HARMONI SCAOS sub-system prototyping

Kacem El Hadi*[1], Jean-François Sauvage , Kjetil Dohlen , Gonzalo Carracedo , Louis Gemmerle , Edgard Renault , William Bon , David Le Mignant , Benoit Neichel , Thierry Fusco , Fraser Clarke , Dave Melotte , Matthias Tecza , Niranjan Thatte , Jérôme Amiaux , and Jerome Paufique

[1]Laboratoire d'Astrophysique de Marseille – Aix Marseille Université, Institut National des Sciences de l'Univers, Centre National d'Études Spatiales [Toulouse], Centre National de la Recherche Scientifique – France

Abstract

HARMONI is the first light visible and near-IR integral field spectrograph for the ELT. It covers a large spectral range from 450nm to 2450nm with resolving powers from R ($\not\equiv\lambda/\Delta\lambda$) 3500 to 18000 and spatial sampling from 60mas to 4mas. It can operate in two Adaptive Optics (AO) modes - SCAO (Single Conjugate AO, including a High Contrast capability) and LTAO (Laser Tomography AO) - or with no AO. The project is preparing for Final Design Reviews.
The SCAO Sensors subsystem (SCAOS) is located within the NGS Sensors System (NGSS) which includes several wavefront sensors (WFS) to cover the needs of the different HARMONI observing modes and operates at +2∘C. To reach the required performance, the SCAOS will use different modules and mechanisms (Dichroic module, Object Selection Module, Low-Order Module, Pupil Rotator, Atmosphere Dispersion Compensator, Beam Correction Module and Pyramid Sensor Module) among which we have identified two particularly critical devices that we have prototyped: The Pyramid Modulator Unit (PMU) and the Object Selection Mirror Unit (OSM).

The two modules have been already designed, manufactured and assembled in our laboratory. Recently, we have already presented the results of different tests of the two systems, both at room temperature and cold environment, in terms of resolution, linearity, repeatability or still of working frequency, ...). However, further tests have yet to be finalised to carry out this study and to conclude on the final performances. In the present work, we will then focus on these remaining tests:

- OSM: although component compliance has been demonstrated, we still need to optimize the calibration algorithm for reaching the full performance. Lifetime cycling measurement and PLC functional control validation will also be performed.
- PMU: PLC functional control validation and Lifetime cycling also planned.

The results will be presented and discussed.

Keywords: ELT HARMONI, Adaptive Optics, SCAO, Wave, Front Sensing, Pyramid, modulator, Tip, Tilt Mechanism

*Speaker