Haystack Quick Update

3 Nov 04 – A. Whitney

Mark 5 SATA Upgrade

Conduant is proceeding to build a SATA prototype upgrade kit. The upgrade will be backwards compatible with the existing PATA modules. The major challenge of the SATA upgrade has been the robustness of the SATA module connector; no suitable connectors are available with specified lifetimes beyond 250 insertions/removal cycles, though Conduant believes they will actually last much longer and the connector manufacturers claim to have tested to 500 cycles, which Conduant will also test. These connectors are very challenging since they move serial data at Gbps speeds. At the correlators, where there will be heaviest connector wear, it may become necessary to replace the connectors on a scheduled basis if wear problems become evident. The PATA connector, on the other hand, is spec'ed for 5000 cycles. The detailed schedule and cost for a SATA upgrade are not yet available, but probably early-mid 2005.

Mark 5 Disk Modules

A new disk module has been designed by Conduant for SATA disks that makes the insertion and removal of individual disks quite convenient. In this design the position of the disks relative to the module backplane is fixed, which is fine with SATA disks since the positions of the disk connectors are specified by the SATA spec. Conduant has asked if it would be OK with the VLBI community to also use this new module for PATA disks. For PDATA disks, unlike SATA disks, some manufacturers use slightly different connector positions. Conduant would design a module backplane with connector positions suitable for IBM/Hitachi disks, which are almost universally used in new disk modules, and users would be constrained to use the IBM/Hitachi disks (or disks with compatible connector positions). A couple of months ago I queried representatives of each of the Mark 4 correlators to get feedback on Conduant's request. All responses were favorable, so we have given Conduant the go-ahead, but it is not yet clear when they will begin selling the new module design. Since we expect that almost all new disk-modules purchases after ~mid 2005 will use SATA disks, the effect of this change on PATA disk modules will be limited.

Mark 5B Progress

The Mark 5B PCB has been designed and is undergoing simulation testing. If all goes well, we expect the first prototype boards to be ready for testing around Christmas time. Station Unit capability has been designed into this board, with the exception of phase-cal extraction and state counting; this design work will be done over the next couple of months and will not impact board layout. The goal is to simultaneously and continuously extract up to 16 phase-cal tones from each of 16 channels at arbitrary phase-cal frequencies.

Checkout of the Station Unit capability and integration into the Mark 4 correlator is likely to take several months. Checkout of recording capability should not take so long. Mark 5B availability for purchase is expected about mid 2005.

The Mark 5B board is being designed to support a 64MHz input clock which, along with a next-generation StreamStor board being designed by Conduant, will increase the recording capability to 2048 Mbps (with SATA disks only). Playback will, however, be constrained to a maximum rate of 1024 Mbps. May be available in late 2005/early 2006.

Mark 5A Compatibility Upgrade

Several months of design work are necessary to augment the Mark 5A Xilinx design to support the playback of Mark 5B data. Because the same engineers are involved now in the Mark 5B, the work on this augmentation will likely not gain full momentum until the checkout of the Mark 5B is complete. Because the VLBA is currently equipping a number of its stations with Mark 5A, these should be correlatable at JIVE, which should lessen the pressure for this upgrade.

DBE

During recent discussions with the Berkeley/ATA people (particularly Dan Werthimer) regarding the possible suitability of ATA 6m dish for use in a next-generation geodetic-VLBI system, we learned of Berkeley plans to modify existing polyphase-filter-bank designs for compatibility with VSI; they want to use such a unit for CARMA VLBI in 2006. They already have working PFB designs and want to put together a VSI-compatible PFB board. A short preliminary specification:

- 2 IF inputs at 512MHz BW each
- 2 independent PFB's
- 2 VSI outputs
- Independent gain control on each output channel

Berkeley plans to send a prototype board to Haystack in mid-2005. Haystack will test and package. Should be useful for both astronomy and geodesy. Cost of a unit is not yet determined, but likely will be no more than about $5K.

This PFB design is obviously not as flexible as the Tuccari DBBC approach, but we believe it will be less expensive since at most two of the PFB units will be needed to service 4 IF's at a station. There will be no 'offset LO' capability, so phase-cal tones will fall on integral MHz values with current frequencies of first LO's.

e-VLBI

We have done several successful 512 Mbps real-time e-VLBI experiments between Westford and GGAO. Haystack link to Abilene has been upgraded to 2.5 Gbps. Link from GGAO has been upgraded to 2xGigE, and link from Westford has been upgraded to 10Gbps. Expect to do 1024 Mbps real-time e-VLBI soon with single Mark 5A's at Westford and GGAO.

At Japan e-VLBI workshop, David Lapsley and I discussed with Steve Parsley how we could organize a cooperative e-VLBI development program. A joint e-VLBI effort with both Haystack and JIVE participation seems to be a good match. Haystack brings much technical expertise to the table and is actively involved in the development of advanced e-VLBI protocols and algorithms, as well as developing automatic networking monitoring and testing systems which we believe are crucial to the long-term health of e-VLBI. JIVE, on the other hand, is becoming rapidly connected to major European telescopes and can leverage this connectivity to undertake large e-VLBI experiments and advance the state of actual e-VLBI observations. One of our major goals in joining together in a joint effort is to try to make best use of our joint strengths and downplay the oneupmanship that seems to have become too commonplace in recent times. By working together and always acknowledging the contributions of each other, we think the end result will be better for all in the long run. We hope that these joint efforts will result, when appropriate, in joint announcements of advances to both internal and external audiences, which we think will be mutually beneficial. It is in this cooperative spirit that we want to move ahead, and we think that it is in this spirit that e-VLBI will progress and expand most rapidly.