

HIGH RESOLUTION OPTICAL SPECTRA OF 120 WHITE DWARFS

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ABSTRACT. High quality optical spectra of 120 white dwarfs have been obtained to search for double degenerate systems, some of which might become type I supernovae. No systems with high amplitude velocity variations have been found. However several exceptionally cool DA white dwarfs have been found to show weak Helium absorption lines, and four stars have split H-alpha line cores indicative of binary systems.

It is now widely believed (eg. Iben and Tutukov 1984) that short period double degenerate stars – binaries containing two white dwarfs – are the most likely progenitors of type I supernovae. Robinson and Shafter (1987) have obtained an upper limit on the space density of these systems by searching for variations in the flux measured in the wing of an absorption line. In common with Bragaglia *et al.* (1988 and these proceedings) and Foss (these proceedings), we are hoping to determine the frequency of occurrence of short period double degenerates by looking for radial velocity shifts in optical spectra.

The Palomar Observatory Hale 5m has been used with the Oke and Gunn double spectrograph to obtain simultaneous spectra of H-beta (4650-5060) and H-alpha (6250-6850). TI 800x800 CCDs were used with 35 km s^{-1} per pixel giving a resolution of 70 km s^{-1} . The wavelength ranges covered are sufficient to include the whole absorption line profile in all cases, while the resolution is just adequate to show the common sharp NLTE line cores. A signal to noise ratio of over 100 was usually obtained with integration times of about 20 minutes. Some 120 stars were observed two or three times each, giving a total of 600 spectra. By cross-correlating numerous spectra of four subdwarf flux standard stars we have found that our wavelength scale has an accuracy of 1 km s^{-1} . The velocities of the white dwarfs can be measured to an accuracy of about $1-10 \text{ km s}^{-1}$, depending on the strength of the line core. A preliminary analysis of about half of the spectra has not revealed any large velocity variations.

The spectra of eight stars which are of particular interest are shown below. The fluxes are only approximate, while the zero points for the spectra of 0501+527 and 1538+269 have been shifted up by 35000 and 30000 μJy respectively. On the left, from top to bottom, are the red spectra of stars which all show split H-alpha lines: 1036+433 (Feige 34, type sd O), WD0501+527 (G191-B2B, DA0), 2317-054 (Feige 110, sd O), and WD2256+249 (G245, DA4+dM). On the right are four stars with both H-alpha and He I $\lambda 6678.15$: WD1637+335 (L1491-027, DA5/DA6), WD1247+553 (GD319, sd B/DA4), WD1538+269 (Ton 245, sd B), and WD1430+427 (PG, DA3). These include the coolest DA stars known to show helium lines.

Bragaglia, A., Greggio, L., Renzini, A. and D'Odorico, S. 1988, *ESO Messenger*, **52**, 35.

Iben, I. and Tutukov, A.V. 1984, *Ap.J. Suppl.*, **54**, 335.

Robinson, E.L. and Shafter, A.W. 1987, *Ap.J.*, **322**, 296.

