

Palomar Adaptive Optics Test Plan

Title	Predictive AO Data Collection
Date	12/2/2006
Lead	M. Troy, L. Poyneer
Time requested	1.5 hr
Required conditions	On sky

Purpose

Lisa Poyneer had developed a method to develop predictive AO control using WFS data. The goal of this procedure is to acquire some data to help validate and test the algorithms. This data is of interest with and without the off-axis subaperture corrector in place.

Resulting data will be transferred to Lisa Poyneer for analysis. Data will include:

- centroids, centroid flux, DM residuals, TTM positions, TTM residuals
- MASS/DIMM data collected by the Palomar seeing monitor

Notes (from Lisa):

1. The 1.6 meter data is higher priority than the 5.1 meter data
2. To estimate the need WFS data recording rate

If you have a reasonable measure of the wind speed, you may need to do a check on that and the sampling rate. The formula for the maximum layer peak temporal frequency is $\text{max freq (Hz)} = \sqrt{2} * 7 * \text{velocity} / \text{diameter}$

For the 5.1 m aperture, if the wind speed was 30 m/s (is that reasonable?) then the maximum layer frequency would be ~58 Hz. A sample rate of 250 Hz would be more than adequate for this. On the WCS, however, the max freq would be 185 Hz, which would alias if the sample rate was 250 Hz.

Test procedure

1. Collect 1.6 meter off-axis data
 - 1.1. re-configure the AO system to use the off-axis re-imaging optics see procedure (http://www.oir.caltech.edu/twiki_oir/pub/Palomar/PalmLGS/AOOperationalProcedures/running_fqpm_with_normal_ao_nov06.pdf). Note this will require going to Zenith for installation of a mask on the DM.
 - 1.2. Acquire a bright guide star, > 3mV (if LGS dichroic is installed then we lose ~3.5mags)
 - 1.2.1. Run the WFS at 1000Hz frame rate.
 - 1.2.2. Use the standard least squares reconstructor (*lse_mar03_1lt2*)
 - 1.2.3. Use `co_zero` centroid offsets
load wfp=ho,cent_offsets=aocp:/tables/cent_offsets/co_zero
 - 1.2.4. Register DM/WFS pupil as normal
 - 1.2.5. Check SNR in the WFS, insure there are at least 300 counts per subaperture, which will provide a SNR of ~10.
 - 1.3. Take a telescope flat_map
In IDL type *ao_make_dm_flat_map,'<filename>'*, when asked if the map should be copied to the default flat map say no

- 1.4. Take data
 - 1.4.1. Lock TT loop only
 - 1.4.2. Apply DM flat_map
load wfp=ho, dm_calib_pos=aocp:/tables/dm_calib_pos/<filename>
 - 1.4.3. Inspect plots to insure T/T lock is good
 - 1.4.4. Stop all plots (IDL and DM)
 - 1.4.5. Set log interval to 4, to record 250Hz data
log wfp=ho, interval=4
 - 1.4.6. Record 5 minutes of data. Note the following:
 - 1.4.6.1. Start/stop time in seconds since 1970 and UT
 - 1.4.6.2. Telescope elevation
 - 1.4.6.3. Wind speed and direction
 - 1.4.6.4. Latest seeing measurement taken with the AO system
 - 1.4.6.5. Latest seeing values from the MASS/DIMM
- 1.5. Perform a quick check of the data
 - 1.5.1. Extract wfp_status for the 5 min period
ao_db_find,start='<start time>',stop='<stop time>',hwfp_status
 - 1.5.2. Read in the data and check the frame rate is correct.
in idl> wfp=ao_read_wfp_status('hwfp_status','ho')
time=ao_time_wfp(wfp)
 - 1.5.3. If average frame rate is significantly different then 250Hz, then investigate.
2. Collect 5.1 meter data
 - 2.1. Re-configure the AO system to the full 5.1 meter aperture. See procedure (http://www.oir.caltech.edu/twiki_oir/pub/Palomar/PalmLGS/AOOperationalProcedures/running_fqpm_with_normal_ao_nov06.pdf). Note this will require going to Zenith for removal of a mask on the DM.
 - 2.2. Execute procedure 1 above, using a ~5mV (if LGS dichroic is installed then we lose ~3.5mags, so look for a star of ~2-3mV)

Results and conclusions

12/07/2006 UT
UT 03:00

Going to Beta And mV=2.03

Using subaperture relay:

Move fq_relay 34,500
Rotate cass ring to 220 to move pupil to a clear portion of the pupil.
At 10000Hz ~1060 counts per subap, log interval = 4
Load co_zero centroid offsets
Make flat_map flatmap_dec06_2006_fqpm

Start time:

1165461752 UT = 3:23
Telescope el=83.18
Wind speed = 3 MPH average at 26 Deg
Seeing ~1.5 arcsec MASS/DIMM

Seeing was 0.58 at K, 2 hours ago

Stop time:

1165462084 UT=3:28

Average frame rate in data 249Hz

Run WFS at 2KHz

Log interval -5, should get ~400Hz data

UT ~3:35 1165462482

Tel el = 85.39

Wind ~5 MPH, at 104 deg

Seeing 1.5-1.8 arcsec

UT: 3:40 1165462848

--done with 1.6 m

Go to 5.1 meter

Restore DEFAULT

Move Cass ring to 335.81

At 1000Hz we are saturating, find fainter star Sao star 54281 Mv 3.9A2

Aocp not responding, dsps out of sync

Reboot AO system

1000Hz ~2500 counts per subap, log interval = 4

Take flatmap flatmap_dec06_2006b

Start:

UT=4:06, 1165464345

Tel el = 82.8

Wind = 7mph at 90 deg

Mass dimm :1.7-2.0 arcsec

Stop:UT=4:11 1165464670

2000H, ~1200 counts

Log_interval =5, should get ~400Hz data

UT = 4:13, 1165464780

Tel el = 81.7

Wind = 7mph at 90 deg

30 sec exposure in PHARO = 0.625at K, which is 0.84" at V

Stop UT = 4:18 1165465130