Palomar LGSAO Engineering Summary 06/14/06 UT Daytime results: 1. Safety interlocks engaged and tested by 1410! 2. Tested new BTO servo control scripts. Night log: 1935 Opening dome for BTO FSM noise tests. Ed and Viswa working on laser. 2005 FSM noise results: 30 mV peak-peak, no effect from RADAR. 2031 Moving to SA063760 (V=5.8 K0) for AO checkout. Closed loop images: ph0000-ph0001 TT only: ph0002. FWHM=1.25 @ K = 1.70" uncorrected at V 2050 Preparing spotters, safety systems for laser propagation at 2100hr. Aligning BTO with 660nm laser. 2102 Projecting at zenith. Laser power = 5W. Acquired LGS. 2110 Focusing LLT: Background 'laser\_sky\_1'. LLT focus runs 11t1, 11t2, 11t3 (steps=300, then 50) Best focus = 75152120 Focusing Acq: Acq focus runs acq1, acq2 (steps=300, then 150) Best focus = 119002125 Focusing LLT focus: 11t4 (7515-50,50,3). Best = 7535 (18.8 pix = 2.8") 2130 LGS images (Johnson V filt, laser power=5.0W): laser 1 and laser 1 detune. 2135 Moving LGS onto HOWFS. 2140 Getting 190ct @ 30Hz. Reducing UTT gain to 0.2 2145 Optimizing laser focus using HOWFS counts. Too variable. 2200 Optimizing laser focys using acquisition camera images: laser\_focus peak cts (5s) 4500 35 5500 29 6500 38 34 7500 8500 38 9500 23 4500 32 3500 36 2500 26 21 1600 Best position: 6000. Measurement: 44 2212 Optimizing 1.32 etalon tuning. etalon posn peak cts (5s) -20 27 -15 37 -10 38 -5 39 0 50 5 48

	10 56		
	15 53		
	20 48		
	25 38		
	30 35		
	35 23		
	See two peaks in re	eturn as expected.	Best position ~ +10.
	-10 51	•	
	-5 61	•	
	-2.5 59	•	
	2 5 57		
	5 53		
	7.5 46		
	10 44		
	12.5 52		
	15 50		
	17.5 46		
	20 41		
	Choosing +10 as bea	st position. Took '	laser_tune_10_3'
2232	CS going to prime f	ocus for laser pola	arization experiment.
2246	Power dropped to 4.8W. Viswa tuning up laser. Now 7.0 W.		
2255	Closing dome to realign two lasers (misaligned due to above		
	adjusment?)		
2320	Opening dome, attem	pting to project la	ger
	· · · · · · · · · · · · · · · · · · ·		
2335	Unable to close shu	tter due to BTO int	cerlock errors.
2335 2340	Unable to close shu Closing dome again	tter due to BTO int to trouble-shoot.	overriding BTO. BTO
2335 2340	Unable to close shu Closing dome again alignment appears (	tter due to BTO int to trouble-shoot. DK. Problem myster	cerlock errors. Overriding BTO. BTO iously disappeared.
2335 2340 0017	Unable to close shu Closing dome again alignment appears ( Propagating at zeni	tter due to BTO int to trouble-shoot. DK. Problem myster th again for polari	cerlock errors. Overriding BTO. BTO iously disappeared. ization test.
2335 2340 0017	Unable to close shu Closing dome again alignment appears ( Propagating at zeni Detuned image: lase	tter due to BTO int to trouble-shoot. DK. Problem myster th again for polari er_sky_5	cerlock errors. Overriding BTO. BTO iously disappeared. ization test. 29300
2335 2340 0017	Unable to close shu Closing dome again alignment appears ( Propagating at zeni Detuned image: lase left laser_po right laser po	tter due to BTO int to trouble-shoot. DK. Problem myster th again for polari er_sky_5 ol_left_2 92 ol right 3 80	cerlock errors. Overriding BTO. BTO iously disappeared. ization test. 29300 31200
2335 2340 0017	Unable to close shu Closing dome again alignment appears ( Propagating at zeni Detuned image: lase left laser_po right laser_po linear laser po	tter due to BTO int to trouble-shoot. DK. Problem myster th again for polari er_sky_5 pl_left_2 92 pl_right_3 80 pl lin 4 47	cerlock errors. Overriding BTO. BTO iously disappeared. ization test. 29300 31200 20600
2335 2340 0017	Unable to close shu Closing dome again alignment appears ( Propagating at zeni Detuned image: lase left laser_po right laser_po linear laser_po left laser po	tter due to BTO int to trouble-shoot. DK. Problem myster th again for polari er_sky_5 ol_left_2 92 ol_right_3 80 ol_lin_4 47 ol left 5 77	cerlock errors. Overriding BTO. BTO iously disappeared. ization test. 29300 31200 20600 27700
2335 2340 0017	Unable to close shu Closing dome again alignment appears ( Propagating at zeni Detuned image: lase left laser_po linear laser_po left laser_po right laser_po right laser_po	tter due to BTO int to trouble-shoot. DK. Problem myster th again for polari er_sky_5 ol_left_2 92 ol_right_3 80 ol_lin_4 47 ol_left_5 77 ol right 6 86	cerlock errors. Overriding BTO. BTO iously disappeared. ization test. 29300 31200 20600 27700 35200
2335 2340 0017	Unable to close shu Closing dome again alignment appears ( Propagating at zeni Detuned image: lase left laser_po linear laser_po left laser_po right laser_po left laser_po linear laser_po linear laser_po	tter due to BTO int to trouble-shoot. DK. Problem myster th again for polari er_sky_5 ol_left_2 92 ol_right_3 80 ol_lin_4 47 ol_left_5 77 ol_right_6 86 ol_linear_7 52	cerlock errors. Overriding BTO. BTO iously disappeared. ization test. 29300 31200 20600 27700 35200 22800
2335 2340 0017	Unable to close shu Closing dome again alignment appears ( Propagating at zeni Detuned image: lase left laser_po linear laser_po left laser_po linear laser_po linear laser_po linear laser_po linear laser_po left laser_po	tter due to BTO int to trouble-shoot. DK. Problem myster th again for polari er_sky_5 ol_left_2 92 ol_right_3 80 ol_lin_4 47 ol_left_5 77 ol_right_6 86 ol_linear_7 52 ol_left_8 74	cerlock errors. Overriding BTO. BTO iously disappeared. ization test. 29300 31200 20600 27700 35200 22800 34600
2335 2340 0017	Unable to close shu Closing dome again alignment appears ( Propagating at zeni Detuned image: lase left laser_po linear laser_po left laser_po linear laser_po linear laser_po left laser_po left laser_po left laser_po left laser_po left laser_po	tter due to BTO int to trouble-shoot. DK. Problem myster th again for polari er_sky_5 ol_left_2 92 ol_right_3 80 ol_lin_4 47 ol_left_5 77 ol_right_6 86 ol_linear_7 52 ol_left_8 74 ol_right_9 80	29300 2000 29300 31200 20600 27700 35200 22800 34600 33400
2335 2340 0017	Unable to close shu Closing dome again alignment appears ( Propagating at zeni Detuned image: lase left laser_po linear laser_po left laser_po linear laser_po left laser_po left laser_po left laser_po left laser_po linear laser_po left laser_po left laser_po left laser_po left laser_po left laser_po left laser_po	tter due to BTO int to trouble-shoot. DK. Problem myster th again for polari er_sky_5 ol_left_2 92 ol_right_3 80 ol_lin_4 47 ol_left_5 77 ol_right_6 86 ol_linear_7 52 ol_left_8 74 ol_left_9 80 ol_linear_10 51	29300 20600 29300 31200 20600 27700 35200 22800 34600 33400 25900
2335 2340 0017	Unable to close shu Closing dome again alignment appears ( Propagating at zeni Detuned image: lase left laser_po linear laser_po left laser_po linear laser_po linear laser_po left laser_po left laser_po Result: Right gives	tter due to BTO int to trouble-shoot. DK. Problem myster th again for polari er_sky_5 ol_left_2 92 ol_right_3 80 ol_lin_4 47 ol_left_5 77 ol_right_6 86 ol_linear_7 52 ol_linear_7 52 ol_left_8 74 ol_left_9 80 ol_linear_10 51 s 44% improvement,	cerlock errors. Overriding BTO. BTO iously disappeared. ization test. 29300 31200 20600 27700 35200 22800 34600 33400 25900 Left gives 32%.
2335 2340 0017 0035	Unable to close shu Closing dome again alignment appears ( Propagating at zeni Detuned image: lase left laser_po linear laser_po left laser_po linear laser_po left laser_po left laser_po left laser_po cleft laser_po left laser_po left laser_po cleft laser_po left laser_po left laser_po left laser_po cleft laser_po left laser_po left laser_po left laser_po cleft laser_po linear laser_po cleft laser_po linear laser_po cleft laser_po linear laser_po cleft laser_po	tter due to BTO int to trouble-shoot. DK. Problem myster th again for polari er_sky_5 ol_left_2 92 ol_right_3 80 ol_lin_4 47 ol_left_5 77 ol_right_6 86 ol_linear_7 52 ol_left_8 74 ol_left_8 74 ol_right_9 80 ol_linear_10 51 s 44% improvement, re plate at RIGHT po	29300 31200 20600 27700 35200 22800 34600 33400 25900 Left gives 32%.
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2335 2340 0017 0035 0040	Unable to close shu Closing dome again alignment appears ( Propagating at zeni Detuned image: lase left laser_po linear laser_po linear laser_po linear laser_po linear laser_po linear laser_po cright laser_po linear laser_po left laser_po cright laser_po linear laser_po cright laser_po linear laser_po cright laser_po linear laser_po cright laser_po linear laser_po cright laser_po linear laser_po cright laser_po linear laser_po cright laser_po	tter due to BTO int to trouble-shoot. DK. Problem myster th again for polari er_sky_5 ol_left_2 92 ol_right_3 80 ol_lin_4 47 ol_left_5 77 ol_right_6 86 ol_linear_7 52 ol_left_8 74 ol_left_8 74 ol_right_9 80 ol_linear_10 51 s 44% improvement, re plate at RIGHT po 09-537 (V=10.35) for ntegrations on Acq olt109_2	cerlock errors. Overriding BTO. BTO iously disappeared. ization test. 29300 31200 20600 27700 35200 22800 34600 33400 25900 Left gives 32%. osition. pr photometric (Johnson V):
2335 2340 0017 0035 0040 0054	Unable to close shu Closing dome again alignment appears ( Propagating at zeni Detuned image: lase left laser_po linear laser_po left laser_po linear laser_po left laser_po left laser_po linear laser_po clinear laser_po linear laser_po linear laser_po clinear laser_po linear laser_po linear laser_po linear laser_po clinear laser_po linear laser_po linear laser_po linear laser_po clinear laser_po linear laser_po linear laser_po clinear laser_po linear laser_po linear laser_po clinear laser_po linear laser_po clinear laser_po linear laser_po clinear laser_po linear laser_po clinear laser_po linear laser_po clinear laser_po linear laser_po clinear laser_po clinear laser_po clinear laser_po linear laser_po clinear laser l	tter due to BTO int to trouble-shoot. DK. Problem myster th again for polari er_sky_5 ol_left_2 92 ol_right_3 80 ol_lin_4 47 ol_left_5 77 ol_right_6 86 ol_linear_7 52 ol_left_8 74 ol_left_8 74 ol_right_9 80 ol_linear_10 51 s 44% improvement, re plate at RIGHT po 09-537 (V=10.35) for ntegrations on Acq olt109_2 target: 008 2611-0	<pre>cerlock errors. Overriding BTO. BTO iously disappeared. ization test. 29300 31200 20600 27700 35200 22800 34600 33400 25900 Left gives 32%. osition. or photometric (Johnson V): 0722-1 (10 arcmin from</pre>
2335 2340 0017 0035 0040 0054 0105	Unable to close shu Closing dome again alignment appears ( Propagating at zeni Detuned image: lase left laser_po linear laser_po left laser_po linear laser_po left laser_po left laser_po left laser_po cleft laser_po left laser_po left laser_po cleft laser_po left laser_po linear laser_po cleft laser_po linear laser_po cleft laser_po linear laser_po linear laser_po clinear laser_po clinear laser_po linear laser_po clinear laser_	tter due to BTO int to trouble-shoot. DK. Problem myster th again for polari er_sky_5 ol_left_2 92 ol_right_3 80 ol_lin_4 47 ol_left_5 77 ol_right_6 86 ol_linear_7 52 ol_left_8 74 ol_right_9 80 ol_linear_10 51 s 44% improvement, re plate at RIGHT po 09-537 (V=10.35) for htegrations on Acq olt109_2 target: 008 2611-0	<pre>cerlock errors. Overriding BTO. BTO iously disappeared. ization test. 29300 31200 20600 27700 35200 22800 34600 33400 25900 Left gives 32%. osition. or photometric (Johnson V): 0722-1 (10 arcmin from ing to NGS mode.</pre>
2335 2340 0017 0017 0035 0040 0054 0105 0140	Unable to close shu Closing dome again alignment appears ( Propagating at zeni Detuned image: lase left laser_po linear laser_po left laser_po linear laser_po left laser_po left laser_po left laser_po linear laser_po Result: Right gives Chris leaving ¼-wav Moving to Landolt 1 calibration. 5s in landolt109_1, lando Moving to first LGS zenith) Focus is appears ve Found telescope fla	tter due to BTO int to trouble-shoot. DK. Problem myster th again for polari er_sky_5 ol_left_2 92 ol_right_3 80 ol_lin_4 47 ol_left_5 77 ol_right_6 86 ol_linear_7 52 ol_left_8 74 ol_left_8 74 ol_right_9 80 ol_linear_10 51 s 44% improvement, re plate at RIGHT po 09-537 (V=10.35) for ntegrations on Acq olt109_2 target: 008 2611-0 my far off. Switchi	<pre>29300 31200 20600 27700 35200 22800 34600 33400 25900 Left gives 32%. osition. or photometric (Johnson V): 0722-1 (10 arcmin from ing to NGS mode. ct, leading to spurious</pre>
2335 2340 0017 0017 0035 0040 0054 0105 0140	Unable to close shu Closing dome again alignment appears ( Propagating at zeni Detuned image: lase left laser_po linear laser_po left laser_po linear laser_po left laser_po left laser_po linear laser_po linear laser_po linear laser_po cright laser_po linear laser_po linear laser_po linear laser_po linear laser_po linear laser_po chris leaving ¼-wav Moving to Landolt 1 calibration. 5s in landolt109_1, lando Moving to first LGS zenith) Focus is appears ve Found telescope fla focus. Seeing = 1	tter due to BTO int to trouble-shoot. DK. Problem myster th again for polari er_sky_5 ol_left_2 92 ol_right_3 80 ol_lin_4 47 ol_left_5 77 ol_right_6 86 ol_linear_7 52 ol_left_8 74 ol_right_9 80 ol_linear_10 51 s 44% improvement, re plate at RIGHT po 09-537 (V=10.35) for htegrations on Acq olt109_2 target: 008 2611-0 ery far off. Switchi tmap to be incorrect.	<pre>29300 31200 29300 31200 20600 27700 35200 22800 34600 33400 25900 Left gives 32%. osition. or photometric (Johnson V): 0722-1 (10 arcmin from ing to NGS mode. ct, leading to spurious Correct focus=58.00</pre>

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0150 TT lock looks good. Checking LOWFS focus. Pegged at zero.
     Searching for correct LOWFS reconstructor. Decided to use
     lwfp_recon_8_subap.
0200 Projecting laser at target. Came in ~10" off.
     3. Turning LOWFS off, sending HOWFS with 1-shot.
     4. Closing TT loop again.
     5. Centered laser behind spot.
     6. Detuned laser - taking background at 100Hz.
     7. Tuned up again. 150 cts @ 100 Hz.
     8. Lock LLT loop.
     9. Closed HO loop on LGS. First lock!
0210 Closed-loop PHARO images:
     0005-0009 4s BrG
     0010-0014: 4s Ks
     0015-0017: HO loop open (4s Ks)
     0018-0020: all loops open (4s Ks)
     0021-0024: ?
0215 Changing cent offset maps. Previous were co_default_2
     co 0: 0024-0028. Better.
     co_4: 0029-0033. Worse
     Will use co_0
0220 Closed focus loop on LOWFS. No obvious improvement, but loop
     seems to work as expected.
0225 Optimizing DM gain
     DM gain images
     0.1
               0049-0053
     0.2
               0054-0058
     0.3
               0059-0063
     0.4
              0064-0068
     0.5
               0069-0073
     0.6
               0074-0078
     0.35
               0079-0083 best
0230 Offsetting to sky: 0084-0088 (Ks, 5s)
0232 Optimizing TT gain
     TT gain
              images
     0.35
                0089-0094
     0.55
                0094-0098
     0.70
               0099-0104
     0.40
                0105-0108
0236 Measuring seeing: FWHM=1.0 (Ks, TT only)
0240 Offsetting target to center of PHARO
     ph0110
                    10s Ks
                               25mas
     ph0111-0118
                    20s Ks
                                25mas
                    10s Ks 40mas
10s Ks 40mas sky
20s KS 25mas
     ph0117-0122
     ph0123-0125
     ph0126-0128
0255 Moving to M57. Extremely difficult to see V=15.2 star in
     Acq. Attempting to acquire.
0315 Trying again. Pharo open-loop images:
     0132-0133 20s 1 endpt
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0134 30s 4 endpt 0320 Lost LOWFS lock due to strong Raleigh off-axis. 0325 Moving star behind dichroic: (354,329) 0330 Projecting laser at Ring Nebula again. 0335 Closed loops, correction poor: ph0142-0145 30s Ks ph0146-0147 30s Ks sky 120s N. 0340 Mysteriously lost HO logging data. 0345 Rebooting AO and giving up on Ring. 0350 Slewing to QU Vul. ph0148-0149 30s Ks sky Unable to detect V=15 star in Acq. 0400 Found problem with Acq video. Not clear what it was, but restored defaults and images came back. 0415 Acquiring with LOWFS 0420 Projecting laser. Running at 150 Hz. fr int filt psfl DMgain TTgain FWHM 0.3 0165 10s Ks 25mas 0.33 12-13 0168 10s 25mas 0.5 0.33 13-14 Ks 0171 10s Ks 25mas 0.3 0.33 8-10 0174 10s Ks 25mas 0.3 0.5 13-14 0177 10s Ks 25mas 0.3 0.2 13-0.3 0180 30s Ks " 0.3 0182 30s Ks п dithered 5" E. 0184 30s H " same posn п 0188 30s J same posn 0443 Shuttered laser, taking open-loop images. 0192 30s TT only J 0193 30s H TT only 0194 30s Ks TT only 30s J 195 sky frames 197 30s H sky frames 199 offset 30s. 30s H 201 30s Ks sky 203 30s Ks offset 30s. 0445 Shutting down laser, safety systems. Laser power at end of night 6.0W. Flats: 205 J 30s 40mas (4 rds) 5000-9000 210 20s 40mas (4 rds) 8000-10000 Η (4 rds) (4 rds) 215 Ks 30s 40mas 6000-10000 225 J 10s25mas 5000-7000 235 н 10s25mas (4 rds) 5000-7000 (4 rds) 9000-(4 rds) 8000-10s 245 25mas J 255 Н 10s 25mas 265 Ks 20s 25mas (4 rds) 6000-Darks: 275 dark 30s - 276 may be bad? 281 dark 20s dark 10s 286