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Maxima Times of Selected Pulsating Variables Obtained with the IST40 Telescope

Zafer Toy[1,2] ⋆, Yasin Dalkılıç[1,2], Melike İlayda Eryılmaz[1,2], Mustafa Turan Sağlam[2], Meryem Çördük[3], Esat Akkaşoğlu[2], Canday Beyaz[1,2], Olcaytuğ Özgüllü[2], Sinan Aliş[1,2]

[1] *Istanbul University Observatory Research and Application Center, 34116 Istanbul, Turkey*
[2] *Istanbul University, Department of Astronomy and Space Sciences, Faculty of Science, 34116 Istanbul, Turkey*
[3] *Darüşşafaka Educational Institutions, 34457 Istanbul, Turkey*

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Abstract
We present 21 times of maxima of 10 δ Scuti type pulsating variables obtained from Istanbul University Observatory between 2020-2023.

Key words: stars: variables: Scuti – methods: observational – techniques: photometric

1 Introduction

In the framework of monitoring variable stars from Istanbul University Observatory, we obtained several maxima times of various pulsating variables.

Target systems were selected based on their brightness ($m_V<15$) and pulsation period ($P<1$ day). Targets were selected from the General Catalogue of Variable Stars (GCVS) (Samus' et al. 2017). As the transparency of the sky at the Beyazit Campus is very variable, we focus mainly on short period pulsators such as δ Scuti variables in order to obtain light curves or only maxima profiles for the measurements of light maxima in a single night of observation.

The variable star monitoring program is conducted as a training for the undergraduate students of the Astronomy and Space Sciences Department of Istanbul University. The program is performed mainly by the 3rd and 4th year students with an increasing interest from the junior and MSc students as well. Observations were severely disrupted during the COVID-19 epidemic, but the situation has been improving steadily since September 2022.

2 Observations and Data Reduction

All observations presented in this study were carried out with the 0.4m Schmidt-Cassegrain telescope (aka. IST40) of the Istanbul University Observatory. The telescope is located in the university campus at Beyazit, Istanbul (N 41.01167°, E 28.96528°, altitude 65 m).

Observations were performed with a thermoelectrically cooled CCD consisting a KAF-8300 chip which has 3358×2536 pixels. Pixel size of 5.4μ yields 0.27″/pixel resolution at the focal plane and this resolution allows to capture 16×12 arcminutes field of view.

All frames were bias, dark and flat-field corrected in a standard manner. Several bias and dark frames were combined in order to create a master calibration frame. Flat-fielding was done with sky flats obtained at dusk. Calibration images were obtained in each observing night. The log of observations is given in Table 1.

Instrumental magnitudes were determined with aperture photometry using *Muniwin* software of the `C-Munipack` package (Hroch 2014). Photometry procedures of the *C-Munipack* package are based on the well-known DAOPHOT (Stetson 1987) package.

Maximum times of pulsating variables were computed with the help of Peranso software (Paunzen & Vanmunster 2016) which uses Kwee and van Woerden method (Kwee & van Woerden 1956). This method requires a homogeneous temporal coverage of the maximum light with an odd number of data points forming a symmetrical profile. Rather symmetrical nature of Delta Scuti light curves making their maxima times to be measured with the K-vW method. Thus, we use the data halfway from the maximum at each side. In result, we omit maxima when the ascending or descending of the light curve is not complete. In this way, we ensure the precision of the maxima times given in Table 2. All times in the table were converted into Heliocentric Julian Date (HJD).

3 Results

Table 2 lists the maxima times that we obtain in this study. Date (UT), maximum time and its uncertainty, filter used in the acquisition of the light curve. B and V are standard Johnson filters.

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⋆ zafertoyy@gmail.com

Table 1. Log of observations. Date is in "year-month-day" format, Add 2459000 to JD Interval, Duration is in hours, VT: Variable Type, Nf: Number of frames, ET: Exposure time in seconds. Observers are as follows; YD: Yasin Dalkılıç, MTS: Mustafa Turan Sağlam, MMB: Muhammed Baki Bayram, EG: Zafer Toy, EA: Esat Akkaşoğlu, CB: Canday Beyaz, EG: Elanur Güler, RM: Rosha Manafzadeh, ANO: Aleyna Nur Öztürk, SS: Sefer Saatçi, EBU: Ebubekir Şark, MIE: Melike İlayda Eryılmaz, EEC: Elif Ece Devecioğlu, EEC: Eyüp Ensar Cesur, SE: Sena Eser, AAI: Aykut Alperen Işıktaş, VK: Vedat Keleş, FIK: Fatmanur İlayda Keleş, MG: Mustafa Gümüştaş, GO: Görkem Özgül, GY: Gamze Yüksel, MuO: Muhammet Özcan, IC: İrem Çoksert, SB: Safahan Başara, KY: Korhan Yelkenci, TD: Taha Demirtutan, MC: Meryem Çördük

Date	JD Interval	Duration	Star	VT	Nf	Filter	ET	Observers
2020-02-13	893.300329 – 893.469596	4.06	AN Lyn	δ Scuti	70	V	30	KY,MTS,MC,EEC
2022-05-19	1719.367706 – 1719.553732	4.46	YZ Boo	δ Scuti	249	Clear	30	MG,SS,EG,EA,MC
2022-06-19	1750.359603 – 1750.528195	4.05	YZ Boo	δ Scuti	460	V	20	ZT,CB
2022-07-02	1763.286445 – 1763.345677	1.42	EH Lib	δ Scuti	200	V	15	ZT,CB,YD
2022-07-19	1780.497874 – 1780.579410	1.96	BN Tri	δ Scuti	225	V	20	ANO,MAY,MIE,CB
2022-07-28	1789.308261 – 1789.506073	4.75	V2013 Aql	δ Scuti	240	V	50	EG,EA,YD,SS
2022-07-30	1791.302116 – 1791.369744	1.62	V2028 Aql	δ Scuti	144	V	30	ZT,CB,YD
2022-07-31	1792.339521 – 1792.430122	2.17	V2013 Aql	δ Scuti	87	B	50	EA,EBU
2022-08-01	1793.284587 – 1793.532317	5.95	V2013 Aql	δ Scuti	291	V	60	FIK,EED,GO
2022-08-02	1794.284973 – 1794.540105	6.12	YZ Umi	δ Scuti	385	V	45	SE,ANO,MBB,CB
2022-08-18	1810.370499 – 1810.592581	5.33	DY Peg	SX Phe	1089	V	12	EG,YD,MuO
2022-10-23	1876.483650 – 1876.587827	2.50	V0488 Gem	δ Scuti	128	V	60	YD,IC,TD,AAI
2022-11-09	1893.402688 – 1893.465863	1.52	NT Cam	δ Scuti	63	V	60	YD,VK,GY,DB
2023-02-16	1992.519060 – 1992.655697	3.28	SZ Lyn	δ Scuti	745	V	10	MTS,RM,MBB
2023-03-09	2013.459871 – 2013.546658	2.08	SZ Lyn	δ Scuti	373	V	10	RM,MTS,SB,SKA,MMB

Table 2. List of maxima times. Table lists UT date, maximum time (HJD), uncertainty of the maximum (days), filter of the observation.

Star	UT Date	T_{max}	Uncert.	Filter
AN Lyn	2020-02-13	58893.36698	0.00072	V
BN Tri	2022-07-19	59780.54896	0.00032	V
DY Peg	2022-08-18	59810.44553	0.00050	V
DY Peg	2022-08-18	59810.51870	0.00024	V
DY Peg	2022-08-18	59810.58955	0.00008	V
EH Lib	2022-07-02	59763.30273	0.00018	V
NT Cam	2022-11-09	59893.42817	0.00096	V
SZ Lyn	2023-02-16	59992.61455	0.00022	V
SZ Lyn	2023-03-09	60013.46591	0.00020	V
V0488 Gem	2022-10-23	59876.55131	0.00060	V
V2013 Aql	2022-07-28	59789.32101	0.00062	V
V2013 Aql	2022-07-28	59789.49262	0.00022	V
V2013 Aql	2022-07-31	59792.42178	0.00119	B
V2013 Aql	2022-08-01	59793.36677	0.00084	V
V2013 Aql	2022-08-01	59793.45221	0.00162	V
V2028 Aql	2022-07-30	59791.33011	0.00028	V
YZ Boo	2022-05-19	59719.41138	0.00170	Clear
YZ Boo	2022-05-19	59719.51277	0.00049	Clear
YZ Boo	2022-06-19	59750.42934	0.00032	V
YZ Boo	2022-08-02	59794.37658	0.00030	V
YZ Boo	2022-08-02	59794.47390	0.00048	V

This research made use of Peranso (www.peranso.com), a light curve and period analysis software.

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