

## SOUL: upgrading the SCAO systems at LBT

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### Summary

Nowaday, 4 SCAO systems named FLAO are operating at LBT. All of them are composed by an Adaptive Secondary Mirror (672 actuators) and a Pyramid Wavefront Sensor (30x30 sub-apertures). Two of these SCAO systems feed the interferometric focal stations of LBTI, while the remaining two provide the correction for the two LUCI spectro-imagers. SOUL is upgrading the 4 AO systems replacing the current wavefront sensor camera (CCD39) with an Electron Multiplied CCD (OCAM2k). SOUL will provide: a faster read out and framerate (2kHz instead of 1kHz) at lower noise ( $< 1e^-$  instead of  $\sim 10e^-$ ) for better rejection of disturbances, and a higher spatial sampling (40 sub-aps on the pupil diameter) for an improved reduction of aliasing error and alignment sensitivity.

We will report here the project status together with the updated estimation of SOUL performances. Two WFSs have been already upgraded and the commissioning of the first system started on September 2018.

We updated the numerical simulation using the measurement results obtained in laboratory tests. These results confirm the gain around 1.5-2 magnitudes at all wavelengths in almost all the range of reference star brightness ( $7.5 < m_R < 18$ ). This improvement will open the SCAO correction to a wider number of scientific cases from high contrast imaging in the visible to extragalactic source in the NIR.

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