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Accepted Abstracts - Submitted Abstracts - Thesis Abstracts
Jobs Adverts - Meetings Adverts - Special Announcements

From the Editor

The Active Galaxies Newsletter is produced monthly. The deadline for contributions is the last friday of the month. 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.

As always as editor of the newsletter I am very interested to hear any suggestions or feedback regarding the newsletter. So do not hesitate in emailing me your suggestions.

Many thanks for your continued subscription.

Rob Beswick

Abstracts of recently accepted papers

High-spatial resolution SED of NGC 1068 from near-IR to radio. Disentangling the thermal and non-thermal contributions

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We investigate the idea that a sizable fraction of the interferometrically unresolved infrared emission of the nucleus of NGC 1068 might originate from processes other than thermal dust emission from the torus. We examine the contribution of free-free or synchrotron emission to the central mid- and near-IR parsec-scale emitting region of NGC 1068. Each mechanism is constrained using parsec scale radio data available for NGC 1068 in the $10^9 - 10^{11}$ Hz regime, and compared with the highest-resolution interferometric data available in the mid-infrared. It is shown that the unresolved emission in the interferometric observation (<1 pc) is still dominated by dust emission and not by contributions from synchrotron or free-free emission. As previous studies suggest, the interferometric observations appear to infer a clumpy structure of the dust distribution. Extrapolation of the radio free-free or synchrotron emission to the IR indicates that their contribution is <20% even for the unresolved fraction of the interferometric flux.

The slope of the available radio data is consistent with a power law exponent $\alpha = 0.29 \pm 0.07$ that we interpret in terms of either free-free emission or synchrotron radiation from quasi-monochromatic electrons. We apply emission models for both mechanisms to obtain physical parameters.

Furthermore, we attempt to quantify the possible contribution of the accretion disk to the near-infrared emission. It has been suggested, that the unresolved K-band flux in VLTI/VINCI interferometric observation at 46 m baseline (40% of the total K-band flux) might originate in the accretion disk. By using an accretion disk spectrum that has been adjusted to the luminosity and black hole mass of NGC 1068, we find that the expected accretion-disk flux in the K-band is negligible. Moreover, the

scenario of detecting the accretion disk through holes in a clumpy torus is extremely unlikely. We conclude that all current IR data of NGC 1068 trace the torus dust emission, favoring a clumpy torus.

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preprint available at http://arxiv.org/abs/0804.0236

J1420-0545: The Radio Galaxy Larger than 3C 236

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We report the discovery of the largest giant radio galaxy yet, J1420-0545: a FR type II radio source with an angular size of 17.4', identified with an optical galaxy at z=0.3067. Thus, the projected linear size of the radio structure is 4.69 Mpc (if we assume that H_0=71 km s^{-1} Mpc^{-1}, $\Omega_m = 0.27$, $\Omega_\Lambda = 0.73$). This makes it larger than 3C 236, which is the largest double radio source known to date. New radio observations with the 100 m Effelsberg telescope and the Giant Metrewave Radio Telescope, as well as optical identification with a host galaxy and its optical spectroscopy with the William Herschel Telescope, are reported. The spectrum of J1420-0545 is typical of elliptical galaxies in which continuum emission with the characteristic 4000 A discontinuity and the H and K absorption lines are dominated by evolved stars. The dynamical age of the source, its jets' power, the energy density, and the equipartition magnetic field are calculated and compared with the corresponding parameters of other giant and normal-sized radio galaxies from a comparison sample. The source is characterized by the exceptionally low density of the surrounding IGM and an unexpectedly high expansion speed of the source along the jet axis. All of these may suggest a large inhomogeneity of the IGM.

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preprint available at http://www.journals.uchicago.edu/doi/abs/10.1086/586703

Bulk Compton motion in the luminous quasar 4C04.42?

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We present the broadband analysis of the powerful quasar 4C04.42 (z=0.965) observed by *XMM-Newton* and *INTEGRAL*. The 0.2–200 keV spectrum is well reproduced with a hard power-law com ponent (Γ ∼1.2), augmented by a soft component below 2 keV (observer frame), wh ich is described by a thermal blackbody with temperature kT∼ 0.15 keV. Altern atively, a broken power-law with E_{break}=2 keV and $\Delta\Gamma$=0.4 can equally we ll describe the data. Using archival data we compile the not-simultaneous Spectral Energy Distribution of the source from radio to gamma-ray frequencies. The SED shows two main components: the low frequency one produced by Synchrotron radiation from the electrons moving in the jet and the high energy one produced through external Compton scattering of the electrons with the photon field of the Broad Line Region. Within this scenario the excess emission in the soft-X ray band can be interpreted as due to Bulk Compton radiation of cold electrons. However, some other processes, briefly discussed in the text, can also reproduce the o bserved bump.

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A circumnuclear disk of atomic hydrogen in Centaurus A

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We present new observations, performed with the Australia Telescope Compact Array, of the HI absorption in the central regions of Centaurus A. For the first time, absorption is detected against the radio core at velocities blueshifted with respect to the systemic velocity. Moreover, the data show that the nuclear redshifted absorption component is broader than reported before. With these new results, the kinematics of the HI in the inner regions of Cen A appears very similar to that observed in emission for the molecular circumnuclear disk. This suggests that the central HI absorption is not, as was previously claimed, evidence of gas infall into the AGN, but instead is due to a cold, circumnuclear disk.

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preprint available at http://arxiv.org/pdf/0805.1627v1

Multi-dimensional modelling of X-ray spectra for AGN accretion-disk outflows

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We use a multi-dimensional Monte Carlo code to compute X-ray spectra for a variety of active galactic nucleus (AGN) disk-wind outflow geometries. We focus on the formation of blue-shifted absorption features in the Fe K band and show that line features similar to those which have been reported in observations are often produced for lines-of-sight through disk-wind geometries. We also discuss the formation of other spectral features in highly ionized outflows. In particular we show that, for sufficiently high wind densities, moderately strong Fe K emission lines can form and that electron scattering in the flow may cause these lines to develop extended red wings. We illustrate the potential relevance of such models to the interpretation of real X-ray data by comparison with observations of a well-known AGN, Mrk 766.

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Accretion Disks and the Nature and Origin of AGN Continuum Variability

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Theory and observations of the dominant thermal continuum emission in AGNs are examined. After correction for reddening, the steady state AGN optical–UV spectral energy distributions (SEDs)are very similar. The SEDs are dominated energetically by the "big blue bump" (BBB), but this bump never shows the $\nu^{+1/3}$spectrum predicted for a standard thin accretion disk with a$r^{-0.75}$ radial temperature gradient. Instead, the observed optical–UV SED implies a temperature gradient of $r^{-0.57}$ independent of the thickness of the disk. This means that there is some flow of heat outwards in the disk. The disk is large and the region emitting the optical continuum is as large as the inner broad-line region (BLR). Because optical variability is seen in all AGNs on the light-crossing time of the BLR, variations must propagate at close to the speed of light, rather than on dynamical timescales. This argues that the energy-generation mechanism is electromagnetic rather that hydrodynamic. Since the velocities are near the speed of light, there can be significant local anisotropy in the emission. The large rapid variations of the BBB imply that the magnetohydrodynamic energy generation is fundamentally unstable. Because of the inevitable radial temperature gradient in the accreting material, *different spectral regions comepredominantly from different radii*, and variations in different spectral regions correspond to variability at different radii. This explains the frequently observed independence of X-ray and optical variations, cases of variability at lower energies leading variability at higher energies, and rapid changes in emission-line reverberation lags. Some observational tests of the local variability hypothesis are proposed.

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preprint available at http://arxiv.org/pdf/0711.2113

On the peculiar properties of the narrow-line quasar PG 1543+489

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We present the analysis of four XMM-*Newton* observations of the narrow-line quasar PG 1543+489 at z=0.400 carried out over a rest-frame time-scale of about three years. The X-ray spectrum is characterized by a broad, relativistic iron K_α emission line and a steep photon index, which can be both explained by a ionized reflection model, where the source of X-ray photons is presumably very close to the black hole. If this were the case, strong light-bending effects are expected, and actually they provide the most plausible explanation for the large equivalent width (EW=3.1$\pm$0.8 keV in the source rest frame) of the iron line. Although the light-bending model provides a good description of the X-ray data of PG 1543+489, it is not possible to rule out an absorption model, where obscuring matter partially covers the X-ray source. However, the apparent lack of variations in the properties of the absorber over the time-scale probed by our observations may indicate that this model is less likely.

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The Toroidal Obscuration of Active Galactic Nuclei

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Observations give strong support for the unification scheme of active galactic nuclei. The scheme is premised on toroidal obscuration of the central engine by dusty clouds that are individually very optically thick. These lectures summarize the torus properties, describe the handling and implications of its clumpy nature and present speculations about its dynamic origin.

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New active galactic nuclei detected in ROSAT All Sky Survey galaxies – II. The complete dataset

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The ROSAT ALL Sky Survey Bright Source Catalogue (RASS-BSC) has been correlated with the Catalogue of Principal Galaxies (PGC) to identify new extragalactic counterparts. 550 reliable optical counterparts have been detected. However there existed no optical spectra for about 200 Active Galactic Nuclei (AGN) candidates before the ROSAT ALL Sky Survey (RASS) was been completed. We took optical spectra of 176 X-ray candidates and companions at ESO, Calar Alto observatory and McDonald observatory. When necessary we used a line profile decomposition to measure line fluxes, widths and centers to classify their type of activity. We discuss the redshift-, linewidth-, as well as optical and X-ray luminosity distribution of our ROSAT selected sample. 139 galaxies of our 166 X-ray counterparts have been identified as AGN with 93 being Seyfert 1 galaxies (61%). Eighteen of them (20%) are Narrow Line Seyfert 1 galaxies. 34 X-ray candidates (21%) are LINERs and only eight candidates (5%) are Seyfert 2. The ratio of the number of Seyfert 1 galaxies to Seyfert 2 galaxies is about 11/1. Optical surveys result in ratios of 1/1.4. The high fraction of detected Seyfert 1 galaxies is explained by the sensitivity of the ROSAT to soft X-rays which are heavily absorbed in type 2 AGN. Two X-ray candidates are HII-galaxies and 25 candidates (15%) show no signs of spectral activity. The AGN in our RASS selected sample exhibit slightly higher optical luminosities

($M_B = (-20.71 \pm 1.75)$ mag) and similar X-ray luminosities ($\log(L_X[\mathrm{erg\ s^{-1}}]) = 42.9 \pm 1.7$) compared to other AGN surveys. The Hα line width distribution (FWHM) of our newly identified ROSAT AGN sample is similar to the line widths distribution based on SDSS AGN. However, our newly identified RASS AGN have rather reddish colors explaining why they have not been detected before in ultraviolet or blue excess surveys.

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Faraday rotation and polarization gradients in the jet of 3C 120: Interaction with the external medium and a helical magnetic field?

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We present a sequence of 12 monthly polarimetric 15, 22, and 43 GHz VLBA observations of the radio galaxy 3C 120 revealing a systematic presence of gradients in Faraday rotation and degree of polarization across and along the jet. The degree of polarization increases with distance from the core and toward the jet edges, and has an asymmetric profile in which the northern side of the jet is more highly polarized. The Faraday rotation measure is also stratified across the jet width, with larger values for the southern side. We find a localized region of high Faraday rotation measure superposed on this structure between approximately 3 and 4 mas from the core, with a peak of ~ 6000 rad m^{-2}. Interaction of the jet with the external medium or a cloud would explain the confined region of enhanced Faraday rotation, as well as the stratification in degree of polarization and the flaring of superluminal knots when crossing this region. The data are also consistent with a helical field in a two-fluid jet model, consisting of an inner, emitting jet and a sheath containing nonrelativistic electrons. However, this helical magnetic field model cannot by itself explain the localized region of enhanced Faraday rotation. The polarization electric vectors, predominantly perpendicular to the jet axis once corrected for Faraday rotation, require a dominant component parallel to the jet axis (in the frame of the emitting plasma) for the magnetic field in the emitting region.

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