

NATIONAL RADIO ASTRONOMY OBSERVATORY
SUITE 100
2010 N. FORBES BOULEVARD
TUCSON, ARIZONA 85705
TELEPHONE 602-882-8250

June 29, 1979

*25 Meter Millimeter Wave Telescope
Memo #122*

Dear

I am enclosing some background material which may help you evaluate the NRAO proposal for a millimeter-wave telescope on Mauna Kea.

This material includes Volumes 1 and 2 of our proposal to the NSF and a Summary (April 4) which we were asked to prepare for the National Science Board. Volume 2 was written to stand alone. It differs from Volume 1 by its discussion of our chosen site and by its detailed cost estimates. Both volumes summarize the calculations made by our structural engineering group during the period 1973 to 1977, which in turn were largely based upon their investigations into the homology concept from 1967 to 1972. The Summary includes construction schedules designed with our PERT planning program, and corresponding price information.

We describe 3 construction plans each beginning with detailed design in CY1981. Plan A completes the project in March 1984 at a cost of \$22.4M. Plan B completes the project in May 1984 at a cost of \$23.9M. Plan C predicts completion in May 1985 at a cost of \$27.1M. Each of these plans deals with the cost of constructing and outfitting a new operating site, and not just the telescope alone.

The estimates of operating costs are based upon our experience at Kitt Peak. The construction costs are based upon the actual bids received by NASA and the Canada-France-Hawaii telescope groups now at Mauna Kea. The most recent costs, contained in the Summary, include the 10% per annum escalation in construction of high-rise buildings in Honolulu from January 1977 to January 1979. This escalation, quite different from changes in the Consumer Price Index, is believed to describe the situation at Mauna Kea. Our forward projections from January 1979 assume 10% per year through completion of the construction.

I want to use this opportunity to make four points:

1. The 25-m telescope was designed to respond to the research requirements of the Ad Hoc Committee listed in Volume 2: increased collecting area and angular resolution at wavelengths now covered by our Kitt Peak telescope, and useful performance at submillimeter wavelengths inaccessible to that telescope.
2. The 25-m telescope will operate at submillimeter wavelengths. The design accuracy of the surface, as described on page 38 of Volume 2, is 70 micrometers rms, which corresponds to an "operating wavelength" of 1.1 mm (16 times the rms surface accuracy). In comparison the 36-ft telescope, which has a surface accuracy of 140 micrometers corresponding to an "operating wavelength" of 2.2 mm, operates usefully at 1.3 mm--40% beyond its nominal design wavelength. We therefore expect that the 25-m telescope as described in Volume 2 will operate in the 740-micrometer atmospheric window.
3. The telescope performance can be improved beyond that described in Volume 2. Of the error budget of 70 micrometers, 61 micrometers is contributed solely by the surface--which can be improved in future years. Since 1977 the NRAO has studied ways to improve the surface, such as carbon fiber plates and the innovative surface designed and constructed at Caltech.
4. The telescope and its support facilities have been designed to provide continuous reliable service at a high altitude site, based upon NRAO's 12 years of experience with the 36-ft telescope on Kitt Peak.

I look forward to discussing our project further with you at our meeting in Washington.

Sincerely yours,

Mark A. Gordon
Project Manager

MAG:mt

Addresses for the letter to the Barrett Committee

Prof. W. J. Welch
Radio Astronomy Laboratory
University of California
617 Campbell Hall
Berkeley, CA 94720

Dear Jack:

Prof. B. F. Burke
Research Laboratory of Electronics
Massachusetts Institute of Technology
Building 26-335
Cambridge, MA 02139

Dear Bernie:

Dr. Francis S. Johnson, Dean
The Graduate School
University of Texas at Dallas
P. O. Box 688
Richardson, TX 75240

Dear Dr. Johnson:

Prof. Robert D. Gehrz
Dept. of Physics and Astronomy
University of Wyoming
University Station
Box 3905
Laramie, WY 82071

Dear Bob:

Prof. G. Richard Huguenin
Dept. of Physics and Astronomy
University of Massachusetts
Graduate Research Center
Amherst, MA 01002

Dear Richard:

Prof. Charles H. Townes
Dept. of Physics
University of California
557 Birge Hall
Berkeley, CA 94720

Dear Charlie:

Dr. John Ruze
MIT Lincoln Laboratory
244 Wood Street
P. O. Box 73
Lexington, MA 02173

Dear John:

Prof. Donald E. Osterbrock
Lick Observatory
University of California
Santa Cruz, CA 95064

Dear Don:

Prof. A. H. Barrett
Dept. of Physics
Massachusetts Institute of Technology
Rm. 26-331
Cambridge, MA 02139

Dear Alan:

Prof. A. T. Moffet
Owens Valley Radio Observatory
California Institute of Technology
Pasadena, CA 91125

Dear Alan:

Prof. P. M. Solomon
Dept. of Earth and Space Sciences
SUNY
Stony Brook, NY 11794

Dear Phil:

Prof. L. E. Snyder
Dept. of Astronomy
University of Illinois
Urbana, IL 61801

Dear Lew:

Prof. Paul A. Vanden Bout
Dept. of Astronomy
University of Texas
RLM 15.212
Austin, TX 78712

Dear Paul

Prof. C. Heiles
Astronomy Department
University of California
Berkeley, CA 94720

Dear Carl:

Dr. Robert W. Wilson
Bell Laboratories
HOH L229
P. O. Box 400
Holmdel, NJ 07733

Dear Bob:

Dr. Patrick Thaddeus
Institute for Space Studies
2880 Broadway
New York, NY 10025

Dear Pat:

Prof. R. B. Leighton
Division of Physics and Astronomy
California Institute of Technology
Pasadena, CA 91125

Dear Bob:

Dr. Donald R. Johnson, Deputy Director
National Measurements Laboratory
National Bureau of Standards
Materials Building, Rm. B354
Washington, DC 20234

Dear Don: