Haystack Observatory VLBI Correlator

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Abstract

This report presents the status of the Haystack Correlator, focusing on its activities, its current and future hardware capabilities, and its staff.

Figure 1. Haystack Mark IV Correlator

1. Introduction

The Mark IV VLBI correlator of the MIT Haystack Observatory, located in Westford, Massachusetts, is supported by the NASA Space Geodesy Program and by the National Science Foundation. The available correlator time is divided approximately equally between processing of geodetic VLBI observations for IVS and of millimeter-wave radio astronomy observations for the Coordinated Millimeter VLBI Array. In addition to its role as an operational processor, the Haystack Correlator also serves as a development system for testing new correlation modes and hardware improvements and for diagnosing correlator problems encountered either at Haystack or one of the identical correlators at the U.S. Naval Observatory and at the Max Planck Institute for Radioastronomy. This flexibility is made possible by the presence on-site of the team that designed the correlator hardware and software.

2. Summary of Activities

Over the last year a focused program of continuous refinements and improvements in the functionality of software (and to some extent hardware) has made the Mark IV correlator a far more stable, capable, and productive instrument than it was one year ago. This is evidenced by the large number of experiments which were processed over this time period. The ease and smoothness of operations have greatly increased due to many improvements. Some notable examples of recent enhancements are multi streaming (up to four concurrent scans), speed doubling (wherein playback speed is twice the record speed), greatly improved head positioning, and improved behavior of the station units (through refinements in the SU code and the suman program). Other refinements either improve the quality and accuracy of the data or add capabilities, such as improvements in fourfit, pre- and post-processing programs (like composer, sara2lvex and aedit), and the addition of accounting software to better track correlator time usage and efficiency. All of these improvements have been exported to, and are utilized by, the Bonn and Washington correlators.

3. Experiments Done

Since the last report (January 2000), 32 geodetic experiments have been processed on the Mark IV. These are broken down into 12 CORE-1s, 9 CORE-3s, 3 CORE-Cs, and 2 CORE-As (from 1999). A collection of various test experiments comprise the remaining 6 (correlator tests (e.g. RDV22 VLBA/MkIV comparison), rack tests, station fringe tests, etc).

4. Current/Future Hardware/Capabilities

Current hardware installed and functional on the system are seven tape units, seven station units, 16 operational correlator boards, two crates, and miscellaneous other support hardware, with the ability to process all baselines for seven stations simultaneously in the standard geodetic modes. In the near future we plan to add one more tape and station unit and fully enable the use of the on-board DSP chip capabilities. Note that all the hardware and capabilities that were anticipated in the 2000 annual report are now installed and functional. Over the next year there will be a major effort to integrate Mark V disc based recording systems into the correlator.

5. Staff:

Staff who participate in aspects of Mark IV development and operations include:

5.1. Software Development Team:

- John Ball - operator interface, playback
- Roger Cappallo - leader, system integration
- Kevin Dudevoir - correlation
- Colin Lonsdale - post processing
- Alan Whitney - system architecture

5.2. Operations Team:

- Peter Bolis - correlator maintenance
- Tom Buretta - playback drive maintenance
- Brian Corey - experiment correlation oversight, station evaluation, technique development
- Dave Fields - playback drive maintenance
- Ellen Lautenschlager - correlator operator
- Glenn Millson - correlator operator
- Arthur Niell - experiment correlation oversight, technique development
- Don Sousa - correlator operator, experiment setup, tape library and shipping
- Mike Titus - correlator operations oversight, experiment setup, computer services
- Ken Wilson - correlator maintenance, playback drive maintenance

6. Conclusion/Outlook:

By taking advantage of the improved production capabilities achieved over the last year, we hope to further refine and improve the quality of operations in order to meet the demands of the coming year's schedule requirements. Integration of Mark V will also be a major project over the coming year, with the hope that the new disc based recording system will greatly improve operational reliability and add the potential for new methods of observing and recording.