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HERMES PATHFINDER & SPIRIT: A PROGRESS REPORT

Abstract

HERMES Pathfinder is an in-orbit demonstration consisting of a constellation of six 3U cubesats hosting simple but innovative X-ray/gamma-ray detectors for the monitoring of cosmic high-energy transients. HERMES-PF, funded by ASI and by the EC trough a H2020 grant, should be launched by the end of 2024/beginning 2025. An identical X-ray/gamma-ray detector is hosted by the Australian 6U cubesat SpIRIT, launched on December 1st 2023. The main objective of HERMES-PF/SpIRIT is to prove that high energy cosmic transients such as Gamma Ray Bursts can be detected by miniatured hardware and localized using triangulation techniques. The HERMES-PF X-ray/gamma-ray detector is made by 60 GAGG scintillator crystals and 12 10x10 silicon drift detector mosaics, used to both detect cosmic X-rays and to detect optical photons produced by gamma-rays in the scintillator crystals. This innovative design provides a unique broad band from a few keV to a few MeV. Furthermore, the use of fast GAGG crystals and of mosaics of small SDDs allows reaching an exquisite time resolution of a fraction of a micro-second. We will present a progress report on the projects focusing the discussion on the scientific innovation of the project and on the main lessons learnt during the project development including: the importance but also the challenges of using distributed architectures to achieve ambitious scientific objectives; the importance of developing critical technologies under science agreements for the realization of innovative, high-performing but low-cost payloads; best use of COTS technologies in scientific missions. We will finally discuss the prospects of applying these concepts for the creation of an observatory with the ability to cover the entire high-energy sky at all times to search for the high-energy counterparts of gravitational wave events that will be find by Advanced Ligo/Virgo/Kagra at the end of this decade and the Einstein Telescope during the 2030'.