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BULGARIAN VIRTUAL OBSERVATORY. MULTICOLOR OBSERVATIONS OF BOX/PEANUT GALAXIES

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Abstract: CCD images for 30 edge-on galaxies - with and without Box/Peanut structures are taken on the 2-m (24 galaxies) and 60-cm (17 galaxies) telescopes as follow: (U), B, V, R, I CCD frames on the 2-m RCC telescope on Rozhen observatory with typical resolution 12"/mm = 0.62"/px with binning and rarely 0.31"/px, CCD camera "Photometrics" and (B), V, R, I frames on the 60-cm telescope on Belogradchick observatory with typical resolution of 27.5"/mm = 0.78"/px with 3x binning, CCD camera ST-8. Every night the standards in selected clusters - M92, NGC 7790 or M67, bias, dark and flat field frames were taken to calibrate the observations.

Typical exposures for these observations was 2 to 5 min, so the bulge/disk regions are clear visible. All the objects, taken in the optics were reduced in the same manner as explained below. Additionally long exposure (15-20 min) B- and R-frames have been taken for 12 more B/P galaxies on the 2-m RCC telescope and 1.23-m telescope on Calar Alto Observatory. Twelve B/P galaxies were observed in the Near Infrared – H and K colors with MAGIC camera on the 1.23-m telescope. All the images were examined using MIDAS reduction package.

1. INTRODUCTION

Investigations of the Edge-on Disk galaxies are very important to understand the formation, ages, structure and evolutions of the galaxy nucleus and the galaxies itself. New statistical data evidence ca. 50 % from edge-on disk galaxies exhibit "Box/Peanut bulges". The nature of these Box/Peanut structures, unclear to the end still, could be examined using multicolor CCD observations. The main goal is to check the mechanism of formation of these structures - accreting matter from nearby galaxies, internal instabilities in the bulges or combination of the reasons above: Clear structure of the Box/Peanut structures could gave us an additional evidences to check the evolution steps toward Hubble sequence - from SA to SB or from Sd to S0/Sa galaxies?

After first work of Dettmar (1989), a lot of significant correlations between magnitudes, morphological types, inclination, luminosities etc. were found and many typical X-structures were demonstrated to show the distribution of the stars in Box/Peanut bulges. The aim of the project was to get additional observational material for galaxies with Box/Peanut structures with better spatial resolution and to check some bulges under question concerning visibility of Box/Peanut characteristics. This is very important to look for a traces of mergering or accreting from nearby satellite galaxies - practically no one galaxy without satellite contains Box/Peanut structure and vice versa.

2. OBSERVATIONS AND DATA REDUCTION

The observations were planned in two stages:
1) Taking CCD images for ca. 30 edge-on galaxies - with and without Box/Peanut structures to check the validity of classifications based on the Palomar Observatory Sky Survey - DSS and checking the prominence of X-structure in different colors
2) Taking deep two color frames of selected Box/Peanut galaxies for detailed study of their bulges

To solve the first problem above mentioned followed ***observational data*** was collected:
1. ***(U), B, V, R, I CCD frames*** on the 2-m RCC telescope on **Rozhen** observatory with typical resolution 12"/mm = 0.62"/px with binning and rarely 0.31"/px, CCD camera "Photometrics" for ***24 objects:***
2. ***(B), V, R, I frames*** on the 60-cm telescope on **Belogradchick** observatory with typical resolution of 27.5"/mm = 0.78"/px with 3x binning, CCD camera ST-8 for ***17 objects***:

Second topic of our investigations was ***detailed study*** of deep two color frames of ***selected Box/Peanut galaxies***. For this we observed:
a) ***6 objects in B and R colors on the 1.23 m telescope at Calar Alto, Spain*** with typical exposures 25 and 15 minutes respectively and the spatial resolution of 20"/mm = 0.50"/px and ***these*** and ***6 more objects*** in the ***near infrared*** H and K with the MAGIC camera.
b) ***6 more objects*** on the ***2-m telescope*** of Rozhen Observatory with typical exposures 25 and 15 minutes in B and R color respectively and spatial resolution of 12"/mm = 0.31"/px. The last two of them are FIR sources according to IRAS Point Source Catalogue.

Every night we got the ***standards*** in selected clusters - M92, NGC 7790 or M67 and ***bias***, ***dark*** and ***flat field frames*** to calibrate our observations. Typical exposure times for these observations was 2 to 5 min, so the bulge/disk regions are clear visible and limiting surface brightness for Belogradchik is ca. 23 mag/sqr.seq and 25 - 26 mag/sqr.seq for Rozhen 2-m telescope in V-color.

All the frames we got were ***reduced*** in the next manner:

1) Bias and Flat Field corrections for the 2-m telescope data and Dark and Flat Field corrections for the 60-cm telescope data
2) Removing the cosmic ray events from all frame
3) Aligned the images to get AVERAGED from several exposures frames for each color
4) Normalized the data to the local sky background
4) Transformation of pixels in arcseconds to have real images
5) Determining the night sky brightness, using the observed standards
6) Calibration of the images in "mag/sqr.sec"
7) Getting the characteristics of bulge/disk regions to prove X-structures - i.e. Box/Peanut bulges in each color

For all observed and reduced images distribution of the surface brightness were examined using ***MIDAS reduction package***.

Basic results from these observations:
1) Ca. 25 % of the edge-on galaxies, classified from Luetticke (1999), as type 4 and 5 - i.e, non Box/Peanut, but ellipsoidal or impossible to classify objects in fact are type 3 Box/Peanut bulges - from the listed above these are NGC 5014, 6368, UGC 8085, 9389 and probably NGC 5610 (Petrov et al., 2005) with definitely Box/Peanut shape of the bulges, but with smaller inclination angles, so the spiral structure is clearly visible.
2) There is no significant difference in the bulge/disk shapes in the different colors, so, it is enough for detailed study to use e.g. B and R images.

3. STEPS TO VIRTUAL OBSERVATORY

All the data and results were combined in the common database of the Sector Galaxies of the Institute of Astronomy, Bulgarian Academy of Sciences. Data are presented in ***FITS format*** and two sets of data are available – ***raw data***, including flat field images and calibrating images too and ***reduced data***.

Following ***observational data*** (see tables below) was ***collected:***

1. **Table 1** - ***24 objects in (U), B, V, R, I on the 2-m RCC telescope on Rozhen observatory*** with typical resolution 12"/mm = 0.62"/px with binning and rarely 0.31"/px, CCD camera "Photometrics" for:

a) ***Box/Peanut galaxies*** type 1 - 3 - i.e. real Box/Peanut structures NGC 493, 669, 684, 1589, 2424, 5403, 5470, 5673, 5854 - ***9 objects***

b) ***Control sample*** of non Box/Peanut galaxies NGC 1032, 2549, 5014, 5610, 5707, 6368, 6504, 6928, 7013, IC 4263 and UGC 8085, 9389, 10214, 10227, 11571 - ***15 objects***.

2. **Table 1** - ***17 objects in (B), V, R, I colors on the 60-cm telescope on Belogradchick*** **observatory** with typical resolution of 27.5"/mm = 0.78"/px with 3x binning, CCD camera ST-8:

a) ***Box/Peanut galaxies*** - NGC 128, 493, 676, 684, 1589, 2424 and UGC 260 - ***7 objects***.

b) ***Control sample*** NGC 1032, 2549, 5610, 6928, 7013, 7817, IC 34, 4263, UGC 8085, 11571 - ***10 objects***

Table 1: A list of BOX/PEANUT galaxies, observed in Bulgaria, sorted by objects

ic34i-3x	98.08.27
ic34i-3x	98.09.25
ic34r-3x	98.08.27
ic34r-6x	98.09.25
ic34v-3x	98.08.27
ic34v-3x	98.09.25
ic4236b-2x	98.02.28
ic4236i-2x	98.02.28
ic4236r-2x	98.02.28
ic4236u-2x	98.02.28
ic4236v-2x	98.02.28
n0128i-3x	98.08.25
n0128r-3x	98.08.25
n0128v-3x	98.08.25
n0493b-2x	98.08.23
n0493i-2x	98.08.23
n0493i-3x	98.09.26
n0493r-2x	98.08.23
n0493r-3x	98.09.26
n0493v-2x	98.08.23
n0493v-3x	98.09.26
n0669b	96.10.12
n0669i	96.10.12
n0669r-3x	96.10.12
n0669v	96.10.12
n0684i-3x	98.09.28
n0684r-3x	98.09.28
n0684r-2x	96.10.12
n0684v	96.10.12
n0684v-3x	98.09.28
n1032i	96.10.12
n1032i-3x	98.09.26

n1032r-2x	96.10.12
n1032r	96.10.12
n1032r-3x	98.09.26
n1032v	96.10.12
n1032v-3x	98.09.26
n1589b	98.01.15
n1589b	98.01.04
n1589i	96.10.12
n1589i	98.01.15
n1589i	98.01.04
n1589r	98.01.15
n1589r-2x	96.10.12
n1589r	98.01.04
n1589v	98.01.04
n1589v	96.10.12
n1589v	98.01.15
n2424b	98.01.04
n2424b	98.01.15
n2424b-2x	98.02.28
n2424i	96.10.12
n2424i	98.01.04
n2424i	98.01.15
n2424i-2x	98.02.28
n2424r-2x	96.10.12
n2424r	98.01.04
n2424r	98.01.15
n2424r-2x	98.02.28
n2424u-2x	98.02.28
n2424v	96.10.12
n2424v	98.01.04
n2424v	98.01.15
n2424v-2x	98.02.28
n2549b	98.01.04
n2549b	98.01.15
n2549b-2x	98.02.28

n2549i	9x.xx.xx
n2549i	96.10.12
n2549i	98.01.04
n2549i	98.01.15
n2549i-2x	98.02.28
n2549r	9x.xx.xx
n2549r	9x.xx.xx
n2549r-2x	96.10.12
n2549r	98.01.04
n2549r	98.01.15
n2549r-2x	98.02.28
n2549u-2x	98.02.28
n2549u	98.02.28
n2549v	98.01.04
n2549v	98.01.15
n2549v-2x	98.02.28
n5014b-2x	98.02.27
n5014b	98.02.27
n5014i	98.04.26
n5014i-2x	98.02.27
n5014r	98.04.26
n5014r-2x	98.02.27
n5014v	98.04.26
n5014v-2x	98.02.27
n5610b	97.06.01
n5610b-2x	98.03.03
n5610i	98.04.26
n5610i-2x	98.03.03
n5610r	98.04.26
n5610r-2x	98.03.03
n5610r	98.03.03
n5610u-2x	98.03.03
n5610v-4x	97.06.01
n5610v-2x	98.03.03
n5610v	98.04.26
n5673b	97.06.01
n5673i	97.06.01
n5673r	97.06.01
n5673v	97.06.01

n5707b	97.06.01
n5707i	97.06.01
n5707r	97.06.01
n5707v	97.06.01
n638b-3x	98.07.18
n638i-3x	98.07.18
n638r-3x	98.07.18
n638u-2x	98.07.18
n638v-3x	98.07.18
n6504b-2x	97.09.10
n6504i-2x	97.09.10
n6504r-4x	97.09.10
n6504v-2x	97.09.10
n6928b-2x	97.06.01
n6928i-2x	97.06.01
n6928r-3x	97.07.10
n6928v-2x	97.06.01
n7013i	96.10.12
n7013i-3x	98.08.27
n7013i	9x.xx.xx
n7013r-3x	96.10.12
n7013r-3x	98.08.27
n7013r-3x	9x.xx.xx
n7013v	96.10.12
n7013v-3x	98.08.27
n7013v	9x.xx.xx
n7817b-3x	98.08.25
n7817i-3x	98.08.25
n7817r-3x	98.08.25
n7817v-3x	98.08.25
u00260i-3x	98.08.25
u00260r-3x	98.08.25
u00260v-3x	98.08.25
u08085b-2x	98.02.27

u08085b	98.02.27
u08085i-2x	98.02.27
u08085i	98.04.26
u08085r-2x	98.02.27
u08085r	98.04.26
u08085v-2x	98.02.27
u08085v	98.04.26
u09389b-2x	98.03.03
u09389i-2x	98.03.03
u09389r-2x	98.03.03
u09389u-2x	98.03.03
u09389v-2x	98.03.03
u10214b	97.06.01
u10214b	97.07.10
u10214b-3x	98.07.19
u10214i	97.06.01
u10214i	97.07.10
u10214i-3x	98.07.19
u10214r	97.06.01
u10214r	97.07.10
u10214r-3x	98.07.19
u10214u-3x	98.07.19
u10214v	97.06.01
u10214v	97.07.10
u10214v-3x	98.07.19
u11571b	97.06.01
u11571b	97.07.10
u11571i	97.06.01
u11571i	97.07.10
u11571i-3x	98.09.28
u11571r	97.06.01
u11571r	97.07.10
u11571r-3x	98.09.28
u11571v	97.06.01
u11571v	97.07.10
u11571v-3x	98.09.28

Table 2: *6 more B/P galaxies in B and R colors on the 1.23 m telescope at Calar Alto, Spain* - NGC 2424, 4013, 4710, 4845, 5529 and 5965 with typical exposures 25 and 15 minutes respectively and the spatial resolution of 20"/mm = 0.50"/px (Aronica and Petrov, 2001) and **Table 3:** *6 more B/P galaxies* - NGC 128, 532, 973, 1175, 7640 and UGC 11973 observed on the *2-m telescope of Rozhen Observatory* with typical exposures 25 and 15 minutes in B and R color respectively and spatial resolution of 12"/mm = 0.31"/px. The last two of them are FIR sources according to IRAS Point Source Catalogue.

Table 2:				**Table 3:**			
Calar Alto, 1.23-m telescope				**2-m RCC telescope, NAO - Rozhen**			
Object	Exp.	Airm.	Date	Object	Date	StartExp	Exp.
n2424B	1200	1.215	01-04-21	N128B-12x	01-09-14	23:43:13	12x90
n2424B	1200	1.329	01-04-21	N128R-9x	01-09-15	00:15:21	9x90
n2424R	1200	1.434	01-04-21				
n2424R	1200	1.561	01-04-21	N532B-10x	01-09-15	01:51:06	10x90
				N532R-8x	01-09-15	02:18:15	8x90
n4013B	900	1.038	01-04-18				
n4013B	900	1.025	01-04-18	N973B-15x	01-09-15	22:24:19	15x90
n4013B	500	1.013	01-04-18	N973R-8x	01-09-15	23:03:55	8x90
n4013R	900	1.022	01-04-18				
n4013R	900	1.037	01-04-18	N1175R-8x	01-09-15	23:27:20	8x90
n4013R	900	1.100	01-04-18	N1175B-15x	01-09-15	23:49:33	15x90
n4013R	900	1.121	01-04-19				
				N76400r-11x	01-09-14	21:03:58	11x90
n4710B	900	1.218	01-04-19	N7640B-10x	01-09-14	21:38:49	10x90
n4710B	1500	1.284	01-04-19				
n4710B	1200	1.402	01-04-19	U11973u-15x	01-09-14	19:34:53	15x90
				U11973r-8x	01-09-14	20:15:23	8x90
n4845B	900	1.234	01-04-21				
n4845B	900	1.244	01-04-21				
n4845R	900	1.263	01-04-21				
n4845R	900	1.291	01-04-22				
n5529B	900	1.059	01-04-22				
n5529B	1800	1.091	01-04-22				
n5529B	1800	1.159	01-04-22				
n5529R	600	1.020	01-04-22				
n5529R	1200	1.031	01-04-22				
n5965B	1800	1.140	01-04-19				
n5965B	540	1.196	01-04-19				
n5965R	900	1.091	01-04-19				
n5965R	900	1.107	01-04-19				

Table 4: *Twelve B/P galaxies in the near infrared H and K colors on the 1.23 m telescope at Calar Alto* - NGC 2424, 3079, 4013, 4710, 4845, 5073, 5529, 5746, 5965 and MGC -1-25-26, -1-33-71, -1-35-13 with the MAGIC camera (Aronica and Petrov, 2001). Log_file is compilation from all the seven log_files and for shortness only the first and last two exposures – object+sky for each object are shown:

Time	File	Name	Alpha	Delta	AirM	Texp	N-Filter
21:29	m_1_25_26H_11_01	sky01	9:42:05.2	-6:45:42.0	1.44	5.00	12H_H08E
21:31	m_1_25_26H_11_02	Obj02	9:42:33.3	-6:45:42.0	1.44	5.00	12H_H08E
22:25	m_1_25_26H_11_44	Obj44	9:42:33.3	-6:45:33.0	1.60	5.00	12H_H08E
22:26	m_1_25_26H_11_45	Sky45	9:42:33.3	-6:52:42.0	1.61	5.00	12H_H08E
19:18	m_1_25_26H_15_01	sky01	9:42:06.1	-6:45:53.0	1.39	5.00	12H_H08E
19:20	m_1_25_26H_15_02	Obj02	9:42:34.3	-6:45:53.0	1.39	5.00	12H_H08E
20:33	m_1_25_26H_15_59	Obj59	9:42:34.3	-6:44:03.0	1.45	5.00	12H_H08E
20:34	m_1_25_26H_15_60	sky60	9:42:34.3	-6:51:12.0	1.45	5.00	12H_H08E
19:55	m_1_25_26K_16_01	sky01	9:42:05.7	-6:45:56.0	1.39	5.00	12KM_H08E
19:56	m_1_25_26K_16_02	Obj02	9:42:33.9	-6:45:56.0	1.39	5.00	12KM_H08E
21:09	m_1_25_26K_16_59	Obj59	9:42:33.9	-6:45:47.0	1.44	5.00	12KM_H08E
21:10	m_1_25_26K_16_60	sky60	9:42:33.9	-6:52:56.0	1.44	5.00	12KM_H08E
22:53	m_1_33_71H_11_01	sky01	13:01:09.7	-8:21:38.0	1.48	5.00	12H_H08E
22:54	m_1_33_71H_11_02	Obj02	13:01:34.0	-8:21:38.0	1.48	5.00	12H_H08E
00:24	m_1_33_71H_11_60	Obj60	13:01:34.0	-8:21:22.0	1.45	5.00	12H_H08E
00:26	m_1_33_71H_11_61	Sky61	13:01:34.0	-8:28:31.0	1.45	5.00	12H_H08E
22:13	m_1_33_71H_14_01	sky01	13:01:06.5	-8:21:44.0	1.55	5.00	12H_H08E
22:14	m_1_33_71H_14_02	Obj02	13:01:34.8	-8:21:44.0	1.55	5.00	12H_H08E
23:27	m_1_33_71H_14_59	Obj59	13:01:34.8	-8:21:34.0	1.43	5.00	12H_H08E
23:28	m_1_33_71H_14_60	sky60	13:01:34.8	-8:28:43.0	1.43	5.00	12H_H08E
23:18	m_1_35_13H_13_01	sky01	13:48:15.6	-7:13:10.0	1.48	5.00	12H_H08E
23:19	m_1_35_13H_13_02	Obj02	13:48:43.8	-7:13:10.0	1.48	5.00	12H_H08E
00:32	m_1_35_13H_13_59	Obj59	13:48:43.8	-7:13:01.0	1.40	5.00	12H_H08E
00:33	m_1_35_13H_13_60	sky60	13:48:43.8	-7:20:10.0	1.40	5.00	12H_H08E
22:57	m_1_35_13H_15_01	sky01	13:48:16.2	-7:13:09.0	1.42	5.00	12H_H08E
22:58	m_1_35_13H_15_02	Obj02	13:48:44.4	-7:13:09.0	1.42	5.00	12H_H08E
00:11	m_1_35_13H_15_59	Obj59	13:48:44.4	-7:13:00.0	1.42	5.00	12H_H08E
00:12	m_1_35_13H_15_60	Sky60	13:48:44.4	-7:20:09.0	1.42	5.00	12H_H08E
20:03	n2424H_12_01	sky01	7:39:48.7	39:13:04.0	1.06	5.00	12H_H08E
20:04	n2424H_12_02	Obj02	7:40:24.9	39:13:04.0	1.06	5.00	12H_H08E
21:17	n2424H_12_59	Obj59	7:40:24.9	39:13:13.0	1.20	5.00	12H_H08E
21:18	n2424H_12_60	sky60	7:40:24.9	39:06:05.0	1.20	5.00	12H_H08E
19:54	n2424H_14_01	sky01	7:39:49.2	39:13:13.0	1.06	5.00	12H_H08E
19:55	n2424H_14_02	Obj02	7:40:25.4	39:13:13.0	1.06	5.00	12H_H08E
21:43	n2424H_14_75	Obj75	7:40:23.4	39:13:20.0	1.30	5.00	12H_H08E
21:44	n2424H_14_76	Sky76	7:40:23.4	39:06:11.0	1.31	5.00	12H_H08E
21:20	n2424K_16_01	sky01	7:39:45.5	39:13:00.0	1.25	5.00	12KM_H08E
21:21	n2424K_16_02	Obj02	7:40:21.7	39:13:00.0	1.26	5.00	12KM_H08E
22:34	n2424K_16_59	Obj59	7:40:21.7	39:13:09.0	1.58	5.00	12KM_H08E
22:35	n2424K_16_60	sky60	7:40:21.7	39:06:00.0	1.59	5.00	12KM_H08E
21:08	n3079H_10_01	sky01	10:01:07.5	55:39:39.0	1.06	5.00	12H_H08E
22:17	n3079H_10_02	Obj01	10:00:58.5	55:39:40.0	1.09	5.00	12H_H08E
23:14	n3079H_10_44	Obj44	10:01:48.1	55:39:49.0	1.15	5.00	12H_H08E
23:16	n3079H_10_45	Sky45	10:01:48.1	55:32:40.0	1.15	5.00	12H_H08E

19:46	n3079H_13_01	sky01	10:01:04.7	55:39:29.0	1.07	5.00	12H_H08E
19:47	n3079H_13_02	Obj02	10:01:54.4	55:39:29.0	1.07	5.00	12H_H08E
21:00	n3079H_13_59	Obj59	10:01:54.3	55:39:38.0	1.06	5.00	12H_H08E
21:01	n3079H_13_60	sky60	10:01:54.3	55:32:29.0	1.05	5.00	12H_H08E
22:40	n3079K_16_01	sky01	10:00:56.1	55:39:48.0	1.14	5.00	12KM_H08E
22:41	n3079K_16_02	Obj02	10:01:45.8	55:39:48.0	1.14	5.00	12KM_H08E
23:54	n3079K_16_59	Obj59	10:01:45.8	55:39:57.0	1.28	5.00	12KM_H08E
23:56	n3079K_16_60	sky60	10:01:45.8	55:32:48.0	1.28	5.00	12KM_H08E
23:53	n4013H_10_01	sky01	11:57:40.9	43:55:39.0	1.03	5.00	12H_H08E
23:54	n4013H_10_02	Obj02	11:58:19.8	43:55:39.0	1.03	5.00	12H_H08E
01:08	n4013H_10_59	Obj59	11:58:19.9	43:55:48.0	1.12	5.00	12H_H08E
01:09	n4013H_10_60	Sky60	11:58:19.9	43:48:39.0	1.12	5.00	12H_H08E
21:26	n4013H_13_01	sky01	11:57:44.0	43:55:21.0	1.04	5.00	12H_H08E
21:27	n4013H_13_02	Obj02	11:58:22.9	43:55:21.0	1.04	5.00	12H_H08E
22:40	n4013H_13_59	Obj59	11:58:22.9	43:55:30.0	1.01	5.00	12H_H08E
22:41	n4013H_13_60	sky60	11:58:22.9	43:48:21.0	1.01	5.00	12H_H08E
00:17	n4013K_16_01	sky01	11:57:38.9	43:55:47.0	1.08	5.00	12KM_H08E
00:19	n4013K_16_02	Obj02	11:58:17.8	43:55:47.0	1.08	5.00	12KM_H08E
01:51	n4013K_16_74	Obj74	11:58:17.7	43:55:56.0	1.28	5.00	12KM_H08E
01:52	n4013K_16_75	Sky75	11:58:17.7	43:48:47.0	1.29	5.00	12KM_H08E
21:23	n4710H_12_01	sky01	12:48:56.3	15:08:09.0	1.24	5.00	12H_H08E
21:24	n4710H_12_02	Obj02	12:49:25.3	15:08:09.0	1.24	5.00	12H_H08E
22:37	n4710H_12_59	Obj59	12:49:25.2	15:08:18.0	1.11	5.00	12H_H08E
22:39	n4710H_12_60	sky60	12:49:25.2	15:01:09.0	1.11	5.00	12H_H08E
23:49	n4710H_14_01	sky01	12:48:55.3	15:08:51.0	1.08	5.00	12H_H08E
23:50	n4710H_14_02	Obj02	12:49:24.3	15:08:51.0	1.08	5.00	12H_H08E
01:18	n4710H_14_61	Obj61	12:49:23.3	15:08:34.0	1.20	5.00	12H_H08E
01:19	n4710H_14_62	Sky62	12:49:23.3	15:15:43.0	1.20	5.00	12H_H08E
01:03	n4845H_12_01	sky01	12:57:17.2	1:33:21.0	1.31	5.00	12H_H08E
01:05	n4845H_12_02	Obj02	12:57:45.3	1:33:21.0	1.31	5.00	12H_H08E
02:17	n4845H_12_59	Obj59	12:57:45.3	1:33:30.0	1.57	5.00	12H_H08E
02:19	n4845H_12_60	sky60	12:57:45.3	1:26:21.0	1.58	5.00	12H_H08E
01:09	n4845H_13_01	sky01	12:57:17.5	1:33:24.0	1.33	5.00	12H_H08E
01:10	n4845H_13_02	Obj02	12:57:45.5	1:33:24.0	1.34	5.00	12H_H08E
02:23	n4845H_13_59	Obj59	12:57:45.5	1:33:33.0	1.63	5.00	12H_H08E
02:25	n4845H_13_60	sky60	12:57:45.5	1:26:24.0	1.64	5.00	12H_H08E
23:19	n5073H_12_01	sky01	13:18:36.3	-14:52:04.0	1.67	5.00	12H_H08E
23:20	n5073H_12_02	Obj02	13:19:05.2	-14:52:04.0	1.67	5.00	12H_H08E
00:38	n5073H_12_59	Obj59	13:19:06.4	-14:51:55.0	1.65	5.00	12H_H08E
00:39	n5073H_12_60	Sky60	13:19:34.8	-14:58:46.0	1.66	5.00	12H_H08E
21:33	n5073H_15_01	sky01	13:18:35.6	-14:52:17.0	1.81	5.00	12H_H08E
21:34	n5073H_15_02	Obj02	13:19:04.6	-14:52:17.0	1.81	5.00	12H_H08E
22:48	n5073H_15_59	Obj59	13:19:05.7	-14:51:56.0	1.63	5.00	12H_H08E
22:49	n5073H_15_60	Sky60	13:19:05.7	-14:59:05.0	1.64	5.00	12H_H08E
03:36	n5529H_11_01	sky01	14:14:42.4	36:12:28.0	1.16	5.00	12H_H08E
03:38	n5529H_11_02	Obj02	14:15:17.1	36:12:28.0	1.16	5.00	12H_H08E
04:57	n5529H_11_61	Obj61	14:15:13.7	36:12:25.0	1.44	5.00	12H_H08E
04:58	n5529H_11_62	Sky62	14:15:13.7	36:05:16.0	1.45	5.00	12H_H08E
02:33	n5529H_13_01	sky01	14:14:44.8	36:12:30.0	1.06	5.00	12H_H08E
02:34	n5529H_13_02	Obj02	14:15:19.5	36:12:30.0	1.06	5.00	12H_H08E
04:05	n5529H_13_68	Obj68	14:15:18.6	36:12:32.0	1.26	5.00	12H_H08E
04:06	n5529H_13_69	sky69	14:15:18.6	36:05:23.0	1.27	5.00	12H_H08E

02:35	n5529K_15_01	sky01	14:14:43.0	36:12:27.0	1.16	5.00	12KM_H08E
02:36	n5529K_15_02	Obj02	14:15:17.7	36:12:27.0	1.16	5.00	12KM_H08E
03:30	n5529K_15_44	Obj44	14:15:17.7	36:12:36.0	1.33	5.00	12KM_H08E
03:31	n5529K_15_45	sky45	14:15:17.7	36:05:27.0	1.33	5.00	12KM_H08E
00:53	n5746H_11_01	sky01	14:44:12.6	1:56:05.0	1.24	5.00	12H_H08E
00:55	n5746H_11_02	Obj02	14:44:40.7	1:56:05.0	1.24	5.00	12H_H08E
03:08	n5746H_11_61	Sky61	14:44:39.9	2:03:10.0	1.33	5.00	12H_H08E
03:10	n5746H_11_62	Obj62	14:44:39.9	1:56:19.0	1.34	5.00	12H_H08E
02:00	n5746H_14_01	sky01	14:44:12.1	1:55:59.0	1.24	5.00	12H_H08E
02:02	n5746H_14_02	Obj02	14:44:40.1	1:55:59.0	1.24	5.00	12H_H08E
03:32	n5746H_14_68	Obj68	14:44:40.7	1:56:18.0	1.45	5.00	12H_H08E
03:33	n5746H_14_69	sky69	14:44:40.7	1:49:09.0	1.46	5.00	12H_H08E
01:34	n5746K_15_01	sky01	14:44:12.5	1:56:09.0	1.27	5.00	12KM_H08E
01:35	n5746K_15_02	Obj02	14:44:40.5	1:56:09.0	1.27	5.00	12KM_H08E
02:29	n5746K_15_44	Obj44	14:44:40.5	1:56:18.0	1.40	5.00	12KM_H08E
02:31	n5746K_15_45	sky45	14:44:40.5	2:03:18.0	1.41	5.00	12KM_H08E
05:07	n5965H_11_01	sky01	15:32:56.1	56:39:54.0	1.20	5.00	12H_H08E
05:08	n5965H_11_02	Obj02	15:33:47.0	56:39:54.0	1.20	5.00	12H_H08E
05:23	n5965H_11_14	Obj14	15:33:47.0	56:40:03.0	1.23	5.00	12H_H08E
05:24	n5965H_11_15	sky15	15:33:47.0	56:32:54.0	1.23	5.00	12H_H08E
03:12	n5965H_12_01	sky01	15:33:01.1	56:39:56.0	1.07	5.00	12H_H08E
03:13	n5965H_12_02	Obj02	15:33:52.1	56:39:56.0	1.07	5.00	12H_H08E
04:26	n5965H_12_59	Obj59	15:33:52.0	56:40:05.0	1.14	5.00	12H_H08E
04:28	n5965H_12_60	sky60	15:33:52.0	56:32:56.0	1.14	5.00	12H_H08E
04:11	n5965H_14_01	sky01	15:32:58.8	56:40:03.0	1.13	5.00	12H_H08E
04:12	n5965H_14_02	Obj02	15:33:49.7	56:40:03.0	1.13	5.00	12H_H08E
05:20	n5965H_14_55	Obj55	15:33:50.9	56:40:12.0	1.25	5.00	12H_H08E
05:21	n5965H_14_56	sky56	15:32:58.9	56:33:03.0	1.25	5.00	12H_H08E
02:22	n5965K_16_01	sky01	15:33:02.7	56:39:45.0	1.06	5.00	12KM_H08E
02:23	n5965K_16_02	Obj02	15:33:53.6	56:39:45.0	1.06	5.00	12KM_H08E
03:02	n5965K_16_32	Obj32	15:33:53.6	56:39:45.0	1.08	5.00	12KM_H08E
03:03	n5965K_16_33	sky33	15:34:44.5	56:39:45.0	1.08	5.00	12KM_H08E

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References

Aronica, G., Petrov, G.: 2001, *Proposal for observations of B/P galaxies*.

Dettmar, R. J.: 1989, In: *The world of galaxies*, Eds.: Corwin H. and Bottinelli L., p.229.

Luetticke, R.: 1999, *PhD thesis*, Bochum.

Petrov, G., Slavcheva-Mihova, L., Mihov, B.: 2005, Proc. of the 4th Serbian-Bulgarian Astronomical Conf., 21-24.04.2004, Belgrade, Serbia. Eds.: M. Dmitrijevic, V. Golev, L. Popovic, M. Tsvetkov., *Publ.Obs.Belgrade*, **74**, 241.