9th Aug. 2007 NGAO Sys. Arch. meeting minutes held at UCSC
Attendees: In person B. Bauman (BB), R. Dekany (RD), D. Gavel (DG),
Over the phone: P Wizinowich (PW) from Keck
Work done by C. Neyman and A. Bouchez was discussed though they were absent.

Agenda : No official agenda was drafted except for reviewing homework assignments from meeting #8

HW task: An illustrative SolidWorks model for packaging of SplitRelay architecture by 7/27 (VV)

VV showed a PDF file and had some solidworks models for packaging the Split relay. the hardest problem is to see if d-NIRI can fit within the envelope indicated in the models. A worm drive can easily be designed with appropriate pre-load to drive the d-NIRI rotation stage.

- PW: Elev. ring does rotate - So a dog leg or some cantilever to mount d-NIRI to the Nasmyth platform on a bearing.
- PW: There are KAONs on the image rotator mechanism for designing the drives for the different rotating parts.
- VV: Vibration, calibration and telescope simulator units need to fit within a cylinder of 200 mm length by 1.8 m dia. This cylindrical portion is located on the far side of the AO bench (closer to the Tertiary mirror) the elev. bearing.
- VV: For the WFS package I still have to work out the position of the FSMs and WFS dimensions exactly. Pick off mechanism details are to be taken care of.
- DG: Artificial source has to have the right wavelength.
- BB: We only need 2 stages for the WFS package. Relative motion between the WFSs may be required.
- BB/PW/DG/RD: Pupil wobble issue. Keeping the DM and lenslet conjugate using an extra lens.
- RD: Packing things into the bearing may complicate issues and the need for additional metrology may be expensive. Transmission IS better for split than cascaded relay, but we have to consider the downsides as well. SRD has have to transmission requirement, point source sensitivity may help decide between cascaded and split relay. AB is trying to generate a report for point source sensitivity.
- RD: BFL is always a problem but, w/ cascaded relay one can fit d-NIRI without trouble.

HW task: Work with Antonin to ensure completion of transmission/emissivity trade study by 7/20 (AB/ RD)

Based on VV's surface count document and various other sources for reflectivity and emissivity calculations AB had generated KAON 501-501 NGAO Background and Transmission Budgets.

- RD: Cooling to -10 to -16 deg. C for d-NIRI is good enough for all arch. except ASM. So we can run warm for imaging and cool it just for spectroscopy
- DG : Then we can't switch between instruments.
- PW: there are science were one wants to go from imager to spectrograph. So it may not be OK to keep the spectrograph warm. It may be cheaper just to keep the sealed enclosure cold all the time.
- VV: what about the actuators? What is the critical temp.?
- RD : AB's report says that a gold tertiary (just one gold 1 surface can be changed to gold to reduce sky background by 17%).

Action items from VV's HW and AB's report :

- *Components performance at low temperatures - Will be dealt with in 3.2*
- *for AB: Make a tool with documentation (after point source sensitivity) that people can use.*
- *VV and RD will discuss details of documenting the reflectivity, surface count and sys. arch. separately.*
- *VV must work on the FRD and completing the sys. arch. KAONs. And wait until Sys. arch is over and 3.2. starts to do more detailed work on WFS package.*
- *IWG will (hopefully) give an answer about d-NIRI in 10 days.*
- *Emissivity and transmission requirements for d-NIRI must be obtained from the AOWG*

A short report confirming that SplitRelay can achieves LOWFS performance requirements at the Instruments (consider TTM's, Rotators, ADC, etc. in a TT error budget to show plausibility of satisfying TT requirements (15mas or 3mas rms over 30% sky)) by 7/27 (DG)

DG's TT report discussion:
At focus 15 milliarcsec is 11 um at focal plane is not a problem but the MEMS pupil wobble is a problem. K mirror is in non-common path is a problem.
the K mirror is better to be near the focus rather than the pupil. So the current K mirror is fine but split relay's K mirror mech. Tolerance can be met by proper engineering. Science instrument mech drift 0.25 milliarcsec/min is the allocation in RD's error budget. For one hr. exposure 15 milliarcsec.

- ALL: 3 milliarcsec spec corresponds to 2-3 microns of motion at the focal plane and DG thinks that can be met.
- BB: dove prism was too small at time of calc. - lateral shift (and dispersion is) at the pupil and nothing at the image.
- DG/ BB: Retro reflector isn't that bad to use as a calibration mechanism.
- Conclusions: Mutliple solutions

Action Item :
- *for RD : Always allocate error budget to science inst. mech. drift, even for short exposures.*

HW task: Extrapolate performance vs. sky coverage for different TFoV between 120" diam. and 180" diam. by 8/10 (RD)

RD's discussion

3 new atm. models. have been generated and will be documented. Median conditions are better than median observing condition of an astronomer. will become a KAON. High alt. from T6 but ground layer was obtained from Chris' KAON (this is for the ridge). 62.5% r0 is 18 cm (from 50% percentile to 62.5%). And theta0 = 2.9". bad seeing case is 37.5%. Bad seeing 14 cm r0 and 2.15 theta0. If it got worse we don't use AO. 87.5% 22 cm and theta0 of 4.0". Mv = 21.8 (brightest of the 3), there may be some operational overhead because of acquiring a dim GS.

- PW: 10 sec. - few min. is okay for d-NIRI were the exposure is in hrs. tomo. and tilt anisoplantism.
- What is the Zero point at H 25.4 (1 photon/ sec. source)?

Action Items :
- *RD: Document the rationale for the 3 atmospheric models and how it was integrated to form a unified model.*
- *AB: In point source sensitivity calc. the SNR on for a low order WFS acq. camera image assuming that all the y, j and h band light goes to the acq/ TT WFS.*
- *RD/CM: Sky coverage at Galactic Pole.*

HW task: A feasible optical layout of CascadedRelay architecture by 7/27 (and a discussion on why to use collimated light to feed science instruments that was not part of the original HW)

- BB: doesn't have much to report on the 3 mirror system.
- DG : Larkin always changes the f/15 beam to something he likes by using 4 lenses and some of the optics are warm (using GPI and IRIS design).
- BB: collimated light with a pupil inside the instrument. If the DM is inside the sci. instrument it has a advantage.
- DG: f/15 is always concerted to f/200. Why don't we give the instrument a pupil using one optic instead of 2.
- DG: our high R IFU see all of the 30"?? OSIRISIS uses a 6.4" field.

Action Items:
- *IWG to confirm - RD says visible IFU can be made into the vol. of the O-SWIFT inst. The near IR instrument can be fit into PHARO's volume (54x18x37"). The near IR IFU can be as big as OSIRSIS. DG says 1.3x2.4m is one quadrant of a 4 module of a IRIS.*
- *IWG must specify what optical interface they would prefer. Is f/45 with a telecentric pupil good enough for the IFUs. What does d-NIRI like (in case of cascaded relay) a f/15 or something greater?*

-----BREAK -----

More on optical relay and instrument suite:
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- RD/ BB/ DG: BFL needs can be met with a f/45 and we can support a f/25 for smaller instruments. f/25 was chosen because of the plate scale for the visible light imager.
- BB: If we go with a f/18 DO we have enough BFL.
- RD: We can have 2 optics (lenses/mirrors) to produce f/25 and f/45 and f/15 (for the interferometer).
- f/45 was chosen because we don't want to have a window greater than 3".
- BB: If pixels are bigger we can feed greater f#s.
- **BB: With the available info. we choose a f/45 and a telecentric system**

Action Items :
- *for IWG - Do you need three f#s: f/25, f/45 and f/15 for the interferometer?*
- *for BB: Write Larkin or Matthews to find out what's the limit on window size for IR instruments.*

HW task: A report describing the feasibility for LargeRelay and CascadedRelay meeting the optical needs of KI (IF split off after 1st relay for CascadedRelay) by 7/27 (CN)

CN's report says that the image quality was not good after opening up the Indian Wells design

- BB: The Indian Wells design (one with a very long and descriptive name ;)) was not meant for NGAO community use and can easily be mis-interpreted. I did a quick zemax model which suggests that the image quality must not degrade.

Action Items:

- *for Chris (if we care): Rich wonders on Chris' big repackaging of Large Relay- can we obtain better image quality by using a different pupil size. This is a $4M question, so it may need more attention. Large relay has a 300 mm pupil, will it be better if it had a 280 mm pupil. We still want to see if this kind of packaging can be pursued with cascaded relay option as well.*
- *for BB: Large relay gives us an MCAO option. Does the Cascaded relay give us a 0, 4 and 8 or 10 Km conjugates. 100X demag. (10Km corresponds to 1 m).*
- *for BB: Put tick marks at 5 and 10 Km mirrors would be.*

DG: First DM may have to be a upper altitude since its lower order.

This will help the kickbots. the first OAP pair we want to keep the image quality decent so we can't use a f/100. d-NIRI needs a large BFL.

Discussion on Chris' risk register draft:

- RD/PW: Chris' risk sheet has impact and likelyhood! When the impact is major and likelyhood is high we must have a risk reduction plan (not just 4 words), perhaps a paragraph. Also Chris is going to have to rank them.
- RD: "Unknowns" have to be factored in.
- RD: Likely >50%, 50%> unlikely, 10%>very unlikely.

- RD: This will be useful to the Sys. design reviewers.
- RD: Some risks are a feature, its a con in a certain arch.

meeting digresses into laser return measurements from the risk register ...

- RD: Why does SOR laser give so much more return.
- DG: AMOS is thinking about duplicating the laser to Haekalala. Laser workshop in Nov. (around the CfAO retreat). DG is going to visit UH lab in HI at George Annie.
- RD: The error budget has assumed many models. The current model DOES assumes SOR return! Must check with LAO Twiki webpage. This may require risk-mitigation. 122 ph/subap/int. time at 1KHz with 9 WFS.
- RD/DG: SOR is between a factor of 5-10 bigger than anything else.
- DG: Claire comes back next week

HW task: A convincing, specific K1Upgrade plan by 8/6 and More careful analysis of reengineering costs (with Don G.) - get Keck AO team review; get Sean A. review by 8/10 (PW)

- PW: Programmatic issues with K1 upgrade - the report has risk mitigation and Gantt chart models that can be used for any arch.
- RD: This looks like a implementation scheme for Cascaded layout.
- DG: What is better with this plan (money, time, difficulty), PW: Money and time, getting some improved science early?
- PW: 5 yrs. has been allocated to build d-NIRI.
- DG/RD: There is a strong link between the cashflow and major upgrades. this may be a problem.
- PW: Dates may be wrong
- Action Item: Re-do costing w/ this report in mind(PW/DG).
- DG: We need to re-do the costing.
- PW: This KAON had addressed all the programmatic issues.

Adjourn