providing updated information on coordinates and expected arrival times of each of the satellites, and data handling capabilities. The angular spread corresponding to the receiving dish size is about 0.6° and at the minimum distance from the satellite (2640 km) the spot size will be about 30 km. The satellites will utilize their magnetometers to turn on transmission at a specified magnetic field (corresponding to altitude) and begin transmission. The triggering magnetic field strength will be selected to allow for a ten minute transmission period symmetrically displaced around perigee.

Initial orbital coordinates will be known from the known position and velocity of the bus at the time of release of the satellite. We anticipate that since the release location and the location at transmission are both close to perigee, uncertainties in release position and velocity should have little effect on azimuth and elevation of the satellite near perigee. However, uncertainties in the magnitude of the satellite velocity can cause significant errors in the orbital period and therefore the time of satellite return. For the higher apogee orbits a 1m/s error in perigee velocity will cause a ten minute variation in period. On the initial orbits, acquisition will, therefore, require that the receiver wait for satellite arrival. For later orbits of the same satellite the period will have been measured and the anticipated arrival time will be known.

Details of the logistics of this acquisition process have not been worked out. However, each satellite will send an identifying signal during transmission. The satellite will be initially programmed to transmit its identifier continuously until it receives an instruction to proceed normally. This will also be used to return to identifier transmission if contact is lost or to shut itself off completely under appropriate conditions.

The receiving dish slew rate is in excess of 10°/s whereas the satellite will be moving overhead at less than 0.2°/s so that tracking should not be a problem. This also means that the dish should have sufficient agility to move from one satellite to another in times that are typically fractions of a minute. Additionally angular accelerations of the dish in excess of 15°/s$^2$ are possible in both angles. This would allow oscillating the beam at frequencies in the 1Hz range in order to detect more precisely the position of the satellite within the receiver spot size thus providing information for updating orbital parameters. If necessary this could also be used to scan for acquisition of the satellite.

## 7. Summary

A constellation mission capable of deploying hundreds of magnetometry nanosatellites in the magnetosphere has been studied. We find that such a mission appears to be feasible within the scope of the new NASA Solar-Terrestrial Probe line. While the challenges of implementing a constellation are largely new ones (e.g., developing queuing algorithms and data analysis tools for hundreds of satellite data streams), we are confident from our study that constellations are possible, even with today's technologies. The scientific values derived from these missions are great and therefore these concepts should continue to be pursued vigorously.

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