Final design and estimated performance of the ELT/METIS high-contrast imaging modes

Olivier Absil*[1]

[1]STAR Institute - University of Liège – Belgium

Abstract

The mid-infrared Extremely Large Telescope imager and spectrograph (METIS) went through its final design review (FDR) in late 2022, and is currently scheduled for installation at Cerro Armazones in late 2028. Since the start of Phase B in 2015, the design of METIS has been optimized to provide high-contrast imaging capabilities that can be coupled with both its imaging and high-resolution integral field spectroscopy cameras. Thanks to its high-contrast imaging modes, METIS is bound to provide an unprecedented vantage point on the inner parts of planetary systems around nearby stars, potentially down to the rocky planet regime. In this contribution, I will review the design of the METIS high-contrast imaging modes at FDR as well as the on-going procurement activities, and present the estimated coronagraphic performance based on end-to-end simulations. I will highlight the main contributors to the coronagraphic performance budget, with a particular emphasis on the main sources of non-common path aberrations that we have included in our simulations. I will also discuss to what extent the behavior of the single-conjugate adaptive optics (SCAO) system drives the high-contrast imaging performance, and describe the interplay between the focal-plane wavefront sensing strategy and SCAO operations within METIS. Finally, I will explain how water vapor seeing will drive the METIS coronagraphic performance in the 10-μm region, and present the on-going investigations using the Very Large Telescope Interferometer to improve our understanding of this phenomenon.

Keywords: ELT, high contrast imaging, end to end simulations, wavefront sensing, exoplanets

*Speaker