

Temporal behavior of a low-order MCAO loop

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Future tomographic Adaptive Optics (AO) systems have strong requirements in terms of sky coverage. A study of the latter is then important for the conceptual design. However, running end-to-end simulations for a representative set of Natural Guide Star (NGS) asterisms is not feasible with standard hardware resources. It is thus necessary to assess the part of the error budget that is related to sky coverage, i. e. the Low Orders (LO), in a much faster way. While this exercise is quite easy in an AO system using only one NGS, the tomographic LO estimation and correction has not been studied thoroughly yet. The goal of the presented work is to analytically compute a temporal power spectral density of the residuals from a LO MCAO loop along any line of sight, given a turbulence/wind profile and a noise level from the NGS sensors. This will allow a fast exploration of the sensitivity of the NGS sensors to different noise and turbulence conditions, as well as an easier optimization of the LO loop control.

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