IAF SPACE COMMUNICATIONS AND NAVIGATION SYMPOSIUM (B2)
Space-based Optical and Quantum Communications (4)

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GAOM: A MODULAR ADAPTIVE OPTICS PLATFORM FOR SPACE-BASED LASERCOM AND QKD

Abstract

Here we present the current status of the Adaptive Optics bench developed in the context of GAOM (Generic Adaptive Optics Module), a project funded by the European Space Agency (ESA) under the ARTES 4.0 SPL Optical communication - Scylight 6c.014/SL.050 initiative. The project Kick-Off was in October 2022, and the final installation is expected by the end of 2024.

In this presentation we will describe the overall system architecture, as well as the status of the project. The purpose of GAOM is to design, manufacture and test a generic adaptive optics (AO) bench for efficient laser light coupling into a single-mode-fiber enabling lasercom applications. The optical bench is designed to be modular, compatible with different hosting telescope sizes and largely based on off-the-shelf (COTS) components, so to cut recurrent costs. GAOM is based on a dual-stage woofer-tweeter AO system to sense and compensate for the atmospheric aberrations of the received wavefront, and it can be configured to be compliant with missions having different wavelength plans. For example, the first GAOM prototype will support lasercom and QKD operations in three spectral bands (785-815nm, 1530-1537 nm and 1565-1570 nm) compatible with CCSDS standard.

The project aims to revisit the generic design of an AO bench bringing in the concept of scalability and modularity. The final goal is to realize an optical bench that can manage both classical and quantum communication signals in downlink, while enabling compensation of atmospheric perturbation for improved fiber coupling at the receiving optical ground station (OGS). The first prototype targets the case of the ESA's IZN-1 Tenerife station and will be installed there, but one of the objectives is to deliver a concept design that can serve OGS of different sizes (600 mm to 1.5 m of diameter) and layouts, depending on targeted performances. The system will enable the supply of classical and QKD optical communication services via the implementation of high efficiency single-mode-fiber coupling, which will enable daytime QKD operation, translating into higher availability of service. Finally, its high flexibility and modularity and the use of COTS components will guarantee maximum compatibility with existing facilities, which

will translate into lower customer lead times and a faster deployment of a widespread global optical and QKD ground station network.