Second Workshop on Robotic Autonomous Observatories
ASI Conference Series, 2012, Vol. 7, pp 79 – 82
Edited by Sergey Guziy, Shashi B. Pandey, Juan C. Tello &
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Bootes 3: first two years of GRB follow-ups in New Zealand

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Abstract. BOOTES-3 is the first robotic observatory located in the southern hemisphere of the BOOTES (Burst Observer and Optical Transient Exploring System) network. It was inaugurated in February of 2009, beginning its operations promptly after. It's located nearby Blenheim, New Zealand.

The main scientific objective is observation and follow-up of the optical counterparts of GRBs (Gamma Ray Bursts), responding to an alert in a quick and completely autonomous manner. For this it is equipped with a high-speed pointing mount (6-10 seconds), and the whole observatory is controlled by the RTS-2 (Remote Telescope System 2) software. Being at Spain's antipode, this observatory complements the coverage of the Spanish BOOTES telescopes.

Keywords : BOOTES – Robotic telescope – GRB – afterglow

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1. The Yock-Allen telescope

Inaugurated February 27, 2009, in New Zealand, Bootes-3 has provided the possibility to complement the visible sky of the Bootes network both in declination and in time, allowing the observation of events that happen during Spain's daytime and objects too far south in Spain's sky. Bootes-3's observations have been used in 15 circulars in the GRB Circulars Network, and several peer reviewed papers, including the Nature paper on the GRB 090423 with ~ z 8.2 (Tanvir et al. 2009).

Table 1. Bootes-3 response to GRBs in it's field of view during good weather.

GRB	Publication	T-GRB	Detecting spacecraft	magnitude	Comments
101011A	GCN 11343	23.76h	Swift	>19	
100904A	GCN 11217	5.98h	Swift	>18	High airmass ~7
100518A	GCN 10778	2.47h	INTEGRAL	>20.7	
100331B	GCN 10566	19.2h	AGILE	>18.5	Through cirrus
100331A	GCN 10557	6.7h	INTEGRAL	17.8	
100316C	GCN 10497	49s	Swift	>18.5	(4s from GCN)
091208B	GCN 10255	45s	Swift		
091111	GCN 10161	0	INTEGRAL	>9.3	Contemporaneous
091109	GCN 10160	19.5h	INTEGRAL	>19.6	Delayed by clouds
091103	GCN 10122	26s	Swift	19.07	
091029	GCN 10104	6.9h	Swift	18.5	
091018	GCN 10043	18.2h	Swift	20	~5h of observations
090423	Tanvir et al. 2009,	31s	Swift	>18.5	z=8.2!!!
090404	GCN 9092	185s	Swift	>15	high airmass
090328	GCN 9058	24.8h	Fermi	19.7	z=1.5

This telescope has a very fast response time of a few seconds (Kubánek et al. 2004), the bulk of the delay being caused by the GCN network and poor weather conditions. Besides the follow up of GRBs, Bootes-3 has also provided observations for micro-lensing events, Nova Eris 2009 and other objects.

1.1 Telescope characteristics

Coordinates: S 41°29′28.72″ E 173°50′21.03″
Altitude: 27 m.a.s.l.
Aperture: 60-cm
F.O.V.: 9.52' x 9.52'
Spatial Resolution: 0.558"
Shutter speed: 10 f.p.s.
CCD model: Andor iXon X3 EMCCD 888
Filter set: Sloan: g',r',i'; Ukirt: Z,Y; Johnson: B; Dark and Clear.
Mount model: Astelco NTM-500.
Slewing speed: 20 degrees per second.

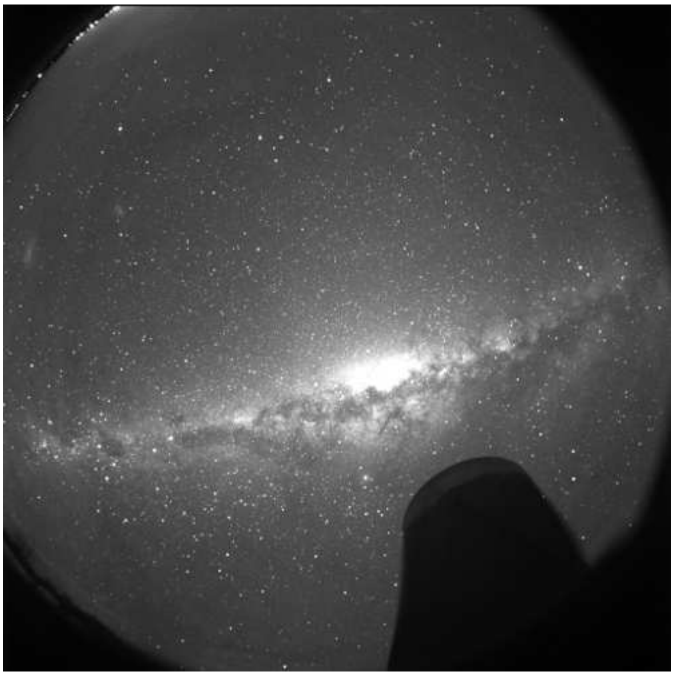

Figure 1. Image from the all sky monitor at Bootes 3 station.

Acknowledgments

We are very grateful for the support given by the Space Sciences and Electronics Technologies Department at INTA, through the project IGE 4900506, to the special action DIF2001-4256-E given by Technology and Science Ministery (MCyT), as well as to the Spanish research projects AYA2001-1708, AYA2002-0802, AYA2004-01515, AYA2007-6377 and AYA 2009-C14000-C03-01 granted by the Spanish Ministry of Science and Education and Innovation and Technology. The development of the BOOTES Network has been also possible thanks to the support of Junta de Andaluca through the Excellence Reseach Projects P06-FQM-2192 and P07-TIC-3094. We are also indebted to the GCN team (in particular to S. Barthelmy) for rapidly distributing the preliminary GRB positions obtained by BATSE up to May 2000. The contribution from Auckland University and Vintage Lane Observatory, Blenheim, New Zealand are thankfully acknowledged.

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