

## **MASS DETERMINATIONS FOR ASTEROIDS VESTA (4) AND EUROPE (52), MADE IN NIKOLAEV OBSERVATORY**

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The determination of the asteroid masses is a primordial problem to be solved in order to improve our knowledge of the dynamics of the asteroid families. Such progress could provide information on their origin and on the formation process of the Solar system. Furthermore, it could also give opportunities to improve the accuracy of the theory of motion of Mars, which is now limited by the uncertainties on the asteroid masses.

The analysis of the perturbing effects of the bigger mass asteroid on the orbit of a lesser mass asteroid is one of the methods to perform mass determination. By now there have been made such numerous attempts for the biggest asteroids. By the use of recent ground-based observations by the CCD astrometry, reduced using contemporary astrometric catalogues, there is a possibility to improve the previously determined masses and to determine new ones.

Asteroids Vesta (4) and Europe (52) were selected as candidates for mass determinations in Nikolaev for such reasons: 1) mass of Vesta is well determined in earlier years, and it is interesting to check whether new observations can be helpful for improvement of its mass; 2) mass of Europe has only few determinations.

Astrometry observations of perturbed by Vesta and Europe asteroids are being made at zone astrograph, equipped with CCD camera, in Nikolaev since 2000. The errors of one observation (observations and reductions made by Hudkova L.A. and Ivantsov A.V.) of minor planet up to 13 magnitude are 0.23 arcsecond on both coordinates. Our observational data taken together with those from the public database AstDys were used for mass determinations.

Integration of relativistic equations of motion was made with the help of the ORSA software and initial conditions taken from DE405 and JPL HORIZONS ephemerides. Mass determinations of Vesta and Europe asteroids are in the limits of determinations, made by other authors.