Gamma-ray Burst Optical Afterglow Observations at Nyrola Observatory

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1. Abstract

We present the results of observing five gamma-ray bursts (GRB000926, GRB010119, GRB010222, GRB000324 and GRB010412) at Nyrola Observatory, Finland. Two optical afterglows were successfully detected. Also the equipment and methods used for the observations are presented. Our example shows how dedicated amateur astronomers with modest equipment can make a significant contribution to the GRB research.

2. Introduction

Nyrölä Observatory is an amateur observatory located in Finland. It is located in countryside near town Jyväskylä and is operated by a 200 member astronomy club. The equipment used in these observations consists of 16-inch Meade LX200 telescope, Santa Barbara Instrument Group ST7E CCD-imager and photometric B, V & R filters.

Our three person GRB team has been involved with GRBs since 1999, when the observatory was joined to the GRB Coordinates Network. Observatory computer is receiving socket alterts and observers are notified via text messages to mobile phones (GSM/SMS). Since that five GRB fields has been imaged: two showing optical afterglows and three negative observations. The observers have joined also to The AAVSO International GRB Network in year 2000.

3. Observations

The first successful observation was GRB 000926 (GCN 813) after several unsuccessful observing attempts. This afterglow was observed after the transient coordinates were published on GCN Circulars. It demonstrated that the detection of 20 magnitude targets was possible.

The second observation was a short-hard burst GRB 010119 (GCN 920) that was observed 42 hours after the burst. The upper-limit for optical transient was R=19.5 magnitudes. This observation is also presented on a paper by K. Hurley et. al. *Afterglow upper limits for four short duration, hard spectrum gamma-ray bursts*.

GRB 010222 (GCN 990) was observed all night from 12 to 22 hours after the burst. Observations were done with photometric filters and the dimming of the transient was measured in V and R bands.

The last two observations were negative: GRB 010324 (GCN 1019) and GRB 010412. The upperlimits for optical transients were C=18.8 and R=19.0 magnitudes respectably.

4. Conclusions

Dedicated amateurs can give significant help in GRB research with modest 'off-the-shelf' equipment. By coordinated pro-am collaboration amateur observations can be quickly forwarded by professional astronomers.

5. Acknowledgments

We want to thank *Jyväskylän Sirius* for providing the observatory, *Gamma-ray Burst Coordinates Network* and specially *Dr. Scott Barthelmy* for accepting us in, *American Assosciation of Variable Stars Observers* for coordinating amateur GRB observations and *Dr. Arne Henden* for helping us with our observations.

Image1. *The 16-inch Meade LX200 telescope with SBIG ST7E CCD-imager of Nyrölä Observatory.*

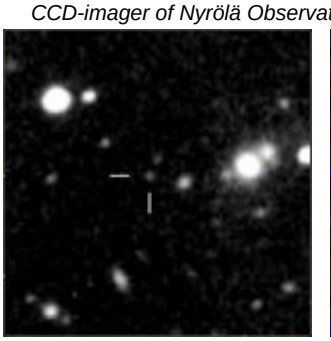

Image2*. GRB 000926 OT imaged on September 28, 2000.*

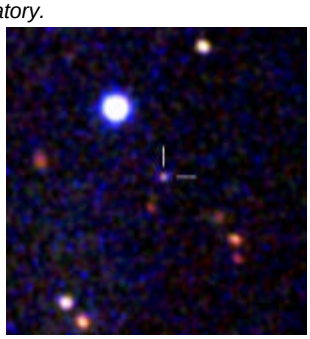

Image3. *GRB 010222. A color composite (BVR) of OT imaged on February 22, 2001.*

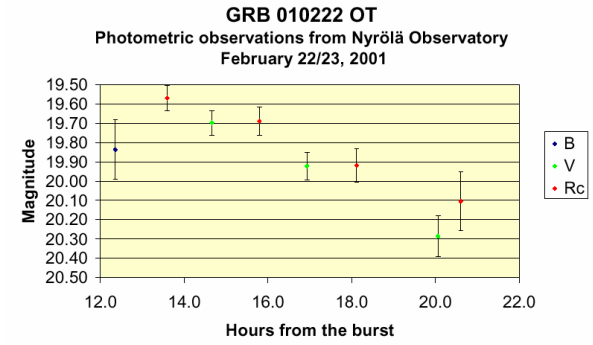

Figure1*. The photometric measurements made of GRB010222 shows the fading nature of the OT.*

Burst	Delay	Filter	Magnitude
GRB000926	43	C	20
GRB010119	42	R	>19.5
GRB010222	12.4	B	19.8
	13.6	R	19.6
	15.8	R	19.7
	18.1	R	19.9
	20.6	R	20.1
	14.6	V	19.7
	16.9	V	19.9
	20.1	V	20.3
GRB010324	10.9	C	>18.8
GRB010412	29	R	>19.0

Table1. *All GRB OT observations. Delay is hours from the burst. Magenitude reference is USNOA2.0 except for GRB010222 where Henden (GCN1025) sequence was used.*