A turnstile placed 3/8 wave above a ground plane has a pattern which is shown in Figure 6-27 B of the *Satellite Experimenters Handbook* (3rd printing, 1985) which matches PTSE user requirements closely if the main lobes can contain 5 dB gain. Notice that the ground plane itself should extend beyond the driven elements at least a half wave in each direction. This would be a problem at the satellite for a two meter antenna and could only be achieved marginally at 70 cm without radial extensions. Turnstiles are traditionally made from crossed dipoles. Some variation in the radiation pattern with azimuth will be present although it is likely to be acceptably small.

VIII. Conclusions

The requirement of a low earth orbiting satellite antenna to adequately cover all of its footprint at any time is clear. Whether the requirement corresponds to an antenna and satellite control situation that can actually be achieved with amateur radio resources is unknown. An adequate user antenna will be simple and inexpensive. Equipment that amateurs already have, not previously intended for satellite work, will in many cases be ample to the task of nominal network participation.

This paper does not attempt to report on construction or testing of an actual satellite antenna or spaceframe integration and testing. The intention here has been to consider satellite user requirements and stimulate physically meaningful goals for the forthcoming system design effort.

References

1. Duncan, C., "Power Budget and Eclipse Considerations for PTSE-H." *AMSAT-NA Technical Journal,* Volume 1, No. 1.

IX. Comments on the idealized pattern for other orbital altitudes

Tables for satellites at different altitudes were generated and studied. A few comments and comparisons may be of interest.

300 Km satellite altitude

The requirement for any gain overhead nearly vanishes; it is 16 dB below the power gain needed at the horizon. The area of importance is much sharper, 50% of the footprint area is concentrated between 71.8 and 72.8 degrees from vertical. The footprint contains less than half of the area of the 800 Km altitude footprint.

600 Km satellite altitude

This case is not practically different from the 800 Km pattern.

1500 Km satellite altitude

This case is also similar to 800 Km except that 50% of coverage is within a two degree slice of the antenna pattern. The total surface area in the footprint is 70% greater.

35,700 Km geosynchronus altitude

From this altitude, nearly half of the surface of the earth is covered. A 20 dB gain antenna boresite on the apparent center of the earth would provide adequate gain to all points visible. This case is easier to visualize considering the way that we normally perceive the earth as viewed from space.