

THE DIGITIZED FIRST BYURAKAN SURVEY DATA BASE. LATE-TYPE STARS CANDIDATES. NEW CONFIRMATIONS. I

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The Digitized First Byurakan Survey (DFBS) is the digitized version of the First Byurakan Survey (FBS, or Markarian survey). The FBS was the first systematic survey of the extragalactic sky. This objective-prism survey was carried out in 1965-1980 by B.E.Markarian and his colleagues using the 1 m Schmidt telescope of the Byurakan Astrophysical Observatory and resulted in discovery of 1517 UVX-excess (Markarian) galaxies. FBS low-resolution spectral plates have been used for a long time to search and study faint Late-Type Stars (LTS, M-type and C stars) at high Galactic latitudes. A total of 18 lists of the FBS LTS were published between 1990 and 2016. We report newly confirmed C and M giants, and also large amount of M dwarfs based on the Gaia DR3 BP/RP low-resolution spectroscopic data base. Some of the newly confirmed M dwarfs presents binary systems. Some of them are new eclipsing binaries. In our previous studies of the DFBS spectral plates, all were presented as LTS candidates. Gaia high-accuracy astrometric and photometric data and Transiting Exoplanet Survey Satellite (TESS) data are used to characterize these new confirmed LTS. TESS phase-dependent light curves show rotational modulations and flares for many new M dwarfs. This confirmations of the large number of completely new objects represents a very significant extension in the census of M giants, faint N-type Asymptotic Giant Branch C stars, CH-type C giants at high Galactic latitudes, and M dwarfs in the solar vicinity. Some objects are located more than 7 kpc from the Galactic plane. Ultimately, we aim to present value-added catalog and update the FBS LTS catalog. Note that a large amount of the blue stellar objects with UVX-excess and numerous of emission line objects were also detected.

Keywords: *catalogs-stars: carbon stars: M-giants: M-dwarfs: surveys: Gaia and TESS data*

1. Introduction. Markarian survey (or the First Byurakan Survey-FBS), was the first systematic survey of the extragalactic sky. This objective-prism (op) low-resolution (1r, 1°5 prism, giving a reciprocal dispersion of 1800 Å/mm near H γ , providing a 3400-6900 Å spectral range) survey was carried out in 1965-1980 by B.E.Markarian and collaborators using the 1 m Schmidt telescope of the Byurakan Astrophysical Observatory and resulted in discovery of 1517 UVX-excess galaxies [1]. This survey covers about ~17000 sq. deg. of the Northern sky and part of the Southern sky at high Galactic latitudes. During the observations, Kodak IIF, IIAF, IIAF, and 103aF plates were used. The limiting photographic magnitude is 17°5-18°0. The

large spectral range of the FBS is well suited to identify very different objects, and especially cool M-type or C-type (carbon) stars. Visual inspection with a magnification of $\times 15$ (using the magnifying glass before 2007) was used to select slitless spectra showing pronounced absorption bands. C stars can be identified through the presence of the Swan bands of the C_2 molecule at 4737, 5165 and 5636 Å (spectra of N-type Asymptotic Giant Branch (AGB) C stars). Several C stars also show the C_2 band head at 4382 Å (early CH-type C stars). M-type stars can easily be distinguished because of the titanium oxide (TiO) molecule absorption bands at 4584, 4762, 4954, 5167, 5500, and 6200 Å [2]. All FBS spectral plates have now been digitized, resulting in the creation of the Digitized First Byurakan Survey (DFBS) data base [3]. Its images and spectra are available on the DFBS web portal in Trieste (on-line at <https://www.ia2-byurakan.oats.inaf.it>, for details see also the web site at <https://www.aras.am.Dfbs/dfbs.html/>). A Second Version of the "Revised and Updated Catalogue of the First Byurakan Survey of Late-Type Stars", containing data for 1471 M and C stars was generated later [4] (SIMBAD CDS Vizier Catalogue J/MNRAS/489/2030/catv2). All DFBS plates are analyzed with the help of standard analysis softwares FITSView and SAOImage ds9. This visualization allows to detect very red and faint C and M stars candidates close to the detection limit in each DFBS plate (particularly, the range 6500-6900 Å for the faint and late subclasses of the N-type and M-type stars [4]). Candidates of faint N-type C stars and M-type giants, for which very short (wedge-like) spectra in the range $\sim 6500\text{-}6900$ Å is visible on the DFBS plates, no C_2 and TiO molecule absorption bands are detectable. Moderate-resolution slit spectroscopy was carried out for thirteen candidates, confirming the C-rich nature of them [5]. Several of such candidates could be M dwarfs and giants [6]. In addition, a large number of such faint candidates detected on the DFBS plates, remained to be classified using spectral information [4,6]. To classify faint candidates and to find out the potential of the FBS for LTS, we use Gaia DR3 BP/RP *I*_r spectroscopic data base, which allows us to confirm the spectral types for candidate objects easily. The present work extends significantly our search for LTS candidates. We present data for seven newly confirmed DFBS C stars and several M giants. We also report on a large number of new M dwarfs, confirmed in the Gaia DR3 *I*_r spectroscopic data base. The list of all spectroscopically confirmed LTS candidates, reported as a supplementary (value - added) catalogue to the second edition of the "Revised and Updated Catalogue of The First Byurakan Survey" [4] will be presented in SIMBAD astronomical data base very soon.

This paper (first in this series) is structured as follows. Section 2 introduces the Gaia DR3 *I*_r spectral data base, which is used to validate the spectral types of the DFBS LTS candidates. It presents Gaia DR3 spectra and important physical characteristics for seven confirmed DFBS C stars. We also describe the spectro-

scopic criteria for candidate LTS classification for C or M stars, and photometric criteria, which are used to separate M giants from M dwarfs. Section 3 and 4 present data for a few of DFBS M giants and M dwarfs. Phase dependence light curves are also given for newly confirmed M stars from the modern variability data bases to clarify their variability types. Finally, Section 5 recalls the main results obtained for the LTS candidates and provide concluding remarks and possible future works.

2. Gaia DR3 spectra. Newly confirmed C stars. The European Space Agency (ESA) mission Gaia (Gaia Collaboration [7]) has already released three catalogues to the astronomical community, of increasing richness in terms of content, precision, and accuracy. With respect to the previous Gaia Early Data Release 3 (EDR3) [8], Gaia Data Release 3 (Gaia DR3, Gaia Collaboration [9]) introduces a number of new data products based on the same source catalogue, including a total of 1.8 billion objects based on a period of 34 month of satellite operations. Blue (BP) and Red (RP) photometer *I*r spectral data are one of the exciting new products in Gaia DR3 (VizieR CDS Catalog I/355/gaiadr3). Time - averaged mean spectra covering the optical to near-infrared wavelength range $\lambda 3300-10500\text{\AA}$ are published for approximately 220 million objects (CDS Catalog I/355/spectra). Most of these are brighter than $G = 17.65$ mag [10]. M-type stars can be detected very easily in the Gaia DR3 *I*r spectral data base by the presence of the broad absorption bands of the TiO molecules in the range $6500-7000\text{\AA}$, $7000-7500\text{\AA}$, and $8000-8500\text{\AA}$. C stars display strong Swan bands at 4383 , 4737 , 5165 , and $5636\text{\AA}$ of C_2 molecule. Among the DFBS LTS candidates, confirmed M stars, which show high proper motions in Gaia DR3 data base, are included as M dwarfs in our new DFBS list. For all of them, 2MASS (Two Micron All-Sky Survey) [11] Near-Infrared (NIR) colors are typical for M dwarfs ($J - H < 0.7$ mag and $H - K > 0.15$ mag) and best discriminator of M giants and dwarfs [12,13]. With high-and moderate-resolution spectra, M giants and M dwarfs can be well segregated through the spectral indices using the template-fitting pipeline [14,15].

Our list of all DFBS LTS candidates is cross-matched with the Gaia DR3 BP/RP spectroscopic data base. Table 1 presents DFBS LTS candidates confirmed as C stars; it gives the DFBS Number, the Gaia I/355/gaiadr3 source designation, other association in SIMBAD data base, and our spectral type determination (C-N or C-CH-type).

Fig.1a and b presents Gaia DR3 Catalogue BP/RP *I*r spectra for objects of Table 1.

Low-resolution CCD spectra for DFBS J004626.12+463720.2 and for DFBS J082310.37-015325.7 in the range $\lambda 3690 - 9100\text{\AA}$ were also secured by LAMOST

Table 1

DFBS LTS CANDIDATES CONFIRMED CARBON STARS

DFBS Number	Gaia DR3 source identifier	Other association in SIMBAD data base	Sp. Type
J004626.12+463720.4	389807868829145856	ATO J125.7932-01.8905	C-CH
J024615.25+484150.9	438564097055438720		C-CH
J082310.36-015325.7	3070045067018279040		C-N
J203956.64-063740.4	6908005165297040896		C-CH
J215952.33+315207.9	1897967802114581888		C-CH
J221816.47+290920.0	1897967802114581888		C-N
J234931.72+442531.5	1926136499744257152	TYC 3244-587-1	C-CH

Notes: The object DFBS J024615.25+484150.9 was announced as new early-type CH-carbon star candidate by Gigoyan [6]. The star ATO J125.7832-01.8905 is presented as R Coronae Borealis type variable in Gaia DR3 Catalogue (SIMBAD Vizier Catalog I/358/vclassre). The object TYC 3244-587-1 is known as spectroscopic binary without spectral type information in SIMBAD astronomical database.

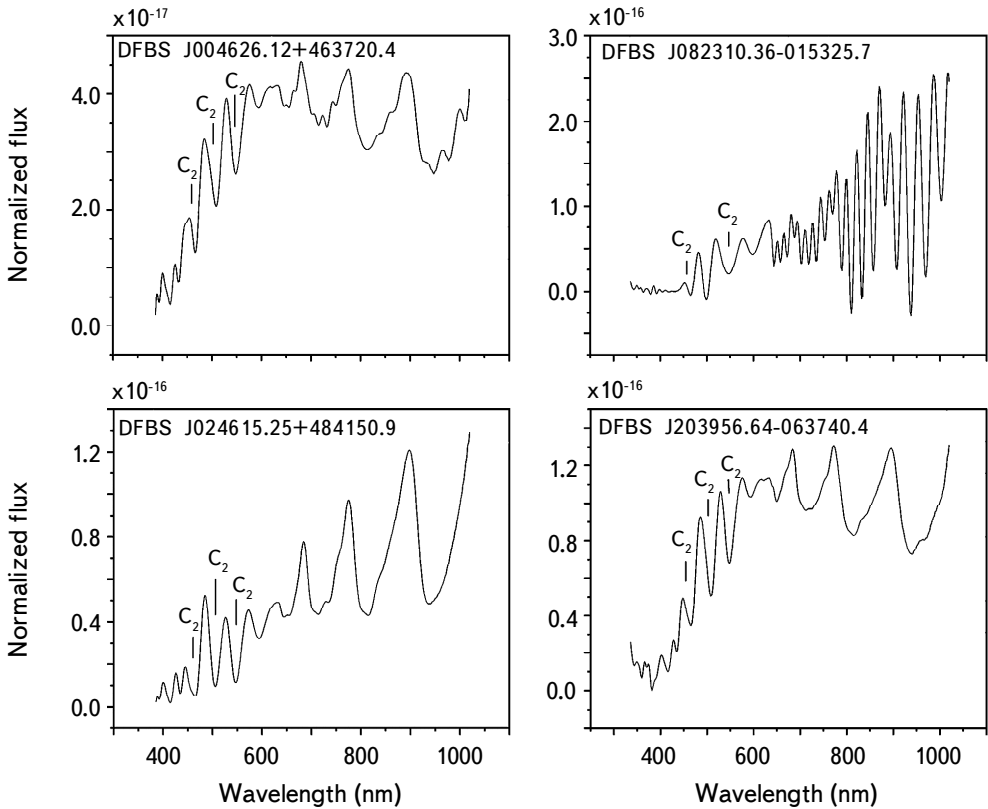


Fig.1a. Gaia DR3 BP/RP I_r spectra for four objects of Table 1 in the 336-1020 nm range. The absorption bands of C₂ molecule in the range 450-570 nm are also indicated.

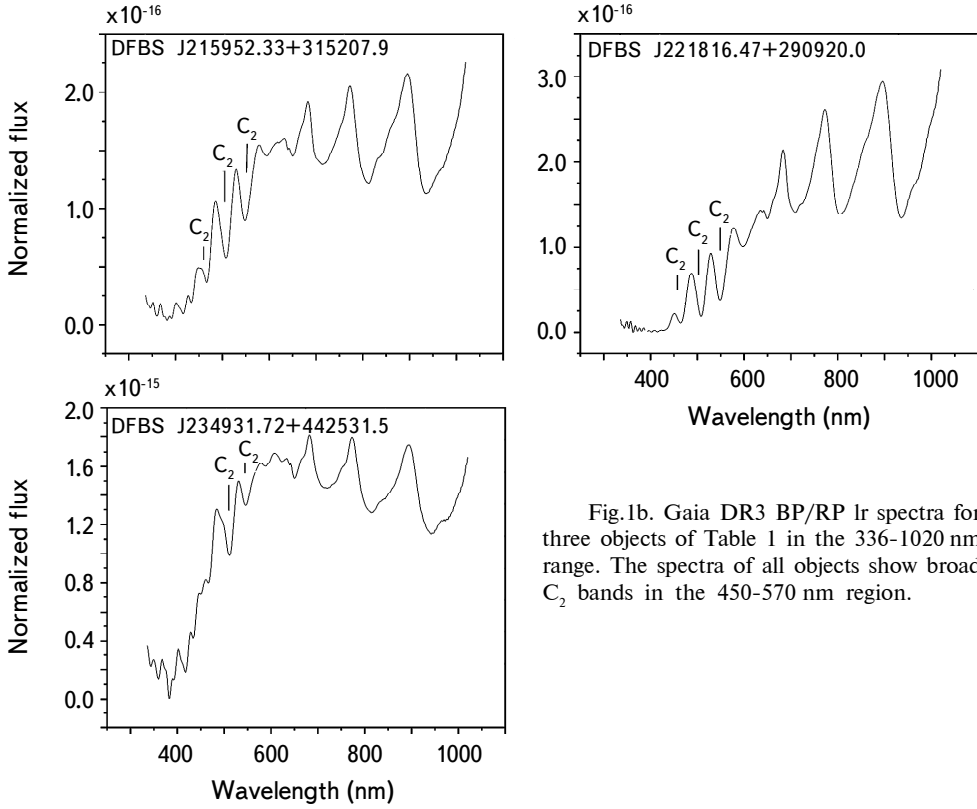


Fig.1b. Gaia DR3 BP/RP I_r spectra for three objects of Table 1 in the 336–1020 nm range. The spectra of all objects show broad C₂ bands in the 450–570 nm region.

(Large Sky Area Multi-Object Fiber Spectroscopic Telescope) [16]) observations (LAMOST DR7, spectra is available online at <http://dr7.lamost.org/search/>, also see SIMBAD Vizier catalog V/156/dr7/lrs).

Fig.2 shows the LAMOST CCD spectra for objects DFBS J004626.12+463720.4 (obtained 18 October 2014) and DFBS J082310.36-015325.7 (obtained on the 25 December 2013), they are classified as C stars in LAMOST DR7 data base.

Table 2 presents Gaia DR3 catalogue key data for seven confirmed C stars and their heights above/below the Galactic plane. The distance estimation is based on Gaia DR3 trigonometric parallaxes (absolutely the same values of parallaxes, as presented in Gaia EDR3 catalogue. Therefore, we used the distance information derived from Gaia EDR3 by Bailer-Jones et al. [17].

3. *M Giants*. M giants are evolved objects with high luminosity $\log L/L_{\odot} \sim 3 \div 4$, which enables their detection at large distances. Therefore, M giant stars are suitable as tracers for discovering and identifying the remnants of stellar streams in the Galactic Halo. Among the DFBS LTS candidates cross-correlated in the Gaia DR3 I_r spectroscopic data base, we found numerous of M giants and mass-losing AGB M stars. Some of these stars are new discoveries.

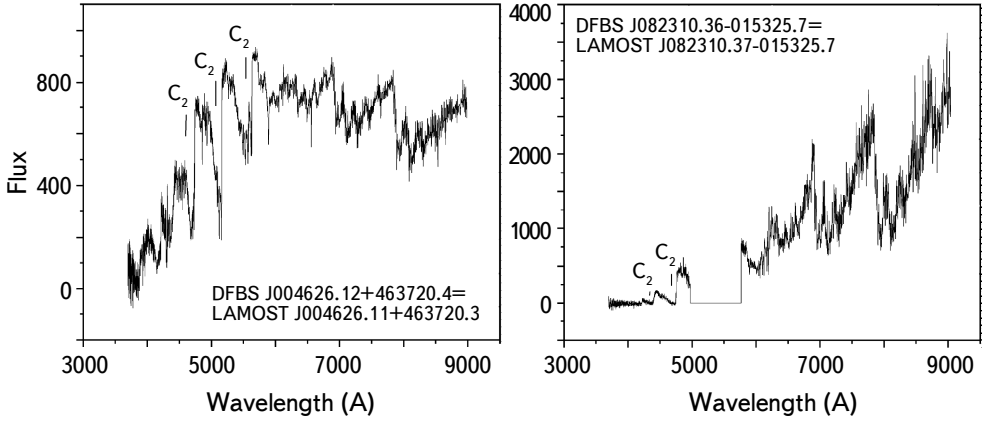


Fig.2. LAMOST Ir CCD spectra in the $\lambda 3690 - 9100\text{\AA}$ range for candidate objects DFBS J004626.12+463720.4 and DFBS J082310.36-015325.7. The C_2 molecule absorption band-heads are also indicated.

Table 2

SOME IMPORTANT GAIA DR3 DATA FOR SEVEN NEW C STARS

DFBS Number	G-band mag	BP-RP Color	RV (km/s)	r (pc)	M(G) mag	Z (pc)
J004626.12+463720.4	14.68	1.53	-247.70(± 3.14)	9783(± 1500)	-0.50(± 0.3)	-2737(± 400)
J024615.25+484150.9	14.28	2.17	-137.35(± 2.57)	6642(± 800)	-0.2(± 0.07)	-1147(± 150)
J082310.36-015325.7	14.19	2.63	+210.10(± 0.87)	11560(± 900)	-1.1(± 0.1)	3833(± 300)
J203956.64-063740.4	13.57	1.58	-283.63(± 0.47)	9035(± 1000)	-1.2(± 0.8)	-4117(± 291)
J215952.33+315207.9	13.18	1.76	-491.45(± 0.43)	11289(± 1600)	-2.1(± 0.4)	-3534(± 500)
J221816.47+290920.0	13.17	2.32	-110.71(± 0.31)	13505(± 1500)	-2.5(± 0.4)	-5239(± 600)
J234931.72+442531.5	10.64	1.49	-13.93(± 1.91)	1658(± 35)	-0.4(± 0.1)	-486(± 10)

Others are IRAS Point Sources Catalogue (PSC) [18] sources but whose spectral types are unknown. A significant part of the newly confirmed M giants are associated with the Gaia Long-Period Variable Stars (Gaia DR3 Part 4. Variability, VizieR CDS Catalog I/358/vlpv).

Table 3 presents Gaia DR3 catalogue important data for some LTSs candidates, confirmed as M giants in the data base I/355/spectra; it gives the DFBS Number, Gaia DR3 designation, Gaia DR3 broad-band G-magnitudes, and other associations in SIMBAD data base. Fig.3a and b presents Gaia DR3 BP/RP Ir spectra for four objects of Table 3 in range 336-1020 nm.

Table 4 presents Gaia EDR3 catalogue important data for six confirmed M giants and their heights above/below the Galactic plane (in analogy with newly confirmed C stars in Table 2).

Table 3

GAIA DR3 DATA FOR 6 DFBS CONFIRMED M GIANTS

DFBS number	Gaia DR3 source name	Gaia DR3 G mag	Gaia DR3 BP-RP color	Other association in SIMBAD data base
J004002.24+445225.2	38820725477589632	12.213	2.346	IRAS 03458+3900 ATO J120.3309+34.9692++ 2MASS J17504123+6915223++ NSNS 17120433+ IRAS 22010+4229+++
J034913.32+390916.9	223984228113842816	12.169	5.158	
J080119.40+345809.3	905739784466468736	12.419	2.689	
J175041.20+6915.23.0	1637841351188506880	12.981	2.202	
J202649.55-081608.9	6905944371269703680	12.795	3.268	
J220305.66+424407.5	1960158241368482432	11.610	5.445	

Notes: (+) In SIMBAD Data Base these objects are noted as Long-Period Variables. (++) These objects are noted as Long-Period Variable Candidates. (+++) Mira Variable. In SIMBAD data base there are no spectral type information for these objects Table 3.

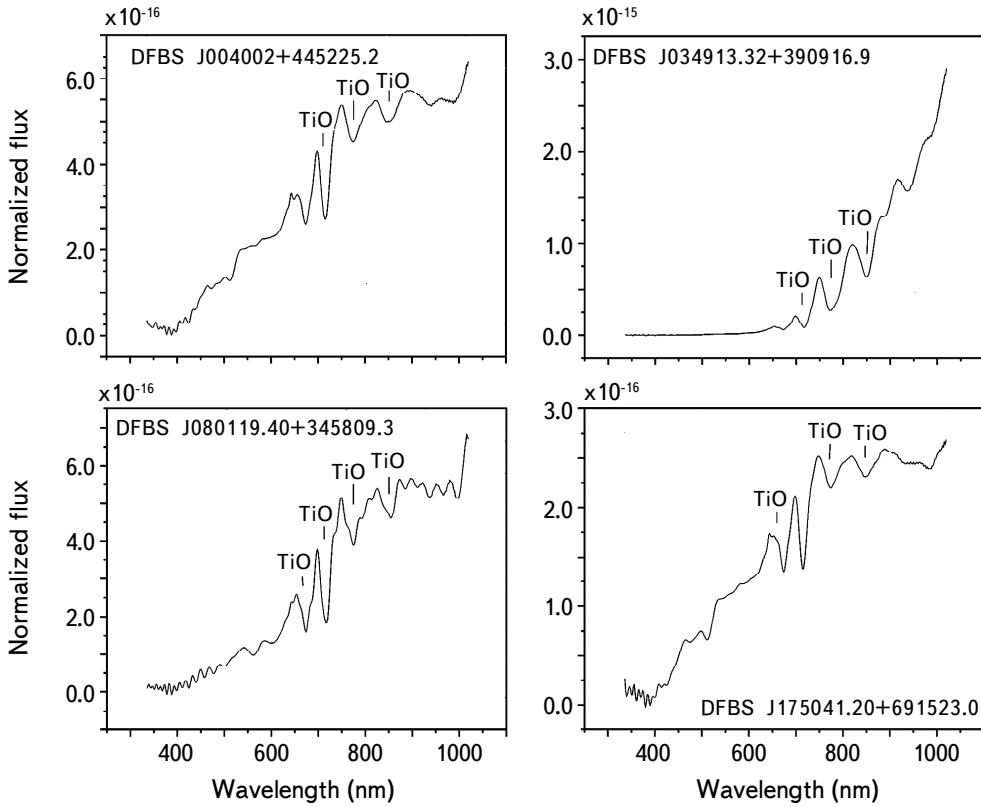


Fig.3a. Gaia DR3 BP/RP Ir spectra for four objects of Table 3 in the 336-1020 nm range. The spectra of all objects show broad absorption bands of TiO molecule.

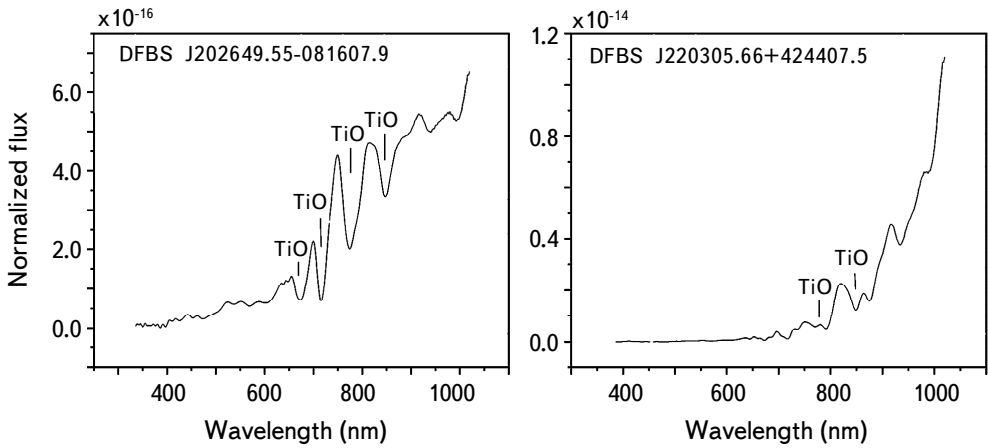


Fig.3b. Gaia DR3 BP/RP Ir spectra for two objects of Table 3 in the 336-1020 nm range. The spectra show broad absorption bands of TiO molecule.

Table 4

SOME IMPORTANT GAIA DATA FOR 6 M GIANTS

DFBS Number	RV (km/s)	r (pc)	M(G)	Z (pc)
J004002.24+445225.2	-83.00(± 0.30)	6591(± 700)	-1.90(± 0.2)	-2031(± 200)
J034913.32+390916.9	-61.73(± 0.56)	2551(± 400)	-0.12(± 0.1)	-522(± 50)
J080119.40+345809.3	+56.32(± 0.72)	7147(± 1000)	-1.87(± 0.2)	3432(± 400)
J175041.20+6915.23.0	-93.80(± 0.58)	14844(± 2500)	-2.87(± 0.32)	7555(± 1000)
J202649.55-081608.9	+72.30(± 0.79)	7451(± 1100)	-1.57(± 0.3)	-3141(± 400)
J220305.66+424407.5		2985(± 500)	-0.76(± 0.3)	-524(± 100)

Fig.4 shows ASAS-SN [19,20] light curve for M giant DFBS J220305.66+424407.5.

We examine visually the Spectral Energy Distribution (SED) for two objects Table 4. Fig.5 illustrates SEDs for two objects of Table 4. Both objects exhibit excess of infrared radiation (IR) at longer wavelengths indicating the existence of the dust envelopes around them.

4. *M Dwarfs*. M dwarfs are the most common stars in the Galaxy [21,22]. They dominate the stellar populations by number, but have a very low mass range $0.075 M_{\odot} \div 0.5 M_{\odot}$ and effective temperature T_{eff} less than 4000 K [23]. M dwarfs have become of central interest for astronomy in the last decades, notably for their application to exoplanet research [24]. For a given Gaia DR3 BP/RP Ir spectra, there are no luminosity criteria to distinguish M giants from dwarfs among the

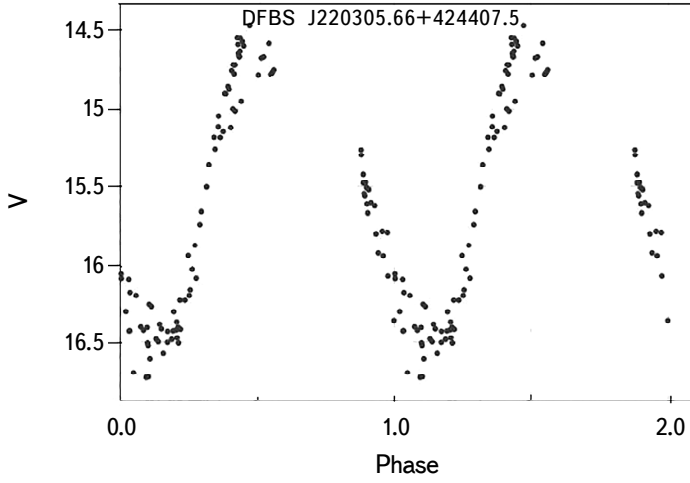


Fig.4. ASAS-SN phased light curve for DFBS J220305.66+424407.5 (ASASSN-V J220305.54+424407.4, on-line access via <https://asas-sn.osu.edu/variables/>) classified as a Mira variable in SIMBAD data base. This object is a SR variable with $P = 365.647$ days, Ampl. = 1.84 mag and $V_{\text{mean}} = 15.66$ mag.

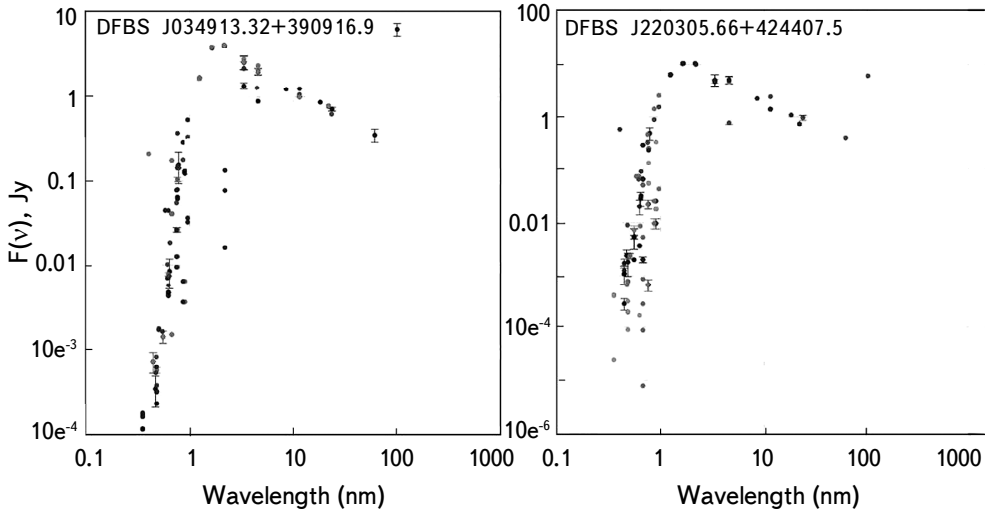


Fig.5. SEDs for two DFBS M giants built in Vizier data base using Gaia EDR3, POSSII-I, POSSII-I, POSSII-F, POSSII-J, Johnson-B, SDSS u, g, r, i, z, 2MASS J, H, Ks, WISE W1, W2, W3, and W4 photometric data (for more detail see <https://vizier.cds.unistra.fr/vizier/sed/>).

confirmed candidates. We classify LTS candidates as M dwarfs based on the presence of the broad absorption bands of TiO molecule in the 6500-7000 Å, 7000-7400 Å, and 7600-8000 Å ranges [25], and based also on their high proper motions in Gaia DR3 catalogue. For all of them, 2MASS NIR colors are typical for M dwarfs [12,13]. Most of the DFBS LTS candidates, in the Gaia DR3 IIR spectroscopic data base, are M dwarfs.

Table 5

TESS INPUT CATALOGUE DATA FOR SOME DFBS M DWARFS

DFBS Number	TIC Identifier	$M / M_{\odot}$	$L / L_{\odot}$	T_{eff} (K)	R (pc)	2MASS $J-H$	2MASS $H-K$
J091007.09+405214.3(A) (B)	9273155			3687	94.78(± 0.48)	0.619	0.204
	801617198			3687	94.78(± 0.48)		
J112124.87+394106.1	17933144	0.523(± 0.02)	0.049(± 0.011)	3752	80.44(± 0.23)	0.618	0.223
J134015.46+354901.5	105657755	0.536(± 0.02)	0.039(± 0.009)	3488	103.32(± 0.41)	0.607	0.217
J172758.96+170919.2(A) (B)	394020934	0.458(± 0.02)	0.032(± 0.007)	3589	89.26(± 0.26)	0.608	0.247
	394020936	0.382(± 0.02)	0.020(± 0.005)	3466	89.16(± 0.33)	0.609	0.231
J222100.82-065620.2	38378875	0.635(± 0.02)	0.06(± 0.015)	3545	109.41(± 0.76)	0.590	0.233

Note. More details for objects DFBS J091007.09+405214.3 (A), (B) and DFBS J172758.96+170919.2 (A) (B) see below.

Table 5 presents TESS Input Catalogue (TIC, version 8.2 [26,27], CDS VizieR Catalogue IV/39/tic8.2) important data for a few new DFBS M dwarfs, confirmed spectroscopically in Gaia DR3 data base.

Gaia DR3 Catalogue, Gaia Catalogue of Nearby Stars (GCNS, Gaia Collaboration [28], VizieR Catalogue J/A+A/649/A6/table1c) and also TESS Catalogues indicate 2 objects in 5 arcsec search radius around positions of DFBS J091007.09+40524.3 and DFBS J172758.96+170919.2 (consequently we noted A-bright and B-faint objects which have practically the same parallaxes in these data bases). There are no 2MASS JHK photometric data for DFBS J091007.09+

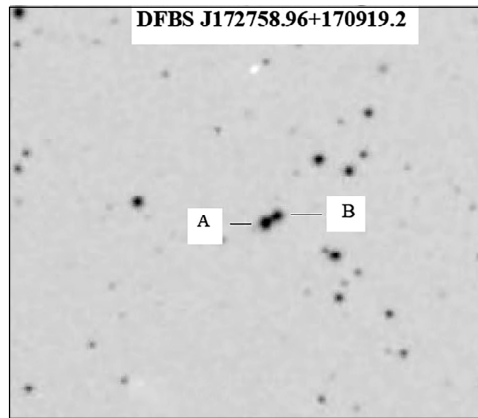


Fig.6. POSS2 I-image of dwarf M star DFBS J172758.96+170919.2 (primary star-A) and close companion (B) that we view as a binary system. Angular separation is 4.0 arcsec on I-image. Field is $5' \times 5'$.

405214.3(B). Gaia DR3 BP - RP = 2.248 mag and 2.329 mag for A and B objects respectively. Such colors are also typical for dwarf M stars. With the help of the data visualization software SAOImage ds9, we search POSS2 I-band images for possible companions. On DSS2 I-chart the image of DFBS J091007.09+405214.3 is elongated, indicating the presence of two very close objects. In the case of DFBS J172758.96+170919.2, two objects (A and B, Gaia BP - RP = 2.241 mag for A and BP - RP = 2.437 mag for B) are relatively well separated from each other. Fig.6 illustrate the POSS2 I-band image of the star DFBS J172758.96+170919.2 A and its close companion B. The close companion is TIC 394020936, $T_{\text{eff}} = 3466$ K, $M = 0.382 M_{\odot}$, $L = 0.01999 L_{\odot}$, $r = 89.16$ pc. Both objects are at the same distance (Table 5). DFBS J172758.96 +170919.2 A and B components (Fig.6) are established as a M dwarf + M dwarf binary in Gaia BP/RP spectral data base. Most probably, DFBS J091007.09+ 405214.3 is also a pair of M dwarf + M dwarf at a distance $r = 94.78$ pc. High-angular resolution CCD image is necessary to resolve the second and faint component of DFBS J091007.09+405214.3.

Fig.7 illustrates the Gaia DR3 spectra for A and B components of DFBSJ 172758.96+170919.2

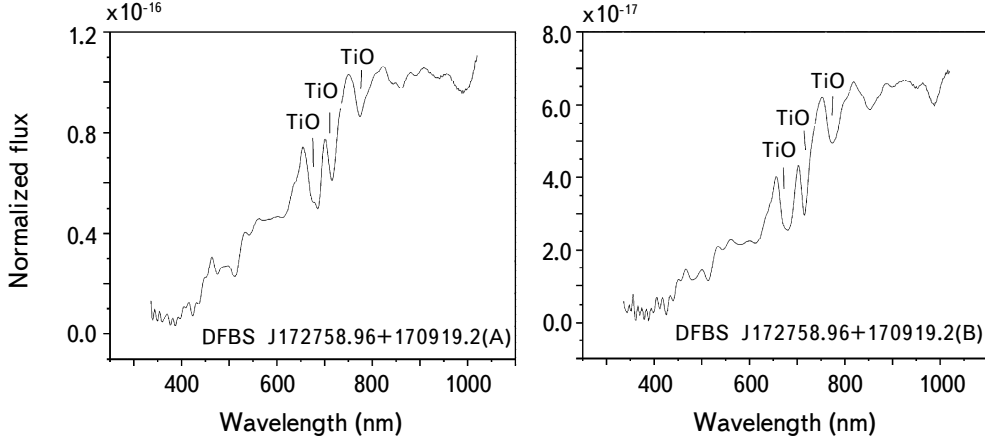


Fig.7. Gaia DR3 BP/RP spectra for DFBS J172758.96+170919.2 A and B in the 336-1020 nm range. Spectra of both objects show strong TiO absorption bands. Both are M dwarfs.

SEDs for only two confirmed M dwarfs, namely DFBS J125402.01+284056.2 and DFBS J162107.91+355637.7 are presented in Fig.8. In the SEDs of these objects, the excess IR radiation is clearly visible after 10 μm (in WISE W3 and W4 passbands).

Fig.9 and 10 show TESS light curves consequently for dwarf stars DFBS J161046.38+ 385809.1 and DFBS J222100.82-065620.3. We download the Presearch Data Conditioning Simple Aperture Photometry (PDC-SAP) light curves from the

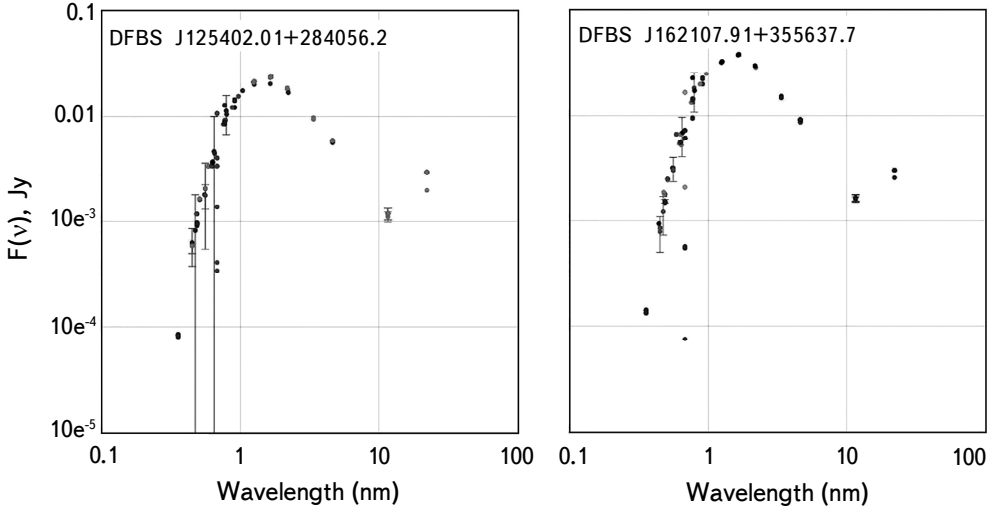


Fig.8. SED for two DFBS M dwarfs confirmed in Gaia DR3 Ir spectroscopic data base and built in Vizier data base using the same catalogue data, as in Fig.6.

Mikulski Archive for Space Telescopes (MAST). We then used *lightcurve* (<http://docs.lightcurve.org/>) to download the target pixel files (TPFs) and analyze light curves for new confirmed M dwarfs noted above.

Fig.10 illustrate TESS phased light curve for dwarf M star DFBS J222100.82-065620.3.

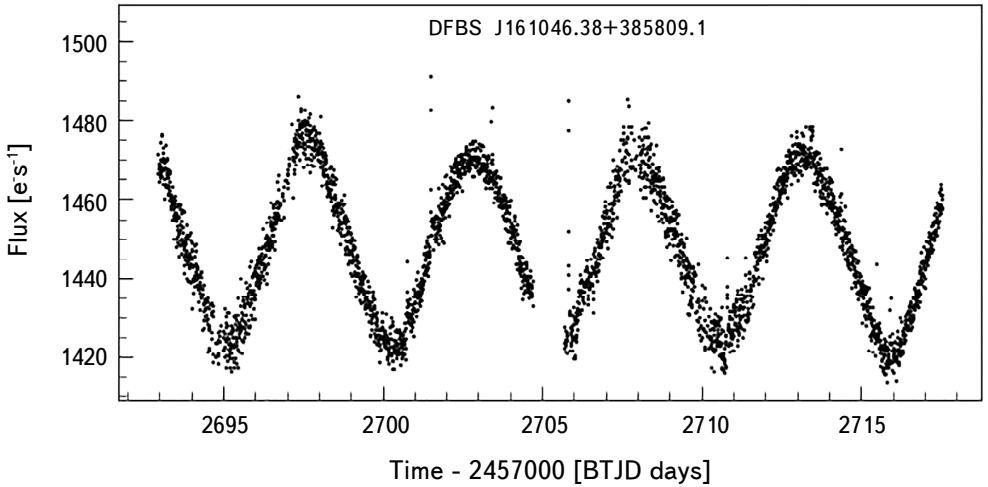


Fig.9. TESS light curve for M Dwarf DFBS J161046.38+385809.1 showing very clear rotational modulation with period $P = 5.2$ day (TIC number is 310531531, $T_{\text{eff}} = 3412$ K, $M = 0.529 M_{\odot}$, $L = 0.03463 L_{\odot}$, $r = 79.06$ pc and $V = 15.4$ mag).

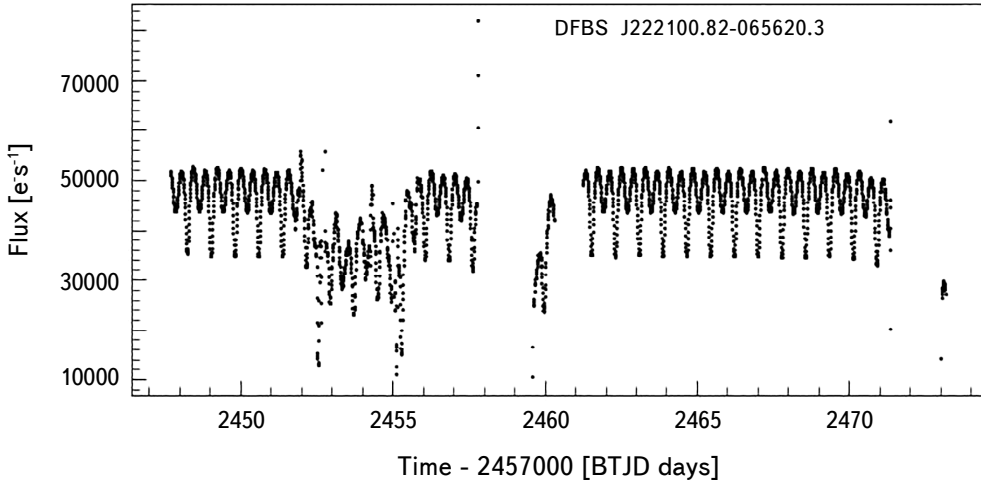


Fig.10. TESS phased light curve (not very good) for M dwarf DFBS J222100.82-065620.3 (TIC 38378875) that we classify as EA(Algol-type) eclipsing binary ($P=0.76$ d, Ampl. = 0.2 mag) where the primary and secondary eclipses are clearly visible.

5. Summary and future works. In this study we have significantly extended the previous FBS survey for LTS search. Discoveries are important, but it is very important to characterize newly confirmed objects. In order to gain more information on the LTS candidates, selected on the DFBS plates, we check Gaia DR3 BP/RP Ir spectroscopic database to confirm the spectral types of the faint objects. Despite the fact, that it is a low-resolution spectroscopic data base, it represents a good opportunity for spectral type determination. In this paper, first in this series, we present some preliminary but very important results and report newly confirmed CH type, N-type carbon stars and M giants. Some of them are more than 7 kpc above the Galactic plane and have high radial velocities. We also report on a large number of new M dwarfs confirmed in the Gaia DR3 Ir spectral database. All these faint objects were presented as LTS candidates in DFBS database before the present study. The object DFBS J172758.03+170918.0 is found to be a binary system (M dwarf + M dwarf) at a distance 89.2 pc. TESS phased light curve for M dwarf DFBS J222100.82-065620.3 (TIC 38378875) shows, that this object is EA-type eclipsing binary with period $P=0.76$ d and Ampl. = 0.2 mag. Many M dwarfs show extra flux in the IR range, this is characteristic of the circumstellar dust which mark certain stages in the life of planetary systems (protoplanetary disc, and final stage is a debris disc [29,30]). TESS light curve for M dwarf DFBS J161046.38+385809.1 shows very clear rotational modulation with period $P=5.2$ d, $M=0.529M_{\odot}$, $L=0.03463L_{\odot}$, $r=79.06$ pc and $V=15.4$ mag. It is likely that DFBS J161046.38+385809 is a rapid rotator.

This paper reports essentially on preliminary results, second paper will include the value-added DFBS LTS catalogue and will certainly be on the statistical analysis of the newly confirmed C, M giants and M dwarfs, and their color-absolute magnitude diagrams and distribution in our Galaxy. A study of the new M dwarfs flares, their multiwavelength properties, stellar activity, ages, and rotational rates, is now in progress, and the results will appear soon in the second part of this serie.

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ОЦИФРОВАННЫЙ ПЕРВЫЙ БЮРАКАНСКИЙ ОБЗОР НЕБА. ЗВЕЗДЫ КАНДИДАТЫ ПОЗДНИХ СПЕКТРАЛЬНЫХ КЛАССОВ. НОВЫЕ ПОДТВЕРЖДЕНИЯ. I

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Digitized First Byurakan Survey (DFBS) - это оцифрованная версия Первого Бюраканского обзора (FBS) или Маркарянского обзора. FBS является первым систематическим внегалактическим обзором. Он был осуществлен Б.Е.Мар-

каряном и его коллегами в 1965-1980гг. с объективной призмой с использованием 1-м телескопа Шмидта Бюраканской астрофизической обсерватории (БАО) и увенчался открытием 1517 галактик с UVX - избытком, названных галактиками Маркаряна. Пластины с результатами спектральных наблюдений низкого разрешения (lr) обзора FBS длительное время использовались для поиска и изучения слабых звезд поздних спектральных типов (LTS, M и C) звезд на высоких галактических широтах. В период с 1990 по 2016гг. были опубликованы 18 списков объектов LTS FBS. В данной работе сообщается о новых подтвержденных C и M-гигантах, а также о большом количестве M-карликов, подтвержденных данными из архива наблюдений Gaia DR3 BP/RP (спектры низкого разрешения). Часть новых подтвержденных M-карликов представляет собой двойные системы, а часть этих двойных систем является новыми затменными двойными. В наших предыдущих исследованиях спектральных данных DFBS lr они представлены как кандидаты в LTS. Для характеристики новых подтвержденных LTS используются высокоточные астрометрические и фотометрические данные Gaia и данные спутника Transiting Exoplanet Survey Satellite (TESS). Кривые блеска TESS многих новых M-карликов показывают вращательные модуляции и вспышки. Факт подтверждения большого числа совершенно новых объектов обещает существенно обогатить статистику M-гигантов, слабых AGB C-звезд N-типа, углеродных звезд CH-типа на высоких галактических широтах, а также M-карликов в окрестностях Солнца. Некоторые объекты расположены на расстоянии более 7 кпк от плоскости Галактики. Мы намереваемся представить модернизированный FBS каталог LTS объектов. Кроме того, в работе сообщается об обнаружении большого количества голубых звездных объектов с UVX-избытком, а также большого количества объектов с эмиссионными линиями.

Ключевые слова: *каталоги-звезды:углеродные звезды:M-гиганты:M-карлики: обзоры данные Gaia и TESS*

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