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TWO-COLOUR PHOTOMETRY OF CLUSTERS OF GALAXIES. II A1213

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A two-colour photometry of more than 420 galaxies in the cluster A1213 has been carried out on the plates of 2.6m telescope of the Byurakan Observatory. The luminosity function, radial and colour distributions in the cluster have been investigated. The existence of a core of about 0.5 Mpc radius consisting of mainly bright and red galaxies is suggested. About half of the total luminosity of the cluster is included within the core radius.

1. *Introduction.* In Kalloghlian et al [1] (hereafter called Paper 1) the results of B and V photometry of galaxies in Abell cluster No1185 have been given. In this paper we give the same kind of data on cluster A1213. According to Karachentsev and Shcherbanovski [2] the two clusters form a pair. The mean redshift of A1213 determined by means of 11 galaxies given by Fanti et al [3] is equal to 0.0464, which is 0.0115 larger than the redshift of A1185. The projected distance between the clusters' centers is about 4 Mpc (hereafter $H = 75$ km s^{-1} Mpc^{-1}). Both clusters belong to Abell's distance group 2 and richness class 1 [4]. The Bautz-Morgan types of A1185 and A1213 are II and III respectively [5]. No X-ray emission from A1213 has been detected [6]. The radio source 4C 29.41 is associated with the northermost component of the double elliptical member Zw 156—46 (No 5 in Table 1 of this paper) of this cluster. According to [3] the source is strongly polarized. With the brightest galaxy of the cluster Zw 156—42 (No 3 in Table 1 of this paper) a second radio source is associated. In [3] morphological types are given for the brightest galaxies in the cluster. Of these 54% belong to S0 type, 41% — to E-type and only two galaxies are classified as Sc or SBc. According to Hintzen [7] and Fanti et al [3] there is a strong contamination from foreground galaxies having redshift about 0.027. This makes the reduction of field galaxies more or less uncertain.

2. *Observations and reduction procedure.* The plates in B and V have been obtained in the prime focus of 2.6m telescope of the Byurakan Observatory. The plate-filter combinations are: Kodak 103a — O + + GG385 for B and 103a — D + GG11 for V band. Only one good quality plate in each colour band has been measured with 30 and 40 minutes exposure respectively.

Photometric calibration of the plates have been performed by means of the Byurakan Observatory 12-tube spot sensitometer of known relative intensities, the exposure being made on a masked-off part of the plates. The zero point has been established by using B and V magnitudes of the brightest galaxy in the cluster according to data given by Sandage [8].

The plates were scanned with the PDS microdensitometer of the Naples Observatory. The reduction procedure is described in Paper I.

3. *Results.* 424 galaxies have been identified in both B and V in an area of 35×35 arcmin^2 size centered around the Abell's center. The machine identifications, as in case A1185, have been checked by simple inspection of the plates to eliminate defects, mistakes and double stars which may be identified by the machine as galaxies. The final list of 424 galaxies confirmed by an additional eye inspection is given in Table 1. In subsequent columns the current numbers, rectangular coordinates in seconds of arc, V-magnitudes and B-V colours are given. For two faint galaxies of the list neither B nor V magnitudes could be measured. The faintest galaxies in the list are of 22.0 and 21.8 magnitudes in B and V respectively. The large difference between total numbers of galaxies in A1185 and A1213 is caused mainly by fainter limiting magnitudes of A1213 plates.

The finding chart of all 424 galaxies is given in Fig. 1.

a) *The luminosity function.* 420 galaxies have been used both in B and V to construct the luminosity functions. In Fig. 2 the differential and cumulative luminosity functions in B and V are presented with and without applying field correction. In the case when no field correction is applied (see Fig. 2) the counts seem to be complete till $B = 21.0$ and $V = 20.0$. An application of field correction however makes these limits for about 1 mag. brighter. The field correction has been applied in a way similar to that in Paper I using mainly the data given by Karachentsev and Kopjlov [9]. As it is seen from Fig. 2 after field correction no cluster galaxy remains beyond the limits $B = 20.0$ and $V = 19.2$. We assume these magnitudes to be the completeness limits of the sample though it is clear that the applied field correction procedure may be not surely correct. At the distance of the cluster the

Table 1

MAGNITUDES AND COLOURS OF GALAXIES IN A1213

No.	X	Y	V	B–V	No.	X	Y	V	B–V
1	2	3	4	5	1	2	3	4	5
1	— 197″	368″	$14^{m}22$	$1^{m}11$	36	564″	—130″	$16^{m}00$	$1^{m}19$
2	— 953	929	14.22	1.28	37	— 890	—505	16.06	1.14
3	— 81	—125	14.29	1.20	38	— 763	670	16.11	1.10
4	— 154	—220	14.39	1.17	39	379	— 77	16.13	1.05
5	78	—119	14.41	1.12	40	196	153	16.23	0.58
6	83	—138	14.59	1.19	41	— 493	—117	16.25	1.12
7	— 5	147	14.61	0.85	42	135	95	16.26	1.09
8	— 232	581	14.73	0.73	43	718	674	16.32	1.22
9	421	—549	14.77	1.27	44	—1011	998	16.33	1.17
10	— 525	—772	14.87	1.24	45	— 4	312	16.35	1.10
11	— 3	— 3	14.94	1.23	46	434	—264	16.37	0.89
12	— 21	—348	14.95	0.94	47	660	677	16.38	1.06
13	440	—707	15.02	1.32	48	— 200	—102	16.41	1.05
14	948	774	15.03	1.20	49	— 241	—416	16.42	1.05
15	— 967	924	15.03	1.31	50	— 498	— 59	16.42	1.17
16	—1030	— 41	15.10	0.85	51	918	580	16.43	1.19
17	— 165	—205	15.21	1.17	52	— 90	—137	16.49	1.35
18	49	— 40	15.25	1.14	53	— 46	—519	16.50	1.02
19	— 17	—368	15.33	0.88	54	—1051	949	16.52	0.87
20	26	—214	15.35	1.09	55	— 445	78	16.54	1.05
21	63	93	15.44	0.98	56	161	—464	16.57	0.99
22	878	285	15.45	1.19	57	271	142	16.60	1.09
23	— 730	—959	15.52	1.62	58	— 518	672	16.60	0.95
24	— 753	919	15.56	0.94	59	— 133	—476	16.62	1.42
25	— 788	287	15.65	1.26	60	— 998	510	16.67	0.78
26	— 572	331	15.65	1.12	61	12	—346	16.69	1.08
27	— 81	568	15.71	0.97	62	240	—456	16.74	0.61
28	— 273	—740	15.72	1.04	63	— 328	—527	16.80	1.20
29	— 606	596	15.76	0.88	64	— 585	—146	16.80	0.87
30	644	173	15.78	0.51	65	121	382	16.83	1.04
31	635	868	15.79	1.37	66	540	507	16.85	0.99
32	— 850	671	15.88	1.36	67	5	—106	16.88	1.07
33	— 937	917	15.92	1.30	68	868	737	16.89	0.96
34	524	910	15.97	1.14	69	— 710	—506	16.93	1.01
35	— 41	— 60	15.99	1.23	70	— 445	615	16.99	1.28

Table 1 (continued)

1	2	3	4	5	1	2	3	4	5
71	—763	— 3	17.00	0.42	108	977	— 88	17.79	0.58
72	438	10	17.07	0.87	109	916	—930	17.83	0.58
73	79	— 65	17.12	0.92	110	— 59	— 5	17.85	0.93
74	—502	— 65	17.14	1.15	111	— 81	—319	17.86	1.31
75	— 74	— 455	17.15	0.55	112	— 477	56	17.86	1.00
76	—383	296	17.20	0.81	113	— 842	198	17.89	0.84
77	246	— 665	17.20	0.91	114	— 87	137	17.92	0.80
78	—578	— 698	17.25	1.14	115	—1028	281	17.96	0.66
79	—134	— 482	17.25	0.94	116	— 728	155	17.98	—
80	300	370	17.26	1.45	117	988	—433	18.02	1.19
81	10	— 155	17.29	1.07	118	492	—389	18.03	1.02
82	438	4	17.29	1.10	119	50	—754	18.04	1.74
83	—821	1004	17.30	0.80	120	304	516	18.05	0.91
84	—807	364	17.32	0.68	121	— 708	59	18.05	0.94
85	807	— 494	17.32	1.06	122	— 150	—430	18.06	0.44
86	—819	694	17.33	1.09	123	— 510	—124	18.07	1.35
87	129	30	17.35	0.89	124	284	491	18.08	1.00
88	—412	587	17.42	1.58	125	— 264	246	18.09	1.57
89	47	— 709	17.43	0.64	126	796	262	18.10	1.14
90	—310	— 327	17.44	0.68	127	764	247	18.12	0.74
91	—463	— 110	17.47	0.75	128	146	283	18.13	0.65
92	305	— 429	17.50	1.26	129	— 143	135	18.16	2.19
93	—178	— 62	17.55	0.97	130	— 72	—800	18.17	1.61
94	—649	— 654	17.57	1.26	131	311	—259	18.19	1.57
95	—853	821	17.57	1.30	132	120	166	18.20	1.01
96	—554	— 584	17.58	0.96	133	63	—366	18.21	1.08
97	— 12	— 260	17.59	0.72	134	— 730	—506	18.23	0.92
98	—865	— 550	17.60	1.10	135	— 304	—206	18.24	1.15
99	—692	— 25	17.65	0.42	136	607	—347	18.25	0.86
100	934	779	17.67	1.02	137	— 37	604	18.27	1.77
101	328	530	17.68	0.03	138	370	856	18.27	1.17
102	109	— 146	17.69	0.31	139	— 169	394	18.29	0.79
103	515	449	17.69	0.73	140	— 56	— 56	18.32	0.78
104	39	— 363	17.72	2.80	141	832	648	18.34	0.50
105	--786	911	17.74	0.95	142	870	922	18.34	0.96
106	480	99	17.76	1.01	143	— 368	295	18.35	1.86
107	—108	— 274	17.78	1.23	144	— 109	—621	18.36	1.15

Table 1 (continued)

1	2	3	4	5	1	2	3	4	5
145	163	−700	18.36	1.47	182	−714	−462	18.65	1.50
146	− 30	−194	18.38	0.76	183	859	253	18.65	0.38
147	930	−617	18.38	2.33	184	621	830	18.65	1.50
148	578	−302	18.39	1.61	185	− 50	−511	18.66	2.3
149	−509	722	18.40	1.49	186	141	−837	18.66	1.41
150	−786	539	18.40	0.92	187	451	−179	18.68	0.58
151	385	−642	18.41	0.85	188	−111	−853	18.68	0.97
152	532	836	18.42	0.54	189	−126	−308	18.70	0.75
153	−139	− 82	18.43	1.03	190	43	−854	18.71	0.73
154	−230	−869	18.44	1.01	191	−817	422	18.72	1.13
155	104	−160	18.45	1.17	192	133	267	18.73	0.74
156	713	−150	18.47	1.07	193	−332	−606	18.73	0.52
157	388	353	18.52	1.42	194	−370	505	18.75	1.91
158	104	−118	18.53	0.81	195	576	−785	18.75	0.07
159	−465	− 96	18.55	0.63	196	−601	− 87	18.77	1.51
160	−301	476	18.55	2.5:	197	−398	−107	18.78	1.18
161	−338	580	18.55	0.20	198	430	57	18.78	0.35
162	−944	157	18.55	0.94	199	−383	541	18.78	0.98
163	−967	767	18.55	1.35	200	857	752	18.82	0.58
164	943	500	18.56	1.22	201	39	−257	18.83	0.88
165	391	442	18.57	1.93	202	−887	700	18.83	1.07
166	−422	−599	18.57	0.69	203	158	109	18.85	1.21
167	−159	− 27	18.58	1.29	204	91	−517	18.85	0.62
168	−755	684	18.58	0.15	205	231	−736	18.86	1.00
169	205	705	18.59	1.21	206	−358	−416	18.87	0.33
170	670	−691	18.59	1.99	207	−561	193	18.87	0.78
171	878	−819	18.59	2.6:	208	971	209	18.88	2.07
172	608	326	18.60	1.24	209	743	−500	18.89	1.05
173	−608	−778	18.60	2.5:	210	−924	660	18.89	0.86
174	−583	46	18.61	1.18	211	−931	195	18.90	1.01
175	39	483	18.62	1.29	212	832	298	18.90	2.9:
176	−655	803	18.63	0.57	213	100	−822	18.91	1.47
177	23	557	18.64	0.89	214	− 21	− 2	18.92	1.48
178	67	135	18.65	0.96	215	−601	45	18.93	1.86
179	−575	64	18.65	1.54	216	307	−264	18.94	1.57
180	299	−465	18.65	0.43	217	816	670	18.96	1.39
181	112	696	18.65	0.85	218	−344	−127	18.96	0.56

Table 1 (continued)

1	2	3	4	5	1	2	3	4	5
219	— 64	619	18.97	1.55	256	— 447	—329	19.29	0.63
220	—173	—556	18.98	2.22	257	163	755	19.30	0.05
221	523	227	18.98	0.40	258	— 685	—532	19.33	0.85
222	— 67	391	18.99	0.69	259	—1014	—474	19.33	0.88
223	334	187	18.99	1.64	260	949	590	19.33	1.33
224	372	165	19.00	1.55	261	— 370	178	19.35	1.91
225	—993	—296	19.00	1.40	262	496	83	19.38	0.74
226	—242	—294	19.01	1.63	263	262	—383	19.38	0.74
227	397	—713	19.01	0.64	264	— 517	— 75	19.40	1.14
228	391	—838	19.02	2.24	265	206	—493	19.40	2.23
229	616	—255	19.03	0.17	266	450	762	19.41	2.5:
230	—459	648	19.03	1.49	267	809	616	19.41	0.65
231	—561	725	19.03	0.66	268	— 755	219	19.41	2.17
232	—487	—417	19.04	1.47	269	— 80	—789	19.41	1.51
233	—579	—175	19.04	1.14	270	— 683	—297	19.42	0.25
234	—859	962	19.04	1.23	271	— 52	319	19.43	2.29
235	—861	357	19.05	0.64	272	—1049	—577	19.45	1.83
236	— 93	—857	19.05	1.06	273	— 850	—771	19.46	0.87
237	—407	392	19.08	0.91	274	316	188	19.47	2.4:
238	37	35	19.09	1.14	275	— 30	—185	19.47	2.05
239	527	938	19.09	1.04	276	135	—661	19.47	0.65
240	—445	—460	19.10	2.9:	277	— 303	750	19.48	0.12
241	—570	— 67	19.11	0.66	278	58	—292	19.49	2.04
242	—885	—652	19.13	1.37	279	429	793	19.50	1.91
243	—398	— 1	19.14	0.46	280	— 602	—781	19.53	2.33
244	813	1003	19.14	2.3	281	159	—170	19.53	1.37
245	—592	18	19.14	1.48	282	— 134	77	19.53	1.40
246	397	—841	19.16	1.11	283	353	302	19.54	1.33
247	856	529	19.16	0.96	284	— 937	—186	19.56	2.20
248	697	876	19.16	0.60	285	956	— 47	19.56	0.99
249	735	—301	19.17	1.31	286	— 248	236	19.56	1.05
250	169	762	19.22	0.37	287	169	256	19.59	1.83
251	444	— 27	19.26	1.41	288	— 129	—341	19.59	0.87
252	507	—359	19.26	0.45	289	— 325	—654	19.59	0.01
253	— 768	114	19.27	—	290	167	—652	19.60	1.12
254	110	—103	19.28	1.47	291	— 182	—912	19.63	1.02
255	718	747	19.29	1.74	292	— 737	—331	19.63	0.87

Table 1 (continued)

1	2	3	4	5	1	2	3	4	5
293	536	354	19.64	0.58	330	637	774	20.01	1.72
294	—197	—342	19.66	1.57	331	796	168	20.01	0.21
295	— 65	—375	19.70	0.31	332	636	316	20.01	0.37
296	602	632	19.71	0.98	333	241	—947	20.03	1.14
297	—605	—105	19.71	0.36	334	775	—112	20.05	0.63
298	—977	291	19.72	1.44	335	587	926	20.06	1.56
299	477	649	19.73	2.16	336	469	554	20.06	1.86
300	270	— 63	19.74	1.81	337	775	832	20.07	—0.21
301	—216	—109	19.77	0.69	338	— 14	—706	20.07	—0.21
302	371	750	19.78	0.80	339	—900	—198	20.08	0.70
303	330	—574	19.78	0.65	340	—137	—575	20.12	0.77
304	918	—125	19.79	0.55	341	382	— 27	20.12	1.13
305	783	—505	19.79	1.11	342	735	—182	20.14	1.35
306	—552	— 76	19.79	0.78	343	—403	140	20.15	1.58
307	495	—428	19.80	1.92	344	—727	589	20.15	0.51
308	—437	992	19.81	1.74	345	522	—553	20.16	0.48
309	729	262	19.81	0.48	346	—485	—608	20.18	0.17
310	—242	—285	19.83	1.91	347	246	86	20.18	0.79
311	—977	—249	19.83	0.95	348	480	—960	20.19	—0.30
312	— 98	—565	19.84	0.39	349	626	518	20.19	1.46
313	90	756	19.84	0.50	350	690	—244	20.19	1.59
314	—756	—228	19.84	1.70	351	—873	52	20.21	1.64
315	488	—681	19.85	0.49	352	—818	—673	20.22	—0.09
316	232	166	19.86	0.74	353	—475	322	20.24	—0.23
317	305	125	19.86	1.23	354	—685	464	20.24	0.74
318	— 18	483	19.87	1.43	355	—567	187	20.28	0.85
319	882	392	19.88	0.98	356	—806	— 77	20.28	0.24
320	358	896	19.89	0.03	357	423	199	20.29	—0.15
321	314	—594	19.89	0.50	358	485	42	20.29	1.61
322	398	676	19.91	1.26	359	—298	45	20.31	—0.20
323	—385	—556	19.92	0.97	360	790	— 26	20.33	0.24
324	—715	971	19.93	0,35	361	390	246	20.37	0.30
325	784	980	19.95	1.30	362	—875	—406	20.41	—0.14
326	164	178	19.95	0.29	363	—493	—426	20.42	1.33
327	608	863	19.96	—0.34	364	268	240	20.43	0.22
328	932	—586	19.99	1.52	365	782	—467	20.45	—0.22
329	—170	— 56	20.00	0.54	366	984	—421	20.47	—0.06

Table 1 (continued)

1	2	3	4	5	1	2	3	4	5
367	495	997	20.48	0.21	396	243	— 865	21.06	0.88
368	574	— 363	20.48	1.36	397	— 845	586	21.08	0.41
369	— 25	— 738	20.54	0.40	398	617	95	21.14	—0.28
370	295	224	20.56	—0.17	399	— 83	— 950	21.18	0.28
371	173	51	20.57	0.33	400	663	636	21.21	0.29
372	— 99	235	20.58	0.28	401	— 540	231	21.21	0.37
373	868	722	20.62	1.28	402	— 915	429	21.26	0.09
374	— 26	— 517	20.63	0.84	403	477	929	21.26	—0.16
375	— 348	— 66	20.66	1.21	404	624	— 665	21.29	0.16
376	— 350	335	20.66	0.91	405	125	97	21.32	0.48
377	97	504	20.69	0.61	406	9	529	21.42	0.27
378	— 386	132	20.75	—0.11	407	420	— 376	21.43	0.04
379	482	— 146	20.75	0.65	408	615	— 744	21.47	0.33
380	— 407	— 510	20.76	0.81	409	498	— 288	21.47	0.20
381	—1038	— 451	20.77	1.19	410	— 266	— 326	21.47	0.29
382	— 983	— 225	20.78	0.91	411	— 561	— 589	21.48	0.17
383	408	230	20.78	0.85	412	— 881	206	21.50	0.02
384	104	767	20.79	1.08	413	— 446	— 776	21.51	0.29
385	300	530	20.82	0.23	414	— 177	— 463	21.54	0.06
386	112	— 934	20.83	0.26	415	563	— 395	21.55	0.02
387	—1001	210	20.83	0.83	416	728	— 278	21.63	—0.25
388	— 684	— 845	20.83	0.72	417	809	346	21.65	—0.11
389	171	— 705	20.86	0.46	418	— 205	140	21.66	0.08
390	719	142	20.89	0.15	419	1000	503	21.68	0.09
391	— 852	836	20.90	0.30	420	— 725	— 844	21.71	0.22
392	— 36	— 560	20.90	0.08	421	— 653	— 837	21.82	0.06
393	— 897	441	20.93	0.97	422	— 429	— 124	21.83	0.16
394	— 775	— 111	21.02	0.27	423	— 512	— 562	—	—
395	427	— 160	21.03	0.67	424	146	13	—	—

completeness limits correspond to the absolute magnitudes $M_B = -16.3$ and $M_V = -17.1$ without correction for galactic absorption. In the list of Table 1 there are 250 galaxies with $V \leqslant 19.2$ from which about 100 are referred to be field galaxies. Thus the number of member-galaxies in the cluster with $V \leqslant 19.2$ and within a radius of 35 arcmin is about 150.

In Fig. 2 the dotted lines in the differential luminosity function histograms (Fig. 2a and c) and crosses in Fig. b and d refer to the data corrected for field galaxies. As it is seen from Fig. 2b and d at the faint end of distributions the dots decline from straight lines only beyond $B = 21.0$ and $V = 20.0$. The application of field correction however decreases these limiting magnitudes for about 1 mag. each.

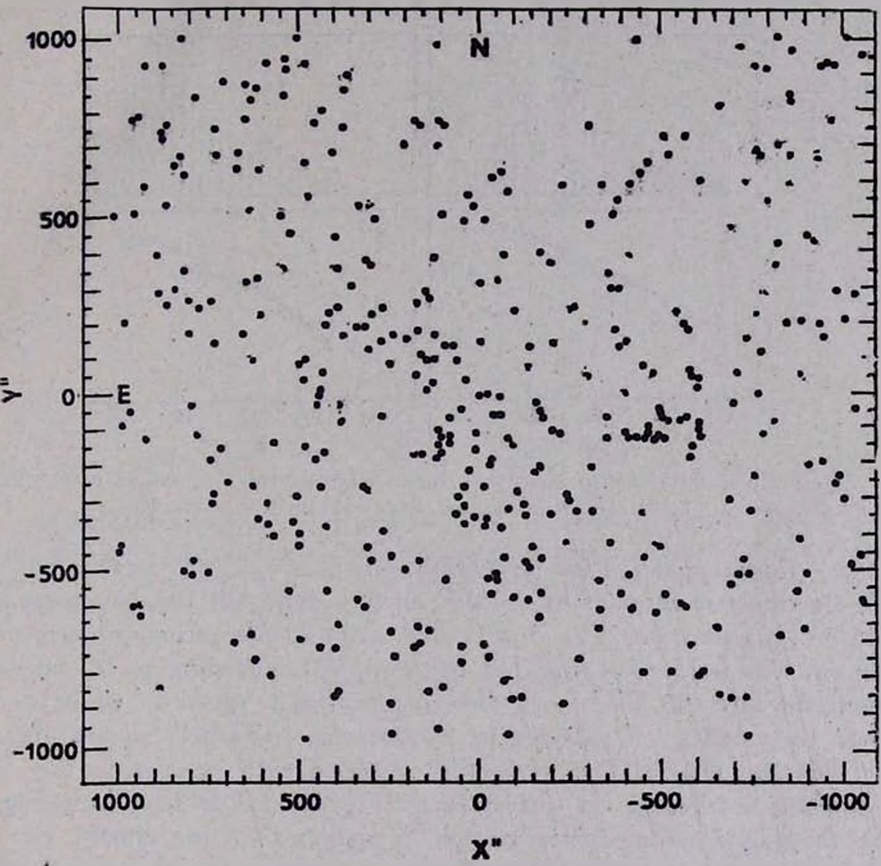

Fig. 1. Identification chart of galaxies in A1213. Tho coordinates of the objects correspond to that in Table 1.

Nevertheless the application of field correction does not change the general form of cumulative luminosity function. In both B and V one can see the changing of slope at the bright ends of the luminosity functions. The characteristic absolute magnitudes are $M_B = -18.9$ and $M_V = -20.3$. The first one coincides with the corresponding value obtained for A1185 in Paper I, while M_V is somewhat brighter and coincides with the value obtained by Abell for Coma cluster [10].

The straight lines in Fig. 2b and d are fitted to the data corrected for field galaxies. They have slopes 0.83 and 0.36 in B and 1.1 and 0.4 in V at the bright and faint parts respectively. In contrast to A1185 both the bright and faint parts of cumulative luminosity function for A1213 are steeper.

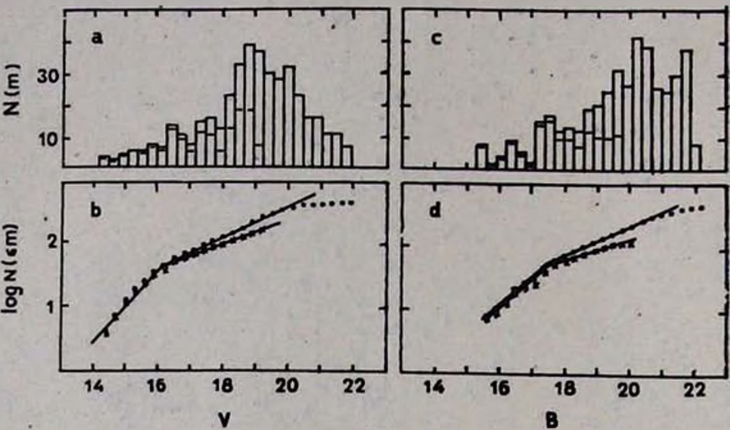

Fig. 2. Differential and cumulative luminosity functions of A1213 in B and V. Solid lines—without field correction, dotted lines—after field correction.

b) *Radial distribution and luminosity segregation effect.* The radial distribution of galaxies in the cluster field till the completeness limit in V is shown in Fig. 3 with and without correction for projected galaxies. The field correction has been applied according to [9] for each magnitude interval. On x-axis the ring radius is plotted, while y-axis shows the number of galaxies in consequent rings per square degree (Fig. 3a) and the relative number of galaxies with respect to the corresponding number in the outest ring (Fig. 3b). It is seen from Fig. 3 that there is a strong concentration of galaxies to the cluster centre. The surface density of galaxies in the central circle of radius 3.′6 is roughly of the order of 2000 per square degree whereas at the distance 35 arcmin it is about 13 times lower (Fig. 3b).

We have also calculated the surface luminosity density on dependence of the distance from the cluster centre. The luminosity densities have been calculated in the same central circle and concentric rings as shown in Fig. 3. In this case however no field correction has been applied. The results are shown in Fig. 4 where the logarithm of luminosity density with respect to the mean surface luminosity density of the cluster is plotted against the radius. The relation may be divided into two parts with significantly different slopes. In fhe central parts of the cluster up to the distance of about 0.5 Mpc (or ~0.15 degree, see Fig. 3) the surface luminosity density decreases very rapidly along the radius. The large difference in the slopes of inner and outer parts

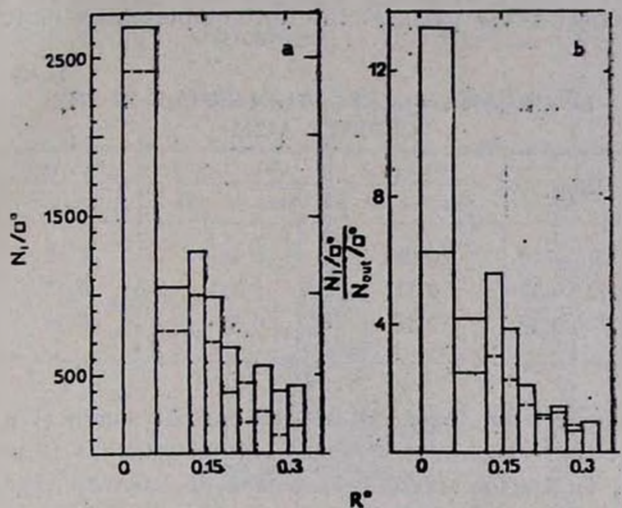

Fig. 3. Radial distribution of galaxies with $V \leqslant 19.2$ along the radius of the cluster. On y-axis are plotted: a) the number of galaxies per square degree, dotted lines-affter field correction; b) the number of galaxies relative to that of in outest ring, solid lines-after field correction.

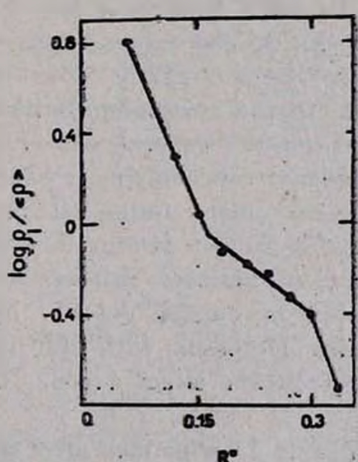

Fig. 4. Surface luminosity density distribntion in the cluster. The logarithm of the luminosity densities in the rings relative to the mean for the measured area of the cluster are plotted against the radius in degrees.

indicates the existence of a core in the cluster with a radius about 0.5 Mpc which is about half of the measured total radius. Slightly more than 50% of total luminosity is included within the core radius.

The luminosity segregation effect in the cluster has been investigated in a way described in Paper I. The results are given in Table 2. The sample contains 249 galaxies till the completeness limit in V.

Table 2

LUMINOSITY SEGREGATION EFFECT IN THE CLUSTER A1213

Ring	$\frac{n_{V<16}}{n_{16<V<19.2}}$	$\frac{n_{V<16.5}}{n_{16.5<V<19.2}}$	$\frac{n_{V<17.0}}{n_{17.0<V<19.2}}$
$0-0.^{\circ}12$	0.28	0.44	0.58
0.12—0.24	0.11	0.17	0.31
0.24—0.33	0.18	0.30	0.39

As it is seen from these data there is some luminosity segregation in the cluster: the relative number of brighter galaxies is greater in the central parts. This effect, however, is less pronounced than in A1185.

c) *Colour distribution and colour segregation effect.* The colour distribution of 420 galaxies with a measured $B-V$ (Table 1) is shown in Fig. 5. The maximum of distribution is at $\sim 1.^{m}0$ which is common for cluster galaxies. The colours however vary in a wide range from -0.4 till to $+3.0$ mag. On the other hand only 5% of galaxies have $B-V >$ > 2.0 and 4% have $B-V < 0$. The existence of negative and very red colours in the sample may be due partly to errors in measurements. A restriction of the sample to the completeness limit in V ($\leqslant 19.2$) gives a distribution different from the general one (Fig. 5, the hatched part of the histogram). In particular relatively more galaxies with $B-V$ smaller than the maximum value are among those with $V > 19.2$. For example, all the galaxies with $B-V < 0$ are fainter than this limit. This means that there is a tendency for fainter galaxies to be bluer. The same effect has been revealad in cluster A1185. Moreover, the relative number of bluer galaxies increases with the increase of the cluster radius, i.e. a colour segregation effect exists. The numerical data are given in Table 3.

All 420 galaxies (Table 1) with measured colours have been used in Table 3. In the last column the number of galaxies with $B-V \leqslant 0.7$ are given with respect to the total number of galaxies in the same ring. The other columns are self-explained. Though the colour segregation effect is not strongly pronounced, nevertheless the scarcity of bluer galaxies in the central part of the cluster is beyond any doubt.

We wish to point out that due to some uncertainties in the determination of ellipticities and position angles of large axes of galaxies the distribution of these parameters is not given in this paper.

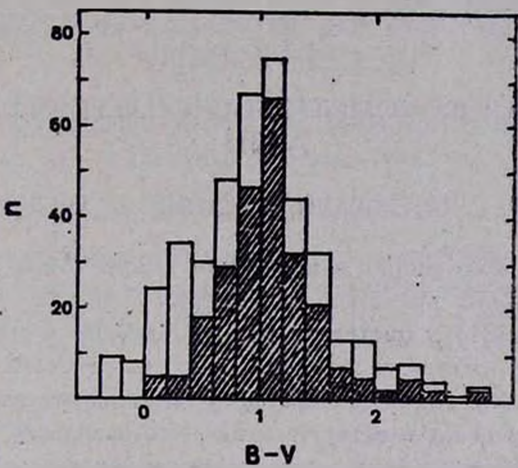

Fig. 5. Colour distribution of galaxies in the cluster. Open areas in the histogram—for all 420 galaxies, hatched areas — for galaxies till the completeness limit of the sample in V,

Table 3

COLOUR SEGREGATION EFFECT IN THE CLUSTER A1213

Ring	$n_{B-V<0.7}$	$n_{B-V>0.7}$	$\frac{n_{B-V<0.7}}{n_{B-V>0.7}}$	$\frac{n_{B-V<0.7}}{N}$
0.0 —0.12	19	79	0.24	0.19
0.12—0.24	68	115	0.59	0.37
0.24—0.33	41	98	0.42	0.29

4. *Summary*. The logarithmic luminosity function of A1213 in both B and V colour bands exhibits a rapid change in the slope at $M_B = -18.9$ and $M_V = -20.3$ respectively. The last value coincides with that of Coma cluster obtained by Abell. The slopes at the bright end of cumulative luminosity functions in B and V differ by a factor 1.3 in V being steeper whereas at the faint end the slopes appear to be the same for both colour bands.

There is a strong concentration of bright and red galaxies towards the centre of the cluster. A significant change of slope is observed in the surface luminosity density-radius relation at about R = 0.5 Mpc. Within this radius the surface luminosity density decreases very rapidly. Combining these results we conclude that in A1213 a core of bright and red galaxies exists surrounded by a corona of fainter and bluer galaxies. Such a structure indicates that the cluster apparently is more or less relaxed.

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ДВУХЦВЕТНАЯ ФОТОМЕТРИЯ СКОПЛЕНИЙ ГАЛАКТИК. II A 1213

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На снимках, полученных в первичном фокусе 2.6-м телескопа Бюраканской обсерватории, проведена фотометрия более 420 галактик в области скопления A 1213 в цветовой системе, близкой к системе *B*, *V*. Построена функция светимости в обоих цветах, исследовано радиальное распределение галактик, эффекты сегрегации галактик по светимости и цвету. Некоторые факты свидетельствуют о том, что скопление A 1213 обладает ядром радиуса около 0.5 Мпс, содержащим, в основном, яркие и красные галактики. Внутри этого радиуса сосредоточено около 50% интегральной светимости скопления.

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