VLB ARRAY MEMO No. 28

Tape Recording Systems for the VLB Array

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The recording system currently planned for the VLB Array is based on the MKIII VLB system. Many of the design parameters of the MKIII system were based on the use of bandwidth synthesis necessary for the accurate measurement of group delay. This results in a very flexible, but costly system which allows different frequency bands to be independently recorded on separate narrow band tracks. It is not clear whether the MKIII design, which is now about 7 years old, is still optimum for an instrument intended primarily for radio astronomy aperture synthesis work. In particular, it may be more simple and less expensive to use broadband recordings. While the recorder itself may be more expensive than the Honeywell instrumentation recorder, the associated electronics are considerably more straightforward and less costly.

Although the broadband recirculating correlator currently being considered for the Array can be used with the multi-track MKIII system, a less complex system would have a signle high rate bit stream inputed to the high speed correlator. Multifrequency spectral line data could be multiplexed into the single bit stream.

The use of broadband recordings has the further advantage, that the whole i.f. correlator system then becomes very similar to that of the VLA, resulting in an obvious ease of simultaneously using all or parts of both instruments.

Suitable broadband recorders may soon become commercially available. One possibly suitable recorder is the AVRX (Advanced Video Recorder Experimental) system being developed by Ampex for unspecified military use. The preliminary specifications of the AVRX recorder given below are based on a presentation by Alan Schulze of Ampex, given at JPL.

Recorder:	Rotary head (6 heads)
Bit Rate:	Total -- 116 Mbits/sec Data -- 107 Mbits/sec
BER:	10^{-5} to 10^{-6} 10^{-7} to 10^{-8} with Error Correcting Code
Record time:	60 minute
Tapes:	0.8 mil x 1" x 1600 ft tape in cassette 10" x 7" x 1-5/8"
Track Spacing:	1.67 mil
Track width:	1.2 mil
Bit Density:	23 x 10^6/sq inch

Tape Speed: 5" ips

Rewind Speed: 150" ips

Cost: $70K
$100K with ECC

Tape Cost: $100 to $175 per cassette

The areal bit density and cost per bit of the AVRX System is comparable with the projected improved MKIII system or MKII VCR system, and a factor of 20 better than the present MKIII system. Due to the shorter tape, however, recording time is limited to 1 hour. Apparently the cassette dimensions are sufficient to hold a 2400 ft reel, so that 90 minutes playing time is possible. A further improvement of a factor of 2 may be possible if we can accept a higher BER. This would bring the recording time to within a factor of two of the improved MKIII System.

Another problem with the AVRX System is the lack of a variable speed (bandwidth) capability. This results in an inefficient use of tape for spectroscopy, and the inability to process spectroscopic data faster than real time.

The AVRX System does not have a read-after-write capability, but has what Ampex calls a CONFIDENCE HEAD. This fixed head samples data one track at a time and the resultant pulses used to continuously monitor the recording performance as well as automatically optimizing the drive level.

Ampex expects to demonstrate the AVRX system to potential customers in August 1981. Production units are expected to be available in late 1982.

Also under development at Ampex is a 750 Mbit (Super HBR) machine. This machine will write 9 to 18 simultaneous helical scans on 2 inch tape which runs at 30 ips. Projected cost is $\sim$ $300 K and product availability is expected in mid-1983.

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