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# DISCOVERY OF CIRCULAR POLARIZATION IN THE RED DEGENERATE STAR G99—47*

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## ABSTRACT

Circular polarization is found in the light of the cool DC white dwarf G99—47 = GR 289, varying from 0.45 percent in the ultraviolet to 0.30 percent in the near-infrared. No evidence for time variability of the polarization is found.

Broad-band optical circular polarization has been previously detected and studied in three white dwarfs: Grw+70°8247 (Kemp *et al.* 1970; Angel and Landstreet 1970; Angel, Landstreet, and Oke 1972), G195—19 (Angel and Landstreet 1971; Angel, Illing, and Landstreet 1972), and G99—37 (Landstreet and Angel 1971). In this *Letter* we report the discovery of continuum circular polarization in G99—47 = GR 289. This red degenerate star is cooler than those above, with an effective blackbody temperature of 5000°–6000° K. Greenstein finds no evidence of spectral features in photographic spectra (Greenstein, Gunn, and Kristian 1971).

Observations were made with the 50- and 84-inch (127- and 213-cm) telescopes of Kitt Peak National Observatory (1971 March 22–27 and 1972 January 8–13, respectively), and with the 82- and 107-inch (208- and 272-cm) telescopes of McDonald Observatory (1971 March 28–April 2 and November 19–22, and 1971 November 15–19, respectively), using the Cassegrain Pockels cell polarimeter described by Angel and Landstreet (1970) with bialkali, S-20, and gallium arsenide photomultipliers. Broad wavelength bands were isolated with various combinations of glass filter and photocathode. All measurements were reduced in the same way as previous observations with this instrument (Angel and Landstreet 1971).

Circular polarization measurements were made on 14 separate nights over a 10-month interval, typically taking half an hour and having a standard error $\lesssim 0.1$ percent. The statistical distribution of the available data has been examined to detect possible time variation; there is no evidence suggesting variability with an amplitude greater than about 0.15 percent for periods between an hour and a year. To search for short-period variability, one run in the band 3500–5200 Å was printed out every 5.5 s for 78 minutes and subsequently Fourier-analyzed. No significant variability was found for any period between 11 seconds and $2\frac{1}{2}$ hours; periodic variation with an amplitude of 0.17 percent would certainly have been detected.

The wavelength dependence of polarization is shown in figure 1. Each point repre-

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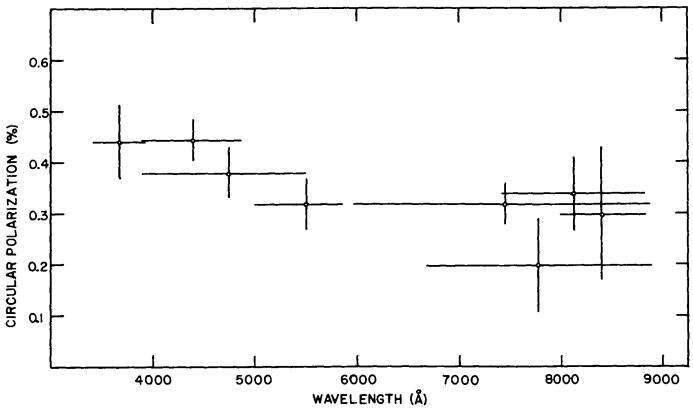


FIG. 1.—Wavelength dependence of circular polarization in G99—47. The sign of the polarization is positive, opposite to that of Grw+70°8247.

sents the weighted mean of all observations in that wavelength band. The horizontal error bars show the width between half-power points of the sensitivity curves of the bands used, while the vertical error bars denote the standard errors of measurement.

Two measurements of linear polarization were made. The measured values in percent are $p_x = p \cos 2\theta_e = 0.17 \pm 0.09$, $p_y = p \sin 2\theta_e = -0.20 \pm 0.09$ in the band 3900–5550 Å; and $P_x = -0.15 \pm 0.09$, $P_y = 0.00 \pm 0.09$ in the band 3500–8800 Å. Thus this white dwarf is similar to the other three with circular polarization, all of which show linear polarization which is weaker than the circular component or undetectable.

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