Palomar Adaptive Optics Test Plan

Title	Low Light Testing
Date	2006 09 06
Lead	C. Shelton
Time requested	
Required conditions	NGS AO, nightime

Purpose

To measure low light NGS performance using various reconstructors and centroid denominators policies. Reconstructors are
R1. Least-squares unobscured with pixel gain mask (traditional combo)
R2. Optimal with alpha = 0.0001, obscuration as measured, pixel_gains_all.
R3. Optimal with alpha = 0.01, obscuration as measured, pixel_gains_all.
R3u. Same as R3, unobscured.
R4. Optimal with alpha = 1.0, obscuration as measured, pixel_gains_all.
Denominator polices are:
D1. Division by current subap intensity, centroid set to zero if below user threshold.
D2. Division by current subap intensity, denom clamped if below user threshold.
D3. Division by quadrant-averaged intensity, clamped if below user threshold.
Servo gains and frame rate are also optimization variables.

Previous analysis

Pixel illumination was measured 2006 09 05, a model with inner, outer circular boundary was fitted and resulting ID, OD values used to calculate tonight's optimal reconstructors. Reconstructors were determined to be stable and result in improved DM residuals on Landolt 95-302, V=11.69, 200Hz, 7 counts, with a 3.3 mag LGS-mode penalty.

Test procedure

Prep -- Denominator policy D1 is not available tonight. AO is configured for LGS, resulting in 3.3 magnitudes extra loss to the HOWFS. Document seeing, transparency.

1. With combo R1D2, acquire 10th-mag star. Map K strehl vs integrator gain, frame rate, and optimize. Repeat for R2, R1, R4. Find global optimum for alpha, frame rate, integrator gain, all for D2. Do at least one comparison of R1, R3, R3u.
2. Repeat with fainter stars to map strehl vs magnitude, all for D2. Try to find optimal alpha, frame rate, servo gains, user threshold within time allowed. Try to get to Veff=16.
3. Pick an object brightness and reconstructor to best compare D2 and D3. Measure K strehl vs user threshold for D2, D3.

Results and conclusions

Develop and document recommendations for parameter settings for AO operation in faint light.