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ASTRONOMY & ASTROPHYSICS
SUPPLEMENT SERIES

NOVEMBER **1982**, PAGE 217

Astron. Astrophys. Suppl. Ser. **50**, 217-231 (1982)

A 1415 MHz survey of Seyfert and related galaxies — III

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Received May 5, accepted May 19, 1982

Summary. — We present the third and final instalment of a high sensitivity search with the Westerbork telescope for radio continuum emission at 1415 MHz from Seyfert and related galaxies. 24 galaxies with declinations in the range $+ 10° > \delta > - 31°$ have been observed to a flux density limit (3 σ) of about 3 mJy. 19 (79 %) were certainly or probably detected. The results of deep (3 σ noise about 1 mJy), full 12-hour syntheses of 3 Seyfert galaxies (Mark 40, 372 and 391) which were undetected in Paper I of this series are also given. Each of these galaxies has now been detected. A summary listing of the results of the entire survey is given in right ascension order.

Key words : radio emission — Seyfert galaxies — active galaxies — Markarian galaxies.

1. **Introduction.** — In two earlier papers (de Bruyn and Wilson, 1976, Paper I ; Meurs and Wilson 1981, Paper II) a sensitive survey in λ 21 cm continuum radiation of Seyfert and related galaxies with the Westerbork Synthesis Radio Telescope (WSRT) was presented. Of the 111 galaxies observed, 62 (56 %) were detected above a flux density limit of 3-4 mJy [2] (3 σ). The present paper gives the results of the ramainder of this survey and includes observations of 24 galaxies to a limit of 3 mJy (3 σ) and 3 galaxies to a limit of 1 mJy (3 σ).

Information on the observational procedure is given in section 2 while section 3 explains how the galaxies were selected. The results and a discussion of the expected level of chance coincidences are presented in table II and section 4. Comments on individual sources are given as notes to table II. A summary listing of the entire survey is given in right ascension order in table III.

2. **Observational procedure.** — The WSRT and its mode of data reduction have been described elsewhere (Högbom and Brouw, 1974 ; Baars and Hooghoudt, 1974 ; van Someren Grève, 1974). Broadly speaking, we have followed the procedures described in Paper II. A summary of the dates and observational parameters is given in table I ; the reader is referred to Paper II for the significance of the terms « old » and « new » systems.

The programme galaxies not previously observed in our survey lie in the declination range $+ 10° > \delta > - 31°$. Each of these galaxies was observed near to transit on either 4 separate occasions (with baseline $9A = 36^m, 54^m, 72^m$ and 90^m) with the « old » system, or on 2 separate occasions (with baseline $9A = 36^m$ and 54^m) with the « new » system. At these declinations, the resolution of the WSRT in declination is poor ; for the few sources within a degree or two of the celestial equator no declination information is available other than that the radio sources must lie within the primary (single dish) pattern, whose FWHM is $\simeq 36'$. Under these circumstances, identification of a radio source with the programme galaxy relies essentially on good agreement between radio and optical right ascensions. As discussed in section 4, however, it is improbable that more than one of the listed identifications is incorrect.

We have also observed, with full 12 hour observations, 3 galaxies with $\delta > 10°$ (Mark 40, 372 and 391) which were undetected in Paper I.

3. **Programme galaxies.** — As before, most of our programme galaxies were selected from the lists of Weedman (1977, 1978). Also observed were Mark 391 (noted as a possible Seyfert by Khachikian and Weedman (1974) but is not a Seyfert according to Shuder and Osterbrock, 1982), Mark 586 (noted as a possible QSO by Markarian and Lipovetskii 1973), NGC 3081 (M. G. Smith, private communication) and T1004-296 (Penston *et al.*, 1977). We note that two galaxies in our survey, Arak 223 and Arak 253, are not now considered Seyferts (Phillips and Osterbrock, 1977).

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[2] 1 mJy = 10^{-29} W m^{-2} Hz^{-1}.

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4. **Results.** — The results of the survey are presented in table II, where the galaxies are listed in increasing Markarian numbers followed by Arakelyan, NGC, Zwicky, MCG and Tololo designated galaxies. Flux densities of detected galaxies (including the 3 galaxies, Mark 40, 372 and 391, which were observed for a full 12 hours) are given in table IIa, whose first 5 columns contain the galaxy name(s) (column 1), the measured total flux density and its r.m.s. error (column 2), the upper limit on the E-W radio source size (column 3), and the radio right ascension, α_r, and declination, δ_r, along with their r.m.s. errors (columns 4 and 5). The remainder of table IIa comprises the difference between the right ascension of the radio source and the optical nucleus, $\alpha_r - \alpha_0$ (in arc sec, column 6), and between the declinations of the radio source and the optical nucleus, $\delta_r - \delta_0$ (in arc secs for the sources with $\delta > +10°$ and in arc min. for the rest, column 7), and a reference to the optical position used to derive $\alpha_r - \alpha_0$ and $\delta_r - \delta_0$ (column 8). For each undetected galaxy (Table IIb), we list the source name(s) (column 1), the 3 σ upper limit to the radio flux density (column 2) and a reference for the optical position at which we searched for radio emission (column 8). For a few galaxies, no accurate optical position was available, so their positions were measured at Leiden or Maryland and are listed in the notes to table II. Of the 27 galaxies in table II, 22 (81 %) have been certainly or probably detected, the great majority of which have not been seen previously at radio wavelengths. In the following, we discuss briefly the expected chance coincidence rate and limits on the radio polarizations. The reader is referred to sections 4.1 and 4.2 of Paper II for explanation of the detection and identification procedure and the methods of source parameter extraction.

Because the declination resolution is poor, it is relevant to discuss the possibility that background radio sources, unassociated with the programme galaxies, may be listed as the identification in table IIa. From the differential source counts at 1415 MHz given by Willis *et al.* (1977), we expect a total of 1.45×10^5 sources sterad^{-1} above the survey limit of 3 mJy. For the 12 sources detected in the transit survey and for which it was possible to derive the declination (Table IIa), the average (1 σ) error in $\alpha_r - \alpha_0$ is $\pm$ 1″.4 and in $\delta_r - \delta_0$ $\pm$ 3′.5. The probability of a background radio source of flux density > 3 mJy lying within the ellipse defined by these errors is 0.028, where 3 σ errors in each coordinate have been taken as the semi major and minor axes of the ellipse. For the 7 sources without declination information, the average error (1 σ) in $\alpha_r - \alpha_0$ is $\pm$ 2″.6. Adopting arbitrarily a declination error (3 σ) equal to $\pm$ 9′ ($\pm$ 0.5 $\times$ HWHM of the primary pattern) and making no correction for primary beam attenuation, the probability of a background source lying within one such error ellipse is 0.045. This probability would be reduced if attenuation of the background sources by the primary pattern were allowed for. While these figures are admittedly only rough estimates of the confusion, it is clear that the number of spurious identifications in table II is most unlikely to be more than one. Perhaps the most doubtful case is Mark 590, for which the displacement $\alpha_r - \alpha_0$ is 3.35 σ.

In several cases, particularly for sources very close to the celestial equator, the first grating response is essentially indistinguishable from the main beam response. The radius of this grating response is 40′.7 in right ascension, where the attenuation by the primary pattern gives a sensitivity of only 4.5 % of its on axis value. Thus for a background source lying on the first grating response and at the same declination as the programme galaxy to be listed as a detection, the flux density would have to be at least 67 mJy. If the declination of the background source differs from the programme galaxy, its flux density would need to be even higher. In fact, the probability of such grating response confusion is more than an order of magnitude smaller than the chance of main beam confusion discussed above.

As in Papers I and II, all galaxies observed with the old system with $S > 12$ mJy were analyzed for linear and circular polarization. No polarization was found in any of the galaxies. The 3 σ upper limits on both linearly and circularly polarized flux density ($\sqrt{Q^2 + U^2}$ and V) are generally 3 mJy, except for MCG-2-58-22 where they are 5 mJy.

5. **Summary listing by right ascension.** — In this series of papers, objects have been listed in order of increasing number of the original designator, most commonly Markarian. For some purposes, the alternate system of a catalogue by right ascension may be more convenient. Table III provides such a listing for the complete survey in the same format as table II but with the addition (last column) of a reference to the paper where the observations were originally reported. Table III also includes the results of observation of 5 « classical » Seyferts by van der Kruit (1971). This list should be regarded as a summary and the reader is referred to the original papers for further information.

Acknowledgements. — We thank the telescope and reduction groups of the Netherlands Foundation for Radioastronomy for their continued assistance and support. Mr. E. D. Clements kindly provided us with a list of accurate optical positions of Seyfert galaxies prior to publication. Dr. A. G. de Bruyn processed the observations of Mark 391. Both authors acknowledge travel support from the Leidsch Kerkhoven Bosscha Fonds. This research was supported in part by the National Science Foundation (AST 79-24381).

The Westerbork Synthesis Radio Telescope is operated by the Netherlands Foundation for Radio Astronomy with the financial support of the Netherlands Organization for the Advancement of Pure Research (Z.W.O.).

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TABLE I. — *Instrumental parameters and observations.*

Parameters:	Old System	New System
Frequency (MHz)	1415	1412
Bandwidth (MHz)	4	10
R.m.s. noise (mJy (beam area)$^{-1}$)	1	0.7
Number of interferometers	20	40

Observations:

Old System

Baselines (m)[a]	36 (72) 1404
Date	July 1977
Galaxies	Mark 509 541 590 609[be] 618 Arak 223[be] 253 NGC 985[be] 3081 7603 IC 4329A[def] Zw 0934+01[be] II Zw 1 II Zw 136[be] III Zw 55[be]
Date	August 1977
Galaxies	T1004-296
Date	November 1977
Galaxies	MCG-2-58-22[cg]
Baseline (m)	54 (72) 1422
Date	June 1977
Galaxies	Mark 590 609[be] 618 Arak 223[cf] 253[cf] T1004-296[cf] NGC 985[be] 3081[cf] Zw 0934+01[cf] II Zw 1 II Zw 136[bh] III Zw 55[be]
Date	July 1977
Galaxies	Mark 509 541[ci] NGC 7603[ci] IC 4329A
Date	September 1977
Galaxies	MCG-2-58-22
Baselines(m)	72 (72) 1440
Date	May 1977
Galaxies	Mark 509[cf] 541 590 609 618[cj] Arak 223 253 T1004-296[cf] NCG 985 3081 7603[cf] IC 4329A[cf] Zw 0934+01[cf] II Zw 1 II Zw 136 III Zw 55[be]
Date	October 1977
Galaxies	MCG-2-58-22[ck]
Baselines(m)	90 (72) 1314[cf]
Date	May/June 1977
Galaxies	Mark 509 541 590 609 618 Arak 223 253 T1004-296 NGC 985 3081 7603 IC 4329A Zw 0934+01 II Zw 1 II Zw 136 III Zw 55
Date	December 1977
Galaxies	MCG-2-58-22[dfl]

New System

Baselines (m)	36 (36) 1440
Date	December 1977/January 1978
Galaxies	Mark 40[q] 391[q]
Date	August 1978
Galaxies	Mark 543 584 586 595
Date:	February 1979[p]
Galaxies	Mark 573 NGC 4235 T2327-027
Baselines (m)	54 (36) 1458[p]
Date	February 1978
Galaxies	Mark 543[me] 584 586 595
Date	December 1978
Galaxies	Mark 573 NGC 4235[n] T2327-027
Baselines (m)	72 (72) 1512
Date	October 1977
Galaxies	Mark 372[qr]

NOTES

a baseline configurations: shortest baseline (increment) longest baseline
b 19 interferometers
c 18 interferometers
d 17 interferometers
e shortest baseline out
f two longest baselines out
g 252 and 756 m out
h 198 m out
i 342 and 414 m out
j 648 and 720 m out
k 792 and 864 m out
l 810 m out
m 39 interferometers
n 36 interferometers, 54, 90, 126 and 162 m out
p parallel dipoles
q full 12 hour observation; r.m.s. noise is 0.3 - 0.4 mJy
r 30 interferometers

TABLE II. — *Radio data at 1412 or 1415 MHz* ([a]).

a) Detected galaxies

Galaxy Name(s)	Flux density (mJy)	E-W Source size (arc sec)	Radio position (1950.0) Right ascension, α_r	Declination, δ_r	Radio-Optical Position Difference $\alpha_r - \alpha_o$	$\delta_r - \delta_o$	Reference for Optical Position[b]
Mark 40*/VV 144 /I Zw 26	1.2 ± 0.3	< 30	$11^h\ 22^m\ 47^s.74 \pm 0^s.36$	+54° 39′ 21".4 ± 3".8	−0".9 ± 3".1	−5".4 ± 3".8	C
Mark 372/IC 1854	2.4 ± 0.4	< 17	02 46 31.64 ± 0.13	+19 05 50.6 ± 5".6	+3.0 ± 1.9	+1".1 ± 5".6	C
Mark 391/NGC 2691 /UGC 04664	6.8 ± 0.4	< 10	08 51 32.32 ± 0.07	+39 43 46.6 ± 1".1	−6.7 ± 4.1	−1".4 ± 4".1	DC
Mark 509	12.5 ± 1.0	< 12	20 41 26.10 ± 0.06	−10° 58'.1 ± 2'.6	−2.6 ± 1.0	−3'.8 ± 2'.6	C
Mark 543*/NGC 7811 /III Zw 127	(4.3 ± 1.4)	< 22	23 59 52.60 ± 0.32	−	−1.2 ± 4.8	−	C
Mark 573*/UGC 01214	20.1 ± 1.1	< 40	01 41 22.61 ± 0.05	+02 04.8 ± 6'.2	−4.7 ± 0.8	−1'.1 ± 6'.2	C
Mark 584	3.6 ± 0.7	< 18	01 57 51.19 ± 0.15	+02 25.0 ± 6'.0	+1.7 ± 2.3	−0'.7 ± 6'.0	C
Mark 586*	(3.5 ± 1.0)	< 21	02 05 14.49 ± 0.25	−	+1.4 ± 6.3	−	K
Mark 590*/UGC 01727 /NGC 863	(11.0 ± 2.0)	< 13	02 12 00.82 ± 0.1	−	+6.7 ± 2.0	−	C
Mark 609	27.3 ± 1.2	< 9	03 22 57.30 ± 0.04	−06 21.4 ± 3'.5	+0.5 ± 0.7	−2'.2 ± 3'.5	C
Mark 618	16.4 ± 1.4	< 11	04 34 00.09 ± 0.06	−10 27.0 ± 1'.5	+1.9 ± 0.9	+1'.6 ± 1'.5	C
Arak 253*/Mark 1261 /UGC 05849	(17.6 ± 1.4)	< 12	10 41 19.08 ± 0.04	−	−1.8 ± 0.8	−	WM1
NGC 985*/VV 285 /Mark 1048	(19.0 ± 5.0)	−	02 32 10.67 ± 0.12	−08 54.8 ± 4'.5	+2.4 ± 1.8	+5'.6 ± 4'.5	C
NGC 3081*	6.6 ± 1.1	< 16	09 57 09.46 ± 0.12	−22 37.0 ± 2'.5	−6.9 ± 1.9	−1'.8 ± 2'.5	WM2
NGC 4235/IC 3098 /UGC 07310	10.0 ± 0.7	< 11	12 14 36.66 ± 0.06	+07 31.2 ± 2'.7	−1.2 ± 0.9	+3'.1 ± 2'.7	C
NGC 7603*/Mark 530 /UGC 12493/Arp 92	(26.7 ± 2.0)	< 10	23 16 22.85 ± 0.05	−	−0.3 ± 0.8	−	C
IC 4329A*	38.5 ± 1.3	< 7	13 46 27.79 ± 0.04	−30 03.1 ± 0'.5	−1.0 ± 0.7	+0'.5 ± 0'.5	WM1
II Zw 136/UGC 11763	9.8 ± 1.6	< 16	21 30 00.69 ± 0.12	+10 01.9 ± 7'.9	−7.2 ± 1.8	+6'.9 ± 7'.9	C
III Zw 55*/NGC 1410 /UGC 02821	(16.5 ± 1.5)	< 12	03 38 38.19 ± 0.06	−	−2.1 ± 1.1	−	WM1
MCG-2-58-22/Mark 926	34.0 ± 2.0	< 20	23 02 07.21 ± 0.04	−08 58.9 ± 1'.0	+0.7 ± 0.8	−1'.6 ± 1'.0	WM1
T1004-296*/NGC 3125	13.0 ± 3.0	< 60	10 04 18.18 ± 0.23	−29 42.8 ± 3'.0	+2.3 ± 3.6	−1'.3 ± 3'.0	WM2
T2327-027*	(5.4 ± 1.0)	< 17	23 27 57.89 ± 0.14	−	−2.1 ± 2.3	−	WM2

b) Undetected galaxies

Galaxy Name(s)	Flux density (mJy)	Reference for Optical Position[b]
Mark 541	< 3.3	C
Mark 595*	< 4	C
Arak 223	< 3	WM1
II Zw 1	< 3	C
Zw 0934+01/Mark 707	< 3	C

Notes to table II.

[a] See table I for the exact frequency of observation for each galaxy.
[b] Referencing code for optical position:
C = Clements (1981)
DC = Dressel and Condon (1976)
K = Kojoian, Elliott and Tovmassian (1978)
WM1 = Wilson and Meurs (1978)
WM2 = This paper, see notes on individual galaxies.

Comments on individual sources in Table II (indicated by *)

Markarian 40:

This galaxy is straddled by two radio sources, the first at 6.″1 in p.a. 187^{o} with flux density 7.5 mJy and the second at 5.″4 in p.a. 13^{o} with flux density 9.5 mJy.

Markarian 543, 586, 590, Arakelyan 253, NGC 7603, III Zw 55, T2327-027:

The lack of declination information renders the identification of the radio source with the galaxy less certain (see discussion in Section 4). For this reason the flux densities are given in parentheses. However, VLA observations by ASW, J.S. Ulvestad and R.A. Sramek at 4.885 GHz reveal radio emission close to the level expected from the present observations (assuming $\alpha \simeq 0.5 - 1.0$, de Bruyn and Wilson 1978) for Mark 590 and an upper limit consistent with the present data for Mark 543. Also, NGC 7603 has been detected by Crane (1977) at 2.7 GHz and by van der Hulst, Crane and Keel (1981) at 5 GHz at flux levels broadly consistent with the present value (see below). For the others, further observations with a non E-W interferometer are desirable.

Markarian 543:

Clements (1981) points out that the optical nucleus is double with component separation about 7". The radio right ascension is consistent with either optical component. We have arbitrarily listed the radio-optical right ascension difference w.r.t. the SE object.

Markarian 573:

A strong source precedes the galaxy by 25". Some emission remained after subtraction of this source, but is probably not real.

NGC 985:

Near to this galaxy we found an extended source of total flux density about 60 mJy. Analysis with the CLEAN routine suggested that the source is composed of at least two components, blended because of the very poor resolution (50′ FWHM) in declination. One component, whose properties are listed in the table, is close to NGC 985, while the other lies about 14′ to the north. Because of uncertainty in this deblending, NGC 985 should be considered as only a tentative detection.

NGC 3081:

Optical position: $\alpha_o(1950.0) = 09^h\ 57^m\ 09^s.96$, $\delta_o(1950.0) = -22^o\ 35'\ 10''.5$ (error ± 1")

NGC 7603:

Detected by Crane (1977) at 2.7 GHz with S(nuclear) = 22 mJy. Also detected by van der Hulst, Crane and Keel (1981) at 5 GHz with S = 10.8 ± 3.0 mJy.

IC 4329A:

Detected by Disney at 5 GHz (private communication, see de Bruyn and Wilson 1976) with S = 24 ± 1 mJy, and by Crane (1977) at 2.7 GHz with S = 49 mJy. These data and the present are not consistent with a power law spectrum and may imply variability (see also Disney 1973).

Notes to table II *(continued)*.

III Zw 55:

This system consists of a pair of galaxies, NGC 1409 and NGC 1410, one lying NE of the other and separated by 14". Sargent (1970) incorrectly states that NGC 1409 is the northern component and the Seyfert galaxy. According to de Vaucouleurs, de Vaucouleurs and Corwin (1976), NGC 1410 is, in fact, the northern component and the Seyfert. The optical position of the Seyfert is given correctly in Table 1 of Wilson and Meurs (1978), but, following Sargent, it is wrongly referred to as NGC 1409. The optical position listed by Clements (1981) refers to the non Seyfert NGC 1409, the southern member. The right ascension of the radio source is consistent with either galaxy; the offset is given w.r.t. the Seyfert NGC 1410.

T1004-296:

Optical position: α_o(1950.0) = $10^h\ 04^m\ 18^s.00$, δ_o(1950.0) = $-29^o\ 41'\ 28''.2$ (error ± 2"). After subtraction of the source close to the galaxy, residual emission was found to the north. This emission may be real or, more likely, residual sidelobe confusion. T1004-296 may have been detected (at 2.2σ) by Penston et al. (1977) at 5 GHz with S = 10.8 ± 4.8 mJy.

T2327-027:

Optical position: α_o(1950.0) = $23^h\ 27^m\ 58^s.03$, δ_o(1950.0) = $-02^o\ 44'\ 19''.7$ (error ± 1").

Markarian 595:

A weak (S ≃ 3 ± 1.1 mJy) feature is found close to the galaxy at $\alpha = 02^h\ 38^m\ 55^s.1 \pm 0^s.4$, $\delta = +07^o\ 04'.9 \pm 4'.4$. The offsets from the optical position are $\alpha_r - \alpha_o = -10''.5 \pm 6''.0$ and $\delta_r - \delta_o = +6'.4 \pm 4'.4$. Although it could be a source associated with Mark 595, we prefer not to list it as a detection because of its low significance and possible displacement from the optical galaxy.

TABLE III. — *A summary of the Westerbork survey of Seyfert, Seyfert-related and other galaxies at 1415 MHz.*

Galaxy Name(s)	Flux density (mJy)	Source size (arc sec)	Radio position[a] (1950.0) Right ascension, α_r	Declination, δ_r	Radio-Optical Position Difference[b] $\alpha_r - \alpha_o$	$\delta_r - \delta_o$	Reference for Optical Position[c]	Paper[d]
Mark 335	< 8	-	-	-	-	-	C	I
IV Zw 29 /Zw 0039+4003	< 3	-	-	-	-	-	WM1	II
Mark 348/NGC 262 /UGC 00499	340 ± 7	< 4	00^h 46^m $04^s.86$ ± $0^s.07$	+31° 41′ 05″.6 ± 2″.0	−0″.3 ± 0″.9	+1″.0 ± 2″.0	C	I
I Zw 1/UGC 00545	10 ± 2	< 30	00 50 57.80 ± $0^s.3$	+12 26 30 ± 22.	−0.2 ± 4.4	+70″ ± 22″	C	I
Mark 352	< 4	-	-	-	-	-	C	I
Mark 1/NGC 449	68 ± 2	< 10	01 13 19.52 ± 0.1	+32 49 33.0 ± 2.0	−1.2 ± 1.3	−0″.1 ± 2″.0	C	I
II Zw 1	< 3	-	-	-	-	-	C	III
Arak 42/UGC 00959	7.8 ± 1.0	< 15	01 21 56.40 ± 0.10	+31 54 17.3 ± 2.2	+0.1 ± 1.3	−3″.1 ± 2″.2	C	II
Mark 358	< 4	-	-	-	-	-	C	I
Mark 573 /UGC 01214	20.1 ± 1.1	< 40	01 41 22.61 ± 0.05	+02° 04′.8 ± 6″.2	−4.7 ± 0.8	−1″.1 ± 6″.2	C	III
Mark 575 /UGC 01260	18.1 ± 1.9	< 12	01 45 52.60 ± 0.07	+12 21 51.3 ± 4.1	−3. ± 5.	0″ ± 6″	K	II
Mark 577 UGC 01282	< 3	-	-	-	-	-	K	II
Mark 584	3.6 ± 0.7	< 18	01 57 51.19 ± 0.15	+02° 25″.0 ± 6″.0	+1.7 ± 2.3	−0″.7 ± 6″.0	C	III
4C 29.6/3C 59	2520 ± 50	290	-	-	-	-	WM1	II
A	109.0 ± 2.7	< 4	02 04 00.89 ± 0.04	+29 14 18.6 ± 0.7	-	-	-	II
B	861 ± 18	~ 90	02 04 06.08 ± 0.09	+29 16 14.7 ± 1.6	-	-	-	II
C	664 ± 14	~ 90	02 04 09.16 ± 0.09	+29 16 37.0 ± 1.5	-	-	-	II
D	886 ± 20	< 4	02 04 16.61 ± 0.04	+29 17 28.9 ± 0.7	-	-	-	II
Mark 586	(3.5 ± 1.0)	< 21	02 05 14.49 ± 0.25	-	+1.4 ± 6.3	-	K	III
Mark 590/NGC 863 /UGC 01727	11.0 ± 2.0	< 13	02 12 00.82 ± 0.1	-	+6.7 ± 2.0	-	C	III
Arak 79/UGC 01757	12.0 ± 1.0	< 12	02 14 19.91 ± 0.08	+38 10 58.3 ± 1.4	+0.9 ± 1.0	−0″.6 ± 1″.5	C	II
Arak 80/V Zw 233	6.9 ± 1.0	< 16	02 20 21.12 ± 0.13	+31 57 41.5 ± 2.9	+3.1 ± 1.6	−2″.5 ± 3″.0	WM1	II
Arak 81/V Zw 233	45.5 ± 1.4	< 7	02 20 23.93 ± 0.05	+31 58 13.8 ± 0.8	−0.1 ± 2.1	+0″.3 ± 2″.1	C	II
NGC 985/VV 285 /Mark 1048	(19.0 ± 5.0)	-	02 32 10.67 ± 0.12	−08° 54′.8 ± 4″.5	+2.4 ± 1.8	+5″.6 ± 4″.5	C	III
Mark 595	< 4	-	-	-	-	-	C	III

TABLE III *(continued)*.

Galaxy Name(s)	Flux density (mJy)	Source size (arc sec)	Radio position[a] (1950.0) Right ascension, α_r	Declination, δ_r	Radio-Optical Position Difference[b] $\alpha_r - \alpha_o$	$\delta_r - \delta_o$	Reference for Optical Position[c]	Paper[d]
Mark 372/IC 1854	2.4 ± 0.4	< 17	02 46 31.64 ± 0.13	+19 05 50.6 ± 5.6	+3.0 ± 1.9	+1".1 ± 5".6	C	III
Mark 609	27.3 ± 1.2	< 9	03 22 57.30 ± 0.04	−06° 21'.4 ± 3'.5	+0.5 ± 0.7	−2'.2 ± 3'.5	C	III
III Zw 55 /NGC 1410 /UGC 02821	(16.5 ± 1.5)	< 12	03 38 38.19 ± 0.06	–	−2.1 ± 1.1	–	WM1	III
NGC 1614	119 ± 4	< 10	04 31 35.70 ± 0.06	−08° 41'.7 ± 2'.5	+0.0 ± 5.1	+0'.8 ± 2'.5	G	I
Mark 618	16.4 ± 1.4	< 11	04 34 00.09 ± 0.06	−10° 27'.0 ± 1'.5	+1.9 ± 0.9	+1'.6 ± 1'.5	C	III
II Zw 23 Companion	14 ± 2	< 20	04 47 00.61 ± 0.2	+03° 14'.1 ± 3'.0	+0.7 ± 3.3	−0'.3 ± 3'.0	S	I
II Zw 23 /UGC 03179	13 ± 2	< 20	04 47 07.28 ± 0.2	+03° 14'.5 ± 3'.0	+3.1 ± 3.3	−0'.4 ± 3'.0	S	I
MCG 8-11-11 /UGC 03374	247 ± 5	–	05 51 09.76 ± 0.05	+46 25 51.3 ± 0.6	+0.8 ± 0.6	+0".1 ± 0".7	C	II
Mark 3 /UGC 03426	1060 ± 20	< 2	06 09 48.28 ± 0.2	+71 03 10.4 ± 1.0	−0.7 ± 1.0	−0".3 ± 1".0	C	I
Mark 6 Core /IC 450 Total /UGC 03547	< 213 ± 5 270 ± 10	< 5 ~ 60	06 45 43.95 ± 0.2	+74 29 09.3 ± 1.0	+0.1 ± 1.0	−0".8 ± 1".0	C	I
Mark 374	13.3 ± 3	< 30	06 55 34.67 ± 0.4	+54 15 58.4 ± 4.0	+1.0 ± 3.5	+1".3 ± 4".0	C	I
Mark 376	< 10	–	–	–	–	–	C	I
Mark 378	3.0 ± 1.0	< 25	07 13 19.82 ± 0.47	+49 46 54.8 ± 6.0	+6. ± 6.	−5". ± 7".	P	II
Mark 9	< 4	–	–	–	–	–	C	I
Mark 78	33 ± 5	< 10	07 37 56.70 ± 0.3	+65 17 40.7 ± 2.0	−0.8 ± 1.9	−1".5 ± 2".0	C	I
Mark 79 /UGC 03973	18.8 ± 1.5	< 15	07 38 47.41 ± 0.3	+49 55 40.3 ± 3.0	+0.7 ± 2.9	−0".6 ± 3".0	C	I
Mark 80	< 20	–	–	–	–	–	P	I
Mark 10 /UGC 04013	< 4	–	–	–	–	–	C	I
Mark 382	< 4	–	–	–	–	–	C	I
Mark 622 /UGC 04229	9.3 ± 1.0	< 14	08 04 20.89 ± 0.10	+39 08 59.4 ± 1.8	−4. ± 5.	−2". ± 5".	K	II
Mark 391 /NGC 2691 /UGC 04664	6.8 ± 0.4	< 10	08 51 32.32 ± 0.07	+39 43 46.6 ± 1.1	−6.7 ± 4.1	−1".4 ± 4".1	DC	III

TABLE III *(continued)*.

Galaxy Name(s)	Flux density (mJy)	Source size (arc sec)	Radio position[a] (1950.0) Right ascension, α_r	Declination, δ_r	Radio-Optical Position Difference[b] $\alpha_r - \alpha_o$	$\delta_r - \delta_o$	Reference for Optical Position[c]	Paper[d]
Mark 704	6.8 ± 0.7	< 13	09 15 39.18 ± 0.08	+16 31 07.0 ± 3.7	-3.5 ± 1.2	+8″.5 ± 3″.7	C	II
Mark 106	< 5	-	-	-	-	-	P	I
Mark 110	11.1 ± 1.5	< 30	09 21 45.10 ± 0.4	+52 30 09.4 ± 5.0	+6.4 ± 3.7	+1″.6 ± 5″.0	C	I
Mark 705/Arak 202 /UGC 05025 /VIII Zw 47	< 2	-	-	-	-	-	C	II
Zw 0934+01 /Mark 707	< 3	-	-	-	-	-	C	III
Mark 124	6.9 ± 1.4	< 30	09 45 24.13 ± 0.7	+50 43 32.7 ± 9.0	-1.7 ± 6.6	+3″.8 ± 9″.0	C	I
Arak 223	< 3	-	-	-	-	-	WM1	III
NGC 3081	6.6 ± 1.1	< 16	09 57 09.46 ± 0.12	-22° 37′.0 ± 2′.5	-6.9 ± 1.9	-1′.8 ± 2′.5	WM2	III
T1004-296 /NGC 3125	13.0 ± 3.0	< 60	10 04 18.18 ± 0.23	-29° 42′.8 ± 3′.0	+2.3 ± 3.6	-1′.3 ± 3′.0	WM2	III
Mark 716	< 2	-	-	-	-	-	MW	II
Mark 141	< 4	-	-	-	-	-	C	I
NGC 3227 /UGC 05620	95 ± 2.0	< 7	10 20 46.8 ± 0.14	+20 07 07. ± 5.8	+0.3 ± 2.0	+0″.9 ± 5″.8	C	vdK
Mark 142	< 4	-	-	-	-	-	C	I
Ton 524b	< 3	-	-	-	-	-	WM1	II
Ton 524a	< 3	-	-	-	-	-	C	II
Mark 34	16.5 ± 2.0	< 20	10 30 51.56 ± 0.3	+60 17 20.3 ± 3.0	+0.8 ± 2.3	-1″.5 ± 3″.0	C	I
Arak 253/Mark 1261 /UGC 05849	(17.6 ± 1.4)	< 12	10 41 19.08 ± 0.04	-	-1.8 ± 0.8	-	WM1	III
T1059+105	< 3	-	-	-	-	-	C	II
NGC 3504 /UGC 06118	310 ± 15	~ 50	11 00 28.54 ± 0.1	+28 14 29.4 ± 3.0	+5.8 ± 4.2	-5″.6 ± 5″.0	DC	I
NGC 3516 /UGC 06153	22 ± 2	< 7	11 03 23.7 ± 0.45	+72 50 21. ± 2.1	+3.8 ± 2.0	+0″.8 ± 2″.1	C	vdK
Mark 734	< 3	-	-	-	-	-	C	II
Mark 40/VV 144 /I Zw 26	1.2 ± 0.3	< 30	11 22 47.74 ± 0.36	+54 39 21.4 ± 3.8	-0.9 ± 3.1	-5″.4 ± 3″.8	C	III

TABLE III *(continued)*.

Galaxy Name(s)	Flux density (mJy)	Source size (arc sec)	Radio position[a] (1950.0) Right ascension, α_r	Declination, δ_r	Radio-Optical Position Difference[b] $\alpha_r - \alpha_o$	$\delta_r - \delta_o$	Reference for Optical Position[c]	Paper[d]
Mark 171 /NGC 3690 /UGC 06472	680 ± 25	~ 60	11 25 43.71 ± 0.16	+58 50 18. ± 1.6	−3.8 ± 4.2	−5"0 ± 4.3	DC	I
Mark 176/VV 150	21 ± 3	< 20	11 29 55.30 ± 0.3	+53 13 37.0 ± 3.4	−0.8 ± 2.7	+1"7 ± 3"4	C	I
Mark 739 /NGC 3758	9.8 ± 0.7	< 11	11 33 52.49 ± 0.06	+21 52 20.1 ± 2.0	−3.8 ± 0.9	−1"9 ± 2"0	C	II
Mark 42	< 4	–	–	–	–	–	C	I
NGC 4051 /UGC 07030	21 ± 2.0	< 7	12 00 36.4 ± 0.19	+44 48 30 ± 2.8	−0.1 ± 2.0	−4"8 ± 2"8	C	vdK
Arak 347 /NGC 4074	3.4 ± 1.0	< 21	12 01 55.95 ± 0.28	+20 35 35.6 ± 11.1	−4.6 ± 4.0	−4"8 ± 11"1	C	II
Mark 198	6.1 ± 1.4	< 30	12 06 42.30 ± 0.8	+47 20 16.3 ± 11.0	−12.2 ± 9.1	+6"3 ± 11"8	P	I
NGC 4151 /UGC 07166	338 ± 7	< 7	12 08 01.00 ± 0.17	+39 41 02 ± 3.1	−0.6 ± 2.0	+0"2 ± 3"1	C	vdK
Mark 201 /NGC 4194 /UGC 07241	113 ± 5	~ 9	12 11 41.22 ± 0.11	+54 48 16.4 ± 1.1	−4.2 ± 4.1	−4"6 ± 4"1	DC	I
NGC 4235 /IC 3098 /UGC 07310	10.0 ± 0.7	< 11	12 14 36.66 ± 0.06	+07° 31'2 ± 2'7	−1.2 ± 0.9	+3'1 ± 2'7	C	II
Mark 766 /NGC 4253 /UGC 07344	39.0 ± 1.2	< 6	12 15 55.68 ± 0.04	+30 05 26.5 ± 0.8	+0.5 ± 0.6	+0"9 ± 0"8	C	II
Mark 205	3.0 ± 0.2	< 20	12 19 33.67 ± 0.2	+75 35 15.2 ± 1.0	+4.0 ± 4.1	+2"2 ± 4"1	P	I
Mark 50	< 4	–	–	–	–	–	C	I
Mark 52 /NGC 4385 /UGC 07515	< 5	–	–	–	–	–	DC	I
Mark 771 /Arak 374 /Ton 1542	< 3	–	–	–	–	–	C	II
Mark 231 /UGC 08058 Core / Total	210 ± 5 / 260 ± 10	< 5 / ~ 60	12 54 05.00 ± 0.11	+57 08 37.5 ± 1.0	0.0 ± 0.9	−0"8 ± 1"0	C	I
Mark 232	< 4	–	–	–	–	–	P	I
Mark 233	< 5	–	–	–	–	–	P	I

TABLE III *(continued)*.

Galaxy Name(s)	Flux density (mJy)	Source size (arc sec)	Radio position[a] (1950.0) Right ascension, α_r	Declination, δ_r	Radio-Optical Position Difference[b] $\alpha_r - \alpha_o$	$\delta_r - \delta_o$	Reference for Optical Position[c]	Paper[d]
Mark 236	< 4	-	-	-	-	-	P	I
Mark 237	13 ± 4	~ 30	12 59 03.5 ± 0.5	+48 19 43 ± 6.0	+12.0 ± 6.4	-7″0 ± 7″2	P	I
Mark 783	32.0 ± 1.2	< 7	13 00 30.47 ± 0.04	+16 40 33.5 ± 1.2	+1.6 ± 0.7	0″0 ± 1″2	C	II
Mark 64	< 4	-	-	-	-	-	P	I
Mark 789 /VIII Zw 323	34.7 ± 1.0	< 6	13 29 55.53 ± 0.04	+11 21 49.8 ± 1.6	+0.9 ± 1.2	+5″2 ± 1″9	MW	II
Mark 268	36.3 ± 1.6	< 15	13 38 53.98 ± 0.11	+30 37 48.4 ± 3.0	-0.6 ± 1.5	-1″0 ± 3″0	C	I
Mark 270 /NGC 5283 /UGC 08672	13.6 ± 1.4	< 15	13 39 41.86 ± 0.6	+67 55 28.6 ± 3.6	+2.5 ± 3.4	+1″2 ± 3″6	C	I
Mark 271 /NGC 5278 /UGC 08677	<23	-	-	-	-	-	P	I
Mark 273 /UGC 08696	134 ± 3	< 10	13 42 51.64 ± 0.11	+56 08 13.8 ± 1.0	+0.7 ± 4.1	-9″2 ± 4″1	P	I
Mark 69	< 4	-	-	-	-	-	C	I
Mark 274	< 5	-	-	-	-	-	P	I
IC 4329A	38.5 ± 1.3	< 7	13 46 27.79 ± 0.04	-30° 03′1 ± 0″5	-1.0 ± 0.7	+0″5 ± 0″5	WM1	III
Mark 279 /UGC 08823	21.2 ± 1.5	< 15	13 51 53.74 ± 0.4	+69 33 11.2 ± 2.0	+0.8 ± 2.0	-2″0 ± 2″0	C	I
Mark 464	13.8 ± 1.0	< 11	13 53 45.41 ± 0.08	+38 49 12.0 ± 1.3	-0.6 ± 0.9	+4″7 ± 1″3	C	II
Mark 668/OQ 208	774 ± 17	< 4	14 04 45.73 ± 0.04	+28 41 29.2 ± 0.7	+1.2 ± 0.6	+0″4 ± 0″7	C	II
I Zw 81	4.9 ± 1.6	< 22	14 06 20.39 ± 0.47	+49 05 52.8 ± 6.0	+0.3 ± 4.6	-3″4 ± 6″1	WM1	II
NGC 5506	315 ± 7	< 2	14 10 39.12 ± 0.04	-02° 58′3 ± 1″0	-0.2 ± 0.7	-0″1 ± 1″0	C	I
NGC 5548 /UGC 09149	27 ± 2	< 7	14 15 43.5 ± 0.15	+25 22 01 ± 4.7	+0.2 ± 2.1	-0″1 ± 4″7	C	vdK
Mark 471 /UGC 09214	5.7 ± 1.0	< 17	14 20 46.77 ± 0.16	+33 04 44.1 ± 3.7	-4. ± 5.	+4″0 ± 8″0	P	II
Mark 679	9.0 ± 1.0	< 14	14 21 17.52 ± 0.10	+33 05 58.1 ± 2.2	-6. ± 5.	+4″0 ± 6″0	K	II
Mark 813	< 3	-	-	-	-	-	MW	II

TABLE III *(continued)*.

Galaxy Name(s)	Flux density (mJy)	Source size (arc sec)	Radio position[a] (1950.0) Right ascension, α_r	Declination, δ_r	Radio-Optical Position Difference[b] $\alpha_r - \alpha_o$	$\delta_r - \delta_o$	Reference for Optical Position[c]	Paper[d]
Mark 474 /NGC 5683	< 3	-	-	-	-	-	C	II
Mark 817 /UGC 09412	10.0 ± 0.7	< 11	14 34 57.83 ± 0.11	+59 00 39.4 ± 1.0	-0.3 ± 0.9	+0".4 ± 1".0	C	II
Mark 477/I Zw 92	58.3 ± 1.6	< 6	14 39 02.60 ± 0.06	+53 43 04.2 ± 0.6	+0.4 ± 0.6	+0".2 ± 0".7	C	II
Mark 478	5.6 ± 1.0	< 17	14 40 05.04 ± 0.17	+35 39 09.5 ± 3.4	+6.0 ± 2.1	+2".1 ± 3".5	C	II
Mark 841	< 6	-	-	-	-	-	C	II
Mark 845	4.5 ± 1.0	< 19	15 06 12.64 ± 0.29	+51 38 39.4 ± 3.4	+0.7 ± 2.9	+2".4 ± 3".6	MW	II
Mark 849	< 3	-	-	-	-	-	MW	II
Mark 289	< 8	-	-	-	-	-	P	I
4C 35.37	578 ± 12	~ 13	15 31 45.12 ± 0.04	+35 54 43.5 ± 0.6	-1.5 ± 0.7	+21".9 ± 0".8	WM1	II
Mark 290	5.2 ± 1.4	< 30	15 34 45.40 ± 1.3	+58 04 03.3 ± 12.0	+4.5 ± 1.3	+2".8 ± 12".0	C	I
Mark 486 /I Zw 121-1	< 3	-	-	-	-	-	C	II
Mark 291	< 5	-	-	-	-	-	C	I
Mark 292	<10	-	-	-	-	-	P	I
Mark 298 /IC 1182 /UGC 10192	4.3 ± 0.8	< 30	16 03 22.00 ± 0.2	+17 56 25.7 ± 9.0	+1.5 ± 2.9	+14".4 ± 9".0	C	I
Mark 299	<29	-	-	-	-	-	P	I
Mark 871 /IC 1198	6.8 ± 0.7	< 14	16 06 15.41 ± 0.08	+12 28 00.8 ± 5.4	-1.9 ± 1.2	+16".7 ± 5".4	C	II
Mark 876	< 5	-	-	-	-	-	C	II
Mark 877	< 6	-	-	-	-	-	MW	II
Mark 699 /III Zw 77	< 3	-	-	-	-	-	C	II
Mark 883	23.2 ± 0.8	< 8	16 27 47.19 ± 0.05	+24 33 04.1 ± 1.0	+1.1 ± 1.2	-2".6 ± 1".4	MW	II
Mark 504	< 3	-	-	-	-	-	C	II
Mark 700 /UGC 10675	12.1 ± 1.4	< 13	17 01 21.49 ± 0.07	+31 31 37.3 ± 1.6	-0.5 ± 1.0	-0".2 ± 1".7	WM1	II

TABLE III *(continued)*.

Galaxy Name(s)	Flux density (mJy)	Source size (arc sec)	Radio position[a] (1950.0) Right ascension, α_r	Declination, δ_r	Radio-Optical Position Difference[b] $\alpha_r - \alpha_o$	$\delta_r - \delta_o$	Reference for Optical Position[c]	Paper[d]
Mark 506	4.3 ± 1.0	< 20	17 20 56.61 ± 0.24	+30 55 27.9 ± 6.0	+0.6 ± 3.1	−11″.6 ± 6″.0	C	II
Mark 507	< 3	–	–	–	–	–	P	III
NGC 6764 /UGC 11407 Core Total	90 ± 3 113 ± 4	< 5 ~ 70	19 07 01.29 ± 0.06	+50 51 07.7 ± 0.6	+0.7 ± 0.6	−0″.4 ± 0″.7	C	II
NGC 6814	< 5	–	–	–	–	–	C	I
Mark 509	12.5 ± 1.0	< 12	20 41 26.10 ± 0.06	−10° 58′.1 ± 2′.6	−2.6 ± 1.0	−3′.8 ± 2′.6	C	III
II Zw 136 /UGC 11763	9.8 ± 1.6	< 16	21 30 00.69 ± 0.12	+10° 01′.9 ± 7′.9	−7.2 ± 1.8	+6′.9 ± 7′.9	C	III
Mark 304	< 4	–	–	–	–	–	C	I
Arak 564 /UGC 12163	27.6 ± 1.2	< 8	22 40 18.38 ± 0.05	+29 27 47.2 ± 1.0	+0.7 ± 1.2	−0″.4 ± 1″.4	MW	II
Mark 315	23 ± 2	< 20	23 01 35.80 ± 0.2	+22 21 17.0 ± 6.0	+1.6 ± 2.8	+0″.6 ± 6″.0	C	I
MCG-2-58-22 /Mark 926	34.0 ± 2.0	< 20	23 02 07.21 ± 0.04	−08° 58′.9 ± 1′.0	+0.7 ± 0.8	−1′.6 ± 1′.0	WM1	III
NGC 7603/Mark 530 /UGC 12493 /Arp 92	(26.7 ± 2.0)	< 10	23 16 22.85 ± 0.05	–	−0.3 ± 0.8	–	C	III
T2327-027	(5.4 ± 1.0)	< 17	23 27 57.89 ± 0.14	–	−2.1 ± 2.3	–	WM2	III
NGC 7714 /UGC 12699	45 ± 3	< 15	23 33 40.7 ± 0.08	+01° 50′ ± 10′.0	+3.0 ± 4.2	−2′.8 ± 10′.0	DC	I
Mark 541	< 3.3	–	–	–	–	–	C	III
Mark 543 /NGC 7811 /III Zw 127	(4.3 ± 1.2)	< 22	23 59 52.60 ± 0.32	–	−1.2 ± 4.8	–	C	III

Notes to table III.

[a] The right ascension, α_r, is always given as: h m s ± s. The declination, δ_r, is given as: ° ′ ″ ± ″, unless otherwise indicated.

[b] The right ascension position difference, $\alpha_r - \alpha_o$, is always given as: ″ ± ″. The declination position difference, $\delta_r - \delta_o$, is given as: either ″ ± ″ or ′ ± ′, as indicated.

[c] Code for references to optical positions:

C = Clements (1981)
DC = Dressel and Condon (1976)
G = Gallouët, Heidmann and Dampierre (1975)
K = Kojoian, Elliott and Tovmassian (1978)
MW = Meurs and Wilson (1981, Paper II)
P = Peterson (1973), corrected for bias as described in Wilson and Meurs (1978)
S = Schoenmaker, quoted in de Bruyn and Wilson (1976, Paper I)
WM1 = Wilson and Meurs (1978)
WM2 = This paper, see notes to Table II

[d] Code for paper in which result was reported:

vdK = van der Kruit (1971)
I = de Bruyn and Wilson (1976)
II = Meurs and Wilson (1981)
III = This paper.