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

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.

Please note that the web & email addresses for the Active Galaxies Newsletter has changed.

THE NEW EMAIL ADDRESS IS: agnews@manchester.ac.uk

THE WEB-PAGE ADDRESS IS: http://www.manchester.ac.uk/jodrellbank/~agnews

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

An Atlas of the Circumnuclear Regions of 75 Seyfert Galaxies in the near-ultraviolet with the Hubble Space Telescope Advanced Camera for Surveys

Víctor M. Muñoz Marín[1], Rosa M. González Delgado[1], Henrique R. Schmitt[2], Roberto Cid Fernandes[3], Enrique Pérez[1], Thaisa Storchi-Bergmann[4], Tim Heckman[5], and Claus Leitherer[6]

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We present an atlas of the central regions of 75 Seyfert galaxies imaged in the near-UV with the Advanced Camera for Surveys of the *Hubble Space Telescope* at an average resolution of $\sim$10 pc. These data complement archival high-resolution data from the *Hubble Space Telescope* at optical and near-IR wavelengths, creating an extremely valuable data set for astronomers with a broad range of scientific interests. Our goal is to investigate the nature of the near-UV light in these objects, its relation to the circumnuclear starburst phenomenon, and the connection of this to the evolution and growth of the galaxy bulge and central black hole. In this paper, we describe the near-UV morphology of the objects and characterize the near-UV emission. We estimate the size and the luminosity of the emitting regions and extract the luminosity profile. We also determine the presence of unresolved compact nuclei. In addition, the circumnuclear stellar cluster population is identified, and the contribution of the stellar clusters to the total light, at this wavelength, is estimated. The size of the sample allows us to draw robust statistical conclusions. We find that Seyfert 1 galaxies (Sy1's) are completely dominated by their bright and compact nuclei, which remains point-like at this resolution, while we find almost no unresolved nuclei in Seyfert 2 galaxies (Sy2's). The Seyfert types 1 and 2 are quite segregated in an asymmetry versus compactness plot. Stellar clusters are found somewhat more frequently in Sy2's (in ∼70% of the galaxies) than in Sy1's (∼57%), and contribute more to the total light in Sy2's, but these two differences seem to be mostly due to the large contribution of the compact nuclei in Sy1's, as the luminosity distribution of the clusters is similar in both Seyfert types.

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Preprint available at http://arxiv.org/abs/0704.3617
Preprint and whole set of figures available at http://www.iaa.es/∼manuel/publications/paper01.html

Hubble Space Telescope far-ultraviolet imaging of the jet in 3C 273: a common emission component from optical to X-rays

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We present far-ultraviolet (UV) observations at ~ 150 nm of the jet of the quasar 3C 273 obtained with the Advanced Camera for Survey's Solar Blind Channel (ACS/SBC) on board the *Hubble Space Telescope*. While the jet morphology is very similar to that in the optical and near-ultraviolet, the spectral energy distributions (SEDs) of the jet's sub-regions show an upturn in νf_ν at 150 nm compared to 300 nm everywhere in the jet. Moreover, the 150 nm flux is compatible with extrapolating the X-ray power-law down to the ultra-violet region. This constitutes strong support for a common origin of the jet's far-UV and X-ray emission. It implies that even a substantial fraction of the *visible light* in the X-ray brightest parts of the jet arises from the same spectral component as the X-rays, as had been suggested earlier based on *Spitzer Space Telescope* observations. We argue that the identification of this UV/X-ray component opens up the possibility to establish the synchrotron origin of the X-ray emission by *optical* polarimetry.

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Preprint available at http://arXiv.org/abs/0706.2564

Radio Through X-ray Spectral Energy Distributions of 38 Broad Absorption Line Quasars

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We have compiled the largest sample of multiwavelength spectral energy distributions (SEDs) of Broad Absorption Line (BAL) quasars to date, from the radio to the X-ray. We present new *Spitzer* MIPS (24, 70, and 160 μm) observations of 38 BAL quasars in addition to data from the literature and public archives. In general, the mid-infrared properties of BAL quasars are consistent with those of non-BAL quasars of comparable luminosity. In particular, the optical-to-mid-infrared luminosity ratios of the two populations are indistinguishable. We also measure or place upper limits on the contribution of star formation to the far-infrared power. Of 22 (57%) upper limits, seven quasars have sufficiently sensitive constraints to conclude that star formation likely contributes little ($< 20\%$) to their far-infrared power. The 17 BAL quasars (45%) with detected excess far-infrared emission likely host hyperluminous starbursts with $L_{\rm fir,SF} = 10^{13-14}\ L_\odot$. Mid-infrared through X-ray composite BAL quasar SEDs are presented, incorporating all of the available photometry. Overall, we find no compelling evidence for inherent differences between the SEDs of BAL vs. non-BAL quasars of comparable luminosity. Therefore a "cocoon" picture of a typical BAL quasar outflow whereby the wind covers a large fraction of the sky is not supported by the mid-infrared SED comparison with normal quasars, and the disk-wind paradigm with a typical radio-quiet quasar hosting a BAL region remains viable.

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preprint available at http://arxiv.org/abs/0705.0538

Spitzer Quasar and ULIRG Evolution Study (QUEST): II. The Spectral Energy Distributions of Palomar-Green Quasars

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This is the second paper studying the QSOs in the *spitzer* QUEST sample. Previously we presented new PAH measurements and argued that most of the observed far infrared (FIR) radiation is due to star-forming activity. Here we present spectral energy distributions (SEDs) by supplementing our data with optical, NIR and FIR observations. We define two sub-groups of "weak FIR" and "strong FIR" QSOs, and a third group of FIR non-detections. Assuming a starburst origin for the FIR, we obtain "intrinsic" AGN SEDs by subtracting a starburst template from the mean SEDs. The resulting SEDs are remarkably similar for all groups. They show three distinct peaks corresponding to two silicate emission features and a 3μm bump that we interpret as the signature of the hottest AGN dust. They also display drops beyond $\sim 20\mu$m that we interpret as the signature of the minimum temperature (~ 200 K) dust. This component must be optically thin to explain the silicate emission and the slope of the long wavelength continuum. We discuss the merits of an alternative model where most of the FIR emission is due to AGN heating. Such models are unlikely to explain the properties of our QSOs but they cannot be ruled out for more luminous objects. We also find correlations between the luminosity at 5100Å and two infrared starburst indicators: L(60μm) and L(PAH 7.7μm). The correlation of L(5100Å) with L(60μm) can be used to measure the relative growth rates and lifetimes of the black hole and the new stars.

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Unveiling the broad band X-ray continuum and iron line complex in Mkr 841

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Mkr 841 is a bright Seyfert 1 galaxy known to harbor a strong soft excess and a variable Kα iron line. Historical UV, X and γ-rays observations show clear variation of its spectrum in flux and in shape on a monthly time scale.

Mkr 841 has been observed during 3 different periods (January 2001, January 2005 and July 2005) by XMM-*Newton* for a total cumulated exposure time of ∼108 ks. We present in this paper a broad band spectral analysis of the complete EPIC-pn data sets. These are the best observations so far for the study of the soft excess and iron line complex in this source.

We use different methods of data analysis including model-independent methods (spectral ratios, RMS, ...) as well as model fitting. We were able to test two different models for the soft excess, a relativistically blurred photoionizen reflection (REF model) and a relativistically smeared ionized absorption (ABS model). The continuum is modeled by a simple cut-off power law and we also add a neutral reflection.

These observations confirm the presence of a soft excess and iron line and reveal extreme and puzzling spectral and temporal behaviors. The 0.5-3 keV soft X-ray flux decreases by a factor 3 between 2001 and 2005 and the line shape appears to be a mixture of broad and narrow components, the former being variable on small (ks) time scale while the later is consistent with being constant. The 2-10 keV spectrum also hardens between 2001 and 2005. We succeed in describing this complex broad-band 0.5-10 keV spectral variability using either REF or ABS to fit the soft excess. Both models give statistically equivalent results even including simultaneous *Beppo*SAX data up to 200 keV. Both models are consistent with the presence of remote reflection characterized by a constant narrow component in the data. However they differ in the presence of a broad line component present in REF but not needed in ABS. Consequently the physical interpretation of the line profile variability is quite different, resulting from the variability of the broad line component in REF and from the variability of the absorbing medium in ABS.

This study also reveals the sporadic presence of relativistically redshifted narrow iron lines, one of them being detected at 4.8 keV in the EPIC-pn instruments at more than 98.5% confidence level. If interpreted as the blue horn of a relativistically distorted neutral iron line, the large redshift implies the presence of a Kerr black hole.

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First Measurement of a Rapid Increase in the AGN Fraction in High-Redshift Clusters of Galaxies

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We present the first measurement of the AGN fraction in high-redshift clusters of galaxies ($z \sim 0.6$) with spectroscopy of one cluster and archival data for three additional clusters. We identify 8 AGN in all four of these clusters from the *Chandra* data, which are sensitive to AGN with hard X-ray (2-10keV) luminosity $L_{X,H} > 10^{43}$ erg s^{-1} in host galaxies more luminous than a rest frame $M_R < -20$ mag. This stands in sharp contrast to the one AGN with $L_{X,H} > 10^{43}$ erg s^{-1} we discovered in our earlier study of eight low-redshift clusters with $z = 0.06 \rightarrow 0.31 (\bar{z} \sim 0.2)$. Three of the four high-redshift cluster datasets are sensitive to nearly $L_{X,H} > 10^{42}$ erg s^{-1} and we identify seven AGN above this luminosity limit, compared to two in eight, low-redshift clusters. Based on membership estimates for each cluster, we determine that the AGN fraction at $z \sim 0.6$ is $f_A(L_X > 10^{42}; M_R < -20) = 0.028^{+0.019}_{-0.012}$ and $f_A(L_X > 10^{43}; M_R < -20) = 0.020^{+0.012}_{-0.008}$. These values are approximately a factor of 20 greater than the AGN fractions in lower-redshift ($\bar{z} \sim 0.2$) clusters of galaxies and represent a substantial increase over the factors of 1.5 and 3.3 increase, respectively, in the measured space density evolution of the hard X-ray luminosity function over this redshift range. Potential systematic errors would only increase the significance of our result. The cluster AGN fraction increases more rapidly with redshift than the field and the increase in cluster AGN indicates the presence of an AGN Butcher-Oemler Effect.

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On the Effects of Dissipative Turbulence on the Narrow Emission-Line Ratios in Seyfert Galaxies

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We present a photoionization model study of the effects of micro-turbulence and dissipative heating on emission lines for number and column densities, elemental abundances, and ionizations typical for the narrow emission line regions (NLRs) of Seyfert galaxies. Earlier studies of NLR spectra generally found good agreement between the observations and the model predictions for most strong emission lines, such as [O III] $\lambda5007$, [O II] $\lambda3727$, [N II] $\lambda6583$, [Ne III] $\lambda3869$, and the H and He recombination lines. Nevertheless, the strengths of lines from species with ionization potentials greater than that of He^{+}(54.4 eV), e.g. N^{+4} and Ne^{+4}, were often under-predicted. Among the explanations suggested for these discrepancies were (selectively) enhanced elemental abundances and contributions from shock heated gas. Interestingly, the NLR lines have widths of several 100 km s^{-1}, well in excess of the thermal broadening. If this is due to micro-turbulence, and the turbulence dissipates within the emission-line gas, the gas can be heated in excess of that due to photoionization. We show that the combined effects of turbulence and dissipative heating can strongly enhance N V $\lambda1240$ (relative to He II $\lambda1640$), while the heating alone can boost the strength of [Ne V] $\lambda3426$. We suggest that this effect is present in the NLR, particularly within $\sim$ 100 pc of the central engine. Finally, since micro-turbulence would make clouds robust against instabilities generated during acceleration, it is not likely to be a coincidence that the radially outflowing emission-line gas is turbulent.

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Using VO tools to investigate distant radio starbursts hosting obscured AGN in the HDF(N) region

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Context: A 10-arcmin region around the Hubble Deep Field (North) contains 92 radio sources brighter than 40 μJy which are well-resolved by MERLIN+VLA at $0.''2$-$2''$ resolution (average size $\sim 1''$). 55 of these have *Chandra* X-ray counterparts in the 2-Ms CDF(N) field including at least 17 with a hard X-ray photon index and high luminosity characteristic of a type-II (obscured) AGN. More than 70% of the radio sources have been classified as starbursts or AGN using radio morphologies, spectral indices and comparisons with optical appearance and rest-frame MIR emission. On this basis, starbursts outnumber radio AGN 3:1.
Aims: We investigate the possibility that very luminous radio and X-ray emission originates from different phenomena in the same high-redshift galaxies.
Methods: This study extends the Virtual Observatory (VO) methods previously used to identify X-ray-selected obscured type-II AGN, to examine the relationship between radio and X-ray emission. We describe a VO cut-out server for MERLIN+VLA 1.4-GHz radio images in the HDF(N) region.
Results: The high-redshift starbursts have typical sizes of 5–10 kpc and star formation rates of $\sim$ 1000 $M_\odot$ yr^{-1}, an order of magnitude more extended and intense than in the local universe. There is no obvious correlation between radio and X-ray luminosities nor spectral indices at $z \gtrsim 1.3$. About 70% of both the radio-selected AGN and the starburst samples were detected by *Chandra*. The X-ray luminosity indicates the presence of an AGN in at least half of the 45 cross-matched radio starbursts. Eleven of these are type-II AGN, of which 7 are at $z \geq 1.5$. This distribution overlaps closely with the X-ray detected radio sources which were also detected by SCUBA. In contrast, all but one of the AGN-dominated radio sources are at $z < 1.5$, including the 4 which are also X-ray selected type-II AGN. The stacked 1.4-GHz emission at the positions of radio-faint X-ray sources is correlated with X-ray hardness.

Conclusions: Almost all extended radio starbursts at $z > 1.3$ host X-ray selected obscured AGN. The radio emission from most of these ultra-luminous objects is dominated by star formation although the highest redshift ($z = 4.424$) source has a substantial AGN contribution. Star-formation appears to contribute less than 1/3 of their X-ray luminosity. Our results support the inferences from SCUBA and IR data, that at $z \gtrsim 1.5$, star formation is observably more extended and more copious, it is closely linked to AGN activity and it is triggered differently, compared with star formation at lower redshifts.

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preprint available at http://uk.arxiv.org/abs/0706.3777

OH main line masers in the M82 starburst

M. K. Argo, A. Pedlar, R. J. Beswick & T. W. B. Muxlow

A study of the distribution of OH gas in the central region of the nearby active starburst galaxy M82 has confirmed two previously known bright masers and revealed several new main line masers. Three of these are seen only at 1665 MHz, one is detected only at 1667 MHz, while the rest are detected in both lines. Observations covering both the 1665 and 1667 MHz lines, conducted with both the Very Large Array (VLA) and the Multi-Element Radio Linked Interferometer Network (MERLIN), have been used to accurately measure the positions and velocities of these features. This has allowed a comparison with catalogued continuum features in the starburst such as HII regions and supernova remnants, as well as known water and satellite line OH masers. Most of the main line masers appear to be associated with known HII regions although the two detected only at 1665 MHz are seen along the same line of sight as known supernova remnants.

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preprint available at http://uk.arxiv.org/abs/0706.1149

Meetings

FROM PLANETS TO DARK ENERGY: THE MODERN RADIO UNIVERSE
The University of Manchester, UK
October 1-5, 2007

Webpage: `http://www.jb.man.ac.uk/mru2007/`
Email: `mru2007@jb.man.ac.uk`

Dear colleagues,

This is the third announcement of the conference "From Planets to Dark Energy: the Modern Radio Universe", organised by the University of Manchester and to be held October 1st-5th 2007 in Manchester, UK.

Further information can be found at the conference website:

THE DEADLINE FOR REGISTRATION AND SUBMISSION OF ABSTRACTS IS
15th JULY 2007
- further information can be found on the conference website.

Also **PLEASE MAKE YOUR HOTEL RESERVATIONS BEFORE JULY 31st**

REGISTRATION & ABSTRACT SUBMISSION FOR MRU2007:

Registration and abstract submission is now open. Please register using the on-line registration form available at:

`http://www.jb.man.ac.uk/mru2007/`

Until July 15th the conference fee will be 250GBP. The late registration fee will be 300GBP. This fee will cover the costs of the conference, the publication of proceedings and the participation of delegates at the 50th anniversary celebrations of the first observations of the Lovell Telescope at Jodrell Bank Observatory.

The final deadline for abstracts will be **July 15th 2007**. The Scientific Organising Committee will select the speakers based upon a review of all abstracts received, and will choose the presentations for the oral and poster sessions.

The size of this conference is strictly limited by the conference venue to 200 delegates. Only full registration will guarantee attendance, so we urge you to register soon.

50th ANNIVERSARY CELEBRATIONS:

On October 4th delegates are invited to a celebration of the 50th Anniversary of the Lovell Telescope at the Jodrell Bank Observatory.

Buses will depart late morning to take visitors to the site, where they will be welcomed by Professor Phil Diamond, Director of the Jodrell Bank Centre for Astrophysics. Short speeches will then be given by Professor Alan Gilbert, President and Vice Chancellor of the University of Manchester; Malcolm Wicks, the UK Science Minister; Professor Keith Mason, Chief Exec of STFC, His Excellency the Russian Ambassador and Sir Bernard Lovell. After lunch, guests will be given tours of the Observatory and the Lovell Telescope. At the end of the afternoon the 2007 Grote Reber Gold Medal will be presented to Professor Govind Swarup by Professor Lord Rees, President of the Royal Society.

VENUE & ACCOMMODATION:

The conference will be held in the University of Manchester's conference venue, the Weston Building, which is situated in city centre of Manchester. Manchester itself is a vibrant city with ample attractions and amenities for all visitors.

We have arranged block bookings of rooms for the duration of the meeting at the conference venue itself and at several other nearby hotels. All of these hotels are within a short walk of the conference venue. On booking accommodation please mention 'Jodrell Bank'.

Further information regarding the venue for the conference as well as specific details regarding the venue and accommodation is available on the conference website.

PLEASE MAKE YOUR HOTEL RESERVATIONS BEFORE JULY 31st

CONFERENCE PROGRAM:

A preliminary outline of the science sessions is now available on the website. The conference week will be split into 16 science sessions. Each session will focus upon the SKA key science themes, around which the conference is based, and will include review, invited and contributory presentations. These sessions will include:

- Future Instruments : SKA, ELTs, ALMA
- The Dark Ages
- Transients
- Gravity
- Galaxies/Dark Energy
- The Cradle of Life
- Cosmic Magnetism
- Discovery Space

The full program will be published in August following the registration deadline and the submission of all abstracts.

ASSOCIATED MEETINGS:

In addition to the main 'Modern Radio Universe' conference three related satellite meetings will be held in Manchester. Further information regarding each of these meetings is linked from the main conference webpage (under 'other meetings').

1) Between 27-29th September, prior to the main meeting, a SKA workshop will be held in Manchester.

`http://www.jb.man.ac.uk/ska2007/`

2) On the evening of Monday 1st October, during the conference, an e-MERLIN Legacy project meeting will be held at the conference venue. All conference delegates are cordially invited to attend this additional meeting. Further details, including registration, for this evening meeting are linked from the main conference website.

`http://www.merlin.ac.uk/eMERLIN-LegacyProg.pdf`

3) The International SKA Steering Committee will meet at the Jodrell Bank Centre for Astrophysics following the meeting on 6-7th October 2007.

`http://www.jb.man.ac.uk/issc18/`

Could all delegates who are attending any of these meetings, in addition to the MRU2007 conference, please register their attendance with each meeting and ensure that they have booked accommodation for the full duration of their stay in Manchester.

IMPORTANT DATES:

- November 17 2006: First announcement
- February 15 2007: Second announcement; Registration open
- June 27 2007: Third and Final announcement
- July 15 2007: Registration and Abstract submission deadline
- August 2007: Final Conference Programme
- September 30 2007: Welcome reception
- October 1 2007: Conference Starts
- October 5 2007: Conference Ends

The Active Galaxies Newsletter is available on the World Wide Web. You can access it via the University of Manchester home page :- http://www.manchester.ac.uk/jodrellbank/∼agnews
If you move or your e-mail address changes, please send the editor your new address. If the Newsletter repeatedly bounces back from an address then that address is deleted from the mailing list.