meet desired antenna specifications in a subsector containing more surface area and therefore, on the average, more users. The "A" and "accm" columns are therefore called the "importance columns."

From the importance columns, it is seen that the right cone (all angles inside 45 degrees from the local vertical axis) comprises only ten percent of the surface area of the footprint! It is also seen that 50 percent of the area of the footprint occurs in the last 1.5 degrees of the idealized antenna pattern. Clearly, the circular lobe toward the horizon should be greatly emphasized in antenna design priority. The area in view directly below the satellite is relatively unimportant and requires relatively little gain in any case.

V. PTSE user antenna pattern

In order to produce the same table but in terms of user elevations at ground level, this formula is introduced el = 90 – arcsin[(Rs/S)•sin(b)] in which the desired result is always < 90.

Here, "A" and "accm" values refer to the amount of time that the satellite spends at the elevation in question as a percentage of total time above the horizon.

The satellite is seen spending less than ten percent of its time in view above 35 degrees elevation, and more than 55 percent below ten degrees. Also, most of the user antenna's gain should be concentrated within ten degrees of the horizon because greatest range to the satellite occurs at these elevations. Although the antenna needs to have some radiation above 35 degrees, it is not very important in terms of satellite access time and the gain does not need to be substantial or even near unity for adequate operation.

VI. Practical considerations

The "ideal" antenna pattern would not be so ideal in practice since the proposed satellite cannot be perfectly stabilized to an apparently stationary condition with respect to the earth. A torus shaped lobe extending toward the horizon must be at least ten or twenty degrees wide (in "a") so as to allow for attitude errors.

A separate command receiver antenna, and possibly a telemetry transmitting antenna should have some radiation in all directions so that before attitude stabilization, or in case of loss of stabilization, the spacecraft can receive and transmit to at least a well equipped com-

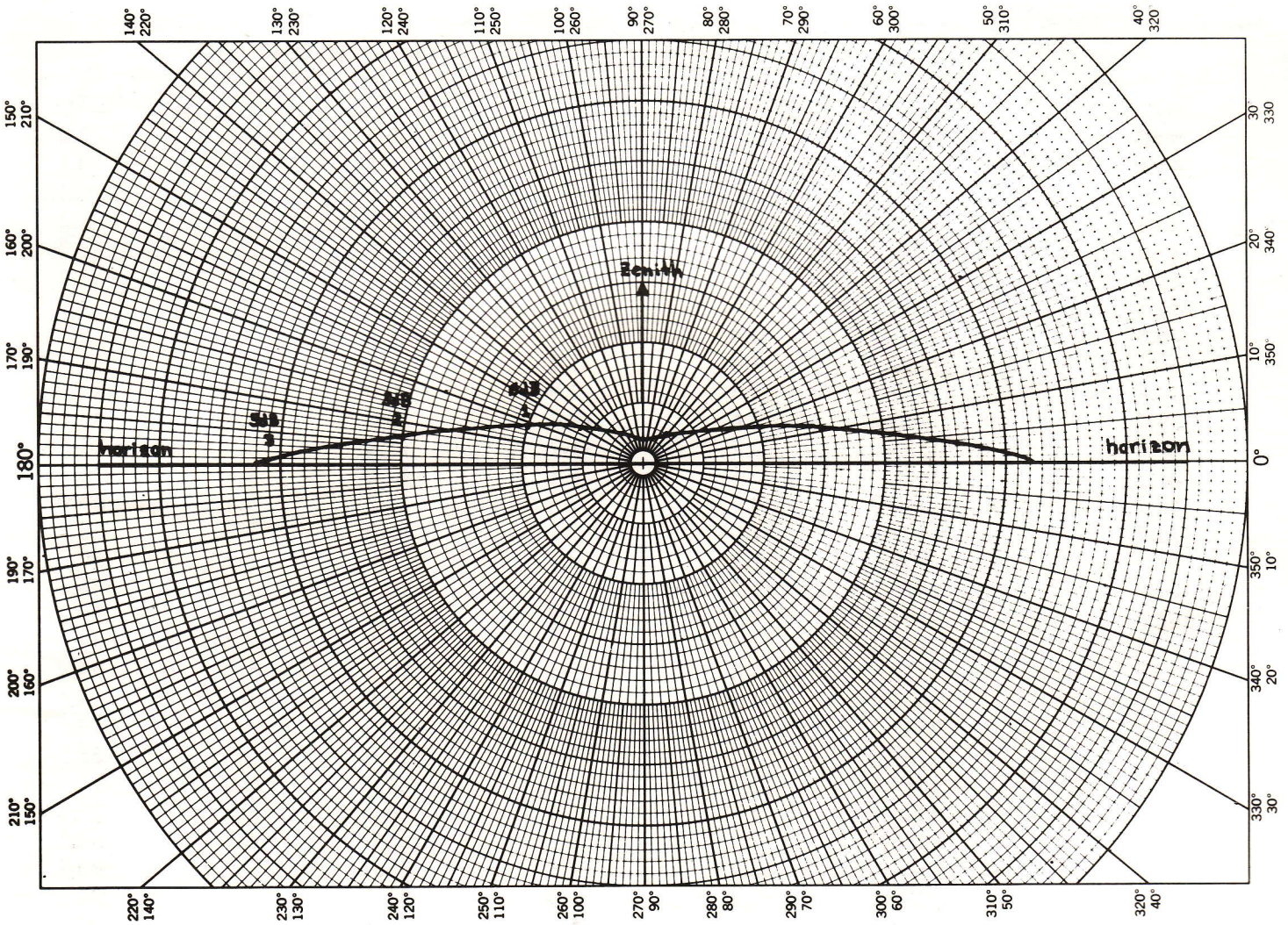

Figure 3: Cross-section of User Antenna Pattern.