Closed-Loop Performance of the Magellan Adaptive Optics VisAO Camera

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Visão: (Portuguese) n. eyesight; sight, view; vision; intuition

\textbf{ABSTRACT}

The Magellan Adaptive Secondary AO system:
- Scheduled for first light in the fall of 2012 on the Magellan Clay 6.5 m telescope
- Will simultaneously perform diffraction limited science in the mid-IR and visible
- The mid-IR imager is the CLIO 3-5 \textmu m camera
- The VisAO instrument will offer a suit of observing modes for high resolution imaging in the visible (0.5-1.0 \textmu m)

The VisAO Camera:
- Will operate as an imager, using a 1KxE2V CCD47 with 8.5 mas pixels
- The VisAO camera will have a full suite of filters, coronographic focal plane occulting spots, an SDI prism, and a separate tip/tilt AO loop.

We also present excellent results from our 1kHz closed loop test of the full AO system in the Arcetri test tower. These results include our 85\% Strehl image at 982 nm. We also present our alignment scheme for the boresight reference and retroreflecting Calibration Return Optic (CRO). This micron-level alignment presents many unique and challenging problems which we have over come with custom alignment fixtures and carefully designed optics mounts. We present hardware images of many of our recently integrated custom optical components, including the prototype Wollaston prism, the SDI filter suits, and our chrome coronographic focal plane masks.

Magellan’s Gregorian design has a concave F/16 adaptive secondary mirror (ASM) that can be tested off-sky with a retro-reflecting optic at the far ellipsoidal conjugate. Our 85 cm diameter ASM uses 585 actuators with a 1 msec response time and will allow us to perform low emissivity AO science. We will achieve very high Strehls (>98\%) in the Mid-IR (8-26 microns). We will use a high order pyramid wavefront sensor (WFS) similar to that used in the Large Binocular Telescope AO systems. Our VisAO science camcorder is on the same stage (the “W-unit”) as the WFS and will allow us to simultaneously perform mid-IR and visible adaptive optics science.

\textbf{ACKNOWLEDGEMENTS}

This project owes a debt of gratitude to our partners and collaborators. The ASM and WFS could not have been possible without the design work of Microgate and ADS in Italy as well as Arcetri Observatory and the LBT observatory. We would like to thank the NSF MRI and TSP programs for generous support of this project in addition to the Magellan observatory staff and the Carnegie Institute. We would also like to thank the engineers and staff at Optimax for doing an excellent job fabricating the ADC, a challenging and unique optic.

\textbf{REFERENCES}

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