

**OBSERVATIONS OF THE DOUBLE QUASAR 0957+561 AT NAO ROZHEN  
FOLLOWING THE MEGAPHOT COLLABORATION**

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Photometric monitoring of brightness variations in quasars should permit the evaluations of cosmological parameters, such as Hubble's constant, the age and structure of the universe, the mass distribution in distant galaxies and the physical behavior of quasars. To all these goals is devoted the MEGAPHOT program.

Following the Joint Proposal for a Photometric Quasar Monitoring Project we observed during the night 13/14 march 1994 the Double Quasar 0957+561. The ST-6 CCD camera available at NAO was used. Observations are made in filter R with 60, 100, 300, 500, 600 and 900 sec expositions each. The seeing was 1-1.5 sec approximately. Dark and flat field corrections were made in the usual way. Standart MIDAS procedure on DECstation was used to plot isophotes in arbitrary units, shown herewith.

Light of a distant quasar, passing very close to the gravitational potential of a foreground galaxy, will be bent. The closer the ray passes to the center of mass of the galaxy the larger the effect will be. In special cases the image of the quasar will be split into two or more images and this is called macrolensing. (e.g. Refsdal, 1965). The first detected macrolensing system was the Double Quasar (Walsh et al., 1979). In this case the foreground galaxy is not visible.

We estimated the magnitude difference between the two images to be 0.09 mag in R. The resulting mean R magnitudes for both images A and B are presented in the table, as well as the difference. We estimate the photometry error to be not more than 0.05 mag approximately.

JD	R (A)	R (B)	delta R	err
2449425.48	16.39	16.23	0.16	0.05

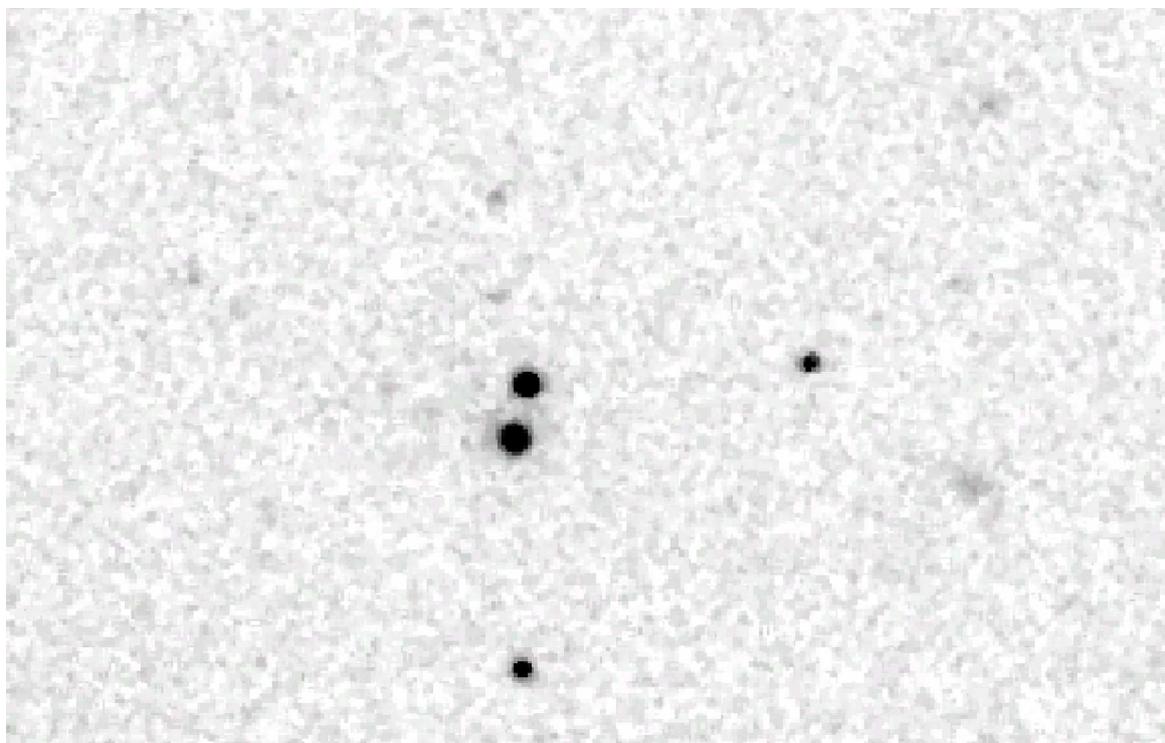
All data we obtain following this project will be sent to Hamburg observatory for detailed analysis.

We thank D-r K. Schramm - Hamburg, the initiator of this program, d-r R. West - ESO, for making available the ST-6 camera at NAO, V. Ivanova - Sofia, for kindly giving us a part of her observational time and B. Komitov - Sofia, for help at the telescope.

## References:

Refsdal, S., "The gravitational lens effect", MNRAS,128,1965,295

Walsh, D., Carswell, R.F.,Weyman, R.J., "0957+561 A,B: Twin quasistellar objects or gravitational lens?",1979,Nat,279,381



This frame shows a 1.8x1.3 arcmin field around the two images of the gravitationally lensed quasar 0957+561A, B (the close stellar-like objects in the centre of the frame; North is at the top, East is to the left). The lensed "A" image is the Northern one, and the lensed "B" image is the Southern one. A number of faint galaxies could be identified in the field: these galaxies are members of a foreground cluster of galaxies. The central galaxy of this cluster plays the main lensing role splitting the quasar image into two subimages separated by approximately 6 arcsec.

This double imaged quasar is the first confirmed example of gravitational lensing on cosmological scales. It was discovered in 1979 by Walsh, Carswell and Weymann during a search for the optical counterparts of a complete sample of radio sources 0957 + 561 A, B - Twin quasistellar objects or gravitational lens. This picture was obtained by Dr. A. Strigachev on March 13, 1994 00:30 UT using 2-m reflector of Rozhen NAO of Bulgaria and SBIG ST-6 CCD camera (375x242 pixels). The final image is a sum of two exposures of 300 and 500 sec duration through Cousins R filter. To suppress the noise the co-added image was median filtered using a 3x3 pixels window.

The image processing was done by Dr. B. Mihov using ESO-MIDAS astronomical package.

The frames used to obtain the composite picture are among the first ones taken by Bulgarian astronomers using a CCD device.