



34th and Massachusetts Ave., NW
Washington, D.C. 20390

IN REPLY REFER TO

ADDITIONAL BASELINE TO INTERFEROMETER MEMO NO 100

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6 Nov 79

Dr. William E. Howard
Director
Astronomical Sciences Division
National Science Foundation
1800 G Street, N. W.
Washington, D. C. 20550

Dear Dr. Howard:

The first year of utilization of the 35-km interferometer has been highly successful. Analysis of the data indicates that Universal Time (UT0) can now be determined to 2ms using 48-hours of interferometer data, and a new source catalog has been developed with accuracies of 0.02 to 0.03 arc seconds. The interferometer hardware has been improved considerably, and reliability is increasing. This has allowed us to already consider--one year earlier than anticipated--certain special programs. For example, the position of the source SS 433 was determined with an accuracy of 0.05 arc seconds, resolving a problem encountered by other interferometers. This source is also being monitored for flux variations and is showing short-duration flare-ups by a factor of two or more. The very stable gain of the instrument contributes to this success. The accuracy of the polar motion data (one component only) is such that we are beginning to look toward improvement of the theory of nutation--notably short-period terms. Scientists in the geophysics area have pointed out that one-or two-day values of polar motion, with the expected accuracy aimed at, might show up short-duration crustal dynamics effects on the position of the pole.

It has become clear, even in this first year of operation, that the availability of a dedicated Radio Astrometry Facility--a first in the world--which is able to study time variable phenomena on a continuing daily basis will be a tremendous asset to the field of science.

We are extremely pleased that the estimated budget for the first year of operations has been found to be entirely adequate; in fact, expenditures were 7 per cent under those anticipated. We have also provided supplementary funds to allow the provision of electric power on Brushy Mountain and the replacement of all encoders on the 85-ft telescopes to commence.

After this successful first year, and realizing that a number of improvements can still be made, we feel that our goal of 1ms for UT1 with 24-hours of data, complete polar motion data to 0.01 arc seconds, and further improved source catalogs can be reached. Among those improvements are the installation of an additional antenna orthogonal to the current 35-km baseline, an improved microwave link, and a new control computer.

The establishment of an additional long baseline allows for the separation of all three components of the Earth's rotation axis. The addition of a new baseline requires an upgrade of both the phase-stable microwave link and interferometer control computer. While the microwave link is expanded, the frequency should be changed to avoid interference with operation of the 300-ft telescope. The opportunity to upgrade the control computer should take into consideration a desire to reduce some of the interferometer data on-site.

A meeting between members of the NSF, NRAO, and USNO is hereby requested to consider the following items:

1. The terms and conditions for adding a new baseline to the 35-km interferometer.
2. The procedure to be followed in selecting and procuring the additional antenna and site.
3. The design, procurement, and installation of a new microwave link.
4. The selection, procurement, installation and programming of a new control computer.
5. The role of the USNO in the implementation of the above improvements.
6. Establishment of a tentative schedule and milestones.

FY80 funding for some or all of these improvements--depending on cost--is available. An early reply would be most appreciated.

Sincerely,

Raymond A. Vohden
Captain, U.S. Navy
Superintendent

Copy to:
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Dr. Tape