

DETECTION OF A BROAD HI ABSORPTION FEATURE AT 5300 km SEC⁻¹ ASSOCIATED WITH NGC 1275 (3C84)

P. C. Crane
National Radio Astronomy Observatory

J. M. van der Hulst
Department of Astronomy, University of Minnesota

A. D. Haschick
Haystack Observatory

Observations of NGC 1275 at ~ 1396 MHz with the NRAO line interferometer in 1974 and 1976 suggest the presence of a very broad, shallow HI absorption feature centered at ~ 5300 km sec⁻¹. These observations were repeated in 1981 June with the Very Large Array using a greater bandwidth to determine a satisfactory baseline.

The line-interferometer observations were calibrated baseline by baseline for instrumental gain and phase variations and for the bandpass shape, using 3C84 and 3C147. The spectra for all baselines and epochs have been averaged and Hanning-smoothed; a bandwidth of 5 MHz and 48 complex frequency channels were used; after Hanning smoothing the effective resolution is 44.8 km sec⁻¹. The VLA observations, which used baselines > 500 m to resolve the extended structure present, were calibrated on an antenna basis using 3C48 to remove instrumental gain and phase variations. All spectra for NGC 1275 and 3C48 were averaged and Hanning-smoothed; the bandpass calibration was done by dividing the NGC 1275 spectrum by the normalized 3C48 spectrum. For 12.5 MHz bandwidth, and 32 complex frequency channels, the effective resolution is 167.9 km sec⁻¹ after Hanning smoothing.

Despite the difference in resolution and the lack of a reliable baseline for the interferometer observations, the two spectra (shown in Figure 1) agree very well. The parameters determined from the VLA observations are given in Table 1, and show that this is the broadest and weakest HI absorption feature yet reported. The velocity and width are very similar to those of the narrow nuclear emission lines reported by Heckman et al. (1981), which they suggest come from the extended low-velocity system of filaments mapped by Rubin et al. (1975). They interpret their observed blueward asymmetries in the line profiles and the net blueshifts with respect to the system velocity of NGC 1275 in terms of radial outflow and attenuation by dust. Cowie et al. (1980) identify the same system of filaments as gas accreting onto NGC 1275 from cooling gas from the Perseus cluster. Our observation of a redshift of ~ 100 km sec⁻¹ supports the latter model.

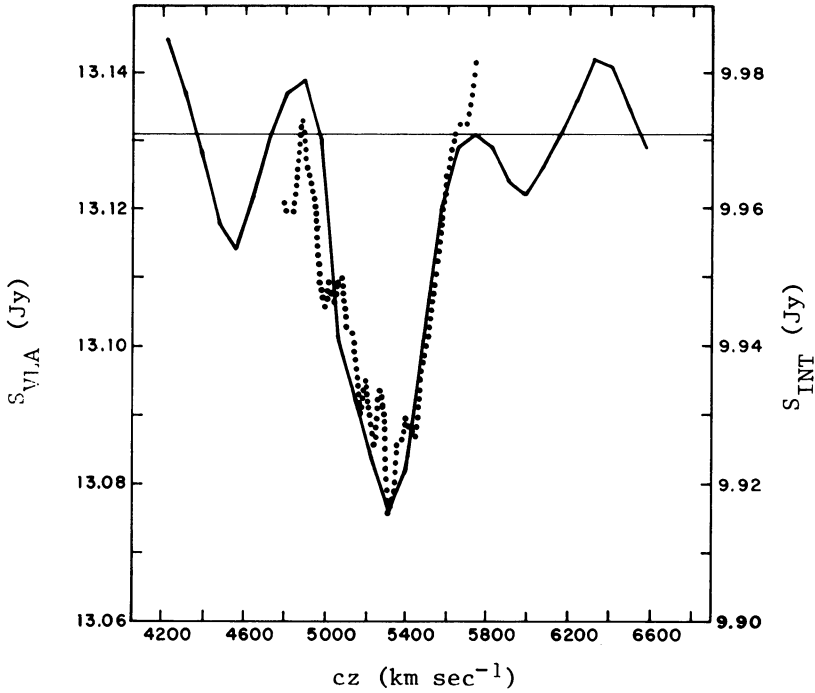


Figure 1. Comparison of interferometer (\cdots) and VLA (---) spectra of NGC 1275.

Table 1

Central velocity (Heliocentric)	5320 km sec ⁻¹
Velocity width (FWHM)	450 km sec ⁻¹
Optical depth	0.0041
Column density ($N_{\text{H}}/T_{\text{S}}$)	4×10^{18} H cm ⁻² K ⁻¹

References

- Cowie, L. L., Fabian, A. C., and Nulsen, P. E. J.: 1980, *M.N.R.A.S.* **191**, 399.
- Heckman, T. M., Miley, G. K., van Breugel, W. J. M., and Butcher, H. R.: 1981, *Ap. J.* **247**, 403.
- Rubin, V. C., Ford, W. K., Jr., Peterson, C. J., and Lynds, C. R.: 1978, *Ap. J. Suppl.* **37**, 235.