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The Large Observatory For x-ray Timing (LOFT): prospects for Terrestrial Gamma-ray Flashes studies

Martino Marisaldi (1), Riccardo Campana (1), Tom Maccarone (2), David M. Smith (3), Marco Feroci (4), Fabio Fuschino (1), and Joern Wilms (5)

(1) INAF-IASF, Bologna, Italy, (2) Texas Tech University, Lubbock TX, USA, (3) Santa Cruz Institute for Particle Physics and Physics Department, University of California, Santa Cruz CA, USA, (4) INAF-IAPS, Roma, Italy, (5) ECAP, Erlangen, Germany

The Large Observatory For x-ray Timing (LOFT) is an astrophysics space mission designed to study the neutron star structure and equation of state of ultra-dense matter and to explore the conditions of strong-field gravity. LOFT was selected by ESA as a candidate medium class mission scheduled for flight in 2022 and is currently in the assessment phase. Although LOFT primary scientific objective is the timing of astrophysical x-ray sources, it will be also suitable to detect Terrestrial Gamma-ray Flashes (TGFs) as one of its many secondary scientific targets. The LOFT payload is composed of two instruments: the Large-Area Detector (LAD) and the Wide Field Monitor (WFM). LAD is a collimated instrument sensitive in the energy range 2-80 keV, with a very large effective area of 10 m^2 at 8 keV and 1 m^2 at 30 keV on axis, and an energy resolution of 200 eV at 6 keV. The LAD primary energy range is 2-30 keV for sources inside the Field of View (FoV), and the 30-80 keV energy range is specifically intended for out-of-FoV events, which will be the typical case for TGFs. WFM is a coded mask instrument sensitive in the same energy range of the LAD, with <1 arcmin location accuracy over a 1 Pi steradian field of view. LOFT will be operated in a low-inclination low Earth orbit and will be able to detect TGFs in an energy range where the emission is expected to be strongly affected by photon transport through the atmosphere. Most of the TGF measurements carried out so far are hampered by dead-time effects because of the large TGF brightness. LOFT, specifically designed for timing studies, has a fine detector granularity and an excellent control of dead-time, therefore it will help to unveil the fine structure of TGFs light curves at 10 microseconds time scale. In this work we present the main characteristics of the LOFT mission and their expected performance for TGF detection.