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Low mass stellar companions around four giant stars

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HIGHLIGHTS

- Three low-mass mass companions found around four intermediate-mass giants.
- The stellar parameters of HD1695, HD120235, HD145316 and HD200004 were derived.
- The orbital parameters of the companions are also derived.
- The most significant result is related HD120235, which have a highly eccentricity.
- The eccentricity value is the largest one known for a SB1.

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ABSTRACT

We present three low-mass and one solar mass companions found around four intermediate-mass giants HD1695, HD120235, HD145316 and HD200004 from precise radial velocity measurements using the 1.5 m Russian-Turkish Telescope (RTT150) at the TÜBİTAK National Observatory of Turkey (TUG). The stellar parameters, which are effective temperature (T_{eff}), surface gravity ($logg$) and metallicity ($[Fe/H]$), as well as rotational velocity ($vsini$) are obtained from spectral analysis. From the estimated stellar masses, the orbital parameters of the companions are also derived. We find two types of Keplerian solutions for the companion of HD120235: (1) periods 5522 days and eccentricity of $e \sim 0.93$, and (2) periods 1566 days and eccentricity of $e \sim 0.83$. From the abundances analysis HD1695 is found to be a metal-rich star with $[Fe/H] > 0.1$, while HD200004 is a metal poor star with $[Fe/H] < -0.2$. The other two stars, HD120235 and HD145316, have solar-like abundances with $[Fe/H] \sim 0.0$. Our stellar parameters and orbital solutions show that all of these stars are evolved intermediate-mass giants.

1. Introduction

The thermally stabilized iodine (I_2) gas absorption cell is one of the most powerful and widely used tool to obtain precise radial velocity (PRV) measurements of solar-type stars. In general, this absorption cell is located in front of the entrance slit of a spectrograph in order to obtain stellar and reference spectra simultaneously. I_2 provides thousands of sharp spectral lines between 5000–6000 Å that are ideal for wavelength references in spectroscopy, particularly for PRV measurements. The I_2−cell is mainly used during exoplanet searches in order to detect tiny Doppler shifts of the absorption lines due to the motion of the host star around the mass center of the star-planet system (Butler et al., 1996; Sato et al., 2002). Over 1000 exoplanets have been discovered so far (see http://exoplanet.eu), and many of these planets have been found by using I_2−cell, based on the PRV measurement technique. In addition, the I_2 cell is also used in asteroseismic studies (Frink et al., 2001) to determine low-amplitude radial velocity (RV) variations due to stellar pulsation and also to identify spectroscopic binaries.

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