

National Radio Astronomy Observatory

Socorro, New Mexico

March 19, 1984

To: VLBA Members

VLBA Electronics Memo No. 11

From: A.R. Thompson

Subject: VLBA Electronics Meeting, March 15, 1983

Attendees: Balister, Weinreb, D'Addario, Walker, Kellermann, Brundage,
Norrod, Bradley, Campbell, Thompson

Front End

Sander Weinreb reported on progress on the 8.4 GHz front end. Ten FETs tested gave receiver temperatures in the range 14 K to 24 K with those by Fujitsu giving, on average, the lowest noise performance. The first 8.4 GHz front end will be sent to the VLA by about July 1. An RFQ for polarizers has gone out to several companies. The bands covered are 5, 8, 10.7, 15, and 23 GHz. Rodger Norrod also has an orthomode junction for the 1.3-1.8 GHz band on order, and expects to be able to do cooldown tests on it in late July.

Cryogenics

It is planned that the 1.3-1.8 GHz and 5 GHz orthomode junctions for polarizers will be cooled to 60 K, and the 8 GHz and higher frequency polarizers cooled to 15 K. It has been demonstrated that the 1.3-1.8 GHz junction is reliably cooled to 15 K using a model 1020 refrigerator which has a 10 W cooling capacity. The model 22 refrigerator that will be used for the VLBA front ends has a 5 W cooling capacity at 60 K. Rodger Norrod has estimated that about 2½ W will be required to keep the 1.3-1.8 GHz orthomode junction cold, and it is currently believed that the model 22 refrigerator will suffice to cool it to 60 K. Sander Weinreb has concluded that it will not be necessary to use a separate mechanical vacuum pump for each Dewar, and one pump (plus a backup) and a manifold system will be satisfactory. A vac-ion pump or a molecular sieve pump may be installed on the manifold to further reduce pressure, if necessary.

Linear Polarization

Present estimates indicate that the somewhat lower losses and wider bandwidth that can be obtained by using linear polarization will not be necessary. Only circular polarization is being considered in present design plans.

Local Oscillator System

Dick Thompson suggested that the synthesizer module described in VLBA Memo No 303 need not have so many lock points, and that frequencies of $(500 N \pm 100)$ MHz would suffice, and would result in a very simple design. Larry D'Addario suggested that by making use of the third harmonic response of the phase detector (mixer) it should be possible to obtain additional locks at $(500 N \pm 300)$ MHz. It was tentatively decided that the design would try to incorporate both sets of frequencies.

Craig Walker mentioned that the maser time standards at Goddard S.F.C. are maintained in a temperature environment controlled to 0.1°C .

Module Design

A discussion of the type and location (front or back panel) for coaxial connectors found advocates for a wide range of schemes. It was decided that further thought would be given to the matter before next month's meeting. Sander Weinreb suggested that for the multi-pin connector a type that could be directly soldered to a p.c. card would reduce assembly labor and errors.

22 and 43 GHz

Ken Kellermann emphasized the desirability of using masers from the purely scientific viewpoint, and also the desirability of starting development on the units very soon. The general engineering opinion is that masers would be difficult to maintain and may be technically obsolescent. In any case, NRAO does not have an available engineer at the present time and would have to hire one to be able to start at

this time. Sander Weinreb mentioned a low-gain paramp for 22 GHz that has been developed by AIL, which gives a noise temperature of 20 K at 15 K physical temperature. He is obtaining details on the unit.

Miscellaneous

Rather than build a complete, full-scale model of a vertex room, it was suggested that one of the feed cones, which will be procured by NRAO separately from the antennas, should be set up at the VLA site at an appropriate height above the ground (relative to the vertex-room floor).

Measurement of the temperature coefficient of phase of the ambient-temperature post amplifiers for the 8.0 - 8.8 GHz front ends indicates that they may not need to be mounted on a temperature controlled board.

Ken Kellermann mentioned that consideration should be give to the uniformity of polarization characteristics of the antennas with regard to the effect on closure errors.

ART/sb