

Highlights of the PanSTARRS/ODI meeting IFA

AUGUST 29-30, 2002

Present from Institute For Astronomy (IFA): John Tonry, Peter Onaka, Gerry Luppino, Nick Kaiser, Charles Lockhart

Present from WIYN/NOAO: Richard Green, Chuck Claver, Abi Saha, Barry Starr, George Jacoby, Pat Knezek

Telecon on August 30: Attended remotely by Charles Bailyn (Yale), Eric Wilcots (Wisconsin), and Barry Burke (MIT/LL).

Review Goals and agenda

Meeting Goals: To explore areas where the 2 groups can collaborate for the mutual benefit of both projects – PanSTARRS and ODI. At the end of Friday, we wish to have a clearer picture of how both groups will proceed toward completing our respective projects, utilizing the combined expertise of the 2 groups where possible.

ODI is currently unfunded, and therefore little progress has been made. Nevertheless, WIYN has an allocation from the WIYN board of \$135K for engineering studies to evaluate:

1. software issues
2. dewar design
3. shutter design
4. corrector design
5. mechanical definition for the corrector

With the failure of the ATI proposal, WIYN's contracting for these studies has been in a holding pattern. A few dollars are being spent on the detailing of the as-built telescope, and for general ODI support efforts, such as these visits. The largest spending allocation has gone toward developing a preliminary design of the optical corrector. In addition, progress made with WTTM has helped to define the performance that we can expect from ODI. WIYN has also identified representatives from the partner institutions:

1. Yale: Charles Bailyn
2. Wisconsin: Amy Barger/Eric Wilcots
3. Indiana: Anurag Shankar
4. NOAO: Abi, Richard and Chuck
5. WIYN Inc.: Pat and George (project oversight)

The representatives have the responsibility to help develop proposals, seek out funding, develop science cases, and to serve as liaisons within their respective institutions.

The fundamental question of how WIYN will fund ODI is being addressed on several fronts. Proposals will be prepared to agencies when possible (e.g., NSF), and a serious fund raising effort is beginning at each of the 3 universities. WIYN has also been looking at the more pessimistic situation where the funding has to come purely from within. There is some cash in the bank, and roughly \$200K per year in new capital. While much of the capital is intended for operations, it may be possible to reprogram a substantial fraction of the money toward ODI if WIYN deems the priority of ODI to be even higher than it currently is.

Pan STARRS is funded for year 1 at \$3.5M for design studies. Funding for future years (total ~\$40M) is expected to lead to first light in 2006. Second year funding (\$15M) has gone through the Senate and is about to go through the House. The team expects to spend 3 months on a conceptual design once the money becomes available. Two main contractors were identified – the Maui High Performance Computing Center (20% of total project) for delivering the systems structure and final software and hardware for pipeline processing, and SAIC, which has strong ties to contractors having extensive experience with large databases. NOAO could possibly play a role as the server of data to the astronomical community, complete with a query based interface. The PanSTARRS proposal did not request funding for the science (other than NEO science) – just to produce the data product. The budget also does not include operations. The PanSTARRS project is funded as a grant, not a contract.

The preliminary schedule for the first year (or so) of PanSTARRS is planned as follows:

1. October 1 – Funding begins
2. October 4-10 – John visits Barry Burke (MIT/LL) to help with the OTA design
3. February 2003 – Design of the OTA masks completed
4. March 2003 – Mask generation to be complete, OTA fabrication begins
5. May 2003 – First thick devices begin rolling off the fab line at Lincoln
6. June–Aug 2003 – Begin characterization of the first OTAs
7. September 2003 – Begin lab tests in a "QUOTA"-like dewar
8. December 2003 – Telescope testing begins of QUOTA-like system

The first lot of OTAs will produce 48 OTAs. John and Barry plan to design the foundry run so that there will be 4 different versions of the OTA employing varying levels of complexity. In addition, the OTA masks will include small experimental devices (e.g., for electronic shuttering) along the chords of the wafers, and these experimental CCDs will also need to be tested in a separate camera. As an indication of the magnitude of the testing required for these projects, PanSTARRS will need 256 OTAs (for a total of 16,384 CCDs) and ODI will need 64 OTAs (total of 4096 CCDs).

Electronics

We discussed the different approaches to the electronics/controller/"pixel server" hardware being developed by NOAO (Barry Starr) and IFA (Peter Onaka). Barry and Peter continued discussing the issues off-line after the main meeting. *There are significant issues here* – PanSTARRS needs to have in-house expertise for their 4 cameras, and WIYN needs to have some commonality with NOAO systems. The net fallout from the discussions was that the two groups plan to provide

very strict interfaces so that the high level software would work across the electronics packages, and the two QUOTA-like dewars would have common physical connectors so that either set of electronics would run the devices.

Areas of Collaboration

This part of the meeting was the main focus. For what aspects of the two projects do we both benefit the most by working together? PanSTARRS is a real project with real commitments and timelines. WIYN/ODI is more open-ended. If PanSTARRS farms work packages out to WIYN, conflicts could arise. So, we need to identify areas of "safe collaboration". These are listed below with the most promising listed first, as judged by ease with which it can be accomplished, monetarily and organizationally:

1. Telescope time at WIYN, with WIYN partner scientists helping to define, plan, execute, and analyze the test data. The telescope time would be used with a second QUOTA dewar so that results from lab tests in Hawaii can be verified at the telescope on Kitt Peak without shipping cameras back and forth. Two QUOTA cameras are required.
2. Exploration of large filter acquisitions (PanSTARRS needs g,r,i,z Sloan set). Chuck is planning to submit an NSF/SBIR proposal in June 2003 for LSST interests anyway. Note that PanSTARRS needs about 20 filters (4 telescopes and 5 filters each).
3. Exploration of a second OTA source, possibly Dick Bredthauer (and Dalsa as the foundry) – this is a highly complex area. Both groups wish to have a second source, but for two different reasons: PanSTARRS wishes to mitigate risk by having an alternative to MIT/LL. WIYN is concerned that MIT/LL will have difficulty sending devices to a non-defense organization. Discussions with Dick Brethauer have been initiated by Barry Burke and Gerry Luppino, but need to be followed up. Initial talks suggest that the Bredthauer/Dalsa connection could provide useful devices at bargain rates, but it may take several years to develop the technology to the same level as MIT/LL. There is a more general and real concern that there simply isn't a single US foundry company that is capable of making OTAs (or other large, high quality CCDs)! Dalsa is Canadian.
4. "Pixel server" interface standards – both groups will benefit by having their electronics documents reviewed and by pushing hard for agreements on interfaces at 2 locations in the design. Those locations are the dewar interconnects (hardware) and the software interface between low level and high level software.
5. Programmers at NOAO may be available to enhance John's "generation 3" OTCCD code to improve its robustness, longevity, and maintainability. A clearer definition of the tasks involved is needed.
6. Dewar design and/or construction for the Gpixel cameras in the long-term, and the QUOTA cameras in the short-term. This includes cooling systems, focal-plane structures, layouts, etc. Yale has an interest in playing a role for engineering and fabrication of camera components.
7. Both groups need to develop CCD test benches that can automate the testing of large numbers of devices.

8. Data distribution through NOAO and/or Indiana. Given the role of the Maui High Performance Computing Center, this area of collaboration may be too complex to pursue.
9. Testing and screening of the OTAs, both the very early runs and the production devices, as well as the small test CCDs. Aspects of the testing need a lot of personnel. Yale/Indiana may be interested in a role here.
10. Is there some role that WIYN can/should play as a 5th PanSTARRS node? Probably, the scheduling differences between the telescopes makes this too awkward.

Action Items

1. John and Chuck will begin development of the large filter SBIR proposal. John to get first cut of filter requirements to Chuck by **Oct 1**.
2. Peter and Barry to review "pixel server" interface standards and send comments to each other by **Oct 31**.
3. QUOTA dewar design (Gerry, Barry, Peter) by **Feb 2003**
4. QUOTA dewar fabrication by **June 2003**
5. George, Chuck, John, and Pat will begin planning for a test of John's OPTIC camera at WIYN in December (16-19). This will include Barry and Behzad. Planning will begin **November 1**, when John will know if he is ready for a T&E run at WIYN.
6. Chuck and John will exchange thoughts on guide star algorithms for the December OPTIC run by **Dec 1**, assuming the run will happen.
7. Define a task set for NOAO programmers based on the December OPTIC T&E by **Jan 15, 2003**.
8. George, Gerry, Barry, and John will explore the option of a second source for OTAs, including contacting other potentially interested parties (e.g., Tony T, Sidney W) in **late September** for possible buy-in. John will send out a summary of his trip visit to MIT/LL by **Oct 15**. Device specifications need to be defined by John, Gerry, Peter, and Barry for alternate source to consider.
9. Design for test bench (Gerry, Barry, Peter, John) by **Feb 2003**
10. Minutes of this meeting to be sent out by Tuesday, **September 3** (by George).
11. George to re-configure the ODI email exploder to include PanSTARRS folks and more WIYN folks, and distribute the ODI web page URL by end of **next week**.