Interoffice

NATIONAL RADIO ASTRONOMY OBSERVATORY

TUCSON, ARIZONA

May 2, 1977

25 Meter Millimeter Wave Telescope
Memo # 89

To: 25-m Working Group

From: M. A. Gordon

Subject: An Account of the Meeting of the Ad Hoc 25-m Telescope Committee at the VLA Site

1. Purpose

The purpose of this meeting, called by Dave Heeschen, was to discuss the final aspects of our design and to consider our recommendation of Mauna Kea as a site.

2. Attendance

Present were:

A. H. Barrett	MIT	L. E. Snyder	Illinois
D. Buhl	NASA	P. Solomon	SUNY
E. K. Conklin	NAIC	M. Simon	SUNY
W. A. Dent	UMass	W. J. Welch	Berkeley
E. E. Epstein	Aerospace	D.R.W. Williams	Berkeley
P. Palmer	Chicago	W. J. Wilson	Texas
T. J. Phillips	BTL	B. Zuckerman	Maryland

and from the NRAO,

M. A. Gordon	H. Hvatum	F. Owen
D. S. Heeschen	J. H. Lancaster	
D. E. Hogg	H. Liszt	
J. M. Hollis	C. M. Wade	

Invited but couldn't attend were: A. Penzias, P. Thaddeus, and B. Turner.

3. Agenda

Status of the Project	D. S. Heeschen
Status of the Telescope Design	H. Hvatum
Recent Developments	M. A. Gordon
A. Surface Measurements	
B. Enclosure	
C. Site	
Project Costs	M. A. Gordon
A. Non-recurring	
B. Recurring	
Design and Procurement Schedule	H. Hvatum

4. Presentations

Status of the Project: Heeschen advised the committee that the 25-m telescope design was complete, that the NRAO had chosen an astrodome over a radome, that our site preference was Mauna Kea, that the price of the project was $12.5M (1976), and that this project was the highest priority within the NRAO. A second volume of the 1975 proposal would be available in June.

Status of the Telescope Design: Hvatum reviewed the design of von Hoerner and Wong proposed to NSF in 1975. He noted that all design goals had been achieved, such as panels of 40 μm RMS accuracy. However, even though we had actually procured panels of 40 μm accuracy, the NRAO would continue investigating fabrication techniques. Because of the error budget of the telescope, better panels would bring even better performance.

Surface Measurements: Gordon reported on the great success that John Findlay has had with the spherometer device. Findlay has shown empirically that he could measure a 12.5 m length of track within the error budget of 40 μm. Theoretically, it may also be possible to measure the surface by means of a precision electronic level and accurate distances (and shapes) for the surface plates. While not complete, this alternative technique shows great promise.

Enclosure: Gordon reviewed the work of Ulich, King and Peery. Because the 25-m telescope would be useful at wavelengths far shorter than its design goal of 16 RMS = 1.2 mm, the enclosure should transmit these short wavelengths with minimal attenuation. In spite of the great potential of radomes, no suitable fabrics exist to meet this specification. To withstand weather stresses, the best existing radome fabrics have a characteristic thickness of 0.9 mm (1.5 mm electric), too thick to avoid substantial resonances at very short wavelengths. Tests of many fabrics by the English National Physical Laboratory and by Ulich at the NRAO are clearly disappointing. In addition, actual measurements at Kitt Peak show that, at very short wavelengths, our transparent astrodome acts as a lens, thereby destroying incoming plane wavefronts. And so, for technical reasons, the NRAO has no other choice than an astrodome with its openable slit. A model of the steel astrodome was shown.

Site: Gordon reviewed the site work principally done by Wade. Because of the sub-millimeter potential of this telescope it was essential to locate it at a predictably dry site. (In fact, the maximum gain of this telescope will be at 0.9 mm.) Also, because of the importance of obtaining maximum coverage of the astronomical sky and of the inner region of our galaxy, low latitude is important. The only site on U.S.

soil meeting both these requirements is Mauna Kea. In addition, unlike the case for the dry southwestern corridor, the best weather at Mauna Kea occurs when the galactic center is up at night. That this site is a now developed site of growing astronomical facilities is also helpful. (Fortuitously, Mauna Kea would give the USA 17° latitude advantage and a substantial atmospheric transmission advantage over the Franco-German telescope.)

Costs: Gordon reviewed the work of Webb and Peery. The NRAO projects a construction cost of $12.5M (1976) for the 25-m project at Mauna Kea. Operating costs should be $1.3M (1976), approximately $0.4M more than was spent on the 36-ft last year.

Schedule: Hvatum showed the committee a PERT analysis and schedule demonstrating that, if design funds were given to the NRAO in January 1979, the telescope could be operating on Mauna Kea in October 1982.

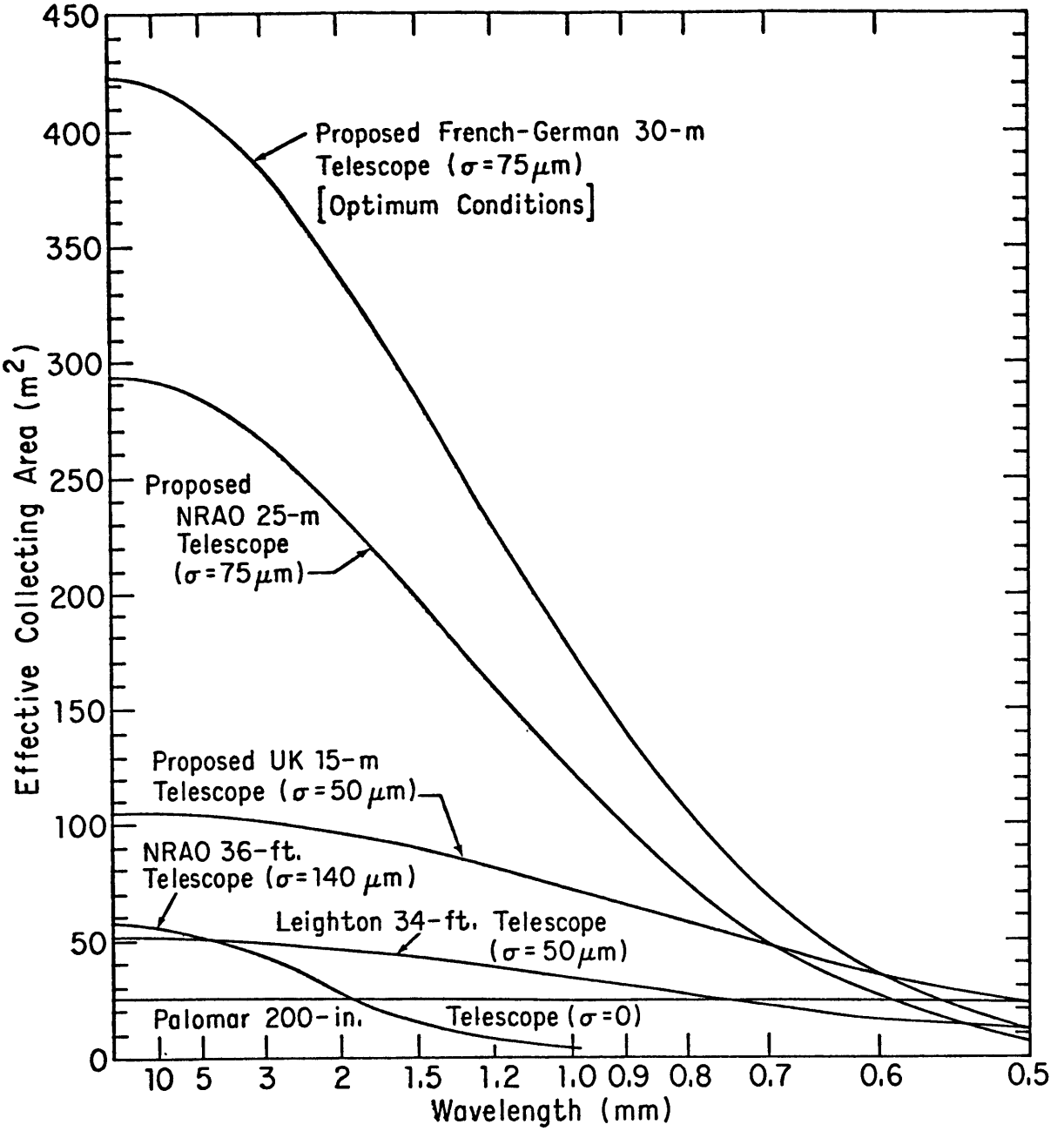
5. Reaction

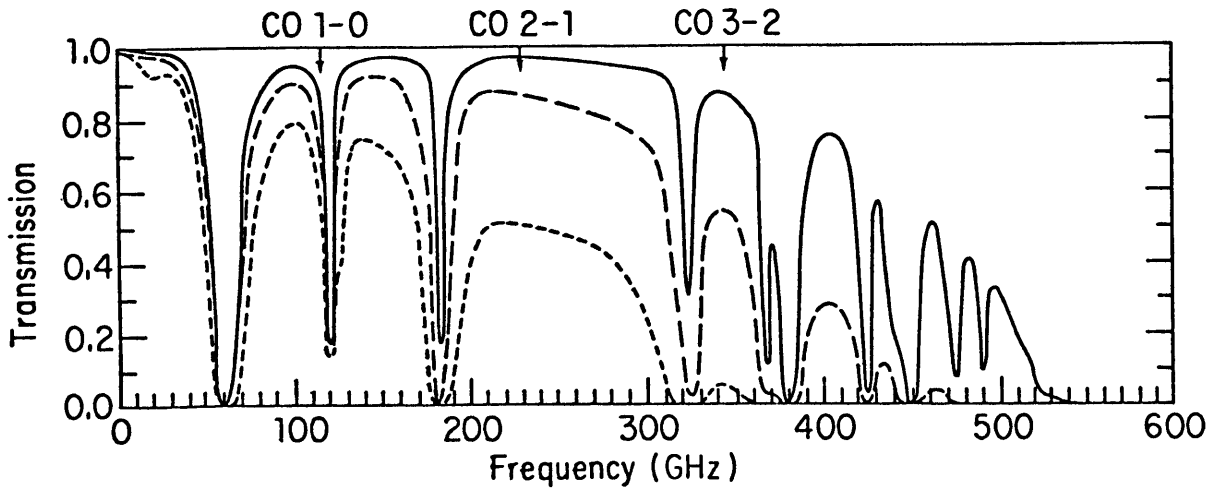
There was unanimous approval of both the astrodome and site choices. While some felt that initially it would be difficult to create a first-class support group in Hawaii, all agreed that this problem could and would be overcome. Of especial help would be the common siting of the UKIRT, NASA, CFH, and NRAO support groups at "sea-level".

6. User's Committee Meeting (next day)

Gordon ran through the entire presentation of the previous day. Heeschen noted repeatedly that the 25-m project was the only one that had been formally submitted to NSF by the NRAO and that it, next to completion of the VLA, held highest priority even among potential projects such as the VLBI network.

c: NSF: P. Boyce
W. Howard
L. Randall





—— 1mm water vapor (4000m alt.)
– – – 4mm water vapor (3000m alt.)
------ 15mm water vapor (Sea level)