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GALAXIES WITH f12>f25

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A sample of galaxies with flux density at 12 micron (f_{12}) higher than at 25 micron (f_{25}) has been compiled. It is argued that criteria $f_{12}>f_{25}$ effectively selects quiescent galaxies which are less active in infrared, radio and optical bands than other types of normal galaxies. Moreover galaxies with $f_{12}>f_{25}$ do not show well-established relations for normal galaxies between far-infrared parameters, for example, anticorrelation between f_{12}/f_{25} and f_{60}/f_{100}. These galaxies also show different far-infrared and radio properties. In our opinion this sample of quiescent galaxies is a well-defined comparison sample when properties of more active galaxies are discussed. Sample of quiescent objects may be used as a sample of underlying galaxies when starburst or nuclear activity of a galaxy are modelling.

1. *Introduction.* The far-infrared (FIR) emission of spiral galaxies can be explained by assuming two components, a cold (30 K) disk component and warm (80 K) component which represents warm gas and dust heated by newly borned stars in the nuclear region.The difference between starbursts and "normal" spirals may be due to relative contribution from the warm component (see, e.g., [1,2]). According to Xu and De Zotti [3] the fraction of warm component in the disk of a galaxy is varying from 10% to 100%. However, Devereux and Young [4] have shown that high-mass ($>6M_{\odot}$) O and B stars could be responsible for FIR emission in spiral galaxies of high luminosity ($\log L_{fir} > 9L_{\odot}$) and, at least, for spiral galaxies of intermediate luminosity ($9L_{\odot} < \log L_{fir} < 11L_{\odot}$); to explain FIR emission there is not a necessity for the requirement of two components.

Observed anticorrelation between the intensity ratios f_{60}/f_{100} and f_{12}/f_{25} for infrared galaxies requires that interstellar dust includes a population of very small grains [1] or large dust grains radiating at high temperatures [5]. As a population of very small grains (a few Angstroms in size) the polycyclic aromatic hydrocarbon (PAH) molecules were proposed (see, e.g., [1,6]). These grains transiently heated to roughly 1000 K, can be an important source of emission at wavelengths between 1 and 20 micron. Most of nearby spirals show logarithm of FIR to blue luminosities ratio around - 0.4 [7], i.e., they emit considerably more in the optical than in FIR band.

Most of spiral galaxies which were selected from IRAS survey are incomplete at 12 micron due to small number of detections at this wavelength. In particular, objects with flux densities ratio $f_{12}/f_{25} > 1$ have not been studied separately as a class of spiral galaxies. However, the situation was changed when Rush et al., [8] have published an all-sky 12 micron flux-limited sample of galaxies selected from the IRAS Faint Source Catalog (FSC-2). In this paper we want to investigate spiral galaxies with $f_{12}>f_{25}$ selected from the extended 12 micron galaxy sample [8]. Our analysis indicates that spiral galaxies with $f_{12}>f_{25}$ show infrared and radio properties different from that for galaxies with $f_{12}<f_{25}$. Throughout of this paper a Hubble constant of 75 km/s Mpc is adopted. Section 2 presents the sample and selection procedure of galaxies. In section 3 we present properties of the galaxies with $f_{12}>f_{25}$ and its comparison with the galaxies which have $f_{12}<f_{25}$. The last section presents discussion of the results.

2. *The sample*. Rush et al.,[8] have selected an all-sky 12 micron flux-limited sample of galaxies from the IRAS Faint Source Catalog (FSC-2). The completeness limit of the sample is 0.3 Jy at 12 micron. About 20% of the sample are galaxies that are "active" in a broad sense (i.e. Seyferts, Quasars, Liners or Starbursts). So called "normal" galaxies (nearly all spirals) comprise 80% of the sample. Therefore extended 12 micron galaxy sample gives best opportunity to investigate homogeneous and complete sample of spiral galaxies in more detail.

We have selected from this sample galaxies which are satisfying the following criteria:

1. $f_{12}>0.3$ Jy: flux density of the galaxy at 12 micron should be greater than 0.3 Jy.

2. $f_{12}>f_{25}$: flux density at 12 micron should be higher than at 25 micron.

The total number of galaxies which are satisfying to these selection criteria is 103. This includes 88 normal galaxies (85%), 5 Sy1 (5%), 1 Sy2 (1%) and 9 Liners (9%). Below we will discuss only non-active galaxies.

It is well known that, in general, the infrared emission of galaxies with $\log(f_{60}/f_{100})> -0.4$ is due to the current star formation and starburst galaxies differ from normal spirals by this parameter. In order to select the candidates of starbursts we divided our original sample of spiral galaxies into two subsamples: (a) galaxies with $\log(f_{60}/f_{100})> -0.4$ (Table 1, 29 galaxies) and (b) galaxies with $\log(f_{60}/f_{100})\leq -0.4$ (Table 2, 46 galaxies, and Table 3, 13 galaxies). The description of Tables 1, 2 and 3 is as follows:

column 1: Name of the galaxy according to [8] and following by increasing right ascension; column 2: Logarithm of the ratio between flux densities at 12 and 25 micron (f_{12}/f_{25}); column 3: Logarithm of the ratio between flux densities at 60 and 100 micron (f60/f100);

column 4: Heliocentric radial velocity (cz), in km/s;

column 5: Blue magnitude (*B*), corrected for galactic and internal absorption;

column 6: The dust temperature (T_d), in K, of the galaxy, computed by fitting the 60 and 100 micron IRAS fluxes with a singl-temperature dust model, using a dust emissivity law λ^{-1};

column 7: Logarithm of the FIR luminosity, computed according to formula $\log L_{fir} = 5.5378 + 2\log(cz/75) + \log(12.66f_{12} + 5f_{25} + 2.55f_{60} + 1.01f_{100})$, in solar units, which takes into account the 4 IRAS flux densities and gives the total FIR luminosity between 8 and 1000 micron [9];

column 8: Logarithm of the blue luminosity, computed according to formula $\log L_b = 12.164 + 2\log(cz/75) - 0.4B$, in solar units;

column 9: Logarithm of the ratio between FIR and blue luminosities (L_{fir}/L_b);

column 10: Morphological type (*T*) given when available, following the revised morphological types given in RC2. The blue magnitudes and morphological types have been extracted from the "Catalogue of Principal Galaxies" (PGC) [10]. We present 13 galaxies of subsample (b) in separate table (Table 3) because according to Keel [11] and Véron and Véron [12] these objects show some signs of either nuclear or starburst activity.

3. *Results.* Our sample of galaxirs with $f_{12}>f_{25}$ is a complete sample, since it was extracted from the complete sample of an all-sky 12 micron survey. Mean value of the

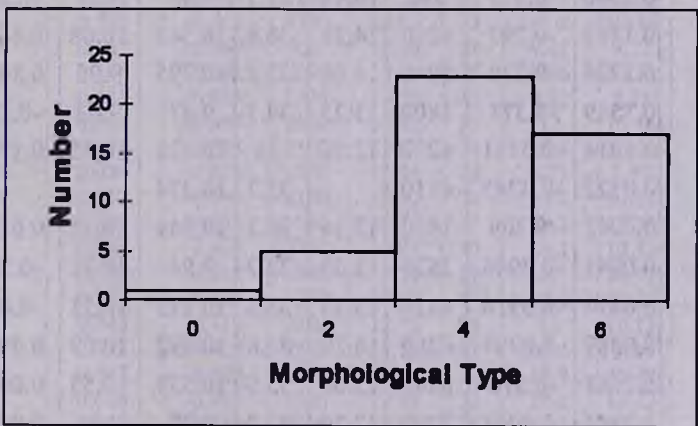

Fig. 1. Morphological distribution of galaxies with $f_{12}>f_{25}$. The following designations of morphological types were accepted 0: So/a and earlier; 2: Sa and Sab; 4: Sb and Sbc; 6: Sc and Scd.

Table 1

POSSIBLE STARBURST GALAXIES

Name	$\log f_{12}/f_{25}$	$\log f_{60}/f_{100}$	cz km/s	B	T_d K	$\log L_{fir}$ $L_{\odot}$	$\log L_b$ $L_{\odot}$	$\log L_{fir}/L_b$	T
N706	0.1714	-0.3482	5070	13.09	34.9	10.605	10.59	0.022	4
N864	0.109	-0.3847	1560	11.62	33.6	9.67	10.15	-0.48	5
E200-G29	0.0884	-0.3436	6660		35	10.716			-1
N1659	0.1383	-0.349	4560	13.14	34.8	10.335	10.48	-0.14	4
N1752	0.0414	-0.3906	3600	13.33	33.4	10.105	10.19	-0.09	4.7
U4132	0.0613	-0.3511	5250	13.61	34.8	10.642	10.41	0.232	4
N2738	0.3144	-0.3659	3090	13.99	34.2	10.031	9.79	0.233	5
M-3-28-8	0.129	-0.326	3300	13.53	35.6	10.111	10.04	0.072	-1.5
F10569-0716	0.1107	-0.2905	2580		36.9	9.89			
M+1-29-38	0.1622	-0.1654	11430	14.36	41.2	11.143	10.79	0.357	4
N3720	0.0923	-0.3937	6090	13.72	33.3	10.684	10.49	0.189	0.9
U6865	0.1761	-0.3783	5820	14.68	33.8	10.564	10.07	0.492	5
M+5-28-78	0.102	-0.2993	3180	13.45	36.6	10.172	10.04	0.134	3
N4428	0.0561	-0.3282	3030	13.38	35.5	10.294	10.02	0.269	5
E507-G62	0.403	-0.399	3540	12.55	33.1	10.149	10.49	-0.34	3
N5068	0.0546	-0.399	690	10.46	33.1	9.38	9.91	-0.53	6
N5263	0.1461	-0.297	4860	14.28	36.6	10.543	10.08	0.468	5
U8739	0.1224	-0.378	5040	14.66	33.8	10.795	9.95	0.841	5
N5560	0.1549	-0.371	1800	13.23	34.1	9.47	9.63	-0.16	3
N5592	0.1214	-0.3741	4290	13.56	34	10.428	10.25	0.173	3.8
N5716	0.0322	-0.3245	4110		35.7	10.374			5
N5792	0.0042	-0.309	1920	12.14	36.2	10.149	10.12	0.024	3
N6438	0.0241	-0.3946	2520	12.53	33.2	9.94	10.21	-0.27	-2
I4836	0.0414	-0.3916	4110	13.33	33.3	10.275	10.31	-0.03	4.3
N6845	0.0389	-0.3794	6360	14.79	33.8	10.692	10.09	0.591	3
N7316	0.2688	-0.376	6120	13.64	33.9	10.539	10.53	0.007	5
N7460	0.3144	-0.3955	3300	13.76	33.2	9.97	9.95	0.025	3.3
N7730	0.085	-0.3388	9390	14.82	35.2	10.949	10.43	0.518	2
M+4-55-45	0.2894	-0.3653	9330		34.3	11.083			

Table 2

QUIESCENT GALAXIES

Name	$\log f_{12}/f_{25}$	$\log f_{60}/f_{100}$	cz km/s	B	T_d K	$\log L_{fir}$ $L_\odot$	$\log L_b$ $L_\odot$	$\log L_{fir}/L_b$	T
N7817	0.055	-0.485	2310	12.56	30	10.1	10.12	0.01	4
N309	0.283	-0.493	5670	12.42	30	10.6	10.95	-0.36	5
N691	0.267	-0.643	2790	12.47	25	9.71	10.32	-0.61	4
N782	0.014	-0.531	6030	12.55	29	10.6	10.95	-0.36	3
N772	0.094	-0.542	2460	11.03	28	10.4	10.78	-0.43	3
N1070	0.491	-0.542	4080	12.72	28	10.2	10.55	-0.39	3
N1317	0.105	-0.451	1920	11.91	31	9.79	10.22	-0.43	1
N2082	0.028	-0.485	1380	12.72	30	9.41	9.62	-0.21	3
N2715	0.077	-0.514	1350	11.84	29	9.52	9.94	-0.42	5
N2776	0.014	-0.444	2640	12.05	32	10	10.45	-0.41	5
N2874	0.236	-0.483	3780	13.36	30	10.3	10.22	0.04	4
U5192	0.081	-0.427	4950	14.21	32	10.2	10.12	0.05	3
N3183	0.025	-0.519	3090	12.65	29	10.2	10.33	-0.14	3.5
N3294	0.078	-0.423	1560	11.76	32	9.86	10.11	-0.25	5
N3486	0.322	-0.418	690	10.94	32	9.09	9.72	-0.63	5
U6135	0.071	-0.429	6480	13.27	32	10.6	10.73	-0.12	5
N3684	0.025	-0.463	1320	12.15	31	9.33	9.79	-0.46	4
Arp83	0.022	-0.427	3600	12.43	32	10.4	10.55	-0.13	3
N3963	0.157	-0.483	3180	12.31	30	10	10.49	-0.46	4
N4047	0.191	-0.452	3420	12.94	31	10.3	10.31	0	3
N4062	0.181	-0.593	780	11.94	26	8.99	9.42	-0.43	5
N4402	0.086	-0.491	450	12.58	30	8.76	8.69	0.07	3
N4429	0.149	-0.437	1140	11.04	32	9.02	10.11	-1.09	-1
N4504	0.272	-0.467	990	11.87	31	9.02	9.66	-0.64	6
N4517	0.061	-0.465	1140	11.26	31	9.59	10.02	-0.43	6
I3704	0.324	-0.411	8700	14.83	33	10.8	10.36	0.48	4
N4800	0.139	-0.467	750	12.39	31	9.11	9.22	-0.11	3
N4814	0.106	-0.591	2670	12.41	26	9.96	10.31	-0.35	3
N4951	0.181	-0.406	1170	13.59	33	9.32	9.11	0.21	6
N5012	0.011	-0.467	2610	12.72	31	10	10.16	-0.15	5
N5078	0.041	-0.518	2160	11.67	29	10.4	10.41	-0.04	1
N5170	0.034	-0.676	1500	12.09	23	9.31	9.93	-0.62	5
N5220	0.317	-0.543	4170	13.12	28	10.1	10.41	-0.26	1
N5247	0.016	-0.415	1350	10.78	33	10.1	10.36	-0.29	4
N5313	0.063	-0.477	2760	12.93	30	10.1	10.12	-0.03	3
N5614	0.364	-0.511	3840	12.54	29	10.1	10.57	-0.44	2
N5605	0.748	-0.421	3360	12.99	32	10.2	10.27	-0.09	4.5
N5633	0.043	-0.412	2850	12.99	33	10	10.13	-0.09	3
N5795	0.035	-0.429	2310	14.72	32	9.84	9.25	0.59	5
N5859	0.097	-0.529	4770	13.19	29	10.4	10.49	-0.05	4
N5875	0.026	-0.485	3540	13.24	30	10.2	10.22	-0.05	3
N5899	0.009	-0.454	2550	12.52	31	10.1	10.22	-0.11	5
M-1-39-5	0.376	-0.402	2010		33	9.55			2
N6503	0.021	-0.448	60	10.94	31	7.23	7.59	-0.36	6
N6943	0.167	-0.551	3120	12.01	28	10.1	10.6	-0.46	6
I5176	0.143	-0.542	1710	13.54	28	9.73	9.46	0.27	3.9

ratio f_{12}/f_{25} is about 1.5. The morphological distribution of the sample (88 galaxies) is shown in Fig. 1. Main part of the sample includes galaxies of intermediate (i.e., Sb-Sbc) and late (i.e., Sc-Scd) types, but there is not galaxy later than Scd. The morphological distributions of groups (a) and (b) do not differ significantly. Hence the intermediate and late-type spirals more often than early-types show $f_{12}>f_{25}$. Simple inspection of Tables 1, 2, and 3 shows that: 1) About 40% (37/88) of the sample are galaxies which have $\log L_{fir}<10L_{\odot}$ and this percentage is 2 times higher for the subsample (b) than for (a). There are only two galaxies, MCG +1-29-38 and MCG +4-55-45 from (a), which have $\log L_{fir}>11L_{\odot}$. 2) About 70% (58/83) of the sample are galaxies which emit considerably more in the optical than in FIR band, i.e. galaxies with $\log L_{fir}/L_{b}<0$. This percentage is again higher (almost 3 times) for the subsample (b) than for (a).

The mean parameters for two samples (a) and (b) are presented in Table 4. In this statistics galaxies from Table 3 have not been included. Evidently there are significant differences (see the last row of Table 4) between those parameters which describe FIR emission. Hence galaxies of group (a) are relatively stronger emitters of FIR radiation than galaxies of group (b).

Table 3

POSSIBLE QUIESCENT GALAXIES

Name	$\log f_{12}/f_{25}$	$\log f_{60}/f_{100}$	cz km/s	B	T_d K	$\log L_{fir}$ $L_{\odot}$	$\log L_{b}$ $L_{\odot}$	$\log L_{fir}/L_{b}$	T
N488	0.281	-0.674	2280	11.19	24	9.88	10.65	-0.77	3
N1291	0.193	-0.621	840	9.39	25	8.94	10.49	-1.56	0
N1316	0.079	-0.436	1770	9.33	32	9.69	11.18	-1.47	-2
N1433	0.017	-0.551	1050	10.71	28	9.39	10.17	-0.78	2
N3672	0.004	-0.445	1860	11.96	31	10.16	10.17	-0.01	5
Arp116	0.124	-0.467	1500	11.64	31	9.83	10.11	-0.28	5
N4699	0.136	-0.513	1410	10.49	29	9.77	10.51	-0.74	3
N4947	0.102	-0.467	2400	12.73	31	9.94	10.08	-0.15	3
N5161	0.062	-0.493	2400	12.06	30	9.96	10.35	-0.39	5
N5363	0.199	-0.474	1080	11.11	30	9.09	10.04	-0.95	0
N5885	0.432	-0.474	2010	12.06	30	9.79	10.19	-0.41	5
N6925	0.071	-0.407	2790	12.08	33	10.23	10.47	-0.24	4
N7599	0.046	-0.486	1680	12.01	30	9.95	10.06	-0.11	5

In order to test whether the FIR emission of galaxies with $f_{12}>f_{25}$ depends on galaxy morphology, we have divided the whole sample of spiral galaxies into two groups: $T \le 3$ (i.e. Sbc and earlier, 30 galaxies) and $T>3$ (i.e. later than Sbc, 50 galaxies). We find that FIR emission is uncorrelated with Hubble types. The same procedure was done for subsamples (a) and (b) separately. Again galaxies of subsample (a) are relatively more active in FIR band than galaxies of subsample (b) irrespective of Hubble types. We investigate whether the existence of a bar structure affects the FIR emission. Unfortunately small number of barred galaxies (20%, 17 galaxies) does not allow for proper conclusion, but it seems likely that barred galaxies are less FIR active than non-barred galaxies for our sample of spirals.

According to PGC the HI data are available for 16 galaxies from subsample (a), and for 36 objects from subsample (b). Preliminary analysis of 10 galaxies (sample (a)) shows that there is a tight correlation (r=0.68) between FIR luminosity and HI content. This relation is much tighter for the sample (b) (r=0.87). Galaxies of the group (a) have higher HI content (more than 5 sigma) than that of galaxies from group (b).

We have compared also FIR and radio properties of two types spiral galaxies, namely galaxies with $f_{12}>f_{25}$ and $f_{12}<f_{25}$. For this purpose we have compiled from [8] a subsample of 45 galaxies with $f_{12}<f_{25}$ which have same mean distance as the galaxies from our sample. We find that there are tight correlations between HI intensity and ratios f_{12}/f_{25}, f_{12}/f_{60}, f_{12}/f_{100} for our sample of galaxies but not for the comparision sample. This means that when relative contribution to FIR emission at 12 micron is

Table 4

PARAMETERS OF TWO SAMPLES

Sample		T_d K	$\log L_{fir}$ $L_\odot$	$\log L_b$ $L_\odot$	$\log L_{fir}/L_b$
(a)	Mean	34.7	10.3	10.19	0.09
	Error	0.3	0.08	0.05	0.07
	N	29	29	25	25
(b)	Mean	30.1	9.84	10.07	-0.23
	Error	0.3	0.09	0.09	0.04
	N	46	46	45	45
Signif. (in sigma)		10.2	4.1	1.2	4.1

higher then relations between FIR and HI emission are more tied. So in low-luminosity galaxies ($\log L_{fir} < 10 L_{\odot}$), the contribution to FIR luminosity from dust in HI clouds appears to become important, where the ISM within the optical disk is primarily atomic. Comparison also showed that mean values of FIR luminosity, dust temperature, hydrogen mass and radio continuum emission (radio continuum data have been extracted from [13]) of comparison sample are very close to mean parameters of our subsample (a), but significantly higher than those of subsample (b). In addition, galaxies of group (a) show tight correlations between L_{fir} / L_b and luminosities at 12, 25, 60 and 100 micron (correlation coefficients are 0.7, 0.7, 0.8 and 0.8 respectively). These correlations do not exist for the galaxies of group (b). Moreover the comparison sample obeys usual FIR properties of infrared galaxies, for example, the anticorrelation between the intensity ratios f_{60}/f_{100} and f_{12}/f_{25}, which does not exist for the galaxies with $f_{12}>f_{25}$. Galaxies of (b) do not show also well-established anticorrelation between f_{12}/f_{25} and L_{fir} and positive correlation between f_{60}/f_{100} and L_{fir} for normal and starburst galaxies (see, e.g., [14]).

4. *Discussion.* It is evident from our results that galaxies with $f_{12}>f_{25}$ are frequently quiescent galaxies in broad sens (they occupy lower luminosity range in the FIR, radio and optical bands than other normal galaxies). Next remarkable property of these galaxies, especially for the objects of Table 2, is the absence of well-established relations between FIR colors and luminosities which show normal and starburst galaxies, such as anticorrelations between f_{12}/f_{25} and f_{60}/F_{100}, and between f_{12}/f_{25} and L_{fir}; positive correlation between f_{60}/f_{100} and L_{fir}, etc. These galaxies emit considerably more in the optical than in FIR band, and they often are galaxies of intermediate (Sb, Sbc) and late-type (Sc, Scd) spirals.

Xu and De Zotti [3] have described a two-temperature dust model for normal and starburst galaxies. In this model FIR emission consists from emission of extended HII regions (warm component) and from emission of cooler dust heated by the general interstellar radiation field. According to [3] nearly all of the 12 micron emission is due to the PAH molecules, while at 25 micron dominate warm larger grains. At 100 micron dominate cool larger grains, and at 60 micron dominate both cool and warm grains. In framework of this model, the FIR luminosities ratio of warm and cold components ($R_{w/c}$) depends from the ratio f_{60}/f_{100}. Using approximation of $R_{w/c}$ we have estimated that for our whole sample (88 galaxies) mean value of $R_{w/c} = 0.33$, and it is 0.57 and 0.26 for subsamples (a) and (b) respectively, which means that contribution to FIR emission from cold component is much higher than from warm component. The most extreme galaxies of the sample have $R_{w/c} \leq 0.1$. Xu and De Zotti [3] have estimated $R_{w/c}$ for the sample of nearby spiral galaxies (this sample contains only a few objects with f_{12}>f_{25}) and Markarian starburst galaxies. For the nearby spirals mean $R_{w/c}$ = 0.43 and $R_{w/c}$ = 1 for Markarian galaxies. Evidently our sample of spirals has significantly (more than 3 sigma) lower value of $R_{w/c}$ than nearby spirals and, of course, much less than Markarian galaxies. In the case of subsample (b) these differences are much greater. Our sample of galaxies is significantly differ by the ratio f_{25}/f_{60} (mean logf_{25}/f_{60} = -0.95) than that of nearby spirals and Markarian galaxies. It was noted by Xu and De Zotti that their model should be refined for the estimating of cold component for those objects which have logf_{60}/f_{100}<-0.45. It should be noted that this model has difficulties in explanation of FIR properties of objects with f_{12}>f_{25} in general, and additional investigations are needed. One of the plausible explanaton of the FIR spectrum with f_{12}>f_{25} is, that significant contribution to the 12 micron emission in normal galaxies may come from late-type stars, OH-IR sources and young planetary nebulae [15], since their integrated spectrum has f_{12}>f_{25}. This situation can be relevant in the case of some quiescent galaxies (especially for the objects from sample (b)), while in relative luminous galaxies significant contribution to FIR band from star forming regions is dominated. On the other hand, since for the galaxies with f_{12}>f_{25}, particularly for the galaxies of subsample (b), FIR colors and luminosities are not correlated, it is possible that in each FIR bands (12 to 25 micron and 60 to 100 micron) different kind of dust grains are taking part in FIR emission.

Isobe and Feigelson [16] have constructed FIR luminosity function of normal galaxies on the basis of a volume-limited sample and investigated relationships between FIR emission and galaxy morphology. Most of galaxies of that sample have upper limits of flux densities at 12 and 25 micron, and objects with f_{12}>f_{25} will not be possible to distinguish and these galaxies were not investigated separately.They found that the normal galaxy FIR emission is uncorrelated with the Hubble sequence of spiral galaxy morphology. The next notable result in their study concerns bar and inner ring structure. It was emphasized that the presence of bars and rings reduces FIR emission though in bars and rings substantial heating sources are OB stars and reduced FIR emission in barred and ringed spirals is due to a reduction in the amount or spatial distribution of dust. They suggested that bar and inner ring instabilities may confine the dust in spiral disk which could decrease the efficiency of conversion of UV photons into the FIR.

The results of our morphological investigation support their results. Isobe and Feigelson also showed that the ratio of very small and large grains does not vary significantly. Since very small grains dominate at 12 micron it is plausible that for galaxies with f_{12}>f_{25} the amount of very small grains is higher than of larger grains.

It should be noted that criteria f_{12}>f_{25} effectively selects quiescent galaxies. In starburst galaxies and AGNs where UV field is stronger small dust grains may be destroyed (see, e.g., [17]).

5. *Conclusion.* The principal findings are the following:

1. There is no a galaxy with $f_{12}>f_{25}$ which has $\log L_{fir}>11.2L_{\odot}$. This criteria effectively selects quiescent galaxies in broad sens. Most of galaxies with $f_{12}>f_{25}$ are quiescent objects in the IR, radio and optical bands, and conequently this sample can be used as a comparison sample when properties of more active galaxies are discussed. Sample of quiescent galaxies can be used also as a sample of underlying galaxies when starburst or nuclear activities of a galaxy are modelling.

2. The sample of quiescent galaxies do not show well-established relations between FIR parameters, such as anticorrelation between f_{12}/f_{25} and f_{60}/f_{100}, anticorrelation between f_{12}/f_{25} and L_{fir}, and positive correlation between f_{60}/f_{100} and L_{fir}, etc.

3. Quiescent galaxies show tighter correlation between L_{fir} and HI content than starburst galaxies. HI content of these galaxies also correlated with f_{12}/f_{25}, f_{12}/f_{60} and f_{12}/f_{100}, which means that in these galaxies emission of atomic hydrogen and FIR emission at 12 micron are taking place in the same region of the galaxy.

4. FIR properties of galaxies with $f_{12}>f_{25}$ are not correlated with Hubble types.

5. The intermediate and late-type spirals more often than early-types have $f_{12}>f_{25}$.

6. Galaxies with $f_{12}>f_{25}$ emit considerably more in the optical than in FIR band.

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ГАЛАКТИКИ С f12 > f25

Р.А.КАНДАЛЯН

Составлена выборка галактик, плотность потока которых на волне 12мкм больше, чем на волне 25 мкм. Показано, что условие $f_{12}>f_{25}$ эффективно отбирает спокойные галактики в широком диапазоне спектра, они менее активны в инфракрасном, радио и оптическом диапазонах, чем другие нормальные галактики. Более того, эти галактики не показывают хорошо известные соотношения между инфракрасными параметрами, которые имеют место в нормальных галактиках, как, на-

пример, антикорреляция между f_{12}/f_{25} и f_{60}/f_{100}. Они показывают также отличные от нормальных галактик инфракрасные и радио особенности. По нашему мнению, эта выборка спокойных галактик является подходящей выборкой сравнения при обсуждении свойств более активных галактик. Кроме того, она может быть использована при моделировании галактик с активным звездообразованием или активным ядром.

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