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TO: VLBA Acquisition Group

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SUBJECT: Automatic Video Cassette Changer

In order for a Data Acquisition/Data Playback System based on VHS recorders to meet the VLBA requirement of 24 hour unattended operation at a sample rate of 100 Mb/s it will be necessary to include an automatic video cassette changer in the design.

VLBA Cassette Changer Design Concept

For the purpose of providing a baseline for comparison of potential systems recall the design concept of a video cassette changer introduced in the VLBA Red Book. This design involves a rack-based system which services 8 VHS recorders and handles a total of 48 cassettes. The cassettes are stored above the rack in a removable bin so that automatic bookkeeping of the daily cassette useage can be accomplished. Since the time of publication of the VLBA Red Book it has been determined that the data recording rate of 16 Mb/s for VHS recorders assumed at that time is too high and 10 Mb/s is more reasonable. Under this assumption a total of 11 recorders would be required per system to achieve 100 Mb/s sampling plus redundancy on the single recorder level. A bin containing 60 cassettes would then be required to achieve 24 hour unattended operation. The estimated cost per system is $5.3K. Assuming two racks of recorders per antenna in the field and two racks per antenna at the processor, a total of 40 cassette changers would be required at a total cost of $212K.

Advantages: Fulfills all VLBA requirements.

Inexpensive.

Disadvantages: Unproven design.

A number of other systems have been considered:

1) Large Random Access Cassette Changer (LRACC)

This system is produced by Video Magnetics, the same company producing the Barger head stacks for JPL. Although the system is

designed for use with 3/4 inch broadcast-type cassettes, Video Magnetics would be willing to make the required mods to accommodate the handling of VHS cassettes.

Maximum Number of Cassettes	300
Maximum Number of Recorders	12
Cost/System (in quantity)	$35K
TOTAL COST	$1400K

Disadvantage: Expensive.
Unproven design.

2) Industrial Robot

A generalized Industrial Robot could be adapted to change cassettes.

Cost/System	> $50K
TOTAL COST	> $2M

Disadvantage: Expensive.

3) SONY Beta Stacker

There is a consumer product available from SONY which can be attached to a Beta recorder to sequentially change up to four Beta cassettes. However, at five hours per tape this means only 20 hours unattended operations for the system.

Cost/Beta Stackers	$160
Number of Beta Stackers Required	440
TOTAL COST	$70.4K

Advantages: Inexpensive

Disadvantages: Only 20 hours unattended operation.

Performance of Beta machines has not been evaluated for VLBI.

No automatic cassette bookkeeping.

4) Multiple VHS Recorders

A number of VHS recorders could be daisy-chained together and sequentially turned on and off over a 24-hour period. The number of additional recorders required at each antenna and per antenna at the processor would be 44.

Cost/Recorder	$500
Number of Extra Recorders Required	880
TOTAL COST	$440K

Advantage: Increase in potential instantaneous bandwidth.

Disadvantage: Excessive use of floor space.

No automatic cassette bookkeeping.

Three other systems produced respectively by SONY, Bosch and Channel Matic were considered but appear too difficult to adapt to the VLBA requirements. Data on all the cassette changers considered has been summarized in a Table for comparison purposes.

Clearly, if the Red Book cassette changer design could be produced for only 5.3K it would be prefered over all other systems.

SYSTEM	CASSETTES #/TYPE	MACHINES #/TYPE	REMOVABLE CASSETTE MM	ESTIMATED COST/UNIT	# UNITS REQUIRED	TOTAL COST	ADVANTAGE	DISADVANTAGE
Red Book Design	60 VHS	11 VHS	VHS	$5.3K	40	$212K	-Fulfills VLBA spec. -Inexpensive.	-Unproven design.
LRACC (VIDEO Magnetics)	>60 VHS	<12 VHS	Unknown	$35K	40	$1400K	-Fulfills VLBA spec.	-Expensive.
Industrial Robot	>60 VHS	=12 VHS	VHS	>$50K	40	$2M	-Fulfills VLBA spec.	-Expensive.
SONY Beta Stacker	4 Beta	1 Beta	NO	$.160K	440	$70+K	-Inexpensive	-Only 20 hours. -Uses only beta cassettes. -No automatic cassette bookkeeping.
Multiple VHS Recorders	60 VHS	60 VHS	NO	$.5K	880	$440K	-Large potential instantaneous BW	-Excessive use of floor space. -No automatic cassette bookkeeping.
SONY Beta Cart	40 Beta	4 Betacam - Broadcast -Side loading	NO	$200K	>40	>$8M	-None	-Too expensive. -Not adaptable.
BOSCH	32 Bosch	?	NO	$50K	>40	>$2M	-None	-Expensive. -Not adaptable.
Channel Matic	15 3/4" Broadcast	2 Sony Type-5 -Broadcast	NO	$10K	240	$2.4M	-None	-Expensive. -Excessive use of floor space. -Not adaptable.