BART Status

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Summary. The Burst Alert Robotic Telescope is a small aperture robotic telescope. The recent configuration consists of a Meade 25 cm tube and two small wide field cameras (for R and I Johnson's filters). The primary scientific goal of this telescope is to provide immediate optical observations of high energy events such as GRBs provided by satellites. In the meantime, the long-term monitoring of selected sources is performed. Most of this time is dedicated to active galaxies and cataclysmic variables which are being also observed with INTEGRAL.

1 Introduction

After movement failure, disabling the robotic telescope for three months, the BART robotic telescope is again in operation. It has got a new WF camera and, additionally, there is another camera being tested.

Fig. 1. One of the BART's WF cameras.

2 Hardware

BART itself is built on top of the Meade LX200 mount, which is available on the market. Optical system consist of the Meade 25cm tube itself equipped with the SBIG ST9E camera and with appended Wide Field cameras, which are Meopta 64mm, 1:1.7 lens with an SBIG ST8 cameras. System is further equipped with several custom-made improvements including lens anti dew heating, electronic focuser and others.

The system did observe during routine observation four gamma-ray bursts, in delays ranging from 90 seconds after receiving position to several hours. (Longer delay has nothing to do with the software, it's caused by other factors — daytime, weather etc.) The optical counterpart was not found, the delay after trigger was too long and the transient (even if it was found) was too faint to be found on our frames. Further improvements of the telescope and expected short-delay GRB alerts may bring more success to this project.

3 Software

The telescope has recently received a new version of operating software. This new, modular solution is designed to be both fast and simple to use. It supersedes the original (rather testing) Python based operating software, allowing faster response to the GRB alerts and better observation planning. It's written in pure C and runs on Linux.

System is built so it's able to react to the GRB alert in a few seconds, the last and only real-time alert of this telescope was the GRB020317, with the delay 90 seconds, but from this delay, 70 seconds were caused by waiting for the camera to finish the previous exposure. It is now proved on several testing alerts, that BART is able to start taking images of the GRB region right after finishing the mount slew, in about 20 seconds.

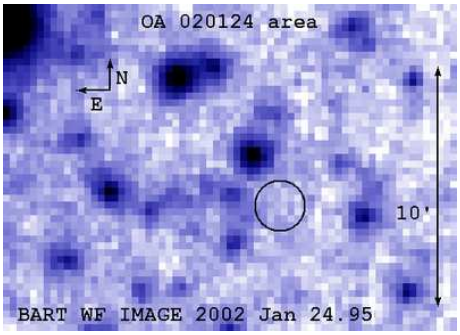

Fig. 2. BART WF non-detection of GRB030124. 10x 120s exposure stacked. [1, 2, 3]

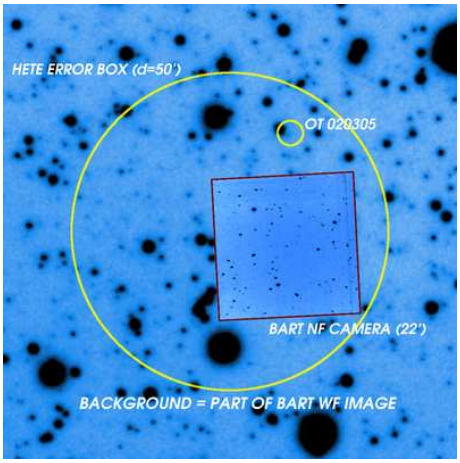

Fig. 3. The HETE error box of GRB020305; background is part of BART WF.[4, 5, 6]

4 GRB observations

The robotic telescope reacted to five GRB alerts during the first half of the year 2002. Table 1 summarizes the basic information.

Delay is the time between the trigger and the first exposure. The only real-time response to a GRB alert was to trigger 020317, achieving the response time of 90 seconds, others were delayed due to daytime and/or waiting for the clear sky.

4.1 GRB 020305

This long burst was detected by HETE. The GCN notice was issued 10.5 hours after the trigger, only few minutes before the BART started observation. The delay therefore is not real-time, but with only 30 minutes was the fastest reply mentioned in GCN notices. On the wide field images from BART there were no new objects found up to magnitude 14, the narrow field images covered only 40% of the HETE error box with limiting mag 17. [5]. The Optical

Table 1. GRBs followed by BART

GRB	delay	WF limit	NFlimit
grb020124	11.5h	>14 (15)	-
grb020305	10.45h	>14.3 (16)	17(18.5)
grb020317	57.8m	>13 (14.5)	-
grb020331	5.54h	>13	16

Afterglow was later found by Price [6]. No object can be reliably confirmed up to noise level of the wide field image. The narrow field image did not cover this position.

4.2 GRB 020317

This gamma ray burst is up to now the only burst which might be observed with BART in real-time. The burst was somewhat peculiar, approx. 2 seconds long, with peculiar spectra. [7] The GRB was reported in 34 seconds, the position came in 56.3 minutes. BART's reaction took 90 seconds, so the first images were obtained in 57.8 minutes after trigger.

Further image analysis is planned, preliminary analysis went to eliminating of an OT candidate found on the first 10 stacked images and reported in GCN1278[1].

Acknowledgement. We acknowledge the support provided by the Grant Agency of the Academy of Sciences of the Czech Republic (grant 3003206), and by the ESA PRODEX (Contract 14527/00/NL).

References

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[1] Internet presentation may be found on http://lascaux.asu.cas.cz/