ON THE CURRENT STATE OF THE MAHIS CONSTRUCTION

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ABSTRACT. Information on the recent results of the tests of the mirror, measuring equipments and computer control is given. The astrometrical capabilities of the MAHIS are considered.

The first information about construction and work on the Sukharev meridian automatic horizontal instrument (MAHIS) by the Pulkovo, Nikolaev and Kazan astronomical observatories was given at the IAU Simposium 141 (Gumerov et al. 1990). During the last years the investigation of the pilot models of main devices was done.

The model of silicon carbide (SiC) flat mirror was manufactured by the Institute of superhard materials of the Ukrainian Academy of Sciences. The reflecting surface coincides with the rotation axis of the mirror. The investigation showed quite good stability of the mirror. The collimation of the mirror can be discribed by the formula

$C_t = C_o + a \cdot t$, where t [°C] is the air temperature,

$C_o = 4\overset{''}{.}585 \pm 0.020$, $a = -0\overset{''}{.}020 \pm 0.004$.

19 sets of measurements were used in the temperature range from -15° to +25° C for determing the coefficients C_o,a.

The computer control connects the telescope setting, circle reading, automatic micrometers, meteorological data collection and time service into a complex. During the investigations of these devices the following results were obtained:

1) the accuracy of setting of the mirror is about ±1";

2) the accuracy of one circle reading made with a microscope is $\pm 0\overset{''}{.}03$. There are six microscopes for one glass divided circle and four microscopes for the another. It permits to determine the circle divisions and pivot errors;

3) the photoelectric eyepiece micrometer with moving slits is similar to that of Pulkovo HMC (Gumerov et al. 1986). The instrumental error caused by the slits motion(the main error of the micrometer) is $\pm 0.03\mu$ or ±0."01 for MAHIS. At present the CCD eyepiece micrometer has been elaborated too. Four CCD chips will be mounted in line on the ceramic plate for covering the image field of the telescope. Every CCD chip has 256 x 288 pixels, 32 x 24 microns each. The CCD chips are cooled by liquid neutrogen (LN_2). Every CCD chip has individual control units. The limiting magnitude of the MAHIS with the CCD micrometer is about $16^m \div 17^m$. The registration time for each chip is about 10 sec.

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The time service of the MAHIS is based on the Rb beam clock with an accuracy of ±0.1 mksec/day. The time service equipment includes mean time and sidereal time clocks, short wave and long wave receivers, special Loran-C system for time synchronization.

Meteorologocal data collection (MDC) is used for collecting the data during star observations for refraction calculation. The MDC measures the temperature with the accuracy ±0.05°C, the pressure ±0.05 mm Hg, the humidity ±5 mm, the speed of wind ±15° around the MAHIS. The temperature measuring part of the MDC by imitation of temperature sensors was tested. The results show the ability to measure the temperature with the accuracy ±0.01°C in the range ±50°C. It is possible to determine the temperature field at 160 points around the MAHIS, time of measurement at one point being 0.75 sec.

The software of the computer control of the MAHIS has a number of routines for control and data handling. The observer's integrated environment (IE) is elaborated. The IE provides connection and execution routines for telescope control, data acquisition and handling, preparation of night input data, keeping book of observation etc. The IE can display information on the current status of the telescope and observation processes. Using the IE is possible to observe in automatic, manual and special modes, to determine the parameters of the telescope (orienation, circle division errors, pivot irregularities etc), test the telescope devices and units.

The technical parameters of the MAHIS permit to determine the coordinates of celestial bodies by differential and absolute methods. There is a set of programmes and methods for determination and investigations of the variation of MAHIS parameters during night observations (relative azimuth and tilt of the mirror, zero- point and division errors of two circles, inclination of the tubes, pivot and mirror' surface errors etc); for determination of the influence refraction errors. Taking into account the results of the investigations of MAHIS' model devices, and the results of the determination of star coordinates by the Pulkovo Sukharev HMC during 1988-90 we can expect the accuracy, about $0\overset{s}{.}02 \div 0\overset{s}{.}03$, which will not be effected by the astronomical flexure (Kirian and Pinigin, 1992).

The expected capabilities of the automatic MAHIS permit to use it efficiently for:

1) the improvement of the FK5 System and its extension during observational period of 2÷3 years;

2) the extension of the stellar reference frame to fainter as compared with FK5 magnitudes;

3) the establishment of the link between optical stellar frame and extragalactic primary reference frame by direct observations of optical counterparts of extragalactic sources.

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