Emission Lines in Active Galaxies: New Methods and Techniques
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3-D TIGER Observations of Radio Galaxies

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1. Cosmological Stellar-Population Evolution Study

The cosmological evolution of stellar populations can be studied by observing, e.g,, high-z radio galaxies, and comparing their SEDs to those of local objects. But in such objects, the nuclear activity strongly influences the optical properties; to disentangle the superposition of spatial and spectral effects, complete 3-D data cubes are needed, such as those that can be obtained with the pioneering 3-D instrument TIGER.

2. The Lyα Morphology of 4C 41.17

4C 41.17 ($z = 3.8$) was observed at CFHT with good seeing ($0''.5$) for a total integration time of only 1.86 h, with $0''.6$ and 8 Å sampling over a $12''$ field. A main Lyα peak shows a brightness of 5.9×10^{-8} ergs cm^{-2} arcsec^{-2}; over 2.7×5.4 kpc^2 ($H_0 = 75$ km s^{-1} Mpc^{-1}, $q_0 = 0.5$), it emits 4.8×10^{43} ergs s^{-1}. A secondary peak is seen to the west, and both peaks are on the radio axis defined by the two strong 15 GHz components B2 and B3, the flat-spectrum N component and the high-resolution *HST* components H2, H3, and H4. General curvature of the Lyα axis is noticeable, extending the known radio-axis twist. Filaments protrude out of the central region; their very inner parts are seen on Lyα *HST* archive images.

A detailed analysis will be presented elsewhere, but some salient features are already clear. The dense central part has a size of 35×18 kpc^2; if a merger is underway, the bulk of the galaxy seems to be already formed at $z = 3.8$. The curved radio jet follows the Lyα isophotes over at least 18 kpc; this would favor a star-formation process rather than scattering to explain the alignment effect. It is difficult to invoke a jet/IGM turbulent interaction at a cocoon frontier to explain the high velocity dispersions (up to 2000 km s^{-1}), as no emission enhancement is seen where the frontal bow shocks are expected. The galaxy stellar continuum and the depression on the blue side of Lyα are detected by integration over several spatial elements; study of the SED is in progress. The dip between the two Lyα peaks may trace an intervening absorber, or a large dust component acting as an efficient Lyα-killer, possibly the host disk plane masking the compact core N. Finally, the crowded Lyα neighborhood of galaxy and the observed velocities may trace the last stages of a merger.

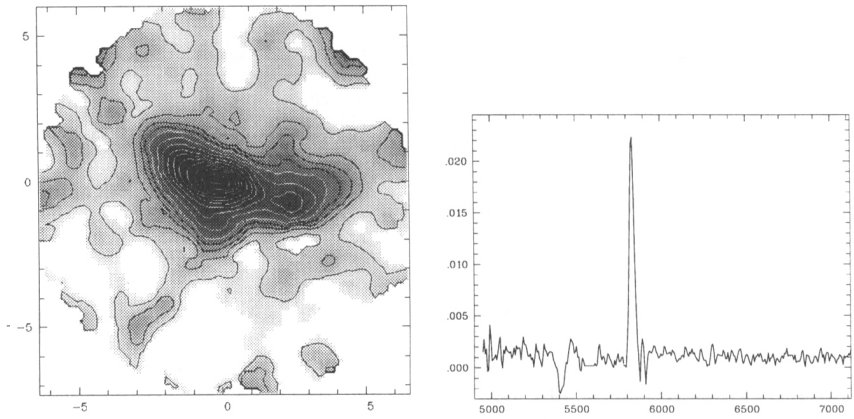

Figure 1. *Left:* 4C 41.17 Lyα image, continuum subtracted, reconstructed from individual spectra and smoothed with a 0″.8 (FWHM) Gaussian filter; coordinates are arcseconds. *Right:* spectrum of the central zone, integrated over a square region 14″.7 on a side.

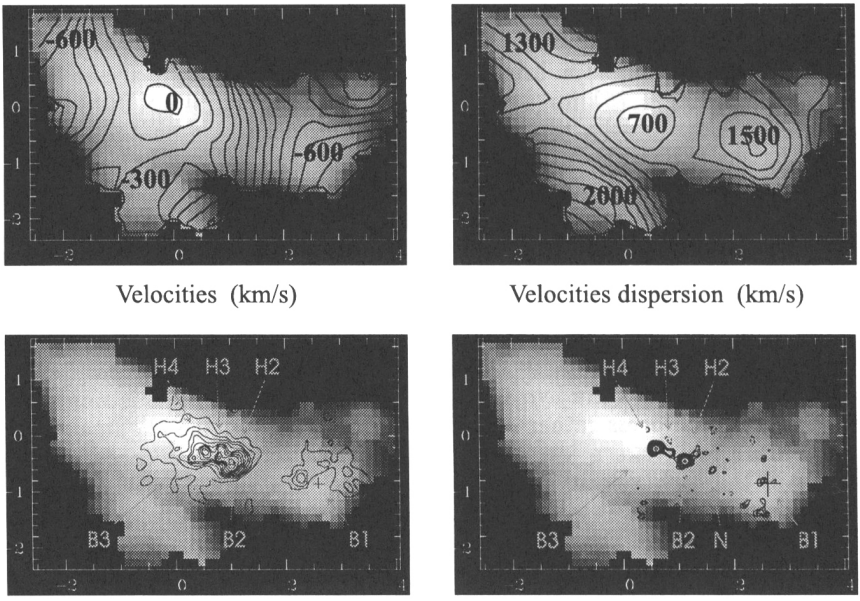

Figure 2. 4C 41.17 velocities, velocity dispersions, *HST* continuum, and 15 GHz radio maps, superposed on a Lyα image; coordinates are arcseconds.

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