ASTROMETRICAL POSITIONS OF NEO INFERRED FROM CCD OBSERVATIONS AT BUCHAREST

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ABSTRACT. We show up the capability of the old Prin-Merz astrograph, completely renewed, to perform narrow-field astrometry. A highly accurate metrological system has been conceived in order to monitor, focus, and track the reference stars. Besides, a high quantum efficiency CCD camera based on a back illuminated chip, allows this instrument to "observe" celestial objects up to 18 magnitudes, in less than 30 seconds of exposure. Due to the small FOV of the instrument we use the most dense star catalogue available - USNO B1.0 which can provide us reference stars enough to compute an accurate plate solution. 2 NEO have been observed during the testing phase (3908) Nyx and (85640) 1998OX4 and the results are presented in this paper. All the data have been submitted to the MPC.

1. OBSERVATIONS AND DATA PROCESSING

The old F/15.8 Prin-Merz visual astrograph, completely renewed is now able to perform narrow-field astrometry. The instrument is endowed with an Apogee 47P CCD Camera with a thinned, back illuminated, 1kX1k chip. The field of view is 7.6 x 7.6 arcmins. High quantum efficiency of CCD camera (92% at 650 nm) allow us to observe objects up to 18 magnitudes in 30 second of exposure time. The rather limited field of view leads us to the use of most dense star catalogue available at the moment - USNO B1.0, in order to have enough reference stars to compute an accurate plate solution.

The software used for images reductions and data processing is IRAF [1] in combination with NOVAS routines [2] from USNO. In the first step *daofind* function from Daophot package is used to extract objects positions from CCD frames. The catalog positions of the reference stars are taken via a small script from Vizier Service [3] and used together with the output of *daofind* by *ccxymatch* and *ccmap* to compute the plate solution.

2. RESULTS

During this testing phase of our instrumentation 2 NEO selected from Near Earth Object Program [4] have been observed. CCD Camera was used in 2x2 binned mode and with 20 seconds exposure time to avoid trailing of the faster asteroids and shorten the download time. The image scale was 0.89 arcsec/pixel.

First NEO observed was (3908) Nyx an asteroid with a magnitude of 16.5V and a rate of apparent motion of 0.096°/day at the moment of observation. The second one was (85640)

1998OX4 at a magnitude of 17.5V and rate of apparent motion of 5.765°/day. On average 30 reference stars have been found on each CCD frame. 14 astrometrical positions have been inferred for the first asteroid and 18 for the second.

Data concerning O-C residuals in α and δ for the two NEO are presented in the Table 1.

Asteroid	$(O\text{-}C)_\alpha$	$(O\text{-}C)_\delta$	$(O\text{-}C)_{total}$	No. of observations		
				≤ 0.2	≤ 0.5	≤ 1.0
(3908) Nyx	0.14 ± 0.16	-0.07 ± 0.14	0.23 ± 0.13	7	14	14
(85640) 1998OX4	-0.22 ± 0.28	-0.24 ± 0.27	0.47 ± 0.19	1	9	18

Table 1: Average offset and the corresponding standard deviations of the observed minus computed position. All values are in *arcsec*. Last three columns represents the number of observations within a given residual

The astrometrical positions of NEO inferred from recent CCD observations at Bucharest have been submitted to Minor Planet Center and distributed to Near Earth Objects - Dynamic Site. [5]

3. REFERENCES

1. http//noao.iraf.edu
2. Kaplan, et al. (1989) Astron. J. 97, 1197
3. Ochsenbein F., Bauer P., Marcout J., 2000, A&AS 143, 221
4. http://neo.jpl.nasa.gov
5. http://newton.dm.unipi.it/cgi-bin/neodys/neoibo?sites:073;obs;1;200