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# LTAO Mode of HARMONI : Status and update

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## Abstract

Among the four ESO-ELT first light instruments, HARMONI will provide a large range of spectroscopic capabilities thanks to its integral field spectrograph optimized for near-infrared observations. It will offer a spatial sampling covering from  $R = 3000$  to  $R = 17000$  and a spatial sampling from 60 mas down to 4 mas.

To reach the diffraction limit of the telescope, the instrument will be equipped with Adaptive Optics (AO) systems to compensate for the atmospheric turbulence. The design of the instrument includes two AO modes that are complementary. The first one consists of a Single Conjugate AO system to provide a very high correction with a low sky coverage and the second one consists of a Laser Tomography AO system to provide a very high sky coverage with slightly lower AO performance. This paper focuses on the LTAO mode only to present the consolidated design of the LTAO mode in preparation of the Final Design Review, scheduled for 2024.

A general description of the AO concepts selected will be presented with its two channels for the Laser Guide Star path and Natural Guide Star path as well as for the truth sensor capabilities.

In addition, a particular attention will be given to several key-points that have emerged since the Preliminary Design Review of 2017. The paper will provide (i) a description of the reconstruction strategy using the concept of super resolution with its associated performance, (ii) a sensitivity analysis of the global performance using end-to-end simulations, (iii) the calibration and control strategy and (iv) the Assembly Integration and Test preparation plan.

**Keywords:** Extremely Large Telescope, Laser Tomography, AO simulation

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