
A new fibered NIR spectrograph for novel wavefront sensing techniques on SCExAO

Julien Lozi^{*1}, Christopher Betters², Nemanja Jovanovic³, Sergio Leon-Saval², and Barnaby Norris²

¹Subaru Telescope – United States

²The University of Sydney – Australia

³California Institute of Technology – United States

Abstract

The advancement of astrophotonics, especially for wavefront sensing, is one of the key goals of the high-contrast instrument SCExAO. We are now demonstrating the use of photonic lanterns in the focal plane as a wavefront sensor (PLWFS), as well as nulling interferometry with GLINT, or more conventional high-contrast high-resolution spectroscopy with REACH-IRD.

For the PLWFS project, after successful demonstrations using narrow bandwidth light, we are moving to polychromatic tests using a newly developed NIR spectrograph using First Light Imaging's C-RED ONE camera. The diffraction limited spectrograph, providing a resolution of 200 to 600 over 1 to 1.8 μm (y- to H-band), was designed to be compatible with any other fibered modules like GLINT and REACH, and can adapt to a large variety of single mode fiber bundles. A photometric mode is also available and can be used for injection optimization.

The opto-mechanical design was challenging due to the small amount of space available inside SCExAO, in front of the camera already used for polarimetric differential imaging, but also due to the camera itself with its cold stop, filter stack and recessed detector.

We will present here the opto-mechanical design of the spectrograph, as well as the first lab and on-sky results.

Keywords: NIR spectrograph, astrophotonics, photonic lantern wavefront sensor

^{*}Speaker