

The Second Kiso Survey for Ultraviolet-Excess Galaxies. VI

Nagako MIYAUCHI-ISOBE and Hideo MAEHARA

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Abstract

The catalogue list and the identification chart of ultraviolet (UV)-excess galaxies (abbreviated as KUGs), which have been detected on two or three-color Kiso Schmidt plates, are presented for 12 Schmidt fields at the low galactic latitude. Catalogued are 42 objects, down to the photographic magnitude ~ 17.5 in the sky area of some 360 square degrees. The number of KUGs detected in this paper is much smaller than that of the high galactic latitude area.

This is the final list of the second KUG survey by Miyauchi-Isobe and Maehara(1998-2005). The total number of KUGs newly detected in the second survey reaches up to 1,994. In total, more than ten thousand UV-excess galaxies are catalogued in about seven thousand square degrees area throughout the KUG survey.

Key words: Ultraviolet-excess galaxies, KUGs, Survey with Schmidt telescope.

1. Introduction

We have been making the second survey of ultraviolet (UV)-excess galaxies with the Kiso 105-cm Schmidt telescope. This is a continuation and an extension of the original survey for Kiso UV-excess galaxies (KUGs) carried out by Takase and Miyauchi-Isobe (1984-1993a). Its comprehensive catalogue was published by Takase and Miyauchi-Isobe (1993b), where 8,104 KUGs were included in the covered sky area of some 5,100 square degrees. (The data of the area A0432 must be replaced to Miyauchi-Isobe et al. 1997.) A variety of faint UV-excess galaxies were catalogued down to $V\sim 17$ mag in the first series of the survey.

The main area of the KUG survey is the belt spread along $l=180^\circ$ from the north galactic pole toward the south. The isolated areas are those of specially selected ones relat-

ing to voids, clusters, or fields, which were studied in the previous papers (cf. Fig.II-2 of Miyauchi-Isobe and Maehara 2000). Accordingly, the sky areas treated in the second survey mainly consist of remaining fields of the main belt and isolated ones with plates of good quality. The main sky areas catalogued in this paper are 12 Schmidt fields at the lower galactic latitude along the main belt of $l\sim 180^\circ$.

In the course of follow-up observations of KUGs (e.g., Maehara et al. 1987, Comte et al. 1994, Tomita et al. 1997), it is clarified that the majority of them are spiral or irregular galaxies with intense star formation in their nuclei, bars, disks, or outer regions. These samples give us clues to the understanding of triggering mechanism of star formation, and of the evolution of some types of galaxies. In addition, Seyferts, LINERs, and active galaxies with some peculiarities are minor constituents of the catalogue. Thus it is a

Table VI-1. The Data of Plates.

Area No.	Plate No.	Observation Date	Plate Center			No. of KUGs
			R.A. (1950.0) Dec.	l	b	
A0049	KL1716	1978 Oct. 6	21 00 + 75	110	19	0
A0402	KL3889	1982 Dec. 10	6 20 + 35	179	10	5
A0403	KL3119	1981 Jan. 30	6 40 + 35	180	14	8(1)
A0474	KL2384	1979 Oct. 31	6 20 + 30	183	8	3
A0476	KL1935	1978 Dec. 25	7 00 + 30	187	15	17(1)
A0543	KL1818	1978 Nov. 7	5 20 + 25	181	-6	0
A0614	KL6678	1991 Dec. 3	5 00 + 20	182	-13	1
A0615	KL3391	1981 Oct. 26	5 20 + 20	185	-9	0
A0616	KL3588	1982 Jan. 26	5 40 + 20	187	-5	0
A0684	KL1330	1978 Jan. 14	4 20 + 15	180	-24	3
A0685	KL1825	1978 Nov. 9	4 40 + 15	183	-20	3
A0686	KL2385	1979 Oct. 31	5 00 + 15	186	-16	2
Total						42 (2)*

* Parenthesized is the number of duplicated objects which are doubly listed in the present survey.

fainter extension of the catalogue of Markarian galaxies (MKGs). In these circumstances, it is worth continuing and supplementing the first KUG survey, and we have been making the second survey (Miyauchi-Isobe and Maehara 1998, 2000, 2002, 2003).

The method of the second survey is, in principle, the same as that of the first one; *U* (ultraviolet), *G* (green) and *R* (red) triple exposure 103a-E plates or *U* and *R* double exposure 103a-E plates are used for the detection of KUGs. Exposure times being so set that the images of early A-type stars are equally bright, the object whose *U* image is brighter than the *R* image is regarded to be bluer than early A-type stars. Typically, a field has several to ten those stars for the comparison. We pick up those galaxies as Kiso UV-excess galaxies (abbreviated as KUGs) with the visual inspection of the plate, and list their parameters in this paper. In some cases, a highly blue portion (e.g., knot, clump, shell, or ring) exists on the less blue main galaxy body. In this circumstance, the degree of UV-excess of a galaxy is estimated on the comparison of the integrated *U* and *R* brightness of the whole galaxy image on the plate, and the redder galaxy is discarded from the list.

The position, the brightness, and the morphological type of a KUG are estimated by referring to the object identified in the Palomar Sky Survey Print (PSS). Its degree of UV-excess is also confirmed by the comparison of the B (103aO) and R (103aE) print of the PSS. As a result, 42 KUGs are detected in the sky area of some 360 square degrees. The data of the sky area, photographic plate, and the number of detected objects in this work are listed in Table VI-1.

2. Survey Catalogue

The list of detected objects and their identification charts are respectively given in Table VI-2 and Figure VI-1.

The evaluation procedures of detected objects, which are presented in Table VI-2, are the same as those of the first survey.

Column 1: The running number according to the right ascension.

Column 2: The KUG-name composed of the values of right ascension and declination.

Column 3 and 4: The right ascension and declination for the epoch 1950.0.

Column 5: The morphological type adopted in this work is different from the traditional morphological classification, because there exist conspicuous blue (UV-excess) portions on these KUGs. Thus we adopt another classification scheme, which pays attention to the blue structures on the galaxy images (Takase et al. 1983); it consists of seven types as follows;

- Ic : Irregular with blue clumps
- Ig : Irregular with a giant clump
- Pi : Pair of interacting components
- Pd : Pair of detached components
- Sk : Spiral with blue knots on the disk
- Sp : Spiral with blue bar and/or nucleus
- C : Compact.

The type is assigned through visual inspections of both Kiso plates and blue and red PSS prints. A colon (:) is attached to the type, when the type is not certainly assigned,

and a question mark (?) means unclassifiable.

Column 6: The image size (along the major and the minor axis) in minutes of arc on the blue PSS print.

Column 7: The apparent (blue) magnitude, which is eye-estimated on the PSS blue print referring to the known magnitude of the catalogued objects. It is usually calibrated using Zwicky catalogues, and extended towards fainter objects.

Column 8: The degree of UV-excess estimated from Kiso plates. H, M, and L denote high, medium, and low degree, respectively. Further explanation on the UV-excess is referred to Takase et al. (1983).

Column 9: The names given in previous catalogues. The abbreviated notations used in this paper have the following correspondence to those adopted in MOL (abbreviation of the catalogue list compiled by Dixon and Sonneborn 1980).

A: ARP, H: HARO, I:IC, M: MCG, MK: MKG, N: RINGC, U: UGC, V: VV, Z: ZWG, nZ: nZW ($n=1,2,\dots,8$), K: KUG (the previous KUG survey), and KE: KUG errata (Miyauchi-Isobe et al. 1997).

According to the identification with the other catalogues, many objects have been listed before. Especially, a number of KUGs appear in the Zwicky catalogues, and bright KUGs are identified as Markarian galaxies. There are morphologically peculiar KUGs, which appear in the MCG catalogue.

3. Discussion

The UV-excess is one of the major indices to detect active galaxies with conventional ground-based telescope. A number of Schmidt surveys have been carried out in the similar methods to us whose representative is the comprehensive work by Markarian et al. (1989), which is called as the first Byurakan survey. Even recently, a number of investigators have carried out new deep surveys for those objects applying the modern digitization machines and techniques treating large Schmidt plates; the Montreal survey (Coziol et al. 1993, 1994), the Madrid survey (Zamorano et al. 1994, Gallego et al. 1995), the Hamburg survey (Hopp et al. 1995, Popescu et al. 1996), and the Marseille survey (Surace and Comte 1998). The Second Byurakan survey was carried out together with spectroscopic follow-ups (cf. Stepanian 2005). According to them, major constituents of their surveys are galaxies with intense star formation (starburst) activity and/or non-thermal Seyfert-like nuclear phenomena.

The image quality and the limiting magnitude of Kiso Schmidt plates are generally less homogeneous due to the variational observation condition of the site. Thus we select the plates of relatively good quality, and apply the visual (non-automatic) inspection method in order to cancel the inhomogeneity originated from the standardized inspection technique. Furthermore, we scrutinize detected objects by referring to Palomar Sky Survey (PSS) prints, preventing the degradation of our survey. Since we usually pick up such objects that possess distinct blue knots, clumps, or components, we possibly miss UV-excess objects with smooth light distribution or uncertain morphological types. Therefore, we try to pick up carefully such objects according to the total

color as well.

During our scrutinizing individual objects to estimate the brightness, morphological type, and degree of UV-excess, we pick up some object, which does not fit a typical morphological type, but exhibits a deformed or a complex feature of the galaxy. In addition, some KUGs exhibit other kinds of peculiar morphologies on the distribution of UV-excess regions. These peculiarities are noticed in the supplements to table VI-2 “notes on individual galaxies”. In these circumstances, the morphological classification of KUGs is more or less ambiguous, especially for faint objects.

Follow-up observations reveal that typical KUGs are photoionized starbursting galaxies of various degrees of excitation (Maehara et al. 1987). In addition, AGNs of high to low activity levels are minor constituents of KUGs. For example, KUG1034+396 was found to be one of peculiar ultrasoft X-ray sources by ROSAT, and has a narrow-line Seyfert 1 nucleus (Mason et al. 1996). Therefore, most KUGs are faint members of Markarian galaxies. There are specially interested galaxies among KUG samples whose properties are appropriate for the study of starburst phenomena and galaxy activities (e.g., KUG1259+280, Dewangan, et al., 2000, KUG0214-057, Watson, et al., 2005). It is suggested that the visual detection method of our survey effectively detects those galaxies.

The fields at the low galactic latitude are mainly treated in this paper, which are in or near the zone of avoidance. Since the detection of KUGs is not complete due to the interstellar extinction and the overlapping with numerous stellar images, small number of KUGs are detected in these fields. On the other hand, there are several high galactic-latitude fields which include small number of KUGs in this paper and in the paper V. Some of them are located in the void areas of the local Universe (Tully and Murdin 2000), and it is not inconsistent with the clustering distribution of normal galaxies.

In general, past surveys have revealed that the large-scale distribution of galaxies in the Universe is far from random: it is highly structured over a vast range of scales (e.g., Jones et al. 2004). The spatial distribution of KUGs mainly follows that of normal galaxies, although they tend to appear in pairs or groups rather than in isolated fields (Comte et al. 1994). For example, Takeuchi et al., (1999) discovered some KUG-rich filaments of length ~ 60 Mpc in the Lynx-Ursa Major region. In this context, it is worth studying properties and distributions of KUGs in relation to those of normal galaxies in more detail.

Since there are no well-exposed multi-color plates taken with the Kiso 105-cm Schmidt telescope, this is the final list of the second KUG survey by Miyauchi-Isobe and Maehara (1998-2006). The total number of KUGs newly detected in the second survey reaches up to 1,994 in six papers, while the first survey catalogued 8,104 KUGs in 5,100 square degrees area in seventeen papers (Takase and Miyauchi-Isobe 1984-1993). In total, more than ten thousand UV-excess galaxies are catalogued in about seven thousand square degrees sky area. The overall discussion on the KUG survey will appear elsewhere, and the comprehensive catalogue will be available in a machine-readable form.

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Table VI-2a. List of KUGs (A0402)

No.	KUG-NAME	R. A. (1950.0)	DEC.	MOR. TYPE	APP. SIZE	APP. MAG.	UVX DEG.	OTHER NAME(S)
1	0607+356	6 7 28.4	35 39 22	Sp:	0.6 X 0.4	15.5	L	Z174.001,M+6-14-3
2	0608+371	6 8 47.6	37 10 45	Sp:	0.4 X 0.3	16.5:	L	
3	0624+355	6 24 31.7	35 32 56	Sk:	0.5 X 0.2	15.7	L	Z175.001(=Z174.004)
4	0627+333	6 27 10.9	33 20 8	Ic:	1.1 X 0.3	15.7	M	U3476,Z175.002
5	0628+341	6 28 50.9	34 6 54	?	0.2 X 0.2	16.5:	L	

Notes on individual galaxies given in Table VI-2a (A0402)

0607+356 : Faint stars are overlapped.

0624+355 : Knots on the northern disk.

0628+341 : Blue nucleus?.

Table VI-2b. List of KUGs (A0403)

No.	KUG-NAME	R. A. (1950.0)	DEC.	MOR. TYPE	APP. SIZE	APP. MAG.	UVX DEG.	OTHER NAME(S)
1*	0627+333	6 27 11.0	33 20 7	Ic:	1.1 X 0.3	15.7	M	U3476,Z175.002
2	0629+352	6 29 3.0	35 13 39	Sp	1.0 X 0.3	15.4	L	U3479,Z175.005
3	0633+376	6 33 16.2	37 38 39	Sp:	0.5 X 0.2	16.0:	L	
4	0644+323	6 44 16.4	32 23 20	Sk	0.7 X 0.7	15.2	L	Z145.008,M+5-16-4
5	0647+336	6 47 30.7	33 40 34	Sk:	0.6 X 0.4	16.0	L	M+6-15-9,K0647+336
6	0648+329	6 48 22.1	32 54 29	Pi:	0.4 X 0.3	16.0:	L	
7	0650+354	6 50 47.7	35 24 57	C:	0.2 X 0.1	17.0:	L	
8	0651+345	6 51 51.6	34 31 4	C:	0.3 X 0.2	17.0:	L	

Notes on individual galaxies given in Table VI-2b (A0403)

0627+333 : Several blue knots in a line.

0629+352 : Sharp red nucleus.

0647+336 : A blue center and a blue partial ring.

0648+329 : A star is overlapped in the east portion.

Table VI-2c. List of KUGs (A0474)

No.	KUG-NAME	R. A. (1950.0)	DEC.	MOR. TYPE	APP. SIZE	APP. MAG.	UVX DEG.	OTHER NAME(S)
1	0615+289	6 15 59.3	28 58 7	?	0.2 X 0.2	15.6:	L	
2	0628+279	6 28 12.6	27 54 19	?	0.2 X 0.2	15.7:	L	
3	0630+309	6 30 40.3	30 55 20	?	0.2 X 0.2	16.0:	L	

Notes on individual galaxies given in Table VI-2c (A0474)

0615+289 : galaxy?.

0628+279 : galaxy?.

0630+309 : galaxy?.

Table VI-2d. List of KUGs (A0476)

No.	KUG-NAME	R. A. (1950.0)	DEC.	MOR. TYPE	APP. SIZE	APP. MAG.	UVX DEG.	OTHER NAME(S)
1	0647+311	6 47 23.6	31 10 33	C	0.2 X 0.2	16.5:	L	
2	0648+290	6 48 9.8	29 4 10	Sp:	0.2 X 0.2	16.5:	L	
3*	0648+329	6 48 22.4	32 54 29	Pi:	0.4 X 0.3	16.0:	L	
4	0648+326	6 48 39.2	32 38 2	C:	0.3 X 0.3	15.7	L	Z146.003(=Z145.016),K0648+326
5	0649+309	6 49 2.5	30 54 6	?	0.6 X 0.3	15.6	L	Z146.005(=Z145.018),M+5-17-1
6	0649+276	6 49 49.1	27 41 43	Sp	0.4 X 0.3	15.0	L	Z146.007,M+5-17-2
7	0655+294	6 55 12.8	29 28 3	C:	0.3 X 0.2	16.5:	L	
8	0658+279	6 58 54.5	27 54 3	Sp	0.4 X 0.4	15.1	L	Z146.018,M+5-17-7
9	0700+277	7 0 22.4	27 45 16	Sp:	0.4 X 0.2	15.6	L	Z146.019
10	0702+283	7 2 52.7	28 22 26	Sp	0.7 X 0.4	14.9	L	Z146.023,M+5-17-10
11	0703+293	7 3 37.1	29 19 30	C:	0.2 X 0.1	16.5:	L	
12	0707+283	7 7 1.2	28 22 32	Sp	0.6 X 0.4	15.3	L	Z146.032
13	0707+294	7 7 7.2	29 26 34	?	0.3 X 0.2	16.5:	L	
14	0707+300	7 7 7.8	30 1 4	Sp:	0.4 X 0.3	16.5:	L	
15	0709+286	7 9 16.8	28 39 53	?	0.6 X 0.3	15.5	L	Z146.038
16	0709+281	7 9 46.4	28 10 17	C	0.2 X 0.2	16.5:	L	
17	0709+278	7 9 51.5	27 51 37	Sp:	0.4 X 0.4	15.1	L	Z146.040,M+5-17-17

Notes on individual galaxies given in Table VI-2d (A0476)

0648+290 : A star is overlapped in the south.

0649+309 : Sagittate.

0702+283 : The central region is red.

0707+294 : Boomerang shaped.

0709+286 : Eye shaped.

Table VI-2e. List of KUGs (A0614)

No.	KUG-NAME	R. A. (1950.0)	DEC.	MOR. TYPE	APP. SIZE	APP. MAG.	UVX DEG.	OTHER NAME(S)
1	0453+219	4 53 29.2	21 55 44	Sp:	0.5 X 0.2	16.5:	L	

Table VI-2f. List of KUGs (A0684)

No.	KUG-NAME	R. A. (1950.0)	DEC.	MOR. TYPE	APP. SIZE	APP. MAG.	UVX DEG.	OTHER NAME(S)
1	0410+132A	4 10 24.5	13 17 43	Sp:	0.7 X 0.4	17.0	M	U2984
2	0410+132B	4 10 26.6	13 13 34	Sp	0.3 X 0.2	16.0:	M	
3	0416+135	4 16 15.4	13 32 21	?	0.2 X 0.2	17.5:	L	

Notes on individual galaxies given in Table VI-2f (A0684)

0410+132 : A star-like knot at the west of the galaxy.

Table VI-2g. List of KUGs (A0685)

No.	KUG-NAME	R. A. (1950.0)			DEC.			MOR. TYPE	APP. SIZE	APP. MAG.	UVX DEG.	OTHER NAME(S)
1	0434+126	4	34	11.4	12	36	52	?	0.2 X 0.1	17.0:	L	
2	0435+154	4	35	35.0	15	25	25	C:	0.2 X 0.1	17.5:	L	
3	0437+151	4	37	16.6	15	8	17	C:	0.2 X 0.2	17.0:	L	

Table VI-2h. List of KUGs (A0686)

No.	KUG-NAME	R. A. (1950.0)			DEC.			MOR. TYPE	APP. SIZE	APP. MAG.	UVX DEG.	OTHER NAME(S)
1	0453+123	4	53	47.7	12	22	40	Pi	0.2 X 0.1	17.0:	L	
2	0503+128	5	3	57.6	12	48	17	?	0.2 X 0.1	16.5:	L	

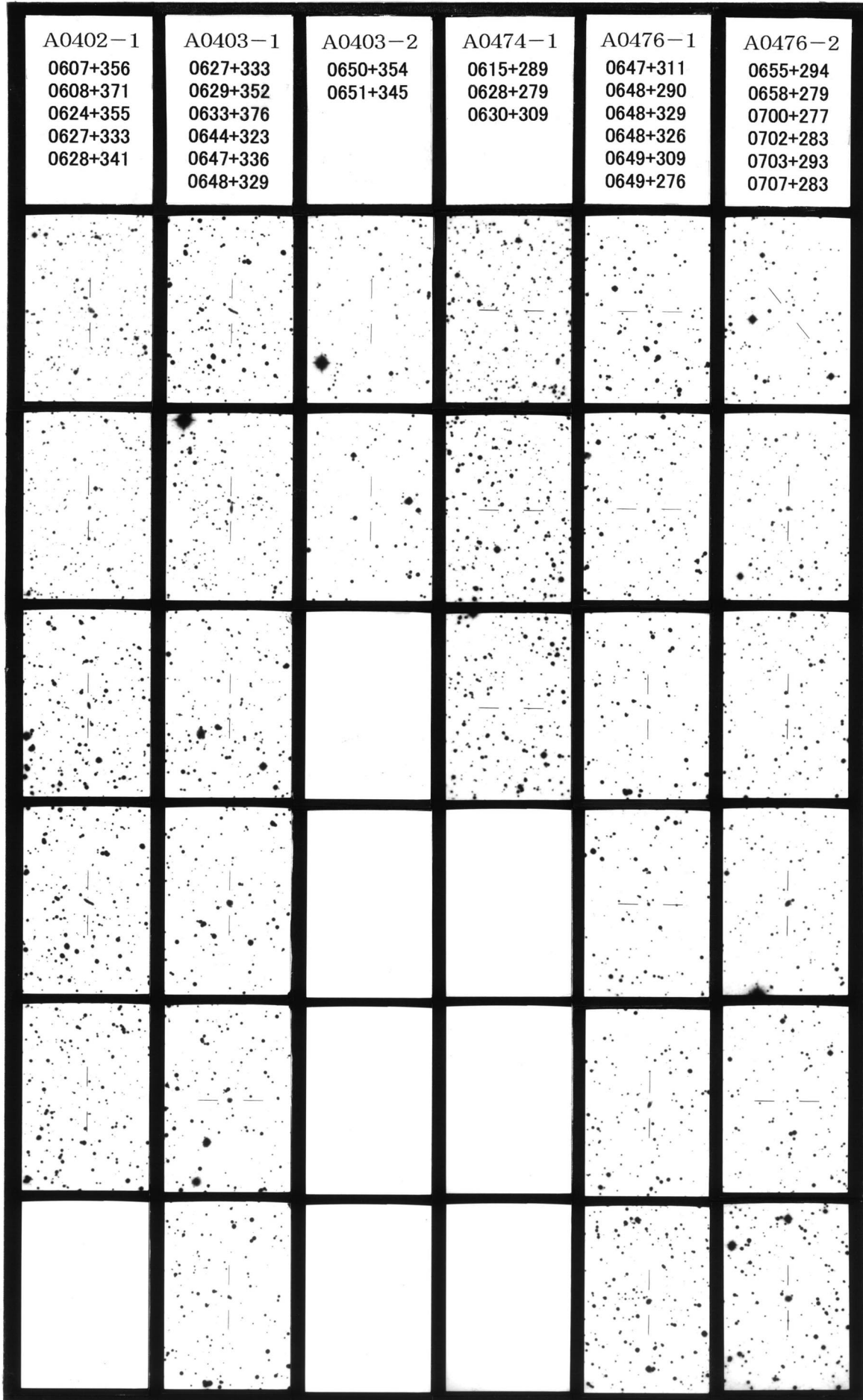
Notes on individual galaxies given in Table VI-2h (A0686)

0453+123 : The west component is not a KUG.

0503+128 : A star is overlapped in the southeast.

Figure VI-1. Finding Charts

In the following pages, finding charts are shown for each KUG listed in the catalogue (table I-2). These photographs are reproduced from the Palomar Sky Survey blue prints (c 1960 National Geographic Society - Palomar Sky Survey reproduced by permission of the California Institute of Technology). The chart is in magnification of 3.0 times (0.37"/mm), and the field of 11.8'~7.7'. The north is up, east to the left.



A0476-3 0707+294 0707+300 0709+286 0709+281 0709+278	A0614-1 0453+219	A0684-1 0410+132A 0410+132B 0416+135	A0685-1 0434+126 0435+154 0437+151	A0686-1 0453+123 0503+128
