

## Airbus and partners demonstrate very high speed optical link between Earth and Space

Successful tracking, downlink and uplink tests between TELEO geostationary in-orbit demonstrator and ground stations

Preparing the future of connectivity, enabling secure massive data transfer

The French Space Agency (CNES) and Airbus have announced completion of the TELEO in-orbit demonstrator designed to prove that massive, rapid ground to space data transfer is possible.

This compact 'orbital laboratory' is hosted onboard Arabsat's Airbus-built Badr-8 geostationary satellite, launched in 2023. Its mission was to exchange masses of data at very high rates (10Gbps) between space and various ground stations.

CNES and Airbus have been working together since 2018 to develop terabits per second optical feeder links for future geostationary (GEO) telecommunication satellites. The successful TELEO demonstration has proven that optical links will be a competitive complementary solution, and in some cases, a real alternative to radio frequency communications, thanks to much higher capacity of transfer per link, as well as a simpler, smaller and more cost effective ground segment.



TELEO optical demonstrator hosted on top of Arabsat's Badr-8 satellite - Copyright Airbus

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“Laser communications to and from space will reshape the telecoms market, similar to how optical fibre transformed telecoms on ground,” said Philippe Pham, Head of Telecommunications and Navigation systems at Airbus. “TELEO is the next generation of laser satellite communication, demonstrating very high speed and resilient connectivity from GEO orbit to the ground through turbulent atmosphere. This technology is license-free, undetectable, immune to military jammers and will complement radio frequency for tomorrow’s rapid global data exchange.”

As the main partner, CNES has contributed to this demonstration right from the start. CNES also made available a prototype ground station, developed by a consortium of French industrial companies, under the lead of OGS Technologies, known as FrOGS (the French Optical Ground StationS).

The TELEO demonstration core team composed of Airbus, OGS Technologies and CNES, performed the first in orbit acquisitions and data links, from FrOGS, demonstrating TELEO’s ability to repeatedly acquire and track laser signals.



CNES FrOGS by night - Copyright OGS Technologies

“The successful TELEO demonstration, designed and implemented in record time, symbolises the fruitful cooperation between the French Space Agency, a space system prime and a start-up”, explains Caroline Laurent, Director of Orbital Systems and Applications at CNES. “Multiplying by 1000 the bandwidth of Earth-Space communications without any risk of jamming, or implementing 10 to 100 Gbps-class point-to-point optical links between ground isolated infrastructures may now become a reality.”

Complementary test campaigns were carried out with European Space Agency (ESA), ONERA and France’s Defence Innovation Agency at sites across Europe. The first communication links

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were achieved with various data rates by an Airbus ground station team in the Netherlands, relying on an existing ESA ground facility in Tenerife, Spain.

The multiple telecommunications link tests have also provided massive amounts of data about atmospheric interference, as well as key technical parameters from the on-board terminal and the optical ground stations, which will enable more rapid development of critical technological bricks and analytical models.

The TELEO optical payload, having proven its maturity, is likely to be reactivated in the future for additional demonstration tests, and to assess the performance of newly developed Optical Ground Stations.

### Technological partnerships

The TELEO innovation project was initiated and incubated within Airbus UpNext starting in 2019, providing financial and technical ramp-up, during the technology maturation phase. UpNext is an Airbus subsidiary aimed at identifying disruptive trends as potential viable products and accelerating research cycles and prototyping in order to develop real-world applications for emerging aerospace technologies, for which TELEO is a perfect illustration.

CNES supports the French national optical SatCom roadmap through the development of the TELEO demonstration, the FrOGS prototype, as well as the future operational high speed OGS products. The industrial consortium includes French start-up OGS Technologies, as main contributor, who built the station, the optical instrument and the steering mechanism; Safran, as ground station prime together with ALPAO, a world leader in adaptive optics, and Airbus, as the end user, responsible for the first ground to Space demonstrations.

FrOGS is based at the côte d'Azur Observatory on the heights of Grasse, France. These activities are supported and supervised by CNES, in the frame of DYSCO and CO-OP Projects (France Relance) and national R&T.

The ESA ARTES project "FOLC2" has enabled the design, production and development of key building blocks for high-capacity optical communication systems, such as those used for the in-orbit demonstrator TELEO.

ONERA's involvement was through its FEEDer LINK Ground Station (FEELINGS), a unique research infrastructure to study the constraints of the propagation environment on optical links: atmospheric turbulence, cloud cover and aerosols and also to test innovative mitigation strategies. Propagation channel mitigation is of critical importance to reap the benefits of optical links for very high throughput data transfer.

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