The readout system and the trigger algorithm implementation for the UFFO Pathfinder - DTU Orbit (01/01/2019)

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Since the launch of the SWIFT, Gamma-Ray Bursts (GRBs) science has been much progressed. Especially supporting many measurements of GRB events and sharing them with other telescopes by the Gamma-ray Coordinate Network (GCN) have resulted the richness of GRB events, however, only a few of GRB events have been measured within a minute after the gamma ray signal. This lack of sub-minute data limits the study for the characteristics of the UV-optical light curve of the short-hard type GRB and the fast-rising GRB. Therefore, we have developed the telescope named the Ultra-Fast Flash Observatory (UFFO) Pathfinder, to take the sub-minute data for the early photons from GRB. The UFFO Pathfinder has a coded-mask X-ray camera to search the GRB location by the UBAT trigger algorithm. To determine the direction of GRB as soon as possible it requires the fast processing. We have ultimately implemented all algorithms in field programmable gate arrays (FPGA) without microprocessor. Although FPGA, when compared with microprocessor, is generally estimated to support the fast processing rather than the complex processing, we have developed the implementation to overcome the disadvantage and to maximize the advantage. That is to measure the location as accurate as possible and to determine the location within the sub-second timescale. In the particular case for a accuracy of the X-ray trigger, it requires special information from the satellite based on the UFFO central control system. We present the implementation of the UBAT trigger algorithm as well as the readout system of the UFFO Pathfinder.

General information
State: Published
Organisations: National Space Institute, Astrophysics
Number of pages: 10
Pages: 84432T
Publication date: 2012
Peer-reviewed: Yes

Publication information
Journal: Proceedings of SPIE, the International Society for Optical Engineering
Volume: 8443
Issue number: PART 2
ISSN (Print): 0277-786X
Ratings:
BFI (2018): BFI-level 1
BFI (2017): BFI-level 1
Scopus rating (2017): CiteScore 0.43 SJR 0.243 SNIP 0.289
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 0.42 SJR 0.226 SNIP 0.258
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): CiteScore 0.3 SJR 0.212 SNIP 0.239
BFI (2014): BFI-level 1
Scopus rating (2014): CiteScore 0.3 SJR 0.217 SNIP 0.249
BFI (2013): BFI-level 1
Scopus rating (2013): CiteScore 0.26 SJR 0.234 SNIP 0.273
ISI indexed (2013): ISI indexed no
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): CiteScore 0.27 SJR 0.219 SNIP 0.275
ISI indexed (2012): ISI indexed no
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): CiteScore 0.31 SJR 0.217 SNIP 0.286
ISI indexed (2011): ISI indexed no
BFI (2010): BFI-level 1