FONDAZIONE BRUNO KESSLER
MAGAZINE

The infinite lightness of exploration

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A journey inside the HERMES-SP project and the cross scientific return in the field of multi-messenger astrophysics

HERMES-SP (**High Energy Rapid Modular Ensemble of Satellites** – **Scientific Pathfinder**) is a project based on a **constellation of nano-satellites in low Earth orbit** (LEO), hosting new miniaturized detectors to probe the X-ray temporal emission of energy transients such as Gamma-Ray Bursts (GRB) and the electromagnetic counterparts of Gravitational Wave Events (GWE).

This project is complemeted by the HERMES-TP, **Technologic Pathfinder** project, funded by the **Italian Space Agency**, and the **University of Melbourne**'s **SpIRIT** project, which hosts a detector identical to those of HERMES-SP and HERMES-TP.

HERMES-SP, HERMES-TP and SpIRIT (HERMES Pathfinder for simplicity), will form a fleet of 7 nanosatellites, of which 6 units based on 3U CubeSat and one unit based on 6U CubeSat, which will provide timely (within minutes) good localizations of relatively bright X-ray transients such as GRBs. **The fleet will be ready for launch by 2023**.

The project will produce the fleet-wide Scientific Pathfinder, consisting of three flight segments based on 3U CubeSats that will provide timely (within minutes) good localizations (<1 degree 2) of relatively bright X-ray transients such as GRBs, **ready for launch within 3 years and able to improve synergies between space and ground observations**.

Gamma-Ray Burst localization is obtained by comparing the time delays between the same epochs of detection of events that occurred on – at least – 3 detectors spaced on different satellites.

Given the complexity of the project, **spatial distribution and event detection are the key ingredients to start building the entire science experiment**.

This ambitious goal is expected to be achieved by making the most of Commercial off-the-shelf (COTS) components, which are currently underperforming in the space environment, but have the potential to provide high impact, as well as radical transformations, in space application. They can also **open up new markets and uses in space and beyond**, contributing to the Space4.0 revolution. Specifically, **concrete examples in the terrestrial market sector are the rapid**

increase and improvement of the performance and capabilities of laptops and smartphones.

The HERMES-SP Consortium has 11 partners from 5 European countries, including la FBK's MNF Facility. The Consortium, under the scientific coordination of Dr. Fabrizio Fiore, joins these forces to design, build and pilot the HERMES-SP fleet.

HERMES-SP has received funding from the European Union's Horizon 2020 research and innovation program. The HERMES-TP consortium includes all Italian and German parners of HERMES-SP, including MNF-FBK and is funded by the Italian Space Agency (ASI), which will also fund the launch of HERMES-Pathfinder and its operations.

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