70.02

A Search for a Hidden Broad Line Region in Cygnus A

J. S. Miller and H. D. Tran (UCO/Lick Observatory)

It has been suggested that the powerful radio galaxy Cygnus A is actually a quasar whose active nucleus is obscured from our viewing direction (Barthel, ApJ, 336, 606, 1989). Imaging polarimetry by Tadhunter et al. (MNRAS, 246, 163, 1990) gives evidence that optical light in the two lobes is reflected light from a hidden central source. We have carried out spectrophotometry and spectropolarimetry of the south-east lobe with the Lick Observatory 3-m telescope. We find evidence that indeed reflected light is present, but we find no evidence of broad emission lines in the polarized flux which would establish the existence of an embedded quasar.

70.03

1213+350 – The Smallest Gravitational Lens or a New Class of Radio-Loud Active Galaxy?

W. Xu, A.C.S. Readhead, T.J. Pearson (Caltech), P.N. Wilkinson, A. Polatidis (NRAL, Jodrell Bank)

We have observed the quasar 1213+350 ($z = 0.851$) as part of the Caltech–Jodrell Survey (Xu *et al.* 1992, BAAS, 24, 1300) at frequencies 1.6 GHz, 5 GHz, 8.4 GHz and 15 GHz. The three lower-frequency maps all show two components, separated by 37 milliarcsec, having very similar spectral indices. The 1.6 GHz and 5 GHz maps show, in addition, that each of these components comprises a compact core and a weak jet. The symmetry of the objects is such that these could be images due to gravitational lensing of the quasar. The overall spectrum flattens between 8 GHz and 15 GHz so that 15 GHz observations (which are now being analyzed) should reveal whether each of the candidate "images" contains a flat-spectrum compact component – which would be strong evidence for lensing. If 1213+350 is lensed, this will be the smallest gravitational lense by a factor ten, implying a lensing mass of around $10^8 M_\odot$.

The flux-density ratio in the two "images" is 30 : 1, so that this is a rather unlikely configuration for a lensed system, given the number of objects searched. If this is not a lensed system, then it must either be a system with two centers of activity or a system in which a compact component is observed on the side of the center of activity opposite the jet – a unique configuration.

Whichever explanation pertains, it is clear that 1213+350 is a most unusual object which will merit much study.

70.04

Characteristics of the Background Source in MG1131+0456, an Einstein Ring Gravitational Lens System

Grace H. Chen and Jacqueline N. Hewitt (MIT)

The Einstein ring gravitational lens has been studied with the VLA at 5, 8, 15, and 22 GHz. The new data at 15 and 22 GHz indicates that the spectra of the two compact components are flat. This suggests that the two compact components are images of the radio core of an extragalactic radio source, so the possibility of variability in MG1131+045 should not be excluded. Faraday rotation and depolarization ratios across the image are computed from the linearly polarized emission detected at 5 and 8 GHz. We find an asymmetry in the depolarization. The variations in the depolarization can be reconstructed by a model consisting of a lens with an elliptical gravitational potential and a radio source with a core, one-sided jet, and two extended radio lobes.

70.05

The nuclear Disk of NGC 4261: HST Images and WHT Spectra

L.Ferrarese, H.C.Ford (JHU, STScI), W.Jaffe, F. van den Bosch (Leiden Observatory), R.W.O'Connell (University of Virginia)

The properties of the nuclear region of the elliptical galaxy NGC4261 have been studied using high resolution HST Planetary Camera images and La Palma WHT spectra. The images of NGC 4261 where obtained with the F555W filter during a survey of a complete sample of elliptical galaxies in the Virgo cluster (Jaffe *et al.* 1993) and reveal a sharply defined elliptical disk centered on the photometrical centre of the galaxy and on the faint (m_V = 23.6) unresolved optical nucleus. Assuming that the disk is intrinsically circular, the plane of the disk is inclined 64° to the plane of the sky. The apparent size of the major axis of the disk, 1".71, corresponds to $\sim$ 120 pc at the distance of the Virgo cluster (14.7 Mpc, Jacoby *et al.* 1990). Our analysis shows that the disk is physically thin ($\leq$ 10 pc) and optically thick ($\tau \sim 0.8$).
The ground-based spectra show strong Hα, [SII] and [NII] emission lines with narrow cores and unusually broad bases. The broad emission lines are symmetrical and have a mean velocity equal to the galaxy systemic velocity, which suggests that the broad wings may be caused by the rotation of ionized gas in the inner parts of the the disk. For central masses of $10^7 \rightarrow 10^8 M_\odot$ the high velocity material which causes the broad wings would be orbiting at radii of $0.03 \rightarrow 0.3$ pc from the center. Furthermore, the hypothesis that NGC4261 harbours a massive compact central object is suggested by the fact that the galaxy has an active nucleus which produces a bright bi-direction radio jet and double lobed radio source (Birkinshaw and Davies, 1985; Jaffe and McNamara, 1993). The rotation curve derived from the narrow [NII] λ 6584 emission is successfully reproduced by adding a central point mass of 4×10^7 $M_\odot$ to the potential of the exponential stellar distribution derived from the luminosity profile for a constant M/L_B=5 and to the (insignificant) potential of the disk with M = 10^6 $M_\odot$. We conclude that the rotation curve for NGC 4261 is consistent with the presence of a central black hole with a mass between $10^{7.4}$ $M_\odot$ and $10^{7.8}$ $M_\odot$.

70.06

Near Infrared Line Strengths and Profiles for AGNs and Quasars

R. I. Thompson (Steward Obs./U. of Arizona)

This talk presents line profiles and line strengths of several 0.86 - 2.5 μm emission lines in NGC 4152, NGC 1068, 3C273, and other objects. A new cross dispersed infrared spectrometer (the GRIS) produced the spectra at a resolution of 4000. Hydrogen Pα, Pβ, Brγ, molecular hydrogen, Fe II, Si VI, He I, and SIII are among the strong observed lines. The line shape of the Fe II 1.644 μm line will receive special attention as its production mechanism in AGNs is a subject of current debate. Comparison of line strengths between the quasar 3C273 and the Seyfert galaxies indicates several differences which may relate to possible differences in the emission mechanisms. The presentation will also discuss the validity of the claimed detection of molecular hydrogen in 3C273. Although the GRIS produces the entire spectrum between 0.86 and 2.5 μm this talk will concentrate on the emission lines. As an example the figure below presents the line profile of Pα in 3C273.