Closing me softly - Handing over from the ELT under mis-registered conditions

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Abstract

The ELT's adaptive mirrors M4 and M5 are integral parts of the telescope, while the wavefront sensors of the instruments are far down the optical train. E.g. METIS, one of the first-light instruments of the ELT, is deplooying a 90x90 pyramid WFS located inside the instrument's cryostat. Due to structural deformations that occur durinbg operation, the high-order DM M4 can move laterally by up to +/- 0.5% of its diameter, and rotate around the optical axis by up to +/- 0.13deg. Since the AO-loop is calibrated (pseudo-)synthetically usinga model of M4, this means that the actuators can be shifted by up to almost half a subaperture wrt the position assumed in the calibration model. Under no circumstances can strehl and most notably contrast requirements be fulfilled with such high mis-registrations. As a means of determining the actual position of M4 we have implemented a method based on the SPRINT algorithm, which will be deployed during the phase where the METIS AO loop takes over control of the ELT's adaptive surfaces. In the presentation, we will describe the method, the strategy of adapting to mis-registered conditions, initital results obtained in simulation, and a full simulated hand-over sequence.

Keywords: Misregistration, ELT, SPRINT method

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