



DEPARTMENT OF THE NAVY
NAVAL RESEARCH LABORATORY

WASHINGTON, D.C. 20375

IN REPLY REFER TO:
4130-445:PRS:pls
22 December 1981

Dr. M. S. Roberts, Director
National Radio Astronomy Observatory
Edgemont Road
Charlottesville, Virginia 22901

12 METER MILLIMETER WAVE TELESCOPE

MEMO No. 119

Dear Dr. Roberts:

I recently had the opportunity to do some sub-millimeter observations both with the IRTF and the KAO and thought that I would write you with some impressions which may be of use in planning instrumentation for the upgraded millimeter telescope on Kitt Peak. Both sets of observations were done with ^4He and ^3He photometers from the University of Chicago group (Hildebrand, Harper, etc.) which have similar performance at mm wavelengths to the system John Payne has developed.

(1) At $\sim 400 \mu\text{m}$ ($\sim 10\%$ bandwidth) with modern bolometers, the dust emission from a spectacular number of very cold molecular clouds is detectable in only a very few minutes of integration. Since the dust emission spectrum is very steep, $S_\nu \propto \nu^4$, and sub-mm observations are very important, being the only probe that is almost linear with density, a sub-mm capability for the bolometer system (850 μm or even 750 μm window) would be quite useful. My limited experience seems to be that even during periods of transmission as low as 1% the atmosphere can be stable enough to allow good measurements to be made provided the opacity is due to H_2O vapor and not clouds.

(2) Al Harper's KAO system utilizes a seven element array of bolometers in the focal plane. Arrays are tremendously useful since much of the time in mapping extended sources is "overhead" and, apparently, quite easily implemented in bolometer systems on long focus telescopes. I would urge John Payne and his collaborators to look into a bolometer array for the upgraded telescope. Harper is currently planning a 30+ element array and seems to be quite open about his instrumentation work - perhaps NRAO could learn something useful from him.

Sincerely,

Philip R. Schwartz
Code 4138