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 then 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 max freq (Hz) = sqrt(2)*7*velocity/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_llt2*)
     - 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_wfp_time(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