

S- and X-Band RF Feed System

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The S-X feed system proposed by the Communications Elements Research Section provides for simultaneous RF propagation from the 64-m antenna for both S- and X-band signals along the same boresight direction. This Section is charged with providing the hardware for the tri-cone system, which consists of an ellipsoid reflector over the S-band horn and a dichroic reflector plate over the X-band cone. The ellipsoid reflector focuses the S-band signal in front of the dichroic plate. The dichroic plate is capable of transmitting X-band signal through it and reflecting S-band. The dichroic plate, mounted in a position about 60 deg to the centerline of the X-band signal, then reflects the S-band signal coincident to the X-band signal. Preliminary hardware mounting schemes are outlined with probable operation requirements.

I. Introduction

To propagate S-band and X-band radio-frequency signals along the same boresight direction for the 64-m antenna, in a simultaneous propagation mode, two cone positions of the tri-cone system will be used. One position utilizes the S-band RF horn and the other, the X-band RF horn. As shown in Fig. 1, the X-band signals are transmitted with no change in their direction through the dichroic plate, which is placed over the X-band. An ellipsoid reflector placed over the S-band horn reflects and focuses the S-band signals in front of the dichroic plate equal distance to the X-band phase center below the plate. By positioning the angular position of the

dichroic plate correctly, the S-band signals are reflected in line with the X-band signals.

The hardware mounting scheme must provide for use of the individual horns in a normal manner by retraction mechanisms. The added mechanisms should be easily mountable and replaceable and, of course, withstand the environmental loads without affecting the performance.

II. Feasibility Study Results

The present plan for manufacturing the ellipsoid will be similar to that used for the existing subreflector. The reflector will consist of a stretch pressed sheet of per-

forated aluminum backed by formed Z-section framework. This will be connected to a stiff circular ring so that concentrated loads from the few attachment points will be possible.

A mechanism using tube-type links and speed-regulated air hoists provides for retraction alongside the feed cone to a minimum blockage position. To aid operations, remote controls will be needed with positive locks in each position, which are now provided by the linkage

system. Before the design is finalized, further checks for stiffness and strength to withstand the environmental loads will be needed.

The dichroic plate is now planned also to retract. This problem is more difficult, since the plate must be protected from moisture and dirt. In the operating position, a thin RF reflective plastic cover will be in position. Also, it is planned to keep a nitrogen gas environment around the dichroic plate with a very low pressure.

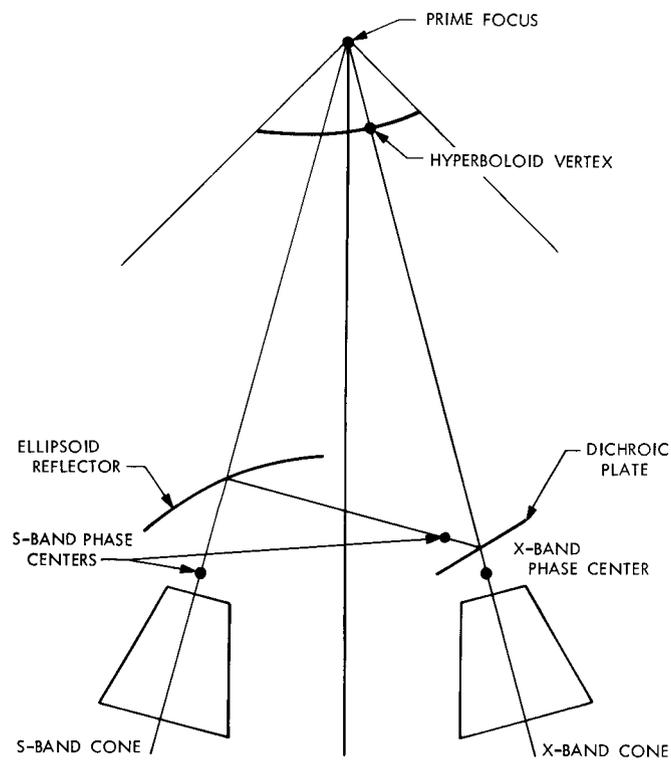


Fig. 1. S-X system on 64-m tri-cone antenna