

Change record

Issue/Rev.	Date	Section/Parag. affected	Reason/Initiation/Documents/Remarks
1.0	24/01/2009	All	First release, based on old EMMI doc.

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List of acronyms

BOB:	Broker of Observing Blocks
CCD:	Charge-Coupled Device
EFOSC2:	ESO Faint Object Spectrograph and Camera - version 2
EMMI:	ESO Multi-Mode Instrument
FOV:	Field Of View
FWHM:	Full Width at Half Maximum
NTT:	New Technology Telescope
OB:	Observing Block
SuSI2:	Superb Seeing Imager - version 2
TBD:	To Be Done
WCS:	World Coordinate System

1 Introduction

Observation of Photometric Standard Stars is necessary if absolute photometry is required from imaging observations. These Standard Stars are typically taken from published catalogues such as the widely used one by Landolt [1]. Since the position and brightness of these stars are catalogued, it makes sense to have pre-prepared Observation Blocks (OBs) to save observers having to make the same ones for each run.

1.1 Purpose and Scope

This document describes a set of OBs has been produced to be used for the observation of fields containing photometric standard stars using EFOSC2 on the NTT. It is based on a previous version covering the fields for EMMI and SuSI2 at the NTT, and EFOSC2 on the 3.6m, but for the completely updated OBs for the new field of view of EFOSC2 at the NTT. The accompanying reference material gives details on how these OBs are made, and provides individual information (finding charts and tabulated photometry) for each standard field. This information is intended to be of help to those involved in the acquisition, analysis, and quality control of photometric observations obtained with these instruments.

1.2 Applicable Documents

LSO-LIS-ESO-40500-0001

2 Selection of Fields

The selected standard fields have been taken from Landolt's 1992 catalogue [1], and contain stars mostly in the range $11.5 < V < 16.0$. With the exception of T Phe, all the fields are located near the celestial equator. The fields here are based on those given for EMMI/SuSI2/EFOSC2 in LSO-LIS-ESO-40500-0001, but with updated field centres for EFOSC2 at the NTT. The centres of the fields have been chosen so that at least 3 standard stars listed in Landolt's paper are contained within a single frame of EFOSC2. Whenever possible, these stars cover a fairly large range in colors, although this is obviously limited by the small number of stars usually fitting within the field of view. Given its sensitivity, the brightest standard stars in Landolt's list are inappropriate to be used with EFOSC2. For this reason, standard stars brighter than $V \simeq 11$ have been generally left out of the selected fields. The list of the field centres for EFOSC2 is given in Table 1. Note that at the time of writing this document two useful fields (SA 92-248 and SA 98-1082) have not yet had new field centres and exposure times determined, but these OBs will be prepared as soon as possible. Their positions below are approximate, and the finder charts show the full EMMI field of view, which at $9' \times 9'$ was considerably larger than the EFOSC2 FOV ($4.1' \times 4.1'$).

Table 1: *Field centres for EFOSC2*

Field name	RA (2000)	dec (2000)
PG0231+051	02 ^h 33 ^m 40.70 ^s	05° 18' 38.1''
SA 92-248	00 ^h 54 ^m 32 ^s	00° 41' 00''
SA 95-107	03 ^h 53 ^m 23.00 ^s	00° 00' 49.8''
SA 98-618	06 ^h 51 ^m 48.00 ^s	-00° 21' 22.7''
SA 98-642	06 ^h 51 ^m 57.30 ^s	-00° 20' 43.6''
RU 149	07 ^h 24 ^m 15.40 ^s	-00° 32' 07.0''
RU 152	07 ^h 29 ^m 57.10 ^s	-02° 05' 33.0''
PG0918+029	09 ^h 21 ^m 28.60 ^s	02° 47' 13.6''
PG0942-029	09 ^h 45 ^m 10.60 ^s	-03° 08' 33.9''
SA 98-1082	06 ^h 52 ^m 30 ^s	-00° 16' 00''
SA 101-408	09 ^h 56 ^m 08.00 ^s	-00° 12' 40.0''
SA 101-341	09 ^h 57 ^m 24.40 ^s	-00° 22' 00.7''
PG1047+003	10 ^h 50 ^m 09.20 ^s	-00° 01' 27.2''
SA 104-334	12 ^h 42 ^m 26.90 ^s	-00° 40' 21.5''
PG1323-086	13 ^h 25 ^m 46.10 ^s	-08° 49' 38.1''
PG1525-071	15 ^h 28 ^m 11.90 ^s	-07° 15' 42.9''
SA 107-456	15 ^h 38 ^m 45.30 ^s	-00° 21' 12.1''
SA 107-599	15 ^h 39 ^m 12.60 ^s	-00° 14' 43.3''
PG1633+099	16 ^h 35 ^m 30.70 ^s	09° 46' 51.5''
PG1657+078	16 ^h 59 ^m 30.00 ^s	07° 42' 52.0''
SA 110-361	18 ^h 42 ^m 43.60 ^s	00° 07' 44.2''
SA 110-316	18 ^h 43 ^m 49.90 ^s	00° 01' 00.4''
Mark-A	20 ^h 43 ^m 57.70 ^s	-10° 46' 45.4''
SA 113-163	21 ^h 42 ^m 36.90 ^s	00° 17' 07.6''
SA 113-493	21 ^h 42 ^m 26.40 ^s	00° 37' 33.5''
PG2213-006	22 ^h 16 ^m 22.70 ^s	-00° 21' 44.1''
PG2331+055	23 ^h 33 ^m 48.00 ^s	05° 46' 14.9''

The accompanying finding charts have been taken directly with EFOSC2 – the bad columns of CCD#40 are visible, and it can be seen that the pointings have been chosen to keep stars away from them. The size of the field is $4.1' \times 4.1'$. North is at the top and East to the right, as indicated

by the arrow. Note that this is flipped horizontally compared with the view on sky, as this is the orientation of EFOSC2 images. These finder charts are also attached to the OBs and viewable from p2pp. The field centre, suggested exposure times and broad band photometry for each star appearing in the field, as listed by Landolt [1], are given in the table under each finding chart.

3 Definition of the OBs

The OBs were produced by finding the optimal pointing interactively, and choosing exposure times for each filter to avoid saturating the brightest stars in the best conditions (seeing FWHM=0.5") in 2x2 binning (the default mode). In poorer seeing the exposure times can be increased. The list of filters is:

- U#640, B#639, V#641, R#642, i#705

Exposures in filters not required on a particular night can be skipped by indicating it in the Broker of Observing Blocks (BOB), under the control of the instrument operator. This is usually more convenient than defining individual OBs for each filter.

4 Execution of the Calibrations

The calibration OBs for photometric standards are stored in `impex-stdcal-new/EFOSC2/PhotStds` on `wg5dhs` machine from where they can be imported into p2pp. They are also stored in an OT queue named `NTT_EFOSC2_CAL_PHOT_STD`.

The calibration OB is then fetched by BOB with all its contents, including the observation templates for filters that are not desired or even available in the setup. The selection of the individual templates to be executed (i.e., the filters which will be actually used in the observation) is done in BOB by the telescope operator, following the instructions of the astronomer. Alternatively, for a visitor run where only a subset of filters will be used, one can import the OBs into p2pp and delete the unnecessary columns in all the OBs before executing them. This has the advantage of reducing the overhead during the night as the telescope operator will simply run the whole OB.

5 Extended Standard Fields

Most of the Landolt fields are also included in the Stetson catalogue [3], which goes deeper and includes a number of the fainter stars in each of these fields. This catalogue is used by the automatic standard star measuring software installed on the NTT offline workstation `wg5off` (see below). There are therefore many Stetson stars within the fields defined by these OBs, however only the primary Landolt standards are marked in the finder charts. In addition to the equatorial standards we are also seeking to extend the list of OBs to the Southern Landolt standards (around -50 declination, including the popular T Phe field) [2], which are observable when the wind from the North limits the pointing of the NTT. These OBs will appear as they are ready in the calibration OB directory on `wg5dhs` and in the OT queues; this document will be updated to include them once a significant number of OBs are prepared.

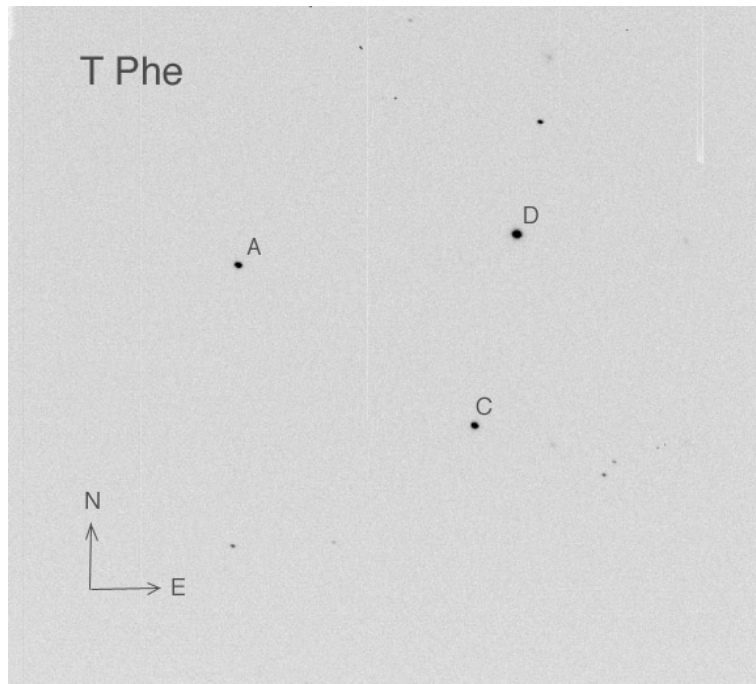
6 Automatic standard star photometry

Since EFOSC2 images now contain World Co-ordinate System (WCS) information, identifying standard stars within the field can be done directly by the RA and Dec position of each star. An automatic routine which identifies all Stetson and Landolt standard stars in each frame is available on the offline machine wg5off. This IRAF based routine identifies and measures the photometry for each star, and then solves for the zeropoint. It can run entirely without interaction to give an assessment of the photometric quality of the night (by comparison with known EFOSC2 zeropoints), or interactively to solve for zeropoints, extinctions and colour terms. Details are available on the webpage <http://www.eso.org/sci/facilities/lasilla/instruments/efosc/inst/zp>.

References

- [1] Landolt A.U., 1992, AJ 104, 340.
- [2] Landolt A.U., 2007, AJ 133, 2502.
- [3] Stetson P.B., 2000, PASP 112, 925.

T Phe



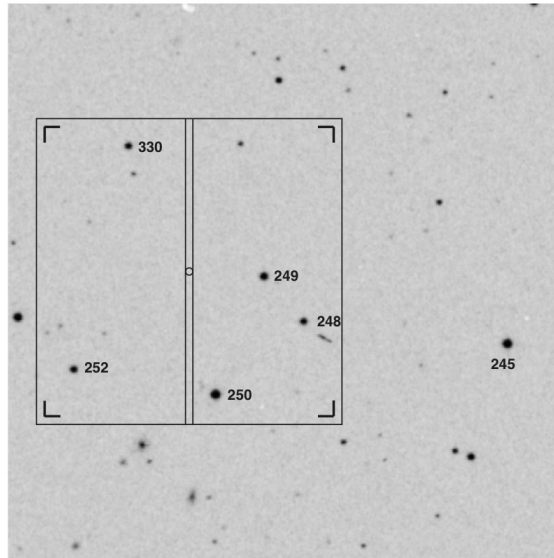
OB name: 0030_TPhe

Field centre: $00^h 30^m 14.00^s$ $-46^\circ 32' 00.0''$

Exposure times (s)				
U	B	V	R	i
20	8	2	1	1

Object	RA (2000)	dec (2000)	V	B-V	U-B	V-R	R-I	V-I
TPHE A	00 30 09	-46 31 22	14.651	0.793	0.380	0.435	0.405	0.841
TPHE C	00 30 17	-46 32 34	14.376	-0.298	-1.217	-0.148	-0.211	-0.360
TPHE D	00 30 18	-46 31 11	13.118	1.551	1.871	0.849	0.810	1.663

SA 92-248



OB name: TBD

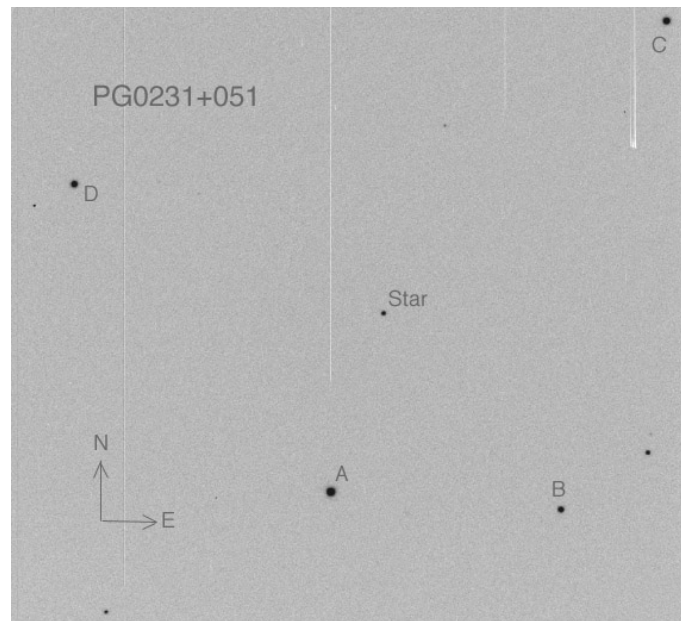
Field centre: $00^h 54^m 32^s$ $00^\circ 41' 00''$ (approx)

Exposure times (s)

U B V R i

Object	RA (2000)	dec (2000)	V	B-V	U-B	V-R	R-I	V-I
92 245	00 54 16	+00 39 51	13.818	1.418	1.189	0.929	0.907	1.836
92 248	00 54 31	+00 40 15	15.346	1.128	1.289	0.690	0.553	1.245
92 249	00 54 34	+00 41 05	14.325	0.699	0.240	0.399	0.370	0.770
92 250	00 54 37	+00 38 56	13.178	0.814	0.480	0.446	0.394	0.840
92 330	00 54 44	+00 43 26	15.073	0.568	-0.115	0.331	0.334	0.666
92 252	00 54 48	+00 39 23	14.932	0.517	-0.140	0.326	0.332	0.666
92 253	00 54 52	+00 40 20	14.085	1.131	0.955	0.719	0.616	1.337

PG0231+051



OB name: 0233_PG0231+051

Field centre: $02^h 33^m 40.70^s$ $05^\circ 18' 38.1''$

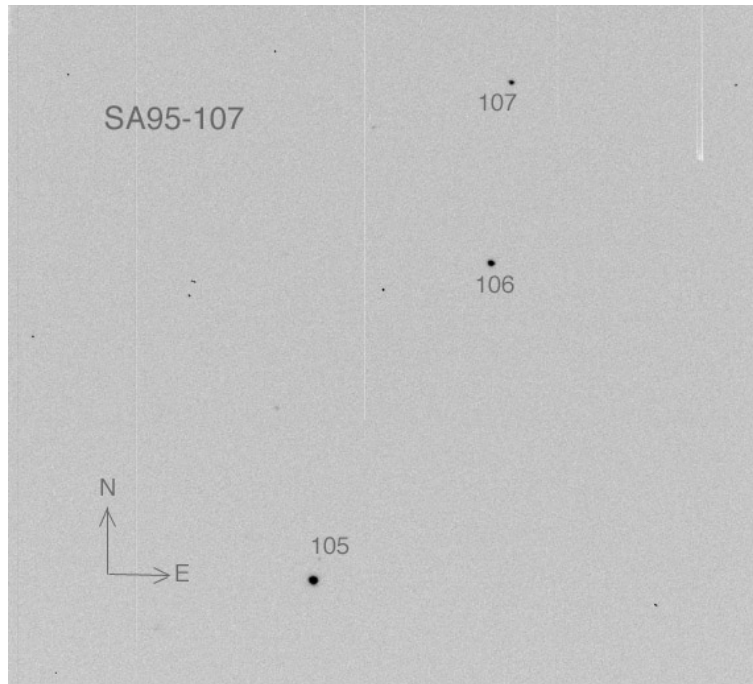
Exposure times (s)

U B V R i

10 5 2 1 1

Object	RA (2000)	dec (2000)	V	B-V	U-B	V-R	R-I	V-I
PG0231+051D	02 33 33	+05 19 28	14.027	1.088	1.046	0.675	0.586	1.256
PG0231+051A	02 33 40	+05 17 38	12.772	0.710	0.270	0.405	0.394	0.799
PG0231+051C	02 33 41	+05 20 19	13.702	0.671	0.114	0.399	0.385	0.783
PG0231+051	02 33 41	+05 18 40	16.105	-0.329	-1.192	-0.162	-0.371	-0.534
PG0231+051B	02 33 45	+05 17 30	14.735	1.448	1.342	0.954	0.998	1.951

SA 95-107



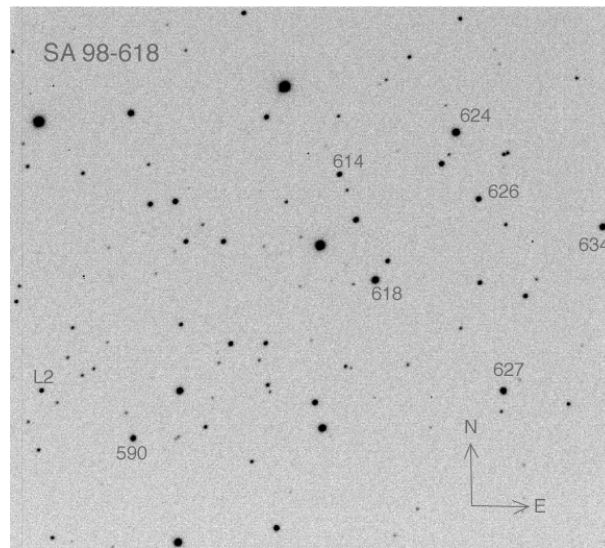
OB name: 0353_SA95-107

Field centre: $03^h 53^m 23.00^s$ $00^\circ 00' 49.8''$

Exposure times (s)				
U	B	V	R	i
45	10	2	1	1

Object	RA (2000)	dec (2000)	V	B-V	U-B	V-R	R-I	V-I
95 105	03 53 21	-00 00 20	13.574	0.976	0.627	0.550	0.536	1.088
95 107	03 53 25	+00 02 18	16.275	1.324	1.115	0.947	0.962	1.907
95 106	03 53 25	+00 01 22	15.137	1.251	0.369	0.394	0.508	0.903

SA 98-618



OB name: 0651_SA98-618

Field centre: $06^h 51^m 48.00^s$ $-00^\circ 21' 22.7''$

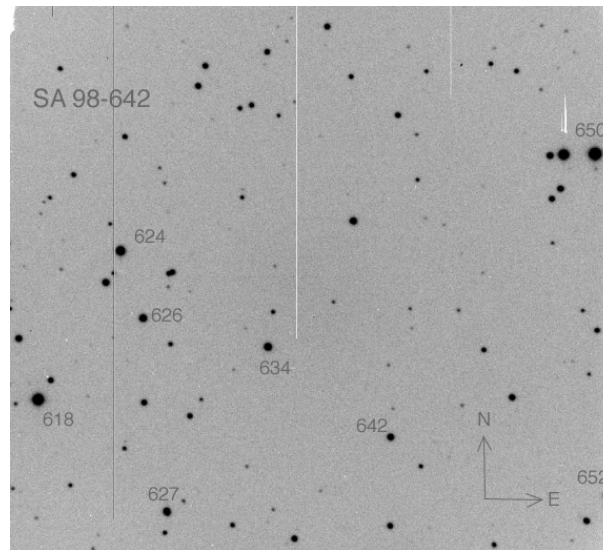
Exposure times (s)

U B V R i

15 4 1 1 1

Object	RA (2000)	dec (2000)	V	B-V	U-B	V-R	R-I	V-I
98 L2	06 51 40	-00 21 11	15.859	1.340	1.497	0.754	0.572	1.327
98 590	06 51 43	-00 22 21	14.642	1.352	0.853	0.753	0.747	1.500
98 614	06 51 49	-00 20 34	15.674	1.063	0.399	0.834	0.645	1.480
98 618	06 51 50	-00 21 17	12.723	2.192	2.144	1.254	1.151	2.407
98 624	06 51 52	-00 20 16	13.811	0.791	0.394	0.417	0.404	0.822
98 626	06 51 53	-00 20 46	14.758	1.406	1.067	0.806	0.816	1.624
98 627	06 51 53	-00 22 03	14.900	0.689	0.078	0.428	0.387	0.817
98 634	06 51 56	-00 20 57	14.608	0.647	0.123	0.382	0.372	0.757

SA 98-642



OB name: 0651_SA98-642

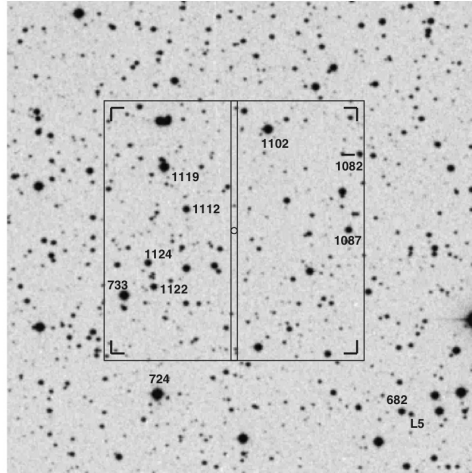
Field centre: $06^h 51^m 57.30^s$ $-00^\circ 20' 43.6''$

Exposure times (s)

U	B	V	R	i
15	3	1	1	1

Object	RA (2000)	dec (2000)	V	B-V	U-B	V-R	R-I	V-I
98 618	06 51 50	-00 21 17	12.723	2.192	2.144	1.254	1.151	2.407
98 624	06 51 52	-00 20 16	13.811	0.791	0.394	0.417	0.404	0.822
98 626	06 51 53	-00 20 46	14.758	1.406	1.067	0.806	0.816	1.624
98 627	06 51 53	-00 22 03	14.900	0.689	0.078	0.428	0.387	0.817
98 634	06 51 56	-00 20 57	14.608	0.647	0.123	0.382	0.372	0.757
98 642	06 51 59	-00 21 33	15.290	0.571	0.318	0.302	0.393	0.697
98 650	06 52 05	-00 19 40	12.271	0.157	0.110	0.080	0.086	0.166
98 652	06 52 05	-00 21 58	14.817	0.611	0.126	0.276	0.339	0.618

SA 98-1082



OB name: TBD

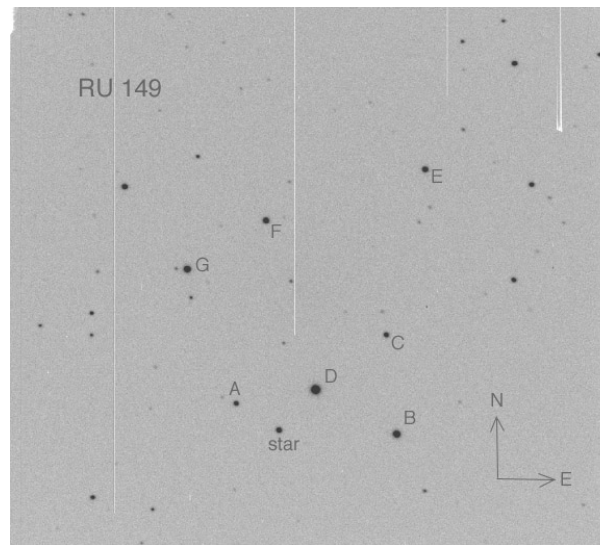
Field centre: $06^h 52^m 30^s$ $-00^\circ 16' 00''$ (approx)

Exposure times (s)

U B V R i

Object	RA (2000)	dec (2000)	V	B-V	U-B	V-R	R-I	V-I
98 L5	06 52 16	-00 19 39	17.800	1.900	-0.100	3.100	2.600	5.800
98 682	06 52 17	-00 19 42	13.749	0.632	0.098	0.366	0.352	0.717
98 1082	06 52 20	-00 14 15	15.010	0.835	-0.001	0.485	0.619	1.102
98 1087	06 52 21	-00 15 50	14.439	1.595	1.284	0.928	0.882	1.812
98 1102	06 52 28	-00 13 43	12.113	0.314	0.089	0.193	0.195	0.388
98 1112	06 52 35	-00 15 23	13.975	0.814	0.286	0.443	0.431	0.874
98 1119	06 52 37	-00 14 33	11.878	0.551	0.069	0.312	0.299	0.611
98 1124	06 52 38	-00 16 34	13.707	0.315	0.258	0.173	0.201	0.373
98 1122	06 52 38	-00 17 05	14.090	0.595	-0.297	0.376	0.442	0.816
98 724	06 52 38	-00 19 22	11.118	1.104	0.904	0.575	0.527	1.103
98 733	06 52 40	-00 17 16	12.238	1.285	1.087	0.698	0.650	1.347

RU 149



OB name: 0724_RU149

Field centre: $07^h 24^m 15.40^s$ $-00^\circ 32' 07.0''$

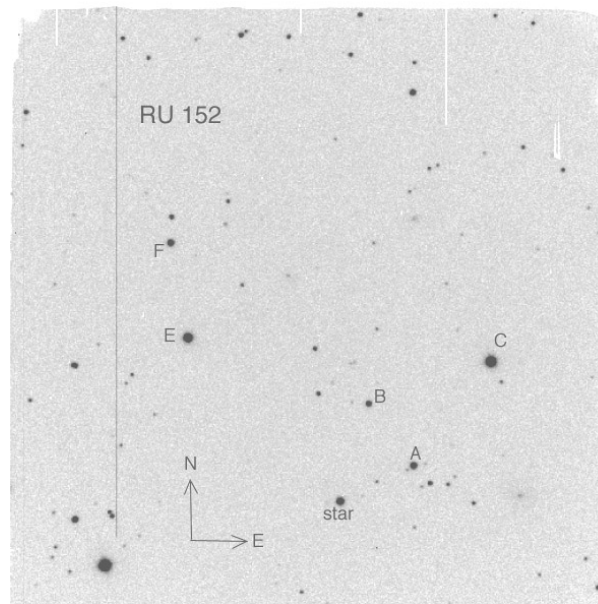
Exposure times (s)

U B V R i

10 2 1 1 1

Object	RA (2000)	dec (2000)	V	B-V	U-B	V-R	R-I	V-I
RU 149G	07 24 12	-00 31 46	12.829	0.541	0.033	0.322	0.322	0.645
RU 149A	07 24 14	-00 32 44	14.495	0.298	0.118	0.196	0.196	0.391
RU 149F	07 24 15	-00 30 58	13.471	1.115	1.025	0.594	0.538	1.132
RU 149	07 24 15	-00 32 55	13.866	-0.129	-0.779	-0.040	-0.068	-0.108
RU 149D	07 24 16	-00 32 38	11.480	-0.037	-0.287	0.021	0.008	0.029
RU 149C	07 24 18	-00 32 17	14.425	0.195	0.141	0.093	0.127	0.222
RU 149B	07 24 18	-00 32 58	12.642	0.662	0.151	0.374	0.354	0.728
RU 149E	07 24 19	-00 31 08	13.718	0.522	-0.007	0.321	0.314	0.637

RU 152



OB name: 0729_RU152

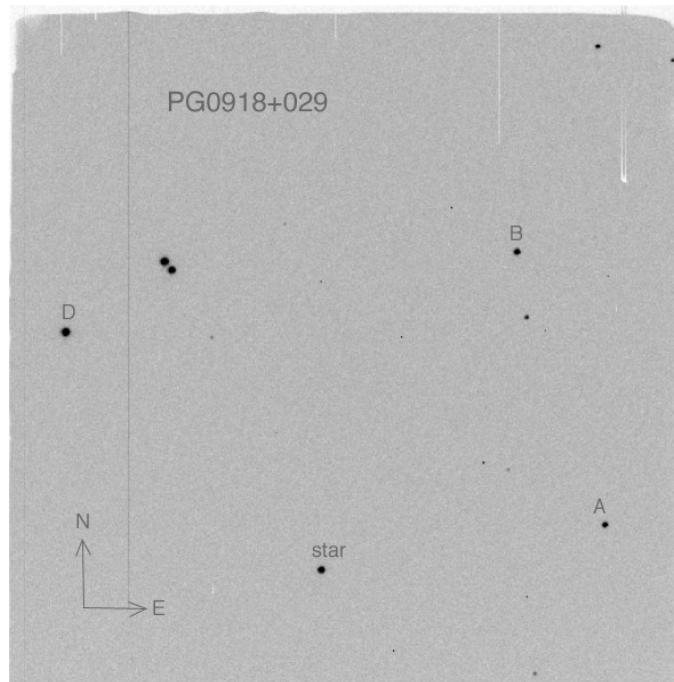
Field centre: $07^h 29^m 57.10^s$ $-02^\circ 05' 33.0''$

Exposure times (s)

U B V R i

10 3 2 1 1

Object	RA (2000)	dec (2000)	V	B-V	U-B	V-R	R-I	V-I
RU 152F	07 29 51	-02 04 29	14.564	0.635	0.069	0.382	0.315	0.689
RU 152E	07 29 51	-02 05 09	12.362	0.042	-0.086	0.030	0.034	0.065
RU 152	07 29 55	-02 06 18	13.014	-0.190	-1.073	-0.057	-0.087	-0.145
RU 152B	07 29 56	-02 05 39	15.019	0.500	0.022	0.290	0.309	0.600
RU 152A	07 29 57	-02 06 02	14.341	0.543	-0.085	0.325	0.329	0.654
RU 152C	07 29 59	-02 05 18	12.222	0.573	-0.013	0.342	0.340	0.683

PG0918+029

OB name: 0921_PG0918+029

Field centre: $09^h 21^m 28.60^s$ $02^\circ 47' 13.6''$

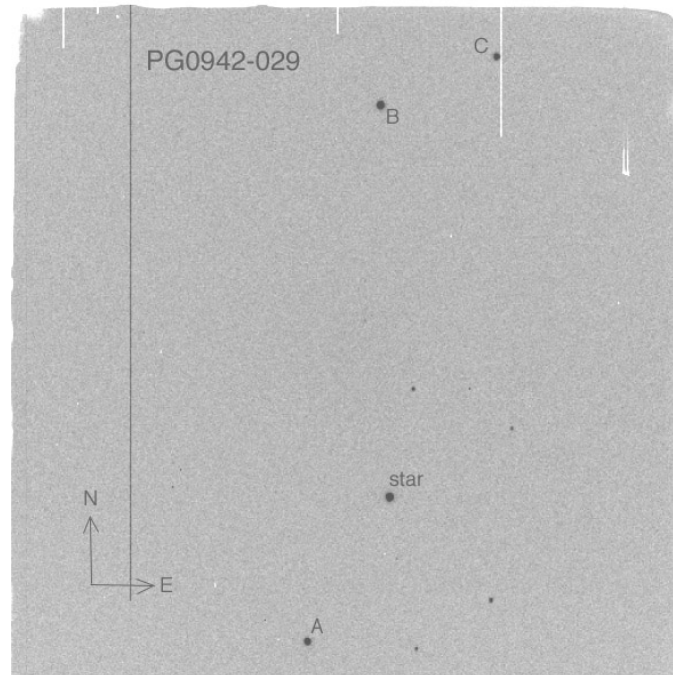
Exposure times (s)

U B V R i

15 3 2 1 1

Object	RA (2000)	dec (2000)	V	B-V	U-B	V-R	R-I	V-I
PG0918+029D	09 21 22	+02 47 30	12.272	1.044	0.821	0.575	0.535	1.108
PG0918+029	09 21 28	+02 46 03	13.327	-0.271	-1.081	-0.129	-0.159	-0.288
PG0918+029B	09 21 34	+02 48 01	13.963	0.765	0.366	0.417	0.370	0.787
PG0918+029A	09 21 35	+02 46 20	14.490	0.536	-0.032	0.325	0.336	0.661

PG0942-029



OB name: 0945_PG0942-029

Field centre: $09^h 45^m 10.60^s$ $-03^\circ 08' 33.9''$

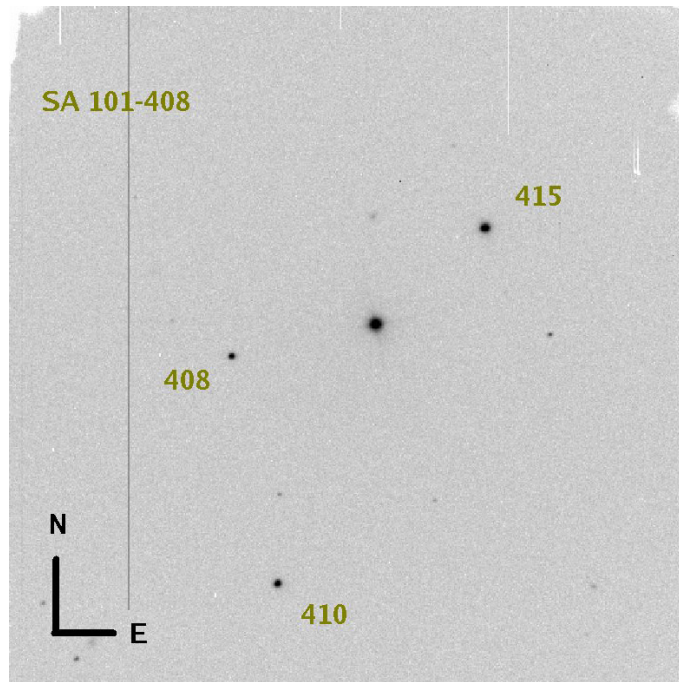
Exposure times (s)

U B V R i

15 7 6 4 4

Object	RA (2000)	dec (2000)	V	B-V	U-B	V-R	R-I	V-I
PG0942-029A	09 45 10	-03 10 17	14.731	0.783	0.339	0.610	0.477	1.081
PG0942-029B	09 45 12	-03 06 57	14.108	0.525	0.085	0.368	0.333	0.697
PG0942-029	09 45 12	-03 09 24	14.004	-0.294	-1.175	-0.130	-0.149	-0.280
PG0942-029C	09 45 15	-03 06 39	14.989	0.727	0.369	0.539	0.376	0.909

SA 101-408



OB name: 0956_SA101-408

Field centre: $09^h 56^m 08.00^s$ $-00^\circ 12' 40.0''$

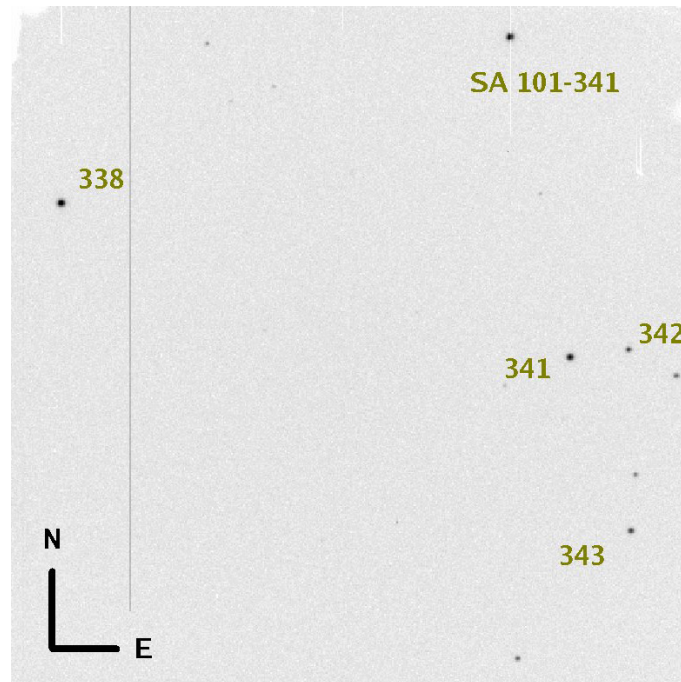
Exposure times (s)

U B V R i

90 7 2 1 1

Object	RA (2000)	dec (2000)	V	B-V	U-B	V-R	R-I	V-I
101 408	09 56 08	-00 12 40	14.785	1.200	1.347	0.718	0.603	1.321
101 410	09 56 09	-00 14 02	13.646	0.546	-0.063	0.298	0.326	0.623
101 413	09 56 14	-00 11 56	12.583	0.983	0.716	0.529	0.497	1.025

SA 101-341



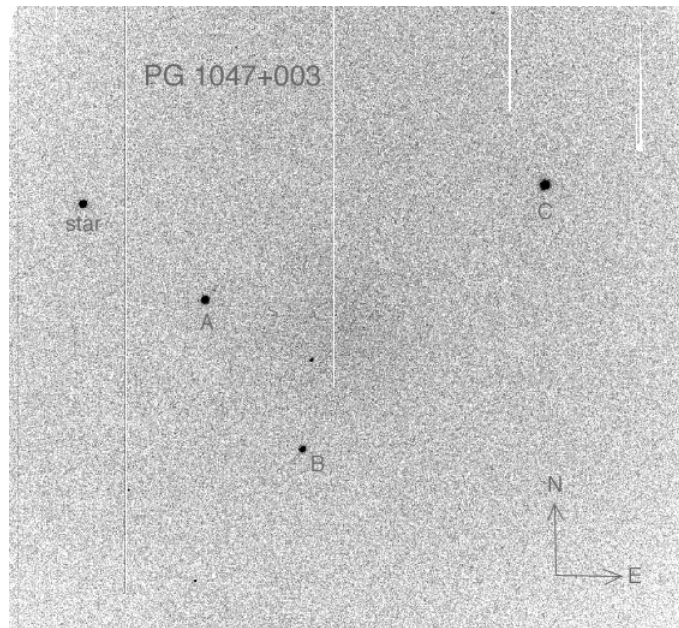
OB name: 0957_SA101-341

Field centre: $09^h 57^m 24.40^s$ $-00^\circ 22' 00.7''$

Exposure times (s)				
U	B	V	R	i
100	15	6	3	4

Object	RA (2000)	dec (2000)	V	B-V	U-B	V-R	R-I	V-I
101 341	09 57 30	-00 21 52	14.342	0.575	0.059	0.332	0.309	0.641
101 342	09 57 31	-00 21 49	15.556	0.529	-0.065	0.339	0.419	0.758
101 343	09 57 31	-00 22 54	15.504	0.606	0.094	0.396	0.338	0.734

PG1047+003



OB name: 1050_PG1047+003

Field centre: $10^h 50^m 09.20^s$ $-00^\circ 01' 27.2''$

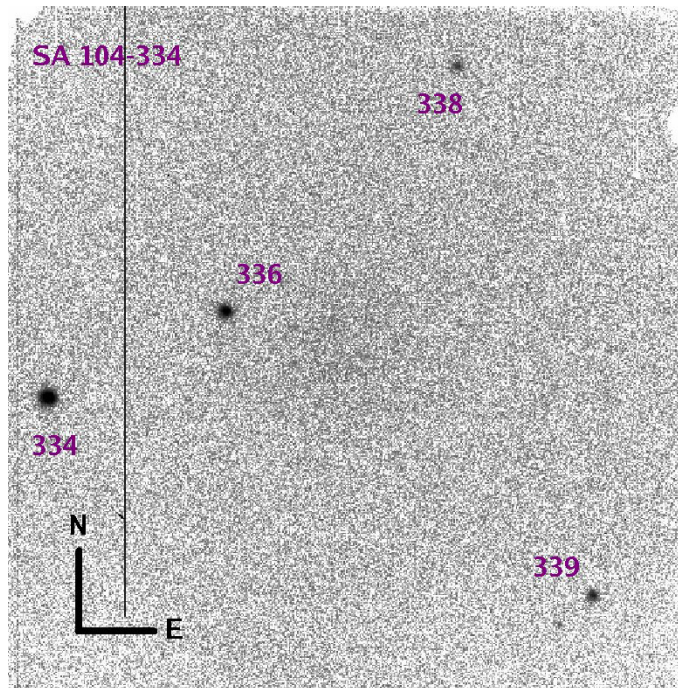
Exposure times (s)

U B V R i

15 5 1 1 1

Object	RA (2000)	dec (2000)	V	B-V	U-B	V-R	R-I	V-I
PG1047+003	10 50 03	-00 00 32	13.474	-0.290	-1.121	-0.132	-0.162	-0.295
PG1047+003A	10 50 06	-00 01 08	13.512	0.688	0.168	0.422	0.418	0.840
PG1047+003B	10 50 09	-00 02 00	14.751	0.679	0.172	0.391	0.371	0.764
PG1047+003C	10 50 18	-00 00 23	12.453	0.607	-0.019	0.378	0.358	0.737

SA 104-334



OB name: 1242_SA104-334

Field centre: $12^h 42^m 26.90^s$ $-00^\circ 40' 21.5''$

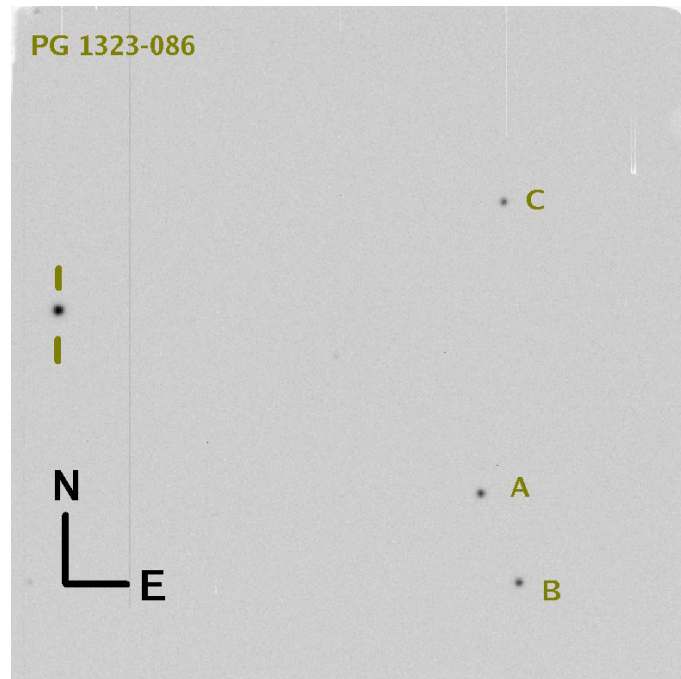
Exposure times (s)

U B V R i

45 6 6 2 2

Object	RA (2000)	dec (2000)	V	B-V	U-B	V-R	R-I	V-I
104 334	12 42 21	-00 40 28	13.484	0.518	-0.067	0.323	0.331	0.653
104 336	12 42 25	-00 39 58	14.404	0.830	0.495	0.461	0.403	0.865
104 338	12 42 31	-00 38 32	16.059	0.591	-0.082	0.348	0.372	0.719
104 339	12 42 34	-00 41 39	15.459	0.832	0.709	0.476	0.374	0.849

PG1323-086



OB name: 1325_PG1323-086

Field centre: $13^h 25^m 46.10^s$ $-08^\circ 49' 38.1''$

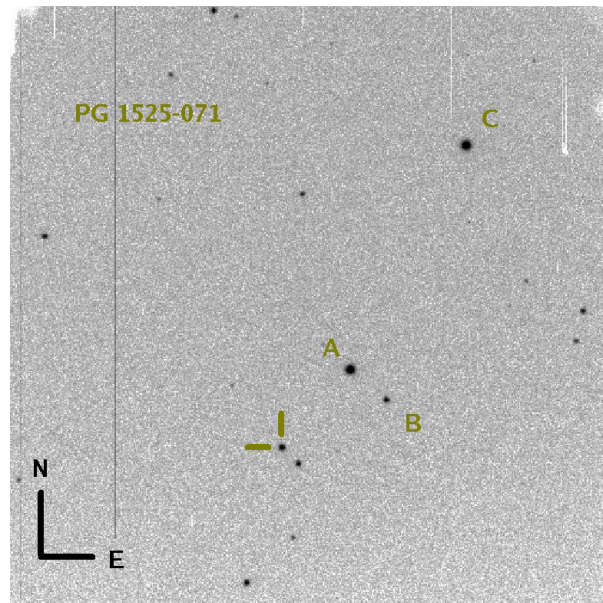
Exposure times (s)

U B V R i

30 5 5 2 5

Object	RA (2000)	dec (2000)	V	B-V	U-B	V-R	R-I	V-I
PG1323-086	13 25 39	-08 49 16	13.481	-0.140	-0.681	-0.048	-0.078	-0.127
PG1323-086A	13 25 49	-08 50 22	13.591	0.393	-0.019	0.252	0.252	0.506
PG1323-086C	13 25 50	-08 48 37	14.003	0.707	0.245	0.395	0.363	0.759
PG1323-086B	13 25 50	-08 51 53	13.406	0.761	0.265	0.426	0.407	0.833

PG1525-071



OB name: 1528_PG1525-071

Field centre: $15^h 28^m 11.90^s$ $-07^\circ 15' 42.9''$

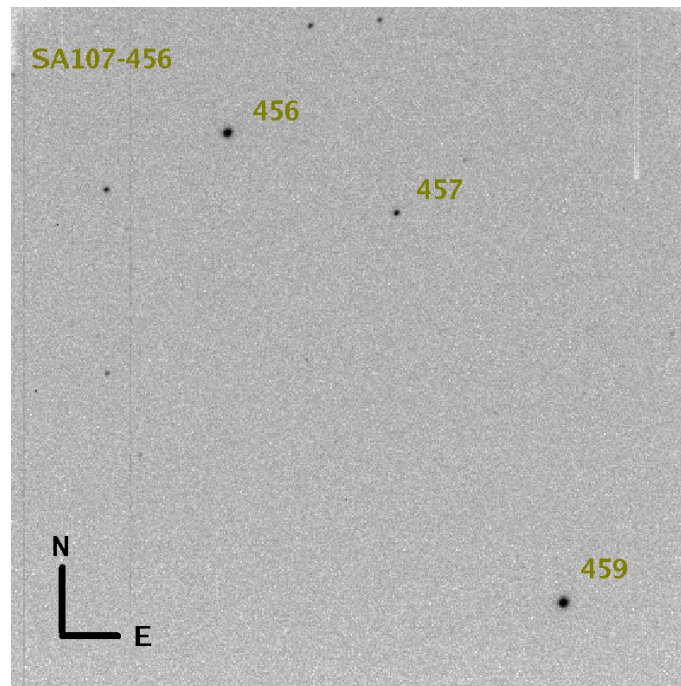
Exposure times (s)

U B V R i

45 10 5 3 3

Object	RA (2000)	dec (2000)	V	B-V	U-B	V-R	R-I	V-I
PG1525-071	15 28 11	-07 16 27	15.053	-0.198	-1.148	-0.088	-0.075	-0.168
PG1525-071D	15 28 12	-07 16 33	16.301	0.564	0.305	0.411	0.346	0.757
PG1525-071A	15 28 13	-07 15 54	13.509	0.757	0.257	0.445	0.425	0.869
PG1525-071B	15 28 14	-07 16 08	16.403	0.730	0.135	0.442	0.366	0.808
PG1525-071C	15 28 16	-07 14 21	13.530	1.109	1.130	0.590	0.513	1.104

SA 107-456



OB name: 1538_SA107-456

Field centre: $15^h 38^m 45.30^s$ $-00^\circ 21' 12.1''$

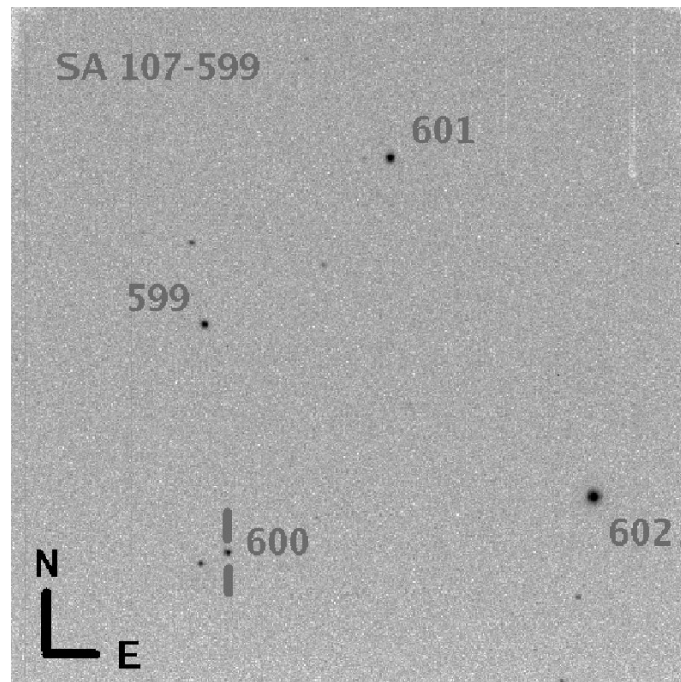
Exposure times (s)

U B V R i

60 5 2 1 1

Object	RA (2000)	dec (2000)	V	B-V	U-B	V-R	R-I	V-I
107 456	15 38 43	-00 19 47	12.919	0.921	0.589	0.537	0.478	1.015
107 457	15 38 46	-00 20 15	14.910	0.792	0.350	0.494	0.469	0.964
107 459	15 38 51	-00 22 31	12.284	0.900	0.427	0.525	0.517	1.045

SA 107-599



OB name: 1539_SA107-599

Field centre: $15^h 39^m 12.60^s$ $-00^\circ 14' 43.3''$

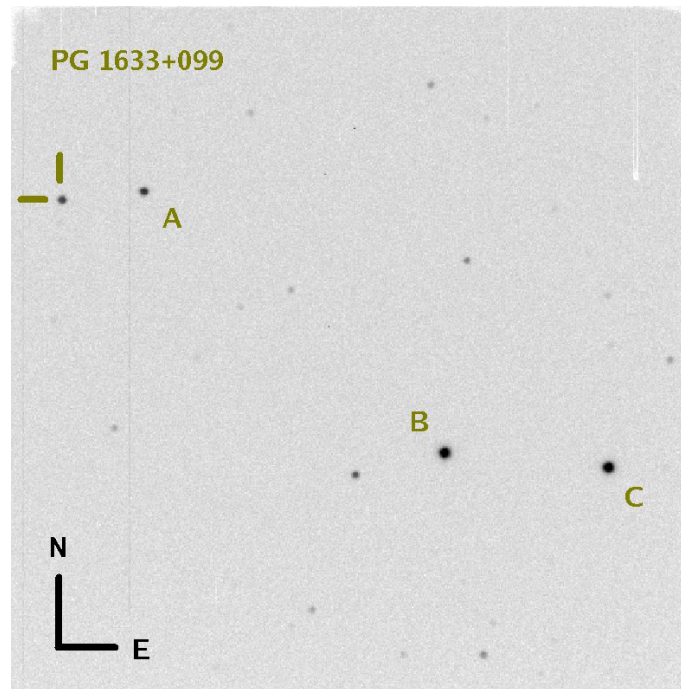
Exposure times (s)

U B V R i

45 5 1 1 1

Object	RA (2000)	dec (2000)	V	B-V	U-B	V-R	R-I	V-I
107 599	15 39 09	-00 14 28	14.675	0.698	0.243	0.433	0.438	0.869
107 600	15 39 11	-00 15 49	14.884	0.503	0.049	0.339	0.361	0.700
107 601	15 39 14	-00 13 26	14.646	1.412	1.265	0.923	0.835	1.761
107 602	15 39 19	-00 15 29	12.116	0.991	0.585	0.545	0.531	1.074

PG1633+099



OB name: 1635_PG1633+099

Field centre: $16^h 35^m 30.70^s$ $09^\circ 46' 51.5''$

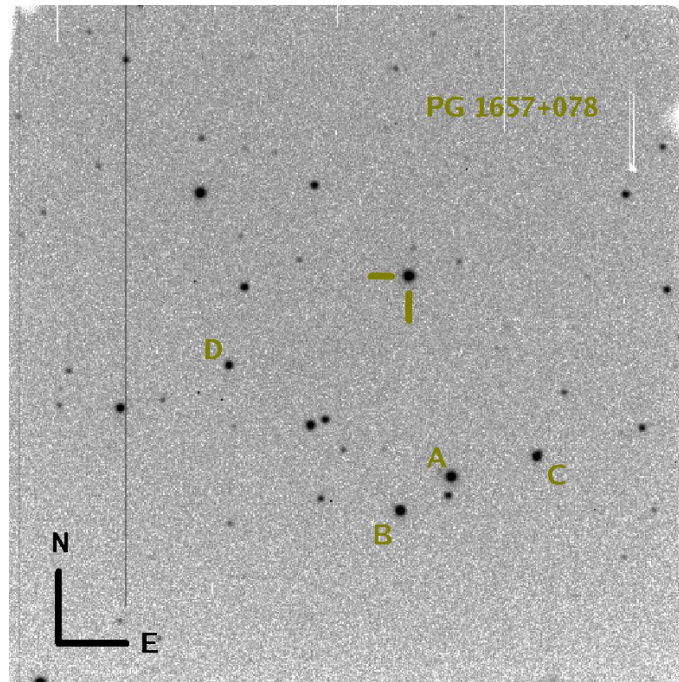
Exposure times (s)

U B V R i

60 20 5 3 5

Object	RA (2000)	dec (2000)	V	B-V	U-B	V-R	R-I	V-I
PG1633+099	16 35 24	+09 47 50	14.397	-0.192	-0.974	-0.093	-0.116	-0.212
PG1633+099A	16 35 26	+09 47 53	15.256	0.873	0.320	0.505	0.511	1.015
PG1633+099B	16 35 34	+09 46 22	12.969	1.081	1.007	0.590	0.502	1.090
PG1633+099C	16 35 38	+09 46 16	13.229	1.134	1.138	0.618	0.523	1.138

PG1657+078



OB name: 1659_PG1657+078

Field centre: $16^h 59^m 30.00^s$ $07^\circ 42' 52.0''$

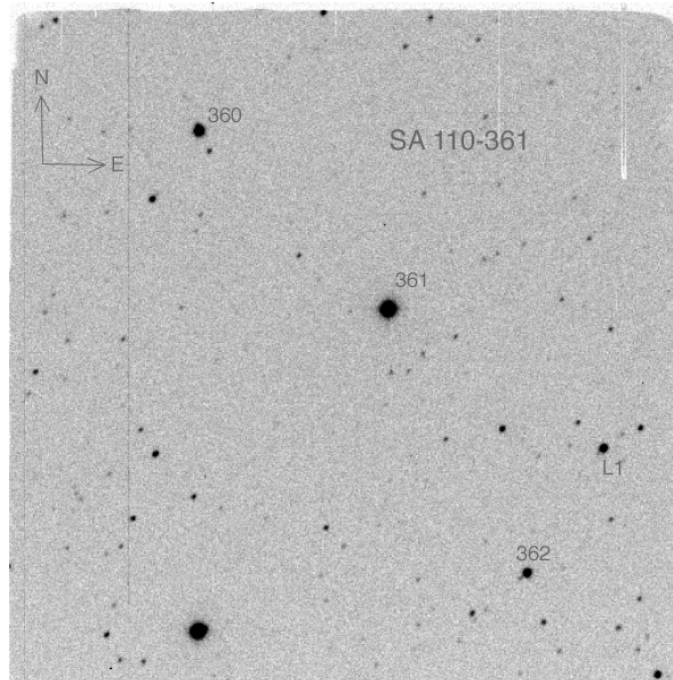
Exposure times (s)

U B V R i

60 15 5 4 4

Object	RA (2000)	dec (2000)	V	B-V	U-B	V-R	R-I	V-I
PG1657+078	16 59 32	+07 43 31	15.015	-0.149	-0.940	-0.063	-0.033	-0.100
PG1657+078B	16 59 32	+07 42 11	14.721	0.708	0.065	0.417	0.420	0.838
PG1657+078A	16 59 33	+07 42 25	14.033	1.069	0.730	0.573	0.539	1.113
PG1657+078C	16 59 35	+07 42 26	15.225	0.840	0.385	0.521	0.444	0.967

SA 110-361



OB name: 1842_SA110-361

Field centre: $18^h 42^m 43.60^s$ $00^\circ 07' 44.2''$

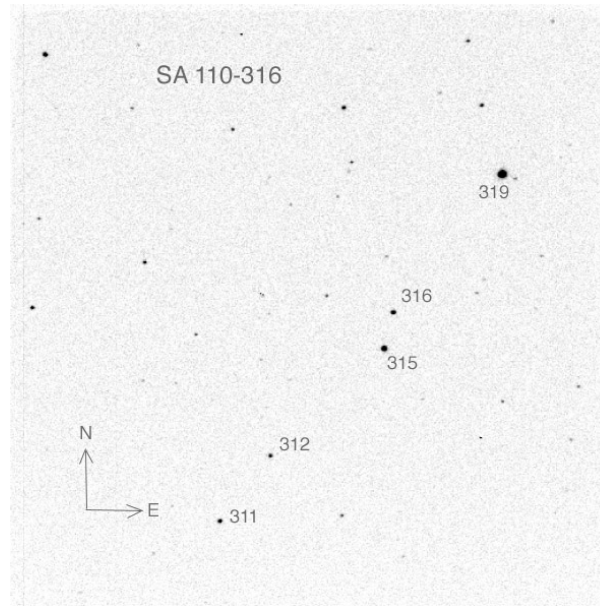
Exposure times (s)

U B V R i

30 3 1 1 1

Object	RA (2000)	dec (2000)	V	B-V	U-B	V-R	R-I	V-I
110 360	18 42 40	+00 09 10	14.618	1.197	0.539	0.715	0.717	1.432
110 361	18 42 45	+00 08 04	12.425	0.632	0.035	0.361	0.348	0.709
110 362	18 42 48	+00 06 26	15.693	1.333	3.919	0.918	0.885	1.803
110 L1	18 42 50	+00 07 10	16.252	1.752	2.953	1.066	0.992	2.058

SA 110-316



OB name: 1843_SA110-316

Field centre: $18^h 43^m 49.90^s$ $00^\circ 01' 00.4''$

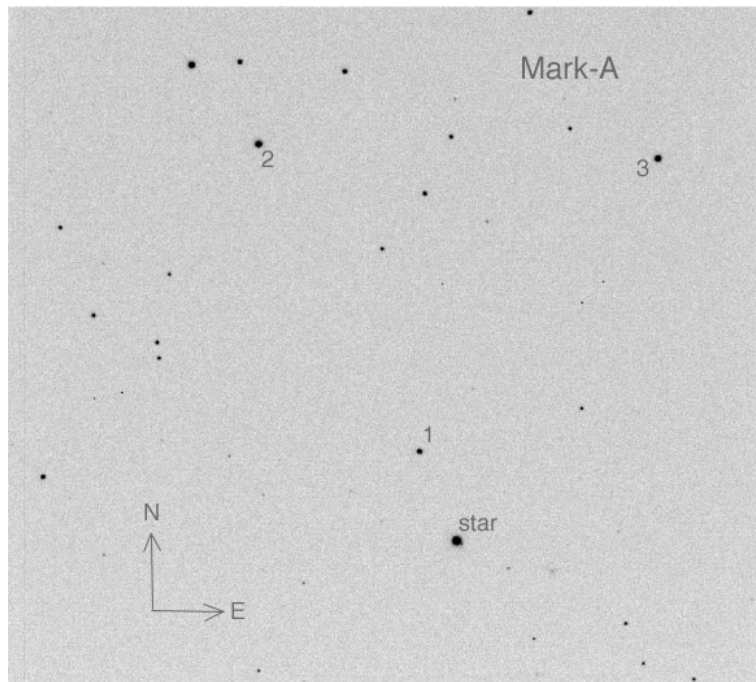
Exposure times (s)

U B V R i

60 3 1 1 1

Object	RA (2000)	dec (2000)	V	B-V	U-B	V-R	R-I	V-I
110 311	18 43 48	-00 00 22	15.505	1.796	1.179	1.010	0.864	1.874
110 312	18 43 50	+00 00 07	16.093	1.319	-0.788	1.137	1.154	2.293
110 316	18 43 52	+00 01 05	14.821	1.731	4.355	0.858	0.910	1.769
110 315	18 43 52	+00 00 49	13.637	2.069	2.256	1.206	1.133	2.338
110 319	18 43 55	+00 02 01	11.861	1.309	1.076	0.742	0.700	1.443

Mark-A



OB name: 2043_Mark-A

Field centre: $20^h 43^m 57.70^s$ $-10^\circ 46' 45.4''$

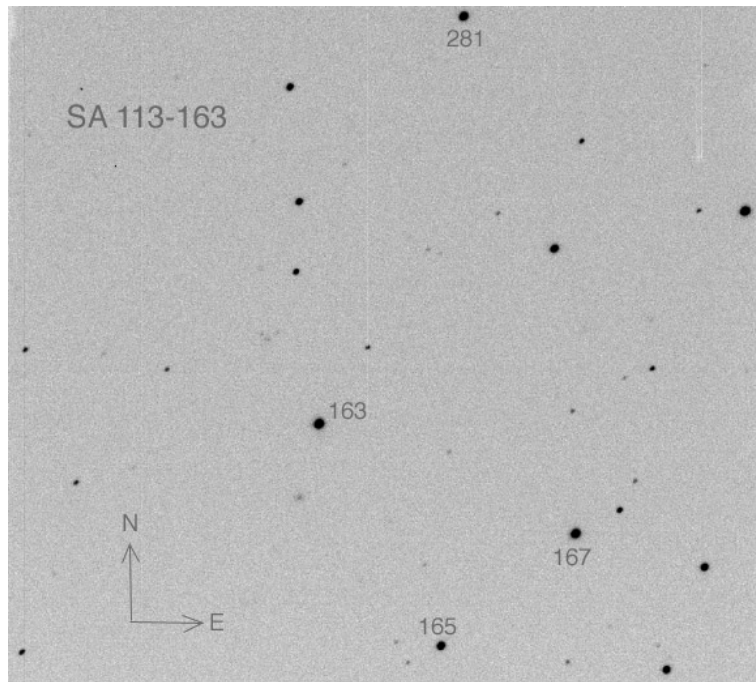
Exposure times (s)

U B V R i

8 2 2 1 3

Object	RA (2000)	dec (2000)	V	B-V	U-B	V-R	R-I	V-I
MARK A2	20 43 54	-10 45 32	14.540	0.666	0.096	0.379	0.371	0.751
MARK A1	20 43 58	-10 47 11	15.911	0.609	-0.014	0.367	0.373	0.740
MARK A	20 43 59	-10 47 42	13.258	-0.242	-1.162	-0.115	-0.125	-0.241
MARK A3	20 44 02	-10 45 39	14.818	0.938	0.651	0.587	0.510	1.098

SA 113-163



OB name: 2142_SA113-163

Field centre: $21^h 42^m 36.90^s$ $00^\circ 17' 07.6''$

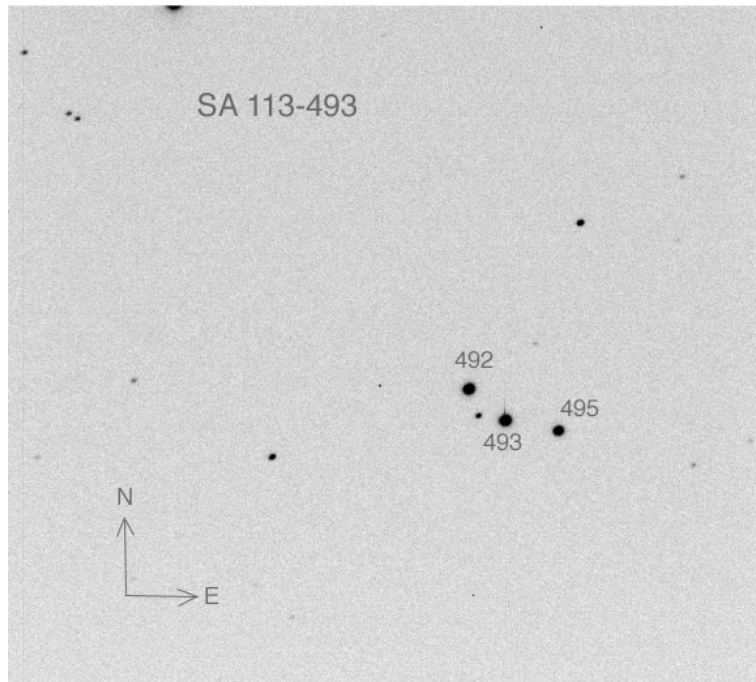
Exposure times (s)

U B V R i

80 15 7 3 5

Object	RA (2000)	dec (2000)	V	B-V	U-B	V-R	R-I	V-I
113 163	21 42 35	+00 16 46	14.540	0.658	0.106	0.380	0.355	0.735
113 165	21 42 38	+00 15 34	15.639	0.601	0.003	0.354	0.392	0.746
113 281	21 42 39	+00 19 00	15.247	0.529	-0.026	0.347	0.359	0.706
113 167	21 42 41	+00 16 08	14.841	0.597	-0.034	0.351	0.376	0.728

SA 113-493



OB name: 2142_SA113-493

Field centre: $21^h 42^m 26.40^s$ $00^\circ 37' 33.5''$

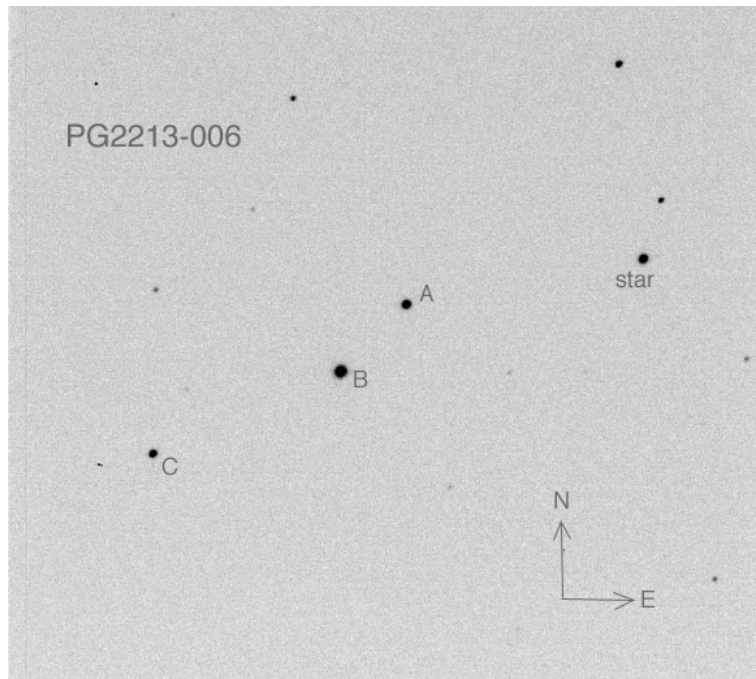
Exposure times (s)

U B V R i

20 2 1 1 1

Object	RA (2000)	dec (2000)	V	B-V	U-B	V-R	R-I	V-I
113 492	21 42 28	+00 38 21	12.174	0.553	0.005	0.342	0.341	0.684
113 493	21 42 29	+00 38 10	11.767	0.786	0.392	0.430	0.393	0.824
113 495	21 42 30	+00 38 07	12.437	0.947	0.530	0.512	0.497	1.010

PG2213-006



OB name: 2216_PG2213-006

Field centre: $22^h 16^m 22.70^s$ $-00^\circ 21' 44.1''$

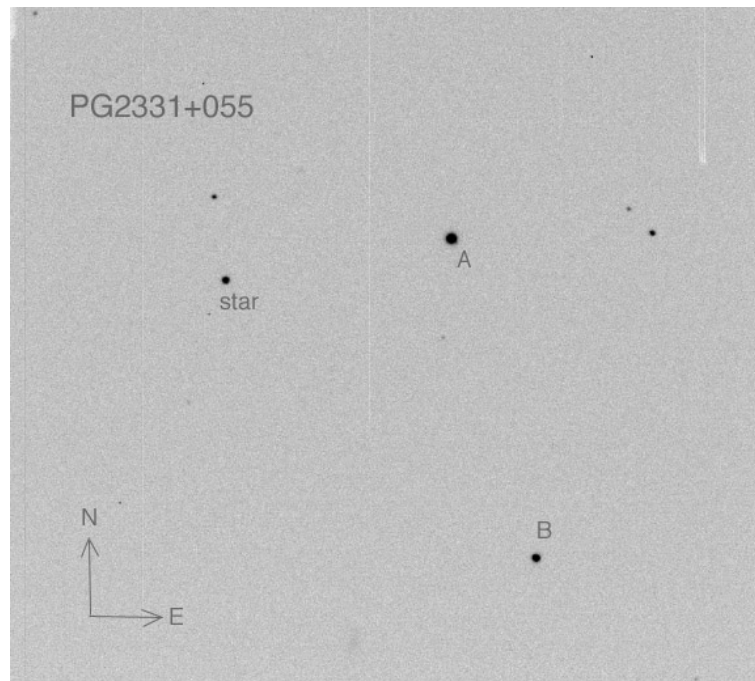
Exposure times (s)

U B V R i

20 4 2 1 1

Object	RA (2000)	dec (2000)	V	B-V	U-B	V-R	R-I	V-I
PG2213-006C	22 16 18	-00 22 15	15.109	0.721	0.177	0.426	0.404	0.830
PG2213-006B	22 16 22	-00 21 49	12.706	0.749	0.297	0.427	0.402	0.829
PG2213-006A	22 16 24	-00 21 27	14.178	0.673	0.100	0.406	0.403	0.808
PG2213-006	22 16 28	-00 21 15	14.124	-0.217	-1.125	-0.092	-0.110	-0.203

PG2331+055



OB name: 2333_PG2331+055

Field centre: $23^h 33^m 48.00^s$ $05^\circ 46' 14.9''$

Exposure times (s)

U B V R i

30 5 2 1 1

Object	RA (2000)	dec (2000)	V	B-V	U-B	V-R	R-I	V-I
PG2331+055	23 33 44	+05 46 36	15.182	-0.066	-0.487	-0.012	-0.031	-0.044
PG2331+055A	23 33 49	+05 46 49	13.051	0.741	0.257	0.419	0.401	0.821
PG2331+055B	23 33 51	+05 45 07	14.744	0.819	0.429	0.481	0.454	0.935