Spectroscopic and photometric observations of galaxies from the ESO/Uppsala list. Third catalogue

R. M. West (1) (*), J. Surdej (2) (**), H.-E. Schuster (3), A. B. Muller (1, 3), S. Laustsen (4) and T. M. Borchkhazde (5)

(1) European Southern Observatory, Karl - Schwarzschild - Strasse 2, D-8046 Garching bei München, F.R.G.
(2) Institut d’ Astrophysique, Université de Liège, Av. de Cointe, 5, B-4200 Cointe-Ougrée, Belgium.
(3) European Southern Observatory, La Silla Chile.
(4) Astronomical Institute, Aarhus University, Langelandsvej, DK-8000 Aarhus C, Denmark.
(5) Abastumani Astrophysical Observatory, SU-383762 Abastumani, Georgia, USSR.

Received February 16, accepted February 23, 1981

Summary. — Spectroscopic and photometric observations are presented for a total of about 275 southern galaxies, selected from ESO/Uppsala lists Nos. 1-8. Many of the galaxies have emission lines and several are members of multiple systems.

Key words: galaxies — radial velocities — UBV-photometry, interacting galaxies.

1. Introduction. — The Third Catalogue of spectroscopic and photometric observations of galaxies from the ESO/Uppsala lists contains about 275 entries, selected from ESO/Uppsala lists 1-8 (Holmberg et al., 1974a, 1974b, 1975, 1977, 1978a, 1978b, 1980; Lauberts et al., 1981). This paper is a sequel to the first two catalogues: West (1977), hereafter referred to as Catalogue I, and Bergvall et al. (1978), hereafter referred to as Catalogue II. We here summarize the observations which were obtained in the period March 1977 - September 1978 by the ESO group. For easy reference, we have included data from two other papers dealing with emission line galaxies which were discovered in the course of this investigation (Borchkhazde and West, 1978, 1980) as well as a few papers concerned with individual objects.

Since the end of 1978 more than 200 other galaxies have been observed spectroscopically and will be included in the Fourth Catalogue which is presently being compiled.

The galaxies were selected according to the following criteria:

a) Bright star-like nucleus
b) Peculiar morphological structure
c) Interaction with nearby companion

and, as would be expected, several systems with peculiar spectra were found. A number of these have been investigated in detail with the ESO 3.6 m telescope.

2. Spectroscopic observations. — The spectroscopic observations were carried out at ESO on La Silla and CARSO on Las Campanas. Two observing runs, in March 1977 and October 1977 with the Las Campanas 1 m Swope telescope equipped with the Carnegie image tube spectrograph yielded a total of 220 spectra (observer R. M. W.). During another run at the Cassegrain focus of the ESO 3.6 m telescope (Boller & Chivens spectrograph) in January 1978, spectra were obtained of 60 galaxies (observer R. M. W.). Furthermore, four brief runs with the Boller & Chivens spectrograph at the ESO 1.52 m telescope, in April 1977, January 1978, February 1978 and September 1978, resulted in 31 spectra (observers H.-E. S. and A. B. M.). The dispersions and the wavelength ranges are indicated in Section 4, in the description of the corresponding column of table I. All spectra were unwidened and many of them covered several components in one system.

Most of the spectra were measured with the ESO GRANT measuring machine by R. M. W. (cf. West et al., 1978). The spectra included in this catalogue and first published by Borchkhazde and West (1978) were measured by T. M. B. on the ESO S-3000 measuring machine and those in the paper by Borchkhazde and West (1980) by T. M. B. on the Ascorecord two-dimensional measuring machine at the Abastumani Astrophysical Observatory. The radial velocities, together with their mean errors are given in table I. The number of measured lines is indicated in each case and comprehensive notes describe the individual objects.

In order to estimate the external accuracy of the catalogue we compare, in table II, radial velocities of 20 galaxies with those from other sources. It can be seen that in all but a few cases the difference is within the given r.m.s. values. In any case the number of common objects is too small to justify any corrections.

Among the many spectra that were obtained, some (absorption line) were unmeasurable, because of underexposure, bad focus, lack of lines, etc. In order to

(*) Guest observer Las Companas Observatory, 1977/78.
(**) Chargé de Recherches au Fonds National de la Recherche Scientifique, Belgique.
make future observers aware of the fact that (unsuccessful) spectra have been obtained of these objects, we have included them in table I and given the reason for our inability to obtain the radial velocity in the notes to table I.

3. Photometric observations. — Photoelectric UBV observations of many of the spectroscopically observed galaxies were obtained in July 1977 and December 1977 by means of the standard one-channel photometer attached to the ESO 1 m photometric telescope on La Silla (observer J. S.) The measurements were reduced on the HP computer system on La Silla with the standard UBV reduction programme. In most cases, the largest diaphragm covered the entire galaxy. The accuracy is about \( \pm 0.002 \) in \( B \) and \( V \) and somewhat lower in \( U \), not including the possible uncertainty from the diaphragm position. Details of the photometry may be found in the paper by West et al. (1978).

The photometric data have been collected in table III. Most of the values are means of 2-3 observations.

4. The catalogue. — The data of the catalogue are contained in tables I and III. Additional information is given in the notes. All galaxies, except those discussed in earlier papers, are shown in figures 1-13, reproduced from ESO 1 m Schmidt or 3.6 m plates. The columns of table I are:

Col. 1: Identifier.
Col. 2: ESO number (as described by Holmberg et al., 1974a) and other name, if any. NGC, IC, Se = Serre (1974), MCG (Vorontsov-Velyaminov and Arkhipova, 1968, 1974), AG = Agüero (1971), FAIRALL = Fairall (1977).
Col. 3 and 4: Right ascension and declination to equinox 1950.0, taken from the ESO/Uppsala lists.
Col. 5: Slit angle \( \theta \), \( 0^\circ-180^\circ \) from north to south over east.
Col. 7: Heliocentric radial velocity \( \pm 300 \cos \beta \sin (\lambda_{\text{eq}} - \lambda) \).
Col. 8: Systemic, heliocentric velocity \( V_{\odot} \) corrected to the local group (+ 300 \( \sin b \cos \beta \)), \( b \), and including relativistic correction.
Col. 9: The r.m.s. of the mean velocity, as given in column 7 and 8.
Col. 10: Number of lines which were used to determine the redshift. \( E \) = emission; \( A \) = absorption.
Col. 11: Linear diameter (kpc) of the object (\( D_{\odot} \), assuming cosmological redshift and \( H_0 = 55 \) km s\(^{-1}\) Mpc\(^{-1}\).
Col. 12: Linear diameter (kpc) of the system (\( D_{\odot} \)).
Col. 13: Equipment used for spectroscopy (I) = ESO 1.5 m telescope, Boller & Chivens spectrograph, 256 Å/mm (3500-5700 Å), blue image tube, (2) = Las Campanas 1 m telescope and Carnegie image tube spectrograph, 280 Å/mm (3700-7200 Å), (3) = Las Campanas 1 m telescope and Carnegie image tube spectrograph, 135 Å/mm (4500-7500 Å), (4) = ESO 1.5 m telescope, B & C spectrograph 172 Å/mm (4000-7200 Å), red image tube, (5) = ESO 3.6 m telescope, B & C spectrograph, 114 Å/mm (3600-7000 Å), (6) = ESO 1.5 m telescope 254 Å/mm (4200-8200 Å), red image tube, (7) = ESO 1.5 m telescope, B & C spectrograph, 254 Å/mm (4800-8500 Å), red image tube.

Col. 14: Number of ESO/Uppsala list in which the object was first listed.
Col. 15: Figure in which object is shown.

The notes to table I include details about the spectra and the lines which were used for determination of the radial velocities. The lines are identified by the wave-lengths as follows:

3933 = Ca II (K), 3969 = Ca II (H) and H\( \alpha \), 4101 = H\( \beta \), 4226 = Ca I, 4304 = G-band, 4341 = H\( \gamma \), 4861 = H\( \beta \), 4959 = [O III], 5007 = [O III], 5175 = Mg I triplet, 5268 = Fe I and Ca I, 5892 = Na I doublet, 6548 = [N II], 6563 = Ha, 6584 = [N II], 6717 = [S II] and 6731 = [S II].

The columns of table III are:

Col. 1: Identifier.
Col. 2: ESO number and NGC or IC, if applicable.
Col. 3 and 4: Right ascension and declination to equinox 1950.0.
Col. 5: Identification of components in multiple systems (cf. Fig. 1-13).
Col. 6: Diameter of circular diaphragm in arcseconds.
Col. 7, 8 and 9: \( V \), \( B-V \) and \( U-B \).
Col. 10: ESO/Uppsala list in which the object was first listed.
Col. 11: Notes, cf. explanation below table.

Acknowledgements. — We thank the nightassistants on La Silla and Las Campanas, Srs. Flores, Moya Ramirez, Roman, Vega, Veliz, Yagnam and Zuniga for their cheerful help at the telescopes. We are much obliged to ESO photographers R. Saxby, C. Madsen and J. Quebette for the photographic work and to Mrs. E. Völk for typing the manuscript. T. M. B. thanks the ESO for hospitality during a stay as fellow in Geneva, R. M. W. is indebted to the Carnegie Institution in Washington for allocation of observing time at Las Campanas.
References


TABLE I — Spectrophotometric observations of galaxies from the ESO/Uppsala list (West et al.).

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1343-186</td>
<td>1343-186</td>
<td>1343-186</td>
<td>1343-186</td>
<td>1343-186</td>
<td>1343-186</td>
<td>1343-186</td>
<td>1343-186</td>
<td>1343-186</td>
<td>1343-186</td>
<td>1343-186</td>
<td></td>
</tr>
<tr>
<td>1343-331</td>
<td>1343-331</td>
<td>1343-331</td>
<td>1343-331</td>
<td>1343-331</td>
<td>1343-331</td>
<td>1343-331</td>
<td>1343-331</td>
<td>1343-331</td>
<td>1343-331</td>
<td>1343-331</td>
<td></td>
</tr>
<tr>
<td>1343-332</td>
<td>1343-332</td>
<td>1343-332</td>
<td>1343-332</td>
<td>1343-332</td>
<td>1343-332</td>
<td>1343-332</td>
<td>1343-332</td>
<td>1343-332</td>
<td>1343-332</td>
<td>1343-332</td>
<td></td>
</tr>
<tr>
<td>1343-333</td>
<td>1343-333</td>
<td>1343-333</td>
<td>1343-333</td>
<td>1343-333</td>
<td>1343-333</td>
<td>1343-333</td>
<td>1343-333</td>
<td>1343-333</td>
<td>1343-333</td>
<td>1343-333</td>
<td></td>
</tr>
<tr>
<td>1343-335</td>
<td>1343-335</td>
<td>1343-335</td>
<td>1343-335</td>
<td>1343-335</td>
<td>1343-335</td>
<td>1343-335</td>
<td>1343-335</td>
<td>1343-335</td>
<td>1343-335</td>
<td>1343-335</td>
<td></td>
</tr>
</tbody>
</table>

© European Southern Observatory • Provided by the NASA Astrophysics Data System
TABLE I (continued).

| 1981A&AS...46...57W | Notes to table 1 |

All objects with "N" in column (16) are included.

Objects with "**" in column (16) have been observed photometrically (Table 3).

---

**012-354 (358-308G) Fig. 1-1: Bridge to component (b). Spectrum somewhat underexposed. Velocity from 5809 (strong), 5575 and 4861 (weak) in absorption.

**013-333 (358-308G) Fig. 1-2: Spectral resolution good, but no lines can be discerned. Possible bridge to component (b).

**028-343 (358-308G) Fig. 1-3: Bright centre. Point 3727 in emission and 3969, 5175 and 5995 in absorption.

**035-358 (358-308G) Fig. 1-5: Double system. Very bright star-like centre. Strong emission lines: 6564, 6563, 5897, 4959, 4651, 4181, 3969, 19599 (19662). Line width ≈ 380 km/s. Approaching Seyfert 2 type. Indication of rotation: Dv ≈ 150 km/s, relative to another, B' W of centre.

**062-444 (358-308G) Fig. 1-7: Very bright centre, most probably galactic star: cz = 0 km/s, later-type spectrum, 3959, 3993 and 4348 in absorption.

**113-332 (358-308G) Fig. 1-8: Featureless continuous spectrum, only visible line tentatively identified with 5892.

**136-331 (358-308G) Fig. 1-9: Exposure time 60 min with L.C. im. and Carnegie tube at 284 A/min. All lines underexposed. No lines measurable, no emission. Double system.

**148-335 (358-308G) Fig. 1-10: Several star-like condensations, 6563, 6561, 5897, 4959, 4651 and 3969 in emission. 19599 (19662) in absorption.

**114-344 (358-308G) Fig. 2-1: The velocity shows that this galaxy most probably belongs to IC 1723/2724 group. Very weak 6563, 6569 and 3727 in emission. Also weak 3959, 3993, 4348 and 5175 in absorption.

**113-343 (358-308G) Fig. 2-2: Diffuse object, no central condensation. Velocity from 5372 and 3727 in emission, 3969 and 5175 in absorption. No IC 111.

**147-351 (358-308G) Fig. 2-3: No emission. Strong 3959 and 5892. Large, lenticular, edge-on.

**147-350 (358-308G) Fig. 2-4: Underexposed. No lines visible. No emission. Probably member of the NGC 696 group.

**122-345 (358-308G) Fig. 2-5: Bright centre in (a) with 3939, 3969, 4181 and 5175 in absorption. Strong star-like condensation, 19599 in absorption. No emission. 380 km/s.

**136-370 (358-308G) Fig. 2-6: N-galaxy, Semi-stellar nucleus, 6563 and 6569 in emission (medium strength), 3969 in absorption.

**135-358 (358-308G) Fig. 2-7: Low surface luminosity spiral with condensations. Strong sky background in spectrum; no lines visible. No emission in condensations.

**135-398 (358-308G) Fig. 2-8: Peculiar shape, 50 min exposure with L.C. im. and Carnegie tube at 284 A/min. But still underexposed. Only two lines visible. Perhaps a ring or an edge-on spiral. All lines well aligned in slit.

**122-346 (358-308G) Fig. 2-9: Double system with interaction. Relatively strong absorption features in (a) identified with 4226, 5175 and 5268. Spectrum of (b) underexposed, no lines visible.

**122-351 (358-308G) Fig. 2-10: Double system with extension towards M. Strong emission 6563, 5897, 4959 and 5175 in absorption. Very large, high dispersion in velocity of individual lines.

**122-336 (358-308G) Fig. 2-11: Spectral absorption spectrum: strong absorption features. 6563, 5897 and 4959. In group with IC 1833.

**122-346 (358-308G) Fig. 2-12: Velocity similar to IC 1811 and 1813. In same group as Active nucleus, Broad, short, and early-type spectrum. Weak 6563 and 4861 in emission. Velocity based on 6563 (b) and 3969, 4348, 5175, 5268 and 5995 in absorption. Large system.

**122-335 (358-308G) Fig. 3-1: Double system, 3939, 3969, 4348 and 5175 in component (a). Spectrum of (b) underexposed no lines visible.

**122-356 (358-308G) Fig. 3-2: Very large system. Silt placed across brightest knot (a). Weak emission: 6731, 6717, 6567, 5897, 4861 and 3727. Strong 4226 and 5995 in absorption. I.e. late-type, (b) not observed.

---

© European Southern Observatory • Provided by the NASA Astrophysics Data System
Notes to table 1 (continued).

0343-361 (1985-1985) FC 17214: Fig. 3-5: A large, diffuse, central, low-excitation spectrum with good resolution, but no lines visible in features continues.

1981A&AS...46...57W (1981-1981) FC 17214: Fig. 3-5: A large, diffuse, central, low-excitation spectrum with good resolution, but no lines visible in features continues.

0344-362 (1984-1984) FC 17214: Fig. 3-5: A large, diffuse, central, low-excitation spectrum with good resolution, but no lines visible in features continues.

0345-363 (1985-1985) FC 17214: Fig. 3-5: A large, diffuse, central, low-excitation spectrum with good resolution, but no lines visible in features continues.

0346-364 (1985-1985) FC 17214: Fig. 3-5: A large, diffuse, central, low-excitation spectrum with good resolution, but no lines visible in features continues.
### TABLE II. — Comparison of radial velocities with other sources.

<table>
<thead>
<tr>
<th>Object</th>
<th>Catalogue III</th>
<th>Other Source</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>0102-463</td>
<td>6003 ± 30</td>
<td>5862 ± 27</td>
<td>Cat. II</td>
</tr>
<tr>
<td>0203-554</td>
<td>5798 ± 22</td>
<td>5981 ± 38</td>
<td>Cat. II</td>
</tr>
<tr>
<td>0339-714</td>
<td>14956 ± 27</td>
<td>14554 ± 25</td>
<td>Rev. S-A</td>
</tr>
<tr>
<td>0608-360 a</td>
<td>760 ± 10</td>
<td>743 ± 12</td>
<td>Sec. Ref. Cat.</td>
</tr>
<tr>
<td>0638-584</td>
<td>2653 ± 10</td>
<td>2669 ± 30</td>
<td>Cat. II</td>
</tr>
<tr>
<td>0648-584</td>
<td>2746 ± 31</td>
<td>2746 ± 18</td>
<td>Cat. II</td>
</tr>
<tr>
<td>0652-648</td>
<td>1096 ± 48</td>
<td>10960 ± 69</td>
<td>Fairall (1960a)</td>
</tr>
<tr>
<td>0825-774</td>
<td>5261 ± 91</td>
<td>5220 ± 56</td>
<td>Cat. II</td>
</tr>
<tr>
<td>0932-2964</td>
<td>8408 ± 20</td>
<td>8330</td>
<td>Fairall (1960a)</td>
</tr>
<tr>
<td>0907-756</td>
<td>4602 ± 53</td>
<td>4746 ± 11</td>
<td>Cat. II</td>
</tr>
<tr>
<td>1100-480</td>
<td>2723 ± 30</td>
<td>2793 ± 40</td>
<td>Cat. II</td>
</tr>
<tr>
<td>1120-651 b</td>
<td>5150 ± 10</td>
<td>4968 ± 85</td>
<td>Cat. II</td>
</tr>
<tr>
<td>1200-439 a</td>
<td>8783 ± 21</td>
<td>8621 ± 40</td>
<td>Cat. II</td>
</tr>
<tr>
<td>1329-439 b</td>
<td>6931 ± 21</td>
<td>6931 ± 80</td>
<td>Cat. II</td>
</tr>
<tr>
<td>1319-430 a</td>
<td>7026 ± 20</td>
<td>7200 ± 2003</td>
<td>Fairall (1959)</td>
</tr>
<tr>
<td>1319-430 b</td>
<td>7115 ± 20</td>
<td>7200 ± 2003</td>
<td>Fairall (1959)</td>
</tr>
<tr>
<td>1325-446</td>
<td>3075 ± 233</td>
<td>3000 ± 40</td>
<td>Fairall (1959)</td>
</tr>
<tr>
<td>1339-479</td>
<td>3185 ± 33</td>
<td>3030 ± 70</td>
<td>Sandage (1978)</td>
</tr>
<tr>
<td>1354-425</td>
<td>403 ± 40</td>
<td>300 ± 2003</td>
<td>Rev. S-A</td>
</tr>
<tr>
<td>1354-479</td>
<td>3195 ± 33</td>
<td>3030 ± 70</td>
<td>Rev. S-A</td>
</tr>
<tr>
<td>1957-472 b</td>
<td>6358 ± 62</td>
<td>6351 ± 62</td>
<td>Cat. II</td>
</tr>
</tbody>
</table>

### Sources:
- Cat. II (Bergvall et al., 1978); Rev. S-A (Sandage and Tamman, 1981); Sec. Ref. Cat. (de Vaucouleurs et al., 1976).

### TABLE III. — Photoelectric UBV data.

<table>
<thead>
<tr>
<th>COMPUL.</th>
<th>RNO.</th>
<th>R.A. (1950)</th>
<th>DEC.</th>
<th>S/N</th>
<th>EXP.</th>
</tr>
</thead>
<tbody>
<tr>
<td>0151-416</td>
<td>200-2061</td>
<td>07 17 53</td>
<td>-41 29.9</td>
<td>88</td>
<td>14.32</td>
</tr>
<tr>
<td>0152-309</td>
<td>110-2379</td>
<td>01 21 51</td>
<td>-58 06.0</td>
<td>84</td>
<td>14.39</td>
</tr>
<tr>
<td>0153-406</td>
<td>110-2379</td>
<td>01 21 51</td>
<td>01 23 32</td>
<td>84</td>
<td>14.39</td>
</tr>
<tr>
<td>0174-245</td>
<td>230-2012</td>
<td>07 27 41</td>
<td>-42 39.9</td>
<td>88</td>
<td>14.31</td>
</tr>
<tr>
<td>0244-626</td>
<td>058-0235</td>
<td>04 28 44</td>
<td>-88 51.7</td>
<td>82</td>
<td>13.75</td>
</tr>
<tr>
<td>0252-568</td>
<td>134-0627</td>
<td>03 33 35</td>
<td>-56 55.6</td>
<td>82</td>
<td>13.75</td>
</tr>
<tr>
<td>0329-506</td>
<td>200-2061</td>
<td>07 20 11</td>
<td>-50 28.7</td>
<td>82</td>
<td>13.78</td>
</tr>
</tbody>
</table>

**Notes:**
1. Also in table I.
2. Measurements made 20 minutes before sky became cloudy.
4. Spectroscopic observation in Catalogue No. II.
5. Spectroscopic observation in Catalogue No. I.
9. Photometric observation in Catalogue No. II.
Figure 1. — Reproduction of objects in Catalogue III. The scale is indicated and is the same in all figures. North is up and East to the left. The objects are identified in table I (col. 15).
Figure 2. — Cf. figure 1.
Figure 3. — Cf. figure 1.
Figure 4. — Cf. figure 1.
Figure 5. — Cf. figure 1.
Figure 6. — Cf. figure 1.
FIGURE 7. — Cf. figure 1.
Figure 8. — Cf. figure 1.
FIGURE 9. — Cf. figure 1.
Figure 10. — Cf. figure 1.
Figure 11. — Cf. figure 1.
Figure 12. — Cf. figure 1.
Figure 13. — Cf. figure 1. Further objects: 13-9 = 200-IG31; 13-10 = 104-IG51; 13-11 = 143-IG16; 13-12 = 145-IG21 (cf. Notes to table III).