Abstract

Satellite formation flying is an essential capability for many space missions that allow several closely spaced smaller satellites to be deployed. Depending on mission requirements, the ground receive station may carry several antennas and receive signal from each of the satellites in order to increase spectral efficiency and Quality of Service (QoS). In this paper, we propose an improved cluster based distributed MIMO channel model based on MIMO models for terrestrial communications in the WINNER/3GPP project for satellite formation flying systems. Monte Carlo simulations were also performed to evaluate the performance of formation flying satellite systems with different configurations using the proposed spatial channel model and comparisons were made with the single satellite-single receive station system using capacity ratio and capacity difference as metrics. Our results show the effects of several factors such as type of formation, number of satellites, number of receive antennas, and SNR on capacity for the single satellite and multi-satellite systems.

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