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IAU STANDARD STAR HD 42397 IS A DOUBLE-LINED BINARY

Twenty years ago, it was proposed by Heard and Fehrenbach (1972) to add about twenty stars of roughly eighth magnitude to the list of stars deemed to be suitable for use as radial velocity standards. These objects were adopted as such by the IAU, and most of them are currently included in the list of standards in the Astronomical Almanac.

Although Heard and Fehrenbach presented observations of their objects obtained from three observatories over three years, and thus felt fairly confident that they had eliminated obvious variables, observations of the K-type giants on their list by Griffin (1975) showed that at least one, HD 14969, was in fact variable, and he subsequently (Griffin 1980) published a spectroscopic orbit for that object. To my knowledge, however, no further observations of those giants have been published, and none at all of the F and G dwarfs which make up the rest of the list, save for a handful reported to the IAU by Heard in 1976.

I have for some years been making occasional observations of IAU radial velocity standard stars, including those of Heard and Fehrenbach, with the radial velocity spectrometer (Fletcher et al. 1982) at the coude focus of the Dominion Astrophysical Observatory's 1.2m telescope. Unfortunately Victoria's cloudy winter skies permit only infrequent observations of objects near six hours of right ascension. Prior to 1991, as a result, I had accumulated only four observations of HD 42397, none of which suggested anything unusual.

However, on 1991 February 3 (UT), the "dip" produced by the spectrometer for HD 42397 proved to be double, indeed well resolved, with the stronger component to the red. Soon thereafter, the star moved into the daytime sky, and I was unable to observe it again until the following September. It still appeared to be double then, with slightly larger separation and the stronger component still to the red. During the fall and winter of 1991-2 the separation gradually decreased, until in 1992 April the dips were no longer fully resolved by the spectrometer. The available observations are set out in Table I.

Although the observations were obtained through several different masks, those presented above have been adjusted by small amounts, in all cases less than 1.0 km/s, in an attempt to place them all on a standard system, which is thought to be very close to the IAU (Pearce 1957) system. Some of the adjustments have been published by Fletcher et al (1982), but others are my own unpublished ones. The uncertainty of a single observation is approximately 0.5 km/s.

Clearly it is impossible to obtain orbital elements from such a limited set of data, or even predict when next the spectra will be resolved, or indeed if they will ever be resolved with the stronger component to the blue. However, by comparing the average of the four

Table I — The Observations

Hel. J.D. 2440000+	Radial Velocity (km s^{-1}) (combined)		
5246.040	37.3		
5770.762	38.0		
7073.0542	38.9		
7878.8711	38.8		
	(component A)	(component B)	
8290.7711	47.0	26.9	
8521.0253	50.9	23.2	
8530.0165	50.0	25.3	
8585.8900	49.5	24.9	
8604.9400	50.0	25.4	
8606.8655	48.4	28.9	
8730.7263	46.3		(unresolved)
8735.7202	44.3		(unresolved)

early velocities, 38.2 km/s, with the averages of the six resolved velocities for each component, 49.3 km/s and 25.8 km/s for the primary and secondary respectively, we can estimate the mass ratio to be close to 0.9, which is roughly consistent with the approximate magnitude difference of 0.5 magnitudes, estimated from the dip areas. Both dips are of about the same width, and give no suggestion of rotational broadening.

I hope to continue to observe HD 42397 occasionally, in order to obtain more information about its orbit, but am publishing this short note now to encourage others to do likewise, and to warn those who might wish to use the object as a standard. It is of course possible that the period is very long, and that the pair may be resolvable in the future by interferometric techniques, and I commend it to the attention of the appropriate observers.

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