



First Elements for nine New Variable Stars in Several Fields, Part VIII

Frank, Peter
Velden, Germany
email: frank.velden@t-online.de

Moschner, Wolfgang
Lennestadt, Germany
email: wolfgang.moschner@t-online.de

Bernhard, Klaus
Linz, Austria
email: klaus.bernhard@liwest.at

Bundesdeutsche Arbeitsgemeinschaft für Veränderliche Sterne e.V.

March 2019

Abstract: 9 new variable stars (UCAC4 746-063569, UCAC4 744-062087, UCAC4 744-062456, UCAC4 742-065437, UCAC4 744-062753, UCAC4 744-061946, UCAC4 744-062788, UCAC4 746-063980, UCAC4 747-061302) are presented, which were found in a search for new variable stars in the fields of several known variables.

Introduction

During the investigation of several known variable stars, nine further variables were found in their surroundings, which are new to our knowledge (not included in AAVSO VSX and GCVS). This paper is the eighth part of a series dealing with numerous discoveries.

All new variables were discovered on images taken with 102mm-TeleVue-Refractor (P. Frank, Velden/Germany) by Peter Frank.

Fr142 Cyg	=	GSC 03949-01667	=	UCAC4 746-063569
Fr143 Cyg	=	UCAC3 298-138673	=	UCAC4 744-062087
Fr144 Cyg	=	UCAC3 298-139487	=	UCAC4 744-062456
Fr146 Cyg	=	GSC 03949-00122	=	UCAC4 742-065437
Fr147 Cyg	=	UCAC3 298-140187	=	UCAC4 744-062753
Fr148 Cyg	=	UCAC3 298-138375	=	UCAC4 744-061946
Fr149 Cyg	=	UCAC3 298-140290	=	UCAC4 744-062788
Fr150 Cyg	=	UCAC3 299-138834	=	UCAC4 746-063980
Fr151 Cyg	=	GSC 03949-01097	=	UCAC4 747-061302

Observations

All discovery observations were carried out with a 102mm/f5.0 TeleVue Refractor (Velden/Germany) and a SIGMA 1603 CCD-Camera containing a cooled Kodak KAF1603ME chip. Normally, the exposures were 90 s resp. 120 s through an IR & UV cut-off filter.

Further observations for all new variables were carried out between June 2015 and October 2018 with the discoverer telescope in Velden and with a robotic telescope 400 mm f/3.7 ASA Astrograph (Nerpio, Spain) equipped with a cooled FLI Proline 16803 CCD-Camera and partly a V-filter or an IR & UV cut-off filter. The exposure times were 120 seconds. The telescope was controlled from Lennestadt via internet.

Data analysis

Muniwin [1] and self-written programs by Franz Agerer and Lienhard Pagel were used for the analysis of the frames, after bias, dark and flatfield correction of the exposures. The period analysis was performed with Peranso [2], and the magnitudes of the variable stars (at maximum brightness) were obtained from the UCAC4 Catalog (Zacharis et al. 2012) [3] or the APASS DR9 Catalog (Henden et al. 2016) [4]. In some cases we did not get any V magnitudes from the usual catalogs. In these cases we instead list Gaia G, BP and RP magnitudes from the Gaia DR2 Catalog [6].

The elements which we present were first calculated with the method of Peranso and then refined with the method of least squares, by taking all O-C values into account (see tables below). The given amplitudes are uncorrected instrumental values.

Explanations:

HJD = heliocentric UTC timings (JD) of the observed minima
mag = (instrumental) magnitude

All coordinates are taken from the Gaia DR2 catalogue [6].

G-band mean magnitude (Vega)	= 350-1000 nm
Integrated BP mean magnitude (Vega)	= 330- 680 nm
Integrated RP mean magnitude (Vega)	= 640-1000 nm

Explanations to the lightcurves:

The colors of the symbols denote different nights.

Fr142 Cyg

= GSC 03949-01667 = UCAC4 746-063569

= Gaia DR2 2236609515091279232

Right ascension: 20h18m10.5324s (2000)

Declination: +59° 10' 12.774"

UCAC4 Catalog:

Vmag: 13.935 Bmag: 14.539 Bmag-Vmag = 0.604

Comparison star = GSC 03949-01617

Check Star = GSC 03949-01413

Amplitude: Min I: 0.38 mag (instr.) Min II: 0.33 mag (instr.)

Type: EW type eclipsing binary

Min I = HJD 2455832.2993 + 0.3318784*E
+/-0.0009 +/-0.0000022

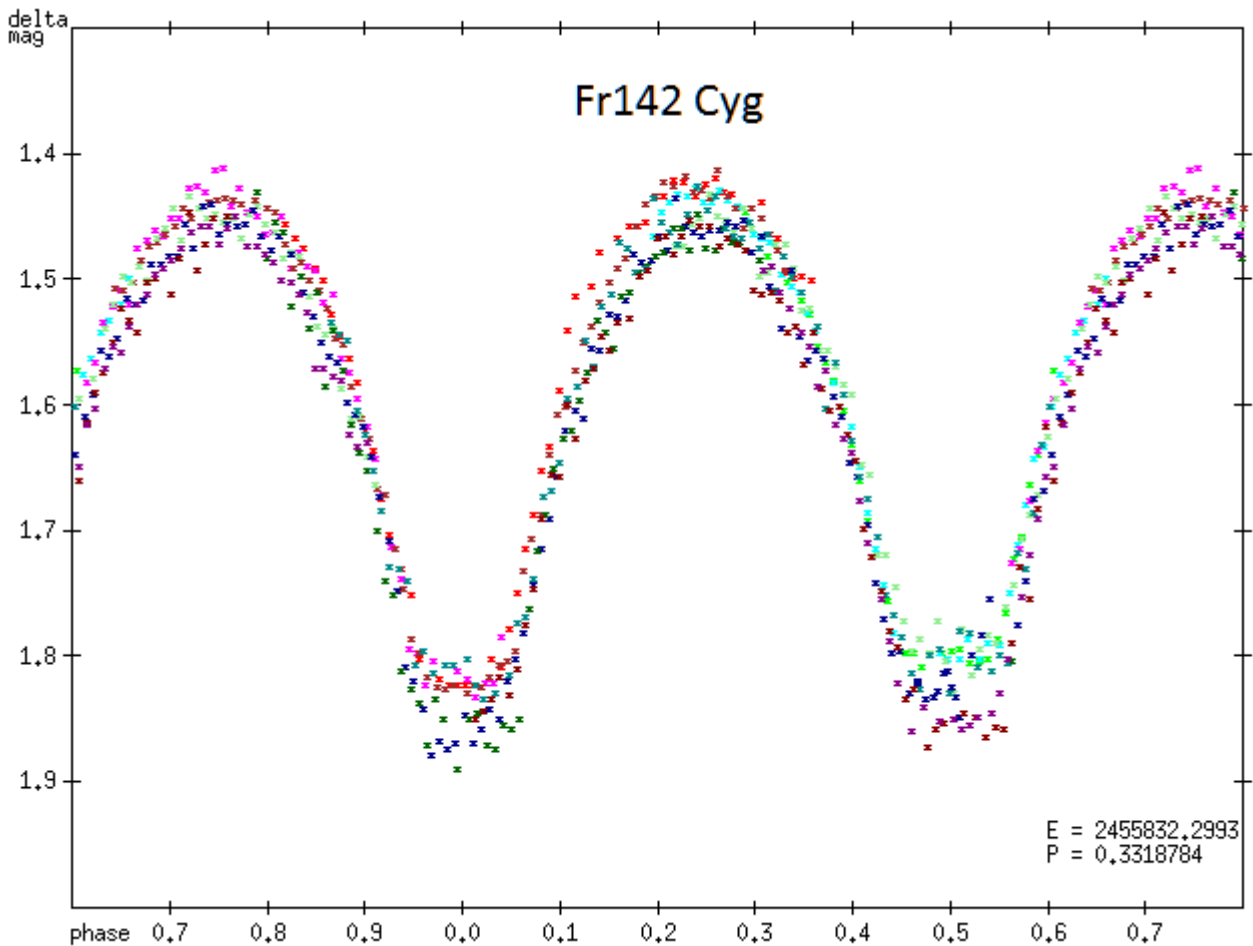


Fig 1: Phased lightcurve of Fr142 Cyg = GSC 03949-01667 using the ephemeris given above. A FLI Proline 16803+V-filter (2015-2018) was used. Presented elements were calculated by taking into account all minima (see tables below) with the method of least squares.

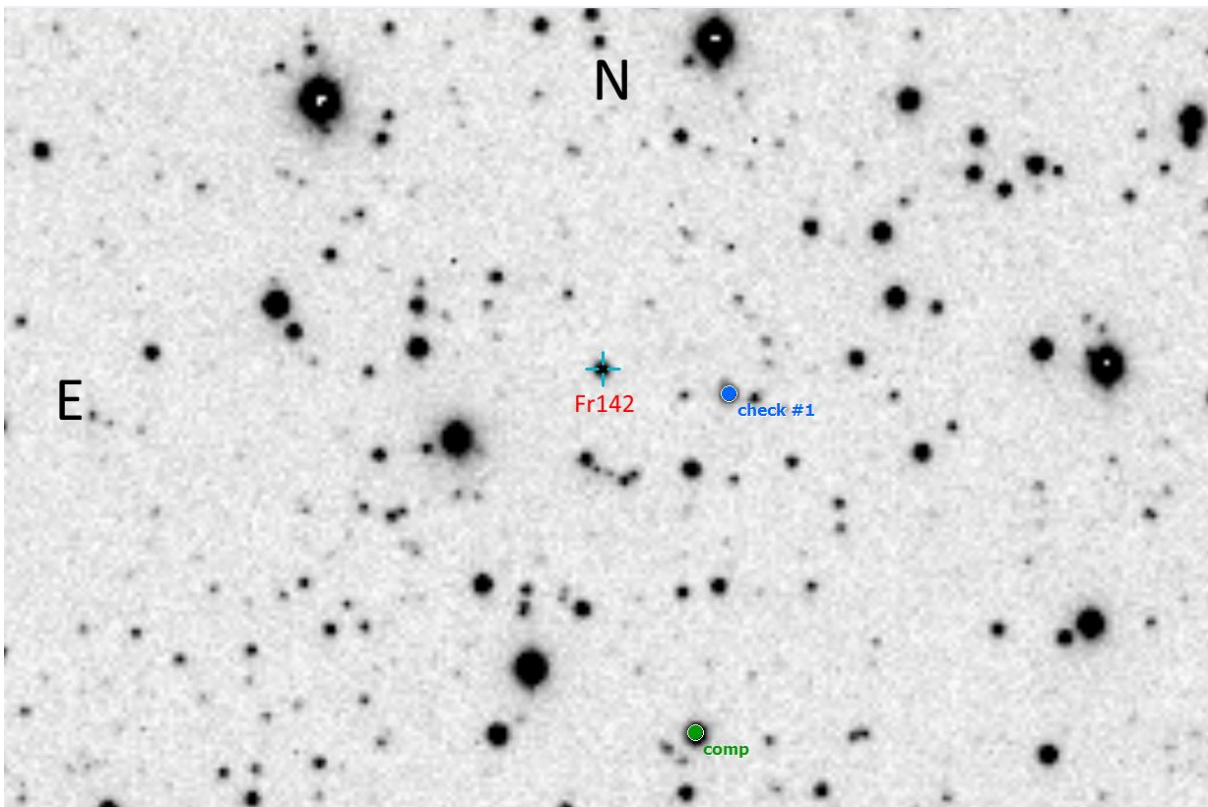


Fig 2: Fr142 Cyg = GSC 03949-01667 in the field of V1193 Cyg; image size: 15'x10'; (comp) is the comparison star and (check#1) is the check star.

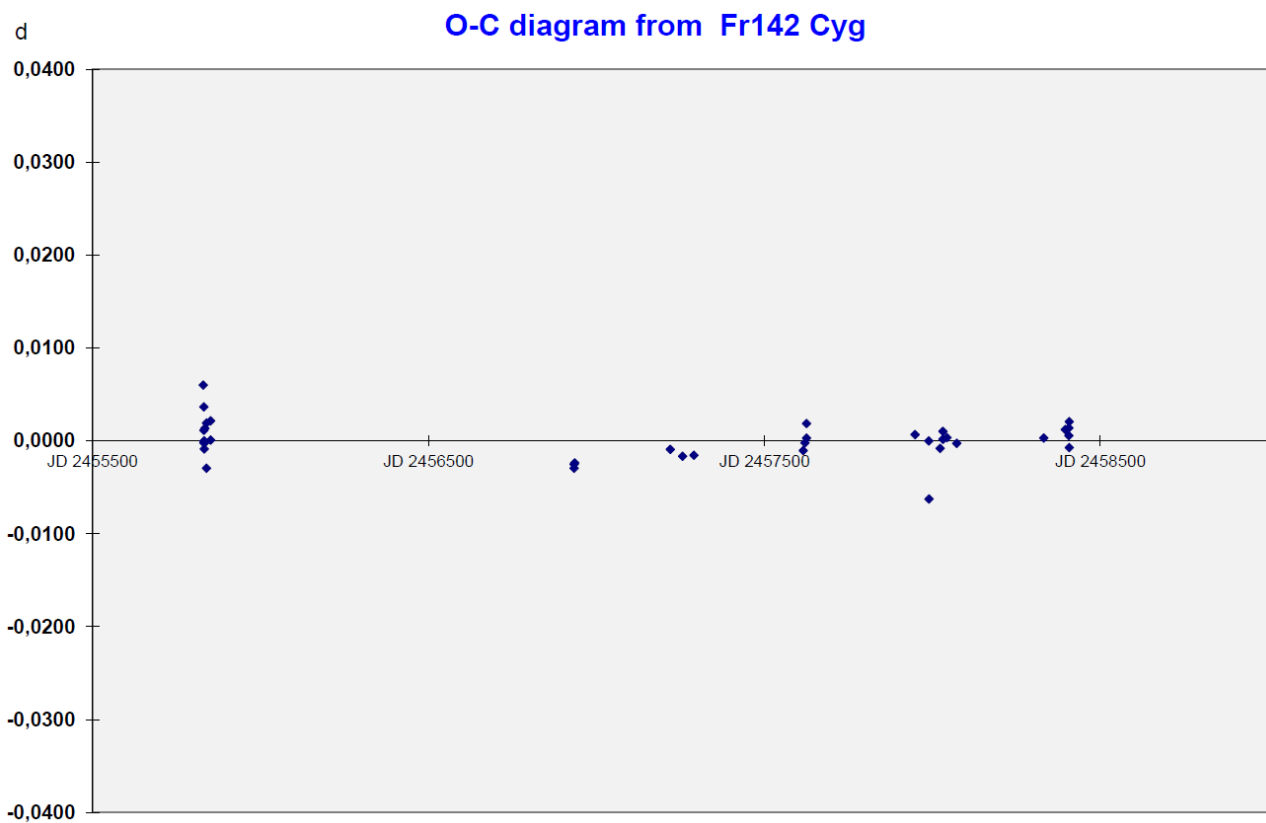


Fig 3: O-C-diagram from Fr142 Cyg = GSC 03949-01667

Table 1: Fr142 Cyg = GSC 03949-01667

Observer	HJD-Date	Type	Epoch	O-C (d)	Remarks
	Minimum				
P. Frank	2455829.3184	I	-9	0.0060	
P. Frank	2455831.3048	I	-3	0.0011	
P. Frank	2455831.4694	II	-2.5	-0.0002	
P. Frank	2455831.6392	I	-2	0.0037	
P. Frank	2455832.2993	I	0	0.0000	
P. Frank	2455832.4652	II	0.5	0.0000	
P. Frank	2455832.6303	I	1	-0.0009	
P. Frank	2455834.2904	I	6	-0.0002	
P. Frank	2455834.4564	II	6.5	-0.0001	
P. Frank	2455834.6238	I	7	0.0014	
P. Frank	2455839.2658	I	21	-0.0029	
P. Frank	2455839.4366	II	21.5	0.0019	
P. Frank	2455851.3824	II	57.5	0.0001	
P. Frank	2455851.5504	I	58	0.0022	
P. Frank	2456933.3034	II	3317.5	-0.0025	
P. Frank	2456933.4689	I	3318	-0.0029	
P. Frank	2456935.2948	II	3323.5	-0.0024	
W. Moschner	2457219.5501	I	4180	-0.0009	
W. Moschner	2457256.5538	II	4291.5	-0.0017	
W. Moschner	2457290.4055	II	4393.5	-0.0016	
W. Moschner	2457615.4809	I	5373	-0.0010	
W. Moschner	2457620.4599	I	5388	-0.0002	
P. Frank	2457625.4386	I	5403	0.0003	
P. Frank	2457625.6061	II	5403.5	0.0019	
W. Moschner	2457948.5226	II	6376.5	0.0007	
W. Moschner	2457989.5089	I	6500	0.0000	
W. Moschner	2457989.6686	II	6500.5	-0.0062	
W. Moschner	2458023.3597	I	6602	-0.0008	
W. Moschner	2458031.3266	I	6626	0.0010	
W. Moschner	2458031.4917	II	6626.5	0.0002	
W. Moschner	2458043.4395	II	6662.5	0.0004	
W. Moschner	2458072.3123	II	6749.5	-0.0003	
W. Moschner	2458331.5099	II	7530.5	0.0003	
W. Moschner	2458395.3974	I	7723	0.0012	
P. Frank	2458406.3496	I	7756	0.0014	
P. Frank	2458406.5147	II	7756.5	0.0006	
P. Frank	2458407.3459	I	7759	0.0021	
P. Frank	2458407.5090	II	7759.5	-0.0007	

Remarks: The variability was discovered by Peter Frank in 2011.
ASAS-SN [5] lists for ASASSN-V J201810.49 + 591013.2 since summer 2018
a period of 0.3319 d. With this period no useful predictions over several years are possible.
With our 34 minima between 2011 and 2018 we could improve the period considerably.
Recently the ASAS-SN team published a rather similar period 0.331876 d on their homepage.

Fr143 Cyg

= UCAC3 298-138673 = UCAC4 744-062087

= Gaia DR2 2188544329922709120

Right ascension: 20h18m38.7334s (2000)

Declination: +58° 45' 53.088"

UCAC4 Catalog:

Vmag: 14.416 Bmag: 15.336 Bmag-Vmag = 0.920

Comparison star = GSC 03949-00338

Check Star = GSC 03949-00650

Amplitude: Min I: 0.27 mag (instr.) Min II: 0.21 mag (instr.)

Type: EW type eclipsing binary

Min I = HJD 2457989.5656 + 0.2719613 * E
+ -0.0008 + -0.0000015

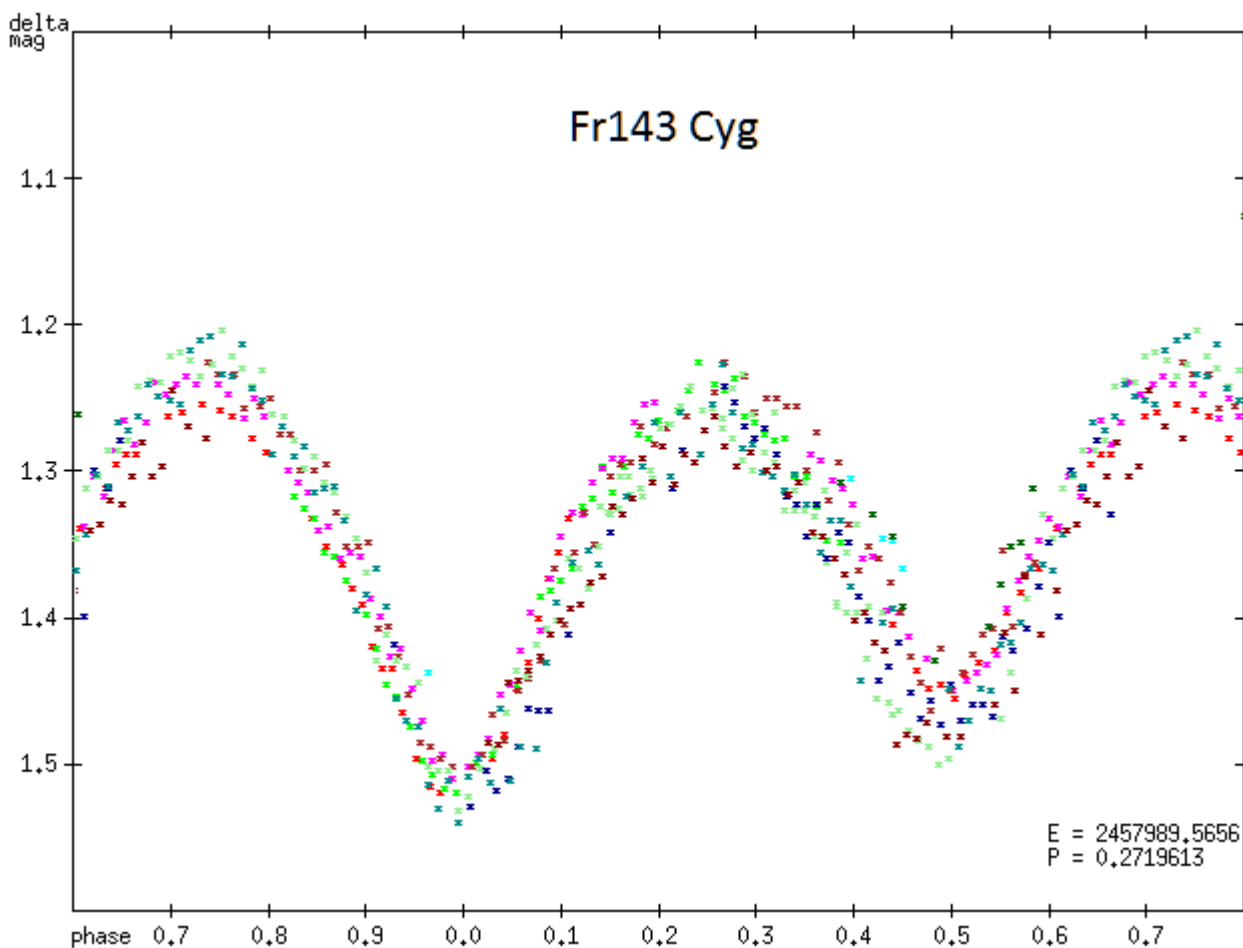


Fig 4: Phased lightcurve of Fr143 Cyg = UCAC3 298-138673 using the ephemeris given above. A FLI Proline 16803+V-filter (2015-2018) was used. Presented elements were calculated by taking into account the minima after JD 2457000 (see tables below) with the method of least squares.

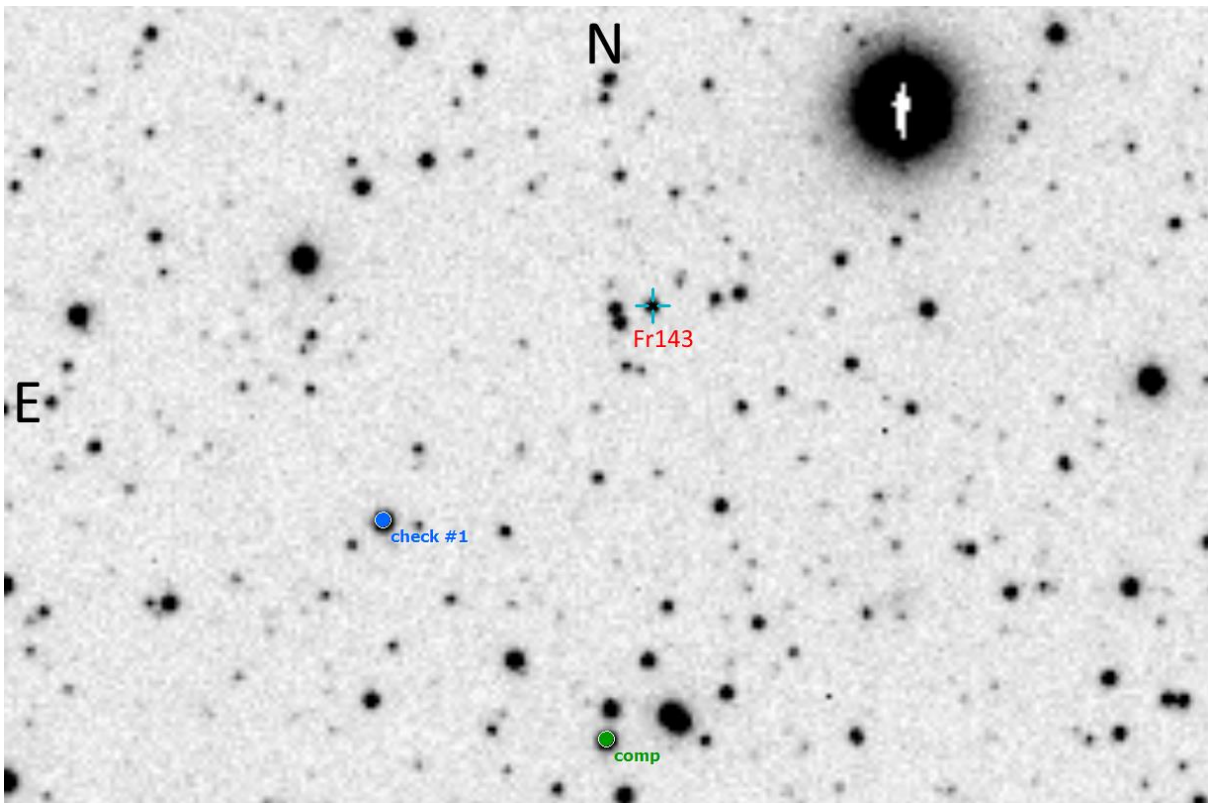


Fig 5: Fr143 Cyg = UCAC3 298-138673 in the field of V1193 Cyg; image size: 15'x10'; (comp) is the comparison star and (check#1) is the check star.

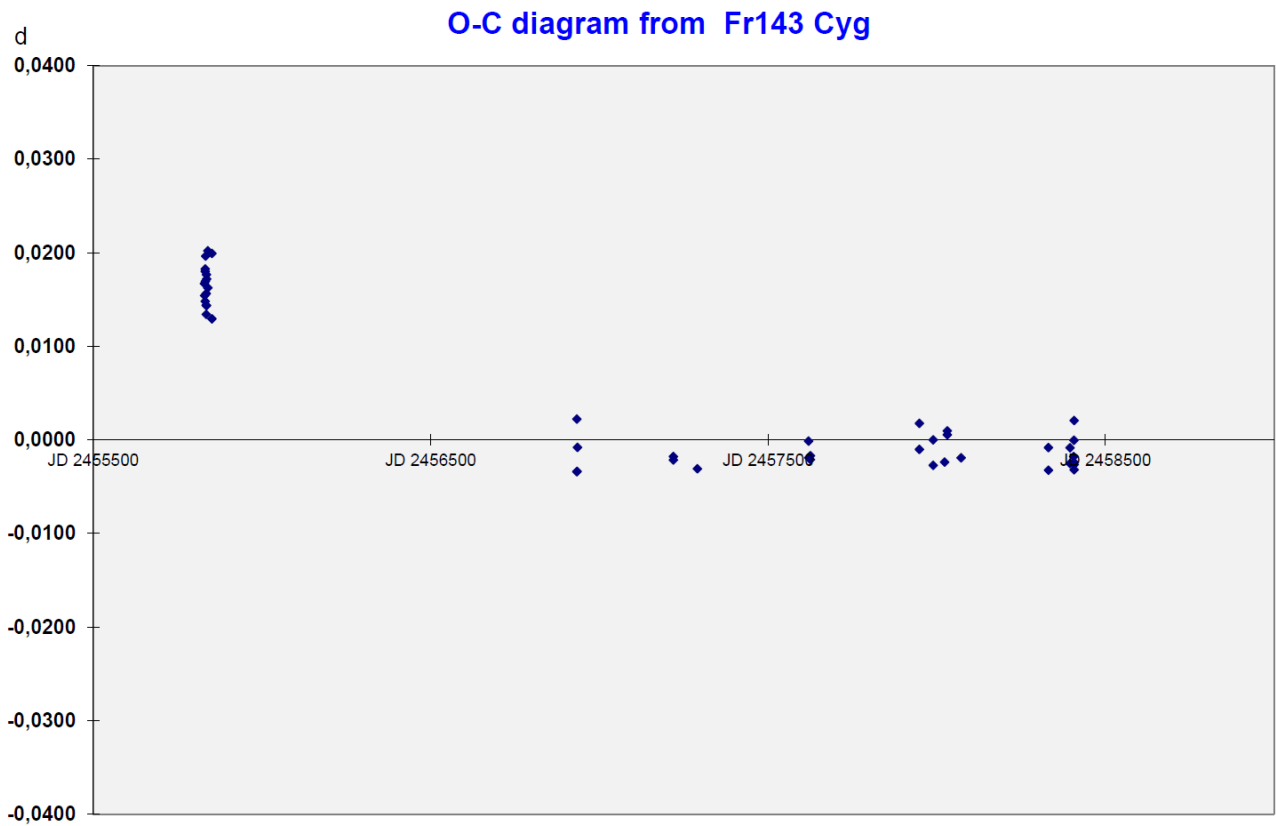


Fig 6: O-C-diagram from Fr143 Cyg = UCAC3 298-138673

Table 2: Fr143 Cyg = UCAC3 298-138673

Observer	HJD-Date	Type	Epoch	O-C (d)	Remarks
	Maximum				
P. Frank	2455835.3778	I	-7921	0.0177	
P. Frank	2455829.3937	I	-7943	0.0167	
P. Frank	2455829.5284	II	-7942.5	0.0154	
P. Frank	2455831.2990	I	-7936	0.0183	
P. Frank	2455831.4315	II	-7935.5	0.0148	
P. Frank	2455831.5707	I	-7935	0.0180	
P. Frank	2455832.3855	I	-7932	0.0169	
P. Frank	2455832.5242	II	-7931.5	0.0197	
P. Frank	2455834.2867	I	-7925	0.0144	
P. Frank	2455834.4217	II	-7924.5	0.0134	
P. Frank	2455834.5599	I	-7924	0.0156	
P. Frank	2455835.3745	I	-7921	0.0144	
P. Frank	2455835.5133	II	-7920.5	0.0172	
P. Frank	2455839.3238	II	-7906.5	0.0202	
P. Frank	2455839.4558	I	-7906	0.0162	
P. Frank	2455851.2898	II	-7862.5	0.0199	
P. Frank	2455851.4188	I	-7862	0.0129	
P. Frank	2456933.2645	I	-3884	-0.0034	
P. Frank	2456933.4061	II	-3883.5	0.0022	
P. Frank	2456933.5365	I	-3883	-0.0034	
P. Frank	2456935.3068	II	-3876.5	-0.0008	
W. Moschner	2457219.5054	II	-2831.5	-0.0018	
W. Moschner	2457219.6410	I	-2831	-0.0022	
W. Moschner	2457290.3500	I	-2571	-0.0031	
W. Moschner	2457620.3780	II	-1357.5	-0.0001	
W. Moschner	2457620.5122	I	-1357	-0.0019	
P. Frank	2457625.4073	I	-1339	-0.0021	
P. Frank	2457625.5437	II	-1338.5	-0.0017	
W. Moschner	2457948.5012	I	-151	0.0018	
W. Moschner	2457948.6344	II	-150.5	-0.0010	
W. Moschner	2457989.4269	II	-0.5	-0.0027	
W. Moschner	2457989.5656	I	0	0.0000	
W. Moschner	2458023.4224	II	124.5	-0.0024	
W. Moschner	2458031.3122	II	153.5	0.0005	
W. Moschner	2458031.4486	I	154	0.0010	
W. Moschner	2458072.3759	II	304.5	-0.0019	
W. Moschner	2458331.4177	I	1257	-0.0033	
W. Moschner	2458331.5561	II	1257.5	-0.0008	
W. Moschner	2458395.3310	I	1492	-0.0009	
W. Moschner	2458395.4653	II	1492.5	-0.0025	
P. Frank	2458406.3445	II	1532.5	-0.0018	
P. Frank	2458406.4799	I	1533	-0.0024	
P. Frank	2458406.6182	II	1533.5	-0.0001	
P. Frank	2458407.3002	I	1536	0.0021	
P. Frank	2458407.4315	II	1536.5	-0.0027	
P. Frank	2458407.5669	I	1537	-0.0032	

Remarks: The variability was discovered by Peter Frank in 2011.

The 43 minima date from 2011 to 2018 and show that the period was not constant during this timespan. In 2014 there was obviously a period jump.

The elements are calculated for the years 2014 to 2018. Only further observations can show whether the period will remain constant in the future.

Fr144 Cyg

= UCAC3 298-139487 = UCAC4 744-062456

= Gaia DR2 2188498631471164032

Right ascension: 20h22m09.9833s (2000)

Declination: +58° 47' 49.224"

Gaia DR2 Catalog:

15.1100 mag G-band mean magnitude (Vega)

15.5393 mag Integrated BP mean magnitude (Vega)

14.5234 mag Integrated RP mean magnitude (Vega)

Comparison star = GSC 03949-00788

Check Star = UCAC3 298-139462

Amplitude: Min I: 0.94 mag (instr.) Min II: 0.17 mag (instr.)

Type: EB type eclipsing binary

Min I = HJD 2455829.4064 + 0.70726466*E
+ -0.0012 + -0.00000165

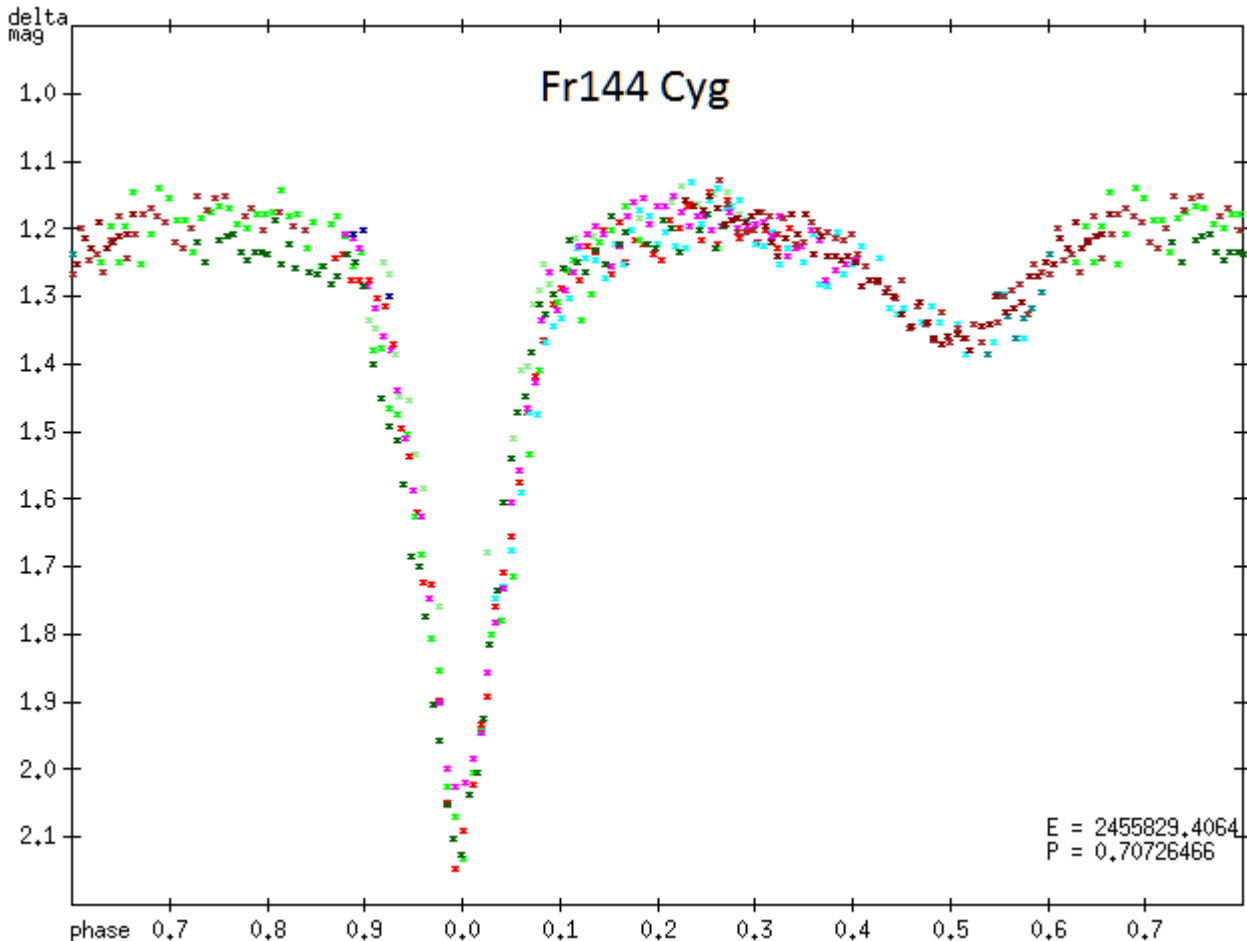


Fig 7: Phased lightcurve of Fr144 Cyg = UCAC3 298-139487 using the ephemeris given above. A SIGMA 1603 CCD-Camera and IR & UV cut-off filter was used. Presented elements were calculated by taking into account all minima (see tables below) with the method of least squares.

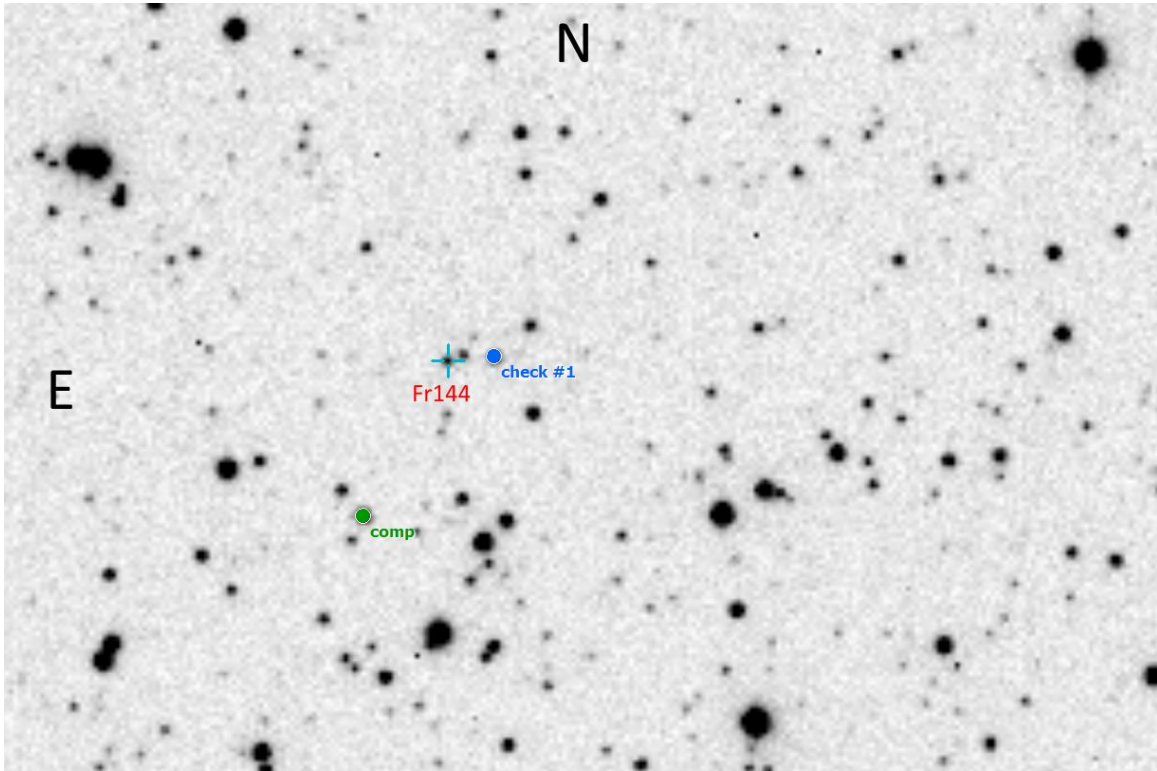


Fig 8: Fr144 Cyg = UCAC3 298-139487 in the field of V1193 Cyg; image size: 15'x10'; (comp) is the comparison star and (check#1) is the check star.

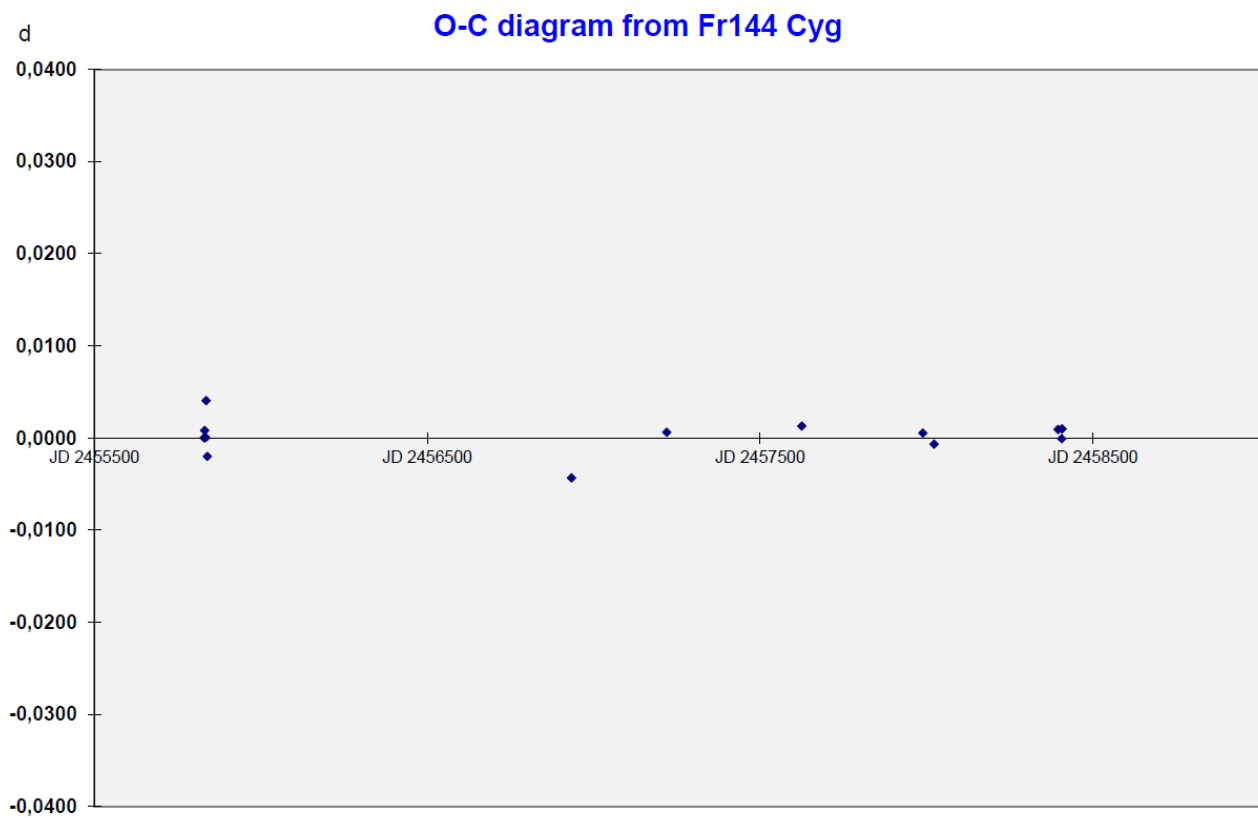


Fig 9: O-C-diagram from Fr144 Cyg = UCAC3 298-139487

Table 3: Fr144 Cyg = UCAC3 298-139487

Observer	HJD-Date Minimum	Type	Epoch	O-C (d)	Remarks
P. Frank	2455829.4064	I	0	0.0000	
P. Frank	2455831.5290	I	3	0.0008	
P. Frank	2455834.3573	I	7	0.0000	
P. Frank	2455835.4222	II	8.5	0.0041	
P. Frank	2455839.3061	I	14	-0.0020	
P. Frank	2456933.4422	I	1561	-0.0043	
W. Moschner	2457219.5357	II	1965.5	0.0006	
P. Frank	2457625.5063	II	2539.5	0.0013	
W. Moschner	2457989.3932	I	3054	0.0005	
W. Moschner	2458023.3407	I	3102	-0.0007	
W. Moschner	2458395.3635	I	3628	0.0009	
P. Frank	2458406.3251	II	3643.5	-0.0001	
P. Frank	2458407.3871	I	3645	0.0010	

Remarks: none

Fr146 Cyg

= GSC 03949-00122 = UCAC4 742-065437

= Gaia DR2 2188114111639881984

Right ascension: 20h20m00.3051s (2000)

Declination: +58° 23' 45.1980"

UCAC4 Catalog:

Vmag: 12.810 Bmag: 13.453 Bmag-Vmag = 0.643

Comparison star = GSC 03949 00278

Check Star = GSC 03949 01188

Amplitude: Min I: 0.43 mag (instr.) Min II: 0.38 mag (instr.)

Type: EW type eclipsing binary

Min I = HJD 2455829.4027 + 0.9458078*E
 +-0.0014 +-0.0000023

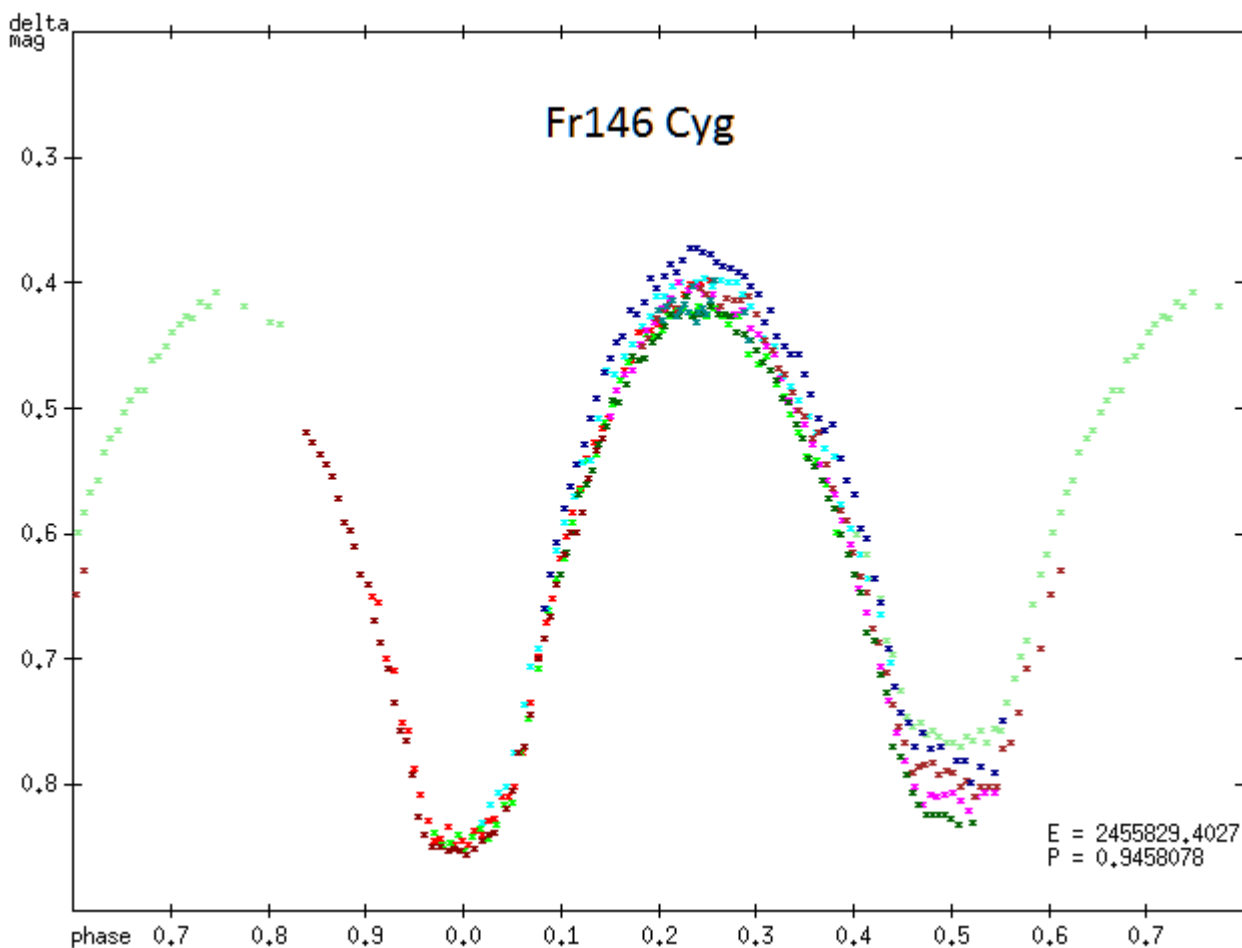


Fig 10: Phased lightcurve of Fr146 Cyg = GSC 03949-00122 using the ephemeris given above. A SIGMA 1603 CCD-Camera and IR & UV cut-off filter was used. Presented elements were calculated by taking into account all minima (see tables below) with the method of least squares.

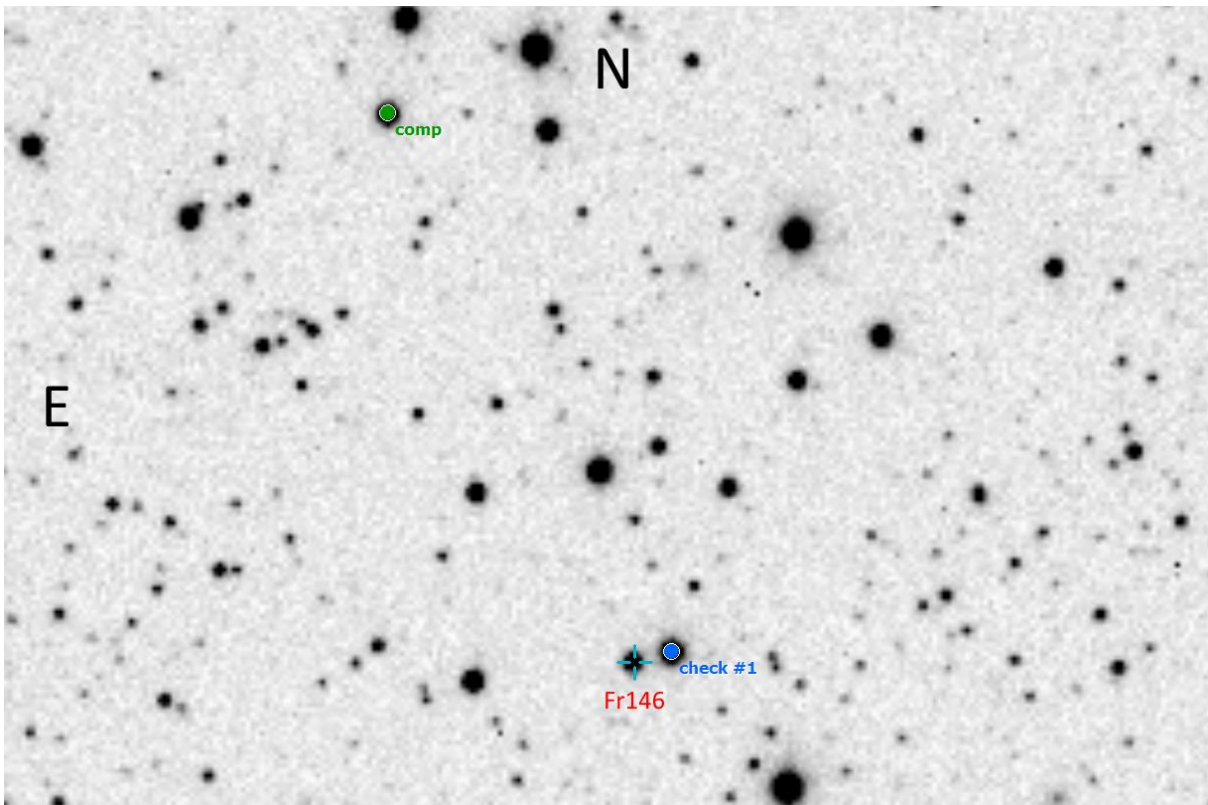


Fig 11: Fr146 Cyg = GSC 03949-00122 in the field of V1193 Cyg; image size: 15'x10'; (comp) is the comparison star and (check1) is the check star.

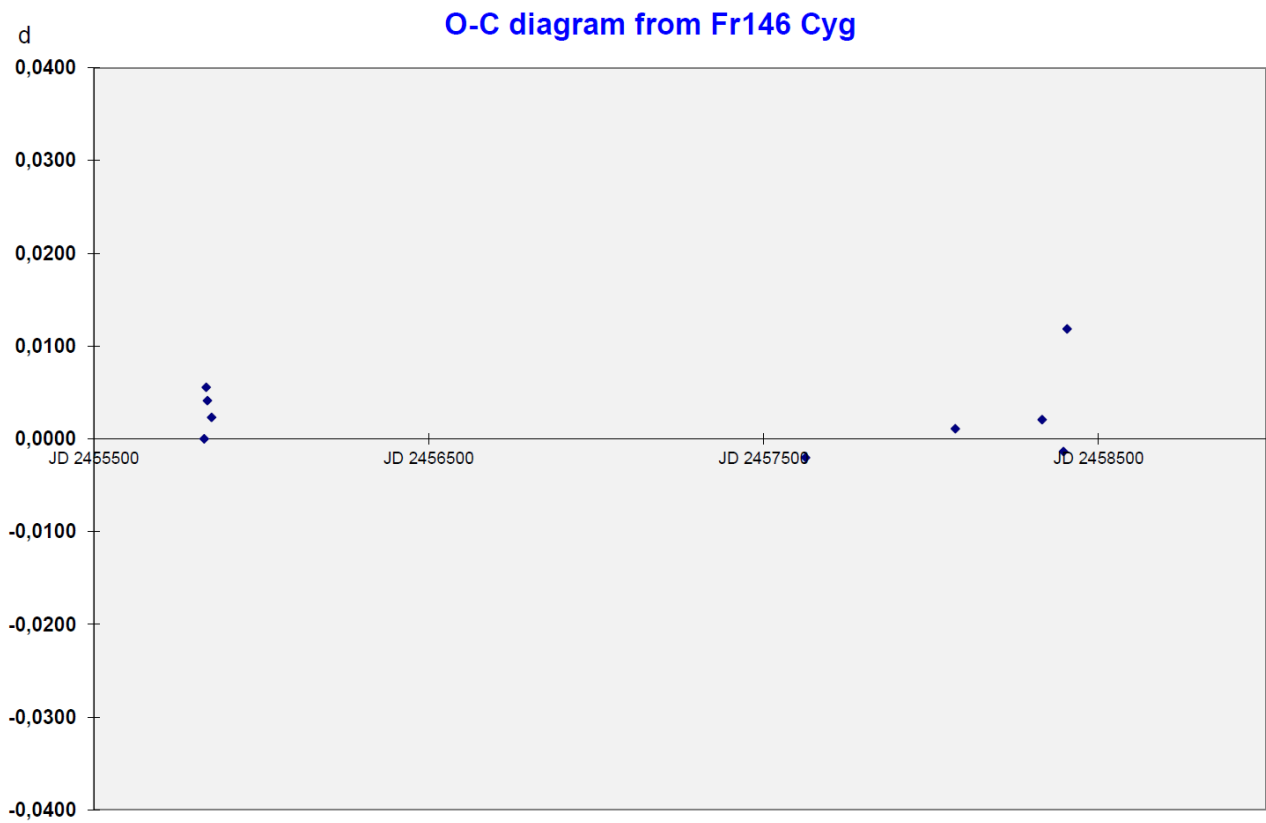


Fig 12: O-C-diagram from Fr146 Cyg = GSC 03949-00122

Table 4: Fr146 Cyg = GSC 03949-00122

Observer	HJD-Date Minimum	Type	Epoch	O-C (d)	Remarks
P. Frank	2455829.4027	I	0	0.0000	
P. Frank	2455835.5560	II	6.5	0.0055	
P. Frank	2455839.3378	II	10.5	0.0041	
P. Frank	2455851.6315	II	23.5	0.0023	
P. Frank	2457625.4897	I	1899	-0.0020	
W. Moschner	2458072.3870	II	2371.5	0.0011	
W. Moschner	2458331.5393	II	2645.5	0.0021	
W. Moschner	2458395.3779	I	2713	-0.0014	
P. Frank	2458406.2679	II	2724.5	0.0118	uncertain

Remarks: none

Fr147 Cyg

= UCAC3 298-140187 = UCAC4 744-062753

= Gaia DR2 2188323877843023488

Right ascension: 20h25m38.0462s (2000)

Declination: +58° 45' 37.320"

APASS DR9 Catalog:

Vmag: 14.385 Bmag: 14.796 Bmag-Vmag = 0.411

Comparison star = GSC 03949-00068

Check Star = GSC 03949-00726

Amplitude: Min I: 0.28 mag (instr.) Min II: 0.11 mag (instr.)

Type: EB type eclipsing binary

Min I = HJD 2457620.4936 + 0.4406117*E
+ -0.0011 + -0.0000023

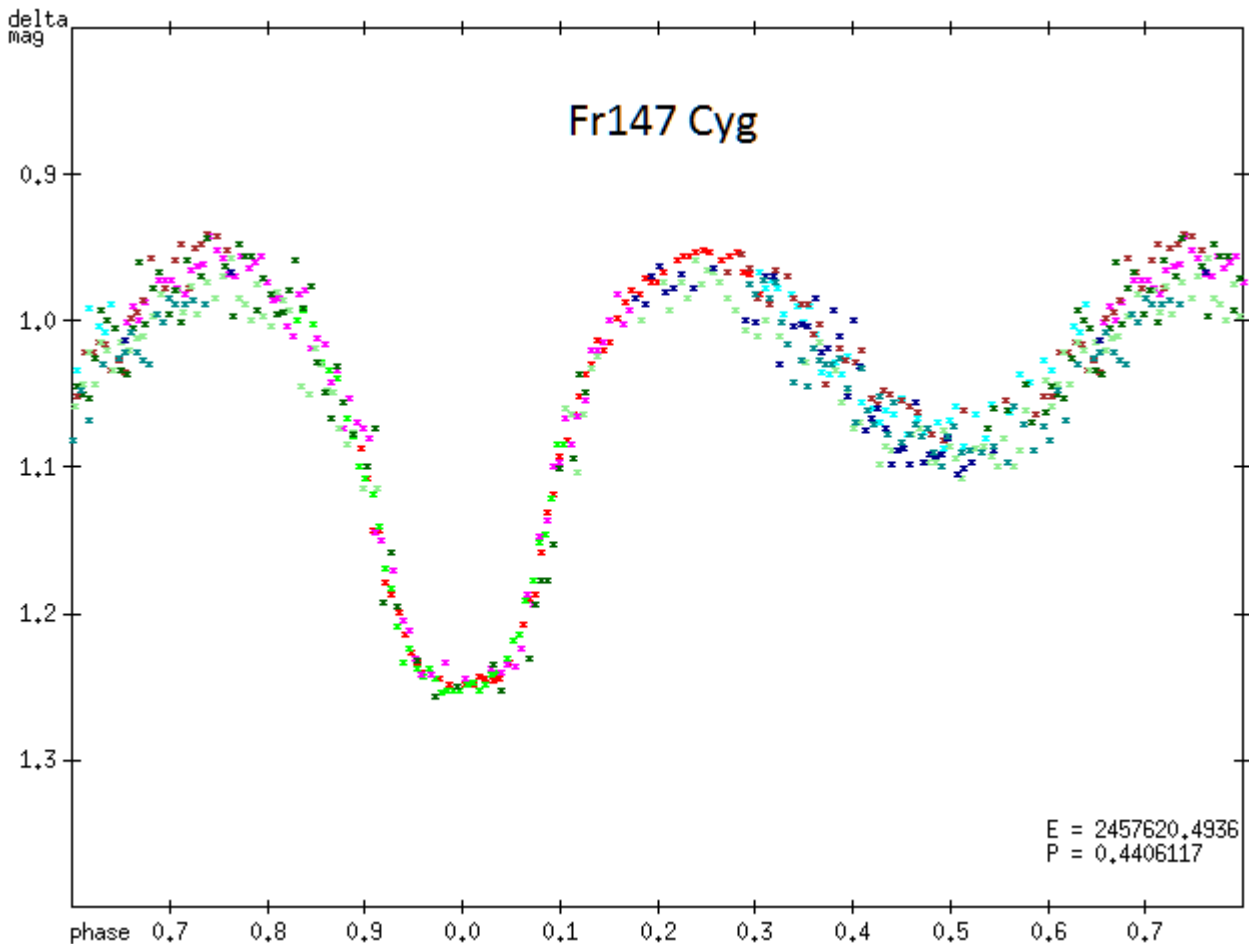


Fig 13: Phased lightcurve of Fr147 Cyg = UCAC3 298-140187 using the ephemeris given above. A FLI Proline 16803+V-filter (2016-2018) was used. Presented elements were calculated by taking into account all minima (see tables below) with the method of least squares.

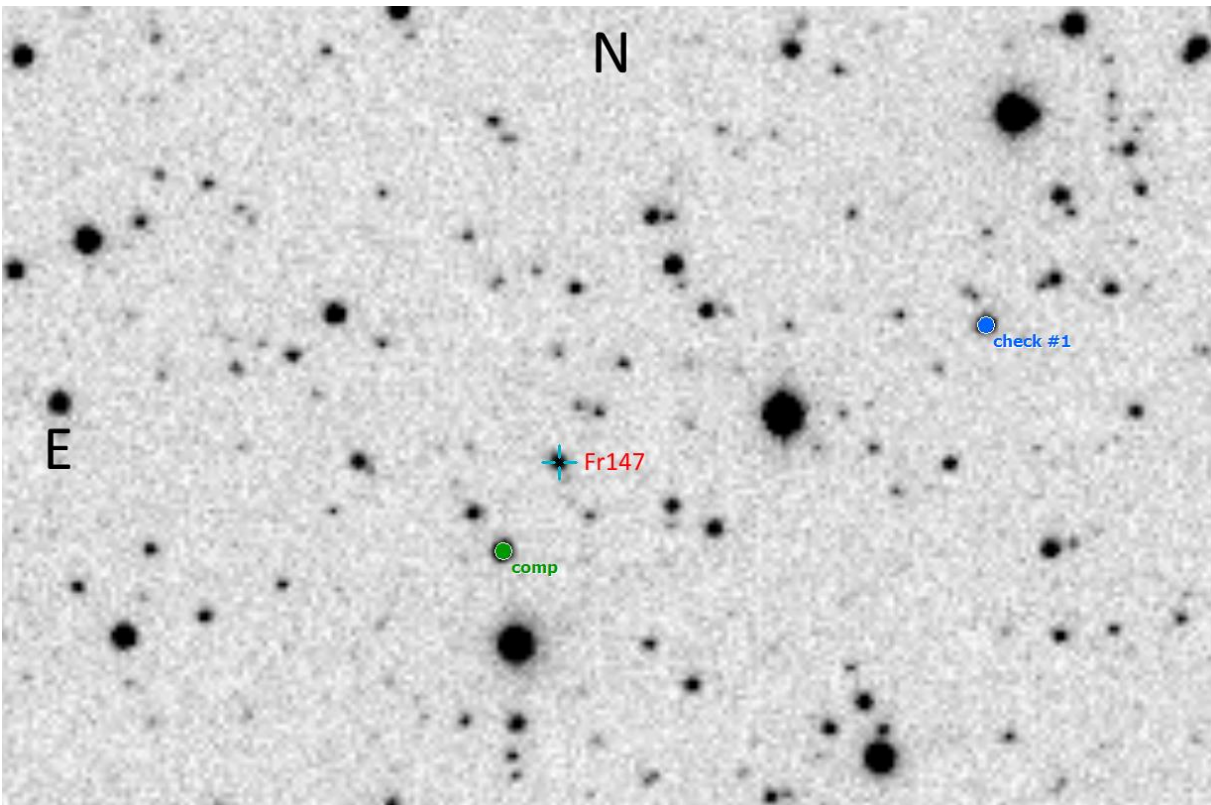


Fig 14: Fr147 Cyg = UCAC3 298-140187 in the field of V1193 Cyg; image size: 15'x10'; (comp) is the comparison star and (check#1) is the check star.

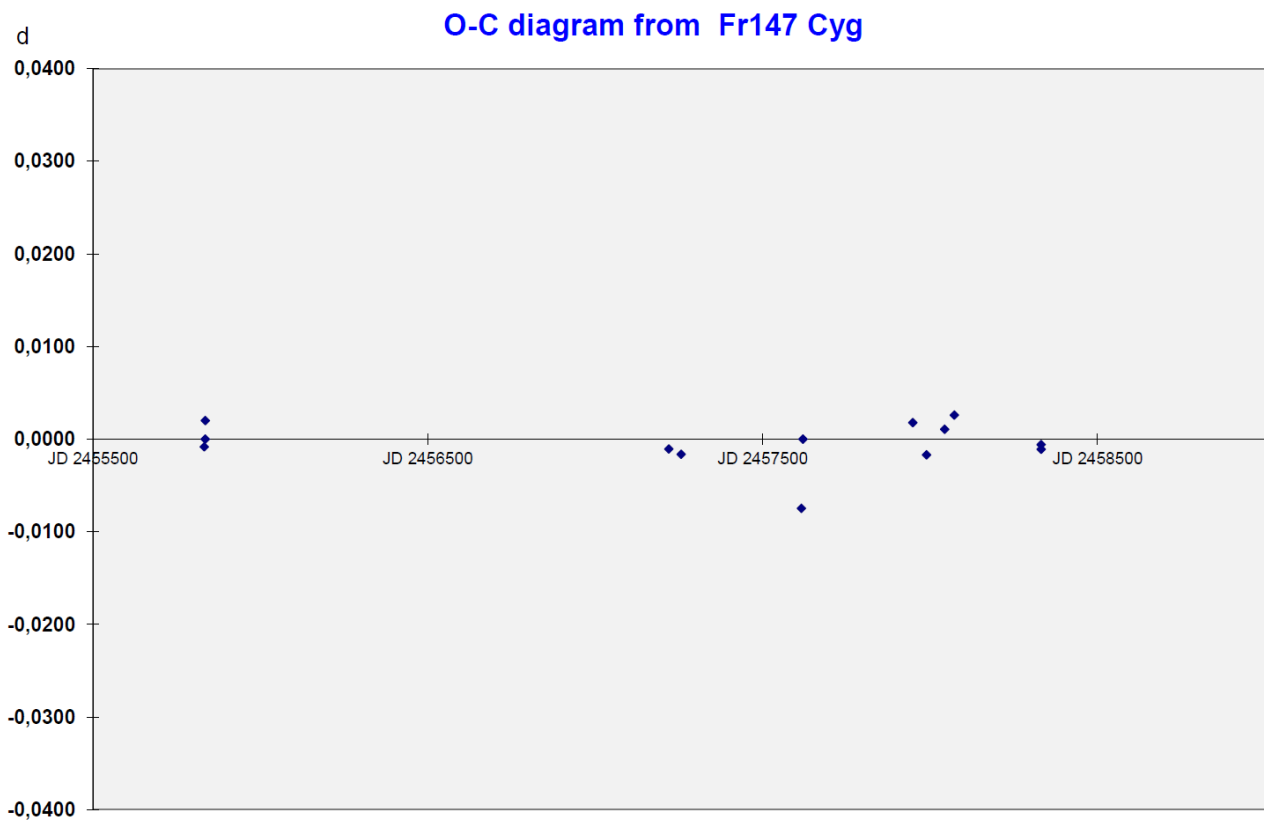


Fig 15: O-C-diagram from Fr147 Cyg = UCAC3 298-140187

Table 5: Minima of Fr147 Cyg = UCAC3 298-140187

Observer	HJD-Date Minimum	Type	Epoch	O-C (d)	Remarks
P. Frank	2455832.4905	I	-4058	-0.0008	
P. Frank	2455835.3573	II	-4051.5	0.0020	
P. Frank	2455835.5756	I	-4051	0.0000	
W. Moschner	2457219.5359	I	-910	-0.0011	
W. Moschner	2457256.5467	I	-826	-0.0016	
W. Moschner	2457615.4191	II	-11.5	-0.0075	
W. Moschner	2457620.4936	I	0	0.0000	
W. Moschner	2457948.5308	II	744.5	0.0018	
W. Moschner	2457989.5042	II	837.5	-0.0017	
W. Moschner	2458043.4819	I	960	0.0011	
W. Moschner	2458072.3435	II	1025.5	0.0026	
W. Moschner	2458331.4195	II	1613.5	-0.0011	
W. Moschner	2458331.6403	I	1614	-0.0006	

Remarks: none

Fr148 Cyg

= UCAC3 298-138375 = UCAC4 744-061946

= Gaia DR2 2188182624958136960

Right ascension: 20h17m09.5579s (2000)

Declination: +58° 41' 42.286"

Gaia DR2 Catalog:

14.0994 mag (i) G-band mean magnitude (Vega)

14.5149 mag (i) Integrated BP mean magnitude (Vega)

13.5117 mag (i) Integrated RP mean magnitude (Vega)

Comparison star = GSC 03949-01350

Check Star = GSC 03949-00490

Amplitude: Min I: 0.38 mag (instr.) Min II: 0.17 mag (instr.)

Type: EA type eclipsing binary

Min I = HJD 2457290.3581 + 1.6234230 * E
+ -0.0015 + -0.0000033

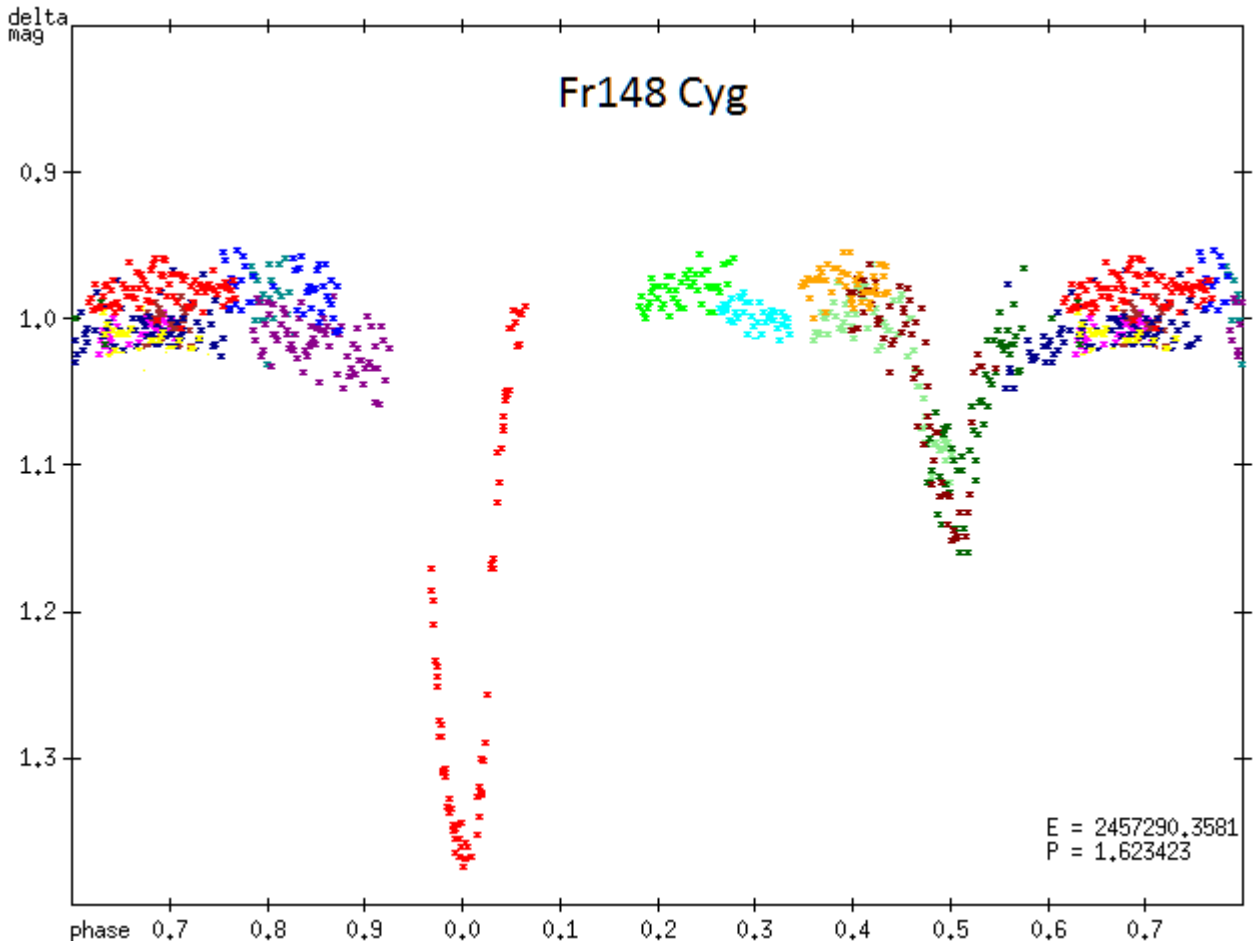


Fig 16: Phased lightcurve of Fr148 Cyg = UCAC3 298-138375 using the ephemeris given above. A FLI Proline 16803+V-filter (2016-2018) was used. Presented elements were calculated by taking into account all minima (see tables below) with the method of least squares.

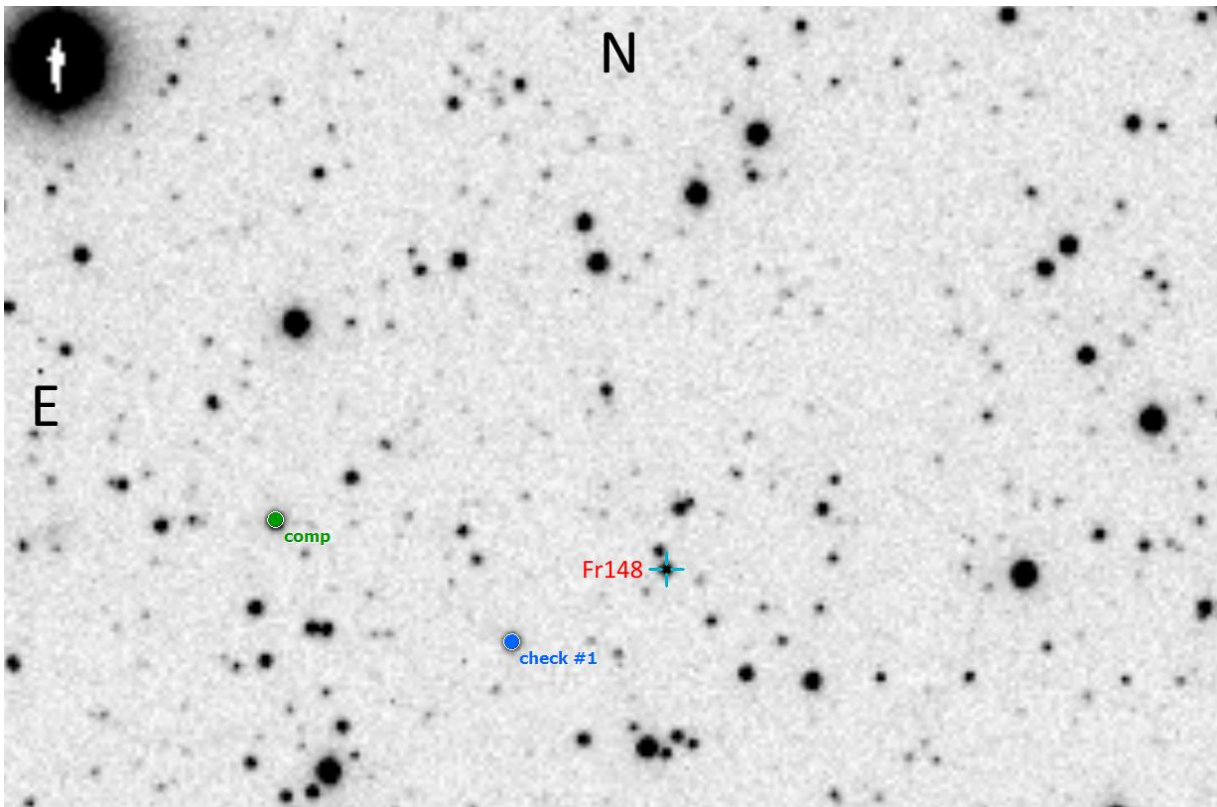


Fig 17: Fr148 Cyg = UCAC3 298-138375 in the field of V1193 Cyg; image size: 15'x10'; (comp) is the comparison star and (check#1) is the check star.

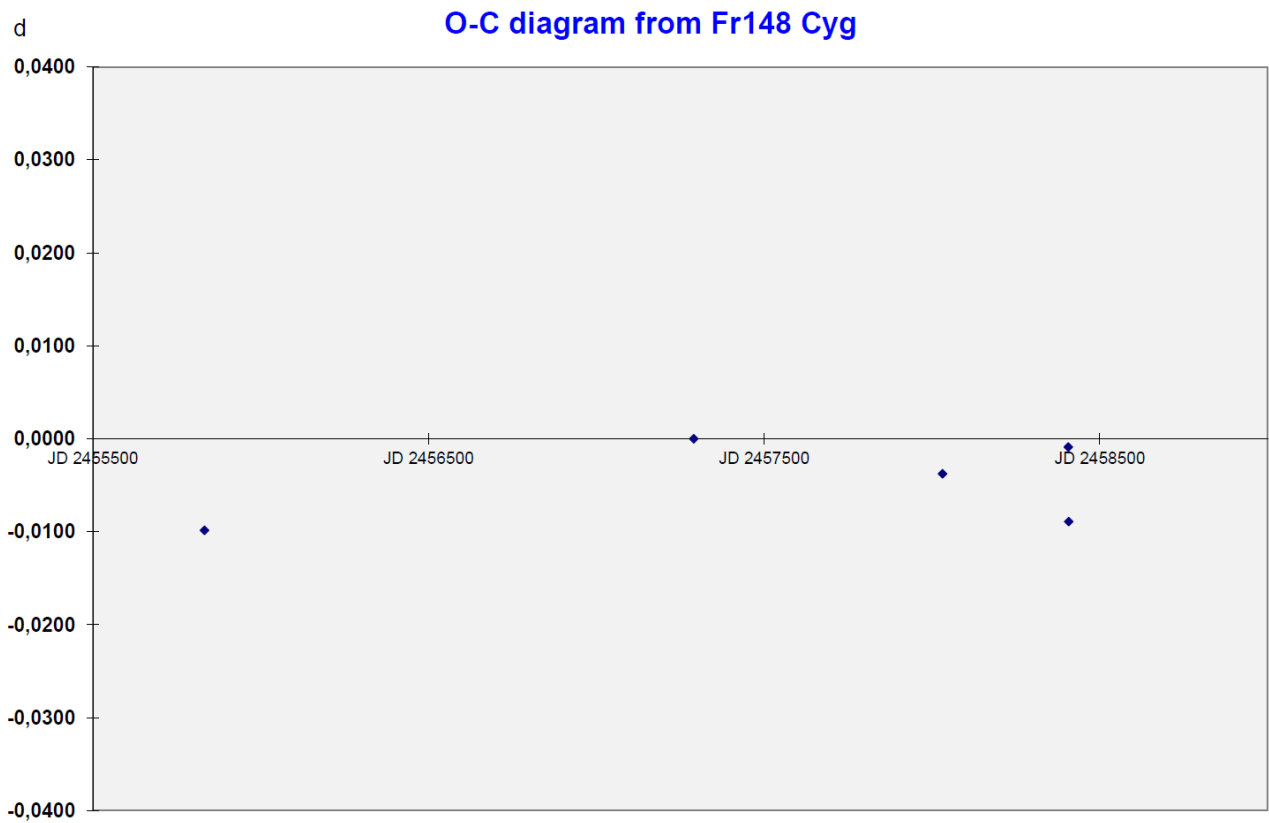


Fig 18: O-C-diagram from Fr148 Cyg = UCAC3 298-138375

Table 6: Minima of Fr148 Cyg = UCAC3 298-138375

Observer	HJD-Date Minimum	Type	Epoch	O-C (d)	Remarks
P. Frank	2455832.5135	I	-898	-0.0098	
W. Moschner	2457290.3581	I	0	0.0000	
Moschner/Frank	2458031.4474	II	456.5	-0.0038	
P. Frank	2458406.4612	II	687.5	-0.0009	
P. Frank	2458407.2649	I	688	-0.0089	

Remarks: none

Fr149 Cyg

= UCAC3 298-140290 = UCAC4 744-062788

= Gaia DR2 2188322091136633984

Right ascension: 20h26m04.5326s (2000)

Declination: +58° 44' 09.158"

APASS DR9 Catalog:

Vmag: 15.456 Bmag: 16.251 Bmag-Vmag = 0.795

Comparison star = UCAC3 298-140220

Check Star = UCAC3 298-140257

Amplitude: Min I: 0.53 mag (instr.) Min II: 0.42 mag (instr.)

Type: EW type eclipsing binary

Min I = HJD 2455832.3686 + 0.3494607*E
+ -0.0008 + -0.0000022

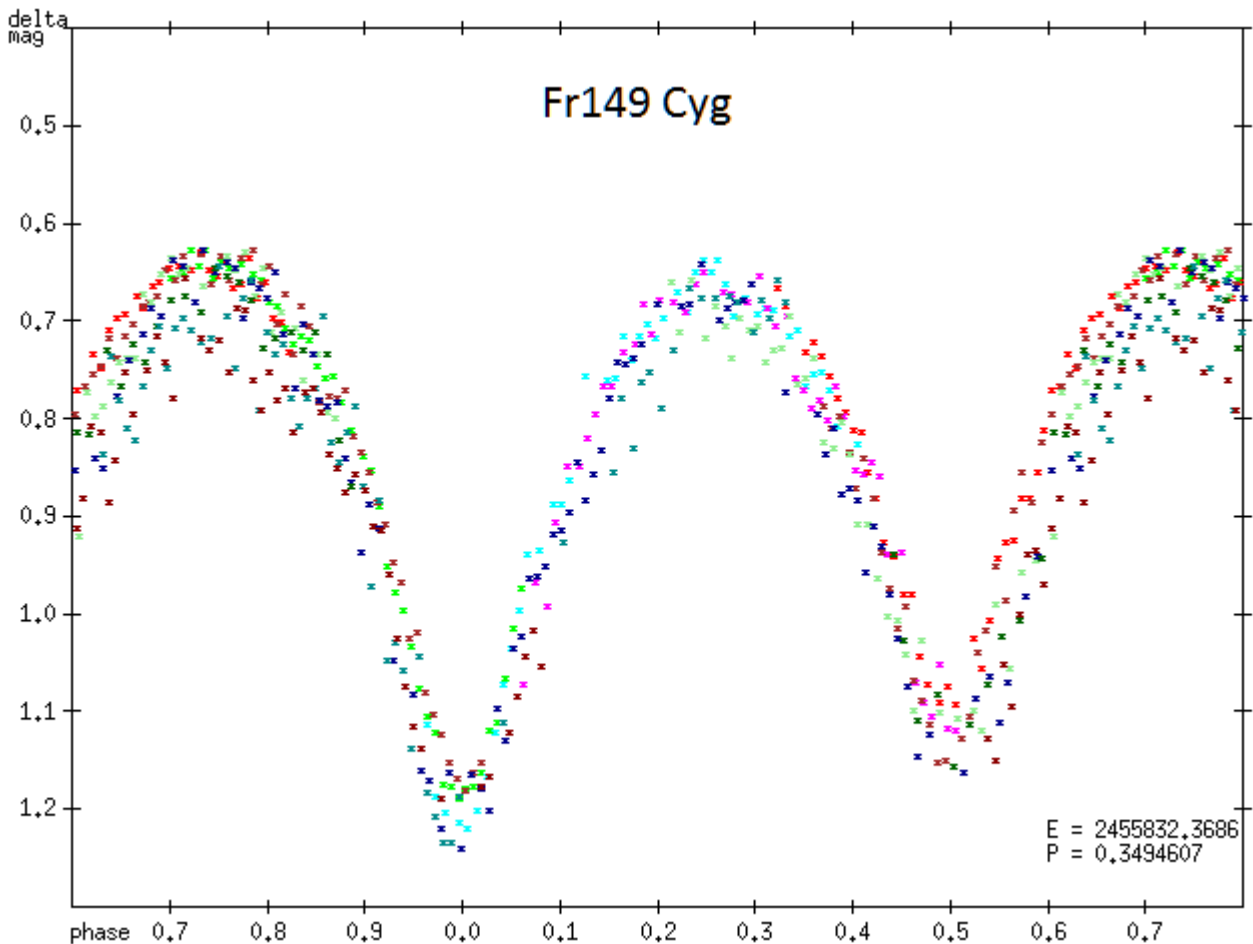


Fig 19: Phased lightcurve of Fr149 Cyg = UCAC3 298-140290 using the ephemeris given above. A FLI Proline 16803+V-filter (2016-2018) was used. Presented elements were calculated by taking into account all minima (see tables below) with the method of least squares.

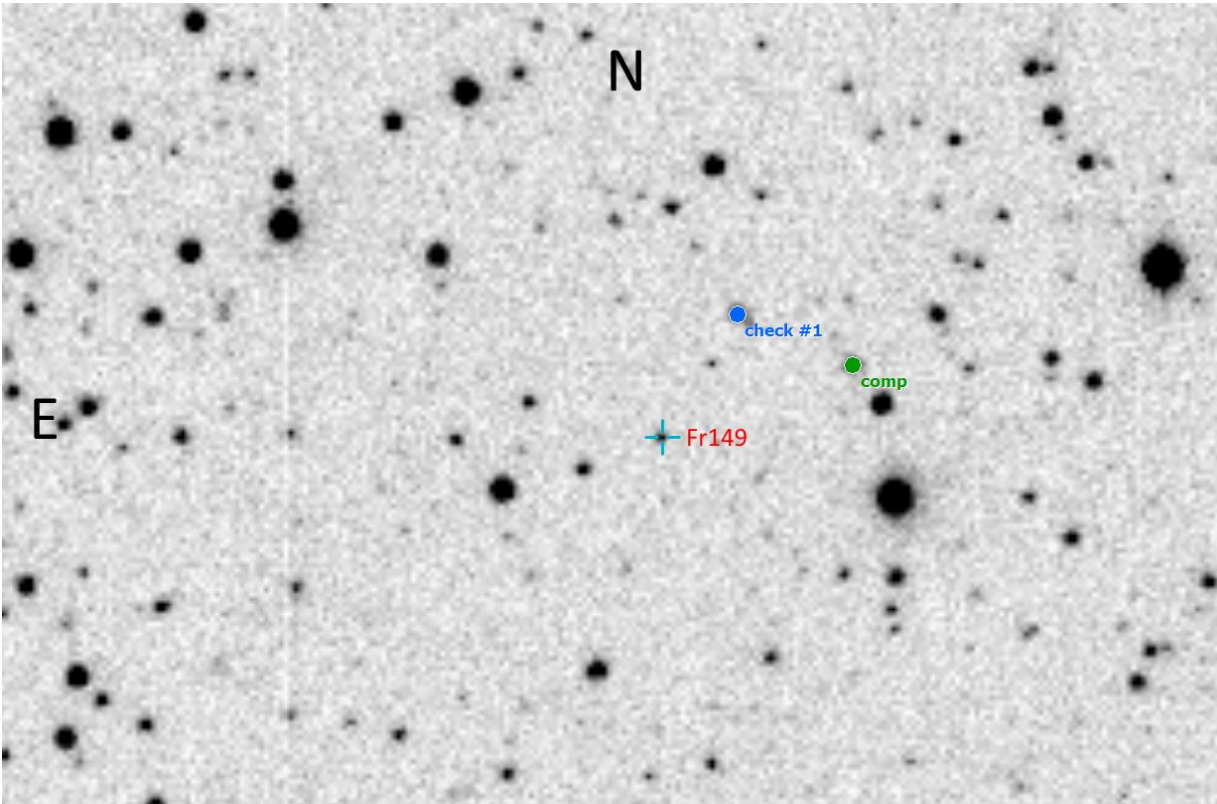


Fig 20: Fr149 Cyg = UCAC3 298-140290 in the field of V1193 Cyg; image size: 15'x10'; (comp) is the comparison star and (check#1) is the check star.

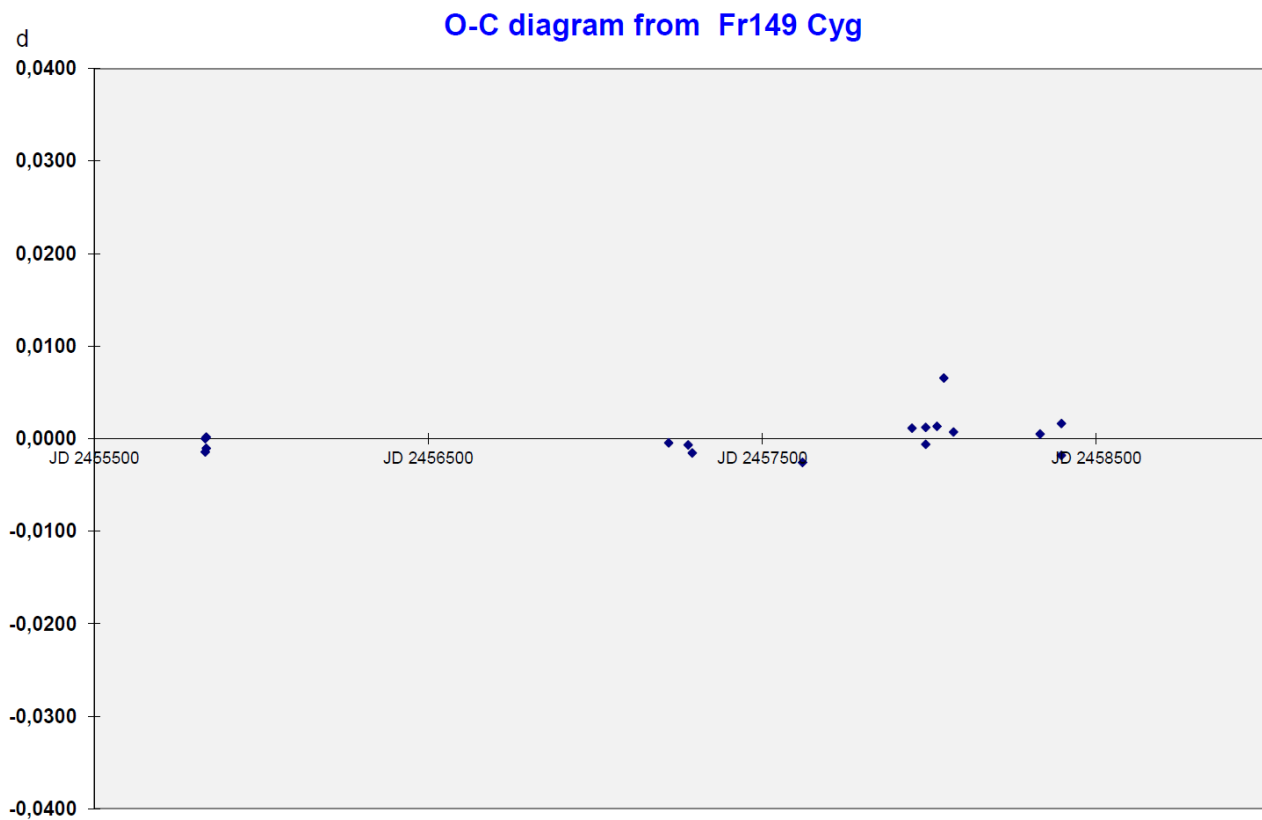


Fig 21: O-C-diagram from Fr149 Cyg = UCAC3 298-140290

Table 7: Minima of Fr149 Cyg = UCAC3 298-140290

Observer	HJD-Date Minimum	Type	Epoch	O-C (d)	Source
P. Frank	2455832.3686	I	0	0.0000	
P. Frank	2455832.5419	II	0.5	-0.0014	
P. Frank	2455835.3392	II	8.5	0.0002	
P. Frank	2455835.5127	I	9	-0.0010	
W. Moschner	2457219.5524	II	3969.5	-0.0004	
W. Moschner	2457278.4363	I	4138	-0.0007	
W. Moschner	2457290.3171	I	4172	-0.0015	
W. Moschner	2457620.3817	II	5116.5	-0.0026	
W. Moschner	2457948.5290	II	6055.5	0.0011	
W. Moschner	2457989.4160	II	6172.5	0.0012	
W. Moschner	2457989.5889	I	6173	-0.0006	
W. Moschner	2458023.3138	II	6269.5	0.0013	
W. Moschner	2458031.3513	II	6292.5	0.0012	
W. Moschner	2458043.4130	I	6327	0.0066	uncertain
W. Moschner	2458072.4124	I	6410	0.0007	
W. Moschner	2458331.5373	II	7151.5	0.0005	
W. Moschner	2458395.3150	I	7334	0.0016	
W. Moschner	2458395.4863	II	7334.5	-0.0018	

Remarks: none

Fr150 Cyg

= UCAC3 299-138834 = UCAC4 746-063980

= Gaia DR2 2188582537952604032

Right ascension: 20h22m20.2215s (2000)

Declination: +59° 10' 43.409"

APASS DR9 Catalog:

Vmag: 16.016 Bmag: 16.632 Bmag-Vmag = 0.616

Comparison star = UCAC3 299-138719

Check Star = UCAC3 299-138854

Amplitude: Min I: 0.30 mag (instr.) Min II: 0.27 mag (instr.)

Type: EW type eclipsing binary

Min I = HJD 2455839.2933 + 0.4014842*E
+/-0.0011 +/-0.0000029

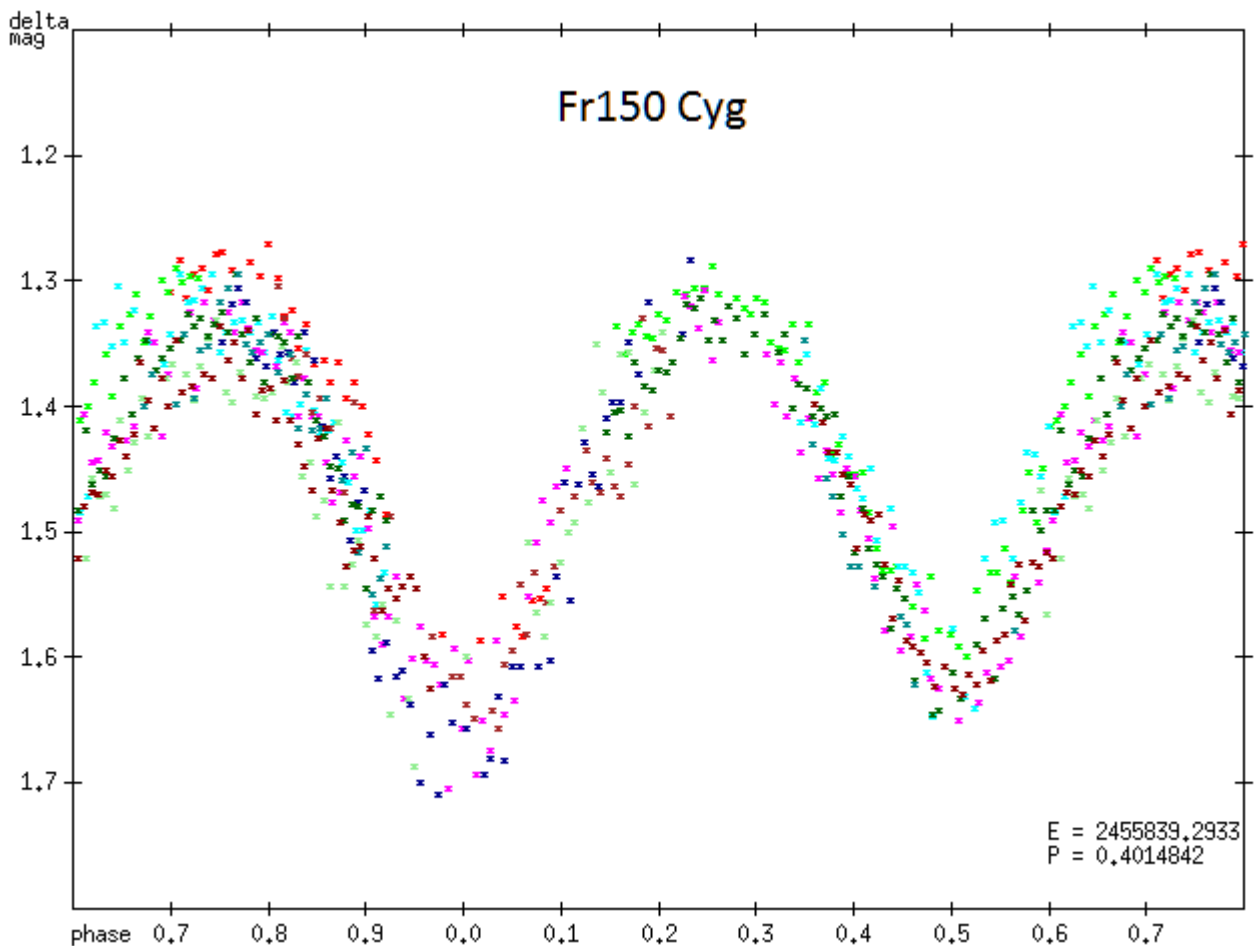


Fig 22: Phased lightcurve of Fr150 Cyg = UCAC3 299-138834 using the ephemeris given above. A FLI Proline 16803+V-filter (2016-2018) was used. Presented elements were calculated by taking into account all minima (see tables below) with the method of least squares.

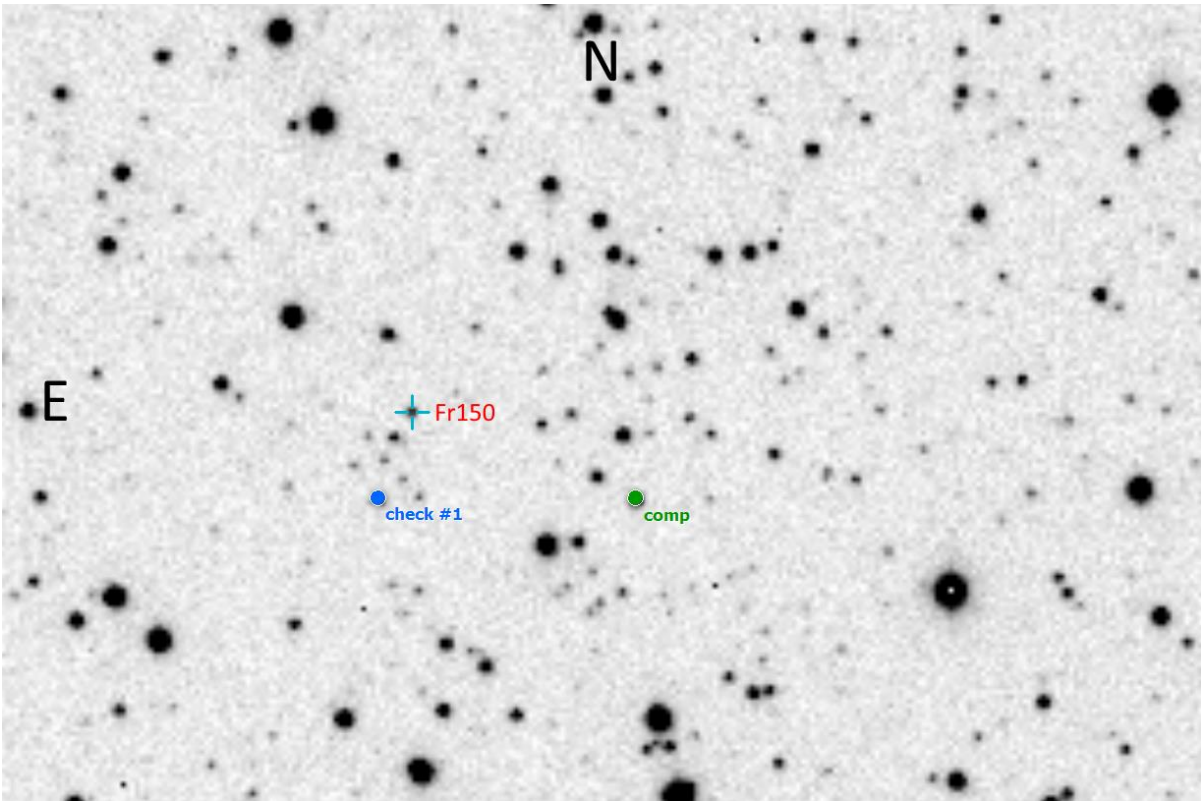


Fig 23: Fr150 Cyg = UCAC3 299-138834 in the field of V1193 Cyg; image size: 15'x10'; (comp) is the comparison star and (check#1) is the check star.

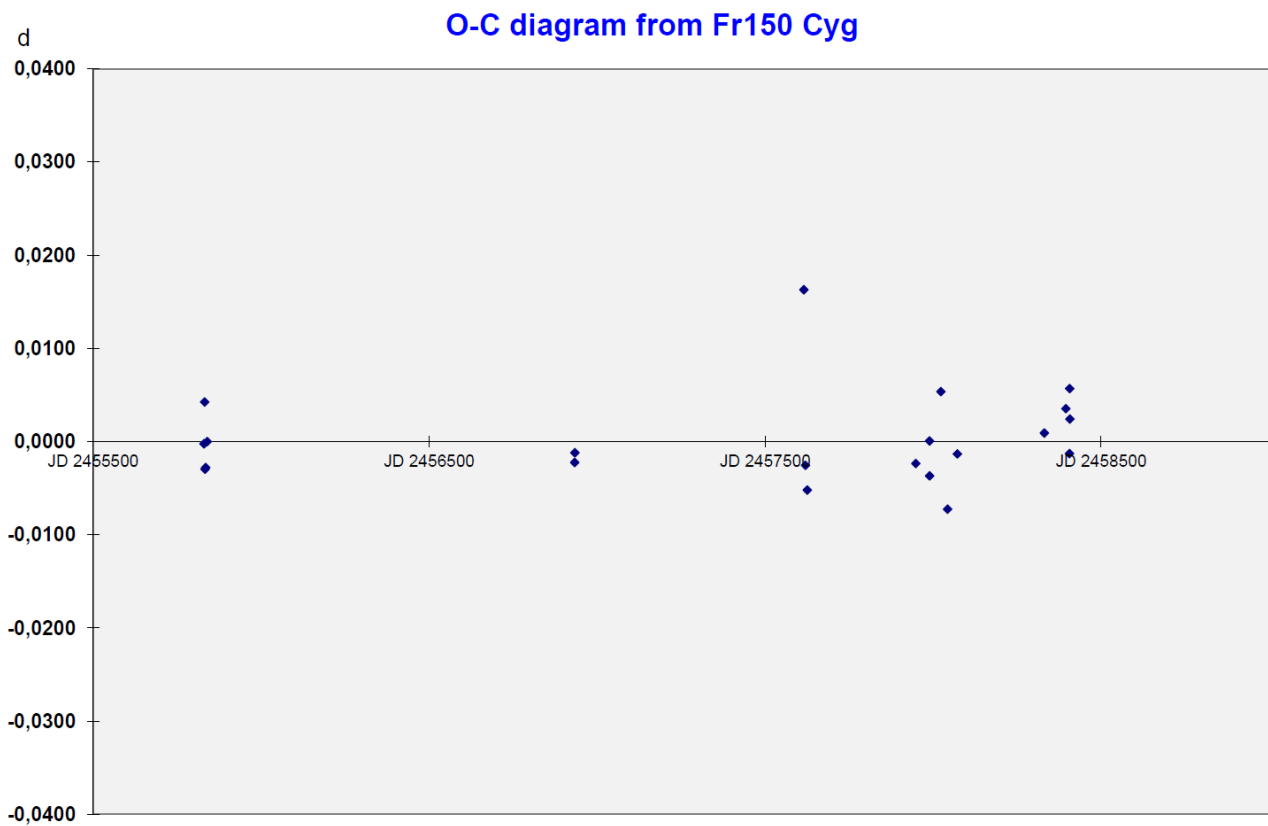


Fig 24: O-C-diagram from Fr150 Cyg = UCAC3 299-138834

Table 8: Minima of Fr150 Cyg = UCAC3 299-138834

Observer	HJD-Date	Type	Epoch	O-C (d)	Remarks
	Minimum				
P. Frank	2455829.4567	II	-24.5	-0.0002	
P. Frank	2455831.4686	II	-19.5	0.0042	
P. Frank	2455832.4651	I	-17	-0.0030	
P. Frank	2455834.4727	I	-12	-0.0028	
P. Frank	2455839.2933	I	0	0.0000	
P. Frank	2456933.3355	I	2725	-0.0022	
P. Frank	2456933.5373	II	2725.5	-0.0012	
Moschner/Frank	2457615.4757	I	4424	0.0163	uncertain
Moschner/Frank	2457620.4754	II	4436.5	-0.0026	
P. Frank	2457625.4913	I	4449	-0.0052	
Moschner/Frank	2457948.4882	II	5253.5	-0.0023	
Moschner/Frank	2457989.4420	II	5355.5	0.0001	
Moschner/Frank	2457989.6390	I	5356	-0.0037	
Moschner/Frank	2458023.3727	I	5440	0.0054	
Moschner/Frank	2458043.4343	I	5490	-0.0073	
Moschner/Frank	2458072.3471	I	5562	-0.0013	
Moschner/Frank	2458331.5074	II	6207.5	0.0009	
Moschner/Frank	2458395.3460	II	6366.5	0.0035	
P. Frank	2458406.3820	I	6394	-0.0013	
P. Frank	2458406.5897	II	6394.5	0.0057	
P. Frank	2458407.3894	II	6396.5	0.0024	

Remarks: none

Fr151 Cyg

= GSC 03949-01097 = UCAC4 747-061302

= Gaia DR2 2236610442804206208

Right ascension: 20h17m26.5126s (2000)

Declination: +59° 12' 57.118"

UCAC4 Catalog:

Vmag: 13.208 Bmag: 13.946 Bmag-Vmag = 0.738

Comparison star = GSC 03949-01117

Check Star = GSC 03949-01447

Amplitude: Min I: 0.48 mag (instr.)

Type: EA type eclipsing binary

Min I = HJD 2455834.3880 + 2.0777543*E
 +-0.0011 +-0.0000126

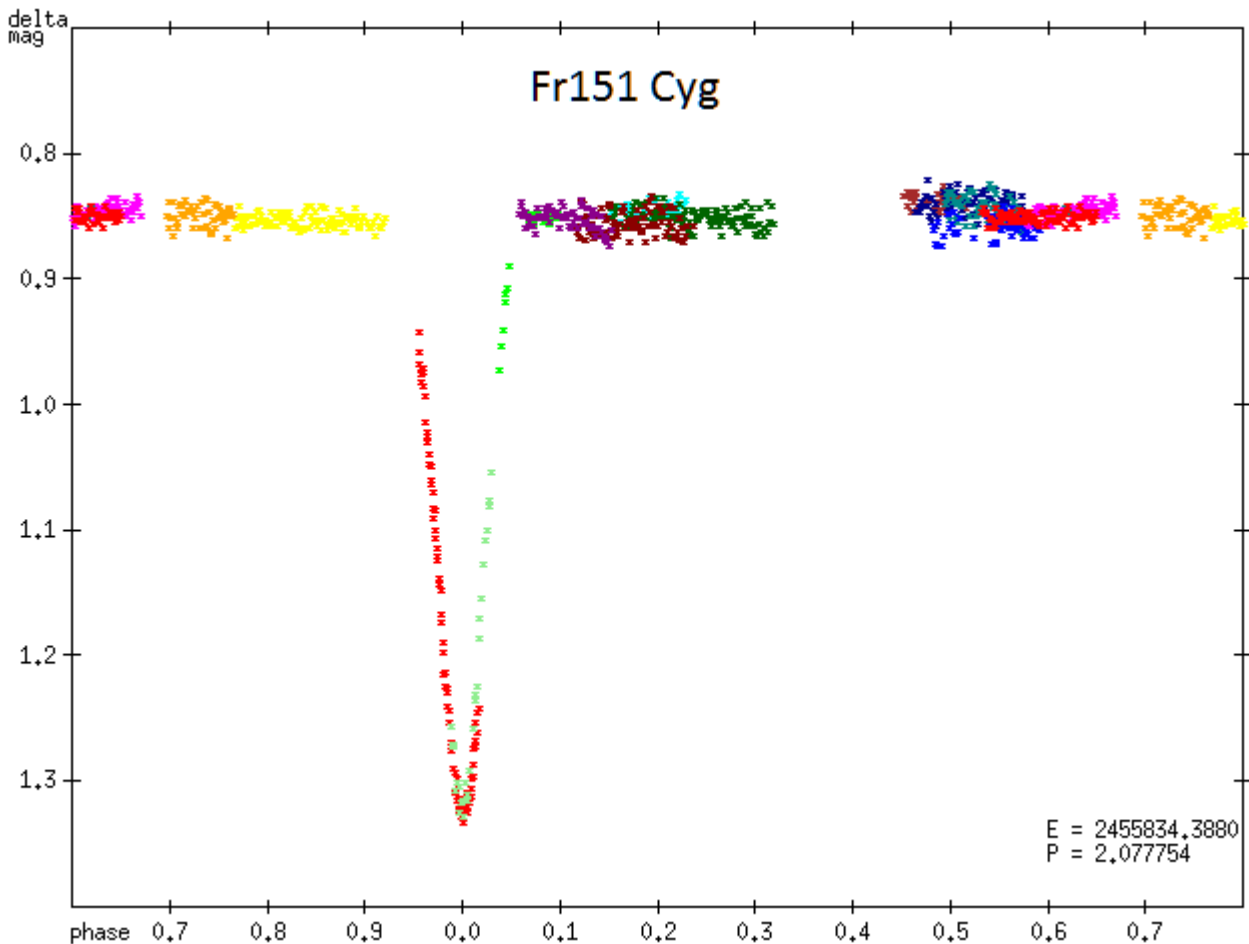


Fig 25: Phased lightcurve of Fr151 Cyg = GSC 03949-01097 using the ephemeris given above. A FLI Proline 16803+V-filter (2016-2017) was used. Presented elements were calculated by taking into account all minima (see tables below) with the method of least squares.

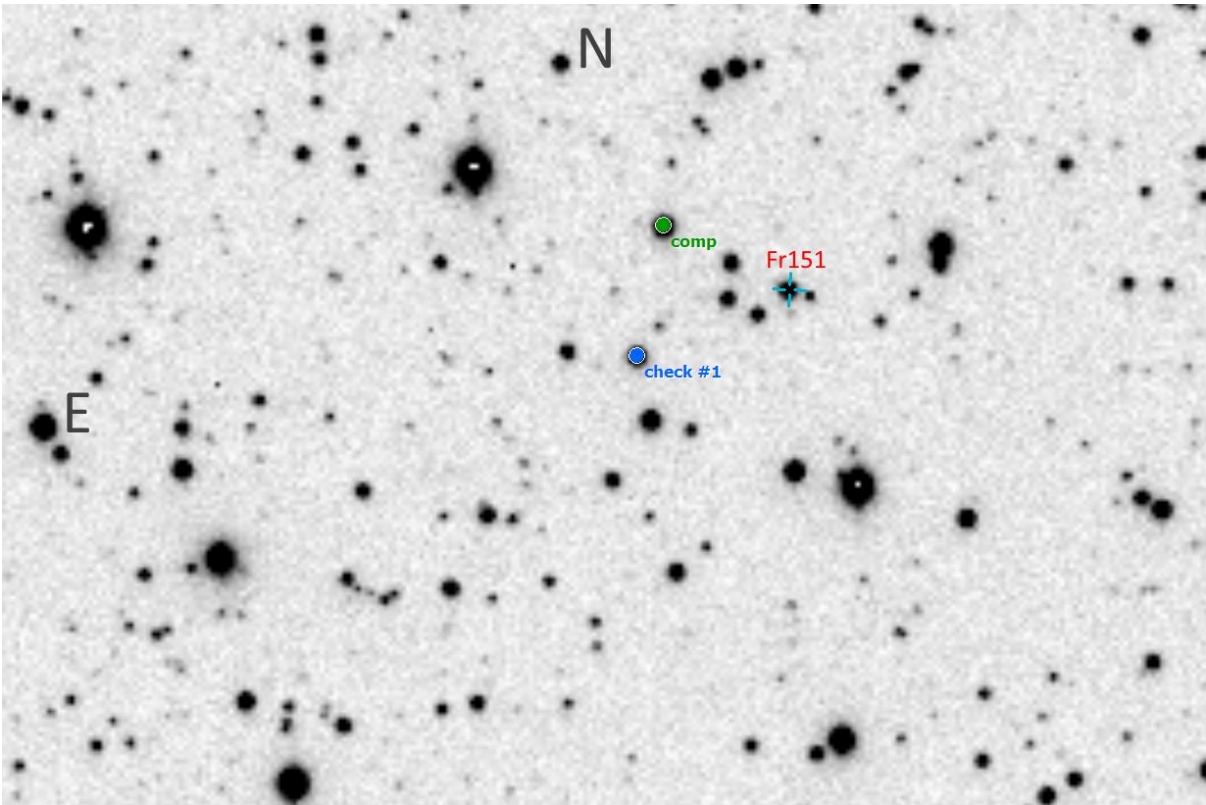


Fig 26: Fr151 Cyg = GSC 03949-01097 in the field of V1193 Cyg; image size: 15'x10'; (comp) is the comparison star and (check#1) is the check star.

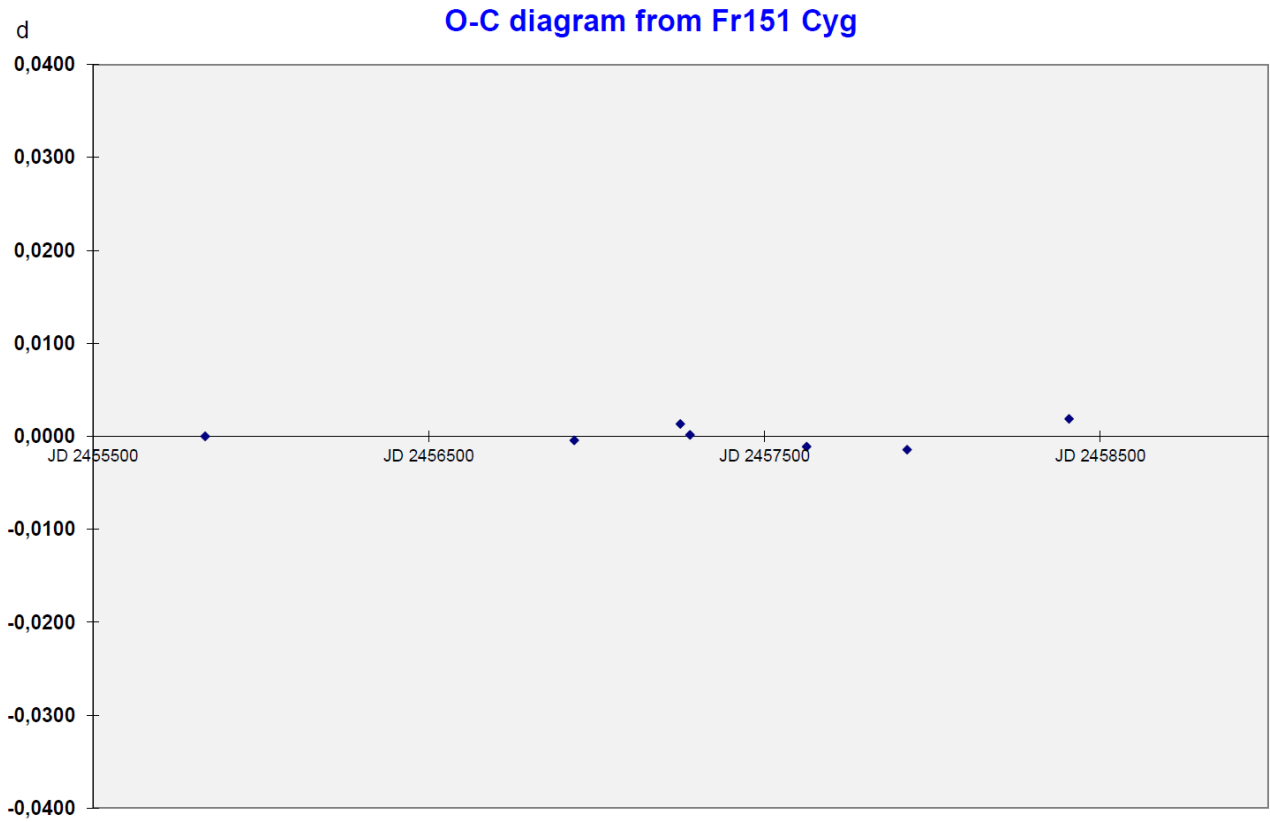


Fig 27: O-C-diagram from Fr151 Cyg = GSC 03949-01097

Table 9: Minima of Fr151 Cyg = GSC 03949-01097

Observer	HJD-Date Minimum	Type	Epoch	O-C (d)	Remarks
P. Frank	2455834.3880	I	0	0.0000	
P. Frank	2456933.5196	I	529	-0.0004	
W. Moschner	2457249.3400	I	681	0.0013	uncertain
Moschner/Frank	2457278.4274	I	695	0.0002	
P. Frank	2457625.4111	I	862	-0.0011	
Moschner/Frank	2457924.6074	I	1006	-0.0014	
P. Frank	2458406.6497	I	1238	0.0019	

Remarks:

A minimum II could not be proven. The period could be twice as long.

Acknowledgements

This research has made use of the SIMBAD database, operated at CDS, Strasbourg, France, the International Variable Star Index (VSX) database, operated at AAVSO, Cambridge, Massachusetts, USA and the ASAS All Star Catalogue operated by the Ohio State University. This work has made use of data from the European Space Agency (ESA) mission Gaia (<https://www.cosmos.esa.int/gaia>), processed by the Gaia Data Processing and Analysis Consortium (DPAC, <https://www.cosmos.esa.int/web/gaia/dpac/consortium>).

The authors thank Franz Agerer (BAV) and Lienhard Pagel (BAV) for providing their personal data analysis program.

References

- [1] Motl, David: MuniWin, <http://c-munipack.sourceforge.net>
- [2] Paunzen, E., Vanmunster, T., 2016, AN, 337, 239
<http://adsabs.harvard.edu/abs/2016AN....337..239P>.
- [3] UCAC4 Catalogue (Zacharias+, 2012)
Fourth U.S. Naval Observatory CCD Astrograph Catalog
<http://vizier.u-strasbg.fr/viz-bin/VizieR?-source=I/322>
- [4] APASS: The AAVSO Photometric All-Sky Survey - Data Release 9
<http://vizier.u-strasbg.fr/viz-bin/VizieR?-source=II/336>
Henden A.A., Templeton M., Terrell D., Smith T.C., Levine S., Welch D., 2015, AAS, 22533616
- [5] ASAS All Star Catalogue
The Ohio State University
<http://www.astronomy.ohio-state.edu/asassn/index.shtml>
- [6] Gaia DR2 (Gaia Collaboration, 2018)
European Space Agency.
<http://vizier.u-strasbg.fr/viz-bin/VizieR?-source=I/345>