Contribution ID: **27** Type: **not specified**

Pyramid WaveFront Sensors and contactless active mirrors: a research program for high contrast imaging

Friday 11 July 2025 11:55 (15 minutes)

WaveFront sensing and control is considered an enabling technology for the the next generation space telescopes such as the HWO. We investigated the possible contributions of ground based Adaptive Optics for space telescopes and in particular the pyramid WaveFront Sensor and the concept of a contactless active primary mirror.
The PWFS, largely adopted on ground, is a pupil-conjugated sensor and is extremely sensitive at the low-mid spatial scales. We run a set of numerical simulations with the PWFS measuring the misalignment and phase steps of a JWST-like primary mirror, with natural guide stars in the magnitude range 8 to 14; we estimated a sensitivity far below 1 nm, while sampling at 1s cadence, in presence of photon and detector noise. In view of these results, the PWFS may help reducing the temporal stability requirements on the DM. In add, the PWFS signal may feed an advanced PSF reconstruction algorithm for contrast enhancement.
Concerning active mirrors: based on the technology of the adaptive secondaries (currently in use at LBT, VLT, e.g.), we developed a 40 cm mirror, 18 kg/m2, controlled by 19 voice coil actuators and capacitive position sensors, in a contactless control scheme. The optical surface floats at 300-1000 um from the mechanical support with no mechanical contact; such scheme potentially provides an intrinsic insulation from vibrations (and enhanced stability at no added cost) while reducing dramatically the mechanical spec of the support. The system is currently in the optical lab and we are assessing the rejection of external vibration and disturbances, while studying how to reduce its density to 14 kg/m2

Presenter: BRIGUGLIO PELLEGRINO, Runa Antonio (Istituto Nazionale di Astrofisica (INAF))

Session Classification: Space technology