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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

Ionized gas kinematics within the inner kiloparsec of the Seyfert galaxy NGC 1365

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We observed the nuclear region of the galaxy NGC 1365 with the integral field unit of the Gemini Multi Object Spectrograph mounted on the GEMINI-South telescope. The field of view covers $13'' \times 6''$ (1173×541 pc^2) centered on the nucleus, at a spatial resolution of 52 pc. The spectral coverage extends from 5600 Å to 7000 Å, at a spectral resolution $R = 1918$. NGC 1365 hosts a Seyfert 1.8 nucleus, and exhibits a prominent bar extending out to $100''$ (9 kpc) from the nucleus. The field of view lies within the inner Lindblad resonance. Within this region, we found that the kinematics of the ionized gas (as traced by [OI], [NII], Hα, and [SII]) is consistent with rotation in the large-scale plane of the galaxy. While rotation dominates the kinematics, there is also evidence for a fan-shaped outflow, as found in other studies based on the [OIII] emission lines. Although evidence for gas inflowing along nuclear spirals has been found in a few barred galaxies, we find no obvious signs of such features in the inner kiloparsec of NGC 1365. However, the emission lines exhibit a puzzling asymmetry that could originate from gas which is slower than the gas responsible for the bulk of the narrow-line emission. We speculate that it could be tracing gas which lost angular momentum, and is slowly migrating from the inner Lindblad resonance towards the nucleus of the galaxy.

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NuSTAR reveals the extreme properties of the super-Eddington accreting super massive black hole in PG 1247+267

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PG1247+267 is one of the most luminous known quasars at $z \sim 2$, and a strongly super-Eddington accreting SMBH candidate. We obtained *NuSTAR* data of this source in December 2014 with the aim of studying the high-energy emission of this intriguing source, leveraging the broad band covered by the new *NuSTAR* and the archival *XMM–Newton* data. Several measurements are in agreement with the super-Eddington scenario for PG1247+267: the soft power-law ($\Gamma = 2.3 \pm 0.1$); the weak ionized Fe emission line and a hint of the presence of outflowing ionized gas surrounding the SMBH. The presence of an extreme reflection component is instead at odds with the high accretion rate proposed for this quasar. This can be explained with three different scenarios, all of them in good agreement with the existing data, but implying very different conclusions: i) a variable primary power-law observed in a low state, superimposed on a reflection component echoing a past, higher flux state; ii) a power-law continuum obscured by an ionized, Compton thick, partial covering absorber; iii) a relativistic disk reflector in a lamp post geometry, with low coronal height and high BH spin. The first model is able to explain the high reflection component in terms of variability. The second does not require any reflection to reproduce the hard emission, while a rather low high-energy cut-off of ~ 100 keV is detected, for the first time in such a high redshift source. The third model require a face-on geometry, which may affect the SMBH mass and Eddington ratio measurements. Deeper X-ray broad band data are required in order to disentangle between these possibilities.

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Coincidence of a high-fluence blazar outburst with a PeV-energy neutrino event

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The astrophysical sources of the extraterrestrial, very-high energy neutrinos detected by the IceCube collaboration remain to be identified. Gamma-ray (γ-ray) blazars have been predicted to yield a cumulative neutrino signal exceeding the atmospheric background above energies of 100 TeV, assuming that both the neutrinos and the γ-ray photons are produced by accelerated protons in relativistic jets. As the background spectrum falls steeply with increasing energy, the individual events with the clearest signature of being of extraterrestrial origin are those at PeV energies. Inside the large positional-uncertainty fields of the first two PeV neutrinos detected by IceCube, the integrated emission of the blazar population has a sufficiently high electromagnetic flux to explain the detected IceCube events, but fluences of individual objects are too low to make an unambiguous source association. Here, we report that a major outburst of the blazar PKS B1424−418 occurred in temporal and positional coincidence with a third PeV-energy neutrino event (HESE-35) detected by IceCube. Based on an analysis of the full sample of γ-ray blazars in the HESE-35 field, we show that the long-term average γ-ray emission of blazars as a class is in agreement with both the measured all-sky flux of PeV neutrinos and the spectral slope of the IceCube signal. The outburst of PKS B1424−418 provides an energy output high enough to explain the observed PeV event, suggestive of a direct physical association.

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Long-term X-Ray Spectral Variability in AGN from the Palomar sample observed by *Swift*

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We present X-ray spectral variability of 24 local active galactic nuclei (AGN) from the Palomar sample of nearby galaxies, as observed mainly by Swift. From hardness ratio measurements, we find that 18 AGN with low accretion rates show hardening with increasing count rate, converse to the softer-when-brighter behaviour normally observed in AGN with higher accretion rates. Two AGN show softening with increasing count rate, two show more complex behaviour, and two do not show any simple relationship.

Sufficient data were available for the spectra of 13 AGN to be summed in flux-bins. In 9 of these sources, correlated luminosity-dependent changes in the photon index (Γ) of a power-law component are found to be the main cause of hardness variability. For 6 objects, with a low accretion rate as a fraction of the Eddington rate ($\dot{m}_{\rm Edd}$), Γ is anticorrelated with $\dot{m}_{\rm Edd}$, i.e. 'harder-when-brighter' behaviour is observed. The 3 higher-$\dot{m}_{\rm Edd}$-rate objects show a positive correlation between Γ and $\dot{m}_{\rm Edd}$. This transition from harder-when-brighter at low $\dot{m}_{\rm Edd}$ to softer-when-brighter at high $\dot{m}_{\rm Edd}$ can be explained by a change in the dominant source of seed-photons for X-ray emission from cyclo-synchrotron emission from the Comptonising corona itself to thermal seed-photons from the accretion disc. This transition is also seen in the 'hard state' of black hole X-ray binaries (BHXRBs). The results support the idea that LINERs are analogues of BHXRBs in the hard state and that Seyferts are analogues of BHXRBs in either the high-accretion-rate end of the hard state or in the hard-intermediate state.

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The Role of Radiation Pressure in the Narrow Line Regions of Seyfert Host Galaxies

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We investigate the relative significance of radiation pressure and gas pressure in the extended narrow line regions (ENLRs) of four Seyfert galaxies from the integral field Siding Spring Southern Seyfert Spectroscopic Snapshot Survey (S7). We demonstrate that there exist two distinct types of starburst-AGN mixing curves on standard emission line diagnostic diagrams which reflect the balance between gas pressure and radiation pressure in the ENLR. In two of the galaxies the ENLR is radiation pressure dominated throughout and the ionization parameter remains constant ($\log U \sim 0$). In the other two galaxies radiation pressure is initially important, but gas pressure becomes dominant as the ionization parameter in the ENLR decreases from $\log U \sim 0$ to $-3.4 < \log U < -3.2$. Where radiation pressure is dominant, the AGN regulates the density of the interstellar medium on kpc scales and may therefore have a direct impact on star formation activity and/or the incidence of outflows in the host galaxy to scales far beyond the zone of influence of the black hole. We find that both radiation pressure dominated and gas pressure dominated ENLRs are dynamically active with evidence for outflows, indicating that radiation pressure may be an important source of AGN feedback even when it is not dominant over the entire ENLR.

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Active galactic nuclei at z∼1.5: II. Black Hole Mass estimation by means of broad emission lines

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This is the second in a series of papers aiming to test how the mass ($M_{\rm BH}$), accretion rate ($\dot{M}$) and spin (a_*) of super massive black holes (SMBHs) determine the observed properties of type-I active galactic nuclei (AGN). Our project utilizes a sample of 39 unobscured AGN at $z \simeq 1.55$ observed by VLT/X-shooter, selected to map a large range in $M_{\rm BH}$ and $L/L_{\rm edd}$ and covers the most prominent UV-optical (broad) emission lines, including Hα, Hβ, MgII, and CIV. This paper focuses on single-epoch, "virial" $M_{\rm BH}$ determinations from broad emission lines and examine the implications of different continuum modeling approaches in line width measurements. We find that using a local power-law continuum instead of a physically-motivated thin disk continuum leads to only slight underestimation of the FWHM of the lines and the associated $M_{\rm BH}$ (FWHM). However, the line dispersion σ and associated $M_{\rm BH}$ (σ) are strongly affected by the continuum placement and provides less reliable mass estimates than FWHM-based methods. Our analysis shows that Hα, Hβ and MgII can be safely used for virial $M_{\rm BH}$ estimation. The CIV line, on the other hand, is not reliable in the majority of the cases, this may indicate that the gas emitting this line is not virialized. While Hα and Hβ show very similar line widths, the mean FWHM (MgII) is about 30% narrower than FWHM (Hβ) . We confirm several recent suggestions to improve the accuracy in CIV-based mass estimates, relying on other UV emission lines. Such improvements do not reduce the scatter between CIV-based and Balmer-line-based mass estimates.

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CIV Broad Absorption Line Acceleration in Sloan Digital Sky Survey Quasars

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We present results from the largest systematic investigation of broad absorption line (BAL) acceleration to date. We use spectra of 140 quasars from three Sloan Digital Sky Survey programs to search for global velocity offsets in BALs over timescales of ≈2.5–5.5 years in the quasar rest frame. We carefully select acceleration candidates by requiring monolithic velocity shifts over the entire BAL trough, avoiding BALs with velocity shifts that might be caused by profile variability. The CIV BALs of two quasars show velocity shifts consistent with the expected signatures of BAL acceleration, and the BAL of one quasar shows a velocity-shift signature of deceleration. In our two acceleration candidates, we see evidence that the magnitude of the acceleration is not constant over time; the magnitudes of the change in acceleration for both acceleration candidates are difficult to produce with a standard disk-wind model or via geometric projection effects. We measure upper limits to acceleration and deceleration for 76 additional BAL troughs and find that the majority of BALs are stable to within about 3% of their mean velocities. The lack of widespread acceleration/deceleration could indicate that the gas producing most BALs is located at large radii from the central black hole and/or is not currently strongly interacting with ambient material within the host galaxy along our line of sight.

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Active galactic nuclei at $z \sim 1.5$: III. Accretion discs and black hole spin

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This is the third paper in a series describing the spectroscopic properties of a sample of 39 AGN at $z \sim 1.5$, selected to cover a large range in black hole mass (M_{BH}) and Eddington ratio (L/L_{Edd}). In this paper, we continue the analysis of the VLT/X-shooter observations of our sample with the addition of 9 new sources. We use an improved Bayesian procedure, which takes into account intrinsic reddening, and improved M_{BH} estimates, to fit thin accretion disc (AD) models to the observed spectra and constrain the spin parameter (a_*) of the central black holes. We can fit 37 out of 39 AGN with the thin AD model, and for those with satisfactory fits, we obtain constraints on the spin parameter of the BHs, with the constraints becoming generally less well defined with decreasing BH mass. Our spin parameter estimates range from ~ -0.6 to maximum spin for our sample, and our results are consistent with the "spin-up" scenario of BH spin evolution. We also discuss how the results of our analysis vary with the inclusion of *non-simultaneous* GALEX photometry in our thin AD fitting. Simultaneous spectra covering the rest-frame optical through far-UV are necessary to definitively test the thin AD theory and obtain the best constraints on the spin parameter.

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Evidence for two Lognormal States in Multi-wavelength Flux Variation of FSRQ PKS 1510-089

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We present a systematic characterization of multi-wavelength emission from blazar PKS 1510-089 using well-sampled data at infrared(IR)-optical, X-ray and γ-ray energies. The resulting flux distributions, except at X-rays, show two distinct lognormal profiles corresponding to a high and a low flux level. The dispersions exhibit energy dependent behavior except for the LAT γ-ray and optical B-band. During the low level flux states, it is higher towards the peak of the spectral energy distribution, with γ-ray being intrinsically more variable followed by IR and then optical, consistent with mainly being a result of varying bulk Lorentz factor. On the other hand, the dispersions during the high state are similar in all bands except optical B-band, where thermal emission still dominates. The centers of distributions are a factor of ~ 4 apart, consistent with anticipation from studies of extragalactic γ-ray background with the high state showing a relatively harder mean spectral index compared to the low state.

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MUSE 3D Spectroscopy and Kinematics of the gigahertz peaked spectrum Radio Galaxy PKS 1934-63: Interaction, Recently Triggered AGN and Star Formation

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We observe the radio galaxy PKS 1934-63 (at $z = 0.1825$) using MUSE (Multi Unit Spectroscopic Explorer) on the Very Large Telescope (VLT). The radio source is GigaHertz Peaked Spectrum and compact (0.13 kpc), implying an early stage of evolution ($\leq 10^4$ yr). Our data show an interacting pair of galaxies, projected separation 9.1 kpc, velocity difference $\Delta(v) = 216$ km s^{-1}. The larger galaxy is a $M_* \simeq 10^{11} M_\odot$ spheroidal with the emission-line spectrum of a high-excitation young radio acive galactic nucleus (AGN, e.g. strong [OI]6300 and [OIII]5007). Emission-line ratios indicate a large contribution to the line luminosity from high-velocity shocks ($\simeq 550$ km s^{-1}) . The companion is a non-AGN disk galaxy, with extended Hα emission from which its star-formation rate is estimated as 0.61 $M_\odot$yr^{-1}.

Both galaxies show rotational velocity gradients in Hα and other lines, with the interaction being prograde-prograde. The SE-NW velocity gradient of the AGN host is misaligned from the E-W radio axis, but aligned with a previously discovered central ultraviolet source, and a factor 2 greater in amplitude in Hα than in other (forbidden) lines (e.g. [OIII]5007). This could be produced by a fast rotating (100–150 km s^{-1}) disk with circumnuclear star-formation. We also identify a broad component of [OIII]5007 emission, blueshifted with a velocity gradient aligned with the radio jets, and associated with outflow. However, the broad component of [OI]6300 is redshifted. In spectral fits, both galaxies have old stellar populations plus $\sim 0.1\%$ of very young stars, consistent with the galaxies undergoing first perigalacticon, triggering infall and star-formation from ~ 40 Myr ago followed by the radio outburst.

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Using leaked power to measure intrinsic AGN power spectra of red-noise time series

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Fluxes emitted at different wavebands from active galactic nuclei (AGNs) fluctuate at both long and short timescales. The variation can typically be characterized by a broadband power spectrum, which exhibits a red-noise process at high frequencies. The standard method of estimating power spectral density (PSD) of AGN variability is easily affected by systematic biases such as red-noise leakage and aliasing, in particular, when the observation spans a relatively short period and is gapped. Focusing on the high-frequency PSD that is strongly distorted due to red-noise leakage and usually not significantly affected by aliasing, we develop a novel and observable normalized leakage spectrum (NLS), which describes sensitively the effects of leaked red-noise power on the PSD at different temporal frequencies. Using Monte Carlo simulations, we demonstrate how an AGN underlying PSD sensitively determines the NLS when there is severe red-noise leakage and thereby how the NLS can be used to effectively constrain the underlying PSD.

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Hidden AGNs in Early-Type Galaxies

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We present a stacking analysis of the complete sample of Early Type Galaxies (ETGs) in the *Chandra* COSMOS (C-COSMOS) survey, to explore the nature of the X-ray luminosity in the redshift and stellar luminosity ranges $0 < z < 1.5$ and $10^9 < L_K/L_\odot < 10^{13}$. Using established scaling relations, we subtract the contribution of X-ray binary populations, to estimate the combined emission of hot ISM and AGN. To discriminate between the relative importance of these two components, we (1) compare our results with the relation observed in the local universe $L_{X,gas} \propto L_K^{4.5}$ for hot gaseous halos emission in ETGs, and (2) evaluate the spectral signature of each stacked bin. We find two regimes where the non-stellar X-ray emission is hard, consistent with AGN emission. First, there is evidence of hard, absorbed X-ray emission in stacked bins including relatively high z (~ 1.2) ETGs with average high X-ray luminosity ($L_{X-LMXB} \gtrsim 6 \times 10^{42}$ erg/s). These luminosities are consistent with the presence of highly absorbed "hidden" AGNs in these ETGs, which are not visible in their optical-IR spectra and spectral energy distributions. Second, confirming the early indication from our C-COSMOS study of X-ray detected ETGs, we find significantly enhanced X-ray luminoaity in lower stellar mass ETGs ($L_K \lesssim 10^{11} L_\odot$), relative to the local $L_{X,gas} \propto L_K^{4.5}$ relation. The stacked spectra of these ETGs also suggest X-ray emission harder than expected from gaseous hot halos. This emission is consistent with inefficient accretion $10^{-5} - 10^{-4} \dot{M}_{Edd}$ onto $M_{BH} \sim 10^6 - 10^8\, M_\odot$.

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Jobs

Postdoctoral Position in Galaxy and Black Hole Astrophysics
ETH Zurich
Deadline: 31st May 2016

Email contact: kevin.schawinski@phys.ethz.ch
Further Information: https://jobs.itp.phys.ethz.ch/postdoc/

The Institute for Astronomy of the ETH Zurich invites applications for a two year postdoctoral position in the black hole group of Prof. Schawinski (http://www.astro.ethz.ch/schawinski) to work on active galaxies, galaxy-black hole co-evolution and the origin of black holes.

The successful candidate will be involved in the planning, execution and analysis of observational projects. Experience with any of: survey data, optical/NIR spectroscopy and radio/sub-mm data, would be a particular asset. There are also opportunities to get involved in citizen science projects, machine learning, and in the mentoring of students.

The position is initially for two years, but can be extended to a third year subject to funding. The salary scale is attractive (CHF 86'300 - 95'000) and there is substantial support for travel (observing, conference, collaboration), computing and publication charges. Switzerland is a full member of ESO and ESA. Zurich is regularly rated one of the top 10 cities of the world in terms of quality of life.

Applicants should have a PhD in astronomy or related field. The application should include a CV, publication list and a brief (3 pages max.) summary of past research and future research interests and should be uploaded to https://jobs.itp.phys.ethz.ch/postdoc/ by May 31, 2016. Three letters of reference should be uploaded, directly by the referees, to the same platform within the same deadline. The search will continue until the position is filled.

For further information, please contact Prof. Schawinski (kevin.schawinski@phys.ethz.ch).

Call for e-MERLIN proposals - Cycle-4

For observations September 2016 - January 2017
Deadline for Receipt of Proposals: 23:59:59 UT on 26th May 2016
Email: emerlin@jb.man.ac.uk
Further Information: http://www.e-merlin.ac.uk/observe/call_cycle4.html

e-MERLIN requests proposals from the international astronomical community for observations to be made during Cycle-4. Proposals are competitively peer-reviewed under standard STFC rules by the PATT e-MERLIN Time Allocation Committee. Allocation will be made on the basis of scientific merit and technical feasibility alone. During e-MERLIN operations 50% of observing time has been allocated to large legacy projects and most of the remaining time will be allocated via PATT to standard proposals solicited prior to each observing semester.

e-MERLIN provides high resolution (12-150mas) and high sensitivity ([7]-14 microJy [inc. Lovell Telescope] in Cycle-4) imaging at cm wavelengths as well as polarimetry, spectroscopy and astrometry. Cycle-4 observations will commence in September 2016.

Developments during Cycle-4: Following testing and commissioning, the introduction of the full 2GHz bandwidth at C and K-Band is scheduled for delivery during the Cycle-4 observing period. PATT observations made after this development may benefit from this extra bandwidth once it becomes available, however, this will be offered initially on a shared-risk basis. All proposals should be justified assuming the current available bandwidth of 512MHz. K-Band observations are also offered on a best-efforts basis. New K-Band receivers with improved sensitivity are being installed during Cycles 3 and 4.

Observing frequencies available:
L-Band: 1.23GHz to 1.74GHz
C-Band: 4.5GHz to 7.5GHz
K-Band: 21GHz to 24GHz

Commencing in summer 2015, The University of Manchester is undertaking a 15 Million pound upgrade programme on the JBO site including major work on the Lovell Telescope. As such during this e-MERLIN cycle there will be a limited availability of up to 10 days of the Lovell telescope for the inclusion within e-MERLIN PATT observations at L and C-band. Proposers must make a detailed case for the inclusion of the Lovell telescope in their proposed observations.

During Cycle-4, e-MERLIN C and K-Band operations utilising bandwidths wider than 512MHz will be on a best-efforts basis and no programmes are guaranteed. Proposals should assume 512MHz observing bandwidth. However, PIs of allocated proposals which may benefit from these enhanced capabilities will be informed and given the option to use these capabilities when they become available.

Proposers should consult the allocated e-MERLIN legacy programme to avoid conflicts (see notes below). In cases where PATT proposals directly replicate portions of allocated legacy projects, legacy projects will normally be given priority.

During Cycle-4 there is one VLBI session. Simultaneous joint VLBI+e-MERLIN observations are offered on a best efforts basis, and every effort will be made to provide simultaneous or contemporaneous matching e-MERLIN observations for joint programmes. EVN proposals should be submitted to the EVN Programme Committee - details for proposing for EVN time can be found via the EVN web pages at http://www.evlbi.org/.

More extensive technical details are available at http://www.e-merlin.ac.uk/observe/cycle4.html.

Proposals should be submitted via the e-MERLIN Web-based Northstar Proposal Tool at:
http://www.e-merlin.ac.uk/observe/northstar.html.
The proposal tool will be open for proposal submissions from 19th April 2016.