# Mark 5 Newsletter
MIT Haystack Observatory
March 2004
Issue #5

The Mark 5 Newsletter is issued from time to time to keep users informed regarding features, plans, problems, solutions and workarounds.  All back issues of the Mark 5 Newsletter are available at the Mark 5 web site at www.haystack.edu/mark5.  We invite input from anyone on subjects we should discuss or questions that need answers; please send them to mark5@haystack.mit.edu.

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## 1. Real-time fringes with Mark 5A and Mark 4 correlator

Real-time fringes were obtained on the Mark 4 correlator at Haystack Observatory on Friday, 5 March 2004, with data transmitted directly from GGAO in Maryland and Westford in Massachusetts. Because Haystack's Gbps network connection is temporarily down due to a major re-configuration, GGAO data were transmitted over Haystack's commodity 100 Mbps Internet connection. Two X-band channels of 8 MHz BW, sampled at 1 bit/sample, were used in the experiment, for a total data rate of 32 Mbps from each station.

Fringes from one of several scans on 3C84 are shown in Figure 1.  Scan length is ~10 minutes.  The correlation amplitude is somewhat weaker than we expected, but there were known pointing problems at GGAO during the experiment due to high winds; furthermore, we do not know the current visibilities of 3C84 on this baseline.  In any case, we don't believe this low amplitude is related to the real-time nature of the experiment.  Several scans over a period of one hour showed similar results, all with consistent residual delays and rates.

Figure 2 shows the block diagram of the experiment setup.  A Mark 5A system was set to the 'in2net' mode at the station so that antenna data were transmitted directly onto the network. At the correlator, a Mark 5A in 'net2out' mode was used to feed the data directly to the correlator.  The 'ROT' (Reconstructed Observing Time) clock of the correlator was set to lag UT by about 3 seconds. For the data arriving from each station, coarse synchronization to ROT was done by managing the read pointer in the 0.5 GB buffer of the each receiving Mark 5A's, and the fine synchronization was then accomplished within the Station Unit.  Correlation and fringe-finding then proceeded in the normal manner.

When our Gbps network connection is restored, we plan to extend these experiments to much higher data rates.
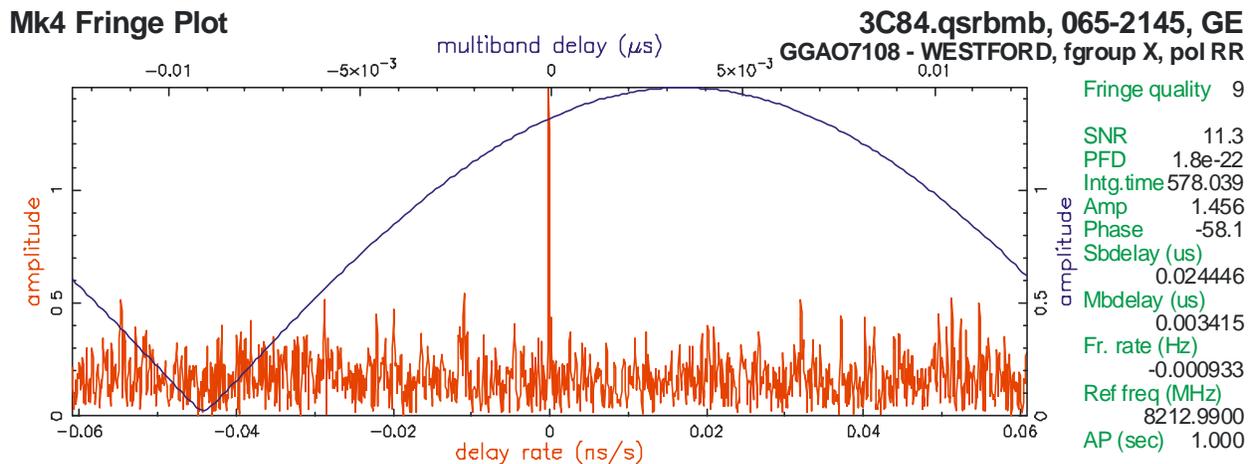
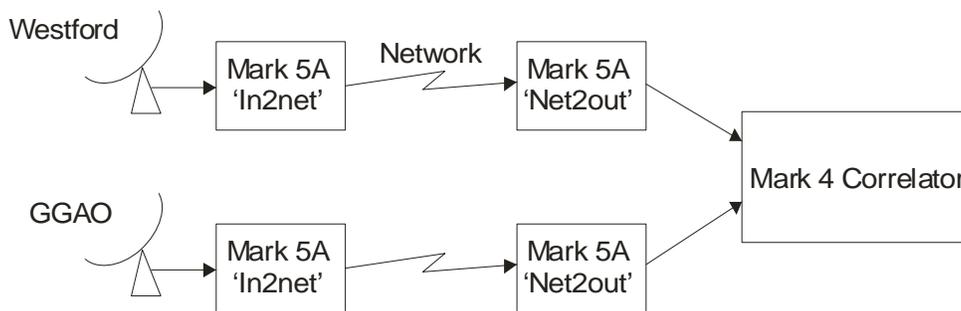Figure 1: Real-time fringes on 3C84 on Westford-to-GGAO baseline



Figure 2: Real-time experiment setup

## 2. Updated Mark 5 toolkit available

The Mark5 tool kit version 0.2 is now available for download from the Haystack website: http://web.haystack.mit.edu/mark5/downloads.html. This is a set of PERL libraries and scripts that have been developed to automate the transfer of data to/from Mark5 disc packs. There are three primary modes of operation:

      1. transfer of data sets from Mark5 disc pack to Mark5 disc pack

      2. transfer of data sets from a regular server system disc to a Mark5 disc pack

      3. transfer of data sets from a Mark5 disc pack to a regular server system disc

The scripts also provide facilities for converting data between different formats (e.g. K5 to Mark5) and have been used extensively in real e-VLBI experiments. Each script takes an input "driver" file which is essentially a list of scans that need to be processed. The scripts then process the scans one at a time until the job is completed. They are very useful for automating many of the repetitive tasks associated with manipulating scans.

The scripts are written in PERL, which has a relatively low learning curve, is easy to read and also highly extensible. Mark5 users are encouraged to make use of these scripts and extend them if they wish. Feedback on extensions and/or suggestions for future functionality are most welcome.

Documentation and software are available from the link above. For any questions, please feel free to contact David Lapsley: dlapsley@haystack.mit.edu.

## 3. Update on NRAO 'track' (from John Romney)

In the previous issue of this Newsletter, we reported on the inauguration of the Mark 5 upgrade to NRAO's 'track' software. This project is now well advanced. The new data fields for tabulating disk-

module capacity and maximum write rate have been added, and all reports have been generalized to display the appropriate information for both tapes and disk modules.

Provisional decisions on the exact structure of the bar-code label, and the mechanism for occasional manual entries, were reached in a special session held during the IVS General Meeting, and are currently being implemented in 'track'. These decisions will be revisited during the EVN TOG meeting on April 1. Current work also includes planning for entry of all existing Mark 5 modules into the database, and correction of non-compliant VSNs for some modules entered previously.

We expect to begin testing, using simulated shipments, about mid-March. A second round of tests, at a correlation facility to be determined, could follow around the beginning of April, with a first release to users about mid-April.

This work is being undertaken for NRAO by Phil Van Buskirk.

## 4. Support for serial-ATA disks

We expect within the next couple of months to receive the first prototype Mark 5 modules that support the new serial-ATA (SATA) disk drives. These modules will be fully interchangeable with the current parallel-ATA (PATA) disk modules now in use, and are being designed for much easier access to the individual drives for insertion and removal. No modifications will be necessary to the Mark 5 chassis to use the new SATA modules. The new SATA modules should be available sometime in summer 2004.

## 5. Conduant will apply disk-module labels

Conduant has agreed to apply VSN labels (both electronic and hardcopy) to all disk modules purchased with disks. When an order arrives at Conduant, Conduant will notify Haystack. Haystack will coordinate with Jon Romney, keeper of the owner-ID database, and the purchaser to assign VSN's to the modules. Haystack will print the labels and ship to them to Conduant; Conduant will apply both the electronic and hardcopy VSN labels before shipment to the customer.

It is hoped that this procedure will help to avoid the problem of unlabeled disk modules, some of which have appeared at correlators and caused confusion.

## 6. Barcode readers for stations

At the IVS General Meeting in Ottawa we discussed the issue of bar-codes applied to the Mark 5 disk modules and their usage. The present system of barcode label places one permanent label on the front of the module with the 'extended VSN' barcode, which includes the module capacity in GB and the max data rate in Mbps. With the soon-to-be-released upgraded version of the NRAO track program, the special 'track-compatible' label on the rear of the module will no longer be necessary; 'track' will use the label on the front of the module.

There was general consensus at the Ottawa meeting that all stations should procure a barcode reader in order to efficiently manage the disk modules within the 'track' program. Haystack Observatory has had very good experience with the Symbol Technologies Model LS4000i series, which is a scanning laser type, available for about $500. The particular model used at Haystack is LS4006I-I100, which is a so-called 'wedge' model that connects between a PC keyboard and the keyboard connector on the motherboard; in this configuration, input from the barcode reader is indistinguishable from keyboard input. The reader works equally well with Windows or Linux. The reader must be setup to read the format of the Mark 5 barcode labels; this is explained in the memo "Mark 5A Disk-Module Labeling and Management Procedures" available at http://web.haystack.mit.edu/mark5/operations.html.

## 7. Replacing defective Western Digital disk drives

Now that the 1-year warranties on the Western Digital Drives in our disk packs are beginning to expire, some of us may be finding it necessary to purchase replacements for drives that fail. Western Digital offers a choice of their "Mainstream" drives (e.g. WD1200BB), which most people have been buying, or

the "High Performance" ("Special Edition") drives (e.g. WD1200JB).  For such replacements, we recommend the "High Performance" JB drives for two reasons:

- − Non-operating Shock of 350G vs. only 200G for the BB models
- − Product Warranty of 3 years vs. only 1 year for the BB models

For more information, see http://www.wdc.com/en/products/products.asp?DriveID=27

The JB models provide this extra reliability for a cost of only a few dollars more than the BB models.

When mixing BB and JB drives in the same disk pack, master-slave pairs must have the same model number.  (In fact, it is possible to mix sizes and brands in the same disk pack, if this pairing rule is followed.  Total capacity will be the same as if all disks in the pack have the same size as the smallest disk.)

### 8. What to do if Mark 5A hangs

Several people have reported occasional Mark 5A 'hangs' that can be cleared only by a power down and re-boot of the system.  We are working with Conduant to diagnose and fix this problem, but it happens seldom enough that they are asking for our help in collecting information.  *You will need the latest version of the utility 'dumpram,' which is available at* ftp://web.haystack.edu/pub/mark5/. If you encounter such a hang, please take the following steps and return the collected information to Conduant for analysis:

1. Record the on/off state of 4 small LED's on the StreamStor board near the back of the chassis (not the LED's close to the drive connectors).  On newer chassis where the back edge of the top chassis cover is folded down, these LED's are visible through the ventilation holes on the back of the chassis; on older chassis, it will be necessary to remove the top chassis cover to see the LED's.

2. If the LED status is '1001', kill the Mark5A program and run 'dumpram'.  Send the resultant output.dat file to support@conduant.com (the file output.txt can be deleted).

3. If the LED is not '1001', kill the Mark5A program and run 'sslog'.  Send the resultant SSLOG.DAT file to support@conduant.com.

4. In the e-mail, please include the LED status, the status of the LED's on the disk modules, and any information about the circumstances under which the crash occurred.