Summary of 5/16/06 NGAO Point Design Telecon

Attended by Adkins, Bauman, Bouchez, Britton, Dekany, Gavel, Green, Hillenbrand, Koo, Liu, Marchis (monitoring), Macintosh, Max, Neyman, Wizinowich

The purpose of this telecon was to address science team concerns with the point design presented at last week's telecon. The primary question is whether the point design satisfies the science requirements. To answer this question we discussed the various performance budgets (wavefront error, emissivity, companion sensitivity, astrometry, photometry, polarimetry).

Here is my summary of the action items (please let me know if I missed something or incorrectly stated something):

- Wavefront error budget (RD reported on the error budgets he has been developing for the GOODS-N, Galactic Center, on-axis tip/tilt and NGS AO cases):
  - GOODS-N case has been evaluated (with help from DG) for 3, 2.5, 2 & 1.5 arcmin field diameters. The tomography error term is 210 nm for the 3' case. This reduces to 135 nm for the 1.5' case, at which point laser power and/or image size becomes an equally limiting factor. The GOODS-N case assumes 45 deg zenith angle and median seeing conditions. Action items:
    - RD to evaluate the 1' field diameter case where the laser power is allowed to increase from 150 to 250W and/or to assume uplink LGS correction.
    - RD to produce a plot of GOODS-N type wavefront errors versus zenith angle.
    - DG to provide RD with star densities versus magnitude (brighter than 20th mag) for the GOODS-N field and an equitorial field.
    - RD to use the above star densities to refine his error budget. Note that AB will take the actual stars to calculate the tip/tilt error as contours across the field.
    - RD to evaluate what it takes to achieve a J-band Strehl of 30%. Could also show how the Strehl varies with seeing (argument for Queue scheduling).
  - Galactic Center evaluated for 48 deg zenith angle and 5 LGS on 10" asterism case. Result is 176 nm rms wavefront error and is limited by the laser power.
    - RD to also look at benefit to GC science of higher laser power &/or uplink correction &/or better seeing.
  - We will need a trade study of the laser architecture. CW versus mode locked CW. Consider sodium return, Rayleigh background, cost, complexity, fiber transport, etc. For now we will continue to use the CTI mode locked CW as the point design laser.
  - Agreed to compare to Keck II LGS AO performance
    - We will need to provide words in the proposal as to how Keck I LGS performance will be improved.
    - Note that PSFs are available from the Keck LGS web page at http://www2.keck.hawaii.edu/optics/lgsao/performance.html.

- Emissivity:
  - Agreed to use a -15C AO system as the baseline in the point design. We will need to have a trade study during the system design to evaluate whether this is worth it. ML noted that the relative weight of L & M is not that high. CM noted that K-band emissivity is important for the high-z galaxies.
  - AB used a fused silica window in his emissivity calculations. Need to replace this with a window that transmits 0.5 to 5 um (and possibly 14 um for the interferometer) and recalculate the emissivity.

- Companion Sensitivity
  - BM and CN to evaluate the relative performance of 62 and 44 actuators for correcting static segment aberrations from the perspective of high contrast.
  - BM to write up a section for the proposal on companion sensitivity.

- We may need a system design phase study to better understand the segment static and dynamic aberrations, and how to best correct them.

- Astrometry
  - Agreed that we will use the Galactic Center case as a test/demonstration that the point design can meet the astrometry performance requirement. ML to discuss with AG.

- Photometry
  - Agreed that we will use the nearby galaxy stellar population case as a test/demo that the point design can meet the photometry performance requirement.

- Polarization
  - We don't currently have the tools to evaluate this. Agreed to defer to the system design phase.

- Miscellaneous
  - Do we need to add another row to the Galactic Center science case requirements for observations of SgrA itself. ML to discuss with AG and provide row to PW if appropriate.
  - PW to distribute list of trade studies this week.
  - Requested proposal input (to be sent to PW):
    - DG to provide a section on the real-time control computational needs.
    - DG to provide a section from his TMT report on technical components that might be useful for the proposal.
    - AB to provide a table of point source sensitivities based on the point design.
    - CN to provide a section on the PSFs and the modeling tools used to produce them.
    - SA to provide baseline sensitivity numbers for deployable IFUs.
  - PW to distribute current proposal draft by end of week.
  - PW to set up a NGAO proposal writing session at the Orlando meeting for Saturday from 2:30 to 5:00 pm.

- Action items from last meeting:

  -----Original Message-----
  From: Peter Wizinowich
  Sent: Tuesday, May 09, 2006 1:51 PM
  To: 'Michael Liu'; 'Claire Max'; 'Franck Marchis'; 'Keith Noll'; 'Mate Adamkovics'; 'Joshua Emery'; 'Antonin Bouchez'; 'Lynee Hillenbrand'; 'Bruce Macintosh'; 'Tom Greene'; 'Andrea Ghez'; 'Nevin Weinberg'; 'Richard Ellis'; 'Aaron Barth'; 'Chuck Steidel'; 'Richard Dekany'; 'Tommaso Treu'; 'David Koo'; 'James Larkin'; 'gavel@ucolick.org'; Ralf Flicker; David Le Mignant; 'kym@tacos.submm.caltech.edu'; Chris Neyman; 'Jessica Lu'; Sean Adkins; 'metchev@astro.ucla.edu'; 'Brian Bauman'
  Cc: Peter Wizinowich
  Subject: Summary of Keck NGAO point design 5/9/06 telecon

  Dear All,

  Thanks for attending today's telecon. The following is intended to be a brief summary of the action items that I got out of today's telecon.

  We will have a follow-up telecon next Tuesday (May 16) at 11 am HST / 2 pm PDT. Please use 877-280-4645 with passcode 045662. The purpose of this telecon will be to agree on the point design to use in the proposal.

  The Technical group "Products" section at http://www2.keck.hawaii.edu/optics/ScienceCase/index.htm now includes a section for the Point Design which includes today's presentation.

  Aloha,

Summary of 5/9/06 NGAO Point Design Telecon

Attended by: Adamkovics, Adkins, Bauman, Bouchez, Dekany, Gavel, Ghez, Green, Hillenbrand, Koo, Liu, Lu, Marchis, Matthews, Max, Metchev, Neyman, Noll, Weinberg, Wizinowich (sorry if I missed someone).

Action Items: (5/16/06 status in blue)

- Add a requirement about the number of NGAO nights/year. (PW) Done
- Rename Phase I and Phase II as High Strehl and Wide Field Modes, respectively. The point is to do as much as we can for the extragalactic science even in an early delivery of the NGAO capabilities. (PW to rename these) Done
- Need a trade study of the advantages of a fixed LGS asterism versus deployable LGS to better match the NGS and/or MOAO science fields. For the moment probably best to make the outer 6 LGS movable at least radially to maximize the Strehl over the field of interest. (PW to add task to list of potential trade studies and to make LGS movable in point design spreadsheet). Done
- Strehl of 10% at J-band inadequate for the GOODS-N field. Need to redo error budget for smaller fields to understand performance versus field (RD). Need to identify what Strehl is needed for the science (CM). A J-band Strehl of 30% would be adequate. RD has achieved a SR of 20% for a 1.5 arcmin diameter field.
- Should we be using a different field than GOODS-N? (CM to identify preferred alternate if any). An equitorial field is also desirable.
- Need to validate Keck II LGS error budget (PW & MvD). RD has been working this.
- Post 120 nm PSF grid (CN). Done
- Complete and distribute interpolation tool (RF & CN). PSFs and convolution kernels at `http://www.oir.caltech.edu/users/rflicker/NGAO/` per Flicker 5/15 email.
- Add a low resolution mode to near-IR deployable IFU summary (SA). Status?
- Reconcile science instrument and AO fields of view (SA & RD). Discussion held. Result?
- Distribute a list of pointed questions to science teams (RD & PW). Emphasis should be on items needed for proposal. Not done.
- Complete and post a table of point source sensitivities based on the point design (AB). Status?
- Propose a NGAO proposal session at the SPIE meeting, preferably on Saturday (PW). Saturday from 2:30-5 pm
- Subsequent to the telecon Ghez pointed out that we need to be able to image at L' to do astrometry/photometry on SgrA, and would like to go to 5 um. She also stated that 120 nm is preferred over 140 nm since contrast is important. (PW to add to science case requirements). Done. RD has produced a GC error budget.