Radiation Systems, Inc.

NLSRT Memo No. 37

30 November 1988
BY FAX

Richard Fleming
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P.O. Box 2
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Subject: NRAO 300-foot Telescope

Dear Dick:

Enclosed is a brief description of the proposed replacement and upgraded full motion 300-foot radio telescope for NRAO.

As discussed, no civil works or feeds are included; neither is a deicing or snow removal system. A spray ethylene glycol system could be offered at a later date. NRAO is to provide receivers.

The basic replacement system includes the improved feed legs and transversing feed cabin. I have assumed that the surface is made of aluminum panels, covered with 3/8" aluminum mesh as RSi provided in 1970. We are proposing an elevation drive gear with counter-torqued DC motors which will, along with the servo control biased pointing and tracking capability, provide variable speed control up to .16°/sec.

The full motion version will also be driven on a dual wheel and track arrangement with variable speed control.

Basic elevation declination drive price is $5,540,000. We estimate panels to be $1,200,000, or a total price of $6,740,000.

To provide the azimuth rotatable mount and drive will add an additional $2,900,000 to the above price.

If you have any questions, please call me. I intend to be at the dedication of the new building in Socorro along with John Wallace. If you will be there, I will be glad to talk with you about this. In the meantime, I intend to have conversations with Dr. Vanden Bout.

Sincerely yours,

RADIATION SYSTEMS, INC.

Dick Thomas

Richard E. Thomas
Chairman and
Chief Executive Officer

Enclosure: 300-foot Telescope Description

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ABSTRACT

300-FOOT RADIO TELESCOPE

Basic Proposal Replacement Telescope

Provide a 300-foot fixed pedestal support telescope with main reflector (North/South) elevation drive capability from 30 degrees to 150 degrees in elevation. The focal point apex will be equipped with a traveling feed house capable of being driven along a transverse set of tracks mounted at the focal point.

Improvements in the structural design and drive capabilities offered in the following areas: The two-speed elevation chain drive will be replaced with dual counter-torqued electric DC motors driving an elevation sector gear. The sector gear support will contain additional structural steel supporter members to provide lateral stability to the elevation declination drive. The system will be powered with a counter biased servo control system similar to the ESI 93C-27 unit that can accurately point the telescope in a preprogrammed computer mode and also has the capability to provide precision signal tracking of radio stars and other celestial sources. A 19 bit elevation encoder will be provided for the elevation drive.

The main reflector will consist of adjustable aluminum panels covered with 3/8" aluminum mesh as provided by RSi in 1970.

The reflector support structure comprises all of the structural elements which rotate about the elevation axis. The main components of the structure assembly are as follows:

Reflector Support Structure

The reflector support structure is the structural mounting platform for the reflector panels, focal point feed support and mechanism, elevation axis bearing housings and the structural connection for the elevation axis drive mechanism.

The support structure consists of an series of open trusses, fabricated from standard structural shapes, radiating from the geometric center, vertex, of the parabolic contour. The radial trusses are connected to each other by a series of concentric structural rings. The concentric rings provide torsional stability to the reflector support structure. A deep box-like truss is incorporated in the structural center of the support center thus providing rigid mounting points for the elevation axis bearings and the elevation drive wheel support frame.

Focal Point Feed and Support

The focal point feed mechanism is a motorized mechanism which is used to position the feed assembly/assemblies relative to the nominal focal point position. This is accomplished by incorporating a carriage and track design.

The entire mechanism is positioned above the reflector vertex by two open box trusses thus providing high strength and rigidity with low blockage.

Elevation Axis Drive Mechanism

The elevation drive is a bull gear and pinion configuration.

The bull gear is formed from high strength gear racks. The racks are machined in identical segments and are installed on the outer circumference of the elevation drive wheel support frame.

The pinions are contained in a self-aligning articulated drive package which is designed to automatically position and engage the bull gear rack. The arrangement eliminates the need for precision radial placement of the racks. The articulated drive is directly secured to the foundation thus eliminating high structural drive loads.

Option for Full Sky Coverage Tleescope

This option incorporates the addition of a full motion pedestal and drive system to the reflector assembly described in the previous section.

The elevation support towers will be incorporated into a rotatable pedestal on wheels which converts the basic transit telescope mount into a fully steerable azimuth mount.

The pedestal will rotate on multiple 4 wheel trucks. The trucks will roll on a flat hardened steel plate that is mounted on a thick concrete foundation. Horizontal forces are reacted by a central pintle bushing which takes only radial loads. Wind moments dead weight are transferred to earth via the wheels.

The azimuth drive will be comprised of multiple counter-torqued D.C. motors, controlled by a 93C-27 antenna control unit.

Azimuth positioning will be provided by a nineteen bit encoding unit that will be located directly on the AZ Axis of rotation.

Equipment room or rooms can be incorporated into the tower elevation supports. An optional elevator could be provided as access to the equipment room/elevation bearing area. A closed tubular tunnel connects the two towers at the elevation bearing level.