewhat gratifying.

The Astronomy and Astrophysics Review, in press

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The MHz-peaked radio spectrum of the unusual γ-ray source PMN J1603–4904

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The majority of bright extragalactic γ-ray sources are blazars. Only a few radio galaxies have been detected by *Fermi*/LAT. Recently, the GHz-peaked spectrum source PKS 1718–649 was confirmed to be γ-ray bright, providing further evidence for the existence of a population of γ-ray loud, compact radio galaxies. A spectral turnover in the radio spectrum in the MHz to GHz range is a characteristic feature of these objects, which are thought to be young due to their small linear sizes. The multiwavelength properties of the γ-ray source PMN J1603–4904 suggest that it is a member of this source class. The known radio spectrum of PMN J1603–4904 can be described by a power law above 1 GHz. Using observations from the Giant Metrewave Radio Telescope (GMRT) at 150, 325, and 610 MHz, we investigate the behavior of the spectrum at lower frequencies to search for a low-frequency turnover. Data from the TIFR GMRT Sky Survey (TGSS ADR) catalog and archival GMRT observations were used to construct the first MHz to GHz spectrum of PMN J1603–4904. We detect a low-frequency turnover of the spectrum and measure the peak position at about 490 MHz (rest-frame), which, using the known relation of peak frequency and linear size, translates into a maximum linear source size of $\sim$1.4 kpc. The detection of the MHz peak indicates that PMN J1603–4904 is part of this population of radio galaxies with turnover frequencies in the MHz to GHz regime. Therefore it can be considered the second confirmed object of this kind detected in γ-rays. Establishing this γ-ray source class will help to investigate the γ-ray production sites and to test broadband emission models.

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BAT AGN Spectroscopic Survey-III. An observed link between AGN Eddington ratio and narrow emission line ratios

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We investigate the observed relationship between black hole mass ($M_{\rm BH}$), bolometric luminosity ($L_{\rm bol}$), and Eddington ratio ($\lambda_{\rm Edd}$) with optical emission line ratios ([N II] λ6583/Hα, [S II] $\lambda\lambda$6716, 6731/Hα, [O I] λ6300/Hα, [O III] λ5007/Hβ, [Ne III] λ3869/Hβ, and He II λ4686/Hβ) of hard X-ray-selected AGN from the BAT AGN Spectroscopic Survey (BASS). We show that the [N II] λ6583/Hα ratio exhibits a significant correlation with $\lambda_{\rm Edd}$ ($R_{\rm Pear} = -0.44$, p-value=3×10^{-13}, $\sigma = 0.28$ dex), and the correlation is not solely driven by $M_{\rm BH}$ or $L_{\rm bol}$. The observed correlation between [N II] λ6583/Hα ratio and $M_{\rm BH}$ is stronger than the correlation with $L_{\rm bol}$, but both are weaker than the $\lambda_{\rm Edd}$ correlation. This implies that the large-scale narrow lines of AGN host galaxies carry information about the accretion state of the AGN central engine. We propose that the [N II] λ6583/Hα is a useful indicator of Eddington ratio with 0.6 dex of rms scatter, and that it can be used to measure $\lambda_{\rm Edd}$ and thus $M_{\rm BH}$ from the measured $L_{\rm bol}$, even for high redshift obscured AGN. We briefly discuss possible physical mechanisms behind this correlation, such as the mass-metallicity relation, X-ray heating, and radiatively driven outflows.

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2WHSP: A multi-frequency selected catalog of HE and VHE γ-ray blazars and blazar candidates

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High Synchrotron Peaked blazars (HSPs) dominate the γ sky at energies larger than a few GeV; however, only a few hundred blazars of this type have been catalogued so far. In this paper we present the 2WHSP sample, the largest and most complete list of HSP blazars available to date, which is an expansion of the 1WHSP catalog of γ-ray source candidates off the Galactic plane. We cross-matched a number of multi-wavelength surveys (in the radio, infrared and X-ray bands) and applied selection criteria based on the radio to IR and IR to X-ray spectral slopes. To ensure the selection of genuine HSPs we examined the SED of each candidate and estimated the peak frequency of its synchrotron emission ($\nu_{\rm peak}$) using the ASDC SED tool, including only sources with $\nu_{\rm peak} > 10^{15}$ Hz (equivalent to $\nu_{\rm peak} > 4$ eV). We have assembled the largest and most complete catalog of HSP blazars to date, which includes 1691 sources. A number of population properties, such as infrared colours, synchrotron peak, redshift distributions, and γ-ray spectral properties, have been used to characterise the sample and maximize completeness. We also derived the radio logN-logS distribution. This catalog has already been used to provide seeds to discover new very high energy objects within *Fermi*-LAT data and to look for the counterparts of neutrino and ultra high energy cosmic ray sources, showing its potential for the identification of promising high-energy γ, sources and multi-messenger targets.

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The Prevalence of gas outflows in type 2 AGNs. II. 3D biconical outflow models

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We present 3D models of biconical outflows combined with a thin dust plane for investigating the physical properties of the ionized gas outflows and their effect on the observed gas kinematics in type 2 active galactic nuclei (AGNs). Using a set of input parameters, we construct a number of models in 3D and calculate the spatially integrated velocity and velocity dispersion for each model. We find that three primary parameters, i.e., intrinsic velocity, bicone inclination, and the amount of dust extinction, mainly determine the simulated velocity and velocity dispersion. Velocity dispersion increases as the intrinsic velocity or the bicone inclination increases, while velocity (i.e., velocity shifts with respect to systemic velocity) increases as the amount of dust extinction increases. Simulated emission-line profiles well reproduce the observed [O III] line profiles, e.g., a narrow core and a broad wing components. By comparing model grids and Monte Carlo simulations with the observed [O III] velocity–velocity dispersion (VVD) distribution of ∼39,000 type 2 AGNs, we constrain the intrinsic velocity of gas outflows ranging from ∼500 km s^{-1} to ∼1000 km s^{-1} for the majority of AGNs, and up to ∼1500–2000 km s^{-1} for extreme cases. The Monte Carlo simulations show that the number ratio of AGNs with negative [O III] velocity to AGNs with positive [O III] velocity correlates with the outflow opening angle, suggesting that outflows with higher intrinsic velocity tend to have wider opening angles. These results demonstrate the potential of our 3D models for studying the physical properties of gas outflows, applicable to various observations, including spatially integrated and resolved gas kinematics.

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Multi-wavelength Temporal Variability of Blazar 3C 454.3 during 2014 Activity Phase

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We present a multi-wavelength temporal analysis of the blazar 3C 454.3 during the high γ-ray active period from May-December, 2014. Except for X-rays, the period is well sampled at near-infrared (NIR)-optical by the *SMARTS* facility and the source is detected continuously on daily timescale in the *Fermi*-LAT γ-ray band. The source exhibits diverse levels of variability with many flaring/active states in the continuously sampled γ-ray light curve which are also reflected in the NIR-optical light curves and the sparsely sampled X-ray light curve by the *Swift*-XRT. Multi-band correlation analysis of this continuous segment during different activity periods shows a change of state from no lags between IR and γ-ray, optical and γ-ray, and IR and optical to a state where γ-ray lags the IR/optical by ∼3 days. The results are consistent with the previous studies of the same during various γ-ray flaring and active episodes of the source. This consistency, in turn, suggests an extended localized emission region with almost similar conditions during various γ-ray activity states. On the other hand, the delay of γ-ray with respect to IR/optical and a trend similar to IR/optical in X-rays along with strong broadband correlations favor magnetic field related origin with X-ray and γ-ray being inverse Comptonized of IR/optical photons and external radiation field, respectively.

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Infrared polarimetry of Mrk 231: Scattering off hot dust grains in the central core

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We present high-angular (0.17−0.35 arcsec) resolution imaging polarimetric observations of Mrk 231 in the 3.1 μm filter using MMT-Pol on the 6.5-m MMT, and in the 8.7 μm, 10.3 μm, and 11.6 μm filters using CanariCam on the 10.4-m Gran Telescopio CANARIAS. In combination with already published observations, we compile the 1−12 μm total and polarized nuclear spectral energy distribution (SED). The total flux SED in the central 400 pc is explained as the combination of 1) a hot (731 $\pm$ 4 K) dusty structure, directly irradiated by the central engine, which is at 1.6 $\pm$ 0.1 pc away and attributed to be in the pc-scale polar region, 2) an optically-thick, smooth and disk-like dusty structure ('torus') with an inclination of 48 $\pm$ 23∘ surrounding the central engine, and 3) an extinguished (A_V = 36 $\pm$ 5 mag) starburst component. The polarized SED decreases from 0.77 $\pm$ 0.14 per cent at 1.2 μm to 0.31 $\pm$ 0.15 per cent at 11.6 μm and follows a power-law function, $\lambda^{\sim 0.57}$. The polarization angle remains constant (∼108∘) in the 1−12 μm wavelength range. The dominant polarization mechanism is explained as scattering off hot dust grains in the pc-scale polar regions.

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Testing the Completeness of the SDSS Colour Selection for Ultramassive, Slowly Spinning Black Holes

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We investigate the sensitivity of the colour-based quasar selection algorithm of the Sloan Digital Sky Survey to several key physical parameters of supermassive black holes (SMBHs), focusing on BH spin ($a_\star$) at the high BH-mass regime $M_{BH} \geq 10^9 M_\odot$). We use a large grid of model spectral energy distribution, assuming geometrically-thin, optically-thick accretion discs, and spanning a wide range of five physical parameters: BH mass M_{BH}, BH spin $a_\star$, Eddington ratio L/L_{Edd}, redshift z, and inclination angle *inc*. Based on the expected fluxes in the SDSS imaging ugriz bands, we find that $\sim$ 99.8 % of our models with $M_{BH} \leq 10^{9.5} M_\odot$ are selected as quasar candidates and thus would have been targeted for spectroscopic follow-up. However, in the extremely high-mass regime, $\geq 10^{10} M_\odot$, we identify a bias against slowly/retrograde spinning SMBHs. The fraction of SEDs that would have been selected as quasar candidates drops below $\sim$ 50 % for $a_\star < 0$ across $0.5 < z < 2$. For particularly massive BHs, with $M_{BH} \sim 3 \cdot 10^{10} M_\odot$, this rate drops below $\sim$ 20 %, and can be yet lower for specific redshifts. We further find that the chances of identifying any hypothetical sources with $M_{BH} = 10^{11} M_\odot$ by colour selection would be extremely low at the level of $\sim$ 3 %. Our findings, along with several recent theoretical arguments and empirical findings, demonstrate that the current understanding of the SMBH population at the high-MBH, and particularly the low- or retrograde-spinning regime, is highly incomplete.

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NuSTAR observations of WISE J1036+0449, a Galaxy at z~ 1 obscured by hot dust

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Hot, Dust-Obscured Galaxies (Hot DOGs), selected from the *WISE* all sky infrared survey, host some of the most powerful Active Galactic Nuclei (AGN) known, and might represent an important stage in the evolution of galaxies. Most known Hot DOGs are at $z > 1.5$, due in part to a strong bias against identifying them at lower redshift related to the selection criteria. We present a new selection method that identifies 153 Hot DOG candidates at $z \sim 1$, where they are significantly brighter and easier to study. We validate this approach by measuring a redshift $z = 1.009$, and an SED similar to higher redshift Hot DOGs for one of these objects, WISE J1036+0449 ($L_{\rm Bol} \simeq 8 \times 10^{46}\,\rm erg\,s^{-1}$), using data from Keck/LRIS and NIRSPEC, SDSS, and CSO. We find evidence of a broadened component in Mg II, which, if due to the gravitational potential of the supermassive black hole, would imply a black hole mass of $M_{\rm BH} \simeq 2 \times 10^{8} M_{\odot}$, and an Eddington ratio of $\lambda_{\rm Edd} \simeq 2.7$. WISE J1036+0449 is the first Hot DOG detected by *NuSTAR*, and the observations show that the source is heavily obscured, with a column density of $N_{\rm H} \simeq (2-15) \times 10^{23}\,\rm cm^{-2}$. The source has an intrinsic 2–10 keV luminosity of $\sim 6 \times 10^{44}\,\rm erg\,s^{-1}$, a value significantly lower than that expected from the mid-infrared/X-ray correlation. We also find that the other Hot DOGs observed by X-ray facilities show a similar deficiency of X-ray flux. We discuss the origin of the X-ray weakness and the absorption properties of Hot DOGs. Hot DOGs at $z \lesssim 1$ could be excellent laboratories to probe the characteristics of the accretion flow and of the X-ray emitting plasma at extreme values of the Eddington ratio.

Submitted to ApJ

E-mail contact: cricci@astro.puc.cl
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Jobs

Research Fellow in Observational Astrophysics
University of Southampton, UK
Deadline: 15th November 2016

Email contact: s.hoenig@soton.ac.uk
Further Information: https://jobs.soton.ac.uk/Vacancy.aspx?ref=779416WF

The Astrogroup of the University of Southampton's Department of Physics & Astronomy invites applications for one or more postdoctoral research fellow positions in infrared/sub-mm studies of active galactic nuclei (AGN). You will be joining an ambitious team and work with Dr Sebastian Hoenig to understand the feeding and feedback processes in the circumnuclear environment of AGN and use their emission as cosmological probes. The team has access to new ALMA and VLT Interferometer data of nearby AGN and leads part of the new ESO public survey *VEILS*, which will facilitate dust reverberation mapping out to redshift 1. You will be contributing to the scientific exploitation of any of these data and take up leading roles, according to your interests.

Applications are welcome from both junior and more senior researchers from a wide range of backgrounds, including infrared/sub-mm observations, interferometry, reverberation mapping, or advanced image processing. Your involvement in the projects will be tailored to your experience.

The Southampton Astrogroup provides a stimulating and collegial environment with many opportunities to collaborate with other group members. Our main research themes are compact objects and time-domain astrophysics. We are strongly committed to diversity in the student and academic population and you will be supported in developing your career while maintaining a good work-life balance through family-friendly policies. The position will provide you with time and resources to explore and develop independent research.

The post is initially for two years and can be extended depending on performance and funding. The appointment will be full time on University of Southampton Level 4 (28,982 - 35,609 commensurate to experience). In addition, the University offers an attractive benefits package and relocation assistance. The starting date is flexible in 2017 and can be as early as January.

If you are interested, please apply via the university's job portal (job reference 779416WF; see link above). Applications submitted by 15 November 2016 will receive full consideration, but the position remains open until filled.

Applications should consist of a cover letter, CV, publication list, and a brief statement of research interests (2 pages max). Please upload all documents as one pdf file. Moreover, three letters of reference are required with contact details to be provided on application (letter requests will be sent automatically by the application system)

Informal inquiries are particularly welcome. Please contact Dr Sebastian Hoenig, s.hoenig@soton.ac.uk (Twitter: @dustrophysix).

Monitoring the Non-thermal Universe

Cochem, Germany
Dec 7-9, 2016

Webpage: `http://indico.scc.kit.edu/indico/e/HAP-Monitoring-Dec2016`
Email: `hap-mon@lists.rwth-aachen.de`

We are happy to announce the international workshop "Monitoring the non-thermal Universe", taking place from Dec 7-9, 2016 in Cochem, Germany.

Studying high energy messengers from astrophysical sources, the importance of monitoring and time-domain astrophysics is evident. To track down the emission mechanism of transient sources, time-resolved energy spectra from radio to very high energies are crucial. The workshop brings together people working on monitoring, the analysis of multi-wavelength data and modelling. Together, we want to assess the status of multi-wavelength monitoring and find synergies for common projects and new collaborations.

The conference will cover the following topics:

- Observations: status, past and future monitoring programs, current instruments and future technologies
- Infrastructure: data sample, data mining, data archive, open data access
- Analysis: methods and algorithms, variability studies, broad-band spectral energy distributions, correlation studies
- Theory vs phenomenology: time-dependent modelling, interpretation of data

Important Dates:

- Abstract Deadline: 31.10.2016
- Registration Deadline: 14.11.2016

Details on the conference, the registration and abstract submission are available at
http://indico.scc.kit.edu/indico/e/HAP-Monitoring-Dec2016