

**10+ Gbps-ready**

## **Optical Ground Stations**

Cailabs provides all levels of support to its customers and partners for their optical link projects: from a single component to the optical ground station and the entire terminal

**Ease of integration and turnkey projects**

**More reliable laser communication**

**Agnostic technology**

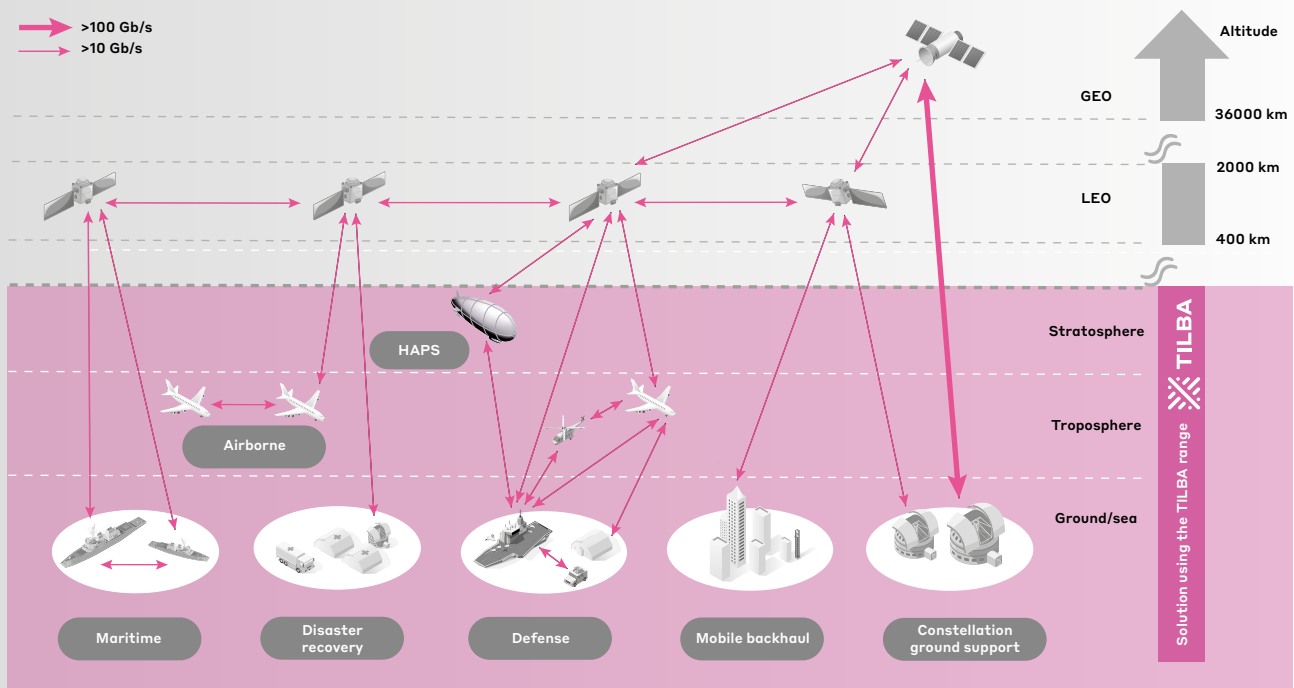
# Laser communications and our various positioning

**Laser communication is essential for future telecom networks to supplement RF communications and enable:**

- Very high throughput links (> 10 Gb/s and up to Tb/s)
- Communication without frequency band limitation
- Highly secure, stealthy and non-interceptable links

**It is essential for operational use cases:**

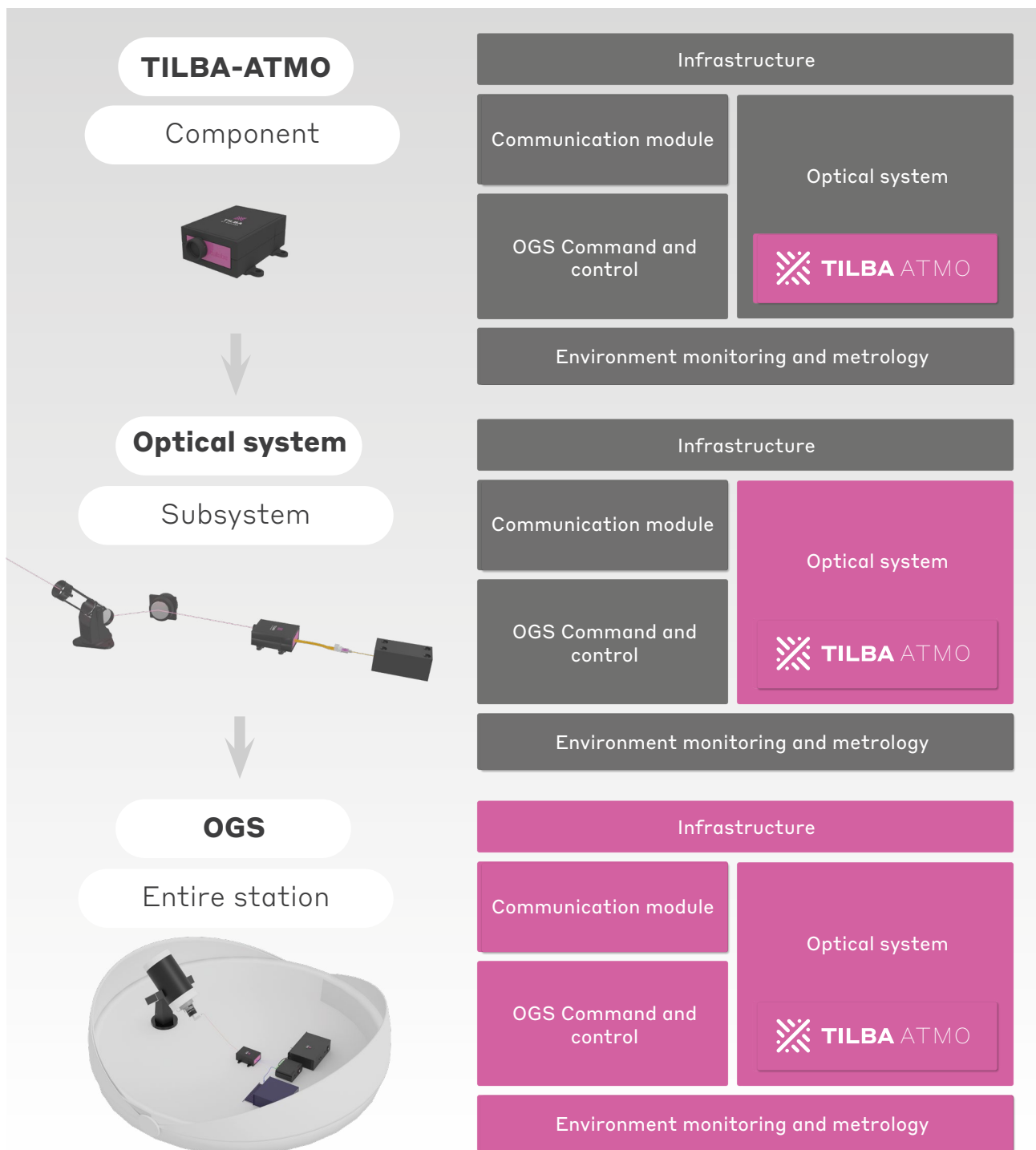
- Multispectral observation of Earth from space (very bandwidth intensive)
- Securing sovereign communication
- Telecommunication constellations that rely on very broad bandwidth links

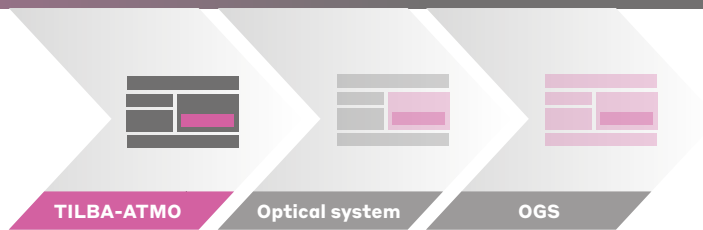


Below the stratosphere, atmospheric turbulence degrades the performance of high throughput optical links, limiting the use of single-mode fibers. However, these fibers are essential for standard telecom components, such as EDFA amplifiers, or single-mode or coherent detection systems.

# A range of solutions from components to turnkey stations

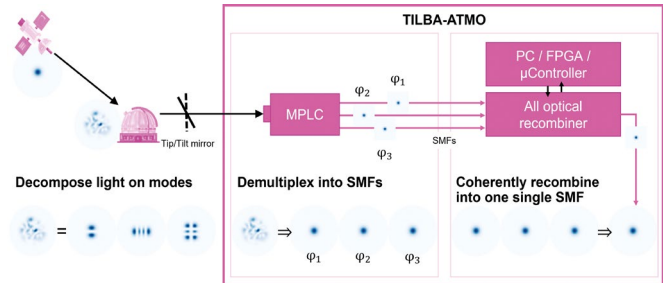
Cailabs has developed a unique range of beam shaping products to counter the effects of atmospheric turbulence. The company has used this technology to develop turnkey laser communication solutions, from single components to the entire station.



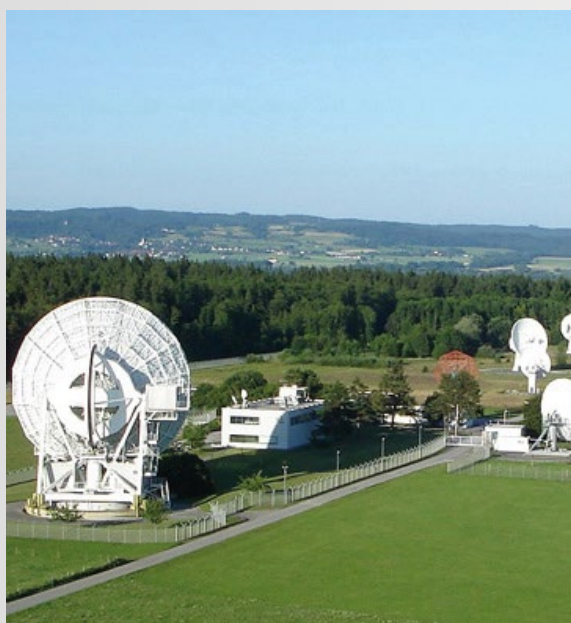
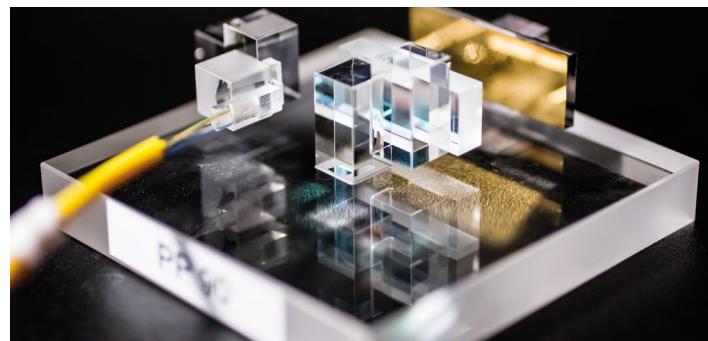


## TILBA-ATMO

**When propagated in the atmosphere, the laser wavefront is perturbed, degrading the coupling efficiency into single-mode fibers, which is crucial for very high throughput links.**



Based on Cailabs' **Multi-Plane Light Conversion (MPLC)** technology, TILBA-ATMO compensates for atmospheric turbulence, improving free-space optical links. TILBA-ATMO is an easy-to-integrate product that takes a perturbed beam, corrects it and couples it into a standard single-mode fiber. **TILBA-ATMO** makes it possible to use conventional telecom equipment and direct or coherent modulation formats to provide robust high throughput links to optical ground stations.

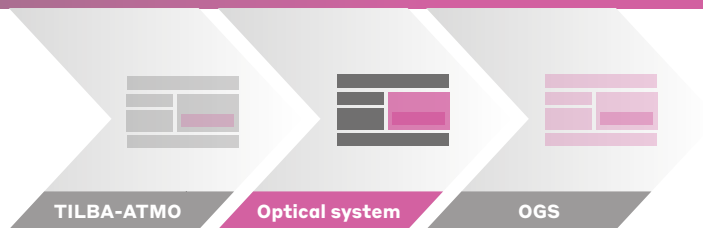


## Case study

**Comparison between TILBA and *adaptive optics (AO)*, two atmospheric turbulence compensation technologies.**

A standard MPLC device was tested by a [DLR](#) team (German Aerospace Centre) on a 10 km link at its Weilheim site.

- The MPLC device was installed in parallel with an AO unit to compare the two technologies side by side.
- Link stability was similar to that of the adaptive optics unit in low and medium turbulence, and more effective in strong scintillation conditions.

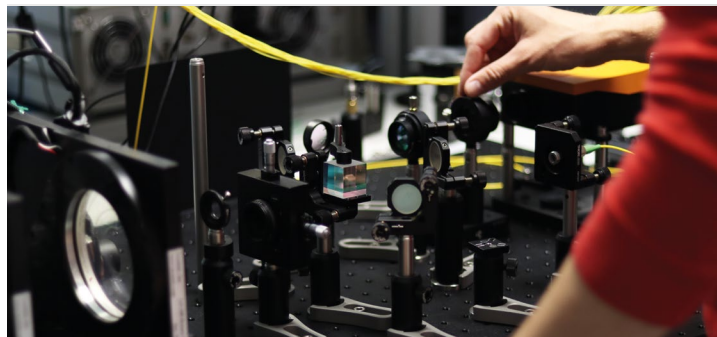


## Optical system

### **Cailabs designs, manufactures and integrates the ground station's optical subsystem.**

Cailabs combines its flagship turbulence compensation product with its unique expertise in precision alignment and optical communication to supply the entire optical chain. Cailabs' offer can be tailor-made, ranging from the input telescope to the output digital telecom signal, including supply of the emitting laser, the detector and the modem.

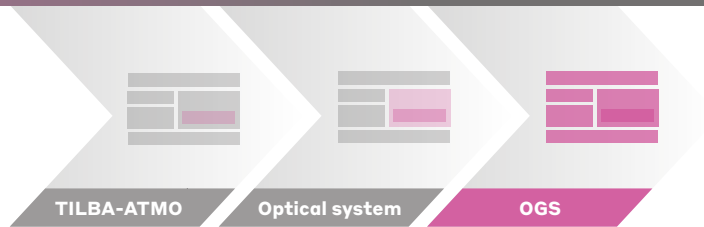
Cailabs offers laser communication solutions to meet its customers' specific operational needs, including communication with satellites, terrestrial networks or land, sea and air vehicles.



## Case study

### **An end-to-end terrestrial optical link through atmospheric turbulence**

Since June 2021, on a dedicated link, Cailabs has been designing, building and operating an entire subsystem, from the telescope to the modem, in order to qualify its products and ensure continuous improvement. Cailabs regularly presents updates on this link at [scientific conferences](#).

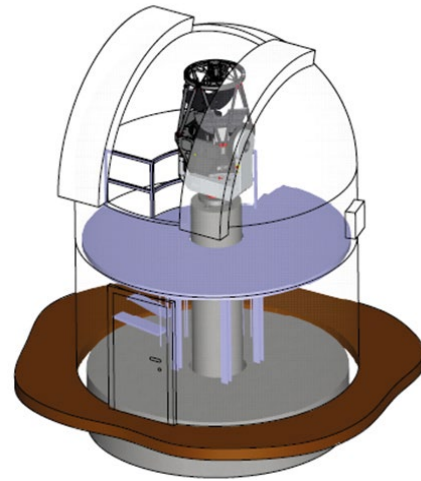


## OGS: Optical ground station

**Cailabs offers its customers and partners turnkey stations.**

Cailabs has leveraged the know-how acquired when manufacturing the pilot link for the **Keraunos project** to become one of the leading experts in project management and integration of an entire station.

With TILBA-ATMO at the heart of the OGS, Cailabs offers its customers a complete turnkey station including infrastructure, control and monitoring. The stations built by Cailabs are based on CCSDS or SDA standards and are agnostic in terms of throughput, protocol and modulation format.



## Case study

**The Keraunos project: building and operating an end-to-end link between the satellite terminal and the ground station**

As part of a partnership with the French Defense Innovation Agency (AID), Defense Procurement Agency (DGA) and Ministry of Defense, in 2022 Cailabs will test optical data transmission from a nanosatellite, designed and launched into low earth orbit by the company [Unseenlabs](#).

Cailabs is responsible for designing, building and operating the entire optical ground station.

## Case study



**Cailabs participates in the Optical Communications consortium «CO-OP» of the Plan de Relance Spatial, led by Airbus and operated by CNES.**

In the framework of the CO-OP project, Cailabs contributes to the development of very high power sources of the optical link up to the kilowatt level to guarantee very high throughput (up to Tb/s) required for these satellites.

During this 3-year-project, Cailabs will develop two technological bricks (spatial and spectral) for the combination of beams, allowing the consortium to deliver a very high throughput station as soon as 2024.

In addition, **find out** about our TILBA-EMIT solution



**TILBA** is the Cailabs' product range dedicated to free-space laser communication. Where TILBA-ATMO mitigates turbulence at reception, **TILBA-EMIT coherently combines multiple sources to increase power during emission.**

**TILBA-EMIT main features:**

- Optimum beam combining
- High power handling
- Large number of sources (>10)



# cailabs

SHAPING THE LIGHT

Founded in 2013, **Cailabs** is a French deep tech company which designs, manufactures and distributes innovative photonic products for telecommunications, free space transmission, industrial lasers, and LANs. A global leader in complex light shaping, its technology is currently protected by 19 patent families. Its innovative optical components are used in a variety of sectors and have contributed to several world records (notably the optical fiber bandwidth record achieved by the Japanese operator KDDI).

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