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POLARIMETRY OF SELECTED SPECTROSCOPIC BINARIES

In an ongoing broad-band photoelectric investigation of linear polarization, eighteen spectroscopic binaries have been surveyed to date. All observations have been made with the Pennsylvania two-channel polarimeter (Wolf 1972) attached to the 72-cm cassegrain reflector. The observational and reduction methods are adaptations of those of Clarke (1965). The results have been freed of the instrumental polarization by the usual technique of observing standard unpolarized stars (Serkowski 1965, 1968).

In the accompanying table we summarize the limits of the observations obtained thus far. The successive columns give:
1, the HD number if available;
2, the binary name;
3 and 4, the filter and the number of observations with that filter, respectively;
5, the minimum observed polarization and its probable error;
6, the maximum observed polarization and its probable error;
7, the minimum observed angle of the plane of polarization in the equatorial system and its probable error; and
8, the maximum observed angle of the plane of polarization in the equatorial system and its probable error.

For a given filter, the values of θ_E^m and θ_E^M do not necessarily correspond to the tabulated values of P_m and P_M. The intention here is to demonstrate the ranges in measured values of P and θ in order to indicate whether an object displays variable polarization. If P is very small or has a large probable error, the result is an indeterminate value for θ_E.

The observations suggest that LY Aur, SZ Cam, RS CVn, SX Cas, AO Cas, KS Per, o Per, ϕ Per, υ Sgr, and ζ Tau exhibit time - dependent polarization. This is interpreted to mean that in addition to any interstellar component, these systems possess at least one intrinsic component of polarization. Variable components of polarization for LY Aur, SZ Cam, RS CVn, SX Cas, AO Cas, KS Per, and o Per have not been detected before. For AO Cas, the observations indicate

that this binary possesses an asymmetric, homogeneous, systemic electron-scattering envelope and that the change in polarization arises from a combination of the variations in the stellar flux and apparent geometry of the envelope as the system revolves and rotates.

Although the observations are few, there are intimations that WW Aur, YY Gem, and Plaskett's star may also possess time-dependent intrinsic components of polarization and hence some sorts of distribution of scattering circumstellar material. In the case of YY Gem, a variable component of intrinsic polarization may be indicative of some vestige of pre-main-sequence activity.

Within the observational errors, α And, β Aur, β Per, BD+16°516, and TX UMa appear to have no variable component of polarization. In fact, β Aur and β Per seem to possess negligibly small polarization.

The wavelength dependences of the polarization for υ Sgr and ζ Tau agree with Coyne and Kruszewski's (1969) results but at this time we make no comment concerning the dependence for AO Cas and LY Aur.

Polarimetric observations are continuing for all the above systems and additional objects are being added to the survey.

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HD	BINARY	FIL.	n	P_m(%)	P_M(%)	θ_E^m	θ_E^M	Remark
358	α And	V	3	0.17± 0.08	0.32±0.05	4°± 13°	176°± 4°	
1337	AO Cas	U	2	0.52 0.08	0.66 0.04	42 2	49 3	
1337	AO Cas	B	7	0.55 0.09	0.73 0.07	30 4	43 2	var.
1337	AO Cas	V	16	0.58 0.05	0.87 0.05	41 3	57 3	var.
1337	AO Cas	R	1	0.41 0.07	----	38 4	----	
10516	φ Per	V	10	0.77 0.07	1.42 0.12	32 2	83 3	var.
19356	β Per	V	2	0.08 0.07	0.14 0.06	69 12	93 24	
23180	σ Per	B	3	0.46 0.05	0.76 0.08	23 5	26 3	var.
23180	σ Per	V	10	0.31 0.07	0.58 0.06	17 4	34 4	var.
---	+16° 516	R	2	0.20 0.21	0.40 0.15	28 31	159 11	
25638	SZ Cam	V	4	6.20 0.07	6.44 0.07	140.2 0.3	141.1 0.3	var.
30353	KS Per	V	6	1.84 0.09	2.18 0.12	147 1	161 1	var.
35921	LY Aur	U	1	1.75 0.11	----	147 2	----	
35921	LY Aur	B	1	2.12 0.10	----	144 1	----	
35921	LY Aur	V	10	1.49 0.07	2.01 0.06	140 1	147.4 0.7	var.
35921	LY Aur	R	2	1.37. 0.12	1.78 0.11	140 2	144 2	var.
37202	ζ Tau	U	2	1.08 0.09	1.13 0.06	26 2	28 2	
37202	ζ Tau	B	2	1.44 0.06	1.45 0.06	29 1	34 1	
37202	ζ Tau	V	11	0.93 0.08	1.35 0.04	23 3	34 1	var.
37202	ζ Tau	R	9	1.03 0.05	1.34 0.06	29 2	36 1	var.
40183	β Aur	V	2	0.05 0.08	0.12 0.06	78 43	91 13	
40183	β Aur	R	1	0.03 0.06	----	83 55	----	
46052	WW Aur	V	3	0.08 0.05	0.25 0.04	27 15	126 10	var.
47129	Plaskett's	V	3	0.88 0.08	0.99 0.05	141 3	158 3	var.
---	YY Gem	R	2	0.27 0.08	0.97 0.11	65 8	132 3	var.
93033	TX UMa	B	2	0.08 0.07	0.15 0.03	16 30	167 6	
93033	TX UMa	V	3	0.07 0.07	0.23 0.06	23 11	80 34	
114519	RS CVn	V	8	0.06 0.06	0.58 0.11	46 12	143 20	var.
181615	υ Sgr	U	2	0.72 0.13	0.89 0.05	163 2	172 5	
181615	υ Sgr	B	3	0.93±0.08	1.10±0.11	157 ± 2	172 ± 3	var.
181615	υSgr	V	3	0.82±0.07	1.01±0.05	173 ± 3	176 ± 2	var.
181615	υSgr	R	2	0.73 0.07	0.80 0.08	176 3	177 3	
232121	SX Cas	B	1	0.76 0.15	----	61 5	----	
232121	SX Cas	V	4	0.36 0.08	0.77 0.10	0 6	47 5	var.
232121	SX Cas	R	16	0.27± 0.10	0.88±0.08	22°± 5°	59°± 10°	var.