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DISCOVERY OF 6-MINUTE OSCILLATIONS IN HD 151878

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The rapidly oscillating Ap (roAp) stars are cool, magnetic, chemically peculiar A-type stars, pulsate with periods ranging from 4-21 minutes, and have pulsation amplitudes $\leq$ 16 mmag in Johnson B. Some of the roAp stars are of great significance to astrophysics because they allow us to study pulsation and chemical diffusion in presence of magnetic fields. Till 2006, of the 35 roAp stars known, 30 are in the southern hemisphere, and thus inaccessible with most of the astronomers from the northern hemisphere. To discover northern roAp stars, we are carrying out a survey programme entitled "Search for pulsation in chemically peculiar stars".

HD 151878 is classified as a F2 star in HD catalogue. The Strömgren indices of the star HD 151878 are $b - y = 0.225$, $m_1 = 0.234$, $c_1 = 0.684$, $\beta = 2.759$ (Hauck & Mermilliod, 1998) which indicate a strong metallicity which is generally found in Ap and Am stars. On the basis of these peculiar colours, we observed the star HD 151878 on May 30, 2007 with 104-cm Sampurnanand telescope of ARIES, Nainital, equipped with high-speed fast photometer. We were rewarded with the discovery of 6-min oscillations in the star. Further, we observed the star HD 151878 on June 01 and 03, 2007 (corresponding JDs 2454253, and 2454255) and noted the same 6-min oscillations.

As we were searching for variations in the 4-21 min range and also due to the absence of any suitable comparison star in the field, we did not observe any comparison star. The data were acquired as continuous single channel 10s integrations through a Johnson B filter. A diaphragm of 2-mm in diameter which corresponds to 30 arcsec was used to minimize the light losses arising from seeing effect and tracking drifts. The observations were interrupted, nearly every 20-30 minutes, for sky background measurements to take account of changes of sky brightness during the night as well as to check the centering of the programme star in the diaphragm.The observed data were corrected for coincidence counting losses due to the dead time of the photon counting electronics, sky background and atmospheric extinction. Because of the absence of any comparison star observations, the observed data have been normalized in the mean to zero on a nightly basis. There is always some degree of contamination of single channel high-speed photometry by sky transparency variations. The normalized nightly data were prewhitened due to some mild sky transparency variations on time scale $\geq$ 0.5 hr with caution, as they do not discriminate between the sky transparency variations and real variations in the star.

The nightly observed light curves of HD 151878 are plotted in Figure 1. Figure 2 shows the nightly amplitude spectrum of the light curve depicted in Figure 1. The amplitude spectrum of the light curve peaks strongly at 2.78 mHz (Period = 6 min) for all the three dates. It is evident from Figures 1 and 2 that the nightly observed mean amplitude of the oscillations of all the three dates are different from each other. This amplitude modulation

may be either due to excitation of different modes or due to rotation of the star. Further observations will be carried out to study rotational and multi-pulsational behaviour of this star.

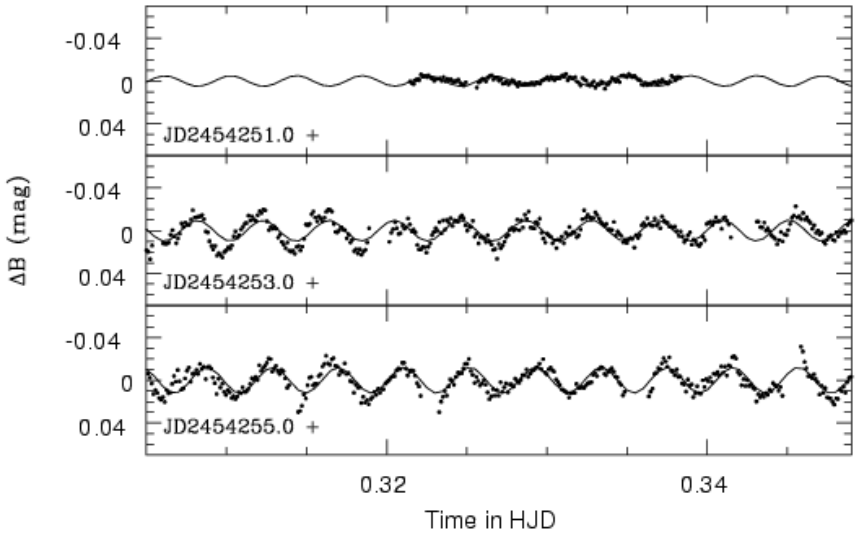

Figure 1. Discovery and confirming light curves of HD 151878 observed in Johnson B filter.

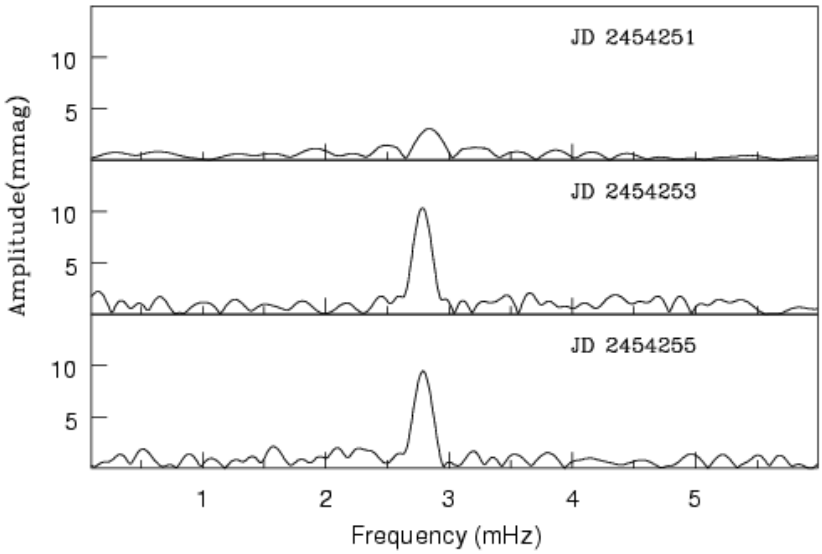

Figure 2. Amplitude spectrum of the nightly light curves depicted in Figure 1.

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Reference:

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