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RADIAL VELOCITIES OF SEVEN SERSIC GALAXIES

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ABSTRACT

The radial velocities of 7 Sersic galaxies are reported Three out of these (NGC 2003 2997 and 6236) have published radial velocities prior to this work while the radial velocities of four remaining galaxies (NGC 922, 5430, 5697 and 6728) are new

Key Words galaxies peculiar nuclei radial velocities

We present in this paper the radial velocities of seven galaxies obtained during the programme of spectroscopic studies of galaxies with peculiar nuclei The galaxies were chosen from a list published by Sersic (1973)

The spectrograms were obtained with a Cassegrain image tube spectrograph on the 1-m telescope of Kavalur Observatory The spectrograph designed by Dr M K V Bappu has a mirror slit to facilitate observations of faint objects, a mirror collimator, and a f/3 5 camera of 175 mm focal length It is equipped with an off set guide and a Varo 8606 image tube with a fibre optic extender The details of different gratings used and the dispersions in the first order red have been listed in Table 1 The gratings were mounted at positive angles (the direction of blaze away from the camera) As Hallam and Reitsema (1976) have shown, this results in less light loss at the grating in comparison with the conventional negative angle mounting, and results in slightly lower dispersion The 300 l mm^{-1} grating was used in the conventional mounting in the early days giving a dispersion of 146 Åmm^{-1} listed in Table 1

Table 1 Dispersions in the first order red with different gratings

Grating (Lines mm^{-1})	Blaze Wavelength (Å)	Dispersion (Å mm^{-1})
80	8600	607
300	6400	186
300*	6400	146
1800	5500	30

* blaze direction facing the camera

Emission lines, when detected, were used to obtain the radial velocities No measurable absorption lines were registered on the plate in the spectral region covered The emission lines of Hα and [NII] λ6584 were used in general, in one case (NGC 5597) Hβ was also used and in another (NGC 6728) [OIII] $\lambda\lambda$4959 and 5007 were also used Hβ emission was detected in the latter, but its intensity was low [SII] $\lambda\lambda$6717 and 6731, though detected in all the cases when Hα emission is seen, were not used to derive radial velocities because of their faintness

The heliocentric radial velocities V_r are listed in Table 2 for the seven galaxies observed, as also the velocities V_o corrected for galactic rotation using the corrections listed by de Vaucouleurs (1964) The nuclei types listed in the second column are the ones given by Sersic (1973)

The corrections for the slit curvature are negligible due to the long focal length (700mm) of the collimator in the spectrograph used The curvature of the spectral lines in plane grating spectra has been theoretically investigated by Walker (1909) and independently by Minkowski (1942) It depends only on the collimator focal length and the slit length For a projected slit length of 3mm employed in the present observations and for a dispersion of 146 Å mm^{-1} we obtain a shift of 0 4 μm between the comparison spectrum and the centre of the spectrum of the galaxy The shift would be lower for the lower dispersions

Table 2 Radial Velocities of 7 Galaxies

NGC	Nucleus	Dispersion (Å mm⁻¹)	V_r (km s⁻¹)	V_o (km s⁻¹)	Error (km s⁻¹)	Lines	Notes
922	HS	148	3120	3058	34	Hε	
2903	HS	148	621	512	24	Hα λ6584	(1)
2997	HS	607,166	1171	886	27	Hα λ6584	(2)
5236	AN	30	445	274	20	Hα λ6584	(3)
5430	—	607	4398	4660	170	Hα + λ6584	(4)
5597	HS	607	2930	2838	130	Hβ,Hα, λ6584	(4)
5728	AN	607 166	2976	2897	20	Hα λ6584, λ4959 λ5007	(5)

Notes (1) V_o - 448 kms⁻¹, Simkin (1975)
(2) V_o - 745 kms⁻¹ Pastoriza (1967)
(3) Wide slit (200μm projected), V_o – 395 kms⁻¹ Pastoriza (1975)
(4) Blend of Hα + λ6584 used, see text
(5) Mean of two plates at 166 Å mm⁻¹ and one at 607 Å mm⁻¹

The measurement of the night sky lines, however, gave a zero point correction of 11 4 μm at centre of the spectrum, with an internal consistency of 5 1 μm (p e) The zero point correction compares well with other spectroscopic observers, for example, the correction -100 ± 15 km s⁻¹ obtained by Simkin (1975) at 4358 Å for a dispersion of 130 Å mm⁻¹ corresponds to a shift of $11\ 2 \pm 1\ 7$ μm The larger dispersion in the zero point of the present spectrograms is due to the irregularities in the alignment of fibres in the fibre optic extension of the image tube

The estimated error listed in Table 2 corresponds to 5 1 μm when a single line is used and is reduced by a factor of $\sqrt{n}$ when n lines were used The squares of the reciprocals of the estimated errors were used as weights when more than one spectrum was measured for an individual galaxy

Out of the seven galaxies reported, three have radial velocities available prior to this work The agreement with the present results is good in the case of NGC 2903 The slightly discordant radial velocity of Pastoriza (1967) in the case of NGC 2997 could be due to the low dispersion (480 Å mm⁻¹) employed by her The spectrogram of NGC 5236 reported here was taken with a wide slit with a view to obtain monochromatic pictures of the nuclear region in Hα and λ 6584 The tabulated error for this object corresponds to 22μm on plate We believe that the present radial velocity is comparable in its accuracy to the one published by Pastoriza (1975) based on 140 Å mm plates

A few more galaxies were also observed in addition to those listed in Table 2 Of these NGC 2196 and 2763 did not show any emission lines, faint emission of Hα + [NII] was suspected in NGC 2935 and 3346, and certainly detected in NGC 3955, 3956 and 4064 NGC 1808, 3177 and 3611 were observed only at 607 Å mm⁻¹ The blend of Hα [NII] treated as Hα in these galaxies as well as in the lower dispersion spectrograms of NGC 922, 2997, 5597 and 5728 gave a correction of $1\ 244 \pm 170$ (p e) km s⁻¹ on comparison with the radial velocities published either earlier or in this paper This correction corresponds to $5\ 3 \pm 3\ 7$ Å Tho dispersion is slightly larger than the internal consistency 3 1 Å of the low dispersion spectra, and suggests an intrinsic dispersion in the wavelength of the blend On correcting for the observational scatter we obtain the wavelength of the blend as $6568\ 1 \pm 3\ 0$ (s d) Å a value consistent with an Hα/[NII] between 2 and 3 This wavelength has been used in deriving the radial velocities of NGC 5430 and 5597 from the blend of Hα + [NII] from 607 Å mm⁻¹ plates

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