Interoffice

National Radio Astronomy Observatory

Charlottesville, Virginia VLB ARRAY MEMO No. 6

To: K. Kellerman

April 16, 1980

From: M. Balister

Subject: VLBI Cost Estimates

This memo proposes a receiver suitable for use in a VLBI array. A projected cost for this receiver and the corresponding feeds is included. A cost estimate for the VLB Mark III recording system is also included.

The following table summarizes the frequency coverage, amplifier type and projected performance of the proposed receiver.

Frequency MHz	Amplifier Type	T _R Kelvin	T _S Kelvin
600 (50 cm)	Cooled GASFET	25	55
1420 - 1720 (18-21 cm)	Cooled GASFET	25	55
5000 (6 cm)	Cooled GASFET	30	50
10,700 (2.8 cm)	Cooled GASFET	60	90
22,200 (1.3 cm)	Cooled GASFET or Cooled Mixer	150	200

The receiver will operate at 20K and will have two channels so that both senses of circular polarization will be available simultaneously.

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A breakdown of the approximate cost follows:

	Material K\$	Labor <u>K</u> \$
Refrigerator System	.15	
Dewar, input lines, etc.	5	
Cooled GASFET Amplifiers:	>	34
50, 18-21, 6 and 2.8 cm at 1K\$ each	8	(1 man year Tech. Spec.)
1.3 cm at 2K\$ each	4	
LO and IF Components	<u>20</u>	
Total	52	34
Total Material & Labor	868	\$

Since the performance at 1.3 cm is critical, an add-on maser preamp which would improve the system temperature (T_S) to 70K is estimated as follows:

	Material <u>K</u> \$	Labor <u>K</u> \$
Refrigerator (4K) System	60	
Dewar, input lines, etc.	5	17
Maser (Dual Channel)	- 10	(6 man months
Solid State Pump	<u> </u>	spec.)
Total	80	<u>17</u>
Total Material & Labor	<u>97k</u>	\$

It is assumed that the receiver will be mounted at the cassegrain focus and the feeds will be mounted off-center and frequency changing will involve rotation of the offset hyperboloidal subreflector. At 50 cm some sort of dipole array at the cassegrain focus is proposed, however, the overall antenna performance will be poor due to non-optimum illumination due to the Memo to: K. Kellerman April 16, 1980 Page 3

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small subreflector. However, the loss is somewhat compensated for by the use of a low-noise cooled GASFET at this frequency. All feeds will give orthogonal linear polarization; combining the receiver IF outputs will give both senses of circular polarization simultaneously.

The actual VLA feed costs were used as a basis to determine the following feed costs.

Feed cms	Feed Cost Estimate Material & Labor K\$
50	5
18 - 21	17
6	9
2.8	6
1.3	7
Total	54

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These estimates are approximate and are based on present day costs and technology. Since most of the components have been developed, no development costs have been included in these estimates. The only components that would require significant development money would be the 2.8 and 1.3 cm cooled FET amplifiers. The labor cost includes burden, benefits and overhead for Green Bank and Charlottesville. No profit is included.

In summary the basic receiver plus feed cost would be 140K. An additional 97K would result in considerably improved 1.3 cm performance.

Mark III Record Terminal

The estimated cost of producing a VLB Mark III record terminal based on the two produced at NRAO is 170K for materials and 51K labor (1.5 man year, technical specialist level) giving a total of 221K\$. This includes the control computer.

MB/jm

cc: S. Weinreb P. Napier