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A Search for Planets and Brown Dwarfs around Subdwarf B Stars Using the Observed-Minus-Calculated(O-C) Method

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We have searched for extrasolar planets and companion stars around several pulsationally un-stable subdwarf B (sdB) stars using the Observed-minus-Calculated (O-C) method. Sub-dwarf B (sdB) stars are in the extreme horizontal branch (EHB) part of the Hertzsprung-Russell diagram. Several dozen sdB stars are known to be pulsators. Such pulsations provide a stable clock whose precision can be tested by the O-C method. A star ' s position in space may wobble due to the gravitational forces of companions and planets orbiting it. In such cases the pulsations from the star are delayed when the star is on the far side of its orbit, and vice versa. We have tracked such pulse arrival time differences in several sdB stars using the O-C method.

The main purpose of our project is to investigate how frequently such highly evolved stars have companions, and by inference how often planets survive the red giant phase of their host stars. The frequency of companions to sdB stars is also important to determining whether binary star evolution plays an important or even essential role in the origin of sdB stars.

We have monitored several stars over the past 1.5 to 10 years. Our program confirmed the existence of a known planet around V391Peg and found candidate companionss around the sdB stars PG1047+003 and PG1613+426. We have also computed the combinations of companion mass and semimajor axis that are excluded by our observational data.