

DLR to use Airbus Bartolomeo Service for First-Ever In-Orbit Verification of Laser-Optical Clocks

German Aerospace Center's COMPASSO mission to fly on new ISS external platform Bartolomeo from end-2024

Highly stable laser-optical clocks are fundamental for improved satellite navigation and inter-satellite links

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Bremen/Friedrichshafen/Cologne, 19 February 2021– The Galileo Competence Center of the German Aerospace Center (DLR-GK) and Airbus have signed a €16.8 Mio contract for the hosting of DLR's COMPASSO mission on the International Space Station (ISS) Bartolomeo platform.

COMPASSO will be the first in-orbit verification of compact and highly stable laser-optical clocks. Via a bi-directional optical link, these clocks are compared to and synchronized with highly stable clocks on Earth. In addition, the optical link between the ISS and the ground station is used for assessing the influence of atmospheric turbulence on the frequency and time transfer.

In combination with optical links, highly stable optical clocks are of particular interest for future generations of satellite navigation systems, such as Galileo, and the basis for new Global Navigation Satellite Systems (GNSS) architectures, such as the Kepler concept developed at DLR. Combined with the control of further parameters, such as accuracy in orbit determination and atmosphere modelling, a higher accuracy in position determination on Earth can be achieved while at the same time reducing the ground segment complexity and size.

"In addition to satellite positioning applications, the frequency reference developed in COMPASSO is a highly stable and extremely coherent light source for inter-satellite laser interferometry," said Hansjoerg Dittus, Member of the Executive Board at DLR. "This is of significant interest for Earth observation missions such as the Gravity Recovery and Climate Experiment follow-on, GRACE-FO, or scientific missions such as the Laser Interferometer Space Antenna LISA".

The 200 kg COMPASSO mission is expected to launch in late 2024 and will occupy a double slot on the Bartolomeo platform. At the end of the 18-month mission, the payload components will be returned to Earth.

"COMPASSO will be fitted onto a dedicated ArgUS Carrier, an adapter plate originally designed for carrying several smaller payloads in a ride-share scenario," said Andreas Hammer, Head of Space Exploration at Airbus. "It is great that with this tailored service

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solution, we were also able to offer DLR-GK an ideal basis for their COMPASSO experiments.”

The DLR Galileo Competence Center (DLR-GK) is responsible for the COMPASSO project management and acts as both the contracting authority and the technical authority. It coordinates the DLR institutes and external suppliers developing COMPASSO subsystems, including on-board and ground software. DLR-GK is located at the DLR site in Oberpfaffenhofen.

For the COMPASSO mission, Airbus provides a specific combination of services tailored to the customer needs, combining the system expertise of the Airbus Bremen team and the engineering expertise of the Friedrichshafen team in Airbus, to realise complex payloads for the ISS. Airbus not only provides the Bartolomeo service, which includes payload launch, installation, operations and return, but also supplies the tailored ArgUS Multi-Payload Carrier and is responsible for systems engineering and assembly & integration activities.

Airbus' Bartolomeo platform was launched and robotically attached to the ISS Columbus Module in 2020. Following the final connection of the cabling, which requires Extravehicular Activity (EVA), the platform will be ready for its in-space commissioning in the coming weeks.

Bartolomeo is an Airbus investment into the ISS infrastructure, enabling hosting of up to twelve external payloads in the space environment, providing unique opportunities for in-orbit demonstration and verification missions. It is operated in a partnership between Airbus, ESA, NASA and the ISS National Laboratory.

Bartolomeo is suitable for many types of missions, including Earth observation, environmental and climate research, robotics, material sciences and astrophysics. It provides sought-after payload-hosting capabilities for customers and researchers to test space technologies, verify new space business approaches, conduct scientific experiments in microgravity or research in-space manufacturing techniques.

The payload accommodation allows slots for a wide range of payload mass, from 5 to 450 kg, and a size envelope of up to roughly 1m³. For smaller payloads, Airbus has developed the ArgUS Multi-Payload Carrier, a ride-share solution that enables the hosting of several payloads on an adapter plate fixed in one payload slot. These payloads can be as small as 3U, i.e. roughly the size of a shoebox (1U = 10x10x10cm³).

As an evolution of the platform, Airbus will provide optical data downlink capacity of one to two terabytes per day.

Launch opportunities are available on every servicing mission to the ISS, which occur about every three months. Payloads can be prepared and ready to operate within one and a half years after contract signature. Payload sizes, interfaces, preparation before launch and integration processes are largely standardised. This reduces lead times and saves costs significantly compared to traditional mission costs.

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Airbus offers this easy access to space as an all-in-one mission service. This includes technical support in preparing the payload mission; launch and installation; operations and data transfer; and an optional return to Earth.



Bartolomeo at ISS – Copyright Airbus 2021

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