

ABSTRACT: Magnetospheric Constellation Design

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Satellite constellations provide the ideal system for simultaneous global in situ measurements of the magnetosphere. Requirements for a magnetospheric mission constellation may differ significantly from standard communications LEO constellations. For example, in order to provide measurements of the magnetosphere at various altitudes, elliptical orbits are required; whereas most communications LEO systems use circular orbits. A simple tutorial of the basic orbital design parameters and mission design trade space is provided to assist the scientist and mission designer considering a magnetospheric constellation mission. The role of sunsynchronous orbits, periodic orbits (those with repeating ground tracks), critically inclined orbits, and frozen orbits are described. Special requirements and considerations for magnetospheric missions are highlighted. Some methodology for the analysis of the constellation coverage along with performance metric are presented. This includes the "visual calculus" for coverage analysis and an ergodic estimate of satellite coverage which does not require orbit integration. A brief description of some of the better known analysis tool packages concludes this presentation.