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HD 106426, A NEW MULTIPERIODIC δ SCUTI VARIABLE

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The class of δ Scuti stars comprise of pulsating variables of spectral types A to early F with luminosity classes V to III. They pulsate in radial and nonradial p (and also g) modes with periods between about thirty minutes to eight hours and photometric amplitudes less than one magnitude (Breger et al. 2009). Most δ Scuti stars do, however, show very small amplitudes; the smaller the amplitudes become, the more variables are found, for example in space mission data of the Kepler and CoRoT missions (Balona 2014).

During a survey to detect new rapidly rotating Ap stars (Paunzen et al. 2012), we discovered the variability of HD 106426 (CP−62 2642, V = 9.31 mag). Although this star is rather bright, it was hardly investigated in the past. It is also not included in the *Hipparcos* catalogue. Houk & Cowley (1975) list a spectral type of A9 V for this object.

We observed this star in two consecutive nights 18/19 March and 19/20 March 2014 with the F(/Ph)otometric Robotic Atmospheric Monitor (FRAM) telescope of the Pierre Auger Observatory which is located in the Mendoza province in Argentina, in the vicinity of the town Malargüe. The telescope is a Meade 0.3m Schmidt-Cassegrain, with a CCD camera G4-16000 of Moravian Instruments which is also on the wide-field camera (300mm objective Nikkor). The telescope works in fully automated mode. We employed integration times of 40 seconds and a Johnson-Bessell B filter. In addition we analysed the data of the All Sky Automated Survey (ASAS) which are in the V band (Pojmanski 1997).

The basic image reduction (bias and flat correction) as well as the aperture photometry was done within the Windows version of CMunipack[1]. The final light curves of FRAM were generated using different comparison and check stars in order to guarantee the statistical significance of the intrinsic variability of HD 106426.

All light curves were examined in more detail using the Phase-Dispersion-Method within the software Peranso[2]. An analysis with a discrete Fourier algorithm gave the same frequencies and amplitudes. The observation log and the results are listed in Table 1.

[1] http://c-munipack.sourceforge.net/
[2] http://www.peranso.com/

Table 1: Observation log and results.

Source	HJD(start) 2450000+	HJD(end) 2450000+	N	Freq. [c/d]	Ampl. [mmag]
ASAS	1899.84343	5048.51607	521	11.54	11
FRAM	6735.76575	6735.88587	125	10.87	33
	6736.53343	6736.66705	112	6.48	29

The three data sets are of different time base and quality. However, we conclude from the analysis that HD 106426 is multiperiodic. Figure 1 shows the phase folded light curve of the first observing night from FRAM.

Perry (1991) published the following Strömgren $uvby\beta$ photometry for our target: $(b-y) = 0.307$, $m_1 = 0.137$, $c_1 = 0.883$, and $\beta = 2.766$, respectively. Using the photometric calibration by Napiwotzki et al. (1993) gives $E(b-y) = 0.144$ mag, $T_{\rm eff} = 7250 \pm 250$ K, $\log g = 3.65 \pm 0.15$ dex, $M_{\rm V} = 1.50 \pm 0.2$ mag, and solar metallicity. The bolometric correction and magnitude of the Sun taken from Flower (1996) yields $\log L/L_{\odot} = 1.30$ dex. Interpolating in the evolutionary grids for solar metallicity by Schaller et al. (1992), we derive a mass of about $1.9\,{\rm M}_{\odot}$ for HD 106426. It spent about 80% of its main-sequence life-time. These values are typical of an A5 V star.

Because δ Scuti stars obey a period-luminosity-color relationship, we are able to compare our results with the "heuristic" one published by Breger (1979):

$$M_{\rm V} = -3.05 \log P + 8.46\,(b-y)_0 - 3.12.$$

We used a mean logarithmic period of -1 resulting in $M_{\rm V} = 1.3$ mag. Within the errors, this value excellently agrees with that from the photometric calibration. Finally, we calculated the pulsation constant as given by Stellingwerf (1979):

$$\log Q = -6.456 + 0.5 \log g + 0.1 M_{\rm Bol} + \log T_{\rm eff} + \log P.$$

The resulting Q-value of 0.024 for our target would suggest a pulsation in the second or third overtone (Stellingwerf 1979). Further photometric and spectroscopic observations are needed to shed more light on the nature of HD 106426.

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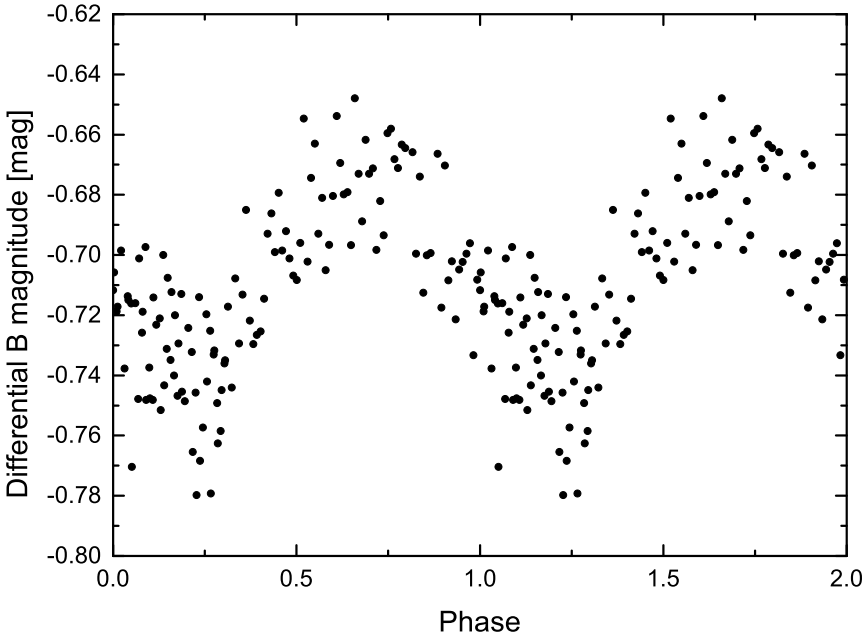

Figure 1. Folded phased light curve of the first observing night from FRAM.

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