SPACE COMMUNICATIONS AND NAVIGATION SYMPOSIUM (B2)
Advanced Systems (6)

Author: Dr. Hongyan Xu
China Academy of Space Technology (CAST), China, xhychina@gmail.com

STUDY ON INTER-SATELLITE-LINKS ESTABLISHMENT BETWEEN DIFFERENT ORBIT CONSTELLATIONS FOR MOBILE TELECOMMUNICATION

Abstract

Space-based telecommunication is focused on again by more people and governments due to the occurrence of unexpected catastrophes, such as earthquake and flood, etc. The snowstorm in south China and the Wenchuan earthquake have given a lesson that the ground-based public service and commonweal are still very weak and easy to be destroyed.

LEO satellite network is a very promising choice for space-based system. And one key constituent element is the inter-satellite links (ISL). ISL are always very important for global mobile telecommunication satellite system. Despite some spacecraft networks can also work without ISL, such as GlobalStar, ICO and other systems, which have to be assisted by many earth stations around the world at the same time. It's not very easy and inexpensive to build the stations globally. In addition, the dependence on so many earth stations will reduce the robustness of the space-based system' natural virtue, which cannot work well as usual in the occurrence of unexpected earthquake,flood and snowstorm, etc. While on the other hand the building of ISL will usually result in a more complex topology network and data management on satellite.

A space-based mobile telecommunication network is put forward with two orbit layers: one key network layer in higher orbit is in charge of the data transportation, exchange and management, the other access network layer performs local exchange in lower orbit. The comparison is carried out between the Iridium system with ISL and a 48 LEO satellite constellation without intra-orbit ISL, inter-orbit ISL but with Inter-Layer ISL to a GEO satellite network. And the capacity of the two systems are nearly equal, but the latter network with the Inter-Layer ISL is much simpler and the feed link of the GEO satellite can work with much heavier load, it can also work well when the LEO constellation is not complete or partly destroyed or out of service. And the LEO satellite needs fewer antennae than the Iridium satellite despite the time delay is bigger transferred by the Inter-Layer ISL. Another

So a LEO satellite network is a good choice for mobile telecommunication with Inter-Layer ISL to the GEO satellite network.