

# Miscellaneous observations of active galactic nuclei. II.\*

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**Abstract.** We observed 37 AGN candidates and classified them on the basis of their spectroscopic properties; three are confirmed QSOs, one is a BL Lac object, nine are Seyfert 1 galaxies, four Seyfert 2s, while twenty are HII regions.

**Key words:** galaxies: active — galaxies: Seyfert — galaxies: BL Lacertae objects: general — galaxies: quasars: general — galaxies: starburst

Additional observations were made with EFOSC (Dekker et al. 1988) at the 3.6 m ESO telescope in La Silla during two runs in July 1995 and August 1996. The detector was the CCD ESO#26, similar to the one used at OHP. The dispersion was  $230 \text{ \AA mm}^{-1}$ ; the slit width was 1.5 arcsec, corresponding to 2.2 pixels and resulting in a resolution of  $15 \text{ \AA}$ . The wavelength range was  $\lambda\lambda 3500\text{--}7600 \text{ \AA}$ . The spectra were flux calibrated using the standard stars W 485A and GD 190 (Oke 1974).

## 1. Introduction

In the course of several observing runs, we obtained optical spectra of 37 AGN candidates with uncertain classification. Twenty of them turned out to be extragalactic HII regions ionized by hot stars, while seventeen were confirmed to be QSOs, BL Lac or Seyfert galaxies. In a previous paper (Véron-Cetty & Véron 1986), the classification of 61 AGN candidates was given.

## 2. Observations

Most of the observations were carried out in 1995, 1996 and 1997 with the spectrograph CARELEC (Lemaître et al. 1989) attached to the Cassegrain focus of the Observatoire de Haute Provence (OHP) 1.93 m telescope. The spectrograph settings used during these runs are given in Table 1. The detector was a  $512 \times 512$  pixels,  $27 \times 27 \mu\text{m}$  Tektronic CCD. The slit width was 2.1 arcsec, corresponding to a projected slit width on the detector of  $52 \mu\text{m}$ , or 1.9 pixel. The resolution, as measured on the night sky emission lines, was 13.5 and  $3.4 \text{ \AA FWHM}$  at low and high resolution, respectively. The spectra were flux calibrated using the standard stars given in Table 1, taken from Oke (1974), Stone (1977), Oke & Gunn (1983) or Massey et al. (1988).

**Table 1.** Spectrograph settings and standard stars during OHP observations

Date	Dispersion ( $\text{\AA mm}^{-1}$ )	$\lambda$ Range ( $\text{\AA}$ )	Standard stars
21 – 23.03.95	66	6500 – 7400	BD 26°2606
24 – 28.08.95	260	4500 – 8000	BD 25°3941 BD 28°4211
28 – 31.08.95	66	6700 – 7600	BD 25°3941 BD 28°4211
31.08 – 04.09.95	66	4860 – 5760	Feige 15 BD 28°4211
10.05.96	66	6700 – 7600	GD 140 BD 26°2606
13.05.96	66	4860 – 5760	Feige 98 Kopff 27
08.06.96	66	4860 – 5760	Feige 66 Kopff 27
09.06.96	66	6700 – 7600	Feige 66 BD 28°4211
06 – 08.01.97	66	4720 – 5620	EG 247
08 – 11.01.97	66	6175 – 7075	EG 247

The journal of observations is given in Table 2 and the list of the observed objects with relevant data, in Table 3. The spectra were analysed in terms of Gaussian components as described in Véron et al. (1997). Table 4 gives for each object the velocity, width and relative strength of each line, together with the adopted classification. Objects with broad Balmer lines were classified as Seyfert 1 galaxies, or QSOs whenever their absolute magnitude was brighter than  $M_B = -23.0$  (assuming  $H_0 = 50 \text{ km s}^{-1} \text{ Mpc}^{-1}$ ); Seyfert 2s and HII regions were distinguished on the basis of the value of the  $[\text{OIII}]\lambda 5007/\text{H}\beta$  and  $[\text{NII}]\lambda 6584/\text{H}\alpha$  line ratios (Veilleux & Osterbrock

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\* Based on observations collected at the Observatoire de Haute-Provence (CNRS), France, and at the European Southern Observatory, La Silla, Chili.

**Table 2.** Journal of observations. A: OHP, 260 Å mm<sup>-1</sup>; B: OHP, 66 Å mm<sup>-1</sup> blue; C: OHP, 66 Å mm<sup>-1</sup> red; D: ESO, 230 Å mm<sup>-1</sup>. An “\*” after the exposure time indicates the presence of clouds during the exposure

Name	Disp.	Date	Exp. time (min)	Name	Disp.	Date	Exp. time (min)
4C 12.05	D	10.08.96	10	PKS 1420 – 27	D	25.07.95	10
Mark 1147	A	26.08.95	20	Mark 816	B	13.05.96	20
Mark 971	B	01.09.95	20	PKS 1437 – 153	D	27.07.95	10
Mark 998	A	26.08.95	20	Mark 833	C	22.03.95	20
Q 0155 + 0220	B	31.08.95	20	Mark 483	C	22.03.95	20
Mark 596	A	25.08.95	20	KUV 15519 + 2144	C	22.03.95	20
KUV 03079 – 0101	A	27.08.95	20	Q 1619 + 3752	B	01.09.95	20
CBS 74	A	30.04.95	15	EXO 1622.0 + 2611	C	22.03.95	20
	C	22.03.95	20	Q 1624 + 4628	C	28.08.95	20
HS 0843 + 2533	C	10.01.97	20	Q 1638 + 4634	A	27.08.95	20
Mark 391	B	07.01.97	20	Kaz 110	B	23.06.96	20
	C	10.01.97	20		C	22.06.96	20
KUG 0929 + 324	C	21.03.95	20	PKS 1903 – 80	D	28.07.95	10
CG 49	C	10.05.96	20	RN 73	B	31.08.95	20
UM 446	C	21.03.95	20		C	30.08.95	20
US 2896	C	22.03.95	20	Q 2233 + 0123	C	30.08.95	20
Mark 646	C	22.03.95	20	Q 2257 + 0221	B	02.09.95	20
2E 1219 + 0447	C	22.03.95	20	NGC 7678	B	02.09.95	20*
KUV 13000 + 2908	C	22.03.95	20		C	30.08.95	20
Q 1356 – 067	C	22.03.95	20	E 2344 + 184	B	01.09.95	20
Mark 469	B	08.06.96	20	UM 11	B	02.09.95	20*
	C	09.06.96	20		C	29.08.95	20

1987). In some cases, the classification is based on a single line ratio, either  $\lambda 5007/H\beta$  or  $\lambda 6584/H\alpha$ . This is potentially dangerous; however we think that in most cases, there is no ambiguity, specially when  $\lambda 6584/H\alpha < 0.3$  (see Fig. 6a in Véron et al. 1997).

### 3. Notes on individual objects

**4C 12.05** (Gower et al. 1967) = PKS 0035+121 (Shimmins et al. 1975) has been tentatively identified by Wills & Wills (1976) and Jauncey et al. (1978) with a 16.5 – 17.0 mag object, the position of which is in good agreement with the accurate radio position measured by Condon et al. (1977); but they have shown that the optical spectrum, although inconclusive, was probably that of a star. However, Wills & Wills have remarked that there appears to be a small, fainter, south-preceding blue object, visible on the Palomar Sky Survey prints, blended with the image of the star. A V image, obtained on August 10, 1996 with EFOSC at the 3.6 m ESO telescope in La Silla shows that, indeed, the object is double, with a separation of 2.8 arcsec. The spectrograph slit was aligned on the two objects (PA = 229°); a 10 min exposure spectrum shows the north-following object to be a star, while the south-preceding object is a QSO at  $z = 1.395$  (Fig. 1). The magnitude of the QSO, as measured on the spectrum is about 0.55 mag weaker than the star in B, and 0.87 mag in V. The emission line fluxes are 570 and 360 10<sup>-16</sup> erg s<sup>-1</sup> cm<sup>-2</sup> for CIII]λ1909 and MgII λ2798, respectively.

**Mark 1147** is an emission line galaxy (Markarian et al. 1980); it has been erroneously classified as a Seyfert

1 by Véron-Cetty & Véron (1985). Our low dispersion spectrum (Fig. 2) shows that it is a HII region, with  $\lambda 5007/H\beta = 2.18$  and  $\lambda 6584/H\alpha = 0.24$ ; this is in agreement with Markarian et al. (1980), who have noticed that  $\lambda 6584$  is weak compared to  $H\alpha$ .

**Mark 971** = KUG 0101+353 (Takase & Miyauchi-Isobe 1991b). Markarian et al. (1984) suggested that it could have an active nucleus; this, however, was not confirmed neither by Denisjuk & Lipovetski (1984) nor by Lipovetski et al. (1989). Our spectrum (Fig. 6) shows narrow emission lines ( $< 280$  km s<sup>-1</sup> FWHM) with  $\lambda 5007/H\beta = 0.41$  together with an  $H\beta$  line in absorption; this object is, therefore, a HII region.

**Mark 998**. According to Markarian et al. (1984), this galaxy could have an active nucleus; Denisjuk & Lipovetski (1984) and Lipovetski et al. (1989) were not able to confirm this. Our low dispersion spectrum (Fig. 2) shows  $\lambda 6584/H\alpha = 0.23$ . It follows that this object is most probably a HII region.

**Q 0155+0220** is an emission line galaxy according to Schneider et al. (1994). Our spectrum (Fig. 6) shows it to be a HII region with narrow ( $FWHM < 325$  km s<sup>-1</sup>)  $H\beta$  and  $\lambda 5007$  emission lines, and  $\lambda 5007/H\beta = 0.71$ .

**Mark 596**. This object, having  $\lambda 6584/H\alpha > 1$  may have an active nucleus (Markarian et al. 1984). It is indeed a Seyfert 2 galaxy as our spectrum (Fig. 2) shows that  $\lambda 5007/H\beta > 5$  and  $\lambda 6584/H\alpha = 1.14$ .

**KUV 03079 – 0101** (Noguchi et al. 1980) is an emission line galaxy according to Chaffee et al. (1991). Our spectrum (Fig. 3) shows broad Balmer lines (3000 km s<sup>-1</sup> FWHM) and narrow [OIII] lines. The ratio of the total  $H\beta$  flux to the  $\lambda 5007$  flux is  $R = 10$ ;

**Table 3.** This table gives for each of the observed objects: the name (Col. 1), the B1950 optical position measured on the Digitized Sky Survey (Cols. 2 and 3), where the the rms error is 0.6 arcsec in each coordinate; “\*” indicates objects with larger errors because of their location near one edge of the Schmidt plate (Véron-Cetty & Véron 1996), the published redshift (Col. 4), the magnitude (Col. 5), the old spectral classification: S2: Seyfert 2, S1: Seyfert 1, HII: HII region, Q: Quasar, ?: unknown (Col. 6), and our classification (Col. 7). References for the finding charts (Col. 8): (1) Anguita et al. (1979), (2) Bolton & Ekers (1966), (3) Bowen et al. (1994), (4) Condon et al. (1977), (5) Kazarian (1979), (6) Kazarian & Kazarian (1980), (7) Kondo et al. (1984), (8) MacAlpine & Williams (1981), (9) MacAlpine et al. (1977), (10) Margon et al. (1985), (11) Markarian & Lipovetski (1971), (12) Markarian & Lipovetski (1972), (13) Markarian & Lipovetski (1973), (14) Markarian & Lipovetski (1974), (15) Markarian & Lipovetski (1976), (16) Markarian et al. (1977a), (17) Markarian et al. (1977b), (18) Markarian et al. (1979), (19) Penston (1971), (20) Pesch & Sanduleak (1983), (21) Pesch & Sanduleak (1986), (22) Sanduleak & Pesch (1984), (23) Schneider et al. (1994), (24) Takase & Miyauchi-Isobe (1985), (25) Wills & Wills (1976)

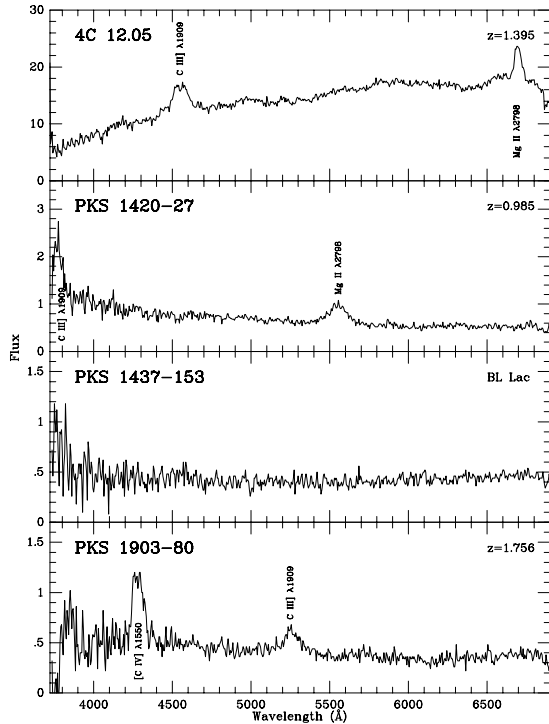
Name	$\alpha$	$\delta$	$z$	mag	old class.	our class.	Ref.
4C 12.05	00 35 41.98	12 11 03.6	–	17.5	?	Q	(25)
Mark 1147	00 45 57.94	10 03 56.9	0.036	15.7	S1	HII	(18)
Mark 971	01 01 32.79	35 18 07.8	0.085	16.5	S?	HII	(16)
Mark 998	01 30 02.04	–02 20 11.9	0.078	16.0	S?	HII	(17)
Q 0155 + 0220	01 55 47.90	02 20 26.3	0.066	16.7	?	HII	(23)
Mark 596	02 40 12.67	07 23 09.5*	0.038	14.8	S?	S2	(13)
KUV 03079 – 0101	03 07 54.83	–01 01 10.3	0.080	16.3	?	S1.0	(7)
CBS 74	08 29 11.46	37 17 49.1	0.091	17.	S	S1.2	(21)
HS 0843 + 2533	08 43 56.47	25 33 14.7	0.050	16.8	S1	S1	–
Mark 391	08 51 32.38	39 43 45.5	0.013	14.1	S?	HII	(11)
KUG 0929 + 324	09 29 01.90	32 26 59.9*	0.005	17.5	?	HII	(24)
CG 49	09 58 07.76	31 26 44.7	0.042	16.4	S2	S2	(20)
UM 446	11 39 12.06	–01 37 27.1	0.005	17.3	?	HII	(8)
US 2896	11 42 33.73	31 03 56.5	0.060	16.0	S1.5	S1	(22)
Mark 646	12 03 17.01	35 27 27.5	0.054	15.3	S	S1	(14)
2E 1219 + 0447	12 19 04.62	04 47 04.3	0.094	16.8	?	S1	(3)
KUV 13000 + 2908	13 00 01.52	29 07 37.0	0.023	16.1	S2	HII	(7)
Q 1356 – 067	13 56 44.90	–06 07 43.8	0.072	16.2	S?	HII	–
Mark 469	14 16 12.98	34 35 46.0	0.069	16.0	?	HII	(12)
PKS 1420 – 27	14 19 55.50	–27 14 20.8	–	18.	Q?	Q	(2)
Mark 816	14 31 40.78	52 59 26.8	0.089	16.5	S?	HII	(15)
PKS 1437 – 153	14 37 11.31	–15 18 58.9	–	19.	Q?	BL	(4)
Mark 833	14 55 59.69	35 24 05.4	0.040	16.0	S?	HII	(15)
Mark 483	15 28 41.48	34 05 53.3	0.048	16.4	HII	HII	(12)
KUV 15519 + 2144	15 51 53.33	21 43 42.9	0.040	15.8	S2	HII	(7)
Q 1619 + 3752	16 19 55.81	37 52 36.3	0.034	17.3	?	HII	(23)
EXO 1622.0 + 2611	16 22 05.33	26 11 23.9	–	16.1	S?	S1	–
Q 1624 + 4628	16 24 34.76	46 28 48.2	0.030	16.1	?	HII	(23)
Q 1638 + 4634	16 38 50.52	46 34 38.8	0.059	16.4	?	HII	(23)
Kaz 110	16 57 16.83	69 09 08.0	0.053	17.2	HII	HII	(5)
PKS 1903 – 80	19 03 56.16	–80 14 59.8	–	19.0	Q?	Q	(1)
RN 73	20 36 08.47	88 02 05.4	0.047	17.5	?	S1.9	(19)
Q 2233 + 0123	22 33 08.78	01 24 00.2	0.058	16.6	?	S1	(23)
Q 2257 + 0221	22 57 00.37	02 21 29.8	0.048	16.7	?	S2	(23)
NGC 7678	23 25 57.91	22 08 44.7	0.012	15.3	S2	HII	(6)
E 2344 + 184	23 44 53.30	18 28 10.8	0.138	15.9	?	S2	(10)
UM 11	23 50 45.22	03 26 22.3*	0.038	16.0	S	HII	(9)

this object is therefore a Seyfert 1.0 galaxy (Winkler 1992).

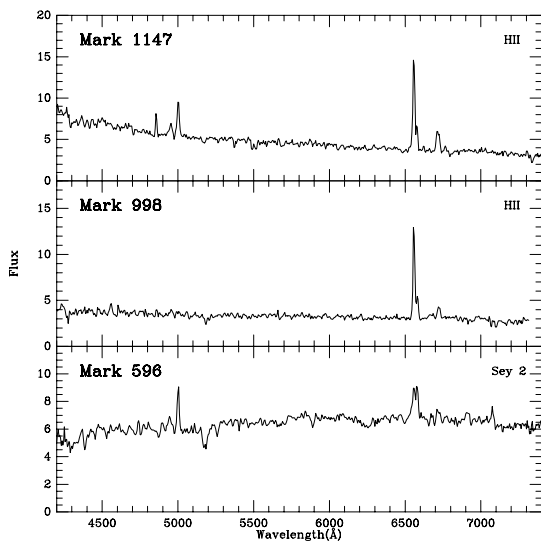
**CBS 74** is a Seyfert galaxy according to Wagner et al. (1988). It was not detected at 4850 MHz by Gregory & Condon (1991) ( $S < 25$  mJy) and is therefore a radioquiet object. Our spectra (Figs. 3, 9) show that it is a Seyfert 1.2 galaxy with a very broad  $H\alpha$  component ( $FWHM \sim 12000$  km s $^{-1}$ ) and  $R = 3.6$ . Such broad lines are common in radioloud quasars and broad line radiogalaxies (Miley & Miller 1979; Wills & Browne 1986; Brotherton et al. 1994; Eracleous & Halpern 1994), but they are rare in Seyfert galaxies although a few cases are known, such as 2E 0450–1816 (Eracleous & Halpern 1994)

and Arp 102B (Chen & Halpern 1989). Indeed, powerful radiogalaxies and radioloud quasars with extended radio morphologies tend to have the broadest Balmer lines, while AGNs with compact radiostructure and radioquiet objects have narrower Balmer lines (Miley & Miller 1979; Steiner 1981; Wills & Browne 1986).

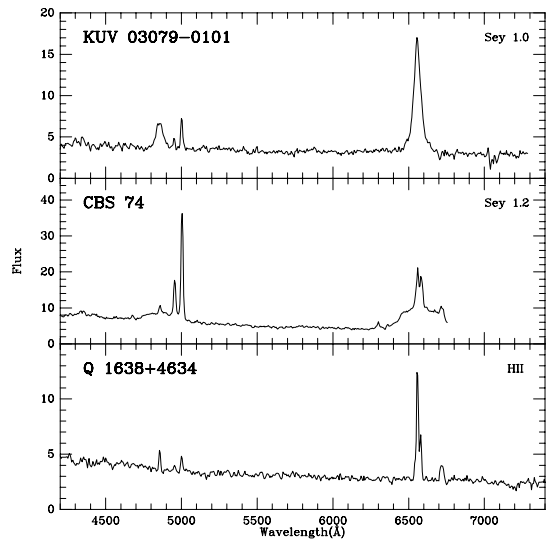
**HS 0843+2533.** The ROSAT X-ray source RX J08469+2522 was identified by Bade et al. (1995) with a 16.8 mag AGN called HS 0843+2533, which exhibits a broad  $H\alpha$  emission line ( $FWHM = 5900$  km s $^{-1}$ ). Our spectrum (Fig. 9) shows, indeed, a strong, broad  $H\alpha$  emission line ( $FWHM = 4850$  km s $^{-1}$ ); this object is therefore a Seyfert 1 galaxy.



**Fig. 1.** Low dispersion spectra (resolution  $\sim 15 \text{ \AA}$ ) of four objects observed with the 3.6 m ESO telescope. The fluxes are in units of  $10^{-16} \text{ erg s}^{-1} \text{ cm}^{-2} \text{ \AA}^{-1}$



**Fig. 2.** Low dispersion spectra (resolution  $\sim 13.5 \text{ \AA}$ ), in the rest frame, of three objects observed with the 1.93 m OHP telescope. The fluxes are in units of  $10^{-16} \text{ erg s}^{-1} \text{ cm}^{-2} \text{ \AA}^{-1}$



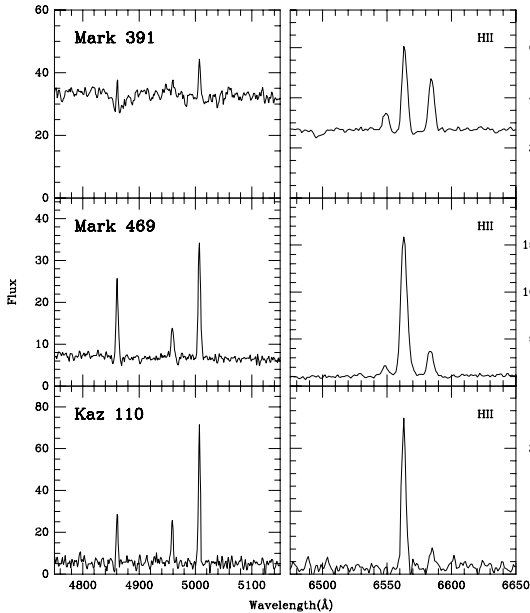
**Fig. 3.** Same as in Fig. 2 for three additional objects

**Mark 391** = NGC 2691 is a S0a galaxy (Huchra 1977). For Arakelian et al. (1972), it weakly shows the characteristics of the Seyfert nuclei, with a broad  $H\alpha$  emission line ( $\sim 50 \text{ \AA}$ ). On this basis, Véron-Cetty & Véron (1985) classified it as a Seyfert 1. Shuder & Osterbrock (1981), however, concluded from their own spectroscopic observations that it is not a Seyfert. Our spectra (Fig. 4) show Balmer lines in absorption together with narrow ( $FWHM < 215 \text{ km s}^{-1}$ ) emission lines with  $\lambda 5007/H\beta = 1.21$  and  $\lambda 6584/H\alpha = 0.55$ , proving that it is a HII region.

**KUG 0929+324** is a moderate excitation ( $\lambda 5007/H\beta = 2.68$ ) emission line galaxy with an heliocentric radial velocity  $V = 1500 \pm 70 \text{ km s}^{-1}$  according to Augarde et al. (1994). Our spectrum (Fig. 7) shows that it is a HII region with narrow emission lines ( $FWHM < 150 \text{ km s}^{-1}$ ) and  $\lambda 6584/H\alpha = 0.10$ . We found the radial velocity to be  $V = 4740 \text{ km s}^{-1}$  (Augarde 1995, private communication, gave  $V = 4478 \text{ km s}^{-1}$ ).

**CG 49.** Salzer et al. (1995) published line intensity ratios for this object as follows:  $\lambda 5007/H\beta = 11.68$  and  $\lambda 6584/H\alpha = 0.30$ . The  $\lambda 6584$  line is too strong for a HII region and too weak for a Seyfert 2 galaxy. Our spectrum shows  $\lambda 6584$  with the same low intensity, however it so happens that the redshifted wavelength of the  $\lambda 6584$  line ( $6874 \text{ \AA}$ ) falls precisely at the position of the atmospheric *B* band. When corrected for atmospheric absorption by dividing the observed spectrum by the spectrum of a standard star (Fig. 7), we obtain  $\lambda 6584/H\alpha = 0.79$ , a normal value for a Seyfert 2 galaxy. The measured  $FWHM$  of the emission lines is  $\sim 300 \text{ km s}^{-1}$ , in agreement with the adopted classification.

**UM 446** is a moderate excitation ( $\lambda 5007/H\beta = 4.54$ ) emission line galaxy (Salzer et al. 1989). Our spectrum (Fig. 7) shows narrow emission lines ( $FWHM <$



**Fig. 4.** Blue and red high dispersion spectra (resolution  $\sim 3.4 \text{ \AA}$ ), in the rest frame, of three objects observed with the 1.93 m OHP telescope. The fluxes are in units of  $10^{-16} \text{ erg s}^{-1} \text{ cm}^{-2} \text{ \AA}^{-1}$

$160 \text{ km s}^{-1}$ ) with  $\lambda 6584/\text{H}\alpha = 0.04$ ; this object is therefore a HII region.

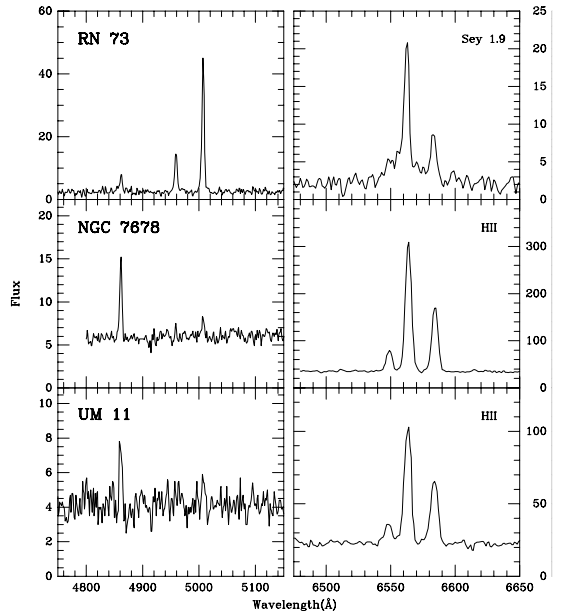
**US 2896** (Huang & Usher 1984) = CS 109 (Sanduleak & Pesch 1984) is an emission line galaxy (Mitchell et al. 1984), and a Seyfert 1.5 galaxy according to Everett & Wagner (1995). This is confirmed by our spectrum (Fig. 7) which shows a broad  $\text{H}\alpha$  component ( $2100 \text{ km s}^{-1} \text{ FWHM}$ ). A  $[\text{O I}]\lambda 6300$  emission line is observed with  $\lambda 6300/\text{H}\alpha_{\text{narrow}} = 0.03$ .

**Mark 646**, PG 1203+35 (Green et al. 1986), CG 885 (Pesch & Sanduleak 1988) or KUG 1203+354 (Takase & Miyauchi-Isobe 1991a) is a Seyfert galaxy according to Green et al. (1986). Our spectrum (Fig. 7) shows a broad  $\text{H}\alpha$  component ( $2350 \text{ km s}^{-1} \text{ FWHM}$ ); Mark 646 is therefore a Seyfert 1 galaxy. A  $\lambda 6300$  emission line is observed with  $\lambda 6300/\text{H}\alpha_{\text{narrow}} = 0.05$ .

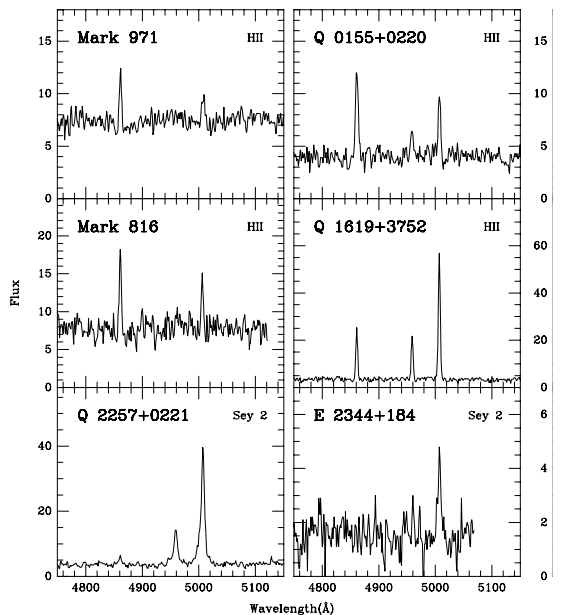
**2E 1219+0447** is an emission line galaxy (Bothun et al. 1984; Margon et al. 1985). We classify it as a Seyfert 1 galaxy on the basis of a weak, broad ( $\text{FWHM} \sim 8500 \text{ km s}^{-1}$ )  $\text{H}\alpha$  component (Fig. 9).

**KUV 13000+2908** (Noguchi et al. 1980), CG 963 (Sanduleak & Pesch 1990) or PB 3241 (Berger et al. 1991) is a Seyfert 2 galaxy according to Wegner & McMahan (1988). Our spectrum (Fig. 7) shows narrow ( $\text{FWHM} < 185 \text{ km s}^{-1}$ ) emission lines with  $\lambda 6584/\text{H}\alpha < 0.1$ , so this object is a HII region.

**Q 1356 – 067** is a QSO according to Goldschmidt et al. (1992). Our spectrum (Fig. 8), however, shows narrow ( $\text{FWHM} < 280 \text{ km s}^{-1}$ ) emission lines with



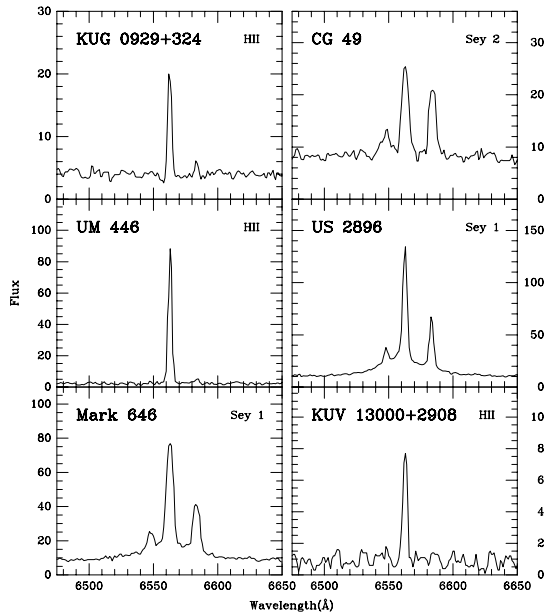
**Fig. 5.** Same as in Fig. 4 for three additional objects



**Fig. 6.** Blue high dispersion spectra (resolution  $\sim 3.4 \text{ \AA}$ ), in the rest frame, for six objects observed with the 1.93 m telescope. The fluxes are in units of  $10^{-16} \text{ erg s}^{-1} \text{ cm}^{-2} \text{ \AA}^{-1}$

$\lambda 6584/\text{H}\alpha = 0.16$ ; this object is therefore a HII region. A  $\lambda 6300$  emission line is observed with  $\lambda 6300/\text{H}\alpha = 0.015$ .

**Mark 469**, CG 899 (Pesch & Sanduleak 1989) or KUG 1416+345 (Takase & Miyauchi-Isobe 1984) is a 16.1 mag, UV excess galaxy (Peterson et al. 1981). Our observations (Fig. 4) show that it is a HII region, with  $\lambda 5007/\text{H}\beta = 1.38$  and  $\lambda 6584/\text{H}\alpha = 0.18$ , the lines being narrow ( $\text{FWHM} < 260 \text{ km s}^{-1}$ ).



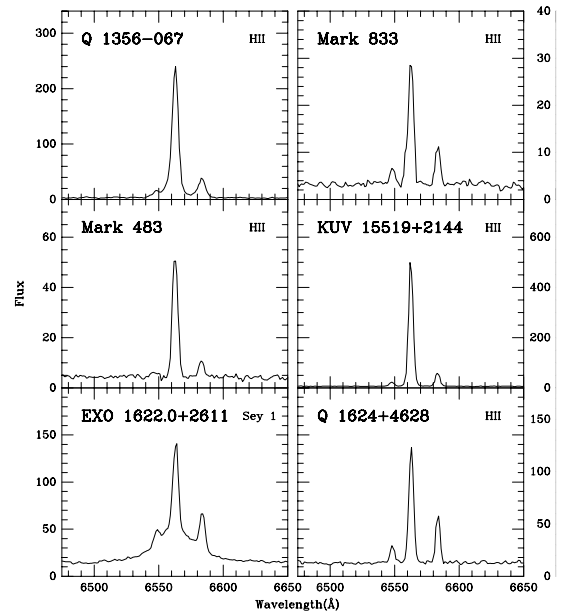
**Fig. 7.** Red high dispersion spectra (resolution  $\sim 3.4 \text{ \AA}$ ), in the rest frame, for six objects observed with the 1.93 m telescope. The fluxes are in units of  $10^{-16} \text{ erg s}^{-1} \text{ cm}^{-2} \text{ \AA}^{-1}$

**PKS 1420 – 27.** This radio source was identified by Bolton & Ekers (1966) with an 18 mag QSO. The identification was later confirmed by accurate optical and radio position measurements (Hunstead 1971, 1972). Our spectrum (Fig. 1) shows that it is indeed a QSO at  $z = 0.985$ . The emission line fluxes are 83 and  $53 \cdot 10^{-16} \text{ erg s}^{-1} \text{ cm}^{-2}$  for  $\text{CIII}\lambda 1909$  and  $\text{MgII}\lambda 2798$  respectively.

**Mark 816 = KUG 1431+529** (Takase & Miyauchi-Isoabe 1985) is a 16.5 mag, possibly Seyfert, galaxy (Afanasev et al. 1979); however,  $\lambda 6584/\text{H}\alpha < 0.3$  (Afanasev et al. 1980). Our spectrum (Fig. 6) shows narrow emission lines ( $< 240 \text{ km s}^{-1} \text{ FWHM}$ ) with  $\lambda 5007/\text{H}\beta = 0.63$ . This object is most probably a HII region.

**PKS 1437 – 153** is a flat spectrum radio source identified by Condon et al. (1977) with a 19.0 mag starlike object. It has a featureless spectrum between 3800 and 7000  $\text{\AA}$  (Fig. 1) and is most probably a BL Lac object.

**Mark 833 = CG 590** (Sanduleak & Pesch 1987) is an emission line galaxy (Markarian et al. 1985) which has been called a “narrow-line active galactic nucleus” by Veilleux & Osterbrock (1987), based on emission-line intensity ratios published by Shuder & Osterbrock (1981); it however happened that the object studied in this last paper is Mark 833 which is, in a few occasions mistakenly called Mark 833 (H. Falcke, private communication). The nature of the emission-line nebulosity in Mark 833 was therefore unknown. Our spectrum (Fig. 8) shows narrow ( $\text{FWHM} < 225 \text{ km s}^{-1}$ ) emission lines with  $\lambda 6584/\text{H}\alpha = 0.30$ . This object is, therefore, a HII region.



**Fig. 8.** Same as in Fig. 7 for six additional objects

**Mark 483 = CG 741** (Sanduleak & Pesch 1987) is an emission line galaxy (Markarian et al. 1988; Izotov et al. 1993) with a strong UV excess ( $U - B = -0.45$ , Peterson et al. 1981). The emission-line ratios published by Markarian et al. ( $\lambda 6584/\text{H}\alpha < 0.33$ ) and Izotov et al. ( $\lambda 5007/\text{H}\beta \sim 2.0$ ) suggested that it is a HII region. This is confirmed by our spectrum (Fig. 8) which shows narrow emission lines ( $\text{FWHM} < 225 \text{ km s}^{-1}$ ) with  $\lambda 6584/\text{H}\alpha = 0.12$ .

**KUV 15519+2144** is a Seyfert 2 galaxy according to Wagner & Swanson (1990). Our spectrum (Fig. 8) shows it to be a HII region, with narrow ( $\text{FWHM} < 185 \text{ km s}^{-1}$ ) emission lines and  $\lambda 6584/\text{H}\alpha = 0.11$ . A  $\lambda 6300$  emission line is observed with  $\lambda 6300/\text{H}\alpha = 0.02$

**Q 1619+3752**, an emission line galaxy according to Schneider et al. (1994), is classified as a HII region, as it shows narrow emission lines ( $< 240 \text{ km s}^{-1} \text{ FWHM}$ ) and  $\lambda 5007/\text{H}\beta = 2.56$  (Fig. 6).

**EXO 1622.0+2611.** An AGN for Giommi et al. (1991), this is a Seyfert 1 galaxy, as it presents a broad  $\text{H}\alpha$  component ( $1770 \text{ km s}^{-1} \text{ FWHM}$ ) (Fig. 8).

**Q 1624+4628.** An emission line galaxy according to Schneider et al. (1994), it is a HII region, with narrow ( $< 195 \text{ km s}^{-1} \text{ FWHM}$ ) emission lines and  $\lambda 6584/\text{H}\alpha = 0.40$  (Fig. 8).

**Q 1638+4634.** An emission line galaxy according to Schneider et al. (1994), it is a HII region, with  $\lambda 5007/\text{H}\beta = 0.86$  and  $\lambda 6584/\text{H}\alpha = 0.40$  (Fig. 3).

**Kaz 110.** The emission-line gas in this object was shown to be ionized by hot stars (Kazarian & Tamazian 1993). Our spectra (Fig. 4) confirm this result, the measured line ratios being:  $\lambda 5007/\text{H}\beta = 2.83$  and  $\lambda 6584/\text{H}\alpha = 0.09$ .

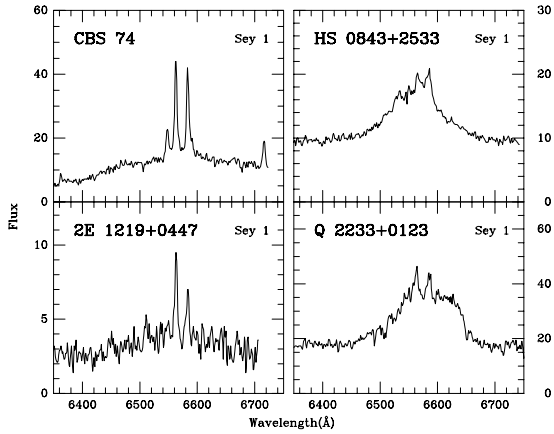


Fig. 9. Same as in Fig. 7 for four additional objects

**PKS 1903 – 80.** This flat spectrum radio source (Quinto & Cersosimo 1993) was identified with a 19.0 mag QSO by Anguita et al. (1979). The identification was confirmed by an accurate radioposition measurement (Russel et al. 1992). It is indeed a QSO at  $z = 1.756$  (Fig. 1). The emission line fluxes are 57 and  $25 \cdot 10^{-16} \text{ erg s}^{-1} \text{ cm}^{-2}$  for  $\text{CIV}\lambda 1550$  and  $\text{CIII}\lambda 1909$  respectively.

**RN 73** (Ryle & Neville 1962) = 8C 2037+880 (Rees 1990) was identified with a 17.5 mag emission line galaxy (Penston 1971). Our spectra (Fig. 5) show a weak, broad ( $FWHM \sim 1590 \text{ km s}^{-1}$ )  $\text{H}\alpha$  component, but no broad  $\text{H}\beta$  component: this object is a Seyfert 1.9 galaxy. However, the ratio  $\lambda 6584/\text{H}\alpha_{\text{narrow}} = 0.37$  is low for a Seyfert galaxy. Halliday (1977) published an accurate radiomap for this source; its position, as measured on this map ( $\alpha_{1950} = 20^{\text{h}}36^{\text{m}}44^{\text{s}}$ ,  $\delta_{1950} = 88^{\circ}01'58''$ ), is about 20 arcsec away from the position of the galaxy, suggesting that the radiostructure and the galaxy are not to be related.

**Q 2233+0123.** An emission line galaxy according to Schneider et al. (1994), it is a Seyfert 1, having a strong and broad ( $FWHM \sim 5500 \text{ km s}^{-1}$ )  $\text{H}\alpha$  component (Fig. 9). The profile of this line deviates significantly from a Gaussian, having a flat top.

**Q 2257+0221** is an emission line galaxy according to Schneider et al. (1994). It is a Seyfert 2 having broad ( $FWHM \sim 500 \text{ km s}^{-1}$ ), asymmetrical  $[\text{OIII}]$  lines, that are much stronger than  $\text{H}\beta$  ( $\lambda 5007/\text{H}\beta \sim 17$ ) (Fig. 6).

**NGC 7678** = Kaz 336 (Kazarian & Kazarian 1980). Although classified as a Seyfert 2 galaxy by Kazarian (1993), this is a HII region with  $\lambda 6584/\text{H}\alpha = 0.52$ ,  $\lambda 5007/\text{H}\beta = 0.25$  and linewidth  $< 260 \text{ km s}^{-1} FWHM$  (Fig. 5).

**E 2344+184** is a spiral galaxy (Hutchings & Neff 1992). According to Margon et al. (1985), it is an emission line galaxy with a strong  $\lambda 6584$  emission line. Our low signal-to-noise blue spectrum (Fig. 6) shows a strong

$\lambda 5007$  line ( $\lambda 5007/\text{H}\beta > 6$ ), so it is most probably a Seyfert 2 galaxy.

**UM 11.** Terlevich et al. (1991) gave line ratios:  $\lambda 6584/\text{H}\alpha = 1.23$  and  $\lambda 5007/\text{H}\beta = 0.83$ , suggesting that this object is a Liner; our spectra (Fig. 5) give  $\lambda 6584/\text{H}\alpha = 0.56$  and  $\lambda 5007/\text{H}\beta \sim 0.5$  (with linewidth  $< 300 \text{ km s}^{-1} FWHM$ ) showing that it is a HII region instead.

#### 4. Conclusions

We have observed 37 AGN candidates and classified them on the basis of their spectroscopic properties; the line intensities and widths were obtained by fitting the spectra with Gaussian components. We concluded that three of the observed objects are confirmed QSOs, one is a BL Lac object, nine are Seyfert 1 galaxies, four are Seyfert 2s, while twenty are HII regions.

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**Table 4.** Fitting profile analysis results (see text). Column 2 gives the redshift used to deredshift the spectra, while Cols. 3 and 7 give the velocity of the lines as measured on the deredshifted spectra. Columns 6 and 10 give the peak intensity of the H $\beta$  and H $\alpha$  lines respectively (in units of  $10^{-16}$  erg s $^{-1}$  cm $^{-2}$  Å $^{-1}$ ). The *FWHM* are observed values, not corrected for the instrumental profile; values in parenthesis are from low dispersion spectra and are unresolved

Name	$z$	$V$ (km s $^{-1}$ )	<i>FWHM</i> (km s $^{-1}$ )	$\frac{\lambda 5007}{H\beta}$	H $\beta$	$V$ (km s $^{-1}$ )	<i>FWHM</i> (km s $^{-1}$ )	$\frac{\lambda 6584}{H\alpha}$	H $\alpha$	Spectral type
Mark 1147	0.0364	14	(780)	2.18	2.3	11	(635)	0.24	11.4	HII
Mark 971	0.0823	15	280	0.41	5.6	–	–	–	–	HII
Mark 998	0.0761	–	–	–	–	22	(580)	0.23	10.3	HII
Q 0155 + 0220	0.0651	–1	325	0.71	8.4	–	–	–	–	HII
Mark 596	0.0388	–16	(960)	> 5.0	< 0.6	45	(720)	1.14	2.2	S2
KUV 03079 – 0101	0.0807	–15	(860)	> 10.0	< 0.4	–	–	–	–	S1.0
		–29	3360	–	3.1	–28	2570	–	12.2	
CBS 74	0.0920	143	(945)	15.6	1.9	–10	260	0.89	27.8	S1.2
		1485	14500	–	2.3	1092	12200	–	10.4	
HS 0843+2533	0.0507	–	–	–	–	90	475	1.6	2.5	S1
		–	–	–	–	–70	4850	–	7.3	
Mark 391	0.0133	9	210	1.21	9.9	45	225	0.55	36.7	HII
KUG 0929+324	0.0158	–	–	–	–	–6	150	0.10	17.6	HII
CG 49	0.0438	–	–	–	–	15	300	0.79	17.4	S2
UM 446	0.0061	–	–	–	–	9	160	0.04	79.8	HII
US 2896	0.0594	–	–	–	–	–3	185	0.43	103	S1
		–	–	–	–	–120	2100	–	12.3	
Mark 646	0.0536	–	–	–	–	0	280	0.46	62.8	S1
		–	–	–	–	–16	2350	–	8.0	
2E 1219+0447	0.0947	–	–	–	–	3	225	0.54	5.5	S1
		–	–	–	–	222	8440	–	1.6	
KUV 13000+2908	0.0223	–	–	–	–	3	185	< 0.1	7.0	HII
Q 1356–067	0.0746	–	–	–	–	6	280	0.16	226	HII
Mark 469	0.0689	–9	295	1.38	19.4	18	260	0.18	147	HII
Mark 816	0.0887	–19	240	0.63	10.5	–	–	–	–	HII
Mark 833	0.0395	–	–	–	–	–8	225	0.30	25.7	HII
Mark 483	0.0481	–	–	–	–	–5	225	0.12	48.3	HII
KUV 15519+2144	0.0392	–	–	–	–	–9	185	0.11	483	HII
Q 1619+3752	0.0331	–3	240	2.56	20.4	–	–	–	–	HII
EXO 1622.0+2611	0.0394	–	–	–	–	15	225	0.40	93.0	S1
		–	–	–	–	12	1770	–	33.0	
Q 1624+4628	0.0301	–	–	–	–	6	195	0.40	124	HII
Q 1638+4634	0.0581	10	(720)	0.86	1.8	36	(625)	0.40	10.3	HII
Kaz 110	0.0527	–5	225	2.83	22.9	9	170	0.09	23.1	HII
RN 73	0.0491	18	310	7.4	5.4	–16	185	0.37	16.3	S1.9
		–	–	–	–	–34	1590	–	3.1	
Q 2233+0123	0.0566	–	–	–	–	15	290	0.60	8.5	S1
		–	–	–	–	1080	5500	–	21.3	
Q 2257+0221	0.0466	3	495	16.7	1.9	–	–	–	–	S2
NGC 7678	0.0116	12	270	0.25	9.5	45	250	0.52	272	HII
E 2344+184	0.1365	24	425	> 6.0	< 0.5	–	–	–	–	S2
UM 11	0.0390	–8	310	0.46	3.8	21	290	0.56	80.2	HII

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