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IONOSPHERE OBSERVATION AND 3D MAPPING MISSION VIA CUBESAT CONSTELLATION;
IN-ORBIT OPERATION RESULTS OF THE SPATIUM-I CUBESAT.

Abstract

This paper will describe the progress in the SPATIUM satellite project, developed to do the global three-dimensional ionosphere mapping via CubeSat constellation equipped with an atomic clock and will show the result of the on-orbit operation of about 1 year of the first path-finder satellite SPATIUM-I. The SPATIUM-I satellite, launched in October 2018, validated the key technologies that are based on the clock-signal phase-shift sent from the satellite carried Chip-Scale Atomic Clock (CSAC). The satellite did the on-orbit demonstration of Chip Scale Atomic Clock (CSAC) as well as the evaluation of the signal time delay due to ionosphere and atmosphere. SPATIUM-I satellite on-orbit operation results will be presented. Knowing the precise satellite location and the signal delay from each satellite that transmits the signal with two UHF frequencies, by solving the inverse problem we can derive the ionosphere density and atmosphere water vapor. This data can be used to improve the accuracy of the earth and space weather forecast. This concept will then be implemented for the evaluation of Ionosphere Observation and Ionosphere 3D mapping via SPATIUM-II and SPATIUM-III projects. The SPATIUM project is under development by the Laboratory of Spacecraft Environmental Interaction Engineering (LaSEINE) of Kyushu Institute of Technology in collaboration with Nanyang Technological University, Singapore.