IDENTIFICATION OF INFRARED SOURCES IN THE IRAS CIRCULARS

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(Received 8 February, 1985)

Abstract. From IRAS (Infrared Astronomical Satellite) Circulars Nos. 4 to 15, 110 infrared sources have been identified. Out of these 110 identified sources 99 are galaxies, nine are nebulae, one is a dark object, and one is a non-stellar object. Thirty-five of these galaxies, have already been studied, mostly are spiral type. The characteristics of sixty-four remaining galaxies, for which the type is not known or uncertain, are studied by compairing their colours and luminosities with known galaxies. The galaxies observed by IRAS are mostly active galaxies.

1. Introduction

So far the far infrared observations have been taken for very few galaxies (Rieke and Lebofsky, 1979; Telesco and Harper, 1980; and references given therein). The infrared astronomical satellite during January to November 1983 has carried out a survey of the entire infrared sky at four different IR wavelengths between 8 and 120 μm. The sources detected by the satellite are presented in several lists giving the positions of the sources and the flux-densities in Janskys at effective wavelengths 12, 25, 60, and 100 μm.

Some of the sources from these circulars have already been studied (Walker *et al.*, 1984; Hauser *et al.*, 1984; Low *et al.*, 1984; Aumann *et al.*, 1984; Pottasch *et al.*, 1984; Olnon *et al.*, 1984; Beichman *et al.*, 1984; De Jong *et al.*, 1984; Bhatt *et al.*, 1984). Iyengar and Verma (1984a, b) identified 22 galaxies from circular Nos. 2 and 3, from catalogues of galaxies and also identified 22 sources, optically, from circular Nos. 2 to 4. In the present work 110 sources have been identified from circular Nos. 4, 5, 6, 8, 10, 11, 13, 14, and 15, mostly are galaxies. Sixty-four of these galaxies for which no information is given about their type or it is uncertain, are studied. Compairing the colours and luminosities of these galaxies with known galaxies, it can be suggested that these are active galaxies may be Seyfert- or *N*-type.

2. Identification of Sources and Results

Out of more than 400 sources, 110 sources are identified by matching their positions with those catalogued in the *Master List of Non-Stellar Optical Astronomical Objects* (MLNSAO) by Dixon and Sonneborn (1980), *Uppsala General Catalogue* (UGC) by Nilson (1973), *Catalogue of Galaxies and Cluster of Galaxies* (CGCG) by Zwicky *et al.* (1961–1968), *ESO/Uppsala Survey of the ESO (B) Atlas* by Holmberg *et al.* (1974, 1975, 1977, 1978a, b), and *Catalogue of Extra Galactic Radio Sources* by Véron-Cetty and Véron (1983). The positional uncertainty considered is up to 1.5 arc min.

Astrophysics and Space Science **113** (1985) 391–404. 0004–640X/85.15

TABLE I

Parameters of identified IRAS sources

Sl. No.	IRAS No.	RA (1950) h m s Dec. (1950) deg arc min	m_{pg}	B_T^0	Major diam. (arc min)	Vel. of rec. km s^{-1}	Dist. (Mpc)	Type	Identification
1	0007+286 P15	00 07 19 +25 38.8	12.7	12.33[a]	2.2	+4568	83.1	SBS1..	UGC 00089 NGC 0023
2	0355+184 P06	03 55 19.3 +18 26 32	15.5			23000	434	galaxy	ZWG 466 – 003 NGC 1488
3	0410+132 P10	04 10 26 +13 17.6	17.0	16.74[b]	1.8			SB dm-m n of 2	UGC 02984
4	0410+100 P10	04 10 51 +10 05.1			11.4			Reflection nebula	VDB 66N 026
5	0424–062 P10	04 24 44 –06 14.1	17.0					galaxy	MCG 01 – 12 – 010
6	0427–126 P10	04 27 27 –12 36.7	14.0					galaxy	MCG 02 – 12 – 030
7	0429–046 P10	04 29 11 –04 41.7	14.5	14.24[b]				.S..4.*.	MCG+01 – 12 – 016 NGC 1599
8	0437+257 P8	04 36 52 +25 39.2						Dark object	B 0 14
9	0440–205 P10	04 40 05 –20 31.7	12.6	12.03				.SBR 3..	MCG – 03 – 12 – 018 NGC 1640
10	0441+727 P05	04 41 52 +72 46.2	14.8	14.49[b]	1.4			S... Disturbed?	UGC 03147
11	0453–299 P10	04 53 54 –29 57.7	14.0		1.0			galaxy	MCG – 05 – 12 – 010 NGC 1701
12	0508+796 P05	05 08 16 +79 36.7						compact galaxy	7 ZW 031
13	0512+531 P05	05 12 52 +53 08.2	15.6					galaxy	ZWG 258 – 006
14	0531–219 P05	05 31 13 –21 58.8	12.0	10.81[a]				.SXS3..	MCG – 04 – 14 – 003 NGC 1964
15	0532+098 P10	05 32 23 +09 53.5			30.0			Diffuse galactic nebula	CED 054

Table I (continued)

Sl. No.	IRAS No.	RA (1950) h m s Dec. (1950) deg arc min	m_{pg}	B_T^0	Major diam. (arc min)	Vel. of rec. km s^{-1}	Dist. (Mpc)	Type	Identification
16	0536 – 026 P10	05 36 14 – 02 37.6			128			Symmetric galactic nebula	YM 30
17	0538 – 220 P05	05 38 06 – 22 01.7	15.0		1.1			galaxy	MCG – 04 – 14 – 008
18	0552 – 327 P05	05 52 01 – 32 45.1			2.3			Sb PW G11	ESO – 364 – G12
19	0556 – 348 P11	05 56 31.9 – 34 53 29			1.1			SB...	ESO 364 – G19
20	0610 + 668 P05	06 10 39 + 66 51.2	15.3			38000	690	galaxy	ZWG 308 – 015
21	0610 + 783 P15	06 10 40 + 78 22.5	11.6	10.52[a]				.SBS2P.	MGC + 13 – 05 – 022 NGC 2146
22	0621 + 495 P08	06 21 04 + 49 32.2	14.9					galaxy	ZWG 233 – 017
23	0623 + 744 P05	06 23 27 + 74 28.6	15.6			38000	690	galaxy	ZWG 330 – 004
24	0705 + 188 P15	07 05 25 + 18 51.6	12.7	11.54[a]	2.6	+ 2361	42.9	.SXT4..	ZWG 086 – 005 NGC 2339
25	0705 + 719 P05	07 05 32 + 71 55.0	13.1	12.87[b]	3.3	57.4	3157	.S..3*P	UGC 03697 A0705 + 71
26	0706 + 718 P05	07 06 45 + 71 50.0	12.7	12.39[b]	2.0			.S...$P	UGC 03714 A0706 + 71
27	0733 + 353 P15	07 33 40 + 35 21.2	12.5	12.44[a]		3822	69.5	.I..9$.	ZWG 177 038 NGC 2415
28	0815 + 035 P11	08 15 18 + 03 31 49	15.3	14.99[b]	1.0			SB:... sp. of 2 distorted	UGC 04318
29	0818 + 033 P11	08 18 49.8 + 03 19 48	13.9	13.62[b]	1.5			Sa?	UGC 04356

Table I (continued)

Sl. No.	IRAS No.	RA (1950) h m s Dec. (1950) deg arc min	m_{pg}	B_T^0	Major diam. (arc min)	Vel. of rec. km s^{-1}	Dist. (Mpc)	Type	Identification
30	0835 + 259 P15	08 35 25 +25 55.8	14.4	14.03[a]	2.2	+5435	98.8	TRP system, contact strongly distorted, tails	UGC 04509 NGC 2623
31	0842 + 742 P15	08 42 33 +74 16.9	12.6	12.34[a]	2.8	+2228	41.8	S B b	UGC 04574 NGC 2633
32	0910 + 403 P15	09 10 54 +40 19.2	12.4	11.78[a]	4.2	+2530	46.0	S...peculiar	UGC 04862 NGC 2782
33	0914 + 422 P15	09 14 10 +42 12.5	12.9	12.43[a]	2.1	+1708	31.1	.SBS1P	UGC 04905 NGC 2798
34	0939 + 320 P15	09 39 55 +32 04.6	11.9	11.63[a]	3.5	+1340	23.6	.SXR4*.	UGC 05183 NGC 2964
35	0951 + 018 P15	09 51 06 +01 48.9	12.6	11.73[a]	4.7	+1326	22.3	.SBS5$/	UGC 05311 NGC 3044
36	0957 − 313 P13	09 57 52 −31 18.7	12.5	12.27[b]				.SXT5..	MGC 05 − 24 − 016 NGC 3095
37	0958 + 559 P15	09 58 35 +55 55.3	11.9	10.43[a]		+1171	21.3	.SBS5./	ZWG 266 − 008 NGC 3079
38	1012 − 286 P13	10 12 24 −28 37.4	12.0	11.72[a]				.SXS1	MCG − 05 − 24 − 028 NGC 3175
39	1012 + 736 P15	10 12 39 +73 39.6	11.9	11.07[a]		+5532	100.6	.SAT4..	UGC 05532 NGC 3147
40	1013 + 213 P15	10 13 48 +21 22.4	12.8	12.72	1.6	+1220	21.2	.SAT3..	UGC 05544 NGC 3177
41	1020 + 201 P15	10 20 47 +20 07.1	12.2	11.23[a]	6.5	+1111	19.2	.SXS1P.	UGC 05620 NGC 3227
42	1029 − 396 P13	10 29 24 −39 42.0						galaxy	NGC 3278

Table I (continued)

Sl. No.	IRAS No.	RA (1950) h m s Dec. (1950) deg arc min	m_{pg}	B_T^0	Major diam. (arc min)	Vel. of rec. km s^{-1}	Dist. (Mpc)	Type	Identification
43	1035 + 537 P15	10 35 40 +53 45.9	10.9		1.0	1026	18.6	.SXR4P	UGC 05786 NGC 3310
44	1049 + 232 P15	10 49 53 +23 12.0	12.6	12.37[b]	2.8			Sc	UGC 05995 NGC 3437
45	1100 + 282 P15	11 00 27 +28 14.5	11.7	11.52[a]	2.5	+ 1529	27.8	RSXS2..	UGC 06118 NGC 3504
46	1119 + 045 P11	11 19 55.6 +04 31 26	14.8			12000	218	galaxy	ZWG 39–152
47	1120 + 168 P15	11 20 17 +16 51.8	12.3	12.07[b]	1.6			.SAS5*.	UGC 06396 NGC 3655
48	1124 + 571 P15	11 24 43 +57 09.1	13.2	12.97[b]	2.1	53000	963	.SBS5$.	UGC 06458 NGC 3683
49	1146 + 489 P15	11 46 01 +48 59.3	11.0	10.73[a]	4.6	+ 1001	18.8	.SXT5*.	UGC 06778 NGC 3893
50	1150 – 388 P14	11 50 40 – 38 51.2	14.0		0.9			galaxy	MCG – 06 – 26 – 013
51	1204 – 316 P14	12 04 17 – 31 40.3	16.0					galaxy	MCG – 05 – 29 – 017
52	1206 – 364 P14	12 06 24 – 36 25.5	15.5		0.8			galaxy	MCG – 06 – 27 – 005
53	1211 + 548 P15	12 11 42 +54 48.1	13.0	12.55[a]	2.3	+ 2585	47	.IB.9P.	UGC 07241 NGC 4194
54	1217 – 356 P14	12 17 21 – 35 41.1	16.0					galaxy	MCG – 06 – 27 – 016
55	1228 – 260 P14	12 28 39 – 26 00.7	15.0		0.7			galaxy	MCG – 04 – 30 – 003
56	1242 – 201 P14	12 42 12 – 20 09.0	14.0	13.77[b]				.SBS5*.	MGC – 03 – 33 – 003 A1242 – 20
57	1248 + 482 P13	12 48 22 +48 12.3	16.0					galaxy	MGC + 08 – 23 – 097

Table I (continued)

Sl. No.	IRAS No.	RA (1950) h m s Dec. (1950) deg arc min	m_{pg}	B_T^0	Major diam. (arc min)	Vel. of rec. km s^{-1}	Dist. (Mpc)	Type	Identification
58	1250 – 271 P14	12 50 29 – 27 11.5	15.0					galaxy	MCG – 04 – 31 – 001
59	1252 + 468 P13	12 52 20 + 46 48.1	12.0	12.0[a]	1.7	+ 746	13.5	.SAT 3...	UGC 08035 NGC 4800
60	1255 – 294 P14	12 55 02 – 29 29.8	15.5					galaxy	MCG – 05 – 31 – 007
61	1300 – 236 P14	13 00 11 – 23 39.2	15.0					galaxy	MCG – 04 – 31 – 023
62	1303 + 419 P13	13 03 34 + 41 59.4	14.2			22 500	409	galaxy	UGC 08190 NGC 4963
63	1304 – 335 P14	13 04 22 – 33 35.9	15.5					galaxy	MCG 06 – 29 – 011
64	1304 – 234 P11	13 04 23.5 – 23 24.5	14.0					galaxy	MCG 04 – 31 – 030 NGC 4968
65	1305 – 241 P11	13 05 59.1 – 24 07.0	16.0					galaxy	PKS 1306 – 09
66	1308 + 373 P15	13 08 37 + 37 19.5	11.3	10.19[a]	6.3	+ 1021	18.6	.SXT4..	UGC 08256 NGC 5005
67	1309 + 469 P13	13 09 03 + 46 58.0	16.0	15.77[b]				SB:...	UGC 08269
68	1316 – 242 P11	13 16 49.3 – 24 13 37						Nebula	HELW 471
69	1319 – 164 P11	13 19 42.3 – 16 27.9	14.5					galaxy	MCG – 03 – 34 – 063
70	1323 + 435 P13	13 23 04 + 43 31.5	13.6	13.19[b]	2.3			S...	UGC 08439 NGC 5145
71	1330 + 630 P15	13 30 27 + 63 01.3	13.1	12.79[a]	2.0			S... Pw 8528 Long bridge,- plume.	UGC 08529 NGC 5218

Table I (continued)

Sl. No.	IRAS No.	RA (1950) h m s Dec. (1950) deg arc min	m_{pg}	B_T^0	Major diam. (arc min)	Vel. of rec. km s^{-1}	Dist. (Mpc)	Type	Identification
72	1331 – 234 P11	13 31 51.2 – 23 25.4	15.0					galaxy	MCG – 04 – 32 – 040
73	1333 – 340 P11	13 33 01.8 – 34 02.5	15.0					galaxy	MCG – 06 – 30 – 015
74	1356 – 188 P11	13 56 16.2 – 18 48.8	15.0					galaxy	MCG – 03 – 36 – 002
75	1359 + 59.5 P15	15 59 09 + 59 34.2	12.7	12.44[b]	2.3			S B b	UGC 08937 NGC 5430
76	1423 – 116 P11	14 23 27.8 – 11 40.6	15.0					galaxy	MCG – 02 – 37 – 004
77	1428 – 030 P11	14 28 51.4 – 03 04.2	15.2			30000	545	diffuse	ZWG 19 – 054
78	1430 + 581 P15	14 30 38 + 58 08.3	12.1	11.84[b]	3.5	+ 2300	41.8	Sb disturbed?	UGC 09358 NGC 5678
79	1524 + 007 P11	15 24 04.5 + 00 46.1	15.6			53000	963	galaxy	ZWG 21 – 096
80	1534 + 167 P15	15 34 14 + 16 46.2	12.5	11.64[a]	2.8	+ 1993	36.2	Sc	UGC 09926 NGC 5962
81	1623 + 030 P04	16 23 33 + 03 01.2	15.4			38000	690	galaxy	ZWG 52 – 015
82	1624 + 116 P04	16 24 25 + 11 41.5	15.0	14.69[b]	1.4			S..	UGC 10384
83	1628 + 041 P04	16 28 27 + 04 11.4	14.9			53000	963	galaxy	ZWG 52 – 037
84	1640 – 188 P04	16 40 58 – 18 51.7						planetary nebula	PKO 00 + 17.1
85	1648 – 030 P10	16 48 55 – 03 00.8	13.0					galaxy	MCG – 01 – 43 – 002
86	1651 – 075 P10	16 51 26 – 07 33.3						non-stellar object	IC 4627

Table I (continued)

Sl. No.	IRAS No.	RA (1950) h m s Dec. (1950) deg arc min	m_{pg}	B_T^0	Major diam. (arc min)	Vel. of rec. km s^{-1}	Dist. (Mpc)	Type	Identification
87	1710 – 032 P04	17 10 14 – 03 12.5	13.4					planetary nebulae	PKO 18 + 20.1
88	1718 + 113 P04	17 18 02 + 11 22.0	15.7			23 000	418	galaxy	ZWG 82 – 020
89	1720 + 129 P04	17 20 49 + 12 57.1	15.6			23 000	418	galaxy	ZWG 82 – 024
90	1725 + 211 P06	17 25 20.3 + 21 08.6	15.3			23 000	418	galaxy	ZWG 140 – 026
91	1729 + 236 P10	17 29 14 + 23 39.5	15.4			38 000	690	galaxy	ZWG 140 – 041
92	1744 + 307 P08	17 44 35 + 30 43.3	14.4	14.09[b]	0.9			SB.. distorted	UGC 10976
93	1751 + 319 P06	17 51 21.2 + 31 53.0	15.7			15 000	272	galaxy	ZWG 171 – 018
94	1756 + 062 P08	17 56 59 + 06 17.4	13.4	13.16[b]	1.6	1815	33	Sc	UGC 11075 NGC 6509
95	1809 + 149 P08	18 09 35 + 14 58.1	12.7	11.95[b]	1.3	+ 2368	43	S...	UGC 11144 NGC 6574
96	1813 + 067 P08	18 13 37 + 06 43.7	15.5	15.19[a]	1.5			S B b	UGC 11177
97	1814 + 220 P08	18 14 34 + 22 05.6	15.6			15 000	272	galaxy	ZWG 142 – 034
98	1821 + 745 P15	18 21 13 + 74 32.2	12.7	11.07[a]	4.0	+ 1538	27.9	Sc	UGC 11218 NGC 6643
99	1824 + 012 P08	18 24 37 + 01 12.6						planetary nebula	PKO 31 + 05.1
100	1826 + 227 P08	18 26 18 + 22 42.1	15.1	14.82[b]	1.3			Sa-b	UGC 11246
101	1833 – 654 P11	18 33 21.8 – 65 28.3			1.1			SO-a S comp 0.5n	ESO 103 – G35

Table I (continued)

Sl. No.	IRAS No.	RA (1950) h m s Dec. (1950) deg arc min	m_{pg}	B_T^0	Major diam. (arc min)	Vel. of rec. km s^{-1}	Dist. (Mpc)	Type	Identification
102	1840 – 624 P11	18 40 07.9 – 62 25			2.1			SB c in group	ESO 140 – G43
103	1844 – 532 P11	18 44 14.7 – 53 12.2			0.7			SBO-a	ESO 183 – G13 I 4777
104	1850 – 796 P08	18 50 19 – 79 37.8			1.1			Sa: L in group	ESO 025 – G04
105	1927 – 746 P08	19 27 31 – 74 39.4						planetary nebula	ESO 046 – PN – 03
106	2026 + 255 P15	20 26 27 + 25 33.9	15.0	14.72[b]	1.1	+ 4317	78.5	.SARO*.	UGC 11570 NGC 6921
107	2300 + 086 P15	23 00 45 + 08 36.3	13.0	12.16[a]	1.6			PSXT1..	ZWG 405 – 027 NGC 7469
108	2302 + 120 P15	23 02 26 + 12 03.1	11.9	11.33[a]	4.4	+ 2441	44.4	S B b	UGC 12343 NGC 7479
109	2312 + 042 P15	23 12 11 + 04 15.6	12.8	11.85[a]	3.4	+ 2672	48.6	.SBT4* P	UGC 12447 NGC 7541
110	2317 + 169 P15	23 18 00 + 16 57.1	12.9	12.47[a]	1.5	+ 1784	32.4	.SAT1P.	UGC 12529 NGC 7625

[a] Given in RC-2.
[b] Calculated following Holmberg (1958).

The identified sources are listed in Table I with their IRAS no. and positions. The apparent photographic magnitudes (m_{pg}) from *Second Reference Catalogue of Bright Galaxies* (RC-2) (1976) and MLNSAO, the major diameters in arc min from UGC and the velocity of recession (uncorrected) from CGCG and UGC are listed in columns 4, 6, and 7, respectively. The morphological type of the sources as given in RC-2, UGC, and MLNSAO and the *Identification Catalogues* are listed in columns 9 and 10, respectively. The integrated blue magnitudes (B_T^0) from RC-2 are listed in column 5 of Table I, wherever they are available. For a few galaxies where the type is known and m_{pg} is given but B_T^0 is not available, the apparent photographic magnitudes are transformed to integrated blue magnitudes by following Holmberg (1958). The integrated blue magnitude is then corrected for (i) the internal absorption in the galaxies, (ii) the extinction due to galactic inclination, and (iii) redshift. K correction (Sandage, 1973) has also been applied considering $z = 0.08$ and $K_B = 0.40$. The distances are calculated, using a value of 55 km s^{-1} Mpc^{-1} (Sandage and Tammann, 1975) for the Hubble constant and listed in column 8 of Table I.

The luminosities can be determined only 30 of these galaxies for which distances are available. The luminosities $P_{ir} = \log_{10}(p_{ir})$, the 10 μm luminosity and $P_{opt} = = \log_{10}(p_{opt})$, the B-band luminosity both in W Hz^{-1} are calculated following Lock and Rowan-Robinson (1983). The colours and luminosities of program galaxies along with some known galaxies are shown in Figures 2 and 3.

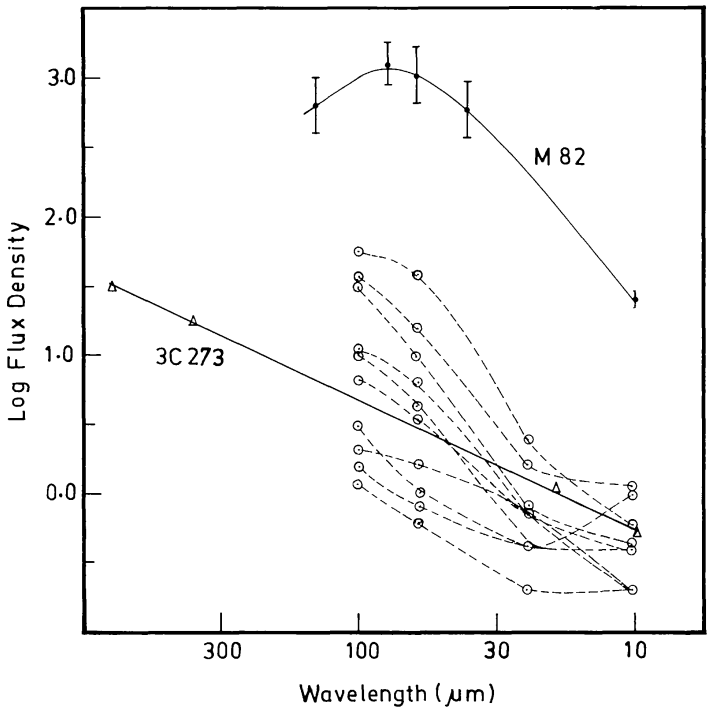

Fig. 1. Far infrared spectra of a few program galaxies, serial Nos. 2, 12, 13, 14, 26, 48, 50, 65, 76, 91 are shown by dotted curves. Far infrared spectra of M82 from Telesco and Harper (1980), and spectra of 3C 273 from Robson *et al.* (1983) are also shown by solid lines.

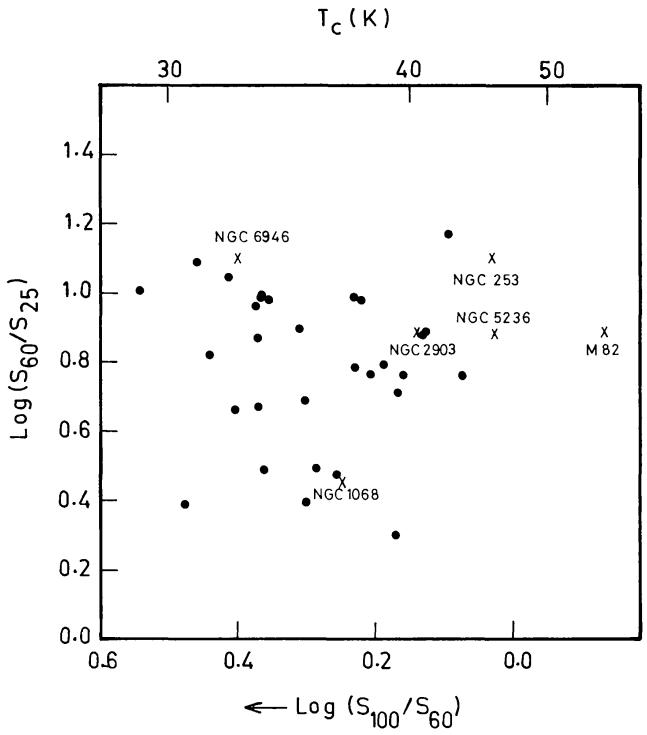

Fig. 2. Colour-colour diagram of program galaxies (●) along with known galaxies (×). S_{100}, S_{60}, S_{25} are the flux densities in Janskys at 100, 60, and 25 μm, respectively. Colour temperature shown in the upper scale.

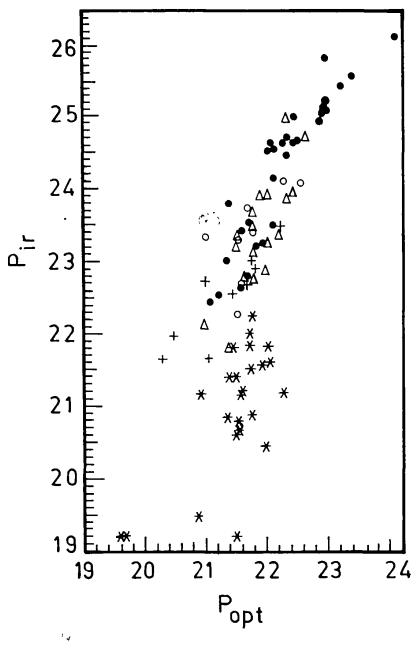

Fig. 3. Optical luminosity P_{opt} plotted against infrared luminosity P_{ir} for different type of galaxies. Triangles, Seyfert 1; crosses, emission line/starburst; open circles, Seyfert 2; stars, normal spiral, from Lock and Rowan-Robinson (1983); dots are program galaxies.

3. Discussion

The far infrared spectra of ten galaxies are plotted in Figure 1 along with the spectra of M82 (Telesco and Harper, 1980) and 3C 273 (Robson *et al.*, 1983). In the IRAS circulars the flux densities are derived assuming the source to be point-like. If a source is extended, its integrated flux density will be greater than that quoted. In the present work, those significant figures are considered which are quoted for flux densities, in IRAS circulars.

The nature of the flux distribution for some of the sources is very similar to that of M82. But for some galaxies the far infrared spectra is similar to that of the radio source 3C 273. The flux density is increasing with increase in wavelength. It can be suggested that along with the infrared flux arises from dust grains in H II regions/cold molecular clouds, there may be a non-thermal component. There may be a radio source associated with the galactic nucleus which is responsible for this excess radiation.

In Figure 2 the colours $\log(S_{100}/S_{60})$ vs $\log(S_{60}/S_{25})$ are plotted, where S_{100}, S_{60}, S_{25} are the flux densities in Jy at 100, 60, and 25 μm. The dots represents the program galaxies along with some known galaxies (Telesco and Harper, 1980), as shown in Figure 2. The temperature (T_C (K)), displayed at the top of Figure 2, assumes a dust emissivity proportional to frequency (De Jong *et al.*, 1984). Most of the program galaxies are in the temperature range 30 to 40 K along with the active galaxies NGC 1068, NGC 2903, and NGC 6946. The radiation in this region can be explained as due to interstellar dust associated with H II regions and molecular clouds which re-radiates the stellar radiation of young stars. A few of these program galaxies have colour temperature more than 40 K, which suggests a higher rate of star formation in those galaxies. The colour temperature of M82 is more than 50 K, which is explained as the heating of dust in molecular clouds by stars earlier than B0 (Telesco and Harper, 1980). Also there is another possibility, if the program galaxies are lenticulars or irregulars. These galaxies will be hotter than spiral galaxies and star formation occurred in bursts, also these galaxies usually contain less dust than spiral galaxies.

Figure 3 shows P_{opt} against P_{ir} for the program galaxies along with some known Seyfert galaxies, emission line/starburst galaxies and normal spiral galaxies (Lock and Rowan-Robinson, 1983). The position of the program galaxies is in the same region as that of the Seyfert and emission line/starburst galaxies. Some of the galaxies have even higher infrared and optical luminosities than Seyfert galaxies. The $\overline{Z}$, mean values of $Z(Z = P_{\text{ir}} - P_{\text{opt}} = \log(p_{\text{ir}}/p_{\text{opt}}))$ is also higher than the Z-values, $Z = 1.6 \pm 0.16$, as calculated by Lock and Rowan-Robinson (1983) for Seyfert galaxies. Nothing can be said definitely about these galaxies unless further observational work is done.

4. Conclusions

The galaxies observed by IRAS are mostly active galaxies, since their colours and luminosities are of the same order as those of known active galaxies. Much more observational work is required to study their activity.

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