THE SPECTRUM OF BD+67°922*

In 1943, Edith Janssen and A. N. Vyssotsky announced that the tenth-magnitude object, BD+67°922[1] showed strong emission lines of hydrogen and at least as strong an emission line of *He* II at λ 4686.[2] No absorption lines were visible on the objective-prism plates. Seven slit spectra of the star were obtained at the Mount Wilson Observatory in the two-year interval, August, 1943—July, 1945. These were described by R. E. Wilson,[3] who found emission lines of hydrogen and helium superposed on an absorption spectrum of type dG7. The radial velocity determined from the emission lines was about 11 km/sec more negative than that determined from the absorption lines. No change was detected either in velocity or in the relative intensities of the emission lines during the interval covered.

By September, 1952, when this star was observed at the McDonald Observatory, the spectrum had changed considerably. The emission continuum was now quite strong, completely masking all but the strongest absorption lines. In the region λλ 3800–5050, all possible lines of hydrogen and ionized helium were found in emission, as well as all but the weakest lines of neutral helium. The H and K lines of *Ca* II were present weakly in emission; no other element could be identified in emission. A sharp absorption K line was visible which cannot be stellar because of its small radial velocity. The Balmer continuum could be detected in emission. The strength of the ultraviolet of the star may be inferred from the fact that on a plate, well exposed in the normal photographic region, the stellar spectrum might be traced beyond λ 3300. There was no detectable change in the spectrum between September 13 and October 4.

Dr. W. P. Bidelman kindly lent me a plate of the star which he had taken in May, 1948. In addition, two plates taken by Sahade in June, 1945, were available in the Yerkes plate file. Although an accurate comparison of these plates was impossible, no striking change occurred between 1945 and 1948. Figure 1 illustrates the appearance of BD+67°922 in 1948 and in 1952, as well as two comparison stars for the 1948 plate. Even in 1948 the absorption spectrum was definitely veiled by emission, but it approximately matched the K1 II star, θ Her. However, Dr. Bidelman pointed out that the low-level line of *Fe* I at λ 4389 was present in moderate strength in BD+67°922 as well as in the high-velocity RV Tauri star, WY And, but that it is not normally found in stars earlier than M0. Most of the emission lines present in 1952 could also be detected on the 1948 plate. The blueness of the star in 1952 is shown by the strength of the region below $H\epsilon$ as compared with this region in the redder comparison stars. In addition, a trace of the underlying *CN* absorption can probably be detected near $H\zeta$.

If the various evidences of high luminosity can be trusted, the star is at a distance of about 2000 parsecs. The interstellar K line indicates that there is some gas between us and the star, but the strength of the ultraviolet regions shows that the star cannot be appreciably reddened. Since the galactic latitude of the star is 41°, the distance of the star places it more than 1000 parsecs above the galactic plane.

The available radial velocity data are summarized in Table 1. This lists for each group of lines the number of lines included, the mean velocity, and the mean error of this mean. Unfortunately, neither the 1948 nor the 1952 plates were taken for this purpose, and no standard stars are available for the determination of instrumental errors. In addition, the dispersion of 75 A/mm used for these plates limits the determination to one of low weight. However, a change in the emission velocity seems definite. In addition, the greater negative velocity derived by Wilson from the single line of *He* II is confirmed by the five lines measured on the 1952 plate.

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[1] α (1900) = 16^h1^m1; δ (1900) = +67°3′.

[2] *Pub. A.S.P.*, **55**, 244, 1943.

[3] *Pub. A.S.P.*, **55**, 282, 1943; **57**, 309, 1945.