

SUBMILLIMETER ARRAY TECHNICAL MEMORANDUM

NUMBER: 53

DATE: November 1991

FROM: Q-METRICS, INC

SUBJECT: SUMMARY OF FINAL REPORT CONCLUSIONS FROM
THE THERMAL ANALYSES OF A GROUND BASED,
SUBMILLIMETER ANTENNAS

SECTION 1 THERMAL DESIGN REQUIREMENTS AND THERMAL BOUNDARY
CONDITIONS FOR THE SMA

SECTION 2 CONCEPTUAL THERMAL DESIGNS FOR A GROUND BASED SUB-
MILLIMETER ANTENNA

SECTION 3 PRELIMINARY, THERMAL DESIGN ANALYSIS OF A GROUND BASED
SUBMILLIMETER ANTEANN

SECTION 4 STEADY-STATE THERMAL ANALYSES OF THE SAO SUBMILLIMETER
ANTENNA

SECTION 5 TRANSIENT THERMAL ANALYSES OF THE SAO SUBMILLIMETER
ANTENNA

November 4, 1991

Smithsonian Astrophysical Observatory
60 Garden Street
Cambridge, MA 02138

Attention: Mr. William R. Bruckman
Antenna Design Leader

Subject: Summary of Final Report Conclusions from the Thermal Analyses of a Ground Based, Sub-Millimeter Antenna

Dear Bill:

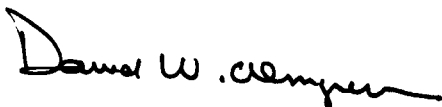
QMI 93046

The five memoranda comprising the final report summarize the results obtained from the thermal analysis of the SAO, ground based, sub-millimeter antenna. The basically passive, thermal design concept, utilizing only an actively controlled (heating and cooling) air conditioner for the cabin air, is the recommended design. A flexible BOOT should be used to enclose the alidade structure and bearing assembly above the cabin, to reduce its thermal coupling to the time varying, external, thermal boundary conditions. The back of the aluminum panels should be insulated and the truss ventilated with ambient air.

As discussed in Memorandum No. 4, the axial and diametral temperature gradients in the CFRP truss are predicted to exceed the specified maximum of 2.0°C, under no wind conditions. These predictions were made assuming a 1/2 inch thick insulation envelope surrounding the ventilated truss. The insulation thickness on the back (conical) and side (cylindrical) surfaces of the truss enclosure should be increased to further isolate the ventilated truss from the external, non-uniform, thermal boundary conditions.

We appreciated the opportunity to work with you on this interesting assignment.

Very truly yours,



David W. Almgren