PHOTOMETRY AND ANALYSIS OF THE STAR HD 199497

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Abstract. Two-colour photoelectric observations of the new eclipsing binary HD 199497 are presented. Our observations confirm that the system is a W UMa type eclipsing binary. The light curves were analysed with the Wilson-Devinney approach. The system is found to be in contact configuration. The inclination is amazingly small. Although there are no spectroscopic data, the photometric mass ratio of the system is well determined.

1. Introduction

HD 199497 = BD + 19° 4574 = AGK3 + 19° 2119 was first discovered to be a possible W UMa type eclipsing binary from its appearance on objective-prisms plates in 1966, and then observed photoelectrically by Bond (1976). He used the y filter of Strömgren's four-colour system and obtained 24 photoelectric observational points. These observations showed that HD 199497 is a new W UMa type eclipsing system, with a range of 0.15 mag. and a period of 0.3638 day.

TABLE I
The data a for variable, comparison, and check stars

<table>
<thead>
<tr>
<th>Star</th>
<th>AGK 3 No.</th>
<th>mpeg</th>
<th>Sp.</th>
<th>α (1950)</th>
<th>δ (1950)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BD 19° 4575 (var.)</td>
<td>19° 2119</td>
<td>8°8</td>
<td>G5</td>
<td>20°54'53''</td>
<td>19°27'20''</td>
</tr>
<tr>
<td>BD 19° 4568 (comp.)</td>
<td>19 2118</td>
<td>9.5</td>
<td>K0</td>
<td>20 53 52</td>
<td>19 38 50</td>
</tr>
<tr>
<td>BD 19° 4576 (check)</td>
<td>19 2120</td>
<td>9.2</td>
<td>K0</td>
<td>20 55 08</td>
<td>19 57 57</td>
</tr>
</tbody>
</table>

2. Observations

Since no other detailed knowledge is available for this recently discovered binary, it was taken into our observational program. Photoelectric observations of HD 199497 were made with the 48 cm Cassegrain telescope of the Ege University Observatory on six nights in the summer of 1982. During the observations an unrefrigerated EMI 9781A photomultiplier tube and B, V filters close to the standard UBV system were used. The comparison star, BD + 19° 4568 showed no significant variations against the check stars, BD + 19° 4576. The data relating to the variable, comparison, and check stars are given in Table I.

A total of 194 blue and yellow observational points were obtained. The atmospheric extinction coefficients in separate colours for each night were calculated from the
observations of the comparison star using conventional methods. Then, all the differential observations (variable minus comparison) were corrected for differential extinction. The probable error of a single observation was estimated to be $\pm 0.006$ in blue and $\pm 0.007$ in yellow. The individual observations are given in Table II.

During the observations three primary and four secondary minima were obtained and the new light elements were published by Sezer et al. (1984) as follows:

$$J.D.\ Hel.\ Min. I = 2445\, 146.4091 + 0.363\, 8368E,$$

$$\pm 9 \quad \pm 4$$

The light and colour curves are presented in Figure 1. The phases in Table II and in Figure 1 are calculated with these new light elements.

![Differential B and V light and B - V colour curves of HD 199497.](image)

**Fig. 1.** Differential $B$ and $V$ light and $B - V$ colour curves of HD 199497.

### 3. Photometric Solution

We adopted the Wilson and Devinney (1971) method for our study. This method has been described by many authors (Wilson and Biermann, 1976; Leung and Wilson, 1977; Leung and Schneider, 1977; Wilson, 1979). The most modern version of the program, which includes corrections and improvements up to November 1983, has been developed by Wilson (1984), and has been used for our solutions. The method assumes the star surfaces to be equipotentials and computes the light curve as a function of the following parameters: $i$ (inclination); $\Omega_{h,c}$ (surface potentials); $T_{h,c}$ (polar tempera-