ASTROMETRIC STANDARD FIELDS FOR CCD OBSERVATIONS OF DOUBLE STARS

D. SINACHOPOULOS[1], E. OBLAK[2], M. GEFFERT[3], J. COLIN[4], J.-F. LeCAMPION[4] and U. HOPP[5]

[1] *Royal Belgian Observatory, Av. Circulaire 3, B-1180 Bruxelles, Belgium*

[2] *Observatoire de Besançon, 41 bis, Avenue de L'Observatoire, F-25010 Besançon, France*

[3] *Sternwarte der Universität Bonn, W-5568 Daun, Germany*

[4] *Observatoire de Bordeaux, F-33270, France*

[5] *Max-Planck-Institut für Astronomie, Königsstuhl 17, W-6900 Heidelberg 1, Germany*

1. Photometry of Double Stars

The number of known double stars is steadily increasing, thanks to ground-based and space observations. Therefore the ratio of known double to single stars has to be revised upwards continuously. With the Hipparcos parallaxes it will be possible to get stellar statistics for precisely defined volumes of space. This will lead to strong constraints on all astrophysical calibrations of masses, spectral types and luminosities in the solar neighbourhood. A European network of laboratories was created in August 1990 in order to remedy the lack of photometric data for close visual double stars. This network intends to study all aspects of formation and evolution of double and multiple star systems. The immediate goal of the group is to provide the scientific community with a compilation of known photometric data on a large selection of close visual double stars and to significantly enlarge this information by new observations with modern devices. A photometric database of stellar systems is being compiled from most widely used photometric systems in collaboration with the 'Centre de Données Stellaires' of Strasbourg.

2. The Astrometric Calibration

CCD frames of double stars normally have only small fields. Therefore an astrometric reduction with reference stars for the determination of position angle and separation of the components is not possible. Instead of that, the calibration has to be done by means of observations of test fields from which the scale and orientation of the frames may be determined. Instead of the standard double stars widely used recently, we have started to provide observers with astrometric standard fields. These fields are spread uniformly over a strip of the sky with α = 0h to 24h and δ between +20° and –20°. They contain 3 to 30 stars within a field of 2′ x 3′ for a reliable calibration of the CCD-frames. Recently we have chosen eight fields. The data were taken partly from the literature or from measurement of new and old plates taken at the (D = 0.3 m,

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f = 5.13 m) photographic tube of the double refractor of Bonn (now located at Hoher List observatory). Only fields which have at least three bright stars (V < 14) with precise positions ($\sigma < 0''.05$) and proper motions ($\sigma < 0''.3/100a$) have been taken into account. Dense open cluster fields like the central field of M 67 (Girard et al. 1989) seem to be most suited, because they contain many well separated stars in a small field. The use of the outer parts of globular clusters is an alternative solution, although there may exist crowding problems. For the fields with low star density (3C 17, NGC 1647, 3C 273), we will provide two or three subfields with two or three calibration stars each.

Table 1. The astrometric test fields

Field	α_{2000}	δ_{2000}	Reference
3C 17	00h 38m	-02°07′	New Measurements
NGC 1647	04h 45m	+19°07′	Geffert et al. 1992
NGC 2323	07h 42m	-14°49′	New Measurements
M 67	08h 50m	+11°49′	Girard et al. 1989
3C 273	12h 28m	+02°03′	Geffert et al. 1992
M 12	16h 47m	-01°57′	Geffert et al. 1992
M 16	18h 19m	-13°47′	Tucholke et al. 1986
M 15	21h 30m	+12°10′	New Measurements

3. An Example: The M 15 Field

M 15 is a globular cluster for which we have already published an astrometric catalogue (LeCampion et al. 1992). The central part of this catalogue was used to reduce measurements of four test plates taken with the 3.5 m telescope at Calar Alto in 1983 and scanned with the PDS in Münster. Our resulting catalogue has about 150 stars with a positional accuracy of $0''.01$ within a field of 15′ x 15′, from which we may choose suited subfields. The final catalogue will be improved by CCD frames taken at the 60 cm telescope at the Observatoire de Bordeaux.

4. Future Aspects

We are planning to provide additional fields in other declination zones. The finding charts and coordinates of our fields are available on request.

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