
SAXO+: Status update of the current design study.

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Abstract

SPHERE+ is a proposed upgrade of the SPHERE instrument at VLT, which will boost the current performances of detection and characterization of exoplanets and disks, and will serve as a demonstrator for the future planet finder (PCS) of the European ELT. The upgrade aims at improving the raw contrast closer to the optical axis and enabling observations of currently inaccessible fainter near infrared stars. The contrast gain improvement will be made possible thanks to a second-stage Adaptive Optics (AO) system (hereafter SAXO+) running at a fast frame rate (2-3 kHz), in addition to the operating first stage system (SAXO).

We focus in this paper on the SAXO+ design study which is currently on-going. We present the AO strategy, hardware choices (wavefront sensor, deformable mirror...), real time and software implementation in the context of an already constrained VLT environment. We

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present the foreseen SAXO+ RTC design using GPU accelerated devices based on the COSMIC platform solution. We focus on the so-called ‘integrated strategy’ which must be interfaced to the current SAXO real time hardware (HODM and VIS WFS) and discuss the challenges and solutions of such an invasive approach. We expose the AIT plan in Europe and present how it can cope with a simulated first stage hardware together with a comprehensive strategy once the instrument will be shipped to Paranal. We finally conclude on the implementation of a 3rd focal plane loop that will minimize the uncorrected quasi static speckles using the latest state-of-the art dark hole techniques and how it will be embedded into the overall SAXO+ correction strategy.

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