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THE SOLAR NEIGHBORHOOD. XV. DISCOVERY OF NEW HIGH PROPER MOTION STARS WITH $\mu \geq 0''.4$ yr^{-1} BETWEEN DECLINATIONS $-47°$ AND $00°$

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ABSTRACT

We report the discovery of 152 new high proper motion systems ($\mu \geq 0''.4$ yr^{-1}) in the southern sky ($\delta = -47°$ to $00°$) brighter than UKST plate $R_{59F} = 16.5$ via our SuperCOSMOS-RECONS (SCR) search. This paper complements Paper XII in the Solar Neighborhood series, which covered the region from $\delta = -90°$ to $-47°$ and discussed all 147 new systems from the southernmost phase of the search. Among the total of 299 systems from both papers, there are 148 (71 in Paper XII, 77 in this paper) new systems moving faster than $0''.5$ yr^{-1} that are additions to the classic Luyten Half Second sample. These constitute an 8% increase in the sample of all stellar systems with $\mu \geq 0''.5$ yr^{-1} in the southern sky. As in Paper XII, distance estimates are provided for the systems reported here based on a combination of photographic plate magnitudes and Two Micron All Sky Survey photometry, assuming that all stars are on the main sequence. Two SCR systems from the portion of the sky included in this paper are anticipated to be within 10 pc, and an additional 23 are within 25 pc. In total, the results presented in Paper XII and here for this SCR sweep of the entire southern sky include five new systems within 10 pc and 38 more between 10 and 25 pc. The largest number of nearby systems have been found in the slowest proper motion bin, $0''.6$ yr$^{-1} > \mu \geq 0''.4$ yr^{-1}, indicating that there may be a large population of low proper motion systems very near the Sun.

Key words: solar neighborhood — stars: distances — stars: statistics

Online material: machine-readable table

1. INTRODUCTION

In this paper we continue our reconnaissance of the solar neighborhood by reporting results of the second phase of our SuperCOSMOS-RECONS (SCR) search for new high proper motion (HPM) objects in the southern sky. In Paper XII of the Solar Neighborhood (TSN) series (Subasavage et al. 2005), we presented results for the portion of the sky between declinations $-90°$ and $-47°$. In this paper we cover the region from declinations $-47°$ to $00°$.

Recently, the northern sky has been searched systematically for HPM objects by Lépine et al. (2002, 2003) utilizing SUPERBLINK, which has been particularly successful at filling in the distribution of HPM objects along the Galactic plane. Their latest compendium (Lépine & Shara 2005) includes 61,977 HPM objects with $\mu \geq 0''.15$ yr^{-1}. The total number of objects is roughly double what was found during the pioneering days of Giclas et al. (1971, 1978) and Luyten (1979, 1980[1]). Historically, however, the southern sky has been investigated with limited depth for HPM objects, which are notoriously good nearby star candidates.

Since the Giclas et al. and Luyten efforts, significant numbers of HPM stars have been found, primarily because of the advent of large databases holding data from digitized photographic plates. Some of the new discoveries are remarkably nearby, including SO 0253+1652 (Teegarden et al. 2003), DENIS 1048−3956 (Delfosse et al. 2001), and SCR 1845−6357 (Hambly et al. 2004, hereafter Paper VIII), which have distances estimated to be 3.7, 4.5, and 4.6 pc, respectively (Henry et al. 2004, hereafter Paper X). Because of their proximity, these three red dwarfs are high-priority targets in our trigonometric parallax program, CTIOPI (Cerro Tololo Inter-American Observatory Parallax Investigation) being carried out in Chile (Jao et al. 2005; Henry et al. 2005). As is the case for all of the recent HPM surveys, the new SCR discoveries are primarily red dwarfs that are underrepresented in current compendia of solar neighborhood membership lists because of their intrinsic faintness (Henry et al. 1997). Additional smatterings of white dwarfs and subdwarfs are also found in the SCR and other HPM searches.

The classic work of Giclas et al. and Luyten has been complemented by the recent HPM surveys summarized in Table 1, each of which has revealed important new HPM objects. (The machine-selected catalog of 11,289 objects generated by Pokorny et al. [2004] remains difficult to assess, because our initial checks indicate that many of the objects are previously known and several are not real HPM sources.) We compare the number of new discoveries from each survey to the Luyten Half Second (LHS) Catalogue (Luyten 1979), which included 3602 objects with proper motions in excess of $0''.5$ yr^{-1} and still accounts for

[1] Information is available from the VizieR Online Data Catalog, catalog number 1098.

TABLE 1
Proper-Motion Surveys and Number of New LHS Objects Discovered

Survey	$\mu \geq 1''.0$ yr^{-1}	$1''.0$ yr$^{-1} > \mu \geq 0''.5$ yr^{-1}	Total	Number of Publications	References
LHS	528	3074	3602	1	1
SUPERBLINK	18	180	198	2	2
SuperCOSMOS-RECONS	9	141	150	4	3, 4, 5, 6
SIPS (Deacon et al.)	10	58	68	1	7
WT (Wroblewski and collaborators)	2	46	48	7	8, 9
Scholz and collaborators	6	21	26	4	10
Calan-ESO (Ruiz and collaborators)	3	14	17	2	11, 12
Oppenheimer et al.	3	8	11	1	13
Pokorny et al.	Unknown	Unknown	Unknown	2	14

References.—(1) Luyten 1979; (2) Lépine et al. 2002, 2003; (3) Paper VIII; (4) Paper X; (5) Paper XII; (6) this paper; (7) Deacon et al. 2005b; (8) Wroblewski & Torres 1989, 1991, 1994, 1996, 1997; (9) Wroblewski & Costa 1999, 2001; (10) Scholz et al. 2000, 2002, 2004a, 2004b; (11) Ruiz & Maza 1987; (12) Ruiz et al. 2001; (13) Oppenheimer et al. 2001; (14) Pokorny et al. 2003, 2004.

87% of all known such objects. This reveals the enormous impact of the work by Giclas et al. and Luyten, who carried out their surveys in times before massive computer searches of digitized photographic plates were possible.

2. SEARCH METHODOLOGY

To reveal new HPM objects, we mine the SuperCOSMOS database developed and maintained at the Royal Observatory in Edinburgh, Scotland. Papers VIII, X, and XII in this series include previous discoveries from our SCR survey. The search techniques used here are identical to those in Paper VIII, in which a full discussion can be found. Briefly, we use the SuperCOSMOS Sky Survey to reveal previously unknown HPM objects using a combination of astrometric and photometric information from the four photographic plates available (B_J, ESO$-R$, R_{59F}, and I_{IVN}) in the southern sky.

In Paper XII, 1424 candidate objects were found having $10''.0$ yr$^{-1} > \mu \geq 0''.4$ yr^{-1} and are brighter than $R_{59F} = 16.5$. In this portion of the search, we have found an additional 3879 candidates meeting the same criteria. The combined coverage of the two portions of the survey includes 46% of the entire sky and 92% of the southern sky, where we have searched from the south celestial pole at $\delta = -90^\circ$ to a northern cutoff at precisely $\delta = 00^\circ$ (even though the plates typically extend to $\delta = 3^\circ.0$). Figure 1 is a map of the sky coverage, including the 894 plate fields in the southern sky. Seventy-one fields have not been searched because of crowding near the Galactic plane and Magellanic Clouds or because of a limited spread in epochs for available plates.

The vetting of candidates, which includes checks of proper motions, magnitudes, colors, and image ellipticities, as well as inspection by eye, was described in detail in Paper XII. For each candidate that appeared to be a real object, coordinates were carefully cross-checked with the New Luyten Two-Tenths (NLTT) Catalogue, the SIMBAD database, and recent HPM publications (see Table 1) to see whether it was a known object. If the coordinates agreed to within a few arcminutes and the magnitudes and proper motions were consistent, the detection was considered previously known. In a few cases, the coordinates and proper motions agreed well but the magnitudes did not. These objects were revealed to be new wide common proper motion companions to previously known proper motion stars; four new companions are reported here (see § 5.5). Overall, the hit rate for new HPM objects decreases with increasing proper motion, because reliable source association between different epochs is more difficult for fast-moving sources. For objects with $10''.0$ yr$^{-1} > \mu \geq 1''.0$ yr^{-1}, only 10% turn out to be real, whereas 87% of objects detected with $1''.0$ yr$^{-1} > \mu \geq 0''.4$ yr^{-1} are real. These fractions include both new and known objects.

The final count of real, distinct, new systems with $10''.0$ yr$^{-1} > \mu \geq 0''.4$ yr^{-1} and brighter than $R_{59F} = 16.5$ found between $\delta = -47^\circ$ and 00° is 152. We continue using our naming convention, SCR, for objects discovered during the survey.

3. COMPARISON TO PREVIOUS PROPER-MOTION SURVEYS

A primary goal of the SCR effort is to further complete the LHS Catalogue for stars with $\mu \geq 0''.5$ yr^{-1}. Our extension of the cutoff to $\mu \geq 0''.4$ yr^{-1} in this survey is to ensure that no known LHS stars were missed due to proper-motion measurement errors for objects very near the $0''.5$ yr^{-1} limit. Of the 299 new SCR systems found to date, 148 have $\mu \geq 0''.5$ yr^{-1}. Figure 2 provides a map of new systems with $\mu \geq 0''.5$ yr^{-1}, including the 148 total SCR systems (*filled triangles representing 150 individual objects*) that are additions to the LHS sample.

Lépine et al. (2002, 2003) and Lépine & Shara (2005) have completed work on the entire northern sky using SUPERBLINK and are so far the most productive survey for revealing new objects with $\mu \geq 0''.5$ yr^{-1}. Although we avoid the Galactic plane and Magellanic Clouds, the SCR survey has the most uniform sky coverage for southern hemisphere searches and is consequently the most productive survey in the southern hemisphere. There are undoubtedly objects remaining to be discovered along the crowded Galactic plane in the southern sky; the gaps in Figure 2 typically match the regions not searched (white spaces in Fig. 1). The same is true of the LMC ($\alpha = 05^h30^m$, $\delta = -68^\circ$) and SMC ($\alpha = 01^h00^m$, $\delta = -73^\circ$) regions.

There are 1462 LHS stars in the LHS Catalogue brighter than a photographic R magnitude (R_{pg}) of 16.5 in the southern sky. Of the 1152 known LHS stars in the southern sky with $10.0 < R_{pg} < 16.5$, we have recovered 1032 (90%). We recover only 234 of 310 (75%) LHS stars brighter than $R = 10.0$, because the search is somewhat less sensitive to bright objects that are saturated in the photographic emulsions. This recovery rate is somewhat less successful for stars moving faster than $1''.0$ yr^{-1} (199 of 251, 79%) than for stars with $\mu = 0''.5$–$1''.0$ yr^{-1} (1067 of 1211, 88%).

4. DATA

As in Paper XII, coordinates, proper motions, and plate magnitudes have been extracted from SuperCOSMOS for the new HPM systems. These data are listed in Table 2 for objects in the

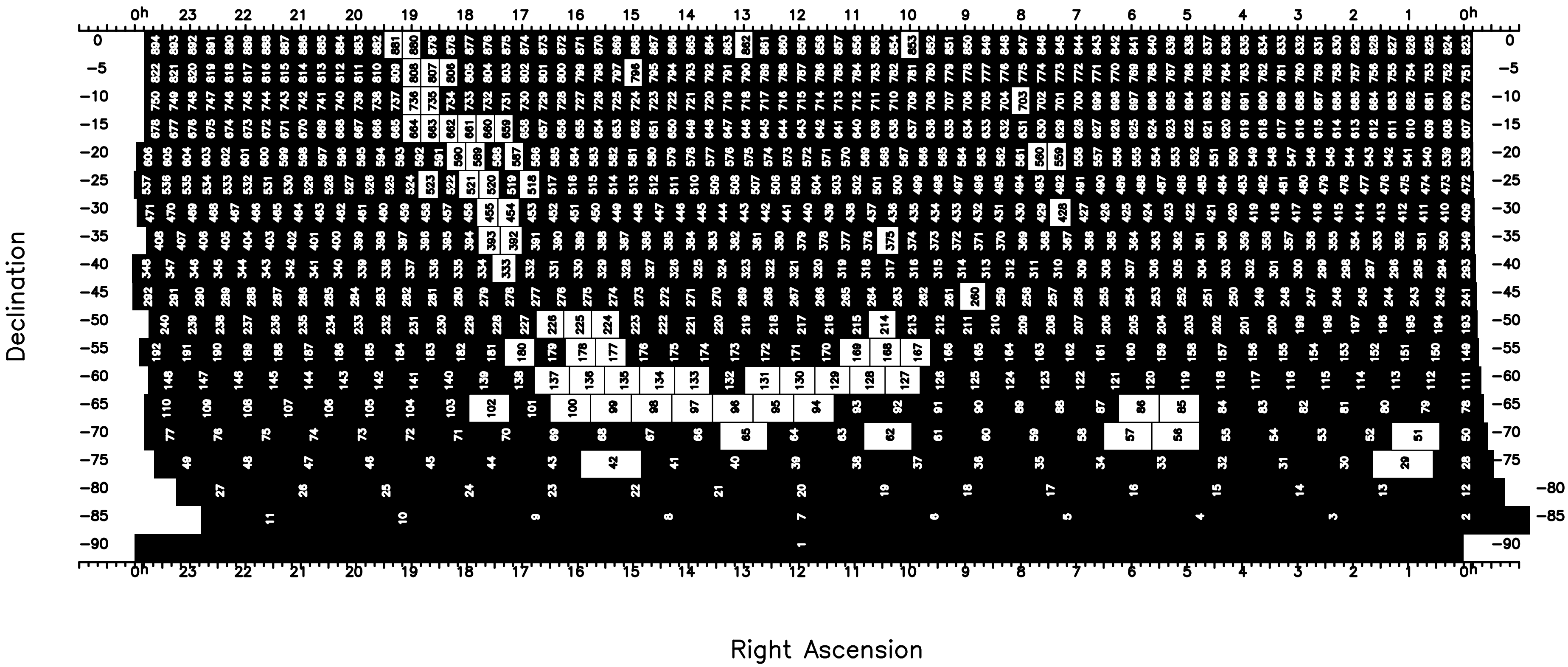

FIG. 1.—Plate coverage of the entire SCR survey, including sky coverage in Paper XII and this paper. Plates colored in white were excluded from the search, primarily because of source crowding (Galactic plane, LMC, and SMC) or a limited time span between plates.

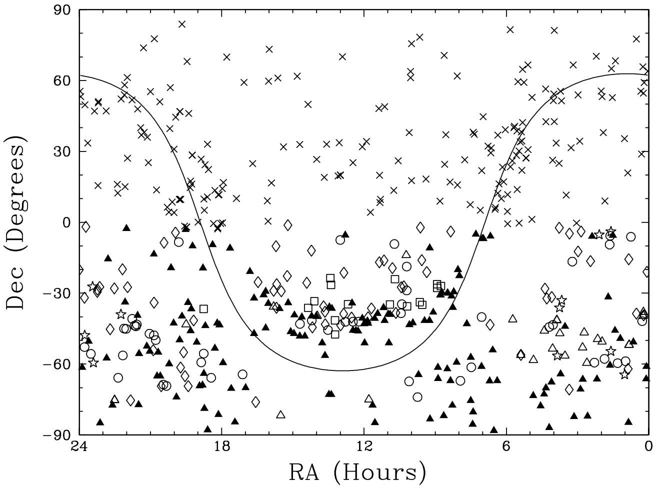

FIG. 2.—Sky distribution of new LHS objects from recent proper-motion surveys. Only stars with $\mu \geq 0''.5\ \mathrm{yr}^{-1}$ are plotted. Filled triangles are from the SCR survey discussed here and in Paper XII. Crosses represent objects from the SUPERBLINK survey. Other symbols represent objects from other surveys: WT (*open circles*), Scholz (*open triangles*), Calan-ESO (*open squares*), Oppenheimer (*open stars*), and SIPS (*open diamonds*). The curve represents the Galactic plane, where more high proper motion objects are yet to be revealed.

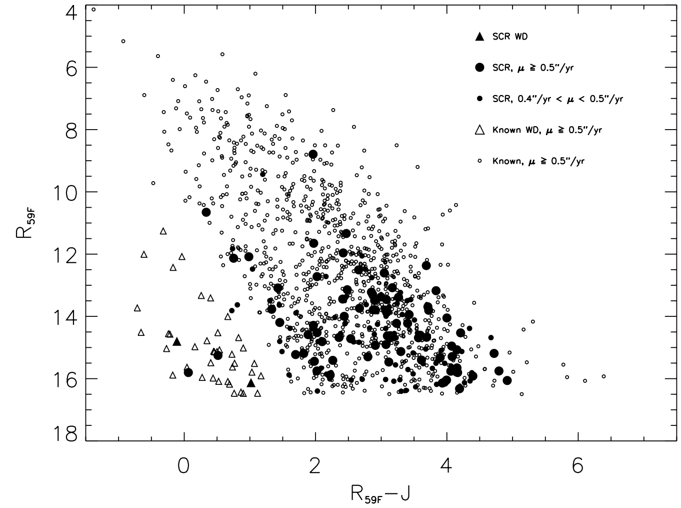

FIG. 3.—Color–apparent magnitude diagram for the SCR systems with $\mu \geq 0''.4\ \mathrm{yr}^{-1}$ (the size of the points splits the SCR sample into stars with μ more or less than $0''.5\ \mathrm{yr}^{-1}$) and known systems with $\mu \geq 0''.5\ \mathrm{yr}^{-1}$ found in this portion of the SCR survey from declinations $-47°$ to $00°$. Triangles indicate confirmed white dwarfs.

new portion of the sky searched here. Coordinates are for epoch and equinox J2000.0. Errors in the coordinates are typically $\pm 0''.3$, and errors in the proper motions are given. Errors in position angle are usually $\pm 0°.1$. Photometric magnitudes are given for three sets of plates: B_J, R_{59F}, and I_{IVN}. Magnitude errors are $\sim$0.3 mag or better for $m > 15$ and actually get larger at brighter magnitudes due to systematic errors (Hambly et al. 2001). A few plate magnitude values are missing because of blending problems that preclude accurate magnitude determinations.

Infrared photometry has been used to extend the color baseline, which allows more accurate photometric distance estimates for red dwarfs and permits a reliable separation of the white and red dwarfs. The infrared JHK_s photometry has been extracted from the Two Micron All Sky Survey (2MASS) via Aladin. Each SCR object has been identified by eye to ensure that no extracted magnitudes are in error. In nearly every case, the errors are smaller than 0.03 mag. Exceptions include objects with $J > 15$, $H > 14.5$, and $K_s > 14$, for which the errors are 0.05 mag or greater. In one case, SCR 1246−1236, the error is null for K_s, and the value is therefore unreliable.

5. ANALYSIS

5.1. *Color-Magnitude Diagram*

Illustrated in Figure 3 is a color–apparent magnitude diagram that compares new SCR objects (split into large filled circles representing objects with $\mu \geq 0''.5\ \mathrm{yr}^{-1}$ and small filled circles representing objects with $0''.5\ \mathrm{yr}^{-1} > \mu \geq 0''.4\ \mathrm{yr}^{-1}$) to previously known stars having $\mu \geq 0''.5\ \mathrm{yr}^{-1}$. As in Paper XII, the SCR discoveries are generally fainter and redder than the bulk of the known stars (note that the open/filled symbols have been exchanged relative to Paper XII for clarity in this figure). However, the portion of sky searched in this paper is much larger (2.2 times the area) than that targeted in Paper XII and overlaps the regions searched by Giclas et al. (1971, 1978) and Luyten (1979, 1980). This results in two important differences from the similar Figure 4 in Paper XII. First, there are far more known objects shown here than in the deep southern sky. Second, because Luyten's Bruce Proper Motion survey for the sky south of $\delta = -33°$ had a relatively bright limit ($m_{pg} \sim 15.5$) and lacked red plates, there were very few known faint stars in the complementary figure of Paper XII. Here there are many faint stars from the overlap region between $\delta = -33°$ and $00°$ where earlier searches did have faint limits. Note also that there are 43 white dwarfs here (39 known and 4 new candidates), whereas there were 16 in Paper XII, entirely consistent with a uniform white dwarf distribution on the sky given the ratio of sky areas searched.

We have not found any additional extremely red objects similar to SCR 1845−6357 ($R_{59F} - J = 7.79$, $R_{59F} = 16.33$, Paper VIII; $V - K_s = 8.89$, M8.5V, distance estimate 4.6 pc, Paper X; trigonometric parallax 282 ± 23 mas, Deacon et al. 2005a) in this portion of the sky. Instead, the remarkable find is SCR 0640−0552 with $R_{59F} - J = 1.95$, $R_{59F} = 8.79$, and a distance estimated here to be 8.5 pc, assuming it is single (see § 5.5). That such a bright object remained unidentified until this survey is surprising, indicating yet again that there may be very nearby, relatively bright stars that have not yet been found. As noted in Paper XII, there is not a significant drop in the number of objects at our adopted faint limit, so there is likely to remain a large population of fainter objects yet to be discovered in the SuperCOSMOS data. Moreover, the population of objects with $\mu < 0''.5\ \mathrm{yr}^{-1}$ has barely been investigated, although a portion of the previously known objects in the NLTT have been examined (Reid et al. 2004).

5.2. *Reduced Proper Motion Diagram*

Shown in Figure 4 is the reduced proper motion (RPM) diagram for objects from the region of the sky reported here. The RPM diagram is used to separate effectively the white dwarfs from main-sequence stars, as well as to assist in identifying subdwarfs. The assumption is, of course, that proper motion is directly related to distance. A complementary plot can be found in Figure 5 of Paper XII for the southernmost portion of the SCR survey.

As in Paper XII it is apparent that most of the new SCR stars are main-sequence red dwarfs, while there is a substantial sample of new subdwarf candidates; note the bifurcated population of circles running from the upper left to lower right in Figure 4. The area just above the dotted line maps out the subdwarf region. The dotted

TABLE 2

PROPER MOTIONS, PHOTOGRAPHIC AND INFRARED PHOTOMETRY, AND DISTANCE ESTIMATES FOR THE SUPERCOSMOS-RECONS SAMPLE WITH $\mu \geq 0''.4\ \mathrm{yr}^{-1}$ FROM $-47° > \delta > 00°$

Name	R.A. (J2000.0)	Decl. (J2000.0)	μ (arcsec)	σ_μ (arcsec)	θ (deg)	B_J	R_{59F}	I_{IVN}	J	H	K_s	$R_{59F} - J$	Est. Distance (pc)	Notes
						SuperCOSMOS-RECONS Sample with $\mu \geq 0''.5\ \mathrm{yr}^{-1}$								
SCR 0125−4545...........	01 25 18.04	−45 45 31.2	0.759	0.007	137.8	17.04	16.13	15.80	15.11	14.84	14.91	1.02	[515.7]	a, b
SCR 0130−0532...........	01 30 43.82	−05 32 22.1	0.552	0.006	118.2	. . .	16.05	13.63	12.06	11.48	11.19	3.99	42.4	
SCR 0142−3133...........	01 42 20.39	−31 33 35.9	0.749	0.012	155.1	18.21	16.11	13.81	12.15	11.65	11.36	3.96	47.2	
SCR 0223−0558...........	02 23 26.64	−05 58 47.4	0.530	0.006	84.5	17.70	15.47	13.49	12.36	11.79	11.56	3.11	73.4	
SCR 0300−4653...........	03 00 45.22	−46 53 50.1	0.779	0.008	68.7	17.62	15.40	12.80	11.79	11.31	11.02	3.61	49.5	
SCR 0640−0552...........	06 40 13.97	−05 52 23.5	0.592	0.008	170.5	11.23	8.79	7.59	6.84	6.21	5.96	1.95	8.5	
SCR 0658−0655...........	06 58 14.14	−06 55 35.4	0.574	0.003	130.6	16.73	14.68	12.93	12.33	11.76	11.53	2.35	[104.9]	a
SCR 0701−0655...........	07 01 17.79	−06 55 49.4	0.582	0.003	183.8	17.68	15.75	14.57	13.73	13.19	13.00	2.02	[234.3]	a
SCR 0717−0501...........	07 17 17.10	−05 01 04.0	0.580	0.004	133.6	13.86	11.34	8.83	8.87	8.35	8.05	2.47	15.9	
SCR 0740−4257...........	07 40 11.80	−42 57 40.1	0.714	0.013	318.1	14.52	12.37	9.99	8.68	8.09	7.77	3.69	10.0	
SCR 0758−2235...........	07 58 53.17	−22 35 52.8	0.547	0.012	153.8	14.87	12.72	10.81	10.71	10.19	9.98	2.01	56.1	
SCR 0802−2002...........	08 02 37.92	−20 02 26.4	0.670	0.008	139.9	15.81	13.29	10.61	10.43	9.80	9.57	2.86	32.3	
SCR 0813−2926...........	08 13 07.54	−29 26 06.9	0.521	0.006	252.6	16.62	14.62	11.82	11.48	10.98	10.73	3.14	56.4	
SCR 0815−3600...........	08 15 15.98	−36 00 58.9	0.612	0.010	350.6	16.29	13.80	11.29	10.74	10.17	9.88	3.06	34.6	
SCR 0818−3110...........	08 18 40.27	−31 10 20.4	0.842	0.008	162.6	15.74	14.80	14.52	14.92	14.73	14.83	−0.12	. . .	b, c
SCR 0827−3002...........	08 27 40.82	−30 02 60.0	0.621	0.010	330.3	16.08	13.14	11.30	10.67	10.17	9.92	2.47	41.1	
SCR 0829−2951...........	08 29 09.73	−29 51 39.2	0.570	0.010	158.3	15.99	13.44	11.54	11.04	10.56	10.32	2.40	54.8	
SCR 0843−2937...........	08 43 09.45	−29 37 30.9	0.514	0.007	145.1	16.13	13.94	11.68	10.53	10.01	9.72	3.41	28.3	
SCR 0845−3051...........	08 45 51.93	−30 51 31.4	0.563	0.008	257.2	16.41	14.22	12.00	10.82	10.30	10.04	3.40	32.9	
SCR 0847−3046...........	08 47 09.79	−30 46 12.7	0.590	0.007	170.7	15.40	13.46	11.10	10.39	9.91	9.60	3.07	33.8	
SCR 0904−3804...........	09 04 46.52	−38 04 07.5	0.643	0.007	145.0	16.88	14.93	13.16	12.03	11.57	11.36	2.90	80.2	
SCR 0913−1049...........	09 13 54.20	−10 49 33.2	0.670	0.004	219.9	. . .	15.19	14.08	13.38	12.86	12.67	1.81	[200.4]	a
SCR 0914−4134...........	09 14 17.43	−41 34 38.9	0.749	0.008	312.5	16.33	13.69	10.98	9.98	9.42	9.12	3.71	18.2	
SCR 0927−4137...........	09 27 07.25	−41 37 12.5	0.511	0.016	120.5	11.93	10.65	10.01	10.32	9.89	9.80	0.33	. . .	c
SCR 0956−4234...........	09 56 37.01	−42 34 27.5	0.620	0.005	146.8	17.00	14.67	11.82	10.99	10.47	10.21	3.68	33.3	
SCR 1005−4322...........	10 05 03.16	−43 22 28.4	0.653	0.014	292.5	14.76	12.51	10.14	9.85	9.32	9.06	2.66	29.2	
SCR 1053−3858...........	10 53 49.42	−38 58 58.7	0.622	0.006	320.1	15.85	13.79	11.81	10.91	10.43	10.13	2.88	44.7	
SCR 1058−3854...........	10 58 47.18	−38 54 15.2	0.565	0.006	284.1	15.65	14.60	12.19	11.01	10.52	10.21	3.59	42.9	
SCR 1107−4135...........	11 07 55.93	−41 35 52.8	1.189	0.006	282.8	16.66	14.72	13.65	12.19	11.69	11.47	2.53	[95.4]	a
SCR 1110−3608...........	11 10 29.03	−36 08 24.7	0.527	0.007	268.5	17.20	15.07	12.72	10.93	10.34	10.00	4.14	22.3	
SCR 1125−3834...........	11 25 37.28	−38 34 43.2	0.586	0.006	252.1	16.04	13.80	11.66	10.09	9.51	9.19	3.71	18.1	
SCR 1132−4039...........	11 32 57.92	−40 39 21.4	0.725	0.008	296.8	15.26	13.38	11.22	10.38	9.89	9.65	3.00	35.9	
SCR 1149−4248...........	11 49 31.61	−42 48 10.2	0.951	0.007	259.9	15.43	13.09	12.41	11.67	11.11	10.90	1.42	[99.4]	a
SCR 1151−4142...........	11 51 07.83	−41 42 17.5	0.713	0.010	247.5	. . .	15.65	13.03	11.51	10.99	10.68	4.14	33.2	
SCR 1159−4256...........	11 59 37.69	−42 56 39.3	0.610	0.007	219.0	14.20	11.96	10.35	9.54	8.98	8.72	2.42	26.7	
SCR 1204−4037...........	12 04 15.54	−40 37 52.6	0.695	0.013	150.0	14.70	12.61	10.72	9.57	9.02	8.75	3.04	21.2	
SCR 1214−4603...........	12 14 40.01	−46 03 14.4	0.750	0.005	250.8	16.80	14.53	11.60	10.32	9.75	9.44	4.21	18.0	
SCR 1220−4546...........	12 20 07.98	−45 46 18.2	0.758	0.005	286.3	16.53	14.59	13.35	12.70	12.16	11.95	1.89	[150.8]	a
SCR 1227−4541...........	12 27 46.82	−45 41 16.7	1.304	0.011	282.0	16.40	14.19	13.31	12.75	12.40	12.27	1.44	[188.2]	a
SCR 1230−3411...........	12 30 01.76	−34 11 24.2	0.527	0.007	234.9	15.29	13.18	10.92	9.34	8.77	8.44	3.84	12.6	
SCR 1247−0525...........	12 47 14.74	−05 25 13.5	0.722	0.007	319.8	15.90	13.38	10.92	10.13	9.62	9.29	3.25	24.2	
SCR 1321−3629...........	13 21 14.84	−36 29 18.3	0.554	0.009	247.8	18.61	16.32	13.84	12.14	11.57	11.24	4.18	38.4	
SCR 1327−3551...........	13 27 39.52	−35 51 01.5	0.535	0.007	236.0	17.01	14.69	12.57	11.13	10.60	10.33	3.56	33.3	
SCR 1400−3935...........	14 00 32.30	−39 35 29.4	0.507	0.006	255.7	17.45	15.44	14.20	13.47	12.90	12.66	1.97	[199.7]	a
SCR 1412−3941...........	14 12 21.14	−39 41 33.8	0.636	0.006	240.2	16.24	14.22	12.44	10.99	10.43	10.18	3.23	37.6	

TABLE 2—*Continued*

Name	R.A. (J2000.0)	Decl. (J2000.0)	μ (arcsec)	σ_μ (arcsec)	θ (deg)	B_J	R_{59F}	I_{IVN}	J	H	K_s	$R_{59F} - J$	Est. Distance (pc)	Notes
SCR 1437−4002...........	14 37 21.41	−40 02 50.9	0.525	0.012	230.1	16.18	13.87	12.36	10.79	10.21	9.90	3.08	32.3	
SCR 1455−3914...........	14 55 51.60	−39 14 33.2	0.798	0.012	266.4	16.61	14.52	13.57	12.50	11.98	11.79	2.02	[130.8]	a
SCR 1457−4705...........	14 57 05.34	−47 05 26.4	0.517	0.008	226.4	16.93	15.23	14.48	13.53	12.96	12.82	1.70	[215.1]	a
SCR 1505−4620...........	15 05 27.33	−46 20 16.2	0.517	0.011	239.8	15.80	13.74	12.02	11.07	10.51	10.28	2.67	51.2	
SCR 1511−3403...........	15 11 38.62	−34 03 16.6	0.561	0.006	202.9	16.04	14.05	12.09	10.05	9.42	9.13	4.00	16.1	
SCR 1533−3634...........	15 33 27.70	−36 34 02.6	0.555	0.006	237.2	16.08	14.62	13.37	11.54	10.99	10.76	3.08	58.9	
SCR 1601−3421...........	16 01 55.72	−34 21 57.0	0.683	0.012	118.2	17.05	15.75	13.27	10.96	10.33	9.98	4.79	20.2	
SCR 1608−4442...........	16 08 43.92	−44 42 28.8	0.628	0.012	193.1	16.59	14.95	12.94	10.88	10.35	10.10	4.07	27.5	
SCR 1608−2913AB.....	16 08 45.49	−29 13 06.6	0.540	0.016	231.0	13.61	11.65	9.91	9.68	9.15	8.51	1.97	28.9	d
SCR 1613−3040...........	16 13 53.57	−30 40 59.0	0.522	0.009	216.7	16.68	15.41	14.32	13.15	12.58	12.38	2.26	[143.0]	a
SCR 1637−3203...........	16 37 50.55	−32 03 11.5	0.587	0.007	221.6	18.42	15.76	13.74	11.70	11.10	10.82	4.06	30.3	
SCR 1637−4703...........	16 37 56.52	−47 03 45.5	0.503	0.007	215.4	16.17	13.49	14.16	10.60	10.04	9.70	2.89	20.8	
SCR 1648−2049...........	16 48 23.38	−20 49 35.4	0.679	0.008	245.8	15.71	14.00	13.25	11.56	10.99	10.77	2.44	68.6	
SCR 1738−1057...........	17 38 35.48	−10 57 25.3	0.510	0.004	178.3	17.24	15.80	14.12	11.64	11.11	10.90	4.16	41.0	
SCR 1805−4326...........	18 05 12.34	−43 26 06.1	0.781	0.006	160.3	17.52	15.13	12.69	11.83	11.37	11.09	3.30	56.6	
SCR 1811−4239...........	18 11 17.20	−42 39 02.5	0.732	0.010	180.9	13.68	12.13	11.21	11.38	10.82	10.65	0.75	...	e
SCR 1822−0928...........	18 22 44.35	−09 28 20.0	0.523	0.003	196.4	17.56	15.92	13.85	11.52	10.98	10.60	4.40	29.8	
SCR 1841−4347...........	18 41 09.79	−43 47 32.6	0.790	0.007	264.2	17.65	15.19	12.32	10.48	9.94	9.60	4.71	14.6	
SCR 1847−1922...........	18 47 16.69	−19 22 20.8	0.626	0.011	230.7	15.36	13.08	10.94	9.91	9.38	9.09	3.17	23.0	
SCR 1913−1001...........	19 13 24.60	−10 01 46.6	0.576	0.004	211.8	16.64	14.81	13.88	12.71	12.16	11.93	2.10	[138.9]	a
SCR 1916−3638...........	19 16 46.56	−36 38 05.9	1.303	0.007	184.1	18.20	15.88	14.78	13.66	13.12	12.95	2.22	[199.2]	a
SCR 1918−4554...........	19 18 29.45	−45 54 31.0	0.700	0.012	220.4	17.89	15.29	12.66	11.21	10.65	10.30	4.08	25.5	
SCR 1924−3356...........	19 24 48.30	−33 56 10.3	0.549	0.013	146.2	15.48	13.77	12.71	12.45	11.99	11.77	1.32	[149.8]	a
SCR 1931−0306...........	19 31 04.70	−03 06 18.6	0.578	0.004	31.0	17.87	16.06	...	11.15	10.56	10.23	4.91	18.0	
SCR 1940−3944...........	19 40 21.31	−39 44 10.7	0.525	0.009	167.5	15.19	13.22	11.17	10.38	9.84	9.57	2.84	35.6	
SCR 2001−4239...........	20 01 16.47	−42 39 37.1	0.594	0.008	165.5	17.08	14.90	13.25	11.84	11.34	11.09	3.06	60.7	
SCR 2007−1915...........	20 07 45.91	−19 15 53.7	0.629	0.011	186.3	16.00	13.79	11.77	10.88	10.38	10.14	2.91	43.2	
SCR 2051−1329...........	20 51 13.57	−13 29 16.2	0.694	0.005	103.7	17.51	15.32	13.05	11.42	10.92	10.61	3.90	33.6	
SCR 2132−3922...........	21 32 29.69	−39 22 50.3	0.531	0.007	118.3	18.36	16.14	13.54	12.21	11.70	11.35	3.93	47.7	
SCR 2200−0240...........	22 00 44.45	−02 40 18.9	0.676	0.008	174.2	17.16	15.30	13.94	12.51	11.98	11.74	2.79	97.5	
SCR 2204−3347...........	22 04 02.28	−33 47 38.9	1.000	0.010	152.0	16.56	14.29	12.96	12.32	11.81	11.60	1.97	[120.6]	a
SCR 2247−1528...........	22 47 13.08	−15 28 37.8	0.512	0.008	195.4	14.02	12.08	11.31	11.10	10.50	10.34	0.98	77.3	
SuperCOSMOS-RECONS Sample with μ between 0.″4 and 0.″5 yr^{-1}														
SCR 0529−3950...........	05 29 40.95	−39 50 25.8	0.406	0.004	57.1	16.58	14.40	13.03	12.46	11.89	11.65	1.94	[124.6]	a
SCR 0533−3908...........	05 33 10.28	−39 08 55.5	0.454	0.005	16.5	15.88	13.73	11.58	10.71	10.18	9.90	3.02	37.0	
SCR 0615−1812...........	06 15 23.95	−18 12 04.8	0.486	0.006	150.9	18.06	15.85	13.69	12.36	11.82	11.56	3.49	62.4	
SCR 0708−4709...........	07 08 32.04	−47 09 30.7	0.402	0.006	115.0	14.50	12.48	11.58	11.44	10.90	10.76	1.04	[93.7]	a
SCR 0709−3941...........	07 09 37.06	−39 41 52.5	0.426	0.004	190.4	16.55	14.21	12.42	11.77	11.21	10.99	2.44	74.8	
SCR 0709−4648...........	07 09 37.34	−46 48 58.6	0.413	0.006	10.4	16.03	13.49	12.57	12.20	11.70	11.49	1.29	[131.3]	a
SCR 0718−4622...........	07 18 12.12	−46 22 37.9	0.423	0.007	343.6	17.75	15.52	13.22	11.88	11.33	11.07	3.64	46.6	
SCR 0727−1421...........	07 27 16.46	−14 21 06.3	0.413	0.004	161.8	16.29	13.99	11.56	10.93	10.38	10.11	3.06	39.8	
SCR 0727−1404...........	07 27 40.71	−14 04 59.0	0.484	0.004	141.7	16.78	14.55	11.95	11.35	10.79	10.52	3.20	46.5	
SCR 0731−0954...........	07 31 37.56	−09 54 50.7	0.438	0.003	177.8	18.00	15.68	12.83	11.57	11.03	10.68	4.11	32.8	
SCR 0736−3024...........	07 36 56.69	−30 24 16.3	0.424	0.013	145.7	14.76	12.06	9.46	9.36	8.79	8.49	2.70	20.2	
SCR 0740−0540...........	07 40 55.60	−05 40 37.9	0.467	0.003	151.1	18.20	16.04	14.62	13.51	12.96	12.77	2.53	[166.4]	a
SCR 0742−3012...........	07 42 41.97	−30 12 39.5	0.418	0.006	134.1	18.34	16.38	14.20	13.00	12.49	12.26	3.38	97.7	

TABLE 2—*Continued*

Name	R.A. (J2000.0)	Decl. (J2000.0)	μ (arcsec)	σ_μ (arcsec)	θ (deg)	B_J	R_{59F}	I_{IVN}	J	H	K_s	$R_{59F} - J$	Est. Distance (pc)	Notes
SCR 0745−0725..........	07 45 54.24	−07 25 56.1	0.437	0.003	162.8	16.71	14.55	12.92	12.18	11.64	11.42	2.37	96.9	
SCR 0753−2524..........	07 53 56.58	−25 24 01.4	0.426	0.007	300.2	16.18	15.25	15.67	14.75	14.47	14.30	0.50	[365.2]	a,b,f
SCR 0754−2338..........	07 54 29.56	−23 38 54.5	0.480	0.006	136.8	16.92	14.80	13.52	13.35	12.86	12.69	1.45	[224.3]	a
SCR 0754−3809..........	07 54 54.86	−38 09 37.4	0.401	0.011	351.4	16.90	14.68	11.75	10.01	9.42	9.08	4.67	12.0	
SCR 0803−1558..........	08 03 30.08	−15 58 30.8	0.493	0.003	153.9	17.00	14.82	12.87	12.24	11.74	11.50	2.58	94.1	
SCR 0804−1256..........	08 04 48.41	−12 56 29.6	0.480	0.003	164.0	17.99	15.66	14.22	13.58	13.05	12.78	2.08	[195.0]	a
SCR 0816−2247..........	08 16 42.32	−22 47 39.8	0.418	0.006	138.4	18.51	16.26	13.40	12.75	12.21	11.90	3.51	78.5	
SCR 0823−4444..........	08 23 03.57	−44 44 50.2	0.414	0.007	308.1	16.82	14.75	12.48	11.61	11.06	10.81	3.14	54.5	
SCR 0829−3855..........	08 29 23.24	−38 55 54.3	0.407	0.005	328.6	17.26	15.43	13.15	11.58	10.95	10.67	3.85	36.8	
SCR 0835−3400..........	08 35 31.73	−34 00 37.4	0.448	0.012	190.1	15.31	12.76	10.25	9.90	9.37	9.08	2.86	25.9	
SCR 0837−4639..........	08 37 15.70	−46 39 50.2	0.447	0.008	303.5	16.21	13.89	12.86	12.20	11.65	11.44	1.69	[119.5]	a
SCR 0849−3138..........	08 49 38.93	−31 38 22.6	0.405	0.006	344.2	16.55	14.57	12.84	11.69	11.16	10.91	2.88	63.3	
SCR 0917−3849..........	09 17 13.65	−38 49 35.8	0.484	0.007	356.7	16.62	14.37	12.28	11.56	11.12	10.80	2.81	61.3	
SCR 1001−2257..........	10 01 06.62	−22 57 04.6	0.426	0.006	142.3	17.99	15.88	14.69	14.28	13.74	13.53	1.60	[328.5]	a
SCR 1014−4428..........	10 14 40.77	−44 28 01.2	0.409	0.008	192.9	18.09	15.71	13.01	12.30	11.84	11.51	3.41	67.2	
SCR 1109−4631..........	11 09 28.32	−46 31 09.9	0.467	0.005	279.2	18.17	16.18	14.00	12.35	11.88	11.55	3.83	55.5	
SCR 1117−3202..........	11 17 29.31	−32 02 09.8	0.448	0.013	204.8	15.90	13.58	11.33	10.34	9.76	9.48	3.24	26.3	
SCR 1151−4624..........	11 51 01.63	−46 24 12.0	0.441	0.008	118.8	16.17	13.62	11.68	10.85	10.33	10.04	2.77	40.6	
SCR 1157−0149..........	11 57 45.56	−01 49 02.4	0.451	0.008	116.4	17.29	15.13	12.62	10.90	10.35	10.02	4.23	22.2	
SCR 1206−3500..........	12 06 58.52	−35 00 52.2	0.422	0.007	229.3	15.55	13.46	11.19	10.01	9.40	9.13	3.45	21.0	
SCR 1208−3723..........	12 08 51.06	−37 23 27.6	0.420	0.006	140.5	16.16	13.94	11.77	10.62	10.08	9.78	3.32	29.7	
SCR 1223−3654..........	12 23 11.19	−36 54 58.5	0.461	0.006	279.4	16.60	14.53	12.45	10.99	10.42	10.15	3.54	31.9	
SCR 1235−4527..........	12 35 34.99	−45 27 03.6	0.485	0.011	317.3	14.97	12.72	11.07	10.57	10.04	9.76	2.15	48.2	
SCR 1241−4717..........	12 41 33.13	−47 17 05.9	0.428	0.011	257.9	16.52	14.38	13.43	12.77	12.21	12.06	1.61	[166.2]	a
SCR 1246−1236..........	12 46 00.70	−12 36 19.4	0.406	0.007	305.4	15.84	15.80	15.86	15.74	15.73	16.13	0.06	. . .	c, g
SCR 1251−1232..........	12 51 34.75	−12 32 59.9	0.450	0.006	264.8	16.89	14.83	13.04	12.18	11.67	11.44	2.65	89.6	
SCR 1256−1316..........	12 56 31.55	−13 16 07.7	0.402	0.006	249.0	18.24	16.08	13.96	12.89	12.42	12.14	3.19	97.2	
SCR 1340−4427..........	13 40 20.40	−44 27 05.8	0.403	0.005	283.5	17.22	15.18	12.72	11.69	11.16	10.88	3.49	49.0	
SCR 1342−3544..........	13 42 00.21	−35 44 51.6	0.488	0.006	283.4	18.12	16.02	14.23	13.31	12.80	12.52	2.71	[141.6]	a
SCR 1433−3847..........	14 33 03.37	−38 47 00.6	0.465	0.006	256.6	18.45	16.40	15.53	14.37	13.78	13.59	2.03	[295.4]	a
SCR 1444−3426..........	14 44 06.58	−34 26 47.3	0.451	0.014	187.7	15.01	12.49	10.47	9.74	9.18	8.88	2.75	24.0	
SCR 1450−3742..........	14 50 02.86	−37 42 10.1	0.449	0.017	212.2	15.41	13.23	11.30	9.95	9.37	9.07	3.28	21.2	
SCR 1457−3904..........	14 57 49.06	−39 04 51.4	0.423	0.009	196.6	17.98	15.86	14.82	13.69	13.21	12.98	2.17	[215.6]	a
SCR 1507−3611..........	15 07 50.51	−36 11 49.7	0.407	0.005	271.6	17.67	15.51	13.67	11.55	11.05	10.78	3.96	35.2	
SCR 1510−4259..........	15 10 42.34	−42 59 25.4	0.430	0.008	229.0	17.18	15.09	12.46	11.19	10.60	10.35	3.90	31.2	h
SCR 1512−4354..........	15 12 52.33	−43 54 12.3	0.419	0.011	214.2	16.00	13.69	11.47	10.57	9.96	9.75	3.12	31.6	
SCR 1529−4238..........	15 29 56.31	−42 38 38.9	0.447	0.015	243.2	16.75	14.72	13.00	11.53	10.96	10.68	3.19	34.0	i
SCR 1532−3622..........	15 32 13.90	−36 22 31.0	0.438	0.007	235.4	15.48	13.50	11.96	10.10	9.54	9.28	3.40	23.0	
SCR 1547−2751..........	15 47 36.68	−27 51 20.9	0.440	0.007	156.8	16.02	14.25	12.51	11.32	10.80	10.55	2.93	55.2	
SCR 1550−4718..........	15 50 55.19	−47 18 48.4	0.413	0.013	247.6	16.12	14.24	13.23	11.79	11.19	10.98	2.45	77.2	
SCR 1559−4442..........	15 59 00.74	−44 42 12.3	0.434	0.012	220.0	15.97	14.81	14.04	12.78	12.16	11.98	2.03	[125.4]	a
SCR 1601−4442..........	16 01 37.48	−44 42 01.4	0.439	0.010	240.3	17.17	15.50	13.71	11.68	11.18	10.93	3.82	44.7	
SCR 1608−4229..........	16 08 34.77	−42 29 37.8	0.408	0.008	221.3	16.97	15.81	15.23	13.57	13.01	12.87	2.24	[147.6]	a
SCR 1621−2810..........	16 21 06.94	−28 10 24.5	0.465	0.007	163.9	17.48	16.01	15.64	13.80	13.26	13.03	2.21	[197.3]	a
SCR 1630−3633..........	16 30 27.29	−36 33 56.0	0.413	0.011	249.2	15.94	14.39	11.88	10.04	9.50	9.03	4.35	14.8	
SCR 1631−2805..........	16 31 33.44	−28 05 28.0	0.468	0.008	220.7	17.46	15.67	13.82	11.90	11.36	11.06	3.77	46.3	
SCR 1634−3112..........	16 34 05.78	−31 12 02.4	0.420	0.010	248.1	16.92	14.69	12.94	11.47	10.94	10.70	3.22	46.3	
SCR 1637−4016..........	16 37 03.35	−40 16 00.1	0.444	0.008	234.2	16.82	16.03	14.39	12.97	12.51	12.24	3.06	128.5	

TABLE 2—*Continued*

Name	R.A. (J2000.0)	Decl. (J2000.0)	μ (arcsec)	σ_μ (arcsec)	θ (deg)	B_J	R_{59F}	I_{IVN}	J	H	K_s	$R_{59F} - J$	Est. Distance (pc)	Notes
SCR 1637−3014...........	16 37 57.54	−30 14 57.3	0.462	0.014	245.1	15.39	13.36	11.65	10.89	10.34	10.11	2.47	52.4	
SCR 1800−0431A........	18 00 21.33	−04 31 47.8	0.402	0.004	227.4	17.26	16.40	15.93	13.10	12.50	12.29	3.30	96.1	
SCR 1800−0431B........	18 00 20.05	−04 32 01.7	...	...	...	...	...	...	13.41	12.83	12.66	...	...	j
SCR 1808−0341...........	18 08 48.40	−03 41 54.6	0.424	0.004	197.2	16.74	16.07	15.40	11.72	11.19	11.03	4.35	49.4	
SCR 1822−4542...........	18 22 58.78	−45 42 45.9	0.436	0.006	216.2	17.86	15.13	13.76	13.65	13.10	12.88	1.48	[228.7]	a
SCR 1832−4217...........	18 32 59.19	−42 17 20.3	0.466	0.009	200.7	15.43	13.64	12.54	12.19	11.57	11.38	1.45	[121.6]	a
SCR 1856−1951...........	18 56 15.32	−19 51 19.5	0.400	0.010	201.1	15.69	13.81	13.13	13.09	12.58	12.47	0.72	227.2	
SCR 1857−4309...........	18 57 33.21	−43 09 24.9	0.403	0.020	169.5	12.32	11.83	11.33	11.09	10.75	10.69	0.74	...	e
SCR 1910−4338...........	19 10 23.58	−43 38 37.5	0.494	0.010	177.1	18.33	16.13	13.39	11.86	11.28	10.99	4.27	34.6	
SCR 1913−2312...........	19 13 06.05	−23 12 05.4	0.416	0.006	159.2	17.89	15.81	13.40	11.43	10.87	10.52	4.38	26.0	
SCR 1918−3323...........	19 18 53.29	−33 23 56.8	0.437	0.010	221.0	17.20	15.05	12.41	11.37	10.88	10.58	3.68	39.3	
SCR 1928−3634...........	19 28 33.60	−36 34 30.1	0.470	0.012	166.4	16.36	14.12	11.92	10.61	10.06	9.81	3.51	27.4	
SCR 1959−3631...........	19 59 21.03	−36 31 03.9	0.436	0.014	158.1	11.58	9.44	8.40	8.24	7.62	7.41	1.20	19.8	
SCR 2007−3551...........	20 07 41.36	−35 51 46.6	0.428	0.010	225.3	17.58	15.59	12.97	11.53	10.96	10.67	4.06	33.8	
SCR 2044−4123...........	20 44 27.89	−41 23 51.6	0.429	0.012	142.5	16.12	14.03	12.52	11.75	11.16	10.99	2.28	82.4	
SCR 2046−4321...........	20 46 27.46	−43 21 06.3	0.405	0.011	173.4	14.70	13.63	13.23	12.83	12.40	12.30	0.80	169.4	
SCR 2059−4615...........	20 59 10.74	−46 15 19.7	0.400	0.009	123.8	16.40	14.39	12.12	11.33	10.79	10.54	3.06	50.8	
SCR 2059−4302...........	20 59 23.19	−43 02 29.7	0.448	0.009	163.7	17.38	16.03	13.49	12.75	12.21	11.96	3.28	104.4	
SCR 2123−3653...........	21 23 14.36	−36 53 27.2	0.446	0.010	133.7	17.44	15.56	13.38	12.34	11.86	11.58	3.22	78.5	k

Notes.—Units of right ascension are hours, minutes, and seconds, and units of declination are degrees, arcminutes, and arcseconds. Table 2 is also available in machine-readable form in the electronic edition of the *Astronomical Journal*.

[a] Distance is likely overestimated because the object is a subdwarf or white dwarf candidate (see § 5.3).

[b] Probable white dwarf.

[c] All colors are too blue for distance relations.

[d] Separation of 2."5 at position angle 266.°2.

[e] No distance estimate is reported because only one color was available within the bounds of the relations.

[f] Common proper motion with LTT 2976.

[g] White dwarf; K_s unreliable.

[h] Common proper motion with CD − 42 10084.

[i] Common proper motion with L408-087.

[j] Not detected during automated search due to faint limit but noticed to be a common proper motion companion during the visual inspection, blended on all four plates.

[k] Common proper motion with LTT 8495.

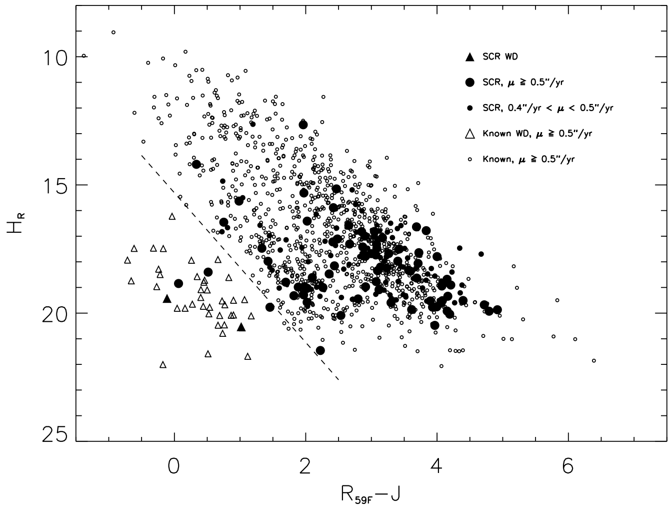

FIG. 4.—Reduced proper motion diagram for the SCR systems with $\mu \geq 0\farcs4$ yr^{-1} (the size of the points splits the SCR sample into stars with μ more or less than $0\farcs5$ yr^{-1}) and known systems with $\mu \geq 0\farcs5$ yr^{-1} found in this portion of the SCR survey from declinations $-47°$ to $00°$. Reduced proper motion (*vertical axis*) has units of magnitudes. The dashed line serves merely as a reference to distinguish white dwarfs from subdwarfs. Triangles indicate confirmed white dwarfs.

line represents a somewhat arbitrary boundary between the subdwarfs and white dwarfs. There are four clear white dwarf candidates, two of which are confirmed white dwarfs (*filled triangles*)—for one we have a confirmation spectrum, and the other is a common proper motion companion to a star of known distance.

5.3. *Red Dwarfs and Subdwarfs*

The combination of the B_J, R_{59F}, and I_{IVN} plate magnitudes and JHK_s photometry from 2MASS allows us to estimate distances to main-sequence stars, as described in Paper VIII. The six magnitudes provide 15 color-M_{K_s} combinations, 11 of which can be used to estimate individual distances (JHK_s-only colors are not used because of limited color discrimination, and $B_J - R_{59F}$ is not sensitive to absolute magnitude for cooler dwarfs). The relations assume that the objects are single, main-sequence dwarfs of types ~K0 V to M9 V. The distances have an average error of 26%, determined by running the RECONS 10 pc sample of single red dwarfs with known distances through the suite of photometric distance relations. For our investigation, the most interesting stars are those that are potentially nearby, specifically within the volumes defined by the RECONS 10 pc and the Catalog of Nearby Stars (Gliese & Jahreiss 1991) and Nearby Stars (NStars) samples (horizons at 25 pc).

Distance estimates for the 152 new systems in the portion of the sky searched here are given in the next-to-last column of Table 2. If only one color was available for a distance estimate, no distance is reported, because the single color falling within the bounds of the relations is possibly aberrant. Two of the systems, SCR 0640−0552 and SCR 0740−4257, are new candidates for the 10 pc sample, and an additional 23 systems are estimated to be between 10 and 25 pc.

There are nine SCR stars having distance estimates in excess of 200 pc (excluding white dwarf candidates) and several more with distance estimates very close to 200 pc, most of which fall blueward of the majority of SCR stars in Figure 4. These are presumably K- and M-type subdwarfs. A sample of 64 potential SCR red subdwarfs from Paper XII and this paper is listed in its entirety in Table 3. These have been selected by identifying stars in Figure 4 (and the twin figure in Paper XII) with $R_{59F} - J > 1.0$ and having RPM H_R within 4.0 mag of the dashed line

TABLE 3

RED SUBDWARF CANDIDATES FROM PAPER XII AND THIS PAPER

Name	R_{59F}	$R_{59F} - J$	H_R	TSN Paper
SCR 0242−5935...........	15.02	1.46	18.36	XII
SCR 0255−7242...........	15.44	1.70	18.65	XII
SCR 0406−6735...........	14.98	1.45	18.90	XII
SCR 0433−7740...........	15.86	1.81	19.41	XII
SCR 0529−3950...........	14.40	1.94	17.44	XV
SCR 0629−6938...........	16.23	2.56	19.60	XII
SCR 0654−7358...........	16.24	2.25	19.58	XII
SCR 0658−0655...........	14.68	2.36	18.47	XV
SCR 0701−0655...........	15.75	2.02	19.58	XV
SCR 0708−4709...........	12.48	1.04	15.50	XV
SCR 0709−4648...........	13.49	1.30	16.57	XV
SCR 0740−0540...........	16.04	2.54	19.39	XV
SCR 0754−2338...........	14.80	1.45	18.21	XV
SCR 0804−1256...........	15.66	2.08	19.07	XV
SCR 0816−7727...........	14.43	1.81	18.58	XII
SCR 0837−4639...........	13.89	1.70	17.14	XV
SCR 0913−1049...........	15.19	1.82	19.32	XV
SCR 1001−2257...........	15.88	1.60	19.02	XV
SCR 1107−4135...........	14.72	2.53	20.09	XV
SCR 1149−4248...........	13.09	1.43	17.98	XV
SCR 1220−4546...........	14.59	1.89	18.98	XV
SCR 1227−4541...........	14.19	1.44	19.77	XV
SCR 1241−4717...........	14.38	1.61	17.54	XV
SCR 1320−7542...........	15.82	1.89	19.01	XII
SCR 1338−5622...........	14.90	1.76	18.59	XII
SCR 1342−3544...........	16.02	2.71	19.46	XV
SCR 1400−3935...........	15.44	1.98	18.97	XV
SCR 1433−3847...........	16.40	2.03	19.74	XV
SCR 1442−4810...........	14.33	1.35	17.86	XII
SCR 1455−3914...........	14.52	2.02	19.03	XV
SCR 1457−4705...........	15.23	1.70	18.79	XV
SCR 1457−3904...........	15.86	2.17	18.99	XV
SCR 1559−4442...........	14.81	2.03	18.00	XV
SCR 1608−4229...........	15.81	2.24	18.86	XV
SCR 1613−3040...........	15.41	2.26	19.00	XV
SCR 1621−2810...........	16.01	2.21	19.34	XV
SCR 1627−7337...........	13.89	1.23	17.10	XII
SCR 1735−7020...........	16.14	3.32	21.06	XII
SCR 1739−8222...........	15.04	2.14	18.37	XII
SCR 1740−5646...........	15.90	2.07	19.16	XII
SCR 1756−5927...........	15.73	2.29	19.38	XII
SCR 1817−5318...........	13.27	1.34	17.22	XII
SCR 1822−4542...........	15.13	1.48	18.33	XV
SCR 1832−4217...........	13.64	1.45	16.98	XV
SCR 1835−8754...........	16.02	1.92	20.05	XII
SCR 1843−7849...........	15.70	2.43	20.06	XII
SCR 1913−1001...........	14.81	2.10	18.61	XV
SCR 1916−3638...........	15.88	2.22	21.46	XV
SCR 1924−3356...........	13.77	1.33	17.47	XV
SCR 1926−5218...........	15.22	1.68	18.69	XII
SCR 1946−4945...........	15.39	1.88	19.22	XII
SCR 1958−5609...........	15.55	2.25	19.02	XII
SCR 2018−6606...........	15.76	2.08	19.08	XII
SCR 2101−5437...........	14.59	1.80	18.71	XII
SCR 2104−5229...........	15.42	1.98	18.43	XII
SCR 2109−5226...........	15.97	2.22	20.46	XII
SCR 2151−8604...........	14.48	1.74	17.77	XII
SCR 2204−3347...........	14.29	1.97	19.29	XV
SCR 2235−7722...........	16.36	2.19	20.29	XII
SCR 2249−6324...........	16.28	1.58	19.56	XII
SCR 2305−7729...........	15.73	1.91	18.89	XII
SCR 2317−5140...........	15.02	2.19	18.26	XII
SCR 2329−8758...........	14.48	1.77	17.64	XII
SCR 2335−5020...........	15.17	2.03	19.27	XII

separating the white dwarfs from the subdwarfs. All of these have distances estimated to be 90 pc or greater, but they are, in fact, likely to be much closer than estimated (i.e., the distances are incorrect), so their distance estimates are bracketed in Table 2 to distinguish them from presumed dwarfs whose distance estimates are plausibly accurate. In the same regions in Figure 4 and the complimentary figure in Paper XII, there are 255 red subdwarf candidates from previous proper-motion searches. Thus, we have made a 25% increase to the red subdwarf candidate pool in the southern sky. Future spectroscopic efforts will reveal whether or not these candidates are true low-metallicity red subdwarfs and will allow us to continue building a sizeable sample of these rare interlopers to the solar neighborhood, very few of which have accurate parallaxes, photometry, and spectral types.

5.4. *White Dwarfs*

Six of the SCR stars reported here have no distance estimates, usually because their colors are too blue for the photometric distance relations. SCR 0927−4137, SCR 1811−4239, and SCR 1857−4309 are possibly early-type subdwarfs, and SCR 1800−0431B is a companion with blended plate photometry (see § 5.5). The remaining two stars, SCR 0818−3110 and SCR 1246−1236, are white dwarf candidates. Both lie solidly in the white dwarf region of Figure 4. Two additional SCR stars, SCR 0125−4545 and SCR 0753−2524 (a companion to LTT 2976), also fall clearly in the white dwarf region of Figure 4 and have the largest distance estimates presented here (516 and 365 pc, respectively). These objects have colors that are within the color ranges of the photometric distance relations but are presumably white dwarfs with erroneous distance estimates, hence the brackets in Table 2. Two additional objects, SCR 1227−4541 and SCR 1916−3638, are near the dotted line dividing the probable white dwarf and subdwarf regions. We have preliminary CCD *VRI* photometry indicating that these two objects are unlikely to be single white dwarfs.

Of the four white dwarf candidates, we have so far obtained spectroscopy on only SCR 1246−1236 and confirm it to be a white dwarf. Another candidate (SCR 0753−2524) is a companion to a star of known distance (thereby ruling it out as a more distant early-type dwarf). Spectroscopic observations for all white dwarf candidates are desired for definitive confirmation. Spectra for SCR 1246−1236 as well as for a handful of the objects labeled with open triangles in Figure 4 as known objects that we have confirmed to be white dwarfs for the first time will be presented in a future publication.

Using the single-color linear fit of Oppenheimer et al. (2001) and their error of 20% for distances, we estimate the following distances for the four white dwarf candidates reported in this paper: 24.7 ± 4.9 pc for SCR 0125−4545, 16.2 ± 3.2 pc for SCR 0753−2524, 13.1 ± 2.6 pc for SCR 0818−3110, and 40.0 ± 8.0 pc for SCR 1246−1236. Should these distance estimates hold true, three of the four objects lie within the 25 pc horizon, a volume in which there are only 109 white dwarfs currently having trigonometric parallaxes. Trigonometric parallax observations via CTIOPI are under way to determine accurate distances.

5.5. *Comments on Individual Systems*

Here we highlight systems included in this portion of the SCR survey, most of which are multiple systems.

SCR 0640−0552 ($\mu = 0''.592$ yr^{-1} at position angle 170°.5) is the brightest new detection, with $R_{59F} = 8.8$ and an estimated distance of 8.5 pc. CCD photometry from two nights indicates $V_J = 10.21$, $R_{KC} = 9.21$, and $I_{KC} = 8.03$, confirming that it is a very bright object. These values, when combined with the 2MASS JHK_s magnitudes, yield a distance estimate of 9.4 pc using the relations in Paper X.

TABLE 4

Distance Estimate Statistics for New SCR Systems

Proper Motion	$d \leq 10$ pc	10 pc $< d \leq 25$ pc	$d > 25$ pc
$\mu \geq 1''.0$ yr^{-1}	2 + 0	0 + 0	2 + 4
$1''.0$ yr$^{-1} > \mu \geq 0''.8$ yr^{-1}	0 + 0	3 + 0	2 + 1
$0''.8$ yr$^{-1} > \mu \geq 0''.6$ yr^{-1}	0 + 1	4 + 7	25 + 23
$0''.6$ yr$^{-1} > \mu \geq 0''.4$ yr^{-1}	1 + 1	8 + 16	95 + 93
Total	3 + 2	15 + 23	124 + 121

Note.—Excluding white dwarfs and new wide companions; the first number is from Paper XII, and the second number is from this paper.

SCR 0753−2524 ($\mu = 0''.426$ yr^{-1} at position angle 300°.2) is a common proper motion companion to LTT 2976, which has $\mu = 0''.361$ yr^{-1} at position angle 303°.7 and a trigonometric parallax of $0''.05116 \pm 0''.00157 = 19.5 \pm 0.6$ pc (Perryman 1997[2]). The separation of the two stars is 400″ (projected separation ~8000 AU) at position angle 208°.9. SCR 0753−2524 is probably a white dwarf, for which we estimate a distance of 16.2 pc. This distance is consistent with the trigonometric distance measured for LTT 2976 within the ~20% errors of the white dwarf distance relations. Although the sizes of the proper motions do not match perfectly, the better determined position angles are consistent, so we conclude that the two stars form a system.

SCR 1510−4259 ($\mu = 0''.430$ yr^{-1} at position angle 229°.0) is a common proper motion companion to CD −42 10084 ($\mu = 0''.436$ yr^{-1} at position angle 228°.1), for which *Hipparcos* measured a trigonometric parallax of $0''.03999 \pm 0''.00241 = 25.0 \pm 1.5$ pc (Perryman 1997). The separation of the two stars is 88″ at position angle 123°.5. The distance estimate for SCR 1510−4259, 31.2 pc, is consistent with the *Hipparcos* distance for CD −42 10084, within the 26% errors of the plate magnitude distance relations, and the proper motions are a match. We conclude that the two stars form a system.

SCR 1529−4238 ($\mu = 0''.447$ yr^{-1} at position angle 243°.2) is a probable common proper motion companion to L408-087 ($\mu = 0''.285$ yr^{-1} at position angle 235°.0; NLTT Catalogue) for which there is no trigonometric parallax available. The separation of the two stars is 45″ at position angle 159°.0. The sizes of the proper motions do not match well, but the position angles are a fair match. Given the incomplete information in the NLTT (no photographic *R* magnitude), presumably because of the very crowded field, the proper motion for L408-087 is suspect. In fact, we cannot estimate a distance for L408-087 because it is blended on several plates, precluding reliable plate magnitudes. We tentatively conclude that the two stars form a system.

SCR 1608−2913 AB ($\mu = 0''.540$ yr^{-1} at position angle 231°.0) is a close double system with separation 2″.5 at position angle 266°.2, determined using frames acquired during CTIOPI. The magnitude differences are 0.56, 0.49, and 0.37 mag at *VRI*, respectively.

SCR 1800−0431 AB ($\mu = 0''.402$ yr^{-1} at position angle 227°.4) is a common proper motion pair with a separation of 24″ at position angle 234°.0. While investigating the primary, the B component was noticed on images extracted from all four available

[2] Information is available from the VizieR Online Data Catalog, catalog number 1239.

plates; however, it is blended with other sources in all four cases, so no reliable plate photometry or distance estimate is available.

SCR 1856−1951 is one of nine objects with a distance estimate in excess of 200 pc and the only one not flagged as a subdwarf candidate. The $R_{59F} - J$ color is too blue for the conservative subdwarf candidate selection criteria. While this object may be a subdwarf, dwarf contamination at these colors warrants exclusion from the subdwarf candidate list.

SCR 2123−3653 ($\mu = 0\farcs446$ yr^{-1} at position angle 133°.7) is a common proper motion companion to LTT 8495 ($\mu = 0\farcs417$ yr^{-1} at position angle 134°.1), for which there is no trigonometric parallax available. The separation of the two stars is 50″ at position angle 168°.0. The proper motions are consistent, indicating that the two stars almost certainly form a system. However, from plate + JHK_s photometry, distance estimates are 25.9 and 78.5 pc for LTT 8495 and SCR 2123−3653, respectively, which indicates that if the two are a pair, LTT 8495 is likely to be an unresolved multiple.

6. DISCUSSION

One of the primary motivations for high proper motion (HPM) surveys is, of course, the promise of detecting new nearby stars. The new nearby discoveries are typically red dwarfs and, occasionally, white dwarfs. The output lists of sources detected, once culled for false hits, also include subdwarfs of very high intrinsic velocity that are generally not as near as their main-sequence counterparts but are nevertheless interesting in their own right as tracers of the Galactic halo population.

Listed in Table 4 is a summary of the number of SCR systems with distance estimates within each of our two target horizons (10 and 25 pc) and beyond. New common proper motion objects that are companions to known objects are not included in the counts nor are probable white dwarfs (because their distance estimates require different relations than applied here). The two numbers given for each entry represent the number of SCR systems reported in Paper XII and this paper, respectively. In most cases the numbers are comparable, which reflects the fact that although much of the sky searched in this paper has already been searched by Giclas et al. (1971, 1978) and Luyten (1979, 1980), there is significantly more sky covered in this paper than in Paper XII.

In total, we have found 43 new candidate systems within 25 pc of the Sun. There remain several likely subdwarfs with overestimated distances that may fall in closer bins than indicated in Table 4. Perhaps the most surprising result of this survey is the discovery that the slowest proper motion ($0\farcs6$ yr$^{-1} > \mu \geq 0\farcs4$ yr^{-1}) contains the largest number (26) of new candidates for systems within 25 pc. In fact, we have found equal numbers of 10 pc candidates with $\mu > 1\farcs0$ yr^{-1} as we have with $0\farcs6$ yr$^{-1} > \mu \geq 0\farcs4$ yr^{-1}. As pointed out in Paper XII, the presence of so many new nearby stars with relatively low proper motions hints that there may be large numbers of even slower moving stars that remain hidden in the solar neighborhood. Thus, searches for nearby stars buried in large samples with smaller proper motions are warranted, particularly given the availability of large photometric databases that allow the derivation of accurate distance estimates when optical and infrared data are combined, such as done here.

In summary, we have revealed a total of 299 new SCR proper-motion systems in the southern sky. Of these, 148 have $\mu \geq 0\farcs5$ yr^{-1}, making them new members of the classic LHS sample. Among the new discoveries, we anticipate that most are main-sequence M dwarfs, at least nine are white dwarf candidates, at least five are new binary systems, and 64 are K- or M-type subdwarf candidates. Seven additional proper-motion companions to previously known HPM stars were also found. Five of the nine white dwarf candidates are anticipated to be within 25 pc. Worthy of note are the eight new SCR stars brighter than $R_{59F} = 12$, six of which have $\mu \geq 0\farcs5$ yr^{-1}, hinting at the possibility of relatively bright nearby stars that have not yet been identified.

All three sets of stars—white dwarfs, red dwarfs, and subdwarfs—provide important contributions to these intrinsically faint, neglected samples. Undoubtedly, objects fainter than our survey cutoff of $R_{59F} = 16.5$ remain to be found, as well as a small number of stars meeting our survey criteria that fell in crowded regions or were simply missed because of the stringent limits required for SCR star veracity. Finally, we are delighted to have discovered during the SCR survey five new systems that are likely new members of the RECONS 10 pc sample and are actively determining accurate parallaxes for them, as well as for many of the 38 other SCR systems within 25 pc, via our parallax program in Chile, CTIOPI.

Finder charts are given in Figure 5 for all of the new systems reported here, as well as for the four new wide companions.

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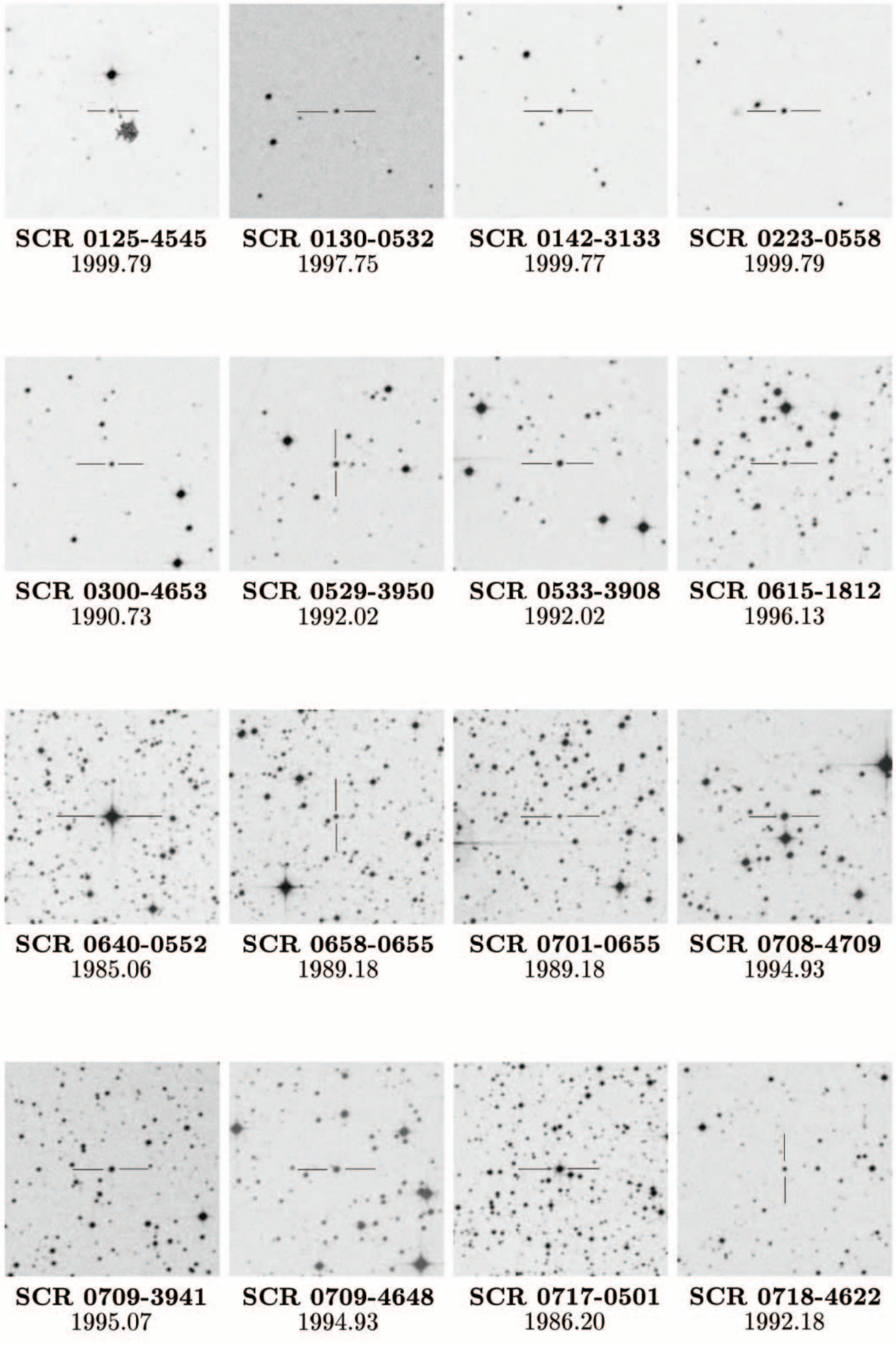

FIG. 5.—Finder charts for the 152 new SCR systems and four wide companions to known HPM stars. Each finder chart is 5′ on a side, with north up and east to the left. The observation epoch for each frame is given. The bandpass for each finder chart is R_{59F}.

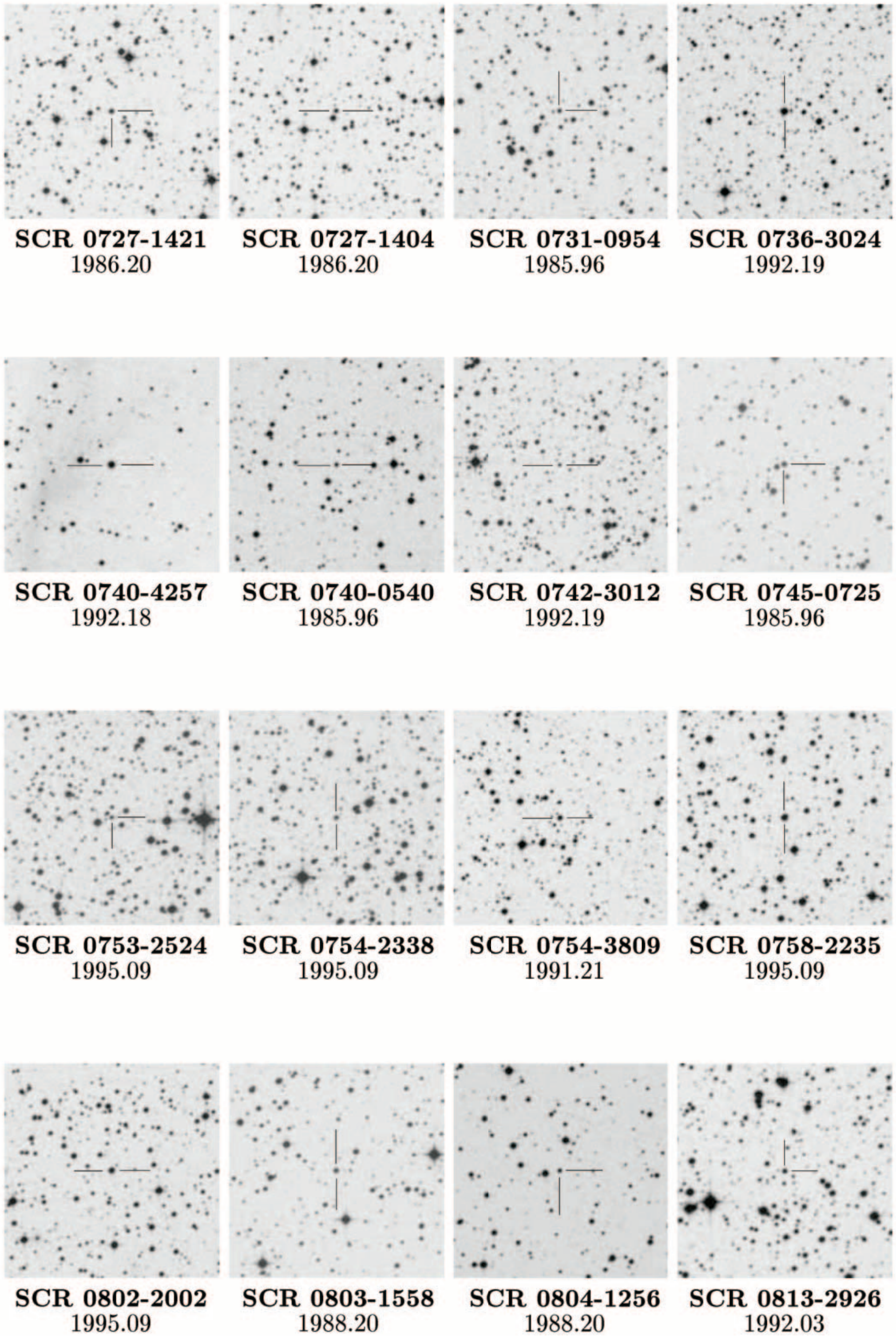

Fig. 5.—*Continued*

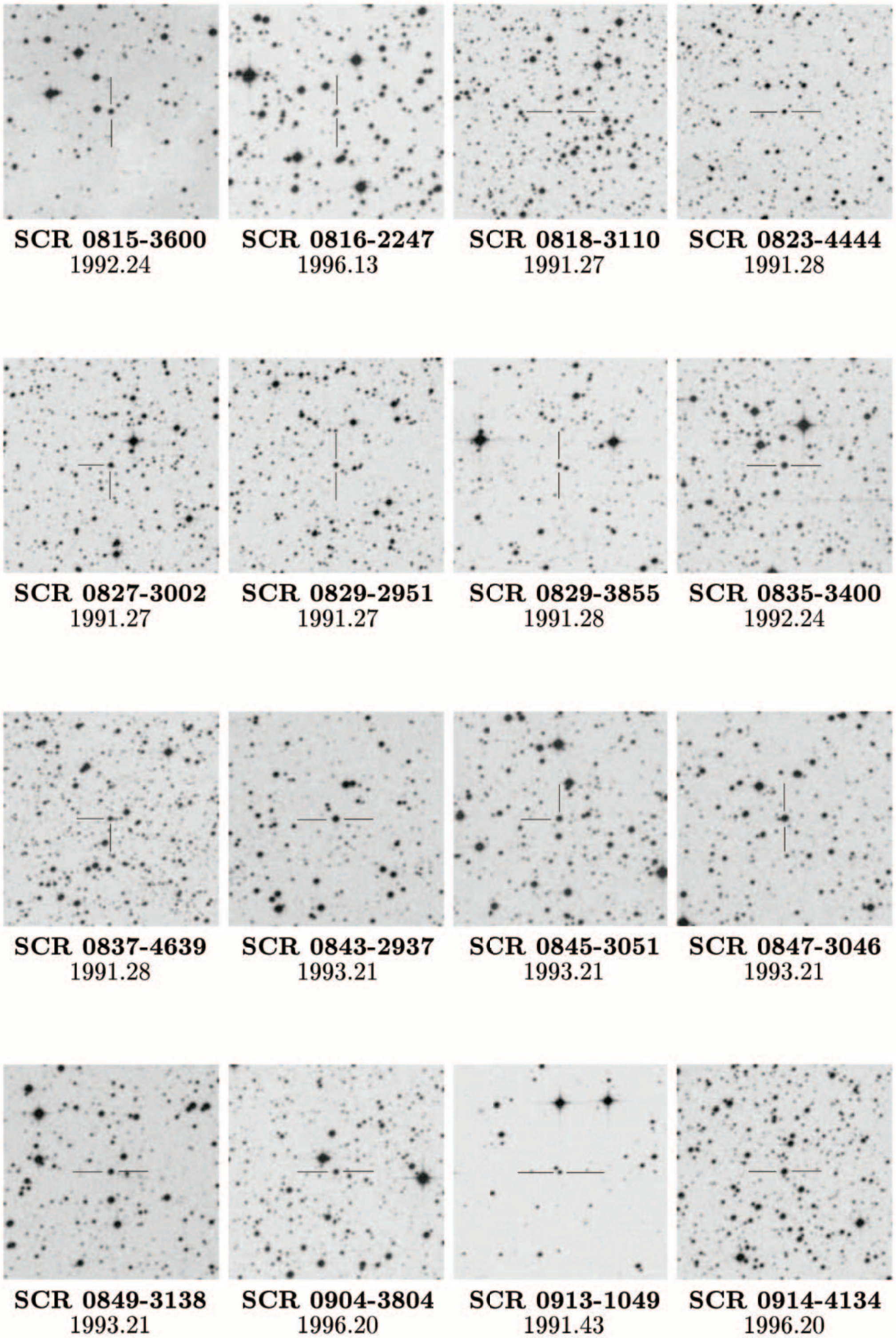

FIG. 5.—*Continued*

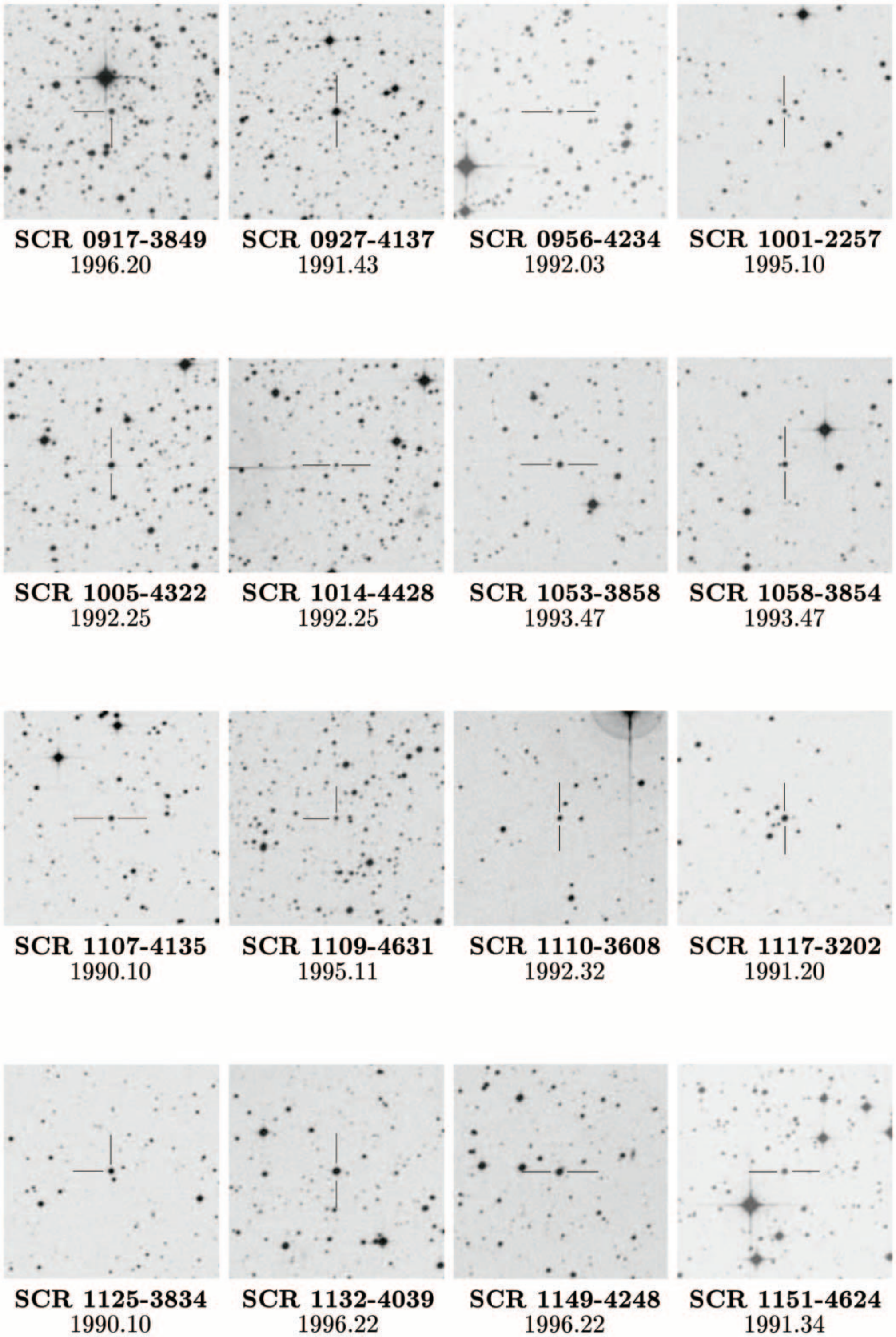

FIG. 5.—*Continued*

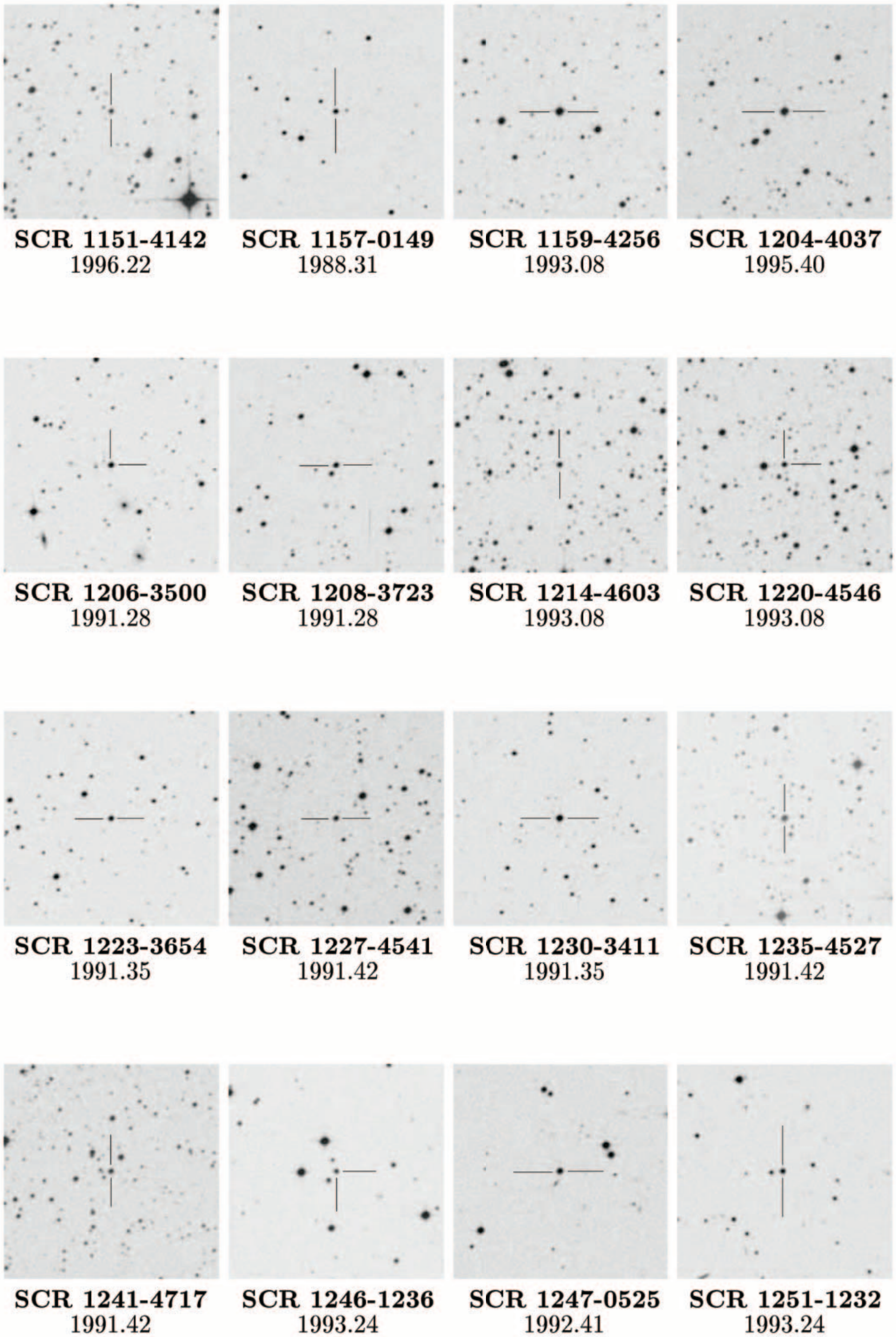

FIG. 5.—*Continued*

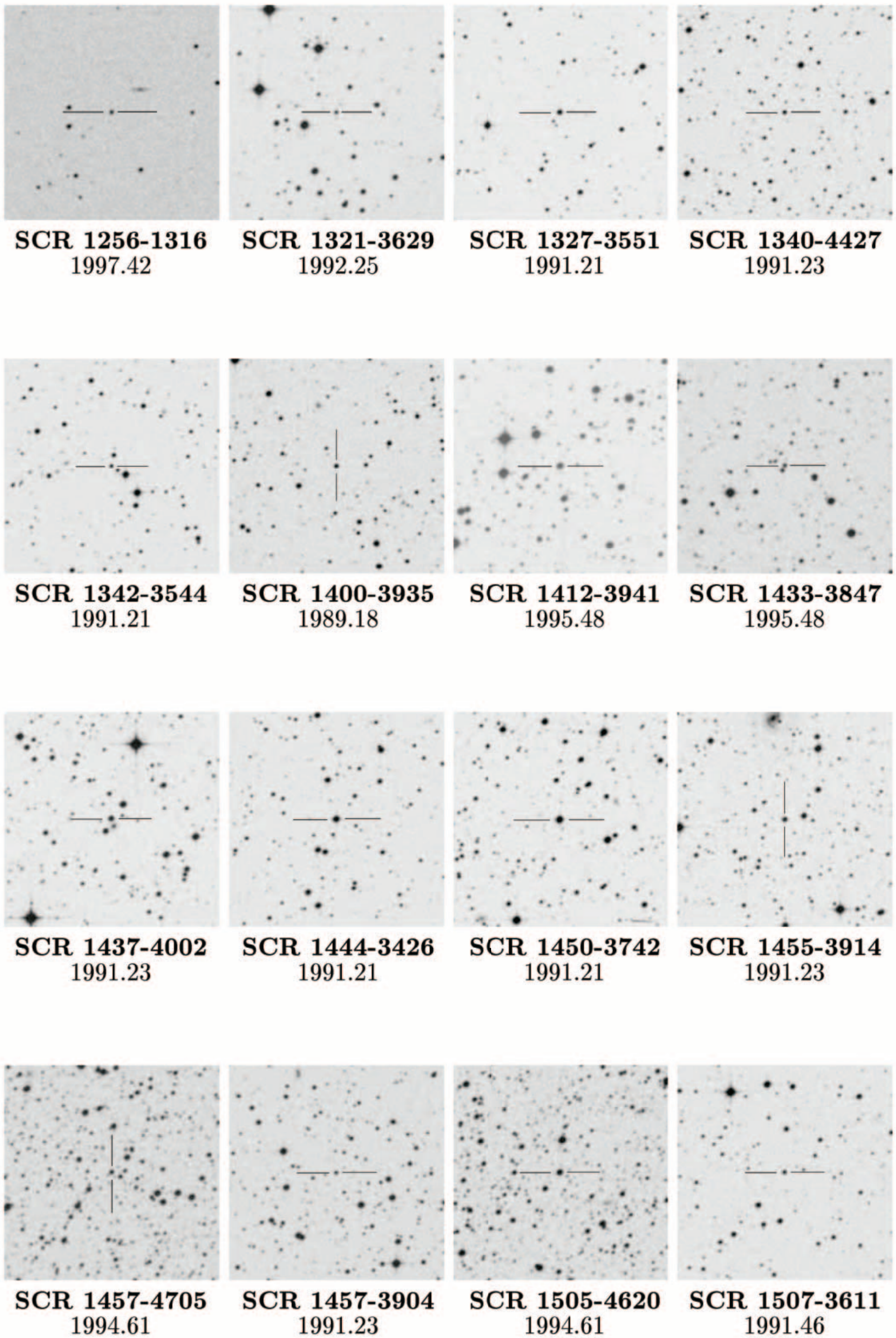

FIG. 5.—*Continued*

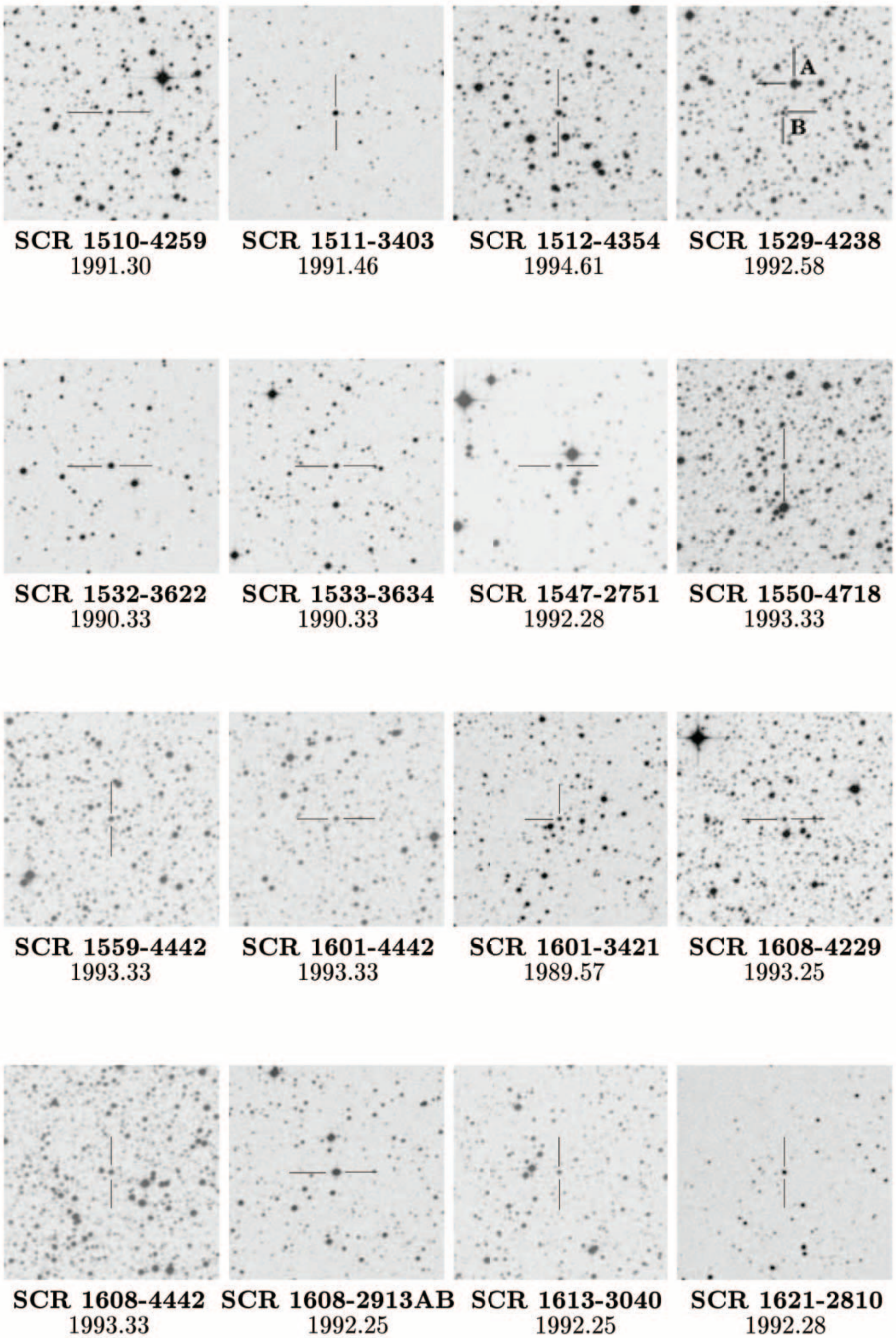

FIG. 5.—*Continued*

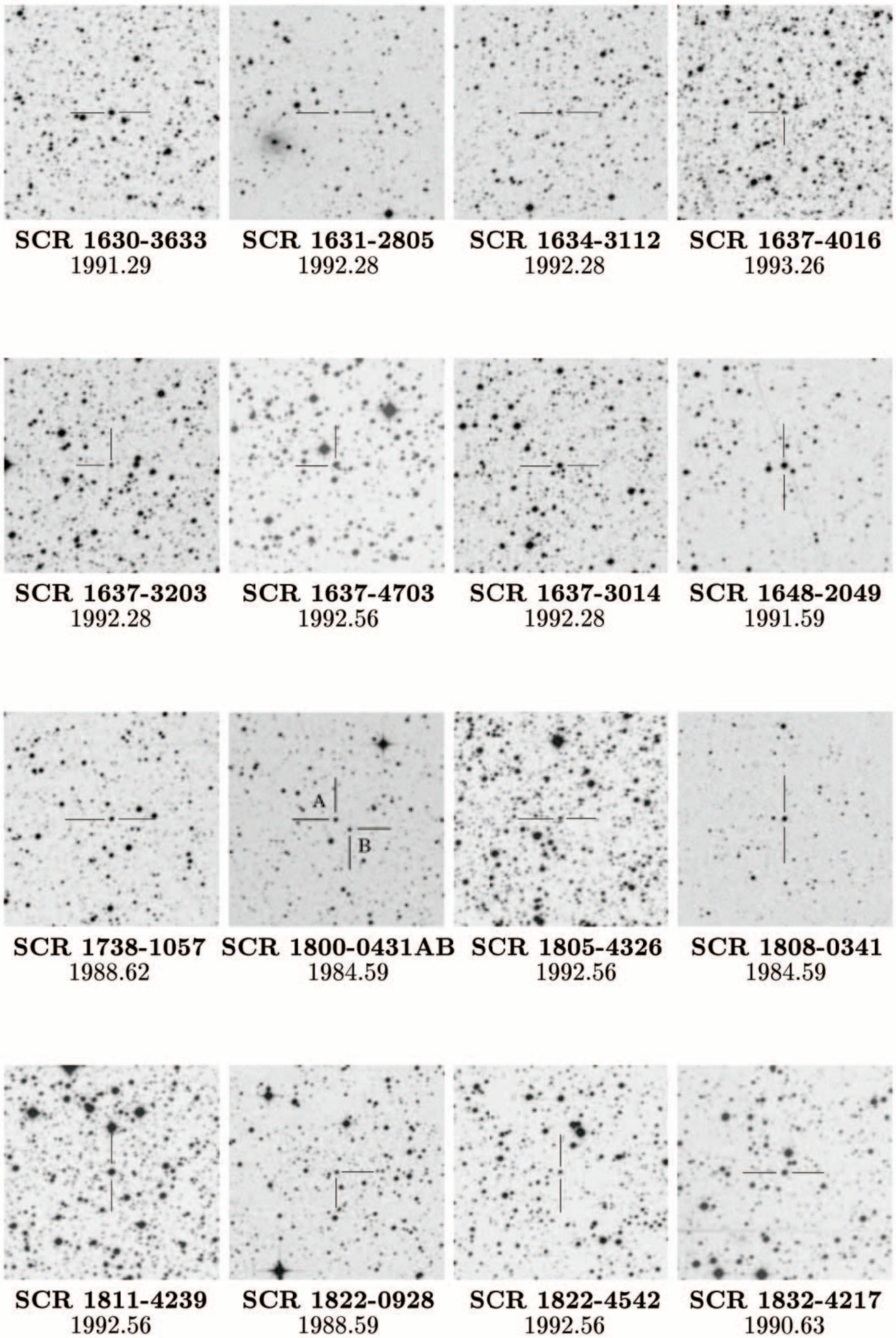

FIG. 5.—*Continued*

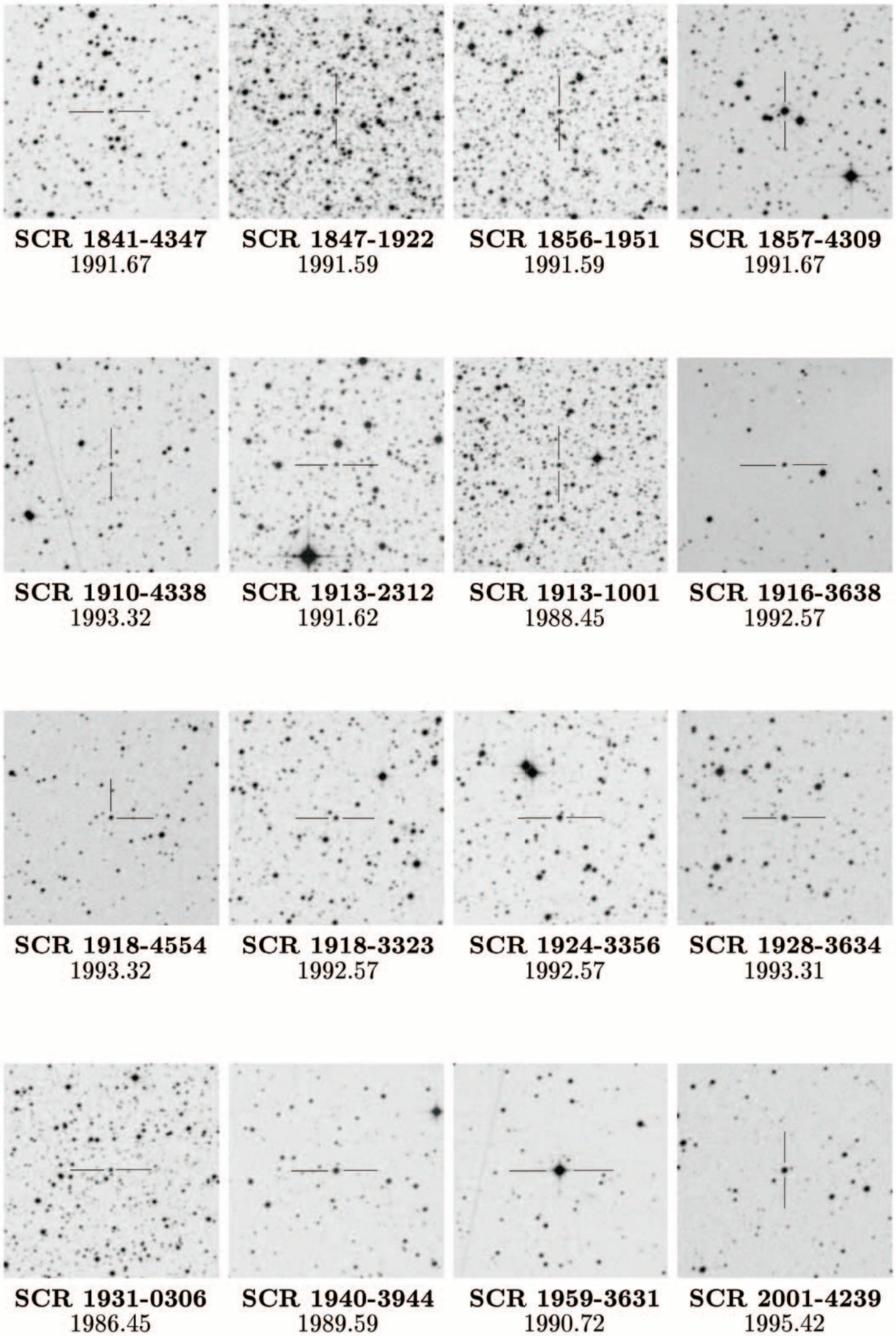

FIG. 5.—*Continued*

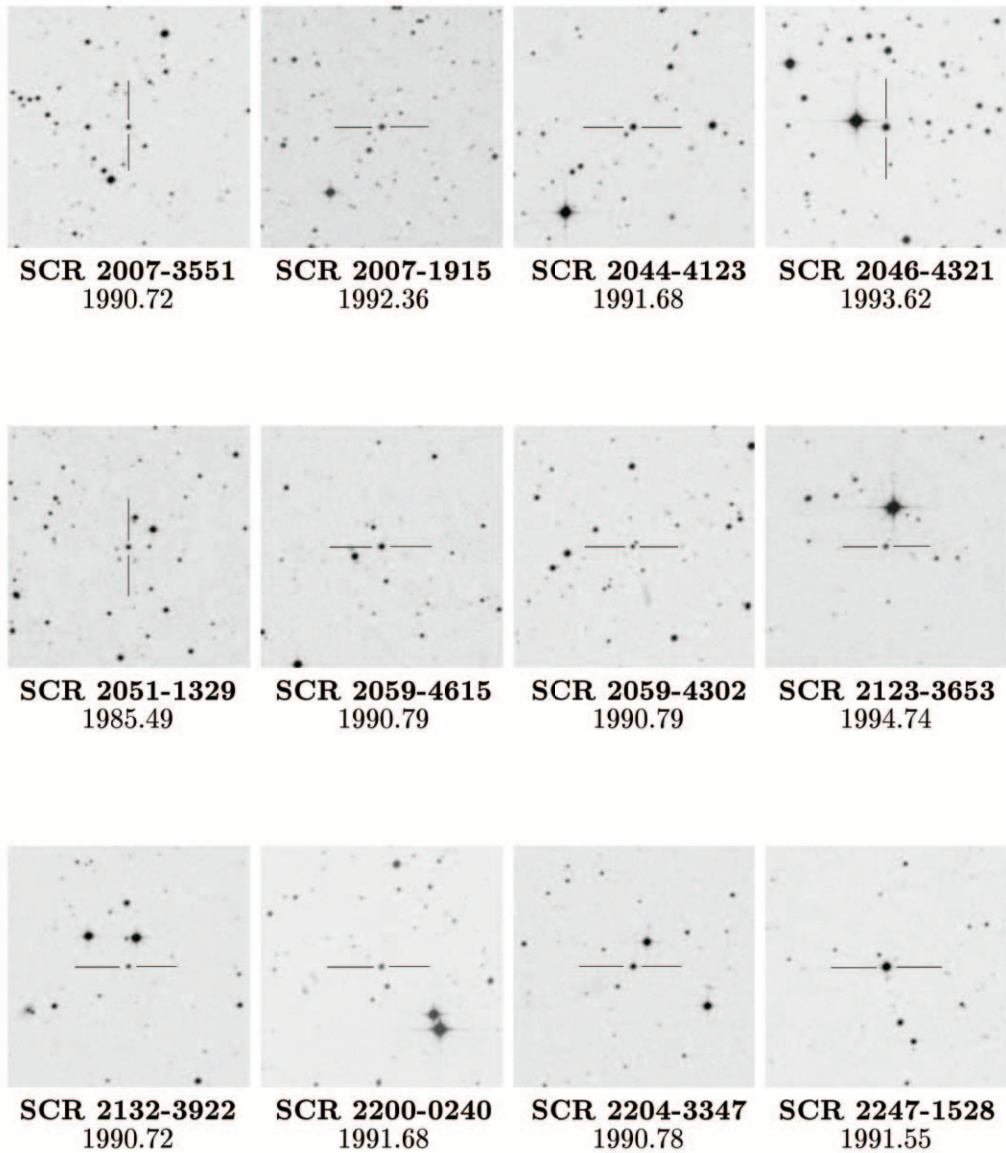

Fig. 5.—*Continued*

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