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ON THE VISIBLE-BAND POLARIZATION OF HR 1099A

HR 1099 (HD 22468) is also ADS 2644. The bright member of this visual pair has been studied as a double-line spectroscopic binary by Bopp and Fekel (1976) who identify it as the brightest member of the class of RS CVn-type systems (Hall 1977). From the small mass functions, it is clear that eclipses do not occur, but small amplitude light variations observed by Landis and Hall (1976) repeat in a period somewhat shorter than the spectroscopic one. Owen (1976) has shown HR 1099 to be a radio variable at two frequencies.

Since Pfeiffer and Koch (1973) had already shown RS CVn itself to be a polarization variable and since HR 1099 was to be the subject of an intensive observing campaign in the fall and winter of 1976, we decided to add the latter star to the Pennsylvania polarization program. For present purposes the instrument is adequately described in Koch and Pfeiffer (1976), which reference also gives the notation for the journal of observations in Table I. It was never possible to isolate ADS 2644A in the focal plane diaphragm. The effective wavelengths, given in Table I and developed by the procedure expressed in Koch and Pfeiffer, refer, however, to this component. It is not known how much ADS 2644B, which is about 3 magnitudes fainter than ADS 2644A, would alter these effective wavelengths or the polarization parameters. Although it must be admitted that the evidence for the orbital eccentricity is not strong, phases have been computed from the spectroscopic

ephemeris:

$$T_o = 2442763.909 + 2.83782E$$

Because the polarization entries of Table I are small and typically less than three times their probable errors, values of Θ_E are not listed in the table.

Within the precision of the measures, no variability exists for the present red, green and blue measures. The only indication of variability occurs for the U-parameter of the ultraviolet observations, and only one night showed a non-zero result.

Since HR 1099 is within 50 parsecs of the sun and near a galactic latitude of -45°, there is likely to be no significant interstellar component of polarization. This is borne out by the summary of Mathewson and Ford (1970). The present observations, therefore, lead to the conclusion that HR 1099 commonly has an intrinsic visible-band polarization no greater than about 0.02%. If one accepts the radii of Bopp and Fekel, the surface-to-surface separation of the component stars is of the order 5 $R_{\odot}$, and an unpolarized condition is consistent with the generality developed by Pfeiffer and Koch (1977).

It is interesting to note that another RS CVn-type binary, AR Lac, (Popper 1976) has also shown no intrinsic visible-band polarization (Pfeiffer and Koch 1977). Of the three members of the RS CVn-type studied thus far, only the prototype has shown intrinsic polarization.

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TABLE I. Linear Polarization Measures for HR 1099.

J.D. (hel.) -2443000	Phase	Q(%)	U(%)	P(%)
λ(eff.) = 7470 Å, FWHM = 210 Å, t = 480 sec., T = 1020 sec.				
64.826	0.040	-0.20(.10)	+0.04(.10)	0.20(.09)
102.655	0.371	-0.16(.13)	-0.39(.13)	0.41(.13)
λ(eff.) = 6570 Å, FWHM = 910 Å, t = 480 sec., T = 1020 sec.				
62.835	0.338	-0.02(.03)	+0.05(.03)	0.05(.03)
102.579	0.344	-0.04(.04)	-0.04(.04)	0.06(.04)
110.569	0.159	+0.00(.02)	+0.03(.02)	0.03(.02)
λ(eff.) = 5390 Å, FWHM = 830 Å, t = 480 sec., T = 1020 sec.				
62.780	0.318	+0.06(.04)	+0.06(.04)	0.08(.04)
102.603	0.352	-0.03(.03)	-0.02(.03)	0.04(.03)
λ(eff.) = 4370 Å, FWHM = 830 Å, t = 480 sec., T = 1020 sec.				
62.808	0.328	-0.08(.04)	-0.03(.04)	0.09(.04)
64.804	0.032	+0.09(.04)	+0.05(.04)	0.10(.04)
66.783	0.729	-0.06(.04)	+0.09(.04)	0.11(.04)
78.713	0.933	-0.01(.04)	+0.10(.04)	0.10(.04)
88.686	0.448	-0.06(.06)	-0.02(.06)	0.06(.06)
99.742	0.344	+0.03(.04)	-0.04(.04)	0.05(.04)
102.627	0.360	-0.00(.04)	+0.04(.04)	0.03(.04)
117.706	0.674	-0.01(.04)	+0.04(.04)	0.04(.04)
λ(eff.) = 3710 Å, FWHM = 290 Å, t = 1920 sec., T = 2800 sec.				
102.687	0.380	+0.17(.20)	-0.18(.20)	0.25(.20)
117.749	0.688	-0.33(.17)	-0.91(.17)	0.97(.17)
200.533	0.859	+0.03(.10)	+0.09(.10)	0.10(.10)

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