Death of Massive Stars: Supernovae and Gamma-Ray Bursts
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The Ultra-Fast Flash Observatory's space GRB mission and science

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Abstract. The Ultra-Fast Flash Observatory (UFFO) is a space mission to detect the early moments of an explosion from Gamma-ray bursts (GRBs), thus enhancing our understanding of the GRB mechanism. It consists of the UFFO Burst & Trigger telescope (UBAT) for the recognition of GRB positions using hard X-ray from GRBs. It also contains the Slewing Mirror Telescope (SMT) for the fast detection of UV-optical photons from GRBs. It is designed to begin the UV-optical observations in less than a few seconds after the trigger. The UBAT is based on a coded-mask X-ray camera with a wide field of view (FOV) and is composed of the coded mask, a hopper and a detector module. The SMT has a fast rotatable mirror which allows a fast UV-optical detection after the trigger. The telescope is a modified Ritchey-Chrétien telescope with the aperture size of 10 cm diameter, and an image intensifier readout by CCD. The UFFO pathfinder is scheduled to launch into orbit on 2012 June by the Lomonosov spacecraft. It is a scaled-down version of UFFO in order to make the first systematic study of early UV/optical light curves, including the rise phase of GRBs. We expect UBAT to trigger ∼44 GRBs/yr and expect SMT to detect ∼10 GRBs/yr.

Keywords. gamma rays: bursts, gamma rays: observations, instrumentation: detectors

1. Overview

The Ultra-Fast Flash Observatory (UFFO) aims to measure the early UV/optical observations of GRBs using the new approach of a beam steerer which can be implemented by a rotatable mirror in the UV/optical telescope. It allows UV/optical observations to

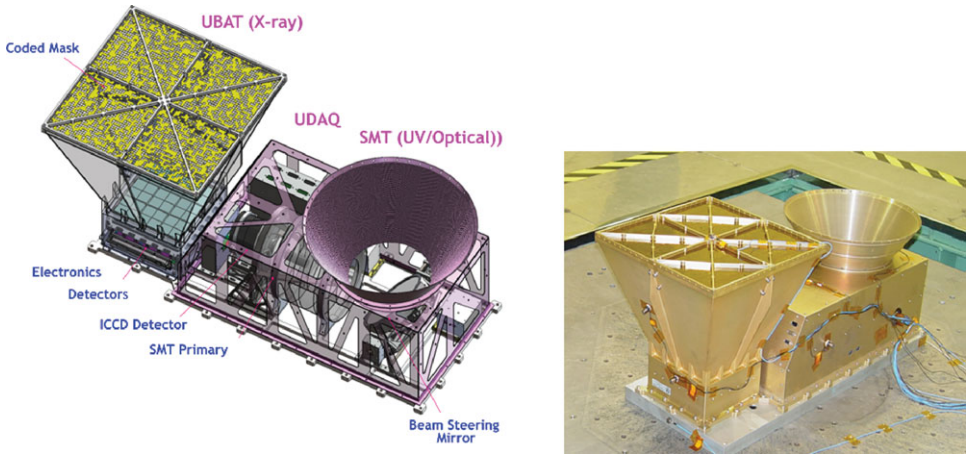

Figure 1. *Left*: UFFO pathfinder payload. *Right*: UFFO pathfinder pre-flight model which passed its space environment tests on 2011-July.

begin in less than a few seconds after the X-ray trigger Park *et al.* 2009). The UFFO will exploit this largely unexplored region of parameter space by providing a statistically significant sample of early UV/optical observations of GRBs.

The UFFO consists of a couple of wide Field-of-View (FOV) trigger telescopes, a narrow-FOV Slewing Mirror Telescope (SMT) for the fast measurement of the UV/optical photons from GRBs, and a gamma-ray monitor for energy measurement. The UFFO Burst Alert & Trigger Telescope (UBAT) will provide the primary trigger using X-rays from GRBs. It monitors the sky for GRBs and determines their position with sufficient accuracy (10 arcmin at 7.0σ) for follow-up in the UV/optical with the SMT. Whereas the fastest previous experiment, the *Swift* observatory, rarely observed GRBs in less than 60 seconds after the trigger, the UFFO is designed to begin UV/optical observations in less than a few seconds after the trigger. The SMT uses the novel approach of steering our telescope beam using a rotatable mirror, instead of re-orienting the instrument platform like *Swift* and other previous instruments. The UFFO pathfinder is the scaled-down version of UFFO with a physical size of $958.5(\mathrm{L})\times400(\mathrm{W})\times382.5(\mathrm{H})$ mm^3 (See Fig. 1(left)) and is scheduled to launch into orbit on 2012-June by the Lomonosov spacecraft. It will be on a sun-synchronous orbit at an altitude of $\sim$550 km. It successfully passed the thermal-vacuum test and the vibration-shock test on 2011-July at Taiwan NSPO (See Fig. 1(right)) and it is in the final stage for launch preparations.

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Reference

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