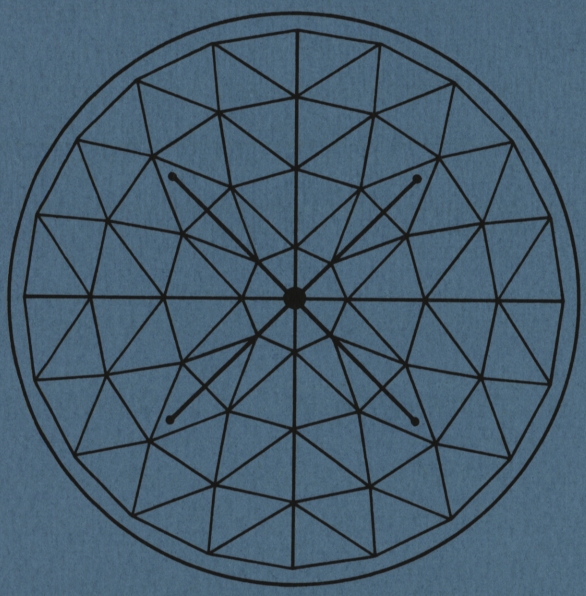

SECTION 1.0

NATIONAL RADIO ASTRONOMY OBSERVATORY
POST OFFICE BOX 2
GREEN BANK, WEST VIRGINIA 24944
TELEPHONE ARBOVALE 456-2011

PROJECT: 300 FT. DIA. HOMOLOGY RADIO TELESCOPE

SUBJECT: POSITION REFERENCE PLATFORM SUMMARY AND CONCLUSIONS

1.0 SUMMARY AND CONCLUSIONS

PREPARED BY O. R. Heine APPROVED BY _____ SUBMITTED BY S.D.L.

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1.1 SUMMARY

The following briefly summarizes the pertinent results and conclusions of the concept study contained herein.

As a result of this effort, it is predicted that the development of a highly accurate position reference platform for the purpose of continuous digital and analog angular direction measurement and error signal generation, (for control purpose), is feasible under all applicable environmental and dynamic perturbations. It is furthermore estimated that the cost of such instrumented position reference platform will be in the order of $300,000.00 and that this system could be developed and built within a period of approximately one year.

An achievement of a total systems accuracy of ±3 arc. sec. RMS appears highly probable with careful selection, matching and integration of commercially available instruments and control components.

1.2 BASIC CONCLUSIONS

a) It appears to be within the state-of-art to design and build a workable two axis position reference platform for the application on the 300 ft. dia. "V. Hoerner - Homology Type" azimuth-elevation radio telescope. This platform would have to be designed to perform a dual function, namely, to establish an accurate angular position readout of the telescope reflector and to provide error feedback signals for correction of the reflector position.

b) The best obtainable accuracy of this system could be as high as ±3 arc. sec. RMS under combination of worst possible operating requirements under normal tracking environment and dynamic perturbations.

c) The platform could be built with existing, commercially available instruments, power and control components.

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d) The required digitizing electronics could be located in a remote control room, which could be as much as 500 ft. away from the platform, without significantly affecting the accuracy and performance of the system. Thus, the system could also be used on much larger radio telescopes.

e) Optical (laser) sources and sensing equipment (collimators) must be positioned on the ground in fixed locations outside the foundation periphery of the radio telescope and service of components will, therefore, be relatively easy.

f) The total weight of the reference platform assembly will be approximately 700 lbs.

g) The design/development and fabrication of the platform will require approximately one year of elapsed time after placement of contract. The subsequent testing and checkout of the system will require an additional six months of time.

1.3 POSSIBLE PROBLEM AREAS

a) Frequent replacement of light sources (laser tubes) will probably be necessary. However, this can be done with relative ease, since the units are located on the ground. Replacement tubes cost approximately $600.00 each; the normal life should be at least one year.

b) Because of the requirement for closely controlled temperatures, the "warm-up" time required to restart the system after replacement of components or sustained period of shutdown will probably be on the order of one to two hours during periods of cold or humid weather conditions.

c) Ground movements will disturb the auto collimation arrangement, thus implementation of a careful analysis of the telescope foundation movements and its effects on the collimator foundations will be essential.

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d) Initial "lining up" and adjustments of the laser collimation system and polygon mirror will be somewhat difficult and time consuming because of the tight tolerance requirements and structural blocking.

e) Service or replacements of instruments and power components on the platform will be difficult because of the location at the intersection of AZ and EL axes of the telescope. It may become necessary to disassemble the entire platform assembly in case of malfunctions.

f) Fog, snow and rain will most likely reduce the performance of the system to some extent.

g) Quartz windows will require frequent cleaning.

None of the before-mentioned problems would make this system impractical.

The designer should, however, take these under consideration so that the final design would result in a highly reliable and easily serviceable system.

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