THE NUCLEAR DISK OF NGC4261: HST IMAGES AND WHT SPECTRA

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Abstract. The properties of the nuclear region of the elliptical galaxy NGC4261 (=3C270), the second brightest radio source in the Virgo cluster, have been studied using high resolution HST images and La Palma WHT spectra.

A 2400s HST Planetary Camera exposure was taken through the F555W filter (~ Johnson V) and shows a central smooth disk of dust with sharp edges and a point-like nucleus [1]. The disk is elliptical, with axes of $1.''71 \times 0.''74$, corresponding to 121×51 pc at the distance of the Virgo cluster, 14.7 Mpc (Jacoby, Ciardullo, & Ford 1990). The major axis of the disk is roughly parallel to the major axis of the galaxy and perpendicular to the axis of the radio jets (Birkinshaw & Davies 1985). The face-on optical depth of the disk increases from 0.3 at the edge to 0.8 at the centre. The nucleus, located in the centre of the disk, is unresolved ($< 0.''1 = 7$ pc) and has an apparent magnitude m_{5500} of 23.6.

WHT long slit spectra in the wavelength ranges 4730 to 5110 Å and 6380 to 6840 Å, show strong [NII] $\lambda\lambda$ 6548,6584, Hα and [SII] $\lambda\lambda$ 6717,6730 emission lines. The emission line ratios classify the nucleus of NGC 4261 as a LINER. The most striking feature in the spectrum is the presence of broad wings (FWZI $\sim$ 4500 km s^{-1}) on the Hα + [NII] blend and on the [SII] doublet. At least one broad component (FWHM $\sim$ 2500 km s^{-1}) and one narrow component (FWHM $\sim$ 450 km s^{-1}) are required to fit each of the observed line profiles. The symmetry of the broad lines and the identity of their mean velocity with the systemic velocity of the galaxy, suggest that the broad emission regions are either rapidly rotating or confined to a region small compared with the dust distribution.

The mean velocity of the narrow emission lines increases steadily from systemic velocity in the centre, to about 100 km s^{-1} 1 arcsec away. The rotation curve cannot be reproduced by a constant M/L model. Since NGC 4261 is a radio source, we tried to model the rotation curve by adding the contribution of a central point mass, corresponding to a hypothetical black hole, to the stellar potential (for a constant M/L) and to the (insignificant) potential of the disk of dust. The best fit is obtained for a central point mass 10^7 to 10^8 M$\odot$.

References

1. Jaffe, W. *et al.* 1993, Nature, **364**, 312 and references therein.

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