

## **Simulations of Effects of Vibration and Pathlength Modulation Errors on the Accuracy of SIM Delay Measurements**

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Optical interferometers determine angular positions from delays, which are measurements of OPD (optical path length difference) of beams of light from different parts of an incoming wavefront.

In the SIM instrument, beams of white light from two siderostats separated by 10 meters are combined to form an interference fringe, which is dispersed along the columns of a CCD detector.

The delay is determined via integrated photon flux measurements on the fringe, made while the pathlength is repeatedly modulated in a known way.

Errors in delay measurement arise from imperfect knowledge of the modulator position, as well as vibration in the positions of elements in the optical path during photon flux measurements. These effects can be monitored via laser metrology, and the resulting information used to partially compensate the errors.

We simulate errors in SIM delay measurements due to vibrations and imperfect knowledge of modulator position, and investigate methods of error compensation via use of metrology measurements. We determine the resulting impact on the accuracy of SIM delay measurements.

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