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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

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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

The XMM-Newton view of IRAS 09104+4109: evidence for a changing-look Type 2 quasar?

E. Piconcelli[1], F. Fiore[1], F. Nicastro[1,2], S. Mathur[3], M. Brusa[4], A. Comastri[5], S. Puccetti[6]

[1] Osservatorio Astronomico di Roma (INAF), Via Frascati 33, I–00040 Monteporzio Catone (Roma), Italy
[2] Harvard-Smithsonian Center for Astrophysics, 60 Garden Street, Cambridge, MA 02138, USA
[3] Ohio State University, 140 West 18th Avenue, Columbus, OH 43210, USA
[4] Max Planck Institut für Extraterrestrische Physik, Postfach 1312, D-85741 Garching bei München, Germany
[5] Osservatorio Astronomico di Bologna (INAF), via Ranzani 1, I–40127 Bologna, Italy
[6] ASI Science Data Center, ESRIN, via G. Galilei, I–00044 Frascati, Italy

We report on a 14 ks XMM-Newton observation of the hyperluminous infrared galaxy IRAS 09104+4109, which harbors a Type 2 quasar in its nucleus. Our analysis was aimed at studying the properties of the absorbing matter and the Fe K complex at 6-7 keV in this source. We analyzed the spectroscopic data from the PN and the MOS cameras in the 0.4–10 keV band. We also used an archival BeppoSAX 1–50 keV observation of IRAS 09104+4109 to investigate possible variations of the quasar emission. The X-ray emission in the EPIC band is dominated by the intra-cluster medium thermal emission. We found that the quasar contributes ∼35% of the total flux in the 2-10 keV band. Both a transmission- (through a Compton-thin absorber with a Compton optical depth of $\tau_C \sim 0.3$, i.e. $N_H \sim 5 \times 10^{23}$ cm^{-2}) and a reflection-dominated ($\tau_C > 1$) model provide an excellent fit to the quasar continuum emission. However, the value measured for the EW of Fe Kα emission line is only marginally consistent with the presence of a Compton-thick absorber in a reflection-dominated scenario, which had been suggested by a previous, marginal (i.e. 2.5σ) detection with the hard X-ray (15–50 keV), non-imaging BeppoSAX/PDS instrument. Moreover, the value of luminosity in the 2–10 keV band measured by the transmission-dominated model is fully consistent with that expected on the basis of the bolometric luminosity of IRAS 09104+4109. From the analysis of the XMM-Newton data we therefore suggest the possibility that the absorber along the line of sight to the nucleus of IRAS 09104+4109 is Compton-thin. Alternatively, the absorber column density could have changed from Compton-thick to -thin in the five years elapsed between the observations. If this is the case, then IRAS 09104+4109 is the first "changing-look" quasar ever detected.

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E-mail contact: piconcelli[at]oa-roma.astro.it,
preprint available at http://it.arxiv.org/abs/0707.2465

Kinematics of the Broad Line Region in M81

Nick Devereux[1], Andrew Shearer[2]

[1] Embry-Riddle Aeronautical University, Prescott, AZ
[2] National University of Ireland,Galway

A new model is presented which explains the origin of the broad emission lines observed in the LINER/Seyfert nucleus of M81 in terms of a steady state spherically symmetric inflow, amounting to $\sim$1 x 10^{-5} $M_{\odot}$/yr, which is sufficient to explain the luminosity of the AGN. The emitting volume has an outer radius of $\sim$1 pc, making it the largest broad line region yet to be measured, and it contains a total mass of $\sim 5 \times 10^{-2}$ $M_{\odot}$ of dense, $\sim 10^8$ cm^{-3}, ionized gas, leading to a very low filling factor of $\sim$ 5 x 10^{-9}. The fact that the BLR in M81 is so large may explain why the AGN is unable to sustain the ionization seen there. Thus, the AGN in M81 is not simply a scaled down quasar.

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E-mail contact: devereux@erau.edu,
DRAFT is available at http://astronomy.pr.erau.edu/M81v4.pdf

The properties of the young stellar populations in powerful radio galaxies at low and intermediate redshifts

J. Holt[1], C. N. Tadhunter[1], R. M. González Delgado[2], K. J. Inskip[1], J. Rodriguez[1], B. H. C. Emonts[3], R. Morganti[4], K. A. Wills[1],

[1] Department of Physics and Astronomy, University of Sheffield, Sheffield, S3 7RH, UK.
[2] Instituto de Astrofisica de Andalucia (CISC), Apdto. 3004, 18080 Granada, Spain.
[3] Kapteyn Astronomical Institute, University of Groningen, P. O. Box 800, 9700 AV Groningen, The Netherlands.
[4] Netherlands Foundation for Research in Astronomy, Postbus 2, 7990 AA Dwingeloo, The Netherlands

We present high-quality, wide spectral coverage long-slit optical spectra for 12 powerful radio sources at low and intermediate redshifts ($z < 0.7$) that show evidence for a substantial UV excess. These data were taken using the WHT and VLT telescopes with the aim of determining the detailed properties of the young stellar populations (YSPs) in the host galaxies as part of a larger project to investigate evolutionary scenarios for the AGN host galaxies. The results of our spectral synthesis model fits to the spectra highlight the importance of taking into account AGN-related components (emission lines, nebular continuum, scattered light) and reddening of the stellar populations in studies of this type. It is also clear that careful examination of the fits to the spectra, as well consideration of auxilary polarimetric and imaging data, are required to avoid degeneracies in the model solutions. In 3 out of the 12 sources in our sample we find evidence for broad permitted line components, and a combination of AGN-related continuum components and an old (12.5 Gyr) stellar population provides an adequate fit to the data. However, for the remaining 9 sources we find strong evidence for YSPs. In contrast to some recent studies that suggest relatively old post-starburst ages for the YSPs in radio galaxies (0.3 – 2.5 Gyr), we deduce a wide range of ages for the YSPs in our sample objects (0.02 – 1.5 Gyr), with $\sim$50% of the sample showing evidence for young YSP ages ($\lesssim$0.1 Gyr) in their nuclear regions. The nuclear YSPs are often significantly reddened ($0.2 < E(B-V) < 1.4$) and make up a substantial fraction ($\sim$1 – 35%) of the total stellar mass in the regions sampled by the spectroscopic slits. Moreover, in all the cases in which we have sufficient spatial resolution we find that the UV excess is extended across the full measureable extent of the galaxy (typically 5 – 30 kpc), suggesting galaxy-wide starbursts. The implications for photometric and spectroscopic studies of active galaxies are discussed.

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E-mail contact: j.holt@sheffield.ac.uk,

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A 100 ks XMM-Newton view of the Seyfert 1.8 ESO 113-G010. Discovery of large X-ray variability and study of the Fe Kα line complex.

D. Porquet[1], P. Uttley[2], J. N. Reeves[3,4,5], A. Markowitz[3,4], S. Bianchi[6], N. Grosso[1], L. Miller[7], S. Deluit[8], I. M. George[9]

[1] Observatoire Astronomique de Strabsourg, Université Louis Pasteur, CNRS, 11 rue de l'Université, 67000 Strasbourg, France
[2] School of Physics and Astronomy, University of Southampton, Southampton SO17 1BJ, UK
[3] Laboratory for High Energy Astrophysics, Code 662, NASA Goddard Space Flight Center, Greenbelt, MD 20771, USA
[4] Dept. of Physics and Astronomy, Johns Hopkins University, 3400 North Charles Street, Baltimore, MD 21218, USA
[5] Astronomy Group, School of Geographical and Physical Sciences, University of Keele, Keele, Staffordshire, ST5 5BG, UK
[6] Dipartimento di Fisica, Università degli Studi Roma Tre, via della Vasca Navale 84, 00146 Roma, Italy
[7] Dept. of Physics, University of Oxford, Denys Wilkinson Building, Keble Road, Oxford OX1 3RH, UK
[8] Centre d'Etude-Spatiale des Rayonnements, 9 Avenue du Colonel Roche, BP 4346, 31028 Toulouse Cedex 4, France
[9] Dept. of Physics, University of Maryland Baltimore County, 1000 Hilltop Circle, Baltimore, MD 21250, USA

The Seyfert 1.8 galaxy ESO 113-G010 had been observed for the first time above 2 keV by XMM-Newton during a short exposure (∼4 ks) in May 2001. In addition to a significant soft X-ray excess, it showed one of the strongest (in EW) redshifted Fe Kα lines, at 5.4 keV. We present here a long (100 ks) XMM-Newton follow-up of this source performed in November 2005, in order to study over a longer time-scale its main X-ray properties. We use both timing analysis (Power Spectra Density analysis, rms spectra, flux-flux analysis) and spectral analysis which mainly focuses on the Fe Kα line complex. The source was found in a higher/softer time-averaged flux state, and timing analysis of this source reveals strong, rapid variability. The Power Spectral Density (PSD) analysis indicates (at 95% confidence level) a break at $3.7^{+1.0}_{-1.7} \times 10^{-4}$ Hz. This cut-off frequency is comparable to those measured in some other rapidly-variable Seyferts, such as MCG–6-30-15 and NGC 4051. From the mass-luminosity-time-scale, we infer that $M_{\rm BH}$ ranges from 4×10^{6}–10^{7} $M_{\odot}$ and the source is accreting at or close to the Eddington rate (or even higher). The existing data cannot distinguish between spectral pivoting of the continuum and a two-component origin for the spectral softening, primarily because the data do not span a broad enough flux range. In the case of the two-component model, the fractional offsets measured in the flux-flux plots increase significantly toward higher energies (similar to what is observed in MCG–6-30-15) as expected if there exists a constant reflection component. Contrary to May 2001, no significant highly redshifted emission line is observed (which might be related to the source flux level), while two narrow emission lines at about 6.5 keV and 7 keV are observed. The S/N is not high enough to establish if the lines are variable or constant. As already suggested by the 2001 observation, no significant constant narrow 6.4 keV Fe Kα line (EW≤32 eV) is observed, hence excluding any dominant emission from distant cold matter such as a torus in this Seyfert type 1.8 galaxy.

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E-mail contact: porquet@astro.u-strasbg.fr,
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Black-Hole Mass and Growth Rate at High Redshift

Hagai Netzer[1], Paulina Lira[2], Benny Trakhtenbrot[1], Ohad Shemmer[3], and Iara Cury[4]

[1] School of Physics and Astronomy and the Wise Observatory, The Raymond and Beverly Sackler Faculty of Exact Sciences, Tel-Aviv University, Tel-Aviv 69978, Israel
[2] Departamento de Astronomía, Universidad de Chile, Camino del Observatorio 1515, Santiago, Chile
[3] Department of Astronomy and Astrophysics, 525 Davey Laboratory, Pennsylvania State University, University Park, PA 16802, USA
[4] Astronomy Department Yale University, P.O. Box 208101, New Haven, CT 06520-8101, USA

We present new H and K bands spectroscopy of 15 high luminosity active galactic nuclei (AGNs) at redshifts 2.3–3.4 obtained on Gemini South. We combined the data with spectra of additional 29 high-luminosity sources to obtain a sample with $10^{45.2} < \lambda L_{\lambda}(5100\text{Å}) < 10^{47.3}$ ergs s^{-1} and black hole (BH) mass range, using reverberation mapping relationships based on the Hβ method, of $10^{8.8} - 10^{10.7}$ $M_{\odot}$. We do not find a correlation of $L/L_{\rm Edd}$ with $M_{\rm BH}$ but find a correlation with $\lambda L_{\lambda}(5100\text{Å})$ which might be due to selection effects. The $L/L_{\rm Edd}$ distribution is broad and covers the range ∼0.07–1.6, similar to what is observed in lower redshift, lower luminosity AGNs. We suggest that this consistently measured and calibrated sample gives the best representation of $L/L_{\rm Edd}$ at those redshifts and note potential discrepancies with recent theoretical and observational studies. The lower accretion rates are not in accord with growth scenarios for BHs at such redshifts and the growth times of many of the sources are longer than the age of the universe at the corresponding epochs. This suggests earlier episodes of faster growth at $z \gtrsim 3$ for those sources. The use of the C IV λ1549 method gives considerably different results and a larger scatter;

this method seems to be a poor $M_{\rm BH}$ and $L/L_{\rm Edd}$ estimator at very high luminosity.

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E-mail contact: netzer@wise.tau.ac.il,
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Probing Unification With Chandra HETGS and XMM-Newton EPIC And RGS Spectroscopy of the Narrow Emission Line Galaxy NGC 2110

Daniel A. Evans[1], **Julia C. Lee**[1], **T. Jane Turner**[2,3], **Kimberly A. Weaver**[2], **and Herman L. Marshall**[4]

[1] Harvard-Smithsonian Center for Astrophysics, 60 Garden Street, Cambridge, MA 02138
[2] NASA Goddard Space Flight Center, Code 662, Greenbelt, MD 20771
[3] Dept. of Physics, University of Maryland Baltimore County, 1000 Hilltop Circle, Baltimore, MD 21250
[4] MIT Kavli Institute for Astrophysics and Space Research, 77 Massachusetts Avenue, NE 80, Cambridge, MA 02139

We present results from Chandra HETGS (250 ks over two epochs) and XMM-Newton EPIC and RGS (60 ks) observations of NGC 2110, which has been historically classified as a Narrow Emission Line Galaxy galaxy. Our results support the interpretation that the source is a Seyfert 2 viewed through a patchy absorber. The nuclear X-ray spectrum of the source is best described by a power law of photon index $\Gamma \sim 1.7$, modified by absorption from multiple layers of neutral material at a large distance from the central supermassive black hole. We report the strong detections of Fe Kα and Si Kα lines, which are marginally resolved with the Chandra HETGS, and we constrain the emission radius of the fluorescing material to > 1 pc. There is some evidence for modest additional broadening at the base of the narrow Fe Kα core with a velocity $\sim$ 4500 km s^{-1}. We find tentative evidence for ionized emission (O VIII Ly α, an O VIII RRC feature, and possibly a Ne IX forbidden line) in the Chandra MEG and XMM-Newton RGS spectra, which could be associated with the known extended X-ray emission that lies $\sim$160 pc from the nucleus. We suggest that the 10^{23} cm^{-2} partially covering absorber originates in broad-line region clouds in the vicinity of the AGN, and that the 3×10^{22} cm^{-2} coverer is likely to have a more distant origin and have a flattened geometry in order to allow the small-scale radio jet to escape.

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E-mail contact: devans@cfa.harvard.edu,
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