# TESTING THE ASTROMETRIC ACCURACY OF THE 2m TELESCOPE OF ROZHEN OBSERVATORY AFTER CHANGING THE PRIME MIRROR

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ABSTRACT. The astrometric accuracy of the recent configuration of the (D=2m, f=16.5m) RC telescope of the Rozhen obesrvatory (Bulgaria) was tested. We compared x and y positions from a plate of the RC telescpe with positions obtained from a plate of the (D=0.7m,f=3m) CERGA Schmidt telescope at CERGA (France).The positions coincided on a level of 0.09 arcsec, which is caused mainly by the error of the measurements of the CERGA plate.

## INTRODUCTION

This investigation has a long history. It began in 1981.Then the first of the authors was in agreement with prof .J.Kovalevsky that the astrometric characteristics of the field of the 2m RC telescope at Bulgarian National Observatory could be determined using plates,taken with the CERGA Schmidt telescope. As it is well known a astrometric test of a telescope can be done by comparison of measurements from plates of that telescope with corresponding ones from a telescope which is known to be of good astrometric quality. The observations were carried out by the French colleagues but the plates were not jet received in Bulgaria, owing to the "competence" of the "special authorities" of the Bulgarian Embassy in Paris. And the history started again. In 1987, Nov. 17, only one plate was taken on the CERGA Schmidt telescope by V. Shkodrov and C. Pollas. The coordinates of the 1909 plate center are RA = $3^h59^m40.0^s$, D = $+41^o47'39.99"$.The area culminate near to the zeniths of the two telescopes at CERGA and in Rozhen. The plate had III a-J emulsion with hypersensitization 310. The exposure time was $51^m$. At the same time the changing of the mirror of 2m Rozhen telescope again delayed the realization of the test problem.It continued from the beginning of 1988 till the summer of 1989,so we succeeded to take plates of the same area at the end of 1989. Among the Rozhen plates we used only plate 1577, taken on October 27,1989. Kodak III a-O emultion with a GG385 filter was used. The exposur time was $60^m$. The coordinates of the plate

https://doi.org/10.1017/S0252921100064186 Published online by Cambridge University Press

center are RA = $04^h01^m41^s$ D = $+42^o16'59"$.

## COMPARISON OF THE PLATES

On the Rozhen plate 121 stars equally distributed over the plate and nearly of the same magnitude have been marked for the comparison. They were also found on the CERGA plate. The CERGA plate was measured on the ZEISS Ascorecord of Rozhen observatory by Shkodrov and Ivanova.For each star four settings were done. The mean error of the mean was $\pm 2.0\mu$. In addition, on the CERGA plate also 50 reference stars from the AGK3 equally distributed over the plate have been measured. They were used for the transformation of the rectangular coordinates into spherical coordinates $\alpha$ and $\delta$. For this transformation we had to use a reduction model with terms up to the third order of the rectangular coordinates x and y. The deviations of the measuremants from the catalogue for different reduction models are given in Table 1.

Table 1. Mean deviations of measurements from the AGK3 positions for diferent reduction models.

| Reduction model with | $\Delta X(\mu)$ | $\Delta Y(\mu)$ |
|---|---|---|
| linear terms | 16 | 16 |
| +quadratic terms | 13 | 13 |
| +cubic terms | 6 | 7 |

The internal error of the catalogue from two independent measurements of the CERGA plate was of the order of ± 0.08 arcsec.

The Rozhen plate was independently measured by both of us at the ASCORECORD of Hoher List Observatory (Geffert, 1986). We measured the plate in four orientations.The measuremants of $0^o$ (respectively $90^o$) were transformed into the corresponding ones in a $180^o$ ($270^o$) orientation and the mean was taken. After that a mean of the two measuremants ($0^o/180^o$ and $90^o/270^o$) was determined for each of us.The mean differances of the various comparisons are given in Table 2.

Table 2. Comparisons of measurements of the Rozhen plate

| Measurement 1 | Measurement 2 | $\Delta X(\mu)$ | $\Delta Y(\mu)$ |
|---|---|---|---|
| Gef $0^o$ | Gef $180^o$ | 4 | 6 |
| Gef $90^o$ | Gef $270^o$ | 4 | 6 |
| Gef $0^o/180^o$ | Gef $90^o/270^o$ | 4 | 6 |
| Shk $0^o$ | Shk $180^o$ | 6 | 10 |
| Shk $90^o$ | Shk $270^o$ | 9 | 9 |
| Shk $0^o/180^o$ | Shk $90^o/270^o$ | 6 | 5 |
| Mean Shk | Mean Gef | 3 | 2 |

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Table 2 indicates that the systematic errors can be reduced by measuring the plate in all four orientations. Since the errors in this table were caused by both measurements, the mean accuracy of our independent mean measurements was better than 2$\mu$ which is an excellent value for the visual centering of large star images.

Comparison of our measurements with the catalogue obtained from the CERGA plate led to large ( >100$\mu$) deviations for reduction models with linear and quadratic terms of the rectangular coordinates. Only the reduction with third order polynomials resulted in errors of 6$\mu$ (in $\alpha$) and 7$\mu$ (in $\delta$) which correspond to 0.07 and 0.08 arcsec for a focal length of 16.5m.

## DISCUSSION

If we compare these deviations of 0.07/0.08 arcsec with the 0.08 arcsec internal error of the positions obtained from the CERGA plate, the Rozhen telescope can be used for further precise astrometric work.

## REFERENCES

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https://doi.org/10.1017/S0252921100064186 Published online by Cambridge University Press