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INTEGRATED MAGNITUDES AND MEAN COLORS OF THE DDO DWARF GALAXIES IN THE *UBV* SYSTEM. I. OBSERVATIONS AND CATALOG

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ABSTRACT

The integrated magnitudes and colors of 163 DDO "dwarf" galaxies in the *UBV* system are derived from 542 photoelectric observations with four telescopes between 1976 and 1980. Total (asymptotic) magnitude B_T, mean color indices $\langle B - V\rangle$, $\langle U - B\rangle$, effective aperture diameter A_e, and mean effective surface brightness m'_e are derived for 150 objects, all but two late-type ($T \geqslant 6$) systems. The total magnitudes are in the range $11.1 < B_T \leqslant 15.8$. The mean surface brightness m'_e is in the range $22.3 \leqslant m'_e \leqslant 25.9$ mag arcsec^{-2}; it is in all cases fainter than the night sky (22.2) and, in the mean, fainter than in the (non-DDO) late-type galaxies in the *Second Reference Catalogue of Bright Galaxies* (RC2), for which $20 < m'_e < 24$. The accidental errors in the photometry, discussed in Appendix B, are correspondingly larger. The luminosity distributions follow closely the standard magnitude-aperture curves for the appropriate types and are characteristic of exponential disks with vanishingly small spheroidal components. The color-aperture relations indicate a slight bluing with increasing aperture, contrary to earlier findings for the brighter (non-DDO) late-type systems in RC2. There is no clear indication of a dependence of color on axis ratio (i.e., inclination) or surface brightness. Mean colors corrected to the standard effective aperture and for galactic extinction are calculated. The magnitude estimates of Fisher and Tully are reduced to the B_T system. Their systematic errors depend on mean surface brightness, diameter, and axis ratio. The corrected magnitudes so derived for 244 objects have mean errors of ~0.5 mag and may be used as first approximations for the 79 objects not yet measured by us. The physical properties of the DDO sample will be discussed in Paper II.

I. INTRODUCTION

Dwarf galaxies are by far the most abundant type of stellar system in the universe. They are also the least common in standard galaxy catalogs, which, for well-known reasons, are dominated by giant systems of high surface brightness. Dwarf galaxies, particularly those of low surface brightness, are almost totally absent. The first systematic search for such objects by van den Bergh (1959) at the David Dunlap Observatory (DDO) yielded 222 objects larger than 1'.0 found on the POSS blue prints north of − 23° declination. An additional list of 21 objects in the zone $-33° < \delta < -23°$ (van den Bergh 1966) brought the total to 243 for which classifications and luminosity classes were provided. Most are late-type spirals and Magellanic irregulars of types $6 \leqslant T \leqslant 10$ in the revised Hubble system as given in the Second Refence Catalogue (RC2) (de Vaucouleurs, de Vaucouleurs, and Corwin 1976). Because of their low surface brightness, few of these systems have been studied in any detail at optical wavelengths, even though nearly all are hydrogen-rich and easily detected in emission at 21 cm (Balkowski *et al.* 1974; Fisher and Tully 1975; Thuan and Seitzer 1979). In the most recent H I line survey by Fisher and Tully (1975, 1981) 179 DDO dwarfs were detected. In the absence of optical photometry for the vast majority of these objects, Fisher and Tully (1975) attempted to estimate magnitudes by visual inspection of the POSS prints. Such estimates are subject to large systematic errors, and the need for proper photometry is obvious. As part of a comprehensive program of photometric studies of late-type spirals and Magellanic iregulars, we have secured between March 1976 and May 1980 some 542 photoelectric observations in the *UBV* system of 163 DDO objects with the telescopes listed in Table I.* Although the survey is currently only 67% complete, the sample available is already large enough to derive valid statistics and, in particular, to reduce the Fisher-Tully "magnitudes" to a well defined system of total *B*-band magnitudes. We consider it advisable not to defer publication of our data, (i) because of the current interest in the theory of galaxy formation and in the physics of galaxy evolution, particularly of dwarf systems (Searle, Sargent, and Bagnulo 1973; Lequeux 1979; Gerola, Seiden, and Schulman 1980; see also the recent ESO/ESA workshop report by Tarenghi and Kjar 1980), (ii) because the majority of the remaining objects are among the faintest and most difficult to observe and further progress will be slow, and (iii) because the DDO list itself is by no means a "complete sample" to any definite limit of magnitude or diameter. Indeed the fre-

*This program is continuing and will be extended to the southern sky to include the numerous low-luminosity dwarfish systems discovered on the IIIa-J UK Schmidt plates south of − 18° declination (Corwin, de Vaucouleurs, and de Vaucouleurs 1977, 1978, 1980).

TABLE I. *UBV* photometry of DDO dwarfs.

Series	Date	Phot[a]	Tel (cm)	Mode	Observers[b]	Nights	Galaxies	Observ.
13	65/10	37	92	DC	GV	1	1	1
21	73/11	WA	92	DC	GV,AV	1	1	3
23	75/04	VP3	92	DC	HC	1	1	1
24	75/10	VP3	92	DC	HC	1	3	6
25	76/03	VP3	76	DC	HC	3	3	7
27	76/10	VP2	92	PC	WP	3	8	22
28A	77/03	VP2	92	PC	WP,JLN	6	30	59
28B	77/09	VP2	92	PC	WP,JLN	3	8	23
29A	77/11	WA	92	DC	GV,AV	6	37	64
30	78/04	WA	92	DC	GV,AV	3	12	24
HC	78/06,09	*	100*	PC	HC	2	8	8
02B	78/10-11	P24K	92	PC	RB	4	8	23
03B	78/12	P24J	92	PC	RB	4	10	25
04B	79/01	P24J	76	PC	RB	1	1	3
05B	78/02-03	P24K	92	PC	RB	5	23	67
06B	79/04	P24K	92	PC	RB	3	5	15
31	79/05	WA	207	DC	GV,AV	1	1	3
09B	79/10	P24K	92	PC	RB	5	14	40
10B	79/12	P24K	92	PC	RB	5	17	41
33	79/12	WA	207	DC	GV,AV	2	3	6
11B	80/03	P24K	92	PC	RB	2	10	29
12B	80/04	P24K	92	PC	RB	5	22	65
35	80/04	WA	207	DC	GV,AV	1	2	5
13B	80/05	P24K	92	PC	RB	1	1	4

*St. Andrews photometer at South African Astron. Obs. (Corwin 1980).
[a]WA: photometer option of Galaxymeter.
[b]Observers: RB: Ron Buta; HC: Harold Corwin; JLN: Jean-Luc Nieto; WP: William Pence; GV: G. de Vaucouleurs; AV: A. de Vaucouleurs.

quency function of apparent diameters ϕ suggests that the DDO survey is incomplete at all $\phi < 10'$ (de Vaucouleurs 1975, p. 589).

In the present paper we will report on the observations (Sec. II), derive total B_T magnitudes, effective apertures A_e, and mean colors for 150 objects (Sec. III), study the mean luminosity profiles of each type T (Sec. IV), discuss the mean effective surface brightness m'_e and the effective and isophotal diameter (Sec. V), discuss the color gradients and effective colors (Sec. VI), and reduce the Fisher-Tully magnitudes M_{pg} to the B_T system (Sec. VII) to provide at least approximate magnitudes for the remaining 79 DDO objects as yet unobserved by us. The observing log is given in Appendix A and a detailed error analysis in Appendix B.

In a follow-up paper we will evaluate distances and discuss the absolute magnitudes, luminosity function, and other physical properties of the DDO dwarfs and other late-type galaxies.

II. OBSERVATIONS AND CATALOG

Several photometers with the standard sets of *UBV* filters were used by the observers listed in Table I, which gives also for each series of observations from March 1977 to May 1980 the dates, photometer designations, and telescopes used. Previously published observations of 17 objects (de Vaucouleurs and de Vaucouleurs 1972; de Vaucouleurs, de Vaucouleurs, and Corwin 1978) are also included for completeness.

The data acquisition and reduction were done in the same manner as in previous series. Each observation consisted of five 10-s integrations on the galaxy and four on the sky in each color. Bright Johnson standard stars were observed in dc mode and fainter Landolt standards in pulse-counting mode. The adopted magnitudes and colors are from a second approximation of the reduction using mean extinction and transformation coefficients for each series; this procedure improved the precision of the nightly zero points. A total of 163 DDO galaxies were observed on 69 nights.

The catalog of observations is given in Appendix A. Duplicate observations with the same aperture or with $\Delta \log A \leqslant 0.05$ were used to estimate the internal errors. From 70 duplicate observations of 39 objects, we find for the rms mean error σ_1 of one observation:

	V	$B-V$	$U-B$	B
σ_1 (mag)	0.186	0.164	0.124	0.114

These mean errors are larger than in the case of bright normal galaxies because of the difficulty of observing low surface brightness objects with low S/N ratios. Many were not even visible through the eyepiece of the photometer and centering was done by means of field stars with the help of finding charts. The errors vary with the mean integrated magnitude, from $\sigma_1(V) = 0.09$ at $\langle V \rangle = 13.0$ to $\sigma_1(V) = 0.23$ at $\langle V \rangle = 15.0$. A more detailed error analysis is presented in Appendix B.

III. TOTAL MAGNITUDES, EFFECTIVE APERTURES, AND MEAN COLORS

The standard luminosity curves given in RC2 for each morphological type (see alse de Vaucouleurs 1977) were graphically fitted to the B (log A) plots for each object to determine the total magnitude B_T. A minimum of two or three apertures is necessary with, if possible, one or two apertures $A > D(0)$, if $D(0)$ is the face-on isophotal diameter in the RC2 system. The diameter A_e of the effective aperture which transmits half the total B luminosity was read by interpolation. The two dwarf ellipticals ($T = -5$) DDO 93 and 132 did not follow the standard curve for normal E galaxies. We cannot conclude from just these two objects that this is a general property of dwarf elliptical galaxies, but this result is confirmed by detailed surface photometry of several other examples (de Vaucouleurs and Ables 1965; Hodge 1971; Hodge *et al.* 1965).

Table II lists for 150 galaxies the following data: (1) identification; (2) DDO number; (3) type T; (4) luminosity class; (5) log of axis ratio R at $\mu = 25.0$ mag arcsec^{-2}; (6) A_B, galactic extinction in the B system; all taken from RC2; (7) B_T, observed total magnitude in B system, determined as indicated above; (8) $\log A_e$, diameter of effective aperture (in 0'.1); (9) $\xi(0) = \log \rho(0) = \log D(0) - \log A_e$ = isophotal diameter in units of effective aperture; (10) m'_e, mean surface brightness in B mag arcsec^{-2} within effective aperture A_e; (11) $\langle X \rangle$, mean value of log $[A/D(0)]$; (12) and (13) observed mean color indices $\langle B-V \rangle$, $\langle U-B \rangle$, and number n of observations used in the means; (14) asterisks which refer to notes at the end of the table.

Uncertain values of B_T are given only to the nearest 0.1 mag. The range of B_T is $11.1 < B_T \leqslant 15.8$.

For some of the brighter and well-known objects, total magnitudes had previously been published either in RC2 or in a revised (post-RC2) list of weighted mean values B_T^W (see de Vaucouleurs and Bollinger 1977 and de Vaucouleurs and Head 1978). The comparison is set out in Table III. With two exceptions where the older measurements had low weight, the systematic agreement is good, particularly with B_T^W, for which

$$\langle \Delta B_T(\text{new} - B_T^W) \rangle = +0.01 \pm 0.04 \quad (n = 9)$$

with a standard deviation $\sigma_{12} = 0.12$ mag. We conclude that our new total magnitudes are precisely on the revised RC2 system.

Only two galaxies (A 0957+05, I 3475 = DDO 70, 132) had previous estimates of $\log A_e$; the residuals (new − RC2) are −0.04 and +0.05, indicating good agreement.

Total (asymptotic) colors could not be derived by the RC2 procedures because the color gradients (Sec. VI) do not obey the standard curves used in RC2. The effective colors derived from $\langle B-V \rangle$, $\langle U-B \rangle$ are discussed in Sec. VI.

IV. MEAN LUMINOSITY PROFILES

Once B_T and A_e are known, we can test the validity of the standard magnitude-aperture curves used by comparing the observed $(\Delta B)_O = B(\xi) - B_T$, where $\xi = \log(A/A_e)$, with the values $(\Delta B)_S$ calculated from the standard curves for each type. The agreement is very close in the mean (Fig. 1). A quantitative fit for the residuals by

$$O - S \equiv (\Delta B)_O - (\Delta B)_S = a + b(\xi - \langle \xi \rangle) \tag{1}$$

shows that in general the slope b is negligibly small (Table IV). A small, possibly significant zero-point difference, $\langle a \rangle = 0.015 \pm 0.004$ mag, is suggested, particularly for types 9 and 10 (Sm and Im). If real, it means that the total magnitudes derived here by graphical fits of the observations to the standard curves may have underestimated the total luminosities by 0.01–0.02 mag. We regard this difference as negligible since the standard deviation of the observations about this mean is $\sigma_1(O-S) = 0.11$ mag (no rejection) or 0.08 mag after 2σ rejection of the most aberrant points.

We conclude that the mean luminosity profiles of the (nonelliptical) DDO dwarf systems obey closely the exponential distributions characteristic of the late-type disk galaxies and nondwarf Magellanic irregulars (see e.g., de Vaucouleurs and Freeman 1972).

V. MEAN EFFECTIVE SURFACE BRIGHTNESS; EFFECTIVE AND ISOPHOTAL DIAMETERS

From B_T and A_e we derive the mean surface brightness m'_e *within* the effective aperture:

$$m'_e = B_T + 0.75 + 5 \log A_e + 3.63, \tag{2}$$

where m'_e is in mag arcsec^{-2} if A_e is in 0'.1 units. Because A_e is a metric diameter, independent of surface brightness and galactic extinction, m'_e (or more precisely $m'_e - A_B$) is an intrinsic measure of the average specific intensity of the galaxy within the effective aperture whose diameter coincides with the effective diameter D_e when the luminosity profile has circular symmetry

TABLE II. Total magnitudes and mean colors.

Object	DDO#	T	L	log R	A_B	B_T	log A_e	ξ(0)	m'_e	<X>	<B-V>	n	<U-B>	n	Notes
A0001+14	222	9	9	0.13	0.25	15.30	0.96	0.41	24.48	-0.23	0.82	4	-0.22	4	
N0045	223	8	8	0.15	0.21	11.20	1.59	0.28	23.53	-0.42	0.70	5	-0.01	5	
A0017+10	2	9	9	0.08	0.23	13.85	1.09	0.30	23.68	-0.32	0.43	5	-0.11	5	
A0031+31	4	9	9*	0.01	0.31	15.0:	1.21	0.06	25.43	-0.23	0.29:	3	-0.14	3	
A0031-31	224	10*	8*	0.02	0.22	13.70	1.35	-0.03	24.83	+0.09	0.48	3	-0.34	3	
I1558	225	8	8*	0.15	0.21	12.64	1.47	0.02	24.37	-0.23	0.42	9	-0.12	9	
I1574	226	10	8	0.35	0.21	14.40	1.05	0.18	24.03	-0.08	0.61	9	-0.04	9	
A0043-11	5	9	9	0.10	0.20	14.42	1.01	0.30	23.85	-0.12	0.40	5	-0.25	5	
A0107+49	9	10*	9	0.03	0.61	14.9:	0.97	0.40	24.13	-0.48	0.76:	2	-0.25:	2	
A0118+12	10	9	8*	0.29	0.23	14.70	1.00	0.31	24.08	-0.07	0.64	6	-0.16	6	
A0127+25	11	9	9*	0.18	0.28	14.70	0.96	0.27	23.88	-0.09	0.74	4	-0.15	4	
A0132+04	12	10	9*	0.27	0.22	14.0:	1.50	0.02	25.88	+0.02	0.29	2	0.23	2	
A0137+15	13	10	9	0.09	0.25	14.7:	1.11	0.55	24.63	-0.12	-0.07	2	-0.11	2	
A0145-12	14	10	8	0.07	0.23	13.70	1.18	0.25	23.98	-0.40	0.50	6	0.02:	6	
A0147-13	15	10	9	0.05	0.23	15.32	0.93	0.28	24.35	-0.17	0.53	3	-0.18	2	*
A0200+21	17	10	9	0.02	0.29	14.40	1.05	0.30	24.03	-0.02	0.44	4	-0.16	4	
A0208+06	18	9*	9	0.00	0.26	14.95	1.12	0.24	24.93	-0.15	0.46	2	0.03:	1	*
A0221+35	19	9	9*	0.10	0.42	14.02	1.30	0.14	24.90	-0.16	0.56	3	-0.29	3	
A0223-21	21	9*	9	0.04	0.23	14.00	1.23	0.10	24.53	-0.30	0.33	3	0.07	3	
A0223-10	20	9	8*	0.39	0.25	14.5:	1.15	0.24	24.63	+0.21	0.13	2	-0.30	2	
A0228-10	23	10	8	0.15	0.26	14.9:	0.77	0.52	23.13	0.00	0.64	2	-0.53:	2	
A0229+38	22	10	9	0.24	0.48	15.6:	0.93	0.39	24.63	-0.26	0.31	4	-0.13	4	
A0230+33	25	10	9	0.01	0.41	13.9:	1.18	0.14	24.18	-0.02	0.56	2	-0.26	2	
A0230+40	24	10	8*	0.06	0.52	14.2:	1.00	0.52	23.58	-0.63	0.60	2	-0.04	2	
A0231+29	26	10	9	0.27	0.38	15.20	0.92	0.35	24.18	-0.23	0.42	5	0.03:	4	*
A0245+03	28	9*	9	0.00	0.30	13.4:	1.55	0.20	23.98	-0.21	0.49	2	-0.24	2	
A0246+01	29	9	9	0.00	0.29	14.10	1.23	0.52	24.63	-0.44	0.63	3	-0.13	3	
A0249-01	30	9	9	0.10	0.29	14.4:	1.17	0.44	24.63	-0.31	0.44	2	-0.33	2	
N1253A	31	9	9*	0.22	0.31	14.4:	0.86	0.32	23.08	-0.04	0.38	4	-0.29	4	
A0312-04	32	10	9*	0.06	0.31	14.10	1.11	0.16	24.03	-0.15	0.37:	2	-0.13	2	
A0441+74	33	10	8*	0.32	0.67	15.0:	0.89	0.34	23.83	-0.29	0.65	2	-0.11	2	
A0446+00	34	10*	9	0.13	0.51	14.30	1.25	-0.04	24.93	-0.04	0.49	3	-0.20:	3	*
A0447-29	228	9*	9	0.07	0.27	13.06	1.23	0.25	23.59	-0.37	0.52	4	-0.29	4	
A0450-25	229	9	8	0.01	0.29	13.24	1.30	0.27	24.12	-0.38	0.48	2	-0.20	2	
A0500+16	35	10*	9*	0.00	0.99	15.0:	1.02	0.29	24.48	-0.03	0.62:	3	-0.05:	3	
A0505-16	36	9	8	0.22	0.37	13.6:	1.15	0.17	23.73	-0.02	0.54	2	-0.18	2	
A0508-31	230	9*	8*	0.08	0.28	12.98	1.20	0.23	23.36	-0.12	0.40	3	-0.23	3	
N1879	232	10	9	0.06	0.29	13.1:	1.10	0.24	22.98	-0.15	0.45	2	-0.17	2	
A0558-28	233	9	9	0.22	0.39	14.34	1.08	0.25	24.13	-0.22	0.42	4	0.29	4	
A0700+56	40	10	9	0.10	0.42	14.58	1.01	0.14	24.01	-0.05	0.52	5	-0.25	5	
A0705+53	41	10	9*	0.07	0.42	15.10	1.12	0.01	25.08	+0.11	0.79:	2	-0.23:	2	
A0724+40	43	10	9*	0.12	0.39	15.02	0.94	0.23	24.10	-0.13	0.28:	3	-0.21	3	
A0738+40	46	10	9	0.01	0.36	14.15	1.22	0.05	24.63	-0.02	0.46	2	-0.30	2	
A0739+16	47	10	9?	0.09	0.44	13.54	1.47	0.18	25.27	-0.27	0.46	4	-0.10	4	
A0754+58	48	9	8*	0.44	0.33	14.90	1.22	0.06	25.38	-0.14	0.67	3	+0.04	3	*
A0807+46	49	10	8*	0.04	0.30	14.22	0.94	0.32	23.30	-0.16	0.39	5	-0.29	5	
A0813+70	50	10	8	0.09	0.36	11.12	1.67	0.19	23.85	-0.55	0.32	3	-0.33	3	*
A0825+42	52	10	9	0.26	0.28	15.1:	1.10	0.15	24.98	-0.06	0.59:	2	0.47:	2	
A0829+66	53	10	9	0.05	0.33	14.5:	1.03	0.19	24.03	-0.03	0.34	2	-0.43	2	
A0905+06	54	9	9	0.04	0.26	14.65	1.10	0.18	24.53	-0.15	0.56	4	0.04	4	
A0908-14	57	10	9	0.00	0.38	14.52	1.13	0.11	24.55	-0.13	0.40	4	-0.24	4	
A0909+35	55	9?	9*	0.19	0.24	14.82	1.06	0.23	24.50	-0.19	0.43	5	-0.11	5	
A0910+19	58	10	9	0.04	0.24	15.18	0.94	0.27	24.26	-0.12	0.36	4	-0.22	4	
A0911+39	59	9	9	0.39	0.24	15.40	0.81	0.36	23.83	-0.07	0.27	5	-0.22	5	
A0917-12	60	10	9	0.06	0.34	14.4:	1.08	0.05	24.18	-0.25	0.47	2	-0.25	2	

TABLE II. (continued)

Object	DDO#	T	L	log R	A_B	B_T	log A_e	ξ(0)	m'_e	<X>	<B-V>	n	<U-B>	n	Notes
A0918-12	61	10	9	0.08	0.34	14.9:	0.91	0.16	23.83	-0.19	0.58	2	-0.28	2	
A0936+71	63	10	9	0.07	0.32	13.06	1.53	0.00	25.09	-0.27	0.02	2	-0.09:	2	*
A0942-31	235	8	8	0.09	0.56	13.34	1.02	0.30	22.82	-0.21	0.38	4	-0.27	4	
A0947+31	64	10	8*	0.37	0.21	14.40	1.02	0.24	23.78	+0.04	0.18	2	-0.57	2	
A0953+69	66	10	9	0.08	0.30	14.3:	1.35	0.02	25.43	-0.18	0.70	2	-0.48	2	
A0953+29	68	10	-	0.37	0.21	14.80	0.87	0.46	23.53	-0.13	0.25	5	-0.32	5	
A0956+30	69	10	9	0.19	0.21	12.7:	1.63	0.01	25.23	-0.03	0.21	3	-0.17	3	*
A0957+05	70	10	8	0.14	0.22	11.86	1.46	0.17	23.54	-0.32	0.45	4	-0.17	4	*
N3057	67	8	7	0.18	0.38	13.42	1.03	0.31	22.95	-0.26	0.51	6	-0.16	6	
A1005+29	72	9	9*	0.19	0.20	15.60	0.83	0.31	24.13	-0.17	0.59	3	0.03	3	
A1006+30	73	10	9	0.02	0.20	14.75	0.98	0.26	24.03	+0.30	0.62	2	-0.14:	2	
A1008-13	76	10	9*	0.37	0.29	15.22	0.93	0.31	24.25	-0.05	0.69	2	-0.02	2	
A1020+71	77	8	8	0.16	0.30	12.75	1.28	0.22	23.53	-0.46	0.60	3	-0.06	3	
A1021+15	79	8	8	0.12	0.19	14.35	1.10	0.32	24.23	-0.28	0.68	5	-0.19	5	
A1026+70A	80	9	9*	0.26	0.30	13.84	1.15	0.35	23.97	-0.31	0.54	2	-0.19	2	
A1026+70B	82	9	9*	0.21	0.30	13.48	1.13	0.35	23.51	-0.44	0.67	3	-0.04	3	
A1033-24	238	8	8*	0.10	0.35	13.26	1.30	0.18	24.14	-0.44	0.52	3	-0.12	3	
A1033+31	83	10	9	0.22	0.19	15.0:	1.21	0.05	25.43	-0.07	0.06:	2	-0.45:	2	
A1039-23	85	9	9	0.03	0.33	14.05	1.05	0.16	23.68	-0.17	0.51	3	-0.06	3	
A1039+34	84	10	9	0.04	0.20	13.65	1.42	0.22	25.13	-0.04	-0.06:	2	-0.43	2	
A1041+60	86	10	9	0.08	0.25	15.32	0.97	0.26	24.55	-0.19	0.18	3	-0.06:	3	
N3377A	88	9	9	0.01	0.19	14.20	1.08	0.22	23.98	-0.20	0.60	5	0.01	5	
A1406+65	87	10	9	0.00	0.27	15.20	1.09	0.38	25.03	-0.36	0.32	4	-0.07	4	
A1407+19	89	10	-	0.29	0.19	14.85	0.93	0.16	23.88	+0.05	0.43	5	-0.20	5	
A1103+20	91	9	9	0.00	0.18	14.75	1.06	0.23	24.43	-0.10	0.44	2	-0.23	2	
A1110+22	93	-5	-	0.05	0.18	12.70	1.70	0.44	25.58	-0.74	0.71	3	0.17	3	*
A1117+02	94	10	9	0.23	0.20	13.7:	1.23	0.10	24.23	-0.14	0.45	2	-0.26	2	
N3664	95	9	8*	0.02	0.20	13.14	1.14	0.16	23.22	-0.04	0.37	5	-0.31	5	
A1140+59	96	9	9	0.06	0.24	14.5:	1.26	-0.04	25.18	-0.03	0.68	2	-0.43	2	*
A1148+56	98	10	8*	0.05	0.23	14.18	1.05	0.15	23.81	-0.10	0.39	5	-0.26	5	
A1148+39	99	10	9*	0.36	0.19	13.48	1.30	0.21	24.36	-0.47	0.18	3	-0.26	3	
A1149+52	100	9	8	0.07	0.22	14.30	1.09	0.36	24.13	-0.41	0.50	3	-0.08	3	
A1153+31	101	10	9	0.19	0.19	14.80	1.01	0.26	24.23	-0.23	0.77	3	0.11	3	
A1155-14B	103	8?	-	0.04	0.25	14.64	0.77	0.30	22.87	-0.03	0.41	3	-0.19	3	
N4025	107	6	7*	0.22	0.19	14.06	0.97	0.48	23.29	-0.27	0.54	5	-0.09	5	
A1208+18	112	10	8	0.69	0.19	15.8:	0.96	0.17	24.98	+0.01	0.76:	1	-0.28:	1	*
A1212+13	114	10	8*	0.40	0.19	15.4:	0.98	0.11	24.68	+0.10	0.68	2	-0.23	2	
I3059	115	10	9*	0.07	0.19	14.7:	1.09	0.14	24.53	-0.04	0.57	2	0.07	2	
N4288	119	9	8?	0.13	0.21	13.26	0.93	0.41	22.29	-0.26	0.42	5	-0.23	5	
A1218+46	120	10	8	0.28	0.21	13.44	1.20	0.15	23.82	-0.11	0.31	5	0.01	5	
A1222+70	122	9	9	0.00	0.29	13.10	1.23	0.29	23.63	-0.36	0.56	5	0.00	5	
A1223+58	123	10	8	0.12	0.24	12.8:	1.38	0.02	24.08	-0.36	0.37	3	-0.15	3	
I3355	124	10	8	0.35	0.19	15.45	0.68	0.35	23.23	+0.16	0.34	2	-0.24	2	
A1224+37	126	10	9	0.16	0.19	14.22	1.03	0.56	23.75	-0.39	0.30	2	-0.30	2	
A1225+43	125	10	8	0.21	0.20	12.90	1.27	0.28	23.63	-0.24	0.44	3	-0.18	3	
A1226+37	127	9	9	0.26	0.19	14.96	0.87	0.39	23.69	-0.22	0.42	3	-0.12	3	
A1226+43	129	10	9	0.02	0.20	13.72	1.25	0.27	24.35	-0.36	0.34	4	-0.26	4	
I3475	132	-5	-	0.02	0.19	13.82	1.30	0.11	24.70	0.03	0.54	4	0.22	4	
A1230+31	133	10	9	0.14	0.19	13.15	1.52	0.20	25.13	-0.42	0.51	3	-0.20	3	
N4523	135	8	9*	0.02	0.19	14.42	0.91	0.50	23.35	-0.37	0.37	3	-0.08	3	
I3617	140	10	8*	0.29	0.20	14.32	0.88	0.17	23.10	-0.01	0.25	3	-0.22	3	
A1241-05	142	9	9*	0.14	0.22	12.88	1.24	0.21	23.46	-0.29	0.64	4	0.03	4	
N4707	150	9	9*	0.03	0.22	13.44	1.03	0.33	22.97	-0.17	0.63	2	0.02	2	
N4789A	154	10	8	0.19	0.19	13.97	1.13	0.28	24.00	-0.31	0.29	5	-0.32	5	
A1255+03	158	8	8	0.05	0.20	14.42	0.92	0.30	23.40	-0.18	0.37	3	-0.08	3	

TABLE II. (continued)

Object	DDO#	T	L	log R	A_B	B_T	log A_e	ξ(0)	m'_e	<X>	<B-V>	n	<U-B>	n	Notes
A1256+14	155	10	9	0.04	0.19	14.66	0.88	0.19	23.44	+0.15	0.30	7	-0.51	7	*
A1300-17	161	10	-	0.73	0.26	13.52	1.04	0.47	23.10	-0.35	0.35	4	-0.32	4	
N4948A	162	7	8	0.09	0.23	13.95	0.90	0.24	22.83	-0.10	0.56	3	-0.16	3	
A1304+67	165	10	8	0.22	0.28	12.80	1.36	0.10	23.98	-0.30	0.32	4	-0.22	4	
A1310+36	166	10	8	0.05	0.19	13.52	1.13	0.25	23.55	-0.32	0.46	3	-0.13	3	*
A1312+46	168	10	8	0.38	0.21	12.70	1.32	0.12	23.68	-0.40	0.44	3	-0.24	3	
A1316-08	171	10	9*	0.14	0.23	14.04	1.00	0.11	23.42	-0.07	0.47	3	-0.07	3	
A1316+42	172	7	8	0.21	0.20	14.40	1.01	0.33	23.83	-0.30	0.48	3	-0.18	3	
A1318+10	173	9	8*	0.22	0.20	14.08	1.04	0.26	23.66	-0.26	0.49	3	-0.03	3	
A1327+45	176	8	8	0.48	0.21	14.45	0.93	0.31	23.48	-0.20	0.41	3	-0.30	3	
A1334+46	177	7	9	0.07	0.21	14.13	1.02	0.19	23.61	-0.17	0.48	3	-0.10	3	
A1334+07	179	10	8	0.24	0.22	13.20	1.20	0.26	23.58	-0.42	0.49	3	-0.14	3	
A1335-09	180	9	8*	0.00	0.24	12.75	1.12	0.21	22.73	-0.29	0.60	3	-0.05	3	
N5264	242	10	8	0.35	0.35	12.64	1.12	0.09	22.62	-0.14	0.55	4	-0.02	4	
A1348+38	183	10	8	0.19	0.19	14.38	1.11	0.14	24.31	-0.21	0.45	4	-0.14	4	*
A1352+54	185	9	8	0.46	0.23	13.8	1.16	0.33	23.98	-0.38	0.49	7	-0.21	7	*
N5477	186	9	8	0.08	0.23	14.34	0.79	0.43	22.67	-0.03	0.34	3	-0.40	3	
A1413+16	188	10	9	0.03	0.24	15.12	0.96	0.31	24.30	-0.23	0.47	3	-0.01	3	
A1413+23	187	10	-	0.09	0.23	14.35	1.04	0.19	23.93	-0.13	0.20	5	-0.17	5	
A1422+44	190	10	7*	0.00	0.20	13.30	1.03	0.28	22.83	-0.09	0.27	5	-0.19	5	
A1423+56	191	7	9	0.14	0.24	14.45	1.00	0.30	23.83	-0.20	0.49	5	-0.05	5	
A1433+59	193	8	9	0.20	0.25	14.82	0.81	0.40	23.25	-0.17	0.48	3	-0.11	3	
A1446-09	197	10	-	0.18	0.33	13.28	1.19	0.24	23.61	-0.03	0.52	3	-0.35	3	
A1535+44	200	9	9	0.24	0.22	14.9:	0.93	0.23	23.93	+0.03	0.40	2	-0.14	2	
A1539+00	201	10	8	0.41	0.39	14.62	1.18	-0.11	24.90	+0.12	0.35	2	-0.19	2	
A1547+81	203	8	8	0.33	0.41	13.75	1.08	0.27	23.53	-0.17	0.61	2	-0.13	2	
A1614+47	204	9	8	0.09	0.24	13.58	1.20	0.23	23.96	-0.23	0.51	5	-0.17	5	
A1616+63	205	10	8	0.27	0.30	14.82	0.80	0.35	23.20	-0.34	0.48	3	-0.25	3	
A1653+53	206	8	9	0.11	0.28	15.25	1.08	0.04	25.03	-0.08	0.53	3	-0.26	3	
A1717+14	207	9	9*	0.03	0.51	15.26	1.13	0.12	25.29	+0.05	0.96	2	-0.68	2	
A2207-19	211	10	9	0.41	0.29	14.52	0.98	0.19	23.80	-0.13	0.39	3	-0.28	3	
A2214-21	212	10	8	0.40	0.28	14.73	0.85	0.40	23.36	-0.21	0.42	3	-0.23	3	
A2231+32	213	9	9	0.07	0.48	14.18	1.18	0.25	24.46	-0.39	0.57	3	-0.05	3	
A2233-03	214	9	8	0.06	0.27	13.35	1.21	0.11	23.78	+0.04	0.43	5	-0.07	5	*
A2236-05	215	10	-	0.49	0.27	15.00	1.07	0.02	24.73	+0.01	0.41	5	-0.20	5	
A2326+14	216	10	9	0.19	0.27	12.2:	1.70	-0.09	25.08	0.00	0.65	3	0.16	3	
A2327+40	217	9	9*	0.07	0.48	12.70	1.40	0.22	24.08	-0.13	0.67	4	0.04	4	
A2332+17	218	10	-	0.12	0.28	14.04	0.92	0.23	23.02	-0.11	0.40	3	-0.25	3	
A2334+00	219	9	9*	0.14	0.23	14.30	1.15	0.29	24.43	+0.02	0.47	5	-0.01	5	
A2346+25	220	10	8*	0.43	0.30	15.65	0.91	0.22	24.58	-0.09	0.72	3	-0.36	3	

*An asterisk in columns 3 and 4 indicates uncertain type or luminosity.

Notes to Table II

A 0147−13 = D 15. Aberrant $U-B$ in small aperture (ap.) rejected.

A 0208+06 = D 18. Aberrant $U-B$ in small ap. rejected.

A 0231+29 = D 26. Aberrant $U-B$ value in ap. 1.33 rejected.

A 0446+00 = D 34. Colors in small ap. rejected.

A 0754+58 = D 48. Aberrant colors in large ap. rejected.

A 0813+70 = D 50. RC2 mag (after Holmberg) at equivalent log $A = 2.00$ also used to derive B_T.

A 0936+71 = D 63. RC2 mag (after Holmberg) at equivalent log $A = 1.72$ also used to derive B_T.

A 0956+30 = D 69. RC2 mag (after Holmberg) at equivalent log $A = 1.77$ also used to derive B_T.

A 0957+05 = D 70. RC2 mag (after Holmberg) at equivalent log $A = 1.83$ also used to derive B_T.

A 1110+22 = D 93. RC2 mag (after Holmberg) at equivalent log $A = 2.20$ also used to derive B_T.

A 1140+59 = D 96. Aberrant colors in small ap. rejected.

A 1208+18 = D 112. Aberrant colors in large ap. rejected.

N 4707 = D 150. B_T includes star superposed on nucleus.

A 1256+14 = D 155. Colors in large ap. which includes 2 stars rejected.

A 1310+36 = D 166. RC2 mag (after Holmberg) at equivalent log $A = 1.51$ also used to derived B_T.

A 1348+38 = D 183. Colors in log $A = 1.34$ (80-04-17) rejected.

A 1352+54 = D 185. Two series of observations in fair agreement. RC2 mag (after Holmberg) at equivalent log $A = 1.66$ is discrepant by 0.7 mag and was not used to derive B_T.

A 2233−03 = D 214. Aberrant colors in log $A = 1.54$ rejected.

TABLE III. Comparison of B_T with previous measurements.

Object	DDO	B_T(RC2)	B_T^W m.e.	New B_T	ΔB_T (new-RC2)	ΔB_T (new-B_T^W)	Rem.
A0813+70	50	11.27	11.11 0.05	11.12	-0.15	+0.01	
A0936+71	63	13.41	13.02 0.05	13.06	-0.35	+0.04	
A0956+30	69	13.09	12.70 0.08	12.70:	-0.39	0.00	
A0957+05	70	11.9	11.89 0.06	11.86	-0.04	-0.03	
N3664	95	(12.72)	(12.70) 0.27	13.14	(+0.42)	(+0.44)	1
I3475	132	13.95	13.93 0.09	13.82	-0.13	-0.11	
A1256+14	155	14.50	14.49 0.13	14.66	+0.16	+0.17	2
A1310+36	166	13.60	13.45 0.08	13.52	-0.08	+0.07	
A1352+54	185	(13.10)	(13.03) 0.11	13.80	(+0.70)	(+0.77)	3
N5477	186	14.2	14.19 0.15	14.34	+0.14	+0.15	
A2326+14	216	12.63	12.41 0.08	12.2:	-0.43	-0.21	
Mean					-0.14	+0.01	
m.e.					±0.07	±0.04	
n					9	9	
σ_{ij}					0.22	0.12	

(1) RC2 gives only m_c, and B_T^w is m_H^{cc}, both fromlow-weight Harvard (Shapley-Ames) magnitude and evidently in error.

(2) Detailed photographic surface photometry (de Vaucouleurs and Moss, unpubl.) gives $B_T = 14.79$.

(3) RC2 and B_T^w values are from single observation (one plate only) by Holmberg (1958), apparently in error. Repeated photoelectric observations (see Appendix) are in good agreement.

(log $R = 0$). When the isophotes are not circular, but are concentric ellipses with a constant axis ratio $b/a = R^{-1} < 1.0$, the mean surface brightness within the effective isophote μ_e' is related to that within the effective aperture, m_e', by $\mu_e' = m_e' - 1.26(\log R)^2$ for an exponential disk (Olson and de Vaucouleurs 1981). For the DDO dwarfs, $0 < \log R < 0.73$ and $0 < \mu_e' - m_e' < 0.67$. For an exponential luminosity profile, the relation between μ_e' and the effective surface brightness μ_e along the effective isophote is $\mu_e' = \mu_e - 0.70$. The central brightness is $\mu(0) = \mu_e - 1.82 = \mu_e' - 1.12$.

The low intrinsic surface brightness of most DDO dwarf galaxies is illustrated by the frequency function of $(m_e')_0 - A_B$ in our sample (Fig. 2). All are fainter than the typical night sky brightness ($\mu_s \simeq 22.2$) and the faintest are close to 5% of the sky brightness ($\mu \simeq 25.5$). For comparison, non-DDO objects in RC2 are in a brighter range of $(m_e')_0$, in general $20 < (m_e')_0 < 24$. It is clear, however, that there is no sharp division between DDO dwarfs and normal galaxies. (To convert surface brightness in mag arcsec^{-2} into specific intensity in solar units per square parsec, note that

$$1 L_{\odot}^{B}\ \mathrm{pc}^{-2} = 27.0\ B\ \mathrm{mag\ arcsec}^{-2}$$

if $M_{\odot}^{B} = +5.4$.)

In RC2 an attempt was made to reduce apparent photographic diameters from various sources to a system of isophotal diameters at $\mu_B = 25.0$ mag arcsec^{-2} by means of some 115 standard galaxies having detailed surface photometry. Clearly, the ratio of the face-on isophotal diameter $D(0)$ to the effective diameter D_e (or A_e if $\log R = 0$) must be a function of m_e'. For a given A_e,

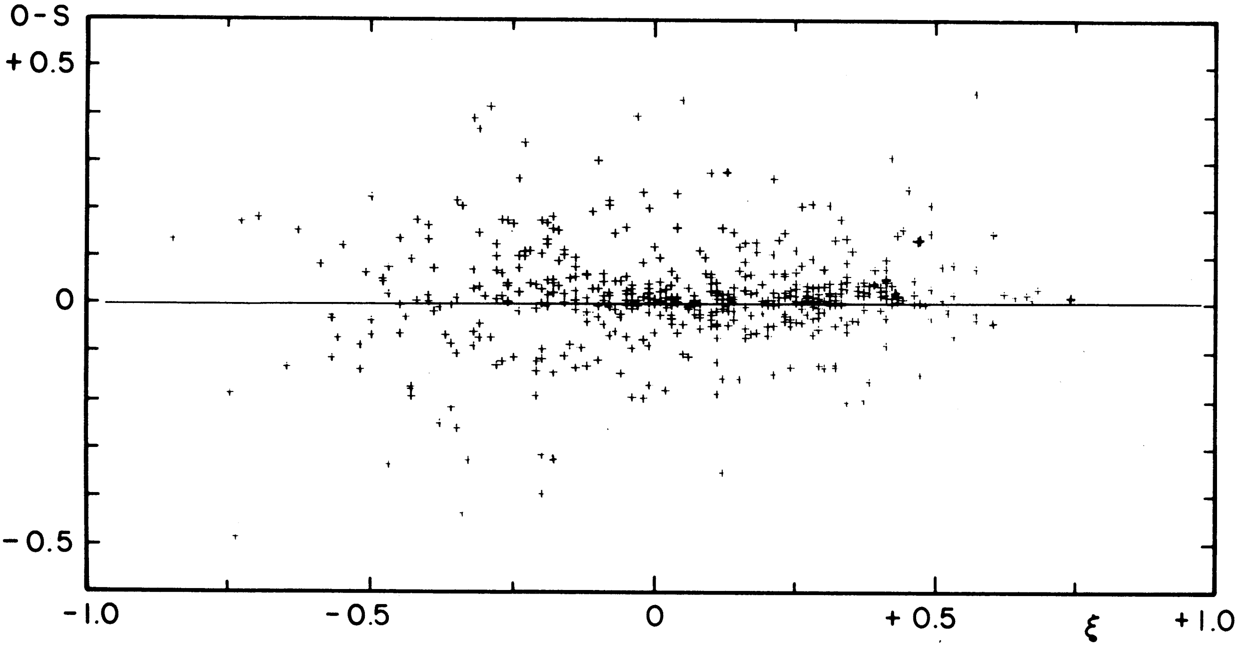

FIG. 1. Residuals $O-S$ of magnitudes of DDO dwarfs from standard magnitude-aperture curves $\Delta m(\xi)$ for types $T = 6$–10. Note absence of systematic departures vs $\xi = \log(A/A_e)$.

TABLE IV. Residuals from standard curves: coefficients of Eq. (1).

Type T	a m.e.	b m.e.	<ξ>	N	σ_1	Rem
6,7,8	-0.003 ±0.013	+0.054 ±0.044	0.010	75	0.116	No rej.
	+0.002 ±0.010	+0.012 ±0.033	0.027	72	0.084	3 rej.
9	+0.013 ±0.008	+0.009 ±0.027	0.064	169	0.097	No rej.
	+0.016 ±0.006	-0.001 ±0.022	0.071	157	0.076	12 rej.
10	+0.023 ±0.007	+0.025 ±0.024	0.049	266	0.114	No rej.
	+0.018 ±0.005	-0.001 ±0.017	0.056	249	0.076	17 rej.
6 - 10	+0.016 ±0.005	+0.026 ±0.017	0.048	510	0.109	No rej.
	+0.015 ±0.004	+0.004 ±0.013	0.058	482	0.079	28 rej.

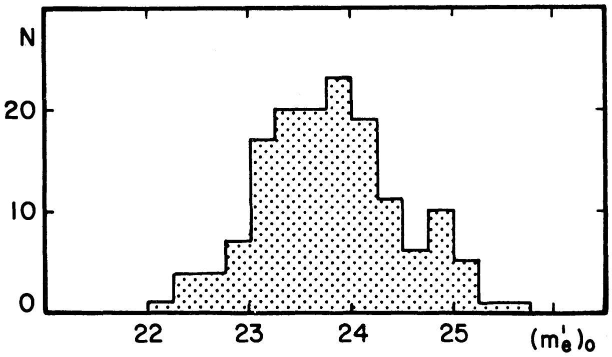

FIG. 2. Frequency function of mean effective surface brightness $(m_e')_0$ corrected for galactic extinction among 150 DDO objects. All are fainter than the average surface brightness of the night sky, $\mu_s(B) = 22.2$ mag arcsec^{-2}.

the fainter the galaxy (greater m_e'), the smaller its isophotal diameter $D(0)$. In extreme cases where the peak brightness $\mu(0) > 25.0$, the isophotal diameter at $\mu_B = 25.0$ does not exist. For a pure exponential disk, $\mu - \mu_e = 1.822(\rho - 1)$, and $\rho = 1 + 0.549(\mu - \mu_e)$, then

$$\xi(0) = \log[D(0)/A_e] = \log[1 + 0.549(25.0 - \mu_e)]$$
$$= \log[1 + 0.549(24.3 - \mu_e')]. \quad (3)$$

Because (i) the DDO objects are generally fainter than the calibrating galaxies, (ii) the DDO list had a cutoff diameter of 1'.0 = 0.9 mm on the POSS prints (van den Bergh 1966), and (iii) the surface brightness of threshold images varies with their linear diameter on the photograph (Hubble 1932; de Vaucouleurs 1959a,b), the isophotal diameters listed in RC2 for these objects could be subject to systematic errors. A search for errors is illustrated in Fig. 3, where $\xi(0) = \log D(0) - \log A_e$ is plotted vs m_e' for the late-type DDO dwarfs ($7 < T < 10$) and for the (non-DDO) RC2 objects of the same types. A smooth trend is in evidence from $\xi(0) \simeq 0.5$, i.e., $D(0) \simeq 3A_e$, for the brightest RC2 objects ($m_e' \simeq 20.5$) to $\xi(0) \simeq 0.0$, i.e., $D(0) \simeq A_e$, for the faintest DDO objects ($m_e' \simeq 25.5$). The trend for the non-DDO objects is in general agreement with the calculated curve for a pure exponential disk (dashed curve) and with the empirical mean relation used in RC2 [Eq. (18)] to estimate A_e from $D(0)$. However, the DDO dwarfs depart significantly from the exponential curve, indicating that a substantial systematic error may be present in the RC2 isophotal diameters for dwarf systems fainter than $m_e' \simeq 23$ mag arcsec^{-2}.

VI. COLOR GRADIENTS AND EFFECTIVE COLORS

In this section we investigate the dependence on T, ξ, $\log R$, and m_e' of the mean colors corrected for galactic extinction following the RC2 precepts (see Appendix C),

$$\langle B - V\rangle_0 = \langle B - V\rangle - E(B - V)$$

and

$$\langle U - B\rangle_0 = \langle U\text{–}B\rangle - E(U - B).$$

First, we examine the trend of $\langle C_0(\bar{X})\rangle = \langle B - V\rangle_0(\bar{X})$ or $\langle U - B\rangle_0(\bar{X})$ with $\log R$ and with

$$\bar{\xi} = \log[(A/D_0)(D_0/A_e)] = \bar{X} + \xi(0),$$

separately for three groups of types T. Solutions of the form

$$\bar{C}_0 = a + b(\log R - \langle\log R\rangle) + c(\bar{\xi} - \langle\bar{\xi}\rangle) \quad (4)$$

are collected in Table V after one cycle of 2σ rejections.

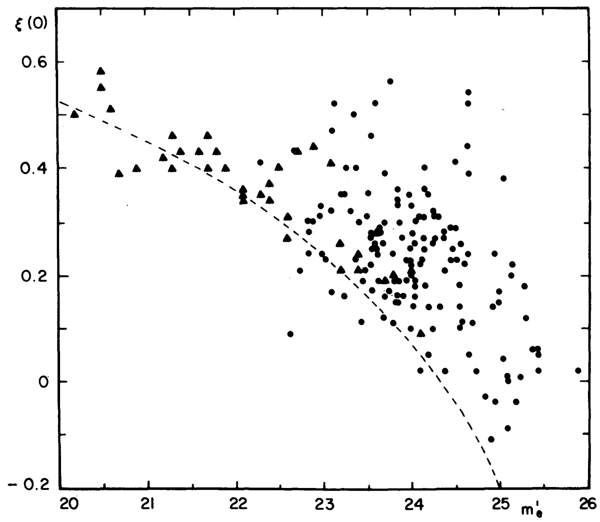

FIG. 3. Dependence of $\xi(0) = \log[D(0)/A_e]$ measuring the isophotal to effective (metric) diameter ratio on mean effective surface brightness m_e'. Note good agreement with calculated curve (dashed) for pure exponential disk in the case of the brighter (non-DDO) RC2 objects (triangles). Systematic departures for most DDO objects (circles) indicate the presence of systematic errors in the isophotal diameters D_{25} listed in RC2 for objects fainter than $m_e' \simeq 23$ mag arcsec^{-2}.

TABLE V. Coefficients of Eq. (4).

T	Color	$\langle \log R \rangle$ / $\langle \xi \rangle$	a / m.e.	b / m.e.	c / m.e.	N / σ_1	Rejected DDO #
6,7,8	$\langle B-V \rangle_0$	0.159	0.439	0.129	-0.186	17	79.235
		0.036	0.020	0.184	0.128	0.083	
	$\langle U-B \rangle_0$	0.157	-0.174	-0.271	-0.067	18	235
		0.037	0.018	0.158	0.110	0.071	
9	$\langle B-V \rangle_0$	0.125	0.440	0.064	-0.142	45	20,207,
		0.062	0.016	0.144	0.124	0.110	222
	$\langle U-B \rangle_0$	0.129	-0.183	0.000	-0.244	46	207,233
		0.073	0.019	0.168	0.139	0.129	
10	$\langle B-V \rangle_0$	0.184	0.377	0.045	0.061	76	13,63,83
		0.056	0.017	0.106	0.096	0.146	84,101
	$\langle U-B \rangle_0$	0.175	-0.251	0.004	-0.093	77	12,52,64
		0.055	0.015	0.093	0.081	0.129	216
6-10	$\langle B-V \rangle_0$			0.061	-0.096	138	
	$\langle U-B \rangle_0$			-0.032	-0.129	141	

The coefficient b does not differ significantly from zero in the mean, indicating that the colors of late-type DDO dwarfs are essentially independent of their apparent axis ratio and, by inference, of their orientation. This result is unlike the case for disk systems at earlier stages of the Hubble sequence, which appear redder when seen edge-on (Heidmann, Heidmann, and de Vaucouleurs 1971).

The coefficient c is not much larger than its mean error, but it is consistently negative in both colors with $\langle c \rangle \simeq -0.1$, indicating a slight *bluing* trend as the measuring aperture increases. This trend is opposite to that found in RC2 for (non-DDO) Magellanic irregulars (see also de Vaucouleurs 1961). A plot of individual color measurements vs ξ (Fig. 4) confirms the trend but shows that it is very slight and poorly determined because of the large errors in the colors.

Next we consider the trend of the colors with $\bar{\xi}$ and corrected surface brightness $(m'_e)_0 = m'_e - A_B$ for the three groups of types. Solutions of the form

$$\bar{C}_0 = \alpha + \beta\,[(m'_e)_0 - \langle (m'_e)_0 \rangle] + \gamma(\bar{\xi} - \langle \bar{\xi} \rangle) \tag{5}$$

are collected in Table VI after one cycle of 2σ rejections.

The coefficient β is not appreciably different from zero, indicating that the colors are very nearly independent of effective surface brightness. This result implies that the low surface brightness is not due to excessive interstellar extinction in our galaxy or in the other system and, consequently, that the spectral composition of the stellar population does not depend on space density. The coefficient γ with $\langle \gamma \rangle \simeq -0.1$ is in substantial agreement with c in Eq. (4); it confirms that the bluing trend is not an artifact due to correlation between ξ and $\log R$ or $(m'_e)_0$.

Finally, since $b = 0$ and $\beta = 0$, new solutions were made for a relation of the form

$$\bar{C}_0 = a_1 + c_1(\bar{\xi} - \langle \bar{\xi} \rangle). \tag{6}$$

The coefficients are collected in Table VII.

The coefficient of $\bar{\xi}$ is essentially unchanged with $\langle c_1 \rangle = -0.08$ and no significant trend with type. We will adopt $c_1 = -0.1$ to calculate the effective colors

$$(B-V)_e = \langle B-V \rangle(\bar{\xi}) + 0.1\bar{\xi}, \tag{7}$$

$$(U-B)_e = \langle U-B \rangle(\bar{\xi}) + 0.1\bar{\xi}. \tag{8}$$

The range of $\bar{\xi}$ is $-0.56 < \bar{\xi} < 0.55$ and the maximum correction is 0.05. Table VIII lists the total magnitudes B_T^0 corrected for galactic extinction and the corrected effective colors. The corrected mean colors by type, given by a_1 in Table VII, show that the pure Magellanic irregulars Im ($T = 10$) are significantly bluer in both colors than the earlier types, but, unexpectedly, types $T = 6$–8 and $T = 9$ have about the same color. This is contrary to the trend in RC2 objects indicating type SBm ($T = 9$) (de Vaucouleurs 1977) to be much bluer than types 7 and 8 (Table IX).

VII. REDUCTION OF THE FISHER-TULLY MAGNITUDE ESTIMATES TO THE B_T SYSTEM

Fisher and Tully (1975) have published for 238 (out of 243) DDO objects photographic magnitudes m_{pg} derived from the major axis a and axis ratio r taken from

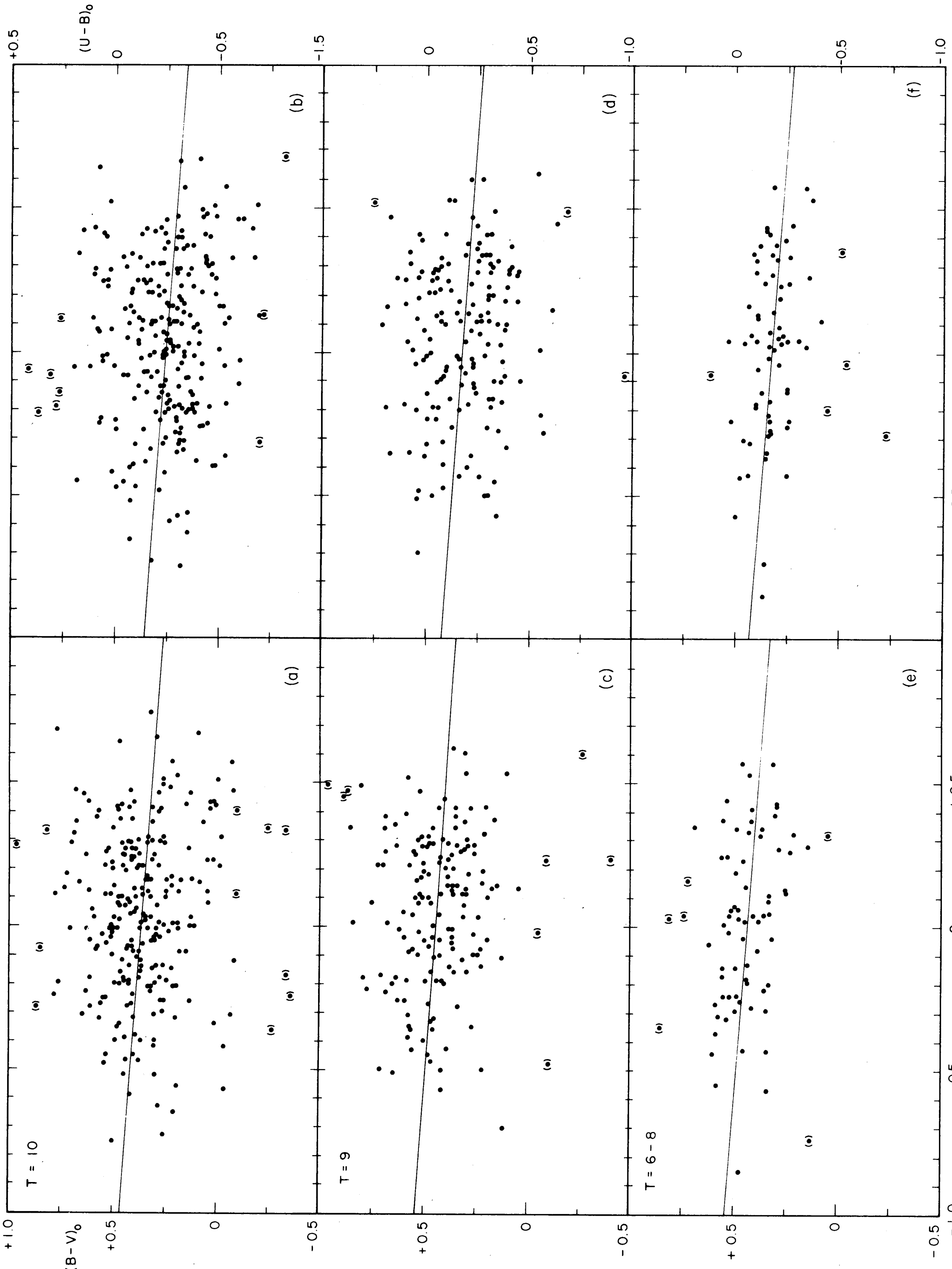

FIG. 4. Corrected colors $(B-V)_0(\xi)$ (left) and $(U-B)_0(\xi)$ (right) for DDO objects of morphological types $T = 6$–8, 9, and 10. Note large, mainly observational scatter and slight bluing trend toward larger apertures.

TABLE VI. Coefficients of Eq. (5).

T	Color	$\langle (m'_e)_0 \rangle$ $\langle \xi \rangle$	α m.e.	β m.e.	γ m.e.	N σ_1	Rejected DDO #
6,7,8	$\langle B-V \rangle_0$	23.31	0.439	0.019	-0.059	17	
		0.047	0.020	0.044	0.164	0.085	223,235
	$\langle U-B \rangle_0$	23.36	-0.174	-0.050	-0.176	18	235
		0.037	0.018	0.037	0.134	0.074	
9	$\langle B-V \rangle_0$	23.67	0.445	0.021	-0.182	44	4,20,207
		0.067	0.016	0.026	0.119	0.103	222
	$\langle U-B \rangle_0$	23.73	-0.183	0.008	-0.236	46	207,233
		0.073	0.019	0.030	0.132	0.129	
10	$\langle B-V \rangle_0$	23.79	0.368	0.014	0.073	76	13,63,84
		0.054	0.017	0.024	0.099	0.146	101,112
	$\langle U-B \rangle_0$	23.79	-0.243	0.013	-0.120	77	12,52,64
		0.057	0.015	0.022	0.084	0.131	66
6-10	$\langle B-V \rangle_0$			0.017	-0.025	137	
6-10	$\langle U-B \rangle_0$			0.003	-0.165	141	

TABLE VII. Coefficients of Eq. (6).

T	Color	$\langle \bar{\xi} \rangle$	a_1 m.e.	c_1 m.e.	N σ_1	Rejected DDO #
6,7,8	$\langle B-V \rangle_0$	0.036	0.440	-0.180	17	79,235
			0.020	0.125	0.082	
	$\langle U-B \rangle_0$	0.037	-0.174	-0.081	18	235
			0.018	0.116	0.076	
9	$\langle B-V \rangle_0$	0.062	0.440	-0.128	45	20,207,222
			0.016	0.119	0.109	
	$\langle U-B \rangle_0$	0.073	-0.183	-0.243	46	207,233
			0.019	0.128	0.128	
10	$\langle B-V \rangle_0$	0.055	0.372	0.077	77	13,63,84
			0.017	0.098	0.150	101
	$\langle U-B \rangle_0$	0.055	-0.251	-0.093	77	12,52,64
			0.015	0.080	0.128	216
6-10	$\langle B-V \rangle_0$			-0.021	139	
6-10	$\langle U-B \rangle_0$			-0.140	141	

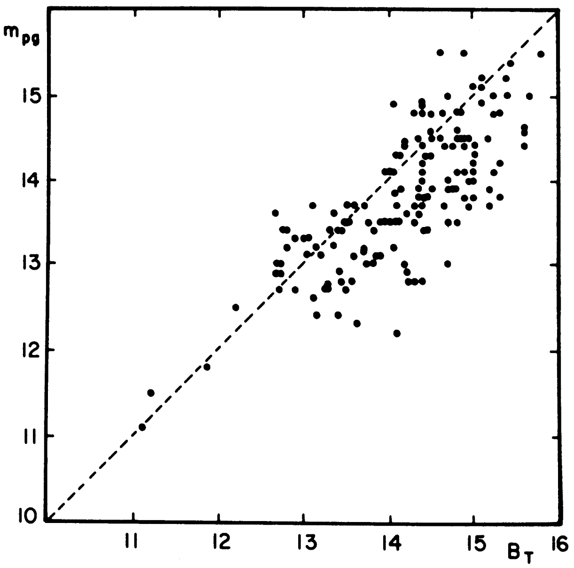

FIG. 5. Comparison of uncorrected photographic magnitudes m_{pg} estimated by Fisher and Tully with total photoelectric magnitudes B_T. Note systematic zero-point error of ~ 0.4 mag at $B \gtrsim 13$. The few points at $B < 13$ and in good systematic agreement with B_T are after Holmberg (1958).

Nilson 1973 (UGC) or Vorontsov-Velyaminov *et al.* 1962–1968 (MCG), both converted to the Holmberg system, and from their own estimates of the mean surface brightness S on the POSS prints, calibrated by a score of objects previously measured by Holmberg (1958).

A plot of m_{pg} vs B_T for 150 objects in common (Fig. 5) indicates no serious scale error in the range $11 < B_T < 16$, but a mean zero-point difference

$$\langle B_T \rangle - \langle m_{pg} \rangle = 14.18 - 13.78 = +0.40$$

with a large scatter in individual values (except for the bright objects measured by Holmberg). A contour plot of $B_T - m_{pg}$ vs S and log a, obtained via the numerical mapping technique of Jones *et al.* (1967), shows little or no dependence on S, but a significant trend with log a (Fig. 6).

Finally, a plot of S vs m'_e (Fig. 7) shows that the S scale is much too compressed, varying only from ~ 24.3 to 25.8 while m'_e varies from ~ 22.5 to 25.5. Evidently, the value of S estimated by Fisher and Tully refers to a progressively smaller and relatively brighter central area as the intrinsic surface brightness decreases. This is a general property of visual estimates and a direct consequence of the dependence of the detection threshold on image size and S/N ratio (Hubble 1932; de Vaucouleurs 1959a,b).

The input data are a, r, and S and the systematic errors in the estimated magnitudes are expected to depend on size, shape, and surface brightness [see the discussions of the Shapley-Ames magnitudes (de Vaucouleurs 1956, 1957) and of the Zwicky magnitudes (de Vaucouleurs and Pence 1979)]. A least-squares solution of the form

$$\begin{aligned} B_T^c &= a + b(S - \langle S \rangle) + c(\log a - \langle \log a \rangle) + d(\log r^{-1} - \langle \log r^{-1} \rangle) \\ &= 14.25 + 1.13(S - 25.1) - 3.73(\log a - 1.55) + 1.72(\log r^{-1} - 0.16) \\ &\quad \pm 0.04 \pm 0.13 \qquad\qquad \pm 0.33 \qquad\qquad\qquad \pm 0.34 \end{aligned} \tag{9}$$

was adopted to transform the F-T data to the B_T system with a mean error $\sigma_1(B_T^c) = 0.54$ (no rejection). This solution is based on 141 objects in common with our list of B_T (Table II), excluding two ellipticals and seven objects measured by Holmberg. The approximate total magnitudes so calculated for 224 DDO objects, including 79 not yet observed by us, are listed in Table X. The 17 objects previously observed by Holmberg (1958) are not included in Table X because for these F-T adopted the Holmberg values (rounded off to the nearest 0.1 mag), which are much more precise and have been previously reduced to the B_T system (de Vaucouleurs, Corwin, and Bollinger 1977). The weighted mean total magnitudes B_T^W of these 17 objects derived from a variety of sources, including Holmberg (de Vaucouleurs, Corwin, and Bollinger 1977; de Vaucouleurs and Bollinger 1977), are listed in Table XI. As noted in Sec. III our new determinations of B_T are in excellent agreement with B_T^W, except for DDO 185 and 216.

Together Tables II and XI provide fairly precise total magnitudes B_T, B_T^W for 159 DDO objects, and Table X provides approximate magnitudes B_T^c in the same system for 79 additional objects.

The external mean error, 0.54 mag, calculated here for the B_T^c magnitudes, is in fair agreement with Fisher and Tully's estimate that the (internal) mean errors of their m_{pg} values "should be less than 0.5 mag." The statistical agreement between B_T^c and B_T is illustrated by Fig. 8.

In a second paper we will study the physical and statistical properties of the DDO objects derived from optical and radio observations.

We thank the several observers listed in Table I who contributed to the photometric observations and, in particular, H. G. Corwin for kindly communicating to us his observations of DDO objects made at the South African Astronomical Observatory. The present work was supported by the National Science Foundation under Grants Nos. AST 78-08744 and 79-16335.

TABLE VIII. Corrected total magnitudes and effective colors

Object	DDO	T	L	B_T^o	$(B-V)_e^o$	$(U-B)_e^o$	Object	DDO	T	L	B_T^o	$(B-V)_e^o$	$(U-B)_e^o$
A0001+14	222	9	9	15.05	0.78	-0.25	A0705+53	41	10	9*	14.68	0.71:	-0.30:
N0045	223	8	8	10.99	0.64	-0.06	A0724+40	43	10	9*	14.63	0.20:	-0.27
A0017+10	2	9	9	13.62	0.37	-0.15	A0738+40	46	10	9	13.79	0.38	-0.36
A0031+31	4	9	9*	14.7:	0.20	-0.21	A0739+16	47	10	9?	13.10	0.35	-0.18
A0031-31	224	10*	8*	13.48	0.43	-0.37	A0754+58	48	9	8*	14.57	0.59	-0.01
I1558	225	8	8*	12.43	0.35	-0.18	A0807+46	49	10	8*	13.92	0.34	-0.32
I1574	226	10	8	14.19	0.57	-0.07	A0813+70	50	10	8	10.76	0.20	-0.43
A0043-11	5	9	9	14.22	0.37	-0.27	A0825+42	52	10	9	14.8:	0.53:	0.43:
A0107+49	9	10*	9*	14.3:	0.61	-0.36	A0829+66	53	10	9	14.2:	0.28	-0.47
A0118+12	10	9	8*	14.47	0.61	-0.17	A0905+06	54	9	9	14.39	0.50	0.00
A0127+25	11	9	9*	14.42	0.69	-0.18	A0908+14	57	10	9	14.14	0.31	-0.30
A0132+04	12	10	9*	13.8:	0.24	0.20	A0909+35	55	9?	9*	14.58	0.38	-0.15
A0137+15	13	10	9	14.45:	-0.09	-0.11	A0910+19	58	10	9	14.94	0.32	-0.25
A0145-12	14	10	8	13.47	0.43	-0.03	A0911+39	59	9	9	15.16	0.24	-0.23
A0147-13	15	10	9	15.09	0.49	-0.21	A0917-12	60	10	9	14.1:	0.37	-0.33
A0200+21	17	10	9	14.11	0.40	-0.18	A0918-12	61	10	9	14.6:	0.50	-0.33
A0208+06	18	9*	9	14.69	0.41	0.00:	A0936+71	63	10	9	12.74	-0.09	-0.17:
A0221+35	19	9	9*	13.60	0.46	-0.36	A0942-31	235	8	8	12.78	0.26	-0.36
A0223-21	21	9*	9	13.77	0.26	0.01	A0947+31	64	10	8*	14.19	0.15	-0.57
A0223-10	20	9	8*	14.25:	0.11	-0.30	A0953+69	66	10	9	14.0:	0.61	-0.55
A0228-10	23	10	8	14.6:	0.63	-0.52:	A0953+29	68	10	-	14.59	0.23	-0.32
A0229+38	22	10	9	15.1:	0.09	-0.19	A0956+30	69	10	9	12.5:	0.16	-0.21
A0230+33	25	10	9	13.5:	0.48	-0.32	A0957+05	70	10	8	11.64	0.38	-0.22
A0230+40	24	10	8*	13.7:	0.47	-0.14	N3057	67	8	7	13.04	0.43	-0.22
A0231+29	26	10	9	14.82	0.36	-0.02:	A1005+29	72	9	9*	15.40	0.56	0.01
A0245+03	28	9*	9	13.1:	0.42	-0.29	A1006+30	73	10	9	14.55	0.62	-0.12:
A0246+01	29	9	9	13.81	0.57	-0.17	A1008-13	76	10	9*	14.93	0.65	-0.04
A0249-01	30	9	9	14.1:	0.38	-0.37	A1020+71	77	8	8	12.45	0.51	-0.13
N1253A	31	9	9*	14.1:	0.36	-0.39	A1021+15	79	8	8	14.16	0.64	-0.22
A0312-04	32	10	9*	13.79	0.30	-0.18	A1026+70A	80	9	9*	13.54	0.48	-0.23
A0441+74	33	10	8*	14.3:	0.50	-0.22	A1026+70B	82	9	9*	13.18	0.59	-0.10
A0446+00	34	10*	9	13.79	0.36	-0.29:	A1033-24	238	8	8*	12.91	0.41	-0.20
A0447+29	228	9*	9	12.79	0.44	-0.35	A1033+31	83	10	9	14.8:	0.01:	-0.48:
A0450-25	229	9	8	12.95	0.40	-0.26	A1039-23	85	9	9	13.72	0.43	-0.12
A0500+16	35	10*	9*	14.0:	0.42	-0.19:	A1039+34	84	10	9	13.45	-0.09:	-0.45
A0505-16	36	9	8	13.2:	0.47	-0.23	A1041+60	86	10	9	15.07	0.13	-0.10
A0508-31	230	9*	8*	12.70	0.34	-0.27	N3377A	88	9	9	14.01	0.56	-0.02
N1879	232	10	9	12.8:	0.39	-0.21	A1046+65	87	10	9	14.93	0.26	-0.11
A0558-28	233	9	9	13.95	0.33	0.23	A1047+19	89	10	-	14.66	0.41	-0.21
A0700+56	40	10	9	14.16	0.43	-0.31	A1103+20	91	9	9	14.57	0.41	-0.24

TABLE VIII. (continued)

Object	DDO	T	L	B_T^o	$(B-V)_e^o$	$(U-B)_e^o$
A1110+22	93	-5	-	12.52	-	-
A1117+02	94	10	9	13.5:	0.39	-0.29
N3664	95	9	8*	12.94	0.33	-0.33
A1140+59	96	9	9	14.3:	0.61	-0.47
A1148+56	98	10	8*	13.95	0.34	-0.29
A1148+39	99	10	9*	13.29	0.11	-0.32
A1149+52	100	9	8	14.08	0.44	-0.12
A1153+31	101	10	9	14.61	0.73	0.08
A1155-14B	103	8?	-	14.39	0.38	-0.21
N4025	107	6	7*	13.87	0.52	-0.10
A1208+18	112	10	8	15.6:	0.73	-0.30
A1212+13	114	10	8*	15.2:	0.65	-0.24
I3059	115	10	9*	14.5:	0.53	0.04
N4288	119	9	8?	13.05	0.39	-0.25
A1218+46	120	10	8	13.23	0.26	-0.02
A1222+70	122	9	9	12.81	0.49	-0.06
A1223+58	123	10	8	12.6:	0.28	-0.22
I3355	124	10	8	15.26	0.35	-0.22
A1224+37	126	10	9	14.03	0.27	-0.32
A1225+43	125	10	8	12.70	0.40	-0.21
A1226+37	127	9	9	14.77	0.39	-0.14
A1226+43	129	10	9	13.52	0.28	-0.30
I3475	132	-5	-	13.63	-	-
A1230+31	133	10	9	12.96	0.44	-0.25
N4523	135	8	9*	14.23	0.34	-0.10
I3617	140	10	8*	14.12	0.22	-0.24
A1241-05	142	9	9*	12.66	0.58	-0.02
N4707	150	9	9*	13.22	0.59	0.00
N4789A	154	10	8	13.78	0.24	-0.36
A1255+03	158	8	8	14.22	0.33	-0.10
A1256+14	155	10	9	14.47	0.29	-0.51
A1300-17	161	10	-	13.26	0.30	-0.35
N4948A	162	7	8	13.72	0.52	-0.18
A1304+67	165	10	8	12.52	0.23	-0.29
A1310+36	166	10	8	13.33	0.41	-0.17
A1312+46	168	10	8	12.49	0.36	-0.30
A1316-08	171	10	9*	13.81	0.42	-0.10
A1316+42	172	7	8	14.20	0.44	-0.21
A1318+10	173	9	8*	13.88	0.44	-0.06
A1327+45	176	8	8	14.24	0.37	-0.32
A1334+46	177	7	9	13.92	0.43	-0.13
A1334+07	179	10	8	12.98	0.42	-0.19
A1335-09	189	9	8*	12.51	0.54	-0.10
N5264	242	10	8	12.29	0.46	-0.08
A1348+38	183	10	8	14.19	0.40	-0.18
A1352+54	185	9	8	13.57	0.43	-0.25
N5477	186	9	8	14.11	0.33	-0.40
A1413+16	188	10	9	14.88	0.42	-0.04
A1413+23	187	10	-	14.12	0.15	-0.20
A1422+44	190	10	7*	13.10	0.24	-0.21
A1423+56	191	7	9	14.21	0.44	-0.08
A1433+59	193	8	9	14.57	0.44	-0.13
A1446-09	197	10	-	12.95	0.46	-0.38
A1535+44	200	9	9	14.7:	0.37	-0.15
A1539+00	201	10	8	14.23	0.26	-0.25
A1547+81	203	8	8	13.34	0.52	-0.18
A1614+47	204	9	8	13.34	0.45	-0.21
A1616+63	205	10	8	14.52	0.41	-0.30
A1653+53	206	8	9	14.97	0.46	-0.31
A1717+14	207	9	9*	14.75	0.86	-0.77
A2207-19	211	10	9	14.23	0.33	-0.32
A2214-21	212	10	8	14.45	0.37	-0.26
A2231+32	213	9	9	13.70	0.44	-0.14
A2233-03	214	9	8	13.08	0.38	-0.10
A2236-05	215	10	-	14.73	0.35	-0.24
A2326+14	216	10	9	11.9:	0.62	0.13
A2327+40	217	9	9*	12.22	0.58	0.02
A2332+17	218	10	-	13.76	0.35	-0.29
A2334+00	219	9	9*	14.07	0.45	-0.02
A2346+25	220	10	8*	15.35	0.66	-0.40

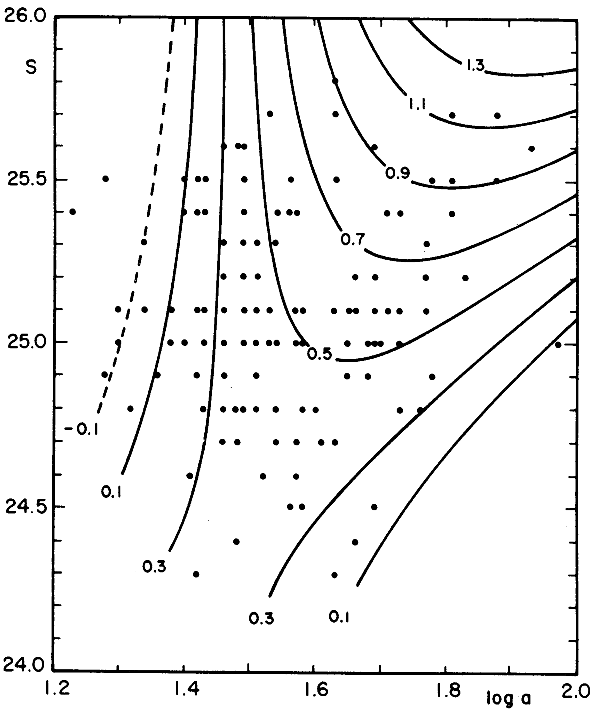

FIG. 6. Numerical mapping of $B_T - m_{pg}$ in (S, log a) plane showing how the correction to Fisher-Tully magnitudes depends on their input parameters, the estimated surface brightness S, and major diameter a.

TABLE IX. Comparison of corrected effective colors.

T	DDO dwarfs $(B-V)_e^o$ m.e.	DDO dwarfs $(U-B)_e^o$ m.e.	RC2 objects* $(B-V)_e^o$ m.e.	RC2 objects* $(U-B)_e^o$ m.e.
7	} 0.444	-0.171	0.444	-0.213
	} 0.023	0.017	0.020	0.039
8			0.418	-0.218
			0.027	0.018
9	0.446	-0.176	0.353	-0.337
	0.016	0.019	0.019	0.028
10	0.378	-0.246	0.370	-0.331
	0.016	0.014	0.015	0.025

*See de Vaucouleurs (1977).

Note to Table IX

Note that internal extinction corrections $A(i) = \alpha \log R_{25}$ [RC2 Eq. (24)] were applied to the RC2 objects. No correction is applied to the DDO dwarfs in view of the absence of correlation between color and log R in this sample.

APPENDIX A: CATALOG OF *UBV* OBSERVATIONS

The catalog (Table XII) lists for each object: (1) the identification N, I, or A in RC2 style; (2) the DDO number; (3) and (4) coded type and luminosity class L as in RC2; (5) log $D(0)$, logarithm of isophotal diameter (in 0'.1) at surface brightness level $\mu_B = 25.0$ mag arcsec^{-2} corrected to face-on ($i = 0°$) as explained in RC2; (6) logarithm of field aperture A (in 0'.1); (7) X = logarithm of $A/D(0)$; (8), (9), and (10) observed V magnitude and $B-V$, $U-B$ color indices; (11) date of observation; (12) series number (see Table I); an asterisk refers to notes at the end of the catalog.

Less precise or doubtful values are marked with a colon or are in parentheses. Magnitudes and colors of field stars included in the aperture are given in the notes.

APPENDIX B: ERROR ANALYSIS

The availability of over 500 measurements covering large intervals of reduced aperture ($-0.85 \leqslant \xi \leqslant 0.74$) and effective surface brightness ($22.29 \leqslant m_e' \leqslant 25.88$) permits a detailed study of the errors in individual measurements and in the derived total magnitudes and colors as functions of ξ and m_e'.

a) Magnitudes

The numerical mapping technique of Jones *et al.* (1967) was used to obtain a polynomial representation of the average deviation of the residuals $(O-S)$ from the standard curves. An initial cubic solution with ten coefficients showed that only the first four were significant. The adopted representation,

$$|O-S| = 0.066 - 0.074\xi + 0.018(m_e' - 24.00) + 0.112\xi^2, \qquad (10)$$

is illustrated in Fig. 9 by a contour map. The distribution of the observations in the (ξ, m_e') plane is shown in Fig. 9(a).

The signs of the coefficients of the linear terms in Eq. (10) are as would be expected *a priori*. They show that the precision of individual measurements is poorer for small apertures ($\xi < 0$) and for low surface brightness objects ($m_e' \gtrsim 24.0$). The contours in Fig. 9(b) show that for $\xi \geqslant 0.35$ ($A \geqslant 2.2A_e$) the errors increase with increasing aperture, while for $\xi \leqslant 0.35$ the errors increase with decreasing aperture. The curves show that, at a given surface brightness level, the residuals from the standard curves are smallest and most insensitive to ξ in the range $0.0 \lesssim \xi \lesssim 0.7$. This is the range which contributes most to the total magnitude estimates, and thus the errors in B_T will depend mainly on surface brightness.

To obtain some estimates of the errors in the total magnitudes, values of $\sigma(O-S)$ were calculated in four intervals of m_e' for measurements with $\xi \geqslant 0.00$. The results are illustrated in Fig. 10, which shows that the

TABLE X. Total magnitudes derived from F-T estimates.

Object	DDO #	T	L	log a	log r^{-1}	m_{pg}	S	B_T^C	$B_T-B_T^C$	Object	DDO #	T	L	log a	log r^{-1}	m_{pg}	S	B_T^C	$B_T-B_T^C$
A0001+14	222	9	9	1.63	0.15	13.8	25.5	14.39	+0.91	A0500+16	35	10*	9*	1.49	0.00	14.0	25.4	14.54	+0.46
N0045	223	8	8	1.97	0.11	11.5	25.0	12.48	-1.28	A0505-16	36	9	8	1.54	0.22	13.7	24.7	13.94	-0.34
A0016-19	1	9	9	1.43	0.03	14.5	25.5	14.93	-	A0508-31	230	9*	8*	1.58	0.03	13.3	25.0	13.80	-0.82
A0017+10	2	9	9	1.58	0.08	13.5	25.1	14.00	-0.15	A0510-33	231	10	9	1.68	0.13	13.7	25.7	14.40	-
A0031+31	4	9	9*	1.49	0.00	13.8	25.2	14.31	+0.69	A0516-21	37	10	9?	1.48	0.10	14.6	25.6	14.97	-
A0031-31	224	10*	8*	1.51	0.06	13.7	25.1	14.23	-0.53	N1879	232	10	9	1.49	0.05	13.7	25.0	14.17	-1.07
I1558	225	8	8*	1.68	0.13	12.9	24.9	13.49	-0.85	A0527+73	38	10	9	1.54	0.00	14.2	25.8	14.80	-
I1574	226	10	8	1.58	0.35	14.2	25.1	14.46	-0.06	A0549+75	39	10	9	1.81	0.19	13.2	25.9	14.24	-
A0043-11	5	9	9	1.51	0.11	14.0	25.1	14.31	+0.11	A0558-28	233	9	9	1.51	0.26	14.5	25.3	14.80	-0.46
A0047-21	6	10	9	1.46	0.34	14.9	25.3	15.12	-	A0613-26	234	10	9	1.40	0.06	15.2	25.9	15.66	-
A0058+07	7	9	9	1.48	0.21	14.3	25.1	14.60	-	A0700+56	40	10	9	1.38	0.06	14.5	25.1	14.71	-0.13
A0107+49	9	10*	9*	1.56	0.04	13.8	25.4	14.35	+0.55	A0705+53	41	10	9*	1.28	0.00	15.2	25.5	15.43	-0.33
A0118+12	10	9	8*	1.65	0.28	13.5	25.0	13.97	+0.73	A0727+40	43	10	9*	1.46	0.16	14.3	25.1	14.59	+0.43
A0127+25	11	9	9*	1.48	0.21	13.9	24.7	14.15	+0.55	A0729+66	44	10	9	1.63	0.15	14.3	26.0	14.95	-
A0132+04	12	10	9*	1.73	0.26	13.5	25.4	14.09	-0.09	A0733+02	45	10	9	1.45	0.14	15.1	25.9	15.49	-
A0137+15	13	10	9	1.81	0.09	13.0	25.7	13.84	+0.86	A0738+40	46	10	9	1.53	0.04	14.3	25.7	14.80	-0.65
A0145-12	14	10	8	1.63	0.08	13.2	25.1	13.81	-0.11	A0739+16	47	10	9?	1.81	0.09	12.8	25.5	13.61	-0.07
A0147-13	15	10	9	1.40	0.06	14.8	25.5	15.09	+0.23	A0754+58	48	9	8*	1.57	0.32	14.4	25.1	14.45	+0.45
A0149+17	16	5	-	1.51	0.41	14.3	25.0	14.72	-	A0807+46	49	10	8*	1.46	0.02	13.6	24.7	13.89	+0.33
A0200+21	17	10	9	1.53	0.04	13.7	25.1	14.12	+0.28	A0819+74	51	7*	8*	1.40	0.00	14.0	24.9	14.31	-
A0208+06	18	9*	9	1.57	0.00	13.7	25.4	14.24	+0.71	A0825+42	52	10	9	1.49	0.26	14.9	25.6	15.21	-0.11
A0221+35	19	9	9*	1.69	0.09	13.5	25.6	14.17	-0.15	A0829+66	53	10	9	1.46	0.07	14.3	25.3	14.66	-0.16
A0223-21	21	9*	9	1.54	0.10	14.1	25.4	14.52	-0.52	A0905+06	54	9	9	1.57	0.00	13.7	25.4	14.24	+0.41
A0223-10	20	9	8*	1.66	0.39	13.9	25.2	14.35	+0.15	A0907-22	56	10	9	1.40	0.14	15.1	25.6	15.34	-
A0228-10	23	10	8	1.51	0.16	14.1	25.1	14.40	+0.50	A0908-14	57	10	9	1.42	0.00	14.5	25.5	14.91	-0.39
A0229+38	22	10	9	1.56	0.24	14.4	25.5	14.80	+0.80	A0909+35	55	9?	9*	1.51	0.24	14.5	25.3	14.76	+0.06
A0230+33	25	10	9	1.63	0.03	13.1	25.1	13.73	+0.17	A0910+19	58	10	9	1.42	0.03	14.5	25.4	14.85	+0.33
A0230+40	24	10	8*	1.69	0.06	12.9	25.1	13.56	+0.64	A0911+39	59	9	9	1.46	0.41	15.0	25.2	15.13	+0.27
A0231+29	26	10	9	1.54	0.22	13.9	25.0	14.28	+0.92	A0917-12	60	10	9	1.30	0.07	14.8	25.1	15.03	-0.63
A0237+01	27	10	9	1.49	0.00	14.3	25.7	14.88	-	A0918-12	61	10	9	1.23	0.09	15.5	25.4	15.66	-0.76
A0245+03	28	9*	9	1.88	0.00	12.4	25.7	13.42	-0.02	A0919-22	62	10	9?	1.58	0.57	15.0	25.4	15.18	-
A0246+01	29	9	9	1.88	0.00	12.2	25.5	13.20	+0.90	A0942-31	235	8	8	1.52	0.06	13.2	24.6	13.62	-0.28
A0249-01	30	9	9	1.77	0.10	12.8	25.3	13.55	+0.85	A0947+31	64	10	8*	1.53	0.38	14.4	25.0	14.59	-0.19
A0301-25	227	9	9	1.48	0.05	14.2	25.4	14.66	-	A0949+01	65	10	9	1.41	0.06	14.7	25.5	15.05	-
N1253A	31	9	9*	1.41	0.21	14.1	24.6	14.29	+0.11	A0953+69	66	10	9	1.63	0.04	13.7	25.7	14.42	-0.12
A0312-04	32	10	9*	1.46	0.07	13.7	24.7	13.98	+0.12	A0953+29	68	10	-	1.58	0.32	13.5	24.5	13.74	+1.06
A0441+74	33	10	8*	1.51	0.24	14.4	25.2	14.65	+0.35	N3057	67	8	7	1.61	0.08	12.9	24.7	13.44	-0.02
A0446+00	34	10*	9	1.49	0.09	14.4	25.5	14.81	-0.51	N3109	236	9	8	2.24	0.48	10.9	24.8	11.89	-
A0447-29	228	9*	9	1.65	0.07	13.1	25.1	13.72	-0.66	A1001+66	71	10	9	1.26	0.00	15.8	25.0	16.35	-
A0450-25	229	9	8	1.71	0.02	12.7	25.1	13.41	-0.17	A1005+29	72	9	9*	1.40	0.19	14.6	25.0	14.75	+0.85

TABLE X. (continued)

Object	DDO #	T	L	log a	log r^{-1}	m_{pg}	S	B_T^C	$B_T-B_T^C$	Object	DDO #	T	L	log a	log r^{-1}	m_{pg}	S	B_T^C	$B_T-B_T^C$
A1006+30	73	10	9	1.46	0.05	13.9	25.0	14.28	+0.47	A1212+3	114	10	8*	1.38	0.38	15.2	25.0	15.15	+0.25
A1008-25	237	9*	9	1.52	0.08	14.1	25.4	14.56	-	I3059	115	10	9*	1.49	0.09	14.0	25.1	14.35	+0.35
A1008-13	76	10	9*	1.51	0.37	14.8	25.3	14.99	+0.23	A1212+36	113	10	-	1.34	0.00	15.4	26.0	15.78	-
A1020+71	77	8	8	1.69	0.16	12.6	24.5	13.05	-0.30	A1213-11	116	10	9	1.30	0.57	16.3	25.3	16.11	-
A1021+15	79	8	8	1.58	0.16	13.6	25.0	14.03	+0.32	A1214+29	117	10	9	1.43	0.00	14.2	25.3	14.65	-
A1022+67	78	10	9	-	-	-	26.0	-	-	A1214-11	118	10	9	1.34	0.30	15.4	25.3	15.50	-
A1026+70A	80	9	9*	1.70	0.21	13.1	25.0	13.66	+0.18	N4288	119	9	8?	1.63	0.19	12.7	24.3	13.10	+0.16
A1026+70B	82	9	9*	1.73	0.18	12.7	24.8	13.27	+0.21	A1218+46	120	10	8	1.60	0.20	13.4	24.8	13.79	-0.35
A1033-24	238	8	8*	1.68	0.06	12.8	25.0	13.48	-0.22	A1221+00	121	10	9	1.23	0.09	15.6	25.5	15.78	-
A1033+31	83	10	9	1.49	0.19	14.1	25.0	14.41	+0.59	A1222+70	122	9	9	1.73	0.00	12.6	25.1	13.30	-0.20
A1039-23	85	9	9	1.49	0.07	14.1	25.3	14.54	-0.49	A1223+58	123	10	8	1.69	0.22	13.2	25.0	13.72	-0.92
A1039+34	84	10	9	1.83	0.07	12.3	25.2	13.16	+0.49	I3355	124	10	8	1.34	0.36	15.4	25.1	15.38	+0.07
A1041+60	86	10	9	1.49	0.00	14.2	25.6	14.76	+0.56	A1224+37	126	10	9	1.77	0.16	12.8	25.2	13.54	+0.68
N3377A	88	9	9	1.43	0.02	14.4	25.4	14.80	-0.60	A1225+43	125	10	8	1.77	0.16	12.7	25.1	13.43	-0.53
A1046+65	87	10	9	1.63	0.00	13.7	25.8	14.47	+0.73	A1226+37	127	9	9	1.49	0.26	14.5	25.2	14.76	+0.20
A1047+19	89	10	-	1.38	0.02	14.8	25.0	14.53	+0.32	A1226+43	129	10	9	1.73	0.05	13.0	25.4	13.73	-0.01
A1050+07	90	10	9	1.41	0.05	14.7	25.6	15.15	-	A1226+02	128	9	9	1.53	0.26	14.2	25.1	14.50	-
A1103+20	91	9	9	1.46	0.00	14.4	25.6	14.88	-0.13	I3418	130	10	9	1.40	0.15	14.9	25.4	15.13	-
A1110+53	92	9	8	1.48	0.12	14.0	25.0	14.33	-	A1229+29	131	10	9	1.49	0.09	14.4	25.5	14.81	-
A1117+02	94	10	9	1.57	0.19	13.3	24.6	13.66	+0.04	I3475	132	-5	-	1.63	0.03	13.4	25.4	14.51	-0.69
N3664	95	9	8*	1.48	0.05	13.2	24.4	13.53	-0.39	A1230+31	133	10	9	1.93	0.13	12.4	25.6	13.35	-0.20
A1140+59	96	9	9	1.43	0.08	14.6	25.5	15.01	-0.51	A1231-02	134	10	9	1.38	0.03	14.8	25.5	15.11	-
A1146-28	239	9	9	1.56	0.00	13.4	25.0	13.82	-	N4523	135	8	9*	1.57	0.05	13.4	25.0	13.87	+0.55
A1146+24	97	10	9	1.49	0.00	14.2	25.6	14.76	-	I3522	136	10	9	1.32	0.26	15.5	25.3	15.51	-
A1148+56	98	10	8*	1.42	0.08	14.3	25.1	14.60	-0.42	I3576	138	9	8*	1.63	0.00	12.9	25.0	13.56	-
A1148+39	99	10	9*	1.78	0.32	13.5	25.5	14.12	-0.64	A1235+07	139	10	9	1.34	0.10	14.9	25.3	15.16	-
A1149+52	100	9	8	1.63	0.07	12.8	24.7	13.34	+0.96	I3617	140	10	8*	1.32	0.21	14.8	24.8	14.85	-0.53
A1153+31	101	10	9	1.49	0.19	14.5	25.4	14.86	-0.06	I3687	141	10	8	1.73	0.18	13.1	25.2	13.73	-
A1155-14	104	10	9*	1.38	0.33	15.4	25.4	15.52	-	A1241-05	142	9	9*	1.66	0.15	13.3	25.1	13.82	-0.94
A1155+51	102	9	9	1.60	0.03	13.6	25.4	14.18	-	A1241+00	144	9	9	1.62	0.13	13.3	25.0	13.82	-
A1155-14B	103	8?	-	1.36	0.08	14.4	24.9	14.60	+0.04	A1242+34	143	10	9	1.58	0.10	14.1	25.7	14.71	-
A1155-22	106	10	9	1.58	0.15	14.0	25.4	14.46	-	I3720	145	-5*	-	1.63	0.19	13.9	25.5	14.46	-
A1155+38	105	9	9	1.88	0.26	12.7	25.3	13.42	-	A1243-05	146	10	9	1.66	0.06	13.2	25.3	13.89	-
N4025	107	6	7*	1.61	0.19	13.2	24.7	13.63	+0.43	A1244+36	147	10	9	1.51	0.22	14.9	25.8	15.29	-
A1201-01	108	10	9	1.46	0.07	14.5	25.5	14.88	-	N4707	150	9	9*	1.57	0.05	13.4	25.0	13.87	-0.43
A1202-27	240	9	9	1.56	0.05	13.8	25.3	14.25	-	A1246-04	148	10	9	1.40	0.00	14.9	25.8	15.33	-
A1204+40	109	10	9	1.40	0.07	15.2	25.9	15.56	-	A1246-03	149	10	9	1.36	0.43	15.5	25.2	15.54	-
A1208+50	111	10	9	1.42	0.43	15.7	25.6	15.76	-	A1247-10	151	10	8	1.72	0.30	13.1	24.8	13.52	-
A1208+02	110	10	9	1.40	0.25	15.2	25.7	15.64	-	A1250-06	152	10	9	1.45	0.00	14.4	25.5	14.80	-
A1208+18	112	10	8	1.43	0.60	15.5	25.1	15.45	+0.35	A1251-11	153	10	-	1.56	0.35	14.5	25.3	14.77	-

TABLE X. (continued)

Object	DDO #	T	L	log a	log r^{-1}	m_{pg}	S	B_T^C	$B_T-B_T^C$
N4789A	154	10	8	1.57	0.05	13.5	25.1	13.99	-0.02
A1255+02	156	9	9	1.42	0.03	14.4	25.3	14.74	-
A1255+15†	157	10	7*	1.51	0.35†	14.9†	25.5	14.88	-
A1255+03	158	8	8	1.43	0.05	13.8	24.8	14.17	+0.25
A1256+14	155	10	9	1.28	0.08	14.8	24.9	14.89	-0.23
A1258-15	159	10	9	1.40	0.00	14.9	25.8	15.33	-
A1258-04	160	8	-	1.30	0.47	15.7	25.0	15.60	-
A1300-17	161	10	-	1.78	0.64	13.7	24.9	13.99	-0.47
N4948A	162	7	8	1.54	0.42	14.1	24.8	14.40	-0.45
A1302-07	163	9	9	1.34	0.34	15.6	25.3	15.57	-
A1303-17	164	10	9	1.40	0.00	14.9	25.8	15.33	-
A1304+67	165	10	8	1.71	0.16	13.4	25.4	13.99	-1.19
A1311+46	167	10	9	1.34	0.19	15.2	25.4	15.42	-
A1312+46	168	10	8	1.76	0.35	13.0	24.8	13.45	-0.75
A1313+47	169	10	9*	1.63	0.41	13.9	25.0	14.27	-
A1313+25	170	10	9	1.34	0.63	15.8	25.3	16.07	-
A1316-08	171	10	9*	1.30	0.15	14.9	25.0	15.05	-1.01
A1316+42	172	7	8	1.57	0.19	13.4	24.7	13.77	+0.63
A1318+10	173	9	8*	1.58	0.32	13.8	24.8	14.07	+0.01
A1321-24	241	10	9*	1.48	0.05	14.4	25.6	14.89	-
A1323+58	175	10	9	1.69	0.13	13.4	25.4	14.02	-
A1323-21	174	10	9	1.45	0.26	15.0	25.5	15.25	-
A1327+45	176	8	8	1.54	0.43	14.3	24.8	14.41	+0.04
A1333+46	178	9	9	1.38	0.00	14.6	25.4	14.95	-
A1334+46	177	7	9	1.46	0.07	13.9	24.9	14.20	-0.07
A1334+07	179	10	8	1.73	0.26	13.1	25.0	13.64	-0.44
A1335-09	180	9	8*	1.51	0.00	13.4	24.8	13.78	-1.03
A1337+40	181	10	8*	1.63	0.26	13.9	25.3	14.35	-
N5264	242	10	8	1.48	0.05	13.6	24.8	13.98	-1.34
A1340+39	182	10	9	1.54	0.00	13.9	25.5	14.46	-
A1348+38	183	10	8	1.54	0.48	14.9	25.3	15.06	-0.68
A1353+18	184	10	9	1.66	0.11	13.3	25.3	13.98	-
N5477	186	9	8	1.48	0.12	13.8	24.8	14.10	+0.24
A1413+16	188	10	9	1.46	0.05	14.1	25.2	14.51	+0.61
A1413+23	187	10	-	1.46	0.05	13.9	25.0	14.28	+0.07
N5556	243	7	8*	1.63	0.00	13.1	25.2	13.79	-
A1420+45	189	10	9	1.57	0.09	14.1	25.6	14.62	-
A1422+44	190	10	7*	1.49	0.00	13.4	24.8	13.86	-0.56
A1423+56	191	7	9	1.51	0.11	13.8	25.0	14.20	+0.25
A1427+44	192	9	9	1.58	0.21	13.7	25.0	14.11	-
A1433+59	193	8	9	1.46	0.19	14.1	24.8	14.30	+0.52
A1433+57	194	10	9	1.57	0.19	13.8	25.1	14.23	-
A1436-08	195	10	9	1.59	0.58	15.2	25.6	15.39	-
A1442+08	196	9	9	1.63	0.00	13.4	25.5	14.13	-
A1446-09	197	10	-	1.66	0.19	12.7	24.4	13.10	+0.18
A1459+52	198	10	8	1.40	0.06	14.2	24.9	14.41	-
A1535+44	200	9	9	1.43	0.24	14.5	25.0	14.72	+0.18
A1539+00	201	10	8	1.40	0.41	15.5	25.4	15.58	-0.96
A1547+81	203	8	8	1.65	0.31	13.5	24.9	13.91	-0.16
A1548+16	202	10	9	1.54	0.06	14.3	25.8	14.91	-
A1614+47	204	9	8	1.65	0.11	13.1	25.0	13.68	-0.10
A1616+63	205	10	8	1.42	0.26	14.6	24.9	14.68	+0.14
A1653+53	206	8	9	1.34	0.14	15.0	25.3	15.22	+0.03
A1717+14	207	9	9*	1.46	0.05	14.1	25.2	14.51	+0.75
A2044-13	210	10	9	1.51	0.25	15.0	25.8	15.34	-
A2207-19	211	10	9	1.51	0.39	14.8	25.3	15.02	-0.50
A2214-21	212	10	8	1.56	0.43	13.9	24.5	14.00	+0.73
A2231+32	213	9	9	1.69	0.06	13.0	25.2	13.67	+0.51
A2233-03	214	9	8	1.51	0.06	13.6	24.9	14.00	-0.65
A2236-05	215	10	-	1.46	0.52	15.1	25.0	15.09	-0.09
A2327+40	217	9	9*	1.81	0.09	12.7	25.4	13.50	-0.80
A2332+17	218	10	-	1.42	0.08	13.5	24.3	13.69	+0.35
A2334+00	219	9	9*	1.63	0.19	13.5	25.1	14.00	+0.30
A2346+25	220	10	8*	1.43	0.39	15.0	25.1	15.09	+0.56

†Diameter in UGC is in error. m_{pg} recalculated with Dxd = 2'0x0'8

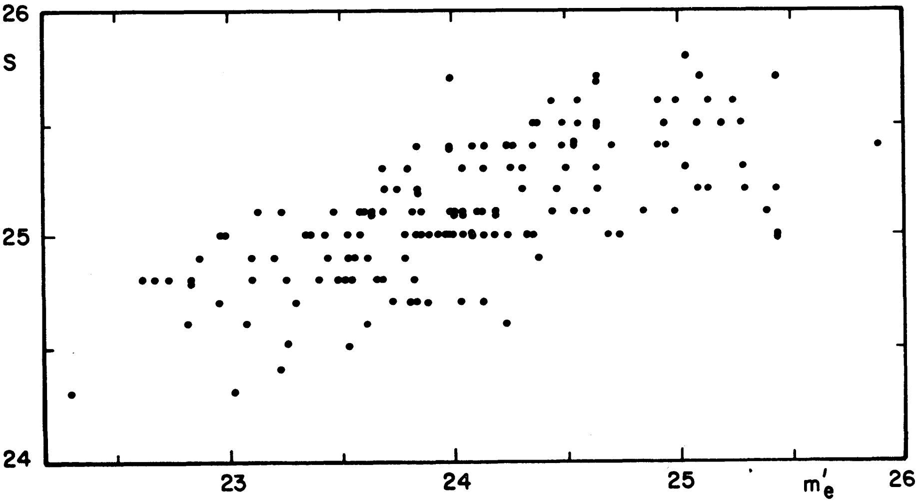

FIG. 7. Correlation between surface brightness parameter S estimated by Fisher and Tully and true mean surface brightness m'_e within effective aperture. Note that the subjective scale S is too compressed and tends to level off at $m'_e > 25$ (see text).

TABLE XI. Total magnitudes of 17 DDO objects measured by Holmberg.

Object	DDO#	T	m_{pg}(Ho)	B_T^W m.e.	New B_T	Name
N147	3	-5p	10.57	10.24 0.05	-	-
I1613	8	10	10.00	9.93 0.04	-	-
N2366	42	10	11.41	11.46 0.05	-	-
A0813+70	50	10	11.14	11.11 0.05	11.12	Ho II
A0936+71	63	10	13.27	13.02 0.05	13.06	Ho I
A0956+30	69	10	12.96	12.70 0.08	12.70:	Leo A
A0957+05	70	10	11.82	11.89 0.06	11.86	Sex B
A1005+12	74	-5	11.27	10.81 0.06	-	Leo I
A1008-04	75	10	11.55	11.69 0.07	-	Sex A
I2574	81	9	10.91	10.84 0.06	-	-
A1110+22	93	-5	12.85	-	12.70	Leo II
A1232+06	137	10	14.59	14.55 0.08	-	Ho VII
A1310+36	166	10	13.46	13.45 0.08	13.52	Ho VIII
A1352+54	185	9	(12.95)*	(13.03)* 0.11	13.80	Ho IV
N6822	209	10	9.21	9.31 0.06	-	-
A2326+14	216	10	12.50	12.41 0.08	12.2:	Peg
A2359-15	221	10	11.14	11.29 0.04	-	WLM

* Low-weight, 1 plate only.

TABLE XII. Catalog of *UBV* observations of DDO dwarfs.

Object	DDO Number	T	L	log D(0)	log A	X	V	B-V	U-B	Date	Series/ Remarks
A0001+14	222	9	9	1.37	0.73	-0.64	15.64	1.23	0.04	79-10-23	08B
					1.04	-0.33	15.02	0.81	0.06	"	08B
					1.33	-0.04	15.00	0.22	-0.36	"	08B
					1.45	+0.08	14.48	1.02	-0.63	77-11-11	29A
N0045	223	8	8	1.87	1.15	-0.72	12.70	0.65	0.02	78-09-08	HC
					1.28	-0.59	12.33	0.62	0.00	65-10-20	13
					1.45	-0.42	11.81	0.60	-0.08	73-11-01	21
					1.62	-0.25	10.99	0.86	0.00	"	21
					1.75	-0.12	10.88	0.77	-0.02	"	21
A0016-19	1	9	9	1.19	1.45	+0.26	16.86	(-1.79)	(-0.77)	77-11-11	29A *
A0017+10	2	9	9	1.39	0.73	-0.66	15.18	0.51	0.05	79-12-18	10B
					1.04	-0.35	14.65	0.25	-0.13	75-10-06	24
					1.04	-0.35	14.12	0.55	-0.19	79-12-18	10B
					1.22	-0.17	14.02	0.23	-0.23	75-10-06	24 *
					1.34	-0.05	13.57	0.59	-0.07	79-12-18	10B *
A0031+31	4	9	9*	1.27	0.73	-0.54	17.46:	-0.03:	0.09:	79-09-10	28B *
					1.04	-0.23	15.57:	0.78:	-0.31:	"	28B *
					1.34	+0.07	15.31	0.12	-0.21	"	28B
A0031-31	224	10*	8*	1.32	1.15	-0.17	14.21	0.47	-0.22	78-09-08	HC
					1.45	+0.13	13.96	0.52	-0.49	77-11-14	29A
					1.62	+0.30	13.47	0.45	-0.31	"	29A
I1558	225	8	8*	1.49	0.73	-0.76	15.30	0.18	-0.10	79-10-25	08B
					1.04	-0.45	14.09	0.50	-0.02	78-10-30	02B
					1.04	-0.45	14.22	0.39	-0.21	79-10-25	08B
					1.15	-0.34	13.75	0.58	-0.03	78-09-08	HC
					1.33	-0.16	13.12	0.54	-0.21	79-10-25	08B
					1.34	-0.15	13.19	0.48	-0.21	78-10-30	02B
					1.45	-0.04	12.96	0.57	-0.12	77-11-14	29A
					1.52	+0.03	12.78	0.38	-0.16	78-10-30	02B
					1.75	+0.26	12.63	0.19	-0.06	77-11-14	29A *
I1574	226	10	8	1.23	0.73	-0.50	15.99	0.61	-0.06	79-10-21	08B
					1.04	-0.19	14.64	0.54	-0.13	78-10-29	02B
					1.04	-0.19	14.57	0.52	0.10	78-11-03	02B
					1.04	-0.19	14.47	0.75	0.08	79-10-21	08B
					1.15	-0.08	14.37	0.50	-0.03	78-09-08	HC
					1.33	+0.10	13.80	1.01	-0.26	79-10-21	08B
					1.34	+0.11	13.87	0.74	-0.26	78-10-29	02B *
					1.34	+0.11	14.18	0.38	0.13	78-11-03	02B
					1.34	+0.11	13.99	0.47	0.06	79-12-20	10B
A0043-11	5	9	9	1.31	0.73	-0.58	15.80	0.38	-0.53	79-10-26	08B
					1.04	-0.27	14.73	0.36	-0.27	"	08B
					1.14	-0.17	14.51	0.35	-0.02	77-11-14	29A *
					1.33	+0.02	13.97	0.48	-0.22	79-10-26	08B *
					1.45	+0.14	14.20	0.45	-0.21	77-11-14	29A *
A0047-21	6	10	9	1.14	1.45	+0.31	15.95	-0.30	-	77-11-14	29A
					1.62	+0.48	14.08	0.40	0.03	77-11-14	29A *
A0058+07	7	9	9	1.22	1.33	+0.11	15.11	0.06	-0.43	79-10-20	08B
A0107+49	9	10*	9*	1.37	0.73	-0.64	15.52:	0.92	-0.19:	79-10-21	08B *
					1.04	-0.33	14.88:	0.60:	-0.30	79-10-21	08B *
A0118+12	10	9	8*	1.31	0.73	-0.58	15.65	0.53	-0.31	79-12-20	10B
					1.04	-0.27	14.87	0.48	0.13	78-11-03	02B *
					1.34	+0.03	14.42	0.51	-0.23	"	02B *
					1.34	+0.03	13.90	0.74	-0.26	79-12-20	10B
					1.45	+0.14	14.07	0.94	-0.59:	77-11-11	29A
					1.52	+0.21	14.10	0.63	0.29	78-11-03	02B *

TABLE XII. (continued).

Object	DDO Number	T	L	log D(0)	log A	X	V	B-V	U-B	Date	Series/ Remarks
A0127+25	11	9	9*	1.23	0.73	-0.50	15.51	0.75	0.00	78-11-20	02B *
					1.04	-0.19	14.61	0.59	-0.17	"	02B
					1.34	+0.11	13.90	0.75	-0.15	"	02B
					1.45	+0.22	14.09	0.87	-0.28	77-11-11	29A
A0132+04	12	10	9*	1.52	1.45	-0.07	14.60	0.35	0.16	77-11-14	29A
					1.62	+0.10	14.25	0.23	0.30	77-11-14	29A
A0137+15	13	10	9	1.65	1.45	-0.20	14.97	-0.19	+0.22	77-11-14	29A
					1.62	-0.03	14.77	0.05	-0.43	"	29A *
A0145-12	14	10	8	1.43	0.43	-1.00	16.54	0.55	-0.28	79-10-20	08B
					0.73	-0.70	15.50	0.45	0.00	"	08B
					0.73	-0.70	15.43	0.58	0.22	78-12-24	03B
					1.04	-0.39	14.41	0.47	-0.11	"	03B
					1.04	-0.39	14.54	0.41	0.31	79-10-20	08B
					1.33	-0.10	13.46	0.71	-0.26	"	08B *
					1.34	-0.09	13.65	0.38	-0.03	78-12-24	03B *
A0147-13	15	10	9	1.21	0.73	-0.48	16.06	0.81	(0.54)	78-12-28	03B
					1.04	-0.17	15.14	0.59	-0.15	"	03B
					1.34	+0.13	15.01	0.47	-0.20	"	03B
A0200+21	17	10	9	1.35	1.04	-0.31	14.80	0.58	-0.18	75-10-06	24
					1.22	-0.13	14.46	0.28	-0.28	"	24 *
					1.45	+0.10	13.90	0.63	0.09	77-11-10	29A *
					1.62	+0.27	14.22	0.28	-0.28	"	29A *
A0208+06	18	9*	9	1.36	1.04	-0.32	15.63	0.29	(-0.91)	79-10-23	08B
					1.33	-0.03	14.62	0.63	0.03	"	08B
A0221+35	19	9	9*	1.44	1.04	-0.40	14.87	0.72	-0.22	78-11-03	02B
					1.34	-0.10	14.25	0.65	-0.12	"	02B *
					1.45	+0.01	13.95	0.32	-0.54	77-11-10	29A *
A0223-21	21	9*	9	1.33	0.73	-0.60	16.12	0.27	-0.26	79-10-25	08B
					1.04	-0.29	14.98	0.47	0.23	"	08B
					1.33	0.00	14.24	0.25	0.25	"	08B
A0223-10	20	9	8*	1.39	1.45	+0.06	14.08	0.47	-0.37	77-11-10	29A
					1.75	+0.36	14.87	-0.20	-0.23	"	29A *
A0228-10	23	10	8	1.29	1.14	-0.15	14.58	0.46	-0.30	77-11-10	29A *
					1.45	+0.16	14.12	0.82	-0.77	"	29A *
A0229+38	22	10	9	1.32	0.73	-0.59	16.47	0.41	-0.27	79-12-18	10B
					1.04	-0.28	15.94	0.02	-0.05	"	10B
					1.14	-0.18	14.89	0.66	-0.15	77-11-10	29A *
					1.34	+0.02	15.60	0.14	-0.04	79-12-18	10B *
A0230+33	25	10	9	1.32	1.14	-0.18	14.17	0.60	-0.35	77-11-12	29A
					1.45	+0.13	13.62	0.53	-0.18	"	29A
A0230+40	24	10	8*	1.52	0.73	-0.79	15.17	0.67	0.08	78-12-28	03B
					1.04	-0.48	14.33	0.53	-0.16	"	03B *
A0231+29	26	10	9	1.27	0.73	-0.54	16.08	0.51	0.35	79-10-26	08B
					1.04	-0.23	15.12	0.70	-0.16	78-11-03	02B
					1.04	-0.23	14.98	0.33	0.17	79-10-26	08B
					1.33	+0.06	14.85	0.35	(0.75)	"	08B *
					1.34	+0.07	15.36	0.23	-0.25	78-11-03	02B *
A0245+03	28	9*	9	1.75	1.45	-0.30	13.87	0.60	-0.28	77-11-11	29A
					1.62	-0.13	13.60	0.38	-0.21	"	29A
A0246+01	29	9	9	1.75	1.04	-0.71	14.77	0.65	-0.01	77-09-10	28B
					1.34	-0.41	13.81	0.59	-0.12	"	28B

TABLE XII. (continued)

Object	DDO Number	T	L	log D(0)	log A	X	V	B-V	U-B	Date	Series/ Remarks	
					1.54	-0.21	13.82	0.66	-0.26	"	28B	
A0249-01	30	9	9	1.61	1.14	-0.47	14.91	0.33	-0.32	77-11-11	29A	
					1.45	-0.16	14.06	0.55	-0.35	"	29A	
A0301-25	227	9	9	1.28	1.15	-0.13	14.74	0.60	-0.07	78-09-08	HC	
N1253A	31	9	9*	1.18	1.04	-0.14	14.33	0.36	-0.33	75-10-06	24	
					1.14	-0.04	14.22	0.42	-0.39	77-11-11	29A	
					1.15	-0.03	14.08	0.46	-0.35	78-09-08	HC	
					1.22	+0.04	13.57	0.29	-0.09	75-10-06	24	*
A0312-04	32	10	9*	1.27	1.04	-0.23	14.46	0.64	-0.10	76-10-20	27	
					1.34	+0.07	14.28	0.11	-0.15	"	27	
A0441+74	33	10	8*	1.23	0.79	-0.44	15.39	0.65	-0.13	79-12-15	33	
					1.09	-0.14	14.66	0.65	-0.10	"	33	*
A0446+00	34	10*	9	1.21	0.73	-0.48	16.20	0.56	–	79-10-21	08B	*
					1.04	-0.17	15.14	0.43	-0.26	"	08B	
					1.14	-0.07	15.07	0.50	-0.51	77-11-10	29A	
					1.33	+0.12	14.29	0.53	0.17	79-10-21	08B	
A0447-29	228	9*	9	1.48	0.73	-0.75	15.00	0.48	-0.24	79-10-21	08B	
					1.04	-0.44	14.02	0.50	-0.27	"	08B	
					1.33	-0.15	13.06	0.57	-0.34	"	08B	
					1.33	-0.15	12.98	0.54	-0.30	"	08B	
A0450-25	229	9	8	1.57	0.73	-0.84	15.46	0.48	-0.29	79-10-25	08B	
					1.04	-0.53	14.32	0.66	-0.08	79-10-23	08B	*
					1.33	-0.24	13.56	0.31	-0.31	"	08B	*
A0500+16	35	10*	9*	1.31	1.04	-0.27	15.00	0.69	-0.14	78-12-28	03B	
					1.34	+0.03	14.12	0.91	-0.27	"	03B	
					1.45	+0.14	14.97	0.25	+0.26	77-11-09	29A	
A0505-16	36	9	8	1.32	1.14	-0.18	13.93	0.47	-0.09	77-11-09	29A	*
					1.45	+0.13	13.21	0.61	-0.26	"	29A	*
A0508-31	230	9*	8*	1.43	1.04	-0.39	13.85	0.36	-0.26	76-10-26	27	
					1.34	-0.09	12.98	0.43	-0.16	"	27	
					1.54	+0.11	12.84	0.42	-0.26	"	27	
A0516-21	37	10	9?	1.14	1.45	+0.31	14.77	(0.85)	(-0.89)	77-11-10	29A	
N1879	232	10	9	1.34	1.04	-0.30	13.58	0.42	-0.25	76-10-26	27	
					1.34	0.00	12.90	0.47	-0.10	"	27	
A0558-28	233	9	9	1.33	0.73	-0.60	15.61	0.36	0.24	79-10-26	08B	
					1.04	-0.29	14.69	0.55	0.56	"	08B	
					1.33	0.00	14.25	0.35	0.16	"	08B	
					1.34	+0.01	14.14	0.42	0.21	79-03-01	05B	
A0700+56	40	10	9	1.15	0.73	-0.42	15.61	0.70	-0.24	76-10-26	27	
					1.04	-0.11	14.78	0.44	-0.28	"	27	
					1.04	-0.11	14.91	0.41	-0.33	79-12-20	10B	
					1.34	+0.19	14.10	0.67	-0.36	76-10-26	27	
					1.34	+0.19	14.34	0.36	-0.05	79-12-20	10B	
A0705+53	41	10	9*	1.13	1.04	-0.09	15.43	0.67	0.02	78-12-27	03B	
					1.45	+0.32	14.36	0.91	-0.48	77-11-09	29A	
N2366	42	10	8	(1.80)	1.04		13.29	0.14	-0.53	78-10-29	02B	*
					1.34		12.67	0.23	-0.44	"	02B	
					1.52		12.14	0.27	-0.38	"	02B	*

TABLE XII. (continued)

Object	DDO Number	T	L	log D(0)	log A	X	V	B-V	U-B	Date	Series/ Remarks
A0724+40	43	10	9*	1.17	0.73	-0.44	16.02	0.29	-0.13	76-10-26	27
					1.04	-0.13	15.03	0.55	-0.11	"	27
					1.34	+0.17	15.14	-0.01	-0.38	"	27 *
A0738+40	46	10	9	1.27	1.04	-0.23	14.97	0.53	-0.33	79-02-24	05B
					1.45	+0.18	14.04	0.39	-0.26	77-11-09	29A
A0739+16	47	10	9?	1.65	1.09	-0.56	15.08	0.49	-0.07	79-12-16	33
					1.27	-0.38	14.43	0.59	-0.30	"	33 *
					1.45	-0.20	13.67	0.60	-0.05	77-11-10	29A *
					1.62	-0.03	13.88	0.18	0.03	"	29A *
A0754+58	48	9	8*	1.28	1.04	-0.24	15.34	0.71	0.16	77-03-15	28A
					1.04	-0.24	15.48	0.87	-0.15	77-03-23	28A
					1.34	+0.06	14.77	0.44	0.10	"	28A
					1.45	+0.17	15.64	(-0.32)	(-1.00)	77-11-09	29A *
A0807+46	49	10	8*	1.26	0.73	-0.53	15.18	0.26	-0.33	79-12-25	10B *
					1.04	-0.22	14.30	0.45	-0.27	77-03-20	28A *
					1.04	-0.22	14.37	0.38	-0.34	79-12-25	10B *
					1.34	+0.08	13.80	0.54	-0.25	77-03-20	28A *
					1.34	+0.08	13.96	0.34	-0.26	79-12-25	10B *
A0819+70	50	10	8	1.86	1.11	-0.75	13.54	0.27	-0.29	76-03-01	25
					1.41	-0.45	12.40	0.35	-0.36	"	25 *
					1.41	-0.45	12.37	0.34	-0.35	"	25 *
A0819+74	51	7*	8*	1.17	0.91	-0.26	14.99	0.31	-0.04	77-11-14	29A *
A0825+42	52	10	9	1.25	1.04	-0.21	15.48	(0.59)	(0.47)	77-03-22	28A *
					1.34	+0.09	14.92	0.46	0.55	"	28A *
A0829+66	53	10	9	1.22	1.04	-0.18	14.88	0.35	-0.44	77-03-24	28A
					1.34	+0.12	14.36	0.33	-0.41	"	28A
A0905+06	54	9	9	1.28	1.04	-0.24	15.11	0.43	-0.05	77-03-15	28A *
					1.09	-0.19	14.78	0.68	0.04	79-12-16	33
					1.27	-0.01	14.47	0.57	0.14	"	33
					1.34	+0.06	13.85	0.70	0.04	77-03-15	28A *
A0908-14	57	10	9	1.24	0.73	-0.51	16.19	0.45	-0.41	79-02-24	05B
					1.04	-0.20	15.12	0.46	-0.35	"	05B
					1.34	+0.10	15.01	0.07	-0.01	"	05B
					1.34	+0.10	14.05	0.62	-0.17	79-12-22	10B
A0909+35	55	9?	9*	1.29	0.73	-0.56	15.79	0.52	-0.35	79-12-22	10B
					1.04	-0.25	15.85	0.01	-0.12	77-03-24	28A
					1.04	-0.25	14.85	0.58	0.05	79-12-22	10B
					1.34	+0.05	14.43	0.69	-0.21	77-03-24	28A
					1.34	+0.05	14.61	0.35	0.06	79-12-22	10B
A0910+19	58	10	9	1.21	0.73	-0.48	16.20	0.38	0.41	79-12-24	10B
					1.04	-0.17	15.36	0.30	-0.22	"	10B
					1.14	-0.07	15.07	0.43	-0.44	77-11-12	29A
					1.45	+0.24	14.92	0.31	-0.64	"	29A *
A0911+39	59	9	9	1.17	0.73	-0.44	15.89	0.42	-0.34	80-03-15	11B
					1.04	-0.13	15.76	-0.03	-0.26	77-03-24	28A
					1.04	-0.13	15.21	0.44	-0.35	80-03-15	11B
					1.34	+0.17	15.16	0.36	-0.09	77-03-24	28A *
					1.34	+0.17	15.21	0.16	-0.07	80-03-15	11B *
A0917-12	60	10	9	1.13	0.73	-0.40	15.99	0.55	-0.24	79-02-24	05B
					1.04	-0.09	14.79	0.38	-0.26	"	05B
A0918-12	61	10	9	1.07	0.73	-0.34	15.54	0.69	-0.25	79-02-28	05B
					1.04	-0.03	14.88	0.47	-0.30	"	05B *
A0936+71	63	10	9	1.53	1.11	-0.42	15.39	0.04	(0.07)	76-03-25	25
					1.41	-0.12	14.19	-0.01	-0.25	"	25

TABLE XII. (continued)

Object	DDO Number	T	L	log D(0)	log A	X	V	B-V	U-B	Date	Series/ Remarks
A0942-31	235	8	8	1.32	0.73	-0.59	14.93	0.47	-0.63	79-02-27	05B
					1.04	-0.28	13.35	0.51	-0.24	"	05B
					1.34	+0.02	13.46	0.18	-0.10	"	05B *
					1.34	+0.02	13.12	0.34	-0.10	80-04-14	12B *
A0947+31	64	10	8*	1.26	1.14	-0.12	14.58	0.29	-0.51	77-11-13	29A *
					1.45	+0.19	14.43	0.06	-0.62	"	29A *
A0953+69	66	10	9	1.37	1.04	-0.33	15.73	0.71	-0.64	77-03-20	28A *
					1.34	-0.03	14.37	0.69	-0.33	"	28A *
A0953+29	68	10	-	1.33	0.73	-0.60	15.77	0.30	-0.33	79-12-25	10B
					1.04	-0.29	14.72	0.38	-0.21	"	10B
					1.34	+0.01	15.02	-0.03	-0.45	77-03-24	28A
					1.34	+0.01	14.25	0.46	-0.26	79-12-25	10B
					1.54	+0.21	14.68	0.14	-0.37	77-03-24	28A
A0956+30	69	10	9	1.64	1.45	-0.19	13.87	0.32	-0.50	77-11-13	29A *
					1.62	-0.02	13.08	0.23	0.08	"	29A *
					1.75	+0.11	13.23	0.09	-0.08	"	29A *
A0957+05	70	10	8	1.63	0.73	-0.90	15.22	0.30	-0.14	80-03-17	11B
					1.04	-0.59	13.71	0.35	-0.20	"	11B
					1.34	-0.29	12.53	0.50	-0.19	77-03-20	28A *
					1.34	-0.29	12.54	0.41	-0.18	80-03-17	11B *
					1.54	-0.09	12.00	0.52	-0.09	77-03-20	28A *
N3057	67	8	7	1.34	0.79	-0.55	14.31	0.57	-0.19	80-04-16	35
					0.81	-0.53	14.50	0.44	-0.09	79-01-01	04B
					1.09	-0.25	13.31	0.60	-0.16	80-04-16	35
					1.12	-0.22	13.63	0.42	-0.14	79-01-01	04B
					1.27	-0.07	13.03	0.62	-0.19	80-04-16	35
					1.42	+0.18	13.21	0.39	-0.17	79-01-01	04B *
A1005+29	72	9	9*	1.14	0.73	-0.41	16.14	0.47	-0.02	79-12-20	10B
					1.04	-0.10	15.17	0.74	-0.01	"	10B
					1.14	0.00	15.21	0.56	0.11	78-04-11	30
A1006+30	73	10	9	1.24	1.45	+0.21	14.09	0.72	-0.39	78-04-10	30
					1.62	+0.38	14.27	0.51	+0.11	"	30 *
A1008-13	76	10	9*	1.24	1.04	-0.20	14.88	0.84	-0.13	78-12-27	03B
					1.34	+0.10	14.78	0.54	0.10	"	03B
A1020+71	77	8	8	1.50	0.43	-1.07	16.11	0.54	-0.08	79-12-20	10B
					0.73	-0.77	14.81	0.65	-0.06	78-12-25	03B
					1.04	-0.46	13.71	0.59	-0.11	"	03B
					1.34	-0.16	12.79	0.55	-0.02	"	03B *
A1021+15	79	8	8	1.42	0.73	-0.69	15.58	0.63	-0.11	79-03-01	05B
					1.04	-0.38	14.46	0.66	-0.07	"	05B
					1.14	-0.28	14.38	0.78	-0.21	78-04-11	30
					1.34	-0.08	13.88	0.60	-0.10	79-03-01	05B
					1.45	+0.03	13.87	0.73	-0.47	78-04-11	30 *
A1026+70A	80	9	9*	1.50	1.04	-0.46	14.42	0.52	-0.12	79-02-26	05B *
					1.34	-0.16	13.61	0.57	-0.25	"	05B *
A1026+70B	82	9	9*	1.48	0.43	-1.05	16.74	0.18	0.095	79-12-22	10B
					0.73	-0.75	15.00	0.57	-0.15	78-12-25	03B
					1.04	-0.44	13.91	0.64	-0.02	"	03B
					1.34	-0.14	12.99	0.79	0.04	"	03B *
A1033-24	238	8	8*	1.48	0.73	-0.75	15.48	0.42	0.06	78-12-28	03B
					1.04	-0.44	14.29	0.55	-0.19	"	03B
					1.34	-0.14	13.32	0.60	-0.24	"	03B *
A1033+31	83	10	9	1.26	1.04	-0.22	16.60	-0.29	-0.23	77-03-22	28A *
					1.34	+0.08	15.05	0.40	-0.66	"	28A *

TABLE XII. (continued)

Object	DDO Number	T	L	log D(0)	log A	X	V	B-V	U-B	Date	Series/ Remarks	
A1039-23	85	9	9	1.21	0.73	-0.48	15.37	0.53	0.05	78-12-27	03B	
					1.04	-0.17	14.41	0.44	-0.23	"	03B	
					1.34	+0.13	13.70	0.55	0.01	"	03B	
A1039+34	84	10	9	1.64	1.45	-0.19	14.16	0.17	-0.23	78-04-11	30	
					1.75	+0.11	14.09	-0.29	-0.63	"	30	
A1041+60	86	10	9	1.23	0.73	-0.50	17.40	-0.30	0.04	79-02-27	05B	
					1.04	-0.19	15.53	0.34	0.12	"	05B	
					1.34	+0.11	14.96	0.52	-0.33	"	05B	
N3377A	88	9	9	1.30	0.73	-0.57	15.49	0.61	0.11	79-12-22	10B	
					1.04	-0.26	14.65	0.41	0.08	77-03-20	28A	
					1.04	-0.26	14.41	0.64	-0.20	79-12-22	10B	
					1.34	+0.04	13.80	0.59	0.07	77-03-20	28A	*
					1.34	+0.04	13.78	0.73	-0.02	79-12-22	10B	*
A1046+65	87	10	9	1.47	0.73	-0.74	17.37	-0.21	-0.48	79-02-26	05B	
					1.04	-0.43	15.73	0.37	0.25	"	05B	
					1.34	-0.13	15.12	0.43	0.08	"	05B	
					1.34	-0.13	14.71	0.69	-0.12	79-02-24	05B	
A1047+19	89	10	-	1.09	0.73	-0.36	15.60	0.51	-0.29	80-04-16	12B	
					1.04	-0.05	14.74	0.55	-0.25	"	12B	
					1.14	+0.05	14.72	0.49	-0.14	78-04-12	30	
					1.34	+0.25	14.68	0.35	-0.40	80-04-16	12B	
					1.45	+0.36	14.64	0.23	0.06	78-04-12	30	*
A1103+20	91	9	9	1.29	1.04	-0.25	15.00	0.57	-0.19	80-04-17	12B	
					1.34	+0.05	14.67	0.30	-0.28	"	12B	*
A1110+53	92	9	8	1.27	1.14	-0.13	15.30	0.08	-0.50	78-04-12	30	
					1.45	+0.18	14.91	(1.01)	–	"	30	*
A1110+22	93	-5	-	2.14	0.73	-1.41	16.37	(1.53)	0.22	80-04-15	12B	*
					1.04	-1.10	15.52	0.81	-0.14	"	12B	*
					1.04	-1.10	15.40	0.56	0.14	80-03-17	11B	*
					1.34	-0.80	13.87	0.81	-0.05	"	11B	*
					1.34	-0.80	13.95	0.76	0.24	80-04-15	12B	*
					1.52	-0.62	13.31	0.56	0.31	80-03-17	11B	*
A1117+02	94	10	9	1.33	1.04	-0.29	14.55	0.49	-0.25	77-03-15	28A	
					1.34	+0.01	13.81	0.40	-0.26	"	28A	
N3664	95	9	8*	1.30	1.04	-0.26	14.17	0.31	-0.42	77-03-15	28A	
					1.04	-0.26	13.77	0.29	-0.33	79-02-26	05B	
					1.34	+0.04	12.97	0.44	-0.27	77-03-15	28A	
					1.34	+0.04	12.98	0.41	-0.29	79-02-26	05B	
					1.52	+0.22	12.89	0.40	-0.22	"	05B	
A1140+59	96	9	9	1.22	0.73	-0.49	16.59	(1.28)	-0.36	79-02-28	05B	
					1.04	-0.18	15.14	0.83	-0.51	"	05B	
					1.34	+0.12	14.52	0.52	-0.34	"	05B	
A1148+56	98	10	8*	1.20	0.73	-0.47	15.45	0.45	-0.27	79-12-18	10B	
					1.04	-0.16	14.59	0.38	-0.20	"	10B	
					1.04	-0.16	14.63	0.34	-0.29	"	10B	
					1.34	+0.14	14.05	0.30	-0.26	"	10B	
					1.34	+0.14	13.90	0.46	-0.27	"	10B	
A1148+39	99	10	9*	1.51	0.73	-0.78	16.17	0.00	-0.27	79-12-24	10B	
					1.04	-0.47	14.94	0.17	-0.28	"	10B	
					1.34	-0.17	13.79	0.39	-0.23	"	10B	
A1149+52	100	9	8	1.45	0.73	-0.72	15.40	0.61	-0.18	79-02-24	05B	
					1.04	-0.41	14.74	0.47	-0.06	"	05B	
					1.34	-0.11	14.13	0.42	0.01	"	05B	*
A1153+31	101	10	9	1.27	0.73	-0.54	15.65	0.91	0.57	80-04-14	12B	
					1.04	-0.23	14.81	0.63	-0.23	"	12B	

TABLE XII. (continued)

Object	DDO Number	T	L	log D(0)	log A	X	V	B-V	U-B	Date	Series/ Remarks
					1.34	+0.07	14.20	0.78	0.00	"	12B *
A1155-14B	103	8?	-	1.07	0.73	-0.34	15.01	0.51	-0.16	80-04-16	12B *
					1.04	-0.03	14.55	0.34	-0.13	"	12B *
					1.34	+0.27	14.28	0.37	-0.29	"	12B *
A1155+38	105	9	9	1.62	1.45	-0.17	13.60	0.43	-0.40	78-04-10	30 *
N4025	107	6	7*	1.47	0.73	-0.74	15.01	0.59	0.06	79-02-28	05B
					1.04	-0.43	14.10	0.54	-0.13	"	05B
					1.34	-0.13	13.62	0.59	-0.08	"	05B
					1.34	-0.13	13.72	0.46	-0.16	77-03-20	28A
					1.54	+0.07	13.56	0.50	-0.15	"	28A
A1208+18	112	10	8	1.13	1.14	+0.01	15.41	0.76	-0.28	78-04-10	30
					1.45	+0.32	14.24	(1.61:)	(-1.34)	"	30
A1212+13	114	10	8*	1.09	1.04	-0.05	15.39	0.64	-0.16	80-04-14	12B
					1.34	+0.25	14.83	0.71	-0.29	"	12B
I3059	115	10	9*	1.23	1.04	-0.19	14.97	0.65	0.04	77-03-23	28A
					1.34	+0.11	14.49	0.48	0.09	"	28A
N4288	119	9	8?	1.34	0.73	-0.71	14.17	0.45	-0.13	80-03-17	11B
					1.04	-0.30	13.44	0.35	-0.27	77-03-20	28A
					1.04	-0.30	13.32	0.41	-0.23	80-03-17	11B
					1.34	0.00	12.92	0.48	-0.26	77-03-20	28A
					1.34	0.00	12.92	0.40	-0.28	80-03-17	11B
A1218+46	120	10	8	1.35	0.73	-0.62	15.02	0.48	-0.06	80-04-15	12B
					1.04	-0.31	14.16	0.41	-0.06	"	12B
					1.34	-0.01	13.75	0.26	-0.05	"	12B
					1.45	+0.10	13.37	0.35	-0.07	78-04-10	30
					1.62	+0.27	13.47	0.05	0.19	"	30
A1222+70	122	9	9	1.52	0.73	-0.79	15.00	0.78	0.02	79-03-01	05B
					1.04	-0.48	14.00	0.56	0.01	"	05B
					1.34	-0.18	13.16	0.38	-0.03	"	05B *
					1.52	0.00	12.81	0.52	-0.01	"	05B *
A1223+58	123	10	8	1.40	0.73	-0.67	15.55	0.26	-0.03	80-04-14	12B
					1.04	-0.36	14.37	0.52	-0.13	"	12B
					1.34	-0.06	13.15	0.32	-0.28	"	12B *
I3355	124	10	8	1.03	1.04	+0.01	15.25	0.35	-0.20	79-02-24	05B
					1.34	+0.31	15.15	0.33	-0.28	"	05B
A1224+37	126	10	9	1.59	0.73	-0.86	15.67	0.30	-0.21	80-04-16	12B
					1.04	-0.55	14.76	0.23	-0.21	"	12B
					1.34	-0.25	14.04	0.37	-0.40	"	12B
A1225+43	125	10	8	1.55	1.04	-0.51	14.13	0.36	-0.26	79-03-01	05B
					1.34	-0.21	13.01	0.48	-0.20	"	05B
					1.52	-0.03	12.65	0.49	-0.10	"	05B
A1226+37	127	9	9	1.26	0.73	-0.53	15.84	0.27	0.03	80-04-16	12B
					1.04	-0.22	14.96	0.43	-0.19	"	12B
					1.34	+0.08	14.46	0.56	-0.19	"	12B *
A1226+43	129	10	9	1.52	0.73	-0.79	15.89	0.34	-0.04	80-04-18	12B
					1.04	-0.48	14.80	0.37	-0.21	"	12B
					1.34	-0.18	13.84	0.47	-0.34	"	12B
					1.52	0.00	13.77	0.18	-0.43	"	12B
I3475	132	-5		1.41	1.34	-0.07	14.61	-0.01	0.19	77-03-20	28A
					1.34	-0.07	13.91	0.59	0.14	77-03-24	28A *
					1.54	+0.13	13.39:	0.92:	0.27	77-03-20	28A *
					1.54	+0.13	13.64	0.66	0.27	77-03-24	28A *

TABLE XII. (continued)

Object	DDO Number	T	L	log D(0)	log A	X	V	B-V	U-B	Date	Series/ Remarks
A1230+31	133	10	9	1.72	1.04	-0.68	15.05	0.58	-0.18	80-04-17	12B
					1.34	-0.38	14.07	0.41	-0.22	"	12B
					1.52	-0.20	13.36	0.55	-0.20	"	12B
N4523	135	8	9*	1.41	0.73	-0.68	15.27	0.48	-0.06	79-02-27	05B *
					1.04	-0.37	14.59	0.30	-0.07	"	05B *
					1.34	-0.07	14.18	0.34	-0.11	"	05B *
I3617	140	10	8*	1.05	0.73	-0.32	15.09	0.35	-0.22	80-04-18	12B
					1.04	-0.01	14.51	0.22	-0.22	"	12B
					1.34	+0.29	14.23	0.17	-0.21	"	12B
A1241-05	142	9	9*	1.45	0.73	-0.72	14.74	0.70	0.08	80-04-18	12B
					1.04	-0.41	13.57	0.70	0.08	"	12B
					1.34	-0.11	12.84	0.59	-0.06	"	12B
					1.52	+0.07	12.52	0.56	0.00	"	12B
N4707	150	9	9*	1.36	1.04	-0.32	13.46	0.73	0.10	77-03-16	28A *
					1.34	-0.02	13.10	0.53	-0.07	"	28A *
N4789A	154	10	8	1.41	0.73	-0.68	15.91	0.34	-0.45	79-12-22	10B
					1.04	-0.37	14.72	0.22	-0.32	"	10B
					1.04	-0.37	14.81	0.19	-0.31	80-04-14	12B
					1.34	-0.07	13.90	0.32	-0.38	79-12-22	10B
					1.34	-0.07	13.97	0.40	-0.13	80-04-14	12B
A1255+03	158	8	8	1.22	0.73	-0.49	15.27	0.48	-0.06	79-02-27	05B
					1.04	-0.18	14.59	0.30	-0.07	"	05B
					1.34	+0.12	14.18	0.34	-0.11	"	05B
A1256+14	155	10	9	1.07	0.73	-0.34	15.66	0.26	-0.34	80-03-17	11B
					1.04	-0.03	14.59	0.38	-0.48	77-03-20	28A
					1.04	-0.03	15.01	0.16	-0.47	80-03-17	11B
					1.34	+0.27	14.09	0.68	-0.58	77-03-20	28A
					1.34	+0.27	14.40	0.32	-0.56	80-03-17	11B
					1.45	+0.38	15.16	-0.03	-0.50	78-04-12	30
					1.62	+0.55	14.32	0.36	-0.61	"	30
					1.75	(+0.68)	(15.17)	(-0.84)	(0.35)	"	30 *
A1300-17	161	10	-	1.51	0.73	-0.78	15.08	0.36	-0.27	80-03-15	11B
					1.04	-0.47	13.96	0.31	-0.23	"	11B
					1.34	-0.17	13.34	0.43	-0.40	"	11B
					1.52	+0.01	13.29	0.28	-0.39	"	11B
N4948A	162	7	8	1.14	0.73	-0.41	14.73	0.61	-0.12	79-02-28	05B
					1.04	-0.10	13.86	0.49	-0.14	"	05B
					1.34	+0.20	13.46	0.58	-0.23	"	05B
A1304+67	165	10	8	1.46	0.73	-0.73	15.67	0.34	-0.30	79-02-26	05B
					1.04	-0.42	14.38	0.26	-0.18	"	05B
					1.34	-0.12	13.24	0.29	-0.18	"	05B
					1.52	+0.06	12.89	0.38	-0.21	"	05B *
A1310+36	166	10	8	1.38	0.73	-0.65	15.24	0.53	-0.04	79-04-28	06B
					1.04	-0.34	14.10	0.44	-0.14	"	06B
					1.34	-0.04	13.43	0.41	-0.20	"	06B
A1312+46	168	10	8	1.44	0.73	-0.71	15.21	0.46	-0.23	79-04-29	06B
					1.04	-0.40	13.90	0.47	-0.26	"	06B
					1.34	-0.10	13.02	0.39	-0.24	"	06B
A1316-08	171	10	9*	1.11	0.73	-0.38	15.38	0.46	-0.10	80-03-15	11B
					1.04	-0.07	14.28	0.41	-0.07	"	11B
					1.34	+0.23	13.66	0.55	-0.04	"	11B *
A1316+42	172	7	8	1.34	0.73	-0.61	15.40	0.46	-0.13	79-02-28	05B
					1.04	-0.30	14.57	0.52	-0.18	"	05B *
					1.34	0.00	14.09	0.47	-0.22	"	05B *

TABLE XII. (continued)

Object	DDO Number	T	L	log D(0)	log A	X	V	B-V	U-B	Date	Series/ Remarks
A1318+10	173	9	8*	1.30	0.73	-0.57	15.16	0.62	-0.05	80-04-17	12B
					1.04	-0.26	14.34	0.50	0.01	"	12B
					1.34	+0.04	13.93	0.34	-0.04	"	12B
A1327+45	176	8	8	1.24	0.73	-0.51	15.10	0.38	-0.40	79-02-27	05B
					1.04	-0.20	14.57	0.38	-0.37	"	05B
					1.34	+0.10	14.13	0.46	-0.12	"	05B
A1334+46	177	7	9	1.21	0.73	-0.48	15.14	0.54	-0.12	79-03-01	05B
					1.04	-0.17	14.37	0.49	-0.12	"	05B *
					1.34	+0.13	13.89	0.42	-0.06	"	05B *
A1334+07	179	10	8	1.46	0.73	-0.73	15.25	0.42	0.03	80-04-15	12B
					1.04	-0.42	13.95	0.51	-0.17	"	12B *
					1.34	-0.12	13.09	0.54	-0.29	"	12B *
A1335-09	180	9	8*	1.33	0.73	-0.60	14.23	0.63	-0.04	80-03-15	11B
					1.04	-0.29	13.14	0.61	-0.04	"	11B
					1.34	+0.01	12.49	0.56	-0.08	"	11B
N5264	242	10	8	1.21	0.73	-0.48	14.18	0.52	-0.03	80-03-17	11B
					1.04	-0.17	13.11	0.51	0.02	"	11B
					1.15	-0.06	12.78	0.57	-0.05	78-06-08	HC
					1.34	+0.13	12.34	0.58	-0.02	80-03-17	11B
A1348+38	183	10	8	1.25	0.73	-0.52	15.74	0.43	-0.36	80-04-18	12B
					1.04	-0.21	15.03	0.45	-0.17	80-04-17	12B
					1.04	-0.21	14.85	0.47	-0.11	80-04-18	12B
					1.34	+0.09	14.65	(0.06)	(-0.34)	80-04-17	12B
					1.34	+0.09	14.17	0.45	+0.07	80-04-18	12B
A1352+54	185	9	8	1.49	0.73	-0.76	15.47	0.61	-0.22	80-04-16	12B
					0.73	-0.76	15.37	0.44	-0.12	80-05-17	13B
					1.04	-0.45	14.45	0.51	-0.19	80-04-16	12B
					1.04	-0.45	14.40	0.37	-0.19	80-05-17	13B
					1.34	-0.15	13.75	0.53	-0.12	80-04-16	12B
					1.34	-0.15	13.73	0.53	-0.40	80-05-17	13B
					1.52	+0.03	13.53	0.36	-0.21	"	13B
N5477	186	9	8	1.22	1.06	-0.16	14.21	0.36	-0.40	75-04-14	23
					1.11	-0.11	14.24	0.26	-0.31	76-02-27	25
					1.41	+0.19	13.97	0.41	-0.50	"	25 *
A1413+16	188	10	9	1.27	0.73	-0.54	16.26	0.68	0.11	79-04-27	06B
					1.04	-0.23	15.58	0.09	0.06	"	06B
					1.34	+0.07	14.62	0.63	-0.21	"	06B
A1413+23	187	10	-	1.23	0.73	-0.50	16.07	-0.02	-0.29	80-04-19	12B
					1.04	-0.19	15.04	0.18	-0.15	77-03-22	28A
					1.04	-0.19	14.88	0.16	-0.29	80-04-19	12B
					1.34	+0.11	14.24	0.36	-0.11	77-03-22	28A
					1.34	+0.11	14.19	0.32	-0.01	80-04-19	12B
N5556	243	7	8*	1.48	1.15	-0.33	12.88	0.69	-0.06	78-06-08	HC *
A1422+44	190	10	7*	1.31	1.04	-0.27	13.60	0.40:	-0.21	77-03-20	28A
					1.04	-0.27	13.87	0.25	-0.21	77-03-22	28A
					1.34	+0.03	(13.47)	(0.02:)	-0.19	77-03-20	28A *
					1.34	+0.03	13.17	0.30	-0.18	77-03-22	28A
					1.34	+0.03	13.14	0.37	-0.14	80-03-17	11B *
A1423+56	191	7	9	1.30	0.73	-0.57	15.43	0.64	-0.12	79-04-27	06B
					1.04	-0.26	14.85	0.41	0.08	77-03-22	28A
					1.04	-0.26	14.58	0.46	-0.06	79-04-27	06B
					1.34	+0.04	14.14	0.42	-0.13	77-03-22	28A
					1.34	+0.04	14.12	0.54	-0.04	79-04-27	06B
A1433+59	193	8	9	1.21	0.73	-0.48	15.56	0.44	0.17	79-04-28	06B
					1.04	-0.17	14.55	0.51	-0.17	"	06B

TABLE XII. (continued)

Object	DDO Number	T	L	log D(0)	log A	X	V	B-V	U-B	Date	Series/ Remarks	
					1.34	+0.13	14.40	0.48	-0.32	"	06B	*
A1446-09	197	10	-	1.43	1.14	-0.29	13.69	0.48	-0.47	78-04-12	30	*
					1.45	+0.02	13.11	0.60	-0.42	"	30	*
					1.62	+0.19	12.89	0.47	-0.16	"	30	*
A1459+52	198	10	8	1.21	1.34	+0.13	14.46	0.55	-0.42	77-03-24	28A	*
A1535+44	200	9	9	1.16	1.04	-0.12	14.94	0.47	-0.21	77-03-16	28A	
					1.34	+0.18	14.68	0.33	-0.06	"	28A	
A1539+00	201	10	8	1.07	1.04	-0.03	15.44	0.38	-0.16	77-03-15	28A	
					1.34	+0.27	14.70	0.33	-0.21	"	28A	
A1547+81	203	8	8	1.35	1.09	-0.26	13.84	0.64	-0.11	80-04-16	35	
					1.27	-0.08	13.51	0.58	-0.14	"	35	
A1614+47	204	9	8	1.43	0.73	-0.70	15.42	0.52	-0.04	80-04-15	12B	
					1.04	-0.39	14.39	0.52	-0.28	80-04-15	12B	
					1.34	-0.09	13.78	0.21	-0.26	77-03-20	28A	*
					1.34	-0.09	13.62	0.40	-0.11	80-04-15	12B	*
					1.54	+0.11	12.86	0.91	-0.15	77-03-20	28A	*
A1616+63	205	10	8	1.15	0.56	-0.59	15.89	0.47	-0.17	79-05-31	31	
					0.79	-0.36	15.18	0.44	-0.28	"	31	
					1.09	-0.06	14.50	0.52	-0.31	"	31	
A1653+53	206	8	9	1.12	0.73	-0.39	16.08	0.92	-0.10	77-09-10	28B	
					1.04	-0.08	15.76	0.38	-0.48	"	28B	
					1.34	+0.22	15.20	0.29	-0.30	"	28B	
A1717+14	207	9	9*	1.25	1.14	-0.11	15.03	0.96	-0.44	78-04-12	30	
					1.45	+0.20	14.48	0.96	-0.92	"	30	*
N6822	209	10	8	2.00	1.34		12.67	1.00	0.18	77-03-16	28A	*
A2044-13	210	10	9	1.27	1.45	+0.18	14.71	0.00	0.00	77-11-10	29A	*
A2207-19	211	10	9	1.17	0.73	-0.44	15.64	0.60	-0.39	77-09-15	28B	
					1.04	-0.13	14.66	0.45	-0.20	"	28B	
					1.34	+0.17	14.55	0.13	-0.24	"	28B	
A2214-21	212	10	8	1.25	0.73	-0.52	15.37	0.43	-0.07	77-09-14	28B	
					1.04	-0.21	14.60	0.50	-0.26	"	28B	
					1.34	+0.09	14.49	0.32	-0.37	"	28B	*
A2231+32	213	9	9	1.43	0.73	-0.70	15.99	0.59	-0.25	77-09-14	28B	
					1.04	-0.39	14.86	0.49	-0.16	"	28B	
					1.34	-0.09	13.92	0.64	0.27	"	28B	*
A2233-03	214	9	8	1.32	1.05	-0.27	14.27	0.42	-0.07	76-10-20	27	
					1.14	-0.18	13.70	0.54	-0.14	77-11-14	29A	
					1.35	+0.03	13.36	0.45	-0.03	76-10-20	27	
					1.45	+0.13	13.07	0.49	-0.17	77-11-14	29A	
					1.54	(+0.22)	(14.13)	(-0.45)	(-0.03)	76-10-20	27	*
					1.62	+0.30	13.20	0.27	0.08	77-11-14	29A	
A2236-05	215	10	-	1.09	0.73	-0.36	16.38	0.07	-0.28	78-10-30	02B	
					1.04	-0.05	(15.62)	0.61	-0.55	77-09-10	28B	
					1.04	-0.05	15.48	0.35	0.11	78-10-30	02B	
					1.34	+0.25	(14.61)	0.58	0.15	77-09-10	28B	*
					1.34	+0.25	14.78	0.45	-0.42	78-10-30	02B	*
A2326+14	216	10	9	1.61	1.45	-0.16	13.04	0.60	0.12	77-11-14	29A	*
					1.62	+0.01	12.49	0.91	0.36	"	29A	*
					1.75	+0.14	12.80	0.45	-0.01	"	29A	*
A2327+40	217	9	9*	1.62	1.14	-0.48	14.61	0.66	-0.09	77-11-14	29A	*
					1.45	-0.17	12.57	0.71	0.06	"	29A	*

TABLE XII. (continued)

Object	DDO Number	T	L	log D(0)	log A	X	V	B-V	U-B	Date	Series/ Remarks
					1.62	0.00	12.58	0.54	0.01	"	29A *
					1.75	+0.13	12.05	0.75	0.16	"	29A *
A2332+17	218	10	-	1.15	0.73	-0.42	15.25	0.30	-0.40	76-10-26	27
					1.04	-0.11	14.10	0.39	-0.21	"	27
					1.34	+0.19	13.64	0.52	-0.14	"	27
A2334+00	219	9	9*	1.44	1.04	-0.40	15.17	0.18	-0.19	76-10-26	27
					1.34	-0.10	14.35	0.27	0.07	"	27
					1.54	+0.10	13.81	0.64	0.06	"	27
					1.62	+0.18	13.57	0.92	0.21	77-11-14	29A
					1.75	+0.31	13.92	0.36	-0.18	"	29A *
A2346+25	220	10	8*	1.13	0.73	-0.40	15.95	0.68	-0.32	77-09-15	28B
					1.04	-0.09	15.57	0.80	-0.66	"	28B *
					1.34	+0.21	15.07	0.68	-0.09	"	28B *

Notes to Table XII

A 0016−19 = D 1. Very faint and uncertain.
A 0017+10 = D 2. 2 largest aperture is (ap.) corr. for field star ($V=14.76$, $B-V=0.90$, $U-B=0.72$).
A 0031+31 = D 4. For 2 smallest ap. low counts and uncertain values.
I 1558 = D 225. 3 F stars incl. (compensated in sky field).
I 1574 = D 226. Large ap. slightly offset to avoid 2 stars.
A 0043−11 = D 5. 3 largest ap. corr. for field star ($V=14.58$, $B-V=0.96$, $U-B=0.63$).
A 0047−21 = D 6. Large ap. incl. 2 F stars. Values in smaller ap. are uncertain.
A 0107+49 = D 9. Both ap. incl. F star near center ($V \approx 17$).
A 0118+12 = D 10. Large ap. centered on B knot.
A 0127+25 = D 11. Near B star.
A 0137+15 = D 13. Large ap. exclu. 2 nearby stars to the south. Another faint, smaller dwarf $\sim 6'$ preceding.
A 0145−12 = D 14 = Arp 4. Large ap. corr. for field star on F arm ($V=15.15$, $B-V=0.82$, $U-B=0.83$). High sb companion 1′7 f. ($\log A=1.04$, $V=14.36$, $B-V=0.64$, $U-B=0.07$).
A 0200+21 = D 17. 3 ap. corr. for field star near center ($V=15.50$, $B-V=0.86$, $U-B=0.17$:).
A 0221+35 = D 19. 2 largest ap. corr. for field star near center ($V=16.71$, $B-V=0.97$, $U-B=0.09$) or compensated in sky field.
A 0223−10 = D 20. Largest ap. corr. for combined light of 2 field stars ($V=14.32$, $B-V=0.96$, $U-B=0.59$).
A 0228−10 = D 23. Both ap. corr. for F star near center ($V=15.56$, $B-V=0.58$, $U-B=0.14$). Large ap. exclu. nearby star to the east.
A 0229+38 = D 22. Large ap. corr. for field star ($V=14.68$, $B-V=0.72$, $U-B=0.15$); probably also included in 2nd largest ap.
A 0230+40 = D 24. Large ap. corr. for field star near center ($V=12.45$, $B-V=0.74$, $U-B=0.28$).
A 0231+29 = D 26. Largest ap. incl. F star ($V \approx 16.5$).
N 1253A = D 31 = Arp 279. Largest ap. includes field star between *D* 31 and *N* 1253.
A 0441+74 = D 33. 3 nearby field stars excluded.
A 0446+00 = D 34. IC 395 $\sim 15'$ f. ($\log A=0.91$, $V=13.13$, $B-V=1.04$, $U-B=0.81$; 2 stars exclu.).
A 0450−25 = D 229. 2 largest ap. corr. for 2 field stars ($V=13.29$, $B-V=0.78$, $U-B=0.07$ and $V=16.01$, $B-V=1.46$:, $U-B=0.02$:).
A 0505−16 = D 36. Small ap. centered on bar. Large ap. exclu. 2 nearby stars.
N 2366 = D 42. All 3 ap. centered on B knot (NGC 2363 = Markarian 71) south end of bar. Largest ap. inclu. F star ($V=15.71$, $B-V=0.76$, $U-B=0.00$).
A 0724+40 = D 43. Large ap. corr. for 2 field stars ($V=15.56$, $B-V=0.50$, $U-B=0.15$; $V=14.47$, $B-V=0.56$, $U-B=0.37$).
A 0739+16 = D 47. 2nd ap. just excludes *A on north side ($V_A=13.54$, $B-V_A=0.80$, $U-B_A=0.38$). 3rd ap. corr. for stars *A + *C on south side ($V_C=15.15$, $B-V_C=0.48$, $U-B_C=0.41$). 4th ap. corr. for 3 stars *A + *B + *C ($V_{A+B}=13.31$, $B-V_{A+B}=0.74$, $U-B_{A+B}=0.31$).
A 0754+58 = D 48. Uncertain in large ap. Clouds increasing.
A 0807+46 = D 49. All ap. corr. for field star on north side of bar ($V=14.92$, $B-V=0.90$, $U-B=0.54$).
A 0813+70 = D 50 = Holmberg II = Arp 168. Large ap. corr. for 2 field stars on east side ($V=11.98$, $B-V=0.47$, $U-B=0.06$; $V=13.66$, $B-V=0.51$, $U-B=0.05$).
A 0819+74 = D 51. ap. just exclu. 2 nearby field stars. Pec. high sb companion 4′ n.
A 0825+42 = D 52. Both ap. corr. for field star near center ($V=14.67$, $B-V=0.67$, $U-B=0.17$).
A 0905+06 = D 54.. Large ap. inclu. fainter of 2 field stars on west side. Small ap. exclu. all stars.
A 0910+19 = D 58.. Large ap. corr. for field star on south side ($V=14.36$, $B-V=0.61$, $U-B=-0.06$) but inclu. F star to the east.
A 0911+39 = D 59. Large ap. corr. for 2 field stars ($V=15.55$, $B-V=0.54$, $U-B=-0.15$:; $V=16.57$, $B-V=0.77$, $U-B=0.15$).
A 0918−12 = D 61. Large ap. corr. for field star ($V=15.45$, $B-V=0.68$, $U-B=0.31$).
A 0942−31 = D 235. Large ap. corr. for 2 field stars on east side ($V=15.90$, $B-V=1.12$, $U-B=0.12$:; $V=15.91$, $B-V=0.48$, $U-B=0.30$). IC 1507 is 3′5 np.
A 0947+31 = D 64. Both ap. corr. for 2 field stars on each side of main central part ($V=14.64$, $B-V=0.91$, $U-B=0.45$; $V=15.20$, $B-V=0.51$, $U-B=0.08$).
A 0953+69 = D 66 = Holmberg IX. Very close to M81. Large ap. corr. for field star on south side ($V=13.69$, $B-V=0.75$, $U-B=0.27$).
A 0956+30 = D 69. Leo A system. 2 larger ap. inclu. 3 F stars (compensated in sky field). Small ap. tangent to 3 stars.
A 0957+05 = D 70. Sextans B system. 2 largest ap. corr. for field star ($V=14.64$, $B-V=0.61$, $U-B=-0.02$).
N 3057 = D 67. Large ap. corr. for field star ($V=15.41$, $B-V=0.52$, $U-B=-0.10$). Very F star inclu.
A 1006+30 = D 73. Large ap. inclu. 2 F field stars.
A 1020+71 = D 77. Large ap. corr. for field star at west end of bar ($V=11.21$, $B-V=0.45$, $U-B=0.06$).
A 1021+15 = D 79. Large ap. slightly offset to exclu. star on south

side.

A 1026+70A = D 80 = VV 294. Both ap. corr. for 2 field stars ($V = 16.01$, $B-V = 0.55$, $U-B = -0.06$; $V = 16.91$, $B-V = 0.31$, $U-B = 1.31$:). The large ap. exclu. companion at sf end.

A 1026+70B = D 82.. Large ap. corr. for field star on east side ($V = 10.99$, $B-V = 0.98$, $U-B = 0.68$).

A 1033−24 = D 238. Large ap. corr. for field star north of bar ($V = 13.04$, $B-V = 0.96$, $U-B = 0.87$).

A 1033+31 = D 83 = Arp 267. F star superposed on nucleus?

N 3377A = D 88. Large ap. corr. for field star ($V = 16.09$, $B-V = 0.86$, $U-B = 0.84$).

A 1047+19 = D 89. Large ap. exclu. 2 field stars.

A 1103+20 = D 91. Large ap. corr. for field star ($V = 15.48$, $B-V = 0.62$, $U-B = 0.07$).

A 1110+53 = D 92. Large ap. just exclu. field star to the west.

A 1110+22 = D 93. Leo II system. All ap. corr. for field star at center ($V = 13.42$, $B-V = 1.10$, $U-B = 1.07$).

A 1149+52 = D 100. Large ap. corr. for F field star ($V = 16.64$, $B-V = 0.54$, $U-B = -0.10$).

A 1153+31 = D 101. Large ap. corr. for field star ($V = 13.72$, $B-V = 0.61$, $U-B = 0.04$).

A 1155−14B = D 103. All ap. corr. for F field star ($V = 16.38$, $B-V = 1.53$, $U-B = 1.55$:). D 104 at 13's, very faint.

A 1155+38 = D 105. ap. corr. for field star ($V = 14.48$, $B-V = 0.87$, $U-B = 0.05$).

A 1222+70 = D 122. 2 largest ap. corr. for field star ($V = 11.45$, $B-V = 0.52$, $U-B = 0.00$).

A 1223+58 = D 123. Largest ap. corr. for 2 field stars ($V = 10.78$, $B-V = 0.56$, $U-B = 0.06$; $V = 16.53$, $B-V = 0.69$, $U-B = -0.10$:).

A 1226+37 = D 127. Largest ap. corr. for field star ($V = 14.34$, $B-V = 0.57$, $U-B = 0.02$).

I 3475 = D 132. 77-03-20, $\log A = 1.54$: poor V. On 77-03-24, clouds increasing.

N 4523 = D 135. 4 field stars superposed. Mag. and colors: *A = 12.60, 0.59, 0.05; *B = 14.76, 0.66, 0.13; *C = 14.82, 0.79, 0.46; *D = 15.97, 0.94, 0.25. First ap. corr. for *D, 2nd ap. corr. for *A + *D, 3rd ap. corr. for all 4.

N 4507 = D 150. Field star superposed on nucleus.

A 1256+14 = D 155 = GR8. Largest ap. inclu. 2 F field stars.

A 1304+67 = D 165. Largest ap. corr. for field star ($V = 16.52$, $B-V = 0.68$, $U-B = -0.24$:).

A 1316−08 = D 171. Large ap. corr. for field star ($V = 15.40$, $B-V = 0.83$, $U-B = 0.17$).

A 1316+42 = D 172. 2 largest ap. corr. for 2 field stars ($V = 15.45$, $B-V = 0.69$, $U-B = -0.03$; $V = 15.53$, $B-V = 0.78$, $U-B = 0.82$).

A 1334+46 = D 177. 3 field stars superposed. Mag. and colors: *A = 15.53, 0.88, 0.23; *B = 16.27, 0.76, 0.01; *C ≈ 17. 2nd ap. inclu. *C, 3rd ap. corr. for all 3.

A 1334+07 = D 179. 2 largest ap. corr. for field star ($V = 10.96$, $B-V = 0.54$, $U-B = 0.02$).

N 5477 = D 186. Largest ap. corr. for field star ($V = 15.47$, $B-V = 0.91$, $U-B = 0.17$).

N 5556 = D 243. Corr. for field star near center ($V = 14.72$, $B-V = 1.01$, $U-B = 0.91$).

A 1422+44 = D 190. 77-03-20, $\log A = 1.34$: poor V. On 80-03-17: stopped by clouds.

A 1433+59 = D 193. Largest ap. corr. for field star west of center ($V = 15.86$, $B-V = 0.62$, $U-B = 1.02$).

A 1446−09 = D 197 = Arp 261. First ap. centered on bright component A, 2nd ap. between components A and B; 3rd ap. centered on component A.

A 1459+52 = D 198. Faint field star inclu. Observation stopped by clouds.

A 1614+47 = D 204. 2 largest ap. corr. for field star ($V = 15.93$, $B-V = 0.75$, $U-B = 0.06$:).

A 1717+14 = D 207. Largest ap. slightly offset to exclu. field star to the north.

N 6822 = D 209. Centering uncertain.

A 2044−13 = D 210. Corr. for 3 field stars. Mag. and colors: *A = 13.72, 0.82, 0.63; *B = 14.79, 0.62, 0.26; *C = 15.39, 0.48, 0.22.

A 2214−21 = D 212. Largest ap. corr. for field star ($V = 16.46$, $B-V = 0.86$, $U-B = 0.5$:).

A 2231+32 = D 213. Largest ap. corr. for 4 field stars. Mag. and colors: *A = 13.91, 0.45, 0.00; *B = 15.11, 0.65, 0.08; *C = 16.45, 0.30, −0.09:; *D = 16.06, 1.21. −0.28:.

A 2233−03 = D 214. For $\log A = 1.54$, V and $B-V$ are poor but $B = 13.63$ is in fair agreement with other apertures.

A 2236−05 = D 215. Largest ap. corr. for 2 field stars ($V = 14.28$, $B-V = 0.60$, $U-B = 0.04$; $V = 15.93$, $B-V = 1.41$:, $U-B = 1.14$:).

A 2326+14 = D 216. Pegasus system. 2 largest ap. corr. for field star ($V = 12.76$, $B-V = 0.58$, $U-B = -0.05$), but inclu. F star.

A 2327+40 = D 217. Small ap. exclu. all field stars. Other ap. inclu. 2–4 F field stars.

A 2334+00 = D 219. Largest ap. corr. for field star west on edge ($V = 14.18$, $B-V = 0.89$, $U-B = -0.09$). NGC 7716 is 15′ sp.

A 2346+25 = D 220. 2 largest corr. for 2 F field stars ($V = 15.24$, $B-V = 0.72$, $U-B = 1.43$:; $V = 16.44$, $B-V = 0.09$, $U-B = 0.32$:).

errors in the large-aperture measurements increase systematically from less than 0.06 mag at $m'_e = 22.0$ to about 0.12 mag at $m'_e = 25.0$. The standard deviations vary in an approximately hyperbolic fashion with m'_e and show that the errors increase rapidly at $m'_e \geqslant 26$. If we assume that the errors in individual measurements with $\xi \gtrsim 0.00$ are never better than 0.01 mag (for very high surface brightness), then the trend in Fig. 10 can be represented by

$$\sigma_1 = 0.01 - \frac{0.18}{m'_e - 26.5}. \tag{11}$$

b) Colors

The errors in the colors $U-B$ and $B-V$ were studied in a similar manner. However, because the DDO dwarfs do not obey the color-aperture relations which were previously derived for RC2 galaxies of the same types, standard curves had to be derived which are appropriate for the dwarfs. These curves were approximated by $(B-V)(\xi) = (B-V)_e - 0.1\xi$, and likewise for $U-B$ for all types $T \geqslant 6$ (Sec. VI). The dependence of the absolute values of the residuals from these lines was then studied vs ξ and m'_e, again by the numerical mapping technique. For both the $B-V$ and $U-B$ residuals, an initial cubic solution with ten coefficients showed that in each case only the first four were important. The adopted solutions,

$$|R(B-V)| = 0.091 + 0.036\xi + 0.044(m'_e - 24.0) + 0.131\xi^2, \tag{12}$$

$$|R(U-B)| = 0.087 + 0.028\xi + 0.054(m'_e - 24.0) + 0.145\xi^2, \tag{13}$$

are illustrated in Figs. 9(c) and 9(d). Except for the coefficient of the linear term in ξ, which was not significant in either case, the polynomials are similar to that determined for the B magnitudes. Both show that the errors

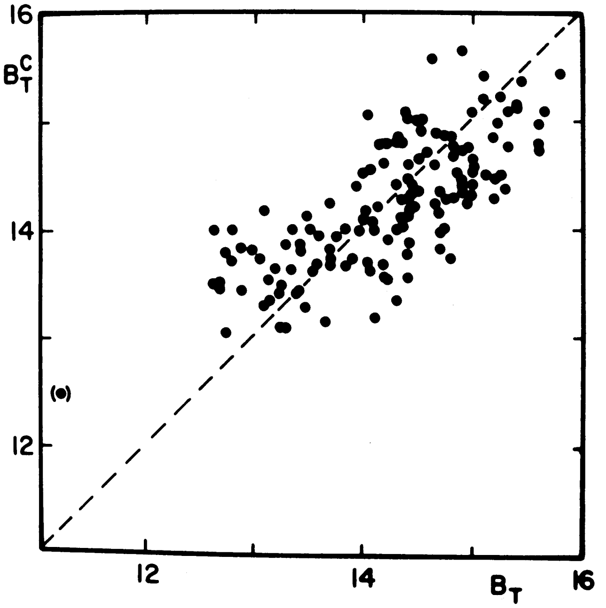

FIG. 8. Comparison of corrected total magnitudes B_T^c derived from the Fisher-Tully (S, log a) data with photoelectric values B_T. Note large scatter, $\sigma(B_T^c) = 0.54$ mag, and slight systematic trend at bright end ($B_T < 14$). The isolated aberrant point refers to NGC 45.

in the colors are very sensitive to surface brightness, and in each case the errors increase with increasing ξ. The curves also show that the errors in the colors are least sensitive to ξ in the range $-0.50 \leqslant \xi \leqslant 0.50$. Most of the color measurements are in this range, and thus the errors in the effective colors depend mainly on surface brightness.

To obtain estimates of the errors in the effective colors, values of $\sigma(O-S)$ were calculated in four intervals of m_e' for all measurements in the interval $-0.50 \leqslant \xi \leqslant 0.50$. The results are illustrated in Fig. 10, which shows that the errors in $(B-V)$ and $(U-B)$ vary similarly with m_e' and increase rapidly for $m_e' > 26.0$. If we assume that the errors in individual color measurements are never better than 0.01 mag for very high surface brightnesses, then the trend in Fig. 10 can be represented by

$$\sigma_1 = 0.01 - \frac{0.27}{m_e' - 26.5}. \tag{14}$$

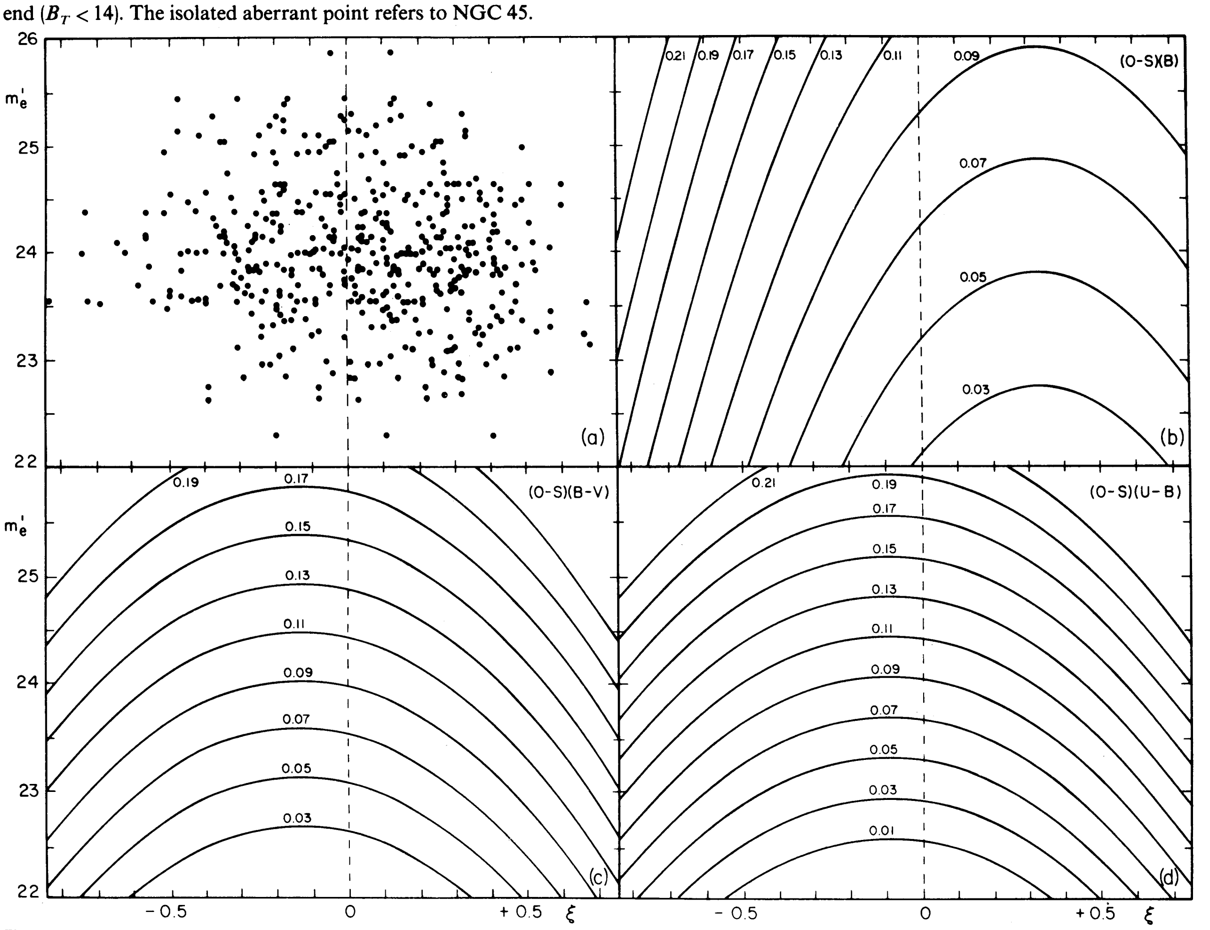

FIG. 9. Numerical mapping of average deviations (in magnitudes) from standard magnitude-aperture and color-aperture curves in (m_e', ξ) plane. (a) Distribution of data. (b) $|(O-S) - 0.015|$ residuals for $B(\xi)$ magnitudes. (c) $|O-S|$ residuals for $(B-V)(\xi)$ colors. (d) $|O-S|$ residuals for $(U-B)(\xi)$ colors. See text.

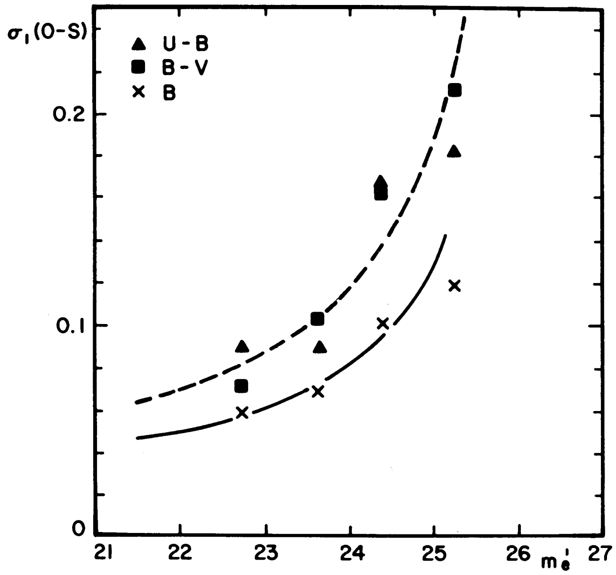

FIG. 10. Variations with m_e' of mean standard deviation $\sigma(O-S)$ of $B(\xi)$ for $\geqslant 0.0$, and of $B-V$ and $U-B$ for $-0.5 \leqslant \xi \leqslant +0.5$. Note hyperbolic trend.

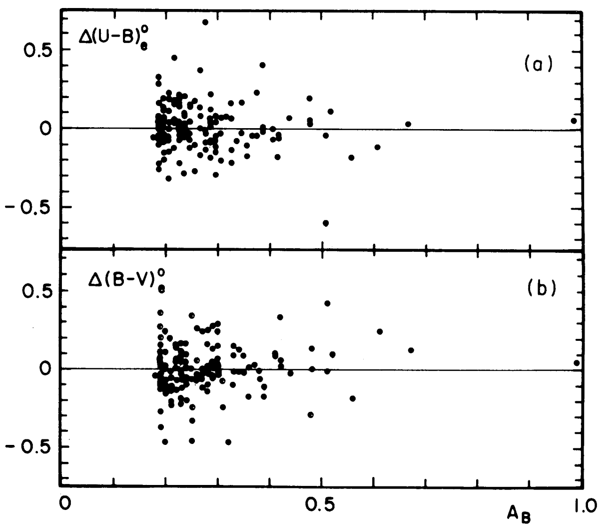

FIG. 11. Test of galactic extinction correction. Color residuals in $(B-V)_e^0$ and $(U-B)_e^0$ are plotted vs total B-band extinction A_B from RC2. No systematic trend is in evidence.

APPENDIX C: TEST OF THE GALACTIC EXTINCTION CORRECTION

The effective colors listed in Table VIII were corrected for galactic extinction according to the formulas given in RC2. To verify the validity of these corrections, we have searched for a possible dependence of the color residuals,

$$\Delta(B-V)_e^0 = (B-V)_e^0 - \langle (B-V)_e^0 \rangle_T$$

and

$$\Delta(U-B)_e^0 = (U-B)_e^0 - \langle (U-B)_e^0 \rangle_T,$$

on galactic extinction A_B. Here A_B is taken from RC2 while $\langle (B-V)_e^0 \rangle_T$ and $\langle (U-B)_e^0 \rangle_T$ are listed in Table IX. Figures 11(a) and 11(b) show plots of Δ vs A_B; there is little or no dependence on A_B. Least-squares solutions yield

$$\Delta(B-V)_e^0 = -0.010 + 0.148(A_B - 0.20) \pm 0.013 \pm 0.097 \qquad (15)$$

($\sigma_1 = 0.123$, $N = 138$, after 2σ rejection of DDO 13, 20, 22, 63, 83, 84, 101, 112, 207, and 222), and

$$\Delta(U-B)_e^0 = 0.005 - 0.079(A_B - 0.20) \pm 0.013 \pm 0.094 \qquad (16)$$

($\sigma_1 = 0.132$, $N = 142$, after 2σ rejection of DDO 12, 52, 64, 207, 216, and 233). The slight trends indicated by these solutions are of marginal significance and moreover are of opposite signs for the two colors. Equations (15) and (16) combined give

$$\Delta(U-V)_e^0 / \Delta A_B = +0.069 \pm 0.067.$$

By Eq. (32) and (33) in RC2, with

$$X = E(U-B)/E(B-V) = 0.72$$

[since $\langle (B-V)_0 \rangle \leqslant 0.60$] and

$$E(B-V)/A_B = 1/(R+1) = 1/4.3,$$

it follows that $E(U-V) = 0.4A_B$. Then the observed value of $\Delta(U-V)_e^0/\Delta A_B$ implies $\Delta A_B/A_B = (17 \pm 17)\%$ or $A_B(90°) = 0.23_5 \pm 0.03_5$ mag, in good agreement with the value $A_B(90°) = 0.20$ adopted in RC2. We conclude that the RC2 procedures have adequately corrected the effective colors of the DDO dwarfs for galactic extinction.

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