

Search for Stable Decommission Orbits for SXM HIEO Satellites

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ABSTRACT

The SiriusXM Satellite Radio's HIEO (Highly Inclined Eccentric Orbit) constellation consists of three GEO synchronous satellites at inclinations close to 63 degrees. SiriusXM provides S-band radio service to North America and chose these orbits to provide elevated look angles for the radio receivers. Each satellite's orbit is separated by 120 degrees in RAAN (Right Ascension of Ascending Node). The three satellites are highly eccentric with eccentricity close to 0.27 which results in apogee altitudes that are about 10,000 km above GEO altitude and the perigees that are about 10,000 km below the GEO altitude. In preparing for the end-of-life operations of the satellites we have studied various possible orbit geometries as options for disposal orbits. One of our objectives is to find a stable disposal orbit without entering the orbit regions of active GEO and MEO satellites to minimize the risks of conjunctions with active satellites. We are also looking for fuel optimal orbit geometry in order to maximize the useful operation life of the HIEO satellites. Because of the high inclination and the high altitude the satellites are influenced by the luni-solar resonance effects which limit the choices of the stable decommission orbit geometry. We will briefly describe the operations of the HIEO satellites and present the results of our studies and our conclusions.