

NOTES

FBS 0137+400: A N-TYPE SEMIREGULAR
VARIABLE CARBON STAR

1. *Introduction.* The N-type carbon (C) star FBS 0137+400 was found on the low-resolution (lr) spectroscopic plates of the First Byurakan Spectral Sky Survey - FBS [1], digitized and explored using virtual observatory tools [2]. 2MASS and USNO-A2.0 catalogue photometric data, also optical spectrum in the range $\lambda 4800\text{--}6800\text{\AA}$ and IRAS Low-Resolution Spectra (LRS) ($7\text{--}23\text{ }\mu\text{m}$) have been presented in previous paper [3] devoted to FBS 0137+400. It can be assumed, that this object belongs to N5-N6 - subclass of C stars, comparing the spectral energy distribution (SED) [3] to the "Moderate-Resolution Spectral Atlas of Carbon Stars" by Barnbaum et al. [4]. Absolute bolometric magnitude (M_{bol}), mass-loss rate and distance to FBS 0137+400 is estimated, assuming that this object belongs to the group of Long-Period Mira-type Variables (LPV) [3]. The star show large near-infrared (IR) colour index ($2MASS J - K_s = 3^m.34$), which is one of the characteristic features of Mirids, surrounded by gas-dust envelopes [5,6].

In the present paper we have revised important characteristics, considering the "Northern Sky Variability Survey - NSVS" [7], also variability type of FBS 0137+400 is established, based on the automatic classification in the NSVS.

2. *Variability.* In order to study variability of FBS 0137+400 the NSVS database was used (<http://skydot.lanl.gov/nsvs/nsvs.php>). This survey is based on the "ROTSE-1" experiment and provides light curves for sources with V-band magnitude of 8 to ~ 15.5 , with one year baseline. In survey NSVS, the monitoring of FBS 0137+400 has number 3839161 identification.

Fig.1 show phase-dependence NSVS light curve for FBS 0137+400. Moreover, in catalogue "Red Variables in the NSVS" by Williams et al. (2004) (<http://vizier.u-strasbg.fr/viz-bin/VizieR?-source=J/AJ/128/2965>) the star is classified as a Semi-Regular (SR) variable with 329 days period.

In Table 1 the data of automatic classification from the catalogue by Williams et al. (2004) for FBS 0137+400 is presented.

Table 1

NSVS DATA FOR FBS 0137+400

Star	NSVS Number	$R(\text{ROTSE-mag})$	P (days)	Ampl (mag)	Var. type
FBS 0137+400	0140205+401518	11.465	329	1.265	SR

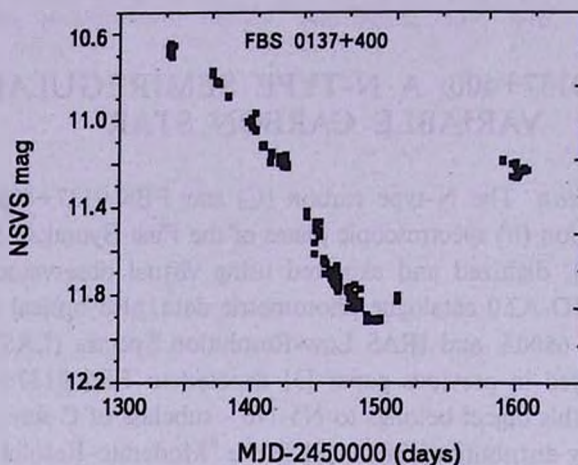


Fig.1. Phase dependence NSVS light curve for FBS 0137+400. X-axis presents the period in Julian Data and Y-axis presents the NSVS magnitude.

3. *Absolute Magnitude And Distance Re-Estimations.* To estimate absolute K -band magnitude, we used Period-Luminosity relation:

$$M(K) = -1.34 \times \log P - 4.5 \quad (1)$$

presented by Knapp et al. [8] for SR variables. This relation was obtained on the base of analyze the K -band luminosities, using parallaxes, measured by the Hipparcos mission. Also, to estimate absolute K -band magnitude, we have used relations, obtained by Mauron [9] for cool C stars in the Galactic Halo and by Sloan et al. [10], for C stars in Magellanic Clouds. In both relations [9,10], the 2MASS $(J-K)_0$ de-reddened colour are used (for FBS 0137+400 $(J-K)_0 = 3.319$, and was estimated considering the extinction map of Schlegel et al. [11], and adopting absorption in K -band $A_K = 0.02$ mag in direction to the star, online at

Table 2

K-BAND ABSOLUTE MAGNITUDE ESTIMATIONS

Method of Estimation	$M(K)$ mag	D (kpc)
Period-Luminosity [8]	-7.85	5.15
Mauron [9]	-7.55	4.57
Sloan et al. [10]	-7.80	4.80

- <http://ned.ipac.caltech.edu/forms/calculator.html>).

In Table 2 the K -band absolute magnitudes and distances is presented, based on relations described above, for FBS 0137+400.

It can be assumed, that FBS 0137+400 is located approximately on distance ~ 5 kpc from the Sun and $Z = -1.8$ kpc hight from the Galactic plane.

4. *Summary.* The N-type carbon star FBS 0137+400 with very large infra-red colour index, is a Semiregular variable, approximately on distance ~ 5 kpc from the Sun and $Z = -1.8$ kpc hight from the Galactic plane. The phase dependence NSVS light curve is presented.

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FBS 0137+400: Полуправильная переменная углеродная звезда класса N. Углеродная звезда FBS 0137+400 с большим инфракрасным показателем цвета, является полуправильной переменной звездой класса N, на расстоянии приблизительно 5 кпк от Солнца и с $Z = -1.8$ кпк высотой от плоскости Галактики. Приводится кривая изменения блеска из базы данных NSVS.

Ключевые слова: *Полуправильные переменные: FBS 0137+400*

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¹ V.A.Ambartsumian Byurakan Astrophysical Observatory,
Armenia, e-mail: kgigoyan@bao.sci.am
e-mail: gayane_ast@yahoo.com

K.S.Gigoyan
К.С.Гигоян
G.Kostandyan
Г.Костандян
A.Sarkissian
А.Саркиссиан

² Universite de Versailles Saint-Quentin,
CNRS/INSU, LATMOS-IPSL,
France, e-mail: alain.sarkissian@latmos.ipsl.fr

³ Laboratoire d'Astrophysique de Marseille,
CNRS-AMU, France, e-mail: Delphine.Russeil@oamp.fr

D.Russeil
Д.Руссей

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