NATIONAL RADIO ASTRONOMY OBSERVATORY

MEMORANDUM

December 5, 1979

ADDITIONAL BASE LINE TO INTERFEROMETER
MEMO NO 101

To: H. Hvatum
R. Brown
M. Balister

From: J. Coe

Subj: Adding a Remote Antenna to the NRAO Interferometer

General

Buck Peery, Fred Crews, Len Howell, Ron Weimer and I discussed the USNO requirement for an additional antenna at right angles to the existing Green Bank—Huntersville baseline. We have the capability of meeting this requirement without adversely affecting the support given to the other instruments, if it is done in the following manner:

(1) The interferometer will still be operated as a four-element interferometer. The removal of one of the existing antennas from the array and installation of it or a new antenna at a remote site will cause a minimal increase in equipment requirements. Addition of a fifth element would mean building a new receiver front end, adding new delay lines and processing equipment, and changing over to a new control computer immediately--a substantial effort.

(2) The DDP-116 will continue to be used as the interferometer control computer. The DDP-116 has the capability to handle an additional antenna on a remote site. Programming support is required to make the program compatible with the new data link interface from the remote antenna and the new data reduction computer which will be added to receive and process the data outputs from the DDP-116.

(3) If the time available for completing this project is three years, and the interferometer can be shut down for up to six months to permit interferometer operating personnel to assist in the construction, no substantial increase in manpower is required. We may need one or two electronics technicians and one draftsman for engineering, and we will need programming support for the operating and data reduction computers.

Microwave Link

A new microwave link would be required to provide a phase stable local oscillator at the remote site, to transmit two 30 MHz wide IF bands to the control building, and to transmit antenna control and position information. The cost of material is $75 K. The existing Green Bank to Huntersville link operates at low frequencies which sometimes interferes with observations at the 140-ft or 300-ft. To shift the frequencies up to 16-18 GHz range would cost about $25 K for material. Total costs for the new link and upgrading the old link would be about $200 K.

Computer

If a MODCOMP computer can be used for the data reduction computer, substantial savings can be realized in spare parts inventory and training of maintenance personnel. Four MODCOMP computers are in operation at Green Bank at the present time. The cost of the new data reduction computer and associated peripherals would be about $100 K. About one man-year of engineering and technician time would be needed to interface the data reduction computer.

Antenna

A study will have to be made to determine if it is better to purchase a new, smaller antenna or move an 85-foot antenna to the remote site.

The Engineering Division in Green Bank indicates that moving one of the 85-ft antennas or erection of a new antenna would be contracted to an outside contractor. Preparation of specifications and general supervision of construction could be included as part of their work program without an increase in personnel with the possible exception of one draft person assuming the time span of three years. It should be noted that all engineering time would be charged to the Navy as engineering services are not included in their present contract.

Remote Site

A site has been located to the west of the Observatory which (1) would give the required baseline length, (2) can be accessed by microwave link, and (3) has commercial power nearby.

JRC/cjd

Copies to:
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