SATELLITE RECEIVING SYSTEM

I. INTRODUCTION

This proposal describes [redacted] intercept system suitable for installation in a 20" diameter metal sphere and capable of withstanding the rigorous environment associated with accelerating into space and orbiting at a distance of approximately 500 miles above the earth. The system described consists of antennas, filters, and detector mounts to achieve reception of electromagnetic energy of any polarization, from any direction, in the two discrete bands: 550-620 mc and 810-920 mc.

II. ANTENNAS

In order to achieve a hemispherical antenna pattern responsive to all polarizations the outputs of 3 mutually perpendicular dipoles with a common phase center must be added. Since a 20" diameter sphere precludes dipoles approximately the same result can be achieved with 6 monopoles except for the phase center problem. However, since the system proposed is xtal video, each monopole output can be detected prior to combining and phase information loses significance.

The fact that two bands are specified implies that either diplexing filters are used with broadband-matched monopoles, or two sets of monopoles are utilized with separate band pass filters on each. The former alternative, although only requiring 6 monopoles, is far more complex because of the antenna matching networks and filters. The antenna system recommended in this proposal is, then, two sets of 6 mutually perpendicular monopoles, each set displaced by 45° from the other.

III. FILTERS

Since total system weight is of importance consideration was given to strip-line band pass filters. Although AEL has had a reasonable amount of experience with microwave filters the design and production of strip-line filters is not within our current direct experience and we anticipate sub-contracting this item.

The filter requirements were submitted to Dr. Seymour Cohn (Rantec Corp.) in view of his pre-eminence in fields of filter design and strip-line techniques. The response from Dr. Cohn recommended photo-etched rather than strip-line filters for the following reasons:

A strip-line filt[redacted]ess adaptable to compact packaging within a prescribed outline than ot[redacted]es. In addition, when designed for compactness, it is likely to have more insertion loss in the pass band for given sharpness of cut-off. However, once a photo-etched filter has been developed it can be produced more economically than other types.

The characteristics of the filters proposed by Dr. Cohn are listed below:

Filter #1

Pass Band:

Frequency Range:	550 to 620 mc.
Insertion Loss:	1 db maximum
VSWR:	1.50:1 maximum

Stop Band:

Frequency:	$\leq$ 500 mc. and $\geq$ 700 mc.
Insertion Loss:	40 db minimum

Size: 4" x 3-1/4" x 3/8" exclusive of connectors

Filter #2

Pass Band:

Frequency Range:	810 to 920 mc.
Insertion Loss:	1 db maximum
VSWR:	1.50:1 maximum

Stop Band:

Frequency:	$\leq$ 715 mc. and $\geq$1070 mc.
Insertion Loss:	40 db minimum

Size: 2-3/4" x 3-1/4" x 3/8" exclusive of connectors

The dimensions indicated do not include low pass filters required to suppress spurious responses. These responses occur at about three times the center frequencies. If low pass filters are to be included in the same package, either the length or width should be increased by one inch. In addition, if a cut-off slope greater than that stated is required, elements must be added which will increase the overall size.

CONTROL SYSTEMS JOINTLY

[redacted]

This proposal is predicated upon the filters indicated by the previous data and not on larger filters as indicated in the last paragraph. Should additional low pass sections be required, however, they can be incorporated.

IV. DETECTOR MOUNTS

Although AEL has a complete line of standard detector mounts the sensitivity required to insure proper system operation voids the standard broadband mounts. However, it is anticipated that a small amount of development work will be sufficient to produce matched detector mounts for the two bands with sensitivities approaching -60 dbm. The minimum anticipated sensitivity at any frequency in either band is -58 dbm.

V. SCHEDULE AND PROPOSED PROGRAM

It is anticipated that a 3 month development phase will be required to produce, evaluate, and test a prototype system mounted in a dummy 20" diameter metal sphere. Since AEL cannot fully evaluate the prototype for environmental requirements we propose bringing this unit to NRL for the latter tests.

After acceptance of the prototype we propose to deliver a complete set of components for 5 systems within a 2 month period.