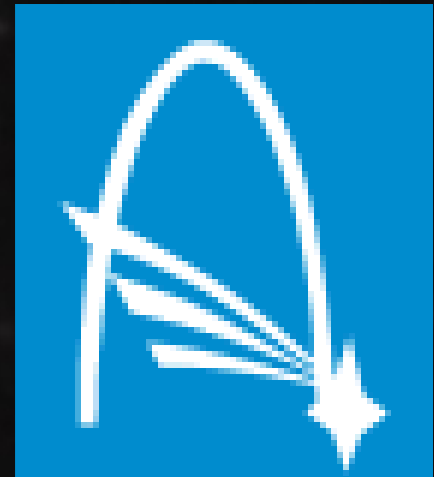




Ground based robotic telescopes support of INTEGRAL and Gaia missions



M. Kocka¹, F. Munz³, R. Hudec¹, J. Strobl¹, M. Nekola¹, C. Polasek¹,
P. Kubanek², M. Jelinek², V. Simon¹

1 - Astronomical Institute of the Academy of Science of the Czech republic , Ondrejov ;
2 - IAA CSIC, Granada ; 3 - IASF/INAF, Bologna



New robotic telescope D50. From left: detail image of wide field camera, image of whole telescope in home position and in random position. In the fourth image there is a detail of secondary mirror and narrow field camera with carousel and focuser without covering robe.

Abstract

In this paper we refer about using robotic or autonome telescopes, such as new D50 and BART telescopes in the Astronomical Institute in Ondrejov, to support the INTEGRAL mission and in the future Gaia mission. These telescopes usually observe CVs, AGNs and error circles of GRBs and are also capable to point at any interesting sources in very short time.

The BART

The Bart (Burst Alert Robotic Telescope, top-left image) is first robotic or autonome telescope in Czech Republic located in Ondrejov observatory. He has been operating since 2000. The idea of BART is to make small aperture remotely controlled telescope attached with wide field camera. It is consist of low-cost commercially easily available parts.

BART is controled with special designed software suitable for remote control and autonomous operating mode called rts2.

BART is Meade Schmidt-Cassegrainn telescope with 250mm aperture on paralatic mount Losmandy HGM Titan with Gemini GoTo controller which is driven via serial port from the PC. Mount is able of slew speed 6 arc-degrees per second with tracking accuracy ~1arcsec.

He is equipped with FLI MaxCam CM2-1 CCD camera with field of view 28.6x28.6 arc-minutes and resolution 1024x1024 pixels and standard Johnson BVRiz filter set for photometry.

The wide field camera (FLI IMG6303) is mounted on the same mount, it is Rubinar 1:5.6/500 with the field of view 2x3 degrees and resolution 3088x2056 pixels.

Goals of BART experiment

Fast optical follow-up observations of GRBs (using GCN circulars) with autonomous rapid response (~30 sec to get target position). He is also used for optical campaigns and long time observations of AGNs, SNe, CVs and other targets of interest.

Beyond BART

BART is a testing device with small aperture, hence he has not enough range. So we made decision to build new and large telescope. New telescope impromptu called D50 is in testing mode since january 2008. He is also located in Ondrejov observatory.

D50 telescope

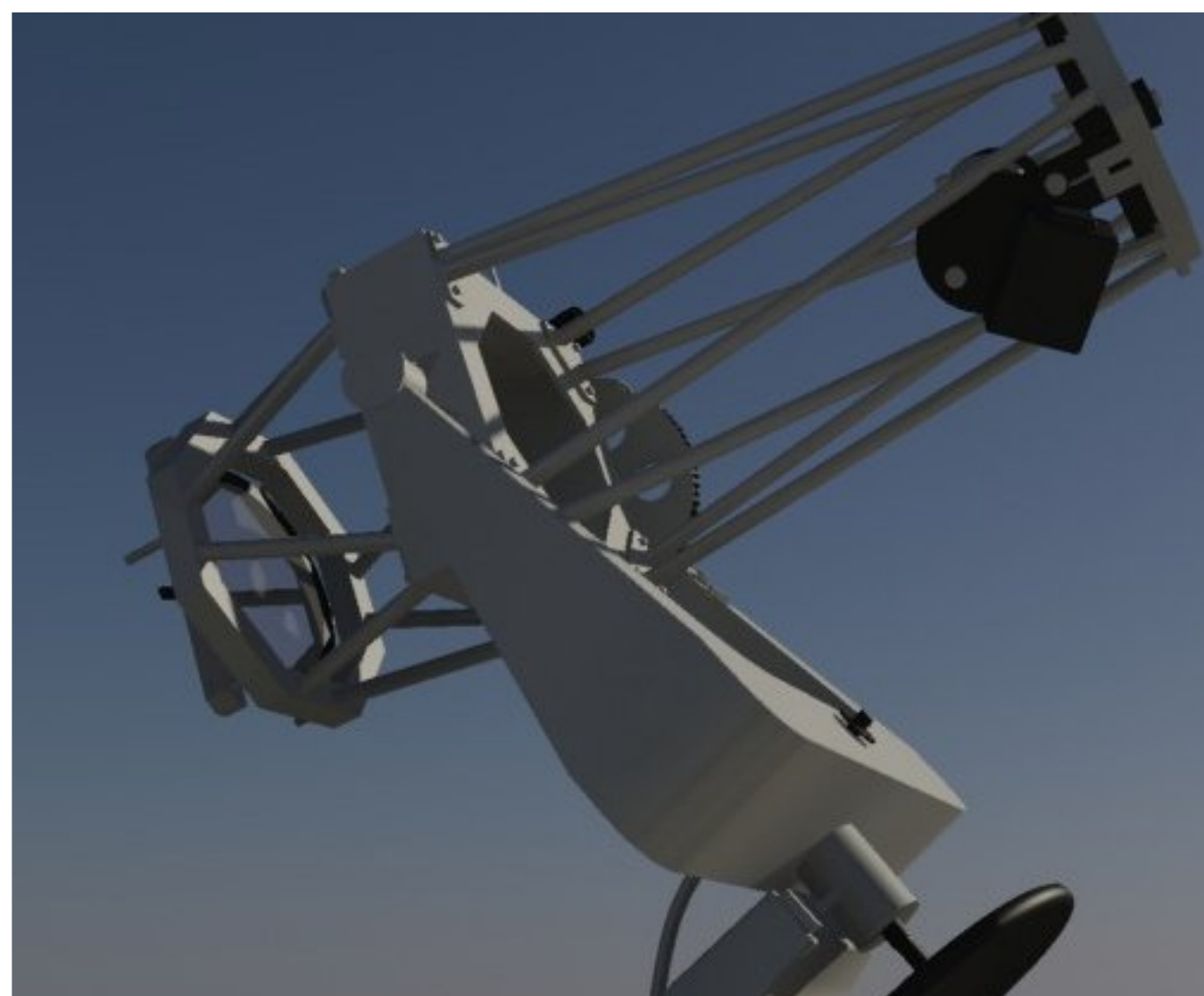
D50 is Newton type telescope with 500mm mirror and focal length 1975mm, which give him perfect focal ratio 1:3.95. The mirror for the telescope has been polished by Dr. Cyril Polasek in Ondrejov.



Mirror of D50 telescope in Dr. Polasek's laboratory and tools used to make the mirror.

D50 has a simple construction from iron tubes and light shield made of black fabric.

There are two cameras on D50, NF (narrow field camera) and WF (wide field camera). NF is FLI IMG 47-10 with coma corrector TeleVue Paracorr PSB-1100. NF is equipped with FLI color filter wheel with Johnson's BVRI filters and FLI focuser. CCD chip E2V 4710 has 1024 x 1024 px with angular resolution 1.18 arcsec/px and field of view about 21x21 arc-min.



Computer model of D50 tubus structure.

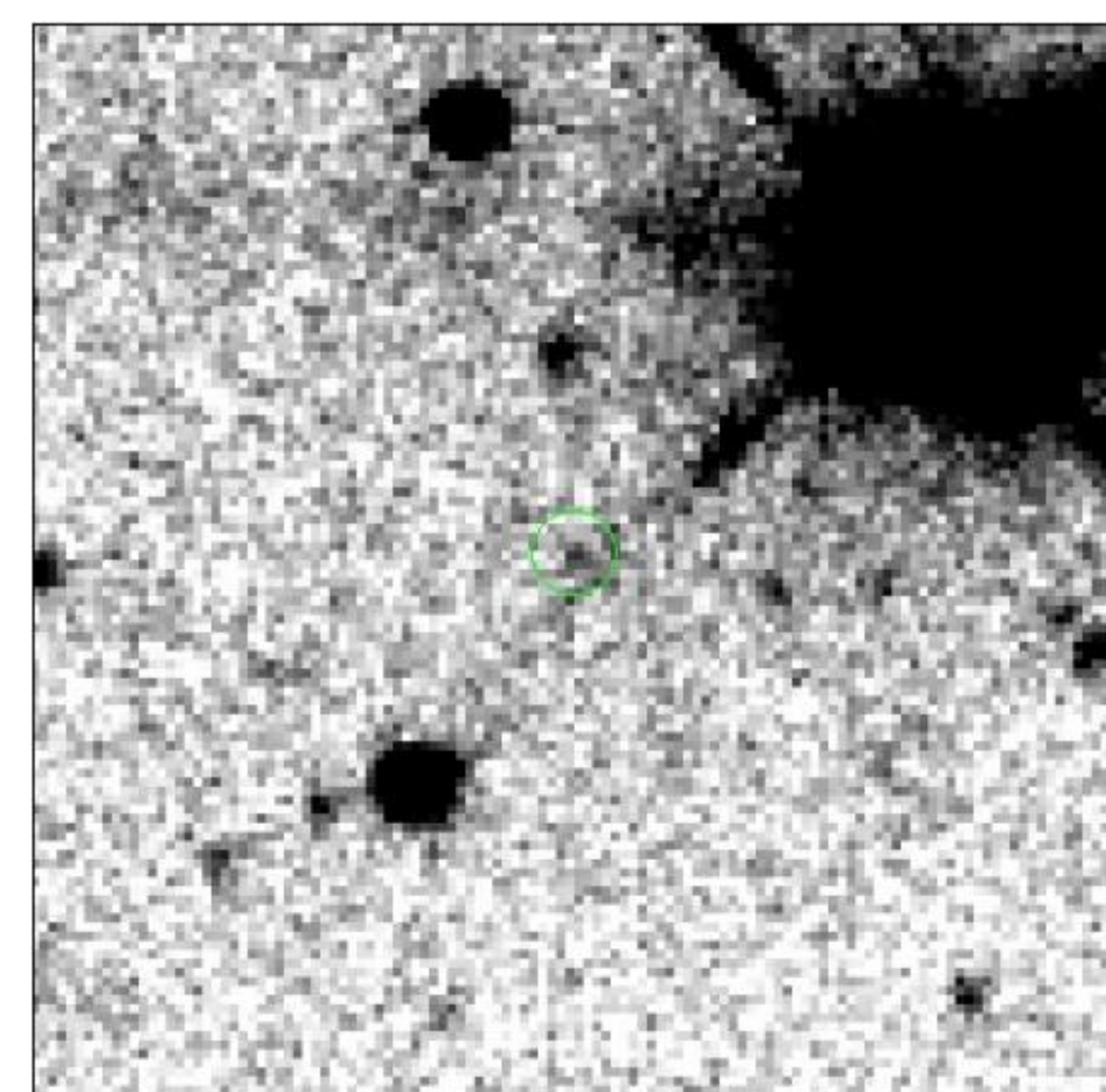
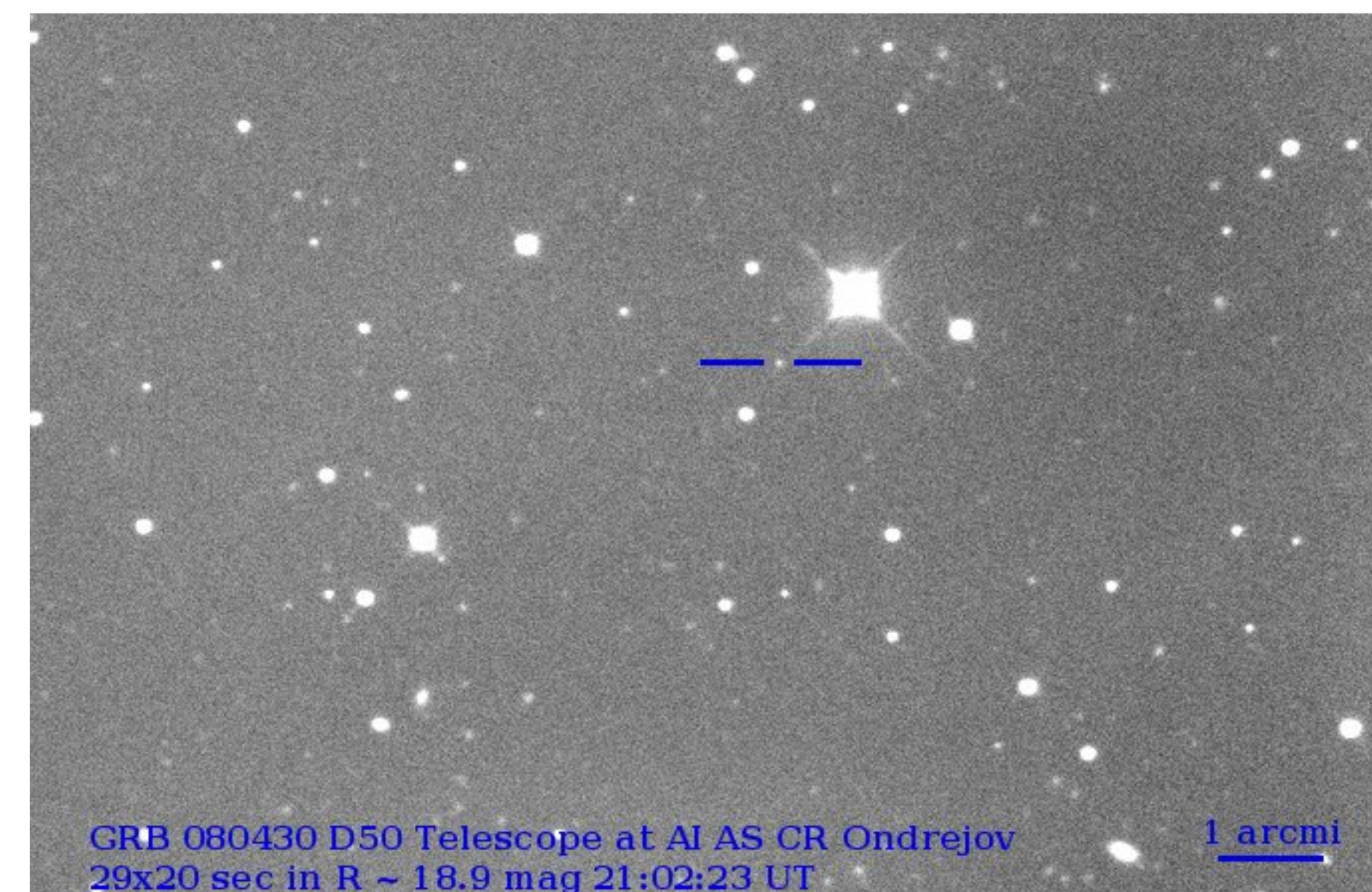
WF consists of FLI MaxCam CM-8 camera and tele-lens Rubinar 1:5.6/500mm, it's giving field of view about 1.5 x 1 degrees.



Wide field camera on D50 telescope.

Science with D50 telescope

Generally D50 is bigger and more powerful brother of BART, so the primary science goals are the same. The relatively big mirror is making D50 an ideal weapon for catching GRBs optical transients. Fast moving mount, sensitive CCD camera and fast computer making immediate astrometry from actual image are necessary atributes to successful catch GRB's optical transients.



Combined images of optical transient of GRB080430 observed with D50 telescope. In the upper picture the OT is clearly visible an hour after detection. In the bottom image is the same GRB one day after detection, R~20.2 mag.

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