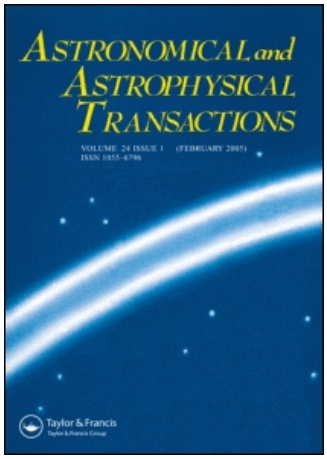

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THE AXIAL MERIDIAN CIRCLE OF THE NIKOLAEV ASTRONOMICAL OBSERVATORY

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We discuss current studies performed at the Nikolaev AMC and trial star observations. Astrometrical capabilities of the AMC are considered.

The Nikolaev axial meridian circle (AMC) is devised for the determination of coordinates of celestial bodies.

The design of the AMC includes a horizontal telescope (D=180 mm, F= 2500 mm, two lenses) in the prime vertical and fixed aligned vacuum collimator (D=180 mm, F=12500 mm) (see Figure 1). The telescope, together with the citall pentag before objective, can rotate around its optical axis to allow observations (Shornikov *et al.*, 1990, 1991). The AMC will be equiped with a computer control system including a CCD eyepiece micrometer, automatic setting and reading systems, meteorological data collection and time service. The expected accuracy of the automatic AMC with allowance for systematic errors will not be worse than $0.02 \div 0.03$ arcsec (Pinigin and Shornikov, 1983).

For a first investigations of the AMC system, visual measuring devices were used.

The collimation of the AMC is stable in time and with temperature and can be described by $C = C_0 + a \cdot t$, where $t[C]$ is the environmental air temperature, $C_0 = 12\overset{''}{.}705 \bullet 0\overset{''}{.}099$ and $a = 0\overset{''}{.}026 \pm 0\overset{''}{.}008$.

The earlier value of the horizontal flexure (b) did not exceed $0\overset{''}{.}22 \pm 0\overset{''}{.}08$ in the temperature range $-7.^0 \div +4.8°C$. The best value of the horizontal flexure derived from investigations in 1993 in the temperature range $+14° \div +22°$ is $b = 0\overset{''}{.}090 \pm 0\overset{''}{.}075$.

An attempt was made to study the orientation of the long focus collimator AMC. Variations in inclination and azimuth with temperature are of the order of $0\overset{''}{.}2$ for 1°C.

Trial measurements of right ascension for FK5 stars allow to estimate the precision of a single visual measurement to be about $\pm 0^s.018 (sec\ \delta)^{0.4} (sec\ z)^{0.8}$. Variations of $\Delta\alpha_\delta \cdot \cos(\delta)$ with temperature derived from trial observations of the FK5

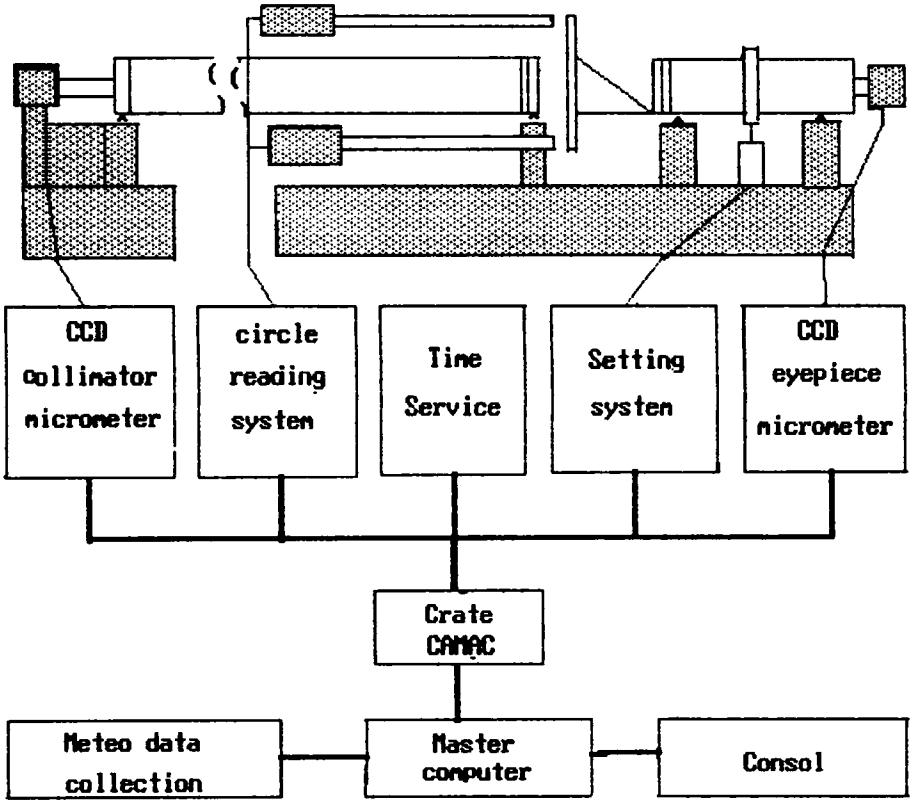

Figure 1 The principal scheme of Nikolaev AMC with the Computer Control System.

stars are at the mean error level of the visual detection. At present, trial observations of FK5 stellar declinations are made too.

The Nikolaev AMC allows to determine coordinates of celestial bodies by differential and absolute methods. The expected capabilities of the fully automatic AMC will make it useful for:

(1) improvement of the FK5 system;

(2) extension of the stellar reference frame (RF) for fainter magnitudes;

(3) establishment of a link between the optical stellar RF and extragalactic radio RF.

Considering the latter, we note that the difference between the optical and radio RFs in more than 10 mag being too large for linking the two RFs directly by photographic method at a sufficiently high accuracy level. Thus, one should establish a new intermediate coordinate system (ICS) for stars in the magnitude interval 14–15 and a dense array of about 100 stars/sq.deg. grouped around the radio sources. The important peculiarity of the ICS is a high internal differential accuracy of about 0.01 arcsec for the stars included in the fields.

On the other hand, it should be noted that absolute observations are required for the determination of a possible unknown rotation of the stellar RF.

These tasks can be solved only with a specialized astrometric telescope whose magnitude limitation has to be 15 mag; its instrumental stability and position accuracy must not be worse than 0.02 arcsec; the telescope must be furnished with a computer control system and modern detection equipment. All this conditions will be met at the Nikolaev AMC after its full automation.

The experimental investigations and observations of stars with the Nikolaev AMC are suggested perspectives and advantages of the horizontal astrometric telescope design. At present, the main task is a quick completion of the AMC automation and commencement of its operation.

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