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TO: VLBA

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SUBJECT: Compatibility Between the Present VLBA Design for the Data Acquisition System (DAS) and the MkIIIA Data Acquisition Terminal (DAT)

The VLBI community around the world is starting to ask questions about the VLBA DAS. Since our present plan is to have a completed DAS prototype for tests at the VLA in August 1986, some groups are considering acquiring the VLBA DAS rather than procuring a MkIIIA. Some groups are very concerned about compatibility because their support is largely from geodynamics programs. In this memo I will try and outline the important differences between the VLBA DAS and MkIIIA DAT as I see them. Most of these differences between the VLBA and MkIIIA have resulted from a desire to improve performance and reduce cost. Many aspects of the VLBA design are still under discussion so that this represents my understanding of design decisions to date (including those made at Green Bank design review held 10-11 Sept. 85.)

1] I. F. Range

        MkIIIA - 100 - 500 MHz
        VLBA   - 500 -1000 MHz

Changes in the receiver L.O. frequencies or upconversion of the 100-500 MHz I.F.'s will be needed at stations who want to replace a MkIIIA DAT with VLBA DAS.

2] I.F. Channels and I.F. Switching

Any VLBA video (baseband) converter can be switched to any of 4 I.F. channels without cable changes. The VLBA is more flexible here and no changes will be needed at stations acquiring a DAS.

3] # Baseband Channels

        MkIIIA - 14 USB + 14 LSB
        VLBA   - 8 USB + 8 LSB

A recent cost-reduction decision has been made to reduce the number of baseband converters from 16 to 8. However, the slots, wiring and formatting capability for 16 should remain. Groups acquiring a DAS for geodynamics observations using the present "POLARIS" mode will need 14 converters.

4] Video (Baseband) Bandwidths

        MkIIIA - 0.125 --- 4 MHz in steps of a factor of 2
        VLBA   - 0.062 ---16 MHz in steps of a factor of 2

5] L.O. Increment, Bandpass Response, Stability, Sampling

        See VLBA Project Book

In general, systems are compatible in these areas with the VLBA having better stability, and less variation between units. The VLBA supports both 2 and 4 level sampling.

6] Formatter Signal Path Modes

        MkIIIA - Mode A,B,C,D - see MkIII manual
        VLBA   - Completely flexible - includes all MkIIIA modes provided
            the DAS has at least 14 converters

7] Track Format

        MkIIIA - Frames of 22,500 bits (data replacement - see MkIII manual)
        VLBA - Flexible - includes MkIIIA

8] Tape Format

        MkIIIA - 40 micron-wide tracks
        VLBA   - 20-micron wide tracks with MkIIIA compatible pitch

The only major difference will be the track width which is set by the headstack. It is anticipated that the Haystack, Washington, Bonn and Block II processors will be able to process VLBA and MkIIIA tapes (written with the formatter set to the MkIIIA format) by installation of compatible headstacks.

9] Computer Control

        MkIIIA - ASCII RS-232 .
        VLBA   - VLBA Monitor and control bus

The MkIIIA "field system" software is unlikely to become compatible with the VLBA monitor and control system. It is expected that the VLBA software will be able to handle all types of observations including geodetic.

10] Racks

There is still discussion of the distribution of VLBA electronics into racks. In MkIIIA all the I.F., baseband and formatting electronics is in one rack. In the VLBA the electronics may be split into as many as 4 racks, but it should be possible to put the modules in fewer racks if desired.

11] Cost

        MkIIIA (one electronics rack + 1 recorder) - ~400K$ (from commercial sources)
        VLBA -
          4 converters + 1 formatter + 1 recorder (max record rate 256 Mb/s) ~85K$
          8 converters + 1 formatter + 1 recorder (max record rate 256 Mb/s) ~100K$
          8 converters + 2 formatters + 2 recorders (max record rate 512 Mb/s)~170K$
         16 converters + 2 formatters + 2 recorders (max record rate 512 Mb/s)~185K$
         (computer control of VLBA DAS is required - the computer hardware should cost < 10K$)

While there are some new designs in the VLBA which are less expensive than the MkIIIA (elimination of front panel controls, displays, etc.), the MkIIIA is expensive because of the high overhead associated with the commercial production of limited quanitities. The VLBA cost estimates assume that the VLBA Team will take responsibility for system integration and check-out. Since the VLBA design uses fewer different parts than the MkIIIA and makes even more use of commercial packaging (VME hardware) it should be easier for other groups to build and check-out.

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