

KYIV MERIDIAN AXIAL TELESCOPE OBSERVATIONAL PROGRAMS: FIRST RESULTS

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ABSTRACT. We present first results of the modernization of the meridian axial circle (MAC) in Kyiv which was accomplished by means of a new CCD micrometer installation. The micrometer was designed by the Observatory of the National Academy of Sciences, the Kyiv University Observatory, and in collaboration with the Mykolaiv Observatory. The MAC (Scoryk et al., 1989) is a meridian refractor (D=180 mm, F=2.3 m) located 10 km from the centre of Kyiv (Ukraine). Now the instrument is used for observations of star fields in the direction of ICRF objects and for the equatorial zone astrometric survey.

1. THE INSTRUMENT DESCRIPTION

The new micrometer is based on a front-illuminated CCD Silar ISD017AP with 1040x1160 pixels. At a 16 mkm pixel size and a scale of 1.394'' per pixel, the CCD covers a 24.2' wide strip in declination. The exposure, or the time interval during which equatorial stars cross a matrix, is about 108 sec. The electric signal from the CCD after amplification is converted to a 12-bit digital form. The dark current is 6 e⁻/pk/sec, and the readout noise 20 e⁻. A two-stage thermo-battery ensures cooling of the chip to 40⁰ below the ambient air temperature. Electronics supports scan mode of observations.

To standardize instrumental photometric system, a glass filter with a passband of 480-580 nm reproducing a Johnson V filter is used. The brightest images detected with no pixel saturation correspond to stars of 11 mag (V), and the limiting magnitude is about 16 mag (V). At 0⁰ < δ < 30⁰ where the CCD scan distortion is small, the star images are of symmetric Gaussian shape with FWHM= 2.5 pk.

2. OBSERVING PROGRAMS

Since March 2001 we have started the program of observations of star fields with extragalactic radio-sources being the objects of the ICRF. The observational list includes 209 ICRF sources

located in declination zone of $0^0 < \delta < 30^0$ and taken from the catalogue GAOUA 99 C 03 (Molotaj, 2000). The purpose of the program is to determine positions, proper motions, magnitudes and V-R colours of faint stars in the direction of radio-sources.

A catalogue of measured astrometric and photometric data for stars to approximately 16 mag (V) will be built in 2003. Reduction to the ICRF system is made differentially, using the Tycho-2 stars as reference. About 900 strip scans of the sky each of $24.2(\text{declinations}) \times 46.5'$ (right ascensions) size (1040x2000pk) have already been obtained, thus most of the fields have a 4-5 fold coverage.

The second observing program of the MAC is aimed at densification of the Hipparcos-Tycho reference frame and its extension to fainter magnitudes in the equatorial zone. Also, the program will provide invaluable information on astronomical events registered during observations and which may be interesting for related studies. The program will continue for a lengthy period of time and is intended to be an astrometric survey of the sky for declinations initially restricted by $0+5^0$, with a 4-fold center-to-edge overlapping of scans.

In this stage of the project, we focused largely on obtaining the observational data. Also, we performed a tentative analysis of the accuracy of observations with the MAC that gave satisfactory results. Computed internal errors of one observation in right ascensions and in declination as a function of magnitude are given in the table. These estimates are slightly better than those reported in (Telnyuk-Adamchuk et al., 2002) due to the improved technique of reduction.

V	σ_α	σ_δ	V	σ_α	σ_δ
10^m	$0.071''$	$0.049''$	14	0.097	0.142
11	0.052	0.047	15	0.130	0.182
12	0.039	0.069	16	0.256	0.298
13	0.078	0.075			

First observations of stars, and error estimates obtained with a CCD micrometer, allow us to conclude that the MAC may be efficiently used in a number of observing projects, in particular, to link the radio and optical reference frames. A large astrometric survey of the equatorial zone in the two photometric passbands will provide extensive astrometric and photometric data that may serve as a source of information when studying non-stationary events and moving objects. The accuracy of a single position measurement for 11-14 mag stars is $0.05 - 0.10''$, and the accuracy of photometry is 0.03-0.06 mag. At 4-5 fold overlapping of strips, the errors of the catalogue data are expected to be $0.02 - 0.05''$ for positions and 0.02-0.03 mag for magnitudes.

3. REFERENCES

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