Characterising the Atmosphere Turbulence with the SHIMM

Saavidra Perera*[1], Richard Wilson[2], Tim Butterley[3], James Osborn[3], Ollie Farley[3], and Douglas Laidlaw[4]

[1]University of California [San Diego] – United States
[2]Durham University – United Kingdom
[3]Durham University – United Kingdom
[4]German Aerospace Center – Germany

Abstract

The Shack-Hartmann Image Motion Monitor (SHIMM) is a portable, low-cost instrument, that can estimate atmospheric seeing, coherence time and a low-resolution three-layer turbulence profile. It is a development of the Differential Image Motion Monitor (DIMM), which is a commonly employed seeing monitor for astronomical observing sites across the world. However, the SHIMM employs a Shack-Hartmann wavefront sensor in place of the two-hole aperture mask utilised by the DIMM. This allows the SHIMM to provide an estimate of the seeing, unbiased by shot noise or scintillation effects. The SHIMM is comprised of off-the-shelf components making it easy to duplicate and therefore well-suited for comparisons of atmospheric conditions within and between different observing sites. Here the SHIMM design and methodology for estimating key atmospheric parameters will be presented, as well as initial field test results with comparisons to the Stereo-SCIDAR high-resolution profiling instrument. In addition, techniques developed for the SHIMM have been applied to adaptive optics telemetry data to retrieve important atmospheric parameters, making in-situ profiling possible.

Keywords: atmospheric effects, site testing, wavefront sensor, adpative optics

*Speaker