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Brh V128 IS A DOUBLE-MODE HIGH-AMPLITUDE δ SCUTI STAR

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The star Brh V128 (= GSC 1893-89; $\alpha_{2000} = 06^{\text{h}}44^{\text{m}}01^{\text{s}}.06$; $\delta_{2000} = +22^{\circ}44'31''.7$) was detected as a short period variable by Bernhard (2003).

The star was subsequently monitored by the authors from observatories across Europe. The instruments used were 20-cm Cassegrain telescopes equipped with a Startlight Xpress SX CCD-camera (KB), an SBIG ST-7 (WQ) and an ST-6 (WP), and 40-cm Newtonian telescopes with an SBIG ST-7 (OP) and an ST10 XME camera (PVC). KB and WP observed unfiltered, all other observers used a *V* filter. OP additionally observed two nights in *R_c* and *I_c*. Comparison star magnitudes were derived from the ASAS3 database (Pojmanski, 2002). The data are available electronically through the IBVS website as 5552-t2.txt.

The observations showed that Brh V128 is a pulsating variable with a total amplitude of about 0.4 mag and two peaks in the periodogram, at 0.1177 and 0.1534 days. Folded light curves for these periods, after prewhitening for the other, are given in Figs. 1 and 2. *V* data are represented with filled circles, unfiltered data with open squares. The ratio between these periods is 0.7673 ± 0.0002 , which makes this star a member of the rare group of radially pulsating double-mode HADS (Petersen and Christensen-Dalsgaard, 1996; McNamara, 2000). Recently found examples include V575 Lyr (Van Cauteren and Wils, 2001), BQ Ind (Sterken et al., 2002) and GSC 2583-504 (Wils et al., 2003).

Using the Fourier analysis program *Period98* (Sperl, 1998), other peaks at linear combinations of the main frequencies were found as well, see Table 1 for an overview. Note that the amplitude of the first overtone frequency f_1 is slightly larger than that of the fundamental mode f_0 , unlike in most other double-mode HADS.

The proper motion of Brh V128 is small, 0.2 *mas/y* in RA and -1.6 *mas/y* in declination, according to UCAC2 (Zacharias et al., 2004). Together with the rather long period, this makes it an unlikely candidate to be an SX Phe star, but rather a Population I object.

Fig. 3 gives the Petersen diagram for the known double-mode HADS in the Milky Way, with data from the literature. The open square indicates the position of Brh V128.

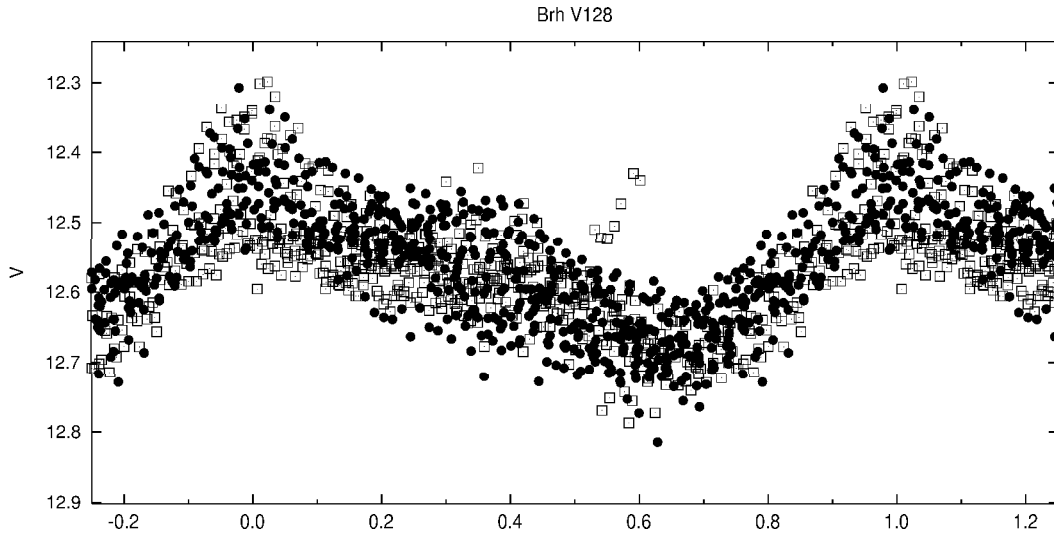


Figure 1. Phase plot for the first overtone period of 0.1177 days, after prewhitening for the fundamental period.

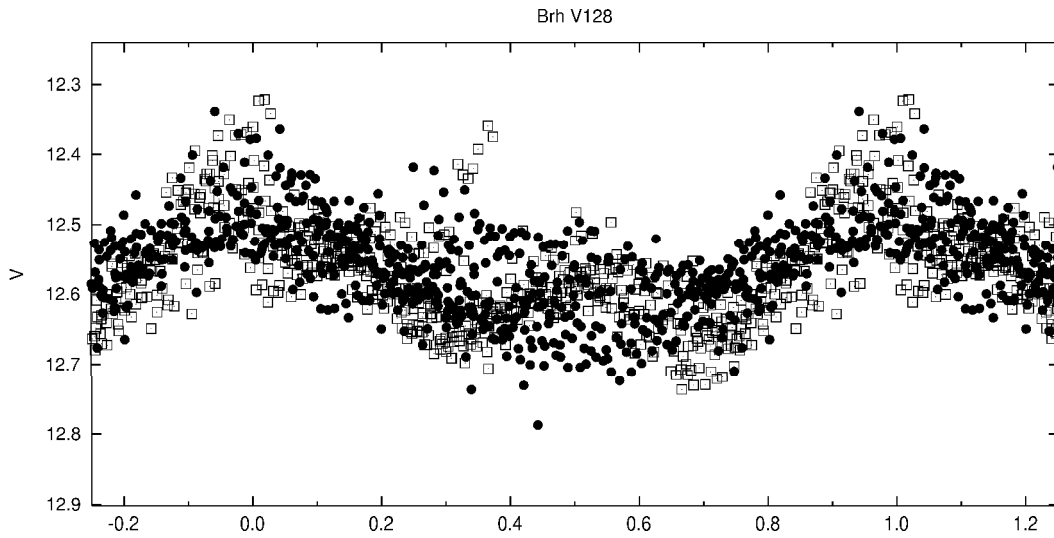


Figure 2. Phase plot for the fundamental period of 0.1534 days, after prewhitening for the first overtone.

Table 1. Frequencies detected in Brh V128

Mode	Frequency (c/d)	Semi-amplitude (mag)	Phase
f_1	8.497 ± 0.001	0.10	0.96
f_0	6.519 ± 0.001	0.07	0.71
$f_0 + f_1$	15.016 ± 0.001	0.03	0.14
$2f_1$	16.993 ± 0.001	0.03	0.40

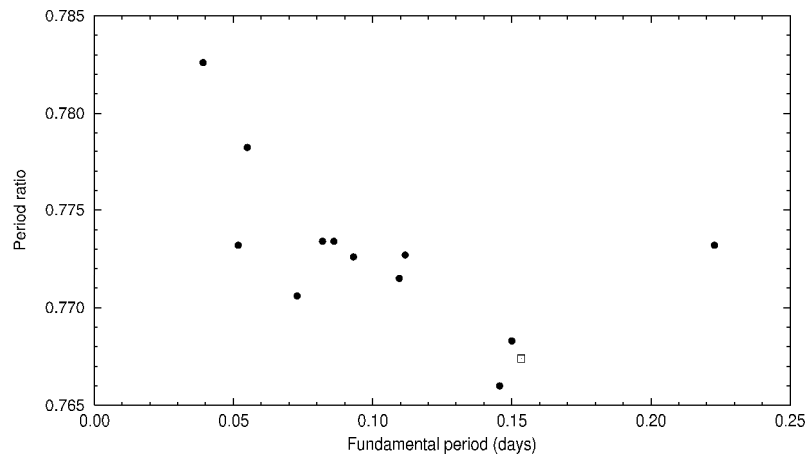


Figure 3. Petersen diagram for the Galactic double-mode HADS.

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