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## New Ephemeris of W UMa-type Star FI Lyn

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### Abstract

We study on the W UMa-type eclipsing binary FI Lyn. The data had inserted into the variable star section of Czech astronomical society. We imported the data range of the minimums into the software "Table Curve". Then, we specify the primary and secondary minimum times. We calculated the period and presented a new ephemeris.

*Keywords: Variable star, W UMa, Ephemeris, Photometry*

### Introduction

FI Lyn (GSC 03421-01871) is an eclipsing binary of W Uma- type with a short period. The W Uma-type is very significant to the study about the formation of the dynamical evolution of contact binary (Haghi, 2015). The periods of this group of variable stars are typically short and range between 0.25 days to around 1.0 days. Each of the components in the binary is of nearly the same spectral type, from around middle A to early K, with the bulk concentrated in middle F through early G (Poro 2019). It is located in Lynx constellation, and its Spectral category is F8, and with magnitude in V filter 9.67 (Høg, E 2000). In 2011, the 80 Name-List of variable stars assigned to TYC 3421-1871-1(Kazarovets et al). Only two authors observed this star from 2011 to 2013 and published times of minimum (Diethelm 2011, 2012, 2013, and Hübscher 2013). In this article is calculated the times of minimums and derived new ephemeris.

### Observation

The observation of FI Lyn was taken on 14 February, 2015 by Tomáš Medulka. The applied equipment comprised of a Canon 450D DSLR camera and a refractor telescope (aperture 90 mm and focal length 500 mm) where located in Humenné observatory, Slovakia. In observation, the method was DSLR photography with the Clear filter. The information of the star is given in Table 1. These data are taken from the internet portal of Czech variable star researchers website<sup>1</sup>.

**Table 1. Information of star from Simbad<sup>2</sup>**

Star name	FI Lynx
Other name of star	GSC 03421-01871
Mag (V)	9.67
Spectral type	F8
ICRS coord (ep=J2000)	08 17 27.3322831193 +51 51 46.941128735

<sup>1</sup> <http://var2.astro.cz/EN/index.php>

<sup>2</sup> <http://simbad.u-strasbg.fr/simbad/>

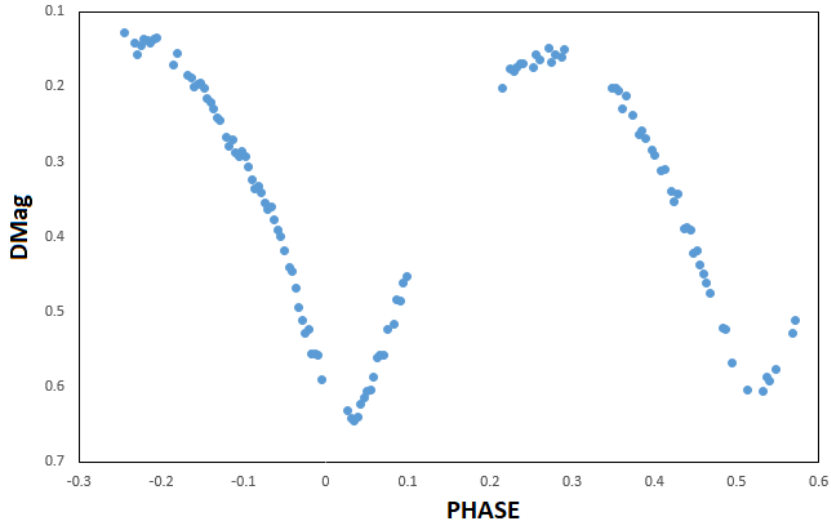


Figure 1. Light curve for FI Lyn in Clear filter

### The time of Minima and Period Computation

In order to, we converted all time to Barycentric Julian Dates (BJD\_TDB) by the Time Utilities website<sup>3</sup>. To calculation the new period, at first we should calculate Epoch for each minimum, so we have used equation 1. In this equation, P (Period) and T<sub>0</sub> (ToM) is related to previous ephemeris (Table 3) and T is the new Time of Minimum. The reference is shown in table 2.

$$T = P \times E + T_0 \quad (1)$$

Table 2. Reference Ephemeris of FI Lyn

BJD_TDB	Period	Filter	Reference
2451578.812744	0.37326	Clear	C. Barani, M. Martignoni, F. Acerbi/2015/The first multi-color light curve analysis of FI Lyn and new V and Rc light curve analysis for GN Boo, Two W-subtype W Ursae Majoris systems/New Astronomy Journal 39

We calculated the new epochs for first and second minimums and added them to the list of the previous observations obtained from other articles; they are shown in table 3. Finally, after the calculated new period of this system and O-C with all other extracted from articles and reports were added to the O-C diagram and fitted that are shown in figures 2 and 3.

Table 3. ToM of Minimums of FI Lyn

No.	ToM	Type	E	O-C	Reference
1	2457068.357769	I	14707	0.003046007	This Study
2	2457068.543769	II	14707.5	0.003676457	This Study
3	2451578.812744	I	0	0	GCVS 4
4	2455563.935978	II	10676.5	-0.003224474	IBVS 5992
5	2455653.707175	I	10917	-0.005174783	IBVS 5992

<sup>3</sup> <http://astrutils.astronomy.ohio-state.edu/time/>

6	2455990.760765	I	11820	-0.00417118	IBVS 6029
7	2456297.951769	I	12643	-0.001453657	IBVS 6063
8	2456355.437868	I	12797	-0.005373903	IBVS 6084
9	2456355.624168	I	12797.5	-0.005043453	IBVS 6084
10	2456670.280665	I	13640.5	-0.002600909	IBVS 6118
11	2456670.470465	I	13641	-0.005770459	IBVS 6118
12	2456690.437066	I	13694.5	-0.002913255	IBVS 6118
13	2456698.649865	II	13716.5	-0.003972434	IBVS 6131
14	2457035.515268	I	14619	-0.001412281	IBVS 6152
15	2457035.701268	II	14619.5	-0.000781831	IBVS 6152

Therefore, a new ephemeris is shown in equation 2,

$$\text{MIN I (BJD\_TDB)} = 2451578.815093 (\pm 0.002832685) + 0.373260901 (\pm 0.000000901) \times E \quad (2)$$

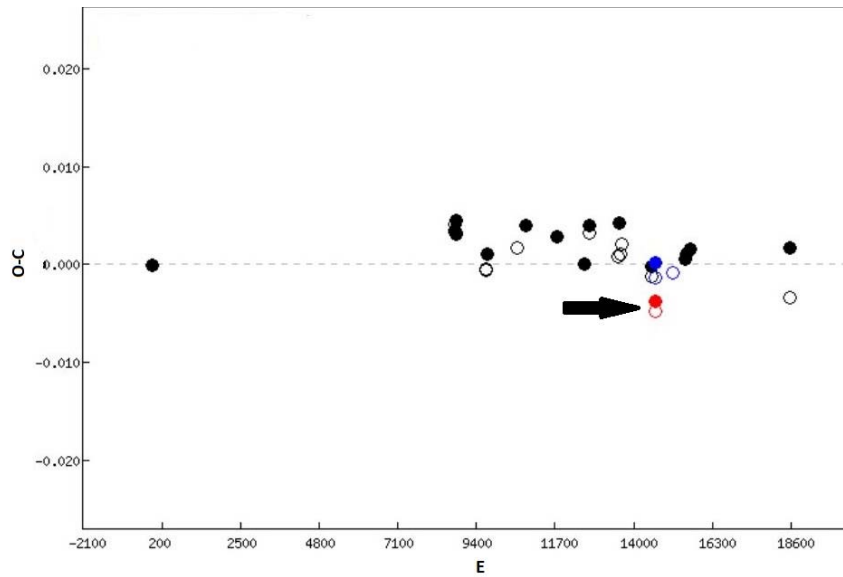


Figure 2. The O-C diagram of FI Lyn

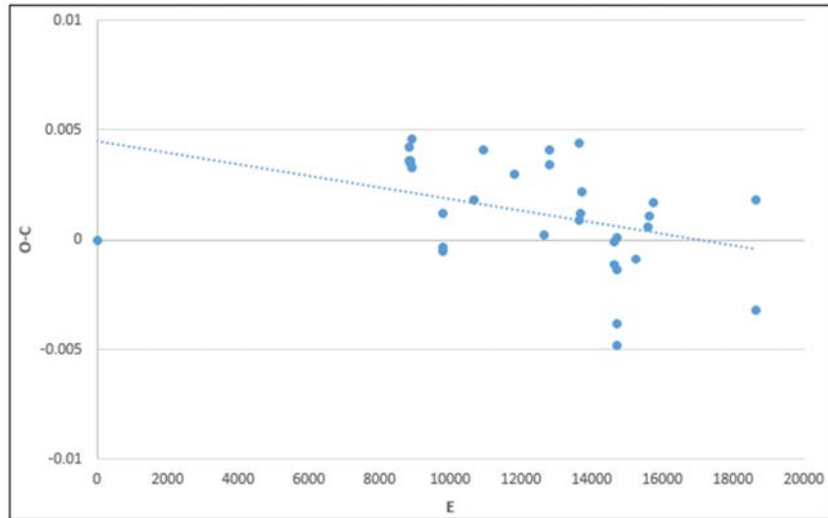


Figure 3. O-C Fitted Diagram of FI Lyn

### Result

In this study, we presented a new ephemeris of FI Lyn (equation 2). The corresponding O-C values and results were calculated and plotted in figure 2 and 3. It can be used to predict the minimum times for this eclipsing binary system. Also, we calculated the O-C for minimums and added them to the list of the previous observations obtained from other articles and reports.

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