

IAF MICROGRAVITY SCIENCES AND PROCESSES SYMPOSIUM (A2)  
Microgravity Sciences on board ISS and beyond (6)

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MISSION BEYOND: THE ITALIAN SPACE AGENCY EXPERIMENTS OVERVIEW

**Abstract**

The return of the European Space Agency (ESA) astronaut Luca Parmitano on board the Soyuz MS-13, on February 6th, 2020, is the event that signed the successful completion of the ESA mission BEYOND. One of the mission goals was to carry out six experiments sponsored by the Italian Space Agency. Three investigations (Acoustic Diagnostics, Amyloid Aggregation and NutrISS) were integrated on board and operated via a specific agreement with ESA, two (XenoGRISS and LIDAL) were launched through the ASI-NASA MoU for the MPLM/PMM modules, one (Mini-Euso) stemmed by an international cooperation led by Italy and Russia, which required a specific agreement between ASI and ROSCOSMOS.

This paper provides an overview of these six Italian experiments successfully initiated and/or performed while Luca Parmitano was on board the ISS, by describing the flight hardware, the major tasks relevant to the mission integration, the ground processing and the on-orbit operations. A description of the ASI educational and public outreach initiatives for the BEYOND Mission, jointly implemented with ESA, is also provided.

The UTISS (Utilization of the ISS) team, composed by Argotec as prime contractor and Telespazio, has provided ASI with the specific support necessary to the experiment success. This support ranged from the early payload development stage to the return of the sample data and hardware to the scientific teams, which are located in different Italian sites.

Mini-EUSO and LIDAL are still on going and are both intended to run at least until mid of 2021.

For what concerns LIDAL, whose scientific objective is to study the cosmic radiation flux as seen by the ISS, the paper provides insight on the ground segment that has been built up to ensure the data flow from the ISS directly to the Tor Vergata University in Rome, Italy, through the American and the Italian nodes of the ASI-net network.

Keywords: ASI, Argotec, Telespazio, utilization, ISS, UTISS, BEYOND